



Starna

NIST Traceable
UV/Vis/NIR
Reference Sets



ISO-17025 Accredited

2012
Catalog and Price List

Why do you need to use reference materials?

Ultraviolet and visible spectrophotometers are fundamentally both accurate and precise but it is vital to check instrument performance on a regular basis to ensure that it is operating within satisfactory parameters. The reference materials provided by Starna are based on materials which have been used by national reference laboratories such as National Institute of Standards and Technology (NIST). When used in periodic testing of your instrument's performance you build a quality control database of the operating characteristics of your specific instrument. This database can then be used for the following purposes:

- * Demonstration of satisfactory instrument performance to any inspecting agencies.
- * Detection of instrument malfunction.
- * Provide data to a service technician allowing detection of instrument faults and assistance in repair.

Each spectrophotometer has specific operating characteristics based on the geometry and basic design of the optical system. These reference materials become your guide to the efficient operation of your instrument.

What makes Starna reference materials unique?

All of the reference materials produced by Starna are "Ready to Use". References are supplied in either heat fusion sealed quartz cells or, in the case of the glass filters, in an aluminum holder with the same dimensions as a cell.

You never need to open an ampoule, use it once and throw it away. You never need to use wet chemistry methods to make up the references from raw materials. With care the sets can last for many years. All NIST traceable sets can be recertified.

Properties of Starna references:

- 1) Sealed cells ensure cleanliness and reliability
- 2) Can be used multiple times over many years
- 3) UV and Visible ranges
- 4) NIST traceable references can be recertified.

Certification of NIST Traceability -
Available on most references.

Construction of reference materials

The Starna group of companies pioneered the technology of sealing reference materials into quartz spectrophotometer cells. This technology allows for the use of these materials in the UV range where glass filters are not usable. Additionally, the sealed cells have the exact same optical characteristics as the cells that you would use in normal analysis thus removing any variables which might be introduced with any other form of optical configuration. The cells are supplied in reusable storage boxes and have an indefinite lifetime as long as they are not physically damaged. The glass filters which we produce are made to the highest industry standards.

Should I use NIST Traceable References?

Traceability to NIST allows for a definitive, certifiable method of analysis of the reference using the same methods as NIST. Additionally, each reference raw material is either purchased from NIST (when available) or directly tested against a NIST supplied reference. The most important element of NIST traceability is the supplied certificate of analysis and traceability. This certificate details the method of analysis and the certified results of the analysis. You can use these certified results as the basis of your quality program. If your lab is routinely monitored by a certifying agency then the NIST traceability is valuable especially if the inspections are by an outside agency.

NIST Traceability / UKAS ISO 17025 Accredited

NIST (National Institute for Standards and Technology in Washington DC, USA) traceability is available on most of our reference materials. This traceability is established by the calibration of our Cary 5000 reference spectrophotometer using standards produced by NIST both before and after testing the Starna reference materials. We supply documentation with the Starna references detailing the analysis procedure, NIST traceability, the analyzed values of the reference and the confidence limits. The certification supplied with the Starna reference materials is suitable for use with inspecting agencies when used in the context of a standard operating procedure for quality control that is established in your laboratory. Our certification laboratory is inspected and accredited by UKAS under **ISO/IEC 17025** and **ISO Guide 34**. This assures that the certifications of our reference materials are of the highest standards and are truly traceable.

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References for use with methods described in...

Material	Test	Range	USP	Ph. Eur.	DAB	BP	ASTM	TGA
Holmium Oxide	Wavelength	UV/Visible	√	√	√	√	√	√
Toluene in Hexane	Spectra Resolution	UV		√	√	√		√
Potassium Chloride	Stray Light	UV	√	√	√	√	√	√
Sodium Iodide	Stray Light	UV		√	√	√	√	√
Potassium Iodide	Stray Light	UV	√					
Potassium Dichromate	Absorbance	UV	√	√	√	√	√	√
Neutral Density Filters	Absorbance	Visible	√	√	√	√	√	√

Potassium Dichromate - UV - Absorbance/Linearity

Description:	Potassium Dichromate from NIST (SRM 935a), sealed in quartz cells, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Testing absorbance scale and linearity in the UV region
Useable Range:	235nm to 350nm (20mg/L to 100mg/L) and 430nm (600mg/L)
Physical Configuration:	UV quartz cells that have been permanently heat sealed

Product Description:

Potassium Dichromate solvated in dilute perchloric acid has been found to be the best method for testing the absorbance scale and linearity of spectrophotometers in the UV. Starna purchases the potassium dichromate crystals directly from NIST (SRM 935a). We then make up the solutions as per the instructions from NIST and permanently heat fuse seal the solutions in UV quartz spectrophotometer cells.

The filled cells are tested and certified against the expected values from NIST and a certificate is provided with each set of cells which has the certified absorbance values for each cell and the confidence limit. The certificate supplied is suitable for use with inspecting agencies when used in the context of a standard operating procedure for quality control that is established in your laboratory. Each set is supplied with a sealed blank cell that was used for the certified measurement.

The following chart is a listing of approximate absorbance values for each concentration based on the wavelength at which the potassium dichromate cells are to be read:

Concentration	235nm	257nm	313nm	350nm	430nm
20 mg/L	0.243	0.281	0.095	0.209	n/a
40 mg/L	0.492	0.572	0.192	0.426	n/a
60 mg/L	0.741	0.862	0.289	0.634	n/a
80 mg/L	0.996	1.159	0.385	0.853	n/a
100 mg/L	1.243	1.448	0.480	1.069	n/a
European Pharmacopoeia Compliance					
600mg/L	n/a	n/a	n/a	n/a	0.950

Suggestions for Use:

Suggested procedure:

Measure the absorbance of the potassium dichromate cells at the certified wavelengths against the blank supplied with the set.

Absorbance Scale Accuracy:

Compare the absorbance values from your spectrophotometer to the certified absorbance values. If the absorbance values fall within the specified absorbance tolerance of your instrument (as specified in your instrument manual) then your instrument is working correctly.

Linearity:

To evaluate linearity, plot a graph of concentration against absorbance for each of the four wavelengths.

Corrective Action:

If you determine that your instrument is not giving you the correct values, consult your service technician for advice on how to determine and correct any problem which this reference may detect.

How to Order:

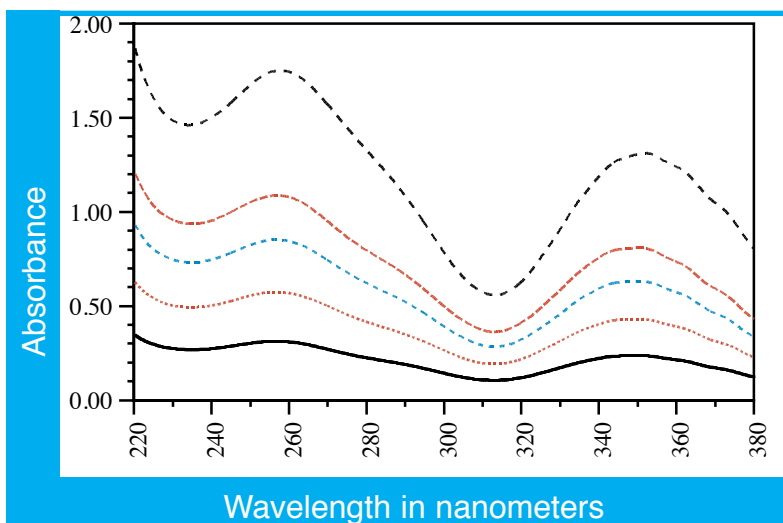
Description	Catalog Number, NIST Traceable	Price per set
Linearity Dichromate set:		
Potassium Dichromate, 5 concentrations	RM-0204060810	\$ 1990.00
Single Concentrations:		
Potassium Dichromate, 20 mg/L	RM-02	\$ 790.00
Potassium Dichromate, 40 mg/L	RM-04	\$ 790.00
Potassium Dichromate, 60 mg/L	RM-06	\$ 790.00
Potassium Dichromate, 80 mg/L	RM-08	\$ 790.00
Potassium Dichromate, 100 mg/L	RM-10	\$ 790.00
Single Concentrations, additional concentration for European Pharmacopoeia Compliance:		
Potassium Dichromate, 600 mg/L	RM-60	\$ 790.00
Linearity Dichromate set, with additional concentration for European Pharmacopoeia Compliance:		
Potassium Dichromate, 6 concentrations	RM-020406081060	\$ 2290.00

Potassium Dichromate - UV - Absorbance/Linearity

RM-0204060810 set:

This NIST traceable set of one blank and five increasing concentrations of potassium dichromate is our most useful and widely purchased set. It consists of 6 cells with the following materials:

Cell#	Containing	Concentration
1	Perchloric acid blank	0.001N
2	Potassium Dichromate	20 mg/L
3	Potassium Dichromate	40 mg/L
4	Potassium Dichromate	60 mg/L
5	Potassium Dichromate	80 mg/L
6	Potassium Dichromate	100mg/L



Spectral scan:

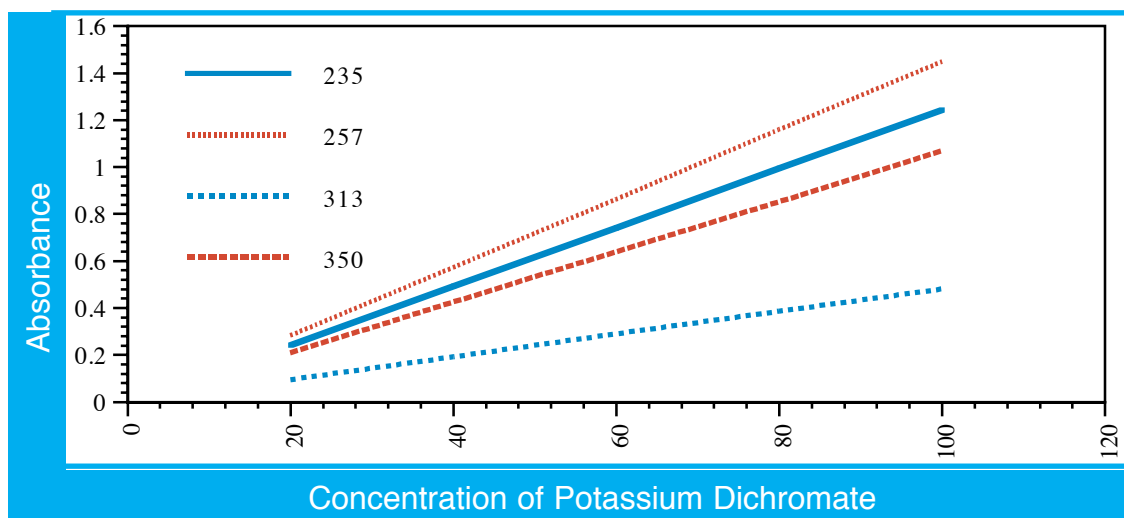
The graph to the left is a scan of a set of the 5 different concentrations of potassium dichromate. It clearly shows the peaks and troughs in relation to absorbance and the differences due to potassium dichromate concentration.

Peaks: 257 and 350 nm
Troughs: 235 and 313 nm

The certificate supplied with the NIST traceable sets lists the absorbance values for each peak and trough at the four wavelengths measured against the perchloric acid blank at the four wavelengths. When measured in your spectrophotometer you can validate your absorption scale for accuracy and linearity using the set with 5 different concentrations and the blank. The values of the non-traceable sets must be determined in your instrument.

Linearity:

Plotting concentration against absorbance using the set of 5 cells against the blank, you can test your spectrophotometer for linearity through the UV range. The use of the NIST traceable set with 5 different concentrations and a blank is recommended for best results.



Nicotinic Acid - Far UV - Absorbance/Linearity

Description:	Nicotinic Acid, Far UV Absorbance standard, sealed in quartz cells, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Testing absorbance scale and linearity in the Far UV region
Useable Range:	213nm and 261nm
Physical Configuration:	UV quartz cells that have been permanently heat sealed

Product Description:

The use of nicotinic acid solvated in dilute hydrochloric acid is a well documented method for the validation of the absorbance scale and linearity of a spectrophotometer in the Far UV region. When prepared in 0.1M hydrochloric acid, nicotinic acid gives a spectral scan containing characteristic peaks at approx. 210nm and 260nm. Within the concentration range 5-25 mg/l, if the absorbance scale of a narrow SBW (2 nm) spectrophotometer is linear, the apparent absorbances of a series of concentrations will be a linear function of concentration, at a specified SBW.

