

TOOL OPERATING MANUAL

188-3926 Cylinder Tester

SMCS: 0784

Foreign Language Format

This Tool Operating Manual is printed in English. For an electronic copy of this manual in another language go to our internet web site at <http://productsupport.cat.com>

1. Click on "Dealer Capability" (left-hand border).
2. Click on "Cat Tools and Supplies" (left-hand border).
3. Log into the "Corporate Web Security" screen.
4. Click on "Products."
5. Click on "Tool Operating Manuals."
6. Browse for NEHS0595-03 in the language of interest.

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4. Cliquez sur "Products."
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6. Rechercher la publication NFHS0595-03 dans la langue de votre choix.

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2. Haga clic en "Cat Tools and Supplies" (borde izquierdo).
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4. Haga clic en "Products."
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6. Seleccione NSHS0595-03 en el idioma deseado.

Português

Este Manual de Operação de Ferramenta está impreso em inglês. Para obter uma cópia eletrônica deste manual em outro idioma, visite nosso web site na Internet em <http://productsupport.cat.com>

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3. Entre na tela "Corporate Web Security".
4. Clique em "Products."
5. Clique em "Tool Operating Manuals."
6. Procure o NPHS0595-03 no idioma que deseja.

Safety



WARNING



Most accidents involving product operation, maintenance, and repair occur through failure to observe basic safety rules or operations. An accident can often be avoided by being alert and recognizing potentially hazardous situations before an accident occurs. Any individuals performing product operation, maintenance, or repair should have necessary training, skills, and tools required to perform the functions properly and safely. The safety information in this manual serves as a basic guide in an attempt to prevent injury or death.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. If a tool, procedure, work method, or operating technique that is not specifically mentioned by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. Make sure the product or machine will not be damaged or be made unsafe by any operation, lubrication, maintenance, or repair procedures that you choose.

If any doubt arises about the correct, safe method of performing any steps of these procedures, DO NOT proceed. Seek out expert assistance from a qualified person.

WARNING



To avoid personal injury or death, carefully read and understand all instructions before attempting to operate any equipment. Do not operate or work on a machine unless you read and understand the instructions and warnings in this and all other applicable manuals. Contact your Caterpillar dealer for replacement manuals. Proper care is your responsibility. Always follow all State and Federal health and safety laws and/or local regulations.



Always consult the Material Safety Data Sheet for chemical hazards and first aid instructions. These sheets should be available from the manufacturer/ supplier of the fluid.



Always wear protective clothing while operating any machines or equipment. DO NOT wear any loose clothing, jewelry, watches, or anything else that might catch on controls, tooling, side bars, or any part of the equipment.



To prevent personal injury, keep fingers and loose clothing away from any moving parts or pinch points to prevent pinching and crushing.



To avoid eye injury, always wear protective glasses or face shield when using any equipment, a hammer, or similar tool. Chips or other debris can fly off equipment under pressure or objects when struck. Make sure no one can be injured by flying debris before applying pressure or striking any object.

WARNING



Personal injury can result from removing hoses or quick-disconnect fittings in a pressure system. Failure to relieve pressure can cause personal injury. Do not disconnect or remove hoses or fittings until all pressure in the system has been relieved.



Personal injury or death can result from a fire. Oil leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up all leaked or spilled oil immediately.



Personal injury can result from slips or falls. DO NOT leave tools or components laying around the work area and clean up all spilled fluids immediately.

Introduction

The function of the 188-3926 Cylinder Tester is to conduct a leakage test of piston and rod seals in re-sealed hydraulic cylinders.



Illustration 1. 188-3926 Cylinder Tester.

The test is performed by pressurizing the oil in the cylinder's rod end cavity while blocking the release of oil from the cylinder's cap end. The test of whether the re-seal has been effective is determined in two (2) ways:

1. By watching the rod (and piston) drift and external leaks at the rod. If the wrong piston seals have been installed or they have been "cut" during assembly, they will leak and cause the rod to drift.
2. By watching the rod and cap-end gauge readings. If the pressures hold, the re-seal has been effective. If the pressures drop and equalize, a leakage path exists either through the seal or past a scratch in the cylinder wall.

The 188-3926 Cylinder Tester also functions to "cycle" a cylinder through rod extend and retract strokes prior to testing.

Cylinder Tester Setup Requirements

1. The 188-3926 Cylinder Tester is wired for 380 Volt/50hz/3 phase.
2. Fill the reservoir with 10W hydraulic oil to within 152 mm (6.0 in) of the top. The reservoir holds approximately 227 liters (60 gal) of oil. Hydraulic oil can be purchased from Caterpillar by ordering 9X-6468 208L (55 gals), 9X-8533 19L (5 gals), or 7X-7862 4L (1 gal).

