Tension Meter

HTG Series

Model HTGS
HTGA

SCHMIDT
control instruments

Edition HTG 02.E

Operating Instructions

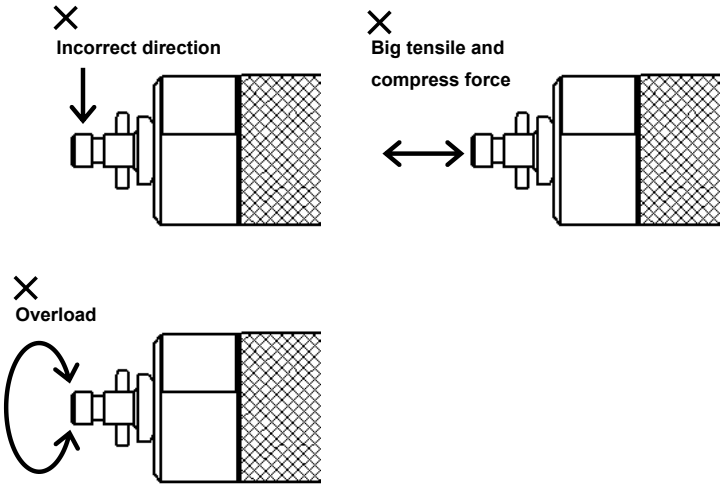
Valid as of: 01.01.2022 - Firmware 5.0 or later • Please keep the manual for future reference!

CE

SCHMIDT · ALL OVER THE TECHNICAL WORLD

Precautions

Cautions of overload



●Please note 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 brakes down when it is overload.

●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 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 of 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.

●Please turn on the power 10 minutes before starting measurement in order to stabilize the indication of value.

Cautions on safety

●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.

Cautions on safety

●Ensure the screen saver function is on when you plan to use the force gauge continuously.
If the display is left on with the same display shown for a long time, the display may suffer from burn-in.

Error Messages

●The display may show error messages such as ‘MEMORY ERROR’ or ‘FATAL ERROR’ when there is a damage found in the memory data or the setting data. There is a possibility of some internal problems.
Please contact our distributor.

Technical terms in this manual

●There are some phrase using “force” instead of “torque”, and “displacement scale” instead of “angle scale” and “rotary encoder” in this manual.

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Features

HTGS/HTGA is an instrument for many purpose of torque measurement with useful functions and high usability. HTGA is advanced model and there is function of input and output of angle from angle scale and rotary encoder.
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

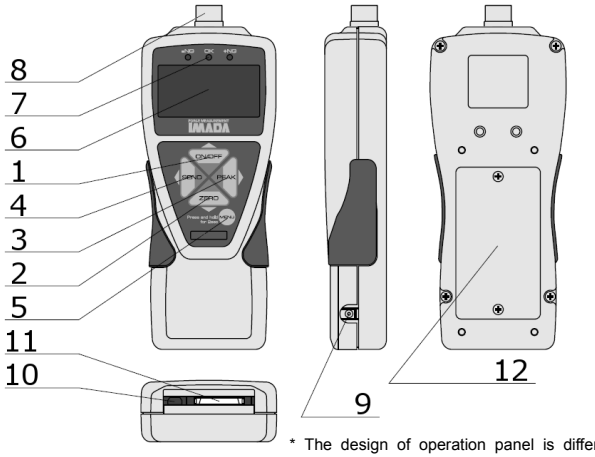
HTGA/HTGS series consists of HTGA series with USB memory connection and displacement output function, and HTGS series without the connection and function.

The separated sensor models are also available.

Model	Capacity	Display	Resolution
HTGS(HTGA)-0.5N	50N-cm	50.00N-cm	0.01N-cm
HTGS(HTGA)-2N	2N-m	2.000N-m	0.001N-m
HTGS(HTGA)-5N	5N-m	5.000N-m	0.001N-m
HTGS(HTGA)-10N	10N-m	10.00N-m	0.01N-m

2. Names and Functions

An amplifier unit



* The design of operation panel is different between HTGS and HTGA.

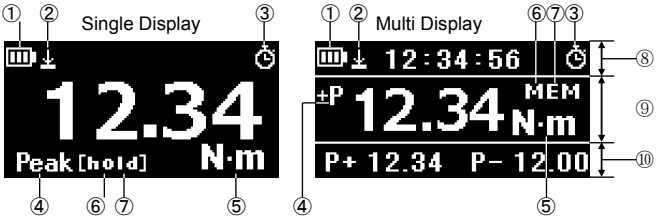
Functions

1	**ON/OFF button**	Turn ON/OFF the power. Select menu.
2	**ZERO button**	Zero values. Select menu.
3	**PEAK button**	Toggle between “Peak mode” and “Track mode”. Select menu.
4	**SEND button**	Save data. Send data to a printer and a computer. Select menu.
5	**MENU button**	Go to Set up mode and measurement mode. Enter settings.
6	**Display**	Show values, settings and the status.
7	**Comparator Judgment LED**	Judge force values according to set comparator values.
8	**Connector**	Connector for sensor
9	**AC adaptor connector**	Recharge battery with AC adaptor.
10	**USB connector**	For data sending to PC with USB cable (included). HTGA only: Save data on USB memory (excluded).
11	**I/O connector**	Connector for other equipments, i.e. PC, printer, and displacement scale.
12	**Battery cover**	Rechargeable battery inside. The battery can be replaced. (*)

*Refer to the page 37.

