Handheld Digital Tachometer

HT-5500

Instruction Manual (Basic Operations)

Thank you for your selection of the HT-5500 Handheld Digital Tachometer.
To ensure the performance of the HT-5500, please read this manual thoroughly.

Warnings and Cautions
In this document precautions are classified into two categories: WARNING and CAUTION. This depends on the degree of danger or damage possible if the precaution is ignored and the product is used incorrectly.

WARNING	This symbol is used to indicate precautions where there is a risk of death or serious personal injury to the operator if the product is handled incorrectly.
CAUTION	This symbol is used to indicate precautions where there is a risk of some personal injury to the operator or only material damage to the product if the product is handled incorrectly.

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■ Omission of Issuance of Certificate
This product has been tested under strict inspections for correct operation before shipment. Please note that the issuance of certificate is omitted.

■ Warranty
1. This product is covered by a warranty for a period of one year from the date of delivery.
2. This warranty covers free-of-charge repair during the warranty period for defects occurred while the product is used under correct operating conditions according to descriptions in this manual and notices on the unit label.
3. For free-of-charge repair during the warranty period, contact your dealer or your nearest Ono Sokki sales office nearby.
4. Even during the warranty period, the following failures will be handled on a fee basis.
   (a) Failures or damages occurring through misuse, misoperation, modification, repairing without ONO SOKKI'S approval.
   (b) Failures or damages occurring through mishandling (dropping) during transportation after purchase.
   (c) Failures or damages occurring by an At of God (fires, earthquakes, flooding, and lightening), environmental disruption, or abnormal voltage.
   (d) Replenishment of expendable supplies, spare parts, and accessories.

This guarantee covers only the performance of the product itself only.
All inconvenience by the trouble of this product is not included.
*Outer appearance and specifications are subject to change without prior notice.
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Observe the Following Points before Use

■ General Notes

- Be sure to read this Instruction Manual.
  To ensure the excellent performance of this product and use it safely, be sure to read this Instruction Manual thoroughly.
- Avoid rapid temperature change.
  Do not move the product rapidly from a hot place to a cold one or vice versa.
  Condensation can form inside the unit and can cause trouble.
- Be careful not to get water, dust, or foreign materials inside the unit.
  Do not use the product in places where you may get water or places which are humid or dusty.
- Do not drop the product or apply excessive shock to it.
  Since this product incorporates high-precision electronic parts, be careful not to drop it or apply strong shock.
- Do not damage the lens of the light projector-receiver.
  There is a risk of the deterioration of the performance.
- Wipe dirt off using a dry cloth or a cloth dampened with neutral detergent and squeezed firmly.
  Do not use volatile oils (thinner or benzine) or alcohols.
- When you do not use the product for a prolonged period of time, remove the battery from the unit.
  Leaving the product unused for a prolonged period of time or consumed battery may cause liquid leak.
- Do not apply external voltage to the analog and pulse output terminals.
- Do not use AC adapters other than our exclusive specified one (PB-7080).

⚠ WARNING

- In revolution measurement using a contact adapter, be sure to use the supplied contact tip or circumferential ring fully being careful of safety. In particular, pay the closest attention in measurement of revolution with 10,000 r/min or more. Also in measurement of the line speed using the circumferential ring, measure high-speed revolution fully being careful of safety.
- Be careful not to touch the body of revolution with hands.
- The contact tip (KS-300) and circumferential rings (KS-100, KS-200) are consumables. Use of a contact tip or circumferential ring with deformation or crack is very dangerous. Replace the deformed or cracked contact tip or circumferential ring with a new one.
- Use of a contact adapter with crack is dangerous. Replace the cracked contact adapter (HT-0502) with a new one.
- When using the AC adapter (PB-7080) and various output cables, be careful not to get them caught by the body of revolution. The condition where a cables is caught by the body of revolution is very dangerous.

Overview

1.Overview

The HT-5500 is a non-contact type handheld tachometer, with the reflective mark attached on the body of revolution, which measures revolution with the visible light reflection system.
The HT-5500 is a handheld type high-class model which is provided with various functions. When used together with the supplied contact adapter (HT-0502), it can be also used as a contact type tachometer.

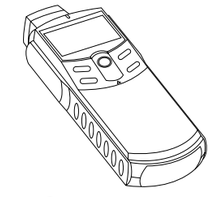
2.Features

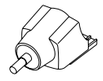
- Wide measurement range from low-speed revolution (6 r/min) to high-speed revolution (99999 r/min by non-contact measurement)
- Measurement unit selectable from r/min, r/s, m/min, COUNT, and ms
- Direct-read measurement of the line speed
- MAX and MIN modes for displaying the maximum and the minimum values (except for COUNT)
- Convenient memory function (up to 20 datas can be memorized) for confirmation of measurement results
- Over alarm function for indicating that the measurement value exceeds the specified value
- Analog output and pulse output
- Can be used as a contact type tachometer with the use of the supplied contact adapter (HT-0502) and contact tip (KS-300).
- A tripod can be attached (only for non-contact measurement).
- Type AAA battery, AC adapter (PB-7080) commonly used
- Back light function which is convenient for use in dark places

3.Unpacking

When you unpack the unit, make sure that you have all the following:

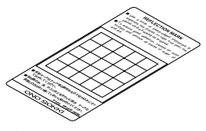
① Main unit (HT-5500) x1
② Contact adapter (HT-0502) x1
③ Contact tip (KS-300) x1
④ Circumferential ring (KS-200) x1
⑤ Reflective mark sheet ..... x1 (=25 pieces)
⑥ Type AAA alkaline battery x4
⑦ Instruction manual ..... x2 (2 different manuals)
⑧ Carrying case x1

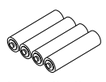

① HT-5500 main unit


② HT-0502 contact adapter


③ KS-300 contact


④ KS-200 circumferential ring

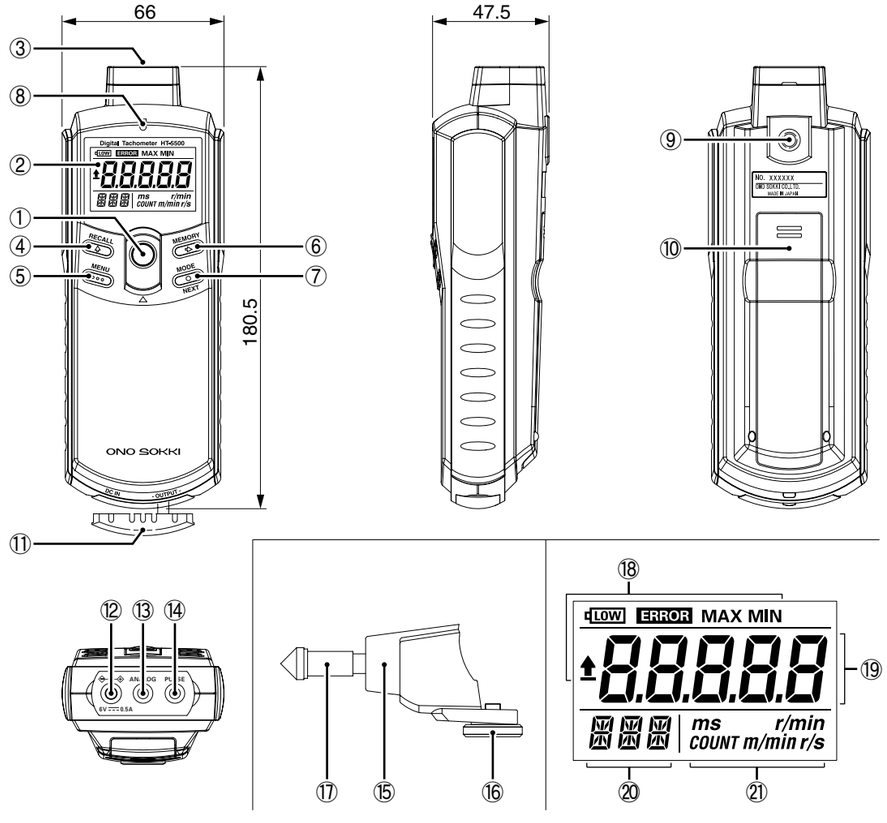

⑤ Reflective mark sheet


⑥ Type AAA alkaline battery


⑦ Instruction manual


⑧ Carrying case

Name and Function of Each Section



① Power switch
Turns the power ON or OFF.

② Display
Displays the measurement value and various settings.

③ Detecting element
Light projector-receiver for detecting the reflected light (rotational signal) from the reflective mark

④ RECALL & ↑ switch
Used for memory recall during measurement and numerical input in the setup mode.

⑤ MENU switch
Used to switch between the measurement mode and the parameter setup mode.

⑥ MEMORY & → switch
Used for memory storing during measurement and numerical digit shift in the setup mode.

⑦ MODE & NEXT switch
Used for mode change during measurement and item selection in the setup mode.

⑧ Indicator (input signal indicator)
When the detecting element detects the reflected light, this LED indicator lights up.

⑨ Tripod mounting hole
Used to mount a tripod.
Also used to attach the contact adapter to the main unit. (Cannot be used at the same time.)

⑩ Battery cover

⑪ Connector cover
Cover of the DC power input and analogue/pulse output connectors.

⑫ DC power input
Input connector for connecting the dedicated AC adapter

⑬ Analog output
Connector for connection with a recorder, etc. through the optional AX-501 cord

⑭ Pulse output
Connector for connection with an FFT analyzer, etc. through the optional AX-501 cable

⑮ Contact adapter: HT-0502
Attached to the HT-5500 main unit to select contact measurement.

⑯ Tripod mounting screw
Screw for attaching the contact adapter to the main unit. Tripod can be also attached for non-contact measurement separately.

⑰ Detection shaft: Contact tip attachment condition
The contact tip, circumferential ring, etc. are attached.

⑱ CONDITION display
Displays the measurement mode, LOW battery, and errors.

⑲ MAIN display
Displays the measurement value, selection, setting, etc.

⑳ SUB display
Displays the memory address, setting, etc.

㉑ UNIT display
Displays various measurement units.

Before Use

1.Power Supply

The HT-5500 operates on four Type AAA batteries or optional dedicated AC adapter (PB-7080).

