# HIOKI

# 3402

## TACHO Hi TESTER

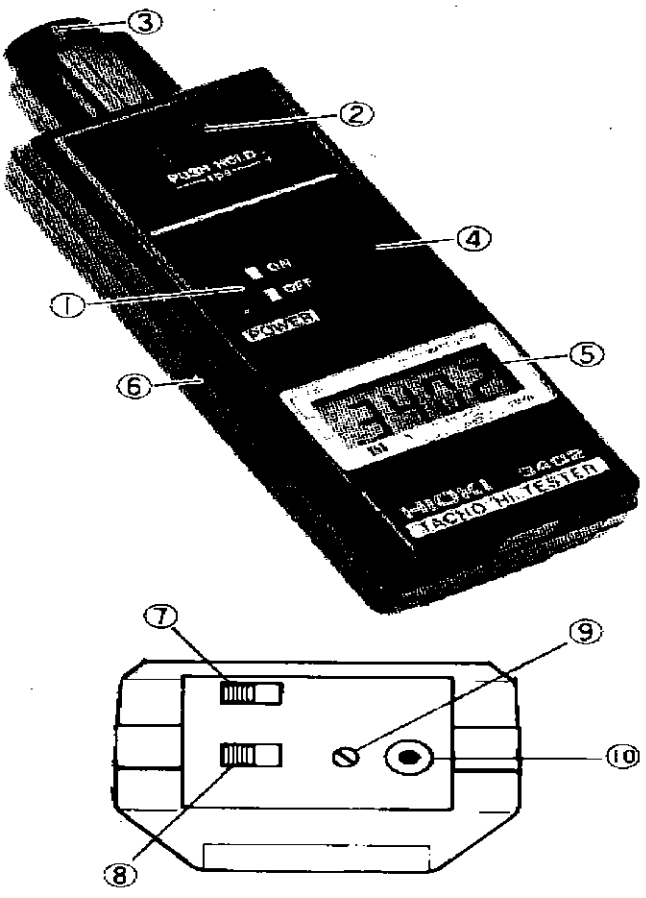
## INSTRUCTION MANUAL

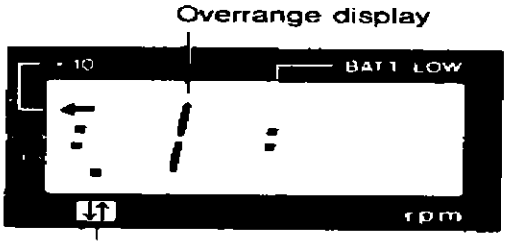
### WARNING

This Instrument is designed to prevent accidental shock to the operator when properly used. However, no engineering design can render safe an instrument which is used carelessly. Therefore, this manual must be read carefully and completely before making any measurement. Failure to follow directions can result in a serious or fatal accident.

