Norville
group

Ophthalmic Lens Technical Reference & Transmission Data

May 2018
E- Edition 11
www.norville.co.uk

PRESCRIPTION COMPANION

Introduction

The UK ophthalmic manufacturing industry is facing a challenge of change as economic forces push and pull at its structure. Today is as different as yesterday whilst tomorrow's changes come along at frenetic pace. This 11th edition Companion contains new material, although its purpose remains the same, to provide further technical support information on products featured in our Rx catalogue and prescription industry trends.

That this edition has a very blue cover is a deliberate choice to reflect the pre-occupation of optics over the last few years with Blue Light Blocking. We have turned the spotlight onto lens transmission by reproducing a goodly number of lens plot diagrams. It is not our position to be telling you what to prescribe but it is our responsibility to provide you with the information to make those decisions, good blue – bad blue or rather UV + blocking is the core, perhaps ever a controversial topic driving lens suppliers everywhere across the globe. We predict ophthalmic lenses for the control of myopia will follow hard on the tail of blues.

As prescribers, you need to deconstruct suppliers' marketing speak into the technical pros and cons of individual products. The largest marketing budget does not necessarily always match the highest technical offering. We believe as an independent supplier it is Norville's responsibility to provide those technical facts and figures enabling you to be highly proficient within your expertise of ophthalmic lens dispensing.

As everywhere, optics today is fast-changing. This edition 11 Companion will be subject to ongoing upgrades, changes and editing as 11A, B, C etc.
Keep in touch on www.norville.co.uk.

A special thanks to all the Norville team and optical friends who have spent many challenging hours preparing this raft of data.

Enjoyable and successful dispensing.

Frank G Norville

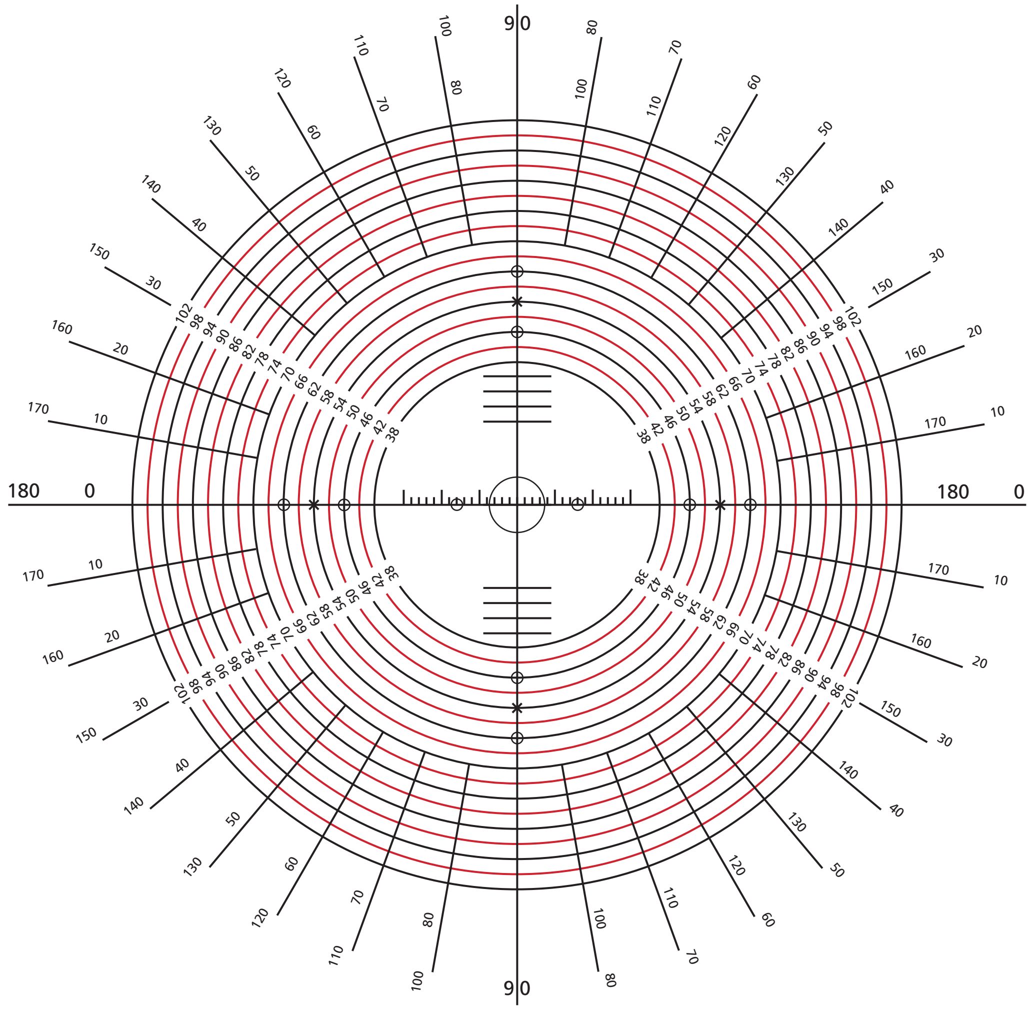
Spectaclemaker January 2018

Norville
your independent supplier of choice

Contents Index

Effective Diameter Chart

MINIMUM SIZE UNCUT (MSU)



STEPS

1) Place the **frame front** down on chart and centralise by use of concentric circles and markings on 180 line so that, in the horizontal direction, an equal number of lines are showing within the eye rim. Repeat for the vertical direction. The frame should now be exactly centralised about its lens centre.

2) Should decentration be required in the finished prescription, then move the centralised frame by the required amount of decentration for that eye, but in the opposite direction to that specified e.g. if 3mm IN is required, move eye 3mm OUT. The distance between the lines is 2mm and either the temporal or nasal inner rim can be used as the reference point. Likewise adjust for vertical decentration if any.

3) Now read around the inner rim of the frame. Note the widest line that is showing, not necessarily the temporal corner, this will indicate the diameter of the blank required to glaze the frame. Make an allowance for the groove depth by simply adding 2mm to the effective diameter from the chart.

4) A quicker process is... should the frame have a demonstration lens insert, detach this and place curve uppermost over the central cross, likewise a glazing shape former. Both can be centralised by using the appropriate marks to judge the equidistance bisect points. Any decentration in the opposite direction indicates M.S.U. necessary.

Reference	*Chart A - See appendix A1*	*Edge Substance - Minus Powers*
	Chart B - See appendix A2	*Centre Substance - Plus Powers*

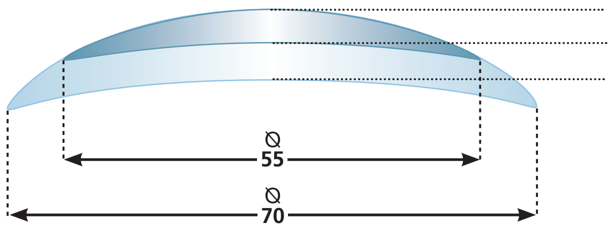
Lens Sizing

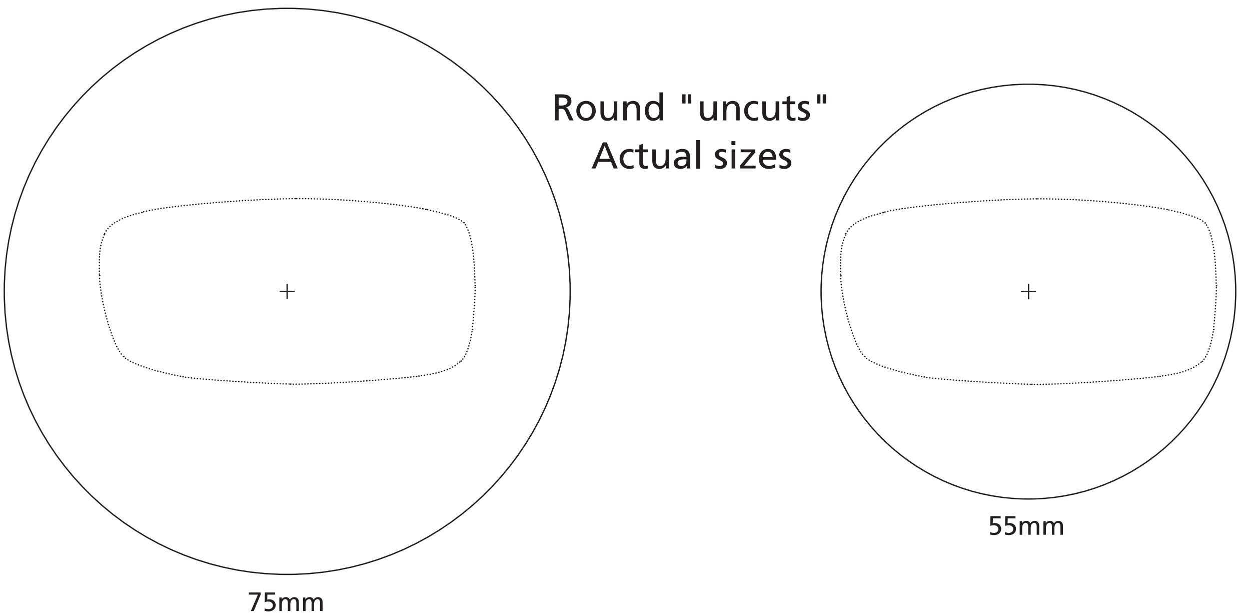
One of the most important hallmarks of an excellent pair of spectacles (besides of course the ability to see well!) is the finished substance of its lenses.

Lens shape and decentration combined results in an effective lens diameter that determines the ultimate **minimum size uncut** (MSU) needed to glaze a spectacle frame to its specified optical centration (see previous page).

Nowadays **stock finished** single vision resin lenses are manufactured as circles and can vary from 75mm down to 50mm rounds. Today we have a 50mm round stock lens in modern Trivex material which takes us almost full circle back to the small stock (glass) lenses of the early 20th Century.

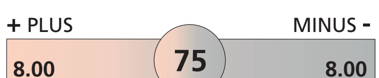
Always use the smallest stock lens size suitable as in Rx lens production SIZE (diameter) matters for LENS SUBSTANCE.





When lenses are **surfaced** to prescription there is usually a range of semi-finished blank diameters available. For single vision resin CR39 this would include 80, 75, 70, 65, 60 and 55mm round diameters, although for bifocals usually only one diameter is available due to the cost of maintaining all those stock keeping units (SKUs) which, over a range of adds from 0.75 to 3.00, would make 10 individual units as a minimum, having a range of three or four lens bases making 30 or 40 SKUs just for each lens type design. It would not be unusual for a large prescription house to hold over 16,000 stock items.

Where progressives or a D Seg is concerned, this is further complicated when held in separate rights and lefts, this of course doubles up to 60 or 80 SKUs per lens type. This would even be higher if 4 or 5 diameters needed to be kept across every lens, however the outcome of the lens surfacing process allows customisation of diameter, reducing from the maximum shown in this bar chart.



Progressive semi-finished lens blanks most usually come in a diameter of 75mm (see above) which as you can note is of little help when we are to glaze an average frame size (50mm). Fortunately during the surfacing process diameter can be reduced simultaneously along with blank substance.

Today's laboratory work instructions are all designed around the spectacle frame parameters, eyeshape, DBL, patient's Rx, optical centre position and, if applicable, segment top/fitting cross position. Considering all these facts ensures that all surfaced lenses are made to the absolute thinnest possible centre and edge substances.

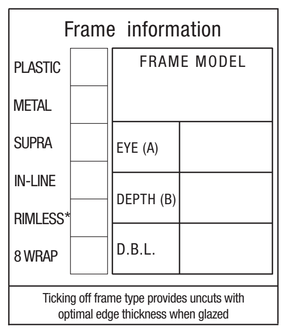
This has obvious benefits for hypermetropes, even those with powers as low as +2.50DS. Myopes gain very little from this process as their lens edge substance is dictated by power and to a lesser degree the final centre thickness specification of the material.

Given the same diameter, lenses can be produced proportionately thinner by increasing the refractive index of the material. Is it not strange that the current most popular lens material, CR39, results in the thickest lenses as it has the lowest refractive index of all n = 1.498.

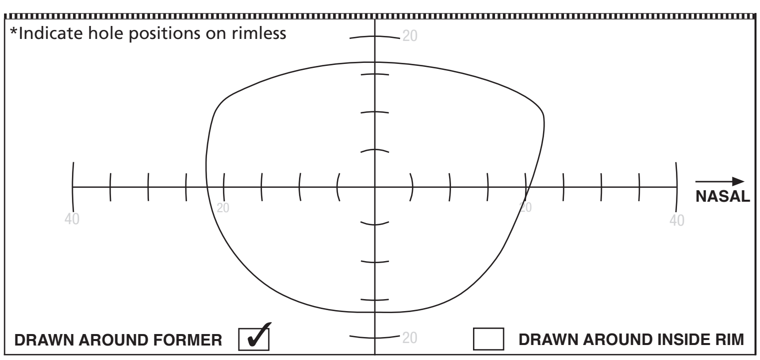
Incorrectly calculating the minimum required diameter (Page 4) can result in considerably thicker lenses than necessary. The old craft adage "measure twice cut once" can be applied to lenses. In this case extra care in assessing lens diameter will result in thinner lenses. If you are unable to use an electronic frame tracer then the diameter can be calculated using an effective diameter chart.

Electronic shape tracing or measurement has completely changed the accuracy or lack of accuracy in recording shape data, from the days of 10s of thousands of metal or plastic lens formers (shapes), with the need to measure from that directly or trace around a frame groove: impossible on supras or rimless. Recording shape took an inordinate amount of time. "Tracers" of today can read a dummy lens shape in or out of the frame and instantly hold and transfer that data both for lens calculations and shape edging.

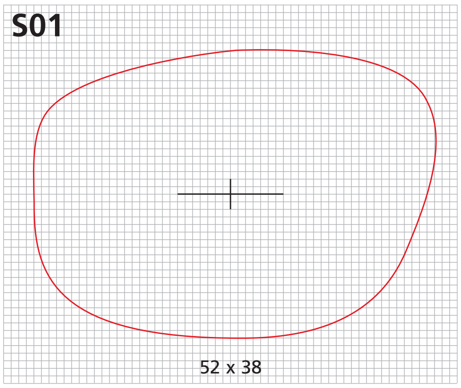
Those ordering uncut lenses need only to quote a frame name of a shape familiar to us - all Norville, Silhouette and Lindberg for instance, or draw around the shape when they send us an order. This is the key as electronic data transfer technology may obscure the importance of always providing a shape for absolute control of substance, it is essential this is provided, especially when an E-style or progressive lens thickness is to be calculated. Not to do so is "substance suicide", so much so that it is better to select a guide shape rather than none. To this end we would use one of the standard design shapes shown on the following page. Select a shape that you consider is the nearest to your frame, quote the key frame dimensions (see box).

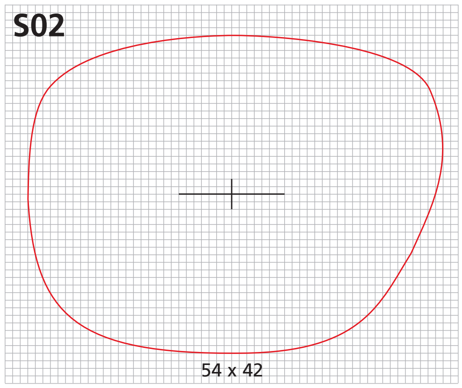


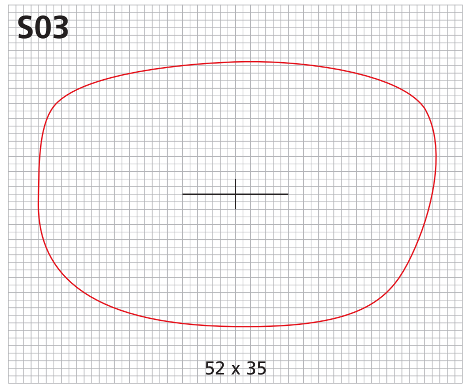
The power of modern computing, together with Norville's advanced ophthalmic lens programming has brought huge benefits to the task of lens diameter and thickness computation. This is especially so for progressive lenses where in-built prism differences between the top and bottom of the lens design make it difficult to manually calculate the finished lens substances (see pages A1 to A3).

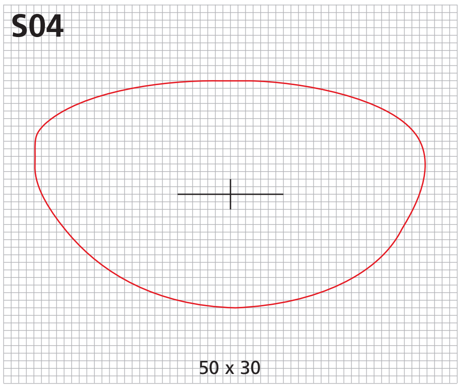


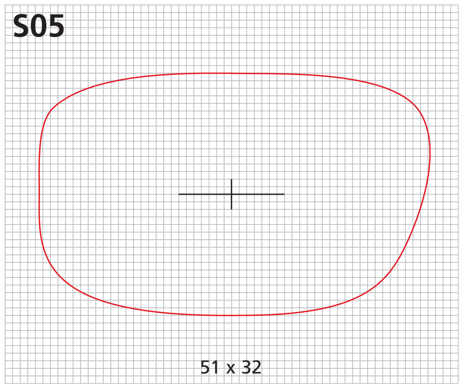
More About Lens Shapes

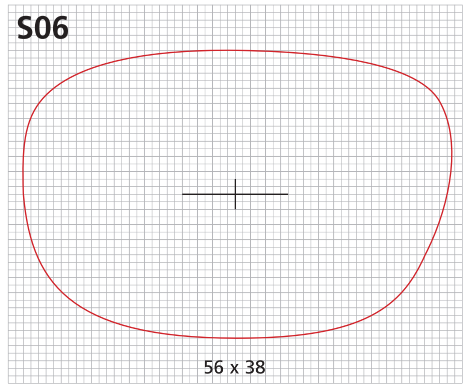


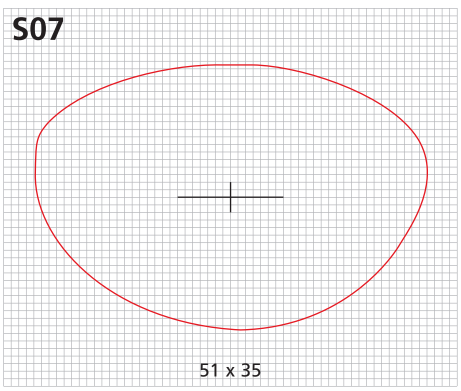


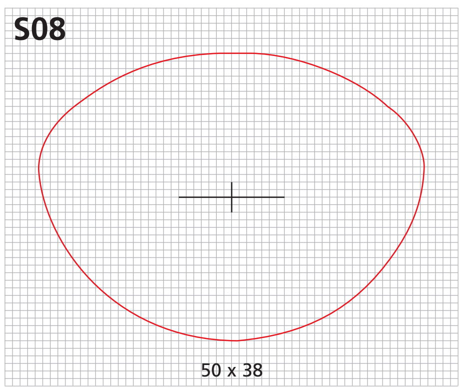


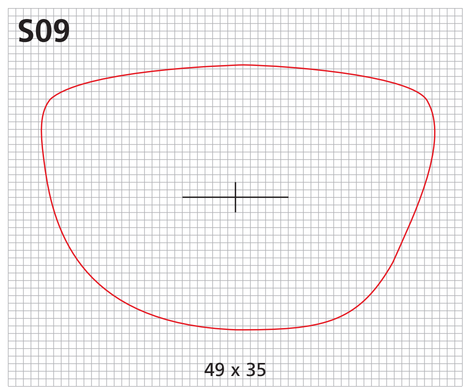


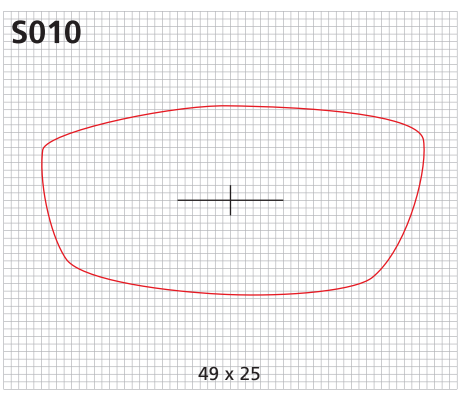


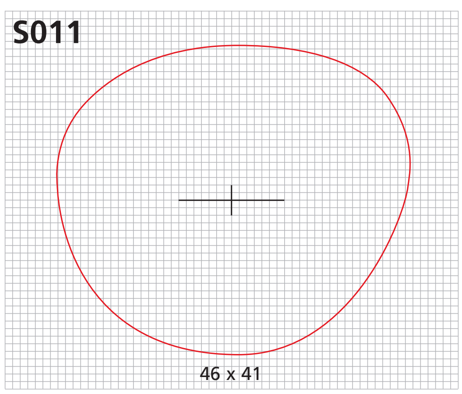


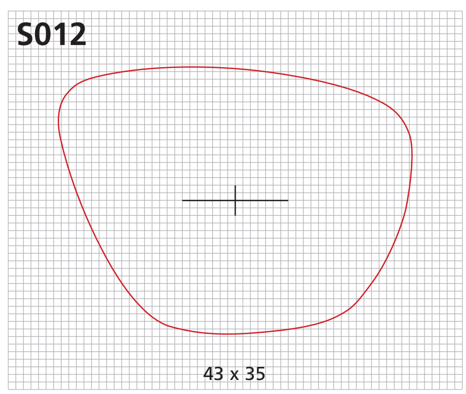












Lens ***DIAMETER*** controls thickness, which is a product of:

- *refractive index*
- *worked curves*
- *eye shape*
- *Rx and decentration*
- *type of mount (e.g. rimless etc.)*

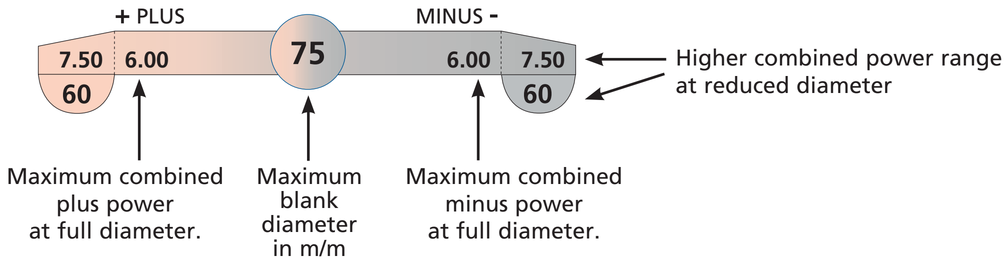
Lens Power Availability

Any sphere with any cylinder falling within total bar power stated

Our **Simplify Rx** programme is based on total power. Forget the complications of the cylinder, just transpose **plus powers into minus cylinder form**, i.e. highest plus power, and **minus powers into plus cylinder form**, i.e. highest minus power. Just compare this total power against the prescription range indicator bar. If the power falls within the bar, then we can make it!

Power Bar

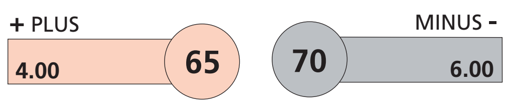
Perhaps the most important part of the "Simplify Rx" programme is our visual prescription range indicator bar. The following illustrates how this works:-



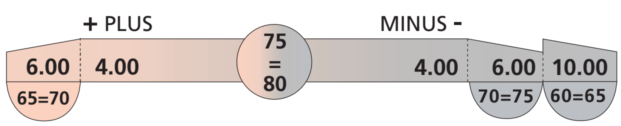
NB: Powers are in dioptres, diameters in mm.
In the Rx Catalogue pink indicates plus power, grey indicates minus.

It is important to note that when the effective diameter of your frame is less than the diameters shown, worked prism for decentration may be required. Also, it is often possible to extend beyond the quoted powers, especially on smaller eyesizes. The central diameter stated is the semi-finished lens blank diameter as supplied by the lens blank manufacturer. To avoid making a great number of stock items these are in the main of a larger diameter than generally needed. As part of our Rx house operation when surfacing lenses to your customised Rx we crib (i.e. reduce) these down to the smallest usable diameter for either a plus or a minus lens i.e. anything from 75mm to 55mm.

Where this is possible in the case of a small frame or one with no decentration we can often increase the above stated powers (please enquire).



Where there is a different diameter available between plus and minus power they will be shown as above.

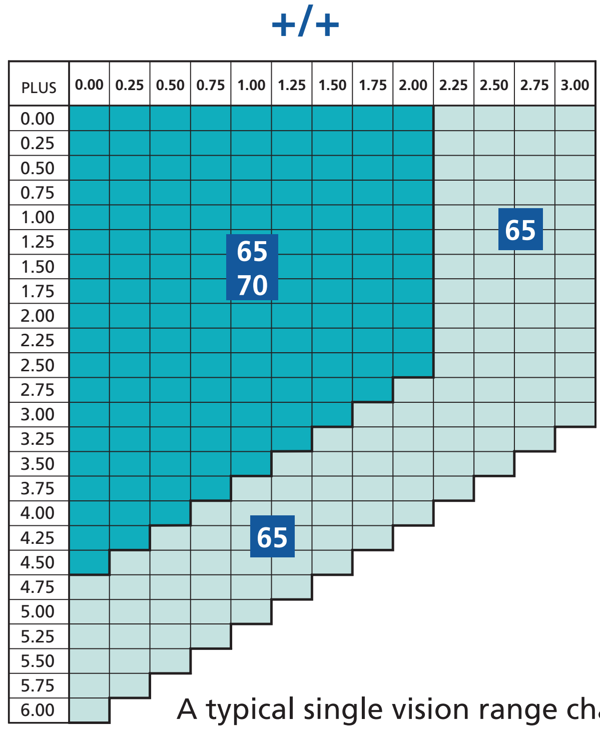


In cases where we have the flexibility of the free-form surfacing XXL programme we can effectively increase the available diameter by lateral decentration of the optical centre by the amount indicated.

Finished SV Lens Charts

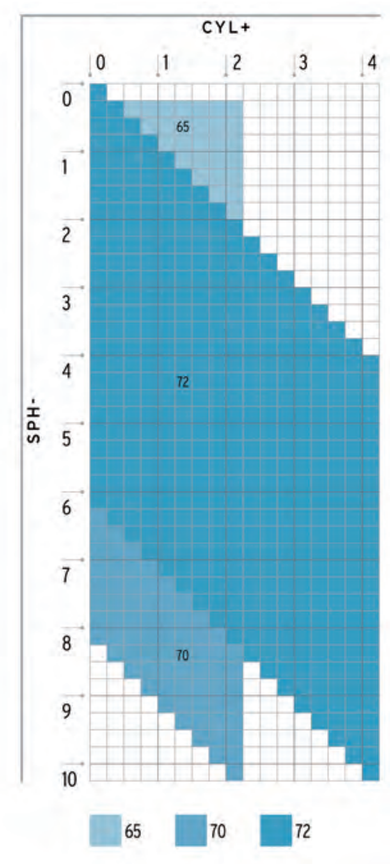
Whilst in the case of surfaced lenses the power bar is the best indicator, this is not always so for stock lenses, when the traditional lens grid (illustrated) is used. A useful reminder not just how many stock sizes need to be stocked at any one time, but how stock lens diameters reduce with increasing plus power.

Extra complications in charting can occur with a change over of cylinder notation, i.e. plus or minus cylinders. Whatever style chosen no longer indicates the form the lens has been produced in i.e. plus or minus cylinder **curvatures**, only the power notation they are recorded in. All modern lenses are manufactured in minus cylinder form.



A typical single vision range chart.

Some manufacturers' stock lens availability charts can be a challenge to explain in words!



Reference: *Toric Transposition The Worshipful Company of Spectacle Makers learning Booklet OTPL B04.*
Ophthalmic Lenses and Dispensing by Mo Jalie

Lens Materials - Ophthalmic Resins

Originally the only volume material used for lens making was naturally occurring quartz (pebble lenses) or perhaps a magnifier from precious jewels for those who might afford it. Slowly the art of batch glass making was perfected and eventually crown glass n = 1.523 became the world's common ophthalmic material. WW II saw experimentation with resin materials. Columbia Resin's 39th test batch created CR39 from which Silor Orma 1000 became Europe's first commonly available CR39 lens product.

Norlite CR39 lenses, like other CR39 lenses, are manufactured from allyldiglycol carbonate, which is a thermo-setting polyester hard resin. Lenses are made by the polymerisation of monomer and "cast" between two highly polished glass moulds held by a gasket. This process is applicable both to the lens in finished and semi-finished forms.

One of the great benefits of resin lens production methods is the economic and multiple output of even very complex lens surfaces, which if individually produced in say glass material would be cost prohibitive, a prime example being aspheric and progressive lens forms.

Chemists having perfected the material, lens designers created more sophisticated lens forms. Then back to the chemists for the application of hard coating to improve the CR39 surface durability, its one Achilles heel versus glass. Notwithstanding CR39, or its near derivatives, is the world's most popular ophthalmic lens material.

Polymer scientists then spent thousands of hours attempting to perfect a photochromic resin lens, to match its earlier highly successful glass forerunners Bestlite and Photogrey. They followed two distinct routes, surface "coated" or integral monomer mix.

Achieving a high performance resin photochromic has not been an easy task and involves numerous chemical balancing acts. Although many early attempts, with American Optical being one, were less than successful, Transitions Optical eventually succeeded.

Transitions Optical supplies to the lens manufacturers a special monomer for the production of photochromic resin lenses. The lens manufacturers then mould the lenses as they would for other products in their ranges but the resulting blanks are then returned to Transitions for a process referred to as imbibition where photochromic pigments are thermally transferred into the lens matrix from a resin filter, to a uniform depth of about 100 microns. It is this even layer in the substrata that ensures a uniform tint in both faded and darkened states. The processed lenses are then returned to the manufacturers for distribution. It is interesting to view how only the front surface of the lens darkens and not its inner surface.

That these later materials are available in a higher index comes as no surprise. Lens manufacturers with the help of chemical companies have been leapfrogging up the index ladder from polycarbonate n = 1.586 to n = 1.6 resin, then to 1.67 and now n = 1.74, and soon even higher? Why all this effort? - because **higher index delivers thinner lenses**.

Thickness reduction resulting from reduced curvature.

		Percentage	
Index	Ratio	actual %	% change
1.498	1.050	105.0	5.0
1.523	**1.000**	**100.0**	**0.0**
1.560	0.934	93.4	-6.6
1.586	0.892	89.2	-10.8
1.600	0.872	87.2	-12.8
1.604	0.866	86.6	-13.4
1.660	0.792	79.2	-20.8
1.700	0.747	74.7	-25.3
1.710	0.737	73.7	-26.3
1.740	0.707	70.7	-29.3
1.760	0.688	68.8	-31.2
1.800	0.654	65.4	-34.6
1.900	0.581	58.1	-41.9

Glass & Resin Indices

Orma 1000 is a registered trade name of Essilor.
Transitions® is a registered trade name of Transitions Optical.

Reference — *European Hard Resin Institute* — *www.hardresin.com*
Norlite Sunsensor Technical Leaflet
Corning Sunsensor — *www.corning.com*

Indices of Ophthalmic Lenses - Resin Materials

Refractive Index nd	Material	Abbe (V) Value	Specific Gravity	Approx.* UV Blocking	Tints	Min CT mm	Some lenses may not be available in these powers, figures given for comparison 60mm Round +10.00DS Centre Subs	60mm Round +10.00DS Weight	60mm Round -10.00DS Edge Subs	60mm Round -10.00DS Weight
1.498	CR39 Standard Index	58	1.3	350nm	All Colours, Polarised, Photo-polarising, Drivewear	2.0	% Difference Compared with 1.498 Resin	% Difference Compared with 1.498 Resin	% Difference Compared with 1.498 Resin	% Difference Compared with 1.498 Resin
1.497	Transitions Resin CR39	57	1.3	370nm	Grey Brown Green	2.0	=	=	=	=
1.53	Trivex Resin (Trilogy) PNX	45	1.1	400nm	Fixed Tints, Photochromic, Polarising, Drivewear, Additional Tinting Not Possible	1.4	-6%	-20%	-7%	-19%
1.56	Mid Index	38	1.17	380nm	Limited additional Tinting Possible	1.5	-11%	-19%	-13%	-19%
	BT66			406nm						
	Resin Vista-Mesh	43	1.16	395nm	Reactolite					
1.586	Polycarb Resin (Airwear)	30	1.2	380nm	Max 20% LT Photochromic, Polarised, Photo-polarising, Drivewear	1.4	-14%	-20%	-16%	-20%
	BT70 BT50			402nm						
	CBF Polyguard			400nm	White Only					
MR6	Resin Mid Index	37	1.34	395nm	Tintable - Max 20% LT Reactolite, Polarised, Transitions, Contrast Filters	1.5	-15%	-10%	-18%	-10%
1.60 MR8		42	1.30	3G Material 410nm						
	TRIBRID	41	1.22	395nm	Tintable GRBRGN Transitions Reactolite	1.3				
1.67 MR7 MR10	Resin High Index	32	1.35	395nm 3G Material 410nm	Tintable - max 20% LT Reactolite, Transitions, Polarised	1.3	-24%	-17%	-26%	-17%
1.74	Resin Very High Index	33	1.47	395nm 3G Material 410nm	Limited Tintable Options Max 20% LT Transitions	1.4	-30%	-23%	-33%	-24%
1.76	Resin Very High Index	30	1.46	400nm	Additional Tinting Not Possible	1.4				

1.451	Perspex	58		355nm

* Varies by lens thickness
Reading at 2.0mm

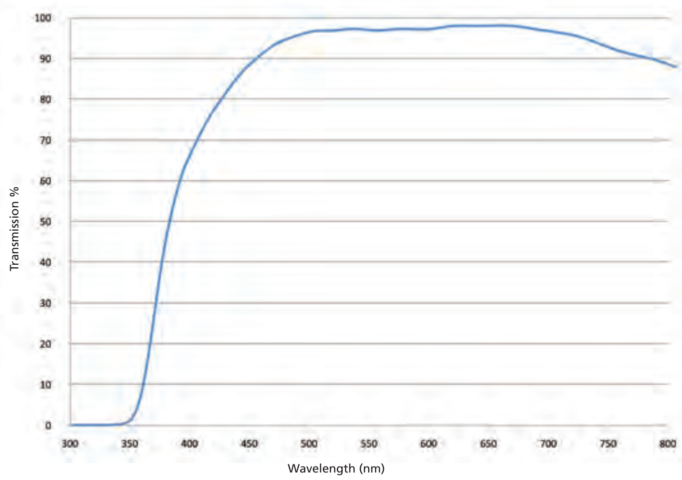
Nominally calculated Plano Convex / Plano Concave 60mm diameter, 1.0mm edge and 1.0mm centre thickness

Transmission Curves

Practitioners in all branches of ophthalmics have seemingly lost their focus on consulting transmission curves as a guide as to what absorption / transmission aspects any particular material exhibits. Such material "finger prints" enabling identification and classification for today's great variety of tinted and specialist absorber materials, within the need to meet Standards BS.EN.ISO. Such analysis is important.

Today's modern equipment makes it unbelievably quick to obtain accurate readings to identify lens characteristics of each and every lens whilst previously likely only recorded in the R&D material or coating process laboratory where flat plano lens surfaces would be the control sample of choice. More recently it was proven that even the electronic mini lens meter (Humphrey spex-scan) proved remarkably accurate for ophthalmic use. Bigger labs with coating facilities will most likely use a spectrophotometer, Perkin-Elmer being a well-known instrument. This will print a transmission/absorption plot.

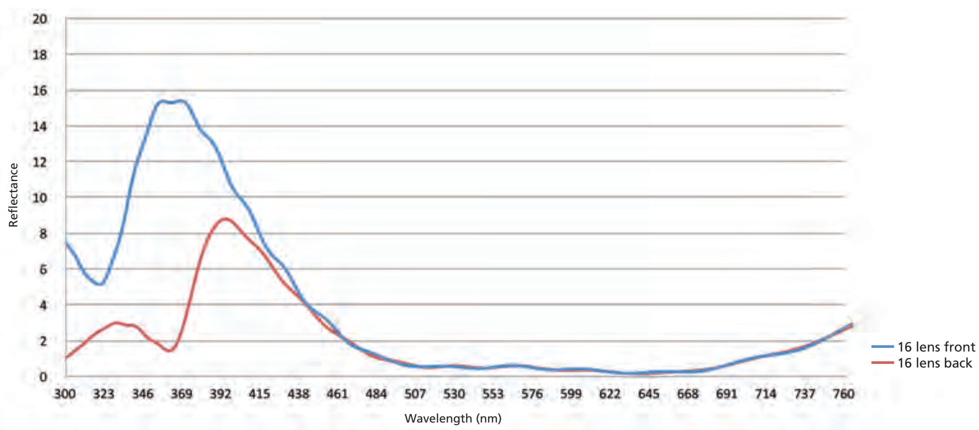
Transmission Chart



This indicates the transmission at nanometre steps across the spectrum.

Prepare to be confused as you will sometimes come across a reflection graph. These are less popular as they take more time to prepare with often a need to blacken the opposite flat surface to avoid recording errors. These are mainly used when developing coatings and modifying individual layers in a coating "stack."

Reflexion Chart



Understanding Transmissions has to be an underlying theme of this Edition 11 Companion.
Visit these following pages if your LT & ABS recall is a little rusty; understanding what a lens can and could deliver to your patients must be the key to 21st C. dispensing.

The next page is an explanation of the transmission / absorption data that is available in the Norville laboratory and is used daily for control purposes.

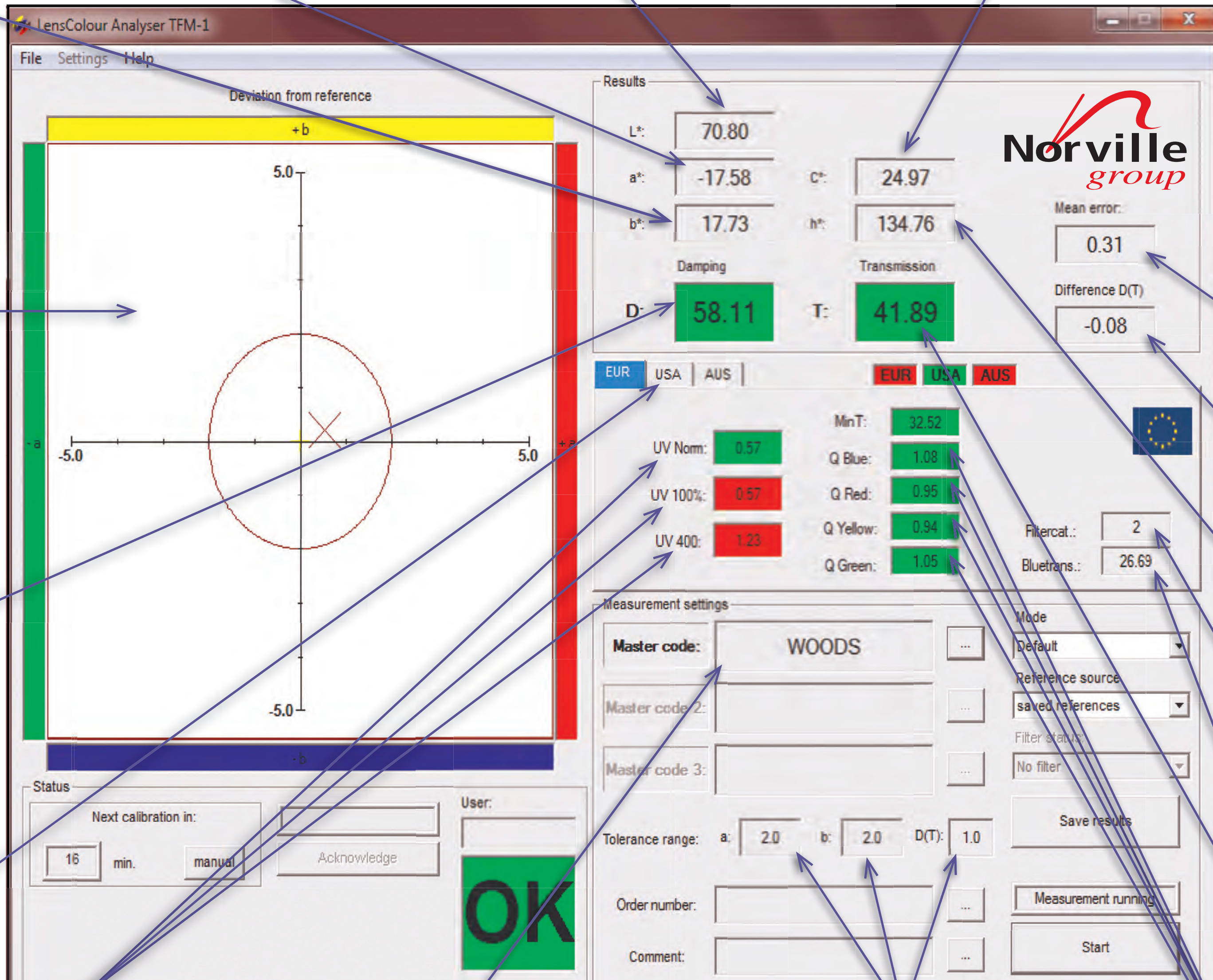
~ READ THE CHARTS ~

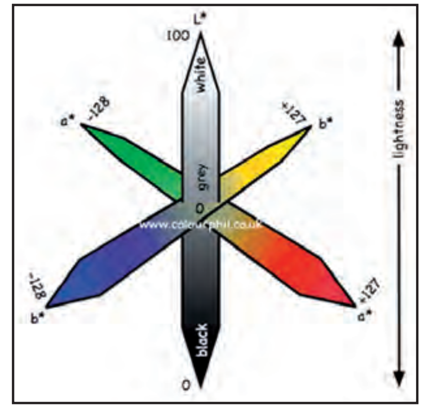
Lens colour value b*
How blue or yellow the colour is: ranges from -128 (blue) to +127 (yellow) *[see model]*.

Lens colour value a*
How green or red the colour is: ranges from -128 (green) to +127 (red) *[see model]*.

Lens lightness value L*
Lightness ranges from 0 to 100, where 0 = no lightness (black) and 100 = maximum lightness (white) *[see model]*.

Lens saturation value C*
Colour saturation ranges from 0 to 100, where 0 = neutral black/white and 100 = very high colour.





COLOUR MODEL

Graphic Display
Displays the difference between the colour values a* and b* of the measured lens (marked with an X) and the reference lens (situated at origin of graph). The tolerance range is marked by a circle.

Damping value
The proportion (%) of light which does not pass through the lens.

Regional standards
UV standards vary between regions, so selecting the appropriate region shows accepted (green) and rejected (red) standards.

UV transmission value
The proportion (%) of UV light which passes through the lens.

Master code
The tint code of the reference lens. This is the colour which you are trying to achieve.

Tolerance range
Maximum variation allowed between the measured lens and the reference lens in terms of colour values (a*, b*) and difference value, D(T). If the variation is above this range then the green 'OK' box will turn red.

Mean error value
The correlation between the measured lens and the reference lens. A larger value means there is a bigger variation between the lenses.

Difference value
Difference in damping value between measured lens and the reference lens.

Lens hue value h*
Ranges from 0° (red) through 90° (yellow), 180° (green), 270° (blue) and back to 0°.

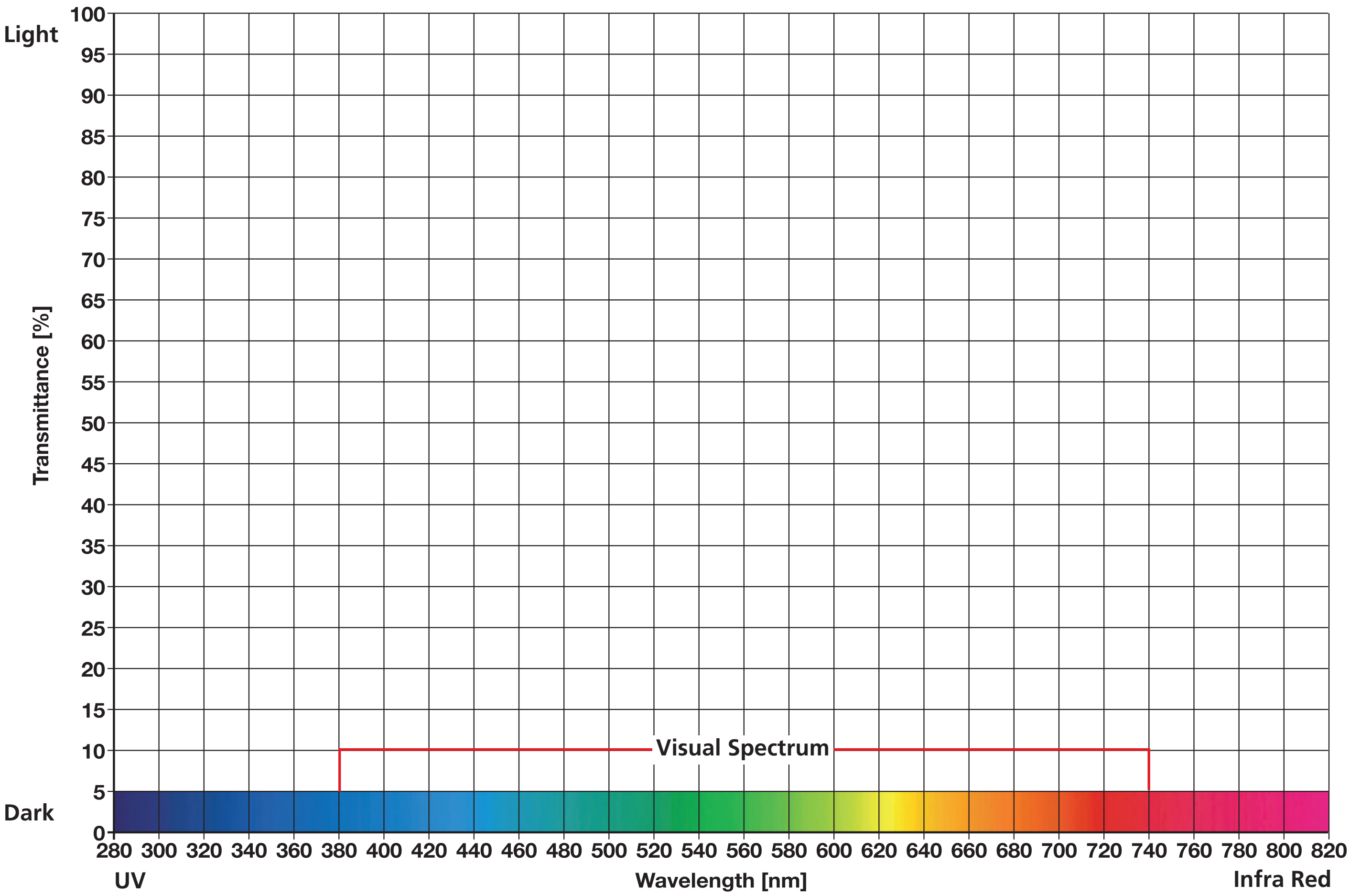
Filter category
=0 for 80% to 100% LT, =1 for 43% to 80% LT, =2 for 18% to 43% LT, =3 for 8% to 18% LT, =4 for 3% to 8% LT.

Blue transmittance
The proportion (%) of blue light which passes from one side of the lens through to the other side. 380nm - 500nm

Light transmission value
The proportion (%) of light which passes from one side of the lens through to the other side.

Q Values
Traffic signal colour identification: shows accepted (green) and rejected (red) standards for driving.

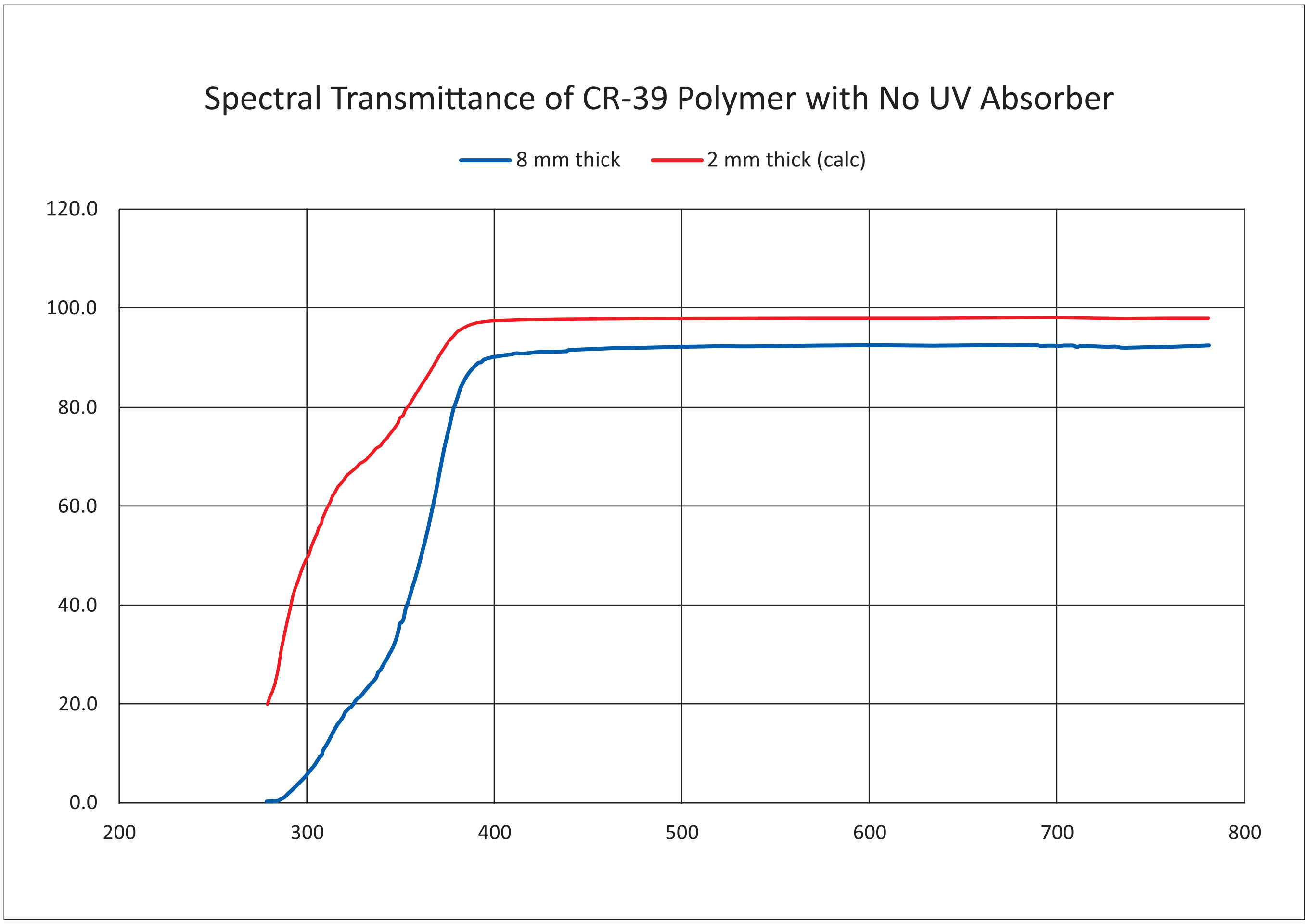
Typical Spectrophotometer Transmission Grid



Typical Transmission % per wavelengths (nanometres)

nm	%	nm	%	nm	%	nm	%
386	0.457397	411	9.28464	436	70.9035	461	83.1304
387	0.469094	412	11.9165	437	71.8035	462	83.3795
388	0.483998	413	14.9256	438	72.6379	463	83.667
389	0.504206	414	18.3002	439	73.4101	464	83.9021
390	0.525125	415	21.9554	440	74.1141	465	84.1039
391	0.545867	416	25.7924	441	74.7619	466	84.3295
392	0.566149	417	29.6717	442	75.3806	467	84.5716
393	0.586327	418	33.4982	443	75.9762	468	84.753
394	0.6077	419	37.177	444	76.5393	469	84.8671
395	0.633539	420	40.6477	445	77.0709	470	84.9554
396	0.664441	421	43.8747	446	77.5897	471	85.0464
397	0.707909	422	46.8636	447	78.097	472	85.1728
398	0.766239	423	49.6254	448	78.5971	473	85.313
399	0.80847	424	52.2	449	79.0757	474	85.4614
400	0.839074	425	54.5529	450	79.5091	475	85.6311
401	0.886921	426	56.7146	451	79.9068	476	85.8081
402	0.974447	427	58.7049	452	80.2688	477	85.9163
403	1.10333	428	60.553	453	80.6478	478	86.0314
404	1.3012	429	62.2347	454	81.0434	479	86.1817
405	1.62566	430	63.7993	455	81.3892	480	86.2969
406	2.12909	431	65.2548	456	81.678	481	86.4255
407	2.86756	432	66.6035	457	81.9895	482	86.604
408	3.8924	433	67.8355	458	82.3349	483	86.7558
409	5.25362	434	68.9391	459	82.6449	484	86.8752
410	7.04665	435	69.9509	460	82.9192	485	86.8769

Centre Thickness
2.0/8.0mm



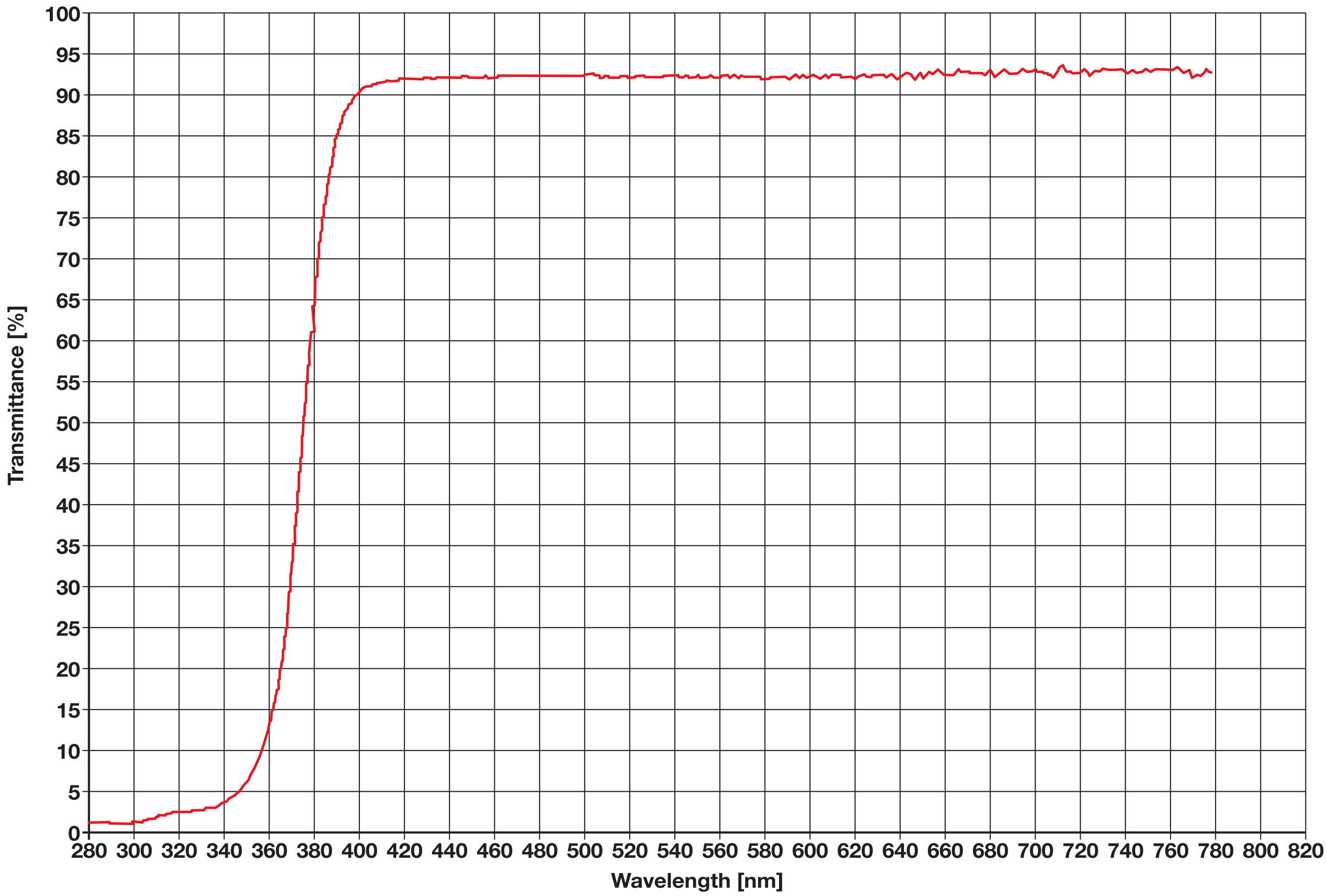
P.P.G. the inventors and suppliers of CR39 monomer leave it to lens casters to add any UV absorber at casting stages. This is an expensive addition and one that alters the residual lens colour (hue) and transmission.

This data has been provided directly by P.P.G. and should be taken as a definitive control lens example.

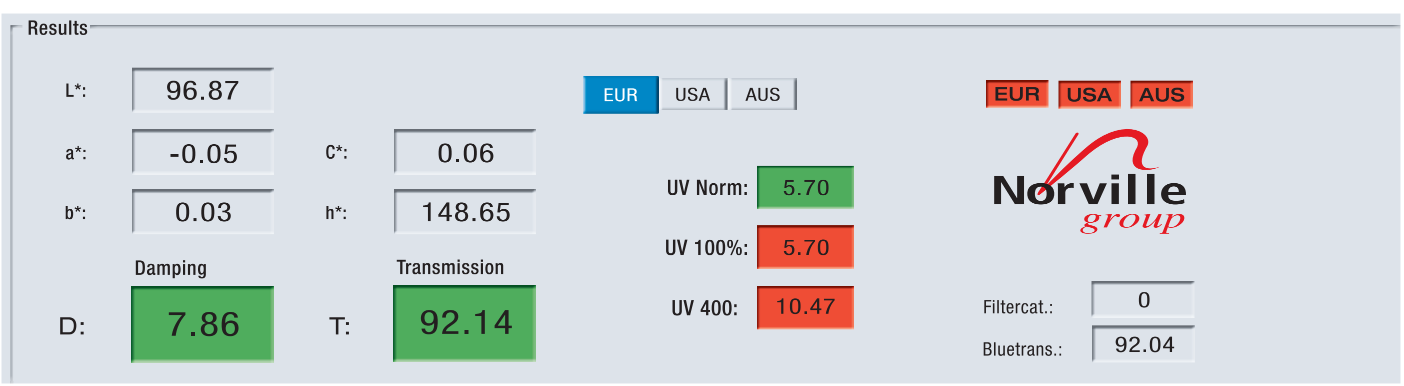
Changes of lens substance will always change transmission/absorption characteristics.

Control samples are 2.00mm ±0.2ths unless otherwise stated.

Lens Name	Code:	Centre Thickness
Regular CR39 UNC	**PSS**	**1.8mm**

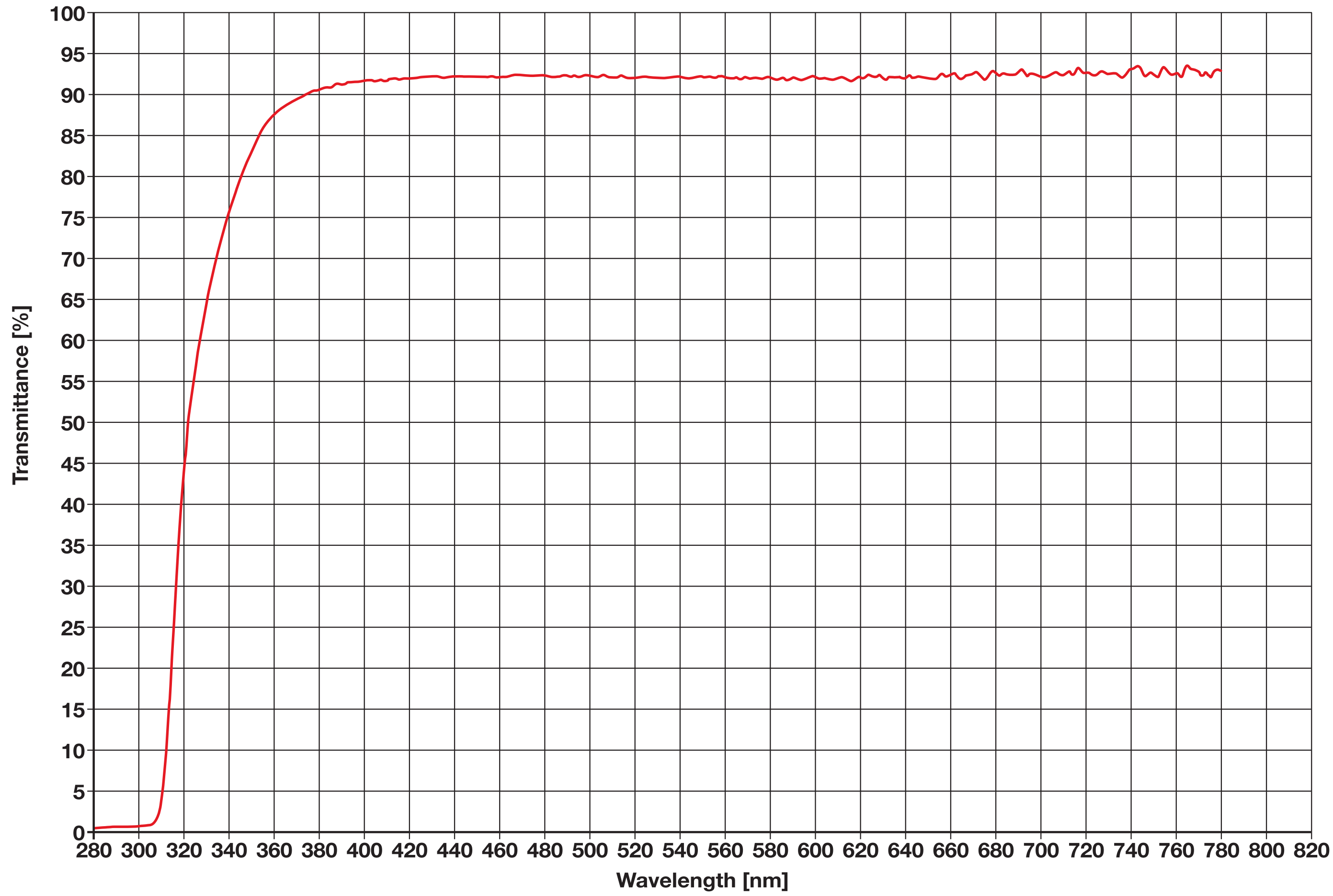


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
316nm	326nm	329nm	92%

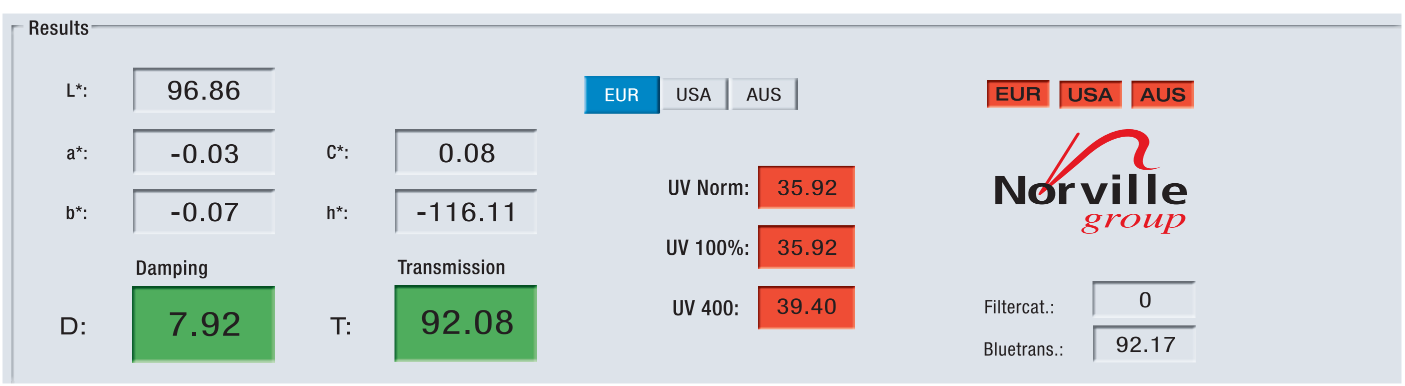


Transmission Curves - White “CR39 FE” n=1.50

Lens Name	Code:	Centre Thickness
FE CR39 UNC	**PSS**	**1.6mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
306nm	309nm	311nm	92%



The closer the study of ophthalmic lens material the more there is the realisation that polycarbonate is a really clever material, a product of continuing ingenuity with materials chemistry. Considered to be the most impact resistant of any lens material: you can drive a nail right through a polycarbonate lens (Fig A) and it doesn't break. Although glass is a far more rigid material, please do not attempt a nail test!

Invented by General Electric USA for Plexiglass protective shields, Gentex later firstly made ophthalmic lenses.

Polycarbonate is a thermoplastic often referred to as a "plastic metal" due to its strength-to-weight ratio, which is equal to that of aluminium and is twice that of zinc.

Lenses are made through the injection of granules into stainless steel moulds where under great pressure, they form a transparent lens. A further hard coating treatment ensures this inherently soft material will now equal a CR39 lens for surface durability when surfaced from hard coated semi-finished. It is essential a hard coat is applied to the inner surface.

Whilst earlier production of polycarbonate lenses did have considerable limitations in matching the optical qualities of other established lens materials, today's are much improved. The first production of polycarbonate lenses was at 3.0mm centre substance (minus powers) designed for industrial safety use. It is the only lens capable of satisfying BS EN 166 Grade F, the ultimate "would stop a bullet" lens (Fig B). Improvements to production techniques saw 2.0mm production series and today 1.5mm centre substance for minus powers. Polycarbonate has completed the transition from an industrial lens product into the field of general ophthalmic lenses, with its index at a high n=1.586 and being so light and strong, some consider it can be regarded as a replacement to CR39. Polycarbonate does require modified edging techniques, where exposed edges can look rather mangy unless edge-polished.

But life is ever a balance of strengths and weaknesses. Polycarbonate is very strong, lightweight and thin but it has one disadvantage and that is it dislikes intensely, to the extent of succumbing to attacks from liquids in the hydrocarbons and ketones family. These include petrol, benzene, toluene, xylene and particularly acetone, many of which won't be found in an optical practice, but acetone might well be (as a constituent of nail varnish remover!). Although technically the lenses, when hardcoated, will resist this, if they are swamped with the chemical and it runs across the surface and enters the material via the exposed v-edge or any drill holes if a rimless, i.e. those areas not hardcoated, the lens will be damaged. However, it is mainly those persons working in an industrial plant that are likely to be affected by these chemicals. The majority of your dresswear patients should be unaffected.

Available in TRANSITIONS® photochromic forms, especially suitable with its higher UV absorption (380nm). A particularly exciting development is NuPolar polarised, making the safest glare-free outdoor lens in the world.

Fig. A

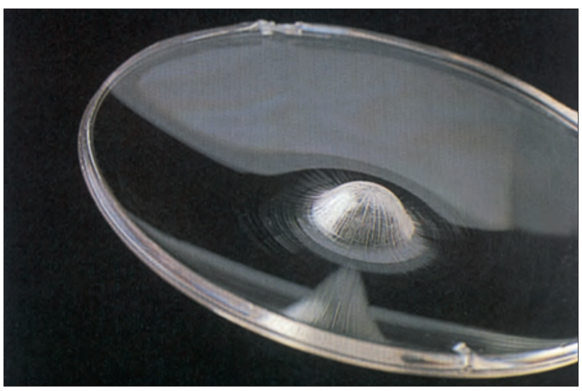
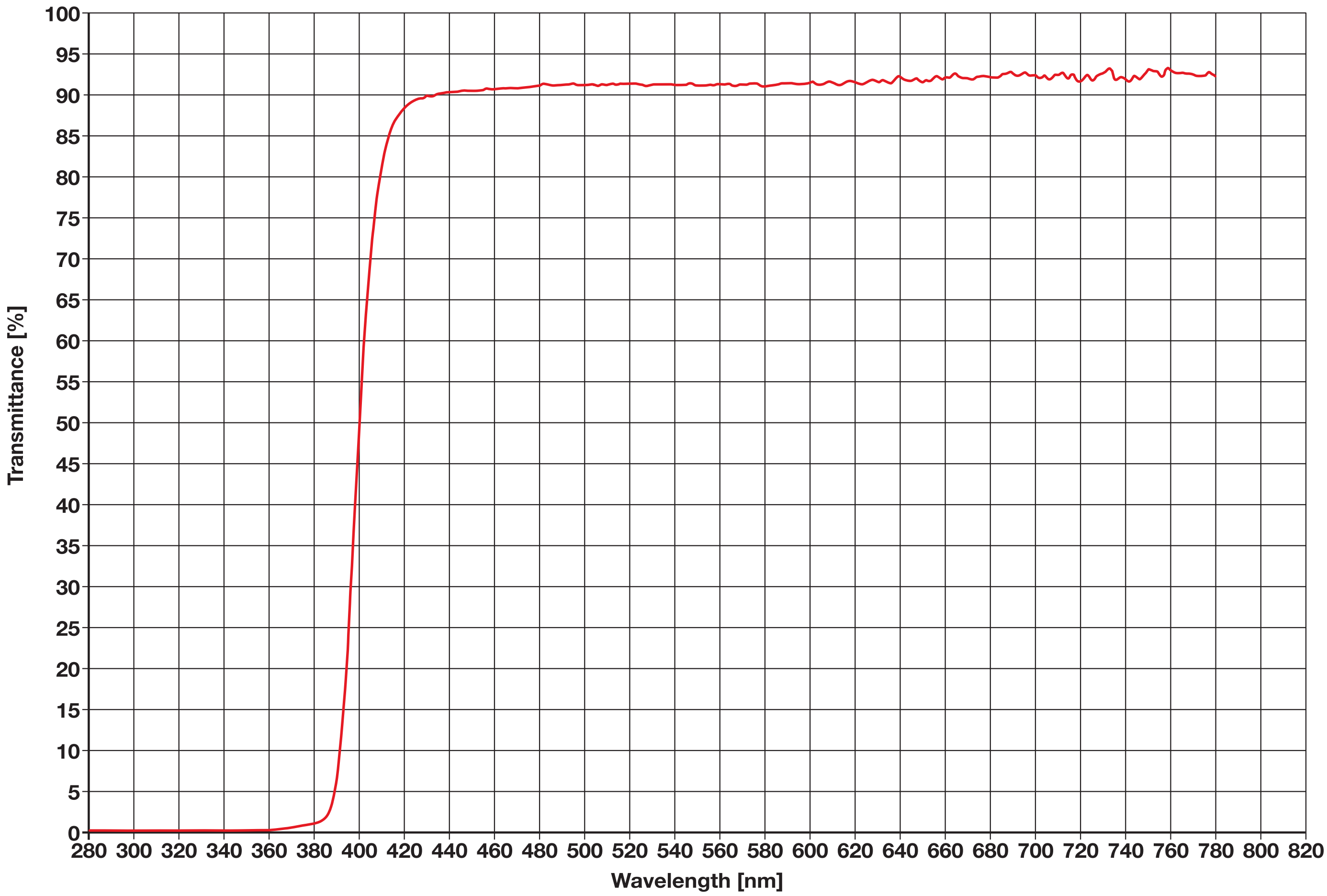
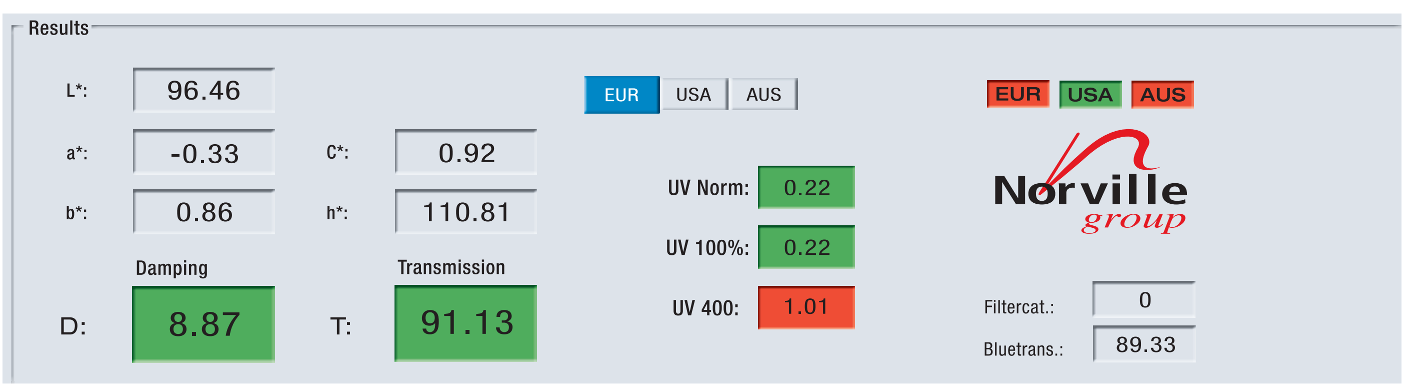


Fig. B
"Bullseye Lens"
Impact made by an 8mm steel ball travelling at over 90mph.

Lens Name	Code:	Centre Thickness
POLYCARBONATE HC	**CARP**	**2.2mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
378nm	387nm	389nm	91%



Trivex - The Second Strongest Ophthalmic Lens Material

Compared to CR39, Trivex has exceptional impact resistance properties, whilst having the lowest specific gravity of any lens (1.11), and also bettering polycarbonate with a 45 V value. It exceeds polycarbonate in its resistance to chemicals and perhaps for this reason alone it is the best lens for glazing rimless frames.

Trivex lenses are the first ultra-lightweight optical material to combine the best attributes of thermoplastics (polycarbonate) and thermosets (CR39). The result is a product that provides high impact resistance while retaining superior optical performance. Output of a highly complex manufacturing process resulting in the unlikely outcome that Trivex can ever be a cheap lens material.

Clear Vision

Especially for reading, computer work and driving vision acuity is important. Trivex lens material provides the optical quality that optimises corrective prescriptions and helps to reduce eye strain.

	Trivex	Std. Plastic (CR-39™)	Polycarbonate	High & Ultra-High Index
Optical Quality Abbe Value	43-45	58	29-32	32-41

Abbe Value: The higher the Abbe Value, the more accurately a lens aligns the spectrum of light waves that pass through it. Lens materials with lower Abbe Values are unable to focus these light waves accurately, resulting in vision defects that appear as distracting fringes of colour around dark type and objects—what is known as "chromatic aberration".

Lightweight Comfort

Lenses made with Trivex are ultra-light for ultimate comfort; Trivex is one of the lightest lens materials on the planet. Unlike other lens materials, Trivex blends the benefits of light weight and thinness, often resembling a high index lens, but weighing even less than polycarbonate. Trivex lenses can be processed to much thinner centre and edge thickness.

	Trivex	Std. Plastic (CR-39™)	Polycarbonate	High & Ultra-High Index
Thinness Typical Centre Thickness	1.2-1.5mm	1.8-2.0mm	1.2-1.5mm	1.5mm

Specific Gravity: The lower the number, the lighter and more comfortable the lens will be. This number represents the relative density of an object to an equal volume of water. Anything with a specific gravity of less than 1.0 will float on water. Although a high-index lens appears to be thin and light, it actually has a higher specific gravity because it is made from a more dense material. On the other hand, a lens made from Trivex material is so light that it almost floats.

	Trivex	Std. Plastic (CR-39™)	Polycarbonate	High & Ultra-High Index
Lightweight Specific Gravity	1.11g/cm^3	1.32g/cm^3	1.22g/cm^3	1.30-1.47g/cm^3

PPG TRIVEX is also known as TRILOGY (Youngers Opt) & PNX (Hoya)

Trivex & Tribrid

Strength and Protection

For the demands of everyday living, eyeglass lenses need to provide protection from unexpected impact, breakage and from the sun's harmful UV radiation.

	Trivex	Std. Plastic (CR-39™)	Polycarbonate	High & Ultra-High Index
Strength/ Durability ANSI Z-87.1 High-Velocity Impact Test	PASS	FAIL	FAIL	FAIL

The high tensile strength and durability of Trivex - plus its stress-free characteristics - make it an excellent choice for drill-mount frames and any lightweight fashion frames that **rely on lenses for structural rigidity**. Trivex blocks 100% of harmful UV rays.

ANSI Z87.1 High-Velocity Test: The American National Standards Institute (ANSI) has established the most stringent impact and projectile penetration standards for optical lenses. The standard specifies that high-impact lenses must pass "high-velocity" testing where 1/4 inch steel pellets are "shot" at the lens at a velocity of 150 feet-per-second. Lenses made from Trivex material pass the ANSI Z87.1 High-velocity Impact Test and the FDA Drop Ball Test.

Never before has a lens material been designed and optimised specifically for rimless frames

Stress in other materials

Stress in Trivex lenses

Stress which can be a factor in star fracturing around screw holes is non-existent in Trivex lenses, which can only be a positive attribute when glazing into rimless mounts. Added to its resistance to chemical attack and Trivex is likely to become the lens of choice for industrial safety, particularly within the petro-chemical industries.

