User's Guide

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DFG21 SERIES
Digital Force Gauge

M-4733/0209

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ΩOMEGA®

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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.
The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

INTRODUCTION

Congratulations on selecting the DFG21 Series force gauge for your precision load measurement requirements. Please read this manual and understand gauge operation before attempting to use this instrument. Follow all precautions and adhere to all Warnings, Cautions and Notes.

PRECAUTIONS

- Read the DFG21 Series User's Guide completely before attempting to use this precision force measuring instrument. By following the instructions contained in this manual, the optimum accuracy and performance can be attained.
- Never operate the DFG21 Series gauge with the cover removed.
- Verify Input Power Source BEFORE charging the DFG21 Series battery or before operating the gauge using AC power.
- Never use the DFG21 Series gauge in a manner not specified by OMEGA ENGINEERING. Contact Omega Engineering for assistance if you do not understand how to operate your force gauge.
- Obey all warning labels on your DFG21 Series gauge.

ICONS

WARNING

The raised hand icon warns of a situation or condition that may lead to personal injury or death. Do not proceed until the warning is read and thoroughly understood. Warning messages are shown in bold type.

DANGEROUS VOLTAGE

The lightning icon warns of the presence of an uninsulated dangerous voltage within the product enclosure that might be of sufficient magnitude to cause serious shocks or death. Never open the enclosures unless you are an authorized and qualified Omega service personnel. Never open any enclosure when power is connected to the system or its components.

CAUTION

The exclamation point icon indicates a situation or condition that may lead to equipment malfunction or damage. Do not proceed until the caution message is read and thoroughly understood. Caution messages are shown in bold type.

NOTE

The note icon indicates additional or supplementary information about the action, activity or concept. Notes are shown in bold type.

GENERAL SAFETY

General safety precautions must be followed when using this Omega Engineering product. Failure to observe precautions and warnings may result in damage to the equipment, or injury to personnel.

It is understood that safety rules within companies vary. If a conflict exists between the material contained in all Omega Engineering User's Guides and the rules of a company using an Omega Engineering product, the more stringent rules should take precedence.

SAFETY CONSIDERATIONS

The DFG21 Series gauge is completely enclosed and provides no potentially hazardous outputs. Safety considerations are related to the power connections and physical mountings.

Electronic and mechanical components housed within the DFG21 housings are to be serviced by authorized Omega Engineering representatives only.

USING THE KEYPAD

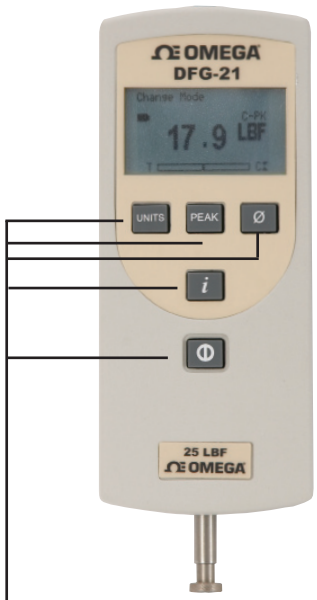
The keypad has an On/Off, Units, Peak, Zero and Info button.

The UNITS button is used to change units of measure. This key may be disabled using the Units Lock feature.

The PEAK button is used to change mode (Normal or Peak). This key is also used during gauge setup to enable/disable features.

The ZERO button is used to zero a result or tare. This key is also used in gauge setup to exit setup and return to the home display.

The INFO (i) button is used to display gauge information including operating characteristics and gauge setup features.



Units — *Changes measurement units: ozf, gf, lbf, kgf, N. May be disabled so that units cannot be changed. (See Units Lock Feature).*

Peak — *Select to view/capture peak measurements. Change between Normal and Peak.*

Ø — *Select to Zero measurement or to Tare up to 10% of the gauge's capacity.*

Note: When in INFO mode, select the Zero key to exit and return to Home.

i — *Select to view gauge information and to select gauge operating options. (See Using INFO Key).*

⏻ — *Turn Gauge On or Off.*

POWER ON/OFF

Turn power On/Off by depressing the power button.

