Digital Tachometers/Sensors and Peripherals

LG/SP/MP/RP series
FV/FT/PA/TM series
Select the rotation detector/rotation display unit that is optimal for your needs from the wide range of products that Ono Sokki is proud to offer.
## Rotation Display Unit Selection Guide

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>TM-3110</td>
<td>Display only</td>
<td>100 to 240 VAC (12VDC/100 mA)</td>
<td>MP series SP-405ZA LG series RP series</td>
<td>p. 18-20</td>
<td></td>
</tr>
<tr>
<td>TM-3120</td>
<td>BCD output</td>
<td></td>
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<tr>
<td>TM-3130</td>
<td>Analog output</td>
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<tr>
<td>TM-3140</td>
<td>Comparator output</td>
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<tr>
<td>TM-5100</td>
<td>Analog output</td>
<td>100 to 240 VAC (5VDC/150 mA) (Total of A and B channels) (12VDC/150 mA) (For each A and B channel)</td>
<td>MP series LG series RP series</td>
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<tr>
<td>FT-2500</td>
<td>Analog output</td>
<td>100 to 240 VAC (12VDC/100 mA)</td>
<td>FT-0501 (Rotation detector for DC motor) Sound/vibration sensors</td>
<td>p. 22-23</td>
<td></td>
</tr>
</tbody>
</table>

### Notes on Detection Gears

#### Electromagnetic Type Rotation Detector

- General-purpose type
- With a directly attached cable
- Measurable for high speed rotation
- Oil-proof type
- Oil-proof/Heat-resistant type (up to 150 °C)
- Heat-resistant type (up to 200 °C)
- Long body type (105 mm)
- Long body type (81 mm)
- Compact type (M12)
- Compact type (M8)
- Ultra-compact type (M5)
- For modules 0.5 to 1 [Compact module]
- For modules 3 to 10 [Medium module]
- For modules 3 to 10

#### Electromagnetic Type (External Gear Type) [Modules 0 to 3]

- Low-to-medium speed
- High-speeds
- Acid-proof/water-proof

#### Magnetic Type

- Low-to-medium speed
- High-speeds
- Acid-proof/water-proof

#### Application

- Application

#### Rotary Encoders

- Ultra-compact type

### Rotation Display Unit

#### General-purpose Use

- Display only
- BCD output
- Analog output
- Comparator output

#### Multifunction Type

- Multifunction tachometer

#### Advanced Model

- Advanced tachometer

### Related Products

#### Elevator Speedometer

- Handheld speedometer
- Low-to-medium speed
- Reversible counter

#### Length Meter

- General-purpose type
- High response type

#### Isolated Signal Amplifier

- Signal amplifier

#### Coupling Selection Guide

- F/F Converter

#### Table of Signal Cable

- F/F Converter

---

Note 1: Please refer to “Table of Signal Cable” on page 34 and 35 to select the suitable signal cable.

Note 2: Please contact your nearest distributors or Ono Sokki sales office for the separated brochures of FT-2500.
Rotation Detector

Notes on Detection Gears

**Detection Gear**
In general, gear made with soft metals (S45C, SS400, etc.) is used as a detection gear, which has magnetic body and large magnetic permeability.

**Shape of a Detection Gear**
Fig.1 shows detector output waveforms from various types of external rotors (detection gears etc.). Involute gear is the most suitable for detection gear.

*Note:
1. Distortion might appear in output waveform, such as high frequency distortion when triangular teeth / square teeth / round teeth / partially missing teeth are used.
2. If the gear is magnetized, output voltage decreases or the abnormal waveform is output due to interference with the permanent magnet inside the detector.

Abbreviation of gears:
- M = Module
- \( \frac{Z}{2} \cdot \pi \cdot N \) = Frequency
- D = Diameter of gear

**Shape of the Gear for the MP-981 and the Mounting Method**

---

Electromagnetic Rotation Detectors (MP-900/9000 series)

By bringing the MP-900/9000 series close to the tooth tip, it detects the frequency signal proportional to the rotation speed (sine wave output). You can select according to the purpose from wide selection, such as general purpose type, special type including oil proof / heat resistant type. Extension cable, signal cable, connector are sold separately (See P34, 35).

---

Electromagnetic Rotation Detectors and Magnetoelectric Rotation Detectors

Electromagnetic Rotation Detectors (MP-900/9000 series)

**Features**
- General-purpose type
  - MP-9100: Low cost and popular type
  - MP-912: Compact type
  - MP-913: Direct attached cable type
- Ultra-compact type
  - MP-920: Low impedance (High-speed rotation type)
- Oil-proof type
  - MP-930: Non-lubricated type
  - MP-931: Lubricated type
- Oil-proof and heat-resistant type
  - MP-950: Oil-proof type
  - MP-951: Heat resistant type
- Compact type
  - MP-955: Compact (M12), directly attached cable 0.5 m
  - MP-960: Compact (M8), directly attached cable 0.5 m
  - MP-962: Ultra-compact (M6), directly attached cable 0.5 m
  - MP-920: Compact module type
- Standard detection gear
  - MP-001: General purpose type
  - MP-910: Medium module type
  - MP-920: Ultra-compact type
  - MP-900: Compact type

---

Magnetoelectric Rotation Detectors (MP-981/9820, AP-981)

**Non-contact type**

- Long body type
  - MP-954: Long body type of 81 mm mounting section, suitable for the rotation detection of the rotating object deeply installed.
- Long body type
  - MP-955: Long body type of 105 mm mounting section, suitable for the rotation detection of the rotating object deeply installed.
  - MP-950: Same size as MP-950
  - MP-951: Direct attached cable 0.5 m

---

When the electromagnetic type rotation detector MP series is used especially in places where great importance is placed on reliability, the technical consultation is required. Please consult your nearest distributor or Ono Sokki sales office nearby.
### MP-900/9000 Series Specifications

**Items** | Detectors | General-purpose | General-purpose (With cable attached) | Low-impedance | High-impedance | Oil-proof | Oil-proof/Heat-resistant (120°C) | Heat-resistant (220°C) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC resistance value [Ω]*1</td>
<td>850 to 950</td>
<td>85 to 105</td>
<td>850 to 950</td>
<td>600 to 700</td>
<td>800 to 900</td>
<td>500 to 600</td>
<td>200 to 350</td>
<td>150 to 300</td>
</tr>
<tr>
<td>Inductance (H)*1 (TYP)</td>
<td>200 to 500</td>
<td>100 to 150</td>
<td>200 to 500</td>
<td>100 to 150</td>
<td>200 to 500</td>
<td>100 to 150</td>
<td>200 to 500</td>
<td>100 to 150</td>
</tr>
<tr>
<td>Impedance [Ω]*2</td>
<td>2.0 k</td>
<td>1.0 k</td>
<td>2.0 k</td>
<td>1.0 k</td>
<td>2.0 k</td>
<td>1.0 k</td>
<td>2.0 k</td>
<td>1.0 k</td>
</tr>
<tr>
<td>Output voltage (Vp-p)</td>
<td>1.2 k</td>
<td>1.0 k</td>
<td>1.2 k</td>
<td>1.0 k</td>
<td>1.2 k</td>
<td>1.0 k</td>
<td>1.2 k</td>
<td>1.0 k</td>
</tr>
</tbody>
</table>

#### Notes on the Detection Gear
- a) Gear size
- b) Detection gear tooth shape
- c) Detection gear module
- d) Detection gear material

**Ono Sokki’s Standard Detection Gear MP-001**

- **Detection gear material**
  - Material: Chrome plated
  - Tooth shape: Involute gear

