

EXPERTS

IN POLARIZED LENS TECHNOLOGY

 **Polaroid**
Polarized Sunglasses



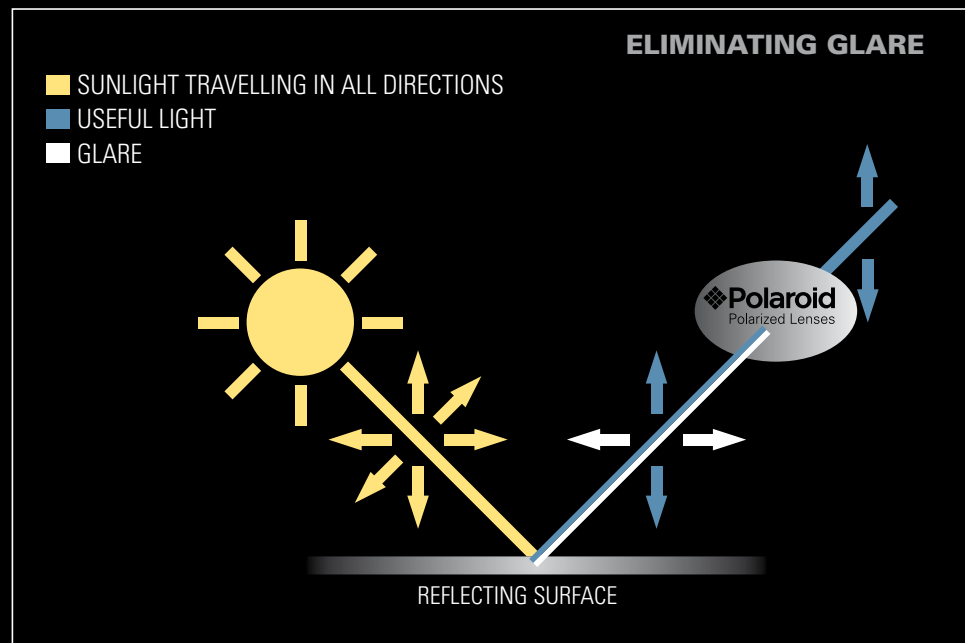
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POLARIZED LENS TECHNOLOGY EXPLAINED

Polarizing lenses block harmful glare

Visible light waves from the sun travel in all directions. When this scattered light meets a horizontal surface, like a road or water, a large portion of the light is reflected into the horizontal plane. This horizontally polarized light is seen as white glare and masks light which is useful to the human eye, reducing visibility. By obstructing normal vision glare makes everyday activities, such as driving, uncomfortable and potentially hazardous.



Normal sunglasses do nothing to eliminate glare and can even impair vision. They only reduce the amount of visible light entering the eye, darkening the view. Good quality polarizing lenses enhance vision. Vertically-aligned filters block the unwanted horizontally polarized light and allow the useful vertical light through to the eye, improving visual acuity.



