Designation: D 2882 – 00

An American National Standard

Standard Test Method for Indicating Wear Characteristics of Petroleum and Non-Petroleum Hydraulic Fluids in Constant Volume Vane Pump[1]

This standard is issued under the fixed designation D 2882; 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 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.* For specific hazard statements, see 6.1.3, 7.1, 7.2, 7.3, 7.4, and Note 7.

2. Referenced Documents

2.1 *ISO Standards:*[2]

ISO 4021 Hydraulic Fluid Power—Particulate Contamination Analysis—Extraction of Fluid Samples from Lines of an Operating System

ISO 4406 Hydraulic Fluid Power—Fluids-Method for Coding Level of Contamination by Solids Particles

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

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

3.1.2 *torquing*, *v*—the 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 (see Note 1) (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 ± 3°C (150 ± 5°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 ± 3°C (175 ± 5°F) is used for all other synthetic and petroleum fluids.

NOTE 1—To improve reproducibility, fluid volume has been standardized in this revision of Test Method D 2882.

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 fluid cleanliness before and after the test, 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 *Twelve Hundred rpm AC Motor*, or other suitable drive, with 11 kW (15 hp) as suggested minimum power requirement (see Fig. 1, Item 5).

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,[3,4] Vickers 104C or 105C rated at 28.4 L/min (7.5 gal/min) flow at 1200 r/min with ISO Grade 32 fluid at 49°C (120°F), and 6.9 MPa (1000 psi) (see Fig. 1, Item 4; Fig. 2; and Fig. 3). (**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 therefore recommended.)

6.1.3.1 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.

[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.N on Hydraulic Fluids.

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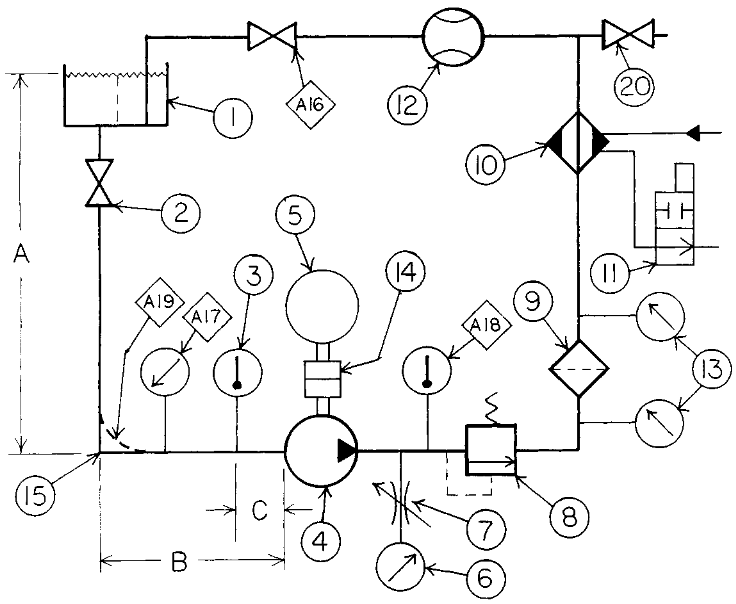
[2] Available from American National Standards Institute, 11 W 42nd St., 13th Floor, New York, NY 10017.

[3] The replaceable cartridge consists of the cam ring, the rotor, two bushings, a set of twelve vanes, and an alignment pin. Two different cartridges are available for this pump. Cartridge No. 429126 is intended to give better performance at 13.8 Mpa and uses Rotor No. 429446 and Cam Ring No. 574814. Cartridge No. 912014 uses Rotor No. 2008 and Cam Ring No. 2013. Some users report fewer pump failures when using Rotor No. 2008.

[4] The individual cartridge parts can be purchased separately, if desired. The Vickers part numbers for these items are Cam Ring No. 2013 or 574814, Pin No. 2020, Rotor No. 429446 or 2008, Bronze Bushings Nos. 2015 and 2016, and Vane Kit (twelve vanes) No. 912021.