The filled cells are tested and certified against the calculated values. A certificate is provided with each set of cells which has the certified absorbance values for each cell and the confidence limit. The certificate supplied is suitable for use with inspecting agencies when used in the context of a standard operating pro-

cedure for the quality control that is established in your laboratory. Each set is supplied with a sealed blank cell that was used for the certified measurement.

The following chart is a listing of approximate absorbance values for each concentration based on the wavelength at which the nicotinic acid cells are to be read:

Concentration	213nm	261nm
6 mg/L	0.243	0.281
12 mg/L	0.492	0.572
18 mg/L	0.741	0.862
24 mg/L	0.996	1.159

Suggestions for Use:

Suggested procedure:

Measure the absorbance of the Nicotinic Acid cells at the certified wavelengths against the blank supplied with the set.

Absorbance Scale Accuracy:

Compare the absorbance values from your spectrophotometer to the certified absorbance values. If the absorbance values fall within the specified absorbance tolerance of your instrument (as specified in your instrument manual) then your instrument is working correctly.

Linearity:

To evaluate linearity, plot a graph of concentration against absorbance for each of the two wavelengths.

Corrective Action:

If you determine that your instrument is not giving you the correct values, consult your service technician for advice on how to determine and correct any problem which this reference may detect.

How to Order:

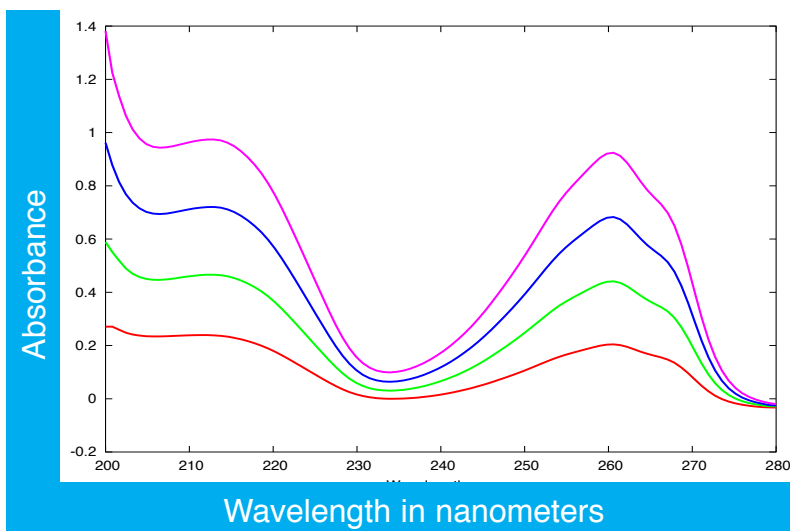
Description	Catalog Number, NIST Traceable	Price per set
Linearity Nicotinic Acid set:		
Nicotinic Acid, 4 concentrations with blank	RM-1A2A3A4A	\$ 1840.00
Single Concentrations:		
Nicotinic Acid , 6 mg/L with blank	RM-1A	\$ 790.00
Nicotinic Acid, 12 mg/L with blank	RM-2A	\$ 790.00
Nicotinic Acid, 18 mg/L with blank	RM-3A	\$ 790.00
Nicotinic Acid, 24 mg/L with blank	RM-4A	\$ 790.00

Nicotinic Acid - Far UV - Absorbance/Linearity

RM-1A2A3A4A set:

This NIST traceable set of one blank and four increasing concentrations of Nicotinic Acid is unique in its ability to validate the Far UV absorbance scale of your instrument. It consists of 5 cells with the following materials:

Cell#	Containing	Concentration
1	Hydrochloric acid blank	0.1M
2	Nicotinic acid	6 mg/L
3	Nicotinic acid	12 mg/L
4	Nicotinic acid	18 mg/L
5	Nicotinic acid	24 mg/L



Spectral scan:

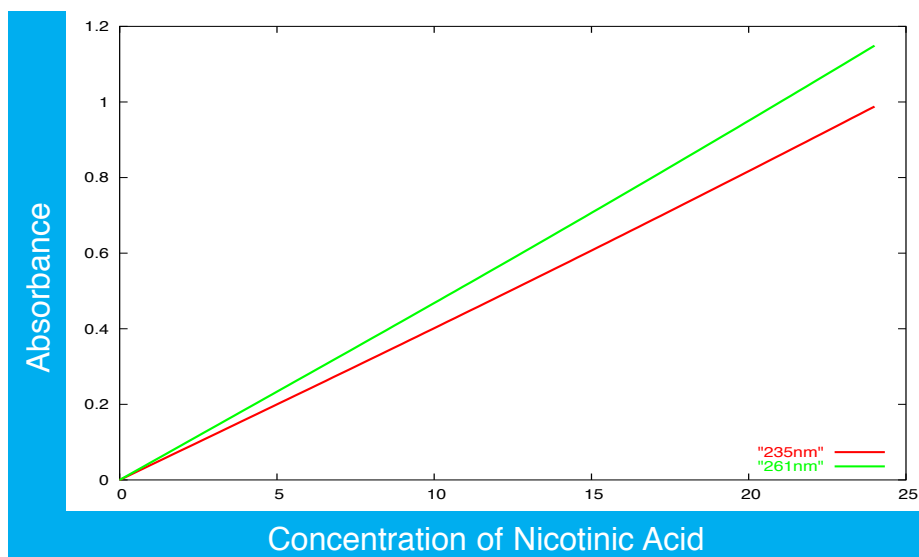
The graph to the left is a scan of a set of the 4 different concentrations of Nicotinic Acid. It clearly shows the peaks in relation to absorbance and the differences due to Nicotinic Acid concentration.

Peaks: 213 and 261 nm

The certificate supplied with the NIST traceable sets lists the absorbance values for each peak at the two wavelengths measured against the hydrochloric acid blank. When measured in your spectrophotometer you can validate your absorption scale for accuracy and linearity using the set with 4 different concentrations and the blank.

Far UV Linearity Assessment:

Plotting concentration against absorption using the set of 4 Nicotinic Acid cells against the blank, you can test your spectrophotometer for linearity through the Far UV range.



Holmium Oxide - UV/Vis - Wavelength Reference

Description:	Holmium oxide (4%) in perchloric acid (10%) NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Assessment of wavelength scale accuracy in both UV and Visible
Useable Range:	240nm to 650nm
Physical Configuration:	Filled far UV quartz cell that has been permanently heat sealed

Product Description:

Holmium has been used as a wavelength standard for many years and now we have extended the use by creating a filled and sealed far UV quartz cell which allows it to be used into the UV spectra. Holmium offers sharp, stable peaks over the range of 219 to 650nm. Holmium perchlorate is used to assure that the wavelength scale of your instrument is within the manufacturer's tolerances to the actual wavelength being measured. The use of the filled quartz cell assures that the optical configuration for your quality control is exactly the same as for a normal analysis.



Resolvable peaks for Holmium Solutions

UV Region	Visible Region	Visible Region
241.0	333.5	451.1
249.9	345.6	467.8
278.2	361.4	485.2
287.1	385.4	536.5
	416.1	640.6

Suggestions for Use:

Holmium presents a wide range of crisply resolvable peaks which are easily used to correlate the wavelength indicator on your spectrophotometer to the known peak. The first procedure should be to scan the cell over the usable range to assure that all peaks can be resolved. Adjust the slit width and scan rate to produce a usable spectra. Check each peak to assure that the reading on your spectrophotometer is within the manufacturer's tolerances of the wavelength readout. If not, get a service

technician to adjust or recheck your instrument. Holmium is measured against an air blank.

Periodically check the spectra, at a minimum in the area where you are doing your analysis. Periodic use of the Holmium cell will build a log of your instrument's spectral accuracy for use with certification and troubleshooting should the correlation change over time.

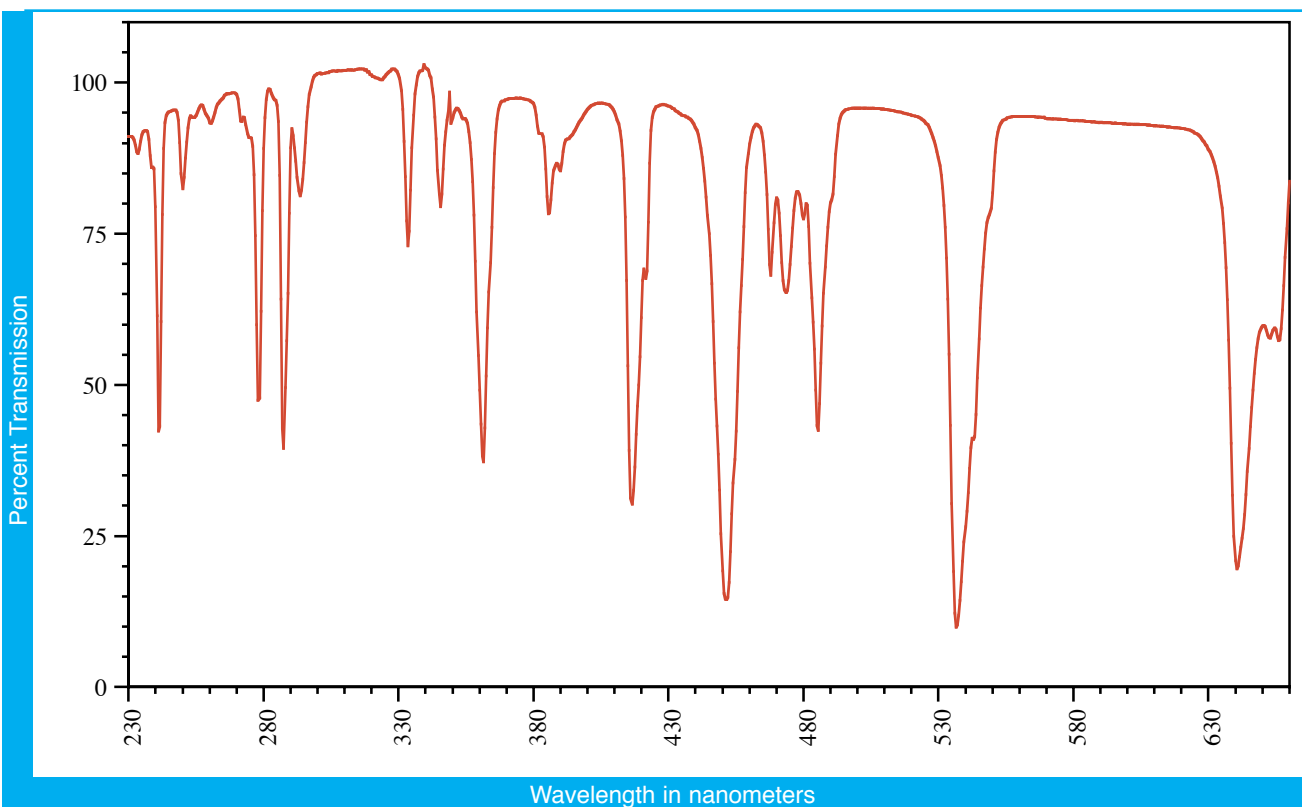
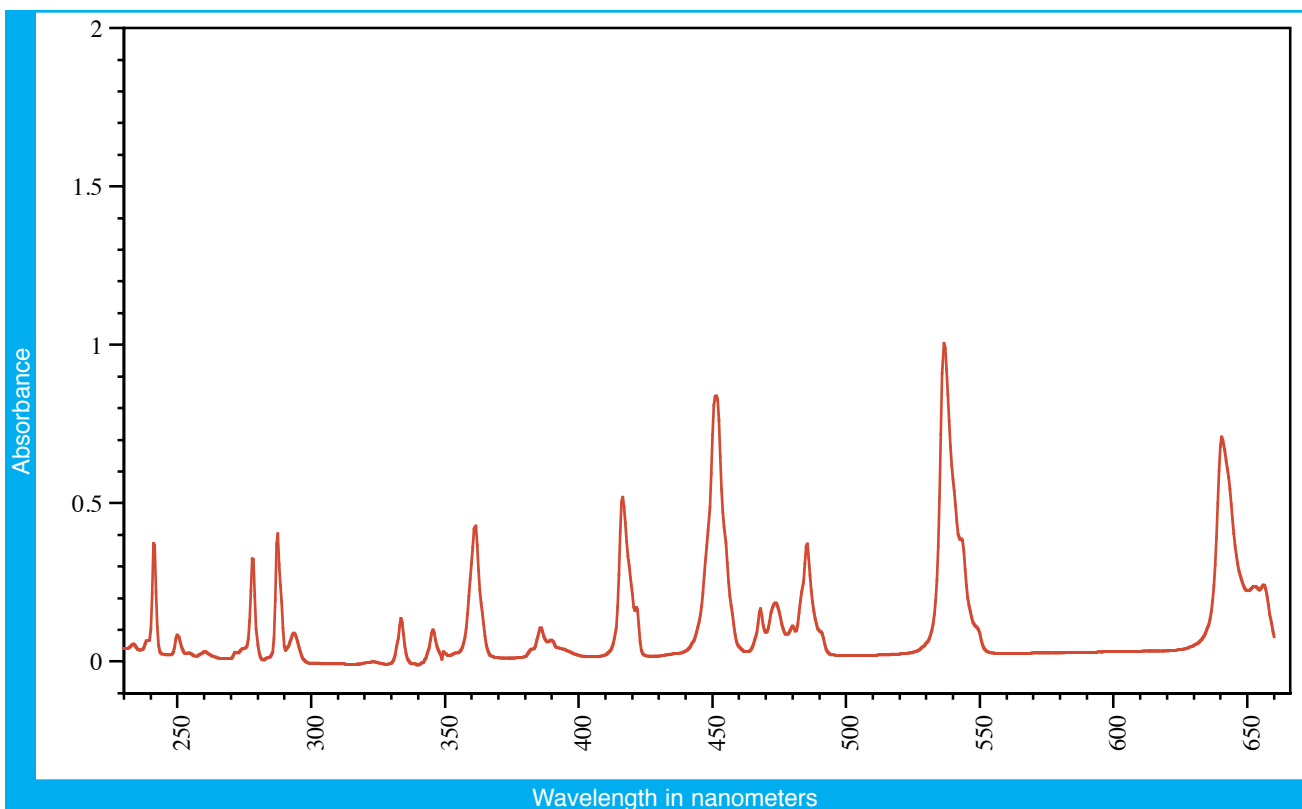
How to Order:

Catalog Number	Description	Price
RM-HL	Wavelength reference cell, Holmium, NIST traceable	\$ 490.00

Starna Cells, Inc (805) 466-8855

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Holmium Oxide - UV/Vis - Wavelength Reference



Didymium - Visible - Wavelength Reference

Description:	Didymium in perchloric acid, sealed in quartz cells, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Assessment of wavelength scale accuracy in the Visible spectrum
Useable Range:	290nm to 870nm
Physical Configuration:	Filled far UV quartz cell that has been permanently heat sealed

Product Description:

Didymium has been used as a visible wavelength standard in the form of a glass filter. We now offer a quartz cell filled and permanently sealed with a didymium perchloric solution that will evaluate more effectively the optical performance of your instrument. Didymium offers sharp, stable peaks over the range of 290 to 870nm. The primary use of Didymium is to assure that the wavelength scale of your instrument is within the manufacturer's tolerances of the actual wavelength being measured. The use of the filled quartz cell assures that the optical configuration for your quality control is exactly the same as for a normal analysis



Resolvable peaks for Didymium Solutions

UV Region	Visible Region	Visible Region
298.0	354.0	574.9
329.0	444.1	731.8
	468.7	740.1
	481.8	794.1
	512.0	801.2
	521.3	865.0

Suggestions for Use:

Didymium presents a wide range of crisply resolvable peaks which are easily used to correlate the wavelength indicator on your spectrophotometer to the known peak. The first procedure should be to scan the cell over the useable range to assure that all peaks can be resolved. Adjust the slit width and scan rate to produce a usable spectra. Check each peak to assure that the reading on your spectrophotometer is within the manufacturer's tol-

erances of the wavelength readout. If not, get a service technician to adjust or recheck your instrument. Didymium is measured against an air blank.

Periodically check the spectra, at a minimum in the area where you are doing your analysis. Periodic use of the Didymium cell will build a log of your instrument's spectral accuracy for use with certification and troubleshooting should the correlation change over time.

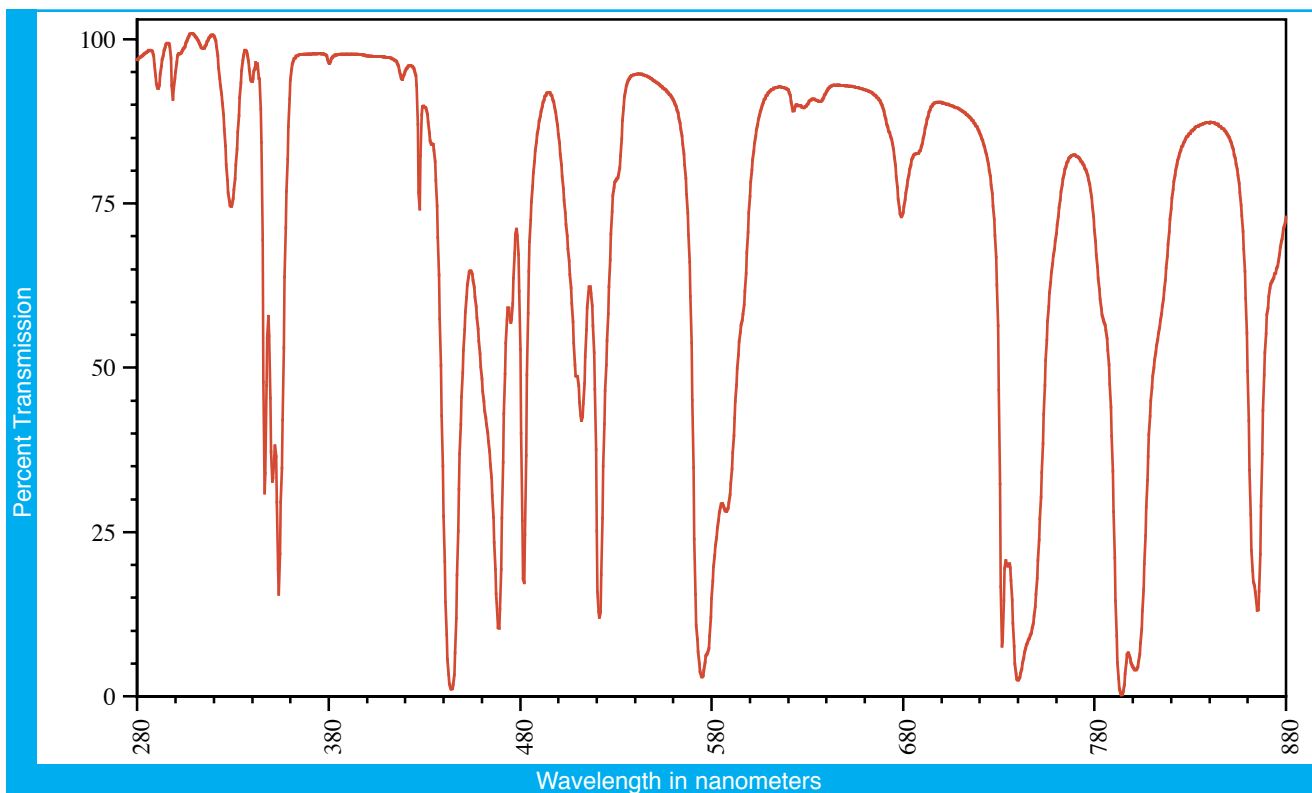
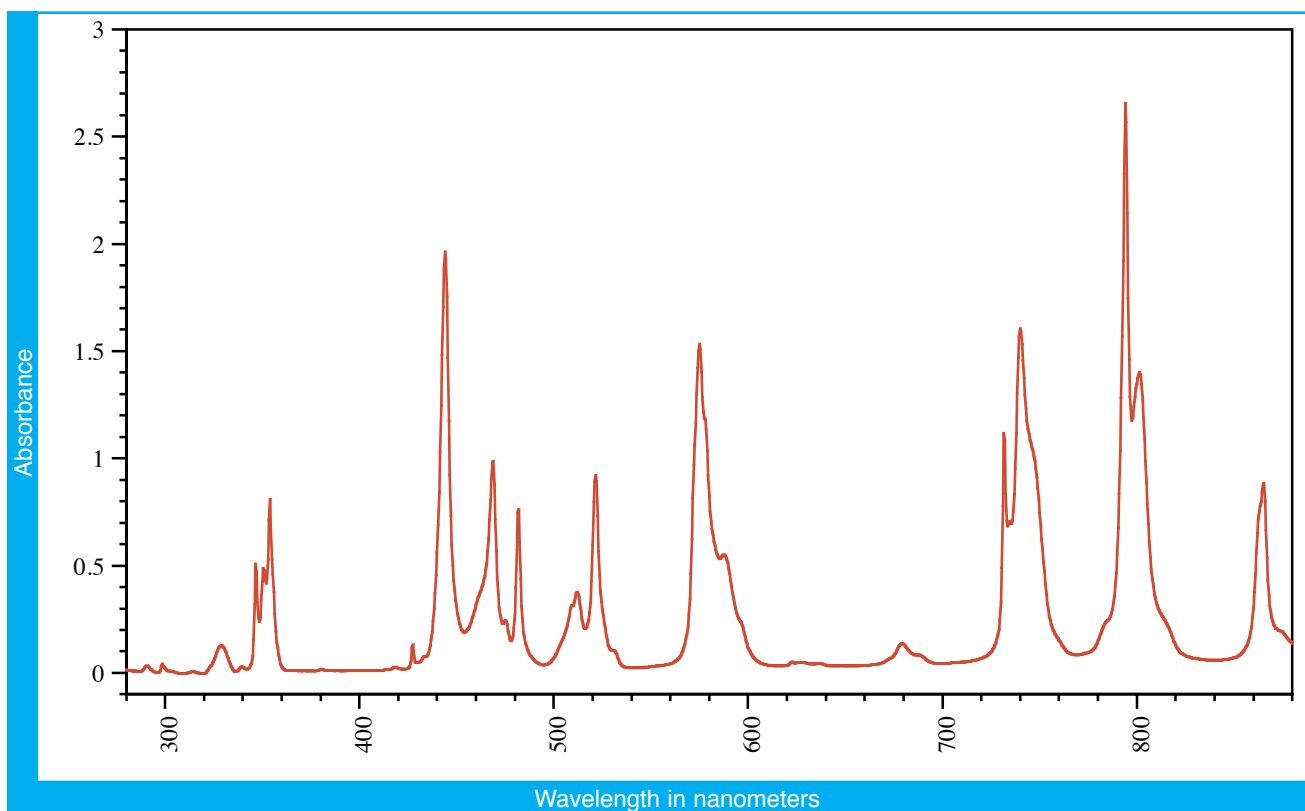
How to Order:

Catalog Number	Description	Price
RM-DL	Wavelength reference cell, Didymium, NIST traceable	\$ 690.00

Starna Cells, Inc (805) 466-8855

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Didymium - Visible - Wavelength Reference



Rare Earth - Far UV - Wavelength Reference

Description:	Rare Earth sulfate (0.05%) in sulfuric acid (0.03%) sealed in a quartz cell, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Validate the Far UV wavelength scale of spectrophotometers
Useable Range:	200nm to 260nm, spectral bandpass of 3nm or less
Physical Configuration:	Filled far UV quartz cell that has been permanently heat sealed

Product Description:

The validation of the wavelength scale in the Far UV is difficult because of the lack of suitable reference materials. Starna has developed the new Rare Earth reference material which allows you to validate the wavelength scale down to 200nm. The reference consists of a solution of the Rare Earth material dissolved in an aqueous solution of very dilute sulfuric acid which has been permanently heat sealed into a high quality quartz cuvette. The use of the filled quartz cell assures that the optical configuration for your quality control is exactly the same as for a normal analysis. Each reference set is supplied with a NIST Traceable certificate which lists the expected wavelength of each of five peaks and the confidence limit of the analysis.

