



Suruga OptGauge User's Manual

Smart LAC H420 Version

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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1. Introduction

This document is the user's manual for the companion software, "Suruga OptGauge", with the measuring instruments by Suruga Seiki Co., Ltd.

This "User's Manual" (thereafter, "this Manual") provides the information and basic operation methods for the "Suruga OptGauge."

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

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Suruga OptGauge User's manual

Issue Date	2026 June
Guide Version	004E

Revision History

Date	Revision	Details
2025. June	001E	1 st edition
2025. July	002E	· Installation PC System Requirements - Removed "Pro" - Added Windows 11 version - Added note that the potential dysfunctionalities depend on version · Symptoms and Solutions - Added details on dysfunctionalities depending on Windows version and countermeasures
2025. September	003E	Added $1/e^2$ beam divergence calculation function and the rotation angle calculation function
2026. June	004E	Instructions for using functions have been migrated from the "User's Manual," and the following features have been added: · Measurement Start/Stop · Adjustment methods for Auto Brightness Control · 2-Point Parallel Mode · Custom Log Output · Measurement Result Streaming Output · Background Operation Operating Environment · Compatible with .NET 10

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 the users of the Product.

For the latest version of this Manual and the Software, you can obtain by downloading them from our website (<http://jpn.surugaseiki.com/>) or (<https://eng.surugaseiki.com/>).

1.1. Warning Labels Addressed in this Manual

 Warning	Serious damage, data loss, or unsafe conditions may occur.
 Careful	Unstable or unexpected results, but not fatal, may occur in the software operations.
Attention	Points users may overlook and important notes about specification limitations. Information that won't cause danger or trouble but knowing it will make operation smoother.

1.2. Overview of the Suruga OptGauge

The Suruga OptGauge is the application software that you can configure parameters and monitor measurement results with the measuring instruments. You can configure parameters and monitor measurement results from the supported measuring instrument connected to a computer.

■ Functions and Features

This section describes the notable features of the Suruga OptGauge.

- Monitoring functions for measurement results

You can acquire measurement results from the supported instrument. Measurement results can be obtained in a .csv file or others.

Ex.: For the H420 Series, they are angle and divergence measurements

- Monitoring functions for the waveform of a received light.

The sensor camera detects and monitors the waveform of a light beam.

- Parameter settings

You may configure operational settings for the sensor cameras to fully detect a light beam and/or configure criteria for a pass/fail test. Multiple sets of parameter settings can be saved. You may select one for a measuring target and another, and restore it again.

Ex. : exposure time, noise threshold value and averaging out of a light beam

- Acquiring measurement results with external devices and setting parameters for them.

You can acquire measurement results or configure parameters with the commands from two computers via the RS232C and/or TCP/IP communications

- Other convenient functions

You may utilize the functions such as the "Origin Offset" parameter that specifies the reference positions of a monitoring waveform or the "Automatic Brightness" control that enables automatic brightness according to your specified range of luminance of a detected light beam or the save function that you can store the image of an acquired waveform.

1.3. 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.]

1.3.1. Software License

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.

1.3.2. 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 or more
	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 or higher 4-core 8-thread
	RAM	8GB or higher
	Storage capacity	1GB or higher
	Display resolution	1920 x 1080 or more
	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

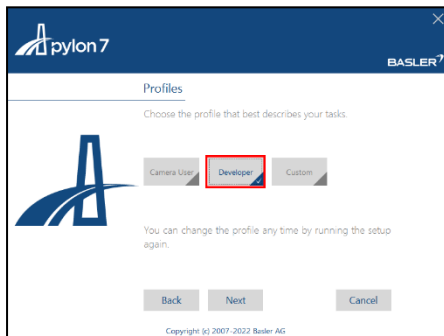
*⁴ The Software may not operate properly on Windows 11 Version 23H2 due to differences in certain system components and operating specifications. Please update to the Windows version (24H2 or later).

1.3.3. Installation of the USB device driver

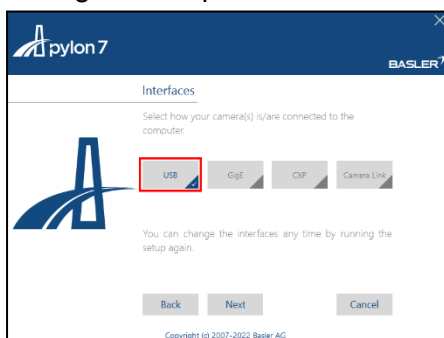
1. Double-click the "... ¥Driver" "Basler_pylon_7.0.0.24651.exe" to begin installation.



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.



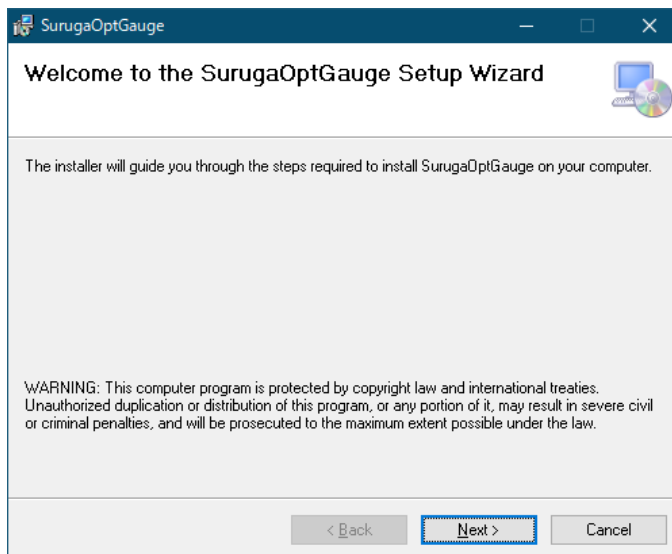
1.3.4. Installation of the Suruga OptGauge.

Install the Software, the Suruga OptGauge.

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

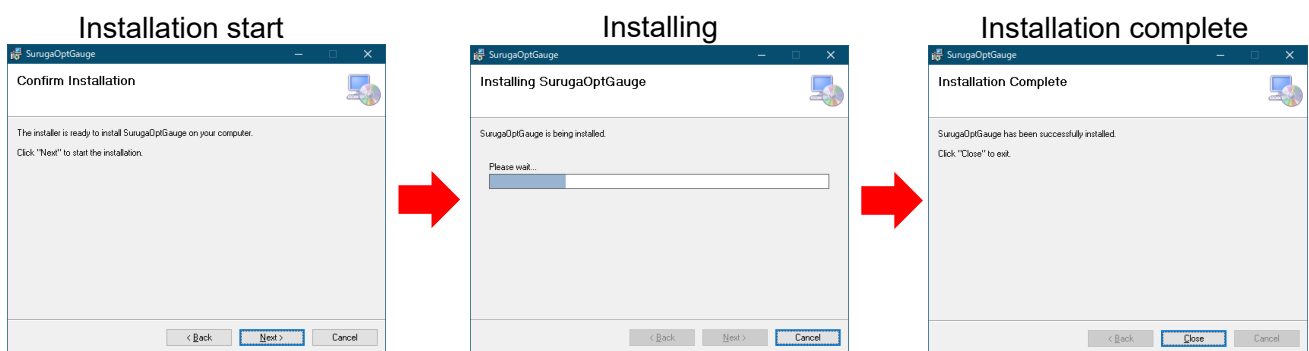
名前	更新日時	種類	サイズ
 SurugaOptGaugeSetup_x.x.x.msi	2023/11/28 19:12	Windows インストー...	61,590 KB

2. Click "Next>".



Click "Next>" to begin installation.

When installation is complete, click "Close".



3. Suruga OptGauge will be created on the desktop. The installation procedures are complete.



1.3.5. Copying the Device Authentication File

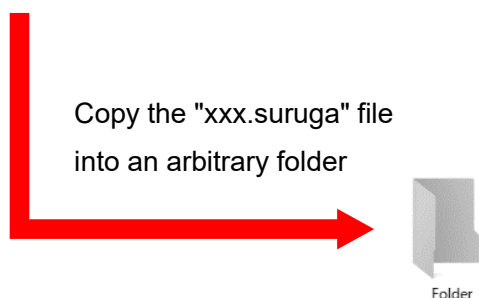
Attention

Authentication File

For this product, calibration values are set for each device. Therefore, the "Suruga OptGauge" requires reading of a "device authentication file (dot suruga extension)" in which the unique information of individual device is stored

To load the device authentication file into the installed the Suruga OptGauge, copy the file "xxx.suruga" in the "... /AuthenticationFile" 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.

1.3.6. Starting up and Closing Down the Suruga OptGauge

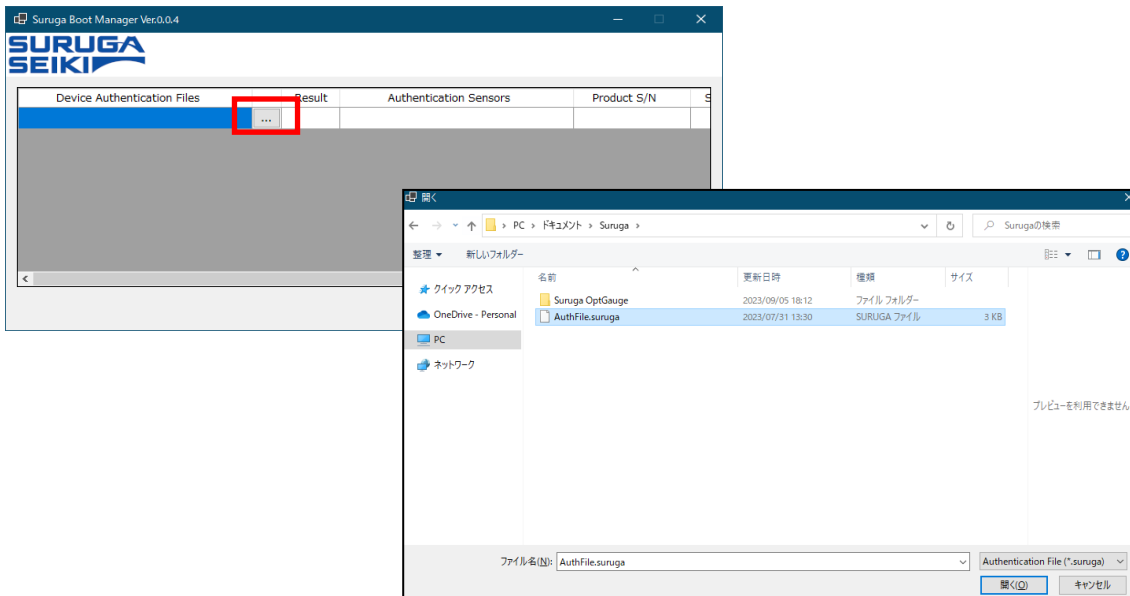
Starting up the Suruga OptGauge

1. Double-click the "SurugaOptGauge" in the "...¥Desktop".

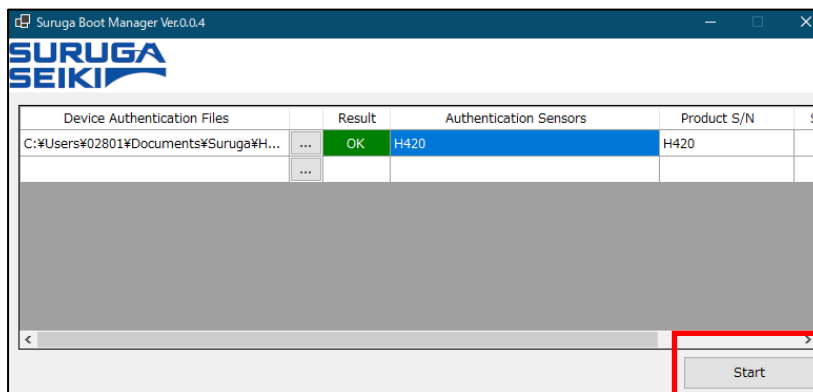


2. Click on "..." in the item "Device Authentication File" and select the extension ".suruga" in the folder in which the unique "Device Authentication File" was copied.

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



3. Confirm that the "Result" is "OK" and click "Start".

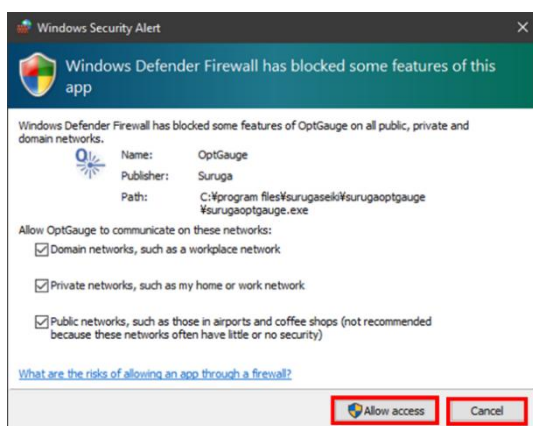


Attention

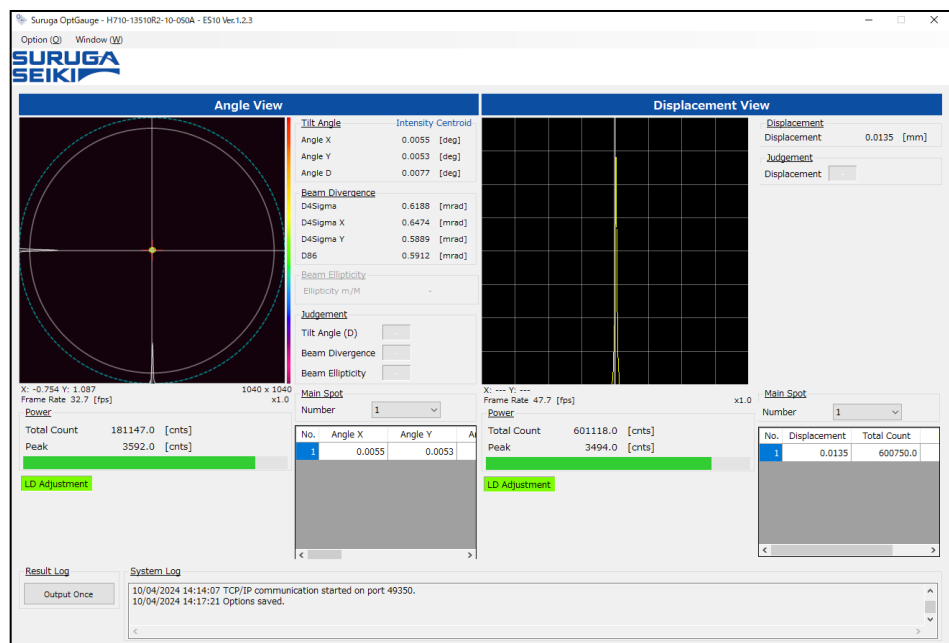
The Software incorporates TCP/IP communication control. Therefore, depending on your PC's security settings, the following warning may appear upon initial startup.

If your computer and network environment allow the TCP/IP communication permission, check all, and click "Allow access". If not, click "Cancel".

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

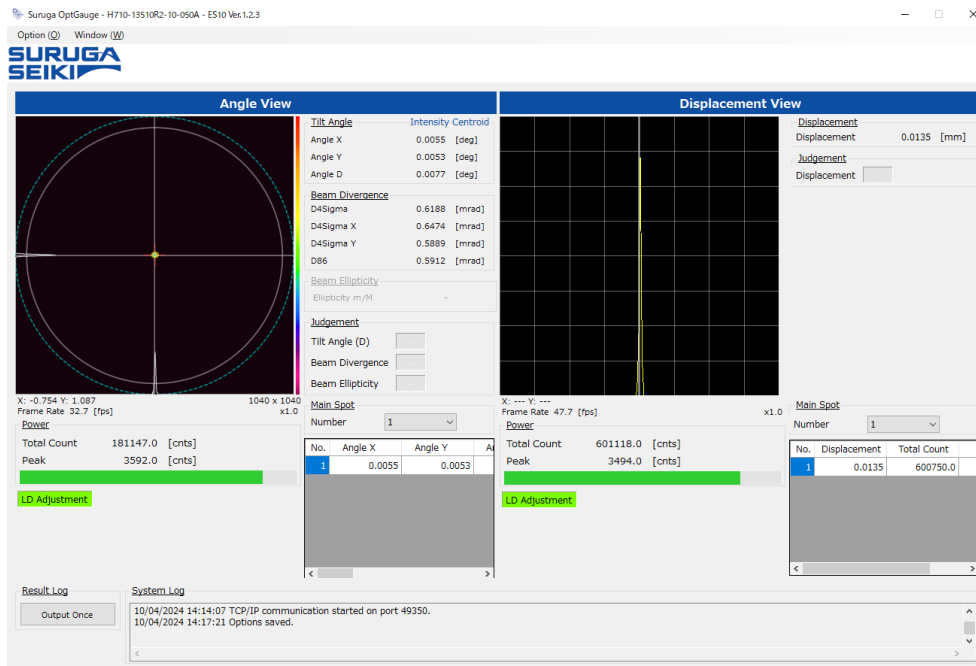


4. The Software will start up.



Closing the Suruga OptGauge

1. Click the "x" button to shut down the Suruga OptGauge.

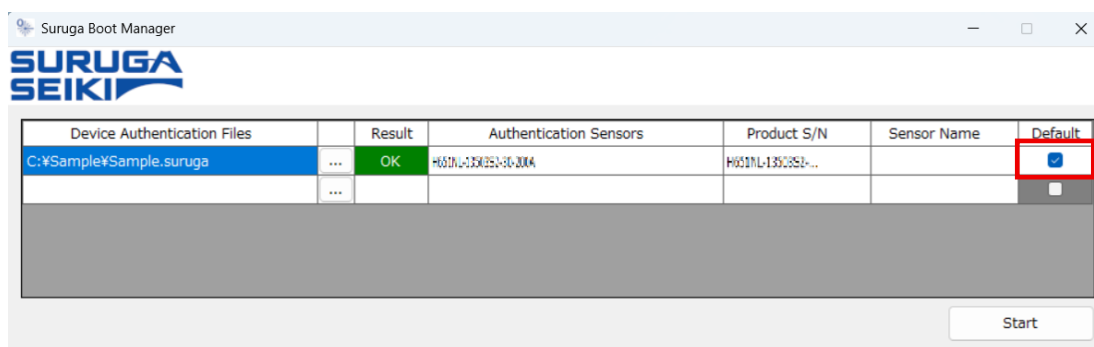


1.3.7. Quick Start

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.



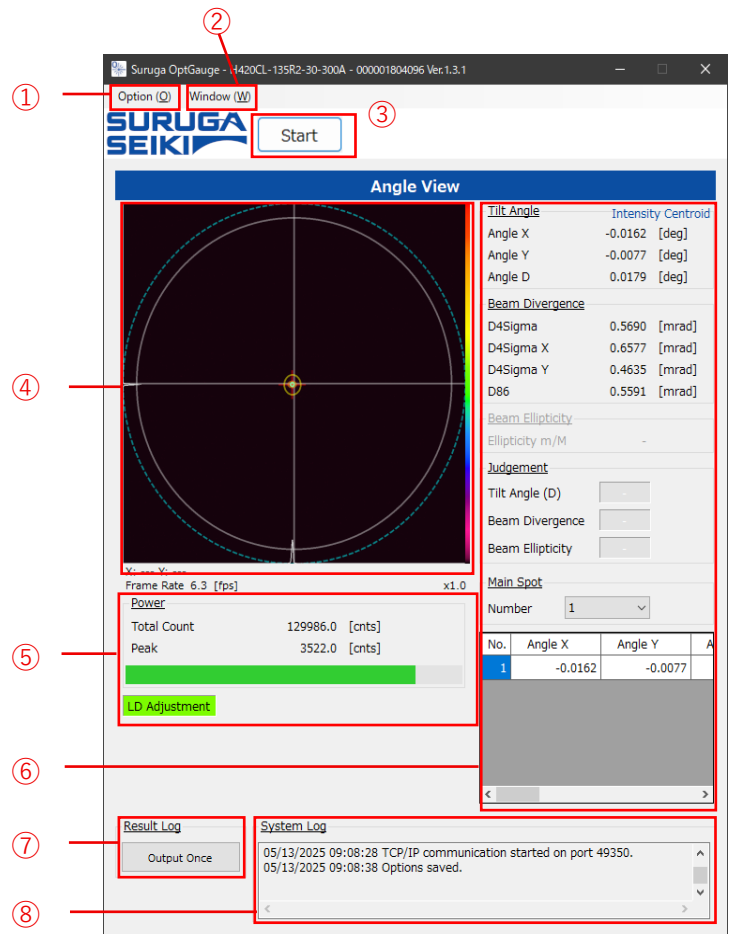
Disabling Quick Start

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.

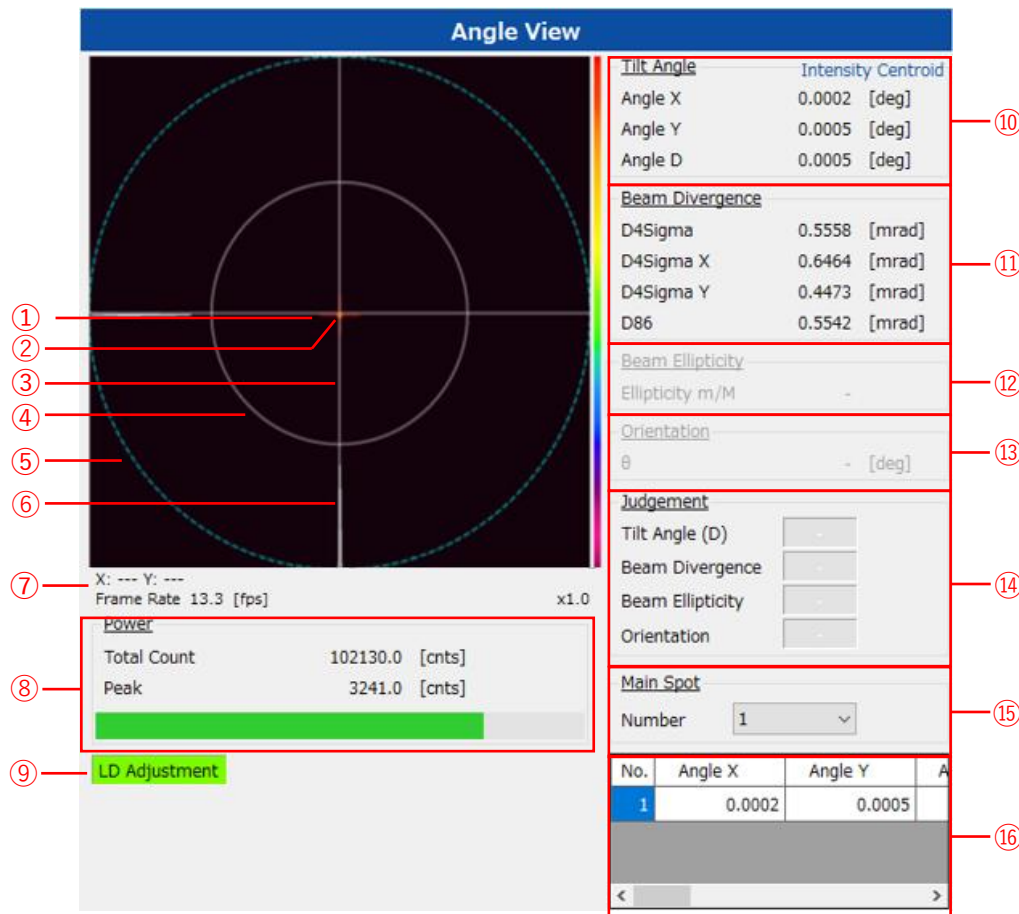
2. Screen Components

2.1. Main screen



① Option	Opens the option dialog box
② Window	Opens dialog boxes related to device authentication and window size.
③ Measurement Operation / Status Display	A display area with buttons of measurement operations and indicators the measurement status
④ Angle View	Display area for an image taken by the angle sensor camera
⑤ Angle Power	Display area for beam strength measured by the angle sensor camera
⑥ Angle Measurement Results Display	Angle measurement results display area
⑦ Result Log	Outputs measurement results and measurement images to the designated folder on the computer
⑧ System Log	Display area for the Suruga OptGauge operation log

2.1.1. Angle View

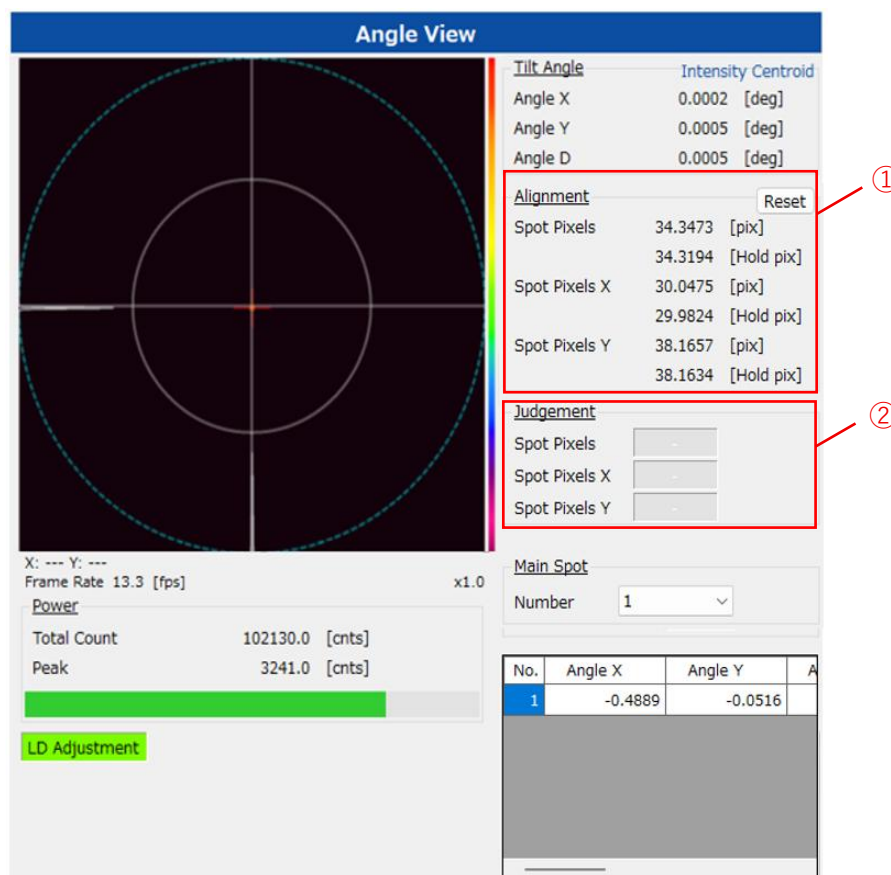


① Cross (red)	 Displays the position of the light beam centroid.
② Auto Aperture (orange)	 Displays the aperture if the Auto Aperture settings are enabled
③ Cross (white)	 Displays the center position of the coordinate
④ Aperture (white)	 Displays the range of angle measurement
⑤ ROI (blue)	 Displays the aperture if the ROI settings are enabled
⑥ Profile	 Displays the strength distribution of the light beam
⑦ XY Coordinates	Displays the coordinates where the mouse cursor points at
Frame Rate	Displays the image refresh rate per second from image data acquisition to completion of measurement data calculation

