

delvo



| | | |
|----|-------------------------|--------------------------|
| GB | TORQUE CHECKER | OPERATION MANUAL |
| D | ANZIEHMOMENTPRÜFER | GEBRAUCHSANLEITUNG |
| F | VÉRIFICATEUR DE COUPLE | MODE D'EMPLOI |
| I | CONTROLLATORE DI COPPIA | MANUALE DI FUNZIONAMENTO |
| S | MOMENTMÄTARE | BRUKSANVISNING |
| E | TORQUÍMETRO | MANUAL DE FUNCIONAMIENTO |
| C | 扭矩测量仪 | 操作手册 |

Models *DLT1173A, DLT1673A, DLT1973A*



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Original instructions


Thank you very much for purchasing a Delvo Torque Checker. For safe and efficient operation, please read this Operation Manual through before use, get a good understanding of the operating precautions, capabilities of this product, how to use it, and other details, and use it correctly.


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Meanings of the "symbols and signal terms"

The meanings of the "symbols and signal terms" indicated at the top of each precaution. Note that even an item described in  Caution may lead to a serious result depending on the case. Be sure to observe all precautions, because every one of them describes something important.

 **Warning:** A precaution about the possibility that mishandling may result in the death or serious injury of the user.

 **Caution:** A precaution about the possibility that mishandling may result in personal injury or property damage.

Note: An important note about the installation, operation, and/or maintenance of the product.

1. Safety precautions

- Be sure to take all "Safety precautions" given here to prevent fires, electric shocks, injury, and other accidents.
- Read these "Safety precautions" carefully before use and use the product correctly according to the instructions.
- After reading it, be sure to store this manual at a place where anyone using the product can have access to the product any time.

- Warnings -

1. Keep the workshop neat and clean at all times.
 - A disorderly workshop or work bench may lead to an accident.
2. Consider the surroundings of the workshop as well.
 - Do not use the Torque Checker in rain or at a wet or moist place.
 - Use it at a place with a constant temperature (about 20°C) whenever possible.
 - Keep the workshop bright enough.
 - Do not use or recharge the product where a combustible liquid or gas is present.
3. Do not let any child come near the product.
 - Do not let any person other than the responsible workers come near the workshop.
4. When not in use, store the product neatly.
 - Store the product at a dry place and at a height inaccessible to children or in a lockable place. When transporting it, use the packaging case that originally contained the product.
5. Wear neat clothes when doing work.
 - Do not wear loose clothes or a necklace or other ornament. Any such object may get caught in the rotary part.
6. Do not handle the cord roughly.
 - Do not move the product while holding its cord when it is attached to the product. Do not pull the cord to unplug it.
 - Do not let the cord come near heat, oil, or a sharp edge.
7. Fasten the product firmly.
 - Before measuring anything that may entail a high torque, fasten the product firmly. That way, you can handle the product more safely than holding it with a hand. You can also hold the electric tool with both hands.
8. Do not work in a straining posture.
 - Keep your feet firm at all times. Keep the balance.
9. Service the Torque Checker carefully.
 - For safe and efficient operation, check the measuring joint regularly. Use one whose thread and other parts are free from deformation and wear.
 - When replacing the accessories, follow the Operation Manual.
 - Check the cord and extension cord regularly. If either of them is damaged, replace it.
10. Switch off the product and unplug it from the power source in any of the following cases:
 - when the product is expected to remain unused or uncharged for some time
 - when it is to be repaired
 - in any other case when danger is expected.
11. Remain alert and take enough care when doing work.
 - Use the product prudently, watching out for the proper method of handling, method of work, surroundings, and other circumstances.
 - Use common sense.
 - Do not use the product when you are tired.

12. Check for damaged parts.
 - Before use, check sufficiently for damage. Make sure that the product functions normally and displays specified functionality.
 - Check all parts that may affect the product's operation for any abnormality.
 - When replacing any part, follow the Operation Manual.
13. Use specified accessories and joints.
 - Do not use any part other than the accessories and joints described in this Operation Manual.
14. When you need any repair, commission it to an agency specializing in it.
 - Do not remodel the product on your own.
 - When you need any repair, be sure to commission it to the shop where you bought the product. If anyone having no knowledge or expertise about the repair procedures tries to repair the product, the product will not display its performance fully. Not only that, it may result in an accident or injury.
15. Do not apply a torque exceeding the specified permissible load to the product.
 - Applying a torque exceeding the specified permissible load may damage the detector, resulting in an accident or injury.
 - Do not use the product on impact loads.
16. Do not disassemble or apply a strong impact or vibration to the product.
 - This product is a precision device. Therefore do not disassemble it. If an excessive impact or vibration damages the Torque Checker, it not only will fail to display its performance fully but also may cause an accident or injury.
17. Recharge the product correctly.
 - Recharge the product to the specified voltage. Do not use a DC power supply or engine generator. Any such practice may cause the product to heat up abnormally, resulting in a fire.
 - Do the recharging at a well-ventilated place. Do not cover the product with a cloth or anything similar during the recharge.
18. Protect against electric shocks.
 - Do not touch the power plug with a wet hand. That may cause an electric shock.
19. Do not throw the battery (contained in the product) into a fire.
 - It may burst or emit a hazardous substance.

