

Category	IM Series - Calibration and Recertification
Title	IM Series Recertification
Objectives	• When to calibrate your IM system • Gage Artifact Requirements • Where can I get the appropriate artifacts? • Creating a Recertification Program, and Performing the Recertification
Keywords	IM, Calibration, Certification, Recertification, Artifact, NIST

When to Recalibrate / Recertify your IM system

The IM is a solid-state image dimensional measurement system, built around 22 fixed position lenses, which include 4 sets of telecentric lenses. The IM's optical measurements are captured instantly through the use of its fixed optics. Since no mechanical measurement is involved in determining these measurement results, there is no need to have KEYENCE or any other third party recalibrate the internal components under normal use. In the event the system dropped or otherwise physically damaged, formal recalibration (repair) may be required.

The IM system is delivered with its matching NIST traceable certificate of factory calibration, which is valid for the life of the machine. However, in order to comply with national standards, the system must be recertified with a NIST traceable artifact at a minimum of once **every 365 days**. This document details the method to assure that your machine is still in accordance with your factory calibration certificate, and maintains its traceability to NIST and national standards.

Requirements for Recertification

In order to recertify the IM, a class XX NIST traceable artifact must be used. The following sections outline the IM series official accuracy specifications for each IM model, the Keyence officially recommended NIST traceable gage artifacts, additional artifact requirements (*i.e.* for when the recommended artifact is not used), and finally outline the routines to be used for the process of recertification. For measurement data traceability, Keyence recommends a recertification program be created. This final sections of this document outline how to create these programs in the IM's 'Program' mode. This automated program can then simply be run at a minimum of once **every 365 days** using the appropriate NIST traceable artifact in order to maintain the NIST certification of the IM system.

Accuracy Specifications

The measurement result captured on the IM must be compared against the official accuracy specifications. They can be entered directly into the upper and lower limits (*i.e.* $\pm$ tolerance) of the appropriate measurement tool when creating the recertification program file.

IM SERIES **MODEL** and **MODE**:

	Camera (Vision) Tolerance
IM-8030T/8030/8020/8005 Wide-Field Mode	$\pm 0.000,15$ inch (± 3.9 μm)
IM-8030T/8030/8020/8005 High-Precision Mode	$\pm 0.000,08$ inch (± 2.0 μm)
IM-RU1 Major Diameter APP Wide Field	$\pm 0.000,15$ inch ($\pm 2.8+0.02D$ μm)
IM-RU1 Major Diameter APP High-Precision	$\pm 0.000,08$ inch ($\pm 2.8+0.02D$ μm)

	Height Measurement Tolerance
IM-8030T Height-Probe Mode	$\pm 0.000,3$ inch (± 7.5 μm)
IM-8030T Wide-range Position Height-Probe Mode	$\pm 0.000,6$ inch (± 15.0 μm)

	Light Probe Measurement Tolerance
IM-8030T/8030/8020 Light-Probe Mode	$\pm 0.000,33$ inch ($\pm 8+0.02L$ μm)

Artifact Requirements

- NIST Traceable ‘Long’ Certification must be attached to the artifact, and also updated **every 365 days** or less (this varies based of the certification received). This is achieved by sending the gage artifact back to an ISO-17025 facility to be recertified.
- For the IM Adjustment Chart (OP-88552), recertification is recommended every 2-5 years. If your chart is subjected to more frequent use, harsher environment, temperature changes, etc. it is recommended to recertify more frequently (2-3 years).
- In order to maintain artifact surface and thermal stability, rigidity, and durability, the artifact must be ceramic or glass material, ideally.
- Artifact must be manufactured to be an order of magnitude more accurate than the IM being recertified (**Class XX / Grade 00**).

Officially Recommended Gage Artifacts

The below recommended gage artifacts have been chosen based on IM recertification specifications, availability, and cost. For our customer’s convenience, these artifacts can be purchased directly from, and recertified annually by Thread Check Inc.:

Thread Check Inc. www.threadcheck.com
For expedited service, contact: Linda Gagné Email: linda@threadcheck.com Direct Tel: 843-388-7555

IM SERIES MODEL, recommended artifacts, and details

For **ALL** 8000 series models for camera certification, you can use one of these (does *not* require *both*)

- **0.1000 inch Class XX** Ceramic Master Gage Pin, 2” in length, with long Cert.¹
Or
- **OP-88552 Adjustment Chart.**

