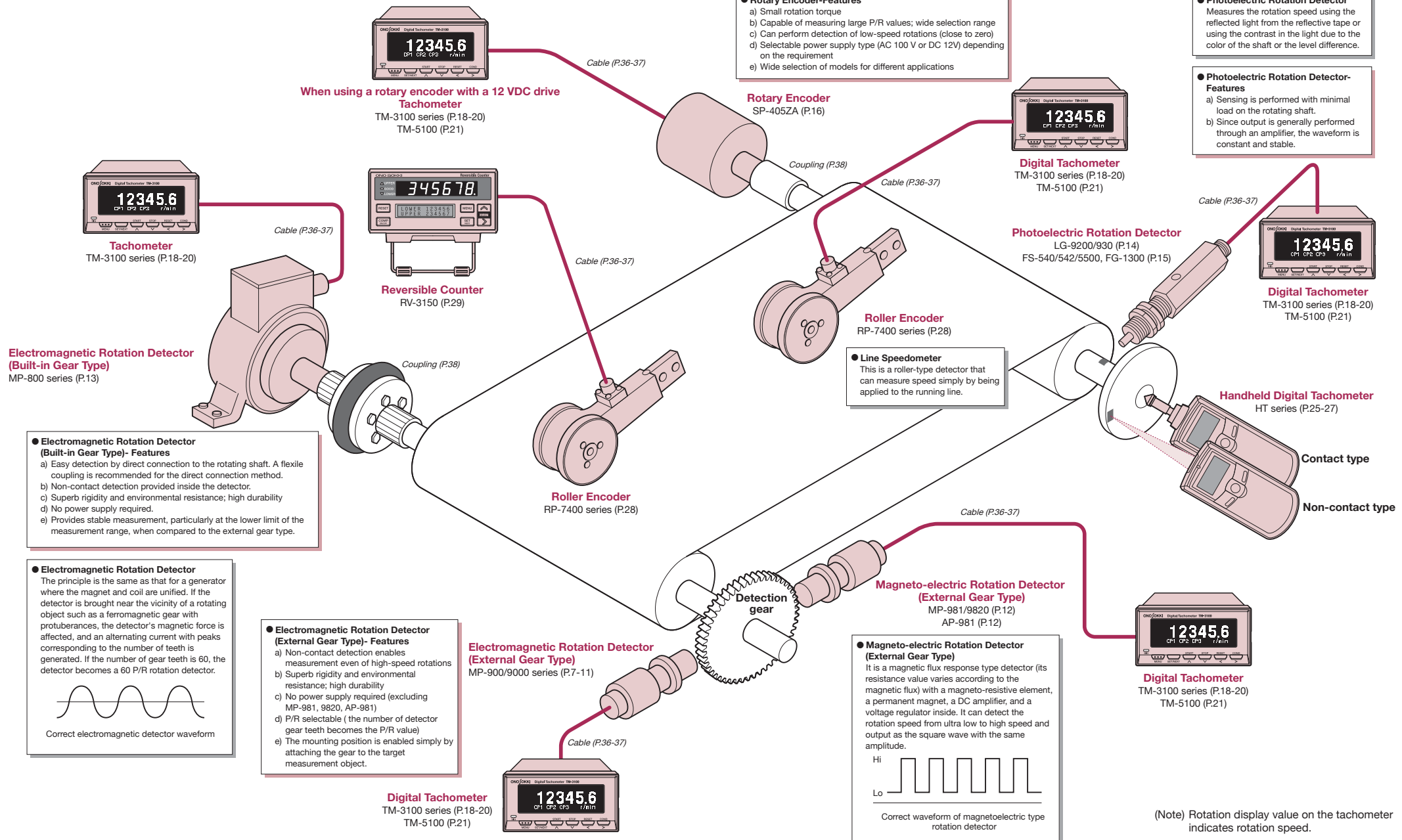
Diverse lineup that Ono Sokki is proud of. Choose the product that satisfies your need.

Rotation Detector Selection Guide



● **Rotary Encoder-Features**
a) Small rotation torque
b) Capable of measuring large P/R values; wide selection range
c) Can perform detection of low-speed rotations (close to zero)
d) Selectable power supply type (AC 100 V or DC 12V) depending on the requirement
e) Wide selection of models for different applications

● **Photoelectric Rotation Detector**
Measures the rotation speed using the reflected light from the reflective tape or using the contrast in the light due to the color of the shaft or the level difference.

● **Photoelectric Rotation Detector-Features**
a) Sensing is performed with minimal load on the rotating shaft.
b) Since output is generally performed through an amplifier, the waveform is constant and stable.

● **Line Speedometer**
This is a roller-type detector that can measure speed simply by being applied to the running line.

● **Electromagnetic Rotation Detector (Built-in Gear Type)- Features**
a) Easy detection by direct connection to the rotating shaft. A flexile coupling is recommended for the direct connection method.
b) Non-contact detection provided inside the detector.
c) Superb rigidity and environmental resistance; high durability
d) No power supply required.
e) Provides stable measurement, particularly at the lower limit of the measurement range, when compared to the external gear type.

● **Electromagnetic Rotation Detector**
The principle is the same as that for a generator where the magnet and coil are unified. If the detector is brought near the vicinity of a rotating object such as a ferromagnetic gear with protuberances, the detector's magnetic force is affected, and an alternating current with peaks corresponding to the number of teeth is generated. If the number of gear teeth is 60, the detector becomes a 60 P/R rotation detector.

Correct electromagnetic detector waveform

● **Electromagnetic Rotation Detector (External Gear Type)- Features**
a) Non-contact detection enables measurement even of high-speed rotations
b) Superb rigidity and environmental resistance; high durability
c) No power supply required (excluding MP-981, 9820, AP-981)
d) P/R selectable (the number of detector gear teeth becomes the P/R value)
e) The mounting position is enabled simply by attaching the gear to the target measurement object.

● **Magneto-electric Rotation Detector (External Gear Type)**
It is a magnetic flux response type detector (its resistance value varies according to the magnetic flux) with a magneto-resistive element, a permanent magnet, a DC amplifier, and a voltage regulator inside. It can detect the rotation speed from ultra low to high speed and output as the square wave with the same amplitude.

Correct waveform of magnetoelectric type rotation detector

(Note) Rotation display value on the tachometer indicates rotation speed.

Rotation Display Unit Selection Guide

	Appearance	Model No.	Output, Specifications, etc.	Power Requirement (Power Supply for the Detector)	Compatible Detectors	Page No.
For General-Purpose Model		TM-3110	Display only	100 to 240 VAC (12 VDC/100 mA)	MP series SP-405ZA LG series RP series	p. 18-20
		TM-3120	BCD output			
		TM-3130	Analog output			
		TM-3140	Comparator output			
Multifunction Model		TM-5100	BCD output Analog output Comparator output RS-232C 2-channel calculation	100 to 240 VAC (5 VDC/150 mA) (Total of A and B channels) (12 VDC /150 mA) (For each A and B channel)	MP series LG series RP series	p. 21
Advanced Model		FT-2500	Analog output Comparator output Pulse output RS-232C FFT calculation	100 to 240 VAC (12 VDC/100 mA)	FT-0501 (Rotation detector for DC motor) Sound/vibration sensors	p. 22- 23

Note1: Please refer to "Table of Signal Cable" on page 36 and 37 to select the suitable signal cable.

CONTENTS

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.
When measuring the rotation speed, if the gate time of the counter is 1 second, it can be read directly by the counter using the gear with 60 P/R.

●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 Z=number of teeth D=diameter of gear

$$M = \frac{D}{Z+2} \qquad \frac{N\ (r/min) \times Z\ (number\ of\ teeth)}{60\ (s)} = C\ (Hz) \qquad When\ Z=60,\ N=C$$

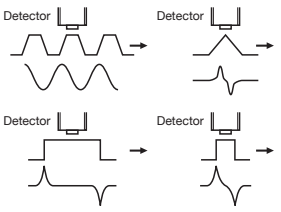
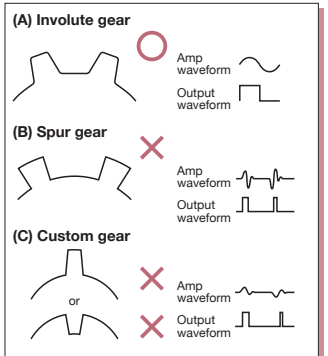


Fig. 1 Various teeth shapes and output waveforms

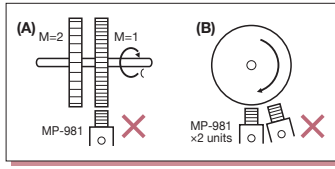
●Shape of the gear for the MP-981 and the mounting method

(1) Output signals according to the shape of the gear



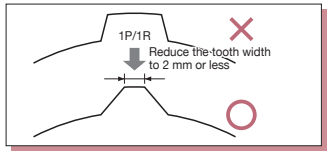
Since two pulses may be output for one tooth in the case of (B) and (C) in the figure above, (B) and (C) are not suitable for use as a detection gear.

(2) Mounting method

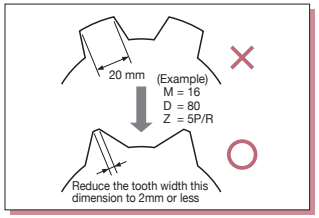


Please avoid the mounting configurations shown in the figures left , as they will cause reciprocal magnetic interference.
In the case of (A), a gear with a different module is mounted in the vicinity of the MP-981.
In the case of (B), two or more MP-981 units are mounted within the vicinity of one gear.

(3) How to use a custom gear



(5) How to use a gear when M = 3 or more



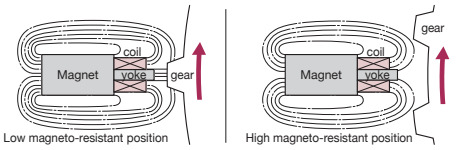
(4) How to calculate Module M

This calculation is for involute gears only

$$Module\ M = \frac{Reference\ pitch\ circle\ diameter}{Number\ of\ teeth}$$

Electromagnetic Rotation Detectors and Magneto-electric Rotation Detectors

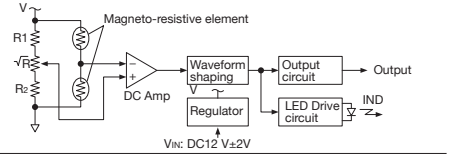
Electromagnetic Rotation Detectors (MP-900/MP-9000 series)



Electromagnetic Rotation Detector generates frequency signal of proportional to the rotation speed by bringing it close to the tooth tip of the detection gear attached to the rotating shaft. It consists of a permanent magnet, a detection coil, and a yoke.
When a magnetic material approaches in the vicinity of the yoke, the magnetic flux passing through the detection coil changes, and an induced voltage of frequency proportional to the change is generated in the detection coil.
Magnetic flux pulsates "frequency f = rotation speed x gear". Therefore, this will be output as the rotation signal of the detector.
Features are as follows.
1. Easy structure
2. No power supply required
3. Compact
4. No need for maintenance

It provides reliable rotation measurement and is widely used in many ways.

Magneto-electric Rotation Detectors (MP-981/9820, AP-981)

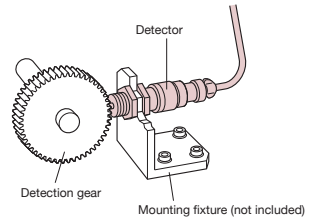


Magneto-electric rotation detector is made by applying a magneto-resistive element whose resistance value varies depending on the intensity of the magnetic field.
Normally, a constant magnetic field is applied by a magnet, and the change in the magnetic field when the detection gear approaches the element is detected as a change in the resistance value.
Changes in resistance value (= differential output) is detected and its signal is amplified by a DC amplifier. The output of the DC amplifier goes through a waveform shaping circuit and is made into a rectangular wave.
Magneto-resistive element is arranged at the tip of the detector. For correct detection, it is necessary that the detection surface and the gear surface face each other with the proper direction and position. As a guide, the detector is marked with an alignment mark.
(power supply: DC 12 ± 2 V)

Electromagnetic Type Rotation Detector 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).

