



Designation: D 7043 – 04

An American National Standard

Standard Test Method for Indicating Wear Characteristics of Petroleum and Non-Petroleum Hydraulic Fluids in a Constant Volume Vane Pump¹

This standard is issued under the fixed designation D 7043; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers a constant volume high-pressure vane pump test procedure for indicating the wear characteristics of petroleum and non-petroleum hydraulic fluids.

1.2 The values stated in SI units are to be regarded as standard. The values in parentheses are provided for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D 2882 Test Method for Indicating Wear Characteristics of Petroleum and Non-Petroleum Hydraulic Fluids in Constant Volume Vane Pump

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *flushing, v*—process of cleaning the test system before testing to prevent cross-contamination.

3.1.2 *torquing, v*—process of tightening the pump head bolts to achieve a uniform clamping force.

4. Summary of Test Method

4.1 An amount of 18.9 ± 0.5 L (5 ± 0.13 gal) of a hydraulic fluid are circulated through a rotary vane pump system for 100 h at a pump speed of 1200 ± 60 r/min and a pump outlet pressure of 13.8 ± 0.3 MPa (2000 ± 40 psi). Fluid temperature

at the pump inlet is $66 \pm 3^\circ\text{C}$ ($150 \pm 5^\circ\text{F}$) for all water glycols, emulsions, and other water containing fluids and for petroleum and synthetic fluids of ISO Grade 46 or lighter. A temperature of $80 \pm 3^\circ\text{C}$ ($175 \pm 5^\circ\text{F}$) is used for all other synthetic and petroleum fluids.

4.2 The result obtained is the total mass loss from the cam ring and the twelve vanes during the test. Other reported values are initial flow rate and final flow rate.

4.3 The total quantity of test oil required for a run is 26.5 L (7 gal).

5. Significance and Use

5.1 This test method is an indicator of the wear characteristics of petroleum and non-petroleum hydraulic fluids operating in a constant volume vane pump. Excessive wear in vane pumps could lead to malfunction of hydraulic systems in critical applications.

6. Apparatus

6.1 The basic system consists of the following (see Fig. 1):

6.1.1 *AC Motor, 1200-rpm*, or other suitable drive, with 11 kw (15 hp) as suggested minimum power requirement (Item 5, Fig. 1). The motor must have right hand rotation (counterclockwise rotation as viewed from the shaft end).

6.1.2 *Test Stand Base*, with appropriate, rigid mounting for the motor, pump, reservoir, and other components.

6.1.3 *Rotary Vane Pump*, replaceable cartridge type. A Vickers³ 104C or 105C housing is used along with internal components from Conestoga USA, Inc.⁴ The assembly should produce 28.4 L/min (7.5 gal/min) flow at 1200 r/min with ISO Grade 32 fluid at 49°C (120°F), at 6.9 MPa (1000 psi) (Item 3, Fig. 1; Fig. 2). (**Warning**—The test pump is rated at 6.9 MPa (1000 psi) but is being operated at 13.8 MPa (2000 psi). A protective shield around the pump is recommended.)

NOTE 1—This method has been written for the use of Conestoga USA Inc. internals along with a Vickers housing and head. If components from

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.N0 on Hydraulic Fluids.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Vickers is a part of Eaton Hydraulics, Hydraulic Supply Company, 300 International Parkway, Sunrise, FL 33325.

⁴ Conestoga USA Inc., P.O. Box 3052, Pottstown, PA 19464.