Additionally, for IM-8030T/8030/8020 for **Light Probe** certification:

- **0.8000 inch Class XX** Ceramic Master ID Gage Ring, 5mm in length, with long Cert.⁴

Additionally, for IM-8030T for **Height Gauge** (ADI) certification:

- **0.1000 inch Grade 00** (Calibration Grade) Ceramic Master Gage Block, rectangular, with long Cert.²
AND
- **0.2000 inch Grade 00** (Calibration Grade) Ceramic Master Gage Block, rectangular, with long Cert.²

1 If another size Pin Gage is used, the Pin diameter must be less than the maximum depth-of-field of the highest accuracy camera:

- **2.5mm** (0.1”)

A Block Gage cannot be used to recertify the IM Cameras due to non-perpendicularity of the block surfaces. Gage blocks are precision ground in a single axis and are not ground to be Precision Square. This allows a gage block to sit “titled” on the machine’s stage and will render a larger measurement than specified by your certified gage block when it is placed on its side. Testing shows a typical disparity of 0.000,4” on the positive side when using a block.

2 If another size Block Gage is used, the Block height must be less than 30mm. If a Block height of more than 30mm and less than 60mm is used, the measurement accuracy can be compared against the known standard of $\pm 12\mu\text{m}$ for standard probe and $\pm 21\mu\text{m}$ for wide-range probe.

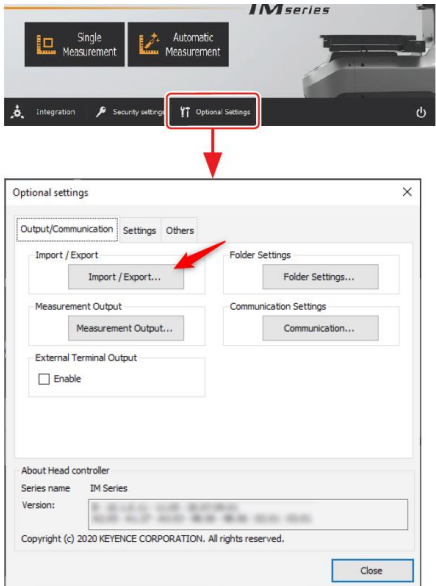
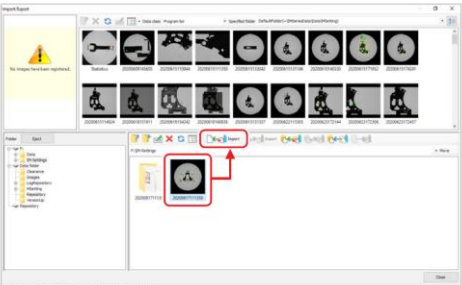
3 **Class XXX** can be used for recertification of all IM models.

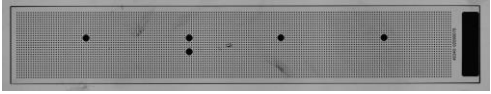
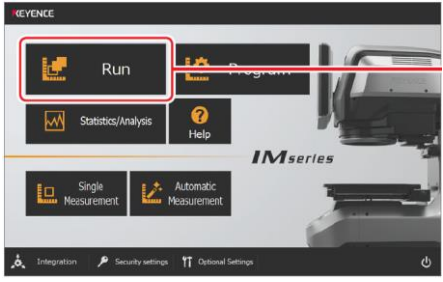
4 If another size Ring Gage is used to recertify the Light Probe, the Ring height (sometimes specified as length) must be less than 20mm, and measurement accuracy must be compared against the calculated accuracy. $\pm(8+0.02 L)\mu\text{m}$, where L is the Ring Gage diameter (or measurement distance) in **mm**.

A Block Gage cannot be used to recertify the Light Probe due to non-perpendicularity of the block surfaces. Gage blocks are precision ground in a single axis and are not ground to be Precision Square. This allows a gage block to sit “titled” on the machine’s stage and will render a larger measurement than specified by your certified gage block when it is placed on its side. Testing shows a typical disparity of 0.000,4” on the positive side when using a block.

