



Beam Profiler & Laser Autocollimator

Smart ProCo H651 Series

The User's Manual

Thank you for choosing our products.

Before using the Products, read this manual, thoroughly.

After reading this manual, please keep it close for your immediate future reference.



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Introduction

This document is the "User's Manual" for the H651 series – Beam Profiler and Laser Autocollimator (hereafter, referred to as "the Products" or "the sensor head").

This "User's Manual" (hereafter referred to as "this Manual") provides information and basic operating instructions for the Products, which prefixed with H651.

To use the Products effectively and safely, please read this Manual carefully and fully understand its contents before using the Products.

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H651 Series User's Manual

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Revision History

Date	Revision	Details
2025 September	001E	1 st version
2026 June	002E	Operating Environment • Compatible with .NET 10 Software Startup • Added Quick Start instructions Measurement Method • For usage instructions, refer to the "Suruga OptGauge User's Manual" Sensor Head Specifications • Frame rate changed to 10~20 Hz

NOTICE

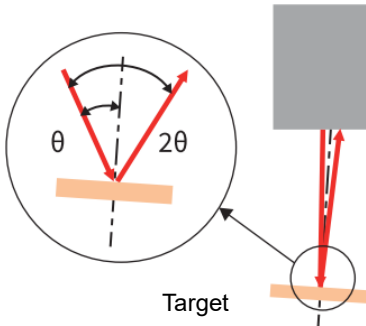
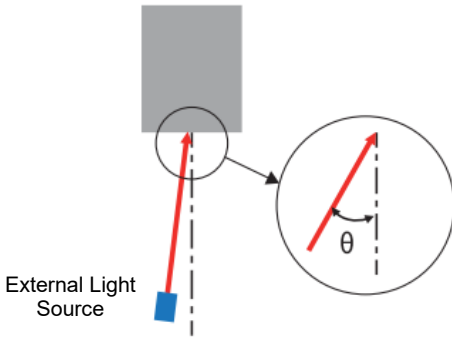
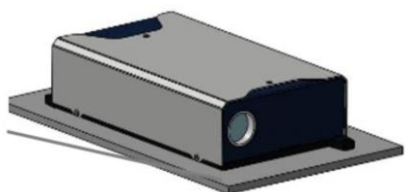
All information contained in this Manual is deemed correct at the time of publication.

The SURUGA SEIKI Co. Ltd. (thereafter, "the SURUGA") reserves the right to change specifications without notice to the users of the Products.

You can download the latest version of this Manual and the Software from our WEB site

(<http://jpn.surugaseiki.com/>) or (<https://eng.surugaseiki.com/>).

0. Definitions (Terms and Abbreviations)

Terms and Abbreviations	Definitions
Reflection Angle Measurement	 The diagram shows a light source (grey rectangle) emitting a red beam towards a 'Target' (orange rectangle). A circular inset provides a magnified view of the reflection. In this inset, a dashed vertical line represents the normal. The incident beam makes an angle θ with the normal, and the reflected beam makes an angle 2θ with the normal. Fig. 1 A measurement method that uses an internal light source to measure the angle of reflected light from an object. The 2θ is measured, and the θ is calculated from the measurement results as shown in Fig. 1.
External Light Angle Measurement	 The diagram shows an 'External Light Source' (blue square) emitting a red beam towards a grey rectangular object. A circular inset shows a magnified view of the incident beam. In this inset, a dashed vertical line represents the normal, and the incident beam makes an angle θ with the normal. Fig. 2 A measurement method that directly utilizes laser or LED light beams to determine angles. The angle θ of the external incident light is taken as the measurement result as shown in the Fig.2.
Reference Plane	 The image shows a black, rectangular electronic device mounted on a grey base plate. A white line points to the bottom surface of the device, which is labeled 'Reference plane'.
The Products	The Smart ProCo H651 Serie
The Software	The Suruga OptGauge software
This manual	The user's manual for Smart LAC H651 serie
Sensor Camera	Internal sensor camera embedded in the Product.
Def.	Default

1. For Your Safety – Precautions of Use

1.1 Warning Labels Addressed in this Manual

 Warning	May result in serious injury, damage to equipment, or other serious damages.
 Careful	May result in minor physical injury or equipment damage.
Attention	Instructions for safe handling are provided for the product.

1.2 Managing the Products

The Product uses a laser diode for its internal light source. We recommend that the Product is in an environment where appropriate safety measures are taken for the laser before any use.

- The SURUGA shall not guarantee the functions and performance of the Products if used in a manner other than that specified in this manual, or if modified.
- When other equipment combines the Products, the functions and the SURUGA shall not guarantee the performance of the Products, depending on your design, operating conditions, and environment.
- Do not subject each device, including peripherals, to sudden temperature changes, which may cause condensation and equipment failure.
- Do not wipe the Products with a wet rag, benzene, thinner, or the alike, which may cause discoloration or deformation of the Products. If they are heavily soiled, wring out a cloth with diluted pH-neutral detergent and wipe off the stain, then dry the Products with a soft cloth.
- If you suspect the Products being malfunctioning, please contact our local sales office.

1.3 Precautions

1.3.1 Ambient Temperature and Illuminance

- Changes in ambient temperature can cause measurement errors. Please be advised to keep the ambient temperature, always, at a constant level.
- Avoid using the Products near lighting equipment that repeatedly turns on and off at high frequencies. If this is not possible, use a light shield or similar device to avoid being affected.

1.3.2 Power Supply



- Use the correct power supply voltage. Otherwise, fire, electric shock, or malfunction may occur.
- Be sure to turn off the power to and devices connected to the Product when connecting or disconnecting various connecting wires. Otherwise, the Products may be damaged.
- Do not turn off the power while setting items. Sudden power cut-off while setting data, part or all configuration data may be lost.

1.3.3 Disassembly / Modification



Do not disassemble or modify any unit of the Products. Disassembly or modification may cause fire or electric shock. The warranty is void if the Products are disassembled or modified by anyone other than our employees or our certified third party.

1.3.4 Effects of Dust and Dirt

The following cases may cause measurement errors due to the influence of dust, dirt, water, oil, etc.

- Dust and dirt on the cover glass: Use dry-clean air to blow off any dirt on the cover glass. If the cover glass is heavily soiled, wipe it off with a soft cloth soaked in thin alcohol.
- Adhesion on the surface of the object to be measured: Blow it off with clean air or wipe off the dirt.
- Intrusion into the optical axis area by floating or by splashing: Please take measures such as installing a protective cover or air purging.

1.3.5 Influence of Vibration

Vibration transmitted either to the Products or to a measurement target (or both) may cause measured values unstable. In such cases, please be advised that, in order to obtain stable results, you may take extra efforts such as suppressing the vibration or averaging out result values upon increasing the number of measurements.

1.3.6 Disturbance by the Air Fluctuation

The influence of slow shimmering of the air may cause the measured value to vary. In such cases, covering the measuring section with an airproof cover is advised.

1.3.7 Waterproof and Explosion-proof



- The Products are not intended for use in areas where explosion protection is required. Do not use the Products in locations where flammable gases or other explosive atmospheres exist.
- The Products are not waterproof. Do not use the Products in locations where liquids may splash or flow into the Products.

1.3.8 Actions in Case of Abnormality



In the following cases, immediately turn off the power and disconnect the USB cable. Continuing to use the Products in an abnormal state may cause damage:

- When abnormal sounds, strange smells, or smoke is detected.
- If the power cord is damaged.
- If water or other liquid is spilled on the Product.

1.3.9 Repair

For repair, please contact our local sales office,

- When water or foreign matter gets inside the Products.
- When the Product is damaged due to being dropped or external impact.
- When you smell a strange odor due to smoke emission from the Product.

1.3.10 Disposal of the Products

When disposing the Products, they are treated as industrial wastes. Please follow in accordance with local laws and regulations or by any other appropriate methods. The SURUGA shall not collect the Products for disposing them.

1.3.11 Residual Risks

Attention

This Manual does not disclose all risks associated with the Products. For residual or unexpected risks, or any other risks involved, please implement the safety design of machinery in accordance with ISO 12100 or your appropriate industrial safety standards that you follow.

1.3.12 CE Marking

The Products comply with the CE marking for the following complying standards and conditions. When the Products are applied in EU countries, the following conditions must be met:

- EN IEC 61326-1:2021
- EMI: EN IEC 61000-6-4:2019
- EMS: EN IEC 61000-6-1:2019

Note: The length of all input and output cables, including the power cable connected to the Product, must be less than 30 meters.

1.4 Use of Laser Products for Your Safety

1.4.1 Corresponding Laser Classes for the Products



The following describes the hazards of the laser class in the Products. For specific safety precautions for the laser classes, please follow your occupational safety regulations.



Laser Class	Precautions
Class 1	Safe under reasonably foreseeable conditions A Laser product which is safe for use with observation optics such as a loupe and binoculars Applicable products: All models with a built-in laser at the wavelength of 980 nm
Class 2	Normally, your eyes are protected and safe due to aversion reactions such as blinking. Laser products that may cause temporary visual impairment or risk of secondary injury due to aversive reactions if the user intentionally stares at the laser beam. Applicable products: All models with a built-in laser at the wavelength of 660 nm

Ref : IEC 60825:2014 / JIS C 6802 : 2014 : *Safety of Laser Products*

1.4.2 Laser Class Identification Labels on the Products

The description contents of the laser class identification labels and the warning labels, and their posting positions are illustrated below.