⑧ Power	Total Count	Displays the beam total count by the value from 0 to 4,429,152,000.
	Peak	Displays the maximum light beam luminance by the value from 0 to 4095. If the value is below the Peak value set in the " Judgement ", the indicator turns green (OK), otherwise, it turns red (NG).
⑨ LD Adjustment	Displays the status of the dimming function (Green = Pass, Yellow = Under adjusting and Red = Fail)	
⑩ Tilt (Beam)Angle	Angle X	Displays the angle X from the X-axis component of the cross (white)
	Angle Y	Displays the angle Y from the Y-axis component of the cross (white)
	Angle D	Displays the angle from the center of the cross (white)
⑪ Beam Divergence	The " Orientation " in the Option Settings is enabled, it alters the measurement mode	
	If the "D4Sigma" is selected at the beam divergence " Type " configuration in the Option Settings, it displays following.	
	D4Sigma	Displays the beam divergence by $D4\sigma$ of half angle
	D4Sigma X(M)	Displays the beam divergence by $D4\sigma$ X(M) of half angle
	D4Sigma Y(m)	Displays the beam divergence by $D4\sigma$ Y(m) of half angle
	If the "1/e^2" is selected at the beam divergence " Type " configuration in the Option Settings, it displays following.	
	1/e^2	Displays the beam divergence by $1/e^2$ of half angle
	1/e^2 X (M)	Displays the beam divergence by $1/e^2$ X(M) of half angle
	1/e^2 Y (m)	Displays the beam divergence by $1/e^2$ Y(m) of half angle
	D86	Displays the beam divergence by D86 of half angle.
⑫ Beam Ellipticity	Operates while the " Orientation " in the Option Settings is enabled	
	Ellipticity m/M	Displays the light beam width by $D4\sigma$ or $1/e^2$

⑬ Orientation	Operates if the " Orientation " in the Option Settings is enabled	
	θ	Displays the rotation angle of the light beam
⑭ Judgement	Operates while the measurement data to evaluate, at the " Judgement " in the Option Settings, are checked, ☒ , thereafter, you specify evaluation criteria for 0.0000 .	
	Tilt Angle (D)	Displays "OK" if the configured evaluation criteria are satisfied or "NG" if not satisfied.
	Beam Divergence	
	Beam Ellipticity	
	Orientation	
⑮ Main Spot	Number	Specify the beam spots to display measurement results while measuring multiple beams.
⑯ Multi Spot Measurement Display	When multiple beams are detected, the measurement results for each beam spot are automatically listed and displayed	

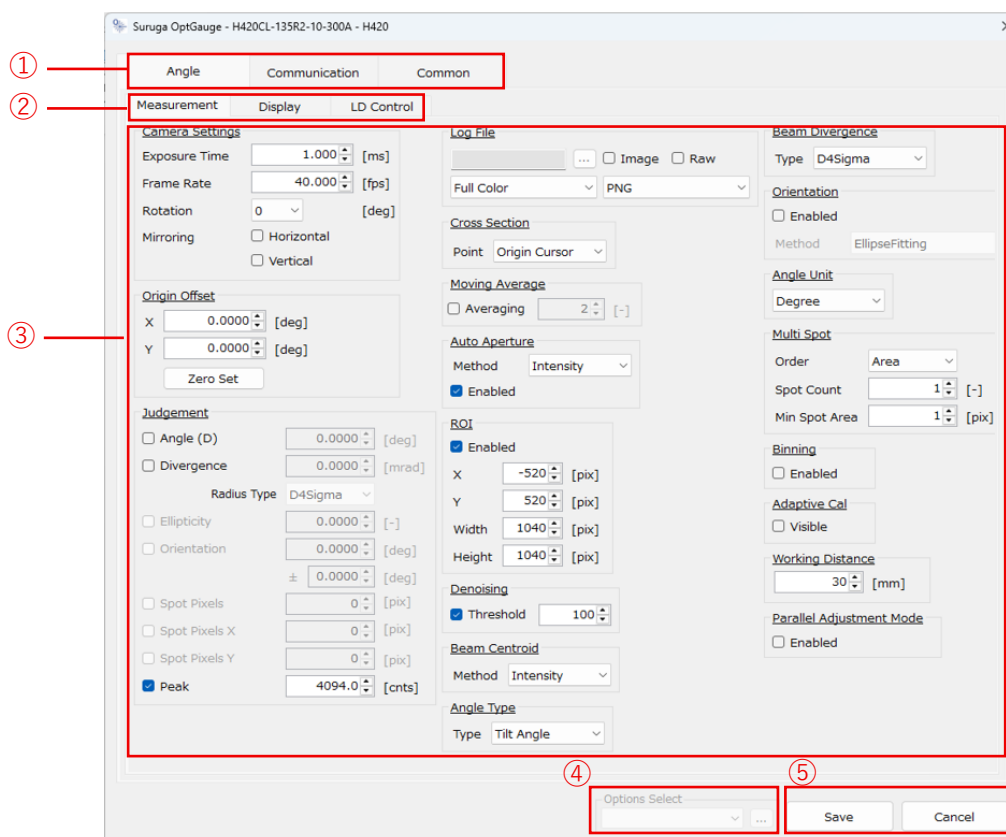
2.1.2. Angle View (2-Point Parallel Adjustment Mode)



① Alignment	This function is enabled when " Parallel Adjustment Mode " in Option settings is set to "Enabled."	
	Spot Pixels	Displays the D4σ beam width (unit: Pixel) [Hold pix] : Automatically holds and displays the minimum value of the D4σ beam width
	Spot Pixels X	Displays the D4σ X beam width (unit: Pixel) [Hold pix] : Automatically holds and displays the minimum value of the D4σ X beam width
	Spot Pixels Y	Displays the D4σ Y beam width (unit: Pixel) [Hold pix] : Automatically holds and displays the minimum value of the D4σ Y beam width
	Reset	Updates the held value in [Hold pix] to the current latest beam width

② Judgement	When you ☒ the measurement data you wish to judge in "Judgement" under Option settings, the function will be enabled, and you can set the judgement criteria. ☒ Spot Pixels 0 [pix] ☒ Spot Pixels X 0 [pix] ☒ Spot Pixels Y 0 [pix]	
	Spot Pixels	Displays “OK” if the set judgement criteria are met, and “NG” if not.
	Spot Pixels X	
	Spot Pixels Y	

2.2. Option Screen



① Option Tab	Select the tab to display options.	
	Angle	The option tab of Angle settings
	Communication	the option tab of Communication settings
	Common	the option tab of Common settings of the entire software
② Subcategory Tab(s)	Displays options subdivided into the measurement, the display, and the LD control for the Angle options	
③ Settings	Measurement conditions can be changed	
④ Option Select	By creating an options list in advance, you can switch between the various setting in ③ (see " Options List ")	
⑤ Save/Cancel	Changing the option settings (③ and ④) will activate the button. After changing the option settings, clicking the "Save" button will save the changes	
	To cancel the changes, click the "Cancel" button	

※For details on options, refer to "[Option](#)"

3. How to Use the Functions

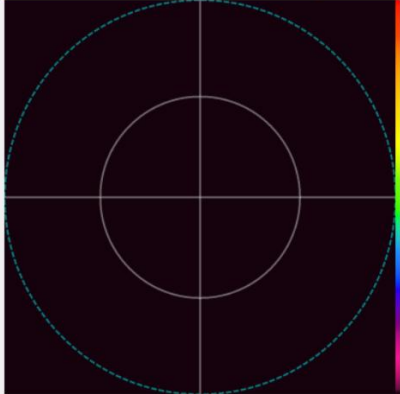
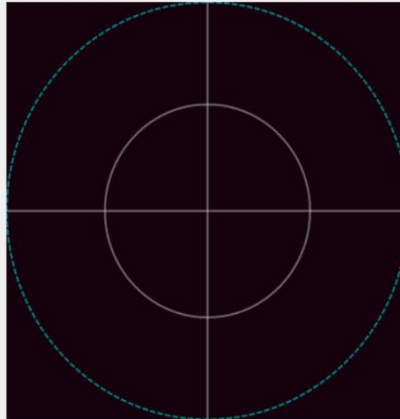
3.1. Measurement Start/Stop

By pressing the [Start/Stop] button at the top of the screen, you can switch between starting and stopping Angle measurement.

*Immediately after launching the software, the measurement state is in started.



Start

Measurement Start																																	
Measurement is started. In this state, pressing the [Stop] button will stop the measurement, and the screen display will turn gray.	Angle View <table><tr><td>Tilt Angle</td><td>Intensity Centroid</td></tr><tr><td>Angle X</td><td>-</td></tr><tr><td>Angle Y</td><td>-</td></tr><tr><td>Angle D</td><td>-</td></tr><tr><td colspan="2">Beam Divergence</td></tr><tr><td>D4Sigma</td><td>- [mrad]</td></tr><tr><td>D4Sigma X</td><td>- [mrad]</td></tr><tr><td>D4Sigma Y</td><td>- [mrad]</td></tr><tr><td>D86</td><td>- [mrad]</td></tr><tr><td colspan="2">Beam Ellipticity</td></tr><tr><td>Ellipticity m/M</td><td>-</td></tr><tr><td colspan="2">Orientation</td></tr><tr><td>θ</td><td>- [deg]</td></tr><tr><td colspan="2">Judgement</td></tr><tr><td>Tilt Angle (D)</td><td>OK</td></tr><tr><td>Beam Divergence</td><td>-</td></tr></table>	Tilt Angle	Intensity Centroid	Angle X	-	Angle Y	-	Angle D	-	Beam Divergence		D4Sigma	- [mrad]	D4Sigma X	- [mrad]	D4Sigma Y	- [mrad]	D86	- [mrad]	Beam Ellipticity		Ellipticity m/M	-	Orientation		θ	- [deg]	Judgement		Tilt Angle (D)	OK	Beam Divergence	-
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Beam Divergence	-																																
Measurement Stop																																	
Measurement is stopped. In this state, pressing the [Start] button will start measurement, and the screen display will turn active.	Angle View <table><tr><td>Tilt Angle</td><td>Intensity Centroid</td></tr><tr><td>Angle X</td><td>-</td></tr><tr><td>Angle Y</td><td>-</td></tr><tr><td>Angle D</td><td>-</td></tr><tr><td colspan="2">Beam Divergence</td></tr><tr><td>D4Sigma</td><td>- [mrad]</td></tr><tr><td>D4Sigma X</td><td>- [mrad]</td></tr><tr><td>D4Sigma Y</td><td>- [mrad]</td></tr><tr><td>D86</td><td>- [mrad]</td></tr><tr><td colspan="2">Beam Ellipticity</td></tr><tr><td>Ellipticity m/M</td><td>-</td></tr><tr><td colspan="2">Orientation</td></tr><tr><td>θ</td><td>- [deg]</td></tr><tr><td colspan="2">Judgement</td></tr><tr><td>Tilt Angle (D)</td><td>OK</td></tr><tr><td>Beam Divergence</td><td>-</td></tr></table>	Tilt Angle	Intensity Centroid	Angle X	-	Angle Y	-	Angle D	-	Beam Divergence		D4Sigma	- [mrad]	D4Sigma X	- [mrad]	D4Sigma Y	- [mrad]	D86	- [mrad]	Beam Ellipticity		Ellipticity m/M	-	Orientation		θ	- [deg]	Judgement		Tilt Angle (D)	OK	Beam Divergence	-
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Angle X	-																																
Angle Y	-																																
Angle D	-																																
Beam Divergence																																	
D4Sigma	- [mrad]																																
D4Sigma X	- [mrad]																																
D4Sigma Y	- [mrad]																																
D86	- [mrad]																																
Beam Ellipticity																																	
Ellipticity m/M	-																																
Orientation																																	
θ	- [deg]																																
Judgement																																	
Tilt Angle (D)	OK																																
Beam Divergence	-																																

In addition, starting and stopping measurement can also be controlled by commands.

3.2. Angle Measurement

You need to change the measurement mode according to your measuring purpose.

For the reflection angle measurement, select the "Tilt Angle".

For the external light angle measurement, select the "Beam Angle".

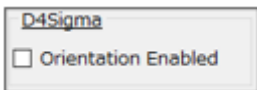
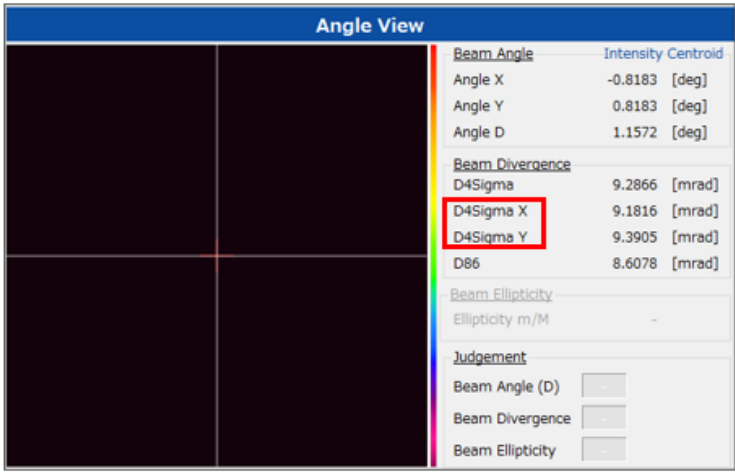
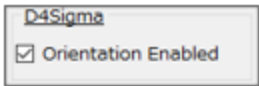
To measure a reflection angle	
Select [Tilt Angle] *1 in the "Angle Type" in the option setting. Angle Type Type Tilt Angle ▼	It starts reflection angle measurement. Angle View Tilt Angle Intensity Centroid Angle X -0.4091 [deg] Angle Y 0.4091 [deg] Angle D 0.5786 [deg] Beam Divergence D4Sigma 40.5876 [mrad] D4Sigma X 39.9275 [mrad] D4Sigma Y 41.2370 [mrad] D86 37.5164 [mrad] Beam Ellipticity Ellipticity m/M - Judgement Tilt Angle (D) Beam Divergence Beam Ellipticity
To measure an external light angle	
Select [Beam Angle] *1 in the "Angle Type" in the option setting. Angle Type Type Beam Angle ▼	Starts external light angle measurement. Angle View Beam Angle Intensity Centroid Angle X -0.8183 [deg] Angle Y 0.8183 [deg] Angle D 1.1572 [deg] Beam Divergence D4Sigma 40.2099 [mrad] D4Sigma X 39.9293 [mrad] D4Sigma Y 40.4886 [mrad] D86 37.3848 [mrad] Beam Ellipticity Ellipticity m/M - Judgement Beam Angle (D) Beam Divergence Beam Ellipticity

3.3. Divergence

Divergence indicates how much the light beam expands at an angle as it propagates.

A light beam with small divergence means that there is little expansion during propagation over long distance while a beam with a large divergence expands rapidly over short distance.

The Products display divergence in a half-angle with mrad (milli radian). It has two modes of measurement.

To measure the divergence in the X-axis and Y-axis directions from a $D4\sigma$ beam diameter*1 (elliptical beam)	
Uncheck the box for the Orientation Enabled in the D4Sigma option setting. 	Allowing to measure the beam divergence with "D4Sigma X" and "D4Sigma Y" *1 
To measure the divergence of the M (major axis) and m (minor axis) of a $D4\sigma$ beam diameter*1 (elliptical beam)	
Check the box for the Orientation Enabled in the D4Sigma option setting. 	Allowing to measure the beam divergence with "D4Sigma M" and "D4Sigma m" *1 

*1 You may select either " $D4\sigma$ " or $1/e^2$ to measure the diameter of the light beam.

3.4. Beam Centroid

The method for determining the center of the light spot can be selected via the 'Beam Centroid' option setting, choosing between the Area Centroid and the Intensity Centroid. It is recommended to switch the 'Beam Centroid' setting depending on the object being measured.

We recommend selecting the type of "Beam Centroid" according to a target to be measured.

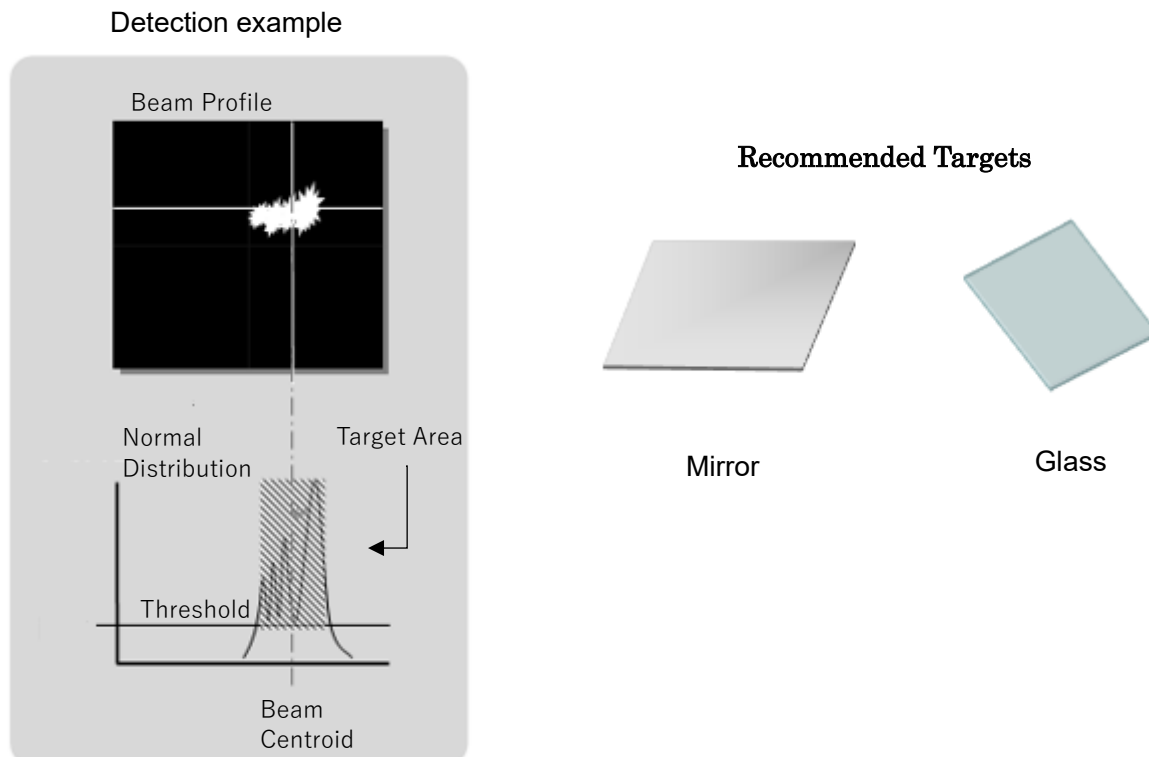
Area Centroid (Area)

The position of the area center of the light beam is calculated from pixels with brightness higher than the noise removal threshold 'Threshold' and displayed as an angle for the Area Centroid.

Increasing the 'Threshold' reduces the influence of the tail end of the peak profile.

We recommend such measurement method for the targets with reflections from surfaces as uniform as a mirror surface, where the light spot exhibits no blurring or smearing.

Note: Optically, blur or smudge is defined as, for instance, luminous point with elongating edge profile in normal distribution, half-width deviating largely from normal distribution, or objects with irregular profiles which are not smooth.



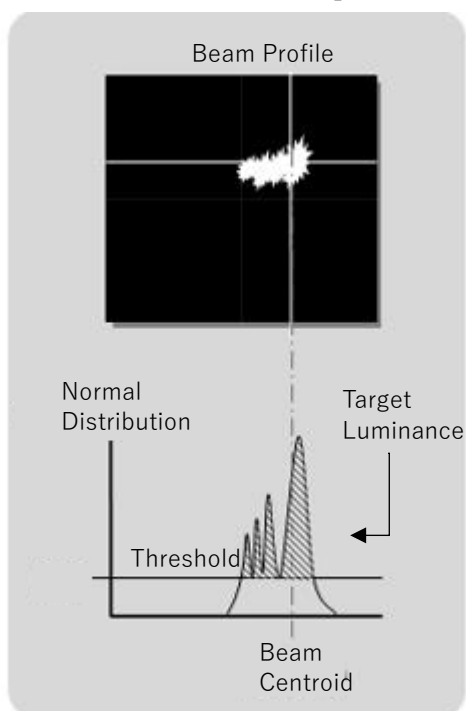
Intensity Centroid

The centroid position of a light beam is calculated from the beam intensity with higher luminance than the denoising threshold value and results as an angle for the for intensity centroid.

By lowering the threshold value, the Intensity Centroid can include the luminous point peripheral area causing blur or smudge.

We recommend this type of measurement mode for the targets such mirror with uniform surfaces which reflects a light beam without blur or smudge*.

Detection example



Recommended Target



Concave Lens

3.5. Beam Ellipticity

It determines the degree to which the beam shape deviates from a circular form towards an elliptical one.

Beam Ellipticity Formula

$$\text{Beam Ellipticity} = (\text{minor}) \text{ beam diameter} / (\text{major}) \text{ beam diameter}$$

The following describes its use.

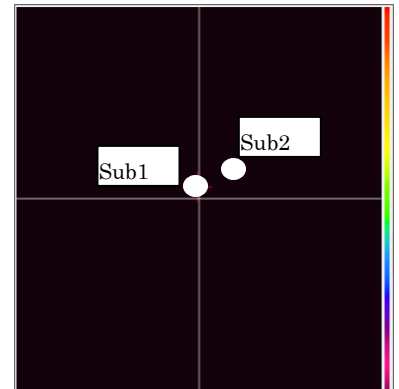
Note: A Beam diameter can be selected as $D4\sigma$ or $1/e^2$.

Beam Ellipticity Usage

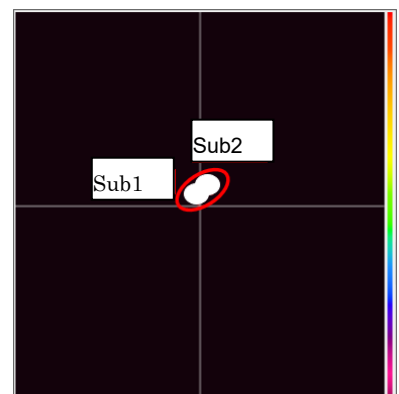
The "Beam Ellipticity" is used to measure the parallelism of two or more measured targets.

1. The beam spots of "Sub 1" and "Sub 2" shown in the right are incident lights on the sensor head, and the angles of each can be measured.

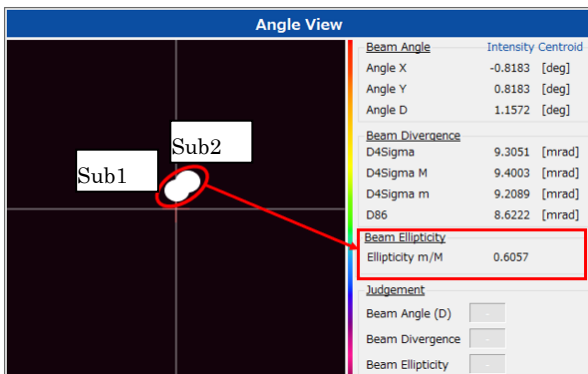
We move the two beam spots close to each other so that the Sub1 and Sub2 are nearly parallel.



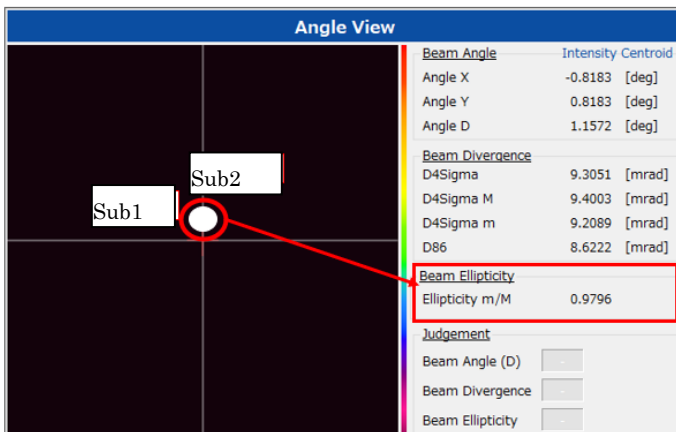
2. As the two light spots are getting closer like in the illustrated frame, the sensor recognizes them as a single elliptical light spot.



3. When the .2 above occurs, use the Beam Ellipticity function. It displays the light beam by ellipticity.

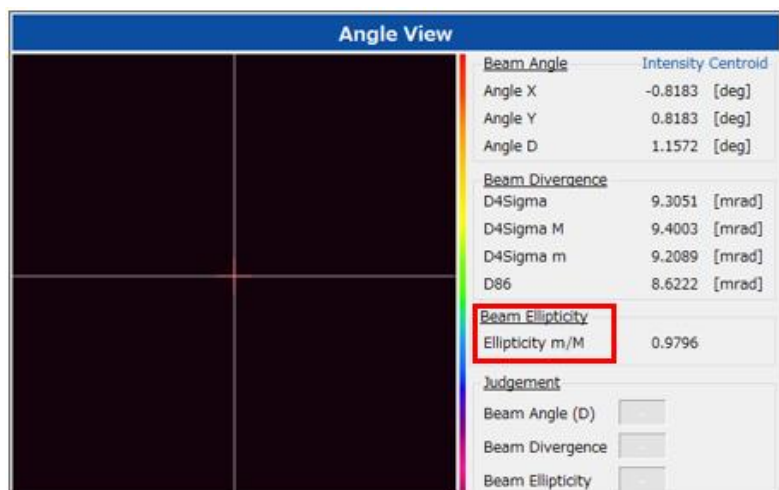
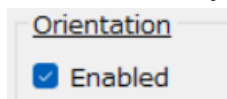


4. Bring the two beams even closer together. The closer the ellipticity is to "1.000", the closer the two measured objects are to being parallel.



For ellipticity measurement

Check the box "Enabled" in the "Orientation" option setting.

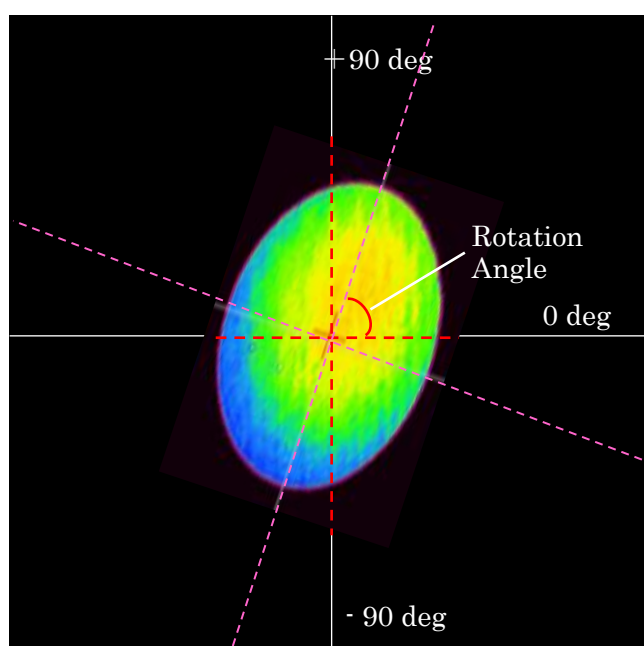


3.6. Rotation Angle Measurement

This function measures the rotation angle of the elliptical beam based on images captured by the camera and displays it on the screen. The rotation angle measurement is only available if the “Orientation” option setting is enabled.

The Definition of Rotation Angle

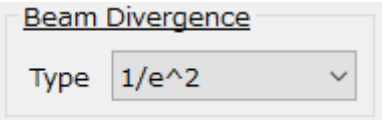
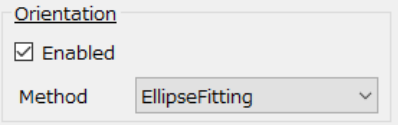
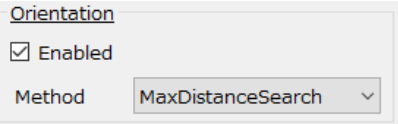
It is defined as the angle between the beam's principal axis in the rightward direction and the horizontal rightward direction. A positive (+) value is assigned when the principal axis points upward relative to the horizontal direction, and a negative (-) value when it points downward. The beam's major axis and minor axis are considered mutually perpendicular, and the rotation angle is expressed within the range of $\pm 90^\circ$.



