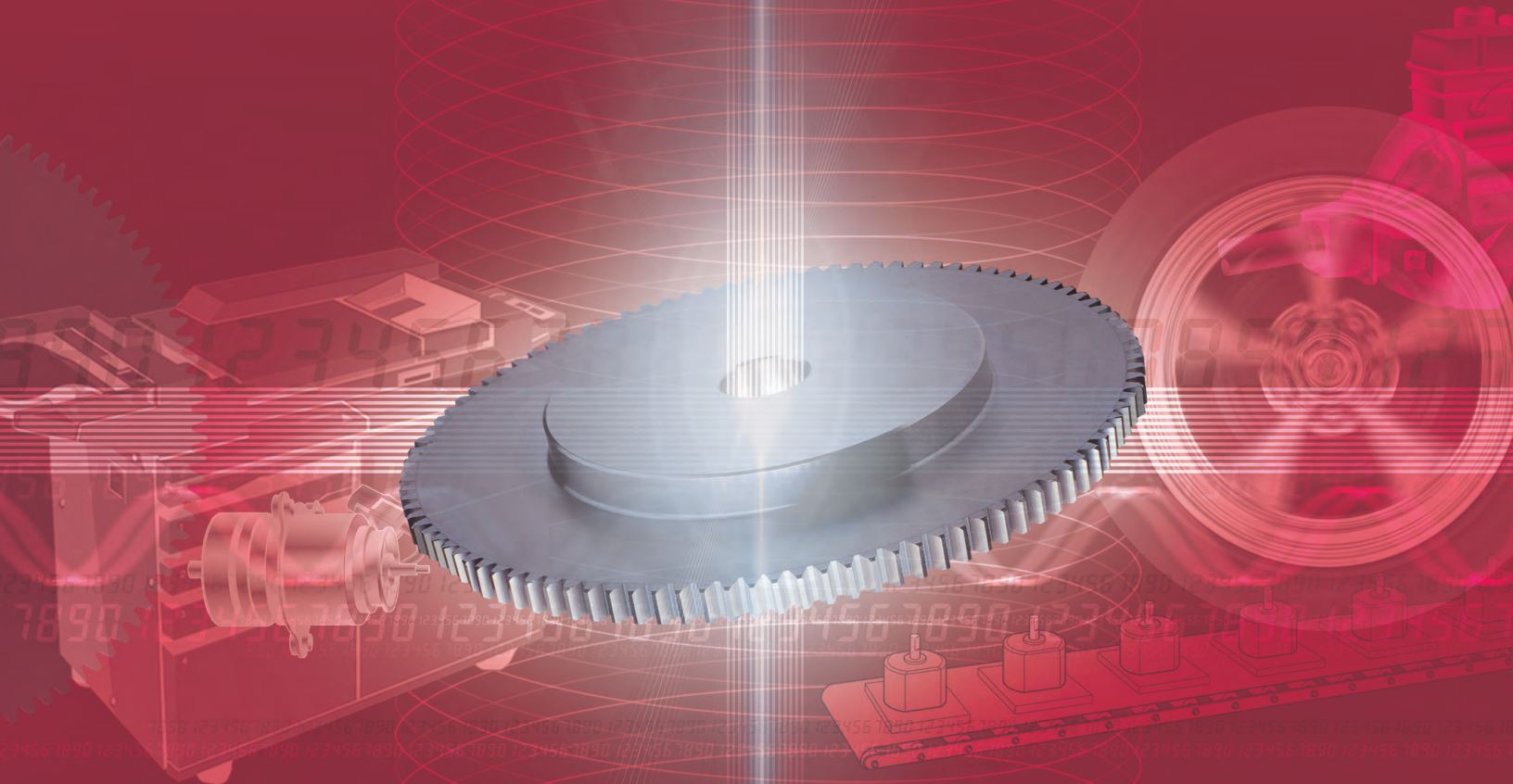


# Digital Tachometers / Sensors and Peripherals



ONO SOKKI

Select the rotation detector/rotation display unit that is optimal for your needs from the wide range of products that Ono Sokki is proud to offer.

## Rotation Detectors Selection Guide



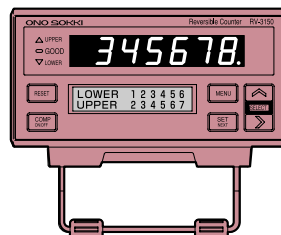
Cable (P. 26)

- When using a rotary encoder with a 12 VDC drive  
TM-2100 Series (P. 4)  
TM-5100 (P. 17)



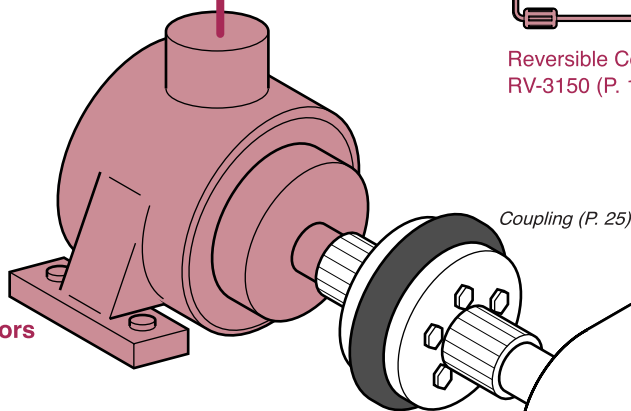
TM Series

Cable (P. 26)

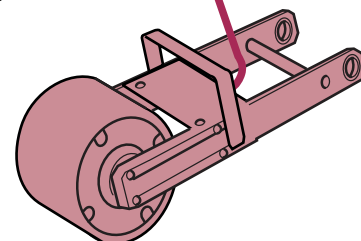


Reversible Counter  
RV-3150 (P. 19)

Cable (P. 26)



Coupling (P. 25)



Length Detector  
RP-732 (P. 18)

### Electromagnetic Rotation Detectors (Internal Gear Type)

MP-610 (P. 14)

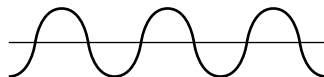
MP-800 Series (P. 13)

#### • Electromagnetic Rotation Detectors (Internal Gear Type) – Features

- Direct connection to the rotating shaft is all that is required. A flexible coupling is recommended for the direct connection method.
- Non-contact detection provided inside the detector.
- Superb rigidity and environmental resistance; high durability
- No power supply required
- Provides stable measurement, particularly at the lower limit of the measurement range, when compared to the external gear type

#### • Electromagnetic Rotation Detectors

The principle used 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

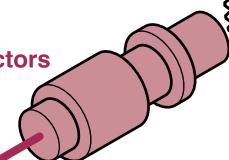
#### • Electromagnetic Rotation Detectors (External Gear Type) – Features

- Non-contact detection enables measurement even of high-speed rotations
- Superb rigidity and environmental resistance; high durability
- No power supply required (excluding MP-981, AP-981)
- P/R selectable (the number of detector gear teeth becomes the P/R value)
- The mounting position is enabled simply by attaching the gear to the target measurement object.

### Electromagnetic Rotation Detectors (External Gear Type)

MP-900/MP-9000 Series (P. 7)

(excluding MP-981 and AP-981)



Cable (P. 26)

TM Series



• **Rotary Encoders – 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) Choice of two types of power supply depending on the model, AC or DC.
- e) Wide selection of models for different applications

**Rotary Encoders**

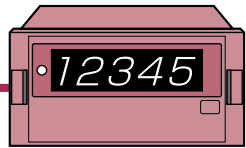
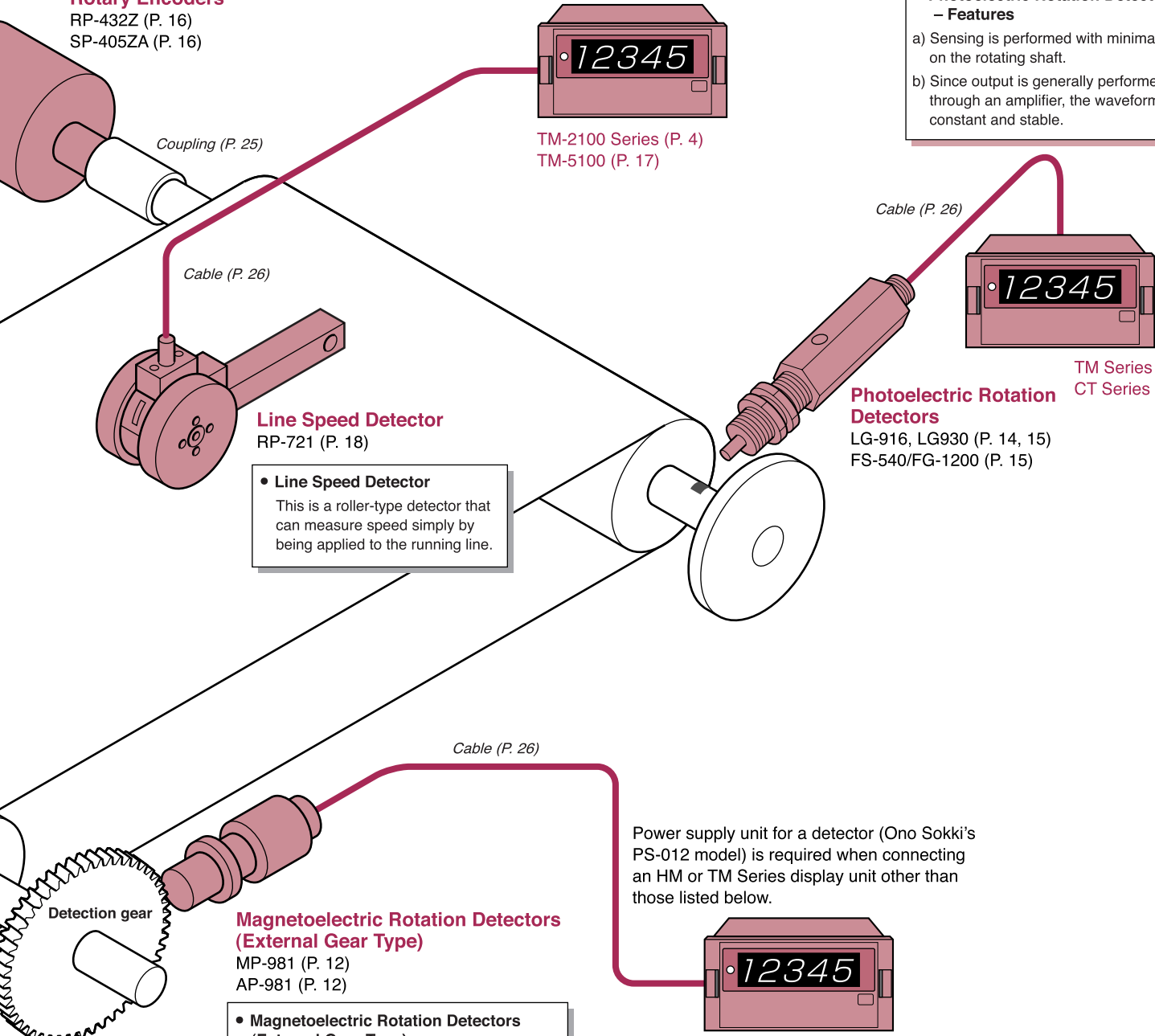
RP-432Z (P. 16)  
SP-405ZA (P. 16)

• **Photoelectric rotation detector**

This device measures the rotation speed either by utilizing the light reflected from reflective tape, or from the contrast in the light received that is caused by the color of the shaft or by a difference in level.

• **Photoelectric Rotation Detectors – 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.



TM-2100 Series (P. 4)  
TM-5100 (P. 17)



TM Series  
CT Series



TM-2100 Series (P. 4)  
TM-5100 (P. 17)

**Line Speed Detector**

RP-721 (P. 18)

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

**Photoelectric Rotation Detectors**

LG-916, LG930 (P. 14, 15)  
FS-540/FG-1200 (P. 15)




**Magnetolectric Rotation Detectors (External Gear Type)**

MP-981 (P. 12)  
AP-981 (P. 12)

• **Magnetolectric Rotation Detectors (External Gear Type)**  
These detectors utilize magnetic flux response (the resistance value changes according to the magnetic flux). The internal mechanism comprises magnetic resistance elements, permanent magnets, a direct current amplifier, and a voltage regulator. Detection can be performed as square wave output of the same amplitude over a wide range from ultra-low speeds to high speeds (1 to 20,000 r/min [60 P/R]).

Power supply unit for a detector (Ono Sokki's PS-012 model) is required when connecting an HM or TM Series display unit other than those listed below.

# Rotation Display Units Selection Guide

		Model No.	Output, Specifications, etc.	Power requirement (Power supply for the detector)	Compatible Detectors	Page No.
For General-Purpose Use		TM-2110	Display only	100 to 240 VAC (12 VDC/100 mA)	MP Series SP-405ZA LG Series RP Series	—
		TM-2120	BCD output			
		TM-2130	Analog output			
		TM-2140	Contact output			
Compatible with Low Pulse Sensors		CT-6520	BCD output Analog output Pulse output Alarm contact output	100 to 240 VAC 11 to 15 VDC (12 VDC/100 mA)	IP Series VP-202, 1220 OM-1200 LG Series MP Series	—
Multifunction Model		TM-5100	BCD output Analog output Comparator output RS-232C 2-channel calculation	100 to 240 VAC (5 VDC /150 mA) (Total of A and B channels) (12 VDC /150 mA) (For each A and B channel)	MP Series LG Series RP Series	p. 17

Note 1: Please see "Table of Signal Cable" on Pages 26 and 27 to select the suitable model of signal cable.

Note 2: Please contact nearest Ono Sokki representative for the separated catalogue of TM-2100 series and CT-6520.

# CONTENTS

Rotation Detectors Selection Guide	2,3
Rotation Units Selection Guide	4

## Rotation Detectors

<b>Notes on Detection Gears</b>	6
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### Electromagnetic Type (External Gear Type) [Modules 1 to 3]

General-purpose type	MP-9100	7 to 10
With a directly attached cable	MP-911	7 to 10
Measurable for high speed rotation	MP-9120	7 to 10
Oil-proof type	MP-930	7 to 10
Oil-proof/Heat-resistant type (up to 150°C)	MP-935	7 to 10
Heat-resistant type (up to 220°C)	MP-936	7 to 10
Long body type	MP-940A	7 to 10
Compact type	MP-950	7 to 10
Long body type	MP-954	7 to 9, 11
Compact type	MP-962	7 to 9, 11
Ultra-compact type	MP-992	7 to 9, 11
[Up to Module 1]		
For modules 0.5 to 1	MP-9200	7 to 9, 11
[Modules 3 to 10]		
For modules 3 to 10	MP-963	7 to 9, 11

### Magnetolectric Type (External Gear Type)

For low-to-medium speeds	MP-981	12
Acid-proof/waterproof	AP-981	12

### Electromagnetic Type (Internal Gear Type)

For low-to-medium speeds	MP-810B/820B/830B	13
Wide range	MP-610	14

### Photoelectric Type

Compact type	LG-916	14
Long distance detection	LG-930	15
Glass Fiber	FS-540/FG-1200	15

### Rotary Encoders

General-purpose compact type	RP-432Z	16
Ultra-compact type	SP-405ZA	16

## Rotation Display Units

### Multifunction type

With 2-channel calculation function	TM-5100	17
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## Related Products

### Line Speed Detector (Roller Encoder)

For medium-to-low speeds	RP-721	18
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### Length Meter

Length detector	RP-732	18
Reversible Counter	RV-3150	19

### Peripheral Devices

Ratio Multiplier	TA-103	20
Signal Amplifier	PA-150	20

### Frequency-Voltage converters

General-purpose type	FV-1100	21
High-speed response type	FV-1300	22, 24
Multi-channel type	FV-5300	23, 24

### Coupling Selection Guide

25

### Table of Signal Cable

26, 27

# Rotation Detectors

## Notes on Detection Gears

### ● Detection Gear

In theory, a detector is a magnetic body. Since it has a large magnetic permeability, soft metals (such as S20C, SS41) are generally used.

When performing normal rotating speed measurements, if the gate time is specified at 1 second, using a 60 P/R gear enables direct readout of the rotating speed by the counter.