IM-8020, 8030, 8030T (NOT 8005)

Creating a Recertification Program and Performing the Recertification with the OP-88552 IM Adjustment Chart

OP-8552 Adjustment Chart Keyence IM Calibration Certificate OP-88552 Calibration Certificate	Premade / Keyence provided program: 'Calibration 8000'
• A single program can be made to evaluate the WF and HP cameras on the 8000 series head units. This program is created and provided by Keyence upon request. • Clean the stage and lens surfaces with Isopropyl Alcohol and a dust free cloth. • Clean the master Gage Artifact(s) with a dust free cloth. • Ensure the environment and the artifact is between 68° and 72°F.	
Import the program onto the IM using the Optional Settings > Import/Export window. 1.) Place the program file 'Calibration 8000' onto a USB flash drive. 2.) Plug the USB flash drive into the IM Controller unit.	
3.) Select the USB from the folder tree on the bottom-left. 4.) Select the 'Calibration 8000' program from the bottom window. 5.) Select [Import] from the center taskbar to load the program into the IM Series.	Clicking  imports (copies) the selected file to the specified folder. 
6.) Navigate to the Run mode from the main menu.	
7.) Browse for the recently imported 'Calibration 8000' program and open/load.	

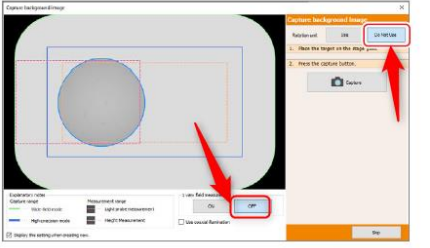
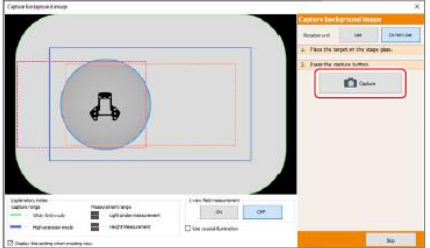
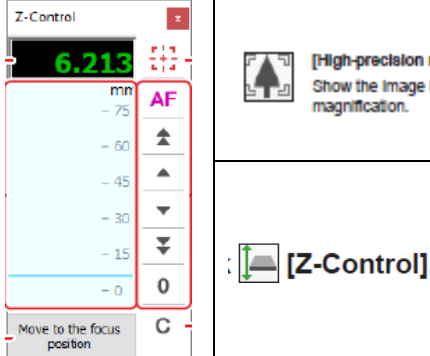
8.) Place the Adjustment Chart so it is visible on the stage and sits on-stage completely (no part is hanging off the stage).	
9.) [Measure] the artifact. All results should be [OK] 10.) If any results are NG, confirm the design value matches the one from your IM Series Adjustment Chart Calibration certification. If not, edit the design value for that feature in Program Mode to match your certification. 11.) After the part run, print or save a 'Single Object Report', which is hard copy report of the recertification. Have the individual who performed the measurement sign the signature field if possible.	
All recertification reports must be filed with the IM's original factory calibration certificate.	

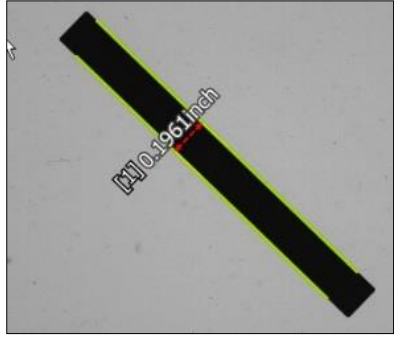
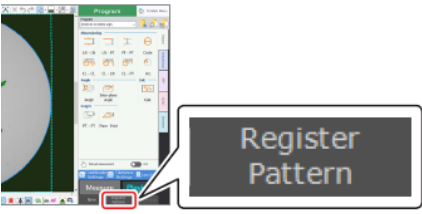
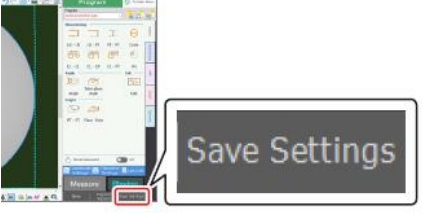
ALL IM MODELS (IM-8005, IM-8020, 8030, 8030T with no Adjustment Chart)

Creating a Recertification Program and Performing the Recertification with the Pin Gage artifact