Measurement Method

There are two types of measurement methods for a rotational angle.

Rotational Angle Measurement Compliant with ISO standards	
Select [D4Sigma] for the “Beam Divergence” in the option setting as below. Beam Divergence Type D4Sigma	Only if [D4 Sigma] is selected, Will the rotation angle be measured in accordance with ISO 11146-2.
Rotational Angle Measurement NOT Compliant with ISO standards	

Select [1/e²] for the “Beam Divergence” in the Option Settings as below. 	Only if [1/e²] is selected, will the following two non-ISO-compliant rotation angles be measured. *1
	[Ellipse Fitting]  This method performs elliptical fitting on the beam regions exceeding 13.5% of its peak value and calculates a rotational angle as the inclination of the major axis of the resulting ellipse. Advantage It obtains a high-precision rotational angle when a shape is close to an ideal ellipse, as this method considers an overall beam shape. [Maximum Distance of Two Points Search Method]  For the beam regions exceeding 13.5% of its peak value, the main axis is defined as the straight line passing through the centroid that maximizes the distance between two points where it intersects the beam boundary. The rotation angle is calculated based on the slope of the main axis. Advantage Although the beam shape contains distortion or noise, it easily obtains a stable rotation angle with minimal variation in the direction of the main axis.

*1 If a beam spot is small (approximately 3x3 pixels or less), the error increases due to reduced pixel resolution.

3.7. Judgement

The judgement function is available in an intuitively understandable expression of whether the measurement value is within the target range or not.

Here, for example, describes the procedures for Angle (D) and Peak.

Angle View				
		Beam Angle		Intensity Centroid
		Angle X		-0.8183 [deg]
		Angle Y		0.8183 [deg]
		Angle D		1.1572 [deg]
		Beam Divergence		
		D4Sigma		9.2701 [mrad]
		D4Sigma M		9.3874 [mrad]
		D4Sigma m		9.1513 [mrad]
		D86		8.5790 [mrad]
		Beam Ellipticity		
Ellipticity m/M		0.9748		
Judgement				
Beam Angle (D)		OK		
Beam Divergence				
Beam Ellipticity				

Angle View				
		Beam Angle		Intensity Centroid
		Angle X		-0.8183 [deg]
		Angle Y		0.8183 [deg]
		Angle D		1.1572 [deg]
		Beam Divergence		
		D4Sigma		9.2417 [mrad]
		D4Sigma M		9.2906 [mrad]
		D4Sigma m		9.1925 [mrad]
		D86		8.5695 [mrad]
		Beam Ellipticity		
Ellipticity m/M		0.9894		
Judgement				
Beam Angle (D)		NG		
Beam Divergence				
Beam Ellipticity				

For Angle (D)

1. Adjusting the angle and aim to set the "Angle(D)" of the measurement result to less than 0.5000. Enabling the "Angle(D)" in the "Judgement Settings" in the Option setting and enter the value to be "0.5000 deg".

Suruga OptGauge - H420CL-135R2-10-300A - H420CL-135R2-10-300A Ver.1.3.1 Options

Angle Communication

Measurement Display LD Control

Camera Settings

Exposure Time 1.000 [ms]

Frame Rate 40.000 [fps]

Rotation 0 [deg]

Mirroring ☐ Horizontal ☐ Vertical

Origin Offset

X 0.0000 [deg]

Y 0.0000 [deg]

Zero Set

Judgement

☒ Angle (D) 0.5000 [deg]

☐ Divergence 0.0000 [mrad]

Radius Type D4Sigma

☐ Ellipticity 0.0000 [-]

☒ Peak 4094.0 [cnts]

Log File

Full Color Image Raw

PNG

Cross Section

Point Origin Cursor

Moving Average

☐ Averaging 2 [-]

Auto Aperture

Method Intensity

☒ Enabled

ROI

☒ Enabled

X -520 [pix]

Y 520 [pix]

Width 1040 [pix]

Height 1040 [pix]

Angle Type

Type Tilt Angle

Denoising

☒ Threshold 100

Beam Centroid

Method Intensity

D4Sigma

☐ Orientation Enabled

Angle Unit

Degree

Multi Spot

Order Area

Spot Count 1 [-]

Min Spot Area 1 [pix]

Binning

☐ Enabled

Adaptive Cal

☐ Visible

Working Distance

30 [mm]

Options Select

Save Cancel

2. As a result of adjusting the angle, the result of Angle D on the measurement screen is not less than 0.5000 deg (1), so the judgment result is "NG" (2) at the "Tilt Angle(D)" of the "Judgement".



3. As a result of adjusting the angle one more time, the result of Angle D on the measurement screen is less than 0.5000 deg (1), so the judgment result of "Tilt Angle(D)" in "Judgement" is displayed as OK (2).



For Peak

1. Adjusting the light intensity and set the “Peak” of the measurement result to be less than 3500.
Set the “Peak” to be enabled in the “Judgement” configuration and the set its value to 3500.0.

Suruga OptGauge - H420CL-135R2-10-300A - H420CL-135R2-10-300A Ver.1.3.1 Options

Angle Communication

Measurement Display LD Control

Camera Settings

Exposure Time 1.000 [ms]
Frame Rate 40.000 [fps]
Rotation 0 [deg]
Mirroring ☐ Horizontal ☐ Vertical

Origin Offset

X 0.0000 [deg]
Y 0.0000 [deg]
Zero Set

Judgement

☐ Angle (D) 0.5000 [deg]
☐ Divergence 0.0000 [mrad]
Radius Type D4Sigma
☐ Ellipticity 0.0000 [-]
☒ Peak 3500.0 [cnts]

Log File

... ☐ Image ☐ Raw
Full Color PNG

Cross Section

Point Origin Cursor

Moving Average

☐ Averaging 2 [-]

Auto Aperture

Method Intensity
☒ Enabled

ROI

☒ Enabled
X -520 [pix]
Y 520 [pix]
Width 1040 [pix]
Height 1040 [pix]

Angle Type

Type Tilt Angle

Denoising

☒ Threshold 100

Beam Centroid

Method Intensity

D4Sigma

☐ Orientation Enabled

Angle Unit

Degree

Multi Spot

Order Area
Spot Count 1 [-]
Min Spot Area 1 [pix]

Binning

☐ Enabled

Adaptive Cal

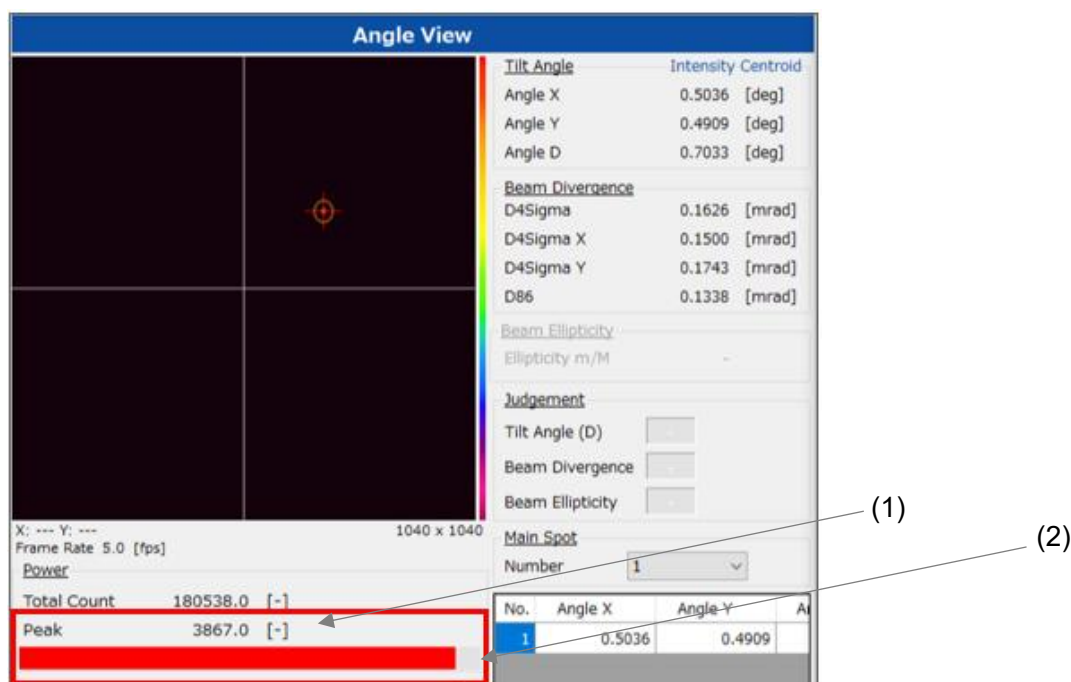
☐ Visible

Working Distance

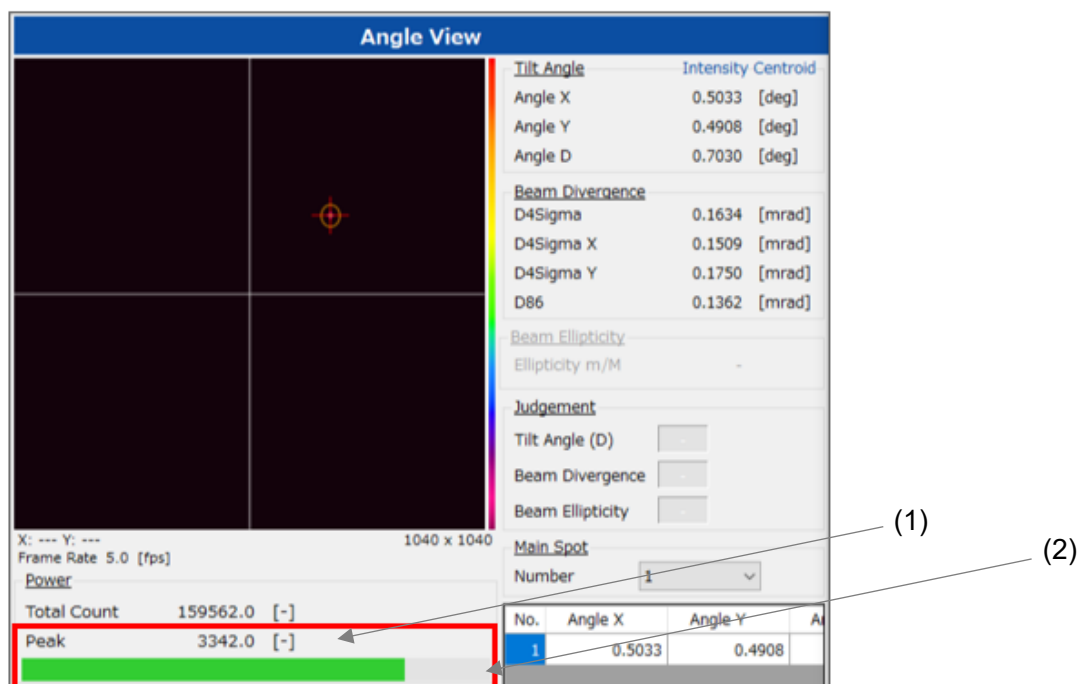
30 [mm]

Options Select ... Save Cancel

- Following light level adjustment, the Peak result on the measurement screen is not below 3500.0 (1), resulting in a non-conforming assessment. Consequently, the Peak bar indicator displays red (2).



- After readjusting the light intensity once more, the Peak reading on the measurement screen fell below 3500.0 (1), resulting in an OK judgement. Consequently, the Peak bar indicator will display green (2).



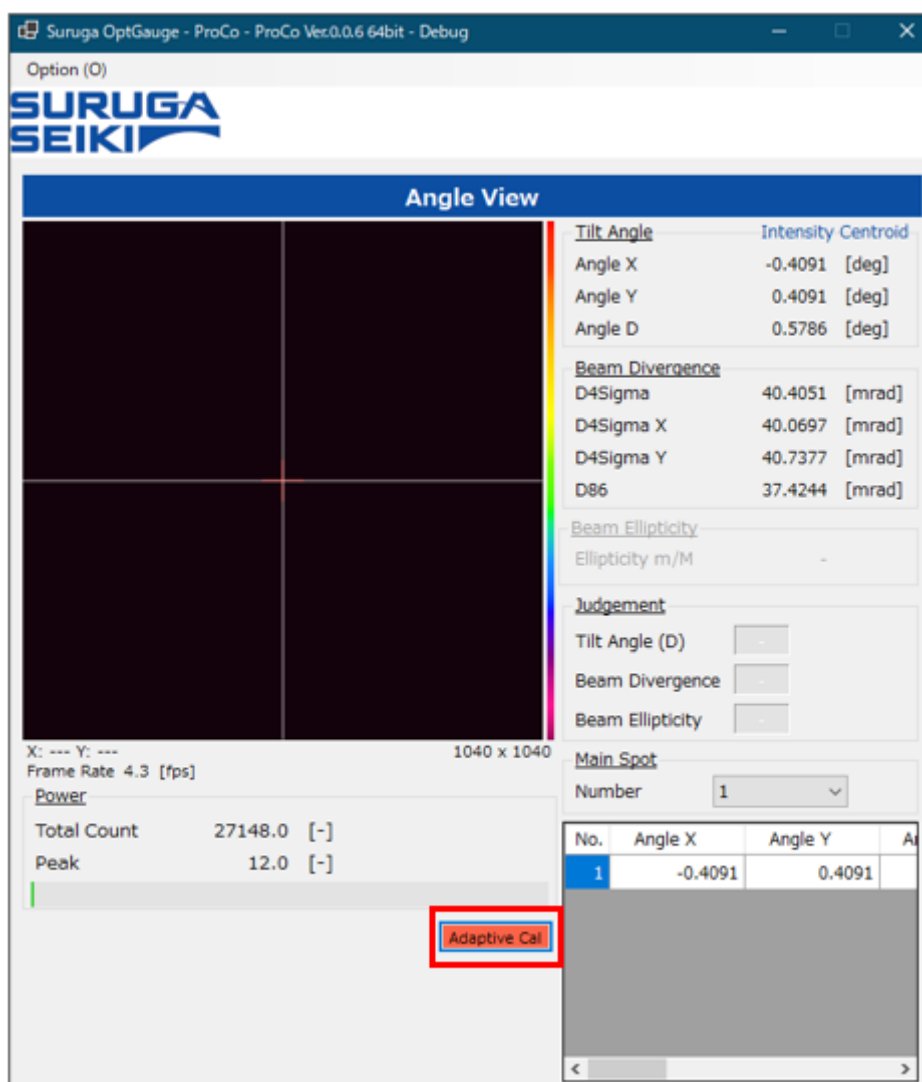
3.8. Adaptive Cal

The Adaptive Cal is a function that removes a certain amount of noise from the entire image data acquired by the sensor camera, thereby reducing measurement errors caused by noise.

It is also an automatic noise reduction function that calculates a baseline correction value and offsets this amount from each pixel data.

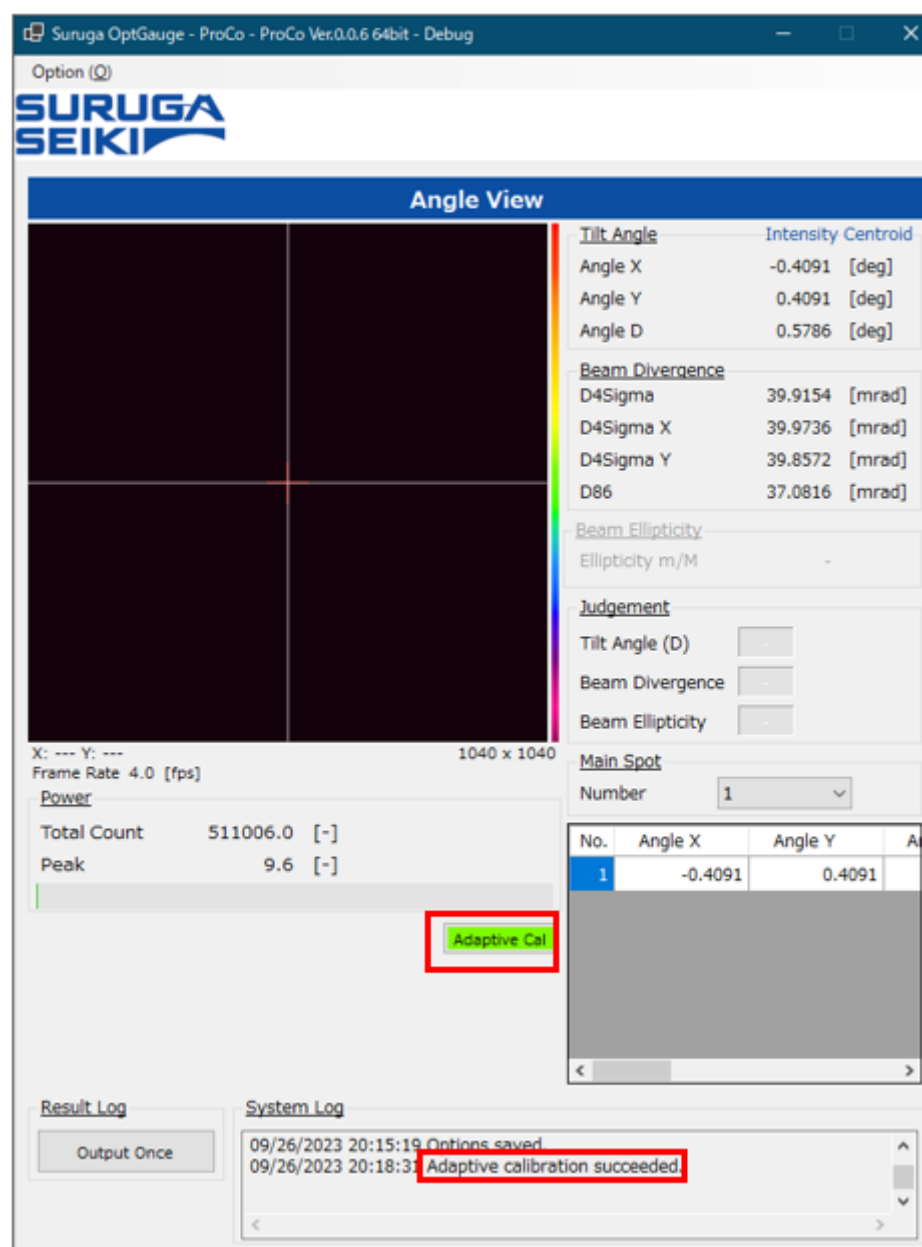
It must be executed each time the exposure time in the camera settings is changed after launching the Software.

1. Ensure the beam light is not incident on this product.
2. Enable the optional Adaptive Cal*1 setting and click the [Adaptive Cal] button.



3. When Adaptive Cal is executed, the button color changes.
4. When the system log shows “Angle adaptive cal succeeded” the Active Cal is executed.
5. Thereafter, set the light beam incoming to the product and begin measurement.

Note: *1 For details of optional features, refer to the separate software manual, the “Suruga OptGauge User's Manual”.

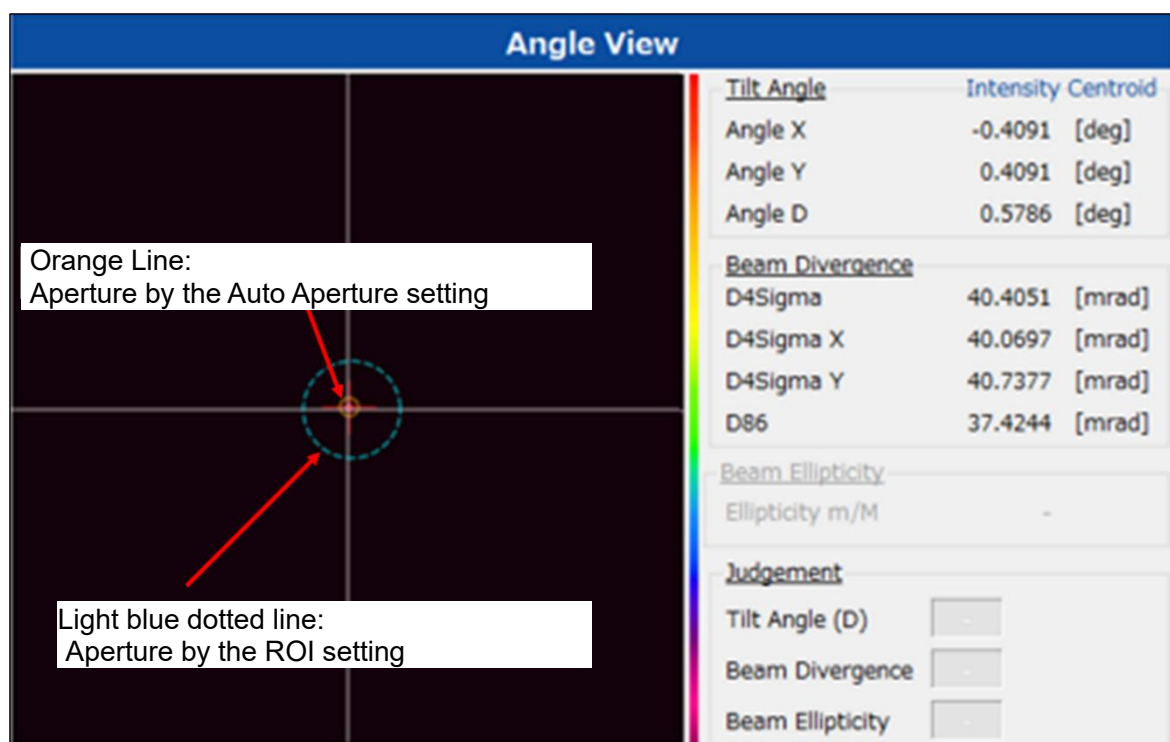


Attention

If the beam is incoming to the product or the ambient light is causing serious noise, adaptive calibration will not succeed. Execute in an environment where light does not enter the sensor camera. Also, disable the denoising function for use.

3.9. Aperture

The “Auto Aperture” and “ROI” settings are available to eliminate that the effects of noise such as ambient light are not included in the beam divergence measurement results. By using these two functions, measurement excluding ambient light can be achieved.



Aperture Explains.

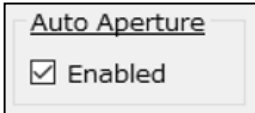
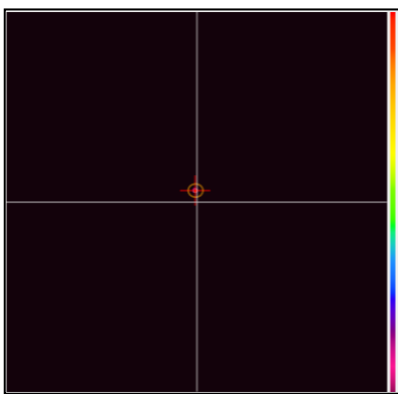
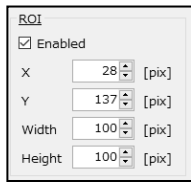
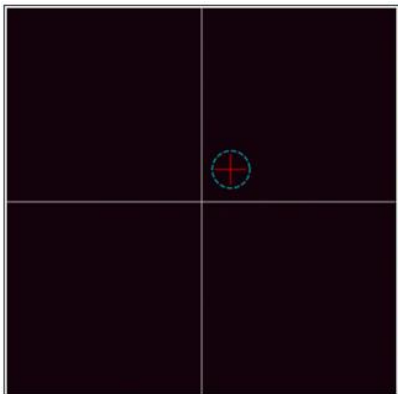
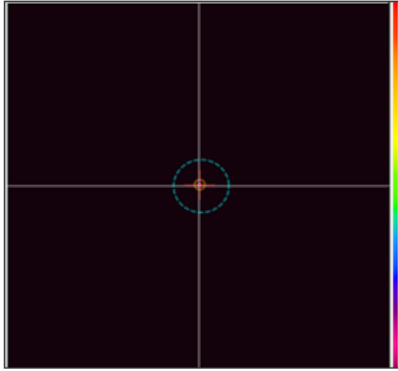
Auto Aperture	It is suitable for measuring dynamic beams in which the position, size, shape, or intensity of the beam may vary over time. It automatically adjusts aperture.
ROI	It is suitable for measuring beams in which position, size, shape, and intensity rarely vary with time. The aperture must be adjusted manually.

Info

Using the Auto Aperture and the ROI simultaneously allows you to emphasize only the critical aspects of the beam's intensity, shape, and position, thereby minimizing the effects of noise and interference.

This results in improved measurement accuracy. When the beam position remains unchanged, we recommend using both simultaneously.

Setting Methods

For Setting Auto Aperture	
Check the box [Enabled] in the "Auto Aperture" option setting 	
For Setting ROI	
Enable "ROI" in the option settings and set the X, position, width, Height (size) to enclose the beam. 	
For Setting Auto Aperture and ROI	
To enclose the light beam, set the "Auto Aperture" and "ROI" to "Enabled" in the option settings, and set the X, Y (location), Width, and Height (size) of the "ROI".	

3.10. Origin Offset

The Origin Offset function offsets the sensor camera center position from the default position to any position as desired.

By using the offset function, an arbitrary position can be aligned as the reference position.

There are three offset methods.

Setting Methods

For Setting from the Option Screen

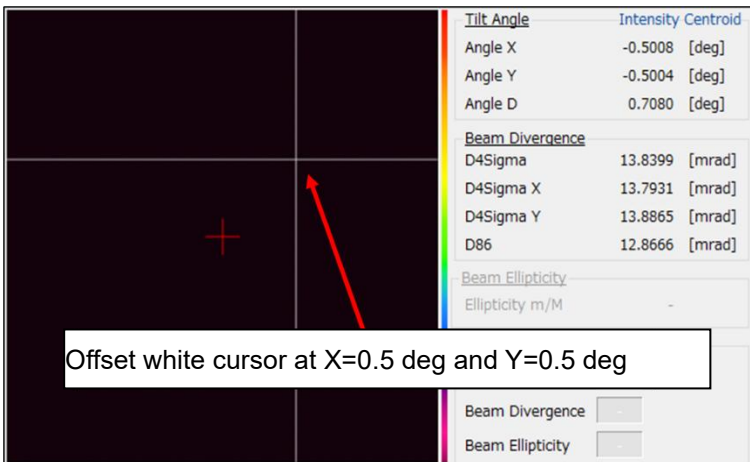
Set the desired values in the “Origin Offset” option settings.

Origin Offset

X 0.0000 [deg]

Y 0.0000 [deg]

Ex.: Set at X = 0.5deg, Y = 0.5deg



Tilt Angle		Intensity Centroid
Angle X	-0.5008 [deg]	
Angle Y	-0.5004 [deg]	
Angle D	0.7080 [deg]	
Beam Divergence		
D4Sigma	13.8399 [mrad]	
D4Sigma X	13.7931 [mrad]	
D4Sigma Y	13.8865 [mrad]	
D86	12.8666 [mrad]	
Beam Ellipticity		
Ellipticity m/M	-	

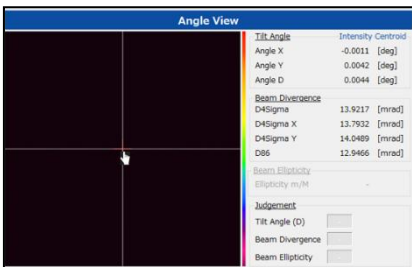
Beam Divergence

Beam Ellipticity

For Setting from the View Screen

1. Open the option setting screen.
2. Target the view screen cross (white) with cursor.
3. When the mouse icon changes, perform “drag and drop.”

