Digital Torque Meter

Operation Manual

AD-TM Series

ATTONIC CO., LTD.

1.Safety precautions

・To prevent accidents such as fire, electric shock and injury, be sure to observe the following "Safety Precautions".
・Read all of the "Safety Precautions" carefully before using this meter, and follow the instructions to use it correctly.
・After reading this manual, be sure to keep it in a place where the users can refer to it whenever necessary.

⚠ WARNING

1-1.Do not apply a torque that exceeds the allowable load. If a torque exceeding the allowable range is applied, the detector may be damaged, resulting in an accident or injury.
1-2.Do not use this meter to measure an impact type fastening tool.
1-3.Make sure the main body is firmly secured so that it will not swing around when measuring.
1-4.Always keep the workplace clean. A cluttered place or workbench could cause an accident.
1-5.Also consider the surrounding conditions of the workplace.
　・Do not use in a place with high temperatures, high humidity, direct sunlight, or a lot of dust or dirt.
　・Use in a place where the temperature is constant (about 23 ℃) , if possible.
　・Make sure the workplace is adequately lit.
　・Do not use or charge in a place with flammable liquid or gas.
1-6.Keep children away. Only the operator is permitted to enter the workplace.
1-7.Don not handle the cords roughly. Do not hold the cords to carry the main body with the cords attached, or pull the cords out from the outlet or connector.
1-8.For safe and efficient operation
　・Check the main body and attachments, etc. regularly, and use the ones that are not deformed and worn.
　・Follow the operation manual when replacing accessories.
　・Check the cords and extension cords regularly, and replace them if they are damaged.
　In the following cases, switch off the main body and disconnect the plug from the power supply.
　・When not used or charged.
　・When other danger is predictable.
1-9.Check if there are any damaged parts.
　・Before use, check it thoroughly for any damage, and ensure that it works normally and performs the designated function.
　・Check if there are any abnormalities in all parts that affect the use.
　・Replace the parts according to this manual.
1-10.Use the specified accessories, appropriate bits and sockets. Do not use any accessories or attachments not described in this manual.
1-11.Ask your dealer for repairs.
　・Do not modify this meter.
　・Be sure to contact the dealer where you purchased this meter for repairs. If it is repaired by a person without repair knowledge or skills, it will not only fail to perform adequately, but also cause accidents and injuries.
1-12.Do not disassemble this meter, or subject it to strong impact or vibration.
　This meter is a precision equipment, do not disassemble it.
　If equipment malfunctions occur due to excessive impact or vibration, it will not only fail to perform adequately, but also cause accidents and injuries.
1-13.Charge it properly.
　・Use only the supplied AC adaptor for charging. Using an AC adaptor other than the one supplied may cause a malfunction.
　・Do not use a DC power supply or engine generator. It may cause a malfunction or fire.
　・Recharge the battery in a well-ventilated place. Do not cover it with any sheet like a cloth while charging.
1-14.Be careful of electric shock. Do not touch the power plug with wet hands. It may result in electric shock.
1-15.Do not throw the battery (built into the main body) into a fire. The battery will explode or release harmful substances.
1-16.Our products use nickel-hydrogen rechargeable batteries. It is a recycled resource.
　If you need to replace the battery, please leave it to us.
1-17.Turn off the power of all devices before connecting to an external device.
　Failure to do so may result in electric shock or equipment damage.
1-18.If a situation other than the contents of this manual occurs, stop using this meter immediately and contact us.

2.Precautions for storage and use

⚠

2-1.Store this meter properly when it's not in use. Store in a dry place, high place or locked place out of the reach of children. Also, please use the original packing box that contained this meter when transporting.

2-2.Wear proper clothes. Do not wear loose clothing, necklaces, or other jewelry as they may interfere with the operation.

2-3.Do not work in an unnatural working posture. Keep proper footing and balance at all times.

2-4.Do not be negligent in using this meter, and handle it with great caution.
・When using this meter, operate it very carefully while paying full attention to the method of handling and operation, the surrounding conditions and so on.
・Use your common sense.
・Do not use it when you are tired.

2-5.Do not apply large twisting forces, lateral bending forces, and forces that exceed a tolerance to the detection shaft, otherwise, the detector will be damaged.

2-6.Do not use this meter for any purpose other than measurement.

2-7.Do not use in an environment of oil, dust, high temperature and humidity.

2-8.After use, store it in a safe place so that no load is applied to the detection shaft.

2-9.Do not use organic solvents, etc. when cleaning this meter.

2-10.If the product is left unused for a long time, the battery may deteriorate and become unable to recharge.

Turn on the power of this meter once a month to check the charging status, and if charging is required, be sure to fully charge it.

（The above information is common to almost all of our products, however, may not be fully applied to some products.）

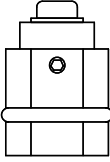# 3.Parts names
3-1.The name and application area of parts

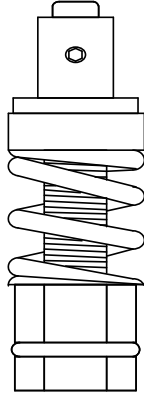|	
①POW Switch	⑪I/O Socket
②DAT Switch	⑫ANALOG Output Jack
③FUN Switch	⑬Rubber Foot
④RES Switch	⑭Mounting hole
⑤Mounting screws for the main body (M5 2places)	
⑥Detection shaft (Drive width 17 socket)	
⑦Display	
⑧DC IN (Power Jack)	
⑨Charge Pilot Lamp	
⑩USB Connector (Mini USB Type-B)	
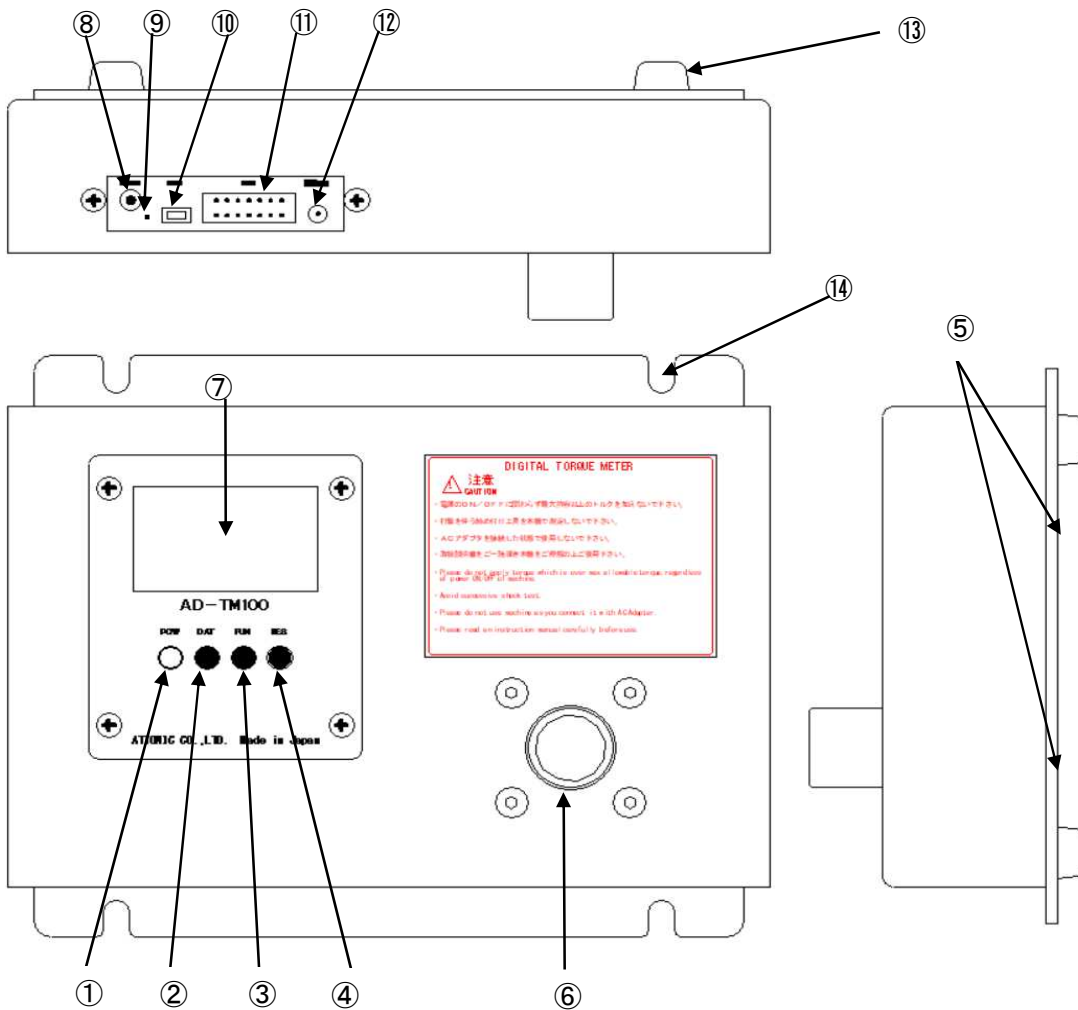
3-2.Attachments

