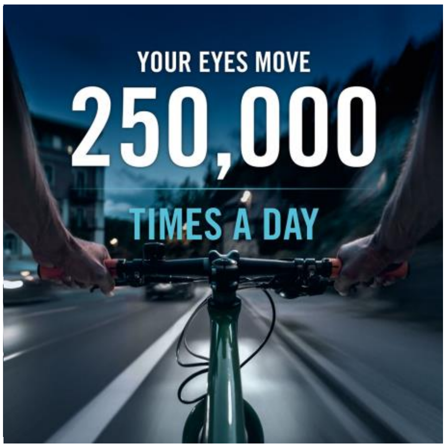
Progressive lenses - Facts & Figures

Vision is by far our most important sense. It allows us to navigate in our surroundings, identify and classify opportunities and risks, and to exchange information and emotions. Around 70% of all our sensory cells can be found in the retina and 65% of all brain activity can be attributed to our eyes. With an average weight of 7.5g and a diameter of 2.3cm, the human eye is roughly the size and weight of a £1 coin – and yet is a real high-performance organ.

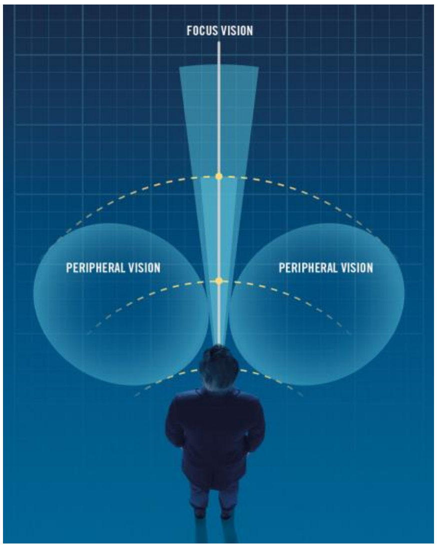
We see not only with our eyes



Source: Rodenstock

For the brain to process visual impressions, they have to be converted into electrical impulses. The eye is responsible for this task: The incoming light from cornea and pupil is focused by the lens and projected by the vitreous body onto the approximately 130 million photoreceptors of the retina, which convert it into electrical impulses for the brain. The retina is ultimately part of the brain which developed outwards and has become sensitive to light over the course of evolution. The photoreceptors are localised around an area in the centre of the retina measuring roughly 1.5 millimetres. However it is not only this area of sharpest vision that contributes to the overall image: Our eyeballs are constantly moving, around 250,000 times a day, in order to deliver sensory impressions from the periphery, the "corners of the eyes", to the brain.

The brain compares all images received with information it has saved over the course of life. From all this data it forms the visual impressions that we perceive within fractions of a second. A person uses two vision systems here: One processes a large number of visual stimuli from the peripheral areas of the retina in order to help us navigate movements and changes in space to prevent us from bumping into things.



Source: Rodenstock

The person also automatically analyses information from the periphery in order to decide where to look next (peripheral selection). The other vision system is used for focussing, e.g. on objects or people. Here the brain relies on stored information to classify the images.

"Autofocus" ensures the right sharpness

The eye’s lens collects the incoming light so that it focuses on the retina and a sharp image is created. The shape of this lens is controlled by the ciliary muscle within the eye and it is this ability to change shape that enables the eye to always keep an object in focus irrespective of the distance. This is called ‘accommodation’ and is what makes near and far vision possible.

If you compare the eye to a camera, the accommodation corresponds to the autofocus, which adjusts the lens (eye lens) to the correct distance, whereas the aperture (pupil) controls the quantity of light so that the correct amount of light always hits the sensor (retina).

Why does our vision worsen as we get older (presbyopia)?

With increasing age, the eye’s lens gradually loses its flexibility and thus also its accommodative ability. It can no longer bend enough to focus near objects on the retina. This process is called presbyopia and starts around 45 years of age in almost every individual. Strictly speaking, presbyopia is not a visual defect and is part of the natural aging process of the eye. However, it can mean a massive restriction of the quality of life and performance capacity for those affected.

Compensation of presbyopia

In order to enable sharp vision at all distances, various zones are manufactured into progressive lenses. It is possible to correct several visual defects including corneal curvature at the same time. The long-distance range is in the upper area of a progressive lens and allows a relaxed distance view. When you look through the middle area, all objects in the intermediate distance (e.g. dashboard, PC monitor) are in focus. The lower the wearer of a progressive lens casts their view, the more they see through the near range, which should allow, for example, reading without any restrictions.