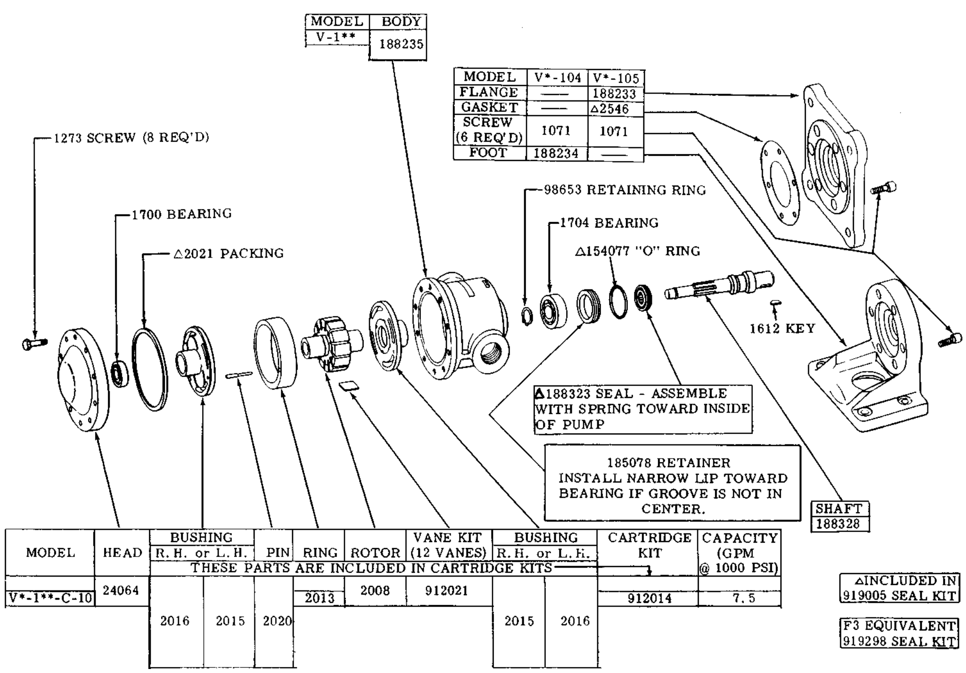


ITEM DESCRIPTION
1. Reservoir
2. Pump inlet shut off valve
3. Pump inlet temperature sensor
4. Pump
5. Motor
6. Pressure gage for high pressure line
7. Snubber valve
8. Relief valve for pressure control
9. Return line filter
10. Heat exchanger
11. Temperature control valve
12. Flow meter
13. Pressure gages for return line filter
14. Flexible coupling
15. Inlet elbow
20. Fluid sampling port

Required Dimensions:
A. 61 - 66 cm (24 - 26 in)
B. 15.2 cm (6 in)
C. 10.2 cm (4 in)

Additional Non-required Items
A16. Return line shut off valve
A17. Pump inlet vacuum gage
A18. Pump outlet temperature sensor
A19. Radius bend at pump inlet

FIG. 1 System Schematic



MODEL	V*-104	V*-105
FLANGE	—	188233
GASKET	—	△2546
SCREW (6 REQ'D)	1071	1071
FOOT	188234	—

MODEL	HEAD	BUSHING R.H. or L.H.		PIN	RING	ROTOR	VANE KIT (12 VANES)	BUSHING R.H. or L.H.		CARTRIDGE KIT	CAPACITY (GPM @ 1000 PSI)
		THESE PARTS ARE INCLUDED IN CARTRIDGE KITS									
V*-1**-C-10	24064	2016	2015	2020	2013	2008	912021	2015	2016	912014	7.5

FIG. 2 Pump Components

6.1.4 *Reservoir*, (see Fig. 1, Item 1), equipped with a removable baffle and lid, all of stainless steel construction. The reservoir design is shown in Figs. 4-6.

6.1.4.1 Additional fluid ports may be added as required by the user to assist in measuring fluid level, reservoir temperature, and so forth.

