

## Instruction Manual

### FL



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#### 1. Introduction

Thank you for choosing the SAUTER FL series instrument. With correct use and regular re-calibration it will give many years of accurate and reliable service.

The FL can measure tensile and compressive forces accurately, being simply used by the operator. It may be used handheld or mounted on a fixture or test stand.

SAUTER offers software and accessories to make the force gauge even more versatile. Ask your SAUTER distributor for additional information or visit our website at [www.kern-sohn.com](http://www.kern-sohn.com)

#### 2. Before Use

After having received the unit please check that no physical damage has occurred to the packaging material, plastic case or the instrument itself. If any damage is evident, please notify SAUTER immediately.

#### 3. Operation Overview

The most common used features (such as displaying force, peak hold, zero and changing of displayed units) can all be done by pressing a single dedicated key identified on the front panel-see the *Basic Functions* section.

You can press a menu key to access the gauge configuration- see the *Main Menu* section.

#### 4. Powering the FL

The FL is supplied with a set of 4 Nickel Metal Hydride AA rechargeable batteries. For safety reasons during transportation the batteries are shipped discharged. To obtain maximum battery life we recommend that you charge them with the charger/adaptor supplied for at least 14-16 hours when you first receive the instrument.

#### 5. Battery Indicator

	Battery level > 4.8 V
	4.8 V > Battery level > 4.7 V
	4.7 V > Battery level > 4.4 V
	4.4 V > Battery level > 4.0 V
	Battery level < 4.0 V

If battery level is less than 3.9 V, The “battery empty” message will be displayed and the gauge will power down automatically.

Important: Only use the adaptor/charger supplied

#### 6. Fitting Accessories

Couple fittings directly to the load cell stem or use an extension rod. The threads are 5mm and have capacities up to 2500 N.

Ensure that the fixing does not contact the force gauge case. Ensure that anything coupled to the gauge is screwed finger-tight only. Excessive torque can damage the load cell and is not covered by warranty.

#### 7. Mounting to a Fixture or Test Stand

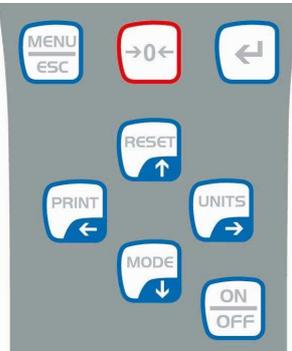
The two 10-32 threaded holes, or four 3mm thread holes on the rear of the gauge can be used for mounting the gauge. A versatile stand mounting plate is available to couple the force gauge to many brands of test stands.

#### 8. Powering up

As shown in Figure 1 the control panel has eight keys.

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**Figure 1**



As shown in Figure 1 the control panel has eight keys.

To power up the gauge, the ON/OFF key has to be pressed. A short self-test runs during which the display will show the capacity in Newton.

After the self test, providing no load has been applied to the instrument, the display will show all zeroes. This is because the gauge re-zeroes itself during the self-test routine.

*\*If a force is applied via the load cell sensor (hole at the bottom of the FL), the reading on display will register the applied force.*

*\*Forces may not show zero if it is moved during the self test routine. Once it is properly mounted and zeroed the reading will be stable.*

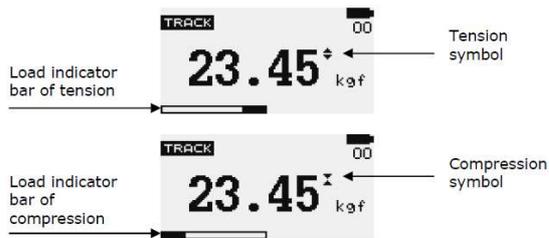
**\*Do not overload** the load sensor. This will cause irreparable damage. Forces greater than 120% of full-scale will produce an audible beep and OL symbol will blink on the display until load is release and RESET key is pressed. To power down the gauge press the ON/OFF key.

*\*All the current settings are saved when the gauge is turned off and the gauge will function in the same mode when powered up again.*

### 9. Basic Functions

Tensile forces are displayed on the FL and recognized by the symbol. Compressive forces are displayed on the FL and recognized by the symbol.

#### Display of Tension/Compression



**Figure 2** Tension and compression displays

A load indicator bar alerts the operator to how much load has been applied to the load sensor.

For tensile force the indicator bar is moving from right to left. For compressive forces the indicator bar is moving from left to right.

#### Zeroing the gauge

During the operation of the gauge it is often necessary to zero the display – e.g. when you wish to tare out the weight of a grip, so it does not become part of the measured reading. Press and release the ZERO key.

#### Changing the unit of measurement

You can choose the following units of measurement depending on the capacity of your gauge:

milliNewtons, kiloNewtons, Newtons, gram-force, kilogram-force, ounceforce or pound-force.

