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# Introduction

- Axial piston pumps with swash plate design for reliable operation and long life.
- Rotating and pressure loaded parts are pressure balanced.
- Wide range of available integrated charge and pilot pressure pump combinations
- Oversize shaft and shaft bearings.
- Standard available transmission circuits with integrated valves and filters to build complete closed loop system. For charge flow and flushing.
- Through drive enable multiple pump installation from a single shaft. Multiple pump combinations are also available.
- Pressure up to 420 bar. Rated speed up to 1800 rpm. Higher speeds possible.
- Large charge flow rates for low system temperature.
- Fast response times.

#### Available displacement sizes

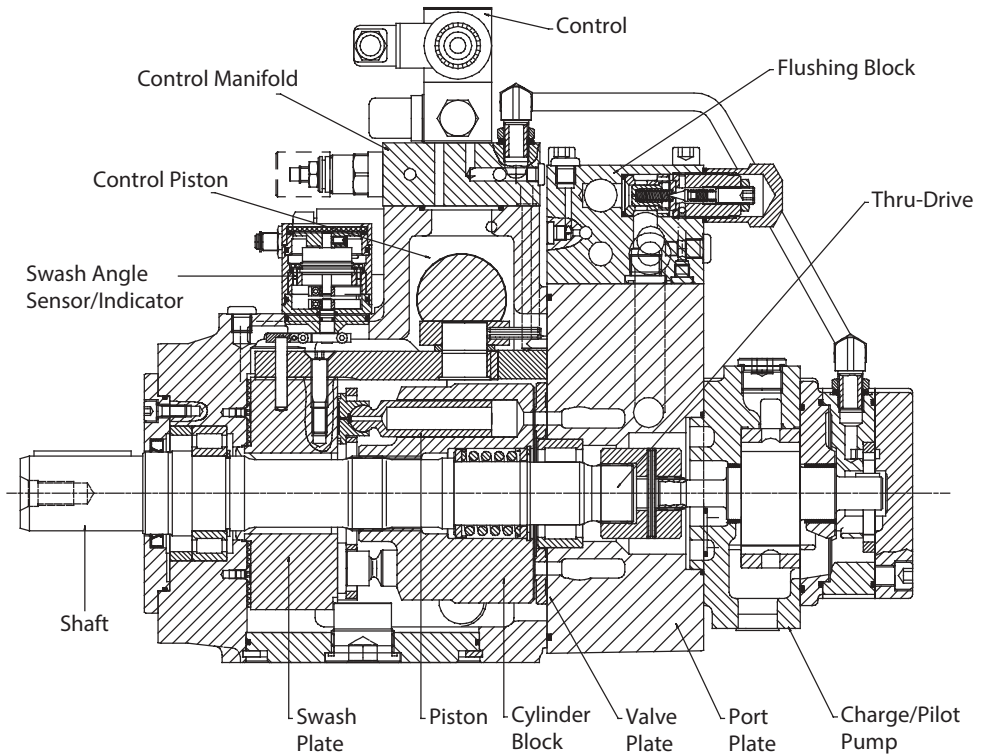
130 ccm
180 ccm
250 ccm
360 ccm
500 ccm
750 ccm

### Displacement controls:

- SP** - Displacement proportional to electric signal
- DP** - Displacement proportional to pressure signal
- ES** - Electric motor displacement control

Extra functions available for SP, & DP: Pressure Limitation and/or power control overriding function.

### Typical Section of Transmission Pump



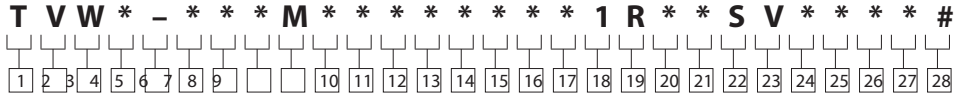
#### Note

Dimensional information listed in this catalog is subject to change without notice.

# Model Code

Closed Circuit Pumps  
W Series - Basic Pumps

- Preferred standard option
- Other standard option
- Special option on request
- X Not available



	Pump Size	130	180	250	360	500	750
<b>1 Pump</b>							
<b>T</b> - Transmission pump		●	●	●	●	●	●
<b>2 Displacement</b>							
<b>V</b> - Variable		●	●	●	●	●	●
<b>3 Pump Series</b>							
<b>W</b> - „W“ series		●	●	●	●	●	●
<b>4 Configuration</b>							
<b>S</b> - Single unit		●	●	●	●	●	●
<b>F</b> - Front unit		○	○	○	○	○	○
<b>M</b> - Middle unit		○	○	○	○	○	○
<b>R</b> - Rear unit		○	○	○	○	○	○
<b>5 Separator</b>		●	●	●	●	●	●
<b>6 7 8 Displacement cm<sup>3</sup>/rev (in<sup>3</sup>/rev)</b>							
<b>130</b> - 130 cm <sup>3</sup> /rev (8 in <sup>3</sup> /rev)		●	X	X	X	X	X
<b>180</b> - 180 cm <sup>3</sup> /rev (11 in <sup>3</sup> /rev)		X	●	X	X	X	X
<b>250</b> - 250 cm <sup>3</sup> /rev (15.3 in <sup>3</sup> /rev)		X	X	●	X	X	X
<b>360</b> - 360 cm <sup>3</sup> /rev (22.0 in <sup>3</sup> /rev)		X	X	X	●	X	X
<b>500</b> - 500 cm <sup>3</sup> /rev (30.5 in <sup>3</sup> /rev)		X	X	X	X	●	X
<b>750</b> - 750 cm <sup>3</sup> /rev (45.8 in <sup>3</sup> /rev)		X	X	X	X	X	●
<b>9 Basic Standard</b>							
<b>M</b> - Metric		●	●	●	●	●	●
<b>10 11 Mounting Flange</b>							
<b>05</b> - ISO 3019/2-160B4HW		●	●	X	X	X	X
<b>07</b> - ISO 3019/2-200B4HW		X	X	●	●	X	X
<b>08</b> - ISO 3019/2 8 bolt metric		X	X	X	X	●	X
<b>0D</b> - SAE D 4-hole flange		○	○	X	X	X	X
<b>0E</b> - SAE E 4-hole flange		X	X	○	○	X	X
<b>0F</b> - SAE F 4-hole flange		X	X	○	○	X	X
<b>12 Rotation</b>							
<b>R</b> - Clockwise		●	●	●	●	●	●
<b>L</b> - Counter-clockwise		○	○	○	○	○	○
<b>13 Maximum Displacement Screws</b>							
<b>0</b> - Displacement adjusting screw							
With control DP/SP/		X	X	●	●	●	X
With control DP or SP + DF		X	X	●	●	●	X
With control DP or SP (+ DF) + LR/ES		X	X	X	X	X	X
<b>4</b> - Fixed mechanical stop ring side A		○	○	○	○	○	○
<b>5</b> - Fixed mechanical stop ring side B		○	○	○	○	○	○
<b>6</b> - Fixed mech. stop ring sides A & B		○	○	○	○	○	○
<b>Note:</b> Customer adjustment required							
<b>4</b> used as max. volume adjustment side A							
<b>5</b> used as min. volume stop side A							
<b>14 15 Thru-Drive Options</b>							
<b>16 17</b>							
<b>00TP</b> - None		●	●	●	●	●	●
<b>0000</b> - None		●	●	●	●	●	●
<b>000A</b> - SAE A		○	○	○	○	○	○
<b>000B</b> - SAE B		○	○	○	○	○	○
<b>000C</b> - SAE C		○	○	○	○	○	○
<b>000P</b> - Pilot pump		○	○	○	○	○	○
<b>0*</b> - * assigned by Engineering		○	○	○	○	○	○

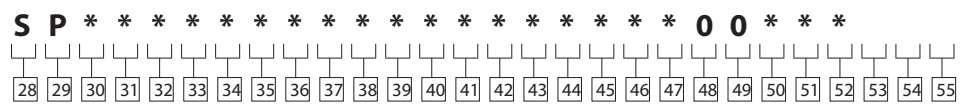
	Pump Size	130	180	250	360	500	750
<b>18 Main Ports</b>							
<b>1</b> - SAE ports - Metric bolts		●	●	●	●	●	●
<b>19 Main Port Orientation</b>							
<b>R</b> - Radial (side ports)		●	●	●	●	●	●
<b>20 Main Drive Shaft End</b>							
<b>21</b>							
<b>01</b> - ISO straight key		●	●	●	●	●	X
<b>02</b> - ISO splines		●	●	●	●	●	●
<b>05</b> - ISO special splines		○	○	○	○	○	X
<b>D1</b> - SAE D keyed 3/4"		○	○	X	X	X	X
<b>D2</b> - SAE D splined 8/16 13T		○	○	X	X	X	X
<b>E2</b> - SAE E splined 8/16 13T		X	X	○	○	X	X
<b>F2</b> - SAE F splines 8/16 15T		X	X	○	○	X	X
<b>22 Drive Shaft Seal Configuration</b>							
<b>S</b> - Single shaft seal		●	●	●	●	●	●
<b>23 Seal Material</b>							
<b>V</b> - FKM		●	●	●	●	●	●
<b>F</b> - FKM + front bearing flushing prepared		○	○	○	○	○	○
<b>K</b> - FKM with HP lubrication		○	○	○	○	○	○
<b>24 Yoke Position Indicator</b>							
<b>0</b> - No position indicator		○	○	○	○	○	○
<b>V</b> - Visual indicator		●	●	●	●	●	●
<b>P</b> - Voltage indicator		○	○	○	○	○	○
<b>M</b> - Voltage + visual indicator		○	○	○	○	●	●
<b>R</b> - Current indicator		○	○	○	○	○	○
<b>S</b> - Current + visual indicator		○	○	○	○	○	○
<b>L</b> - current + visual indicator (new design)		●	●	●	●	X	X
Other options on request.							
<b>25 Surface Coating</b>							
<b>A</b> - Primer blue		●	●	●	●	●	●
<b>0</b> - Rust inhibitor oil		○	○	○	○	○	○
▼ Other finishes on request.							
<b>26 Transmission circuit</b>							
<b>0</b> - No trans. circuit (with interface closed by plate)		●	●	●	●	●	●
<b>1</b> - with trans. circuit, filter visual ind., with HP relief		●	●	●	●	●	X
<b>2</b> - with trans. circuit, filter Elec.ind., with HP relief		●	●	●	●	●	X
<b>3</b> - with trans. circuit, without filter, with HP relief		●	●	●	●	●	●
<b>4</b> - with 2nd B-port, no trans. circuit, (interface closed by plate)		X	X	X	X	●	●
<b>5</b> - with 2nd B-port, transm.block, filter electr.ind, no HP relief,		X	X	X	X	●	●
<b>6</b> - with 2nd B-port, transm.block, no filter, no HP relief,		X	X	X	X	●	●
<b>7</b> - with 2nd B-port, transm.block, filter electr.ind, with HP relief,		X	X	X	X	●	●
<b>8</b> - with 2nd B-port, transm.block, no filter, with HP relief,		X	X	X	X	●	●
<b>27 Zero Position valve</b>							
<b>0</b> - No Zero Position valve		●	●	●	●	●	●
<b>A</b> - with Zero Position valve		○	○	○	○	○	○

# Model Code

- Preferred standard option
- Other standard option
- Special option on request
- X Not available

Closed Circuit Pumps  
**W Series -SP Control**

**[22] = P, M, R, S or L** mandatory  
 (electrical yoke position indicator)



	Pump Size	130	180	250	360	500	750
<b>[28] [29] Control Type</b>							
<b>SP</b> – Displacement adjustment via proportional valve		●	●	●	●	●	●
<b>[30] Displacement Adjustment Options</b>							
<b>A</b> – CETOP 3 interface only		○	○	○	○	○	○
<b>B</b> – CETOP 5 interface only		○	○	○	○	○	○
<b>C</b> – CETOP 3 proportional valve KDG4V-3		●	●	●	●	●	●
<b>D</b> – CETOP 3 proportional valve KBSDG4V-3 with OBE		○	○	○	○	○	○
<b>E</b> – CETOP 5 proportional valve KBSDG4V-5 with OBE		X	X	○	○	○	○
<b>G</b> – CETOP 3 – KBS2		○	○	○	○	○	○
<b>H</b> – CETOP 5 - KBS2		○	○	○	○	○	○
<b>[31] [32] Electronic Amplifier Control</b>							
<b>03</b> – ER 9.3-10 <sup>▲</sup>		●	●	●	●	●	●
<b>00</b> – No amplifier card		○	○	○	○	○	○
▲ Amplifier card required for <b>[26] = C, D, E</b>							
<b>[33] Yoke Displacement Zone</b>							
<b>A</b> – Single side of centre “A”		○	○	○	○	○	○
<b>C</b> – Over Center		●	●	●	●	●	●
<b>[34] Additional Functions</b>							
<b>0</b> – Not required for this control type		○	○	○	○	○	○
<b>1</b> – Pressure limiter overriding function side A		○	○	○	○	○	○
<b>2</b> – Pressure limiter overriding function side B		○	○	○	○	○	○
<b>3</b> – Pressure limiter overriding function side A and B		●	●	●	●	●	●
<b>4</b> – Pressure limiter and power control overriding function side A		○	○	○	○	○	○
<b>5</b> – Pressure limiter and power control overriding function side B		○	○	○	○	○	○
<b>6</b> – Pressure limiter and power control overriding function side A and B		○	○	○	○	○	○
<b>7</b> – Pressure limiter function side A and B power control function side A		○	○	○	○	○	○
<b>8</b> – Pressure limiter function side A and B power control function side B		○	○	○	○	○	○
<b>[35] Pressure Control Options</b>							
<b>0</b> – Standard screw adjustment		●	●	●	●	●	●
<b>F</b> – Remote port, only side A		○	○	○	○	○	○
<b>G</b> – Remote port, only side B		○	○	○	○	○	○
<b>H</b> – Remote port, only side A and B		○	○	○	○	○	○
<b>A</b> – Electro Proportional Relief Valve Side A		○	○	○	○	○	○
<b>B</b> – Electro Proportional Relief Valve Side B		○	○	○	○	○	○
<b>K</b> – Electro Proportional Relief Valve Side A and B		○	○	○	○	○	○
<b>[36] [37] [38] [39] [40] [41] Power Control Specification</b>							
<b>??000</b> – ??? kW at 1500 RPM Side A							
<b>000???</b> – ??? kW at 1500 RPM Side B							
Note : If no power limiter override: 000 000”							
	Pump Size	130	180	250	360	500	750

	Pump Size	130	180	250	360	500	750
<b>[42] Pilot Oil Filter</b>							
<b>0</b> – None		○	○	○	○	○	○
<b>V</b> – Filter with visual indicator		○	○	○	○	○	○
<b>E</b> – Filter with electrical indicator		●	●	●	●	●	●
<b>[43] Fail Safe Valve</b>							
<b>0</b> – Not applicable		●	●	●	●	●	●
<b>1</b> – with solenoid valve		○	○	○	○	○	○
<b>[44] Position Monitoring</b>							
<b>0</b> – Not applicable		●	●	●	●	●	●
<b>[45] Electric Motor Type</b>							
<b>0</b> – Not applicable		●	●	●	●	●	●
<b>[46] Control Voltage of Fail Safe Valve</b>							
<b>0</b> – Not applicable		●	●	●	●	●	●
<b>B</b> – 110 AC 50 Hz/120 AC 60 Hz		○	○	○	○	○	○
<b>D</b> – 220 AC 50 Hz/240 AC 60 Hz		○	○	○	○	○	○
<b>G</b> – 12 VDC		○	○	○	○	○	○
<b>H</b> – 24 VDC		●	●	●	●	●	●
<b>[47] [48] [49] [50] Customer Adjustment Specification</b>							
<b>0000</b> – None		●	●	●	●	●	●
<b>****</b> – Danfoss assigned number as per data specified in table below ◊		○	○	○	○	○	○
<b>[51] [52] [53] Special Features</b>							
<b>000</b> – None		●	●	●	●	●	●
<b>***</b> – Defined by Danfoss		○	○	○	○	○	○
<b>[54] [55] Design Number</b>							
<b>**</b> – 10-99 assigned by Danfoss		●	●	●	●	●	●
	Pump Size	130	180	250	360	500	750

◊ **Example for Customer Adjustment Specifications**

Special Pressure Adjustment	Main Stage Pressure Control	Pilot Valve Pressure Control
Standard setting (bar)	20	90
Max. setting (bar)	40	350
Customer-specified adjustment (bar)	.....	.....

