

DTG-6000 Instruction Sheet

The "Direct Drive Difference" in Digital

Introduction

Thank you for choosing the DTG-6000 (Digital Test Gauge) from 3D Instruments. The DTG-6000 is very much like the 3D Direct Drive Test Gauge: Rugged, accurate and easy to use. The **Difference** is the greater accuracy possible with a digital display and, through an advanced design, **accuracy that is specified in percent of reading between 20% and 100% of span over the entire operating temperature range of -10°C (14°F) to 50°C (122°F).**



The large LCD was designed to be reliable and easy to read under a variety of environmental conditions. The DTG-6000 display is a full five digits (99999), so auto-ranging is not required to have sufficient display resolution for the rated accuracy.

The silicon chip pressure sensors used in all DTG-6000's are highly repeatable over pressure and temperature. DTG-6000 sensors incorporate a permanently filled oil isolated stainless steel diaphragm in an all-welded fitting. The only wetted materials are 316 stainless steel.

Other features include the ability to select from up to 9 different pressure units (depending on pressure range), High and Low pressure reading detection, auto shutdown after 20 minutes (shutoff can be easily disabled), and 1500 hour battery life (continuous use) on 3 standard alkaline AA batteries. Long battery life while maintaining high performance are the result of using a RISC (Reduced Instruction Set Computer) type microprocessor. The case is electro-polished stainless steel with elastomeric seals for weather and corrosion resistance.

And finally, the DTG-6000 is manufactured and serviced by the company that makes THE Premier Pressure Gauge on the market today. **Get The Direct Drive Difference in Digital Today!**



An ISO 9000 Registered Company

 **3D Instruments, LLC**

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Operating Instructions

The DTG-6000 is shipped with batteries installed so that it is ready to use. Simply press the POWER button for at least one second. **There is a built-in delay for the POWER button so that if it is depressed accidentally the DTG-6000 will not turn on.**

After pressing the POWER button the display will briefly test all LCD segments followed by a display of the full scale pressure range of the DTG-6000 in the units of pressure last used. Since the DTG-6000 does not automatically re-zero when turned on, it may have to be re-zeroed. Simply press the ZERO button for 1 second.

All DTG-6000's are intended for gauge pressure measurement. That is, they indicate the difference between applied pressure and ambient barometric pressure. The ZERO button also can be used as a tare function - extending the functionality of the gauge for special applications.

Connect the DTG-6000 to your system. Always use pipe thread tape or pipe thread sealant on the " NPT fitting. To ensure safe and accurate operation please be familiar with the following warnings:

WARNING:

SEVERE INJURY OR DAMAGE CAN OCCUR THROUGH IMPROPER USE OF PRESSURE INSTRUMENTS. Do not exceed recommended pressure limits of tubing and fittings. Be certain all pressure connections are secured.

THIS GAUGE CAN DISPLAY ZERO PRESSURE EVEN WITH FULL SCALE PRESSURE APPLIED. Do not rely on the display indication before disconnecting - it may not be indicating true pressure.

NEVER DISCONNECT PRESSURE INSTRUMENTATION WITHOUT FIRST RELIEVING SYSTEM PRESSURE.

CAUTION:

NEVER INSERT ANY OBJECT (other than an optional filter) INTO THE PROCESS CONNECTION. The sensor diaphragm is very thin and can be damaged or destroyed by solid or sharp objects. Cleaning of the sensor must be done with appropriate solvents only.

Zero/Tare

The DTG-6000 should be re-zeroed whenever exposed to changes in temperature to insure that it is performing to the rated accuracy.

The DTG-6000 can zero or tare any applied pressure within the specified operating range. This means that even if zero is displayed pressure may be being applied to the unit and it may be dangerous to disconnect the DTG-6000 from the pressure source. **Always insure that the pressure has been equalized with ambient pressure before disconnecting!** To zero or tare the DTG you must press the ZERO button for at least one second before it responds. This is to avoid unintentional changes to the zero/tare setting.

Over-pressure Conditions

The DTG-6000 will read pressure up to approximately 110% of the rated pressure range at which point the display will start flashing and the readings are no longer reliable. The zero function does not affect the point at which the display starts flashing to indicate over-pressure, so depending on the tare value it is possible that the display can start flashing without the maximum pressure being displayed. For instance, if a 100 PSI DTG-6000 is zeroed when 30 PSI is being applied, it will indicate that the over-pressure condition has been reached at 80 PSI (i.e., 110% x 100 PSI - 30 PSI = 80 PSI).