CAUTION

The sensor used in your DFG21 Series gauge is a temperature sensitive device. Before measurements can be made, turn the gauge ON and allow the instrument to warm-up for at least 7 minutes.

UNDERSTANDING THE DISPLAY

The display has 8 lines that can display up to 21 characters. Display contrast is set at the factory and cannot be adjusted. The following icons may be displayed to show the user features that are active for the gauge:

- Battery Status
- Auto Shutdown is On
- Units Lock is On
- Mode
- Units of Measure
- Measured Result Numeric
- Measured Load Direction Arrows (Tensile or Compression)

Load Bargraph

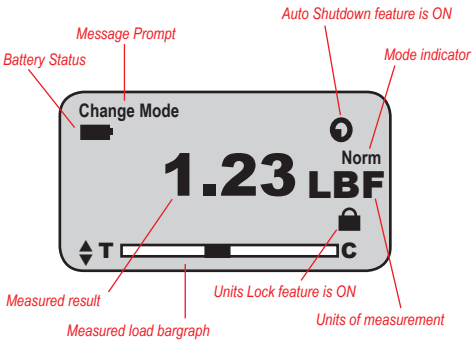
The bargraph provides a graphical representation of the actual load and direction of load being applied to the load cell. The bargraph fills from the centerline. The left side indicates Tensile force. The right side indicates Compressive force.

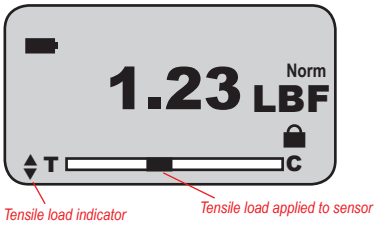
Sensor Overload

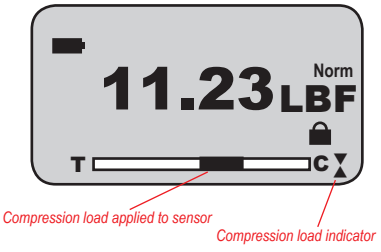
The term "Overload" is displayed if the load cell has a force applied that is equal or greater than 116% of its rated capacity.

CAUTION

Overloading a load cell can cause permanent damage to the sensor. Exercise caution to ensure than no force greater than the load cell's rated capacity is applied.

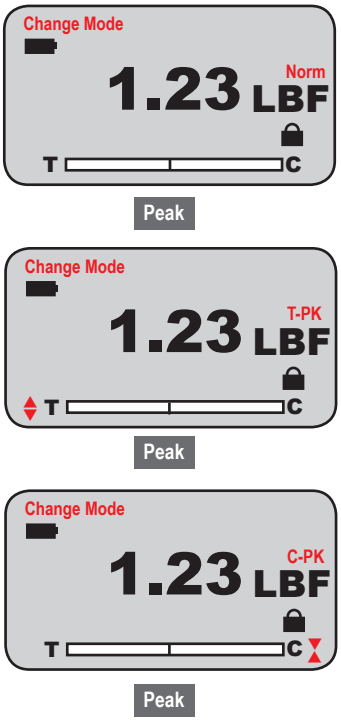






CHANGING MODE

The DFG21 gauge has Normal and Peak modes. Select the PEAK button to change between modes.