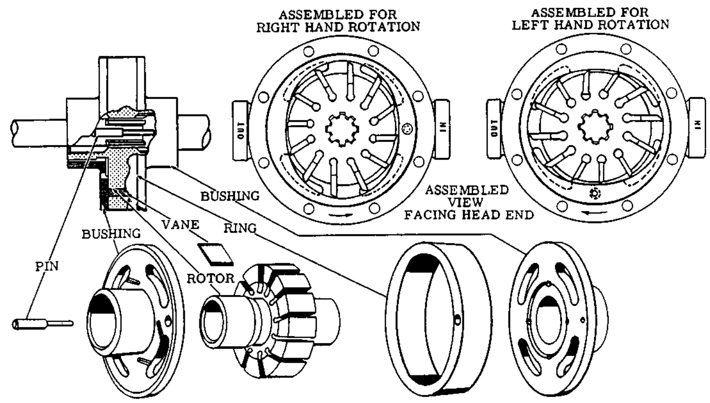


FIG. 3 Cartridge Kit

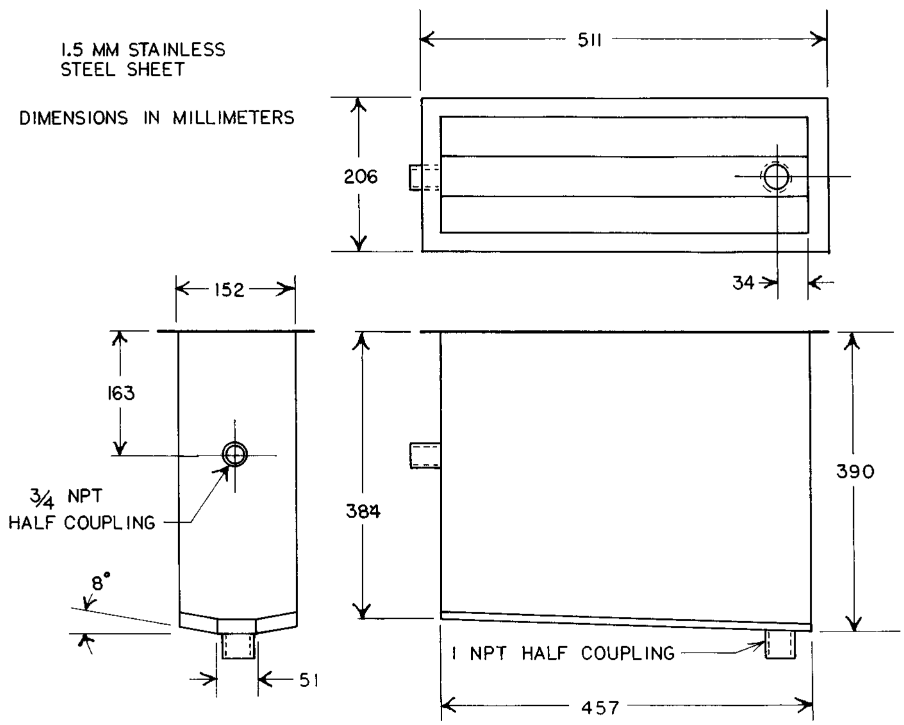


FIG. 4 Reservoir

6.1.4.2 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 (see Fig. 1, Item 8, and Fig. 7).

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

6.1.7 *Temperature Indicator* (see Fig. 1, Item 3) shall have an accuracy of ± 1°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 (see Fig. 1, Dimension C). The sensing probe shall be inserted into the midpoint of flow.

NOTE 2—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 (see Fig. 1, Item A18).

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

NOTE 3—It is suggested that a shell-and-tube type heat exchanger, if 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* (see Fig. 1, Item 6), to measure pump discharge pressure shall have an accuracy of at least ± 0.3 MPa (± 40 psi). The pressure indicator should be snubbed (see Fig. 1, Item 7) to prevent damage from pulsations or