Starrett®

PKG08806- UMDFG

TRUST IS IN THE NAME

User Manual

READ THIS MANUAL BEFORE USING THE INSTRUMENT

**ANTES DE UTILIZAR EL INSTRUMENTO,
LEA ATENTAMENTE ESTE MANUAL**

LIRE CE MANUEL AVANT D'UTILISER L'INSTRUMENT

**LEIA ATENTAMENTE ESTE MANUAL ANTES
DE UTILIZAR O INSTRUMENTO**

使用仪器前请阅读本操作手册

**DIESES HANDBUCH VOR DER VERWENDUNG
DES MESSGERÄTS LESEN**

**LEGGERE ATTENTAMENTE QUESTO MANUALE PRIMA
DI UTILIZZARE QUESTO STRUMENTO**

DFG DIGITAL FORCE GAGE

USER MANUAL

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PRODUCT WARRANTY

Starrett force measurement products carry a 3-year (from date of purchase) warranty against defects in material and workmanship (parts and labor), subject to factory inspection.

Starrett will repair or replace, at its option, any part or parts found to be defective in workmanship or material. Starrett warrants repaired or replaced parts for the balance of the original warranty period or 90 days, whichever is longer. Parts returned to the factory under warranty will be repaired at no charge. Freight charges to the factory will be paid by the customer. Return freight charges to the customer will be paid by Starrett.

This warranty does not cover damages from such causes as abuse, accident, neglect, fire or freight damage. It does not apply to defects resulting from modifications made by the customer or improper use of the system or its components.

DISCLAIMER OF LIABILITIES

Starrett shall have no liability or responsibility to the customer or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by this documentation, or the hardware described in it. This includes but is not limited to any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use or operation of hardware or equipment.

GENERAL SAFETY PRECAUTIONS

Force measurement systems are potentially hazardous. Prior to operating your testing system, Starrett recommends that you read and understand the instruction manuals for your system and components and that you receive training on the proper use of this equipment from your authorized Starrett representative.

Observe all warnings and cautions identified in this manual for your equipment. A warning identifies a function that may lead to injury or death. A caution identifies a hazard that may lead to damage to equipment or loss of data.

Starrett products, to the best of our knowledge, comply with various national and international safety standards as they apply to material and force measurement testing. This Starrett product has been tested and found to comply with the following recognized standards:

- EN61010-1 Safety Requirements for Electrical Equipment
- EN61000-6-3 EMC Generic Emissions Standard
- EN61000-6-1 EMC Generic Immunity Standard

Starrett also certifies that this product complies with all relevant EU directives and carries the CE mark.

ELECTROMAGNETIC COMPATIBILITY

Your DFG Force Gage is designed to comply with International Electromagnetic Compliance (IEC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

WARNINGS

Emergency Stop (FMM System Applications)

Press the emergency stop button whenever you feel there is an unsafe condition during a test. The emergency stop button removes power to the motor drive system causing the crosshead to stop.

FLYING DEBRIS

Eye protection, protective clothing and splinter/safety shields should be used whenever any possibility exists of a hazard from the failure of a sample, assembly or structure under test. Due to the wide range of materials that may be tested and that may result in a failure which may cause bodily injury, the precautions and preventative methods taken prior to testing is entirely the responsibility of the owner and the user of the equipment.

CRUSH HAZARD (FMM SYSTEM APPLICATIONS)

Always use caution when installing or removing apparatus and your sample material between the frame's crosshead and the base. A potential pinch/crush hazard exists. Keep clear of the testing fixture, and particularly the jaw faces at all times. Keep clear of the crosshead during movement. If available, always make sure the Grip Load feature is enabled. This will stop inadvertent crosshead operation if in manual mode. Always ensure that other personnel cannot operate the system while you are working within the test fixture area.

ELECTRICAL HAZARD

Disconnect equipment from the electrical power supply before removing any electrical safety covers. Disconnect power when replacing fuses. Never reconnect power while the covers are removed. Never operate the system with protective covers removed.

ROTATING MACHINERY HAZARD (FMM SYSTEM APPLICATIONS)

Always disconnect power before removing covers that protect the user from the internal rotating mechanisms. If maintenance to the drive mechanism is required, and power is needed to perform maintenance to the drive system, maintenance should be performed by an authorized Starrett representative who has received factory training on performing such procedures.

DFG DIGITAL FORCE GAGE

THIS IS A STARRETT USER GUIDE FOR THE DFG DIGITAL FORCE GAGE.

ALL SPECIFICATIONS IN THIS DOCUMENT ARE CORRECT AT TIME OF PRODUCTION AND ARE SUBJECT TO CHANGE.

1.0 INTRODUCTION

Thank you for choosing the DFG Force Gage.

The DFG is our basic digital force gage. It may be used as a handheld instrument or mounted to our FMM Digital Force Testers or our manual testers, models MTL and MTH. If more functionality is required, the DFG is our advanced digital force gage.

This manual provides an overview and general instructions of how to use the DFG Force Gage.

2.0 SPECIFICATIONS

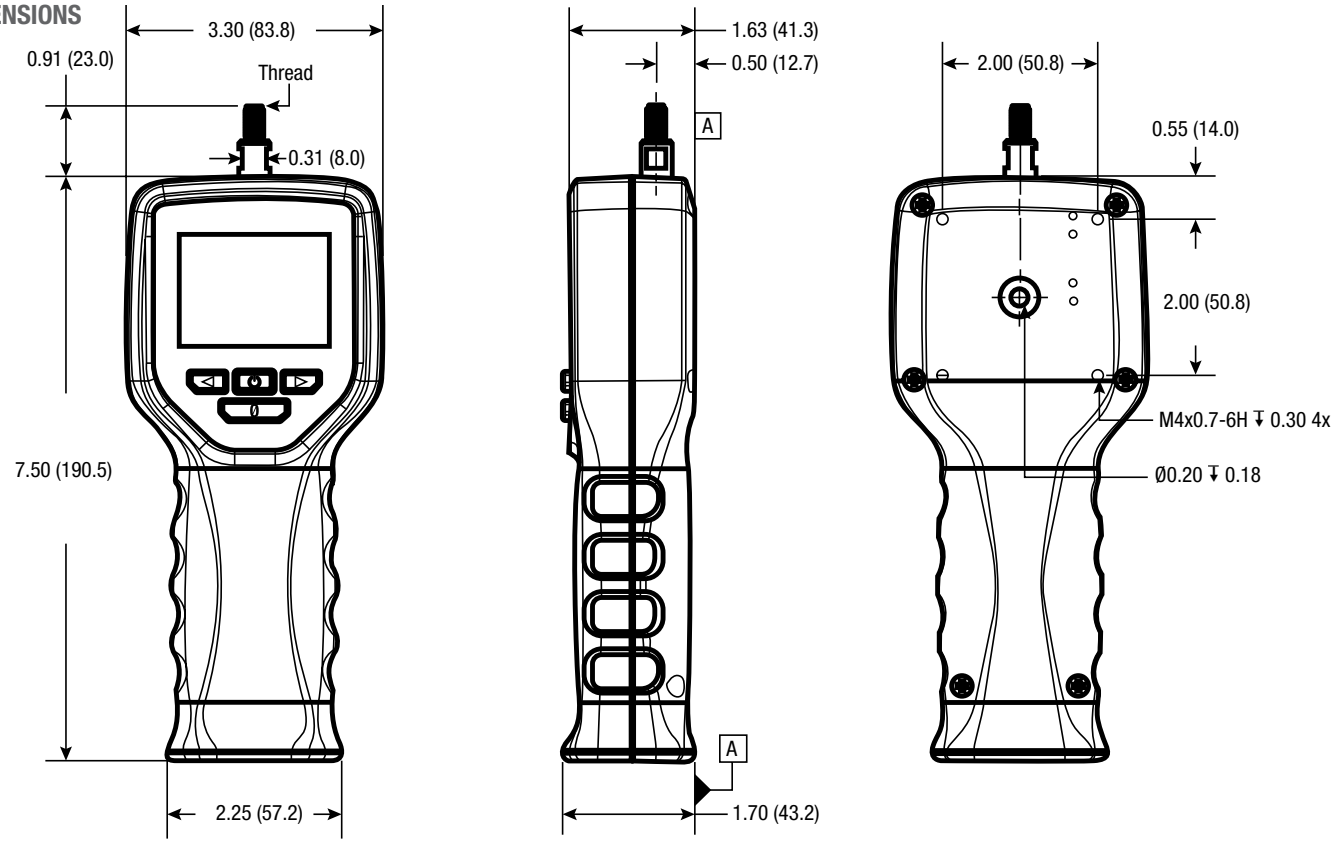
DFG Advanced Force Gage	
Specification	**DFG**
Accuracy, Full Scale	0.20%
Data Sampling (Hz)	10,000
Display Resolution	5,000:1
Safe Overload, Full Scale	200%
Maximum Tare	10%
Communications	
USB 2.0	Yes
RS-232	Yes
Memory, maximum results saved in gage	50
Operating Mode	
Real Time	Yes
Peak Compression	Yes
Peak Tension	Yes
Power, Environmental	
Battery Type	Lithium Ion
Battery Life, typical @ 20% brightness	>30 hours
Charge Time, using 110/240V Mains	<3hours
Display	OLED 320 x 240
Operating Temperature	40°F to 110°F (4°C to 43°C)
Thread, for adapters (Metric)	M6, M10
Instrument Weight (approx.)	3 lbs (1.36 kgs)

DFG - Advanced Force Controller

	Load Capacity					Safe Overload % Full Scale	Full Scale Deflection		Thread	Accessory
Model No.	N	KGF	LBF	OZF	GF		in	mm	mm	Kit
DFG-10	50	5	10	160	5000	200	0.006	0.15	M6 x 1-6H	SPK-FG-S
DFG-20	100	10	20	320	9000	200	0.008	0.20	M6 x 1-6H	SPK-FG-S
DFG-50	250	25	50	800	23,000	200	0.015	0.39	M6 x 1-6H	SPK-FG-S
DFG-100	500	50	110	1600	45,000	200	0.024	0.60	M6 x 1-6H	SPK-FG-S
DFG-200	1000	100	225	-	-	200	0.021	0.54	M6 x 1-6H	SPK-FG-M
DFG-500	2500	250	550	-	-	200	0.028	0.70	M10 x 1.5-5H	SPK-FG-L

NOTES
Load measurement accuracy is ±0.2% of load cell capacity. Display resolution is 5,000:1.

DIMENSIONS



3.0 FORCE GAGE FUNDAMENTALS

3.1 KEYPAD AND NAVIGATION

The DFG keypad is multi-functional. There are four keys. Each is described below.

Shown: Keypad mapping with display in NORMAL format

3.1.1 ON/OFF/MENU KEY

This key is used to power the gage on/off. Press to power the gage on. Press and hold for 3 seconds to power the gage off.

This key is also used to access the Setup Menu. When the gage is powered ON, press to access the Setup Menu.

This key is also used to navigate UP when in the Setup Menu. ▲

3.1.2 ZERO KEY

This key is used to zero the displayed values. Press to zero load and if connected to the FMM Digital Force Tester, zero distance.

This key is also used to navigate DOWN when in the Setup Menu. ▼

3.1.3 SOFTKEY 1

This is the left arrow key. It is used to move out of a setup when in the Setup Menu. ◀

This key may also be mapped to a specific function.

The Setup Menu has a Key setup function where you may assign how Softkey 1 performs. For example, you can assign a SAVE function to the key. When pressed, the measured values are "saved" to memory.

3.1.4 SOFTKEY 2

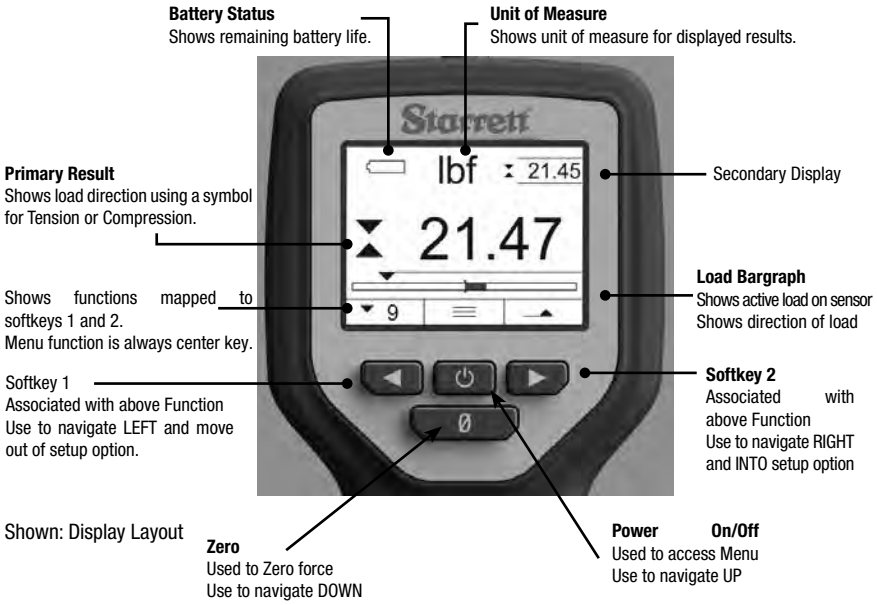
This is the right arrow key. It is used to move in to a setup when in the Setup Menu. ▶

Like the Softkey 1, it also may be mapped to a specific function. For example, you can assign a MODE function to the key. Pressing the key can change the operating modes of the gage. You can switch from Real Time to Peak Tension by pressing Softkey 2.

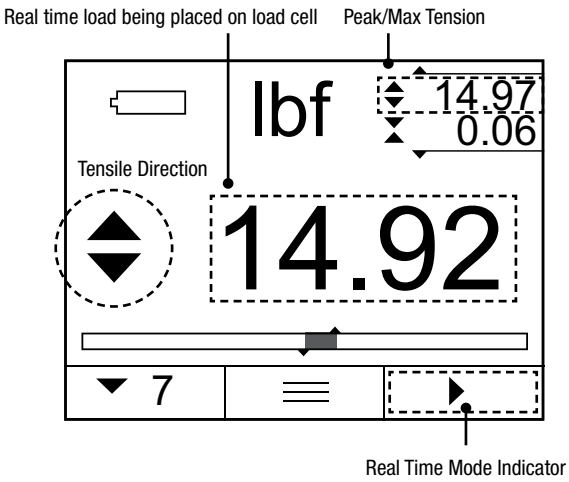
3.2. DISPLAY LAYOUT

The force gage features a high-resolution OLED color display with adjustable backlight. The backlight may be adjusted from a setting in the Main Menu.