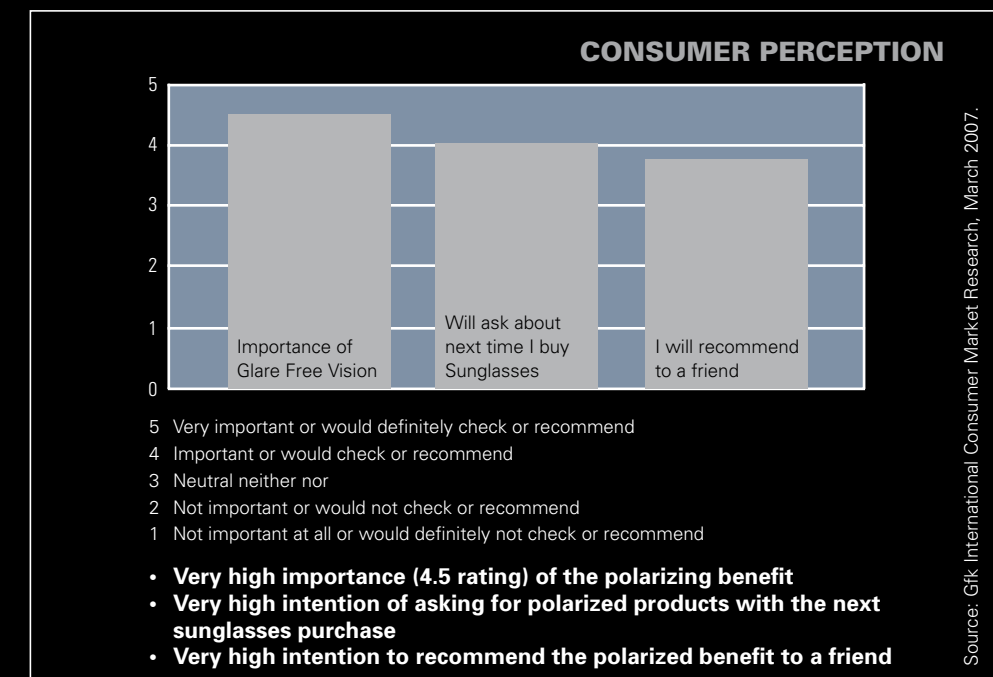
NON-POLARIZED LENSES



POLAROID® POLARIZED LENSES

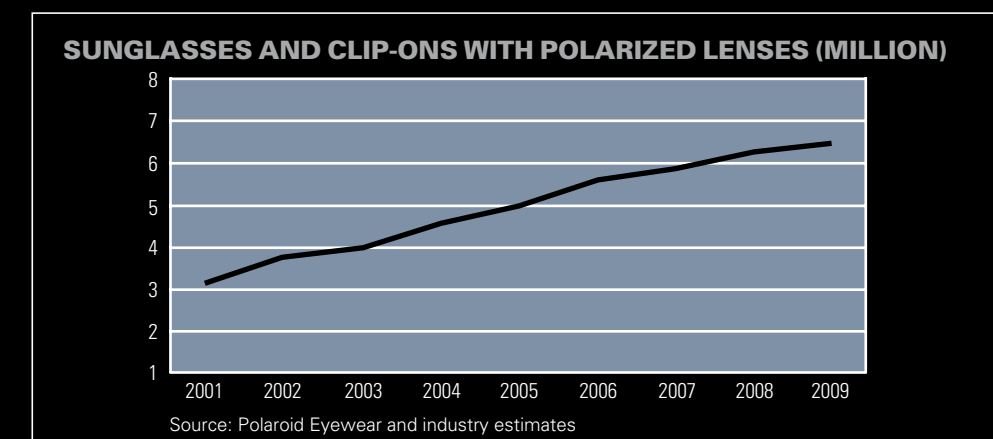
STRONG MARKET FOR POLARIZED LENSES

More and more people understand the benefits of wearing polarized sunglasses. Already, one in five sunglass lenses sold worldwide is a polarized lens, amounting to almost 60 million polarizing lenses. This is a major growth sector within the sunglass market, with forecasts showing sales will continue to grow significantly over the coming years.



- 5 Very important or would definitely check or recommend
 - 4 Important or would check or recommend
 - 3 Neutral neither nor
 - 2 Not important or would not check or recommend
 - 1 Not important at all or would definitely not check or recommend
- **Very high importance (4.5 rating) of the polarizing benefit**
 - **Very high intention of asking for polarized products with the next sunglasses purchase**
 - **Very high intention to recommend the polarized benefit to a friend**

The trend towards polarization at the high-price end of the market will serve to make polarized lenses an aspirational feature. Consumers' perceptions that polarized lenses are worth up to double the price of non-polarized lenses will also stimulate further market growth.



The history of polarized lens technology

Dr. Edwin Land became captivated by light at an early age. Born in 1909 in Connecticut, USA, his fascination with kaleidoscopes and desire to control light led him to invent the world's first man-made polarizer for commercial use in 1929. The first pair of Polaroid sunglasses was sold in 1935 and Edwin Land established Polaroid Corporation in 1937. In 1972 sunglass lens manufacture was brought to the Vale of Leven, in Scotland, in the UK from where Polaroid Eyewear now services a worldwide market.



