

RP/SP series

ONOSOKKI

Rotary Encoder Roller Encoder



RP-1710/1720 series

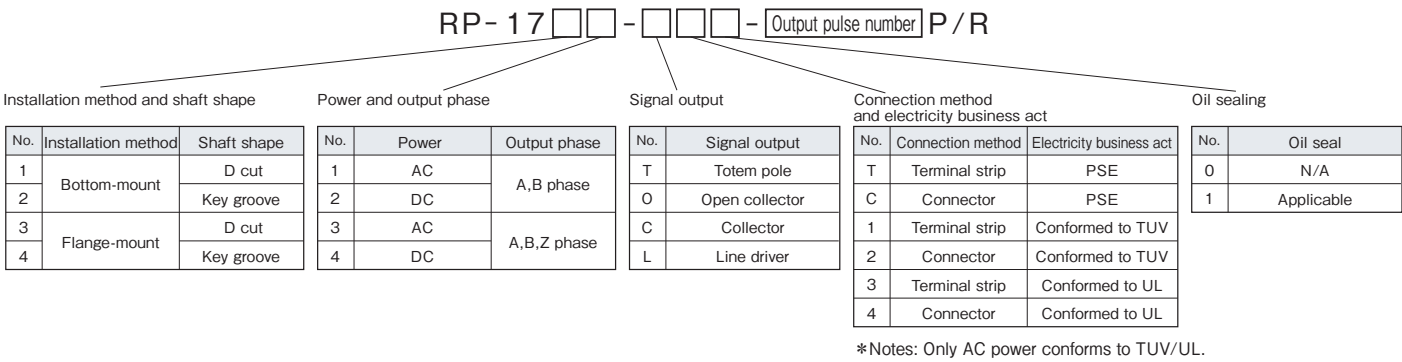


RP-1730/1740 series

Model code

The model code of the RP series rotary encoder consists of abbreviations of functions and structures. However, there are exceptions, such as simplifying abbreviations for some models.

【RP-1700 series】



【RP-432Z series】

RP- 4 3 2 Z - P / R

【SP-405ZA series】

SP- 4 0 5 Z A - P / R

*Note: Collector output : standard
Open collector output : option (Please specify when ordering.)

Ingress Protection code (IP)

The RP series conforms to JIS C 0920 (compliant with IEC 529), protection class for electro-mechanical equipment waterproofing and dustproofing. Grade is classified as follows, and the test method is stipulated.

[Example] IP65 . . . Dustproof, jet-proof water form

↑↑ The second characteristic number: protection from water intrusion
↑ The first characteristic number: protection from external solid material

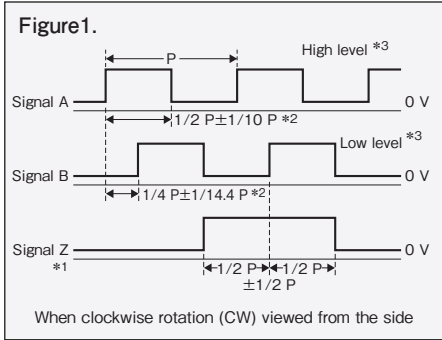
Protection against external solid material		
The 1st number	Structure	Test conditions
0	Not protected	—
1	Protection for hand etc.	Solid material of φ50 mm or more does not intrude.
2	Protection for finger etc.	Solid material of φ12.5 mm or more does not intrude.
3	Protection for tools etc.	Solid material of φ2.5 mm or more does not intrude.
4	Protection for wire etc.	Solid material of φ1 mm or more does not intrude.
5	Dust proof type	Dust among which prevents operation does not intrude.
6	Dust resistance type	Dust does not intrude.
×	Not stipulated.	—

Protection against water intrusion		
The 2nd number	Structure	Test conditions
0	Not protected	—
1	Protection against water dripping vertically	Dripping water droplets of 1 mm/min. from a height of 200 mm for 10 minutes
2	Protection against water dripping vertically ±15 °C	Dripping water droplets of 3 mm/min. from a height of 200 mm, at ±15 °C tilted for 10 minutes
3	Protection against sprinkling water	Spray water of 10 ℓ/min. from a distance of 300 mm at ± 60 °C. for 5 minutes
4	Protection against water splashes in all directions	Spray water of 10 ℓ/min. from a distance of 300 mm at ± 180 °C. for 5 minutes
5	Protection against jet flow water	Jet flow of 12.5 ℓ/min. from a distance of 2.5 m in all directions for 3 minutes
6	Protection against excessive jet flow water	Jet flow of 100 ℓ/min. from a distance of 2.5 m in all directions for 3 minutes
7	Protection against flooded condition	30 minites at a depth of 1 m
8	Protection against diving condition	Consultation between the user and the manufacturer
×	Not stipulated.	—

Signal output

①Output waveform

Ono Sokki rotary encoder incorporates an amplifier circuit, DUTY (High-Low-level time ratio) is 1: 1, the pulse height (voltage) is shaped to a constant square wave signal regardless of the change in the rotation speed. The output signal converted into a high voltage and low impedance is hardly affected by external noise, and it enables on-site installation and long distance transmission.



*1: only with zero-mark
*2: only RP-1700 series. For other products, please refer to each individual page.
*3: For detail specifications, please refer to each individual page.

②Output signal phase number

●Two-phase output type

Outputs two-phase signals that have 90 °C phase of <signal A> and <signal B> in Fig.1. Since it is possible to distinguish the rotation direction, it can be used for detection of precise angle, moving amount, and control of automatic positioning, etc. by combining with reversible counter with direction detecting circuit.

●Single-phase output type

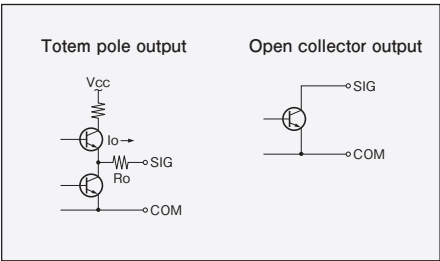
Only the signal of <signal A> in Fig.1 is output. Since it does not distinguish the direction of rotation, it outputs the same single phase signal regardless of whether it rotates to the right or the left. So it can be used for rotation detection, and also length or feeding amount measurement by moving in a fixed direction with measuring roll.

By using only <signal-A> or, <signal B>, you can use it as single phase output type.

●Output type with zero-mark

In accordance with the output of the <signal A> or <signal B> in Fig. 1, outputs a <signal Z> which is one pulse per revolution. The position of <signal Z> for <signal A> <signal B> is not specified. (The timing is not specified.)

③Example of output circuit



* In the output resistance Ro, 22 Ω is a thermistor with PTH positive temperature coefficient. It is an element for over current protection of the output circuit and shows approx. 22 Ω resistance value at 25 ° C. (If the output is mistakenly short-circuited, the resistance value will increase and Io will decrease. Normal output can not be obtained. The normal output will be restored by appropriate load connection.)

