# Table of Contents

- **Introduction** ........................................................................................................... 4
- **Model Code**
  - Form Page .................................................................................................................. 5
  - Basic Pump ................................................................................................................... 6
  - ES Control .................................................................................................................... 7
  - DP Control .................................................................................................................... 8
  - SP Control ................................................................................................................... 9
  - SM Control ................................................................................................................... 10
  - Special Features .......................................................................................................... 11
  - Combination Units ...................................................................................................... 12
  - Examples for Combination units ................................................................................ 13
- **Pump Specifications**
  - US ............................................................................................................................... 14
  - Metric ............................................................................................................................ 15
- **Performance Curves**
  - 130 Series .................................................................................................................. 16
  - 180 Series .................................................................................................................... 17
  - 250 Series .................................................................................................................... 18
  - 360 Series .................................................................................................................... 19
  - 500 Series .................................................................................................................... 20
  - 750 Series .................................................................................................................... 21
- **Hydraulic Transmission Circuit** .................................................................................. 22
  - With Charge Flow Filter .............................................................................................. 23
  - Without Charge Flow Filter ....................................................................................... 24
  - Combination of Two Pumps ......................................................................................... 25
- **Controls**
  - Electric Motor Displacement Control ES ..................................................................... 26
  - Controls for Position/Displacement DP, SP, SM .......................................................... 27
  - Pressure Signal Displacement Control DP ................................................................... 28
  - Example for TVW... - DP Control ................................................................................. 29
  - Proportional Valve Displacement Control SP ............................................................... 30
  - Control Cards ............................................................................................................... 31
  - SP Control with Pressure and Power Limitation ......................................................... 32
  - Servo Adjustment Displacement Control with Mechanical Feedback SM ............... 33
Table of Contents
(cont.)

Pump Dimensions
- TVWS 130/180 ................................................................. 34
- TVWS 250 ................................................................. 35
- TVWS 360 ................................................................. 36
- TVWS 500 ................................................................. 37
- TVWS 750 ................................................................. 38

Control Dimensions
- TVWS 250/360/500/750 ES Control ........................................ 39
- TVWS 130/180 SP Control ............................................. 40
- TVWS 250/360/500/750 SP Control ....................................... 42
- TVWS 130/180 DP Control ............................................. 44
- TVWS 250/360/500/750 DP Control ....................................... 46
- TVWS 130/180 SM Control ............................................... 48
- TVWS 250/360/500/750 SM Control ....................................... 50
- TVWS Position of Center Gravity ...................................... 52
- TVWS... Swash Angle/Flow Direction .................................... 53

Application Data ................................................................. 54
Fluid Recommendations ................................................................. 55
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 for single and combination units.
- Special design for closed loop application.
- 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.

Displacement controls:
- **ES** - Electric motor displacement control
- **HG** - Handwheel displacement control (Special feature)
- **FE** - Screw adjustment control (Special feature)
- **SP, SM** - Displacement proportional to electric signal
- **DP** - Displacement proportional to pressure signal

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

<table>
<thead>
<tr>
<th>AVAILABLE DISPLACEMENT SIZES</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 ccm</td>
</tr>
<tr>
<td>180 ccm</td>
</tr>
<tr>
<td>250 ccm</td>
</tr>
<tr>
<td>360 ccm</td>
</tr>
<tr>
<td>500 ccm</td>
</tr>
<tr>
<td>750 ccm</td>
</tr>
</tbody>
</table>

Typical Section of Transmission Pump

Dimensional information listed in this catalog is subject to change without notice.
Model Code
Transmission Pumps

"W" Series

Form Page
The following 55-digit coding system has been developed to identify all of the configuration options for the "W" Series Transmission (Closed Loop) pumps. Use this model code to specify a unit with the desired features. All 55-digits must be present when ordering. You may want to photocopy the matrix below to ensure that each number is entered in the correct box. If adjustments other than the standard settings (character 47...50) or special features (character 51...53) are needed, please provide the information when ordering. At the end of this section you may need to provide an additional model code if a combination unit is needed. In case of a combination unit, each single pump section must be specified separately using this or other Eaton catalog information.

In the model code string below some characters are already filled out and shown on this and the following pages. For such characters there is no option available.

Explanation for each character can be found as follows:

<table>
<thead>
<tr>
<th>CHARACTER PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Pump Model Code 1......27 6</td>
</tr>
<tr>
<td>Control Options 28.....46 7 - 10</td>
</tr>
<tr>
<td>Customer Adjustment Specification 47.....50 7 - 10</td>
</tr>
<tr>
<td>Special Features 51.....53 11</td>
</tr>
<tr>
<td>Design Number 54.....55 11</td>
</tr>
<tr>
<td>Combination Model Code 1.....39 12</td>
</tr>
</tbody>
</table>

SPECIFY NON STANDARD ADJUSTMENT BELOW

SPECIFY SPECIAL FEATURE BELOW
### Transmission Code

**Transmission Pumps**

"W" Series - Basic Pump

<table>
<thead>
<tr>
<th>Model Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Transmission Pump</td>
</tr>
<tr>
<td>V</td>
<td>Variable displacement</td>
</tr>
<tr>
<td>W</td>
<td>&quot;W&quot; Series (was 30 design)</td>
</tr>
<tr>
<td>M</td>
<td>Metric</td>
</tr>
<tr>
<td>I</td>
<td>(optional)</td>
</tr>
<tr>
<td>R</td>
<td>Rotation Direction</td>
</tr>
<tr>
<td>S</td>
<td>Separator</td>
</tr>
<tr>
<td>V</td>
<td>Viton*</td>
</tr>
<tr>
<td>P</td>
<td>Pilot pump (8 cm³/r)</td>
</tr>
<tr>
<td>S</td>
<td>Main Ports</td>
</tr>
<tr>
<td>V</td>
<td>Main Port Orientation</td>
</tr>
<tr>
<td>T</td>
<td>Thru-Drive Options</td>
</tr>
<tr>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>0000</td>
<td>SAE A</td>
</tr>
<tr>
<td>000B</td>
<td>SAE B</td>
</tr>
<tr>
<td>000C</td>
<td>SAE C</td>
</tr>
<tr>
<td>000D</td>
<td>ISO 3019/2 - 125A2HW</td>
</tr>
<tr>
<td>000E</td>
<td>ISO 3019/2 - 160A2HW</td>
</tr>
<tr>
<td>000F</td>
<td>ISO 3019/2 - 125B4HW</td>
</tr>
<tr>
<td>000G</td>
<td>ISO 3019/2 - 160B4HW</td>
</tr>
<tr>
<td>000H</td>
<td>ISO 3019/2 - 200B4HW</td>
</tr>
<tr>
<td>000P</td>
<td>ISO 3019/2 - 250B4HW</td>
</tr>
<tr>
<td>001T</td>
<td>Charge pump (~25% of unit displacement size) and Pilot pump (8 cm³/r)</td>
</tr>
<tr>
<td>00TP</td>
<td>Charge pump (~25% of unit displacement size)</td>
</tr>
<tr>
<td>00PP</td>
<td>Double pilot pump (8 cm³/r + 8 cm³/r)</td>
</tr>
<tr>
<td>0</td>
<td>No transmission circuit</td>
</tr>
<tr>
<td>1</td>
<td>Block filter, optical dirt indicator</td>
</tr>
<tr>
<td>2</td>
<td>Block, filter, electrical dirt indicator</td>
</tr>
<tr>
<td>3</td>
<td>Block without filter</td>
</tr>
<tr>
<td>0</td>
<td>No Zero Position Valve</td>
</tr>
</tbody>
</table>

*Viton is a trademark of E.I. Du Pont (other materials available, contact your Eaton Representative)

### Displacement Size

<table>
<thead>
<tr>
<th>Value</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>130 cm³/r [79 in³/rev]</td>
</tr>
<tr>
<td>180</td>
<td>180 cm³/r [110 in³/rev]</td>
</tr>
<tr>
<td>250</td>
<td>250 cm³/r [15.3 in³/rev]</td>
</tr>
<tr>
<td>360</td>
<td>360 cm³/r [22.0 in³/rev]</td>
</tr>
<tr>
<td>500</td>
<td>500 cm³/r [30.5 in³/rev]</td>
</tr>
<tr>
<td>750</td>
<td>750 cm³/r [45.8 in³/rev]</td>
</tr>
</tbody>
</table>

### Configuration

- S - Single Unit
- F - Front Unit
- M - Middle Unit
- R - Rear Unit
- Separator

### Rotation Direction

- R - Right hand [CW]
- L - Left hand [CCW]

### Adjustment Stop

- 0 - No adjustment stop
- 4 - Fixed mechanical Adjustment stop side A
- 5 - Fixed mechanical Adjustment stop side B
- 6 - Fixed mechanical Adjustment stop side A and B

### Mounting Flange

- 05 - ISO 3019/2 - 160B4HW (130 and 180 cm³/r)
- 07 - ISO 3019/2 - 200B4HW (250 and 360 cm³/r)
- 08 - ISO 3019/2 - 250B4HW (500 and 750 cm³/r)