Resolvable peaks for Rare Earth reference
Far UV: 201nm, 212nm, 223nm
UV: 240nm, 253nm



Suggestions for Use:

This reference presents a wide range of crisply resolvable peaks which are easy to correlate with the wavelength indicator on your spectrophotometer. The first procedure should be to scan the Rare Earth reference cell over the usable range to assure that all of the peaks can be resolved. Alter the slit width and scan rate to produce a usable spectra. Check each peak to assure that the reading on your spectrophotometer is within the manufacturer's

tolerances for the wavelength of your spectrophotometer. If not, get a service technician to check and, if necessary, adjust your instrument. The Rare Earth reference is measured against an air blank.

Periodically check the spectra. The periodic use of your Rare Earth cell will build a log of your instrument's wavelength accuracy for use with certification and troubleshooting should the correlation change over time.

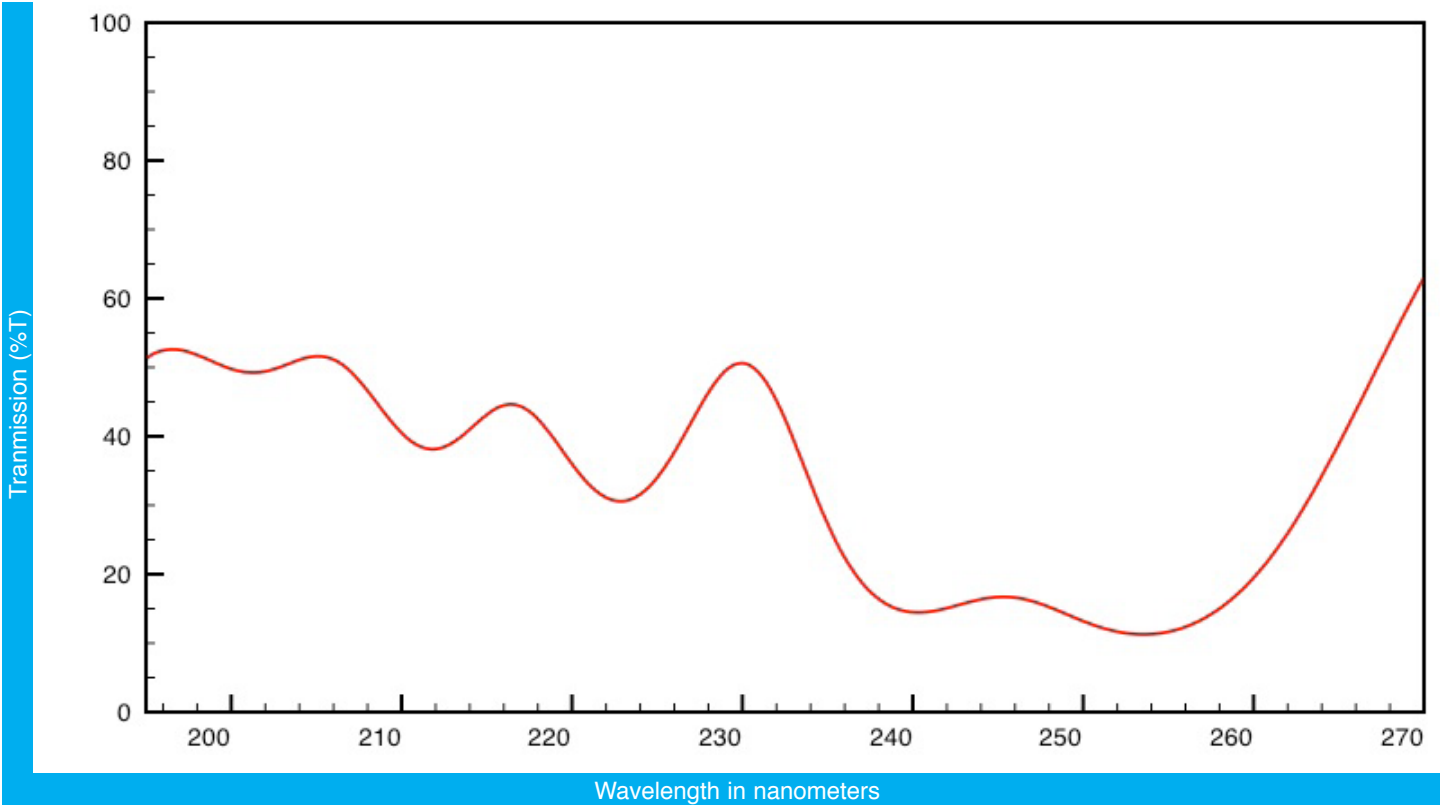
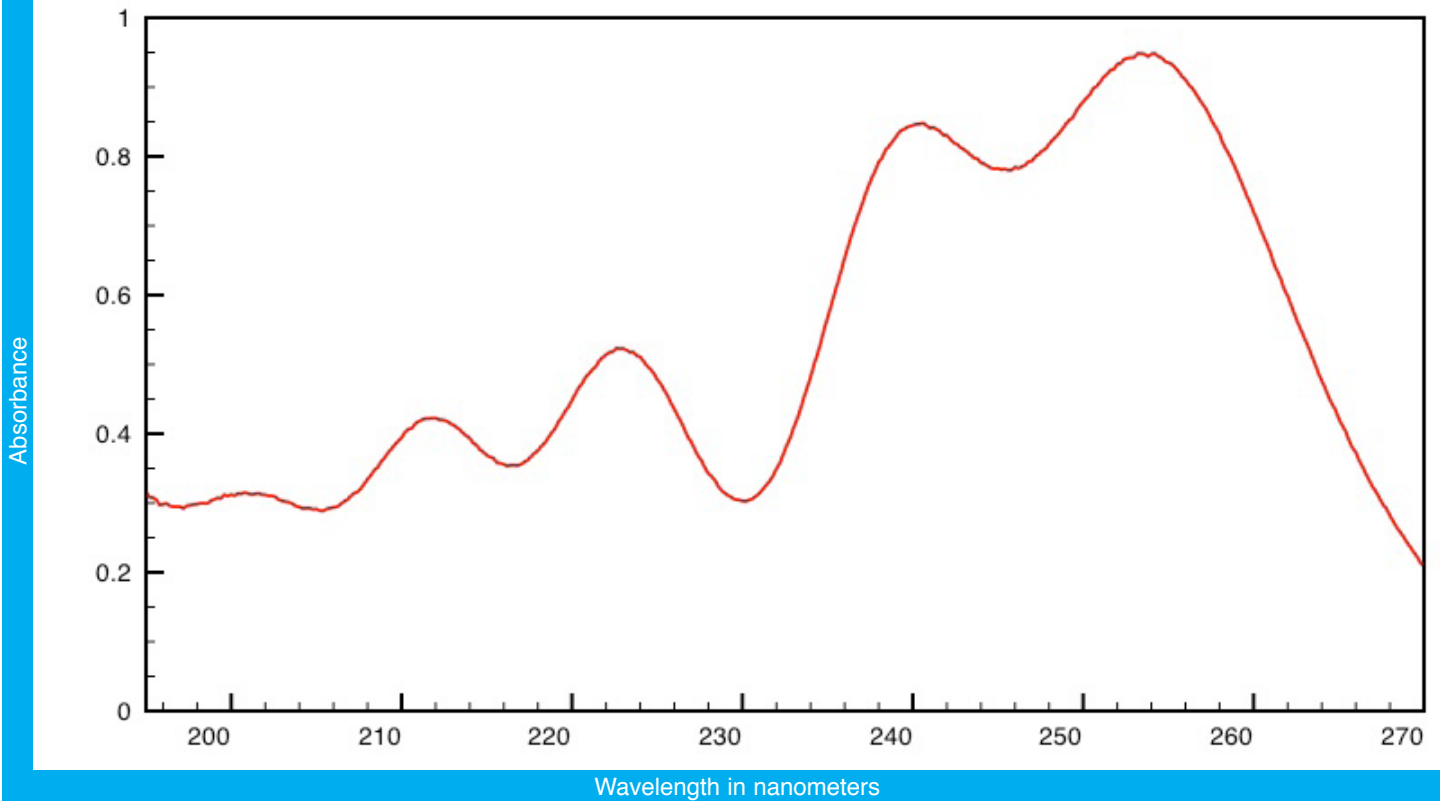
How to Order:

Catalog Number	Description	Price
RM-RE	Far UV Wavelength Reference, NIST traceable	\$ 690.00

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Rare Earth - Far UV - Wavelength Reference

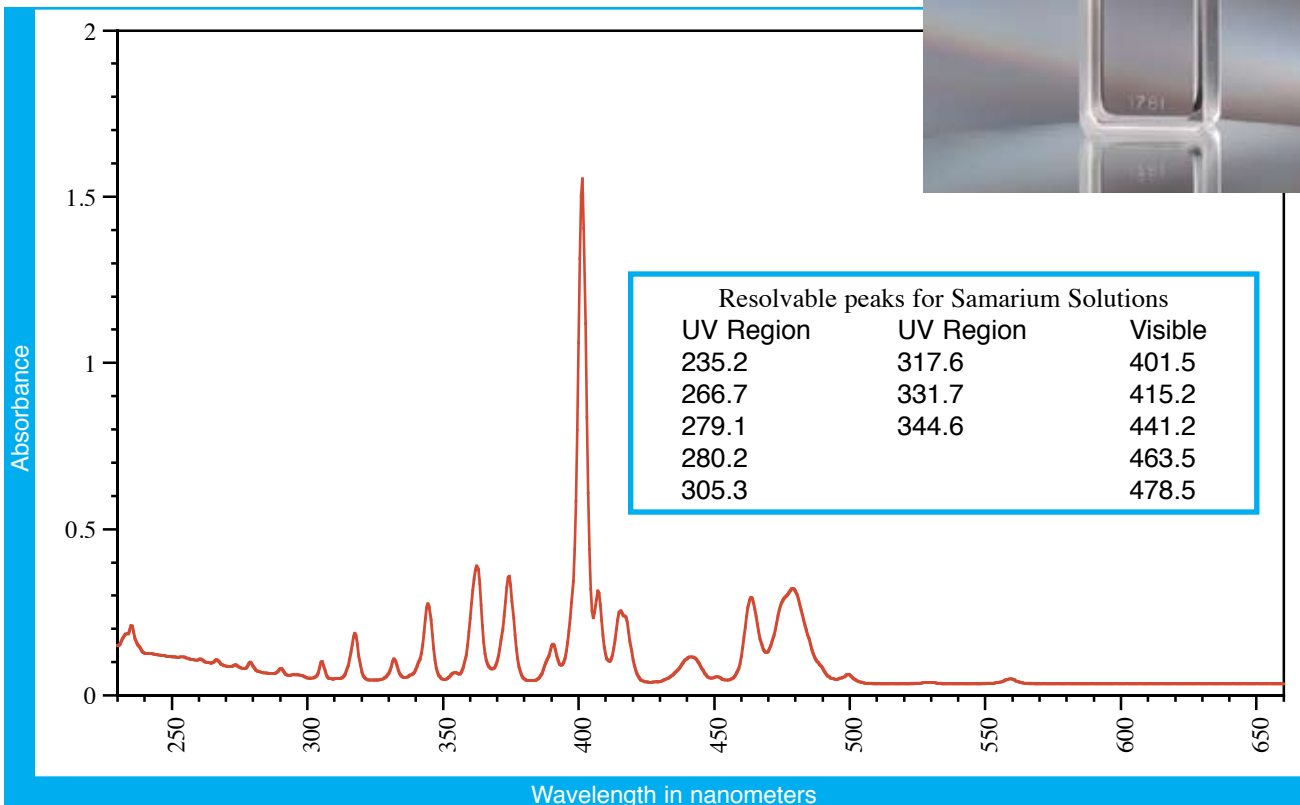


Samarium Perchlorate - UV/Vis - Wavelength

Description:	Samarium Perchlorate sealed in quartz cells, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Assessment of wavelength accuracy in both UV and Visible, resolving complex peaks
Useable Range:	230nm to 560nm
Physical Configuration:	Far UV quartz cell that has been permanently sealed by heat fusion

Product Description:

Samarium Perchlorate is a particularly good reference for establishing wavelength calibration because it has useful peaks from 230 to 560nm, many of which have a spectral bandwidth of less than 5nm permitting precise location of the peaks. This is a great advantage over using glass filters which may have spectral bandwidths over 30nm. In addition to offering wavelength calibration, the Samarium Perchlorate can be used for checking instrument spectral bandwidth. By using peaks in the 230-240 or the 410-420 region, the ability to resolve complex peaks can be tested.