## 2.

## INSTRUMENT NOMENCLATURE AND FUNCTION

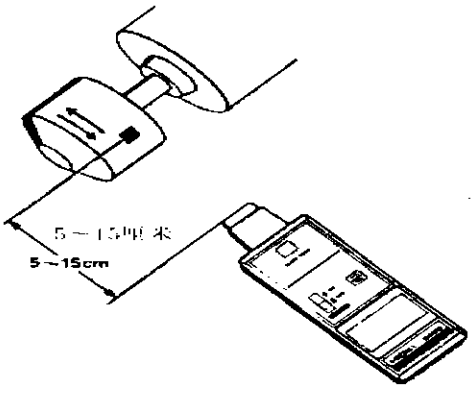


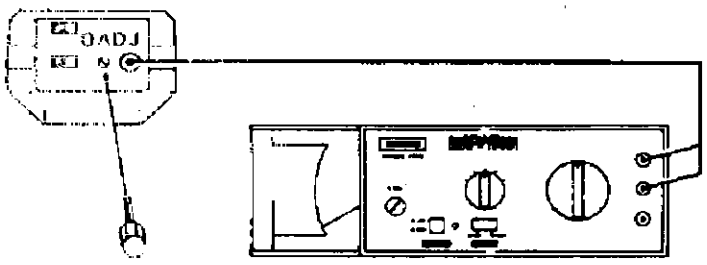

Reflector pick-up confirmation

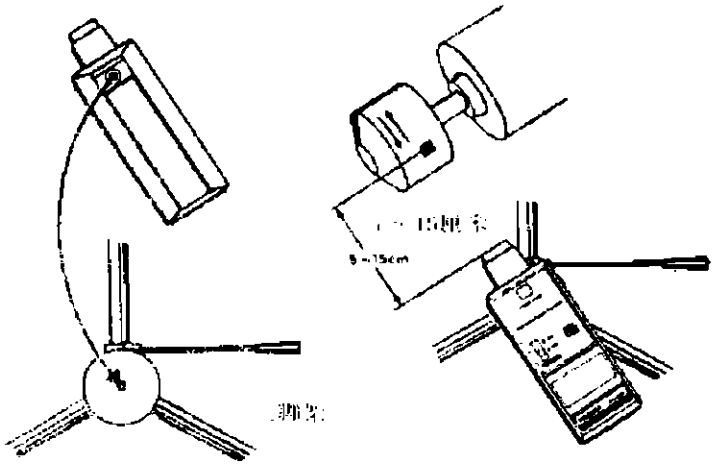
## 3.

## OPERATING PROCEDURE (MEASUREMENTS)

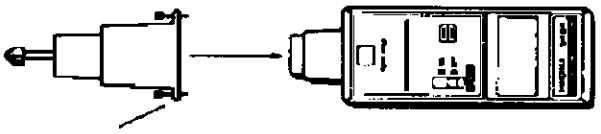


## USING THE ANALOG OUTPUT

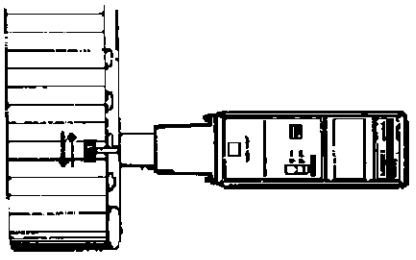


## TRIPOD MOUNTING



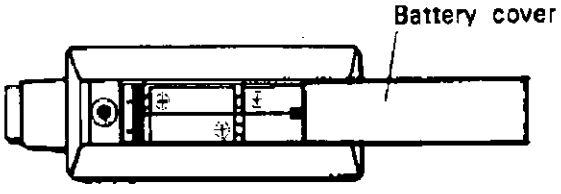
Adaper



Conveyor

7.

## PRECAUTIONS REGARDING RPM MEASUREMENTS

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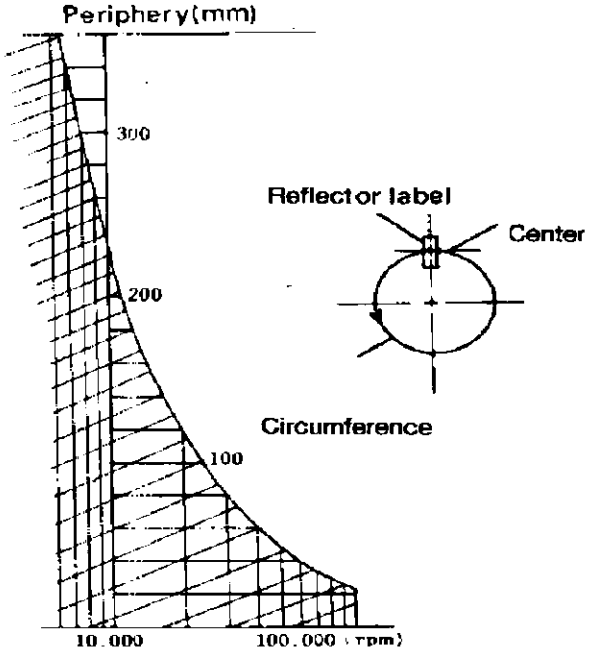
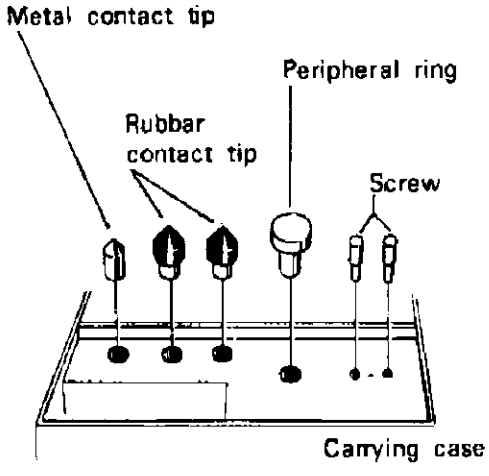
## MEASUREMENTS USING THE 9210 CONTACT ADAPTER

※The circumference is described as the circular drawn by the center of revolution reflector label.