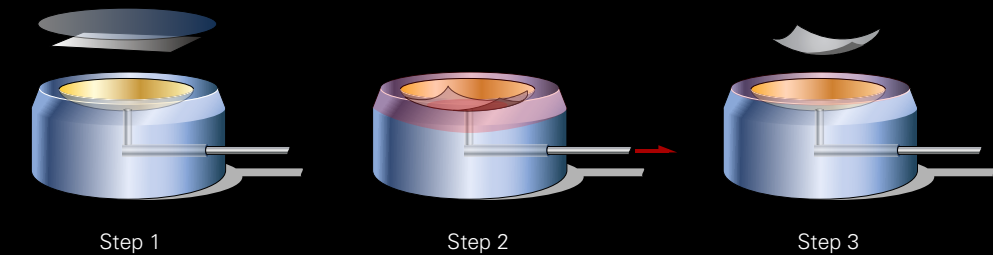
Polaroid, as the inventor of the polarized lens, continues to innovate with a new generation of lenses created in their European research centre in the Vale of Leven (Scotland). Here, lens forming is backed by extensive testing facilities to ensure exceptionally high standards and consistency for the millions of polarizing lens pairs manufactured every year.

LENS POLARIZATION TECHNIQUES

Four main methods are used to create a polarized sunglass lens. These are vacuum forming, injection moulding, casting and press-polishing forming.

Vacuum forming

Traditional manufacturers use 'vacuum forming' to curve their lenses. In this process, flat lens blanks, which contain a polarizing layer, are curved when a vacuum is created using heat and atmospheric pressure. The technique is popular due to cost advantages, but it does not allow for optical correction of the lens.



Step1: The flat plastic lens sheet is inserted in the concave base mould and sealed with a cover

Step 2: Heat is applied and air drawn out below the sheet to curve the lens under vacuum

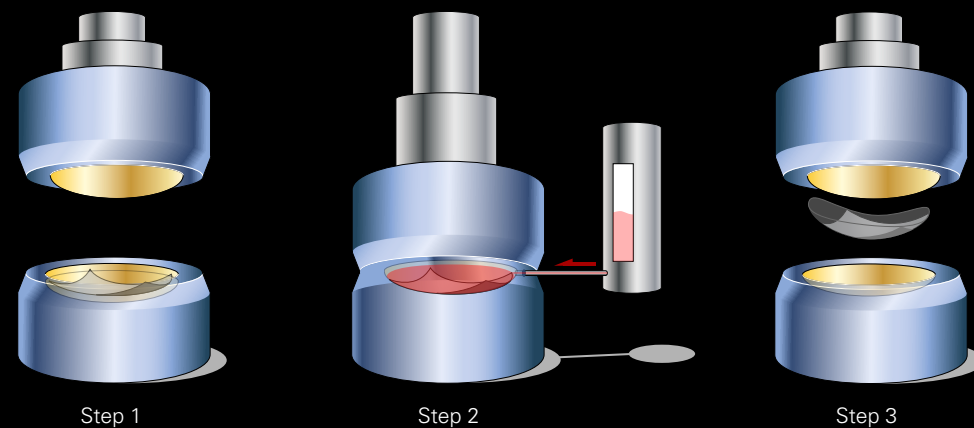
Step 3: The cover is removed and the curved lens extracted for use

The polarized lens presents optical distortion and loses visual acuity because the plastic remains as thick at the edges as it is in the centre. The result is a lens that distorts the wearer's perception of sizes, shapes and distances, often without them even realizing. Since the eye is forced to compensate for the lenses' inferior optical performance, regular sunglass wearers are at risk of eye-strain.

Injection moulding and casting

Instead of creating the lens from a flat sheet, these techniques entail creating a curved lens with melted plastic or liquid.

Injection moulding involves injecting hot, melted polycarbonate or polyamide under pressure, into a mould which contains a polarized film insert. The material resolidifies as it cools. The polarized film comes into direct contact with hot plastic and this can interfere with its polarization efficiency.



Step 1: A thin polarized film insert is placed in the concave base mould and the convex lid of the mould sealed onto it creating a curved cavity

