Tension Meter

ZT Series

Model *ZTS*
ZTA
ZTS-DPU
ZTA-DPU

SCHMIDT
control instruments

Edition *ZT 01.E*

Operating Instructions

Valid as of: 01.04.2013 • Please keep the manual for future reference!

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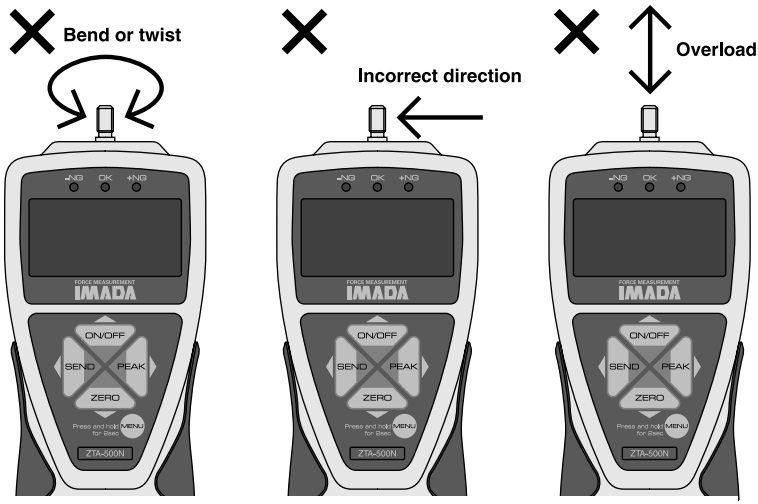
SCHMIDT · 1ST IN TENSIONMETERS WORLDWIDE

Precautions

Cautions of overload



- Keep in mind that this unit will break down if the force exceeding capacity is applied irrespective of power status.
- If the force exceeding approx. 110% of capacity is applied, the following message shows up while the power is on. In this case, please stop applying force immediately. The sensor breaks down when it is overloaded.

- The sensor breaks down when apply force to bend or twist the measuring shaft.

Cautions of use

- Use this product only for measurement.
- Read these instructions before using this product. Use it based on this instruction.
- Avoid misuse or rough treatment.
- Do not disassemble or tamper with this product.

Cautions of storage

- Please avoid oil, dust, and heat and high humidity, and keep it in a cool place.
- Please keep it after use in an attached carrying case to prevent from force or a shock applying to a measuring shaft.
- In case you remove the dirt of this unit, please do not use organic solvents, such as thinner.
- Very small electrical current is consumed also at the time of a power OFF. Please use it after charging, when it is not used for a long period of time.

Cautions of an accuracy warranty

- Although based on operating frequency or force range, measurement accuracy deteriorates little by little. We recommend periodical calibration.
- The specification temperature range of this is 0 to 40 Celsius degrees. In order to carry out more exact measurement, please use it by temperature within the limits set to the inspection certificate.

Cautions on safe

- During destruction, breaking points, or performing another test where fragments could fly out, always wear protection for the eyes and body.
- Be sure to use attached AC adapter. Otherwise, it may cause inaccuracy of measuring, fire, or a breakdown.
- When you attach this unit on a test stand etc., please read this instruction manual well and attach it correctly.

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Features

Thank you for choosing IMADA digital force gauge ZT series. This product has an easy-to-read display with superior specifications, and can be used for various kinds of tensile / compression measurement.

Organic EL display, on-demand multi display and information in English lead easy operation.

The high speed data sampling (2000 data / sec.) also helps more accurate measurement even for the measurement of sudden force change such as destruction test.

The accurate graph can be made with optional software, which supports evaluation and analyze of measurement.

Please make sure to thoroughly read this instruction manual before use to obtain the maximum benefit from this instrument.

1. Models

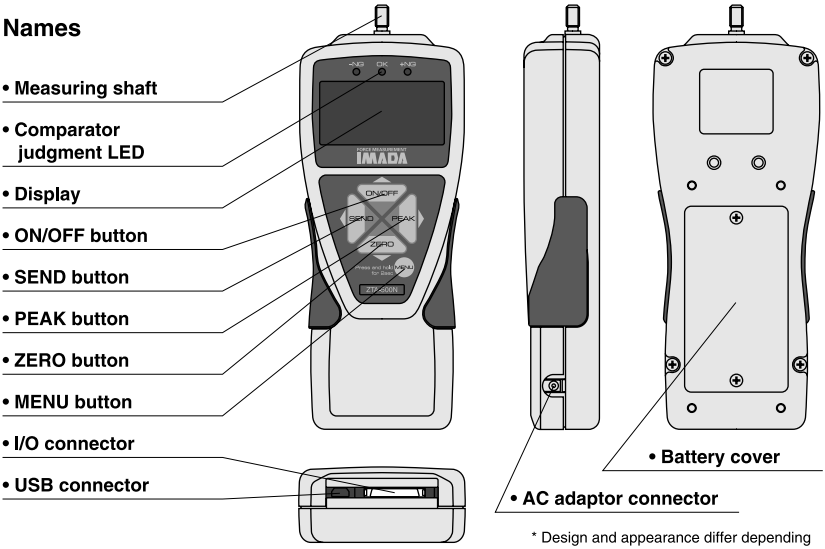
ZT series consists of ZTA series with USB memory connection and displacement output function, and ZTS series without the connection and function.
The separated sensor models are also available.

Model		Capacity	Display	Resolution
Standard	**ZTA(ZTS)-2N**	2N	2.000N	0.001N
	ZTA(ZTS)-5N	5N	5.000N	0.001N
	ZTA(ZTS)-20N	20N	20.00N	0.01N
	ZTA(ZTS)-50N	50N	50.00N	0.01N
	ZTA(ZTS)-100N	100N	100.0N	0.1N
	ZTA(ZTS)-200N	200N	200.0N	0.1N
	ZTA(ZTS)-500N	500N	500.0N	0.1N
	ZTA(ZTS)-1000N	1000N	1000N	1N
High Capacity	**ZTA(ZTS)-2500N**	2500N	2500N	1N
	ZTA(ZTS)-5000N	5000N	5000N	1N
Separated Sensor*	**ZTA(ZTS)-DPU-2N**	2N	2.000N	0.001N
	ZTA(ZTS)-DPU-5N	5N	5.000N	0.001N
	ZTA(ZTS)-DPU-20N	20N	20.00N	0.01N
	ZTA(ZTS)-DPU-50N	50N	50.00N	0.01N
	ZTA(ZTS)-DPU-100N	100N	100.0N	0.1N
	ZTA(ZTS)-DPU-200N	200N	200.0N	0.1N
	ZTA(ZTS)-DPU-500N	500N	500.0N	0.1N
	ZTA(ZTS)-DPU-1000N	1000N	1000N	1N
	ZTA(ZTS)-DPU-2000N	2000N	2000N	1N
	ZTA(ZTS)-DPU-5000N	5000N	5000N	1N
	ZTA(ZTS)-DPU-10KN	10KN	10.00kN	0.01kN
	ZTA(ZTS)-DPU-20KN	20KN	20.00kN	0.01kN

* Various kinds of load cell other than DPU are available.

2. Names and Functions

Names



* Design and appearance differ depending on the model and range.