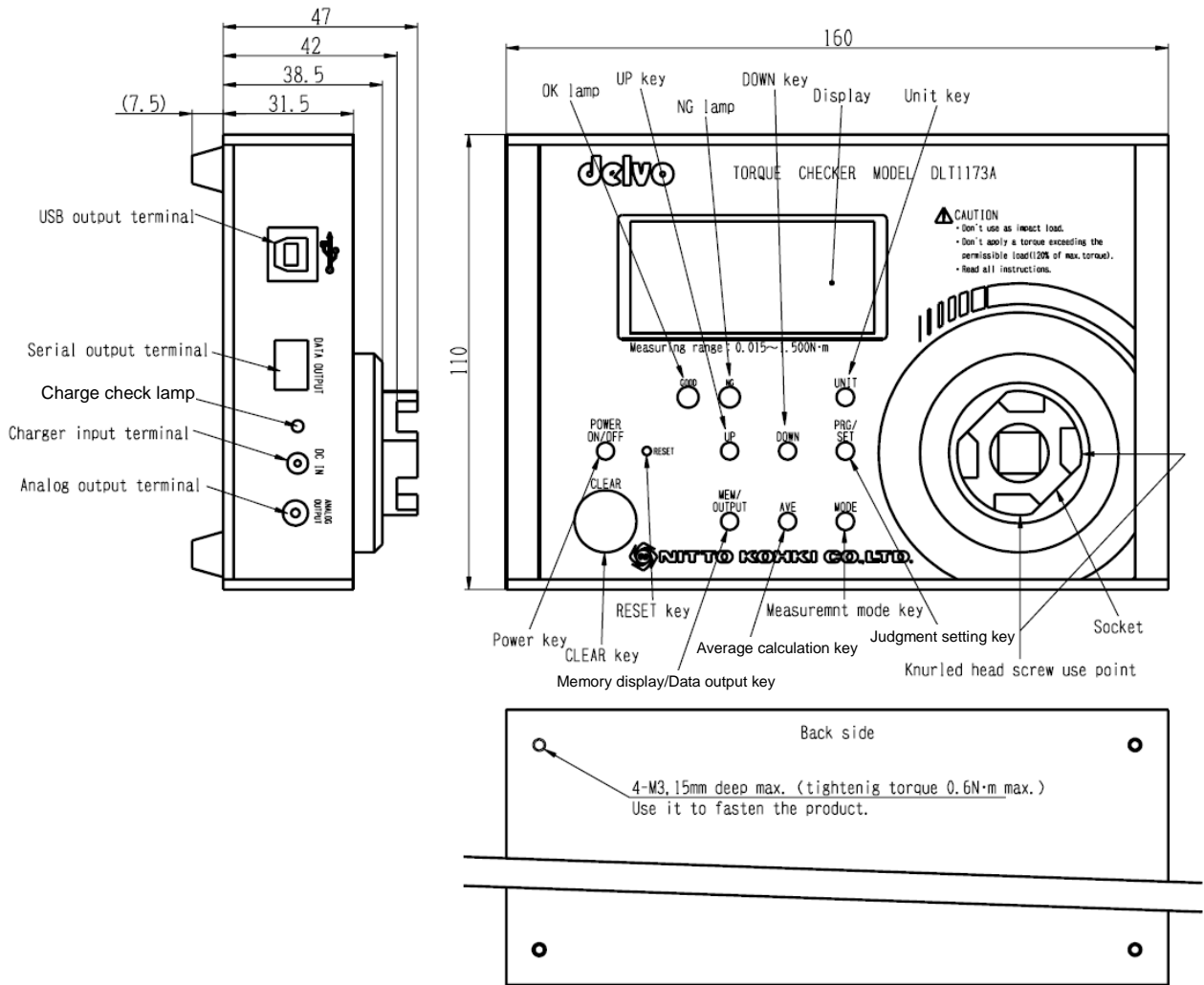
2. Overview

This Torque Checker aims to control screwdrivers on a routine basis (by means such as checking the changes in torque with time).

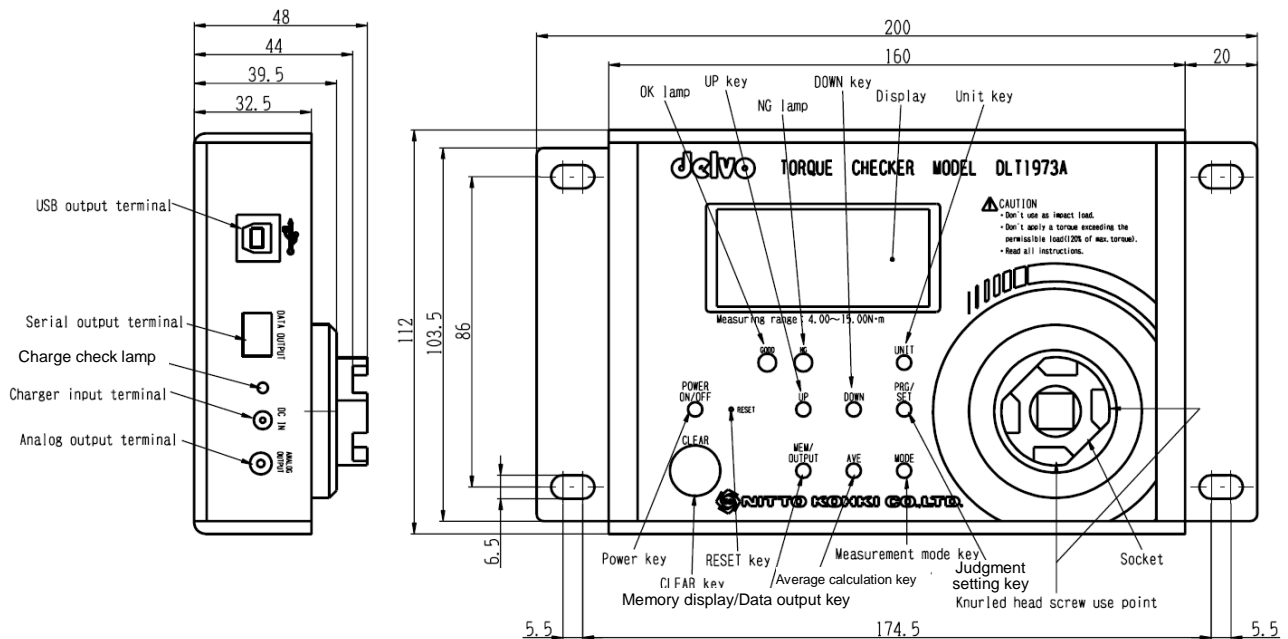
It stores up to 800 items of data and has many user-friendly functions, including automatic power-off and automatic clearing of torque display.

