DESCRIPTION

The MCV115 Series 90 Hydraulic Displacement Control (HDC) is a hydromechanical pump stroke control which uses mechanical feedback to establish closed loop control of the swashplate angle of Danfoss Series 90 pumps.

The first stage, provided by the customer, produces a differential pressure to the HDC. The second stage uses the differential pressure to drive its unique spool arrangement and port oil to the pump servo cylinders. The second stage spool configuration allows a null deadband (for machine safety) in the pump's output while maintaining optimum dynamic response to control commands.

FEATURES

• Servo control deadband independent of signal null deadband; offers safety combined with accurate and responsive control
• Fully tested to resist the off road environment
• Minimum long term null shift

ORDERING INFORMATION

The MCV115 HDC is ordered through the following part number scheme:

<table>
<thead>
<tr>
<th>MCV115</th>
<th>X</th>
<th>XX</th>
<th>XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONFIGURATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUMP CATEGORY (frame/linkage size)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESSURE RANGE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CONFIGURATION

A Standard control
B Annular control (not available on 30, 42 or 55 cc pumps)

PUMP CATEGORY

05 30, 42, 55 cc
07 75 cc
10 100 cc
13 130 cc (with short pin)
18 180 cc

PRESSURE RANGE

<table>
<thead>
<tr>
<th>MCV115 PART NUMBER</th>
<th>PRESSURE RANGE</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AXX01, BXX01</td>
<td>1.1 - 6.7 bar (16 - 98 psi)</td>
<td>Same Pressure Range as MCV112</td>
</tr>
<tr>
<td>AXX02, BXX02</td>
<td>1 - 11 bar (15 - 160 psi)</td>
<td>Same Pressure Range as MCV112</td>
</tr>
<tr>
<td>AXX03, BXX03</td>
<td>3 - 11 bar (44 - 160 psi)</td>
<td>Same Pressure Range as MCV112</td>
</tr>
<tr>
<td>AXX04, BXX04</td>
<td>8 - 16.5 bar (116 - 239 psi)</td>
<td>Not available as MCV112</td>
</tr>
<tr>
<td>AXX05, BXX05</td>
<td>0.8 - 4.6 bar (11 - 66 psi)</td>
<td>Same Pressure Range as MCV114's lower range</td>
</tr>
<tr>
<td>AXX06, BXX06</td>
<td>5 - 15 bar (73 - 218 psi)</td>
<td>Not available as MCV112</td>
</tr>
</tbody>
</table>
HDCs ordered separate from the pump must have mounting kits ordered separately. The following table shows the pump/kit relationships.

### 30/55 cc PUMP KIT (KIT NUMBER KK12655)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>K11419</td>
<td>1</td>
<td>Gasket</td>
</tr>
<tr>
<td>9007314-0611</td>
<td>6</td>
<td>Screw</td>
</tr>
</tbody>
</table>

### 75/100/130 cc PUMP KIT (KIT NUMBER KK12675)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>K11420</td>
<td>1</td>
<td>Gasket</td>
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<tr>
<td>9007314-0611</td>
<td>6</td>
<td>Screw</td>
</tr>
</tbody>
</table>

### 42 cc PUMP KIT (KIT NUMBER KK12642)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>K11419</td>
<td>1</td>
<td>Gasket</td>
</tr>
<tr>
<td>9007314-0611</td>
<td>6</td>
<td>Screw</td>
</tr>
<tr>
<td>K09123</td>
<td>1</td>
<td>Seal Washer</td>
</tr>
</tbody>
</table>

### 180 cc PUMP KIT (KIT NUMBER KK12618)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>QUANTITY</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
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<td>Gasket</td>
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<td>9007314-0611</td>
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</tr>
<tr>
<td>K09123</td>
<td>1</td>
<td>Seal Washer</td>
</tr>
</tbody>
</table>

### TECHNICAL DATA

Some specifications apply to all HDCs. Others will vary based on the MCV115 number scheme, as outlined in the Ordering Information section.

#### THRESHOLD
See Pressure Range in the Ordering Information section. Defined as the center of hysteresis extracted to the pump start stroke.

#### DEADBAND
Twice the threshold, ±7% of the rated pressure.

#### RATED PRESSURE
See Pressure Range, in the Ordering Information section. Tolerance is ±10%. Defined as the pressure required to reach rated pump output. Maximum pressure is 500 psid above rated pump case pressure. See the Input Pressure Vs. Swashplate Angle Curve.