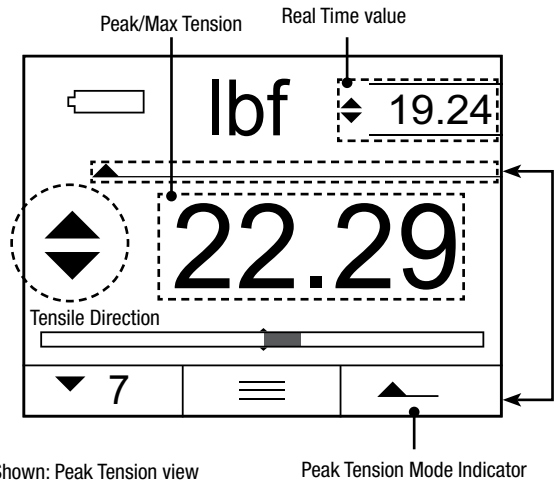
The display layout is optimized for easy viewing. Recognizable symbols are used for immediate interpretation.



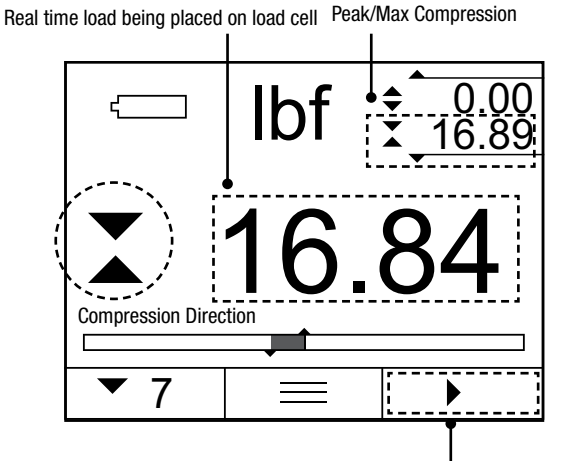
Shown: Display Layout



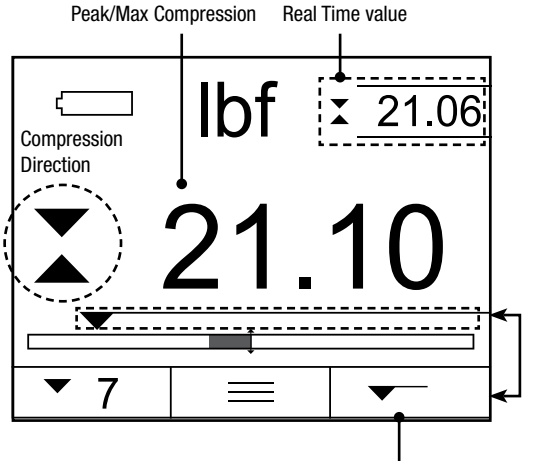
Shown: Real Time view showing Peak Tension



Shown: Peak Tension view



Shown: Real Time view showing Peak Compression



Shown: Peak Compression view

3.2.1 PRIMARY DISPLAY

The center of the display is used to display the primary result(s). This result is displayed in a large format with a resolution of 5,000:1. When tolerance is used, the displayed results will show in RED when the result is "out-of-tolerance". Results "in-tolerance" are displayed in BLACK.

3.2.2 SECONDARY RESULT

The upper right display area shows secondary results. These results vary depending on the force gage mode and the primary result being displayed. For example, if the primary result is a peak measurement, the secondary result displays the real time load being applied.

Display Formats

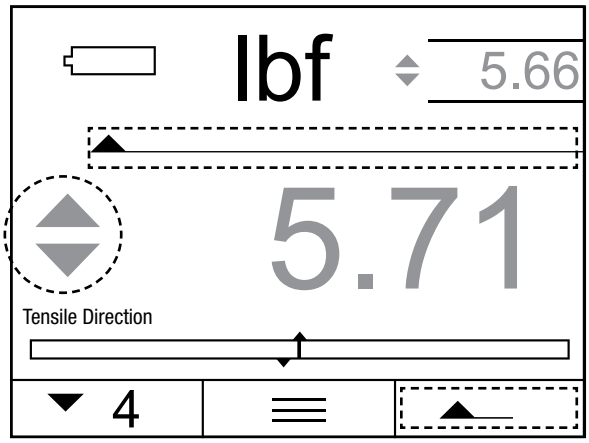
Primary Display	Secondary Display
Real Time	Peak Measurement
Peak Tension	Real Time Measurement
Peak Compression	Real Time Measurement

3.2.3 DIRECTION

Symbols are used to indicate the direction of load for the current readings.

3.2.4 TOLERANCE

When a tolerance is setup for your result, results that are "within" the tolerance range are displayed in BLACK. If the results is "outside" the tolerance range, the result is displayed in RED. The gage may also be setup to give a sound if the result is "outside" the tolerance range. The sound is configured in SETUP and may be a "beep", "Chirp" or "Tone".



Out-of-Tolerance Result

3.2.5 BARGRAPH

The bargraph shows the measured load as detected by the load cell sensor. The load is displayed from a center line.

Compressive loads fill to the left while tensile loads fill to the right.

Color is used to depict the load status relative to the full scale of the load cell.

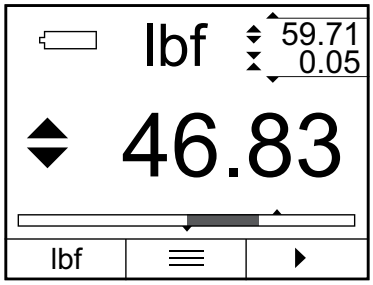
The bargraph will display GREEN when the measured load is from 1 to 75% of the full scale capacity.

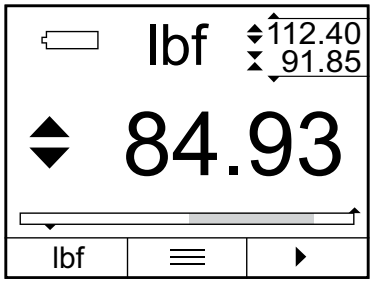
The bargraph will display YELLOW when the measured load is from 76% to 90%.

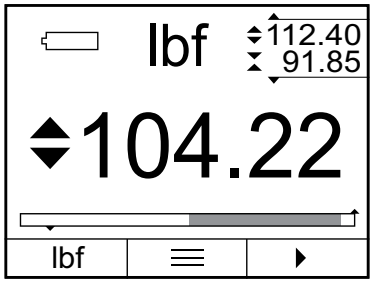
The bargraph will display RED when the measured load exceeds 90%.

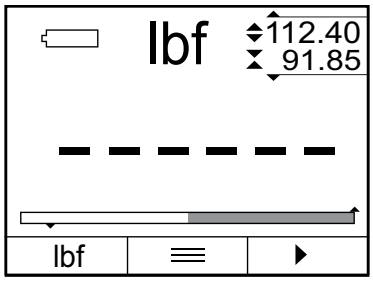
If the measured load exceeds the full scale capacity of the load cell, the primary display will show a RED "- - - -", indicating an OVERLOAD condition.

The bargraph also uses markers to show maximum values achieved during a test. For example, a marker may depict a peak load measurement.









3.2.6 SOFTKEY LABELS

The bottom of the display has three targets that are mapped to the three keys on the keypad.

The right- and left-most keys have dynamic functions that may change based on the test operation being performed. These targets may also be assigned specific functions in the SETUP MENU for KEYS.

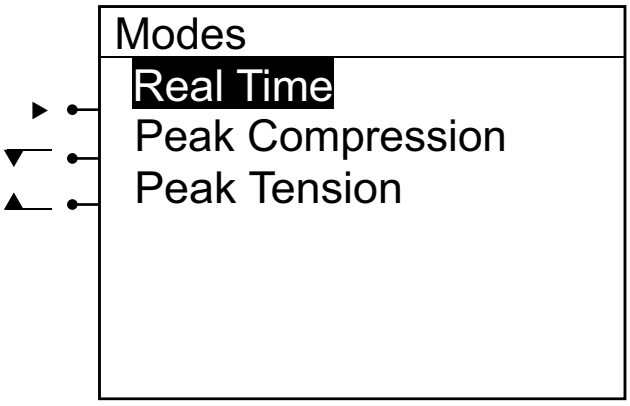
The center target is reserved for access to the SETUP MENU.

Softkey Labels

Symbol	Type	Description
◀▮▮▮▮	Send	Exports result or memory via RS232 or Bluetooth
lbf	Units	Changes current unit of measure
▼4	Save	Saves current results to gage memory and shows number of records saved
▼—	Mode	Shows current mode and allows modes to be changed
∑	Stats	Displays statistics for results saved in memory

3.2.7 OPERATING MODES

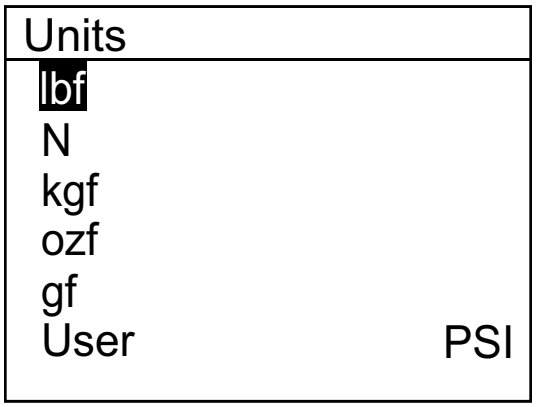
Symbols are used to depict the operating mode of the force gage. The operating mode is a setting in the SETUP MENU.



Modes and Symbols

3.2.8 UNITS OF MEASURE

The units of measure is displayed with the associated result. Load results may use ozf, gf, lbf, kgf, or N. Distance results may use in (inch) or mm (millimeter).



Units of Measure

3.2.9 DISPLAY ORIENTATION (FLIP)

The display orientation may be changed in the SETUP MENU. In applications where the load cell stem needs to point downward, it may be necessary to "flip the orientation" of the display so rather than reading right-side up, the display reads right-side down.

Normal Display View

Flip Display View

3.3 CABLES & I/O

The force gage is supplied with a USB cable.

Force Gage with USB Cable

3.3.1 USB CABLE

The USB cable (p/n L1-USB) is used for charging the force gage. This cable may also be used to connect the force gage to a computer. Using the force gage with a computer, you can upload new software for the force gage, or use it to download data from the gage to the computer. For example, you can download results saved in the force gage memory to Microsoft® Excel.

NOTE

The USB cable is NOT used for communication to the FMM Digital Force Tester.

3.3.2 RS-232 CABLE

The RS-232 cable (p/n L1-RS232) is used when you are connecting the force gage to the FMM Digital Force Tester. This cable provides communication between the force gage and force tester. The RS-232 cable is supplied with the FMM Test Frame.

NOTE

The RS-232 cable is ALWAYS used for communication to the FMM Digital Force Tester.

3.4. TEST FRAME OPERATION

The force gage mounts to our test frames with a mounting block (SPK-FG-BLOCK). On the back side of the force gage is an alignment bushing. This bushing fits over the alignment pin on the mounting block to ensure proper gage alignment.

SPK-FG-BLOCK Force Gage Mounting Block

3.4.1. USING FMM TEST FRAMES

Use the mounting block when mounting the force gage to the FMM crosshead. Four M4 screws fasten the force gage to the mounting block. The mounting block is fastened to the crosshead with six screws.

Force Gage Mounted on FMM-550 Test Frame

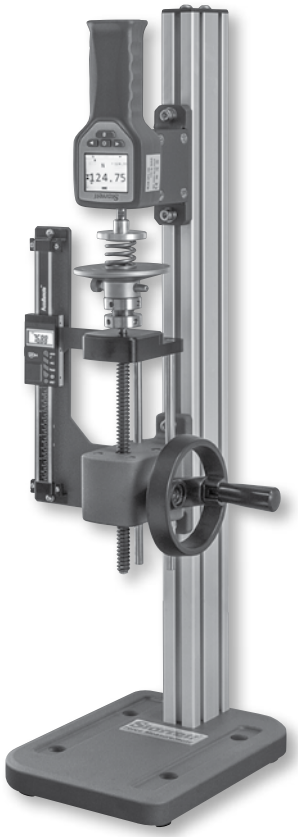
3.4.2 USING MTL TEST FRAMES

The force gage mounts to the MTL Manual Tester using four M4 screws.

Force Gage Mounted on MTL-110 Test Frame

3.4.3 USING MTH TEST FRAME

The force gage mounts to the MTH Manual Tester using four M4 screws.



Force Gage Mounted on MTH-550 Test Frame

3.5 LOAD SENSOR MEASUREMENT

The load cell sensor, within the force gage housing, has a measurement accuracy of better than 0.1% full scale and a safe overload rating of 200%. Force gages with a load capacity of 200 lbf (1000N) and below are fitted with an M6 threaded load stem. The 500 lbf (2500N) force gage model is fitted with an M10 threaded load stem.

NOTE

1. Load must always be applied axially. Use care and prevent any side loading on the sensor. Side loading can affect the measurement accuracy and lead to load cell damage.
2. Load cell sensors should NEVER exceed their rated full scale capacity. Overloading the load cell sensor will lead to irreparable damage.
3. Load cell should go through a 10 minute "warm-up" period if the force gage has been turned off for an extended period of time. Turn the force gage on and wait 10 minutes for the load cell electronics to warm-up.

Force Gage Load Cell Stem Thread

3.6. USING ACCESSORIES

The DFG Force Gage can use standard gage accessories for common types of testing. Or, you can equip the DFG force gage with a clevis adapter. With a clevis adapter, a large assortment of testing fixtures are available from Starrett including platens, vise-action grips, wedge-action grips, peel grips, pneumatic grips, roller grips and more. Starrett can supply hundreds of different style grips for virtually any force measurement application. And Starrett can design, engineer, and manufacture custom grips and test fixtures to your exact requirements.

A complete list of accessories can be found in Section 6.

3.6.1 STANDARD GAGE ACCESSORIES

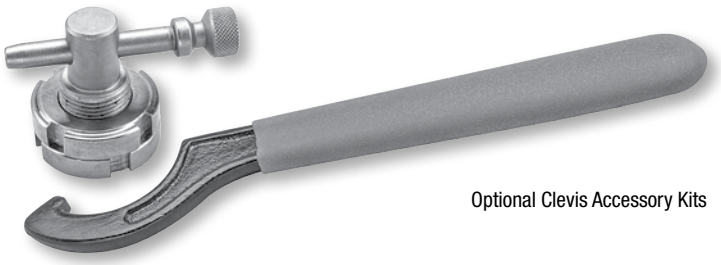
The force gage is supplied with a variety of standard accessories suitable for the full scale measuring capacity of the instrument. All gages are supplied with these threaded accessories. Accessories are supplied as "Kits" or you may purchase any accessory individually.

