



Product Catalog

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CRM 100

CRM 100: Holmium Oxide Solution/ Cuvette Wavelength Standard

CRM 100 is a secondary reference material intended for the calibration verification of the wavelength scales of molecular absorption spectrophotometers in the ultraviolet (UV) and visible (VIS) regions of the electromagnetic spectrum. The standard consists of a single filter which is provided in a protective canister for storage and transportation purposes. The filter is batch calibrated, relative to an air-only reference path, for the wavelength location of minimum transmittance (maximum absorbance) of 14 absorption bands within the spectral range 240 nm to 642 nm. The calibration is provided for six spectral bandpasses (0.1 nm, 0.3 nm, 0.5 nm, 1 nm, 2 nm and 3 nm).



Product Number 100

This standard is patterned after NIST SRM 2034. The scope of calibration is derived from the comprehensive batch calibration of a specified lot number of the holmium oxide solution, and also from the individual calibration verification (three absorption bands within the spectral range 240 nm to 642 nm) and quality-control scan of the integrated solution/cuvette filter after the solution has been flame-sealed in the cuvette. A total of 81 wavelength values are reproduced in the Certificate of Calibration.

Product Number 100A

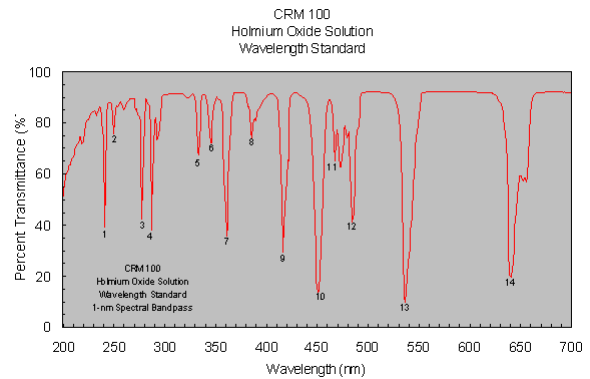
This standard is offered as an option if the customer needs a consumable standard, as the solution is sold in sealed, pre-scored ampoules. They are available in either 2-mL ampoules or 5-mL ampoules, with ten ampoules per unit.



Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 100 if its traditional scope of calibration does not satisfy the desired performance requirements for the instrument qualification and/or method validation. For the customized scope, one or more resolvable absorption bands within the spectral range 240 nm to 642 nm may be calibrated,

relative to an air-only reference path, for spectral bandpasses other than the six traditional spectral band passes within the range 0.1 nm to 5 nm. The customized scope of calibration is derived from the individual calibration and quality-control scan of the integrated solution/cuvette filter after the solution has been flame-sealed in the cuvette. The total number of wavelength values provided in the Certificate of Calibration depends on the number of absorption bands and spectral bandpasses for which the standard is calibrated.



NIST Traceability

The wavelength reference values are traceable to SRM 2034 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is five years.

Certificate of Calibration

The Certificate for CRM 100 contains the following information:

- wavelength reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

A representative spectrum of the integrated solution/cuvette filter is also provided.

CRM 110

CRM 110: Holmium Oxide Glass Wavelength Standard

CRM 110 is a secondary reference material intended for the calibration verification of the wavelength scales of molecular absorption spectrophotometers in the ultraviolet (UV) and visible (VIS) regions of the electromagnetic spectrum. The standard consists of a single filter which is provided in a protective canister for storage and transportation purposes. The filter is individually calibrated, relative to an air-only reference path, for the wavelength location of minimum transmittance (maximum absorbance) of 11 absorption bands within the spectral range 279 nm to 638 nm. The calibration is provided for one spectral bandpass (1 nm).



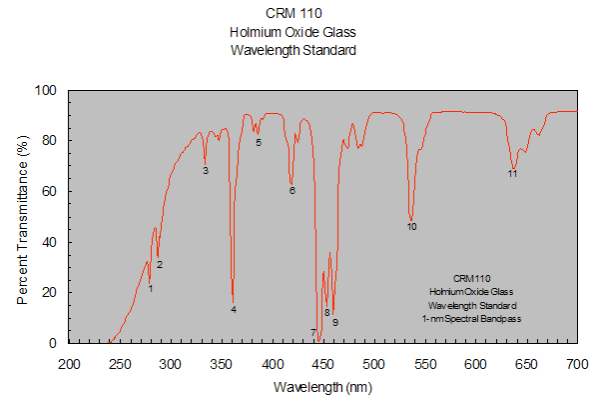
The standard consists of a single filter which is provided in a protective canister for storage and transportation purposes. The filter is individually calibrated, relative to an air-only reference path, for the wavelength location of minimum transmittance (maximum absorbance) of 11 absorption bands within the spectral range 279 nm to 638 nm. The calibration is provided for one spectral bandpass (1 nm).