### Drive Shaft Seal Configuration

- S - Single shaft seal

### Seal Material

- V - Viton*

### Yoke Position Indicator

- 0 - No position indicator
- V - Visual position indicator
- P - Position sensor
- L - Position limit switch
- M - Position sensor and visual indicator

### Housing Surface Finish

- A - Blue painted

### Transmission Circuit

- 0 - No transmission circuit
- 1 - Block filter, optical dirt indicator
- 2 - Block, filter, electrical dirt indicator
- 3 - Block without filter

### Add Control Model Code

Code (characters 28...50) on the following pages
Model Code
Transmission Pumps

"W" Series - ES Control

---

**Control type**
ES - Electric motor displacement control

**Displacement Adjustment Options**
M - Electric Motor - Fast response
N - Electric Motor - Medium response
P - Electric Motor - Slow response

**Electronic Controls**
00 - Not required

**Yoke Displacement Zone**
A - Single side of center "A"
C - Over center

**Extra Functions**
0 - Not available

**Pressure Control Options**
0 - Not available

**Power Control Options**
00000 - Not required

**Pilot Oil Filter**
0 - Not required

**Fail Safe Valve**
0 - Not required

**Position Monitoring**
A - 4 limit switches
B - 8 limit switches
P - 4 limit switches + sensor
T - 8 limit switches + sensor

**Electric Motor Type**
2 - Motor with brake (IP54)
3 - Motor without brake (Explosion proof)

**Control Voltage of Zero Position Valve and Directional Control Valve**
0 - Not applicable
B - 110 AC 50 Hz/120 AC 60 Hz
D - 220 AC 50 Hz/240 AC 60 Hz
G - 12 VDC
H - 24 VDC

---

### Response Time (sec) for Zero to Max. Displacement

<table>
<thead>
<tr>
<th>SIZE</th>
<th>130</th>
<th>180</th>
<th>250</th>
<th>360</th>
<th>500</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
<td>60 Hz</td>
<td>50 Hz</td>
<td>60 Hz</td>
<td>50 Hz</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Fast</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Medium</td>
<td>20</td>
<td>17</td>
<td>20</td>
<td>17</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>Slow</td>
<td>50</td>
<td>42</td>
<td>50</td>
<td>42</td>
<td>40</td>
<td>33</td>
</tr>
</tbody>
</table>

---

### CUSTOMER ADJUSTMENT SPECIFICATIONS

| All Revolution Adjustments below set at ... | rpm | 1500 | - |
| Pressure Relief Valve Side A | bar | 350 | |
| Pressure Relief Valve Side B | bar | 350 | |
| Charge Pressure Relief Valve | bar | 20 | - |
| Flushing (Low) Pressure Relief Valve | bar | 10 | - |
| Mechanical Adjustment Stop Side A | L/min | Q_max | |
| Mechanical Adjustment Stop Side B | L/min | Q_max | |
| Displacement Adjusted to ... | L/min | -50% Q_max Side A | |
| Position Monitoring Switch 1 | L/min | 0 from A | |
| Position Monitoring Switch 2 | L/min | 95% Q_max Side A | >95% not possible |
| Position Monitoring Switch 3 | L/min | 0 from B | |
| Position Monitoring Switch 4 | L/min | 95% Q_max Side B | >95% not possible |
| Position Monitoring Switch 5 | L/min | - | |
| Position Monitoring Switch 6 | L/min | - | |
| Position Monitoring Switch 7 | L/min | - | |
| Position Monitoring Switch 8 | L/min | - | |

---

**Customer Adjustment Specification**
0000 - None

???? - Yes (final number will be assigned by Eaton. Specify on table below)

**Special Features**
- Add special feature description (characters 51...55) on page 11 if required.
Model Code
Transmission Pumps

"W" Series - DP Control

Control type
DP – Pressure signal displacement control

Displacement Adjustment Options
G – Mounting interface Cetop 3 only
H – Remote port G 1/4
J – Proportional relief Inc. electronics
K – Proportional relief inc. electr. & dir. control

Electronic Controls
00 – Not required

Yoke Displacement Zone
A – Single side of center “A”
C – Over center

Extra Functions
0 – Not required for this control type
1 – Pressure limiter overriding function side A
2 – Pressure limiter overriding function side B
3 – Pressure limiter overriding function side A and B
4 – Pressure limiter and power control overriding function side A
5 – Pressure limiter and power control overriding function side B
6 – Pressure limiter and power control overriding function side A and B
7 – Pressure limiter function side A and B power control function side A
8 – Pressure limiter function side A and B power control function side B

Power Control Options
000000 - Not required for this control type
??000-??? kW at 1500 RPM Side A
000??-??? kW at 1500 RPM Side B

Pilot Oil Filter
0 – Not applicable
V – Filter with visual indicator
E – Filter with electrical indicator

Fail Safe Valve
0 – Not applicable

Position Monitoring
0 – No position monitoring

Electric Motor Type
0 – No electric motor

Control Voltage of Zero Position Valve and Directional Control Valve
0 – Not applicable
B – 110 AC 50 Hz/120 AC 60 Hz
D – 220 AC 50 Hz/240 AC 60 Hz
G – 12 VDC
H – 24 VDC

Customer Adjustment Specification
0000 – None
???? – Yes (final number will be assigned by Eaton. Specify on table below)

Special Features - Add special feature description (characters 51...55) on page 11 if required

Customer Adjustment Specification
0000 – None

CUSTOMER ADJUSTMENT SPECIFICATIONS

<table>
<thead>
<tr>
<th>CUSTOMER ADJUSTMENT SPECIFICATIONS</th>
<th>UNIT</th>
<th>STANDARD SETTING</th>
<th>CUSTOMER ADJUSTMENT OPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Revolution Adjustments below set at</td>
<td>rpm</td>
<td>1500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pressure Relief Valve Side A</td>
<td>bar</td>
<td>350</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pressure Relief Valve Side B</td>
<td>bar</td>
<td>350</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Charge Pressure Relief Valve</td>
<td>bar</td>
<td>20</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Flushing (Low) Pressure Relief Valve</td>
<td>bar</td>
<td>10</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pilot Pressure Size 130, 180, 250, 360</td>
<td>bar</td>
<td>60</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pilot Pressure Size 500 &amp; 750</td>
<td>bar</td>
<td>80</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Mechanical Adjustment Stop Side A</td>
<td>L/min</td>
<td>Qmax</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Mechanical Adjustment Stop Side B</td>
<td>L/min</td>
<td>Qmax</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Max. Stop by Control Side A</td>
<td>L/min</td>
<td>95% Qmax</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Max. Stop by Control Side B</td>
<td>L/min</td>
<td>95% Qmax</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pressure Override Side A</td>
<td>bar</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Override Side B</td>
<td>bar</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Model Code**

**Transmission Pumps**

"W" Series - SP Control

---

### Control Type
- **SP** - Proportional valve displacement control

### Displacement Adjustment Options
- **C** - With Cetop 3 valve KD4V S
- **F** - With Cetop 5 Proportional valve

### Electronic Controls
- **03** - ER 9.3 - 10 (Cetop 3)
- **04** - ER 9.4 - 10 (Cetop 5)

### Yoke Displacement Zone
- **A** - Single side of center "A"
- **C** - Over center

### Extra Functions
- **0** - Not required for this control type
- **1** - Pressure limiter overriding function side A
- **2** - Pressure limiter overriding function side B
- **3** - Pressure limiter overriding function side A and B
- **4** - Pressure limiter and power control overriding function side A

### Pressure Control Options
- **5** - Pressure limiter and power control overriding function side B
- **6** - Pressure limiter and power control overriding function side A and B
- **7** - Pressure limiter function side A and B power control function side A
- **8** - Pressure limiter function side A and B power control function side B

### Power Control Options
- **000000** - Not required for this control type
- **??? kW at 1500 RPM Side A**
- **??? kW at 1500 RPM Side B**

### Pilot Oil Filter
- **0** - Not applicable
- **V** - Filter with visual indicator
- **E** - Filter with electrical indicator

### Fail Safe Valve
- **0** - Not applicable
- **1** - With solenoid valve

### Position Monitoring
- **0** - No position monitoring

### Electric Motor Type
- **0** - No electric motor

### Extra Features
Add special feature description (characters 51...55) on page 11 if required

---

### Customer Adjustment Specifications

<table>
<thead>
<tr>
<th>CUSTOMER ADJUSTMENT SPECIFICATIONS</th>
<th>UNIT</th>
<th>STANDARD SETTING</th>
<th>CUSTOMER ADJUSTMENT OPTION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Revolution Adjustments below set at ...</td>
<td>rpm</td>
<td>1500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pressure Relief Valve Side A</td>
<td>bar</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Relief Valve Side B</td>
<td>bar</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge Pressure Relief Valve</td>
<td>bar</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flushing (Low) Pressure Relief Valve</td>
<td>bar</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot Pressure Size 130, 180, 250, 360</td>
<td>bar</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot Pressure Size 500 &amp; 750</td>
<td>bar</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Adjustment Stop Side A</td>
<td>L/min</td>
<td>Qmax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Adjustment Stop Side B</td>
<td>L/min</td>
<td>Qmax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Step by Control Side A</td>
<td>L/min</td>
<td>95% Qmax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Step by Control Side B</td>
<td>L/min</td>
<td>95% Qmax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramp Time 0 _ A</td>
<td>sec</td>
<td>0</td>
<td>El. Card Adjustment Done by Customer</td>
<td>Refer to El. card manual</td>
</tr>
<tr>
<td>Ramp Time A _ 0</td>
<td>sec</td>
<td>0</td>
<td>El. Card Adjustment Done by Customer</td>
<td>Refer to El. card manual</td>
</tr>
<tr>
<td>Pressure Override Side A</td>
<td>bar</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Override Side B</td>
<td>bar</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Model Code