### ● Shape of a Detection Gear

Fig. 1 shows detector output waveforms from various types of external rotors (detection gears and so forth).

If the gear is a spur gear, an involute gear is the most suitable type, as it produces waveforms with high frequency spikes from squared-off, triangular or rounded teeth. Care is required because spikes appear in waveforms even when the gear teeth are chipped in places.

Furthermore, if the gear teeth are magnetized, please be aware that reciprocal interference between the teeth and the permanent magnets inside the detector will result in a reduction of the output voltage, and abnormal waveform signals.

Fig. 2 shows the relational dimensions of the gear and detector that are required in order to obtain the optimal output voltage and output waveform.

"a" shall be the same dimension as or larger than "d"

"b" shall be the same dimension as or larger than "c"

"c" shall be three times the dimension of "d"

"e" shall be less than half the dimension of "b", and as small as possible

The tooth width shall be at least 4 mm

- a: Gear tip thickness      b: Tooth height      c: The spacing between teeth  
d: Yoke diameter          e: Gap between the gear and the detector

Abbreviations used

M = Module      Z = Number of teeth      D = Outer diameter of gear

$$M = \frac{D}{Z+2}$$

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

If Z = 60, then N = C

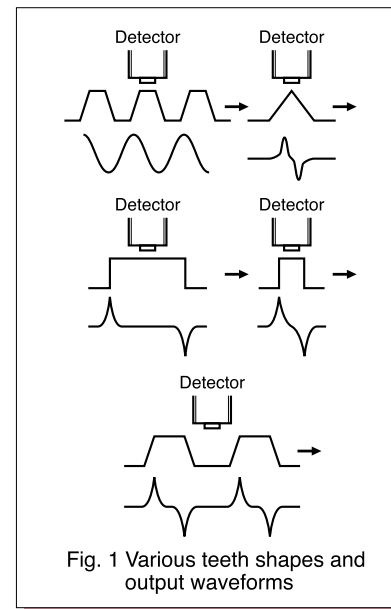


Fig. 1 Various teeth shapes and output waveforms

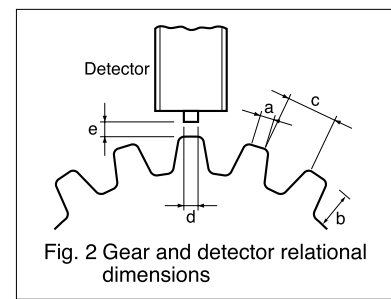
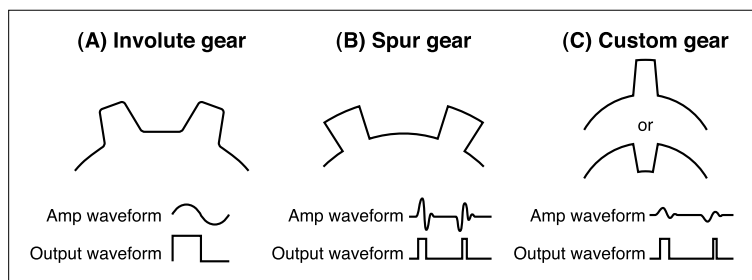


Fig. 2 Gear and detector relational dimensions

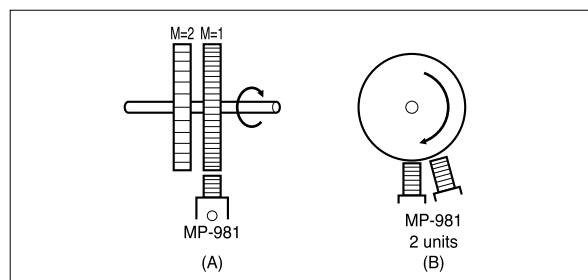
### ● Shape of the gear for the MP-981 and the mounting method

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



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

#### (2) Mounting method

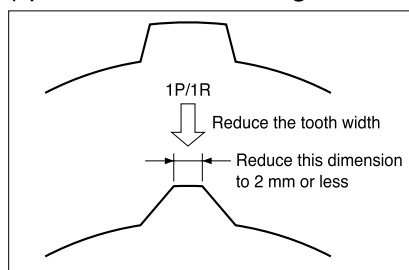


Please avoid the mounting configurations shown in the above figure, as they will cause reciprocal magnetic interference.

In the case of (A), a gear with a different module is mounted in the vicinity of the MP-981.

In the case of (B), two or more MP-981 units are mounted within the vicinity of one gear

#### (3) How to use a custom gear

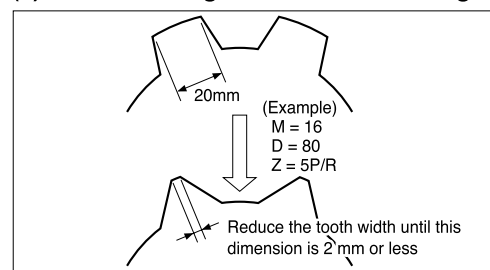


#### (4) How to calculate Module M

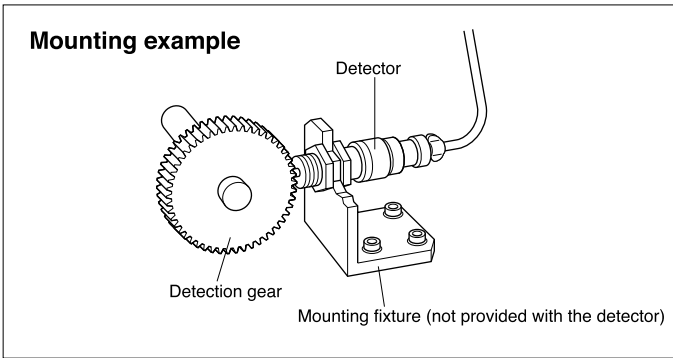
This calculation is for involute gears only

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

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



The MP-900/9000 Series detectors have been designed primarily to detect frequency signals in proportion to the rotating speed by bringing the detector in close proximity to the addendum of a detection gear fitted to a rotating shaft (sine wave output). Various types are available, from general-purpose, oil-proof and heat-resistant types through to user-customized types, enabling you to select the one that best suits your application. Extension cables, signal cables and connectors can also be purchased separately.



## ● Features

- **General-purpose type**  
**MP-9100**  
General-use type
- **General-purpose type with a directly attached cable**  
**MP-911**  
MP-910 with a 5-m directly attached (cable: 3D-2V type)
- **Low impedance type (for measuring high-speed rotations)**  
**MP-9120**  
Low impedance enables better noise resistance  
Ideal for the detection of high-speed rotations  
Same outer dimensions as those of the MP-9100 model
- **Oil-proof type**  
**MP-930**  
Complies with the JEM (Japan Electrical Manufacturers Association) 1030-1983 standard for oil-proof models
- **Oil-proof/Heat-resistant type**  
**MP-935**  
Complies with the JEM (Japan Electrical Manufacturers Association) 1030-1983 standard for oil-proof models  
Heat-resistant up to 150°C  
Comes with a 1-m heat-resistant cable
- **Heat-resistant type**  
**MP-936**  
Heat-resistant up to 220°C  
Comes with a 1-m heat-resistant cable
- **Long body type**  
**MP-940A**  
The 105-mm mounting section on this long body type makes it ideal for detecting rotations deep in the rotating object.
- **Compact type**  
**MP-950**  
Compact; comes with a 0.5-m cable

## • Long body type

### MP-954

The 81-mm mounting section on this long body type makes it ideal for detecting rotations deep in the rotating object. The mounting screw dimensions are the same as those of the MP-950 model.

## • Compact type

### MP-962

Compact; comes with a 0.5-m cable

## • Ultra-compact type

### MP-992

Ultra-compact; comes with a 0.5-m cable

## • Small module type

### MP-9200

For modules 0.5 to 1

## • Medium module type

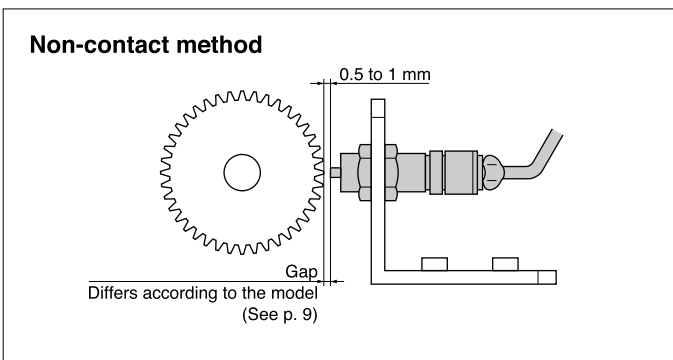
### MP-963

For modules 3 to 10

## ● Standard Detection Gear

### MP-001 ( $\phi = 62$ )

Module 1, 60 teeth



Note: When using the MP Series electromagnetic rotation detectors in locations where there are requirements for high reliability, please contact nearest Ono Sokki representative for separate technical solutions that meet your needs.

## ● MP-900/9000 Series Specifications

Item	Detector		General-purpose	With cable attached	Low impedance (Measurable for high speed rotation)	Oil-proof	Oil-proof/Heat-resistant (150°C)	Heat-resistant (220°C)
	MP-9100	MP-911	MP-9120	MP-930	MP-935	MP-936		
DC resistance value (Ω) <sup>*1</sup>	850 to 950		85 to 105	850 to 950	600 to 700	800 to 900		
Inductance (mH) [1 kHz, typ.]	300		30	300	270	370		
Impedance (Ω) [1 kHz, typ.]	2 k		240	2 k	1.8 k	2.5 k		
Output voltage (Vp-p) [1 kHz, typ.] <sup>*2</sup>	2.0 or greater							
Detectable frequency range (Hz) <sup>*3, *4</sup>	200 to 35,000		200 to 80,000	200 to 35,000	300 to 35,000			
Detection gear module	1 to 3							
Operating temperature range	-10 to +90°C				-10 to +150°C	-10 to +220°C		
Vibration resistance (m/s <sup>2</sup> ) <sup>*5</sup>	196							
Shock resistance (m/s <sup>2</sup> ) <sup>*6</sup>	1,960							
Weight (g)	90	300 (including cable)	90	100 (including cable)	100			
Surrounding magnetic field (T)	Up to 0.03				Up to 0.02			

Item	Detector		Long body	Compact type (With cable attached)	Long body	Compact type (With cable attached)	Ultra-compact type	For small modules	For medium modules
	MP-940A	MP-950	MP-954	MP-962	MP-992	MP-9200	MP-963		
DC resistance value (Ω) <sup>*1</sup>	500 to 600	2.1 k to 2.3 k	2.1 k to 2.3 k	1.25 k to 1.45 k	160 to 190	850 to 950	3.7 k to 4 k		
Inductance (mH) [1 kHz, typ.]	270	400		210	25	300	1800		
Impedance (Ω) [1 kHz, typ.]	1.8 k	3.5 k		2.1 k	250	2 k	16 k		
Output voltage (Vp-p) [1 kHz, typ.] <sup>*2</sup>	2.0 or greater			1.5 or greater	0.5 or greater	0.6 or greater (M=0.75)	2.5 or greater		
Detectable frequency range (Hz) <sup>*3, *4</sup>	300 to 35,000			400 to 35,000	400 to 100,000	300 to 35,000	45 to 15,000		
Detection 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 <sup>2</sup> ) <sup>*5</sup>	196						147		
Shock resistance (m/s <sup>2</sup> ) <sup>*6</sup>	1,960								
Weight (g)	150	70	90	50	3	90	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 is 0.4% / °C.

\*2 Load resistance is 10 kΩ, M = 1, Gap = 0.5 mm

\*3 The frequency value (Hz) indicated corresponds to the rotating speed (r/min) indicated when a 60 P/R detection gear is used.

\*4 When using the Ono Sokki standard MP-001 detection gear

\*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 the rotational speed that 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.

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

For a module that is greater than 1, we recommend a tooth width of 4 mm.

#### d) Detection gear material

Material with a property of being strongly attracted to a magnet, or in other words, a ferromagnet, is ideal. If you have a choice, we recommend materials such as S45C, SS400, SUS430, or FC400.

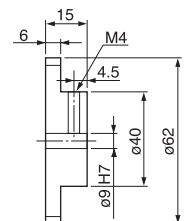
#### ● Ono Sokki's standard detection gear MP-001

The detection gear available from Ono Sokki is a module 1 involute gear with 60 teeth.

Number of teeth: 60

Module: 1

Material: SS400 (Chrome plated)





## ● The Relationship between the Gap and Detection Rotation Range

- (1) The relationship between the gap between the detector and the detection gear and the detection range (Lowest measurable value) is given in the tables below.
- (2) The rotating speed range is that for which an output voltage of 0.5 V<sub>p-p</sub> or greater can be maintained (load resistance = 10 kΩ).
- (3) The rotating speed that can be measured varies according to the type of display unit used.

### • MP-900/9000 Series: Rotating speed (r/min) that can be measured

Note: When a 60-tooth gear is used

Model name	Module	Lowest measurable value						Highest measurable value
		M=1		M=1.5		M=2		
		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

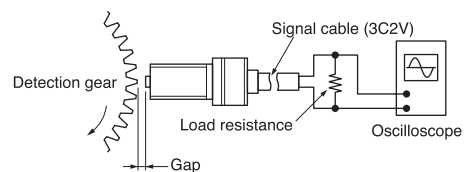
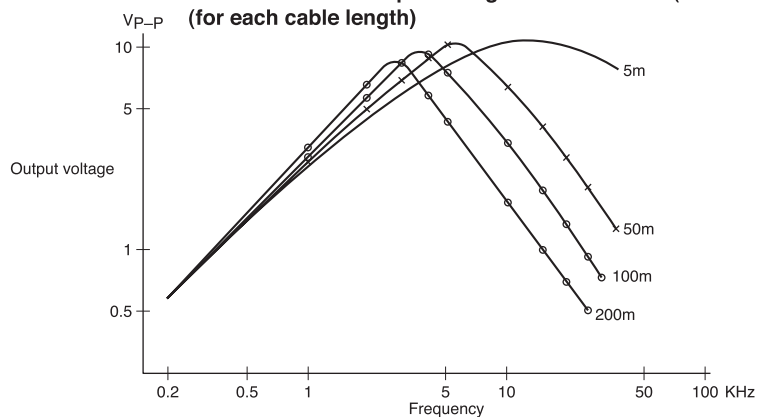
Model name	Module	M=1		M=1.5		M=2		Highest measurable value
		0.2	0.5	0.2	0.5	0.2	0.5	
MP- 992		400	1000	230	600	140	330	100,000

Model name	Module	M=0.75		Highest measurable value
		0.5		
MP- 9200		1000		35,000

Model name	Module	M=3		M=5		M=7.5		Highest measurable value
		1	2	1	2	1	2	
MP- 963		45	90	25	50	20	45	15,000

Note: The data in the above tables are standard values, and operation at these values is not guaranteed.  
 An Ono Sokki display unit was used to be available at the above figures.

