For better use of our Catalog

⟨For specifications⟩

Specifications in this product catalog are subject to change without prior notice. Detailed specifications are omitted for some of the products due to limited space.
Please inquire and ask for individual specification sheets when ordering.

⟨Information⟩

• Please note that the following models with The products indicated by ➔ mark will be manufactured upon receipt of your order.
• ➔ mark models
• POLYGON LASER SCANNERS

Those without ➔ mark are standard stock items unless otherwise specified.
Our product catalog consists of two volumes.
This catalog, the second volume, carries product information on sensors and motors. Please see the first volume for other products such as switches, trimmers, attenuators, circuit protector and so on.

Note prior to placing order

Please do not use our products under conditions or environments not described in this catalog. Even under the conditions or environments described in this catalog, if you want to use our products for applications requiring high reliability (These include, but are not limited to, nuclear power control equipment, railroad equipment, aviation equipment, vehicle equipment, combustion equipment, medical equipment, entertainment equipment, and disaster prevention equipment), be sure to contact our point of contact beforehand.

The details of warranty shall be as per the descriptions in this document and we shall not be liable for any damage on you resulting from the use of any equipment or device (including control systems) which is not in accordance with this document (hereinafter referred to as "use in violation"). In the case where you resell our products, we shall not be liable for any damage on a third party resulting from use in violation by the third party, and even if we make payment to the third party in connection with such use in violation regardless of the name by which such payment may be called, we may demand the whole amount thereof from you.

⟨**Warranty Period**⟩
The warranty period is one year from the date of delivery. The warranty is only applicable to the product itself, not applic a ble to con sumable products such as batteries and etc.

⟨**Warranty Coverage**⟩
If any malfunctions should occur due to our fault, NIDEC COMPONENTS warrants any part of our product within one year from the date of delivery by repair or replacement at free of charge. However, warranty is not applicable if the causes of defect should result from the following con ditions:
- Failure or damages caused by inappropriate use, inappropriate conditions, and inappropriate handling.
- Failure or dam ages caused by inappropriate modifications, adjustment, or repair.
- Failure or damage caused by technically and Scientifically unpredictable factors.
- Failure or damage caused by natural disaster, fire or unavoid able factors.

The Rotary Encoder series includes optical and magnetic encoders. Optical models run from ϕ 12 to ϕ 30 and include small, light weight, and low cost models, as well as high resolution, and manual setting models. These encoders can be used to sense the angle, size and rotation speed of industrial equipment, including industrial robots, numerically controlled (NC) machine tools, elevators, production equipment, terminals at financial institutions, computer peripheral equipment, etc. They can also be used as manual setting encoders for digital equipment, such as measuring, communications and medical equipment.

ROTARY ENCODERS OPERATING PRINCIPLES

■ BASIC CONSTRUCTIONS

● Optical encoders

The light from the LED which passes through the slit of the rotating disk actuates the photo-sensor. The output of the photo-sensor which is quasi-sinusoidal is shaped into square wave by the voltage comparator and fed into a logic circuit.

● Magnetic encoders

Principle structure is composed of magnetic sensor and magnetic drum (corresponding to LED and photo-sensor in an optical encoder).
Without power consuming LED, total dissipation power of the magnetic encoder is far less than that optical encoder.

Fig. 1

Fig. 2
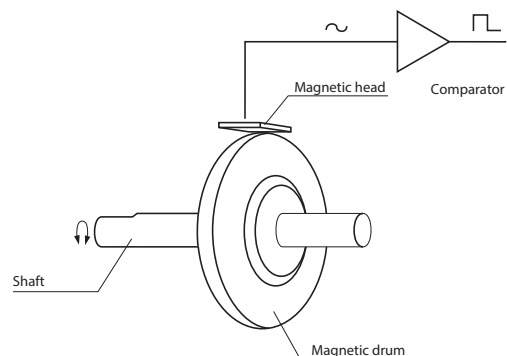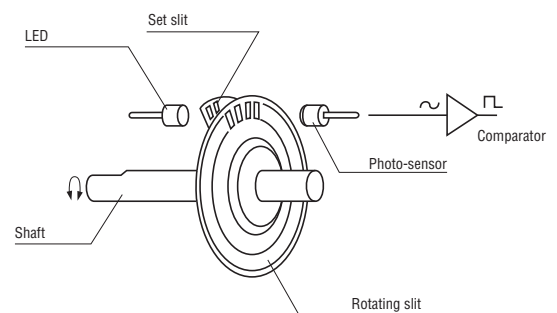
OPERATING PRINCIPLES
ROTARY ENCODERS

■ OUTPUT SIGNALS
● Quasi-sinusoidal signal output (RE20F)

Output signals of the RE20F rotary encoders are direct signals from the photo-sensor in the quasi-sinusoidal wave form. An external circuit is therefore required to shape them into square wave signals.