Over-pressure can affect accuracy but the effect is only temporary unless the sensor has been destroyed. See Specifications on Page 5 for maximum over-pressure.

Eng. Units

Pressing this button causes the DTG-6000 to select the next unit of pressure measurement. There are up to 9 units available. See Specifications on page 5 for the list of scales.

Hi / Lo detection

The DTG-6000 continuously records the maximum and minimum applied pressures. To view the maximum pressure value press the HI/LO button. Press the HI/LO button again to view the minimum recorded pressure. Pressing the HI/LO button once more returns the display to the current applied pressure reading. Maximum and Minimum pressure readings are updated when viewing and are retained in memory even if the unit is turned off. These readings are lost if the batteries fail or are changed.

Resetting recorded Hi / Lo values

When displaying either high or low recorded pressure, the ZERO button is used to reset the high and low values to the currently displayed pressure. This will not affect the zero or tare value. If you need to re-zero the gauge, the gauge must be in normal pressure mode.

Auto shut-off

Normally, the DTG-6000 will turn off automatically after 20 minutes of operation without a key depression. This can be defeated however, when turning the DTG-6000 on. Pressing the POWER and ZERO buttons simultaneously will prevent the DTG-6000 from automatically turning off. The DTG-6000 will briefly display the words "No AUTO OFF" to indicate that it will not turn off.

This procedure is required each time the DTG-6000 is turned on, if you want to defeat the auto-shutoff.

Low battery indication

A flashing battery icon is the first indication of a low battery. The DTG-6000 will continue to operate accurately while the icon is lit. When the batteries are exhausted, the

Calibration

Digital Interface

The DTG-6000 can be connected to standard RS-232 computer ports. This requires a custom accessory cable/interface adapter from 3D Instruments.

With the RS-232 interface it is possible to record the displayed and recorded values directly into a spreadsheet with third party software.

If adjustment is required, we recommend returning the unit to the factory.

Factory service offers benefits you won't find anywhere else. We have the facilities to provide calibration reports that include test data at a variety of temperatures utilizing NIST traceable standards. In addition, upgrades may be available to add or enhance operating features. We designed the product to last and we support it so that you can get the most from your investment.

We recommend the DTG-6000 be recalibrated on an annual basis. However, your quality system requirements may require more or less frequent calibration depending on the environment in which it is used and the calibration history of your DTG-6000.

Although we prefer that you return the DTG-6000 to 3D Instruments for calibration, ordinary recertification and/or adjustments may be performed by any qualified personnel with appropriate training and equipment. **The following instructions are ONLY intended for such qualified personnel.**

We recommend that the calibration standards used have a minimum rated accuracy of 0.025% of reading. Usually, this level of accuracy requires the use of piston (deadweight) gauges or very high performance pressure controllers.

After re-zeroing the DTG-6000, take as found readings for at least two or more pressure points.

There are no internal potentiometers: The DTG-6000 contains a "span" factor which all readings are multiplied by. Normally, this is set to a value of 1.0000. However, as components age this may need to be changed to a value slightly higher or lower than 1. This adjustments is made via the keypad or the RS-232 interface. If adjustment is required, determine the span factor that results in the best fit of the data to the true pressure applied.

To change the span factor, press the POWER, ENG UNITS and HI/LO buttons simultaneously. The word "cal" will briefly be displayed followed by the actual span value. The span factor may be adjusted by pressing either the ENG UNITS button (to increase the value) or the HI/LO button, to decrease the value. The value changes in 0.0001 increments. Press the ZERO button to store the new value in memory.

letters "batt" will appear across the display and no further pressure measurements will be possible until the batteries are replaced.

Battery replacement

The DTG-6000 uses 3 AA batteries. Alkaline batteries are recommended, but not required if the gauge will only be operated in warm environments. Most alkaline batteries will operate down to -10°C or colder.



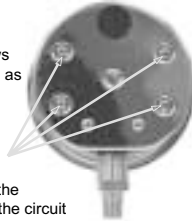
Remove the trim ring on the front of the DTG-6000 (Fig. 1) by rotating it counter-clockwise.