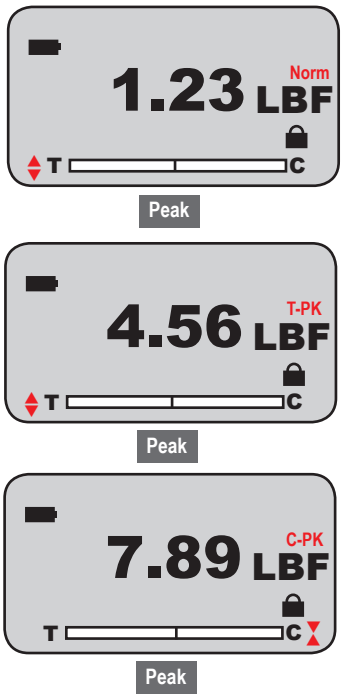


VIEW PEAK MEASUREMENTS

The DFG21 will display the peak (maximum) load achieved during a test. There are two methods to view peak results:

1. Place the gauge in Normal mode. Measure the load. Press the PEAK button once the measurement is completed to view the Peak result.

2. Place the gauge in Peak mode prior to making the measurement. Press the PEAK button. Take the measurement and view the Peak result.



ZERO AND TARE

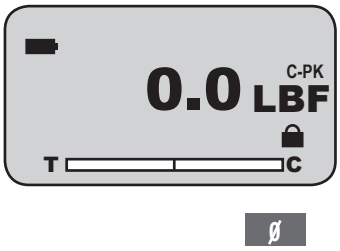
Press the ZERO button to zero a result.

You may tare out up to 10% of the force gauge's capacity to compensate for the weight of fixtures.

Add the fixture to the force gauge.

Press the ZERO button to tare out the fixture's weight.

NOTE
The ZERO button is used in gauge setup to exit the setup procedures and return the gauge to normal measurement operation.

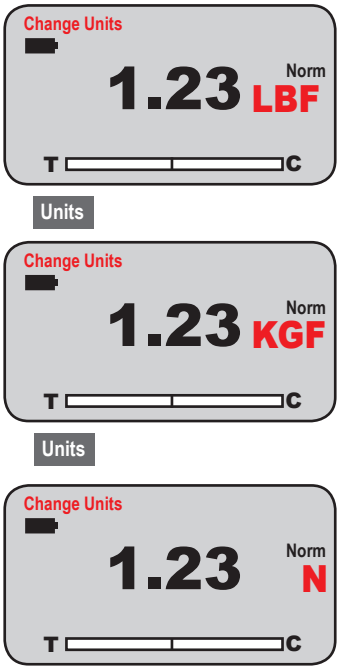


CHANGING UNITS

Press the UNITS button to change the units of measure. Units are presented in the following order: ozf, gf, lbf, kgf and N.

Force gauges with a rated capacity of 100 lbf (500N, 50 kgf) and higher do not display ozf or gf equivalents. These capacity force gauges display units in the following order: lbf, kgf and N.

NOTE
Resolutions cannot be changed. The resolution of the load result is a function of the load cell being used by the force gauge.



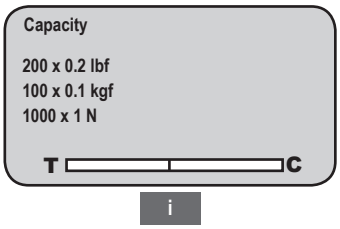
SETTING UP YOUR GAUGE

The DFG21 Series setup is performed using the Setup Menu display. Individual gauge features are listed. You access the desired feature using "i" button. The "i" button is used to display gauge information and configurable features in this order when depressed:

1. Capacity
2. Firmware Revision
3. Overload History
4. Battery Life
5. Automatic Shutdown (configure)
6. Units Lock (configure)
7. Display Language (configure)

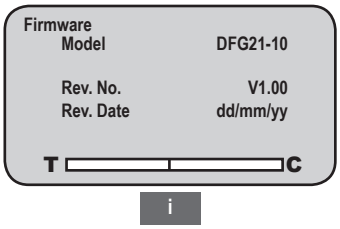
View Gauge Capacity

Press the "i" button to view the DFG21 capacity x resolution.



