



MEMS Resonant Mirror "ECO SCAN"

ESS115H ECO SCAN

LG9518H

Instruction Manual

Ver.2

Micro Electro Mechanical Systems Promotion Dept.,

Visionary Business Center

The Nippon Signal Co., Ltd.

A-LG9518H-001

Preface

We would like to thank you for purchasing NIPPON SIGNAL ESS115H. In order to fully understand the product and use it effectively, please read this instruction manual carefully before use. After reading this manual, keep it in a safe place.

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General Notes on Safety

In this manual, pictorial indications are used for the purpose of preventing personal injury and property damage and of helping customers use ECO SCAN correctly. The pictorial indication means as follows:



Caution!

This icon highlights potential danger of personal injury and property damage due to handling the product without following the indication.

General Notes on Handling the Product



Caution!

- Do not disassemble or modify the product. It may cause failure and damage due to abnormal motion.
- ECO SCAN uses strong magnets. The mirror part may be damaged if screws and tools are attracted to the magnets. Be very careful to handle the product.
- Since the mirror part is exposed, ensure your finger or tweezers do not touch and damage the mirror.
- Never touch the drive unit while ECO SCAN is turned on. The mirror part may be damaged and scattered.
- Never use the product beyond the maximum rating or the scope of specifications. It may cause abnormal heat, burning, and damage.
- Make sure to turn off the ECO SCAN before installation, maintenance, and troubleshooting.
- Connect the terminals correctly by referring to the internal circuit diagram. Wrong termination may cause unexpected malfunction, heat, and fire.
- In case damage to ECO SCAN or breaking of wire could cause personal injury or death or property damage, ensure the system is safe and fool proof.

Precautions



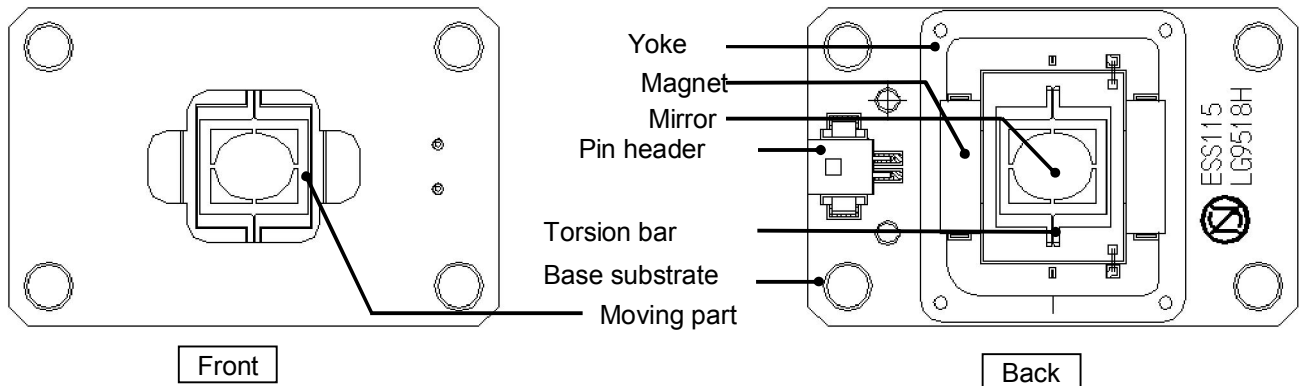
Caution!

- ECO SCAN is a precision optical component. Depending on the conditions of use, malfunction or failure may result. Use ECO SCAN within the scope of specifications, such as the maximum rating.
- Since the mirror part is exposed, dust in the air may stick to the mirror and may decrease the reflectance. Take measures to prevent dust from sticking to the mirror.
- ECO SCAN uses permanent magnets. Therefore, use in a high external magnetic field may affect its performance characteristics.
- Since ECO SCAN uses permanent magnets, secure them to prevent them sticking to each other during transportation.
- During transportation and handling, do not apply a strong impact or shock to ECO SCAN by dropping or hitting it.