#### HYSTERESIS (Maximum)
7% of rated pressure. Measured on the hysteresis curve generated at a frequency of 0.01 Hz with an excursion of ± rated pressure. The hysteresis measurement will be made between 1 and 16 degrees of swash angle.

#### SYMMETRY
Input current required to reach rated output in each direction must be equal within 15%.

#### LINEARITY
10% maximum of swashplate angle change between any two points except within 1° of neutral.

#### RETURN TO NEUTRAL
The spool will return to neutral if the input differential pressure signal is zero and mechanical feedback is present.

#### OPERATING CHARGE PRESSURE
300 psi above case pressure (nominal).

#### TIME RESPONSE (Maximum)
1.0 seconds (0 to full stroke) (pressure limited valves)
2.0 seconds (full to full stroke) (pressure limited valves)
0.30 seconds (0 to full stroke) (non-pressure limited valves)
0.40 seconds (full to full stroke) (non-pressure limited valves)

#### SENSITIVITY
The valve will respond to a 2% change in input pressure throughout the rated pressure range except for the deadband region.

### INPUT PRESSURE VS. SWASHPLATE ANGLE

[Graph showing Input Delta Pressure Vs. Swashplate Angle for the MCV115 (Typical).]
THEORY OF OPERATION

The HDC uses a unique spool-barrel-feedback arrangement that serves to separate the null deadband from the feedback, giving both safety against null drift and quick dynamic response to command changes. The barrel contains the spring which provides the matching requirements for differential pressure rating to output swashplate angle rating. The barrel is driven directly by the feedback linkage from the swashplate. See the Internal Workings Schematic.

The HDC’s null adjust is set with a feedback spring to provide an effective pressure-preload threshold, which is the amount of differential pressure required to move the spool one direction or the other. By tightening or loosening the main null adjust screw, the fixed deadband is adjusted to the pump to create the pump stroking start differential pressures.

As differential control pressure input from the external source rises beyond the threshold, the spool moves in one direction or the other, opening one of the control ports to charge pressure, which ports oil to one of the pump servocylinders to move the swashplate. As the swashplate moves, the drag linkage follows, moving the barrel in the opposite direction of the spool input motion, driving the spool back to its neutral position through the feedback spring within the barrel.

The HDC is a removable module from the main pump housing such that no internal hardware changes are required to the basic unit to switch from a manual to a hydraulic displacement control. It will, however, be necessary to add a charge check orifice, spring and retainer (which are part of the pump assembly). The 90 Series HDC is comprised of several physical sizes of controls to meet the requirements of all the pump sizes. High response HDCs are not compatible with pressure limiters. This is a limit set by the design of the pressure limiters within the pump.

Loose parts will be captive so there is no danger of them falling into the pump during servicing. Control pressure ports (from the external hydraulic input device) will be provided on the boost stage as SAE-6 straight thread O-ring ports located on the HDC’s surface opposite the pump mounting surface.

INTERNAL WORKINGS SCHEMATIC

Schematic of the MCV115.
DIMENSIONS FOR 30, 42, AND 55 CC PUMPS

Dimensions in Millimeters (Inches).

DIMENSIONS FOR 75 - 180 CC PUMPS

Dimension in Millimeters (Inches).
TEMPERATURE
The valve will be functional and undamaged at oil temperatures of –40° to 250°F (–40° to 121°C) with oil viscosities from 40 to 6000 SUS. The valve will meet performance specifications with oil temperatures of 70° to 180°F (21° to 82°C).

SHOCK
50 g for 11 milliseconds. Three shocks in both directions of the three mutually perpendicular axes for a total of 18 shocks.

VIBRATION
Withstands a vibration test designed for mobile equipment controls mounted on hydrostatic transmissions consisting of two parts:
1. Cycling from 5 to 2000 Hz in each of the three axis.
2. Resonance dwell for one million cycles for each resonance point in each of the three axis.

FILTRATION
The system hydraulics shall have 10 micron or better filtration. The pump will contain screen filters near the interface to the HDC at the charge port and control ports.

FLUID
Automatic transmission fluid or hydraulic oil (Ref: Mobile DTE 24 or equivalent).

DIMENSIONS
See the Dimension drawings.