Angle View



Tilt Angle		Intensity Centroid
Angle X	-0.0011 [deg]	
Angle Y	0.0042 [deg]	
Angle D	0.0044 [deg]	
Beam Divergence		
D4Sigma	13.9217 [mrad]	
D4Sigma X	13.7932 [mrad]	
D4Sigma Y	14.0489 [mrad]	
D86	12.9466 [mrad]	
Beam Ellipticity		
Ellipticity m/M	-	

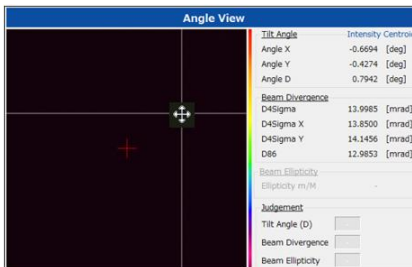
Judgement

Tilt Angle (D)

Beam Divergence

Beam Ellipticity

Angle View



Tilt Angle		Intensity Centroid
Angle X	-0.6694 [deg]	
Angle Y	-0.4274 [deg]	
Angle D	0.7942 [deg]	
Beam Divergence		
D4Sigma	13.9985 [mrad]	
D4Sigma X	13.8500 [mrad]	
D4Sigma Y	14.1456 [mrad]	
D86	12.9853 [mrad]	
Beam Ellipticity		
Ellipticity m/M	-	

Judgement

Tilt Angle (D)

Beam Divergence

Beam Ellipticity

4. Once changing "Origin Offset", save the Option settings.

Origin Offset

X 0.6747 [deg]

Y 0.4445 [deg]

44

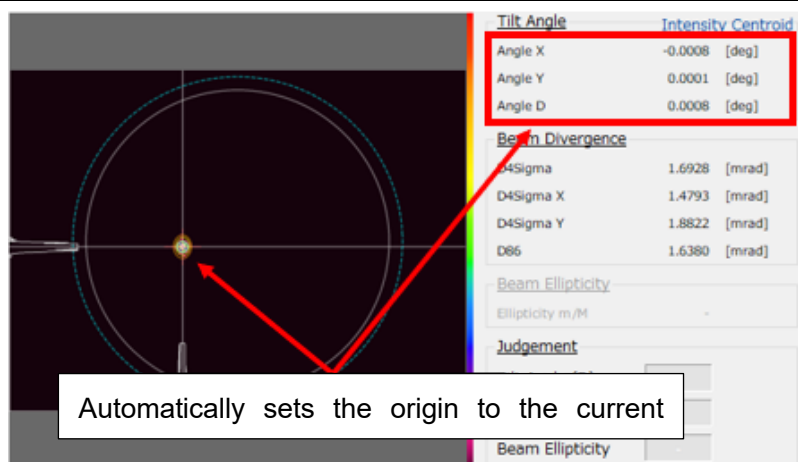
For Setting by the Zero Set button

Press the “Zero Set” button in the option settings.

Origin Offset

X	0.0000	[deg]
Y	0.0000	[deg]

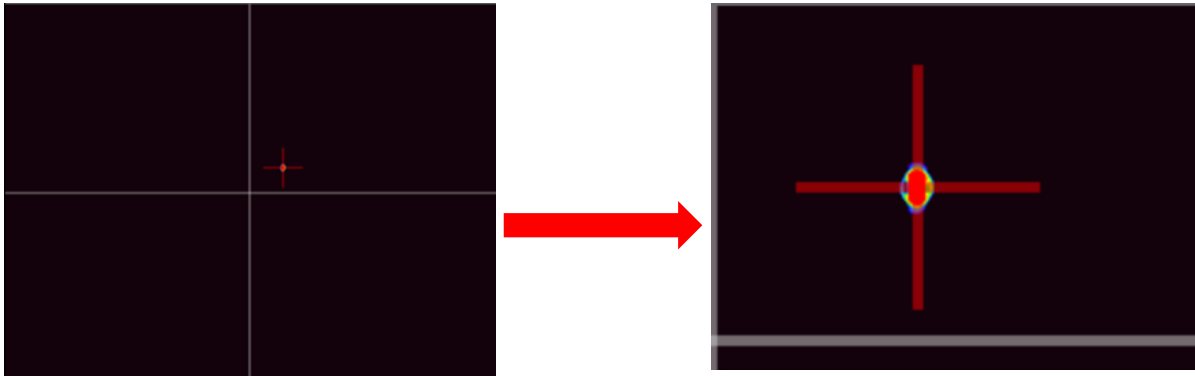
*The values of Origin Offset X and Origin Offset Y will be automatically set to the current measurement coordinates.



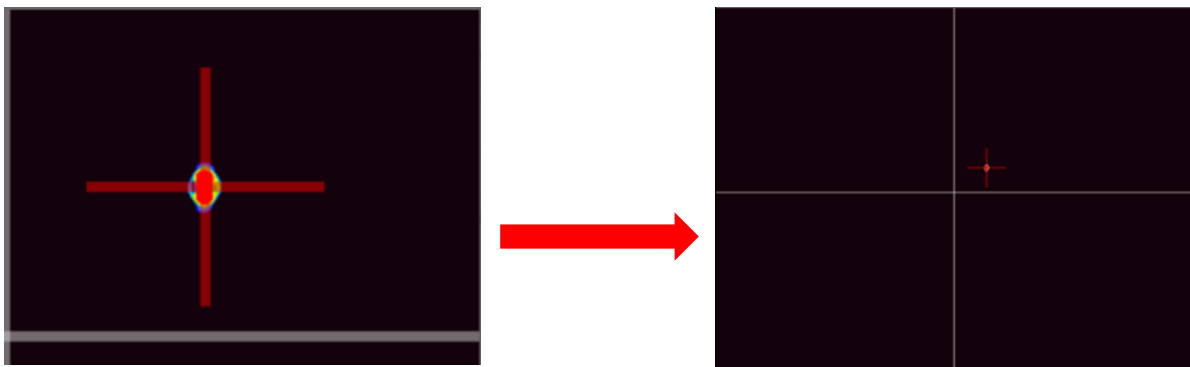
3.11. Zoom In

A zoom function is available for the observation of the light beam status on the View screen.

1. To zoom in, hold down the Ctrl key and scroll the mouse wheel forward (upward) on the View screen.



2. You can adjust the display position using mouse drag operations.
3. To zoom out, hold down the Ctrl key and scroll the mouse wheel backward (downward) on the View screen. You can continue the Zooming Out until the display to its original size.



4. To exit the zoom mode, right-click on the mouse in the View screen.

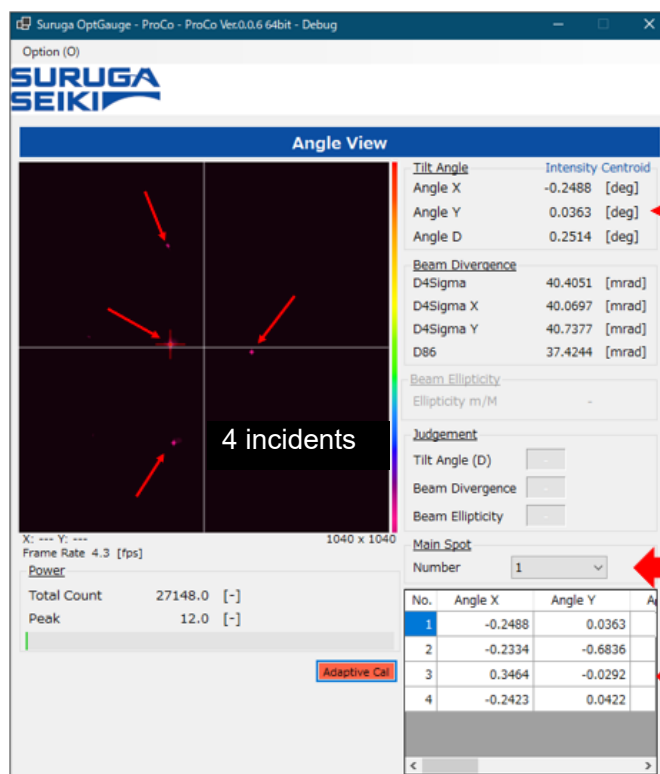
3.12. Multi Spot

The Products support multi-spot measurement of up to 100 spots simultaneously.

The use of the Multi Spot setting enables the measurement results screen display order and number to be set.

Detection conditions can also be set to filter measurement targets.

Ex. Explaining the screen for detection of multiple beams (4 spots)



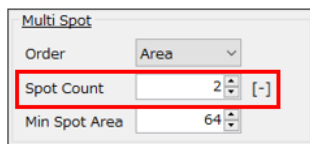
By changing "Number", the corresponding Number (No.) in the list below can be displayed in the Title Angle at the top.

Displays the measurement results of 4 spots on the measurement results screen. The list is automatically updated with the number of detected beams.

Setting method

To enter the number of measuring spots to be displayed

Change "Spot Count"
in the option settings.



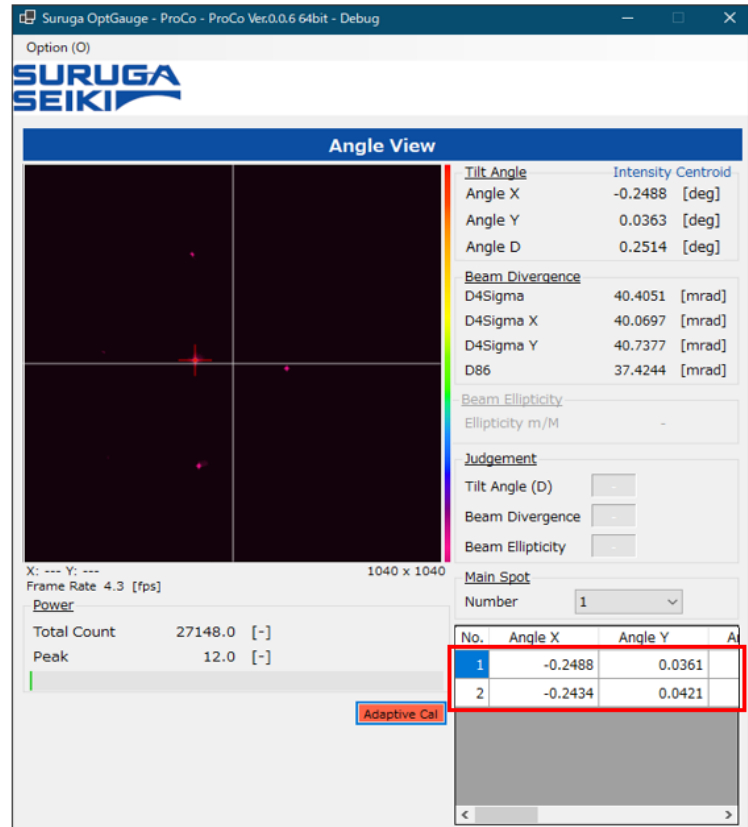
Multi Spot

Order: Area

Spot Count: 2 [-]

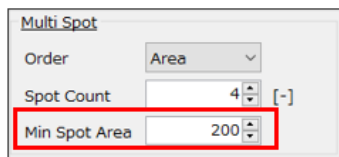
Min Spot Area: 64

Changing "Spot Count" enables the number displayed on the measurement results screen to be designated.



To enter the conditions (size) of the beams to be detected as measurement targets

Change "Min Spot Area"
in the option settings.



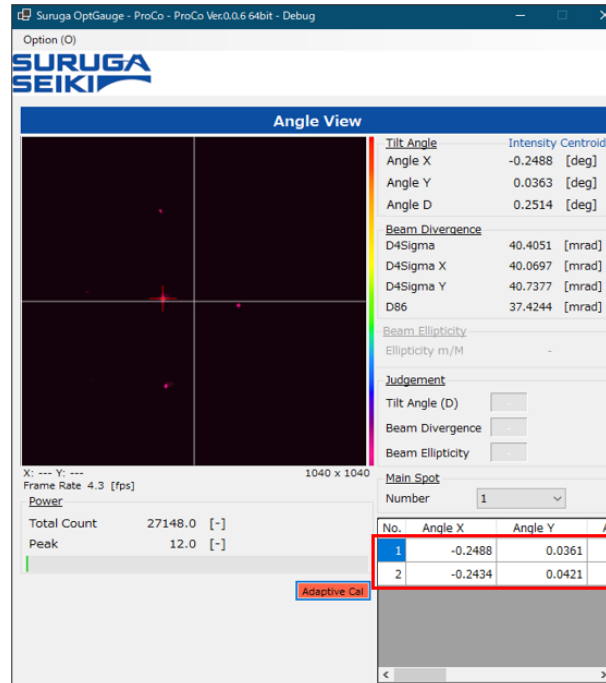
Multi Spot

Order: Area

Spot Count: 4 [-]

Min Spot Area: 200

Changing "Min Spot Area" enables the conditions of the beams to be detected as measurement targets to be designated.



Info

Use pixels for the values set for beam conditions.

The setting example detects beam areas of 200 pix or higher received by the camera as measurement targets.

3.13. Automatic Brightness Control

The Products regulate the exposure time and automatically adjust the beam's peak brightness value to a specified level.

Note that within the 'LD Adjustment' group, if the reflectance of the measurement target is unknown, please input the default value of 100 for 'Reflectivity'.

3.13.1. Brightness Control Methods

There are two methods for automatic brightness control.

Brightness Control Method	Features
Adjustment for the entire image	Saturation is less likely to occur across the entire camera image.
Adjustment for Main Spot	The peak value of the specified Main Spot can be adjusted to the target value, optimizing the brightness of the spot to be measured.

The brightness control method is switched according to the Option settings -> "Order".

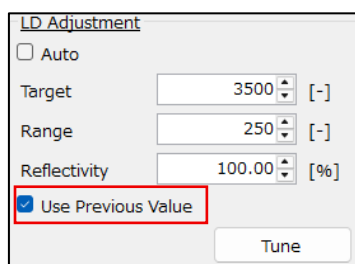
Order	Brightness Control Method Applied
Angle / Area	Adjustment for the entire image
Peak / Total Count	Adjustment for Main Spot

3.13.2. Operating Overview

The brightness control method operates in the following sequence. 1. Adjustment of exposure time
Finally, the beam brightness value (Peak) is adjusted so that it falls within the target value (Target) $\pm$ allowable range (Range).

■ Use Previous Value

When "Use Previous Value" is enabled, the exposure time (Exposure Time) determined during the previous auto brightness control are used as the initial values. If the measurement conditions or adjustment environment have not changed significantly since the last time, this can shorten the time required to complete auto brightness control.



LD Adjustment

☒ Auto

Target [-]

Range [-]

Reflectivity [%]

☒ Use Previous Value

Tune

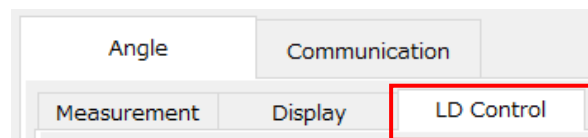
Note that the previous values will be reset if any of the following related settings are changed:

- LD Control->Camera Settings
- LD Control->LD Adjustment
- LD Control->Auto Exposure Time

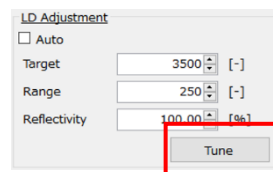
3.13.3. Automatic Brightness Control (Single Execution)

The following procedure explains how to manually execute the Automatic Brightness control at an arbitrary timing.

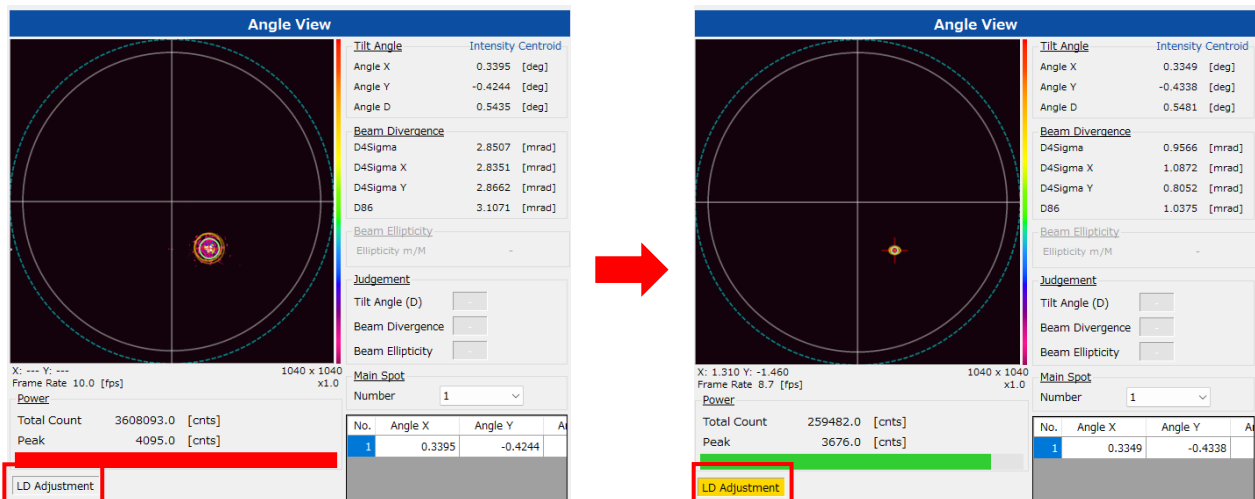
1. Open the Options window and select the LD Control tab.



2. Click the Tune button in the LD Adjustment group.



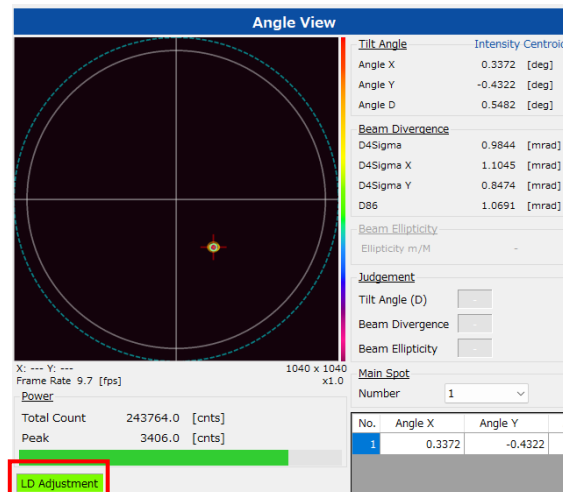
3. Automatic Brightness control starts.



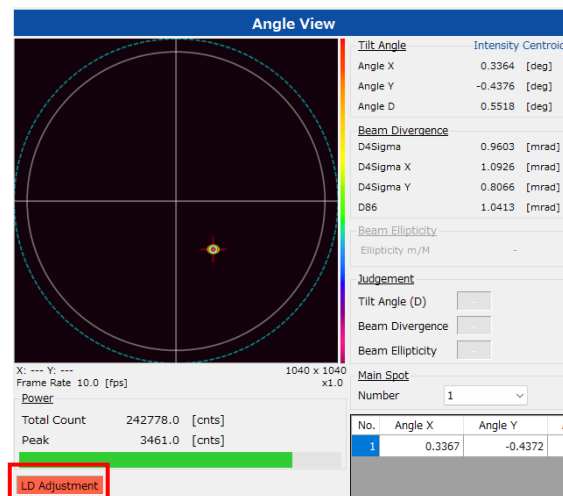
Note1: The 'LD Adjustment' option on the main screen will appear greyed out when the automatic brightness is not in operation.

Note2: Once the automatic brightness is commenced, the 'LD Adjustment' will display in yellow, indicating that automatic dimming is active.

4. Automatic Brightness control completes.



Note: After completing the adjustment, successfully, the LD Adjustment section will be turned to green, indicating the successful completion.



Note: If the adjustment fails, the LD Adjustment section will be turned red to indicate the failure.

Note

- To avoid incorrect brightness adjustment results, do not change the Main Spot or the Option setting for "Order" while dimming is in progress.

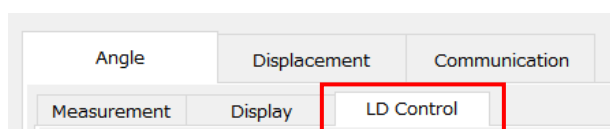
3.13.4. Automatic Brightness Control (Continuous Execution)

When the beam light moves due to angle or displacement, the luminance value may increase or decrease.

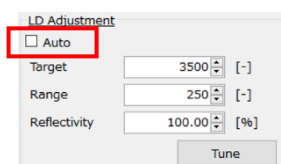
To retain the luminance value at the designated value even when the beam light moves, execute constant automatic brightness.

The usage method for constant automatic brightness is indicated below.

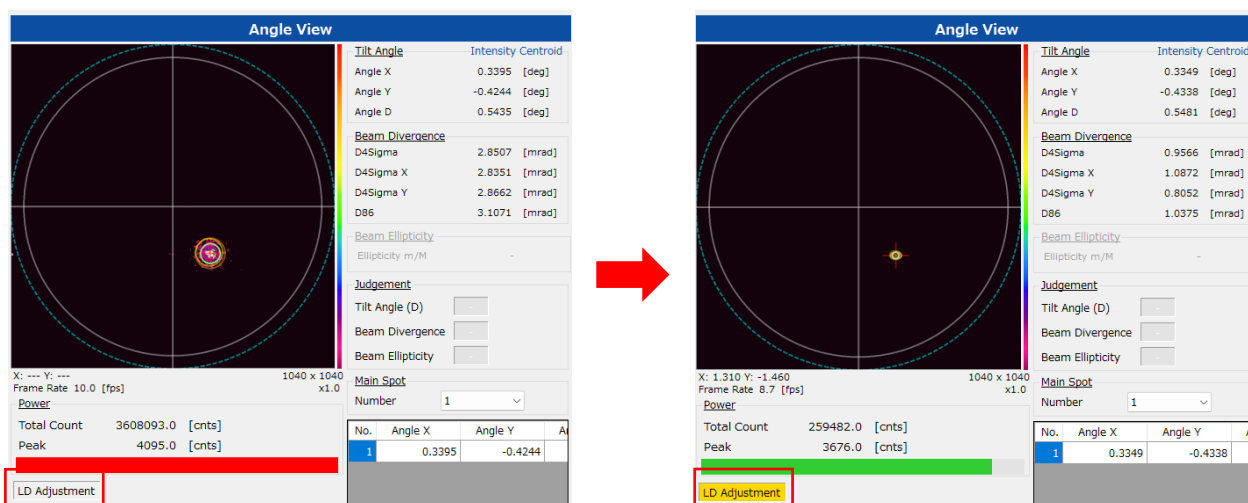
1. Open the Options window and display the LD Control tab.



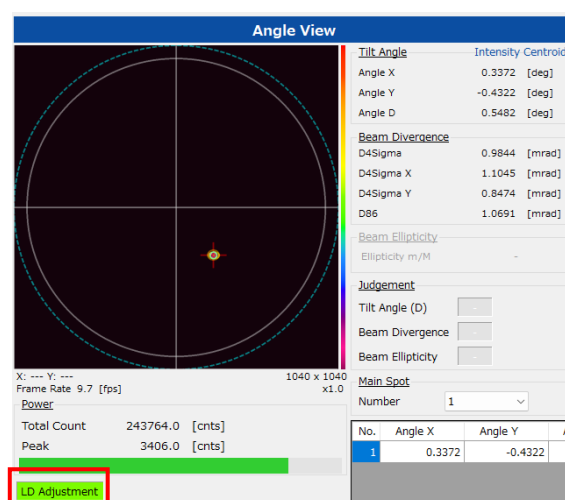
2. Checkbox for the Auto LD Adjustment enter values.



3. The Automatic Brightness control starts.



4. The Automatic Brightness control completes.



From this point onward, the Automatic Brightness control will be executed when the measured brightness value goes beyond the range specified in the Range option. The brightness range is set beforehand in the Target Option in the LD Adjustment Window.

Notes

- Automatic brightness control assumes that the spot is correctly detected.
- The control method changes according to the Order setting. If the intended brightness is not achieved, please check the settings.
- When automatic brightness control settings are changed, the previous convergence values are reset.

Summary

- **To adjust brightness of the entire image** → Set Order to Angle or Area
- **To adjust brightness of a specified spot** → Set Order to Peak or Total Count
- **To further shorten auto adjusting time** → If measurement conditions or adjustment environment have not changed much after one auto dimming, set "Use Previous Value"
- **To perform automatic brightness control only once** → Use LD Adjustment -> Tune
- **To keep automatic brightness control always on** → Use LD Adjustment -> Auto

3.14. 2-Point Parallel Adjustment Mode

This function is used with the T-splitter (parallelism measurement accessory) to adjust multiple measurement points to the same angle.

When this mode is enabled, the spot size (Spot Pixels) is displayed in pixel units to assist with the parallel adjustment of two points. Since adjustments can be made while checking the values in pixel units, highly reproducible and high-precision parallel adjustment is possible.

This mode is used for adjustment operations such as:

- Simultaneous adjustment of two points when using the T-splitter
- Parallelism adjustment to align multiple beams at the same angle
- Fine adjustments based on changes in spot size rather than angle values

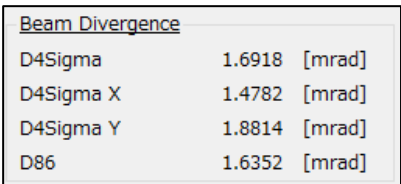
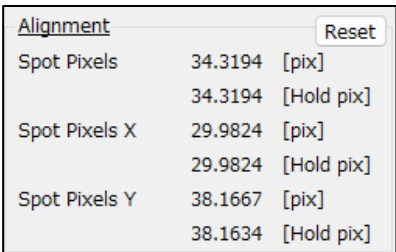
How to enable/disable 2-Point Parallel Adjustment Mode:

1. Open the Option screen.
2. Enable "Parallel Adjustment Mode".
3. When the mode is enabled, the display on the Angle View screen will switch.

※ This mode can be switched on/off via both the UI and command operations.

Display Switching

The contents displayed in the measurement results section will switch depending on whether the 2-Point Parallel Adjustment Mode is enabled or disabled.

Disabled	
When "Parallel Adjustment Mode" in Option settings is [Disabled]:	Divergence is displayed. 
Enabled	
When "Parallel Adjustment Mode" in Option settings is [Enabled]:	Divergence is not displayed; instead, spot size (Spot Pixels) is displayed. 

Spot Size Display Contents

When 2-Point Parallel Adjustment Mode is enabled, the following spot sizes are displayed.

Spot size is based on the **D4 σ beam diameter**.

- **Spot Pixels** : D4 σ
- **Spot Pixels X** : D4 σ (X direction)
- **Spot Pixels Y** : D4 σ (Y direction)

All units are in **Pixels**.

Minimum Spot Size Holding Function

While 2-Point Parallel Adjustment Mode is enabled, the **minimum value** of each spot size (X / Y / D) is **automatically held and displayed**.

By checking the smallest spot size during adjustment, you can determine the optimal adjustment position.

- Minimum value holding starts when the mode is turned ON.
- When the mode is turned OFF, the held minimum value is cleared.

<u>Alignment</u>		Reset
Spot Pixels	34.3194 [pix]	34.3194 [Hold pix]
Spot Pixels X	29.9824 [pix]	29.9824 [Hold pix]
Spot Pixels Y	38.1667 [pix]	38.1634 [Hold pix]

Minimum Spot Pixels Reset

If you want to re-measure the minimum spot Pixels, **perform the minimum spot Pixels reset operation** to update the held minimum value to the "current latest spot Pixels."

<u>Alignment</u>		Reset
Spot Pixels	34.3194 [pix]	34.3194 [Hold pix]
Spot Pixels X	29.9824 [pix]	29.9824 [Hold pix]
Spot Pixels Y	38.1667 [pix]	38.1634 [Hold pix]

Notes

About Spot Switching

When the two spots overlap into one, check the Main Spot Number and set it to "1" if it is not already "1".

※If anything other than "1" is specified, you may be selecting a non-existent spot, and the measurement value may be displayed as "-".

About Automatic Switching Behavior

When 2-Point Parallel Adjustment Mode is enabled, some measurement options are automatically switched to ensure correct spot size measurement.

