

LIWIT[®]
Supply Advanced Testing Instruments

温州力微特仪器有限公司
Wenzhou Liwit Instruments Co.,Ltd.

User's Guide

FG/FG-B Series Digital Force Gauge

CE FCC

Quality
质量

Service
服务

Innovation
创新

FG-10...500/10...500-B



FG-1K...5K/1K...5K-B



Many thanks for purchasing FG/FG-B series digital force gauge from LIWIT company, that designs and produces force and torque measurement instruments professionally.

With measuring range up to 5000N and 0.3%FS high accuracy, FG/FG-B series digital force gauge is very essential component of a force testing system.

With proper usage, we are very sure that you will get many years of good performance with this product. FG/FG-B series digital force gauge could be applied in many fields and industries, such as laboratory, motor industry, lighter industry, leather industry etc.

The User's Guide provides setup, safety and operation instructions. Dimensions and specifications are also included. For additional inquiry or answers to your questions, please don't hesitate to contact us. We are very willing and eager to help you, and provide lifelong technical support.

Before using, please read the User's Guide very carefully for right operation and safety procedures.

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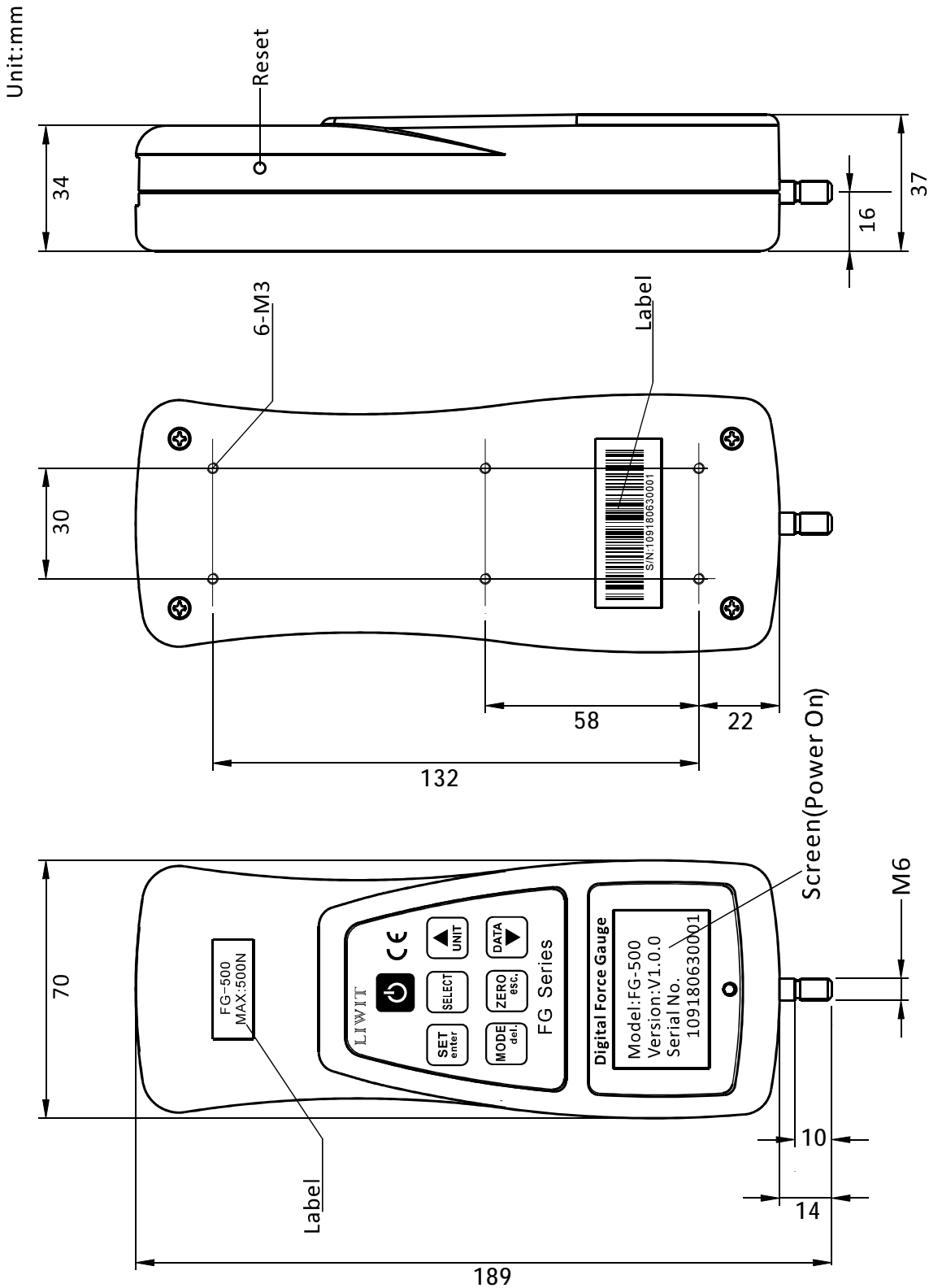
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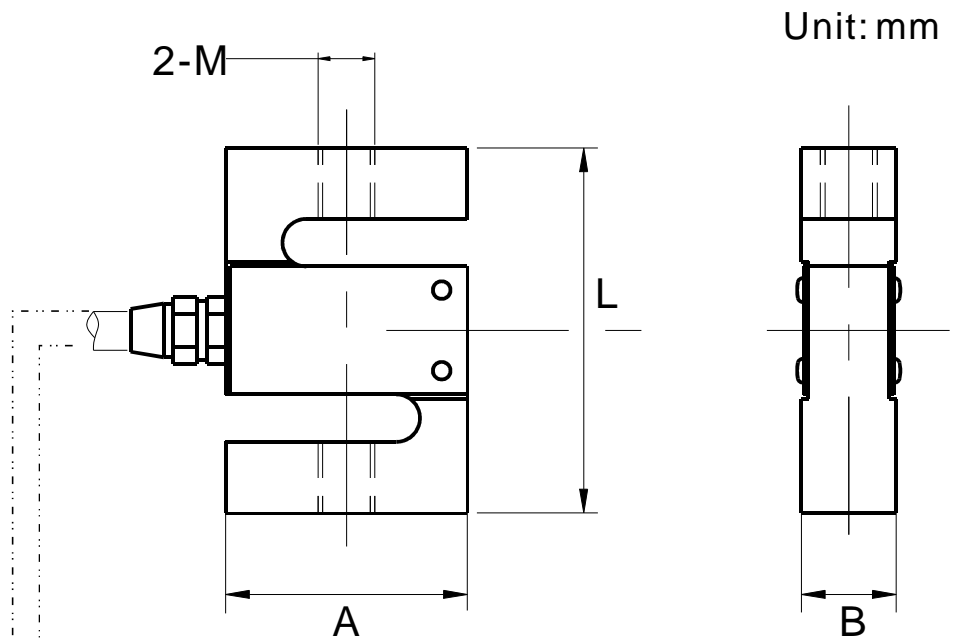
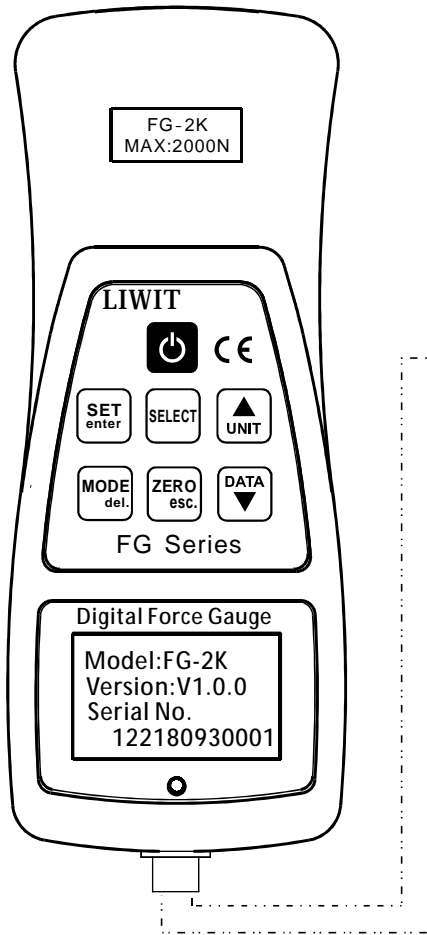
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1 DIMENSION AND SPECIFICATION