Product Number 110

A total of 11 wavelength values are provided in the Certificate of Calibration.

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 110 if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, one or more resolvable absorption bands within the spectral range 279 nm to 638 nm may be calibrated, relative to an air-only reference path, for spectral bandpasses within the range 0.1 nm to 5 nm. The total number of wavelength values provided in the Certificate of Calibration depends on the number of absorption bands and spectral bandpasses for which the standard is calibrated.



NIST Traceability

The wavelength reference values are traceable to SRM 2034 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is five years.

Certificate of Calibration

The Certificate for CRM 110 contains the following information:

- wavelength reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

A representative spectrum of the glass filter is also provided.

CRM 150

CRM 150: Didymium Oxide Glass Wavelength Standard

CRM 150 is a secondary reference material intended for the calibration verification of the wavelength scales of molecular absorption spectrophotometers in the ultraviolet (UV), visible (VIS) and short-wave near infrared (NIR) regions of the electromagnetic spectrum. The standard consists of a single filter which is provided in a protective canister for storage and transportation purposes. The filter is individually calibrated, relative to an air-only reference path, for the wavelength location of minimum transmittance (maximum absorbance) of 15 absorption bands within the spectral range 327 nm to 880 nm. The calibration is provided for one spectral bandpass (1 nm).



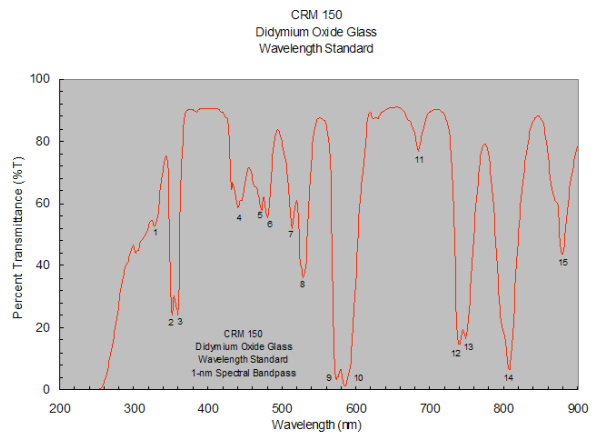
sorption bands within the spectral range 327 nm to 880 nm. The calibration is provided for one spectral bandpass (1 nm).

Product Number 150

This standard is patterned after NIST SRM 2009a. A total of 15 wavelength values are provided in the Certificate of Calibration.

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 150 if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, one or more resolvable absorption bands within the spectral range 327 nm to 880 nm may be calibrated, relative to an air-only reference path, for spectral bandpasses within the range 0.1 nm to 5 nm. The total number of wavelength values provided in the Certificate of Calibration depends on the number of absorption bands and spectral bandpasses for which the standard is calibrated.



NIST Traceability

The wavelength reference values are traceable to SRM 2034, SRM 2009 and/or SRM 2065 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is five years.

Certificate of Calibration

The Certificate for CRM 150 contains the following information:

- wavelength reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

A representative spectrum of the glass filter is also provided.

CRM 200

CRM 200: Cobalt-Nickel-Nitrate Solution/ Cuvette Photometric Standard

CRM 200 is a secondary reference material intended for the calibration verification of the transmittance and/or absorbance scales of molecular absorption spectrophotometers in the ultraviolet (UV), visible (VIS) and short-wave near infrared (NIR) regions of the electromagnetic spectrum. The standard consists of designated filters which are provided in a protective canister for storage and transportation purposes. Each filter is individually calibrated, relative to an air-only reference path, for optical transmittance at four traditional wavelengths (302.0 nm, 395.0 nm, 512.0 nm and 678.0 nm).



Each filter is individually calibrated, relative to an air-only reference path, for optical transmittance at four traditional wavelengths (302.0 nm, 395.0 nm, 512.0 nm and 678.0 nm).

