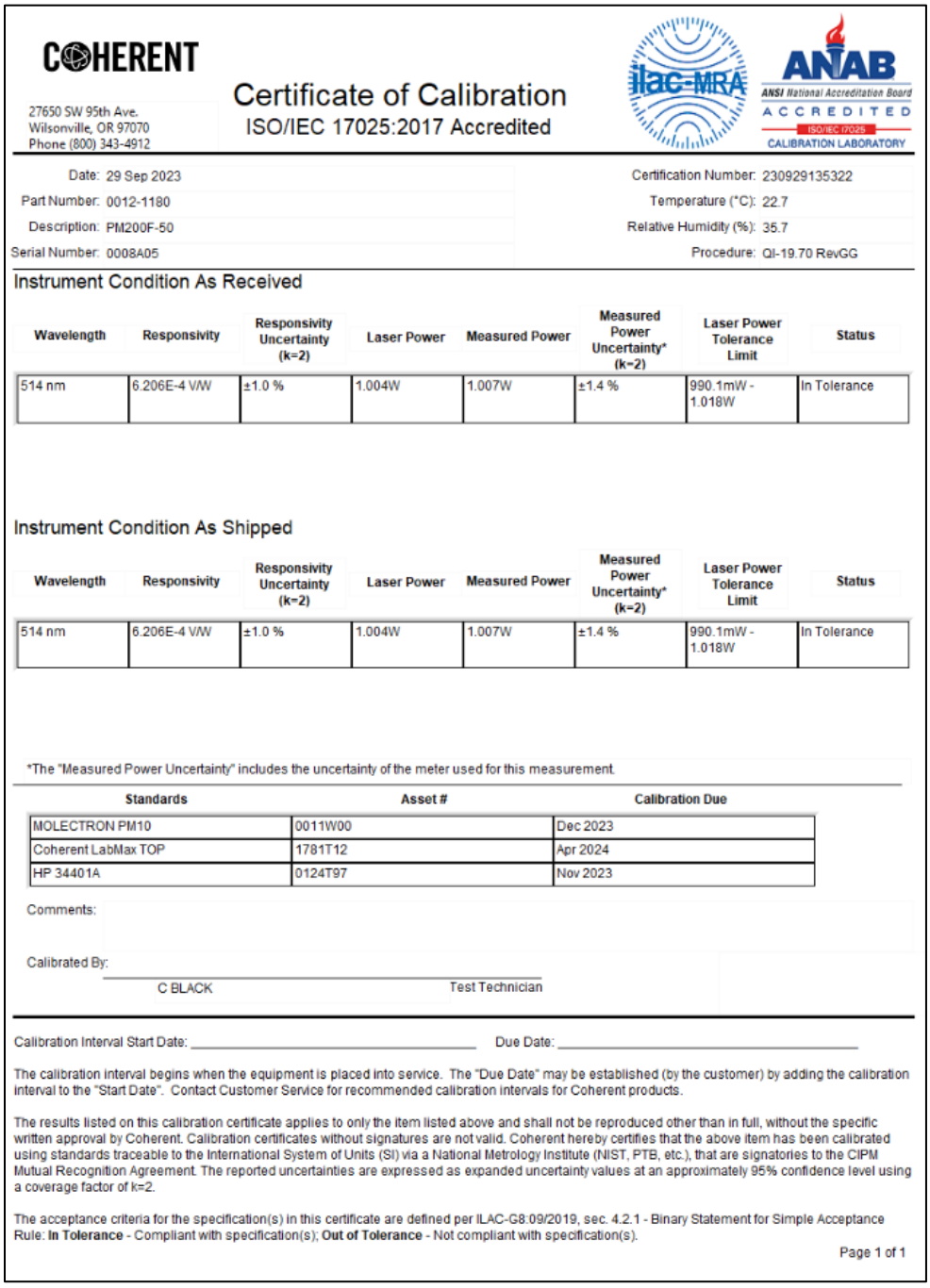
# Tech Note: Understanding a Certificate of Calibration

## Introduction

This tech note describes information in the various sections of a Coherent certificate of calibration.