View Gauge Firmware Revision

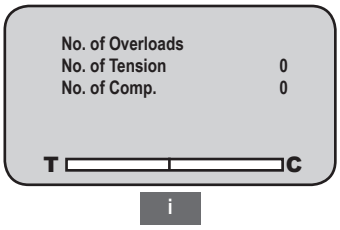
Press the "i" button twice to view the DFG21 model, firmware number, firmware revision number and revision date.



View Gauge Overload History

Press the "i" button to view the number of overloads recorded for tension (Tension) and compression (Comp).

CAUTION
Overloads can damage the load cell. Always take care to observe the measured load bargraph when taking a measurement. Stop your measurement when the bargraph is nearly full to avoid overloading your load cell.

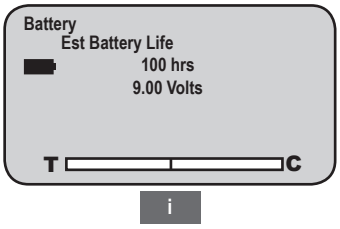


View Battery Life

Press the "i" button to view the battery life. The gauge will display the estimate battery hours remaining and the current battery voltage.

NOTE
The DFG21 will display "Replace Batteries" when the battery voltage drops to approximately 7.2Vdc.

NOTE
The DFG21 Series will shutdown automatically when the battery voltage drops to approximately 6.8Vdc.



CHANGING THE 9VDC BATTERIES

Remove the screws on the back housing. Unplug or plug-in a new 9Vdc battery to the connector. Close and secure housing. Turn gauge ON to verify power.

The DFG21 Series is designed to provide over 120 hours of continuous use with two 9Vdc alkaline batteries.

CAUTION
Make sure power to the DFG21 is OFF.
Use ESD protection when replacing batteries.

USING A BATTERY ELIMINATOR

The DFG21 Series may be operated using the battery eliminator accessory (p/n DFG-UBE) that was supplied with your gauge. When the battery eliminator is used, the internal batteries are by-passed. The battery eliminator may be plugged into a 115V or 230V power source using one of the three plug styles that were provided: USA plug, EURO plug, or UK plug.

WARNING
Use the appropriate plug style that matches your source power outlet.

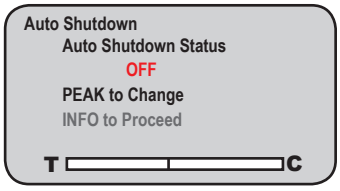
WARNING
Always use the charger/adapter that was supplied with your force gauge. Never substitute another type of charger/adapter.

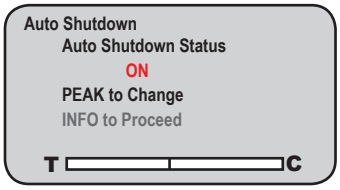
USING AUTO SHUTDOWN

The automatic shutdown feature preserves your battery. If you accidentally leave the power on, the gauge power will shut off automatically after 30 minutes of inactivity.

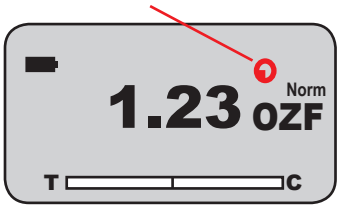
Press the "i" button until you display the Auto Shutdown feature. Press the Peak button to turn the Auto Shutdown feature ON or OFF.

NOTE
The DFG21 Series will shut down automatically whenever the battery voltage drops to approximately 6.8Vdc. You must replace the batteries or use the Battery Eliminator for continued use.





Automatic Shutdown Indicator when On.



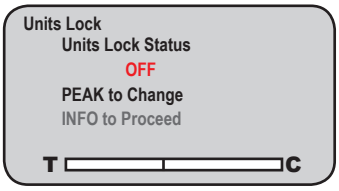
USING UNITS LOCK

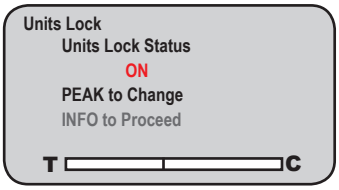
You may lock the units of measure so that the Units key is disabled.

