LG/SP/MP/RP series
FV/FT/HT/TM series

Digital Tachometer

ONO SOKKI

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

Rotation Detector Selection Guide

FV Converter
FV-1500 (P.22)

Cable (P.28-31)

- **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

Rotary Encoder
SP-405ZA (P.14)

Coupling (P.23)

- **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.

Digital Tachometer
TM-4100 series (P.16-19)
TM-4200 series (P.16-19)

Cable (P.28-31)

Digital Tachometer
TM-4100 series (P.16-19)

Cable (P.28-31)

Reversible Counter
TM-4300 series (P.16-19)

Cable (P.28-31)

Roller Encoder
RP-7400 series (P.15)

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

Photoelectric Rotation Detector
LG-9200/930 (P.12)
FS-540/542/5500, FG-1300 (P.13)

Cable (P.28-31)

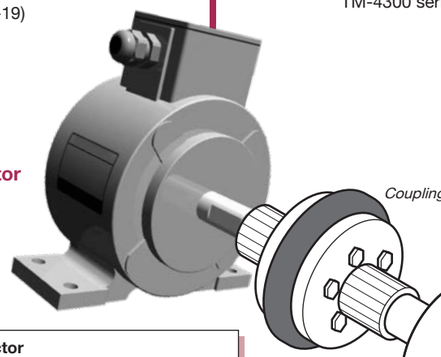
Digital Tachometer
TM-4100 series (P.16-19)
TM-4200 series (P.16-19)

Handheld Digital Tachometer
HT series (P.25-26)

Contact type

Non-contact type

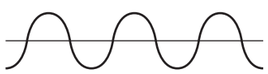
Electromagnetic Rotation Detector (Built-in Gear Type)
MP-800 series (P.11)



Coupling (P.23)

- **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-9810, 9830 & 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.

Electromagnetic Rotation Detector (External Gear Type)
MP-900/9000 series (P.5-9)

Cable (P.28-31)

Digital Tachometer
TM-4100 series (P.16-19)
TM-4200 series (P.16-19)

Detection gear

Cable (P.28-31)

Magneto-electric Rotation Detector (External Gear Type)
MP-9810/9830 (P.10)
AP-981 (P.10)

- **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

Digital Tachometer
TM-4100 series (P.16-19)
TM-4200 series (P.16-19)

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

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.

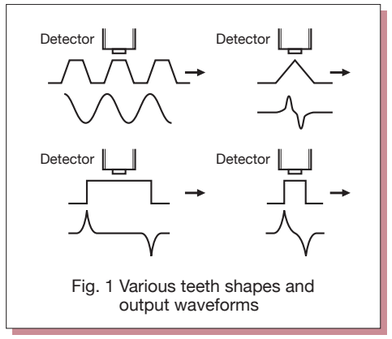


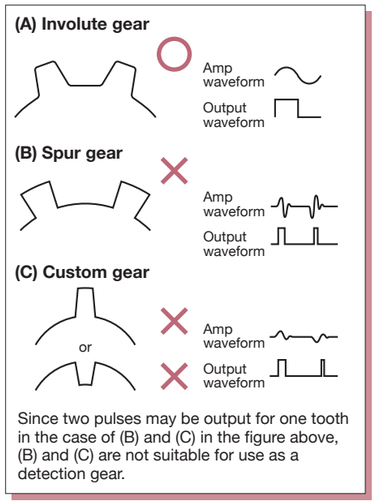
Fig. 1 Various teeth shapes and output waveforms

Abbreviation of gears: M=Module Z=number of teeth D=pitch circle diameter of gear

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

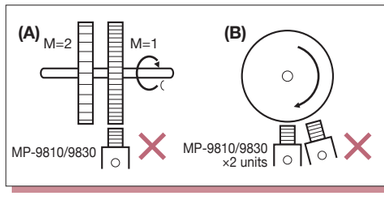
●Shape of the gear for the MP-9810/9830 and the mounting method

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



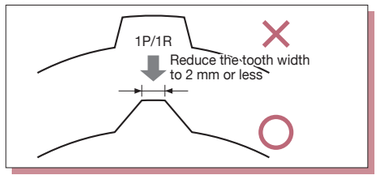
Since two pulses may be output for one tooth in the case of (B) and (C) in the figure above, (B) and (C) are not suitable for use as a detection gear.

(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-9810/9830.
In the case of (B), two or more MP-9810/9830 units are mounted within the vicinity of one gear.

(3) How to use a custom gear

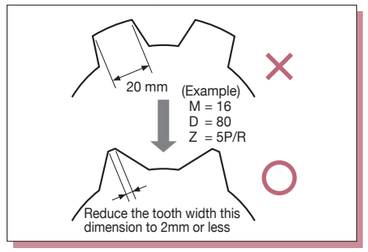


(4) How to calculate Module M

This calculation is for involute gears only

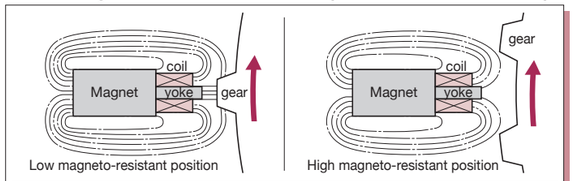
$$\text{Module } M = \frac{\text{Reference pitch circle diameter}}{\text{Number of teeth}}$$

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



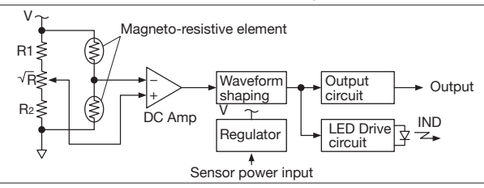
Electromagnetic Rotation Detectors and Magneto-electric Rotation Detectors

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-9810/9830, AP-981)

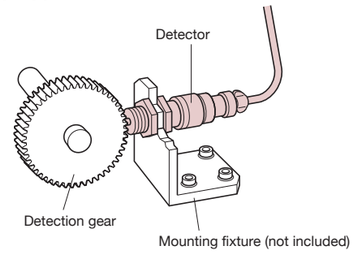


Magneto-electric rotation detector is made by applying a magneto-resistive element whose resistance value varies depending on the intensity of the magnetic field. Normally, a constant magnetic field is applied by a magnet, and the change in the magnetic field when the detection gear approaches the element is detected as a change in the resistance value. The use of two elements reduces the effect on the detection magnetic flux due to factors such as gap changes, making it possible to output a stable detection signal.
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 square wave with fast rise and fall time. Since the magnetic resistance elements are arranged at the tip of the detector and the gear detection requires directionality, the detector has an alignment mark.

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 P28-31).

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

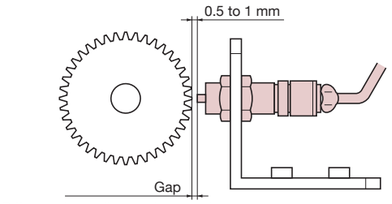
*1 Protective type F: Not affected harmful by oil droplets/oil spill from any direction.

- **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



Different depending on the model (See P.7)

** 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.

●MP-900/9000 series specifications

Items \ Detectors	General-purpose	General-purpose (With cable attached)	Low impedance (High-speed rotation type)	Oil-proof (With cable attached)	Oil-proof/Heat-resistant (150 °C) (With cable attached)	Heat-resistant (220 °C) (With cable attached)
	MP-9100	MP-911	MP-9120	MP-930	MP-935	MP-936
DC resistance value (Ω)*1	850 to 950		85 to 105	850 to 950	600 to 700	800 to 900
Inductance (mH) [1kHz, T.Y.P]	300		30	300	270	370
Impedance (Ω) [1kHz, T.Y.P]	2 k		240	2 k	1.8 k	2.5 k
Output voltage (Vp-p) [1kHz, T.Y.P]*2	2.0 or more					
Detectable frequency range (Hz) *3, *4	200 to 35,000		200 to 80,000	200 to 35,000	300 to 35,000	
Detecting gear module	1 to 3					
Operating temperature range	-10 to 90 °C				-10 to 150 °C	-10 to 220 °C
Vibration resistance (m/s^2)*5	196					
Shock resistance (m/s^2)*6	1,960					
Weight (g)	Approx. 90	Approx. 300 (Including cable)	Approx. 90	Approx. 100 (Including cable)		
Surrounding magnetic field (T)	0.03 or less				0.02 or less	

Items \ Detectors	Long body	Long body (With cable attached)	Compact type (With cable attached)	Compact type (With cable attached)	Ultra-compact type (With cable attached)	For small modules	For medium modules
	MP-940A	MP-954	MP-950	MP-962	MP-992	MP-9200	MP-963
DC resistance (Ω)*1	500 to 600	2.1 to 2.3 k		1.25 to 1.45 k	160 to 190	850 to 950	3.7 to 4 k
Inductance (mH) [1kHz, T.Y.P]	270	400		210	25	300	1800
Impedance (Ω) [1kHz, T.Y.P]	1.8 k	3.5 k		2.1 k	250	2 k	16 k
Output voltage (Vp-p) [1kHz, T.Y.P]*2	2.0 or more			1.5 or more	0.5 or more	0.6 or more (M=0.75)	2.5 or more
Detectable frequency range (Hz)*3, *4	300 to 35,000			400 to 35,000	400 to 100,000	300 to 35,000	45 to 15,000
Detecting gear module	1 to 3					0.5 to 1	3 to 10
Operating temperature range	-10 to 90 °C				-10 to 120 °C	-10 to 90 °C	
Vibration resistance (m/s^2)*5	196						147
Shock resistance (m/s^2)*6	1,960						
Weight (g)	Approx. 150	Approx. 90 (Including cable)	Approx. 70 (Including cable)	Approx. 50 (Including cable)	Approx. 3 (Including cable)	Approx. 90	Approx. 200
Surrounding magnetic field (T)	Up to 0.01			Up to 0.005	Up to 0.001	Up to 0.005	Up to 0.03

*1: The temperature coefficient for the DC resistance value: 0.4% / °C
*2: Load resistance: 10 kΩ, M=1, gap=0.5 mm (As for MP-963; load resistance 10 kΩ, M=3, gap=1.5 mm)
*3: When using the 60 P/R detection gear, the value for frequency [Hz] and value for rotation speed [r/min] are the same.
*4: When using the Ono Sokki standard MP-001 detection gear (when using a gear with M=3 for MP-963, M=0.75 for MP-9200)
*5: JIS E 4031, five types, 40 Hz, two hours in each of the X and Y directions; four hours in the Z direction
*6: Three times each in the X, Y and Z directions

• Notes on the Detection Gear

a) Gap between the detector and the detection gear
The smaller the gap, the lower rotation speed can be detected.
The gap should normally be set between 0.5 to 1 mm.

b) Detection gear tooth shape
An involute gear is recommended.

c) Gear size
The module unit (M) is used. This value is used to determine the size of the teeth. Modules with the same number of teeth can be meshed.