The label contents differ depending on the product model. Please confirm the model of the Product before any use.



Table 1 : Laser Labels and Descriptions

Laser Class Identification Label	
Class1	Class2
 Background color: Yellow Text color: Black	 Background color: Yellow Text color: Black

Warning Label
 Background color: Yellow Text color: Black

The notation method and description of the label conform to JIS C 6802:2014

SURUGA SEIKI CO.,LTD.

505, Nanatsushinya, Shimizu-ku,
Shizuoka-shi, Shizuoka, 424-8566, JAPAN

No.

MFD

Model



MADE
IN
JAPAN



About KC correspondence: Class A

사용자 안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

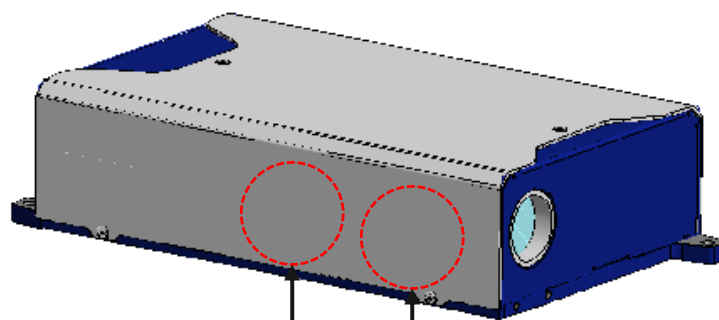
Reference English translation:

User guide This equipment has been conformity-assessed for use in a professional environment and Interference may occur.

Careful

Common locations for the laser labels to all models

The warning label for the laser emission port and the identification label for the laser class are attached to the left side of the product when viewed from the front.



Laser Warning Label

Laser Class ID Label

2. Preparing

2.1 Functions and Features

The Products are multifunctional measuring instrument that determines the angle, divergence, position, and beam diameter of an object from the beam incident upon the sensor camera.

The following features are mainly available.

- Angle measurement
(Φ 3 mm diameter by determining the angle of incident light from an external source)
 - Measurement range: $\pm 1.5^\circ$ (circular Area)
 - Linearity: $\pm 0.45\%$ of F.S.
(F.S. = 3.0° : measuring by the internal light source wavelength ± 10 nm)
 - Repeatability: 1 sec.
(within the 6σ of the averaging times = 256 measurements)
- Divergence measurement
 - Measurement range: 20 mrad or less
 - Linearity: 5% of F.S. (F.S. = 20 mrad)
- Position measurement (when using $\Phi 3$ mm beam)
 - Viewing range: Φ 6 mm.
 - Linearity: $\pm 0.5\%$ of F.S.
(F.S.=2.8 mm: measuring by the internal light source wavelength ± 10 nm).
 - Repeatability: 1 μ m (6σ , when measured with averaging = 256 times).

*See "[Specifications of the Products and Accessories](#)" for more details.

- Beam diameter measurement

- Measurement range: Φ 60 μ m to Φ 6 mm
(we recommend that the Spot diameter should be less than 1/2 of viewing range if you apply the Auto Aperture).

*See ["Specifications of the Products and Accessories"](#) for more details.

- The PC Software is available for connecting the Product for various measurements.

*See ["Installation Method \(Example\)"](#) for more details.

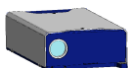
- Measurement of multiple light points is available.

- The reflection angle measurement and the external light angle measurement are available.

- For reflection angle measurement, use the internal light source to measure the angle of its reflected light.
- For external light angle measurement, the angle of the beam of laser or LED can be measured directly.

2.2 Package Items

In addition to the Product, the package delivered to the user contains an adjusting screwdriver for the internal light source and a USB memory stick.

1.  The Product

2.  A USB memory stick contents:

Suruga OptGauge (the sensor application), camera driver, device authentication file and this Manual).

*The latest version can be downloaded from the SURUGA website (<http://jpn.surugaseiki.com/>).

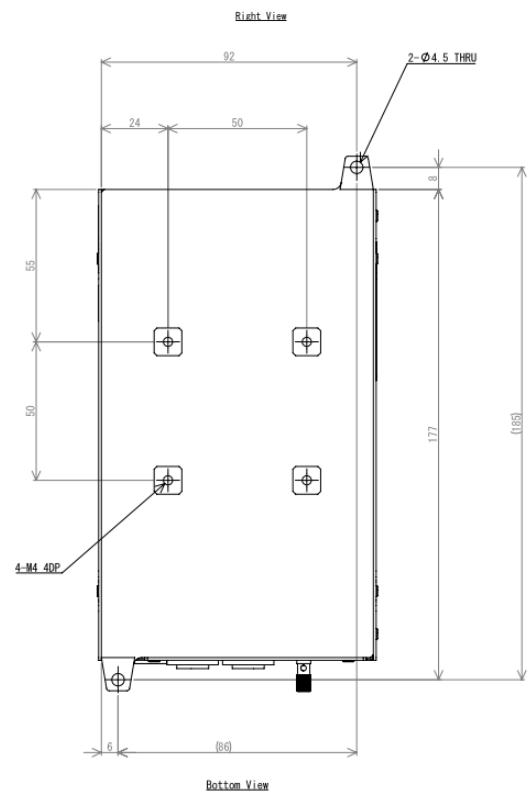
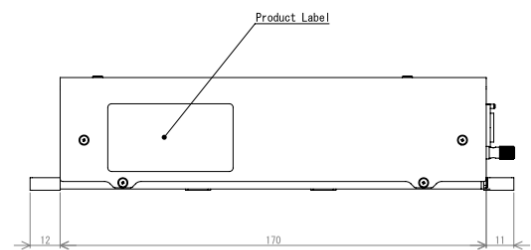
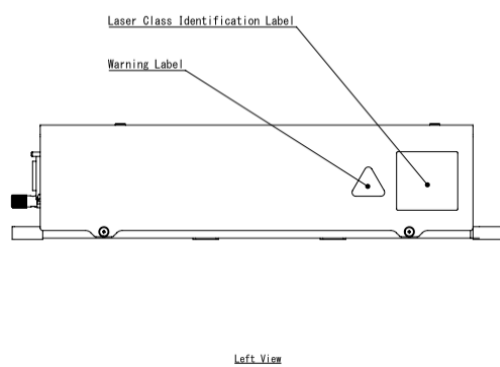
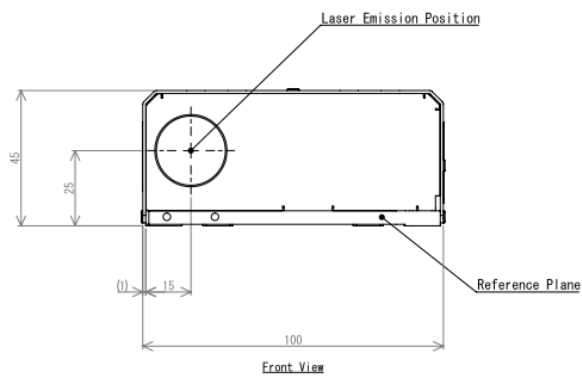
3. The AC/DC power supply for the Internal light source

2.3 Overview Specifications of the Products

Specifications Table of the Products

External Dimensions	170 mm x 100 mm x 45 mm (excluding protruding parts)
Body Weight	Approximately 0.9 kg
Power Supply	12 VDC
Power Consumption	5 W or below
Laser Class	Class1 (H651NL) / Class2 (H651VL)
Protective Functions	Short-circuit protection and reverse polarity protection
Communication Functions	USB3.0 standard
Operating Temperature and Humidity	0°C to + 40°C、 35% to 85% RH (no condensation)
Storage Temperature and Humidity	- 10°C to + 60°C、 35% to 85% RH (no condensation)
Atmosphere	Avoid direct sunlight, corrosive or inflammable gases, liquids, powders & dust, and other toxic substances
Housing Material	Aluminum

2.4 External Dimensions of the Products



2.5 Names and Functions of the Products

① Power switch

Turns the power of the unit ON/OFF.

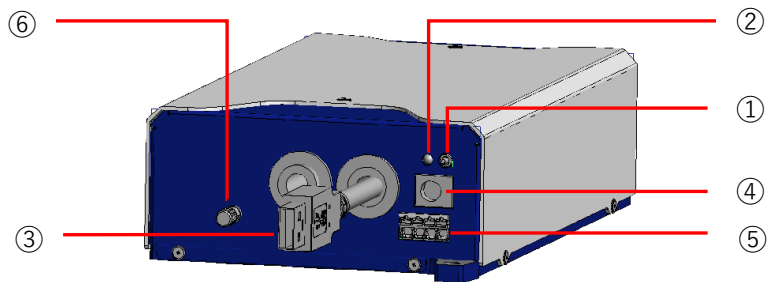
② Indicator

Displays the internal light source status with 3 colors.