Special Max. Displ. Adjustment	Minimum Displacement	Maximum Displacement
Standard	0 cm <sup>3</sup> /rev	100%
Customer-specified adjustment (cm <sup>3</sup> /rev)	.....	.....

**Note:** Special pressure adjustments and/or maximum displacement adjustments are the most common reasons for using this option.



# Model Code

- Preferred standard option
- Other standard option
- Special option on request
- X Not available

Open Loop Pumps

W Series -ES Control

Available to special order only

**E S \* 0 0 \* 0 0 0 0 0 0 0 0 0 0 \* \* \* \* \* \* \* \* #**  

28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52

		Pump Size					
		130	180	250	360	500	750
<span style="border: 1px solid black; padding: 2px;">28</span>	<b>Control Type</b>						
<span style="border: 1px solid black; padding: 2px;">29</span>	<b>ES</b> – Electric motor displacement control	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">30</span>	<b>Displacement Adjustment Options</b>						
<span style="border: 1px solid black; padding: 2px;">M</span>	– Electric motor, fast response	○	○	○	○	○	○
<span style="border: 1px solid black; padding: 2px;">N</span>	– Electric motor, medium response	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">P</span>	– Electric motor, slow response	○	○	○	○	○	○
	Note: for response times for different options see below table with standard values (response times may vary, depending on design and size of pump – final definition on request)						
<span style="border: 1px solid black; padding: 2px;">31</span>	<b>Control Electronics</b>						
<span style="border: 1px solid black; padding: 2px;">32</span>	<b>00</b> – Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">33</span>	<b>Yoke Displacement Zone</b>						
<span style="border: 1px solid black; padding: 2px;">A</span>	– Single side of centre “A”	○	○	○	○	○	○
<span style="border: 1px solid black; padding: 2px;">C</span>	– Over center	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">34</span>	<b>Additional Functions</b>						
<span style="border: 1px solid black; padding: 2px;">0</span>	– Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">35</span>	<b>Pressure Control Options</b>						
<span style="border: 1px solid black; padding: 2px;">0</span>	– Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">36</span> <span style="border: 1px solid black; padding: 2px;">37</span> <span style="border: 1px solid black; padding: 2px;">38</span>	<b>Power Control Specification</b>						
<span style="border: 1px solid black; padding: 2px;">39</span> <span style="border: 1px solid black; padding: 2px;">40</span> <span style="border: 1px solid black; padding: 2px;">41</span>	<b>000000</b> – Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">42</span>	<b>Pilot Oil Filter</b>						
<span style="border: 1px solid black; padding: 2px;">0</span>	– Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">43</span>	<b>Fail Safe Valve</b>						
<span style="border: 1px solid black; padding: 2px;">0</span>	– Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">44</span>	<b>Position Monitoring</b>						
<span style="border: 1px solid black; padding: 2px;">A</span>	– 4 limit switches	○	○	○	○	○	○
<span style="border: 1px solid black; padding: 2px;">B</span>	– 8 limit switches	○	○	○	○	○	○
<span style="border: 1px solid black; padding: 2px;">P</span>	– 4 limit switches + sensor	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">T</span>	– 8 limit switches + sensor	○	○	○	○	○	○
<span style="border: 1px solid black; padding: 2px;">45</span>	<b>Electric Motor Type</b>						
<span style="border: 1px solid black; padding: 2px;">2</span>	– Motor with brake (IP54)	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">3</span>	– Motor without brake (explosion-proof)	○	○	○	○	○	○
	<b>Pump Size</b>	<b>130</b>	<b>180</b>	<b>250</b>	<b>360</b>	<b>500</b>	<b>750</b>

		Pump Size					
		130	180	250	360	500	750
<span style="border: 1px solid black; padding: 2px;">46</span>	<b>Control Voltage of Zero Position Valve and Directional Control Valve</b>						
<span style="border: 1px solid black; padding: 2px;">0</span>	– Not applicable	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">47</span> <span style="border: 1px solid black; padding: 2px;">48</span>	<b>Customer Adjustment Specification</b>						
<span style="border: 1px solid black; padding: 2px;">49</span> <span style="border: 1px solid black; padding: 2px;">50</span>	<b>0000</b> – None	●	●	●	●	●	●
	<b>????</b> – Yes (final number will be assigned by Danfoss. Specify on table below)	○	○	○	○	○	○
<span style="border: 1px solid black; padding: 2px;">51</span>	<b>Special Features</b>						
<span style="border: 1px solid black; padding: 2px;">000</span>	– None	●	●	●	●	●	●
<span style="border: 1px solid black; padding: 2px;">***</span>	– Defined by Danfoss	○	○	○	○	○	○
	<b>Pump Size</b>	<b>130</b>	<b>180</b>	<b>250</b>	<b>360</b>	<b>500</b>	<b>750</b>

◇ **Example for Customer Adjustment Specifications**

	Minimum Displacement	Maximum Displacement
<b>Special Maximum Displacement Adjustment</b>	0 cm <sup>3</sup> /rev	100%
Standard		
Customer-specified adjustment (cm <sup>3</sup> /rev)		
	.....	.....

**Note:** Special response times and/or maximum displacement adjustments are the most common reasons for using this option.

**Note:** ES control is a non-preferred, but available control type. Please contact Hydrokraft Technical Support for detailed specification

**Standard values**

Size	130		180		250		360		500		750	
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
Fast	10	8	10	8	8	7	11	9	10	8	14	12
Medium	20	17	20	17	20	17	27	23	24	20	35	29
Slow	50	42	50	42	40	33	55	47	50	42	70	58

Numbers show approximate adjustment times from 0-100% displacement ( and vice versa ) in seconds.







# Pump Specifications

Metric

Model	TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750		
Design	Swashplate – Axial piston pump						
Type of mounting	Flange or foot-mounted - Combination units foot mounted only						
Pipe connection ISO 6162-1 (SAE J518)B SAE Flange ISO 6162-2 (SAE J518) A	psi	P64M (2 1/2" - 500) P32M (1 1/4" - 6000)	P89M (3 1/2" - 500) P32M (1 1/4" - 6000)	P89M (3 1/2" - 500) P32M (1 1/4" - 6000)	P127M (5" - 500) P51M (2" - 6000)	P127M (5" - 500) P51M (2" - 6000)	
Direction of rotation	Clockwise or counterclockwise						
		130/180	250	360	500	750	
	max. speedrpm	1800	1800	1800	1800	1500	
	min. speedrpm	150	150	150	150	150	
Mounting attitude	Optional, see relevant Dimensions page						
Ambient temperature range	min max	°C -20 +50					
Mass	m	kg	130 / 140	212	220	340	395
Moment of inertia	J	kg m <sup>2</sup>	0,045	0,146	0,152	0,5	0,55

Note: higher / lower speed values possible depending on application conditions , contact Hydrokraft Technical Support

Mass values are estimated values, final data depending on design options

Hydraulic Characteristics	TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750		
Rated pressure (100% duty cycle)	p <sub>N</sub>	bar	350				
Peak Pressure at outlet port as per ISO 5598-2008	p <sub>2max</sub>	bar	420				
Hydraulic fluid	Hydraulic oil to DIN 51524 part 2 See Fluid Recommendations in Application Data						
Hydraulic fluid temperature range	min max	°C	-25 +90				
Viscosity range for continuous operation	min max	cSt	10 75				
Maximum permissible start viscosity	max	cSt	1000				
<i>Note: with pressure below 100 bar and flow below 25% of max. flow, max. 15 min</i>							
Cleanliness	ISO 4406		18/15/13				
Maximum geometric displacement at shaft speed n = 1200 rev/min n = 1500 rev/min n = 1800 rev/min	V <sub>g</sub>	cm <sup>3</sup> / rev	130 / 180 130 / 180 130 / 180	250 250 250	360 360 270	500 500 500	750 750 625
Max Case pressure (overpressure) n = 1200 rev/min n = 1500 rev/min n = 1800 rev/min	p <sub>case</sub>	bar	3,2 2,6 2,0	2,8 2,2 1,6	2,8 2,2 1,6	2,35 1,85 1,35	2,1 1,7 -

Drive	TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750		
Driving torque (p 350 bar, V <sub>g</sub> at 1500 rev/min, η = 100%)	M <sub>1single</sub>	Nm	724/1002	1392	2005	2785	3481/4177
Power consumption (p 350 bar, V <sub>g</sub> at 1500 rev/min, η = 100%)	P <sub>1single</sub>	kW	113 / 157	218	315	437	546/656
Combination Units	TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750		
Maximum driving torque ISO splined shaft only	M1	Nm	2x870/2x1204	2 x 1670	2 x 2405	5000	5000

# Pump Specifications

US

Model			TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750
Design	Swashplate – Axial piston pump						
Type of mounting	Flange or foot-mounted - Combination units foot mounted only						
Pipe connection ISO 6162-1 (SAE J518) B	psi		P64M (2½" - 500)	P89M (3½" - 500)	P89M (3½" - 500)	P127M (5" - 500)	P127M (5" - 500)
SAE Flange ISO 6162-2 (SAE J518) A			P32M (1¼" - 6000)	P32M (1¼" - 6000)	P32M (1¼" - 6000)	P51M (2" - 6000)	P51M (2" - 6000)
Direction of rotation	Clockwise or counterclockwise						
			130/180	250	360	500	750
	max. speed	rpm	1800	1800	1800	1800	1500
	min. speed	rpm	150	150	150	150	150
Mounting attitude	Optional, see relevant Dimensions page						
Ambient temperature range	min	°F	-4				
	max		+122				
Mass	m	lb	215	467	485	750	871
Moment of inertia	J	lb ft²	3.46	3.46	3.61	11.9	13.1

Note: higher / lower speed values possible depending on application conditions, contact Hydrokraft Technical Support

Mass values are estimated values, final data depending on design options

Hydraulic Characteristics			TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750
Rated pressure (100% duty cycle)	$p_N$	psi	5075				
Peak Pressure at outlet port as per ISO 5598-2008	$p_{2max}$	psi	6090				
Hydraulic fluid	Hydraulic oil to DIN 51524 part 2 See Fluid Recommendations in Application Data						
Hydraulic fluid temperature range	min	°F	-13				
	max		+194				
Viscosity range for continuous operation	min	cSt	10				
	max		75				
Maximum permissible start viscosity	max	cSt	1000				

Note: max. start viscosity only with pressure below 100 bar and flow below 25% of max. flow, max. 15 min

Cleanliness	ISO 4406	18/15/13					
Maximum geometric displacement at shaft speed	$V_g$	in³/rev	7.9 / 11	15.2	22	30.5	45.7
			n = 1200 rev/min	7.9 / 11	15.2	22	30.5
			n = 1500 rev/min	7.9 / 11	15.2	16.4	30.5
			n = 1800 rev/min	7.9 / 11	15.2	16.4	38.1
Case pressure (overpressure)	$p_{case}$	psi	46	40	40	34	30
			n = 1200 rev/min	38	32	32	27
			n = 1500 rev/min	29	23	23	20
			n = 1800 rev/min				–

Drive			TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750
Driving torque ( $p=5075$ psi, $V_g$ at 1500 rev/min, $\eta=100\%$ )	$M_{1single}$	lbf ft	534/739	1027	1479	2054	2567/3081
Power consumption ( $p=5075$ psi, $V_g$ at 1500 rev/min, $\eta=100\%$ )	$P_{1single}$	hp	152/211	293	422	586	733/880
Combination Units			TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750
Maximum driving torque ISO splined shaft only	M1	lbf ft	2x642/2x888	2 x 1232	2 x 1774	3688	3688

# Pump Specifications

Metric & US – All sizes

## Standard values for charge and pilot pumps:

### 1. Displacements

Model		TVW 130	TVW 180	TVW 250	TVW 360	TVW 500	TVW 750
Displacement charge pump	Vg cm <sup>3</sup> /rev	40	40	64	80	125	200
	Vg in <sup>3</sup> /rev	2.44	2.44	3.91	4.88	7.63	12.2
Displacement pilot pump	Vg cm <sup>3</sup> /rev	ca. 8...11 ( depending on design status )					
	Vg in <sup>3</sup> /rev	ca. 0.5...0.7 ( depending on design status )					

### 2. Pressure

#### 2a. Pressure values for normal operation conditions

	TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750
charge[bar]:	20	22	22	24	26
purge[bar]:	12	14	14	16	18
charge [psi]	290	320	320	350	375
purge [psi]	175	205	205	235	260

#### 2b. Pressure values for extended operation conditions (for higher speed and very fast up/downstroke times )

	TVW 130/180	TVW 250	TVW 360	TVW 500	TVW 750
charge[bar]:	24	28	28	30	32
purge[bar]:	16	20	20	22	24
charge [psi]	350	405	405	435	465
purge [psi]	235	290	290	320	350

Note:

- size and design of charge and pilot may change depending on design status
- short up / downstroke times will require larger pilot pump and higher pilot pressure ( and/or accumulator )
- for applications with risk of drop down of charge pressure ( e.g. in return line by blocking of an actuator driven by pilot ) ( motor an accumulator should be connected to transmission block ( port PAC 2 )

System oil viscosity 20-40cSt is recommended for optimal volumetric efficiency . case flushing oil viscosity between 40-50cSt is recommended for optimal bearing life and mechanical efficiency

Min . load pressure is depending on operation and application . Contact Hydrokraft Technical Support in case of critical conditions ( high speed, very fast up/downstroke time )

Higher speed – especially for smaller sizes – is possible depending on operation conditions( be aware that lifetime of bearings will decrease with higher speed ) . For details please contact Hydrokraft Technical Support .