**Surrounding Magnetic Field**

<table>
<thead>
<tr>
<th>Items</th>
<th>General-purpose</th>
<th>General-purpose (With cable attached)</th>
<th>Low-impedance</th>
<th>High-impedance</th>
<th>Oil-proof</th>
<th>Oil-proof/Heat-resistant (120°C)</th>
<th>Heat-resistant (220°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surrounding magnetic field</td>
<td>0.005 T</td>
<td>0.01 T</td>
<td>0.02 T</td>
<td>0.03 T</td>
<td>0.05 T</td>
<td>0.1 T</td>
<td>0.2 T</td>
</tr>
</tbody>
</table>

**Performance Characteristics**

- **Detectable frequency range (Hz)**
  - MP-9100: 200 to 35,000 Hz
  - MP-911: 200 to 500 Hz
  - MP-9120: 200 to 500 Hz
  - MP-930: 200 to 500 Hz
  - MP-935: 300 to 1200 Hz
  - MP-936: 300 to 1200 Hz
  - MP-950: 300 to 1200 Hz
  - MP-954: 300 to 1200 Hz
  - MP-962: 400 to 1500 Hz

**Load Resistance**

- Load resistance: 10 kΩ

**Compact Module**

- Model: MP-001
  - Module: M = 0.5

**Shunt Resistance**

- Shunt resistance: 10 kΩ
- Load resistance: 10 kΩ

**Measurement Conditions**

- Detection gear: M = 1, Z = 120 P/R
- Load resistance: RL = 10 kΩ
- Gap: G = 0.5 mm

**Vibration Resistance (m/s²)***

- MP-9100: 196
- MP-911: 196
- MP-9120: 196
- MP-930: 196
- MP-935: 196
- MP-936: 196

**Temperature Range**

- Operating temperature range: -10 to 90 °C

**Output Voltage**

- Output voltage (Vp-p): 1.2 kV

**Gaps and Detection Ranges**

<table>
<thead>
<tr>
<th>Items</th>
<th>MP-9100</th>
<th>MP-911</th>
<th>MP-9120</th>
<th>MP-930</th>
<th>MP-935</th>
<th>MP-936</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Upper limit of rotation speed</td>
<td>50</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Model</td>
<td>MP-9100</td>
<td>MP-911</td>
<td>MP-9120</td>
<td>MP-930</td>
<td>MP-935</td>
<td>MP-936</td>
</tr>
<tr>
<td>Gap</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Upper limit of rotation speed</td>
<td>50</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

**External Gear Type**

- **Rotation Detectors**
  - External Gear Type
  - JIS E 4031, five types, 40 Hz, two hours in each of the X and Y directions; four hours in the Z direction

**Impedance (Ω)**

- DC resistance: 850 to 950 Ω

**Inductance (mH)**

- 1.2 kH

**Surrounding Magnetic Field (T)**

- Up to 0.01 T

**Vibration Resistance (m/s²)**

- Up to 196

**Detectable Frequency (Hz)**

- 300 to 35,000 Hz

**Output Voltage (Vp-p)**

- 1.2 kV

**Gap**

- 0.5 mm

**Load Resistance**

- 10 kΩ

**Measurement Conditions**

- Signal cable (3C2V)
- 5 m, 10 m, 20 m

**Detection Gear Module**

- Module: M = 0.5

**Detection Gear Size**

- MP-9100: ø40 mm
- MP-911: ø80 mm
- MP-9120: ø120 mm
- MP-930: ø80 mm
- MP-935: ø120 mm
- MP-936: ø150 mm

**Measurement Conditions**

- Detection gear: M = 1, Z = 120 P/R
- Load resistance: RL = 10 kΩ
- Gap: G = 0.5 mm
Magnetoelectric Rotation Detector MP-810/9820
General-purpose/high speed detection model

This is a magnetic flux response type detector (the resistance value changes according to the magnetic flux) which internally has magnetic resistance elements, permanent magnets, a direct current amplifier, and a voltage regulator. It can detect over a wide range of rotation speeds from ultra low speed to high, and outputs the results as a square waveform. Three models are provided: General-purpose type (MP-981), high speed detection type (MP-9820), and acid-resistance and waterproof type (AP-981).

**Features**
- Detection from nearly 0 r/min
- Detection from low to high speeds (1 to 100,000 r/min: MP-9820 [60-tooth gear])
- Output as square waveform
- Compact, light weight, easy-to-mount

**Specifications**
- Detection range: 1 Hz to 20 kHz
- Detection detector: Ferromagnet (both width: at least 3 mm)
- Detection distance: see the graph at the right
- Power requirement: -12 ± 2 VDC
- Power consumption: approx. 40 mA (at 10 V, 25°C)
- Output waveform: square wave (±0.5 VHI and ±0.5 VLO)
- Protective circuit: power source polarity, output short-circuit protection
- Operating temperature: -10 to 70°C
- Withstand voltage: ±250 VDC
- Vibration resistance (conductivity): ±40 m/s² each in X, Y, Z direction
- Shock resistance (non-conductivity): ±400 m/s² (three times each in the X, Y, Z directions)
- Connection method: see P. 34-35
- Weight: approx. 80g (including the two nuts used for fastening)
- Accessory: two nuts for fastening, instruction manual x1

**Output waveform**
- Lo: up to 0.5 V, Hi: ±0.5 V

**Module and detection distance**

---

Magnetoelectric Rotation Detector AP-981
Acid-resistant, waterproof type

The AP-981 is a waterproof model that complies with the JIS C 0920 Protective Class 7 (marking symbol: IPX7) requirements for the waterproof testing of electrical equipment and wiring materials.

**Features**
- Can be used for measurement in locations where nitric acid mist is in the atmosphere, or in environments where the detector may be submerged.
- Performs by non-contact detection.
- Detection from ultra low to high speeds (1 to 20,000 r/min [60-tooth gear]) as square waves of the same amplitude
- Comes with a 1.9 m length acid-resistant cable attached

**Specifications**
- Detection range: 1 Hz to 20 kHz
- Detection detector: Ferromagnet (both width: at least 3 mm, module: 1 to 3)
- Detection distance: see the graph at the right
- Power requirement: -12 ± 2 VDC
- Power consumption: approx. 30 mA (at 12 V, 25°C)
- Output waveform: square wave (±5 ± 0.5 V)
- Protective circuit: power source polarity, output short-circuit protection
- Operating temperature: -10 to 70°C (on the condition that it is within the atmosphere of IP-X7 [JIS C0920])
- Withstand voltage: ±250 VDC
- Inductance: 50 ± 5 Ω
- Moment of inertia: approx. 1.5 kg·cm²
- Allows shaft load: radial 147N, thrust 98N
- Connection method: see P. 34-35
- Weight: approx. 2 kg
- Connection method: M3 crimp terminal (JIS C 2805 1.25-3) (When using MP-801) See P.34 and P.35
- Cable outlet: cable clamp (complies with IP-68)
- Surrounding magnetic field: up to 0.01 T
- Option: connector output (MP-081)

**Output waveform**
- Lo: up to 0.5 V, Hi: ±0.5 V

---

Electromagnetic Rotation Detector MP-300 series
Low-to-medium speed

There are three models in the series, each with a different outer appearance: MP-810, MP-820 and MP-830.