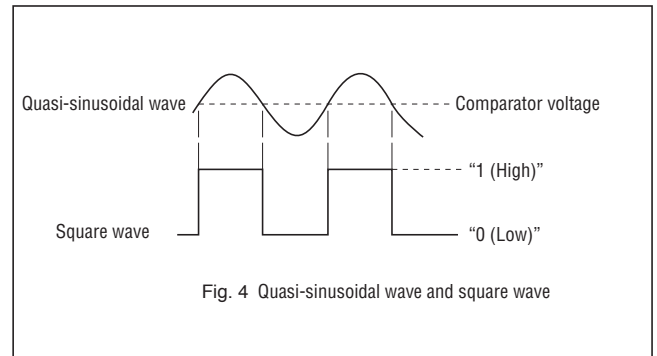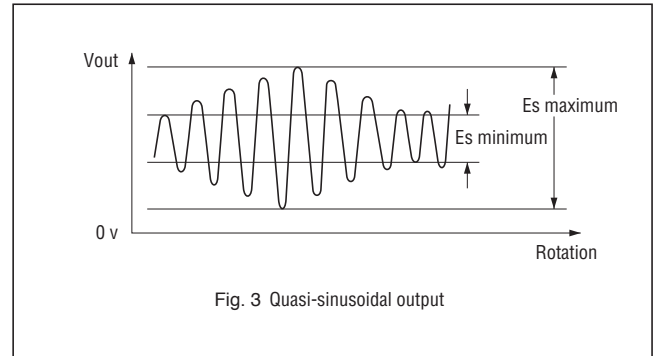Fig. 3 shows the output amplitude variation (ripple), ΔEs which is defined as follows.

$$\Delta Es = \left(\frac{Es \text{ maximum}}{Es \text{ minimum}} - 1 \right) \times 100 \ [\%] \qquad \Delta Es \leqq 40 \ \%$$

Fig. 3 Quasi-sinusoidal output

● Square wave signal output
(REC16, RES16, RES20D, REC20D, RESW20D, RECW20D, RMS20, REC20, RES20B, REC20C, RE12D, RE30E)

Output signals of the series encoders are in the form of square waves and can be fed into a digital circuit directly without an interface.

There are three versions available, for 5 V output, 12 V output and 24 V output.

Fig. 4 Quasi-sinusoidal wave and square wave

■ OUTPUT PHASES

Output "A" : This is a basic output and will give as many pulses per turn as the resolutinon.

Output "B" : This output is the same as the output "A" except that there is an electrical phase difference of 90° between the output "A" and "B" and is used to sense the direction of rotation.
The rotating direction is usually determined by sensing the signal level of the output "B" at the pulse edge of the output "A".

Output "Z" : This is an index output of one pulse per turn and is used as a reset signal or start signal.
The encoders are so designed that there will be only one rising edge on CW rotation (falling edge on CCW rotation) in the output "B" during the time period when the output "Z" is "high". Therefore, an ideal reference position signal can be obtained by getting the outputs "B" and "Z".

Fig. 5   Timing of output phases
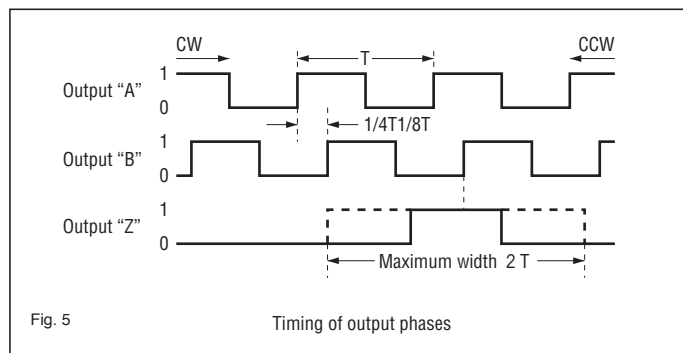
■ SPEED, RESOLUTION AND FREQUENCY RESPONSE

The maximum operating speed of the encoders is given by the following formula.

$$\text{Maximum speed (min}^{-1}) = \frac{\text{Maximum frequency response (Hz)} \times 60}{\text{Resolution (P/R)}}$$

Note) Encoders exceeding the above limit may be available on a special order basis.