Cylinder Tester Maintenance Requirements

The 188-3926 Cylinder Tester is equipped with a 9U-5870 Spin-On Filter that should be changed every 3 months. The change interval should be shortened or extended depending upon the volume of cylinders tested and their cleanliness.

Cylinder Testing Connections

From the assortment of adapters in the "High Pressure Fittings" section of this manual, select adapters that connect directly to the cylinder port. Conduct all tests directly on the cylinder. Avoid testing through tubes, quick-drop valves, or special port adapters and plumb the quick-disconnect adapters using as few connections as possible to minimize potential leakage paths.

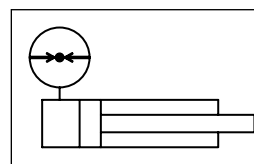
Regardless of the connectors used, the adapters should terminate in a 9U-7453 or 9U-7454 Nipple which mates with the 9U-7452 Quick-Disconnects used on the tester's hoses. If a Caterpillar Excavator or other cylinder using ports having the SAE Code 62 bolt-hole pattern is tested, it is necessary to use either an XT-5 flange adapter or an XT-3 fitting adapter with the assembly terminating in a 9U-7453 or 9U-7454 Nipple. Refer to Chart A for part numbers.

Connect the supply hoses to the 9U-7453 or 9U-7454 Nipples. Note that one hose is marked ROD. Connect the ROD-end hose to the ROD-end port (the end of the cylinder from which the rod protrudes). Connect the other hose to the CAP-end port. Make sure the quick-disconnects are securely connected.

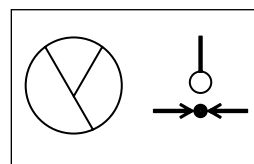
Control Panel Description



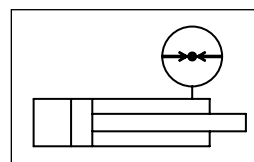
Illustration 2. (1) Cap Pressure. (2) Test Pressure. (3) Rod Pressure. (4a) Observe Cylinder. (4b) Rod Extend. (4c) Rod Retract. (5) Adjust Test Pressure. (6a) Observe Cylinder. (6b) Cylinder Cycle.



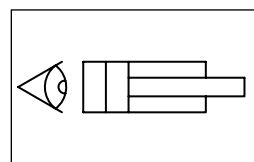
(1) Cap Pressure: The pressure in the non-rod cavity side of the test cylinder.



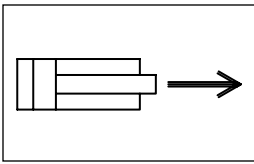
(2) Test Pressure: The system pressure available for testing the cylinder.



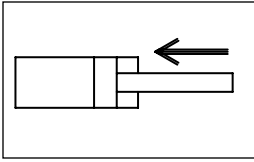
(3) Rod Pressure: The pressure in the rod cavity side of the test cylinder.



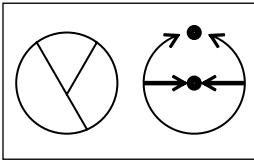
(4a) Observe Cylinder: Rotate manual valve to center position (as shown) to permit testing of cylinder. (NOTE: The other manual valve must be in position "6a".)



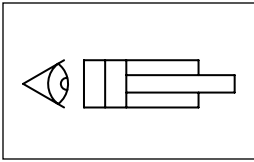
(4b) Rod Extend: Rotate manual control valve counter-clockwise to permit the cylinder's rod to extend. (NOTE: The other manual valve must be in position "6b".)



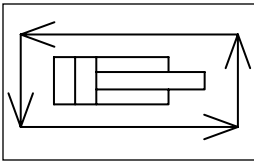
(4c) Rod Retract: Rotate the manual control valve CW to permit the cylinder's rod to retract. (NOTE: The other manual valve must be in position "6b".)



(5) Adjust Test Pressure: Rotate knob clockwise to increase the system pressure available for testing the cylinder. Rotate knob counter-clockwise to decrease pressure.



(6a) Observe Cylinder: Rotate the manual valve counter-clockwise to permit testing of cylinder. (NOTE: The other manual valve must be in position "4a".)



(6b) Cylinder Cycle: Rotate manual valve clockwise to permit the cylinder to be extended or retracted. (See note "4b" and "4c".)

Testing Procedure

1. Start the hydraulic pump by pushing the START button.



Illustration 3. "Rod Retract" Lever Position.