Rotary Encoder Specifications

	General-purpose industrial type		Low torque miniature type	
	Bottom-mount type	Flange-mount type	Ultra miniature type	General-purpose miniature type
Model name	RP-1710/1720 series	RP-1730/1740 series	SP-405ZA series	RP-432Z series
The number of output pulses	60, 100, 120, 180, 200, 240, 250, 256, 300, 360, 400, 480, 500, 512, 600, 720, 750, 800, 900, 960, 1000, 1024, 1200, 1250, 1280, 1440, 1500, 1600, 1800, 2000, 2048, 2400, 2500, 2560, 2880, 3000, 3600, 3750, 4000, 4096, 4500, 4800, 5000, 5120, 6000, 7500, 9000, 12000, 15000, 18000, 22500, 24000, 30000, 36000, 45000, 48000, 60000, 72000, 90000, 96000, 120000 P/R		60, 100, 200, 300, 360, 500, 600 P/R	120, 360, 600, 1000, 1024 P/R
Mechanical specifications	Max. rotation speed	5000 r/min		5000 r/min
	Max. allowable shaft load	Radial	80 N	25 N
		Thrust	50 N	15 N
	Shaft diameter	φ15 mm		φ6 mm
General specification	Starting torque	15 mN·m*1		2 m N·m
	Moment of inertia	161 g·cm²		6 g·cm²
	Weight	Approx. 3.7 kg		Approx. 0.1 kg
	Operation temperature range	-5 to 55 °C		Approx. 0.25 kg
Electrical specification	Humidity	95 % *2		0 to 50 °C
	Protection class	IP65 *3		90 %
	Vibration resistance	98 m/s²*4		85 %
	Shock resistance	980 m/s²*5		49 m/s²*14
Electrical specification	Output waveform	2-phase square waveform*6		490 m/s²
	Output voltage	Hi: 10 V or more, Lo: 0.5 V or less*7		2-phase square waveform + zero-mark
	Duty	50 %±10 %		Hi: supply voltage -20 % or more, Lo: 0.5 V or less
	Phase difference	90 ° ±25 °		Hi: 4 V or more, Lo: 0.2 V or less*17
	Response frequency	100 kHz / 500 kHz (line driver output only)		50 %±25 %
	Signal accuracy (adjacent error)	See P.4		90 ° ±45 °
	Output type	Totem pole*8		±1/20 Pitch
	Connection method	Terminal strip or connector		±1/2 Pitch
Electrical specification	Power requirement	AC 100 V (50 mA) to 240 V (63mA)/ DC 12 V (83 mA) to 24 V (42 mA)		Collector*15
	Applicable model	TM-4100/4200/4300 series, FV-1500		Totem pole*18
		Directly attached cable*16		Connector*19
		DC 5 to 12 V (50 mA)		DC 5 V or DC 12 V (100 mA)

*1 When the rotating shaft with an oil seal.
*2 When at 40 °C/8 h, the rotating shaft with an oil seal, with no condensation.
*3 Applicable by affixing an oil seal to the rotating shaft and selecting terminal strip for connection method.
*4 Axial direction for 4 h, up/down left/right for 2 h each
*5 Three times each in X, Y and Z directions, 98 m/s² in the axial direction
*6 Zero-mark is available as an option
*7 Totem pole output, open collector output, collector output. Line driver output has 90-degree phase differential square waveform. RS422A compliant line driver output (equivalent to 26C31).
*8 Totem pole output : standard (470 Ω or more of load resistance)
Open collector output : option (DC40 V, 50 mA or less)
Collector output : option (load resistance 10 kΩ or more)
Line driver output : option
*9 When the rotating shaft with an oil seal.
*10 Applicable by affixing an oil seal to the rotating shaft.
*11 Axial direction for 4 h, up/down left/right for 2 h each.

*12 Totem pole output : standard (470 Ω or more of load resistance)
Open collector output : option (DC40 V, 50 mA or less)
*13 Crimped terminal: RBC 1.25-4 (JIS C 2805)
*14 Three directions for 2 h each
*15 Totem pole output : standard (470 Ω or more of load resistance)
Open collector output : option (DC30 V, 35 mA or less)
*16 5-core shielded wire 500 mm (terminal: open).
*17 Value at DC5 V. At DC 12 V, Hi: 10 V or more, Lo: 0.3 V or less.
*18 1 kΩ or more of load resistance
*19 7-core connector (cable side: TRC116-12A10-7F).

Notes: It varies according to the number of output signal phases, power supply type, number of output pulses, etc.

RP-1700 series

60 100 120 180 200 240 250 256 300 360 400 480 500 512 600 720 750 800 900 960 1000 1024 1200 1250 1280
1440 1500 1600 1800 2000 2048 2400 2500 2560 2880 3000 3600 3750 4000 4096 4500 4800 5000 5120 6000 7500
9000 12000 15000 18000 22500 24000 30000 36000 45000 48000 60000 72000 90000 96000 120000



- Compatible to worldwide AC and DC power supply
- Selectable connection from either terminal strip or connector
- Complied with IP65 by affixing an oil seal to the rotating shaft and selecting terminal strip as an option

- Excellent resistance to shock and shaft loading
- High resolution, wide range of output pulse types (Selectable from 61 types, max. 120000 P/R)
- Line driver output can be selected to enable long distance transmission

Electrical specification

Output waveform : 2-phase square waveform
 *Zero-mark is available as an option. (arbitrary timing)

Output voltage : Hi: 10 V or more, Lo: 0.5 V or less

Output method : Totem pole (standard) ; load resistance 470 Ω or more
 Collector output (option) ; load resistance 10 k Ω or more
 Open collector output (option); within 40 VDC, 50 mA
 Line driver output (option)

Max. rotation speed	:5000 r/min
Max. allowable shaft load	:radial: 80 N, thrust: 50 N
Starting torque	:15 mN·m * However, the oil seal non-rotating shaft is specified separately.
Moment of inertia	:161 g·cm ²
Weight	:approx. 3.7 kg

Output waveform : 2-phase square waveform
 *Zero-mark is available as an option. (arbitrary timing)
 Output voltage : Hi: 10 V or more, Lo: 0.5 V or less
 Output method : Totem pole (standard) ; load resistance 470 Ω or more
 Collector output (option) ; load resistance 10 k Ω or more
 Open collector output (option) ; within 40 VDC, 50 mA
 Line driver output (option)

Adjacent error	Adjacent Error	Number of Pulses (P/R)
	Within 1/200 P	60, 100, 180, 250, 256, 300, 750, 4500, 6000
	Within 1/83 P	120, 200, 240, 360, 400, 500, 512, 600, 720, 900, 1000, 1024, 1200, 1250, 1280, 1500, 3000, 3750, 9000, 12000, 18000, 22500, 24000, 30000
	Within 1/46 P	480, 800, 1440, 1800, 2000, 2048, 2400, 2500, 2560, 7500, 36000, 45000, 48000, 60000
	Within 1/33 P	960, 1600, 2880, 4000, 4096, 4800, 72000, 96000
	Within 1/25 P	3600, 5000, 5120, 15000, 90000, 120000

* When measuring the rotation fluctuation from the pulse interval, please use a pulse with adjacent error $1/200P$.

