Force-Displacement Measurement Unit FSA series

A measurement unit to draw force-displacement curves
Ideal for sensation test or material characteristic evaluation
High sampling rate and high data reproducibility

The **Force-Displacement Measurement Unit FSA series comprises all the tools** necessary for conducting force-displacement measurements, including a digital force gauge, a test stand with a linear scale installed, and graphing software. A high-speed sampling rate of 2000 Hz enables accurate force measurements, resulting in highly reproducible force-displacement graphs.

By combining it with the included standard or optional attachments (sold separately), various force measurements, such as tensile force, compressive force, and peel force, can be achieved.

The detachable force gauge is suitable for various handheld measurements and is particularly advantageous for calibration and repair processes, as it can be managed independently.

Features

◎ Enable precise / highly reproducible measurements

The high-speed sampling rate of 2000 Hz enables the instrument to track rapid changes in force values. The motorized test stand ensures uniformity in test speed and force direction.

◎ Real-time force-displacement graphing

By connecting a PC and a force gauge, force-displacement data can be graphed in real-time records. PC and a force gauge are connected with the dedicated USB cable included.

◎ Graphing Software with Various Functions

A wide range of functions, such as statistical value display, graph overlay, and comment inputs. Measurement data can also be output to CSV.
Report format output functions (print, Word, Excel, and PDF) are available to enhance report creation efficiency.

◎ Applicable for various Force measurements

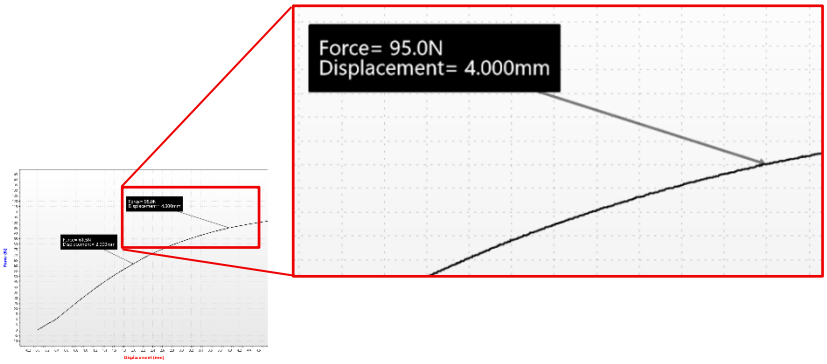
Addition to the standard attachments included optional attachments (sold separately) are available for installation. With the optional attachments, various force measurements, such as tension, compression, peel, and friction tests, are conducted according to specific needs.

Measuring examples with FSA series

- Comprresion and tension tests of various materials
- Simple evaluations of spring characteristics
- Elasticity test of various materials
- Cushioning materials repulsion tests
- Evaluation of switch characteristics
- Insertion pressure evaluation of parts
- Peeling test of adhesive tape
- Coefficient of friction measurement: film/paper, etc.

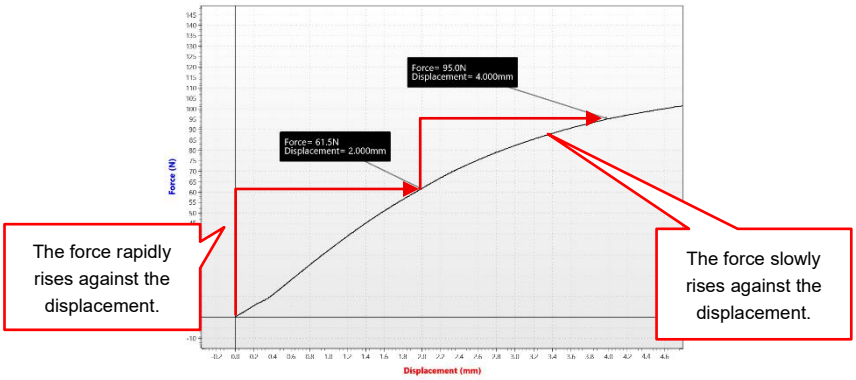
[Available data by FSA series]

Force value when the specified displacement is compressed/pulled (Displacement when compressed/pulled with the specified force value)



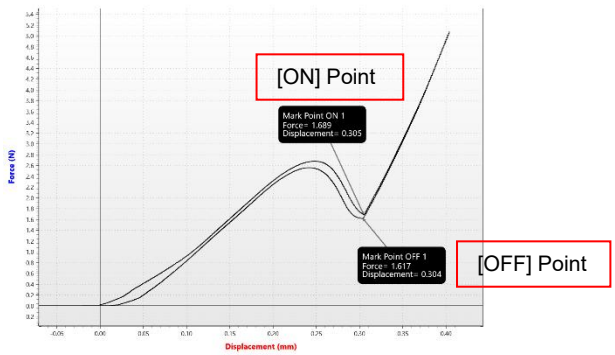
Data obtained for the amount of push-in, pulling distance, and the force value. The graphing software enables the visualization of the transition of force values and the retrieval of force values at specific displacements. Statistics such as averages and peak values are automatically detected and displayed. Comments can be inserted on the graphs.