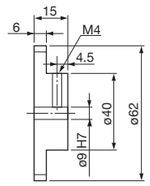
$$\text{Module} = \frac{\text{Pitch circle diameter}}{\text{Number of teeth}}$$

We recommend a module of greater than 1 and the width of teeth 5 mm or more. As for MP-9810/9830, we recommend a module of 0.5 to 3, the width of teeth 3 mm or more. For details, please refer to P10.

d) Detection gear material
Material with a property of being strongly attracted to a magnet, (ferromagnet) is good to use. If you have a choice, we recommend materials such as S45C, SS400, SUS430, etc.

•Ono Sokki's Standard Detection Gear MP-001

The detection gear Ono Sokki provides is a module 1 involute gear with 60 teeth.
Number of teeth: 60
Module : 1
Material : SS400 (surface treatment: trivalent chromate)



●The relationship between the gap and detection range

(1) The relationship between the gap from the detector to the detection gear and the detection range (lowest measurable value) is given in the tables below.
(2) The rotation speed range where an output voltage of 0.5 Vp-p or more can be maintained. (load resistance = 10Ω)
(3) The measureable rotation speed varies according to the type of display unit used.

• MP-900/9000 series measureable rotation speed (r/min)

** When using a detection gear with 60 teeth*

Model	Module	Lower limit of rotation speed						Upper limit of rotation speed
		M=1		M=1.5		M=2		
	Gap	0.5	1	0.5	1	0.5	1	
MP-9100		200	500	50	300	30	100	35,000
911		200	500	50	300	30	100	35,000
9120		200	500	50	300	30	100	80,000
930		200	500	50	300	30	100	35,000
935		300	1200	75	300	40	100	35,000
936		300	1000	75	300	40	100	35,000
940A		300	1200	80	300	50	130	35,000
950		300	1000	100	300	60	150	35,000
954		300	1200	100	300	60	150	35,000
962		400	1500	140	420	80	200	35,000

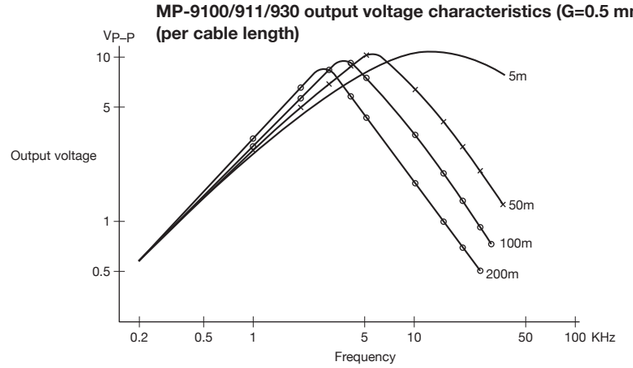
Model	Module	M=1		M=1.5		M=2		Upper limit of rotation speed
	Gap	0.2	0.5	0.2	0.5	0.2	0.5	
MP- 992		400	1000	230	600	140	330	100,000

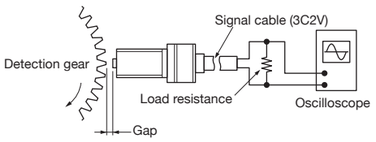
Model	Module	M=0.5	M=0.75		Upper limit of rotation speed
	Gap	0.2	0.2	0.5	
MP- 9200		2,000	300	1,000	35,000

Model	Module	M=3		M=5		M=7.5		Upper limit of rotation speed
	Gap	1	2	1	2	1	2	
MP- 963		45	90	25	50	20	45	15,000

**The data is standard value and do not warrant the operation. When using our rotation detectors.*

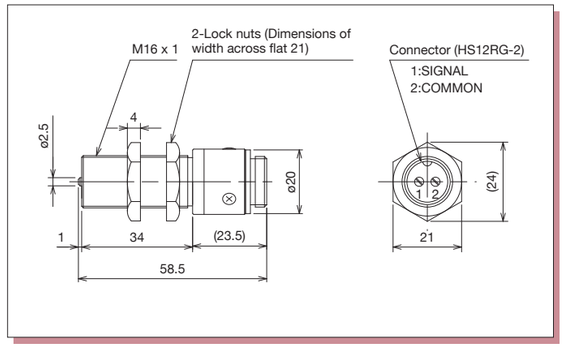
MP-9100/911/930 output voltage characteristics (G=0.5 mm) (per cable length)



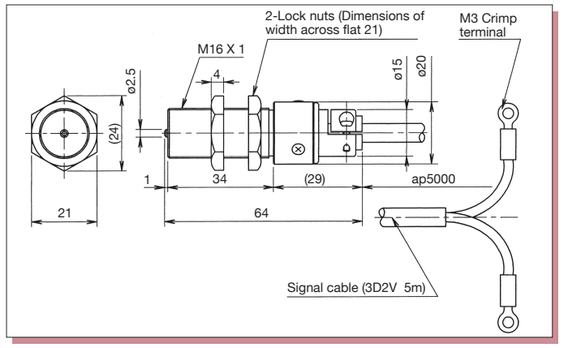


[Measurement conditions]
Detection gear: M = 1, Z = 120 P/R
Load resistance: R_L = 10 kΩ
Gap: G = 0.5 mm