3. Designations and dimensions of the components

■ DLT1173A, DLT1673A



■ DLT1973A



4. Specifications

4-1. Product proper

| | | | |
|-------------------------------|--|---|--|
| Model | DLT1173A | DLT1673A | DLT1973A |
| Measurement range N•m | 0.015 - 1.500 | 0.15 - 10.00 | 4.00 - 12.00 |
| Maximum allowable torque N•m | 1.800 | 12.00 | 18.00 |
| Precision | Within $\pm 0.5\%$ (F.S.) For 0.2N•m or less, ± 1 digit | Within $\pm 0.5\%$ (F.S.) For 2N•m or less, ± 1 digit | Within $\pm 0.5\%$ (F.S.) |
| Display | 4-digit digital display (single-line) Data sampling: 1,000 times/sec Display rate: 12 times/sec | | |
| Measuring direction | CW and CCW | | |
| Measuring mode | 3 modes: PD-TR-PP | | |
| Measuring unit | N•m /kgf•cm/lbf•in (3 different units can be switched.) | | |
| Display reset | In PP and PD: Manual/auto switchover possible TR: Manual only | | |
| Display reset time | Only effective in PP and PD auto: 0.1, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0 sec When PP and PD manual, the display retains its value reading until manually operated. | | |
| Auto power-off | Powered off if left untouched for 10 minutes | | |
| Memory | 800 data items | | |
| External output | As per USB output (single-direction, no procedure) Mitsutoyo Digimatic (sequential output) | | |
| Analog output | Approx. 1.5V max. | Approx. 1.0V max. | Approx. 1.1V max. |
| | No zero offset; identical waveforms produced in PP, PD, and TR modes | | |
| Sensor system | Bending system | | |
| Spring shape | 75×14×1.4(t) | 75×14×2.8(t) | 75×14×3.8(t) |
| Measuring jig | Spring cushion system | | |
| Method of measurement | Measurements taken with the bit installed | | Using NK bit NK35BN 13×19×10×75 (TD20457) |
| Environmental conditions | Storage temperature range | | -10 - +40°C |
| | Operating temperature range | | +5 - +35°C |
| | Humidity range | | +10 - +90% (non-condensing) |
| Operating Environment | less than 2000m above sea level | | |
| Pollution Degree | degree 3 according to IEC60664-1 | | |
| Over Voltage Category | category I according to IEC60664-1 | | |
| Rechargeable battery | Nickel metal hydride battery | | |
| Rechargeable battery capacity | 1100mAh | | |
| Recharge time | 4 hours | | |
| Continuous use time | 20 hours | | |
| Outside dimensions | 160 (W) ×110 (D) ×47 (H) | | 200 (W)×112 (D)×48 (H) |
| Weight | 1.1kg | | 1.4kg |

4-2. Battery charger

| | |
|----------------------|-------------------------|
| Article designation | DLE1833A |
| Rated input voltage | 100 - 240V AC , 50/60Hz |
| Rated output voltage | 12 V DC |
| No-load current | 0.1 mA or less |
| Rated current | 500 mA |
| Rated capacity | 6 VA |
| Weight | 75 g |

5. Accessories

(1) Standard accessories

| Model | DLT1173A | DLT1673A | DLT1973A |
|-------------------------|--|---|---|
| Measuring joint | Model: DLW4430 with spring for 0.15-1.5N•m (spring color: golden) | Model: DLW4360 with spring (strong) for 0.15-6.5N•m (spring color: black) | Model: DLW4000 Soft joint |
| Accessory spring | | Model: DLW4660 Spring (weak) alone for 0.15-1.5N•m (spring color: golden) | |
| Accessory bit | | | NK Bit NK35BN 13×19×10×75 (TD20457) |
| Battery charger | Model: DLE1833A, Input: 100-240V AC, Output: 12V DC, 500mA | | |
| Plug for power supply | A type plug x 1 | | |
| Fix the measuring joint | Two M3x6 knurled head screws | | |
| Casing | With black polyester casing | | |

(2) List of options

| Article | Model | Specification | Applicable models | | |
|----------------------------------|----------|--|-------------------|----------|----------|
| | | | DLT1173A | DLT1673A | DLT1973A |
| Holding fixture | DLW1300 | Bracket to fix the body | ○ | ○ | — |
| Cable for analog signal output | DLW9080 | Cable for analog waveform output | ○ | ○ | ○ |
| Battery charger | DLE1833A | Overseas use: 100-240V AC, 50/60Hz | ⊙ | ⊙ | ⊙ |
| Plug for power supply | TV06573 | Plug for Japan (A type) | ⊙ | ⊙ | ⊙ |
| Plug for power supply | TV06574 | Plug for Europe (C type) | ⊙ | ⊙ | ⊙ |
| Duralumin case | DLW4900 | Special-purpose duralumin case | ○ | ○ | — |
| Soft joint | DLW4000 | torque range: 4.0 to 12.0N•m | — | ○ | ⊙ |
| Bolt for hard joint | DLW4040 | torque range: 4.0 to 12.0N•m | — | — | ○ |
| Measuring joint | DLW4330 | 4mm-diameter type, torque range: 0.015 to 0.25N•m | ○ | — | — |
| Measuring joint | DLW4340 | 4mm-diameter type, torque range: 0.15 to 1.5N•m | ○ | ○ | — |
| Measuring joint | DLW4350 | Hex 5 and hex 6.35 types, torque range: 0.15 to 1.5N•m | ○ | ○ | — |
| Measuring joint | DLW4360 | Hex 5 and hex 6.35 types, torque range: 0.15 to 6.5N•m | — | ⊙ | — |
| Measuring joint (for screw type) | DLW4430 | No.2 screw type, torque range: 0.15 to 1.5N•m | ⊙ | ○ | — |
| Measuring joint (for screw type) | DLW4530 | No.2 screw type, torque range: 0.15 to 5.0N•m | — | ○ | — |
| Bolt for soft joint | DLW4020 | Size of screw for (DLW4000): M8X35-10.9 | — | — | ○ |
| Bolt for hard joint | DLW4030 | Size of screw for (DLW4040): M8X25-10.9 | — | — | ○ |
| Shaft for measuring joint | DLW4610 | For 4mm-diameter type (DLW4330), screw size M4 | ○ | — | — |
| Shaft for measuring joint | DLW4620 | For 4mm-diameter type (DLW4340), screw size M6 | ○ | ○ | — |
| Shaft for measuring joint | DLW4630 | For hex 5 and hex 6.35 types (DLW4350), screw size M6 | ○ | ○ | — |
| Shaft for measuring joint | DLW4640 | For hex 5 and hex 6.35 types (DLW4360), screw size M8 | — | ○ | — |
| Disc spring for joint | DLW4010 | For the torque range of 4.0 to 12.0N•m | — | — | ○ |
| Spring for measuring joint | DLW4650 | For the torque range of 0.015 to 0.25N•m, spring color: golden | ○ | — | — |
| Spring for measuring joint | DLW4660 | For the torque range of 0.15 to 1.5N•m, spring color: golden | ○ | ⊙ | — |
| Spring for measuring joint | DLW4670 | For the torque range of 0.15 to 6.5N•m, spring color: black | — | ○ | — |

⊙: Comes with the product as standard equipment ○: Available option —: Unsupported

6. How to use the product

6-1. Getting ready for measurement

(1) Stabilize the product.