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 20, [8.Function Setting, Displacement reset]) (*)

③ **Auto Zero Timer** / Valid or invalid: Zero force value after arbitrary time.
(Refer to page 20, [8.Function Setting, Auto Zero Timer])

④ **Peak mode** / Valid or invalid (Refer to page 20, [8.Function Setting, Auto Zero Timer])
(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 14, [6.Single display / Multi display])

⑨ **Middle display**

⑩ **Footer** / (Refer to page 14, [6.Single display / Multi display])

* Only for HTGA

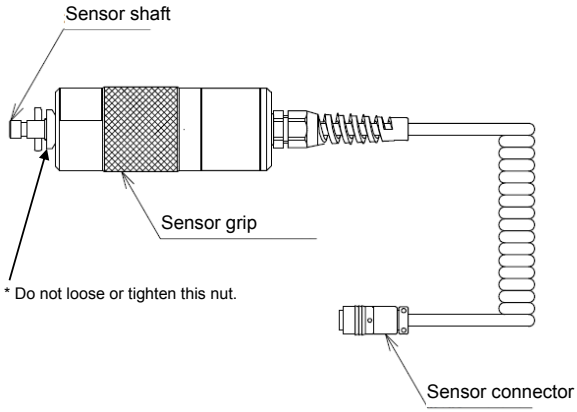
Screen Saver function

This force gauge equips with a screen saver function.
It shows a moving image (right) on its screen when the force gauge is on but is not being used for a certain time for the protection of the screen.
Press Menu button to close the screen saver display.

To set up the time to activate this function, go to [Function Setting] - [Display Functions] - [Screen Saver].
* When it is set OFF, the screen saver function does NOT work.

Note that no button works except Menu button while the screen saver is on.
It continues to send signals or transfer data to PC for graphing even when the screen saver is on.

A sensor unit



Sensor shaft	Installing an attachment to this sensor shaft
Sensor grip	Hold this part for measurement
Sensor connector	Connector for connecting with display

● Do not loose or tighten nut of this sensor. If you loose of tighten this, it may affect the accuracy of this sensor.

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 torque gauge.

●Instruction manual (This book)
●Inspection certificate
●Warranty
●AC adapter
●Carrying case
●USB cable
●CD-ROM
●Force Recorder Professional Trial Edition CD-ROM (30 days limits)
●Adapter for USB memory (HTGA only)
●Optional handle (Available for 10N-m model only)
●L wrench for installation of attachment

4. Preparation

4.1. Battery and Charge

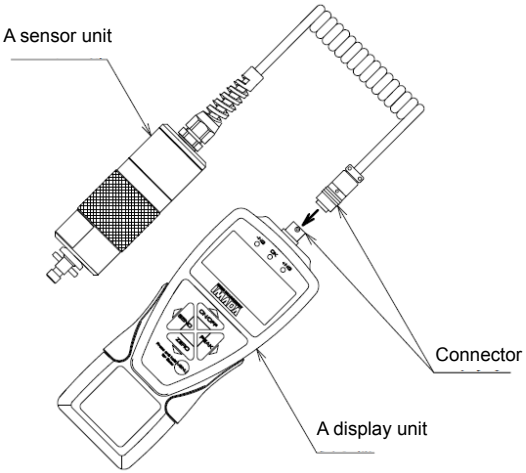
Please charge before your first use of this product.
Charging completes in approximately 2 hours when using the included AC adaptor.
The battery icon shows the 3 remaining levels. It appears after the power is turned on.
Please recharge when it shows  .
It shows an animation of charging while connected with the AC adaptor.
 appears once the battery is full and it automatically stops recharging.

●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 37.
●Please note the date and time setting is reset when battery dies and replaced.
●When AC adaptor remains connected, it automatically starts recharging again.
●The product may temporarily get warm while recharging.
●When the product is connected to PC with the USB cable, it shows  and start recharging regardless of the remaining level of battery. Recharging this way takes longer and the required period of time varies depending of the PC.
●It shows  flashing and the power goes off automatically when the battery is empty.
●When connecting a USB memory stick, a liner scale, or a test stand, the power is supplied from this product. Please use it with AC adaptor connected for such measurement as the battery runs out quicker.

4. Preparation

4.2. Connection of display and sensor

Please connect sensor and display before use.



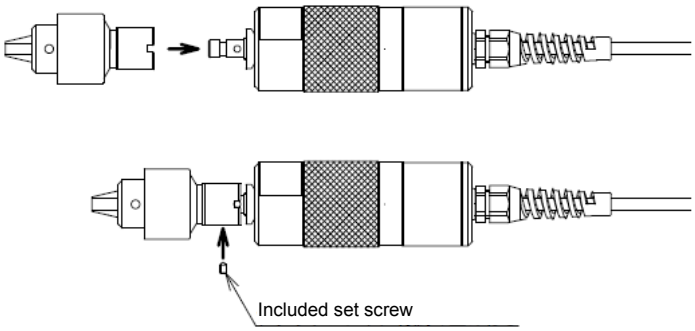
●A display unit is calibrated with included sensor. Please do not connect other sensor.

●Do not insert the connector forcibly.

4.3. Installation of an attachment

Please install suitable attachment to sensor unit.

Below image is for installation of HT-DC-6.5.



After inserting an attachment to sensor shaft, please fix the attachment with included set screw.

- ●Please pay attention that attachment may fall down if the set screw is not fixed.
- ●It is not necessary the set screw to tighten too strong

5. Basic Operation

The display indicates either clockwise or counter-clockwise torque.

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 17 for detail.
Peak / Track mode	 Press	Toggle Peak mode and Track mode.
Memory saving / Data 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 20 for detail of toggling.