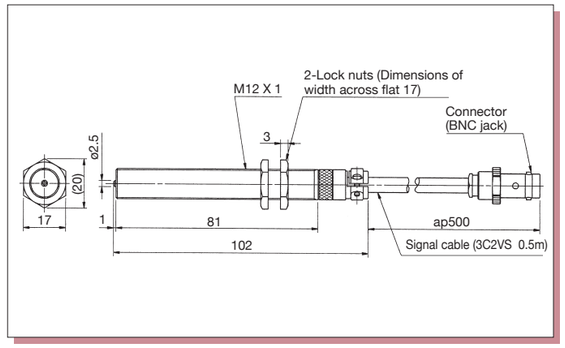
●MP-9100



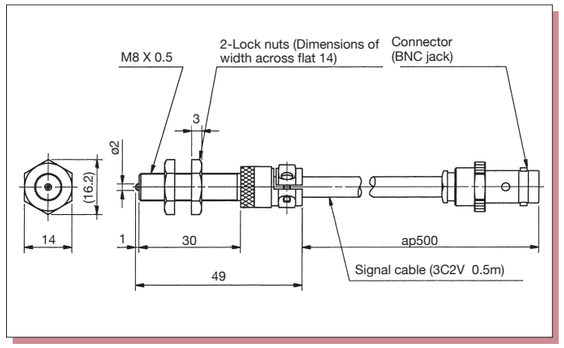
●MP-911



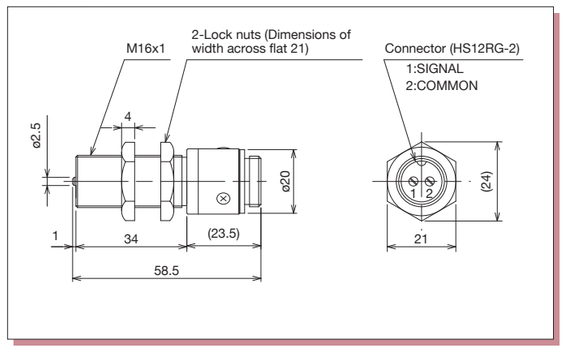
●MP-954



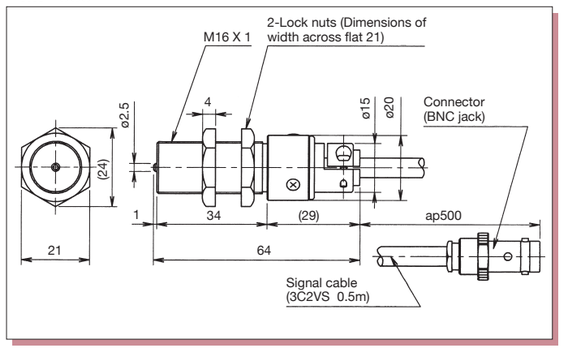
●MP-962



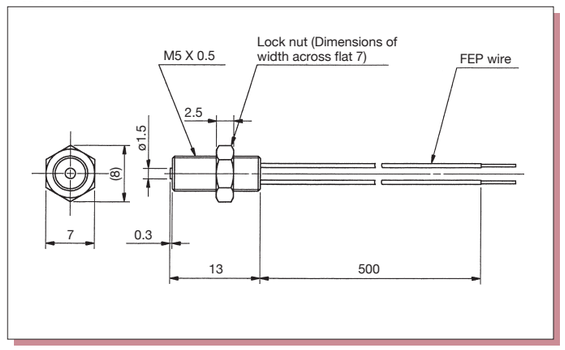
●MP-9120



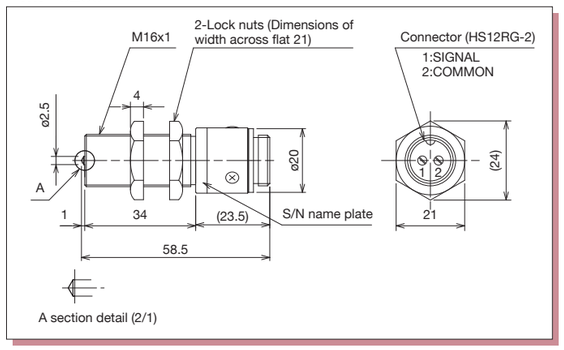
●MP-930



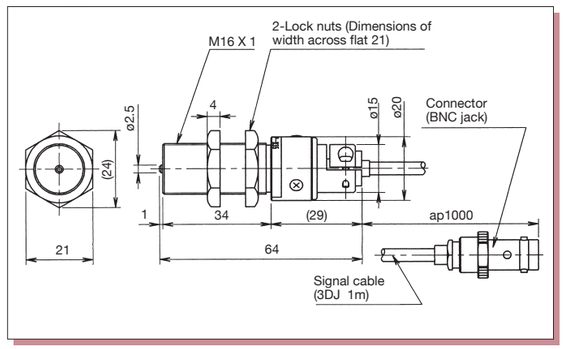
●MP-992



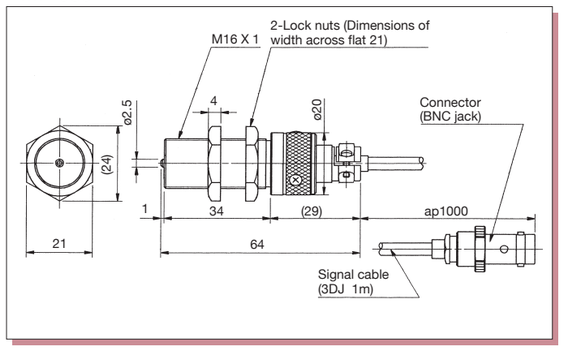
●MP-9200



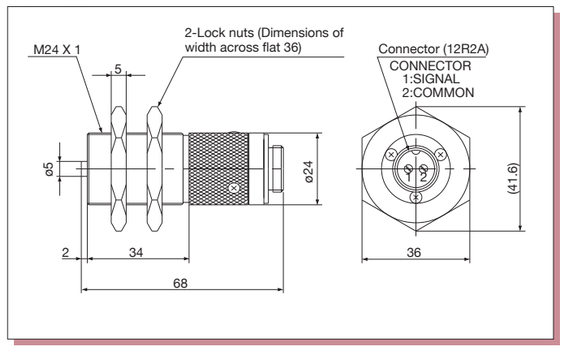
●MP-935



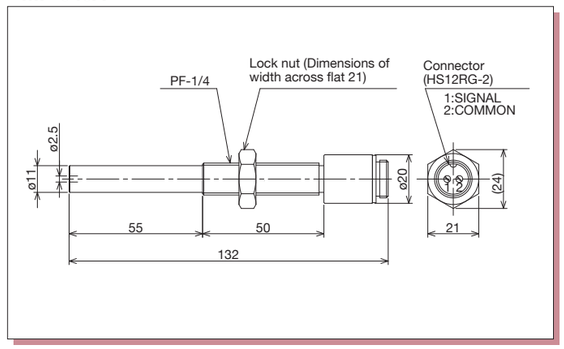
●MP-936



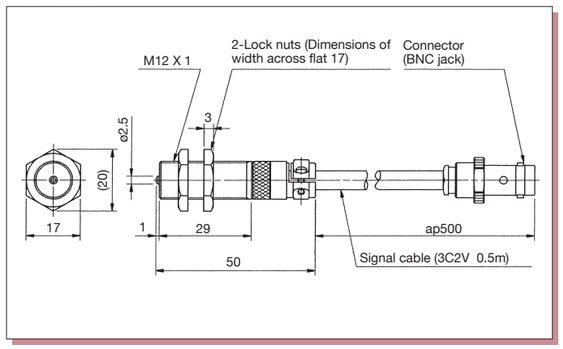
●MP-963



●MP-940A



●MP-950

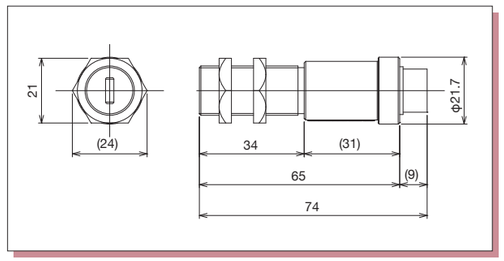


Magneto-electric Rotation Detector MP-9810/9830

General-purpose/ high speed detection type

This is a magnetic flux response type detector (the resistance value changes according to the magnetic flux) which internally has magnetic resistance elements, permanent magnets, a direct current amplifier, and a voltage regulator. It can detect over a wide range of rotation speed from ultra low speed to high, and outputs the results as a square waveform.

MP-9810
MP-9830



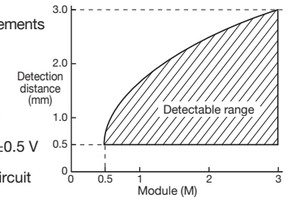
●Features

- Detection from 0 r/min
- Output as a square wave from ultra-low to high speed (1 to 100,000 r/min [60-teeth gear])
- IP67 compliant: Improved environmental resistance

●Specifications

Detection method : detection using magnetic resistance elements
Detection range : MP-9810···0 Hz to 20 kHz
MP-9830···0 Hz to 100 kHz*1
Detection gear : ferromagnet (tooth width: at least 3 mm, module: 0.5 to 3)
Detection distance : see the graph at the right
Power requirement : DC 12 to 24 V ±10 % (10.8 to 26.4 V)
Power consumption : approx. 40 mA (at 12 V, 25 °C)
Output waveform : square wave, Lo; 0.5 V or less, Hi; 5 ±0.5 V
Output impedance : approx. 330 Ω
Protective circuit : power source polarity, output short-circuit protection
Operating temperature : -10 to + 70 °C
Storage temperature : -20 to +80 °C
Withstand voltage : DC 500 V (1 minute)
Vibration resistance (conduction) :
50 m/s², 11 ms
10 to 150 Hz, 150 minutes each in X/Y/Z directions
Shock resistance (non-conduction) :
500 m/s², 11 ms impact duration,
3 times each in ±X/Y/Z directions
Connection method : see P.28-31
Weight : approx. 80g (including the two nuts used for fastening)
Protection clas : IP67
Conforming standard*2 : CE marking
Accessory : nut for fastening x 2, instruction manual ×1

Module and detection distance



MP-9810
• Rotation speed: 1 to 20,000 r/min (60 P/R)
• Temperature: 25 °C

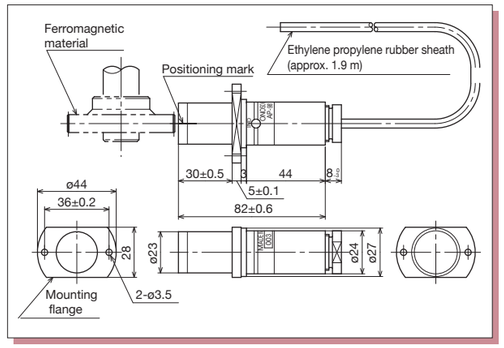
MP-9830
• Rotation speed: 1 to 100,000 r/min (60 P/R)
• Temperature: 25 °C

*1: The maximum measurement range varies depending on the gear module used. 100 kHz is the frequency at 16,666 r/min using a 0.5 module, 360 P/R gear.
*2: EMC non-compliant when using another company's product with power supplied from an external source.

Magneto-electric Rotation Detector AP-981

Acid-resistant, waterproof type

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



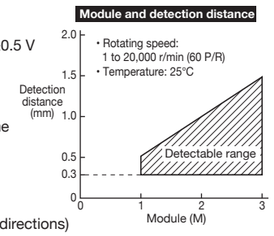
●Features

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

●Specifications

Detection method : detection using magnetic resistance elements and magnetic gears
Detection range : 1 Hz to 20 kHz
Detection gear : ferromagnet (tooth width: at least 3 mm, module: 1 to 3)
Detection distance : see the graph at the right
Power requirement : 12 ±2 VDC
Power consumption : approx. 30 mA (at 12 V, 25 °C)
Output waveform : square wave, Lo; 0.5 V or less, Hi; 5 ±0.5 V
Output impedance : approx. 330 Ω
Protective circuit : power source polarity, output short-circuit protection
Operating temperature : -10 to 70 °C
-10 to 50 °C (with a nitric acid fume concentration of 10%)
Storage temperature : -20 to 80 °C
Withstand voltage : 250 VDC
Vibration resistance (conduction) :
1.2 mm compound amplitude, 30 Hz
(for 1 hour in each of the X, Y, and Z directions)
Shock resistance (non-conduction) :
490 m/s² (three times each in the X and Y directions)
Outer surface material : polycarbonate
Connection method : 1.9 m length directly attached cable (other end: open)
Weight : approx.130 g (including a signal cable)
Accessory : instruction manual ×1
*The cable length can be specified as 5, 10, 15 and 20 m.

Module and detection distance

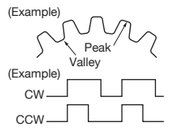


Caution

MP-9810/9830 and AP-981 have been designed for the purpose of detecting rotation speed. Please observe the following points when using these detectors.

(1) A square wave with the same amplitude is output as the result of rotation measurement from low speed to high speed (1 to 20,000 r/min: 60 gear teeth per a gear). However, it does not necessarily mean that the high level is appeared at the peak of the gear, the low level at the valley. The starting points may not be the same when using several detectors for synchronous operation.

(2) The output pulse width may be different depending on the rotating direction of a detection gear (CW direction / CCW direction).



Electromagnetic Type Rotation Detector MP-800 series

Low-to-medium speed

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

●Features

- There are three models in the series, differentiated by their outer appearances.

MP-810: base mount type
MP-820: dual-shaft type
MP-830: flange type

- Number of output pulses

Model	Number of Pulses (P/R)
MP-810F, 820F	300
MP-810G, 820G, 830G	60, 120, 360
MP-810B, 820B, 830B	600

** Models other than MP-810B are made-to-order products.*

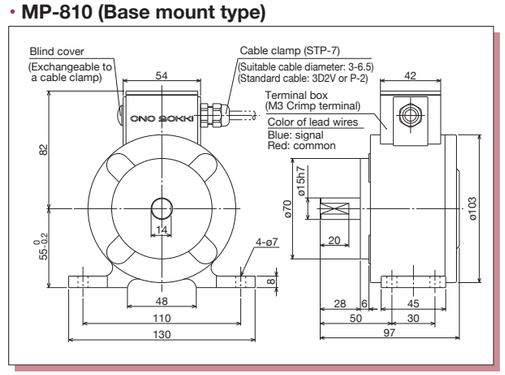
●Specifications

Rotating speed range : 5 to 5,000 r/min
Output waveform : approximate sine wave
Output voltage : 0.5 Vp-p or more
DC resistance value : 770 ±30 Ω
Inductance : 2 H typ. (at 1 kHz)
Starting torque : 245 mN·m or less
Moment of inertia : approx. 1.5 kg·cm²
Allowable shaft load : radial 147N, thrust 98N
Vibration resistance : 98 m/s² in each direction of X, Y, Z (for 2 hour)
Shock resistance : 980 m/s² in each direction of X, Y and Z (three times each)
Operating temperature : -10 to 80 °C
Weight : approx. 2 kg
Connection method : M3 crimp terminal (JIS C 2805 1.25-3) (When using MP-081) See P28 to 31
Cable outlet : cable clamp (complies with IP-68)
Surrounding magnetic field : up to 0.01 T
Option : connector output (MP-081)

