

A person in silhouette is shown in the foreground, wearing glasses and holding a tablet. The background is a futuristic, blue-lit industrial setting with robotic arms and digital overlays. The text "Microfabrication Slit Solution For Optical Encoders" is overlaid in white.

Microfabrication Slit Solution For Optical Encoders

Positional accuracy is the key for robot control

Industrial robots first appeared in Japan in 1969. In 2022, more than half a century later, the robot technology is getting improvement and expand not only the conventional industrial market, mainly in manufacturing plants, but also the agriculture and the food industry.

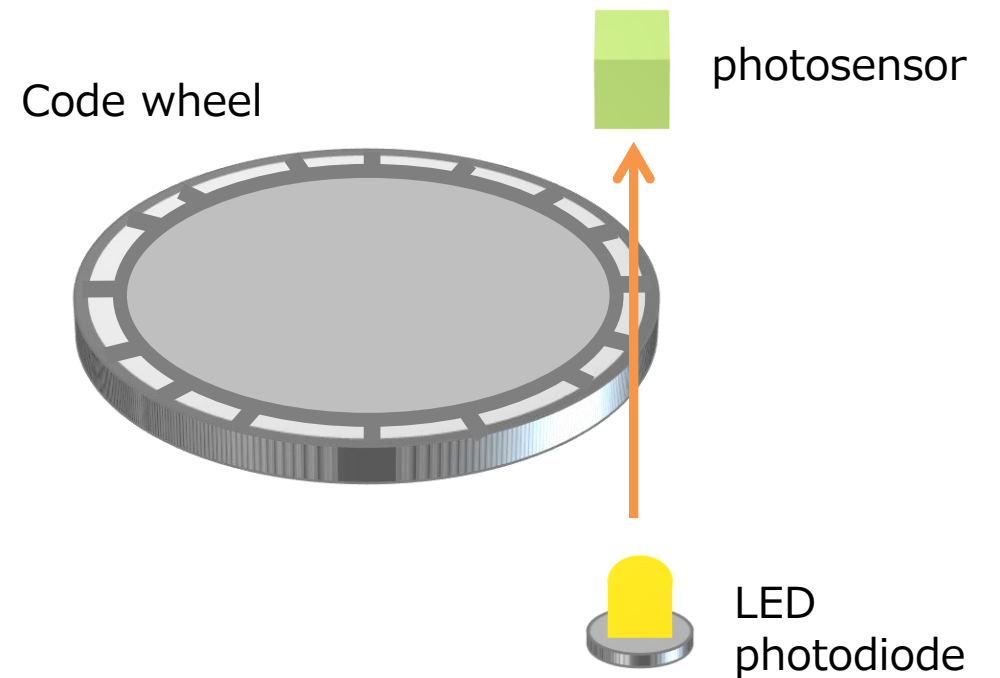
The position detection is one of the important technologies in robot control. The efforts of developers who have improved the precision control of these machines have expanded the sphere of activity of today's robots and self-powered machines.

Increasing positioning accuracy is more important for any type of manufacturing equipment to reduce the operation cost and improve the yield rate.