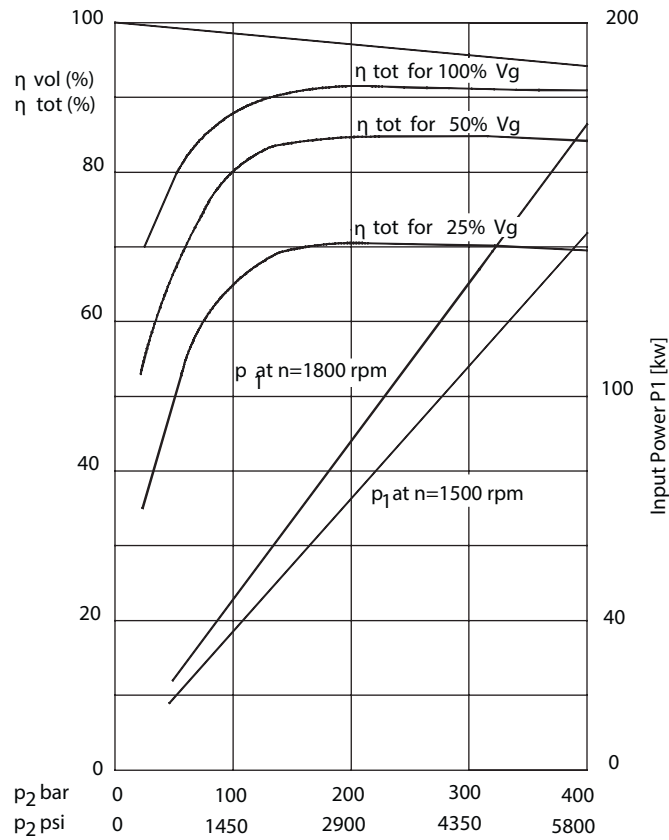
Lifetime of shaft seal is depending on shaft speed of the pump, fluid, case drain pressure and others . It is recommended that the average, continuous case drain pressure acc . Technical data shown above should not be exceeded (maximum permissible case pressure 4 bar absolute at min . speed) Short pressure peaks ( < 0,1 sec ) of up to 5 bar absolute are permitted . The lifetime of shaft seal will be negatively influenced by increase of frequency of pressure peaks . Case pressure must always be equal to or greater than the outside pressure to shaft seal .

All technical data above are general values and/or guidelines; restriction may be necessary under certain opening conditions . Please be aware that pump cannot always be operated at all limits of operation conditions shown above at the same time .

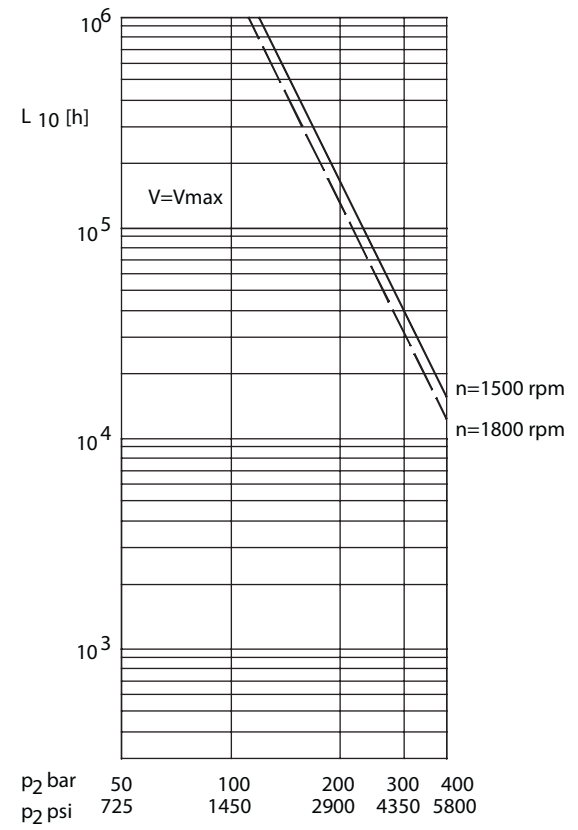
# Performance curves

## 130 Series

**Power efficiency performance curve**



**Roller bearing life**



**Combination units**

For combination pumps the characteristic values are as for the individual units.

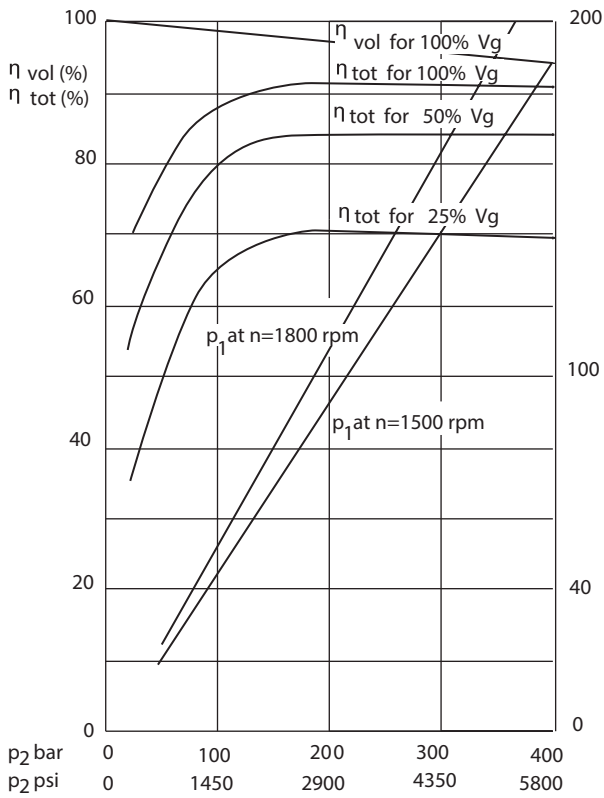
For reduced swash-angle:

$$L_h = (L \text{ at } V_{max}) \times \frac{1}{\left(\frac{V}{V_{max}}\right)^{\frac{10}{3}}}$$

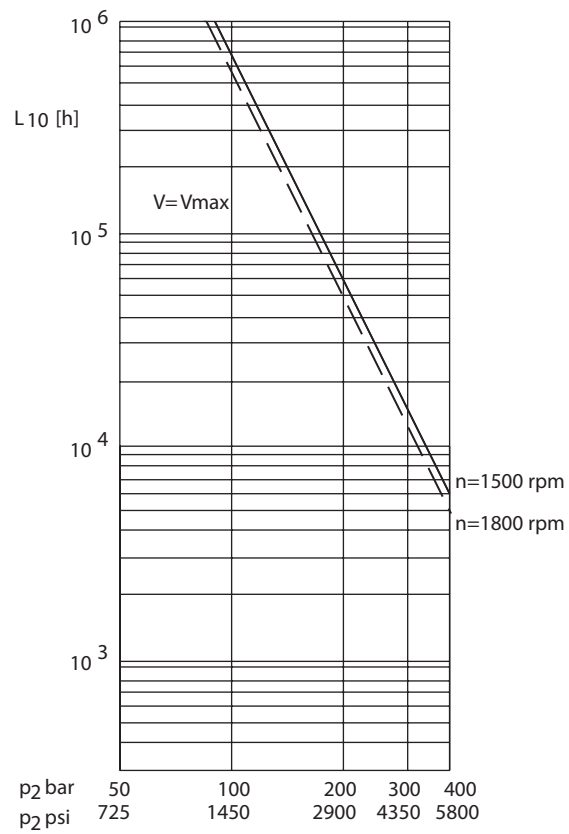
# Performance curves

## 180 Series

**Power efficiency performance curve**



**Roller bearing life**



**Combination units**

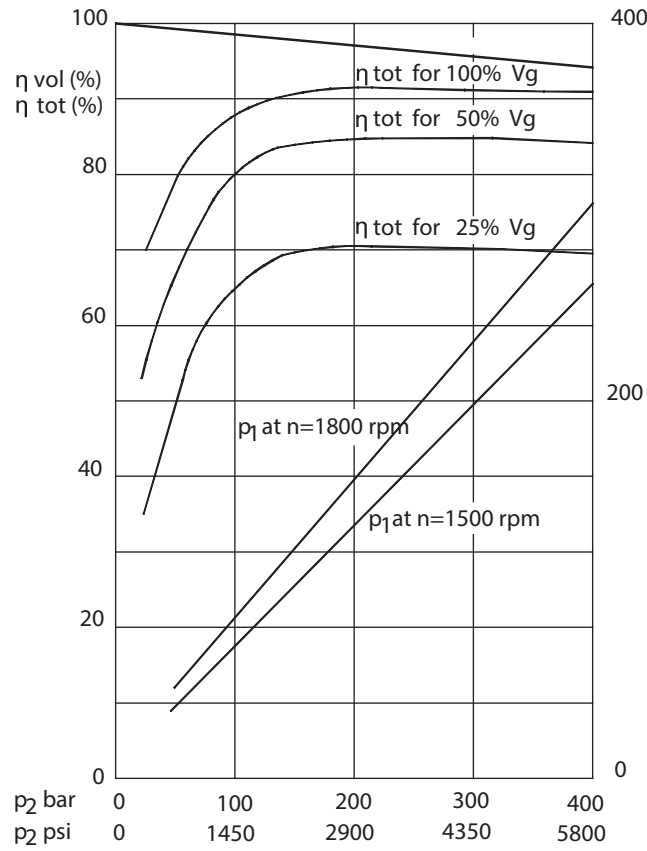
For combination pumps the characteristic values are as for the individual units.

For reduced swash-angle:

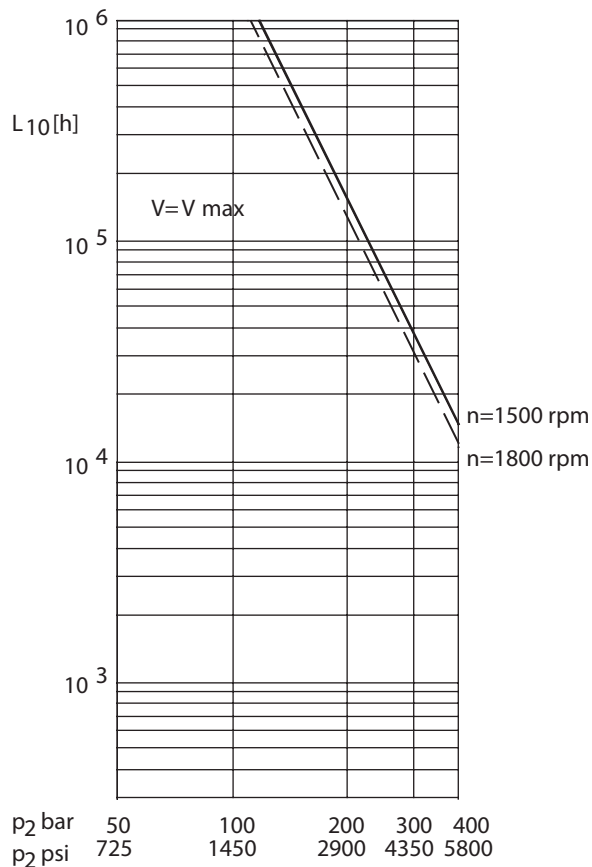
$$L_h = (L \text{ at } V_{max}) \times \frac{1}{\left(\frac{V}{V_{max}}\right)^{\frac{10}{3}}}$$

# Performance curves 250 Series

**Power efficiency performance curve**



**Roller bearing life**



**Combination units**

For combination pumps the characteristic values are as for the individual units.

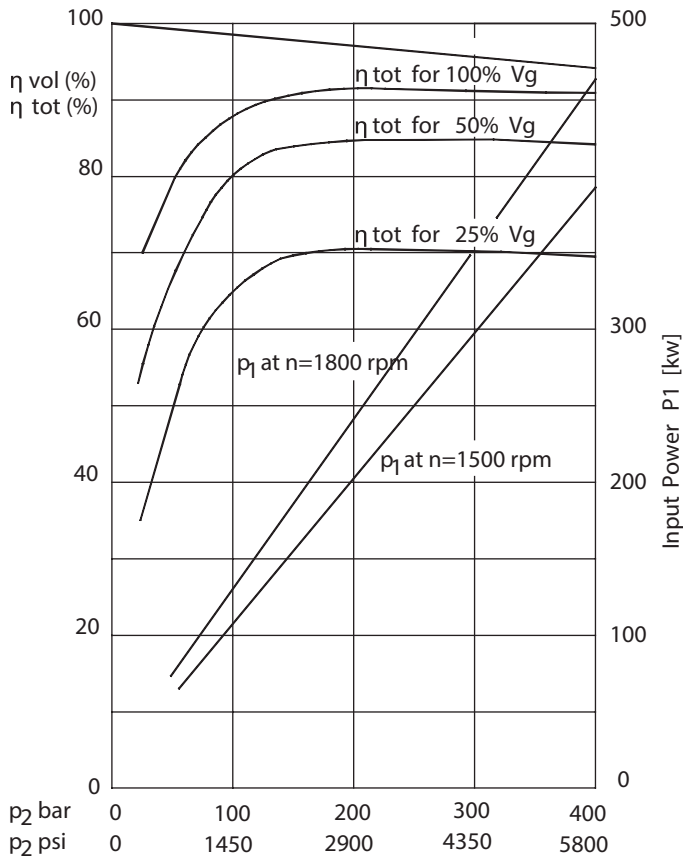
For reduced swash-angle:

$$L_h = (L \text{ at } V_{max}) \times \frac{1}{\left(\frac{V}{V_{max}}\right)^{\frac{10}{3}}}$$

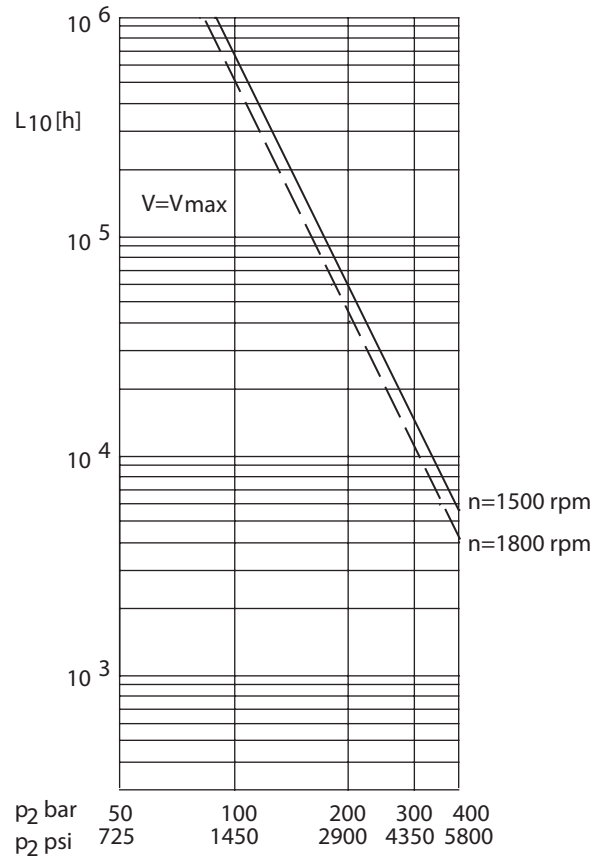
# Performance curves

## 360 Series

**Power efficiency performance curve**



**Roller bearing life**



**Combination units**

For combination pumps the characteristic values are as for the individual units.