Other Cautions

- Do not copy, reprint, distribute, or modify the instruction manual and data sheets in whole or in part without permission.
- Do not imitate ECO SCAN or produce similar goods.
- Products that ECO SCAN is built in may, depending on their configuration, be classified as strategic goods (or services) under the Foreign Exchange and Foreign Trade Control Act.
- Please note that the contents of the instruction manual may change without notice.
- ECO SCAN is a trademark of Nippon Signal Co., Ltd. Other part names or other names noted in this manual are generally trademarks or registered trademarks of their respective companies. The ™ and ® marks are omitted in this manual.

ECO SCAN: Names of ESS115H components

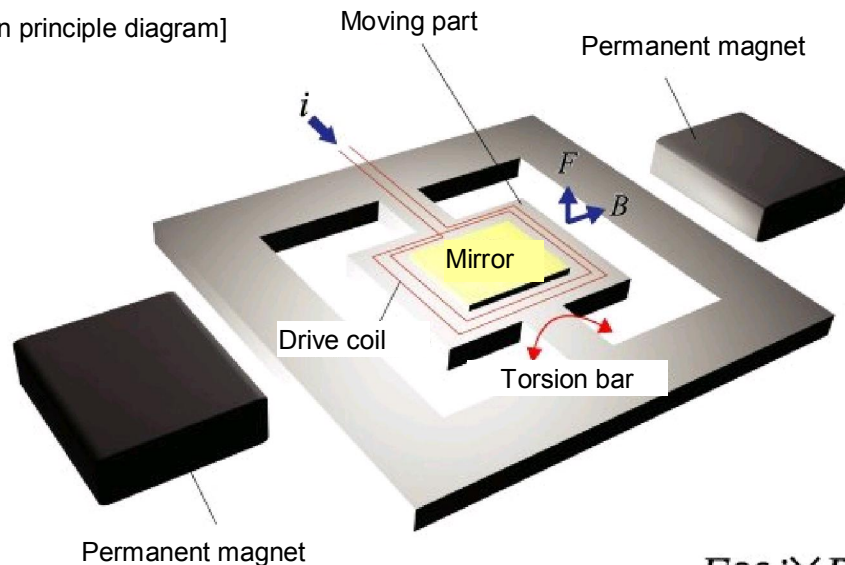


Operation principle

While applying a magnetic field with the flux density B crossing the torsion bar, applying the current i to the drive coil generates running torque by the Lorentz force F , and the mirror can tilt to the position balanced with the righting moment of the torsion bar. By changing the volume of this current i , the mirror can tilt freely.

For ECO SCAN ESS115H, by applying the ECO SCAN specific frequency (resonant frequency) to the drive coil, even a small current can enable a large tilt of the mirror.

[Operation principle diagram]



$$F \propto i \times B$$

F : Lorentz Force
 B : Magnetic Flux Density

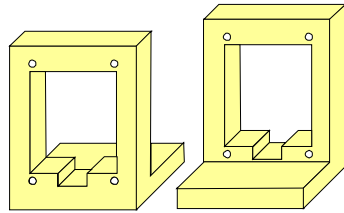
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Operation procedure

Prepare the following:

(1) Fixture

Example



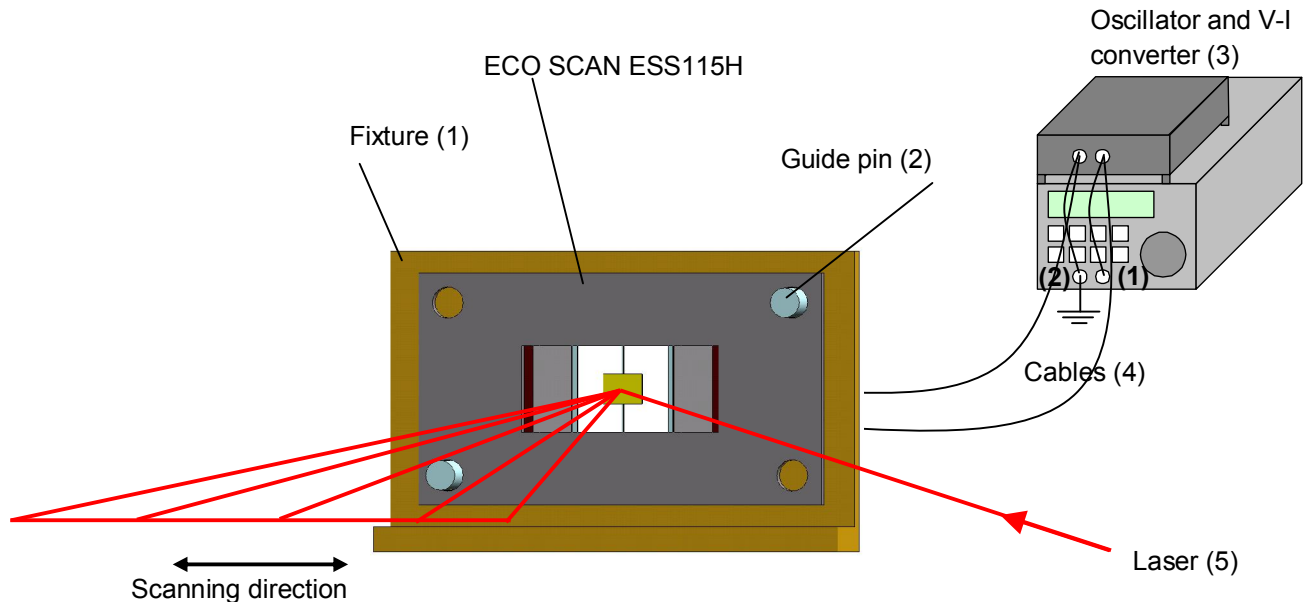
- (2) Guide pin (for precise optical use)
- (3) Oscillator and V-I converter
- (4) Cables (recommended insertion-side socket DF13-2S-1.25C)
- (5) Laser

1 Align the ECO SCAN reference surface (see the Product Specifications/Dimensional Outline Drawing in the next page) with the fixture (1), insert a guide pin (2) into a $\phi 3.2$ mm tooling hole, and then secure it by a screw of 3 mm nominal diameter with a tightening torque of 50 N·cm.

☆

2 Connect ECO SCAN and the oscillator (3) with cables (4).

Note: For pin assignment, see the Product Specifications/Dimensional Outline Drawing in the next page.



3 (5) Irradiate a laser to adjust the optical axis.

- Laser-spot diameter: $\phi 3$ mm
- Maximum laser incident angle: 30 degrees (when irradiating in the center of the mirror)

Note: Irradiate vertically to the torsion bar.

4 When the oscillator (3) outputs a sine wave at the resonant frequency, the device starts scanning in the direction shown in the figure.



- ECO SCAN uses strong magnets. The mirror part may be damaged if screws and tools are attracted to the magnets. Be very careful to install the product.
- When connecting or disconnecting the connector, be careful not to damage it.

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Product Specifications

General specifications

Dimensions	24×37×5.6t mm
Effective mirror size	4.5×5.5 mm (ellipse) ±0.02 mm
Mass	9 g ±10%

Electrical and optical characteristics

Resonant frequency	565Hz±7%
Amplitude (optic angle)	±30° (sine wave driven)
Driving current	33.6 mA _{p-p} or less (sine wave driven)
Resistance value	240 Ω ±25%
Material of the mirror part	Au
Mirror reflectance*1	90% or more @λ=670 nm, incident angle 5°
Mirror arch*1	PV=1000 nm or less
Jitter*1	1% or less