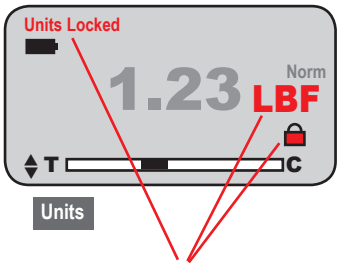
Press "i" button until the Units Lock feature is displayed. Press the PEAK button to activate/deactivate the Units Lock feature.

NOTE
Locking the Units disables the Units button so that users cannot change the load units of measure.

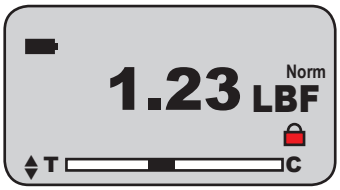
NOTE
A pad lock icon displays when the Units Lock feature is ON.



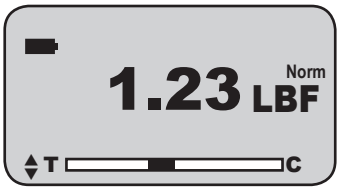




Note
The Units Locked icon appears when this option is ON. Pressing the UNITS key will not change the units of measurement.



Shown: Units Lock feature is ON.

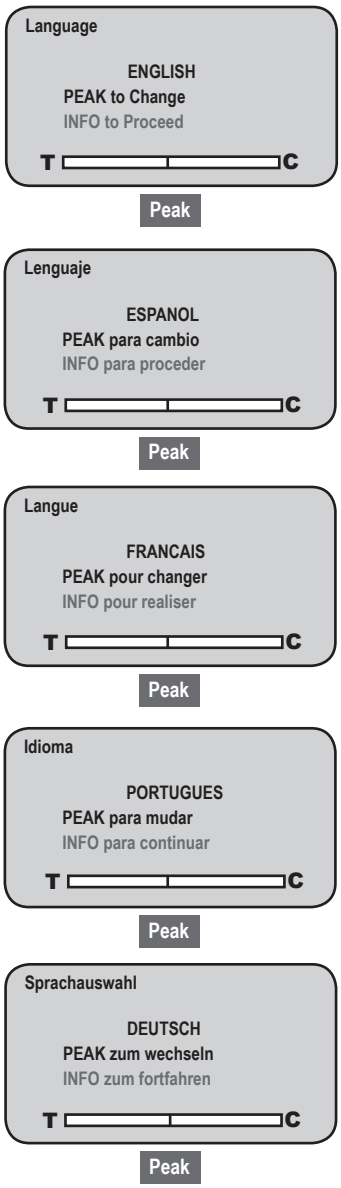


Shown: Units Lock feature is OFF.

SETUP DISPLAY LANGUAGE

You may change the language used to display information. Textual information may be displayed in English, Spanish, French, Portuguese, Chinese or German.

Press “i” button until the Language feature is displayed. Press the PEAK button to specify and activate the desired display language.



OPERATING YOUR GAUGE

MEASURE LOAD

The DFG21 gauge will measure tensile (pull) and compressive (push) force. The gauge will display the active measured result.

Measure a tensile load (pull) by attaching the sample to the load cell rod and pulling in an axial direction.

Measure a compressive load (push) by depressing the sample with the load cell rod in an axial direction.

NOTE

All loads being applied to the force gauge must be applied in an axial position, e.g. directly perpendicular to the measurement rod that extends from the load cell. Applying loads at an angle will produce incorrect results and may damage the load cell.

VIEW NORMAL RESULT
Place the DFG21 Series in NORM (normal) mode by pressing Peak button.

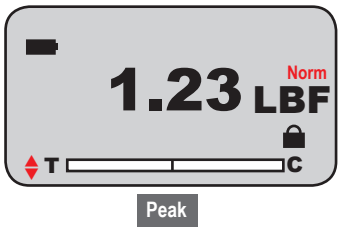
Measure sample and view the result on the display.