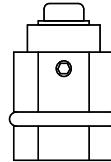### ■AD-TM1/5

TC-2
(M3 Screw/#2)
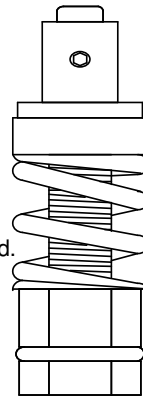
TSS-5
(M4 Screw/#2+With Spring)

* Spare screw :
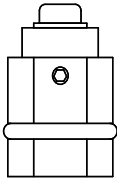 2 screws each are attached.

■AD-TM10

TC-3
(M4 Screw/#2)

TSS-10
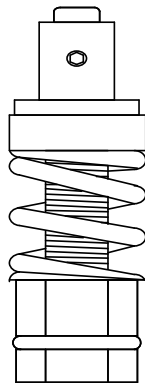(M4 Screw/#2+With Spring)

* Spare screw :
  2 screws each are attached.
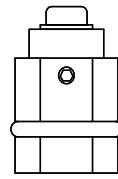
■AD-TM50

TC-6
(M5 Screw/#2)

TSS-30
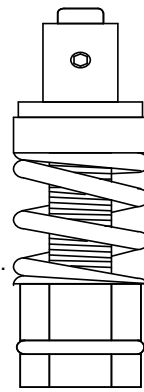(M6 Screw/#3+With Spring)

* Spare screw :
  2 screws each are attached.

■AD-TM100/200

TC-4
(M6 Screw/#3)

TSS-30
(M6 Screw/#3+With Spring)

* Spare screw :
  2 screws each are attached.

4.Specifications

Model (AD-)	TM1	TM5	TM10	TM50	TM100	TM200
Measurement range	±1.000～±10.00 N·cm	±5.00～±50.00 N·cm	±10.00～±100.0 N·cm	±0.500～±5.000 N·m	±1.000～±10.00 N·m	±2.00～±20.00 N·m
	±100.0～±1000 gf·cm	±0.500～±5.000 kgf·cm	±1.000～±10.00 kgf·cm	±5.00～±50.00 kgf·cm	±10.00～±100.0 kgf·cm	±20.0～±200.0 kgf·cm
	±0.100～±1.000 lbf·in	±0.500～±5.000 lbf·in	±1.000～±10.00 lbf·in	±5.00～±50.00 lbf·in	±10.00～±100.0 lbf·in	±20.0～±200.0 lbf·in
Accuracy	±0.5% FS					
Display	4 Digits LCD					
Measurement direction	+ : Right rotation, - : Left rotation					
Measurement mode — PEAK	Hold the maximum torque					
Measurement mode — TRACK	The display changes as the torque value changes. Used for zero adjustment, etc.					
Measurement mode — Right peak / Left peak(P−P)	Hold the left and right peak values.					
Battery-powered	Rechargeable Ni-MH Battery 1.2v×4cells (1650mAh)					
Measurement unit	Switchable 3 units: N·m(N·cm)/kgf·cm(gf·cm)/lbf·in					
Charging time	About 3 hours					
Usage time	About 12 hours in continuous use					
Battery life	Rechargeable more than 300 times (depending on usage conditions)					
Auto power off	Power off after being left for 10 min. (Measurement without any time limit is also available)					
Data output	ASCII format (Baud rate: 19200)					
Dedicated charger	IN：AC100V～240V OUT：DC9V					
Dimension	About172(L)×210(W)×55(75 with the measuring socket included) (H)					
Net weight	About 2.4kg					

Accessories

	Attachments	Others
AD-TM1 AD-TM5	TSS-5 / TC-2	AC adaptor(AD-20) USB cable（AD-USB-1.5）
AD-TM10	TSS-10 / TC-3	
AD-TM50	TSS-30 / TC-6	
AD-TM100 AD-TM200	TSS-30 / TC-4	

5.Preparation for measurement

5-1.Check the charging status
Be sure to check the charging status (battery icon) before using this meter.
* The sign on the upper left of the screen is the battery icon.
* If you need to recharge the battery immediately, use the supplied AC adaptor to recharge the battery.

Battery icon ──────── TRACK

00.00
N·m

| | : In good condition with more than 50% power remained. |

| | : Less than 50% remaining. A status that requires caution. (still usable.) |

| | : Recharging is required immediately. |

5-2.Mounting
・When measuring by holding this meter in your hand, please be careful about the surroundings.
・When fixing this meter, use a tool appropriate to fixing it firmly in 2 places with M5 screws.
* When fixing to a device, etc., check the fixing method and fix this meter firmly with a tool, etc.

5-3.Attachment installation
・Use the supplied attachments according to the measurement conditions.
* If you cannot measure with the supplied attachments, please contact us.
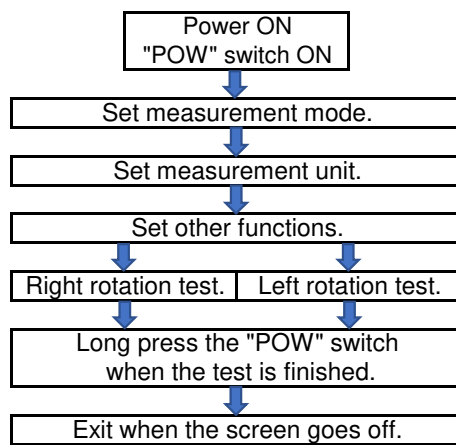We also manufacture special attachments.
* Do not use the attachments from other suppliers. They may cause a malfunction or injury.