Features

- Low power consumption/high speed operation
- Small-sized/lightweight/quiet
- High endurance/mass-productiveness

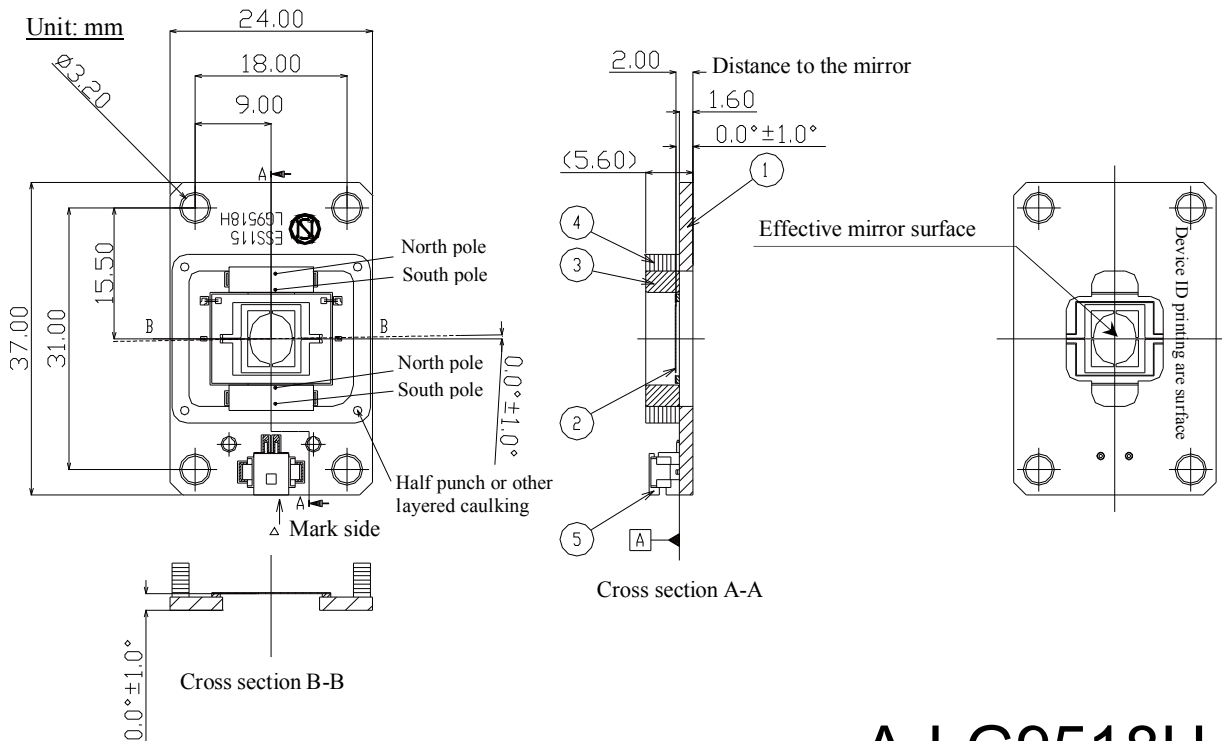
Absolute maximum rating

Maximum DC power *1 *2	100mW
Maximum amplitude (optic angle) *1	±34°

*1 Measurement environment: temperature 23±5°C, humidity 50±20%, atmospheric pressure 860 to 1034 hPa

*2 The maximum value at which the coil part is not burned out when a DC current is applied