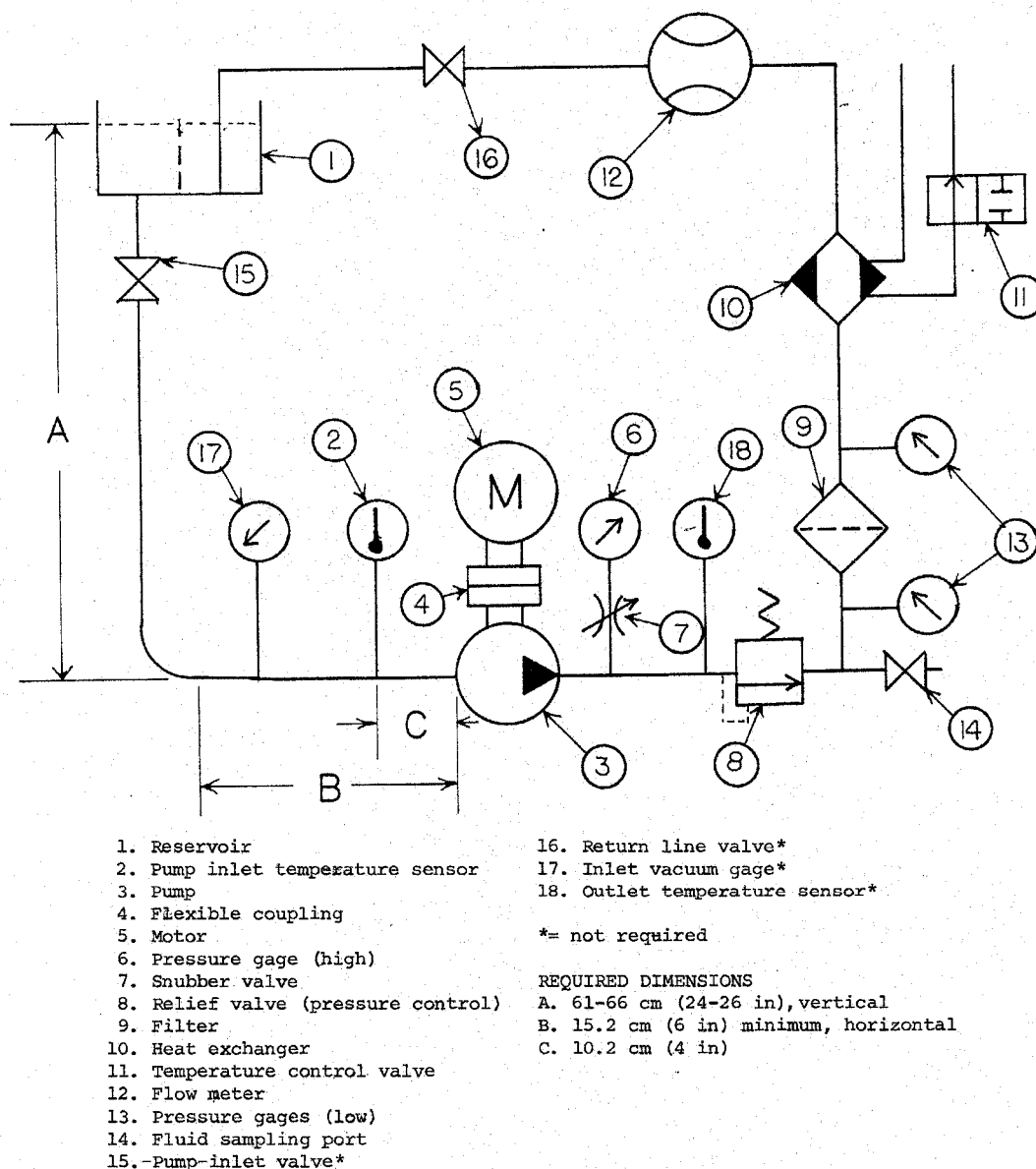


FIG. 1 System Schematic

other manufacturers are used, refer to Test Method D 2882-00 for preparation and selection guidelines.

6.1.3.1 The replaceable cartridge consists of the cam ring, the rotor, two bushings, a set of twelve vanes, and an alignment pin.

6.1.3.2 The individual cartridge parts are purchased separately. Conestoga USA, Inc. part numbers for these items are: cam ring No. 2882-5, alignment pin No. 2882-10, rotor No. 2882-1C, bronze bushings No. 2882-4C and 2882-4E, and vane kit (12 vanes) No. 2882-V12.

6.1.3.3 There are to be no modifications to the pump housing such as plugging the drain hole in the pump body or drilling and tapping a hole in the head for an external drain.

6.1.4 *Reservoir*, (Item 1, Fig. 1).

6.1.4.1 The reservoir shall be equipped with a removable baffle and a close fitting lid, all of stainless steel construction.

The reservoir can be square or rectangular (with a flat bottom) or cylindrical (with a spherical or cone shaped bottom) and must be designed so as to avoid air entrainment in the fluid.

NOTE 2—A suitable reservoir design is presented in Test Method D 2882-00.

6.1.4.2 To promote deaeration and thermal mixing of the fluid, fluid residence time in the reservoir should be maximized. To achieve this, the baffle shall be designed so that returning fluid will follow an indirect path from the return port to the outlet port.

6.1.4.3 To avoid air entrainment, the reservoir shall be designed so that the return line enters well below the fluid level, fluid flow does not cascade over the baffle, and there will be a minimum of 15 cm (6 in.) of fluid depth above the pump inlet line.