Green: the internal light source is OFF (initial status)

Orange: the internal light source is ON

Red: Detecting interlock (*Internal light source can not be turned ON while being interlocked)



③ USB connectors x 2

It connects the Product to a computer of a customer.

④ Power source

Connector for the supplied AC/DC adapter.

⑤ The Interlock and trigger input connector

You may connect the interlock and the trigger inputs as following;

1: INTERLOCK+

2: INTERLOCK-

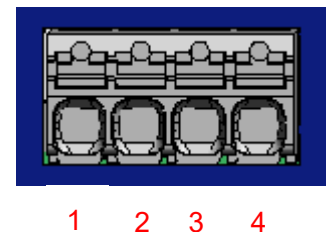
3: TRIG 5V+

4: TRIG 5V-

*For the applicable wires, please see "The Specifications of The Applicable

Wire Range for The Interlock and Trigger Inputs" for more details.

See "The Specifications of The Applicable Wire Range for The Interlock and Trigger Inputs"

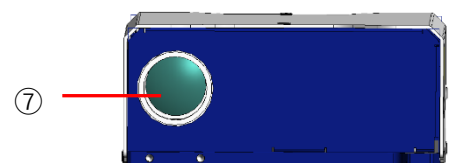


⑥ FG Terminal

A frame ground to reduce electrical noise and to prevent malfunction.

⑦ Laser emission port

Irradiates the laser when the internal light source is ON.



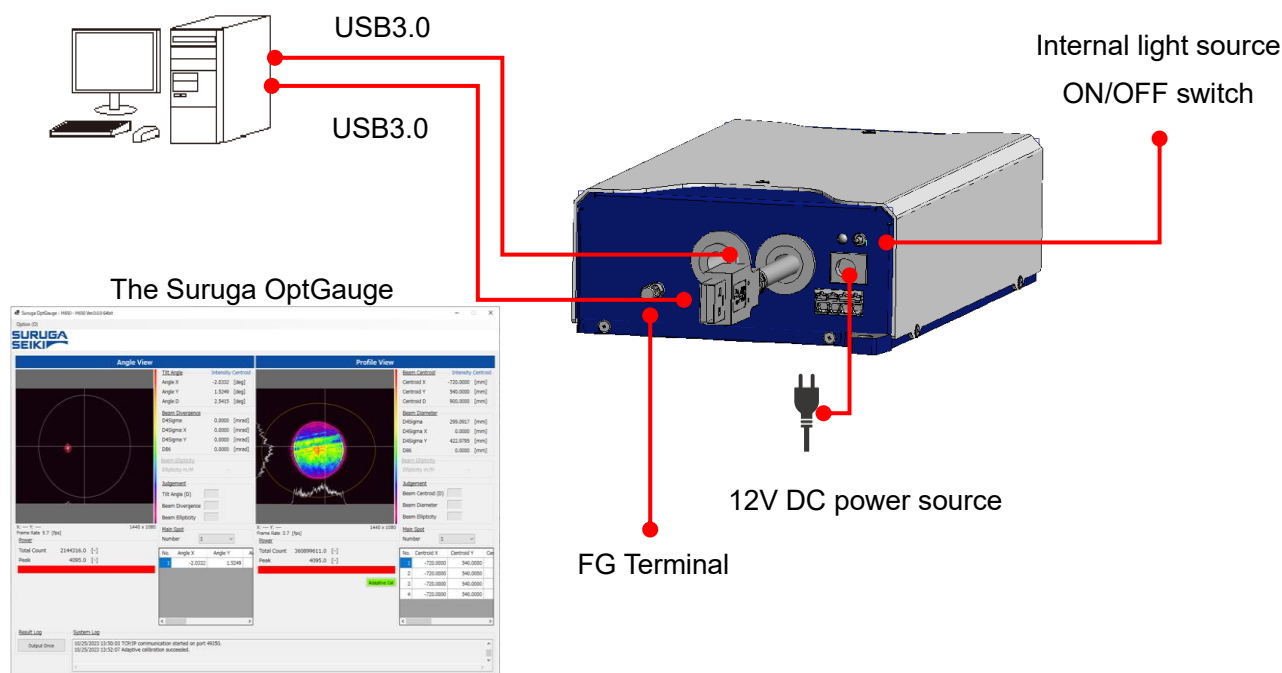
Laser emission
surface (front)



Careful

DO NOT irradiate the human body; eyes, skin, or any other parts before all safety precautions are taken.

2.6 System Configuration Example



2.7 Components Required for the Configuration

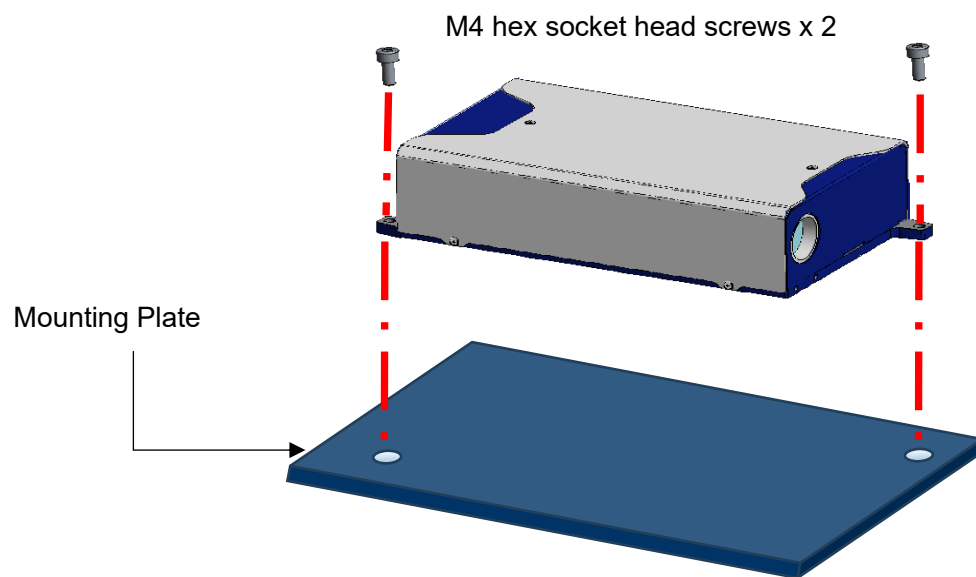
- The sensor head
- The 12VDC power source (the AC/DC adapter included).
- A computer, a monitor, and a keyboard for the Products.
- The Suruga OptGauge: measurement software for the Products.

2.8 Installation Method (Example)

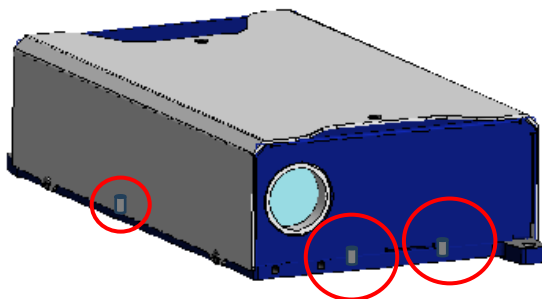
This section provides an example of mounting the Product.

1. Place the Product on a mounting plate that you prepared.
Use M4 hex socket head cap screws (length: 8 mm to 10 mm).

*See [External Dimensions of the Products](#)"



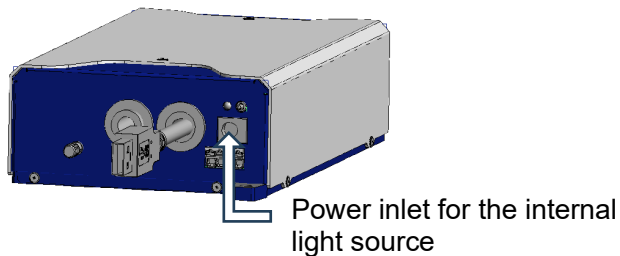
2. The reference position is the base plate on the front, left side of the Product.
Fasten the bolt with a parallel pin or other means pressed against it.



2.9 Connecting Power to the Internal Light Source

Please use only the proper AC/DC adapter.

Insert the DC plug of the AC/DC adapter into the designated socket before inserting the AC side into an outlet. Note: you should ground the FG terminal.



Attention

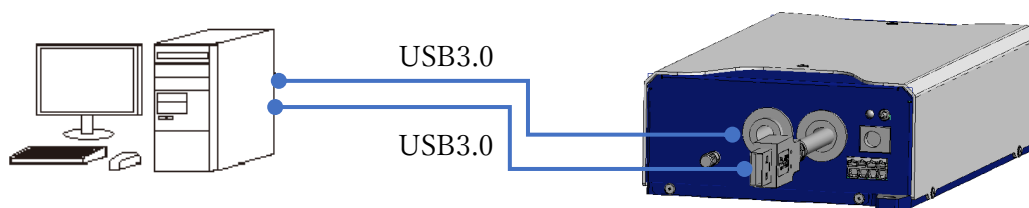
Do not turn on the AC/DC adapter until the Software installation is complete.

Please ground the FG terminal to prevent malfunctions caused by electrical noise.

2.10 Connecting to a Computer

Connect the USB3.0 cable to a USB port compatible with USB3.0.

Be sure to use a computer with a USB3.0-compatible port.