Power requirement : AC 100 to 240 V or DC 12 to 24 V
Response frequency : 100 kHz/500 kHz (line driver output only)
Connection method : terminal strip or connector

Operating temperature range	: -5 to 55 °C
Storage temperature range	: -20 to 70 °C
Humidity	: 95 % (When at 40 °C / 8 h, the rotating shaft with an oil seal), with no condensation.
Protection class	: IP 65 dust-proof and jet-proof type (applicable by affixing oil seal to the rotating shaft as an option, and selecting the terminal strip for the connection output method.)
Vibration resistance	: 98 m/s ² each direction of X/Y (120 min. each), Z direction (for 240 min) 10 to 150 Hz sweep
Shock resistance	: 980 m/s ² each direction of X/Y for both ±directions (4 directions each three times, total 12 times), shock activation time: 6 ms : 98 m/s ² Z for both ±directions (2 directions each 3 times, total 6 times) shock activation time: 11 ms

Adjacent error is the absolute value of the pitch difference between two adjacent pulses.

The diagram shows a square wave. The period of the wave, labeled 'A', is indicated by a double-headed arrow spanning one full cycle of the wave. Above this arrow, the text 'Theoretical value=1 pitch' is written. The pulse width, labeled 'B', is indicated by a double-headed arrow spanning the width of one pulse. The wave consists of four pulses of equal width and height, separated by equal gaps.

COM and F.G. are common in the RP-1700 series. Make sure to ground the power connector F. G. as it may cause malfunction or breakdown.

Be sure to use M4 with a coating on the crimp part of the crimp terminal for connection to the protection earth terminal. COM and F.G. are common in the RP - 1700 series. Make sure to ground the F. G. or it may cause malfunction or breakdown.

Diagram illustrating the terminal block wiring for the 1000 Series. The terminal block has 10 positions. Terminal 10 is connected to the Yellow/Green ground wire (labeled M4). Terminal 9 is connected to the White or 1 wire and the Black or 2 wire. The diagram also shows the AC input voltage range (100 to 240 V), frequency (50/60 Hz), and maximum power (15 VA).

Protection ground
Make sure to ground to F.G.

AC 100 to 240 V
50/60 Hz
Max. 15 VA

() is mounted on RP-1713, 23, 33, and 43.

() is mounted on RP-1713, 23, 33, and 43.

() is mounted on RP-1714, 24, 34, and 44.

Diagram illustrating the structure of a spherical virus particle. The particle is composed of a central core (Infilling material) surrounded by a layer (Shield) and an outer layer (Sheath). The core contains eight numbered nucleocapsids (1-8).

No.	Color	Contents	
		AC Type	DC Type
1	Blue	Sig A(A)*1	Sig A(A)*1
2	Green	Sig COM(A)*1	Sig COM(A)*1
3	White	Sig B(B)*1	Sig B(B)*1
4	Gray	Sig COM(B)*1	Sig COM(B)*1
5	Orange	Sig Z(Z)*1,*2	Sig Z(Z)*1,*2
6	Yellow	Sig COM(Z)*1,*2	Sig COM(Z)*1,*2
7	Red	Sig COM	Power supply+
8	Brown	Sig COM	Power supply-

*1 Within () : when a line driver output is selected.
*2 Sig Z : used when option is added.

- Cables used for the connector type RP-110 and RP-130 series can also be used for the RP-1700 series by using an optional conversion cable. However, please note that it does not comply with EMC requirements. In addition, AC type requires AC power supply separately.
- The output resistance values differ between the Y specification (collector output type/output resistance 330 Ω) of the RP-100 series and the C specification (collector output type /output resistance 470 Ω) of the RP-1700 series. Therefore, when replacing with RP-1700 series, please use it by making the external load resistance (load resistance of existing equipment side) 10 k Ω or more.

Old model name	Conversion cable model name
RP-110, RP-130 series (without Z-phase)	RP-0154
RP-110, RP-130 series (with Z-phase)	RP-0155

○ Cables used for the RP-110 and RP-130 series of terminal strip type can also be used with the RP-1700 series. However, please note that it does not comply with EMC requirements. Also, be sure to connect the F.G. securely. Since RP-1700 series cable grand conforming diameter is 8 mm or more, it can not be diverted when using R6 cable.

Old model name	Compatible cable	Replacement recommended cable
RP-112A-T	R6	RP-0144,0145,0151,0152,0153
RP-132A-T	R6	RP-0144,0145,0151,0152,0153
RP-112D-T	R6	RP-0146,7
RP-132D-T	R6	RP-0146,7
RP-112AZ-T	R8	RP-0144,5 (R8)/RP-0151,2,3
RP-132AZ-T	R8	RP-0144,5 (R8)/RP-0151,2,3
RP-112DZ-T	R8	RP-0146,7(R8)
RP-132DZ-T	R8	RP-0146,7(R8)

* Please refer to P.12 for more details of the cables.

No.	1	2	3	4	5	6
Color	Blue	Green/ gray	White	Green/ brown	Red	Black

A cross-sectional diagram of a four-core cable. The cable is circular and divided into four quadrants by a vertical and a horizontal line. Each quadrant contains a conductor, numbered 1 through 8. Conductors 1 and 2 are in the top-left quadrant, 3 and 4 in the bottom-left, 5 and 6 in the bottom-right, and 7 and 8 in the top-right. Labels with leader lines point to various components: 'Drain wire' points to a thin line near the top-left conductor; 'Vinyl sheath' points to the outermost layer; 'Tape' points to a layer just inside the sheath; 'Shield' points to a layer between the conductors and the tape; and 'Conductor' points to one of the numbered conductors.

Identification of wire core

No.	1	2	3	4	5	6	7	8
Color	Blue	Green/ gray	White	Green/ brown	Orange	Green	Red	Black

† In the table, green/gray indicates that

* In the table, green/gray indicates that the circumference of the green PVC is marked with gray.

Technical drawing of the MAX36 pump showing front and side views with dimensions.