FG-10.....500/FG-10.....500-B Size For Inner Load Cell

⚠ press the 'Reset' button with a needle when the gauge is under crash state.



Unit: mm

Capacity	Load cell size(mm)			
	Thread(M)	A	B	L
1	M12	50.8	19	77
2	M12		24.4	
5	M12		25	
10	M16			
20	M24	60	35	80
50	M24	95		110

FG-1K...5K/FG-1K-B...5K-B Size for external load cell

Model	FG-10 FG-10-B	FG-20 FG-20-B	FG-50 FG-50-B	FG-100 FG-100-B	FG-200 FG-200-B	FG-500 FG-500-B	FG-1K FG-2K-B	FG-2K FG-2K-B	FG-5K FG-5K-B
Capacity	10N	20N	50N	100N	200N	500N	1000N	2000N	5000N
Resolution	0.002N	0.005N	0.01N	0.02N	0.05N	0.1N	0.2N	0.5N	1N
Accuracy	0.3% FS								
Units	N,kgF,lbf								
Sampling Rate	500 Hz								
Power	AC or Li/Ni-mH rechargeable battery								
Battery Life	Backlight on/off: up to about 18/36 hours of continuous use								
Warranty	1 year								
Net Weight	1.2 kgs						1.5 kgs		
Environmental Requirement	Work temperature: 5°C-45°C Relative humidity:35%-65%HR								

⚠ More high-capacity may be custom-made

2 SAFETY AND PROPER USAGE

Caution!

Note the capacity of force gauge before using and make sure that the capacity is not exceeded. Overload (force greater than the gauge's capacity) can damage the internal load cell. An overload can occur whether the gauge is powered on or off and "OVER" occur in the display.

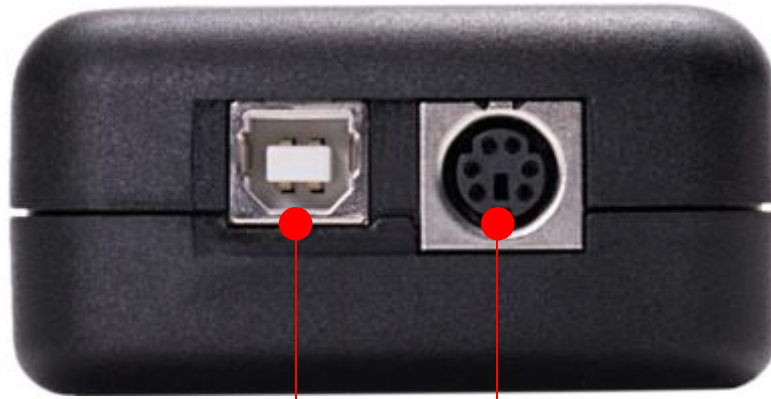
Many typical materials are able to be tested, such as springs, electronic components, leathers, buttons, fasteners, caps, films, mechanical assemblies, etc. Some items should not be used with the gauge, including potentially flammable substances, items that can shatter in an unsafe manner, and any other components that can present an exceedingly hazardous situation when acted upon by a force.

The following safety checks is necessary before and during operation:



1. Don't use the gauge if there is any visible damage to the gauge itself.
2. Don't use the gauge near water or any other electrically conductive liquids at all times.
3. Before the housing is opened, AC power must be disconnected and the gauge must be powered off.
4. Don't use other chargers or battery to replace the supplied otherwise it may cause short circuit and damage the gauge, even fire.
5. Wear glove and face protection mask while testing, especially while testing brittle samples that have the potential to shatter under force.
6. In certain applications, such as the testing of brittle samples that can shatter, or other applications that may lead to a dangerous situation, it is strongly recommended that a guarding system should be used to protect the operator and others.
7. When the gauge is not in use, turn off the gauge and put it into the carrying case.

3 POWER SECTION






The gauge is powered either by an 3.7V Lithium/Ni-mH rechargeable battery or by an AC adapter. Due to self discharge of the battery, it may be necessary to recharge the unit after a long time of storage. Plug the accompanying USB charger into the AC socket and insert the USB plug into the gauge (refer to the illustration below). The battery will be charge fully in approximately 6 hours.




