

Natural Accommodation Lens

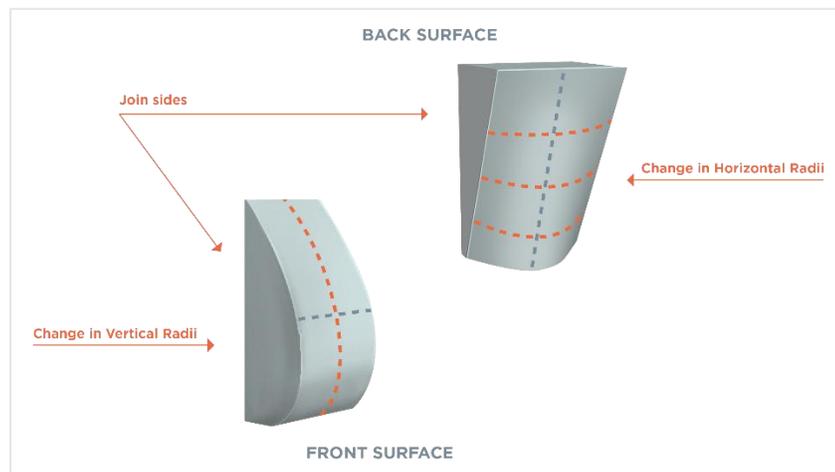
The Journey from PAL to NAL[®]

There is a revolutionary new multifocal lens. It's a lens that requires a gentle raising or lowering of the chin to facilitate distance, intermediate, and near vision. But unlike progressive addition lenses (PAL), there are no narrow corridors to contend with, and no fitting height measurement is required. This new multifocal lens technology is the NAL[®] which stands for the Natural Accommodation Lens.

But before we review the structure, features, and benefits of this breakthrough lens. And before we describe how this lens expands the opportunity for Brick-And-Mortar stores to capitalize on the trend of e-commerce, let's take a brief walk through the history of multifocal lenses.

History of Progressive Addition Lenses – PAL

The first patent for a progressive lens was British Patent 15,735, granted to Owen Aves with a 1907 priority date. Unlike modern progressive lenses, it consisted of a conical back surface and a cylindrical front with opposing axes to create a power progression. Although Owen Aves' design



was never commercialized, Essilor cannot technically be considered the creator of the first progressive lens.



Bernard Maltenez

In 1948 Bernard Maitenez followed in his father's and grandfather's footsteps and joined *Société des Lunetiers* as a research engineer. On March 2, 1951, Bernard Maitenez deposited an envelope at the *National Institute of Industrial Property* in France, which included four drawings and mechanical data that would make it possible to manufacture the modern-day progressive lens. On November 25, 1953, *Esse!* submitted the first patent for his invention.

The first commercially viable progressive lens in Europe, Essel's Varilux, was introduced in 1959. In 1965 the Univis Omnifocal was introduced in the United States. The first progressive lenses were made of glass. In 1972 Essel changed its name to ESSILOR because of the fusion of two companies, Essel and Silor. In 1976 the first organic progressive lens, Essilor's version of Columbia Resin 39 (CR39) index 1.50, the Varilux Orma, was released. A physicist Werner Koeppen and his team worked on the development of the Varilux Comfort from 1960 into the 1990s, and VARILUX became the most successful PAL. Over half a century has passed since the introduction of the PAL, and the world has not been the same. Essilor has done an amazing job in the development, education, promotion, and marketing of progressive lenses and deserves the largest share of the credit.

The PAL Evolution and Its Current State

The advancements in equipment, technology, and software mathematical and development tools have opened the doors to amazing new conceptual and design possibilities – the *Freeform* Revolution! First, it was OptoTech's founder Roland Mandler, who, in 1985, adapted aerospace industry computer numerical control (CNC) technology in the production of ophthalmic lenses. Then, in 1986, Gunter Schneider of Schneider GmbH started using CNC technology in precision optics production, which later evolved into ophthalmic lens production. However, the biggest game-changer in PAL evolution came with the development of *PAL Freeform Lens Design Software*.