Front View Dimensions:

- Overall width: 114
- Overall height: 102
- Flange diameter: 14
- Flange thickness: 14
- Mounting holes: 4- $\varnothing 10$
- Base width: 80
- Base height: 12
- Overall base width: 130
- Overall base length: 150

Side View Dimensions:

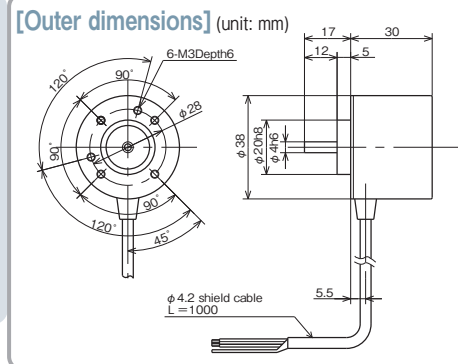
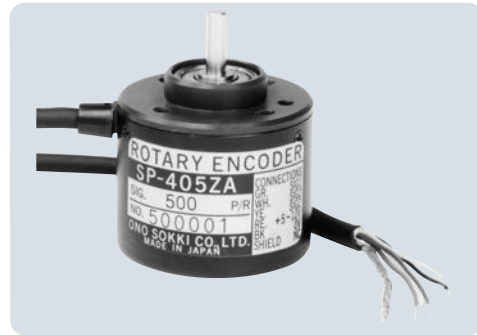
- Overall length: 98
- Mounting flange diameter: $\varnothing 15$
- Mounting flange thickness: 21
- Mounting flange hole diameter: 25
- Mounting flange hole offset: 28
- Overall length to centerline: 65
- Overall length to end: 165
- Overall height: 78
- Overall width: 35
- Overall width to end: 55
- Model designation: MAX36

Ultra-compact
type

SP-405ZA series

Standard output pulses (P/R)	60	100	200	300
Optional output pulses (P/R)	360	500	600	
	40	50	250	400 800 900

Ultra-compact shaft type appropriate to the built-in assembly



- [Features]
- Economical type to meet the needs of OEM
 - Outer diameter $\phi 38$, the mass approx. 100 g ultra-compact and lightweight
 - 2-phase square wave + zero-mark signal output
 - Selectable the number of pulses from 13 kinds

[Electrical specification]

(*: an optional specification)

Output Waveform	: 2-phase square wave + zero-mark (timing optional)
Output Voltage	: Hi: supply voltage - 20 % or more, Lo: 0.5 V or less
Output type	: collector load resistance 10 k Ω or more *open collector: within DC30 V, 35 mA
Adjacent error	: $\pm 1/15$ P
Power supply	: DC5 to 12 V ± 10 %, 50 mA * Only open collector by an option, 24 VDC is possible.
Response frequency	: 100 kHz
Connection method	: direct cable 1 m (terminal: open)

[Mechanical specification]

The maximum rotation speed	: 6000 r / min
Allowable shaft load	: radial: 25 N thrust: 15 N
Starting torque	: 2 mN $\cdot$ m
Moment of inertia	: 6 g $\cdot$ cm ²
Weight	: approx. 0.1 Kg

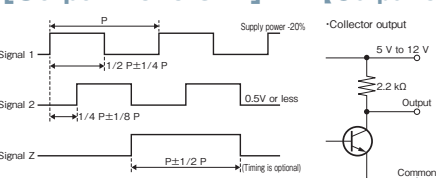
[General specification]

Operating temperature range	: -10 to 70 $^{\circ}$ C
Storage temperature range	: -20 to 80 $^{\circ}$ C
Humidity	: 90 %, with no condensation
Protection degree	: IP40
Vibration resistance	: 98 m/s ² (3 directions each 2 h)
Shock resistance	: 980 m/s ² (3 directions 3 times each, for axis : 98 m/s ²)

[Signal connection]

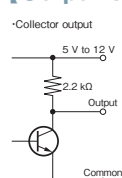
Green	White	Yellow	Shield	Red	Black
Signal 1	Signal 2	Signal Z	Case	5 to 12 V	0 V

[Output waveform]



When turning clockwise (C/W), viewed from the axial direction (Inverted output diagram is omitted.)

[Output circuit]

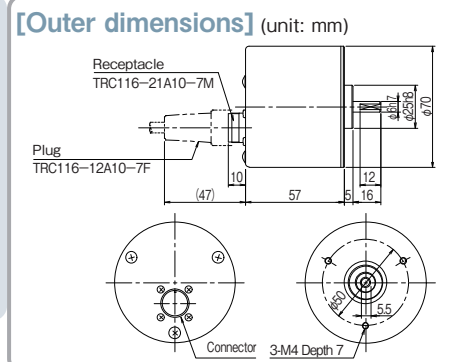
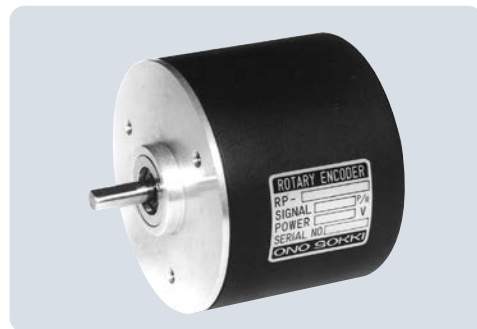


General-purpose
compact type

RP-432Z series

Standard output pulses (P/R)	120	360	600	1000	1024
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General-purpose type that can be used for a wide range of applications



- [Features]
- General-purpose type that can be used for a wide range of applications
 - A low price by miniaturization and standardization.
 - Suitable for OEM
 - Both DC5 V/DC12 V available for power supply
 - Easy-to-use connector system for signal output connection
 - Outputs 2-phase square wave + zero-mark signal.

[Electrical specification]

Output waveform	: 2-phase square wave + zero-mark (timing is optional)
Output voltage	: when using 5 V power supply Hi: 4 V or more, Lo: 0.2 V or less when using 12 V power supply Hi: 10 V or more, Lo: 0.3 V or less
Output method	: totem pole, load resistance: 1 k Ω or more
Adjacent error	: $\pm 1/20$ P
Power supply	: DC5 V ± 5 %, 100 mA or DC12 V ± 5 %, 100 mA
Response frequency	: 50 kHz
Connection method	: 7-core connector (cable side: TRC116-12A 10-7F)

[Mechanical specification]

Max. rotation speed	: 5000 r/min
Max. allowable shaft load	: radial: 20 N, thrust: 10 N
Starting torque	: 1.5 mN $\cdot$ m
Moment of inertia	: 24 g $\cdot$ cm ²
Weight	: approx. 0.25 kg

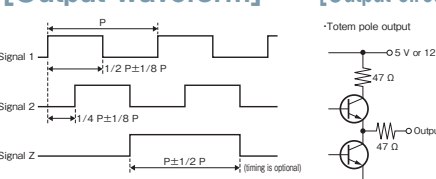
[General specification]

Operating temperature range	: 0 to 50 $^{\circ}$ C
Storage temperature range	: -20 to 80 $^{\circ}$ C
Humidity	: 85 % (40 $^{\circ}$ C, 8 h), with no condensation
Vibration resistance	: 49 m/s ² (3 directions 2 h each)
Shock resistance	: 490 m/s ² (3 directions 3 times each, for axis : 98 m/s ²)

[Signal connection]