Availability

Trivex is possible in most lens forms within a good sample of powers, Transitions and Drivewear. However, it is not a material that takes kindly to tinting and availability is restricted to "fixed" tint semi-finished products which limits options.

Tribrid

A revolutionary lens technology that combines the best lens properties to provide wearers with enhanced all-round performance for higher prescriptions. Described as the n=1.6 index equivalent of Trivex, Tribrid shares Trivex attributes for high optical clarity, strength and lightness. Tribrid™ lenses are produced using a unique hybrid material technology that is the combination of Trivex® lens material and traditional high index technology.

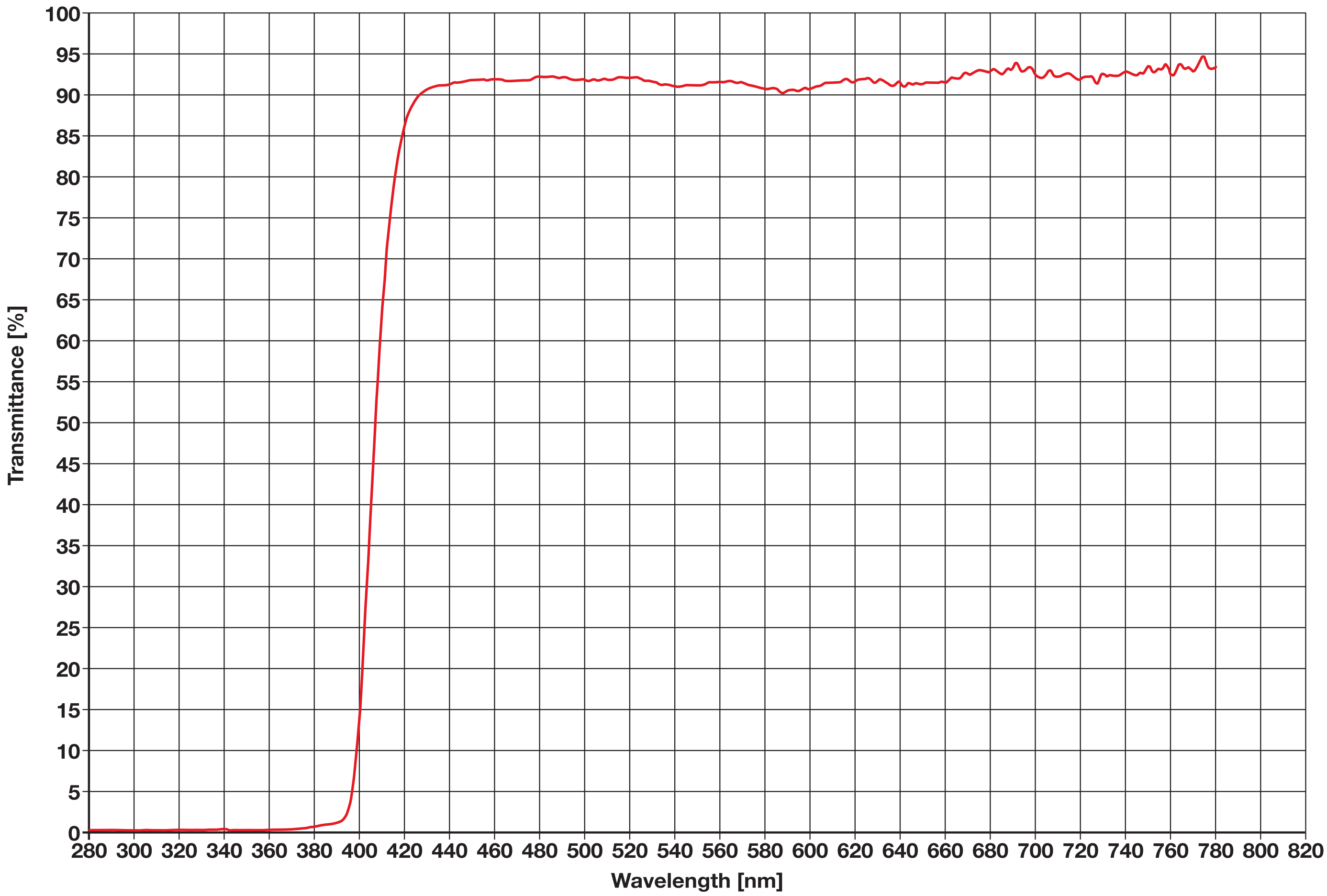
Availability

Available in Clear, Transitions and tintable to 15%.

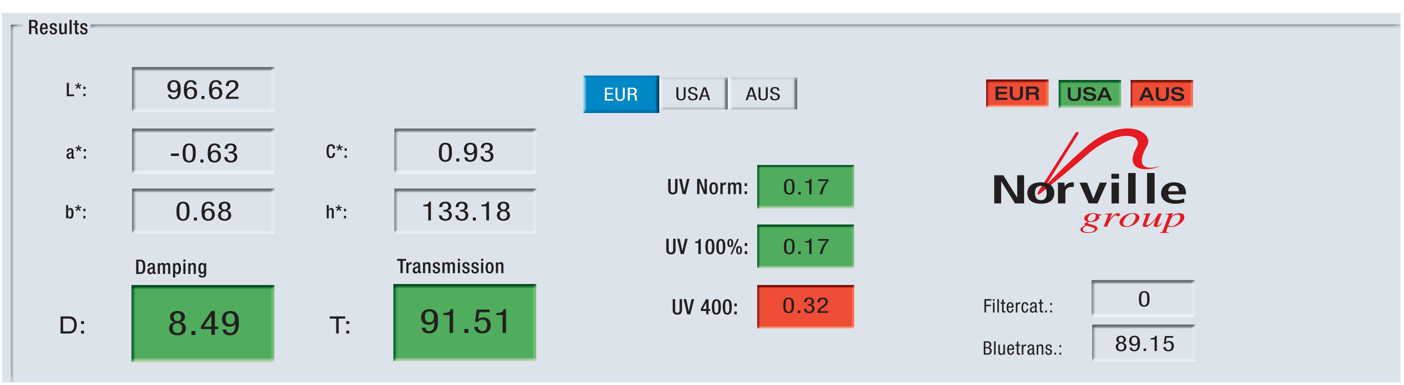
www.ppgtrivex.com

Transmission Curves - White Trivex HC n=1.53

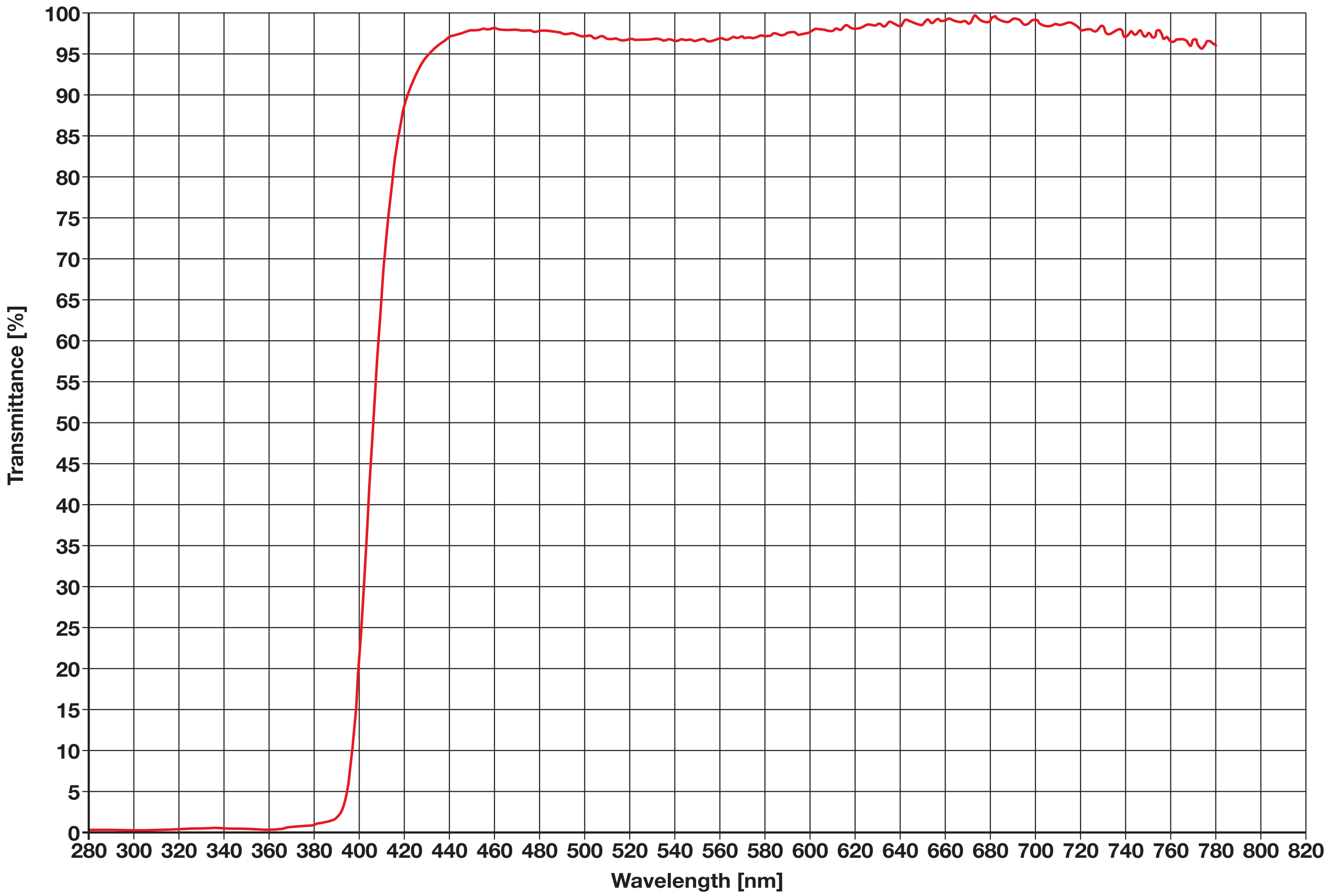
Lens Name	Code:	Centre Thickness
TRIVEX HC	**TRSS**	**2.2mm**



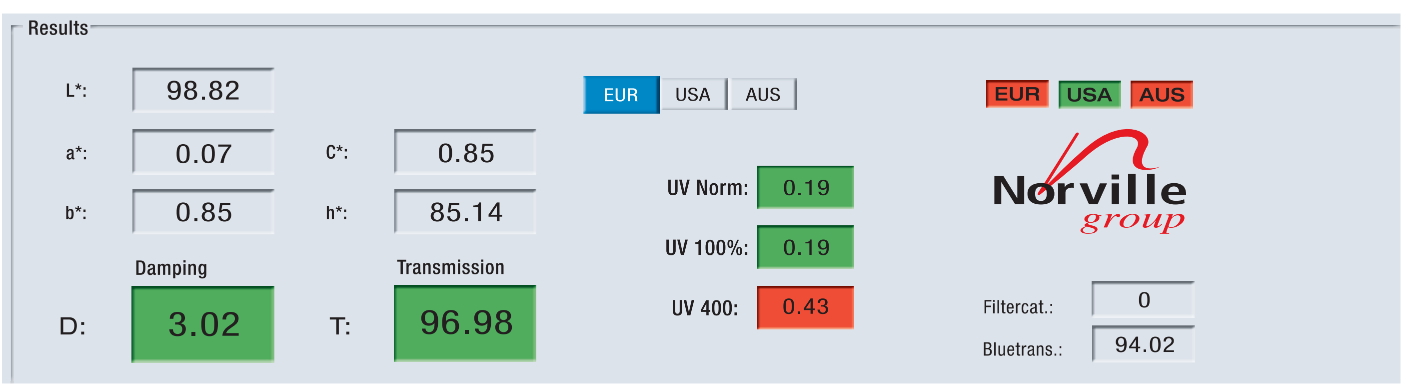
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
385nm	395nm	397nm	91%



Lens Name	Code:	Centre Thickness
TRIBRID HMAR	**STRS**	**2.0mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
385nm	393nm	395nm	97%



Mid - High & Very High Index Resins

The jump from CR39 and Polycarbonate to a new series of ophthalmic lens materials was made possible by Mitsui Chemicals of Japan. Their research was driven, perhaps ironically, from the move from glass to CR39 in a country of predominately negative lens powers. That change resulted in thicker lenses, CR39 being the lowest index and a material which needs to be processed to a thicker centre substance in minus Rxs than glass.

In 1982 the target was set for a higher index material 1.6 with a minimum abbe number of 35. This was no easy task that had every set back imaginable over the five years it took to achieve. The world's first urethane based material very, very different than anything that had gone before and challenging to lens producers.

Mitsui Chemicals Inc. contributes to the development of "epoch making" lens materials

MCI is globally known as a leading manufacturer of urethane products and in 1987 became the first company in the world to apply thiourethane chemical technology to ophthalmic lenses. MCI's global R&D network with a broad range of technology contributed to excellence in designing the most advanced molecules for ophthalmic lens materials.

Sodegaura R&D Centre, Chiba, Japan

MR™ Series History

- Pioneer in high index lens material development -

Early 1980s	Started development of high index lens materials
1987	Commercial release of **MR-6™**, the world's first thiourethane high index ophthalmic lens material (n=1.60)
1991	Commercial release of **MR-7™**, the world's first refractive index 1.67 ophthalmic lens material
1998	Commercial release of **MR-10™**, (n=1.67)
1999	Commercial release of **MR-8™**, (n=1.60)
2000	Commercial release of **MR-174™**, (n=1.74)
2015	Commercial release of **MR-8/400™**, (n=1.60)

MR-6™ & MR-8™ n= 1.60

The original n=1.60 material re-engineered with higher UV absorption. (2016)

The best balanced high index lens material with the largest share of the 1.60 lens material market.

MR-7™ & MR-10™ n= 1.67

Global standard 1.67 index lens material.
Excellent material for thinner lenses with stronger impact resistance.

Material Characteristics	
MR-7™	: Better colour tintability
MR-10™	: Higher heat distortion temperature

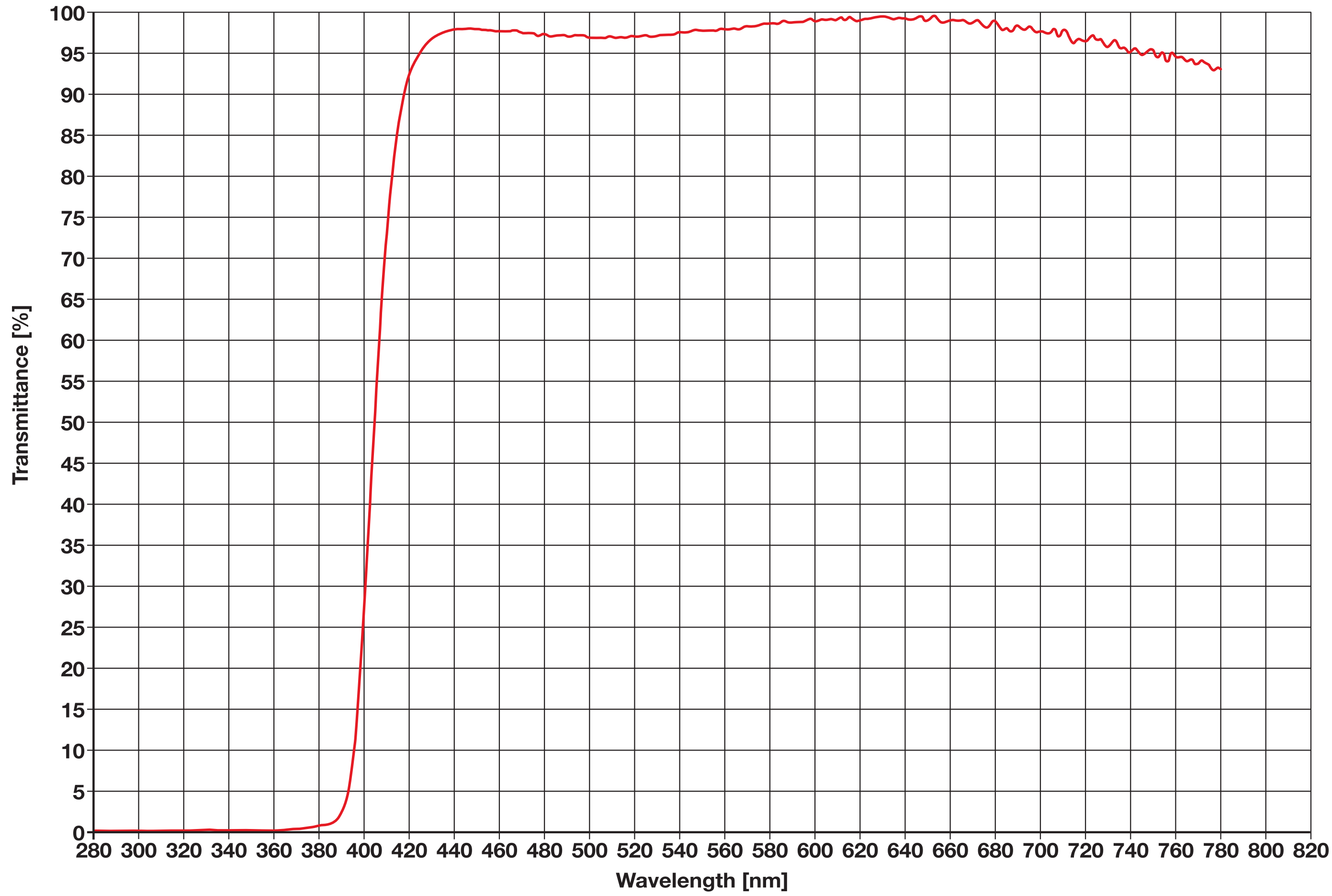
MR-174™ n= 1.74

Ultra high index lens material for ultra-thin lenses.
Strong prescription lens wearers are now free from thick and heavy lenses

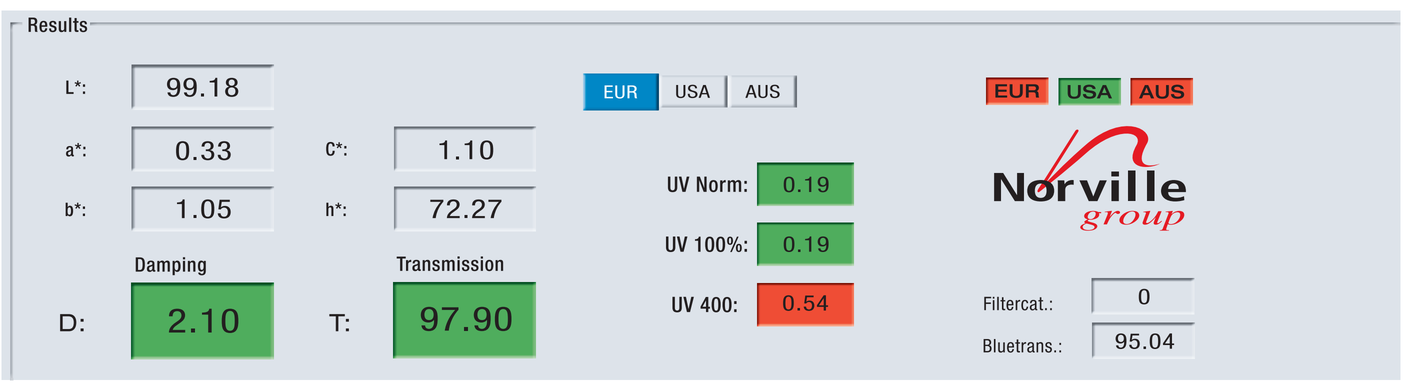
Data reproduced by kind permission M.C.I.

Transmission Curves - White n=1.60 HMAR *(MR8)*

Lens Name	Code:	Centre Thickness
WHITE HMAR	**LC16**	**1.4mm**

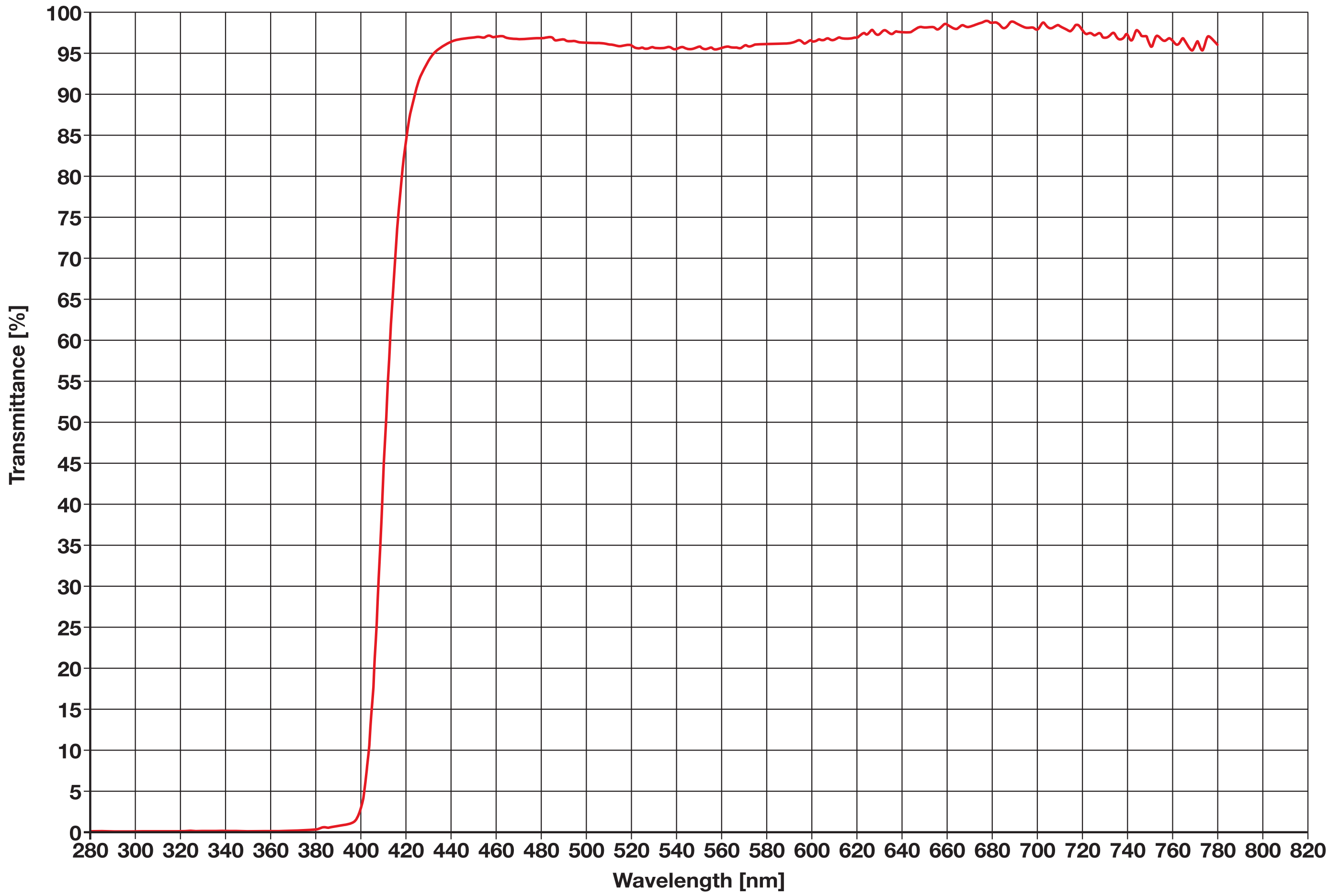


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
383nm	391nm	393nm	98%

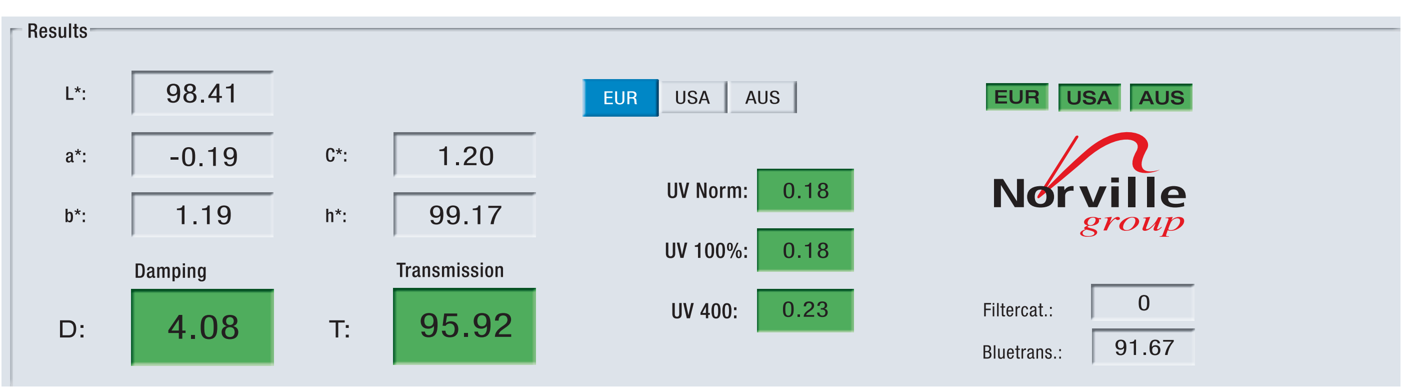


Transmission Curves - White n=1.60 HMAR (NEW 2016 MR8)

Lens Name	Code:	Centre Thickness
WHITE HMAR	**LC16**	**2.3mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
392nm	400nm	401nm	96%

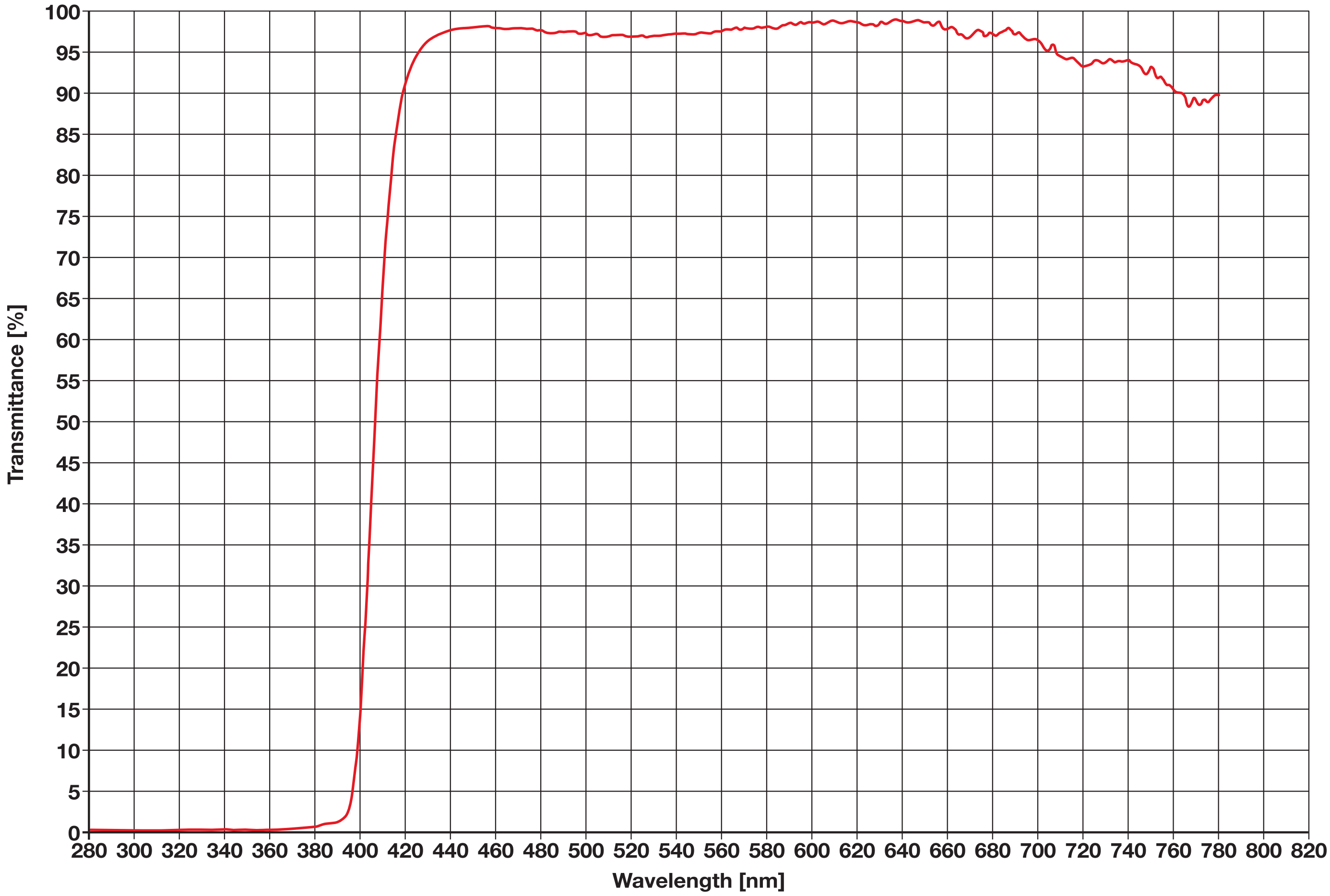


Transmission Curves - White n=1.67 HMAR (MR7 - MR10)

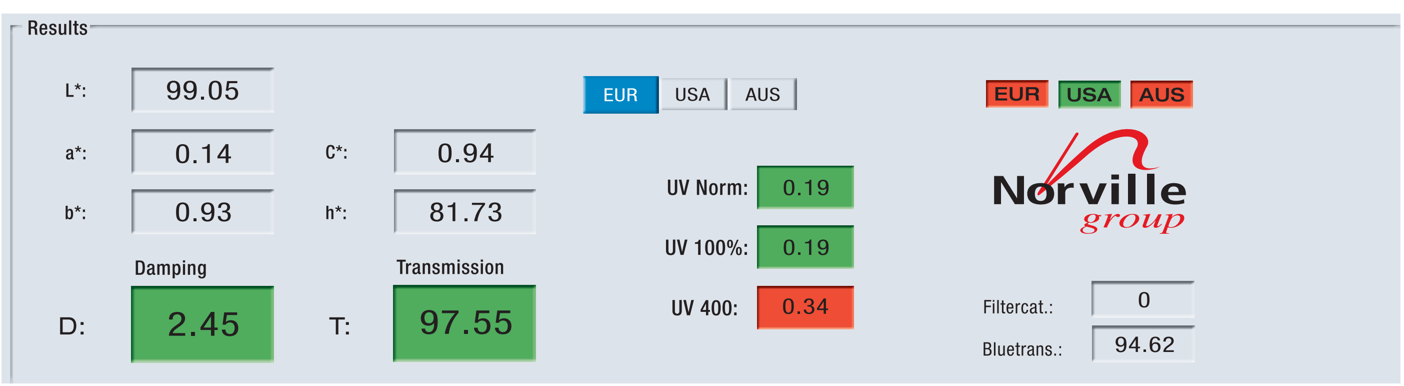
Lens Name
WHITE HMAR

Code:
NHIL

Centre Thickness
1.3mm

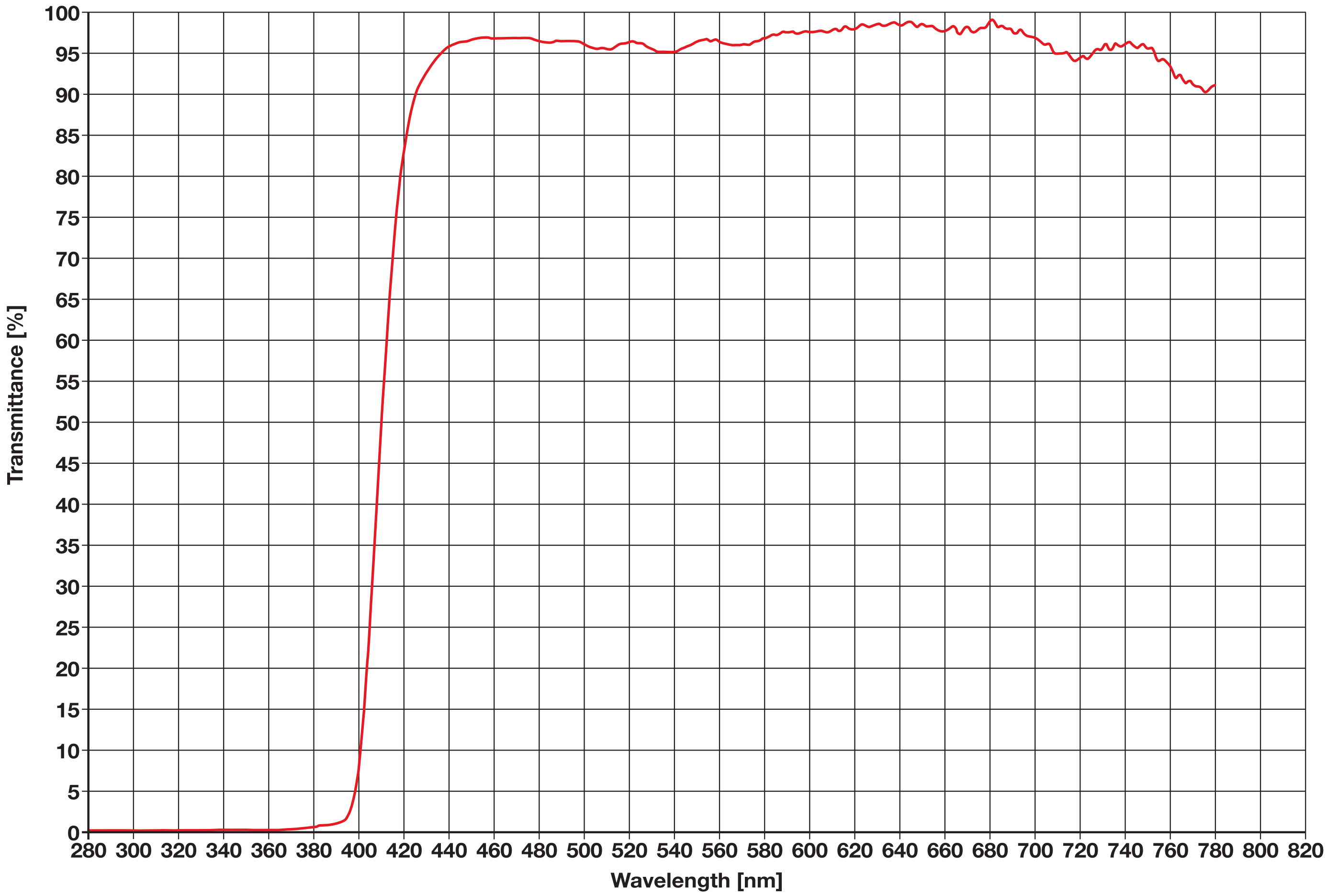


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
386nm	395nm	397nm	98%

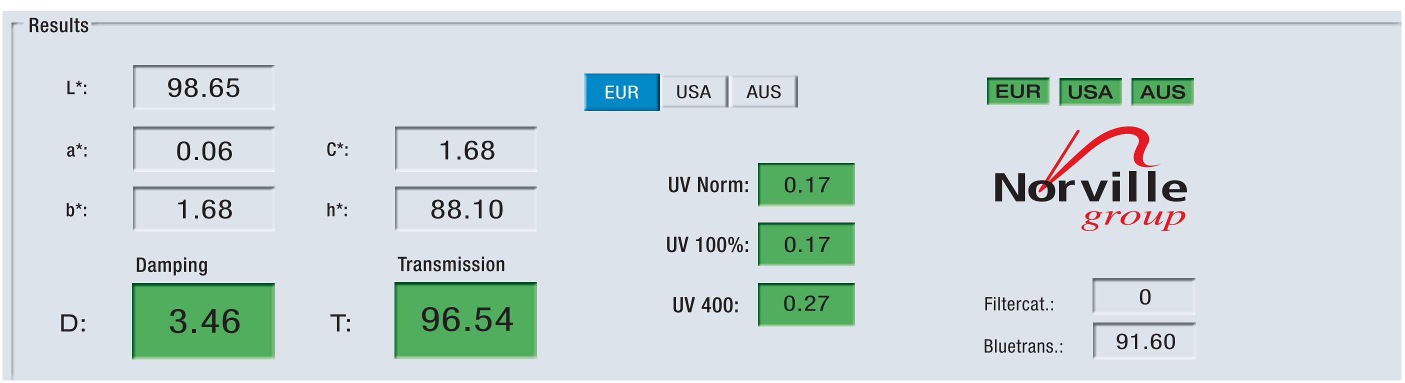


Transmission Curves - White n=1.74 HMAR (MR174)

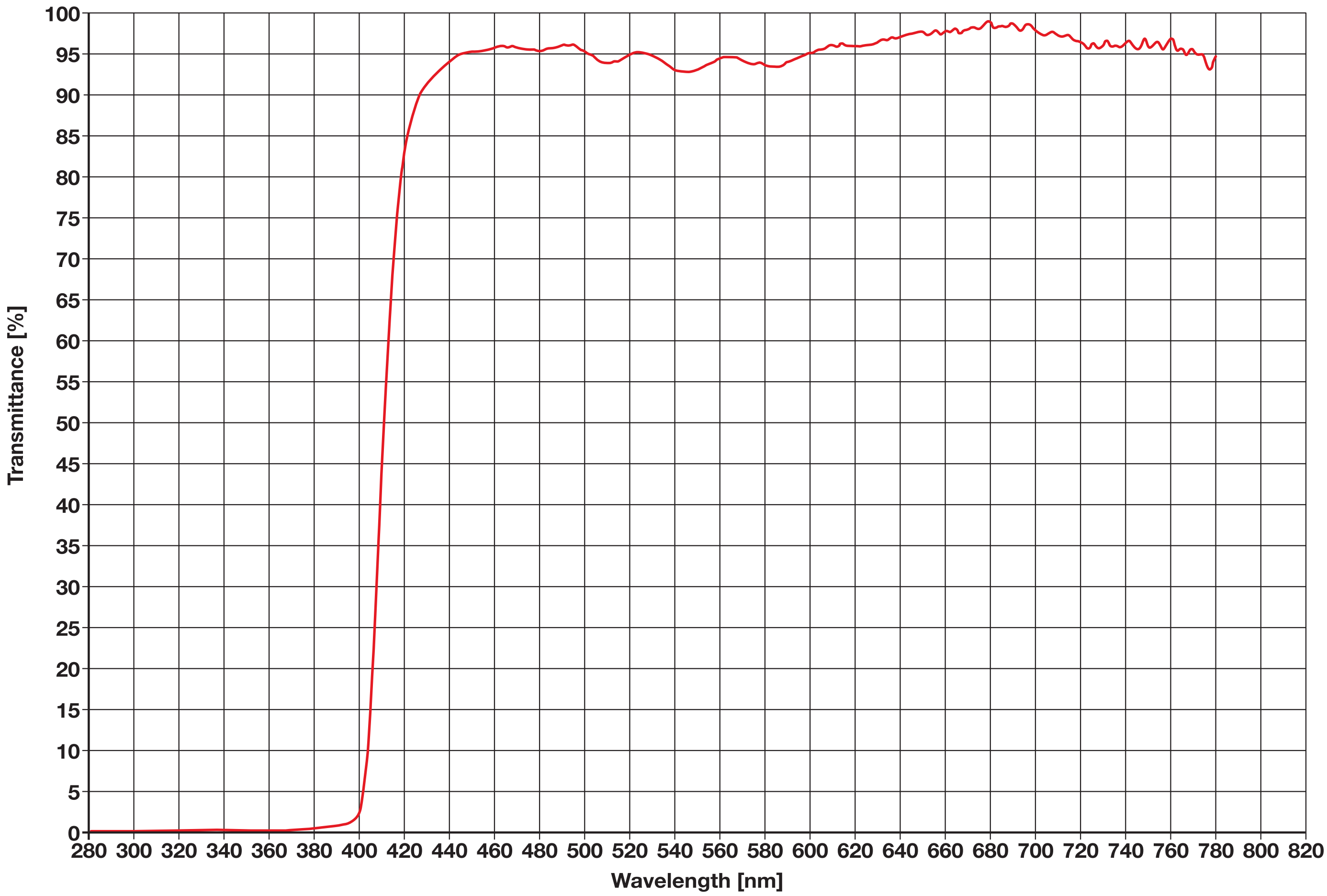
Lens Name	Code:	Centre Thickness
WHITE HMAR	**N74**	**1.2mm**



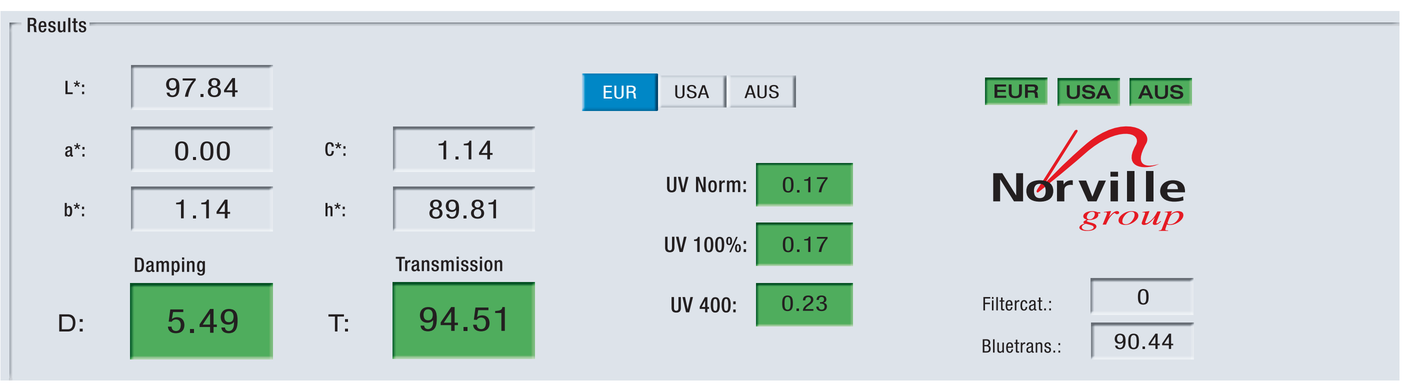
Wavelength, nm at which the spectral transmittance, $\tau(\lambda)$, is			Luminous transmittance
1%	3%	5%	τv
390nm	397nm	399nm	97%



Lens Name	Code:	Centre Thickness
WHITE HMAR	**NS76**	**2.2mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
392nm	400nm	402nm	95%



Ophthalmic lens materials that change colour - adaptive lenses.

The first commercially available photochromic lens material was Bestlite glass from Corning, USA in 1964 available as "rough" mouldings (requiring two-side working) or semi-finished single vision from suppliers such as Webster Lens, USA. Corning followed this with an improved version photo-grey, photo-brown and later darker photo-sun. These are still available today.

Meanwhile Chance Pilkington worked on their own version, Reactolite, but in order to circumvent Corning's patent they used a variant of borosilicate glass that was prone to straining but did change colour more quickly.

Following on the rapid growth of CR39 resin in the U.S.A. there was a race to put photochromic properties into plastics, indeed for many years the only reason glass sales held up was due to photochromic glass demand. American Optical came close to achieving a CR39 photochromic resin lens breakthrough, Photolite, but its light changing properties seemed prone to early fatigue and the lenses after a while would stop changing colour! Then the inventors of CR39, the renowned Pittsburgh Plate Glass Co. (PPG), managed around 1990 to stabilise light-changing properties within CR39 material, hence Transitions, a complete success story both technically and financially. Corning attempted to re-enter the resin photochromic lens market with Sunsensor and herein the subtle difference: theirs was an integrally mixed photochromic material, just as original Bestlite, whereas Transitions is a thin surface (front) layer, so when processing (the back surface) of Transitions only regular CR39 material is displaced but with Sunsensor expensive photochromic material is discarded, hence the price of Sunsensor was always going to be more expensive than Transitions. In 2014 Corning sold their Sunsensors interests to Mitsui Chemicals (see page 24).

In 2014 Essilor purchased Transitions worldwide facilities and know-how, whilst at their zenith of world wide sales, from PPG. Over recent years, Transitions have improved the UV absorption of their materials and the current TXA formulae makes for an excellent blue absorber (see page 33). Further development efforts saw Youngers and Transitions jointly producing Drivewear, NuPolar polarising and photochromic Transitions material. Later Transitions produced Vantage, which is a unique photochromic material that, as it darkens, achieves polarising properties as its darkened crystals become temporary polarisers. Not to be confused with another Younger product INFINITE, a NuPolar (polarised) photochromic, i.e. becomes darker in sunlight with an LT shift of 40% - 9%LT.
It was handy that wafer bonding technology improved to permanently lock in these cases a Transitions wafer onto, say a white TRIVEX or polycarbonate substrate.

The advent of free-form surfacing has completely transformed the available range of Transitions products, as indicated on the facing page.

Various other larger lens manufacturers introduced their own label photochromic brands, as an example Hoya Sensity, using other than Transitions materials. The technical and economical threat to Transitions is Rx lab methods of applications i.e. vacuum, dip or spin hard-coat applications with photochromic properties.

Achieving that aim has been a long term Norville goal and in January 2018 we introduced **Reactolite**® resin photochromic lenses in two options: Mid 40%LT and Dark 15%LT across grey and brown colours in all indices up to 1.67.

That in ophthalmic optics nothing is ever as simple as it seems is especially true for photochromics. Technically photochromic properties are far more complex to define.

- Specified Light Transmission range(s)
- Speed of colour change
- Colour stability during change
- Speed of lightening
- Ability of photochromic particles to maintain their core colour change integrity over many repeat cycles 3000+
- Effect of temperature variation - photochromics traditionally always willing to go darker in colder climates than equatorial warm.
- Advantage of RF coating

The chosen application method can further affect these outcomes:-

Integral Photochromic Material - Sunsensor
Through and through material mix of 'solid' photochromic material. Although this method may not help any equitint claims in those more extreme powers. Usually more expensive option discarding photochromic material.

Imbibed - Transition
Any photochromic properties are injected into the front surface of the lens. Extremely vigorous front surface action could rub it away.

Coating - Spin
Economic to consider single spin to either one of the lens surfaces, although a double spin could be achieved.

Coating - Dip
The lenses when dipped simultaneously become photochromic coated on both surfaces. This can enhance the speed of darkening as both surfaces are receptive to light activation.

Laminated or Bonded
A number of the more exotic higher resin materials have recently become "photochromicised" by bonding, say, a lower index photochromic bifocal segment onto a higher index base. This process has been available for some years on glass (mineral) high index, n=1.70, 1.80 and 1.90. Applicable to both SV and bifocal wafers.

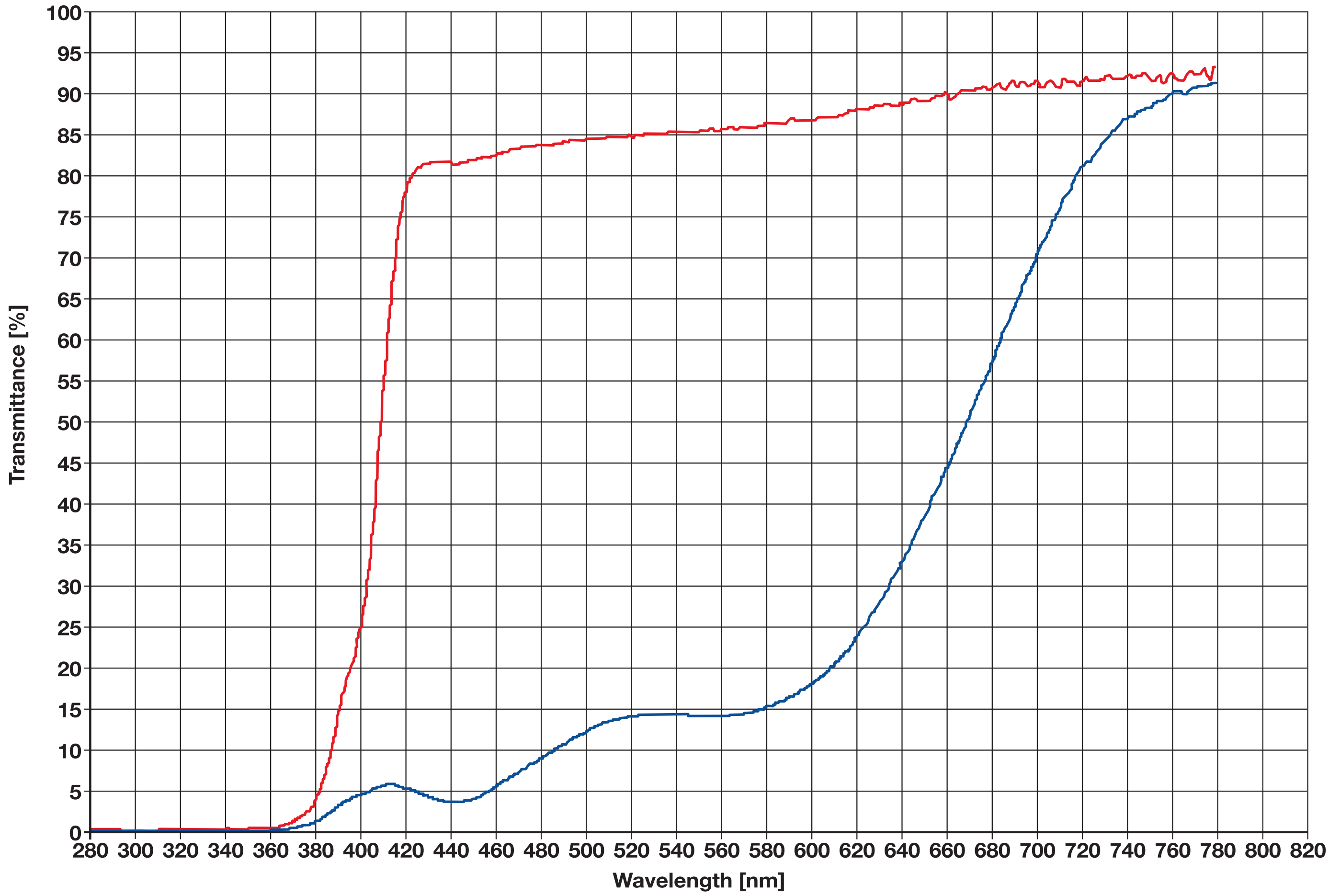
Photochromics are perhaps lenses for all seasons, but they can often work at rather inconvenient times, too dark outside and appearing slow to lighten (to the beholder) when moving inside. But for the user, really useful if one becomes caught unexpectedly in that sunny stand watching a sports event with just one pair of spectacles to hand!

Some photochromic material will work behind the windscreen of vehicles but it has to be adapted to both work in sun light and the modified light behind a windscreen because the glass filters out aspects of the UV generally needed to make photochromics work. Think of such in car photochromics as needing double activations, this is more costly.

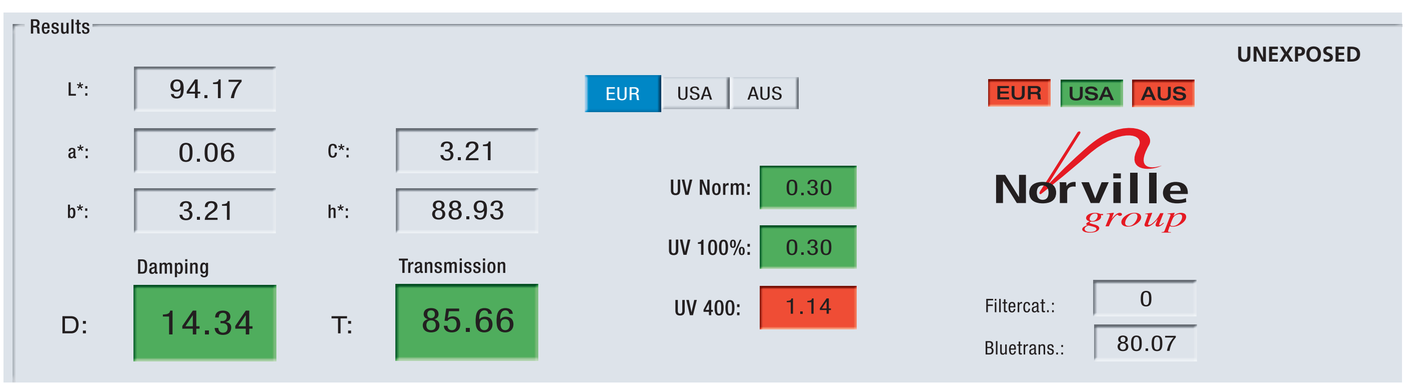
Transmission Curves - Reactolite Brown n=1.50

Lens Name	Code:	Centre Thickness
REACTOLITE BROWN	**RB15**	**2.8mm**

Unexposed State (red line)
Exposed State (blue line)

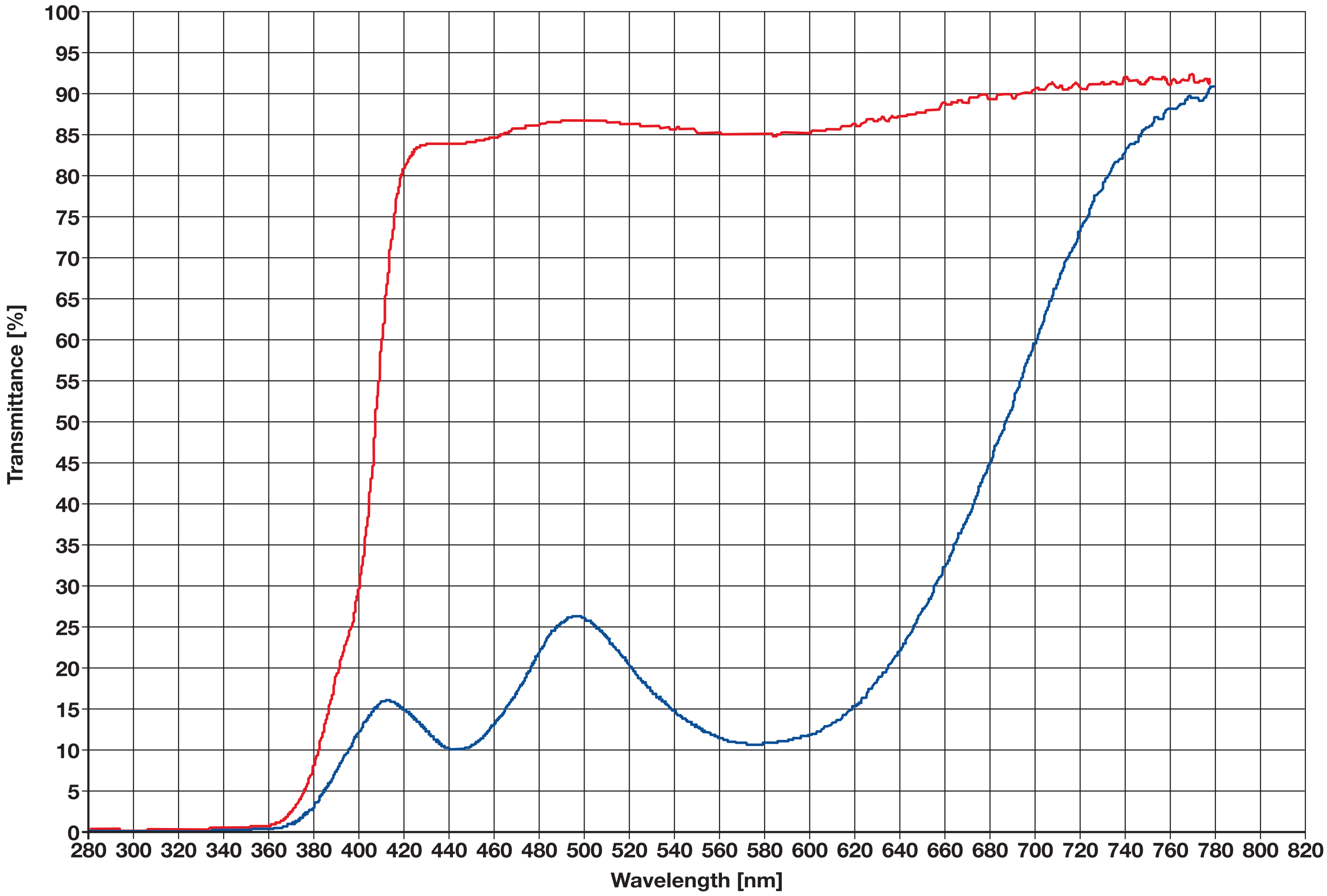


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
377nm	389nm	404nm	85%

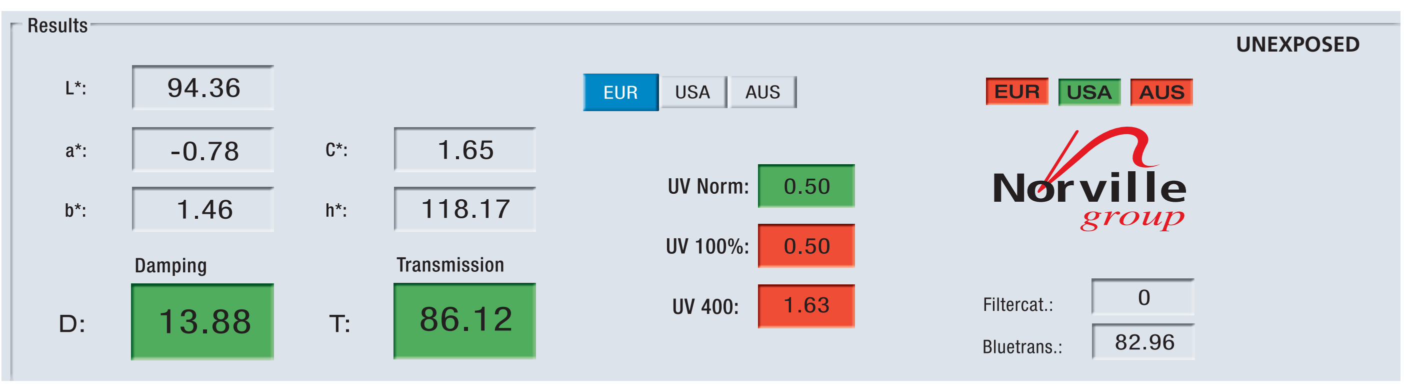


Lens Name	Code:	Centre Thickness
REACTOLITE GREY	**RG15**	**2.8mm**

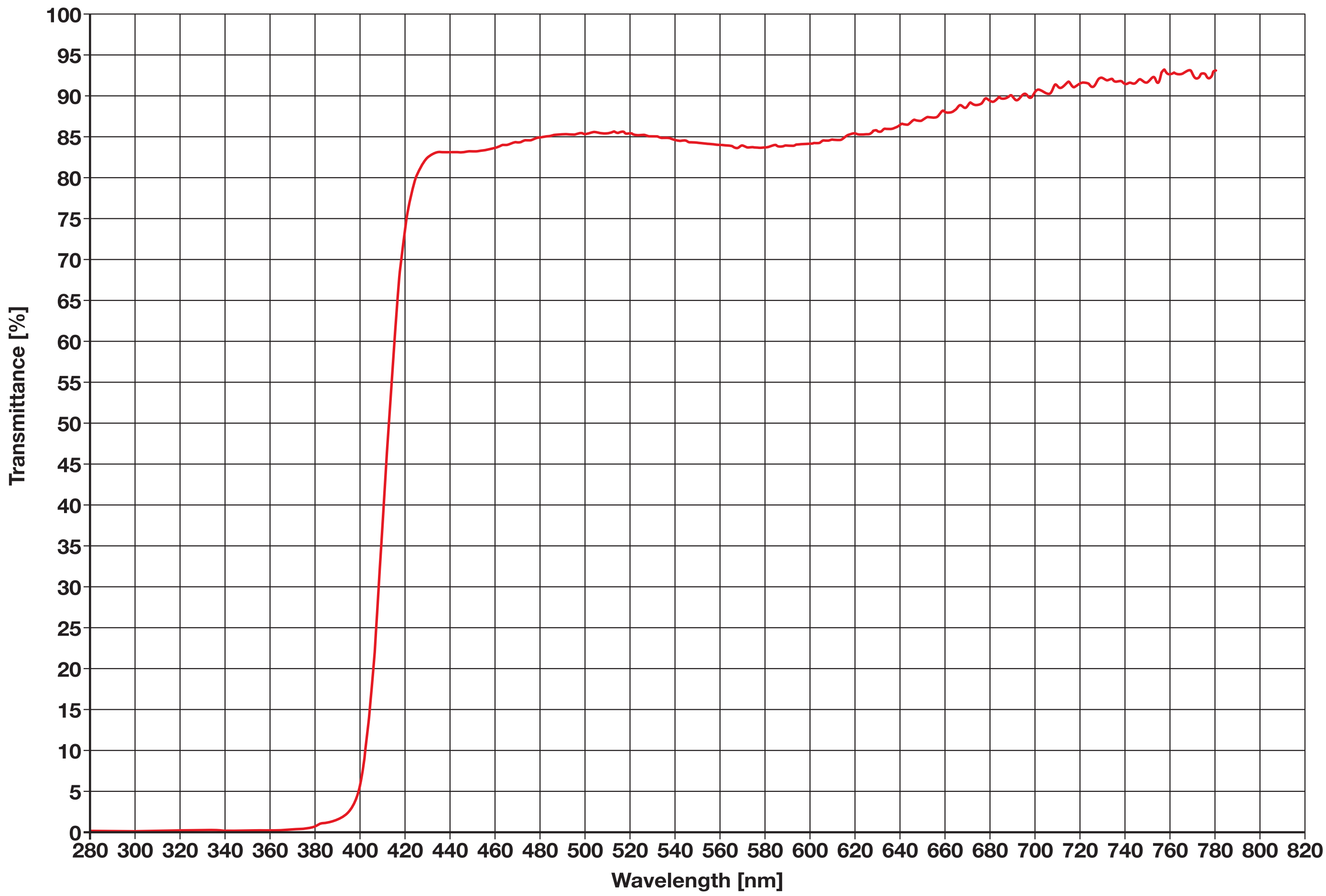
Unexposed State (red line)
Exposed State (blue line)



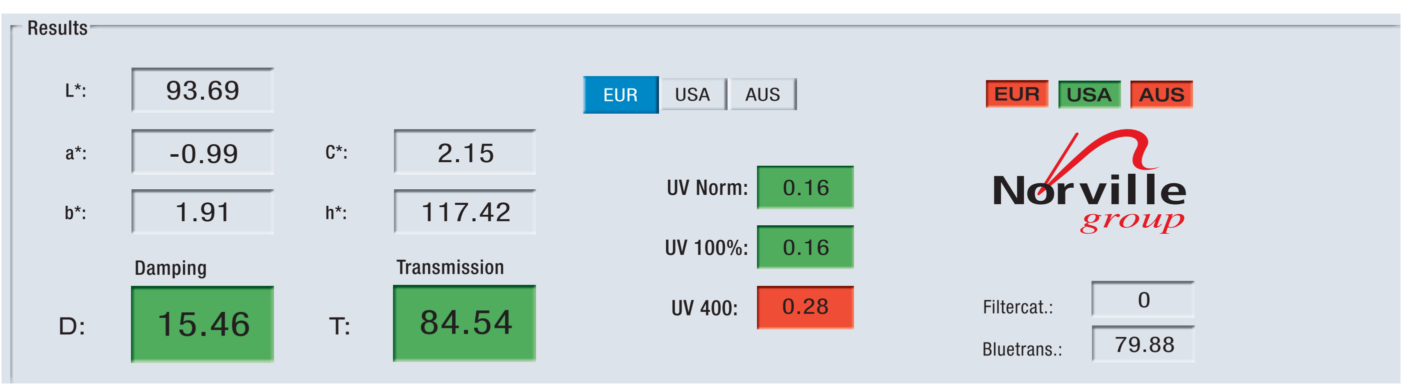
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
371nm	379nm	385nm	84%



Lens Name	Code:	Centre Thickness
TRANSITIONS VII GREY HC	**TRAP**	**2.2mm**
		Unexposed State

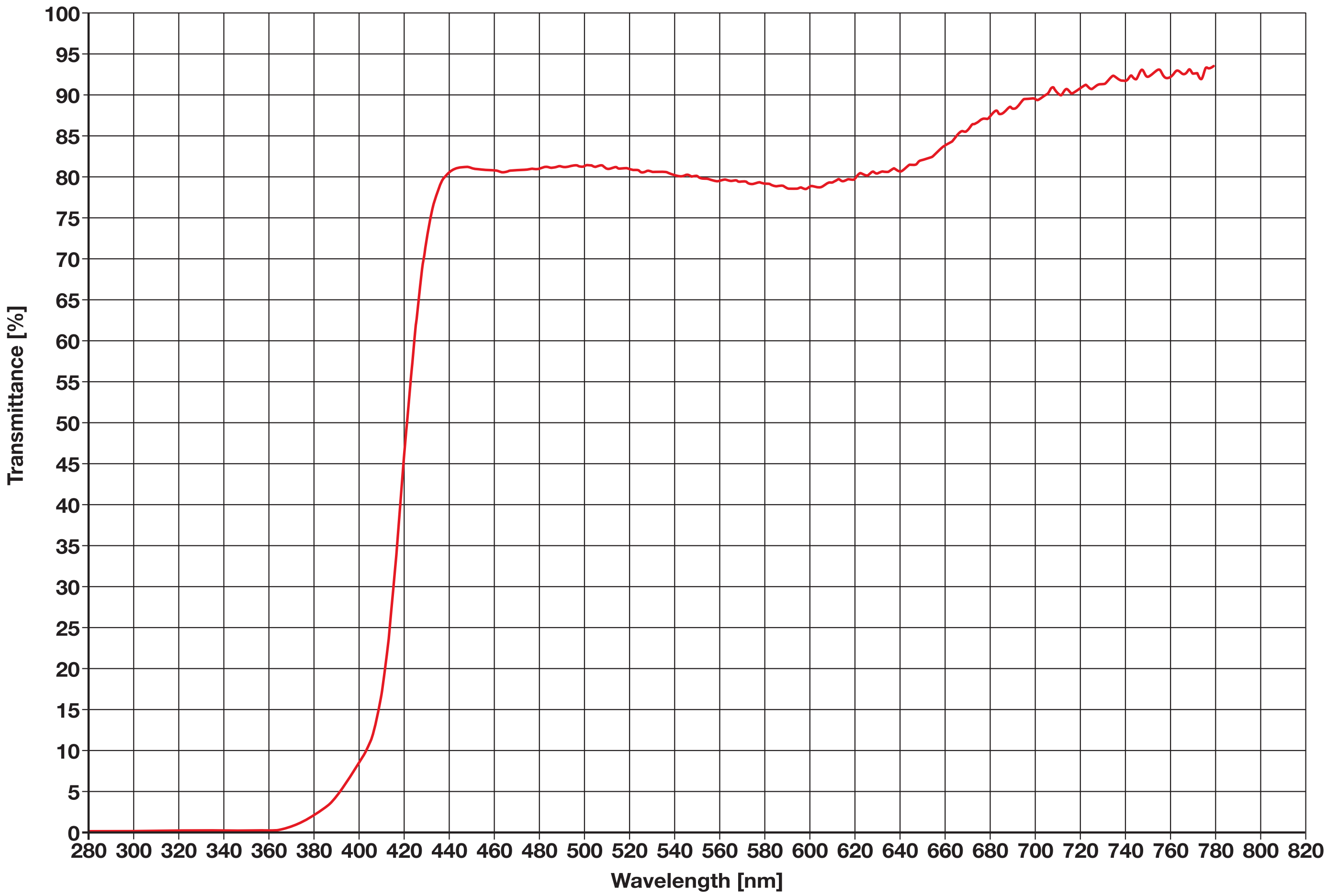


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
381nm	396nm	399nm	85%

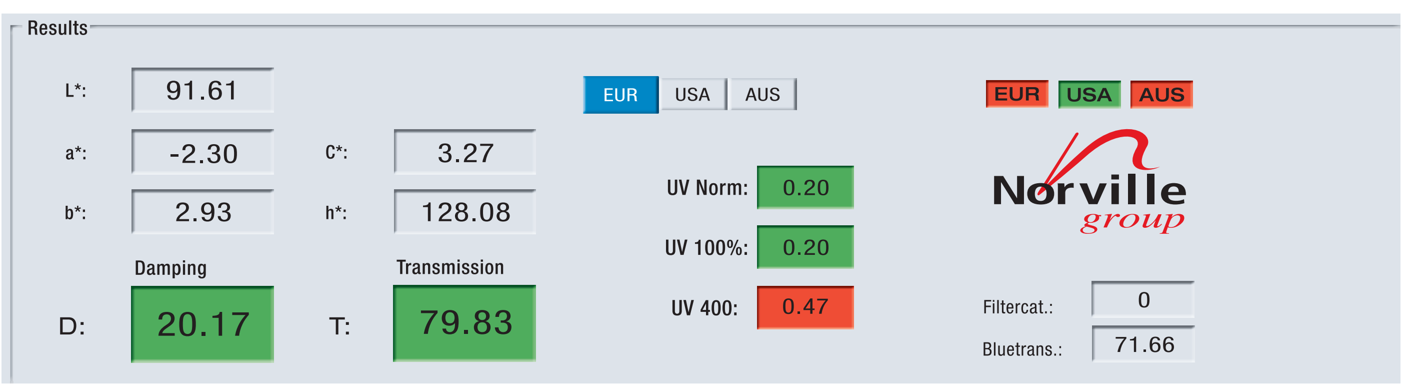


Transmission Curves - Transitions XTRActive n=1.50

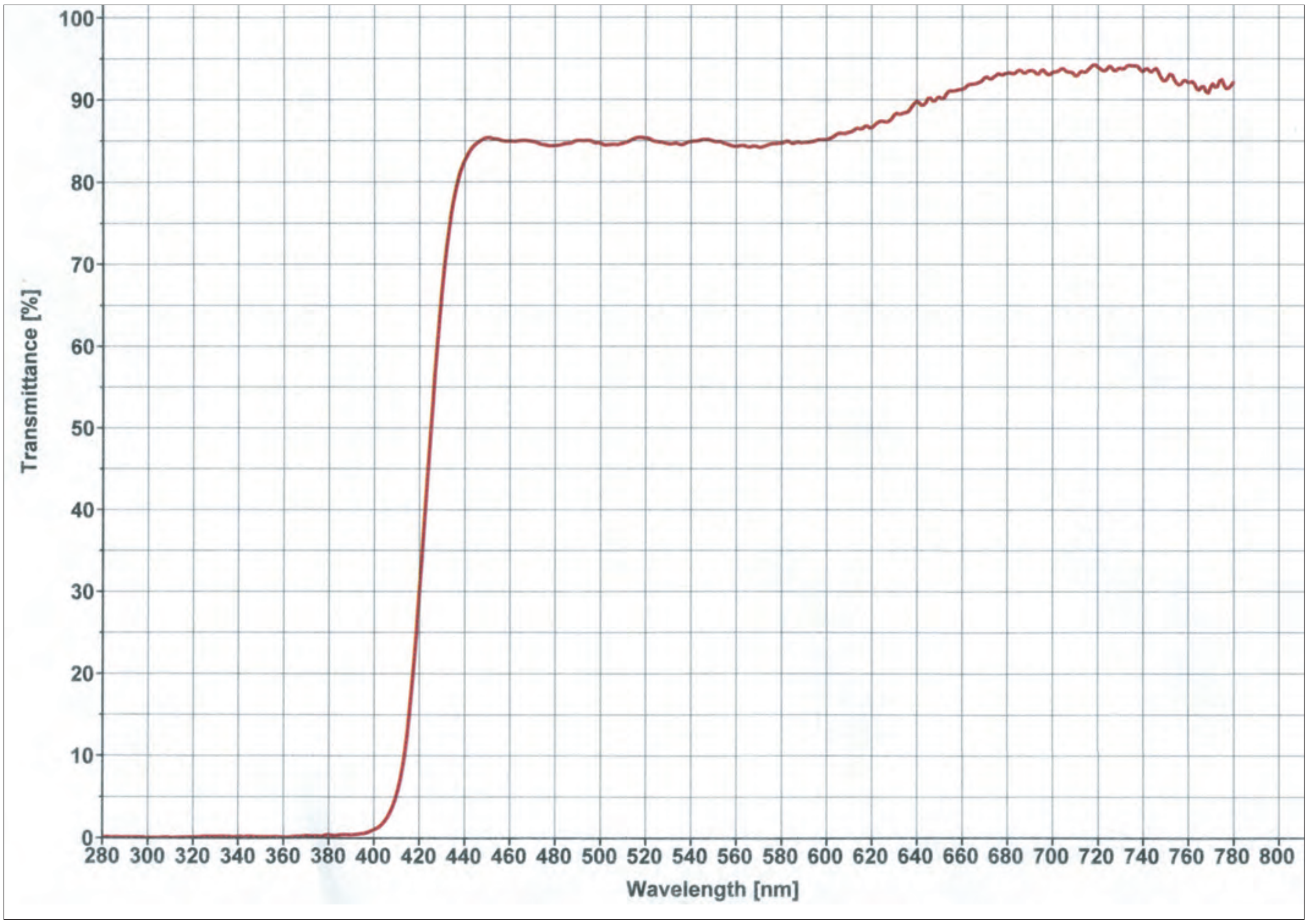
Lens Name	Code:	Centre Thickness
TRANSITIONS XTRACTIVE GREY HC	**TXA**	**2.5mm**
		Unexposed State



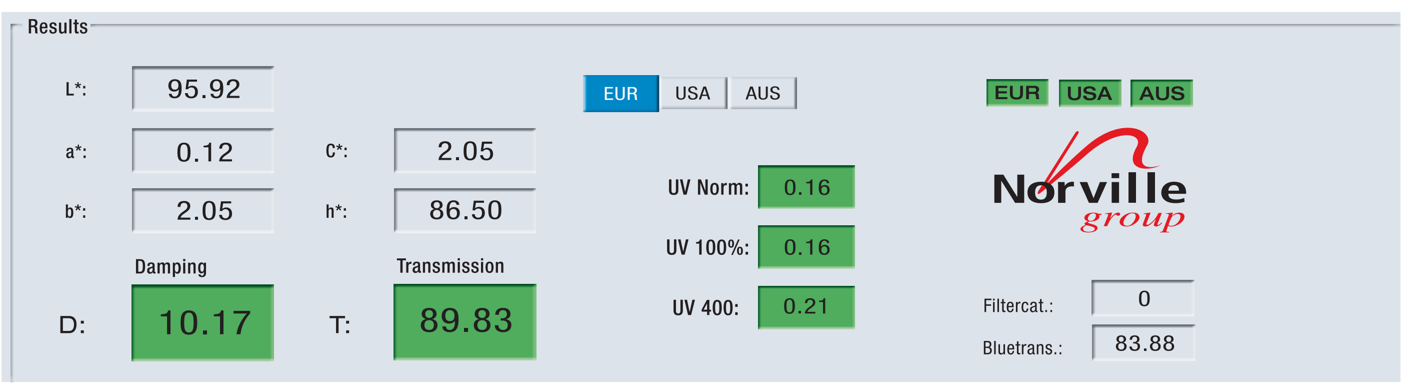
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
373nm	385nm	392nm	80%



Lens Name	Code:	Centre Thickness
TRANSITIONS GREY HMC	**NH6M**	**2.2mm**
		Unexposed State