On October 11, 1977, Japanese scientists Hiroyuki Mukalyama and Kazutoshi Kato filed a patent application for a progressive multifocal lens and manufacturing method. The US 6,019,470 patent was granted on February 1, 2000 and was assigned to Seiko Epson Corporation. On July 18, 2000, the USPTO granted a patent for a spectacle lens with a spherical front side and multifocal back side and process for its production, US6089713A, to Albrecht Hof and Aldabert Hanssen. They then assigned it to Carl Zeiss Vision GmbH. Both patents followed the conventional PAL concept, but instead of utilizing a semifinished lens with the progressive design cast or molded on the front side of the lens, the multifocal surface was created on the back of a rotationally symmetrical front of a semifinished donor lens blank. In addition to the PAL design on the back side of the lens, the final lens back surface was further modified with Individual Optimization. Over the past twenty-plus years, that concept and production technology radically improved multifocal lenses' visual performance and acceptance/adaptability. Today, apart from ZEISS and SEIKO, there are numerous freeform lens design companies like IOT, Crossbows, Shamir, and Horizon, HOYA, to name a few. All freeform lens designs companies are based on the conventional PAL utility, providing distance, intermediate, and near vision with about a ± 8 mm progressive corridor. Hundreds of PAL designs and individual optimization nuances offer "unique" or "proprietary" features. Although even the most astute ECPs aren't able to study and assess differences, most freeform lens manufacturers tend to offer three types of PAL designs: GOOD, BETTER, or BEST.

The Challenge

The good, the bad and the ugly

The good:

Yes, we are all well familiar with all the wonderful features and benefits of PAL lenses like:

- No line
- No image jump
- Three focal distances; far, intermediate, near vision

The bad:

- We are all also well aware of some of the less desirable features of the PAL like:
- Cumbersome navigation through short and narrow intermediate vision corridors
- Taking accurate and time-consuming fitting height measurements and frequent fitting height redo's
- Spatial disorientation, nausea, or dizziness due to peripheral waviness and distortions
- Adaptation period

The ugly: To be serious, there is nothing aesthetically *UGLY* about a PAL; *The Good, The Bad and The Ugly* came from a movie that I enjoyed, the 1966 epic spaghetti western film directed by Sergio Leone - remember?

The Dream Wish List:

It is more than 60 years since the introduction of PAL. With new knowledge and technological evolution in computer technology and advancements in software development tools, we have reached the point that our dream wish list can be realized. First, we must drop our self-imposed limitations, get out of the box, and start our quest armed with new knowledge, unaffected insight, creativity, commitment, and courage. And the dream wish list? Actually, it is not that far-fetched or long, thanks to the numerous PAL advancements we can enjoy today:

- NO ADAPTATION PERIOD or NON-ADAPTS due to feelings of *swim or nausea*
- NO ADAPTATION PERIOD or NON-ADAPTS due to *the learning process of navigation through a short and narrow intermediate vision corridor*
- NO IRRITATING AND COSTLY REDOS due to *inaccurate fitting height measurements*
- FITTING HEIGHT MEASUREMENTS that are often complex and time-consuming *should not be required*

Assembling the development team, compiling relevant and timely data, gaining the insight

Upon extensive deliberations and complex considerations, a multifocal lens that would almost certainly meet the wish list criteria could be developed. After nearly 5 years of blood, sweat, and tears, a functional, commercially viable, cloud-based freeform digital lens design platform was developed.

That platform is ideally suited to meet all our specialty and vocational lenses, bifocal and multifocal lenses, and our unconventional lens utility objectives. It can be integrated with

any lab management system. To gain new, untainted optical insight, we studied large numbers of fitting height statistical data based on frame measurements, frame shapes, and pantoscopic angles. We have created unconventional eye-lens ergonomic models and studied natural vision dynamics, and natural vision habits, consulted with numerous ECPs, optical business experts, and professionals, and the Natural Accommodation Lens concept was born.