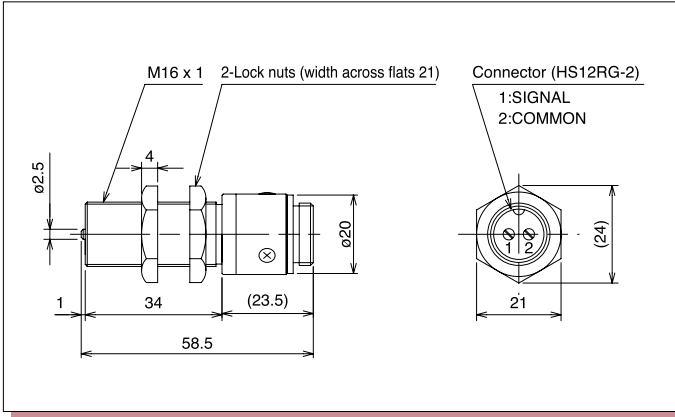
MP-9100/911/930 output voltage characteristics (G = 0.5 mm)  
 (for each cable length)



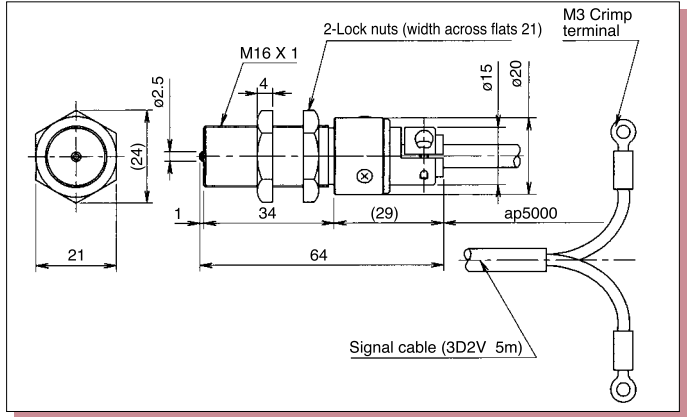
#### [Measurement parameters]

Detection gear: M = 1, Z = 120 P/R  
 Load resistance: R<sub>L</sub> = 10 kΩ  
 Gap: G = 0.5 mm

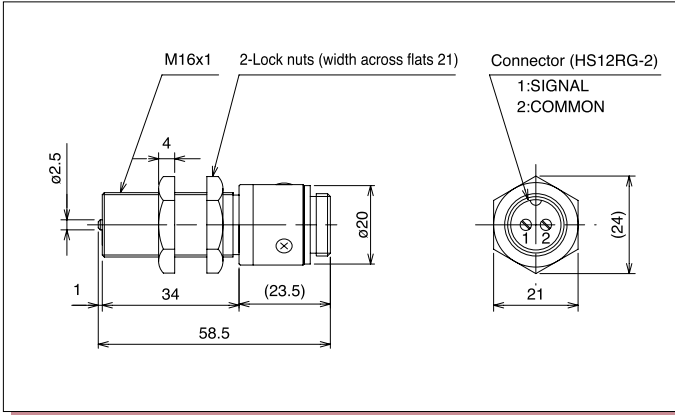
• MP-9100



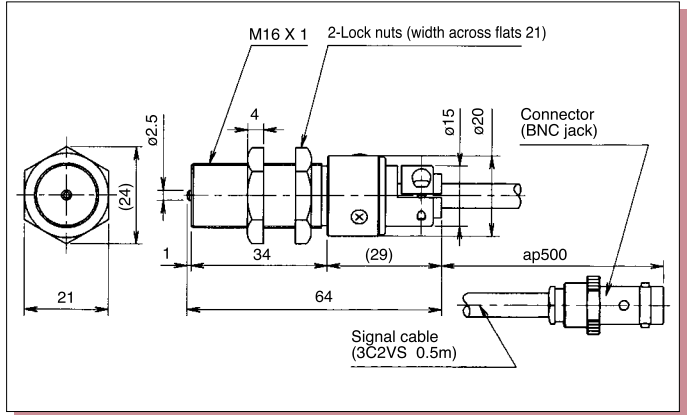
• MP-911



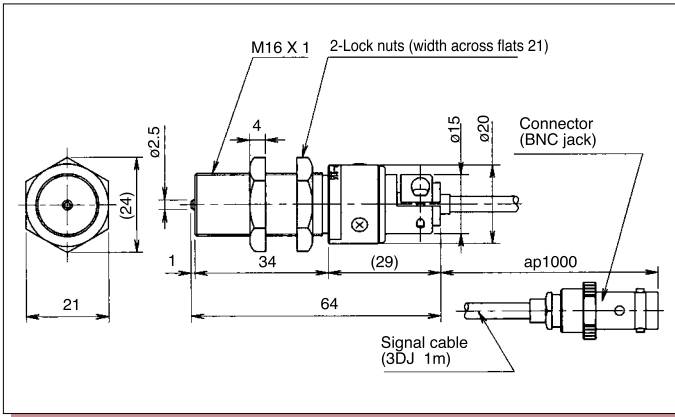
• MP-9120



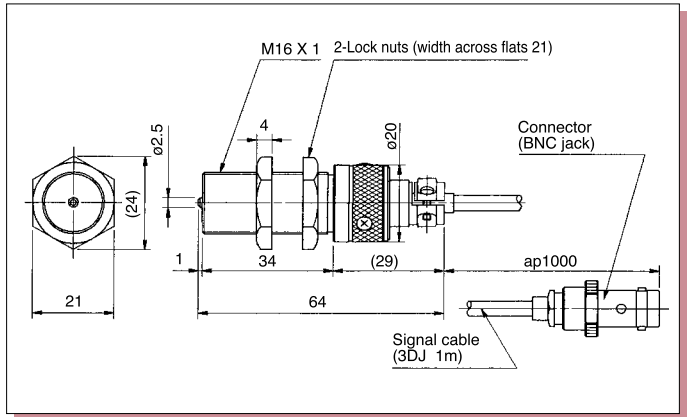
• MP-930



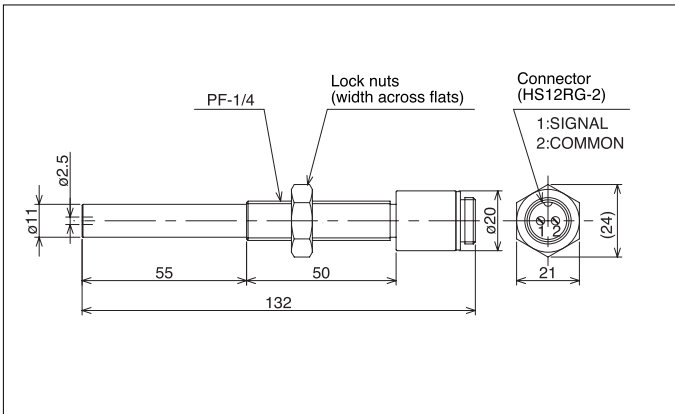
• MP-935



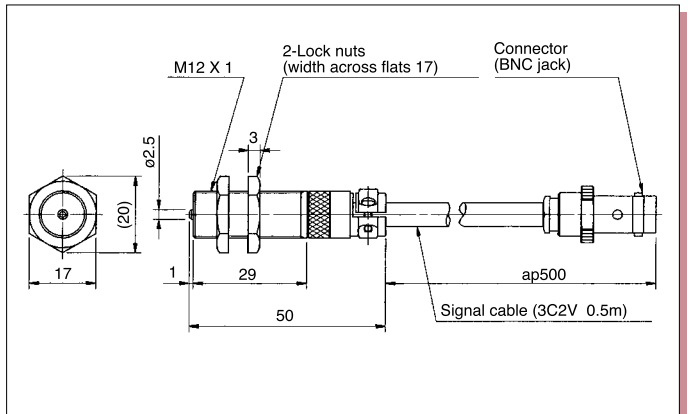
• MP-936



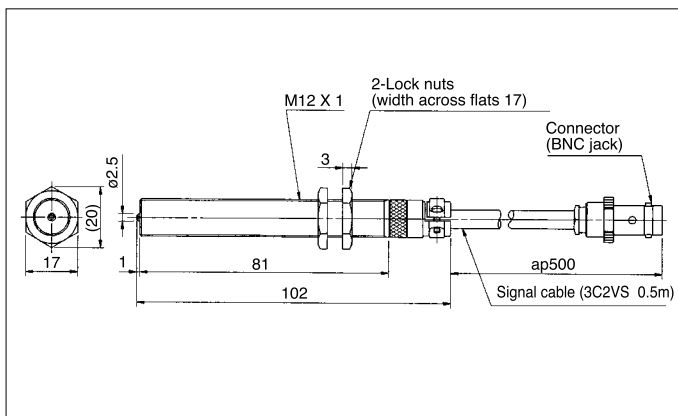
• MP-940A



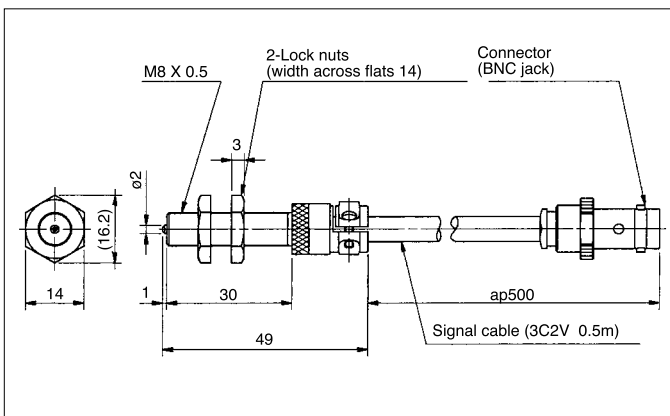
• MP-950



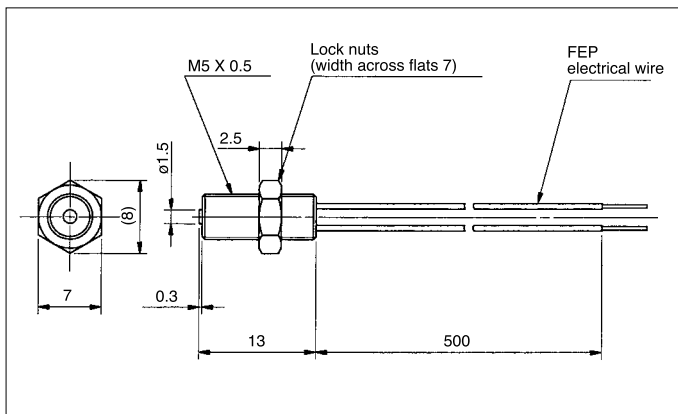
• MP-954



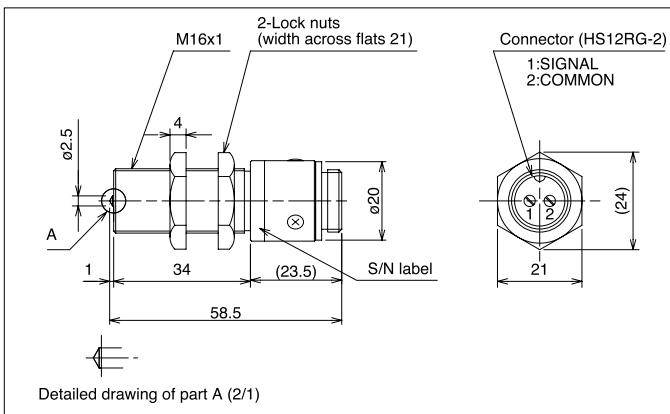
• MP-962



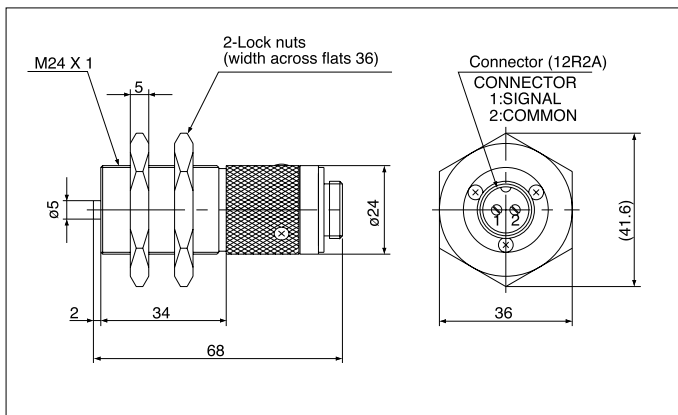
• MP-992



• MP-9200



• MP-963

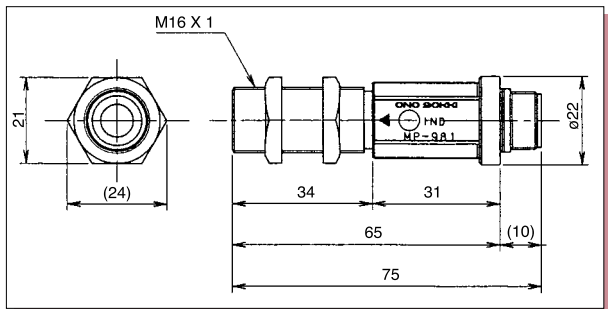


# Magnetolectric Rotation Detector MP-981

## For detection of low-to-medium speeds

These detectors utilize magnetic flux response (the resistance value changes according to the magnetic flux). The internal mechanism comprises magnetic resistance elements, permanent magnets, a direct current amplifier, and a voltage regulator. Detection can be performed as square wave output over a wide range from ultra-low speeds to high speeds (1 to 20,000 r/min [60 P/R]). There are two models: the general-purpose MP-981 model and the waterproof AP-981 model.

Rotation Detectors  
External Gear Type



### ● Features

- Detection from nearly 0 r/min
- Output from ultra-low to high speeds (1 to 20,000 r/min [in the case of a 60-tooth gear])
- Compact, lightweight, easy-to-mount

### ● Specifications

Detection method: Detection using magnetic resistance elements

Detection range: 1 Hz to 20 kHz

Detection gear: Ferromagnet (Tooth width: At least 3 mm, Module: 0.5 to 3)

Detection distance: See the figure at the right

Power requirement: 12 VDC  $\pm 2$  V

Power consumption: Approx. 40 mA (at 12 V)

Output waveform: Square wave Lo: Up to +0.5 V  
Hi: +5  $\pm 0.5$  V

Output impedance: Approx. 330  $\Omega$

Protective circuit: Power source polarity, output short-circuit protection

Operating temperature range: -10 to +70°C

Withstand voltage: 250 VDC

Vibration resistance: (normal power supply):

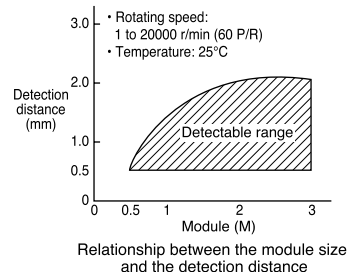
1.2 mm compound amplitude, 30Hz (for one hour in each of the X, Y, and Z directions)

Shock resistance (when not connected to a power supply):

490 m/s<sup>2</sup> (three times each in the X and Y directions)

Connection method: Connector (compatible plug, R04-PB6F) or MX-700, MX-800 Series signal cable

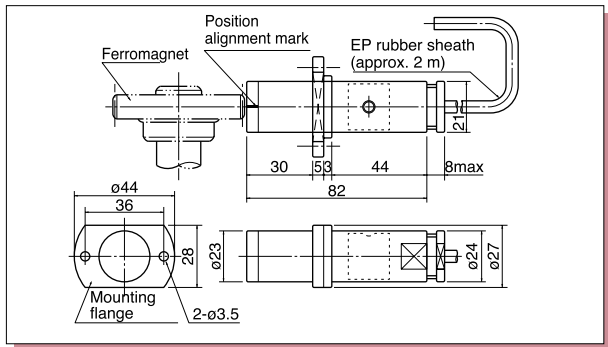
Weight: Approx. 80 g (including the two nuts used for fastening)



# Magnetolectric 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 is nitric acid mist in the atmosphere, or in environments where the detector needs to be submerged.
- Performs detection by non-contact rotation
- Output from ultra-low to high speeds (1 to 20,000 r/min [in the case of a 60-tooth gear]) as square waves of the same amplitude
- Comes with a 2-m length acid-resistant cable attached

### ● Specifications

Detection method: Detection using magnetic resistance elements

Detection range: 1 Hz to 20 kHz

Detection gear: Ferromagnet (Tooth width: At least 3 mm, Module: 1 to 3)

Detection distance: See the figure at the right

Power requirement: 12 VDC  $\pm 2$  V

Power consumption: Approx. 40 mA

Output waveform: Square wave Lo: Up to +0.5 V  
Hi: +5  $\pm 0.5$  V

Output impedance: Approx. 330  $\Omega$

Protective circuit: Power source polarity, output short-circuit protection

Operating temperature range:

-10 to +70°C (on the condition that it is within the atmosphere or IP-X7{JIS C0920})

Withstand voltage: 250 VDC

Vibration resistance (when connected to a power supply):

1.2 mm compound amplitude, 30Hz (for one hour in each of the X, Y, and Z directions)

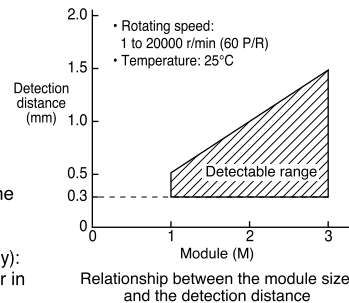
Shock resistance (when not connected to a power supply):

490 m/s<sup>2</sup> (three times each in the X and Y directions)

Outer surface material: Polycarbonate

Connection method: 2-m length directly attached cable (other end: open)

Weight: Approx. 130 g

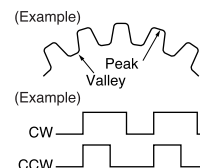


### CAUTION

The MP-981 and AP-981 have been designed for the purpose of detecting rotational speed.