Step 2: Melted plastic is injected, filling the cavity, creating a curved lens

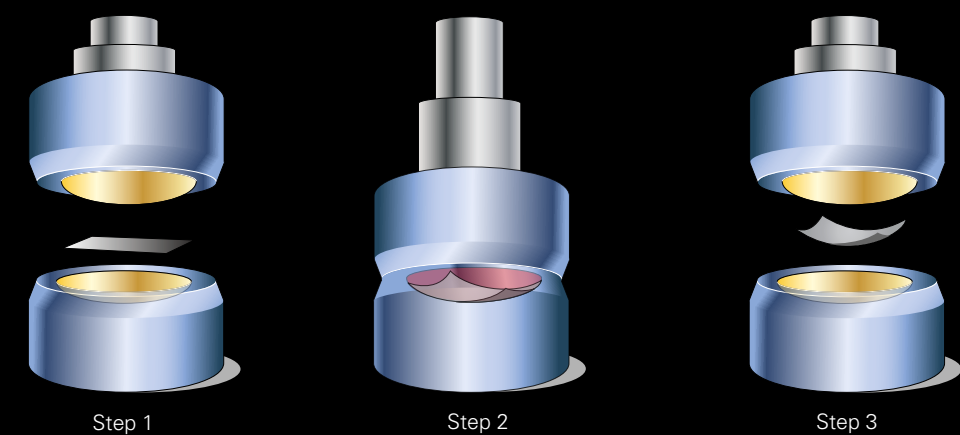
Step 3: The mould is cooled and the lens removed

Injection moulding usually involves high set-up costs for mould fabrication which restricts design flexibility. Process variations are often required, such as adding compression into the cavity volume or varying the temperature, in order to produce the required lens quality. The process is generally considered to provide lenses which deliver high optical clarity but polarizing efficiency may be affected.

Casting techniques are similar but instead of injecting melted plastic into the mould, acrylic or polyurethane may be used in liquid form. A chemical reaction between the components causes the material to solidify.

Press-polishing forming

The press-polishing forming process entails inserting special PTX4000 lens material, between highly polished concave and convex moulds. Temperature and pressure are applied from above and below to form the curved lens.



Step 1: Flat PTX4000 lens blank placed between the highly polished concave and convex moulds

Step 2: Heat and pressure are applied, precisely curving the lens for optical clarity

Step 3: The lens curve is set during the cooling cycle and then unloaded for use

The process allows for production of lenses which are optically correct, because they are thicker at the centre and tapered towards the edges, in effect optically 'fine tuning' the lens while curving it. And because the temperature is carefully controlled and the polarizer protected by 6 other lens layers, the heat used in the process does not impact on its efficiency. This process also allows for great flexibility in the forming of lenses of different curvature. The technique is unique to Polaroid Eyewear.

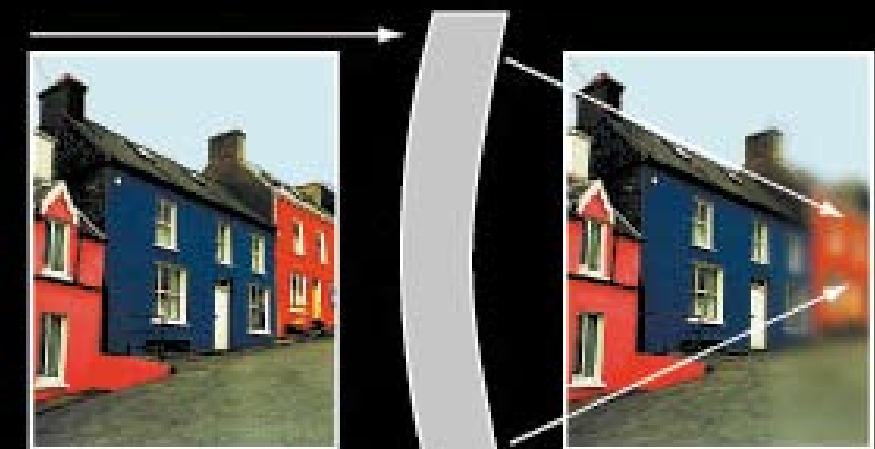
COMPARISON OF TECHNIQUES

Differences	Traditional vacuum forming	Injection moulding and casting	Press-polish forming
Light-weight	✓	✗	✓
Excellent lamination	✓	✗	✓
Excellent impact resistance	✗	✓	✓
Excellent optics	✗	✓	✓
Excellent curve retention	✗	✓	✓
Excellent optical clarity	✗	✓	✓
Excellent polarizing efficiency	✓	✗	✓
Best performing polarizing lens overall	✗	✗	✓

Press-polished lenses provide high levels of both optical clarity and polarizing efficiency, setting them apart from many other polarizing lens materials manufactured today.

PRESS-POLISHED FORMED LENSES – PERFECT OPTICS AND A BETTER VIEW

Traditional manufacturers use 'vacuum forming' to curve their lenses. This technique results in lenses which warp the wearer's perception of sizes, shapes and distances, often without them even realizing. Since the eye is forced to compensate for the lenses inferior optical performance, regular sunglass wearers are at risk of eye-strain.