Description of Items				
Item Number	Name	Amount	Description	
1	Head Bolt	8	$\frac{3}{8}$ -16 $\times$ 1- $\frac{1}{4}$ -in. hex head cap screw, Grade 8	
2	Head Bearing	1	No. 6200, open type	
3	Pump Head	1	Vickers 24064	
4	Head Packing ^A	1	-235 square cut O-ring	
5	Outer Bushing	1	Conestoga 2882-4E	
6	Alignment Pin	1	Conestoga 2882-10	
7	Cam Ring ^B	1	Conestoga 2882-5	
8	Rotor ^B	1	Conestoga 2882-1C	
9	Vane ^B	12	Conestoga 2882-V12 (12 piece kit)	
10	Inner Bushing	1	Conestoga 2882-4C	
11	Pump Body	1	Vickers 188235	
12	Retaining Ring	1	20-mm steel retaining ring 3AM-10	
13	Shaft Bearing	1	#6204, open type	
14	Seal Retainer	1	Vickers 185078	
15	O-Ring ^A	1	-223 O-ring	
16	Shaft Seal ^A	1	double lip with garter spring .875 $\times$ 1.500 $\times$.312 rubber clad	
17	Shaft	1	Conestoga 2882-2A or Vickers 188328	
18	Key	1	Conestoga 2882-20A or Vickers 1612	
19a	Foot Mount	1	Vickers 188234	
19b	Flange Mount	1	Vickers 188233	
20	Gasket	1	Conestoga 2882-27 or Vickers 2546 not used with Foot Mount (item 19a)	
21	Screw	6	$\frac{3}{8}$ -16 $\times$ $\frac{7}{8}$ socket head cap screw	

^A Specify compound.

^B Specify size.

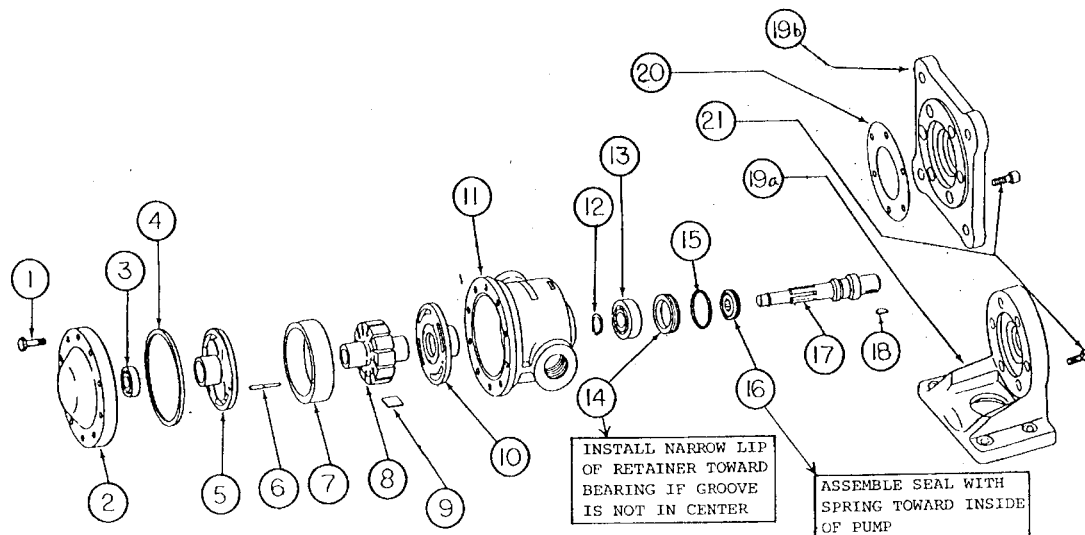


FIG. 2 Pump Components

6.1.4.4 Fluid ports may be added as required by the user for the installation of a low level switch, reservoir temperature sensor, bottom drain, and so forth.

6.1.4.5 If the reservoir is positioned so that the contents cannot be visually checked for aeration by removing the lid, a fluid-tight glass viewing port may be located in the side of the reservoir.

6.1.5 *Outlet Pressure Control Valve*, Vickers pressure relief valve (CT-06-C/500-2000 psi) with either manual or remote control (Item 8, Fig. 1; Fig. 4).

6.1.6 *Temperature Control Device*, suitable for controlling coolant flow to the heat exchanger to maintain test fluid at the specified temperature (Item 11, Fig. 1).

6.1.7 *Temperature Indicator*, (Item 2, Fig. 1) shall have an accuracy of $\pm 1^\circ\text{C}$ and shall have an appropriate sensor to monitor pump inlet temperature.