Mounting method



●Features

- **General-purpose type**
  MP-9100
  •Low cost and popular type
- **Direct attached cable type**
  MP-911
  •Cable 5m direct attached type of MP-9100 (cable: 3D-2V)
- **Low impedance (high-speed rotation type)**
  MP-9120
  •Noise-resistant due to low impedance
  •Adapted for detection in high speed range
  •Same size as MP-9100
- **Oil-proof type**
  MP-930
  •Conforms to Japan Electrical Manufacturers Association (JEM) standard (old), JEM-1030-1983*1 oil proof type
  •Direct attached cable 0.5 m
- **Oil proof and heat-resistant type**
  MP-935
  •Conforms to Japan Electrical Manufacturers Association (JEM) standard (old), JEM-1030-1983*1, oil proof type
  •Heat resistant cable up to 150 °C
  •1 m directly attached type
- **Heat resistant type**
  MP-936
  •Heat resistant up to 220 °C
  •Heat resistant cable 1 m directly attached type
- **Long body type**
  MP-940A
  •Long body type of 105 mm mounting section, suitable for the rotation detection of the rotating object deeply installed.
- **Long body type**
  MP-954
  •Long body type of 81 mm mounting section, suitable for the rotation detection of the rotating object deeply installed.
  •Mounting screw size is same as MP-950
  •Directly attached cable 0.5 m

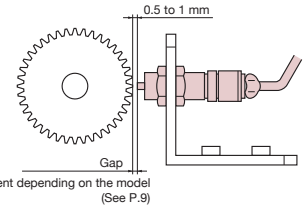
*1 Protective type F: Not affected harmful by oil droplets/oil spill from any direction.

- **Compact type**
  MP-950
  •Compact (M12), directly attached cable 0.5 m
- **Compact type**
  MP-962
  •Compact (M8), directly attached cable 0.5 m
- **Ultra-compact type**
  MP-992
  •Ultra-compact (M5), directly attached cable 0.5 m
- **Compact module type**
  MP-9200
  •For module 0.5 to 1
- **Medium module type**
  MP-963
  •For module 3 to 10

●Standard detection gear

MP-001 (ø = 62)
•Module 1, 60 teeth

Non-contact type



** When the electromagnetic type rotation detector MP series is used especially in the place where great importance is placed on reliability, the technical consultation is required.*
Please consult your nearest distributor or Ono Sokki sales office nearby.

Digital Tachometer TM-3100 series

DIN standard size (96×48 mm) / for general-purpose

TM-3110 Display only

●Features

- Basic model for measurement and display
- Wide measurement range from low to high speed (0.1 Hz to 100 kHz)
- The fluorescent display tube greatly improves the visibility and the operability.
- Compatible with our various detectors.

TM-3120 BCD output

BCD mode setting screen

●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 mode : continuously outputs the print command every approx.100 ms.
Request mode : Data is output for each request pulse.
Outputs data and print command within a minimum of 50 ms after receiving the request pulse.

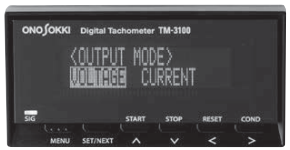
Output signal

BCD output
Output form : 6-digit parallel output
Output format : open collector
Sync current : max. 32 mA
Output withstand voltage : max. 24 V
Output logic : positive logic
Data refresh time : 100 ms or less

Input signal

Request signal
Input logic : negative logic (pulse width: 10 µs or more)
Operating edge : falling edge
Input voltage : TTL
Gate function : start, stop, reset

TM-3130 Analog output



Analog output setting screen

●Features

- Output pulse can be switched between voltage and current.
- Update time (10 ms) improved by using D/A conversion method.

●Specifications

Output signal (voltage or current selectable)
Output method: 12bit D/A conversion
*Resolution decreases depending on the set value.
Output voltage range : selected from 0 to 10 V, 0 to 5 V, 1 to 5 V
Output current range : selectable from 4 to 20 mA, 0 to 16 mA

Load resistance
Voltage output : 100 kΩ or more
Current output : 500 Ω or less
Linearity : ± 0.3 %/F.S.
Analog output adjustment
Voltage output : ± 5 %/F.S. or more
Current output : ± 3 %/F.S. or more
Zero drift : ± 0.05%/F.S./°C
Span drift : ± 0.05 %/F.S./°C
Output refresh time : selectable from followings; 10, 20, 50, 100, 200, 500 ms, 1 s

TM-3140 Comparator output

●Features

- Up to 3 types of judgment levels for upper and lower range
- High speed response with output update time of approx.10 ms
- Various output functions

●Specifications

UPPER setup : 6-digit numeric input (The relay is ON when UPPER ≦ displayed value)
LOWER setup : 6-digit numeric input (The relay is ON when LOWER > displayed value.)
OK setup : The relay is ON when UPPER or LOWER is OFF.
ERROR setup : The relay is ON when any ERROR other than RS communication error occurs.
Output format : 1-make contact output
Three outputs : COMP1, COMP2, and COMP3
Either of UPPER, LOWER, OK, or ERROR can be set to.
Measurement mode
Automatic recovery mode : Automatically recovers when the rotation speed returns to within the set range
Comparator hysteresis : Sets hysteresis in judgment value at comparator return.
Holding mode : Even if the rotation speed returns to within the setting range, it holds the state.
Shot output function : Holds comparator output time for a certain time. OFF (shipping 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 1000 ms, set in increments of 50 ms.
Reset function : Resets in comparator holding mode.
Maximum contact capacity : 30 VDC V/1A, 250 VAC/1 A
Output format : terminal block
Output refresh time : approx.10 ms

Depending 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)

●Common specifications

Input

Input terminal : M3, free terminal screw
Input impedance : 10 kΩ or more
Input format : voltage or non-voltage
Input amplification: AC or DC
Compatible detectors: electromagnetic type/magneto-electric type/photoelectric type/rotary encoder/ proximity switch
[Input amplification format specification]
•AC amplifier
Signal waveform : sine or square wave
Signal voltage : sine wave; 0.2 to 45 Vms
square wave; 0.6 V to 63 Vp-p
Signal frequency : 1 Hz to 100 k Hz
•DC amplifier
Signal waveform : rectangular waveform having a pulse width at 5 µs or more
Signal voltage : Hi level; +4 to +30 V, Lo level; -1 to +1 V
Signal frequency : 0.1 Hz to 100 kHz
Low pass filter : OFF/20 kHz switchable

Output

<Pulse output>
Output voltage : Hi level; 4.5 V or more
Lo level; 0.5 V or less
Output logic : negative
Load resistance : 100 kΩ or more
Output terminal : M3 free terminal screw

Display

Display unit : fluorescent display tube (selectable from three-stage brightness, 6-digit display)
Display refresh time : selectable from 0.2 s (factory setting), 0.4s, 0.5s, 0.6s, 0.8s, 1.0 to 10s (every 1.0s).
Display unit : select from the table below

Calculation	Unit
Rotation speed	r/s, r/min, r/h
Circumferential speed	mm/s, m/s, mm/min, m/min
Moving speed	mm/s, m/s, mm/min, m/min, km/min, mm/h, m/h, km/h
Period	s, min
No. of times (1/s)	1/s, 1/min, 1/h
Frequency	Hz, kHz
Flow rate	ml/s, ml/min, ml/h, l/s, l/min, l/h
*Transit time	s, min
Option	EU/s, EU/min, EU/h

Character height : 10 mm
Number of decimal points : Select from OFF (none), 1st, 2nd, 3rd
SIG indicator : flashes synchronously with the input pulse
Error display : backup memory error, board error, input frequency error, display digit number error, memory full error, setting value error

Calculation

Calculation display : rotation speed, circumferential speed, moving speed, period, number of times (1/s), frequency, flow rate, transit time
Measurement method : period calculation method
Measurement time : 10 ms + 1 period time
Measurement accuracy : Displayed value × (± 0. 01%) within ± 1 count
* The displayed value here indicates the count value excluding the decimal point.
Auto zero function : This function sets the displayed value to 0 if there is no pulse input during the set time. Select from OFF (11 s), 0.5 s, 1.0 s, 2.0 s, 3.0 s, 4.0 s, 5.0 s, 6.0 s, 7.0 s, 8.0 s, 9.0 s, 10.0 s.
Sudden deceleration follow-up function : When the input pulse suddenly decreases and not being input after approx.1 s or more, the display value automatically decreases and becomes 0 after approx.11 seconds.
Moving average function : Selectable from OFF (shipping time), 2, 4, 8, 16, 32, 64, 128
* Analog output of TM-3130/0330 performs moving average of the calculation value every 10 ms and outputs it.
Peak hold function : This function holds the peak values (maximum value, minimum value, average value) from measurement start to stop.

Memory

Panel condition memory : Memorizes 4 kinds of measurement conditions (The setup conditions can be stored and recalled.)

Power supply for detector

Output voltage : 12 VDC ± 10%
Maximum output current : 100 mA

General specifications

Rated power : 100 to 240 VAC (50 Hz/ 60Hz) 30 VA max.
TM-3100 ; 11 to 19 VA
TM-3120 ; 13 to 21 VA
TM-3130 ; 16 to 25 VA
TM-3140 ; 12 to 21 VA
* When all the cards (analog output, BCD output, comparator output) are installed: 20 to 30 VA
Withstand voltage : 1500 VAC (1 min)
Insulation resistance : 10 MΩ or more (at 500 VDC mega)
Operating temperature : 0 to 50 °C
Storage temperature : -10 to 60 °C
Operating humidity : 30 to 80% RH (with no condensation)
Storage humidity : 30 to 85% RH (with no condensation)
Outer dimensions : 96 (W)×48 (H)×148 (D) mm
Weight : approx.310 g

Conforming standards

CE marking : Low voltage Directive
EN61010-1:2001 (2nd)
Overvoltage category Ⅱ /pollution degree 2
EMC Directive
EN61326-1:2006 Embedded board type

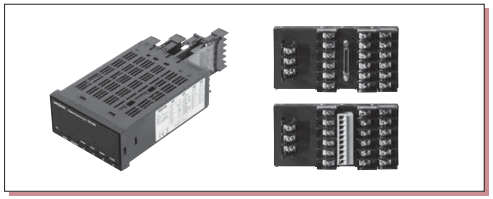
Accessory

Instruction manual × 2 set (spec edition, basic operation manual),
panel mounting fixture ×1 set
condenser×1

Option

power cable for 100 V 3m (AX-2050N)

Optional card



●Features

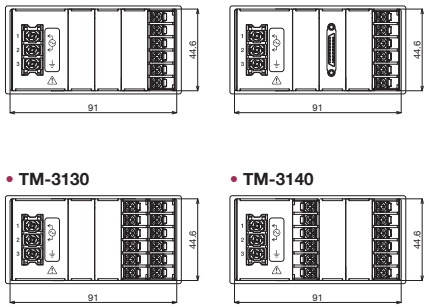
- The functions can be added by the optional cards.
- By addition of TM-0350, further advanced measurement such as rotation fluctuation rate, section data can be performed besides RS-232C communication.

●Optional card list

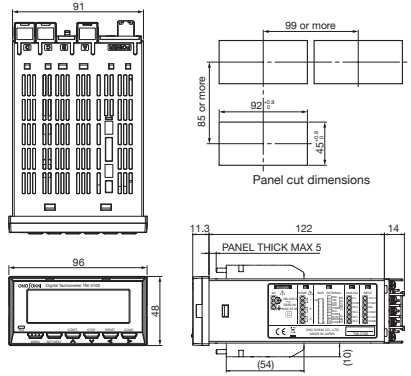
TM-0301: DC power supply card
TM-0321: BCD output card, voltage output
TM-0322: BCD output card, open collector output
TM-0330: Analog output card
TM-0340: Comparator output card
TM-0350: RS-232C card

* The additional fee for installation of optional cards after ordering a main body is required. Please contact your nearest distributor or Ono Sokki sales office nearby.

Rear side panel connector terminal screw: M3



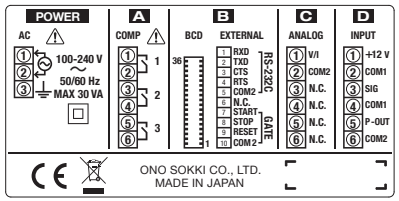
Outer dimensions TM-3100 series



●TM-3100 series output enlarged view

TM-3110 (display only) : POWER + D (INPUT)
TM-3120 (BCD output) : POWER + D (INPUT) + B (O.C.)
TM-3130 (analog output) : POWER + D (INPUT) + C (ANALOG)
TM-3140 (comparator output) : POWER + D (INPUT) + A (COMP)

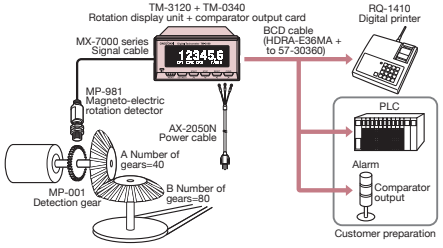
*The function can be added by addition of board.



●Application

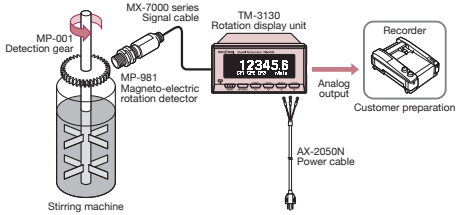
• Measure and display the rotation speed of the shaft and output the result to the printer, the PLC and the comparator.