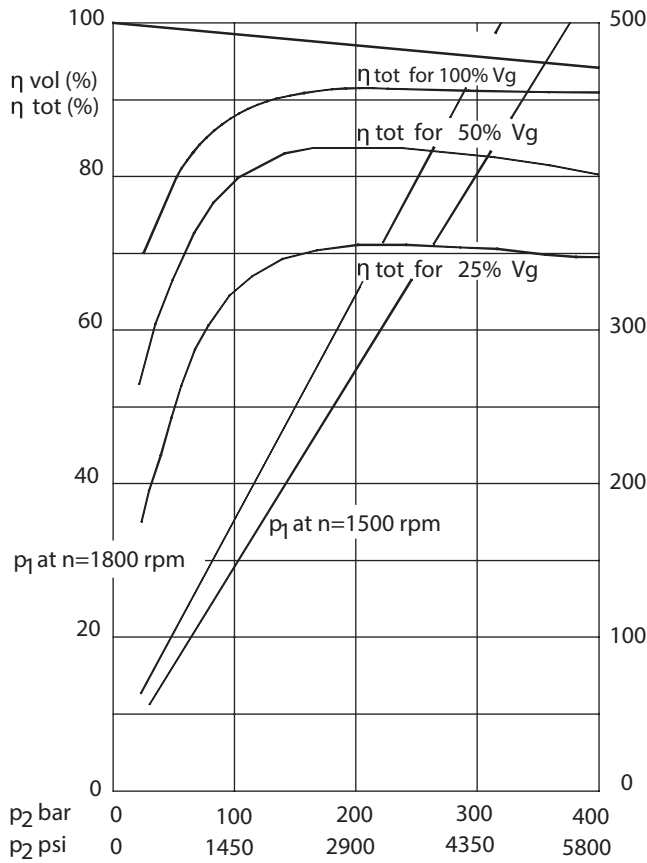
For reduced swash-angle:

$$L_h = (L \text{ at } V_{max}) \times \frac{1}{\left(\frac{V}{V_{max}}\right)^{\frac{10}{3}}}$$

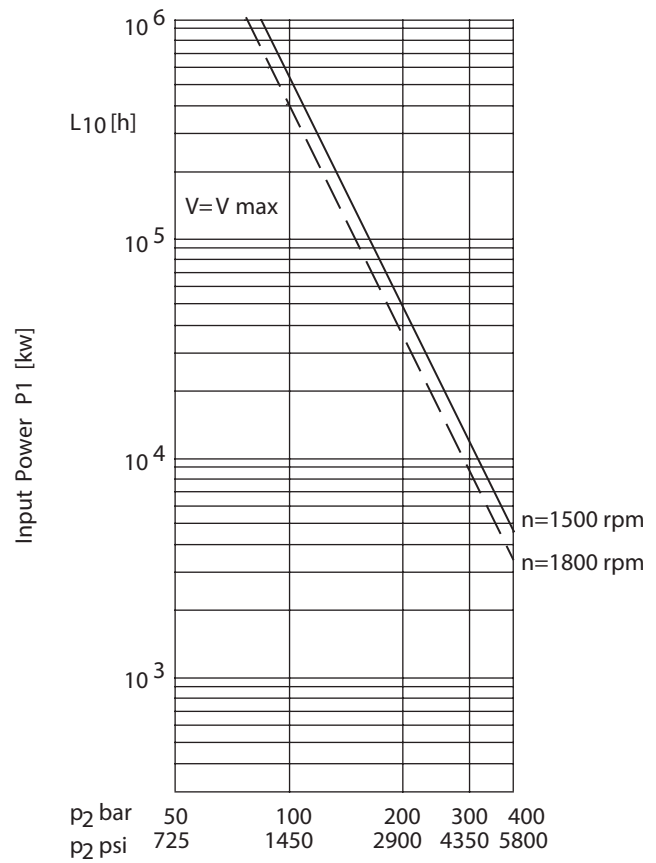


# Performance curves 500 Series

**Power efficiency performance curve**



**Roller bearing life**



**Combination units**

For combination pumps the characteristic values are as for the individual units. Only the torque  $M$  is limited to 5000 Nm.

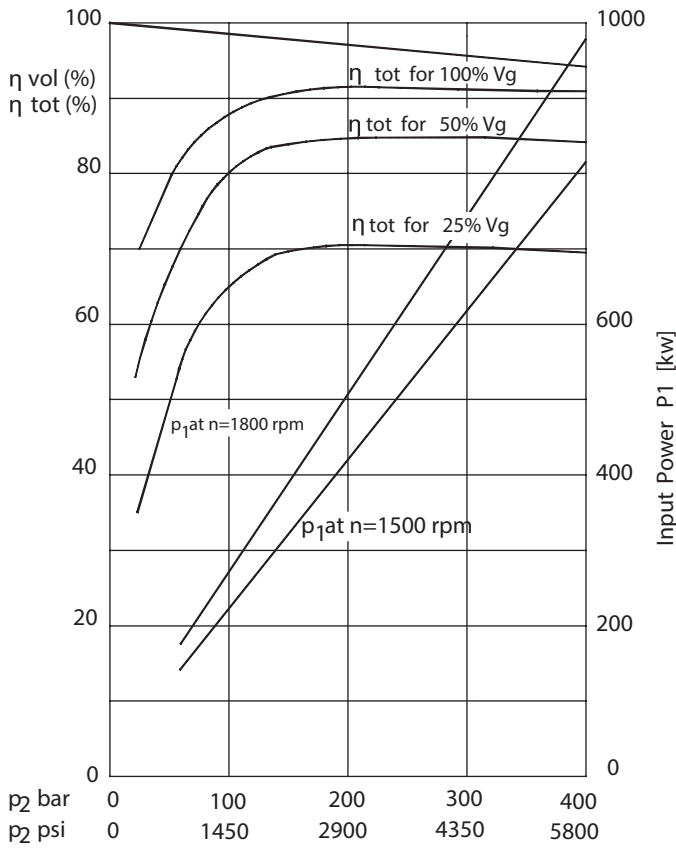
For reduced swash-angle:

$$L_h = (L \text{ at } V_{max}) \times \frac{1}{\left(\frac{V}{V_{max}}\right)^{\frac{10}{3}}}$$

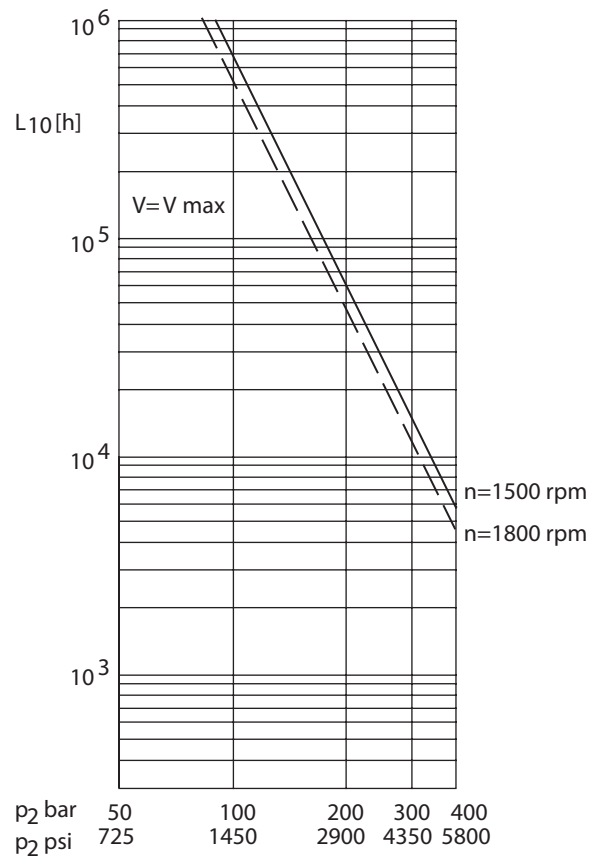
# Performance curves

## 750 Series

Power efficiency performance curve



Roller bearing life



For reduced swash-angle:

$$L_h = (L \text{ at } V_{\max}) \times \frac{1}{\left(\frac{V}{V_{\max}}\right)^{\frac{10}{3}}}$$



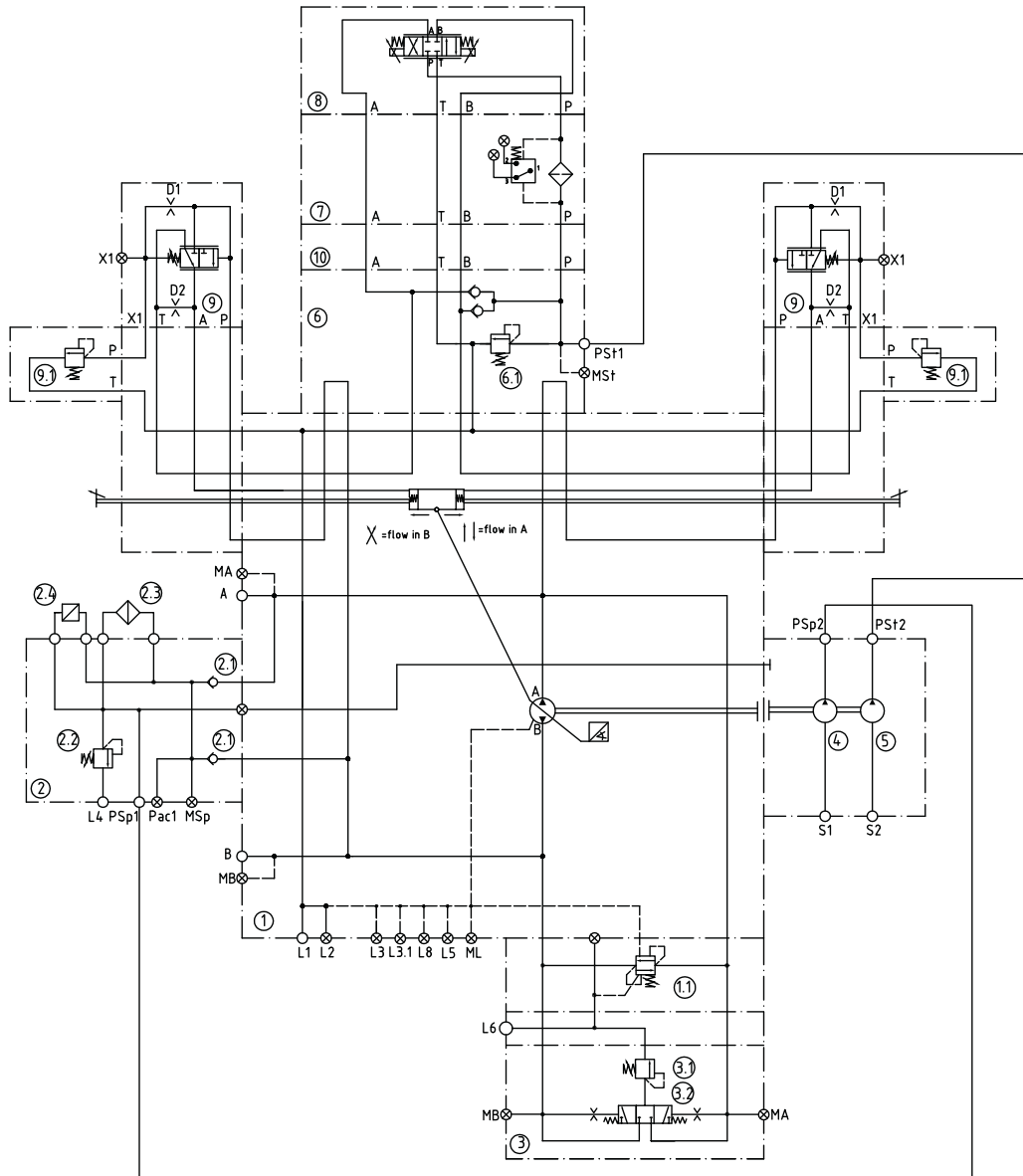
# Controls Option SP

with pressure limiter side A & B

circuit shows TVWS-250/360M07R000TP1R\*\*SVLA2

\*SPC\*\*C30000000E0000000000030

others on request



- |  |   |  |  |
|--|---|--|--|
| <b>A, B</b> – System port                          | <b>Psp1</b> – External port of charge pressure    | <b>2</b> – Charge block                    | <b>8</b> – Proportional valve                      |
| <b>L1, L2</b> – Drain port                         | <b>Psp2</b> – Charge pump outlet port             | <b>2.1</b> – Charge check valve            | <b>9</b> – Pressure limiter override-main stage    |
| <b>L3</b> – Ventilation port for vertical mounting | <b>PS1</b> – Inlet port of pilot pressure         | <b>2.2</b> – Charge pressure relief valve  | <b>9.1</b> – Pressure limiter override-pilot stage |
| <b>L3.1, L8</b> – Air bleeding port                | <b>PS2</b> – Pilot pump outlet port               | <b>2.3</b> – Charge oil filter             | <b>10</b> – Adaptor plate                          |
| <b>L4</b> – Drain port (charge oil)                | <b>X1</b> – Remote port pressure limiter override | <b>2.4</b> – Charge oil filter indicator   |  |
| <b>L5</b> – Oil filling plug                       | <b>S1</b> – Inlet of charge pump                  | <b>3</b> – Flushing block                  |  |
| <b>L6</b> – Drain port (flushing oil)              | <b>S2</b> – Inlet of pilot pump                   | <b>3.1</b> – Low pressure relief valve     |  |
| <b>MA, MB</b> – Gauge port, system pressure        |   | <b>3.2</b> – Flushing flow shuttle valve   |  |
| <b>ML</b> – Gauge port, case pressure              |   | <b>4</b> – Charge pump                     |  |
| <b>Msp</b> – Gauge port, charge pressure           |   | <b>5</b> – Pilot pump                      |  |
| <b>Mst</b> – Gauge port, pilot pressure            | <b>1</b> – Basic pump                             | <b>6</b> – Connection plate for SP-control |  |
| <b>Pac1</b> – Accumulator port                     | <b>1.1</b> – High pressure cross relief valve     | <b>6.1</b> – Pilot pressure relief valve   |  |
|  |   | <b>7</b> – Pilot oil filter                |  |