Force Gage Standard Accessory Kit

3.6.2 CLEVIS ACCESSORIES

The DFG Force Gage can be fitted with an optional clevis adapter. This adapter lets you affix any 15.9mm diameter clevis-style test fixture to your force gage.

Clevis fixtures are ideal for applications where you need to quickly change-out test fixtures. The clevis adapter, screws on to the DFG load cell stem. Two locking rings and a grip pin are used to secure the test fixture during your test.



Optional Clevis Accessory Kits

4.0 FORCE GAGE OPERATION

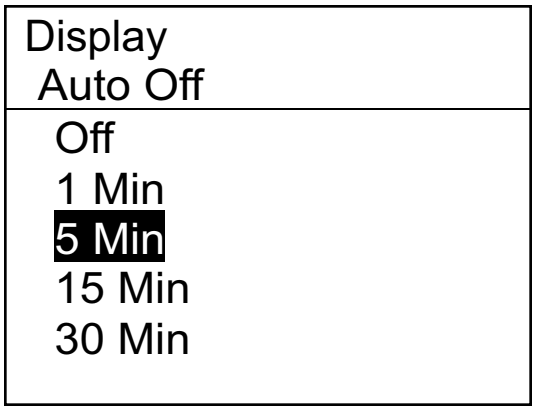
4.1 POWER ON/OFF

Turn the force gage ON by pressing the Power key.

Turn the force gage OFF by pressing and holding the Power key down for 3 seconds.

4.1.1 AUTOMATIC SHUTDOWN

The force gage may be setup to automatically turn OFF after a period of time when no load has been applied or when no keypress has taken place.



Auto Off Setup Option
(See Setup for more information)

4.1.2 CHARGING BATTERY

Charge the battery using the USB Cable that was supplied with the force gage. Connect the USB cable to the force gage and then to the power source.

Charging through source power @ 100-240V is considerably faster than charging through a personal computer's USB.

NOTE

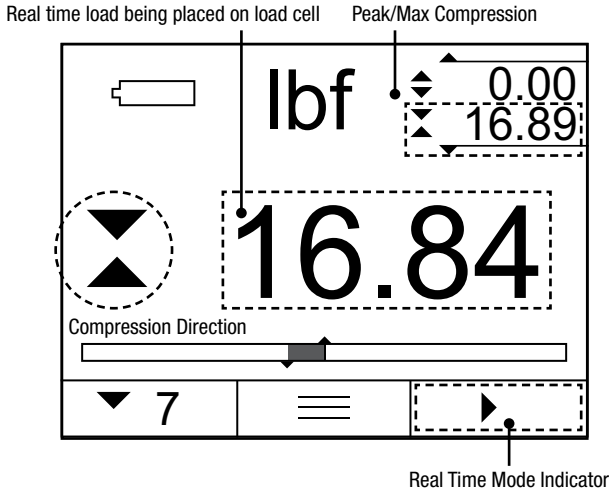
1. When the force gage is connected to the FMM Digital Force Tester using the RS-232 cable, the force gage is continually being charged while the FMM Digital Force Tester is ON.
2. The force gage may be used while it is being charged.
3. The force gage display will remain ON during charging. You cannot turn the force gage to OFF during a charge.

4.2 GAGE DISPLAY FORMATS

This section will show common display formats and their attributes.

4.2.1 REAL TIME DISPLAY

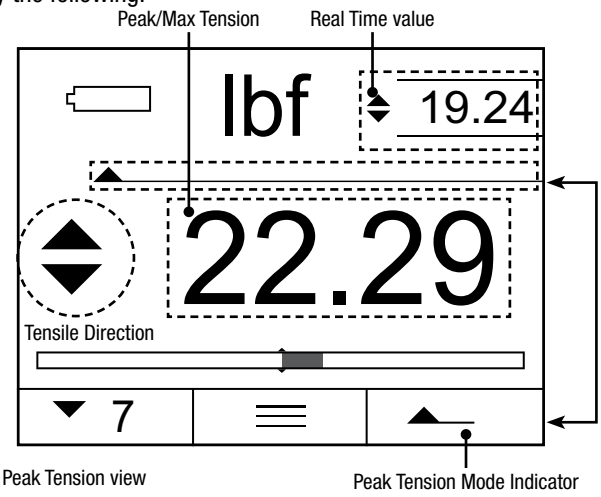
When the force gage is in REAL TIME MODE, the force gage will display the following:



Shown: Real Time view showing Peak Compression

4.2.2 PEAK TENSION DISPLAY

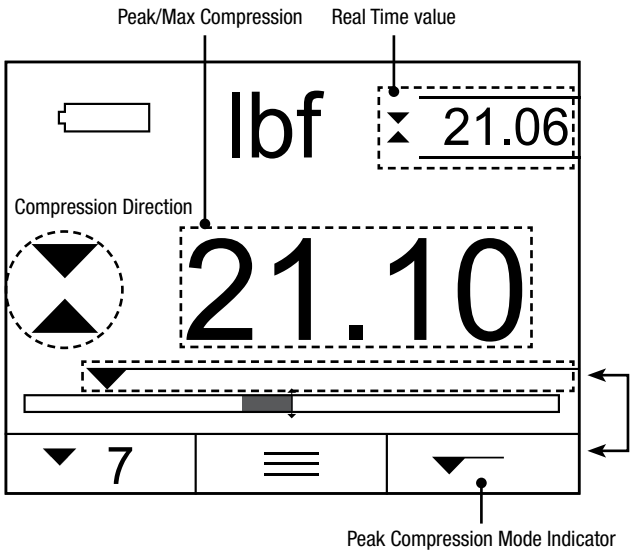
When the force gage is in PEAK TENSION MODE, the force gage will display the following:



Shown: Peak Tension view

4.2.3 PEAK COMPRESSION DISPLAY

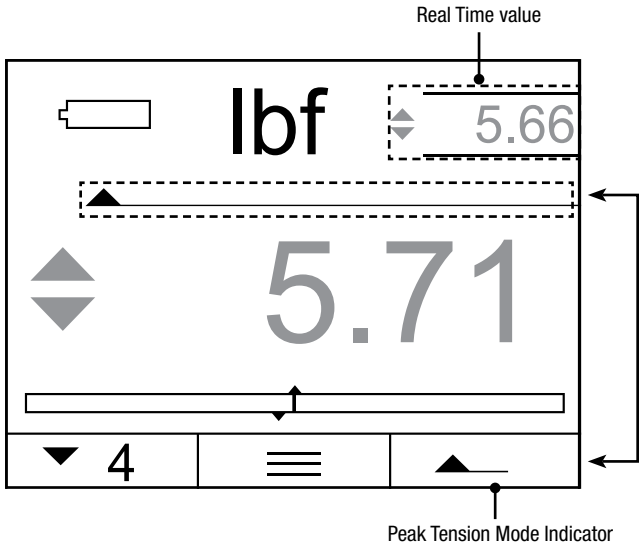
When the force gage is in PEAK COMPRESSION MODE, the force gage will display the following:



Shown: Peak Compression view

4.2.4 TOLERANCE DISPLAY

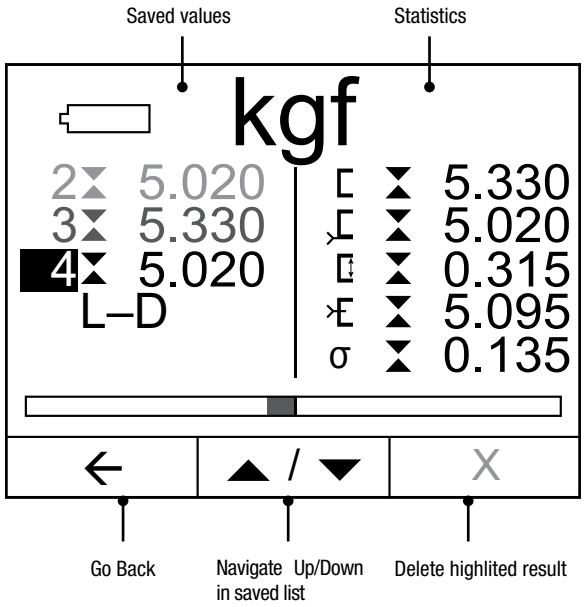
When tolerance is used for a measurement, the force gage will display the following:



Shown: Peak Tension view with Tolerance result

4.2.5 STATISTICS DISPLAY

When statistics are used on saved results, the force gage will display the following:



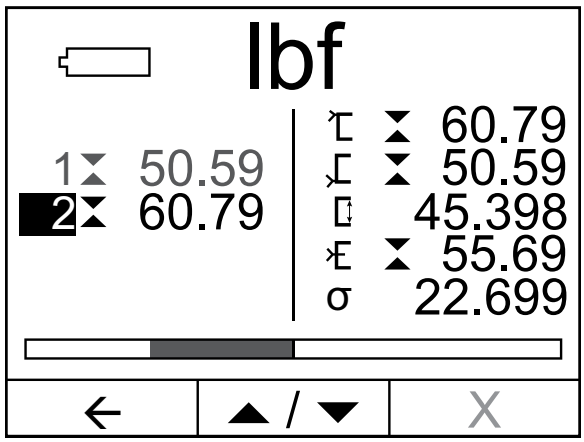
Statistics Display

NOTE

When using statistics, all results in the memory must have the same sign: tension or compression for valid statistics.

4.2.8 MEMORY DISPLAY

When results are saved to memory, the force gage will display the following for the saved results:



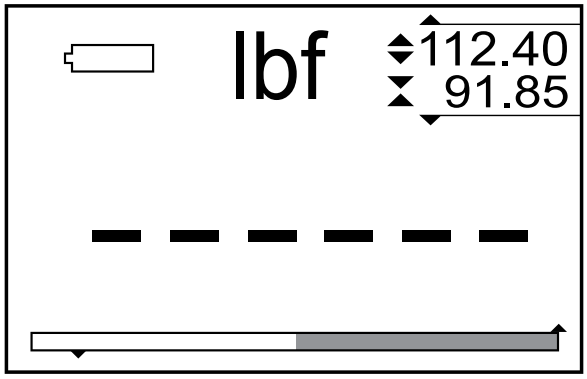
Results Saved to Memory

4.2.9 OVERLOAD CONDITION DISPLAY

When the load applied to the force gage's load cell exceeds the full scale capacity, an overload condition occurs and the force gage will display the following:

NOTE

Immediate action to remove the overload should be taken to avoid permanent damage to the load cell sensor.

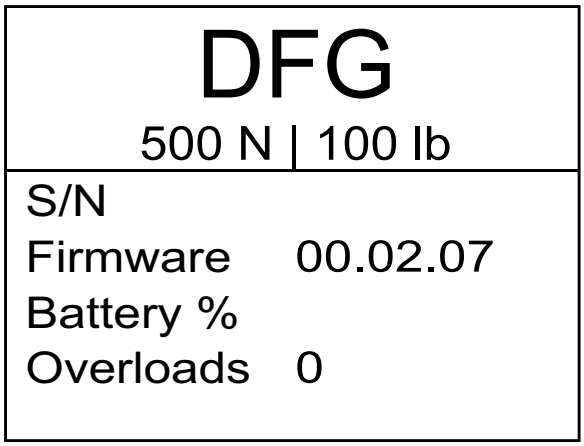


Load Overload Display

4.2.10 ABOUT DISPLAY

The About view is accessed through the main setup menu. Select the About menu option and the DFG will display the following:

- DFG Model Number
- Serial Number
- Full Scale Capacity
- Last Calibration Date
- Overload History



About Display

4.4 SAVING RESULTS

The DFG feature an internal memory for saving results for the purpose of calculating and displaying statistics. You may save up to 50 individual results in memory.

Results saved to memory MUST be of the same type. You cannot have mixed type results. For example, you cannot save tension results with compression results. Results MUST be of the same type.

Result Type	Memory Type
MODES	
Real Time	Real Time
Tension Peak	Tension Peak
Compression Peak	Compression Peak

Management of the DFG memory is important to ensure correct statistical analysis. Always clear old results that are from a different test method.

NOTE

Results saved for statistics must be of the same test method for statistics to be correctly calculated.

To Save results to memory, a Softkey must be setup with the SAVE function. See the Setup section for more information.

Once a result is displayed by the DFG, pressing the SAVE softkey will save the displayed result to memory.

Results may be saved with or without units.

4.5 EXPORTING RESULTS

The DFG can export results to an external device, such as a computer with WinWedge software. Use the Send function to export a result to WinWedge on a computer connected to the DFG Force Gage.

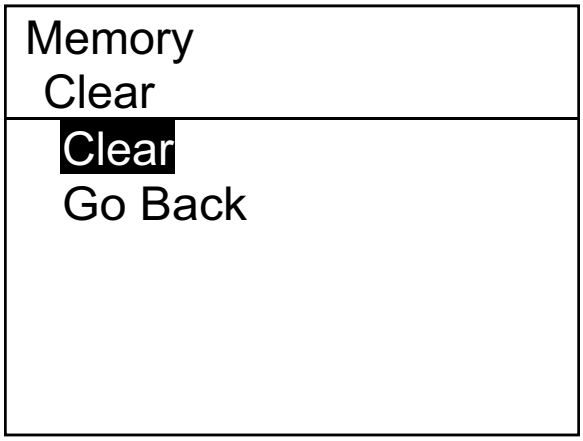
4.6 CLEARING RESULTS FROM MEMORY

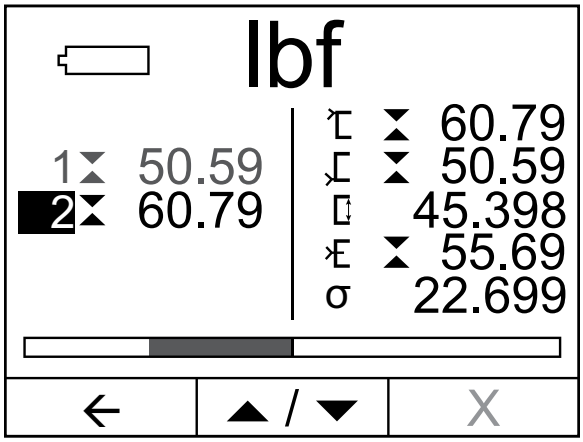
Results may be cleared from memory using the Memory setup or using the Statistics view.