Cautions
・When the power is turned off, the stored data (N:○○○) will be cleared to zero.

6.Basic flow of usage

```
┌─────────────────────┐
│     Power ON        │
│  "POW" switch ON    │
└─────────────────────┘
           ↓
┌─────────────────────────────┐
│   Set measurement mode.     │
└─────────────────────────────┘
           ↓
┌─────────────────────────────┐
│   Set measurement unit.     │
└─────────────────────────────┘
           ↓
┌─────────────────────────────┐
│    Set other functions.     │
└─────────────────────────────┘
      ↓              ↓
┌──────────────┬──────────────┐
│ Right        │ Left         │
│ rotation     │ rotation     │
│ test.        │ test.        │
└──────────────┴──────────────┘
      ↓              ↓
┌─────────────────────────────┐
│  Long press the "POW" switch │
│   when the test is finished. │
└─────────────────────────────┘
           ↓
┌─────────────────────────────┐
│ Exit when the screen goes off.│
└─────────────────────────────┘
```

* Once set, these settings are memorized unless the battery runs out or the setting is changed.

* The display becomes 0 (zero) when "RES" switch is pressed.

7.Function settings and descriptions

To set each function, long press the "FUN" switch until you hear a beep.
"FUN" will be displayed at the top of the screen when the meter becomes the function setting mode.
If "FUN" is not displayed, long press the "FUN" switch again until you hear a beep.
* Please note that it is set longer so that the measurement mode will not be switched due to a malfunction during measurement.
To complete the setting, long press the "FUN" switch again until you hear a beep.
The screen will look as follows.

The display changes every time the "DAT" switch is pressed.
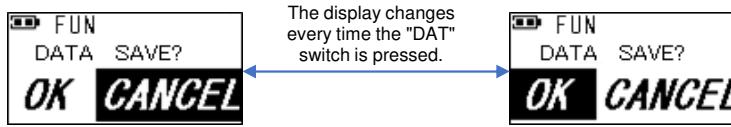
* The set data will "not" be saved.   * The set data will be saved.

Select "OK" if you want to save the data, or "CANCEL" if you don't, and press the "POW" switch.
* "DATA SAVE?" screen appears when you long press the "FUN" switch anywhere in the settings.
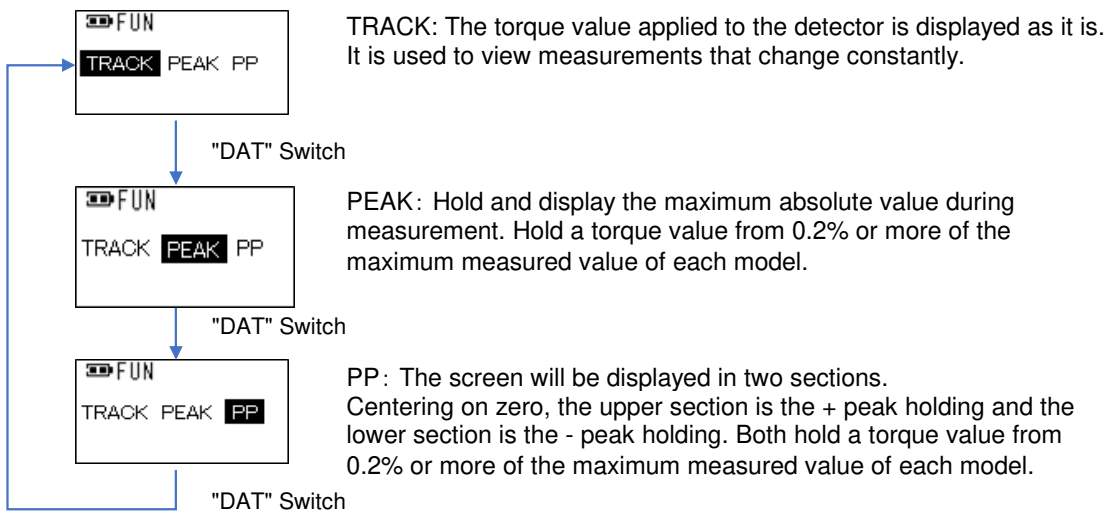Select "OK" or "CANCEL" and press the "POW" switch to complete the setting.

7-1.Set measurement mode (Initial Setting: TRACK)
・You can switch the measurement mode.
Switch between TRACK mode and PEAK mode by pressing the "DAT" switch.
The one with a black background is the one selected.

TRACK: The torque value applied to the detector is displayed as it is.
It is used to view measurements that change constantly.

"DAT" Switch

PEAK: Hold and display the maximum absolute value during measurement. Hold a torque value from 0.2% or more of the maximum measured value of each model.

"DAT" Switch

PP: The screen will be displayed in two sections.
Centering on zero, the upper section is the + peak holding and the lower section is the - peak holding. Both hold a torque value from 0.2% or more of the maximum measured value of each model.

"DAT" Switch

* Short press the "FUN" switch to confirm the setting. Next is the setting for changing measuring unit.

7-2.Change measuring unit (Initial Unit: N・m or N・cm)
・You can change the measurement unit.
  Switchable 3 units: N・m(N・cm), kgf・cm(gf・cm), lbf・in
* The unit symbol changes depending on the model.

"POW" Switch   "POW" Switch

"POW" Switch
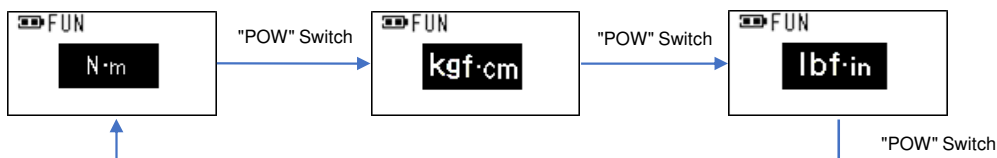
* Short press the "FUN" switch to confirm the setting. Next is the setting for comparator HI.

