

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.

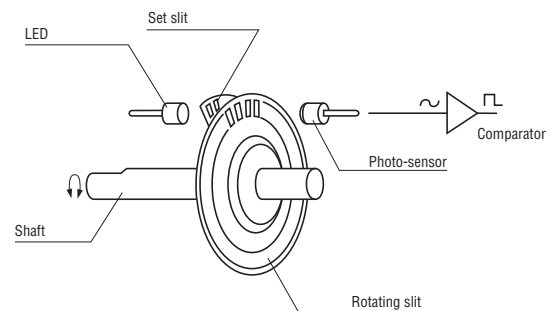


Fig. 1

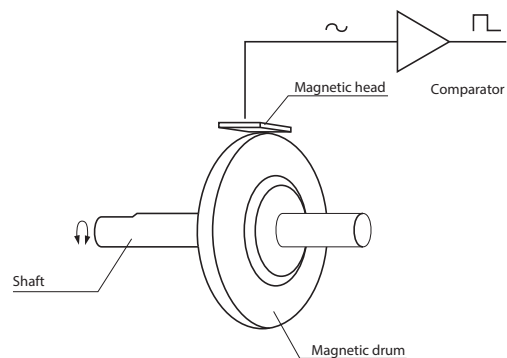


Fig. 2

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), ΔE_s which is defined as follows.

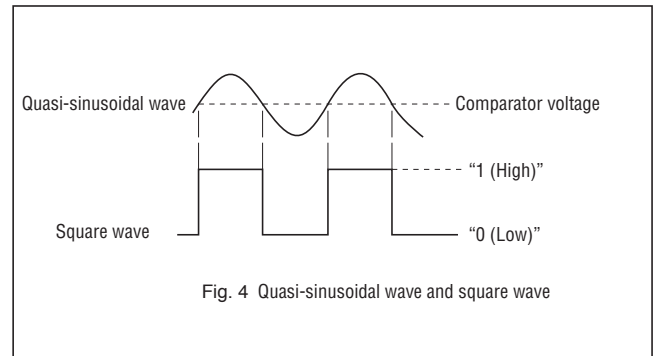
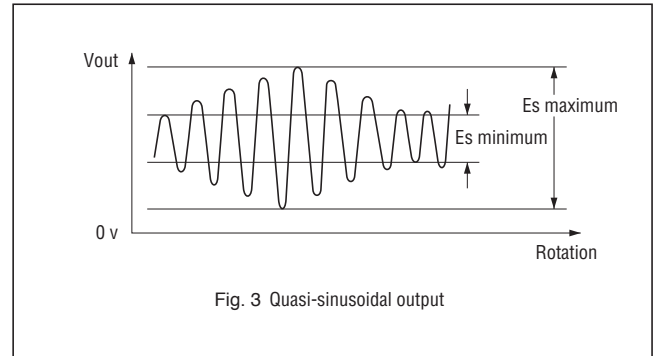
$$\Delta E_s = \left(\frac{E_s \text{ maximum}}{E_s \text{ minimum}} - 1 \right) \times 100 [\%] \quad \Delta E_s \leq 40 \%$$

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.



OPERATING PRINCIPLES

ROTARY ENCODERS

OUTPUT PHASES

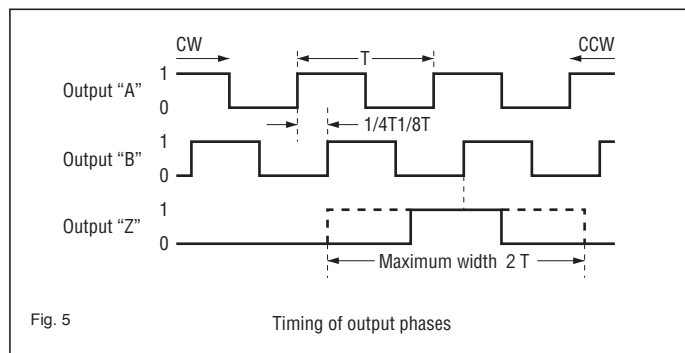
Output "A" : This is a basic output and will give as many pulses per turn as the resolution.

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".



SPEED, RESOLUTION AND FREQUENCY RESPONSE

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

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

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