Figure 1: Remove Trim Ring

Then remove the four #6 screws from the back of the DTG-6000 as shown in Fig. 2. Carefully separate the front of the DTG-6000 from the housing.

Figure 2: Four Access Screws

Be careful to not put stress on the cable between the sensor and the circuit cards. When replacing the batteries be sure to install them in the indicated orientation.



Other display conditions

All decimal points lit simultaneously is an indication of an internal problem or failure. All segments slowly flashing on and off is due to a program memory error, "ERR 1" is due to an error with calibration memory. In either case, you should contact customer service, as listed on the last page of this manual, should this occur.

Reset

If for some reason the unit needs to be reset remove any battery for at least one minute, then reinstall the battery. If the reset is successful the DTG-6000 will start operating without pressing the POWER button.

Measuring Vacuum

All versions of the DTG-6000 can be used to measure moderate vacuum. When measuring pressure less than ambient barometric conditions, a minus (-) sign will appear. DTG-6000's are not recommended for continuous use at high vacuum (pressures less than -14.5 PSI, at sea level).

DTG-6000 Model Numbering System

This manual applies to all models in the current DTG product line. To determine the specifications for your model you will need to determine the model number.

6 5 5 1 4 - [XX] B [X] 5 [XXX - XXX]

Pressure Range	P/N Code
15 PSI =	15
30 PSI =	21
100 PSI =	23
300 PSI =	26
500 PSI =	27
1000 PSI =	29
2000 PSI =	32
3000 PSI =	33
5000 PSI =	35

Flange / Fitting	Code
Front / Bottom =	1
Front / Back =	2
Back / Bottom =	3
Back / Back =	4
None / Bottom = *	5
None / Back =	6

* = Standard Configuration

Options	P/N Code (Omit Code)
None	
NIST Calibration Certificate (w/data)	GCO
8110-300 Pump and Case	PNO
8111-300 Pump and Case	PRO
8112-3000 Pump and Case	PUO
Oxygen Clean Per 3D RYY110-102	GBK
Custom RS232 Data Cable	RAA

- Examples:
- 65514-23B25 _____ 100 PSI, Front Flange, Back Fitting
 - 65514-26B35GCO _____ 300 PSI, Back Flange, Bottom Fitting, NIST Calibration Certificate with Data.
 - 65514-33B55PUO-RAA _____ 3000 PSI, No Flange, Bottom Fitting, 8112-3000 Pump with Carrying Case, With RS-232 Data Cable.

Specifications

Accuracy

20 to 100% of Full Scale: $\pm 0.1\%$ of reading
 0 to 20% of Full Scale: $\pm 0.02\%$ of Full Scale
 0 to -14.5 PSIG: $\pm 2\%$ of Full Scale (where F.S. = 14.5 PSI)

Note: Accuracy specifications are for one year and include all effects of linearity, hysteresis, repeatability and temperature, within the specified operating temperature range. The gauge must be re-zeroed whenever exposed to significant changes in environmental conditions to achieve these specifications.

Exposure to environmental extremes of temperature, shock or vibration may warrant a more frequent recertification period. To quote from MIL-STD-45662A "<Calibration> Intervals shall be shortened or may be lengthened...when the results of previous calibrations indicate such action is appropriate to maintain acceptable reliability".

Media Compatibility

Liquids and gases compatible with 316 Stainless Steel

Power

Batteries: 3 X AA, alkaline recommended
 Battery Life: 1500 hours continuous operation
 Low Battery Indicator: Battery Icon
 Dead Battery Indication: The letters "batt" in place of pressure reading

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Connection

Pressure Fitting: 1/4" male NPT.

Enclosure

Dimensions: See Page 6
 Weight: 635g (22.oz.) including batteries.

Temperature

Operating & Compensated Range: -10°C to 50°C (14°F to 122°F)
 Storage Range: -20°C to +70°C (-4°F to +158°F)

Humidity

Temperature Range	Humidity
-10 to 10°C	Uncontrolled
10 to 30°C	0 to 95% Relative
30 to 40°C	0 to 75% Relative
40 to 50°C	0 to 45% Relative

Replacement parts

The only user-replaceable parts are the batteries and optional filter.