Vision without polarized lenses

Vision with vacuum formed polarized lens



Vision without polarized lenses

Vision with press-polish formed polarized lenses

The press-polishing process optically 'fine tunes' the lens while curving it. This creates sunglasses, which are optically correct, allowing the eye – and the wearer – to relax.

POLAROID® PTX4000 POLARIZING LENSES – THE NEW GENERATION

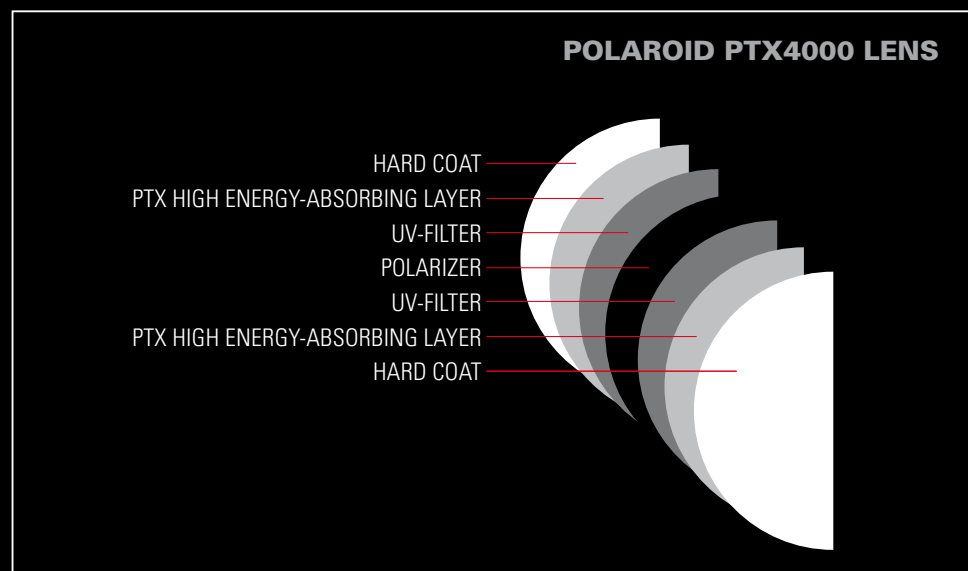
Premium quality polarized lenses

Polarized lenses exist today because Edwin Land, the founder of Polaroid, invented them. The innovation continues with Polaroid PTX4000 and press-polishing forming technology. This is a new generation of premium quality polarizing lenses exclusive to Polaroid. These lenses:

- Exceed all international standards for optics
- Exceed all international standards for UV
- Exceed all international standards for polarizing efficiency

Polaroid’s polarizing lenses are made up of 7 functional elements ultra-carefully bonded together to achieve a high-performance optical product. The main element of the sandwich-lens construction is the polarizing light filter in the centre manufactured to exacting LCD industry standards.

7 functional layers



UV light absorbers are laminated to both sides of the filter. These block all harmful UVA, UVB, and UVC light rays. Optically-corrected, shatter-resistant cushion elements are then laminated to both sides of the UV absorbers, making the lens material lightweight, flexible, and impact-resistant. Finally, a unique scratchproof layer is applied to both the outer surfaces.

Exceptional performance

Polaroid’s PTX4000 lenses are the most extensively tested Polaroid Eyewear lens. Hundreds of attributes are tested across thousands of lens pairs and glazed sunglasses and every lens passes through a thorough quality-assurance process.

PTX4000 lenses fully meet all international standards:

- European – EN1836
- Chinese – GB10810
- American – ANSI Z80.3
- Australian – AS/NZS1067

In fact, these lenses also comply with Europe Class 1 Optics Standards, providing superior optical performance and clarity of vision.

Compared to the PTX4000 lens used in Polaroid sunglasses many other ‘polarized’ lenses – even those used in brands costing 2–4 times as much as Polaroid sunglasses – simply do not deliver a comparable level of performance. The situation begs the question: “Why pay for a polarizer if it does not perform well?” Common issues are poor polarizing efficiency and variable optical performance. This means that some expensive polarized sunglasses do not deliver the full benefits of polarization and may cause optical strain to the user’s eyes.