6.1. Single display

Display torque value only.
*Displacement value can be checked on
Multi display (HTGA only).

Single display

6.2. Multi display

Display torque 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 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 17 for how to set.

Multi Display : Menu on header

	Contents	Description	Valid Model
Header	**Date**	Date	HTGA/HTGS
	Time	Time	HTGA/HTGS
	Number of memory	The number of saved force value.	HTGA/HTGS
	Number of +NG	The number of force torque exceeding set comparator (High) value. Zero with  (ZERO button) while this content lights on.(*)	HTGA/HTGS
	Displacement	Displacement. Zero with  (ZERO button) while this content lights on.(*)	HTGA
	Average values of memory	Average of saved force value. Unit is disregarded. It shows **** when the data contains different units or positions of decimal points.	HTGA/HTGS

* Angle scale or rotary encoder is necessary to indicate displacement.

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).	HTGA/HTGS
	+/- Peak	Torque peak value. Zero with  (ZERO button) while this content lights on. Show either or both peak value of clockwise / counter-clockwise directions, depending on [AND][OR] selection. Refer to the page 22.	HTGA/HTGS
	1st / 2nd Peak	1st and 2nd torque peak value. Zero with  (ZERO button) while this content lights on. P1 shows 1st, and P2 shows 2nd peak values.	HTGA
	Force bar graph	The rate of torque value among capacity.	HTGA/HTGS
	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.	HTGA/HTGS
	Max. / Min. values of memory	Show maximum and minimum values among memory data. Torque data only.	HTGA/HTGS

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. Push 

to show 'Exit Menu' and go back to measurement-ready display with 

(MENU button）.

*Push and hold 

(MENU button） more than 2 seconds for the same action.

Initial Setting(Setup Menu)

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Model info.	—	—	Firmware Ver5.0 or later supports the display of product model name / serial number / product code. This information is required to receive our after support. Please also refer to the model information on the instrument body and carrying case.	HTGA / HTGS	—

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Units	Force Units	[N-m] / [N-cm] [Kgf-cm] / [lbf-in] / [ozf-in] （*1）	Change torque units.	HTGA / HTGS	N-m
	Displacement Units	[°] / [inch] / [mm]（*1）	Change displacement units	HTGA	°
+/- Indicator	+/- Force	[+/-Normal] / [+/-Reverse]	Change +/- signs of torque value. [Normal] (+)clockwise、 (-)counter clockwise [Opposite] (+)counter clockwise、 (-)clockwise	HTGA / HTGS	Normal
	+/- Displacement	[+/-Normal] / [+/-Reverse]	Change +/- signs of displacement value.	HTGA	Normal
Sensitivity	—	[Max] / [High] / [Medium] / [Low]	Change sensitivity of torque measurement. [Max] is the highest sensitivity. [Max] is suitable for rapid change like impact test.	HTGA / HTGS	Max
Displacement Type	—	[OFF] / [Type A] / [Type B] / [Type C] / [Type D] / [Type E] / [Manual]	Select when connect with displacement scale. Enable to manually set at [Manual].Refer to the page 25 for detail.	HTGA	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 torque value. Displacement value is not reset.	HTGA / HTGS	All reset

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

7. Initial Setting

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Send function	Send Data Select	[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 28-29 for detail.	HTGA / HTGS (*2)	Display value
	Ext-Input Invert	[ON] / [OFF]	Choose signal setting of SEND input from outside. OFF: Read edge when connected to GND. ON: Read edge when departed GND.		
Date Format	—	[YYYY/MM/DD] / [MM/DD/YYYY] / [DD/MM/YYYY]	Select display type. Y:Year,M:Month,D:Date	HTGA / HTGS	YYYY/ MM/ DD
Language	—	[English] And more	Select languages.	HTGA / HTGS	English
Setting LOCK	—	[ON] / [OFF]	It prevents unintentional changes of settings. When it is ON, function setting menu would not show therefore the settings such as comparator cannot be changed. Set it [OFF] to unlock.	HTGA / HTGS	OFF
Wireless setting	Wireless output	[ON] / [OFF]	Enables the wireless transmission adapter. * See the optional instruction manual.	HTGA / HTGS	OFF
	ID-Symbol	[A] – [Z]	A symbol for identifying a measuring instrument. You can select from A to Z.	HTGA / HTGS	[A]

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

∗2 The function of 1st / 2nd Peak is valid only for HTGA.

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 

（PEAK button）.

Go back to Main menu with 

(SEND 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 Set points	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 set point OK: Low set point ≦ Displayed value ≦ Hi set point +NG: Displayed value > Hi set point	HTGA / HTGS	+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 set point. ON: No.1 or No.2 set point ≦ Displayed value This function is only for output.	HTGA	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 clockwise and counter clockwise peak values are displayed in order of clockwise peak, counter clockwise peak, torque value, with  (PEAK button). [or] Either clockwise or counter clockwise peak value which is higher absolute value is displayed. Refer to the page 28 for detail.	HTGA / HTGS	OR
	Auto Peak Memory	[ON] / [OFF]	The data is automatically saved Whenever  (ZERO button) is pressed.	HTGA / HTGS	OFF
	1st/2nd Peak Drop	Absolute value [0000 to 9999]	The peak drops to detect 1st and 2nd peak values. Refer to the page 29 for detail.	HTGA	0000