7-3.Set comparator HI   (Initial value: 0000)
○ TRACK / PEAK Mode
・You can change the HI side setting value of the comparator.
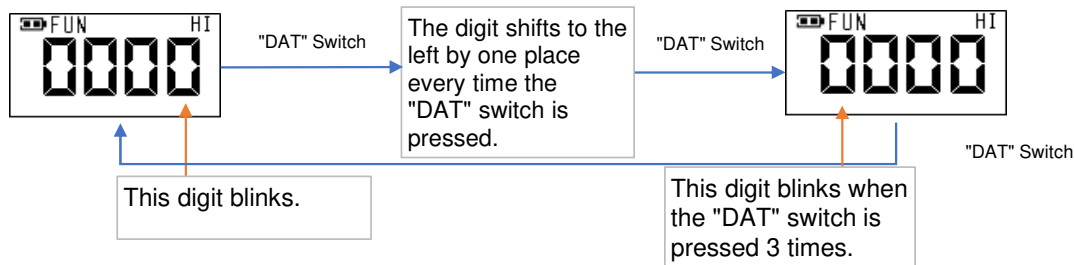 A comparator is a comparison with a set value.
  For example, if you set the point of high value (HI) to 1.00N・m and the point of low value (LO) to 0.50N・m
  and gradually apply force from 0.00N・m, LO will be indicated with a long intermittent sound at first,
   but the display and buzzer sound will disappear when the force exceeds 0.50N・m.
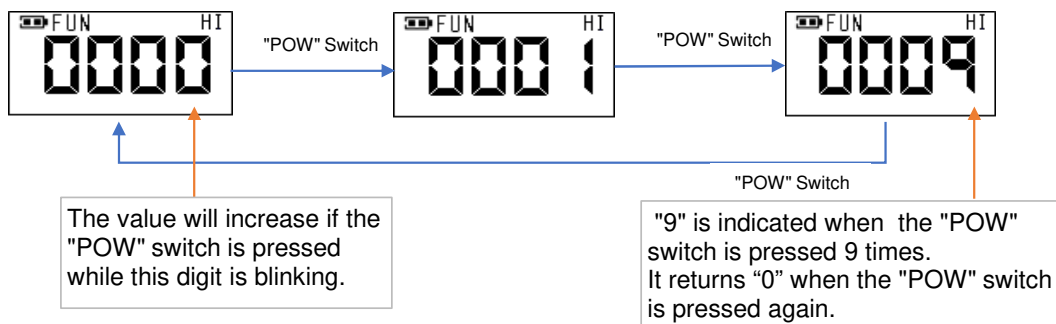 When the force exceeds 1.00N・m, HI will be indicated and a short intermittent sound will be heard.
* When the HI or LO value is set (non-zero), the external output is also outputted in conjunction with it.
* The setting value should be entered as an absolute value (regardless of whether it is positive or negative).

| | "DAT" Switch | The digit shifts to the left by one place every time the "DAT" switch is pressed. | "DAT" Switch | |

This digit blinks.

This digit blinks when the "DAT" switch is pressed 3 times.

"DAT" Switch

* It returns to the beginning when the "DAT" switch is pressed 4 times.

"POW" Switch

"POW" Switch

The value will increase if the "POW" switch is pressed while this digit is blinking.

"POW" Switch

"9" is indicated when the "POW" switch is pressed 9 times.
It returns "0" when the "POW" switch is pressed again.

○ PP Mode
・You can change the setting value on the + side (upper section) of comparator.
  For example, if you set the point of + side (HI) to 1.00N・m and the point of - side (LO) to -0.50N・m, and
  gradually apply force to the + side from 0.00N・m, the display of the upper section will be changed, and
  when the force exceeds 1.00N・m, a short intermittent sound will be heard.

* The setting value should be entered as the value of + side instead of an absolute value.
* A short intermittent sound will be heard if the HI setting value (+ side) is exceeded, and a long one if the LO
  setting value (- side) is exceeded. After that, even if the HI peak value is exceeded, a long intermittent sound
  continues.
* A long intermittent sound will be heard if the LO setting value (- side) is exceeded, and a short one if the HI
  setting value (+ side) is exceeded. After that, even if the LO peak value is exceeded, there is still a short
  intermittent sound.
* The position of the decimal point varies with each unit and each model.
* For models that increase in digits, the maximum setting value is 9999.
  For example: When the unit is N・m in AD-TM100, the settable maximum value is 9.999(N・m).
* The setting value returns 0 when the mode is changed.
* Short press the "FUN" switch to confirm the setting. Next is the setting for comparator LO.

7-4.Set comparator　LO　(Initial value: 0000)
○ TRACK / PEACK Mode
・You can change the setting value on the LO side of comparator.

・Refer to 7-3. Set comparator HI for the function description, setting method, and operation method.

○ PP Mode
・You can change the setting value on the - side (lower section) of comparator.
  For example, if you set the point of + side (HI) to 1.00 N・m and the point of - side (LO) to -0.50 N・m, and
  gradually apply force to the - side from 0.00N・m, the display of the lower section will be changed, and
  when the force exceeds -0.50N・m, a short intermittent sound will be heard.

* The setting value should be entered as the value of - side instead of a absolute value.
* A short intermittent sound will be heard if the HI setting value (+ side) is exceeded, and a long one if the LO
   setting value (- side) is exceeded. After that, even if the HI peak value is exceeded, there is still a long
   intermittent sound.
* A long intermittent sound will be heard if the LO setting value (- side) is exceeded, and a short one if the HI
   setting value (+ side) is exceeded. After that, even if the LO peak value is exceeded, there is still a short
   intermittent sound.
* The position of the decimal point varies with each unit and each model.
* For models that increase in digits, the maximum setting value is 9999.
   For example: When the unit is N・m in AD-TM100, the settable maximum value is -9.999(N・m).
* The setting value returns 0 when the mode is changed.
* Short press the "FUN" switch to confirm the setting. Next is the setting for overload.

7-5.Set overload　OV　(Initial value: 120)
・It is a function to warn the users to avoid accidental damage to the torque sensor.
   For example, when performing a torque test, it can display a warning at 80% of full scale and output a signal
   to stop the test so that the sensor is not damaged by applying excessive force accidentally.
* The setting can be set by 10% up to 120%.
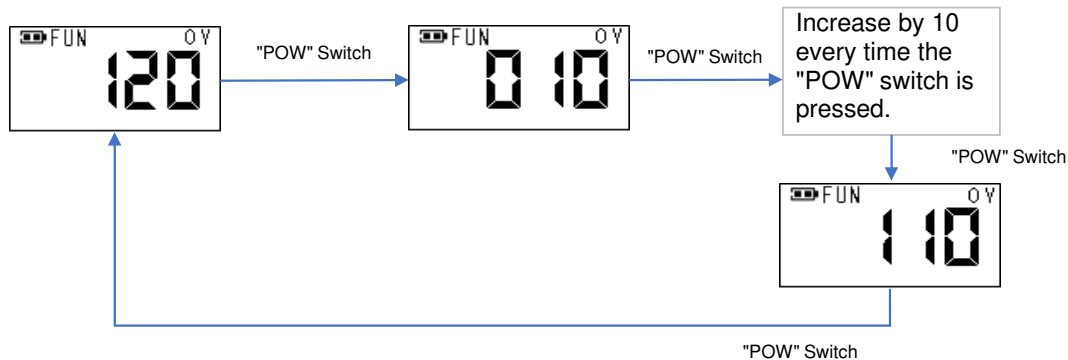
* Short press the "FUN" switch to confirm the setting. Next is the setting for screen update rate.

7-6.Set screen update rate　UD　（Initial value: 20）
・You can set the screen update rate (switching speed).
   By decreasing the value, you can check the changing values in more real time.
   However, if the update rate is too fast, the values will change quickly and it may be difficult to see.
* Update rate is in seconds. If the display value is 20, the display will be updated every 20 seconds.
* There are 4 types of settings: 20, 10, 5, and 2 seconds.
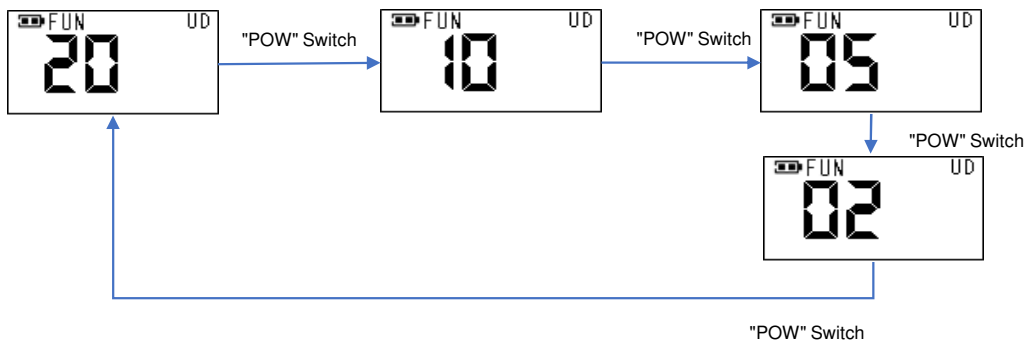
* Short press the "FUN" switch to confirm the setting. Next is the setting for flipping screen.