Please observe the following points when using these detectors.

- (1) Output is performed from ultra-low to high speeds (1 to 20,000 r/min [in the case of a 60-tooth gear]) as rectangular waves with the same amplitude, but this does not necessarily mean that the High level will be at the peaks of the gear and the Low level at the valleys. Accordingly, when using several detectors to performed synchronized measurement, the starting positions may not be the same.
- (2) The pulse width that is output when the gear is rotated in the clockwise direction may differ from the width that is output when the gear is rotated in the counter-clockwise direction.



# Electromagnetic Rotation Detectors MP-800 Series

## For the detection of low-to-medium speeds

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



### ● Features

- Since the output is 600 P/R (MP-810B), the detector can be connected to a digital tachometer with a gate time being specified at 1 second, to enable direct reading in 0.1 r/min units.
- If required, these detectors can perform high-precision measurement of low speeds.
- There are three models in the series, differentiated by their outer appearance.

MP-810B: Base mount type

MP-820B: Dual-shaft type

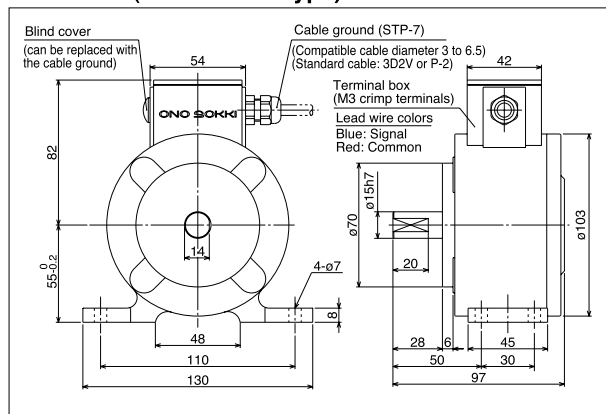
MP-830B: Flange type

- Number of output pulses

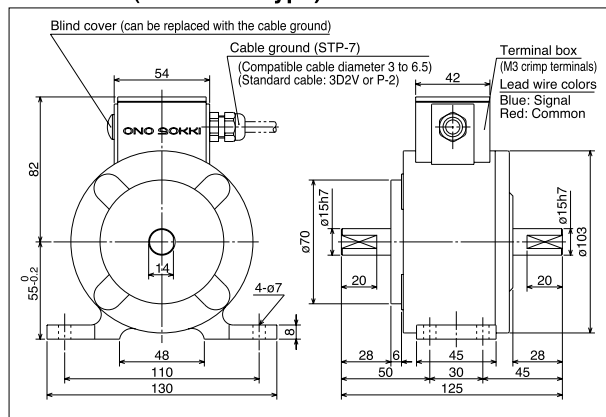
Model	Number of Signals (P/R)
MP-810B/820B*/830B*	600
MP-810F/820F*/830F*	300
MP-810G*/820G*/830G*	60, 120, 180, 200, 240, 360, 400, 420

\*Manufactured after receipt of order

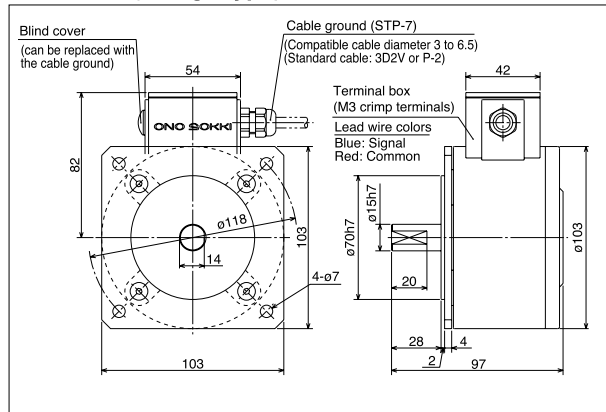
### • MP-810B (Base mount type)



### • MP-820B (Dual-shaft type)



### • MP-830B (Flange type)



### ● Specifications

Rotating speed range: 5 to 5,000 r/min

Output waveform: Sine wave approximation

Output voltage: At least 0.5 V<sub>p-p</sub>

DC resistance value: 770 ±30 Ω

Inductance: 2 H (typ)

Starting torque: 245 mN·m or less

Moment of inertia: Approx 1.5 kg/cm<sup>2</sup> (1588 g/cm<sup>2</sup>)

Permissible shaft load: Radial 147 N, thrust 98N

Vibration resistance: 98 m/s<sup>2</sup> (for two hours in each of the X, Y, and Z directions)

Shock resistance: 980 m/s<sup>2</sup> (three times in each of the X, Y, and Z directions)

Operating temperature range: -10 to +80°C

Weight: Approx. 2 kg

Connection method: M3 crimp terminal (JIS C 2805 1.25-3)

(when using the MP-081)

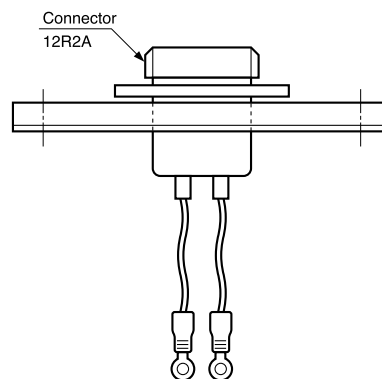
• MP-081 + MX-005 Series (BNC) /Sold separately

• MP-081 + MX-505 Series (Crimp terminals)

/Sold separately

Cable outlet: Cable plug (complies with IP-68)

Surrounding magnetic field: Up to 0.01 T



Option: MP-081

Connector plugs 12P2B

For attachment to the terminal box (with covers)

# Electromagnetic Rotation Detector MP-610

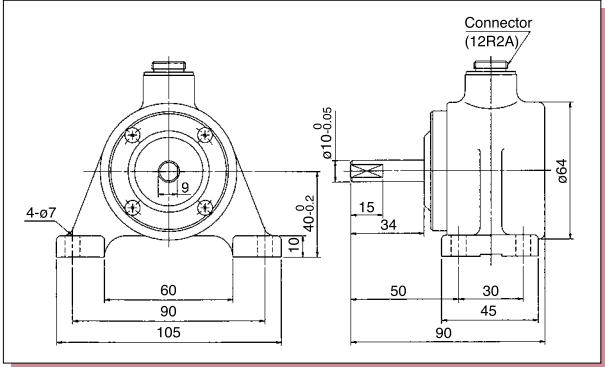
For measurement over a wide range

Rotation Detectors

Built-in Gear Type/Photoelectric Type



• MP-610 (Base mount type)



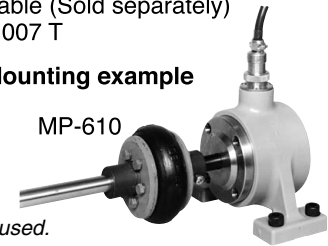
● Features

- Handles a wide rotation range from 50 to 15,000 r/min
- Since the output is 60 P/R, the detector can be connected to a digital tachometer with a gate time being specified at 1 second, to enable direct reading in 1 r/min units.

● Specifications

Rotating speed range: 50 to 15,000 r/min  
 Number of output pulses: 60 P/R  
 Output waveform: Sine wave approximation  
 Output voltage: 0.5 Vp-p or greater  
 DC resistance value: 760 to 920 Ω  
 Inductance: 860 mH (typ)  
 Starting torque: 9.8 mN·m or less  
 Moment of inertia: Approx 70 g/cm<sup>2</sup>  
 Permissible shaft load: Radial 68.6 N, thrust 39.2 N  
 Vibration resistance: 98 m/s<sup>2</sup>  
 (for two hours in each of the X, Y, and Z directions)  
 Shock resistance: 980 m/s<sup>2</sup>  
 (three times in each of the X, Y, and Z directions)  
 Operating temperature range: -10 to +90°C  
 Weight: Approx. 650 g  
 Connection method: Connector (compatible plug: 12P2B), or MX-005 Series signal cable (Sold separately)  
 Surrounding magnetic field: Up to 0.007 T

• Mounting example

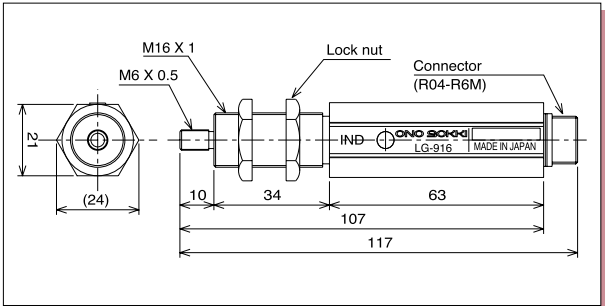
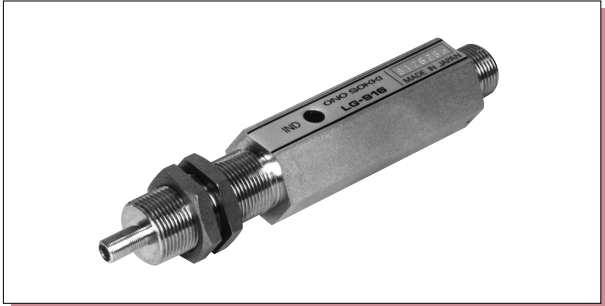


Note: Please refer to p.25 for the coupling used.

# Photoelectric Rotation Detector LG-916

Compact, Optical Fiber Sensor

The LG-916 model is a reflective-type photoelectric rotation detector that employs an optical fiber at its tip. A pulse modulation method has been used for the light projection source, and the detector has been designed to be virtually unaffected by ambient light.



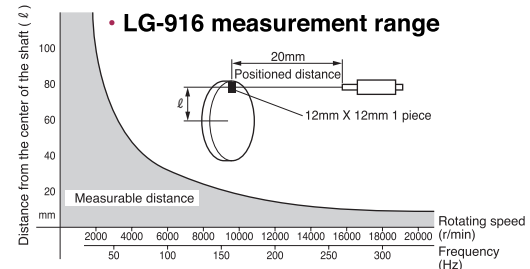
● Features

- Detection from nearly 0 r/min
- This compact, easy-to-use photoelectric detector that features the light source, light receiver and amplification section in a unified structure is a lightweight model weighing only 150 g.
- A light-emitting diode is used for the light element.
- A waterproof connector is provided as standard.

● Specifications

Detection method: Light reflection using an optical fiber sensor  
 Detection distance: Up to a maximum of 20 mm when using the 12-mm-square reflective mark (Ono Sokki Model HT-011).  
 Maximum response speed: 20 m/s (conversion of the rotating shaft's circumferential speed)  
 Time response delay: 0.6 m/s (light receiver conversion time) or less  
 Light source: Light-emitting diode (infrared light)  
 Light receiver element: Phototransistor  
 Power requirement: 12 VDC ±2 V  
 Current consumption: 60 mA or less (when using 12 V)  
 Output waveform: Rectangular wave Hi: +5 ±0.5 V, Lo: Up to +0.5 V  
 Output impedance: 1 kΩ or less  
 Connection method: Connector (compatible plug: R04-PB6F or MX-700/800 Series signal cable/sold separately)  
 Operating temperature range: -10 to +60°C  
 Storage temperature range: -20 to +80°C  
 Weight: 150 g

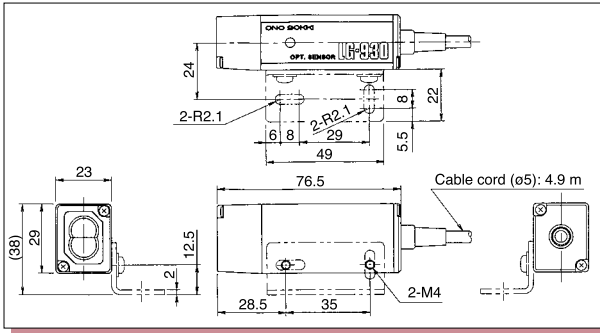
• LG-916 measurement range



## Photoelectric Rotation Detector LG-930

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

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



#### ● Features

- Can be positioned at a distance of up to 200 mm away from the target measurement object
- The compact design enables it to be mounted in small spaces. Moreover, the L-shaped mounting fixture enables easy mounting.
- 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: Photoelectric reflection of visible light  
 Detection distance: 70 to 200 mm (when using the 12-mm-square reflective mark)  
 Object detected: Reflective mark  
 Maximum response speed: 25 m/s (when using the 12-mm-square reflective mark, and when the distance from the point to which the mark was affixed is 48 mm)  
*\*Ono Sokki Model HT-011 is recommended as reflective mark.*  
 Time response delay: 0.5 ms (light receiver conversion time) or less  
 Light source: Light-emitting diode (red visible rays)  
 Light receiving element: Phototransistor  
 Power requirement: 12 VDC  $\pm 2$  V  
 Current consumption: 85 mA or less (when using 12 V)  
 Output waveform: Rectangular wave Hi: +5 V  $\pm 0.5$  V, Lo: Up to +0.5 V (on condition that a load resistance is at 100 k $\Omega$  at least.)  
 Output impedance: 1 k $\Omega$  or less  
 Operating temperature range: -10 to +60°C  
 Storage temperature range: -20 to +80°C  
 Input/output connectors: Directly attached cable with the other end open  
 Cable length: 4.9 m  
 Weight: Approx. 200 g  
 Accessory provided: Mounting fixture

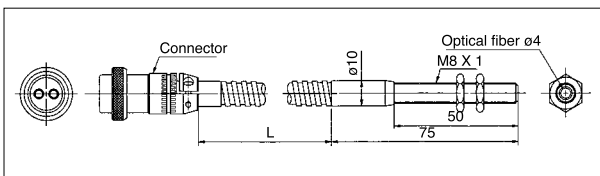
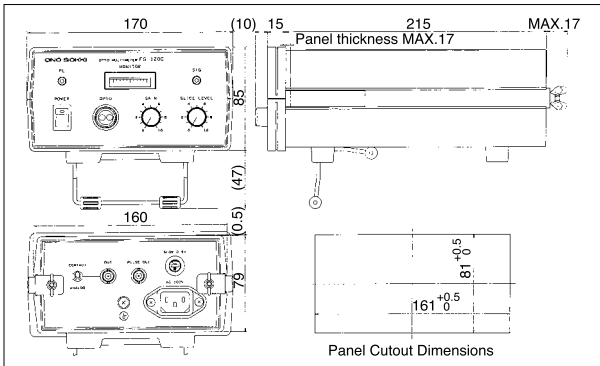
#### ● Application Example

Attach the reflective mark to the shaft of the rotating object and then perform detection.

## Photoelectric Rotation Detector FS-540/FG-1200

### Optical Fiber Sensor/Optical Multimeter

Combine the FS-540 Optical Fiber Sensor with the FG-1200 Optical Multimeter to enable a detection distance of up to 70 mm



#### ● Features

- Detects the rotational speed, number of objects, position, level, and judges whether or not an object is present
- If reflective mark (Ono Sokki Model HT-011) that generates a large amount of reflected light is affixed to the target object, detection can be performed at a distance of up to 70 mm.
- Since light is used for detection, the products are virtually unaffected by noise.
- Detection of even ultra-small amounts of light can be performed.