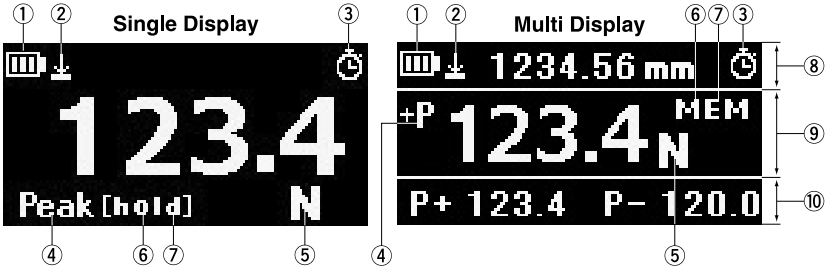
Functions

ON/OFF button	Turn ON/OFF the power. Select menu.
ZERO button	Zero values. Select menu.
PEAK button	Toggle between “Peak mode” and “Track mode”. Select menu.
SEND button	Save data. Send data to a printer and a computer. Select menu.
MENU button	Go to Set up mode and measurement mode. Enter settings.
Display	Show values, settings and the status.
Comparator judgment LED	Judge force values according to set comparator values.
Measuring shaft	Detect force values of tensile and compression measurement. Various kinds of attachment can be attached.
AC adaptor connector	Recharge battery with AC adaptor.
USB connector	For data sending to PC with USB cable (included). ZTA only: Save data on USB memory (excluded).
I/O connector	Connect with other equipments, i.e. test stand and PC, with optional cables to control the force gauge and the equipments.
Battery cover	Rechargeable battery inside. The battery can be replaced.*

* Refer to the page 34.

2. Names and Functions

Display

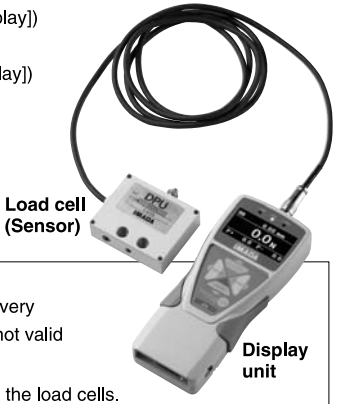


① **Battery** / Battery status
② **Displacement value zero** / Valid or invalid: Zero displacement value at arbitrary force value.
(Refer to page 21, [8. Function Setting, Displacement reset]) (*1)
③ **Auto Zero Timer** / Valid or invalid: Zero force value after arbitrary time.
(Refer to page 21, [8. Function Setting, Auto Zero Timer])
④ **Peak mode** / Valid or invalid (Refer to page 20, [8. Function Setting, Peak Functions])
⑤ **Unit** / Measurement units
⑥ **Data hold** / Valid or invalid: Holding measuring values.
([hold] is displayed instead of [mem] on Multi display, while holding values.)
⑦ **USB memory** / On: Connected, Flashing: Sending data.
([mem] is displayed on Simple display, while USB memory is connected.)
⑧ **Header** / (Refer to page 13, [6. Single display / Multi display])
⑨ **Middle display**
⑩ **Footer** / (Refer to page 14, [6. Single display / Multi display])

*1 Only for ZTA

Separated sensor model ZTA(ZTS)-DPU

ZTA (ZTS) – DPU is connected to load cells (sensors) with cables and does not contain load cells inside.



- This display unit needs to be adjusted every after replace load cells. The display is not valid with more than two load cells.
- Make sure to use the cables included to the load cells.
- A connector must be inserted to the right direction and please do not connect with force.

3. Accessories

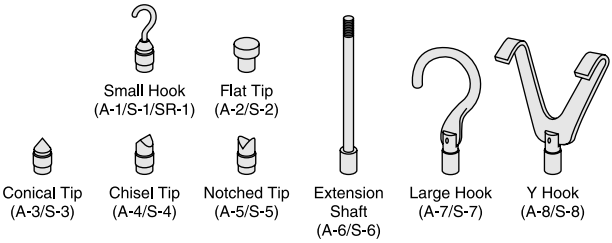
The following accessories are included. Make sure to keep them in the carrying case. Carrying case is necessary when transport to protect the force gauge and its sensor.

Accessories of ZTA / ZTS

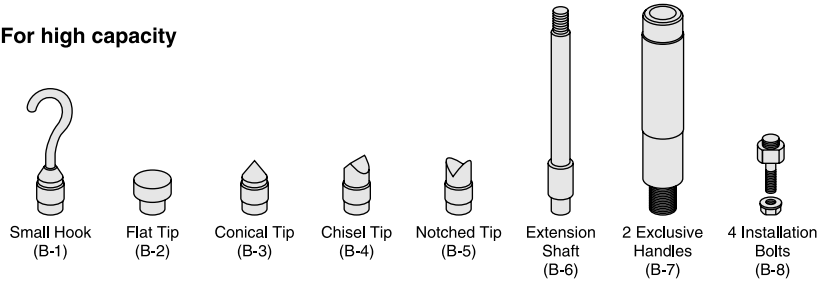
• Instruction manual (This book) • Inspection certificate • Warranty • AC adapter
• Carrying case • 8 attachments • USB cable • Driver CD-ROM • Reverse sticker
• Adapter for USB memory (ZTA only)

For standard

- Type A: capacity up to 100N
- Type S: capacity from 200N to 1000N



For high capacity



- **Separated sensor model includes different attachments depending onload cell models.**
- Standard attachments are included to ZTA(ZTS)-DPU-2N to 500N.
- High capacity attachments (B1 to B6) are included to ZTA(ZTS)-DPU-1000N to 5000N.
- No attachments are included to ZTA(ZTS)-DPU-10kN and 20kN. The sensor has female screw.

4. Preparation

4-1. Charge

Charge the battery with included AC adapter when use the force gauge at the first time. Charging completes in approx. 8 hours (when power is off). Three types of battery mark show up depending on remaining power. Charge the battery when  shows up. Battery mark flashes while charging, and stop flashing when completed.

- Make sure to use the included AC adapter only. The accuracy is not guaranteed and break down and fire may occur when use other AC adapters.
- The battery may be dying when charged power is low or not charged at all. Replacement of battery is recommended. Please refer to the page 34.
- Please note the date and time setting is reset when battery dies and replaced.

4-2. Mount of Attachments

Mount appropriate attachment to the measuring shaft. The direction can be adjusted with the included nut.

- Applying the force to wrong direction or using tools to mount an attachment will cause load cell damage. For safety, please mount an attachment while checking a display value.
- The point where force is applied should come to the point where a hook crosses an extension of the gauge measuring shaft when you use a hook attachment. If force is applied at a tip of hook, it may bend or break and is very DANGEROUS.
- The weight of attachment is detected as force to the sensor. We recommend the weight of attachment should be under 10% of gauge capacity.

4-3. Mount on test stand

This force gauge can be attached to a test stand. The four holes on the back can be used for mounting. Refer to the page 39.

Standard mode

Mount the force gauge to a mounting plate of a test stand with four screws included to the test stand.

Mount the mounting plate on the test stand.

High capacity model

Attach the included four installation bolts (B-8) to the force gauge. Mount the force gauge to a mounting plate of a test stand and mount the plate on the test stand.

Refer to the instruction manual of test stand for detail.

- Make sure to use the screw with the length shorter than 6 mm (Standard model).
- Make sure to use the included bolts (B-8) to mount ZTA(ZTS)-2500N and 5000N.

5. Basic Operation

The force gauge detects the force applied to the direction of a measuring shaft.
The measurement is done on Peak mode or Track mode.

Functions	Operation	Description
Power on	 Press	Turn on power. The introduction message shows up first, and measurement can be started after the message disappears. The introduction message and multi display (Header) show time setting.
Shut off	 Hold for more than one second.	Turn off power.
Zero values	 Press	Zero values. Refer to the page 16 for detail.
Peak / Track mode	 Press	Toggle Peak mode and Track mode.
Memory saving / Dada sending	 Press	Save data to the internal memory. Enable to send data to PC and other equipments at the same time. Refer to the page 17 for detail.