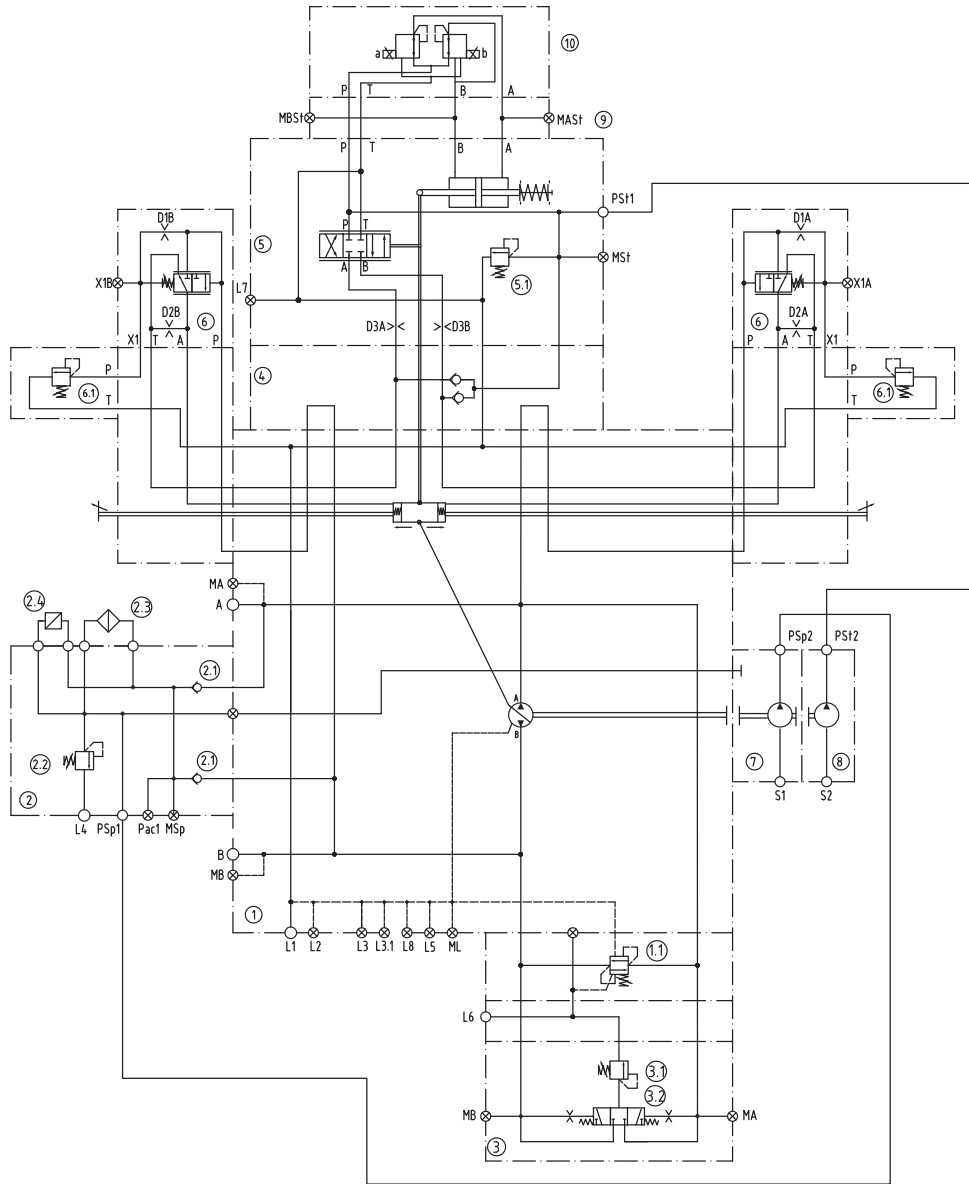
# Controls Option DP

with pressure limiter side A & B

circuit shows TVWS-250/360M07R000TP1R\*\*SVVA2

\*DPL\*\*C300000000000000000030

others on request



- |  |   |  |  |
|--|---|--|--|
| <b>A, B</b> - System port                            | <b>Mst</b> - Gauge port, pilot pressure                 | <b>1</b> - Basic pump  | <b>5.1</b> - Pilot pressure relief valve           |
| <b>L1, L2</b> - Drain port                           | <b>Pac1</b> - Accumulator port                          | <b>1.1</b> - High pressure cross relief valve                    | <b>6</b> - Pressure limiter override main stage    |
| <b>L3</b> - Ventilation port for vertical mounting   | <b>Psp1</b> - External port of charge pressure          | <b>2</b> - Charge block  | <b>6.1</b> - Pressure limiter override pilot stage |
| <b>L3.1, L8</b> - Air bleed port                     | <b>Psp2</b> - Charge pump outlet port                   | <b>2.1</b> - Charge check valve                                  | <b>7</b> - Charge pump                             |
| <b>L4</b> - Drain port (charge oil)                  | <b>Pst1</b> - Inlet port of pilot pressure              | <b>2.2</b> - Charge pressure relief valve                        | <b>8</b> - Pilot pumo                              |
| <b>L5</b> - Oil filling plug                         | <b>Pst2</b> - Pilot pump outlet port                    | <b>2.3</b> - Charge oil filter                                   | <b>9</b> - Sub plate                               |
| <b>L6</b> - Drain port (flushing oil)                | <b>X1A, X1B</b> - Remote port pressure limiter override | <b>2.4</b> - Charge oil filter-clogging indicator Flushing block | <b>10</b> - Proportional control valve             |
| <b>L7</b> - External port oil return line (Optional) | <b>S1</b> - Inlet of charge pump                        | <b>3</b> - Flushing block  |  |
| <b>MA, MB</b> - Gauge port, system pressure          | <b>S2</b> - Inlet of pilot pump                         | <b>3.1</b> - Low pressure relief valve                           |  |
| <b>ML</b> - Gauge port, case pressure                |   | <b>3.2</b> - Flushing flow shuttle valve                         |  |
| <b>Msp</b> - Gauge port, charge pressure             |   | <b>4</b> - Connection plate for DP-control                       |  |
|  |   | <b>5</b> - Dp-Control  |  |

# Controls Options ES

**Available to special order only.**

For basic pump details, see general installation dimensions.

## General Description

This unit is used for flow adjustment. It has a 3-phase electric servo-motor, worm-gear and a switchbox with 4 or (optional) 8 limit switches for different positions.

A potentiometer for stepless adjustment and/or position monitoring is also available. Response times from zero to maximum depend on the ratio selected and on the (fixed) speed of the servo-motor,

with the result that once the control is specified and built, response time are not variable in operation. Explosion Protection versions are also available.

**No Pressure/Power Limiter possible!**

## Pump Dimensions with **ESM...A2 Control**

For other options and sizes, please contact Hydrokraft Technical Support for individual pump drawings.

Options illustrated:

**28/29** = **ES** (electric motor adjusted displacement)

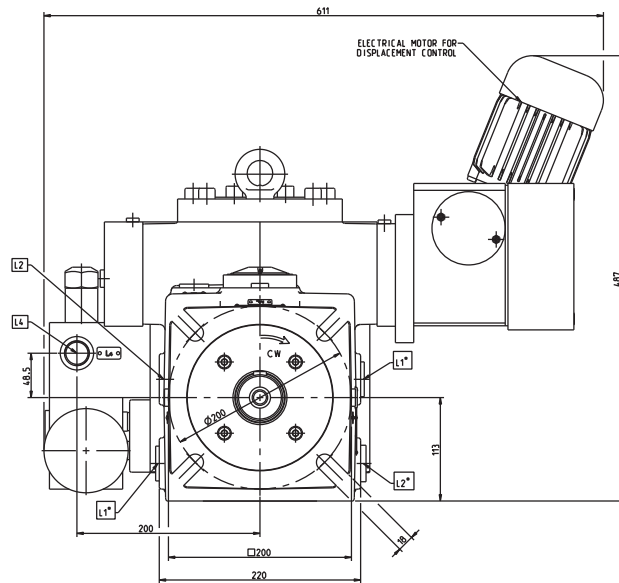
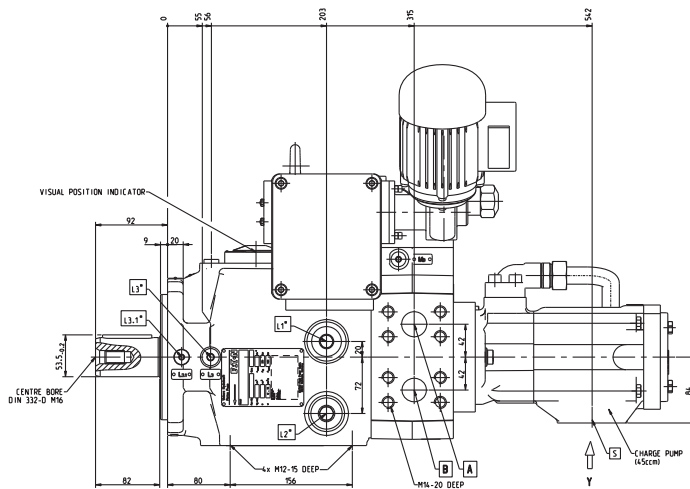
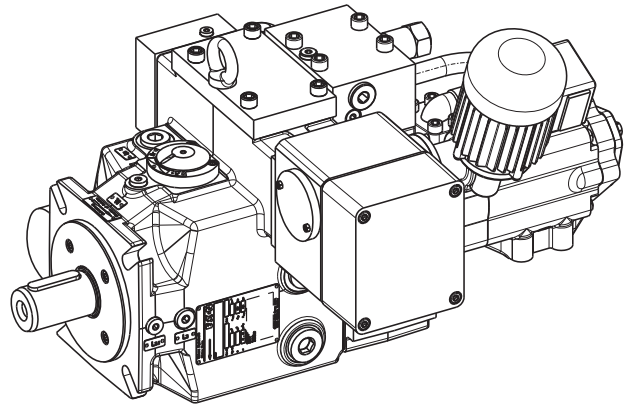
**30** = **M** (electric motor, fast response)

**44** = **A** (4 limit switches)

**45** = **2** (motor with brake, IP54)

## Theoretical Response Time for Maximum Displacement

Response time from 0 to 100% displacement can vary between 5s and 70s depending on pump size, motor type and supply voltage. Contact Hydrokraft Technical Support for details.

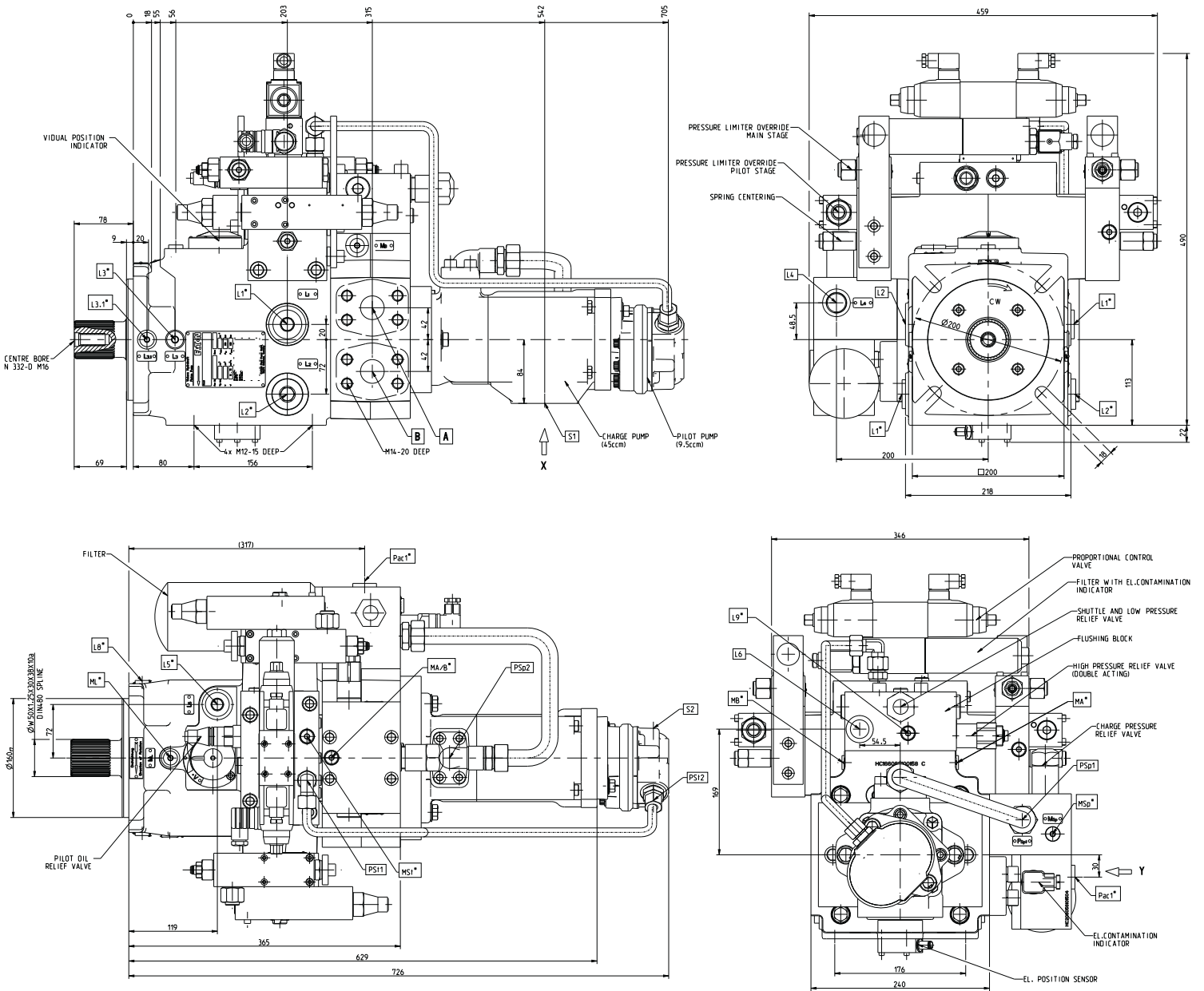


dimensions shown for TVW-180 only



# General dimensions

## TVWS-130-SP & TVWS-180-SP pumps



Drawing shows

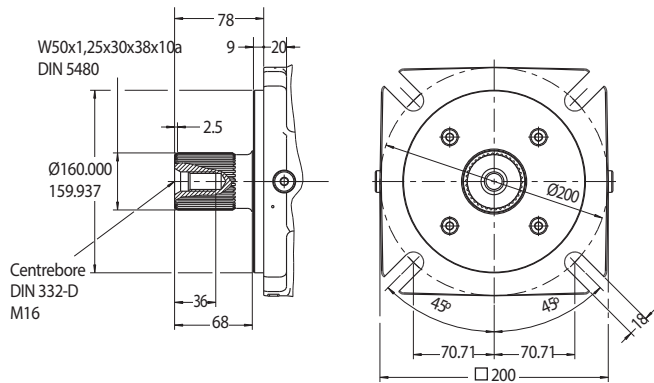
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others on request