- Orientation (rotation angle measurement): Fixed to OFF
- Beam Divergence->Type (rotation angle measurement method): Fixed to D4Sigma

These settings **will return to their original state** when 2-Point Parallel Adjustment Mode is disabled. There is no need for the user to reconfigure them individually.

Summary

- **Turn ON 2-Point Parallel Adjustment Mode** when you want to align two points at the same angle
- Check the display for Spot Pixels (spot Pixels in pixels) instead of angle
- When there is only one spot, ensure that Main Spot Number is set to "1"
- Use the **minimum spot size display** as a reference during adjustment
- If you want to redo the adjustment, use the **minimum value reset**

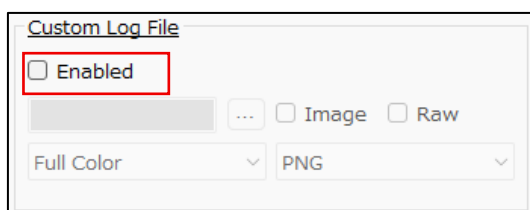
3.15. Custom Log Output

This function allows users to freely select and edit the measurement result output items, **enabling output of only the required measurement items in the specified order**. It supports CSV file output, image data saving, command output, and streaming output, making it suitable for integration with external systems and data analysis purposes.

Differences Between Normal Output and Custom Output

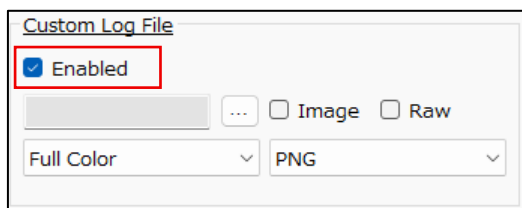
Normal Output: When Custom Log File is “Disabled”

- All measurement result items corresponding to the view type are output.



Custom Output: When Custom Log File is “Enabled”

- Outputs data in the format set on the Custom Result editing window.
- Output items and their order follow the user settings.
- The settings of saving image data and raw image data also follow the Custom Log File settings.



Basic Usage (CSV Output)

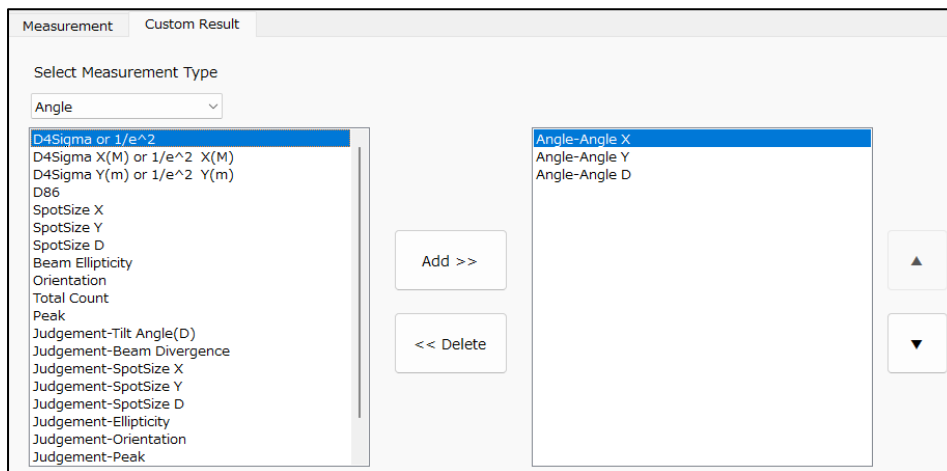
1. Open the Custom Result settings window

Open the Option window and go to the Common -> Custom Result tab.

2. Set the output items (Custom Result Output)

1. Select the measurement type (Angle) *Angle is fixed
2. Select the items you want to output from the "Output Item List".
3. **Add them to the "Edited Result List" using the Add button**
4. Adjust the order as needed using the ▲ (up) / ▼ (down) buttons

※ Items added to the Edited Result List will no longer be shown in the Output Item List.



3. Enable the Custom Log File

Set "Enabled" to ON for the Custom Log File.

- Set the output file path
- Set whether to output Image and Raw data
- Set the image output format (PNG/BMP/TIFF) and color type (Full Color/Gray Scale)

4. Save the settings

The Custom Result settings will not be enabled unless the Option settings are saved.

After making changes, be sure to click Save.

If not saved, the output will follow the previously saved settings.

5. Output the measurement results

When you press the **Output Once** button on the View screen, a CSV file will be output in the configured format.

- Each time the button is pressed, the measurement results are **appended to the end of the existing file**
- If the output items are changed, **the header row will be output again**

Output during measurement stop

If Output Once is executed while measurement is stopped, the result immediately before the measurement was stopped is output.

Operation during streaming output

When the Streaming function is ON, the same format as set in Custom Result will be output to the streaming port.

※ For streaming output, the custom format is used regardless of whether Custom Log File is ON or OFF.

About Image Data Saving

When the Custom Log File is enabled, the following image data can be saved together with the measurement results:

- Image data from the View screen (.png/.bmp/.tiff)
- Raw image data (CSV format)

Notes

- Changes to Custom Result settings become effective **only after saving in Options**
- When the output format is changed, the header will be output again
- A directory containing the product serial number is automatically added to the output path

Summary

- **To output only the required items** → Edit with Custom Result
- **To manage saving formats collectively** → Enable Custom Log File
- **Always save after changing settings**
- **The same format can be used for both Output Once and Streaming**

3.16. Measurement Result Streaming Output

This function enables measurement results to be transmitted in real time and continuously to an external control system.

When this function is enabled, measurement results are automatically sent each time a measurement is completed, allowing data to be received without the need for sequential acquisition by commands. It is suitable for integration with external control systems and data collection software.

Features of Streaming Output

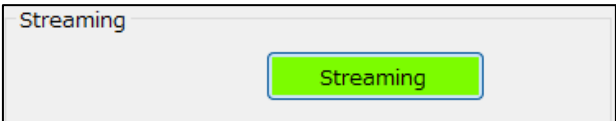
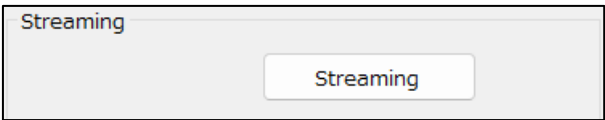
- **Automatic, continuous transmission** of measurement results
- **Real-time output** via TCP/IP communication
- Output content **can be customized** using the Custom Result settings
- Error notifications are also available

Enabling/Disabling the Streaming Function

1. Open the Option screen.
2. Click the "Streaming" button on the Communication tab.

※ This mode can be toggled using both the UI and command operations.

Operation Overview

Streaming ON
Measurement results are sent from the streaming port each time they are generated. 
Streaming OFF
No streaming transmission is performed. 

Streaming Output Timing

Streaming output is automatically performed **whenever measurement results are calculated**.

- Measurement result calculated
 - Output data created
 - Sent to the streaming port

Output Data Content

The data content output by streaming follows the format set in "**Custom Result**".

- Frame number (hyphen Fixed)
- Measurement date and time (yyyy/MM/dd HH:mm:ss.fff), e.g., 2026/04/1 10:15:30.123
- Output items set in Custom Result

About the Streaming Communication Port

Streaming output uses **a different TCP port** than regular command communication.

- The port number for streaming is set automatically
- It can be checked on the Communication tab of the Option window
- The software sets the port standby when it launches

The connection status is displayed in the System Log.

About Notification Output

In addition to measurement results, the following notification information is also sent via streaming output:

- **Error Notification**

System error	ER,-1
Sensor disconnection error	ER,7

Notification data is sent from the streaming port in the same way as measurement results.

Notes

- The content of streaming output **depends on** the settings in "Custom Result."
- After changing settings, be sure to save the Option settings.
- The measurement process is prioritized over the communication environment, so older data may be discarded.

Summary

- **To acquire data in real time** → Turn Streaming ON
- **To edit the output content** → Configure Custom Result
- **To link with an external control system without stopping measurement** → Use streaming output

3.17. Background Operation

This function allows the software to start and operate in background without displaying the UI.

By combining it with command control from an external control system or streaming output, it can be used for automatic measurement and equipment integration without relying on the UI.

Main Applications

- **Fully automated control** from a host system
- **Light operation** without UI display
- **Background operation** when embedded in equipment
- Measurement operation as an always-on process

How to Start Background Operation

To run in background mode, specify command line arguments (startup options) when launching from the command line.

Startup command example:	SurugaOptGauge.exe -Hide "path of authentication file"
---------------------------------	--

※When this software is installed, the executable file (SurugaOptGauge.exe) is placed by default in the following folder:

- C:\Program Files\SurugaSeiki\SurugaOptGauge\

Description of Command Line Arguments (Startup Options)

UI Hide Option (-Hide)
• Specify -Hide as an argument, the software will start in the background without displaying the UI. • Uppercase and lowercase letters are not distinguished (e.g., -hide, -HIDE are also acceptable). • If -Hide is not specified, the software will start with the normal UI display.
Authentication File Selection
• Specify the authentication file enclosed in double quotation marks. • The software will start using the sensor linked to the specified authentication file.

※ The order of arguments is arbitrary.

Authentication File Selection and Behavior on Startup

Startup with UI Display

The authentication file used depends on the startup method in the following order:

1. **If the authentication file is specified via command line at startup**
→The specified authentication file is used to start the software.
2. **If no authentication file is specified via command line at startup**
→If Quick Start is configured, the specified authentication file is used to start the software.
3. **If no authentication file specified by neither the command line nor Quick Start**
→The Boot Manager will launch.

Startup with UI Hidden (Background Operation)

Startup is basically performed via command line.

1. **If the authentication file is specified via command line at startup**
→The specified authentication file is used to start the software.
2. **If no authentication file is specified via command line at startup**
→If Quick Start is configured, the specified authentication file is used to start the software.
3. **If no authentication file specified by neither the command line nor Quick Start**
→ The software will not launch. (An error code will be output.)

Display and Operation During Startup

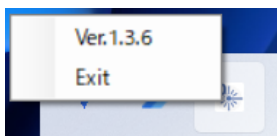
Task Tray Display

- When starting without UI, the software **displays an icon only in the task tray**.
- It will not be shown on the taskbar.

Task Tray Operation

Right-click the icon in the task tray, the following operations are available:

- Show version
- Exit (close the application)



How to Operate (During Background Operation)

While running in the background, **operation from the screen is not possible**.

Operate using the following methods:

- Command control from external devices
- Turn on streaming output to obtain measurement results

How to Exit Background Operation

While running in the background, this software can be exited in the following ways:

- Right-click the icon in the task tray → Exit
- Send an application exit command

Notes

- Even if there are unsaved option settings, the software will exit **without saving them**.
(It is recommended to execute the option save command before exiting.)
- When started with the UI displayed, the application exit command cannot be used.

Behavior When Startup Fails

If startup fails in UI hidden mode (background operation), an error code will be output to the command line.

Command format error	1
Authentication file does not exist / not specified	2
Sensor already in use	3
Software already started	4
Sensor not connected / authentication file loading failed	5
Invalid option file detected	6

Notes

- During background operation, UI operation is not possible.
- Control is **only possible via commands**.
- Not specifying an authentication file will cause startup failure.

Summary

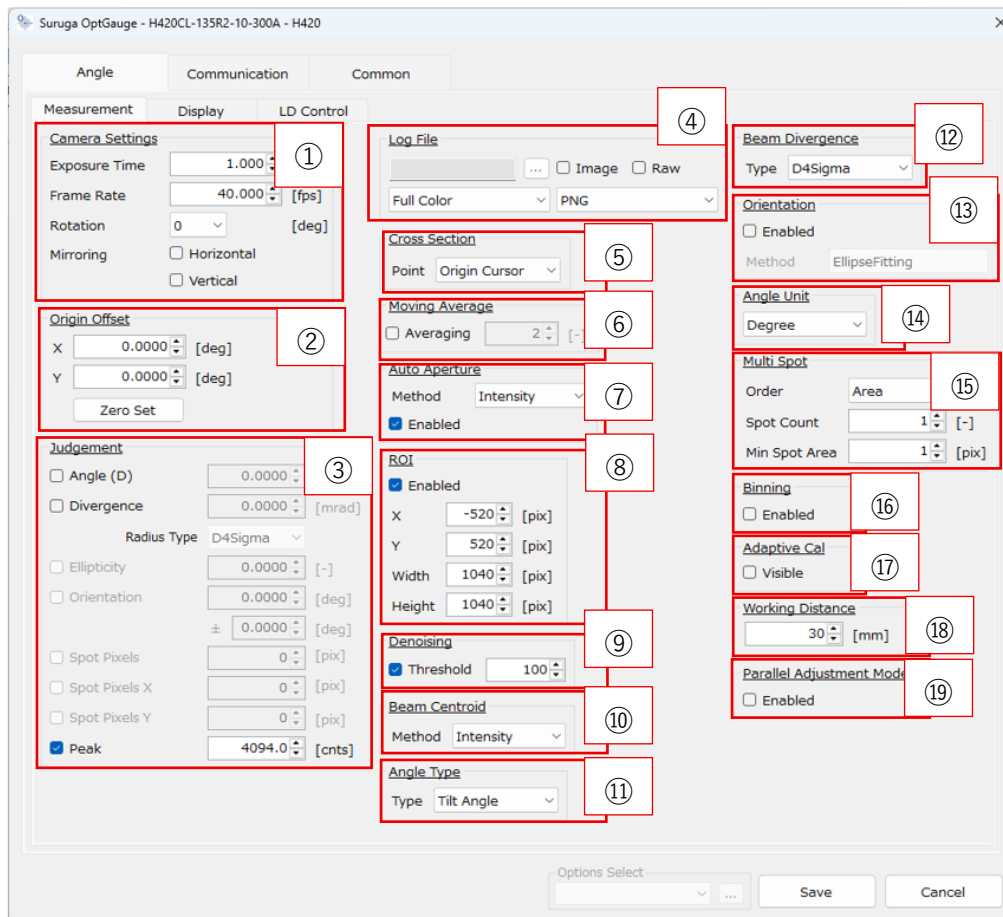
- **If want to run without using the UI** → Start in background with the -Hide option
- **For automatic measurement or equipment integration** → Use in combination with streaming output
- **Exit via task tray or command**

4. Option

4.1. Names and Functions of Each Option

4.1.1. Angle

4.1.1.1. Measurement



① Camera Settings		
Exposure Time	Sets the sensor camera exposure time. (def. = 1.0) Setting range: 0.027 to 2000.000	
Frame Rate	Sets the sensor camera frame rate. (def.=40.000) Setting range: 0.1 to 100.000	
Rotation	Sets the display rotation of the image	
	0 (def.)	No Rotation.
	90	Rotate the image clockwise by 90 degrees
	180	Rotate the image clockwise by 180 degrees
	270	Rotate the image clockwise by 270 degrees

Mirroring	Horizontal	Vertical	Sets mirroring
	Disabled (def.)	Disabled (def.)	No mirroring
	Enabled	Disabled	Horizontal mirroring
	Disabled	Enabled	Vertical mirroring
	Enabled	Enabled	Vertical and horizontal mirroring
② Origin Offset	Offsets coordinate center position (white cross).		
	X	Sets the center of the sensor camera as “0.0000 (def.)” and adjusts (Offset) the position of the crosshair (white) in the X direction. Setting range: -10.0000 to 10.0000	
	Y	Sets the center of the sensor camera as “0.0000 (def.)” and adjusts (Offset) the position of the crosshair (white) in the Y direction. Setting range: -10.0000 to 10.0000	
	Zero Set	Offsets to the current measurement coordinates	
③ Judgement			
Angle (D)	Sets OK / NG evaluation for the angle (def. = 0.0000). Setting range: 0.0000 to 10.0000		
	Enabled	Enables the judgement.	
	Disabled (def.)	Disables the judgement.	
Divergence	Sets OK / NG evaluation for the D4Sigma, 1/e ² , or D86 Setting range: 0.0000 to 1000.0000 (def. 0.0000)		
	Enabled	Enables the Judgement.	
	Disabled (def.)	Disables the Judgement.	
Radius Type	D4 Sigma (def.)	Sets the D4Sigma to evaluate "Divergence".	
	1/e ²	Sets the 1/e ² to evaluate "Divergence".	
	D86	Sets the D86 to evaluate "Divergence".	
Ellipticity	Sets the "OK/NG" evaluation for the "Beam Ellipticity". Setting range: 0.0000 to 1.0000 (def. 0.0000)		
	Enabled	Enables the judgement.	
	Disabled (def.)	Disables the judgement.	
Orientation	Set the OK/NG evaluation for the Orientation The evaluation is made by combining the set angle and Range (±) Setting range: - 90.0000 to + 90.0000 (def. 0.0000)		

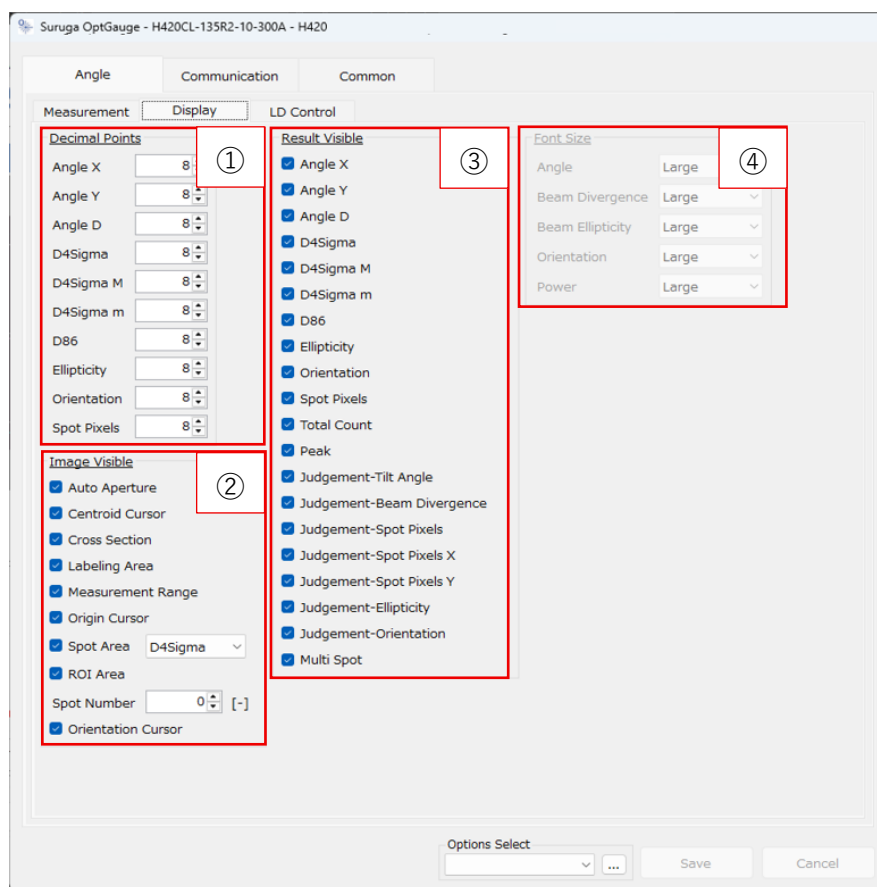
	Range [±]	Setting range: - 90.0000 to + 90.0000 (def. 0.0000)
	Enabled	Enables the judgement.
	Disabled (def.)	Disables the judgement.
Spot Pixels	Sets the OK/NG judgement criteria for Spot Pixels Setting range: 0~1040 (def.0)	
	Enabled	Enables the judgement
	Disabled (def.)	Disables the judgement
Spot Pixels X	Sets the OK/NG judgement criteria for Spot Pixels X Setting range: 0~1040 (def.0)	
	Enabled	Enables the judgement
	Disabled (def.)	Disables the judgement
Spot Pixels Y	Sets the OK/NG judgement criteria for Spot Pixels Y Setting range: 0~1040 (def.0)	
	Enabled	Enables the judgement
	Disabled (def.)	Disables the judgement
Peak	Sets the "OK/NG" evaluation for the "Peak". Setting range: 0.0 to 4095.0	
	Enabled	Enables the judgement.
	Disabled (def.)	Disables the judgement.
④ Log File		
	To specify outputs where to save the measurement results (CSV).	
Image	Enabled	Outputs image data at the Angle View along with the measurement results
	Disabled (def.)	Does not output the Angle View image data
	Full Color (def.)	Outputs the image data in 24-bit full color
	Gray Scale	Outputs the image data in 8-bit grayscale
	PNG(def.)	Outputs the image data in PNG format
	BMP	Outputs the image data in BMP format
	TIFF	Outputs the image data in TIFF format
RAW	Enabled	Outputs Angle View luminance value data (CSV)* along with measurement results (CSV). Outputs luminance values as text data in CSV format, not as binary data.
	Disabled (def.)	Does not output the Angle View raw image data (CSV)

⑤ Cross Section	Sets the display location for the beam intensity distribution	
	Origin Cursor (def.)	Displays the coordinate center position for the beam strength distribution.
	Beam Cursor	Display the beam intensity distribution at the beam centroid
⑥ Moving Average	Sets averaging process (moving average) for measurement values. Setting range: 2 to 262144 (def. = 2)	
	Enabled	Enables the averaging process
	Disabled (def.)	Disables the averaging process
⑦ Auto Aperture	Sets the Auto Aperture	
	Enabled (def.)	Enables the Auto Aperture setting
	Disabled	Disables the Auto Aperture setting
	Area	Set the Auto Aperture based on the center position calculated using the area centroid processing
	Intensity(def.)	Sets Auto Aperture from centroid position calculated with intensity weighed process
⑧ ROI	Sets "ROI." If enabled, it evaluates a light beam by these range settings	
	Enabled (def.)	Enables ROI setting
	Disabled	Disables ROI setting
	X	Sets the ROI X direction setting position. Range: -3000 to 3000 (def.=520)
	Y	Sets the ROI Y direction setting position. Range: -3000 to 3000 (def.=520)
	Width	Sets the ROI horizontal width. Setting range: 0 to 3000 (def.=1040)
	Height	Sets the ROI vertical width. Setting range: 0 to 3000 (def.=1040)
⑨ Denoising	Sets the threshold. If enabled, it derives the measurement values using the pixels of the pixel values higher than the set value. Setting range: 1 to 4095 (def. = 100)	
	Enabled (def.)	Enables the denoising settings
	Disabled	Disables the denoising settings
⑩ Beam Centroid	Sets the calculation method for the Centroid position of a light beam	
	Area	Calculates the centroid position with the Area of Centroid process

	Intensity (def.)	Calculates the centroid position with the intensity weighing process
⑪ Angle Type	Sets targets for the angle measurement	
	Tilt Angle (def.)	Sets for the reflection angle measurement. Sets 1/2 of an incident beam as the measured target angle
	Beam Angle	Sets for the external light incidence angle measurement. Sets the incident beam angle to the angle of a measurement target.
⑫ Beam Divergence		
Type	Sets the type of the beam divergence	
	D4Sigma (def.)	Displaying the beam divergence by $D4\sigma$
	$1/e^2$	Displaying the beam divergence by $1/e^2$
⑬ Orientation		
Enabled	Toggle either “Beam Ellipticity,” or “Orientation” for the measurement of the beam divergence	
	Enables	Display the beam divergence in M (Major) and m (Minor) Enable Beam Ellipticity Enable Orientation
	Disables (def.)	Display Beam Divergence in X and Y Disable Beam Ellipticity Disable Orientation
Method	Sets the non-ISO compliant rotation angle measurement method *Only effective if the “ Type ” is set to the $1/e^2$ in the Beam Divergence	
	Ellipse Fitting(def.)	Takes the measurements by using the elliptical fitting method
	MaxDistanceSearch	Takes the measurement using the search method of the maximum distance between two points
⑭ Angle Unit	Sets the angle unit for measurement values	
	Degree(def.)	Sets for decimal degree unit
	DegMinSec	Sets for degrees-minutes-seconds unit
	Milliradian	Sets for milli radian unit
⑮ Multi Spot		

Order	Sets the sorting type of the measurement result list to be displayed when detecting multiple beams	
	Area(def.)	Sorts by beam area from the largest size
	Angle	Sorts in ascending order of beam centroid position.
	Peak	Sorts in descending order of Peak
	Total Count	Sorts in descending order of Total Count
Spot Count	Sets the number to display on the measurement results screen when detecting multiple beams. Setting range: 1 to 100 (def. = 1)	
Min Spot Area	Sets the threshold value for the beam size (pixels) conditions of the beam is detected (def. = 1). Setting range: 1 to 1023	
⑩ Binning	Sets the Binning function (2x2) of the sensor camera. Enabling the Binning combines adjacent pixels to reduce camera noise and improve sensitivity. Additionally, the image size is reduced to 1/4, lowering data volume and improving frame rate	
	Enabled	Enables the binning function
	Disabled (def.)	Disables the binning function
⑪ Adaptive Cal	Sets "Adaptive Cal" button show/hide. Attention	
	Please be advised to disable the " Denoising " for your operation.	
	Enabled	Shows the "Adaptive Cal" button
	Disabled (def.)	Hides the "Adaptive Cal" button
⑫ Working Distance	Specifies the measurement distance to the target object. By specifying this, you can obtain a measurement result with guaranteed linearity. Setting range: 30 to 300 (default = 30).	
⑬ Parallel Adjustment Mode	Set the 2-Point Parallel Adjustment Mode For details, refer to " 2-Point Parallel Adjustment Mode "	
	Enabled	Enables the 2-Point Parallel Adjustment Mode
	Disabled (.def)	Disables the 2-Point Parallel Adjustment Mode

4.1.1.2. Display



① Decimal Points

Specify the number of decimal places for the outputting measurement results*

Setting range: 0 to 8 (default=8)

*Note: Outputting measurement results refers to results output via the [Output Once] button (CSV) and output via communication for control by external devices.