6. Single display / Multi display

Select either Single display or Multi display.
Refer to the page 22 for detail of toggling.

6-1. Single display

Display force value only.

* Displacement value can be checked on Multi display (ZTA only).

Single display

6-2. Multi display

Display force value on the middle display.
The contents on the header and footer are selectable.

Multi display

6-3. Setting of Multi display

Press MENU (MENU button) at measurement-ready display and the header lights on.

Press SEND PEAK (SEND, PEAK button) to select contents while lighting on.

Press MENU (MENU button) and the footer lights on.

Press SEND PEAK (SEND, PEAK button) to select contents while lighting on.

Press MENU (MENU button) and go back to measurement-ready display.

6. Single display / Multi display

Refer to the page 15 for how to set.

Multi Display: Menu on header.

	Contents	Description	Valid Model
Header	**Date**	Date	ZTA/ZTS
	Time	Time	ZTA/ZTS
	Number of memory	The number of saved force value.	ZTA/ZTS
	Number of +NG	The number of force value exceeding set comparator (High) value. Zero with  (ZERO button) while this content lights on.	ZTA/ZTS
	Displacement	Displacement. Zero with  (ZERO button) while this content lights on. (*)	ZTA
	Average	Average of saved force value. Unit is disregarded.	ZTA

* Test stand with linear scale option is needed.

Multi Display: Menu on footer

	Contents	Description	Valid Model
Footer	**Comparator High / Low values**	Set comparator High / Low values. Enable to set the values with  (MENU button) while this content lights on. Change values with  (ON/OFF, ZERO button) and enter with  (MENU button).	ZTA/ZTS
	+/- Peak	Force peak value. Zero with  (ZERO button) while this content lights on. Show either or both peak value of tensile / compression directions, depending on [AND] [OR] selection. Refer to the page 20.	ZTA/ZTS
	1st / 2nd peak	1st and 2nd force peak value. Zero with  (ZERO button) while this content lights on. P1 shows 1st, and P2 shows 2nd peak values.	ZTA
	Force bar graph	The rate of force value among capacity.	ZTA/ZTS
	The latest memory value	Show the latest memory data. Press  (MENU button) to show all the memory data with  (ON/OFF, ZERO button) while this content lights on.	ZTA/ZTS
	Max. / Min. values of memory	Show maximum and minimum values among memory data. Force data only.	ZTA

7. Initial Setting

1. Turn off power.

2. Hold 

(MENU button) and turn on power with 

(ON/OFF button).

3. Select menu in Main menu with 

(ON/OFF, ZERO buttons), and go to Sub menu with 

(PEAK button). (Some menu doesn't have Sub menu.)

4. Select menu in Sub menu with 

(ON/OFF, ZERO buttons), and go to Setting menu with 

(PEAK button). Go back to Main menu with 

(SEND button).

5. Select menu in Setting menu with 

(ON/OFF, ZERO buttons), and enter the setting with 

(MENU button).

   (The setting can be saved only when entered with MENU button.)

6. The display automatically goes back to Sub menu after entering.

   Go back to Main menu with 

(SEND button).

7. Hold 

(MENU button) for more than two seconds and go back to measurement-ready display.

Initial Setting (Setup Menu)

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Units	**Force Units**	[N] / [kN] / [mN] / [gf] / [kgf] / [ozf] / [lbf] (*1) (Valid selection differs depending on capacity.)	Change force units.	ZTA/ZTS	N basis

*1 Selectable units differ between Japan model and non-Japan model

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Units	**Displacement Units**	[mm] / [°] / [inch] (*1)	Change displacement units	ZTA	mm
+/- Indicator	**+/- Force**	[+/-Normal] / [+/-Reverse]	Change +/- signs of force value. [Normal] +: compression, -: tensile. [Opposite]+: tensile, -: compression	ZTA/ZTS	Normal
	+/- Displacement	[+/-Normal] / [+/-Reverse]	Change +/- signs of displacement value. (*2)	ZTA	Normal
Sensitivity	—	[Max] / [High] / [Medium] / [Low]	Change sensitivity of force measurement. [Max] is the highest sensitivity. [Max] is suitable for rapid change like impact test.	ZTA/ZTS	Max
Displacement Type	—	[OFF] / [Type A] / [Type B] / [Type C] / [Type D] / [Type E] / [Manual]	Select when connect with displacement scale. Refer to the operation manual of test stand for detail. Enable to manually set at [Manual]. Refer to the page 23 for detail.	ZTA (*2)	OFF
Zero / Tare Reset	—	[All reset] / [Peak only]	Select zero contents. [All reset]: Zero all the displayed values. [Peak only]: Press the button to zero peak value. Hold the button to zero the measuring force value. Displacement value is not reset.	ZTA/ZTS	All reset

*1 Selectable units differ between Japan model and non-Japan model.
*2 A test stand with linear scale option is needed to measure displacement.

7. Initial Setting

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Send Function	—	[Display value] / [+Peak] / [-Peak] / [+/-Peak] / [1st Peak] / [2nd Peak] / [1st/2nd Peak]	Select data sent to external equipment. [Display value]: Send displayed value. On multi display the value on the middle display is sent. [+Peak]: Send + Peak value. [-Peak]: Send - Peak value. [+/-Peak]: Send + and - Peak values. [1st Peak]: Send 1st Peak value. [2nd Peak]: Send 2nd Peak value. [1st / 2nd Peak]: Send 1st and 2nd Peak values. Refer to the page 25-26 for detail.	ZTA/ZTS (*3)	Display value
Date Format	—	[YYYY/MM/DD] / [MM/DD/YYYY] / [DD/MM/YYYY]	Select display type. Y: Year, M: Month, D: Date	ZTA/ZTS	YYYY/ MM/ DD
Language	—	[Japanese] [English] and more	Select languages.	ZTA/ZTS	English

In addition, the selected data is memorized into the inner memory when press [SEND], and sent to external equipments via USB/RS232C/Digimatic.

*3 The function of 1st / 2nd Peak is valid only for ZTA.

8. Function Setting

1. Hold 

(MENU button) for more than two seconds while power is on.

2. Select menu in Main menu with 

(ON/OFF, ZERO button), and go to Sub menu with 

(PEAK button). (Some menu doesn't have Sub menu.)

3. Select menu in Sub menu with 

(ON/OFF, ZERO button), and go to Setting menu with 

(SEND button).

(Go back to Main menu with 

(PEAK button.)

4. Select menu in Setting menu with 

(ON/OFF, ZERO button), and enter the setting with 

(MENU button).

(The setting can be saved only when entered with MENU button.)

5. The display automatically goes back to Sub menu after entering.

Go back to Main menu with 

(SEND button).

6. Hold 

(MENU button) for more than two seconds and go back to measurement-ready display.