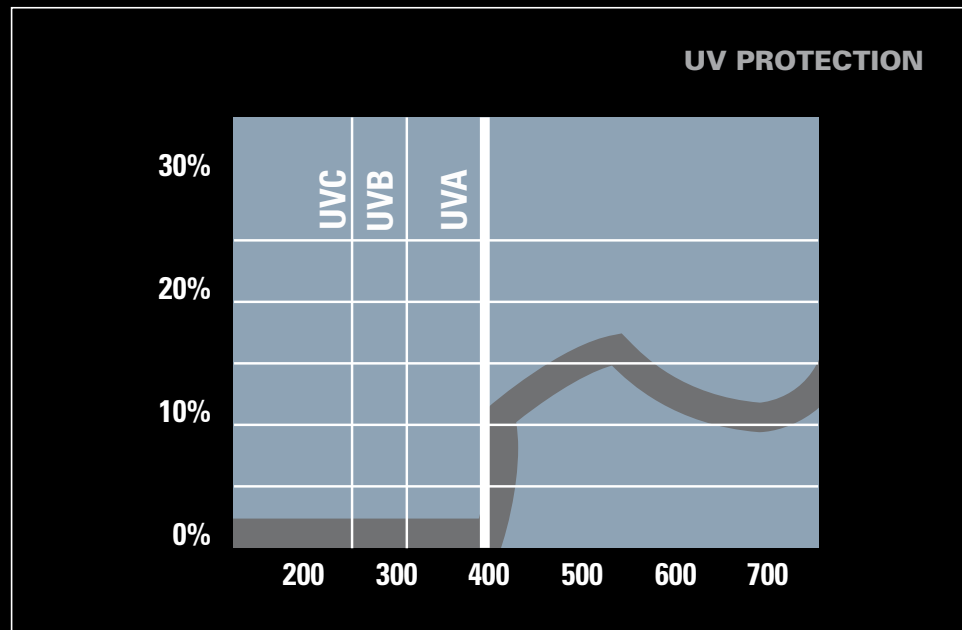
The Polaroid® seal of approval is a symbol of Polaroid’s premium standard of quality and identifies Polaroid sunglasses as the original polarized sunglasses. The disks in the seal represent the polarization effect in simplified form with horizontal and vertical light waves.

Environmental credentials

From raw materials to finished sunglasses, the Polaroid supply chain is certified to ISO14001 International Environmental Management Standards. Not only that, Polaroid PTX4000 lens technology utilises triacetate derived from renewable energy sources within the 7 functional layers, making it the green lens choice.

100% UV protection

Polaroid polarized lenses not only eliminate glare they offer 100% protection against harmful UVA, UVB and UVC rays, fully meeting the higher Australian Standard (AS/NZS1067) up to 400nm. The lens has been assigned the highest possible EPF (Eye Protection Factor) of 10 by the Australian Cancer Council.



Scratch-resistant

To ensure that lens performance is not compromised when the lens is worn a durable scratch-proof finish is applied to the lenses. This coating allows the lenses to retain their high optical performance.

Shatter-resistant

Polaroid PTX4000 lenses help protect the eye and eye zone in an impact situation, providing greater protection than acrylic lenses which may fragment on impact. Shatter-resistant cushioning layers are bonded inside each lens making them safe for medium-impact sports, driving, outdoor activities and everyday urban life.

Shock-absorbent

These unique Polaroid PTX4000 lenses are resistant to high velocity impact. Whereas polycarbonate lenses offer only low energy absorption, so any impact on the lens is transferred to the frame and the head, Polaroid PTX4000 lenses absorb impact, protecting the eye and the eye zone.

BENEFITS OF POLAROID® POLARIZED LENSES

- Glare-free vision
- Clear contrasts
- Natural colours
- Reduced eye fatigue
- 100% UV protection
- Protection from impact and shock

POLARIZED LENSES – VITAL FOR DRIVING SAFETY

When driving, glare isn't just inconvenient – it's dangerous

Every year drivers take unnecessary risks. Not because they drive too fast or ignore safety signs but because they fail to wear sunglasses with polarized lenses. This leaves even safe drivers vulnerable to the dangers of glare.

Roads create glare when the sun reflects from their surface, because they are in a horizontal plane to the driver's eye. This polarizing effect is amplified when the road is wet and the sun is low on the horizon, but in any conditions some glare can be present. In addition, drivers often need to contend with other sources of glare such as lakes, rivers, snow fields and other reflective surfaces. The car's interior adds to this problem, with glare being reflected from the dashboard onto the back of the windscreen, creating a mirror-like surface, and directly into the eye of the driver.