USB port The port to connect motorized stand

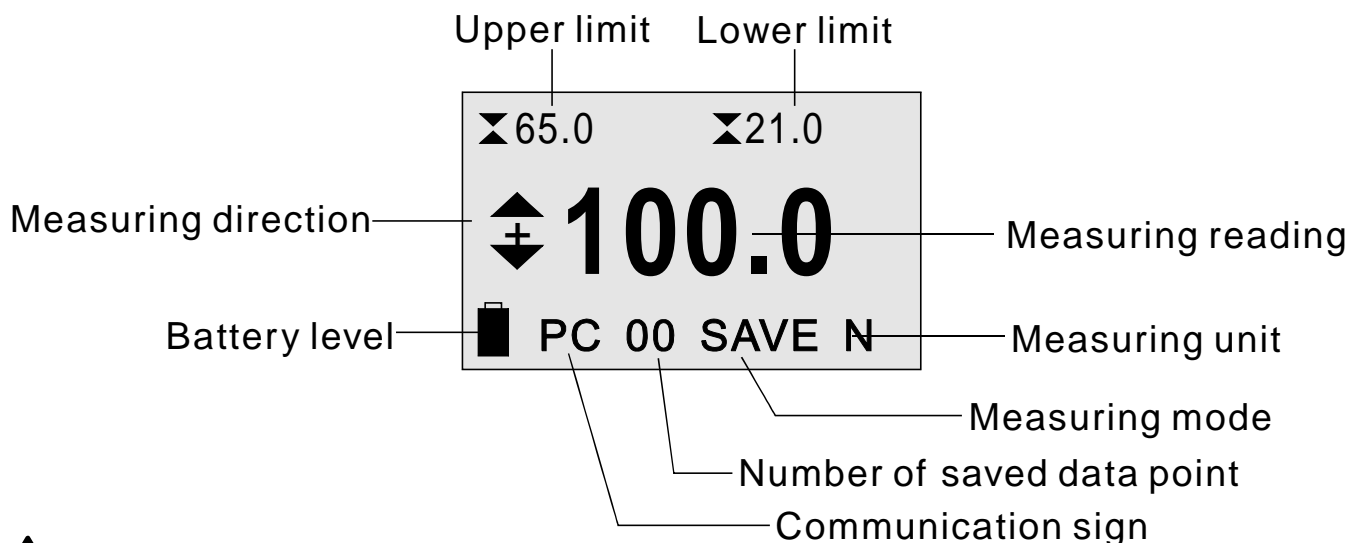
If the AC adapter is plugged in, an plug icon appears in the lower left corner of the display, as follows: , it means that the battery is being charged. Once the following indicator is present: , it means the battery is already full.



If the AC adapter is not plugged in, battery power icon is indicated in the following five-step process:








1. When battery life is 100%, the following indicator is present: 
2. When battery life is about 75%, the following indicator is present: 
3. When battery life is about 50%, the following indicator is present: 
4. When battery life is about 25%, the following indicator is present: 
5. When battery life drops to approximately 0%, the following indicator is present: 

 **When electric quantity is very low, the gauge will power off once power on. If battery replacement is necessary, please contact the dealer in your local or our company**

4 HOME SCREEN AND CONTROLS



 The LCD can be inverted by pressing  key for about 3 seconds.

Keys	Function Description
	Press and hold to power on/off
	Toggles between tension and compression high/low limit in the home screen Choose the setting option under setting menu Toggles among pages under data menu
	Press to enter the setting menu in the home screen Confirm the selected item
	Toggles between measurement modes Delete single memory value under data menu
	Toggles between measurement units Increase setting parameter Choose the memory value upward under data menu
	Press to enter data processing menu in the home screen Decrease setting parameter Choose the memory value downward under data screen
	Zero the peak reading Escape the current screen

5 MEASUREMENT MODES

⚠ Caution!

In any measurement mode, if the capacity of the gauge has been exceeded, the display will show "OVER" to indicate an overload. A continuous audible tone will be sounded until the load has been reduced to a safe level (under capacity).

Four measurement modes are available with FG series digital force gauge. To cycle between the modes by pressing **MODE del.** key in the home screen.

Note: the zeroing range is within 5%FS

5.1 Real time (RT)

The reading depends on the live measured reading.

5.2 Peak (PK)

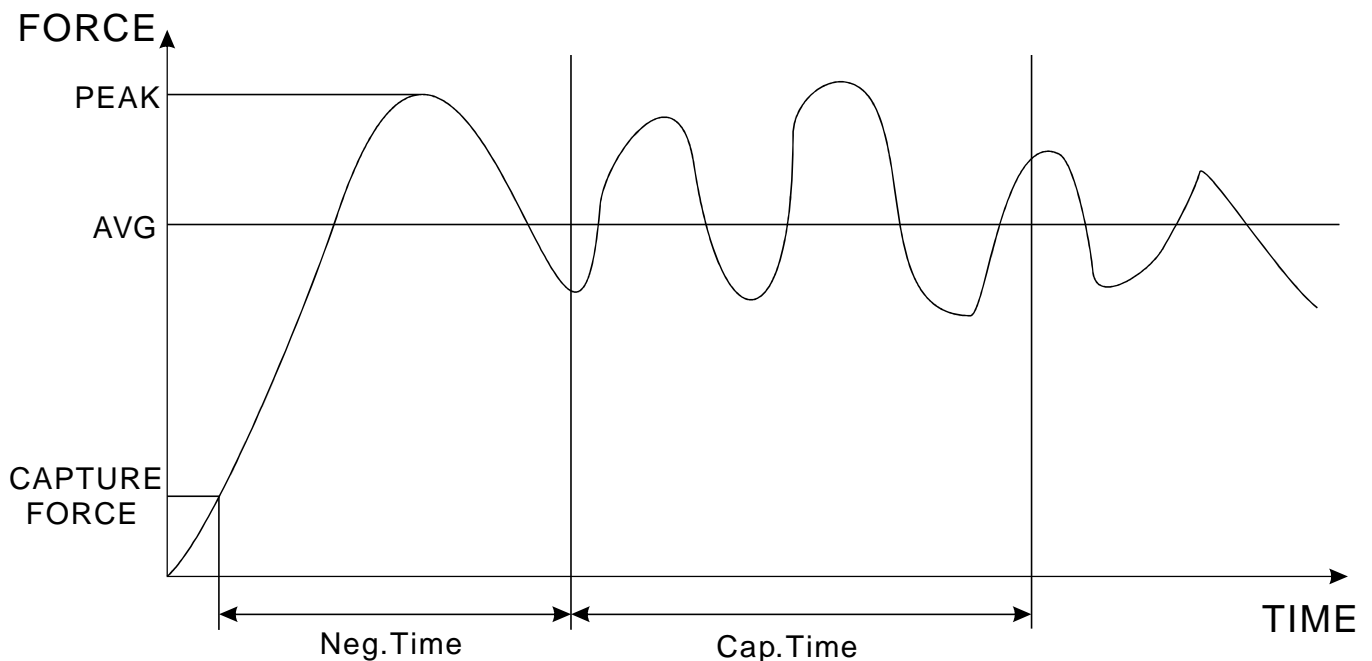
The reading depends on the maximum tension/compression reading observed. If the actual force decreases from the peak value, the peak will still be remained in the reading area of the display. Pressing **ZERO esc.** key will reset the value and start another new testing.