Product Number 200

This standard is derived from NIST SRM 931f. It is comprised of three filters (203, 206 and 209). A total of 12 optical transmittance values and 12 apparent absorbance values are provided in the Certificate of Calibration.

Product Number 200C

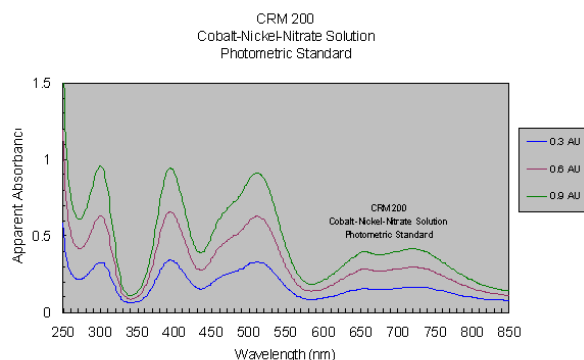
This standard is offered as an option if Product Number 200 does not provide the desired combination of filters. The customized configuration may be comprised of any other combination of filters, including single filters, selected from the filter table below. The total number of optical transmittance values and apparent absorbance values provided in the Certificate of Calibration depends on the number of filters included in the configuration.

Solution/ Cuvette Filter	Nominal Percent Transmittance	Nominal Apparent Absorbance
000	92%T	0.0 AU
203	50%T	0.3 AU
206	25%T	0.6 AU
209	13%T	0.9 AU

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 200 or 200C if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, each filter may be individually calibrated, relative to an air-only reference path, at one or more of the four traditional wavelengths (302.0 nm, 395.0 nm, 512.0 nm and 678.0 nm); alternatively, each cobalt-nickel-nitrate filter may be individually calibrated relative to the blank filter (000) in the reference path position. The total number of optical transmittance values and/or

apparent absorbance values provided in the Certificate of Calibration depends on the number of filters and the number of wavelengths at which the standard is calibrated.



NIST Traceability

The photometric reference values are traceable to SRM 931 and SRM 2031 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is one year.

Certificate of Calibration

The Certificate for CRM 200 contains the following information:

- photometric reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

CRM 300

CRM 300: Potassium Dichromate Solution/ Cuvette Photometric Standard

CRM 300 is a secondary reference material intended for the calibration verification of the transmittance and/or absorbance scales of molecular absorption spectrophotometers in the ultraviolet (UV) region of the electromagnetic spectrum. The standard consists of designated filters which are provided in a protective canister for storage and transportation purposes.



Each filter is individually calibrated, relative to an air-only reference path, for optical transmittance at four traditional wavelengths (235.0 nm, 257.0 nm, 313.0 nm and 350.0 nm).

PRODUCT NUMBER 300

This standard is derived from NIST SRM 935a. It is comprised of four filters (305, 310, 315 and 320). A total of 16 optical transmittance values and 16 apparent absorbance values are provided in the Certificate of Calibration.

PRODUCT NUMBER 300B

This standard is offered as an option if the customer needs a consumable standard, as the solutions are sold in amber bottles (50mL of solution per bottle). A customized configuration is chosen by the customer, with solutions selected from the far right column of the table below. Each solution is individually calibrated, relative to a water blank, for apparent absorbance at four traditional wavelengths (235.0 nm, 257.0 nm, 313.0 nm and 350.0 nm). The total number of apparent absorbance values provided in the Certificate of Calibration depends on the number of solutions included in the configuration.



PRODUCT NUMBER 300C

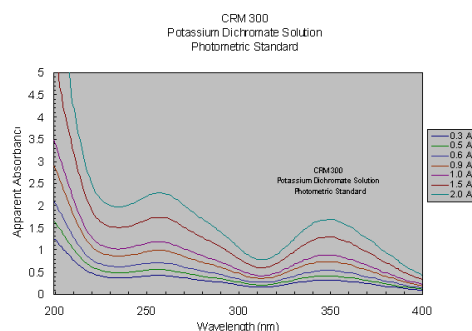
This standard is offered as an option if Product Number 300 does not provide the desired combination of filters. The customized configuration may be comprised of any other combination of filters (maximum of six), including single filters, selected from the filter table below. The total number of optical transmittance values and apparent absorbance values provided in the Certificate of Calibration depends on the number of filters included in the configuration.

