Your purchase of this FORCE GAUGE marks a step forward for you into the field of precision measurement. Although this FORCE GAUGE is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.
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1. FEATURES

* Large LCD display with back light.
* 5,000 g, wide capacity, high resolution, high accuracy, high repeatability.
* 3 kind display unit : g, oz, Newton.
* Tension & compression capability.
* Peak hold (Max. load) can be held in display during make tension or compression measurement.
* Zero button can operate both for normal measuring & the "peak hold" operation.
* Full capacity zero (tare) control capability.
* Fast/Slow response time push button.
* Positive or reverse display direction select.
* Full line accessories (adapters) are included.
* Hand held & stand mounted gauges are available.
* Low power consumption gives long battery life.
* Build in low battery indicator.
* Microprocessor circuit & exclusive load cell transducer.
* Over load protection.
* RS-232 computer interface
* Built-in DC 9V power adapter input socket.
* Professional test stand (optional).

2. SPECIFICATIONS

<table>
<thead>
<tr>
<th>Display</th>
<th>LCD (Liquid crystal display).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 digits, 16 mm (0.63&quot;) digit size.</td>
</tr>
<tr>
<td></td>
<td>Back light.</td>
</tr>
</tbody>
</table>

1
<table>
<thead>
<tr>
<th><strong>Display Direction</strong></th>
<th>Positive or Reverse direction, select by the push button on the front panel.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Function</strong></td>
<td>Tension &amp; Compression (Push &amp; Pull). Normal force, Peak hold (Max. load).</td>
</tr>
<tr>
<td><strong>Peak hold</strong></td>
<td>Will freeze the display value of the Peak load (Max. load).</td>
</tr>
<tr>
<td><strong>Zero</strong></td>
<td>Zero button can be operated both for &quot;normal force&quot; or &quot;peak hold&quot; operation</td>
</tr>
<tr>
<td><strong>Unit select</strong></td>
<td>g/oz/Newton</td>
</tr>
<tr>
<td><strong>Measure Capacity</strong></td>
<td>5,000 g/176.40 oz/49.03 Newton.</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>1 g/0.05 oz/0.01 Newton.</td>
</tr>
<tr>
<td><strong>Min. Display</strong></td>
<td>3 g/0.10 oz/0.03 Newton.</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± (0.4 % + 1 digit), within 23± 5°C.</td>
</tr>
<tr>
<td><strong>Update time</strong></td>
<td>Fast Approx. 0.2 second. Slow Approx. 0.6 second.</td>
</tr>
<tr>
<td><strong>Over range Indicator</strong></td>
<td>Display show &quot; - - - - &quot; when in over range status.</td>
</tr>
<tr>
<td><strong>Data output</strong></td>
<td>RS-232 serial computer interface.</td>
</tr>
<tr>
<td><strong>Overload Capacity</strong></td>
<td>Max. 7 kg.</td>
</tr>
<tr>
<td><strong>Full Scale Deflection</strong></td>
<td>Approx. 2 mm max.</td>
</tr>
<tr>
<td><strong>Zero/tare Control</strong></td>
<td>Max. full capacity.</td>
</tr>
<tr>
<td><strong>Circuit</strong></td>
<td>Exclusive microprocessor LSI-circuit.</td>
</tr>
<tr>
<td><strong>Power Supply</strong></td>
<td>6 x 1.5 V AA (UM-3) size battery or DC 9V adapter (not included).</td>
</tr>
<tr>
<td><strong>Power Consumption</strong></td>
<td>Approx. DC 28 mA</td>
</tr>
<tr>
<td>Transducer</td>
<td>Exclusive load cell.</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C to 50°C (32°F to 122°F)</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>Less than 80% RH</td>
</tr>
<tr>
<td>Dimension</td>
<td>215 x 90 x 45 mm (8.5 x 3.5 x 1.8 inch)</td>
</tr>
<tr>
<td>Weight</td>
<td>650 g (1.43 LB) with batteries</td>
</tr>
<tr>
<td>Mounting Holes</td>
<td>Main instrument with mounting holes are provided on the back case, easy stand mounting</td>
</tr>
<tr>
<td>Accessories Included</td>
<td>Operating manual ..............1 PC.</td>
</tr>
<tr>
<td></td>
<td>Flat-head adapter ..............1 PC.</td>
</tr>
<tr>
<td></td>
<td>Hook adapter ..............1 PC.</td>
</tr>
<tr>
<td></td>
<td>Cone head adapter ..............1 PC.</td>
</tr>
<tr>
<td></td>
<td>Chisel head adapter ..............1 PC.</td>
</tr>
<tr>
<td></td>
<td>120 mm extension rod ..............1 PC.</td>
</tr>
<tr>
<td></td>
<td>Carrying case ..............1 PC.</td>
</tr>
<tr>
<td>Optional Accessories</td>
<td>* Test stand, Model: FS-1001</td>
</tr>
<tr>
<td></td>
<td>* Wedge grip, Model: WG-01</td>
</tr>
<tr>
<td></td>
<td>* RS232 cable, Model: UPCB-01</td>
</tr>
<tr>
<td></td>
<td>* USB cable, Model: USB-01</td>
</tr>
<tr>
<td></td>
<td>* Software for data logging &amp; data recorder. Model: SW-U801-WIN</td>
</tr>
</tbody>
</table>
# 3. FRONT PANEL DESCRIPTION