Press	▲	Select MENU
Press	▼	Select MEMORY
Press	▶	Select CLEAR
Press	▼	Select CLEAR
Press	◀	Move out of MEMORY
Press	◀	Move out of Setup

To clear results from memory using the Memory setup, do the following:

To clear results from memory at the Statistics view, select the memory record and select "X".





4.7 VIEWING MEMORY

You may view results in memory using either a STATS softkey or by going through the main menu and selecting the Memory and Display options.

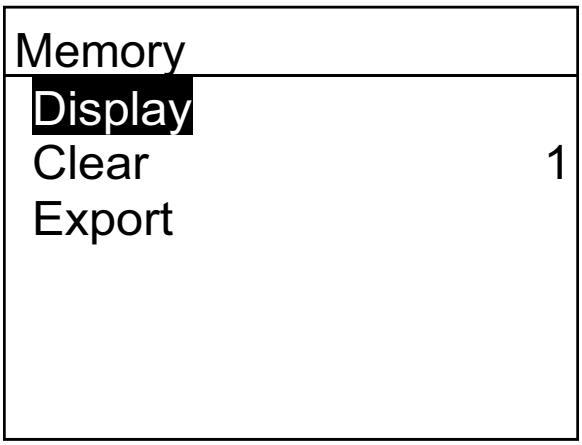
Press	▲	Select MENU
Press	▶	Select MEMORY
Press	▶	Select DISPLAY

The saved results in memory are displayed in the left column of the Statistics view.

Results are saved to memory by pressing the SAVE softkey. Each saved results is one record in memory. You may have up to 50 records.

View individual results saved to memory as follows:

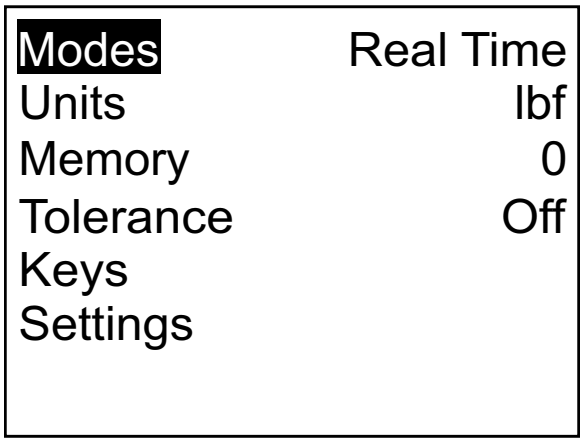
Press	▲	Select MENU
Press	▶	Select MEMORY
Press	▶	Select DISPLAY
Press	▲	to navigate UP your results
Press	▼	to navigate DOWN your results
Press	X	to DELETE a result



Memory Setup- Display Saved Results

5.0 FORCE GAGE SETUP MENU

The SETUP MENU for the force gage is depicted below. Shown are the options available for each feature within your DFG Force Gage.

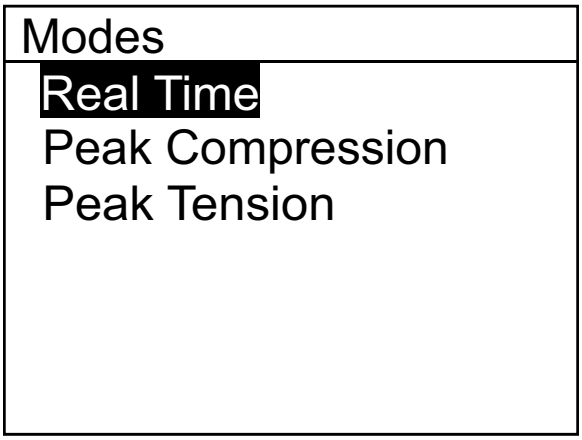


Main Menu

Modes	Units	Memory	Tolerance	Keys	Settings
Real Time	ozf	Display	Enable	Enable	Comms
Peak Tension	lbf	Clear	Limit 1	Softkey 1	Data Channel
Peak Compression	gf	Export	Limit 2	Send	RS-232
	kgf		Sound	Units	Xmit Comp -
	N			Save	Xmit Units
				Mode	Xmit TOL
				Stats	Display
				Softkey 2	Auto Off
				Send	Backlight
				Units	Flip
				Save	Radix
				Mode	Filter
				Stats	About
					Password
					Language
					English
					Deutsch
					Español
					Português
					Français
					Italiano
					Chinese
					Russian
					Polski
					Czech

5.1 MODES

This section will describe the various operating modes for the force gage.



Mode Setup Menu

Press	▲	Select MENU
Press	▶	Select MODE
Press	▶	Select the Mode needed
Press	◀	Move out of MODE
Press	◀	Move out of Setup

NOTE

MODE may be assigned to Softkey 1 or Softkey 2. This will allow you to switch between modes using a Softkey press.

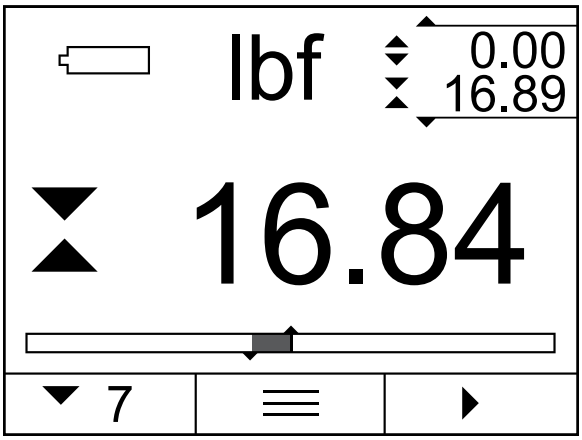
5.1.1 REAL TIME

The REAL TIME MODE displays the load that is currently being applied to the load cell.

The primary display shows the currently applied load.

The secondary display shows the PEAK TENSION or PEAK COMPRESSION values achieved during the real time measurement.

The REAL TIME MODE is depicted by this symbol:



Real Time Mode Display

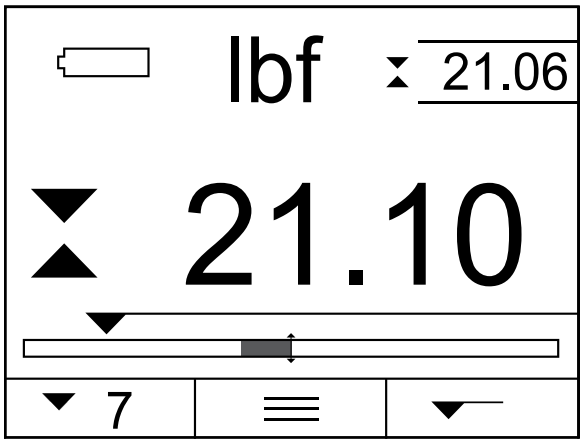
5.1.2 PEAK COMPRESSION

The PEAK COMPRESSION MODE displays the maximum load achieved during a compression (Push) direction.

The primary display shows the results for the maximum achieved load in the compression direction, i.e. the peak compression result.

The secondary display shows the Real Time result or what is currently being applied to the load cell.

The PEAK COMPRESSION MODE is depicted by this symbol:



Peak Compression Display

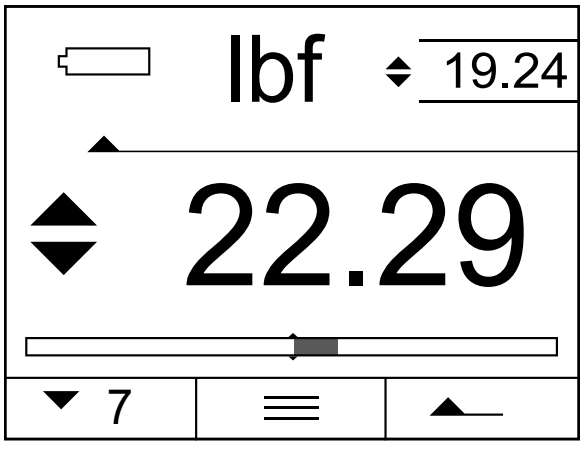
5.1.3 PEAK TENSION

The PEAK TENSION MODE displays the maximum load achieved during a tensile (Pull) direction.

The primary display shows the results for the maximum achieved load in the tensile direction, i.e. the peak tension result.

The secondary display shows the Real Time result or what is currently being applied to the load cell.

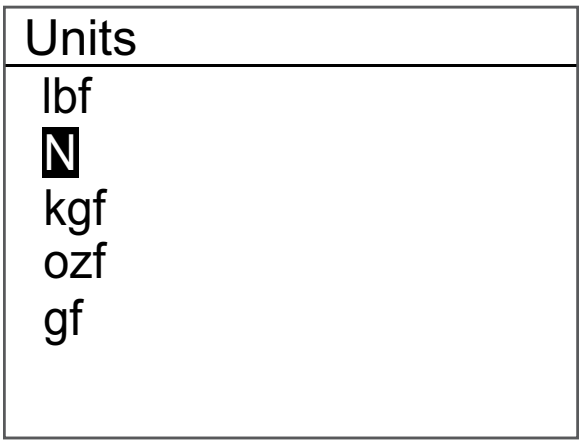
The PEAK TENSION MODE is depicted by this symbol:



Peak Tension Display

5.2 UNITS OF MEASURE

Set the units of measure as follows:



Units of Measure Setup Menu

Press	▲	Select MENU
Press	▶	Select UNITS
Press	▶	Select the Unit needed
Press	◀	Move out of Units
Press	◀	Move out of Setup

5.3 MEMORY SETUP

The DFG has memory for saving up to 50 results. Results may be saved manually, by pressing a softkey or automatically at the completion of a test.

Results in memory can be displayed and used for statistics or exported to an external device.

NOTE

Because results in memory are used for statistical calculations, all results in memory must be of the same type. For example, saved results should be all tension results in order for statistics to be calculated correctly.

Press	▲	Select MENU
Press	▼	Select MEMORY
Press	▶	Select DISPLAY to view memory and Statistics
Press	▶	Select CLEAR to erase ALL results from Memory
Press	▶	Select EXPORT results to an external Device
Press	◀	Move out of MEMORY

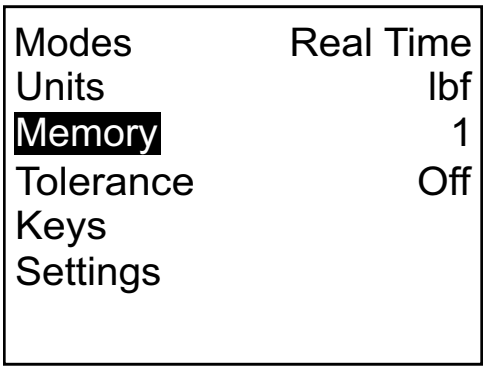
5.3.1 DISPLAY MEMORY

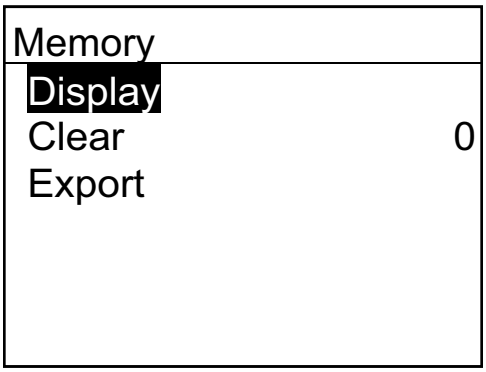
You can view the results in memory using the Memory menu or by mapping a softkey to STATS.

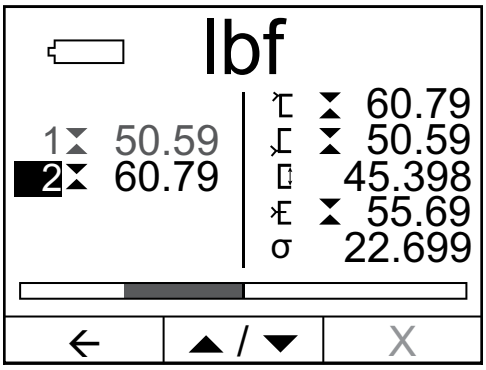
From the Memory setup, select Display to view the results in memory. From the main menu:

The DFG will display the saved results in memory in the left column while displaying the calculated statistics in the right column.

Press the center power key and zero key to navigate up/down to view your results.







Display Memory view

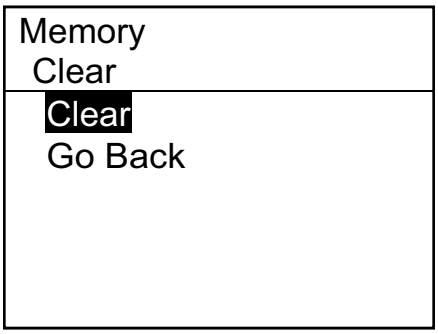
Press the X softkey to delete the highlighted result.

Press the Back softkey to move out of the Display Memory view.

5.3.2 CLEAR MEMORY

Results in memory may be cleared individually or collectively. To clear an individual result from memory, go to the STATS view. Select the results you want to clear. Select the "X" (delete) key.

To clear all results from memory, go to the Memory setup and select CLEAR. This will erase all results for the gage's memory.



Clear Memory Setup

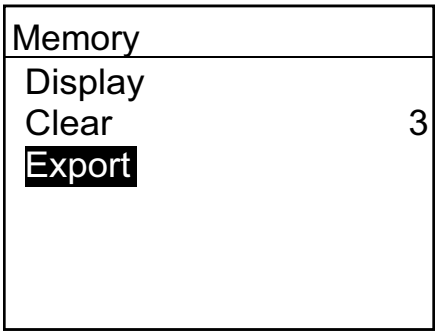
5.3.3. EXPORT MEMORY

Use the SAVE feature to save results to memory. Results saved to memory MUST be of the same type based on test mode or test type.

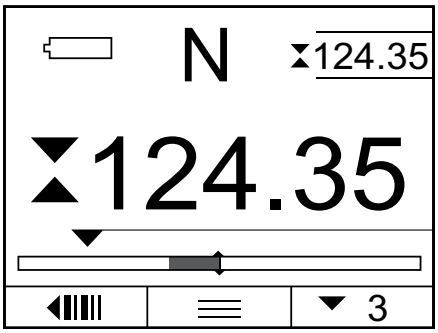
If you attempt to save a different result type with an existing result, the gage will display a message requiring you to delete the results currently in memory.

5.3.4 EXPORT SAVED RESULTS

Results may be exported to a externally connected device, such as a personal computer using the Send feature. You must map one of your softkeys to SEND. Press the SEND key to transmit the result via RS232 to the connected device.