**Features**
- There are three models in the series, differentiated by their outer appearances.
- MP-810: base mount type
- MP-820: dual-shaft type
- MP-830: flange type
- Number of output pulses

**Specifications**
- Rotating speed range: 5 to 5,000 r/min
- Output waveform: approximate sine wave
- Output voltage: ±0.5 Vp-p or more
- DC resistance value: 770 ± 10 Ω
- Inductance: ±2 H typ. (at 1 kHz)
- Starting torque: ±245 mN·m or less
- Moment of inertia: approx. 1.5 kg·cm²
- Allowable shaft load: radial 147N, thrust 98N
- Vibration resistance: ±98 m/s² (for two hours in each of the X, Y, and Z directions)
- Shock resistance: ±98 m/s² (for three times in each of X, Y, and Z directions)
- Operating temperature: -10 to 80°C
- Storage temperature: -20 to +80°C
- DC resistance value: 770 ± 10 Ω
- Output waveform: square wave (±0.5 V, Hi: ±5 V)
- Power consumption: approx. 40 mA (at 12 V, 25°C)

**Module and detection distance**

---

**Related product:** MP-837 (low impedance type)

- **Number of output pulses (different from MP-810/820/830)**
- Module: 0.5 to 3)
**Optical Detector**

**LG-9200**

Compact optical detector

LG-9200 is a reflective type photoelectric rotation detector using an optical fiber at the tip. Designed to be resistant against disturbance light using pulse modulation method for the light source emitting modulation.

- **Features**
  - Detection from nearly 0 rpm to 360 rpm
  - Compact and easy-to-use type optical detector
  - A unified structure of light source, receiver and amplifier (weight: approx. 150g)
  - Light emitting diode is used for light emitting element
  - Easy positioning (visible light and operation indicator lighting function)

- **Specifications**
  - Detection method: visible light photoelectric reflection method
  - Detecting distance: recommended distance 20 to 40 mm (when using a dedicated reflective mark 12 mm square)
  - Maximum response speed: 40 mm (converted to circumferential speed of rotating shaft)
  - Response delay time: 0.6 ms (light receiver conversion time) or less
  - Light source: light emitting diode (red visible light)
  - Light receiving element: phototransistor
  - Power requirement: 12 ±2 VDC
  - Current consumption: 50 mA or less (at 12 V)
  - Output waveform: rectangular wave; Hi: + 5±0.5 V, Lo: 0.5 V or less (on condition that a load resistance is 100 kΩ at least.)
  - Output impedance: 1 kΩ or less
  - Output range: 0 to 10 V
  - Operating temperature: -10 to 60 °C
  - Storage temperature: -20 to 80 °C
  - Conforming standard: compliant with CE marking

- **Measurement range of the LG-9200**

<table>
<thead>
<tr>
<th>Distance from a shaft center L (mm)</th>
<th>Rotation speed (r/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12×12 mm 1 piece</td>
<td>150 rpm</td>
</tr>
</tbody>
</table>

**Compact model designed for the long-distance detection of visible light**

The LG-930 is a compact reflective type photoelectric rotation detector that can be positioned up to 200 mm away from the target object.

- **Features**
  - Can be positioned at a distance of up to 200 mm away from the measurement object.
  - The compact design enables it to be mounted in small spaces. Moreover, an L-shaped mounting fixture is provided.
  - Visible light is used for easy positioning, and the built-in operating indicator light enables easy setup.
  - The pulse lighting method ensures that the LG-930 is virtually unaffected by ambient light.

- **Specifications**
  - Detection method: visible light photoelectric reflection method
  - Detecting distance: 70 to 200 mm (when using dedicated reflective mark of 12mm square)
  - Object detected: reflective mark
  - Maximum response speed: 25 m/s (when using the dedicated 12-mm-square reflective mark, affixed interval 48 mm)
  - Response delay time: 0.5 ms (light receiver conversion time) or less
  - Light source: light emitting diode (red visible light)
  - Light receiving element: phototransistor
  - Power requirement: 12 ±2 VDC
  - Current consumption: 50 mA or less (at 12 V)
  - Output waveform: rectangular wave; Hi: + 5±0.5 V, Lo: 0.5 V or less (on condition that a load resistance is at 100 kΩ at least.)
  - Output impedance: 1 kΩ or less
  - Output range: 0 to 10 V
  - Operating temperature range: -10 to 60 °C
  - Storage temperature: -20 to 80 °C
  - Conforming standard: compliant with CE marking

<table>
<thead>
<tr>
<th>Distance from a shaft center L (mm)</th>
<th>Rotation speed (r/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40mm</td>
<td>500 rpm</td>
</tr>
<tr>
<td>80mm</td>
<td>750 rpm</td>
</tr>
<tr>
<td>100mm</td>
<td>1000 rpm</td>
</tr>
<tr>
<td>150mm</td>
<td>1500 rpm</td>
</tr>
<tr>
<td>200mm</td>
<td>2000 rpm</td>
</tr>
</tbody>
</table>

**Optical Fiber Rotation Detector**

**FS-540/542/S5000, FG-1300**

Used with the combination of optical fiber with an optical multimeter, can be detected up to 69 mm away from the target.

- **Features**
  - 10 kHz of maximum response frequency. Supports detection of high-speed rotation
  - Red visible light adopted, easy to detect an object that is difficult to adjust optical axis position, such as a thin shaft
  - Detection with high sensitivity to be able to detect even minimal changes in light amount and measures without reflective mark. (Unequal interval pulse which may be generated in detection without reflective mark can be divided into 1 pulse.)
  - Selectable gain/trigger level adjustment depending on a use application; manual adjustment using volume control button or auto adjustment using auto trigger.
  - Provides two measurement distance settings; normal range or adjacent range. Detectable from adjacency to 69 mm max.

- **Specifications**
  - Detection type: detects amount of red visible light reflected
  - Light source: red visible light LED
  - Output level: 0.5 V or less
  - Output voltage range: 0 to 10 V
  - Load resistance: 10 kΩ or more (analogue, pulse)
  - Frequency: 10 kHz
  - Output signal: analogue, detected reflected light and output signal waveform in proportion to the light amount.
  - Operating temperature range: -10 to 60 °C

- **Measurement range of the FS-540to5500**

<table>
<thead>
<tr>
<th>Distance from a shaft center L (mm)</th>
<th>Rotation speed (r/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40mm</td>
<td>500 rpm</td>
</tr>
<tr>
<td>80mm</td>
<td>750 rpm</td>
</tr>
<tr>
<td>100mm</td>
<td>1000 rpm</td>
</tr>
<tr>
<td>150mm</td>
<td>1500 rpm</td>
</tr>
<tr>
<td>200mm</td>
<td>2000 rpm</td>
</tr>
</tbody>
</table>

**Photoelectric Rotation Detector**

**FS-540/542**

- **Features**
  - Rotation measurement using photoelectric type non-contact rotation detector
  - Affix a dedicated 12 mm square reflective mark to the shaft of the motor etc. and measure the rotation speed without contact by an optical fiber sensor. You can measure the target from a distance 250 mm max. Measurement distance from a detector to reflective marks: 70 to 200 mm.

- **Application**

**Measurement of motor, fan, engine**

- **Rotation Measurement**
  - Rotation target
  - TM-310 series tachometer
  - FG-1300 Fiber optic sensor amplifier
  - Optical fiber sensor
  - Optical fiber sensor
  - CF series FFT analyzer
  - CS series Data station

*For more details of FS-540/542/S5000, FG-1300, please refer to the Product Brochure page of our website."
**Application**

- **Presence or absence detection of small parts**
  - FS-5502 can project to a small part at a pinpoint with a 2 mm of light emission. Presence or absence of a small part flowing on a production line can easily be detected by measuring reflected light amount and judging the level of it by the threshold function.