Pressure conversions

1 PSI =

27.6806 inches of water column (water at 4°C [39.2°F])
 2.03602 inches of mercury (mercury at 0°C [32°F])
 6.8948 kilopascals
 51.7149 millimeters of mercury (mercury at 0°C [32°F])
 703.087 millimeters of water column (water at 4°C [39.2°F])
 0.068948 bar
 68.948 millibar
 0.070307 kilograms per square centimeter

Note: Other conversions may have been specified at time of order.

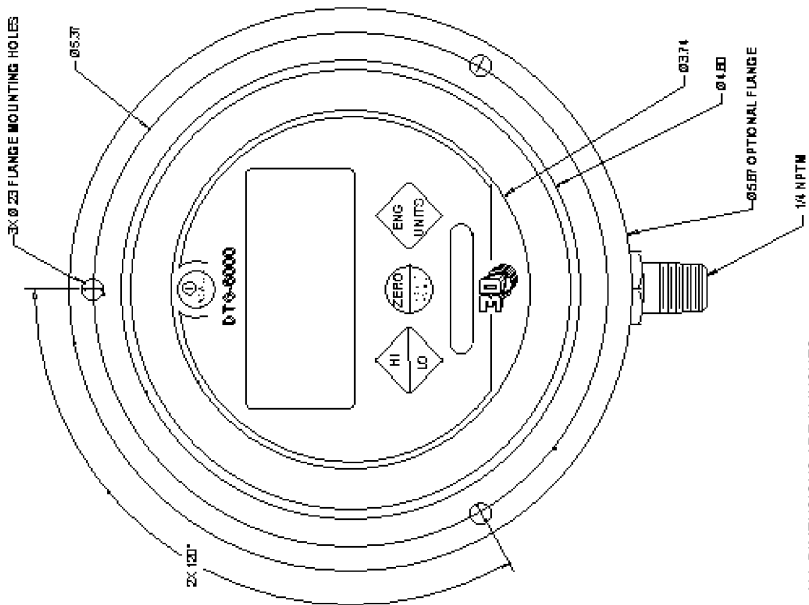
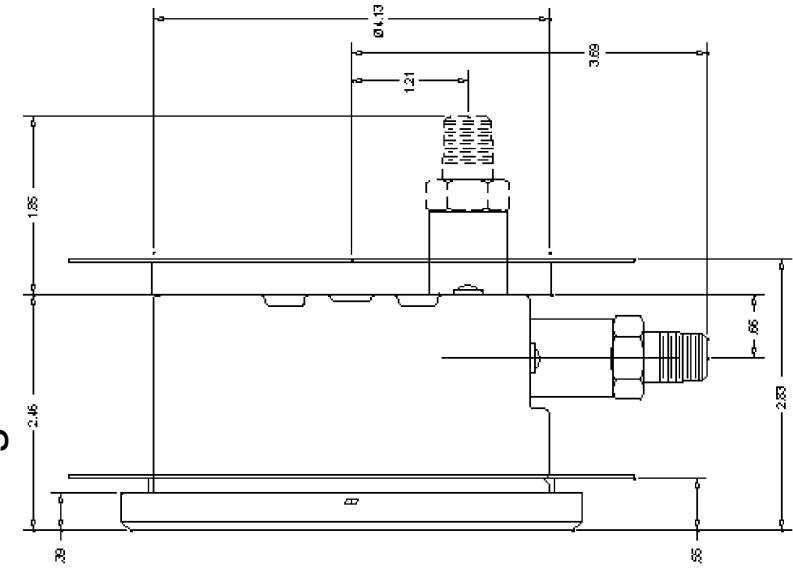
Options & Accessories

NIST Certificate of Conformance standard
 NIST Calibration Certificate (with data) optional
 P/N 2025-0007 (RS-232 interface adapter) optional
 P/N 8110-300 (Pneumatic Handpump: 0 to 300 PSI) optional
 P/N 8111-300 (Duplex Handpump: -13.7 to 300 PSI) optional
 P/N 8112-3000 (Hydraulic Handpump: 0 to 3000 PSI) optional
 P/N 0146-0215 (Waterproof Carrying Case) optional
 P/N RS380-1 (25 to 50 Micron optional Filter)