The range in which detection is possible using a 12mm×12mm reflector lable.



—English—

# 1. Specifications

**Display**: 4-digit LCD (9999); Other display information: (X 10) symbol, Reflector Pick-up Confirmation Mark (■), BATT Low, Hold Mark, rps Mode

**Ranging** : Automatic

**Sampling Rate** : 0.7~2s

**Data Hold** Pushbutton switch operation

**Overrange Display** : ( 1 ) in MSD column appears

**Measurement Range** :

| Mode | Range |
|---|---|
| rpm Mode | 30.0~999.9, 1000~9999<br>1000~9999×10<br>(Less than 30 rpm: 0.0 displayed) |
| rps Mode | 0.50~99.99, 100.0~999.9<br>1000~1600<br>(Less than 0.5 rps: 0.0 displayed) |

Contact Operation Range: 30.0~20000 rpm

**Accuracy** : ±1 dgt

**Detection Distance** : 50~150mm

**Reflector Pick-up Confirmation** : Electronic buzzer sounds; Confirmation mark (■) displayed

**Tripod Mounting** : Tripod mounting screw provided on body

Operating Temperature, Humidity Range: 0~40°C; 80% RH or less

**Analog Output** : mV/10 rpm range (30~40000rpm): 3~4000 mV; mV/100rpm range (30~100000rpm): 0.3~1000mV (Accuracy: ±4% rdg. ±2mV) (Input Resistance: 50Ω)



**Power Source**:Four size AA (SUM-3) batteries provide approx. 15 hours continuous operation. AC Adapter (DC output 6V —300mA) may be used for AC line operation.

**Dimension/Weight**: 200L×65W×50D(mm)/approx. 400g

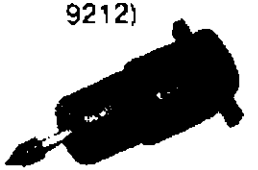
**Accessories**: Basic 3402 includes one sheet of 9211 reflective tape (30labels), 9094 Line Cord, and Carrying Case. 3402-01, in addition to the above, includes 9210 Contact Adapter, 9032 Metal Contact Tip, 9033 Rubber Contact Tip (2 ea.), and 9212 Peripheral Ring.

**Accessories Available**

9094 Line Cord

9211 Reflective Tape (10 sheets)

9210 Contact Adapter (with 9032, 9033 9212)



9032 Metal Contact Tip

9033 Rubber Contact Tip

9212 Peripheral Ring

## 2. INSTRUMENT NOMENCLATURE AND FUNCTION

**①Power Switch**

Powers the instrument and places it in a measurement status.

**②Hold Switch**

During the course of a measurement, pressing this switch holds the present reading on a static display. It is also used to set the revolutions-per-second (rps) mode. In this case, the Hold Switch is first pressed and locked down, then the Power Switch is turned ON.

Operation

1. Power on→rpm→Push sw on→Hold
2. Push sw on→Power on→rps→Push sw off →rpm→Push sw on→Hold

**③Photoelectric Detection Window**

Functions to pass the internally generated flash, and pick up the reflections from the rotating member.

**④Electronic Buzzer**

Sounds to verify accurate reflection pick up.

**⑤Display**

Digitally displays rpm or rps. Maximum reading: 9999. Additional symbols include the " ← " mark (signifying X10), "■" (signifying HOLD status), " ▮ " (signifying rps mode), and " ■ " (signifying accurate reflector pick up). BATT. LOW appears when the batteries require replacement, and a " ! " mark appears in the MSD column to indicate overrange.



## 3. OPERATING PROCEDURE (MEASUREMENTS)

**⑥AC Adapter Jack**

Used to connect the AC Adapter (6V—300mA).

**⑦Function Switch**

Used to select either LCD display mode, or OUTPUT (analog output).

**⑧Analog Output (OUTPUT) Range Switch**

Positioning this switch to **mV/10rpm** (1mV output per 10 revolutions) selects the 30~40,000rpm range.

The **mV/100rpm** (1mV output per 100 revolutions) position selects the 30~100,000rpm range.

**⑨O ADJ**

Used to adjust output to 0mV when no input pulse is present.

**⑩Output Terminal**

Serves to connect tachometer output to a recorder using the connection cable provided.