To change the display units, press the UNIT key. Each successive key pressed will select the next available units until the gauge returns to its original setting. The FL automatically converts readings as a new unit of measurement is selected.

*\*Note: All units may not be displayed depending on the capacity of the gauge.*

#### Changing the mode of measurement

You can choose the following modes of measurement:

Track, Peak-Tension, and Peak-Compression, to change the display mode press MODE key. Each successive key pressed will select the next available modes until the gauge returns to its original setting.

#### Track mode

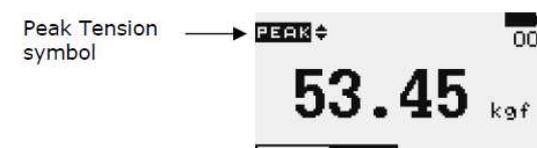
Press MODE key until the appeared on the display. The display will now indicate forces applied in both directions as they are applied to the load sensor and maintain the live display. See Figure 3a



**Figure 3a** Track

#### Peak-Tension mode

Press MODE key until the **PEAK** symbol appears on the display. The display will show the maximum tensile force. See Figure 3b



**Figure 3b** Peak Tension

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### Peak-Compression mode

Press MODES key until **PEAK** appears on the display. The display will show the maximum compressive force. See Figure 3c

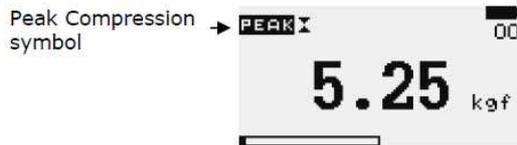


Figure 3c Peak Compression

### Resetting the gauge

Press RESET key to clear both maximum registers and prepare for detecting the next maximum readings.

### Backlight Display

If any key is pressed or forces are applied to the load sensor bigger than 0.5 % of full scale, the backlight be activated for 60 seconds.

### Saved reading to memory

Any reading can be saved anytime by pressing MEM/ENTER key. A total of 500 readings can be stored in the database included the reading unit.

### Computer Control of Force Gauge

A computer can control the force gauge by sending RS-232 commands.

RS-232 Command	Action
"m"	Changing measure mode.
"u"	Changing measure unit.
"z"	Zero the gauge.
"r"	Reset the gauge.

### RS232 output signal

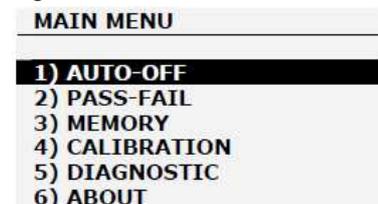
The displayed reading may be transmitted to PC by pressing the PRINT key or sending request command from PC to the gauge.

RS232 command	Action
"l"	Send live reading value with unit.
"p"	Send peak tension value with unit.
"c"	Send peak compression value with unit.
"x" or pressing PRINT key	Send live reading value with unit, if current mode is track mode.  Send peak tension value with unit, If current mode is peak tension mode.  Send peak compression value with unit. If current mode is peak compression mode.
"d"	Send memory
"i"	Send information of gauge (model, capacity, serial number, firmware revision, original offset, current offset, overload count).

### 10. Main Menu

Press MENU/ESC key to access the main menu. To move between the option listed on the main menu page, press UP and DOWN arrow keys to move the cursor. Press ENTER to select the sub-menus, activate feature and enter values. Within sub-menus UP, DOWN, LEFT and RIGHT arrow keys will also change numerical values. Press ESC to return to the main menu page.

Figure 4



#### 1) AUTO-OFF

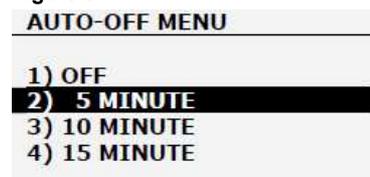
Press the MENU key, the display will show the main menu page and use UP and DOWN to move the cursor point to *AUTO-OFF*.

Press the ENTER key. The display will show the Auto-off menu page.

Press ESC key to return to the main menu page.

An Auto-off feature can be enabled to conserve battery power where the gauge powers down after 5,10 and 15 minutes (depending on Auto-off time) since the last key has been pressed. The AO will appear in the main display if you activate this feature.

Figure 5



Use UP and DOWN key to move the cursor. Press the ENTER key to select auto-off option and return to main menu page.

#### 2) PASS-FAIL

The Pass-Fail feature used to set a defined acceptable maximum and minimum forces gap for measuring. It is activated by setting the lower level and upper level forces limit. If the forces value is within the gap level, the display will show message *PASS*. Any reading values outside this gap (higher or lower), the display will show message *FAIL*. If you activate this feature the *PF* symbol will be shown on main display.