■ PROTECTION GRADE

- Protection grade applies to the environment of rotary encoder use.

- The Protection grade aims at water protection. For the oil or various types of liquid, please be reminded that the degree of protection is different.

$$IP \square \square$$

International Protection

[First characteristic numeral]
Level of protection against contact and penetration of solid bodies.

[Second chracteristic numeral]
Level of protection against the penetration of liquids.
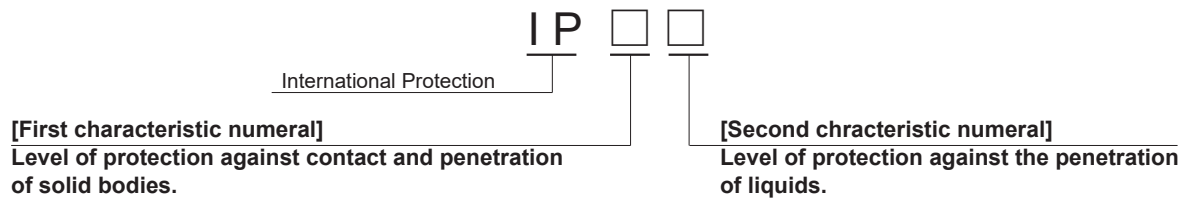
Grade		Degree of protection
0		No protection
1		Protected against solid foreign objects such as hands of ϕ 50 mm and greater.
2		Protected against solid foreign objects such as finger of ϕ 12.5 mm and greater.
3		Protected against solid foreign objects such as tools or wires of (ϕ or thickness of) 2.5mm and greater.
4		Protected against solid foreign objects such as tools or wires of (ϕ or thickness of) 2.5mm and greater.
5		Protected against such dust as damages the equipment operation.
6		Dust-tight

Grade	Category		Degree of protection
0			No protection
1	Drip-proof I type		Protected against vertically falling water drops.
2	Drip-proof II type		Protected against vertically falling water drops when enclosure is tilted up to 15°.
3	Rain-proof type		Protected against rainfall when enclosure is tilted up to 60°.
4	Splash-proof type		Protected against splashing water.
5	Water-jets-proof type		Protected against water jets.
6	Waterproof type		Protected against powerful water jets.
7	Watertight type		Protected against the effects of temporary immersion in water.
8	Underwater type		Protected against the effects of continuous immersion in water.

【Related standards】

IEC (The International Electrotechnical Commission) standard
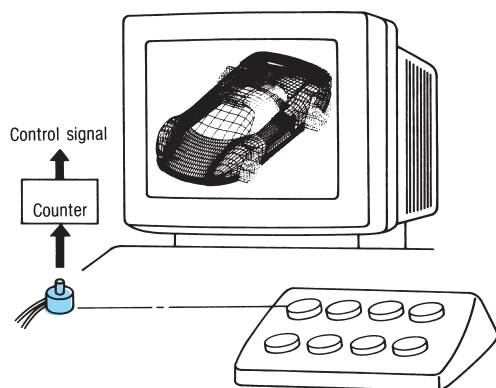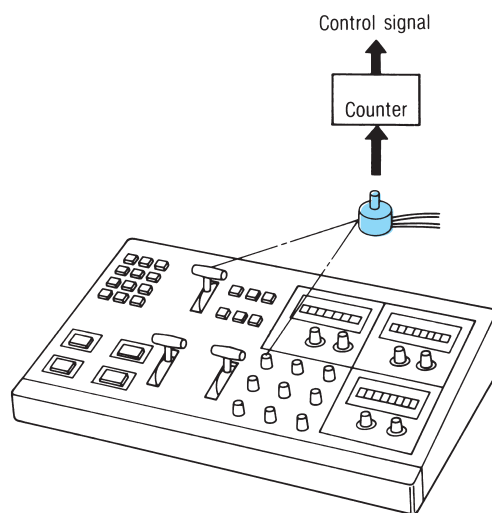IEC 60529
Degrees of protection provided by enclosures

