Unique lens design leveraging behavioral artificial intelligence

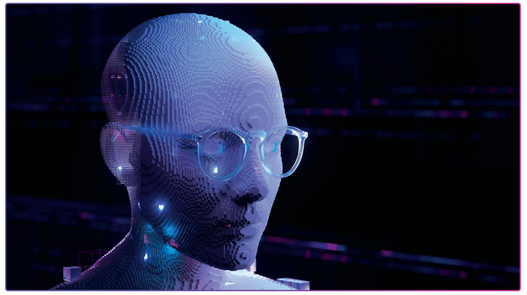
For the very first time, a Varilux® lens is designed with behavioral artificial intelligence.

Beyond prescription and eye physiology, the design now considers **visual behavior,** a prerequisite for fast and precise eye movements.

More than **1 million** data points from exclusive research, real-life wearer tests, wearer behavioral and postural measurements in store were computed and analyzed.

Therefore the digital twin of the patient is created in its 3D environment, reproducing real life situations, to predict its visual behavior profile[6].

What is artificial intelligence?
It is the simulation of human intelligence processes by machines, especially computer systems. AI is a part of our daily lives from GPS navigation to the digital assistance we get from our smartphones.



This behavioral AI system is composed of several predictive models, and for the first time two new predictive models of visual behavior were defined:
- **Gaze lowering model**
- **Accommodation model**

Wearer parameters
Age
Prescription
Pupillary distance
Eye/head coefficient
Pupil size

Predictive models
Visual acuity loss
Head/eye coordination
Accommodation
Gaze behavior
Postural efforts

For every single wearer prescription, the visual behavior profile is established **to design a progressive lens that respects their natural eye behavior.**

6. Objects distances defined in a 3D environment as a function of gaze direction thanks to gaze lowering and accommodation exclusive models.

The result? The best overall progressive lens[12]

N°1

1. **14 key attributes defined by progressive lens wearers**
2. **Digital twinning technology to reproduce daily activities**
3. **Tested against high-end progressive lenses of main competitors**
4. **Approved by an independent institute**

73 progressive lens wearers wearing high-end progressive lenses have been equipped with Varilux® XR series™ lenses, and they compared them to their current pair.[17]

95%
adapted by the first day[14]

95%
felt confident or very confident while in motion[15]

90%
perceived instant sharpness at all distances, even while in motion[16]

How to recommend Varilux® XR series™ to your patients

1. We live on the go, hyper connected. With more than 100,000[3] movements per day, our eyes need to make extra efforts to maintain sharpness while we are in motion.
2. Current progressive lenses are conceived for standardized and linear eye behaviors, considering mainly prescription data.
3. Varilux® XR series™ lens goes beyond your prescription. This lens responds to your visual behavior predicted by artificial intelligence based on exclusive real-life data.
4. It is the best overall progressive lens[12], offering instant sharpness at all distances even in motion[2], adaptation from the very first day[13] and natural eye navigation.

Varilux XR series, progressive lenses that know how our eyes really move.

12. Based on achieving the highest composite score among premium Progressive designs of leading U.S. competitors on 14 attributes identified as important by a survey of U.S. consumers. Measurements were the result of Essilor R&D state of the art avatar simulations 2022.
13. Essilor International - Varilux® XR series™ lens - in-life consumer study - Eurosyn – 2022 – France (n=73 high-end progressive lens wearers).
14. ®Essilor -Varilux® XR series -in-life consumer study -Eurosyn-2022 -France (n=73 progressive lens wearers; 69/73).
15. ®Essilor -Varilux® XR series -in-life consumer study -Eurosyn-2022 -France (n=73 progressive lens wearers; 69/73). In motion is defined as driving, walking, and biking.
16. ®Essilor -Varilux® XR series -in-life consumer study -Eurosyn-2022 -France (n=73 progressive lens wearers; 66/73).
17. Test carried out by an independent institute with identical prescriptions.

Find out more on:
LEONARDO

NEW
Varilux® XR series™

Varilux®
#1 progressive lens brand
worldwide*

The first eye-responsive progressive lens[1]

Instant sharpness even in motion[2]

essilor

*Essilor monitor, 2021 data. Retail value amongst spectacle lenses category, brands representing progressive lenses.
1. Eye-responsive defined as the consideration of two parameters in the design of the progressive lens prescription & visual behavior.
2. Varilux XR® series™ -in-life consumer study -Eurosyn-2022 -France (n=73 high-end progressive lens wearers). 66/73 perceived instant sharpness at all distances while in motion.

Did you know that our eyes move more than 100,000[3] times a day!

We live in an era of information overload that is increasingly on the go. Information is shared across a variety of devices.

We are constantly in motion, whether it's our environment, our body, our head or our eyes.

125 billion devices by 2030[4]

80 notifications/day[5]

Maintaining sharp vision while moving requires **additional attentional efforts** from our eyes. Progressive lens wearers have to subconsciously adapt their behavior to maintain sharpness: taking a millisecond to adjust, slow down or even stop moving.

WHY?

Current progressive lens designs have a linear conception; however, eye movements are much more multi-directional. That may force the eyes to do extra efforts when changing gaze rapidly.

Current progressive lens design	Multi-directional eye movements
	

In order to have sharp vision at all times, sharpness all over the lens and efficient eye movements are required.