In the following application, motor rotation is measured using MP-981 magneto-electric rotation detector, TM-3210 digital tachometer, and its optional functions.
The rotation speed of a motor shaft is amplified by gears, and the rotation speed (r/min) and speed (m/min) of the rotator are calculated. The rotation speed of the shaft is measured by MP-981 magnetoelectric rotation detector, the calculation is made by TM-3120 digital tachometer. Adding an option expands the range of output devices to.
BCD output function (TM-0321, TM-0322): Printing, loading to the PLC
Comparator function (TM-0340): Alarm can also be set.

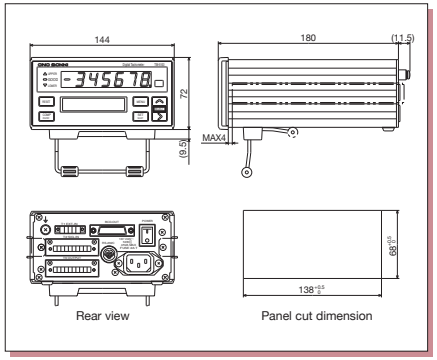


• Measure, display, and record the shaft rotation speed and its fluctuation

A rotation detector is attached to a gear on a rotating main shaft such as a stirrer, a mixer, a centrifugal separator, and the rotation speed of the shaft is measured and displayed. By using the analog output, you can record it on a recorder and check the rotation change.



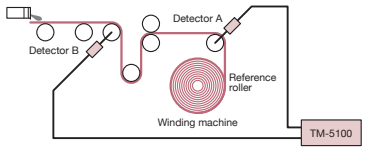
Digital Tachometer TM-5100
Multifunction Digital Tachometer



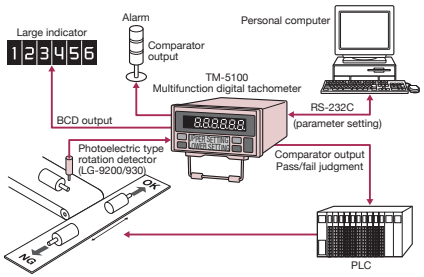
●Application example

• Measurement of drawing on paper and glass manufacturing lines

Attach rotation detectors to the rotating sections of the line and input signals to TM-5100. The speed change rate of the reference roller and other rollers is displayed in TM-5100. Therefore, adjusting the speed of the line each section accordingly enables to make products stable quality.



• Product inspection of motors



●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 × 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/coefficient value/ 2ch measurement values).

●Specifications

Applicable detector	: MP 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	: 0.0001 to 99.9999
2ch calculation function	: difference <B-A>, ratio <(B/A) × 100> change rate <(B-A/A) × 100>
Rotation direction measurement function	: The direction of rotation is indicated by polarity display when 2-phase rotary encoder is used.
Main display section	: green 7-segment LED (character height: 14 mm) display range··· 0 ± 999999 (0. 00 to 9999. 99 %)
Sub display section (parameter setting display section)	: LCD module number of display characters··· 16 characters × 2 steps
Signal input section	: input impedance··· 10 kΩ or more (at 100 kHz)
AC amplification section	: signal waveform··· sine wave or square wave signal voltage range···sine wave; 0.2 to + 45 Vrms square wave; 0.6 to 63 V_{P-P} signal frequency range··· 1 Hz to 100 kHz
DC amplification section	: signal waveform···rectangular wave with pulse width 4μs or more signal voltage range··· Hi; 4 to 30 V, Lo; -1 to 1 V signal frequency range··· 0.0006 Hz to 100 kHz
Comparator function	: number of setting stages··· 2 setting range··· 0 ± 999999 output item··· UPPER /GOOD/ LOWER output format··· semiconductor relay makeup contact (30 VDC, 0.1 A)
Analog output	: conversion method··· 12 bit, D / A method voltage range··· 0 to ± 10 V / F.S. (F.S. = Full Scale; can be set arbitrarily.)
BCD output	: positive/negative logic (switchable), 6-digit parallel output format··· open collector
RS-232 communication	: 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 12 VDC ± 0. 6 V (max 150 mA) for each channel of A ch and B ch
Power supply voltage	: 100 to 240 VAC (50/60 Hz)
Power consumption	: 45 VA or less
Operating temperature	: 0 to 40 °C
Storage temperature	: -10 to 55 °C
Operating (storage) humidity	: max. 95 % (with no condensation)
Weight	: approx.1.5 kg
Withstand voltage	: 1500 VAC (between power supply and GND, 1 min)
Insulation resistance	: 10 MΩ or more (500 VDC mega)
Accessory	: power cable×1, panel mounting fixture× 1, foot stand×1, rubber foot × 1, terminal socket (5 pins) × 1, (10 pins) × 2, unit seal × 1, instruction manual × 1
Option	: BCD cable 3 m (AA-8107) RS-232C cable 2m (AX-5022B)

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 sensor : FT-0501, IP-292/296/3000A/3100, VP-202/1220, OM-1500/1200, Constant Current Line Drive sensors (microphones, accelerometers) and so on.

Measurement section
•Measurement mode: Steady rotation measurement mode
Arithmetic operation : 1024 points, FFT processing
Frequency range : 500 Hz, 2 kHz, 10 kHz
Rotation speed searching : Measurement frequency range (Hz) x 60/ range (Pulse count [P/R])
Measurement frequency range
• When 500 Hz range selected; 3.75 Hz to 500 Hz
• When 2 kHz range selected; 15 Hz to 2 kHz
• When 10 kHz range selected; 75 Hz to 10 kHz
Update time : within 500 ms
Measurement accuracy : ±2 x rotating speed resolution[r/min] ±1 count
*Measurement accuracy depends on frequency range.
Rotation speed resolution : Frequency range [Hz] ÷ 12800 × 60 ÷set pulse count [P/R]
*12800 = 400 line x 32
•Measurement mode: Rotation acceleration/deceleration measurement mode
Arithmetic operation : 512 & 256 points, FFT processing
Frequency range : 250 Hz, 500 Hz, 2 kHz
Rotation speed measurement range : Measurement frequency range (Hz) x 60/ (Pulse count [P/R])
Measurement frequency range
• When 250 Hz range selected; 3.75 Hz to 250 Hz
• When 500 Hz range selected; 7.5 Hz to 500 Hz
• When 2 kHz range selected; 30 Hz to 2 kHz
Update time : within 250 ms
Measurement accuracy : ±2 x rotating speed resolution[r/min] ±1 count
*Measurement accuracy depends on frequency range
Rotation speed resolution : Frequency range [Hz] ÷ 6400 × 60 ÷set pulse count [P/R]
*If the rotation speed is changing, the resolution is worsen.
*6400 = 200 line x 32

Display section
•Main display unit
Display unit : fluorescent display tube (Blue - Green)
Display update time : 0.5 ±0.2 second
Display resolution : 1 r/min, 1 Hz
Measurement display range : 0 to 999,999 r/min(0 to 10,000 Hz)
•Level monitor LED
Display method : 2-color LED
Unlit ;Sensor signal amplitude is small and stable measurement is disabled.
Red ;Sensor signal amplitude exceeds the set voltage range.
Green ;Sensor signal amplitude is appropriate
•Comparator monitor LED (common to Upper, Lower, Rotation)
Display method : 2-color LED
Unlit ;Comparator is disabled.
Red ;Comparator is active and measurement values do not meet operating conditions.
Green ;Comparator is active and measurement values meet operating conditions.

Rotation pulse count setting
Set range : 0.5 to 199.5
Minimum number of steps : 0.5 [P/R]

Averaging processing
Averaging type : Moving average
Allowable count : OFF, 2, 4, 8, 16

Filter function
Processing type : Specifying the desired measurement rotating speed (frequency) range within the selected frequency range
Setting : Specifying upper and lower rotation speeds (frequencies)

Rotating direction judgment
Applicable sensor : FT-0501
Judgment : CW/CCW
Judgment output : semiconductor relay, status display

Key protection function
Setting/Cancelling : It can be switched by pressing and holding SET/NEXT key approximately 2 seconds in measurement mode.
Protection range : All keys except < (SAMPLE) key when returning to measurement ready state in rotation acceleration/deceleration mode.

Analog voltage output
•REVO output
Output contents : displayed value
Voltage range : 0 to F.S./ 0 to 10 V
Conversion type : D/A conversion
Linearity : ±0.3 % of F.S.
Output update time : steady rotation measurement mode (CONSTANT); 500 ms or less
rotation acceleration/deceleration mode (ACTIVE); 250 ms or less
Temperature stability : ±0.05 % F.S./℃ (common to ZERO and SPAN)
Set error : ±0.5 % of F.S. (default error, common to ZERO and SPAN)
Load resistance : 100 kΩ or more
Output connector : R03RB3F
Calibration function : Outputting ZERO/FULL calibration signal
•SIG output
Output contents : analog output for monitoring obtained by wave-shaping of sensor signal
Load resistance : 100 kΩ or more
Output connector : switching to/from REVO output connector

Comparator output
Items : LOWER, UPPER, ROTATOIN, OK
LOWER : closed when LOWER threshold value >displayed value
UPPER : closed when UPPER threshold value ≤displayed value
ROTATION : closed when comparator ROTATION operating direction setting = measurement value (CW/CCW)
OK : closed when three comparators above are all open
Output type : semiconductor relay (Photo-MOS)
Output connector : D-SUB (15-pin connector)
Maximum contact capacity : 30 VDC, 0.1A
Contact ON resistance : 50 Ω or more

Pulse output
Signal contents : Pulse of power spectrum frequency extracted by FFT operation
Output voltage : LO; 1 V or less, HI; 4.5 V or more (no load)
Output update time : steady rotation measurement mode (CONSTANT); 500 ms or less
rotation acceleration/deceleration mode (ACTIVE); 250 ms or less
Load resistance : 100 kΩ or more
Output type : D-SUB (15-pin connector)

Remote input signal
Remote input signal : Terminal open; measurement start, displayed value update, comparator activated
Terminal close; measurement stop, display value hold, comparator output hold, analog/pulse output hold
Input logic switching : enabled by RS-232C communications in setup mode
Input connector : D-SUB (15-pin connector)
Input signal type : no voltage contact input, open voltage; +5 V ±0.25V, short-circuit current; 1 mA or less, contact resistance; 50 Ω or less

Condition memory function
Function contents : saving parameter settings to nonvolatile memory
Number of conditions : 3 kinds (selectable in setup mode)
Target item : set parameters

Communications function
•RS-232C
I/F : reading function measurement data, setting parameters, reading parameters
Connector : HR12-10R-8SDL
Character code : ASCII
Baud rate : 2400/4800/9600/19200 bps
Data length : 8 bit
Stop bit : 1bit
Parity check : none
X parameter control : none
Hardware control : RTS/CTS
Terminator : CR + LF

General specifications
Power requirement : 100 to 240 VAC±10% (50/60 Hz)
Conforming standard : CE marking
Outer dimensions : 144(W) × 72(H) × 180(D) mm
Weight : 2 kg or less
Power consumption : 22 to 32 VA
Operating temperature range : 0 to +40 °C
Storage temperature range : -10 to +55 °C
Operating (storage) humidity : 20 to 80 %RF (without condensation)
Withstand voltage : 1500 VAC (between power supply and FG, 1min)
Insulation resistance : 5 MΩ or more (between power supply and FG, 500 VDC)
Accessories : power cable, panel mounting bracket, stand foot, rubber foot, connector, instruction manual
Options : analog output cable 1.5m (FT-0100) [R03PB3M-BNC245],
pulse output cable 1.5 (FT-0110) [D-SUB15PIN-BNC245],
RS-232C cable 2m (AX-5022B)

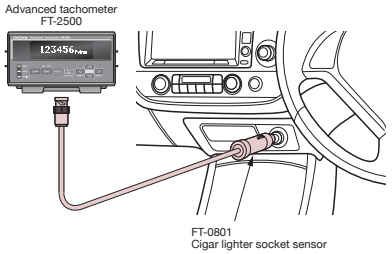
They may be some cases that FT-2500 cannot measure depending on the type of engines and motors, or the measurement range may change. Please confirm with the demonstration machine before order. Please contact the nearest distributors or our sales office for demonstration machines.

* Please contact us for more detail brochure of the FT-2500.

●Application

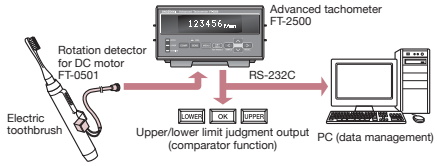
•Example of engine rotation speed measurement using cigar lighter socket sensor

Connect to power outlet installed in an automobile or a construction machine. The ignition noise of the voltage output from the power outlet is detected and the rotation speed of engine can be measured by the FT-2500. Compatible with battery 12 and 24 VDC.