Optical Encoders

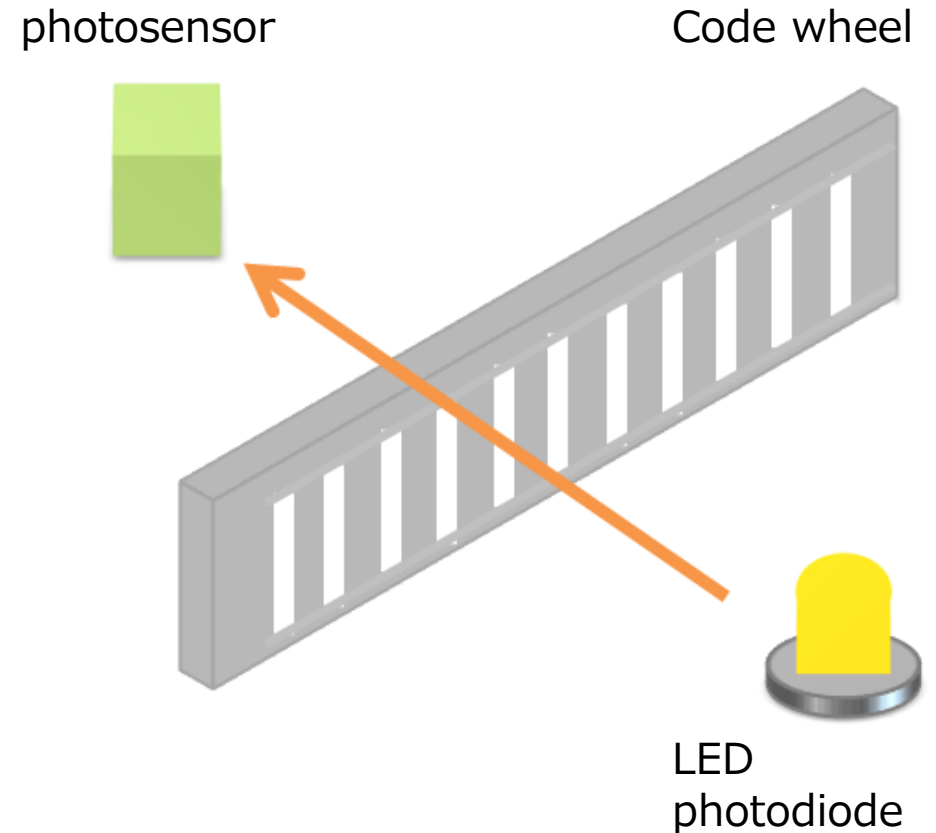
Optical Rotary Encoders

Used to detect the position of servo motors. There are two types which are the incremental type and absolute type. In cases where more precise operation is required, the absolute type is commonly used to convert absolute position detection into a signal. The encoder consists of the light emitting elements such as LEDs and laser diodes, and a code wheel is incorporated between the passive and light emitting elements. Position detection is performed when an optical pulse signal passes through a slit formed on the code wheel.