Catalog Number
RM-SL

Description
Samarium Perchlorate filled cell, NIST Traceable

Price
\$ 690.00 each

Starna Cells, Inc (805) 466-8855

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Near Infrared - Wavelength Reference

Description:	Quartz cell in either Transmittance or Transmittance/Transflectance format NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Assessment of wavelength scale accuracy in the NIR spectrum
Useable Range:	990nm to 2537nm
Physical Configuration:	Filled near IR quartz cell that has been permanently heat sealed

Product Description:

The reference is used to validate the wavelength scale of a NIR spectrophotometer. With 13 certified peaks from 990 to 2537 nm that include some complex for instrument resolution evaluation. The reference is available in two formats:

Transmittance: - 10mm optical pathlength with two clear windows (opposite windows to allow light to pass through the cell).

Transmittance/Transflectance - 5mm or 10mm optical path length, depending on orientation. In 5mm configuration, the rear window is mirror coated to provide reflectance optical return so pathlength is effectively 10mm (2 x 5mm = 10mm).

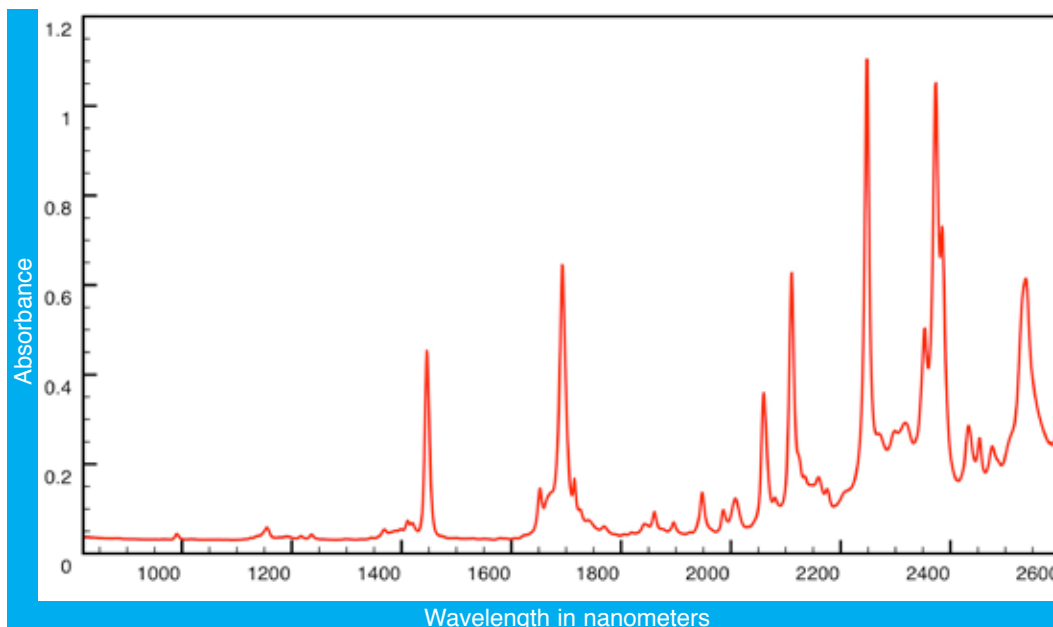
Each reference set is supplied with full certification and traceability to NIST through SRM-2065. The reference material is produced and certified in our ISO Guide 34 and ISO/IEC 17025 accredited laboratory. The reference can also be recertified as required.



Transmittance



Transmittance/Transflectance



Resolvable Peaks

- 990.7 nm
- 1154.9 nm
- 1446.6 nm
- 1652.3 nm
- 1693.1 nm
- 1948.0 nm
- 2060.1 nm
- 2111.0 nm
- 2248.2 nm
- 2353.3 nm
- 2373.4 nm
- 2385.4 nm
- 2537.5 nm

Catalog Number	Description	Price
RM-NIR	NIR wavelength reference, Transmittance, NIST Traceable	\$ 1,290.00 each
RM-NIR/T	NIR wavelength reference, Transmittance and Transflectance, NIST Traceable	\$ 1,480.00 each

Stray Light Reference Materials

Description:	Materials with sharp cutoffs in transmission at specified wavelengths, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Detection of stray light in the UV and Visible
Useable Range:	200nm to 390nm, depending on the material
Physical Configuration:	Far UV quartz cells that have been permanently sealed by heat fusion

Product Description:

Stray light can be described as an indication by the instrument of transmitted light when in reality there is no light being transmitted through the sample. The presence of more stray light than specified in your instrument operator's manual may cause errors in your analysis. Stray light can be a problem in any wavelength range of the instrument but the problem increases the further into the UV that you will be measuring. The stray light reference materials are useful in determining the amount of stray light in your instrument because each material stops transmitting light below a specified wavelength. Hence, below the specified "cut-off" wavelength, any indication of light transmission must be stray light. The testing for stray light is important even if the spectrophotometer is not used below 390nm, because it is an excellent indication of the overall system health of the instrument optics, grating and deuterium lamp. Stray light determinations are run against a water blank. This blank is supplied with all NIST traceable stray light references. The Certificate of Traceability supplied with the stray light reference is measured against the water blank supplied with that reference cell.



Suggestions for Use:

The procedure for using the stray light references is similar for all materials. Set your spectrophotometer's wavelength 20nm above the cutoff for the stray light reference that you are using (for Potassium Iodide you would start at 280nm). Insert the stray light reference cell in the measurement cell holder and the stray light blank cell in the blank cell holder of your instrument. Scan down into the UV to the lowest wavelength that your instrument manual specifies. Any light transmitted below the cutoff wavelength will be stray light. If the amount of stray light is

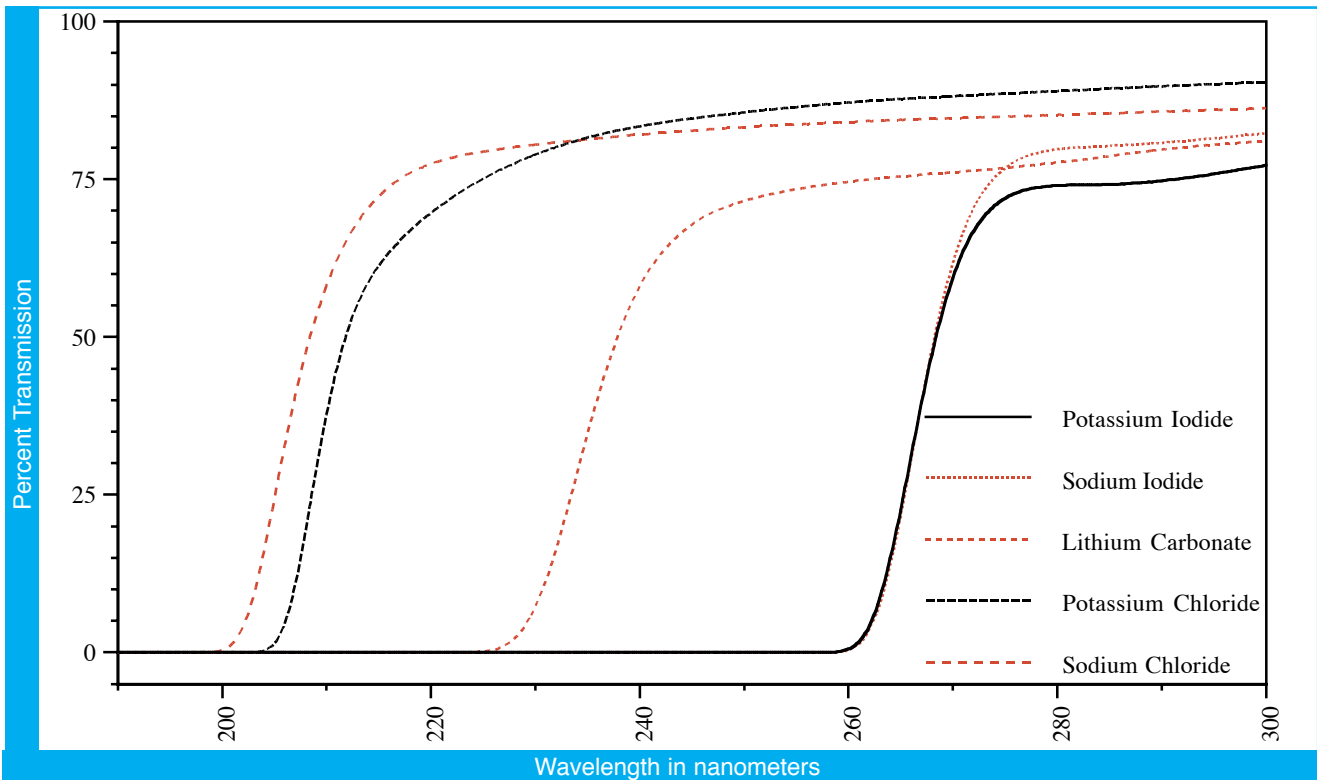
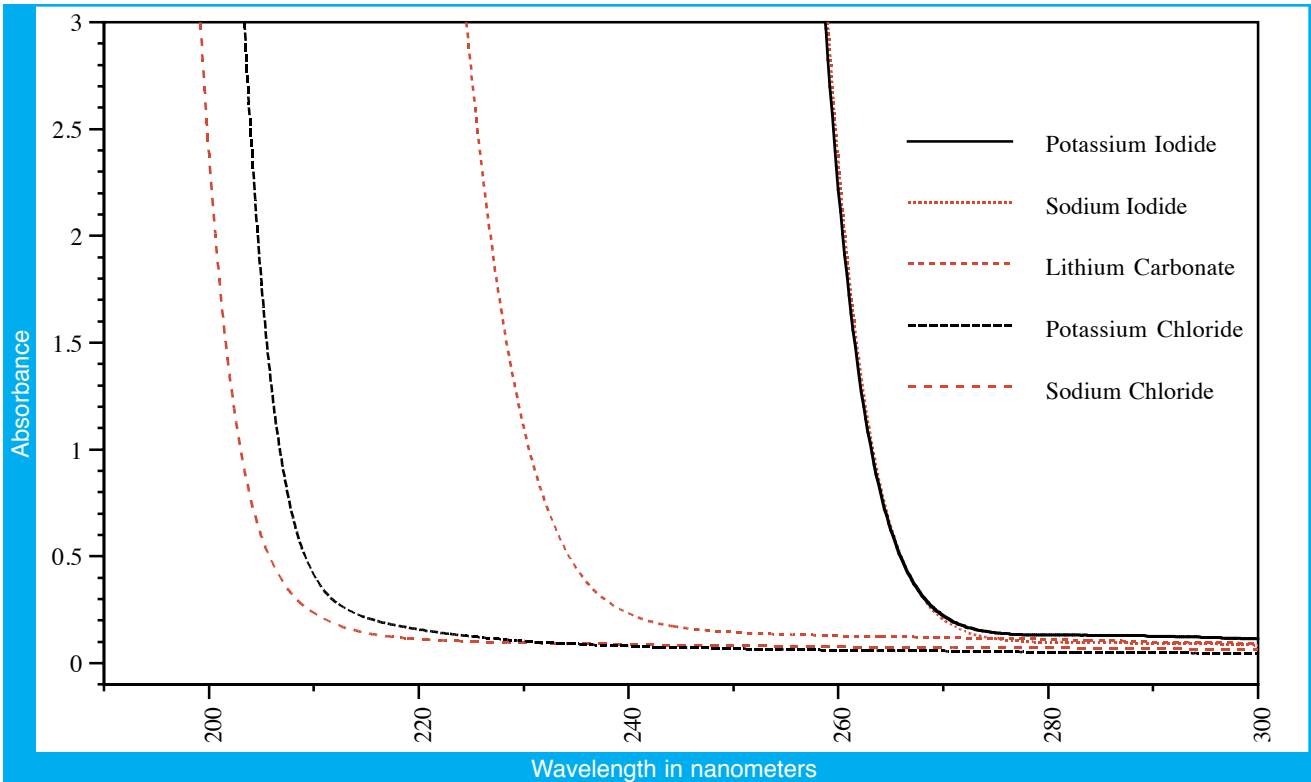
Material:	Cutoff:	Concentration:
Sodium Nitrite	390 nm	5% aqueous
Potassium Iodide	260 nm	1% aqueous
Sodium Iodide	260 nm	1% aqueous
Lithium Carbonate	227 nm	saturated
Sodium Chloride	205 nm	1% aqueous
Potassium Chloride	200 nm	1.2% aqueous

greater than the specification given in your instrument manual, call a service technician to investigate and correct the problem. Periodically rescan with the same instrument configuration and compare the results. Over time you will have a data trail for your instrument which will make the detection and correction of any problems relating to stray light much more reliable.