■ DLT1173A、DLT1673A

Fasten the product if necessary. To fasten it securely, remove the rubber legs attached to the back side and use the tap holes.

A holding fixture “DLW1300” is available as a separately sold item.

■ DLT1973A

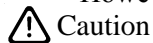
Fix the body to a working bench with bolts, or securely fix the flange part of the base plate of the body with a C-clamp, etc.

(2) Checking the battery level

The remaining battery level is indicated at the top of the display board. If the battery is insufficient, charge it by inserting the connector of the supplied battery charger “DLE1833A” to the “DC IN” terminal.

* When the battery charger is connected, there are cases where the battery level becomes FULL.




However, you should keep charging the battery while the lamp next to the “DC IN” terminal is lit.



Caution

As a battery charger, always use a DLE1833A.

Meaning of display on liquid crystal panel

| Display on liquid crystal panel | Description |
|---|---|
|  | The battery is sufficient. No need to charge the battery. |
|  | The battery is low. You should charge the battery before long. If you use the lamps and buzzers, for instance when performing judgment, you should charge the battery ahead of time. |
|  | The battery is running out. Charge the battery immediately. |
| | When the battery runs out, the power is immediately turned off. |

(3) Setting the measurement mode

When you press the measuring mode switch key “MODE” for approx. 1 sec, the measuring mode displayed on the liquid crystal panel is changed.

Every time you press the key, measuring mode is switched in turn.

There are the following three modes. You can use an appropriate one according to the use purpose.

[1] PP (peak measurement): Usually used to measure the torques of electric screwdrivers.

(Retained at 10 digits or higher.)

[2] TR (track measurement): Used to measure torque changes and to perform zero adjustment.

[3] PD (Peak down measurement): Used to measure the manual direct reading torque wrench, etc.

(Works at 10 digits or higher.)

(4) Zero adjustment

When the power is turned on and when the measuring mode is switched, zero adjustment is automatically performed.

Although equipped with an automatic zero adjuster, the product may, although very rarely, fail to display a “0” at power-up. In such a case, follow the steps described below to perform zero adjustment.

To perform zero adjustment, set the “TR” mode, which measures the track, using the “MODE” key to switch the measuring mode, and press the “CLEAR” key as no load is applied to the socket unit.

(5) Setting and change of measuring unit

When you press the “UNIT” key for approx. 1 sec, the measuring unit displayed on the liquid crystal panel is switched.

(6) Setting the automatic reset function

You can set measurement display resetting in manual or auto (time setting). Setting it in auto mode allows you to save labor in taking continued measurements.

[1] Set the power ON/OFF key to the OFF position.

- [2] While holding down the CLEAR key, press the power ON/OFF key once. When the liquid crystal panel displays something, stop pressing the CLEAR key.
- [3] Each push of the CLEAR key changes the time reading. (The time reading will change as shown below.) Select an automatic reset time. If, at that time, you cannot finish the setting within 3 seconds, repeat the procedure with step 1).
- [4] Now the automatic reset setting is over. But you have to reset the 0.0C reading manually. Selections of the automatic reset times (in seconds)

$$\begin{array}{ccccccc}
 0.0C & \rightarrow & 0.1C & \rightarrow & 0.5C & \rightarrow & 1.0C \\
 & & \uparrow & & & & \downarrow \\
 3.0C & \leftarrow & 2.5C & \leftarrow & 2.0C & \leftarrow & 1.5C
 \end{array}$$

6-2. How to take measurements

- (1) Set the “PP” mode, which measures the peak, to “MODE”, which is the measuring mode switch key, and press the “CLEAR” key as no load is applied to the socket unit.

- (2) Plug the measuring joint to the socket of the product. Insert the screwdriver into the measuring joint.

Each joint has a specific measurable torque range. Therefore check the torque range in which you wish to take measurements and the torque range in which the joints can be measured.

Note Since there is an M3 screw hole at the socket side, fix the measuring joint into the socket with the attached knurled head screw if necessary.

- (3) Reverse the screwdriver to be measured and loosen the spring of the measuring joint.

- (4) Press the “CLEAR” key and check that 0 is displayed.

Note If 0 is not displayed, perform zero adjustment.

- (5) Turn the screwdriver to be measured in forward direction. Turn it until the screwdriver stops automatically.

- (6) Check that the screwdriver has stopped normally. Take the torque reading on the display. The measurement is then over.

- (7) Reverse the screwdriver again. Then loosen the measuring joint to a specified height.

- (8) Repeat the steps (4) through (7) described above to check the output torque.

If pressing the CLEAR button does not reset the torque reading, or if the button will not function, or if the product malfunctions otherwise, press the RESET button.

Push the RESET button by inserting the tip of a pen or something else with a thin tip into the hole.

Note that pressing that button will clear all data in the memory.

Note Any measurement taken with the Torque Checker may differ from the actual screw-tightening torque.