Available Pressure Ranges & Display Resolution

Pressure Range	Maximum Over Pressure	Display Resolution Available Units
-14.5 PSIG Vacuum 15 PSIG Pressure	100 PSIG	0.001 PSI ■; 0.01" H ₂ O ●; 0.001" Hg ■; 0.01 kPa; 0.01 mmHg ●; 1 mmH ₂ O ◆; 0.0001 bar; 0.1 mbar; 0.0001kg/cm ² ⌘
-14.5 PSIG Vacuum 30 PSIG Pressure	100 PSIG	0.001 PSI ■; 0.01" H ₂ O ●; 0.001" Hg ■; 0.01 kPa; 0.1 mmHg; 1 mmH ₂ O ◆; 0.0001 bar; 0.1 mbar; 0.0001kg/cm ² ⌘
-14.5 PSIG Vacuum 100 PSIG Pressure	200 PSIG	0.01 PSI; 0.1" H ₂ O; 0.01" Hg; 0.01 kPa; 0.1 mmHg; 1 mmH ₂ O ◆; 0.0001 bar; 0.1 mbar; 0.0001kg/cm ² ⌘
-14.5 PSIG Vacuum 300 PSIG Pressure	600 PSIG	0.01 PSI; 0.1" H ₂ O; 0.01" Hg; 0.1 kPa; 1 mmHg; 0.001 bar; 1 mbar; 0.001kg/cm ²
-14.5 PSIG Vacuum 500 PSIG Pressure	1000 PSIG	0.01 PSI; 1" H ₂ O; 0.1" Hg; 0.1 kPa; 1 mmHg; 0.001 bar; 1 mbar; 0.001kg/cm ²
-14.5 PSIG Vacuum 1000 PSIG Pressure	2000 PSIG	0.1 PSI; 0.1" Hg; 0.1 kPa; 0.001 bar; 0.001kg/cm ²
-14.5 PSIG Vacuum 2000 PSIG Pressure	4500 PSIG	0.1 PSI; 0.1" Hg; 1 kPa; 0.01 bar; 0.01kg/cm ²
-14.5 PSIG Vacuum 3000 PSIG Pressure	4500 PSIG	0.1 PSI; 0.1" Hg; 1 kPa; 0.01 bar; 0.01kg/cm ²
-14.5 PSIG Vacuum 5000 PSIG Pressure	7500 PSIG	0.1 PSI; 1" Hg; 1 kPa; 0.01 bar; 0.01kg/cm ²
<p>■ Resolution on Vacuum Readings below -9.999 = 0.01 PSI, 0.01" Hg. ● Resolution on Vacuum Readings below -99.99 = 0.1" H₂O, 0.1 mmHg. ◆ Maximum Vacuum Reading = -9999 mm H₂O. ⌘ Resolution on Vacuum Readings below -.9999 = 0.001 kg/cm².</p>		

Dimensional Drawing



ALL DIMENSIONS ARE IN INCHES

Warranty

3D Instruments, LLC warrants the DTG-6000 to be free from defects in material and workmanship under normal use and service for one (1) year from date of purchase to the original purchaser. It does not apply to batteries or when the product has been misused, altered or damaged by accident or abnormal conditions of operation.

Within one (1) year from date of purchase, 3D Instruments will, at our option, repair or replace a defective device free of charge and the device will be returned, transportation prepaid. However, if we determine the failure was caused by misuse, alteration, accident or abnormal condition of operation, you will be billed for the repair.

3D INSTRUMENTS, LLC MAKES NO WARRANTY OTHER THAN THE LIMITED WARRANTY STATED ABOVE. ALL WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, ARE LIMITED TO A PERIOD OF ONE (1) YEAR FROM THE DATE OF PURCHASE. 3D INSTRUMENTS, LLC SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT OR OTHERWISE.

For warranty or non-warranty service, we can be reached at:

Phone 714•894•5351

Fax 714•895•4309

Email service@3dhub.com

Address 3D Instruments, LLC
..... Attn: DTG-6000 Service Department
..... 15542 Chemical Lane
..... Huntington Beach, CA 92649-1576
..... U.S.A.

Web www.3dinstruments.com

Return Authorization is not required for servicing. Please return, Freight Prepaid, to the address above and include a Contact Name, Address, Phone and Fax Number. If you wish to be notified of the charges before any service is done, 3D Instruments will contact you after evaluating the unit. Units evaluated but not serviced are subject to an evaluation charge. Defective units need to be returned to 3D Instruments, LLC within 90 days of identification of a problem.

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<http://www.digitaltestgauge.com>

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