JIS JIS-C-0920
JIS(Japanese Industrial Standards) standards JIC-C-0920
Test to prove protection against ingress of water and degree of protection

● **Input equipment for Image simulation, e.g. CAD**

Control signal

Counter

● **For manual setting of broadcasting system, e.g.switcher**

Control signal

Counter

● **Cursol position setting for wave observation of Oscilloscope etc.**

Control signal

Counter
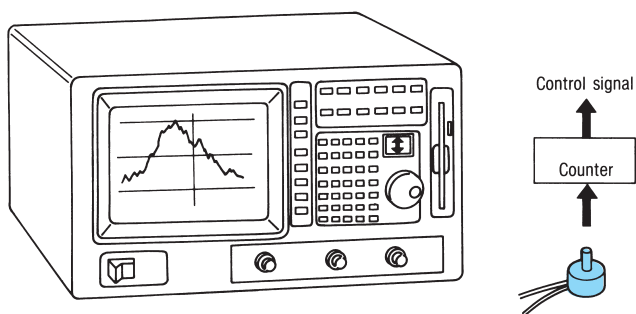
● **Level settings for ultrasound imaging devices**
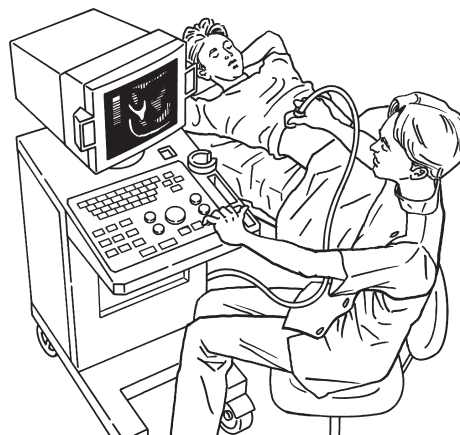
1.Cautions regarding handling

● The encoder comprises precision parts and should be handled carefully. If the shaft or body are struck, dropped, or otherwise subjected to shock, function may be impaired.

● When installing the encoder, minimize the eccentricity and declination and use flexible couplings to reduce the load on the shaft. If the load is increased, it will reduce the life of the bearings.

2.Use environment

● The encoders do not have drip-proof construction. Prevent exposure to oil, water and other liquids. (RESW20D & RECW20D are with panel seal.)

3.Wiring

● Error in wiring or power supply voltage can damage in internal circuitry. Take sufficient care during wiring.

● To prevent induction noise, make cable wire lengths as short as possible. Do not run wires parallel to high voltage or other power wires.
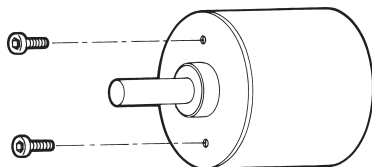
4.Installation
<Bushing mount type>
**(Manual setting encoders
REC16,RES16,RES20,RES20-Z,REC20,RES20B,
REC20C,RES20D,REC20D,RESW20D,RECW20D)**

Nut　　Washer　　Stopper

<Screw mount type>
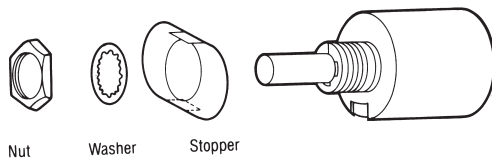
5.Soldering conditions
(Manual setting encoders
RES16A,REC16B,REC16M,REC16K)

● Manual soldering

Use solder gun under 20W, Soldering shall be done at 350 ℃ (lead-free for 3seconds [max.].)

● Dip soldering

The PCB thickness is 1.6mm above with one side copper lamination or two sides copper lamination.

For Flux, It is applied on half of PCB with specific gravity (0.83-0.85) with bubble.

For pre-heat, the surface temperature is under 100℃ within 1 minute.

The soldering temperature is under 260℃ . The process is within 5 seconds one time only.

● Reflow Soldering

It will destroy the function. Please do not proceed.