6-3. Handling the measuring joints

- (1) Replacing the spring

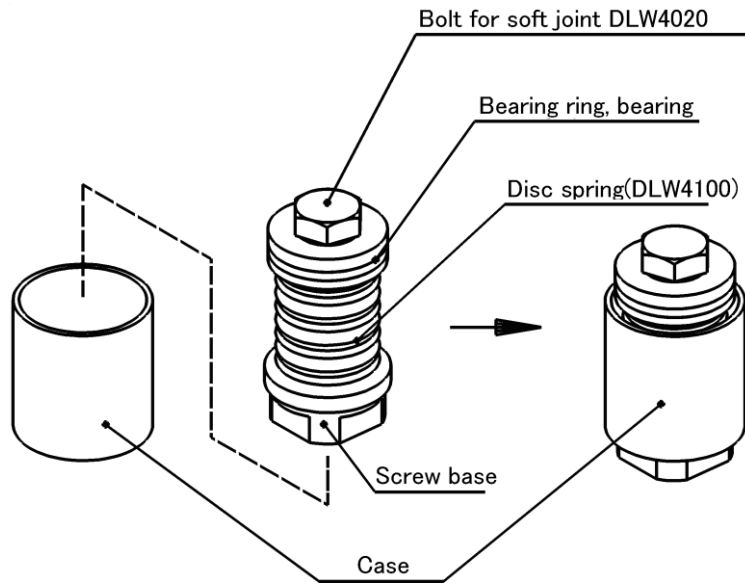
The DLT1673A comes with two kinds of springs: one for 0.15-1.5N•m (weak) and another for 0.15-6.5N•m (strong). The joints are equipped in advance with springs for 0.15-6.5N•m. Therefore replace the joint with one for 0.15-1.5N•m when measuring low torques.

(2) How to use a soft joint or a hard joint (DLT1973A)

■ Soft joint DLW4000 (included as standard)

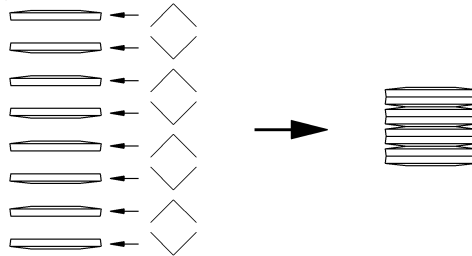
According to ISO5393, a screw is defined to turn more than 720° in its seated position before it gets the specified torque when it tightens a soft item (soft joint). Use the proper combination for the tightening condition.

Attention: Note that some drivers may not be able to measure with a soft joint.



■ Combination of disc spring (DLW4010) for soft joint (separately sold)

The combination of disc springs ($\langle \diamond \diamond \diamond \diamond \rangle$) should be as the diagram below indicates. Do not change the number (8) and the combination (direction) of disc springs in using a soft joint.



(3) Checking the measuring joints

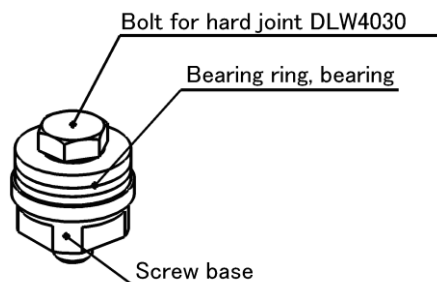
Be sure to grease up the threaded portion of each measuring joint. Check the inside thrust bearing regularly for damage.

Note In the measurement of ungreased threads, it may be that correct measurement is not possible, for such reasons as accelerated thread wear. Before storage, be sure to loosen the threads.

Note It is recommended to replace the measuring joints at intervals of 2,500 operations or 1 year as a guide.

■ Hard joint DLW4040 (separately sold)

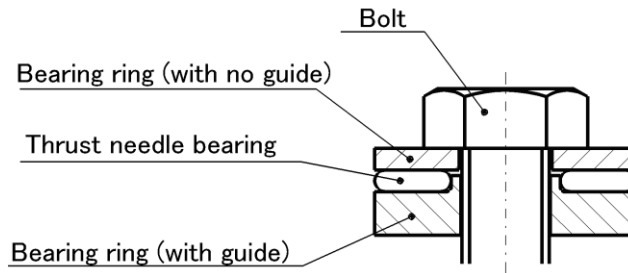
According to ISO5393, a screw is defined to turn 30° in its seated position before it gets the specified torque when it tightens a hard item (hard joint)



■ Combination of bearing ring and bearing

The combination of a bearing ring and a thrust needle bearing should be the diagram below indicates, and apply grease to the bearing ring and the bearing.

Using a different combination (direction) from the diagram below may cause the damage to the parts.



6-4. Memory function

Before storing data, you must set the automatic resetting to manual in advance as per [6-1]-(6).

Note Note that data cannot be stored in the TR mode.

(1) How to store data

This product can store measurement data in its memory. Take measurements by following the procedure described in 6-2.

[1] To save the displayed torque, press the “UP” key, and the data is saved in the memory from the memory number “001”.

If any data has been already saved in the memory, the data is saved in the next memory number.

Note Up to 800 data can be saved. When data exceeds 800, data is overwritten from the memory number 001.

(2) How to delete memory data individually

[1] Press the “MEM/OUTPUT” key and “MEM” is displayed at the bottom of the liquid crystal panel, and the last saved data number and measurement value are displayed in turn.

[2] Press the “UP” key or “DOWN” key, the memory number is changed, and you can search data.

Note When you do not perform any operation for 6 sec, the “MEM” display disappears, and the machine goes back to the measurement mode.

[3] Press the “CLEAR” key while the memory number and measurement value are displayed in turn, “CLR” is blinking on the liquid crystal panel.

Note When you do not perform any operation while “CLR” is blinking, the measurement becomes available. (No data is deleted.)

[4] Press the “CLEAR” key again while “CLR” is blinking, and “- - -” is displayed on the liquid crystal panel, and the selected data is deleted.

(3) Deletion by specifying the range of the memory data

[1] Press the “MEM/OUTPUT” key, and “MEM” is displayed at the bottom of the liquid crystal panel, and the last saved data number and measurement value are displayed in turn.

[2] Press the “UP” key or “DOWN” key to display the first data of the data that you want to delete.

[3] Press the “CLEAR” key while the memory number and measurement value are displayed in turn, and “CLR” is blinking on the liquid crystal panel.

[4] When you press the “UP” key, the memory number increases. Press the key until the memory number of the last data in the range you want to delete is displayed.

[5] When you press “CLEAR” key while the memory number and measurement value are displayed in turn, “- - -” is displayed on the liquid crystal panel, and the data in the selected range is deleted.

Note When any data in the memory is deleted, the succeeding data moves up to the deleted memory position.

(4) Deletion of all memory data

[1] Press the “CLEAR” key for 4 sec or more, “ALL” is displayed on the liquid crystal panel.

[2] Pressing the “CLEAR” key a second time while [ALL] is displayed on the liquid crystal panel will make [CLR] display. Pushing “CLEAR” again will result in [- - -] being displayed, deleting all data.