5.3 Average Mode (AVG)

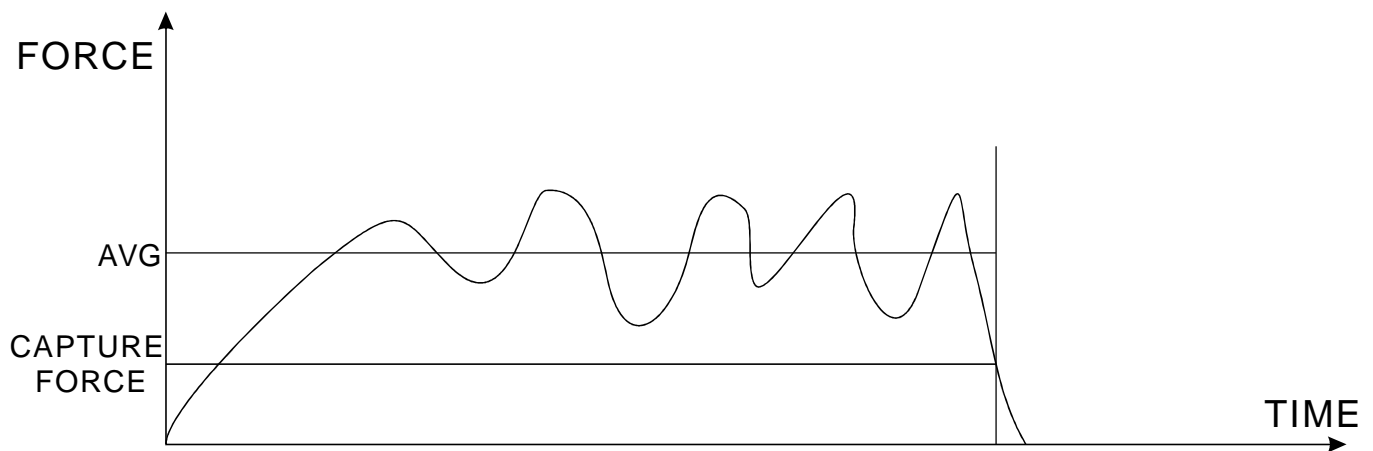
Average mode is used to get an average force over time. Applications include measurement of peel force, frictional force, and other tests requiring time-averaged readings.


The averaging function operates in one of two ways: MOD1 and MOD2.

MOD1: Averaging occurs between the minimum capture force and defined time limit.



MOD2: Averaging occurs only while above the minimum capture force. As the force drops back down to this minimum capture force, averaging stops. Total time is 10 minutes for MOD2. The averaging continues above the minimum capture force, unless the 10 minutes limit is reached.



To enable the measurement mode. Press the  key twice to enter the parameters setting screen of Average Mode. See the picture below:

```
A. M. C. F: 69.0
Neg. Time: 6.5
Cap. Time: 29.0
Ave. Mode: MOD1
```


Note: select the one of them by pressing  key and change the parameter by pressing  /  key.



A. M. C. F is Average Minimum Capture Force during AVG mode testing. The force may be configured from 0 to full scale.

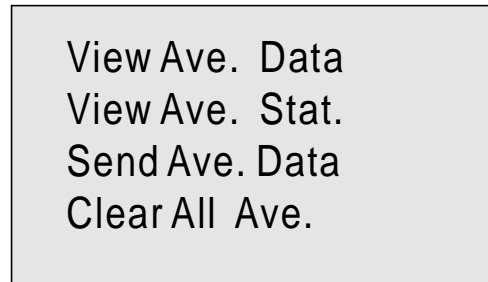
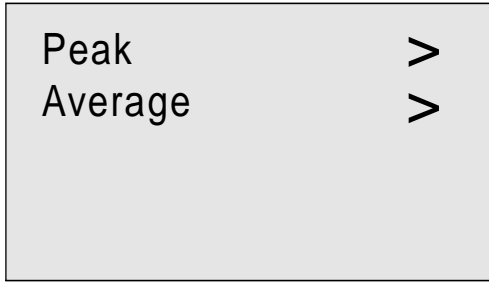
Neg. Time is Neglectful Time, after the minimum capture force, before the averaging sequence commences. Available setting: 0.0 - 300.0 sec., in 0.1 sec. Increments. Applied only for MOD1.



Cap. Time is Capture Time, the time duration of the averaging sequence. Available settings: 0.1 - 300.0 sec., in 0.1 sec. Increments. Applied only for MOD1.



Ave. Mode is Capture Mode, two ways (MOD1 or MOD2) to capture and calculate the average.

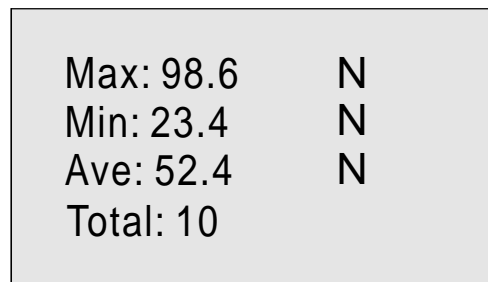
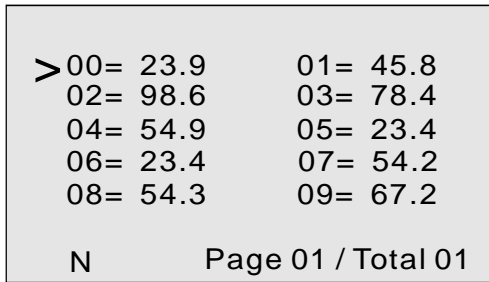
After finishing the settings, press  key to save and back to the home screen for start of average testing.

In AVG mode, the displayed average force could be zero and saved by pressing  key. The home screen display the saved average point and can save 10 average. Also, the saved average could be viewed/deleted/outputed. Press  key in the home screen and to enter the left screen below.