8. Function Setting

Function Setting (Program Menu)

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
High / Low Setpoints	**High**	+/- [0000 to 9999]	Set Hi and Low values. LED and output signal show whether the measurement value is below, within, or above the set values. -NG: Displayed value < Low setpoint OK: Low setpoint ≦ Displayed value ≦ Hi setpoint +NG: Displayed value > Hi setpoint	ZTA/ZTS	+Capacity
	Low	+/- [0000 to 9999]			-Capacity
High / Low Output	**Value no.1**	+/- [0000 to 9999]	Set sub comparator value to judge whether displayed value reaches the set value. The result is output to external equipment. OFF: Displayed value < No.1 or No.2 setpoint. ON: No.1 or No.2 setpoint ≦ Displayed value This function is only for output.	ZTA	0000
	Value no.2	+/- [0000 to 9999]			0000

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Peak Functions	**[and] [or] Peak**	[and] / [or]	[and] Both compression and tensile peak values are displayed in order of compression peak, tensile peak, force value, with  (PEAK button). [or] Either compression or tensile peak value which is higher absolute value is displayed. Refer to the page 25 for detail.	ZTA/ZTS	OR
	Auto Peak Memory	[ON] / [OFF]	The data is automatically saved whenever  (ZERO button) is pressed.	ZTA/ZTS	OFF
	1st / 2nd Peak Drop	Absolute value [0000 to 9999]	The peak drops to detect 1st and 2nd peak values. Refer to the page 26 for detail.	ZTA	0000

8. Function Setting

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Displacement Reset (*1)	**Reset Condition**	[OFF] / [Once] / [Each time]	The condition to zero displacement value. [Once] Rest displacement value once when the force value reaches to the set reset value after zero values. [Each time] Zero displacement value whenever the force value reaches to the set reset value.	ZTA	OFF
	Reset value	Absolute value [0000 to 9999]	Zero the displacement value when the force value reached to the set value.		0000
Internal Memory	**Data recall**		The saved data in the internal memory is displayed.	ZTA/ZTS	--
	Data Delete	[Last Data Delete] / [All Data Delete]	Delete the saved data.		--
USB Memory	**Export to USB**	—	Transport data in internal memory to USB memory. Refer to the page 28 for detail.	ZTA	--
	USB disconnect	—	Disconnect USB memory from force gauge.		--
Auto Zero Timer	—	[1 to 60 sec.] / [OFF]	Automatically zero values after set time period.	ZTA/ZTS	OFF
Sound	**Keypad Beep**	[ON] / [OFF]	Operating sound of buttons.	ZTA/ZTS	ON

*1 A test stand with linear scale (option) is needed to measure displacement.

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Sound	**High / Low Alarm**	[ON] / [OFF]	Alarm when the force value exceeds the comparator High setpoint.	ZTA/ZTS	OFF
Display Functions	**Display Format**	[Single Display] / [Multi Display]	[Single Display] Display force value only. [Multi Display] Display force value on the middle display. The contents on the header and footer are selectable.	ZTA/ZTS	Multi Display
	Brightness	[Bright] / [Power Save]	Adjust brightness of the display. It automatically turns to [Power Save] mode even chosen [Bright] when no-operation conducted. It goes back to [Bright] when use. (*2)	ZTA/ZTS	Power Save
	Reverse Display	[ON] / [OFF]	Reverse the display up-side down. Recommended for measurement with test stand.	ZTA/ZTS	OFF
	Auto Shut Off	[OFF] / [5 min] / [10 min] / [30 min] / [60 min]	Automatically shut off after the set time period when no operation conducted.	ZTA/ZTS	10 min
Data and Time	**Date Set**	[Year] / [Month] / [Date]	Date & Time setting. [Hour] is on 24 hours basis.	ZTA/ZTS	----/--/--
	Time Set	[Hour] / [Minute]			--:--

*2 [Bright] mode consumes the battery more than [Power Save] mode.

9. Measurement of Displacement (ZTA only)

ZTA series can detect both force and displacement values.
(A displacement meter needed.) Displacement Type is [OFF] at default.
Select appropriate Displacement Type depending on displacement meters.

9-1. Connect to a test stand with linear scale by IMADA

Please refer to the operation manual of test stand for Displacement Type.
Please choose from [Type A] to [Type E].

9-2. Connect to a displacement meter not by IMADA

Please choose [Manual].

* Please refer to the specification sheet of external output on page 40 to 50.

- When you choose [Manual], make sure to check the difference between the displayed displacement value and the actual displacement, by using digital length meter and so on.
- The battery is consumed more when connected with a test stand with linear scale. Please connect AC adapter or charge frequently when long hours operation.

9-3. Display of displacement

The displacement is displayed on the header on Multi display.
Please refer to the page 13 for setting.

9-4. Display of displacement at peak force

This function is recommended when graphing is not needed such as destruction test. When displacement is displayed on the header at Peak mode on Multi display, the displacement at peak force is displayed.

* The displacement corresponds to the force value on the middle display on Multi display.
* The displacement is not displayed when [1st Peak], [2nd Peak] and [1st / 2nd Peak] is chosen as SEND button setting. In this case, the displacement can be only saved and sent to external equipment. (Send Functions: Refer to page 17.)

9-5. Displacement Zero

Zero displacement only.

Press 

(MENU button) at measurement display and choose displacement on the header on Multi display. Press 

(ZERO button) to zero displacement.

10. Peak Value

Peak is the maximum force value of measurement.

Press 

(PEAK button) and [P] or [Peak] is displayed at left side of display.

[P] and [Peak] mean Peak mode.

- In case of [OR] at Peak mode, higher peak value among compression and tensile peak values is displayed.

  Press 

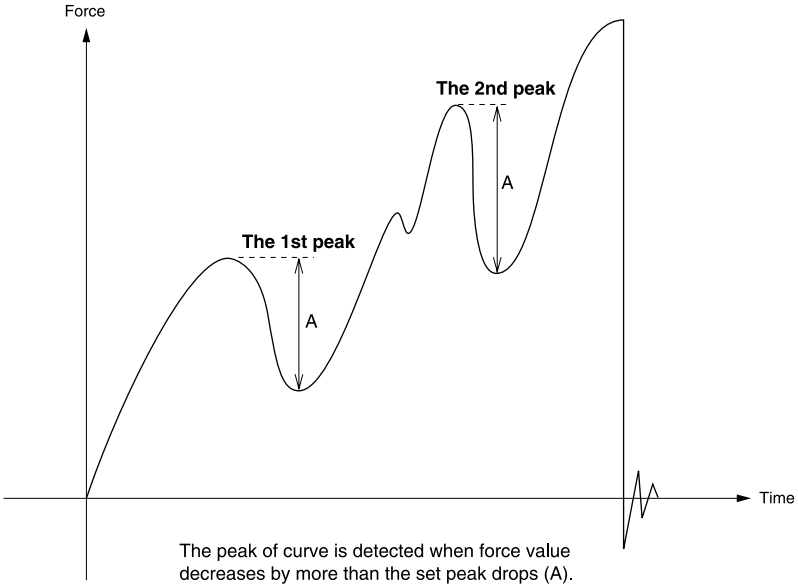
(PEAK button) and peak value, measuring value, and peak value are displayed in order.

- In case of [AND] at Peak mode, both peak value of compression and tensile are displayed. Press 

(PEAK button) and compression peak, tensile peak, measuring value, and compression peak are displayed in order. In case that +/- sign is chosen as [+/-Reverse], tensile peak, compression peak and measuring value in order.

11. 1st / 2nd Peak Value (ZTA only)

The peaks of the first and the second curves, instead of the peak of whole measurement, can be detected.
The 1st peak as [P1] and the 2nd peak as [P2] are displayed on the footer on Multi display.



The 1st and the 2nd peak drops (decreasing value) can be set on “1st / 2nd Peak Drop” of “Peak Functions” in Program Menu. Refer to page 20. After force value increases, the peak of curve is detected as the 1st (2nd) peak when the force value decreases by more than the set peak drops. (See above picture)

* The set peak drop should be absolute value.

The 1st and the 2nd peaks can be detected on one direction (compression or tension). The direction of the 2nd peak follows one of the 1st peak.

12. Output

12-1. Output to USB memory: ZTA series only

ZTA can be connected to USB memory (excluded) using the included adapter. Data of internal memory can be sent to USB memory and measuring data can be saved in USB memory at real time.

12-1-1. Connection to USB memory

Connect USB memory (excluded) to ZTA with included adapter. MEM (MEM mark) shows up on measurement-ready display when ZTA detects USB memory.