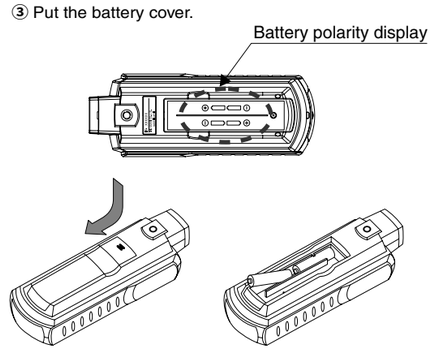
If the batteries are consumed and the LOW mark "LOW" appears, replace them with new ones. Be sure to replace all the four batteries at the same time.

Battery replacement procedure

① While pushing lightly the two (anti-slip) slots of the battery cover with your finger, slide it to remove.

② Put the batteries properly in the battery compartment with the correct polarity (+/-).

③ Put the battery cover.



2.Preparing for Non-contact Measurement

① Stick a reflective mark to the body of revolution under measurement. (For how to stick the reflective mark, refer to the next section 3, "Notes on Non-contact Measurement."

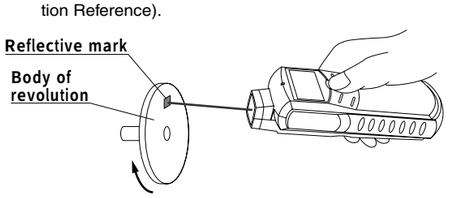
a. Wipe off oil, water, dust, and other dirt from the surface to which the reflective mark is to be stuck, and then stick the reflective mark without irregularity.

b. If the surface to which the reflective mark is to be stuck is shiny because of plating, etc., perform measurement aslant with respect to the reflective surface or apply black paint before sticking the reflective mark.

② Turn ON the power switch. Align the light from the light projector with the position of the reflective mark, and make sure that the indicator lights up. (With high-speed revolution, it seems that the indicator is lit continuously.)

a. To obtain correct data, continue measurement for at least 3 seconds.

b. Keep a proper distance between the detecting element and the reflective surface.
(For the measurement distance, refer to subsection (4), "Is the Distance Appropriate ?" for Non-contact Measurement in "Troubleshooting" in the Instruction Manual (Function Reference).



3.Notes on Non-contact Measurement

(1) Measurement distance

The 30cm maximum measurement distance of the specification is the measurement distance when a 12mm x 12mm reflective mark is used on the flat surface and then the light is applied perpendicularly to the reflective mark.

In the following cases, the measurement distance becomes short.

① When the reflective mark is stuck on the curved surface, for example, when the reflective mark is stuck on the shaft

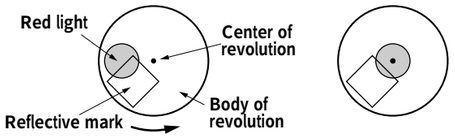
② When the reflective mark is cut into pieces

③ When the light is applied aslant

(2) Applying light to the reflective mark

Since this product detects revolution based on the presence or absence of the reflected light, it cannot detect revolution if the light is constantly applied to the reflective mark. Apply red light to the reflective mark so that there are timing when the red light from the light projector hits the body and timing when it does not hit the body while the body of revolution rotates once.

In particular, be careful when you stick the reflective mark near the center shaft of revolution.



(3) Sticking the reflective mark in high-speed revolution measurement

In order for the HT-5500 to detect the rotational signal, it is necessary to receive the reflected light from the reflective mark for about 0.2 ms or longer. With high-speed revolution, the light receive time becomes shorter than 0.2 ms disturbing measurement depending on the position for sticking the reflective mark. Therefore, be careful of the position for sticking the reflective mark.

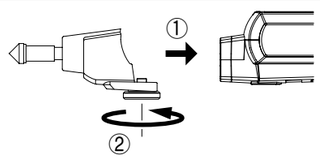
(4) If the reflective mark peels during high-speed revolution

If the reflective mark peels during high-speed revolution of 10,000 r/min, etc., use other adhesives together.

(5) If the reflective mark cannot be stuck

If the reflective mark cannot be stuck on the body of revolution for a certain reason, make a portion which reflects light and a portion which does not reflect it on the body of revolution. Note that the measurable distance and angle differ largely in comparison with the case when the reflective mark is stuck.

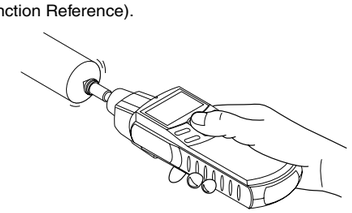
4.Preparing for Contact Measurement



① Align the contact adapter with the detecting element of the main unit and then fix it firmly to the tripod mounting screw at the bottom of the main unit using a knurling screw.

② Turn ON the power of the main unit. Rotate the detection shaft and make sure that the indicator lights up.

③ Attach the KS-300 contact tip and then select the measurement unit (r/min, ms, r/s, m/min, or COUNT). (For measurement unit setting, refer to the Instruction Manual (Function Reference).



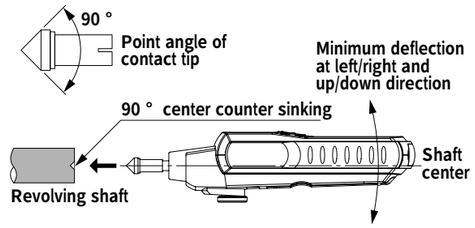
⚠ Be careful not to touch the body of revolution by hand.