Pin Gage Artifact Keyence IM Calibration certificate	NIST Traceable Long Certification IM Tools: Basics > LN-LN
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- A single program can be made to evaluate the WF and HP cameras on the 8000 series head units. - Clean the stage and lens surfaces with Isopropyl Alcohol and a dust free cloth. - Clean the master Gage Artifact(s) with a dust free cloth. - Ensure the environment and the artifact is between 68° and 72°F.	
12.) Place the Pin Gage artifact onto the center of the stage, so it will be visible with both cameras.	
13.) From the main menu, click [Measurement Settings] or [Program].	
14.) Select [New]	

	
15.) Set the '1 view field measurement' to [OFF] 16.) Select the Rotation unit to [OFF] if it is connected	Click [Do Not Use] "Rotation unit" when the rotation unit IM-RU1 is connected. 
17.) Select [Capture]	
18.) From the taskbar at the bottom, select the High Precision Camera. Make sure the pin is visible. 19.) Click the Z-Control button to activate the Z-Control function. 20.) Type in the Z value equal to half the diameter of the pin so the IM will focus on the cross-section as desired. For a .1" pin, this value would be .05".	
21.) From the Basics tool tab, select the Line-to-Line [LN-LN] tool. Drag down one side of the Pin Gage edge, and then down the opposite edge. Click one more time to place the measurement value display. Avoid the first 1mm and last 1mm of the pin ends. On the right side, set the "Tolerance settings":	

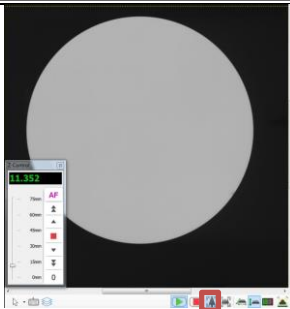
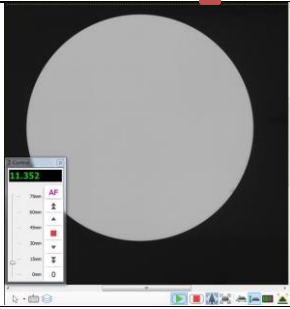
a.) Design Value: the actual NIST certified value listed on the pin's long-cert. b.) Limits: The accuracy specification of the current camera mode: High-Precision Mode $\pm 0.000,08$ inch (± 0.002 mm) Depending on the default unit display settings of your machine, increasing the significant digit limit in display settings might be required [Settings>Display settings]. c.) Press Apply, then press OK.	
22.) From the taskbar at the bottom, select the Wide Field Camera. 23.) From the Basics tool tab, select the Line-to-Line [LN-LN] tool. Drag down one side of the Pin Gage edge, and then down the opposite edge. Click one more time to place the measurement value display. Avoid the first 1mm and last 1mm of the pin ends. On the right side, set the "Tolerance settings": d.) Design Value: the actual NIST certified value listed on the pin's long-cert. e.) Limits: The accuracy specification of the current camera mode: Wide-Field Mode $\pm 0.000,15$ inch ($\pm 0.003.9$mm) Depending on the default unit display settings of your machine, increasing the significant digit limit in display settings might be required [Settings>Display settings]. 24.) Press Apply, then press OK.	 [Wide-field measurement mode] Shows the image in the preview display at low magnification. 
25.) At the bottom right of the screen select Register Pattern, and follow the prompts to register the part pattern.	
26.) At the bottom right of the screen select Save Settings. You will be presented with a quick-setting window. Click OK.	
27.) You will be presented with a Save As window. Save the program file name as Certification Program or similar appropriate name.	
28.) Use [Run] mode to perform your recertification, and press the Save or Print button to create a 'Single Object Report', which is hard copy report of the recertification. Have the individual who performed the measurement sign the signature field if possible.	
- For IM-8020 and IM-8030/8030T, you will also need to create a recertification program for the light probe. - For IM-8030T, you will also need to create a recertification program for the height probe.	

- All recertification reports must be filed with the IM's original factory calibration certificate.

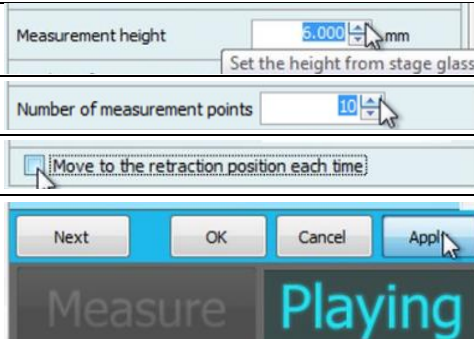
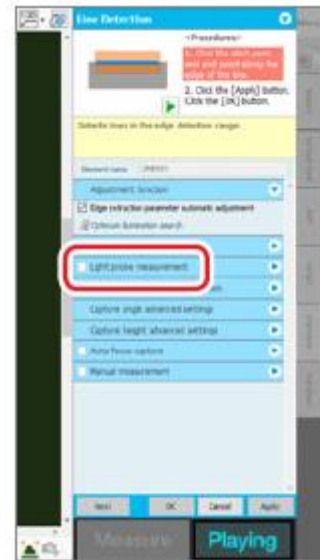
IM-8030T, 8030, 8020 ONLY