Displacement value when a sample is broken by compressing/pulling



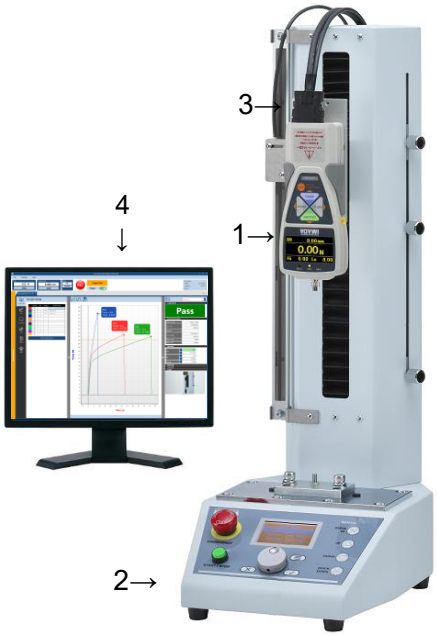
The force-displacement transition until the sample breaks is graphed. The force transition up to the break and the force change at the break can be visually confirmed. Automatically detects and displays statistical values such as peak values.

Hysteresis and returning zero



For example, in click sensation test of tactile switch, hysteresis and returning zero is obvious from the graph of a reciprocating motion. It is simple to evaluate the graph by setting threshold value, searching for returning peak values and inserting an arbitrary border line. Moreover, the point of switch ON/OFF can be automatically defined and displayed by using Mark On function.
Note: Custom-made cable is required for Mark-On function.

[Configuration]

Accessories and Descriptions	
	1. High Functionality Model Digital Force Gauge **ZTA series** Measuring instrument with an integrated load cell. In addition to force values, it displays displacement with a connection to a linear scale. The unit enables handling wide force ranges by exchanging force gauges appropriately. 2.Test Stand with pre-installed Linear Scale The test stand conduct measurement with the up/down movements of the mounted force gauge. The linear scale is pre-installed and connected to a force gauge for force-displacement measurements. The operation method and functions differ depending on the test stand model. (Refer to P6 for individual [Specifications] details.) 3. Cable **CB-718** (*1) The dedicated cable connects a force gauge to a test stand and a linear scale. By connecting a force gauge and a test stand, various interlinking functions are enabled. 4. Graphing Software (*2) **Force Recorder Professional** **Force Recorder Next Professional** Connect the force gauge and a PC by USB cable (included), for the **force-displacement graphing: PC use only.** The Test Stand Models with the Next series have Force Recorder Next Professional, a downloadable version included, and for other models, the Force Recorder Professional CD version is included. (*3,4) Included Attachments (*5) Standard attachments are included for basic tests. (Examples of included attachments)

*1 Cable CB-718 is not included in FSA-MSL.
*2 Monitor PC shown #4 in the above image is not included in this Unit.
*3 The graphing software included can be exchanged. Refer to page 5 [Option for changing the graphing software] for more details.
*4 To download Force Recorder Next Professional, user & product registration on IMADA Connected is required. An Internet connection is required in this process.
*5 The included attachments are different depending on the selected ZTA model. Refer to the specification sheet of standard attachment for the details.

[FSA Series Models]

<table>
<tr><th colspan="2">Horizontal Type</th><th colspan="2">Vertical Type
(Standard/Next series)</th></tr>
<tr><td>Models</td><td>FSA-0.5HK2-__N
FSA-2.5HK2-__N</td><td>Models</td><td>FSA-0.5K3-__N
FSA-2.5K3-__N
FSA-5K3-__N</td></tr>
<tr><td colspan="2">MH2 Series with the FSA Series
High-Cost Performance Model: Standard horizontal type model test stand. Digital settings for speed / number of repetitions / load keep time, etc.

■Maximum capacity lineup
500N/2500N</td><td colspan="2">MX3 Series with the FSA series
Upgraded version from the MX2 series.
Improved operability and software (DL version) included for Test Condition settings in Auto Test Mode.