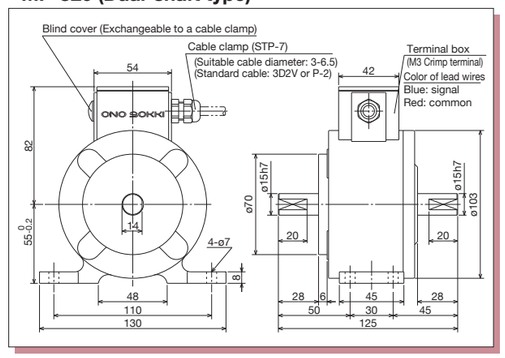
Connector

Connector plugs 12P2B
For attachment to the terminal box (with covers)

• MP-810 (Base mount type)



• MP-820 (Dual-shaft type)



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

• Number of output pulses

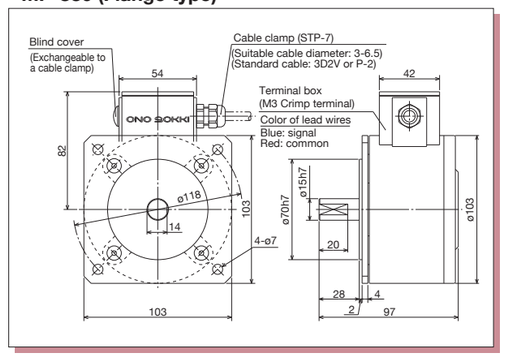
Model	Number of Pulses (P/R)
MP-837J	180
MP-837K	240
MP-837L	300
MP-837M	360
MP-837N	420

●Specifications

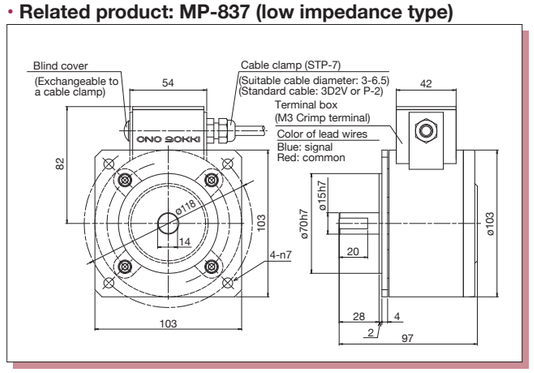
Rotation speed : 50 to 2500 r/min
Output voltage : 1.5 Vp-p or more
Direct current resistance value : 50 ± 5 Ω
Inductance : 0.12 H typ. (at 1 kHz)

* The other than the above are same as MP-810/820/830.

• MP-830 (Flange type)



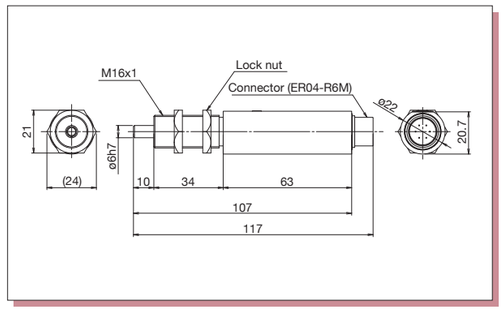
• Related product: MP-837 (low impedance type)



Photoelectric Detector LG-9200

Compact optical detector

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



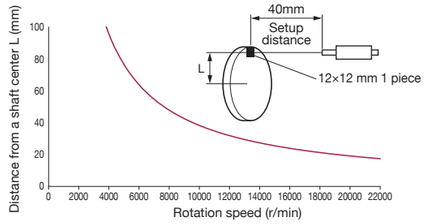
●Features

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

●Specifications

Detection method	: visible light photoelectric reflection method
Detecting distance	: recommended distance 20 to 40 mm (when using a dedicated reflective mark 12 mm square)
Maximum response speed	: 40 m/s (converted to circumferential speed of rotating shaft)
Response delay time	: 0.6 ms (light receiver conversion time) or less
Light source	: light emitting diode (red visible light)
Light receiving element	: phototransistor
Power requirement	: 12 ±2 VDC
Current consumption	: 60 mA or less (at 12 V)
Output waveform	: rectangular wave; Hi ... 5 ± 0.5 V, Lo ... 0.5 V or less
Output impedance	: 1 kΩ or less
Connection method	: see P28 to 31
Operating temperature	: -10 to 60 °C
Storage temperature	: -20 to 80 °C
Vibration resistance	: 19.6 m/s^2 in each direction of X, Y, Z
Shock resistance	: 490 m/s^2 in each direction of X, Y and Z (three times each)
Conforming standard	: CE marking
Weight	: approx. 150 g (including 2 nuts for fastening)
Accessory	: reflective mark (12 mm square, 25 sheets) × 1, mounting nut × 2, instruction manual × 1

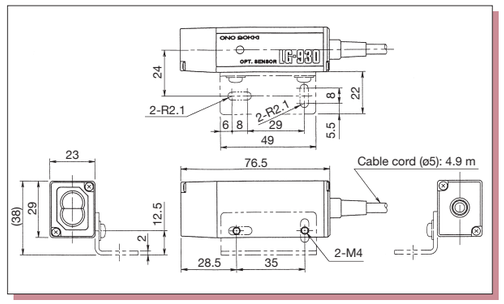
• Measurement range of the LG-9200



Photoelectric Detector LG-930

Compact, optical model designed for the long-distance detection

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



●Features

- Can detect the target up to 200 mm away.
- Compact design, only small installation space required. An L-shaped mounting fixture for installation provided.
- Visible light is used for easy positioning, and the built-in operating indicator light enables easy setup.
- The pulse lighting method ensures that the LG-930 is virtually unaffected by ambient light.

●Specifications

Detection method	: visible light photoelectric reflection method
Detection distance	: 70 to 200 mm (when using dedicated reflective mark of 12mm square)
Object detected	: reflective mark
Maximum response speed	: 25 m/s (when using the dedicated 12-mm-square reflective mark, affixing interval 48 mm)
Response delay time	: 0.5 ms (light receiver conversion time) or less
Light source	: light emitting diode (red visible light)
Light receiving element	: phototransistor
Power requirement	: 12 ± 2 VDC
Current consumption	: 85 mA or less (at 12 V)
Output waveform	: rectangular wave; Hi: + 5±0.5 V, Lo: 0.5 V or less (load resistance: 100 kΩ or more)
Output impedance	: 1 kΩ or less
Operating temperature	: -10 to + 60 ºC
Storage temperature	: -20 to +80 ºC
Input/output connectors	: directly attached cable with the other end open
Cable length	: 4.9 m
Weight	: approx. 300 g
Accessory	: reflective mark (12 mm square × 25 sheets)× 1 mounting fixture × 1, screw× 2, instruction manual× 1

Photoelectric Rotation Detector FS-540/542/5500, FG-1300

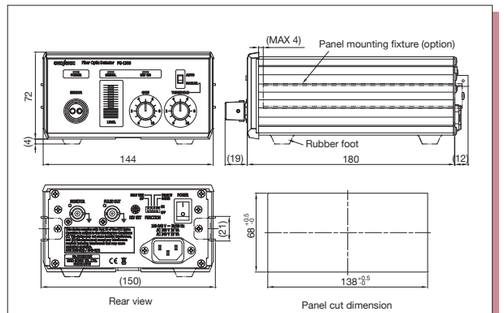
Fiber Optic Sensor/Fiber Optic Sensor Amplifier

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

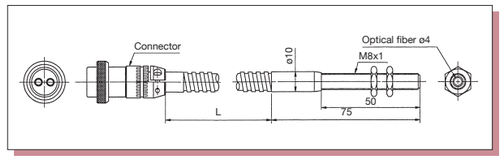
●Features

- 10 kHz of maximum response frequency. Supports detection of high-speed rotation.
- Red visible light adopted, easy to detect an object that is difficult to adjust optical axis position, such as a thin shaft.
- Enables to detect even minimal variation in light intensity, and measure without reflective marks.
- Selectable gain/trigger level adjustment in accordance with applications; manual adjustment using volume control button or auto adjustment using auto trigger.
- Two detection distance adjusting functions are available; normal range and proximity range (from a proximity of 10 mm to the maximum 69 mm)
- Unequal interval pulse which may be generated during measurement can be divided into 1 pulse without reflective mark.

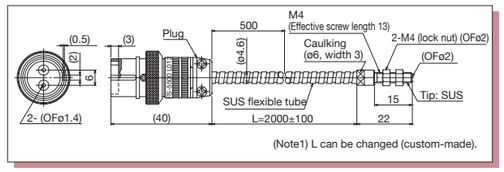
• FG-1300



• FS-540/542



• FS-5500



●Specifications

FG-1300 Fiber Optic Sensor Amplifier

Detection method	: detects amount of red visible light reflected light source; red visible light LED, light receiving element; phototransistor
Detection distance	: 7 to 69 mm (FS-540/542), 2 to 50 mm (FS-5500)
Maximum response frequency	: 10 kHz
Output signal	: analog; detects reflected light and outputs signal waveform in proportion to the light amount. output range: 0 to 10 V pulse; outputs pulse signal after the waveform of reflected light is shaped and converted to square wave. output voltage range; Lo level 0.5 V or less, Hi level 4.5 V or more
Load resistance	: 10 kΩ or more (analog, pulse)
Function	: gain; can be adjusted by control knob or selection SW. threshold level; can be adjusted manually/automatically by control knob or selection SW. range; the detection distance can be adjusted by selection SW. frequency dividing; divides the PULSE OUTPUT signal in the range of dividing ratio 1 to 10 by selection SW. peak hold time constant; select from 1 s/10 s by selection SW.
Display	: for checking sensitivity; LED bar chart type monitor others; LED indicator
Connecting method	: see P28 to 31
Power supply	: 100 to 240 VAC (50 Hz/60 Hz)
Operating temperature	: 0 to 40 ºC
Operating humidity	: 5 to 80 % RH (with no condensation)
Storage temperature range	: -10 to +50 °C
Storage humidity range	: 5 to 80 %RF (without condensation)
Conforming standard	: CE marking
Weight	: approx. 1 kg
Accessory	: power cable (AC 100 V)×1, instruction manual×1, rubber foot (4 pieces)×1 set
Option	: stand (FG-0131), panel mounting fixture (FG-0132)

• Specifications (FS-540/542/5500)

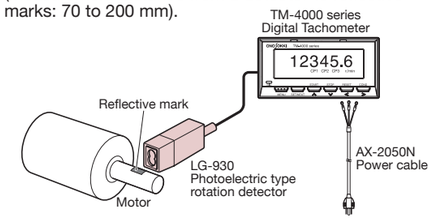
	FS-540	FS-542	FS-5500
Detection type	Optical fiber reflection type		
Emitting port diameter at the tip of fiber	ø 4 mm		ø 2 mm
Fiber length (L)	1 m	2 m	
Mounting nut	M8 x 1.0		M4 x 0.7
Operating temperature range	-10 to 250 °c		-40 to 250 °c
Vibration resistance	–		50 m/s^2 (frequency range; 10 to 500 Hz, at tip only)
Shock resistance	–		1000 m/s^2

** Reflective mark (12 mm square 25 sheets) 1 sheet included. * Fiber cable can be extended.*

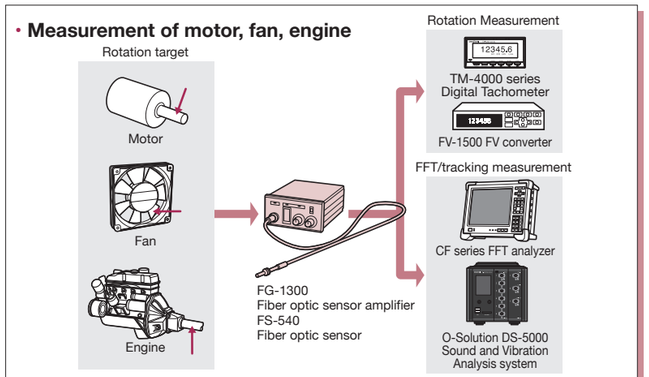
●Application

• Rotation measurement using photoelectric type non-contact rotation detector

Affix a dedicated 12 mm square reflective mark to the shaft of the motor etc. and measure the rotation speed without contact by an optical fiber sensor. You can measure the target from a distance 200 mm max. (measurement distance from a detector to reflective marks: 70 to 200 mm).

