

Refinery Supply Company, Inc.



OPERATING INSTRUCTIONS
Super Pressure Dead Weight Tester
Catalog No. 35260



"Serving the Oil & Gas Industry since 1923"

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GENERAL INFORMATION

Dead Weight Testers are a source of very accurate pressures and are used for calibration of other less accurate types of pressure measuring devices, such as bourdon tube pressure gauges. The high accuracy is obtained by balancing the force exerted by the oil pressure on a piston of known area against weights of known mass. The weights and piston are calibrated in sets to give an accuracy of 1/10 of 1% which is 10 PSI at 10,000 PSI indicated pressure.

The portable Super Pressure Dead Weight Tester consists of a piston and table, weights, pressure pump, and gauge connector, all mounted on bases and enclosed in a convenient carrying case, and one carrying case with extra weights. Various connecting adapters and tools for working on gauges are enclosed.

PRINCIPLES OF MEASUREMENT

The most accurate instrument available for measurement of pressures above the range where manometers may be used is the Refinery Supply Dead Weight Tester. This type of tester operates on the principle of balancing a known mass against the force exerted by an unknown pressure on a piston of a known area.

ACCURACY OF TESTER

A Certificate of Calibration accompanies every new instrument, verifying that its accuracy is 1/10th of 1% of the rated pressure. A Certification traceable to NIST standards can be supplied when a 0.02% accuracy is required.

ACCURACY OF REFINERY SUPPLY DEAD WEIGHT INSTRUMENTS

- A. All **Refinery Supply Dead Weight Instruments** are calibrated with traceability to a National Institute of Standards and Technology (NIST). Pressure standards are referenced on the certificate supplied with the instrument.

- B. The instrument calibrations performed for temperature are based on Standard Gravity 980.665 cm/sec². The temperature and pressure Coefficients are found on the certification sheet supplied with each Dead weight instrument.

- C. If accuracy greater than 0.05% is desired, a Certificate of Calibration is furnished . If the "actual psi" values on the certificate are used, the instrument will have an accuracy of 0.05% or better. Reference the equations for correcting for the effects of temperature, pressure, buoyancy and elevation.

SECTION I.— START UP

UNPACKING THE DEAD WEIGHT TESTER

The Refinery Supply Dead Weight Tester or Gage and its accessories were tested and inspected before the unit was shipped from our warehouse.

Carefully inspect the instrument and its accessories. If the unit is received in a damaged condition, immediately notify Refinery Supply and file a claim with the carrier.

WHERE TO FIND HELP

In the event of problems, the sales representative will be able to help or the personnel at Refinery Supply can be contacted.

- Telephone number: (918) 621-1700
- Toll free number: 866-836-4729
- Fax number: (918) 621-1704
- E-mail address: Jason@refinerysupply.com
- Website: www.refinerysupply.com

TOOLS/EQUIPMENT REQUIRED

- High pressure tubing (must be rated for use at the maximum pressure of the instrument)
- Suitable high pressure fittings or adapter fittings (must be rated for use at the maximum pressure of the instrument)
- Adjustable wrench or suitable open-end wrench
- A supply of proper oil (recommend 10W Non-detergent motor oil)

SAFETY PROCEDURES

Read and observe the following precautions:

- ☐☐ Always wear safety glasses when operating dead weight instruments. A high pressure oil leak can cause permanent eye damage.
- ☐☐ Do not attempt to operate the instrument in excess of the maximum pressure noted on the instrument.
- ☐☐ “NO SMOKING” signs should be displayed in laboratories and laboratory doorways whenever testers are being used for instrument calibration. Because a leak in the tester’s high pressure line can release an explosive mist of oil, proper fire extinguishers should be immediately available.
- ☐☐ Pre-load the tester’s piston with weights before applying pressure to the gage. Otherwise, shock from the pressure can dislodge the piston retainer ring, allowing the piston to fly out of the tester at high velocity. The operator could be seriously injured if standing directly over the instrument.
- ☐☐ Spinning the table counterclockwise and failing to load the table with weights before introducing pressure into the instrument can cause the table to spin off on some models, and the pressure nut to blow off, allowing the piston to become a dangerous projectile.
- ☐☐ When a tester is used to test a gas or liquid line pressure, connecting tubing and fittings should be rated at a pressure that is higher than the line pressure.
- ☐☐ Before bleeding pressure from the tester, the valve at the pressure source should be closed. The instrument’s pressure should then be slowly bled to atmosphere. If a vent valve is unavailable, the fitting at the tester should be carefully and slowly loosened. This procedure is to create a small leak, minimizing the volume of oil that will enter the interconnecting tubing.

CAUTION !!!!!!!

Hydraulic Fluid, such as Shock absorber, brake fluid, or transmission fluid **may not** be substituted for the hydraulic oil specified for the instrument.

Only approved oils are to be used as tester oils.

We recommend 10W Non-detergent motor oil
or any light weight machine oil.

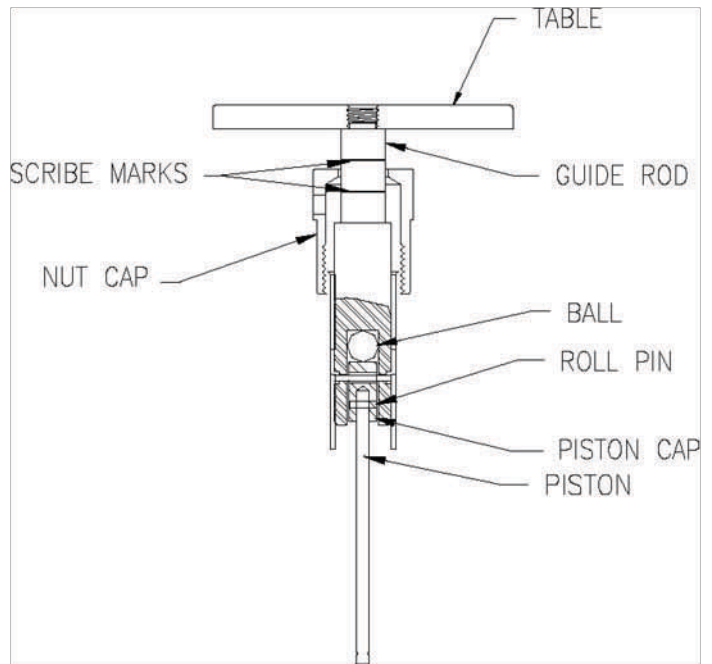
SETTING UP and OPERATING a DEAD WEIGHT TESTER

Procedure for Calibrating a Gage

- 1) Position instrument on the table. The weight table of the Dead Weight Tester must be level and stable before a gauge is calibrated with the tester. A level is mounted on the tester's base plate for leveling the instrument.
- 2) Remove the carrying case cover, weight rods, and weights from the tester's base.
- 3) Fill reservoir with recommended oil.
- 4) Connect the gauge to be calibrated to the tester, using one of the adapters supplied with the tester.
- 5) Apply pressure. Close the suction line valve, open the discharge valve, and use the hand-operated oil pump to generate pressure applied to both the piston and the gauge being calibrated.
- 6) Float the table. When the table, while loaded with appropriate weights, "floats" while being rotated, the known pressure is being applied to the gage being calibrated, and its indication or dial can be observed.

Note: Maintain pressure by keeping the guide rod positioned between the two scribe marks on the guide rod, increasing or decreasing pressure as necessary

- 7) If the reading of the gauge being calibrated is in error, the gauge can be adjusted while pressure is still applied from the tester.



Using a Tester as a Dead Weight Gage

When an unknown pressure is to be measured by a tester, the tester's chamber is filled with oil, and the unknown pressure is applied through a valve and a tube or hose and then through the connector that is mounted on the testers base.