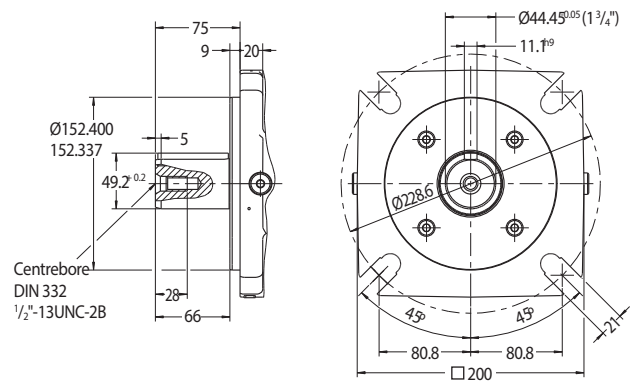
- |  |  |  |  |
|--|--|--|--|
| <b>A</b> - "System pressure port ISO 6162-2 P32M (SAE J518 code 62 - 1 1/4" - 6000 PSI)" | <b>L3</b> - PORT FOR FRONT BEARING FLUSHING G3/8 (OPTIONAL)  | <b>MB</b> - Gauge port system pressure G 1/4"          | <b>S1</b> - INLET OF CHARGE PUMP ISO 6162-1 P64 (SAE J518 CODE 61 - 2 1/2" - 3000 PSI) |
| <b>B</b> - "System pressure port ISO 6162-2 P32M (SAE J518 code 62 - 1 1/4" - 6000 PSI)" | <b>L3.1</b> - AIR BLEEDING PORT FOR VERTICAL MOUNTING G1/4"  | <b>ML</b> - Gauge port of case pressure G 1/4"         | <b>S2</b> - INLET OF PILOT PUMP 1 5/16" - 12 UNF-28                                    |
| <b>L1</b> - DRAIN PORT 1 5/16"-12 UNF-2B (ACCORDING TO MOUNTING POSITION USE UPPER PORT) | <b>L4</b> - Drain port (Charge oil) G 3/4"                   | <b>Pac1</b> - Accumulator port G 3/4"                  | <b>... *</b> - Port usually plugged  |
| <b>L2</b> - "Drain port G 1" (According to mounting position use upper port)             | <b>L5</b> - Oil filling plug 1 1/16"-12 UNF-2B               | <b>PSP1</b> - "External port of charge pressure G 3/4" | <b>X1A</b> - "Remote port pressure limiter override. G 1/4"                            |
|  | <b>L6</b> - Drain port (flushing oil) G 3/4"                 | <b>PSP2</b> - Charge pump outlet port G 3/4"           | <b>X1B</b> - "Remote port pressure limiter override. G 1/4"                            |
|  | <b>L8</b> - AIR BLEEDING PORT FOR VERTICAL MOUNTING G1/4"    | <b>MSp</b> - GAUGE PORT OF CHARGE PRESSURE G 1/4"      | <b>MAB</b> - "Gauge port system pressure G 1/4"  |
|  | <b>L9</b> - "Drain port for low pressure relief valve G 1/4" | <b>PS1</b> - Port of pilot pressure G 3/8"             |  |
| <b>MA</b> - Gauge port system pressure G 1/4"  |  | <b>PS2</b> - Port of pilot pressure 7/8"-14 UNF        |  |
|  |  | <b>MSt</b> - Gauge port of pilot pressure G 1/4"       |  |

# Shaft and Mounting options TVWS-130 & TVWS-180 pumps

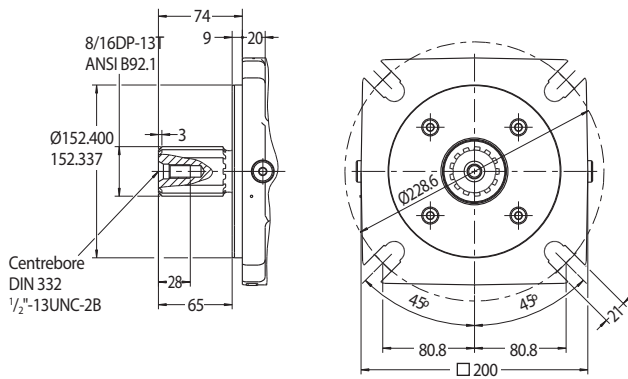
## Mounting Flanges & Shaft Ends



ISO splined shaft: 10 11 = 05 & 18 19 = 02

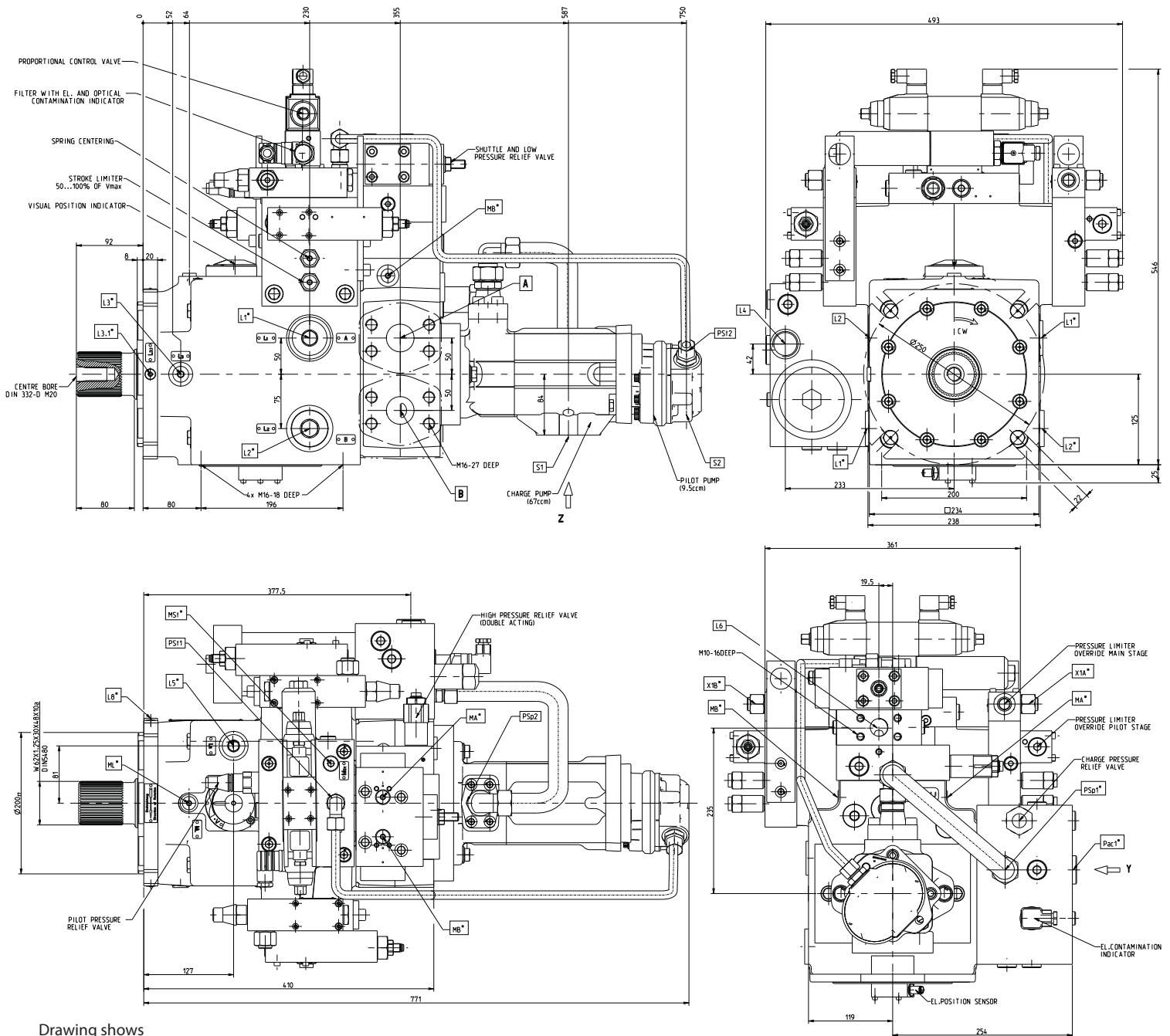


SAE D keyed shaft: 10 11 = 0D & 18 19 = D1



SAE D splined shaft: 10 11 = 0D & 18 19 = D2

# General dimensions TVWS-250-SP Pumps

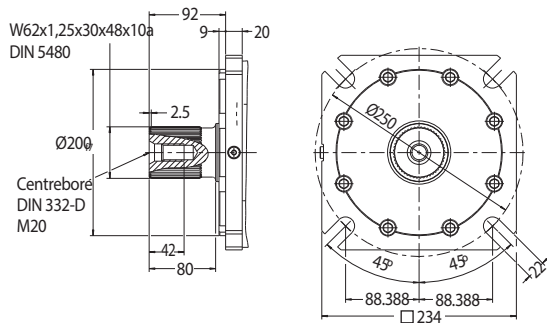


Drawing shows  
TVWS-250M07R000TP1R02SKLA20SPC03C30000000E0000000000040  
others on request

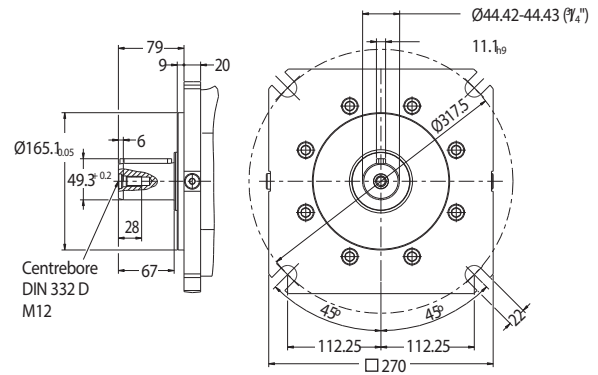
- |  |  |   |  |
|--|--|---|--|
| <p><b>A</b> - "System pressure port ISO 6162-2<b>L3.1</b> - AIR BLEEDING PORT FOR P38M (SAE J518 code 62 - 1 1/2" - 6000 PSI)"</p> <p><b>B</b> - "System pressure port ISO 6162-2<b>L5</b> P38M (SAE J518 code 62 - 1 1/2" - 6000 PSI)"</p> <p><b>L1</b> - DRAIN PORT 1 5/8"-12 UNF-2B (ACCORDING TO MOUNTING POSITION USE UPPER PORT)</p> <p><b>L2</b> - "Drain port G 1 1/4"" (According to mounting position use upper port)</p> <p><b>L3</b> - PORT FOR FRONT BEARING FLUSHING G3/8 (OPTIONAL)</p> | <p><b>L4</b> - Drain port (Charge oil) G 1"</p> <p><b>L5</b> - OIL FILLING PLUG 1 1/16"-12 UNF-2B</p> <p><b>L6</b> - "Drain port (flushing oil) ISO 6162-1 P25M"</p> <p><b>L8</b> - Air bleeding port G 1/4"</p> <p><b>MA</b> - GAUGE PORT OF SYSTEM PRESSURE G 1/4"</p> | <p><b>MB</b> - GAUGE PORT OF SYSTEM PRESSURE G 1/4"</p> <p><b>ML</b> - Gauge port of case pressure G 1/4"</p> <p><b>Pac1</b>- Accumulator port G 1"</p> <p><b>PSp1</b>- "External port of charge pressure G 3/4"</p> <p><b>PSp2</b>- Charge pump outlet port ISO 6162-1 P25 (SAE J518 CODE 61 - 1" - 3000 PSI)</p> <p><b>Msp</b> - "Gauge port of charge pressure G 1/4"</p> <p><b>PSt1</b> - Port of pilot pressure G 3/8"</p> | <p><b>PSt2</b>- Port of pilot pressure 7/8"-14 UNF</p> <p><b>MSt</b> - Gauge port of pilot pressure G 1/4"</p> <p><b>S1</b> - INLET OF CHARGE PUMP ISO 6162-1 P64 (SAE J518 CODE 61 - 2 1/2" - 3000 PSI)</p> <p><b>S2</b> - INLET OF PILOT PUMP 1 5/16" - 12 UNF-28</p> <p>...* - Port usually plugged</p> <p><b>X1A</b> - "Remote port pressure limiter override G 1/4"</p> <p><b>X1B</b> - "Remote port pressure limiter override G 1/4"</p> |
|--|--|---|--|

# Shaft and Mounting options TVWS-250 pumps

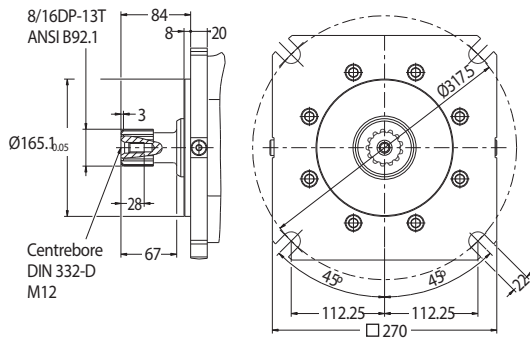
## Mounting Flanges and Shaft Ends



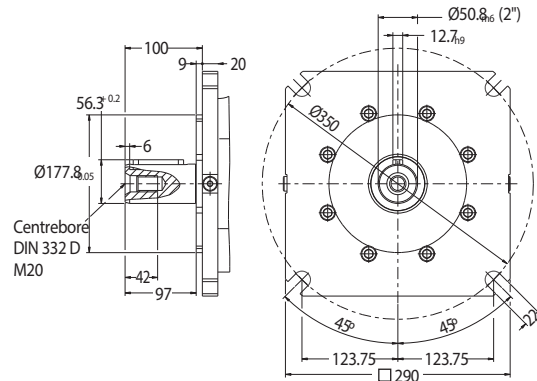
ISO splined shaft: **10|11 = 07 & 18|19 = 02**



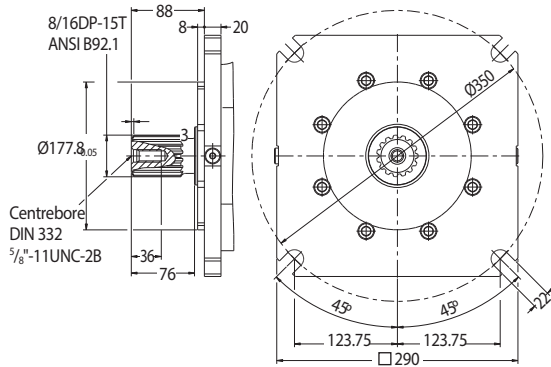
SAE E keyed shaft: **10|11 = 0E & 18|19 = E1**