7-7.Set flipping screen　DP　(Initial Setting: OFF)
・It is a setting to flip the screen.
　For example, when measuring with the detection shaft facing up, the values are displayed upside-down and
　difficult to read, but by turning on this setting, the values can be read as they are.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

The display changes every time the "DAT" switch is pressed.
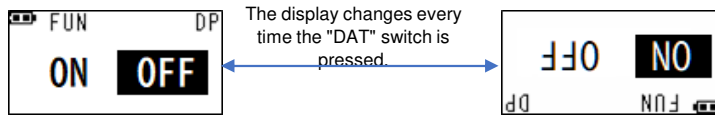
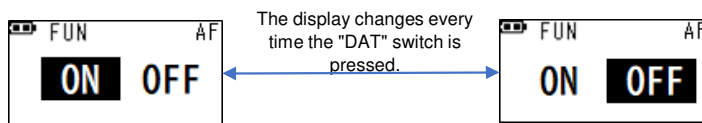* Short press the "FUN" switch to confirm the setting. Next is the setting for auto power off.

7-8.Set auto power off　AF　（Initial Setting: ON）
・It is a setting to turn off the power if no operation is performed for 10 minutes.
　Turn this setting OFF if you want to use the meter for a long time.
　The measurement will remain until the battery runs out.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

The display changes every time the "DAT" switch is pressed.

* Short press the "FUN" switch to confirm the setting. Next is the setting for auto reset.

## 7-9.Set auto reset　AC　(Initial Setting : OFF)
・It is a setting to automatically reset after 3 seconds when the load torque disappears.
　You don't have to press the reset button every time you run the same test over and over again.
* When reset, the data will be saved automatically.
* Work efficiency will increase when used in combination with printer output.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

The display changes every time the "DAT" switch is pressed.
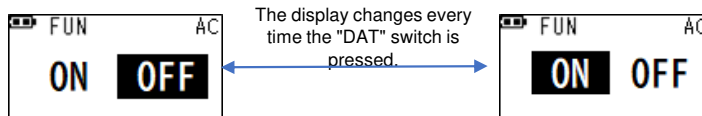
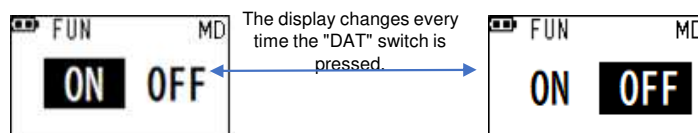* Short press the "FUN" switch to confirm the setting. Next is the setting for the minimum digit display.

7-10.Set the minimum digit display　MD　(Initial Setting: ON)
・Set whether to display the minimum digit or not.
　The display looks more stable when the minimum digit is not displayed (OFF).
* The display range varies depending on the model. For the display range, refer to the display range table.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

The display changes every time the "DAT" switch is pressed.

* Short press the "FUN" switch to confirm the setting. Next is the setting for buzzer.

7-11.Set buzzer　BP　(Initial Setting: ON)
・Set whether to sound the buzzer or not.
　The buzzer gives a warning during the main body operation or various settings.
　When the buzzer sound is annoying, you can turn it off to silence the sound.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

| FUN BP / ON OFF | The display changes every time the "DAT" switch is pressed. | FUN BP / ON OFF |
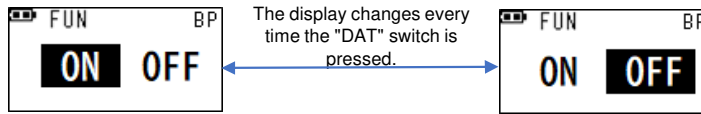
* Short press the "FUN" switch to confirm the setting. Next is the setting for backlight.

* The following is a list of buzzer sounds.

| Action	Sound	The way to stop buzzer
Overload	Continuous sound	Remove the load and press "RES" switch.
Comparator　HI	Intermittent sound (fast)	Remove the load and press "RES" switch.
Comparator　LO	Intermittent sound (slow)	Remove the load and press "RES" switch.
Switch operation	Short sound	

7-12.Set backlight　BL　(Initial Setting: OFF）
・Turn the backlight ON / OFF.
　Turn on the backlight when using in a dark place. The backlight will brighten the screen and make it easier to see
* When the backlight is ON, it consumes a lot of battery power and shortens the usage time.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

| FUN BL / ON OFF | The display changes every time the "DAT" switch is pressed. | FUN BL / ON OFF |
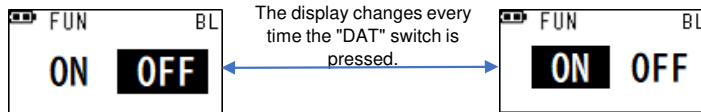
* Short press the "FUN" switch to confirm the setting. Next is the setting for polarity.

7-13.Set polarity　IN　(Initial Setting: OFF）
・When OFF, right rotation is set to + and left rotation is set to -, but when ON, right rotation is set to - and left
　rotation is set to +.
* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

| FUN IN / ON OFF | The display changes every time the "DAT" switch is pressed. | FUN IN / ON OFF |
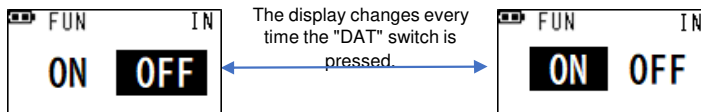
* Short press the "FUN" switch to confirm the setting. Next is the setting for reset to Initial Setting.

7-14 Reset to Initial Setting IV （Initial Value： OFF）

・Reset all setting into Initial Value

※Change ON/OFF by pressing "DAT" switch


The display changes every time the "DAT" switch is pressed.
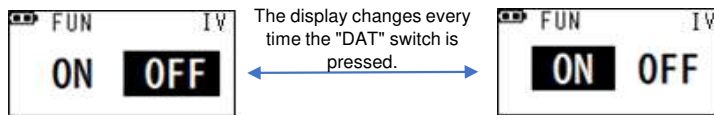
※Short press the "FUN" switch for confirm & Move to Printer Output Setting

※All setting will be changed into initial value after completing the setting.