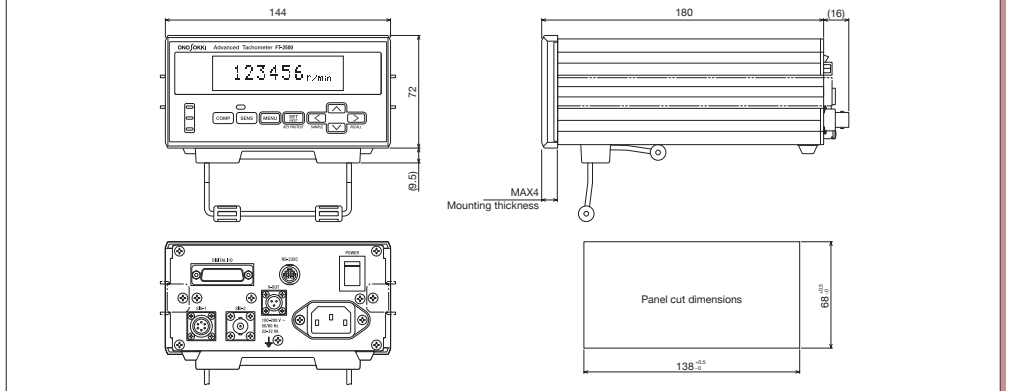


•Measurement example of rotation speed of DC motor incorporated in home electric appliances

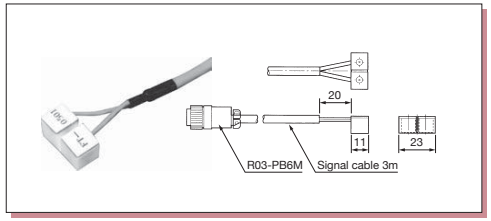
In this application, we measure the rotation of the electric toothbrush, which DC motor rotation is converted into brush vibration inside.
The FT-2500 measures the rotation speed by detecting the magnetic flux leakage from the DC motor incorporated in the toothbrush.
- Detects pulsation of magnetic flux leakage proportional to the number of poles of the DC motor from the completed product.
- With upper / lower limit comparator output for OK, LOWER, UPPER judgment on production line.
- Data management with RS-232C
- System can be upgraded at low price.



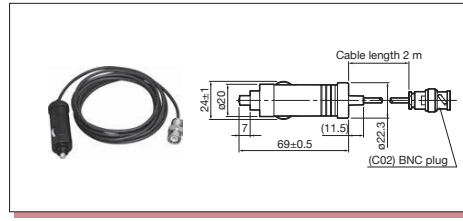
• FT-2500 advanced tachometer



• FT-0501 Rotation detector for DC motor



• FT-0801 Cigar lighter socket sensor



Sensor specification	FT-0501	FT-0801
Measurement target	DC motor etc. (commutator type)	Automobile, construction machine
Detection method	Leakage magnetic flux detection	Voltage noise
Major specifications	Direct attached signal cable 3m With tip connector (R03-PB6M) *It is necessary to set the number of poles of the motor.	Plug in cigarette lighter socket. Cable length 2m With tip connector (C02) (BNC)
Operating temperature range	-10 to 60 °C	0 to 40 °C

Handheld Tachometer FT-7200

Advanced Handheld Tachometer

FT-7200 FFT calculation method

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.

●Features

- Enables rotation 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
Calculation method : FFT calculation method
Measurement time : within 250 ms
Input frequency range : 3.75 Hz to 2 kHz (3 ranges switching)
Measurement unit : r/min (rotation speed)
Measurement accuracy (r/min) : ± 2 × rotation speed resolution (r/min) ± 1 count
*Measurement accuracy depends on the frequency range.
Rotation speed resolution (r/min): frequency range (Hz) ÷ 6400 × 60 ÷ number of set pulses
frequency range; 250, 500, 2000 (Hz)
number of set pulses; 0.5, 1, 1.5, etc. (P/R)
6400 = 200 lines x 32
*It becomes coarse when the rotation speed is accelerating or decelerating.
Filter function : Specifies the frequency range (rotation speed range) to be measured within the selected frequency range.
Averaging processing : moving average processing
number of averaging processing···
OFF, 2, 4, 8, 16
Sensor amplifier sensitivity adjustment volume : Sensor amplifier sensitivity can be adjusted with the rotary type volume knob on the right side of the main unit.

Detection section

Compatible sensors : dedicated for engine rotation measurement
OM-1200/1500, VP-1220/202,
IP-292/296, IP-3000A/3100, FT-0801
FT-0501+FT-0150, NP-3000 series (with built-in preamplifier), MI series (microphone + preamplifier)
Input voltage level : 3-range available; 5 V (max±5 V), 0.5 V (max±0.5 V), 0.05 V (max±0.05 V)
Input coupling : AC coupling
Power supply for NP series accelerometer : constant current power supply (2.4 ± 0.5 mA)
*Note on measurement: depending on the type of engine and measuring object, it may not detect properly.

Display section

LCD display : 5 digits, LCD 7 segments, with backlight (character height 10.2 mm)
Display update time : 0.5 ± 0.2 s
Display resolution : 1 r/min

Measurement mode

CNS (Constant) : Used when the fluctuation of the rotation speed of the object to be measured is small (when measuring the rated rotation speed, etc.)
ACT (Active) : Used when the rotation speed of the object to be measured accelerates or decelerates. (However, when it changes suddenly, it may not measure correctly.)

Output section

[ANALOG] analog output (switch to analog output for monitor)

Output content : Output for the display value of rotation speed.
Voltage range : 0 to 1 V / 0 to F.S. (F.S. is arbitrarily set.)
Conversion method : 10 bit D/A conversion method
Linearity : ± 1% of F.S.
Output update time : within 250 ms
Temperature stability : ± 0.05% of F.S. / °C (ZERO & SPAN)
Setting error : ± 0.5% of F.S. (factory setting adjustment error, ZERO & SPAN)
Load resistance : 100 kΩ or more
Output connector : mini jack (ø 2.5)

[ANALOG] analog output for monitor (switch to analog output)

Output content : analog output for monitoring after waveform shaping of sensor pulse
Load resistance : 100 kΩ or more
Output connector : mini jack (ø 2.5/commonly used with ANALOG output)

[PULSE] output

Signal content : Outputs frequency pulse of the power spectrum extracted by FFT processing.
Output voltage : Lo··· 0.5 V or less, Hi··· 4.5 V or more (no load)
Output frequency range : 3.75 Hz to 2 kHz, equivalent to display rotation speed × number of set pulses per rotation (P/R)
Output update time : steady rotation mode (Constant); within 500 ms
rotation acceleration/deceleration mode (Active); within 250 ms
Load resistance : 100 kΩ or more
Output connector : mini jack (ø 2.5/commonly used with ANALOG output)

General specification

Power supply : AAA battery ×4 or dedicated AC adapter (PB-7090, sold separately)
Battery life : approx. 6 hours (When the backlight is off.)
approx. 5 hours (When the backlight is on.)
(When alkaline battery is used, at 20 °C, excluding when using the NP-3000 series accelerometer*1)
*1: When using NP-3000 series accelerometer, consumption current increases due to driving constant current power. We recommend using the dedicated AC adapter.
Low battery display : The LOW mark is displayed, when the battery voltage drops 4.2 V or less.
Operating temperature : 0 to 40 °C
Storage temperature : -10 to 50 °C
Operating (storage) humidity : 35 to 85% RH (with no condensation)
Outer dimensions : 66.0 (W)×189.5 (H)×47.5 (D) mm
Conforming standard : CE marking
Weight : approx. 230g (not including battery)
Accessory : AAA battery ×4, instruction manual (basic operation, function guide, measurement procedure) ×1 each, carrying case ×1
Option : relay cable for FT-0501, 0.5 m (FT-0150)
output signal cable, 2m (AX-501)
dedicated AC adapter (PB-7090)
magnet stand (HT-0522)
stand jig (HT-0521A)
measurement tripod (LA-0203 D)
(Airy L 100 manufactured by SLIK)

* Please visit our website for more detail brochure of the FT-7200.

Handheld Tachometer HT-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).

●Features

- Memory function: up to 20 data of memory can be recorded.
- Both contact and non-contact measurement, line speed measurement is available with non-contact method.
- Both analog and pulse outputs provided as standard. Used for recording rotation speed and as rotation synchronization signals.
- Peak hold function installed: maximum value and minimum value during measurement can be displayed.
- Large LCD with backlight.
- Tripod, stand jig (option) mounting: can be fixed to a tripod etc. for continuous measurement.

●Specifications

Detection method : red visible light photoelectric reflection method, contact method (attaching contact adapter)
Detection distance : 20 to 300 mm
Display section : LCD, 5 digits, with backlight (character height: 10.2 mm)
Measurement time : Within 1 s + time for one cycle (however, when the rotation is less than 60 r/min, twice the time for one cycle).
Display update time : approx. 1 s
Measurement unit : r/min, r/s (rotation speed), m/min (circumferential speed), ms (period), COUNT (integration count)
Measurement range :

	Non-contact type	Contact type
r/min (Hi level)	6 to 99999	6 to 20000
r/min (Lo level)	6.0 to 600.0	6.0 to 600.0
r/s	0.10 to 999.99	0.10 to 400.00
m/min	0.6 to 9999.9	0.6 to 400.0
COUNT	0 to 99999	0 to 99999
ms	0.6 to 9999.9	2.5 to 9999.9

Measurement accuracy : display value* × (± 0.02%) ± 1 count
*Display value is the count value excluding the decimal point.
(Note)
- The measurement accuracy of circumferential speed depends on the rotation speed of the rotating body.
- The above measurement accuracy is for non-contact measurement. It does not include errors due to camera shake. Contact slippage and accuracy are added at the time of contact measurement.

Measurement function

Peak hold function : maximum value (MAX), minimum value (MIN)
Memory function : up to 20 data
Over range function : over range (ERROR mark) is displayed when the measured value exceeds the measurement range.
Rotation upper limit warning function : When the rotation speed exceeds a preset upper limit value, upper limit warning (↑ mark) is displayed.
Circumferential speed calculation function : [non-contact type] circumferential speed is calculated with the preset diameter (mm) and the measured rotation speed.
[contact type] circumferential ring KS-100/200 is used.
Integration count function : Performs integration pulse counting of input signal
*Note: The display is updated every display update time.
Period measurement function : Measures the period of input pulse (however, average value of input pulse if it is 1 second or more)
Rotation speed : non-contact type (with reflective mark), contact type (using KS-300)

Output section [analog output]

Output voltage : 0 to 1 V / 0 to F.S. (Full scale is arbitrarily set.)
Conversion method : 10 bit D/A conversion method
Linearity : ± 1% F.S.
Output update time : 50 ms + input pulse within 1 period time
Temperature stability : ± 0.05 %/ F.S. /°C (span & zero)
Full scale setting error : ± 0.5 % /F.S.
Load resistance : 100 kΩ or more

Output section [pulse output]

Output voltage : Hi level··· 4.5 V or more (when detecting with reflective mark)
Lo level··· 0.5 V or less
Output logic : positive logic
Load resistance : 100 kΩ or more

General specifications

Power : AAA battery x4 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)
(When alkaline dry battery used, at 20 °C)
Low battery display : The LOW mark is displayed, when the battery voltage drops 4.5 V or less.
Operating temperature : 0 to 40 °C
Storage temperature : -10 to 50 °C
Operating (storage) humidity : 35 to 85% RH (with no condensation)
Outer dimensions : 66 (w)×180.5 (H)×47.5 (D) mm (only main unit)
66 (W) ×237.2 (H) ×57.5 (D) mm (contact adapter + rotation contact tip)
Conforming standard : CE marking
Weight (excluding batteries): approx.220g (only main unit)
approx.282g (contact adapter+ rotation contact)
Accessory : contact adapter (HT-0502)×1,
rotation contact tip (KS-300)×1,
circumferential ring (KS-200 for m/min)×1,
reflective mark (12mm square, 25 sheets) ×1,
AAA battery ×4,
carrying case×1,
instruction manual (function guide: Japanese/English, basic operation: Japanese/English)×1
Option : pulse output cable; 2 m (AX-501)
dedicated AC adapter (PB-7090)
reflective mark; 12 mm square 25 sheet, 10 sheet 1 set (HT-011)
circumferential ring for mm/s (KS-100)
circumferential ring for m/min (KS-200)
rotation contact tip (KS-300)
contact adapter (HT-0502)
extension relay shaft for KS-300 (KS-700)
stand jig (HT-0521B)
magnet stand (HT-0522)
measurement tripod (LA-0203D)
(Airy L 100 manufactured by SLIK)

HT-3200 Contact type / general purpose liquid crystal display

With a low range setting that can measure from 0.5 r/min. A circumferential ring/rotation contact can be stored in a pocket of the main body.

●Features

- Measurable from a low speed of 0.5 r/min to 10,000 r/min (circumferential speed: 0.05 to 1,000.0 m/min).
- Large liquid crystal display on a compact, lightweight body (character height 10.5 mm).
- With memory function useful for checking measurement results.
- By replacing the contact tip with the attached circumferential ring, it can also measure circumferential speed.
- With a pocket to store the circumferential ring.
- Continuesly displays the latest measurement value for approx. 30 seconds after power-off.
- Displays the timing of battery replacement.