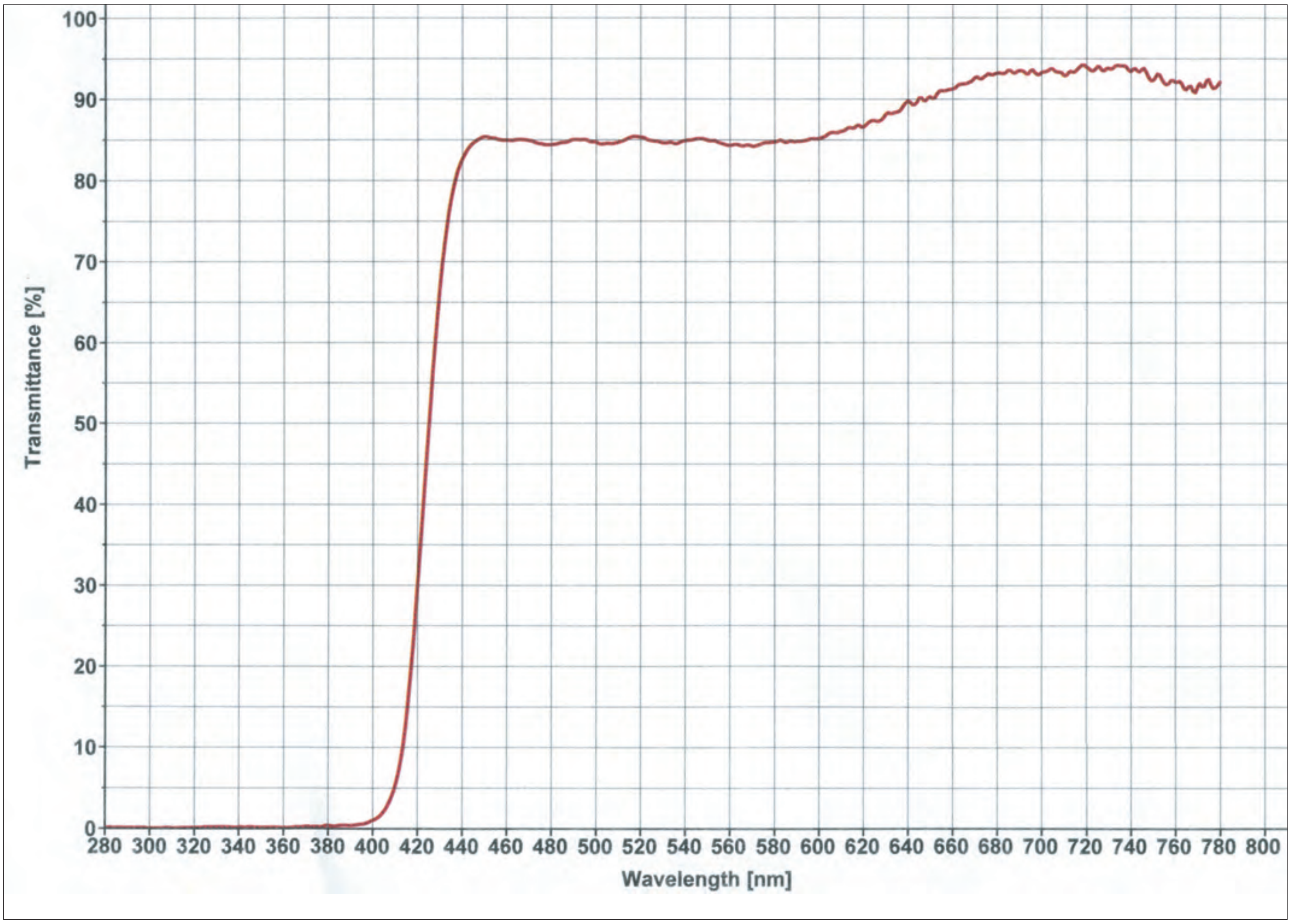


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
395nm	401nm	403nm	90%

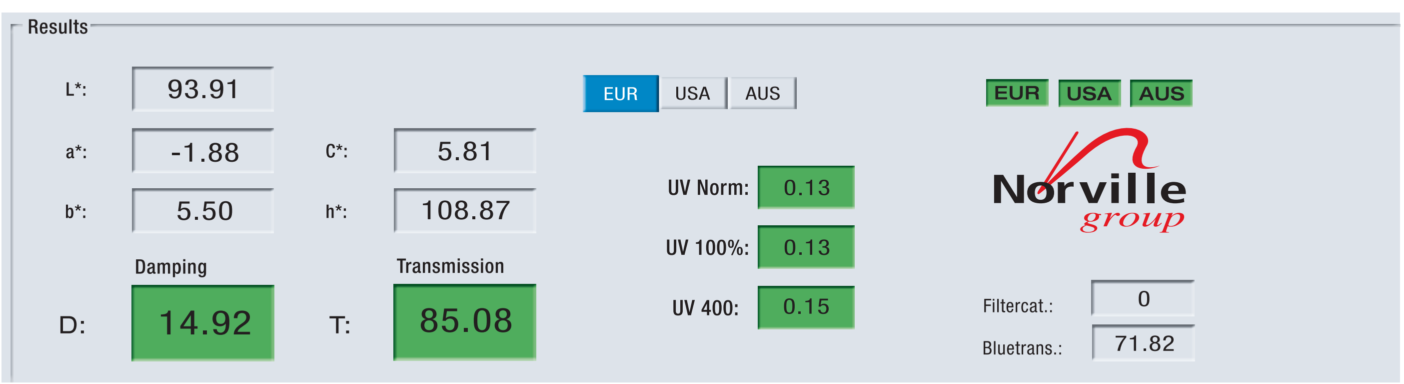


Transmission Curves - Transitions XTRActive HMC n=1.60

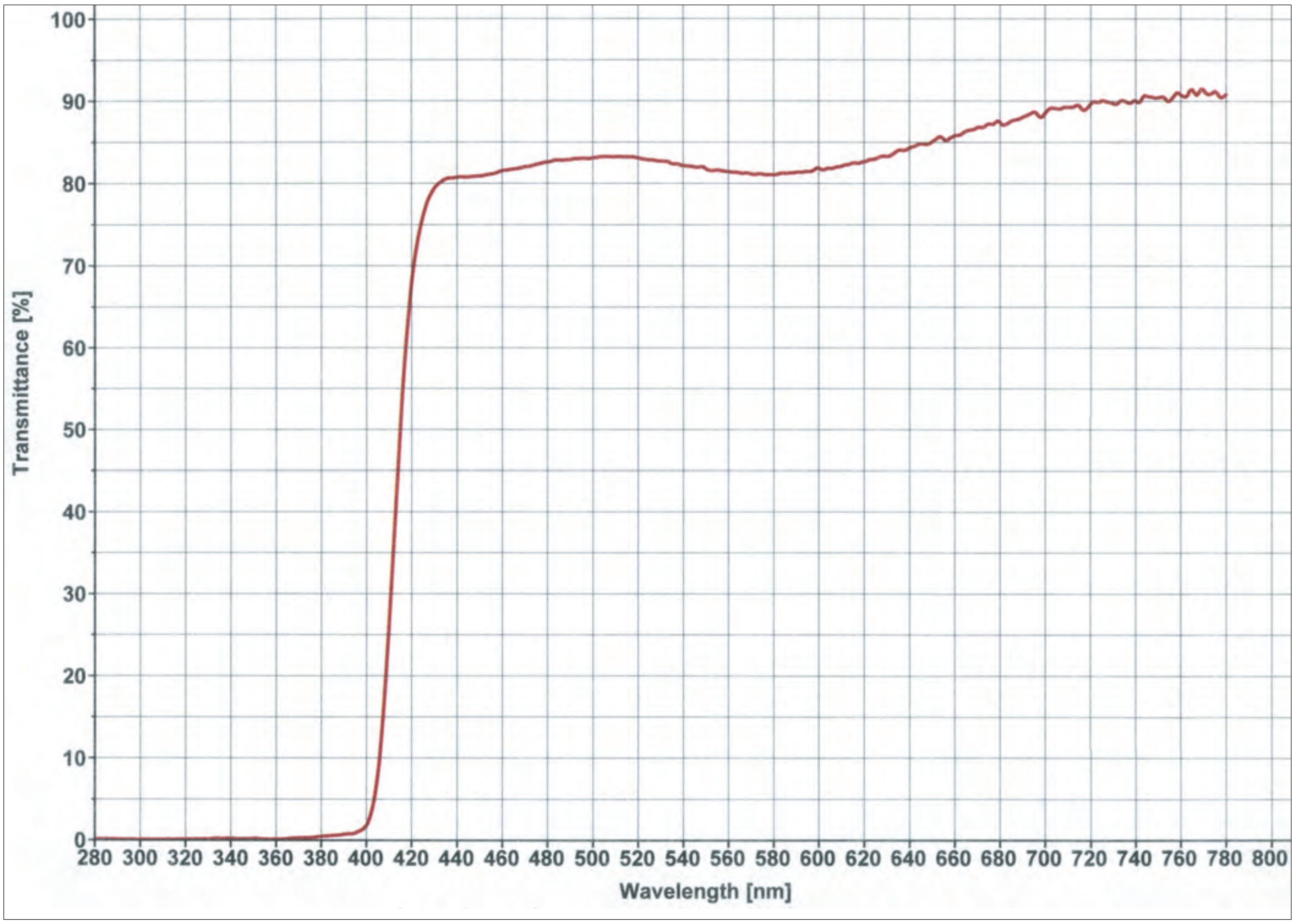
Lens Name	Code:	Centre Thickness
TRANSITIONS XTRACTIVE GREY HMC	**NHTX**	**2.2mm**
		Unexposed State



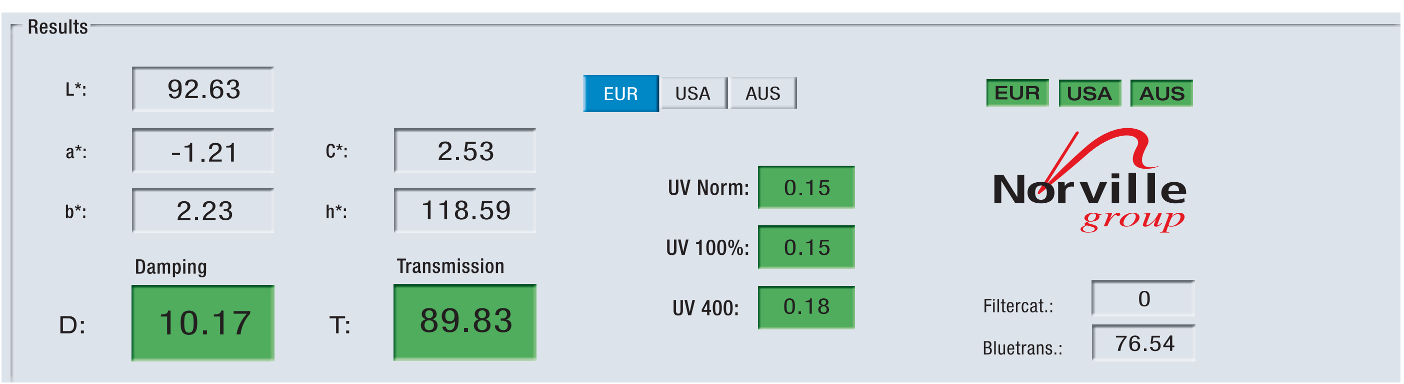
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
401nm	407nm	410nm	85%



Lens Name	**Code:**	Centre Thickness
TRANSITIONS GREY HC	**N17S**	**2.8mm**
		Unexposed State

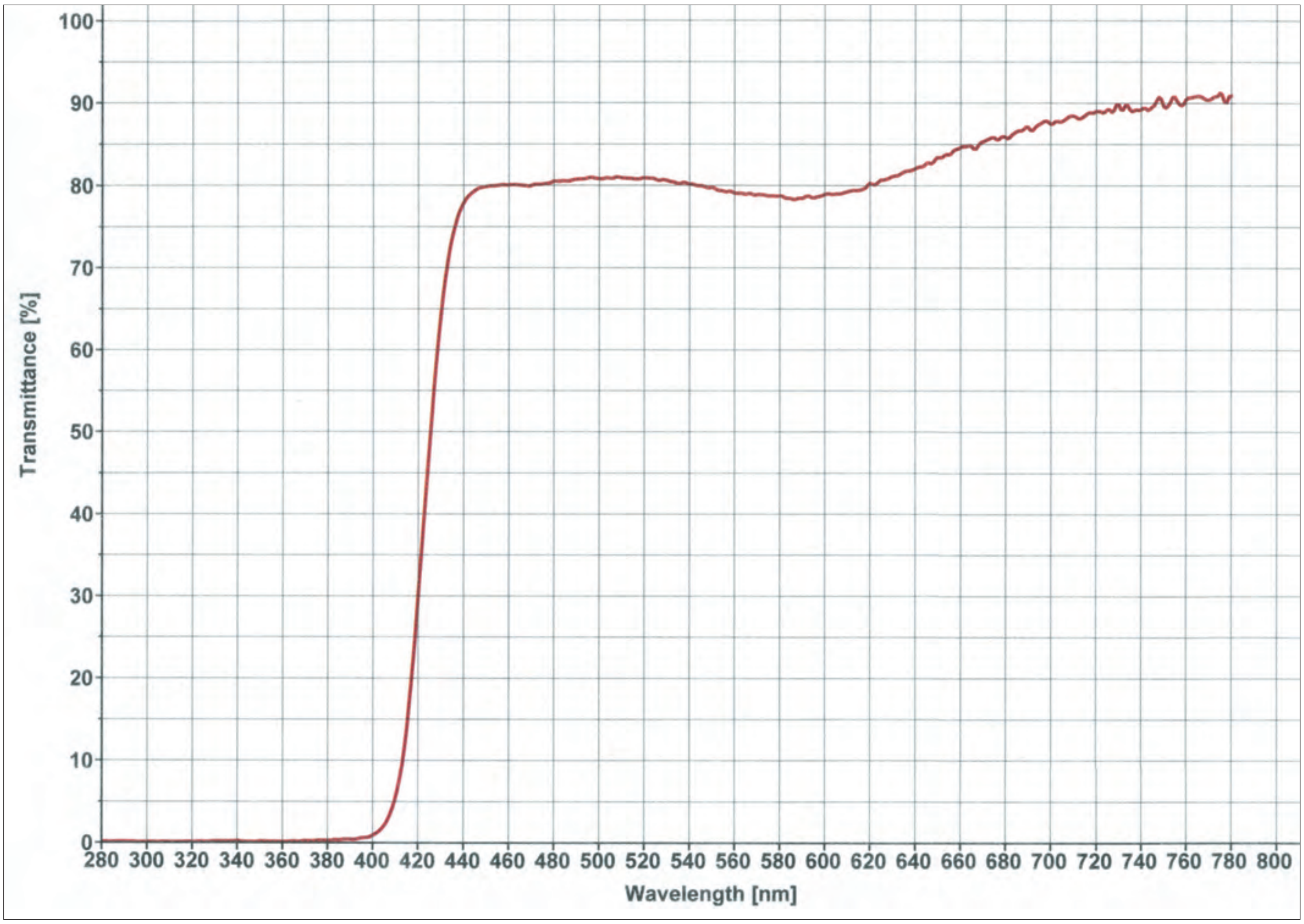


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
396nm	402nm	403nm	82%

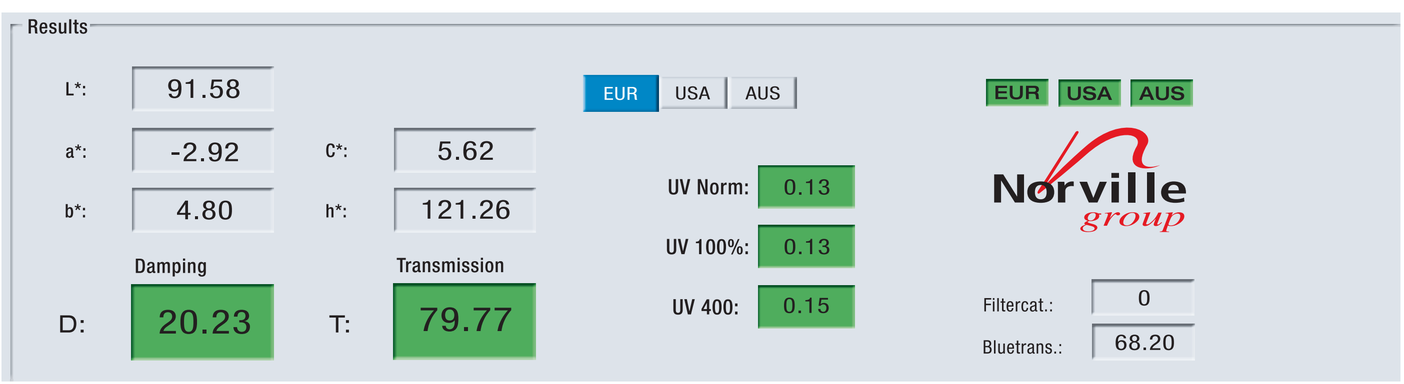


Transmission Curves - Transitions XTRActive HC n=1.67

Lens Name	Code:	Centre Thickness
TRANSITIONS XTRACTIVE GREY HMC	**NX7S**	**2.8mm**
		Unexposed State



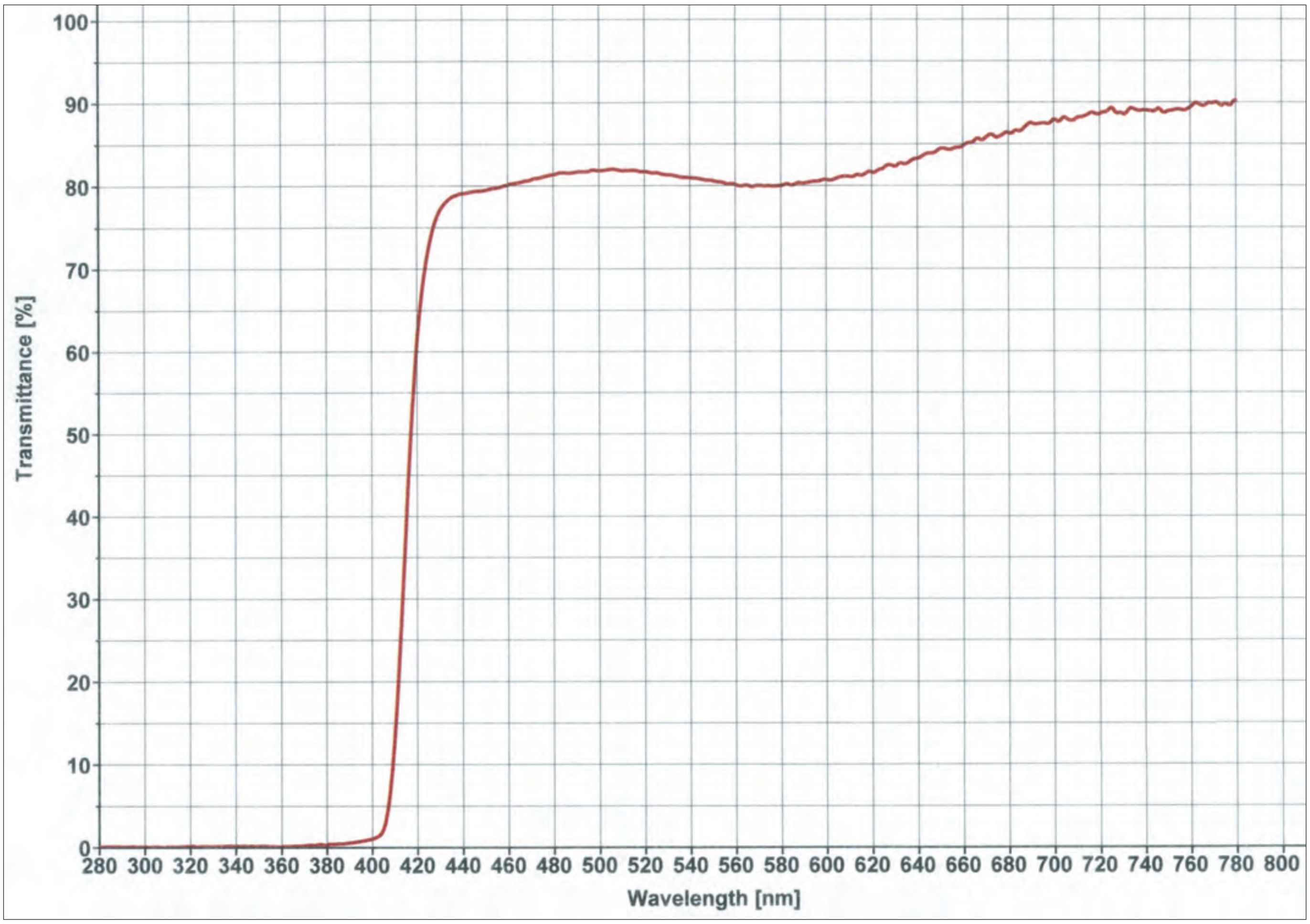
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
401nm	407nm	409nm	80%



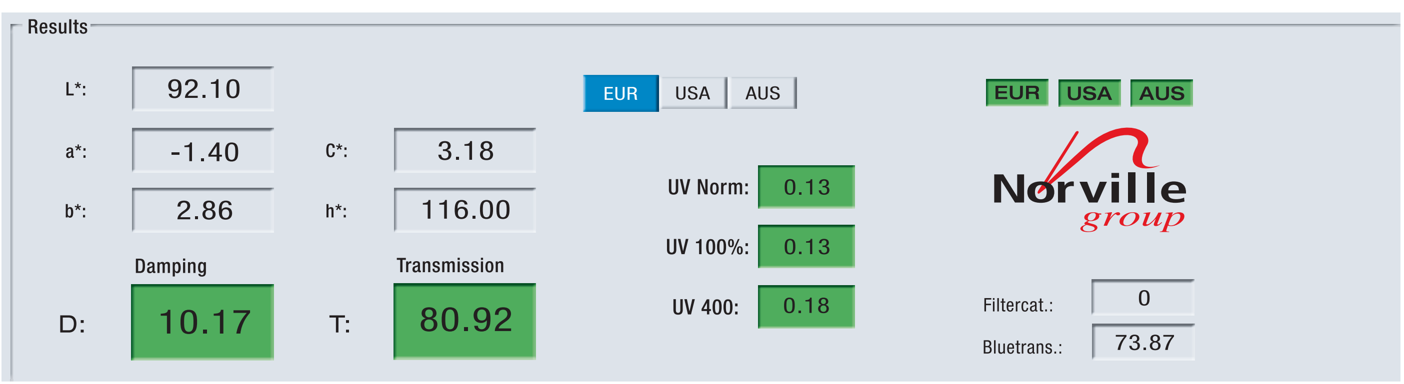
Lens Name
TRANSITIONS GREY HC

Code:
NS74

Centre Thickness
2.8mm
Unexposed State



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
327nm	336nm	366nm	85%



NuPolar Polarising Lenses

Another clever optical idea that's effectiveness is rather overlooked. Perhaps instead of being termed POLARISING LENSES (restricting vibrations of light waves to one direction) they were termed "Glare Beaters", consumers would more readily understand their unique advantages. In today's hard world environment, with the visual confusion of reflected light from concrete, buildings and roads, cars and other mechanical clutter, polarising lenses, with their unique ability to sort out disorderly reflective light, are the answer to eliminate glare. Polarised film is created by having iodine crystals randomly embedded into a translucent film base. The embedded film is stretched in one direction which causes the crystals to become aligned in parallel rows. The classic polarising test is to look at the surface of water, try it with and without a polarising filter; you will be convinced!

A polarising filter is not a new innovation; Polaroid afocal sunspecs have been around in quantity since 1935. That past has seen both glass and resin polarised Rx, with earlier resin that unfortunately enjoyed the habit of delaminating itself when overheated. What is new is today's technology of casting the polarising filter in and around its CR39 (or other resins) host material, so that it will not fall apart. With the polarising element held parallel in the front 1mm of the semi-finished blank, this means that today's surfacing can be as thin as 1.8mm centre thickness for minus.

One of the questions often asked is "can I have a clear polarising lens"? (No!) Owing to the parallel row alignment of the iodine crystals, if they were clear they would not block light in a specific direction. You can see from the chart that NuPolar is available in a lighter transmission around 35% but the efficiency begins to fall off albeit only slightly.

Untinted Nupolar	Luminous %	Absorption %	Polarisation %
Gray 1	35%	65%	99.7%
Gray 3	15%	85%	99.9%
Brown 3	19%	81%	99.9%
Green 3	15%	85%	99.9%

NuPolar can be AR coated; it will NOT delaminate due to its "cast in" design. Should you want to vary the colour then it is possible to over-tint NuPolar with either a mono or graduated tint.

There is one important critical factor in that the axis of the polarising filter must be accurately determined for surfacing and glazing processes. The BSI standard tolerance for this is 5 degrees. An even worse error, usually only apparent on SV meniscus Rx lenses, is to set one or both the polarising axes 90 degrees from their correct alignment. To confirm correct alignment all glazed polarised finished Rxs need to be checked on a polarising axis verification unit. This error is more common than you would think, until one remembers even a spherical polarised Rx lens always needs a horizontal reference line!

Rx polarising NuPolar in SV, bifocal or progressive is undoubtedly one of the better sun lens available anywhere, eliminating glare and enhancing contrast. Today, with the switch from toughened to laminated car windscreens, NuPolar is an excellent drivers' lens.

NuPolar Gradient Lenses

A possibility to combine fashion gradient tints with polarisation.

NuPolar in polycarbonate.

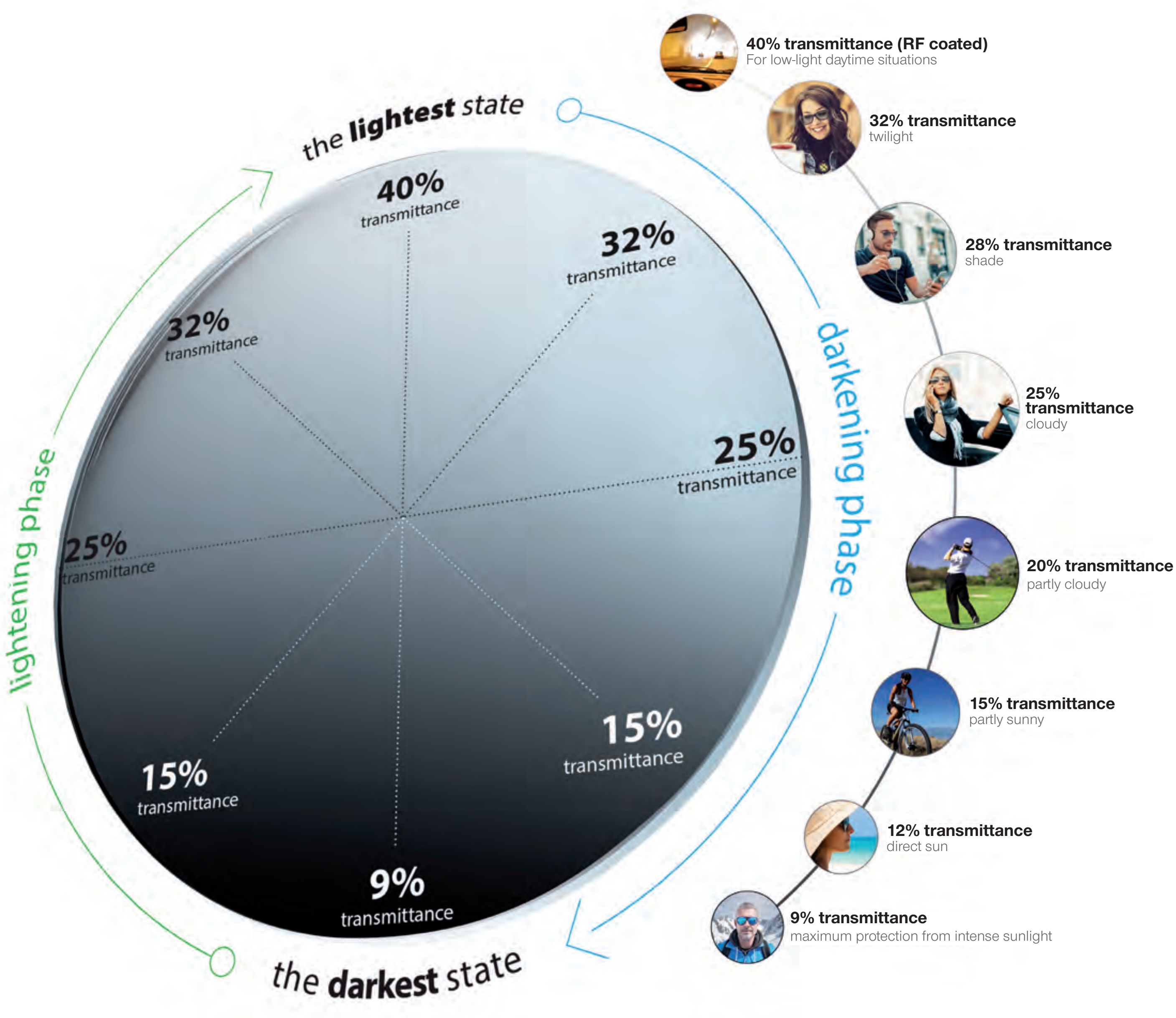
Grey 15% LT dark top 30% Grey light bottom

Brown 20% LT dark top 30% grey bottom

The full polarisation effect is present across the entire lens without any compromise in efficiency.

Reference — *NuPolar® (Younger Optical)* — *www.youngeroptics.com*
The Art and Science of Polarization — *Publication '04* — *Youngers Optics via Norville*

infinite grey



Nupolar Infinite Grey – the most versatile Rx sunlens.

It combines polarisation technology with photochromic and offers the widest available today range of light transmittance characteristics.

Nupolar Infinite Grey can be the lightest or the darkest polarised lenses in the same pair of eyewear depending on the light conditions while maintaining consistent 99% polarisation efficiency and blocking virtually all blinding glare. The unique photochromic technology allows Nupolar Infinite Grey to change its light handling properties extremely fast, providing the required amount of light in every daytime situation.

Lightest state – 40% Transmittance
Darkest state – 9% Transmittance

Notes: 1. Transmission data is measured for AR coated finished lenses.
2. Transmittance and speed of change may vary depending on the temperature. The declared values are measured at 24° C.

Norville

Resin Polarised Availability Check List

Bespoke Order BO

Winter 2018

	Range	INDEX	SV Surfaced	SV Nortor	SV Sportor	RD28 IRS	RD28 HSA	FT28	FT35	Trifocal 728	PPL Booster	Deg Versatile	PPL Image	PPL Simage	PPL Vector	PPL Ultor	PPL Sentor	PPL Screen	PPL Freeway	PPL Resolve	PPL Digitor	PPL Sportpal
CR39	NUPOLAR UV400	1.50	Page 16	Page 16			Page 19	Page 20	Page 21	Page 22			Page 31		Page 32	Page 32			Page 32	Page 32	Page 32	
CR39	NUPOLAR UV400 35% LTF	1.50	Page 16																			
CR39	POLARISED + GRAD TINT	1.50	Page 16	Page 16															Page 32			
CR39	Transitions DRIVEWEAR	1.50	Page 15	Page 15			Page 19	Page 19					Page 30	Page 30		Page 30			Page 30	Page 30		
CR39	Transitions Vantage	1.50	Page 15	Page 15		Page 19										Page 30	Page 30	Page 30	Page 30			
CR39	NUPOLAR INFINITE CHROMATIC	1.50	Page 16	Page 16		Page 19	Page 19				Page 24	Page 24			Page 31	Page 31	Page 31	Page 31	Page 31			
TRIVEX	NUPOLAR UV400 15% LTF	1.53	Page 38	Page 38	Page 39	Page 41										Page 47	Page 47		Page 47	Page 47		Page 47
TRIVEX	Transitions DRIVEWEAR	1.53	Page 38	Page 38	Page 39	Page 41	Page 41									Page 46			Page 46	Page 46		Page 46
TRIVEX	Transitions Vantage	1.53	Page 38	Page 38	Page 39	Page 41										Page 46	Page 46	Page 46	Page 46			Page 48
POLYCARB	NUPOLAR UV400 DARK	1.59	Page 58	Page 58	Page 59		Page 60	Page 61					Page 68	Page 68		Page 68			Page 68	Page 68	Page 68	Page 70
POLYCARB	POLARISED + GRAD TINT	1.59	Page 58													Page 68			Page 68			Page 70
POLYCARB	POLARISED MELANIN	1.59	Page 58		Page 59			Page 61														Page 70
POLYCARB	POLARISED MIRROR	1.59	Page 58		Page 59																	Page 70
POLYCARB	Transitions DRIVEWEAR	1.59	Page 58		Page 58		Page 60						Page 69	Page 69		Page 69			Page 69		Page 69	Page 70
POLYCARB	NUPOLAR INFINITE CHROMATIC	1.59	Page 58	Page 58	Page 59	Page 60					Page 62	Page 62			Page 69	Page 69	Page 69		Page 69			Page 70
MID INDEX	NUPOLAR UV400 15% LTF	1.60	Page 76	Page 76	Page 76		Page 77									Page 84	Page 84		Page 84	Page 84	Page 84	Page 84
HIGH INDEX	NUPOLAR UV400 15% LTF	1.67	Page 93	Page 93	Page 93		Page 95	Page 94								Page 102	Page 102		Page 102	Page 102	Page 102	Page 102
VERY HIGH INDEX	NUPOLAR UV400 10% LTF	1.74	Page 105	Page 105			Page 107									Page 110			Page 110			

Page numbers ref February 2018 Norville Ophthalmic Lens Catalogue.

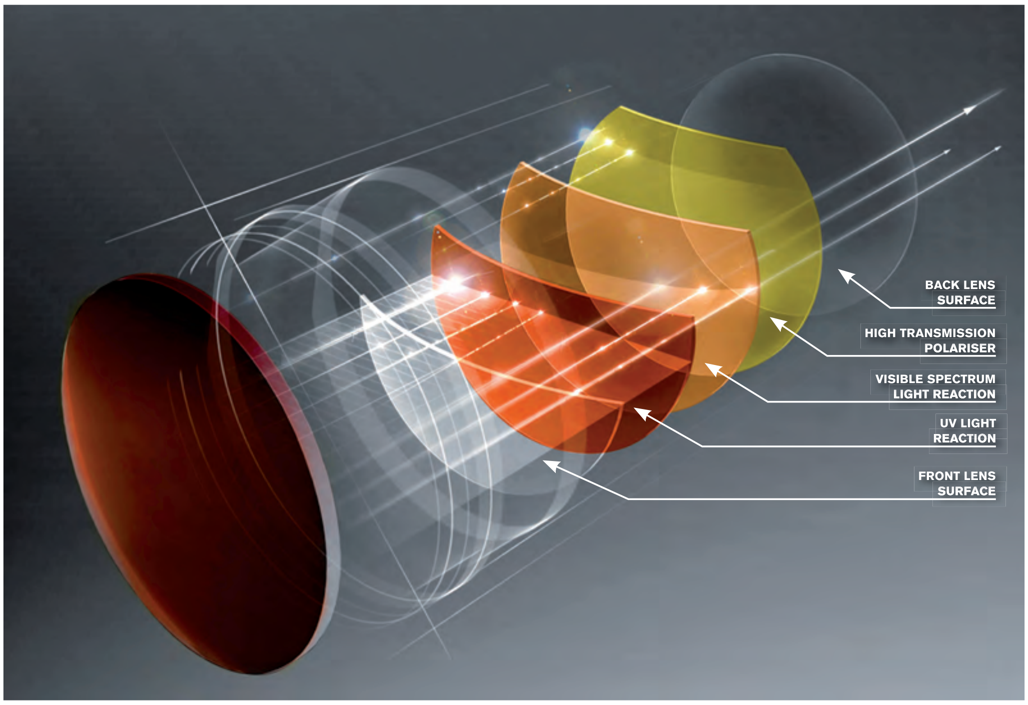
Norville Checklist Series PA-218

Drivewear Polarising Photochromic Lenses

Younger Optics, under the ownership of the Ripps family, are the largest independent lens casters remaining in the Western World. Younger's were the very first to meld all the combinations of polarisation and photochromics together in one lens, which they called **Drivewear**. Drivewear has the specific advantage of being the first photochromic that darkened behind a vehicle windscreen.

In creating Drivewear the following technological breakthroughs were achieved by Youngers:

Development of light, high contrast polariser, which maintains high polarisation efficiency.	Casting polarisation into Transitions monomer and achieving strong chemical bond.	Making the polarised and dye package work together to deliver the proper spectral colour results at the varying states of the lens.
Development of of the dye package which includes photochromics initiated by visible and UV light.	Developing a polariser which withstands the higher temperature of the Transitions and multi-coating processes.	Complying with traffic colour recognition according to ISO standards at every state of the lens.



Drivewear's variable tint technology is provided by using advancements in Transitions® Optical Photochromic Technology, while Drivewear's polarisation properties are provided by breakthroughs in NuPolar® technology by Younger Optics.

Many attempts have been made to combine polarisation and photochromics. These attempts did not work because the properties of the lens were not designed specifically to make the two technologies work together in a complementary and synergistic way. The resulting product did not utilise either technology to its fullest potential or achieve any direct visual improvements.

Drivewear lenses go beyond these unsuccessful attempts by using each of these specific technologies in ways that enhances each one's capabilities. Drivewear represents the highest utilisation of technology of any lens ever introduced into our industry.

Drivewear's combination of technologies is so advanced and novel that multiple patents have been filed on this invention (for instance, "Eyewear having selective spectral response", US patent #6926405 and WO 2005/001554).

www.drivewearlens.com

See Page 45 for Drivewear availability

Arguably the world's BEST DRIVING LENSES



OVERCAST

LOW LIGHT CONDITIONS
HIGH CONTRAST GREEN/YELLOW COLOUR

During the overcast weather, the lens only active element is the high contrast green/yellow polarised film. The polariser blocks blinding glare and high contrast colour enhances the object recognition and depth perception for the driver. The lens light transmission in this state is 32%.

DAYLIGHT

DRIVING CONDITIONS
COPPER COLOUR

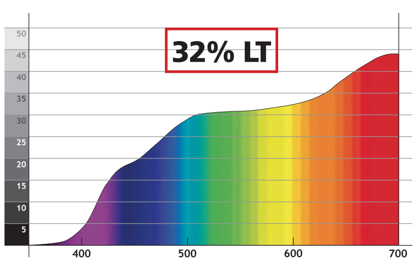
While the windshield blocks UV light and prevents the standard photochromic molecules from regular activation, the new, visible spectrum photochromic molecules are activated by intense visible portion of the sunlight spectrum.

Due to this, the lens colour changes to Copper/Brown and the lens light transmission darkens to 22%. The lens continues to block blinding glare and ensures great visual comfort for the driver.

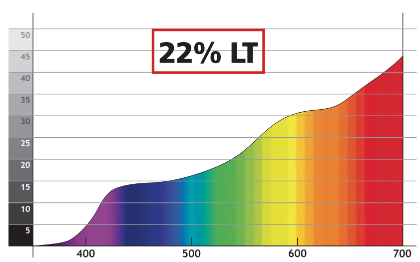
BRIGHT LIGHT

OUTSIDE CONDITIONS
DARK REDDISH BROWN COLOUR

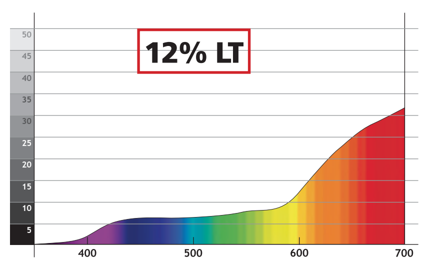
As the UV rays are no longer blocked by the car windshield, the layer of Transitions photochromic molecules become active. As all 3 technology layers of the lens are active, the colour changes to Dark Brown and the light transmission darkens further again to 12% while 100% UV rays are blocked.



DRIVEWEAR TRANSMISSION IN LOW LIGHT CONDITIONS



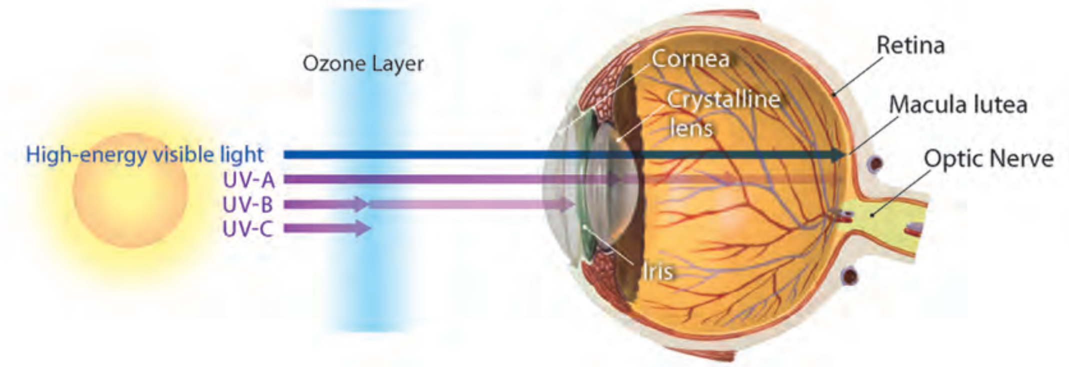
DRIVEWEAR TRANSMISSION DURING DRIVING



DRIVEWEAR TRANSMISSION IN BRIGHT LIGHT CONDITIONS

Reference ** Note excellent UV Absorption*

There is scientific and governmental concern at the enlarging size of the Northern pole's ozone hole and the thinning of the ozone layer over Northern Europe. The absence of this protective layer, absorber of the Sun's UV light, now exposes us all to greater risks. The visual risk being that the crystalline lens may become prematurely aged by excessive exposure.
Within the vast scope of electromagnetic spectrum that stretches from radio wave frequencies at one end to Gamma radiation at the other, there is a very limited range (380 - 770nm) of wavelengths that we humans perceive as "light". Each side of this visible spectrum there is invisible radiation, which our eyes are not designed to detect: ultra-violet and infra-red.
Infra-red radiation to the eyes should be avoided. However, there is a sensation of "heat" which our natural instincts tell us to "pull back" from, unlike ultra-violet, perceived by many as the most dangerous range as its presence may not be felt or even seen so readily.
The UV spectrum extends from around 400nm down to approximately 1nm where it overlaps with X radiation.



UV can be sub-divided:

UVC - Wavelengths below 280nm are effectively filtered out by the ozone layer surrounding the earth. The amount of absorption varies and is less near to the equator and at high altitudes due to the reduced atmospheric thickness.

UVB - Wavelengths between 280nm and 315nm; responsible for sunburn and snow blindness. The amount of ultra-violet affecting a person is substantially increased by reflection from surfaces such as snow, sand and water.

UVA - Possibly the most dangerous area, between 315nm and 380nm, potentially causing chronic eye damage to the eye, especially low dose exposure over a long period of time.

Some lens products are naturally UV absorbing*, such as polarising photochromics, and high index products.
Untreated CR39 lenses give protection only up to 350nm. However by requesting "Norlite UV400" they can be treated to increase UV protection up to 400nm, giving your patients and yourself peace of mind that their eyes are being protected from potentially harmful UV.

Who will gain most benefits from Norlite UV400?
- Aphakics who, through surgery, lose nature's own intraocular filter. UV treated lenses are essential to offset this loss in post-operative cataract patients.
- Those that take photosensitising medication, such as certain tranquillisers, diuretics, anti-diabetic and hypersensitive medication, oral contraceptives, antibiotics and Psoralen, as used in psoriasis treatment.
- Those that spend either a lot of time in the sun or are subjected to bright light.
- All young eyes.

Reference *Illustration courtesy of Mitsui Chemicals Inc.*

Good Blue - Bad Blue

A report from the Vision Council of America titled *Picture This: A Lifetime of UV Eye Protection* has highlighted a lack of awareness of the dangers of prolonged exposure to ultraviolet (UV) rays.

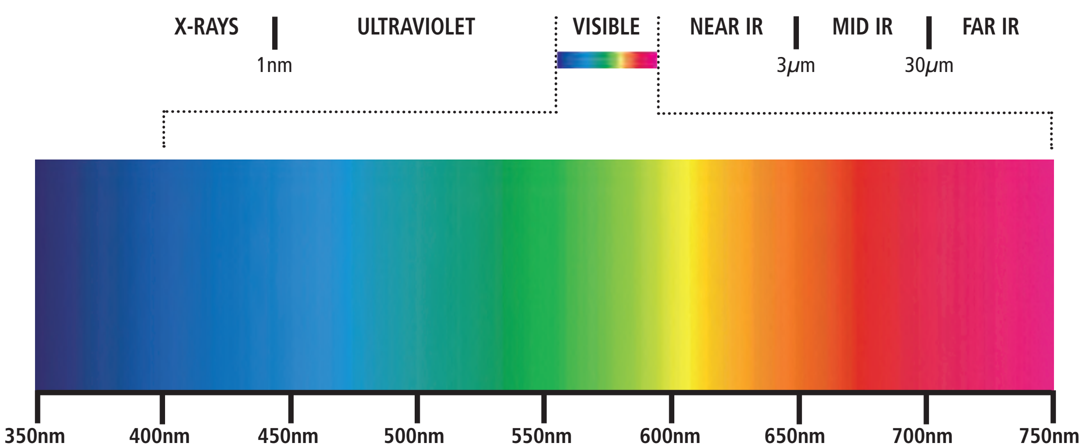
Nearly half (49 per cent) of adults surveyed were not aware that UV exposure could increase the likelihood of cataract formation and, when interviewed, 35 per cent did not know if their eyewear provided UV protection and 10 per cent believed they did not offer any protection at all.

In recent years commentators, particularly USA based, have become increasingly agitated by this blue light topic, primarily accentuated by the arrival of LED light sources across public, domestic and vehicle environments. The assumed visual detriment from staring at high energy (HEV) blue light sources e.g. mobile devices at 440nm output. It is true that any LED blue effects on a teenager today may not manifest themselves until 2050 onwards.

The significant point for dispensers' current view is that we have moved on and up from just UVA (380nm) level of protection. Specialist Blue Blockers would seem to be the order of the day. Excessive exposure to HEV light, particularly at night, suppresses melatonin, which promotes sleep, however it must not be overlooked that blue light 470nm upwards is essential for balanced living and its absence may be the trigger of seasonal depressions.

There are an ever increasing number of lens options available to tackle blue. Some as lens coatings, lens substrates and others combinations of both these elements. We can provide the technical information; opticians are the prescribers.

Why blue light can be harmful to you



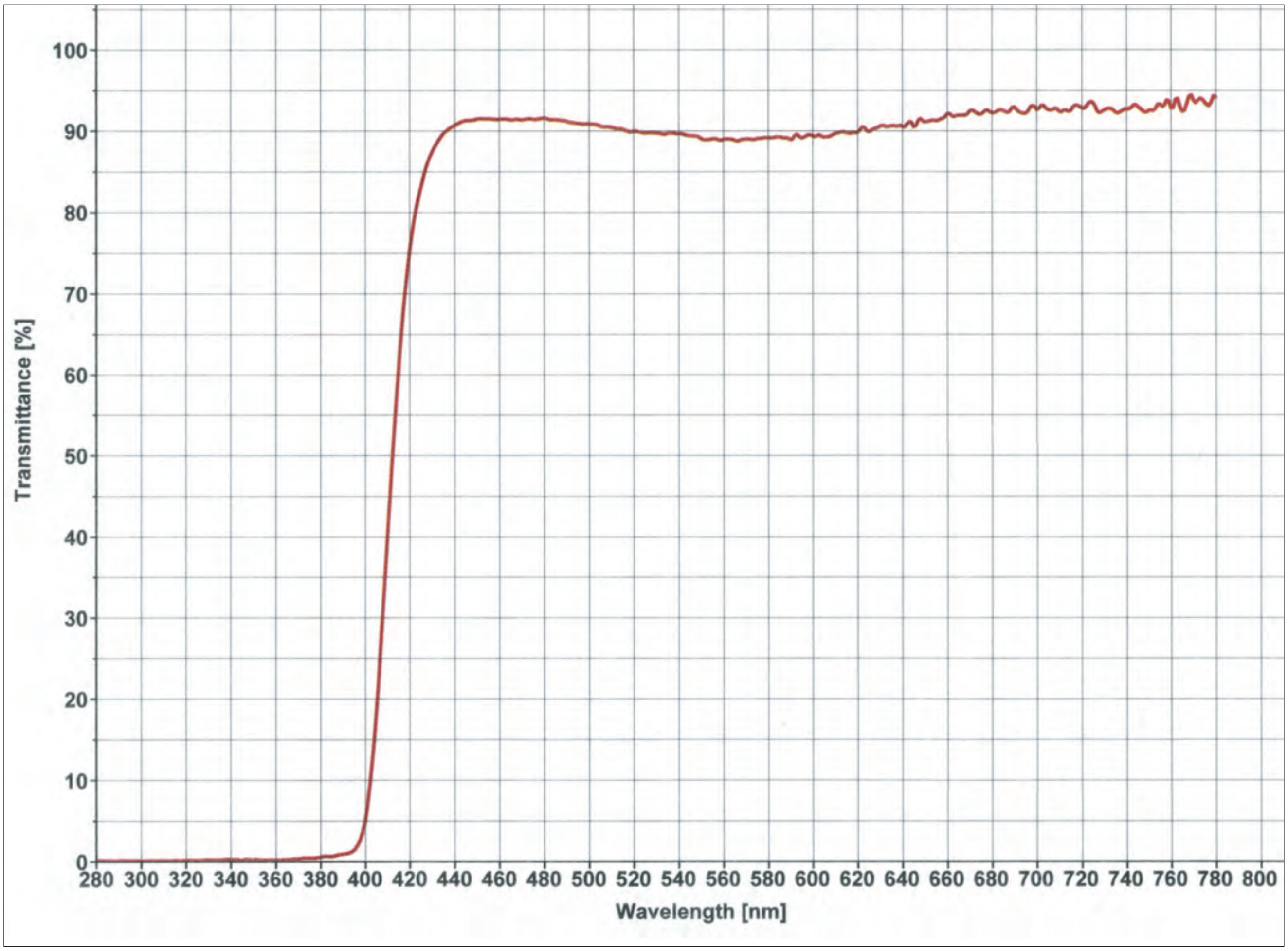
$$\text{(Energy per photon)} = \frac{\text{(Planck's Constant)} \times \text{(Speed of light)}}{\text{(Wavelength)}}$$

At 380nm, the energy per photon is 3.27eV
At 760nm, the energy per photon is 1.63eV

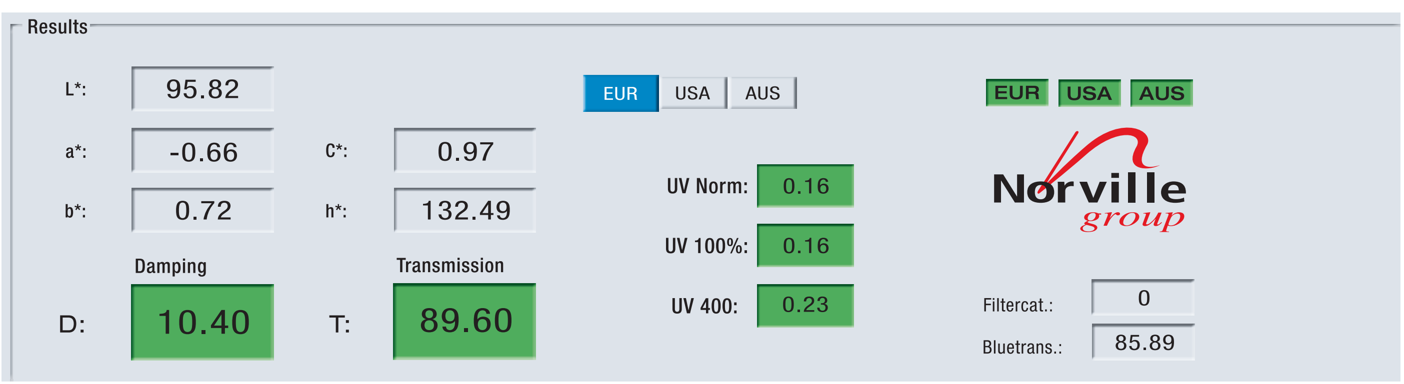
Blue light has almost twice the energy per photon
as red light at the other end of the visible spectrum.
This is the same energy that causes sunburn and cataracts.

See Pages 45 to 48 for more information

Lens Name	Code:	Centre Thickness
CR39 UV400 HC	**PUVH**	**2.1mm**

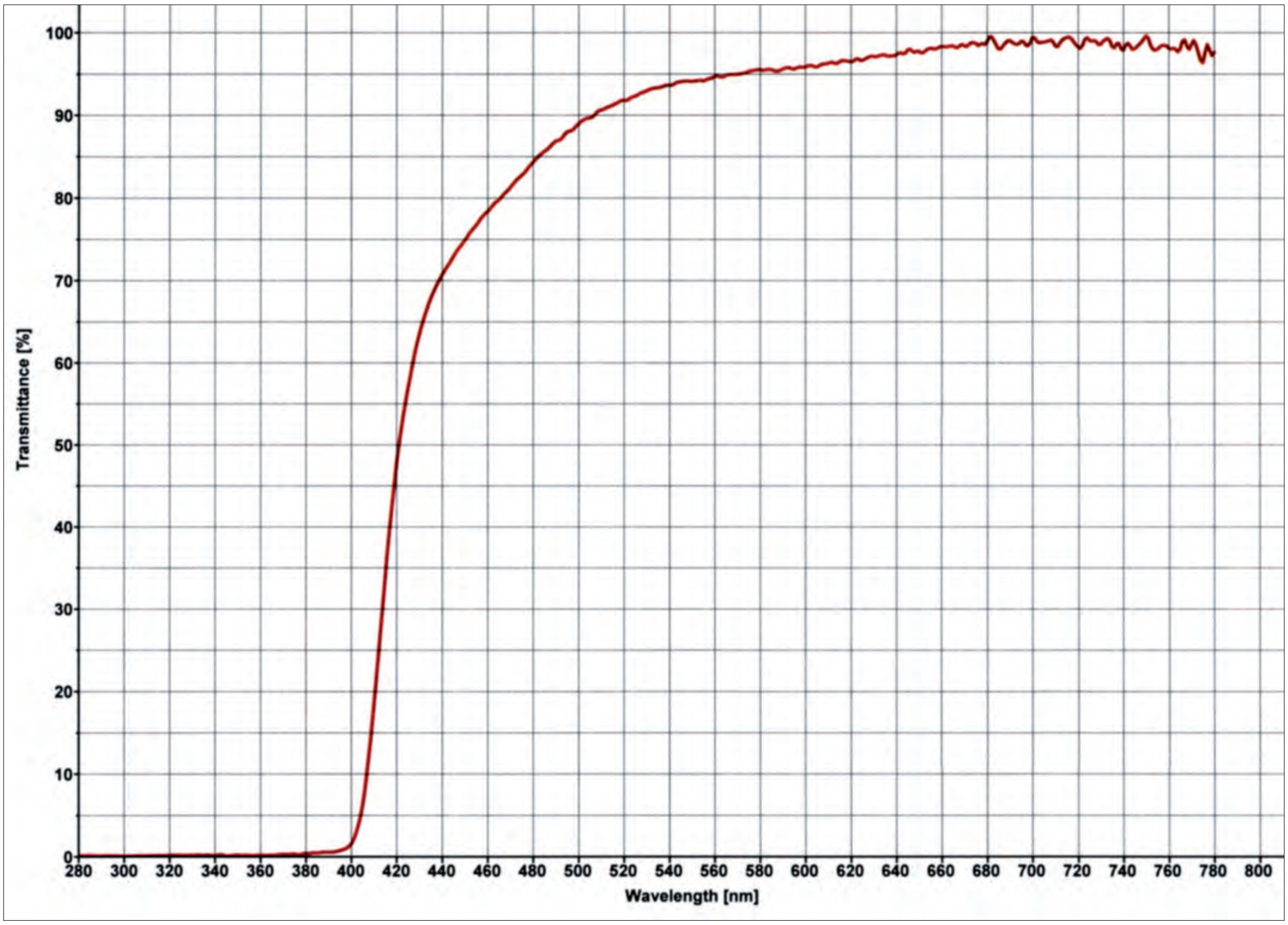


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
393nm	398nm	400nm	90%

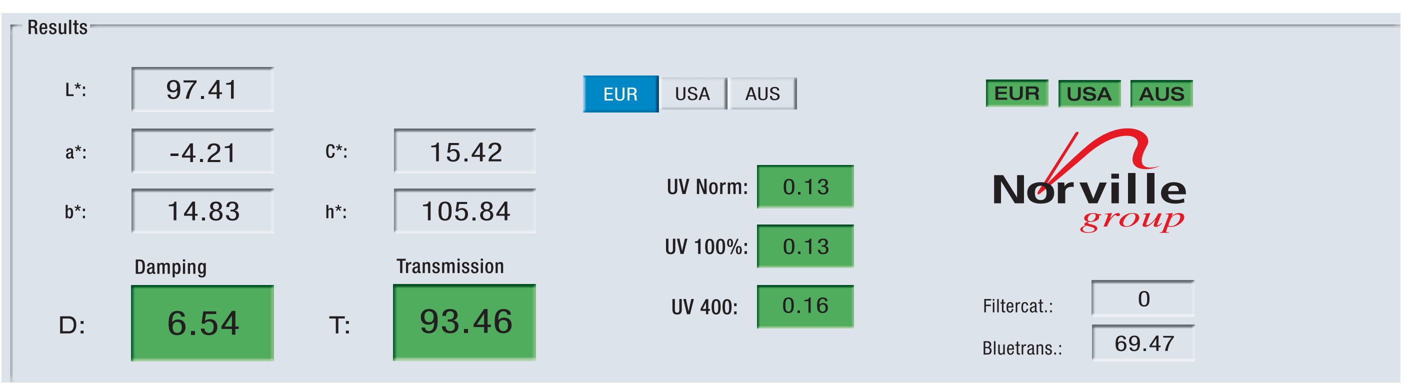


* Comparison Page 16
Regular CR39

Lens Name	Code:	Centre Thickness
CR39 UV400 MAR KBLU	**PSBB**	**2.1mm**

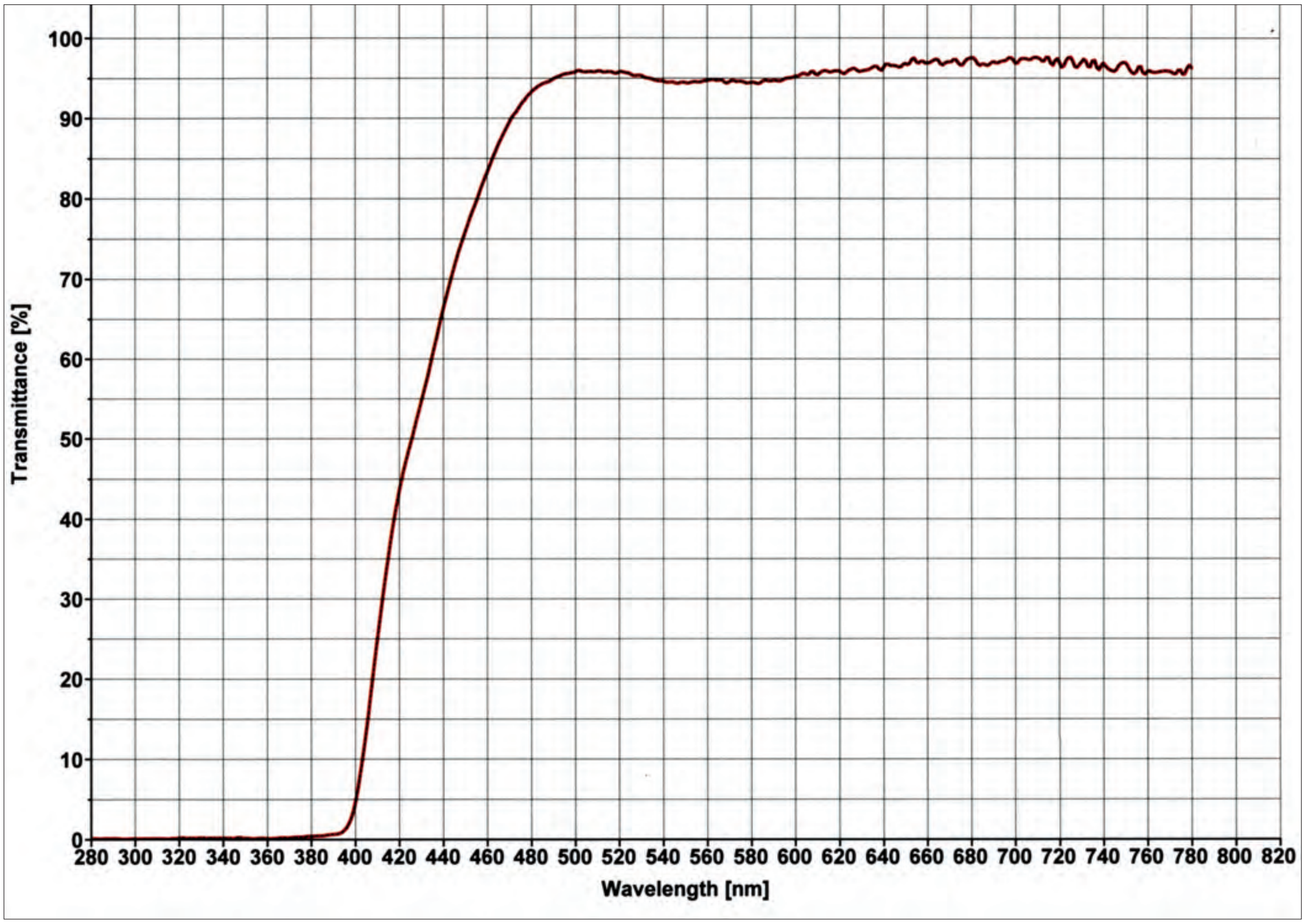


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
398nm	402nm	404nm	94%

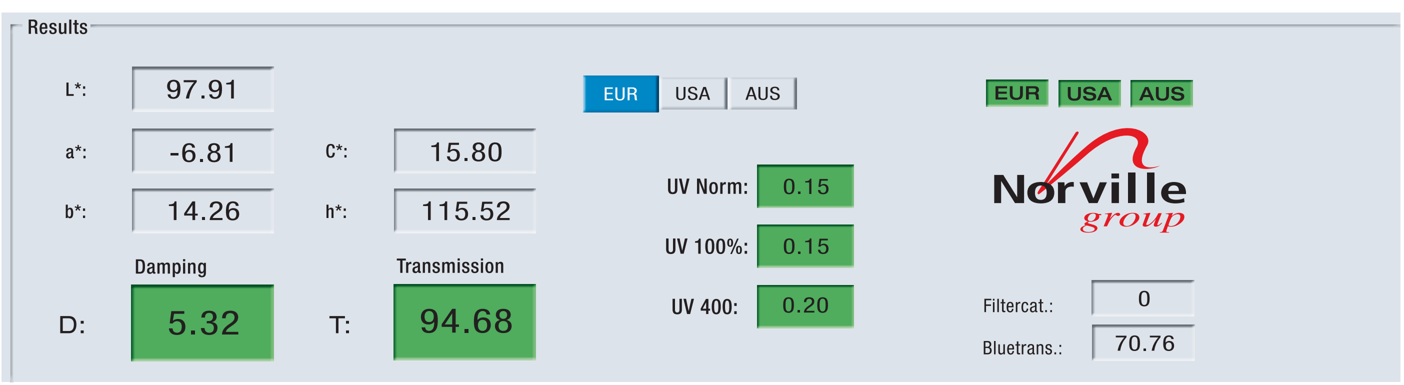


Lens Name
TRIVEX Blue Filter

Centre Thickness
2.0mm



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
394nm	398nm	400nm	95%

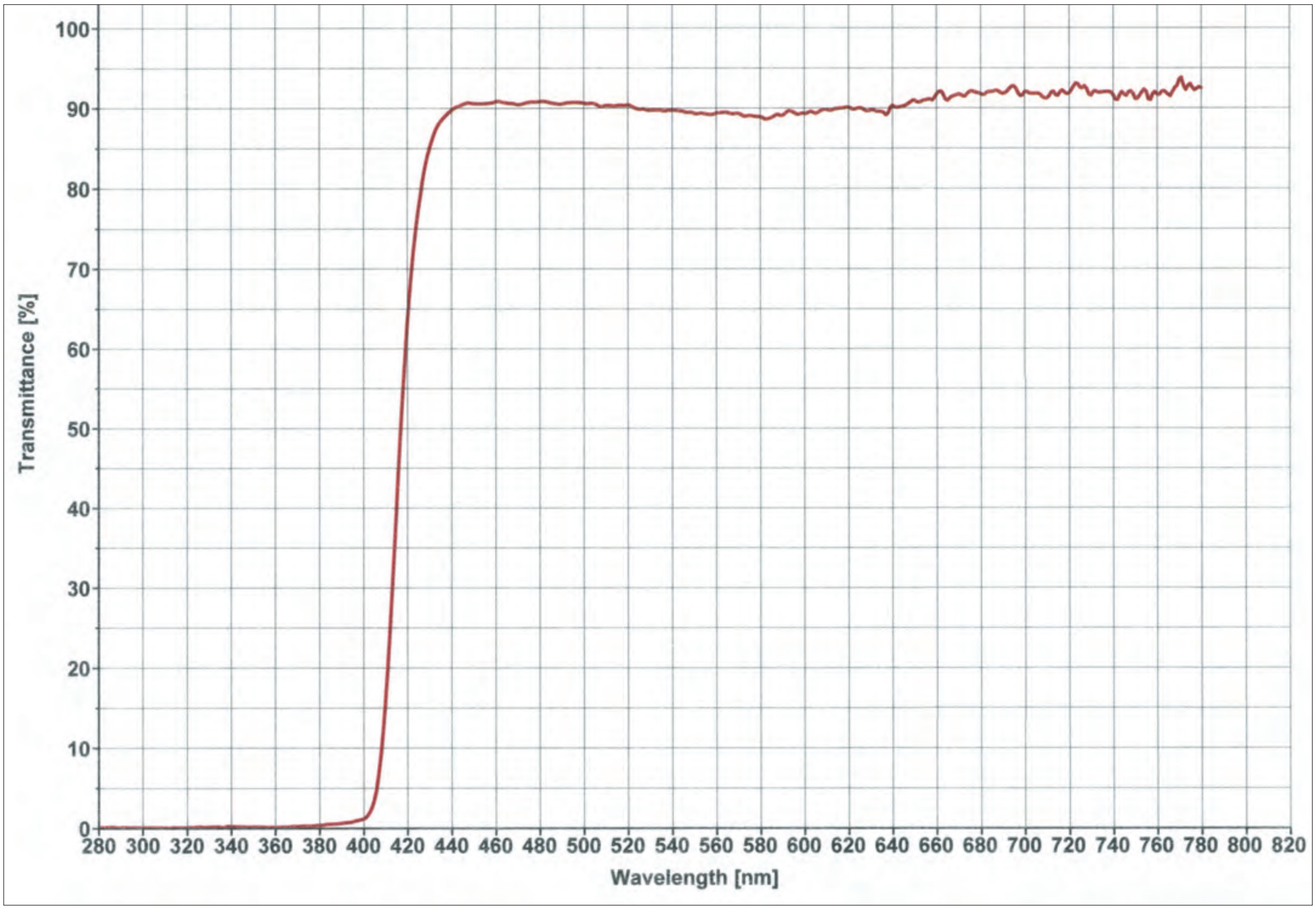


* Comparison Page 22
Regular Trivex

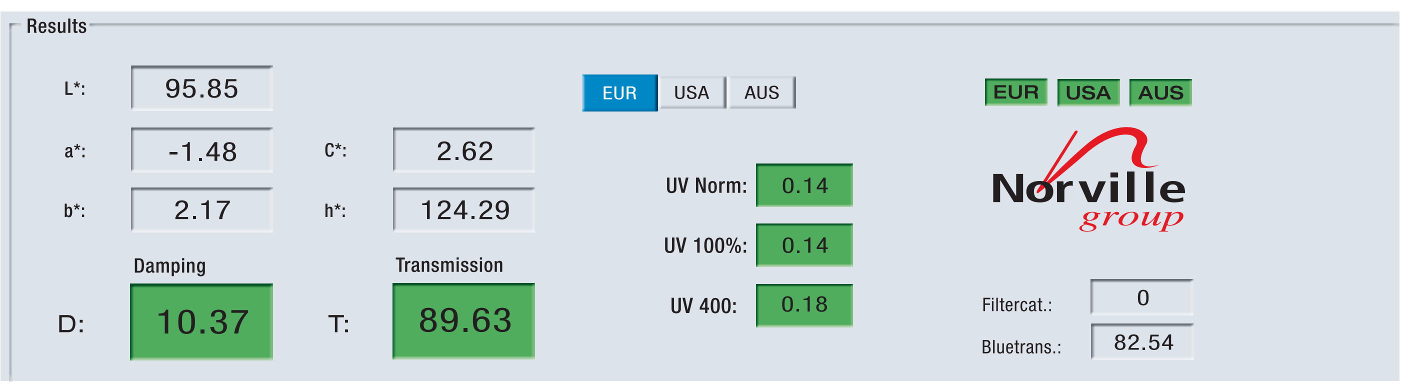
Transmission Curves - Polycarbonate n=1.59 Clear Blue Filter

Lens Name
POLYCARBONATE Clear Blue Filter
Vision-Ease

Centre Thickness
2.0mm



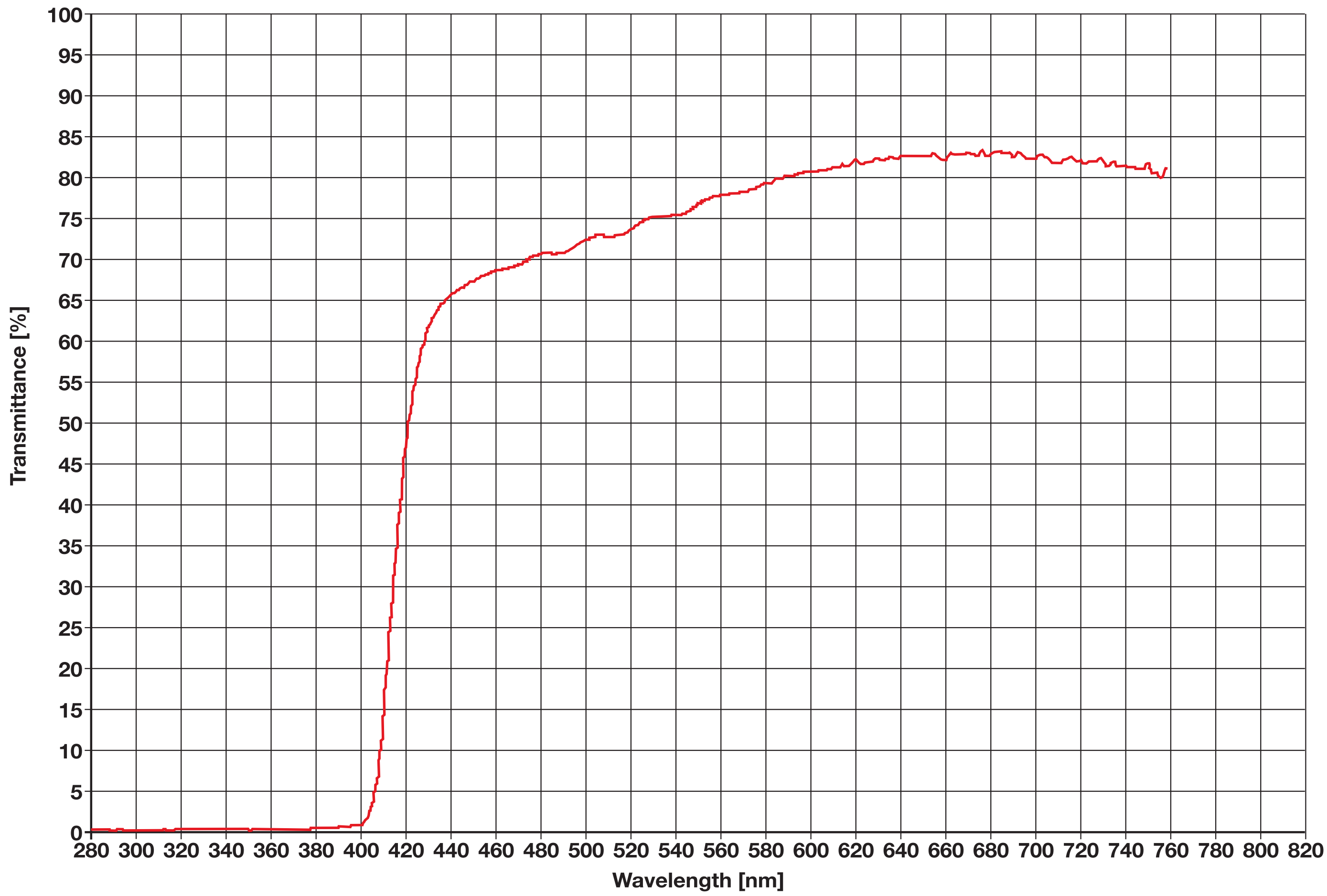
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
399nm	404nm	406nm	90%



* Comparison with Page 19
Regular Polycarbonate

Transmission Curves - BluTech BT66 n=1.56 Blue Filter

Lens Name	Code:	Centre Thickness
BT66 Filter	**BT66**	**2.0mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
406nm	410nm	412nm	87%

Results

L*:	94.71		
a*:	-1.03	C*:	12.16
b*:	12.11	h*:	94.86
Damping		Transmission	
D:	13.06	T:	86.94

EUR USA AUS

UV Norm:	0.13
UV 100%:	0.13
UV 400:	0.15

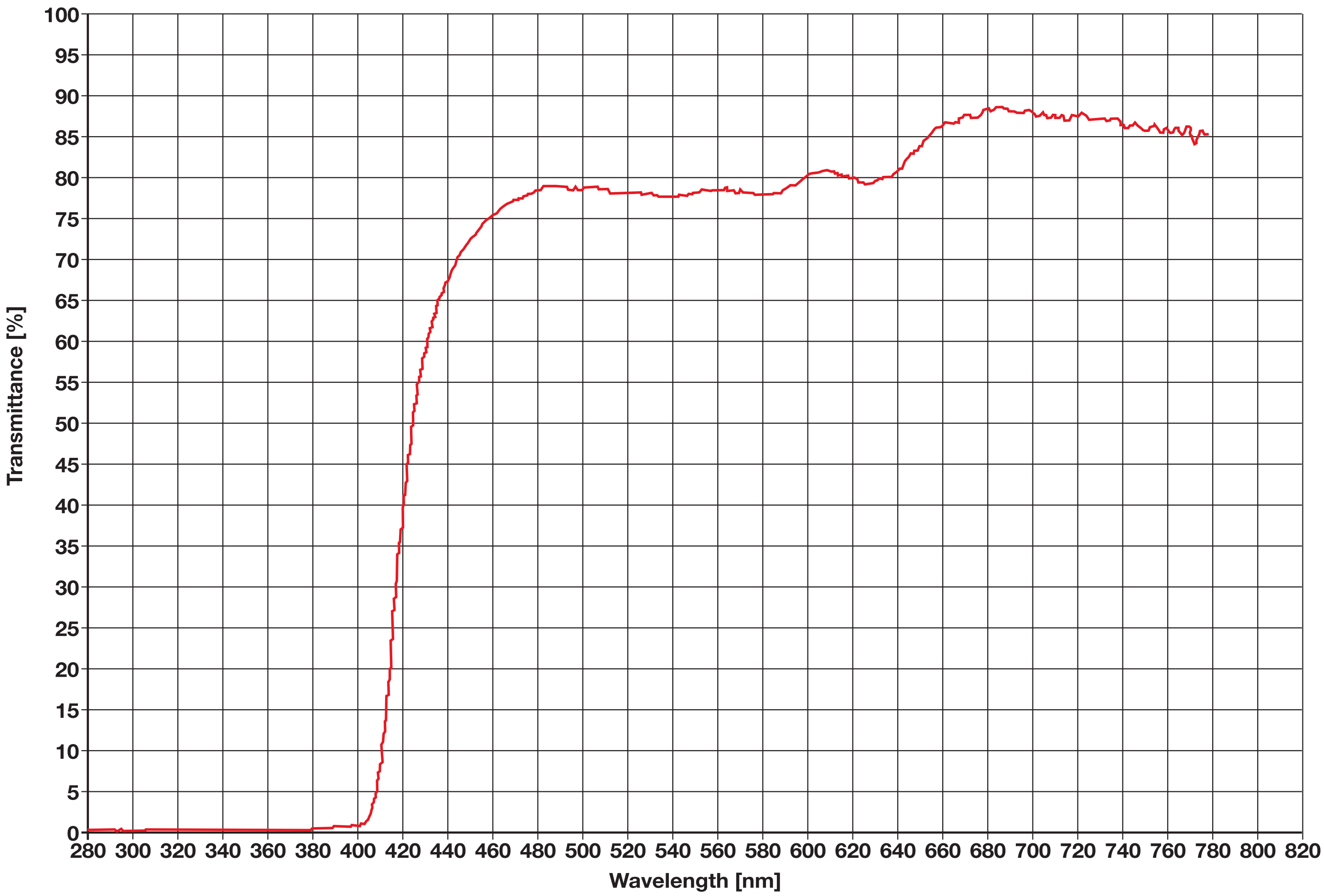
EUR USA AUS

Norville group

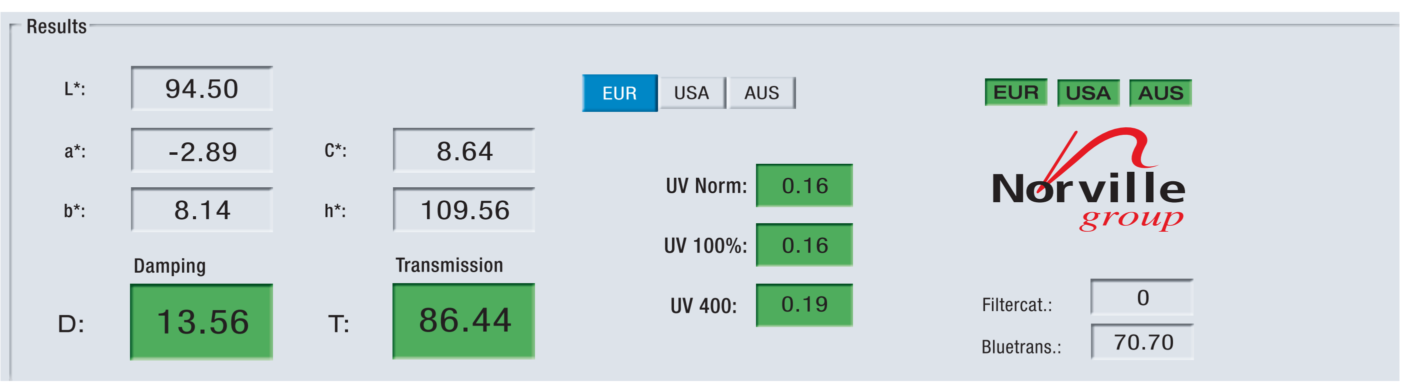
Filtercat.:	0
Bluetrans.:	66.02

Transmission Curves - BluTech BT70 n=1.58 Blue Filter

Lens Name	Code:	Centre Thickness
BT70 Filter	**BT70**	**2.0mm**

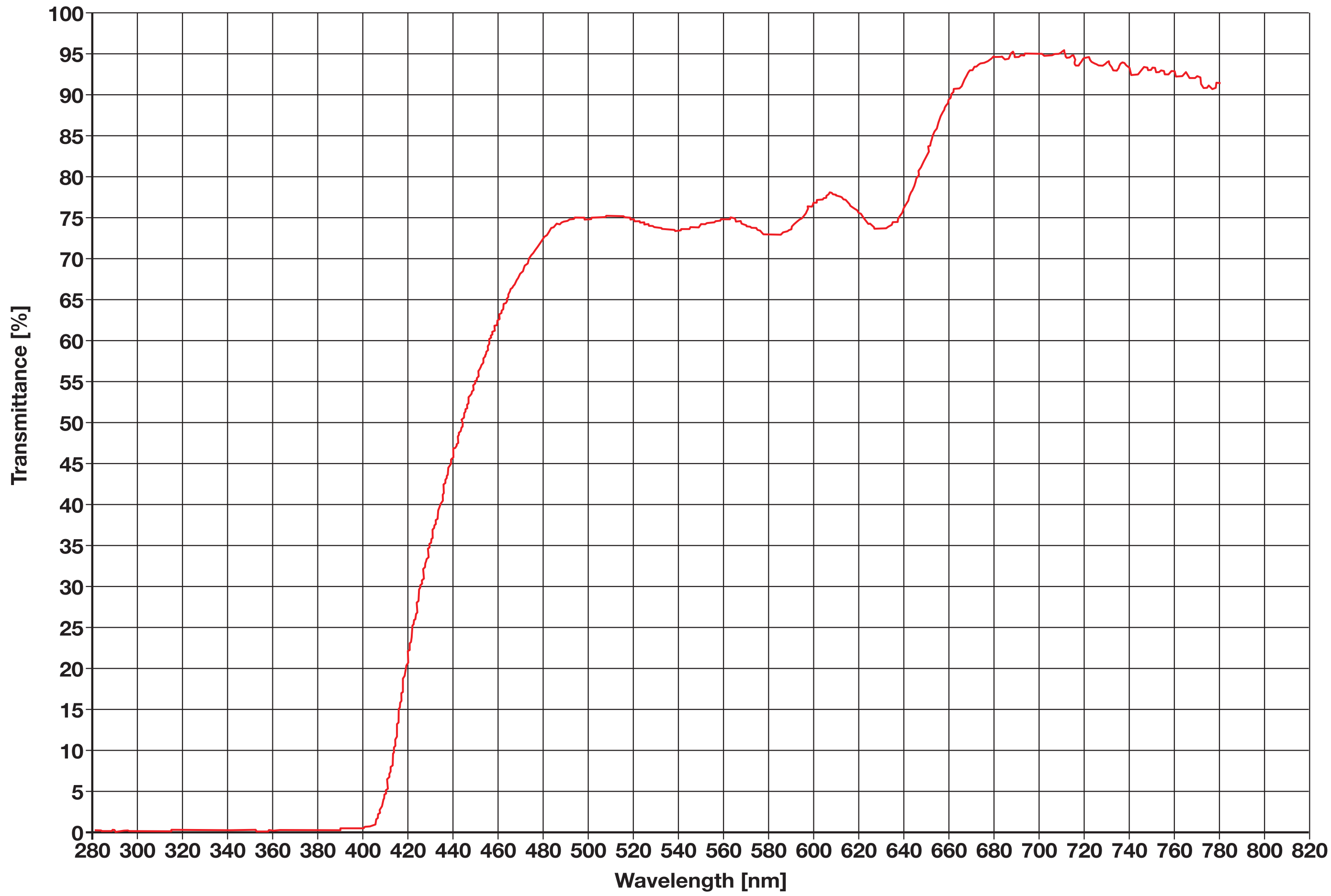


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
402nm	407nm	409nm	86%



Transmission Curves - BluTech BT50 MaxBlink n=1.58

Lens Name	Code:	Centre Thickness
Max Blink	**MULB**	**2.0mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
405nm	409nm	411nm	75%

Results

L*:	89.17		
a*:	-6.77	C*:	18.87
b*:	17.61	h*:	111.03
	Damping		Transmission
D:	25.45	T:	74.55

EUR USA AUS

UV Norm:	0.11
UV 100%:	0.11
UV 400:	0.13

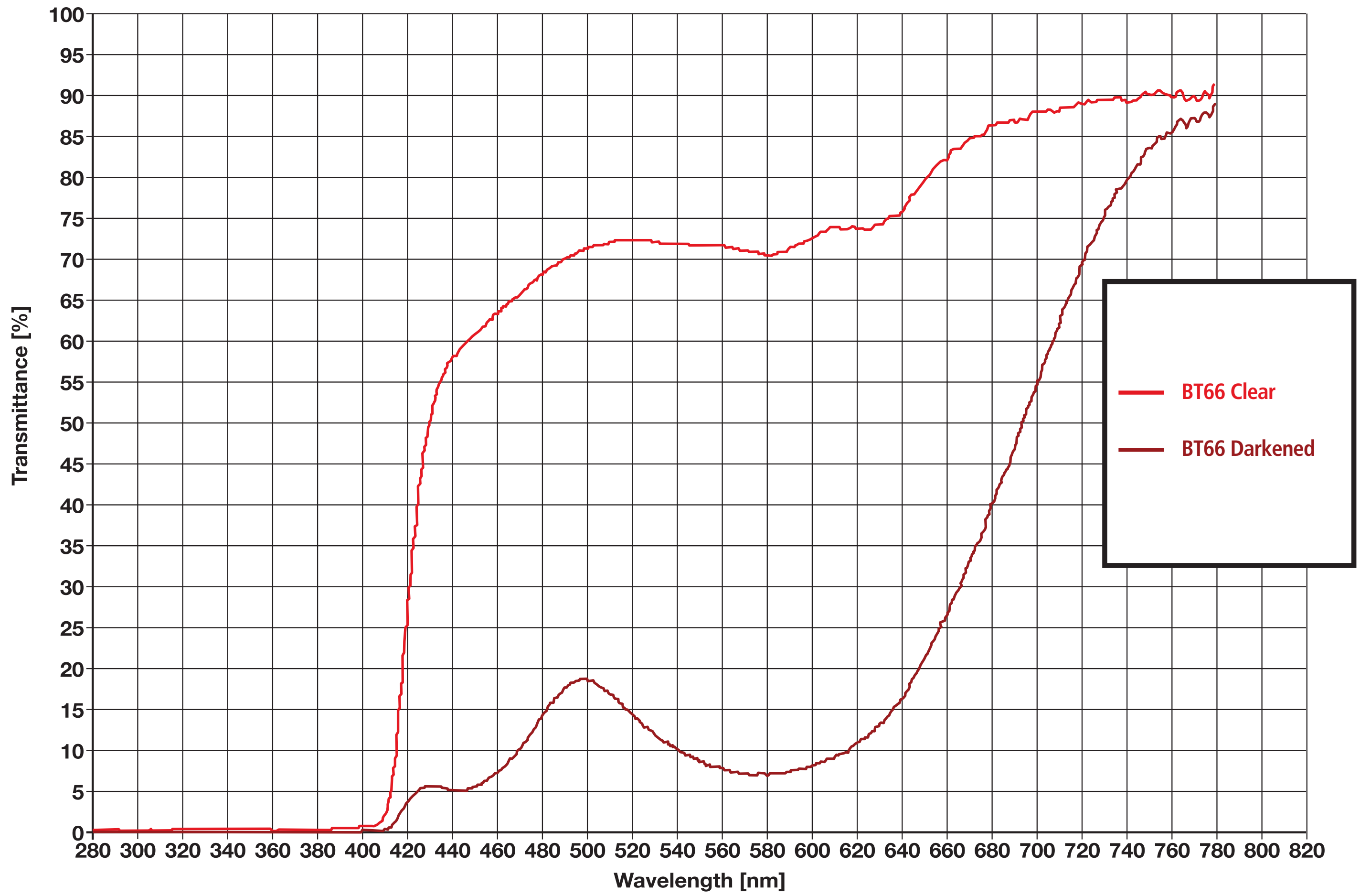
EUR USA AUS

Norville group

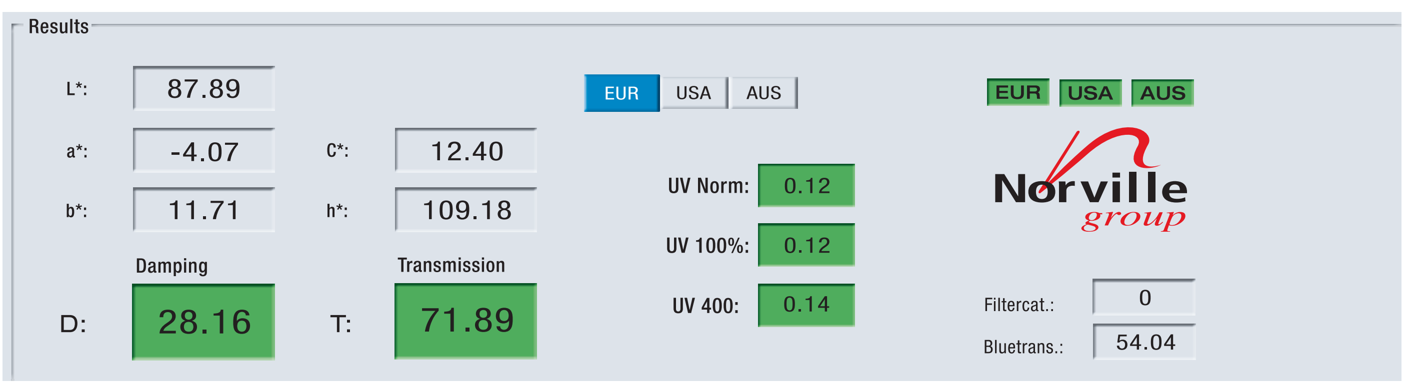
Filtercat.:	1
Bluetrans.:	50.07

Transmission Curves - BluTech BT66 n=1.56 Reactolite Light

Lens Name	Code:	Centre Thickness
BT66 Filter	**BT66**	**2.0mm**



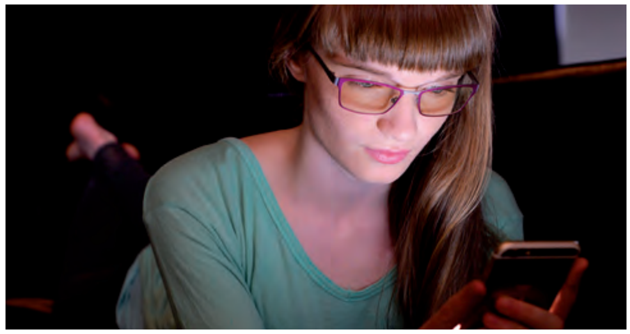
Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
401nm	406nm	408nm	72%



Technology downside

Due to ever-present LED lit electronics we are exposed to an increasing level of harsh blue light day-on-day.
Computer monitors, laptops, tablets, smart phones, LED TVs - even compact fluorescent (CFL) bulbs emit it.