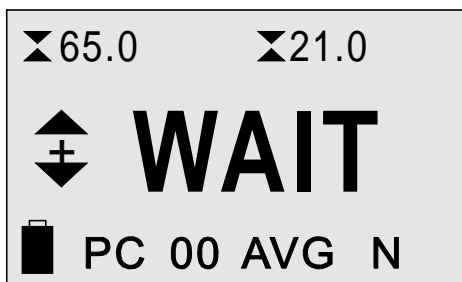


Select "Average" by pressing  key and press  to enter the right screen above.

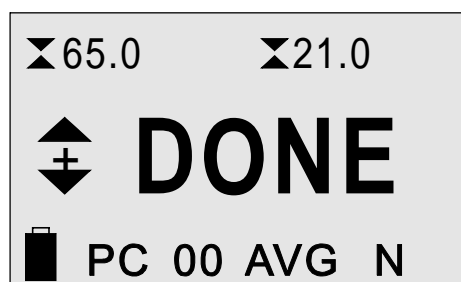
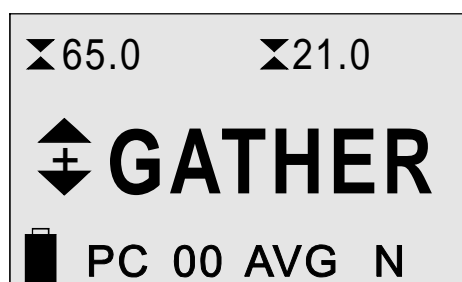
Select the option by pressing  key and press  key to enter. The left screen below is saved average data from 00 to 09. The right screen below is statistical data.




When AVG mode is chosen, it will display the left screen below. It means that it doesn't start to test. When the right screen is displayed, it means that force is loaded to the sensor and start to test. I. DLY means that the gauge is calculating the Neg. time you set.






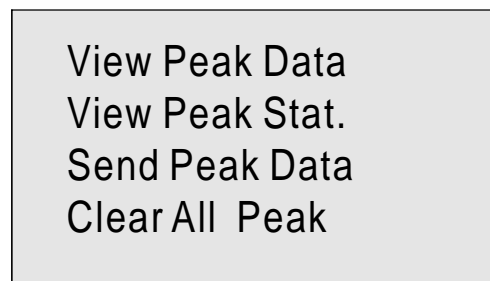
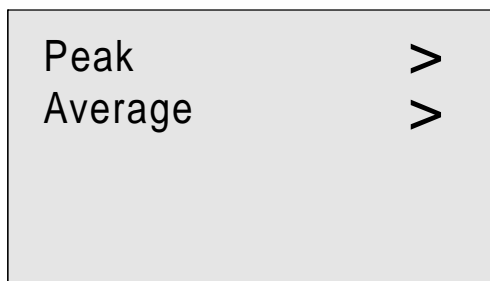
After reaching the Neg. time, it will capture the data in Cap. time and display the left screen below. After reaching the Cap. time, it means that it already finish the data capture and display the right screen below. Then it display the average.





5.4 SAVE MODE

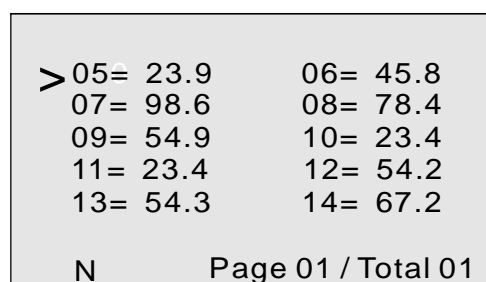
SAVE mode could save the max. measuring value automatically in a single test. FG series digital force gauges have storage capacity of 100 data (circle from 00 to 99). Readings may be saved, viewed, and output to an external device. Individual or all data may be deleted. When you choose the SAVE as measurement mode by pressing  key, the number of saved data point will appear on the left of SAVE in the home screen. Every time, finish one test and the reading will be saved to the displayed record number automatically, then the record number will increment each time. If the record number has the previous saved data, the new reading will replace the previous data.




To view/delete/output saved readings and statistics, press  key to enter the left screen below. Select "Peak" option by pressing  key and press . Then it display the right screen below.



Four options are available. Select one of them by pressing  key upward/downward, then press  key to enter.

View Peak Data is used to view all the saved data from the selected data points which is set in setting mode(see the 8.3 part of other settings). The record number is displayed, along with the corresponding value and unit of measurement in the lower left corner of the display. The display appears as follows.




In the displayed data screen, every page includes 10 data. Toggles among pages by pressing  key and select the single data by pressing  /  key upward/downward. The selected data will show the icon >.









6 UPPER AND LOWER LIMIT SETTING

Upper and lower limits are useful for tolerance checking (pass/fail) with indicator lamp of three different colors in special applications. Two limits, high and low, are configured in the gauge and the measuring reading is compared to the two limits. If the measuring reading is less than lower limit, the indicator lamp will display two colours (green and red). If the measuring reading is in the middle of lower limit and upper limit, it will display green. If the measuring read is greater than upper limit, it will display red.




 **The indicator lamp will display only under RT, PK, SAVE measurement modes. If the load is equal to the stop force or is greater than it under RT mode, the indicator lamp only display green.**

To configure the limits, press  key once in the home screen to enter the following menu.

◆ H. Limit: 57.0
 ◆ L. Limit: 11.6
 ✕ H. Limit: 65.0
 ✕ L. Limit: 21.0

- ◆ **H. Limit** : Tension Upper limit value. Press  /  to increase/decrease the parameter. The parameter setting range is from lower limit to full scale.
- ◆ **L. Limit** : Tension Lower limit value. Press  /  to increase/decrease the parameter. The parameter setting range is from zero to upper limit.
- ✕ **H. Limit** : Compression Upper limit value. Press  /  to increase/decrease the parameter. The setting parameter range is from lower limit to full scale.
- ✕ **L. Limit** : Compression Lower limit value. Press  /  to increase/decrease the parameter. The setting parameter range is from lower limit to full scale.

 **Upper limit value must be greater than lower limit value.**

After finishing the settings, press  for next setting or press  to save and back to the home screen. The limit values display at the top of the home screen with tension or compression direction icon. Press  key to toggle between tension and compression.

7 COMMUNICATION AND OUTPUT

The gauge has two communications, one force gauge only has one communication.


FG series has force curve display software, FG-B series has App. display and Bluetooth.

Option 1: App. display and transmission via Bluetooth on the phone.

Option 2: Curve display and transmission via USB cable on the PC.