■Maximum capacity lineup
500N/2500N/5000N</td></tr>
<tr><td colspan="2"> FSA-0.5HK2-__N
 FSA-2.5HK2-__N</td><td colspan="2"> FSA-0.5K3-__N</td></tr>
<tr><th colspan="2">Vertical Type
(Precise/Multiple functions/Next series)</th><th colspan="2">Portable</th></tr>
<tr><td>Models</td><td>FSA-0.5KE2-__N
FSA-1KE2-__N</td><td>Models</td><td>FSA-MSL-__N</td></tr>
<tr><td colspan="2">EMX2 Series with the FSA series
Upgraded version from the EMX series.
Improved operability and software (DL version) included for Test Condition settings in Auto Test Mode.

■Maximum capacity lineup
500N/1000N</td><td colspan="2">MSL-50N with the FSA Series
Compact and Manual operation type test stand. Portable and measurements conducted without a power source. Caters to outdoor or small space measurements.

■Maximum capacity lineup
50N</td></tr>
<tr><td colspan="2"> FSA-0.5KE2-__N</td><td colspan="2"> FSA-MSL-__N</td></tr>
</table>

[Selecting Model]

FSA-0.5K3-__N-__

Add the required optional code from P5-7 [Specifications (General)] and [Specifications/Individual System Details].
E.g. -L, -CN, -V45, -NEXT

Select the force range from P6-7 [Specifications/Individual System Details].
E.g. 5N, 200N and 5000N

Select from above [FSA Series Models]
E.g. FSA-1KE2 and FSA-MSL

[Basic Specifications for All Models]

FSA series		
Measurement Unit	Force	N, kgf, lbf
	Displacement*	mm, inch
Resolution	Force	4 digits (e.g. Resolution of 5N force gauge is 0.001N)
	Displacement	0.001mm (on software) 0.01mm (on force gauge display)
Accuracy	Force	+/- 0.2%F.S. +/-1 digit
	Displacement	+/- 0.1mm +/- 1digit (with no load) (*1)
Sampling cycle		2000 data/sec
Display update cycle		16 data/sec
Various functions of force gauge		Customized display (header and footer), Peak hold (tension and compression), Internal 1000 points data memory, Comparator (judgment of OK or NG), Reversible display, Sign inversion, Zero clear timer, +NG alarm, Off timer (auto power off), Dumping, Time display, 1st/2nd peak, Displacement detection at force peak value, Displacement zero reset at selected force, setting lock
Output function		USB, Serial (RS232C), +/-2VDC analog output (D/A), Comparator, Overload, Sub comparator, USB flash drive (*2)
Motorized Test Stand Power		AC100V-240V Free input (*3)
Operating Environment		Temperature:0 - 40°C Humidity:20 -80%RH
Accessories		Instruction Manual, Inspection Certificate, Warranty Certificate, Power cable, Spare hues, USB cable, Graphing software (*4, *5)

*1 When maximum force is applied, the stand may be deformed vertically as below.
FSA-0.5 to 5K2: less than 0.5mm, FSA-0.5K3 to 5K3: less than 0.5mm, FSA-0.5/1KE: less than 0.25mm, FSA-0.5KE2/1KE2: less than 0.25mm, FSA-0.5/2.5HK2: less than 0.5mm
*2 USB flash drive is not included.
*3 Power supply units are required individually for Motorized Test Stand and the Force gauge.
*4 Refer to the [Individual Model Specification Details] (Page 6-7) for the software included and details.
*5 Refer to the separate specifications sheet for the Software Operating Environment.

[Option for changing the graphing software]

- Downloadable Graphing Software Option

Applicable Models	**FSA-0.5HK2 series, FSA-2.5HKseries, FSA-MSL series**
-NEXT	With this option, **Downloadable** Graphing Software **Force Recorder Next Professional** is included instead of CD version Graphing Software Force Recorder Professional. *1 * Please add the code to the end of model. Example: FSA-0.5HK2-500N-NEXT

*1 When -NEXT option is applied, the dedicated download card providing the redemption code is included. To use the software, downloading the software from IMADA Connected is required.
* To download Force Recorder Next Professional, user & product registration on IMADA Connected is required.
* An Internet connection is required in the process of user & product registration and downloading the software.
* Some specifications such as operating environment are different from the CD version. Please refer to the specification sheet of the Force Recorder Next series for details.

- Floating license version Graphing Software Option

Applicable Models	**FSA-0.5K3 series, FSA-2.5K3 series, FSA-5K3 series, FSA-0.5KE2 series, FSA-1KE2 series**
-FLT	With this option, **Force Recorder Next Professional-FLT**[*1] is provided instead of Downloadable Graphing Software Force Recorder Next Professional. * Please add the code to the end of model. Example: FSA-0.5K3-500N-FLT

***1** Force Recorder Next Professional-FLT is a floating license version of the software that can be installed in an offline environment using a USB flash drive. Its specifications differ from those of the download version, such as the inability to install additional functions. For details, please refer to the specifications of the Force Recorder Next series.