④ Apply the contact tip to the shaft end center hole of the revolving shaft under measurement so that it may not slip. At this time, support the contact tip so that the shaft center of the revolving shaft under measurement is aligned with that of the detection shaft.

Do not perform measurement without using the contact tip or circumferential ring.

a. Do not use bodies of revolution without a concave portion (center counter sinking).

b. A measurement error may arise depending on the material of the body of revolution and how the contact adapter is applied.

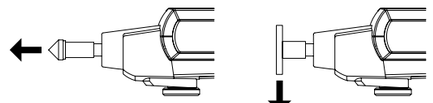


5.Notes on Contact Measurement

■ Be sure to observe the following points to ensure safety.

In contact measurement, since the HT-5500 is pressed directly to the body of revolution, danger arises. During measurement, observe the following precautions.

① When attaching the contact adapter to the main unit, insert the contact adapter properly to the detecting element and then fasten it securely using mounting screws.Use the instrument with the pressure shown below or less.



30N (3kgf) or less (when the contact tip is used)

30N (3kgf) or less (when the circumferential ring is used)

② During contact measurement, if the OVER alarm mark "⬆" blinks, stop measurement immediately.

③ Apply correctly the contact tip to the concave portion of the center of the revolving shaft under measurement. Do not apply the contact tip aslant or do not apply excessive force to the contact adapter or revolving shaft.

④ During measurement of high-speed revolution of 5,000 r/min or more, be sure to support the main unit with both hands so that the contact tip does not shift from the center of the revolving shaft. If the contact tip shifts from the center, excessive force is applied to the main unit which is dangerous.

⑤ In measurement of high-speed revolution (10,000 r/min), deflection (inclination) between the revolving shaft and the shaft center is very dangerous when you apply the contact tip to the body of revolution, In particular, if the contact tip is deteriorated or applied in wrong way, there is a risk of flying which may cause injury.In measurement of high-speed revolution, we recommend non-contact measurement.

⑥ When operating switches even during measurement of revolution of 10,000 r/min or less, be sure to support the main unit with both hands and then press switches.Operate each switch before measurement. If possible, do not perform switch operation during measurement.

⑦ In measurement with the circumferential ring, the measurement specification range is 400 m/min (mm/s).Also from the viewpoint of safety, the line speed less than the above value is recommended.

Specifications

1.Measurement Section

Measurement system : Non-contact method by visible light reflection and contact method using contact adapter

Calculation system : Periodic calculation system

Measuring time : 1s + Input signal 1 period time (In case of 60 r/min (=1Hz), up to twice the periodic time)

Measurement unit : r/min, r/s (revolution)
m/min (line speed)
ms (period)
COUNT (accumulated count)

Measuring range :

Non-contact Measurement	Contact Measurement
6 to 99999 r/min (*1)	6 to 20000 r/min (*1)
0.10 to 999.99 r/s	0.10 to 400.00 r/s
0.6 to 9999.9 m/min	0.6 to 400.0 m/min
0.6 to 9999.9 ms	2.5 to 9999.9 ms
0 to 99999 COUNT	0 to 99999 COUNT

(*1) 6.0 to 600.0 r/min (displays to one decimal place) when the Lo range is selected

Measurement accuracy : Display value* x (±0.02%) ±1 count*) The display value is the count value excluding the decimal point.*) However, the accuracy of the line speed depends on the accuracy of the revolution (r/min).

Over range function : If the measurement value exceeds the display range, over range "ERROR" appears.

Over alarm function : If the revolution exceeds the upper limit setting, the over alarm mark "⬆" appears.

2.Detecting Element

Detection system : Visible light photoelectric reflection

Detection distance : 20 to 300 mm

Light source : Red LED

Light-sensitive element : Photo transistor

Detection mark : 1 reflective mark/revolution

3.Display Section

Number of display digits : 5 digits

Character height : 10.2 mm

Display : 7-segment LCD with back light

Refresh time : 1 ± 0.2s

4.Measurement Mode

MAX (peak hold): Displays the maximum value during measurement.

MIN (peak hold): Displays the minimum value during measurement.

Others: Displays the present measurement value.

Memory function: Up to 20 measurement values can be memorized each time the Memory SW is pressed. Since these values are stored in non-volatile memory, they are retained even after you turn OFF the power.

Rapid deceleration following function: If the input signal decreases rapidly and then no input signal is supplied for one second or more, this function decreases the revolution automatically and then displays zero in about 11 seconds.

5. Analog Output Section

Output contents : Output to the display value. (Full scale value can be set aebitrarily.)

Voltage range : 0 to F.S./0 to 1V

Conversion system : 10-bit D/A conversion system

Linearity : ± 1% of F.S.

Output refresh time : 50 ms + Input signal 1 period time or less

Temperature stability : ±0.05% of F.S./℃ (ZERO & SPAN)

Setting error : ± 0.5% of F.S. (adjustment setup error at the time of shipment, ZERO & SPAN)

Load resistance : 100k Ω or more

Output connector : Pin jack

6.Pulse Output Section

Non-contact measurement : Outputs one pulse for each reception of reflected light.