Solution/ Cuvette Filter	Nominal Percent Transmittance	Nominal Apparent Absorbance
000	92%T	0.0 AU
303	50%T	0.3 AU
305	30%T	0.5 AU
306	25%T	0.6 AU
309	13%T	0.9 AU

Solution/ Cuvette Filter	Nominal Percent Transmittance	Nominal Apparent Absorbance
310	10%T	1.0 AU
315	3%T	1.5 AU
320	1%T	2.0 AU
325	0.3%T	2.5 AU
330	0.1%T	3.0 AU

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 300 or 300C if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, each filter may be individually calibrated, relative to an air-only reference path, at one or more of the four traditional wavelengths (235.0 nm, 257.0 nm, 313.0 nm and 350.0 nm); alternatively, each potassium dichromate filter may be individually calibrated relative to the blank filter (000) in the reference path position. The total number of optical transmittance values and/or apparent absorbance values provided in the Certificate of Calibration depends on the number of filters and the number of wavelengths at which the standard is calibrated.



NIST Traceability

The photometric reference values are traceable to SRM 1935 and SRM 2031 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval for CRM 300 and CRM 300C is one year. The calibration interval for CRM 300B is six months.

Certificate of Calibration

The Certificate for CRM 300 contains the following information:

- photometric reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

CRM 400

CRM 400: Neutral-Density Glass Photometric Standard

CRM 400 is a secondary reference material intended for the calibration verification of the transmittance and/or absorbance scales of molecular absorption spectrophotometers in the visible (VIS) and short-wave near infrared (NIR) regions of the electromagnetic spectrum. The standard consists of designated filters which are provided in a protective canister for storage and transportation purposes; an empty filter holder for the reference beam position is also provided. Each filter is individually calibrated, relative to an air-only reference path, for optical transmittance at five traditional wavelengths (440.0 nm, 465.0 nm, 546.1 nm, 590.0 nm and 635.0 nm).



Product Number 400

This standard is patterned after NIST SRM 930e. It is comprised of three filters (410, 420 and 430). A total of 15 optical transmittance values and 15 transmittance density (absorbance) values are provided in the Certificate of Calibration.

Product Number 400E

This standard is patterned after NIST SRM 1930. It is comprised of three filters (401, 403 and 450). A total of 15 optical transmittance values and 15 transmittance density (absorbance) values are provided in the Certificate of Calibration.

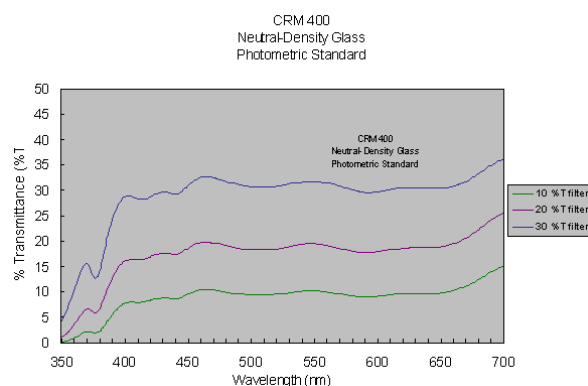
Product Number 400C

This standard is offered as an option if Product Number 400 or 400E does not provide the desired combination of filters. The customized configuration may be comprised of any other combination of filters (maximum of five), including single filters, selected from the filter table below. The total number of optical transmittance values and transmittance density (absorbance) values provided in the Certificate of Calibration depends on the number of filters included in the configuration.

Glass Filter	Nominal Percent Transmittance	Nominal Transmittance Density
401	1%T	2.00 AU
403	3%T	1.52 AU
410	10%T	1.00 AU
420	20%T	0.70 AU
430	30%T	0.52 AU
450	50%T	0.30 AU

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 400, 400E or 400C if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, each filter may be individually calibrated, relative to an air-only reference path, at one or more traditional and/or custom wavelengths within the spectral range 400 nm to 900 nm. The total number of optical transmittance values and/or transmittance density (absorbance) values provided in the Certificate of Calibration depends on the number of filters and the number of wavelengths at which the standard is calibrated.



NIST Traceability

The photometric reference values are traceable to SRM 930 and/or SRM 1930 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is two years.