[Individual Model Specifications Details: Models with vertical motorized test stand]

FSA Series					
Spec/Model	**FSA-0.5K3**	**FSA-2.5K3**	**FSA-5K3**	**FSA-0.5KE2**	**FSA-1KE2**
Included Force Gauge (*1)	ZTA-2N/5N/20N/50N/100N/200N/500N				
	—	ZTA-1000N ZTA-2500N	ZTA-1000N ZTA-2500N ZTA-5000N	—	ZTA-1000N
Included Test Stand (*2)	MX3-500N-FA	MX3-2500N-FA	MX3-5000N-FA	EMX2-500N -FA	EMX2-1000N -FA
Test Stand Capacity	500N	2500N	5000N	500N	1000N
Max. sample height (*3)	235mm	320mm	385mm	280mm	310mm (*4)
Speed	10 to 300 mm/min	2.5 to 300 mm/min	0.5 to 300 mm/min	0.5 to 600mm/min	
Stroke limit setting	Limit-Knobs			Digital / Limit-Knobs	
Functions of test stand	Measuring modes JOG/Manual/Auto (Cycle), Counter/Timer, Load Control, Overload Stop, Emergency Stop				
	General Settings Lock, Test Conditions Change Lock			Contact Detection, Break Detection	
				Auto Test Mode Patterns:10 patterns, Locking (General Settings, Test Conditions, Test Numbers)	
Software operation settings	✓ (*5)				
Option for Long Stroke	-L(+200mm) -2L(+400mm)	-L(+300mm)	-EXT (+200mm) (*6)	-L(+300mm)	
Option for Speed Range changes (*7)	-V45 -V90 -V450 -V600 -V900	—	—	—	
Option for External Signal Input/Output (*8)	-CN			Equipped	
Included Graphing Software	Force Recorder **Next** Professional				

*1 Refer to the digital force gauge Specification sheet for the ZTA series for details.
The capacity of the entire unit is limited by the capacity of the selected ZTA model.
*2 Refer to the individual specification sheet for test stands for details
*3 Maximum sample height means the following distance when the test stand head is at the highest position.

Model	With ___ mounted	Distance
FSA-2.5K3/FSA-5K3	ZTA-2500N/5000N	From force gauge measuring shaft tip to the test stand table
Other Series Models	ZTA-2N/5N/20N/50N/100N/200N/500N/1000N	From force gauge measuring shaft tip to the test stand table

*4 The maximum sample height varies depending on the mounting position and direction of the force gauge mounting plate. Refer to the specification sheet of each test stand for details.
*5 Downloadable operation setup software included. Refer to the specification sheet of the included test stands for details.
*6 Extended Column option**:** EXT model enables measurement of the extended height sample; the stroke distance remains unchanged.
*7 The speed change available as follows. (-V45=1.5 to 45 mm/min, -V75=2.5 to 75 mm/min, -V90=3 to 90 mm/min, V150=5 to 150 mm/min, -V450=15 to 450 mm/min, -V600=20 to 600 mm/min, -V750=25 to 750 mm/min, -V900=30 to 900 mm/min, -V1000=35 to 1000 mm/min)
When the speed is changed, the capacity may decrease. Refer to the individual specification sheet for details.
*8 [Option for External Signal Input/Output]: the function to enable the interfacing with external devices such as interlocking shields.

[Individual Model Specifications Details
: Models with horizontal motorized test stand / manual test stand]