- **Product inspection of motors**
  - FS-5500
  - FG-1300
  - Red LED light

- **Non-contact measurement of rotation speed on small rotating shaft of 5 mm diameter**
  - If there is unevenness on the rotating shaft or a black line, a periodic change occurs in the amount of reflected light of the optical fiber detector. Based on this periodic change, the rotation speed of the shaft is measured.
  - Suitable diameter of rotating shaft: 5 mm or more
  - Detection distance: approx. 2 to 50 mm
  - OK, LOWER, UPPER judgment on the production line available (comparator output from the FV-1500)

- **Presence or absence of a small part flowing on a production line**
  - Can easily be detected by measuring reflected light amount and judging the level of it by the threshold function.

**Features**

- **Economic type designed for OEM needs**
- ø 38 outer diameter; ultra-compact, light weight model weighing only 100 g
- 2-phase square wave + zero mark signal output
- Choice from 13 pulse output types

**Specifications**

- **Number of output pulses:** 40, 50, 60, 100, 200, 250, 300, 360, 400, 500, 600, 800, 900 P/R
- **Output waveform:** 2-phase square waveform + zero mark
- **Output voltage:** HI: Power supply voltage -20 % or more
- **Output method:** Collector
- **Adjacent error:** ±1/15 P
- **Power requirement:** 5 to 12 VDC ± 10 %, 50 mA
- **Response frequency:** 100 kHz
- **Connection method:** directly attached cable (1 m)
- **Maximum rotation speed:** 6000 r/min
- **Allowable shaft load:** radial: 25 N, thrust: 15 N
- **Starting torque:** 2mN·m
- **Moment of inertia:** 6g·cm²
- **Operating temperature:** -10 to 70 °C
- **Storage temperature:** -20 to 80 °C
- **Withstand humidity:** 90 % (with no condensation)
- **Protection class:** IP 40
- **Vibration resistance:** 98 m/s² (for 2 hours each in 3 directions)
- **Shock resistance:** 980 m/s² (for 3 times each in 3 directions, shaft: 98 m/s²)
- **Weight:** approx. 0.1 kg

*We have extensive variety of rotary encoders. Detailed brochures are prepared separately, so please visit our website.*
### TM-3110 Display only

- **Features**
  - With BCD output of 6-digit display
  - General-purpose

- **Input**
  - Output terminal: M3, free terminal screw
  - Input impedance: 10 kΩ or more
  - Input format: Voltage or non-voltage
  - Input amplification: AC or DC

- **Common specifications**
  - Output signal: BCD output
  - Output from: Comparator output
  - Output gain: ±100 mV (max. ±50 mA)
  - Output logic: Positive logic
  - Data refresh time: 100 ms or less

- **Features**
  - Improved update time (10 ms) by using DC amplifier
  - Output pulse can be switched between open collector output and direct connection with a PLC

- **Specifications**
  - Normal mode: continually outputs the print command every approx. 100 ms.
  - Request mode: Data is output for each request pulse.

- **Input**
  - Output pulse can be switched between voltage and current.
  - Improves update time (10 ms) by using D/A conversion method.

- **Specifications**
  - Output: Voltage or current selectable
  - Output method: 12-bit D/A conversion
  - Resolution decreases depending on the set value.
  - Output voltage: Selected from 0 to 10 V, 0 to 5 V ± 1 V

### TM-3120 BCD output

- **Features**
  - With BCD output of 6-digit display
  - Open collector output for direct connection with a PLC
  - Output mode is selectable from normal or request.
  - Output can be optionally changed to voltage output.

- **Specifications**
  - Mode:
    - Normal: continuously outputs the print command every approx. 100 ms.
    - Request: Data is output for each request pulse.
  - Output voltage:
    - M3: 10 V ± 10%, 12 V ± 10%
    - M2: 5 V ± 10%, 6 V ± 10%

### TM-3130 Analog output

- **Features**
  - Output pulse can be switched between voltage and current.
  - Improves update time (10 ms) by using D/A conversion method.

- **Specifications**
  - Output: Voltage or current selectable
  - Output method: 12-bit D/A conversion
  - Resolution decreases depending on the set value.
  - Output voltage: Selected from 0 to 10 V, 0 to 5 V ± 1 V

### TM-3140 Comparator output

- **Features**
  - 6-bit numeric input
  - Upper LOpper: 6-digit numeric input
  - Lower LOpper: 6-digit numeric input
  - OK: Comparator output
  - ERROR: Comparator output
  - Error feedback: Comparator output
  - Command output: Comparator output
  - Either of UPPER, LOWER, OK, or ERROR can be set to 0 or 1.

- **Specifications**
  - Comparator hysteresis: 
    - Set hysteresis in judgment value at comparator return.
  - Holding mode: Even if the rotation speed returns to within the set range, it holds the state.
  - Shot output function: 
    - Holds comparator output for a certain time.
    - Off (shutting-off time), 10 to 2000 ms, set in increments of 10 ms.
  - COMP delay function: 
    - When the set value exceeds the setting time continuously for the set time or more, the comparator operates.
    - 0 to 5000 ms, set in increments of 5 ms.
  - Reset function: 
    - Reverts comparator hold mode.
  - Maximum contact capacity: 
    - 30 VDC/V, 250 VAC/1 A

### Option Board

- **Features**
  - Depends on the application, you can choose the suitable model from four types: display only type, BCD output type, analog output type, or comparator output type.
  - Various functions (common to all models):
    - Display in various units is available by coefficient setting.
    - Condition memory function
    - Sudden deceleration follow-up function enables to follow up and display even at the time of a sudden stop.
    - Calculation of the maximum value, minimum value, average value for each section
    - Moving average function
    - With auto zero function
    - Pulse output
    - World wide power supply (100 to 240 VAC)

### Specifications

- **Input**
  - Display unit:
    - Analog output: ± 5 %/F.S. or more
    - Signal voltage: ± 5 %/F.S. or more
    - Signal waveform: sine or square wave
    - Signal voltage: ± 5 %/F.S. or more
  - Input logic: negative logic (pulse width: 5 µs or more)
  - Operating edge: falling edge
  - Input voltage: ± 5 %/F.S.
  - Gate function:
    - Select from OFF (shipping time), 2, 4, 8, 16, 32, 64, 128, 256 (in 1/2 step).

- **Output**
  - Output current range:
    - selectable from 4 to 20 mA, 0 to 16 mA
  - Load resistance:
    - 100 kΩ or more
  - Output current:
    - 500mA or less
  - Linearly:
    - ± 0.3 %/F.S.
  - Analog output adjustment:
    - Voltage output: ± 5 %/F.S. or more
    - Current output: ± 5 %/F.S. or more
  - Zero drift:
    - ± 0.05 %/F.S./°C
  - Spin drift:
    - ± 0.05 %/F.S./°C
  - Output refresh time:
    - selectable from following:
      - 10, 20, 50, 100, 200, 300 ms, 1 s

- **Character height:** 10 mm

- **Number of decimal places to display:**
  - Select from OFF (none), 1, 2nd, 3rd

- **Error display:**
  - Flashes synchronously with the input pulse.
  - Backup memory error, board error, input frequency error, display digit number error, memory full error, stopping value error (10%, 5%, 1%, 0.5%, 0.25%, 0.1%, 0.05%, 0.025%, 0.01%, 0.005%, 0.0025%, 0.001%)

- **Calculation display:**
  - Reduces the count value by 1 when there is no pulse input during the set time.
  - Select from OFF (11 s), 5.5 s, 3 s, 1.5 s, 1 s, 0.5 s, 0.25 s, 0.1 s, 0.05 s.