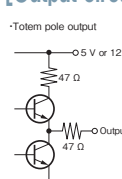
A	B	C	D	E	F	G
Signal 1	Signal 2	Signal Z	Common	5 V or 12 V	Common	Case

[Output waveform]



When rotating in right direction (CW) viewed from the axial direction

[Output circuit]



Roller encoder

RP-7400 series

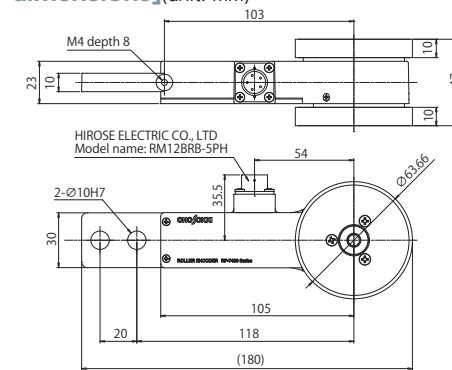
Standard output pulses (P/R)	120	200	1200
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Easy measurement of line speed and length of traveling body



120, 200 P/R
1200 P/R

[Outer dimensions] (unit: mm)



[Features]

- The number of pulses selectable from 120, 200, 1200 P/R.
- 4 output methods (Standard: totem pole/ Option: collector, emitter, and open collector)

[Electrical specification]

Number of output pulses	: For speed: 120, 1200 For length: 200
Output waveform	: 2-phase square wave
Duty ratio	: 50 $\pm$ 25 %
Phase difference	: 90 $\pm$ 45 $^{\circ}$
Output voltage (at DC12 V supply)	Hi: 10 V or more Lo: 0.5 V or less
Output method	: totem pole output (load resistance 470 Ω or more) * option RP-0701 : emitter output RP-0702 : collector output RP-0703 : open collector output
Supply voltage/ Current consumption	: DC12 V ± 5 %/100 mA or less (for DC12 V supplied)

[General specification]

Operating temperature range	: 0 to 50 $^{\circ}$ C (without freezing or condensation)
Storage temperature range	: -10 to 65 $^{\circ}$ C (without freezing or condensation)
Humidity	: 35 to 93 % RH or less (without freezing or condensation)
Protection class	: IP40 (when using a cable RP-0181/0182)
Weight	: approx. 400 g
Accessory	: instruction manual:1 connector 1 (RM12BPE-5S, made by Hirose electric Co.,LTD.)
Conforming Standards (CE marking)	: EMC Directive 2014/30/EU Standard EN61326-1 RoHS Directive 2011/65/EU Standard EN IEC 63000

[Mechanical specification]

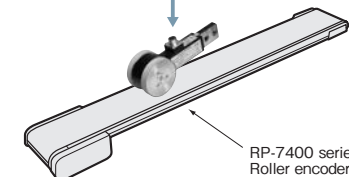
Speed range	: 0 to 600 m/min *Speed range will vary depending on the conditions of the object to be measured.
Measurement unit	: 120 P/R : 0.1 m/min 1200 P/R : 0.01 m/min 200 P/R : 1 mm
Roller material	: metal core; aluminum rubber : polyurethane rubber baked on the roller surface (degree of hardness: A90)
Roller outer circumference	: 200 mm
Max. allowable shaft load	: radial 20 N
Starting torque	: 1 mN $\cdot$ m
Moment of inertia	: 0.6 kg $\cdot$ cm ²
Vibration resistance	: 19.6 m/s ² X/Y/Z directions (150 min. each), 10 to 150 Hz sweep, 20 cycles
Shock resistance	: 196 m/s ² X/Y/Z directions in each $\pm$ direction (6 directions) for 3 times each (total 18 times), half-sine, operation time: 11 ms
Mounting hole (position)	: $\phi 10$ mm $\times$ 2 intervals 20 mm
Options	: RP-0181 (5 m) crimped terminal (M3) (10 m) crimped terminal (M3) RP-0182 (5 m) terminal open (10 m) terminal open RP-0181/RP-0182 (10 m): made to order For details of cables, refer to P12.

*: When measuring the moving speed (m/min) with the combination of RP-7400 1200 P/R and FV-1500, set the display unit to "USER".
*: Cumulative error will occur in the measured value due to installation situation of the roller encoder, roller slip, roller wear and so on.
*: Compensation function of the TM-4300 series reversible counter can correct such circumferential errors.

Applications

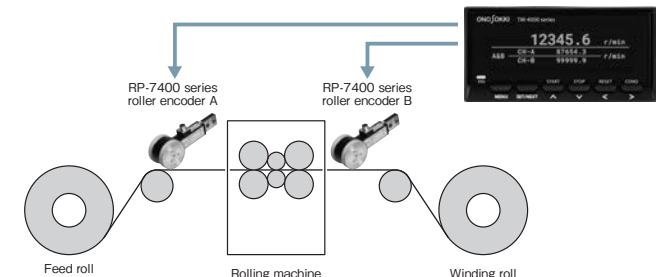
● Measurement of line speed

Measures the line speed of belt conveyor etc. in units of m/min.



● Measurement of the difference/ratio in rotation speed

Measures the elongation percentage and rolling reduction of the steel sheet.



- Achieves the rotation speed measurement over a wide range with high accuracy, high response
- Clearly visible on the organic EL display
- Ethernet selectable (optional function)
- Customized according to the connected devices

*For details, please refer to our website.

TM-4100 series Digital Tachometer

1 channel input type
Maintains compatibility with previous models (TM-3100 series)



TM-4110
(for display, AC power supply)

【Electrical specification】

Number of input channels	1 ch
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

TM-4200 series 2 channel Digital Tachometer

Measurement of rotation speed differences/ rotation speed ratio



TM-4270

【Electrical specification】

Number of input channels	2 ch, 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)
Measurement time	Within 1 ms + 1 cycle time