<table>
<tr><th colspan="5">FSA Series</th></tr>
<tr><td>Spec/Model</td><td colspan="2">FSA-0.5HK2</td><td>FSA-2.5HK2</td><td>FSA-MSL</td></tr>
<tr><td rowspan="3">Included
Force Gauge
(*1)</td><td colspan="3">ZTA-2N/5N/20N/50N</td></tr>
<tr><td colspan="2">ZTA-100N/200N/500N</td><td rowspan="2">—</td></tr>
<tr><td colspan="2">—</td><td>ZTA-1000N/2500N</td></tr>
<tr><td>Included
Test Stand (*2)</td><td colspan="2">MH2-500N-FA</td><td>MH2-2500N-FA</td><td>MSL-50N</td></tr>
<tr><td>Test Stand Capacity</td><td colspan="2">500N</td><td>2500N</td><td>50N</td></tr>
<tr><td>Max. sample height (*3)</td><td colspan="2">245mm</td><td>340mm</td><td>44mm</td></tr>
<tr><td>Speed</td><td colspan="3">10～300mm/min</td><td>—</td></tr>
<tr><td>Stroke limit setting</td><td colspan="3">Limit-Knobs</td><td>—</td></tr>
<tr><td>Functions of
test stand</td><td colspan="3">Measuring modes JOG/Manual/Auto (Cycle), Counter/Timer,
Load Control, Overload Stop, Emergency Stop</td><td>—</td></tr>
<tr><td>Software operation settings</td><td colspan="4">—</td></tr>
<tr><td>Option for
Long Stroke</td><td colspan="4">—</td></tr>
<tr><td>Option for
Speed Range changes
(*4)</td><td colspan="2">-V45
-V90
-V450
-V600
-V900</td><td>-V75
-V150</td><td>—</td></tr>
<tr><td>Option for
External Signal Input/Output (*5)</td><td colspan="3">-CN</td><td>—</td></tr>
<tr><td>Included Graphing Software</td><td colspan="4">Force Recorder Professional</td></tr>
</table>

*1 Refer to the digital force gauge Specification sheet for the ZTA series for details.
The capacity of the entire unit is limited by the capacity of the selected ZTA model.

*2 Refer to the individual specification sheet for test stands for details

*3 Maximum sample height means the following distance when the test stand head is at the highest position.

Model	With ___ mounted	Distance
FSA-0.5HK2	ZTA-2N/5N/20N/50N/100N/200N/500N/1000N	From force gauge measuring shaft tip to the attachment mounting plate tip
FSA-2.5HK2:	ZTA-2500N/5000N	From force gauge measuring shaft tip to the grip mounting adaptor GF-2
FSA-MSL	ZTA-2N/5N/20N/50N/100N/200N/500N/1000N	From force gauge measuring shaft tip to the test stand table

*4 The speed change available as follows. (-V45=1.5 to 45 mm/min, -V75=2.5 to 75 mm/min, -V90=3 to 90 mm/min, V150=5 to 150 mm/min, -V450=15 to 450 mm/min, -V600=20 to 600 mm/min, -V750=25 to 750 mm/min, -V900=30 to 900 mm/min, -V1000=35 to 1000 mm/min)
When the speed is changed, the capacity may decrease. Refer to the individual specification sheet for details.

*5 [Option for External Signal Input/Output]: the function to enable the interfacing with external devices such as interlocking shields.

[RS232C Sprit Cable and RS232C Printer Options]

RS232C Sprit Cable *1	
-RS	- The RS232C Sprit Cable CB-718-RS is included instead of the standard cable CB-718. - By using the RS232C Sprit Cable, ZTA can be connected simultaneously to the motorized test stand and the external devices (RS232C communication). * Please add the code to the end of model. Example: FSA-0.5KE-500N-RS
RS232C Printer Package with a Dedicated Cable *1 *2	
-PRT	- The RS232C Sprit Cable CB-718-RS is included instead of the standard cable CB-718. - RS232C Printer BL2-58 series (Sanei Electric Inc.) is additionally included. - By using the RS232C Sprit Cable, ZTA can be connected simultaneously to the motorized test stand and BL2-58 series. * Please add the code to the end of model. Example: FSA-1K2-1000N-L-PRT

* For details on the RS232C printer and connection cable, please refer to the individual specification sheets.
*1 FSA-MSL is not eligible for this option. The test stand for the model, MSL-50N requires cable customization, to add RS232C split cable required. Please contact us for details.
*2 This product can be sold to customers in Japan and EU markets only. Please contact us if you would like to purchase the product in other regions. Data output from ZTA to RS232C printer is supported only for products with firmware Ver. 3.10 or later; For Next Series products, "RS232C Print Function" must be installed via network.

[Related Products]

Force-Deformation Evaluation Unit FSA-Q series	
	The unit facilitates the easy evaluation of sample deformation by simultaneously measuring force, displacement, and strain. Graphing software enables the creation of graphs that display each measurement value on a time axis.

* Refer to the specification of FSA-Q series for more detail.

[Cautions]

- Information in this document is subject to change without prior notice.
- This document is product descriptions and handling precautions, and do not guarantee various characteristics or safety.
- This product is designed for force measurement purpose only.
- Do not copy and use this content without authorization.
- Some sample cannot be measured depending on their materials or shapes.
- Please do not add load over capacity of a force gauge to prevent sensor break-down.
- Displacement reading error can occur due to deflection of a sensor or test stand when load is added.
- Optional attachment and PC are Not included in this unit.
- Software could not work in some operating environment.

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Visit our website for more information on a wide range of product specifications, measurement applications and videos.