#### ● Specifications

**FG-1200 Optical Multimeter**  
 Response frequency: 0 to 5 kHz  
 Lighting method: Light-emitting diode (near infra-red rays)  
 Light receiving method: Photodiode  
 Output signals: Analog output (proportional to the amount of reflected light): 0 to 10 V  
 Load resistance: At least 10 k $\Omega$   
 Pulse output: Hi: +5 V, Lo: Up to +0.5 V  
 Load resistance: At least 10 k $\Omega$   
 Contact output: 0.1 A (100 VAC resistance load)  
 Slice level: User-specifiable setting  
 Connection method: Connector (compatible plug: BNC) or MX-100 Series signal cable (option)  
 Power requirement: 100 VAC  $\pm 10\%$  (100/120/220/240 VAC on request)  
 Operating temperature range: 0 to +40°C

#### Gap between the optical fiber sensor and the target measurement object (when the output signal is 1 V)

Target measurement object	Minimum Gain	Maximum Gain
Black matte painted surface	$\approx 7$ mm	$\approx 14$ mm
White paper 12 mm x 12 mm	$\approx 8$ mm	$\approx 15$ mm
Mirror 12 mm x 12 mm	$\approx 32$ mm	$\approx 44$ mm
Reflective mark 12 mm X 12 mm (Ono Sokki Model HT-011)	$\approx 44$ mm	$\approx 69$ mm

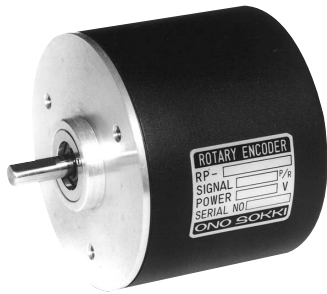
#### FS-540 Optical Fiber Sensor Specifications

	FS-540	FS-340 (Manufactured after receipt of order)
Detection method	Reflective	Reflective
Diameter of fiber tip	$\phi 4$ mm	$\phi 4$ mm
Length of fiber (L)	1 m	1 m
Temperature	-10 to +70°C	-10 to +250°C

\* TMF-80 swivel-neck model with magnetic base  
 \* The optical fiber can be extended up to a length of 10 m. (option)  
 \* Reflective mark Model HT-011 can be supplied as an option. 1 set of HT-011 includes 250 pcs. of reflective mark.

## Rotary Encoder RP-432Z

Compact type for general-purpose use

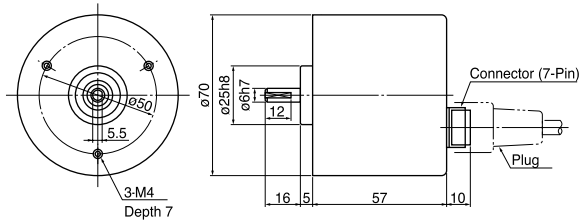


### ● Features

- Small, standardized, economical design
- Compact, general-purpose type with a shaft diameter of  $\phi 6$ , an outer diameter of  $\phi 70$ , and weighing only 300 g
- 5 VDC or 12 VDC power supply can be selected
- 2-phase square wave + zero mark output
- Easy-to-use connector
- Choice of eight pulse output types

### ● Specifications

Detection method: Photoelectric  
 Number of output pulses: 60, 120, 300, 360, 500, 600, 1000, 1024 P/R  
 Response frequency: 50 kHz  
 Output signal: 90° phase difference; 2-phase square wave + zero mark output  
 Output voltage: Square wave Hi: At least 4 V,  
 Lo: Up to 0.2 V (5-V power supply)  
 Hi: At least 10 V,  
 Lo: Up to 0.3 V (12-V power supply)  
 Output method: Totem pole output, load resistance at least 1 k $\Omega$   
 Power requirement: 5 VDC  $\pm 5\%$ , 100 mA or 12 VDC  $\pm 5\%$ , 100 mA  
 Maximum rotating speed: 5000 r/min  
 Starting torque: 1.5 mN·m  
 Moment of inertia: 24 g/cm<sup>2</sup>  
 Operating (storage) temperature range: 0 to +50°C (-20 to +80°C)  
 Connection method: Connector (cable end: TRC116-12A10-7F provided as standard)  
 Permissible shaft load: Radial 20 N, thrust 10 N



## Rotary Encoder SP-405ZA

Ultra-compact type

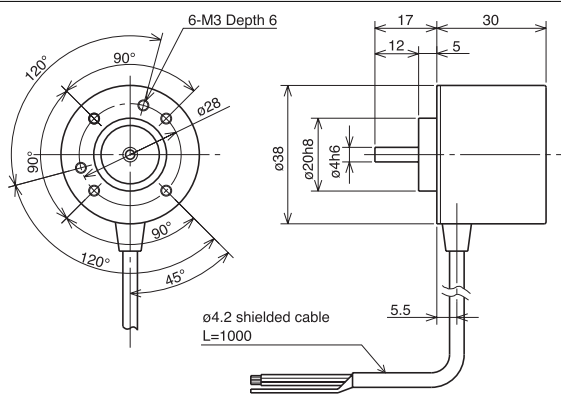


### ● Features

- Economical type designed for OEM needs
- $\phi 40$  outer diameter; ultra-compact, lightweight model weighing only 100 g
- 2-phase square wave + zero mark signal output
- High resolution up to a maximum of 600 P/R
- Choice of seven pulse output types

### ● Specifications

Detection method: Photoelectric  
 Number of output pulses: 60, 100, 200, 300, 360, 500, 600 P/R  
 Response frequency: 100 kHz  
 Output signal: 90° phase difference; 2-phase square wave + zero mark  
 Output voltage: "1": At least the power voltage -20%, "0": Up to 0.5 V  
 Output method: Collector, load resistance at least 10 k $\Omega$   
 Power requirement: 5 to 12 VDC  $\pm 10\%$ , 50 mA  
 Maximum rotating speed: 6000 r/min  
 Starting torque: 2 mN·m  
 Moment of inertia: 6 g/cm<sup>2</sup>  
 Operating (storage) temperature range: -10 to +70°C (-20 to +80°C)  
 Connection method: Directly attached 1-m length cable (other end: open)  
 Permissible shaft load: Radial 25 N, thrust 15 N  
 Protection class: IP40

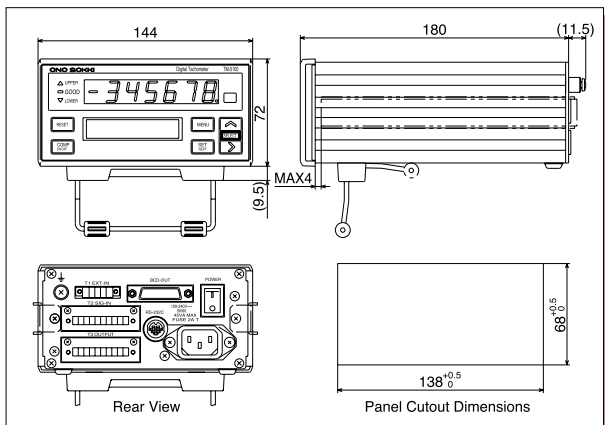


Note: Ono Sokki handles a wide range of rotary encoders, and we have printed a separate catalog for these products. Please ask nearest Ono Sokki representative for a copy of the "RP Series" catalog or download it from the company's web site.



# Digital Tachometer TM-5100

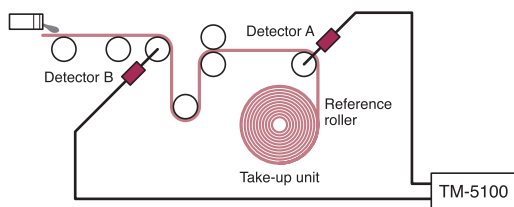
## Multifunctional tachometer with a 2-channel calculation function



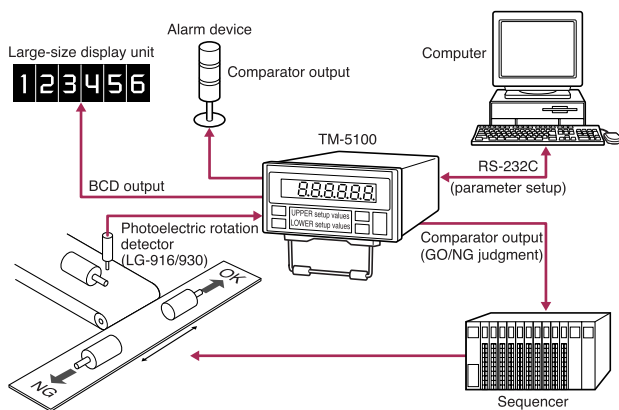
### ● Applications

#### • Measurement of the draw on paper manufacturing or glass manufacturing line

Rotation detectors are mounted on the rotating parts of the line, and signals from the detectors are input to the TM-5100. At this time, the speed of the reference roller and the rate of change are displayed on the TM-5100, enabling the speed at different parts of the line to be adjusted and thereby ensure stable quality products.



#### • Inspection of Motor Products



### ● Features

- Capable of measuring a wide range of rotations from low to high speeds (input frequency: 0.6 mHz to 100 kHz)
- Calculation and display of signals from two rotating objects
- The independent coefficient compensation function for each channel enables conversion to the desired physical quantity proportional to the rotating speed.
- Built-in upper and lower level comparator functions
- The 2-channel calculation function displays the rotational difference, rotational ratio, draft, draw, rotational rate of change and rotational direction.
- BCD, analog, comparator and RS-232C output functions are provided as standard.
- DIN standard size (144 x 72) for easy panel mounting.
- Two display sections have been incorporated: the main display section for displaying the numerical values and a sub display section (two rows) for displaying the setup parameters (comparator setup values, coefficient values, measurement values for two channels, and so forth).

### ● Specifications

Compatible detectors: MP Series electromagnetic and magnetoelectric detectors, LG Series photoelectric detectors, RP Series rotary encoders, etc.

Number of input channels: 2

Input amplification mode: AC/DC (switch-selectable)

Measurement method: Synchronized calculation, gate calculation (switch-selectable)

Measurement time: 0.2s + time required for one period (for period calculation)

Coefficient measurement range: 0.0001 to 99.9999

2-ch calculation function: Difference <B-A>, Ratio <(B/A) x 100>, rate of change <B-A/A> x 100>

Rotational direction measurement function:

When a 2-phase rotary encoder is used, the rotational direction is displayed as a polarity display

Main display section: Green 7-segment LED (character height: 14 mm)

Display range: 0 to ±999999 (0.00 to 9999.99%)

Sub display section: (parameter setup display section):

LCD module

Number of characters displayed: 16 characters x 2 rows

Signal input section: Input impedance: At least 10 kΩ (At 100 kHz)

AC amplification section: Signal waveform: Sine wave or square wave

Signal voltage range: Sine wave 0.2 to +45 Vrms

Square wave 0.6 to 63 Vp-p

Signal frequency range: 1 Hz to 100 kHz

DC amplification section: Signal waveform: Rectangular wave with a pulse width of at least 4 μs

Signal voltage range: Hi : +4 to +30 V

Lo : -1 to +1 V

Signal frequency range: 0.0006 Hz to 100 kHz

Comparator function: Number of setting levels: 2

Setting range: 0 to ±999999

Parameters output: UPPER/GOOD/LOWER

Output format: Semiconductor relay make contact (30 VDC, 0.1A)

Analog output: Converter: 12-bit, D/A method

Voltage range: 0 to ±10 V/FS (full scale is user-specifiable)

BCD output: Positive/negative logic (switch-selectable), 6 digits in parallel

Output format: Open collector

RS-232 transmission: Baud rate: 2400, 4800, 9600 bps

Sensor power supply: 5 VDC ±0.25 V (max. 150 mA) for the total value of channels A and B

12 VDC ±0.6 V (max. 150 mA) for each of the channels A and B

Power requirement: 100 to 240 VAC (50/60 Hz)

Power consumption: 45 VA or less

Operating temperature range: 0 to 40°C

Humidity range: Max 95% (non-condensing)

Outer dimensions: 144 (W) x 72 (H) x 191.5 (D) mm

Weight: Approx. 1.5 kg

# Related Products

## Line Speed Detector (Roller Encoder) RP-721

For low-to-medium speed applications



### ● Features

- Capable of directly reading and outputting signals in increments of 0.1 (120 P/R) m/min or 0.01 m/min (1200 P/R) (When the gate time is specified at 1 second, we recommend that you use the TM-2100 series counter.)
- Detects from close to 0 m/min
- Can also be used as a length detector (200 P/R)

### ● Specifications

Speed detection range: Medium speeds: 0 to 400 m/min (0.1 m/min measurement unit)  
 Low speeds: 0 to 200 m/min (0.01 m/min measurement unit)

Detection method: Photoelectric

Number of output pulses: Medium speed measurement: 120 P/R

Low speed measurement: 1200 P/R

Length measurement: 200 P/R

Output signal: Single-phase square wave Hi:  $+10 \pm 1$  V, Lo: Up to  $+0.5$  V

Roller outer circumference: 200 mm (hardened urethane rubber baked onto aluminum; hardness value: 90)

Starting torque: 1 mN·m or less

Connection method: Connector (cable end: RM12BPG-5S)

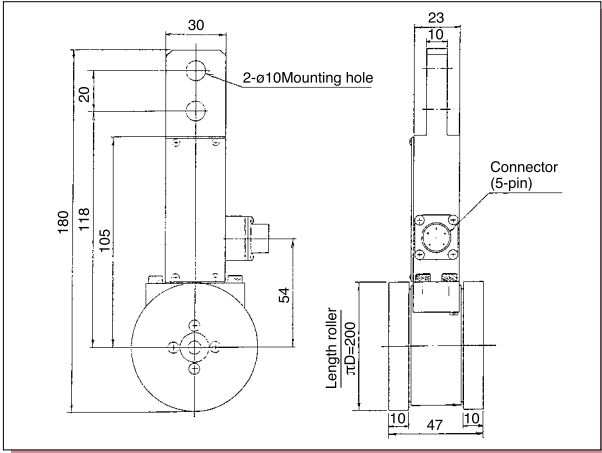
Operating temperature range: 0 to  $+50^{\circ}\text{C}$

Power requirement: 12 VDC  $\pm 5\%$ , 100 mA

Weight: Approx. 500 g

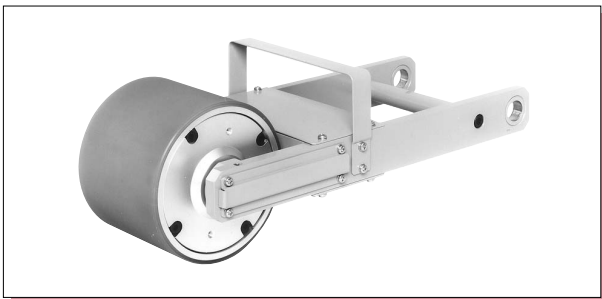
Compatible display unit: TM-2100 Series

*Note: There is no plug attached to the cable end of the RP-721 device.*



## Length Detector (Roller Encoder) RP-732

Reversible type



### ● Features

- Hardened baked-on urethane rubber roller used to reduce slipping
- Discrimination of the rotational direction is enabled.