Exposure to constant blue light can suppress melatonin and disrupt natural sleep cycles. It may also lead to eye strain, headaches and blurred vision.



REDUCE INCIDENT BLUE LIGHT*
with Rx lenses that are not blue in colour!

BT70

n=1.58 Emerald MAR Pale Olive colour 86% LT ⊕
Blue transmittance factor - 70.7% 22.3 ABS 380 - 500nm

All wearers everyday use. Especially recommended for night shift workers (always under artificial light), hospital staff etc. Applicable for safety eyewear.

BT66

n=1.56 Emerald MAR Pale Cream colour 87% LT ⊕
Blue transmittance factor - 66.6% 33.4 ABS 380 - 500nm

Full Rx availability. Indoor screen users: children and adults.
Those working in PR, television production, presentation and journalism, trading rooms & stores.
Advantages: POST CATARACT SPECTACLE WEARERS SLEEP IMPROVEMENT ✓

MaxBlink

n=1.58 Blue/Violet MAR Mid Olive colour 75% LT
Blue transmittance factor - 50% 380 - 500nm

CLs have little blue filtering. MaxBlink for extra protection for CL wearers working on screens who feel dry-eye effect building.
Wear afocal MaxBlink over contacts when desk working.

⊕ Data at 2.0mm thickness. Thicker lenses will look darker and transmit less light.

Vista-Mesh (VM)

A unique product that, due to its unusual construction, has the ability to improve the quality and form of light arriving at and travelling into the human visual system.

A product of the printed circuit industry and technology, it is not entirely clear how or why this combination delivers benefits to the visual cortex, but numerous clinical feedback examples confirms this to be the case. Norville is highly indebted to the enthusiasm of Anne Silk *Hon DSc, FRSM, FRSA MIoP* for her unfailing support, when many others have been dismissive.

Vista-Mesh lenses, with their front surface photolithographic mesh, deflect EMR radiations and it is thought light travelling through the grids acquires some plasmonic wavelength patterning that is beneficial to the visual cortex when sequencing vision. This improvement in inter-ocular light scattering reduces visual stress (Meares-Irlen) and is beneficial to migraine and flicker sufferers. It could be said that Vista-Mesh acts as a light comb.

The following Vista-Mesh case studies have been reported and lead us to conclude the beneficial effects of Vista-Mesh extends to:

Night driving	Post Cataract	Migraines
Fluorescent light flicker	Visual Stress (Meares-Irlan)	Special needs reading
Keratoconus	Stroke victim	Photosensitive Epilepsy
Electronic Hypersensitivity (EHS)	Motion sickness	Hay Fever

Individual dispensers may discover other beneficiaries of Vista-Mesh and we welcome feedback.

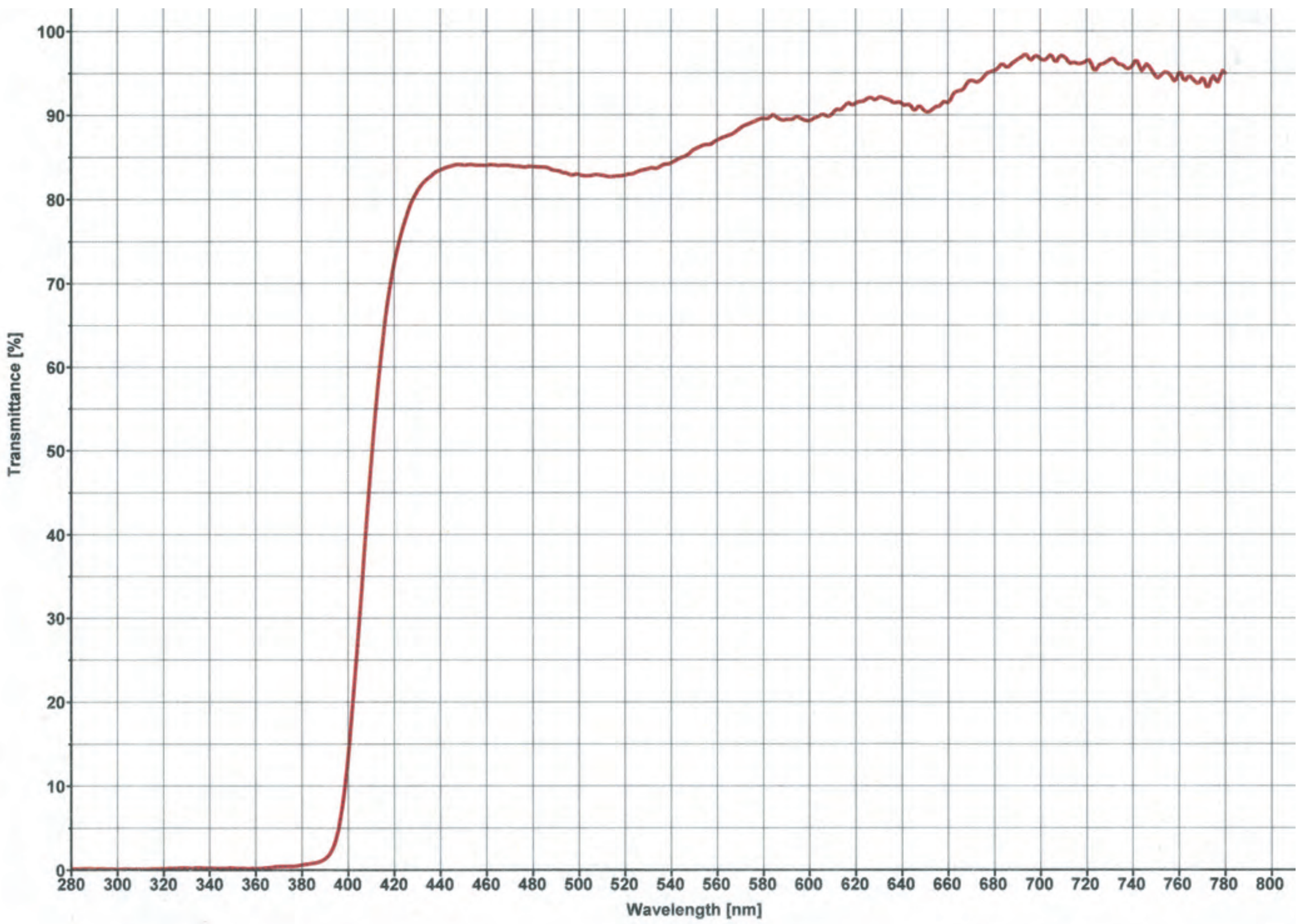
The science of light is at a new threshold, Photonics developing imaging techniques will ultimately play a key role in treating brain related debilitating diseases and conditions, Optogenetics is allowing scientists to selectively control neural activity with pulses of light.

Transmission Curves - Vista-Mesh n=1.56 HMAR

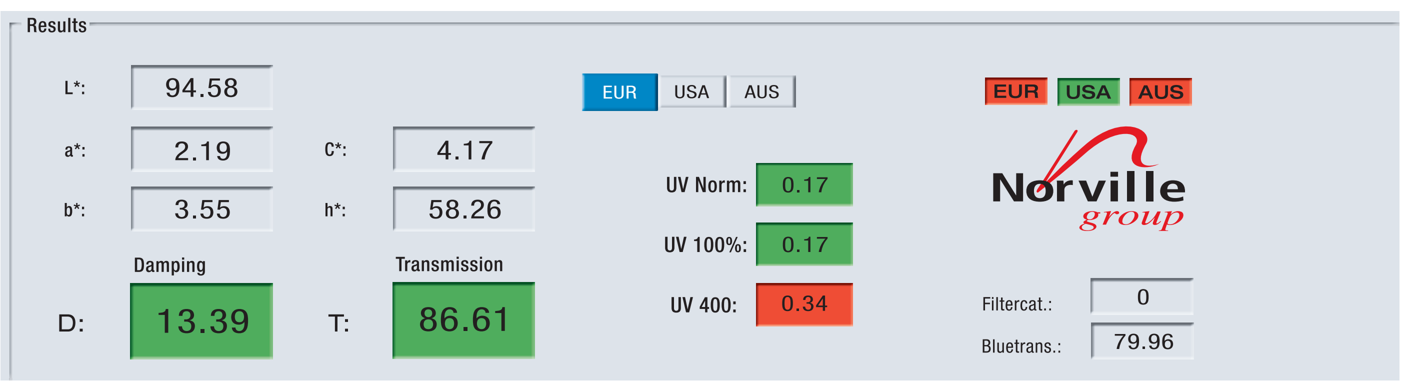
Lens Name
VISTA-MESH HMAR

Code:
MESS

Centre Thickness
2.1mm

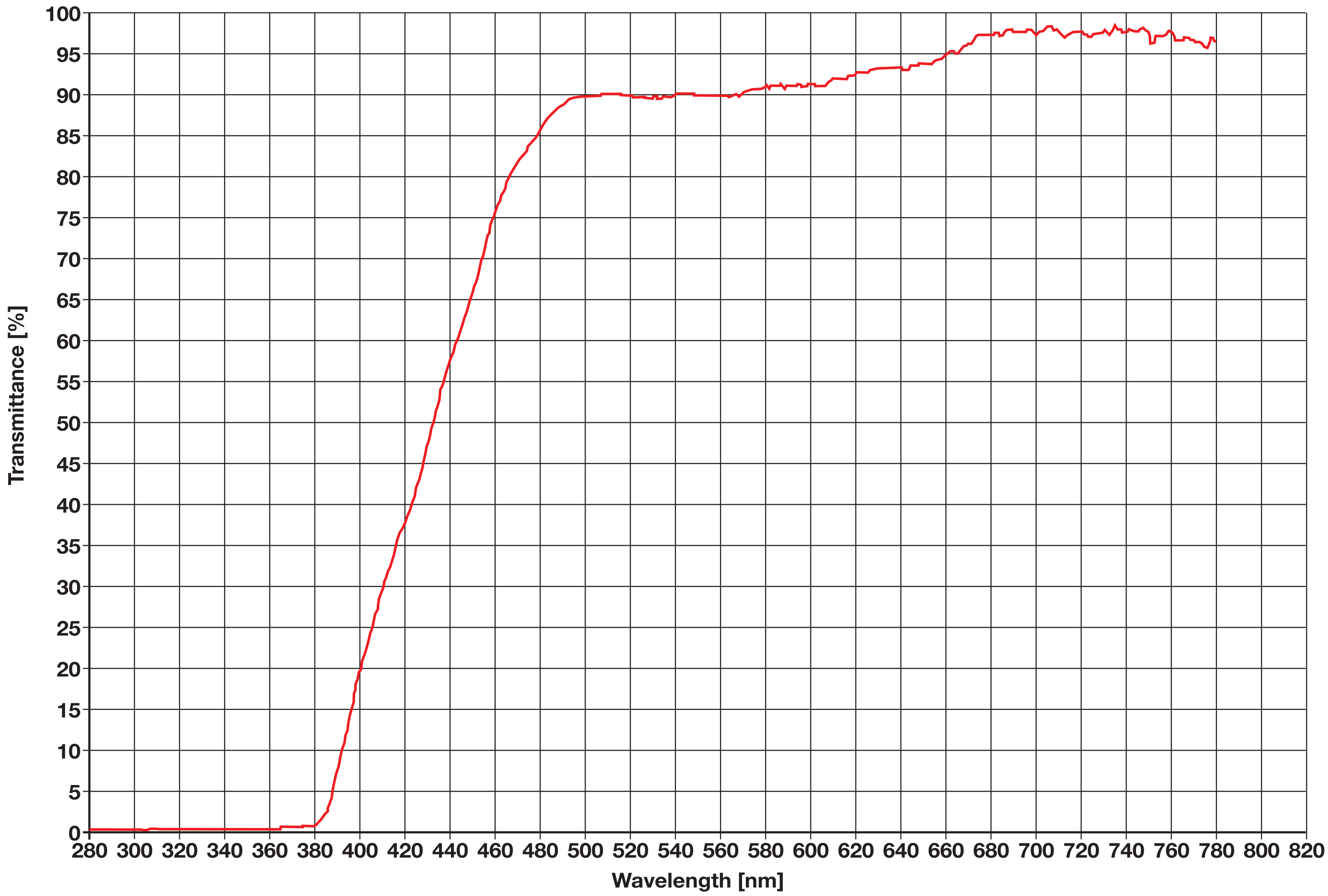


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
387nm	394nm	396nm	87%



Transmission Curves - Vista Mesh Blue Blocker n=1.56

Lens Name	Code:	Centre Thickness
VISTA MESH	**MESS + KBLU Coating**	**2.2mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
382nm	386nm	389nm	89%

Results

L*:	95.96		
a*:	-6.84	C*:	18.79
b*:	17.50	h*:	111.37
	Damping		Transmission
D:	10.09	T:	89.91

EUR USA AUS

UV Norm:	0.18
UV 100%:	0.18
UV 400:	0.63

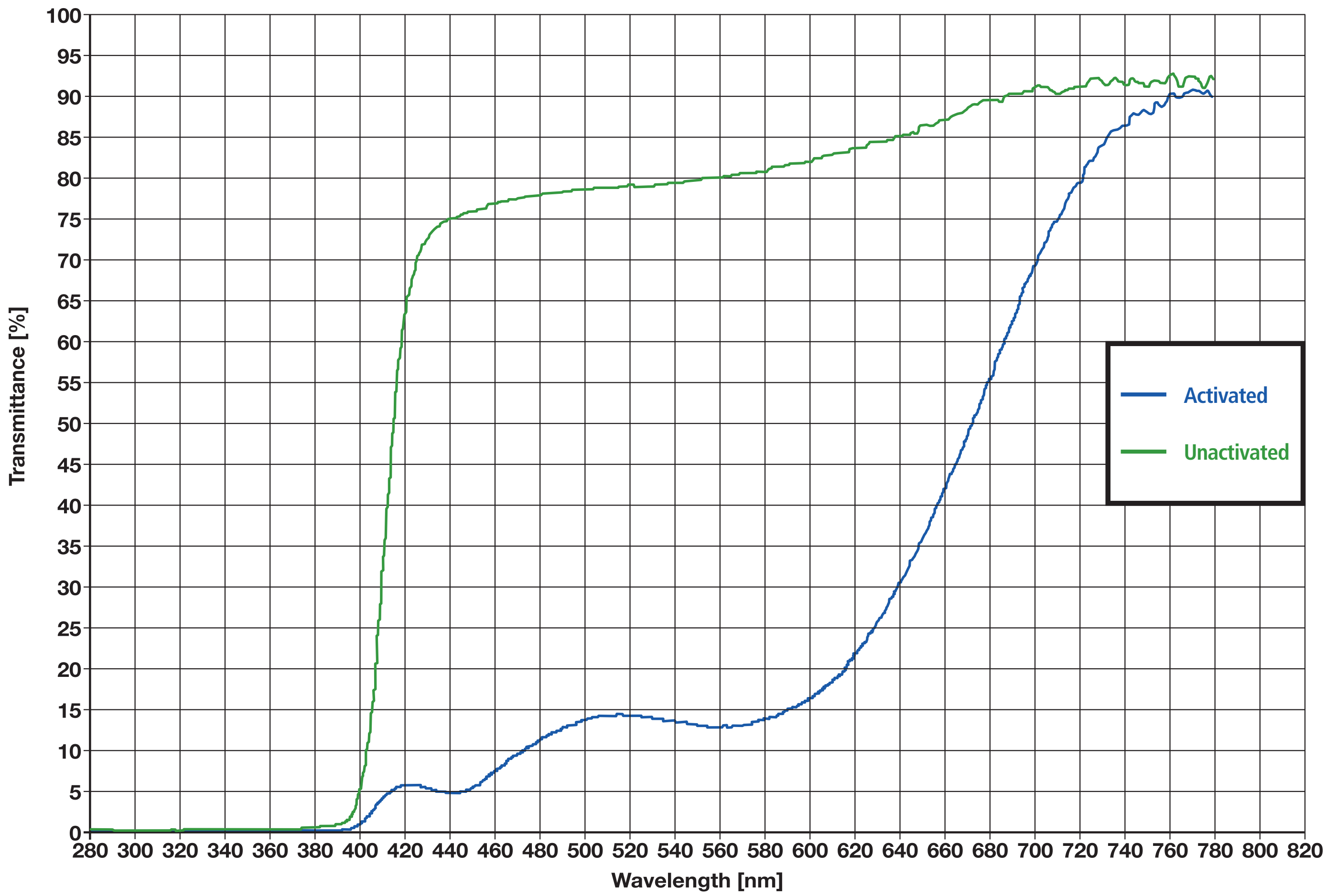
EUR USA AUS

Norville group

Filtercat.:	0
Bluetrans.:	63.35

Transmission Curves - Vista Mesh Reactolite n=1.56

Lens Name	Code:	Centre Thickness
VISTA MESH	**MESS + RB15**	**2.2mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
400nm	407nm	414nm	80%

Results

L*:	45.57		
a*:	7.46	C*:	23.39
b*:	22.17	h*:	71.39
	Damping		Transmission
D:	85.04	T:	14.96

EUR USA AUS

UV Norm:	0.05
UV 100%:	0.05
UV 400:	0.06

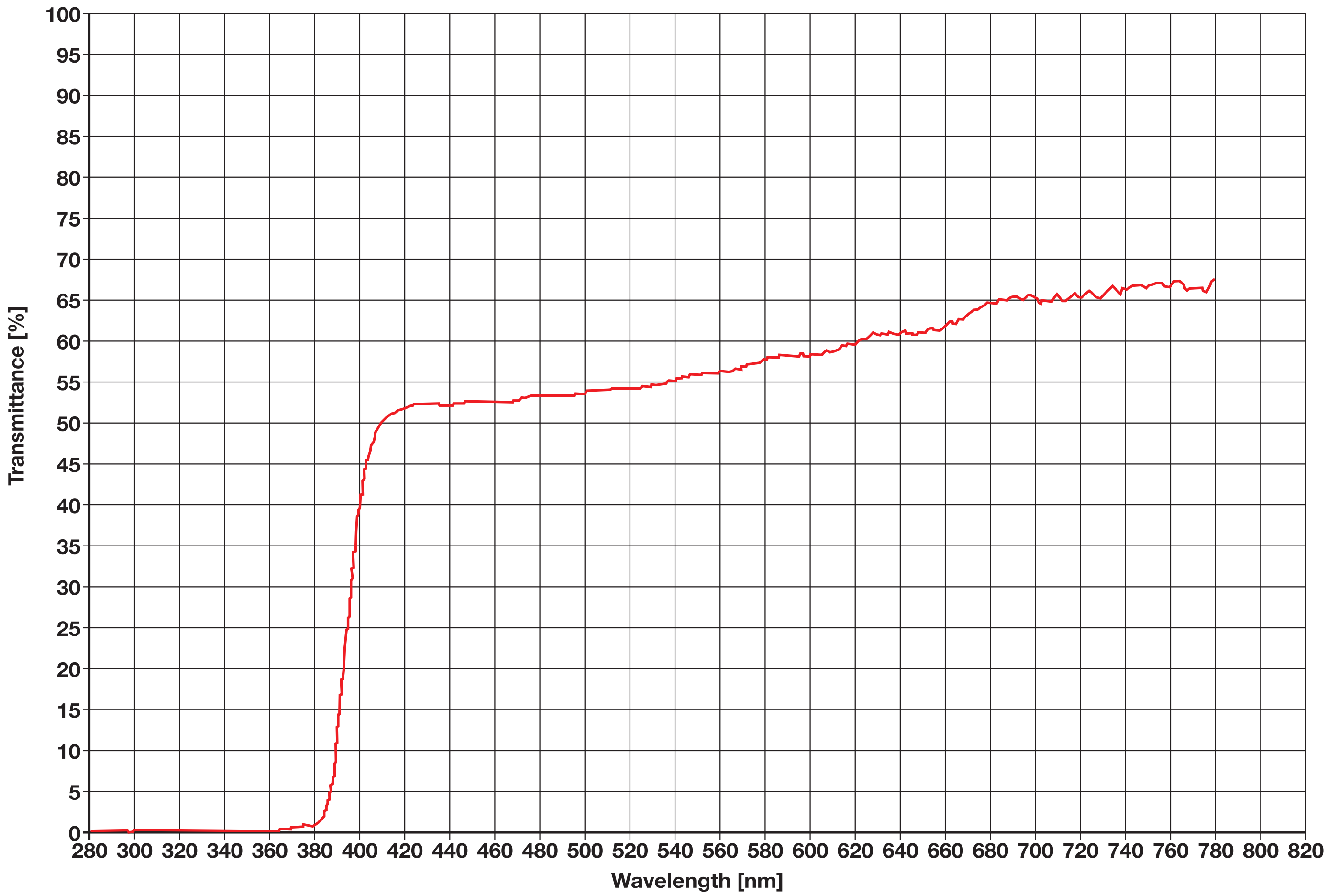
EUR USA AUS

Norville group

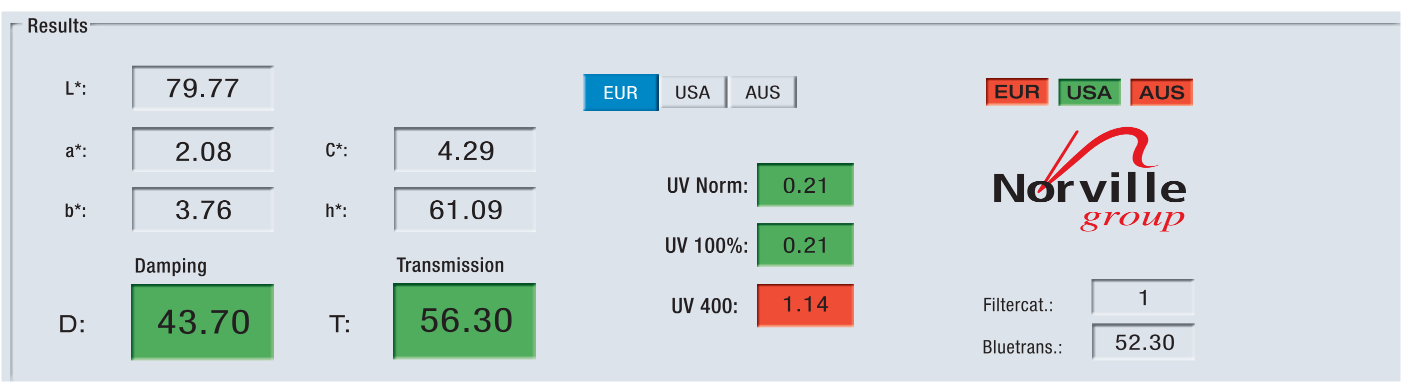
Filtercat.:	3
Bluetrans.:	7.00

Transmission Curves - Vista Mesh Silver Mirror n=1.56

Lens Name	Code:	Centre Thickness
VISTA MESH	**MESS**	**2.9mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
381nm	384nm	387nm	56%



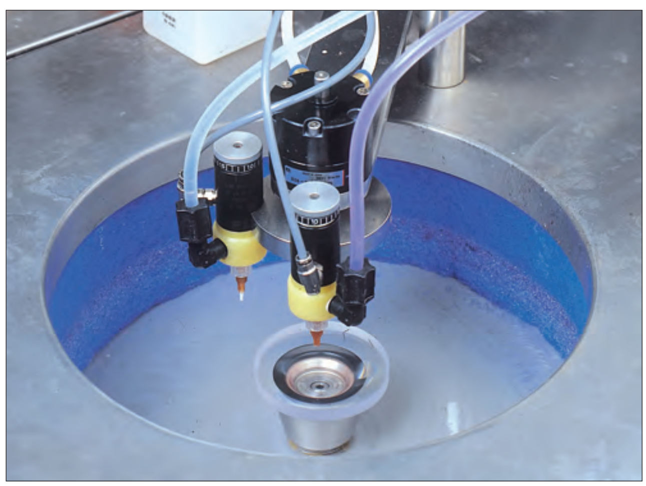
UV400 CR39 Lenses

With the exception of regular CR39 and glass material most of today's ophthalmic lenses absorb up to 395nm. This improvement from the rather low 280/300nm of non-treated CR39 can be achieved by the addition of expensive UV absorber at the time of monomer casting. Some manufacturers find this an avoidable expense. In those early days when CR39 was the only popular resin prescription houses increased the UV grade of CR39 lenses by the use of UV dye hence the term UV 400 process. A process not dissimilar to lens colour tinting i.e. immersing the lens in UV dye for a period of time. For 2018 Norville provide a CR39 stock lens range inclusive of UV absorption (UV400).

Hardcoating All Resin Materials

All resin ophthalmic lenses have a softer surface than glass. This can only be improved, although still not reaching the level of glass, by dipping or spin application of a lacquer hard surface coatings. This is a complex process in time, chemicals, checks and controls. In an ideal world the hard coat material should be exactly matched to the refractive index of the substrate lens but this could result in the need for many multiple coating variants. So in reality 1.50, 1.60 and 1.59 are used to cover all the indices leaving 1.74 and 1.76 requiring future attention. Hard coating material can also be designated tintable or non-tintable. It has long been considered for the latter to be the preferred option as it may be a better substrate for subsequent RF coating process. Another holding option that immediately doubles those lacquer stocks needed. Further compilations are the process option of dipping or spinning as this again requires entirely different chemicals. Dipping by its nature treats both sides of the lens simultaneously whilst spinning just one, usually the concave. Following these options the front (semi-finished) surface has already previously been front hard coated. This may not be a complete solution as some manufacturers only supply that which suits their own manufacturing supply lines. Hard coating is the area high on the list of the most challenging and demanding for an Rx house to operate and control. Hardcoat prescription service started with a spin process then moved to dip lines yet today the pendulum appears to be swinging back to spin coating on a process termed "on the block application" where immediately post lens polishing and prior to de-blocking the lens can be automatically spun with a back surface hard coating prior to the reflection free coating process.

A. Dip Hardcoating Unit



B. Spin Hardcoat application - Concave surface

Anti-fogging Lenses Trivex,1.59 Poly,1.60,1.67

Advances in chemical technology has improved the process resulting in a more durable outcome; however it still remains currently impossible to co-join AF with RF (AR) which appears an unsurmountable "oil and water" combination. Only recently has AF been able to combine with hard coat although still only achievable mostly on Trivex , polycarbonate and higher index lens materials.

Reactolite® Photochromic All lenses except n=1.74

The application of photochromic properties to a lens has always been challenging, the original Bestlite glass material was a total mixture whereby every layer of material was photochromic. This did give the disadvantage that it was not an equitint product so when high powered lenses were produced they included darker centres or edges depending whether plus or minus powers. When CR39 photochromic came along this was produced as a thin top layer of photochromic properties seeded onto a white base. Some products were made with a photochromic wafer laminated to the front surface of a white lens. Many further attempts were made to deposit photochromic properties by vacuum but this was not successful although in theory the better outcome. An alternative process was by using photochromic Hardcoat lacquer this as all the others has disadvantages against advantages but by dipping both sides can be simultaneously photochromic coated. However the speed of removal from the material can change the darkening lightening features as also excessive curvature, it never was an easy process. However Norville believe their R&D work has resulted in a successful return of Reactolite® a British photochromic product.

Anti-static All lenses

Available as an additional layer in the RF coating "stack" as is

Hydrophobic top coat

Hydrophobic and Oleophobic top coating the final process of the lens layer vacuum coating process stack (see page 103)

Lens Tinting - Resin

Most resin lenses can be tinted (coloured) in a range of densities
See pages 66 onwards

Lens Tinting - Glass

Small availability of tinted glass material, wider range achieved by vacuum tint processing - See pages 93/97/98

Just because a lens is tinted, it doesn't follow that it will be a good UV absorber. In fact, it could be visually more dangerous wearing a very dark lens than one completely clear. This is explained by the fact that a dark low transmittance lens, say 15% LTF, causes the wearer's pupils to enlarge with the potential to allow even more UV light into their eyes! All tinted lens suppliers should be able to supply a Transmission chart showing individual absorption characteristics of particular tints. Assessment of the charts will show the UV cut-off point and how other parts of the visual spectrum are altered. Lens transmission charts can often seem rather bland, so for a more interesting plot see page 85, NEO

You will perhaps believe that resin lens tinting is simple and straightforward; unfortunately this is not so. A simplistic view is that all it involves is dunking lenses in hot dye water. Quite the opposite, two lenses simultaneously put in the same dye for the same duration will not emerge with identical colours! Lenses of different 'ages', different thicknesses or from different manufacturers all take up the tint dye at varying rates. These complications apply before you even consider hard coated lenses and differing index lenses. Some lenses tint in 3 minutes for light colours, but very dark hues may take up to 3 hours. One half of every pair will need its colour finely "tuned" to exactly match its twin.

This is where the tinter's skill comes into play, when deciding which colour "dip" is needed to perfect the match, or if just a quick visit to the neutralizer pot is enough. This is reasonably manageable with CR39 resin, but hardcoated and other materials bring new concerns. Polycarbonate, for instance is tintable, but only its micron thin outer hard coat; there is a limit to how dark a tint this layer can absorb. This is why many high index materials can only be tinted to 60% LTF. To achieve darker in polycarbonate we need to start with a pre-tinted base material, then add extra tint to its own hard coat layer.

Always remember colour is a very subjective process for different eyes and brains. Some will often say "that brown has too much red" which another person cannot perceive. Another area of potential strife is when an RF coating is applied over a tinted lens. It can change the transmission characteristics by 8% as well as the perception of colour, particularly so on lighter hues, e.g. B80. The best way around this is also to have some RF coated colour samples amongst your other demonstration lenses. Finally the greatest challenge is that samples of say five or more years old, especially if exposed to sunlight, will bleach out.

If you are looking for a critical colour match either send your sample and a colour match or keep your samples fresh i.e. less faded with time!

Regulations.
Under CEN regulations it is necessary to classify tint densities by a filter category number based on the transmission characteristics of the lens as defined by BS EN ISO 8980-3 : 2013. There are five categories under the "Sunglare Filters" classification

Transmittance Range LT %	Description	Usage	Restrictions	Filter Category
Clear 100 - 81	Clear or very light tint	Comfort, indoors, cosmetic	None	**0**
80 - 44	Light tint	Low sunlight	Not suitable for night driving	**1**
43 - 19	Medium tint	Medium sunlight	Not suitable for night driving	**2**
18 - 9	Dark tint	Bright sunlight	Not suitable for night driving	**3**
8 - 3 Dark	Very dark tint	Very bright sunlight	Not suitable for any driving	**4**

The end wearer should be informed as to which category their tinted lenses come under and any usage/ restrictions that may apply.

Drivers should not at any time be using lenses where the transmission is less than 8% (i.e. very dark), or the lens colour has an unacceptable traffic signal recognition. For night driving a minimum of 75% LTF is required.
See Pages 97 and 98 for Glass tints.

Reference *Further reading: "Tinted Lenses" section 7 Ophthalmic Lenses and Dispensing by Mo Jalie*
Abi Grute Dispensing Optics April '04

Mid and High Index Resin Tintability

Like any new species, those higher index ophthalmic materials tend to be fragile “plants”. Many can only prosper due to the fact that they are wrapped in sophisticated and advanced coatings. All that brings some remarkable benefits - extra thin substance 1.0mm at the centre, only possible due to the complex stiffening chemistry of their “outer coats”, resulting in a final lens as durable to standard CR39 at 2.0mm centre thickness.

Many of these lenses achieve excellent “natural” UV absorption without further treatment at the Rx house. Whilst standard glass sits at just 300nm cut off, many mid and high index resins come in at a full 380nm, even 400nm.

One of the challenges is to recall which can and cannot be subsequently tinted. Depending upon the chemical make-up of the lens and the semi-finished manufacturer’s application or type of hardcoating, the ability of the lens to be tinted will vary. Does the material substrate itself encourage a tint? For example CR39 material is hungry for a tint where polycarbonate is not. It’s only the hardcoat on polycarbonate that is tintable but putting a tintable hardcoat onto Trivex is of little help.
Yes, it does tint but some of the Trivex substrate takes up the tint whilst nearby areas do not, hence patchy outcomes. Index n=1.60 & 1.67 materials do take a colour.
Below we have listed guidelines as to tint / density availability. These are general guidelines and are subject to change as material specifications advance.

Lens Material/Type	Full Tint	Graduated Tint
Transitions Photochromic in all indices Sunsensors	No	No
All MAR coated lenses (only pre-coating)	No	No
15% LTF NuPolar Polarised	No	No
35% LTF NuPolar Polarised	Yes	Yes
Standard Resin 1.498	Yes	Yes
Trilogy 1.53	No Pre-tinted Semi-fin Only	No Pre-tinted Semi-fin Only
Polycarbonate 1.59 Stock Lenses Surfaced Lenses	Up to 20% Transmission Up to 20% Transmission	No No
Norlite 1.60	Up to 20% Transmission	No
Tribrid 1.60	Up to 20% Transmission	No
Norlite 1.67	Up to 20% Transmission Grey, Brown, Green	Up to 20% Transmission Grey, Brown, Green
Norlite 1.74	Limited Lens Types Up to 20% Transmission Grey, Brown, Green	Limited Lens Types Up to 20% Transmission Grey, Brown, Green

LT v ABS (Luminous Transmission v Absorption).

A great problem arises from those practices who are using “continental” tint samples and forget their codes are in lens absorption and not transmission percentage, i.e. 20% ABS is a light tint whilst 20% LT is the exact opposite, very dark.

The conventional and established UK style of ordering tints is by LT, Luminous Transmission i.e. Norlite B80 is the LT%, 20% of the light being absorbed by the tint with 80% being transmitted (a light tint). If in doubt always use the letters LT or ABS after the tint code - this will alert lab staff. International optical standards are recommending the adoption of the UK LT system, so many will eventually need to change from ABS codes.

All UK lenses are Light Transmission LT, NOT Absorption, ABS. Be Warned!

	GREY GR	BROWN BR	GREEN GN	ATLANTIC AT	ORCHID OR (NEW)	LILAC Lilac	MAGENTA Purplish Red	INDEX
PALE	GR80	BR80	GN80	AT80	OR80	L80	M80	*CR39 1.50 1.53 - 1.67 1.74* *Where 1.74 tinting is available - see pages 95 - 101 Norville Ophthalmic Lens Catalogue 2018
LIGHT	GR60	BR60	GN60	AT60	OR60	L60	M60	
MEDIUM	GR40	BR40	GN40	AT40	OR40	L40	M40	
SUN	GR15	BR15	GN15	AT15	OR20			

	DOVE Grey	BLACK Balanced	GREY Grey	BROWN	HAZEL Warm	VERONA Green Brown	INDEX
PALE	D80	N80	G88	B80	H80	V80	*CR39 1.50 1.53 - 1.67 1.74* *Where 1.74 tinting is available - see pages 95 - 101 Norville Ophthalmic Lens Catalogue 2018
LIGHT	D60	N60	G75	B65	H60	V60	
MEDIUM	D40	N40	G40	B35	H40	V40	
DARK	D20	N20	G33	B25	H20		

All meet 2015 traffic signal recognition requirements   Numbers quoted = Lens transmission (LT) %

GRADUATED RESIN TINTS

NEW

Please note: Grad tints not available on Polycarbonate

	GR	BR	GV	AT	GO	INDEX
MEDIUM	GG60	GB60	GV60	GA60	GO60	CR39 1.50 1.53 - 1.67 1.74* *Where 1.74 tinting is available - see pages 95 - 101 Norville Ophthalmic Lens Catalogue 2018
DARK	GG20	GB20	GV20	GA20	GO20	

* All CR39 1.50 index lenses with an L.T.F. of 35% or less will automatically be supplied with a UV400 block, add £2.50

SPECIAL NOTE: Specifying RF coating will alter the reflex colour(s)

Norlite Tint Transmission Charts

The following pages exhibit the transmission graphs for Norlite tints, remember all data stated is LT.

Mono Resin Tints - Brown BR

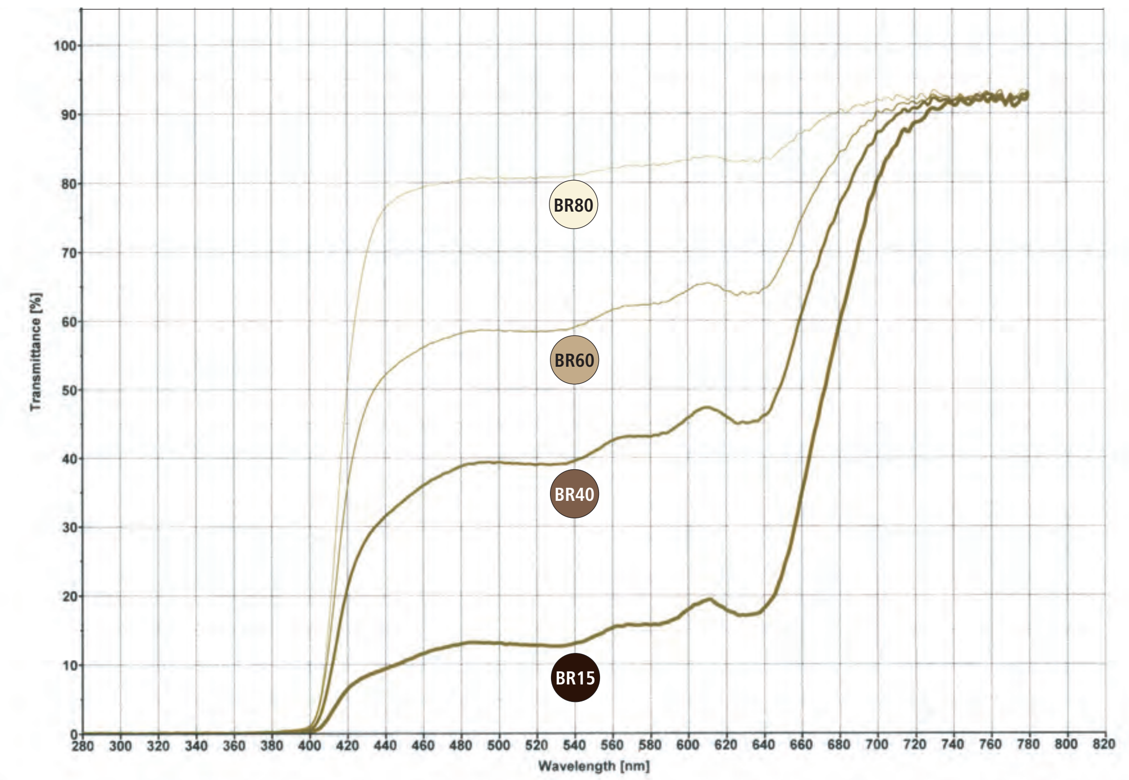
Tint Code

BR 80%
Cat 1 Filter

BR 60%
Cat 1 Filter

BR 40%
Cat 2 Filter

BR 15%
Cat 3 Filter



Mono Resin Tints - Grey GR

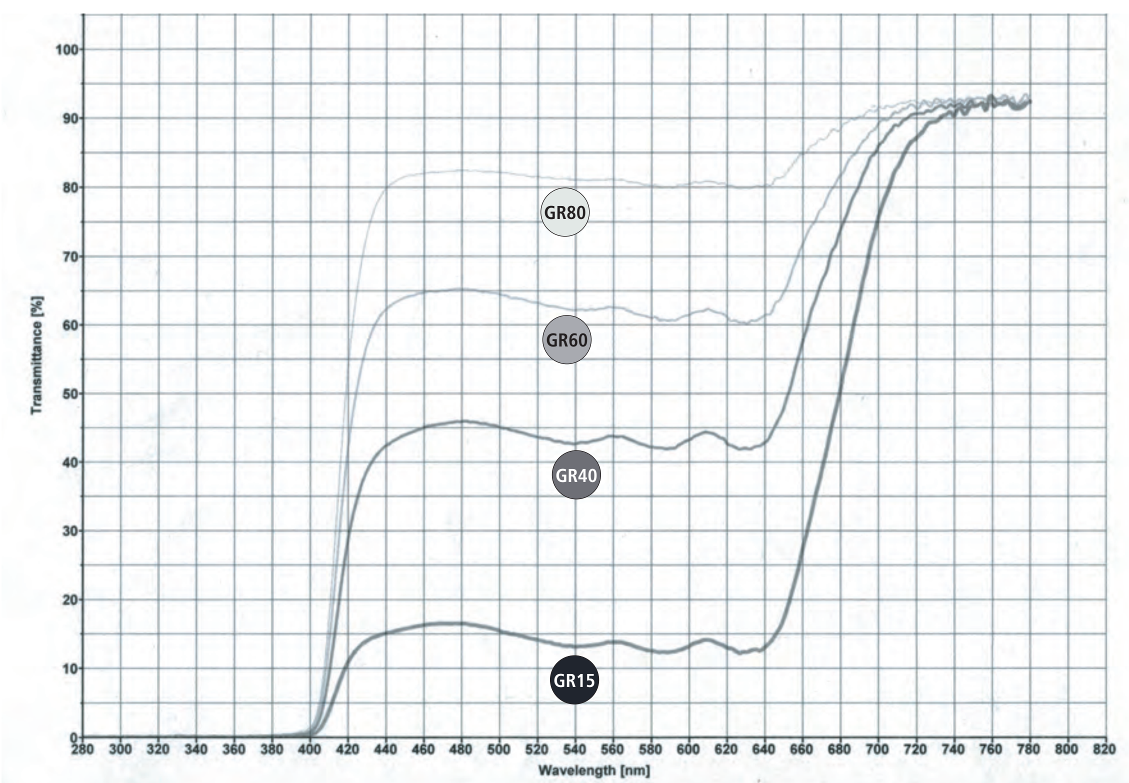
Tint Code

GR 80%
Cat 1 Filter

GR 60%
Cat 1 Filter

GR 40%
Cat 2 Filter

GR 15%
Cat 3 Filter



Mono Resin Tints - Atlantic AT

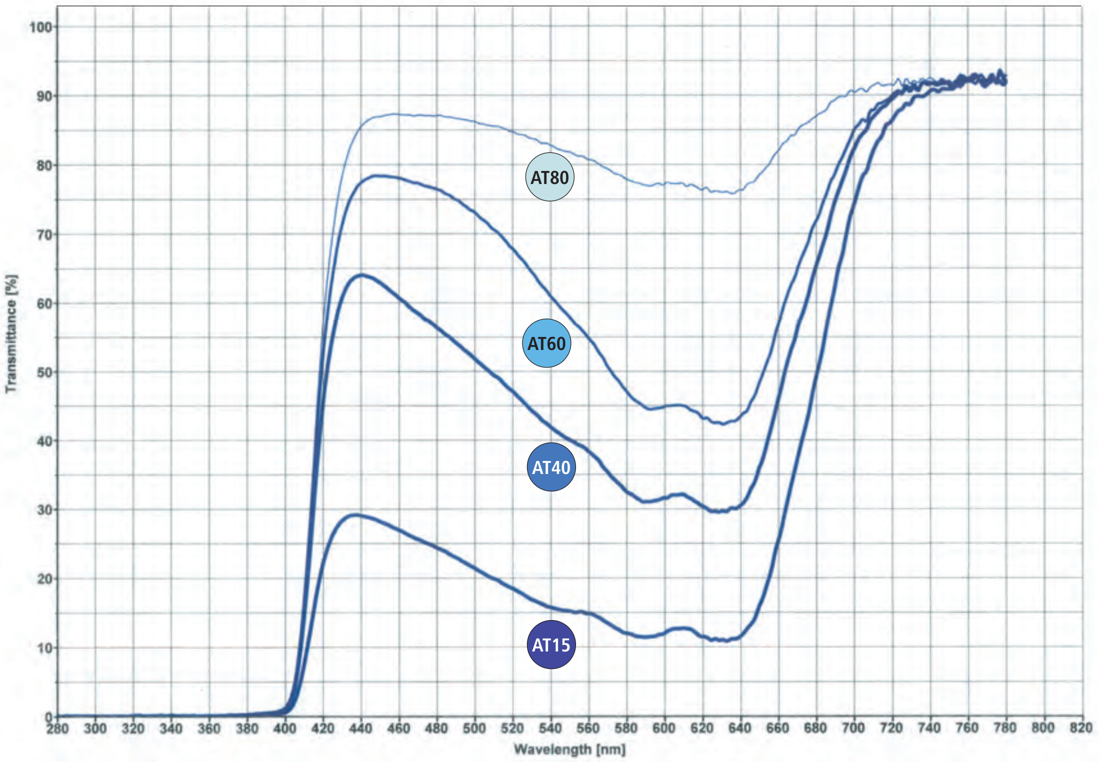
Tint Code

AT 80%
Cat 1 Filter

AT 60%
Cat 1 Filter

AT 40%
Cat 2 Filter

AT 15%
Cat 3 Filter



Mono Resin Tints - Green GN

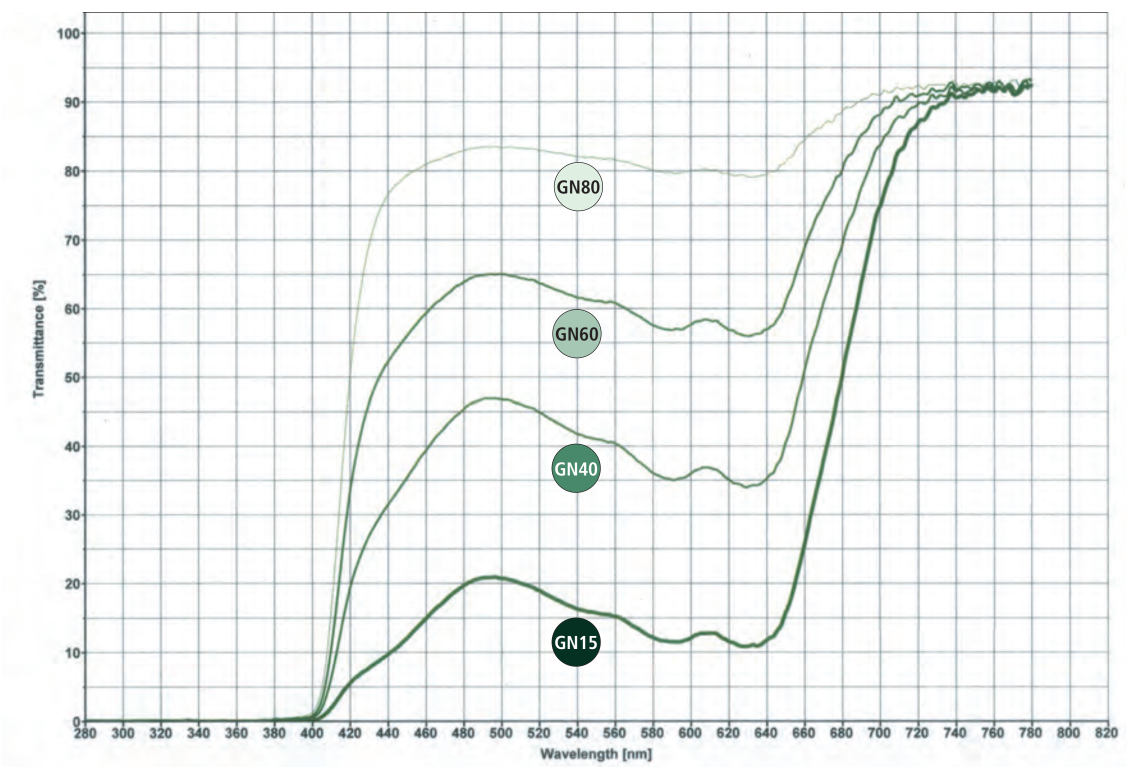
Tint Code

GN 80%
Cat 1 Filter

GN 60%
Cat 1 Filter

GN 40%
Cat 2 Filter

GN 15%
Cat 3 Filter



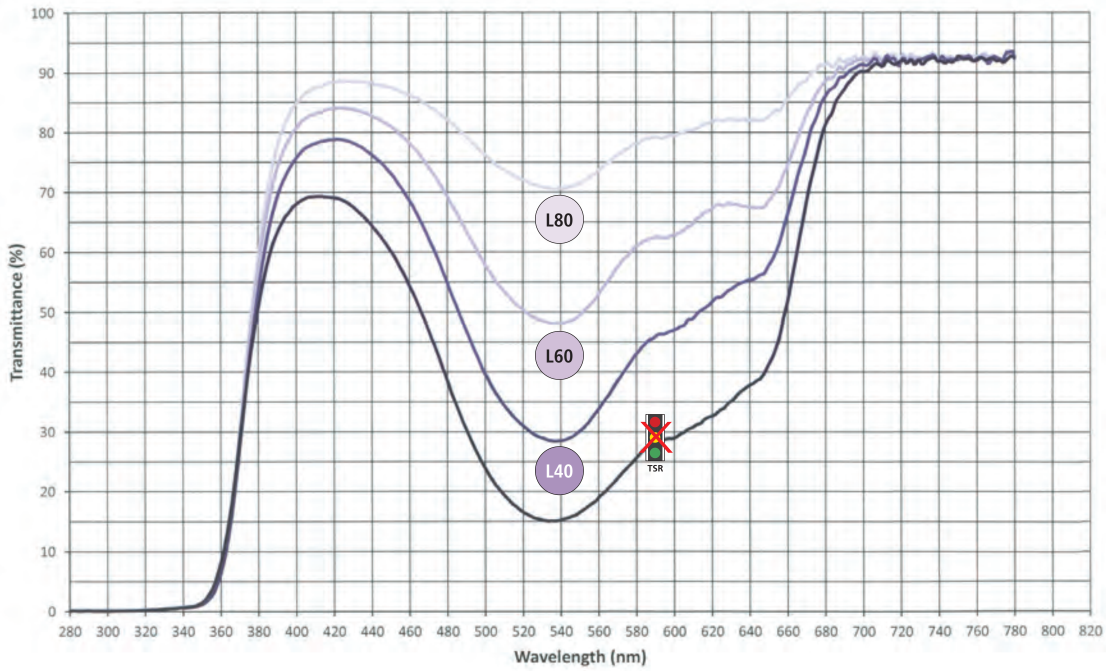
Mono Resin Tints - Lilac L

Tint Code

L 80%
Cat 1 Filter

L 60%
Cat 1 Filter

L 40%
Cat 2 Filter



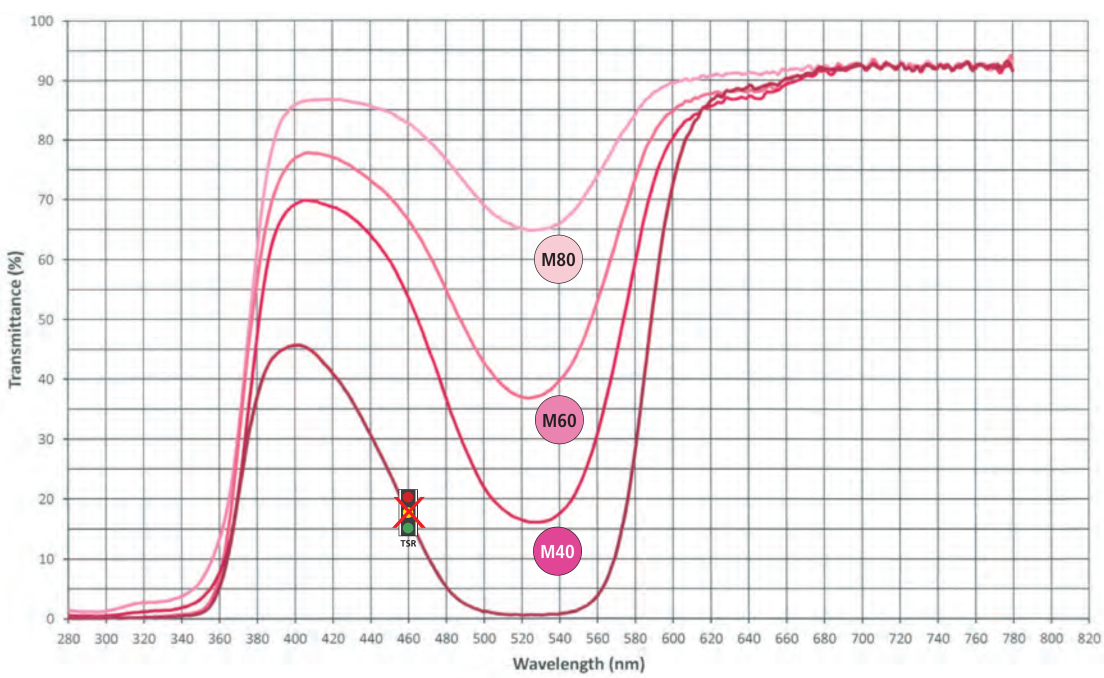
Mono Resin Tints - Magenta M

Tint Code

M 80%
Cat 1 Filter

M 60%
Cat 1 Filter

M 40%
Cat 2 Filter



Mono Resin Tints - Black N

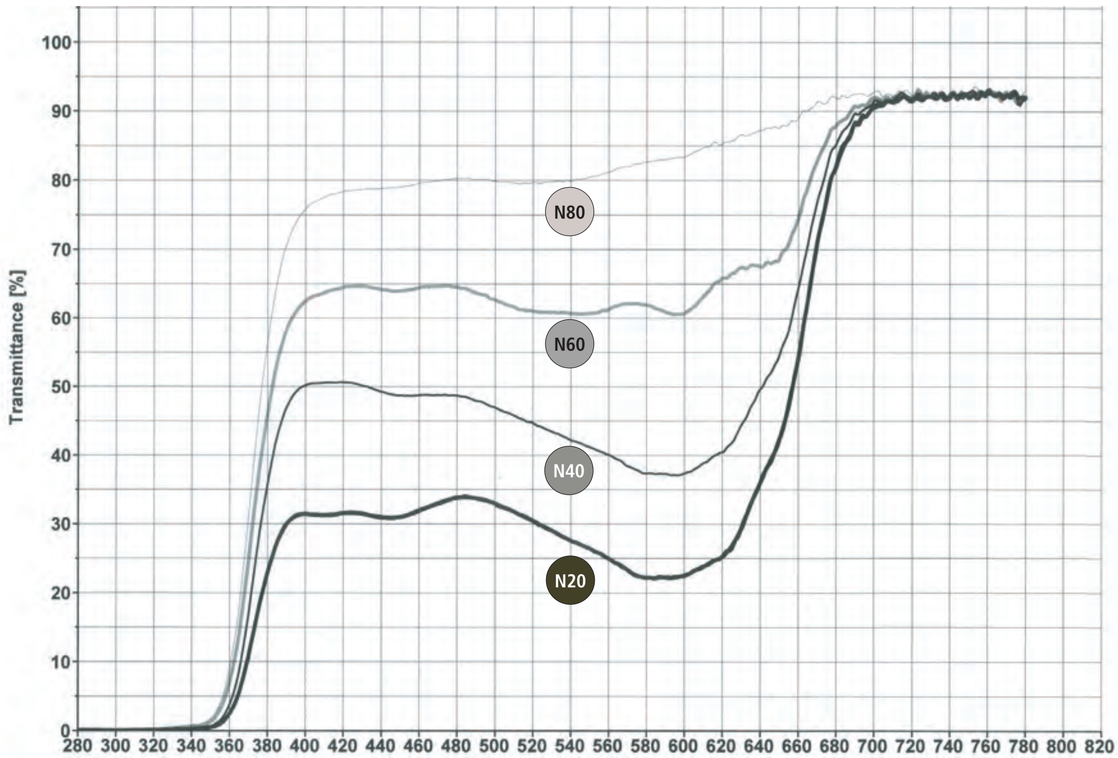
Tint Code

N 80%
Cat 1 Filter

N 60%
Cat 1 Filter

N 40%
Cat 2 Filter

N 20%
Cat 3 Filter



Mono Resin Tints - Dove D

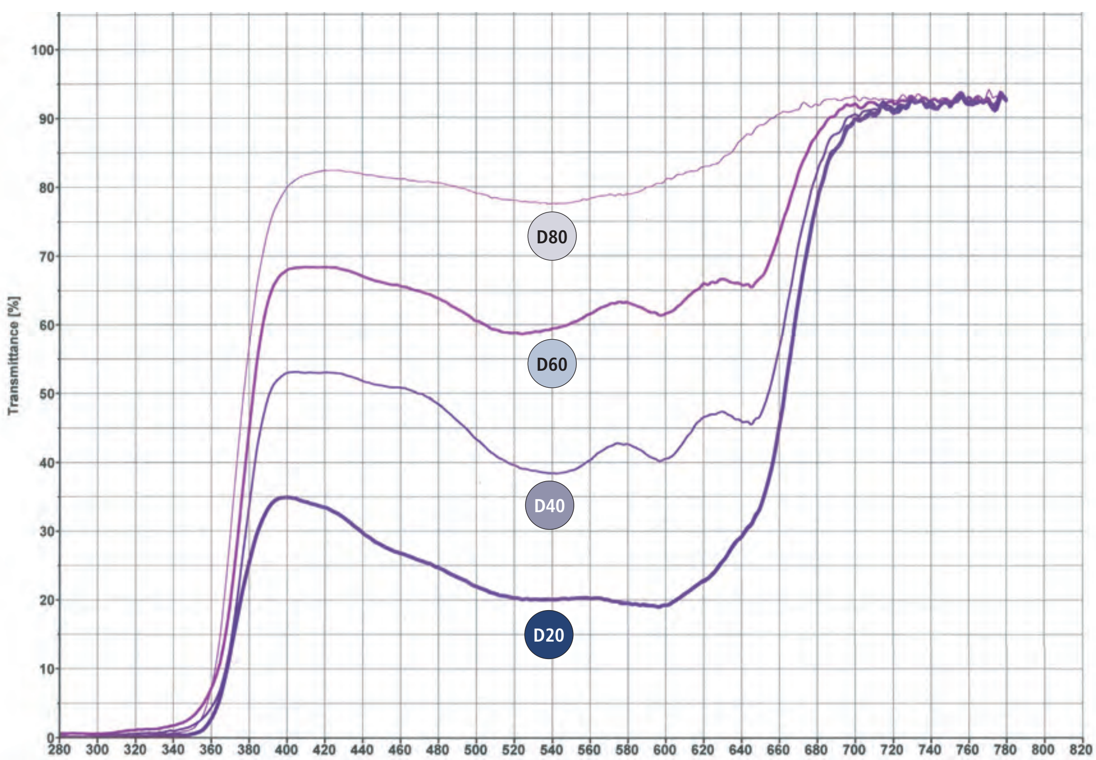
Tint Code

D 80%
Cat 1 Filter

D 60%
Cat 1 Filter

D 40%
Cat 2 Filter

D 20%
Cat 3 Filter



Mono Resin Tints - Grey G

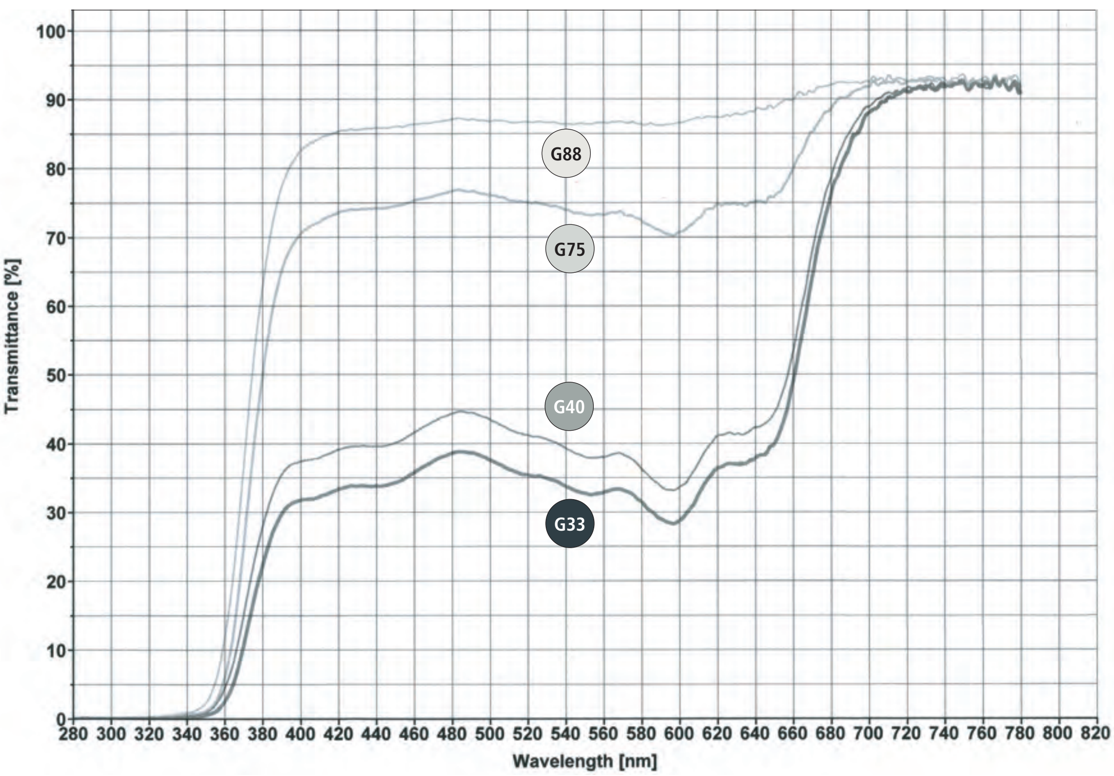
Tint Code

G 88%
Cat 1 Filter

G 75%
Cat 1 Filter

G 40%
Cat 2 Filter

G 33%
Cat 3 Filter



Mono Resin Tints - Brown B

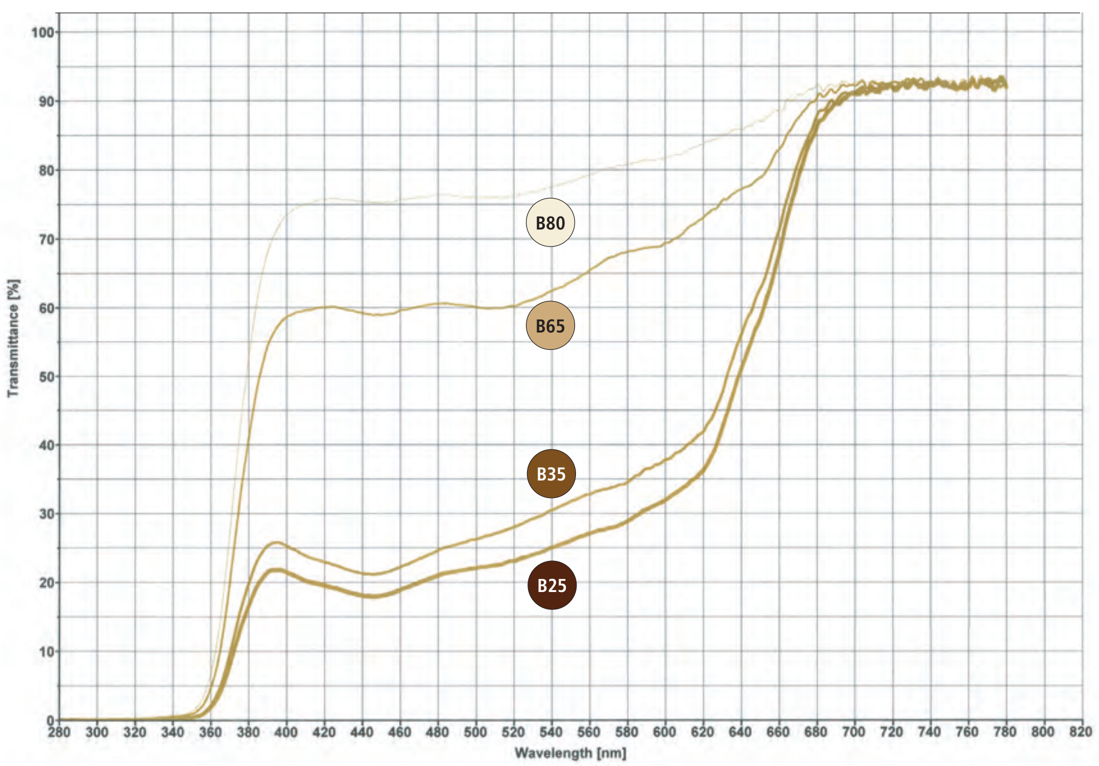
Tint Code

B 80%
Cat 1 Filter

B 65%
Cat 1 Filter

B 35%
Cat 2 Filter

B 25%
Cat 3 Filter



Mono Resin Tints - Hazel H

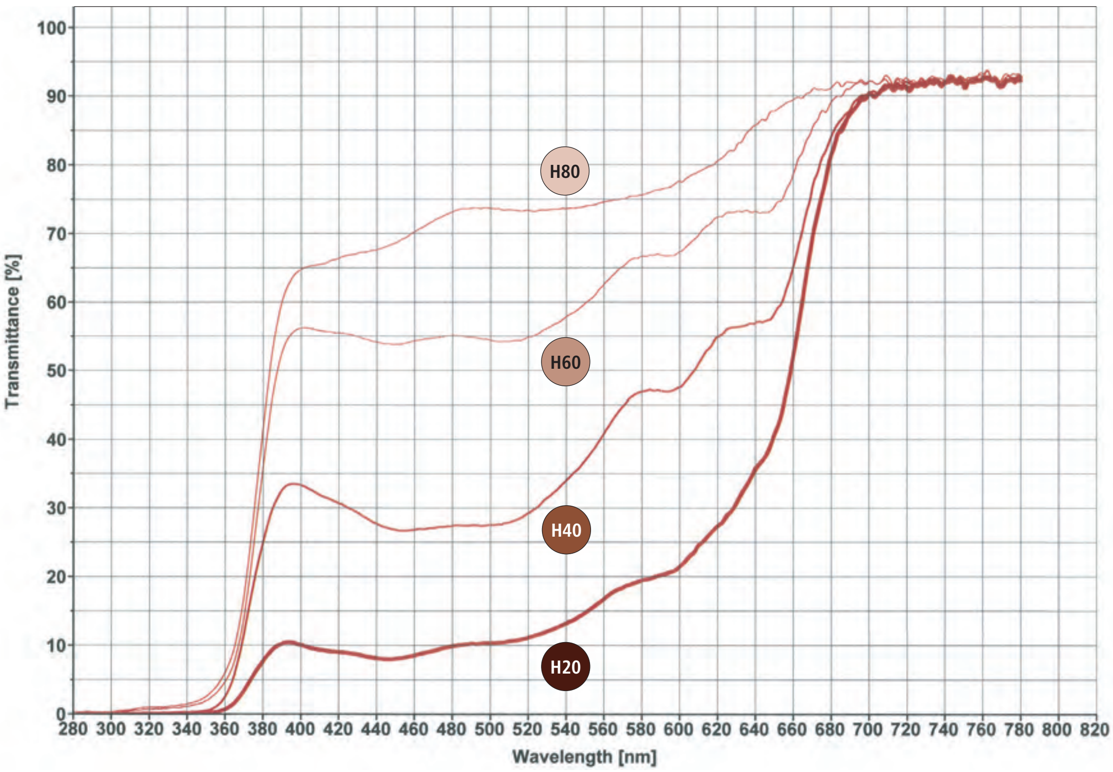
Tint Code

H 80%
Cat 1 Filter

H 60%
Cat 1 Filter

H 40%
Cat 2 Filter

H 20%
Cat 3 Filter



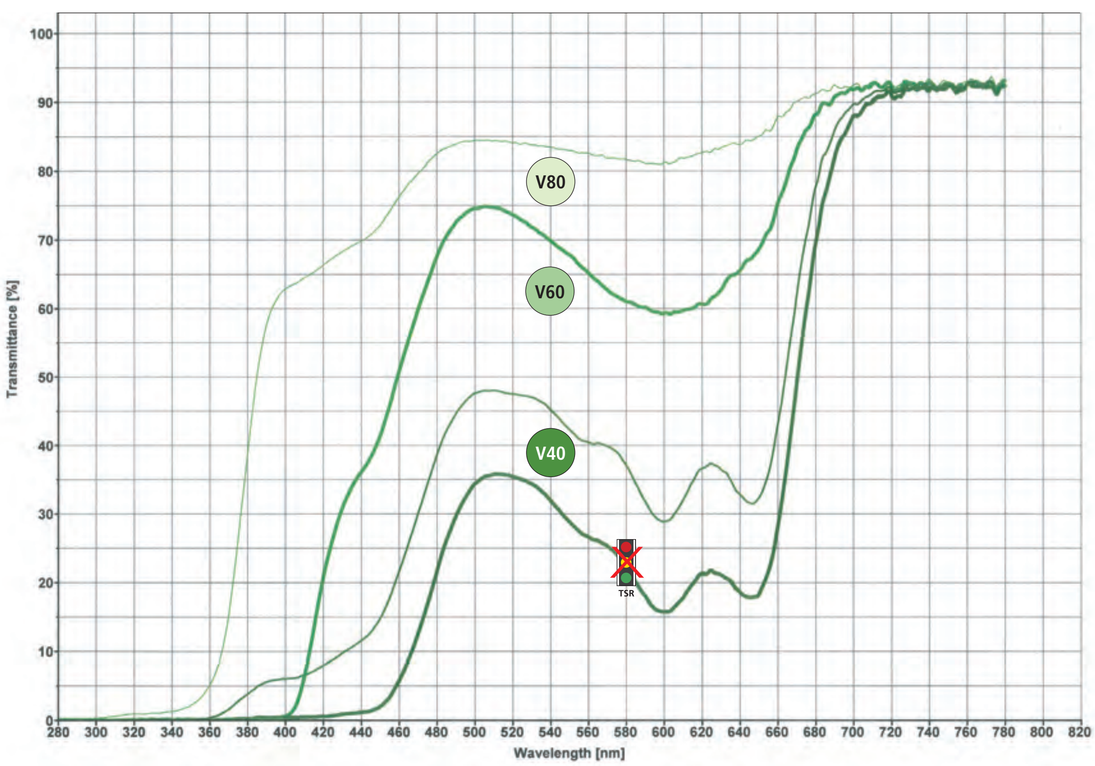
Mono Resin Tints - Verona V

Tint Code

V 80%
Cat 1 Filter

V 60%
Cat 1 Filter

V 40%
Cat 2 Filter



Mono Resin Tints - Orchid OR

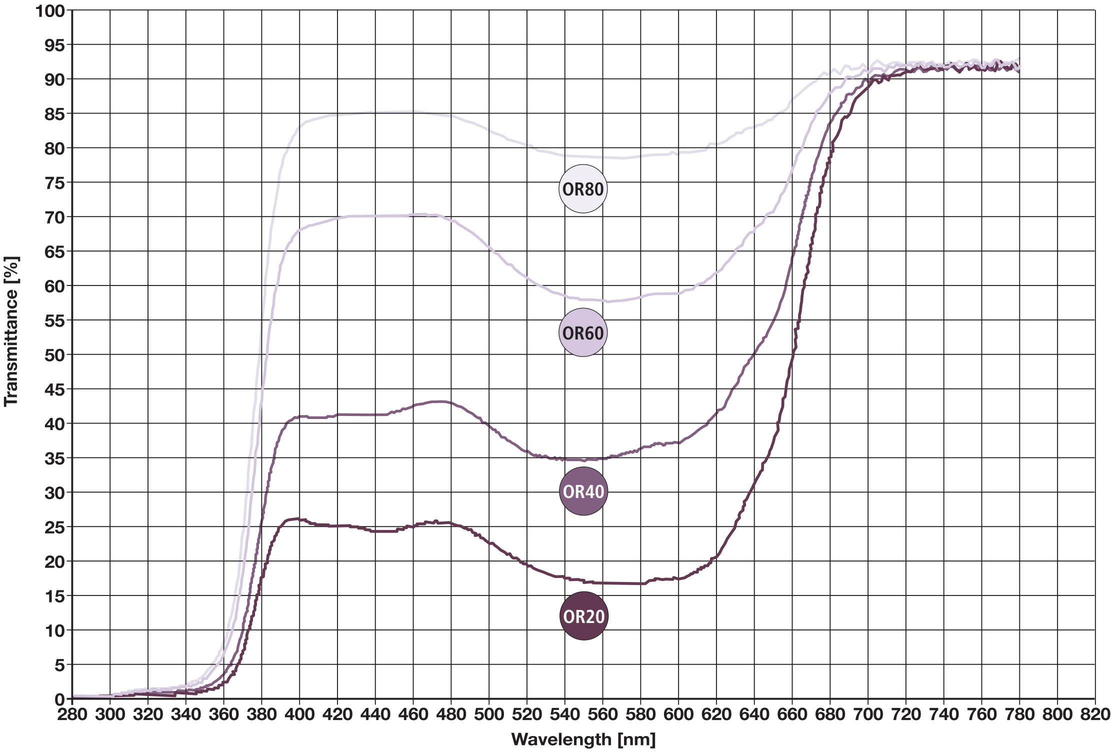
Tint Code

OR 80%
Cat 1 Filter

OR 60%
Cat 1 Filter

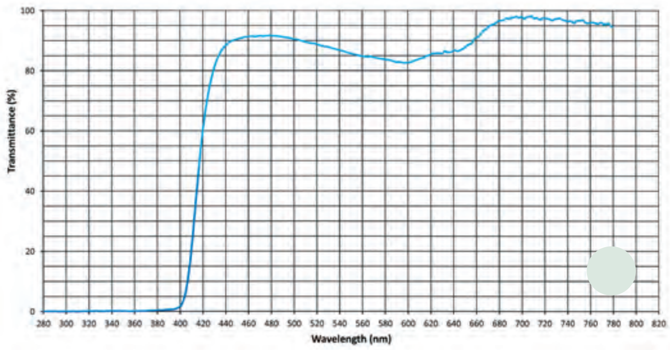
OR 40%
Cat 2 Filter

OR 20%
Cat 2 Filter

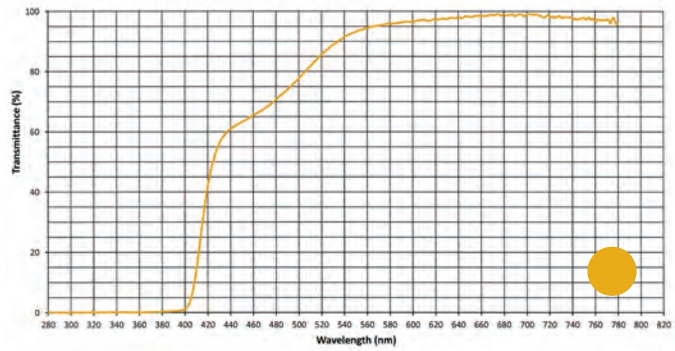


NORLITE TINT RANGE CLASSIFICATION (according to BS EN ISO 8980-3 : 2013)		
TINT CODES	TRANSMISSION %	FILTER CATEGORY & COMMENTS
STANDARD RANGE		
GR80, BR80, GN80, AT80, L80, M80	80	0 Very light tint
GR60, BR60, GN60, AT60, L60, M60	60	1 Light tint - not suitable for night driving
GR40, BR40, GN40, AT40, L40, M40	40	2 Medium tint - not suitable for night driving
GR15, BR15, GN15, AT15	15	3 Dark tint - not suitable for night driving

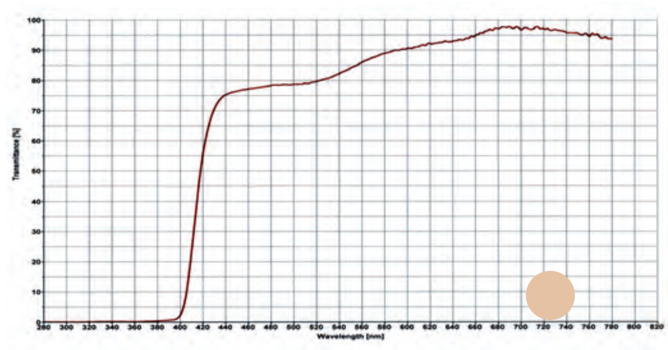
<u>Dot Com Office Tints.</u>
A range of comfort "office tints" to help to relax your eyes, particularly under fluorescent lighting, when using visual display units.