Attention

Do not disconnect the USB cable while the Software is running. Normal operation will be disrupted.

If the cable disconnects, close the application, reinsert the USB cable, and restart the application.

2.11 The Software - Installation of the Suruga OptGauge



If downgrading of the Software, setting information added to a newer version may not be correctly loaded. If downgrading to an earlier version of the Software, it would not read correctly the settings only available to the newer versions so that the software would not even start up.

Therefore, please be advised to back up the folder with your option files being stored, to delete the original option file folder and then to re-installing an earlier version.

[Folder Path]

C:/Users/[UserName]/Documents/Suruga/OptGauge/[Product Serial No.]

2.11.1 Software License Agreement

To use the Suruga OptGauge (hereafter as "the Software"), the customer must consent to the following software license agreement (hereafter as "this agreement").

When installing or copying all or part of the Software on a computer, or using the Software after installation, it is considered that the customer has consented to all terms of this agreement, and the agreement is bilaterally concluded.

Article 1 (Permissions)

The Software is free of charge.

The copyright for the Software, its manual, and other documents concerning the Software belong to SURUGA SEIKI Co., Ltd. (hereafter as "the SURUGA").

The SURUGA grants all users for non-proprietary rights to the use of the Software.

Article 2 (Usage Restrictions)

The SURUGA permits the use of the Software only for the purposes of operating the Products and collecting data.

The SURUGA prohibits the use of the Software for any other purposes than that the SURUGA's intended.

Article 3 (Reproduction and Modification)

The Software can be copied only to the computers using the Products. The SURUGA prohibits modification, redistribution, and reverse engineering.

Article 4 (Disclaimers)

Users make the use of the Software on their own responsibility.

The SURUGA bears no responsibility and is not liable for any direct, indirect, incidental, special, supervenient, or punitive damage including but not limited to; data loss, business interruptions, and loss of profit, incurred arising out of or failure to use the Software.

In addition, The SURUGA bears no responsibility and is not liable for any damage incurred arising out of software bugs, errors, viruses, malfunctions due to illicit third-party access, or security issues with the Software.

The SURUGA holds no responsibility and is not liable to damages incurred upon modification of the Software.

Article 5 (Support)

The SURUGA provides technical support for the Software. However, there is no guarantee that our technical support will achieve the customer's purpose.

Article 6 (Termination of Agreement)

The right to use the Software will be, immediately, terminated upon violation of the conditions of this agreement.

2.11.2 Installation PC System Requirements

[Recommended System Requirements]*¹

Hardware requirements	Supported OS	Windows 11 64-bit, Version 24H2 or later* ⁴
	CPU	Intel Core i5 - 1345U CPU 1.6 GHz or higher 10-core 12-thread
	RAM	16GB or higher
	Storage capacity	1GB or higher
	Display resolution	1920 x 1080
	USB	USB3.0 (type A) port: 2 or more
Software requirements	Framework	.NET10.0* ³

[Minimum System Requirements]*²

Hardware requirements	Supported OS	Windows 10 Pro 64bit, Windows 11 64-bit, Version 24H2 or later* ⁴
	CPU	Intel Core i5 - 8265U CPU 1.6GHz 4-core 8-thread
	RAM	8GB or higher
	Storage capacity	1GB or higher
	Display resolution	1920 x 1080
	USB	USB3.0 (type A) port: 2 or more
Software requirements	Framework	.NET10.0* ³

*1 “Recommended System Requirements” refers to a level where waiting times are minimal and operation is comfortable.

*2 “Minimum System Requirements” refers to a level where the Software can start and perform basic functions.

*3 If .NET10.0 is not installed on your computer, install “.NET Desktop Runtime 10.x.x.” from the Microsoft website

*4 It has been confirmed that the Software may not operate properly on Windows 11 Version 23H2 due to differences in certain system components and operating specifications. Please update to the Windows version (24H2 or later).

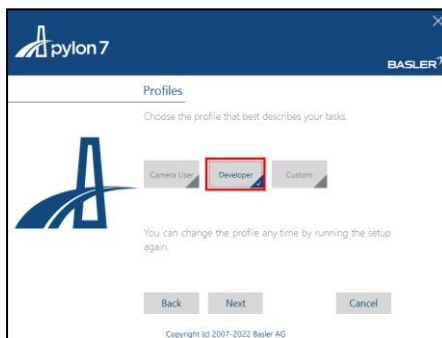
2.11.3 Installation of the Software

2.11.3.1 Installation from the USB Driver

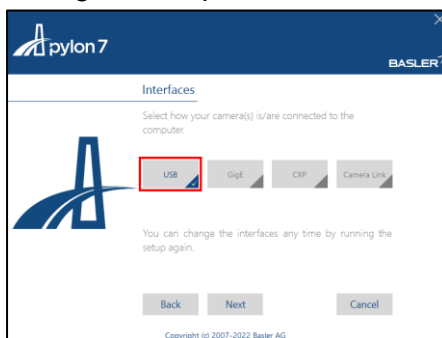
1. Double-click the "... ¥Driver" "Basler_pylon_7.0.0.24651.exe" to begin installation.



2. Consent to your installation on the confirmation screen.
3. Set the installation method (Profiles) to "Developer".



4. Set the sensor camera connection method (Interfaces) to "USB." Thereafter, use the default settings to complete the installation .



2.11.3.2 Download

The latest version can be downloaded from our website (<http://jpn.surugaseiki.com/>).

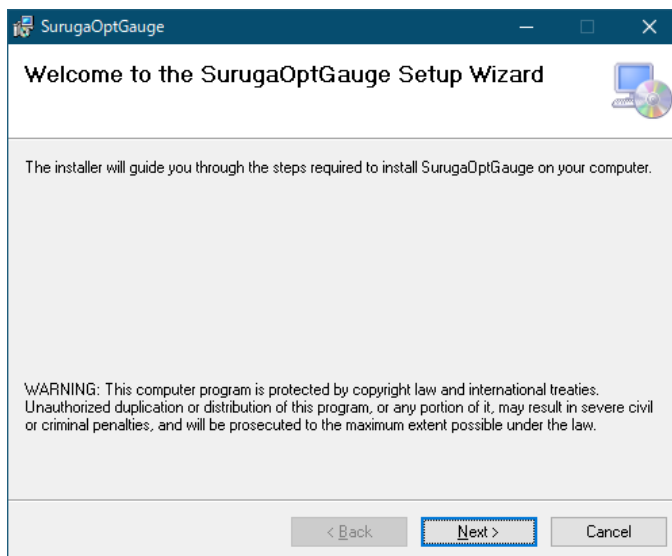
2.11.3.3 Installation of the Software

Install the Software.

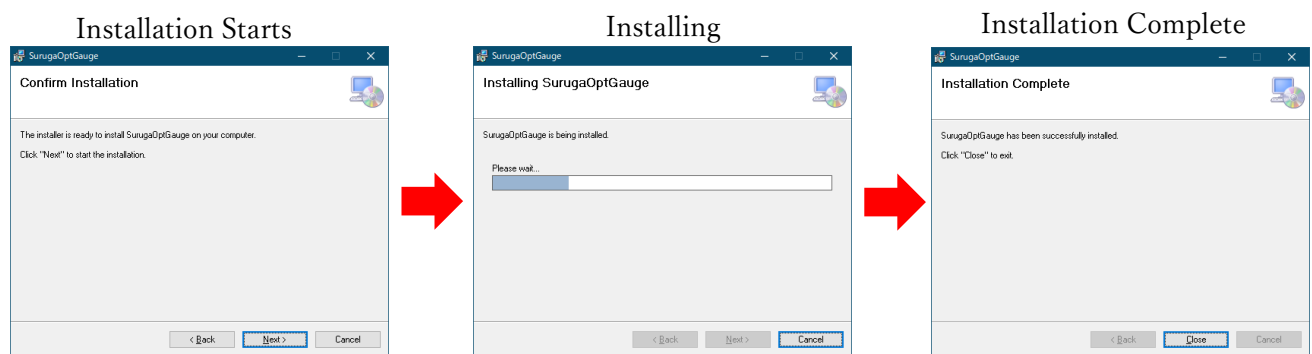
1. Double-click "SurugaOptGaugeSetup_x.x.xx.msi" in the directory "... ¥Application".

名前	更新日時	種類	サイズ
 SurugaOptGaugeSetup_x.x.x.msi	2023/11/28 19:12	Windows インストー...	61,590 KB

2. Click 「Next>」



3. Click "Next>" to begin installation .
When installation is complete, click "Close".



4. The Suruga OptGauge will be created on the desktop.



This concludes the installation procedures.

2.11.3.4 Copying the Device Authentication File

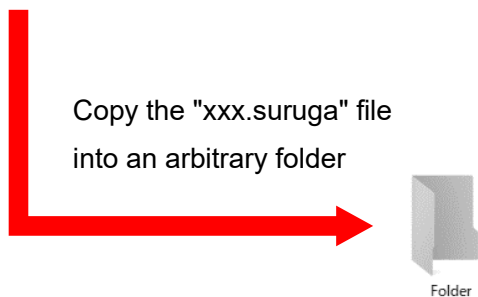
Attention

Authentication file

For the Products, calibration values are set for each device. Therefore, the Software requires reading of a "device authentication file (.suruga)" in which the unique individual device information is stored.