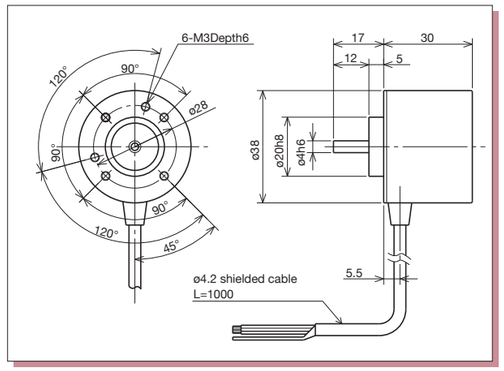


• Measurement of motor, fan, engine

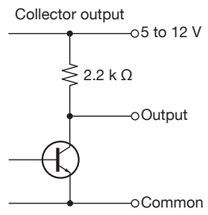


Rotary Encoder SP-405ZA

Ultra-compact type



• **Output circuit**



●Features

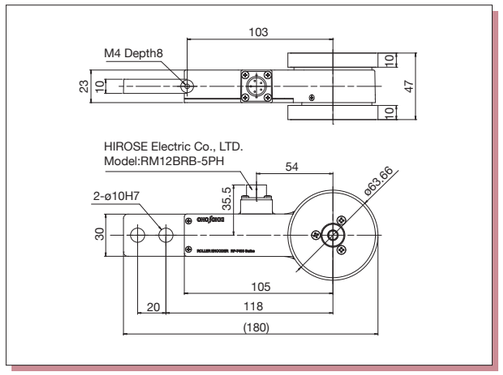
- Economic type designed for OEM needs
- ø 38 outer diameter; ultra-compact, light weight model weighing only 100 g
- 2-phase square wave + zero mark signal output
- Choice from 13 pulse output types

●Specifications

Number of output pulses	: 40, 50, 60, 100, 200, 250, 300, 360, 400, 500, 600, 800, 900 P/R
Output waveform	: 2-phase square waveform+ zero mark (timing is optional)
Output voltage	: Hi···Power supply voltage -20 % or more Lo···0.5 V or less
Output method	: collector load resistance; 10 k Ω or more *Open collector: 30 VDC, 35 mA or less
Adjacent error	: ±1/15 P
Power requirement	: 5 to 12 VDC ± 10 %, 50 mA * 24 VDC is also available only when the open collector is selected (option).
Response frequency	: 100 kHz
Connection method	: directly attached cable (1 m) (other end: open)
Maximum rotation speed	: 6000 r/min
Allowable shaft load	: radial; 25 N thrust; 15 N
Starting torque	: 2mN·m
Moment of inertia	: 6g·cm^2
Operating temperature	: -10 to 70 °C
Storage temperature	: -20 to 80 °C
Withstand humidity	: 90 % (with no condensation)
Protection class	: IP 40
Vibration resistance	: 98 m/s^2 in each direction of X, Y, Z (for 2 hour)
Shock resistance	: 980 m/s^2 in each direction of ±X, Y and Z (three times each, 18 times), 98 m/s^2 at shaft
Weight	: approx. 0.1 kg

Line Speedometer (Roller Encoder) RP-7400 series

Low to medium speed applications



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

●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 (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) P28 to 31 RP-0184 cable (5 m) P28 to 31

* We have extensive variety of rotary encoders. Detailed brochures are prepared separately, so please visit out website.

Digital Tachometer TM-4000 series

Integrating 4 models & New standard for tachometers

●Features

- Selecting from 4 models: 1-channel input for basic measurement, 2-channel input, reversible counter and passing time/passing speedometer
- Achieves the rotation speed measurement over a wide range with high accuracy, high response
- Clearly visible on the organic EL display
- Ethernet selectable
- Customized according to the connected device

TM-4100 series

Digital Tachometer

1-channel input type. Since it follows the input/output specifications and outer dimensions of the existing models, you can use your current detectors, cables, and mounting jigs as they are. (Successor model: TM-3100 series)

TM-4200 series

2-channel Digital Tachometer

Measures the line speed ratio, speed differences, rolling reduction, etc. from two rotation speeds. Effective for improving the quality of production lines.

TM-4300 series

Reversible counter

Multiplication/addition/subtraction counter with 7-digit display. In combination with our rotary encoders and roller encoders, it measures the length and distance of materials and finished products flowing through the production line.

TM-4400 series

Passing Time/Passing Speedometer

Measures the passing time and passing speed between two points with high accuracy.
In addition to measuring the passing speed of vehicles and the opening/closing speed of vehicle doors, it is also possible to measure the falling speed and the speed of objects such as pendulums.

**Please refer to the details in the product brochure of TM-4000 series on our web site.*

●Product Lineup

Standard models

A new standard digital tachometer with exactly the functions you want. It is also recommended for those want to quickly consider a replacement for an existing model.

Product type	Model name	Output type	Power supply type	Features
1-ch input	TM-4110	For display	AC	Standard models for display only
	TM-4111		DC	
	TM-4120	BCD output	AC	6-digit BCD output Open collector output that can be directly connected to a PLC. There are 2 types of output mode: normal mode, request mode.
	TM-4121		DC	
	TM-4130	Analog output	AC	Selectable voltage output or current output 1 ms rapid output refresh time Highly accurate linearity of 0.1% FS for voltage output and 0.1% of span for current output
	TM-4131		DC	
	TM-4140	Comparator output	AC	Equipped with three contact outputs and evaluation conditions can be set for each. Comparison cycle every 1 ms Equipped with diverse output functions
	TM-4141		DC	
2-ch input	TM-4270*	Analog output / Comparator output / 2-ch Voltage input	AC	Wide input frequency range: 0.05 Hz to 100 kHz 2 ch calculation function (rotation difference/rotation ratio/rate of change/rotation direction)
Reversible counter	TM-4370*	Analog output / Comparator output / 2-ch Voltage input	AC	Reversible counter that measures linear position, displacement, dimensions, etc. Wide input frequency range: DC to 100 kHz Multiplication function (×1/×2/×4) and counting direction switching function are equipped.
Passing time/Passing speedometer	TM-4470*	Analog output / Comparator output / 2-ch Voltage input	AC	Calculates the passing speed from the distance and the passing time between two points. Enables passing time measurement at a minimum resolution of 1 µs. Pulse detection condition setup function (HIGH/LOW level, rising edge/falling edge)

*BCD output is not supported.

Customized models

You can customize the tachometers according to the connected sensors and external devices.
These are made to order products by combining 7 types of signal input/output boards and 2 types of power supply boards.

Selectable measurement functions

- 1-channel input for measurement of rotation speed
- 2-channel input for measurement of rotation speed differences /rotation speed ratio
- Reversible Counter for multiplication/addition/subtraction
- Passing Time/Passing Speedometer

Selectable signal input /output types

- Input: Voltage/Line driver
- Output: Analog/Comparator/BCD*
- Communication: RC-232C/Ethernet

*TM-4100 series only

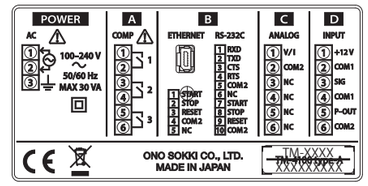
Calculation functions (optional software)

- Achieved speed/time measurement mode
  Calculates the time required from the start condition to the stop instruction measurement value. (TM-4100, 4300 only)

●Table of optional boards/software combination

Slot	POWER		A	B				C		D			Software	
Specifications	Power		Comparator output	BCD output		RS-232C communication	Ethernet communication	Analog output		Voltage input		Line driver inputt	Calculation function	
	AC	DC		Voltage output	Open collector output					1ch	2ch	2ch		
Model name	TM-0400	TM-0401	TM-0440	TM-0421	TM-0422	TM-0450	TM-0460	TM-0431	TM-0432	TM-0405	TM-0406	TM-0407	TM-0470	TM-0480
TM-4100	○	○	○	○	○	○	○	○		○			○	
TM-4200	○	○	○			○	○		○		○	○		
TM-4300	○	○	○			○	○		○		○	○		○
TM-4400	○	○	○			○	○		○		○			

- Only one board can be installed in each slot.
- Be sure to install a board in slot POWER and slot D.