Contact measurement : Outputs one pulse per revolution.

Output voltage : Hi level : 4.5V or higher
Lo level: 0.5V or lower

Output logic : Positive logic pulse

Load resistance : 100k Ω or more

Output connector : Pin jack

7.General Specifications

Power supply : Type AAA battery x 4 or dedicated AC adapter (PB-7080: option)

Continuous operating time : About 32 hours (with the back light turned OFF)
About 8 hours (with the back light turned ON)
(When alkali batteries are used at 20℃)

Battery LOW display : 4.4V ± 0.45V or less

Operating temperature range : 0℃ to +40℃

Storage temperature range : -10℃ to +50℃

Operating humidity range : +35 to +85%RH (without condensation)

Storage humidity range : +35 to +85%RH (without condensation)

Mass : About 220g (main unit only, batteries not included)
About 282g (with the adapter, batteries not included)

Dimensions : 180.5 x 66.0 x 47.5 mm (main unit only)
237.2 x 66.0 x 58.5 mm (with the adapter)

Option

① Output cable: AX-501
② AC adapter: PB-7080 (IN: 100-240VAC, OUT: 6VDC)
③ Reflective mark sheet: HT-011 (10-sheet set)
(12mmx12mm mark x 250)
④ Circumferential ring: KS-100 (mm/s)
⑤ KS-700: Extension shaft
⑥ HT-0521A: Stand jig
⑦ HT-0522: Magnet stand
⑧ LA-0203: Tripod
(HT-0521A and HT-0522 should be used in combination.)

Storage

The storage temperature range of the HT-5500 is -10℃ to +50℃. When you store it, avoid locations where the temperature is extremely high or low or the humidity is high. Store it in a place which is well-ventilated and not exposed to direct sunlight. If you do not use it for a prolonged period of time, be sure to remove the batteries to prevent accident caused by battery leakage, etc.

Handheld Digital Tachometer

HT-5500

Instruction Manual (Function Reference)

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Functions and Operations

1.Power Switch

① When you slide the power switch upward, the power of the main unit turns ON.

② When you turn ON the power, the software version is displayed in the MAIN display and product code "HT5" of the main unit is displayed in the SUB display. Then, the measurement mode is entered.

③ For each parameter, the condition of previous measurement is backed up. However, the peak-hold mode becomes the "NORMAL" condition.

④ Set each parameter at first whenever the measurement condition and function shall be changed.

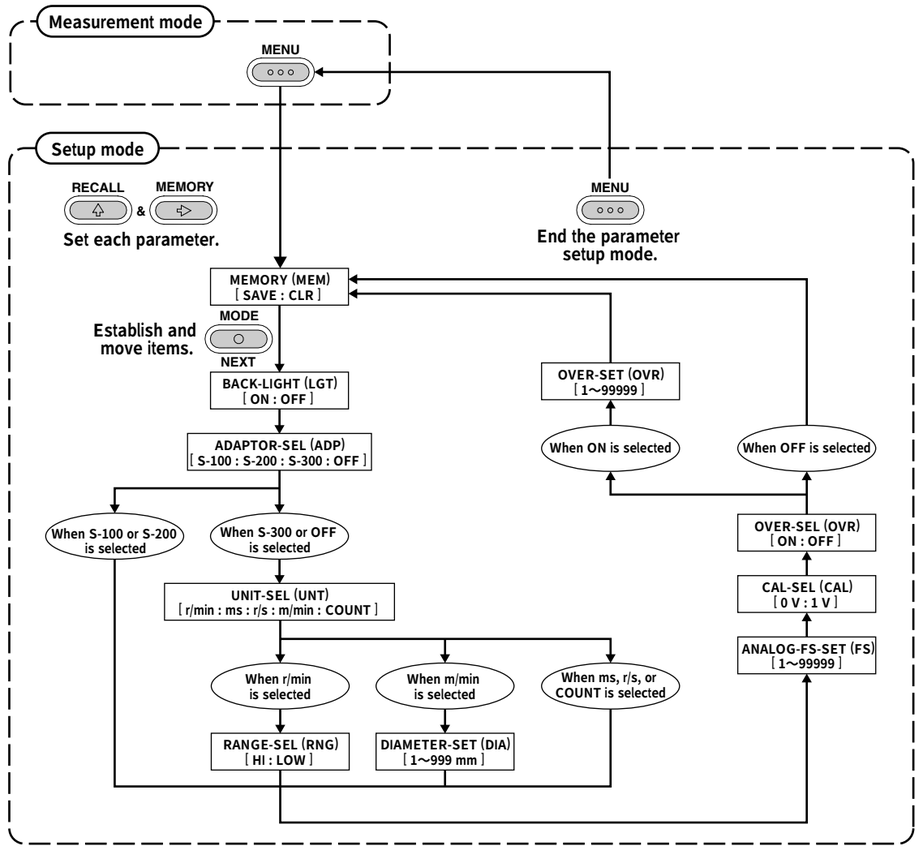
2.Function of Each Switch

When you turn ON the power, each switch has a different function between the measurement mode and the parameter setup mode.
The function of each switch in each mode is shown below.