To load the device authentication file into the Software, copy the file "xxx.suruga" in the ".../Authentication File" to an arbitrary file location .

名前	更新日時	種類	サイズ
xxx.suruga	2023/09/28 10:55	SURUGA ファイル	6 KB



Note:

If your security policy does not allow the device authentication file to be copied to your PC, you can read the file directly from the USB memory device provided with the product. In this case, this procedure is not required.

2.11.3.5 Starting up / Shutting Down of the Software

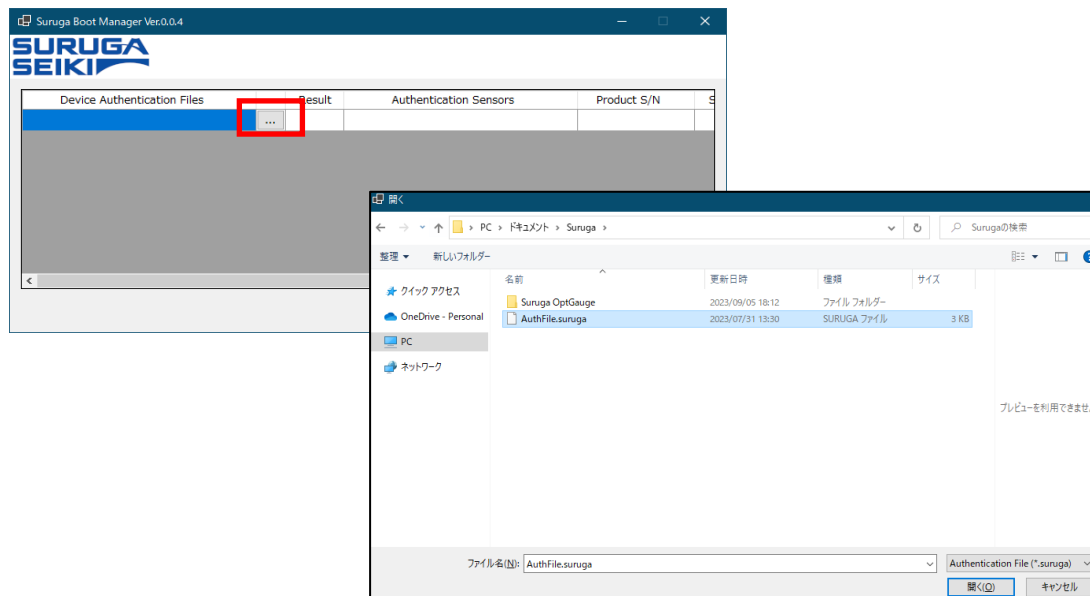
How to start-up

1. Double-click "Suruga OptGauge" icon in the "...¥Desktop".

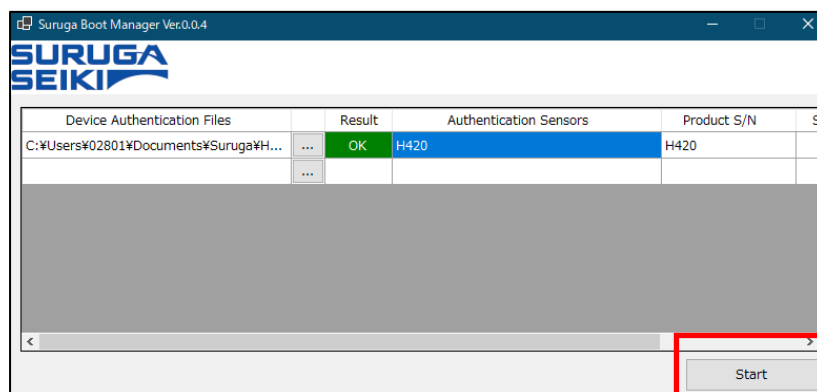


2. Click on " ..." in the item "Device Authentication File" and select the extension ".suruga" in the folder in which the unique "Device Authentication File" was copied.

If not able to copy the device authentication file to your computer, select it directly from the USB memory stick.



3. Confirm the "Result" is "OK", and press "Start" .

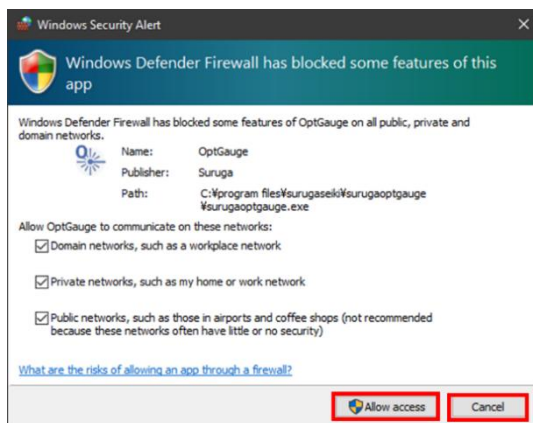


Attention

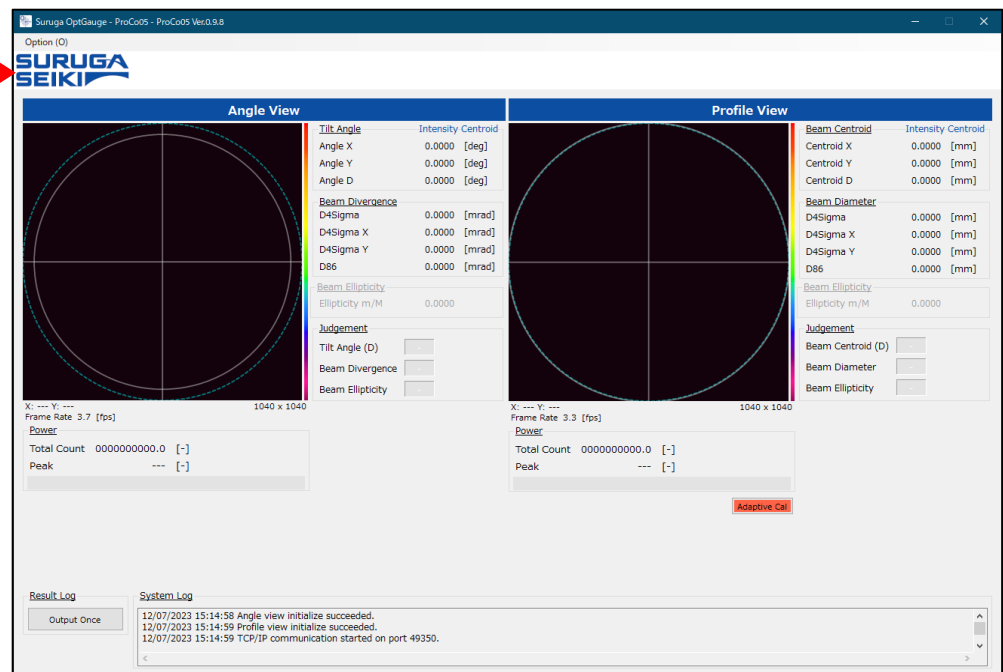
The Software incorporates TCP/IP communication controls. Consequently, upon initial launch, the following warning may appear depending on your PC's security settings.

If your PC or network environment permits TCP/IP communication, please tick all boxes and click 'Allow access'. If you cannot permit it, click 'Cancel'.

If not, click "Cancel".



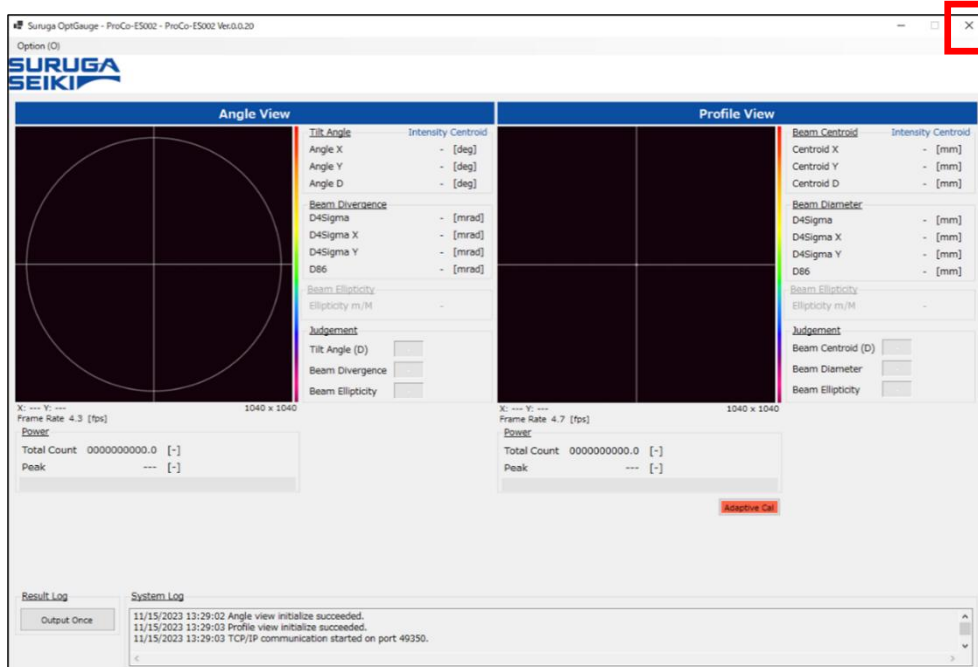
4. The application will start up.