Tensile loads are displayed as negative results (-).

Compressive loads are displayed as positive results (no sign).

When load is removed, the display indicates zero.

NOTE
You can view the peak load result after using the Normal model.
Do not zero the gauge.
Change the mode to PEAK by pressing the Peak button.

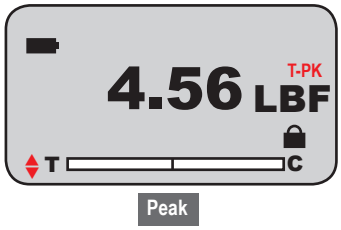


VIEW PEAK RESULT
Place the gauge into PEAK mode to capture and view the maximum load measurement result.

Press the Peak button to place gauge in Peak mode. TPK is for tensile peak results. CPK is for compression peak results.

The gauge will display and hold the peak tensile or compressive result for your test.

You may save or zero the peak result.



PACKAGING
The DFG21 Series is supplied with the following standard accessories:

- Flat Adapter, 100 lbf (p/n DFG-011A) or
- Flat Adapter, 200 lbf (p/n DFG-011B)
- Hook Adapter, 50 lbf (p/n DFG-012A) or
- Hook Adapter, 100 lbf (p/n DFG-012B) or
- Hook Adapter, 200 lbf (p/n DFG-012C)
- DFG21 Battery Eliminator (p/n DFG-UBE)
- DFG21 Carrying Case (p/n DFG-CASE)
- Calibration Certificate with NIST Data

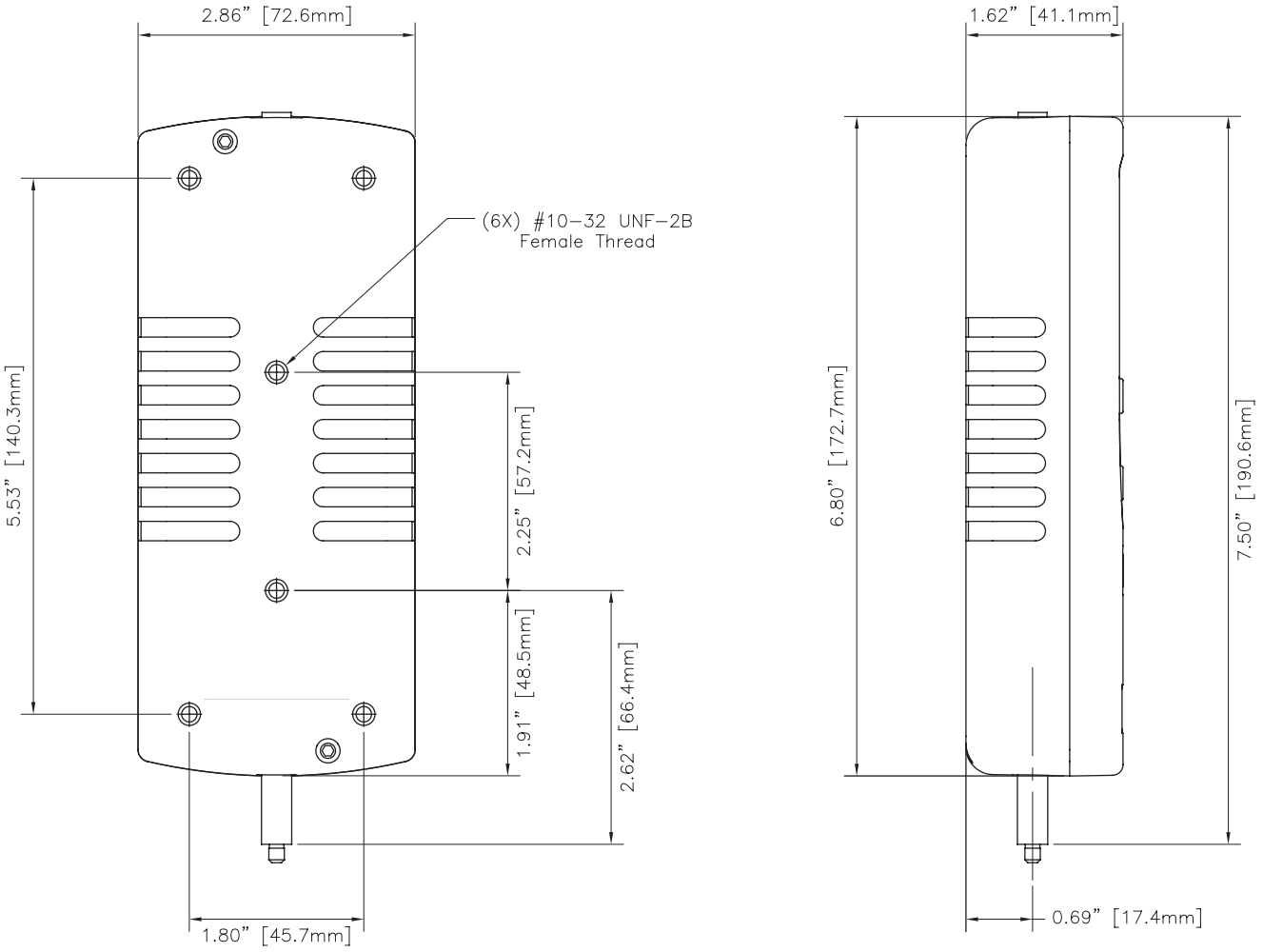
Requires two (2) 9Vdc Alkaline Batteries (Included).