SAE E splined shaft: **10|11 = 0E & 18|19 = E2**

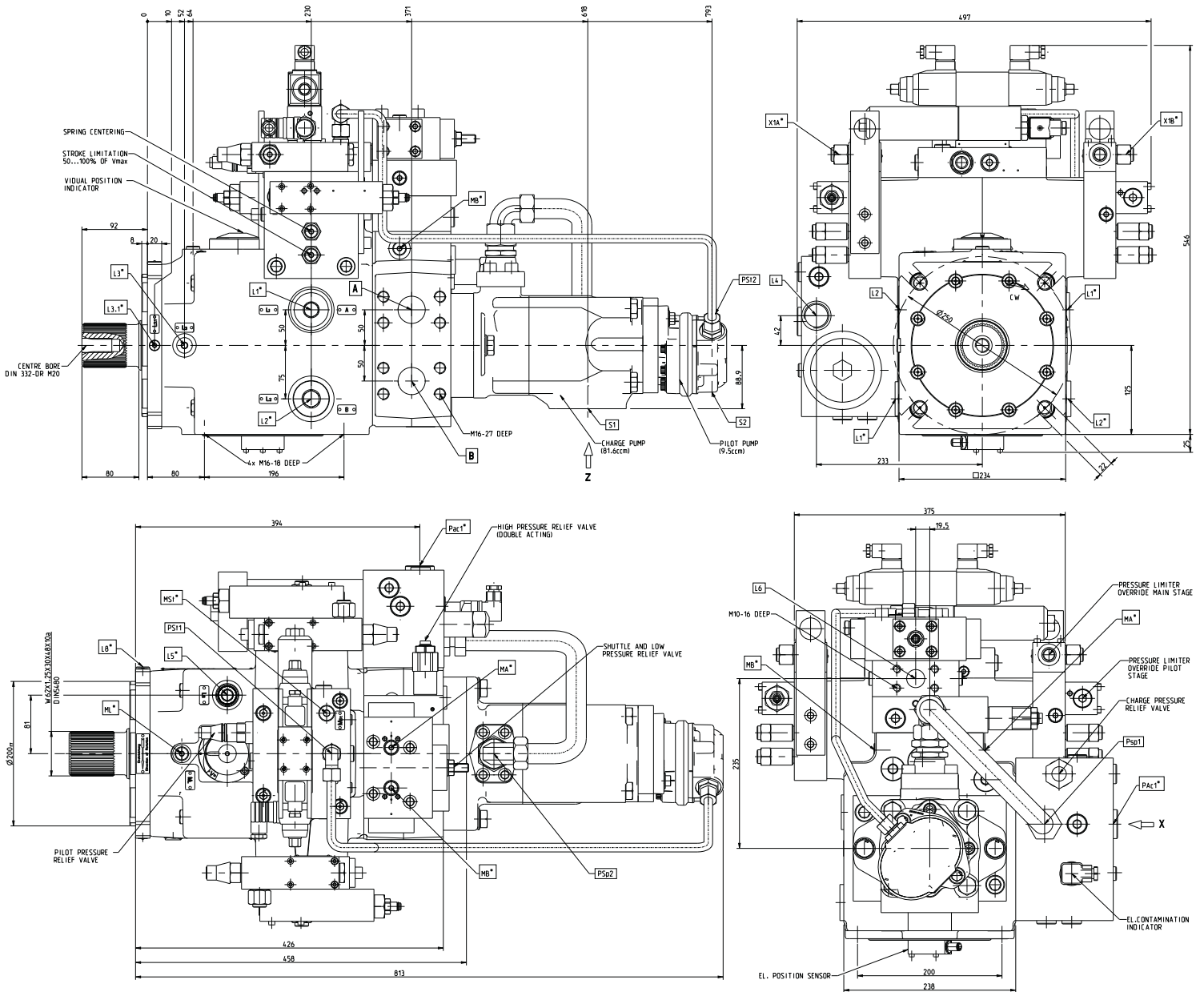


SAE F keyed shaft: **10|11 = 0F & 18|19 = F1**



SAE F splined shaft: **10|11 = 0F & 18|19 = F2**

# General dimensions TVWS-360-SP Pumps

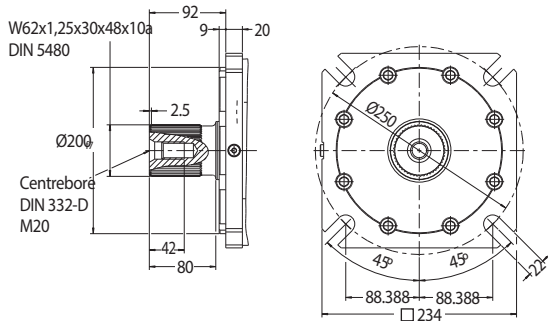


Drawing shows  
TVWS-360M07R000TP1R02SKLA20SPC03C30000000E000000000040  
others on request

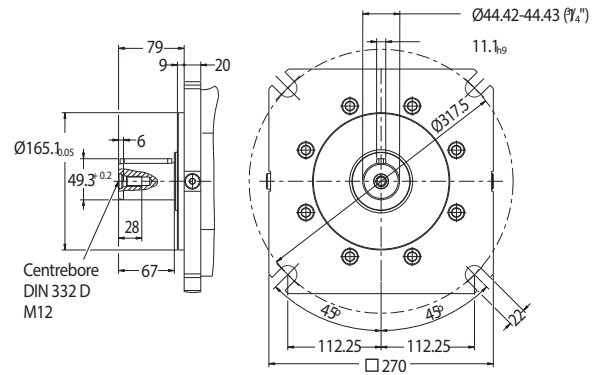
- |  |   |  |  |
|--|---|--|--|
| <b>A</b> - "System pressure port ISO 6162-2L3 P38M (SAE J518 code 62 - 1 1/2" - 6000 PSI)" | <b>L3</b> - PORT FOR FRONT BEARING FLUSHING G3/8 (OPTIONAL) | <b>MB</b> - GAUGE PORT OF SYSTEM PRESSURE G 1/4"       | <b>Pst2</b> - Port of pilot pressure 7/8"-14 UNF                                     |
| <b>B</b> - "System pressure port ISO 6162-2 P38M (SAE J518 code 62 - 1 1/2" - 6000 PSI)"   | <b>L3.1</b> - AIR BLEEDING PORT FOR VERTICAL MOUNTING G1/8" | <b>ML</b> - Gauge port of case pressure G 1/4"         | <b>Mst</b> - Gauge port of pilot pressure G 1/4"                                     |
| <b>L1</b> - "Drain port 1 5/8"-12 UNF-2B (According to mounting position use upper port)"  | <b>L4</b> - Drain port (Charge oil) G 1"                    | <b>Pac1</b> - Accumulator port G 1"                    | <b>S1</b> - "Inlet of charge pump ISO 6162-1 P76 (SAE J518 code 61 - 3" - 3000 PSI)" |
| <b>L2</b> - "Drain port G 1 1/4" (According to mounting position use upper port)"          | <b>L5</b> - OIL FILLING PLUG 1 1/16"-12 UNF-2B              | <b>Psp1</b> - "External port of charge pressure G 3/4" | <b>S2</b> - "Inlet of pilot pump 1 5/16"-12 UNF-28"                                  |
|  | <b>L6</b> - "Drain port (flushing oil) ISO 6162-1 P25M"     | <b>Psp2</b> - CHARGE PUMP OUTLET PORT ISO 6162-1 P32   | ...* - Port usually plugged  |
|  | <b>L8</b> - Air bleeding port G 1/4"                        | <b>Msp</b> - "Gauge port of charge pressure G 1/4"     | <b>X1A</b> - "Remote port pressure limiter override G 1/4"                           |
|  | <b>MA</b> - GAUGE PORT OF SYSTEM PRESSURE G 1/4"            | <b>Pst1</b> - Port of pilot pressure G 1/2"            | <b>X1B</b> - "Remote port pressure limiter override G 1/4"                           |

# Shaft and Mounting options TVWS-360 pumps

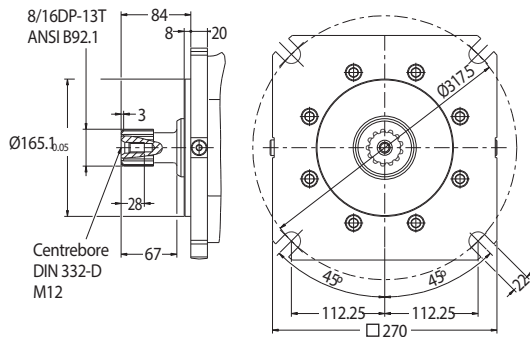
## Mounting Flanges and Shaft Ends



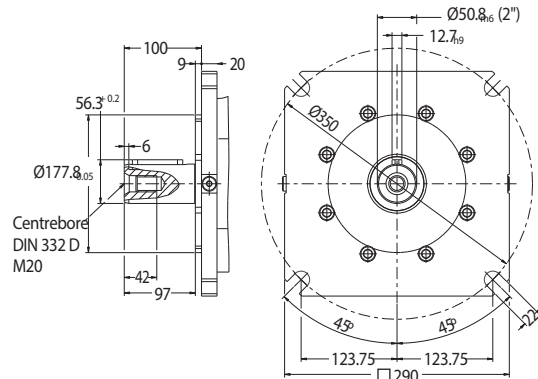
ISO splined shaft: **10|11 = 07 & 18|19 = 02**



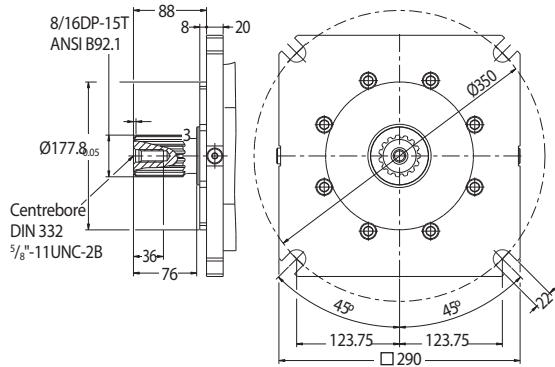
SAE E keyed shaft: **10|11 = 0E & 18|19 = E1**



SAE E splined shaft: **10|11 = 0E & 18|19 = E2**



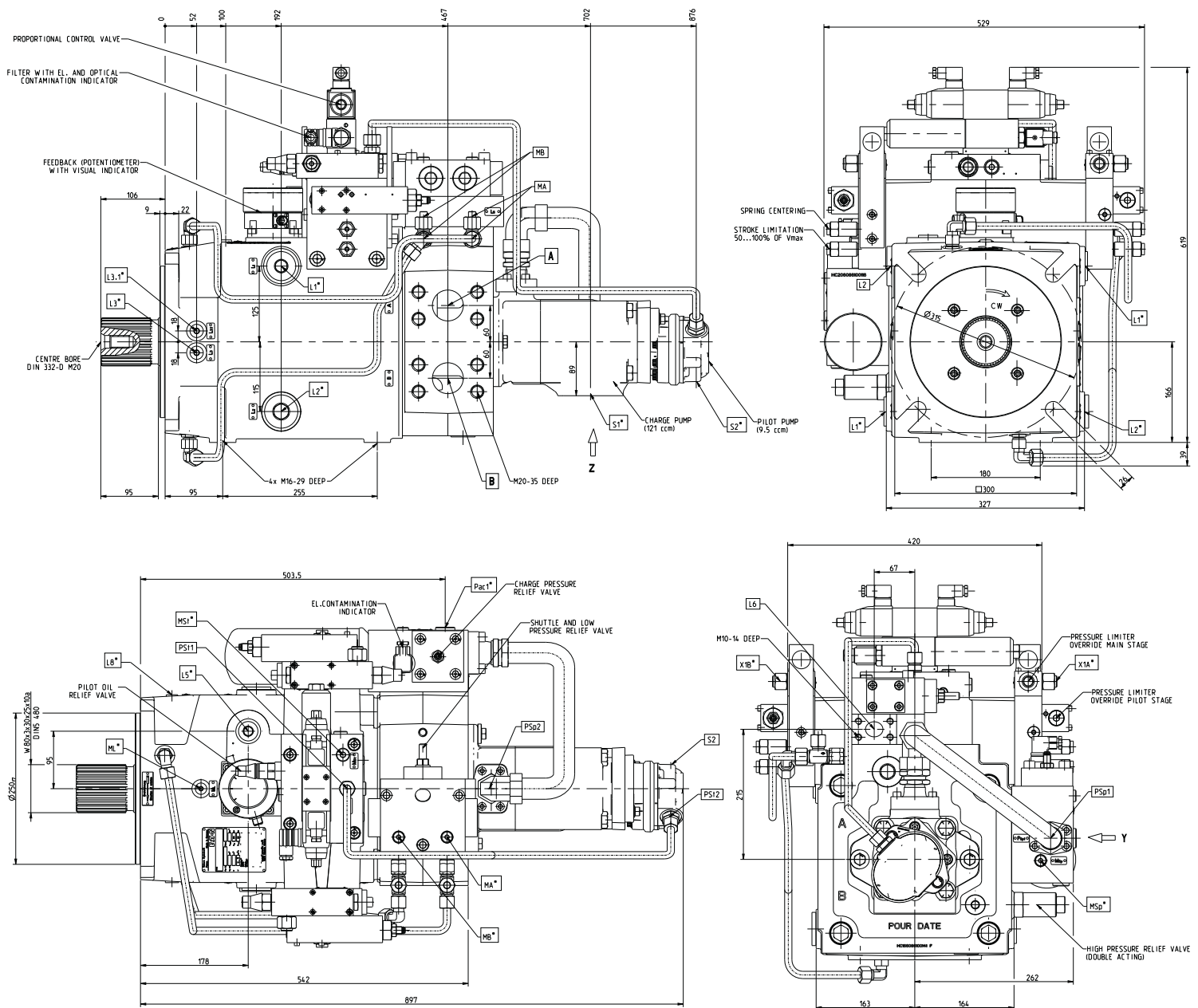
SAE F keyed shaft: **10|11 = 0F & 18|19 = F1**



SAE F splined shaft: **10|11 = 0F & 18|19 = F2**



# General dimensions TVWS-500-SP Pumps



Drawing shows  
TVWS-500M08R000TP1R02SKSA20SPC03C30000000E0000000000030  
others on request

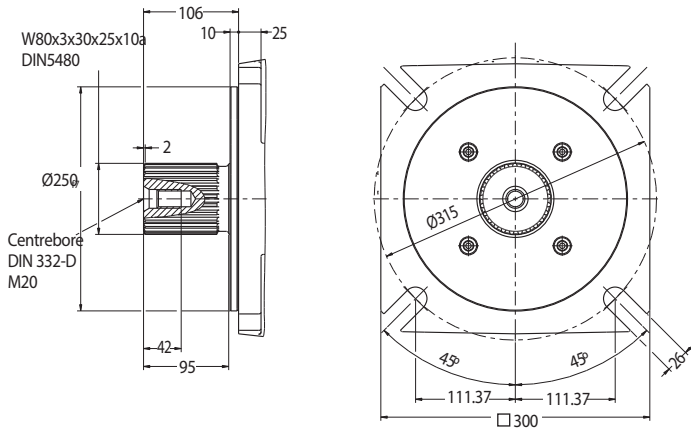
<b>A</b> - "System pressure port ISO 6162-2 P51M (SAE J518 code 62 - 2" - 6000 PSI)"	<b>L3</b> - PORT FOR FRONT BEARING FLUSHING G3/8 (OPTIONAL)	<b>MB</b> - GAUGE PORT OF SYSTEM PRESSURE G 1/4"	<b>Pst2</b> - Port of pilot pressure 7/8"-14 UNF
<b>B</b> - "System pressure port ISO 6162-2 P51M (SAE J518 code 62 - 2" - 6000 PSI)"	<b>L3.1</b> - AUX. PORT FOR FRONT BEARING FLUSHING G3/8	<b>ML</b> - GAUGE PORT OF CASE PRESSURE G 1/4"	<b>MSt</b> - Gauge port of pilot pressure G 1/4"
<b>L1</b> - "Drain port 1 5/8"-12 UNF-2B (According to mounting position use upper port)"	<b>L4</b> - Drain port (Charge oil) G 1 1/4"	<b>Pac1</b> - Accumulator port G 3/4"	<b>S1</b> - "Inlet port of charge pump ISO 6162-1 P76"
<b>L2</b> - "Drain port G 1 1/2" (According to mounting position use upper port)"	<b>L5</b> - OIL FILLING PLUG 1 1/16" - 12 UNF-2B	<b>Psp1</b> - "External port of charge pressure G 1"	<b>S2</b> - INLET OF PILOT PUMP 1 5/16"-12 UNF-28
	<b>L6</b> - "Drain port (flushing oil) ISO 6162-1 P25M"	<b>Psp2</b> - CHARGE PUMP OUTLET PORT ISO 6162-1 P32	<b>...*</b> - Port usually plugged
	<b>L8</b> - Air bleeding port G 1/4"	<b>Msp</b> - "Gauge port of charge pressure G 1/4"	<b>X1A</b> - "Remote port pressure limiter override G 1/4"
	<b>MA</b> - GAUGE PORT OF SYSTEM PRESSURE G 1/4"	<b>Pst1</b> - Port of pilot pressure G 3/8"	<b>X1B</b> - "Remote port pressure limiter override G 1/4"