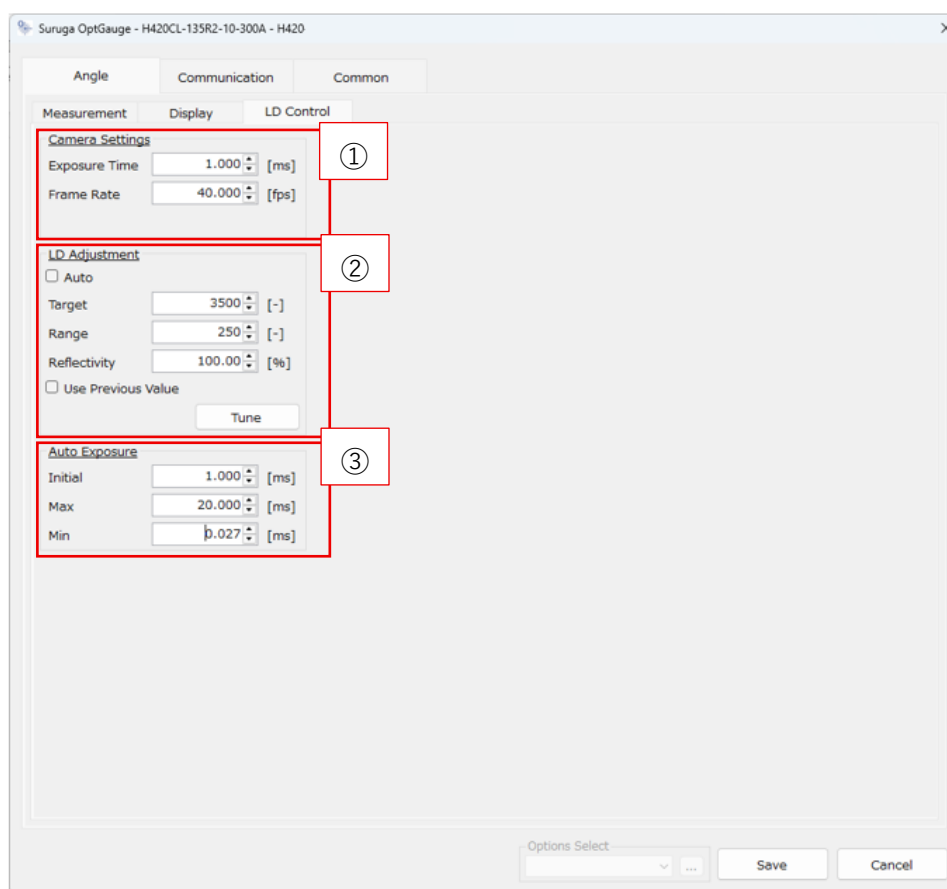
Angle X	Sets the number of decimal places for the Angle X measurement results
Angle Y	Sets the number of decimal places for the Angle Y measurement results
Angle D	Sets the number of decimal places for the Angle D measurement results
D4Sigma	Sets the number of decimal places for the D4Sigma measurement results
D4Sigma X(M)	Sets the number of decimal places for the D4SigmaX(M) measurement results
1/e ² X(M)	Sets the number of decimal places for the 1/e ² X(M) measurement results
D4Sigma Y(m)	Sets the number of decimal places for the D4SigmaY(m) measurement output
1/e ² Y(m)	Sets the number of decimal places for the 1/e ² Y(m) measurement output
D86	Sets the number of decimal places for the D86 measurement results
Ellipticity	Sets the number of decimal places for the Ellipticity measurement results
Orientation	Sets the number of decimal places for the Orientation measurement results

Spot Pixels	Sets the number of decimal places for the Spot Pixels measurement results	
② Image Visible		
Auto Aperture	Sets the Auto Aperture to display or hide	
	Enabled (def.)	Displays the Auto Aperture
	Disabled	Hides the Auto Aperture
Centroid Cursor	Sets the Centroid Cursor to display or hide	
	Enabled (def.)	Displays the Centroid Cursor
	Disabled	Hides the Centroid Cursor
Cross Section	Sets the Cross Section to display or hide	
	Enabled (def.)	Displays the Cross Section
	Disabled	Hides the Cross Section
Labeling Area	Sets the Labeling Area to display or hide	
	Enabled (def.)	Displays the Labeling Area to display or hide
	Disabled	Hides the Labeling Area
Measurement Range	Sets the Measurement Range to display or hide	
	Enabled (def.)	Displays the Measurement Range
	Disabled	Hides the Measurement Range
Origin Cursor	Sets the display / hide of the Origin Cursor to display or hide	
	Enabled (def.)	Displays the Origin Cursor
	Disabled	Hides the Origin Cursor
Spot Area	Sets the Spot Area to display or hide	
	D4Sigma (def.)	Sets the beam diameter calculation method for the Spot Area display to D4Sigma
	1/e^2	Sets the beam diameter calculation method for the Spot Area display to 1/e^2
	D86	Sets the beam diameter calculation method for the Spot Area display to D86
	Enabled (def.)	Displays the Spot Area
	Disabled	Hides the Spot Area
ROI Area	Sets the ROI Area to display or hide	
	Enabled (def.)	Displays the ROI Area
	Disabled	Hides the ROI Area
Spot Number	Sets the number of serial number labels to display if light beams are measured (def. = 0). The setting range: 0 to 100	

Orientation Cursor	Set the Orientation Cursor to display or hide	
	Enabled (def.)	Displays the Orientation Cursor
	Disabled	Hides the Orientation Cursor
③ Result Visible		
Sets the display / hide of the measurement result.		
Angle X	Enabled (def.)	Displays the Angle X of measurement result
	Disabled	Hides the Angle X of measurement result
Angle Y	Enabled (def.)	Displays the Angle measurement result
	Disabled	Hides the Angle Y measurement result
Angle D	Enabled (def.)	Displays the Angle D measurement result
	Disabled	Hides the Angle D measurement result
D4Sigma	Enabled (def.)	Displays the D4Sigma measurement result
	Disabled	Hides the D4Sigma measurement result
1/e ²	Enabled (def.)	Displays the 1/e ² measurement result
	Disabled	Hides the 1/e ² measurement result
D4Sigma X(M)	Enabled (def.)	Displays the D4Sigma X(M) measurement result
	Disabled	Hides the D4Sigma X(M) measurement result
1/e ² X(M)	Enabled (def.)	Displays the 1/e ² X(M) measurement result
	Disabled	Hides the 1/e ² X(M) measurement result
D4Sigma Y(m)	Enabled (def.)	Displays the D4Sigma Y(m) measurement result
	Disabled	Hides the D4Sigma Y(m) measurement result
1/e ² Y(m)	Enabled (def.)	Displays the 1/e ² Y(m) measurement result
	Disabled	Hides the 1/e ² Y(m) measurement result
D86	Enabled (def.)	Displays the D86 measurement result
	Disabled	Hides the D86 measurement result
Ellipticity	Enabled (def.)	Displays the Ellipticity measurement result
	Disabled	Hides the Ellipticity measurement result
Orientation	Enabled (def.)	Displays the Orientation measurement result
	Disabled	Hides the Orientation measurement result
Spot Pixels	Enabled (def.)	Displays the measurement results for Spot Pixels
	Disabled	Does not display the measurement results for Spot Pixels
Total Count	Enabled (def.)	Displays the Total Count measurement result
	Disabled	Hides the Total Count measurement result
Peak	Enabled (def.)	Displays the Peak measurement result
	Disabled	Hides the Peak measurement result

Judgement – Tilt Angle	Enabled (def.)	Displays the measurement results for Judgement – Tilt Angle
	Disabled	Does not display the measurement results for Judgement – Tilt Angle
Judgement – Beam Divergence	Enabled (def.)	Displays the measurement results for Judgement – Beam Divergence
	Disabled	Does not display the measurement results for Judgement – Beam Divergence
Judgement – Spot Pixels	Enabled (def.)	Displays the measurement results for Judgement – Spot Pixels
	Disabled	Does not display the measurement results for Judgement – Spot Pixels
Judgement – Spot Pixels X	Enabled (def.)	Displays the measurement results for Judgement – Spot Pixels X
	Disabled	Does not display the measurement results for Judgement – Spot Pixels X
Judgement – Spot Pixels Y	Enabled (def.)	Displays the measurement results for Judgement – Spot Pixels Y
	Disabled	Does not display the measurement results for Judgement – Spot Pixels Y
Judgement - Ellipticity	Enabled (def.)	Displays the measurement results for Judgement – Ellipticity
	Disabled	Does not display the measurement results for Judgement – Ellipticity
Judgement – Orientation	Enabled (def.)	Displays the measurement results for Judgement – Orientation
	Disabled	Does not display the measurement results for Judgement – Orientation
Multi Spot	Enabled (def.)	Displays the measurement results for Multi Spot
	Disabled	Does not display the measurement results for Multi Spot
④ Font Size ※Not used		

4.1.1.3. LD Control



① Camera Settings		
Exposure Time	Sets the sensor camera exposure time. (def. = 1. 000) Setting range: 0.027 to 2000.000	
Frame Rate	Sets the sensor camera frame rate. (def. = 40. 000) Setting range: 0.1 to 100. 000	
② LD Adjustment		
Auto	It always enables / disables the Automatic Brightness control	
	Enabled	Keeps the Automatic Brightness control enabled
	Disabled (def.)	Keeps the Automatic Brightness control disabled
Target	Sets the upper limit of peak luminance (def. = 3500) The setting range: 1000 to 3500	
Range	Sets the range of the dimming adjustment complete (def. = 250) It adjusts [light beams] within the target dimming range. The setting range: 100 to 1000	
Reflectivity	Sets the reflectance of the measuring target (def. = 100). Sets the reflectance of the measuring object optimizes the time required for light	

	adjustment. The setting range: 0.05 to 100	
Use Previous Value	The results of the previous automatic brightness control (Exposure Time) are set as the initial values.	
	Enabled	The results of the previous auto-brightness adjustment are enabled
	Disabled (def.)	The results of the previous auto-brightness adjustment are disabled
Tune	If the Auto feature is not enabled, clicking the Tune button will activate auto-brightness each time.	
③ Auto Exposure		
Initial	Sets the initial exposure time applied in the auto-brightness control for the first time (default = 1.000). Setting range: 0.027 to 20.000	
Max	Sets the maximum value for the exposure time adjusted at the automatic brightness (def. = 20.000). Its setting range: Min to 20.000	
Min	Sets the minimum value for the exposure time adjusted at the automatic brightness (def. = 0.027). Its setting range: 0.027 to Max	

4.1.2. Communication

① Communication Type		
Interface	Select the interface used for communication with external devices	
	TCP/IP	Uses TCP/IP communication (def.)
	COM	Uses serial communication (RS 232C)
② TCP/IP Settings		
Port	Set the TCP port number Setting Range: 49152–65535 (def. = 49350)	
Streaming Port	TCP port number used for Streaming output (automatic)	
③ COM Settings		
Port	Set the COM port to use	
Baud Rate	Set the communication speed 9600/19200/38400/57600/115200(def.)	
④ Streaming		
Streaming	Switch Streaming output ON/OFF (def.=OFF) For details, refer to “ Measurement Result Streaming Output ”	

4.1.3. Common

4.1.3.1. Measurement

Angle Communication Common

Measurement Custom Result

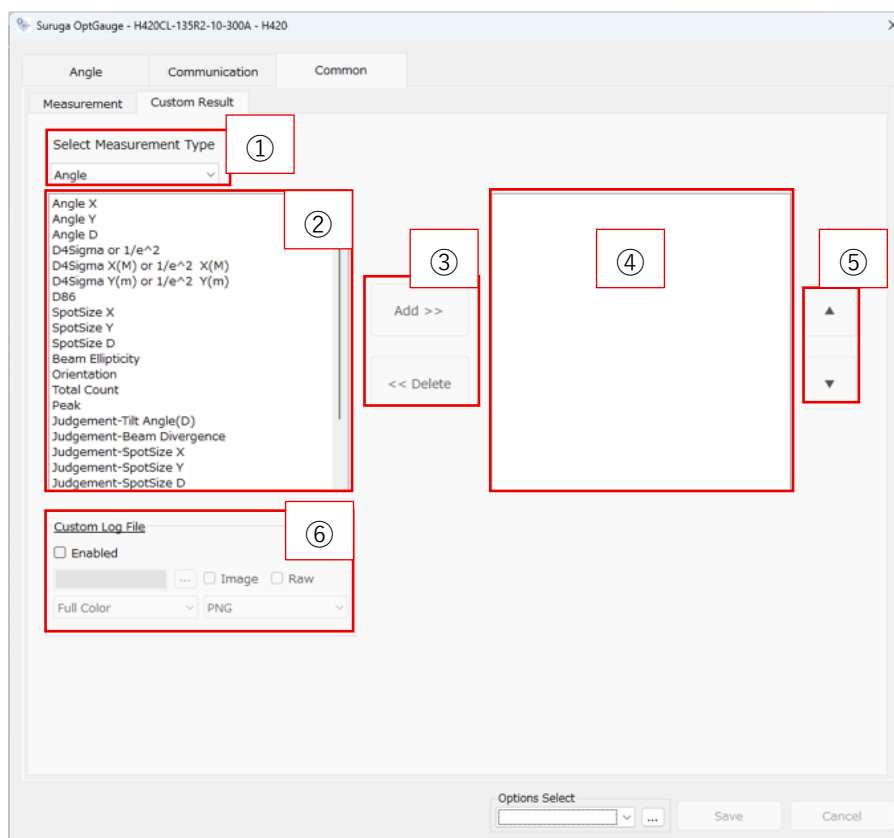
Trigger Mode

FreeRun

Trigger Period 16 [ms]

① Trigger Mode	
Trigger Mode	Select the trigger mode (fixed to Free Run)

4.1.3.2. Custom Result



① Select Measurement Type	
Select the measurement type to be edited for custom log output (fixed to Angle). Items corresponding to the selected measurement type will be displayed in the output item list. ※For details, refer to Custom Log Output.	
② Output Item List	
Displays a list of measurement items that can be output to the log. Various measurement values and judgement results related to Angle measurement are displayed. Select the items you wish to output from this list. ※Items that have been added to the edited result list will not be displayed in the output item list.	
③ Add / Delete	
Add >>	Add the items selected in the output item list to the edited result list. Multiple items can be selected and added at the same time.
<< Delete	Delete items selected in the edited result list. Deleted items will be displayed again in the output item list.
④ Edited Result List	
Displays the items that will actually be output to the log, along with their output order. Items added from the output item list are displayed here.	

At the time of output, items are output to CSV/Streaming in the order shown from the top of this list. ※The measurement type prefix (e.g. Angle) is added to the item names.		
⑤ Sorting		
▲/▼	Move the selected item up or down one row. ※When multiple items are selected, their relative order is maintained during the move.	
⑥ Custom Log File		
Enabled	Enable or disable custom log output. (def.= Disabled)	
	Specify the save location for measurement result output (CSV) using the Output Once button.	
Image	Enabled	Output image data from View together with the measurement results (CSV).
	Disabled (def.)	Do not output image data from View.
	Full Color (def.)	Output image data in 24-bit full color.
	Gray Scale	Output image data in 8-bit grayscale.
	PNG (def.)	Output image data in PNG format.
	BMP	Output image data in BMP format.
	TIFF	Output image data in TIFF format.
Raw	Enabled	Output luminance value data (CSV) from View together with measurement results (CSV). ※Luminance values are output as CSV text data, not binary data.
	Disabled (def.)	Do not output raw image data (CSV) from View.

4.2. The Option List

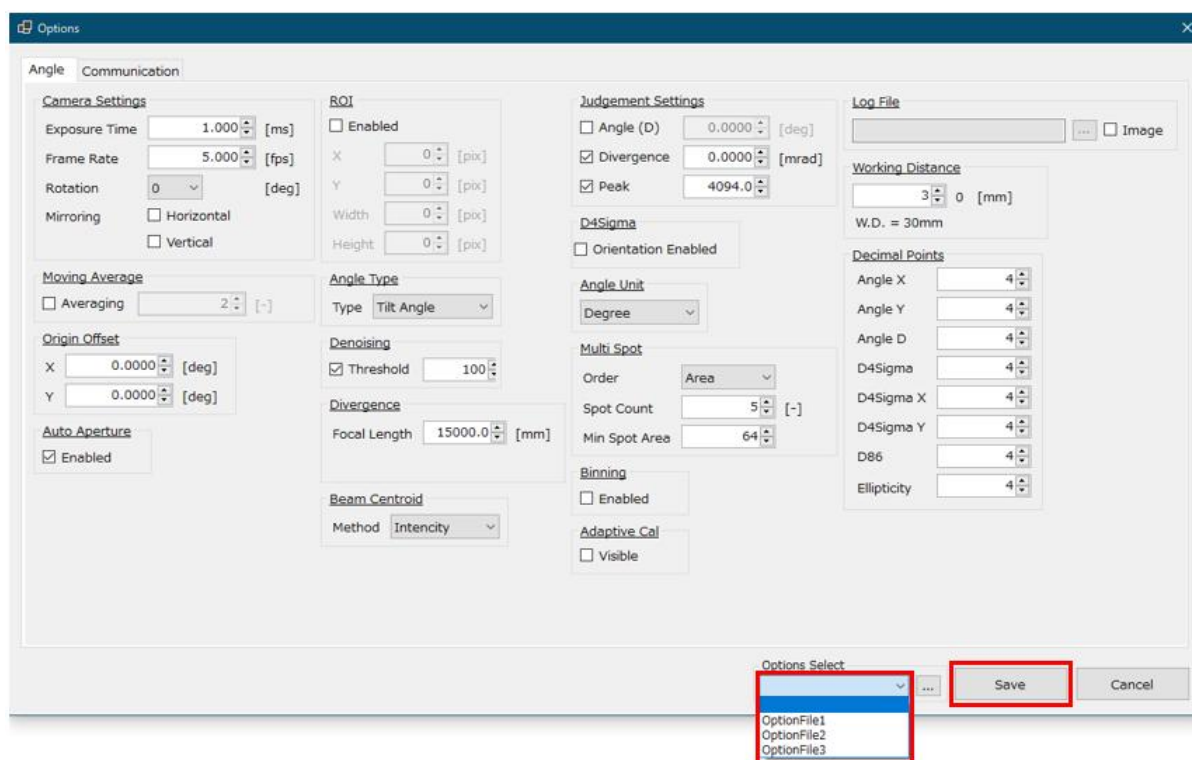
Multiple option lists can be available to the Suruga OptGauge and you can switch between them. When you may apply different option settings based on the measurement target or wavelength by switching to another option list while the Suruga OptGauge is running.

This chapter describes how to switch between multiple option lists, register it, or delete it.

4.2.1. Switching the Option Lists

This section describes how to switch option lists.

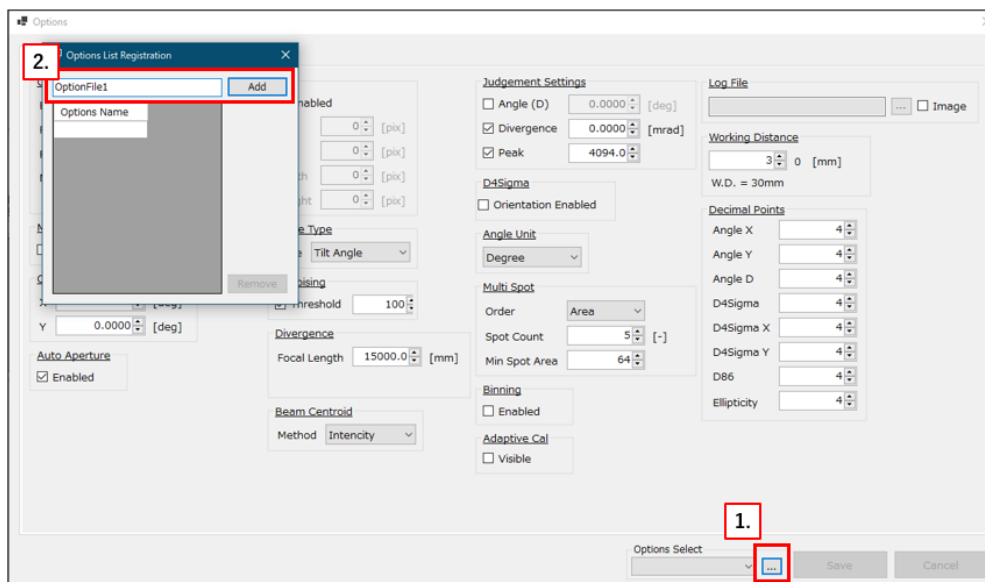
1. From the "Options Select" pulldown menu, select the desired option list name.
2. Click the "Save" button.



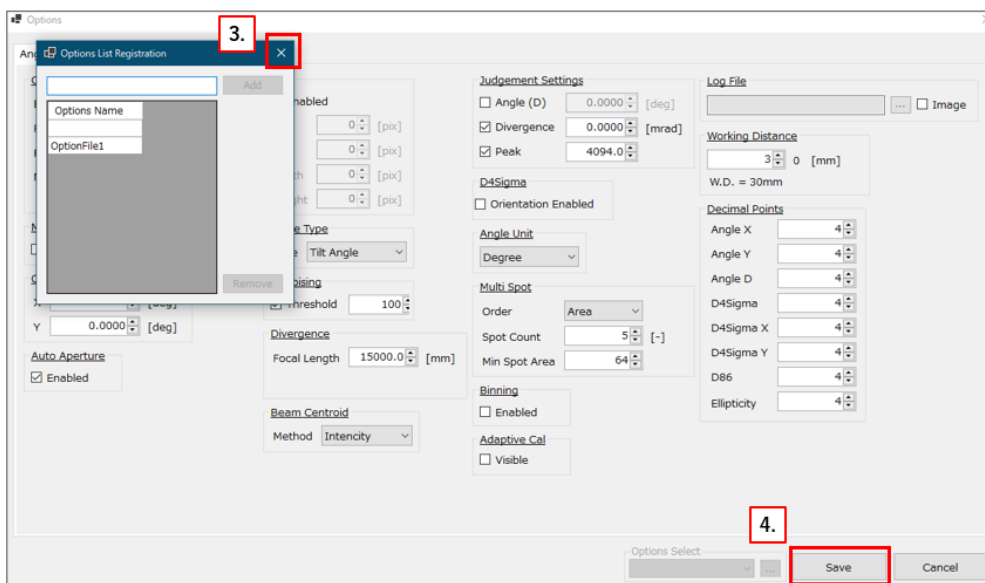
4.2.2. Registering an Option List

This section describes how to register an option list. It holds up to 31 option lists to be registered.

1. Click the [...] button.
2. Enter an arbitrary option name and click the [Add] button.



3. Click the [X] button.
4. Click the [Save] button.

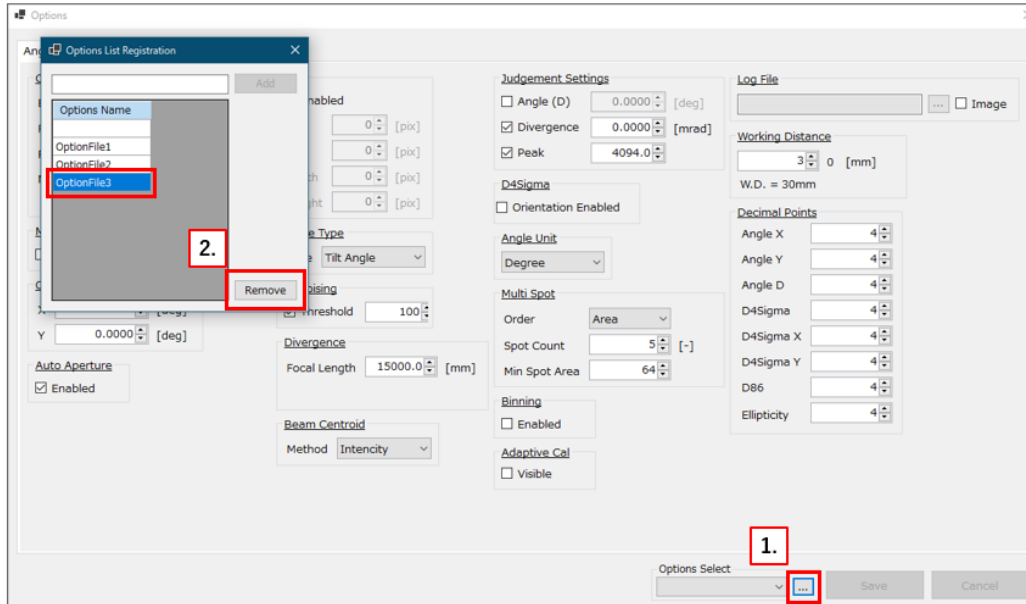


5. The list is now registered in "Options Select" to choose (*See ["Switching the Option Lists"](#)).

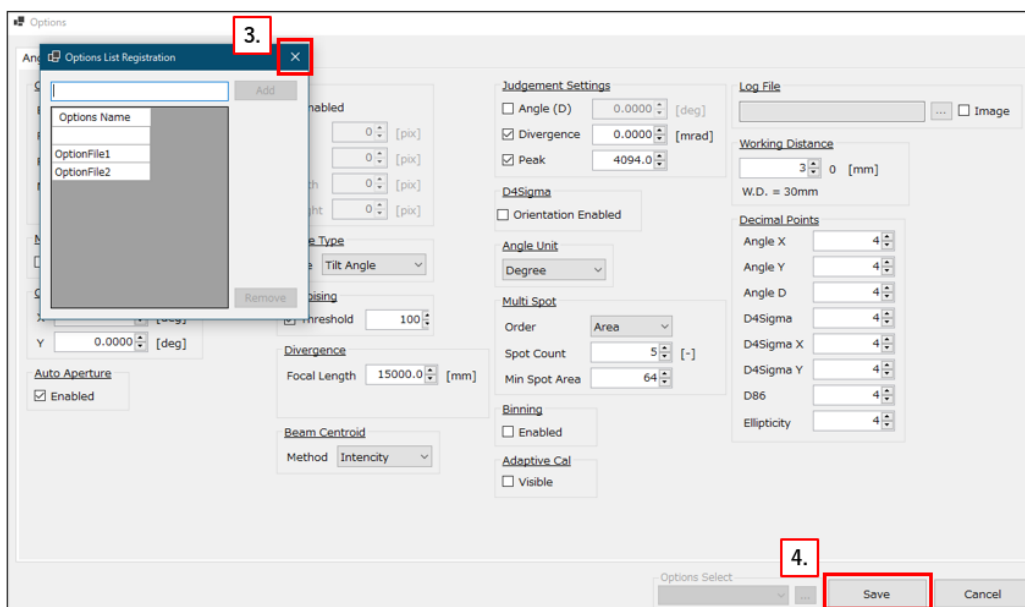
4.2.3. Deleting an Option List

This section describes how to delete an option list.

1. Click the [...] button while selecting an option other than the one you wish to delete.
2. Select the option name you want to remove and click the [Remove] button.



3. Click the [X] button.
4. Click the [Save] button.



5. Controlling from External Devices

5.1. RS232C

The RS232C connections can be broadly categorized into two patterns. After connecting, use terminal software* to send and receive data via serial communication with the Suruga OptGauge.

*Note: Terminal software must be provided by the customer.

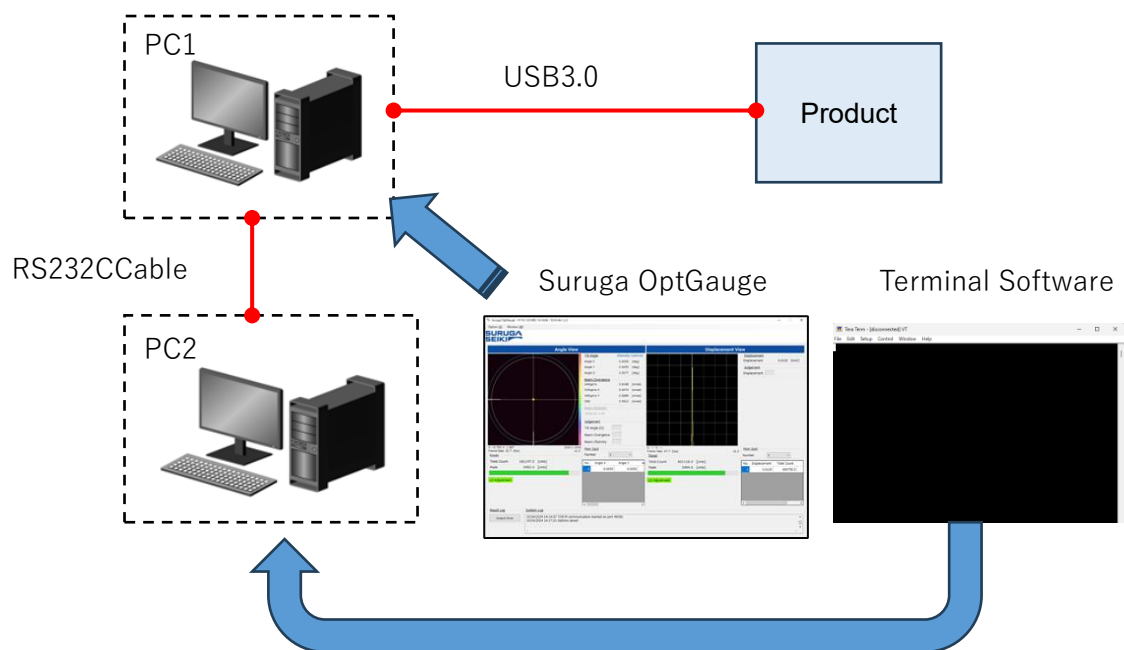
5.1.1. Communication Specifications

Item	Content
Synchronization method	Asynchronous
Transmission code	UTF-8
Data type	8 bits
Stop bit	1 bit
Parity	None
Flow control	None
Baud rate (bps)	9600 / 19200 / 38400 / 57600 / 115200

5.1.2. Example: Connections via the RS232C Communication

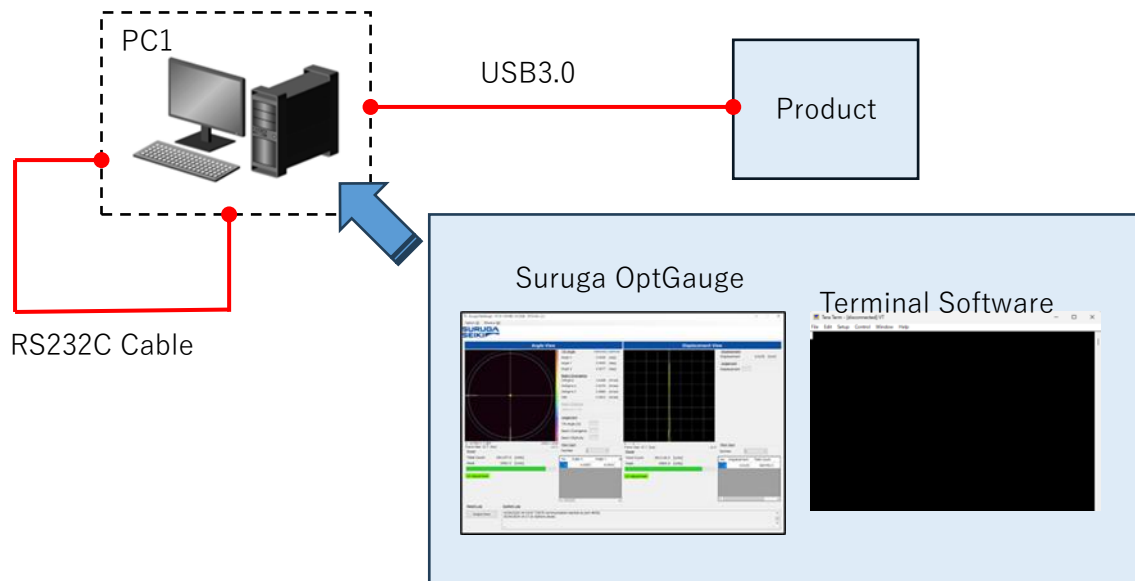
■ Using external PCs for communication

1. Set up two computers and connect with an RS232C cable.
2. Connect this product to one of the computers, launch the Suruga OptGauge, and start measurements.
3. Prepare terminal software on the other computer.
4. Configure the command communication settings and initiate communication.