Valid USB memory

- USB mas storage class
- USB 2.0/1.1
- Max. current: less than 200mA
- Format: FAT16/FAT32

* Some USB memory may not be used even meeting the above conditions. Please try another USB memory. Please do not connect other equipment such as USB fan and USB cleaner.

- Data cannot be output to RS232C and digimatic interface when connected to USB memory.
- Please note that we do not guarantee data even if data in USB memory is lost when connecting to ZTA.
- Do not leave USB memory under the strong sun light to avoid transform and discoloration.
- The battery is more consumed when connected to USB memory. Please charge the battery frequently or keep the AC adapter connected to ZTA when use for a long hours.

12-1-2. Data transport

Transport data in the internal memory to USB memory.

Refer to page 21. [8.Function Setting, USB Memory]

Program Menu → **USB Memory** → **Export to USB**

The following message shows up during transport. (Do not remove the USB memory.)
The message disappears when transport ends.

* Data in the internal memory is not deleted when transported. Please delete it when needed.
* Please refer to the page 43 for file format of USB memory.
* The data is transported to the new file of USB memory. (Not re-written)

- Do not disconnect USB memory during transport.
- Please make sure to follow the direction to disconnect USB memory, otherwise data can be lost.

12-1-3. Data saving at real time

Save measuring data to USB memory at real time without saving to internal memory.
The saving speed is fixed as 100 data per second.

12. Output

12-1-4. Start and stop of saving

MEM (MEM mark) shows up, press 

(SEND button) to start saving data in USB memory. Press 

(SEND button) again to stop saving.

MEM (MEM mark) blinks during saving.

* Please refer to the page 43 for file format of USB memory.
* The data is saved in the new file of USB memory. (Not re-written)

12-1-5. Disconnect of USB memory

Please make sure to follow the direction below to disconnect USB memory from ZTA.
Refer to page 20. [8.Function Setting, USB Memory]

Program Menu → **USB Memory** → **USB Disconnect**

[MEM] disappears when USB memory is ready to be disconnected.
Make sure to disconnect USB memory after [MEM] disappears.

- 100 data/sec. is saved in USB memory, while the sampling speed of ZTA is 2000 data/sec. The measuring value can differ between one displayed on ZTA and one saved in USB memory because of the speed difference.
- Optional software Force Recorder is recommended for measurement with sudden force change such as destruction test. Force Recorder can receive 2000 data/sec the same speed of ZT series.
- Do not disconnect USB memory during saving.
- Please make sure to follow the direction to disconnect USB memory, otherwise data can be lost.

12. Output

12-1-4. Start and stop of saving

MEM (MEM mark) shows up, press 

(SEND button) to start saving data in USB memory. Press 

(SEND button) again to stop saving.

MEM (MEM mark) blinks during saving.

* Please refer to the page 43 for file format of USB memory.
* The data is saved in the new file of USB memory. (Not re-written)

12-1-5. Disconnect of USB memory

Please make sure to follow the direction below to disconnect USB memory from ZTA.
Refer to page 20. [8.Function Setting, USB Memory]

Program Menu → **USB Memory** → **USB Disconnect**

[MEM] disappears when USB memory is ready to be disconnected.
Make sure to disconnect USB memory after [MEM] disappears.

- 100 data/sec. is saved in USB memory, while the sampling speed of ZTA is 2000 data/sec. The measuring value can differ between one displayed on ZTA and one saved in USB memory because of the speed difference.
- Optional software Force Recorder is recommended for measurement with sudden force change such as destruction test. Force Recorder can receive 2000 data/sec the same speed of ZT series.
- Do not disconnect USB memory during saving.
- Please make sure to follow the direction to disconnect USB memory, otherwise data can be lost.

12-2-4. Installation of data logger software ZT-Logger

Install data logger software ZT-Logger after installation of driver.
Select CD drive in My Computer and click an icon of Setup. (CD-ROM is still inserted to PC.) Follow the direction of ZT Logger Installation manual to install.

• Some PC and environment may not correspond to the CD-ROM. Please get a contact with your local distributor or us in this case.

12-3. Output on RS232C/USB

Connecting with external equipments, data transport and control of force gauges are possible. The connection is based on RS232C (optional cable) and USB (included cable).

Condition

Data bits	8 bit
Stop bit	1 bit
Parity bit	None
Transmission rate	19200bps

Commands

The command is common among RS232C and USB interface.
The force gauge basically responses after receiving commands.
Commands and responses are consisted of ASCII code.
Commands and responses are followed by code [CR]. The force gauge responses when receive code [CR].
The force gauge sends E[CR] when a wrong command is sent.
Please refer to the page 44-50 for commands in detail.

12-4. Analog output

12-4-1. Analog output: D/A (standard spec.)

Analog voltage is always output depending on measuring force value. (+/- 2V when max. force is applied.)

Force value can be recorded at real time by connecting to external equipments with analog cable (excluded).

Analog output

Data update: 2000 data / sec.

Zero adjustment: within +/-20mV

Accuracy: 1% or less

* Connect to the external equipments with resistance 1kΩ and more.

* The analog output is unstable when the introduction message shows up on the display. Please use the analog output during measurement.

12-4-2. Analog output: RAW (optional spec.)

The raw analog data is output without digital processing.

The response speed is fast, but zero reset is invalid. (Noise may also be detected as the data is not filtered.)

Output voltage is approx. +/-1v when max. force is applied. The voltage may differ depending on load cells of separated sensor model.

* Connect to the external equipments with input resistance 1kΩ and more.

* Please refer to the data sheet included to RAW option model.

12. Output

12-5. Digimatic Output

Force value can be printed out by connecting to Mitutoyo Digimatic mini-processor DP-1VR with optional cable. Please refer to the instruction manual attached to DP-1VR.

Press 

(SEND button) to print data out to DP-1VR.

Data can be printed out with DATA (DATA button) on DP-1VR, too.

The sent data is the value chosen at “SEND function” of Setup Menu.

Print out all the saved data

To print out all the saved data, go to

Program Menu → **Internal Memory** → **Data storage**

and press DATA (DATA button) on DP-1VR.

It takes time to print out big number of data.

To stop printing, turn off DP-1VR.

* Unit should be the same among all the data saved in the force gauge, otherwise it cannot be printed out.

* Some equipment with digimatic output may not be used with the force gauges.
* Digimatic output is only for force value. To output displacement value of ZTA series, save data in the internal memory of ZTA which can be sent to USB memory.

13. Maintenance

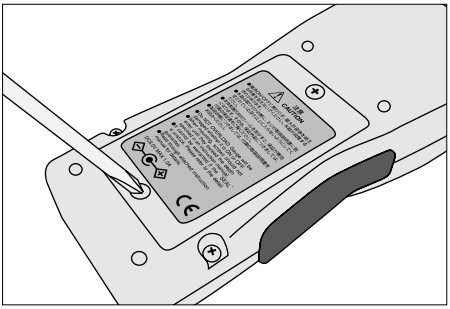
13-1. Battery Change

The force gauge has rechargeable battery inside.

If the battery is worn out soon after charging or not charged at all, the battery is dying.

Please change the batteries. (Battery model: BP-308)

The direction is as follows.



Turn off the force gauge.

Loosen the two screws on the back of force gauge and remove the battery cover.

Take the battery out and disconnect the connector.

(Pull off the connector with tweezers and needle nose pliers.)

* Please note that the cable may get bad if force to pull the cable out.

Connect the connector of the new battery.

Put the new battery into the case and fix the battery cover with the screws. Make sure to store the cable of battery inside.