(Changes can be made after the fact in "Control Panel / All Control Panel Items / Windows Defender Firewall / Allowed Apps").

Shutting Down the Suruga OptGauge

1. Click the "x" button to shut down the Software

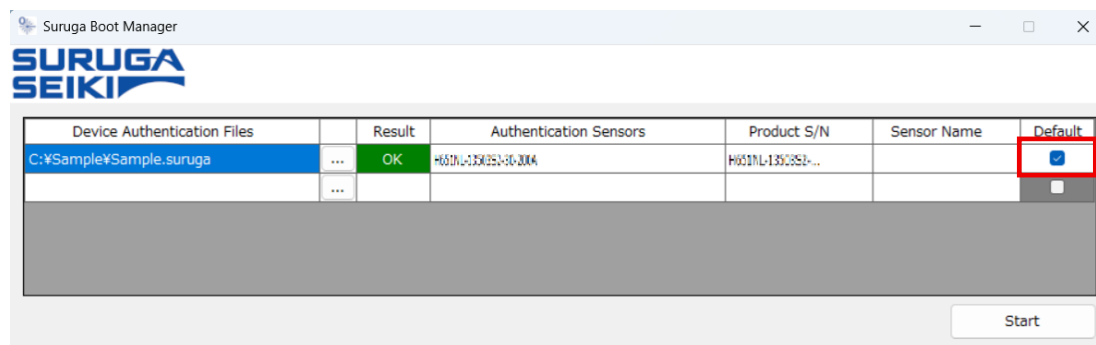


2.11.3.6 Quick Start

Quick Start is a feature that allows you to pre-select the authentication file used at software startup with the Boot Manager.

By configuring Quick Start, you can skip selecting the authentication file in the Boot Manager and pressing [Start] at the next startup.

When you enable Default for the relevant authentication file, Quick Start will be applied from the next startup.



Disabling Quick Start

Even if Quick Start is enabled, you can still open the Boot Manager **by starting the software while holding down the Shift key** (hold down the Shift key until the Boot Manager screen appears).

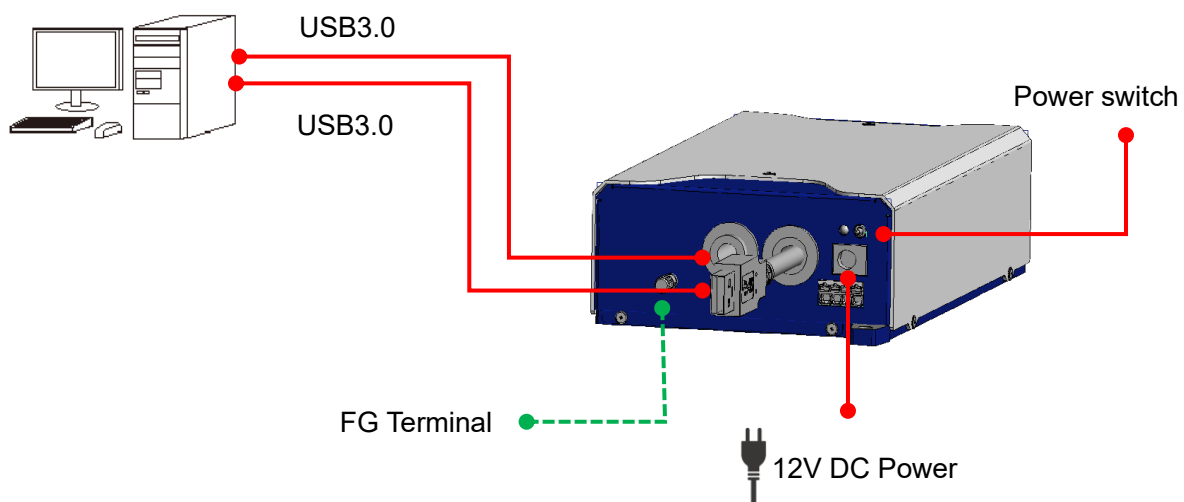
By using this method, you can temporarily disable Quick Start and select the authentication file in the Boot Manager before starting the software.

2.12 Turning the Power On



DO NOT turn on the power to the Product until the Software installation on your PC are completed and your supervisor confirms work safety.

Connect the AC/DC adapter to a power outlet, and then turn the power switch ON.



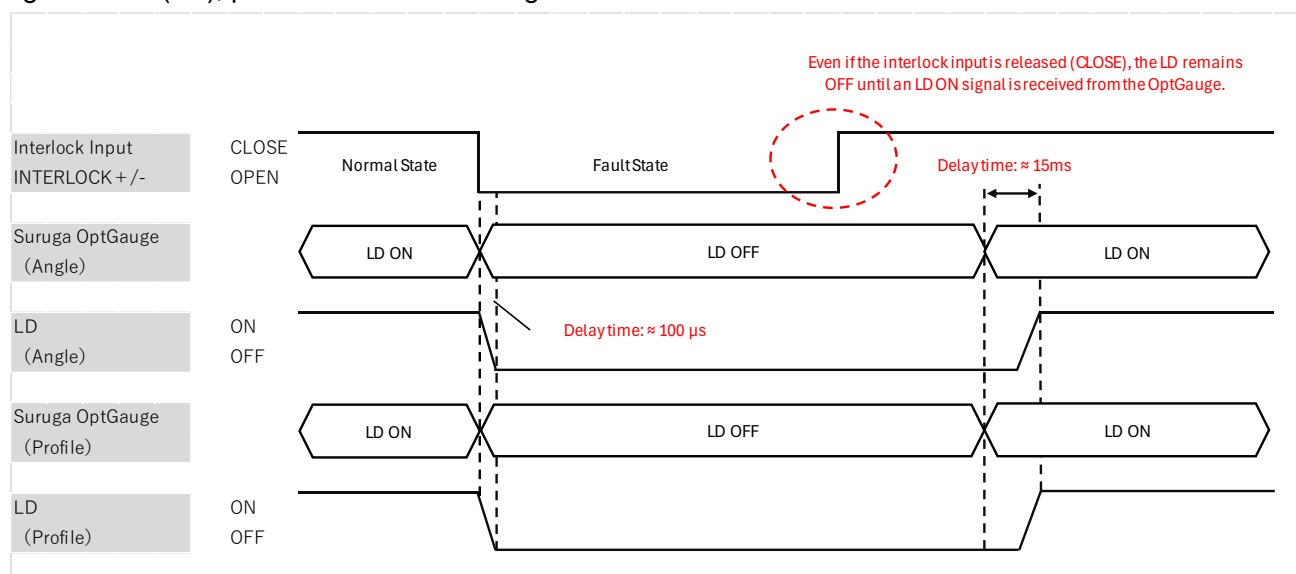
3. Measuring

3.1 Sensor Head Usage Precautions and Setting (Installation)

This section describes the setting method for the Products, using the Software.

3.1.1 Interlock Control Specifications

To ensure safe operation, the Products use the interlock control to manage the switching on and off of the internal light source (LD). For details on the timing of interlock control, the Software, and the internal light source (LD), please refer to the timing chart below.



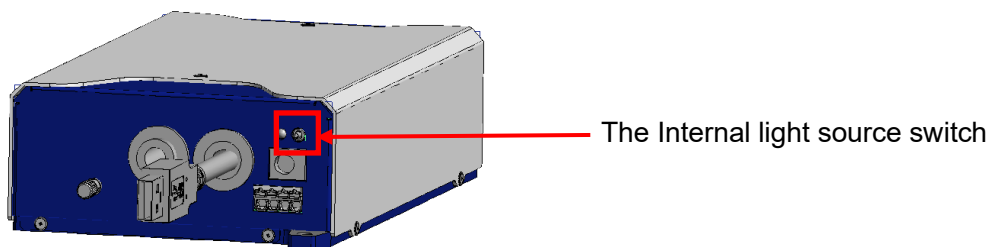
3.1.2 For Reflection Angle Measurement

1. Switch off the internal light source and position the measuring target 200 mm away from the reference surface.

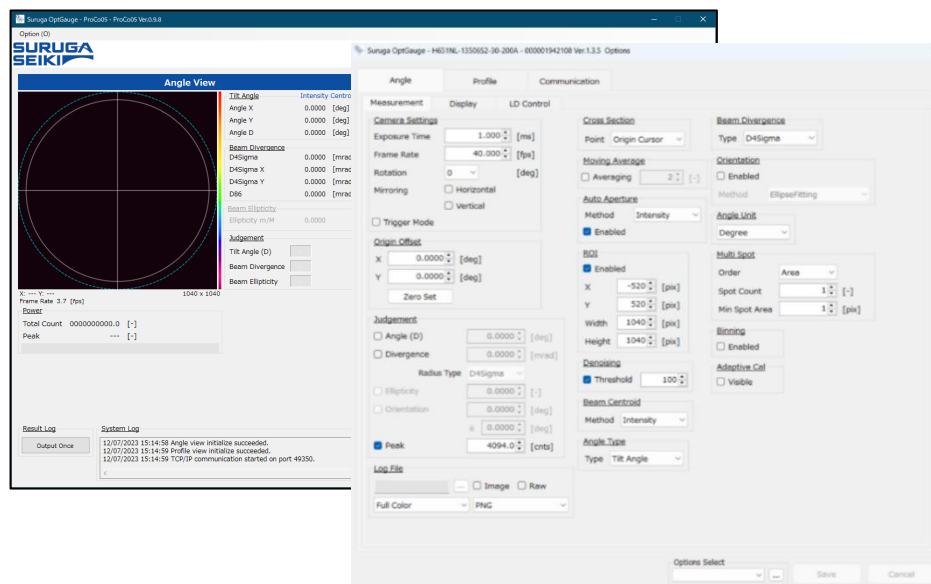
If the measuring target has a low reflectance, measurement may not be possible. (Reflectance of 10% or higher is recommended.)