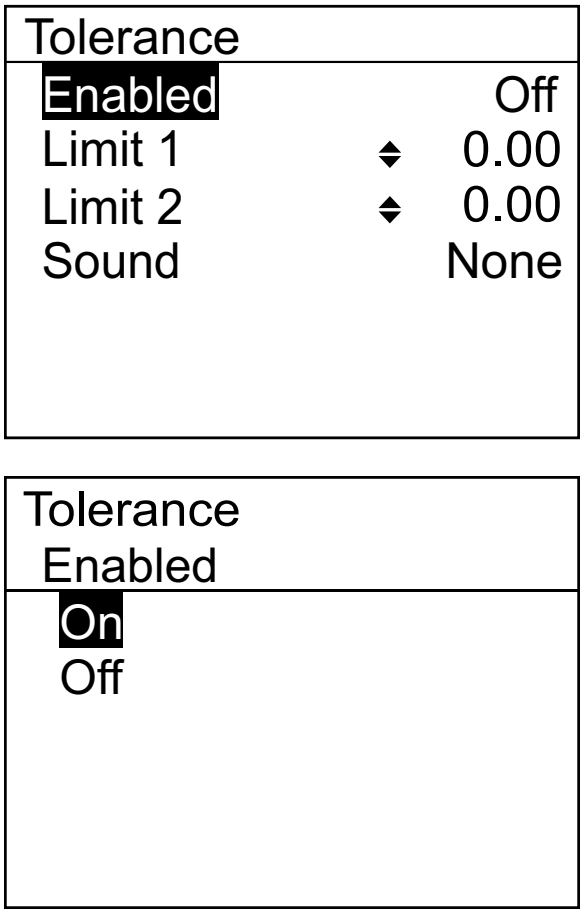
Export Memory Setup



SEND Softkey

5.4 TOLERANCE

Use tolerances to setup "pass" and "fail" measurements. You may specify a Limit 1 and a Limit 2 to create a tolerance band. Measured results that equal or fall within the range created by the two limits are considered "pass" results. This results will display in BLACK. If the measured result falls outside the band created by the two Limits, the result is considered a "fail" result. A "fail" results displays in RED.

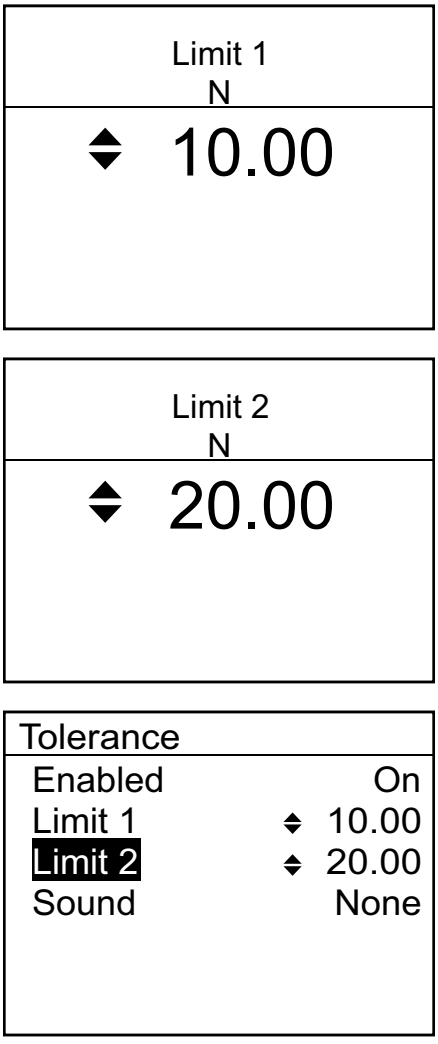


Tolerance Setup Menu

5.4.1 SETTING TOLERANCE LIMITS

When Tolerance is used, you must setup two Limits that define the tolerance range. Enter a value for Limit 1 and Limit 2 making sure your limits are of the same sign for tension or compression.

Press	▼	Move down to TOLERANCE
Press	▶	Select ENABLE if needed or,
Press	▶	Select DISABLE if not needed
Press	▼	Move down to LIMITS
Press	▼	Move down to LIMIT 1
Press	▶	Select Limit 1 value using ▼▲
Press	◀	Move out of Limit 1
Press	▼	Move down to LIMIT 1
Press	▶	Select Limit 2 value using ▼▲
Press	◀	Move out of LIMIT 2
Press	◀	Move out of TOLERANCE

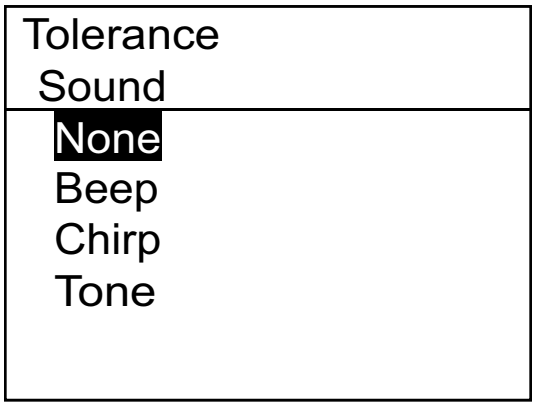


Tolerance Limit Setup

5.4.2 SOUNDS

You may configure a SOUND that provides the user with an audible alarm. If the result is "fail", an audible "beep", "chirp" or "tone" may be issued by the force gage. The default is NONE.

Press	▼	Move down to TOLERANCE
Press	▼	Move down to SOUNDS
Press	▶	Select Sound Type using ▼▲
Press	◀	Move out of SOUNDS
Press	◀	Move out of TOLERANCE



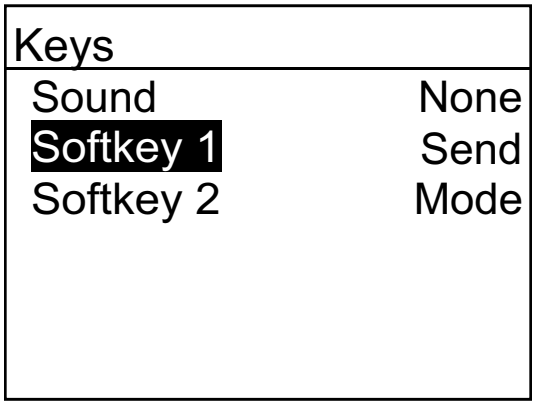
Tolerance Sound Setup

5.5 KEYS SETUP

The DFG Force Gage Softkeys can be mapped to a specific function. Softkey 1 and Softkey 2 may be mapped to perform the following functions:

- Send
- Mode
- Stats
- Save
- Units

The center Softkey is always mapped to the SETUP MENU. This softkey cannot be mapped to any other function.



Softkey Setup Menu

5.5.1 SEND FUNCTION

The SEND function is used to send the displayed data to an external device. Data may be sent via USB or RS-232. You can specify how you want the Send function to transmit data using the COMMS feature and by specifying the Data Channel.

5.5.2 MODE FUNCTION

The MODE function allows the user to change and select the operating mode for the force gage.

5.5.3 STATS FUNCTION\

The STATS function is used when their are results saved in the DFG force gage memory. Pressing the STATS softkey will display statistical calculations for the saved results in memory.

5.5.4 SAVE FUNCTION

Use the SAVE function to manually save a result to the DFG memory.

NOTE

Results saved to memory MUST be of the same type. For example, you cannot save tension results and compression results. You can only save either tension or compression.

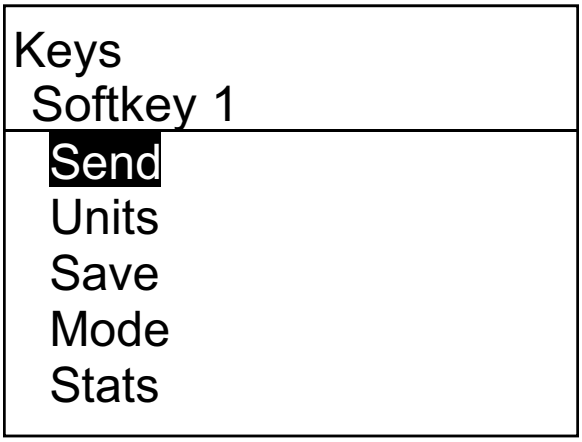
5.5.5 UNITS FUNCTION

The UNITS function lets the user select and change the unit of measure.

5.5.6 MAPPING SOFTKEY 1

When the display is in Normal view mode (not Flip view mode), the Softkey 1 is the left-most key.

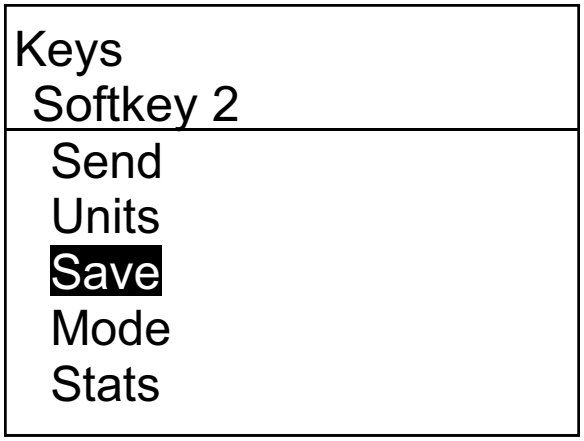
Press	▼	Move down to KEYS
Press	▶	Select Softkey 1
Press	▼	Select Softkey option list
Press	▶	Select Softkey 1 option
Press	◀	Move out of Softkey 1
Press	◀	Move out of KEYS



5.5.7 MAPPING SOFTKEY 2

When the display is in Normal view mode (not Flip view mode), the Softkey 2 is the right-most key.

Press	▼	Move down to KEYS
Press	▼	Select Softkey 2
Press	▼	Select Softkey option list
Press	▶	elect Softkey 2 option
Press	◀	Move out of Softkey 2
Press	◀	Move out of KEYS



5.6 SETTINGS

The Setting menu contains common universal setup options. Each option type is discussed below.

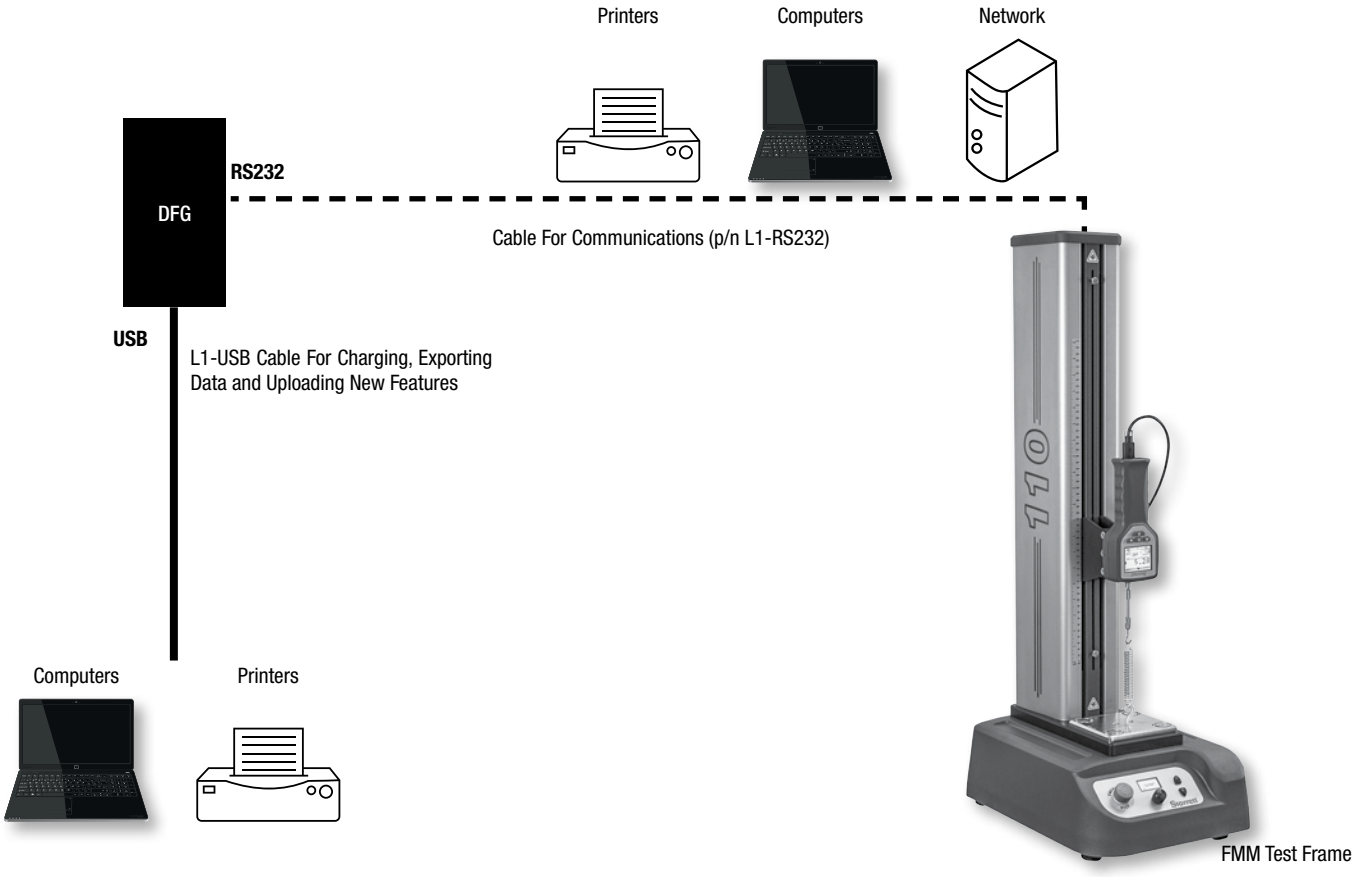
5.6.1 COMMUNICATIONS

The SETUP options for communication are listed below. The diagram shows the various communication methods that may be used with the force gage.