8. Function Setting

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Displacement Reset	Reset Condition	[OFF] / [Once] / [Each time]	The condition to zero displacement value. [Once] Rest displacement value once when the torque 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.	HTGA	OFF
	Reset value	Absolute value [0000 to 9999]	Zero the displacement value when the torque value reached to the set value.		0000
Internal Memory	Data recall		The saved data in the internal memory is displayed.	HTGA / HTGS	--
	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 31 for detail.	HTGA	--
	USB disconnect	—	Disconnect USB memory from force gauge.		--
	Save Data Setting See P30-32【12-1. Output to USB Memory】 for details.	[Cont-Data 100Hz] [Cont-Data 50Hz] [Cont-Data 1Hz] [Single Data]	Select data to directly save to USB memory. [Cont-Data 100, 50, 1Hz] Save real-time data of selected interval up to 3 settings from 100 data /sec to 1 data /sec. [Single Data] Save a single data.		
Auto Zero Timer	—	[1～60sec] / [OFF]	Automatically zero values after set time period.	HTGA / HTGS	OFF
Sound	Keypad Beep	[ON] / [OFF]	Operating sound of buttons.	HTGA / HTGS	ON
	High / Low Alarm	[ON] / [OFF]	Alarm when the force value exceeds the comparator High set point.		OFF

Main menu	Sub menu	Setting menu	Description	Valid model	Initial setting
Display Functions	Display Format	[Single Display] / [Multi Display]	[Single Display] Display torque value only. [Multi Display] Display torque value on the middle display. The contents on the header and footer are selectable.	HTGA / HTGS	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. (*1)	HTGA / HTGS	Power Save
	Reverse Display	[ON] / [OFF]	Reverse the display up-side down.	HTGA / HTGS	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. When force gauge is connected to power via USB or AC adapter, the power stays on and screen saver starts instead.	HTGA / HTGS	30min
Data and Time	Date Set	[Year] / [Month] / [Date]	Date & Time setting. [Hour] is on 24 hours basis.	HTGA / HTGS	----/--/--
	Time Set	[Hour] / [Minute]			--:--

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

9. Measurement of Displacement (HTGA only)

HTGA 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.

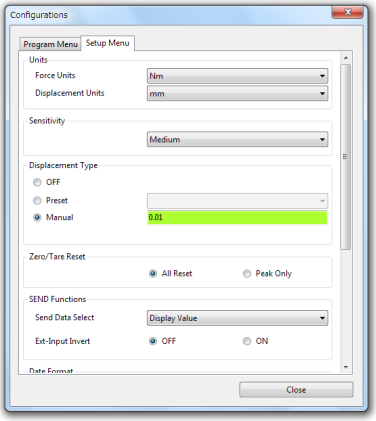
9.1. Connecting to IMADA Test Stand with Liner Scale

Instruction manuals of test stands explain types of liner scales. Please select from [Type A] – [Type E].

9.2. Connecting to Other Liner Scale

9.2.1. Scale setup

When you choose “Manual” in “Displacement type,” you can input Manual coefficient values from “Set up Torque Gauge” of Force Logger (Included software) or Force Recorder (Optional software).



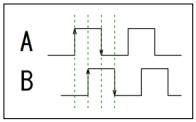
*Setup window of Force Logger

This window is opened by the following procedures.

Force Logger
“Gauge” in menu bar ->“Gauge Setup” .

Force Recorder
“Setting” in menu bar ->“Set up Force Gauge.”

Please refer to “Displacement Type” in “Initial Setup 1” of “Set up Force Gauge”.
Please select “Manual” and input displacement per 1 count of the displacement meter in the left box.
After pressing Enter key, the color of the box will change, which means the manual coefficient values has been successfully reflected.



It uses phaseA and phaseB together to know the direction.
It reads incremental signals input in the 2 phases.
An up/down edge is regarded as 1 count,
in other words, please input a quarter of 1 signal period.

For example

In the case when you combine a HTGA with the displacement scale which uses line driver output with 20μm signal period.

->20μm/4 = 5μm, therefore, “0.005” should be input as a manual coefficient values.

● 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.

9.2.2. Connectable displacement scale

Please use displacement scale to meet the followings.

Output specifications of displacement scale

- Line driver output * Line receiver in accordance with RS-422/485must be built-in.
- Open collector output *Voltage difference between points of contact must be below 0.5V.

* Some displacement scale may not work.

* There are some displacement scales which we have inspected their working condition with HTGA series.

Please contact us for further information.

Voltage and current from a HTGA torque gauge to a displacement meter

HTGA series can provide voltage up to DC+5V, and current up to 200mA to displacement meters.
When you would like to supply power from a HTGA to external equipment, please
Make sure to connect it to an included AC adapter.

* Operation of this instrument could be unstable when over 200mA is provided.

9. Measurement of Displacement (HTGA only)

9.3. Display of displacement

The displacement is displayed on the header on Multi display.
Please refer to the page 14 for setting.

9.4. Display of displacement at peak torque

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

*The displacement corresponds to the torque 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 

button setting. In this case, the displacement can be only saved and sent to external equipment. (Send Functions: Refer to page 19.)

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.

*When a peak torque value is indicated in middle display, you cannot zero displacement. In this case, displacement value at peak torque value is indicated.

10.Peak Value

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 clockwise and counter clockwise peak values is displayed.