### ● Specifications

Roller outer circumference: 300 mm ( $\phi 95.49$ )

Number of output pulses: 300 P/R, 750 P/R

Measurement unit: 1 mm (300 P/R)  
 0.4 mm (750 P/R)

Output waveform: Two-phase square wave

Output voltage: Hi:  $+10$  V  $\pm 1$  V,

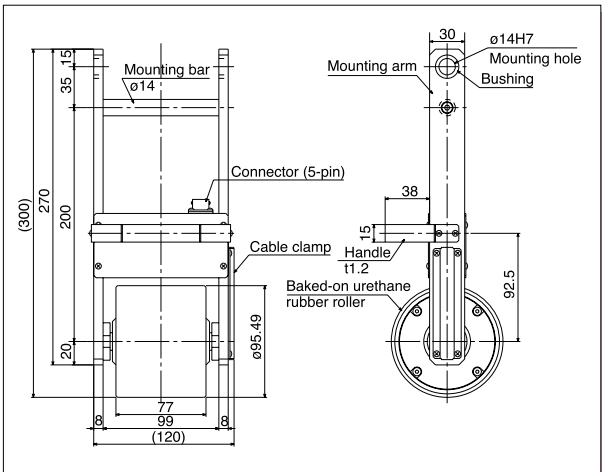
Lo: Up to  $+0.5$  V

Operating temperature range: 0 to  $+50^{\circ}\text{C}$

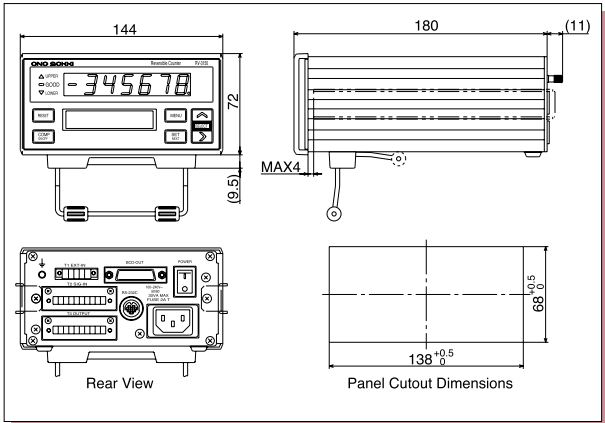
Power requirement: 12 VDC  $\pm 5\%$ , 100 mA

Weight: Approx. 2.2 kg

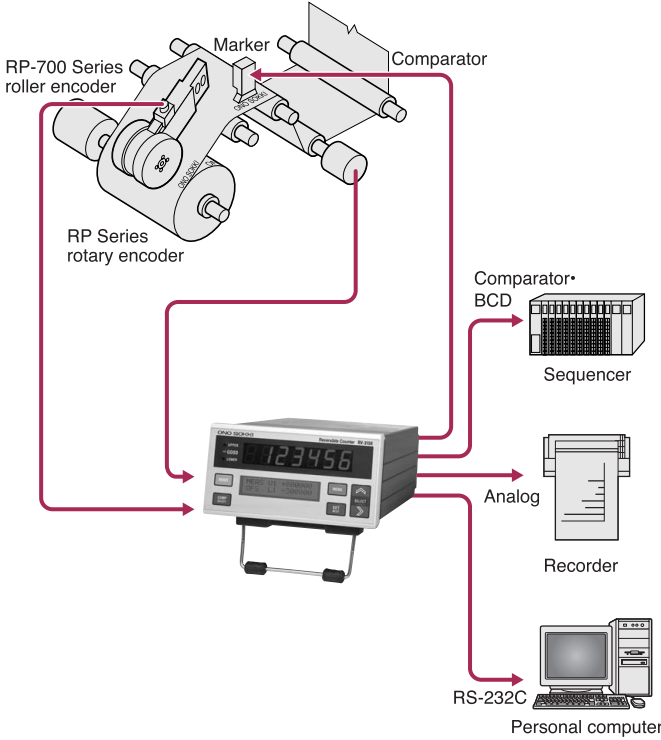
Compatible display unit: RV-3150



**Reversible Counter**



**System Configuration Example**



**Features**

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

**Specifications**

Compatible sensors: RP Series (rotary encoders), RP-700 Series (roller encoders), GS Series (linear gauge sensors),

Display sections: Main display section: Red LEDs (24 mm), 6 digits and polarity(0 to ±999999)  
 Sub display section: LCD, 16 characters x 2 rows, with backlight (yellow-green)  
 Decimal point: 0, 0.0, 0.00, 0.000 (select one)  
 Status display section: Comparator output display: UPPER (red)/GOOD (green) /LOWER (red)

Sensor input signal: Single-phase or 90° phase difference square wave voltage signal  
 (Hi: + 4 to +30 V, Lo: 0 to +1 V)  
 Line receiver (conforms to RS-422A)  
 Input frequency DC to 100 kHz

Sensor power supply: 5 VDC ±0.25 V (max. 150 mA) or 12 VDC ±0.6 V (max. 120 mA), selectable

External control signal: Input signal type: Voltage signal (Hi: + 4 to +5.25 V, Lo: 0 to +1 V), non-voltage contact input  
 Input signal function: Reset, Gate, Offset, Key Protection

Modes/Functions: Multipliers: 1/2/4  
 Ratio compensation range: 0.000001 to 0.999999  
 Exponent values: 1/1, 1/10, 1/100, 1/1000  
 Offset setting range: 0 to ±999999

Comparator function: Setting range: 0 to ±999999  
 Setting levels: 2  
 Output parameters:  
 LOWER (LOWER setting value ≥ calculated value)/  
 GOOD (LOWER setting value < Calculated value < UPPER setting value)/  
 UPPER (UPPER setting value ≤ calculated value)  
 Output format: semiconductor relay (single make contact)  
 Maximum contact capacity: 30 VDC, 0.1A, Refresh time within 15 ms

BCD Input/Output: Output signals (BCD, Polarity, Judgment, Error, Print command): Open collector (withstand voltage: Max. 30 V)  
 Control signal (reset, hold), Input format (voltage input)  
 Hi: +4 to 5.25 V, Lo: 0 to +1 V

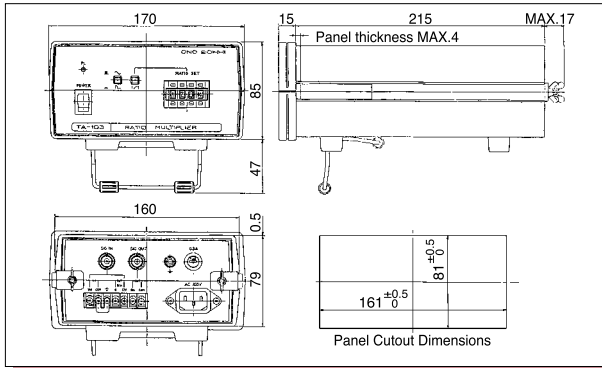
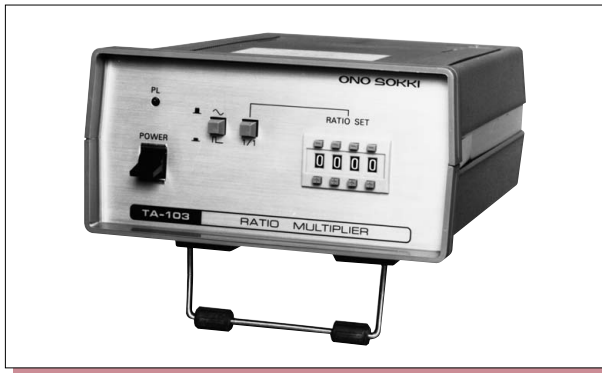
Analog output: Output voltage range 0 to ±10 V/FS (FS is user-specifiable)  
 Load resistance: At least 10 kΩ  
 Linearity measurement error: ±0.3 % of FS  
 Calibration function: ZERO/FULL 12 bit D/A method  
 Refresh time: Within 15 ms

RS-232C transmission: Functions: Readout of measured data, parameter setup and readout  
 Baud rate: 2400/4600/9600 bps

Power requirement: 100 to 240 VAC (50 to 60 Hz)  
 Power consumption: 30 VA or less  
 Operating temperature range: 0 to +40°C  
 Outer dimensions: 144 (W) x 72 (H) x 191 (D) mm  
 Weight: Approx. 1.3 kg

## Ratio Multiplier TA-103

### Ratio multiplier



#### ● Features

- The number of pulses generated by the detector can be multiplied as desired from 99.99% to 0.01% (pulse stream spot sampling method).
- Use to change the number of output pulses of the detection signals in accordance with the changes to wear compensation, temperature compensation, and gear ratio.
- Ideal for a wide range of applications such as fraction compensation for length compensation, flow, and wind speed
- The low output impedance enables long-distance signal transmission.
- Both the input and output circuits are isolated to make them less susceptible to noise.

#### ● Specifications

Input/output connectors: BNC connector and terminal block

Input impedance: At least 30 kΩ (at 100 kHz)

Amplification mode: AC/DC, switch-selectable

AC amplification input signal range: Sine wave, 0.2 to 50 Vrms (10 Hz to 100 kHz)

DC amplification input signal range: Rectangular wave with a pulse width of at least 5μs

Hi: +4 to +30 V

Lo: -1 to +1 V (DC to 100 kHz)

Setting method: 4-digit digital switch

Setting range: 0.0001 to 0.9999 or 1/1

Output signal: Hi: +10 ± 2V, Lo: 0 to +0.5 V rectangular wave

Output impedance: 5 Ω or less

Detection power supply: 12 VDC ±0.6 V, 100 mA

Power requirement: 100 VAC ±10% (100/120/220/240 VAC on request)

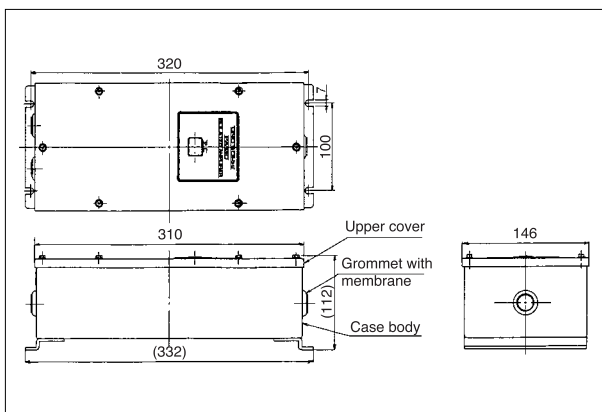
Power consumption: Approx. 18 VA

Operating temperature range: 0 to +40°C

Weight: Approx. 2 kg

## Isolated Signal Amplifier PA-150

### Signal Amplifier



#### ● Features

- Electromagnetic type designed for use as a detector amplifier in adverse electrical environments.
- Converts detector signals to a high voltage for low-impedance output.
- 12 VDC output to those detectors for which a power supply is required.
- Sealed structure, terminal block for easy wiring, outlet designed for easy handling of piping and cabling.
- Both the input and output circuits are isolated to make them less susceptible to noise.

#### ● Specifications

Input frequency range: 1 Hz to 50 kHz

Input waveform: Sine wave or square wave

Operating voltage range: Sine wave input: 0.1 to 30 Vrms

Square wave input: 0.3 to 30 Vp-p

Voltage output: Hi: +10 ± 2 V

Lo: Up to +0.5 (when the load resistance is 4.7 kΩ.)

Can be switched to open collector output

Output impedance 330 Ω

Detector power supply: 12 VDC ±0.6 V, 100 mA

Operating temperature range: -10 to +40°C

Power requirement: 100 VAC ±10%, 50/60 Hz (110/200/220 VAC on request)

Power consumption: Approx. 8 VA

Weight: Approx 4 kg

Accessories: 11 crimp terminals

### General-purpose type



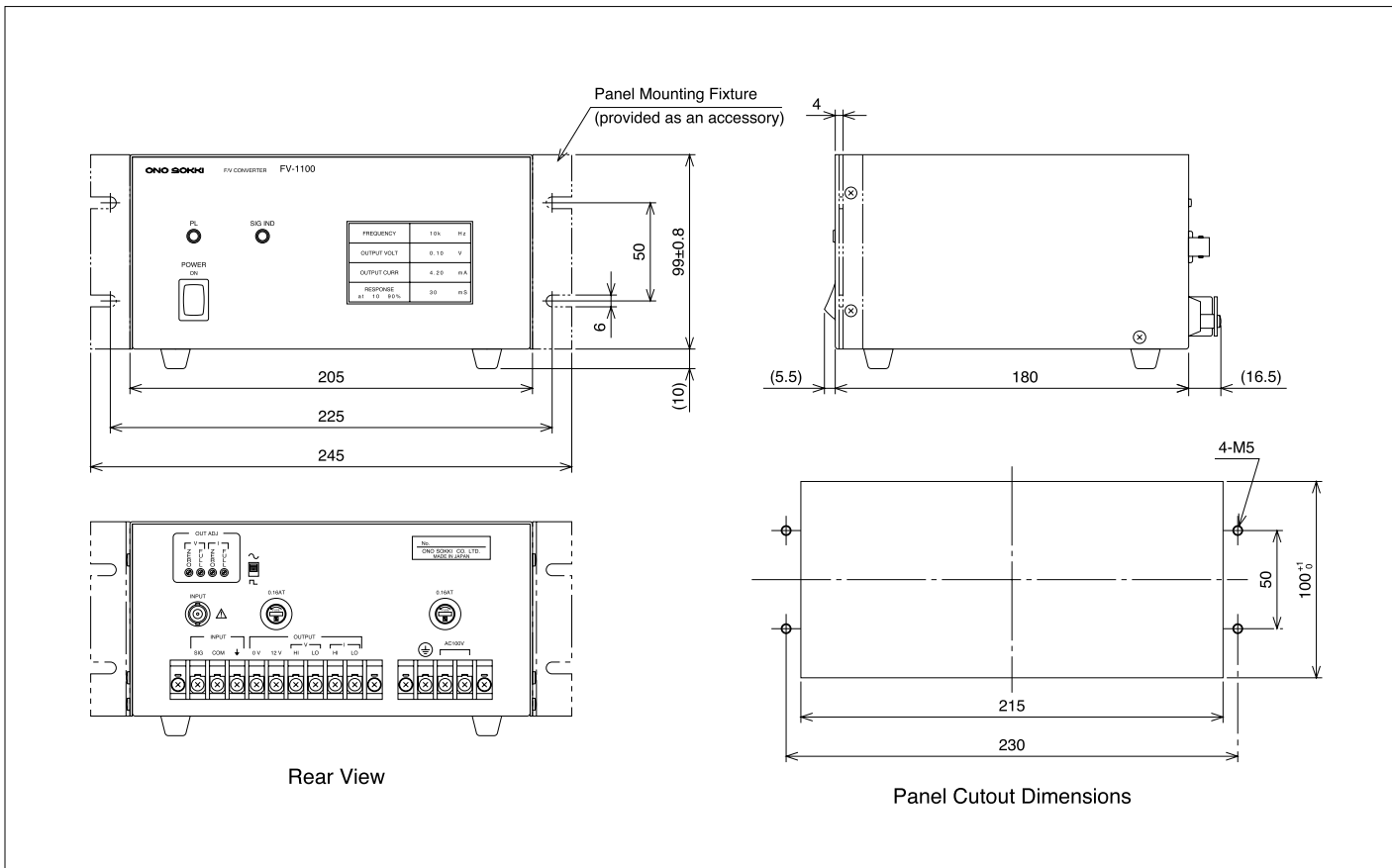
### ● Features

- Withstand voltage: 2000 VAC for one minute (between the chassis and primary power supply)
- Comes with a power supply for the detector (12 V, 100 mA)
- Switch-selectable AC/DC input signals
- The frequency range can be specified as any desired frequency in the range from 100 Hz to 100 kHz (option; standard is 10 kHz). (The specified frequency is fixed and the setting cannot be changed).
- Data output as current or voltage signals can be recorded using a pen recorder or displayed on a display unit such as an indicator.
- Convenient, compact, single-function type that smoothes out the input frequency to enable viewing of the average behavior of the fluctuations

### ● Specifications

Conversion method: Fixed width pulse integration  
 Frequency range: 10 kHz (specification of a different frequency is available as an option.)  
 Response: 30 ms (varies according to the specified optional frequency)  
 Input frequency: 10 kHz (a frequency in the range from 100 Hz to 100 kHz can be specified as an option)  
 Input terminal: BNC (C02), terminal block (3.5 M)  
 Input voltage: AC input Sine wave: 0.2 to 50 Vrms  
 Square wave: 0.6 to 70 Vp-p  
 DC input Rectangular wave: Hi: +4 to +30 V,  
 Lo: -1 to +1 V  
 Pulse width: At least 3 μs  
 Input impedance: At least 80 kΩ (20 kHz),  
 at least 30 kΩ (100 kHz)

Output terminal: Terminal block (3.5 M)  
 Output voltage: 0 to 10 V Load resistance at least 1 kΩ  
 (0 to 5 V/0 to 1 V/0 to 0.1 V available as options)  
 Output current: 4 to 20 mA Load resistance 500 Ω or less  
 (can also be set in the 0 to 16 mA range)  
 Linearity: Within ±0.2% of the maximum rated value  
 Ripple: 0.1% of the maximum rated value or 10 mV or less  
 (when the frequency input is 5% of the frequency range.)  
 Detector power supply: +12 VDC ±10% 100 mA  
 Power requirement: 100 VAC + within 10 to 15%, 46 to 63 Hz  
 (110/120/200/220/240 VAC on request)  
 Operating temperature range: 0 to +40°C  
 Outer dimensions: 245 (W) x 99 (H) x 202 (D) mm  
 Weight: Approx. 2 kg



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

### High-speed response type



#### ● Features

- Output delay: High-speed response within 1 period +7.6  $\mu$ s
- Measurement scale settable in 1-Hz units
- 1 Hz to 20 kHz input frequency range
- Built-in deviation output function
- Built-in moving average function
- Built-in detector power supply (+12 VDC)
- Capable of measuring variations in rotational speed and transient phenomena

#### ● Specifications

Conversion method: Period calculation

Response: Time of input frequency period + 7.6  $\mu$ s (DSP calculation time)

Input configuration: Isolated single-ended input  
(Difference in electric potential between common and ground on the chassis: 42 VDC max.)