Transmission Pumps

"W" Series - SM Control

## CUSTOMER ADJUSTMENT SPECIFICATIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Standard Setting</th>
<th>Customer Adjustment Option</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Adjustment below set at</td>
<td>RPM</td>
<td>1500</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pressure Relief Valve Side A</td>
<td>bar</td>
<td>350</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pressure Relief Valve Side B</td>
<td>bar</td>
<td>350</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Charge Pressure Relief Valve</td>
<td>bar</td>
<td>20</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Flushing (low) Pressure Relief Valve</td>
<td>bar</td>
<td>10</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pilot Pressure Size 130, 180, 250, 360</td>
<td>bar</td>
<td>60</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Pilot Pressure Size 500 and 750</td>
<td>bar</td>
<td>80</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Max. Mechanical Stop Side A</td>
<td>l/min</td>
<td>Qmax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Mechanical Stop Side B</td>
<td>l/min</td>
<td>Qmax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Override Side A</td>
<td>bar</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Override Side B</td>
<td>bar</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Extra Functions

- 0 - Not required for this control type
- 1 - Pressure limiter overriding function side A
- 2 - Pressure limiter overriding function side B
- 3 - Pressure limiter overriding function side A and B
- 4 - Pressure limiter and power control overriding function side A
- 5 - Pressure limiter and power control overriding function side B
- 6 - Pressure limiter and power control overriding function side A and B
- 7 - Pressure limiter function side A and B
- 8 - Pressure limiter function side A and B

### Pressure Control Options

- 0 - Not required for this control type
- F - Remote port, only side A
- G - Remote port, only side B
- H - Remote port, only side A and B
- A - Electro Prop. Relief Valve Side A
- B - Electro Prop. Relief Valve Side B
- K - Electro Prop. Relief Valve Side A and B

### Power Control Option

- 000000 - Not required for this control type
- ???000 - ?? kW at 1500 RPM Side A
- 000??? - ?? kW at 1500 RPM Side B

### Pilot Oil Filter

- 0 - Filter has to be installed by customer

### Customer Adjustment Specification

- 0000 - None
- 000000 - None
- 000000 - None

### Fail Safe Valve

- 0 - Not required for this control type

### Position Monitoring

- 0 - Not required for this control type

### Electric Motor Type

- 0 - Not required for this control type

### Control Voltage of Zero Position Valve

- 0 - Not required for this control type

### Special Features

Add special feature description (characters 51..55) on page 11 if required
### Model Code

**Transmission Pumps**

"W" Series -
Special Features

<table>
<thead>
<tr>
<th>51</th>
<th>52</th>
<th>53</th>
<th>54</th>
<th>55</th>
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</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
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<td>1</td>
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</table>

#### * * * 1 0

<table>
<thead>
<tr>
<th>51</th>
<th>52</th>
<th>53</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Special Features**

- **000** - None
- ******* - Defined by Eaton

#### 51 52 53 Design Number

- **10** - Design Number
### Combination Units

**Table:**

<table>
<thead>
<tr>
<th>First Control Type</th>
<th>Assembly Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 - No Control (for Fixed Displacement Only)</td>
<td>HC81 - Defined By Eaton</td>
</tr>
<tr>
<td>066 - 66 cm³/r [4.0 in³/rev]</td>
<td>006 - 66 cm³/r [4.0 in³/rev]</td>
</tr>
<tr>
<td>090 - 90 cm³/r [5.5 in³/rev]</td>
<td>090 - 90 cm³/r [5.5 in³/rev]</td>
</tr>
<tr>
<td>130 - 130 cm³/r [7.9 in³/rev]</td>
<td>130 - 130 cm³/r [7.9 in³/rev]</td>
</tr>
<tr>
<td>180 - 180 cm³/r [11.0 in³/rev]</td>
<td>180 - 180 cm³/r [11.0 in³/rev]</td>
</tr>
<tr>
<td>250 - 250 cm³/r [15.3 in³/rev]</td>
<td>250 - 250 cm³/r [15.3 in³/rev]</td>
</tr>
<tr>
<td>360 - 360 cm³/r [22.0 in³/rev]</td>
<td>360 - 360 cm³/r [22.0 in³/rev]</td>
</tr>
<tr>
<td>500 - 500 cm³/r [30.5 in³/rev]</td>
<td>500 - 500 cm³/r [30.5 in³/rev]</td>
</tr>
<tr>
<td>750 - 750 cm³/r [45.8 in³/rev]</td>
<td>750 - 750 cm³/r [45.8 in³/rev]</td>
</tr>
</tbody>
</table>

- Charge and Pilot Pump through drive option must be specified on the rear unit of the combination (as a special feature).
- Front and middle units shall have the through drive option of the following unit in the combination.

---

**Table:**

<table>
<thead>
<tr>
<th>Second Control Type</th>
<th>Assembly Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 - No Control (for Fixed Displacement Only)</td>
<td>HC81 - Defined By Eaton</td>
</tr>
<tr>
<td>DF - Pressure Compensator</td>
<td>006 - 66 cm³/r [4.0 in³/rev]</td>
</tr>
<tr>
<td>LR - Power Control</td>
<td>090 - 90 cm³/r [5.5 in³/rev]</td>
</tr>
<tr>
<td>ES - Electric Motor Control</td>
<td>130 - 130 cm³/r [7.9 in³/rev]</td>
</tr>
<tr>
<td>HG - Handwheel</td>
<td>180 - 180 cm³/r [11.0 in³/rev]</td>
</tr>
<tr>
<td>FE - Screw Adjustment</td>
<td>250 - 250 cm³/r [15.3 in³/rev]</td>
</tr>
<tr>
<td>SM - Servo Adjustment</td>
<td>360 - 360 cm³/r [22.0 in³/rev]</td>
</tr>
<tr>
<td>SP - Proportional Valve</td>
<td>500 - 500 cm³/r [30.5 in³/rev]</td>
</tr>
<tr>
<td>DP - Pressure Signal</td>
<td>750 - 750 cm³/r [45.8 in³/rev]</td>
</tr>
</tbody>
</table>

- For a combination of two or more units fill out this Combination Model Code.
- Start with the biggest size unit for the first displacement.
- For each unit included in this combination, a separate model code must be chosen. Use the form on page 5.
- Character 26 to 39 will be P/N of the combination. This number will be defined by Eaton and provided in the order acknowledgement.

---

**Table:**

<table>
<thead>
<tr>
<th>Combination Unit</th>
<th>Assembly Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>P - Pump</td>
<td>HC81 - Defined By Eaton</td>
</tr>
<tr>
<td>T - Transmission Pump</td>
<td>006 - 66 cm³/r [4.0 in³/rev]</td>
</tr>
<tr>
<td>M - Motor</td>
<td>090 - 90 cm³/r [5.5 in³/rev]</td>
</tr>
<tr>
<td>SP - Proportional Valve</td>
<td>130 - 130 cm³/r [7.9 in³/rev]</td>
</tr>
<tr>
<td>DP - Pressure Signal</td>
<td>180 - 180 cm³/r [11.0 in³/rev]</td>
</tr>
<tr>
<td>SM - Servo Adjustment</td>
<td>250 - 250 cm³/r [15.3 in³/rev]</td>
</tr>
<tr>
<td>FE - Screw Adjustment</td>
<td>360 - 360 cm³/r [22.0 in³/rev]</td>
</tr>
<tr>
<td>HG - Handwheel</td>
<td>500 - 500 cm³/r [30.5 in³/rev]</td>
</tr>
<tr>
<td>ES - Electric Motor Control</td>
<td>750 - 750 cm³/r [45.8 in³/rev]</td>
</tr>
</tbody>
</table>

- For a combination of two or more units fill out this Combination Model Code.
- Start with the biggest size unit for the first displacement.
- For each unit included in this combination, a separate model code must be chosen. Use the form on page 5.
- Character 26 to 39 will be P/N of the combination. This number will be defined by Eaton and provided in the order acknowledgement.
Examples for Combination Units

Example 1: Combination of two closed loop pumps
Model Code Front Unit  TVWF-500M08R0000H1R02VMA20SPC03C00000000E100H000000010
Model Code Rear Unit  TVWR-250M07R000PP1R02VMA20SPC03C00000000E100H000000010
Model Code Combination Unit  TVWC-500SP250SP0000000000000000000010