List of Initial Value

FUNCTION NAME	MARK	Initial Setting	Page to refer
Set measurement mode		TRACK	7-1
Change measuring unit	UN	N・m or N・cm	7-2
Set comparator HI	HI	0	7-3
Set comparator LO	LO	0	7-4
Set overload OV	OV	120	7-5
Set screen update rate UD	UD	10	7-6
Set flipping screen DP	DP	OFF	7-7
Set auto power off AF	AF	ON	7-8
Set auto reset AC	AC	OFF	7-9
Set the minimum digit display MD	MD	ON	7-10
Set buzzer BP	BP	ON	7-11
Set backlight BL	BL	OFF	7-12
Set polarity IN	IN	OFF	7-13
Reset to Initial Setting IV	IV	OFF	7-14
Set printer output PO	PO	OFF	7-15

7-15.Set printer output PO （Initial Setting: OFF）

・Set whether to output to the printer or not.

 When the printer output setting is ON, the display data can be outputted to the printer by pressing the "RES"
 switch.

* Use Mitutoyo's Digimatic Mini Processor DP-1VA as the printer.

* You can switch ON / OFF repeatedly by pressing the "DAT" switch.

*When "TRACK" mode is chosen, it cannot be printed out even though Printer output setting is ON.

The display changes every time the "DAT" switch is pressed.
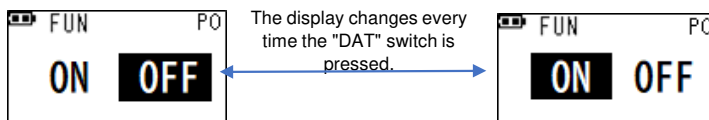
*When Printer Output Setting is ON & "PEAK" or "PP" mode is chosen, the letter "PO" is showed at the lower left
 part of display.

(This letter "PO" is not shown when "TRACK" mode is chosen)

When you push Reset switch at this moment, the main unit will not be controlled while few seconds until the
 display is reset because the main unit is in the mode for searching printer.

Please choose this setting "OFF" when you do not use printer.

or
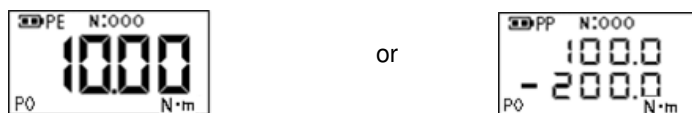
* Short press the "FUN" switch to confirm the setting.

  Returns to the first setting(7-1. Measurement mode).

8.Checking method on history data and function description

Measure in peak mode and press the "RES" switch to save the value at that time.
You can go back and check the history of those values.

■Check history data
To check history data, long press the "DAT" switch until you hear a beep.
When the display shifts to history check screen, "MO" will be displayed in the upper right corner of the screen.
If "MO" is not displayed, long press the "DAT" switch again until you hear a beep.
* Please note that it is set longer so that the measurement mode will not be switched due to a malfunction
  during measurement.
To complete the setting, long press the "FUN" switch again until you hear a beep.
The "MO" in the upper right conner of the screen disappears and the meter becomes measurement mode.
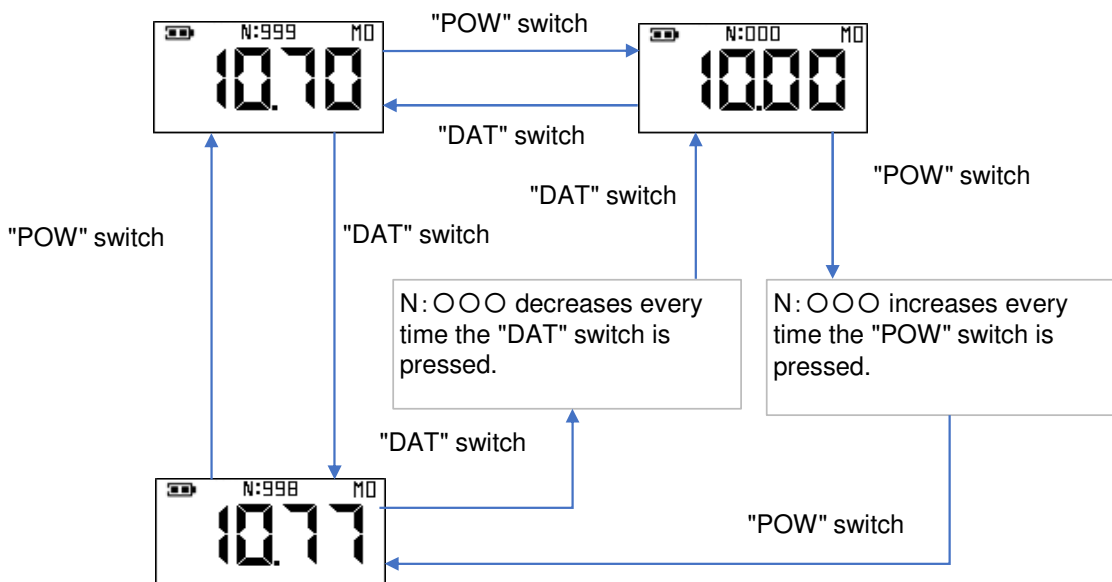
8-1.Display history data
You can check the stored data.
The N:○○○ at the top center of the screen is the number of imported data.
1000 data from N:000 to N:999 can be imported.
* The larger the number of N:○○○, the newer the data.
* When the number is more than N:999 (over 1000 data), the old data will be overwritten.

* Short press the "FUN" switch to move to the batch transfer function.
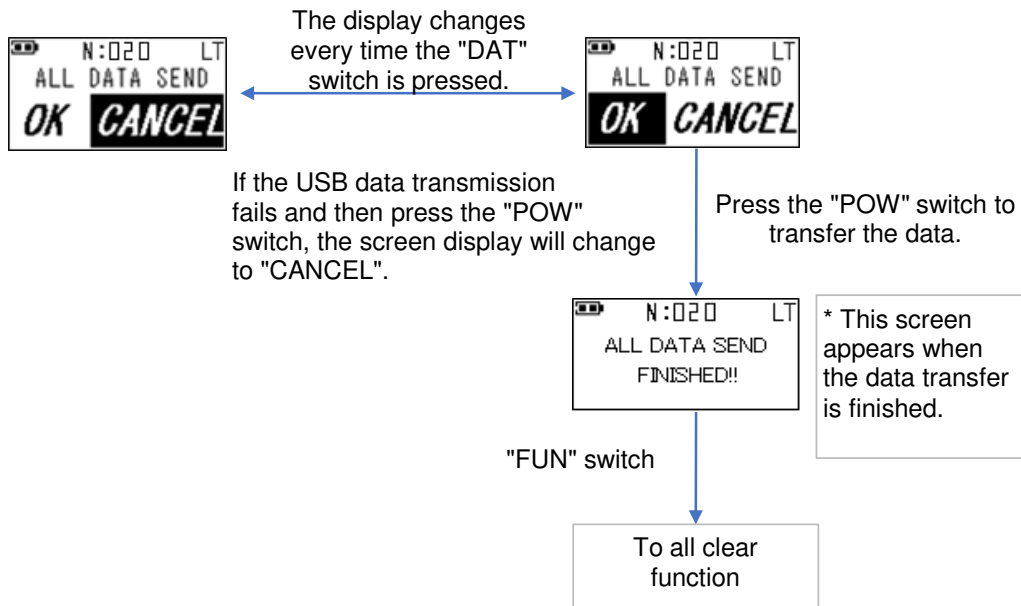* Long press the "FUN" switch to return to the measurement mode.

8-2.Batch transfer

Transfer all the stored data to a PC, etc. in a batch.