Input frequency range: 1 to 20,000 Hz (50 kHz and 100 kHz also available as options)

Input voltage range: 0.3 to 30 Vp-p (AC, DC)

Input terminal: C02 type (BNC), and terminal block (M3)

Frequency range: Full scale output mode:

The maximum frequency can be set in 1-Hz increments in the range from 1 to 20,000 Hz.

Deviation output mode:

The center frequency can be set in the range from 2 to 19,801 Hz, in 1-Hz increments.

Deviation setting range:  $\pm 1$ ,  $\pm 5$ ,  $\pm 10$ ,  $\pm 20\%$

(Cannot be set if the maximum measuring frequency exceeds 20,000 Hz due to the deviation setting)

Frequency display: 5-digit, 7-segment, green/1-s display interval

Output signal (voltage): When full scale: 0 to 10 V, deviation output setting; 0 $\pm$ 5V/load resistance at 10 k $\Omega$  or less

Output signal(current): When full scale : 0 to 16 mA (factory default setting)/4 to 20 mA/load resistance at 100  $\Omega$  or more  
When deviation output; 8  $\pm$ 8mA/12  $\pm$ 8 mA

Output terminal: BNC (voltage output), terminal block (current output)

D/A conversion: 16-bit

Linearity (excluding offset):

Full-scale output mode:  $\pm 0.1\%$ /FS (voltage),  $\pm 0.7\%$ /FS (current)

Deviation output mode:  $\pm 0.5$  to  $+5\%$ /FS (voltage),  $\pm 3$  to  $\pm 10\%$ /FS (current)

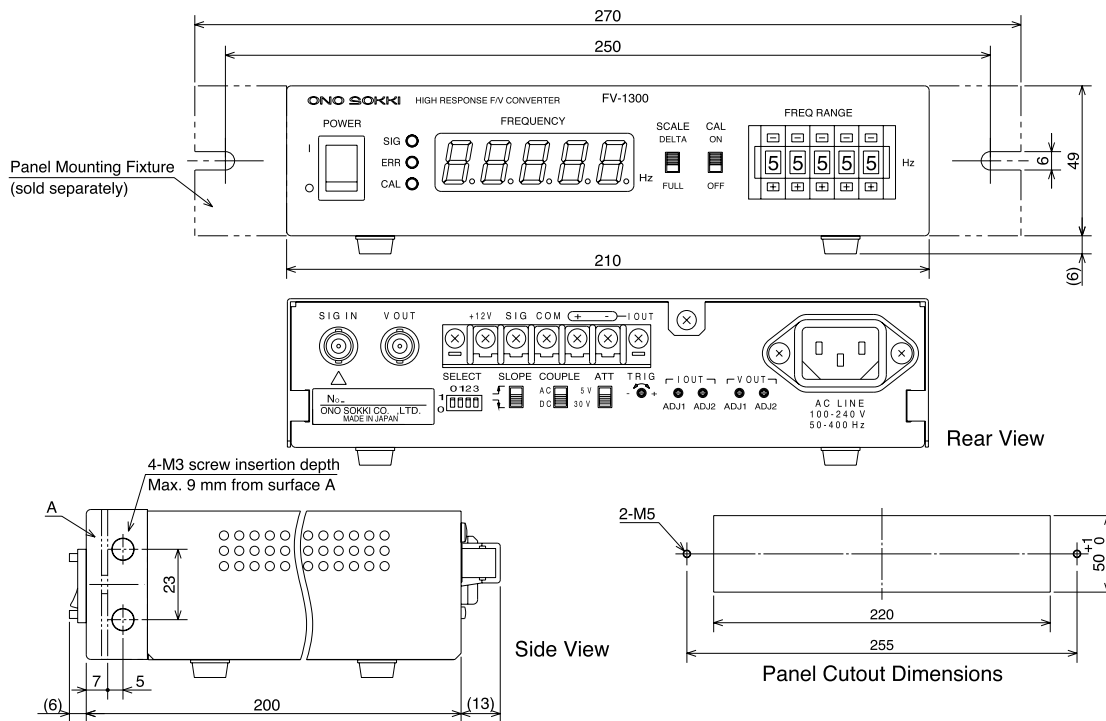
(differs according to the central frequency and the deviation setting range)

Sensor power supply: +12 V ( $\pm 10\%$ )/100 mA max.  
(ripple 20 mVp-p max.)

Operating temperature range: 0 to +40°C/0 to 80% RH  
(non-condensing)

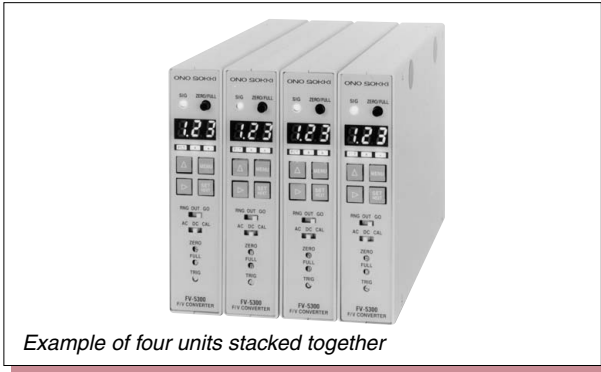
Power requirement: 100 to 240 VAC/50 to 400 Hz  
(continuous), approx. 13 VA

Outer dimensions: 210 (W) x 49 (H) x 219 (D) mm  
Weight: Approx. 1.1 kg



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

### Stackable for multi-channel capability



Example of four units stacked together

#### ● Features

- Wide input frequency range: 0.1 mHz to 100 kHz (DC)
- Wide input voltage range: 0.14 to 30 Vp-p (AC)
- User-specifiable measurement ranges and output voltages (in 1% increments)
- Built-in estimate calculation and emergency stop judgment functions (PERIOMATIC™)\*1
- Equipped with a simple 3-digit monitor
- Factor setup function enables display and setting of the rotating speed, etc.
- The stacking feature enables up to four units to be linked together.
- DC drive: 10 to 42 VDC (an AC adapter is also available)

#### ● Specifications

Conversion method: 1 ms averaged period calculation (PERIOMATIC™)\*1

Response: 1 ms + 1 input signal period

Input signal mode: AC/DC, switch-selectable

Input frequency range: DC: 0.1 mHz to 100 kHz

AC: 1 Hz to 100 kHz

Input voltage range: AC: 0.14 to 30 Vp-p

DC: Lo: Up to +1V, Hi: +4 to +30 V

Input terminal: C02 type (BNC), R03-R6F

Measurement ranges\*2: 0.10 to 999 k

3 digits (0.10 to 999) x1 or x1000 times

Frequency or factor setup

conversion value

Functions: Factor, estimate calculation, emergency stop judgment, stepless

Factor setup: Mantissa (3-digit, 0.01 to 999), multiplier (0.01, 0.1, 1, 10, 100)

Simple monitor: 3-digit LED, decimal point matches the measurement range setting

Trigger level: AC: 0.07 to +2 V (variable using the VR on the front panel)

Output range: 0 to 10 V (full scale settable in 1% increments) /load resistance at 10 kΩ or more  
(Option: 0 to 16 mA, 4 to 20 mA/Load resistance at 500 Ω or less)

Resolution: ±0.03%/10 V

Accuracy: ±0.2%/FS (when FS = 10 V)

Output adjustment: Zero and Full

Sensor power supply: 12 VDC ±10%, 100 mA max.

Power requirement: Terminal block: 10 to 42 VDC  
AC adapter terminal: 14 to 18 VDC

Consumption current: Approx. 0.6 A (when 12 VDC)

Operating temperature range: 0 to 40°C

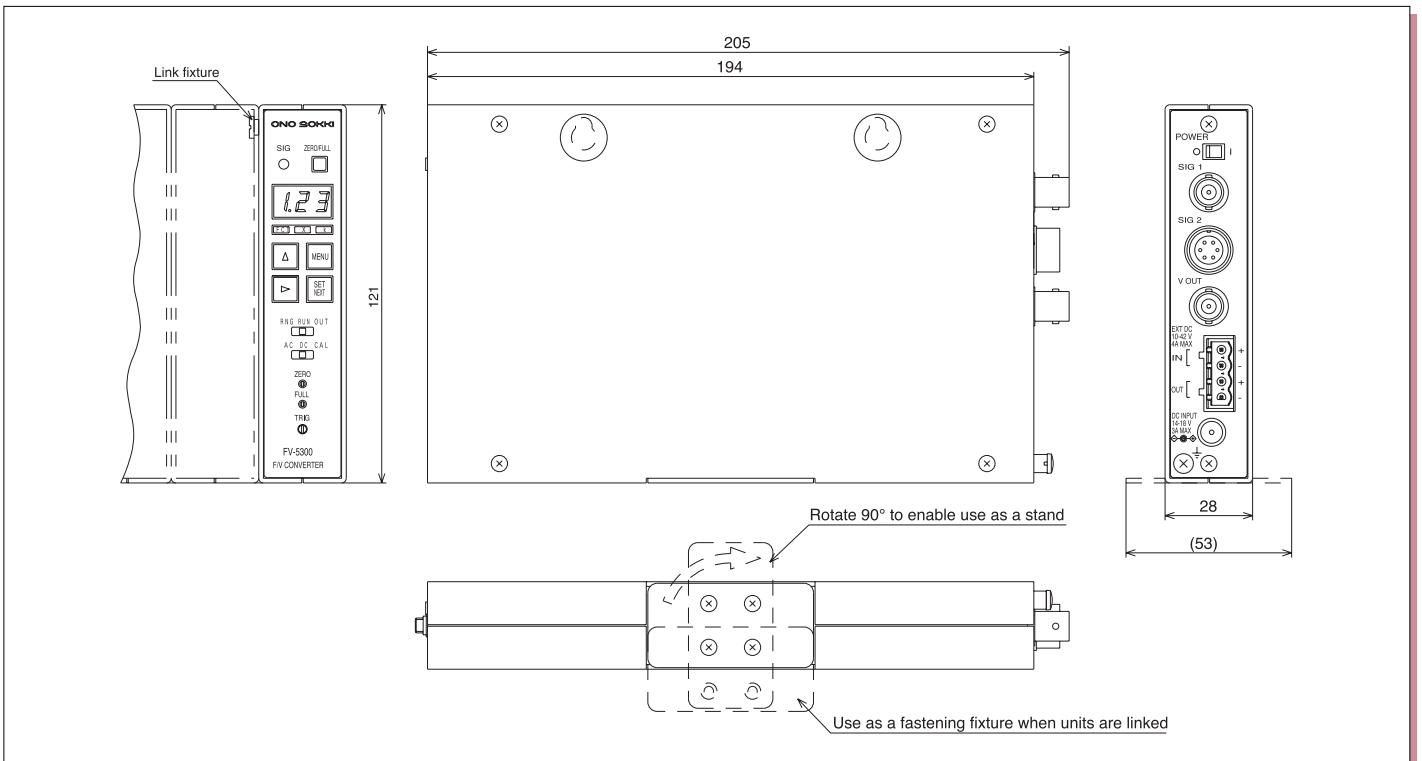
Weight: Approx. 500 g

Outer dimensions: 28 (W) x 121 (H) x 205 (D) mm

Option: PB-707 AC adapter (100 to 240 VAC, 50/60 Hz)

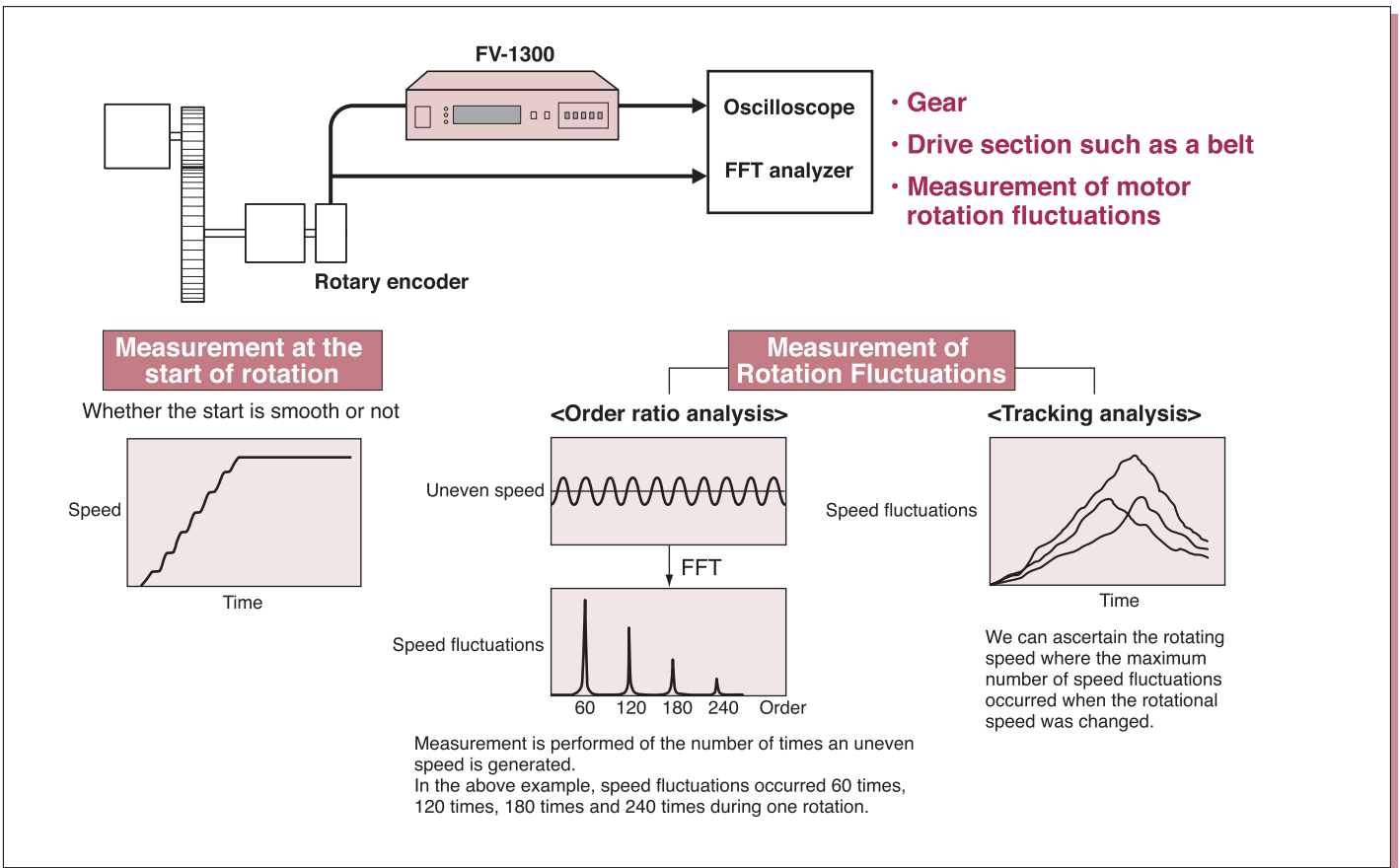
\*1 PERIOMATIC™ is a registered trademark of Cocoresearch, Inc.

\*2 The measurement ranges that can be set are limited by the factor setup values.