■ Using the same computer for communication

1. Connect the sensor head to one computer and then connect the RS232C cable to your computer.
2. Launch the Suruga OptGauge and start measurement.
3. Prepare terminal software on the computer.
4. Configure the communication settings to command and begin communication.



5.1.3. Command Communication Setting Method

This section describes how to configure the Suruga OptGauge and terminal software to command communication.

■ The Suruga OptGauge

1. Select the [Communication] tab in option settings.
2. Set the "Interface" to "COM" at the Communication Type.
3. Set "Port" and "Baud Rate" (arbitrary) in the COM settings.

*"Port" automatically displays the connected port candidates when RS232C is connected.

The screenshot shows the 'Communication' tab of the Suruga OptGauge settings. It features three main sections: 'Communication Type', 'TCP/IP Settings', and 'COM Settings'. The 'Communication Type' section has a dropdown for 'Interface' set to 'COM'. The 'TCP/IP Settings' section has a 'Port' field set to '49350'. The 'COM Settings' section has a 'Port' dropdown set to 'COM1' and a 'Baud Rate' dropdown set to '115200'. Red boxes highlight the 'Communication Type' and 'COM Settings' sections.

■ Terminal Software

The terminal software, to be provided by the customer, is to be set as below.

1. Set the COM port which matches the "Port" setting in the Suruga OptGauge.
2. Set the same baud rate as the "Baud Rate" setting in the Suruga OptGauge.
3. For settings other than the above, see the "[Communication Specifications](#)".

5.2. TCP/IP

TCP/IP supports three main connection patterns. After establishing a connection, data transmission is performed using terminal software* to exchange commands with the Suruga OptGauge via TCP/IP communication.

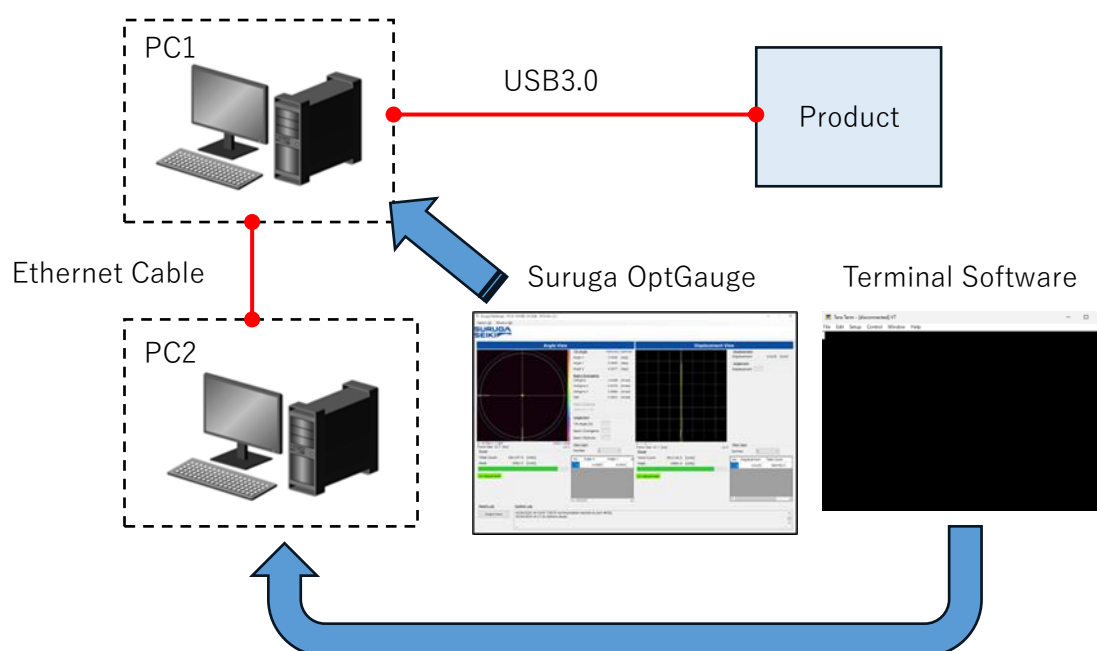
*Note: Terminal software must be provided by the customer.

5.2.1. Communication Specifications

Item	Details
Protocol	TCP
IPv4 Address	See " Command Communication Setting Method "
Subnet Mask	
Default Gateway	
DNS Server Address	
Port Number	Private Port of (49152-65535) Range

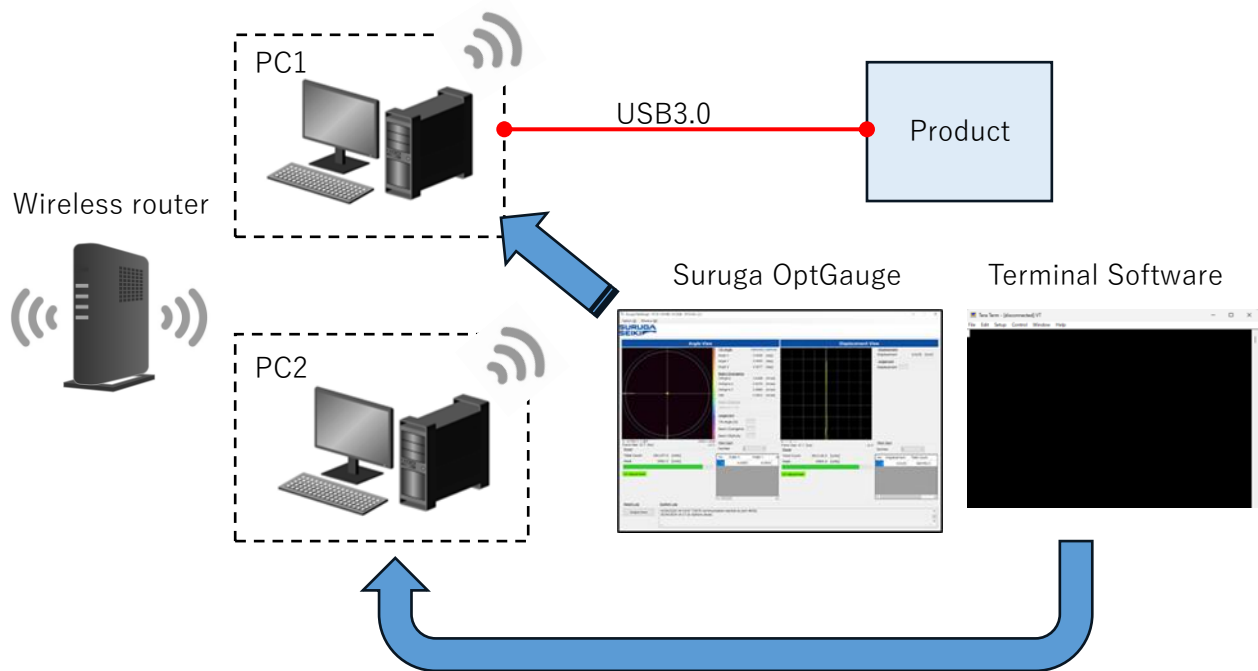
5.2.2. Example: Connections via the TCP/IP communication

- Using external devices for communication via Ethernet cable.
- 1. Set up two computers and connect them with an Ethernet cable.
- 2. Connect this product to one of the computers, launch the Suruga OptGauge, and start measurements.
- 3. Prepare terminal software on the other computer.
- 4. Configure the communication settings to command and start communication.



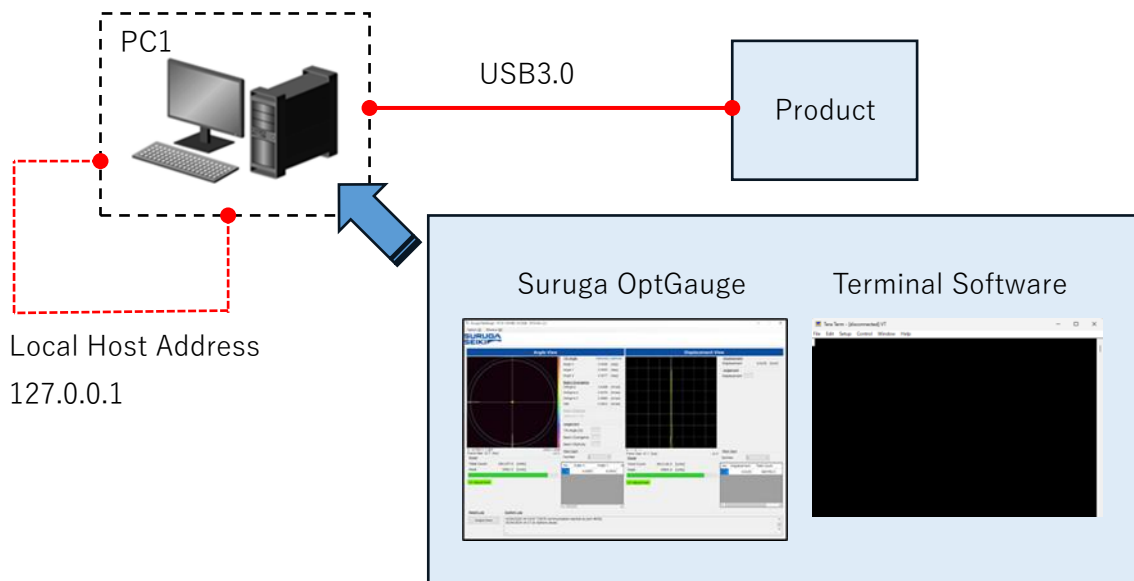
■ Using external devices for communication: Wireless router

1. Set up two computers and connect them via a wireless router.
2. Connect the Product to one of the computers, launch Suruga OptGauge, and start measurements.
3. Prepare terminal software on the other computer.
4. Configure the communication settings for the command and start communication.



■ Using the Same Computer for Communication

1. Connect the Product to one computer.
(There is nothing to connect, as the local host address is used).
2. Launch the Suruga OptGauge and start measurement.
3. Prepare terminal software on the computer.
4. Configure the communication settings to command and start communication.



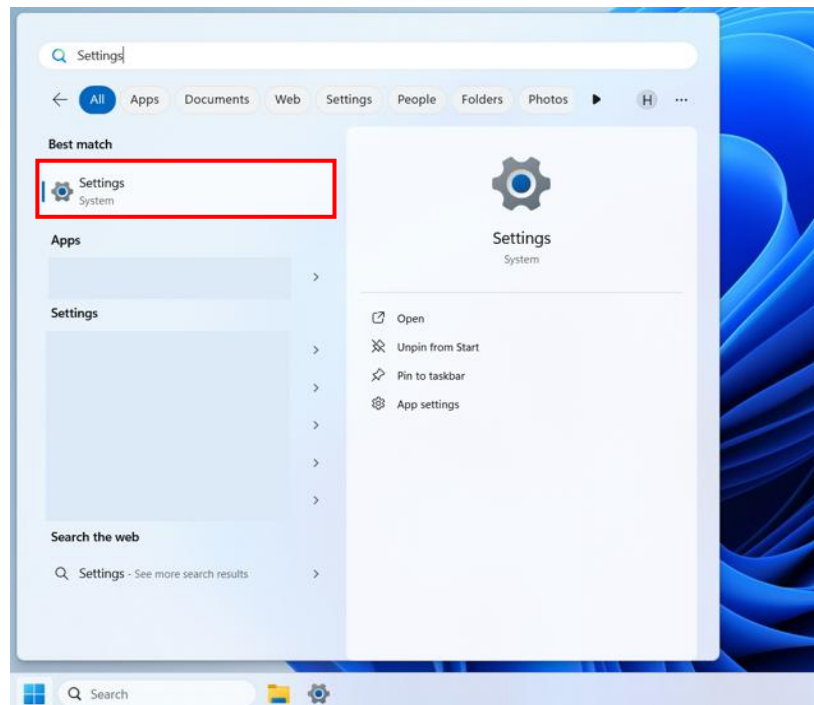
5.2.3. Command Communication Setting Method

This section describes how to configure the PC, the Suruga OptGauge, and terminal software to command communication.

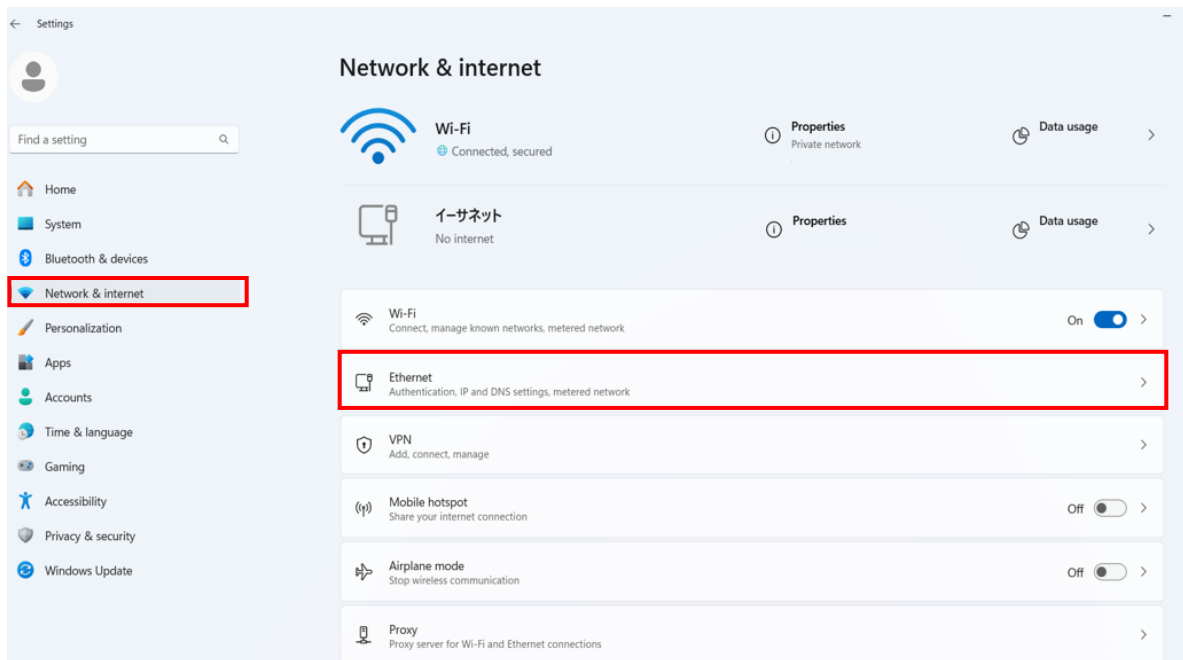
5.2.3.1. When communicating using an external device

PC Settings

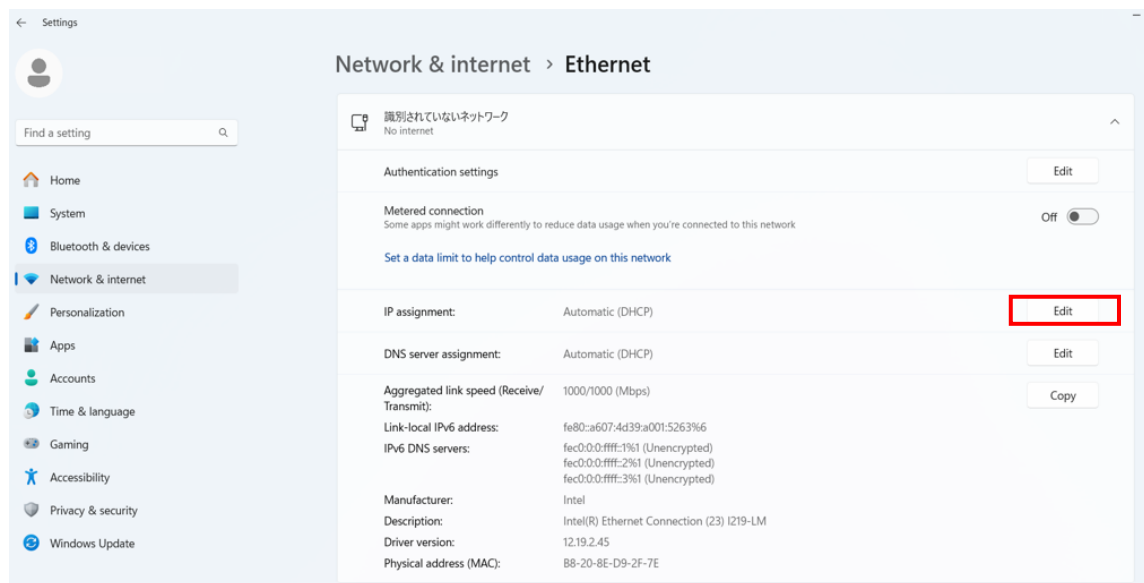
1. Click the [Start] button and select [Settings].



2. Select [Network & Internet], and then select [Ethernet]. If you are using a wireless LAN router, select [Wi-Fi] → [Hardware Properties].



3. Click [Edit] under [IP Assignment].

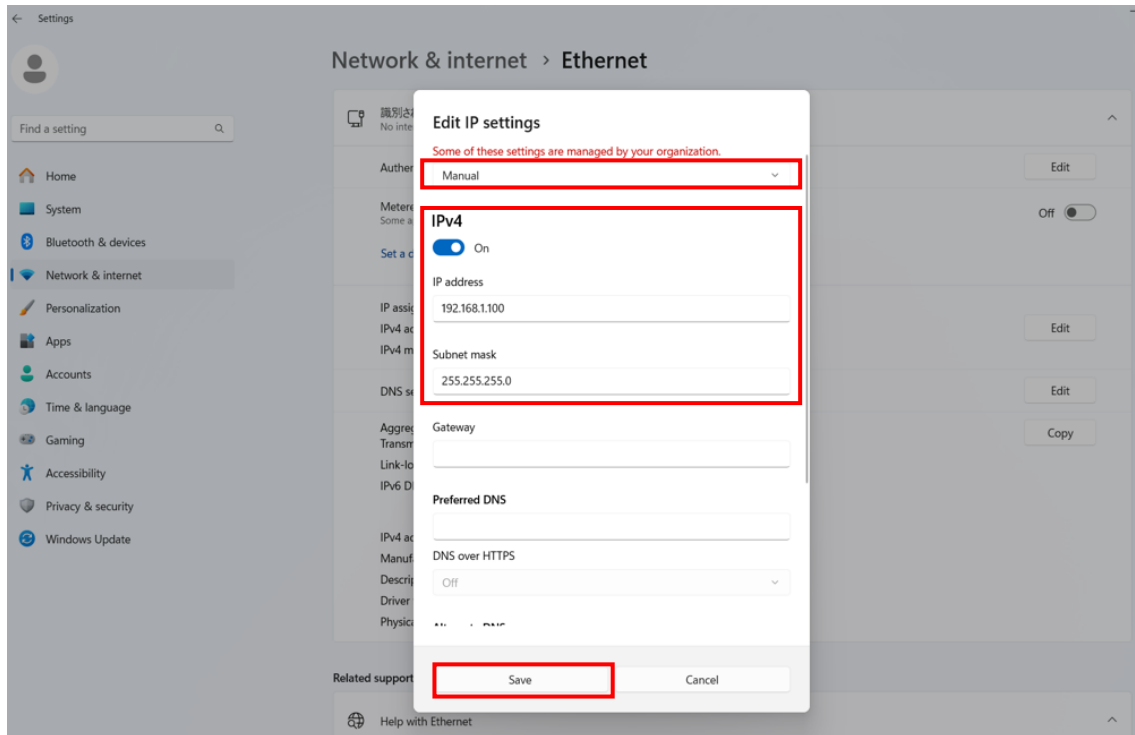


4. Select [Manual] and enter the [IP address] and [Subnet mask] under [IPv4].

Example)

IP address: 192.168.1.100

Subnet mask: 255.255.255.0



5. Click [Save].

The settings for the PC to which the product is connected are complete.

6. Perform steps 1 through 5 on the other PC as well.

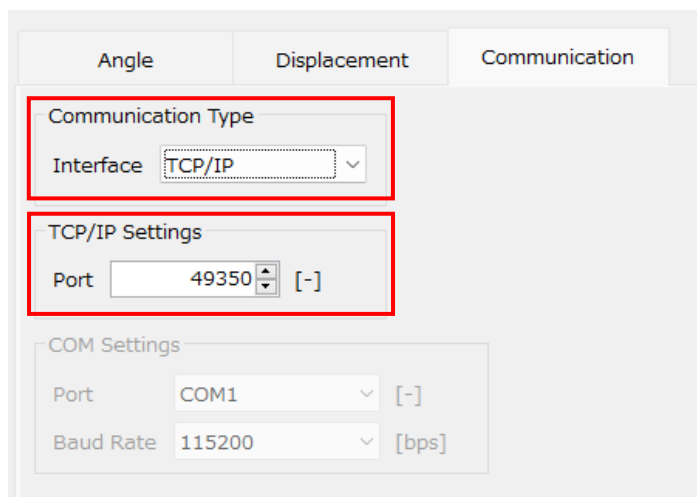
However, when configuring the IP address in step 5, ensure it does not duplicate the following:

EX. IP address: 192.168.1.**101** (*change only the last number)

Subnet mask: 255.255.255.0

Setting the Suruga OptGauge

1. Select the [Communication] tab in option settings.
2. Set "Communication Type - Interface" to "TCP/IP".
3. Set "Port" (arbitrary) in TCP/IP settings.
4. If the "Port" is changed, please restart the software.



Terminal Software

For the terminal software you provide yourself, please configure the following settings:

- Specify the IP address set on the PC to which this product is connected, as configured in 'PC Settings ~ When Communicating Using External Devices ~', as the destination address.
- Configure the same TCP port as the 'Port' set on the Suruga OptGauge.

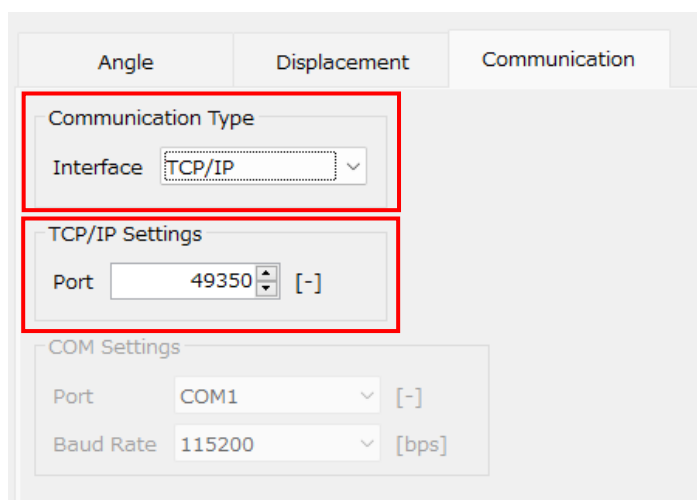
Note: This constitutes the minimum configuration required for command communication using the TCP/IP. As this involves network communication.

Please be advised to consider security and other settings appropriate to your specific application.

5.2.3.2. Using the same computer for communication

Setting the Suruga OptGauge

1. Select the [Communication] tab in option settings.
2. Set "Communication Type - Interface" to "TCP/IP".
3. Set "Port" (arbitrary) in TCP/IP settings.
4. If the "Port" is changed, please restart the software.



Terminal Software

The terminal software, to be provided by the customer, is to be set as below.

- Local host address: Set **127.0.0.1**
- Set the TCP port which matches the "Port" setting in Suruga OptGauge.

5.3. Command Format

Commands are sent in the following format.