# Shaft and Mounting options

## TVWS-500 pumps

### Mounting Flanges and Shaft Ends



ISO splined shaft:  $\boxed{10\ 11} = 08$  &  $\boxed{18\ 19} = 02$



# Shaft and Mounting options TVWS-750 pumps

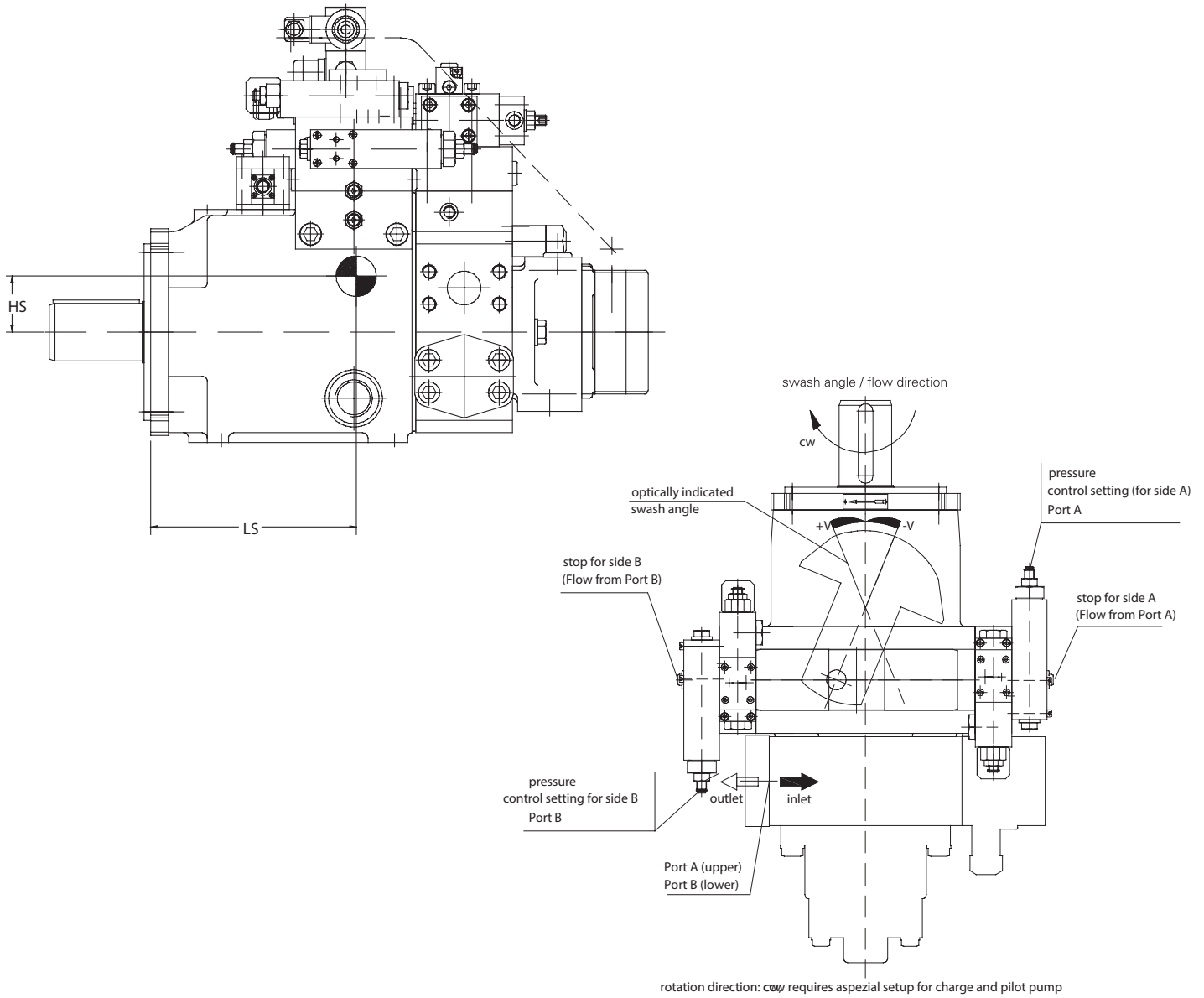
## Mounting Flanges and Shaft Ends

ISO splined shaft:  $\boxed{10|11} = 08$  &  $\boxed{18|19} = 02$

as illustrated on the previous page is the only arrangement suitable for Hydrokraft pumps TVW-750.

# TVWS

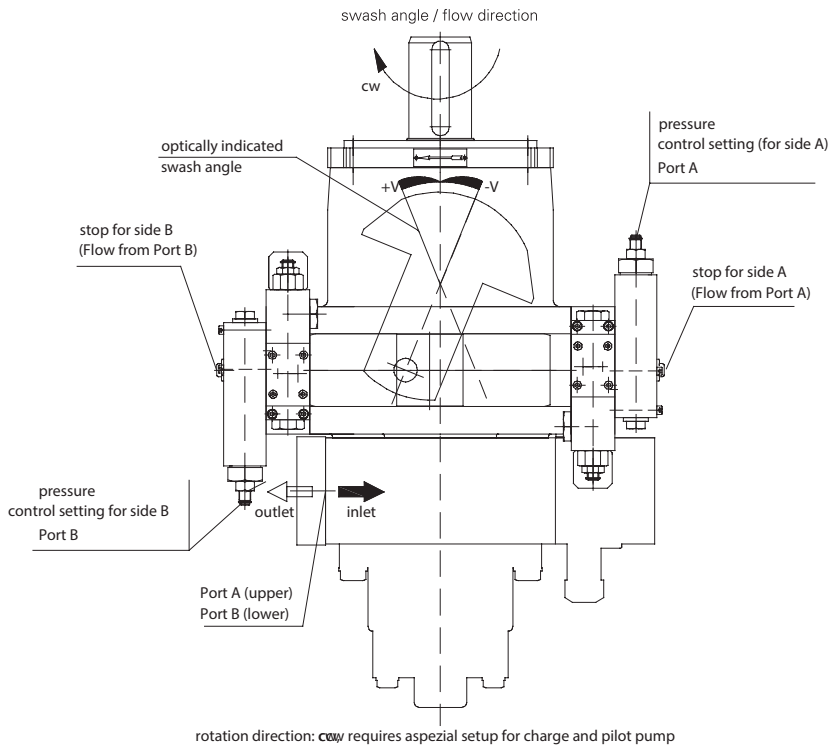
## Position of Center of Gravity



TVW SIZE	WEIGHT KG	LS MM	HS MM
130	160	205	55
180	165	205	55
250	235	233	63
360	240	250	63
500	420	306	55
750	460	318	65

	ACTUATOR STOP A (+V)	PISTON STOP B (-V)
Inlet port	B	A
Outlet port	A	B

## Swash Angle/ Flow Direction



	<b>ACTUATOR STOP A (+V)</b>	<b>PISTON STOP B (-V)</b>
Inlet port	B	A
Outlet port	A	B

# Installation and Start-up

**Warning:** Care should be taken that mechanical and hydraulic resonances are avoided in the application of the pump. Such resonances can seriously compromise the life and/or safe operation of the pump.

## Drive Data

Mounting attitude should be horizontal using appropriate case drain ports to ensure that the case remains full of fluid at all times. Consult Hydrokraft Technical Support or look to the "Hydrokraft Application Guide-line Presentation" if a different arrangement is required.

In those cases where geometric tolerances of mounting are critical, or where specific tolerance ranges are required and not specified, consult for specific limits.

Direction of shaft rotation, viewed from the prime mover end, must be as indicated in the model designation on the pump – either right hand (clockwise) or left hand (counterclockwise).

Direct coaxial drive through a flexible coupling is recommended. If drives imposing radial shaft loads are considered, please consult your Hydrokraft Technical Support.

## Start-up Procedure

Make sure the reservoir and circuit are clean and free of dirt/debris prior to filling with hydraulic fluid.

Fill the reservoir with filtered oil and fill to a level sufficient enough to prevent vortexing at the suction connection to pump inlet. It is good practice to clean the system by flushing and filtering, using an external slave pump.

**Caution:** Before the pump is started, fill the case through the uppermost drain port with hydraulic fluid of the type to be used. The case drain line must be connected directly to the reservoir and must terminate below the oil level.

Once the pump is started, it should prime within a few seconds. If the pump does not prime, check to make sure that there are no restrictions between the reservoir and the inlet to the pump, and that the pump is being rotated in the proper direction, and that there are no air leaks in the inlet line and connections. Also check to make sure that trapped air can escape at the pump outlet.

After the pump is primed, tighten the loose outlet connections, then operate for five to ten minutes (unloaded) to remove all trapped air from the circuit.

If the reservoir has a sight gage, make sure the fluid is clear – not milky.

## Cleanliness

if is recommended to run the unit first at no load to flush-out any in-built contaminations. Disconnect working pipes of the hydraulic motor and interconnect them directly (short circuit). Insert filter, direct in front of pump, into the inlet pipe - observe delivery direction - pressure resistance 25 bar, filter mesh 25 um absolute, running time approx, 1/2 hour, probably also at reduced delivery rate (according to circumstances).

## Air bleeding

The drain line must be arranged in such a way that the motor housing is kept full of oil at all times. if necessary, the drain line is to be looped above the hydraulic motor. For any installation, the highest drain port is to be used.

## Operation start

Check rotation direction of hydraulic motor shaft by momentarily pump flow to an inlet port of hydraulic motor and observe rotation. if the direction is wrong interchange the two working lines. Additional recommendations and guidelines are shown in Hydrokraft Application Guide-line Presentation ( available on request )

# Application Data and Fluid Recommendations

## Fluid Cleanliness

Hydrokraft pumps are rated in anti-wear petroleum fluids with a contamination level of 18/15/13 per ISO 4066. Operation in fluids with levels more contaminated than this is not recommended. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these codes. Please contact your Hydrokraft Technical Support

for specific duty cycle recommendation. Danfoss Hydrokraft pumps, as with any variable displacement piston pumps, will operate with apparent satisfaction in fluids up to the rating specified here. Experience has shown however, that pump and hydraulic system life is not optimized with high fluid contamination levels (high ISO cleanliness codes).

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity and inclusion of air. Essential information on the correct methods for treating hydraulic fluid

is included in Danfoss publication "Danfoss Guide to Systemic Contamination Control" available from your local Danfoss distributor. In this publication, filtration and cleanliness levels for extending the life of axial piston pumps and other system components are listed. Included is an excellent discussion of the selection of products needed to control fluid condition.

Fluid Type	DIN/ISO Classification	Rated Pressure p <sub>a</sub> (bar)	Maximum Speed (rev/min)			Recommended Seal Material	Maximum Operating Temperature (°C)	Bearing Life
			130 & 180 c <sub>m</sub>	250 & 360 c <sub>m</sub>	500 & 750 c <sub>m</sub>			
Water Glycol <sup>▲</sup>	HFC	250	1800	1500	1250	NBR	45	25-100%
HFDR (phosphate ester based)	HFDR	350	1500	1200	1000	FKM	60	100%▼
HFDU (glycol based)	HFDU	350	1500	1200	1000	FKM	60	100%▼
HFDU (ester based)	HFDU	350	1800	1500	1250	FKM	60	100%▼
HEES (synthetic ester)	HEES	350	1800	1500	1250	FKM	60	100%▼

■ See general specifications for speed limitation depending on displacement.

▲ For HFC operation, bearing flushing is mandatory. Highest speed only recommended at optimized application conditions.

Use Model Code [21] = "C" for seal option, and contact your Danfoss Representative for validation.

Seal material can differ on an individual pump depending on specific seal function.

Bearing life with HFC fluid depends significantly on fluid temperature, cleanliness, quality, flushing and application parameters.

Typical values vary between 25% and 100% compared to mineral oil.

▼ Only fluids with fully saturated esters (iodine value <10) should be used.

HFDU and HEES fluids can be used at full ratings, but need to be monitored continuously to maintain quality and performance. The following important values should always be checked:

- Water content (<= 500 ppm)
- Fluid cleanliness (18/15/13 per ISO 4406)
- TAN value (no significant change from new oil)
- Viscosity (no significant change from new oil)
- Additives (no significant change from new oil)

Under harsh operation conditions, especially with regard to temperature and water content, ester-based HFDU and HFDR fluids are prone to hydrolysis, the resulting chemical processes and products of which could damage seals and other pump components. In general, the susceptibility to temperature and contamination is significantly higher than with standard mineral oils.

In line with Danfoss warranty conditions covering use of HFDR/HFDU/HEES fluids, fluid-related damage is excluded.

## Case/Bearing Flushing

Case and bearing flushing are strongly recommended for all conditions where the pump is operating at following conditions - 24h/7d operation mode with high speed and high operation pressure and/or intervals at low pressure i.e. <20 bar (<300 psi) and/or low flow at high pressure - other unusual operation conditions

## Vertical Mounting

Vertical mounting of Hydrokraft pumps is possible, but venting and lubrication of shaft bearings can require special flushing and installation procedures. For details, please refer to the Hydrokraft Application Guideline Presentation available from your Danfoss Representative.

## High pressure lubrication / Hydrostatic Balancing for Yoke Bearings (half-cup bearings)

High-pressure bearing lubrication and balancing (Model Code [21] = "K") is recommended for operating conditions with either high cycle frequencies (very short up/downstroke times) and/or where the swashplate is constantly maintained at a certain angle for long periods of time (compensated mode).



For details and additional information, please refer to the "Hydrokraft Application Guideline Presentation" available from your Danfoss Representative.

## Estimated Flushing Flow Values at 1500 rev/min

Pump Size (cm <sup>3</sup> /rev)	Flushing Flow (l/min)
130/180	4/5,5
250/360	7,5/11
500	15
750	20



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