Press 

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

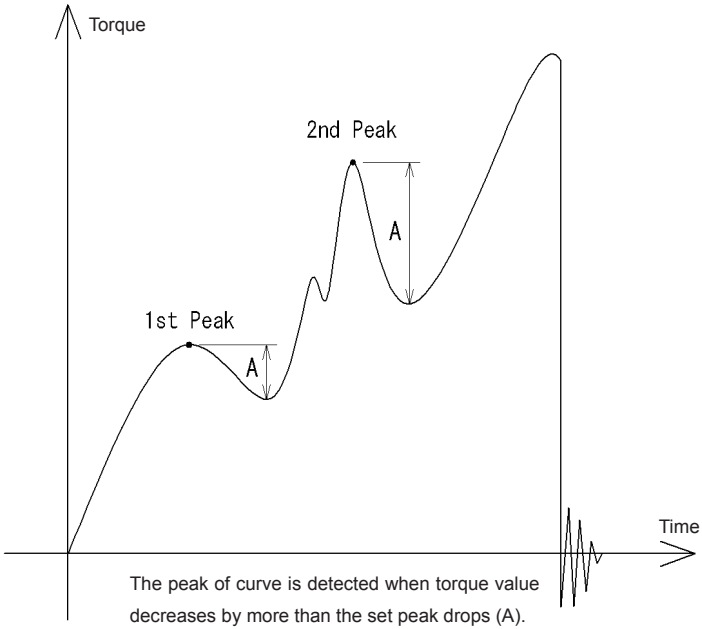
●In case of [AND] at Peak mode, both peak value of clockwise and tensile are displayed. Press 

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

11.1st / 2nd Peak Value (HTGA 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 22. 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 (clockwise or counter clockwise).
The direction of the 2nd peak follows one of the 1st peak.

12.Output

12.1. Output to USB memory: HTGA series only

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

12.1.1. Connection to USB memory

Connect USB memory (excluded) to HTGA with included adapter. MEM (MEM mark) shows up on measurement-ready display when HTGA 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 memories may not work properly even when the above conditions are satisfied. Please try another one in case MEM does not appear on the display when an USB memory is connected,.

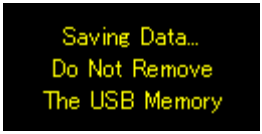
- ● Data cannot be output to RS232C interface when connected to USB memory.
- ●Please note that we do not guarantee data even if data in USB memory is lost when connecting to HTGA.
- ●Do not leave USB memory under the strong sun light to avoid transform and discoloration.
- ●The battery is more consumed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

12.1.2. Data transport

Transport data in the internal memory to 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 47 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

When either Cont-Data 100, 50, or 1Hz is selected under [USB Memory] - [Save Data Setting] settings, the real time data is saved to the connected USB memory. The data cannot be saved in the internal memory.
The saving speed is 100, 50 or 1 data per second according to the settings.

Starting / stoping saving

While MEM (MEM sign) is on, press SEND (SEND button) to start saving data in USB memory. Press SEND (SEND button) again to stop recording and save.

MEM (MEM mark) blinks during saving.

* Please refer to page 47 for the file format of the data saved in USB memory.
*This operation saves data as a new file in USB memory. (It does not overwrite an existing file.)

●The recommended settings of inverval is 50 /sec or 1 /sec when recording to USB memory for a long period of time.
●Recording may stop due to USB memory capacity, speed or other factors.
●Some USB memories may show error message during recording.
●It is recommended to connect to PC and use our optional software Force Recorder for stable consecutive recording.

12.1.4. Saving single data

A single data is saved to USB memory when 'Single Data' is selected in the settings.
The data cannot be saved in the internal memory.

How to save

While MEM (MEM sign) is on, press 

(SEND button) to save the data of which selected in 【SEND Functions】-【Send Data Select】. The message 'Data Saved' appears.

*See [18.3. File Format saved in then USB memory (HTGA only)] for the format of saving data.
*This operation creates a file in USB memory and adds data to it as repeated.
* In case the USB memory is disconnected and reconnected or the power turned off and back on, another new file is created with this operation.
*It may pause a while before 'Data Saved' message appears when saving for the first time after USB memory is automatically found.

12.1.5. Disconnect of USB memory

Please make sure to follow the direction below to disconnect USB memory from HTGA.

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.

●Up to 100 data/sec. is saved in USB memory, while the sampling speed of HTGA is 2000 data/sec. The measuring value can differ between one displayed on HTGA 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 HTGA series.
●Do not disconnect USB memory during saving.
●Please make sure to follow the direction to disconnect USB memory, otherwise data can be lost.
●The sign of MEM may not light after USB memory is repeatedly connected and disconnected. Please turn off the power and turn it back on. An error message may appear otherwise.

12. Output

12.2. USB output (output to PC)

HTGA / HTGS can be connected to PC with included USB cable.
The connection with PC using the included data logger CD-ROM is as follows.

12.2.1. Operation environment

See the label on the CD-ROM for the details of its operating environment.

12.2.2. Connection to PC

Connect the display unit and USB port of PC with the included USB cable.

12.2.3. Installation of driver

Make sure to install the driver first to use the data-logging software, Force Logger.
Before installing software, install the driver according to “The Installation Instruction for Device Driver and Force Logger” in CD-ROM.

●Installation of driver is necessary for data logger software Force Logger (included) and graphing software Force-Recorder (optional).

12.2.4. Installation of data logger software Force Logger

After you complete installation of the driver, install Force Logger.
You can see how to install it in “The Installation Instruction for Device Driver and Force Logger” in CD-ROM.

●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 this unit are possible. The connection is based on RS232C (optional cable) and USB (included cable).
*It is accessible as a COM port from PC connecting with USB.