The DFG21 is supplied with one (1) flat adapter and hook.
The accessory supplied is dependent on the DFG21 capacity.

OPTIONAL ACCESSORIES

Description	Part No.
Point Adapter (100 lbf)	DFG-009A
Point Adapter (200 lbf)	DFG-009B
Chisel Adapter (100 lbf)	DFG-008A
Chisel Adapter (200 lbf)	DFG-008B
Notch Adapter (100 lbf)	DFG-010A
Notch Adapter (200 lbf)	DFG-010B
Extension Rod, 6-inch (#10-32)	DFG-013A
Extension Rod, 6-inch (5/16-18)	DFG-013B
Handle Assembly	DFG-Handle
Pistol Grip	DFG-141

DIMENSIONS



SPECIFICATIONS

Accuracy:	±0.5% of Full Scale
Mechanical Overload	150% of Rated Capacity
Tare Capacity	10% of Rated Capacity
Dial Resolution	1000:1
Data Sampling Rate	1000Hz
Operating Temperature	40°F to 110°F (5°C to 45°C)
Instrument Weight	1.5 lbs (0.7 kg)
Shipping Weight	4 lbs (2 kg)

CAPACITY x RESOLUTION

Model	Capacity x Resolution				
	ozf	gf	lbf	kgf	N
DFG21-10	160 x 0.1	5000 x 1	10 x 0.01	5 x 0.001	50 x 0.01
DFG21-50	800 x 0.1	25,000 x 10	50 x 0.01	25 x 0.01	250 x 0.1
DFG21-100	1600 x 1	50,000 x 10	100 x 0.1	50 x 0.01	500 x 0.1
DFG21-200	-	-	200 x 0.1	100 x 0.1	1000 x 1

CONFORMANCE

The DFG21Series has been accessed against the essential health and safety requirements of the Low Voltage and the EMC Directives listed and found to be in compliance.

BS EN 61010-1:2001	Safety Requirement for Electrical Equipment
BS EN 61000-6-3:2001	EMC Generic Emission Standard
BS EN 61000-6-1:2001	EMC Generic Immunity Standard

The DFG21 Series is a RoHS, China RoHS and WEEE compliant device.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers received maximum coverage for each product.

If the units should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (RA) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S0 TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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