How to Order:

Description	Catalog Number, NIST Traceable	Price per set
Sodium Nitrite	RM-SN	\$ 690.00
Potassium Iodide	RM-KI	\$ 690.00
Sodium Iodide	RM-SI	\$ 690.00
Lithium Carbonate	RM-LC	\$ 690.00
Potassium Chloride	RM-KC	\$ 690.00
Sodium Chloride	RM-SC	\$ 690.00

Stray Light Reference Materials



Benzene Vapor for Spectral Resolution

Description:

0.1ml Benzene in a vapor state sealed in a quartz cell

Primary Usage:

Test the resolution at various bandwidths of grating based instruments in the UV

Useable Range:

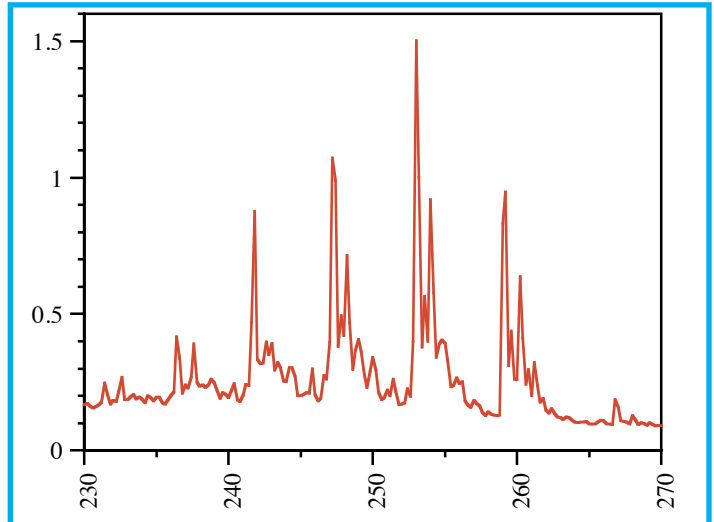
270nm to 230nm

Physical Configuration:

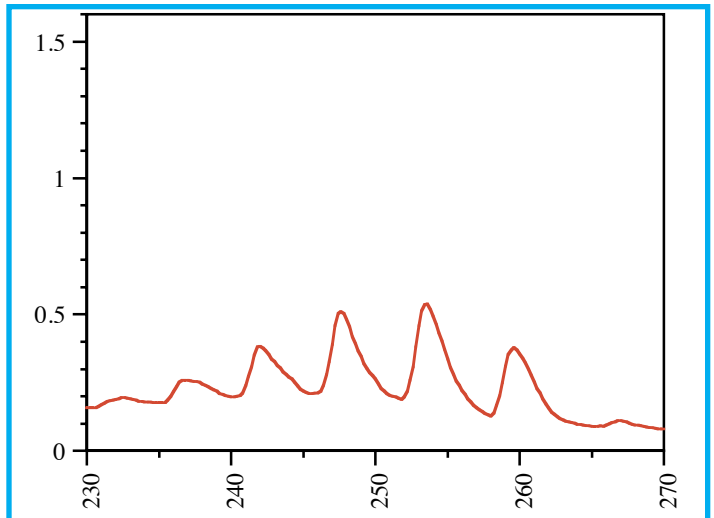
Far UV quartz cell that has been permanently sealed by heat fusion

Product Description:

The ability of your spectrophotometer to resolve absorption lines is the basis of its theory of operation. If absorption lines can not be resolved adequately, then interfering lines will be integrated with the correct line, thus giving an inaccurate measurement. Benzene vapor is an effective material for the detection of a grating based spectrophotometer's resolving power, as it has a great number of close but distinct absorption lines. Benzene vapor will not work well with a photodiode array spectrophotometer as it does not measure a continuum and the peaks will not be resolved well enough to be usable.



Spectral Bandwidth = 0.1nm



Spectral Bandwidth = 1.0nm

Suggestions for Use:

Set your spectrophotometer to a slit width and a scan rate and note the settings. Scan from 240 to 265nm which is the area of the largest peaks. Compare the peaks to the two charts and determine what changes need to be made to the setting of your spectrophotometer to improve the resolution of the scan. Continue to alter both the slit and scan rate until you have optimized the resolution. Make a note of the settings in your quality procedures.

Each time that the scan is repeated you can compare the new scan with previous scans to check for any variance. If your instrument needs service because of a drop in resolution, the historical data will greatly assist the service technician.

How to Order:

Catalog Number

UR-BZ

Description

Resolution reference cell, Benzene Vapor

Price

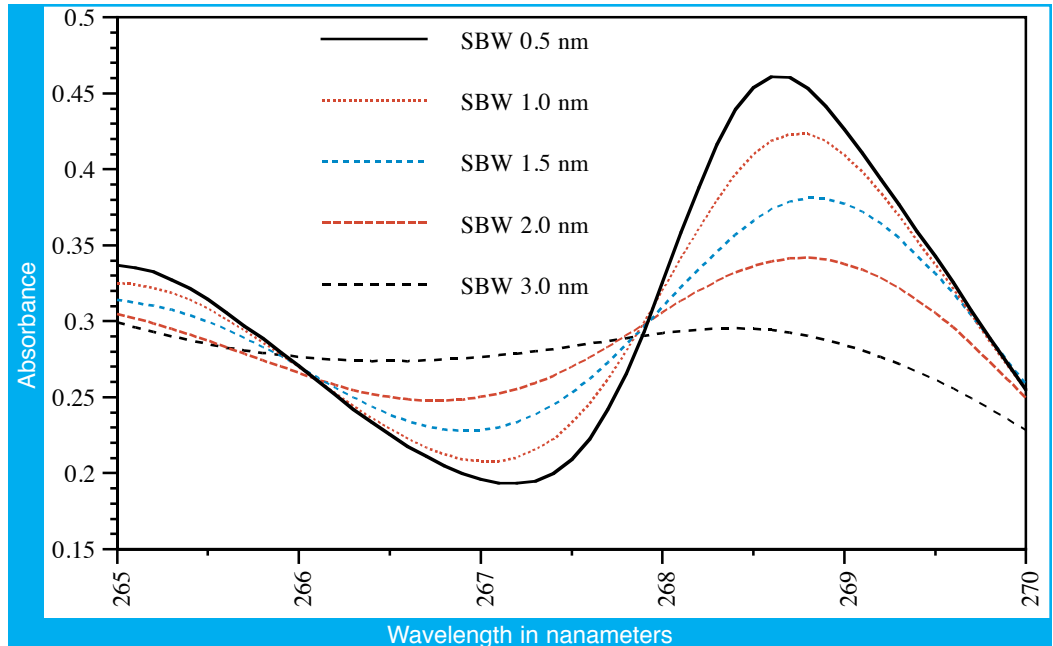
\$ 390.00

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Ultraviolet Bandwidth- Toluene in Hexane

Description: Quartz cell filled with Toluene in Hexane and permanently sealed, NIST traceable
Primary Usage: Determination of bandwidth and resolution in the UV region
Useable Range: 267.0nm and 268.7nm
Physical Configuration: Far UV quartz cells that have been permanently sealed by heat fusion



The Spectral Bandwidth (SBW) of a spectrophotometer is the basis of establishing its ability to resolve absorption lines separated by small differences in wavelength. If a substance that you need to measure has an absorption line at 257.4nm and there is an interfering line at 260.0nm you need to have established whether your spectrophotometer can resolve the two lines separately or “mixes” the two absorption lines into a single line which will give erroneous results.

Toluene in Hexane is used as a reference for the calculation of SBW. The ratio of the absorption of the solution when read at two peak wavelengths (~268.7 and ~267.0nm) relates directly to the SBW of the instrument being assessed. Regular use of this technique will assure that the resolution of your instrument is within the required range for your work.

The Toluene in Hexane reference consists of two far UV quartz spectrophotometer cells with the solution permanently sealed by heat fusion in the cells. One cell is 0.02% Toluene in Hexane, the other is a Hexane only blank. The Toluene in Hexane cell is traceable to SRM 935a which is an absorption reference material.

Table of Approximate Ratios

Ratio:	2.5	2.1	1.6	1.4	1.0
SBW:	0.5	1.0	1.5	2.0	3.0

How to Order:

Catalog Number	Description	Price
RM-TX	Toluene in Hexane cell with blank, NIST traceable	\$ 790.00

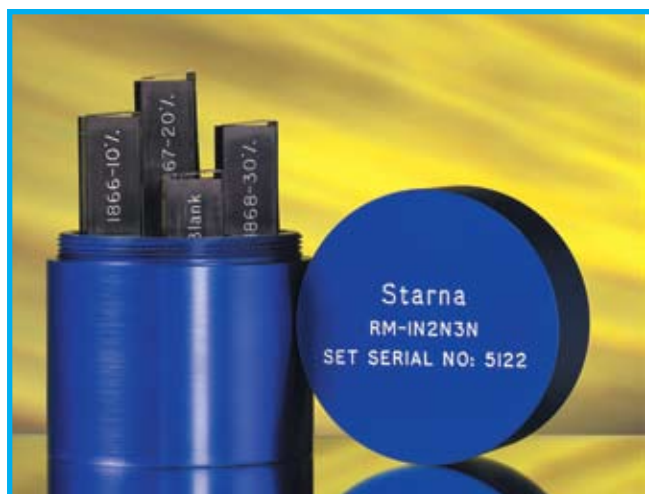
Neutral Density Filters

Description:	Neutral Density Filter Set, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Validation of the visible of photometric scale of spectrophotometers.
Certified Wavelengths:	440.0, 465.0, 546.1, 590.0, 635.0 nm
Physical Configuration:	Glass Filters mounted in anodized aluminum holder

Product Description:

Our neutral density filter sets are based on and traceable to the NIST sets SRM 930e, SRM 1930 and SRM 2930. These sets are used to test the photometric scale in both Transmission and Absorbance in the visible wavelength range. The filters are made from Schott NG-type glass which blocks a known percentage of the light passing through it. We calibrate the glass type and thickness of the filters to produce known transmission and absorption

values. The approximate values are shown on the chart below. Each NIST traceable filter is individually tested and certified to transmission values and confidence intervals. The neutral density filters are mounted in a black anodized aluminum holder, 12.5 x 12.5 x 45 mm, which is fully compatible with all standard spectrophotometer cell holders. The filters have been shown to be effective in instruments with an effective bandwidth of 2.2nm to 6.5nm.