	Measurement Mode	Parameter Setup Mode
Power switch	Ends the measurement mode and then turns OFF the power.	Cancels the current setting and then turns OFF the power.
RECALL & ↑ switch	Recalls the memory value in sequence.	Changes the selection of the current setting. During numerical parameter setting, increments the numerical value of the relevant digit. When 9, returns to 0.
MENU switch	Selects the parameter setup mode. When pressed during memory value call, returns to the measurement mode.	Establishes the current setting condition and then change to the measurement mode.
MEMORY & → switch	Memorizes up to 20 measurement values present when pressed.	During numerical parameter setting, moves the setting cursor to the right. When it is at the least significant digit, returns to the most significant digit.
MODE & NEXT switch	Changes the peak-hold mode (MAX, MIN and normal) in order.	Establishes the current setting condition and then moves to the next setting.

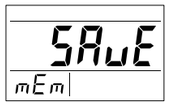
3.Setup Mode

When you press the MENU switch in the measurement mode, the parameter setup mode is selected.
Then, set parameters using the RECALL & ↑ and MEMORY & → switches. Establish parameters and select items using the MODE & NEXT switch.
The operation flow in the parameter setup mode is shown below.



① Setting clearance of all memory values (Memory → mEm)
When you press the MODE & NEXT switch when "CLr" is displayed in the MAIN display or press the MENU switch to return to the measurement mode, the memory values are all cleared.
Note: The setting of this function is not retained. When you select this item, "SAuE" is initially selected.

SAuE	Saves the memory values.
CLr	Clears all the memory values.

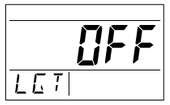


Also for the following settings, when you press the MODE & NEXT switch to move items or press the MENU switch to return to the measurement mode, the setting condition is established.

② Setting the lighting condition of the LCD back light (Light → LGT)
Turn the LCD back light ON or OFF.

OFF	Back light OFF
ON	Back light ON

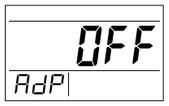
* Set to "OFF" at the time of shipment.



③ Setting the contact adapter (Adaptor → AdP)
Select whether the contact adapter is used or not and the type of tip accessories.
・When KS-100 or KS-200 is selected, the measurement unit is converted automatically into line speed.
KS-100: The measurement unit is set to m/min
Note: Owing to no capability to display the unit of "mm/s", r/min is displayed instead. Read the unit as "mm/s" for usage.
KS-200: The measurement unit is set to m/min.

OFF	Adapter not used (non-contact).
S-100	Adapter + KS-100 (circumferential ring)
S-200	Adapter + KS-200 (circumferential ring)
S-300	Adapter + KS-300 (contact)

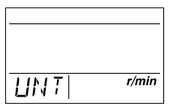
* Set to "OFF" at the time of shipment.



④ Setting the measurement unit (Unit → UNT)
Select the measurement unit for each measurement.
Note: Except for COUNT, if no input signal is received for 10 seconds, "0" or "0.0" is displayed.

r/min	Revolution (No decimal point or 0.0)
ms	Average period time (Decimal point position 0.0)
r/s	Revolution (Decimal point position 0.00)
m/min	Line speed (Decimal point position 0.0)
COUNT	Accumulated value (No decimal point)

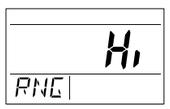
* Set to "r/min" at the time of shipment.



⑤ Setting the measurement range (Range → RNG)
(Enabled only when r/min is selected as the unit setting.)
Select high-speed revolution or low-speed revolution.

Hi	6 to 99999 r/min (non-contact) 6 to 20000 r/min (contact)
Lo	6.0 to 600.0 r/min (non-contact and contact)

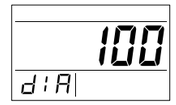
* Set to "Hi" at the time of shipment.
* When Lo range is selected, it is displayed at one digit after decimal point(0.0 r/min).



The above revolution corresponds to frequency 0.1 to 1666.66 Hz (non-contact) for Hi and frequency 0.1 to 10Hz for Lo. If the input signal exceeds this range, the error alarm mark "ERROR" lights up.

⑥ Setting the diameter of the body of revolution (Diameter → dIA)
(No diplaying when KS-100/KS-200 is used.)
Set the diameter of the body of revolution when obtaining the revolution from the line speed.
Setup range: 1 to 999 mm (When 0 is set, 1 is set automatically.)

* Set to "100" at the time of shipment.

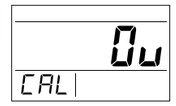


⑦ Setting the analog output full-scale (Full Scale → FS)
Set the count value corresponding to the full-scale (F.S. value: 1 V) of the analog voltage output.
Setup range: 1 to 99999 (When 0 is set, 1 is set automatically.)
Note: When Lo range is selected, the values is set which disregard the decimal point.
Set 1000 when 1V is output against 100.0 r/min.

* Set to "99999" at the time of shipment.

⑧ Setting analog output calibration (Calibration → CAL)
Output the calibration signal at 0V or 1V for the analogue voltage output.
Note: The setting of this function is not retained. When you select this item, "0u" is selected initially.
The selected analog output is enabled only while the same item is selected.

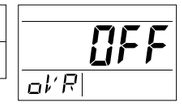
0 V	Output at 0 V
1 V	Output at 1 V



⑨ Setting the upper limit value against measurement value (Over → oVR)
Turns the measurement value peak-limit function ON or OFF.