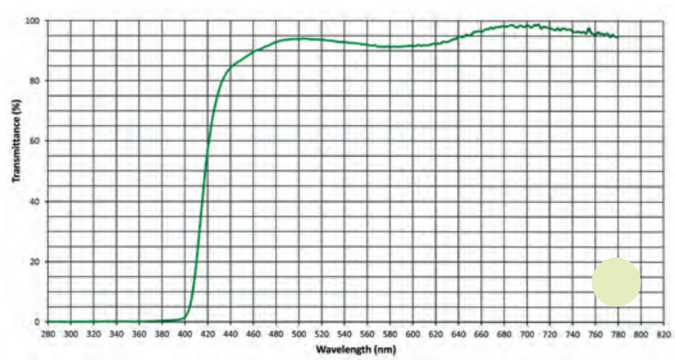
<u>Dot Com Alpha - DTA 85%</u>
A blue/grey colour.
With XARE coating.



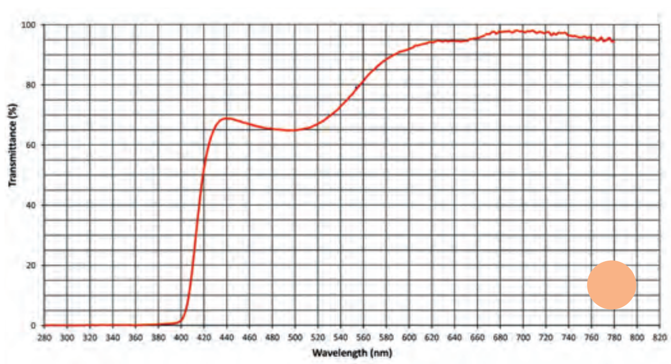
<u>Dot Com Beta - DTB 82%</u>
A golden syrup colouring.
With XARE coating.



<u>Dot Com Eva - DTE 85%</u>
A hazel brown colour.
With XARE coating.



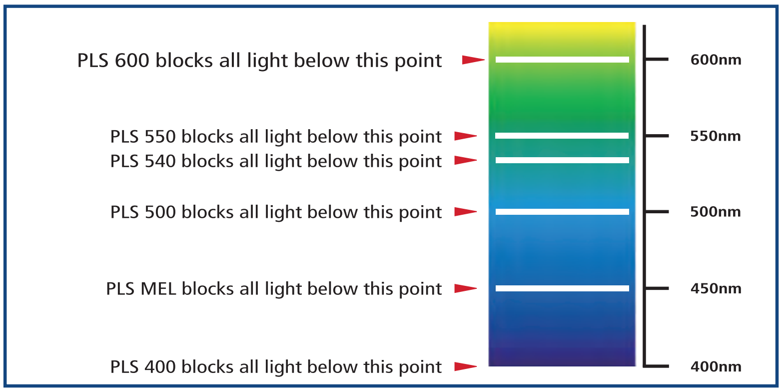
<u>Dot Com Gamma - DTG 93%</u>
A blue/green colour.
With XARE coating.



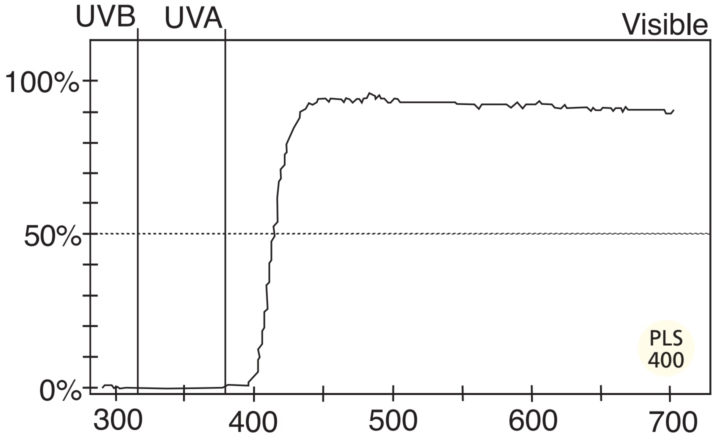
<u>Dot Com F - DTF 80%</u>
A rose colour.
With MAR coating.

Protective Lens Series - PLS

Some general recommendations follow for the selection of UV blocking lenses by occupation and ocular disorders :



PLS (UV) 400 - Nearly clear 92%

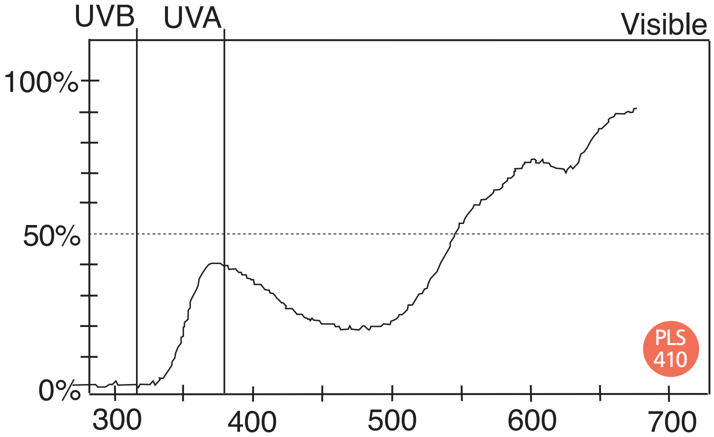


Clear lens absorbing up to 400nm.

Passed traffic light recognition test.
Select for patients who :
* spend a lot of time in the sun e.g. construction workers
* live in sunny climates
* do a lot of driving e.g. representatives, truck drivers
* take photosensitising medication e.g. certain tranquilliser, diuretics, anti-diabetic & hypertensive medications, oral contraceptives, antibiotics and even artificial sweeteners, laxatives and psoralen as used in psoriasis treatment.
* have had cataract surgery
* have pterygiums or pingueculae

It is likely only CR39 lenses need additional UV400 treatments.

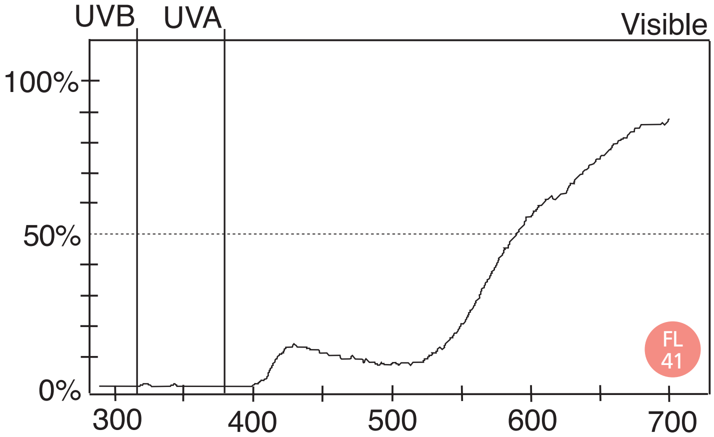
PLS 410 - Rose 50%



Rose lens

Select for :
* fluorescent lighting
* light flicker
* eye strain
* tension headache
* photophobia - blepharospasm

PLS FL41 - Rose 30%



Rose lens

Original Cambridge FL41 mix.

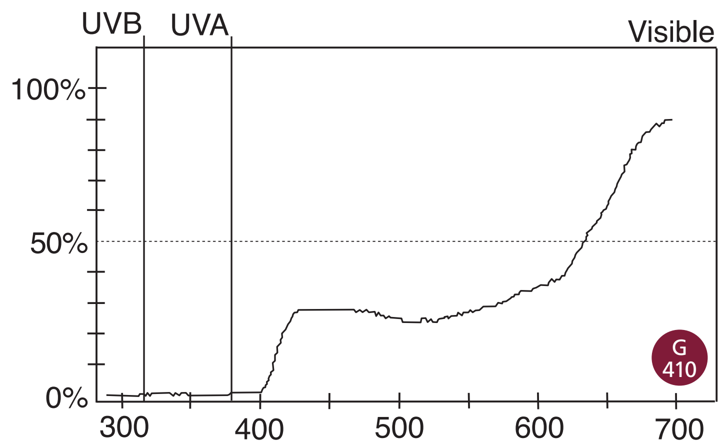
Select for :
* fluorescent lighting
* light flicker
* eye strain
* tension headache
* photophobia - blepharospasm

PLS G410 - Grey 30%

Grey lens

Similar transmittance as PLS 410 but overtinted light grey to subdue lens colour.

Select for :
* fluorescent lighting
* light flicker
* eye strain
* tension headache
* photophobia - blepharospasm

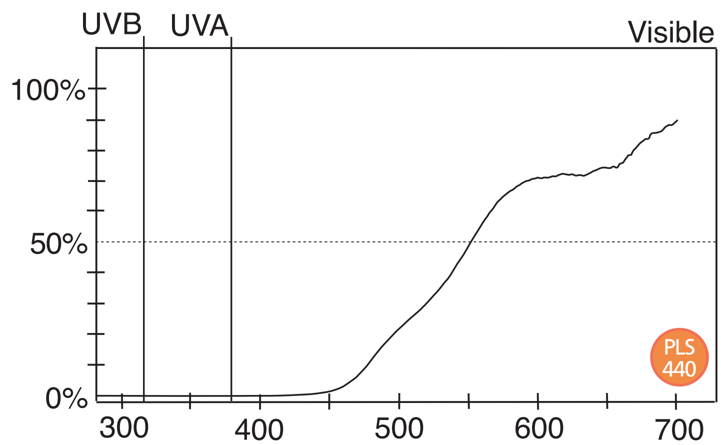


PLS 440 - Amber 50%

Amber lens

Provides blue/violet attenuation with minimal colour distortion.

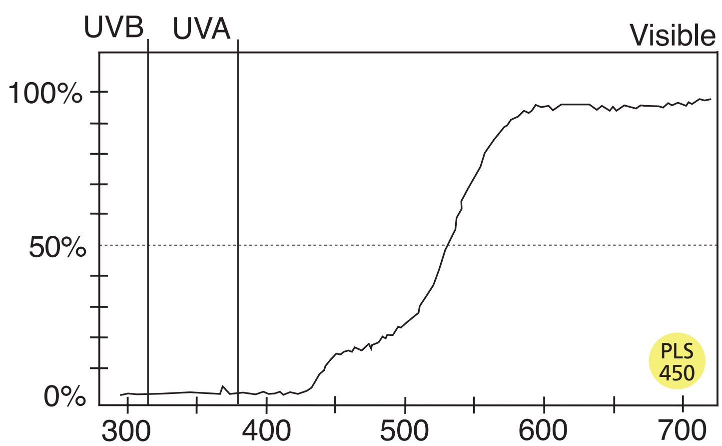
Select for :
* macular degeneration



PLS (UV) 450 - Yellow 86% Winter Sun

Yellow lens absorbing up to 450nm.

Select for :
* night blindness
* macular degeneration
* retinitis pigmentosa
* pre-operative cataract
* forensic science
* SAD (Seasonal Affective Disorder)

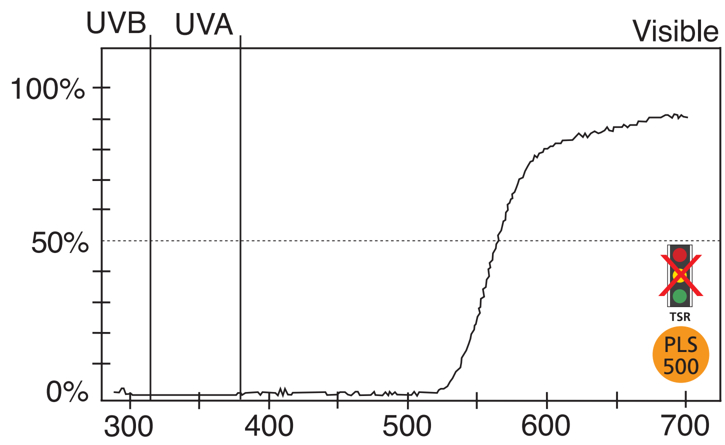


Passed traffic light recognition test.
For sporting applications see the Trail tint on page 79

PLS 500 - Orange 50%

Orange lens absorbing up to 500nm.

Select for patients with :
* developing cataracts and post operative
* diabetic retinopathy
* corneal dystrophy
* albinism
* aphakia and pseudophakia
* photophobia
* optic atrophy
* sporting needs such as fishing, sailing, water sports, tennis, cycling, golf, hiking, skiing, mountain climbing and flying.
* The Retinitis Pigmentosa Society recommend a UV527 which is a similar colour to the UV500.
* also for dentists

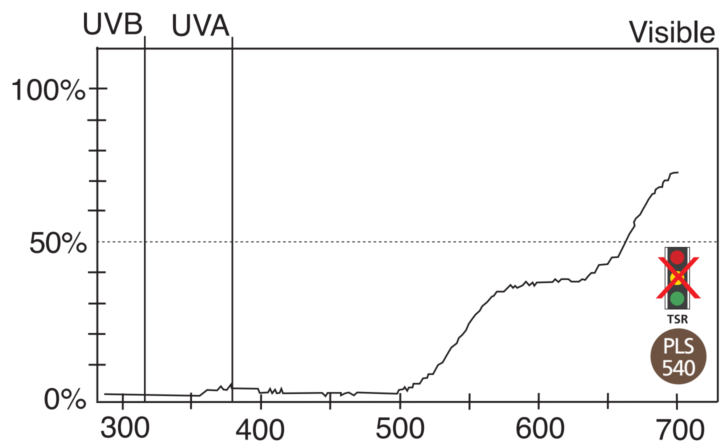


PLS (UV) 540 - Brown 10%

Dark amber brown lens absorbing up to 540nm sunglass blocking violet & blue.

Primarily for outdoor use.
* macular degeneration
* pre-operative cataract
* RK-PRK

Also select for patients who are :
* contact lens wearers
* senior citizens
* skiers, boatmen, pilots and mountaineers

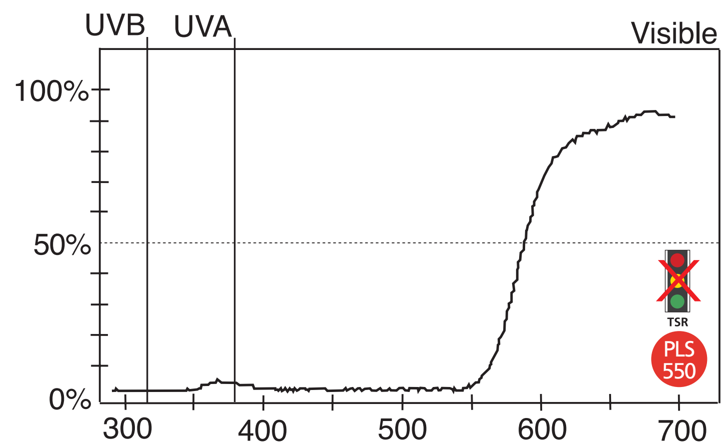


PLS (UV) 550 - Red 20%

Intense orange red lens absorbing up to 550nm

Select for patients who have :
* macular degeneration
* colour blindness
* retinitis pigmentosa

Also for:
* forensic science



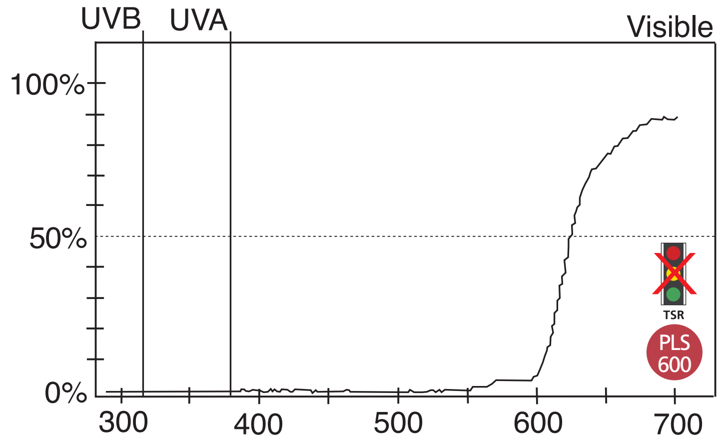
PLS (UV) 600 - Red 8%

Red lens absorbing up to 600 nm

Select for patients with :
* macular degeneration
* anridia
* retinitis pigmentosa
* glaucoma
* extreme photophobia
* exposure to intense ultraviolet light such as dentists and dental nurses using ultraviolet cured dental fillings and nurses working under bilirubin lights
* exposure to welding flash (wear under helmet)
* red/green colour blindness (UV600 filter may aid this condition which is more common in males)

Also for :
* dark room filters, 3-D lenses and red light target definition.

NB for 3-D green specifications see next page.

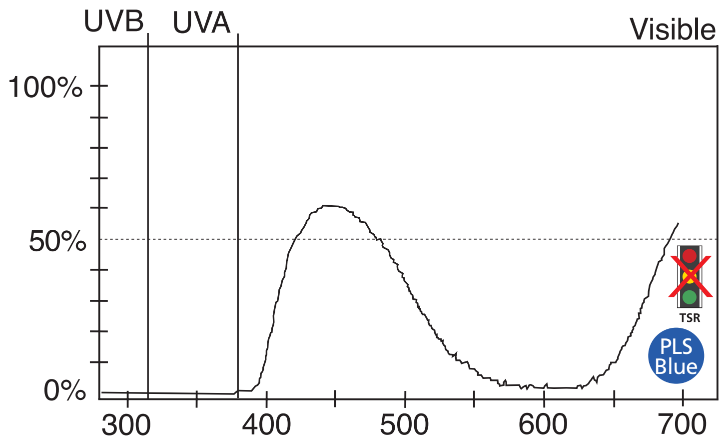


PLS BRISTOL BLUE - 14%

Recent studies have shown that certain blue tints can be helpful for people with light sensitive epilepsy. Of over 600 photosensitive epileptic patients tested, 94% had their photoparoxysmal responses (PPR's) completely eliminated or greatly reduced by using a deep blue lens.

Aging and ocular conditions can make eyes extremely sensitive to what is normally seen as moderate glare. These same pathological conditions also increase the possibility of veiling glare caused by blue light scatter within the eye. Filtering out UV and blue light reduces glare and relieves discomfort. This can benefit patients with conditions such as:

* developing cataracts
* macular degeneration
* aphakia and pseudophakia
* diabetic retinopathy
* glaucoma
* aniridia
* albinism
* optic atrophy
* corneal dystrophy
* retinitis pigmentosa
* photosensitive epilepsy



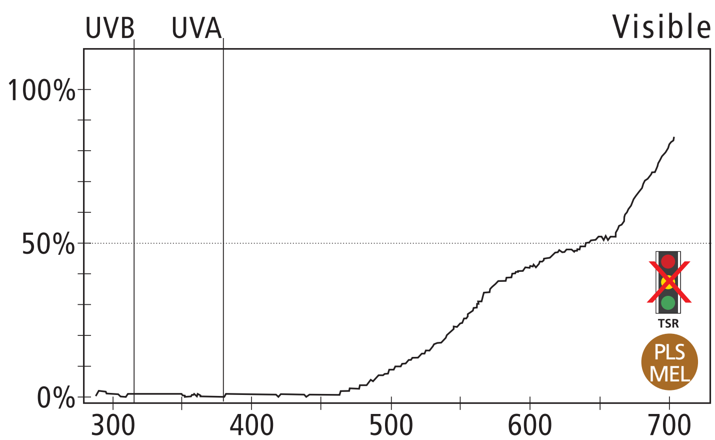
PLS Melanin - Brown 30%

Yellow brown lens

* natural body pigment protects against sunlight damage
* maintains natural colours

Uses :
* post cataract
* AMD protection

PLS are available on any standard CR39 lens material. Sample lorgnettes are available and can be ordered from our Telesales Department.

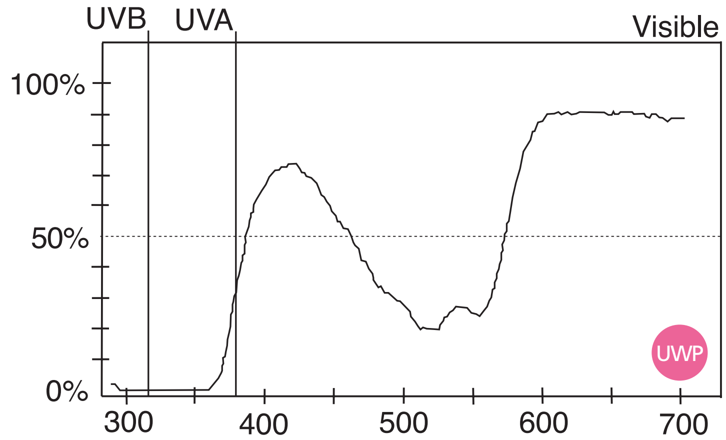


UNDERWATER PINK - 50%

This USA product is designed to filter out blue wavelengths in the water enabling users to better experience underwater colours that are often lost at depth.

UNDERWATER YELLOW - 86%

See PLS 450 details on page 76.
Use for low light situations, (lakes, quarries, caves) and those diving in the North Atlantic will benefit from this tint, which optimises available light and helps improve visibility.

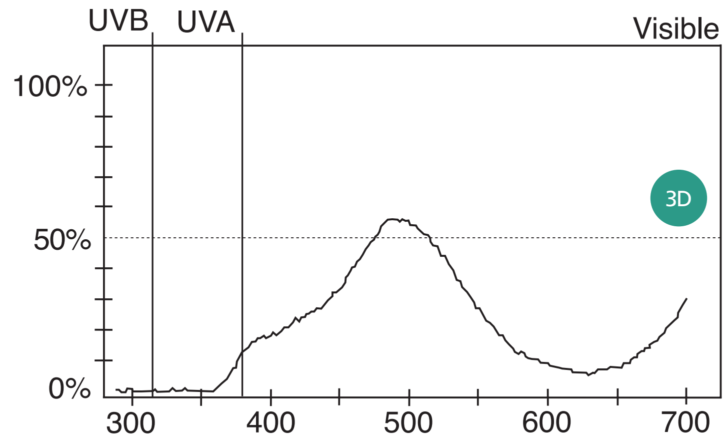


BRIGHT GREEN 3D.

A green/blue colour.

RED 3D.

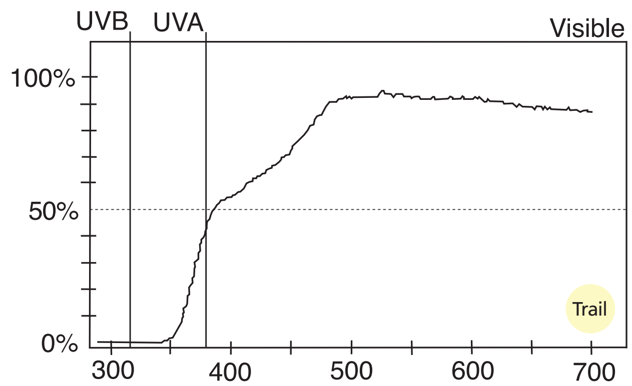
see PLS600 details on previous page.



TRAIL - 96%

A yellow colour.

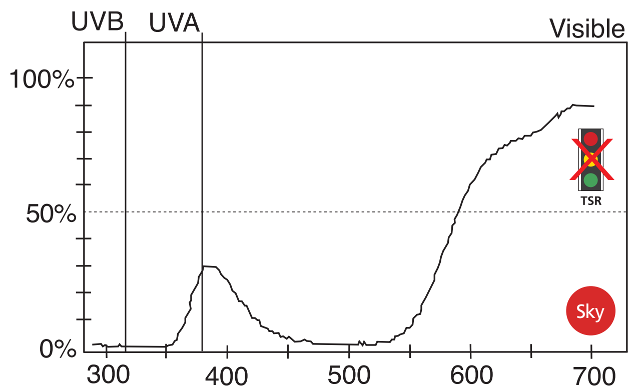
Yellow assists in enhancing definition and this tint is therefore of use to those who participate in shooting sports and tracking golf balls.



SKY - 28%

A reddish-orange colour with a tan flare.

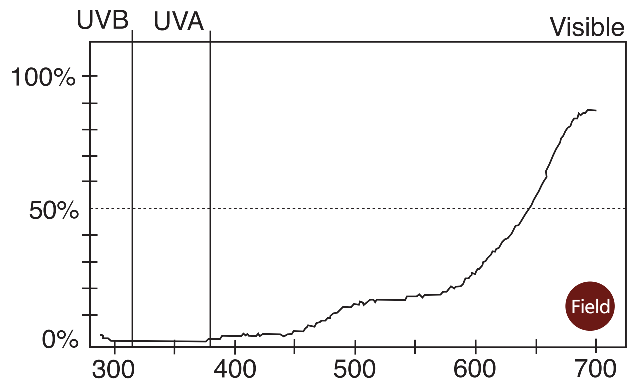
Developed for the expert who wants to increase his or her skill when shooting at a clay pigeon or tracking a target. Increased background lighting brings the target visually closer for sharper distance estimations.



FIELD - 19%

A brown colour with a tan flare.

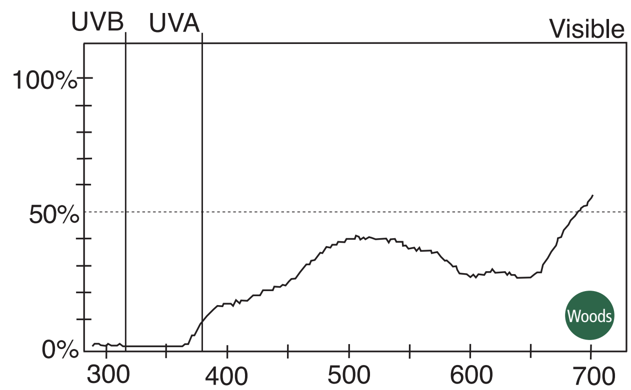
It is designed for heightened contrast ability and is highly recommended for restful glasses.
Particularly useful for general spectator activities.



WOODS - 42%

A forest green colour.

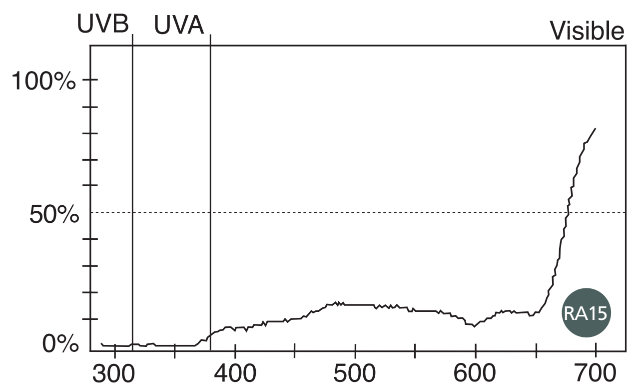
It enhances critical outdoor shades, particularly benefiting golfers making it easier for them to see the fairway contours and read the slopes and curves of the greens.



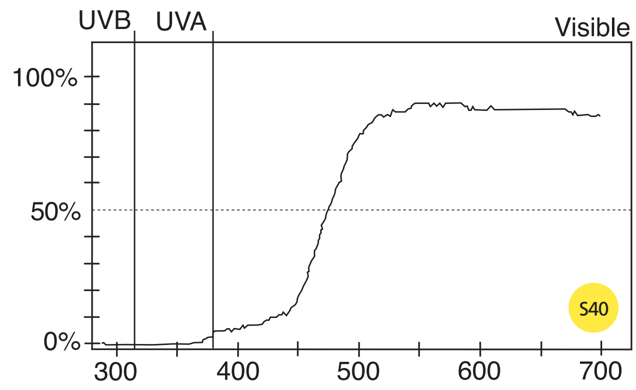
RA 15 - 18%

A dark greenish grey colour.

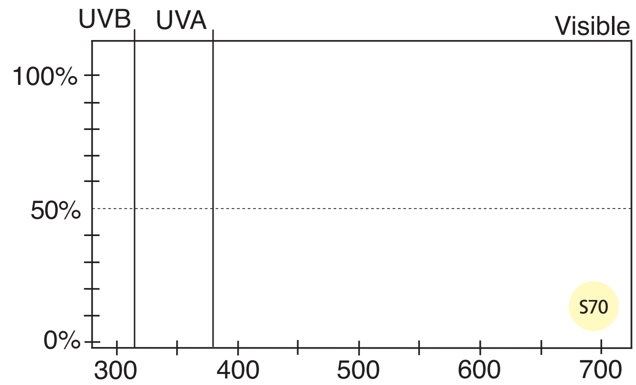
The Norlite colour equivalent to the Ray-ban G15 lens.



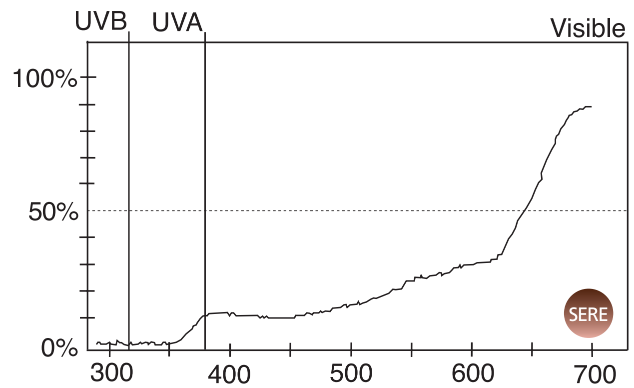
S40 - 40%.
A yellow blue blocker.



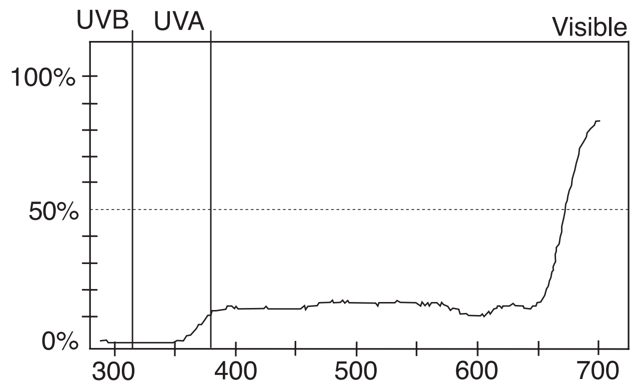
S70 (+ AR) - %.
A yellow blue blocker.
Night Driving



SERENGETI COLOUR EQUIVALENT.
A colour tint equivalent to the fully exposed colour of the Serengeti Drivers.



London Transport Neutral LTN 15%.
A neutral grey tint.

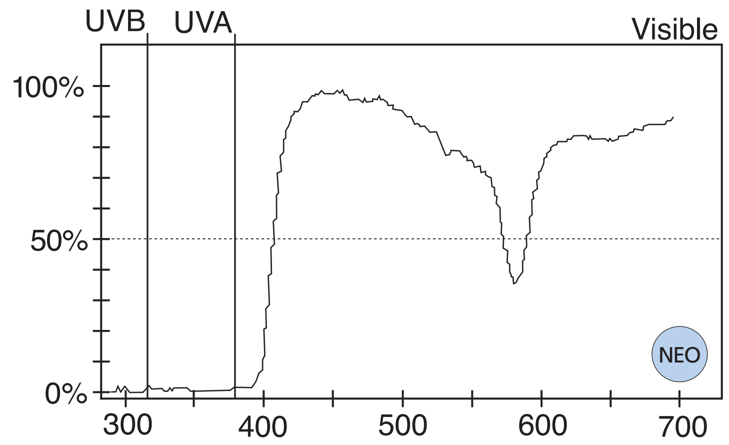


Speciality Tinted Resins contd.

NEO CONTRAST 580 Band Blocker - 72%

Neodymium Ion Dissolution Technology

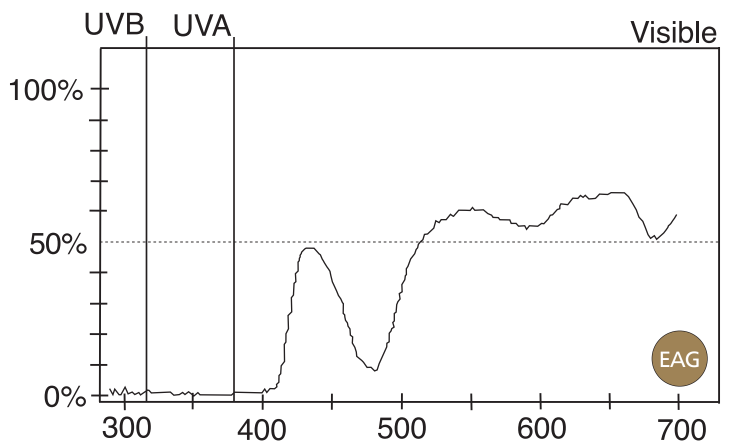
Japanese research has shown that when yellow light 580nm is reduced there is an increase in contrast sensitivity for the older eye and a reduction in glare equal to that of dark sunglasses for the elderly.
Select for patients with:
* growing discolourisation of crystalline lens
* improves sense of colour while reducing glare.



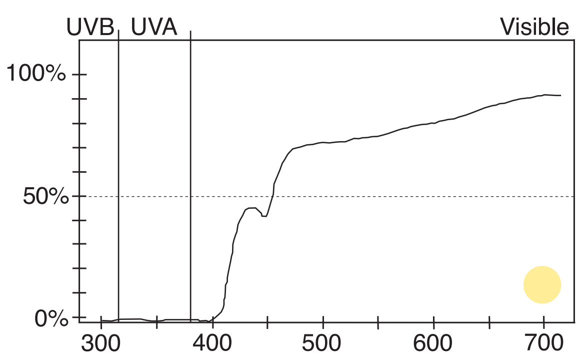
EAGLE - Brown 50%

UV-410

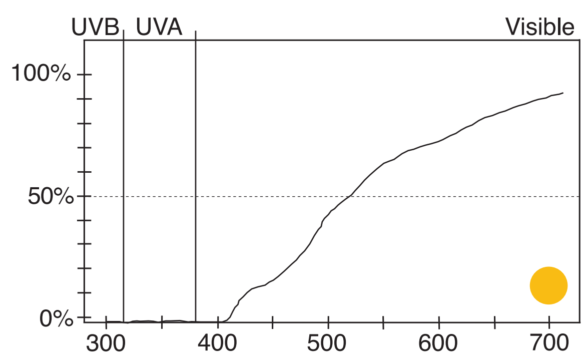
A contrast enhancement tint for outdoor sports - golf - shooting. Spotting a moving target against a confused background.



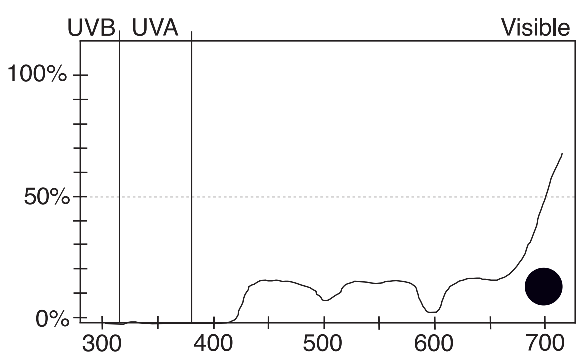
Norlite Trivex NXT Fixed Tints Transmission Charts



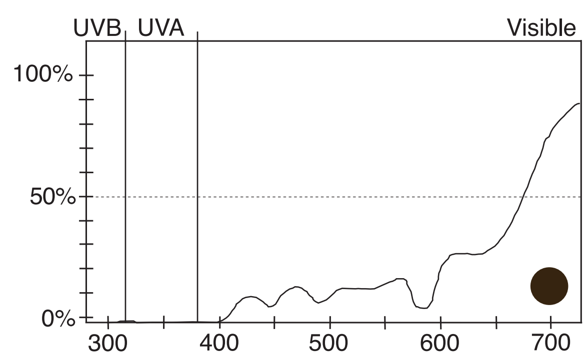
TNXT *D.E. Yellow Contrast* 84% LTF



TNXT *Berkeley Yellow Contrast* 62% LTF



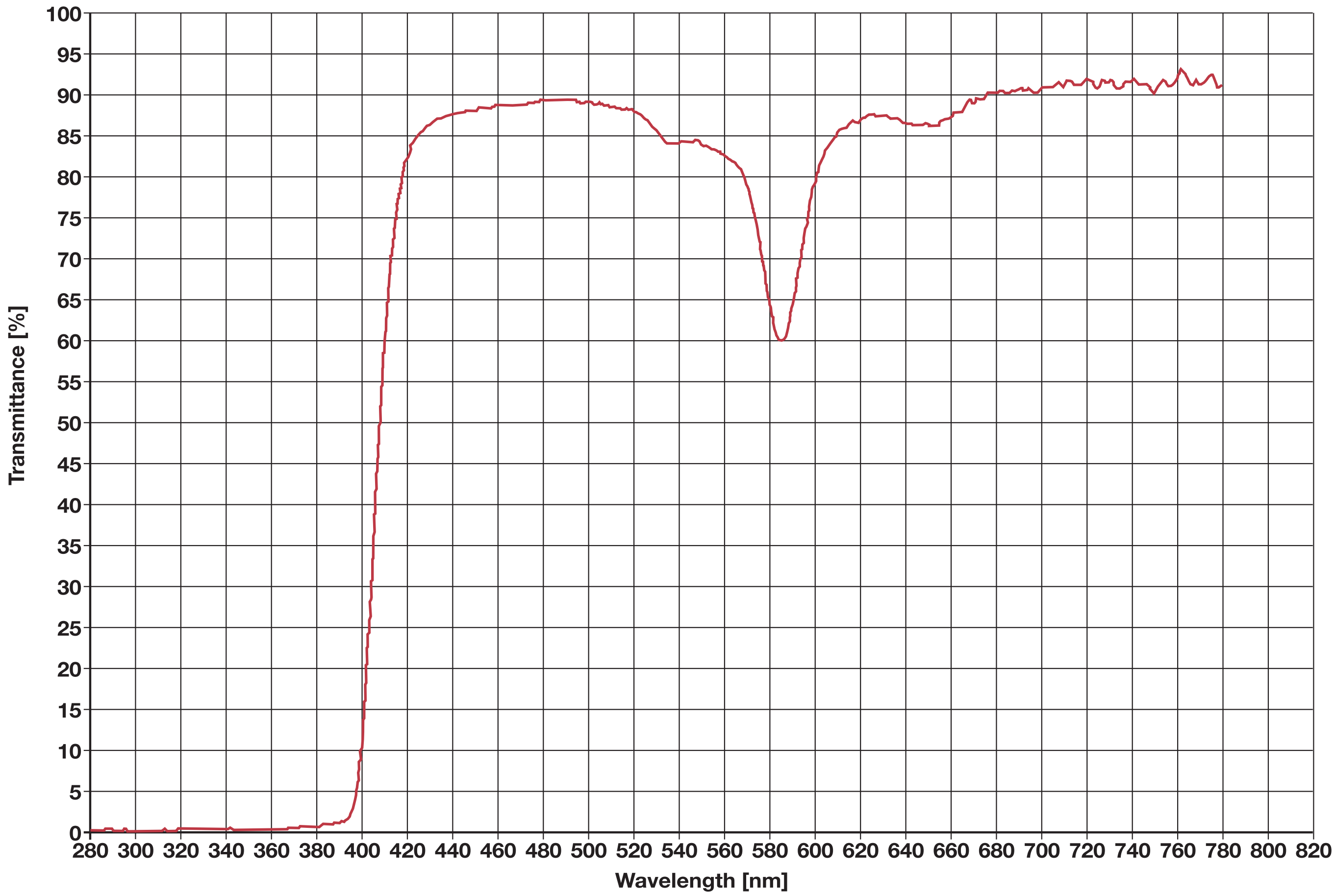
TAXT Atmos Altitude ***Grey*** **15% LTF**



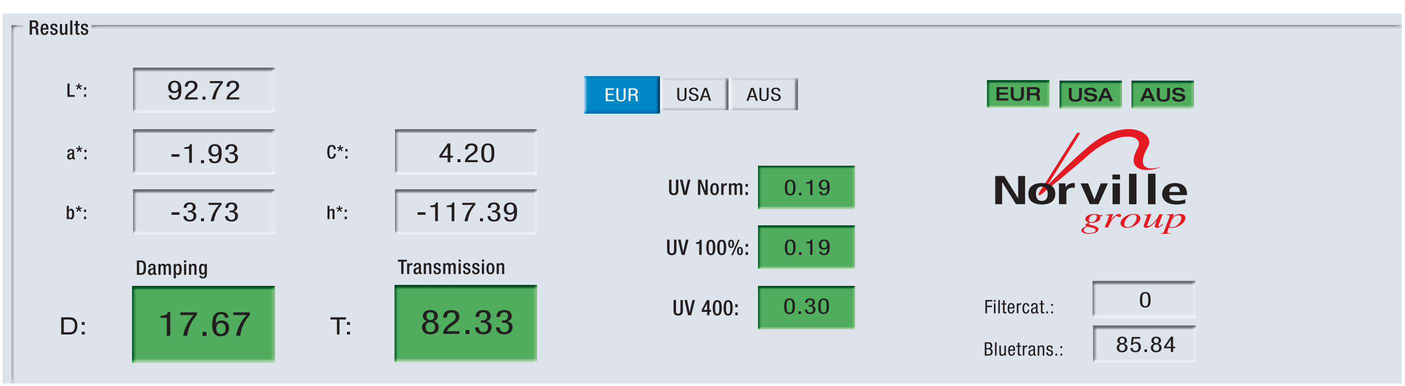
TAXT Atmos Altitude ***Brown*** **15% LTF**

Transmission Curves - NEO Contrast A1 n=1.60 Blue

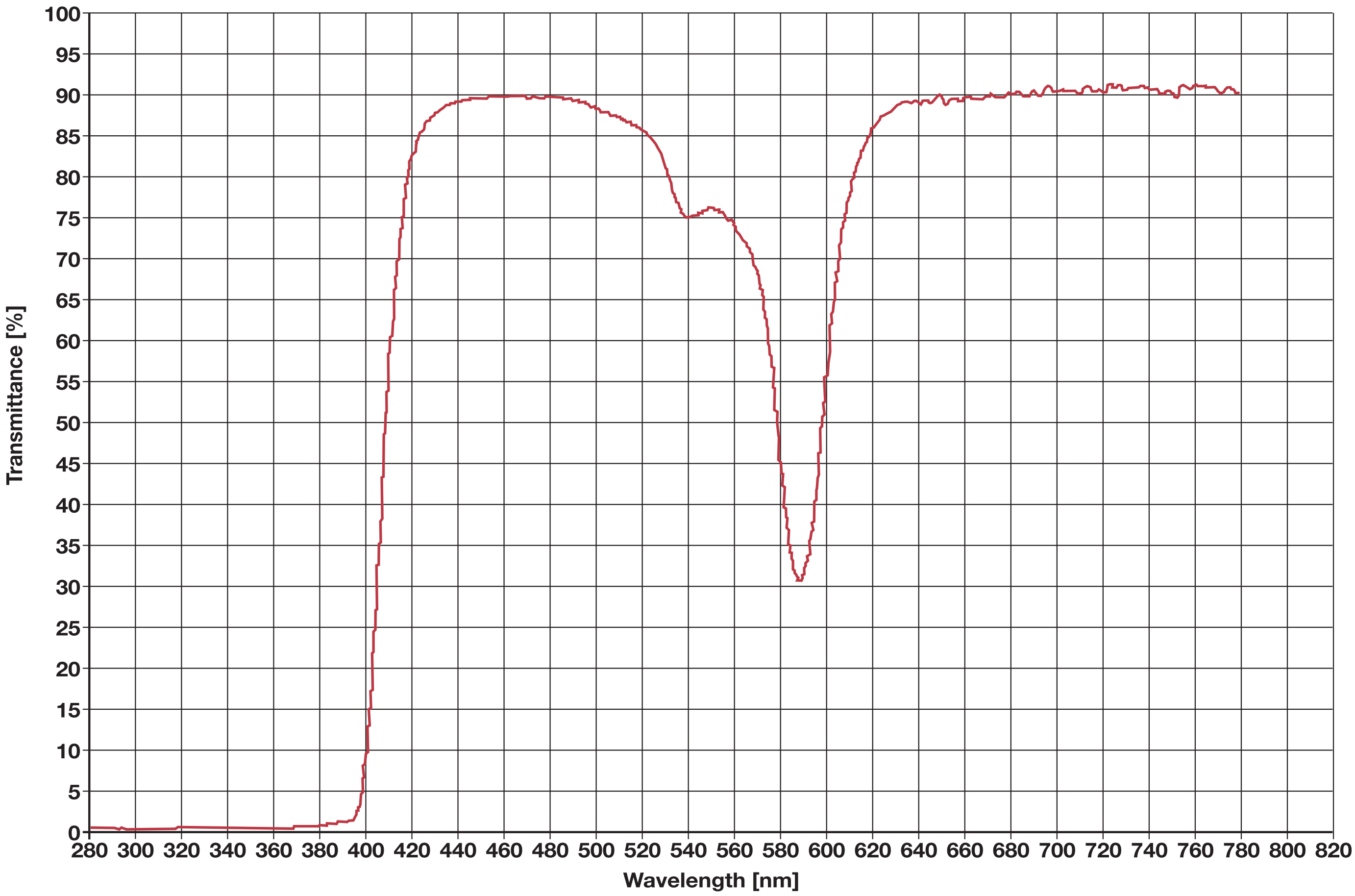
Lens Name	Code:	Centre Thickness
NEO CONTRAST A1	**NCNC**	**2.1mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
390nm	397nm	398nm	82%



Lens Name	Code:	Centre Thickness
NEO CONTRAST A2	**NHNC**	**2.1mm**



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
390nm	395nm	398nm	72%

Results

L*:	88.33		
a*:	-2.03	C*:	11.82
b*:	-11.64	h*:	-99.90
Damping		Transmission	
D:	27.26	T:	72.74

EUR USA AUS

UV Norm:	0.16
UV 100%:	0.16
UV 400:	0.27

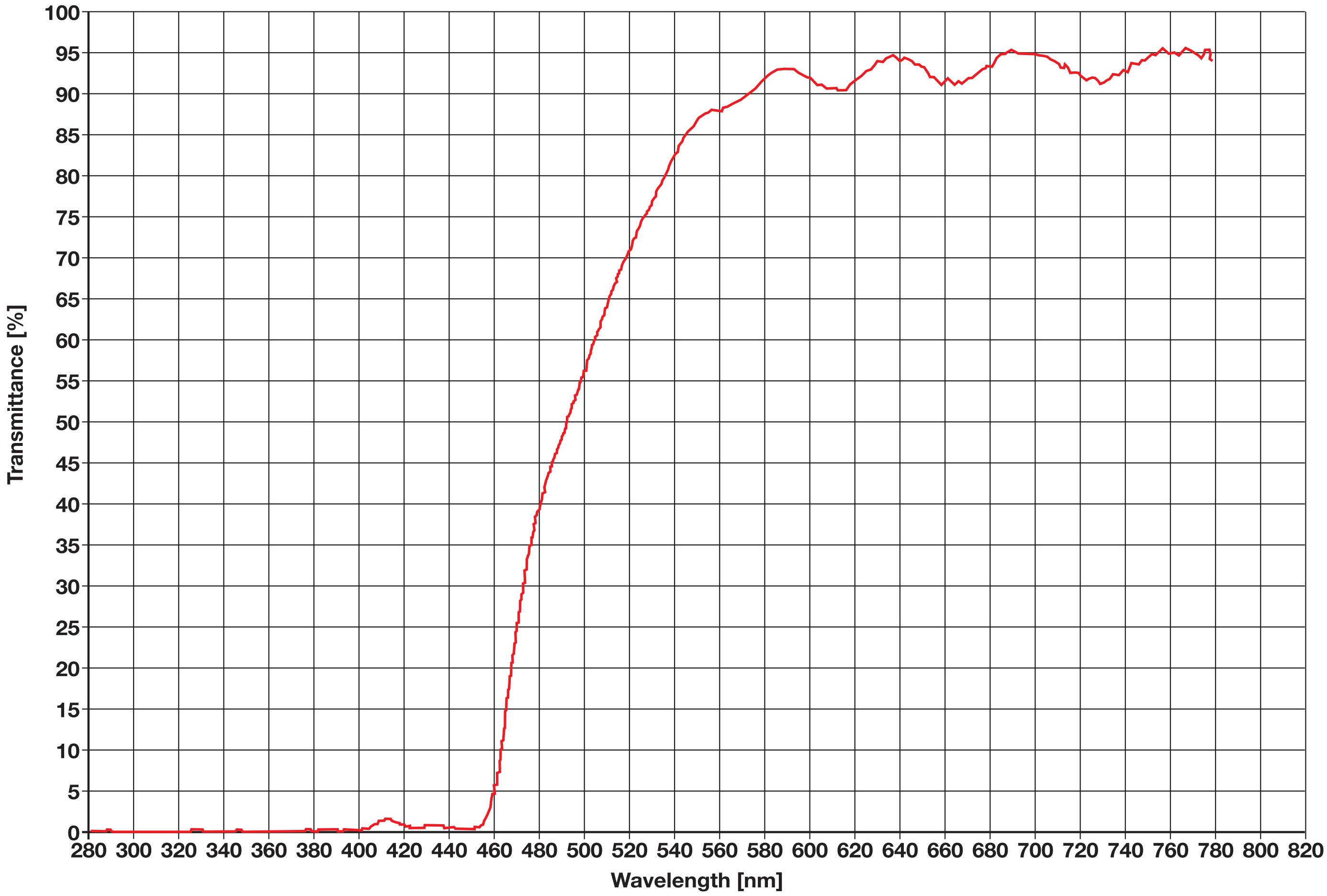
EUR USA AUS

Norville group

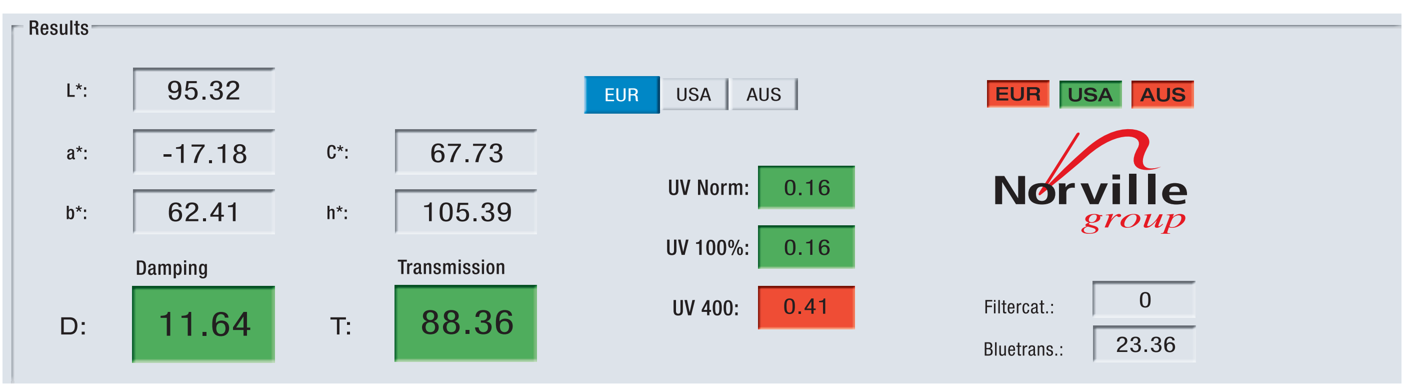
Filtercat.:	1
Bluetrans.:	86.44

Lens Name
E-SCOOP YELLOW

Centre Thickness
2.1mm

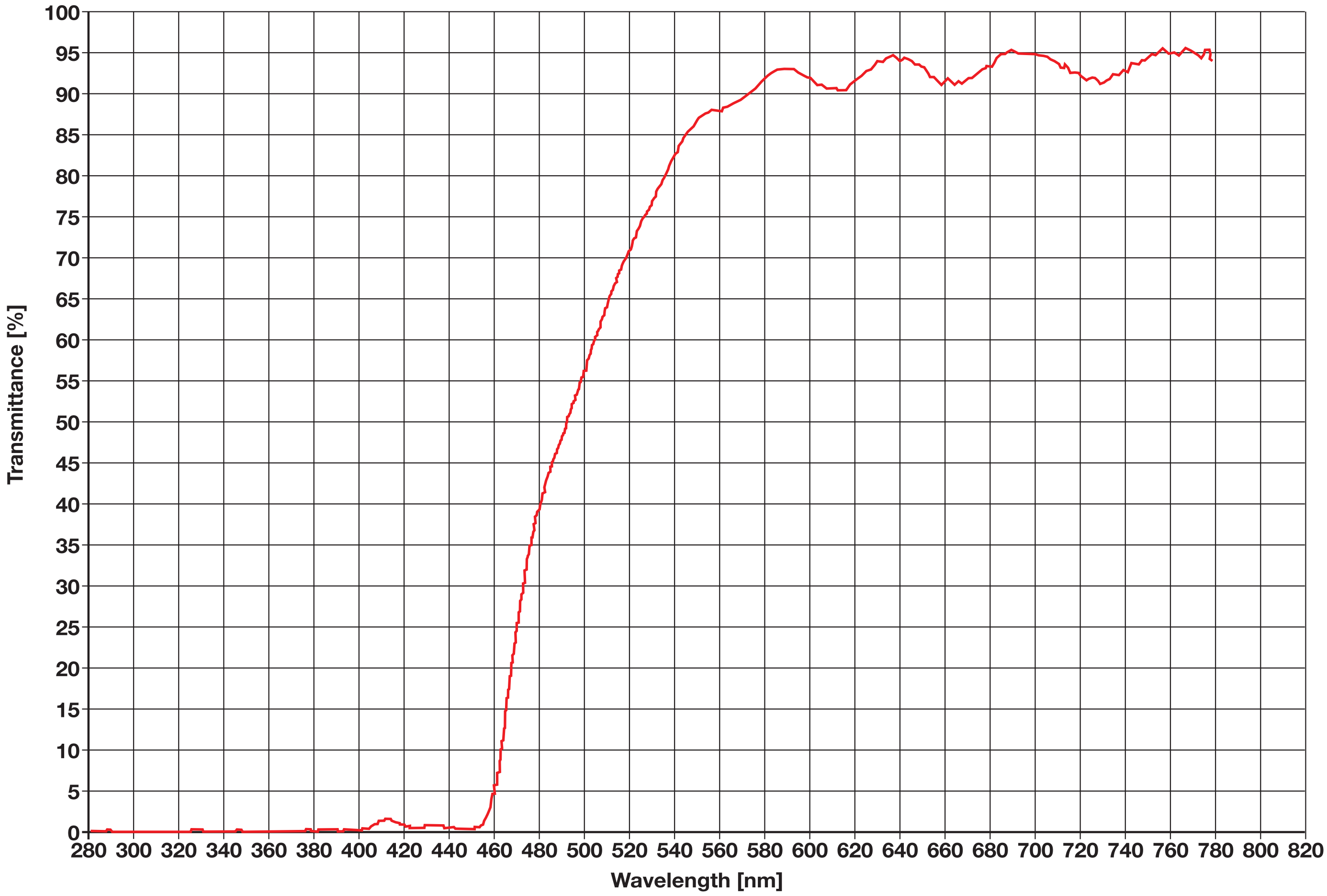


Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
374nm	383nm	407nm	88%

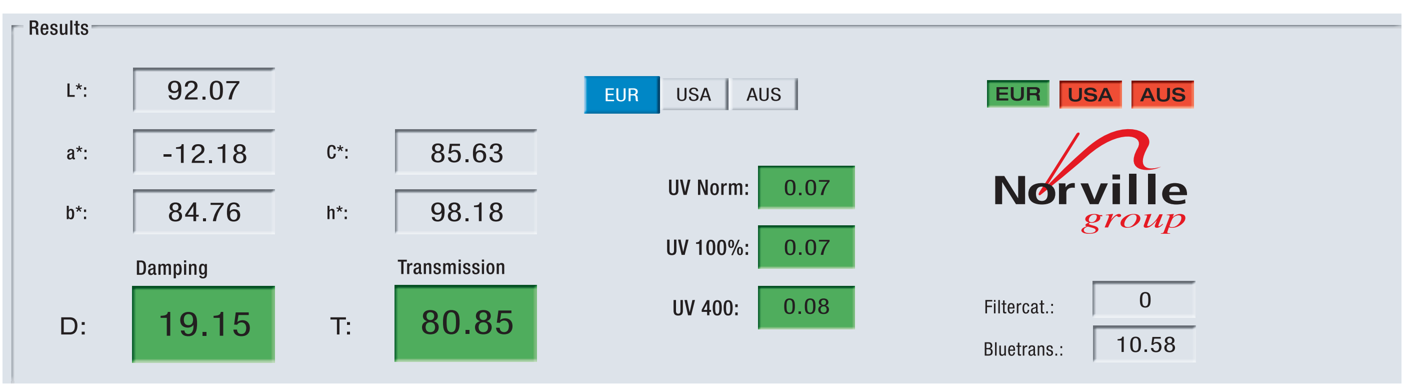


Lens Name
GFO YELLOW

Centre Thickness
2.1mm



Wavelength, nm at which the spectral transmittance, τ(λ), is			Luminous transmittance
1%	3%	5%	τv
455nm	457nm	460nm	81%



Mirror and Flash Coatings

Mirror and Flash mirror coatings, in all their peacock reflections, can be applied to any dark tintable resin substrate to obtain the full mirror series on the following pages.

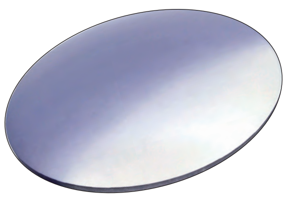
The complete process comprises **substrate** – full G15 or B15 tint – if the material is unable to take tint it will not be possible to proceed. **Hard coating** follows, deposition of **mirror** stack in a vacuum process, finally in **AR coating** on the rear surface completes the process.

Important User Note: By nature of its effect mirror surfaces will emphasise any sight surface scratching, especially when viewed through the lens. This, and the importance of handling, should be indicated to clients at hand-over time. Norville can only warranty the lens against premature (12 months) surface degradation and not every day handling abuse.

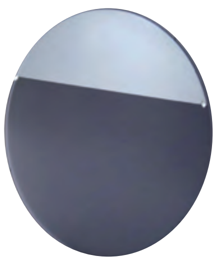
Today we can further customise mirrors in the following ways:
Flash Mirrors – a description of less mirror, to obtain this flashy effect just specify a lesser tint density than the 15% LT dark of the regular mirror series, going as low as 80% grey. When mirrored, this gives the appearance of Flare or Flash mirror.

Graduated Mirrors – these can be produced with either a soft fuzzy colour edge or a sharp line (Pelmet)

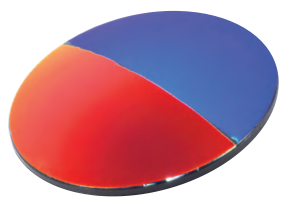
Split Mirror - Mixing any two colour mirrors can be produced as a straight edge



Graduated Mirror

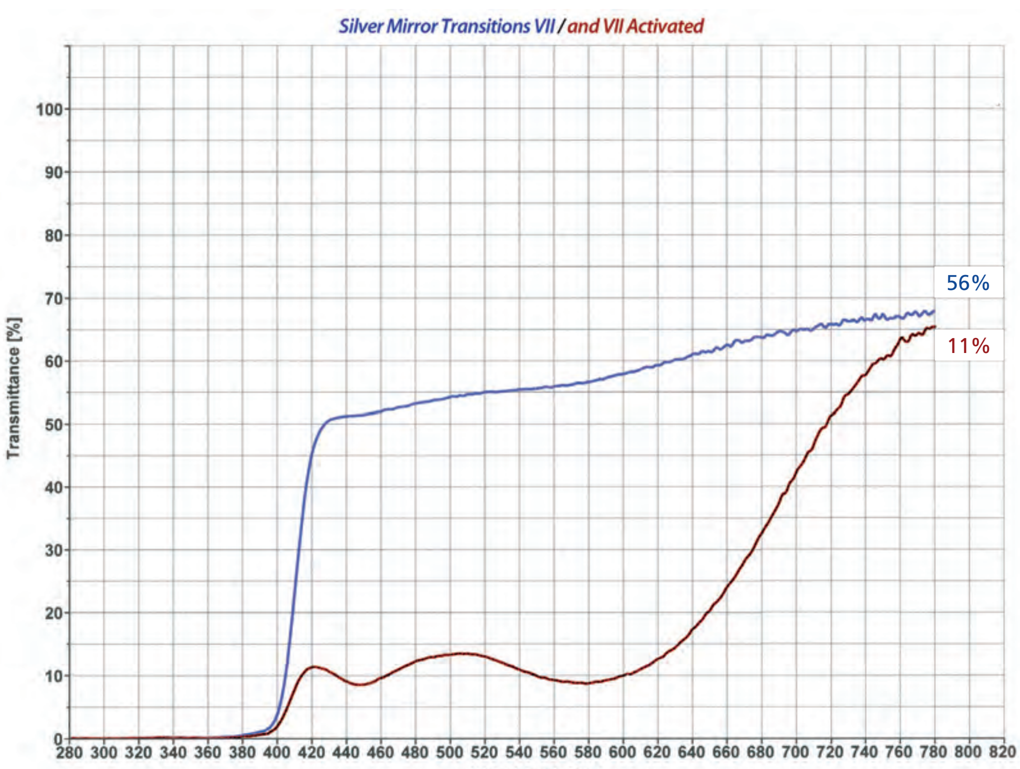


Pelmet Graduated Mirror

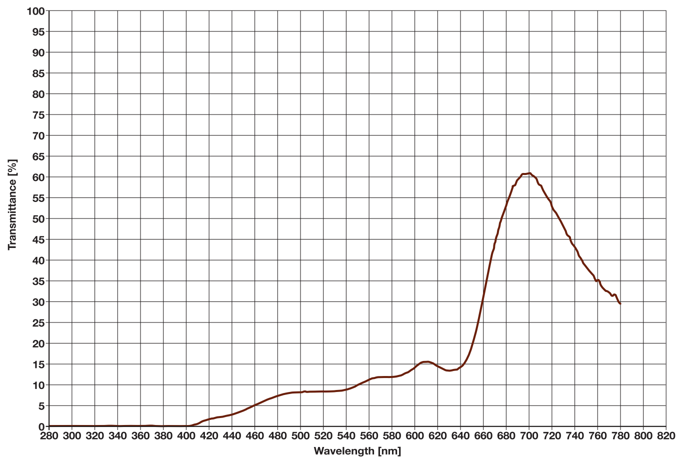


Split Mirror

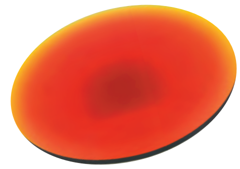
Photochromic Mirrors
With a changing base tint from 80% to 15%, the mirror effect reflects the complete swing from flash to full mirror.