Glare – the driver's enemy

Glare can turn everyday driving conditions – such as vehicles turning, pedestrians crossing or cars stopping – into a real hazard. Drivers squint to try to see clearly which in turn can cause eye fatigue, reduce concentration and trigger headaches. Reaction times are slower and at worst the driver is momentarily 'blinded' by dazzling glare. This compromises the safety of the driver, pedestrians and other road users alike.

Polarizing lenses – for safer driving

The simple step of wearing sun protection with polarized lenses has been proven to improve visibility, so reducing the risk of accidents. Driving without them is taking an unnecessary risk when 'glare from the sun' is cited as a factor in so many driving accidents and fatalities around the world.

Polarizing sunglasses improve driving safety



NON-POLARIZED LENSES



POLAROID® POLARIZED LENSES

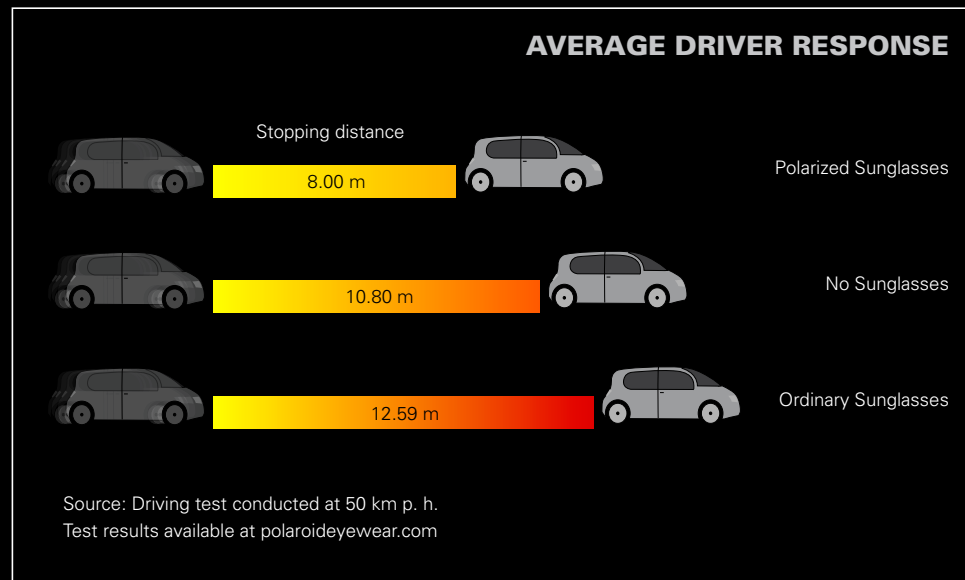
Tests prove polarized lenses work

Drivers' reaction times and stopping distances have been investigated in an independent test, conducted by RLT Car World.

A 12,000 watt lamp provided a simulation of the sun's glare. Drivers travelled at a constant 50kms per hour towards the 'sun'. A hazard – a baby's pram – was suddenly introduced into the drivers' path. Each driver was instructed to apply the brake only when they could see the pram. The study compared the results for drivers wearing ordinary sunglasses and polarized sunglasses against the 'control test' – no sunglasses at all. Stopping distances and reaction times were measured.

The test reveals that when faced with glare from the sun while driving, ordinary non-polarized sunglasses make it harder to see than no sunglasses at all. Drivers take a longer time to react, resulting in a dangerously long brake-path distance before their vehicle comes to a standstill.

Glare test results



Reaction times for drivers wearing polarized sunglasses are up to 20% quicker compared to driving without any sunglasses and up to 40% quicker than with ordinary sunglasses. Faster reactions mean that stopping distances are shorter – by up to 6 metres – compared to driving with non-polarized sunglasses, and as much as 3 metres shorter than driving without sunglasses. Wearing sunglasses with polarized lenses is proven to block out glare, significantly improving driving safety.

Top performance – Polaroid® Polarized Lenses

Polaroid polarized lenses provide the highest possible levels of polarizing efficiency for glare-free vision. The clarity, natural colours and clear contrasts mean no squinting, less eye fatigue and shorter reaction times when driving.



Before Polaroid® there was glare,
then Polaroid® invented the polarized lens
now there is perfect vision

polaroideyewear.com