<Format Definition>

[CommandType],[Parameter0],[Parameter1], ... ,[ParameterXX]<CR><LF>

< Field Description >

Field	Content
CommandType	Command type
Parameter0	First argument
Parameter1	Second argument
ParameterXX	XX-th argument
CR	Carriage Return (0x0D)
LF	Line Feed (0x0A)

※ Each field is separated by a comma (0x2C)

※ All characters must be ASCII

5.4. Command List

5.4.1. List of Reading Commands

< Read Commands >

Command					Content	Reading Information
Type	Parameter					
	0	1	2	3		
RD	VS				Reads version information	See “ Command Request/Response Details ”
	OL				Reads option list information	
	AR				Angle Measurement Results	See “ Command Request/Response Details ”
		MLT			Angle Multi Spot Measurement Results	
		ASC			Angle Multi Spot Count	
	AS	LAS			Automatic Brightness Status	
	AO	EXT			Sensor Camera Exposure Time	0.027～2000
		FRA			Sensor Camera Frame Rate	0.1～100
		ROT			Rotation	0 = OFF 1= Rotation right 90° 2 = Rotation right 180° 3 = Rotation right 270°
		MHE			Mirroring Horizontal	0=OFF 1= Horizontal Mirroring
		MVE			Mirroring Vertical	0=OFF 1= Vertical Mirroring
		MAV			Number of Averaging Times	2～262144
		MAE			Averaging Processing Enabled	0=disabled、 1=enabled
		CSP			Cross Section Point	0=Origin Cursor 1=Beam Cursor
		OOX			Origin Offset X Value	-20～20
		OOY			Origin Offset Y Value	-20～20
		AAM			Auto Aperture Method	0= Area、 1= Luminance
		AAE			Auto Aperture Enabled	0=disabled、 1=enabled
		ROE			ROI Enabled	0=disabled、 1=enabled
		RAX			ROI X Value	(- 3000 to 3000) or (-1500 to 1500) if Binning is enabled

Command					Content	Reading Information
Type	Parameter					
	0	1	2	3		
		RAY			ROI Y Value	(- 3000 to 3000) or (- 1500 to 1500) if Binning is enabled
		RAW			ROI Width	(0 to 3000) or (0 to 1500) if Binning is enabled
		RAH			ROI Height	(0 to 3000) or (0 to 1500) if Binning is enabled
		ANT			Angle Type	0= Tilt Angle1= Beam Angle
		AJE			Angle Judgement Enabled	0=disabled、 1=enabled
		AJV			Angle Judgement Value	If the Angle Type is Tilt Angle, (0 to 10.0000). If the Angle Type is Beam Angle, (0 to 20.0000)
		DJE			Divergence Judgement Enabled	0=disabled、 1=enabled
		DJV			Divergence Judgement Value	0.0000~1000.0000
		BRT			Radius Type Judgment	0= D4Sigma or 1/e 2 1= D86
		EJE			Ellipticity Judgment Enabled	0=disabled、 1=enabled
		EJV			Ellipticity Judgement Value	0.0000~1.0000
		OJE			Rotation Angle Judgement Enabled	0=disabled、 1=enabled
		OJV			Rotation Angle Judgement Criteria Value	-90.0000~90.0000
		OJR			Rotation Angle Judgement Value Range	0.0000~90.0000
		SJE			Judgement Spot Pixels Enabled	0=disabled、 1=enabled
		SJV			Judgement Spot Pixels Threshold	0~1040
		XJE			Judgement Spot Pixels X Enabled	0=disabled、 1=enabled
		XJV			Judgement Spot Pixels X Threshold	0~1040
		YJE			Judgement Spot Pixels Y Enabled	0=disabled、 1=enabled
		YJV			Judgement Spot Pixels Y Threshold	0~1040
		PJE			Peak Judgment Enabled	0=disabled、 1=enabled
		PJV			Peak Judgement Value	0.0~4095.0
		RFP			Log File Output Path	Log File Path Strings

Command					Content	Reading Information
Type	Parameter					
	0	1	2	3		
		IOE			Image File Output Enabled	0=disabled、 1=enabled
		RAE			RAW Data Output Enabled	0=disabled、 1=enabled
		IOC			Image File Output Color	0= Full Color 1= Gray Scale
		IOF			Image File output format	0= png 1= bmp 2= tiff
		CNM			Beam Centroid	0= Area、 1= Intensity
		ANU			Angle Unit	0= Degree 1= DegMinSec 2= Milliradian
		DNE			Denoising Enabled	0=disabled、 1=enabled
		DNT			Denoising Threshold Value	1～4095
		DAX			Number of Decimal Places for the Angle X	0～8
		DAY			Number of Decimal Places for the Angle Y	0～8
		DAD			Number of Decimal Places for the Angle D	0～8
		DDS			Number of Decimal Places for the (Beam Divergence) D4Sigma or 1/e ²	0～8
		DDX			Number of Decimal Places for the (Beam Divergence) D4Sigma or 1/e ² X(M)	0～8
		DDY			Number of Decimal Places for the (Beam Divergence) D4Sigma or 1/e ² Y(m)	0～8
		DD8			Number of Decimal Places for the (Beam Divergence) D86	0～8
		DEL			Number of Decimal Places for the Ellipticity	0～8
		DOR			Number of Decimal Places for the Rotation Angle Measurement	0～8

Command					Content	Reading Information
Type	Parameter					
	0	1	2	3		
		DSS			Number of decimal places for spot Pixels	0~8
		MSO			(Multi Spot) Order	0= Area 1= Angle 2=Peak 3=Total Count
		MSC			(Multi Spot) Spot Count	1~100
		MSM			(Multi Spot) Min Spot Area	1~1023
		ACE			Adaptive Cal Execution Button Display Enabled	0=disabled、 1=enabled
		BDT			Beam Diameter Type	0=D4Sigma 1=1/e ²
		DOE			Orientation Enabled	0=disabled、 1=enabled
		OCM			Rotation Angel Measurement Method	0= Ellipse Fitting 1= Max Distance Search
		BIE			Binning Enabled	0=disabled、 1=enabled
		WDS			Working Distance	30~300
		VAA			Auto Aperture Display	0=disabled、 1=enabled
		VCC			Centroid Cursor Display	0=disabled、 1=enabled
		VCS			Cross Section Display	0=disabled、 1=enabled
		VLA			Labeling Area Display	0=disabled、 1=enabled
		VMR			Measurement Range Display	0=disabled、 1=enabled
		VOC			Origin Cursor Display	0=disabled、 1=enabled
		VSA			Spot Area Display	0=disabled、 1=enabled
		IST			Spot Area Display Type	0= D4Sigma or 1/e ² 1= D86
		VRA			ROI Area Display	0=disabled、 1=enabled
		VOU			Rotation Angle Cursor Display Enabled	0=disabled、 1=enabled
		DSN			Display Spot Number	0~100
		VAX			Angle X Result Display	0=disabled、 1=enabled
		VAY			Angle Y Result Display	0=disabled、 1=enabled
		VAD			Angle D Result Display	0=disabled、 1=enabled
		VDS			(Beam Divergence) D4Sigma or 1/e ²	0=disabled、 1=enabled

Command					Content	Reading Information
Type	Parameter					
	0	1	2	3		
					Result Display	
		VDX			(Beam Divergence) D4Sigma or 1/e ² X(M) Result Display	0=disabled、 1=enabled
		VDY			(Beam Divergence) D4Sigma or 1/e ² Y(m) Result Display	0=disabled、 1=enabled
		VD8			(Beam Divergence) D86 Result Display	0=disabled、 1=enabled
		VEL			Ellipticity Result Display	0=disabled、 1=enabled
		VOR			Rotation Angle Result Display	0=disabled、 1=enabled
		VSS			Spot Pixels result display	0=disabled、 1=enabled
		VTC			Total Count Result Display	0=disabled、 1=enabled
		VPE			Peak Result Display	0=disabled、 1=enabled
		FAN			Font Size for the Angle	0= Small 1= Medium 2= Large
		FBD			Font Size for the Beam Divergence	0= Small 1= Medium 2= Large
		FBE			Font size for the Beam Ellipticity	0= Small 1= Medium 2= Large
		FOR			Font Size for the Rotation Angle	0= Small 1= Medium 2= Large
		FPO			Font Size for the Power	0= Small 1= Medium 2= Large
		LAE			Automatic Brightness Execution Enabled	0=disabled、 1=enabled
LAV			Automatic Brightness Peak Target Value	1000～3500		
LAR			Automatic Brightness Peak Target Range	100～1000		
LRV			Reflectance of the target	0.05～100		

Command					Content	Reading Information
Type	Parameter					
	0	1	2	3		
		UPV			Adopt previous convergence values used in automatic brightness control	0=disabled、 1=enabled
		LEI			Initial Exposure Time Value applied in the Automatic Brightness	0.027～20
		LEX			maximum value of exposure time applied in automatic brightness	0.027～20
		LEN			minimum value of Exposure time applied in the Automatic Brightness	0.027～20
		PAM			Enable 2-Point Parallel Adjustment Mode	0=disabled、 1=enabled
	CR				Custom Result Output	See “Command Request/Response Details”
	CO	CLF			Custom Log File enabled	0=disabled、 1=enabled
		RFP			[Custom Log File] Log File Output Path	Log File Path Strings
		IOE			[Custom Log File] Image file output enabled	0=disabled、 1=enabled
		IOC			[Custom Log File] Image file output color	0= Full Color 1= Gray Scale
		IOF			[Custom Log File] Image file output format	0= png 1= bmp 2= tiff
		RAE			[Custom Log File] RAW data output enabled	0=disabled、 1=enabled
		ACM			Trigger Mode	2 : Free Run (fixed)

5.4.2. List of Write Commands

< Write Commands >

Command					Content
Type	Parameter				
	0	1	2	3	
WR	OL	※1			※1 : See “ Command Request/Response Details ”
	AO	EXT	0.027～2000		Sensor Camera Exposure Time
		FRA	0.1～100		Sensor Camera Frame Rate
		ROT	0 = OFF 1= Rotation right 90° 2 = Rotation right 180° 3 = Rotation right 270°		Rotation
		MHE	0=OFF 1= Horizontal Mirroring		Mirroring Horizontal
		MVE	0=OFF 1= Vertical Mirroring		Mirroring Vertical
		MAV	2～262144		Number of Averaging Times
		MAE	0=disabled、 1=enabled		Averaging Processing Enabled
		CSP	0=Origin Cursor 1=Beam Cursor		Cross Section Point
		OOX	-20～20		Origin Offset X Value
		OOY	-20～20		Origin Offset Y Value
		AAM	0= Area 1= Luminance		Auto Aperture Method
		AAE	0=disabled、 1=enabled		Auto Aperture Enabled
		ROE	0=disabled、 1=enabled		ROI Enabled
		RAX	-3000～3000 (Binning enabled -1500～1500)		ROI X Value
		RAY	(- 3000 to 3000) or (-1500 to 1500) if Binning is enabled		ROI Y Value
		RAW	(0 to 3000) or (0 to 1500) if Binning is enabled		ROI Width
		RAH	(0 to 3000) or (0 to		ROI Height

Command					Content
Type	Parameter				
	0	1	2	3	
			1500) if Binning is enabled		
		ANT	0= Tilt Angle 1= Beam Angle		Angle Type
		AJE	0=disabled、 1=enabled		Angle Judgement Enabled
		AJV	If the Angle Type is Tilt Angle, (0 to 10.0000). If the Angle Type is Beam Angle, (0 to 20.0000)		Angle Judgement Value
		DJE	0=disabled、 1=enabled		Divergence Judgement Enabled
		DJV	0.0000~1000.0000		Divergence Judgement Value
		BRT	0= D4Sigma or 1/e 2 1= D86		Radius Type Judgment
		EJE	0=disabled、 1=enabled		Ellipticity Judgment Enabled
		EJV	0.0000~1.0000		Ellipticity Judgement Value
		OJE	0=disabled、 1=enabled		Rotation Angle Judgement Enabled
		OJV	-90.0000~90.0000		Rotation Angle Judgement Criteria Value
		OJR	0.0000~90.0000		Rotation Angle Judgement Value Range
		SJE	0=disabled、 1=enabled		Judgement Spot Pixels Enabled
		SVJ	0~1040		Judgement Spot Pixels Threshold
		XJE	0=disabled、 1=enabled		Judgement Spot Pixels X Enabled
		XJV	0~1040		Judgement Spot Pixels X Threshold
		YJE	0=disabled、 1=enabled		Judgement Spot Pixels Y Enabled
		YJV	0~1040		Judgement Spot Pixels Y Threshold
		PJE	0=disabled、 1=enabled		Peak Judgment Enabled
		PJV	0.0~4095.0		Peak Judgement Value
		RFP	Log File Path Strings		Log File Output Path
		IOE	0=disabled、 1=enabled		Image File Output Enabled
		RAE	0=disabled、 1=enabled		RAW Data Output Enabled
		IOC	0= Full Color 1= Gray Scale		Image File Output Color
		IOF	0= png 1= bmp 2= tiff		Image File output format

Command					Content
Type	Parameter				
	0	1	2	3	
		CNM	0= Area、 1= Intensity		Beam Centroid
		ANU	0= Degree 1= DegMinSec 2= Milliradian		Angle Unit
		DNE	0=disabled、 1=enabled		Denoising Enabled
		DNT	1～4095		Denoising Threshold Value
		DAX	0～8		Number of Decimal Places for the Angle X
		DAY	0～8		Number of Decimal Places for the Angle Y
		DAD	0～8		Number of Decimal Places for the Angle D
		DDS	0～8		Number of Decimal Places for the (Beam Divergence) D4Sigma or 1/e ²
		DDX	0～8		Number of Decimal Places for the (Beam Divergence) D4Sigma or 1/e ² X(M)
		DDY	0～8		Number of Decimal Places for the (Beam Divergence) D4Sigma or 1/e ² Y(m)
		DD8	0～8		Number of Decimal Places for the (Beam Divergence) D86
		DEL	0～8		Number of Decimal Places for the Ellipticity
		DOR	0～8		Number of Decimal Places for the Rotation Angle Measurement
		DSS	0～8		Number of decimal places for spot Pixels
		MSO	0= Area 1= Angle 2=Peak 3=Total Count		(Multi Spot) Order
		MSC	1～100		(Multi Spot) Spot Count
		MSM	1～1023		(Multi Spot) Min Spot Area
		ACE	0=disabled、 1=enabled		Adaptive Cal Execution Button Display

Command					Content
Type	Parameter				
	0	1	2	3	
					Enabled
		BDT	0=D4Sigma 1=1/e ²		Beam Diameter Type
		DOE	0=disabled、1=enabled		Orientation Enable
		OCM	0= Ellipse Fitting 1= Max Distance Search		Rotation Angel Measurement Method
		BIE	0=disabled、1=enabled		Binning Enabled
		WDS	30~300		Working Distance
		VAA	0=disabled、1=enabled		Auto Aperture Display
		VCC	0=disabled、1=enabled		Centroid Cursor Display
		VCS	0=disabled、1=enabled		Cross Section Display
		VLA	0=disabled、1=enabled		Labeling Area Display
		VMR	0=disabled、1=enabled		Measurement Range Display
		VOC	0=disabled、1=enabled		Origin Cursor Display
		VSA	0=disabled、1=enabled		Spot Area Display
		IST	0= D4Sigma or 1/e ² 1= D86		Spot Area Display Type
		VRA	0=disabled、1=enabled		ROI Area Display
		DSN	0~100		Rotation Angle Cursor Display Enabled
		VOU	0=disabled、1=enabled		Display Spot Number
		VAX	0=disabled、1=enabled		Angle X Result Display
		VAY	0=disabled、1=enabled		Angle Y Result Display
		VAD	0=disabled、1=enabled		Angle D Result Display
		VDS	0=disabled、1=enabled		(Beam Divergence) D4Sigma or 1/e ² Result Display
		VDX	0=disabled、1=enabled		(Beam Divergence) D4Sigma or 1/e ² X(M) Result Display
		VDY	0=disabled、1=enabled		(Beam Divergence) D4Sigma or 1/e ² Y(m) Result Display
		VD8	0=disabled、1=enabled		(Beam Divergence) D86 Result Display
		VEL	0=disabled、1=enabled		Ellipticity Result Display
		VOR	0=disabled、1=enabled		Rotation Angle Result Display
		VSS	0=disabled、1=enabled		Spot Pixels result display

Command					Content
Type	Parameter				
	0	1	2	3	
		VTC	0=disabled、 1=enabled		Total Count Result Display
		VPE	0=disabled、 1=enabled		Peak Result Display
		FAN	0= Small 1= Medium 2= Large		Font Size for the Angle
		FBD	0= Small 1= Medium 2= Large		Font Size for the Beam Divergence
		FBE	0= Small 1= Medium 2= Large		Font size for the Beam Ellipticity
		FOR	0= Small 1= Medium 2= Large		Font Size for the Rotation Angle
		FPO	0= Small 1= Medium 2= Large		Font Size for the Power
		LAE	0=disabled、 1=enabled		Automatic Brightness Execution Enabled
		LAV	1000～3500		Automatic Brightness Peak Target Value
		LAR	100～1000		Automatic Brightness Peak Target Range
		LRV	0.05～100		Reflectance of the target
		UPV	0=disabled、 1=enabled		Adopt previous convergence values used in automatic brightness control
		LEI	0.027～20		Initial Exposure Time Value applied in the Automatic Brightness
		LEX	0.027～20		maximum value of exposure time applied in automatic brightness
		LEN	0.027～20		minimum value of Exposure time applied in the Automatic Brightness
		PAM	0=disabled、 1=enabled		Enable 2-Point Parallel Adjustment Mode
	CO	CLF	0=disabled、 1=enabled		Custom Log File enabled
		RFP	Log File Path Strings		[Custom Log File] Log File Output Path
		IOE	0=disabled 1=enabled		[Custom Log File]

Command					Content
Type	Parameter				
	0	1	2	3	
					Image file output enabled
		IOC	0= Full Color 1= Gray Scale		[Custom Log File] Image file output color
		IOF	0= png 1= bmp 2= tiff		[Custom Log File] Image file output format
		RAE	0=disabled 1=enabled		[Custom Log File] RAW data output enabled
		ACM	2 : Free Run		Trigger Mode

5.4.3. List of Execution Commands

< Execution Commands >

Command					Content
Type	Parameter				
	0	1	2	3	
EX	SV				Save Options
	AL				Automatic Brightness for the Angle Measurement
	AR	MSN	1~100		Angle Main Spot Number Switching
	RO				Output Measurement Log
	AZ				Angle Zero Set
	CM	STA			Start Measurement
		STO			Stop Measurement
	ST	STA			Start Streaming
		STO			Stop Streaming
	SD				Exit application during background operation

5.4.4. List of Error Commands

<Error Commands>

Command					Content
Type	Parameter				
	0	1	2	3	
ER	—	1			System Error
	2				Setting Data Error
	3				Command Format Error
	4				Execution Error
	5				State Error
	7				Sensor Disconnection Error

5.5. Command Request/Response Details

5.5.1. Reading

Version Information

<Request>

R	D	,		V	S	CR	LF
---	---	---	--	---	---	----	----

<Response>

R	D	,	*1	,	*2	,	*3	CR	LF
---	---	---	----	---	----	---	----	----	----

*1 : Major number

*2 : Minor number

*3 : Build number

Option List Information

<Request>

R	D	,	O	L	CR	LF
---	---	---	---	---	----	----

<Response>

R	D	,	*1	,	*2	,	*3	CR	LF
---	---	---	----	---	----	---	----	----	----

*1 : Number of option lists

*2 : Option name (includes many option names as there are option lists, separated with commas)

*3 : Index indicating selected options

Measurement results

<Request>

R	D	,	D	R	CR	LF
---	---	---	---	---	----	----

<Response>

R	D	,	*1	,	*2	,	*3	.	.	.	*16	,		*17	CR	LF
---	---	---	----	---	----	---	----	---	---	---	-----	---	--	-----	----	----

*1: Tilt Angle/Beam Angle: Angle X measurement value

*2: Tilt Angle/Beam Angle: Angle Y measurement value

*3: Tilt Angle/Beam Angle: Angle D measurement value

*4: Beam Divergence: D4Sigma or $1/e^2$ measurement value

*5: Beam Divergence: D4Sigma X(M) or $1/e^2$ X(M) measurement value

*6: Beam Divergence: D4Sigma Y (m) or $1/e^2$ Y(m) measurement value

*7: Beam Divergence: D86 measurement value

*8: Beam Ellipticity measurement value

*9: Beam: Total count value

*10: Beam: Peak value

*11: Judgement: Tilt angle (D) judgement result (OK / NG)

*12: Judgement: Beam divergence judgement result (OK / NG)

*13: Judgement: Ellipticity judgement result (OK / NG)

*14: Judgement: Peak judgement result (OK / NG)

*15: Angle Unit (degree / DegMinSec / milli-radian)

*16: Orientation Measurement value

*17: Orientation Judgement result (OK / NG)

Multi Spot Measurement results

<Request>

R	D	,	A	R	,	M	L	T	,	*1	,	*2	CR	LF
---	---	---	---	---	---	---	---	---	---	----	---	----	----	----

*1 : Acquisition Start Spot Number (1 to 100)

*2 : Consecutive Spot Count to Read from *1 (1 to 100)

<Response>

R	D	,	*3	,	*4	,	*5	.	.	.	*19	*20	CR	LF
---	---	---	----	---	----	---	----	---	---	---	-----	-----	----	----

*3: Tilt Angle/Beam Angle: Angle X measurement value

*4: Tilt Angle/Beam Angle: Angle Y measurement value

*5: Tilt Angle/Beam Angle: Angle D measurement value

*6: Beam Divergence: D4Sigma or $1/e^2$ measurement value

*7: Beam Divergence: D4Sigma X(M) or $1/e^2$ X(M) measurement value

- ※8: Beam Divergence: D4Sigma Y (m) or $1/e^2$ Y(m) measurement value
- ※9: Beam Divergence: D86 measurement value
- ※10: Beam Ellipticity measurement value
- ※11: Beam: Total Count value
- ※12: Beam: Peak value
- ※13: Judgement: Tilt Angle (D) judgement result (OK / NG)
- ※14: Judgement: Beam Divergence judgement result (OK / NG)
- ※15: Judgement: Ellipticity judgement result (OK / NG)
- ※16: Judgement: Peak judgement result (OK / NG)
- ※17: Angle Unit (degree / DegMinSec / milli-radian)
- ※18: Orientation measurement value
- ※19: Judgement: Orientation judgement result (OK / NG)
- ※20: Measurement Results of ※3 to ※19 specified in ※2 (The specified number of results will be included, separated by “,”)

Multi Spot Measurement Spot Number

<Request>

R	D	,	A	R	,	A	S	C	CR	LF
---	---	---	---	---	---	---	---	---	----	----

<Response>

R	D	,	※1	CR	LF
---	---	---	----	----	----

※ 1 : Number of measured Spot Count (0 to 100)

Auto Brightness Control Status

<Request>

R	D	,	A	S	,	L	A	S	CR	LF
---	---	---	---	---	---	---	---	---	----	----

<Response>

R	D	,	※1	CR	LF
---	---	---	----	----	----

※1 : Dimming status

("0" = dimming complete, "1" = dimming in process, "2" = dimming failed, "3" = dimming not started)

Angle Option

<Request>

R	D	,	A	O	,	*1	CR	LF
---	---	---	---	---	---	----	----	----

*1 : See [List of Reading Commands](#)

<Response>

R	D	,	*1	CR	LF
---	---	---	----	----	----

*1 : Currently configured option settings (See [List of Reading Commands](#))

Custom Result Output Measurement Results

<Request>

R	D	,	C	R	CR	LF
---	---	---	---	---	----	----

<Response>

R	D	,	*1	,	*2	,	*3	.	.	.	CR	LF
---	---	---	----	---	----	---	----	---	---	---	----	----

*1 : Frame No. (fixed to "-")

*2 : Measurement date and time

*3 : Measurement results (the measurement results selected in Custom Result under Option settings are included and separated by ",")

Common Option

<Request>

R	D	,	C	O	,	*1	CR	LF
---	---	---	---	---	---	----	----	----

*1 : See [List of Reading Commands](#)

<Response>

R	D	,	*1	CR	LF
---	---	---	----	----	----

*1 : Currently configured option settings (See [List of Reading Commands](#))

5.5.2. Writing

Option List

<Request>

W	R	,	O	L	,	※1	CR	LF
---	---	---	---	---	---	----	----	----

※1 : Option list Index number

<Response>

W	R	CR	LF
---	---	----	----

Angle Option

<Request>

W	R	,	A	O	,	※1	,	※2	CR	LF
---	---	---	---	---	---	----	---	----	----	----

※1, ※2 : See [List of Writing Commands](#)

<Response>

W	R	CR	LF
---	---	----	----

Common Option

<Request>

W	R	,	C	O	,	※1	,	※2	CR	LF
---	---	---	---	---	---	----	---	----	----	----

※1, ※2 : See [List of Writing Commands](#)

<Response>

W	R	CR	LF
---	---	----	----

5.5.3. Execution

Option Save

<Request>

E	X	,	S	V	CR	LF
---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

Auto Brightness Control (Tune)

<Request>

E	X	,	A	L	CR	LF
---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

Main Spot Number Switch

<Request>

E	X	,	A	R	,	M	S	N	,	※1	CR	LF
---	---	---	---	---	---	---	---	---	---	----	----	----

※1 : Main Spot Number(1~100)

<Response>

E	X	CR	LF
---	---	----	----

Measurement Results Log Output

<Request>

E	X	,	R	O	CR	LF
---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

Zero Set

<Request>

E	X	,	A	Z	CR	LF
---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

Measurement Start / Stop

<Start Request>

E	X	,	C	M	,	S	T	A	CR	LF
---	---	---	---	---	---	---	---	---	----	----

<Stop Request>

E	X	,	C	M	,	S	T	O	CR	LF
---	---	---	---	---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

Streaming Start / Stop

<Start Request>

E	X	,	S	T	,	S	T	A	CR	LF
---	---	---	---	---	---	---	---	---	----	----

<Stop Request>

E	X	,	S	T	,	S	T	O	CR	LF
---	---	---	---	---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

Application Close (Background Operation)

<Request>

E	X	,	S	D	CR	LF
---	---	---	---	---	----	----

<Response>

E	X	CR	LF
---	---	----	----

5.5.4. Error Commands

When a command was not successfully received or could not be executed, the Products will return error information in the following format.

<Error Response>

E	X	,	*1	CR	LF
---	---	---	----	----	----

The error codes appear in *1 as below.

"-1": System Error

- The command could not be processed successfully. (Please contact support.)

"2": Setting Data Error

- Value outside setting range was set.

"3": Command Format Error

- Number of commas from header to [CRLF] does not match.
- Command not in command list, or non-alphanumeric characters.
- Text after header includes characters not in list above.

"4": Execution Error

- The command could not be executed successfully.

"5": State Error

- The command cannot be accepted due to the current configuration or operating state.

"7" : Sensor Disconnection Error

- Communication with the sensor was lost.

6. System Log

6.1. System Log List

System Log	Content
Angle view initialize succeeded	Angle screen initialization was successful. Measurement starts normally.
Angle view initialize failed. Please check the connection with the Suruga OptGauge.	Angle screen initialization failed. Check the sensor head and computer connection.
Angle result output succeeded	By pressing the [Output Once] button icon, it executes the output of the Angle measurement results, successfully.
Angle result output failed	Measurement results output with [Output Once] button failed.
Adaptive Cal succeeded	Adaptive calibration with [Adaptive Cal] button was successful
Adaptive Cal failed	Adaptive Cal with [Adaptive Cal] button failed
It is necessary to block the light	Adaptive Cal failure: Block the light

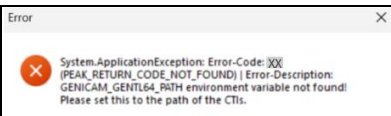
6.2. Error Messages and Countermeasures

Error message	Cause	Countermeasure
Angle view initialize failed. Please check the connection with the Suruga OptGauge.	The Product and computer are not connected.	Check that the Product and computer are connected and restart the Suruga OptGauge. If this error is repeatedly generated, the Product interior camera may not be working properly. Contact the Suruga Seiki Optical Device Business Division Sales Section.
Angle result output failed.	Measurement results output file (.csv) is open.	Please close the measurement results output file (.csv) if opened and execute outputting measurement results.
Adaptive Cal failed. It is necessary to block the light.	Because the light is not blocked, the Adaptive Cal cannot be executed.	Check that the beam is not incoming to the Products. Also, make sure before measurement that there is no unwanted exterior light or other laser light source interfering with the sensor.

7. Failures? Frequently Asked Questions

7.1. Symptoms and Countermeasures

Useful information for troubleshooting is listed below. Check if the table below shows your trouble.

Symptom	Cause	Countermeasure
Internal light source power is NOT turned on.	AC adapter or power cable is not correctly connected.	DC12V is not supplied.
	DC12V is not supplied.	Correctly connect the DC12V power source.
Application does not start.	USB cable is not correctly connected.	Connect the USB cable to the USB3.0 port.
	Device authentication file is not being read.	Read: device authentication file (.suruga) corresponding to the Product purchased.
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 of the USB device driver) After installation, please restart your PC.
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	Exposure Time is too short.	Adjust the Exposure Time to the optimal speed.
	Large tilt on the target.	Adjust the tilt angle of the target so that the reflected light beam enters within the range.
Measurement target centroid	Noise is causing serious	Enable the Threshold in the

is unstable	effects	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 the Ethernet cable.
	Computer communication conditions are not met correctly.	Set the communication settings correctly on the PC.

8. Warranty - After-Sales Service

8.1. 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.

8.2. 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, the SURUGA conducts a repair service for free. For any damages out of warranty period mentioned above, the 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

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