Example 2: Combination of one closed loop - and two open loop pumps (For open loop model code refer to the according catalog)
Model Code Front Unit  TVWF-500M08R0000H1R02VMA20SPC03C00000000E100H000000010
Model Code Middle Unit  PVWM-250M07R00E1R02SVOADF000A00000000000000000010
Model Code Rear Unit  PFXR-130M02R00P1A02SVOA00000000000000000010
Model Code Combination Unit  TVWC-500SP250DF1300000000000000000010
## Pump Specifications - US

### Design
- **Type of mounting**: Flange or foot-mounted. Combination units foot mounted only
- **Pipe connection SAE/Flange**: B A psi 1-1/4"-6000 1-1/4"-6000 1-1/2"-6000 1-1/2"-6000 2"-6000 2"-6000
- **Direction of rotation**: Clockwise when viewing shaft end of pump. Counterclockwise available on request
- **Speed range**: n min rpm 150 1800 1500
- **Installation position**: Optional, see mounting information
- **Ambient temperature range**: min °F -4 max 122
- **Weight**: m lb 353 364 518 529 926 1014
- **Mass of inertia**: J lb ft² 1.07 1.07 3.46 3.61 11.9 13.1

### Hydraulic Characteristics
- **Nominal pressure (100% duty cycle)**: pN psi 5075
- **Input pressure**: pmin psi 38 abs
- **Max. pressure to DIN 24312**: pmax psi 6090
- **Hydraulic fluid**: Hydraulic oil to DIN 51524 part 2. Refer to section Application Data-Fluid Recommendations
- **Hydraulic fluid temperature range**: min °F -13 max 194
- **Viscosity range for continuous operation**: min cSt 10 max cSt 150
- **Max. permissible start viscosity**: max cSt 1000
- **Filtering**: ISO 4406 18/15/13
- **Maximum geometric displacement**: Vg in³ 7.9 11 15.2 22 30.5 45.7
- **Max. geom. pump flow**: n= 1500 rpm Qg USgpm 51.5 71 99 142 198 297
  - n= 1800 rpm 62 85.5 119 171 238 297
- **Case pressure**: pv max psi max. 7.2 psi over p1. pmax = 58 psi abs.

### Hydraulic Characteristic of Charge and Pilot Pump
- **Displacement charge pump**: Vg Sp in³ 2.44 2.44 3.91 4.88 7.63 12.2
- **Charge pressure**: pk Sp psi 145/290 145/290 145/290 145/290 174/290 232/348
- **Input pressure charge & pilot pump**: pmin Sp/St psi 11.6 absolute
- **Displacement pilot pump**: Vg St in³ 0.5
- **Pilot pressure**: pv psi 870 870 870 870 1160 1160

### Drive
- **Max. driving torque - single unit (p2 max., n=100%)**: M 1 Single lb-ft. 642 888 1232 1774 2463 3688
- **Max. power consumption - single unit (p2 max., n=100%; n=1800 rpm)**: P 1 Single hp 220 304 422 608 845 1055
- **Max. driving torque - comb. unit**: M 1 Comb. lb-ft. 2x642 2x888 2x1232 2x1774 3688 3688

1) TVW - 750 at 1800 rpm reduced to 38.1 in³
2) When pressure below 1450 psi and flow below 25% of max. flow

---

**EATON Vickers** Hydrokraft Transmission Piston Pumps V-PUPI-TM002-E February 2003
## Pump Specifications - Metric

<table>
<thead>
<tr>
<th>MODEL</th>
<th>TVW 130</th>
<th>TVW 180</th>
<th>TVW 250</th>
<th>TVW 360</th>
<th>TVW 500</th>
<th>TVW 750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Swash plate - Axial piston pump</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of mounting</td>
<td>Flange or foot-mounted. Combination units foot mounted only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe connection SAE/Flange</td>
<td>B psi</td>
<td>A psi</td>
<td>1-1/4&quot;-6000</td>
<td>1-1/4&quot;-6000</td>
<td>1-1/2&quot;-6000</td>
<td>1-1/2&quot;-6000</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>Clockwise when viewing shaft end of pump</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed range</td>
<td>n min min⁻¹</td>
<td>150</td>
<td>1800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation position</td>
<td>Optional, see mounting information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>min °C</td>
<td>max °C</td>
<td>-20</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>m kg</td>
<td>160</td>
<td>165</td>
<td>225</td>
<td>240</td>
<td>420</td>
</tr>
<tr>
<td>Mass of inertia</td>
<td>J kg m²</td>
<td>0.045</td>
<td>0.045</td>
<td>0.146</td>
<td>0.152</td>
<td>0.5</td>
</tr>
</tbody>
</table>

### HYDRAULIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Nominal pressure (100% duty cycle)</th>
<th>p1 min bar</th>
<th>p1 max bar</th>
<th>350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input pressure</td>
<td>p2 min bar</td>
<td>4</td>
<td>Pressure can be applied to the pump inlet but the sum of p1 and p2 must not exceed the maximum value of 420 bar</td>
</tr>
<tr>
<td>Max. pressure to DIN 24312</td>
<td>p2 max psi</td>
<td>420</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hydraulic fluid</th>
<th>Hydraulic oil to DIN 51524 part 2. Refer to section Application Data-Fluid Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>min °C</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td>min cSt</td>
</tr>
<tr>
<td>Max. permissible start viscosity</td>
<td>max cSt</td>
</tr>
<tr>
<td>Filtering</td>
<td>ISO 4406</td>
</tr>
<tr>
<td>Maximum geometric displacement</td>
<td>Vg cm³</td>
</tr>
<tr>
<td>M ax. geom. pump flow</td>
<td>Qg l/min</td>
</tr>
<tr>
<td>Case pressure</td>
<td>pV max bar</td>
</tr>
</tbody>
</table>

### HYDRAULIC CHARACTERISTIC OF CHARGE AND PILOT PUMP

<table>
<thead>
<tr>
<th>Displacement charge pump</th>
<th>Vg Sp cm³</th>
<th>40</th>
<th>40</th>
<th>64</th>
<th>80</th>
<th>125</th>
<th>200</th>
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</thead>
<tbody>
<tr>
<td>Charge pressure</td>
<td>pn Sp bar</td>
<td>10/20</td>
<td>10/20</td>
<td>10/20</td>
<td>10/20</td>
<td>12/20</td>
<td>16/24</td>
</tr>
<tr>
<td>Input pressure charge &amp; pilot pump</td>
<td>pmin Sp/St bar</td>
<td>0.8 absolute</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacement pilot pump</td>
<td>Vg St cm³</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot pressure</td>
<td>pSc bar</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>80</td>
<td>80</td>
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</table>

### DRIVE

<table>
<thead>
<tr>
<th>M ax. driving torque - single unit</th>
<th>M 1 Single Nm</th>
<th>870</th>
<th>1204</th>
<th>1670</th>
<th>2405</th>
<th>3340</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>M ax. power consumption - single unit</td>
<td>P1 Single kW</td>
<td>164</td>
<td>227</td>
<td>315</td>
<td>454</td>
<td>630</td>
<td>787°</td>
</tr>
<tr>
<td>M ax. driving torque - comb. unit</td>
<td>M 1 Comb. Nm</td>
<td>2x870</td>
<td>2x1204</td>
<td>2x1670</td>
<td>2x2405</td>
<td>5000</td>
<td>5000</td>
</tr>
</tbody>
</table>

1) TVW - 750 at 1800 min⁻¹ reduced to 625 cm³
2) When pressure below 100 bar and flow below 25% of max. flow
**Performance Curves - 130 Series**

**Power efficiency performance curve**

- $\eta_{\text{vol}} (\%)$
- $\eta_{\text{tot}} (\%)$
- $\eta_{\text{tot}}$ for 100% $V_g$
- $\eta_{\text{tot}}$ for 50% $V_g$
- $\eta_{\text{tot}}$ for 25% $V_g$
- $p_1$ at $n=1800$ rpm
- $p_1$ at $n=1500$ rpm

**Roller bearing life**

- $10^6$
- $10^5$
- $10^4$
- $10^3$

**Combination units**

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

**For reduced swash-angle:**

$$L_h = (L \text{ at } V_{\text{max}}) \times \frac{1}{\left(\frac{V}{V_{\text{max}}}\right)^{\frac{10}{3}}}$$
Performance Curves - 180 Series

**Power efficiency performance curve**

- \( \eta_{\text{vol}} \% \) for 100% \( V_g \)
- \( \eta_{\text{tot}} \% \) for 100% \( V_g \)
- \( \eta_{\text{tot}} \% \) for 50% \( V_g \)
- \( \eta_{\text{tot}} \% \) for 25% \( V_g \)

\[ p_2 \text{ at } n=1800 \text{ rpm} \]
\[ p_1 \text{ at } n=1500 \text{ rpm} \]

**Roller bearing life**

- \( L \) for \( V=V_{\text{max}} \)
- \( L \) for \( n=1500 \text{ rpm} \)
- \( L \) for \( n=1800 \text{ rpm} \)

**Combination units**

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

**For reduced swash-angle:**

\[ L_h = (L \text{ at } V_{\text{max}}) \times \left( \frac{1}{V} \right)^{10/3} \]
Combination units
For combination pumps the characteristic values are as for the individual units.