- **Auto zero function:**
  - This function sets the displayed value to 0 if there is no pulse input during the set time.

### General Specifications

- **Rated power:**
  - ± 500 VAC (1 mA)

- **General specifications**
  - Input voltage: 12 VDC ± 10%
  - Maximum current output: 100 mA
  - Operating temperature: 0 to 50 ºC
  - Storage temperature: -10 to 60 ºC
  - Operating humidity: 30 to 85% RH (with no condensation)
  - Storage humidity: 30 to 80% RH (with no condensation)
  - Operating temperature: 0 to 50 ºC
  - Storage temperature: -10 to 60 ºC
  - Insulation resistance: 10 MΩ or more (at 500 VDC)
  - Storage humidity: 30 to 85% RH (with no condensation)
  - Storage temperature: -10 to 60 ºC
  - Operating temperature: 0 to 50 ºC
  - Storage temperature: -10 to 60 ºC
  - Operating humidity: 30 to 85% RH (with no condensation)

### CE marking

- Low voltage Directive EN61010-1:2001 (2nd)
- Overvoltage category II
- Pollution degree 2

### Option Board

- TM-3031: DC power supply card
- TM-3032: BCD output card, voltage output
- TM-3033: BCD output card, open collector output
- TM-3030: Analog output card
- TM-3040: Comparator output card
- TM-3050: RS-232C card

### Additional Information

- Installation of optional boards after ordering a main body requires separate fee.
- Please contact your nearest distributor or Cho Sokil sales office nearby.
**Features**

- **Rotation measurement over a wide range from low to high speed (input frequency: 0.6 mHz to 100 kHz)**
- **Two sensors are used to display the rotation direction with phase difference pulse input**
- **Converts to arbitrary physical amount that is proportional to rotation speed by each channel independent coefficient correction function**
- **Built-in comparator function of upper and lower range in two stages**
- **2ch calculation function displays rotation speed difference/rotation speed ratio/rolling reduction/draw/rotation change rate/direction of rotation**
- **BCD, analog comparator, RS-232C are provided as standard for output function**
- **Easy-to-install DIN standard size (144 x 72 mm)**
- **Two Displays: a main display section that indicates coefficient value and a sub display (2 steps) that indicates set items (comparator setting value/coeficient value/2ch measurement values).**

**Applications**

- **Measurement of the rotation speed of the shaft to display, output the measurement result to the printer or sequencer, also output to the comparator.**

The rotation speed of a motor shaft is measured by gears, and the rotation speed of the shaft is calculated by the TM-310 digital tachometer. Adding an option expands the range of input devices to BCD output function (TM-0321, TM-0322). Printing, loading to the PLC, Comparator function (PM-0340): Alarm can also be set.

**Rear side panel connector terminal screw: M3**

**Outer dimensions TM-3100 series**

**Digital Tachometer TM-5100**

- **Multifunction Digital Tachometer**

**Specifications**

- **Applicable detector**: PM series electromagnetic type / magneto electric type rotation detector, LG series photoelectric type rotation detector, RP series rotary encoder, roller encoder etc.
- **Number of input ch**: 2
- **Input amplifier type**: AC/DC (switching type)
- **Measurement method**: Periodic calculation method, gate calculation method (switching type)
- **Measurement time**: 0.2 s ± 1 period time (by periodic calculation method)
- **Coefficient setting range**: 0.001 to 99.999
- **2ch calculation function**: difference <B-A>, ratio <(B/A) x 100>
- **Change rate <(B-A)/A x 100>**
- **Main display section**:
  - **Display character number**: 16 characters × 2 steps
  - **Panel cut dimensions**: 144 (more width)
  - **Signal input section**: display character number — 16 characters × 2 steps
  - **Input impedance**: 10 kΩ or more (capacitor leakage, 100 kHz)
  - **Signal voltage range**: sine wave/cube wave square wave
  - **Square wave**: 0.6 to 63 Vp-p
  - **Square wave**: sine wave: 0.2 to + 45 Vrms
  - **Square wave**: square wave: 0.6 to 63 Vp-p
- **DC amplification section**: signal waveform··· sine wave or square wave
- **Signal voltage range**: ± 10 V
- **Analog output**: conversion methods··· 12 bit, D/A method
- **Output format··· semiconductor relay makeup
  - **Number of setting stages**: 2
- **Setting range**: 0 ± 9999
- **Setting range**: 0 to ± 9999
- **Baud rate··· 2400, 4800, 9600 bps**
- **Supply power for sensor**: 5 VDC ± 0.25 V (max 150 mA) with the total value of A ch and B ch
- **Power supply voltage**: 100 to 240 VAC (50/60 Hz)
- **Power consumption**: 45 VA or less
- **Input amplifier type**: AC/DC (switching type)
- **Number of input ch**: 2
- **Input impedance**: 10 kΩ or more (at 100 kHz)
- **Output impedance**: 10 kΩ or more (at 100 kHz)
- **Input frequency**: 0.0006 Hz to 100 kHz
- **Signal voltage range**: Hi; 4 to 30 V
- **Output format··· RS-232C, open collector
  - **Number of setting stages**: 2
- **Setting range**: 0 ± 9999
- **Signal frequency range**: ± 10 V
- **Signal voltage range**: Hi; 4 to 30 V
- **Output format··· semiconductor relay makeup
  - **Number of setting stages**: 2
- **Setting range**: 0 ± 9999
- **Signal voltage range**: ± 10 V
- **Output format··· semiconductor relay makeup
  - **Number of setting stages**: 2
- **Setting range**: 0 ± 9999
- **Signal voltage range**: ± 10 V
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- **Output format··· semiconductor relay makeup
  - **Number of setting stages**: 2
- **Setting range**: 0 ± 9999
- **Signal voltage range**: ± 10 V
- **Output format··· semiconductor relay makeup
  - **Number of setting stages**: 2
- **Setting range**: 0 ± 9999
- **Signal voltage range**: ± 10 V
FFT Tachometer FT-2500
Advanced Tachometer

The FT-2500 is a tachometer that performs frequency analysis by FFT calculation processing and measures rotation speed. Even when the rotating shaft is not accessible, it can measure from sound, vibration, etc. and supports various types of rotating objects such as steady rotation of a motor, acceleration / deceleration rotation of an engine.

**Features**
- No need for reflective mark and special machining to install a detector
- Enables rotation measurement using sound and vibration easily. Machining of the rotating shaft is not required.
- Supports rotation speed change and acceleration/deceleration. (when selecting rotation acceleration/deceleration measurement mode)
- Rotation direction judgment function (FT-0501)
- Easy-to-read indication by fluorescent display tube
- With analog output, pulse output

**Specifications**

**Input section**
Applicable sensors: FT-0501/0801, VP-202/1220, OM-1200/1500, Current LIne Drive sensors, Microphones, accelerometers and so on.