TO INSTALL THE NEW CONTROL

WARNING
Exercise care when placing the valve on a surface before mounting on a transmission. Dropping or otherwise forcefully setting the valve down may damage the pin.

WARNING
Do not put the MCV115X13XX HDC on an older model pump. Consult factory for proper installation. Older style pumps previously used MCV112 HDCs with a manifold between the HDC and the 130 cc pump. Directly-mounted MCV115s use a pin that is too short for older pumps. Using them improperly will result in pump displacement without feedback signal to the HDC.

WARNING
Uncontrollable vehicle or load movement will occur upon start-up if the control is installed without proper engagement of the control feedback link pin into the swashplate link.

During control installation, feel for pin engagement by tipping the control before installing the mounting screws. The control will not tip more than 5° if the pin is engaged.

Vehicle or load movement can also result from lack of or improperly adjusted control neutral. Follow service manual procedures for adjusting neutral after start-up. Always raise the vehicle, or block the vehicle load, from moving upon start-up.

1. Place a new gasket on the pump housing. Ensure that the control orifice and spring are in the proper position in the control.
2. Engage the pin on the control into the mating hole in the link attached to the swashplate. See the Linkage Assembly and Port Locations photo.
3. Ensure that the pin is engaged in the link by tilting the control upwards from the narrower end. If the pin catches in the link and allows only a slight upward tilt, there is positive engagement. If the control swings up freely, the pin is not properly aligned.
4. Position the control into place against the pump housing. Align the gasket. Install the cap screws (On 42 cc and 180 cc pumps use the included seal washer per the Dimension drawings.) and torque to 10-12 ft-lbs.

LINKAGE ASSY & PORT LOCATIONS

Assembly of control linkage and location of pump ports for the MCV115.
Use the following procedure to bring the pump to neutral once the hydraulic displacement control has been mounted.

1. Install a 500 psi gauge into the charge pressure gauge port on the pump. See the Linkage Assembly and Port Locations photo.

2. Loosen the null adjust plug on the null adjust screw.

3. Start the prime mover and run at low idle.

4. Warm the system up for several minutes to bleed air.

5. Slowly increase the prime mover speed to rated rpm. (Ensure that the input differential pressure is zero.)

6. If the transmission operates as shown by motor shaft rotation, reduce speed to idle. Using a 4 mm internal hex wrench, slowly turn the null adjustment screw clockwise or counterclockwise until the transmission does not operate. Repeat step 5. Note that charge pressure should drop with forward or reverse stroking of the pump swashplate due to the shifting of the shuttle valve in the motor manifold. Slowly turn the null adjust screw clockwise until charge pressure decreases.

7. With the hex wrench, slowly turn the null adjustment screw counterclockwise, observing the wrench angle rotation, until charge pressure decreases again (charge pressure will rise in neutral and drop when going into stroke).

8. Turn the adjustment screw clockwise half the amount of the turn observed in step 7. This should be the center of neutral.

9. Hold the adjustment screw and securely tighten the null adjust plug to 3–5 ft-lbs. Note that if a motor is used that does not have a manifold, neutral should be adjusted (steps 7–9) by observing the motor shaft rotation without a load.

10. Stop the prime mover.

11. Run the system briefly to ensure that it operates proportionally on both sides of null. Swashplate movement can be verified by watching motor shaft rotation without a load.

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**CUSTOMER SERVICE**

**NORTH AMERICA**

ORDER FACTORY INSTALLED MCV115s ON PUMPS FROM

Danfoss (US) Company
2800 East 13th Street
Ames, Iowa 50010
Phone: (515) 239-6000
Fax: (515) 239-6318

ORDER INDIVIDUAL MCV115s FROM

Danfoss (US) Company
Customer Service Department
3500 Annapolis Lane North
Minneapolis, Minnesota  55447
Phone: (763) 509-2084
Fax: (763) 559-0108

**DEVICE REPAIR**

For devices in need of repair, include a description of the problem, a copy of the purchase order and your name, address and telephone number.

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**RETURN TO**

Danfoss (US) Company
Return Goods Department
3500 Annapolis Lane North
Minneapolis, Minnesota  55447

**EUROPE**

ORDER FROM

Danfoss (Neumünster) GmbH & Co.
Order Entry Department
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Postfach 2460
D-24531 Neumünster
Germany
Phone: 49-4321-8710
Fax: 49-4321-871355