For reduced swash-angle:

$L_h = (L \text{ at } V_{\text{max}}) \times \frac{1}{\left(\frac{V}{V_{\text{max}}}\right)^{\frac{10}{3}}}$
Performance Curves - 360 Series

**Combination units**

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

**For reduced swash-angle:**

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

---

**Power efficiency performance curve**

- \( \eta_{\text{vol}}(\%) \)
- \( \eta_{\text{tot}}(\%) \)
- \( p_1 \text{ at } n=1800 \text{ rpm} \)
- \( p_1 \text{ at } n=1500 \text{ rpm} \)

**Roller bearing life**

- \( L \text{ in} h \)
- \( V=V_{\max} \)
- \( n=1500 \text{ rpm} \)
- \( n=1800 \text{ rpm} \)
Combination units
For combination pumps the characteristic values are as for the individual units. Only the torque $M_1$ is limited to 5000 Nm.

For reduced swash-angle:

$$L_h = (L \text{ at } V_{\text{max}}) \times \frac{1}{\left(\frac{V}{V_{\text{max}}}\right)^{\frac{10}{3}}}$$
For reduced swash-angle:

\[ L_h = (L \text{ at } V_{\text{max}}) \times \left(\frac{V}{V_{\text{max}}}\right)^{10/3} \]
Hydraulic Transmission Circuit

A, B System port
ASt, BSt Control
L1, L2 Drain port
L3 Ventilation port for vertical mounting
L3.1 Air bleeding port for vertical mounting
L4 Return line charge flow
L5 Oil filling plug
L6 Return line charge flow
MA, MB Gauge port system pressure
MSp Gauge port charge pressure
MSp Gauge port pilot pressure
pSt Port for pilot flow to control
pSt1 Port for pilot flow
pSt2 Pilot pump outlet port
pSp1, pSp2 Port for external charge flow
pac1 Accumulator port
pac2 Suction port for charge and pilot pump
pac Air bleeding port for vertical mounting

Acumulator recommended in case of short pressure build up time
Hydraulic Transmission Circuit
with Charge Flow Filter

Size 130 .... 500.
(Not available for 750)
Hydraulic Transmission Circuit
without Charge Flow Filter

Size 130 ..... 750

A, B System port
Ae, Be Control
L1, L2 Drain port
L3 Ventilation port for vertical mounting
L3.1 Air bleeding port for vertical mounting
L4 Return line charge flow
L5 Oil filling plug
L6 Return line charge flow

MA, MB Gauge port system pressure
M Sp Gauge port charge pressure
M Sp Gauge port pilot pressure
Pact accumulator port
Pent Port for external charge flow
Pent Port for pilot flow
Pent Port for pilot flow
Pent Pilot pump outlet

S Suction port for charge and pilot pump
Sp S Charge block
Sp 1 Port for external charge flow
Sp 2 Port for pilot flow
Sp 2 Pilot pump outlet

M St Gauge port pilot pressure
MSp Gauge port charge pressure
MSt Gauge port pilot pressure
Sp1p Port for external charge flow
Sp1p Port for external charge flow
Sp2p Port for pilot flow
Sp2p Port for pilot flow

M St Gauge port pilot pressure
M St Gauge port pilot pressure

Items 2.3 & 2.4 provided by customer

3 Flushing block
3.1 Low pressure relief valve
3.2 Flushing flow shuttle valve
6 Charge block
6 Charge check valve
7 Charge/ pilot pump (option)
Hydraulic Transmission Circuit
Combination of Two Pumps
Controls -
Electric Motor Displacement Control ES

The unit is used for stepless flow adjustment. It has a three phase electric servo motor, worm gearing and a switch box with 4 and 8 limit switches for 4 or 8 positions. A potentiometer is also available.

The response times from zero to maximum depends on the chosen ratio and the speed of the servo motor (this means that during operation the response times are not variable).

No pressure/power limiter possible.
Explosion protection version are also available.

<table>
<thead>
<tr>
<th>Size</th>
<th>130</th>
<th>180</th>
<th>250</th>
<th>360</th>
<th>500</th>
<th>750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq. Hz</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Fast</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Medium</td>
<td>20</td>
<td>17</td>
<td>20</td>
<td>17</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>Slow</td>
<td>50</td>
<td>42</td>
<td>50</td>
<td>42</td>
<td>40</td>
<td>33</td>
</tr>
</tbody>
</table>

Response time from 0 to +Qmax or 0 to -Qmax.
The electro or pressure proportional hydraulic displacement control will operate a hydrostatic drive in all four quadrants and work without throttle losses within either electrically or hydraulically adjustable limits. This done by controlling delivery flow respect; ie. swash angle.

The displacement of the axial piston unit is proportional to the swash plate angle and can be adjusted by a spring centered servo piston.

The servo piston is controlled by the required input signal with a mechanical, hydraulic or electrical control device.

Economical and energy saving drives can be produced with the "building block" principle for open loop and closed circuits as well.

Note: setting the pressure compensator or a control or a constant power, lower than the adjusted pilot oil pressure ps min= 60/80 bar (870/1160 psi), is not possible.

Pressure Limitation:
Each of the servo controls DP, SM and SP can be combined with a hydromechanical pressure limitation control. This destrokes the swash plate when the system pressure reaches a control setting. The response time for de-stroking the the pump is much faster than that of the servo control alone.

The pressure limitation control can also operate the unit in the motor mode of operation. This means when the hydraulic motor delivers energy to the system e.g. from energy stored in a flywheel, the pump goes over-center thus acting as a motor delivering mechanical energy to the drive, as in a mooring control function.

For each of the system sides, A and B, a separate pressure control is required. This control consist of a main stage valve conducting the system pressure to the pump actuator piston a pressure relief valve where the pressure is set. The minimum setting of this valve cannot be lower than the pilot pressure.

Power Limitation (Torque Control):
An additional power limitation valve can be used in conjunction with the pressure limitation control. This senses the position of the pump actuator piston which is proportional to the swash plate angle. In accordance with the swash plate angle the pressure adjustment is set to a determined level to follow a hyperbolic relationship between flow and pressure.

High Flow - Low Pressure
Low Flow - High Pressure

The power level, a function of the product of flow and pressure, is hence adjustable.
The output flow of the pump is proportional to the pilot pressure. Each of the two pilot ports is responsible for an output flow direction.

A separate pilot oil circuit is necessary with $p_{min}=60/80$ bar, $Q_{St}=12$ l/min (3.17 USgpm). From this the control pressure is reduced to the desired set value by means of a suitable circuit.

For exchange with:
Pressure limiting valve (mechanical or proportional) from P to T line and throttle in P line 0,8 Dia. (0.03)

The pressure proportional adjustment can also be supplied with a pressure and/or power limitation.

**Pressure proportional adjustment DP**

The output flow of the pump is proportional to the pilot pressure. Each of the two pilot ports is responsible for an output flow direction.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>RESPONSE TIME (s)</th>
<th>RESPONSE TIME* (s)</th>
<th>PILOT PRESSURE $P_{cr}$ (BAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>130/180</td>
<td>0.8</td>
<td>0.07</td>
<td>60</td>
</tr>
<tr>
<td>250/360</td>
<td>1.0</td>
<td>0.08</td>
<td>60</td>
</tr>
<tr>
<td>500/750</td>
<td>2.2</td>
<td>0.110</td>
<td>80</td>
</tr>
</tbody>
</table>

*Measured with a 2m pressure line of diameter 50 mm
Controls –
Example for TVW
- DP Control
with Pressure - & Power
Limiter

A, B  System port
A_{St}, B_{St}  Control
L1, L2  Drain port
L3  Ventilation port for vertical mounting
L3.1  Air bleeding port for vertical mounting
L4  Return line charge flow
L5  Oil filling plug
L6  Return line charge flow

MA, MB  Gauge port system pressure
M_{sp}  Gauge port charge pressure
M_{St}  Gauge port pilot pressure
Accumulator port
p_{ac1}  Port for external charge flow
p_{ps1}  Port for pilot flow
p_{p1}  Port for pilot flow
p_{p11}  Port for pilot flow
p_{p2}  Pilot pump outlet port

S  Suction port for charge and pilot pump
T  Tank port
XA, XB  Pilot port pressure control
1  Basic pump
11  High pressure relief valve
2  Charge block
2.1  Charge check valve
2.2  Charge pressure relief valve

2.3  Filter
2.4  Clogging indicator
3  Flushing block
3.1  Low pressure relief valve
3.2  Flushing flow shuttle valve
6  Control manifold
6.1  Pilot pressure relief valve
7  DP-Control
8.1  Pressure limiter 100 to 350 bar
The electro hydraulic displacement control will operate a hydrostatic drive in all four quadrants and work without throttle losses within electrically adjustable limits.