The New Natural Accommodation Lens – NAL® Has Finally Arrived

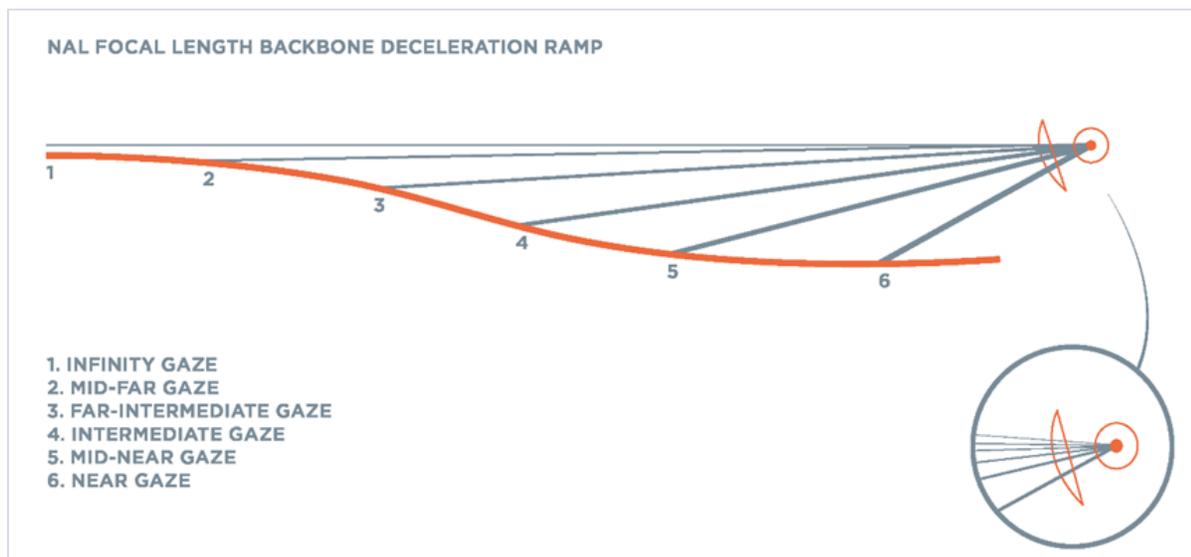
The dream lens concept is born: Natural Accommodation Lens (NAL®)



Michael Walach, the inventor, is the President of Quest Vision Care Specialty Lab and the CEO of QLDS, both located in Largo, Florida. On September 21, 2021, the USPTO issued US Patent No. US 11,126,012 for Broadview Natural Addition Lens. On March 29, 2022, USPTO granted a second patent, US Patent No. US 11,287,673 B1. NAL® and OMNILUX® are USPTO registered trademarks. The registrant is Quest Vision Care Specialty Lab.

The NAL® does not have the short, awkward to navigate intermediate vision corridor inherent in PALs. NAL® has a funnel-shaped visual field comprised of substantially aspheric, lateral power bands that are aligned along a vertical design backbone. The design backbone has mathematically created curvature based on actual natural downward gaze focal length deceleration requirements based on our unique eye/lens interaction ergonomic model, and extensive PAL fitting data.

The focal length deceleration curve addresses natural accommodation requirements for focal lens reduction *from 6 meters (20') all the way to 25 cm (1')* along a continuous, smooth focal length deceleration ramp.



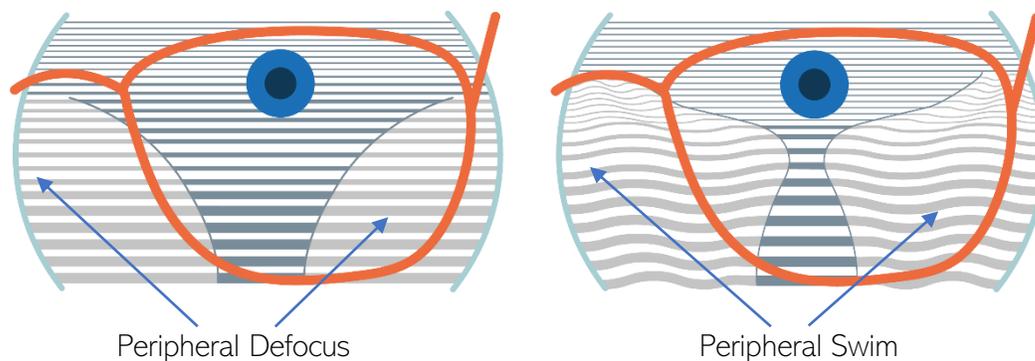
NO ADAPTATION PERIOD or NON-ADAPTS *due to feelings of swim or nausea.*

The new NAL® eliminates the peripheral swim effect inherent in PAL due to peripheral defocus.