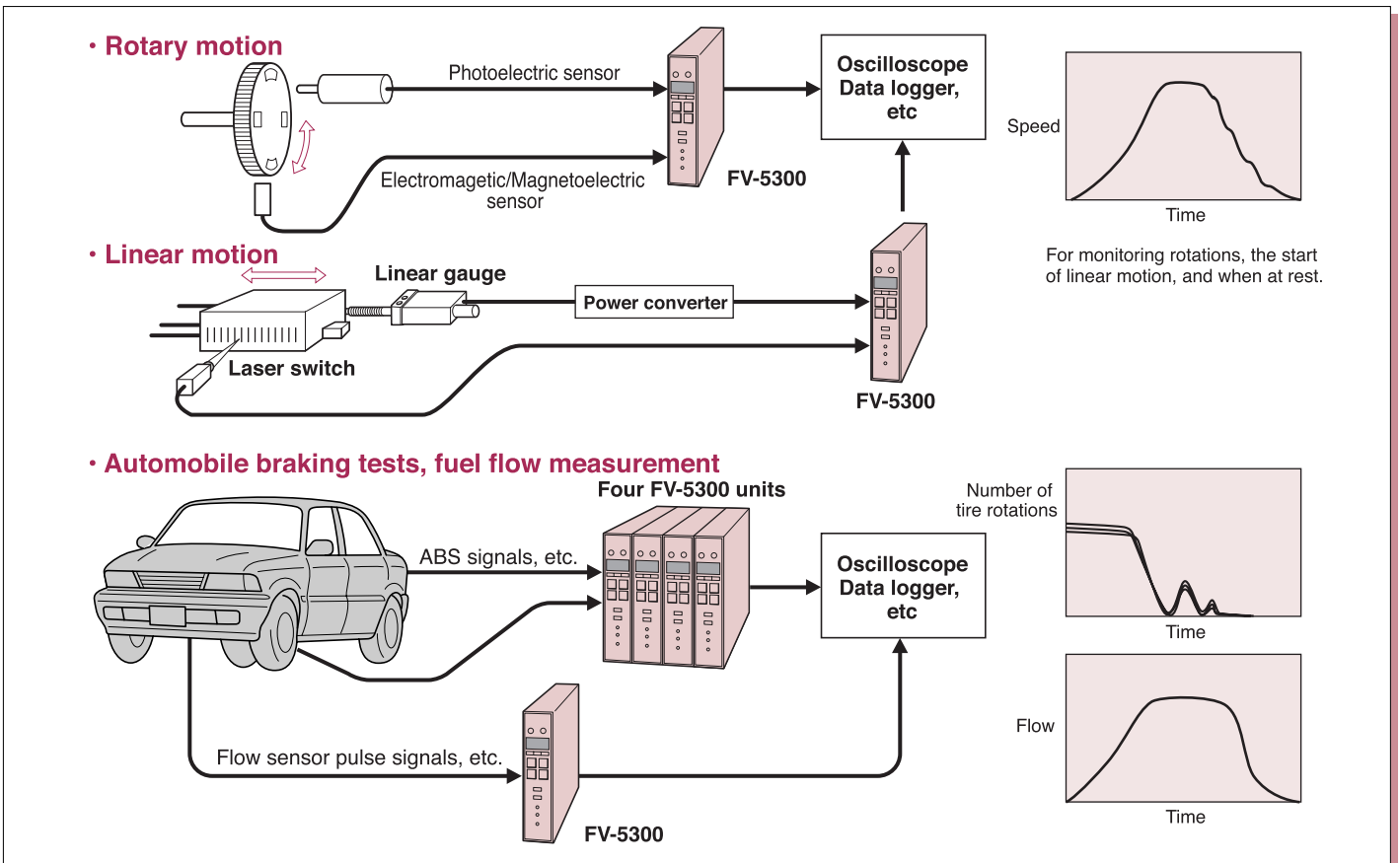


## F-V Converter Applications

### ● FV-1300 High-speed F-V converter High-speed period conversion output for each period



### ● FV-5300 F-V converter 1-ms response period conversion, smooth signal output even at a low pulse



Related Products

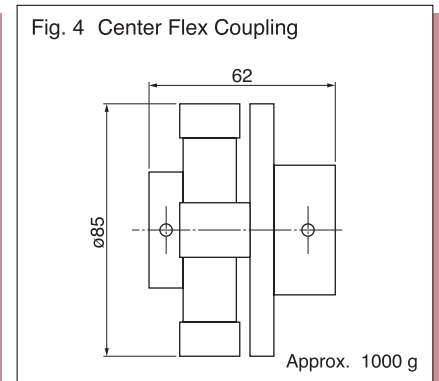
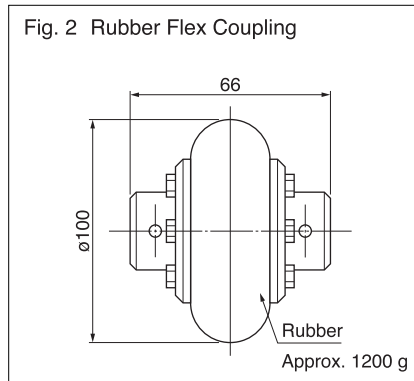
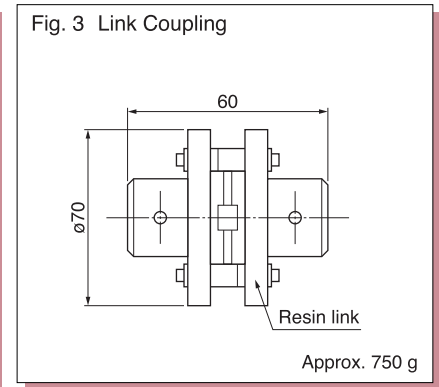
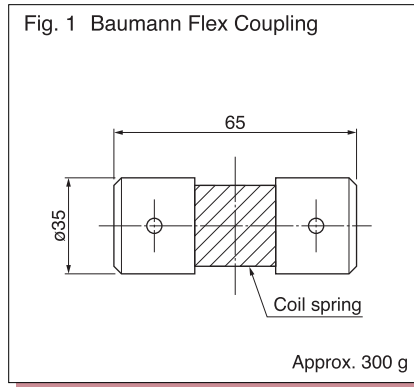
F-V Converter



## Coupling Selection Guide

While a rigid coupling can ensure accurate rotation and angle measurements when an electromagnetic detector is connected to a device, mounting errors such as shaft misalignment and play in the thrust direction can result in deformation of the elasticity of the bearings and can cause loss of detector accuracy and even damage to the detector. To ensure stable operation when using a rigid coupling over a long period of time, the shaft misalignment should be kept within 6/1000 mm. If precise center alignment such as that stipulated above is a practical impossibility, a flexible coupling that can take up such center misalignment and play in the thrust direction must be used. A wide range of flexible couplings with high torsional rigidity as well as couplings that are suitable for general-purpose rotational measurements is available for an optimal selection to suit the application. Even with the use of a flexible coupling, however, there is always the possibility that the method used for mounting will subject the shaft to more than the allowable static or dynamic load. For this reason, centering of the shaft should be performed with extreme care.

### ● Example of couplings (Shape and weight)

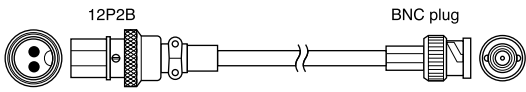
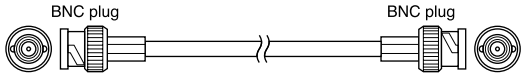
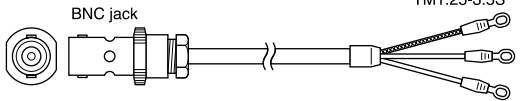
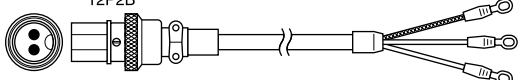
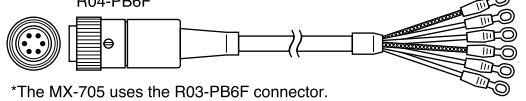
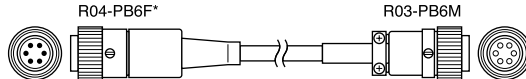
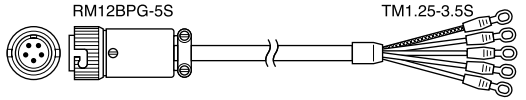
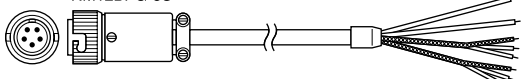
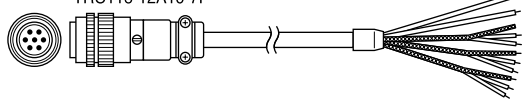


Coupling Name	Compatible Models	Features	Permissible eccentricity, angle of deviation [Note 1]	Mounting/removal methods	Remarks
Baumann Flex Coupling	MP-610	<ul style="list-style-type: none"> <li>Utilizes a coil spring for elasticity</li> <li>Small outer diameter dimension</li> </ul>	Number of rotations: 2000 r/min Deviation: 0.9 mm Angle of deviation: 6°	Mount the coupling on the detector or on the device, and then insert them as one piece into the mating piece.	Since a coil spring is used, sudden forward/reverse rotations are not possible because of backlash, and play in the thrust direction is not absorbed. Drive shaft diameter ø10 to ø16 [See Note 2]
Rubber Flex Coupling	MP-810B	<ul style="list-style-type: none"> <li>Utilizes rubber for elasticity; reduces shock</li> <li>Provides a vibration attenuation effect</li> </ul>	Number of rotations: 2000 r/min Deviation: 1.5 mm Angle of deviation: 6°	Mount the flange on the detector or device, and then after establishing the various centering dimensions required, attach the rubber ring. Mounting and removal can be performed without moving the device.	At high speeds, a thrust force caused by expansion of the rubber due to centrifugal force will damage the detector. Drive shaft diameter ø10 to ø22 [See Note 2]
Link Coupling		<ul style="list-style-type: none"> <li>Utilizes a stainless steel spring for elasticity</li> <li>Available for higher revolution than rubber flex coupling as above.</li> </ul>	Number of rotations: 5000 r/min Deviation: 0.3 mm Angle of deviation: 1°	This is the same as the rubber flex coupling as above and similar models except that a stainless steel link is used instead of rubber ring.	Drive shaft diameter ø10 to ø20
Center Flex Coupling		<ul style="list-style-type: none"> <li>Absorbs vibration and shock</li> <li>Does not take up space in the shaft direction</li> </ul>	Number of rotations: 5000 r/min Deviation: 0.5 mm Angle of deviation: 1°	Mount the flange and the flange hub on the detector or device, perform centering, and then attach the rubber body.	Drive shaft diameter ø10 to ø25

Note 1 The permissible eccentricity and angle of deviation are within the range that enables guaranteed performance of the coupling. Even though these values are within the permissible range, avoid mounting the coupling in a location where the load on the detector shaft will exceed the stipulated limits.

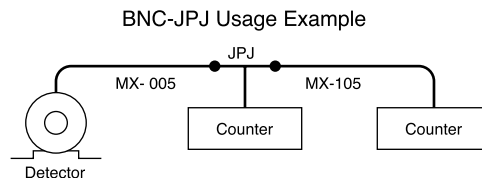
Note 2 Hole machining is the responsibility of the user.

# Table of Signal Cable

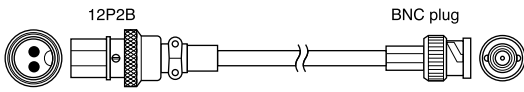
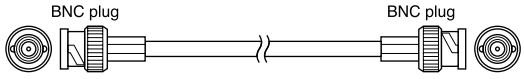
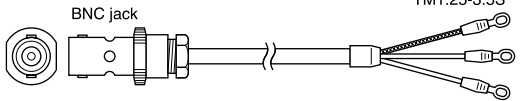
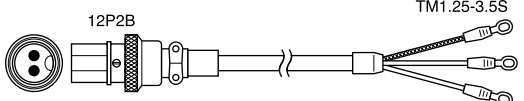
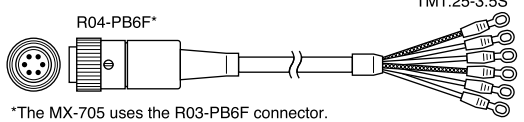
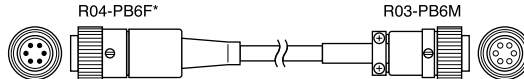
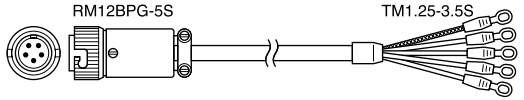
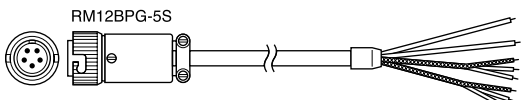
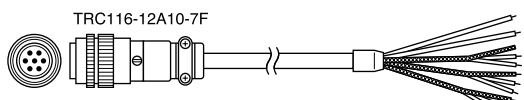
Item	Compatible Detectors	Cable	Model Name/Specifications
1	MP- 610•610B•9100•9120• 9200•940A•963  MP- 810B•820B•830B (MP-081+MX-005 Series)	3C-2V (high-frequency coaxial cable)	MX-005 5 m 010 10 m 015 15 m 020 20 m  
2	MP- 930•935•936•950•962 FG-1200	3C-2V (high-frequency coaxial cable)	MX-101 1.5 m 105 5 m 110 10 m 115 15 m 120 20 m  
3	MX- 000 Series cable 100 Series cable	P-2 (2-core outer shielded cable)	MX-603 0.3 m  
4	MP- 610•610B•9100•9120• 9200•940A•963  MP- 810B•820B•830B (MP-081+MX-500 Series)	P-2 (2-core outer shielded cable)	MX-505 5 m 510 10 m 520 20 m  
5	MP- 981 LG- 916	D-5 (Composite 5-core vinyl sheath cable)	MX-705 5 m 710 10 m 715 15 m 720 20 m  MX-705: One end is open. MX-710 and longer: One end is fitted with crimp terminals.   *The MX-705 uses the R03-PB6F connector.
6	MP- 981 LG- 916	D-5 (Composite 5-core vinyl sheath cable)	MX-805A 5 m 810 10 m 815 15 m 820 20 m   *The MX-805A uses the R03-PB6F connector.
7	RP- 721	R-6 (twisted-pair cable)	RP- 004 5 m *10 m  
8	RP- 721•732	R-6 (twisted-pair cable)	RP- 006 5 m *10 m  
9	RP- 432Z	R-8 (twisted-pair cable)	RP- 008 5 m *10 m  

\* Manufactured after receipt of order

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

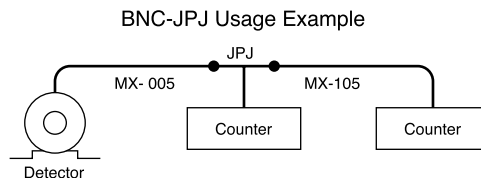


# Table of Signal Cable

Item	Compatible Detectors	Cable	Model Name/Specifications
1	MP-610•610B•9100•9120•9200•940A•963  MP-810B•820B•830B (MP-081+MX-005 Series)	3C-2V (high-frequency coaxial cable)	MX-005 5 m 010 10 m 015 15 m 020 20 m 
2	MP-930•935•936•950•962 FG-1200	3C-2V (high-frequency coaxial cable)	MX-101 1.5 m 105 5 m 110 10 m 115 15 m 120 20 m 
3	MX-000 Series cable 100 Series cable	P-2 (2-core outer shielded cable)	MX-603 0.3 m 
4	MP-610•610B•9100•9120•9200•940A•963  MP-810B•820B•830B (MP-081+MX-500 Series)	P-2 (2-core outer shielded cable)	MX-505 5 m 510 10 m 520 20 m 
5	MP-981 LG-916	D-5 (Composite 5-core vinyl sheath cable)	MX-705 5 m 710 10 m 715 15 m 720 20 m MX-705: One end is open. MX-710 and longer: One end is fitted with crimp terminals.  <p>*The MX-705 uses the R03-PB6F connector.</p>
6	MP-981 LG-916	D-5 (Composite 5-core vinyl sheath cable)	MX-805A 5 m 810 10 m 815 15 m 820 20 m  <p>*The MX-805A uses the R03-PB6F connector.</p>
7	RP-721	R-6 (twisted-pair cable)	RP-004 5 m *10 m 
8	RP-721•732	R-6 (twisted-pair cable)	RP-006 5 m *10 m 
9	RP-432Z	R-8 (twisted-pair cable)	RP-008 5 m *10 m 

\* Manufactured after receipt of order

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





# ONO SOKKI

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

URL: <http://www.onosokki.co.jp/English/english.htm>

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