Creating a Recertification Program and Performing the Recertification with the Ring Gage Artifact

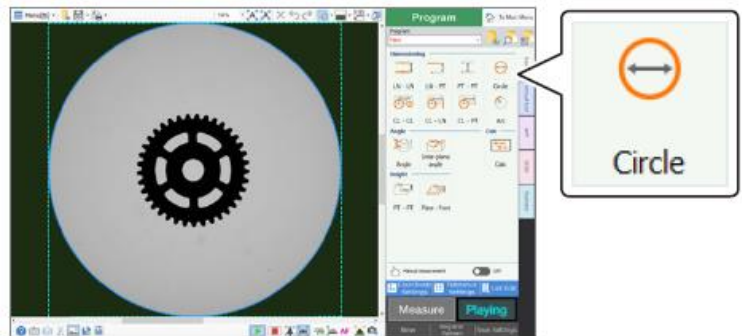
Ring Gage Artifact	NIST Traceable Long Certification
Keyence IM Calibration certificate	IM Tools: Basics > LN-LN

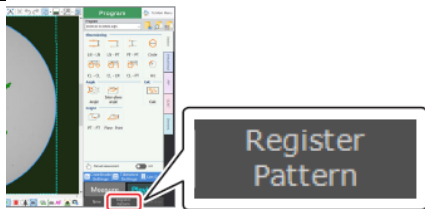
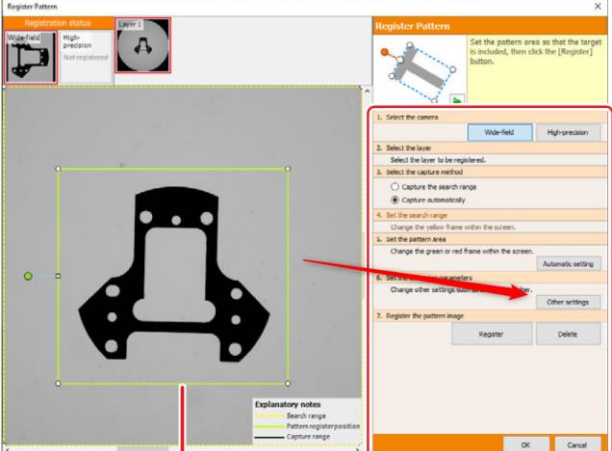
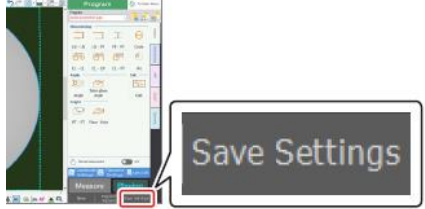
• Clean the stage and lens surfaces with Isopropyl Alcohol and a dust free cloth. • Clean the master Gage Artifact(s) with a dust free cloth. • Ensure the environment and the artifact is between 65° and 70°F.	
1.) Place your Ring Gage artifact onto the center of the stage.	
2.) From the main menu click on [Program], then click [New]	
3.) Set the '1 view field measurement' to [OFF] Select the Rotation unit to [OFF] if it is connected Select the High Precision camera	
• Adjust the position of the ring on the stage as needed. 4.) Use Z-Control to focus the ring edge. 5.) This button is located on the bottom menu bar. 6.) Auto-Focus should be used to fine-focus.	
7.) From the Element tool tab, select the Circle tool. 8.) Click three points around the edge of the Ring Gage surface.	

- 9.) On the right side, select the Light Probe Measurement option from the Circle Detection options.
- 10.) When prompted to set the height settings, click OK to keep the setting at 30mm.
- 11.) On the right side, under the Light probe measurement section set the Measurement height to half of the Ring gage height.
- 12.) Set the number of measurement points to 10.
- 13.) You may uncheck the Move to the retraction position each time
- 14.) Press Apply, then press OK.