Base
Tint
B15

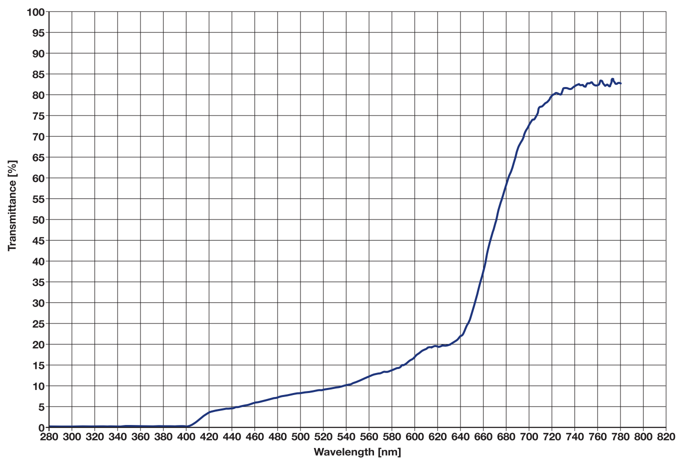


Red Mirror
RM



LT
11%

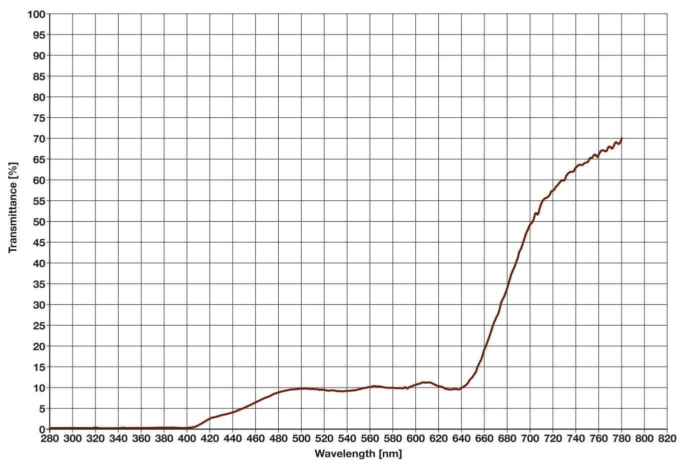
Base
Tint
G15



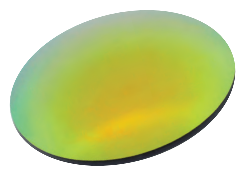
Blue Mirror
BM

LT
13%

Base
Tint
B15

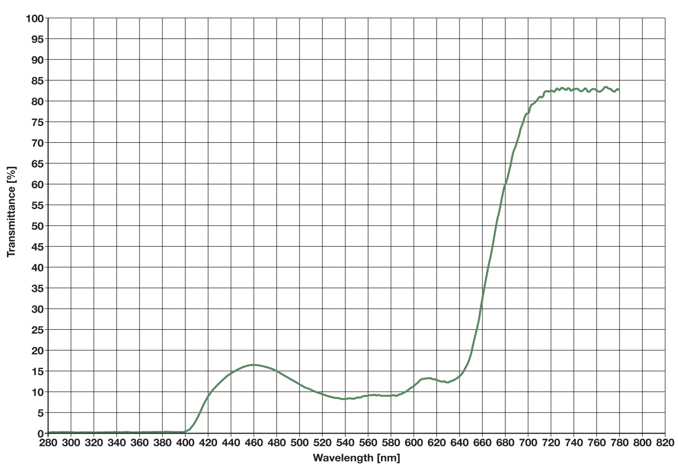


Yellow Mirror
YM (was MG)

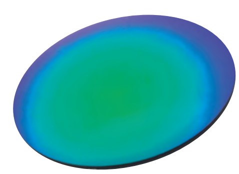


LT
10%

Base
Tint
G15



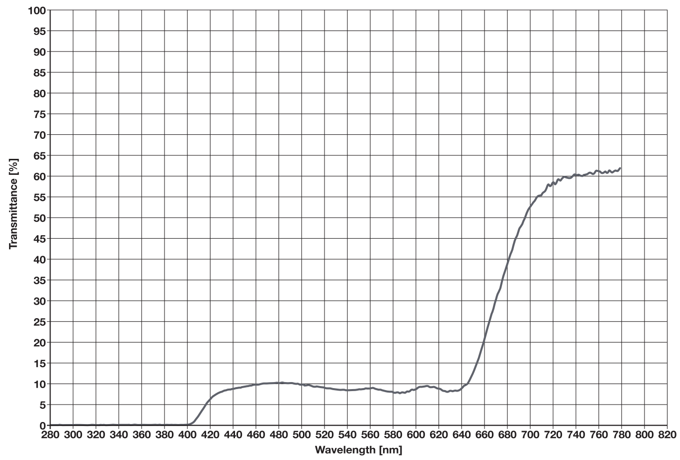
Green Mirror
EM



LT
10%

All mirrors Filter Category 3 : All met Traffic Signal Recognition : No mirror is suitable for night driving

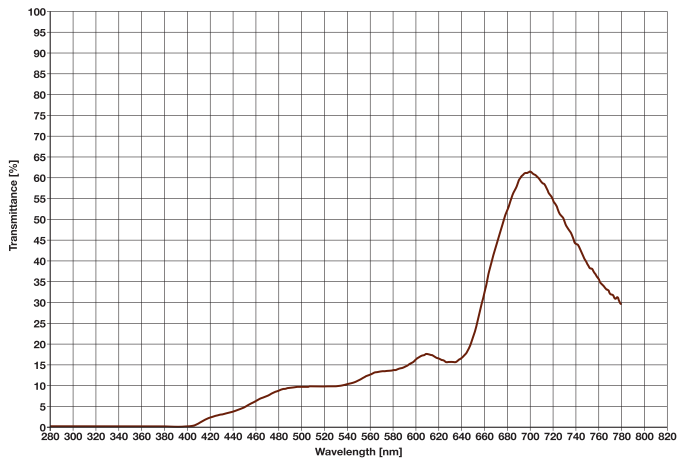
Base
Tint
G15



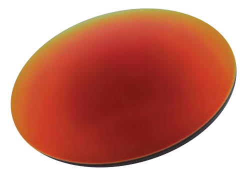
Silver Mirror
SM (was MS)

LT
9%

Base
Tint
B15



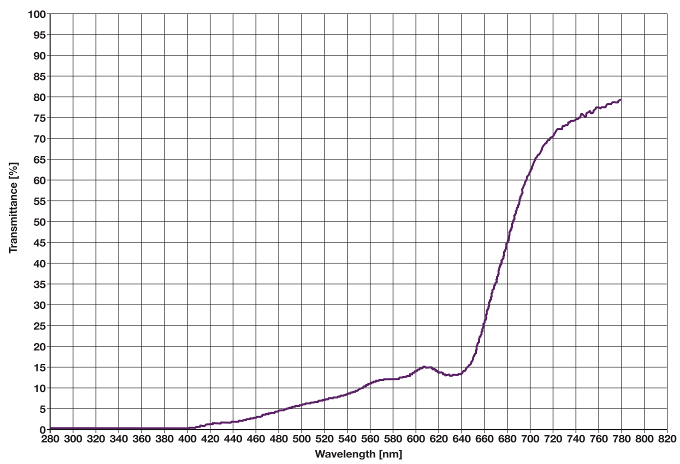
Copper Mirror
CM



LT
12%

NEW

Base
Tint
B15



Purple Mirror
PM

LT
10%

Special Note: Red and Copper mirrors absorb/reflect into the Infra Red

All mirrors Filter Category 3 : All met Traffic Signal Recognition : No mirror is suitable for night driving

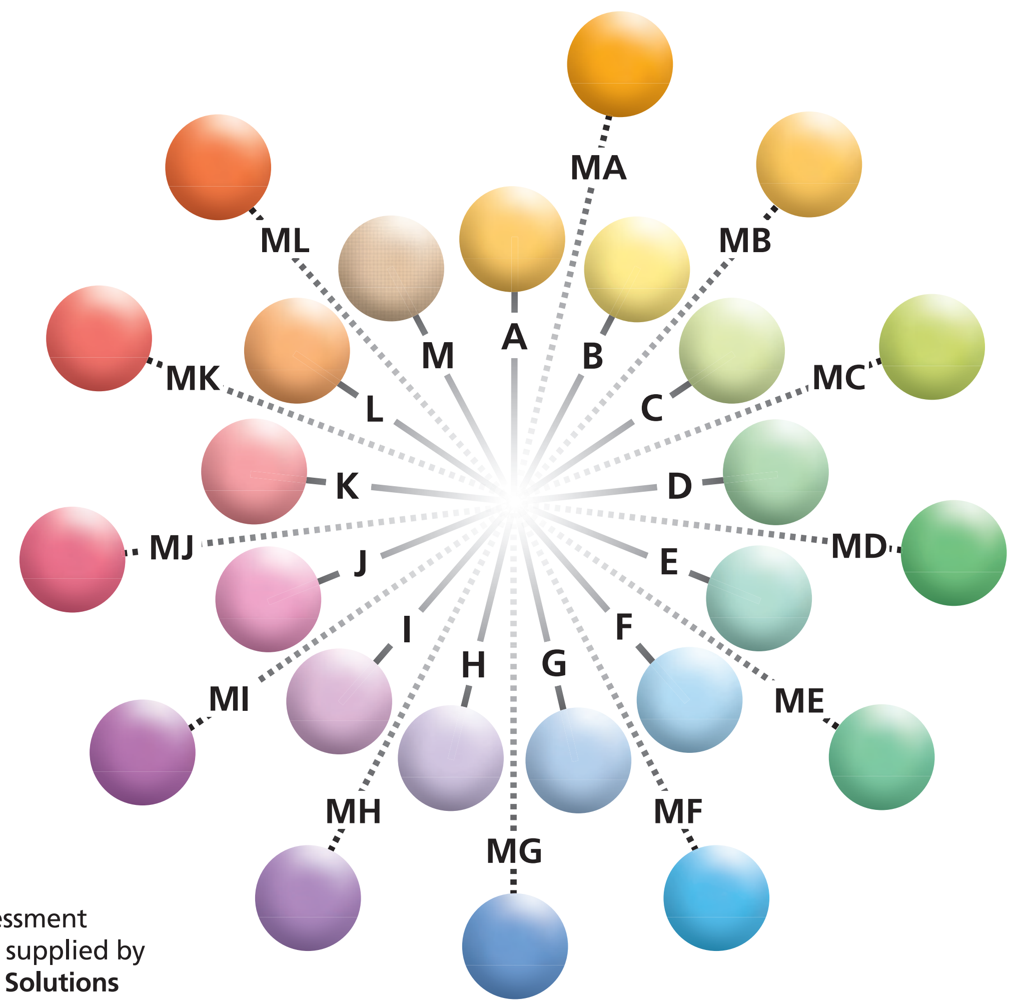
Clinical Lens Tints

Lenses for Visual Stress and Dyslexia.
Meares, a New Zealand teacher, and Irlen, a Californian psychologist, described the symptoms whereby reading is distorted as "jumping print".
Professor Arnold Wilkins (UK) demonstrated and provided coloured over-lays (Intuitive Colorimeter)
There are a number of other systems in the UK market place, EyeBrights and C3Rs

ReadEZ.
The ability to control colours has advanced greatly over recent years. Whilst those eye skills have always been there, different eyes do sense colours in varying outcomes, so let the instruments judge!

Modern spectrophotometers have moved from lab R&D to production control and can deliver extraordinary accuracy. This is particularly important for control of therapeutic tints, visual stress and dyslexia control lenses for the ReadEZ system are closer than 2% on their a and b coordinates. British Standards allow a generous 8% on regular tints, although one suspects this is an enabler to deal with occasional application of RF coating, which will alter the characteristics of the lens absorption and transmission, usually by 8%! This is of particular significance on lower tint values (higher transmission), where application of AR to the tinted lens colour causes significant change. It may be that practices should consider holding RF coated tint samples. We can provide these; likewise changing the lens index can alter the outcomes beyond acceptable margins.

ReadEZ are "clinical" tints that we hold control samples for. Cerium colours we cannot supply. Practices that ask us to tint "as sample" should be aware that, if we know these to be clinical range colours, we will decline to do this. In the event of any possible future litigation from your clients we would be unable to justify the outcomes of accurate transmission matches.



ReadEZ

Sets & computer assessment software designed & supplied by **Thompson Software Solutions**

Glass (Mineral) Lens Availability

Refractive Index n=	Material	Abbe (V) Value	Specific Gravity	Approx. UV Cut Off	Tints	60mm Round +10.00DS		60mm Round -10.00DS	
						Centre Subs	Weight	Edge Subs	Weight
1.523	Glass Regular Index	58	2.5	300nm	Solid Photochromic Vacuum Tints	% Difference Compared with Crown Glass	% Difference Compared with Crown Glass	% Difference Compared with Crown Glass	% Difference Compared with Crown Glass
1.600 to 1.604	Glass Mid Index	42	2.6	330nm	Photochromic Vacuum Tints	-12.2%	-8.2%	-13.9%	-8.0%
1.700	Glass High Index	35	3.2	360nm	Vacuum Tints Photo-wafer	-24.5%	-10.3%	-25.9%	-8.9%
1.802	Glass Very High Index	35	3.7	350nm	Vacuum Tints Photo-wafer	-32.7%	+2.6%	-34.3%	+4.8%
1.900	Glass Very High Index	30	4.0	340nm	Vacuum Tints Photo-wafer	-38.8%	+1.8%	-40.7%	+4.8%

Glass Vacuum Tints

✓ Glass tints vacuum deposition
✓ Mono colours only

BROWN (LT) B80 B50 B20

GREY (LT) G80 G50 G20

GLASS VACUUM COATING OPTIONS CHART

n = Material	MAR Green	B80	B50	B20	G80	G50	G20
1.523	✓	✓	✓	✓	✓	✓	✓
1.600	✓	✓	✓	✓	✓	✓	✓
1.700	✓	✓	✓	✓	✓	✓	✓
1.800	✓	✓	✓	✓	✓	✓	✓
1.900	✓	✓	✓	✓	✓	✓	✓

We regret no other tint colours, graduated tints or combinations available

For transmission charts see pages 95 / 96

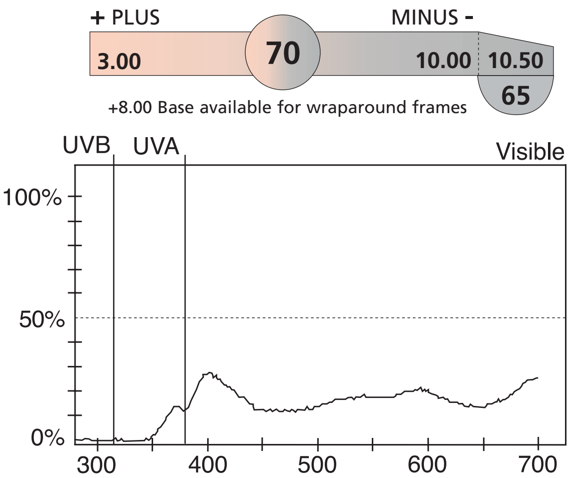
Glass Photochromic Lenses

Type	n=	Photochromic Transmission Values	
Photogrey (PGX)	1.52	87	22
Photobrown (PBX)	1.52	87	22
Photogrey (PGX)	1.60	85	23
Photobrown (PBX)	1.60	84	27
		100% LIGHT — 50% LUMINOUS TRANSMISSION FACTOR — 0% DARK	

Note: Glass lenses made from photochromic wafers will exhibit different transmission data.

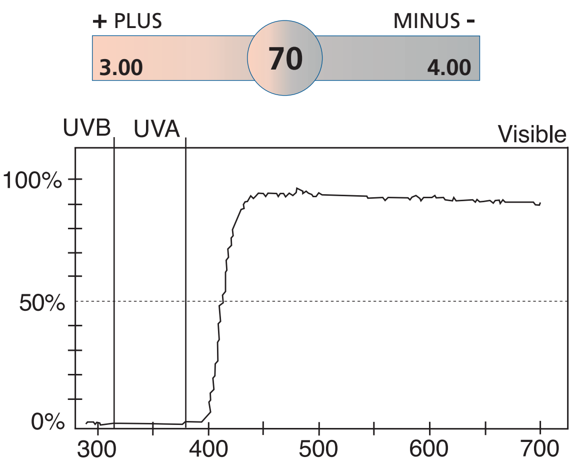
Reference *Index of Refraction (n) - A measure of the ability of a lens material to refract or bend a ray light of given wavelength, the higher the index the more refractive power.*

Grey Ray.



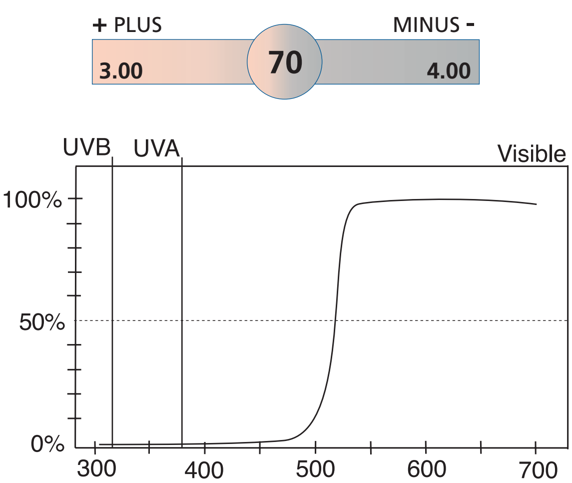
A crown 1.523 index alternative to the Ray-ban G15. It's colour is a green/grey in 15%LTF, with a similar transmission plot as the Ray-ban; available in a +8.00 base for wraparound frames.
It is also suitable for toughening. Absorbing 100% UVA and UVB plus 50% of IR, it is ideal for climbing.
n = 1.523 Abbe value 58 Density 2.55g/cm³
Single Vision and Progressive.

Green/grey. (UV400)



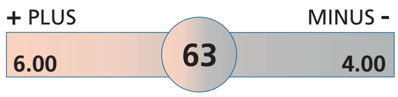
This lens features nearly total absorption of UV wavelength below 400nm. In this visible region of the spectrum, transmission is controlled with peaks in the blue, green and red ranges. This results in the colour enhancing effect, using technology developed for the aerospace industry.
Recommended for high quality sun protection with a visible transmittance of 15% at 400nm.
Neutral grey in natural light, when viewed indoors under fluorescent or other light, appears green.
n = 1.597 Abbe value 43.3 Density 2.86 g/cm³
Single Vision and Progressive.

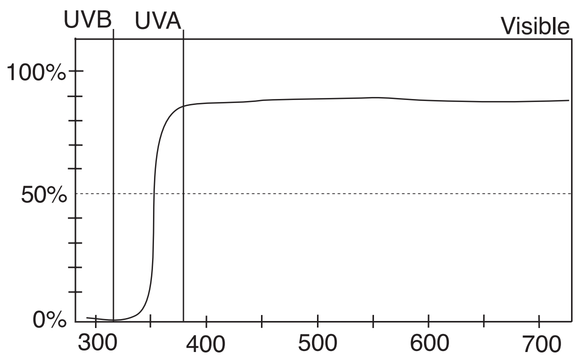
Yellow (UV480).



This lens features high absorption of blue light. This provides for clear object definition under cloudy, hazy or foggy conditions, while maintaining high visible light transmittance. It absorbs 100% of UVA and UVB in addition to the violet and blue regions of the spectrum. It also has a high luminous transmittance of 82%. Due to its high visible transmittance and low infrared absorption it should not be used for sun protection unless it is coated. With vacuum deposition coatings this is an excellent base material for sunwear.
Recommended for sporting applications e.g. shooting, for which toughening is available.
n = 1.523 Abbe value 49.3 Density 2.55 g/cm³
Single Vision and Progressive.

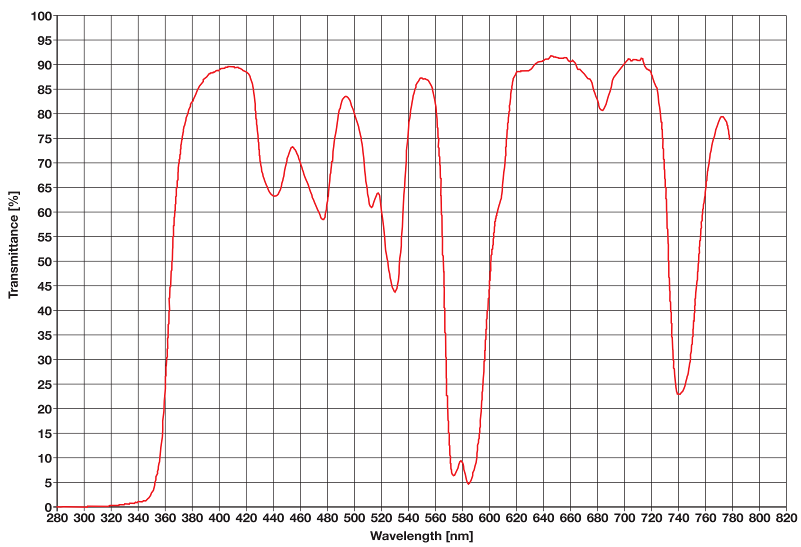
X-Ray Glass



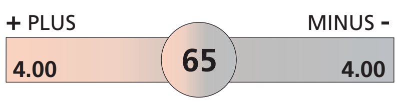


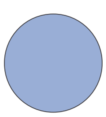
Apart from the accepted medical use, although increasingly used in veterinary and dental procedures X-Rays are increasingly being used in industry to detect, for example, internal faults in metal or welds. Sufficient lead screening is normally used, however individuals may still be at risk. Research indicates that cataracts may develop due to exposure of handling radio active materials. Eyelid dermatitis and conjunctivitis may possibly be caused by X-Rays.
The lens is clear (not tinted) and has a refractive index of 1.80, density 5.18 g/cm^3 and Abbe number 25.4.
Available in single vision and progressive. Not suitable for toughening.

Didymium BG20



LT
57%



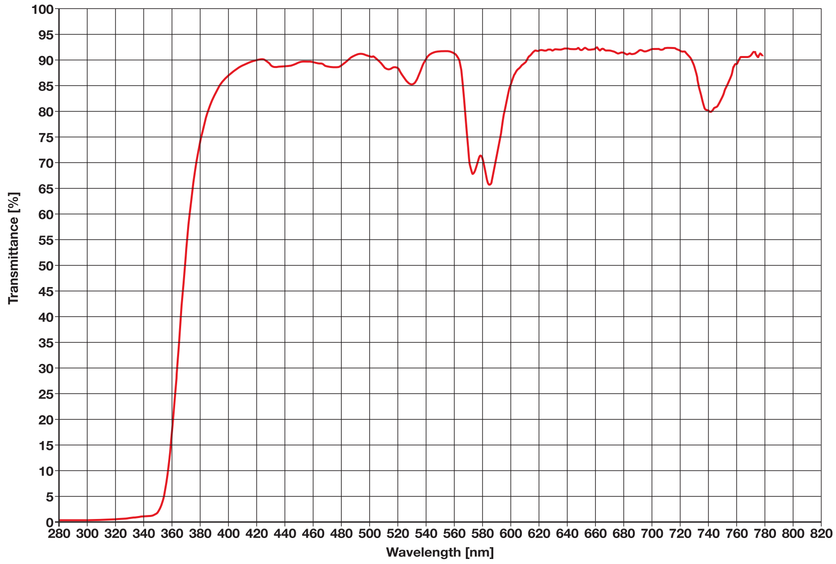


This lens utilises rare earth compounds in its composition to achieve unique colour enhancing characteristics. This concept works by selectively positioning transmissions across the spectral regions. This helps to improve colour discrimination between different colour objects. Use for hot glass workers, also other high ambient light conditions, glowing heat sources e.g. kilns, acetylene torch work in jewellery, enamelling also leisure and occupational activities including golf and in particular VDU usage comfort. Although it has a lower luminous transmittance of 57%, it is not recommended for sun protection (poor UV absorption).
Passes traffic signal requirements to BS EN 1836.
n = 1.523   Abbe value 54   Density 2.86 g/cm^3
Single vision & progressive

Note: Sometimes described as Blue Didymium.
Rose Didymium discontinued 2011.

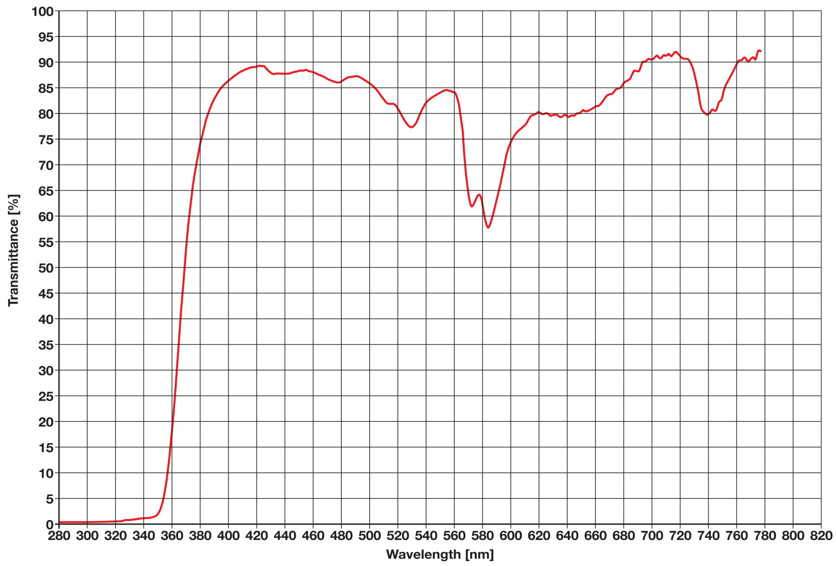
Blue tints were extremely popular throughout the 20thC.

Crookes Alpha



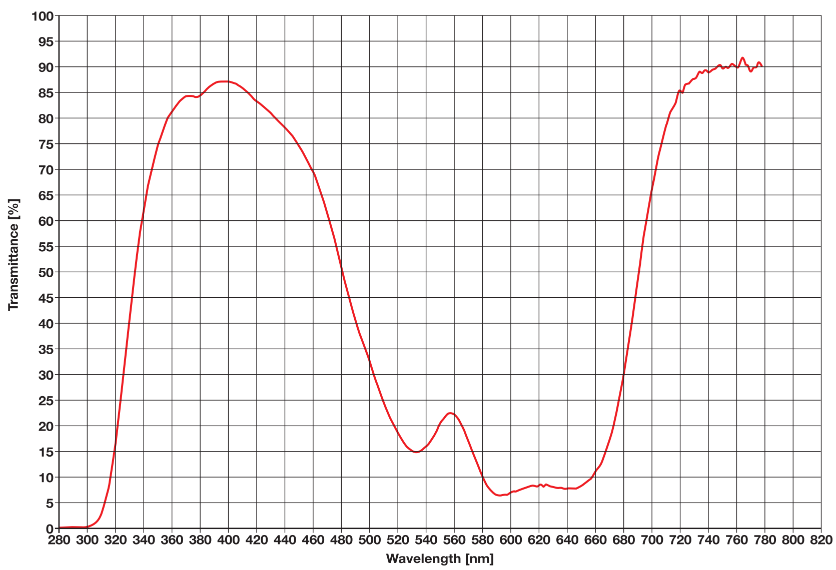
LT
86%

Crookes A2

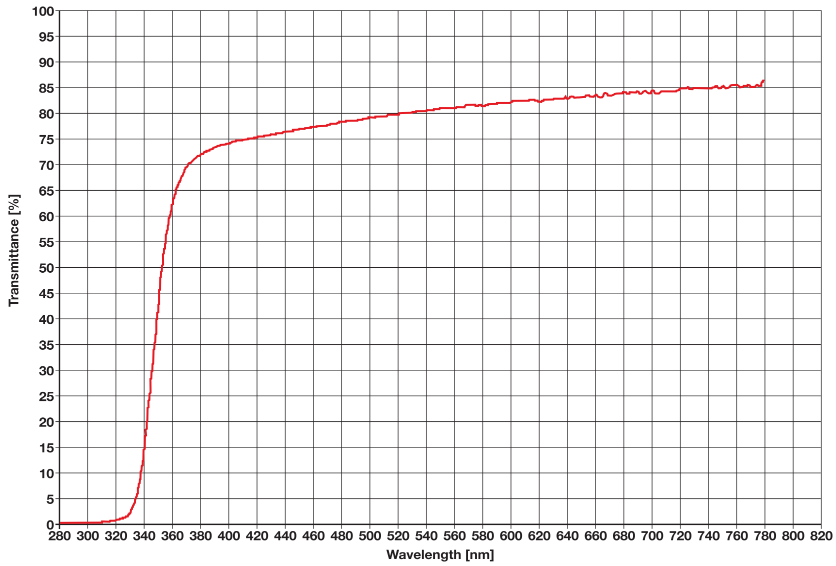


LT
77%

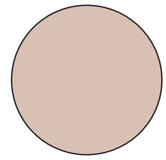
100 Year Old Blue Spectacle Glass



LT
18%

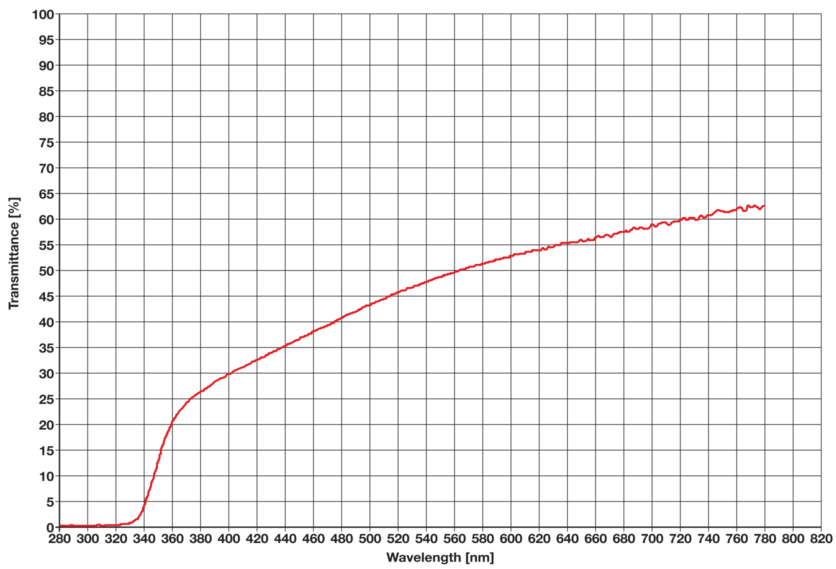


BROWN LIGHT

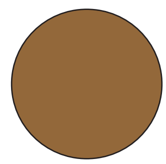


LT

80%

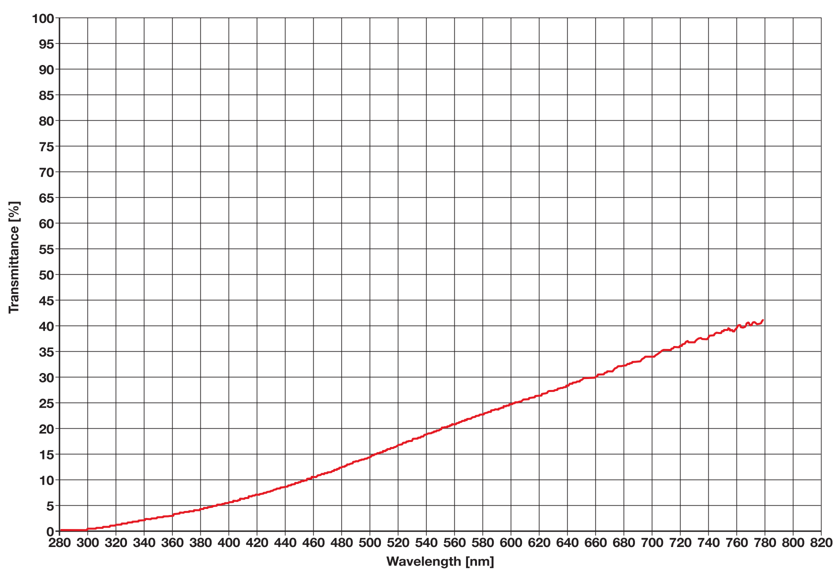


BROWN MEDIUM

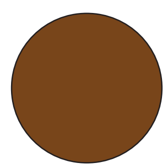


LT

50%



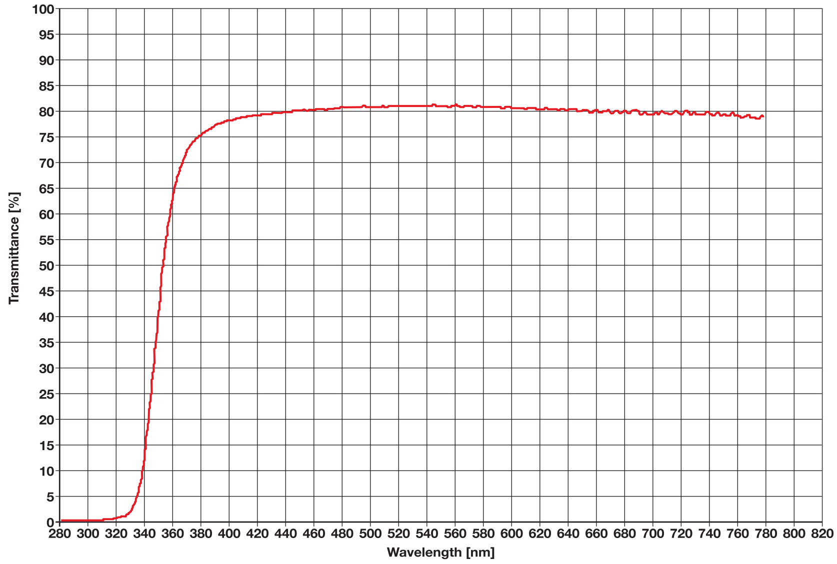
BROWN DARK



LT

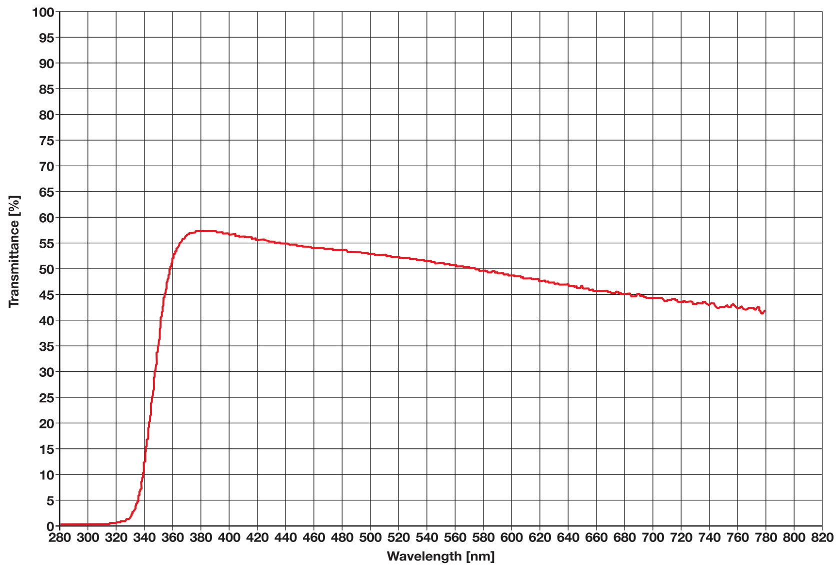
20%

Applicable to all Glass indices



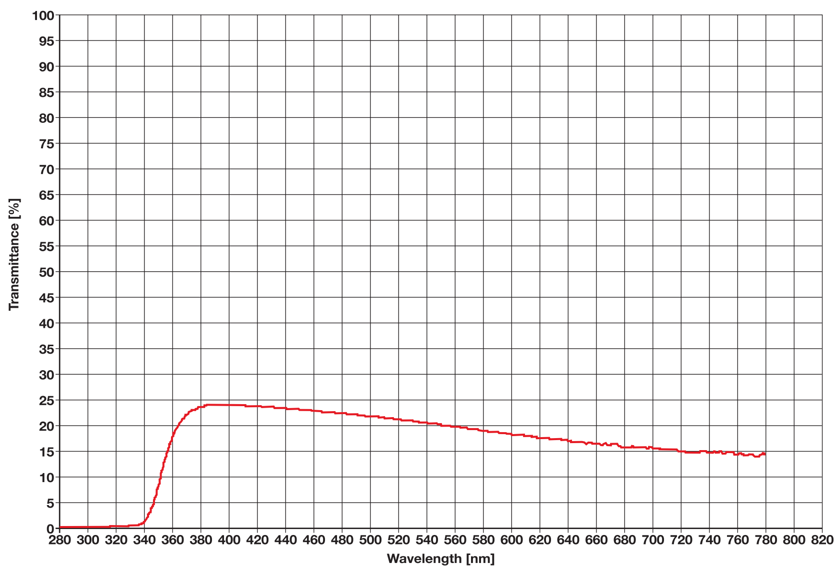
GREY LIGHT

LT 80%



GREY MEDIUM

LT 50%



GREY DARK

LT 20%

Applicable to all Glass indices

Anti-reflection coatings are far from new. As with many ideas, the phenomenon was known for many years prior to 1935, when Zeiss finally discovered a method of applying coatings by high vacuum process to the surface of a glass lens, reducing reflections whilst remaining durable.

Carl Zeiss B12/V 1970's

In a modern marketing world asking people to pay significant money for something with the word **anti** is considered a challenge with its rather negative connotation. Essilor America came along with the better description - **reflection free**.

Spectacle lenses lose a considerable degree of their transmission to reflected, or as you could describe it, rejected light. The higher the index the greater this value but even regular index lenses at 4% per optical surface, equivalent from 8% per lens up to 12% - 14% on higher indices, those ironically costing more money.

Most RF coating would soon fall off a mid or high index resin lens if it wasn't for all those layers of hard coat applied to the uncoated (naked) lens surface. This acts as an undercoat surface holding limpet like onto the RF layers.

From the original simple one or two layer vacuum deposition programmes, those today may comprise 8 or 10 layers in total. In the early days of glass coating magenta, gold and steel blue were options, then there is the option of lens surface reflex colours that is an indicator there is a coating applied to the lens surface, nowadays primarily green or emerald or strong blue for specific Blue blocking 420nm – 440nm. Finally some providers offer a clear AR coating that is devoid of easily noticeable reflex colour! That each one has to be "tuned" for every index makes for 21 complex processes before thinking of adding 5 mirrors (also applied by vacuum deposition process). Modern coating features an anti-static layer and a hydrophobic top coat of Easy Clean to repel water.

Applying hard and reflection free coatings, due to the need for index-matching avoiding Newtons rings, is an intricate laboratory process requiring experience and complex arrangement of clean rooms, trained staff and, above all, a QA process-checking system to ensure all elements are working within correct parameters. A scheduling challenge at the best of times.

Norville Coating Dept. 1980's

Buhler Boxer 700 2016

Reflection Free Coatings

A 1.50 index lens reflects approximately 8% of light, or put another way, only transmits 92% to the user's eye. With higher index materials this reflectance can increase up to 16%.

Reflections are disconcerting not only for the spectacle wearer, but for the observer as well. Reflections are unflattering and especially troublesome for spectacle wearers when driving a car at night or in dimly lit conditions when reflections from car headlights and windscreen add to the discomfort of the wearer.

Reflections can be reduced to less than 1% by the application of reflection free coatings.

Material		Reflectance each surface	Transmittance uncoated surfaces
CR39	1.498	4.0%	92%
Glass	1.523	4.3%	91.6%
Poly	1.59	4.8%	90.5%
Glass	1.60	5.3%	89.6%
Glass	1.66	6.0%	88%
Glass	1.706	6.8%	86.8%
Resin	1.74	7.3%	85.6%
Glass	1.802	8.2%	84.3%
Glass	1.90	9.6%	81.6%

When we are looking through an uncoated lens with a refractive index of n=1.5, we will observe a particular effect. Besides the objects we are interested in seeing through the spectacle lenses, our vision will be disturbed by reflected "images" from the lens surfaces.
Using the Fresnel equation, we can calculate values:

$r = (n0 - n\text{-}1)^2 / (n0 + n1)^2$,

n0 = refractive index of air

n1 = refractive index of lens material

This disturbing reflected light comes from the back side and from internal reflections. Roughly speaking in the case of CR39 (where n1 =1.5), 92.2% of usable information (transmitted light) will be disturbed by reflected light of about 7.8%.

The ratio - "disturbing light/usable light" of 7.8/92.2 = 8.5% is drastically decreased to 1/99 = 1 % by an AR coating, as we can easily see in the graphic.

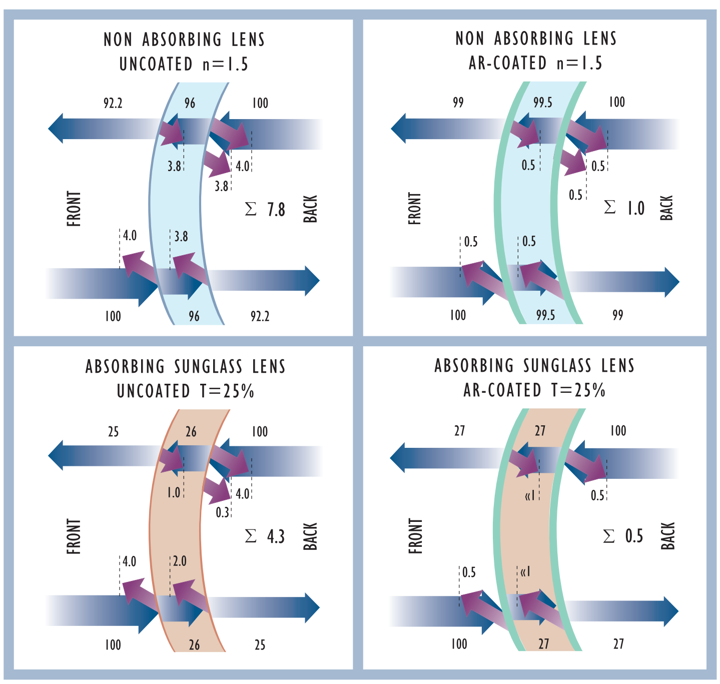
This means: the real benefit of an AR coating is a strong decrease of this "disturbance" ratio.

This becomes even more important if we imagine these ratios on absorbing sunglass lenses.

In the case of an uncoated sunglass lens with a refractive index of n = 1.5 and a light transmission of 25%, we can calculate the ratios - using the same simplified approach as mentioned above - as follows:

Ratio "disturbing light/usable light" without AR of 4.3/25 = I 7.2% - much worse than with non-absorbing lenses - and with AR of 0.5/27 = 1.8%.

This shows that sunglass wearers in particular also derive a real benefit from using AR coated lenses.



By Dr V. Bondesan & M Witzany, Satis Vacuum

References *Chapter 5 Ophthalmic Lenses and Dispensing by Mo Jalie*
Norville Clarity Booklet

Norville has invested heavily in the latest technology, allowing us to provide your patients with a practical solution to their visual comfort when it comes to reflection reduction.

Using the very latest deposition vacuum technology enables us to apply up to seven layers of coating to each side of the lens, reducing reflections over a wide band of wavelengths, hence the expression "Broadband".

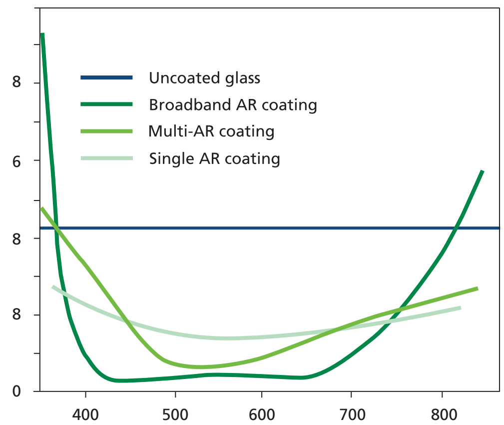
Application of the coating subjects the lens to a whole range of cleaning, preparation and evaporation procedures. Much of this is carried out within the confines of the computer-controlled vacuum chamber.

For added patient confidence all our resin reflection free coatings have added Cleancote final surface deposition.

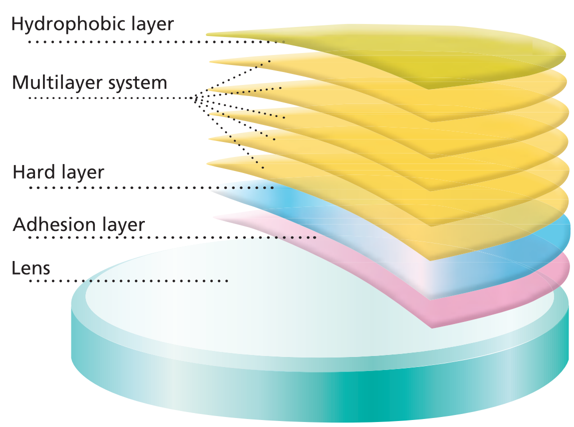
Why are some multi-coats more durable than others?
It's all due to the variables, which are:
a) Lens material substrate
b) The type of hard coat applied to the lens
c) The pre-processing regime
d) Vacuum machine techniques
e) Process integrity
f) Rigid adherence to prescribed operating procedures

The MAR coating of resin lenses is still an unpredictable science. Recent developments that have not helped are a multiplicity of hardcoats already applied to lenses before we receive them, the arrival of photochromic and new mid and high index products. The key to success is to ensure that the adhesion layer on each lens surface is perfect. If you apply the analogy of painting, its the difference between primer, undercoat and top coat, so if some of those vary or are omitted altogether then premature failure of the coating is likely. One application undercoat and gloss coat is not in our view a correct option.

RF - Reflection Free Coating



MAR - Multi Anti Reflection Coating



High Performance RF Coating

Each machine manufacturer focuses on the top of the range latest RF coating for ophthalmic applications.

These processes provide anti-static properties and better optical and mechanical quality. Such process also achieves anti-radiation properties for low energy electromagnetic fields, in fact the measurement at the frequency of 1 KHz shows an attenuation of 85% of the electromagnetic field intensity. This process is completed with an easy-to-clean top coat.

These **anti-static properties** are very useful to reduce the tendency of the lens to attract dust, reducing the need of frequent cleanings and therefore the possible scratching. The new optical properties guarantee higher performance in the colour repeatability, lower colour difference between the centre and the border on the lenses. Finally, the improved mechanical properties guarantee a higher abrasion resistance on lacquered lenses.

Although it is many years since we posed some frequently asked questions to a recognised expert in the materials and coating industry : **Dr. Werner Lobsiger**, a physicist and thin-film specialist, most are still as relevant today as then.

What is the best process for applying antireflection coatings to ophthalmic lenses?
There is no best coating process. There are several that rate from useful to good. Aside from the process itself, there are a number of factors that govern the quality of coating systems, such as the condition of the vacuum system, cleaning the substrate, the vapour-deposited materials, proper maintenance and operation of the coating equipment and, of course, continuous product quality control.

Are there currently any coated plastic ophthalmic lenses that can match glass lenses in terms of durability and fitness for everyday service?
No, there is no such process yet - or to put it another way, until some completely novel plastic is developed, these qualities cannot be achieved with the coating processes known at present.

Can plastic ophthalmic lenses be rendered "as hard as glass" by coating?
Only glass is "as hard as glass". Coated plastic lenses simply have a thin hard coating, and while the coating may have this property, the much thicker substrate (the lens material) cannot. Think of a layer of ice on a "frozen" pond : if you apply a load to the thin ice it breaks or at least it cracks, but the water underneath yields. The plastic material does the same.

Why can we not simply make the hard coating thicker?
There have been many attempts to do just that, but the results have been unsatisfactory. The plastic ophthalmic lens and the thin-film system applied to it have completely different physical properties. The plastic lens is made of an organic material; it is heat-sensitive, soft and elastic, and it has a large coefficient of thermal expansion. The coating of inorganic materials, on the other hand, is not sensitive to heat; it is hard and brittle, and it expands less than the substrate when heated. As a result, stresses arise and lead to cracking and detachment. For this reason, maximum hardness is no longer the paramount objective. A balance between hardness and elasticity is much better.

But is it conceivable to make plastic as hard as silicate glass?
Anything is conceivable, for development never stands still. But the trend in ophthalmics is the opposite: toward lighter, thinner, and therefore even softer lenses. Hard coatings are indispensable for such lenses if they are to meet the requirements of daily use.

What does the phrase "integral coating process" mean?
The overall coating system on a plastic ophthalmic lens, of course, has three components, each performing its own function:
1) The hard coating, directly on the substrate (often with an intermediate coating to improve adhesion), which is intended to impart the desired surface hardness to the product.
2) The antireflection coatings to enhance transmission. These also produce the characteristic reflection colours. They are applied on top of the hard coating.
3) The protective coating, a hydrophobic material that repels water and dirt and blocks air from the lens.

"Integral coating process" is the new term for a process in which these three components are applied in a single production step. Such processes are nothing new in the treatment of ophthalmic lenses; they have been on the market for years and some of them deliver very high quality.

What does "plasma" mean and what function does it have in connection with cutting reflection?
A plasma is a highly ionised gas. A variety of plasmas have been used for years in vacuum coating processes, including those used in ophthalmic optics. What is of interest is ion bombardment, usually with argon ions. Compression depends entirely on the energy of the ions that strike the coating. There is no doubt that major improvement in coatings can be achieved by this technique.

When coatings are applied with ion bombardment, can they not become detached in daily service?
Experience confirms that detachment is not impossible. Like other problems with coatings, detachment results from a wide range of causes, such as the condition of the vacuum system, substrate cleaning, process technique, deposited materials, surface quality and so forth.

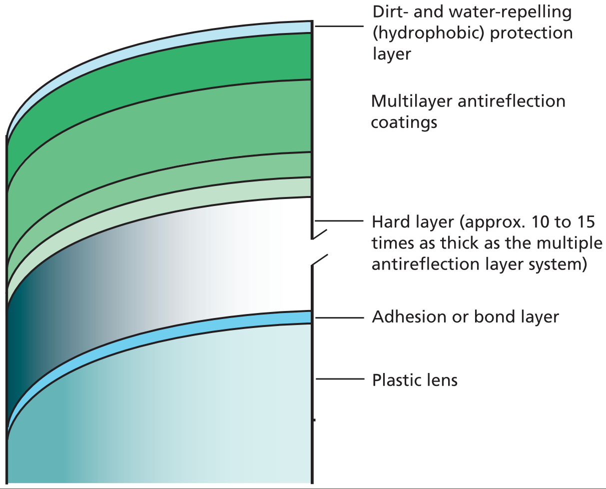
What kind of coatings are there today? What functions do they perform?
The point of a hard coating is to protect the plastic ophthalmic lens against external physical effects, that is, to enhance its scratch and abrasion resistance and thus improve its service qualities. Proven methods include applying hard lacquer coatings, plasma polymerisation (such as Diaplas), and depositing a hard coating in vacuum (such as IONCOTE ZB). The optimal resistance of a coating is always a compromise between hardness and elasticity. The rule of thumb is this: the harder (and thus the more brittle) the coating, the greater the risk of cracking and detachment.

Do plastic ophthalmic lenses consistently have hard inorganic coatings to protect the sensitive antireflection coatings?
As I already mentioned, the antireflection coating is always on the outside, over the hard coating. This is for physical reasons. The hardcoating therefore cannot protect the antireflection coating from the outside. What is more, the antireflection component of an "integral" coating system (which can include over 10 individual layers in all) is made up of several different materials, so that it cannot be thought of as a consistent, homogeneous inorganic coating.

Can scratching and detachment also occur in "integral" coating systems?
In this connection the words "integral" and "integrated" often give rise to misunderstandings and false hopes. These coating systems do not exhibit any special protective qualities in practice, and it is impossible to prevent scratching and detachment in them just as in all other coating systems.

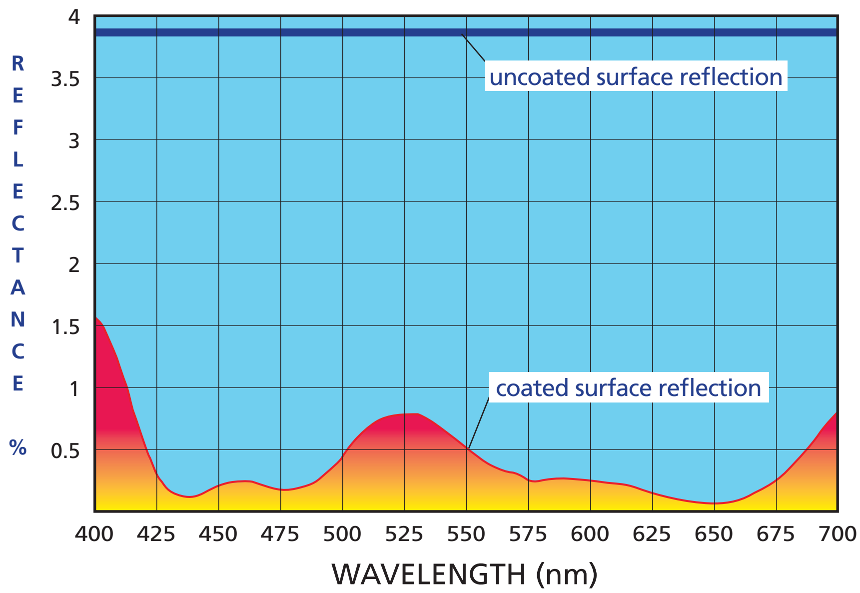
What advantages does a hydrophobic or "clean" coating offer?
As the outermost layer and hence the one in closest contact with the air, such a coating acts to reduce friction and to keep water and dirt from the surface. The word "hydrophobic" indeed means water-repelling. Hydrophobic coatings are widely used today and are part of the state of the art.

Basic design of a coating system for plastic lenses



What, today, is anticipated in terms of residual reflection in broadband antireflection coatings?

The degree to which reflections are supposed is really of secondary importance to the customer, the person wearing the spectacles, who is used to values generally lying in the desirable range below 1%. On the other hand, the consumer is very interested in the colour and effect of the residual reflection. A soft green is preferred now. The customer's wishes therefore take priority, and wishes are influenced by fashion and taste, which are purely subjective factors. It is the job of technology and marketing to fulfil these wishes.



Antireflection coating for organic lenses

How much information do coating quality tests provide?

It depends on how they are designed. To get useful results, accepted methods must be used to identify the governing factors, and this means long-term tests on large numbers of lenses. It is known from practice that dissatisfaction arises, as a rule, after a pair of glasses has been worn for two to nine months. Straight laboratory tests cannot predict this outcome because most tests give a "snapshot" of lens performance. Test methods under lab conditions thus provide only a limited amount of information.
If more dependable results are wanted, long-term testing on large lots of current production is indispensable. The following are the four leading tests used in practice:

- Abrasion test (mechanical friction on the coating with a well-defined contact pressure)
- Boiling salt water test (2 minutes boiling, 1 minute cooling in cold water, repeated 8-10 times)
- Ultrasonic test with caustic
- Bayer test (rocking gently to and fro in sand)

QUV Test

The durability performance of AR coatings is regularly validated using a QUV test chamber designed to simulate 2 years of environmental exposure of the lens coating. Production coated samples are mounted inside the chamber. The test lasts for 256 hours and cycles the conditions within the chamber every four hours between a specified UV exposure to simulate sunlight and 100% humidity. This test is used because there is an accepted good correlation between the test results and real life coating performance.

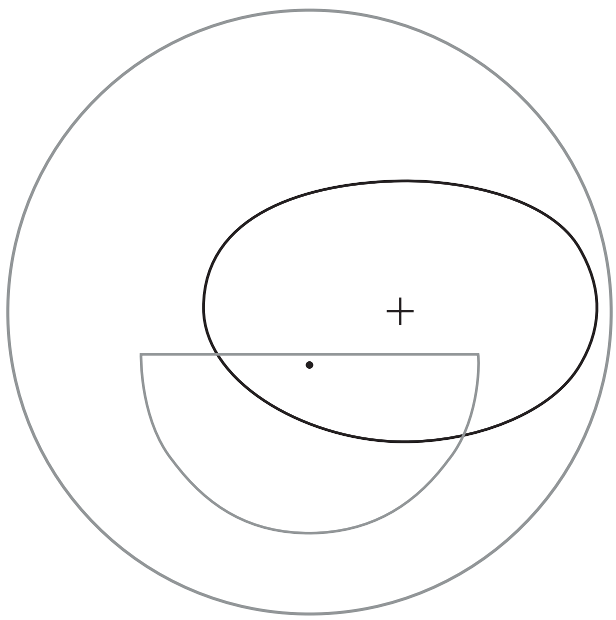
Thermal Shock Test

AR coatings comprise up to 8 layers of different metal oxides and silica applied by vacuum deposition. To check the adhesive integrity between the layers a test referred to as the "Thermal Shock" test is utilised. This involves transferring coated lenses between salty boiling water and cold water at two minute intervals. Due to the different coefficients of thermal expansion of the layers, stress is applied at the interfaces and any weakness exposed. The salinity of the water attacks the metal oxides, assisting removal of any detached layers so that the test result is clearly visible.

Unfortunately, following the supply demise of our Resin E Style **prism segment** bifocal, the number of options in which **horizontal prism** corrections in near or distance only is now seriously limited.

Horizontal prism correction can be achieved by the following lens types:

1) **A grossly decentered D segment**, preferably one that comes in an 80mm lens blank.
Please find below a chart showing the amount of extra insert required to induce the listed horizontal prism.
The difficulty with this method is enabling enough segment to be visible to ensure a useable reading area for the wearer. The diagram below highlights this concern.



Example - 12m/m Inwards Decentration

Approximate amount of extra segment inset (in mm) for base in, induced at near only. D45 bifocal.

ADD / Δ Base In	+1.00	+1.25	+1.50	+1.75	+2.00	+2.25	+2.50	+2.75	+3.00
1Δ	10	8	7	6	5	4	4	4	3
1.5Δ	×	12	10	9	8	7	6	5	5
2Δ	×	×	×	11	10	9	8	7	6
2.5Δ	×	×	×	×	×	11	10	9	8
3Δ	×	×	×	×	×	×	12	11	10
3.5Δ	×	×	×	×	×	×	×	12	11

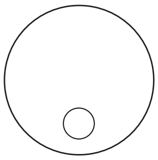
WARNING:- Outcome variable with Rx / Eyesize / Decentration -
The greater the decentration the smaller the eyesize glazable.

2) **Franklin Split bi-prism** (see page 106).

and * Optical Centre Position

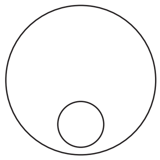
Bifocal - Round Segments.

Round 15



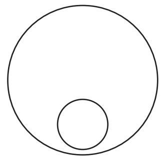
*8 mm below seg top
n = 1.50
n = 1.60

Round 22



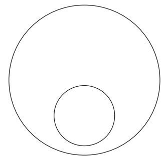
*11 mm below seg top
n = 1.50

Round 24/25



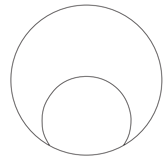
*12 mm below seg top
n = 1.50

Round 28



*14 mm below seg top
n = 1.50

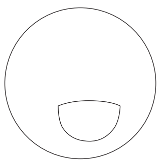
Round 38/40



*19 mm below seg top
n = 1.50

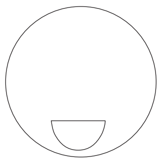
Bifocal - Shaped Segments.

C28 (28 x 19)



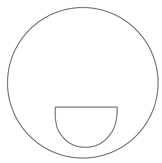
*5 mm below seg top
n = 1.50
n = 1.60
n = 1.66
n = 1.74

S25 (25 x 17)



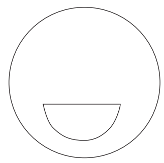
*4.5 mm below seg top
n = 1.50

S28 (28 x 19)



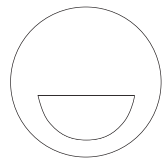
*5 mm below seg top
n = 1.50
n = 1.53
n = 1.59
n = 1.60
n = 1.66

S35 (35 x 22)



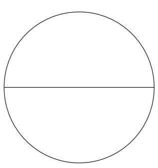
*4.5 mm below seg top
n = 1.50
n = 1.53
n = 1.59

S45 (45 x 24)



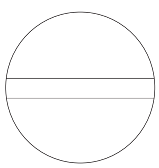
*1.5 mm below seg top
n = 1.50

Bifocal - E Line.



*On the line
n = 1.50
n = 1.67

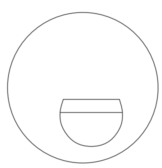
Trifocal - E Line.



50% Inter 7 mm
n = 1.50

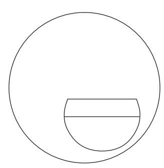
Trifocal - Shaped Segments.

S728



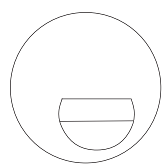
50% Inter Add 28 x 7
Reading 28 x 11
n = 1.50
n = 1.53
n = 1.59

S835



50% Inter Add 35 x 8
Reading 35 x 20
n = 1.50
n = 1.59

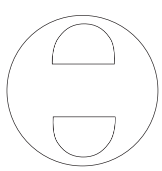
S1435



60% Inter Add 35 x 14
Reading 35 x 30
n = 1.50

Double Trifocal - Shaped Segments.

Double D Seg



60% Add or Same Add Top & Bottom
Separation 14mm
DD28
n = 1.50

Anisometropia.

It is suggested that spectacle wearers can tolerate binocularly up to 1.5 dioptres of anisometropia (vertical imbalance). Optically this can be mitigated in a number of ways:

a) Unequal segment sizes - Round Segments.

Although visually a little strange for beholders of those wearing such combinations, a 24mm round bifocal in one eye with a 45mm bifocal segment in the other, in reading addition of +2.00 will provide an extra 2 dioptres of prism difference. Whilst +3.00 addition contributes a full 3.5 prism dioptres. This effect in both glass and resin materials is due to the variation of the reading optical centres (10mm in the case above).

Prismatic Effect at N.V.P. due to the Segment (Additional Base Down Prism).

N.V.P. assumed 5mm below segment summit, all prismatic effects base down.

Near Addition	**15mm** Round Segment	**24mm** Round Segment	**28mm** Round Segment	**40mm** Round Segment	**45mm** Round Segment
+1.00	0.3 base down	0.7 base down	0.9 base down	1.5 base down	1.8 base down
+1.25	0.3 base down	0.9 base down	1.1 base down	1.9 base down	2.2 base down
+1.50	0.4 base down	1.1 base down	1.4 base down	2.3 base down	2.6 base down
+1.75	0.4 base down	1.2 base down	1.6 base down	2.6 base down	3.1 base down
+2.00	0.5 base down	1.4 base down	1.8 base down	3.0 base down	3.5 base down
+2.25	0.6 base down	1.6 base down	2.0 base down	3.4 base down	3.9 base down
+2.50	0.6 base down	1.8 base down	2.3 base down	3.8 base down	4.4 base down
+2.75	0.7 base down	1.9 base down	2.5 base down	4.1 base down	4.8 base down
+3.00	0.8 base down	2.1 base down	2.7 base down	4.5 base down	5.3 base down
+3.25	0.8 base down	2.3 base down	2.9 base down	4.9 base down	5.7 base down
+3.50	0.9 base down	2.5 base down	3.2 base down	5.3 base down	6.1 base down
+3.75	0.9 base down	2.6 base down	3.4 base down	5.6 base down	6.6 base down
+4.00	1.0 base down	2.8 base down	3.6 base down	6.0 base down	7.0 base down

b) Unequal segment sizes - Shaped Segments.

Due to their construction, segments other than round are not so useful. The physical optical centre of a Fused D25 segment (17mm deep) is 25mm ÷ 2 = 12.5mm, so 17mm - 12.5mm = 4.5mm, the optical centre being 4.5mm below the seg top, just the point around which we consider our NVP calculations to be based.

We list the other shaped segments:

Prismatic effect at NVP for various shaped segment designs. Value is shown for a 1.00 add (for 2.00 add double the amount etc.) Prisms under 0.05 dioptres are classed as nil. The days of using R5 - R9 shaped glass D segments for this outcome are long gone.

S25 x 17	Nil base DN
S28 x 19	Nil base DN
S35 x 22	Nil base DN
S40 x 20	0.5 base DN

c) Bi-prism (Slab-Off) Bifocals/Multifocals.
These glass bifocals or multifocals can be adapted:-

Crown Glass SV, E Style, D25, D28, D35, D725, D728, D735, selected progressives - All white or photochromic
1.7 Index SV, Progressives

and the following resin lenses:-
Standard CR39 E Style, S25, S28, S35, S725, S728, S835, S1435, S1128, E Style Trifocals - white, or Transitions where available, selected progressives - white or Transitions,
Mid Index 1.6 S28, selected progressives.

Type / Indices	S.V.	D Seg.	Vari focal	Min Δ to slab	Max Δ to slab
1.5	✓	✓	✓	1.5	Approx 10*
1.55	✓	✓	✓	1.5	Approx 10*
1.586 (Poly)	×	×	×	1.5	
1.60	✓	✓	✓**	1.5	Approx 10*
1.67	✓	✓	✓		Approx 10*

*Dependent on blank substance
** Can not slab Gen 6

A bi-prism lens is technically achieved by surfacing the concave rear surface with BASE UP prism (minimum value 2.0$^{\Delta}$) of equal value to the imbalance between the right and left prescriptions over the entire lens i.e. distance and reading, usually the lens of the pair with the greater base down prism. Then (and this is the clever bit!) we remove that same prism but now from the front of the lens, stopping (we have started at the top as we are creating a base down prism) just before we reach the segment line. We now have a lens with base up prism but only as far up as the segment top, now leaving the distance portion prism free again as it was before all this started.

Well, this is how it works for glass; resin lenses are really challenging as, due to the segment bulge, all the above needs to take place on the inside surface only! Which perhaps explains why slabbing off is the pinnacle of Rx lens making skills. Remember slab-offs can only provide a variation in vertical prism. The special skill and indeed difficulty is achieving a neat, straight slab line coincident with the segment line. Some higher index resins are too soft to produce a clean line, the reason why some higher index materials, e.g. polycarbonate, cannot be slabbed.

d) Franklin Split An alternative is to resort to an old E Style Franklin Split and to Norbond (see pages 109 and 110) two half lenses together, one reading portion carrying the corrective vertical prism. Remember in all of the above it's only one lens that is needed with segment prism, the other half pair being just a standard bifocal.

e) Presto A flat top segment button pressed into the appropriate aperture formed in a single vision lens. Effective for correcting prisms, differing cylinders for near, even white segments in a photochromic carrier. Pronounced edges can be an issue.

Prism Controlled Lenses (Presto)

Very High Powers

Presto Lenses

Whilst higher plus power lens thickness can be neatly alleviated by the use of lenticular forms, higher negative prescriptions are the more challenging. The solution of visible convex or plano flattening is a greater challenge to achieve in resin rather than mineral materials. Mid powers up to -20.00D is where the challenge increases, beyond even more so. It is here that Presto, circular or oval, may offer the better solution. Their 25mm button is literally pressed into the equivalent "hole" of the carrier lens. Utilising matching thickness carrier lenses minimises the protruding edge differences. Very high prisms can also be accommodated by this method, although obviously still with a visible thickness difference. Diameters can be adjusted to whatever is required

Prism Bifocals

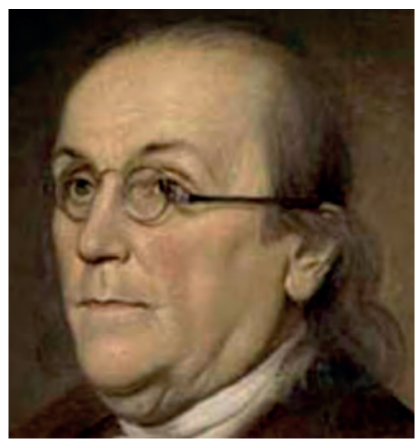
Presto-Prism

Our descriptor for bifocal lenses with a differing prism in its reading portion to that of distance vision, achieved by pressing a prism segment into a pre-cut aperture cut into the lower area of a distance single vision correction. This technique overcomes those occasions when insufficient base in values can be obtained ,through excessive decentration or when much higher values, oblique angles were requested.

21st Century Franklin - A lens of two halves

If ever a lens design has stood the test of time.

Attributed to Benjamin Franklin (1706-1790) printer turned inventor, American ambassador to Paris and London, one-time resident of Craven Street, just down from the current location of the College of Optometrists, London.



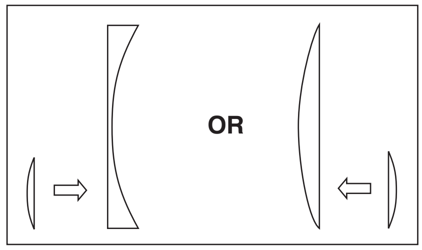
Although he may not have been the inventor of a Franklin Split bifocal, two halves of different powers divided horizontally and remounted together, he certainly was an enthusiastic promoter of his bifocals that to this day, over 250 years later, continue to bear his name.

Later manufactured as a one piece glass bifocal named Executive Bifocals by American Optical, copied by others and called E Style or E Line. Its generous reading area and optical centres for distance and reading coincident on the segment divide. The Norville FS Bifocal enables all sorts of prism options separate in the reading portion from that of the distance include offering different cylinder powers and axis in each half.

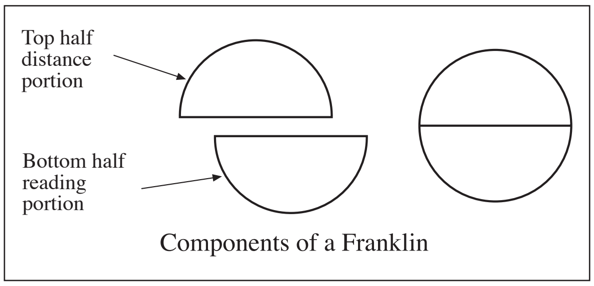
Franklin Split – FS Bifocals – flexible stuff in any index or material - your call!

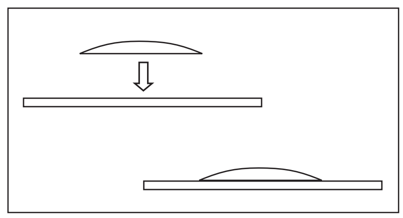
We use the term Norbond to describe the bonding of two (or perhaps more) pieces of glass using a permanent bonding agent that is unaffected by the elements. There are many applications for this process. For example, flat glass lenses can be Norbonded to the back of a faceplate from a diving mask.

Segments can be Norbonded to single vision lenses where, due to nature of occupation or hobby, the segment has to be in an "unusual" place or shape, or indeed when Rx is such that to make from conventional bifocals would not be possible.



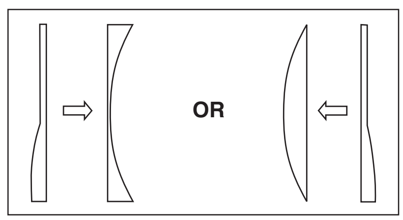
When high power or larger blanks than listed are required, or different prism amounts in distance and reading are needed, then perhaps a Franklin bifocal could be of use, the components being Norbonded to form one single lens.



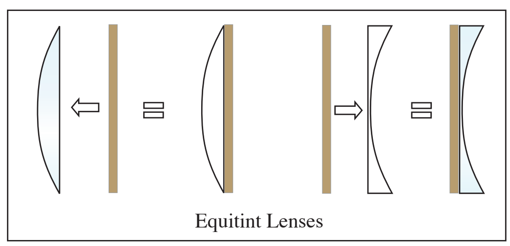


Lenticulars are another application.

Out of range bifocals or trifocals can be produced by taking a very thin lens containing the segment and Norbonding it to a single vision semi-finished to create an extra thick blank that can be surfaced in the normal manner.



Equitint solid tinted or photochromic lenses can also be created by Norbonding a layer of tinted material to a powered lens, which can be either standard Crown glass or any higher index.



Due to the need for the photochromatic layer to be on the front of the lens, the process is really only suited to minus prescription when a photochromic element is involved.

AR coating can be applied but only when lenses are in their separate component parts. On Franklin type lenses we do not apply any form of AR or vacuum coating due to the complex nature and additional handling required during glazing.

It is not possible to Norbond toughened lenses.

It is only possible to Norbond glass to glass i.e. we cannot Norbond resin.

Norbonded lenses can be fitted to plastic and metal rims but not supras and rimless.

Norbonding has many applications - To make the "impossible possible" please enquire.

Part II

Rx  ALLSORTS

of Rx House Working Details

Abbe Number.

When only Crown glass was available the interest in Abbe number or V-value (59) was but academic. Today with so many new materials, all with great variations of Abbe numbers, interest has heightened. The higher the V-value the less chromatism perceived by the wearer.

Be aware when checking lenses on lensmeters (automatic focimeters) that, because they work on a different wavelength to that of “manual” focimeters, power discrepancies can occur that really do not exist.

The new generation of lensmeters have a facility to adjust the Abbe number, thereby allowing a truer representation of the power reading. This is of particular importance on higher index materials that generally have lower Abbe numbers than standard Crown glass or resin.

Failure to appreciate this important factor may lead to unnecessary delays to your patient while you return the lens to us as incorrect, only to be told that the Rx is correct when set for the Abbe number of the material.

A point also of particular concern, is that there continues to be a failure to agree an international standard on a single reference wavelength to be used when checking lenses. The UK and USA use the Helium d line (wavelength 587.56nm) with Europe using the Mercury e line (wavelength 546.07nm). For high powered lenses the same lens could read 0.12D difference!

Fused Photochromic.

Remember glass fused bifocals! You might recall they are made from two pieces of glass, the segment portion needing to be of a higher index otherwise it would be single focus! All photochromic fused bifocals and trifocals are produced using white fused buttons, so the higher the reading addition the less coloured the reading portion. Some would claim this to be an advantage for reading!

Glazing Bevel Position.

Misunderstandings often arise over the placement of minus lens glazing bevels. It is our policy to always machine these flush with the spectacle front plane. This ensures the best cosmetic view for anyone looking at the spectacle wearer as there is no protrusion of bevel to the front, all is hidden to the back, although it is of course visible to the wearer when they take their spectacles off.

Should you wish to specify an alternative position, this is possible providing you state so at the time of ordering, e.g. 50% 50% or 30% 60% etc. The bevel cannot be changed once glazed, unless it is reglazed to a smaller eyesize.

It cannot be stressed enough that to make any significant reduction in the bevel thickness, consider smaller eyesizes or higher indices.

E Style Bifocal and Trifocal.

Earlier Franklin Split lenses were, if anything, better than today's one piece representations, as it was far easier then to control the distance and reading centres, something today we find very difficult. The heyday of the Executive glass bifocal was a time when eyesizes were small and the substance of the finished lenses, because their diameter was small, could be kept thin - 55mm was considered very large!

Today we have 78mm diameter Resin Executive lens blanks, which, when used to the full diameter, can result in extremely thick finished lenses, even when you attempt to minimise the finished lens substance. Why? Because of the basic design of the E Style. This is wonderfully illustrated by Mo Jalie's diagram (page 151 Ophthalmic Lenses and Dispensing). The Rx may seem a mild +0.25 sphere but combined with a +2.75 add the total power is +3.00 DS. This is the power for which we need to calculate the finished substance, not its +0.25 distance Rx.

Whenever you think of using an E Style consider Prof. Mo Jalie's succinct words, "Look upon an E Style as a **near vision lens** to which is added a minus segment for distance vision". Then you will understand its limitations. If it's used as a lens for myopes only, or very small frames in plus Rxs, then it will look fine, otherwise it needs to be renamed the "Door Stop" lens. Remember a D seg, even when a large 45 D segment, even a +4.00 add, is always surrounded by a circle of lower power "distance" Rx, which contains and controls the finished lens substance.

Talking of control or lack of, the other problematical area of E Style is the optical centre position. Whilst it has very little vertical prism jump, with the distance and reading centres vertically coinciding, this is not the case with its horizontal reading centre. For accurate near centration E styles are extremely difficult to position; most Rx Labs, including us, will ignore reading centre positions on E Style. To accurately overcome this usually results in too great a reduction in the overall blank size, because the distance optical centre has to be bodily decentred outwards from the near optical centre position often thus leaving too little lens blank left to glaze correct distance centres!

Edge Thickness.

One of the lost wonders of dispensing optics is the ability of seemingly anyone to recall their sag formula to calculate edge thickness!

$$S = r - \sqrt{(r^2 - y^2)}$$

Additionally, it's important we state the parameters we have set into our computer for edging allowances (at thinnest edge). Standard Rim Edge Thickness Calculation for plus power Rxs:

Plastic rimmed	1.4mm at glazed edge
Metal rimmed	1.8mm at glazed edge
Rimless Trilogy/Trivex	1.4mm at drill hole
Supra	2.2mm at nylon
Swim Goggle	2.5mm

PS: We have a facility to "custom design" any edge thickness you specify; also to set varying parameters against individual account numbers for those always wishing ultra thin lenses.

One of the more trying areas of optics to understand. In simplistic terms, there is no prism at the exact optical centre of a powered Rx lens, but as soon as you move away from that centre, in any direction, you have prism. Prism by decentration or worked prism, that is your decision: is the single vision lens blank large enough to move laterally for the required prism value or is it a case of surfacing that prism into the lens prescription. Warning: aspheric lenses can not be decentred, the user has to look through the exact centre of the aspheric.

High Value Prisms.

Specified prisms over 6D can prove difficult for an Rx house for a number of reasons, mainly due to the need to seek out sources of lens blanks that are thick enough e.g. 8D of prism will need a lens blank of at least 8mm at its edge, even before extra is added for the Rx itself. It is not uncommon to require 12mm or even 16mm blanks, often an impossibility in some lens types.

Sometimes an OMP may specify an Rx that, for instance, might be 12D base up in the right eye with no prism in the left eye. This can be rewritten 6D base up right eye, 6D base down left eye, i.e. the prism has been split.

More complex is an Rx that requires 8D prism base up and 4D base in for the right eye, this resolves to 8.94D prism base up and in along 63.4 degrees. Now what do we do to split this prism? 4.5D prism at 45 degrees in the right eye and 4.5D prism at 135 degrees in the left eye.

High prisms will always look thick when glazed; anything reducing their specified values or using higher index material can only be an advantage.

Fresnel Press-on Prisms.

Over 170 years ago, Augustine Fresnel conceived the idea of replacing the continuous surface of a lens with a series of minute stepped zones.

Today's high technology allows polyvinyl chloride membranes, no more than 1mm thick, to be cast from precision dies resulting in a totally flexible material. Computer technology is used to calculate the angles and spaces that make up the zones.

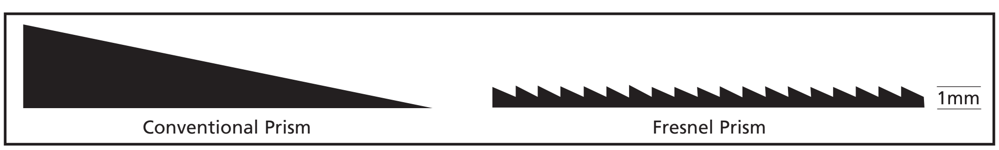
Can you imagine a 30 dioptre prism no more than 1mm substance? You can obtain this with a Fresnel.

Available from 1 to 30 dioptres they can be attached to the posterior surface of a conventional prescription lens, e.g. +4.00DS +1.00DC x 20 7 prism IN. A normal stock lens (with no prism) is obtained, then a 7 dioptre Fresnel membrane would be cut to the eyeshape of the frame. Using just water adhesion the shaped Fresnel, with correct prism orientation, is applied to the back surface of the lens.

Fresnels can even be used on multifocals and progressives, providing the addition is on the front surface (that is to say the back surface onto which the Fresnel is applied must be free from segment ridges which would prevent the membrane from adhering to the lens surface).

A Fresnel can create a form of prism controlled where it is cut so as to cover the distance or reading portion only, thus allowing different prismatic values for distance and near, something a conventional multifocal will not allow.

Many professionals often prescribe Fresnels as temporary or trial lenses to ascertain patient acceptance. Some patients may be glad to use a pair of lenses fitted with Fresnels as occasional dress wear spectacles, although there is a significant reduction in visual acuity.



Intelligent Prism Thinning

The solution: After much calculation and trial, **Intelligent Prism Thinning** (I.P.T.) was born at Norville. It is now totally integrated within our lens design programmes. I.P.T. takes factors such as power, addition, frame size and shape, and fitting cross position into account and attempts to balance the thickness at the top and bottom, while achieving minimum substance when glazed. In some instances this will mean incorporating traditional base down prism thinning, others none at all or occasionally even prism base up thinning, whatever gives the thinnest possible lens. It is obviously essential that both prisms be of the same power so, in instances of different powers or fitting cross heights, the programme will 'average out' the prism values to achieve the thinnest, most balanced pair of spectacles that is possible to obtain.

The prescribing practitioner has nothing to do other than writing out the order. When there is an accompanying frame to be glazed, this will be traced by our pre-process shape tracing unit. The other calculations are then processed within the normal NIDES (Norville Integrated Design and Edging System) facility with the added consideration of I.P.T. where applicable. Similarly, for uncut lens supply rather than glazed, the presentation of an accurately drawn eye-shape diagram, with an indication of lens settings, enables us to provide similar design advantages. This is your opportunity to benefit from the king-size computing power at Norville's disposal, which enables us often to make lenses thinner even than the brand manufacturers can themselves.

Whilst on the subject of prism thinning. It cannot be taken in total isolation from the Px who is going to wear those finished spectacles. Some benefit, tolerate or suffer from 1½$^{\Delta}$ to 2$^{\Delta}$ base down inserted into their prescription. In order to check we have devised a lorgnette with rotating lenses (plano power 1½$^{\Delta}$ or 2$^{\Delta}$ base). These loosely fitted round lenses can be rotated to produce base down or up direction even in or out prisms so that the effect of prism thinning might be checked before ordering those actual lenses.