COHERENT

27650 SW 95th Ave.
Wilsonville, OR 97070
Phone (800) 343-4912

Certificate of Calibration
ISO/IEC 17025:2017 Accredited

ilac-MRA

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17025
CALIBRATION LABORATORY

Date: 29 Sep 2023
Part Number: 0012-1180
Description: PM200F-50
Serial Number: 0008A05

Certification Number: 230929135322
Temperature (°C): 22.7
Relative Humidity (%): 35.7
Procedure: QI-19.70 RevGG

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 | 6.206E-4 V/W | ±1.0 % | 1.004W | 1.007W | ±1.4 % | 990.1mW - 1.018W | In Tolerance |

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 | 6.206E-4 V/W | ±1.0 % | 1.004W | 1.007W | ±1.4 % | 990.1mW - 1.018W | In Tolerance |

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

| Standards | Asset # | Calibration Due |
|---|---|---|
| MOLECTRON PM10 | 0011W00 | Dec 2023 |
| Coherent LabMax TOP | 1781T12 | Apr 2024 |
| HP 34401A | 0124T97 | Nov 2023 |

Comments:

Calibrated By:
C BLACK Test Technician

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).

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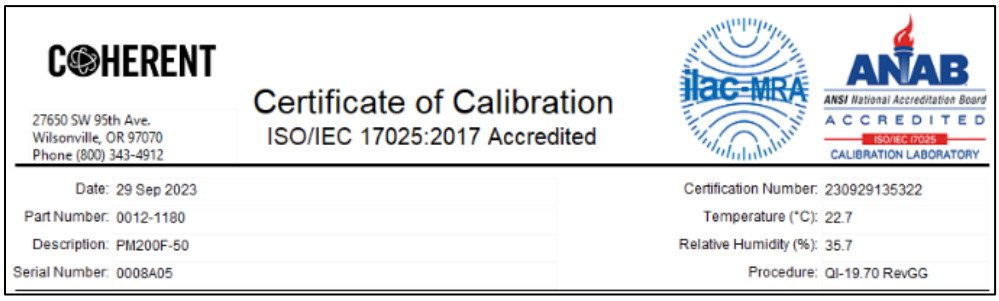
# Coherent ANAB Accreditation and Calibration Date

The header section displays the Coherent address and standards to which Coherent is accredited, including the ISO/IEC 17025:2017 standard. The ANAB logo verifies that the Coherent product, listed on the calibration certificate, is accredited and certified. If the ANAB logo is missing signifies a Coherent product outside the Coherent ANAB scope of accreditation.

The date, stated on the top of the certificate, is the date of calibration.



COHERENT

27650 SW 95th Ave.
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Phone (800) 343-4912

Certificate of Calibration
ISO/IEC 17025:2017 Accredited

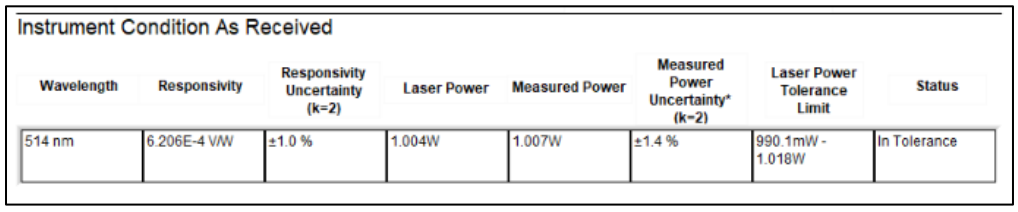
ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY

| | | | |
|---|---|---|---|
| Date: | 29 Sep 2023 | Certification Number: | 230929135322 |
| Part Number: | 0012-1180 | Temperature (°C): | 22.7 |
| Description: | PM200F-50 | Relative Humidity (%): | 35.7 |
| Serial Number: | 0008A05 | Procedure: | QI-19.70 RevGG |

# Instrument Condition As Received

This section identifies the product's As Received condition as returned to Coherent for calibration. The As Received lists the operating conditions and status under which the unit is tested upon receipt.