- Do not use any battery except BP-308. Other battery may lead break down and fire.
- The date and time setting is reset when battery is disconnected.

13. Maintenance

13-2. Calibration and Repair

We offer calibration service with charge. To maintain the best accuracy and reliable measurement, the periodical calibration is recommended.
Please ask your local distributor about fee and lead time.
Please note that the function setting (Program Menu) and saved data may be erased when repaired.
Please make sure to send the force gauge with the carrying case to protect the gauge.

14. Warranty

We warrant the products to be free from defects in workmanship and material under normal use and proper maintenance for one year from original purchase.

* Please make sure to read through the included warranty for guarantee conditions.
* We cannot guarantee the products without warranty.

15. Specifications

Model	ZTA	ZTS
Feature	Advanced model with various functions such as data saving in USB memory stick, displacement I/O and more.	Standard model with the same benefit in performance as ZTA series but reduced functions.
Accuracy	+/-0.2%F.S.+/-1digit (*1)	
Unit of measurement (*2)	N, kgf, lbf (*3)	
Display	4-digit with sign	
Display update	10 times / sec.	
Sampling rate	2000 data / sec. at maximum (*4)	
Battery	8 hours (8 hours charge)	
Overload capacity	Approx.200% of capacity	
Operating environment	Temperature: 0 to +40 degree Celsius, Humidity: 20 to 80%RH	
Functions	On-demand display (header and footer), Peak hold (tension and compression), Internal memory (1000 data), High/Low Setpoints (judgment of OK or NG), Reversible display, Reversible sign, Auto Zero Timer, High/Low Alarm, Off timer (auto shut off), Sensitivity, Date and Time display	
	1st/2nd peak, Displacement detection at force peak, Displacement zero at selected force	—
Output	USB, RS232C, Mitutoyo digimatic (*5), 2 VDC analog output (D/A), Comparator judgement (-NG/OK/+NG)	
	High/Low Output (output of judgement) / USB memory / Displacement	—
Overload warning	Approx.110% of capacity (Warning message and alarm)	
External connecting switch	Send (a point of contact holding), Zero, Peak ON/OFF setting	
Weight	Capacity 1000N and under : Approx. 490g (*6) Capacity 2500N and 5000N: Approx. 1100g (*6)	
Dimensions (*7)	Capacity 1000N and under : Approx. W75*D34*H191 Capacity 2500N and 5000N: Approx. W83*D44.5*H221	
Accessory	AC adapter, Inspection certificate, CD driver (including simple software for data logging), Attachments (The set of attachments varies according to range.), USB cable, Carrying case.	
	Adapter for USB memory stick (*8)	—

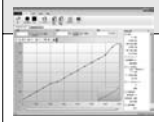
*1 The accuracy for sensor separated model differs depending on the models of connected load cell.
*2 This is the specifications for International model. Please note that available unit is different from Japanese domestic model and international one.
*3 [N indication] The indication of 2N and 5N models is mN or N.
The indication of 1000N,2500N and 5000N model is N or kN.
[kgf indication] The indication of 2N and 5N models is gf.
[lbf indication] The indication of 2N and 5N models is ozf.
*4 When save data in USB memory stick, the sampling rate is 100 data/sec.
*5 Connection may be invalid with some Mitutoyo products even having digimatic output.
*6 Weight is slightly different according to range.
*7 The dimensions of sensor separated model is W75*D34*H191 regardless capacity.
*8 USB memory stick is not included.

16. Optional Items

Test Stands			
For stable measurement, we recommend use force gauges with test stand.			
			
HV-500N Ⅱ **Manual Test Stand**	**MX2-500N** **Motorized Test Stand**	**MX2-1000N** **Motorized Test Stand**	**MX2-2500N** Motorized Test Stand (High capacity)

Optional Attachments				
Various kinds of attachments are available corresponding to very diverse shape of samples.				
				
FP-50 **Fine Point Chuck**	**GR-30** **Knurled Cam Grips**	**KC-1001** **Wedge Grips**	**FC-20** **Film Grips**	**GT-30** **Vise Grips**

Printer: DP-1VR	Handle: FOH-1	Battery: BP-308
		
Measuring value and saved data can be printed out. Optional cable CB-308 is needed.	Easy operation to apply high force.	Replacement battery.



Graphing Software: Force-Recorder

A smooth and accurate graph with USB connection. (2000 data / sec.)

Main Functions	Professional	Standard	Light
Force-Time graphing	○	○	○
Function setting of force gauge	○	○	○
Data storage in CSV format	○	○	○
5 graphs (max.) can be displayed in a table.	○	○	—
Force-Displacement graphing	○	—	—

* Professional version needs ZTA and a test stand with linear scale.
* Please refer to the data sheet of software for detail.

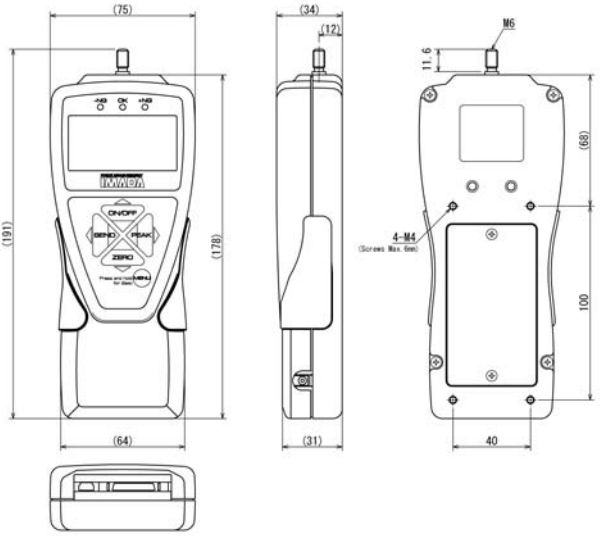
Optional cables

Model	Function	Description
CB-108	Analog cable	Connection with multi meter, oscilloscope and so on.
CB-118	Analog cable (for option code-AN)	Connection with multi meter, oscilloscope and so on.
CB-208	RS232C cable	Connection with PC and other external equipment.
CB-308	Digimatic cable	Connection with Mitutoyo printer DP-1VR
CB-508	Stand (MX) cable	Overload prevention and stand control according to measuring force.
CB-518	Stand (MX2, EMX) cable	Overload prevention and stand control according to measuring force.
CB-718	Stand (MX2-FA) cable (for stand with linear scale)	Measurement of force and displacement. Overload prevention and stand control according to measuring force.
CB-728	Stand (EMX-FA) cable (for stand with linear scale)	Measurement of force and displacement. Overload prevention and stand control according to measuring force.
CB-908	Open-end cable	Cable without connector. (37 pins) For customized connection use.

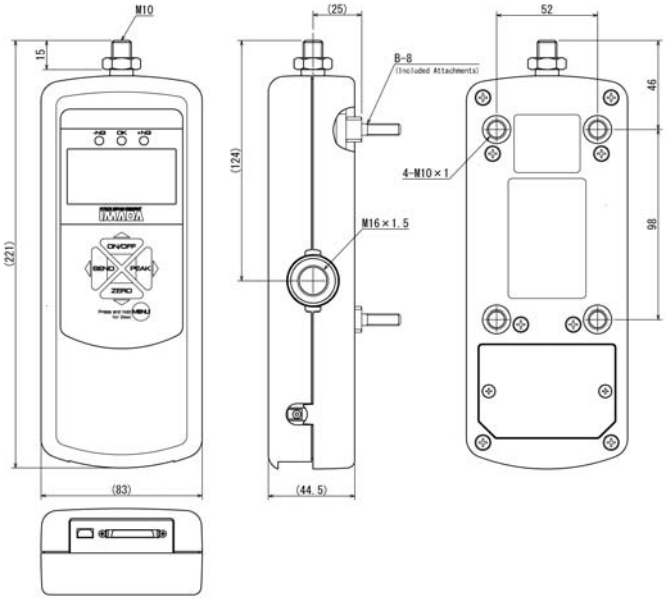
We have various optional attachments and accessories adding to above.
Please ask your local distributor for detail.