The Dead Weight Tester measures applied pressures using the same principle as the Dead Weight Gage. The only differences are the parts that comprise the pressure chambers. In either configuration, the external pressure is applied to the bottom of the piston and is balanced by the mass of the weights that are added to the table.

- 1) When an unknown pressure is to be measured by a tester, the tester's chamber is filled with oil, and the unknown pressure is applied through a valve and a tube or hose and then through the connector that is mounted on the tester's base.
- 2) To move oil from the reservoir into the chamber, the discharge line valve is closed, and suction line valve is opened. The pump handle is turned counterclockwise to pull oil into the pump. Then, the suction line valve is closed, and discharge line valve is opened.
- 3) Turn the pump handle clockwise to force the oil out of the pump and into the pressure chamber.
- 4) To transfer another pump load of oil, the discharge line valve is closed, the suction line valve opened, and the process is repeated.
- 5) When using the Tester to measure unknown pressure, both valves should be closed.
- 6) After the unknown pressure has been measured by the tester, the oil is returned to the reservoir by reversing this procedure.

SECTION II.-OPERATING INSTRUCTIONS

Procedure for Calibrating a Dead Weight Gage:

The weight table of the Dead Weight Tester must be level and stable before a gage is calibrated with the tester (or if the tester is used as a gage to determine an unknown pressure). A level is mounted on the tester's base plate for leveling the instrument. In the field, a tripod provides a stable support for the device.

After the carrying case cover, weight rods, and weights are removed from the tester's base, the gage to be calibrated is connected to the tester, using one of the adapters supplied with the tester. When the gauge is connected to the tester, the gage becomes part of the tester's pressure chamber. To apply pressure, the suction line valve closed, the discharge valve opened, and the oil pump is hand-operated to generate pressure applied to both the piston and the gage being calibrated.

When the piston, loaded with appropriate weights, "floats" while being rotated, the known pressure is being applied to the gage being calibrated, and its indication or dial can be observed.

If the reading of the gage being calibrated is in error, the gage can be adjusted while pressure is still applied from the tester.

Adjusting Test Gages

Calibration of this type of instrument will normally consist of removing the pointer from its shaft and then reattaching it to the shaft at the proper indication. Two tools are furnished with the tester to aid in this corrective procedure. One is a hand jack that assists in removal of the pointer from its shaft. The other is a pointer driver that can be used as a drift punch to tap the pointer back onto its shaft without damage to the gage. Both accessories are attached to the base of a new tester. We recommend you store them after their use, using the mounting screws that are provided in the tester's base.

Preparing an Instrument for Transport

After the test gage has been calibrated, the oil in the tester's piston should be pumped back onto the tester's reservoir and the test gage removed from the tester. Then the weights, weight rods, and tester cover are replaced, preparing the instrument for the next job.

SECTION III. - MAINTENANCE

Tools Required

Adjustable wrench or suitable open-end wrenches

Maintenance and Service

To ensure accuracy of Refinery Supply Dead Weight Instruments:

- 1) Transport the instrument with cover in place. If the cover becomes damaged, it should be replaced.
- 2) Firmly tighten the knurled nut of the weight rod before transporting to avoid abrasion of the weights and loss of their mass.
- 3) If the weights are abraded in transport or are damaged by being dropped, they should be replaced.
- 4) Clean the weights with a soft brush rather than with a coarse or soiled cloth to avoid altering the mass of the weights.
- 5) Avoid contaminating the instrument with dust and grit, preventing unnecessary wear of moving parts. Contamination of the oil in the system will accelerate piston and cylinder wear and degrade instrument accuracy.
- 6) Fill the oil reservoir through the filler cap with light weight non-detergent motor oil **BEFORE** an instrument is used for the first time. The oil level must be maintained above the lower end of the cylinder, or the gas will bypass the oil. Maximum sensitivity of the instrument to pressure requires that the oil be "light" at the time of measurement.
- 7) For the instrument to be sensitive, the metal-to-metal interface of its piston and cylinder assembly is designed to allow for the minor escape of oil past the piston to minimize friction and lubricate the piston. Therefore, some leakage past the piston is normal and necessary. A moderate escape of oil can be controlled by adding heavier oil. Excessive leakage or "blowing" of oil past the piston indicates excessive wear of the piston and cylinder assembly and requires replacement of the assembly. The piston and cylinder assembly can be replaced without need of factory calibration if the model and serial number of the dead weight instrument is supplied.
- 8) Replace hydraulic oil (**do not use transmission fluid, brake fluid, or shock absorber**) in the reservoir with recommended 10W Non-detergent motor oil when the test fluid or gas (oxygen) will be reactive with the hydraulic oil. Before use with oxygen, clean and purge the system, and replace all seals.
- 9) Ensure that high pressure fittings on the dead weights instruments are tight when operating the instrument indoors.
- 10) Remove the piston and cylinder for cleaning by unscrewing the adapter nut. If the nut is sealed to the body with an "O" ring, it should only be finger tight when replaced.

CERTIFICATION PROCEDURES:

The Refinery Supply Dead Weight Tester or Gage is a precision device that will require periodic re-certification due to wear of the piston area and weights. To re-certify the dead weight instrument, ship to 9133-A East 46th Street Tulsa, Oklahoma 74145 along with Dead Weight Tester Repair Form supplied with these instructions. We will repair any damaged components and perform a “cross-float” with our Master Dead Weight Instrument that is NIST certified. Once completed, an up-dated certificate is issued.

OIL CHANGES:

Replace the oil if any contamination is suspected. Corrosive contaminants in the oil may damage the piston and cylinder assembly.

SUGGESTED MAINTENANCE SCHEDULE:

Inspect condition & safety of instrument:	After each use
Change oil:	Every 6 months or as necessary
Re-certify:	Every 12 months (or as needed)

REFINERY SUPPLY COMPANY, INC.

9133-A EAST 46TH STREET
TULSA, OKLAHOMA 74145

PRODUCT WARRANTY

REFINERY SUPPLY CO. INC. shall warranty its products to be free of material and workmanship defects for a period of one year from shipping date. Refinery Supply liability for defective equipment shall be limited to the repair or replacement of said equipment without charge to the customer.

REFINERY SUPPLY CO. INC. will be liable only if the defect is reported immediately.

REFINERY SUPPLY CO. INC. must give written permission for any product under warranty to be returned for repair or replacement. The warranty will be null and void if the equipment was subject to alteration, misuse, neglect, modification, and improper installation or repaired by unauthorized persons not approved by Refinery Supply Co.

REFINERY SUPPLY CO. INC. will not be liable for expenses, loss or damages, damages directly or indirectly arising from use of the products or for any liability from their use either separately or in combination with other equipment, material or any other cause.

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SECTION IV.—TROUBLESHOOTING

PROBLEM	SOLUTION
Gas escapes past piston when used to determine unknown gas pressure.	<p>A) <i>Insufficient oil in reservoir adapter -</i> Shut off and bleed pressure from tester. Pump oil to adapter until reservoir is full.</p> <p>B) <i>Damaged Cylinder O-ring -</i> Unscrew cap nut. Remove guide rod and piston. Use wrench to unscrew cylinder adapter. Replace O-ring.</p>
Gas bubbles or blows into oil of center reservoir when determining unknown gas pressure.	<p><i>Damaged adapter O-ring -</i> Unscrew cap nut. Remove guide rod and piston. Use wrench to unscrew cylinder adapter. Replace O-ring.</p>
Not sensitive to small weight changes when used to determine unknown gas pressure.	<p>A) <i>Over tightened cylinder cap nut -</i> Unscrew cap nut. Re-tighten only until snug.</p> <p>B) <i>Dirty Oil -</i> Remove oil. Clean reservoir with solvent. Fill reservoir with clean oil.</p> <p>C) <i>Damaged Piston -</i> Remove piston & cylinder as per above “Damaged O-ring” Clean with solvent. If “Binding” is evident, replace with new Piston & Cylinder assembly.</p>
Pressure cannot be maintained when calibrating another pressure gage.	<p>A) <i>Air is drawn into pump because of insufficient oil in center reservoir -</i> Unscrew cap and check oil level in reservoir. Add oil if necessary.</p> <p>B) <i>Damaged cylinder adapter O-ring -</i> Unscrew cap nut. Remove guide rod and piston. Use wrench to unscrew cylinder adapter. Replace O-ring.</p> <p>C) <i>Leakage through valve</i></p>