●Specifications

Method : contact method
Display section : liquid crystal display, 5 digits (character height 10. 5 mm)
Measurement unit : Lo range··· 0.1 r/min, Hi range··· 1 r/min
Display update time : 1 second automatic repeat
For Lo range (0.5 to1.0 r/min); every 2 seconds
For Hi range (5 to 10 r/min); every 2 seconds
Measurement range and accuracy of rotation speed :
Lo range··· 0.5 to 1249.9 r/min; within ±0.1 r/min
1250.0 to 2000.0 r/min; within ±0.2 r/min
Hi range···5 to 10,000 r/min; within ±1 r/min
Circumferential speed measurement range:

	KS-200 (provided)	KS-100 (option)
Lo range	0.05 to 200.00 m/min	0.5 to 2000.0 mm/s
Hi range	0.5 to 1000.0 m/min	5 to 10,000 mm/s

- The accuracy is calibrated with the rotation speed.
- The unit of measurement can not be changed. When using KS-200, setting the measurement value to 1/10 will result in the value in m/min.

Memory function : number of memories; 10
Data hold function : automatic power off 30 seconds after the end of measurement
Low battery display : "LOW" mark is displayed when the battery voltage drops 3.3 V or less.
Over range display : "ERROR" is displayed.
Power requirement : AAA battery×3
Battery life : approx. 20 hours (using alkaline dry batteries, at 20 °C)
Operating temperature : 0 to 40 °C
Storage temperature : -10 to 55 °C
Operating (storage) humidity range : 35 to 85% RH (with no condensation)
Outer dimensions : 63 (W) x 172 (H) x 38.5 (D) mm
Conforming standard : CE marking
Weight : approx. 160 g (without batteries)
Accessory : contact tip for rotation measurement (KS-300) x2 (One of them is stored in the main body), circumferential ring (KS-200 for m/min)×1 (stored in the main body) AAA batteryx3, instruction manual (English, Japanese) x1 each
Option : circumferential ring for mm/s (KS-100), circumferential ring for m/min (KS-200), rotation contact tip (KS-300), extension shaft for KS-300 (KS-700), a carrying case (HT-0300)

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 lower speed.

●Features

- The 5-digit display enables wide-range measurement from 4 to 50,000 r/min (when several reflective marks are used).
- A large-size display (character height 10.5 mm) is adopted to the compact, lightweight body.
- Memory function for easy confirmation of the measurement results
- Even it is shiny shaft its rotation can be measured by using the reflective marks provided as standard.
- Measurement can be performed over a wide range from 30 to 50,000 r/min, in 1 r/min unit (When one reflective mark is used.).
- Safe measurement available for being detectable from a position away from the measurement target (20 to 300 mm).
- Continuously displays the latest measurement value for approx. 30 seconds after power off.
- Displays the timing of battery replacement.

●Specifications

Detection method : red visible light photoelectric reflection method
Detection distance : 20 to 300 mm
Display : LCD, 5 digits (character height ; 10.5 mm), fixed measurement unit (r/min)
Display update time : 1 second automatic repeat (however, 2 seconds when the circumferential speed is lower than 60/reflective marks r/min)
Measurement range: measurement unit ;1r/min
Affixing of multiple reflective marks enables measurement of lower rotation speeds.

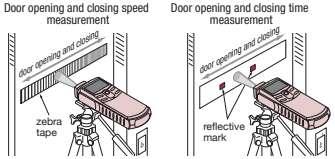
Measurement range	Number of reflective marks
30 to 50,000 r/min	1
15 to 25,000 r/min	2
10 to 16,667 r/min	3
8 to 12,500 r/min	4
5 to 8,333 r/min	6
4 to 6,250 r/min	8

Measurement accuracy (when one reflective mark is used) :
30 to 12,499 r/min; within ±1 r/min
12,500 to 24,999 r/min; within ±2 r/min
25,000 to 50,000 r/min; within ±4 r/min
Pulse number setting function :
The number of reflective marks used can be specified in order to perform measurement from lower rotation speeds.
setting values; 1, 2, 3, 4, 6, 8 P/R
Memory function : 10 data can be memorized.
Data hold function : The power automatically turns off 30 seconds after the end of measurement.
Low battery display : "LOW" mark is displayed when the battery voltage drops 3.3 V or less.
Over range display : "ERROR" mark is displayed.
Power source : AAA battery×3
Battery life : approx. 20 hours (when using alkaline batteries at 20 ºC)
Operating temperature : 0 to 40 ºC
Storage temperature : -10 to + 55 ºC
Operating (storage) humidity : 35 to 85 %RH (with no condensation)
Outer dimensions : 62 (W)×129(H)×26.4 (D) mm
Conforming standard : CE marking
Weight : approx. 90 g (not including batteries)
Accessory : reflective marks 1 sheet (12 mm square×25 marks), AAA battery×3, instruction manual (English, Japanese)×1 each
Option : reflective mark 12mm square×25; 10 sheets 1set (HT-011)
carrying case (HT-0400), soft case (HT-0003)

HT-5510 Digital handheld speedometer

●Features

- The HT-5510 is the model added two functions (opening and closing speed measurement and door opening and closing time measurement functions) to the HT-5500 handheld digital tachometer.



●Specifications

Measurement section
Measurement method : visible light reflection method
Calculation method : period calculation method
Measurement time : 50 ms + input signal within one period time
Measurement unit : r/min, r/s (rotation speed), m/min (circumferential speed, moving speed), ms (period, moving time, COUNT (integration count))
Measurement range: door opening and closing speed measurement ; 0.6 to 45 m/min (1 pulse interval 4 mm)
door opening closing time measurement ; 0.6 to 9999.9 ms
rotation measurement mode; same as HT-5500 (P.25)
Measurement accuracy : display value × (± 1%) ± 1 count (Displayed value is a count value excluding decimal point.)

Detection section
Detection method : visible light photoelectric reflection method
Detection distance : 30 to 70 mm
Light source : red light emitting diode
Light receiving element : phototransistor
Detection mark : 1 reflective mark/ 1 rotation, high precision reflection zebra tape

Measurement function
Peak hold function : maximum value (MAX), minimum value (MIN)
Memory function : up to 20 data
Over range function : Over range (ERROR mark) is displayed when a measured value exceeds the measurement range.
Rotation upper limit warning function : When the rotation speed exceeds the preset upper limit value, displays upper limit warning (↑ mark).
Circumferential speed calculation function : [non-contact type]
Calculates the circumferential speed from the preset diameter value (mm) and the measured rotation speed. [contact type]
Uses circumferential ring KS-100/200
Integration count function: Measures the period of the input pulse.
Period measurement function : Measures the period of input pulse.
However, if it is less than 1 second, average value of input pulse
Rotation speed : non-contact type (with reflective mark), contact type (using KS-300)

Output section [analog output]
Output voltage : 0 to 1 V/0 to F.S. (Full scale is arbitrarily set.)
Conversion method : 10 bit D/A conversion method
Linearity : ± 1%/F.S.
Output update time : 50 ms + input pulse within 1 period time
Temperature stability : ± 0.05% / F.S./ °C (span & zero)
Full scale setting error : ± 0.5 % F.S.
Load resistance : 100 kΩ

Output section [pulse output]
Output voltage : Hi level···4.5 V or more (when detecting with reflective mark), Lo level···0.5 V or less
Output logic : positive logic
Load resistance : 100 kΩ or more

General specification : P.25 same as HT-5500
Accessory : high precision reflective zebra tape (1 m) x 2 rolls 1 set
Other accessories are same as P.25 HT-5500.
Option : high precision reflective zebra tape (1 m) x 2 rolls 1 set
Other optional items are same as P.25 HT-5500.

HR-6800 High speed rotation type

●Features

- High-speed rotation measurement from 100 to 999,990 r/min
- Built-in memory function, up to a maximum of 20 data can be saved to memory.
- Both analog and pulse outputs provided as standard. Used for recording rotation speeds, confirming detected waveforms and as rotation synchronization signals
- Built-in peak hold function: The maximum and minimum values can be displayed during measurement.
- Large LCD with backlight

●Specifications

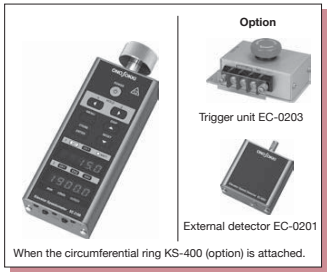
Measurement section
Measurement target: rotating objects used in dentistry, texturizing machine, high-speed machine tools
Note: target measurement objects must be magnetized.
Display section : LCD with backlight, 5-digit (character height: 10.2 mm)
Measurement time : 50 ms + input signal within 10 periods
Display update time: approx. 1 s/approx. 0.5 s selectable
Measurement unit : 10 r/min (rotation speed)
Rotation speed measurement range : 100 to 999,990 r/min (range selectable)
Measurement accuracy : display value × ± (0.02 %) ± 1 count
Peak hold function : maximum value (MAX), minimum value (MIN)
Memory function : up to 20 data
Over range display : When the measured value exceeds the measurement range, over range (ERROR mark) is displayed.
Rotation upper limit warning function : When the rotation speed exceeds the preset upper limit value, upper limit warning (↑ mark) is displayed.
Analog output section : output voltage; 0 to 1 V/0 to F.S. (F.S.: arbitrarily set.)* output update time; 50 ms + input pulse within 10 period time
Monitor output : for monitor analog output after waveform shaping of sensor pulse (before pulse waveform conversion)
Pulse output : 1 pulse output per pulse detection
output voltage; Hi level···4.5 V or more, Lo level···0.5 V or less
Power supply : AAA battery ×4 or a dedicated AC adapter (PB-7090, sold separately)
Battery life : approx. 13 hours (when the backlight is OFF), approx. 8 hours (when the backlight is ON) (using alkaline batteries, at 20 °C)
Low battery display : "LOW" mark is displayed when the battery voltage drops 4.5 V or less.
Operating temperature : 0 to 40 °C
Storage temperature : -10 to 50 °C
Operating (storage) humidity : 35 to 85% RH (with no condensation)
Outer dimensions : 66 (W) × 189.5 (H) × 47.5 (D) mm
Conforming standard : CE marking
Weight : approx. 230 g (main unit only, not including batteries)
Accessory : AAA battery×4, adapter for tripod mounting (MI-0301)×1, carrying case×1, instruction manual (basic operation, function explanation) × 1 each
Option : output signal cable 2m (AX-501)
dedicated AC adapter (PB-7090)
Stand jig (HT-0521B)
Magnet stand (HT-0522)
Measurement tripod (LA-0203D)
(Airy L 100 made by SLIK)
Tripod mounting adapter (MI-0301)

Detection section (sold separately)
Dedicated detector : MP-5350
Detection method : electromagnetic induction method
DC resistance value: 25 to 40 Ω (20 °C)
Connection cable (included) : 1 m (both ends BNC connector included)
Operating temperature : 0 to 40 °C
Storage temperature : -10 to 50 °C
Vibration and shock resistance : 19.6 m/s^2 · 490 m/s^2
Outer dimensions : 107 x ø 14 mm
Conforming standard : CE marking
Weight : approx. 50 g (detection section only)

*Please refer to HT-5500 for electrical specification of analog output.

Elevator Speedometer EC-2100

Handheld Type Speedometer



When the circumferential ring KS-400 (option) is attached.

●Features

- Analog output function
- Maximum value hold function
- Memory function
- Function of remaining battery level
- Auto power off function
- Averaging function
- Distance measurement function (option)

●Specifications

Measurement method : contact type
Measurement range :
speed; 0.1 to 2,000.0 (m/min)
rotation speed; 1 to 20,000 (r/min)
distance (option); 0 to ±999 (mm)
*Distance measurement up to ±5000 mm is available. However, measurement values more than ±999 mm is not guaranteed.
Measurement accuracy :
±1 count (not including the error due to camera shake and slippage of contact part.)
Measurement time : 10 ms
Display : 5-digit, 7 segment, red LED in two-step display
Display update time : 100 ms
Resolution : 0.1 (m/min/average number 10 or more), 1 (r/min, average number 10 or more), 1 (mm)
Measurement unit : m/min, r/min, mm (option)
Auto power off function :
The power automatically turns off 180 seconds after the last operation.
Data hold function : data hold of each channel (CH 1, CH 2, Max value, each independent)
Averaging function : 1 to 200 times (optionally setup)
Memory function : Up to 10 measurement results can be stored in the main unit.