Terminal arrangement diagram (Ex.TM-4100 series)

●Specifications

TM-4100 series

Number of channels	1ch	
Input amplification format	Selectable from AC or DC	
AC amplifier	Sine wave input:	0.2 to 30 Vrms
	Square wave input:	0.6 to 42 Vp-p
	Input frequency:	1 Hz to 100 kHz
DC amplifier	Input signal:	Square waveform having a pulse width of 4 µs or more
	Input voltage range:	Hi: 4 to 30 V/Lo: -1 to 1 V
	Input frequency:	0.05 Hz to 100 kHz
	Time measurement:	10 ms to 3600 s
Measurement accuracy	Within displayed value x (±0.01%) ± 1 count (count value excluding decimal point)	
Measurement time	Within 1 ms + 1 cycle time	
Unit display	Rotation Speed:	r/s, r/min, r/h
	Circumferential Speed:	mm/s, m/s, mm/min, m/min
	Linear Speed:	mm/s, m/s, mm/min, m/min, km/min, mm/h, m/h, km/h
	Cycle:	s, min
	Frequency:	Hz, kHz
	Count:	1/s, 1/min, 1/h
	Flow Rate:	mL/s, mL/min, mL/h, L/s, L/min, L/h
	Passing time:	s, min
	User-defined: engineering unit	EU/s, EU/min, EU/h
Number of display digits	6 digits	

TM-4200 series

Number of channels	2ch, 1ch (2-phase)	
Input amplification format	Selectable from AC or DC	
AC amplifier	Sine wave input:	0.2 to 30 Vrms
	Square wave input:	0.6 to 42 Vp-p
	Input frequency:	1 Hz to 100 kHz
DC amplifier	Input signal:	Square waveform having a pulse width of 4 µs or more
	Input voltage range:	Hi: 4 to 30 V/Lo: -1 to 1 V
	Input frequency:	0.05 Hz to 100 kHz
Measurement accuracy	Single CH: (CH-A or CH-B)	Within displayed value × (±0.01%) ± 1 count (count value excluding decimal point)
	B/A or (B-A)/A:	2 × (Single CH measurement accuracy)
	B-A:	± (CH-B measurement accuracy) ± (CH-A measurement accuracy)
Unit display	Rotation Speed:	r/s, r/min, r/h
	Circumferential Speed:	mm/s, m/s, mm/min, m/min
	Linear Speed:	mm/s, m/s, mm/min, m/min, km/min, mm/h, m/h, km/h
	Frequency:	Hz, kHz
	User-defined: engineering unit	EU/s, EU/min, EU/h
Number of display digits	6 digits + sign	

TM-4300 series

Number of channels	1ch (2-phase)	
Input amplification format	DC	
DC amplifier	Input signal:	Square waveform having a pulse width of 4 µs or more (when the low-pass filter is OFF)
	Input voltage range:	Hi: 4 to 30 V/ Lo: -1 to 1 V
	Input frequency:	DC to 100 kHz
Input waveform	[TM-4300] Square wave signal with 90° phase difference or single-phase square wave signal	
Duty	[TM-4300] 50±10 %	
Counting range (internal counter)	0 to ±2 000 000 000	
Multiplication	× 1/× 2/× 4	
Offset function	0 to ± 9 999 999	
Counting direction switching function	+/–	
Pulse factor	0.00001 × 10E-3 to 9.99999 × 10E+3 EU/Pulse	
Unit display	OFF/mm/m/Count/s	
Number of display digits	7 digits + sign	

TM-4400 series

Number of channels	2ch	
Input amplification format	DC	
DC amplifier	Input signal:	Square waveform having a pulse width of 4 µs or more (when the low-pass filter is OFF)
	Input voltage range:	Hi: 4 to 30 V/ Lo: -1 to 1 V
	Input frequency:	DC to 100 kHz
Measurable cycle	0.1 ms to 3600 s	
Minimum resolution	1 µs	
Measurement range	10 s/1000 s/3600 s	
Display accuracy	Within displayed value × (± 0.05 %) ± 1 count (When measuring passing time)	
Measurement item	Selectable from passing time/passing speed	
Measurement distance	0.1 to 99 999.9 mm	
Prescale function	0.00001 × 10E-3 to 9.99999 × 10E+3 EU/Pulse	
Unit display	Passing time (TIME): ms, s Passing speed (P.SPEED): m/s, km/h	
Number of display digits	6 digits	

Common specifications

Display unit	OLED Display	
Power supply for detector	Output voltage:	12 VDC ± 10 %
	Maximum output current:	[TM-4100] 100 mA [TM-4200/4400] Total of 2 channels 180 mA [TM-4300] 180 mA
Power supply	AC power supply model:	100 to 240 VAC ± 10 %, 50/60 Hz, 30 VA max.
	DC power supply model:	12 to 24 VDC ± 5 %, 1.25 A max.
Operating temperature and humidity	0 to 50 °C/30 to 80 %RH (no condensation)	
Outer dimensions	96 (W) x 48 (H) x 140 (D) mm max.	
Weight	[TM-4110] Approx. 340 g [TM-4270/4370/4470] Approx. 400 g	
Applicable standards	CE marking FCC/Canada	
Accessories	[TM-4100]	Mounting jig 1 set (2 pcs) Instruction manual 1 pcs
	[TM-4200/4300/4400]	Input connector for D slot made by Phoenix Contact 1 pcs (packed in the D slot) Mounting jig 1 set (2 pcs) Instruction manual 1 pcs

●Power supply, Signal input/output boards

TM-0400/TM-0401 Power Supply Board

Please refer to "Power supply" in [Common specifications].

TM-0405/0406 Input Voltage Board

Voltage input specifications	Same as Input unit
Input connector	[TM-0405] Terminal block (D slot SIG-COM1 terminal) [TM-0406] FMC 1,5/10-ST-3,5 1952348x1 made by Phoenix contact

TM-0407 Line Driver Signal Input Board

Signal input specifications	Equivalent to RS-422A
Input connector	FMC 1,5/10-ST-3,5 1952348x1 made by Phoenix contact

TM-0421/0422 BCD Output Board (TM-4100 series only)

Output form	6-digit parallel output
Output format	[TM-0421] 5 V internal pull-up output [TM-0422] NPN open collector output
Sink current	32 mA max
Output withstand voltage	24 V max
Output logic	Positive logic
Data refresh time	100 ms or less
Operation modes	Selectable from Normal (Continue) mode, Request mode
Request signal input form	Negative logic (pulse width 10 µs or more)
Operating edge	Falling edge
Input voltage	Hi: 4.2 to 5.25 V/Lo: 0 to 0.9 V

TM-0431/0432 Analog Output Board

Number of output channels	1 ch	
Output type	Selectable from voltage or current	
Output method	16-bit D/A conversion	
Output refresh time	Selectable from 1 ms/10 ms/20 ms/50 ms /100 ms/200 ms/500 ms/1 s	
Voltage output	Output range:	Selectable from 0 to 10 V/0 to 5V/1 to 5 V
	Load resistance:	100 kΩ or more
	Linearity:	± 0.1 % FS
	Zero temperature drift:	± 0.05 % FS/°C
	Span temperature drift:	± 0.05 % FS/°C
Current output (TM-0431 only)	Output range:	Selectable from 4 to 20 mA or 0 to 16 mA
	Load resistance:	500 Ω or less
	Linearity:	± 0.1 % of span
	Zero temperature drift:	± 0.05 % of span/°C
	Span temperature drift:	± 0.05 % of span/°C

TM-0440 Comparator Output Board

Contact output	1 make contact output × 3 (COMP1/COMP2/COMP3)
Evaluation conditions	UPPER, LOWER, OK, ERROR
Contact operation modes	Automatic recover mode, Hold mode (except TM-4400), Shot output mode
Condition setting	Output delay function (except TM-4400), Reset function (except TM-4400)
Maximum contact capacity	30 VDC/1 A 250 VAC/1 A
Output refresh time	Approx. 10 ms

TM-0450 RS-232C Board

Baud rate	9 600/19 200/115 200 bps
Data bits	8 bit
Parity	None
Stop bits	1-bit
Flow control	Hardware
Terminator	CR+LF

TM-0460 Ethernet Board

Electrical specifications	IEEE802.3 compliant
Transmission method	10BASE-T/100BASE-T automatically selected
Communication protocol	Socket communication by TCP/IP (IPv4)

Gate Signal Input

(Valid when any of the BCD output, RS-232C communication, or Ethernet communication board is installed)

Gate function	[TM-4100/4200] START/STOP/RESET [TM-4300] START, STOP/OFFSET/RESET [TM-4400] START/RESET
Voltage input	Hi: 4.2 to 5.25 V/Lo: 0 to 0.9 V
Non-voltage input	Open voltage: 5 V ± 0.25 V Short-circuit current: 1 mA max. Contact resistance: 50 Ω or less

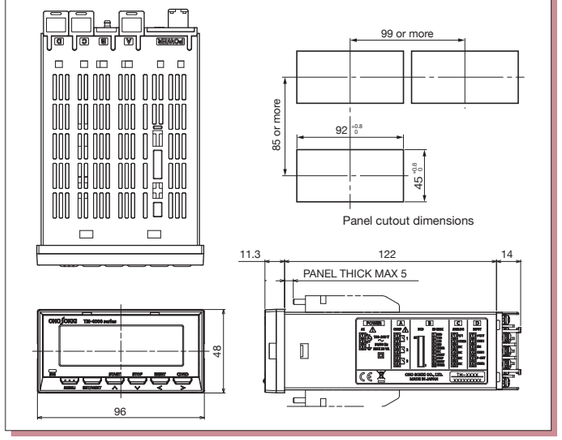
●Optional software

TM-0470/0480 Calculation function

Calculation details	Calculate the time required from the start condition to the stop instruction measurement value.
Calculation item	[TM-0470] Selectable from rotation speed/ circumferential speed/moving speed [TM-0480] Pulse accumulated value
Unit of measurement	s (fixed display)

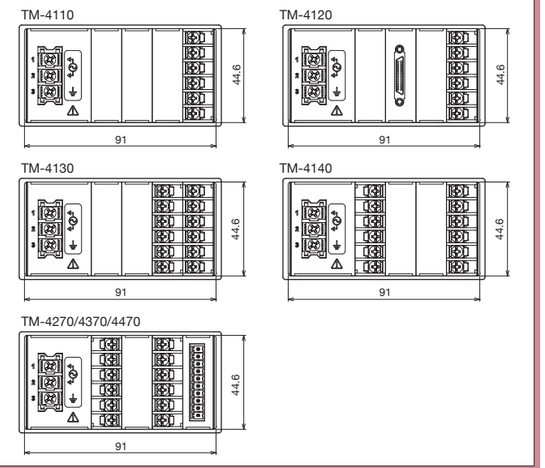
●Outer dimensions

Unit: mm



●Rear panel connector (terminal screw: M3)

Unit: mm



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 : ER03-RB3F
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

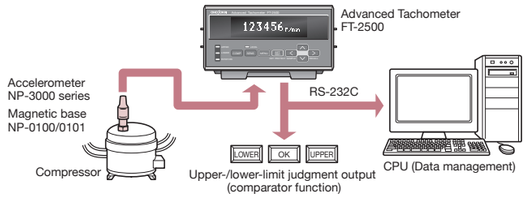
General specifications
Power requirement : 100 to 240 VAC±10% (50/60 Hz)
Conforming standard : CE marking
Outer dimensions : 144(W) × 72(H) × 180(D) mm
Weight : 2 kg or less
Power consumption : 22 to 32 VA
Operating temperature range : 0 to +40 °C
Storage temperature range : -10 to +55 °C
Operating (storage) 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) [ER03-PB3M-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.