TM-4300 series Reversible Counter

Multiplication/addition/ subtraction, 7 digits display



TM-4370

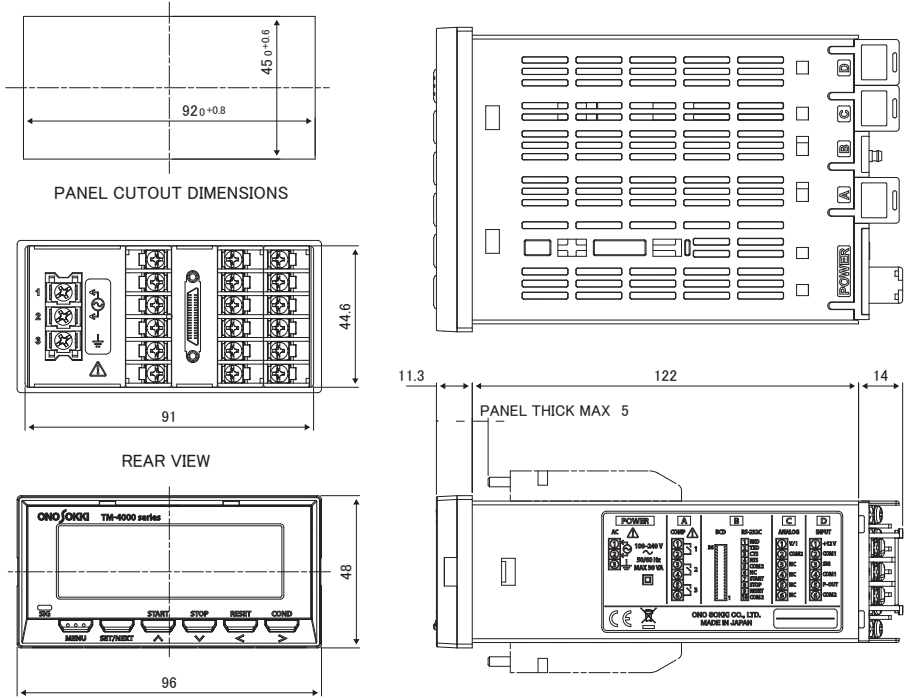
【Electrical specification】

Number of input 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
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

【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. 15 W max 0 to 50 °C/30 to 80 %RH (no condensation)
Operating temperature and humidity	[TM-4110] Approx. 340 g
Weight	[TM-4270/4370] Approx. 400 g
Applicable standards (CE marking)	EMC Directive 2014/30/EU Standard EN 61326-1 RoHS Directive 2011/65/EU Standard EN IEC 63000
Applicable standards (FCC/Canada)	FCC part 15B/ICES-003(A)/NMB-003(A)
Accessories	[TM-4100] Mounting jig 1 set (2 pcs), Instruction manual (1pc) [TM-4200/4300/4400] Input connector for D slot made by Phoenix Contact (1 pc, packed in the D slot), Mounting jig 1 set (2 pcs), Instruction manual (1 pc) 1 make contact output × 3 (COMP1/COMP2/COMP3) Evaluation conditions can be set individually. Maximum contact capacity 30 VDC/1 A, 250 VAC/1 A Output refresh time Approx. 10 ms *It is provided as standard for TM-4140/4141/4270/4730.
Comparator output* (option)	

【Outer dimensions】(Unit: mm)



*The configuration of the rear connectors varies depending on the specifications of the installed option boards.

Encoder / indicator / amplifier correspondence table

There are 4 types of connection methods for our encoder. Devices connectable are decided depending on the connection method. First of all, check "List of Encoder Output System." Then, check the available indicator/amplifier with "Indicator/Amplifier Compatibility Table by Output System."

"List of Encoder Output System"

Encoder	Output System of Detector	Compatible Load Resistance
RP-1700 series	Totem pole	470 Ω or more
	Collector	10 kΩ or more
	Open collector	—
	Line driver	—
SP-405ZA series	Collector	10 kΩ or more
	Open collector	—
RP-432Z series	Totem pole	1 kΩ or more
	Collector	10 kΩ or more
RP-7400 series	Totem pole	470 Ω or more
	Collector	10 kΩ or more
	Open collector	—
	Line driver	—

Indicator / Amplifier Compatibility Table by Output System

Output System	Indicator/ amplifier	Connection Availability ○:Available △:Conditionally available ×:Unavailable
Totem pole	FV-1500	○
	TM-4100 series	○
	TM-4200 series	○
	TM-4300 series	○
Collector	FV-1500	○
	TM-4100 series	○
	TM-4200 series	○
	TM-4300 series	○
Open collector	FV-1500*1	△
	TM-4100 series*1	△
	TM-4200 series*1	△
	TM-4300 series*1	△
Line driver	FV-1500	×
	TM-4100 series	×
	TM-4200 series*2	△
	TM-4300 series*2	△

*1: It is necessary to change input setting to PULL UP.
*2: It is necessary to install the TM-0407 Line Driver Input board.



- Wide measurement range from low to high speed (0.2 Hz to 320 kHz)
- High-speed conversion per signal period
- Rapid deceleration follow-up function
- Automatic center frequency follow-up function (option) can close up transient fluctuation component.

[Electrical specification]

Response : within one cycle time of input frequency + 3.5 μ s

Input voltage : AC input signal voltage range: 0.3 to 30 V p-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

In full scale mode output:
Arbitrarily set in 1 Hz unit at 1 to 320,000 Hz.
Arbitrarily set in units of 1 r/min at 1 to 320,000 r/min.
Arbitrarily set at 1 m/min at 1 to 320,000 m/min.

In deviation output mode:
Any measurement frequency up to 320 Hz
 $\pm 1\%$, $\pm 5\%$, $\pm 10\%$, $\pm 20\%$, $\pm 50\%$, $\pm 100\%$ or
 ± 1 to 180,000 (set in units of 1 Hz, 1 r/min, 1 m/min)

Input terminal : C02 type (BNC) and terminal strip selectable

Input format : single-phase, AC/DC/non-voltage (+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 connector signal : voltage output: 0 to 10 V (F.S. mode, direction recognition function OFF)
 ± 5 V (F.S. mode, direction recognition function ON, deviation output mode, automatic center frequency follow-up mode)
load resistance: 100 k Ω 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: $\pm 0.1\%$ (to 180 kHz),
 $\pm 0.2\%$ (to 320 kHz),
AC: $\pm 0.2\%$ (to 180 kHz),
 $\pm 0.4\%$ (to 320 kHz)
current output: DC: $\pm 0.7\%$ (to 180 kHz),
 $\pm 1.4\%$ (to 320 kHz)
AC: $\pm 1.4\%$ (to 180 kHz),
 $\pm 2.8\%$ (to 320 kHz)

Analog output low pass filter : selectable from OFF/3 Hz/10 Hz/1 kHz

Analog output connector : C02 type (BNC) (voltage output) or terminal strip (phoenix contact:MC1.5/6-STF-3, 81) (current output) selectable

Display : fluorescent display tube (display range 69.85 mm $\times$ 11.45 mm)

Display unit : Hz, r/min, m/min, USER

Sensor power : 12 VDC $\pm 10\%$ 150 mA, 5 VDC $\pm 10\%$ 150 mA selectable by SENSOR/POWER switch on the rear panel.