* For example, if the number of stored data is 20, "N:○○○" at the top center of the screen will be "N: 020".
When this "N: 020" is set, 20 data will be transferred in a batch.
* The value of "○○○" in "N: ○○○" cannot be changed.

The display changes every time the "DAT" switch is pressed.

```
 ▭   N:020   LT
ALL DATA SEND
OK  CANCEL
```

```
 ▭   N:020   LT
ALL DATA SEND
OK  CANCEL
```

If the USB data transmission fails and then press the "POW" switch, the screen display will change to "CANCEL".

Press the "POW" switch to transfer the data.

```
 ▭   N:020   LT
ALL DATA SEND
FINISHED!!
```

* This screen appears when the data transfer is finished.

"FUN" switch

To all clear function

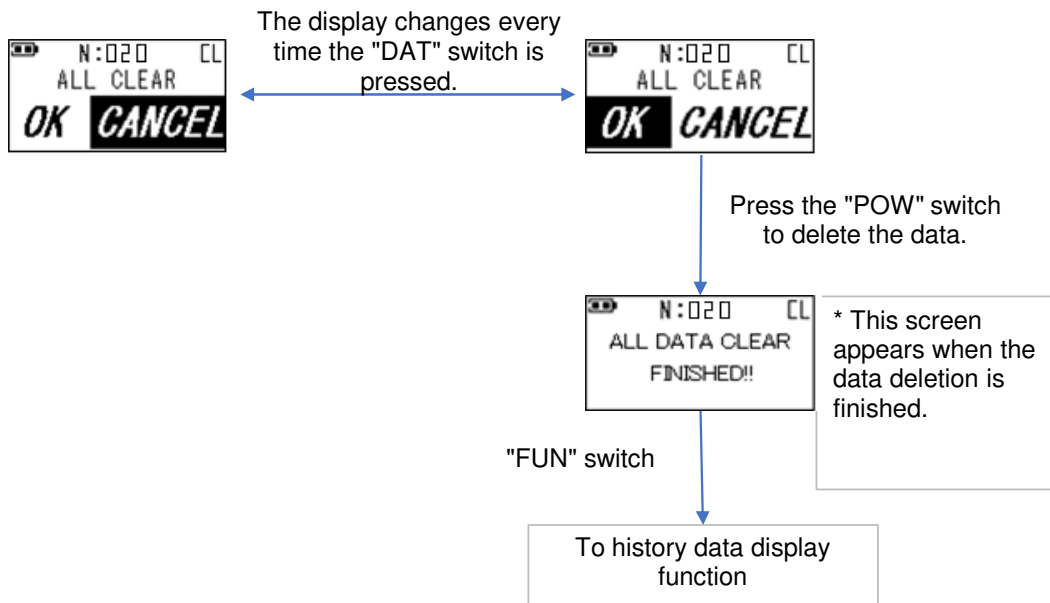* Short press the "FUN" switch to move to all clear function.
* Long press the "FUN" switch to return to measurement mode.

8-3.All clear

Delete all the stored data.

* For example, if the number of stored data is 20, "N:○○○" at the top center of the screen will be "N: 020".
* The value of "○○○" in "N: ○○○" cannot be changed.

The display changes every time the "DAT" switch is pressed.

```
 ▭   N:020   CL
ALL CLEAR
OK  CANCEL
```

```
 ▭   N:020   CL
ALL CLEAR
OK  CANCEL
```

Press the "POW" switch to delete the data.

```
 ▭   N:020   CL
ALL DATA CLEAR
FINISHED!!
```

* This screen appears when the data deletion is finished.

"FUN" switch

To history data display function

* Short press the "FUN" switch to move to history data display function.
* Long press the "FUN" switch to return to measurement mode.

9.Checking method on MAX/MIN/AVE values and function description

You can check the MAX/MIN/AVE values of all stored data.

■Check MAX/MIN/AVE values
Short press the "DAT" switch in peak mode (PE) to check MAX/MIN/AVE values.
When the display shifts to the check screen for MAX/MIN/AVE values, "AV" will be displayed in the
upper right corner of the screen.
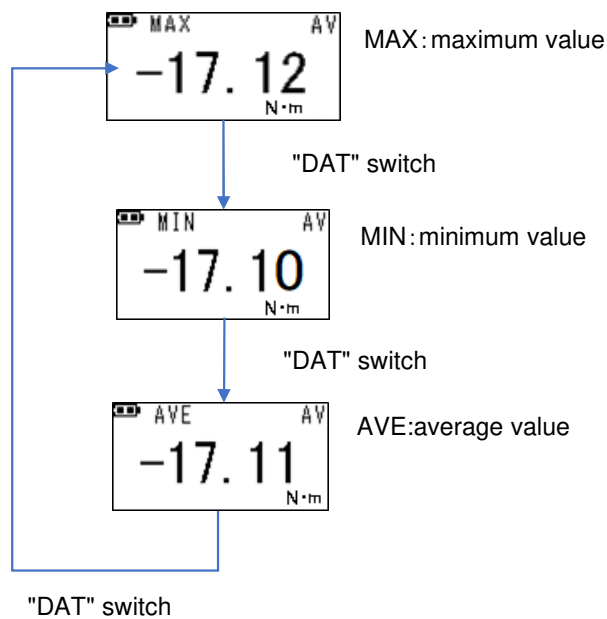If "AV" is not displayed, short press the "DAT" switch again.
To complete the setting, long press the "FUN" switch until you hear a beep.
The "AV" display in the upper right corner of the screen disappears and the meter becomes measurement mode.

9-1.MAX/MIN/AVE values
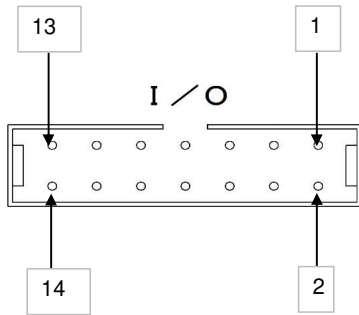The MAX/MIN/AVE values of all stored data can be displayed.
* The data is displayed in absolute value.

MAX AV −17.12 N·m	MAX：maximum value

"DAT" switch

MIN AV −17.10 N·m	MIN：minimum value

"DAT" switch

AVE AV −17.11 N·m	AVE:average value

"DAT" switch
* Long press the "FUN" switch to return to the measurement mode.