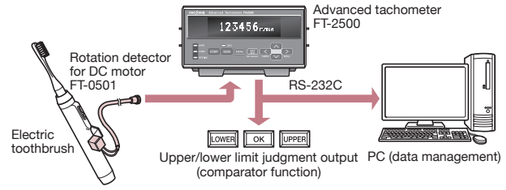
* Please contact us for more detail brochure of the FT-2500.

●Application

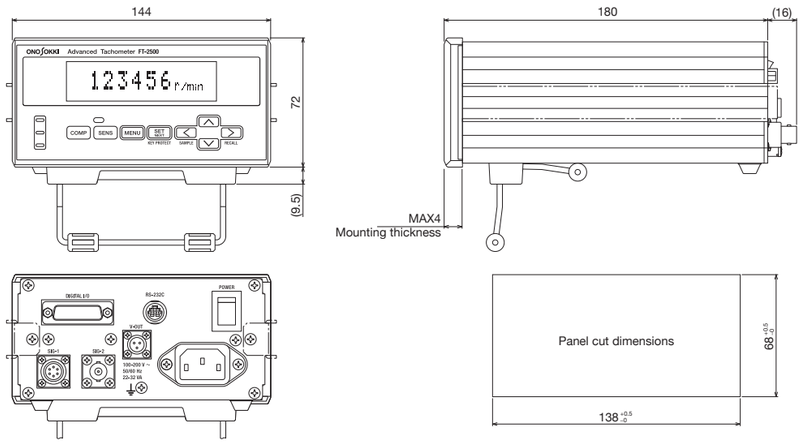
・Rotational speed measurement of a compressor using an accelerometer
With a combination of the FT-2500 and suitable accelerometer, the rotational speed of a compressor in the refrigerator, vending machine, air conditioner etc, which shaft is not directly accessible, can be measured easily.
・Permits easy measurement of compressor shaft's rotational speed even though a rotating shaft is not accessible.
・Permits measurement of the rotational speed of a compressor itself and also which is already built in a final product.



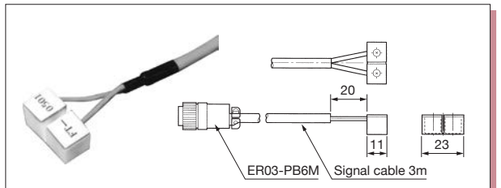
・Measurement example of rotation speed of DC motor incorporated in home electric appliances
In this application, we measure the rotation of the electric toothbrush, which DC motor rotation is converted into brush vibration inside.
The FT-2500 measures the rotation speed by detecting the magnetic flux 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



Sensor specification	FT-0501
Measurement target	DC motor etc. (commutator type)
Detection method	Leakage magnetic flux detection
Major specifications	Direct attached signal cable 3m With tip connector (ER03-PB6M) *It is necessary to set the number of poles of the motor.
Operating temperature range	-10 to 60 ºC

・NP series Accelerometer

* Please contact us for more detail of NP/GK series brochure.

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)

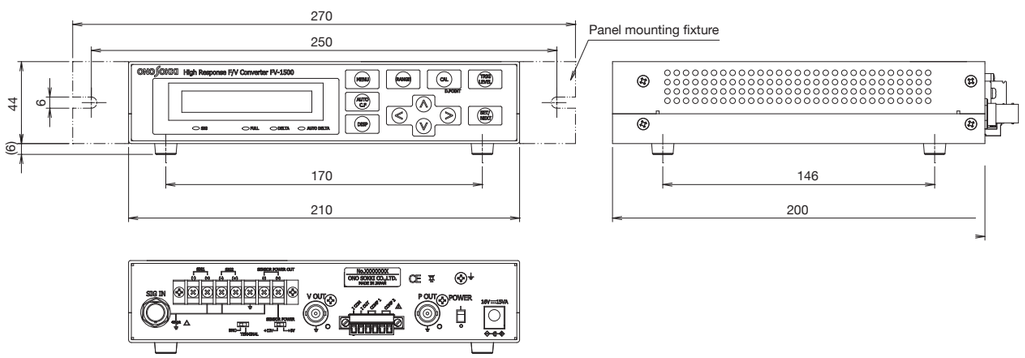
Storage humidity : 5 to 85 % RH (with no condensation)

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)



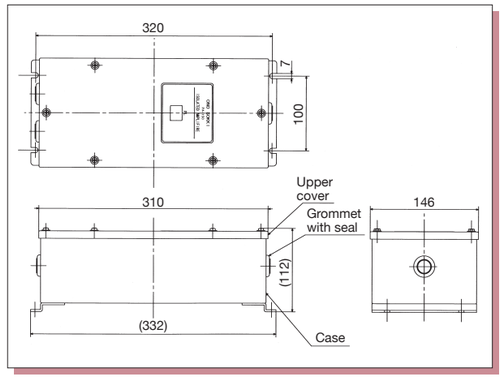
Rear view

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

Related Products

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

Coupling Selection Guide

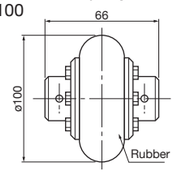
When connecting an electromagnetic rotation detector to a device, a rigid coupling will give accurate transmission of rotation and angle. However, if there is misalignment of the centering or allowance in the thrust direction, the bearing will be elastically deformed, which will impair accuracy or damage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

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.

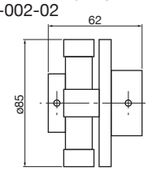
• Recommended coupling shape/weight

Fig.1 Rubber flex coupling
RF-100



1200 g

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



1000 g

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

Handheld Tachometer

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-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 ºC, 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 ºC
Storage temperature	: -10 to 50 ºC
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	: 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, 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)

Handheld Tachometer HT-3200/4200/HR-6800

Handheld Digital Tachometer

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) 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)

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), instruction manual (English, Japanese)×1 each
Option : reflective mark 12mm square×25; 10 sheets 1set (HT-011)

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 : 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)

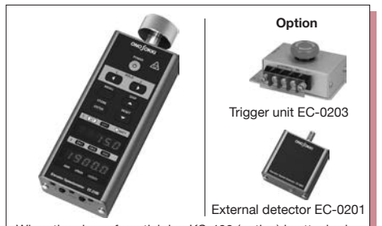
Detection section (sold separately)

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)

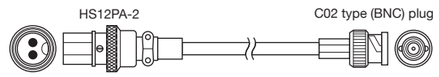
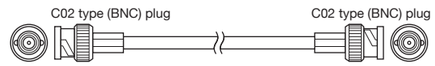
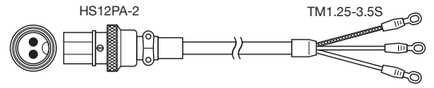
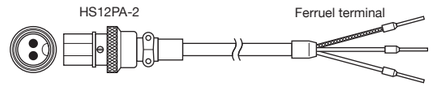
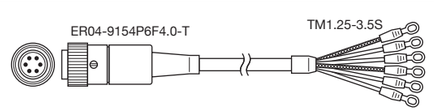
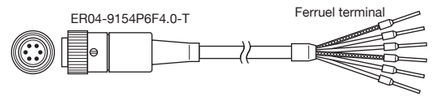
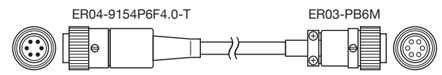
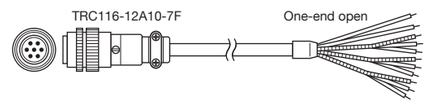
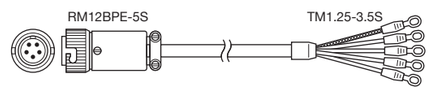
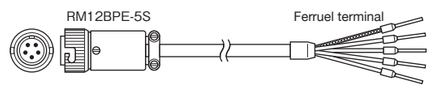
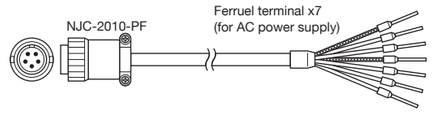
General specification

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/set)
EC-0935 carrying case x 1 piece
hexagonal wrench (opposite side:1.5mm) x 1 piece
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 (black) × 1 piece
EC-0935 carrying case (plastic) x 1 piece

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

Signal Cable

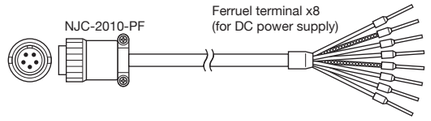
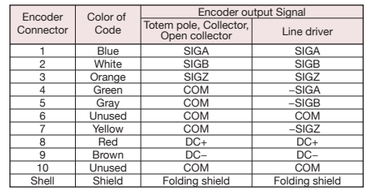
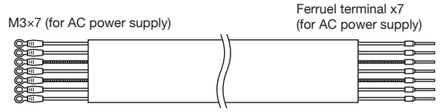
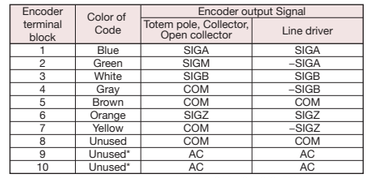
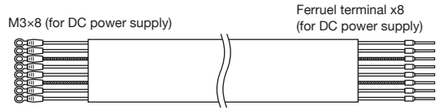
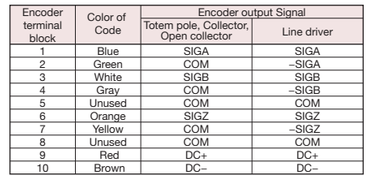
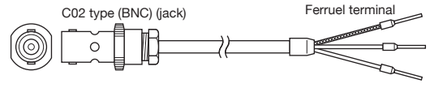
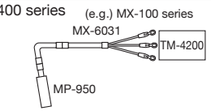
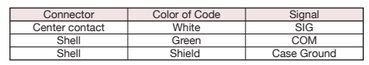
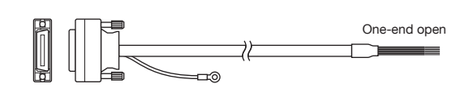
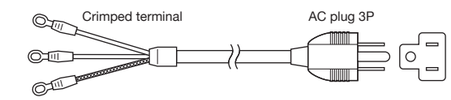
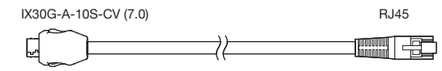
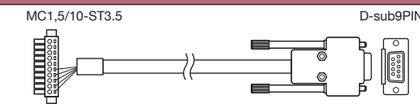
Table of Signal Cable