**Measurement section**
- Steady rotation measurement mode
  - Frequency range: 500 Hz, 2 kHz, 10 kHz
  - Rotation speed resolution: frequency range (Hz) ÷ 12800 × 60 ÷ pulse count
- Rotation acceleration/deceleration measurement mode
  - Frequency range: 250 Hz, 500 Hz, 2 kHz
  - Rotation speed resolution: frequency range (Hz) ÷ 6400 × 60 ÷ pulse count

**Output section**
- Analog output
  - Output update time: constant; 500 ms or less (steady rotation measurement mode)
  - Output update time: constant; 250 ms or less (rotation acceleration/deceleration mode)
- Sensor signal monitoring output
  - Signal content: pulse of frequency corresponding to the frequency range of the detection sensor signal output for monitoring
  - Comparator output: judgment of upper/lower limit, rotation acceleration/deceleration measurement mode

**Power requirement**
- FT-0501: 24 VAC (50/60 Hz)
- FT-0801: 12 and 24 VDC

**Application**
- Example of engine rotation speed measurement using a tachometer
Connect by power output installed in an automobile or a construction machine. This is a device for detecting the voltage output from the power output and measuring the rotation speed of the engine. The rotation speed of the engine can be calculated by the FT-2500 which is compatible with battery 12 and 24 VDC.

**Measurement example of rotation speed of DC motor incorporated in home electric appliances**
- In this application, we measure the rotation speed of the DC motor incorporated in home electric appliances. The FT-2500 measures the rotation speed by detecting the magnetic flux leakage from the DC motor incorporated in the toothbrush.

*Please contact us for more detailed information.*
Handheld Tachometer

**FT-7200**

**Advanced Handheld Tachometer**

The FT-7200 is a handy type tachometer that performs frequency analysis by FFT calculation processing and measures rotation speed. Can measure a wide range from steady motor rotation to acceleration/deceleration of engine rotation.

### Display section
- **LCD display**: 5 digits, LCD 7 segments, with backlight.
- **Display update time**: 0.1 to 1 s (F. S. is arbitrarily set.).
- **Display resolution**: ±0.02 % (F. S.).

### Measurement mode
- **Measurement object**: DC motor, compressor, engine or general rotating body.

### Calculation method
- **FFT calculation method**

### Measurement section
- **Measurement object**: DC motor, compressor, engine or general rotating body.
- **Rotation speed (Hz)**: 6000 Hz (2 kHz). Equivalent to display resolution.
- **Load resistance**: 100 kΩ or more.
- **Output update time**: 0.01 to 0.1 s.
- **Output section**: ANALOG output
  - **Output voltage**: Hi level···4.5 V or more (when detecting waveform)
  - **Output update time**: 0.01 to 0.1 s.
- **Output content**: Analog output for monitoring after waveform shaping of sensor pulse.
- **Output resistance**: 100 kΩ or more.
- **Output connector**: Mini jack (2.5 mm, commonly used with ANALOG output).

### Specifications
- **General specification**
  - **Power supply**: AAA battery × 4 or dedicated AC adapter (PB-7090; sold separately).
  - **Battery life**: approx. 32 hours (when the backlight is OFF), approx. 8 hours (when the backlight is ON).
  - **Low battery display**: When the battery voltage becomes approx. 4.5 V or less, a LOW MARK is displayed.

### Accessories
- **Accessory**
  - **Contact adapter (HT-0502)**
  - **Contact contact tip (KS-300)**
  - **Non-contact type (KS-300)**

### Measurement range
- **Measurement range**: Non-contact type: 0.000 to 99999 r/min, Contact type: 66 to 99999 r/min.

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**Handheld Tachometer**

**FT-5500**

**Handheld Digital Tachometer**

**HT-5500**

**Contact/non-contact type - multifunction type**

**Extensive measurement from 6.0 r/min (low speed rotation) to 99999 r/min (high speed rotation).**

**Rotation upper limit warning function**: When the rotation speed exceeds a preset upper limit value, upper limit warning (1 mark) is displayed.

**Circumferential speed calculation function**: When the rotation speed exceeds a preset value, a circumferential speed that is calculated with the preset diameter (mm) and the measured rotation speed, [contact type] circumferential speed is displayed.

**Integration count function**: Performs integration pulse counting of output signal.

**Rotation speed measurement function**: Measures the period of input pulse (low pulse) and displays average value of input pulse if it is 1 second or more.

### Output section
- **Output voltage**: 0 to 1 V to 0 to F.S. (Full scale is arbitrarily set.)
- **Linearity**: ±0.1 F.S.
- **Output update time**: 0.01 to 0.1 s.
- **Temperature stability**: ±0.05 % F.S. / °C (SNP & zero).
- **Load resistance**: 100 kΩ or more.
- **Output section (pulse output)**: LED indicator (HI level), with backlight.

### General specifications
- **Power**: AAA battery × 4 or dedicated AC adapter.
  - **Battery life**: approx. 32 hours (when the backlight is OFF), approx. 8 hours (when the backlight is ON).
  - **Low battery display**: When the battery voltage becomes approx. 4.5 V or less, a LOW MARK is displayed.

### Accessories
- **Accessory**
  - **Contact adapter (HT-0502)**
  - **Contact contact tip (KS-300)**
  - **Non-contact type (KS-300)**

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**Measurement accuracy**

- **Measurement accuracy**: Display value × (0.002 %) ± 1 count
- **Measurement range**: 66 to 99999 r/min.

**Continuous measurement function**

- **Detection method**: continuous measurement.

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**Features**

- Enables navigation measurement easily using sound and vibration.
- Machining of the rotating shaft is not required.
- Supports rotation speed change and acceleration/deceleration.
- Efficient for measuring engine rotation speed of completed vehicles etc.
- Various sensors can be used.
- Both analog and pulse outputs provided as standard. Used for recording rotation speed and as rotation synchronization signals.
- Large LCD with backlight.
- With averaging processing function.

**Specifications**

- **Measurement section**
  - **Measurement object**: DC motor, compressor, engine or general rotating body.
  - **Rotation speed (Hz)**: 6000 Hz (2 kHz). Equivalent to display resolution.
  - **Load resistance**: 100 kΩ or more.
  - **Output update time**: 0.01 to 0.1 s.

- **Output section**
  - **Output voltage**: Hi level···4.5 V or more (when detecting waveform)
  - **Output update time**: 0.01 to 0.1 s.
  - **Output content**: Analog output for monitoring after waveform shaping of sensor pulse.
  - **Output resistance**: 100 kΩ or more.
  - **Output connector**: Mini jack (2.5 mm, commonly used with ANALOG output).

- **General specification**
  - **Power supply**: AAA battery × 4 or dedicated AC adapter (PB-7090; sold separately).
  - **Battery life**: approx. 32 hours (when the backlight is OFF), approx. 8 hours (when the backlight is ON).
  - **Low battery display**: When the battery voltage becomes approx. 4.5 V or less, a LOW MARK is displayed.

- **Accessories**
  - **Accessory**
    - **Contact adapter (HT-0502)**
    - **Contact contact tip (KS-300)**
    - **Non-contact type (KS-300)**

- **Measurement accuracy**
  - **Measurement accuracy**: Display value × (0.002 %) ± 1 count
  - **Measurement range**: 66 to 99999 r/min.

**Continuous measurement function**

- **Detection method**: continuous measurement.

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**Features**

- Enables navigation measurement easily using sound and vibration.
- Machining of the rotating shaft is not required.
- Supports rotation speed change and acceleration/deceleration.
- Efficient for measuring engine rotation speed of completed vehicles etc.
- Various sensors can be used.
- Both analog and pulse outputs provided as standard. Used for recording rotation speed and as rotation synchronization signals.
- Large LCD with backlight.
- With averaging processing function.
Handheld Tachometer
HT-3200/4200/5510, HR-6800

Handheld Digital Tachometer
HT-5510, HR-6800

**Handheld Tachometer HT-3200**
Contact type / general purpose liquid crystal display

With a low range setting that can measure from 0.5 min./r to 10,000 min./r (maximum speed: 1,000 r/min). It is a min./r tachometer and a tachometer with a wide range of lenses.