NOTE

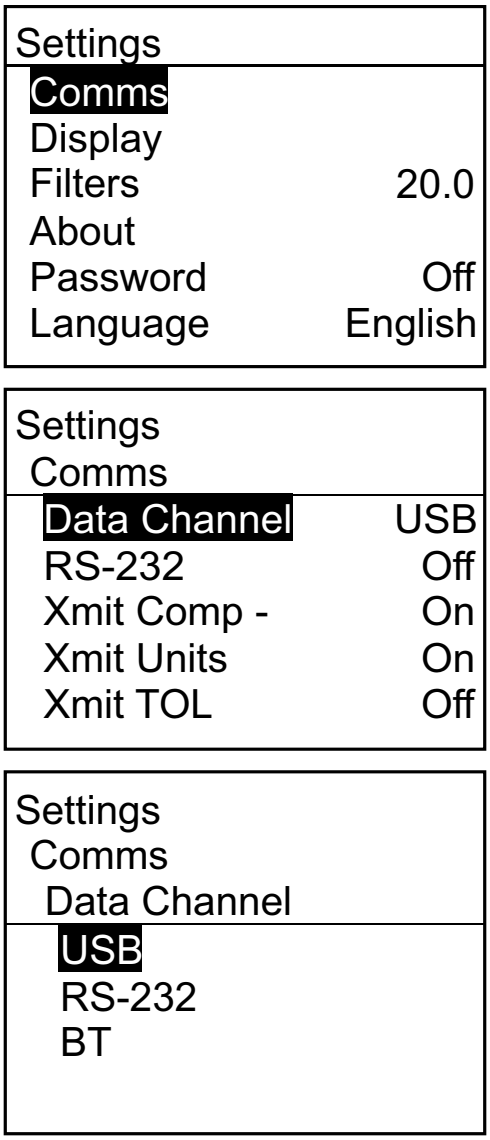
1. The RS-232 cable supplied with the FMM digital test frame is used to communicate with the DFG.
2. The USB cable supplied with the force gage is used to communicate with a personal computer. This cable is used for charging the battery; for uploading new features to the force gage; or for exporting data from the force gage to a personal computer.
3. The USB cable is not used for communication between the force gage and the FMM digital test frame.

Protocol	Where to Use
USB 2.0	Charge DFG Battery Upload firmware and new features to DFG from a PC Export data to a printer Export data to a PC
RS-232	Communicate with FMM Series digital force tester Charge DFG Battery when connected to the FMM Digital Force Tester Communicate with a serial printer Communicate with a serial external computer or hard drive



5.6.1.1 USING USB 2.0

The DFG force gage is equipped with USB 2.0. A mini USB 2.0 connector is located on the base of the gage. The DFG is supplied with a USB 2.0 cable (p/n L1-USB).



Data Channel Setup for using USB

The primary use of USB 2.0 with the DFG is for battery charging and for exporting and interfacing to a USB device, such as a personal computer or external drive.

There is no setup required when using USB 2.0.

5.6.1.2 USING RS-232

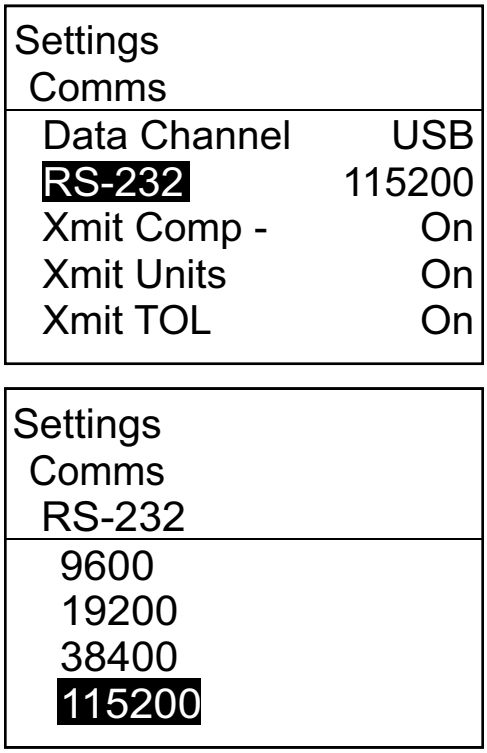
RS-232 is the primary communication protocol used when the DFG is communicating and interfaced to the FMM Series digital force tester. The FMM Series force tester is supplied with an RS-232 cable (p/n L1-RS232). The cable features two D-sub connectors for connecting to the DFG and to the back panel on the FMM Series force tester. The cable provide bidirectional communication between the gage and the test frame.

NOTE

1. When the DFG is interfaced to the FMM, the baud rate is automatically set at 115200.
2. The L1-RS232 cable is used for communicating using RS-232. It is also a signal cable that can be used with external devices for I/O control and for switch testing.

Press	▼	Move down to COMMS
Press	▼	Move down to RS232
Press	▶	Select BAUD RATE needed
Press	◀	Move out of RS232
Press	◀	Move out of COMMS

You may configure the BAUD rate for the RS-232 communications. Baud options are: 9600, 19,200, 38,400 and 115,200. The default is 115,200.



RS-232 Setup Menu

NOTE

RS-232 can be used separately and in addition to Bluetooth® and USB.

5.6.1.3 TRANSMIT COMPRESSION - SIGN

You may specify a sign for compression and tension values. If Xmit Comp - is ON, a compression result will use a negative sign to denote a compression value. A tensile result will use a positive sign to denote a tension value.

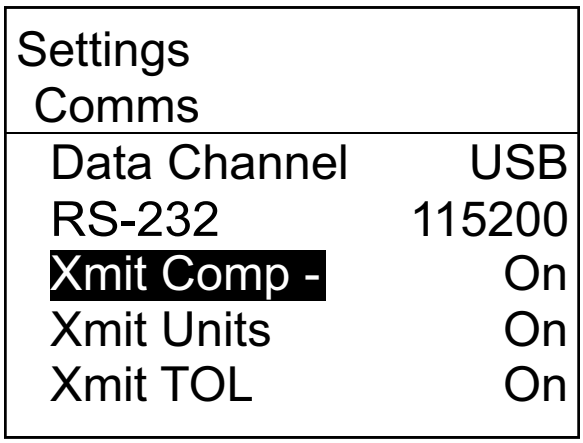
If Xmit Comp - is OFF, a compression value will use a positive sign to denote a compression value. A tensile result will use a negative sign to denote a tension value.

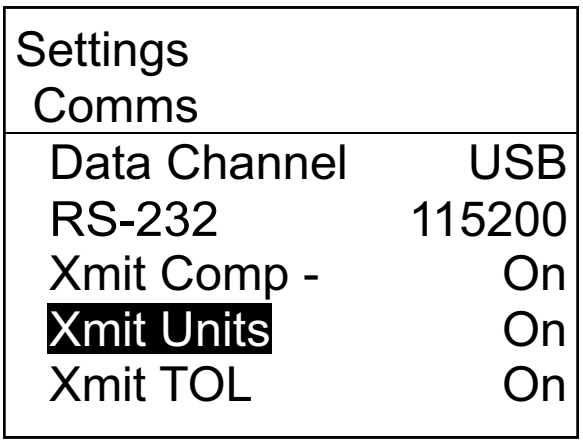
If Xmit Comp - is NONE, there is no sign used for either a compression or tensile result.

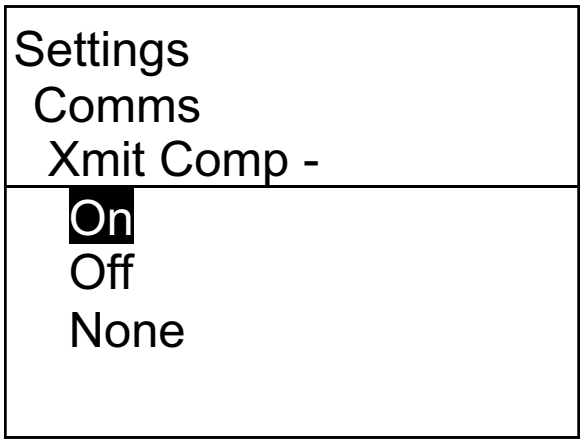
5.6.1.4 TRANSMIT UNITS

When a result is exported from the force gage to an external device, i.e., a computer, the UNITS may be sent with the measured value. The default is NO. If you want UNITS to be sent, change to YES.

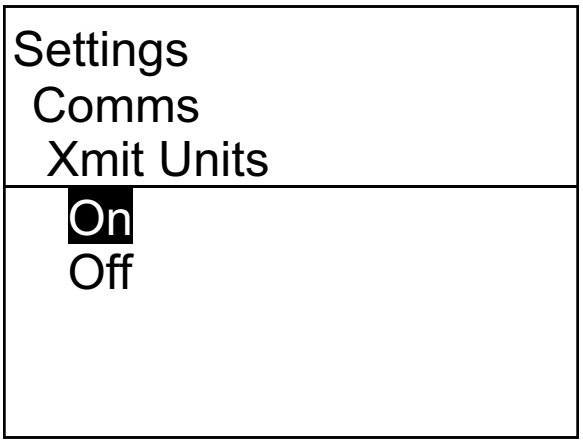
Press	▼	Move down to COMMS
Press	▼	Move down to XMIT UNITS
Press	▶	Select ENABLE if needed or,
Press	▶	Select DISABLE if not needed
Press	◀	Move out of XMIT UNITS
Press	◀	Move out of COMMS







Xmit Comp -

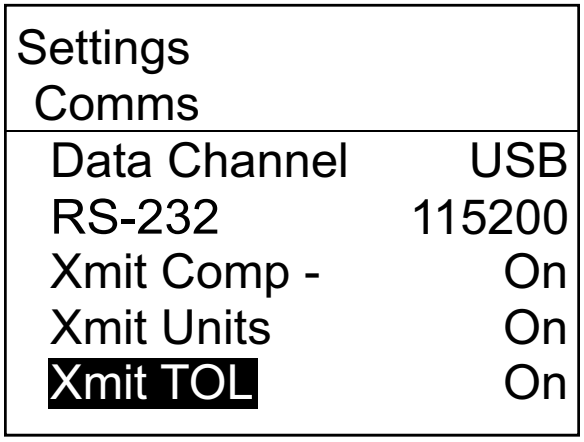


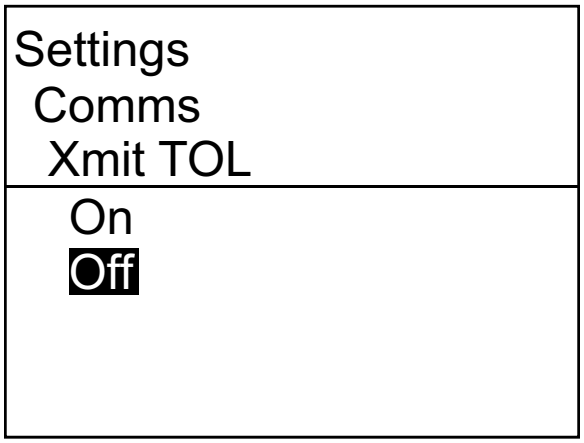
Transmit Units Setup

5.6.1.5 TRANSMIT TOLERANCES

When a result is exported from the force gage to an external device, i.e., a computer, the values for LIMIT 1 and LIMIT 2 may also sent with the measured value.

Press	▼	Move down to COMMS
Press	▼	Move down to XMIT TOLS
Press	▶	Select ENABLE if needed or,
Press	▶	Select DISABLE if not needed
Press	◀	Move out of XMIT TOLS
Press	◀	Move out of COMMS



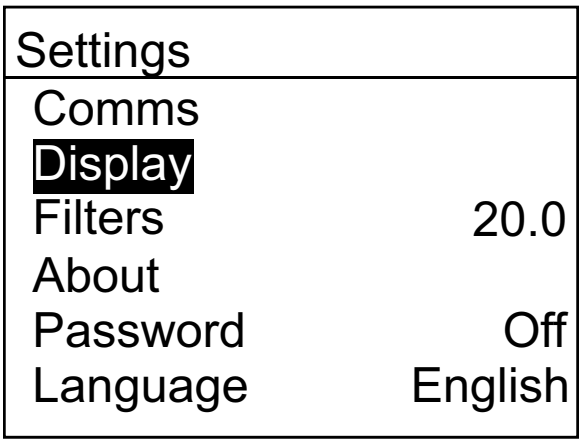


Transmit Tolerance Setup

5.6.2 DISPLAY

The force gage features a high-resolution 320 x 240 OLED color display. Use the SETUP MENU to configure the following display features.

- Auto Off
- Backlight Intensity
- Display Orientation (Flip)
- Radix



Display Setup Menu

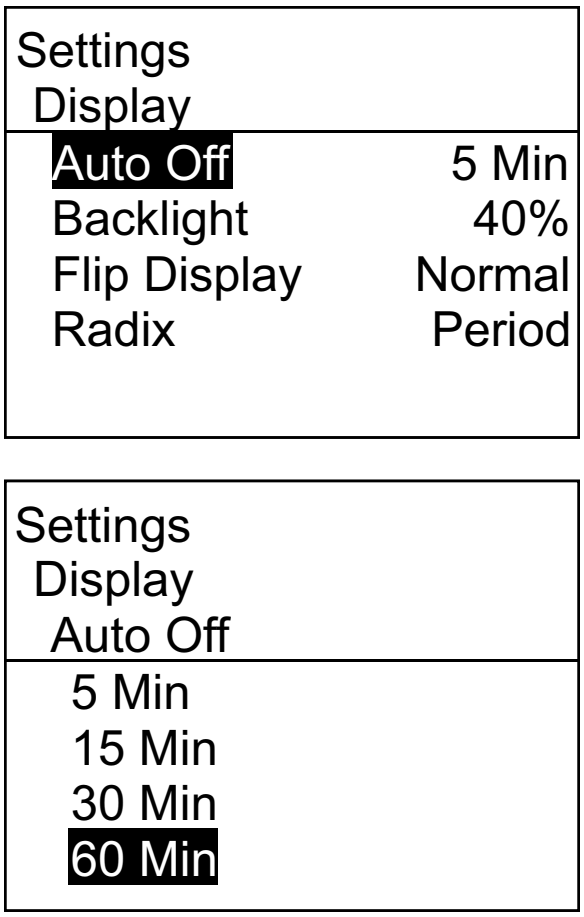
5.6.2.1 USING AUTO OFF

You may configure the force gage to automatically power OFF after an elapsed, specified time duration where the following conditions occur:

- there was no load applied to the load cell sensor
- there was no keypress applied to the keypad

The default is 5 Minutes.