A blank As Received identifies the calibration certificate as the initial production calibration certificate or that the unit as received state was unable to provide a valid as received condition. This happens when the element is damaged or broken beyond a reasonable measurement collection.



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 | 6.206E-4 V/W | ±1.0 % | 1.004W | 1.007W | ±1.4 % | 990.1mW - 1.018W | In Tolerance |

# Instrument Condition As Shipped

The As Shipped section describes the final calibration condition of the unit when shipped 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 | 6.206E-4 V/W | ±1.0 % | 1.004W | 1.007W | ±1.4 % | 990.1mW - 1.018W | In Tolerance |

1. The Laser Power/Energy is for this specific measurement, as measured by the Working Standard.
2. The Measured Power/Energy is the measurement made by the Unit Under Test.
3. Uncertainty values include both the meter and sensor, added up using the sum of squares method. Therefore, 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.)
4. The Tolerance Limit is based upon applying the uncertainty of the measurement to the laser Power/Energy, as measured by the Working Standard.
   Upper Tolerance Limit = Laser Power + (Laser Power * Uncertainty)
   Upper Tolerance Limit = Laser Power - (Laser Power * Uncertainty)
   This lists the allowable range of Measured Power/Energy or the "tolerance limits". If the measurement, by the Unit Under Test, is within these limits it is in tolerance.
5. The Status column compares the Measured Power/Energy to the Tolerance Limits and reports if the Measured Power/Energy is In Tolerance or Out of Tolerance.

# Equipment Used for Calibration

This section lists the Coherent equipment used to perform the calibration and against which the calibration is measured for standard traceability. The standard equipment Calibration Due date is listed and understood to be on the last day of the month.

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

| Standards | Asset # | Calibration Due |
|---|---|---|
| MOLECTRON PM10 | 0011W00 | Dec 2023 |
| Coherent LabMax TOP | 1781T12 | Apr 2024 |
| HP 34401A | 0124T97 | Nov 2023 |

Comments:

Calibrated By:

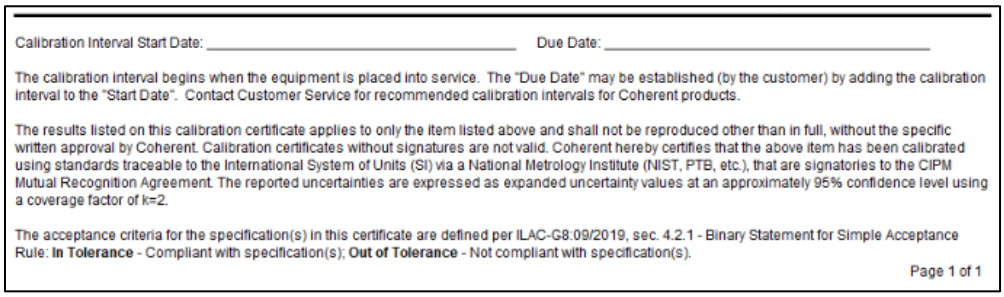
C BLACK Test Technician

# Calibration Decision Rule

The Calibration Interval Start Date and Due Date are left blank for the customer to identify the recalibration requirements after the product is placed in service.

The decision rule explains the calibration acceptance criteria for the Tolerance specifications.

Coherent reports the Uncertainty at the k=2 confidence level. This is also called an Expanded Uncertainty, defined as two Standard deviations. This equates to 95% confidence interval.



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 to view a list of contacts worldwide)
- Send an e-mail to: LSMservice@Coherent.com
- Call the Coherent Technical Support Hotline
  - Within the USA: 1-(800)-343-4912
  - Outside of the USA: 1-(408)-764-4042

Additional sensor products information can be found on the Coherent website under Lasers/Laser Measurement Instruments or this address:
https://www.coherent.com/laser-power-energy-measurement

Sensor product current software downloads can be found on the Coherent website under Support/Downloads or this address:
https://www.coherent.com/resources?resourceType=Manual%2BSoftware%2BLMC%20Video%20Library

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

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