Power requirement : 16 VDC exclusive AC adapter (100 to 240 VAC) is provided

[General specification]

Operating temperature range : 0 to 40 $^{\circ}$ C

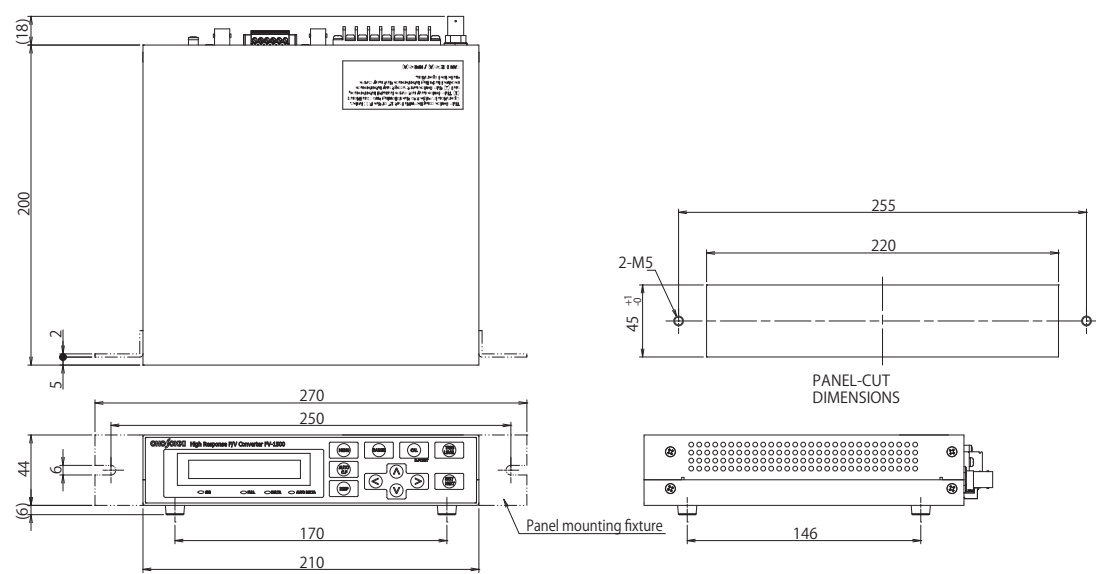
Operating humidity range : 5 to 80 % (with no condensation)

Weight : approx. 1 kg

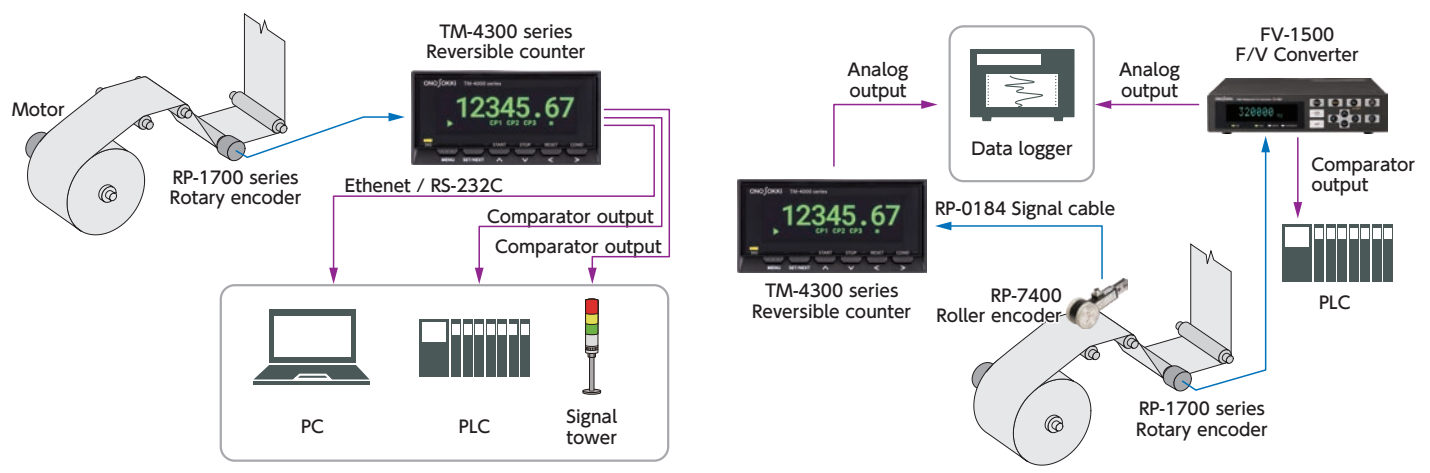
Accessory : exclusive AC adaptor (AC adapter PS-P20023A, cable assembly VM1072-VM1700 2 m) X 1, instruction manual X 1, connector (MC1.5/6-STF-3.81) X 1 (already installed in the unit)

Option : Automatic center frequency follow-up function (FV-0151)
Comparator output function (FV-0152)
Deviation scale change function (FV-0153)
Open collector output function (FV-0154)
Panel mounting fixture (FV-0014)

[Outer dimensions] (unit: mm)



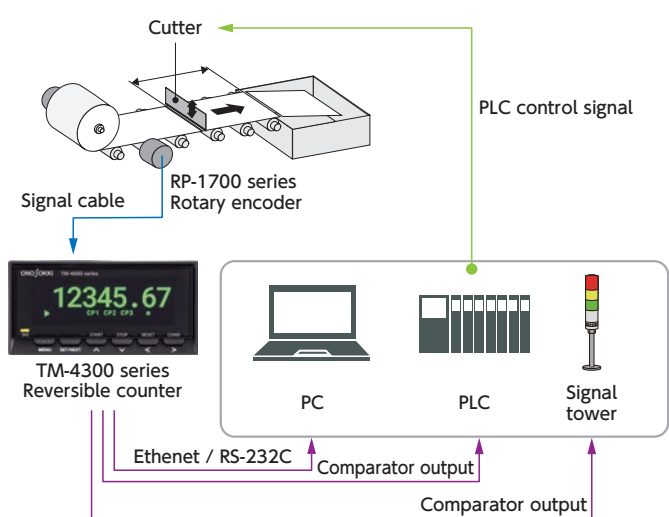
Measurement of winding length of film, steel plate, and paper



By attaching a rotary encoder to the roll shaft on the production line, measure the winding length. The judgement conditions can be output to the PLC using the comparator output function of reversible counter, or measurement results can be saved to a PC via Ethernet or RS-232C communication.

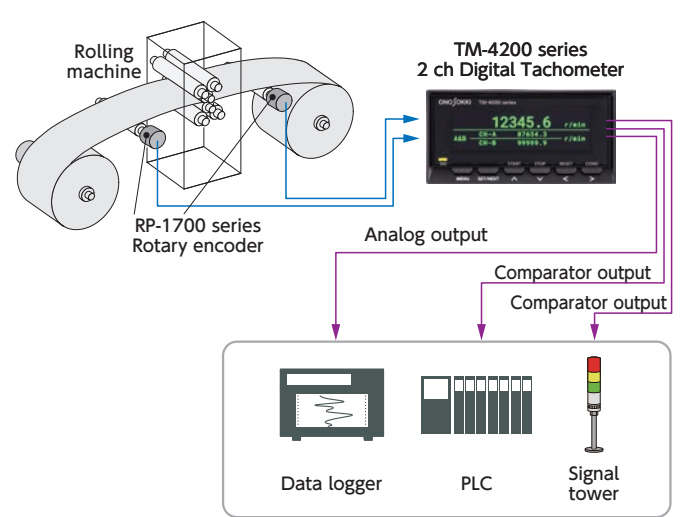
By using the deviation output mode of the F/V converter, it is possible to monitor rotational speed fluctuations (uneven rotation). This supports stable material feed with consistent tension, unaffected by factors such as winding amount.