Output section

Analog output : output content; instantaneous value (output after averaging processing) voltage range; 0 to 1 V/0 to F.S. conversion method; 10-bit D/A conversion linearity; ±1% F.S. output update time; 10 ms output connector; ø 2.5 mm pin-jack
Pulse output : output method; transistor output (open collector) withstand voltage; 14 V current; 20 mA or less number of pulses; 600 pulses / rotation logic; negative logic pulse width; approx. 0.5 to 1.2 µs output connector; ø 2.5 mm pin-jack

Detection section

Number of generated pulses :
150 pulses/ rotation, slit reflection method
Light source : infrared-emitting diode
Light receiving element : photodiode
Allowable shaft load: radial; 5 kg, thrust; 5 kg
Bearing life : 2×10^7 r/min·h (maximum load within the specification)

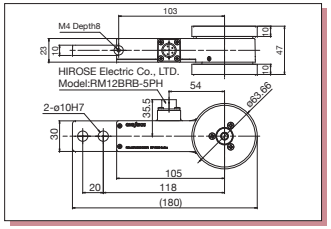
General specification

Power supply : AA battery x 3 pieces
Battery life : 15 hours or more (continuous using at room temperature)
Current consumption : 100 mA max. (power voltage 4.5 V)
Operating temperature : 0 to 45 °C
Storage temperature : -10 to 60 °C
Operating (storage) humidity : 35 to 85 % (RH) (with no condensation)
Outer dimensions : 60 (W) × 162 (L) ×38 (D) mm
Conforming standard : CE marking
Weight : approx. 423 g (including batteries, not including the circumferential ring)
Accessory : EC-0922 external hold signal cable (1.4m) x 1 set (2 pieces)
EC-0925 carrying case x 1 piece
hexagonal wrench (opposite side:1.5mm) x 1 piece
AA battery x 3 pieces
Instruction manual x 1 piece
Option : EC-0202 Distance measurement function
*If ordering after delivering the main unit, installation fee is required separately.
KS-400 circumferential ring (wide type) ;15 mm
KS-500 circumferential ring (narrow type) ;2 mm
KS-0800 circumferential ring (rubber coating wide type) ;15 mm
KS-300 rotating contact tip
EC-0924 relay shaft for rotating contact tip
EC-001A external hold detection switch
EC-0921 signal cable (5 m)
EC-0923 pulse output cable (2 m)
EC-0926 trigger unit cable (1.5 m)
AX-501 analog output cable (2 m)
EC-922 external hold signal cable (1.4 m) × 1 set (2 pieces)
EC-0925 carrying case × 1 piece

* Please visit our website for more details on EC-2100.

Line Speedometer (Roller Encoder) RP-7400 series

Low to medium speed applications



●Features

- Number of pulses selectable from 120, 200, or 1200 P/R
- Wide variety of output signal
Totem pole (standard), Collector (option)
Emitter (option), Open collector (option)

●Specifications

Electrical specification

Number of output pulses : speed; 120, 1200 P/R length; 200 P/R
Output waveform : 2-phase rectangular wave
Duty ratio : 50 ±25 %
Phase difference : 90 ±45°
Output voltage (when 12 VDC is supplied.) : Hi; 10 V or more, Lo; 0.5 V or less
Output method : Totem pole output (load resistance 470 Ω or more)
Options; RP-0701 Emitter output
RP-0702 Collector output
RP-0703 Open collector output
Power supply : 12 VDC±5 % (100 mA or less)

General specification

Operating temperature : 0 to +50 °C (with no freezing, no condensation)
Storage temperature : -10 to +65 °C (with no freezing, no condensation)
Operating humidity : 35 to 93 % RH or less (with no freezing, no condensation)
Protection class : IP 40 (when RP-0181/0182 cable used)
Conforming standard : CE marking
Weight : approx. 400 g
Accessory : instruction manual x 1
connector (RM12BPE-5S) x 1; HIROSE Electric Co., LTD.

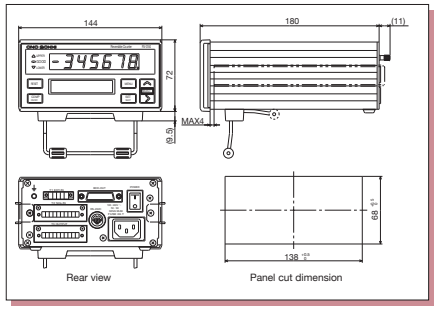
Mechanical specification

Speed range : 0 to 600 m/min
*Speed measurement range depends on condition of measurement object.
Measurement unit : 120 P/R 0.1 m/min
1200 P/R 0.01 m/min
200 P/R 1 mm
Roller material : mandrel; aluminum
rubber; polyurethane rubber baked on the roller surface (rigidity A90)
Roller outer circumference : 200 mm
Maximum allowable load : radial 20 N
Starting torque : 1 mN·m
Moment of inertia : 0.6 kg·cm^2
Vibration resistance : 19.6 m/s^2
X/Y/Z each direction (150 minutes each)
10 to 150 Hz sweep, 20 cycles
Shock resistance : 196 m/s^2
±X/Y/Z (3 times for each, total 18 times)
Mounting hole (position) :
ø10 mm x 2, 20 mm of interval
Option : RP-0701 Emitter output
RP-0702 Collector output
RP-0703 Open collector output
RP-0181 cable (5 m) P.36-37
RP-0182 cable (5 m) P.36-37

* Please visit our website for more details on RP-7400 series.

Length Meter RV-3150

Reversible Counter



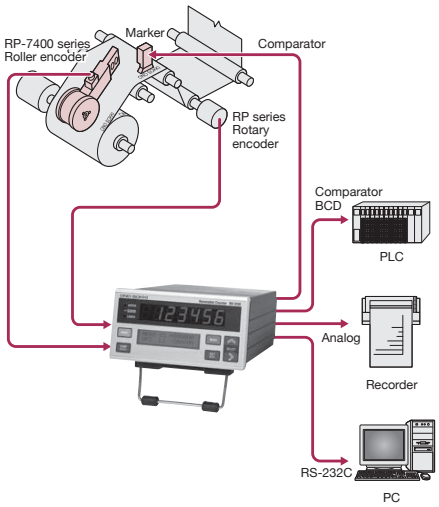
●Features

- Reversible counter designed to measure linear position, displacement, dimensions and so forth
- Easy-to-read large size LED (14 mm)
- Wide range of external output functions (comparator, analog, BCD, and RS-232C communication)
Four comparator setting values can be saved as conditions.

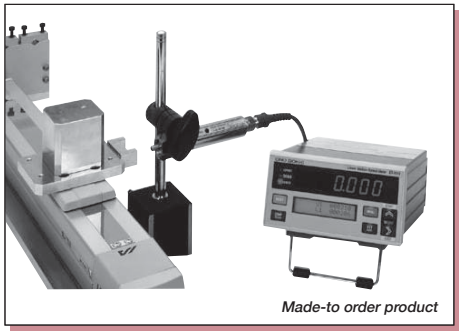
●Specifications

Applicable sensor : RP series (Rotary encoder)
RP-7400 series (Roller encoder)
GS series (Linear gauge sensor)
*Conversion cable required
Display section : main display; red LED (14mm), 6-digit and polarity (0 to ±999999)
sub display; LCD, 16 characters x 2 lines, with backlight (yellow green)
decimal point; 0, 0.0, 0.00, 0.000 (selectable)
condition display; comparator condition; UPPER (red) / GOOD (green) / LOWER (red)
Sensor input signal : single phase or 90°phase difference square wave voltage pulse (Hi...4 to 30 V, Lo...0 to 1 V)
line receiver (conforms to RS-422A)
input frequency range...DC to 100 kHz
Power supply for sensor : selectable from
5 ± 0.25 VDC (max 150 mA)
12 ± 0.6 VDC (max 120 mA)
External control signal : format of input signal; voltage input (Hi; 4 to 5.25 V, Lo; 0 to 1 V), Non-voltage contact input
types of input signal; reset, gate, offset, key protect
Mode/function : multiplication; 1/2/4
ratio compensation range; 0.000001 to 0.999999
exponent value; 1/1, 1/10, 1/100, 1/1000
offset setting range; 0 to ±999999
Comparator function : setting range; 0 to ±999999
setting step; 2 steps
output parameter; LOWER (Lower setting value ≧ calculated value)
GOOD (Lower setting value < calculated value < upper setting value)
UPPER (Upper setting value ≦ calculated value)
output format; semiconductor relay (single make contact each)
Max. contact capacity; 30 VDC, 0.1 A
update time: within 15 ms
BCD Input/Output : output signal (BCD, polarity, judgment, error, print command)
open collector (withstand voltage: max. 30 V)
control signal (reset, hold)
input format (voltage input); Hi; 4 to 5.25 V, Lo; 0 to 1 V
Analog output : output voltage range; 0 to ±10 V/F.S. (F.S. can be set arbitrarily.)
load resistance; 10 kΩ or more
linearity error; ± 0.3 % of F.S.
calibration function; ZERO / FULL, 12 bit D/A method
update time; within 15 ms
RS-232 communication : function; readout of data and parameter, setting of parameter
baud rate; 2400/4800/9600 bps
Power requirement : 100 to 240 VAC (50/60 Hz)
Power consumption : 30 VA or less
Operating temperature : 0 to +40 °C
Storage temperature : -10 to +55 °C
Operating/storage humidity : max. 95 % (with no condensation)
Weight : approx. 1.3 kg
Withstand voltage : 1500 VAC (between power supply·GND, 1 min)
Insulation resistance : 10 MΩ or more (at 500 VDC mega)
Accessory : power cable x 1, panel mounting fixture x 1 set, stand foot x1 set, rubber foot x 1 set, terminal socket (5 pins) x 1/ (10 pins) x 2, instruction manual x 1
Option : BCD cable 3 m (AA-8107)
RS-232C cable 2 m (AX-5022B)

• System Configuration Example



Liner motion speedometer

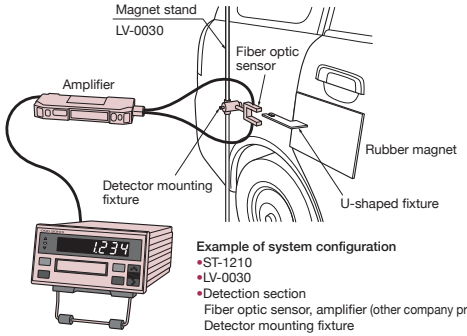


Made-to order product

●Feature

- It enables to measure the passing speed such as a plunger speed of an injection cylinder, passing speed of open/close sections (doors) of a vehicle with high accuracy.
- The distance between two points can be set arbitrarily.
- Passing time can be measured in minimum resolution (by 1 μs)

• Measurement of automobile door opening /closing speed

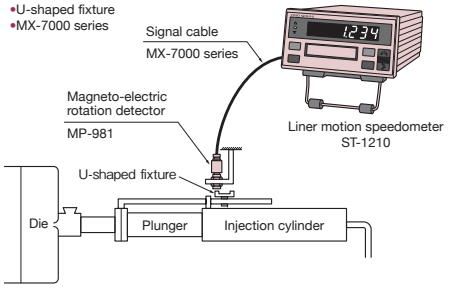


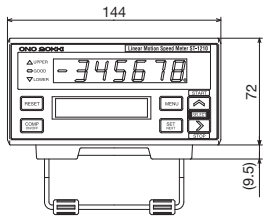
Liner motion speedometer ST-1210

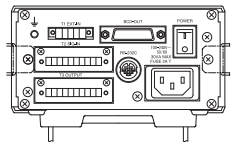
Example of system configuration
- ST-1210
- LV-0030
- Detection section
  Fiber optic sensor, amplifier (other company products)
  Detector mounting fixture
  U-shaped fixture
  Rubber magnet

• Speed measurement of die-cast machine

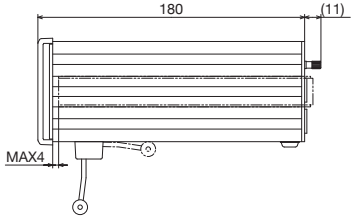
Example of system configuration
- ST-1210
- MP-981
- U-shaped fixture
- MX-7000 series

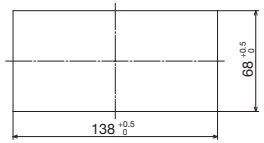






Rear view





Panel cutout dimensions

●Specifications

Input section

[Signal input section]
Input signal type
- Input voltage level : Hi level ; +4 to +30 V
  Lo level ; 0 to +1 V
- Number of input channels : 2 (Ch.A and Ch.B)

[External control signal input]
- Input signal type : Input voltage level Hi level ; +4 to +5.25 V
  Lo level ; 0 to +1 V
  non-voltage contact input (open voltage 5.25 V or less, short-circuit current 1 mA or less)

Signal type
- Reset : Reset the count value to zero and recover error status.
- Start : Start measurement and enable input pulse.
- Key protection : Disable the key switch setting on the front panel. Disable setting changes.