RS232C, 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.
This instrument basically responses after receiving commands.
Commands and responses are consisted of ASCII code.
Commands and responses are followed by code [CR]. This instrument responses when receive code [CR].
This instrument sends E[CR] when a wrong command is sent.
Gain with Command + [CR]code. Please refer to the page 48 for commands in detail.

12. Output

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. torque is applied.)

Torque 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.

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

12.5. Wireless Transmission Adapter (sold separately) Output

This instrument is compatible with a *Wireless Transmission Adapter (*sold separately) for the Wireless Transmission of the measurement values.

Settings as follows:

[Setup Menu] – [Wireless Setting] – [Wireless Output] – [ON]

When the Wireless Output ON, the following operations are restricted:

- RS-232C communication
- External SEND input,
- The combination with the USB memory output function

*Refer to the Wireless Transmission Adapter Operating Manual for details.

13.Maintenance

13.1. Battery Change

The display unit 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 display unit.

Loosen the two screws on the back of display unit 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.

13.2. 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 this instrument 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	HTGA	HTGS
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 HTGA series but reduced functions.
Accuracy	+/-0.5%F.S.+/-1digit	
Unit of measurement	N-m, N-cm,Kgf-cm,lbf-in,ozf-in	
Display	4-digit with sign	
Display update	16 times / sec.	
Sampling rate	2000 data / sec. at maximum(*1)	
Battery	Max. 6.5 hours (Approx. 2 hours to 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 (clockwise and counter clockwise), 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),Screen Saver, Sensitivity, Date and Time display	
	1st/2nd peak, Displacement detection at torque peak, Displacement zero at selected torque	—
Output	USB, RS232C, 2 VDC analog output (D/A), Comparator judgement (-NG/OK/+NG) Overload warning	
	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	An amplifier unit: Approx. 450g A sensor unit: Approx. 450g	
Dimensions	An amplifier unit: Approx. W75 x D34 x H187 A sensor unit: Approx. Dia.39 x L120 (*2)	
Accessory	AC adapter, Inspection certificate, CD-ROM (including simple software for data logging), Force Recorder Professional Trial（30days limited）, USB cable, Carrying case, Optional handles(10N-m range only)／ L wrench for installation attachment	
	Adapter for USB flash drive (*3)	—

*1 When save data in USB flash drive, the sampling rate is Max 100 data/sec.

*2 Please refer to P43 for the dimension of sensor unit with optional handles.

*3 USB flash drive is not included.

16.Optional Items

Expand the usage with various attachments			
			
Pin chuck Suitable to fix shaft and rod type samples	Socket holder Suitable to fix torque wrench	Torque driver Suitable to measure tightening and loosing torque	M10 adapter Adaptable for M10 female attachment
Large pin chuck Model : HT-DC-13 Opening width : φ1.2~13mm Weight : approx. 600g *Cannot be used with 2N-m range	**Socket holder** Model : HT-9.5SQ Socket : 9.5mm square Weight : approx. 100g	**Torque driver** Model : HT-DBH Bit : + : No.1×50 + : No.2×50 - : No.3×50 Weight : approx. 100g	**M10 adapter** Model : HT-AD-M10 Screw : M10×L20 Weight : approx. 50g
Standard pin chuck Model : HT-DC-6.5 Opening width : φ0.5~6.5mm Weight : approx. 200g			
Small pin chuck Model : HT-DC-4 Opening width : φ0.5~4mm Weight : approx. 100g			

Battery: BP-308

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 (Sampling rate : 2000 times/sec)	○	○	○
Function setting of force gauge	○	○	○
Data storage in CSV format	○	○	○
5 graphs (max.) can be displayed in a table.	○	○	—
Force-Displacement graphing	○	—	—

∗Angle scale is necessary for force-displacement using professional version.

16. Optional Items

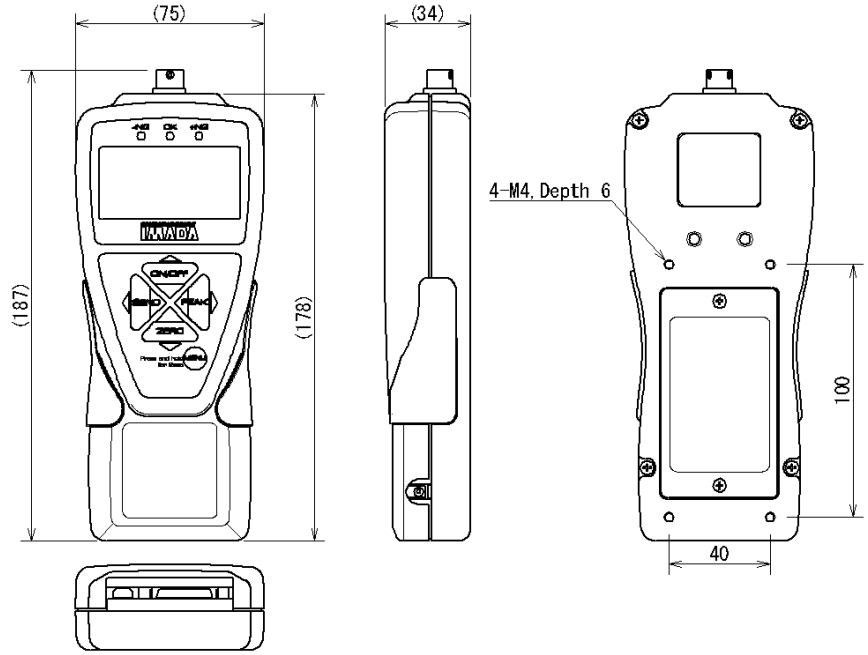
Optional cables

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-908	Open-end cable	For customized connection use.