- 15.) **From the Basics tool tab, select the Circle tool.**
Select the previously created circle element.
 - **Click on the GREEN EDGE of the CIRCLE on the left image window.**
On the right side, set the "Tolerance settings":
 - a.) **Design Value:** the actual NIST certified value listed on the ring's long-cert.
 - b.) **Limits:** The accuracy specification:
If a different size Ring Gage is used to recertify the Light Probe, the limits entered must be the calculated accuracy: $\pm(8+0.02 L) \mu\text{m}$, where L is the Ring Gage diameter (or measurement distance) in **mm**.
- IM-8020 **Light-Probe Mode** 0.8000 inch ID ring: $\pm 0.000,33$ inch ($\pm 0.0084\text{mm}$)
- Depending on the default unit display settings of your machine, increasing the significant digit limit in display settings might be required [Settings>Display settings].
 - c.) Press **Apply**, then press **OK**.



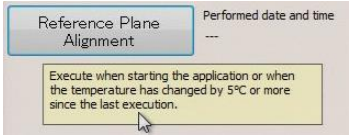
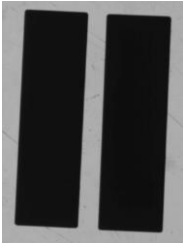
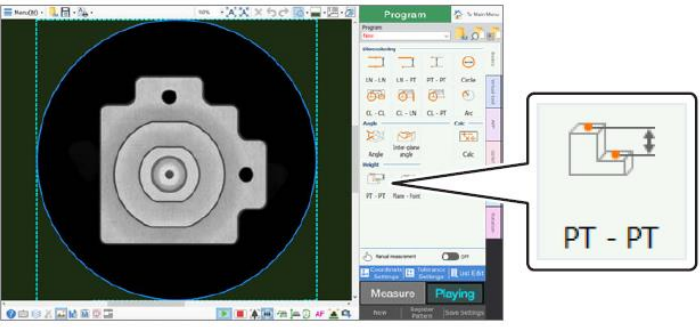
16.) At the bottom right of the screen select Register Pattern, and follow the prompts to register the part pattern.	
17.) On the Register Pattern window click Other Settings and set the 'Angle Range' to 0 degrees to avoid duplicate pattern errors. Click OK on both windows.	
18.) At the bottom right of the screen select Save Settings. You will be presented with a quick-setting window. Click OK.	
19.) You will be presented with a Save As window. Save the program file name as Certification Program Light Probe or similar appropriate name.	
20.) Use [Run] mode to perform your recertification, and press the Save or Print button to create a 'Single Object Report', which is hard copy report of the recertification. Have the individual who performed the measurement sign the signature field.	
All recertification reports must be filed with the IM's original factory calibration certificate.	

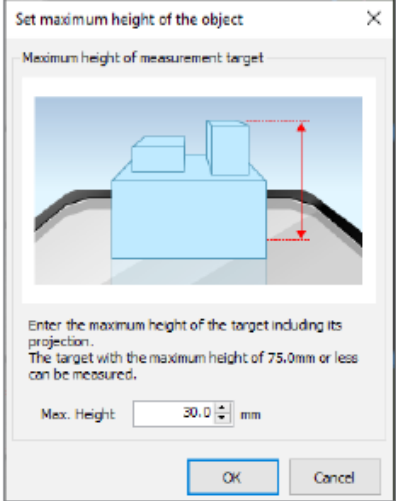
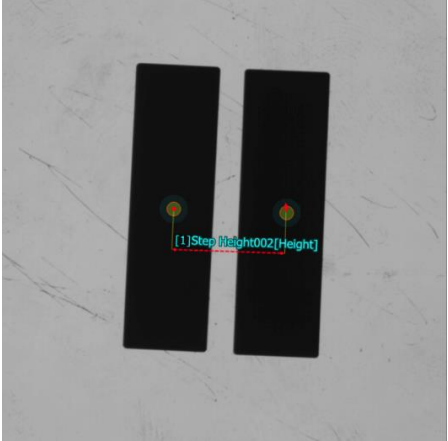
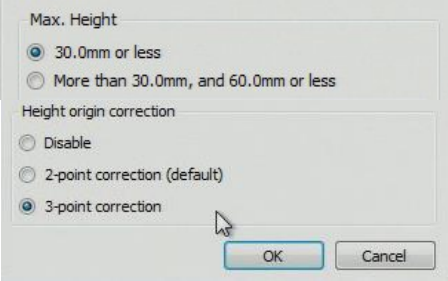
IM-8030T ONLY