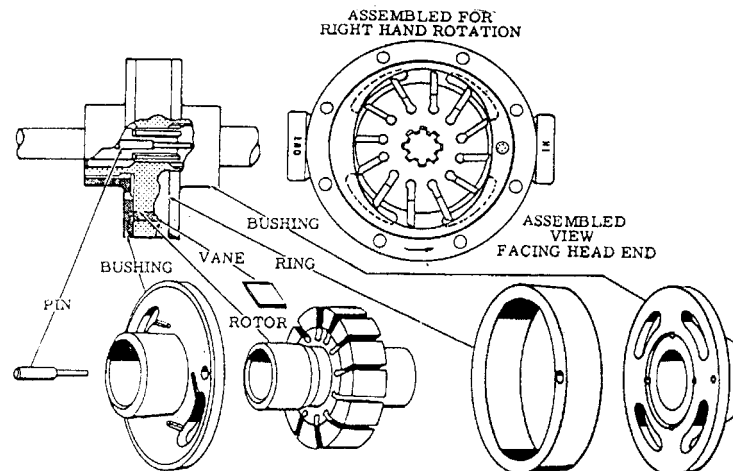
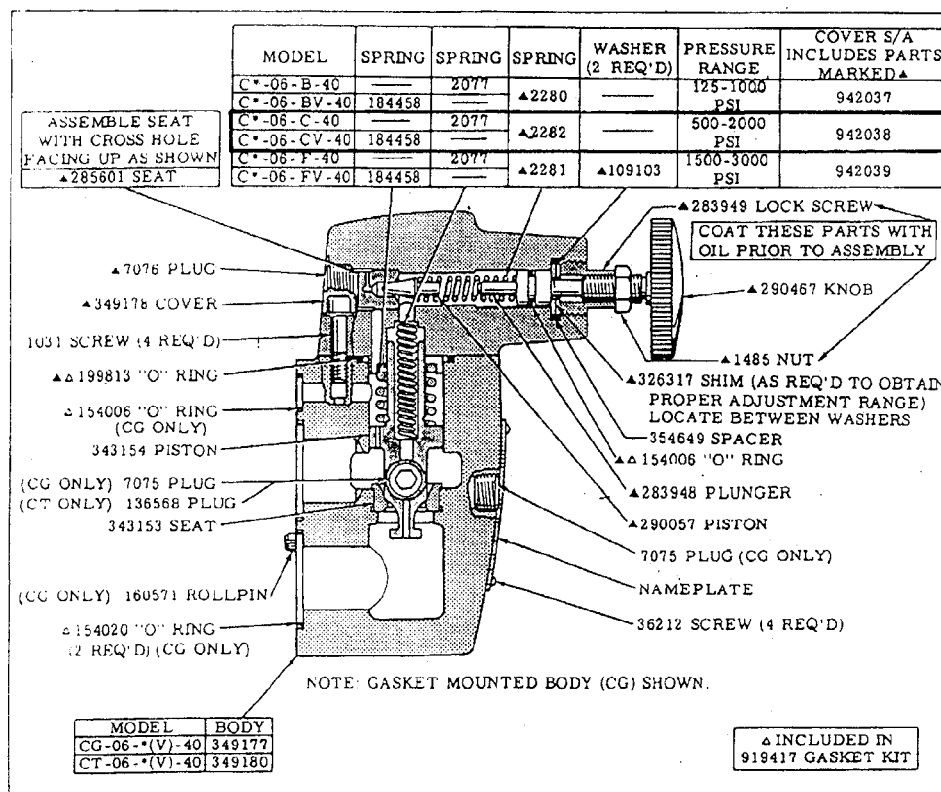
6.1.7.1 To prevent a flow restriction near the pump inlet port, the temperature probe shall have a diameter of not more than 6 mm (0.25 in.).

6.1.7.2 The test fluid temperature shall be measured within 10.2 cm (4 in.) of the pump inlet (Dimension C, Fig. 1). The sensing probe shall be inserted into the midpoint of flow.

NOTE 3—Some users have found the addition of a pump outlet temperature sensor to be a useful diagnostic tool. If used, it shall be suitable for 13.8-MPa duty and should be placed in the high pressure line between the pump and the relief valve (Item 18, Fig. 1).

6.1.8 *Heat Exchanger*, (Item 10, Fig. 1). The heat exchanger should be of adequate size and design to remove the excess heat from the test system when using the available coolant supply.

NOTE 4—It is suggested that a shell-and-tube-type heat exchanger be used.

D 7043 - 04

FIG. 3 Cartridge Kit

FIG. 4 Relief Valve

used, should be connected in reverse (the hydraulic fluid is passed through the tubes and not around them) so that the interior of the heat exchanger can be effectively cleaned between tests.

6.1.9 *Pressure Indicator* (Item 6, **Fig. 1**), to measure pump discharge pressure shall have an accuracy of at least ± 0.3 MPa (± 40 psi) at 13.8 MPa. The gage shall be suitable for 13.8-MPa duty.

6.1.9.1 The pressure indicator should be snubbed (Item 7, **Fig. 1**) to prevent damage from pulsations or sudden fluctuations of system pressure.

6.1.10 *Filter Unit* (Item 9, **Fig. 1**), 3- μ m (minimum Beta 3 ratio of 100) replaceable fiberglass element with housing. Two new filter elements are required for each test.