Press	▼	Move down to DISPLAY
Press	▼	Move down to AUTO OFF
Press	▶	Select Time Duration needed
Press	◀	Move out of AUTO OFF
Press	◀	Move out of DISPLAY



Display Automatic Power Off Setup

5.6.2.2 ADJUSTING BACKLIGHT

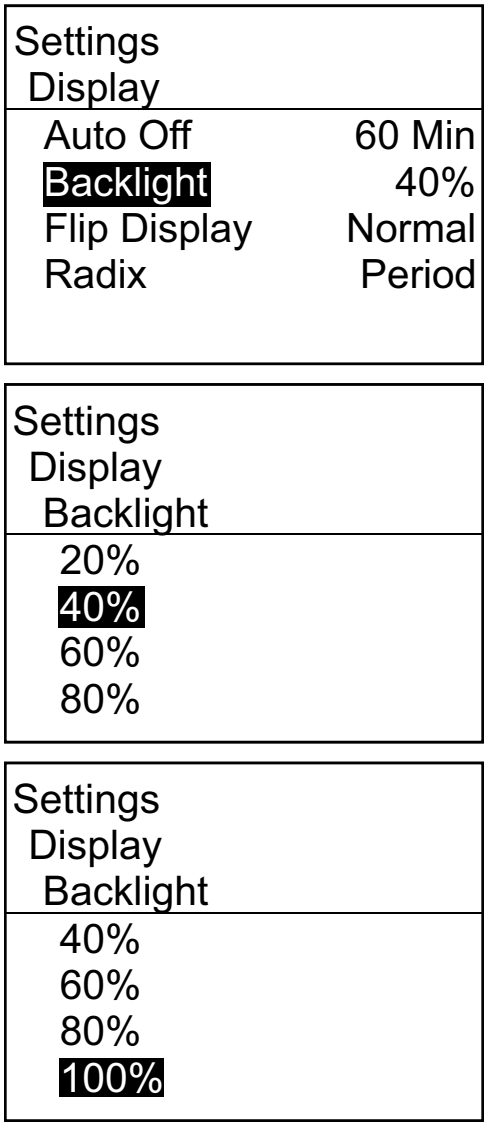
The force gage features and adjustable backlight. This is useful to counter issues with low or high ambient light conditions.

The force gage default is 20%. This means the backlight is displayed at 20% of its full intensity/brightness.

NOTE

Battery life is affected by the backlight setting. More power is consumed with a higher backlight setting. At 20% backlight, and normal use, the force gage can provide over 30 hours of use.

Press	▼	Move down to DISPLAY
Press	▼	Move down to BACKLIGHT
Press	▶	Select Backlight intensity needed
Press	◀	Move out of BACKLIGHT
Press	◀	Move out of DISPLAY



Display Backlight Adjustment

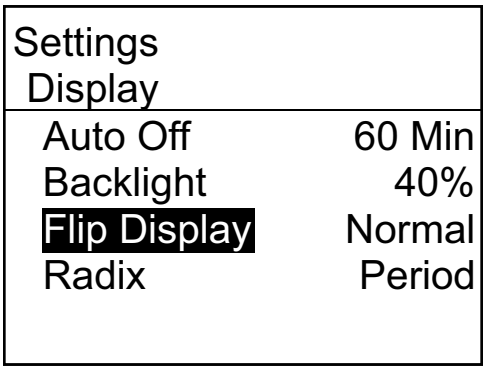
5.6.2.3 USING FLIP FEATURE

The load cell stem extends through the top housing of the force gage. When using an FMM Digital Force Tester, it may be necessary to turn the gage upside down for compression load applications. The "Flip" feature lets you orient the display so it always reads "right-side up".

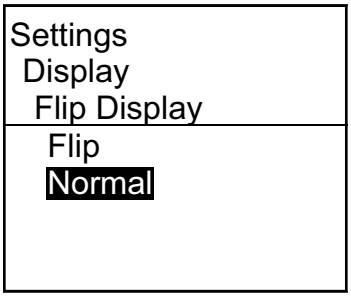
NOTE

The Softkeys automatically map to the display target regardless of whether the force gage is in Normal or Flip view mode.

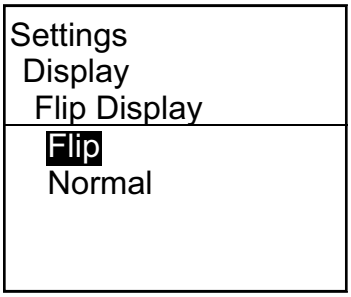
Press	▼	Move down to DISPLAY
Press	▼	Move down to FLIP
Press	▶	Select Yes to invert the display
Press	◀	Move out of FLIP
Press	◀	Move out of DISPLAY



Flip Display Setup



Normal Display Setup

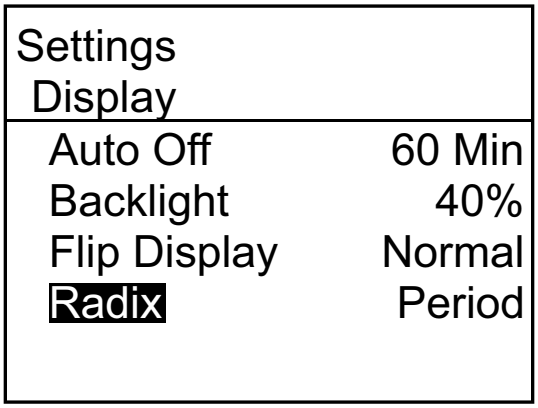


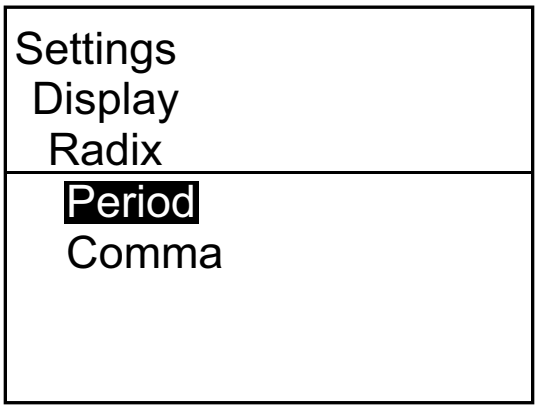
Flip Display Setup

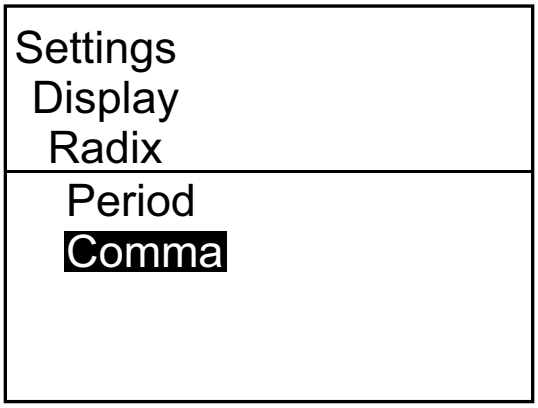
5.6.2.4 RADIX SETUP

The force gage can use either a period or comma for radix.

Press	▼	Move down to DISPLAY
Press	▼	Move down to RADIX
Press	▶	Select PERIOD or
Press	▼	Select COMMA
Press	◀	Move out of RADIX
Press	◀	Move out of DISPLAY







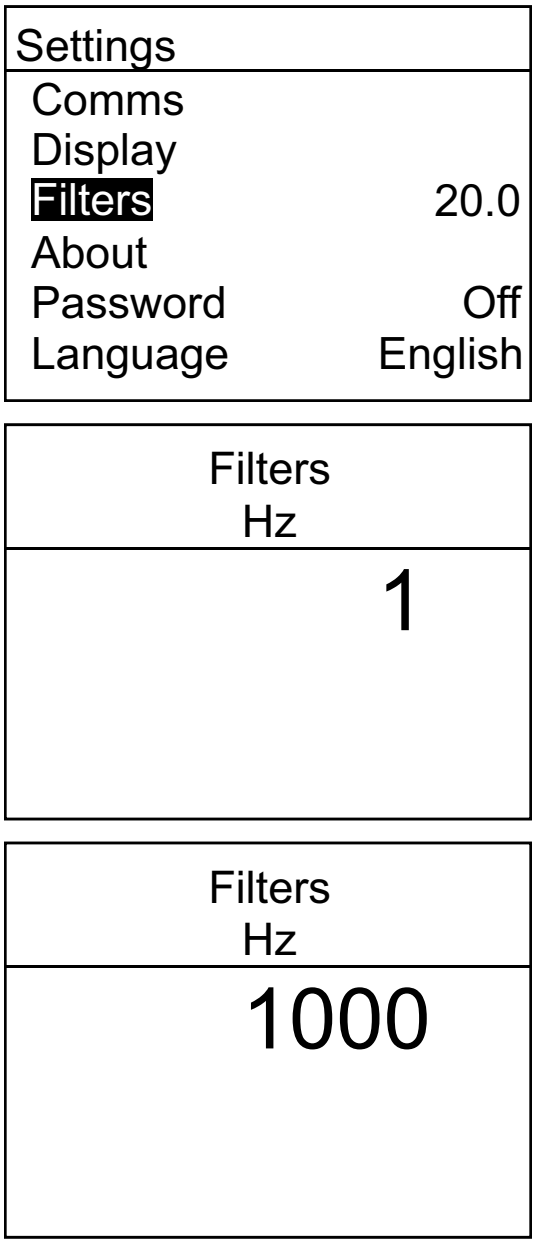
Radix Setup Menu

5.6.3 USING FILTER

Filtering can be used to compensate for noisy test measurements and to help dampen or smooth a reading and results. The DFG features an internal sampling rate of 10kHz, ideal for capturing peak loads on brittle materials. Since most tests do not require this sample frequency, you may use filters for the displayed information or for measuring maximum loads.

NOTE

High sampling should only be used for short test durations on brittle materials. Sampling at 100Hz is sufficient for most force measurement applications.

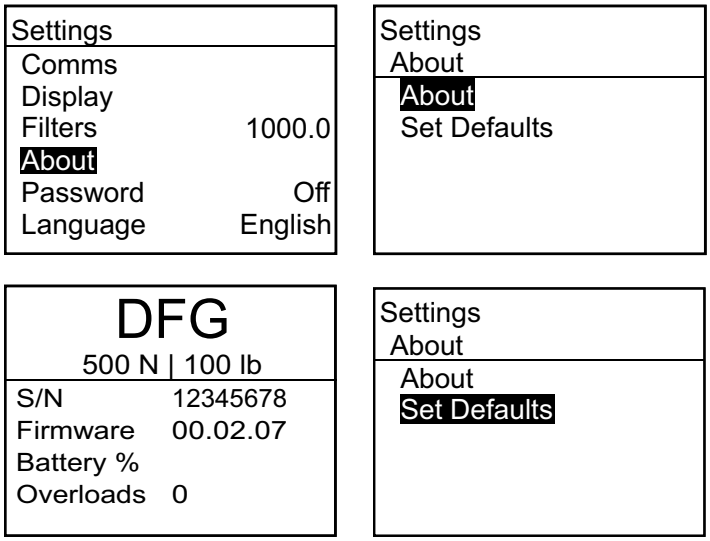


Filters Setup Menu

5.6.4 ABOUT

The About section is a view only that shows basic gage information:

- Model Number
- Gage Capacity
- Serial Number
- Firmware Revision
- Overload Count



About Display

The About display may also be used to set the Factory Defaults for your force gage.

Force Gage Default Settings	
Setting	**Default**
Mode	Real Time
Units	N (Newtons)
Memory	0
Tolerance	Off
Softkey 1	Units
Softkey 2	Mode
Data Channel	RS-232
RS-232	115,200
Xmit Comp -	Yes
Xmit Units	Off
Xmit TOL	Off
Auto Off	5 Minutes
Backlight	40%
Flip Display	Normal
Radix	Period
Password	Off
Language	English

5.6.5 USING A PASSCODE

A Password may be used to restrict unauthorized access to the DFG setup menu.

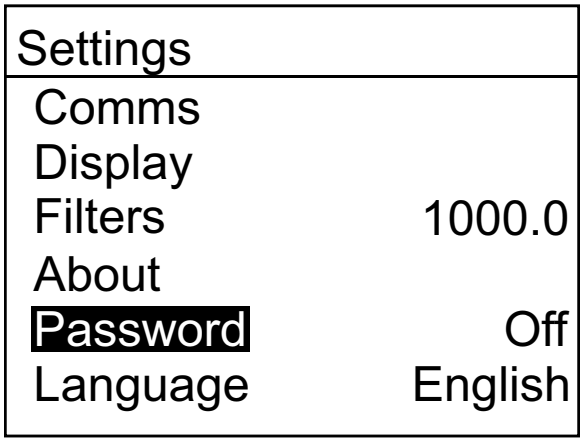
Your Starrett representative will provide you with your Passcode.

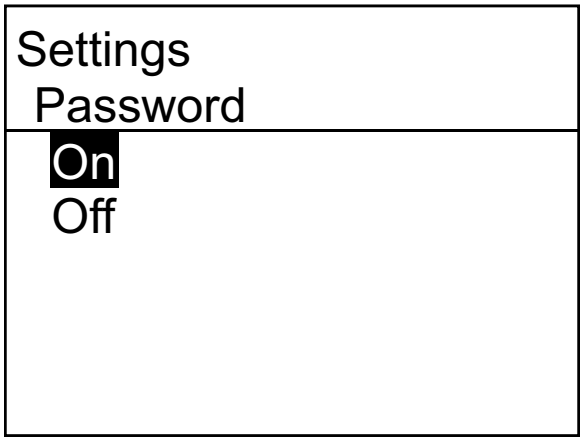
If a Password is enabled, the user is required to enter the Passcode. Only users with the Pass Code can access the force gage menu and options.

Press	▼	Move down to PASSWORD
Press	▶	Select Pass Code
Press	▼▲	to create a Pass Code number
Press	◀	Move out of PASSWORD

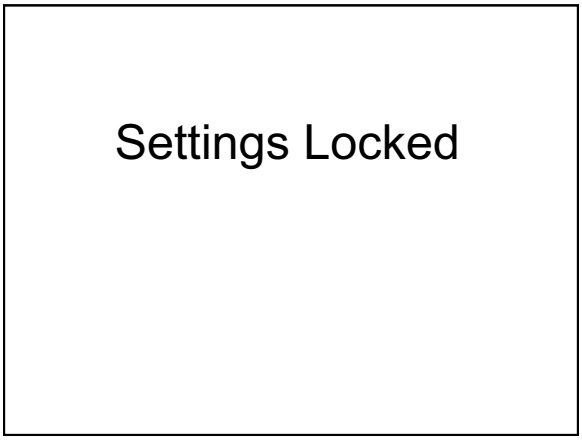
NOTE

The passcode is not configurable. The passcode is assigned to you by your Starrett representative.





When the Password = ON, the force gage menu cannot be accessed. Changes to the gage cannot be made until the Passcode number is entered. The gage will display "Settings Locked".