3-1 Universal Sensing Head
3-2 LCD Display
3-3 Fast Indicator
3-4 FAST/SLOW Button
3-5 LCD Reverse Display Button
3-6 Zero Button
3-7 \textit{g/oz/Newton Unit} Switch
3-8 Power Off/On/Peak Hold \(0 = \text{Off}, 1 = \text{On}\)
3-9 Mounting Holes/fixing Screws
3-10 Battery Cover/Compartment
3-11 Flat-head Adapter
3-12 Cone Adapter
3-13 Chisel Adapter
3-14 Hook Adapter
3-15 120 mm Extension Rod
3-16 LCD Back Light Button
3-17 DC 9V Power Adapter Input Socket
3-18 RS-232 output terminal

![Fig. 1](image)
4. MEASURING PROCEDURE

4-1 The Tension & Compression measuring function is executed automatically.

1) Compression measurement, the display will show the "-" mark automatically.

2) During the measurement, the SENSING HEAD along the adapter has to be on a line with measuring object. (ref. Fig. 2)
3) Rotate the SENSING HEAD is prohibited. Some certain angles between SENSING HEAD & measuring object are not allowed (ref. Fig. 3).

![Fig. 3](image)

4-2 Normal Measurement
1) Slide the "Power Off/On/Peak Hold Switch" (3-8, Fig. 1) to the "On" position.
   \[ 0 = \text{Off}, \quad 1 = \text{On} \]
2) Determine display unit of g, oz or Newton by selecting "g/oz/Newton Unit Switch" (3-7, Fig. 1).
3) Connect "Sensing Head" (3-1, Fig. 1) with proper "Adapter" (3-11 to 3-14, Fig. 1) and the "Measuring Object" should be in straight line. Don't give any force in standby mode.
4) "Zero Adjust" by pushing "Zero Button" (3-6, Fig. 1) before every measurement.
5) Start measurement by giving force (push or pull), then the LCD will display the Average reading value.

Note:
* During the measurement, if intend to change the display direction, just push the "Reverse Button" (3-5, Fig. 1) once.
* There are two kind sampling time of display, FAST and SLOW. Push the " FAST/SLOW Button " once ( 3-4, Fig. 1 ), if the upper left corner of LCD show " FAST " ( Fast Indicator, 3-3, Fig. 1 ), then the display reading is under the operation of fast sampling time.

* If the upper left corner of LCD not show the " Fast Indicator " ( 3-3, Fig. 1 ), the display reading is under the slow sampling time.

* Over range display of tension function, LCD will show " - - - - - "

* Over range display of compression function, LCD will show " _ _ _ _ _ "

**4-3 Peak Hold Measurement**
The meter can measure the peak value of force both of tension & compression operation. The operation procedures of Peak Hold Measurement are same as above " 4-2 Normal Measurement " but should slide the " Power Off/On/Peak Hold Switch " ( 3-8, Fig. 1 ) to the " PEAK H. " position.

Slide the " Power Off/On/Peak Hold Switch " ( 3-8, Fig. 1 ) to the " On " position will cancel the peak hold function.

**4-4 LCD Back Light On/ Off**
During the measurement, press and hold ( > 2 seconds ) the " Button " ( 3-16, Fig. 1 ) until LCD Back Light is ON, then it will be off after a period time.

several seconds then off automatically
5. BATTERY REPLACEMENT

1) When the LCD shows "Lo", it is necessary to replace the batteries. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.

2) Take out the battery cover (3-10, Fig. 1) away from the instrument and remove the batteries.

3) Install the batteries (6 x 1.5 V AA, UM-3) correctly into the battery case.

6. RS232 PC SERIAL INTERFACE

The instrument features an RS232 output via 3.5 mm Terminal (3-18, Fig. 1).

The connector output is a 16 digit data stream which can be utilized to the user's specific application.

An RS232 lead with the following connection will be required to link the instrument with the PC serial input.