Certificate of Calibration

The Certificate for CRM 400 contains the following information:

- photometric reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

CRM 500

CRM 500: Neutral-Density Metal-on-Quartz Photometric Standard

CRM 500 is a secondary reference material intended for the calibration verification of the transmittance and/or absorbance scales of molecular absorption spectrophotometers in the ultraviolet (UV), visible (VIS) and short-wave near infrared (NIR) regions of the electromagnetic spectrum. The standard consists of designated filters which are provided in a protective canister for storage and transportation purposes; an empty filter holder for the reference beam position is also provided. Each filter is individually calibrated, relative to an air-only reference path, for optical transmittance at ten traditional wavelengths (250.0 nm, 280.0nm, 340.0 nm, 360.0 nm, 400.0 nm, 465.0 nm, 500.0 nm, 546.1 nm, 590.0 nm and 635.0 nm).



Product Number 500

This standard is patterned after NIST SRM 2031a. It is comprised of three filters (510, 530 and 590). A total of 30 optical transmittance values and 30 transmittance density (absorbance) values are provided in the Certificate of Calibration.

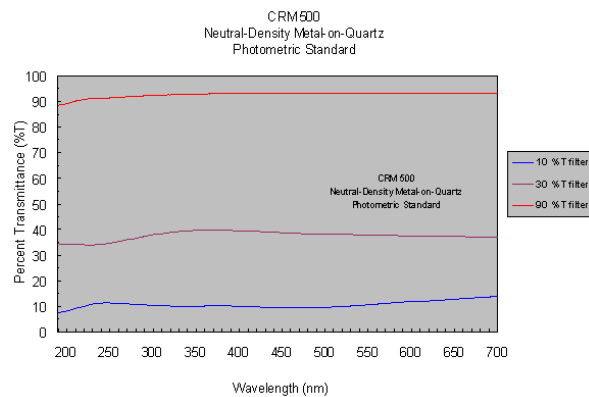
Product Number 500C

This standard is offered as an option if Product Number 500 does not provide the desired combination of filters. The customized configuration may be comprised of any other combination of filters, including single filters, selected from the filter table below. The total number of optical transmittance values and transmittance density (absorbance) values provided in the Certificate of Calibration depends on the number of filters included in the configuration.

Quartz Filter	Nominal Percent Transmittance	Nominal Transmittance Density
510	10%T	1.00 AU
530	30%T	0.52 AU
590	90%T	0.04 AU

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 500 or 500C if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, each filter is individually calibrated, relative to an air-only reference path, at one or more traditional and/or custom wavelengths within the spectral range 190 nm to 900 nm. The total number of optical transmittance values and/or transmittance density (absorbance) values provided in the Certificate of Calibration depends on the number of filters and the number of wavelengths at which the standard is calibrated.



NIST Traceability

The photometric reference values are traceable to SRM 2031 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is two years. For the customized scope of calibration, the calibration interval ranges from six months to two years depending on the wavelengths at which the standard is calibrated.

Certificate of Calibration

The Certificate for CRM 500 contains the following information:

- photometric reference values and expanded uncertainties
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

CRM 600

CRM 600: Cut-Off Glass Stray Light Standard

CRM 600 is a secondary reference material intended for the assessment of stray radiant energy (stray light) in molecular absorption spectrophotometers in the ultraviolet (UV) and visible (VIS) regions of the electromagnetic spectrum. The standard consists of designated filters which are provided in a protective canister for storage and transportation purposes; an empty filter holder for the reference beam position is also provided. Each filter is individually calibrated, relative to an air-only reference path, for optical percent transmittance (%T) and stray radiant energy (SRE) limit at one specific test wavelength within the combined spectral range 220 nm to 400 nm.



The glass filters comprising this standard provide a convenient, science-based and cost-effective alternative to the use of chemical solutions sealed in cuvettes.

Product Number 600

The test measurement principle of this standard is derived from the test measurement principle of NIST SRM 2032. It can be used to determine the presence of heterochromatic stray light down to 0.01%T. The standard is comprised of three filters (628, 638 and 647). A total of 3 optical percent transmittance (%T) values and 3 SRE limit values are provided in the Certificate of Calibration.