Display section

[MAIN data display unit]
- Display : red LED with 7-segment
- Display range : 0 to 999999
- Display (measurement) update time : approx. 0.5 seconds

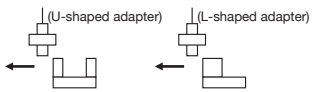
[SUB parameter setting display section]
- Display : LCD module
- Display item : The selected data or set value is displayed in two rows.

Measurement mode

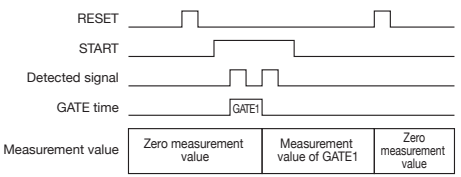
[ST-901 mode]
- Measurement range : 0.050 to 99.999 m/s
- Measurement distance : 32 mm (fixed)
- Detection adapter : U-shaped type (fixed)
- Number of sensor channels : 1 ch (A ch input fixed)
- Measurement operation : After turning ON the start signal, it starts measurement with the first pulse signal and stops measurement with the second pulse signal.

[ST-902 mode] The mode in which a comparator function is added to the functions of the ST-901 mode.

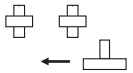
[USER mode]
- Measurement range : 0.050 to 99.999 m/s
- Measurement time : 3.2 to 999.9 ms (approx. 1 seconds)
- Distance between two points : arbitrarily setting available, setting range; 16 to 9999 mm (= 9.999 m)
- Detection adapter : U-shaped type or L-shaped type
- Number of sensor channel : 2 ch (A ch & B ch)
- Measurement operation :
  SINGLE operation
  : equivalent to ST-901



Timing chart (when using U-shaped adapter)



DUAL operation
: A ch side input=measurement start
B ch side input=measurement stop



- Measurement unit : m/s or km/h
- Decimal point : none, 0.0, 0.00, 0.000

[Passing time measurement mode]
- Max. measurement time : max. 999.999 ms (approx. 1 seconds)*
  *It can be modified up to 10 seconds.
- Measurement accuracy : display value × 0.1%±1 count
- Measurement operation : same as the USER mode
- Decimal point : none, 0.0, 0.00, 0.000

Output section

[Comparator function (excluding ST-901 mode)]
- Operation : comparison with the main display value
- Setting range : 0 to 999999
- Number of setting stages : 2 stages
- Output item : LOWER / GOOD / UPPER
- Output type : semiconductor relay (each with one make contact)
- Contact capacity : max. DC 30 V, 0.1 A
- Output update time : 20 ms or less after completion of measurement
  LOWER; ON when setting value ≧ measurement value
  UPPER; ON when setting value ≦ measurement value
  GOOD; ON when all the conditions other than above

[BCD input/output section (excluding ST-901 and ST-902 mode)]
- Operation : output for the main display value
- Signal item : BCD output/judgment output/error output/print command output/reset input/start input
- Output update time : 20 ms or less after completion of measurement
- Output method : open collector output
- Input type : HI level; 4 to 5.25 V, LO level; 0 to +1 V

[Analog output (excluding ST-901 and ST-902 mode)]
- Operation : conversion and output for the main display value
- Conversion method : 12 bit D/A conversion
- Output voltage range : 0 to 10 V/F.S (F.S: setting arbitrarily)
- Output update time : 20 ms or less after completion of measurement
- Load resistance : 10 kΩ or more

[RS-232C communication (excluding ST-901 and ST-902 mode)]
- Function : reading of measurement data, setting and reading of parameters
- Baud rate (selectable) : 2400/4800/9600 bps

Power supply for sensor

- Select either voltage : DC 5 V (max 120 mA, total of A ch and B ch) or DC 12 V (max 120 mA, total of A ch and B ch)

General specification

- Power requirement : AC 100 to 240 V, (50/60 Hz)
- Power consumption : 30 VA or less
- Operating temperature range : 0 to 40 °C
- Storage temperature : -10 to 55 °C
- Operating (storage) humidity : 95% max. (without condensation)
- Weight : approx. 1.3 kg
- Withstand voltage : 1500 VAC (between power supply and GND for one minute)
- Insulation resistance : more than 10 MΩ(with a 500 VDC megger)
- Accessory : power cable (for AC100 V) x 1, panel mounting fixture x 1, foot stand x 1, rubber foot x 1, terminal board socket (10 pin×2, 5 pin×1), instruction manual x 1
- Option : BCD cable 3 m (AA-8107)
  RS-232C cable 2 m (AX-5022B)
  Detection adopter (made-to-order) (32 mm); U-shaped type, L-shaped type
  Magneto-electric rotation detector (MP-981)
  Photoelectric rotation detector (LG-9200)
  Signal cable (MX-7000 series)

F/V Converter FV-1100

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

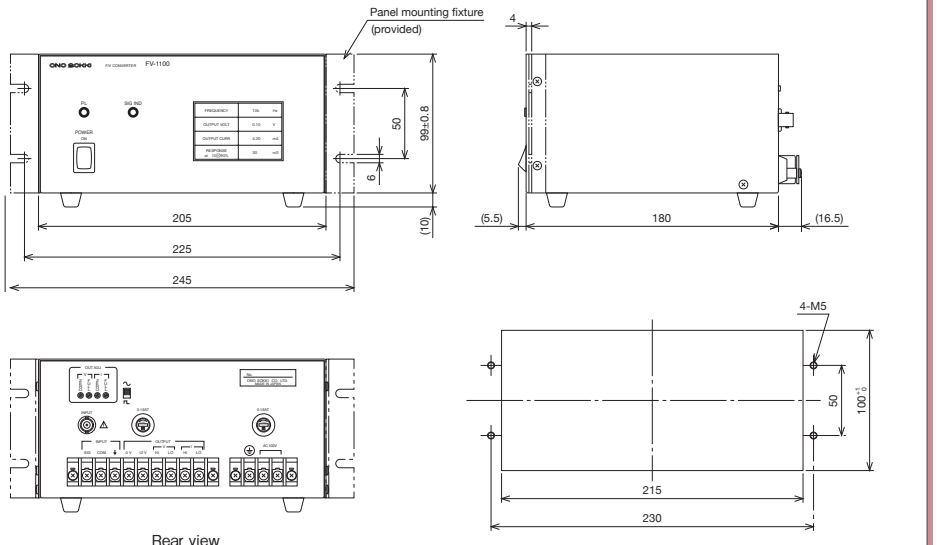
General-purpose type

●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) (Once the frequency is fixed, 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

Conversion method	: constant width pulse integration method
Response	: 30 ms (Varies according to the frequency optionally specified.)
Input frequency range	: 10 kHz as standard (optionally specified from 100 Hz to 100 kHz)
Input terminal	: BNC (C02), terminal block (3.5 M)
Input voltage	: AC input; sine wave ; 0.2 to 50 Vrms square wave ; 0.6 to 70 Vp-p 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 (0 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 (Input frequency level during 5% of full-scale frequency input)
Detector power supply	: 12 VDC ±10 % 100 mA
Power requirement	: within AC 85 to AC 110 V, 46 to 63 Hz (110/120/200/220/240 VAC on request)
Operating temperature range	: 0 to +40 °C
Weight	: approx. 2 kg
Accessory	: power cable for 100 VAC (AX-2050N, 3m) x 1 flat-bladed screwdriver x 1 panel mounting fixture x 1 instruction manual x 1



Rear view

Panel cut dimension

F/V Converter FV-1500

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

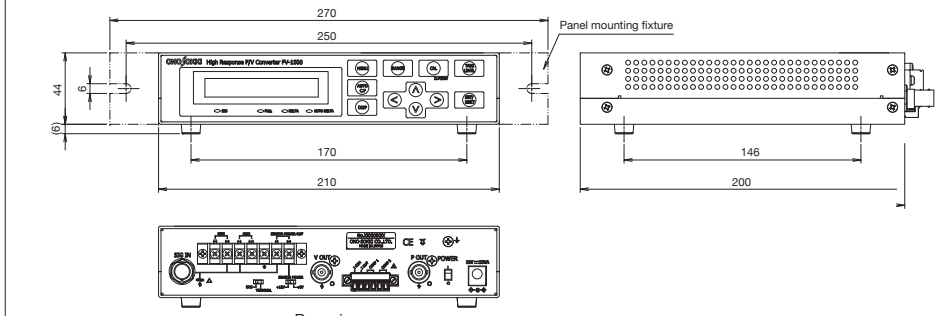
High response type

●Features

- Wide frequency range: 0.2 Hz to 320 kHz
- High-speed response of every signal period
- Rotation direction judgment using two-phase signal input
- Rapid deceleration follow-up function
- Automatic center frequency follow-up function can analyze transient fluctuation component (option)

●Specifications

Response	: within 1period time of input frequency + 3.5 µs
Input voltage	: AC input signal voltage range; 0.3 to 30 Vp-p DC input signal voltage range; Hi +4 to +30 V, Lo 1 V or less
Input frequency range	: 0.2 Hz to 320 kHz For full scale mode output; • Can be set between 1 and 320000 Hz every 1 Hz • Can be set between 1 and 320000 r/min every 1 r/min • Can be set between 1 and 320000 m/min every 1 m/min For deviation mode; Selectable from the measurement frequency range up to 320 kHz ±1 %, ±5 %, ±10 %, ±20 %, ±50 %, ±100 % or ±1 to 180,000 (can be set every 1Hz, 1r/min, or 1m/min.)
Input terminal	: BNC (C02) or terminal block selectable
Input format	: single-phase, AC/DC/non-voltage selectable (+12 V pull-up for open collector devices) Two-phase signal with 90° phase difference (DC input only)
Filter	: OFF / 20 kHz / 120 kHz low-pass filter
Analog output terminal signal	:
	voltage output; 0 to 10 V (Full scale mode signal output, direction recognition function OFF) ± 5 V (Full scale output mode, direction recognition function ON, deviation mode, automatic center frequency follow-up mode) Load resistance 100 kΩ or more
	current output; 0 to 16 mA (at the time of shipment)/4 to 20 mA Load resistance 500 Ω or less
Linearity	: voltage output; DC: ±0.1 % (to 180 kHz), ±0.2 % (to 320 kHz) AC: ±0.2 % (to 180 kHz), ±0.4 % (to 320 kHz)
	current output; DC: ±0.7 % (to 180 kHz), ±1.4 % (to 320 kHz) AC: ±1.4 % (to 180 kHz), ±2.8 % (to 320 kHz)
Analog output low pass filter	: OFF/ 3 Hz/ 10 Hz/ 1 kHz selectable
Analog output terminal	: BNC/C02 type (voltage output) or terminal block (phoenix contact: MC1,5/6-STF-3,81) (voltage output) selectable
D/A resolution	: 16-bit
Display	: fluorescent display tube (display range 69.85 mm × 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 Selectable by switch on the real panel.
Operating power voltage range	: 16 VDC dedicated AC adapter (100 to 240 VAC) provided as standard
Operating temperature	: 0 to +40 °C
Storage temperature	: -10 to 50 °C
Operating humidity	: 5 to 80 % RH (with no condensation)
Storage humidity	: 5 to 85 % RH (with no condensation)
Weight	: approx. 1 kg
Accessory	: dedicated AC adapter (AC adapter: PS-P20023D cable: VM1391-VM1700 2m) x 1, instruction manual x 1, connector (MC1.5/6-STF-3.81)× 1 (equipped with the main body)
CE marking	: Low Voltage Directive; 2006/95/EC EN61010-1:2010 EMC Directive; 2004/108/EC EN61326-1:2006 Class A Table 2
Option	: FV-0151 (Automatic center frequency follow-up function) FV-0152 (Comparator output function) FV-0153 (Deviation scale change function) FV-0154 (Open collector output function) FV-0014 (Panel mounting fixture)

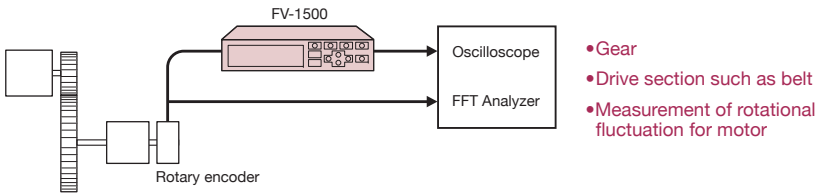


Rear view

* Please visit our website for more details on FV-1500.

F/V converter application

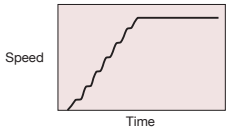
• **FV-1500 High-speed F/V Converter** High-speed cycle conversion output for each cycle



- Gear
- Drive section such as belt
- Measurement of rotational fluctuation for motor

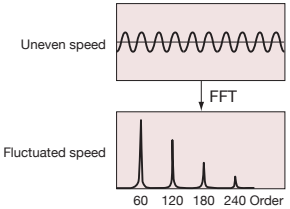
Measurement of rising characteristics

Checking if the rotation rises smoothly.