Note When you perform no operation while “ALL” or “CLR” is blinking on the liquid crystal panel, the measurement becomes available.
(Data is not deleted.)

6-5. External output

(1) Serial output

This product comes with output terminals connectable to products compliant to the specifications of Mitsutoyo Digimatic manufactured by Mitsutoyo Corp.

For the details of the serial output specifications, consult us.

Recommended product: Digimatic Mini-Processor manufactured by Mitsutoyo Corp.

- Input tool (IT-012U) by Mitsutoyo Corp.

(2) Analog output Specifications

Load impedance > 1kΩ

Note As analog outputs, this product always produces identical waveforms regardless of the mode activated by the measurement mode selector MODE. The output voltages of each model will be as per the specifications indicated in 4.

This product comes optionally with an analog output cable DLW9080.

(3) USB output

The output data is output in the ASCII format via a USB cable.

You can download the import software “DSS-3” (supported OS: Windows 98 to Windows 7) from our website www.nitto-kohki.co.jp. Please note that the software might not work in some PCs.

To import the data, you need to install the import software “DSS-3” and driver software.

Download the latest version of “VCP Drivers” from FTDI Chips **Virtual COM Port Drivers** <http://www.ftdichip.com/Drivers/VCP.htm> and make the setting of the driver.

(3-1) Setting of PC

[1] Download “VCP Drivers” and decompress the saved file.

[2] Move the decompressed file to the desktop or other location where you can access easily.

[3] Connect the torque checker to the PC with a USB cable.

* Turn on the power of the torque checker.

[4] The new hardware detection wizard window is displayed on the PC monitor. Select “No. Not connect now” and click “Next”.

[5] Go to the next page, select “Install from a list or specified location”, and click “Next”.

[6] Go to the next page, select “Include the following locations”, and click “Reference (R)”.

[7] Select the decompressed file in Reference, and press “OK”.

[8] When the installation is completed, the new hardware search wizard completion window is displayed. Press Finish to exit.

[9] To check that the installation is done, move the cursor on “My Computer” and right-click on it, select “Manage”, and open the “Manage Computer” window. Select “Device Manager”.

[10] Click “Port (COM and LPT)” in the tree on the right side of Device Manager, and “USB Serial Port (COM*)” is displayed.

Note The number after COM varies according to the computer. When you make the setting of the communication software, you need to specify the COM port. Please check the setting.

Note If USB Serial Port is not displayed when you select “Port (COM and LPT)”, disconnect the USB cord and connect it again, and then install the driver again.

(3-2) Communication setting of import software “DSS-3”

[1] Select “Communication condition setting” in “Setting” in the menu.

[2] Set “19200,n,8,2” to the “Communication Speed” setting.

[3] Make the appropriate setting to “COM Port” in accordance with the COM port of your PC.

Note For information on the COM port numbers, refer to [8] to [10] in the setting of the VCD Drivers.

Specifications

| | | | |
|-----------------|---|-----------------|--------------|
| Data bit length | Start bit, 1 bit + 8 bits + 2 stop bits + no parity | | |
| Baud rate | 19200bps | Connector shape | USB (B type) |

Format

| | | | | | | | | | |
|-------------|-----|----|-------|------|-------------|-------|----|--------|----|
| 18 | ○○○ | OE | 20 | ± | ○○○○○ | 20 | OF | ○○○○○○ | OD |
| CAN | * | SO | Space | Code | Measurement | Space | SI | Unit | CR |
| All data 21 | | | | | | | | | |

CAN : Cancel

* : In memory mode = number of samples / in normal mode = space

SO : Specifies enlarged printout with double width.

± : + tighten/- reverse

Measurement code: Includes a decimal point. If no decimal point, a space at the end.

10 .00 → 10.00

SI : Releases the enlarged printout with double width.

Unit : In N•m or otherwise, the rest is a series of spaces.

N • m → N•m (k g f • C m → kgfcm)

CR : Carriage return

6-6. How to output data

Data is output every time the “CLEAR” key is pressed after measurement is completed. If the auto reset is set, data is automatically output.

When you save the data using the memory function, the data is output with the procedure given below:

- [1] Press the “MEM/OUTPUT” key, and the last saved memory number and measurement value are displayed in turn.
- [2] Press the “MEM/OUTPUT” key while the data number and measurement value are displayed.
- [3] After “FA” (First Address) is displayed on the liquid crystal panel, the memory number is displayed. Select the first memory number you want to output using the “UP” or “Down” key, and then press the “MEM/OUTPUT” key.
- [4] After “LA” (Last Address) is displayed on the liquid crystal panel, the memory number is displayed. Select the last memory number you want to output using the “UP” or “Down” key, and then press the “MEM/OUTPUT” key.
- [5] “-P-“ is displayed on the liquid crystal panel, and the data is output. When output is finished, the machine goes back to the measurement mode.

Note When you press the “CLEAR” key for 1 sec or more, the data output mode is cleared.

6-7. Changing data output speed

You can change the speed to output the saved data.

Note When you output the data in the high speed output setting, it might result in an error depending on your PC and peripherals. If an error occurs, use the normal output mode.

- Normal output: [00] is displayed on the liquid crystal panel. High speed output ...[01] is displayed on the liquid crystal panel.
- * The default setting is [00].
- How to change the output speed
 - [1] Turn on the power by pressing the “ON/OFF” key as holding down the “PRG” key while the power is OFF.
 - [2] When you let go the “PRG” key, “00” or “01” is displayed on the liquid crystal panel. Press the “UP” key, and the speed setting is switched.
 - [3] After selecting the speed, press the “PRG” key, “-5-“ is displayed on the liquid crystal panel. Then, the machine goes back to the torque display, and measurement becomes available.

6-8. Judgment function and peak down setting

Whether the measurement result is within the standard values or not judged, and the judgment result is notified using lamps and/or buzzers.

The judgment is executed only when the measuring mode is PP (peak mode). (The measurement value must be 10 digits or higher.)