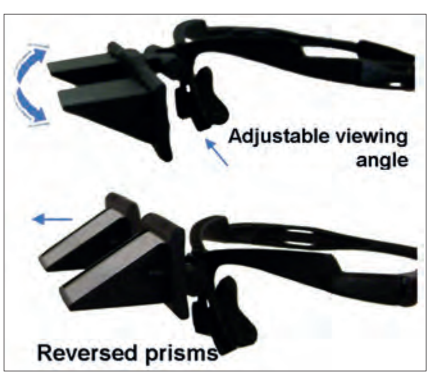
Prism Specs

Recumbent Overspec
Prism Down

Recumbent Model
Prism Down

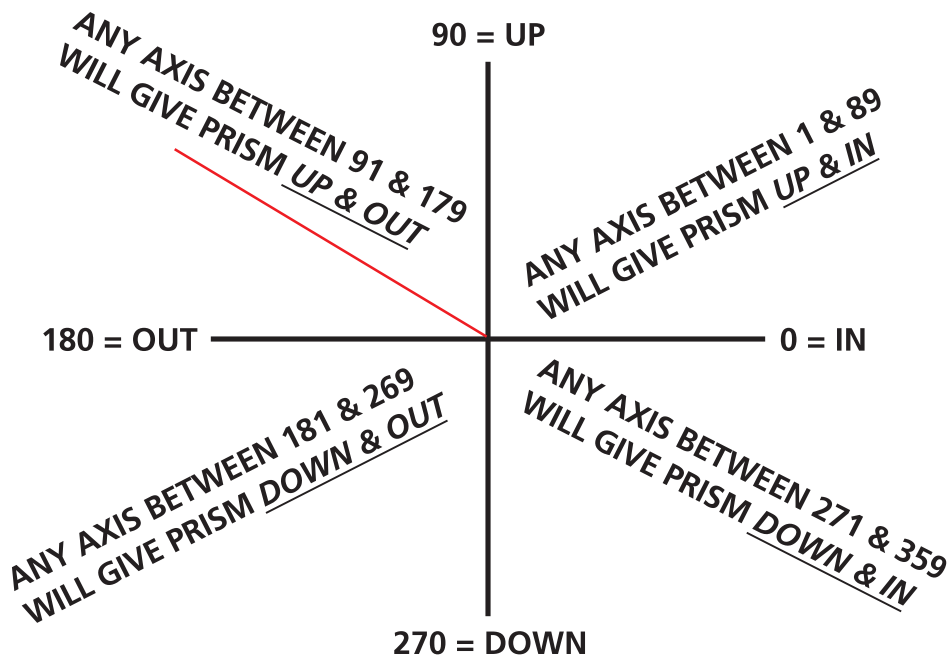
Stoop Model
Prism Up

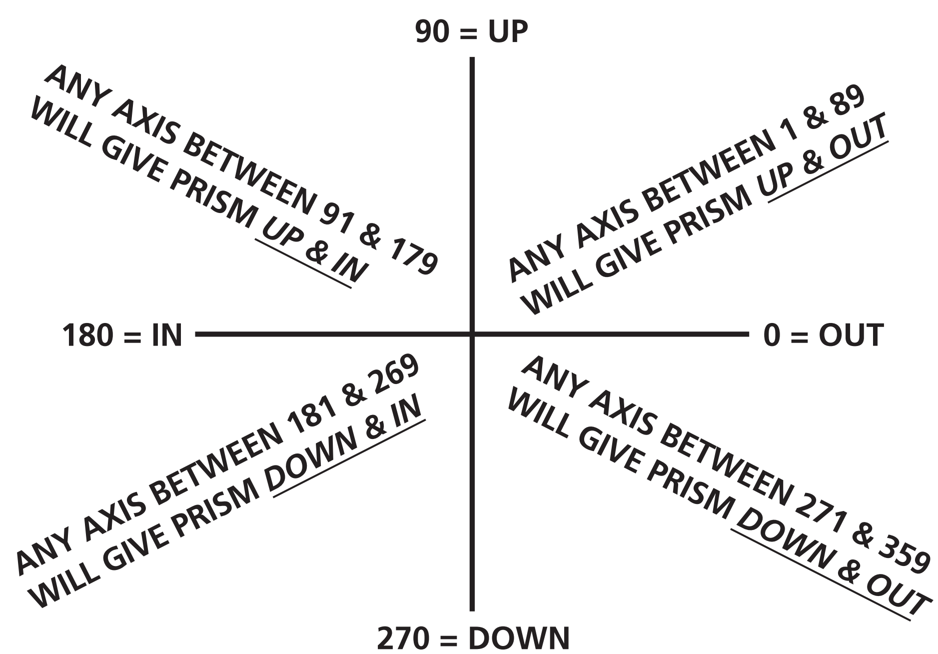
Ultimate Model
Adjustable Prism



The ultimate in prism glasses has a unique open frame design with fully adjustable viewing angles which stay fixed in the necessary position. Flip-up function allows the user to lift up the prism glasses rather than take them off.

THIS CHART IS BASED ON *STANDARD NOTATION* AND TAKEN FROM AN OBSERVER'S POINT OF VIEW
(i.e. LOOKING AT SOMEONE WEARING THE SPECTACLES)





R L

THIS CHART WILL ALLOW YOU TO ASCERTAIN THAT PRISM SHOWN ON LENSWARE TICKET EQUATES TO THE DIRECTIONS SHOWN ON CUSTOMER ORDER - IT WILL NOT GIVE EXACT VALUES, JUST AN APPROXIMATION

Plus cyl v Minus cyl form.

It's worth considering, or being aware of the fact, that in "bygone" times, unlike today, it was common practice to produce lenses with front toric surfaces, that is, made in plus cyl form (solid glass bifocals with a segment on the inside had to be made this way).

Front surface torics, whilst optically performing better than back (minus cyl) surface torics had several drawbacks.

Firstly, a lens made in plus cyl form had a tendency to be thicker than its minus cyl form counterpart.

Secondly, especially with oblique cyls, the lens form tended to distort the frame shape when glazed. A minus cyl form toric presents a spherical surface to the front, thus reducing this phenomenon, the toric surface being "out of sight" on the rear lens surface.

Finally, from a manufacturing point of view, a lens made in plus cyl toric form had to have both its base and cross curve compensated for vertex power allowance. Lenses made in minus cyl toric form may only require the front sphere (single) curve to be compensated.

We know the tale of one patient who can tell the difference between front and rear toric form and has to have resin lenses made in plus toric form in order to "see"!

Ranges.

How often the words "out of range" brings on that sinking feeling. Why so unpredictable? Well mostly it's down to that "wandering" axis. Depending on its setting it sometimes enables us to extend the stated range by allowing a thinner lens to be crafted - and at other times the opposite effect.

For example, assuming the lenses are made in minus cyl form, then a plus lens with its minus cyl axis at 90 i.e. +10.00DS -2.00DC x 90 has its lowest power in the horizontal meridian.

An optical cross demonstrates this very easily (see figure A). Due to the fact that the lowest power meridian (+8.00) is in the horizontal direction and that eyeshapes are generally wider than they are deeper, it means the lens can take on an oval shape or even "waste away" top and bottom and still be sufficient to glaze into a frame. The lens will also be of minimum substance as it is the +8.00 meridian rather than the +10.00 that is controlling the final centre thickness.

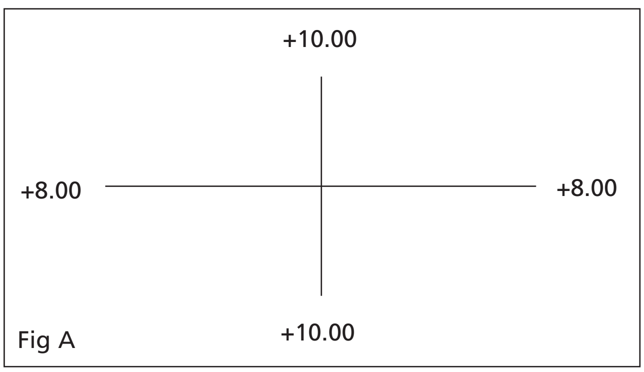


Fig A

Fig B

Minus powers work out "best" when the minus cyl axis is in the region of 180 i.e. -12.00DS +2.00DC x 90 (-10.00DS -2.00DC x 180). Figure B demonstrates that the meridian of lowest power (-10.00) is horizontal. As with the previous example the area of highest power is vertical, and as eyeshapes are generally wider than they are deeper, this too means the resulting lens will be of minimum edge substance, the higher power being over the least diameter.

It also means that if, because of the Rx, we cannot fully "open up the blank" to full aperture, it doesn't matter as any resulting "witness" will be at the extremity of the vertical meridian where the diameter is reduced in comparison to the horizontal meridian.

Base Curves.

Increasingly we find customers who no longer consider Best Form lens design to be their prime criterion; cosmetic appearance is their priority. We have the ability to log your account number onto our computer so that for an individual account requiring cosmetic appearance as first priority it will always select a 2.00D lower base than usual. However, if you are only occasionally likely to need a lower base then please state at time of ordering "use lower base curve" or state the actual front surface dioptric curve you would prefer and we will work to the nearest that is available. Remember these are usually only in 2.00D steps

Of course, much of the above is becoming less relevant as specifying an aspheric lens will ensure that you obtain lenses of the best cosmetic appearance, manufactured with the flattest curves and with little deterioration in visual quality. However, it should be remembered that even aspherics can differ, from a relatively simple aspheric, if you can call them that, to the ultimate digital (freeform) lens design.

Finished Single Vision

Original 1950s Best Form Base Curves

All Torics in PLUS cyl form

	Nominal Base Curve	Spherical Powers Combined with all Cylinder Powers to +6.00
	+3.25	-9.00 to -5.50
	+4.37	-5.25 to -4.00
x	+5.50	-3.75 to -1.75
x	+6.75	-1.50 to +0.50
x	+7.75	+0.75 to +1.75
x	+8.75	+2.00 to +2.75
	+10.00	+3.00 to +4.00
	+11.75	+4.25 to +6.00

Standard range of all powers Meniscus and Toric is 50mm round.

Modern Flatter Base Curves

All Torics in MINUS cyl form

Plus	Power Dioptres	Minus
5.25	0.00	5.25
5.50	0.25	5.00
5.75	0.50	4.75
6.00	0.75	5.00
6.25	1.00	4.75
6.00	1.25	5.00
6.25	1.50	4.75
6.50	1.75	4.50
6.25	2.00	4.75
6.50	2.25	4.50
6.25	2.50	4.25
6.50	2.75	4.50
6.75	3.00	4.25
7.00	3.25	4.00
6.75	3.50	3.75
7.00	3.75	3.50
7.25	4.00	3.25
7.50	4.25	3.50
7.25	4.50	3.25
7.50	4.75	3.50
7.75	5.00	3.25
8.00	5.25	3.00
8.25	5.50	2.75
8.50	5.75	2.50
8.75	6.00	2.25
8.50	6.25	
8.75	6.50	
9.00	6.75	
9.25	7.00	
9.50	7.25	
9.75	7.50	
10.00	7.75	
10.25	8.00	
Base Curve		Base Curve

Extra Low Base Curves

All Torics in MINUS cyl form

Power	Curve (D)	
Plus Powers	Front	Back
+0.00		
+0.25	4.23	3.98
+0.50	4.48	3.98
+0.75	4.73	3.98
+1.00	4.98	3.98
+1.25	5.23	3.98
+1.50	5.48	3.98
+1.75	5.73	3.98
+2.00	4.58	2.58
+2.25	4.83	2.58
+2.50	5.08	2.58
+2.75	5.33	2.58
+3.00	5.58	2.58
+3.25	5.83	2.58
+3.50	6.08	2.58
+3.75	6.33	2.58
+4.00	6.58	1.83
+4.25	6.08	1.83
+4.50	6.33	1.83
+4.75	6.58	1.83
+5.00	6.83	1.83
+5.25	7.08	1.83
+5.50	7.33	1.83
+5.75	7.58	1.83
+6.00	7.83	1.83
+6.25	8.08	1.83
+6.50	8.33	1.83
+6.75	8.58	1.83
+7.00	8.83	1.83
+7.25	9.08	1.83
+7.50	9.33	1.83
+7.75	9.58	1.83
+8.00	9.83	1.83
	Base Curve	Inside Curve

Base Curves II

Appreciating the relevance of base curve variation may today seem a little used requirement, excepting where rimless mounts are concerned. Assessment between those models having a front or rear drilling location can be critical, as variations in the lens base curves will result in the designed splay angle of the sides (head width) changing from its standard 6.00 base carrier lens curve (Fig. 1).

Using too shallow a lens base results in a frame having sides with pronounced over splay (Fig. 2).

Fig. 1 Correct head width

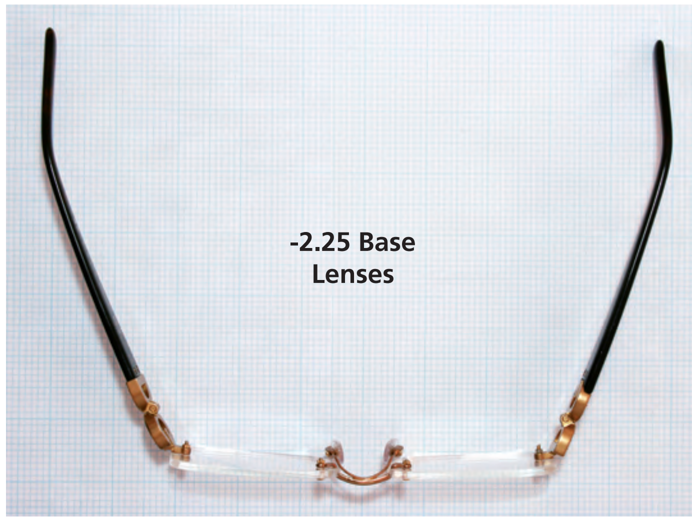


Fig. 2 Incorrect - over splayed sides

For this reason wrap-around sunspecs (generally known as "8.00 base") will require lenses to be especially surfaced to a higher than normal lens base so that the lens bevel when edged can maintain the design contour of the frame. This is only possible providing the sunspec is actually a glazeable model, as many (non-ophthalmic) are manufactured without a glazing vee bevel, having only a flat slot into which a 2mm plano flat edged lens is fitted, yet this does not work when thicker powered lenses are used. Also many wrap-around sunspec designs have a higher stepped rear bevel, which often can only be accommodated by using a special profile bevel cutting wheel.

Practices must proceed with caution when suggesting a wrap-around sunspec **could be glazed** to patient's Rx. Most competent sunspec suppliers will advise this possibility at the time of supply. When metal wrap sunspecs are concerned, a check that they have been actually made with an opening glazing block is a useful starter!

PS: A lens clock is an ever essential piece of practice equipment.

It is well worth checking sunspec lens curves as it can be visually confusing - what may appear to be a +8.00 base may only be a +6.00 base. Larger eyesizes can be deceiving.

Lens Measure

Variously called lens clocks or genevas, previously known as the latter due to their invention by the Geneva Lens Co, Chicago, USA. Lens measures are instruments to give a reading of lens curve, when used in comparison against a known test curve; this can indeed be a very accurate comparison measurement. With the two fixed pins usually 20mm apart and a central variable depth pin, the lens measure is a form of sagometer whose hand positioning on the printed dial converts to dioptres. This movement records plus lens curves from flat to 17 dioptres with a similar range for minus curves. The choice of 20mm for the pins enables segment curves of 22mm solid bifocals to be read. Although different manufacturers adopted different pin widths, the principle being similar this just required a re-calculated face dial. Those mostly produced in the mid 20th century were from USA sources, calibrated in index 1.530, with others produced in the UK (to 1.523 index), France and Germany also having their own production sources. The majority of measures today are produced in the Far East. One recent introduction has been a joint 1.523 and 1.60 clock face.

Looked after carefully, these slightly fragile instruments can perform sterling service to the lens technician for assessing lens curves, particularly useful when determining those of a glazed spectacle frame. Lens measures might appear to be an instrument from, and for, yesteryear but are equally as important today. How else will you determine if you are looking at a front or back surface design progressive? However, operators need to exercise particular care in use, by placing the lens measure steadied by fore-finger into a perpendicular position on the lens surface, to then lift and reset at 90° for any second reading (cyl). Too often the hasty move rotating a pressed lens measure against the lens surface will leave a trail of permanent scratches from the pointed pins! With today's high quality float glass, reference to a glass top (zero), in the absence of a known test plate, can be used to check calibration.

2015 saw the arrival of Chinese designed and produced digital lens measures. Same principle but now with an electronic chip enabling six different indices to be entered. 125 years of evolution!

Geneva Optical, USA Feb 1891

AO

Bausch & Lomb, USA 1960


Dual Index, P&W Cat 2009

Digital 2015

Ultimate Combo 2016

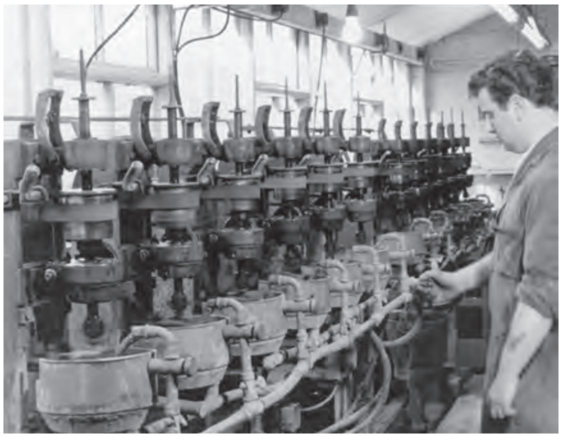
History isn't heritage – that school experience of history rote of some long distance past events isn't the same as a group of technicians recalling those inherited experiences remembering "how we used to do it" of production methods and machines used.

Craft skills change with each generation; our optical forbears gave great service. Soon Poker arm, 122, Radmaster, hanging spindle, pitch pot, shanking pliers, melton cloth, red rouge even 524 and 722 will be history but just now, albeit for a dwindling few, they are heritage. (See below for photo quiz!)

1.

2.

3.



4.

5.

The College of Optometrists maintains the British Optical Association Museum at their London headquarters (Curator Neil Handley). Mainly spectacle frames and eye testing equipment. Unfortunately their space is very limited so they are unable to store much in the way of optical production equipment. There is some in the reserve store of the London Science Museum and Norville hold a few items in our Gloucester Display. Very little else of optical production machinery has been preserved. Members of the Optical Antiques International Collectors Club do their best to keep on track.

www.college-optometrists.org/museum

www.oaicc.com

1. Poker Arm
2. 122 Hand Generator
3. Radmaster
4. Hanging Spindle
5. UKO Newfit 524

Norville have a small display of ophthalmic products, frames and lenses available to visit at our Gloucester Training & Heritage centre.

Optical Heritage

Even today's Rx spectacle manufacturing, certainly of the style we undertake, is still a craft occupation. That means lots of individual people who, as each year passes, so does their knowledge and skill improve with practice. Many wonderful people have spent a significant proportion of their working careers making spectacles in our various Gloucester locations as we have grown over 70 years of spectacle making under Norville Optical, prior to that 50 years of F Norville Opticians, not overlooking our nationwide network of spectacle manufacturing locations, a total of 9 at our peak. We have completed transferring hundreds of photographs onto our website heritage section: spot someone you know. Enjoy the memories. www.norville.co.uk.















Asphericics.

Asphericity is a gradual change in the curvature of a lens calculated to reduce the effects of oblique aberrations. Reduction of aberrations means better visual acuity for the patient.

In the 1900s stock SV lenses were just small flat curve single vision. In an attempt to improve patients' vision, along came meniscus and best form toric lenses. This was the first effort to reduce annoying aberrations by adapting the lens curves.

With the possibility of larger eyesizes, there were then cosmetic considerations. Patients wanted less bulbous lenses. Manufacturers found that by reducing the front curvature the appearance of the lenses was significantly enhanced, however this "flattening" of the front curve increased optical aberrations.

Calculation and research gave us a new aspheric lens surface. If a lens measure is placed on a conventional convex surface the reading would be constant regardless of where it is placed i.e. it is spherical.

If one repeats this exercise on an aspheric lens one will immediately see the change of curvature across the surface. Thus an aspherical surface is spherical at its centre but becomes astigmatic as you move away from the central optical axis. This gradual change in curvature differs between plus power and minus power lenses. The curvature of a plus powered lens gradually flattens as you move from centre to edge. A minus powered lens is just the opposite, and gradually steepens as you move towards the edge. These are rotationally symmetrical aspherics.

An aspheric lens "bends" light rays differently than a spherical lens and therefore can be made flatter, thinner and lighter than its spherical counterpart. While this is more dramatic in high plus powers the effects and visual benefits are achieved in any power. The advantages of aspheric lenses to the patient are numerous. Aspheric lenses have flatter curves, up to 40% flatter than conventional spherical surfaces. Being less bulbous, lenses look much better. Unwanted magnification of the patient's eyes is reduced by up to 30% by the use of aspheric designs, whilst still reducing the aberrations just like conventional best form designs i.e. oblique astigmatism and curvature error. Aspherics provide patients with slimmer, more attractive lenses. Because of this they are lighter.

Whilst traditionally aspherics were used for high plus prescriptions or low vision aids, they have developed so much that they are now used for a range of powers from very low to very high in both plus and minus prescriptions. It is important to remember to place the optical centre so that the optical axis of the lens passes through the eye's centre of rotation. The optical centre should be decentred vertically 0.5mm from the zero visual direction for every 1 degree of pantoscopic tilt. The lenses should be fitted as close to the eyes as possible but remember, owing to the flatter inside curves, you need to consider eyelash problems.

Unlike some non aspheric lens forms, prism should not be provided by decentration with an aspheric lens. **It is essential that the pole of the surface should coincide with the visual axis of each eye**. This would not be the case if prism were achieved by decentration. However, it is possible to incorporate prescribed prism during surfacing without any detrimental effect to the vision perceived through the lens, providing the prismatic lens is compensated by decentration in the direction of the prism apex.

The flatter curves of an aspheric lens may cause reflections to be noticed by the subject. For this reason, aspheric lenses should be supplied with a reflection free coating.

Finally, a concluding statement which was written by the late Eric Crundel during the 1930s -
"We therefore emphatically state that no spectacle lenses, other than those embracing aspherical curves, can be designed to correct *all* marginal errors or even to provide exactly the same spherical power at the lens margin as at the centre whilst adequately correcting the marginal astigmatic errors."

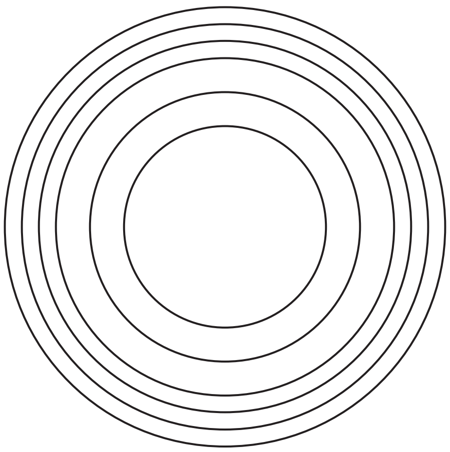
References *Chapter 4 "Ophthalmic Lenses and Dispensing" Prof Mo Jalie*

New Aspheric.

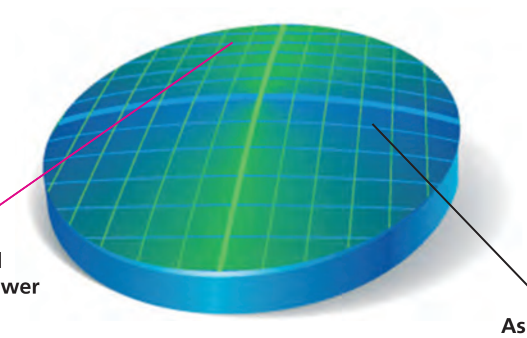
Suddenly, after decades of very little change, along comes a rush of new design aspheric lenses!

The new Augen double aspheric available in moulded CR39 semi-finished addresses that long term challenge whereas the +6.00 element of a +4.00DS +2.00DC Rx was perfectly corrected on say +6.75 base rotationally symmetrical semi-finished (working minus cylinder form) its +4.00 power meridian (or whatever the variation of the cross power) was always going to be over corrected.

By moulding a double aspheric "toric" semi-finished any cylinder variations from the sphere power might be more individually addressed but even then never 100%.



Rotationally Symmetrical Aspheric
Traditional Aspheric Semi-finished



Double Aspheric
Two different aspheric curves on one (front) surface.
Semi-finished Lens Blank.

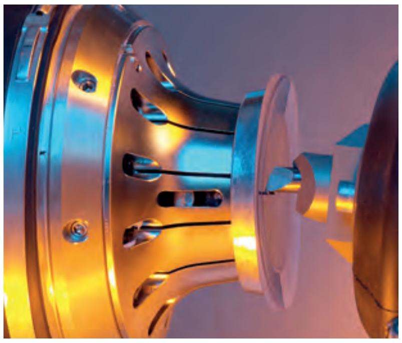
This term, double aspheric, raised some confusion because Seiko, who had previously been calling a lens **bi-aspheric,** suddenly changed its name (but not the design), to Double Aspheric and probably need to change it back again! Why you ask? Well, if you consider the double aspheric as two aspheric surfaces on **one side** of the lens, the bi-aspheric, which is also two aspheric surfaces, but now on **both sides** of the lens. The optical quality of a bi-aspheric is always likely to be better than that of a Double Aspheric and both are better than a RS aspheric.

The real reason for the dramatic change in aspheric designs is today's availability of free-form production, the ability to calculate, cut and polish a unique aspheric corrected curve in virtually any lens power combination and, uniquely, including progressive lenses which are, of course, aspheric designs in themselves.

Combining both lens surfaces as Bi (or Dual) Aspheric form, a rotationally symmetrical front surface aspheric correction with an inside atoroidal free-form production delivers near perfect optics, never before economically achievable in Rx single ophthalmic lenses.

Over the recent years that we have been producing this Companion, free-form in manufacturing optics has shot from obscurity to now dominate the Rx lens production scene. Over the previous 60 years little had really changed. Lenses (glass) were cut on diamond impregnated cup wheels with water coolant splashing all over the place; glass is hard, diamond even harder. Those lenses ground to their approximate dioptic curve were then loose emery "smoothed" to the matching curve of the "master" cast iron tool. Newer machine designs enabled this to be achieved for toric as well as spherical curves. Eventually a fine smooth lens surface free from holes (left by Diamond generating process) was obtained before a polishing cloth was affixed onto the same tool ready for the long polishing process (20 mins) in red rouge or later Cerium polish. Great personal skills were required to coax quality lenses from such primitive machinery and ancient processes.

Surprisingly, exactly the same procedures were used to surface early CR39 resin and your scribe recalls many fruitless hours spent trying every variant under the sun (and moon) to get early CR39 to polish without scratches, eventually running two very separate production lines but still not dissimilar processes over the next 50 years. Glass volume fell, while CR39 and later other higher index resins increased until they completely swopped their market share percentages to achieve today's 99% resin with only 1% glass (mineral).



During 1994 work was afoot in Germany to convert engineering 4 axis CNC milling machines to process precision optics, grinding astro mirrors and optics plates. Zeiss and Schneider Germany were the first to achieve this. As better electronic controllers and linear motors were developed the potential and the benefits of similar production technology applied to Rx lens production became apparent. The year 2000 saw automated free-form polishers arriving onto the market and unlike their previous incarnation of simple motorised polishing spindles these were highly complicated computer driven units. It wasn't until other firms offered the enabling software that this free-form production technology became more readily accessible to the marketplace.

Free-form brought a real revolution to manufacturing Rx optics where previously only a spherical or toroidal lens surface could have been cut on a cup wheel grinder. Now single point diamond tools activated by cad cam computer aided design deliver the most complex of atoroidal lens surfaces and you can't get more complicated than a progressive surface design that also incorporates a cylindrical correction and even perhaps a bi-prism (slab-off) element. Perhaps a better description of this free-form technology might be Digital Design.

Over the first twelve years of the 21st Century free-form has grown to be a must-have technology for any serious ophthalmic lens supplier.

Today our over 100 pages (and growing!) Digital free-form technical directory outlines the vast array of better **high definition** lens designs that free-form has enabled.

We guarantee patients will appreciate their HD vision.

References *Norville Digital Free-form Technical Directory*

Here's a topic to raise optical blood pressure!

As investigations into progressive lens fitting by lens designers plumbed even greater depths more and more detailed questions were asked about the "as worn" position Rx and how any deviations from that considered the norm might further alter the given Rx. For, with even medium powers, these were not insignificant changes to the prescribed Rx.

In the relentless progress of chasing that holy grail of zero wearer progressive intolerances many of the latest calculating programmes for progressive designs now convert all calculations automatically to compensated powers using default measurement figures, unless different data has been supplied.

The new Norville order forms feature this new line for "as worn" calculations.

COMPENSATED RX	BVD		ANGLE °		READ DIST
	TRIAL FRAME	SPECTACLE	WRAP	TILT	
Please tick (✓) ☐	mm	14 mm	5 °	12 °	cm

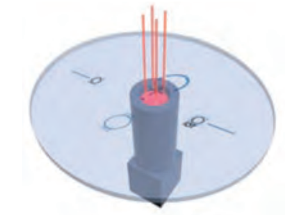
With pupil size soon as a future addition

The above are the actual default figures used in the Norville design suite for Sentor, Freeway and Bureau, our free-form lenses.

Indeed, some design programmes will now only calculate using "as worn" input, either the design default figures or those you alternatively provide. ISO BSI lens tolerances will be based from the "as worn" calculation, i.e. compensated Rx, not that of the original Rx. Medium to high Rxs will result in a not inconsiderable shift in sphere / cyl power and axis. Not all company software systems (Norville included) have so far kept up with all this information, vis the compensated Rx used by way of reference, conveyed back to you!

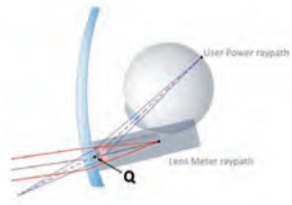
Of course variances are significantly different where an +8.00 base wrap design is required but even small changes, e.g. the standard frame default position, can make a noticeable difference, for instance -5.00 -2.00 35° changes to -4.64 / -2.12 x 41.

Understanding the Rationale



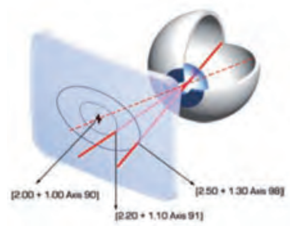
Focimeter measuring a lens

The drawing on the left shows a typical set-up for measuring lens power with a lensometer. Notice that the lens surface is placed perpendicular to the ray beam of the instrument. Conventional lenses have been developed to yield the correct power when being measured like this. This type of calculation method is known as nominal power calculation. It assumes that the same design is good for every prescription, what we could call a “static” design.



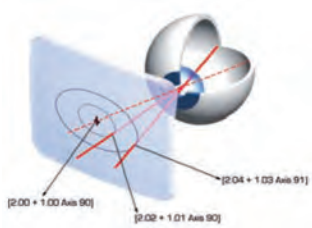
User power vs. lens meter ray-paths

The eye’s optical system is very different from the optical system used to measure a lens, as you can see on the left. The eye rotates around its centre; and the light follows an oblique trajectory that affects the power experienced by the wearer.



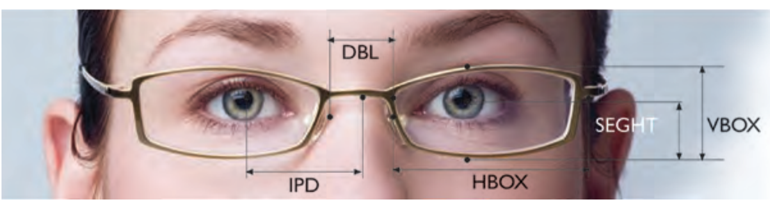
Oblique errors in a conventional lens

The drawing on the left illustrates the effect described above. This example shows the power experienced by the wearer of a conventional Single Vision lens when looking through various areas of the lens. The difference between power experienced and that actually prescribed can be more than 0.5D for a lateral gaze angle of 30°.This effect is known as oblique aberration, and is the main optical aberration that cannot be resolved by conventional surfacing techniques.



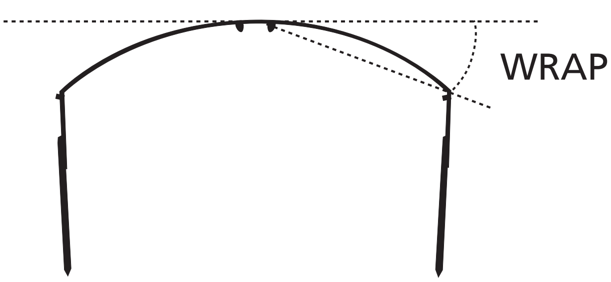
Digital Ray-Path performance

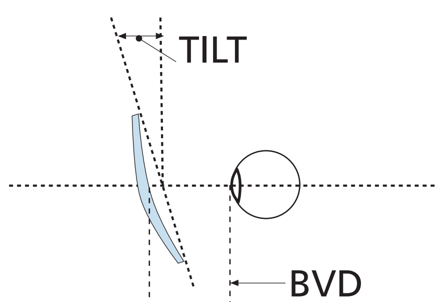
This last drawing shows the effect of a lens with the same prescription, calculated with Digital Ray-Path, ground with free-form equipment. The power experienced by the wearer is stable on the whole lens, providing perfect vision for every direction of sight.



Calculation parameters

IPD - Monocular Centration Distance
SEGHT - Vertical P.R.P. height measured from the lower boxed tangent
HBOX - Horizontal Boxed Lens Size of Frame
DBL - Distance Between Lenses
VBOX - Vertical Boxed Lens Size
TILT - Pantoscopic Angle
WRAP - Frame Wrap Angle
BVD - Back Vertex Distance
NWD - Near Working Distance





SPECTACLE LENSES CH/172/3			
BS/EN/ISO	10322-1:2016	Semi-Finished Lens Blanks - S.V. and Multifocal	supersedes 10322-1:2006
BS/EN/ISO	10322-2:2016	Semi-Finished Lens Blanks - Progressive power and degressive power	supersedes 10322-1:2006
BS/EN/ISO	13666:2012	Spectacle Lenses - Vocabulary	under review
BS/EN	14139:2010	Ophthalmic Optics - Specifications for ready-to-wear spectacles	
BS/EN/ISO	14889:2013+A1 2017	Fundamental requirements for Uncut Finished Lenses	
PD ISO/TR	18476:2017	Ophthalmic optics and instruments - Free-form technology - spectacle lenses and measurement	
BS EN ISO	21987:20017	Ophthalmic optics - Mounted spectacle lenses	supersedes 21987:2009
BS	2738-3:2004+A1:2008	Specification for Presentation of Prescriptions and Prescription orders	
ISO/TR	28980:2007	Spectacle lenses. Parameters affecting lens power measurement	
BS	7394-2:2007	Specification for Prescription Spectacles	
BS/EN/ISO	8429:1997	Graduated dial scale	
BS/EN/ISO	8598-1:2014	Focimeters	
BS/EN/ISO	8980-1:2017	Uncut S.V. and Multifocal Lenses	supersedes 8980-1:2004
BS/EN/ISO	8980-2:2017	Uncut Finished Spectacle Lenses	supersedes 8980-2:2004
BS/EN/ISO	8980-3:2013	Uncut Finished Lenses Transmittance Specifications and Test Methods	under review
BS/EN/ISO	8980-4:2006	Specification and Test Methods for Anti-Reflective Coatings	
BS/EN/ISO	8980-5:2005	Minimum Requirements for Abrasion Resistance	
BS/EN/ISO	9342-2:2005	Test Lenses to calibrate focimeters	under review
BS	2738-3:2004+A1:2008	Specification for Presentation of Prescriptions and Prescription orders	
EYE PROTECTION FOR LEISURE ACTIVITIES			
BS	7930-1:1998	Eye protectors for racket sports - Squash	
FRAME STANDARDS			
The following are the list of all the spectacle frame standards.			
ISO/TS 24373 on nickel release is irrelevant in Europe, since EN 1811 and 12472 take precedence.			
BS EN ISO	10685-2:2016	Ophthalmic Optics - Spectacle frames and sunglasses electronic catalogue and identification	
BS EN ISO	11380:1997	Optics and Optical Instruments - Ophthalmic Optics - Formers	
BS EN ISO	11381:2016	Optics and Optical Instruments - Ophthalmic Optics - Screw threads	supersedes 11381:1997
BS EN	12472:2005 + A1:2009	Method for simulation of wear and corrosion for the detection of nickel release from coated items.	
BS EN ISO	12870: 2014	Ophthalmic Optics - Spectacle Frames - Requirements and test methods	work in hand
BS EN	16128:2015	Ophthalmic optics - Reference method for the testing of spectacle frames and sunglasses for nickel release	supersedes 16128:2011
BS EN ISO	7998:2005	Ophthalmic Optics - Spectacle frames - lists of equivalent terms and vocabulary	
BS EN ISO	8624: 2011+A1:2015	Ophthalmic Optics - Spectacle frames - measuring system and terminology	under review
S.C. PH2/1 STANDARDS RELATED TO SUNGLASSES AND PPE			
BS EN	1122:2001	Plastics. Determination of Cadmium. Wet decomposition method	
BS EN ISO	12311:2013	Personal Protective Equipment - Test methods for sunglasses and related eyewear	
BS EN ISO	12312-1:2013 +A1:2015	Eye & face protection. Sunglasses & related wear. Sunglasses for general use	
BS EN	12472:2005 + A1:2009	Simulation of wear and corrosion (pre-wear test for nickel release)	
BS EN	16128:2015	Reference test method for release of nickel from those parts of spectacle frames intended to come into close contact with the skin.	
BS EN	166:2002	Personal Eye Protection - Specifications	work in hand
BS EN	167:2002	Personal Eye Protection - Optical test methods	work in hand
BS EN	168:2002	Personal Eye Protection - Non optical methods	work in hand
BS EN	71-3:2013	Safety of toys - Specification for migration of certain elements (to ensure no leaching	
		of heavy metals - lead, cadmium, mercury, antimony, chromium, barium,	
		selenium and arsenic - from paints or pigments used on children's	
		sunglasses)	
OTHER RELATED STANDARDS			
BS EN	174:2001	Personal eye protection. Ski goggles for downhill skiing	
AS 1067		Sunglasses and fashion spectacle (Australian / New Zealand standard)	
ANSI Z80.3		Non-prescription sunglasses and fashion eyewear - Requirements (American Standard)	
OTHER STANDARDS			
BS EN ISO	9001:2015	Quality Management System Requirements	
BS EN ISO	13485:2016	Quality Management Systems - Requirements for regulatory purposes	supersedes 13485:2012
BS EN	170:2002	Personal eye-protection - Ultraviolet filters Transmittance requirements and recommended use	under review
BS EN ISO	15253:2000	Ophthalmic optics and instruments. Optical devices for low-vision aids	
OPTICAL COATINGS			
BS ISO	9211-1:2010	Optics and Photonics: Optical Coatings: Definitions	under review
BS ISO	9211-2:2010	Optics and Photonics: Optical Coatings: Optical Properties	
BS ISO	9211-3:2008	Optics and Photonics: Optical Coatings: Environmental Durability	
BS ISO	9211-4:2006	Optics and Photonics: Optical Coatings: Specific Test methods	

List provided by Federation of Manufacturing Opticians Standards Panel 2018

It is a requirement of the current Health and Safety Regulations that companies must provide employees in certain occupations with eye protectors.

Large companies normally purchase these afocal eye protectors together with other protective equipment from specialist suppliers. If prescription protective spectacles are required, these specialist suppliers sub-contract the work to an optical prescription manufacturer, in most cases.

Arrangements vary from one protective supplier to another, but the usual procedure is for the manufacturing company to send employees requiring protective spectacles to an optician. The opticians will provide an examination and dispense the spectacles, charging a fee for this service to the protective spectacle supplier.

It is important that the instructions given by the protective eyewear company on the order are followed to avoid queries and delays in payment of fees.

Smaller companies may not already have a specific arrangement for product type and will seek advice from their local optician. Indeed, more practices are offering both their services and complete spectacle supply options direct to industry.

Key Points

1. Standards to be aware of include :
   BS EN166 Personal Eye Protection Specification, which is the European standard for protective eyewear.
   BS7930 - 1 Squash Standard is now in force within the UK. Sports eyewear must meet this requirement if used for squash.
   BS7028 (1999) A useful guide for selection, use and maintenance of eye protectors.

2. CE Mark became mandatory on all protective products under the PPE Directive as of July 1995.

3. The KITEMARK on protective spectacles indicates that the manufacturer is licensed and assessed on a regular basis by an independent test authority i.e. British Standards Institute, who audit the manufacturing system to confirm compliance with relevant British/EU standard.

4. Be aware that protective spectacles are looked upon as a complete unit, frame and lenses together, and therefore both frames and lenses must be marked with the relevant standard, class of protection and manufacturing mark to give traceability. The CE mark should appear somewhere on the product.

5. Ensure that the Safety/Occupational health department, on issuing an order for protective eyewear spectacles, states the lens material to be used; this dictates the grade of impact resistance and therefore is very important. If an order is received at the practice with no indication of lens material or grade of protection, the employee should be referred back to the safety/occupational health department for further information.

6. A British standard is now available for guidance, it is BS7028 (1999), ‘A Guide to Selection, Use and Maintenance of Protective Eyewear for Industrial Use’, and can be purchased from British Standards Tel : 0208 996 9001 Fax : 0208 996 7001 Website : www.bsi.org.uk

References *Full product information is available from the Norville Protective Eyewear catalogue.*

General Sports Protection.

There are a number of sports goggles available, offering both protective as well as corrective applications. Polycarbonate should, in all cases, be the only material of choice. Polycarbonate can be tinted and is also available in Transitions options for outdoor sports enthusiasts helping to eliminate glare.

Squash has now got its own eye protection standard, BS 7930-1, to which all squash specific protectors must be tested.
Their use is mandatory for all squash doubles and junior competitions in the U.K.

Swimming Goggles.

As the name implies, the goggles are made for swimming rather than diving, i.e. primarily above the surface. A swimming goggle is therefore used primarily for protection from pool chlorine, over-exposure to water borne bacteria, and most importantly to confirm the direction in which you are travelling, e.g. not out to sea!

As most of the usage is as a normal spectacle wearer, no change in Rx is necessary other than compensation of vertex distances.

Ready-glazed spherical power options are available off the shelf for negative spherical powers with some plus, usually in polycarbonate with anti-mist.

Full corrective powers can be supplied in either CR39 or polycarbonate; the latter tends to have better demisting properties.

Diving Goggles.

This is where the complications set in for, unlike swimming, when we have an air to lens relationship, now the consideration is water to lens, a whole new calculation! A flat face plate requires no change but a curved lens surface will require compensated powers.

Most diving goggles are now available with off the shelf corrective ***spherical lenses***, pre-shaped and toughened, for a quick transfer option.

Where higher powers, positive or astigmatic powers are required, the Norbond process allows us to surface, shape and bond your required prescription to the flat front face plate, but please consider the effect of the change of vertex distances. Distance only and distance/reading combinations possible.

It would be helpful if, when ordering, the required positioning of segments is drawn onto the rear of the face plate.

Where a customer’s own goggle is being used the process required for Norbonding means it must be able to be dismantled.

References *The Norville Sports Eyewear Catalogue offers fuller details of Rx options.*

3D The American 3D@home Consortium and AOA have compiled this summary in their "3D in the Classroom, See Well, Learn Well" public health report.

Technology Overview.

Normal stereopsis is a consequence of the fact that our eyes are spaced about two and a half inches apart - and so each of them sees a slightly different view of the world In order to create the virtual stereoscopic effect; 3D displays also need to send a slightly different - and unique - view to each eye, without the other eye seeing the image that is not intended for it.

Historically, this has been achieved by projecting the two stereo images onto a screen from the same side as the audience (front projection), or from behind the screen (rear projection) Both approaches are still in use in movie theatres, museums, homes and classrooms, depending on the size and requirements of the location and the audience.

More recently-and mainly, but not exclusively, for home use - modern high-definition television sets can display the two unique stereo images in a number of different ways, which are then decoded and presented to the viewer as distinct and separate left eye and right eye views.

But with all of these display technologies, how are the two images separated for each of the eyes of each individual member of the audience, wherever they are sitting in the living room, the movie theatre or in the classroom? This has always been the toughest problem for 3D scientists to solve...

Main viewing technologies have evolved, for front projection, rear projection and modern TV 3D presentations...

1 ANAGLYPH

The viewer wears glasses with different-coloured filters (usually red and blue) placed in front of each eye. The two stereo images - left eye and right eye - are also coloured red and blue. In theory, each eye will therefore only see the image intended for it. Recently, more advanced forms of colour separation (known as wavelength multiplex visualization) have been developed, with striking - and economical - results.

2 PASSIVE (CIRCULARLY) POLARIZED

The viewer wears glasses with oppositely polarized filters placed in front of each eye. The two stereo images are also projected through oppositely polarized filters, so that each eye only sees the view intended for it. In movie theatres the effect is achieved by using special screens that preserve the polarization of each reflected image. In the home, image electronics and special screen materials produce the polarizing effect.

3. ACTIVE SHUTTER

The viewer wears battery-powered glasses that receive signals from the TV equipment, or the projector, which instructs them to alternately occlude each eye in synchrony with the alternating (left and right eye) images being displayed. This 'eye sequential shuttering' typically occurs 120 times a second - too fast to be perceived. Many movie theatres around the world also use this technology.

4. 'GLASSES-FREE' 3D

...also known as 'autostereoscopy.'

Currently, this technology works best in displays that are viewed at close distances and in carefully controlled environments.

It does have applications in certain specialized signage and entertainment situations, but is not yet suitable for larger audiences.

Norville provide 3D circular polarised (passive) Afocal & Afocal Adults and children's overspecs for 3D viewing in cinemas and at home. Rx 3D lenses are now available.

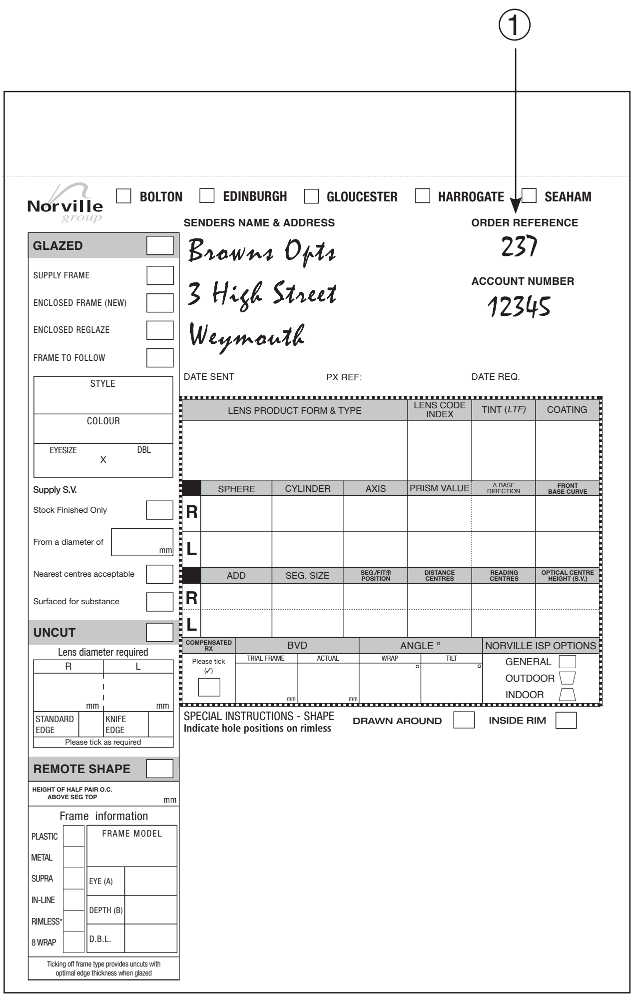
To learn more, go to **www.3deyehealth.org**

Our latest pre-printed order form does not show an account number, practice address or an order number, these details are left for our customers to fill in.

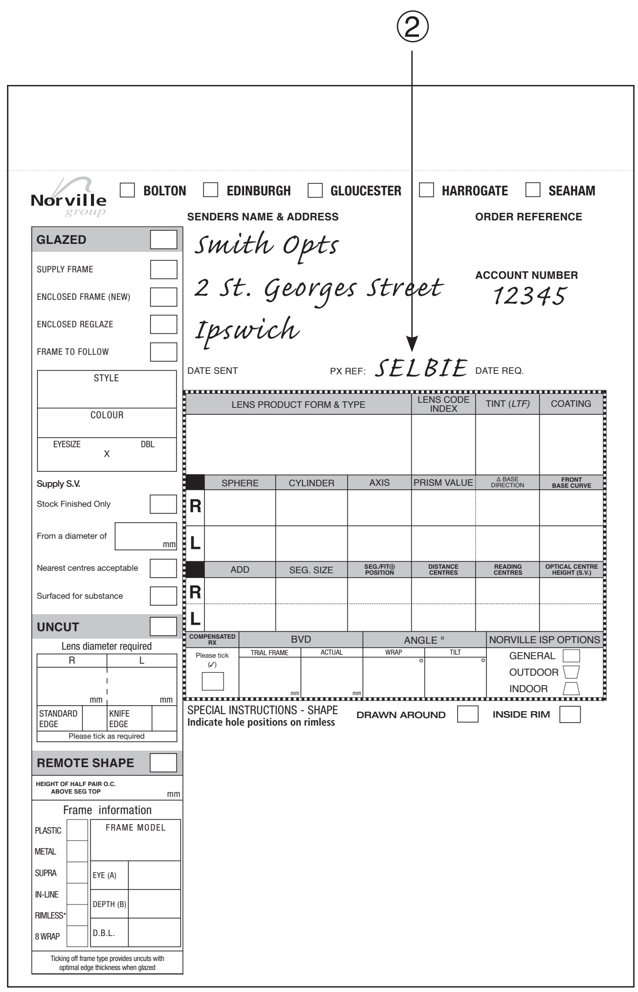
An account number, practice name and town is required on all orders to ensure, when completed, it is sent and charged to the correct location.

With regard to order numbers and patient reference, this is left to your practice to decide how you wish us to log your orders. Be mindful of any GDPR issues. If you require us to use an order number, please specify in the space provided ① .

If, however, you wish to use your patient reference, do not show an order number and we will automatically default to the patient reference ② when no order number is shown.


①
Norville group
BOLTON EDINBURGH GLOUCESTER HARROGATE SEAHAM
SENDERS NAME & ADDRESS
Browns Opts
3 High Street
Weymouth
ORDER REFERENCE
237
ACCOUNT NUMBER
12345
DATE SENT PX REF: DATE REQ.
GLAZED
SUPPLY FRAME
ENCLOSED FRAME (NEW)
ENCLOSED REGLAZE
FRAME TO FOLLOW
STYLE
COLOUR
EYESIZE X DBL
Supply S.V.
Stock Finished Only
From a diameter of mm
Nearest centres acceptable
Surfaced for substance
UNCUT
Lens diameter required
R L
mm mm
STANDARD EDGE KNIFE EDGE
Please tick as required
REMOTE SHAPE
HEIGHT OF HALF PAIR O.C. ABOVE SEG TOP mm
Frame information
PLASTIC METAL SUPRA IN-LINE RIMLESS* 8 WRAP
FRAME MODEL
EYE (A)
DEPTH (B)
D.B.L.
Ticking off frame type provides uncuts with optimal edge thickness when glazed
LENS PRODUCT FORM & TYPE | LENS CODE INDEX | TINT (LTF) | COATING
SPHERE | CYLINDER | AXIS | PRISM VALUE | Δ BASE DIRECTION | FRONT BASE CURVE
R
L
ADD | SEG. SIZE | SEG./FIT® POSITION | DISTANCE CENTRES | READING CENTRES | OPTICAL CENTRE HEIGHT (S.V.)
R
L
COMPENSATED RX
Please tick (✓)
BVD
TRIAL FRAME ACTUAL
mm mm
ANGLE °
WRAP TILT
NORVILLE ISP OPTIONS
GENERAL
OUTDOOR
INDOOR
SPECIAL INSTRUCTIONS - SHAPE
Indicate hole positions on rimless
DRAWN AROUND
INSIDE RIM

A


②
Norville group
BOLTON EDINBURGH GLOUCESTER HARROGATE SEAHAM
SENDERS NAME & ADDRESS
Smith Opts
2 St. Georges Street
Ipswich
ORDER REFERENCE
ACCOUNT NUMBER
12345
DATE SENT PX REF: SELBIE DATE REQ.
GLAZED
SUPPLY FRAME
ENCLOSED FRAME (NEW)
ENCLOSED REGLAZE
FRAME TO FOLLOW
STYLE
COLOUR
EYESIZE X DBL
Supply S.V.
Stock Finished Only
From a diameter of mm
Nearest centres acceptable
Surfaced for substance
UNCUT
Lens diameter required
R L
mm mm
STANDARD EDGE KNIFE EDGE
Please tick as required
REMOTE SHAPE
HEIGHT OF HALF PAIR O.C. ABOVE SEG TOP mm
Frame information
PLASTIC METAL SUPRA IN-LINE RIMLESS* 8 WRAP
FRAME MODEL
EYE (A)
DEPTH (B)
D.B.L.
Ticking off frame type provides uncuts with optimal edge thickness when glazed
LENS PRODUCT FORM & TYPE | LENS CODE INDEX | TINT (LTF) | COATING
SPHERE | CYLINDER | AXIS | PRISM VALUE | Δ BASE DIRECTION | FRONT BASE CURVE
R
L
ADD | SEG. SIZE | SEG./FIT® POSITION | DISTANCE CENTRES | READING CENTRES | OPTICAL CENTRE HEIGHT (S.V.)
R
L
COMPENSATED RX
Please tick (✓)
BVD
TRIAL FRAME ACTUAL
mm mm
ANGLE °
WRAP TILT
NORVILLE ISP OPTIONS
GENERAL
OUTDOOR
INDOOR
SPECIAL INSTRUCTIONS - SHAPE
Indicate hole positions on rimless
DRAWN AROUND
INSIDE RIM

B

We show two examples above:

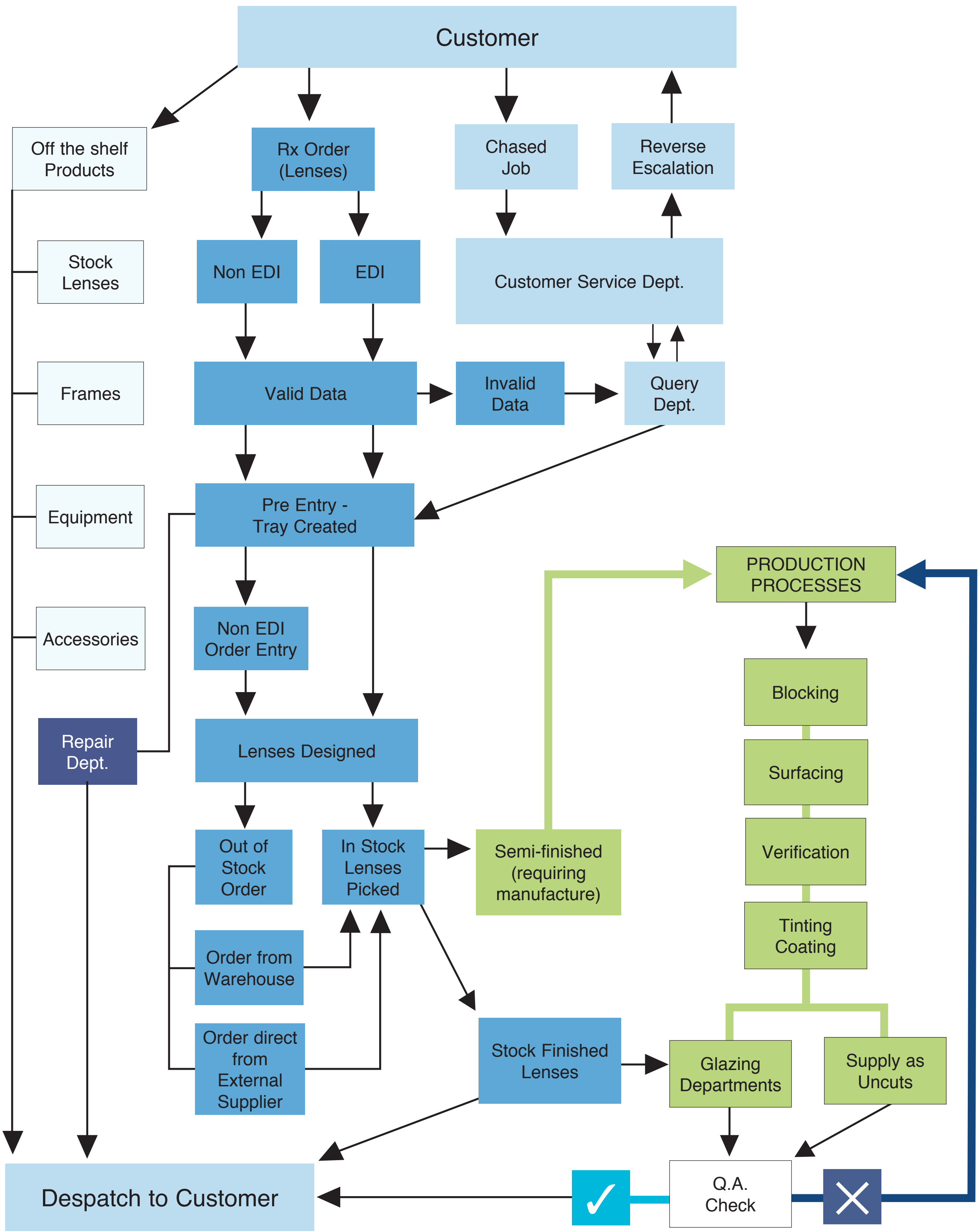
Example A: We will log by the order number ①

Example B: We will log by the patient reference ②

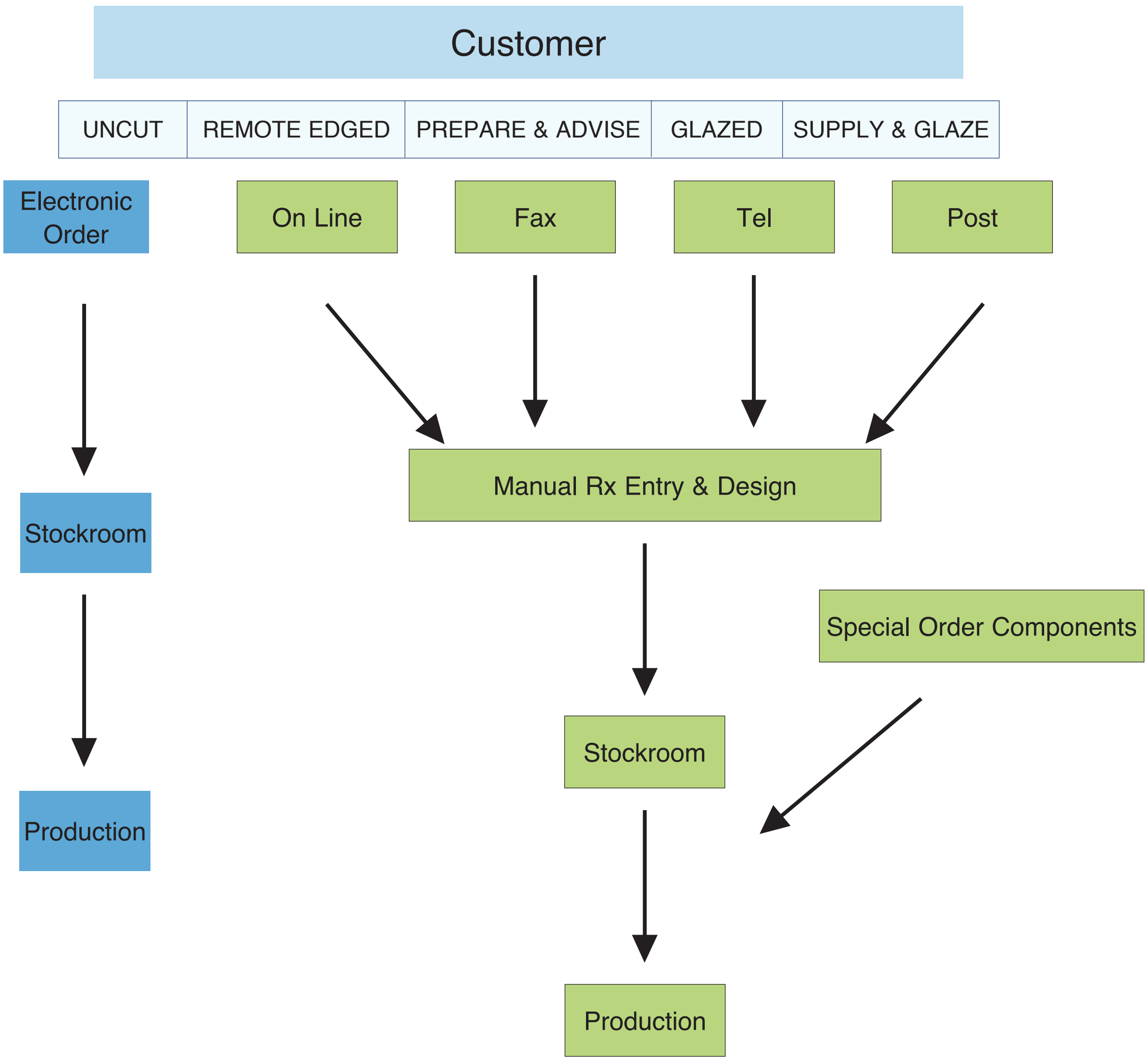
This Rx order form is downloadable from www.norville.co.uk

Rx House Order Progress

"From customer to completion"



"From customer to production"

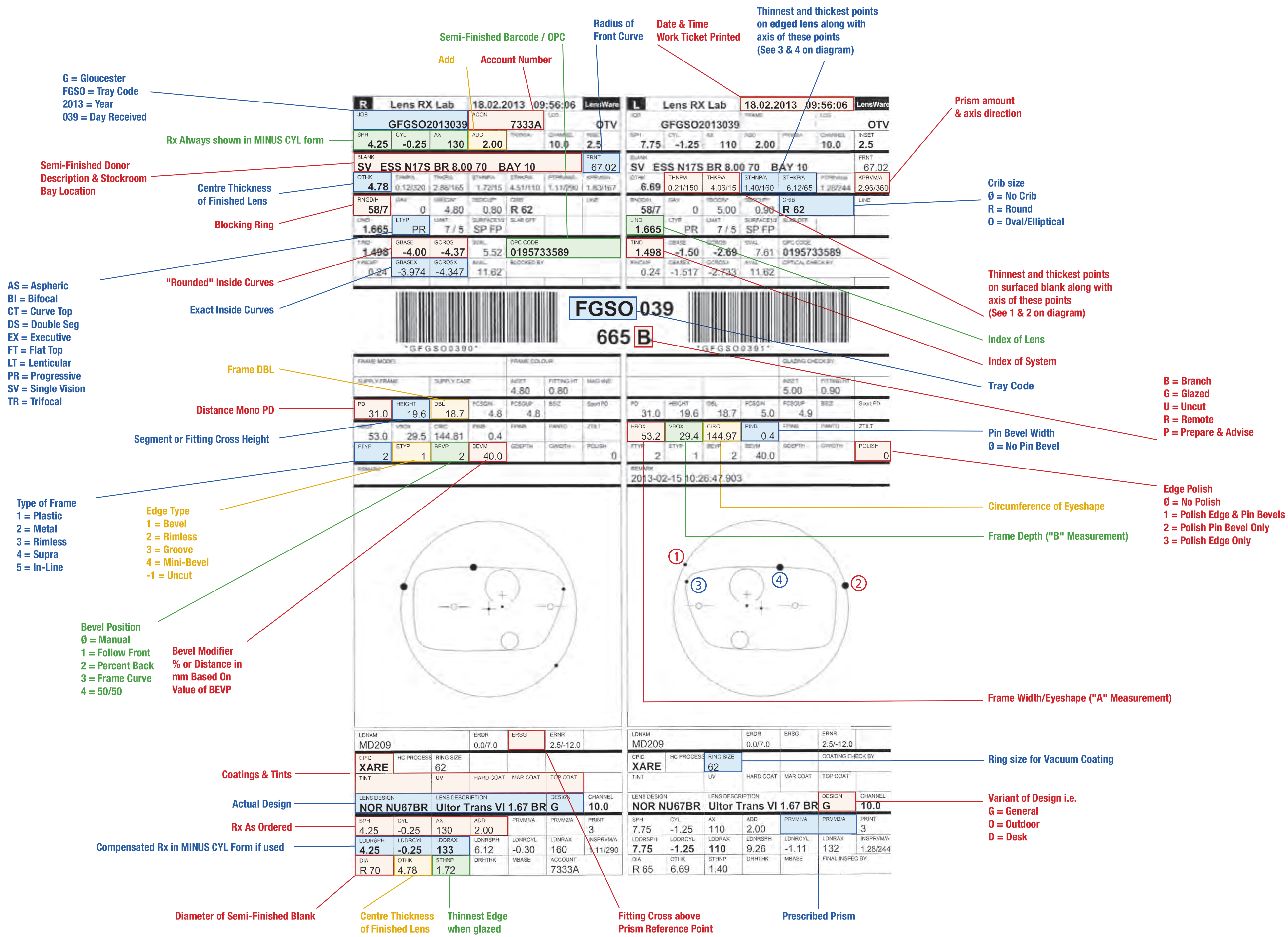


Remote or Distance Lens Shape Edging

The arrival of more accurate shape tracers and EDI data transfer coupled to lens edgers that can accurately match incoming electronic shapes have enabled the growth of lens shaping in the absence of any actual spectacle frame. That small package of pre-edged lenses being returned to the practice to fit directly into the frame, possibly even pre-drilled rimless lenses.

Where the frame is known to the Rx supplier, either historically or one of their own house lines, this is possible without the need for an electronic shape trace in practice. Practice staff need to take on this function and invest in a shape tracer unit. Some would still consider this a trace too far. Any idea of the "cloud" international shape storage is rendered impossible due to vast number of spectacle frames across the international spectacle scene. Their rapidly changing specification and, more importantly, the lack of shape control in each new batch means never having exact similar sizing as their older siblings. This generally means a fresh right and left edge trace of each and every frame is the only way to manage precise remote edging. When done correctly at all stages it is a very green way to process Rx lenses, with spectacle frames that don't travel backwards and forwards and the smallest lightest final shaped lenses.

Deciphering An Rx Laboratory Job Instruction



SUBSTANCE COMPARISON CHART
FOR NEGATIVE RX AT VARIOUS POWERS IN RESIN

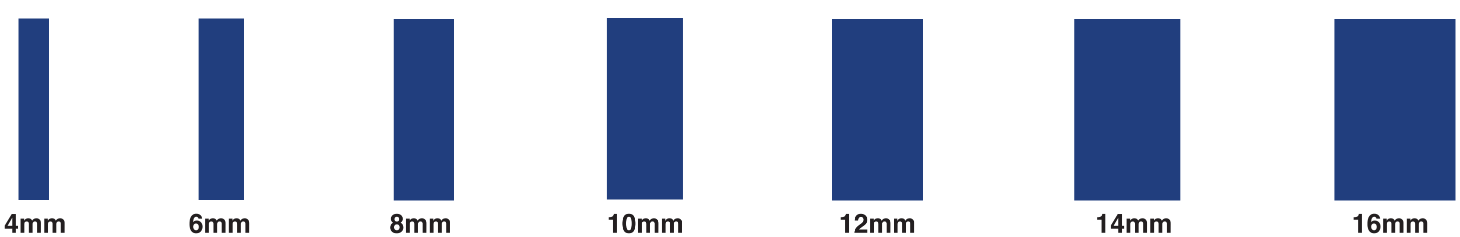
Figures represent an approximation of the average edge substance and take no account of glazing, chamfering, or lens form.

** This does not include Seiko products which are manufactured using Thin Centre Substance Technology and will therefore be thinner than figures in this column.

Figures were calculated using front curves as follows : Up to -6.00 DS, +4.00 sph curve, -6.50 to -9.00 DS, +2.00 sph curve, -10.00 to -12.00 DS, Flat form, where available.

Power In Highest Meridian	CR39 1.498 CT 2.0mm					Resin 1.60** CT 1.8mm				Resin 1.67 CT 1.0mm				Resin 1.74 CT 1.0mm			
	60 MM	65 MM	70 MM	75 MM	80 MM	60 MM	65 MM	70 MM	75 MM	60 MM	65 MM	70 MM	72 MM	60 MM	65 MM	70 MM	75 MM
-4.00	6.0	6.8	7.8	8.8	10.0	5.0	5.6	6.3	7.1	3.7	4.1	4.6	5.1	3.2	3.7	4.0	4.5
-4.50	6.6	7.5	8.6	9.8	11.2	5.5	6.2	6.9	7.8	4.1	4.6	5.1	5.7	3.5	3.9	4.5	5.1
-5.00	7.2	8.2	9.5	10.9	12.5	5.9	6.7	7.6	8.6	4.4	4.9	5.6	6.2	3.8	4.4	4.8	5.4
-5.50	7.8	9.0	10.4	12.0	13.9	6.3	7.2	8.2	9.4	4.7	5.4	6.1	6.8	4.1	4.7	5.3	6.1
-6.00	8.4	9.8	11.4	13.2	15.5	6.8	7.8	8.9	10.2	5.0	5.7	6.5	7.3	4.4	5.2	5.6	6.3
-6.50	8.4	9.7	11.1	12.7	14.5	7.0	8.0	9.0	10.2	5.5	6.3	7.1	7.8	4.7	5.4	6.2	7.3
-7.00	9.0	10.4	12.0	13.8	15.9	7.4	8.5	9.7	11.0	5.8	6.7	7.6	8.3	5.1	5.9	6.6	
-8.00	10.2	11.9	13.9	16.2		8.3	9.6	11.0	12.6	6.5	7.5	8.6	9.5	5.7	6.7	7.5	
-9.00	11.6	13.6	16.1	19.0		9.3	10.8	12.5	14.4	7.2	8.4	9.7	10.8	6.5	7.5	8.6	
-10.00	12.1	14.1	16.4			9.8	11.4	13.1	15.0	8.0	9.3	10.8		7.2	8.4	9.6	
-11.00	13.4	15.6				10.8	12.5	14.5		8.8	10.3	11.9		8.0	9.3		
-12.00	14.8					11.8	13.8	16.1		9.6	11.3	13.2		8.8	10.2		

EDGE SUBSTANCE



Shaded blocks represent a cross section to visualise cosmetic appearance of edge thicknesses

SUBSTANCE COMPARISON CHART

FOR POSITIVE RX AT VARIOUS POWERS IN RESIN

Figures represent an approximation of the average centre substance calculated at the stated blank diameter with a knife edge (0.5mm) subatance.
Lenses with Aspheric surfaces have not been included in the calculations, but any Aspheric lens in a given index will be thinner than figures shown.
All lenses produced on standard front surface curves for that power.

Power In Highest Meridian	CR39 1.498 CT 2.0mm					Resin 1.60** CT 1.8mm				Resin 1.67 CT 1.0mm				Resin 1.74 CT 1.0mm			
	60 MM	65 MM	70 MM	75 MM	80 MM	60 MM	65 MM	70 MM	75 MM	60 MM	65 MM	70 MM	72 MM	60 MM	65 MM	70 MM	75 MM
+4.00	4.6	5.3	6.1	7.0	7.9	4.0	4.6	5.3	5.8	3.4	3.8	4.2	4.3	3.3	3.6		
+4.50	5.0	5.8	6.6	7.7	8.6	4.4	5.0	5.8	6.3	3.7	4.2	4.6	4.8	3.6	3.9		
+5.00	5.6	6.5	7.3	8.8	9.3	4.7	5.5	6.3	6.8	4.1	4.5	5.0	5.2	3.9	4.3		
+5.50	6.0	7.1	8.2	9.6	10.0	5.1	5.9	6.8	7.4	4.4	4.9	5.4	5.7	4.2	4.6		
+6.00	6.4	7.5	8.8	10.2	10.8	5.4	6.3	7.2	8.0	4.7	5.2	5.9	6.1	4.5	5.1		
+6.50	6.9	8.0	9.4	10.9		5.8	6.7	7.7	8.6	4.9	5.5	6.9	7.2	4.4	5.1		
+7.00	7.5	8.5	9.9	11.5		6.1	7.1	8.1	9.1	5.2	5.8	7.3	7.7	4.6	5.4		
+8.00	8.3	9.5	10.9	12.7		6.8	7.9	9.0		5.8	6.6			5.2	6.1		
+9.00	9.1	10.4	12.1			7.5	8.6	10.1		6.5	7.3			5.8			
+10.00	10.4	11.7	13.1			8.1	9.5	10.9		7.1	8.0						
+11.00	11.2	12.8	14.9			8.8	10.3	11.8		7.6	8.7						
+12.00	11.9									9.0							

CENTRE SUBSTANCE

GLASS SUBSTANCE - PLUS POWERS

FOR DIFFERENT INDEX MATERIALS AT VARIOUS DIAMETERS

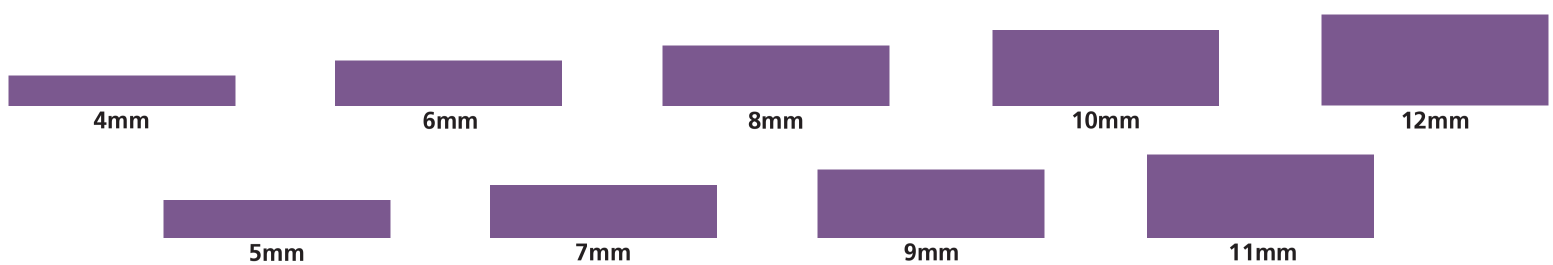
These figures represent an approximation of the average centre substance calculated at the stated blank diameter with a knife edge (0.5mm) substance.
Lenses with Aspheric surfaces have not been included in the calculations, but any Aspheric lens in a given index will be thinner than figures shown.
All lenses produced on standard front surface curves for that power.