This is done by controlling delivery flow with swash plate angle feedback. All control valves are recorded as an electrical signal and feed back to the control card. The proportional valve or servo valve and servo piston transform the output signal of the control card to the desired setting.

This results in a very precise and dynamic control.

**Electrohydraulic servo adjustment SP**

The electro hydraulic displacement control will operate a hydrostatic drive in all four quadrants and work without throttle losses within electrically adjustable limits. This is done by controlling delivery flow swash plate angle feedback.

### PROPORTIONAL VALVE

<table>
<thead>
<tr>
<th>NOMINAL FLOW</th>
<th>CONTROL PRESSURE PST</th>
<th>CONTROL ELECTRONICS</th>
<th>RESPONSE TIME</th>
<th>UNIT SIZE</th>
<th>SERVO PISTON</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medium response (CETOP 3)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 (3.17)</td>
<td>10 (150)</td>
<td>60 (870) to 80 (1160)</td>
<td>ER 9.0 - 10</td>
<td>130 (7.9)</td>
<td>60 (2.36)</td>
<td>150 (6.30)</td>
</tr>
<tr>
<td>180 (11)</td>
<td>250 (15.2)</td>
<td>ER 9.0 - 10</td>
<td>130 (7.9)</td>
<td>60 (2.36)</td>
<td>150 (6.30)</td>
<td></td>
</tr>
<tr>
<td>250 (15.2)</td>
<td>75 (2.95)</td>
<td>25 (9.8)</td>
<td>79 (4.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360 (22)</td>
<td>75 (2.95)</td>
<td>25 (9.8)</td>
<td>79 (4.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 (30.5)</td>
<td>75 (2.95)</td>
<td>22 (8.7)</td>
<td>97 (5.92)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>750 (45.7)</td>
<td>75 (2.95)</td>
<td>30 (1.18)</td>
<td>132 (8.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High response (CETOP 5)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 (11)</td>
<td>70 (1000)</td>
<td>80 (1160) to 100 (1450)</td>
<td>ER 9.4 - 10</td>
<td>130 (7.9)</td>
<td>60 (2.36)</td>
<td>150 (6.30)</td>
</tr>
<tr>
<td>180 (11)</td>
<td>250 (15.2)</td>
<td>ER 9.4 - 10</td>
<td>130 (7.9)</td>
<td>60 (2.36)</td>
<td>150 (6.30)</td>
<td></td>
</tr>
<tr>
<td>250 (15.2)</td>
<td>75 (2.95)</td>
<td>18 (7.1)</td>
<td>79 (4.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>360 (22)</td>
<td>75 (2.95)</td>
<td>25 (9.8)</td>
<td>110 (6.71)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500 (30.5)</td>
<td>75 (2.95)</td>
<td>22 (8.7)</td>
<td>97 (5.92)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>750 (45.7)</td>
<td>75 (2.95)</td>
<td>30 (1.18)</td>
<td>132 (8.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Controls – Control Cards
SP - Control with Pressure and Power Limitation

The ER 9.3 - 10 and ER 9.4 - 10 Digital control cards are available and optimized for use with the SP - Control. Software is available for parameter setting and storing (Database function). Contact Eaton to request the free of charge manual- and software CD.

Control Cards
The patented circuit provides extremely short response times for the pressure compensator regardless of the servo control used:
The response time is independent from the particular flow characteristic!

<table>
<thead>
<tr>
<th>FRAME SIZE</th>
<th>RESPONSE TIME WHEN COMPENSATING FROM +/- V\text{max} — 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>130/180</td>
<td>80 ms</td>
</tr>
<tr>
<td>250/360</td>
<td>90 ms</td>
</tr>
<tr>
<td>500/750</td>
<td>110 ... 130 ms</td>
</tr>
</tbody>
</table>

SP - Control with pressure and power limitation

1. Pressure limiter setting
2. Power limiter setting
3. SP Displacement control

Drive torque "compensated"
Controls –
SP Control with and without
Pressure Limitation
Example for TVWS

... SPC03C0 ...
... SPC03C3 ...

A, B System port
A<br>, B<br> Pilot oil port pump side A, B
L1, L2 Drain port
L3 Ventilation port for vertical mounting
L3.1 Air bleeding port
L4 Drain port (charge oil)
L5 Oil filling plug
L6 Drain port (flushing oil)
L7 Port for return line of control circuit
MA, MB Gauge port system pressure
M<br> Gauge port charge pressure
M<br> Gauge port pilot pressure
p<sub>ac1</sub> Accumulator port
p<sub>ac2</sub> External port charge flow
p<sub>sp1</sub> Additional charge pump outlet port
p<sub>sp2</sub> Port for pilot pressure
p<sub>sp2</sub> Piston pump outlet port
S Suction port for charge and pilot pump
T Tank port
XA, XB Pilot port pressure control
1 Basic pump
11 High pressure relief valve
2 Charge block
2.1 Charge check valve
2.2 Charge pressure relief valve
3 Flushing block
3.1 Low pressure relief valve
3.2 Flushing flow shuttle valve
4 Charge pump
5 Pilot pump
6 Connection plate for SP-Control
6.1 Pilot pressure relief valve
7 Proportional valve
8.1 Pressure limiter 100 to 350 bar
9 Fail safe valve intermediate plate
10 Pilot oil filter
Controls –
Servo Adjustment
Displacement
Control with
Mechanical
Feedback SM

- Servo control with integrated mechanical feedback of swash plate position. Mainly used in hazardous environments.
- No electronic control card necessary
- Input signal ± 50 mA (linear coil connection) ; ± 100 mA (parallel coil connection)
- Hysteresis, repeatability: 8% of end value

- Available in explosion proof class Eex i II version for hazardous duty.
- Pressure/power limitation available
Dimensions in mm

### Dimensions in mm

**View "X"**

<table>
<thead>
<tr>
<th>DIRECTION OF ROTATION</th>
<th>RANGE OF SWASH ANGLE</th>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Hand Rotation</td>
<td>To +V_mmax</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>To - V_mmax</td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

For left hand rotation a special setup of charge and pilot pump is required!

**A**

System pressure port SAE 1 1/4", 6000 psi

**L1**

Drain port 1 1/16" - 12 UNF-2B (according to mounting position use upper port)

**L2**

Drain port G 1" (according to mounting position use upper port)

**L3**

Ventilation port for vertical mounting G 3/8" (shaft upwards)

**L4**

Drain port G 3/4" (charge oil)

**L5**

Oil filling plug 1 1/16" - 12 UNF-2B

**L6**

Drain port G 3/4" (flushing oil)

**L8**

Air bleeding port G 1/4"

**L9**

Drain port for low pressure relief valve G 1/4"

**MA**

Gauge port system pressure G 1/4"

**ML**

Gauge port of case pressure G 1/4"

**ML1**

Gauge port of charge pressure G 1/4"

**ML3**

Gauge port of pilot pressure G 1/4"

**ML51**

El. contamination indicator for charge pressure

**Sp1p**

Gauge port of charge pressure

**pSp1**

External port of charge pressure G 3/4"

**pSp2**

Additional charge pump outlet port G 3/4" (closed)

**Sp2**

Suction port of charge and pilot pump SAE 1 1/4", 3000 psi (common port)

For left hand rotation a special setup of charge and pilot pump is required!
Pump Dimensions - TVWS 250

Dimensions in mm

<table>
<thead>
<tr>
<th>DIRECTION OF ROTATION</th>
<th>RANGE OF SWASH ANGLE</th>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>To + V_{max}</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>To - V_{max}</td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

For left hand rotation a special setup of charge and pilot pump is required!

A  System pressure port SAE 1 1/2", 6000 psi
B  System pressure port SAE 1 1/2", 6000 psi
(L1) Drain port 1 5/8" - 12 UNF-2B (according to mounting position use upper port)
L2  Drain port G 1 1/4" (according to mounting position use upper port)

(L3) Ventilation port for vertical mounting G 3/8" (shaft upwards)
(L3.1) Port G 1/8"
(L4) Drain port G 1" (charge oil)
(L5) Oil filling plug 1 1/16" - 12 UNF-2B
(L6) Drain port G1" (flushing oil)
(L8) Air bleeding port G 1/4"

(L9) Drain port for low pressure relief valve G 1/4"
(MA) Gauge port system pressure G 1/4"
(MB) Gauge port system pressure G 1/4"
(ML) Gauge port of case pressure G 1/4"
(MSp) Gauge port of charge pressure G 1/4"

(Pac1) Accumulator port G 1"
(PSp2) External port of charge pressure G 3/4"
(PSt2) Pilot pump outlet port M27x2
Port S    SAE 2", 3000 psi
Port pSp2 SAE 1", 3000 psi

Fail safe valve intermediate plate
Adjustment pilot oil relief valve
Feedback (potentiometer) with visual indicator
High pressure relief valve (doubleacting)
Setting range 100...350 bar
Charge pressure relief valve
50...100% of V_{max}
Spring centering
Stroke limitation

Proportional control valve
DM 20 DIN 332
W 62x48x1.25x10a DIN 5480

DIN 5480

For left hand rotation a special setup of charge and pilot pump is required!
Dimensions in mm

**DIRECTION OF ROTATION** | **RANGE OF SWASH ANGLE** | **INPUT** | **OUTPUT**
--- | --- | --- | ---
Right Hand Rotation | To + V_{max} | B | A
To - V_{max} | A | B

For left hand rotation a special setup of charge and pilot pump is required!