We have been able to achieve that effect by:

- The application of substantially lateral aspheric broad power bands aligned vertically along the NAL® backbone and interpolated by various bi-quadratic, cubic, and quintic polynomials and splines into one smooth continuous surface
- Complex digital ironing out across visual field peripheral areas
- Significant reduction in focal length deceleration rate along the substantially vertical NAL® principal design axis due to a 2 to 4 times longer add power acceleration ramp radically reduces unwanted lateral astigmatism as per Minkwitz Theorem
- NO ADAPTATION PERIOD or NON-ADAPTS due to the learning process of navigation through a short and narrow intermediate vision corridor. Because the NAL® visual field is funnel-shaped, there is no short narrow progressive corridor for the wearer to learn to navigate. As a result, NAL® adaptation is virtually instant, and the navigation is intuitive and natural
- NO IRRITATING AND COSTLY REDOS due to inaccurate fitting height measurements

The NAL® visual field is shaped like a funnel or martini glass. Therefore, it does not have a



NAL® on left and standard PAL design on the right

short, narrow intermediate vision corridor like a PAL. The NAL® has no progressive corridor. Consequently, NO time-consuming FITTING HEIGHT measurement is required, which means that NO issues arise from incorrect FITTING HEIGHT. And there are NO irritating redo's typically caused by PALs ordered with an incorrect fitting height. To change the focal distance in NAL®, the patient gently lowers or raises their chin to fix their gaze on the object viewed and perfectly focus on the distance needed.

The objective of the NAL® concept is to provide a youthful, natural single vision viewing experience for active and professional presbyopes. Our numerous wearer studies proved that the actual viewing experience with the NAL® is more natural and closer to the visual experience afforded single vision lens wearers. Remember youthful vision? Remember how natural the transition from the office, golf, bike, tennis, or viewing the computer screen? This is the visual experience that patients desire in their multifocal eyewear.

The timely arrival of NAL® and its Impact on the Industry and the Patient

Despite the enduring efforts of lens designers worldwide, the bell curve of new PAL concept design innovations is significantly leveling off. There have been over 60 years of PAL design improvements and design modifications. Since SEIKO, ZEISS and RODENSTOCK pioneered the backside lens surface individual optimization concept over 20 years ago, more than 200 "proprietary" or patented designs have been introduced since the freeform digital revolution. New PAL innovation at this time appears to be trying to squeeze water from the stone.

The consequence that comes as no surprise is considerable disorientation among the global ECP community regarding the actual and objective visual performance of the abundance of PAL design offerings. Most understand that today's freeform digital technology is more about branding and marketing. Most commonly, it is GOOD, BETTER, or BEST PAL by major corporate brands and various private labels: the same PAL concept, different day.

It is also important to realize that the prescription eyewear e-commerce business is growing about ten times faster than brick-and-mortar. It seems reasonable to assume that the trend is going to continue. The ECP brick-and-mortar community should seriously consider this and expand its marketing outreach to include an e-commerce presence. At this moment, multifocal PAL internet sales are falling far behind brick-and-mortar PAL sales. Still, the NAL® with no fitting height requirement creates an opportunity for retailers to expand e-commerce. The NAL® has the potential to shift the numbers in favor of e-commerce significantly.

NAL® is available as OMNILUX for all daily youthful vision needs, OMNILUX OFFICE for extensive computer work, and advanced version OMNILUX PRO for brick-and-mortar ECP practices where the fitting height measurement is required. When fitting height data is provided, the data is utilized further to refine the vertical position of the NAL® design to facilitate the best optical performance and visual comfort for atypical frame shapes and unusual or unique fitting requirements. NAL® is available in all lens materials and treatments. The Rx power range is +8.00 D to -12.00 D SPH, -5.00 D CYL, and PRISM up to 5.0 D. The ranges can vary, broader or narrower, depending on the type of freeform production line, lens material, and lens design systems (LDS) provider.

For more information on NAL® ECP availability to secure LDS license for freeform labs globally contact:

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