In order to use the different visual zones of a progressive lens, their wearer must follow the eye movements with their head. If they only move the eyes, this directs the gaze to the blurry areas at the edges of the progressive lens. How quickly the eyes get used to the new way of seeing depends largely on the quality of the progressive lenses. This quality impacts the size of the visual zones, the severity of the transitions between the visual zones and the blurry areas at the edges of the lens. The narrower these peripheral areas are and the more they lie outside the field of vision, the larger the usable visual zones and the softer the transitions are – the higher quality the progressive lens is and the better the visual comfort (see below).

Source: Rodenstock

Quality levels of progressive lenses

Standard progressive lenses have narrow long- and near-distance ranges, hard transitions between the visual zones, as well as a long progression channel. In order to focus on an object, therefore the spectacles wearer must move their head all the time. Comfort progressive lenses have wider long- and near-distance zones and a wider transition area than standard lenses, the transitions are not as hard. Premium progressive lenses offer considerably better visual comfort. Their unusable areas are small and distributed across the lens so that they barely disturb the wearer. This makes the acclimatisation period quicker and easier. Customised progressive lenses have the highest quality level. They are adapted to the eyes so that the wearer hardly notices the small blurry areas and enjoys the best possible visual comfort.

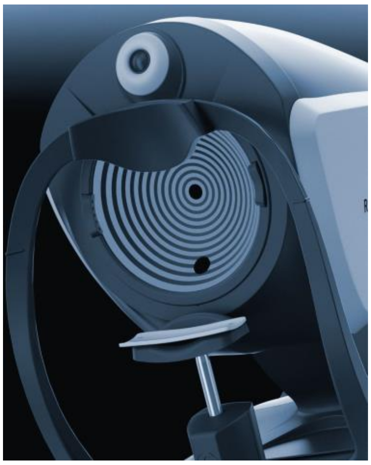
Problems with progressive lenses

Even though almost everyone will have the same problem (presbyopia) sooner or later, each eye is unique. Nevertheless, traditional progressive lenses are manufactured for a significantly simplified, static eye model with fixed parameters, which when combined only applies to 2% of all eyes. 98% of the progressive lenses produced in this manner therefore do not match the eye perfectly. Traditional eye models also concentrate mostly on central vision and ignore peripheral vision. The peripheral view with dynamic visual functions such as motion detection and low-contrast vision for maximum visual performance is even more useful than the central, focused view.

Source: Rodenstock

The fact that many presbyopic patients find it hard to manage with their traditional progressive lenses is often due to this inadequate adaptation to the individuality of the eye. The affected individuals do not exploit their full vision potential and are often not even aware of it as their eyes constantly try to compensate for the lack of focus through a greater effort. They "only" suffer from annoying side effects such as headaches and rapid fatigue, which they assume are caused by something else.

Biometric eye model



Source: Rodenstock

The key to optimal vision is the precise adaptation of the progressive lens to the individual eye. With the DNEye® Scanner and its B.I.G. Vision™ technology, Rodenstock uses the potential of state-of-the-art measurement, IT and production technologies in order to develop an individual biometric eye model as the basis for a lens that is perfectly adapted to the respective eye.

The patented DNEye® Scanner also records the length and shape of the overall eye in addition to the traditional measurement method of the optician. The device collects more than 7,000 data points per eye, which are transmitted to Rodenstock for the customised production of the lens. With this biometric data record, significantly more parameters are integrated in the lens production at Rodenstock than at any other manufacturer.

Rodenstock optimises the lenses at each individual visual point, angle and object distance based on the biometric eye model. Only Rodenstock uses refractive errors in the near-distance range, the actual anterior chamber depth, the surface curvature of the cornea, the pupil size in bright light, the eccentricity of the retina and many other parameters. This is how the most precise biometric progressive lenses in the world are produced.

B.I.G. Vision™ brings the best possible image onto the retina and supports vision through every angle – not only through one point in the middle. This takes account of the constant movements of the eyes. Even a subjective tunnel effect, where a narrow "tunnel" with very sharp vision is surrounded by a much less detailed field of view, fails to appear. Instead, the users report an unlimited field of view without sudden changes in the visual acuity.

Rodenstock studies revealed that 87% of the purchasers of Rodenstock spectacles experienced shorter adaptation periods and 92% had sharper vision than before.