Length measurement on continuous cutting line



By attaching a rotary encoder to the roll shaft of a continuous cutting line, the length of objects flowing on the line can be measured. By using the comparator output of reversible counter, it is possible to output cutting signals from the PLC or output the operating status of the production line to a signal tower.

Measurement of rolling reduction of steel plate, film and paper



By attaching the rotary encoders to the roll shafts before and after rolling process of film, steel plate, paper, etc., measures the reduction rate (elongation rate) from the rotation speed and roll diameter. The fluctuation of rolling reduction can be recorded continuously on a data logger via analog output.

Cable list

[Cable List for RP-1700 Series]

Application	Power	Type	Model	Terminal Processing (Cable Length)	Example of Connectable Device
Signal output	AC	△t	RP-0140	NJC-2010-PF ⇔ M3×7 (5 m)	RP-17□1-□C, RP-17□3-□C →TM-3100 series
	AC	⊙t	RP-0141	NJC-2010-PF ⇔ Open (5 m)	RP-17□1-□C, RP-17□3-□C →TM-5100, RV-3150
	AC	△t	-	NJC-2010-PF ⇔ ferrule terminal (5 m)	RP-17□1-□C, RP-17□3-□C →TM-4200/4300 series Item code:PE3534952(PS-D11144)
	DC	△t	RP-0142	NJC-2010-PF ⇔ M3×8 (5 m)	RP-17□2-□C, RP-17□4-□C →TM-3100 series
	DC	⊙t	RP-0143	NJC-2010-PF ⇔ Open (5 m)	RP-17□2-□C, RP-17□4-□C →TM-5100, RV-3150
	DC	△t	-	NJC-2010-PF ⇔ ferrule terminal (5 m)	RP-17□2-□C, RP-17□4-□C →TM-4200/4300 series Item code:PE3534953(PS-D11145)
	AC	△t	RP-0144	M3×7 ⇔ M3×7 (5 m)	RP-17□1-□T, RP-17□3-□T →TM-3100 series
	AC	⊙t	RP-0145	M3×7 ⇔ Open (5 m)	RP-17□1-□T, RP-17□3-□T →TM-5100, RV-3150
	AC	△t	-	M3×7 ⇔ ferrule terminal (5 m)	RP-17□1-□T, RP-17□3-□T →TM-4200/4300 series Item code:PE3534954(PS-D11146)
	DC	△t	RP-0146	M3×8 ⇔ M3×8 (5 m)	RP-17□2-□T, RP-17□4-□T →TM-3100 series
	DC	⊙t	RP-0147	M3×8 ⇔ Open (5 m)	RP-17□2-□T, RP-17□4-□T →TM-5100, RV-3150
	DC	△t	-	M3×8 ⇔ ferrule terminal (5 m)	RP-17□2-□T, RP-17□4-□T →TM-4200/4300 series Item code:PE3534955(PS-D11147)
Power supply	AC	⊙t	RP-0148	NJC-203-PF ⇔ 3P AC plug (2.4 m)	For RP-1700 series-□C
	AC	△t	RP-0149	NJC-203-PF ⇔ M3×2, M4×1 (5 m)	For RP-1700 series-□C
	AC	△t	RP-0150	NJC-203-PF ⇔ open(5m)	For RP-1700 series-□C
	AC	⊙t	RP-0151	M3×2, M4×1 ⇔ 3P AC plug (2.4m)	For RP-1700 series-□T
	AC	△t	RP-0152	M3×2, M4×1 ⇔ M3×2, M4×1 (5m)	For RP-1700 series-□T
	AC	△t	RP-0153	M3×2, M4×1 ⇔ open (5m)	For RP-1700 series-□T
Conversion cable	AC, DC	⊙t	RP-0154	NJC-2010-PF ⇔ RM12BJB-5P (0.5 m)	Old RP-100 series connector type (without Z-phase) →RP-1700 series
	AC, DC	⊙t	RP-0155	NJC-2010-PF ⇔ TRC116-32A10-7M (0.5 m)	Old RP-100 series connector type (with Z-phase) →RP-1700 series

* Option cables above are for domestic use. Please contact your nearest distributor or Ono Sokki sales office nearby when export.
*For China : not provided

[Cable List for RP Series (Except RP-1700 Series)]

Application	Power	Type	Model	Terminal Processing (Cable Type/ Length)	Example of Connectable Device
Two-phase + zero-mark signal output	AC,DC	⊙t	RP-0169	TRC116-12A10-7F⇔open(R8,5 m)	RP-432Z-C, RP-122AZ-C →RV-3150, TM-3100/4100 series
Two-phase signal output	DC	⊙t	RP-0181	RM12BPE-5S⇔ M3×5 (D5UL,5 m)	RP-7400 series →TM-3100 / 4100 series
	DC	⊙t	RP-0182	RM12BPE-5S⇔ open (D5UL,5 m)	RP-7400 series →RV-3150 series
	DC	⊙t	RP-0184	RM12BPE-5S ⇔ ferrule terminal(D5UL, 5 m)	RP-7400 series →TM-4200/4300 series

Cable Specification					
0.75×2	t	VCTF 0.75×2	2-core cabtyre cable for AC power 0.75 mm ²	R8	t 4 pairs twist, 3 pairs shield cable of that, for 2-phase + zero-mark signal output
R6	t		3 pairs twist, 2 pairs shield cable of that, for single-phase and 2-phase signal output	RT7	t PVC 0.3×7 cores for RP-5610D series

* Normally the cable length is 5 m for signal output and 2.4 m for power supply. A cable of non-standard length is estimated separately in units of 5 meters.

⊙ mark: The standard item that is always stocked. ○ mark: The standard item that may be out of stock. If it is out of stock, the delivery time is 1 to 2 months.
△ mark: Made-to-order product. The delivery time is about 1 to 4 months. t mark: The shipping fee will be charged separately.
Note: Refer to page 5 for details on cable R6 and R8.

* Notes on export to China

We only provide encoders of terminal block type for China. Cables for exporting to China are not provided.

ONOSOKKI

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 : +81-45-930-1808
E-mail : overseas@onosokki.co.jp

* Outer appearance and specifications are subject to change without prior notice.
URL: <https://www.onosokki.co.jp/English/english.htm>

U.S.A.

Ono Sokki Technology Inc.
2100 Golf Road, Suite 370
Rolling Meadows, IL. 60008,
U.S.A.
Phone : +1-630-627-9700
Fax : +1-630-627-0004
E-mail : info@onosokki.net
<http://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