2. When installation is complete, turn the internal light source switch ON.



3. Launch the Software and open the Option screen.

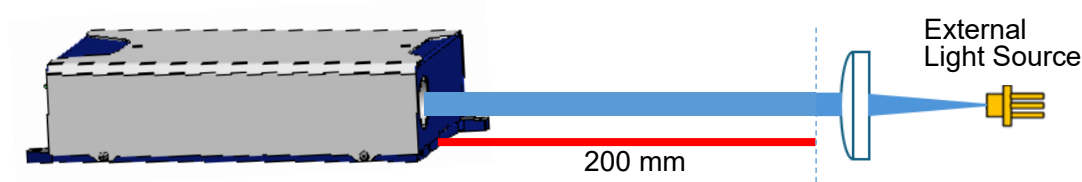


4. Set the Angle Type to "Tilt Angle" on the Angle tab in the Option screen.
(See "the Angle Measurement" in the Angle View).
5. Select the LD Control sub-tab at the Angle tab in the Option screen.
6. Click the LD button*1 within the Internal Light Source group box to turn on the internal light source.
7. Click the Tune button*1 within the LD Adjustment group box.
8. Select the LD Control sub-tab in the Profile tab of the Option screen.
9. Click the Tune button*1 within the LD Adjustment group box.
10. 90 minutes warm-up time to ensure stable measurements (no operation necessary)

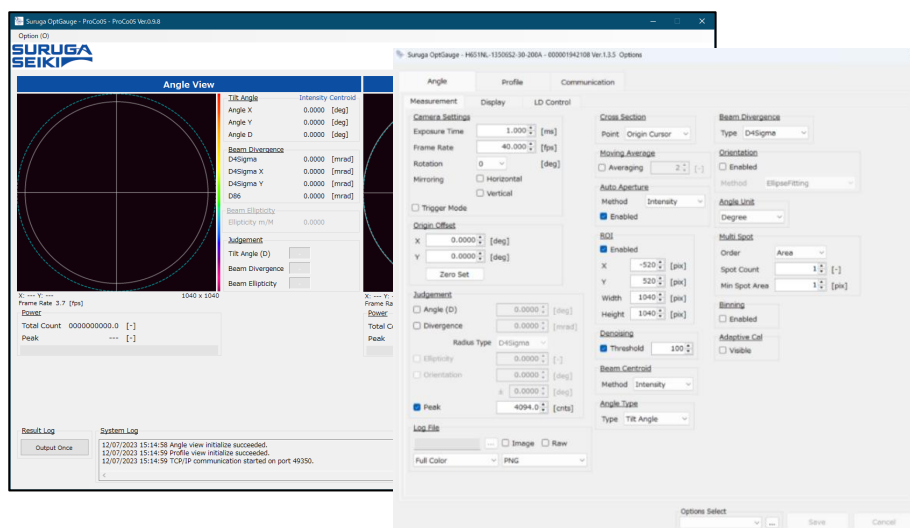
*1 see the separate software manual, the *"Suruga OptGauge User's Manual"* for details.

3.1.3 For External Light Angle Measurement

1. Turn off the internal light source and set the distance between the front edge of the sensor head reference plane and the beam position you wish to measure to be 200 mm away



2. Launch the Suruga OptGauge and open the Option screen.



3. Set the Angle Type to "Beam Angle*2" on the Angle tab in the Option screen.
4. Select the LD Control sub-tab in the Angle tab of the Option screen.
5. Adjust the light intensity of the external light source, click the Tune button*¹ in the LD Adjustment group box, and set it to "3500 to 3800" (optimal value) while observing the Peak*¹ on the measurement screen.
6. Select the LD Control sub-tab in the Angle tab of the Option screen.
7. Adjust the light intensity of the external light source, click the Tune button*¹ in the LD Adjustment group box, and set it to "3500–3800" (optimal value) while observing the Peak*¹ on the measurement screen.

*¹ See the separate software manual, *the "Suruga OptGauge User's Manual"* for details.

3.2 Measurement Method

For instructions on using each measurement-related function, please refer to the separate software manual "SurugaOptGauge_User's Manual".

4. Specifications of the Products and Accessories

4.1 The Specifications of the Products

Item		Specifications	
Model Series		H651VL-13506R2-30-200A	H651NL-13506S2-30-200A
External Light Source	Wavelength	VIS: 400 nm to 700 nm	NIR: 700 nm to 1000 nm
	Mix. Diameter	6 mm	
	Light Intensity	0.05 mW to 1.0 mW	
Internal Light Source	Wavelength	660 nm	980 nm
	Diameter	Φ 3 mm	
	Emission Intensity	1 mW or less (Class2)	0.2 mW or less(Class1)
	Emission Position	15 mm (from the side surface of the reference plane) 25 mm (from the bottom surface of the reference plane) (see the External Dimensions of the Products)	
Angle Measurement	Range ^{*1}	+/- 1.5°(circular range)	
	Linearity ^{*2}	+/- 0.45% of F.S.(F.S.=3.0°)	
	Repeatability ^{*3}	1 s (6σ)	
Divergence Measurement	Range	20 mrad or less	
	Linearity	5% of F.S.(F.S. = 20 mrad)	
Location Measurement	Viewing Range	Φ 6 mm	
	Linearity	+/- 0.5% of F.S.(F.S. = 2.8 mm)	
	Repeatability	1 μm (6σ)	
Beam Diameter Measurement	Actual Spot Size ^{*4}	Φ 60 μm to Φ 6 mm	
Working Distance		200 mm +/- 4 mm	
Frame Rate		10 to 20 Hz (with the recommended computer specifications)	
Interlock input terminal INTERLOCK+ INTERLOCK—		Interlock inputs: (none-voltage contact, the laser emission starts with the short circuit of +/-) Internal voltage: 3.3 V. Short circuit current: 2 mA. Open input conditions: 10 kΩ or more or 2.6 V or above.	

		Short-circuit input conditions: 0.5 kΩ or less or "1.0 V or below.
Trigger input terminal TRIG 5V+ TRIG 5V—		The trigger input for a measurement starts: (rising edge detection to start a measurement in the 5V signal system) Input voltage: 0 V to 6 V. Input current: 4 mA (at 5 V input). ON voltage: 3.0 V or above. OFF voltage: 1.0 V or below.
Environmental Conditions	Operating Condition ^{*5}	0 to + 40°C、 35 to 85% RH
	Storage Condition	- 10 to + 60 °C
	Vibration Resistance	Frequency range: 10 Hz to 500 Hz Max. acceleration: 2 G in X, Y, Z 3 directions (10 sweeps)
Weight		Approximately 0.9 kg

*1 When measuring with Φ 3 mm external laser beam

*2 When measuring with the internal light source (wavelength ±10 nm)

*3 Averaging counts of 256 measurements

*4 When using Auto Aperture settings, it is recommended to measure spot diameters of less than half the field of view.