2. Move the RIGHT lever to the CYLINDER CYCLE position, as shown in Illustration 3.
3. Move the left control lever to the position marked ROD RETRACT, as shown in Illustration 3. This setting will supply oil to the rod end of the cylinder. If the hoses have been connected correctly, the rod will retract.



Illustration 4. "Rod Extend" Lever Position.

4. Move the left control lever to the position marked ROD EXTEND, as shown in Illustration 4. This setting will supply oil to the cap end of the cylinder. If the hoses have been connected correctly, the rod will extend. If the rod does not extend, switch the hoses, otherwise, the wrong end of the cylinder will be pressurized during testing.
5. Extend and retract the rod numerous times, bottoming the piston on each stroke. This action will expel any trapped air from the cylinder. As the cylinder is cycled, observe the ROD PRESSURE and CAP PRESSURE gauges to determine whether the piston and seals travel through any tight spots. With a constant flow of oil into the cylinder, there should be no appreciable change in pressure except in conditions where wear has created looser fits.
6. Extend (or retract) the rod so that the piston is approximately centered in the cylinder.

NOTE: On cylinders with pistons having built-in relief valves, it is important the piston be centered and not bottomed at either end of the stroke. If the piston is bottomed, it will not be possible to build pressure in the cylinder.



Illustration 5. "Observe Cylinder" Lever Position.

7. Move the left control lever to the center or OBSERVE CYLINDER position. Move the right control lever to the OBSERVE CYLINDER position, as shown in Illustration 5.
8. Turn the TEST PRESSURE ADJUST knob clockwise to increase the system pressure until the cylinder test pressure is reached (as indicated by the center gauge). As soon as the test pressure is reached, turn the TEST PRESSURE ADJUST knob counterclockwise to reduce the system pressure outside the cylinder. (Note that the TEST PRESSURE gauge will decrease and both the ROD PRESSURE and CAP PRESSURE gauges should remain constant.) Valves in the hydraulic circuit will maintain the test pressure on the cylinder.
9. Observe the ROD PRESSURE and CAP PRESSURE gauges for 30 seconds. The gauge readings should not drop. The gauge readings should also **not** be the same because of the difference in areas between the "rod" and "cap" sides of the piston. If the cylinder has been properly rebuilt and if there is no internal or external leakage, then there should be no change in the gauge readings.
10. Check for rod movement. Refer to the "Hydraulic Cylinder Test Specifications" section in this manual. It may be necessary to mount a dial indicator on the cylinder to determine if the rod moves. A less precise method is to measure from the head to "grease pencil" marks made on the rod. If the rod does not move and there is no change in the gauge readings, the test is complete. If the rod moves as soon as the test pressure is reached, the cylinder probably contains trapped air. Repeat the procedure to purge the cylinder of air. The procedure will be more effective if first one end of the cylinder and then the other is elevated while the rod is being cycled in and out.
11. If further attempts to purge the cylinder of air reduce the amount the rod moves (ie. drift), compare the amount of drift to the specifications. If the drift is within allowable specifications, the test is complete. If the drift exceeds allowable specifications, disassemble the cylinder and determine the cause of the leak. Re-test the cylinder at a later date.

12. If the test is complete, turn the TEST PRESSURE ADJUST knob completely counterclockwise and lower pressure to zero.
13. Move the right control lever to the CYLINDER CYCLE position. Move the left control lever to the ROD EXTEND position and extend the rod. Turn the hydraulic pump OFF by pushing the STOP button.



Illustration 6. Release Pressure.

14. Move the left control lever to the ROD EXTEND and ROD RETRACT positions several times, as shown in Illustration 6. Disconnect both oil supply hoses.



Illustration 7. Air Valve (Closed Position).

15. Connect the hose marked TANK to the CAP end port. Connect the air hose adapter to the ROD end port adapter. (Important: The gauge must read zero before attaching. Move the handle of the three-way valve to block air pressure to the cylinder, as shown in Illustration 7. Rotate the cylinder so the port on the ROD end faces downward (to help drain the oil).



Illustration 8. Air Valve (Open Position).

16. Move the handle of the three-way valve to direct pressurized air into the ROD end of cylinder. Oil in the CAP end of the cylinder will be pushed into the hydraulic tank. Refer to Illustration 8.
17. Rotate the air supply valve, as shown in Illustration 7. This will block the air pressure supply and allow the pressurized air in the ROD end of the cylinder to vent through the breather on the hydraulic tank. When the pressure gauge indicates "0" (zero), disconnect the air hose from the adapter.
18. Disconnect all adapters and test equipment from the cylinder. Cover all ports with blocking covers tape or similar material.