Please ask your local distributor for detail.

17.Dimensions

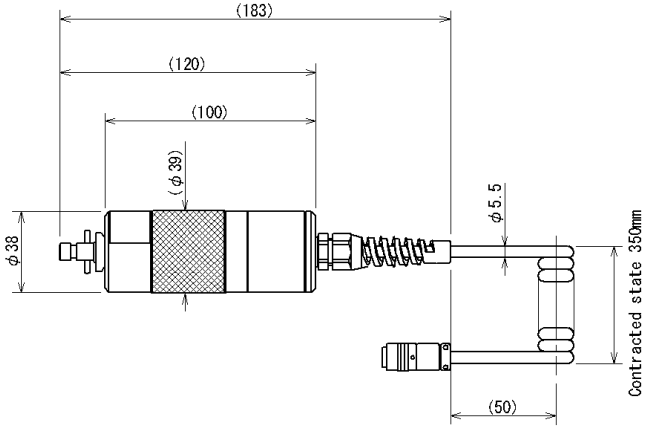
■An display unit



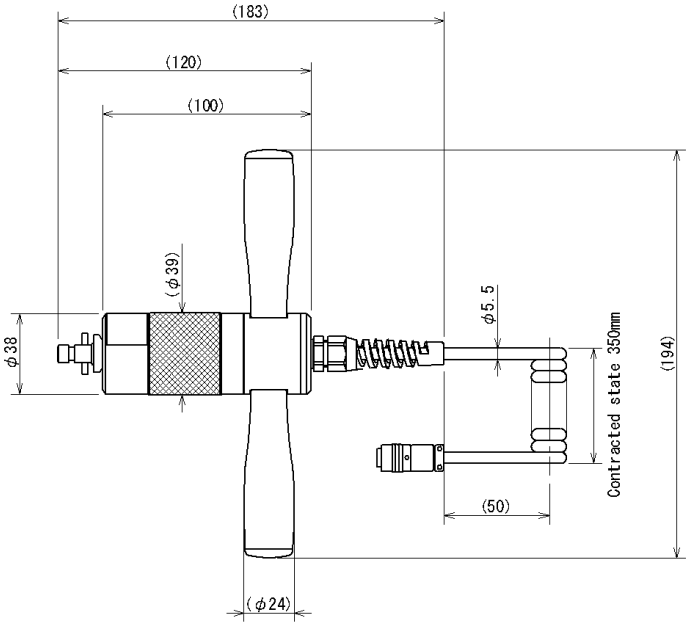
17. Dimensions

■A sensor unit

HTGS(HTGA)-2N-m、HTGS(HTGA)-5N-m

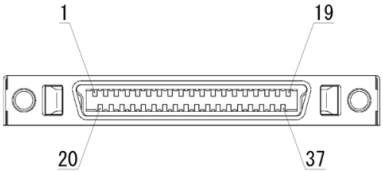


HTGS(HTGA)-10N-m



18.Output Data

18.1. Output connector



Connector pin arrangement

Pin number	Signal name	Description	Model
1	-NG	High Low set points of comparator output. Either signal is output depending on comparator judgment. (*1) (*4)	HTGA/HTGS
2	OK		
3	+NG		
4	SC1	Output depending on set high / low output values. (*1) (*5)	HTGA
5	SC2		
6	OVL	Overload output. Output when warning overload. (*1)	HTGA/HTGS
7	READY	Measurement-ready signal. Output when the display is ready to start measurement. (*1)	HTGA/HTGS
8	OUT GND	Grand common through pin #1 to 7.	HTGA/HTGS
9	ANALOG RAW ＋	Analog output (RAW) (*2) (*3)	optional
10	ANALOG RAW −		
11	ANALOG D/A ＋	Analog output (D/A) (*2) (*3) Approx. +/-2v is output when max. torque is applied.	HTGA/HTGS
12	ANALOG D/A −		
13	232C_TxD	RS232C signal	HTGA/HTGS
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 10mA.)

*2 Please keep resistance 1kΩ and more.

*3 Differential voltage output between 2 wires.

*4 The indicated value is referred to output.

*5 The real-time value is referred to output.

18. Output Data

Pin number	Signal name	Description	Model
19	NC	N/A	optional
20	NC		
21	NC		
22	NC		
23	NC		
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.) (*4)	HTGA/HTGS
25	EXSW2:ZERO		HTGA/HTGS
26	EXSW3:SEND		HTGA/HTGS
27	EXSW4:PEAK		HTGA/HTGS
28	Rec		HTGA/HTGS
29	Shift		HTGA/HTGS
30	GND	Input grand common through pin #24 to 29 and 31.	HTGA/HTGS
31	Mark Input	Input mark point	HTGA/HTGS
32	Scale A+	Displacement input (*5) Connectable linear scale and rotary encoder. (Corresponds to line driver output and open collector output.)	HTGA
33	Scale A- (OC1)		
34	Scale B+		
35	Scale B- (OC2)		
36	+5V	External power supply +5V (*6)	HTGA/HTGS
37	GND	External power supply Grand	HTGA/HTGS

*4 Pin # 24-29 and #30 are short-circuited: ON.

*5 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.)

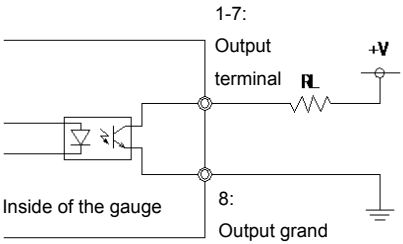
*6 Enable to supply 5V 200mA at max. Make sure to charge with AC adapter when supply power to external equipments.