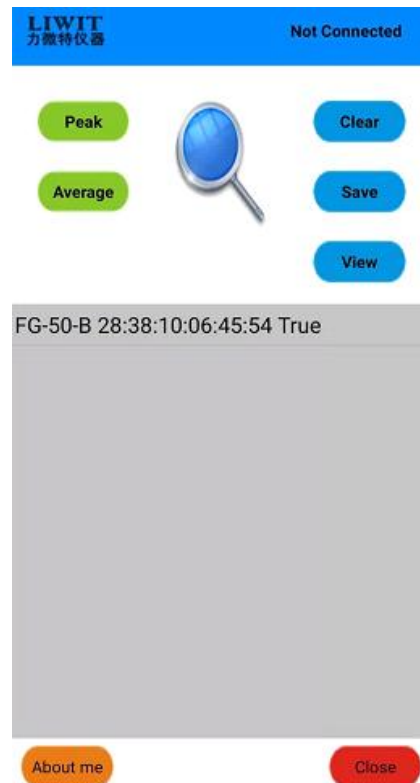
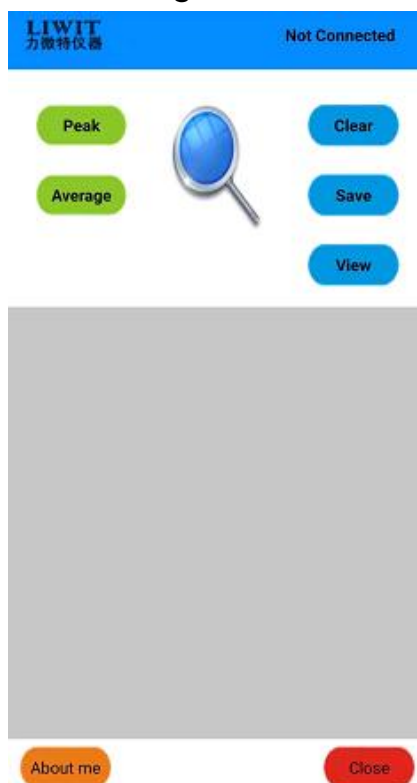
App. Display and transmission

Step 1: Use the phone Browser to scan the following left QR code and download the App. 'FG Tool' into the phone. See the first picture below.

Step 2: Open the App.'FG Tool' (see the middle App. interface below), then use the tool  to search the Bluetooth from the gauge and the model will appear in the gray zone, see the right interface below.

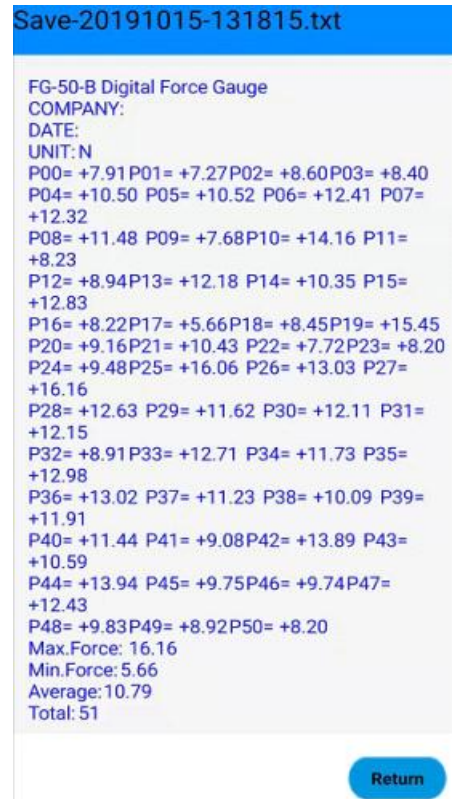
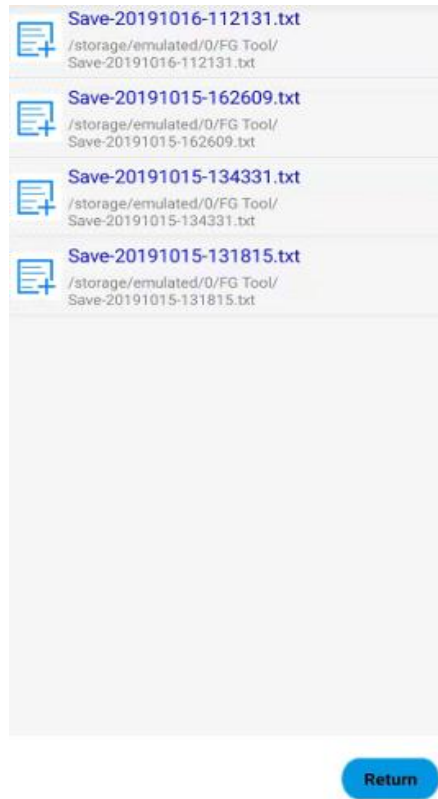
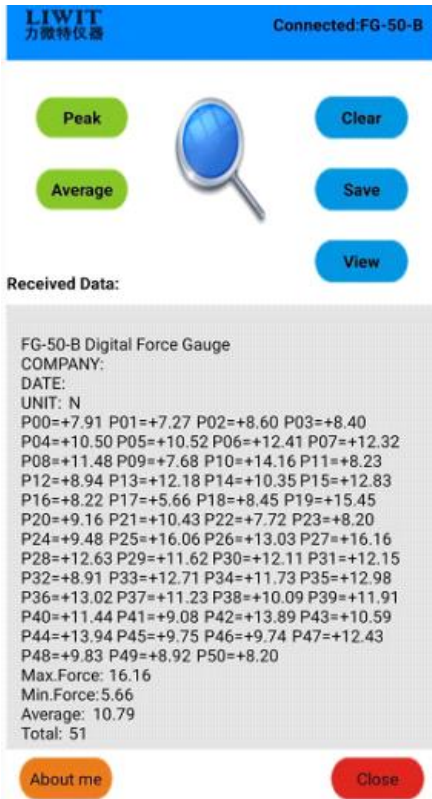


FG_Tool



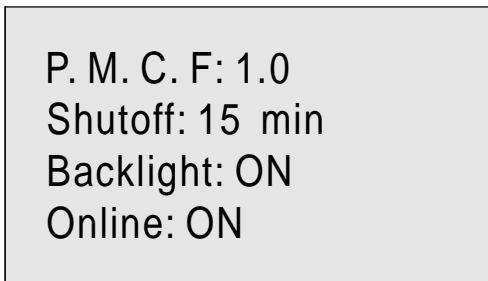
Label	Description
Peak	Send the saved PEAK data to App. by pressing Peak button
Average	Send the saved AVERAGE data to App. by pressing Average button
Clear	Delete the displayed data by pressing Clear button
Save	Save the displayed data by pressing Save button
View	View the saved data by pressing View button

Step 3: Select the displayed model and input the PIN code '1809' and connect, then press the green 'Peak' or 'Average' to send the saved data of the gauge into the App. gray zone(see the first picture below).Then the data can be saved(see the second picture below)and the saved data can be viewed(see the third picture below).