To access *PASS-FAIL* menu, Press UP and DOWN to move the cursor point to *PASS-FAIL* and press the ENTER key the display will show the Pass-Fail menu page. Press ESC key to return to the main menu page.

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**Figure 6**

PASS FAIL MENU		
UPPER =	<u>2.5</u>	N
LOWER =	1.0	N
Press 'Zero' key to Clear both value.		

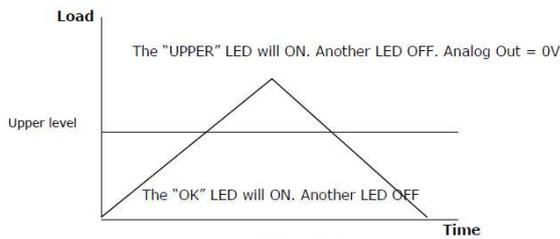
Use LEFT ARROW keys to move the cursor point to *the desired value*.

Use UP and DOWN keys to change the value, press and hold to scroll values. Use RIGHT ARROW key to change the unit. Press ENTER to save the settings and return to main menu page.

*\*Pass-Fail feature will automatically be disabled if you set LOWER and UPPER = 0 N.*

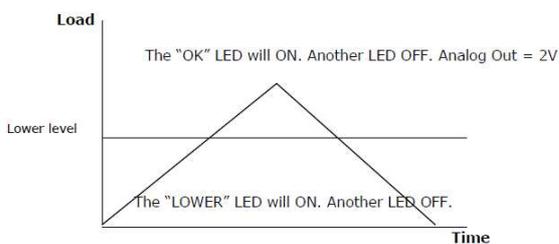
*\*LOWER must be less than the UPPER.*

**Example** LOWER LEVEL = 0 N, UPPER LEVEL = 20 N



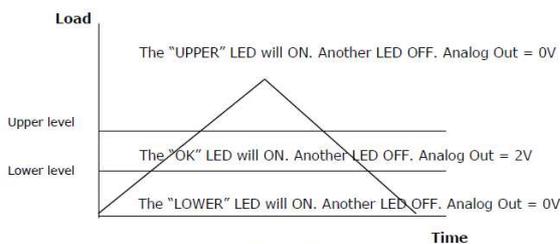
**Figure 6a**

**Example** LOWER LEVEL = 10 N, UPPER LEVEL = 20 N



**Figure 6b**

**Example** LOWER LEVEL = 10 N, UPPER LEVEL = 20 N



**Figure 6c**

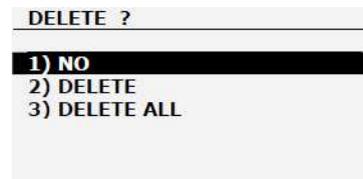
### 3) MEMORY

This is used to view the saved record, delete current record, delete all record and print data of the saved record. To access *MEMORY* menu, go to the main menu page press UP and DOWN to move the cursor point to *MEMORY* and press ENTER key the display will show the memory page. Press ESC key to return to main menu page.



**Figure 7a** Memory Page

Press UP and DOWN to change memory page, press and hold to scroll change memory page. Press PRINT key to print the memory to the serial port. Press ZERO key to access the *DELETE* menu.



**Figure 7b** Delete last Menu

Press UP and DOWN to select the delete option. If you selected *NO* and press ENTER key, the gauge will return to memory page. If you selected *DELETE* and press ENTER key the gauge will delete current saved record and return to memory page. If you selected *DELETE ALL* and press ENTER key the gauge will delete all saved record and return to memory page.

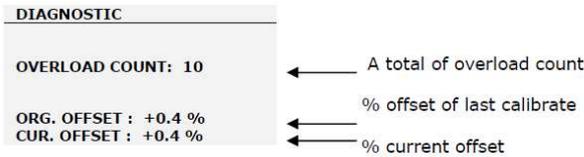
### 4) CALIBRATION

This is used by service technicians when calibrating the gauge. Contact your SAUTER distributor for details.

### 5) DIAGNOSTIC

This is used to check status of the load cell. If you suspect that your load cell transducer has sustained an overload it is possible to check the status of the load cell immediately. Place the gauge horizontally on the flat level surface and go to main menu page. Use UP and DOWN key to move the cursor point to *DIAGNOSTIC* and press ENTER key the display will show Diagnostic menu page. Press ESC to return to main menu page.

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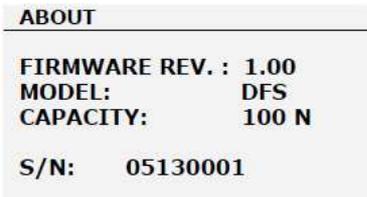


**Figure 8** Diagnostic Menu

If the % offset is between 5% - 10 % please contact your supplier to arrange a recalibration of your gauge.  
 If the % offset is greater than 10% please contact your supplier to arrange for load cell replacement.  
 These values are given as an indicator only – the need for calibration / repair may vary according to the individual characteristics of the load cell.