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	(RESERVE)
EXSW4	Same operation with PEAK button	(RESERVE)
Rec	Control recording on software Force-Recorder series.	

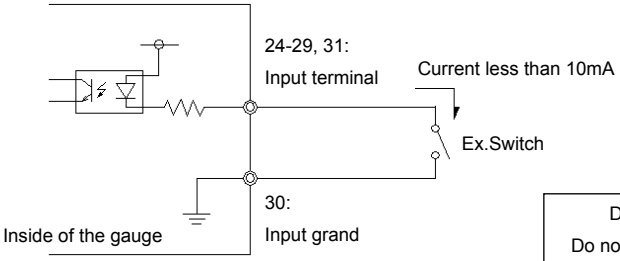
18.2. Connection example of I/O terminals

Connection example to output terminal of this instrument



Max.source:less than 30V
Max.current:less than 10mA

Connection example to input terminal of this instrument



Dry contact input.
Do not apply voltage to the input terminal.

18. Output Data

18.3. File Format saved in then USB memory (HTGA 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: RRR[CR][LF] yyyy,mm,dd,hh,nn,ss[CR][LF] ffffff,uuu,ddddddddd,rrr[CR][LF] ffffff,uuu,ddddddddd,rrr[CR][LF] …	File name: The continuous numbers follow after [R]. Each number is followed by comma and saved in CSV style. Contents: RRR: Interval of saving of real-time data 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 / ddddddddd: displacement value with sign and decimal point / rrr: unit for displacement The date and time is one when start saving. The displacement data is saved as 0 when the Displacement Type at Setup Menu is OFF.
Save of measuring values at single data	File name: S00001.csv Contents: yyyy,mm,dd,hh,nn,ss[CR][LF] YYYY,MM,DD,HH,NN,SS,ffffff,uuu, ddddddddd,rrr[CR][LF] YYYY,MM,DD,HH,NN,SS,ffffff,uuu, ddddddddd,rrr[CR][LF] …	File name: The continuous numbers follow after [S]. 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 / ddddddddd: displacement value with sign and decimal point / rrr: unit for displacement The date and time is one when start saving. The displacement data 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][LF] YYYY,MM,DD,HH,NN,SS,ffffff,uuu, ddddddddd,rrr[CR][LF] YYYY,MM,DD,HH,NN,SS,ffffff,uuu, ddddddddd,rrr[CR][LF] …	File name: The continuous numbers follow after [M]. 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 / ddddddddd: displacement value with sign and decimal point / rrr: unit for displacement The date and time is one when start saving. The displacement data is saved as 0 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) [s]: 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	[t]: 0=AND / 1=OR

*1 Decimal point is not included to setting and response. *2 Only for HTGA

18. Output Data

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Reset	XFY	Rest peak force value and its displacement	—	○	–	R	
	XFZ	Reset measuring force value	—	○	–	R	
	XLZ	Reset measuring displacement value	—	○	–	R	Only for HTGA
	XAZ	Reset peak, force, and displacement values	—	○	–	R	
Memory	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	
	XMC	Delete all internal memory	—	○	–	R	
	XME	Delete the latest Internal memory	—	○	–	R	
Power	XQT	Turn off	—	○	–	R	
Measurement value output	XAR	Measuring value output (Force and displacement)	○	—	Q±fffff± ddddddPLCSX	r+123.4+ 123456701L00	Refer to appended chart 1 for format.
	XFP	+peak / -peak output (Force and displacement)	○	—	Q±fffff± ddddddPLCSX	p+123.4+ 123456701L00 n+123.4+ 123456701L00	Refer to appended chart 1 for format.

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Measurement value output	XFF	1st peak / 2nd peak output (Force and displacement)	○	—	Q±fffff± ddddddPLCSX	1+123.4+ 123456701L00 2+123.4+ 123456701L00	Refer to appended chart 1 for format.
	XAg	Continuous data output (Force and displacement, 1/10sec.)	○	—	Q±fffff± ddddddPLCSX	I+123.4+ 123456701L00	Refer to appended chart 1 for format.
	XAG	Continuous data output (Force and displacement, 1/2000 sec.) * Error when sent to RS232C port	○	—	Q±fffff± ddddddPLCSX	f+123.4+ 123456701L00	Refer to appended chart 1 for format.
	XAS	Stop data output	—	○	—	R	
+NG	XCN	Number of +NG	○	—	XCN[nnnn]	XCN1234	[nnnn] : Number of +NG
	XCC	Reset number of +NG	—	○	—	R	
unit	XFC	Unit list output	○	—	XFC [0][1][2][3][4][5]	XFC020511000000	Pair out(Number of unit Setting and unit). 6 pairs with 2 digits integer are output. Refer to appended chart 2.

18. Output Data

Category	Command	Setting Contents	Receive	Setting	Format	Example	Description
Compatible commands	D	Data output (Interchangeable with HTG2/HTG2-P format)	○	—	±FFFFFUMC	+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 HTG2/HTG2-P format)	○	—	I	+123.4NMO +234.5NMH … END	Output pattern is the same with command D. [END] is sent after all data is output.
	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 4digits 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±ddddddddPLCSX

[Measuring value / Peak value]

m±fffff±ddddddddPLCSYYMMDDhhmmss

[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 No.1 / 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+Shift 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 50 of XFC command for detail.)

Appended chart 2. Unit 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(*)

*Unit 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	mm
1	inch(*)
2	°

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

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