*5 Shipping inspection environment: 22–24 °C, 35–85% RH

4.2 AC/DC Converter Electrical Specifications

AC / DC Converter Specifications Overview	
Rated Input (AC)	AC100~240 V
Rated Output (DC)	12 V/3.0 A
Acquired Industrial Standards	PSE, BSMI, cUL, FCC, KC, CE, GS, RCM, CCC
Protective Functions	short-circuit protection, overcurrent protection, overvoltage protection
RoHS	RoHS10
AC Side Plug Shape	Type-A
Product Dimensions (mm)	99 x 50 x 33
DC Cable Length	1.5 m +/- 30 mm
DC Plug Polarity	Center Positive

4.3 The Products and Cable Electrical Specifications

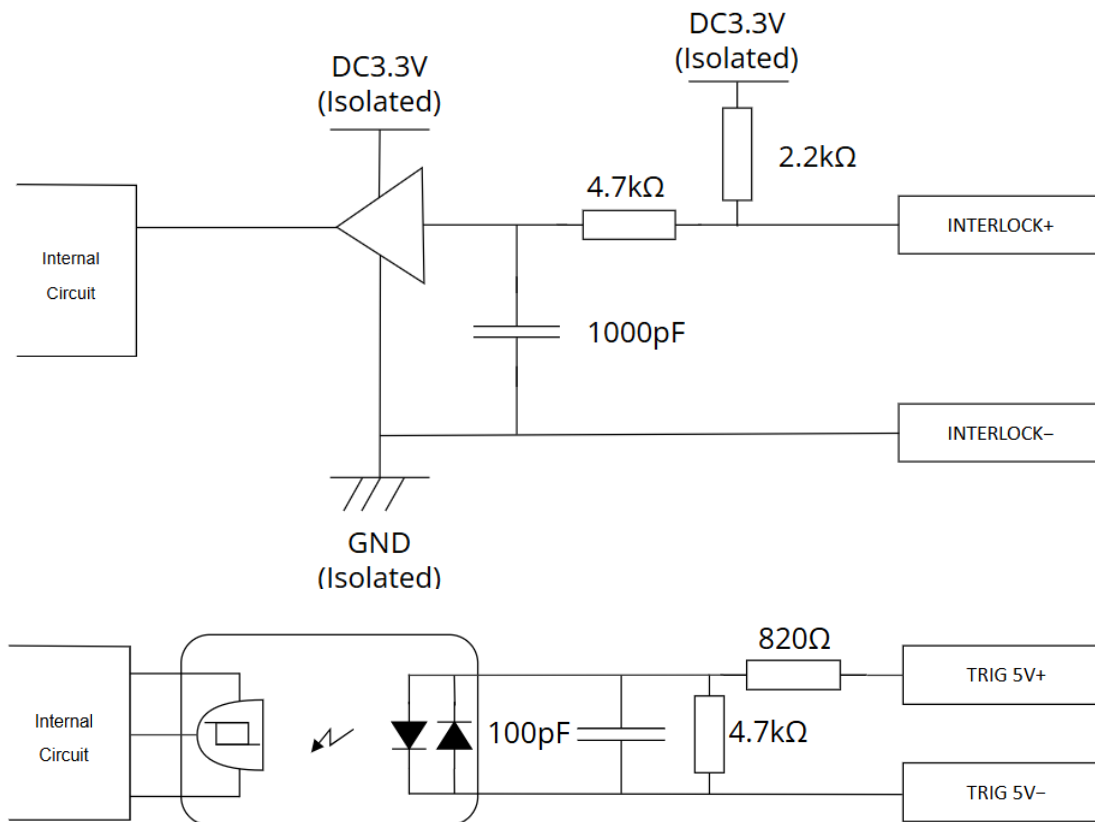
The Products and Cable Specifications Overview	
Rated Input (power consumption)	DC12 V / 3 A (5 W or below)
Cable Type	USB cable compliant with USB3.0 (5Gbps) standard
Connector	USB3.0 Type A
Cable Length	3.0 m

4.4 The specifications of the Applicable Wire Range for the Interlock and Trigger Inputs

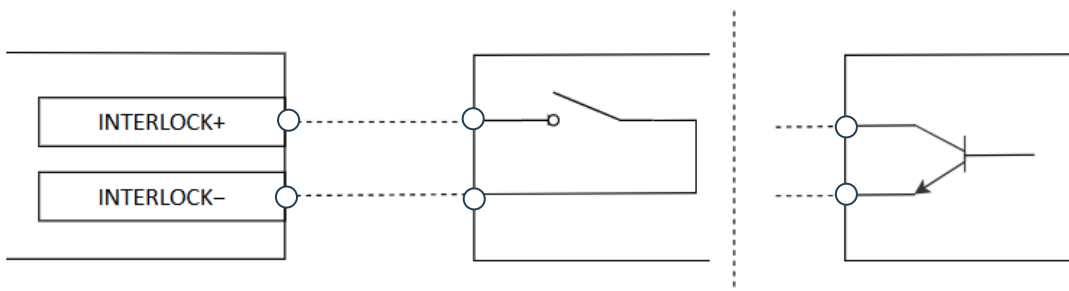
Stranded wire	0.2 mm ² to 1.5 mm ² (AWG24 to 16)
Solid wire	0.2 mm ² to 1.5 mm ² (AWG24 to 16)
Stranded wire with a ferrule terminal without insulation sleeve	0.2 mm ² to 1.5 mm ² (AWG24 to 16)
Stranded wire with a ferrule terminal with insulation sleeve	0.2 mm ² to 0.75 mm ² (AWG24 to 18)
Stripping length of outer sheath	8 mm

4.5 Equivalent Circuit Diagram

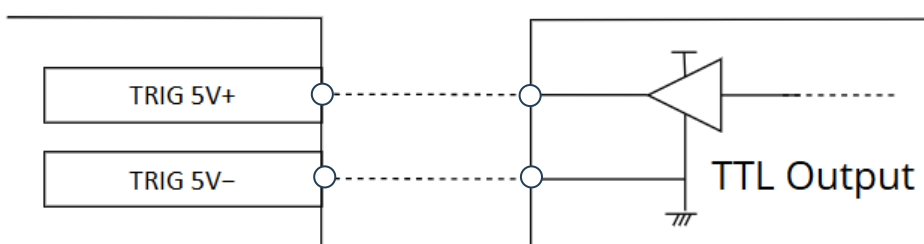
This section provides interlock input and trigger input terminal circuit diagrams and connection examples.



● INTERLOCK+/- connection example



● TRIG 5V+/- connection example

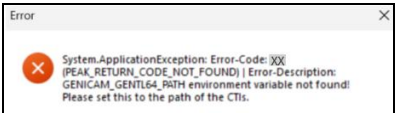


5. Failures? Frequently Asked Questions

5.1 Symptoms and Countermeasure

Useful information for troubleshooting is listed below.

Check if the table below shows your trouble.

Symptom	Cause	Countermeasure
The power does not turn on.	AC/DC adapter or power cable is not correctly connected.	12VDC is not supplied.
	12VDC is not supplied.	Correctly connect the 12VDC power source.
Application does not start up.	USB cable is not correctly connected.	Connect the USB cable to the USB3.0 port.
	Device authentication file is not being read.	Read the device authentication file (.suruga) corresponding to the purchased sensor head.
The following message appears when starting this software and it cannot be launched: 	The camera driver may not be installed.	Please install the camera driver. (Installation from the USB Driver) After installation, please restart your PC.
Application stops during startup.	USB cable disconnected.	Close the application, connect the USB cable correctly, and restart the application.
The Software does not start correctly	The sensor camera may be malfunctioning (check the all cable connections)	Please contact our sales representative from the optical equipment division for further assistance.
Application stops during startup	With Windows 11 Version 23H2, due to differences in some system components and specifications, the Software may not function properly.	Please update to the latest Windows version (24H2 or later).
	USB cable disconnected.	Close the application, connect

		the USB cable correctly, and restart the application.
Beam is not displayed on screen.	The LD is not turned ON.	Turn ON the LD in the software settings.
	Exposure Time* ¹ is too short.	Adjust exposure time to the optimal speed.
	Large tilt on the target.	Adjust the measurement target tilt so that the reflectance light enters within +/- 1.5° of the visual angle.
Measurement target centroid is unstable.	Noise is causing serious effects	Enable the Threshold in the Denoising settings and adjust the threshold.
RS232C communication is not working.	RS232C cable is not correctly connected	Correctly connect RS232C cable.
	Computer communication conditions are not set correctly.	Set the communication settings correctly on the PC.
TCP/IP communication is not working.	Ethernet cable is not correctly connected.	Correctly connect Ethernet cable.
	Computer communication conditions are not set correctly.	Set the computer communication settings correctly.

*1 see the separate software manual, *the "Suruga Opt Gauge User's Manual" for details.*

6. Warranty - After-Sales Service

6.1 Warranty Terms, Conditions and Coverage

- Before contacting us, please confirm the serial number of the individual product.
- The warranty period is one year after delivery.
- However, the following cases are not covered by the warranty and will be repaired for a fee.
 - Failure or damage caused by misuse, modification or repair by someone other than the company's designated persons from us.
 - Failure or damage caused by improper handling, such as dropping the Products during transportation or moving.
 - Failure or damage caused by fire, salt damage, gas damage, abnormal voltage, earthquake, lightning, wind, flood, or other natural disasters
 - In the event of a malfunction or damage caused by improper handling contrary to the methods and precautions described in the instruction manual.

We reserve the right to revise, modify, or amend these Warranty Terms and Conditions (hereinafter referred to as "Revisions, etc."), and in the event of such revisions, etc., we shall promptly post the revised Warranty Terms and Conditions in this catalog or on our website (<http://jpn.surugaseiki.com/>). If you place an order for the Products after such revision, you shall be deemed to have accepted the revision.

6.2 After-Sales Service

Before requesting repair, please check the items in "[Failures? Frequently Asked Questions](#)".
If you have any questions, please contact our Optical Instruments Division Sales Department.

< During the Warranty Period >

When damage occurs under a normal use state following the cautions/warnings/notes written in this manual, Suruga conducts a repair service for free. For any damages out of warranty period mentioned above, Suruga charges a fee for any repair service.

< After the Warranty Period >

A repair service is available with a fee to maintain the functionalities of the Products up on your requests.

< If repair is required >

For repair and calibration inquiries, please contact to the following address.

info@suruga-g.co.jp

Misumi Group

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