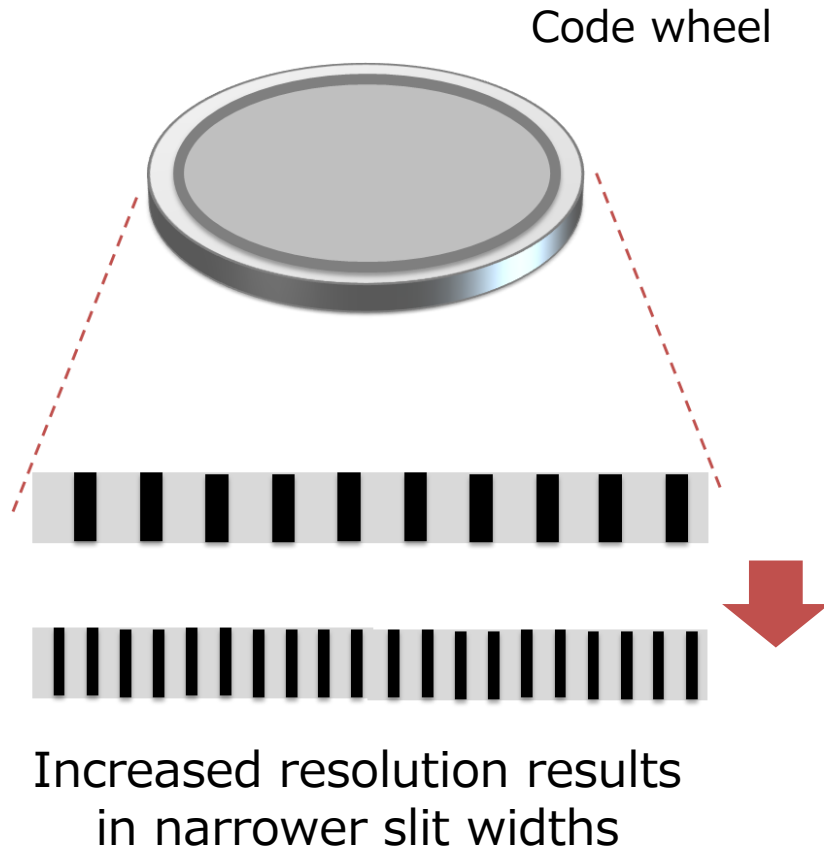


Linear Scale Encoder

It is based on the same principle as the optical rotary encoder, but the slit is formed in a straight line. This linear scale encoder normally is used for milling machines, drilling machines, bending presses, and other machine tools that require high positioning accuracy.



Slitting accuracy makes higher resolution



One technical approach to improving optical encoder capability is to increase resolution. Increasing the number of slits in the encoder's internal code wheel improves resolution, but increasing the number of slits per area means that the slit width itself becomes narrower, so high processing technology and precision are required to manufacture the slits.

Proposal

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For small, high-precision optical encoders, we offer the high precision slits by etching or electroforming technology, which enable high-precision production.

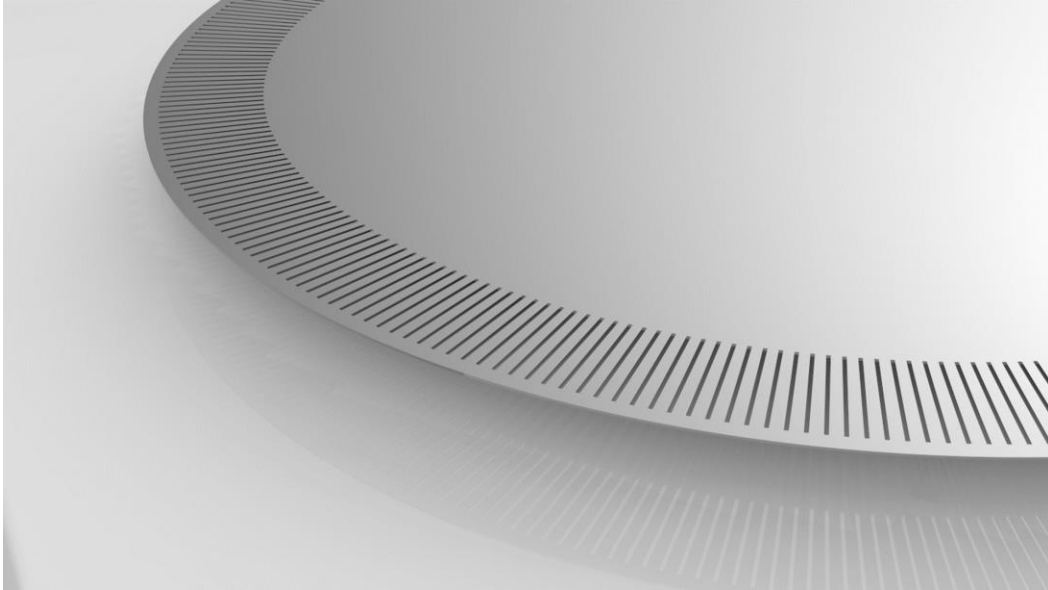
Advantage

- UPT can achieve the required machining accuracy by selecting the most suitable machining method.
- Having standard materials in stock allows for immediate processing and low cost, and short leadtime.
- Even if there are different place/country between development and production, we can provide global support through our network.