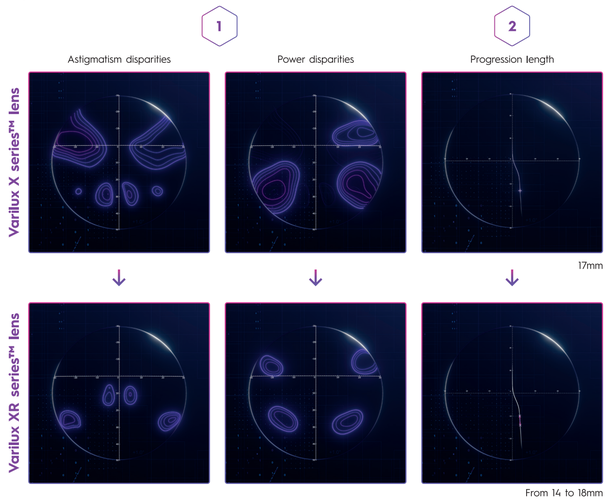
3. Peter H. Schiller, Edward J. Tehovnik, Neural mechanisms underlying target selection with saccadic eye movements, Progress in Brain Research, Elsevier, Volume 149, 2005, Pages 157-171.
4. Mintel Global Consumer Trends 2030 – April 2020.
5. Acer, Utku & Mashhadi, Afra & Forlivesi, Claudio & Kawsar, Fahim. (2015). Energy Efficient Scheduling for Mobile Push Notifications. EAI Endorsed Transactions on Energy Web.

New XR-motion™ technology, a visual behavior-based optimization

The XR-motion™ technology optimizes both lenses according to the visual behavioral profile of the patient through two major optimizations.

1. Taking binocular vision to the next level
Optical differences in the left and right lenses, for a single target, can slow down eye movements. The visual behavior profile allows the optimization of each focal point of the lens by reducing the optical disparities between the two lenses. As a result, **this behavior-based binocular optimization offers high visual acuity wherever the patient needs it.**

2. Precise positioning of the focus zones
Without any additional measurement, the gaze lowering model calculates the progression length for each eye, which may be different between the left eye and right eye. This ultra-precise positioning of the zones **guarantees a natural ocular navigation from near to far.**



Binocular mapping -2.00 (-0.25) 175° Add 2.00 / -1.75 (0) 0° Add 2.00 – colored zones express the disparities, from 'light' in blue circle to 'strong' in pink.

Capitalizing on exclusive **Varilux® X Series™ lens technologies:**

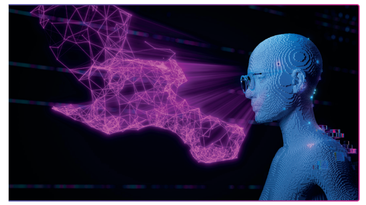
Xtend® Nanoptix®

With the new technology powered by behavioral artificial intelligence

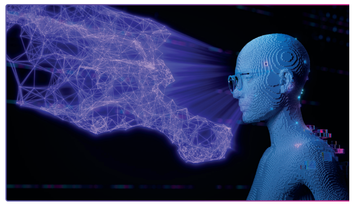
XR-motion™

The first eye-responsive progressive lens[7]

A new criterion, named volume of broadband vision, calculates the 3D area where the wearer can benefit from a highly sharp vision on any visual target, even while moving, with a seamless ocular navigation between 30cm and infinity[8].



High-end progressive lenses



Varilux® XR series™

+67% volume of broadband vision vs high-end progressive lenses from competitors[10]

+49% volume of broadband vision vs Varilux® X series™ lens[9]

Thanks to the extended volume of broadband vision, **Varilux® XR series™ is the first eye-responsive progressive lens[7],** which predicts wearers' visual behavior (gaze lowering and object distances), thereby responding to how their eyes really move. This ensures sharp and fluid vision.

Recommended technologies and coating combinations with Varilux® lenses

Crizal® Shield: The Crizal® Shield stamp expresses the guarantee of the optimal protection Crizal® coating provides to Essilor® lenses. Combined with Varilux® lenses, Crizal® protects the lenses from reflections, scratches, smudges, dust, water; and the eyes from UV rays.

Essential Blue series®: Protects against UV and filters blue-violet light.[11]

Transitions™ Light Intelligent Lenses: Combined with Varilux® lenses, Transitions® Light Intelligent Lenses™ offer sharp vision indoors and outdoors, seamlessly adapting to changing light situations.

A comprehensive personalized range to offer the best of Varilux® XR series™ lenses.

Varilux® XR design
- PD and Fitting Height
- Position of Wear Measurements optional*

*Vertex Distance, Pantoscopic Tilt, and Frame Wrap.

Varilux® XR track
- PD and Fitting Height
- Position of Wear Measurements
- Near Vision Behavior Measurements

NVB Upgrade

7. Eye-responsive defined as the consideration of two parameters in the design of the progressive lens: prescription and visual behavior.
8. Volume of broadband vision is the volume of space between 30cm and infinity having: 1/ A binocular acuity loss lower than 0.15logMAR (eq. to a binocular visual acuity of ~ 8/10) 2/ A power disparity lower than 0.15D 3/ A resulting astigmatism disparity lower than 0.25D.
9. Internal R&D simulations – 2022 – vs. Varilux® X series™ lens.
10. Internal Essilor International R&D simulations – 2022 – calculation based on lenses measurements – Analysis done on most relevant competitive brands offering premium progressive lenses with good level of awareness among consumers (Consumer Lens Brand Tracking – Ipsos – Q3 2022 – BR/CA/CN/FR/IN/IT/UK/US – n=8000). Volume of broadband vision considers sharpness and fluidity of vision.
11. Full UV protection in the lens and filters at least 20% of blue-violet light between 400 and 455nm as stated by ISO TR20772:2018.