### 6) ABOUT

This shows the information of your gauge (Firmware revision, Model, Capacity, Serial number). To access ABOUT menu, go to main menu page and press UP and DOWN to move the cursor point to ABOUT and press ENTER key the display will show About menu page. Press ESC key to return to main menu page.



**Figure 9** About Menu

### 11. Measurement practice

For best measurement accuracy keep the compression/tension forces in line with the force gauge. Alleviate bending loads and torque loads applied to the load cell as these can adversely affect measurement performance.  
 Always keep the gauge below the capacity limit shown on the front of the gauge. If gauge is used above this capacity in either tension or compression, even for a short time, permanent load cell damage can result. Overload damage is not covered by warranty.

### 12. FL Specifications Capacity and Divisions

Capacity (N)	mN	N	kN	g-f	kg-f	oz-f	lb-f
5	5000 x 2	5 x 0.002	-	500 x 0.2	0.5 x 0.0002	17.5 x 0.010	1.1 x 0.0005
10	10000 x 5	10 x 0.005	-	1000 x 0.5	1 x 0.0005	35 x 0.02	2.2 x 0.0010
25	25000 x 10	25 x 0.010	-	2500 x 1.0	2.5 x 0.0010	87.5 x 0.05	5.5 x 0.002
50	50000 x 20	50 x 0.02	-	5000 x 2	5 x 0.002	175 x 0.10	11 x 0.005
100	-	100 x 0.05	-	10000 x 5	10 x 0.005	350 x 0.2	22 x 0.010
250	-	250 x 0.10	-	25000 x 10	25 x 0.010	875 x 0.5	55 x 0.02
500	-	500 x 0.2	-	50000 x 20	50 x 0.02	1750 x 1.0	110 x 0.05
1000	-	1000 x 0.5	1 x 0.0005	-	100 x 0.05	-	220 x 0.10
2500	-	2500 x 1.0	2.5 x 0.0010	-	250 x 0.10	-	550 x 0.2

Accuracy: ± 0.2 % of rated capacity

Operating temperature: 60 °F - 95 °F (15 °C - 35 °C)

Temperature shift at zero load: ± 0.04 % of full-scale/°C

### Output



RS-232 and USB: 8 data bits, 1 Start bit, 1 Stop bit, no parity

Baud rate: 38400

Peak Capture Rate : 0.100 S

ADC Sampling Rate : 1,000 Hz

### 13. Conversion Factor

Unit	mN	N	kN	g-f
mN	1	0.001	1e-6	101.97e-3
N	1000	1	0.001	101.97
kN	1e6	1000	1	101.97e3
g-f	9.807	9.807e-3	9.807e-6	1
Kg-f	9807	9.807	9.807e-3	1000
oz-f	278.01	0.27801	278.01e-6	28.345
lb-f	4448.2	4.4482	4.4482e-3	453.5

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kg-f	oz-f	lb-f
101.97e-6	3.597e-3	224.81e-6
101.97e-3	3.597	224.81e-3
101.97	3597	224.81
0.001	35.28e-3	2.205e-3
1	35.28	2.205
28.345e-3	1	0.0625
0.4535	16	1

### 14. Declaration of Conformity



**SAUTER GmbH**  
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#### Konformitätserklärung

Declaration of conformity for apparatus with CE mark  
 Konformitätserklärung für Geräte mit CE-Zeichen  
 Déclaration de conformité pour appareils portant la marque CE  
 Declaración de conformidad para aparatos con marca CE  
 Dichiarazione di conformità per apparecchi contrassegnati con la marcatura CE

- English** We hereby declare that the product to which this declaration refers conforms with the following standards.
- Deutsch** Wir erklären hiermit, dass das Produkt, auf das sich diese Erklärung bezieht, mit den nachstehenden Normen übereinstimmt.
- Français** Nous déclarons avec cela responsabilité que le produit, auquel se rapporte la présente déclaration, est conforme aux normes citées ci-après.
- Español** Manifestamos en la presente que el producto al que se refiere esta declaración es: a de acuerdo con las normas siguientes
- Italiano** Dichiariamo con ciò che il prodotto al quale la presente dichiarazione si riferisce è conforme alle norme di seguito citate.

#### Digital Push Pull Gauge: SAUTER FL

Mark applied	EU Directive	Standards
<b>CE</b>	89/336/EEC EMC 2004/109/EC	EN 61326 : 1997/A1:1999/A2:2001/A3 : 2003

Date: 01.04.2012

Signature:   
 SAUTER GmbH  
 Management

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