Set RM-1N2N3N

This set is identical to NIST SRM 930e and consists of 3 filters and a blank. Approximate values are:

Transmission	Absorbance
10%	1.10 A
20%	0.78 A
30%	0.56 A

Set RM-N1N35N

This set is identical to NIST SRM 1930 and consists of 3 filters and a blank. Approximate values are:

Transmission	Absorbance
1%	2.10 A
3%	1.60 A
50%	0.30 A

Set RM-D1D39N

This set is identical to NIST SRM 2930 and consists of 3 filters and a blank. Approximate values are:

Transmission	Absorbance
0.1%	3.00 A
0.3%	2.50 A
92%	0.04 A

Suggestions for Use:

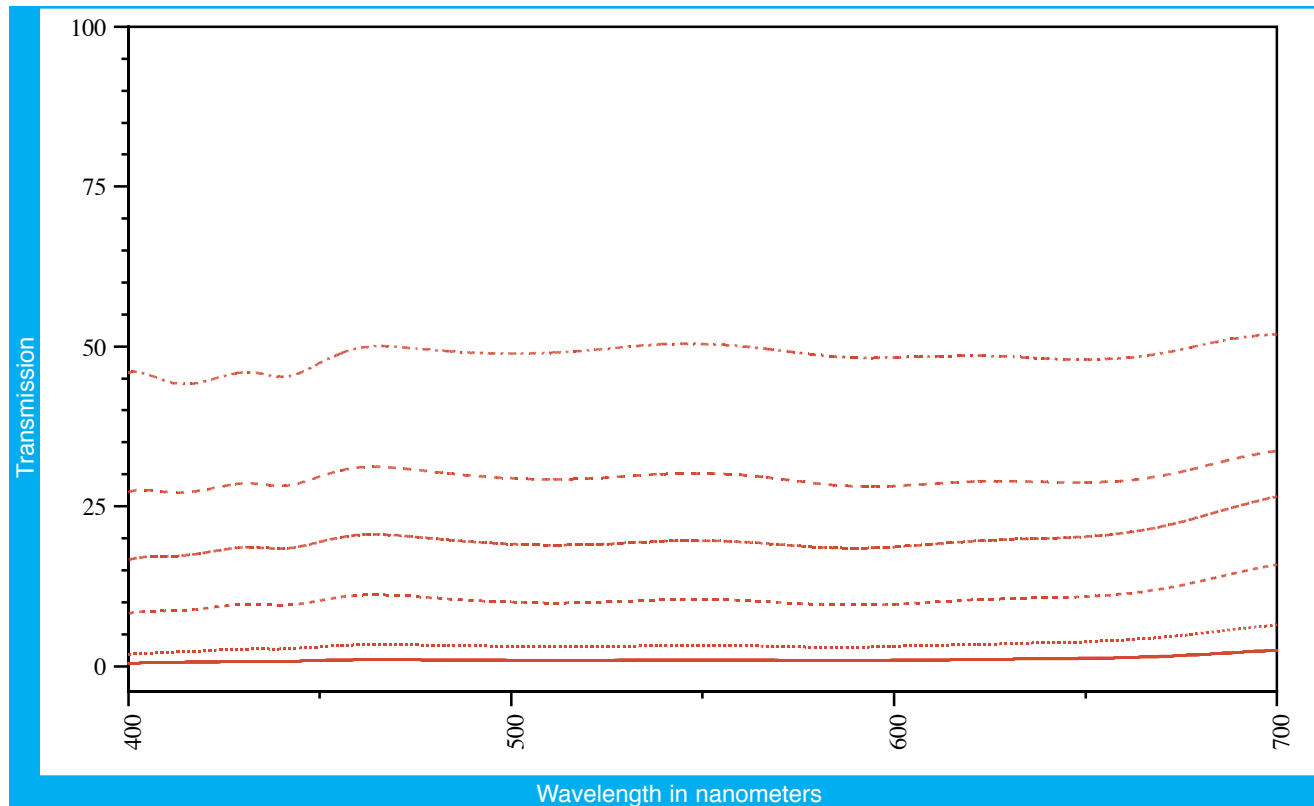
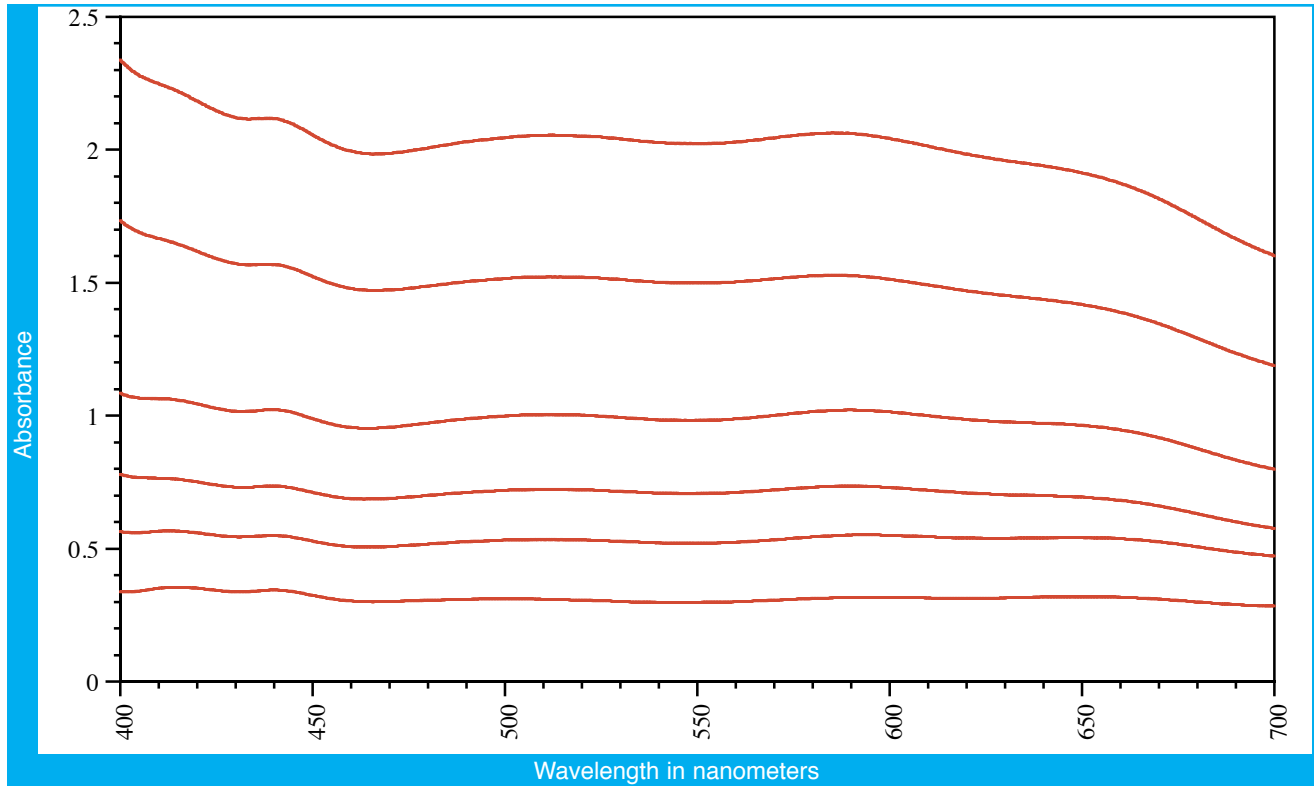
Set your spectrophotometer in either absorbance or transmission at 440.0 nm. Using the empty filter holder (blank) zero the instrument. Insert each filter in turn and note the value. Set your instrument to each successive wavelength and repeat the procedure. The value that you read should be close to the measured certificate value listed for that filter. Using the readings from your instrument

you can assure that the readings are of the correct value (photometric accuracy). You can also plot the readings on graph paper and plot the figures to check the linearity of your scale. Repeat the tests at a fixed period of time. If you note any discrepancy in the readings, call your service technician and they can use the data that you have collected from using the filters to diagnose and correct any problems with your instrument.

How to Order:

Description	Catalog Number, NIST Traceable	Price per set
Neutral Density Filter set, 10, 20, 30 %T	RM-1N2N3N	\$ 1190.00
Neutral Density Filter set, 1, 3, 50 %T	RM-N1N35N	\$ 1190.00
Neutral Density Filter set, 0.1, 0.3, 92 %T	RM-D1D39N	\$ 1290.00

Visible References - Neutral Density Filters

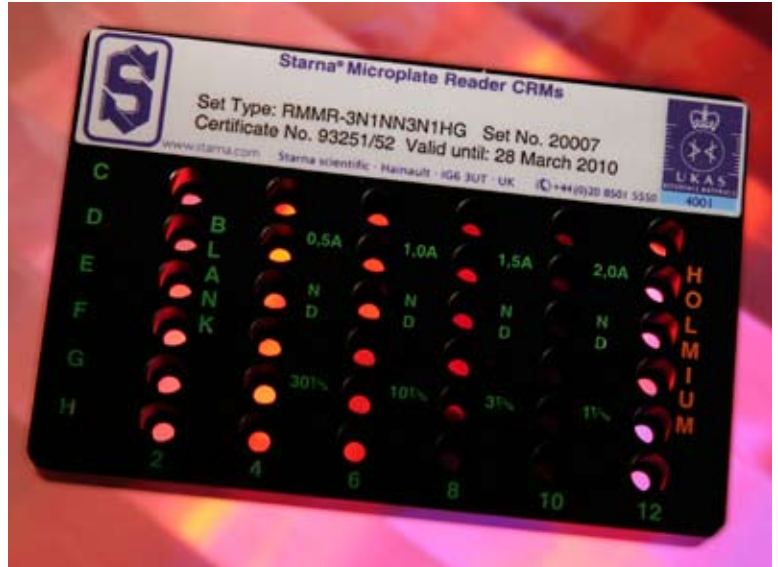


Micro-Plate Reader Visible Reference Plate

- Description:** 96 well micro plate validation filters for wavelength and absorbance scales, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
- Primary Usage:** Validation of the visible of photometric scale of 96 well micro plate readers.
- Useable Range:** Wavelength: 360nm to 637nm, Absorbance scale: 440nm to 635nm
- Physical Configuration:** Glass Filters mounted in 96 well format anodized aluminum holder

Product Description:

Our 96 well micro plate reader filter sets are based on and traceable to the NIST sets SRM 930e, SRM 1930 and NIST 2034. This micro plate is used to test the photometric scale in both Transmission and Absorbance and wavelength accuracy in the visible wavelength range. The absorbance filters are made from Schott NG-type glass which blocks a known percentage of the light passing through it. We calibrate the glass type and thickness of the filters to produce known transmission and absorption values. The approximate values are shown on the chart below. Each NIST traceable filter is individually tested and certified to transmission values and confidence intervals. The wavelength filter is made of Holmium glass and is effective across the visible range. The filters have been shown to be effective in all micro plate readers on the market.



Specifications:

Certified Wavelengths:

Neutral Density Absorbance Filters:

440.0nm 465.0nm 546.1nm 590.0nm 635.0nm

Holmium Wavelength Filter (approximate wavelengths):

637 nm 536 nm 460 nm 453 nm 445 nm
418 nm 360 nm

Filters in reference plate:

Configuration of Reference Plate:

Well Positions	Filter Type	Filter Values
C2 - H2	Air Blank	
C4 - H4	Neutral Density	30%T (0.5 Absorbance)
C6 - H6	Neutral Density	10%T (1.0 Absorbance)
C8 - H8	Neutral Density	3%T (1.5 Absorbance)
C10 - H10	Neutral Density	1%T (2.0 Absorbance)
C12 - H12	Holmium	Peaks from 360 to 637nm

How to Order:

Catalog Number	Description	Price per set
RMMR-1N3NN1N3HG	96 Well Micro Plate Reader Validation Plate	\$ 2,250.00

Cuvette to 96 Well Micro Plate Adaptor

Description:

Adaptor plate which allows the use of standard cuvettes with your 96 well micro plate reader. Patent pending

Primary Usage:

Performance validation of your micro plate reader with Starna Reference sets

Useable Cuvettes:

Standard rectangular cuvettes and filters.

Physical Appearance:

Injection molded polymer tray with slots for 8 cuvettes

Compatible Readers:

The adaptor should be compatible with all 96 well plate readers

The CuvettePlate has a hole alignment that conforms to the wells in a 96 well micro plate. There are slots which align the cuvettes over the available holes through the bottom plate. A small ridge in the center of the CuvettePlate slightly tilts the cuvettes so that the bubble in a liquid sample will be kept away from the light beam of the micro plate reader.