SECTION IV.—TROUBLESHOOTING

PROBLEM	SOLUTION
Excessive oil leakage at piston.	<p>A) Damaged cylinder O-ring - Replace o-ring.</p> <p>B) Oil too light - Check and remove fluid in reservoir if it is transmission fluid, brake fluid, or shock absorber. Replace with recommended 10W Non-detergent motor oil.</p> <p>C) Worn piston & cylinder assembly - Replace with new Piston & Cylinder assembly</p>
Not sensitive and/or inaccurate operation during hydrostatic testing.	<p>Water emulsifying with tester oil -</p> <p>Best = Use synthetic oil instead of standard mineral oil.</p> <p>Satisfactory = Use oil water separator.</p>

PARTS LIST FOR 35260 DEAD WEIGHT TESTER

Catalog Number	Description
N13000	Needle valve 1/8" male
N16001	Bushing 1/2" x 1/4"
N16011	Female connection, steel 1/8"
N16012	Compression fitting, brass 1/8"
N27001	O-ring, piston
N27002	O-ring
N27038	U-cup
N29000	Pump handle
N35000	Spirit level
N35001	Handle, carrying case
N60018	Hand Jack
N60026	Weight, .1 PSI
N60027	Weight, .2 PSI
N60028	Weight, .5 PSI
N60029	Weight, low pressure 1 PSI
N60030	Weight low pressure 2 PSI
N60031	Weight, low pressure 5 PSI
N60033	Weight, low pressure 10 PSI
N60034	Weight, low pressure 20 PSI
N60035	Weight, low pressure 100 PSI
N60036	Weight, low pressure 500 PSI
N60037	Weight boss
N60051	Stand off for 7" carrying case
N60071	Base plate for weights 7"
N60074	Base plate for tester
N60089	Pump plunger, brass
N60092	Reservoir cover
N63007	Weight rod
N63010	Pointer driver
N63011	Oil pump cap
N63012	Filler plug
N63013	1/4" male x 1/4" female adapter
N63014	1/4" male x 1/8" female adapter
N63015	1/2" reservoir adapter
N65025	Cover, carrying case
N67030	Piston & Cylinder assembly
N76500	Nut, knurled
N93050	Oil, dead weight tester 8 oz.

PLEASE FILL OUT THIS FORM AND RETURN IT WITH TESTER WHEN YOU SEND IT IN FOR REPAIRS AND/OR RECERTIFICATION.

COMPANY NAME _____

BILLING ADDRESS _____

PURCHASE ORDER NUMBER _____

SHIP TO ADDRESS _____

(INCLUDING PHYSICAL LOCATION FOR UPS SHIPMENTS)

REASON FOR RETURN OF UNIT: _____

RECERTIFICATION _____

REPAIR _____

DESCRIPTION OF ANY MALFUNCTION OF UNIT _____

IS NIST CERTIFICATION REQUIRED ON THIS UNIT? ____YES ____NO

NAME OF PERSON RETURNING UNIT _____

PHONE NUMBER _____

SERIAL NUMBER _____

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