In the case that the measuring mode is PD (peak down), when a higher value than the peak down setting is detected, it is notified by a green lamp. The green lamp keeps ON and the numeric value is retained until the "CLEAR" key or "UP" key is pressed.

| Judgment | Lower limit or less * | Within upper and lower limits | Upper limit or more | Over torque |
|----------|-----------------------------------|-------------------------------|-----------------------------------|----------------------|
| Lamp | Red lamp (NG) is blinking (slow). | Green lamp (GOOD) is ON. | Red lamp (NG) is blinking (fast). | Red lamp (NG) is ON. |
| Buzzer | Intermittent sound (slow) | Continuous sound | Intermittent sound (fast) | Continuous sound |

* Lower limit or less*: It is detected when the load during measurement almost disappears (less than 15 digits) while it does not reach the lower limit value. (It is not detected when the maximum value does not reach 15 digits.)

(1) Setting of Judgment

- [1] Press the "PRG/SET" key for 1 sec, and the green LED (GOOD lamp) is turned ON, and "HI" is displayed on the liquid crystal panel, and then the upper limit value is displayed.
* The green LED (GOOD lamp) is ON during the setting mode.
- [2] To set the upper limit value, select the digit by pressing the "DOWN" key. When the selected digit is blinking, change the numeric value by pressing the "UP" key. After setting the value, press the "DOWN" key again, select the digit, and change the numeric value using the "UP" key.
- [3] When you finish the setting, press the "PRG/SET" key. "LO" is displayed on the liquid crystal panel, and then the lower limit value displayed.
- [4] To set the lower limit value, perform the same operation explained in [2]. After the lower limit value is set, press the "PRG/SET" key.
Note When the lower limit value is larger than the upper limit value, the judgment is not performed.
- [5] Make the setting of the peak down start value. "PdLO" is displayed on the liquid crystal panel, the peak down start value is displayed. To make the setting, perform the same operation explained in [2]. After the peak down start value is set, press the "PRG/SET" key.
Note Peak down works (is displayed) when the measurement value is lowered by 15 digits or more from the setting value.
- [6] Make the setting of the buzzer. After "6P" is displayed on the liquid crystal panel, the ON, OFF, FF settings are displayed. Make the setting of the buzzer using the "UP" and "DOWN" keys. After the setting is finished, press the "PRG/SET" key.
(“On”: Buzzer sounds in all cases; “OFF”: Buzzer does not sound except in the case of over torque; “FF”: Buzzer sounds only in the case of NG)
- [7] "-5-" is displayed on the liquid crystal panel, and the setting is finished. The green LED (GOOD lamp) is turned OFF.
* To cancel the setting, press the "CLEAR" key. "-5-" is displayed on the liquid crystal panel, and the measurement becomes available. The green LED (GOOD lamp) is turned OFF.
* You can check the currently specified numeric values by stopping the numeric values on the liquid crystal panel from blinking (by pressing the "DOWN" key) and pressing the "MODE" key.
(“HI”: Upper limit value setting; “LO”: Lower limit value setting; “PdLO”: Peak down start value; “6P”: Buzzer setting)

(2) Measurement Method Using Judgment

- [1] Set the upper limit value and lower limit value which are used as the standard values. For information on how to set them, refer to Step (1) in 6-8.
- [2] Check that the measuring mode is "PP". * The judgment works only when the measuring mode is "PP".

- [3] When the measurement value is larger than the lower limit value or lower than the upper limit value, the GOOD lamp is turned ON.
When the measurement value is larger than the upper limit value or lower than the lower limit value, the NG lamp is turned ON.
- [4] When the measurement is finished, press the “UP” key when you save the numeric value, and press the “CLEAR” key when you restore 0 to the display value. At this point, the lamp and buzzer used for the judgment result are turned OFF.
 - * If you do not use the judgment function, set 0 to the upper limit value and lower limit value, or set a larger value to the lower limit value than the upper limit value.

6--9. Maximum, minimum, and average values calculation function

You can display and check the maximum value, minimum value, average value, and number of data of the measurement values.

Up to 30 data can be calculated. If the number of data exceeds 30, the oldest data is deleted, and new data is calculated.

(1) How to measure maximum value, minimum value, and average value

- [1] Check if the measuring mode is “PP” or “PD”.
- [2] Press the “AVE” key. “AVE” is blinking at the bottom of the liquid crystal panel.
- [3] Perform the torque measurement. Press the “UP” key when you add the numeric value in the calculation, and press the “CLEAR” key when you clear the numeric value and set 0 to the display value. Repeat this operation.
- [4] After the measurement is finished, press the “AVE” key to display the number of the data, maximum value, minimum value, and average value.
- [5] The number of the data (no display at the bottom of the liquid crystal panel), maximum value (“MAX” at the bottom of the liquid crystal panel), minimum value (“MIN” at the bottom of the liquid crystal panel), and average value (“AVE” at the bottom of the liquid crystal panel) are displayed in this order on the liquid crystal panel.
 - * When you measure new maximum value, minimum value, and average value, the previously saved data become invalid.

6-10. Recharging

(1) Automatic power-off

This product will power itself off if it is left for 10 minutes or if the battery level is low.

(2) Battery charger

The battery has a limited life span. If you find that it only lasts for an extremely short time after fully charged, or if you find any similar problem, please consult the shop where you bought the product.

(3) How to recharge the battery

When the battery level on the liquid crystal panel is low, insert the connector of the supplied battery charger to the “DC IN” terminal to charge the battery. The charge is finished when the lamp next to the “DC IN” terminal turned OFF, and the battery level on the liquid crystal panel is full.



Note

Overcharge may cause a battery burst, heat-up, or leak, resulting in a fire or injury. As a battery charger, always use a DLE1833A



CONTAINS NICKEL-METAL HYDRIDE BATTERY. MUST BE RECYCLED OR DISPOSED OF PROPERLY.

