



Starna scientific
'Setting the Standard'

Quality Assurance in the Analytical Laboratory

Visible Spectrophotometer Absorbance Qualification

Starna Neutral Density Glass References



Purpose

These references can be used to qualify the absorbance accuracy and linearity of visible spectrophotometers with a spectral bandwidth of 6.5 nm or less, over the wavelength range 440 - 635 nm. They are accepted for this purpose by most pharmacopoeias and other regulatory bodies

Description and Discussion

Schott NG type glass filters, from which a wide range of transmission and absorbance can be produced, have been available for over forty years. All Starna neutral density filters are manufactured and certified in accordance with the 'Technical Specification for Certification of Spectrophotometric NIST Traceable Reference Materials' (NIST Special Publication 260-140). This recommends calibration at 440 nm, 465 nm 546.1 nm, 590 nm and 635 nm, and Starna filters are certified at these wavelengths. Starna absorbance references are calibrated at a bandwidth of 1 nm, however other bandwidths are available on request. They can also be certified at other wavelengths to suit customer requirements with the provision that the 440 nm, 546.1 nm and 635 nm wavelengths are included for traceability.

A range of 18 filters is available from Starna, covering absorbance values from approximately 0.04 A to 3.5 A (see **How to Order**, below). Originally, these filters were manufactured with selected transmission values. Available transmission values and equivalent absorbances are:

% Transmission	Absorbance
92	0.04
79.4	0.10
73	0.14
60	0.22
56.5	0.25
50	0.30
40	0.40
30	0.52
25	0.60
20	0.70
10	1.00
6	1.22
3	1.52
1.5	1.82
1	2.00
0.3	2.52
0.1	3.00
0.06	3.22
0.03	3.52

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This recommends calibration at 440 nm, 465 nm 546.1 nm 590 nm and 635 nm, and Starna filters are certified at these wavelengths.

NIST also lists three specifications for neutral density filter Standard Reference Materials (SRMs): SRM 930e, SRM 1930 and SRM 2930.

For those users wishing to work to these specifications, sets of filters equivalent to these SRMs are available (see **How to Order**). For convenience, but to comply with the SRM specifications, all certification measurements are made at a SBW of 1.0 nm. These sets consist of three filters together with an empty aluminium holder, to be used as a blank.

These SRMs were originally specified in transmittance, the specified nominal transmittance and approximate absorbance values are given below:

	SRM 930e		SRM 1930		SRM 2930	
	%T	A	%T	A	%T	A
Filter 1	10	1.0	1	2.0	0.1	3.0
Filter 2	20	0.7	3	1.5	0.3	2.5
Filter 3	30	0.5	50	0.3	92	0.04

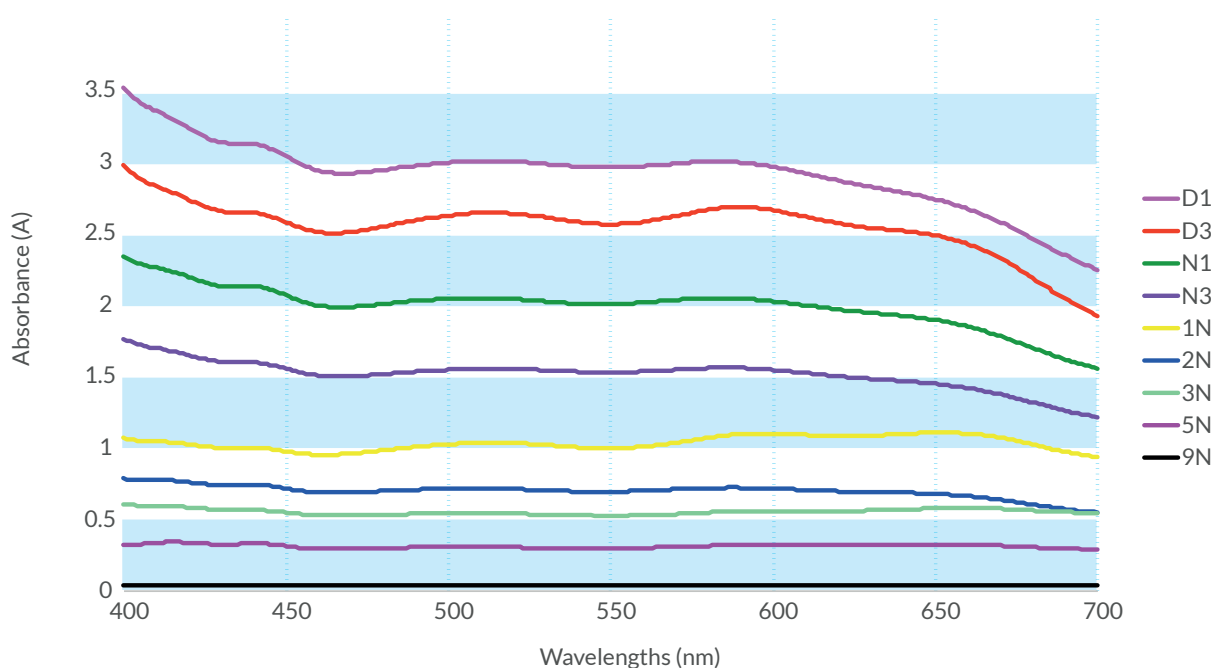
Certificate values are given in both %T and Absorbance.