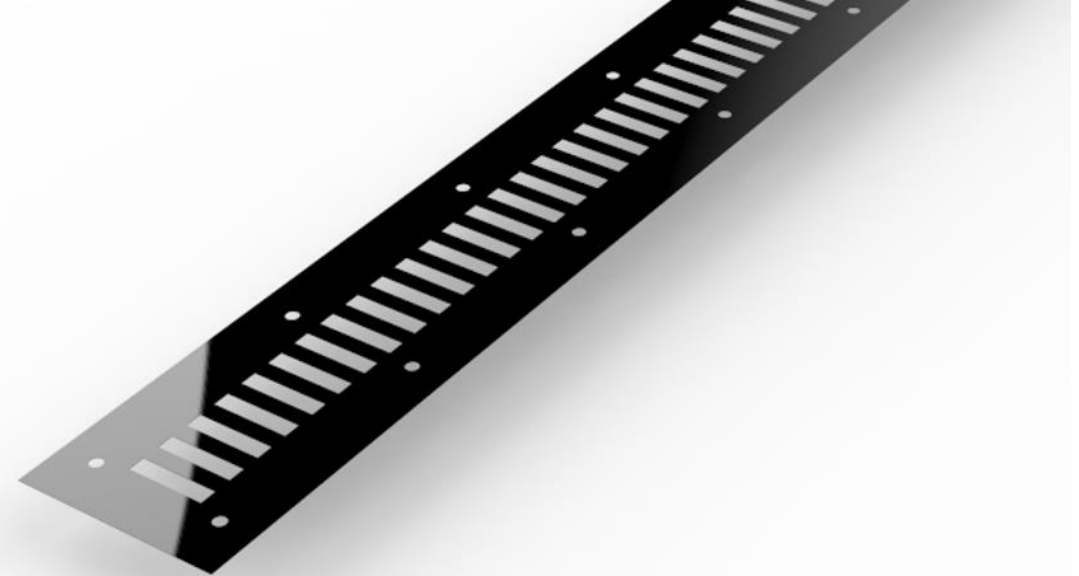
For Optical Encoders Micro-slit Processing



Example



Material : SUS304
Thickness : 0.08mm
Method : Photo Etching
Slit width : 110 μ m
Size : 49 ϕ



Material : SUS304
Thickness : 0.1mm
Method : Photo Etching
Surface Treatment : Black Plating
Slit width : 3mm/ 6mm Pitch
Size(Width x Length) : 40mm x 370mm

■ Material thickness that photo etching can handle
 Thickness 0.004mm~ 2.0mm

	Etching	electroforming	Laser Processing	Press Processing
Material Type	Almost all metals	Ni Cu	ほぼ全ての金属	Almost all metals Except difficult-to-machine materials such as Mg
Molds and jigs (= initial cost and lead time)	Low cost Fast speed	Expensive Fast speed	Low cost Fast speed	Expensive long lead time
Design Changes	Quick and easy Low cost	Quick and easy More cost then etching	Quick and easy Low cost	Time and cost for additional tooling
Micro Design	High Quality	High Quality	High Quality	Mold making range Difficult to make less than tens of μ
Mass Production	Available	Available, but takes time and cost	Available, but takes time and cost	Available
Delivery time	1 week	2 weeks	1 week	1.5 month-6 months (Depends on the mold)
Material deformation (burrs, distortion, etc.)	N/A	N/A	Very small burrs and dross	Overall Prone to occur

Value 1



UPT's etching factory in Japan

High dimensional accuracy of $\pm 10\%$ of plate thickness

The accuracy of etching technology for dimension/design is $\pm 10\%$, and it meet with the requirement of optical slits which need to have high accuracy design.

The etching process with the same pattern on both sides

Value 2



Enough Inventory

We have 500 kinds inventory of materials and thicknesses in stock. For example, we can order 5 types of SUS304 material in 5 μ m steps based on 50 μ m.

Value 3



Global Network Supply

Our factory are located in Japan and Thailand, and overseas sales offices are located in the USA, Korea, and Thailand. We can support customers whose development country is different from production country.

Specification List

Specification Items	Contents
Target Metal Type	All etchable metals (Excluding tungsten-based, gold and silver)
Target Metal Thickness	Available in any thickness (0.004mm~)
Machining Accuracy	±10% of thickness (Min tolerance ±0.01mm)
Surface Treatment	Black treatment and also various treatments are available

Driving global innovation with precision technologies



Think ahead, Make differently