10.I/O connector

■The pin layout of I/O connector

| Pin No.	Name	I/O	Function
1	VBO	-	Power input (It is also possible to output battery voltage from the circuit board.)
2	POW	I	POW switch
3	COP	I	Continuous output
4	INT	I	One-shot output (output the value to the PC when the signal is LO)
5	RES	I	RES switch
6	HI	O	ON when the value is greater than or equal to comparator HI. (ON when the display value of + side is greater than or equal to the setting value in PP mode.)
7	OK	O	ON when it is OK.
8	LO	O	ON when the value is less than or equal to comparator LO. (ON when the display value of - side is greater than or equal to the setting value in PP mode.)
9	OV	O	ON when it is overloaded.
10	CLK	-	Digimatic CLK
11	DAT	-	Digimatic DAT
12	RDY	-	Digimatic RDY
13	REQ	-	Digimatic REQ
14	GND	-	External ground (board ground is also possible)

* Pin No.10〜13 are for Mitutoyo's printer output only.
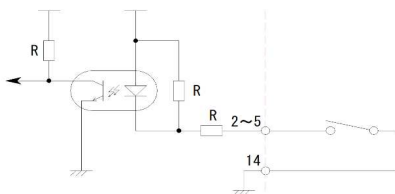 Mitutoyo's Digimatic Mini Processor (DP-1VA)

■Circuit diagram
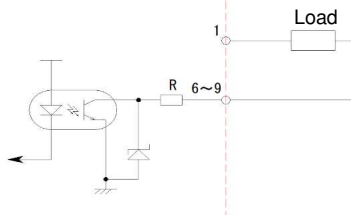Power supply circuit
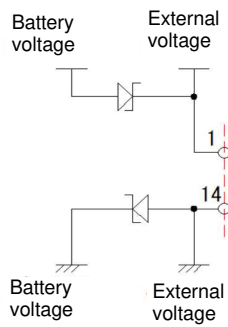
* External supply voltage: max. DC24V

Input circuit
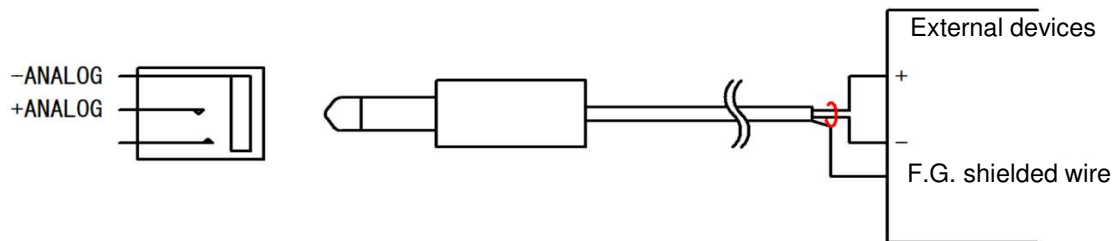

* Max. DC24V 20mA

Output circuit

* Max. DC24V 50mA

11.Analog output

The analog output provides an analog voltage proportional to the sensor signal.

■Analog circuit diagram

    * Voltage: ± 2V to the max.
    * Please use an analog earphone jack (with shield) for connection to external devices.
    * Do not short circuit. It may cause a malfunction.
    * Do not apply voltage from outside.

12.Digimatic communication connection（Printer（DP-1VA））

The measured values can be printed out by Mitutoyo's Digimatic Mini Processor (DP-1VA).
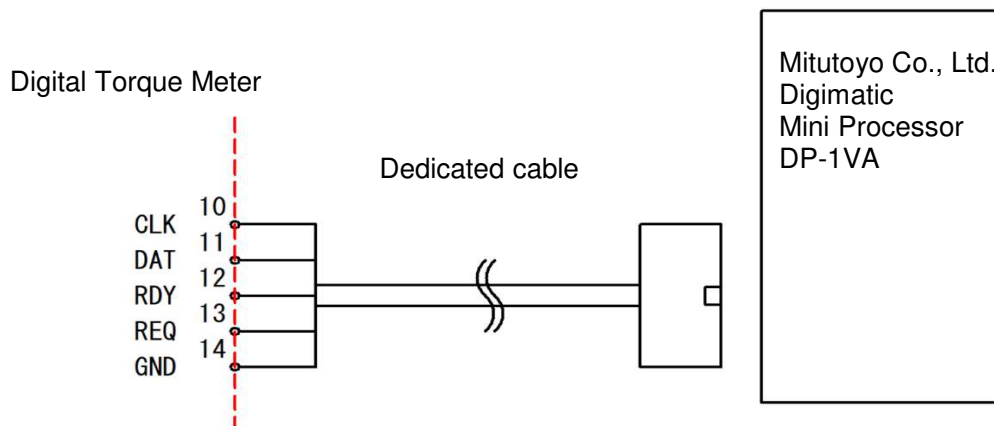
    * The cable is available as an option.

13.Data transmission settings

You can change the settings and the output data via USB.

■ Data transmission protocol

Baud rate: 19200
Character length: 8 bits
Stop bit: 1 bit
Parity bit: None
Delimiter: CR + LF
Flow control: None

■Transmission and reception code list

"Command"	Contents	Cautions	Example (all with CR+LF attached at the end)
"STAT"	Continuous transmission	The signal is transmitted at 2KHz. (The output continues until the "STOP" signal is received.)	STAT
"STOP"	Continuous transmission stop		STOP
"MEMORY"	Transmit all stored data		MEMORY
"CLEAR"	ALL CLEAR	Delete the stored data	CLEAR
"FUNC_MODE"	FUNC Switching	Please send first when you change the settings.	FUNC_MODE
"TRACK"	Change to TRACK		TRACK
"PEAK"	Change to PEAK		PEAK
"PP"	Change to PP		PP
"GF"	Change to gram unit system		GF
"NEWTON"	Change to Newton unit system		NEWTON
"POND"	Change to pound unit system		POND
"CMP_HI:"	Comparator HI setting	Error if more than the settable value. Cannot exceed the maximum value.	CMP_HI:2000
"CMP_LO:"	Comparator LO setting	Error if more than the settable value. Cannot exceed the comparator HI setting.	CMP_LO:1000
"OVER:"	Overload setting value	Error if not a settable value．10～120 in 10 increments	OVER:100
"LCD_LATE:"	Screen update rate	Error if not a settable value．20,10,5,2 only	LCD_LATE:2
"LCD_FLIPPED:"	Flip the screen vertically	"ON": permission, "OFF": none	LCD_FLIPPED:ON
"POWER_OFF:"	Auto power off	"ON": permission, "OFF": none	POWER_OFF:ON
"AUTO_CLEAR:"	ALL CLEAR	"ON": permission, "OFF": none	AUTO_CLEAR:ON
"MIN_DIGIT:"	Minimum digit display	"ON": permission, "OFF": none	MIN_DIGIT:OFF
"BUZZ:"	Buzzer permission	"ON": permission, "OFF": none	BUZZ:OFF
"BACK_LIGHT:"	Backlight permission	"ON": permission, "OFF": none	BACK_LIGHT:ON
"GAIN_INVERT:"	Plus / minus inversion	"ON": permission, "OFF": none	GAIN_INVERT:OFF
"INIT_VALUE:"	Reset to initial setting	"ON": permission, "OFF": none	INIT_VALUE:
"PRINTER:"	Printer permission	"ON": permission, "OFF": none	PRINTER:ON
"SET_SAVE"	Save change value	Send it at last to save values.	SET_SAVE
"CANCEL"	Cancel the change	Send it at last to cancel the change.	CANCEL
"VALUE_READ"	Read current value	Read current value. COM_OK is not returned.	VALUE_READ

* An example of send command input
Set the comparator HI to 10.0.
Command: setting value CR + LF
COMP_HI: 10.0 CR+LF

* Receive a reply message of "COM_OK!!", if the command input is correct.
* Receive a reply message of "COM_ERR!!", if the command input is incorrect.
* Be sure to send "SET_SAVE" after changing the settings. Otherwise,the settings will not be enabled and the display
   will not return to the measurement screen, either.
* Once set, it cannot be returned to the original value.