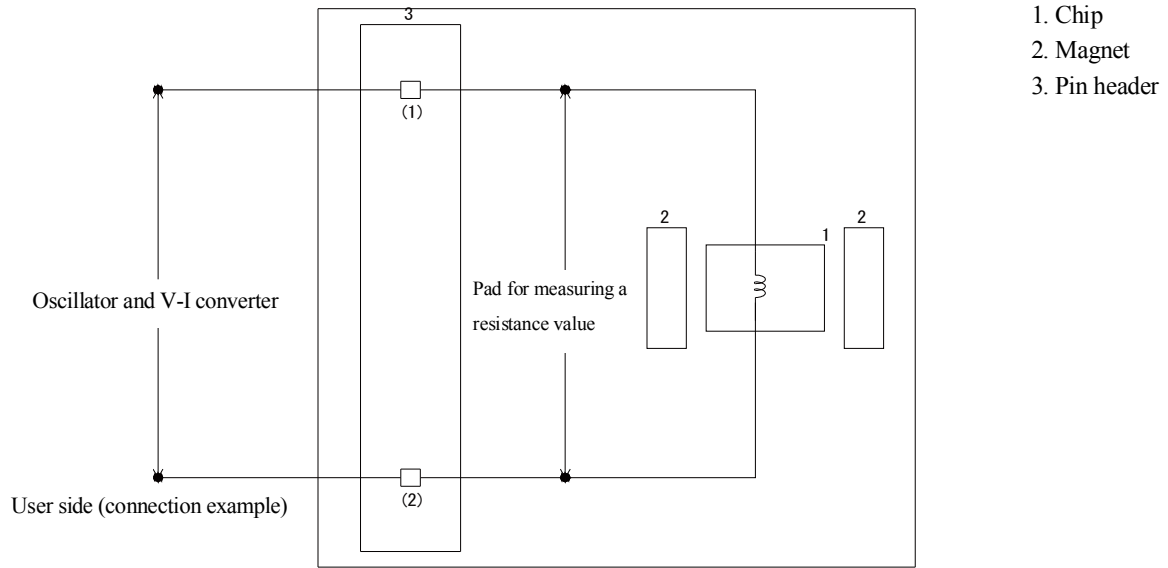
Dimensional Outline Drawing



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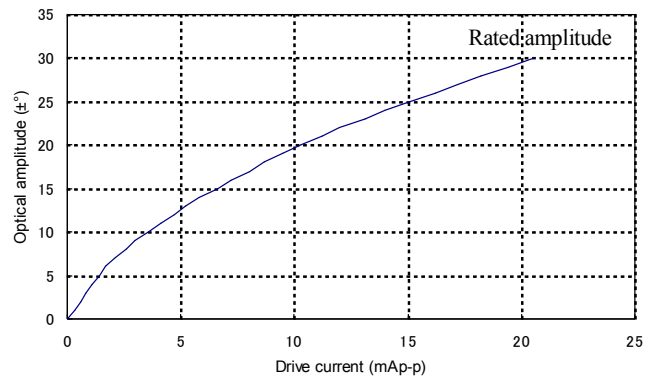
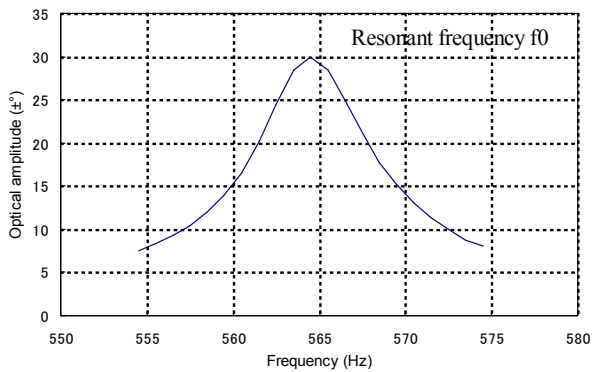
Product Specifications

■ Connection wiring diagram



■ Property data (representative example) *1

□ Frequency - amplitude characteristic (sine wave driven) □ Current - amplitude characteristic (sine wave driven)



*1 The characteristics may slightly vary due to the individual difference of device, atmospheric pressure/temperature, and long-term use.

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Discarding method

Main materials of components of ECO SCAN are shown in the Dimensional Outline Drawing. When discarding them, follow local government instructions.