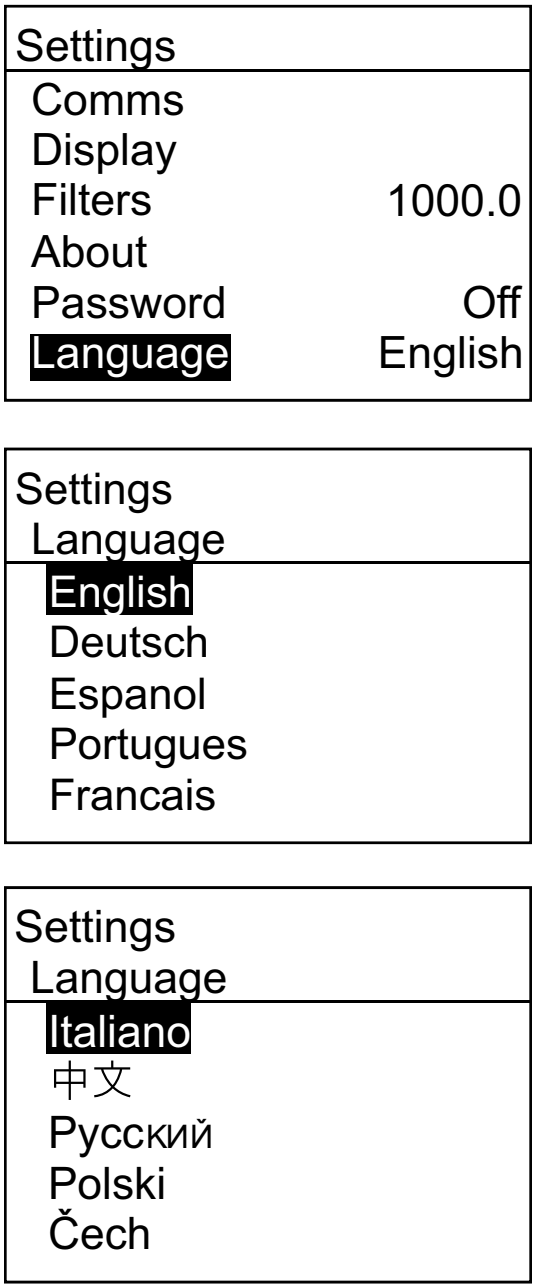
Once the Passcode number is entered, the user must go immediately to the Password menu and change the Password setting to OFF.

Passcode Entry

5.6.6 SELECTING DISPLAY LANGUAGE

The force gage will display terms in the following languages. To select the desired display language, go to SETUP MENU>LANGUAGES. Select the language from the list.

Press	▼	Move down to LANGUAGE
Press	▶	Select Display Language list
Press	▶	Select LANGUAGE needed
Press	◀	Move out of LANGUAGE



Language Setup Menu

6.0 DFG FORCE GAGE ACCESSORIES

Starrett can supply all types of testing fixtures, grips and accessories for your force measurement systems and instruments. We can also design and manufacture custom testing fixtures to your exact requirements. Contact Starrett for assistance.

Included in this section are common accessories used with your force gage.

ACCESSORY KITS

Each force gage is supplied with a complete accessory kit. The accessory kit includes a hook, notch, chisel, flat, and point adapter. A 6-inch extension rod is included. The adapter material and thread size correspond to the force's gage rated capacity.

NOTE

Force gages with full scale capacities of 2 lbf (10N) and 5 lbf (20 N) have accessories made of aluminium. All other capacities have accessories made of stainless steel.

Included with the force gage is a carrying case, USB cable, a User Guide and Certificate of Calibration.

STANDARD FORCE GAGE ACCESSORIES

Accessories	Order No.	Material	Thread	DFG-2	DFG-5	DFG-10	DFG-20	DFG-50	DFG-100	DFG-200	DFG-500	SPK-FG-A	SPK-FG-S	SPK-FG-M	SPK-FG-L
Carrying Case	L1-FG-CASE	-	-	●	●	●	●	●	●	●	●				
USB Cable	L1-USB	-	-	●	●	●	●	●	●	●	●				
Flat Adapter, Small	MLX-FLAT-A	Aluminum	M6 x 1-6H	●	●							❑			
Flat Adapter, Small	MLX-FLAT-S	Stainless Steel	M6 x 1-6H			●	●	●	●	●			❑	❑	
Flat Adapter, Large	MLX-FLAT-L	Stainless Steel	M10 x 1.5-6H								●				❑
Point Adapter, Small	MLX-POINT-A	Aluminum	M6 x 1-6H	●	●							❑			
Point Adapter, Small	MLX-POINT-S	Stainless Steel	M6 x 1-6H			●	●	●	●	●			❑	❑	
Point Adapter, Large	MLX-POINT-L	Stainless Steel	M10 x 1.5-6H								●				❑
V-notch Adapter, Small	MLX-NOTCH-A	Aluminum	M6 x 1-6H	●	●							❑			
V-notch Adapter, Small	MLX-NOTCH-S	Stainless Steel	M6 x 1-6H			●	●	●	●	●			❑	❑	
V-notch Adapter, Large	MLX-NOTCH-L	Stainless Steel	M10 x 1.5-6H								●				❑
Chisel Adapter, Small	MLX-CHISEL-A	Aluminum	M6 x 1-6H	●	●							❑			
Chisel Adapter, Small	MLX-CHISEL-S	Stainless Steel	M6 x 1-6H			●	●	●	●	●			❑	❑	
Chisel Adapter, Large	MLX-CHISEL-L	Stainless Steel	M10 x 1.5-6H								●				❑
Hook, Xtra Small	MLX-HOOK-XS	Aluminum	M6 x 1-6H	●	●							❑			
Hook, Small	MLX-HOOK-S	Stainless Steel	M6 x 1-6H			●	●	●	●	●			❑	❑	
Hook, Medium	MLX-HOOK-M	Stainless Steel	M6 x 1-6H												
Hook, Large	MLX-HOOK-L	Stainless Steel	M10 x 1.5-6H								●				❑
6” Extension Rod, Small	MLX-ROD-A6	Aluminum	M6 x 1-6H	●	●							❑			
6” Extension Rod, Small	MLX-ROD-S6	Stainless Steel	M6 x 1-6H			●	●	●	●	●			❑	❑	
6” Extension Rod, Large	MLX-ROD-L6	Stainless Steel	M10 x 1.5-6H								●				❑

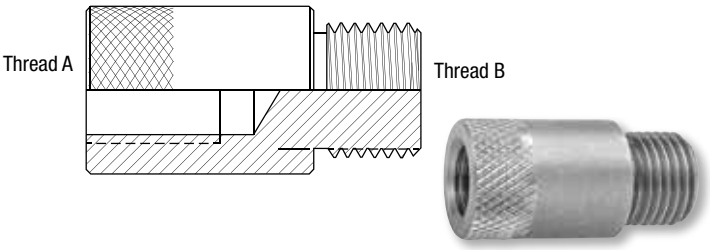
OPTIONAL ACCESSORIES

Extension Rods	Order Number	Thread Size
Extension Rod, Aluminum, 1-inch	MLX-ROD-A1	M6 x 1-6H
Extension Rod, Stainless Steel, 1-inch	MLX-ROD-S1	M6 x 1-6H
Extension Rod, Aluminum, 2-inch	MLX-ROD-A2	M6 x 1-6H
Extension Rod, Stainless Steel, 2-inch	MLX-ROD-S2	M6 x 1-6H
Extension Rod, Stainless Steel, 2-inch	MLX-ROD-L2	M10 x 1.5-6H

Clevis Accessories	Order Number	Thread Size
Clevis Adapter, Aluminum	MLX-CLEVIS-FA-M6	M6
Clevis Adapter, Stainless Steel	MLX-CLEVIS-FS-M6	M6
Clevis Adapter, Stainless Steel	MLX-CLEVIS-FS-M10	M10
Locking Ring, Aluminum	MLX-RING-A	M20
Locking Ring, Stainless Steel	MLX-RING-S	M24
Grip Pin, Aluminum	MLX-PIN-A	-
Grip Pin, Stainless Steel	MLX-PIN-S	-
Spanner Wrench	L1-SPANNER	-
Cable, RS-232, 6 ft. (2m)	L1-RS232	-

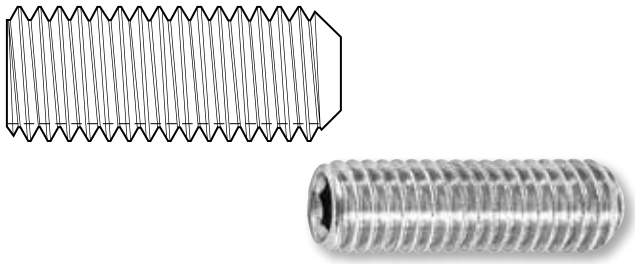
FEMALE-TO-MALE THREAD ADAPTERS

Order Number	Length	Thread A	Thread B
MLX-25043	0.75 inch	#10-32 UNF-2B	M6 x 1-6g
MLX-25044	0.75 inch	M6 x 1-6H	#10-32 UNF-2A
MLX-25045	0.75 inch	1/4-28 UNF-2B	M6 x 1-6g
MLX-25046	0.75 inch	M6 x 1-6H	1/4-28 UNF-2A
MLX-25047	1.00 inch	5/16-18 UNC-2B	M6 x 1-6g
MLX-25048	0.875 inch	M6 x 1-6H	5/16-18 UNC-2A
MLX-25049	1.125 inch	5/16-18 UNC-2B	M10 x 1.5-6g
MLX-25050	1.25 inch	M10 x 1.5-6H	5/16-18 UNC-2A
MLX-25051	1.25 inch	1/2-20 UNF-2B	M10 x 1.5-6g
MLX-25052	1.25 inch	M10 x 1.5-6H	1/2-20 UNF-2A



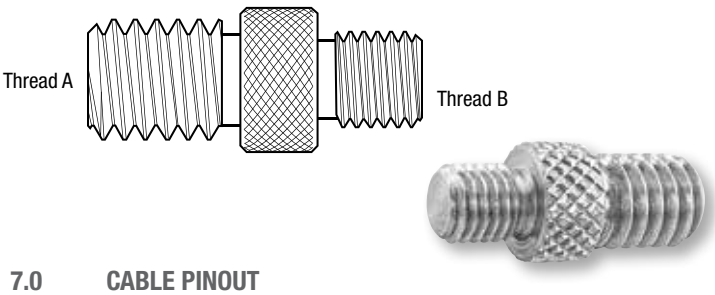
SET SCREWS

Order Number	Length	Thread A
MLX-50000545	1.00 inch	#10-32 UNF-2A
MLX-50000546	1.00 inch	1/4-28 UNF-2A
MLX-50000547	1.00 inch	5/16-18 UNF-2A
MLX-50000548	1.00 inch	1/2-20 UNF-2A
MLX-51000195	20mm	M4 x 0.7-6g
MLX-51000187	25mm	M6 x 1-6g
MLX-51000188	25mm	M10 x 1.5-6g
MLX-51000196	25mm	M12 x 1.75-6g



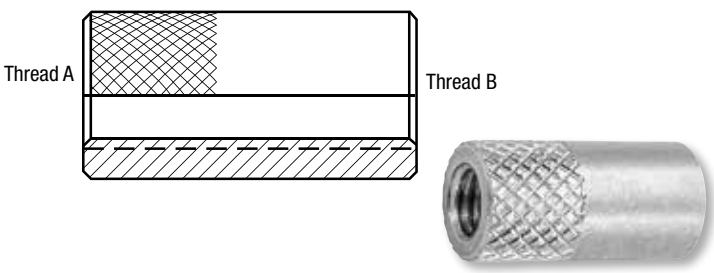
MALE-TO-MALE THREAD ADAPTERS

Order Number	Length	Thread A	Thread B
MLX-25053	0.75 inch	M4 x 0.7-6g	M6 x 1-6g
MLX-25054	0.875 inch	M10 x 1.5-6g	M6 x 1-6g
MLX-25055	0.75 inch	#10-32 UNF-2A	1/4-28 UNF-2A
MLX-25056	0.875 inch	#10-32 UNF-2A	5/16-18 UNC-2A
MLX-25057	0.875 inch	5/16-18 UNC-2A	1/4-28 UNF-2A
MLX-25058	0.875 inch	1/4-28 UNF-2A	1/2-20 UNF-2A
MLX-25059	1.00 inch	5/16-18 UNC-2A	1/2-20 UNF-2A
MLX-25060	0.75 inch	#10-32 UNF-2A	M6 x 1-6g
MLX-25061	0.75 inch	1/4-28 UNF-2A	M6 x 1-6g
MLX-25062	1.00 inch	5/16-18 UNC-2A	M10 x 1.5-6g
MLX-25063	1.00 inch	1/2-20 UNF-2A	M10 x 1.5-6g



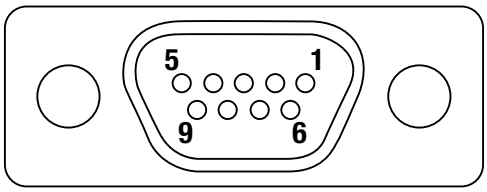
THREAD COUPLERS

Order Number	Length	Thread A	Thread B
MLX-25037	0.75 inch	#10-32 UNF-2B	1/4-28 UNF-2B
MLX-25038	0.75 inch	#10-32 UNF-2B	M6 x 1-6H
MLX-25039	1.00 inch	5/16-18 UNF-2B	M6 x 1-6H
MLX-25040	0.75 inch	1/4-28 UNF-2B	M6 x 1-6H
MLX-25041	1.25 inch	5/16-18 UNF-2B	M10 x 1.5-6H
MLX-25042	1.25 inch	1/2-20 UNF-2B	M10 x 1.5-6H
MLX-25064	0.75 inch	M6 x 1-6H	M6 x 1-6H
MLX-25065	1.25 inch	M10 x 1.5-6H	M10 x 1.5-6H
MLX-25066	0.75 inch	#10-32 UNF-2B	#10-32 UNF-2B
MLX-25067	0.75 inch	1/4-28 UNF-2B	1/4-28 UNF-2B
MLX-25068	1.00 inch	5/16-18 UNC-2B	5/16-18 UNC-2B
MLX-25069	1.25 inch	1/2-20 UNF-2B	1/2-20 UNF-2B



7.0 CABLE PINOUT

Pin Number (Male)	Wire Color	Signal Name	Pin Number (Female)
1	Black	OUT_0	NC
2	Brown	TX_OUT	2
3	Red	RX_IN	3
4	Orange	External voltage In (5-24V)	NC
5	Yellow	GND	5
6	Green	IN_1	NC
7	Blue	VCC(+5V) 125ma	NC
8	Violet	OUT_1	NC
9	Grey	VCC_IN	NC



L1-RS232 Cable