Item	Compatible Products	Cable	Model Name	Specifications	Compatible Products	Non-compatible Products	Remarks
Signal cable (Sensors ⇔ Counter)							
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 5 m 010 10 m 015 *15 m 020 *20 m		CT-6710 FV-1500	TM-4100/4200/4300/4400 series 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 or MX-6031.) 	<table><tr><th>Connector</th><th>Signal</th></tr><tr><td>1</td><td>SIG</td></tr><tr><td>2</td><td>COM</td></tr></table>
2	MP-930/935/936/950/954/962 FG-1300	3C-2 V (High-frequency coaxial cable)	MX-101 1.5 m 105 5 m 110 *10 m 115 *15 m 120 *20 m		CT-6710 FV-1500	TM-4100/4200/4300/4400 series 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 or MX-6031.) 	<table><tr><th>Connector</th><th>Signal</th></tr><tr><td>Center contact</td><td>SIG</td></tr><tr><td>Shell</td><td>COM</td></tr></table> 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	MP-9100/9120/9200/940A/963 MP-810/820/830/837 (MP-081+MX-500 series)	P-2 (2-core outer shield cable)	MX-505 5 m 510 10 m 520 20 m		FV-1500 PA-150 TM-4100 series	TM-4200/4300/4400 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>Contact 1</td><td>White</td><td>SIG</td></tr><tr><td>Contact 2</td><td>Green</td><td>COM</td></tr><tr><td>Housing</td><td>Shield</td><td>Case Ground</td></tr></table>
4	MP-9100/9120/9200/940A/963 MP-810/820/830/837 (MP-081+MX-5205)	P-2 (2-core outer shield cable)	MX- 5205 5 m		TM-4200/4300/4400 series	FV-1500 PA-150 TM-4100 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>Contact 1</td><td>White</td><td>SIG</td></tr><tr><td>Contact 2</td><td>Green</td><td>COM</td></tr><tr><td>Shell</td><td>Shield</td><td>Case Ground</td></tr></table>
5	MP-9810/9830 LG-9200	D5-UL (Composite 5-core vinyl sheath cable)	MX-7105 5 m 7110 10 m 7115 15 m 7120 20 m		FV-1500 PA-150 TM-4100 series	TM-4200/4300/4400 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>A</td><td>Blue</td><td>SIG</td></tr><tr><td>B</td><td>White</td><td>Unused</td></tr><tr><td>C</td><td>Red</td><td>+12 V</td></tr><tr><td>D</td><td>Shield</td><td>Case Ground</td></tr><tr><td>E</td><td>Green</td><td>COM</td></tr><tr><td>F</td><td>Black</td><td>0 V</td></tr></table>
6	MP-9810/9830 LG-9200	D5-UL (Composite 5-core vinyl sheath cable)	MX-7305 5 m 7310 10 m 7320 20 m		TM-4200/4300/4400 series	FV-1500 PA-150 TM-4100 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>A</td><td>Blue</td><td>SIG</td></tr><tr><td>B</td><td>Unused</td><td>Unused</td></tr><tr><td>C</td><td>Red</td><td>+12 V</td></tr><tr><td>D</td><td>Shield</td><td>Case Ground</td></tr><tr><td>E</td><td>Green</td><td>COM</td></tr><tr><td>F</td><td>Black</td><td>0 V</td></tr></table>
7	MP-9810/9830 LG-9200	D5-UL (Composite 5-core vinyl sheath cable)	MX-8105 5 m 8110 10 m 8115 15 m 8120 20 m		CT-6710 TS-2800 (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.
8	RP-432Z	R8 (4 twisted pairs twist with 3 sheild cables)	RP-0169 5 m		TM-4200/4300 series	TM-4100 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>A</td><td>Blue</td><td>SIG1</td></tr><tr><td>B</td><td>White</td><td>SIG2</td></tr><tr><td>C</td><td>Orange</td><td>SIGZ</td></tr><tr><td>D</td><td>Gray/Green, Brown/Green, Green</td><td>COM</td></tr><tr><td>E</td><td>Red</td><td>+5 V or +12 V</td></tr><tr><td>F</td><td>Black</td><td>COM</td></tr><tr><td>G</td><td>Shield</td><td>Case Ground</td></tr></table>
9	RP-7400 series	D5-UL (Composite 5-core vinyl sheath cable)	RP-0181 5 m *10 m		PA-150 TM-4100 series	TM-4200/4300 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>1</td><td>Blue</td><td>SIG1</td></tr><tr><td>2</td><td>White</td><td>SIG2</td></tr><tr><td>3</td><td>Red</td><td>+12 V</td></tr><tr><td>4</td><td>N.C.</td><td>N.C.</td></tr><tr><td rowspan="2">5</td><td>Green</td><td>COM</td></tr><tr><td>Black</td><td>0 V</td></tr></table>
10	RP-7400 series	D5-UL (Composite 5-core vinyl sheath cable)	RP- 0184 5 m		TM-4200/4300 series	PA-150 TM-4100 series	<table><tr><th>Connector</th><th>Color of Code</th><th>Signal</th></tr><tr><td>1</td><td>Blue</td><td>SIG1</td></tr><tr><td>2</td><td>White</td><td>SIG2</td></tr><tr><td>3</td><td>Red</td><td>+12 V</td></tr><tr><td>4</td><td>Unused</td><td>Unused</td></tr><tr><td>5</td><td>Black, Green</td><td>COM</td></tr><tr><td>Shell</td><td>Shield</td><td>Case Ground</td></tr></table>
11	RP-1700 series (AC power supply)	20276-VSV-4P	PE3534952 (PS-D11144) 5 m		TM-4200/4300 series	TM-4100 series	<table><tr><th rowspan="2">Encoder Connector</th><th rowspan="2">Color of Code</th><th colspan="2">Encoder output Signal</th></tr><tr><th>Totem pole, Collector, Open collector</th><th>Line driver</th></tr><tr><td>1</td><td>Blue</td><td>SIGA</td><td>SIGA</td></tr><tr><td>2</td><td>White</td><td>SIGB</td><td>SIGB</td></tr><tr><td>3</td><td>Orange</td><td>SIGZ</td><td>SIGZ</td></tr><tr><td>4</td><td>Green</td><td>COM</td><td>–SIGA</td></tr><tr><td>5</td><td>Gray</td><td>COM</td><td>–SIGB</td></tr><tr><td>6</td><td>Red</td><td>COM</td><td>COM</td></tr><tr><td>7</td><td>Yellow</td><td>COM</td><td>–SIGZ</td></tr><tr><td>8</td><td>Unused</td><td>Unused</td><td>Unused</td></tr><tr><td>9</td><td>Unused</td><td>Unused</td><td>Unused</td></tr><tr><td>10</td><td>Brown</td><td>COM</td><td>COM</td></tr><tr><td>Shell</td><td>Shield</td><td>Folding shield</td><td>Folding shield</td></tr></table>

* Made to order

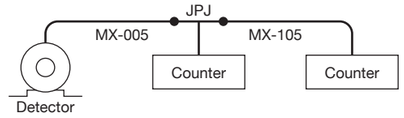
Signal Cables

Table of Signal Cable

Item	Compatible Products	Cable	Model Name	Specifications	Compatible Products	Non-compatible Products	Remarks
Signal cable (Sensors ⇔ Counter)							
12	RP-1700 series (DC power supply)	20276-VSV-4P	PE3534953 (PS-D11145) 5 m		TM-4200/4300 series	TM-4100 series	
13	RP-1700 series (AC power supply)	20276-VSV-4P	PE3534954 (PS-D11146) 5 m		TM-4200/4300 series	TM-4100 series	 * Encoder terminal block:Power cable (RP-0151/0152/0153) is required separately for 9-pin, 10-pin.
14	RP-1700 series (DC power supply)	20276-VSV-4P	PE3534955 (PS-D11147) 5 m		TM-4200/4300 series	TM-4100 series	
Conjunction cable (Cables ⇔ Counter)							
1	MX-000 series cable 100 〃	3D-2V (2-core outer sheild cable)	MX-603 0.3 m		FV-1500 PA-150 TM-4100 series 	TM-4200/4300/4400 series	
2	MX-000 series cable 100 〃	3D-2V (2-core outer sheild cable)	MX-6031 0.3 m		TM-4200/4300/4400 series 	FV-1500 PA-150 TM-4100 series	
BCD cable							
	TM-4100 series	30AWG×18P BIOS-E-3018-E	AA-8207 3 m				
Power cable							
	TM-4100/4200/4300/ 4400 series	Universal power cable	AX-2050N 3 m AC100 V				
Ethernet cable							
	TM-4100/4200/4300/ 4400 series	R-OKTP-E5-P-SASB	AX-6103 3 m AX-6105 5 m				
RS-232C cable							
	TM-4100/4200/4300/ 4400 series	R6 (3 twisted pairs with 2 sheild cables)	PE3532908 (PS-D10502) 2m				

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

Example of using C02 type (BNC)-JPJ



BNCTAJPJ Coaxial connector (PE1507010)

BNCTAJJJ Coaxial connector (PE1507025)

Signal Cables

* Outer appearance and specifications are subject to change without prior notice.

URL: https://www.onosokki.co.jp/English/english.htm

ONO SOKKI

WORLDWIDE ONO SOKKI CO., LTD.
12F Yokohama Connect Square 3-3-3 Minatomirai, Nishi-ku, Yokohama 220-0012, Japan
Phone : +81-45-514-2603 Fax : +81-45-476-9726
E-mail : overseas@onosokki.co.jp

U.S.A.
Ono Sokki Technology Inc.
2171 Executive Drive, Suite 400,
Addison, IL. 60101, U.S.A.
Phone : +1-630-627-9700
Fax : +1-630-627-0004
E-mail : info@onosokki.net
https://www.onosokki.net

THAILAND
Ono Sokki (Thailand) Co., Ltd.
1/293-4 Moo.9 T.Bangphud
A.Pakkred,
Nonthaburi 11120, Thailand
Phone : +66-2-584-6735
Fax : +66-2-584-6740
E-mail : sales@onosokki.co.th

INDIA
Ono Sokki India Private Ltd.
Plot No.20, Ground Floor, Sector-3,
IMT Manesar Gurgaon-122050,
Haryana, INDIA
Phone : +91-124-421-1807
Fax : +91-124-421-1809
E-mail : osid@onosokki.co.in

P.R.CHINA
Ono Sokki Shanghai Technology Co., Ltd.
Room 506, No.47 Zhengyi Road, Yangpu
District, Shanghai, 200433, P.R.C.
Phone : +86-21-6503-2656
Fax : +86-21-6506-0327
E-mail : admin@shonosokki.com

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