OFF	Over alarm function for upper limit value against measurement value OFF
ON	Over alarm function for upper limit value against measurement value ON

* Set to "OFF" at the time of shipment.



⑩ Setting the upper limit value (Over → oVR)
(Can be set only when the over alarm function against upper limit value is set to ON.)
Set the upper limit value.
If the measurement value exceeds the specified value, OVER mark "▲" lights up.
Setup range: 1 to 99999 (When 0 is set, 1 is set automatically.)

* Set to "99999" at the time of shipment.

Note: When measured using the contact adapter, if the following values are exceeded, OVER mark "▲" blinks (even when the measurement value peak-limit function is set to OFF).

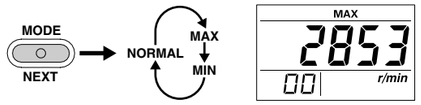
1) r/min unit : 20000 r/min
2) m/min unit : 400.0 m/min
3) mm/s unit : 4000 mm/s
(Display unit: r/min when KS-100 is used.)
4) r/s unit : 400.00 r/s
5) ms unit : 2.5 m/s
6) COUNT unit : At a revolution equivalent to 2000 r/min

Measurement Operations

1.Peak value hold function

① To measure and hold the peak value (Max. or Min.), select the desired peak-hold measurement mode (MAX or MIN) by pressing the MODE & NEXT switch in the measurement mode.

② When measurement of the peak value (Max. or Min.), "MAX" or "MIN" lights up in the CONDITION display section of the LCD.



When "MAX" or "MIN" is not lit, the peak-hold mode is suspended. (Displays the current measurement value for the body of revolution.)

③ Each peak-hold value is updated only when the peak-hold measurement mode is selected.

④ To clear the peak-hold value, select "CLr" for setting "mEm" (Memory) in the setup mode to clear the peak-hold value and then return to the measurement mode.
The measurement value present when cleared is set to "MAX" and "MIN."

Note: If the peak-hold measurement mode is entered when the body of revolution stops, the "MIN" value becomes zero. Therefore, the value is not updated even if the body of revolution rotates, disabling measurement of the "MIN" value. Therefore, if the peak-hold measurement mode is entered when the body of revolution is rotating or if the "MIN" value becomes zero, once clear the peak-hold value before starting measurement.

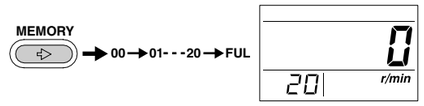
Note: When the peak-hold value is cleared, the memorized measurement values are also cleared. The peak-hold value is also cleared when you turn OFF the power.

2.Memorizing Measurement Values

① To memorize the current measurement value, press the MEMORY & → switch during measurement.

② When the measurement value is memorized, the numerical value in the SUB display is incremented.
Therefore, the number "00" in the SUB display indicates that there is no measurement value memorized.

③ Up to 20 measurement values can be memorized. When the number of the memory values reaches 20, no more values can be memorized.
When you press the MEMORY & → switch at this time, "FUL" is displayed.



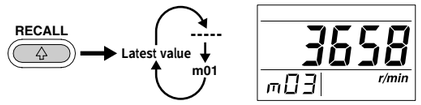
④ Since memory values are stored in the non-volatile memory, they are retained even if you turn the power OFF.

3.Recalling Memory Values

① Memory values can be recalled by pressing the RECALL & ↑ switch in the measurement mode.
The memory No. is displayed as "mXX" (for example, m05) in the SUB display.

② Memory values are recalled from the latest memory No. and then in order of the memory No., m01, m02, m03, and so on.

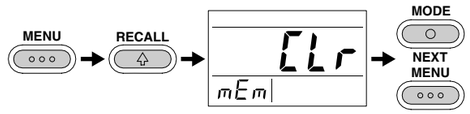
③ If there are three memory values, the value of memory No. m03 is displayed first. Then, the SUB display displays m04 and the MAIN display displays " ————— " indicating that there is no measurement value memorized. Therefore, if there is no memory value, " ————— " is displayed at m01.



④ To return to the measurement mode, press the MENU switch. The numerical value in the SUB display changes to "XX" which indicates the number of values memorized (without leading "m").

4.Clearing All Memory Values

① To clear all memory values, select "CLr" for setting "mEm" (Memory) in the setup mode and press the MODE & NEXT switch or press the MENU switch to return to the measurement mode.

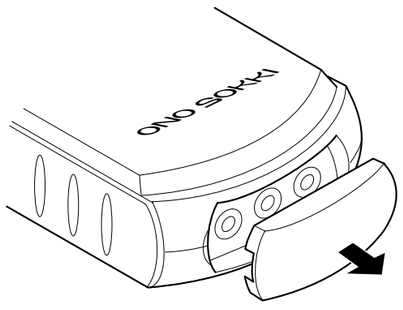


② When the memory values are cleared, the numerical value in the SUB display becomes "00."
Note: When you perform the memory clear operation (all clear), the memory values are all cleared. When there is the peak-hold value, it is also cleared at the same time.