Curve display and transmission

The gauge can communicate to computer through USB located at the bottom of the gauge. Communication is possible only when the gauge is in the home screen. Saved data may be transmitted to the software and force graph is also viewed in the software. To achieve the function, press **SET enter** key four times in the home screen and the display appears as follows:



Select "Online" by pressing **SELECT** key. Available settings is ON or OFF by pressing **UNIT** / **DATA** key.

Before connecting the gauge to computer, choose ON. After finishing the setting, press **ZERO esc.** key to back to the home screen.

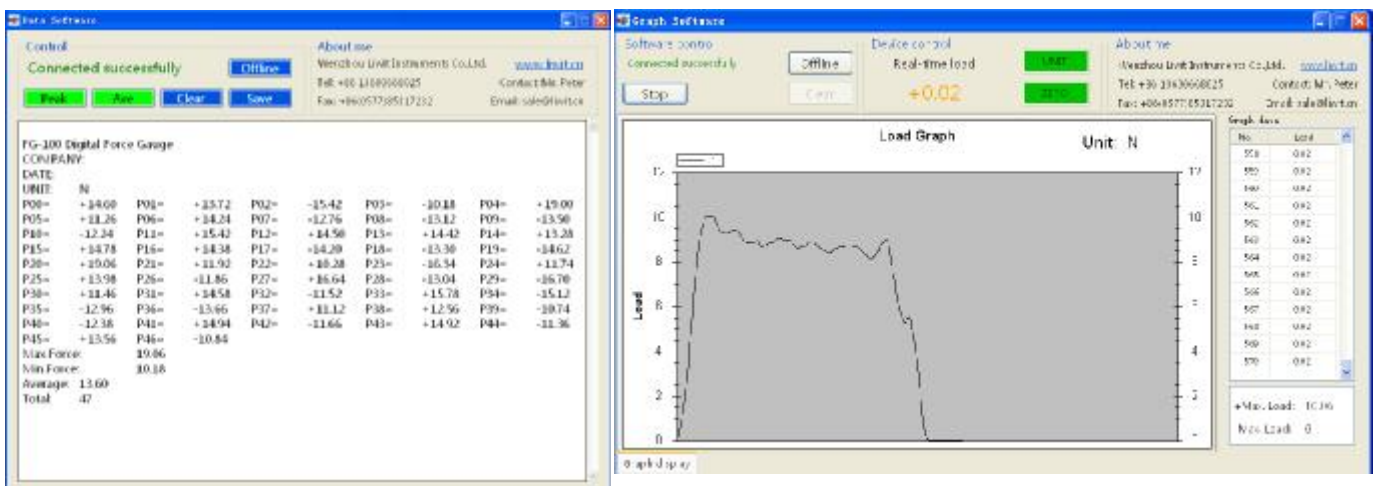
Below, it shows how to transmit the saved data to the Data software. First, connect force gauge to PC through USB data cable, and install the driver (USB to COM).

Second, open the software "Data Software" and click the 'Online' button, If succeed, It will display 'Connected successfully'.

Then, click 'Peak' or 'Ave' to send the saved data to the blank zone (see the first picture below). Note: "Peak" is the command of sending peak data which are saved in SAVE mode; "Ave" is the command of sending average data which are saved in AVG mode.


The data may be saved with TXT format by clicking "SAVE" button and also be deleted by clicking "CLEAR" button.

For the right graph display and operation below, please see the 'Graph Software Manual' in software CD.







8 OTHER SETTINGS






8.1 Automatic Shutoff

The gauge may be configured to automatically power off for a period of inactivity time. Inactivity means no operation for any keys or load changes. To access the setting, press  key four times in the home screen and the display appears as follows:


P. M. C. F: 1.0
Shutoff: 15 min
Backlight: ON
Online: ON

Select "Shutoff" by pressing  key. Available settings is 0-30 minutes by pressing  /  key. 0 is disabled to power off automatically. After finishing the setting, press  key to back to the home screen.



8.2 Backlight

The gauge has brightness from the back of screen. To access the setting, press  key four times in the home screen. Select "Backlight" by pressing  key. Available settings is ON or OFF by pressing  /  key. After finishing the setting, press  key to back to the home screen.


8.3 S. Point and F. Point

S. Point is Start Point of viewing saved data. F. Point is Finish Point of viewing saved data. The setting is used to view the saved data among the number of saved data point. To access the settings, press  key three times in the home screen and the display appears as follows:





```
St. Force: 28.8
Stop Mode: OFF
S. Point: 05
F. Point: 20
```

Select "S. Point" and "F. Point" by pressing  key, then press  /  key to increase/decrease the parameter. After finishing the setting, press  key for next setting or press  to save and back to the home screen.


8.4 P. M. C. F

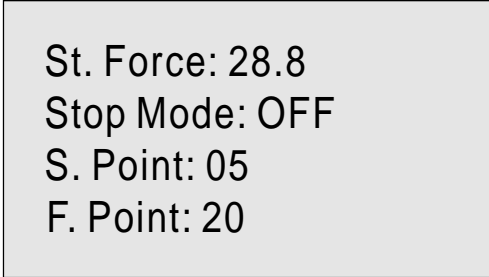
P. M. C. F is minimum saved force in the SAVE mode. The setting is used to compare the reading in the SAVE mode. If the reading is bigger than the setting value, it will save the max. value in a single test. To access the setting, press  key four times in the home screen and the display appears as follows:

```
P. M. C. F: 1.0
Shutoff: 15 min
Backlight: ON
Online: ON
```






Select "P. M. C. F" by pressing  key, then press  /  key to increase/decrease the parameter. After finishing the setting, Press  to save and back to the home screen.