<table>
<thead>
<tr>
<th>Meter (3.5 mm jack plug)</th>
<th>PC (9W 'D' Connector)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center Pin..................Pin 2</td>
<td></td>
</tr>
<tr>
<td>Ground/shield...............Pin 5</td>
<td></td>
</tr>
</tbody>
</table>
The 16 digit data stream will be displayed in the following format:

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

Each digit indicate the following status:

<table>
<thead>
<tr>
<th>Digit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0</td>
<td>End Word</td>
</tr>
</tbody>
</table>
| D1 & D8 | Display reading, D1 = LSD, D8 = MSD  
For example:  
If the display reading is 1234, then D8 to D1 is : 1234 |
| D9    | Decimal Point(DP), position from right to the left  
0 = No DP, 1 = 1 DP, 2 = 2 DP, 3 = 3 DP |
| D10   | Polarity  
0 = Positive 1 = Negative |
| D11 & D12 | Anunuciator for Display |
|        | g = 57  
Newton = 59  
oz = 58  
Kg = 55  
LB = 56 |
| D13   | 1 |
| D14   | 4 |
| D15   | Start Word |

RS232 setting

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>9600</td>
</tr>
<tr>
<td>Parity</td>
<td>No parity</td>
</tr>
<tr>
<td>Data bit no.</td>
<td>8 Data bits</td>
</tr>
<tr>
<td>Stop bit</td>
<td>1 Stop bit</td>
</tr>
</tbody>
</table>
7. MOUNTING HOLES & OPTIONAL TEST STAND

FORCE GAUGE is a precise instrument, best results are obtained when the gauge is fitted to a test stand. Mounting holes (3-9, Fig. 1) are provided on the back of the gauge for easy stand mounting.

Optional Test Stand & accessory:

* TEST STAND, Model: FS-1001
  Test stand, cooperate with Force gauge, whole system will be become the useful tool for material’s tension & compression analysis.
  Size: 630 x 250 x 230 mm. Weight: 7.02 Kg (15.4 LB).

* WEDGE GRIP, Model: WG-01
  Wedge grip, the optional accessory to install to the base of FS-1001 be used to hold the tested material.
8. APPLICATIONS

8-1 Electronics
* Test strength of solder points and spot welds on circuit boards.
* Test wire wraps on clip connection.
* Test pull strength of modified wire wrap connection on posts.
* Test spring clip insertion and withdrawal forces.
* Pull test welds in micro-electronic devices.
* Measure torque, timing belt tension, sliding friction, etc., on computer peripheral equipment.
* Test P.C. board insertion force.
* Test insertion and withdrawal forces of various circuit components such as transistors and integrated circuits.
* Test actuating force of snap action switches.

8-2 Business Equipment
* Measure force required to perforate cards.
* Measure load on slitter knives.
* Measure actuating requirements of typewriter.
* Test clutch release force.
* Measure torque, timing belt tension (by deflection), sliding friction, etc., on computer peripheral equipment.
* Test adhesion strength of labels and stickers.
* Test load on paper thickness gages.
* Measure tension of pencils.
* Test actuating requirements on push buttons and flip switches.
8-3 Chemical & Plastics
* Test film bond strengths.
* Tensile test rubber, fibers and filaments.
* Measure firmness of polyurethane foam.
* Test crush strength of pills (medicine)
* Test peel strength of adhesives.
* Measure compression of ceramic compounds.
* Test vacuum take-down pressure on process machines.

8-4 Machinery & Manufacturing
* Test load on wire feel
* Test force to open cabinet doors.
* Test sprocket chain tension.
* Test pull-out forced of drive shaft.
* Rate testing of springs in systems.
* Calibrate a cantilever beam-type Apparatus to obtain a force/deflection relationship.

8-5 Automotive
* Measure force of seat belt retractors.
* Measure arm pressure of windshield wipers.
* Measure flip force in mechanical snap action switches.
* Test effort to operate hand tool.
* Test forces required to move linkages and tension cables.
* Measure force of odometer pull.
* Test peel strength of vinyl insert bonded to body side moldings
* Evaluate physical efforts (door, look, hood, glove compartment, brake pedal, etc.).
8-6 Other Industries

* Measure pedal depression force in aircraft.
* Test hardness of gypsum wallboard.
* Test keyboard and pedal contact force of organs and pianos.
* Test force to remove cover tops of aerosol cans.
* Measure trigger pulling forces on firearms, hand tools etc.
* Test firmness of sausages in casings.
* Test integrity of seals on blister packages and plastic bags.
* Test pressure of surgical instruments (forceps, scissors).
* Test fruit removal force and fruit firmness.
* Measure force on spindles of photographic equipment