- **A**
  - System pressure port SAE 1 1/2", 6000 psi
  - Ventilation port for vertical mounting G 3/8" (shaft upwards)

- **B**
  - System pressure port SAE 1 1/2", 6000 psi
  - Port G 1/8"
  - Drain port G 1" (charge oil)

- **L1**
  - Drain port 1 5/8" - 12 UNF-2B
  - Oil filling plug 1 1/16" - 12 UNF-2B
  - Drain port G 1" (flushing oil)

- **L2**
  - Drain port G 1/4"
  - Air bleeding port G 1/4"
  - Drain port for low pressure relief valve G 1/4"

- **(L3)**
  - Fail safe valve intermediate plate
  - Adjustment pilot oil relief valve
  - Feedback (potentiometer) with visual indicator

- **(L3.1)**
  - High pressure relief valve (double acting)
  - Setting range 100..350 bar

- **(L5)**
  - Ventilation port for vertical mounting G 1/8"

- **L6**
  - Drain port G 1"
  - Oil filling plug G 1/2" - 12 UNF-2B

- **(L8)**
  - Air bleeding port G 1/4"

- **(L9)**
  - Drain port for low pressure relief valve G 1/4"

- **L3.1**
  - High pressure relief valve

- **L3**
  - Outlet port for charge oil

- **L4**
  - Drain port G 1"
  - Charge and pilot pumps (80/8 ccm)

- **L2**
  - Drain port G 1/4"

- **(L5)**
  - Oil filling plug 1 1/16" - 12 UNF-2B

- **L6**
  - Drain port G 1"

- **L8**
  - Air bleeding port G 1/4"

- **L9**
  - Drain port for low pressure relief valve G 1/4"

- **(L5)**
  - Oil filling plug 1 1/16" - 12 UNF-2B

- **L6**
  - Drain port G 1"

- **(L8)**
  - Air bleeding port G 1/4"

- **(L9)**
  - Drain port for low pressure relief valve G 1/4"

- **(MA)**
  - Gauge port system pressure G 1/4"

- **(MB)**
  - Gauge port system pressure G 1/4"

- **ML**
  - Gauge port of case pressure G 1/4"

- **(L5)**
  - Oil filling plug 1 1/16" - 12 UNF-2B

- **L6**
  - Drain port G 1"

- **(L8)**
  - Air bleeding port G 1/4"

- **(L9)**
  - Drain port for low pressure relief valve G 1/4"

- **(MB) p_{sp1}**
  - Gauge port of charge pressure G 1/4"

- **ML p_{sp1}**
  - Gauge port of charge pressure G 1/4"

- **ML p_{sp2}**
  - Gauge port of charge pressure G 1/4"

- **(p_{sp1})**
  - Accumulator port G 1"

- **(p_{sp2})**
  - External port of charge pressure G 3/8"

- **(...)**
  - Normally plugged

**Additional charge pump outlet port M27x2**

**Pilot pump outlet port G 3/8"**

**Suction port of charge and pilot pump SAE 2", 3000 psi (common port)**

**Feeder (potentiometer) with visual indicator**
Dimensions in mm

**DIRECTION OF ROTATION | RANGE OF SWASH ANGLE | INPUT | OUTPUT**

<table>
<thead>
<tr>
<th>Right</th>
<th>Hand Rotation</th>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To + V\text{max}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To - V\text{max}</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For left hand rotation a special setup of charge and pilot pump is required!

A  System pressure port SAE 2", 6000 psi  (L3)  Ventilation port for vertical mounting G 3/8" (shaft upwards)  (MA)  Gauge port system pressure G 1/4" (p\text{sp1})  Additional charge pump outlet port M27x2

B  System pressure port SAE 2", 6000 psi  (L3.1)  Port G 1/8"  (L4)  Drain port G 1" (charge oil)  (ML)  Gauge port of case pressure G 1/4" (p\text{sp2})  Port of pilot pressure G 1/2"  (p\text{st2})  Pilot pump outlet port G 3/8"

(L1)  Drain port 1 5/8" - 12 UNF-2B (according to mounting position use upper port)  (L5)  Oil filing plug 1 1/16" - 12 UNF-2B  (L6)  Drain port G 1" (flushing oil)  (M\text{sp1})  Gauge port of pressure G 1/4" (p\text{sp2})  Shuttle and low pressure relief valve  M B

(L2)  Drain port G 1/2" (according to mounting position use upper port)  (L8)  Air bleeding port G 1/4"  (p\text{p1})  Gauge port of pilot pressure G 1/4"  (S)  Suction port of charge and pilot pump SAE 2", 3000 psi (common port)

(L9)  Drain port for low pressure relief valve G 1/4"  (p\text{p1})  Accumulator port G 1"  (p\text{acc})  External port of charge pressure G 3/4"

(…) Normally plugged
Pump Dimensions - TVWS 750

Dimensions in mm

<table>
<thead>
<tr>
<th>DIRECTION OF ROTATION</th>
<th>RANGE OF SWASH ANGLE</th>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Hand Rotation</td>
<td>To + Vmax</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>To - Vmax</td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

For left hand rotation a special setup of charge and pilot pump is required!

A  System pressure port SAE 2", 6000 psi
B  System pressure port SAE 2", 6000 psi
(L1) Drain port 1 5/8" - 12 UNF-2B
(L2) Drain port G 1 1/2"
(L3) Ventilation port for vertical mounting G 3/8"
(L4) Drain port G 1 1/4" (charge oil)
(L5) Oil filling plug 1 1/16" - 12 UNF-2B

L6  Drain port G 1 1/4" (flushing oil)
L7  Port G 3/8" for return line of control circuit
(L8) Air bleeding port G 1/4"
(MAB) Gauge port system pressure G 1/4"
(ML) Gauge port of case pressure G 1/4"
(MSp) Gauge port of charge pressure G 1/4"
(MSp1) External port of charge pressure G 1/4" (Port of charge pressure internal)
(MSp2) Additional charge pump outlet port G 1/4"
(MSt) Gauge port of pilot pressure G 1/4"
(MSt1) Port of pilot pressure G 1/2"
(MSt1.1) Port of pilot pressure G 3/8"

Accumulator port G 1 1/4"
Accumulator port G 1 1/4" (optional)
External port of charge pressure G 1" (Port of charge pressure internal)
Additional charge pump outlet port G 1/4"
Port of pilot pressure G 1/2"***
Port of pilot pressure G 3/8"***

Pilot pump outlet port G 3/8"***
Suction port of charge and pilot pump SAE 3", 3000 psi (common port)

Normally plugged
According to mounting position use upper port
Shaft upwards
Piping by HYDROKRAFT (alternatively pSt1 or pSt1.1)
Control
Dimensions -
TVWS
130/180/250/360/
500/750
ES Control

Dimensions in mm

<table>
<thead>
<tr>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>B1</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>130*</td>
<td>365</td>
<td>203</td>
<td>216,5</td>
<td>256</td>
<td>192</td>
<td>120</td>
</tr>
<tr>
<td>180*</td>
<td>365</td>
<td>203</td>
<td>216,5</td>
<td>256</td>
<td>192</td>
<td>120</td>
</tr>
<tr>
<td>250</td>
<td>410</td>
<td>230</td>
<td>222</td>
<td>271</td>
<td>236</td>
<td>135</td>
</tr>
<tr>
<td>360</td>
<td>426</td>
<td>230</td>
<td>222</td>
<td>285</td>
<td>236</td>
<td>135</td>
</tr>
<tr>
<td>500</td>
<td>541,5</td>
<td>300</td>
<td>222</td>
<td>330</td>
<td>267,5</td>
<td>172</td>
</tr>
<tr>
<td>750</td>
<td>571</td>
<td>307</td>
<td>222</td>
<td>372</td>
<td>270</td>
<td>172</td>
</tr>
</tbody>
</table>

* Only alternative location possible.