EDGE SUBSTANCE

Power In Highest Meridian	Glass 1.523 CT 1.3mm					Glass 1.60 CT 1.3mm			Glass 1.70 CT 1.3mm			Glass 1.80 CT 1.3mm			Glass 1.90 CT 1.3mm	
	60 MM	65 MM	70 MM	75 MM	80 MM	60 MM	65 MM	70 MM	60 MM	65 MM	70 MM	60 MM	65 MM	70 MM	60 MM	65 MM
-4.00	5.1	5.8	6.7	7.6	8.7	4.5	5.1	5.8	4.0	4.5	5.1	3.6	4.0	4.4	3.3	3.7
-4.50	5.6	6.5	7.5	8.6	9.8	5.0	5.7	6.4	4.4	4.9	5.6	3.9	4.3	4.8	3.6	4.0
-5.00	6.2	7.1	8.3	9.5	11.0	5.4	6.2	7.1	4.7	5.4	6.1	4.2	4.7	5.3	3.8	4.3
-5.50	6.7	7.8	9.1	10.6	12.3	5.8	6.7	7.7	5.1	5.8	6.6	4.5	5.0	5.7	4.1	4.6
-6.00	7.3	8.5	10.0	11.7	13.6	6.3	7.3	8.4	5.5	6.3	7.1	4.8	5.4	6.1	4.4	4.9
-6.50	7.4	8.6	9.9			6.5	7.5	8.5	5.7	6.5	7.4	5.1	5.8	6.6	4.6	5.2
-7.00	7.9	9.2	10.7			6.9	8.0	9.2	6.0	6.9	7.9	5.4	6.1	6.9	4.9	5.5
-8.00	9.0	10.6	12.4			7.8	9.1	10.5	6.8	7.8	8.9	6.0	6.9	7.8	5.4	6.2
-9.00	10.2	12.1	14.3			8.8	10.3	12.0	7.5	8.7	10.0	6.6	7.6	8.7	6.0	6.8
-10.00	10.8	12.6				9.3	10.9	12.6	8.1	9.3	10.7	7.1	8.2	9.7	6.5	7.5
-11.00	12.0					10.3	12.0	14.0	8.8	10.2	11.8	7.8	9.0	10.7	7.1	8.2
-12.00	13.3					11.3	13.3	15.6	9.6	11.1	13.0	8.4	9.8	11.7	7.7	8.9

CENTRE SUBSTANCE

Power In Highest Meridian	Glass 1.523					Glass 1.60			Glass 1.70			Glass 1.8	
	60 MM	65 MM	70 MM	75 MM	80 MM	60 MM	65 MM	70 MM	60 MM	65 MM	70 MM	60 MM	65 MM
+4.00	4.4	5.0	5.8	6.5	7.2	3.8	4.4	5.0	3.5	4.0	4.5	3.2	3.7
+4.50	4.8	5.5	6.3	7.2		4.3	4.8	5.4	3.8	4.4	5.0	3.5	4.0
+5.00	5.2	6.0	6.8	7.9		4.7	5.3	6.1	4.1	4.7	5.4	3.7	4.3
+5.50	5.7	6.5	7.4			5.0	5.8	6.5	4.4	5.1	5.8	4.0	4.6
+6.00	6.1	7.1	8.0			5.3	6.2	7.1	4.7	5.5	6.2	4.3	4.9
+6.50	6.5	7.6	8.5			5.7	6.5		5.0	5.8	6.6	4.5	5.2
+7.00	6.9	8.1	9.1			6.2	7.3		5.5	6.4	7.4	4.8	5.6
+8.00	7.9	9.0	10.6			6.9	8.0		6.1	7.1	8.2	5.3	6.2
+9.00	8.7	9.9				7.6	8.9		6.6	7.8	9.0	5.7	6.7
+10.00	9.5	10.7							7.0	8.1	9.3	6.3	7.4
+11.00	10.2								7.7	8.8	10.2		
+12.00	10.9								8.3	9.5	11.1		



Shaded blocks represent a cross section to visualise cosmetic appearance of edge thicknesses

Alphabetical Lens Codes inc. Description

LENS CODE	DESCRIPTION	REF INDEX	TYPE
143S	Norlite Flat Top 1435 1.50	1.498	Trifocal
4I50	IRS HD 40mm Bif Infinite NuPolar 1.50	1.498	Bifocal
4I58	IRS HD 40mm Bif Infinite NuPolar Polycarb 1.59	1.586	Bifocal
4P53	Trivex IRS HD 40mm NuPolar 1.53	1.530	Bifocal
4PBT	IRS HD 40mm Bif Blutech BT70 Filter 1.58	1.586	Bifocal
4R50	Norlite IRS HD 40mm Bifocal	1.498	Bifocal
4R5X	Norlite IRS HD Trans XTRA 40mm Bifocal 1.50	1.498	Bifocal
4R53	Trivex IRS HD 40mm Bifocal 1.53	1.530	Bifocal
4R56	Norlite IRS HD 40mm Bif Vista-Mesh 1.56	1.560	Bifocal
4R67	Norlite IRS HD 40mm Bifocal 1.67	1.670	Bifocal
4R6U	Norlite IRS HD 40mm Bifocal **UV410** 1.67	1.670	Bifocal
4R67	Norlite IRS HD 40mm Bifocal 1.67	1.670	Bifocal
4R76	Trivex IRS HD 40mm Bif Drivewear 1.76	1.760	Bifocal
4T58	IRS HD 40mm Bifocal Polycarb 1.59	1.586	Bifocal
4T5V	IRS HD 40mm Bifocal Polycarb **UV410** 1.59	1.586	Bifocal
4T60	Norlite HD IRS HD 40mm Bifocal 1.60	1.600	Bifocal
4T67	Norlite HD IRS HD 40mm Bifocal Trans 1.67	1.670	Bifocal
4T6U	Norlite HD IRS HD 40mm Bifocal **UV410** 1.60	1.600	Bifocal
4T6X	Norlite IRS HD 40mm Bifocal Trans XTRA 1.67	1.670	Bifocal
4V50	IRS HD 40mm Bif Trans Vantage 1.50	1.498	Bifocal
4V53	Trivex IRS HD 40mm Bif Trans Vantage 1.53	1.530	Bifocal
4X53	Trivex IRS HD 40mm Bif Trans XTRA 1.53	1.530	Bifocal
4X58	IRS HD 40mm Bif Polycarb Trans XTRA 1.59	1.586	Bifocal
4X60	IRS HD 40mm Bif Trans XTRA 1.60	1.600	Bifocal
74A	Norlite Stock Aspheric 1.74	1.740	Single Vision
74AS	Norlite Aspheric 1.74	1.740	Single Vision
74HY	Norlite Hybrid 1.74	1.740	Single Vision
ACCE	Sola Access 1.50	1.498	Progressive
AISS	Airware Surf 1.59	1.586	Single Vision
AIST	Airware Trans 1.59	1.586	Single Vision
AISV	Airware Stock 1.59	1.586	Single Vision
AL22	Norlite Aspheric Lentic 22mm Bif 1.50	1.498	Bifocal
AOE	AO Pro Easy 1.50	1.498	Progressive
AOE6	AO Pro Easy 1.60	1.600	Progressive
AOET	AO Pro Easy Trans 1.50	1.498	Progressive
AOPB	AO Pro 15 Trans Brown 1.50	1.501	Progressive
AOPT	AO Pro 15 Trans Grey 1.50	1.501	Progressive
AR22	Norlite Aspheric Full App Bifocal 1.50	1.498	Bifocal
ASLS	Polycarb Aspheric	1.586	Single Vision
ASVT	Polycarb Trans Stock SV 1.59	1.586	Single Vision
BG52	Booster HD Glass 1.523	1.523	Progressive
BG60	Booster HD Glass 1.60	1.600	Progressive
BG70	Booster HD Glass 1.70	1.700	Progressive
BI24	Norlite Round 24mm Bi-Concave	1.498	Bifocal
BI50	Booster HD Infinite NuPolar 1.50	1.498	Progressive
BI59	Booster HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
BO50	Norlite Booster HD 1.50	1.498	Progressive
BO53	Booster HD 1.53	1.530	Progressive
BO59	Booster HD Polycarb 1.59	1.586	Progressive
BO5V	Booster HD Polycarb **UV410** 1.59	1.586	Progressive
BO60	Booster HD 1.60	1.600	Progressive
BO67	Booster HD 1.67	1.670	Progressive
BO6U	Booster HD **UV410** 1.60	1.600	Progressive
BO6X	Booster HD Trans XTRA 1.60	1.600	Progressive
BO74	Booster HD 1.74	1.740	Progressive
BO7U	Booster HD **UV410** 1.67	1.670	Progressive
BOBT	Booster HD Blutech BT66 Filter 1.56	1.560	Progressive
BOX5	Booster HD Trans XTRA 1.53	1.530	Progressive
BP50	CombiPal 1.50	1.498	Progressive
BP53	CombiPal Trivex D28 1.53	1.530	Progressive
BP60	Norlite CombiPal Digital 1.60	1.600	Progressive
BPBT	Bureau HD ISP Blutech BT70 Filter 1.58	1.586	Progressive
BT28	Blutech BT66 Filter FT 28mm 1.56	1.560	Bifocal
BTPS	Blutech BT70 Filter 1.58	1.586	Single Vision
BTR6	Tribrid Bureau HD 1.60	1.600	Progressive
BTS	Blutech BT66 Filter Stock 1.56	1.560	Single Vision
BTP	Blutech BT70 Filter Stock 1.58	1.586	Single Vision
BTSS	Blutech BT66 Filter 1.56	1.560	Single Vision
BU39	Bureau HD 1.50	1.498	Progressive
BU53	Bureau Trivex HD 1.53	1.530	Progressive
BU60	Bureau HD 1.60	1.600	Progressive
BU67	Bureau HD 1.67	1.665	Progressive
BU6U	Bureau HD **UV410** 1.60	1.600	Progressive
BU74	Bureau HD 1.74	1.740	Progressive
BU7U	Bureau HD **UV410** 1.67	1.665	Progressive
BUBT	Bureau HD Blutech BT66 Filter 1.56	1.560	Progressive
BUME	Bureau HD Vista-Mesh HD 1.56	1.560	Progressive
BUPC	Bureau HD Polycarb 1.59	1.586	Progressive
BUPV	Bureau HD Polycarb **UV410** 1.59	1.586	Progressive
BX39	Bureau HD Trans XTRA ISP 1.50	1.498	Progressive
BX50	Booster HD Trans XTRA 1.50	1.498	Progressive
BX53	Booster HD Trans XTRA 1.53	1.530	Progressive
BX60	Bureau HD Trans XTRA 1.60	1.600	Progressive
C28A	Norlite Curve Top 28mm 1.50	1.498	Bifocal
C28B	Trans Curve Top 28mm 1.50	1.501	Bifocal
C2V	Essilor Varilux Computer 2V	1.500	Progressive
C3V	Essilor Varilux Computer 3V	1.500	Progressive
C74S	Curve Top 28mm 1.74	1.740	Bifocal
CARB	Polycarb Flat Top 28 1.59	1.586	Bifocal
CARG	Polycarb SV Trans 1.59	1.586	Single Vision
CARP	Polycarb Stock SV 1.59	1.586	Single Vision
CARX	Polycarb Stock SV HMAR 1.59	1.586	Single Vision
CF5	Norlite Cont Focus Auto 1.50	1.498	Progressive
CF5L	Norlite Cont Focus Long 1.50	1.498	Progressive
CF5S	Norlite Cont Focus Short 1.50	1.498	Progressive
CF6	Norlite Cont Focus Auto 1.60	1.600	Progressive
CF6L	Norlite Cont Focus Long 1.60	1.600	Progressive
CF6S	Norlite Cont Focus Short 1.60	1.600	Progressive
CF7	Norlite Cont Focus Auto 1.67	1.670	Progressive
CF7L	Norlite Cont Focus Long 1.67	1.670	Progressive
CF7S	Norlite Cont Focus Short 1.67	1.670	Progressive
CFH	Norlite Cont Focus Auto 1.74	1.740	Progressive
CFHL	Norlite Continuous Focus Long 1.74	1.740	Progressive
CFHS	Norlite Continuous Focus Short 1.74	1.740	Progressive
CFP	Norlite Cont Focus Polycarb Auto 1.59	1.586	Progressive
CFPL	Norlite Cont Focus Polycarb Long 1.59	1.586	Progressive
CFPS	Norlite Cont Focus Polycarb Short 1.59	1.586	Progressive
CFT	Trivex Cont Focus Auto 1.53	1.530	Progressive
CFTL	Trivex Cont Focus Long 1.53	1.530	Progressive
CFTS	Trivex Cont Focus Short 1.53	1.530	Progressive
CHU8	Norlite Aspheric Curve Top 28mm 1.67	1.660	Bifocal
CM50	DigitorPlus DHD 1.50	1.498	Progressive
CM53	DigitorPlus DHD Trivex 1.53	1.530	Progressive
CM59	DigitorPlus DHD Polycarb 1.59	1.586	Progressive
CM60	DigitorPlus DHD 1.60	1.600	Progressive
CM67	DigitorPlus DHD 1.67	1.665	Progressive
CO6T	Essilor Comfort Ormix Trans 1.60	1.600	Progressive
COM6	AO Compact 1.60	1.600	Progressive
COMA	Essilor Comfort Airwear 1.59	1.586	Progressive
COMP	AO Compact 1.50	1.498	Progressive
COP	Essilor Comfort Polarising 1.50	1.498	Progressive
CP50	DigitorPlus DHD NuPolar 1.50	1.500	Progressive
CP59	DigitorPlus DHD NuPolar Polycarb 1.59	1.586	Progressive
CP60	DigitorPlus DHD NuPolar 1.60	1.600	Progressive
CP67	DigitorPlus DHD NuPolar 1.67	1.670	Progressive
CT28	Glass Curve Top 28mm	1.523	Bifocal
CU28	Norlite Curve Top 28mm 1.60	1.600	Bifocal
CV78	Glass Flat Top D728 Trifocal 1.52	1.523	Trifocal
CXRG	Polycarb Trans XTRA 1.59	1.586	Single Vision
DD28	Double D28 60% Add at Top	1.498	Bifocal
DDR8	Double D28 Same Add at Top	1.498	Bifocal
DR28	DriveWear Flat Top 28mm 1.50	1.500	Bifocal
DRA	DriveWear Nortor-SV ISA 1.50	1.498	Single Vision
DRPO	DriveWear Polycarb SV 1.59	1.586	Single Vision
DRW	DriveWear NuPolar + Trans SV 1.50	1.498	Single Vision
EAG6	Eagle Tint UV410 Brown 47% LT 1.60	1.600	Single Vision
ECST	Essilor Comfort Stylis Trans 1.67	1.670	Progressive
EQ70	Glass Equitint Photobrown/Photogrey 1.70	1.700	Single Vision
EQ80	Glass Equitint Photobrown/Photogrey 1.80	1.800	Single Vision
FFDA	FF Double Aspheric 1.60	1.600	Single Vision
FG52	Glass IRS HD 28mm Bifocal 1.523	1.523	Bifocal
FG60	Glass IRS HD 28mm Bifocal 1.60	1.600	Bifocal
FG90	Glass IRS HD 28mm Bifocal 1.90	1.900	Bifocal
FI50	IRS HD 28mm Bif Infinite NuPolar 1.50	1.498	Bifocal
FI58	IRS HD Bif Infinite NuPolar Polycarb 1.59	1.586	Bifocal
FP53	Trivex IRS HD 28mm NuPolar 1.53	1.530	Bifocal
FP60	Norlite Polarised IRS HD 28mm Bifocal 1.60	1.600	Bifocal
FP67	Norlite Polarised IRS HD 28mm Bifocal 1.67	1.670	Bifocal
FPBT	IRS HD 28mm Bif Blutech BT70 Filter 1.58	1.586	Bifocal
FR50	Norlite IRS HD 28mm Bifocal	1.498	Bifocal
FR53	Trivex IRS HD 28mm Bifocal 1.53	1.530	Bifocal
FR56	Norlite IRS HD 28mm Vista-Mesh 1.56	1.560	Bifocal

Alphabetical Lens Codes inc. Description cont.

LENS CODE	DESCRIPTION	REF INDEX	TYPE
FR5V	Norlite IRS HD 28mm Vantage 1.50	1.498	Bifocal
FR5X	Norlite IRS HD 28mm Trans XTRA Bifocal 1.50	1.498	Bifocal
FR67	Norlite IRS HD 28mm Bifocal 1.67	1.670	Bifocal
FR6U	Norlite IRS HD 28mm Bifocal **UV410** 1.67	1.670	Bifocal
FR74	Norlite IRS HD 28mm Bifocal 1.74	1.740	Bifocal
FR76	Norlite IRS HD 28mm Bifocal 1.76	1.760	Bifocal
FRDW	Trivex IRS HD 28mm Drivewear 1.53	1.530	Bifocal
FRHY	Norlite IRS HD 28mm Tintable 1.74	1.740	Bifocal
FT16	Norlite Custom Myoplet Lentic 1.50	1.498	Single Vision
FT58	IRS HD 28mm Bifocal Polycarb 1.59	1.586	Bifocal
FT5V	IRS HD 28mm Bifocal Polycarb **UV410** 1.59	1.586	Bifocal
FT60	Norlite IRS HD 28mm Bifocal 1.60	1.600	Bifocal
FT67	Norlite IRS HD 28mm Bifocal Trans 1.67	1.670	Bifocal
FT6U	Norlite IRS HD 28mm Bifocal **UV410** 1.60	1.600	Bifocal
FT6X	Norlite IRS HD 28mm Bifocal Trans XTRA 1.67	1.670	Bifocal
FT74	Norlite IRS HD 28mm Bif Trans 1.74	1.740	Bifocal
FTR6	TriBrid IRS HD 28mm Bifocal 1.60	1.600	Bifocal
FV50	IRS HD 28mm Bif Trans Vantage 1.50	1.498	Bifocal
FV53	Trivex IRS HD 28mm Trans Vantage 1.53	1.530	Bifocal
FV58	IRS HD 28mm Trans Vantage Polycarb 1.59	1.586	Bifocal
FX53	Trivex IRS HD 28mm Trans XTRA 1.53	1.530	Bifocal
FX58	IRS HD 28mm Bifocal Trans XTRA Polycarb 1.59	1.586	Bifocal
FX60	Norlite IRS HD 28mm Trans XTRA 1.60	1.600	Bifocal
FX74	Norlite IRS HD 28mm Trans XTRA 1.74	1.740	Bifocal
GCFG	Glass Green Grey 15% LT 1.60	1.600	Single Vision
GCOM	Essilor Comfort 1.60	1.604	Progressive
GCT6	Glass Curve Top 28mm 1.60	1.604	Bifocal
GD28	Glass Flat Top 28mm 1.52	1.523	Bifocal
GD35	Glass Flat Top 35mm 1.52	1.523	Bifocal
GFC	Glass Didymium 1.52	1.523	Single Vision
GFRD	Glass Fused R25mm 1.52	1.523	Bifocal
GN50	Glass Nortor-SV 1.52	1.523	Single Vision
GN60	Glass Nortor-SV 1.60	1.604	Single Vision
GN90	Glass Nortor-SV 1.90	1.900	Single Vision
GP50	Glass Polarised Grey & Brown 1.52	1.523	Single Vision
GR30	Glass Solid R30mm 1.52	1.523	Bifocal
GR38	Glass Solid R38mm 1.52	1.523	Bifocal
GR3R	Glass 38 EDRP 1.52	1.523	Bifocal
GR45	Glass Solid R45mm 1.52	1.523	Bifocal
GR70	Glass Solid R30mm 1.70	1.700	Bifocal
GR80	Glass Solid R30mm 1.80	1.800	Bifocal
GRAD	Sola Graduate 1.50	1.498	Progressive
GRTB	Sola Graduate Trans Brown 1.50	1.498	Progressive
GRTR	Sola Graduate Trans Grey 1.50	1.501	Progressive
GS60	Glass Ultor 1.60	1.604	Progressive
GS70	Ultor HD Glass 1.70	1.700	Progressive
GS80	Glass Ultor 1.80	1.800	Progressive
GS90	Glass Ultor 1.90	1.900	Progressive
GSDD	Glass Ultor HD Didymium 1.523	1.523	Progressive
GSF-	Glass Stock SV 1.52	1.523	Single Vision
GSS+	Glass Surf SV 1.52	1.523	Single Vision
GXR	Glass X Ray Filter 1.80	1.800	Single Vision
HAC6	Hoyalux TACT 1.60	1.600	Progressive
H6BL	Glass Bi-Convex Photobrown 1.60	1.604	Single Vision
HBL	Highlite Bi-Lentic Glass 1.70	1.700	Single Vision
HBL6	Bi-Lentic Glass 1.60	1.600	Single Vision
HBL8	Bi-Lentic Glass 1.80	1.800	Single Vision
HBL9	Bi-Lentic Glass 1.90	1.900	Single Vision
HCOM	Glass Essilor Comfort 1.80	1.807	Progressive
HGU7	HoyaLux Summit Pro 1.70	1.700	Progressive
HGU8	HoyaLux Summit CD 1.80	1.800	Progressive
HGUL	HoyaLux Summit CD 1.60	1.600	Progressive
HGUM	HoyaLux Summit Pro 1.52	1.523	Progressive
HHA8	Norlite HIGH PLUS Flat Top 28mm 1.67	1.670	Bifocal
HHH8	Norlite HIGH PLUS Aspheric Flat Top 28	1.670	Bifocal
HHU8	Norlite Aspheric Flat Top 28mm 1.67	1.670	Bifocal
HI19	Glass Minlite SV 1.90	1.885	Single Vision
HID	Hoyalux iD LifeStyle ISP 1.50	1.498	Progressive
HID6	Hoyalux iD LifeStyle ISP 1.60	1.600	Progressive
HID7	Hoyalux iD LifeStyle ISP 1.67	1.670	Progressive
HIDE	Hoyalux WIDE	1.498	Progressive
HIDM	Hoyalux iD Mystyle V+ 1.50	1.498	Progressive
HIM6	Hoyalux iD Mystyle V+ 1.60	1.600	Progressive
HIST	Highlite Stock 1.70	1.700	Single Vision
HISV	Highlite Surfaced 1.70	1.700	Single Vision
HLX7	Hoya Nulux LX 1.70	1.710	Single Vision
HLXP	Hoya Nulux LX Prog 1.70	1.701	Progressive
HM67	Hoyalux iD Mystyle V+ 1.67	1.670	Progressive
HMTL	Trivex Hoyalux iD Mystyle V+ 1.53	1.530	Progressive
HR28	Highlite IRS HD 28mm 1.70	1.700	Bifocal
HS19	Glass Minlite Stock SV 1.90	1.892	Single Vision
HSL	Highlite Lentic Plus 1.70	1.700	Single Vision
HSL8	Highlite Lentic Plus 1.80	1.800	Single Vision
HSL9	Highlite Lentic Plus 1.90	1.900	Single Vision
HU28	Norlite Flat Top 28mm 1.60	1.600	Bifocal
HU6L	Hoyalux Summit Pro 1.60	1.600	Progressive
HU6S	Hoyalux Summit CD 1.60	1.600	Progressive
HU7L	Hoyalux Summit Pro 1.67	1.670	Progressive
HU7S	Hoyalux Summit CD 1.67	1.670	Progressive
HUML	Hoyalux Summit Pro 1.50	1.498	Progressive
HUMS	Hoyalux Summit CD 1.50	1.498	Progressive
IM67	Image Transitions 1.67	1.670	Progressive
IMAA	Norlite Image HD High Add 1.50	1.498	Progressive
IMAG	Norlite Image 1.50	1.498	Progressive
IMDN	Image Drivewear Poly 1.59	1.586	Progressive
IMDW	DriveWear Image 1.50	1.498	Progressive
IMGB	Norlite Image Trans Brown 1.50	1.498	Progressive
IMGR	Norlite Image Trans Grey 1.50	1.498	Progressive
IMGX	Norlite Image Trans XTRA 1.50	1.500	Progressive
IMPC	Image Polycarb 1.59	1.586	Progressive
IMPP	Image Polycarb NuPolar 1.59	1.586	Progressive
IMPX	Image Polycarb Trans XTRA 1.59	1.586	Progressive
IMQU	Image Polycarb Trans 1.59	1.586	Progressive
INFI	Infinite NuPolar Chromatic 1.50	1.498	Single Vision
LC16	Norlite Stock MAR 1.60	1.600	Single Vision
LD28	Glass D seg 28mm Large 1.52	1.523	Bifocal
LI6S	Essilor Liberty Short Ormix 1.60	1.600	Progressive
LI6T	Essilor Liberty Trans Short Ormix 1.60	1.600	Progressive
LIB	Essilor Liberty PAL 1.50	1.498	Progressive
LI6S	Essilor Liberty Short Ormix 1.60	1.600	Progressive
LI6T	Essilor Liberty Trans Short Ormix 1.60	1.600	Progressive
LIB	Essilor Liberty PAL 1.50	1.498	Progressive
LIB6	Essilor Liberty Ormix 1.60	1.600	Progressive
LIBP	Essilor Liberty Polarising 1.60	1.600	Progressive
LIBS	Essilor Liberty Short 1.50	1.498	Progressive
LIBT	Essilor Liberty Trans 1.50	1.498	Progressive
LITE	Norlite Nupolar GR Finished 1.50	1.498	Single Vision
LITS	Norlite Nupolar GR Surfaced 1.50	1.498	Single Vision
MAXI	Seiko Maxima Finished 1.60	1.600	Single Vision
MAXS	Seiko Maxima Surfaced 1.60	1.600	Single Vision
MESB	Vista-Mesh Booster 1.60	1.560	Progressive
MESH	Norlite Vista-Mesh Brown Stock 1.56	1.560	Single Vision
MESS	Norlite Vista-Mesh Brown Surf 1.56	1.560	Single Vision
MEZA	ReadEZ Plano MA	1.500	Single Vision
MEZB	ReadEZ Plano MB	1.500	Single Vision
MEZC	ReadEZ Plano MC	1.500	Single Vision
MEZD	ReadEZ Plano MD	1.500	Single Vision
MEZE	ReadEZ Plano ME	1.500	Single Vision
MEZF	ReadEZ Plano MF	1.500	Single Vision
MEZG	ReadEZ Plano MG	1.500	Single Vision
MEZH	ReadEZ Plano MH	1.500	Single Vision
MEZI	ReadEZ Plano MI	1.500	Single Vision
MEZJ	ReadEZ Plano MJ	1.500	Single Vision
MEZK	ReadEZ Plano MK	1.500	Single Vision
MEZL	ReadEZ Plano ML	1.500	Single Vision
MIP5	Screen HD Infinite NuPolar 1.50	1.500	Progressive
MO3X	Screen HD Trans XTRA 1.50	1.500	Progressive
MO50	Screen HD 1.50	1.500	Progressive
MO53	Screen HD 1.53	1.530	Progressive
MO58	Screen HD 1.59	1.586	Progressive
MO60	Screen HD 1.60	1.600	Progressive
MO6U	Screen HD **UV410** Material 1.60	1.600	Progressive
MO67	Screen HD 1.67	1.670	Progressive
MO74	Screen HD 1.74	1.740	Progressive
MO7U	Screen HD **UV410** Material 1.67	1.670	Progressive
MOBT	Screen HD Blutech BT66 Filter	1.560	Progressive
MOME	Screen HD Vista-Mesh Brown 1.56	1.560	Progressive
MOPT	Screen HD Bluetech BT70 Filter 1.58	1.580	Progressive
MOTX	Screen HD Trans XTRA 1.53	1.530	Progressive
MOX6	Screen HD Trans XTRA 1.60	1.600	Progressive
MRN6	Tribrid Screen HD 1.60	1.600	Progressive
MULB	Blutech MaxBlink Filter Stock 1.58	1.586	Single Vision

LENS CODE	DESCRIPTION	REF INDEX	TYPE
MV39	Screen HD Trans Vantage 1.50	1.500	Progressive
MV53	Screen HD Trans Vantage 1.53	1.530	Progressive
N17S	Norlite Trans 1.67	1.670	Single Vision
N17T	Norlite Aspheric Trans 1.67	1.670	Single Vision
N67	Norlite Asph Stock Transitions 1.67	1.670	Single Vision
N74	Norlite Aspheric Stock 1.74	1.740	Single Vision
N74-	Norlite Bi-Concave 1.74	1.740	Single Vision
N74M	Norlite Bi-Concave 1.74	1.740	Single Vision
NASM	Norlite Superocular ASM Bi-Convex	1.498	Single Vision
NCF8	Glass Vector Progressive 1.80	1.807	Progressive
NCFL	Norlite Cont Focus Long 1.50	1.498	Progressive
NCFS	Norlite Cont Focus Short 1.50	1.498	Progressive
NCFX	Glass Vector Progressive 1.70	1.700	Progressive
NCNC	Neo Contrast A1 82% LT 1.60	1.600	Single Vision
NEOO	Seiko Neo ISP Orgatech 1.67	1.670	Progressive
NG5	Glass PPL Progressive 1.52	1.523	Progressive
NG6	Glass PPL Progressive 1.60	1.600	Progressive
NG7	Glass NG7 Progressive 1.70	1.700	Progressive
NG8	Glass NG8 Progressive 1.80	1.800	Progressive
NG52	Glass Ultor HD 1.523	1.523	Progressive
NGPD	Glass Ultor HD Polarised 1.523	1.523	Progressive
NEOO	Seiko Neo ISP Orgatech 1.67	1.670	Progressive
NH17	Norlite Aspheric SV 1.67	1.662	Single Vision
NH6M	Norlite Transitions Stock HMAR 1.60	1.600	Single Vision
NH6P	Norlite Transitions Stock 1.60	1.600	Single Vision
NH7	Norlite 1.67	1.665	Single Vision
NH7U	Norlite **UV410** 1.67	1.665	Single Vision
NHA6	Norlite Aspheric HMAR Stock 1.60	1.600	Single Vision
NHAH	Norlite Aspheric Finished 1.60	1.600	Single Vision
NHI	Norlite 1.60	1.600	Single Vision
NHI-	Norlite Minus base 1.67	1.660	Single Vision
NHI6	Norlite Stock Tintable HC 1.60	1.600	Single Vision
NHIA	Norlite Aspheric 1.60	1.600	Single Vision
NHIL	Norlite HMAR Stock 1.67	1.670	Single Vision
NHIU	Norlite **UV410** 1.60	1.600	Single Vision
NHNC	Neo Contrast A2 72% LT 1.60	1.600	Single Vision
NHTS	Norlite Trans 1.60	1.600	Single Vision
NHTX	Norlite Trans XTRA 1.60	1.600	Single Vision
NI59	Ultor HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
NIP5	Ultor HD Infinite NuPolar 1.50	1.498	Progressive
NNEO	Ultor HD ISP Neo Contrast 1.60	1.600	Progressive
NOHI	Norlite Polar UV400 15% LT 1.60	1.600	Single Vision
NP28	Norlite Polycarb Polar Flat Top 28 1.59	1.586	Bifocal
NP39	Ultor HD NuPolar 15% LT ISP 1.50	1.498	Progressive
NP58	Ultor HD NuPolar 15% LT 1.59	1.586	Progressive
NP6	NG6 PBX Photo Glass 1.60	1.600	Progressive
NP60	Ultor HD Polar ISP 15% LT 1.60	1.600	Progressive
NP67	Ultor HD Polar ISP 15% LT 1.67	1.670	Progressive
NP74	Ultor HD ISP Polarised 1.74	1.740	Progressive
NPBT	Ultor HD ISP Blutech BT70 Filter 1.58	1.586	Bifocal
NRPO	Ultor HD ISP Polycarb DriveWear 1.59	1.586	Progressive
NS16	Seiko Super 1.60	1.600	Single Vision
NS74	Norlite 1.74	1.740	Single Vision
NSX	Seiko Finished MAR Dia-coat 1.60	1.498	Single Vision
NU39	Ultor ISP 1.50	1.498	Progressive
NU53	Ultor Trivex ISP 1.53	1.530	Progressive
NU58	Ultor Polycarb ISP 1.59	1.586	Progressive
NU5V	Ultor Polycarb ISP **UV410** 1.59	1.586	Progressive
NU60	Ultor ISP 1.60	1.600	Progressive
NU67	Ultor ISP 1.67	1.665	Progressive
NU6U	Ultor ISP **UV410** 1.60	1.600	Progressive
NU6X	Ultor ISP Trans XTRA 1.60	1.600	Progressive
NU74	Ultor ISP 1.74	1.740	Progressive
NU7U	Ultor ISP **UV410** 1.67	1.665	Progressive
NUBT	Ultor ISP Blutech BT66 Filter 1.56	1.560	Progressive
NUD8	Ultor ISP Drivewear Polycarb 1.59	1.586	Progressive
NUDR	Ultor ISP DriveWear 1.50	1.498	Progressive
NUDW	Ultor HD Trivex Drivewear 1.53	1.530	Progressive
NUHY	Ultor HD Tintable 1.74	1.740	Progressive
NULT	Ultor HD Ultra Blutech Indoor 1.58	1.586	Single Vision
NUME	Ultor ISP Vista-Mesh UV385 1.56	1.560	Progressive
NUNC	Neo Contrast A1 82% LT 1.60	1.600	Single Vision
NUNE	Nortor-SV Neo Contrast A2 72% LT 1.60	1.600	Single Vision
NUNL	Nortor-SV Neo Contrast A1 82% LT 1.60	1.600	Single Vision
NUNP	Ultor HD Trivex NuPolar 1.53	1.530	Progressive
NUSO	Ultor Slab Off	1.498	Progressive
NUXP	Ultor NXT Polar 15% LT 1.53	1.530	Progressive
NUXT	Ultor NXT Sun 15% LT 1.53	1.530	Progressive
NUXV	Ultor NXT Polar + Varia 1.53	1.530	Progressive
NV39	Ultor HD Trans Vantage 1.50	1.498	Progressive
NV53	Ultor HD Trivex Vantage 1.53	1.530	Progressive
NX39	Ultor HD Trans XTRA Grey ISP 1.50	1.498	Progressive
NX53	Ultor HD Trivex Trans XTRA 1.53	1.530	Progressive
NX58	Ultor HD Trans XTRA 1.59	1.586	Progressive
NX60	NU60 RIMLESS PRM	1.600	Progressive
NX67	Ultor HD Trans XTRA 1.67	1.670	Progressive
NX74	Ultor HD Trans XTRA 1.74	1.740	Progressive
NX7S	Norlite Trans XTRA 1.67	1.670	Single Vision
OF67	Norlite Versatile Office 1.67	1.665	Progressive
OF6F	Norlite Versatile Office 1.60	1.600	Progressive
OF6X	Versatile Office Trans XTRA 1.60	1.600	Progressive
OF7U	Norlite Versatile Office **UV410** 1.67	1.665	Progressive
OFF6	Versatile Office Degression 1.60	1.600	Progressive
OFFF	Versatile Office Degression 1.50	1.498	Progressive
OFFI	Versatile Office Infinite NuPolar 1.50	1.498	Progressive
OFFT	Norlite Versatile Office Trans 1.50	1.498	Progressive
OFFU	Versatile Office Degression **UV410** 1.60	1.600	Progressive
OFLI	Versatile Office Infinite NuPolar Poly 1.59	1.586	Progressive
OFLT	Versatile Office Polycarb Trans 1.59	1.586	Progressive
OFLV	Versatile Office Polycarb **UV410** 1.59	1.586	Progressive
OFLY	Versatile Office Polycarb 1.59	1.586	Progressive
OFTR	Versatile Office Trivex 1.53	1.530	Progressive
OFUL	Versatile Ultra Blutech Indoor BT70 1.58	1.586	Single Vision
OFXR	Versatile Office Trans XTRA 1.53	1.530	Progressive
OG52	Versatile Office Glass 1.523	1.523	Progressive
OG60	Versatile Office Glass 1.60	1.600	Progressive
OG70	Versatile Office Glass 1.70	1.700	Progressive
OM22	Omega Oval 22mm Aspheric 1.50	1.498	Bifocal
OMSV	Omega SV 1.50	1.498	Single Vision
OMV2	Essilor Omega Varifocal 1.50	1.498	Bifocal
OTR6	Tribrid Versatile Office HD 1.60	1.600	Progressive
OX67	Versatile Office Trans XTRA 1.67	1.670	Progressive
P16B	Glass SV Photo Brown 1.60	1.600	Single Vision
P16G	Glass SV Photo Grey 1.60	1.600	Single Vision
P728	Flat Top 728 15% LT NuPolar 1.50	1.498	Trifocal
PA22	Norlite Lentic 22mm Aperture 1.50	1.498	Single Vision
PA25	Norlite Lentic 25mm Aperture 1.50	1.498	Single Vision
PA27	Norlite Lentic 27mm Aperture 1.50	1.498	Single Vision
PA34	Norlite 34mm Lentic SV 1.50	1.498	Single Vision
PA38	Norlite 38mm Lentic SV 1.50	1.498	Single Vision
PA40	Norlite 38mm Lentic R22 1.50	1.498	Bifocal
PA50	Norlite 50mm Lentic SV 1.50	1.498	Single Vision
PAD	Norlite Aspheric Lentic SV 1.50	1.498	Single Vision
PAL	Norlite Aspheric Lentic SV 1.50	1.498	Single Vision
PAPH	Polycarb Aspheric Stock SV 1.59	1.586	Single Vision
PAPX	Polycarb Aspheric Stock SV HMAR 1.59	1.586	Single Vision
PASF	Norlite Aspheric Stock 1.50	1.498	Single Vision
PASP	Norlite Aspheric Poly 1.59	1.586	Single Vision
PB34	Norlite 34mm Lentic R22 Bif 1.50	1.498	Bifocal
PB38	Norlite 38mm Lentic R22 Bif 1.50	1.498	Bifocal
PCT3	Norlite Polycarb Flat Top 835 1.59	1.586	Trifocal
PCTR	Norlite Polycarb Flat Top 728 1.59	1.586	Trifocal
PEX	Norlite E-Style 1.50	1.498	Bifocal
PEXL	Norlite Exec 1.50	1.498	Bifocal
PEXT	Norlite Exec 1.50	1.498	Bifocal
PF5	Essilor Physio f-360 1.50	1.498	Progressive
PF67	Essilor Physio f-360 Stylis 1.67	1.670	Progressive
PF74	Essilor Physio f-360 Lineis 1.74	1.740	Progressive
PFAA	Norlite Aspheric Surf 1.50	1.498	Single Vision
PFO	Essilor Physio f-360 Ormix 1.60	1.600	Progressive
PGRA	Sola Graduate Polycarb 1.59	1.586	Progressive
PH22	Norlite R22mm High Add 1.50	1.498	Bifocal
PH24	Norlite R24mm High Add 1.50	1.498	Bifocal
PH28	Norlite R28mm High Add 1.50	1.498	Bifocal
PH4L	Essilor Physio Lineis Long 1.74	1.740	Progressive
PH4S	Essilor Physio Lineis Short 1.74	1.740	Progressive
PH7L	Essilor Physio Stylis Long 1.67	1.670	Progressive
PH7P	Essilor Physio Stylis Trans 1.67	1.670	Progressive
PH7S	Essilor Physio Stylis Short 1.67	1.670	Progressive
PHA	Norlite Hyper Aspheric SV 1.50	1.498	Single Vision
PHAL	Essilor Physio 2.0 Airwear Long 1.59	1.586	Progressive
PHAP	Essilor Physio AirWear Polar 1.59	1.586	Progressive

Alphabetical Lens Codes inc. Description cont.

LENS CODE	DESCRIPTION	REF INDEX	TYPE
PHAS	Essilor Physio 2.0 AirWear Short 1.59	1.586	Progressive
PHOL	Essilor Physio Ormix Long 1.60	1.600	Progressive
PHPL	Essilor Physio 2.0 Polarising 1.50	1.498	Progressive
PHYL	Essilor Physio Long 1.50	1.500	Progressive
PHYP	Essilor Physio Trans 1.50	1.500	Progressive
PHYS	Essilor Physio Short 1.50	1.500	Progressive
PI59	Sportpal HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
PIPE	Sportpal HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
PL22	Norlite Round 22 Lentic 1.50	1.498	Bifocal
PL30	Norlite Minus Lentic 1.50	1.498	Single Vision
PL34	Norlite Plus Lentic 1.50	1.498	Single Vision
PO35	Norlite Polycarb Flat Top 35 1.59	1.586	Bifocal
PODS	Nupolar Flat Top 28mm 15% LT 1.50	1.498	Bifocal
POH4	Norlite Polarised 1.74	1.740	Single Vision
POL6	Polarised Stock 6.00 Base 1.50	1.498	Single Vision
POL8	Polarised Stock 8.00 Base 1.50	1.498	Single Vision
POLA	Polarised Stock SV 1.50	1.498	Single Vision
POLV	Polycarb Surfaced **UV410** 1.59	1.586	Single Vision
POLY	Polycarb Surfaced 1.59	1.586	Single Vision
POMM	Polarised PolyCarb SV Mirror 1.59	1.586	Single Vision
PP58	Sportor Polycarb NuPolar ISA 1.59	1.586	Single Vision
PP60	Sportor SV Wrap Polarised 1.60	1.600	Single Vision
PP67	Sportor Polarised 15% LT 1.67	1.670	Single Vision
PR15	Norlite Round 15 Bifocal 1.50	1.498	Bifocal
PR16	Norlite Round Bifocal 1.60	1.600	Bifocal
PR22	Norlite Round 22mm Bifocal 1.50	1.498	Bifocal
PR24	Norlite Round 24mm Bifocal 1.50	1.498	Bifocal
PR25	Norlite Round 25mm Bifocal 1.50	1.498	Bifocal
PR28	Norlite Round 28mm Bifocal 1.50	1.498	Bifocal
PR38	Norlite Round 38mm Bifocal 1.50	1.498	Bifocal
PR40	Norlite Round 40mm Bifocal 1.50	1.498	Bifocal
PR45	Norlite Round 45mm Bifocal 1.50	1.498	Bifocal
PROP	Image NuPolar 15% LT 1.50	1.498	Progressive
PRPO	Sportor Drivewear Polycarb 1.59	1.586	Single Vision
PS35	Nupolar Flat Top S35 Bifocal 1.50	1.498	Bifocal
PS6	Norlite Pre-Tinted 15% LT Stock 1.60	1.600	Single Vision
PSBR	Norlite Brown 20% LT UV400 1.50	1.498	Single Vision
PSF-	Norlite Stock 1.50	1.498	Single Vision
PSGN	Norlite Green 20% LT UV400 1.50	1.498	Single Vision
PSGR	Norlite Grey 20% LT UV400 1.50	1.498	Single Vision
PSHC	Norlite HC Stock 1.50	1.498	Single Vision
PSHH	Norlite Polarised High Power UV400 1.67	1.664	Single Vision
PSHI	Norlite Polarised 1.67	1.664	Single Vision
PSMR	Norlite HMAR Stock 1.50	1.498	Single Vision
PSS+	Norlite CR39 SV 1.50	1.498	Single Vision
PSS-	Norlite CR39 SV Minus Base 1.50	1.498	Single Vision
PT35	Norlite Polycarb Flat Top 35 Trans 1.59	1.586	Bifocal
PTRI	Norlite E-Style Trifocal 1.50	1.498	Trifocal
PU53	Sportor Trivex ISA Trans 1.53	1.530	Single Vision
PU58	Sportor HD 1.59	1.586	Single Vision
PU5V	Sportor HD **UV410** 1.59	1.586	Single Vision
PU60	Sportor HD 1.60	1.600	Single Vision
PU67	Sportor ISA 1.67	1.665	Single Vision
PU6U	Sportor HD **UV410** 1.60	1.600	Single Vision
PU6X	Sportor Trans XTRA 93-10 LTF 1.60	1.600	Single Vision
PU74	Norlite 1.74 SV Moulding 1.74	1.740	Single Vision
PU7U	Sportor HD **UV410** 1.67	1.667	Single Vision
PUCK	Norlite 1.67 SV Moulding 1.67	1.667	Single Vision
PULT	Ultra Blutech Indoor BT70 1.58	1.586	Single Vision
PUNE	Sportor HD Neo Contrast A2 72% LT 1.60	1.600	Single Vision
PUNL	Sportor HD Neo Contrast A1 82% LT 1.60	1.600	Single Vision
PUTP	Sportor HD Trivex NuPolar	1.530	Single Vision
PUXP	Sportor HD NXT Pola 15% LT ISA 1.53	1.530	Single Vision
PUXT	Sportor HD NXT Trivex Sun 15% LT 1.53	1.530	Single Vision
PUXV	Sportor HD NXT Polarised Photo ISA 1.53	1.530	Single Vision
PV53	Sportor HD Vantage 1.53	1.530	Single Vision
PX53	Sportor HD Trivex Trans XTRA ISA 1.53	1.530	Single Vision
PX58	Sportor HD Polycarb Trans XTRA 1.59	1.586	Single Vision
PX60	Sportor HD Trans XTRA 1.60	1.600	Single Vision
PX67	Sportor HD Trans XTRA 1.67	1.670	Single Vision
QF60	HSA 28mm ISM NuPolar 1.60	1.600	Bifocal
QI39	HSA 28mm ISM Infinite NuPolar 1.50	1.498	Bifocal
QNEO	HSA 28mm Neo Contrast A1 82% LT 1.60	1.600	Bifocal
QP39	HSA 28mm ISM NuPolar 1.50	1.498	Bifocal
QP53	HSA 28mm ISM NuPolar Trivex 1.53	1.530	Bifocal
QP58	HSA 28mm ISM NuPolar Polycarb 1.59	1.586	Bifocal
QP60	HSA 28mm ISM NuPolar 1.60	1.600	Bifocal
QP67	HSA 28mm ISM NuPolar 1.67	1.670	Bifocal
QP74	HSA 28mm ISM NuPolar 1.74	1.740	Bifocal
QRPO	HSA 28mm ISM Drivewear Polycarb 1.59	1.586	Bifocal
QTR6	HSA 28mm ISM Tribrid 1.60	1.600	Bifocal
QU39	HSA 28mm ISM 1.50	1.498	Bifocal
QU53	HSA 28mm ISM Trivex 1.53	1.530	Bifocal
QU58	HSA 28mm ISM Polycarb 1.59	1.586	Bifocal
QU60	HSA 28mm ISM 1.60	1.600	Bifocal
QU67	HSA 28mm ISM 1.67	1.670	Bifocal
QU6U	HSA 28mm ISM **UV410** 1.60	1.600	Bifocal
QU74	HSA 28mm ISM 1.74	1.740	Bifocal
QU7U	HSA 28mm ISM **UV410** 1.67	1.670	Bifocal
QUDR	HSA 28mm ISM Drivewear 1.50	1.498	Bifocal
QUDW	HSA 28mm ISM Drivewear Trivex 1.53	1.530	Bifocal
QUME	HSA 28mm ISM Vista-Mesh 1.56	1.560	Bifocal
QX39	HSA 28mm ISM Trans XTRA Trivex 1.50	1.500	Bifocal
QX53	HSA 28mm ISM Trans XTRA Trivex 1.53	1.530	Bifocal
QX58	HSA 28mm ISM Trans XTRA Polycarb 1.59	1.586	Bifocal
QX60	HSA 28mm ISM Trans XTRA Trivex 1.60	1.600	Bifocal
QX67	HSA 28mm ISM Trans XTRA 1.67	1.670	Bifocal
R12C	Norlite Concentric 12x36 Trifocal 1.50	1.498	Trifocal
R722	Norlite Concentric 22x36 Trifocal 1.50	1.498	Trifocal
R728	Norlite Concentric 28x42 Trifocal 1.50	1.498	Trifocal
RAY	Glass Grey 15 LTF 1.52	1.523	Single Vision
RAYG	Glass Grey 15 LTF 1.52	1.523	Single Vision
RAYY	Glass Grey 15 LTF 1.52	1.523	Single Vision
RB15	Norlite Reactolite® Brown Stock 1.50	1.500	Single Vision
REZA	ReadEZ Plano A	1.500	Single Vision
REZB	ReadEZ Plano B	1.500	Single Vision
REZC	ReadEZ Plano C	1.500	Single Vision
REZD	ReadEZ Plano D	1.500	Single Vision
REZE	ReadEZ Plano E	1.500	Single Vision
REZF	ReadEZ Plano F	1.500	Single Vision
REZG	ReadEZ Plano G	1.500	Single Vision
REZH	ReadEZ Plano H	1.500	Single Vision
REZI	ReadEZ Plano I	1.500	Single Vision
REZJ	ReadEZ Plano J	1.500	Single Vision
REZK	ReadEZ Plano K	1.500	Single Vision
REZL	ReadEZ Plano L	1.500	Single Vision
RG15	Norlite Reactolite® Grey Stock 1.50	1.500	Single Vision
RL28	Round 28 Lentic	1.498	Bifocal
RO85	Polarised 85mm 1.50	1.498	Single Vision
ROID	Nupolar SV 15% LT 1.50	1.498	Single Vision
ROIG	Polarised + Graduated Tint 1.50	1.498	Single Vision
ROIP	Norlite Polycarb NuPolar 15% LT 1.59	1.586	Single Vision
RP39	Resolve HD ISP Polarised 1.50	1.498	Progressive
RP58	Resolve HD ISP Polarised Polycarb 1.59	1.586	Progressive
RP60	Resolve HD Polarised 1.60	1.600	Progressive
RP67	Resolve HD Polarised 1.67	1.670	Progressive
RRPO	Resolve HD ISP Drivewear Polycarb 1.59	1.586	Progressive
RS28	Norlite Seamless R28 1.50	1.498	Bifocal
RS6X	Nortor-SV Super-Lenti Trans XTRA 1.60	1.600	Single Vision
RSL4	Nortor-SV Super Lenti 1.74	1.740	Single Vision
RSL5	Nortor-SV HD Super-Lenti 1.50	1.498	Single Vision
RSL6	Nortor-SV Super-Lenti 1.60	1.600	Single Vision
RSL7	Nortor-SV Super-Lenti 1.67	1.670	Single Vision
RTR6	Resolve HD Tribrid 1.60	1.600	Progressive
RU39	Resolve HD Trans 1.50	1.498	Progressive
RU53	Resolve HD Trilogy 1.53	1.530	Progressive
RU58	Resolve HD Trans Polycarb 1.59	1.586	Progressive
RU60	Resolve HD 1.60	1.600	Progressive
RU67	Resolve HD 1.67	1.670	Progressive
RU6U	Resolve HD **UV410** 1.60	1.600	Progressive
RU74	Resolve HD 1.74	1.740	Progressive
RU7U	Resolve HD **UV410** 1.67	1.670	Progressive
RU6X	Resolve HD Trans XTRA 1.60	1.600	Progressive
RUDR	Resolve HD Drivewear 1.50	1.498	Progressive
RUDW	Resolve HD Trilogy Drivewear 1.53	1.530	Progressive
RUME	Resolve HD Vista-Mesh 1.56	1.560	Progressive
RUNP	Resolve HD Trilogy Polarised 1.53	1.530	Progressive
RW39	Resolve HD 1.50	1.498	Progressive
RX39	Resolve HD Trans XTRA 1.50	1.498	Progressive
RX53	Resolve HD Trans XTRA Trilogy 1.53	1.530	Progressive
RX58	Resolve HD Trans XTRA Polycarb 1.59	1.586	Progressive
RX67	Resolve HD Trans XTRA 1.67	1.670	Progressive

Alphabetical Lens Codes inc. Description cont.

LENS CODE	DESCRIPTION	REF INDEX	TYPE
S25A	Norlite Flat Top 25mm 1.50	1.498	Bifocal
S25Y	Norlite Flat Top 25mm High Add 1.50	1.498	Bifocal
S28A	Norlite Flat Top 28mm 1.50	1.498	Bifocal
S28P	Norlite Flat Top 28mm Trans Grey 1.50	1.501	Bifocal
S28X	Norlite Flat Top 28mm Trans XTRA 1.50	1.498	Bifocal
S28Y	Norlite Flat Top 28mm High Add 1.50	1.498	Bifocal
S35A	Norlite Flat Top 35mm 1.50	1.498	Bifocal
S35B	Norlite Trans Brown Flat Top 35mm 1.50	1.501	Bifocal
S35P	Norlite Trans Grey Flat Top 35mm 1.50	1.501	Bifocal
S35Y	Norlite Flat Top 35mm High Add 1.50	1.498	Bifocal
S40A	Norlite Flat Top 40mm 1.50	1.498	Bifocal
S45A	Norlite Flat Top 45mm 1.50	1.498	Bifocal
S728	Norlite Flat Top 728 1.50	1.498	Trifocal
S72T	Flat Top 728 Transitions 1.50	1.501	Trifocal
S72X	S728 Trifocal Trans XTRA 1.50	1.498	Trifocal
S7AZ	Seiko SPG AZ Double Asph 1.74	1.740	Single Vision
S835	Norlite Flat Top 835 1.50	1.498	Trifocal
SAS	Seiko Aspheric Stock 1.74	1.737	Single Vision
SASS	Seiko Aspheric Surfaced 1.74	1.737	Single Vision
SE60	Seiko Emblem ISP 1.60	1.600	Progressive
SE74	Seiko Emblem ISP 1.74	1.740	Progressive
SG60	Glass Hawk HD 1.60	1.600	Progressive
SG70	Glass Hawk HD 1.70	1.700	Progressive
SG80	Glass Hawk HD 1.80	1.800	Progressive
SI39	Nortor-SV Infinite NuPolar Chromatic 1.50	1.498	Single Vision
SI50	S-Image HD 1.50	1.498	Progressive
SI53	S-Image HD Trivex 1.53	1.530	Progressive
SI59	S-Image HD Trans Polycarb 1.59	1.586	Progressive
SI5D	S-Image HD Trans Drivewear 1.50	1.498	Progressive
SI5P	S-Image HD NuPolar 1.50	1.498	Progressive
SI5X	S-Image HD Trans XTRA 1.50	1.498	Progressive
SI60	Seiko Indoor PPL	1.600	Progressive
SI67	Seiko Indoor ISP 1.67	1.670	Progressive
SIM7	S-Image HD 1.67	1.670	Progressive
SINP	Sentor HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
SIP5	Sentor HD Infinite NuPolar 1.50	1.498	Progressive
SIPD	S-Image HD Polycarb Drivewear 1.59	1.586	Progressive
SIPP	S-Image HD Polycarb NuPolar 1.59	1.586	Progressive
SIPX	S-Image HD Trans XTRA Polycarb 1.59	1.586	Progressive
SITX	S-Image HD Trans XTRA Trivex 1.53	1.530	Progressive
SMAX	Sola Max Progressive 1.50	1.500	Progressive
SN39	Sentor ISP 1.50	1.498	Progressive
SN3P	Sentor Polarised 1.50	1.498	Progressive
SN3V	Sentor HD Trans Vantage 1.50	1.498	Progressive
SN3X	Sentor Trans XTRA 1.50	1.498	Progressive
SN4P	Sentor Polarised 1.74	1.740	Progressive
SN53	Sentor Trivex HD 1.53	1.530	Progressive
SN5P	Sentor HD NuPolar 1.50	1.498	Progressive
SN60	Sentor ISP 1.60	1.600	Progressive
SN67	Sentor ISP 1.67	1.665	Progressive
SN6P	Sentor HD Polarised 1.60	1.600	Progressive
SN6U	Sentor ISP **UV410** 1.60	1.600	Progressive
SN74	Sentor 1.74	1.740	Progressive
SN7P	Sentor Polarised 1.67	1.670	Progressive
SN7U	Sentor ISP **UV410** 1.67	1.670	Progressive
SNBT	Sentor HD Blutech BT66 Filter 1.56	1.560	Progressive
SNDR	Sentor HD Drivewear 1.50	1.498	Progressive
SNDW	Sentor Drivewear 1.53	1.530	Progressive
SNGG	Ultor Green Grey Solid Tint 15% LT 1.60	1.604	Progressive
SNGS	Ultor Brown Solid Tint 15% LT 1.52	1.523	Progressive
SNEO	Seiko Neo 1.67	1.670	Progressive
SNEP	Seiko SSP-1	1.740	Progressive
SNHY	Sentor 1.74 HD Tintable	1.740	Progressive
SNME	Sentor Vista-Mesh 1.56	1.560	Progressive
SNRY	Ultor Green Grey Solid Tint 15% LT 1.52	1.523	Progressive
SNTX	Sentor HD Trivex Trans XTRA 1.53	1.530	Progressive
SNX6	Sentor HD Trans XTRA 1.60	1.600	Progressive
SNX7	Sentor Trans XTRA 1.67	1.670	Progressive
SO28	Norlite Round 28mm Slab-On Bif 1.50	1.498	Bifocal
SOP	Sola One Progressive 1.50	1.498	Progressive
SOPP	Sola One Progressive 1.60	1.600	Progressive
SP39	Nortor-SV NuPolar 15% LT ISA 1.50	1.498	Single Vision
SP60	Nortor-SV Polarised 15% LT ISA 1.60	1.600	Single Vision
SP67	Nortor-SV Polarised 15% LT ISA 1.67	1.670	Single Vision
SP74	Nortor-SV Polarised 10% LT ISA 1.74	1.740	Single Vision
SP7H	Nortor-SV Polarised ISA High Power 1.67	1.670	Single Vision

LENS CODE	DESCRIPTION	REF INDEX	TYPE
SPBT	Sentor HD ISP Blutech BT70 Filter 1.58	1.586	Progressive
SPR4	Seiko Prime 1.74	1.740	Progressive
SPR6	Seiko Prime 1.60	1.600	Progressive
SPR7	Seiko Prime 1.67	1.670	Progressive
SPRI	Seiko Prime 1.50	1.498	Progressive
SPRT	Seiko Prime TriBrid 1.60	1.600	Progressive
SSV	Seiko SSV Aspheric Stock 1.67	1.670	Single Vision
SSVP	Seiko SSV Aspheric Surf Trans 1.67	1.667	Single Vision
SSVS	Seiko SSV Aspheric Surf 1.67	1.662	Single Vision
SSVT	Seiko SSV Aspheric Surf 1.67	1.662	Single Vision
ST39	Nortor SV Trans ISA 1.50	1.498	Single Vision
STR6	Nortor Tribrid 1.60	1.600	Single Vision
SU39	Nortor-SV ISA 1.50	1.498	Single Vision
SU53	Nortor-SV Trivex 1.53	1.530	Single Vision
SU57	Atoral FR UV400 ISA 1.56	1.560	Single Vision
SU58	Nortor-SV Polycarb ISA 1.59	1.586	Single Vision
SU5V	Nortor-SV Polycarb ISA **UV410** 1.59	1.586	Single Vision
SU60	Nortor-SV ISA 1.60	1.600	Single Vision
SU67	Nortor-SV ISA 1.67	1.665	Single Vision
SU6U	Nortor-SV ISA **UV410** 1.60	1.600	Single Vision
SU70	Atoral ISA 1.70	1.700	Single Vision
SU74	Nortor-SV ISA 1.74	1.740	Single Vision
SU76	Nortor-SV HD 1.76	1.760	Single Vision
SU7U	Nortor-SV ISA **UV410** 1.67	1.665	Single Vision
SUBI	Big Atmosphere NXT ISA 1.53	1.530	Single Vision
SUBT	Nortor SV HD Blutech BT66 Filter 1.56	1.560	Single Vision
SUDW	Nortor SV HD Trivex DriveWear 1.53	1.530	Single Vision
SUHY	Nortor-SV HD Tintable 1.74	1.740	Single Vision
SULT	Nortor-SV Ultra Blutech Indoor BT70 1.58	1.586	Single Vision
SUMO	Atoral Vista-Mesh ISA 1.56	1.560	Single Vision
SUPX	Nortor-SV Trans XTRA Polycarb 1.59	1.586	Single Vision
SUSO	Ultor HD Slab Off 1.50	1.498	Single Vision
SUTP	Nortor-SV Trivex NuPolar 15% LT ISA 1.53	1.530	Single Vision
SUXP	Nortor-SV Trivex Polar 15 ISA 1.53	1.530	Single Vision
SUXT	Trivex Nortor-SV Sun 15% LT 1.53	1.530	Single Vision
SUXV	Nortor-SV NXT Pola Photo ISA 1.53	1.530	Single Vision
SV50	Nortor-SV Trans Vantage 1.50	1.498	Single Vision
SX50	Nortor-SV Trans XTRA 1.50	1.498	Single Vision
SX53	Nortor-SV Trivex Trans XTRA 1.53	1.530	Single Vision
SX60	Nortor-SV Trans XTRA ISA 1.60	1.600	Single Vision
SX67	Nortor-SV Trans XTRA 1.67	1.670	Single Vision
SXGR	Glass Ultor HD X Ray Filter 1.80	1.800	Progressive
SY40	Seiko Synergy P-1SY ISP 1.74	1.740	Single Vision
SY50	Seiko Synergy X 1.50	1.500	Single Vision
SY70	Seiko Synergy X 1.67	1.670	Progressive
T28B	Norlite Trans Brown Flat Top 28mm 1.50	1.501	Bifocal
T28P	Norlite Trans Grey Flat Top 28mm 1.50	1.501	Bifocal
T728	Trivex Flat top 728 1.53	1.530	Trifocal
TAXT	Trivex NXT Altitude 1.53	1.530	Single Vision
TIXA	Trivex Image Trans XTRA 1.53	1.530	Progressive
TNXP	Trivex NXT Polar 15% LT 1.53	1.530	Single Vision
TNXT	Trivex NXT Sun 15% LT 1.53	1.530	Single Vision
TR28	Trivex Flat Top 28mm 1.53	1.530	Bifocal
TRAB	Norlite Trans Brown Stock 1.50	1.498	Single Vision
TRAL	Trivex Lentic 1.53	1.530	Single Vision
TRAP	Norlite Trans Grey Stock 1.50	1.498	Single Vision
TRAS	Norlite Trans Grey 1.50	1.501	Single Vision
TRBS	Norlite Trans Brown 1.50	1.501	Single Vision
TRDW	Trivex Drivewear 1.53	1.530	Single Vision
TRHS	Trivex SV Surfaced HC 1.53	1.530	Single Vision
TRIA	Trivex Aspheric Stock 1.53	1.530	Single Vision
TRIS	Trivex SV Surfaced 1.53	1.530	Single Vision
TRIX	Trivex Aspheric Stock HMAR 1.53	1.530	Single Vision
TRNP	Trivex NuPolar 1.53	1.530	Single Vision
TRSS	Trivex Stock 1.53	1.530	Single Vision
TRUP	Trivex Image 1.53	1.530	Progressive
TRUS	Trivex Aspheric 1.53	1.530	Single Vision
TRV	Trivex HMAR Stock 1.53	1.530	Single Vision
TRXB	Norlite Trans Brown HMAR Stock 1.50	1.498	Single Vision
TRXP	Norlite Trans Grey HMAR Stock 1.50	1.498	Single Vision
TTIM	Trivex Image Trans 1.53	1.530	Progressive
TTIS	Trivex Aspheric Trans 1.53	1.530	Single Vision
TUAS	Norlite Trans Grey Surf 1.50	1.501	Single Vision
TUBS	Norlite Trans Brown Surf 1.50	1.501	Single Vision
TXA	Norlite Trans XTRA 1.50	1.498	Single Vision
TXIS	Trilogy Trans XTRA 1.53	1.530	Single Vision

Alphabetical Lens Codes inc. Description cont.

LENS CODE	DESCRIPTION	REF INDEX	TYPE
TXX	Trans XTRA Finished SV 1.50	1.498	Single Vision
UL67	Sola Compact Ultra 1.67	1.670	Progressive
ULP	Sola Compact Ultra Polycarb 1.59	1.586	Progressive
UP50	Ultor Pilotor RD40 1.50	1.498	Bifocal
UPES	Ultor Pilotor E 1.50	1.498	Progressive
VCOB	Essilor Comfort Trans 1.50	1.500	Progressive
VCOM	Essilor Comfort 1.50	1.498	Progressive
VCOP	Essilior Comfort Trans 1.50	1.502	Progressive
VESH	Norlite Vista-Mesh Versatile 1.56	1.560	Progressive
VF5	Vector Used for Continuous Focus 1.50	1.500	Progressive
VF6	Continuous Focus as Vector 1.60	1.600	Progressive
VF7	CF7L Equivalent Ultor 1.67	1.665	Progressive
VFH	CFH equivalent 1.74	1.740	Progressive
VG52	Glass Vector HD 1.523	1.523	Progressive
VG60	Glass Vector HD 1.60	1.600	Progressive
VG70	Glass Vector HD 1.70	1.700	Progressive
VG80	Glass Vector HD 1.80	1.800	Progressive
VG90	Glass Vector HD 1.90	1.900	Progressive
VI59	Vector HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
VIP5	Vector HD Infinite NuPolar 1.50	1.498	Progressive
VP39	Vector HD Polarised 15 LTF 1.50	1.500	Progressive
VP60	Vector HD Polarised 15 LTF 1.60	1.600	Progressive
VT39	Norlite Vector HD Transitions ISP 1.50	1.498	Progressive
VU39	Vector HD 1.50	1.500	Progressive
VU53	Vector HD 1.53	1.530	Progressive
VU56	Vector HD Vista-Mesh 1.56	1.560	Progressive
VU58	Vector HD Polycarb 1.59	1.586	Progressive
VU60	Vector HD 1.60	1.600	Progressive
VU67	Norlite Vector HD ISP 1.67	1.665	Progressive
VU6U	Vector HD **UV410** 1.60	1.600	Progressive
VU74	Vector HD 1.74	1.740	Progressive
VU7U	Norlite Vector HD ISP **UV410** 1.67	1.665	Progressive
VX50	Varilux X 1.50	1.498	Progressive
VU53	Trivex Vector HD 1.53 Trans XTRA	1.530	Progressive
VX60	Varilux X 1.60	1.600	Progressive
VX67	Varilux X 1.67	1.670	Progressive
VX74	Varilux X 1.74	1.740	Progressive
WP39	Sportpal HD Polarised 1.50	1.498	Progressive
WP58	Sportpal Polycarb NuPolar ISP 1.59	1.586	Progressive
WP60	Sportpal Wrap Polar 15% LT 1.60	1.600	Progressive
WP67	Sportpal Polarised 1.67	1.670	Progressive
WRPO	Sportpal HD Drivewear Polycarb 1.59	1.586	Progressive
WSL	Glass Super Lenti Photobrown 1.60	1.600	Single Vision
WSL7	Glass Super Lenti 1.70	1.700	Single Vision
WSL8	Glass Super Lenti 1.80	1.800	Single Vision
WU53	Sportpal Trivex ISP Trans 1.53	1.530	Progressive
WU60	Sportpal HD 1.60	1.600	Progressive
WU67	Sportpal ISP 1.67	1.670	Progressive
WU6U	Sportpal HD **UV410** 1.60	1.600	Progressive
WU6X	Sportpal HD Trans XTRA 1.60	1.600	Progressive
WU7U	Sportpal HD **UV410** 1.67	1.670	Progressive
WUDW	Sportpal Trivex Drivewear 1.53	1.530	Progressive
WUNP	Sportpal Trivex NuPolar 1.53	1.530	Progressive
WUXP	Sportpal NXT Trivex Polar 1.53	1.530	Progressive
WUXT	Sportpal NXT Sun/D.E./Berkeley Yellow ISP 1.53	1.530	Progressive
WUXV	Sportpal NXT Pola/Photo ISP 1.53	1.530	Progressive
WV53	Sportpal Trivex Trans Vantage 1.53	1.530	Progressive
WX53	Sportpal Trans XTRA ISP 1.53	1.530	Progressive
WX58	Sportpal Polycarb Trans XTRA ISP 1.59	1.586	Progressive
WX67	Sportpal Trans XTRA ISP 1.67	1.670	Progressive
YG60	Glass ProDrive HD 1.60	1.600	Progressive
YI59	Freeway HD Infinite NuPolar Polycarb 1.59	1.586	Progressive
YIP5	Freeway HD Infinite NuPolar 1.50	1.498	Progressive
YP39	Freeway HD NuPolar 1.50	1.498	Progressive
YP58	Freeway HD NuPolar 1.59	1.586	Progressive
YP60	Freeway HD Polarised 1.60	1.600	Progressive
YP67	Freeway HD Polarised 1.67	1.670	Progressive
YP74	Freeway HD Polarised 1.74	1.740	Progressive
YP7H	Freeway HD Polarised High Power 1.67	1.670	Progressive
YRPO	Freeway HD Drivewear Polycarb 1.59	1.586	Progressive
YTR6	Tribrid Freeway HD 1.60	1.600	Progressive
YU39	Freeway HD 1.50	1.498	Progressive
YU53	Freeway HD Trivex 1.53	1.530	Progressive
YU58	Freeway HD Polycarb 1.59	1.586	Progressive
YU60	Freeway HD 1.60	1.600	Progressive
YU67	Freeway HD 1.67	1.665	Progressive
YU6U	Freeway HD **UV410** 1.60	1.600	Progressive
YU6X	Freeway HD Trans XTRA 1.60	1.600	Progressive
YU74	Freeway HD 1.74	1.740	Progressive
YU7U	Freeway HD **UV410** 1.67	1.670	Progressive
YUDR	Freeway HD DriveWear 1.50	1.498	Progressive
YUDW	Freeway HD Trivex DriveWear 1.53	1.530	Progressive
YUME	Freeway HD Vista-Mesh ISP 1.56	1.560	Progressive
YUNP	Freeway HD Trivex NuPolar 1.53	1.530	Progressive
YUXT	Freeway HD NXT D.E. Yellow 1.53	1.530	Progressive
YUXV	Freeway HD Polarised Photo 1.53	1.530	Progressive
YV39	Freeway HD Vantage 1.50	1.498	Progressive
YV53	Freeway HD Vantage Trivex 1.53	1.530	Progressive
YV58	Freeway HD Trans Vantage 1.59	1.586	Progressive
YW39	Freeway HD 1.50	1.498	Progressive
YX39	Freeway HD Trans XTRA 1.50	1.498	Progressive
YX53	Freeway HD Trans XTRA 1.53	1.500	Progressive
YX58	Freeway HD Trans XTRA 1.59	1.586	Progressive
YX67	Freeway HD Trans XTRA 1.67	1.670	Progressive
ZE35	Glass Zenlite SV 1.80	1.800	Single Vision
ZN80	Glass Zenlite Nortor-SV 1.80	1.800	Single Vision
ZR28	Glass Zenlite IRS 28mm 1.80	1.800	Bifocal

A Danger to Navigation

A special thank you goes to OPTICIAN reader MD Mansfield, who brought to our attention an item in Maritime Feedback, a Maritime Safety Newsletter from the Confidential Hazardous Incident Reporting Programme. His diligence may just avert a maritime disaster or the threat of litigation to suppliers of magnetic clip-on sunglasses.

"On a passage on a small yacht as crew I had occasion to disagree with the owner about the bearing of a navigation mark. My reading using binoculars (with an incorporated bearing compass) was 160 degrees and hers, with a type of hand bearing compass used by many sailors, which hangs around the neck and is held up to the eye, was 200 degrees. When I used her compass the reading was again 160 degrees.

There had to be some local deviation about her person and, as a joke, I suggested her glasses. After a few moments she said that she had glasses which had clip-on sunglasses, which were magnetically attached! It transpired that her glasses frames were magnetised and this was the local deviation which she had not noticed before!"

The advice box that followed stated: 'In the absence of a cross-check this could have led to a serious incident. Current training suggests if all else fails use a hand-held compass! The RYA has been informed and intends to raise awareness of the issue.' You have been warned.

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Polarised Rx

One of the areas of care when glazing polarised lenses is to ensure that the polarising axis is always maintained exactly along the 180° reference line. Not a problem with bifocals and progressives but can be tricky with meniscus prescription lenses. One of our glazing technicians devised his own Murray test whereby when he couldn't see the numbers of his digital watch when held vertically in front of him, he knew it was an on axis polarised lens but he could read the time if it was twisted off axis.

Likewise we've heard the comment that some BMW car owners found that their instrumentation was blank unless they held their head sideways when wearing polarised lenses, however this is not the case with certain other marques. So a warning, particularly to drivers and airline pilots, that they should be mindful that any digital instrumentation remains visible when wearing polarised lenses. Fortunately now all car windscreens by law are laminated, when older versions were being toughened their spots would show up viewed through polarised lenses.

Skiing Prescription Wear

Most interesting to read a newspaper article describing someone who had lost their sun specs whilst skiing and spent the rest of the day out on the slopes with no eye protection. How the resulting snow blindness ruined the rest of their holiday with the outcome of making a promise always to carry a spare pair of sunglasses. It also pointed out that skiing is one of the UK's favourite winter sports. One might suggest many optical practices are totally unprepared for the needs of their skiing or altitude holiday patients. Norville has been serious about sports Rx specs for many years, yet so many optical outlets are treating this as an occasional or very subsidiary part of the business of supplying eye care. How do we know? Because very few practices are stocking a range of prescription sports eyewear. Why don't you make a resolution to get serious on this, ensuring that you've the products in practice to discuss with the patient as and when the opportunities arrive "are you going on holiday soon"? Oh skiing. Really, what arrangements have you made for your prescription wear? Can I show you some of the options for contact lens or spec wearers? Rather than say "perhaps can you come back once I get some examples in from my supplier", great turn off!!

.....and we close this edition with a

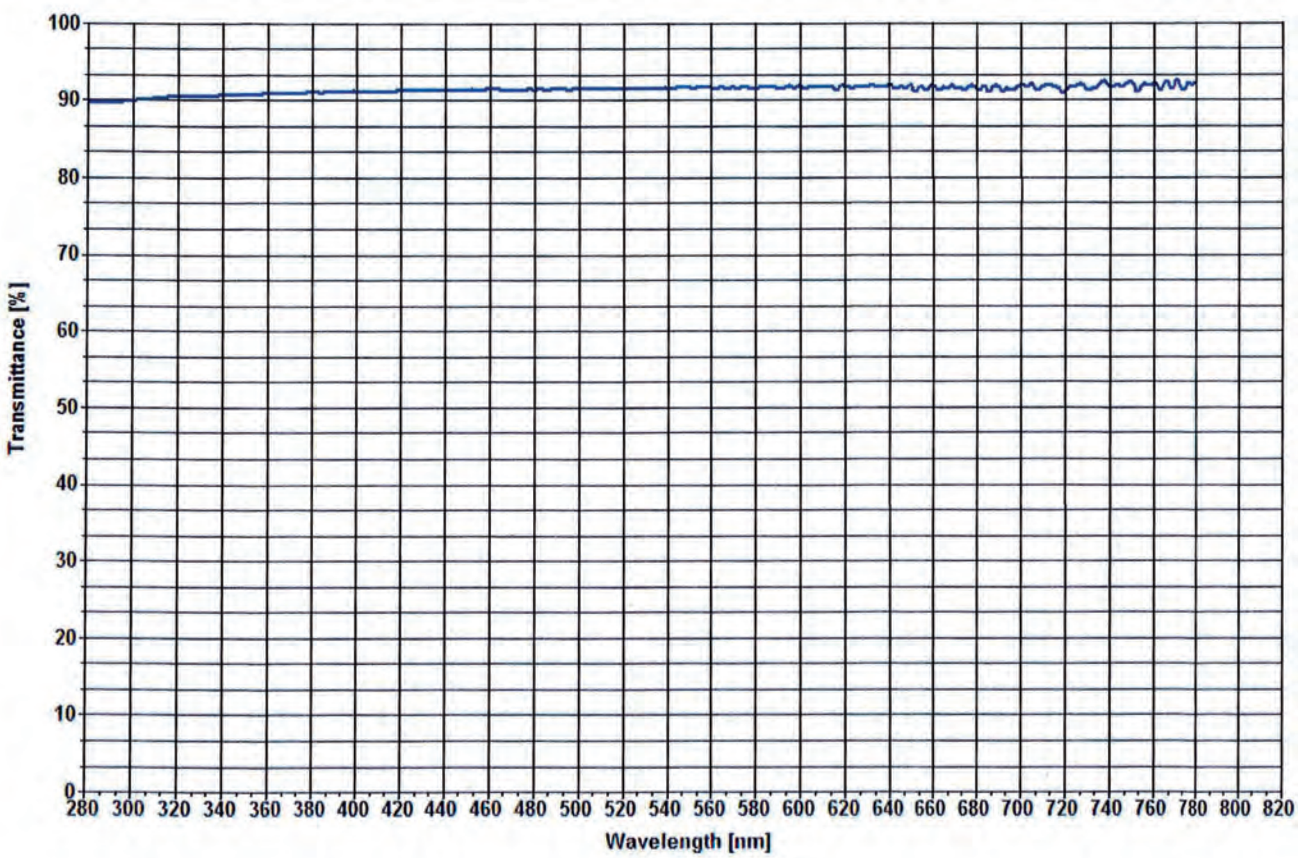
Dry Eye Story

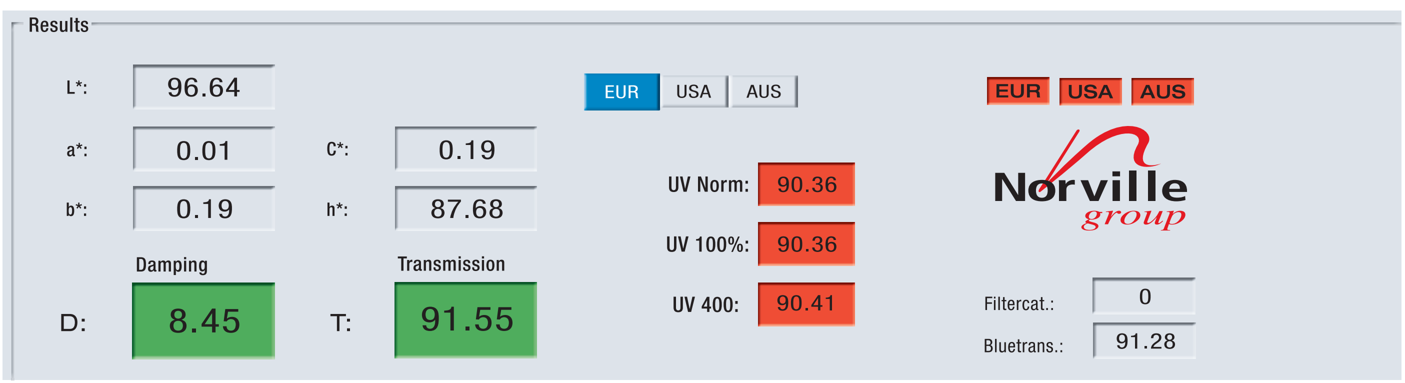
Might you be driving in the Lake District and become concerned at the vision of a lady driving her Morris 1000 convertible whilst wearing swimming goggles, don't be alarmed - it was her optician's answer to a dry eye problem, which worked by the way!

Concluding Thought.

Thank you for referencing our Rx companion. It has indeed been a fun challenge compiling its data although I am afraid its always going to be a work in progress.

In the spirit of Edn 11, which is very much transmission graphs and UV, I leave you with an optical puzzle.
What ophthalmic lens material is indicated by this transmittance chart, its optical “fingerprint”? (see bottom of page for the answer).





Answer: Natural quartz, or „pebble„ lens, popular in the 19th C.

Norville group

provide these additional technical publications and catalogues

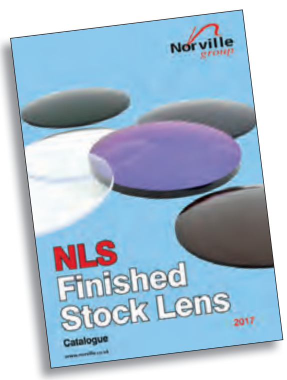
Lenses:-

Rx Lenses

Mineral Lenses

Digital Free-form Technical Directory

Finished Stock Lenses

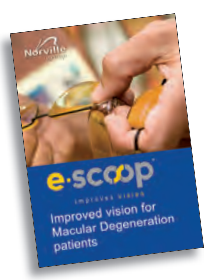


Reactolite Lenses

Ophthalmic Lens Coatings

Drivewear

EScoop



Vista-Mesh

ReadEZ