1. **Affix the reflector label to the rotating member.**
   * Clean all oil and other contaminants off the surface you are going to stick it to first.
2. Position the **Function Switch to LCD.**
3. If rpm is selected as the measurement mode, turn the **Power Switch ON.** For rps, lock the **Hold Button** down first, then turn the **Power Switch ON.**
4. Aim the Photoelectric Detection Window at the rotating reflector label to pick up the reflected red beam. When the instrument recognizes an accurate pulse detection, the

electronic buzzer sounds, and "■" appears in the display. You can then read the display. Where the rotating member itself is highly reflective, and the reflected light is being picked up from a point other than the label, reposition the tachometer to an angle where the reflected pulse is only received from the label.

5 When a " ← " mark appears in the upper left area of the display, multiply the reading by 10. The rps mode is recognized by the "÷" mark in the left side of the display. The rpm mode does not have a special marking. When the tachometer is operated in the rps mode, the "■" mark will first appear, followed by the "÷" mark after calculation has been completed and the results displayed.

## 4. USING THE ANALOG OUTPUT

1 Affix the reflector label to the rotating member.

2 Position the **Function Switch to OUTPUT.**

3 The Analog Output Range setting should be determined by the maximum rpm of the selected tachometer range, and the range of the recorder.

mV/10rpm range: 30~40,000rpm→3~4000mV

mV/100rpm range: 30~100,000rpm→0.3~1000mV

**Example** : For a maximum rpm of 2000, set the tachometer range to mV/10rpm and the recorder range to 200mV.

**Example** : For a maximum rpm of 50000, set the tachometer range to mV/100rpm and the recorder range to 0.5V.



4 Set the **"O"** position on the recorder, and connect the tachometer and recorder using the accessory connector cable.

5 Turn the **Power Switch ON.**

6 Without reflector pulse input, turn **O ADJ** until output is **zero.**

7 Aim the Photoelectric Detection Window at the rotating label to obtain output.

The analog signal for each sampling event is passed through a D/A converter prior to being gated to OUTPUT to obtain a highly stable signal even at low rpm's. The sampling rate at low rpm (under 900) is once per revolution, and every 0.12 second at high rpm.

## 5. TRIPOD MOUNTING

Tripod mounting is recommended for long-term measurements. A standard tripod mounting socket is provided.

## 6. MEASUREMENTS USING THE 9210 CON TACT ADAPTER

1 The contact adapter is attached to the tachometer by aligning it with the groove and fitting it over the Photoelectric Detection Window. Secure it with the screws located on both sides.

2 For use in measuring the speed of a rotating member, insert a rubber or metal (when the rotating member is made of rubber) contact tip into the adapter chuck.

3 Rotate the contact tip by hand to make sure that the electronic buzzer sounds and the LCD lights.

4 Make light contact between the contact tip and the center of the rotating member to determine whether the surface of the shaft is rough or not. (Do not use the direct contact method on unsmooth surfaces.)

5 To measure linear speeds (conveyor belts etc.), insert the peripheral ring in the adapter.

- ○ In the rpm mode, multiply the reading by 0.1 to obtain meters per minute (m/min).
- ○ In the rps mode, multiply the reading by 0.1 to obtain meters per second (m/sec).

## 7. PRECAUTIONS REGARDING RPM MEASUREMENTS

In order to accurately detect the reflected light signal, and eliminate the effects of stray light at the same time, a modulation method is used. The reflected light must be modulated over a period exceeding 0.3msec for the instrument to recognize it as a rotating pulse. Consequently, the Photoelectric Detection Window must also be aimed at the reflector label for over 0.3msec.

The graph shows the range in which detection is possible using a 12mm X 12mm reflector label. The left side of the curve indicates the range over which detection is possible. If the reflector label cannot be affixed to the rotating member within that range, a larger piece of reflective tape will have to



be cut, and the minimum detection time (0.3msec) increased.

Additionally, the higher the rotating speed of the member, the greater the effect hand-shake has on accuracy. Thus, tripod mounting is also recommended for high speed measurements.

## 8. BATTERY REPLACEMENT

1 Remove the battery cover by sliding.

2 Replace the battery with a new one, observing correct pole polarity (⊕ — ⊖).

**9.** The 3402-01 and 9210 will have the metal contact tip, rubber contact tip, and peripheral ring enclosed in a vinyl bag. Remove these items and store them in the location shown in the diagram.

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