




# Application Note: Understand a Certificate of Calibration

## Introduction


This Application Note provides describes information in the various sections of a Certificate of Calibration so you can better understand how a meter or sensor is calibrated by Coherent. Following is an example of a complete Certificate of Calibration:




27850 SW 95th Ave.  
Wilsonville, OR 97070  
Phone (800) 343-4912

### Certificate of Calibration

ISO/IEC 17025:2017 Accredited



**ANAB**  
ANSI National Accreditation Board  
ACCREDITED  
CALIBRATION LABORATORY



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Date: 28 Jan 2021  
Part Number: 1097901  
Description: PM10  
Serial Number: 1268C08R

Certification Number: 210128233536  
Temperature (°C): 22.8  
Relative Humidity (%): 34.4  
Procedure: QI-19.70 RevGF

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**Instrument Condition As Received**

Wavelength	Responsivity	Responsivity Uncertainty (k=2)	Laser Power	Measured Power	Measured Power Uncertainty* (k=2)	Laser Power Tolerance Limit	Status
514 nm	1.623E-3 VW	±1.0 %	1.000W	1.004W	±1.4 %	986.0mW - 1.014W	In Tolerance

①
②

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**Instrument Condition As Shipped**

Wavelength	Responsivity	Responsivity Uncertainty (k=2)	Laser Power	Measured Power	Measured Power Uncertainty* (k=2)	Laser Power Tolerance Limit	Status
514 nm	1.623E-3 VW	±1.0 %	1.000W	1.004W	±1.4 %	986.0mW - 1.014W	In Tolerance

③
④
⑤
⑥

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\*The "Measured Power Uncertainty" includes the uncertainty of the meter used for this measurement.

Standards	Asset #	Calibration Due
MOLECTRON PM10	0011W00	Mar 2021
Coherent LabMax-TO <span style="border: 1px solid orange; border-radius: 50%; padding: 2px 5px;">⑦</span>	2128T14	Jul 2021
HP 34401A	0124T97	Nov 2021

Comments:

Calibrated By: D XIONG Test Technician


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Calibration Interval Start Date: \_\_\_\_\_ Due Date: \_\_\_\_\_

The calibration interval begins when the equipment is placed into service. The "Due Date" may be established (by the customer) by adding the calibration interval to the "Start Date". Contact Customer Service for recommended calibration intervals for Coherent products.

The results listed on this calibration certificate applies to only the item listed above and shall not be reproduced other than in full, without the specific written approval by Coherent. Calibration certificates without signatures are not valid. Coherent hereby certifies that the above item has been calibrated using standards traceable to the International System of Units (SI) via a National Metrology Institute (NIST, PTB, etc.), that are signatories to the CIPM Mutual Recognition Agreement. The reported uncertainties are expressed as expanded uncertainty values at an approximately 95% confidence level using a coverage factor of k=2.

The acceptance criteria for the specification(s) in this certificate are defined per ILAC-G8:09/2019, sec. 4.2.1 - Binary Statement for Simple Acceptance Rule: **In Tolerance** - Compliant with specification(s); **Out of Tolerance** - Not compliant with specification(s).



## Coherent Accreditation

The header section displays the site address and standards to which Coherent is accredited, including the ISO/IEC 17025:2005 standard. The ANAB logo verifies that Coherent is accredited and certified.



27650 SW 95th Ave.  
Wilsonville, OR 97070  
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Certificate of Calibration  
ISO/IEC 17025:2017 Accredited



## Instrument Condition As Received

The first section identifies units returned to the factory from the customer for calibration. Information includes the operating conditions under which the unit is tested and the status of returned units.