**Features**
- Measurable from a low speed of 0.5 min./r to 10,000 min./r (maximum speed: 1,000 r/min).
- Large liquid crystal display on a compact, lightweight body (character height 10.5 mm).
- With memory function useful for-checking measurement results.

**Specifications**
- **Measurement range:** 0.5 min./r to 10,000 min./r
- **Accuracy:** ±4 min./r
- **Operating temperature:** -10 to 40°C
- **Storage temperature:** -10 to 50°C
- **Display:** 5 digits (character height 10.5 mm), fixed measurement unit (min./r)
- **Battery:** 1 piece (AAA), 3.0V disposable battery
- **Weight:** approx. 150 g

**Handheld Tachometer HT-4200**
Non-contact type/general purpose liquid crystal display

Affix a reflective mark to the rotating body of the measurement target object, and then aim the red visible light at the mark. By attaching multiple reflective marks, it is possible to measure from a low speed.

**Features**
- **Measurement range:** 5 to 10,000 min./r (maximum speed: 10,000 r/min).
- **Accuracy:** ±4 min./r
- **Operating temperature:** -10 to 40°C
- **Storage temperature:** -10 to 50°C
- **Battery:** 1 piece (AAA), 3.0V disposable battery
- **Weight:** approx. 160 g

**Specifications**
- **Measurement range:** 5 to 10,000 min./r
- **Accuracy:** ±4 min./r
- **Battery:** 1 piece (AAA), 3.0V disposable battery
- **Weight:** approx. 160 g

**Handheld Digital Tachometer HT-5510**
Digital handheld tachometer

**Features**
- The HT-5510 is the model added two functions (opening and closing speed measurement and door opening and closing time measurement) to the HT-5500 handheld digital tachometer.
- Over range display: (ERROR mark) is displayed.
- Over range function: Over range (ERROR mark) is displayed when the measured value exceeds the measurement range.

**Specifications**
- **Measurement range:** 100 to 999,990 r/min
- **Accuracy:** ±10 r/min
- **Battery:** 4 pieces (AAA), 1.5V disposable battery
- **Weight:** approx. 50 g

**Handheld Tachometer HT-6800**
High rotation speed measurement model

**Features**
- High rotation speed measurement from 100 to 999,990 r/min
- Built-in memory function, up to a maximum of 20 rotation values can be saved to memory.
- Built-in data output, up to a maximum of 20 rotation values can be output.
- Analog output: voltage: 0 to 1 V/0 to 5 V/0 to 10 V, current: 4 to 20 mA
- Power supply: 4 to 6.250 r/min 8 to 12,500 r/min 4 to 6,250 r/min 8 to 12,500 r/min

**Specifications**
- **Measurement range:** 100 to 999,990 r/min
- **Accuracy:** ±10 r/min
- **Battery:** 4 pieces (AAA), 1.5V disposable battery
- **Weight:** approx. 50 g

*Please refer to HT-5500 for additional specifications of analog output.*
**Features**
- Number of pulse selectable from 120, 250, or 500 P/R
- Wide variety of output signal
  - Torque pole (standard), Collector (option)
- **Specifications**
  - **Electrical specification**
    - **Number of output**: 120, 250, 500 P/R
    - **Pulse waveform**: 2-phase rectangular wave
    - **Phase difference**: 90 ± 45°
    - **Output voltage**: 10 V (max), 5 V or less
    - **Output method**: Torque pole output (load resistance 470 Ω or more)
  - **Mechanical specification**
    - **Speed range**: 0 to 600 m/min
    - **Input frequency range**: DC to 100 kHz
    - **Roller material**: Polyurethane rubber baked on the roller surface (0.6 mm)
    - **Roller diameter**: 200 mm, 150 mm
    - **Maximum loadable load**: 200 N

**Specifications**
- **Power supply**: 120/240 V, 50 Hz, 250 V, 60 Hz
- **Power consumption**: 30 VA or less
- **Operating temperature**: 0 to +40 °C
- **Storage temperature**: -10 to +65 °C
- **Operating/storage humidity**: max. 95 % (with no condensation)
- **Weight**: approx. 0.4 kg
- **Accessory**: Instruction manual x 1 piece, Connector (RM12BPE-5S) x 1, Instruction manual x 1 piece, EC-0925 carrying case x 1 piece

*Please visit our website for more details on RP-7400.*
**F/V Converter**

**FV-1100**

**Frequency-to-Voltage/Frequency-to-Current Converter**

**General-purpose type**

**Specifications**

- **Conversion method**: Constant width pulse integration method
- **Frequency range**: 10 kHz (optionally available of specifying other frequency)
- **Response**: 30 ms (Varies according to the frequency optionally specified.)
- **Input frequency range**: 10 kHz (Frequency in the range from 100 Hz to 100 kHz can be specified as an option.)
- **Input terminal**: BNC (C02), terminal block (3.5 M)
- **Input voltage**: AC input: sine wave 0.2 to 50 Vrms DC input: rectangular wave: Hi +4 to +30 V Lo -1 to +1 V
  - Pulse width: 3 μs or more
- **Input impedance**: 80 kΩ or more (20 kHz), 30 kΩ (100 kHz)
- **Output terminal**: terminal block (3.5 M)
- **Output voltage**: 0 to 10 V, load resistance 1 kΩ or more
  - (To 5 V 0 to 1 V 0 to 0.1 V: available as an option)
- **Output current**: 4 to 20 mA, load resistance 500 Ω or less (setting also available in the range from 0 to 16 mA)
- **Linearity**: within ±0.2 % of the maximum rated value
- **Ripple**: 0.1 % of the maximum rated value or 10 mV or less
  - (When the frequency input is 5 % of the frequency range.)
- **Detector power supply**: 12 VDC ±10 % 100 mA
- **Power requirement**: within AC 65 to AC 110 V, 46 to 63 Hz
  - (110/120/200/240 VAC on request)
- **Operating temperature range**: 0 to +40 °C
- **Weight**: approx. 2 kg
- **Power consumption**: for 100 VAC (AX-2050N, 3m) x 1
- **Accessory**: flat-bladed screwdriver x 1 panel mounting fixture x 1 instruction manual x 1

**Features**

- Withstand voltage: 2000 VAC 1 minute (chassis, primary power supply)
- Equipped power supply for detector as standard (12 VDC, 100mA).
- AC/DC input signal selectable.
- Frequency range can be optionally specified from 100 Hz to 100 kHz. (standard: 10 kHz) (Fixed to the specified frequency. The setting cannot be changed.)
- Data output as current and voltage signals can be recorded to a pen recorder, and displayed to other indicators, etc.
- Compact monofunction type. Simple to use for smoothing the input frequency and indicating the average behavior or variation.

**Specifications**

- **Input format**: single-phase, AC/DC/DC/AC/DC
- **Filter**: OFF / 20 kHz / 120 kHz low-pass filter
- **D/A resolution**: 16-bit
- **Display**: fluorescent display tube
  - (display range 69.85 mm x 11.45 mm)
- **Display unit**: Hz, r/min, m/min, USER
- **Power requirement for sensor**: 12 VDC ±10 %, 150 mA / 5 VDC ±10 % 150 mA
- **Storage temperature**: -10 to 50 °C
- **Storage humidity**: 5 to 85 % RH (with no condensation)
- **Weight**: approx. 1 kg
- **Accessory**: dedicated adapter (AC adapter PS-P20023A cable: VM1072-VM1700 2m) x 1, instruction manual x 1, connector (MC1.5/6-STF-3.81) × 1 (equipped with the main body)


**Option**

- **FV-0161** (Automatic center frequency follow-up function)
- **FV-0152** (Comparator output function)
- **FV-0153** (Deviation scale change function)
- **FV-0154** (Open collector output function)
- **FV-0214** (Panel mounting fixture)
**Features**

- Used as an amplifier for electromagnetic detectors under electrically bad environment.
- Converts the input signal into a high-voltage low-impedance signal to transmit the signal to remote locations accurately.
- 12 VDC power terminal for use with various sensors.
- Terminal block allowing easy wiring, sealed structure, a take-off vent for various plumbing and cabling methods.
- Isolated shielded type to allow installation on site. Noise-resistant.