Outputs

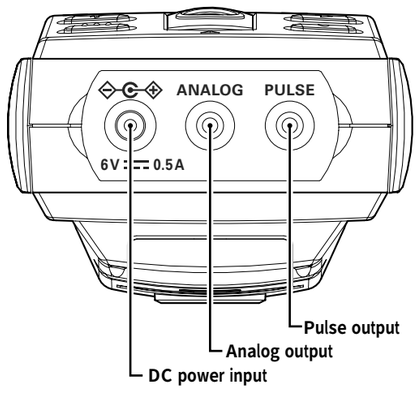
1.Analog Output

- The analog voltage output of the value set in the setup mode as the analog output "F.S." (full scale) setting is output from the analog output connector.
- The analog output becomes 1V when the value of the MAIN display agrees with the full-scale setting. The minimum load resistance of the analog output is 100k Ω .



2.Pulse Output

- A pulse waveform shaped according to the detected amount of reflected light is output from this connector.
- As for the output level, the Hi level is 4.5 to 5V and the Lo level 0 to 0.5V. The minimum load resistance is 100k Ω .



Rapid Deceleration Following Function

If the input signal decreases rapidly (sudden drop of revolution) and then no input signal is supplied for one second or more, this function decreases the revolution automatically and then displays zero in about 11 seconds.
The tachometer waits for the input signal for 10 seconds because the input frequency on the low-speed side is 0.1Hz. This function predicts the revolution reduction in the meantime and performs operation so that zero display is made in 11 seconds.

Description of CONDITION Display Section

1.ERROR Display

If the error alarm mark "ERROR" lights up, one of the following error has occurred.

① If the measurement value exceeds "99999", the display digit over error occurs.
* The display value is averaged. Therefore, even if the display value is smaller than "99999" (except for the decimal point), this mark lights up when the result of one measurement is larger than "99999."

② If the input frequency exceeds the upper-limit frequency corresponding to the revolution of the measurement range, the frequency over error occurs.
* Although the display value is averaged, this mark lights up if the result of one measurement exceeds the upper-limit frequency.

Hi range: 0.1 to 1666.66 Hz (non-contact)
Lo range: 0.1 to 10Hz (non-contact and contact)

2.LOW Display

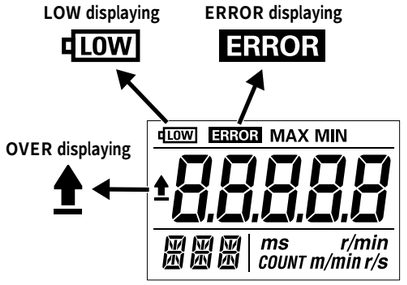
If the low alarm mark "LOW" lights up, the battery has been consumed and the low battery condition occurred.

- This mark lights up if the battery voltage drops to 4.5V or less.
- If this mark lights up, immediately replace the four batteries with new ones.
  Using the consumed batteries may disable measurement.
- If the batteries are further consumed under this condition, measurement is disabled and the MAIN display displays " – – – – – "
- If the battery voltage drops to about 4.5V or less, the back light becomes dark (with no problem).

3.OVER Display (Blink)

With the measurement value peak-limit function set to ON in setup mode, if the display value exceeds the upper limit setting, the "▲" mark blinks.

* The displayed value is processed averagely. Therefore, even if the display value is smaller than the upper-limit setting, this mark blinks when result of one measurement exceeds the upper-limit value.



Troubleshooting

If you perceive any abnormal condition, first check the following points. If the instrument does not operate correctly after check, contact your dealer (Ono Sokki agency) or Ono Sokki sales office nearby.

Symptom	Check Point	Solution
● No display	① Are batteries set ?	① Set batteries.
	② Are the batteries set at correct polarity ?	② Put the batteries at thecorrect polarity.
	③ Are batteries consumed ?	③ Replace all batteries with new ones.
	④ When using the AC adapter, is the dedicated AC adapter connected to an outlet and the DC input connector of the main unit ?	④ Plug the dedicated AC adapter to an outlet and then connect the DC plug to the DC input connector of the main unit.
◆ Non-contact measurement ● Display value different from actual value	① Are reflective marks stuck on the body of revolution ?	① Stick the reflective mark on the body of revolution during measurement.
	② Does projected light hit the reflective mark ?	② Apply projected light to the reflective mark.
	③ Is projected light applied properly ?	③ Make arrangement so that projected light hit the reflective mark once per revolution.
	④ Is the distance appropriate ?	④ Use the instrument with a measurement distance of 20 mm to 300 mm. However, 300-mm measurement distance may not be ensured depending on how the reflective mark is stuck (for example, stuck on a thin shaft)
	⑤ Is the body of revolution shiny with plating ?	⑤ Apply black tape, apply light aslant, or take other measures.
	⑥ Does irregular reflection occur by a crack or irregularity on the body of revolution ?	⑥ Apply black tape or take other measures.
	⑦ Any space between several reflective marks which are is attached to the rotational body?	⑦ When sticking two or more reflective marks, do not make a space between them.
	⑧ Is the distance appropriate ?	⑧ Maintain an appropriate distance.
◆ Contact measurement ● Display value different from actual value	① Is the end of the of contact tip worn or deformed ?	① Replace the contact tip
	② Does slip occur between the body of revolution and the contact tip ?	② Support the main unit firmly to prevent slip.