Date: 28 Jan 2021	Certification Number: 210128233536						
Part Number: 1097901	Temperature (°C): 22.8						
Description: PM10	Relative Humidity (%): 34.4						
Serial Number: 1268C08R	Procedure: QI-19.70 RevGF						
<b>Instrument Condition As Received</b>							
Wavelength	Responsivity	Responsivity Uncertainty (k=2)	Laser Power	Measured Power	Measured Power Uncertainty* (k=2)	Laser Power Tolerance Limit	Status
514 nm	1.623E-3 VW	±1.0 %	1.000W	1.004W	±1.4 %	986.0mW - 1.014W	In Tolerance

1                      2

Coherent reports the **Uncertainty** at the k=2 confidence level. This is also called an Expanded Uncertainty, defined as two Standard Uncertainties (k=2). This can also be thought of as a 95% confidence interval.

1. Coherent tests and reports **Responsivity Uncertainty** data for the “As Received” condition.
2. Coherent reports the **Measured Power Uncertainty** for the instrument “As Received”.

## Instrument Condition As Shipped

This section describes the final test condition of the unit when shipped back to the customer.

### Instrument Condition As Shipped

Wavelength	Responsivity	Responsivity Uncertainty (k=2)	Laser Power	Measured Power	Measured Power Uncertainty* (k=2)	Laser Power Tolerance Limit	Status
514 nm	1.623E-3 VW	±1.0 %	1.000W	1.004W	±1.4 %	986.0mW - 1.014W	In Tolerance

3

4

5

6

3. The **Laser Power** is the laser power level for this specific measurement, as measured by the Working Standard.
4. The **Measured Power** is the laser power measurement made by the Unit Under Test.
5. **Uncertainty** values include both the meter and sensor, added up using the sum of squares method. This is why the Uncertainty is slightly higher than the Uncertainty for the sensor Responsivity (Rv) value only. (See the Note on the Certificate that the “Measured Power Uncertainty” includes the uncertainty of the meter used for this measurement.)
6. The **Laser Power Tolerance Limit** is based on applying the Uncertainty of the measurement to the Laser Power, as measured by the Working tolerance.
  - Upper Tolerance Limit = Laser Power + (Laser Power \* Uncertainty)
  - Lower Tolerance Limit = Laser Power - (Laser Power \* Uncertainty)

This lists the allowable range of Measured Power or the “tolerance limits”. If the power measured by the Unit Under Test is within these limits it is in tolerance.

## Equipment Used for Calibration

This section lists the equipment at Coherent used to perform the calibration and against which the calibration is measured.

\*The “Measured Power Uncertainty” includes the uncertainty of the meter used for this measurement.

Standards	Asset #	Calibration Due
MOLECTRON PM10	0011W00	Mar 2021
Coherent LabMax-TO	2128T14	Jul 2021
HP 34401A	0124T97	Nov 2021

7. The Status column compares the Measured Power to the Tolerance Limits and reports if the Measured Power is in or out of tolerance.

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### Calibration Decision Rule

The decision rule at the bottom of the form explains the calibration acceptance criteria for the specifications.

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Calibration Interval Start Date: \_\_\_\_\_ Due Date: \_\_\_\_\_

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### Contact Coherent

For assistance or additional information, contact Coherent Technical Support as follows:

- Contact your local Coherent Service Representative (or visit [www.Coherent.com](http://www.Coherent.com) to view a list of contacts worldwide)
- Send an e-mail to: [LSMservice@Coherent.com](mailto:LSMservice@Coherent.com)
- Call the Coherent Technical Support Hotline
  - Within the USA: 1-(800)-343-4912
  - Outside of the USA: 1-(408)-764-4042

For additional information about **sensor products**, go to:

<https://www.coherent.com/measurement-control>

To download the **current software** for sensor products, go to this link and scroll down to the Software, Drivers & Manuals section:

<https://www.coherent.com/measurement-control/measurement/laser-measurement-and-control-help-center>

To arrange for **warranty service or annual recalibration**, contact your regional Coherent service center to obtain a Return Material Authorization (RMA) number. Use the shipping box and packaging materials you retained to safely transport the sensor back to the factory, and ship to this address:

Coherent, Inc.  
Attn: RMA #  
27650 SW 95th Ave.  
Wilsonville, OR 97070