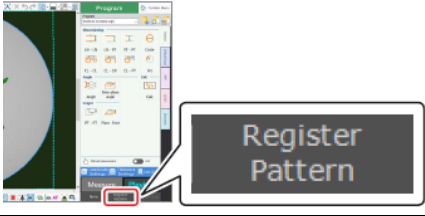
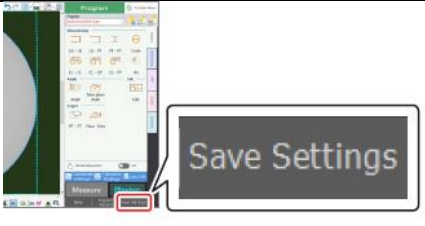
Creating a Recertification Program and Performing the Recertification with the Block Gage Artifact

Block Gage Artifact	NIST Traceable Long Certification
Keyence IM Calibration certificate	IM Tools: Basics > Height

- Clean the stage and lens surfaces with Isopropyl Alcohol and a dust free cloth. - Clean the master Gage Artifact(s) with a dust free cloth. - Ensure the environment and the artifact is between 65° and 70°F.	1.) Place both Block Gage artifacts next to each other on the center-left portion of the stage.
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2.) From the main menu click on [Program], then click [New]	
• If prompted to execute the reference plane alignment, remove the blocks and click Yes, click the Reference Plane Alignment button, and wait for the alignment to complete. Click OK once complete. • Glass Replacement Alignment must also be completed if the glass has ever been removed and/or replaced at any point since factory installation. If you are not sure, you should complete the Glass Replacement Alignment. • Both of these alignment functions are accessible from the Settings menu, Height Measurement Settings, Reference Plane Alignment. • Proceed to step 3 only after these two steps are performed.	
3.) Adjust the position of the blocks on the stage as needed. ➔ With your finger, press on each block gage firmly. This is required in order to remove or minimize the gap between the stage and the block.	
4.) From the Basics tool tab, select the Height Point to Point Measurement [PT-PT] tool.	

5.) Set the Maximum Height to a small amount more than the top of the largest gauge block. 6.) This should be < or = 30 mm.	
7.) Click once in the center of the first block surface, and then click once in the center of the second block gage. Click one more time to place the measurement value display. The IM will then begin moving the height probe to capture the height. On the right side, set the “Tolerance settings”: a.) Design Value: the difference between the actual NIST certified values listed on the block’s long-certs. b.) Limits: The accuracy specification: Accuracy specification depends on which height probe mode you are using. Go to the Settings menu, Height Measurement Settings, and select Stylus Replacement to view your current height probe mode. IM-8030T Standard Position Height-Probe Mode ±0.000,3 inch (±0.007,5mm) IM-8030T Wide-range Position Height-Probe Mode ±0.000,6 inch (±0.015mm) Depending on the default unit display settings of your machine, increasing the significant digit limit in display settings might be required [Settings>Display settings]. c.) Press Apply.	
8.) If it has not already been set, you will be prompted to set the basic height measurement settings: select 30.0mm or less select 3-point correction Click OK.	

9.) At the bottom right of the screen select Register Pattern, and follow the prompts to register the part pattern. 10.) Note, the Other Settings > 'Angle Range' may need to be set to less than 180 degrees to avoid duplicate pattern errors, depending how the blocks are placed on the stage.	
11.) At the bottom right of the screen select Save Settings. You will be presented with a quick-setting window. Click OK.	
12.) You will be presented with a Save As window. Save the program file name as Certification Program Height Measurement or similar appropriate name. *Identify this file with the appropriate probe position mode you are Recertifying.	
13.) Use [Run] mode to perform your recertification, and press the save or print button to create a 'Single Object Report', which is hard copy report of the recertification. Have the individual who performed the measurement sign the signature field.	
14.) If you are using both Stylus Position Height-Probe styles, you will need to return to step 1 to also create a recertification program for the other height probe tip. 15.) Open the same program for editing in Program mode. Go to the Settings menu, Height Measurement Settings, and select Stylus Replacement to change your stylus to the other stylus tip. 16.) Perform a Save-As to save this program separately.	
All recertification reports must be filed with the IM's original factory calibration certificate.	