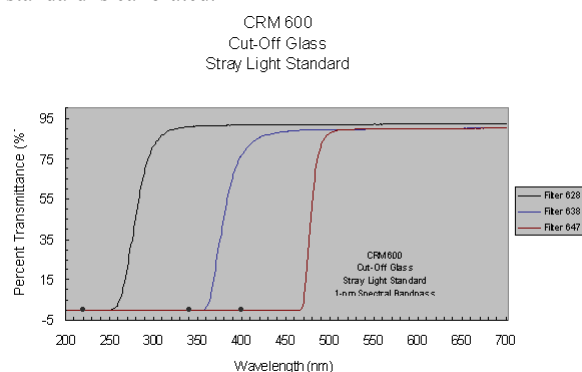
Product Number 600C

This standard is offered as an option if Product Number 600 does not provide the desired combination of filters. The customized configuration may be comprised of any other combination of filters, including single filters, selected from the filter table below. The total number of optical percent transmittance (%T) values and SRE limit values provided in the Certificate of Calibration depends on the number of filters included in the configuration.

Glass Filter	Spectral Range	Test Wavelength
628	190 nm to 240 nm	220 nm
629	190 nm to 270 nm	220 nm
638	270 nm to 350 nm	340 nm
647	350 nm to 460 nm	400 nm

Customized Scope of Calibration (Optional)

A customization in scope of calibration is provided upon request for Product Number 600 or 600C if its traditional scope of calibration does not satisfy the desired performance requirements of the instrument qualification and/or method validation. For the customized scope, each filter is individually calibrated, relative to an air-only reference path, at one or more traditional and/or custom wavelengths within the spectral range 190 nm to 460 nm. The total number of optical percent transmittance (%T) values and SRE limit values provided in the Certificate of Calibration depends on the number of filters and the number of wavelengths at which the standard is calibrated.



NIST Traceability

The photometric reference values are traceable to SRM 2031 of the National Institute of Standards and Technology (NIST).

Calibration Expiration

The calibration interval is two years. For a customized scope of calibration, the calibration interval ranges from six months to 2 years depending on the wavelengths at which the standard is calibrated.

Certificate of Calibration

The Certificate for CRM 600 contains the following information:

- optical percent transmittance (%T) reference values, expanded uncertainties and SRE limit values
- instructional guidelines for its intended use
- calibration measurement parameters and conditions
- measurement traceability chain, timeline and uncertainty budget

Representative spectra of the individual glass filters are also provided.

CRM 1404

CRM 1404: Spectrophotometer Calibration Kit

CRM 1404 has a recommended calibration interval of one year.

Check wavelength accuracy and photometric accuracy with one convenient kit!

CRM 1404 is a spectrophotometer calibration kit. It is comprised of a wavelength standard (CRM 100), and two photometric standards (CRM 300 and CRM 400), which together will cover both the UV and Visible ranges. There is only one certificate of calibration and one recommended calibration interval to keep track of!

CRM 100 is calibrated, relative to an air-only reference path, for the wavelength location of minimum transmittance (maximum absorbance) of 14 absorption bands within the spectral range 240 nm to 642 nm. The scope of calibration is derived from the comprehensive batch calibration of a specified lot number of the holmium oxide solution, and also from the individual calibration verification and quality-control scan of the integrated solution/cuvette filter after the solution has been flame-sealed in the cuvette. The calibration is provided for six spectral bandpasses (0.1 nm, 0.3 nm, 0.5 nm, 1 nm, 2 nm, and 3 nm). A representative spectrum of the integrated solution/cuvette filter is provided.



CRM 300 is comprised of one filter (310) with nominal percent transmittance of 10%, which corresponds to nominal apparent absorbance of 1.0 AU. The filter is individually calibrated, relative to an air-only reference path, for optical transmittance and apparent absorbance at four traditional wavelengths (235.0 nm, 257.0 nm, 313 nm, and 350.0 nm) for a total of 4 optical transmittance values and 4 apparent absorbance values.

CRM 400 is comprised of three filters (410, 420, and 430) with nominal percent transmittances of 10%T, 20%T, and 30%T, which correspond to nominal transmittance densities (absorbances) of 1.0 AU, 0.7 AU, and 0.52 AU, respectively. Each filter is individually calibrated, relative to an air-only reference path, for optical transmittance and transmittance density at five traditional wavelengths (440.0 nm, 465.0 nm, 546.1 nm, 590.0 nm, and 635.0 nm) for a total of 15 optical transmittance values and 15 transmittance density values.