8.5 St. Force and Stop Mode

St. Force is Stop Force. It means that the electric test stand will stop to test automatically once the load reach the preset stop force. To achieve the function, the stop mode must be ON and the measurement mode must be RT. To access the settings, press  key three times in the home screen and the display appears as follows:

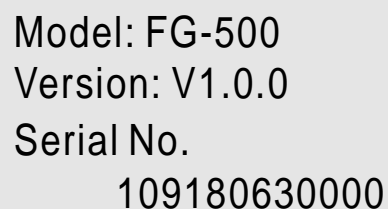


St. Force: 28.8
Stop Mode: OFF
S. Point: 05
F. Point: 20

Select “St. Force” and “Stop Mode” by pressing  key, then press  /  key to increase/decrease the parameter and change the stop mode. St. Force may be set from 0 to full scale. After finishing the setting, Press  for next setting or press  to save and back to the home screen.

8.6 Product Info.

The gauge is with basic product information, such as model, version and serial number. When you turn on the gauge, it will display the product information and the display appears as follows:



Model: FG-500
Version: V1.0.0
Serial No.
109180630000








9 Calibration






9.1 Initial Physical Setup




The gauge should be mounted vertically to a test stand or fixture rugged enough to withstand a load equal to the full capacity of the instrument. Certified weights or master load cells should be used, along with appropriate mounting brackets and fixtures. Caution should be taken while handling such equipment.




9.2 Calibration Procedure




Take FG-10 as an sample, capacity is 10N.

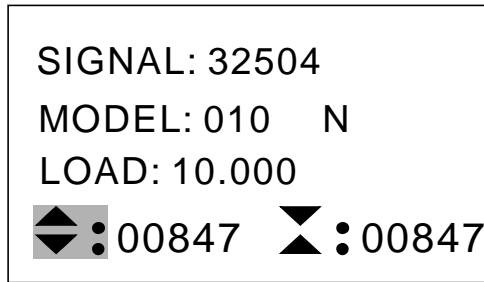
1. Under power off, press  and  key at the same time, then press  key once (don't loose  and  key), then loose  and  to enter the calibration, see the following screen.

<p>SIGNAL: 32504  MODEL: 010 N LOAD: 10.000  :00847  :00847</p>	<p>SIGNAL: the captured value from load cell MODEL: the capacity of force gauge LOAD: the real load value of weight  :00847: the fine adjustment value of tension  :00847: the fine adjustment value of compression</p>
---	---

2. Fix the force gauge well vertically. Adjust the MODEL value which is the same as the capacity of force gauge by pressing  or  key (If the MODEL value is the capacity value, no adjustment). When the only last digit of the SIGNAL value change, press  key and it will display the following screen.

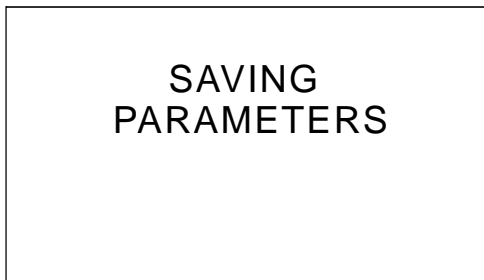
SIGNAL: 32504
 MODEL: 010 N
 LOAD: 10.000
 :00847  :00847

3. Adjust the LOAD value by pressing  or  key which make it the same as the real weight load (Generally, the real weight load is the capacity of force gauge). Put the weight to the hook. When the only last digit of the SIGNAL VALUE change, press  key and it will display the following screen.



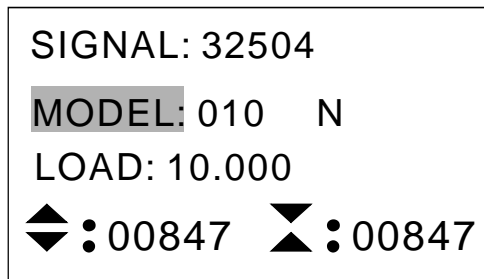
4. Unload the weight and press key to exit the calibration. Then it will display the following screen. After 2 seconds, the gauge will power off and finish the calibration.

⚠ If the wrong capacity is calibrated, press key to back to the MODEL. Repeat the step 2 and 3 to recalibrate.



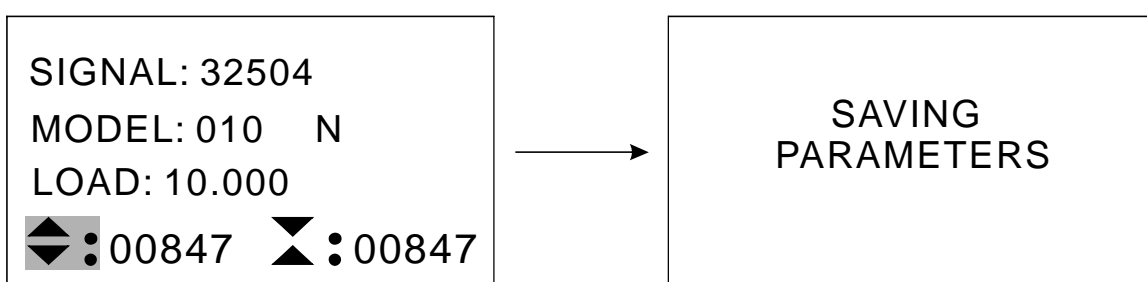
After calibration, and check the force. If the reading is out of 0.3%FS accuracy, it can be adjusted showed below.

1. Under power off, press and key at the same time, then press key once (don't lose and key), then loose and to enter the calibration, see the following screen.



2. Press key repetitively until the is marked. Adjust the value by pressing or . Then press key to escape the calibration. It displays the following screen.

⚠ If the displayed is less than standard value, add the tension or compression value behind the sign or .



10 PACKING LIST

No.	Name	Quantity
1	Force Gauge Body	1
2	USB Adapter With USB Cable	1
3	Extension Rod(only for 10....500N)	1
4	M6 Thread adapter(only for 10....500N)	1
5	Hook(only for 10....500N)	1
6	Cone(only for 10....500N)	1
7	Flat(only for 10....500N)	1
8	Knuckle Bearing Hook(only for 1K....5K)	1
9	1# Compression Head(only for 1K....5K)	1
10	2# Compression Head(only for 1K....5K)	1
11	3# Compression Head(only for 1K....5K)	1
12	M3*12 Installation Screw	4+2
13	Carrying Case	1
14	Software CD(only for FG series)	1
15	User's Guide	1
16	Factory Inspection Report	1

Dear customers/users:

The description in the User's Guide depends on the latest products. We still improve our products, so forgive us not to tell the place of modifications for all customers. Here, we are very thankful for your understanding and support.

We strive to accomplish 100% customer satisfaction through high-quality products and good service. Based on our standard products, we can provide product modifications for your OEM applications, including shape design, functions change, etc. Our technical team is eager to satisfy any custom requirement. Please contact us for more information and suggestions.

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