These specifications also stipulate the maximum spectral bandwidth to be used at these wavelengths for certification measurements:

Wavelength (nm)	440	465	546.1	590	635
SBW (nm)	2.2	2.7	6.5	5.4	6.0

The spectrum of these filters is essentially flat over the range of calibration.

Neutral Density Filters



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Starna Neutral Density Glass References

Certification and Documentation

A Certificate of Calibration and Traceability and full instructions for use are provided with each Reference Material. The certificate is supplied in electronic format, on a USB drive in the same box as the references, allowing hard copy to be produced on demand and giving easy interface to the user's own IT systems. Certification measurements are made on a reference spectrophotometer that has been qualified using Standard Reference Materials (SRMs) certified by the National Institute of Standards and Technology (NIST) in the USA, or against primary physical references such as elemental emission lines.

Warranty

STARNA offers a Lifetime Guarantee on all Starna Certified Reference Materials (CRMs), unless otherwise stated, such that any reference material that moves outside its published uncertainty budget will be replaced free of charge. This guarantee is subject to the reference materials being re-certified at least every two years and that the references have not been physically, thermally or optically abused. The STARNA UKAS accredited calibration laboratory aims to re-certify and despatch references within five working days from receipt.

Accreditation

Starna Scientific is accredited to both ISO 17034 as a Reference Material producer, and ISO/IEC 17025 as a Calibration Laboratory for optical reference measurements. Starna Scientific's manufacturing facility is accredited to the ISO 9001 Quality Management System with BSI.

How to Order

Individual filters and Starna selected sets:

These sets allow absorbance linearity qualification over a range of values.

Nominal % Transmittance	Nominal Absorbance	CATALOGUE NUMBER			
		Set of 4 filters	Set of 6 filters	Set of 9 filters	Single filter
		RM-4ND	RM-6ND	RM-9ND	
92	0.04			•	RM-9N
79.4	0.10				RM-8N
73	0.14			•	RM-7N
60	0.22			•	RM-6N
56.5	0.25	•	•		RM-5D
50	0.30				RM-5N
40	0.40				RM-4N
30	0.52	•	•	•	RM-3N
25	0.60				RM-2D
20	0.70				RM-2N
10	1.00	•	•	•	RM-1N
6	1.22				RM-N6
3	1.52		•	•	RM-N3
1.5	1.82				RM-1D
1	2.00	•	•	•	RM-N1
0.3	2.52			•	RM-D3
0.1	3.00		•	•	RM-D1
0.06	3.22				RM-H6
0.03	3.52				RM-H3
0.01	4.00				RM-A1

Any combination of references can be ordered as a set by combining the single filter catalogue numbers.

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Neutral Density Glass Filters

NIST Equivalent SRM Sets

Three specifications for neutral density filter Standard Reference Materials (SRMs) are listed by NIST: SRM 930e, SRM 1930 and SRM 2930. For those users wishing to work to these specifications, sets of filters equivalent to these SRMs are available:

	CATALOGUE NUMBER
SRM 930e equivalent set: 10, 20 & 30 %T (1.0, 0.7 & 0.5A) and blank holder	RM-1N2N3N
SRM 1930 equivalent set 1, 3 & 50 %T (2.0, 1.5 & 0.3 A) and blank holder	RM-N1N35N
SRM 2930 equivalent set 0.1, 0.3 & 92 %T (3.0, 2.5 & 0.04 A) and blank holder	RM-D1D39N
NIST SRM Set Set of all 9 above filters and blank holder	RM-SRM9ND

Certificate values are given in both %T and Absorbance

Visible Spectrophotometer Qualification Set

This is a convenient way of qualifying a visible spectrophotometer for photometric accuracy, linearity and wavelength accuracy.

	CATALOGUE NUMBER
Starna Transmission/Absorbance and Wavelength Set Neutral Density Filters: 1.00, 0.50 & 0.25 A (10, 30 & 52 %T) and blank holder & Holmium Glass Filter	1N3N5DHG



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