17. Dimensions

Standard

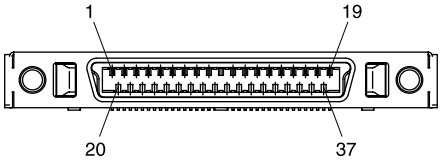


High Capacity



18. Output Data

18-1. Output connector



Connector pin arrangement

Pin number	Signal name	Description	Model
1	-NG	High Low setpoints of comparator output. Either signal is output depending on comparator judgment. (*1)	ZTA/ZTS
2	OK		
3	+NG		
4	SC1	Output depending on set high / low output values. (*1)	ZTA
5	SC2		
6	OVL	Overload output. Output when warning overload. (*1)	ZTA/ZTS
7	READY	Measurement-ready signal. Output when the display is ready to start measurement. (*1)	ZTA/ZTS
8	OUT GND	Grand common through pin #1 to 7.	ZTA/ZTS
9	ANALOG RAW OUT	Analog output (RAW) (*2)	Optional
10	ANALOG RAW GND		
11	ANALOG D/A GND	Analog output (D/A) (*2) Approx. +/-2v is output when max. force applied.	ZTA/ZTS
12	ANALOG D/A GND		
13	232C_TxD	RS232C signal	ZTA/ZTS
14	232C_RxD		
15	232C_GND		
16	NC	N/A	Optional
17	NC		
18	NC		

*1 Open collector output. (Please keep source voltage less than 30V and current of 25mA.

*2 Please keep resistance 1kΩ and more.

18. Output Data

Pin number	Signal name	Description	Model
19	**REQ**	Digimatic output	ZTA/ZTS
20	**READY**		
21	**CLOCK**		
22	**P-DATA**		
23	**GND**		
24	**EXSW1:POWER**	Input signal The functions differ depending on signal of Shift. Refer to the bottom of the page for detail. (Detect edge signal when each pin connected to GND pin #30.) (*3)	ZTA/ZTS
25	**EXSW2:ZERO**		ZTA/ZTS
26	**EXSW3:SEND**		ZTA/ZTS
27	**EXSW4:PEAK**		ZTA/ZTS
28	**Rec**		ZTA/ZTS
29	**Shift**		ZTA/ZTS
30	**GND**	Input grand common through pin #24 to 29 and 31.	ZTA/ZTS
31	**Mark Input**	Input mark point	ZTA/ZTS
32	**Scale A+**	Displacement input (*4) Connectable linear scale and rotary encoder. (Corresponds to line driver output and open collector output.)	ZTA
33	**Scale A-(OC1)**		
34	**Scale B+**		
35	**Scale B- (OC2)**		
36	**+5V**	External power supply +5V (*5)	ZTA/ZTS
37	**GND**	External power supply Grand	ZTA/ZTS

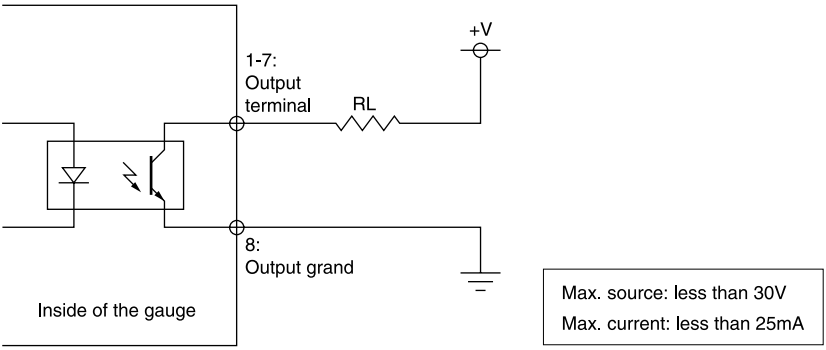
*3 Pin # 24-29 and #30 are short-circuited: ON.
*4 Connect pin #32(A+) / #33(A-) and #34(B+) / #35(B-) in case of line driver output.
Connect pin #33(OC1) / #35(OC2) in case of open collector output. (Keep voltage drop 0.5v and less.)
*5 Enable to supply 5V 200mA at max. Make sure to charge with AC adapter when supply power to external equipments.

Input signal depending on Shift signal

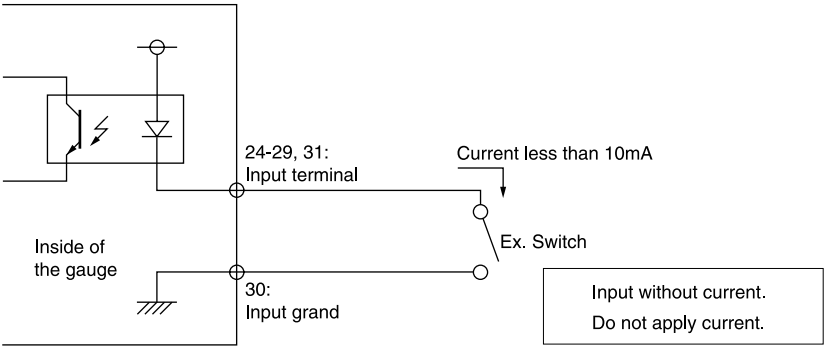
	Shift Input invalid	Shift Input valid
EXSW1	Turn on	Shut off
EXSW2	Same operation with ZERO button	Zero measuring displacement
EXSW3	Same operation with SEND button	(REVERSE)
EXSW4	Same operation with PEAK button	(REVERSE)
Rec	Control recording on software Force-Recorder series.	

18-2. Connection example of I/O terminals

Connection example to output terminal of force gauge



Connection example to input terminal of force gauge



18. Output Data

18-3. File Format saved in USB memory (ZTA only)

The file format saved in USB memory is as follows.

The files are saved in root directory of USB memory.

	File Format	Description
Save of measuring values at real time	File name: R00001.csv Contents: yyyy,mm,dd,hh,nn,ss[CR] ffffff,uuu,dddddddd,rrr[CR] ffffff,uuu,dddddddd,rrr[CR] ffffff,uuu,dddddddd,rrr[CR] ...	File name: The continuous numbers follow after [R]. Each number is followed by comma and saved in CSV style. Contents: yyyy: Year / mm: Month / dd: Day hh: hour (24 hours) / nn: minute / ss: second / ffffff: force value with sign and decimal point / uuu: unit for force / ddddddd: displacement value with sign and decimal point / rrr: unit for displacement The date and time is one when start saving. The file format of displacement is saved as 0 when the Displacement Type at Setup Menu is OFF.
Data transport saved in internal memory	File name: M00001.csv Contents: yyyy,mm,dd,hh,nn,ss[CR] YYYY,MM,DD,HH,NN,SS,ffffff,uuu,dddddddd,rrr[CR] YYYY,MM,DD,HH,NN,SS,ffffff,uuu,dddddddd,rrr[CR] YYYY,MM,DD,HH,NN,SS,ffffff,uuu,dddddddd,rrr[CR] ...	File name: The continuous numbers follow after [R]. Each number is followed by comma and saved in CSV style. Contents: yyyy: Year / mm: Month / dd: Day hh: hour (24 hours) / nn: minute / ss: second / ffffff: force value with sign and decimal point / uuu: unit for force / ddddddd: displacement value with sign and decimal point / rrr: unit for displacement The date and time is one when start saving. The displacement data is not saved when the Displacement Type at Setup Menu is OFF.