Hydraulic Cylinder Test Specifications

Allowable Drift Rate (per minute)	
Description	mm (in)
Current style square or rectangular cross-section piston seals having round or oval cross-section load rings.	3.0 (.12)
Pistons with square ring packings.	25.0 (.98)
Pistons with u-cup piston seals.	25.0 (.98)
Pistons with chevron packing.	25.0 (.98)
Test Pressure	
All cylinders	20,670 kPa (3,000 psi)

High-Pressure Fittings

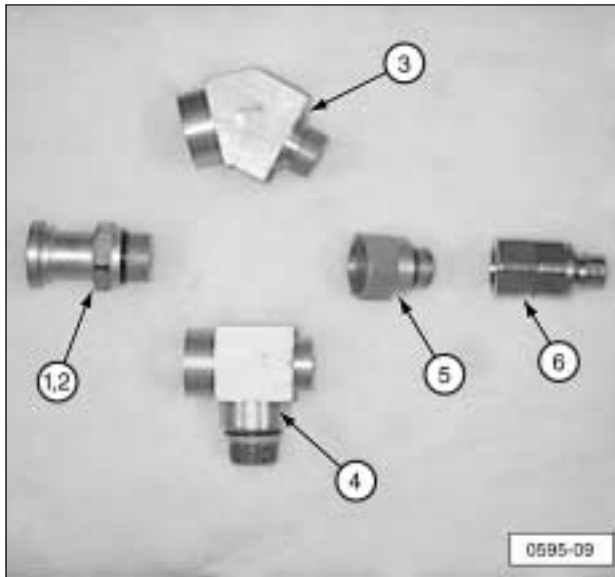


Illustration 9. Typical High-Pressure Fittings. Refer To Chart A For Item Identification.

Chart A. Flange Fittings and Quick-Disconnect Couplings		
Item	Part No.	Description
1	9U-7442	Adapter XT-3, 1/2 inch flange x #16 SAE boss
	4J-5140	Seal, O-ring for XT-3, 1/2 inch flange
	9U-7443	Adapter XT-3, 3/4 inch flange x #16 SAE boss
	4J-5267	Seal, O-ring for XT-3, 3/4 inch flange
	9U-7444	Adapter XT-3, 1 inch flange x #16 SAE boss
	4J-0520	Seal, O-ring for XT-3, 1 inch flange
	9U-7445	Adapter XT-3, 1 1/4 inch flange x #16 SAE boss
	4J-0522	Seal, O-ring for XT-3, 1 1/4 inch flange
	9U-7446	Adapter XT-3, 1 1/2 inch flange x #16 SAE boss
	4J-0524	Seal, O-ring for XT-3, 1 1/2 inch flange
2	9U-7438	Adapter XT-5, 3/4 inch flange x #16 SAE boss
	1P-3702	Seal, O-ring for XT-5, 3/4 inch flange
	1U-8292	Adapter XT-5, 1 inch flange x #16 SAE boss
	1P-3703	Seal, O-ring for XT-5, 1 inch flange
	9U-7440	Adapter XT-5, 1 1/4 inch flange x #16 SAE boss
	1P-3704	Seal, O-ring for XT-5, 1 1/4 inch flange
	9U-7441	Adapter XT-5, 1 1/2 inch flange x #16 SAE boss
1P-3705	Seal, O-ring for XT-5, 1 1/2 inch flange	
3	1U-8305	Elbow, #16 SAE port x #16 SAE boss, 45°
4	1U-8303	Tee, #16 SAE port x #6 SAE port x #16 SAE boss
5	6V-5258	Adapter, #16 SAE port x #12 SAE boss
6	9U-7453	Nipple, #12 SAE port x 3/4 inch quick-disconnect
—	9U-7454	Nipple, 3/4 inch NPTF x 3/4 inch quick-disconnect
—	9U-7455	Coupling, 3/4 inch NPTF x 3/4 inch quick-disconnect
—	3J-1907	Seal, O-ring for #6 SAE
—	3D-2824	Seal, O-ring for #12 SAE
—	7M-8485	Seal, O-ring for #16 SAE
—	9S-8004	Plug, #6 SAE

Notes

Notes

For information on service tools or shop supplies,
contact Caterpillar Service Technology Group on:

Caterpillar Service Technology
501 S.W. Jefferson Ave.
Peoria, Illinois 61630-2184
1-800-542-8665 (USA)
1-800-541-8665 (Illinois)
1-800-523-8665 (Canada)
404435 (Telex)
1-309-675-6650 (Fax)

or

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