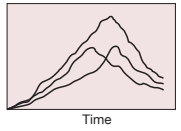
Measurement of rotational fluctuation

Order ratio analysis



Measure how many times the uneven speed occurs during one rotation. In this example, the speed fluctuates 60, 120, 180, and 240 times during one rotation.

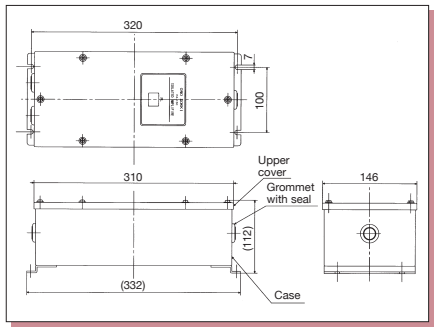
Tracking analysis



At which rotation speed the maximum speed fluctuation occurs while the rotation speed is changing.

Isolated Signal Amplifier PA-150

Signal Amplifier



●Features

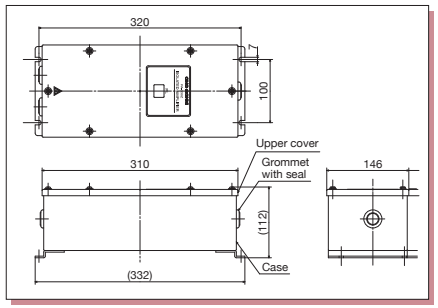
- Used as an amplifier for electromagnetic detectors under electrically bad environment.
- Converts the input signal into a high-voltage low-impedance signal to transmit the signal to remote locations accurately.
- 12 VDC power terminal for use with various sensors.
- Terminal block allowing easy wiring,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

●Specifications

Input amplification	: AC amplification
Input impedance	: differential input: approx. 70 kΩ (50 kHz) single-ended input: approx. 45 kΩ (50 kHz)
Input waveform	: sine wave or rectangular wave (with a duty of approx 1:1)
Input sensitivity	: sine wave input ; 0.1 Vrms, rectangular wave input; 0.3 Vp-p (max. allowable bias voltage: ± 1 VDC)
Frequency range	: 1 Hz to 50 kHz
Operating voltage range	: sine wave input ; 0.1 to 30 Vrms rectangular wave input; 0.3 to 30 Vp-p
Max. input apply voltage	: sine wave; 100 Vrms, rectangular wave; 100 VDC
Output waveform	: rectangular waveform
Voltage output	: max. peak voltage (Vp-p) ; 12 ±1 V max. bias voltage (VBIAS); 0.5 V or less *When OUT2 and OUT1 is short-circuited and no load between COM2 and OUT1/2. output impedance; approx. 330 Ω
Open collector output	: collector maximum applied voltage; 40 VDC collector maximum input current; 50 mA *Between OUT2 and OUT1; open Between OUT1 and COM2; collector maximum applied voltage, and collector maximum input current
Power source	: 12 VDC ± 5 %, 100 mA max.
Operating temperature	: -10 to 40 °C
Storage temperature	: -20 to 70 °C
Power requirement	: 100 VAC ±10 %, 50/60 Hz
Power consumption	: approx. 8 VA
Weight	: approx. 4 kg
Accessory	: crimp terminal x 11, fuse for 200/220V x 1, instruction manual x 1
Terminal block	: applicable to JIS C 2805 2-4 crimp terminal

Isolated Signal Amplifier PA-330Z

Signal Amplifier



●Features

- Can be used as an insulated amplifier by receiving square wave output from rotary encoder.
- Low impedance transmission for long distance available after wave-shaping.
- Supplies 12 VDC to DC power type RP series.
- The case is sealing structure which allows close mounting to the encoder.
- Isolated shielded type to allow installation on site. Noise-resistant.

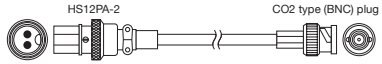
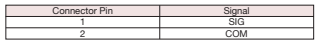
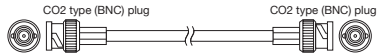
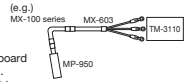
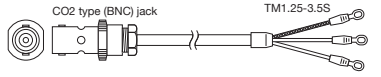
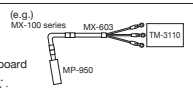
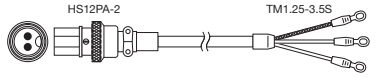
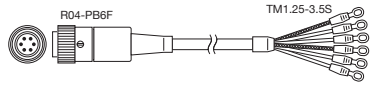
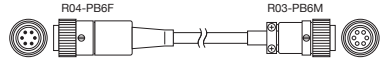
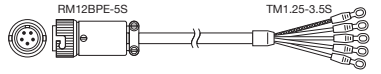
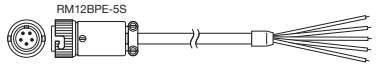
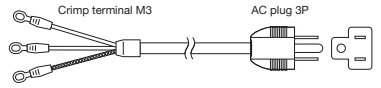
●Specifications

Number of input phases	: three-phase
Input resistance	: 470 Ω
Input waveform	: rectangular waveform approx. 50 % duty
Input voltage	: Hi; 8 to 12.5 V, Lo; 0 to 4 V
Frequency range	: 0 to 50 kHz
Output voltage	: Hi; 10 V±2 V (5 kΩ load), Lo; 0.5 V or less (5 kΩ load)
Output resistance	: collector resistance 330 Ω
Delay time	: approx. 2 μs between input and output
Operating power supply	: 100 VAC, approx. 12 VA
Power source	: 12 VDC, 0.15 A
Operating temperature	: -5 to 40 °C
Storage temperature	: -10 to 70 °C
Weight	: approx. 4 kg
Accessory	: crimp terminal
Terminal strip	: applicable to JIS C 2805 1.25 to 3 crimp terminal
Optional modification	:

Item	Modified specification	Standard
Open collector output	Max. rating : 40 VDC, 50 mA	Collector output
Power voltage	AC110 V	100 VAC
	AC200 V	
	AC220 V	
Input resistance	1.5 kΩ	470 Ω
	47 kΩ*	
Output resistance	220 Ω (Output Z is not available.)	330 Ω (three-phase)

Please specify the item and specification to be modified when ordering.
* Modification of input resistance to 47 Ω is required when RP-1700 series with C specification (collector output type/ pull up resistance 470 Ω) is used.

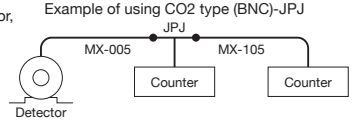
Table of Signal Cable

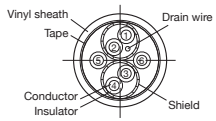
Item	Compatible Detectors	Cable	Model Name	Specifications	Compatible Products	Non-compatible Products	Remarks
1	MP-9100/9120/9200/940A/963 MP-810/820/830 (MP-081+MX-005 series)	3C-2 V (High-frequency coaxial cable)	MX-005 5m 010 10m 015 *15m 020 *20m		FV-1100/1500	Counter without a BNC input connector * However, if the input connector is connected to the terminal block's display unit, connection is enabled by using a cable combination (MX-000 series+ MX-603.)	
2	MP-930/935/936/950/954/962 FG-1300	3C-2 V (High-frequency coaxial cable)	MX-101 1.5m 105 5m 110 *10m 115 *15m 120 *20m		FV-1100/1500 TM-3100 series TM-5100 * The TM-5100 has a terminal board socket for signal input/output. To connect to the TM-5100, it is required to process the cable end by removing a crimp terminal. 	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-100 series+ MX-603.)	The following models have a directly attached cable. MP- 930: 0.5 m MP-950: 0.5 m 935: 1 m 954: 0.5 m 936: 1 m 962: 0.5 m
3	MX-000 series cables, MX-100 series cables	P-2 (2-core outer shield cable)	MX-603 0.3m (Junction cable)		PA-150 TM-3100 series TM-5100 * The TM-5100 has a terminal board socket for signal input/output. To connect to the TM-5100, it is required to process the cable end by removing a crimp terminal. 		Use only for connecting the compatible detectors at item No.1 & 2 when the input connector is the terminal block's display unit. Connector / Color of Code / Signal The Center Contact / White / SIG Shell / Green / COM Shell / Shield / Case Ground
4	MP-9100/9120/9200/940A/963 MP-810/820/830 (MP-081+MX-500 series)	P-2 (2-core outer shield cable)	MX-505 5m 510 10m 520 20m		FV-1500, PA-150, TM-3100 series/5100 * The TM-5100 has a terminal board socket for signal input/output. To connect to the TM-5100, it is required to process the cable end by removing a crimp terminal.	Counters without an input terminal block	Connection to counter Connector / Color of Code / Signal Contact 1 / White / SIG Contact 2 / Green / COM Housing / Shield / Case Ground
5	MP-981/9820 LG-9200	D5-UL (Composite 5-core vinyl sheath cable)	MX-7105 5m 7110 10m 7115 15m 7120 20m		FV-1100/1500, PA-150, TM-3100 series/5100 * The TM-5100 has a terminal board socket for signal input/output. To connect to the TM-5100, it is required to process the cable end by removing a crimp terminal.		Connection to counter Connector Pin / Color of Code / Signal A / Blue / SIG B / White / Unused C / Red / +12 V D / Shield / Case Ground E / Green / COM F / Black / 0 V
6	MP-981/9820 LG-9200	D5-UL (Composite 5-core vinyl sheath cable)	MX-8105 5m 8110 10m 8115 15m 8120 20m		TS-2800/3200A (LG-9200 cannot be used.)	Counters other than those listed in the column at the left	The connector pin arrangement is the same as MX-7105 to 7120.
7	RP-7400 series	D5-UL (Composite 5-core vinyl sheath cable)	RP-0181 5m *10m		PA-150 TM-3100 series	Counters without an input terminal block	Connector Pin / Color of Code / Signal 1 / Blue / SIG1 2 / White / SIG2 3 / Red / +12 V 4 / Shield / Case Ground 5 / Green / COM Black / 0 V
8	RP-7400 series	D5-UL (Composite 5-core vinyl sheath cable)	RP- 0182 5m *10m		RV-3150 TM-5100		Connector Pin / Color of Code / Signal 1 / Blue / SIG1 2 / White / SIG2 3 / Red / +12 V 4 / Shield / Case Ground 5 / Green / COM Black / 0 V
9	TM-3100 series	Power cable for general purpose	AX- 2050N 3m Compliant with Electrical Appliance and Material Safety Act				

* Made to order

• When several counters are connected to one detector, it is convenient to use BNC-JPJ connector.

Example of using CO2 type (BNC)-JPJ





• R6 Cable

Identification of wire core

No.	1	2	3	4	5	6
Color	Blue	Green/Gray	White	Green/Brown	Red	Black

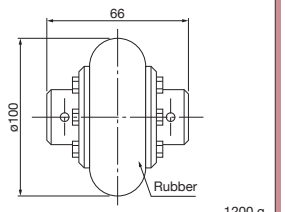
Related Products
Signal Cables

Coupling Selection Guide

When connecting an electromagnetic rotation detector to a device, a rigid coupling will give accurate transmission of rotation and angle. However, if there is misalignment of the centering or allowance in the thrust direction, the bearing will be elastically deformed, which will impair accuracy or damage the detector.
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.

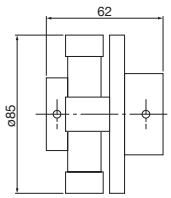
• Recommended coupling shape/weight

Fig.1 Rubber flex coupling
RF-100



1200 g

Fig.2 Center flex coupling
CF-A-002-02



1000 g

Coupling name	Application	Features	Allowable eccentricity, deflection angle [Note 1]	Detaching method	Remarks	Manufacturer
Rub flex coupling RF-100 etc. Fig.1	MP-810B MP-200	• Relaxation of rubber impact elasticity • Vibration damping	Rotation speed: 2000 r/min Deviation: 1.5 mm Deflection angle: 6 °	Attach the flange to the detector and the machine side. After setting to the dimensions specified in the centering rules, attach the rubber tire. Removable without moving system.	At high speed, expansion of the rubber due to centrifugal power causes a thrust power and it damages the detector. Drive side shaft diameter ø 10 to ø 22 [Note 2]	Nitta Chemical Industrial Products Co., Ltd.
Center flex coupling CF-A-002-02 Fig.2		• Absorbs vibrations and shocks • Does not occupy wide space in the axial direction	Rotation speed: 5000 r/min Deviation: 0.5 mm Deflection angle: 1 °	Attach the flange hub and hub to the detector and the machine side, and attach the rubber body after centering.	Drive side shaft diameter ø 10 to ø 25	Miki Puli Co., Ltd.

[Note 1] Allowable eccentricity and deflection angle are the ranges that guarantee the performance as a coupling. However, please avoid installing in the way that the detector shaft exceeds the specified load even if it is within the allowable range.
[Note 2] Customers should prepare hole machining on the drive shaft side.

** For details of coupling, please contact each manufacturer.*