Validating your micro plate reader with liquid filled cuvettes is easy with the CuvettePlate. Place your NIST traceable standards in the CuvettePlate and they will be aligned into the format for your reader and held so that the bubble in the cuvettes will not interfere with the analysis. You can use any of the Starna validation references as well as the NIST SRM-2034 Holmium.



You can validate your micro plate reader using standard NIST traceable filters such as neutral density filters (our catalog number RM-1N2N3N or NIST SRM-930) that you may already have for your spectrophotometer.

Catalog Number

SCP-96-8R

Description

CuvettePlate 96 well micro plate adaptor

Price

\$ 99.00

260/280nm Validation Reference for DNA and RNA

Description:	Standard solution which gives a stable 260/280nm ratio of 1.8 to 2.0, NIST Traceable with UKAS ISO 17025 accredited certificate of calibration
Primary Usage:	Control the quality of DNA/RNA purity analysis
Useable Range:	260nm and 280nm
Physical Configuration:	Far UV quartz cell that has been permanently sealed by heat fusion

Product Description:

When running DNA or RNA purity analysis on your spectrophotometer it is important to assure that your instrument is working correctly. Our DNA/RNA validation standard is a permanently sealed quartz cell which contains a stable solution which mimics the 260/280nm ratio of DNA and RNA. The reference is supplied with a certificate which lists the expected 260/280nm ratio of the cell and the confidence limit of the ratio. The validation analysis is performed by our ISO 17025 accredited laboratory and is traceable to NIST.

Suggestions for Use:

The importance of this reference is that it allows you to validate your work in real time. When measuring unknown samples you can assure that your instrument is working correctly by reading the validation standard both before and after each run of unknowns. If you are using a spectrophotometer which automatically calculates the 260/280 ratio then all that you need to do is place the DNA/RNA validation reference in your spectrophotometer and run the instrument's routine for the 260/280 ratio. If the ratio is valid when compared to the certificate then you can be assured that your instrument is calculating the ratio correctly. In a spectrophotometer without an automatic calculation feature, simply use the DNA/RNA validation reference as you would your other samples to validate your analytical procedure.



Typical Uncorrected Absorbance Values:

260nm 0.765A
280nm 0.405A
Ratio: 1.89

How to Order:

Catalog Number	Description	Price
RM-DNA	260/280 ratio validation reference	\$ 990.00

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Product Summary and Price List

Ultraviolet References:

All prices are US Dollars
FOB: Atascadero, CA USA

Description:	Used for:	Catalog#	Price
Potassium Dichromate, 20 mg/L	Photometric Scale Verification	RM-02	\$ 790.00
Potassium Dichromate, 40 mg/L	Photometric Scale Verification	RM-04	\$ 790.00
Potassium Dichromate, 60 mg/L	Photometric Scale Verification	RM-06	\$ 790.00
Potassium Dichromate, 80 mg/L	Photometric Scale Verification	RM-08	\$ 790.00
Potassium Dichromate, 100 mg/L	Photometric Scale Verification	RM-10	\$ 790.00
Potassium Dichromate, 600 mg/L	Photometric Scale Verification	RM-60	\$ 790.00
PDC 5 concentration set	Photometric accuracy/linearity	RM-0204060810	\$ 1,990.00
PDC 6 concentration set	as above and including 600mg/L	RM-020406081060	\$ 2,290.00
Nicotinic Acid, 6mg/L	Far UV absorbance	RM-1A	\$ 790.00
Nicotinic Acid, 12mg/L	Far UV absorbance	RM-2A	\$ 790.00
Nicotinic Acid, 18mg/L	Far UV absorbance	RM-3A	\$ 790.00
Nicotinic Acid, 24mg/L	Far UV absorbance	RM-4A	\$ 790.00
Nicotinic Acid, 4 concentration set	Far UV absorbance/linearity	RM-1A2A3A4A	\$ 1,840.00
Holmium Perchlorate	Wavelength Accuracy	RM-HL	\$ 490.00
Samarium Perchlorate	Wavelength Accuracy	RM-SL	\$ 690.00
Rare Earth	Far UV Wavelength Accuracy	RM-RE	\$ 690.00
Potassium Iodide	Stray Light	RM-KI	\$ 690.00
Lithium Carbonate	Stray Light	RM-LC	\$ 690.00
Potassium Chloride	Stray Light	RM-KC	\$ 690.00
Sodium Chloride	Stray Light	RM-SC	\$ 690.00
Sodium Nitrite	Stray Light	RM-SN	\$ 690.00
Benzene Vapor	Resolution	UR-BZ	\$ 390.00
Toluene in Hexane	Bandwidth Calibration	RM-TX	\$ 790.00
Microplate Cuvette Adaptor	Use references with microplates	SCP-96-8R	\$ 99.00

DNA and RNA 260/280 Reference:

Description:	Used for:	Catalog#	Price
DNA and RNA 260/280nm reference	Validation of 260/280 ratio	RM-DNA	\$ 990.00

Visible References:

Description:	Used for:	Catalog#	Price
Didymium Perchlorate	Wavelength Accuracy	RM-DL	\$ 690.00
Neutral Density Filter set, 10, 20, 30%T	Absorbance scale	RM-1N2N3N	\$ 1,190.00
Neutral Density Filter set, 1, 3, 50%T	Absorbance scale	RM-N1N35N	\$ 1,190.00
Neutral Density Filter set, 0.1, 0.3, 92%T	Absorbance scale	RM-D1D39N	\$ 1,290.00
Microplate Reference	Absorbance scale and Wavelength	RMMR-1N3NN1N3HG	\$ 2,250.00
Microplate Cuvette Adaptor	Use references with microplates	SCP-96-8R	\$ 99.00

Near Infrared References:

Description:	Used for:	Catalog#	Price
NIR transmittance reference	Wavelength Accuracy	RM-NIR	\$ 1,290.00
NIR transmittance/reflectance reference	Wavelength Accuracy	RM-NIR/T	\$ 1,480.00

Sets for Simplified Instrument Verifications

To make your verification task easier, we have assembled our reference materials into sets which allow you to meet specific verification requirements. In addition, you can save money by purchasing a group of references in a set instead of purchasing several references individually. We have sets which will allow you to meet the qualifications of the European Pharmacopoeia, the United States Pharmacopoeia and one set that will satisfy the requirements of both the EP and USP.



European Pharmacopoeia:

Catalog Number: **RM-0660HLKCTX**

NIST Traceable

Price per set: **\$ 2,840.00**

This set is used to meet European Pharmacopoeia requirements. This set contains:

Potassium Dichromate blank	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 60 mg/L	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 600 mg/L	Photometric Accuracy	430 nm
Holmium Perchloric	Wavelength Accuracy	240 nm to 650 nm
Stray Light blank	Stray Light	200 nm to 400 nm
Potassium Chloride, blank	Stray Light	200 nm
Toluene in Hexane	Resolution	267 nm to 268.7 nm

European Pharmacopoeia and USP:

Catalog Number: **RM-0660HLKCSITX**

NIST Traceable

Price per set: **\$ 3,290.00**

This set meets European Pharmacopoeia requirements as well as the requirements of the United States Pharmacopoeia.

This set contains:

Potassium Dichromate blank	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 60 mg/L	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 600 mg/L	Photometric Accuracy	430 nm
Holmium Perchloric	Wavelength Accuracy	240 nm to 650 nm
Stray Light blank	Stray Light	200 nm to 400 nm
Potassium Chloride	Stray Light	200 nm
Sodium Iodide	Stray Light	220 nm
Toluene in Hexane	Resolution	267 nm to 268.7 nm

Sets for Simplified Instrument Verifications

United States Pharmacopeia set:

Catalog Number: **RM-06HLKI**

NIST Traceable

Price per set: **\$ 1,890.00**

This set is primarily used in North America because of the similarity to NIST SRM's. The set contains:

Potassium Dichromate blank	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 60 mg/L	Photometric Accuracy	235 nm to 350 nm
Holmium Perchloric	Wavelength Accuracy	240 nm to 650 nm
Stray Light blank	Stray Light	200 nm to 400 nm
Potassium Iodide	Stray Light	260 nm

United States Pharmacopeia set with Didymium:

Catalog Number: **RM-06DLKI**

NIST Traceable

Price per set: **\$ 1,890.00**

This set is used where wavelength verification is needed at higher visible wavelengths. The set contains:

Potassium Dichromate blank	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 60 mg/L	Photometric Accuracy	235 nm to 350 nm
Didymium Perchloric	Wavelength Accuracy	290 nm to 870 nm
Stray Light blank	Stray Light	200 nm to 400 nm
Potassium Iodide	Stray Light	260 nm

United States Pharmacopeia set with linearity:

Catalog Number: **RM-020610HLKI**

NIST Traceable

Price per set: **\$ 2,490.00**

This set is used where absorbance linearity in the UV can be validated as well as the wavelength and stray light requirements of the USP. The set contains:

Potassium Dichromate blank	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 20 mg/L	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 60 mg/L	Photometric Accuracy	235 nm to 350 nm
Potassium Dichromate 100 mg/L	Photometric Accuracy	235 nm to 350 nm
Holmium Perchloric	Wavelength Accuracy	240 nm to 650 nm
Potassium Iodide, blank	Stray Light	260 nm

UV Absorbtion Scale Linearity:

Catalog Number: **RM-0204060810**

NIST Traceable

Price per set: **\$ 1,990.00**

This set has five different concentrations of Potassium Dichromate and can be used to test both the photometric scale and linearity. The set contains:

Potassium Dichromate Blank		
Potassium Dichromate 20, 40, 60, 80, 100 mg/L	Photometric Accuracy	235 nm to 350 nm

Presorted Standard
U. S. Postage Paid
Permit # 7
San Luis Obispo, CA
93401

Product Warranty

Our Starna® Spectroscopic References are warranted to meet the specifications as listed in this catalog when you receive them. We offer a lifetime guarantee on the reference cells and filters providing that they are not physically, optically or thermally abused and that they are recertified at least every two years by Starna. We will replace, at our expense, any reference that changes value outside of its expanded uncertainty budget ($k=3$) within this time frame of 2 years or less since its last certification. Breakage is not covered by any warranty. Any references to be returned under warranty require a Return of Merchandise Authorization (RMA) number. The RMA can be obtained by calling our customer service department.

Recertification

All of our NIST Traceable References can be recertified. The certificates issued for the recertified sets are identical in form to the certificates issued with new sets. We calculate the uncertainty values based on a 2 year known drift and recommend recertification at either 1 or 2 years. Call for current pricing and return instructions. We also recertify references from NIST such as SRM 930, SRM 1930, SRM 2031 and SRM 2034.

Terms of Sale

Our terms of sale are Mastercard, VISA, American Express or net 30 days to recognized accounts. If you are unsure of your account status, please call us so that we can verify your account for you. The prices published in this catalog are current at the time of publication and are subject to change without notice. Our terms of shipment are FOB Atascadero, CA USA. We prepay shipping charges and add them to your charge card, invoice or UPS account.

Method of Shipment

We usually ship via United Parcel Service and have all levels of service available including Red (overnight). If required we can also ship via Federal Express. Orders for delivery outside of the USA are shipped via UPS or Fedex using the customer's account. All shipping charges are prepaid and added to the invoice or on the customer's account.

Technical Information

We have technical staff available to assist you with any information that you may need for the selection of a reference or its use. The best method of inquiry is via e-mail at: sales@starnacells.com. We are usually able to answer your inquiries within 24 hours via return e-mail.

Our hours of business are:
8:30AM to 4:30PM, USA Pacific Time

Delivery

Delivery on the reference materials ranges from one to three weeks depending on current inventories and production schedules. It is always best to call us for price and delivery verification when placing your order. We make a great effort to keep delivery times to a minimum but, due to the certified nature of the product, we must do all that is necessary to assure that the reference materials are accurate, stable and properly documented.

Please call us at any time for a delivery estimate.

Mail orders:

Starna Cells, Inc
PO Box 1919
Atascadero, CA 93423

Phone Orders:

(800) 228-4482
or
(805) 466-8855

E-Mail Address:

sales@starnacells.com

FAX Orders:

(805) 461-1575

World Wide Web:

<http://www.starnacells.com>