DISPLACEMENT (CCM)

<table>
<thead>
<tr>
<th>Pump Size</th>
<th>Charge Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>40</td>
</tr>
<tr>
<td>180</td>
<td>40</td>
</tr>
<tr>
<td>250</td>
<td>63</td>
</tr>
<tr>
<td>360</td>
<td>87</td>
</tr>
<tr>
<td>500</td>
<td>125</td>
</tr>
<tr>
<td>750</td>
<td>200</td>
</tr>
</tbody>
</table>
Control Dimensions - TVWS 130/180
SP Control

Dimensions in mm

SP - With Prop. Valve CETOP 3

View X

SP - With pressure limiter overriding function

View Y

SP - With pressure limiter and power control overriding function

SP - With pressure limiter and power control overriding function

SP - With Prop. Valve CETOP 3 + Fail safe valve

SP - With pressure limiter overriding function

SP - With pressure limiter and power control overriding function

swash angle indicator

clockwise

pressure limitation setting

power limitation setting
Control
Dimensions -
TVWS 130/180
SP Control

Dimensions in mm

SP - With Prop. Valve CETOP
3 + filter with el. indicator

SP - With Prop. Valve CETOP
3 + filter with visual indicator
+ fail safe valve

pilot oil filter

spacer to be used with filter and pressure control only!

fail safe valve

View Y

charge & pilot pump 40/8ccm
Control Dimensions -
TVWS
250/360/500/750
SP Control

Dimensions in mm

<table>
<thead>
<tr>
<th>L1</th>
<th>L2</th>
<th>B1</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
</tr>
</thead>
<tbody>
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<td>135</td>
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<tr>
<td>500</td>
<td>541.5</td>
<td>300</td>
<td>330</td>
<td>267.5</td>
<td>172</td>
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<tr>
<td>750</td>
<td>571</td>
<td>307</td>
<td>372</td>
<td>270</td>
<td>172</td>
</tr>
</tbody>
</table>

SP - With Prop. Valve
CETOP 3

View Z

SP - With pressure limiter overriding function

View Y

SP - With pressure limiter and power control overriding function

SP - With pressure limiter and power control overriding function

pressure limitation setting

power limitation setting
Control Dimensions - TVWS 250/360/500/750 SP Control

Dimensions in mm

SP - With Prop. Valve CETOP 3 + filter with el. indicator

SP - With Prop. Valve CETOP 3 + filter with visual indicator + fail safe valve

DISPLACEMENT FOR CHARGE PILOT PUMPS (CCM)

<table>
<thead>
<tr>
<th>Pump Size</th>
<th>Charge Pump</th>
<th>Pilot Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>64</td>
<td>8</td>
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</tbody>
</table>
Control Dimensions -
TVWS 130/180
DP Control

Dimensions in mm

DP - With remote control

DP - With pressure limiter overriding function

DP - With pressure limiter and power control overriding function
Control
Dimensions -
TVWS 130/180
DP Control

Dimensions in mm

DP - With mounting interface
CETOP 3

- Prop. pressure valve NG6

DP - With prop. relief

Swash angle indicator

DP - With pressure limiter
overriding function

- Charge & pilot pump 40/8ccm

DP - With pressure limiter
and power control overriding function

View Y

PSp2
PS12

S

Dimensions in mm
Control
Dimensions -
TVWS
250/360/500/750
DP Control

Dimensions in mm

DP - With remote port

<table>
<thead>
<tr>
<th></th>
<th>L1</th>
<th>L2</th>
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<td>188.5</td>
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</tbody>
</table>

DP - With pressure limiter overriding function

DP - With pressure limiter and power control overriding function

power limitation setting

pressure limitation setting
Control Dimensions -
TVWS
250/360/500/750
DP Control

Dimensions in mm

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</table>
Control
Dimensions -
TVWS 130/180
SM Control

Dimensions in mm

SM - With pressure limiter
overriding function

SM - With pressure limiter
and power control overriding
function

pressure limitation
setting

power limitation
setting
Control Dimensions - TVWS 130/180 SM Control

Dimensions in mm

View X

- swash angle indicator
- P St1: G 1/2"
- M St: G1/4"
- cable connector
- pilot pressure adjustment

View Y

- P Sp 2
- P St2
- S

SM - With pressure limiter
SM - With pressure limiter overriding function
SM - With pressure limiter and power control overriding function

- charge & pilot pump 4 0/8 ccm
- P St1
- P St2
- 93.5
- 130
- 114
- 90
- 52.1
- 256
- 180
- 42
- 192
- 122
- 94
- 38
- 128
- 108.3
- 52
- 120

Dimensions in mm
Control Dimensions - TVWS
250/360/500/750
SM Control

Dimensions in mm

<table>
<thead>
<tr>
<th>Power Limitation Setting</th>
<th>L1</th>
<th>L2</th>
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Control
Dimensions -
TVWS
250/360/500/750
SM Control

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</tr>
</tbody>
</table>
Control Dimensions - TVWS
Position of Center of Gravity
130/180/250/360/500/750
SP - DR

Dimensions in mm

<table>
<thead>
<tr>
<th>TVW SIZE</th>
<th>WEIGHT KG</th>
<th>LS MM</th>
<th>HS MM</th>
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</thead>
<tbody>
<tr>
<td>130</td>
<td>160</td>
<td>205</td>
<td>55</td>
</tr>
<tr>
<td>180</td>
<td>165</td>
<td>205</td>
<td>55</td>
</tr>
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<td>250</td>
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<td>420</td>
<td>306</td>
<td>55</td>
</tr>
<tr>
<td>750</td>
<td>460</td>
<td>318</td>
<td>65</td>
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</tbody>
</table>
Dimensions in mm

<table>
<thead>
<tr>
<th>ACTUATOR PISTON STOP A (+V)</th>
<th>STOP B (-V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet port</td>
<td>B</td>
</tr>
<tr>
<td>Outlet port</td>
<td>A</td>
</tr>
</tbody>
</table>

rotation direction: cw, ccw requires aspecial setup for charge and pilot pump
### Installation position

Installation position is optional however note bearing lubrication with respect to mounting.

<table>
<thead>
<tr>
<th>INSTALLATION POSITION</th>
<th>DRAIN PIPING</th>
<th>INSTALLATION POSITION</th>
<th>DRAIN PIPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft horizontal</td>
<td></td>
<td>Shaft pointed downwards</td>
<td></td>
</tr>
<tr>
<td>Pump can be rotated freely about the lateral axis</td>
<td>Use ventilation line L1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use the highest case drain connection L1 or L2</td>
<td>Prime main case drain connection L1 (L2) with 0.2 bar (2.9 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vertically mounted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internal connection close with plug G 1/8&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Horizontally mounted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Internal connection open L1 plugged</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Application Data

- L3: PV130...360
- LB: L3
- L4: PV500...750
**Application Data**

**Fluid Recommendations**

**Case Flushing Requirements**
A check valve must not be used in the drain pipe. The drain pipe must terminate below the oil level in the reservoir.

For all other conditions with low pressure (<20 bar (<300 psi)) and low flow (<10% of Qmax) case flushing is required.

For operation with special fluids HFB and HFC, case flushing is recommended.

**Flushing Flow**
Flush flow via the pump case should be >1% of maximum pump flow. Maximum flushing flow depends on case pressure.

**Notes:**
- All listed ratings are based on the use of a good quality fluid.
- Alternative fluids have a reduced tolerance for contamination over petroleum base fluids. Good filtration is therefore critical.
- The pumps will provide exceptional life when used with a good quality clean fluid at the pump ratings specified for that fluid.

**Fluids**
Pumps in the catalogue are primarily designed to operate with conventional petroleum based hydraulic oil. Alternative fluids and restrictions:
- Fluid maintenance is critical to the durability of all hydraulic components, and particularly so with hydraulic pumps. This becomes even more of a factor when alternative fluids are used. All types of alternative fluids require extensive maintenance in order to maintain proper levels of water content, acidity, viscosity and contamination.

**Fluid Cleanliness**
These pumps are rated for anti-wear petroleum fluids with a contamination level of 18/15/13 per ISO 4406. Operation in fluids with levels more contamination than this is not recommended and may reduce the life of the pump components. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these codes. Please contact your Eaton representative for special duty cycle recommendations.

Eaton pumps, as well as 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 optimised 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 inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Eaton publication 561- "Vickers Guide to Systemic Contamination Control" available from your local Eaton 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.

**Ordering Procedure**
When ordering please specify full model designation of items required; see “Model Codes” section of this catalogue.

Note the following:
- Designation of variable displacement pumps must include the supplementary designation of the required control

<table>
<thead>
<tr>
<th>FLUIDS</th>
<th>MAX. PRESSURE BAR</th>
<th>MAX. SPEED RPM</th>
<th>RECOMMENDED SEAL MATERIAL</th>
<th>MAX OPERATING TEMPERATURE °C</th>
<th>BEARING LIFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil in Water Emulsion</td>
<td>HFAE</td>
<td>Not Rated</td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Water in oil Emulsion</td>
<td>HFB</td>
<td>250</td>
<td>1800</td>
<td>Fluorocarbon</td>
<td>49</td>
</tr>
<tr>
<td>Water Glycol</td>
<td>HFC</td>
<td>250</td>
<td>1800</td>
<td>Fluorocarbon</td>
<td>49</td>
</tr>
<tr>
<td>Phosphate Ester</td>
<td>HFDR</td>
<td>350/420</td>
<td>1800</td>
<td>Fluorocarbon</td>
<td>66</td>
</tr>
<tr>
<td>Polyol Ester</td>
<td>HFDU</td>
<td>350/420</td>
<td>1800</td>
<td>Fluorocarbon</td>
<td>66</td>
</tr>
</tbody>
</table>

*Refer to the general specifications for the displacement speed limitation*