**Specifications**

<table>
<thead>
<tr>
<th>Input Amplification</th>
<th>AC amplification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input impedance</td>
<td>differential input: approx. 70 kΩ (50 kHz)</td>
</tr>
<tr>
<td></td>
<td>single-ended input: approx. 45 kΩ (5 kHz)</td>
</tr>
<tr>
<td>Input waveform</td>
<td>sine wave or rectangular wave (with a duty of approx 1:1)</td>
</tr>
<tr>
<td>Input sensitivity</td>
<td>sine wave input: 0.1 Vrms</td>
</tr>
<tr>
<td></td>
<td>rectangular wave input: 0.3 Vp-p</td>
</tr>
<tr>
<td>Frequency range</td>
<td>1 Hz to 50 kHz</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>sine wave input: 0.1 to 30 Vrms</td>
</tr>
<tr>
<td></td>
<td>rectangular wave input: 0.3 to 30 Vp-p</td>
</tr>
<tr>
<td>Max. input apply voltage</td>
<td>sine wave: 100 Vrms, rectangular wave: 100 VDC</td>
</tr>
<tr>
<td>Output waveform</td>
<td>rectangular waveform</td>
</tr>
<tr>
<td>Voltage output</td>
<td>max. peak voltage (Vp-p): 12 ±1 V</td>
</tr>
<tr>
<td></td>
<td>max. bias voltage (Vbias): 0.5 V or less</td>
</tr>
<tr>
<td>Open collector output</td>
<td>impedance: approx. 330 Ω</td>
</tr>
<tr>
<td>Power source</td>
<td>12 VDC ± 5 %, 100 mA max.</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10 to 40 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 to 70 °C</td>
</tr>
<tr>
<td>Power requirement</td>
<td>100 VAC ± 10 %, 50/60 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 8 VA</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 4 kg</td>
</tr>
<tr>
<td>Accessory</td>
<td>crimp terminal x 11, fuse for 200/220V x 1, instruction manual x 1</td>
</tr>
<tr>
<td>Terminal block</td>
<td>applicable to JIS C 2805 2-4 crimp terminal</td>
</tr>
</tbody>
</table>

**Coupling Selection Guide**

Rigid coupling of the electromagnetic type rotation detector with a device is required condition for the accurate transmission to both rotation and angle. If it has mounting errors including differences in shaft core and allowance in thrust direction, all of them are received as elastic deformation of the bearing, and it will cause the decrease of accuracy or damage.

For stable and long use with rigid coupling, the shaft misalignment should be within 6/1000 m. When you cannot make shaft centering with that accuracy, it is necessary to use flexible coupling which can accept the differences in shaft center and the allowance in thrust direction.

There are various kinds of flexible couplings, such as one with high torsional rigidity, one suitable for general rotation speed measurement. It must be selected according to the application. Please perform the centering work as carefully as possible to prevent dynamic and static loads on the shaft beyond allowance.

**Recommended coupling shape/weight**

- **Rubber flex coupling**
  - FF-100 etc.
  - MP-10B MP-200
  - MP-70B MP-200

- **Center flex coupling**
  - CF-A-002-02
  - FF-100 etc.
  - MP-10B MP-200

**Coupling name**

- Recessed rubber impact elasticity
- Vibration damping
- Rotation speed
- Deviation
- Deflection angle

**Detaching method**

- Attach the flange to the detector and the machine side. If the dimensions specified in the centering rules, attach the rubber body and the machine side. If it has mounting errors including differences in shaft core and allowance in thrust direction, all of them are received as elastic deformation of the bearing, and it will cause the decrease of accuracy or damage.

**Remarks**

- At high speed, expansion of the rubber due to centrifugal power causes a thrust power and it damages the detector.
- For details of coupling, please contact each manufacturer.

**Related Products**

- Signal Amplifier PA-150
- Signal Amplifier PA-330Z

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*For details of coupling, please contact each manufacturer.*
Table of Signal Cable

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Compatible Detectors</th>
<th>Cable</th>
<th>Model Name</th>
<th>Specifications</th>
<th>Compatible Products</th>
<th>Non-compatible Products</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MP-5100/5120/5130/5150/5160</td>
<td>5100</td>
<td>MX-005 5m</td>
<td></td>
<td></td>
<td></td>
<td>Counter without a BNC input connector</td>
<td>Counter without a BNC input connector. However, if the input connector is connected to the terminal block's display unit, connection is enabled by using a cable combination (MX-005 series + MX-603.)</td>
</tr>
<tr>
<td>2</td>
<td>MP-8100/8200/8300</td>
<td>8200</td>
<td>MX-101 1.5m</td>
<td></td>
<td></td>
<td></td>
<td>Counter without a BNC input connector</td>
<td>Counter without a BNC input connector. However, if the input connector is connected to the terminal block's display unit, connection is enabled by using a cable combination (MX-005 series + MX-603.)</td>
</tr>
<tr>
<td>3</td>
<td>MX-000 series cables, MX-100 series cables</td>
<td>000</td>
<td>MX-603 0.3m (function cable)</td>
<td></td>
<td></td>
<td></td>
<td>Use only for connecting the compatible detectors at No.1 &amp; 2 when the input connector is the terminal block's display unit.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MP-9100/9120/9130/9150/9160</td>
<td>9120</td>
<td>MX-546 5m</td>
<td></td>
<td></td>
<td></td>
<td>Connection to counter</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MP-9110/9120/9130/9150/9160</td>
<td>9130</td>
<td>MX-7105 5m</td>
<td></td>
<td></td>
<td></td>
<td>Connection to counter</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MP-9110/9120/9130/9150/9160</td>
<td>9150</td>
<td>MX-8105 5m</td>
<td></td>
<td></td>
<td></td>
<td>Connection to counter</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>RP-1400 series</td>
<td>1400</td>
<td>TP-0181 5m</td>
<td></td>
<td></td>
<td></td>
<td>Counters without an input terminal block</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RP-1400 series</td>
<td>1400</td>
<td>TP-0182 5m</td>
<td></td>
<td></td>
<td></td>
<td>Counters without an input terminal block</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>TM-3100 series</td>
<td>5100</td>
<td>AX-000 1m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Made to order

** Related Products **

- **Signal Cables**
  - Counter with a BNC input connector
  - Counters without a BNC input connector
  - Counters without an input terminal block

** Example of using CO2 type (BNC)-JPJconnector:**

1. **When several counters are connected to one detector, you will find it convenient to use BNC-JPJ connector:**

   - Insert the CO2 type (BNC) plug into the detector's BNC input.
   - Connect the CO2 type (BNC) jack to the counter's BNC output.
   - Use only for connecting the compatible detectors at No.1 & 2 when the input connector is the terminal block's display unit.

2. **Compatibility:**

   - Counter: MX-005, MX-105
   - Detector: MX-000, MX-105