18-4. Command (RS232C / USB)

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Comparator setting	**XCW**	Comparator High / Low	○	○	XCW[±UUUU] [±LLLL]	XCW+0100-0100	Pair of integer with sign (*1) [+/-UUUU]: High [+/-LLLL]: Low
	XCS	High / Low output Value no. 1 / 2	○	○	XCS[±FFFF] [±SSSS]	XCS+0100-0100	Pair of integer with sign (*1) (*2) [+/-FFFF]: Value 1 [+/-SSSS]: Value 2
	XCR	Comparator (Judgment) result output	○	—	XCR[u]	XCRL	[u]: Comparator judgment H=+NG / O=OK / L=-NG / E=OVL
	XCO	High / Low Output Result, Value 1	○	—	XCO[f]	XCO1	(*2) [f]: Setting value ＞ measuring value: 0 Setting value ≦ measuring value: 1
	XCT	High / Low Output Result, Value 2	○	—	XCT[s]	XCT1	(*2) [s]: Setting value ＞ measuring value: 0 Setting value ≦ measuring value: 1
Peak setting	**XDS**	Peak setting change (middle display at multi display)	○	○	XDS[n]	XDS0	[n]: number setting of peak 0= measuring value 1= Either +/- Peak value 2= +Peak 3= -Peak
Other operations	**XFU**	Unit setting of force value	○	○	XFU[s]	XFU0	[s]: number setting of unit The corresponding units differ depending on models. * Refer to XFC command
	XFT	1st / 2nd peak drop setting	○	○	XFT[bbbb]	XFT1234	[bbbb]: peak drops (four digits without sign) (*1) (*2)
	XFG	Peak selection [AND] [OR]	○	○	XFG[t]	XFG0	0= AND / 1=OR

*1 Decimal point is not included to setting and response. Place of decimal point depends on units.
*2 Only for ZTA

18. Output Data

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Reset	XFY	Reset peak force value and its displacement	—	○	—	R	
	XFZ	Reset measuring force value	—	○	—	R	
	XLZ	Reset measuring displacement value	—	○	—	R	Only for ZTA
	XAZ	Reset peak, force, and displacement values.	—	○	—	R	
Memory	XMC	Delete all internal memory	—	○	—	R	
	XME	Delete the latest internal memory	—	○	—	R	
Power	XQT	Turn off	—	○	—	R	
Measurement value output	XMM	Data save in internal memory (Data contents depending on the setting of SEND button)	—	○	—	R	
	XMR	Output all the data in internal memory (1000 data)	○	—	—	[Memory Data 1] [Memory Data 2] ... END	
	XAR	Measuring value output (Force and displacement)	○	—	Q±fffff± ddddddPLCSX	r+123.4+ 123456701L00	Refer to appended chart 1 for format.

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Compatible commands	**P**	Change to Peak Mode [OR]: Display the measuring value => either higher value among +/- peak values. [AND]: Display the measuring value => + peak value => -peak value => + peak value =>...	—	○	P	R	Operation depends on the setting of PEAK button.
	E	Comparator High / Low output (HHHH/LLLL) (Absolute value of 4 digits integer)	—	○	E[HHHH][LLLL]	E12341234	HHHH=Comparator High LLLL=Comparator Low The values are absolute values.
	g	Data output every 0.1 sec. (Response is the same with command D.	○	—	g	R +123.4NTO ...	Output pattern is the same with command D.
	Y	Output stop of command g.	—	○	Y	R	

18. Output Data

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Compatible commands	**D**	Data output (Interchangeable with ZP/Z2 format)	○	—	±FFFFF UMC	+123.4NTO	FFFFF: 4 digits force value with decimal point U: Unit number M: Current mode C: Comparator judgment
	M	Save data	—	○	—	R	
	B	Delete the latest data	—	○	—	R	
	C	Delete all data	—	○	—	R	
	Z	Zero	○	—	—	R	Operation depends on the setting of ZERO button
	V	+/- peak value output	○	—	V	P+123.4N P-123.4N	
	I	All data output (Interchangeable with ZP/Z2 format)	○	—	I	+123.4NMO +234.5NMH … END	Output pattern is the same with command D. [END] is sent after all data is output.
	N	Change units to N basis	—	○	N	R	
	K	Change units to Kgf basis	—	○	K	R	
	O	Change units to lbf basis	—	○	O	R	
	T	Change to real time mode	—	○	T	R	

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Compatible commands	**P**	Change to Peak Mode [OR]: Display the measuring value => either higher value among +/- peak values. [AND]: Display the measuring value => + peak value => -peak value => + peak value =>...	—	○	P	R	Operation depends on the setting of PEAK button.
	E	Comparator High / Low output (HHHH/LLLL) (Absolute value of 4 digits integer)	—	○	E[HHHH][LLLL]	E12341234	HHHH=Comparator High LLLL=Comparator Low The values are absolute values.
	g	Data output every 0.1 sec. (Response is the same with command D.	○	—	g	R +123.4NTO ...	Output pattern is the same with command D.
	Y	Output stop of command g.	—	○	Y	R	

18. Output Data

Appended Chart 1. Format of force response

Q±fffff±ddddddPLCSX

[Measuring value / Peak value]

m±fffff±ddddddPLCSYYMMDDhhmmss

[Saved data]

Description of respond data format

Q	Status of requested force data	f	Continuous output Measuring value (Approx. 2000data/sec.)
		l	Continuous output Measuring value (Approx. 10data/sec.)
		a	Continuous output +peak value
		h	Continuous output -peak value
		r	Measuring value
		p	+peak value
		n	-peak value
		1	1st peak value
		2	2nd peak value
±fffff	4 digits force value with sign and decimal point	Ex., +123.4	
±ddddddd	7 digits displacement value with sign and no decimal point	Ex., +1234567	
P	Unit number setting of force, 1 digit integer	0 to 5 (*)	
L	Unit number setting of displacement, 1 digit integer	0 to 2 (*)	
C	Comparator judgment	H	Judgment: +NG
		O	Judgment: OK
		L	Judgment: -NG
		E	Overloaded
S	High / Low output	0	Less than No.1 / No.2
		1	On and more than No.1
		2	On and more than No.2
		3	On and more than No1 / No.2
X	Status of REC signal and mark point	0	No Rec input / No mark point input
		1	No Rec input / Mark point input
		2	Rec input / No mark point input
		3	Rec input / Mark point input
		4	Rec+Shift input / No mark point input
		5	Rec+Shif input / Mark point input
YYMMDD	Saved date (YY: year / MM: month / DD: day)		
hhmmss	Saved time (hh: hour / mm: minute / ss: second)		

* Setting numbers and units are different depending on models. (Refer to page 46 of XFC command for detail.)

Appended chart 2. Units list

* Setting units are different depending on models.

00	No unit
01	mN
02	N
03	kN
04	g
05	kg
07	gf (*)
08	kgf (*)
10	ozf (*)
11	lbf (*)
12	klbf (*)
13	N-cm
14	N-m
16	kgf-cm (*)
17	kgf-m (*)
22	ozf-in (*)
23	lbf-in (*)

* Units selection differs between Japan model and on-Japan model.

Appended chart 3. Unit setting numbers and units of displacement

* Setting units are different depending on models.

0	Displacement setting OFF
1	mm
2	inch (*)
3	

* Units selection differs between Japan model and on-Japan model.

Please contact your local distributor or IMADA for any inquiries about products and measurements.

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