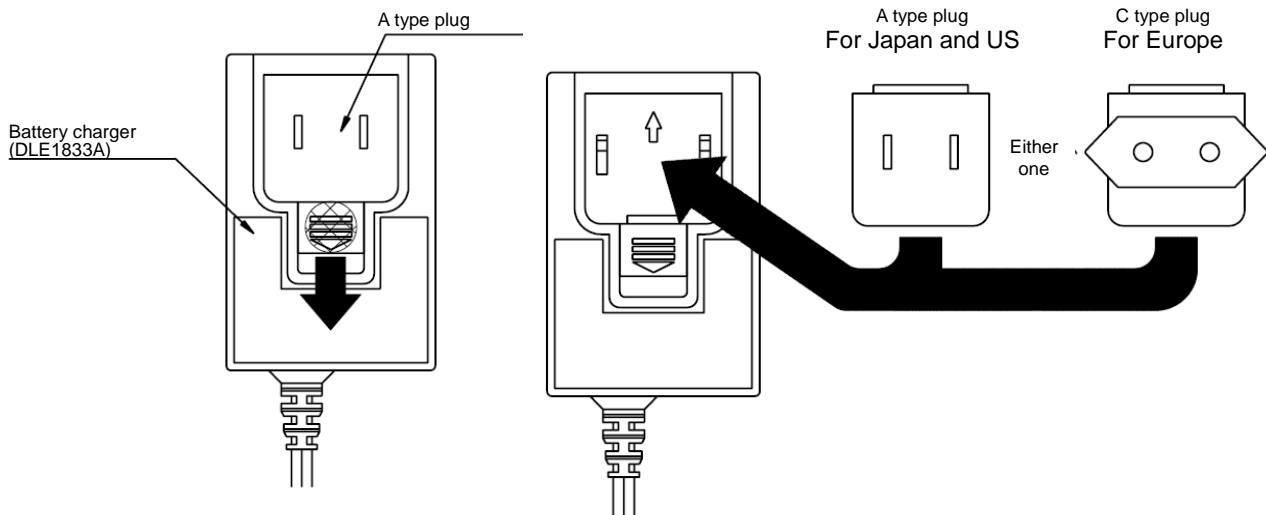
This product uses a nickel-metal hydride battery. Nickel-metal hydride batteries are a recyclable, precious resource. If you find that it only lasts for a short time after a full recharge, consult the shop where you bought this product.

(4) How to replace the plug of the battery charger

How to install the plug for Japan and the US (A type) and the plug for Europe (C type)

- [1] Slide the circled part of the plug mounted on the battery charger in the arrow direction.
- [2] You can remove the plug by sliding the circled section.
- [3] You can mount the A type or C type plug to the battery charger with the plug removed.

Note When you use the battery charger in Japan, be sure to use the A type plug.



6-11. Resetting of the system

In some case, the CPU inside the device may not be activated when the power is on with a Ni-MH battery charged after fully discharged (due to being left unused for a long time). In such a case, push the RESET button once.

The system will restore the initial state (all the contents of the memory will be deleted). (A RESET button is located next to the power button.)

The system should not be reset except in the conditions below indicated.

- In the case no digits shall be displayed on the liquid crystal panel when the power is turned ON with the connection of an AC adaptor after the system has been left unused for a long time.
- In the case, other than the above, the measurement instrument cannot operate.

Set up the system again when the system is reset because all the contents of the memory shall be deleted.

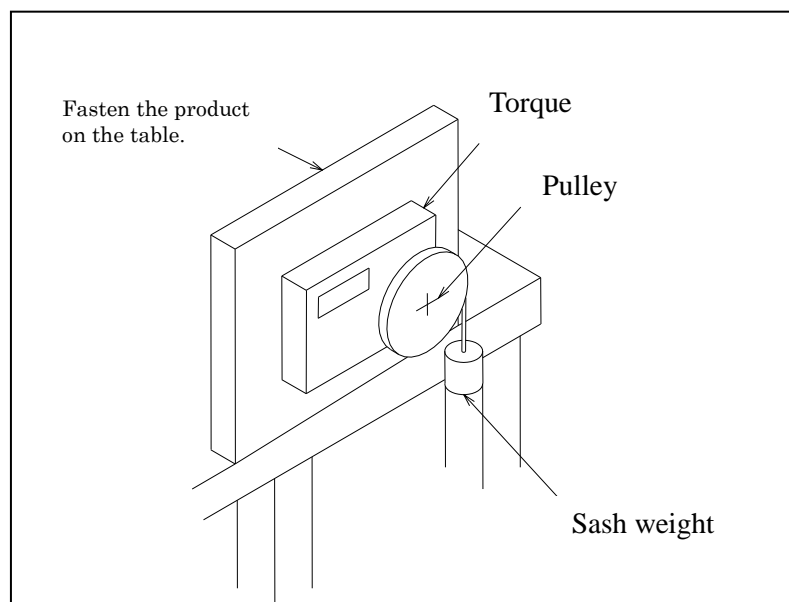
7. Examining and calibrating the Torque Checker

It is recommended to have the product examined about once a year.

To calibrate it, follow the procedure described below.

We are ready to calibrate it for you if you wish. If so, consult the shop where you bought the product.

- [1] For a calibration and inspection, provide a sash weight, pulley, and fastening table as shown in the figure below.
- [2] Engage the pulley with the torque detector.
- [3] With the tap of the socket, fasten the pulley by means of screws or something similar.
- [4] Fasten the Torque Checker on the table.
- [5] Disable the automatic resetting, then set the measurement mode to TR.
- [6] Suspend the sash weight on the pulley, then take the readings (for both forward and reverse revolutions).



*Standard values

DLT1173A

| | Pulley diameter Ø199.5mm | | | |
|----------------------------|--------------------------|--------------|-------|-------|
| Weight of sash weight [kg] | 0.1 | 0.5 | 1.0 | 1.5 |
| Measured torque [N•m] | 0.098 | 0.490 | 0.981 | 1.471 |
| Standard value | ±1 digit | ±0.5% (F.S.) | | |

DLT1673A

| | Pulley diameter Ø399mm | | | |
|----------------------------|------------------------|------|--------------|------|
| Weight of sash weight [kg] | 0.5 | 1.5 | 2.5 | 5.0 |
| Measured torque [N•m] | 0.98 | 2.94 | 4.90 | 9.81 |
| Standard value | ±1 digit | | ±0.5% (F.S.) | |

DLT1973A

| | Pulley diameter Ø399mm | | | |
|----------------------------|------------------------|------|-------|-------|
| Weight of sash weight [kg] | 2.0 | 4.0 | 6.0 | 7.5 |
| Measured torque [N•m] | 3.92 | 7.85 | 11.77 | 14.71 |
| Standard value | ±0.5% (F.S.) | | | |