LENTIS®

Extend your Vision!
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The best combination of of two high-tech solutions: with the multifocal-toric LENTIS® MplusXtoric, the innovative presbyopia correction of the advanced LENTIS® MplusX and the optimal astigmatism treatment of the new LENTIS® TplusX were combined in an intraocular lens. The result: optimal vision for your patients!

Multifocal lens technology of the neXt generation

According to the refractive principle, the LENTIS® MplusXtoric displays excellent visual acuity results thanks to its innovative, sector-shaped near zone. The MplusX-technology offers great advantages for the patient. The advanced MIOL offers an extended depth of focus for all ranges of vision, which results in high spectacle independency for near, intermediate and distance vision. Furthermore the maximised light efficacy of > 95% guarantees high visual acuity and a natural contrast and color perception. The new design of the sector shaped near vision segment is characterized by an increased pupil independence, also for very small pupils and photic phenomena are significantly reduced by homogeneous peripheral zone transition.

Technical evolution of the optical mode of action

LENTIS® MplusXtoric with „Additive Paraxial Asphericity“ (APA):
- Enhanced far and near focus zones for better depth of focus and a balanced vision at all viewing distances
- Outstanding visual performance in the entire intermediate vision field by adapted zone focusing
- Easier neuronal image interpretation due to intelligent focal modulation for all light conditions

LENTIS® MplusXtoric with „Surface Design Optimisation“ (SDO)
- Higher pupil independence and better reading through a new surface design of the near vision segment
- Light efficiency > 95% by improved SML production technology
- Significantly reduced photic phenomena by homogeneous peripheral transition zone

Figure: SEM pictures of the near vision segments of MplusXtoric and MplusXtoric
Get off the peaks, get into the zone!

The ambition behind the Mplus modification and the objective of the new MplusX is to achieve a general enhancement and extension of the depth of focus, not just an improvement of individual focal points. The unique and unmistakable defocus curve of the MplusX visualises the following:

Instead of being limited to the maximisation of so-called „peaks“ in the near, intermediate and far vision, the MplusX maximises the total area under the defocus curve, which corresponds to the entire viewing zone.

The result: genuine extension of the depth of focus at all distances!

Clinical results

Prof. Dr. Sunil Shah, Midland Eye, Solihull West Midlands, UK

The binocular defocus graph of the LENTIS® MplusX confirms the outstanding visual acuity performance of this multifocal lens for all distances. In addition to the strong visual performance for the distance vision the chart shows, in particular the balanced visual results for the intermediate and near vision. No significant slopes in visual acuity between the individual visual distances exist. Furthermore, the area-of-focus metric is maximised and thus creating a balanced and natural vision.

See also Shah S., Buckhurst PJ et al.
Toric functionality with simplified implantation characteristics

With the LENTIS® Mplus Xtorc we offer a tailor-made solution for patients who suffer from presbyopia in conjunction with regular corneal astigmatism. The toric MIOL, thanks to its customised production, balances out every form of corneal distortion, thereby helping to create sharp, clear vision. In addition, the prescribed inferior placement of the multifocal near segment and the correspondingly adjusted torus facilitate the alignment and therefore the implantation. The tried and tested plate haptic design guarantees the highest rotational stability.

(a) Unique: Perfection path of light rays for more depth of focus and visual acuity.
(b) Simplified operation: The prescribed inferior placement of the multifocal near zone and the customised torus facilitate alignment and implantation.

The Mplus Xtorc technology offers many advantages compared with common rotationally symmetric multifocal-toric IOL

LENTIS® Mplus Xtorc attributes
- Excellent visual acuity results for the near, intermediate and distance ranges
- Extended depth of focus and optimized image quality for all ranges of vision
- Increased pupil independence, now suitable for very small pupils
- Maximised light efficiency of > 95%
- +3.0D addition
- Minimal halo and glare effects

LENTIS® Tplus Xtorc attributes
- Individual and highly accurate astigmatism correction to precisely 0.01D
- Natural high contrast and colour perception
- True 360° sharp optic edge for best possible PCO prevention
- Very high rotational stability thanks to its haptic design
- Aberration neutrality for better depth of focus
- Optional: Violet light filter for improved retinal protection
Toric LENTIS® IOL for an eXact astigmatic correction!

In a large-scale clinical trial, conducted by Professor Jan Venter (MD, Optical Express, London), multifocal toric intraocular lenses of the LENTIS® Mplus® type were implanted in 1,030 eyes. The lenses are tailored to each patient’s parameters with an accuracy of 0.01 diopters and the outcomes proved convincing owing to their excellent refractive results, the precise correction of astigmatism and presbyopia, and above-average patient satisfaction.

![Double Angle Plot](image)

**Figure:** Refractive cylinder pre-op (a) compared to the rest of cylinders post-OP (b)
- \( N = 1030 \)
- Sphere pre-OP: +3.12D +/- 5.18 SD (-11.0D to +12.25D)
- Cylinder pre-OP: -3.81D +/- 1.43 (-1.50D to -6.75D)

![Size of the refractive cylinder](image)

- 84.3% of all eyes had a refractive cylinder post-OP < -0.5D
- 97.7% of all eyes had a refractive cylinder post-OP < -1.0D

**High rotational stability:** The average rotation after 3 months post-surgery was minimal 2.53° +/- 2.27°.

**Source:**
Jan Venter, MD, PhD, Toric Multifocal Mplus, study results presented at the 1st International Ocu lentis User Meeting, Majorca, October 2012.
Siehe auch: Jan Venter, MD, PhD, Outcomes and complications of a multifocal toric intraocular lens with a surface-embedded near section, Journal of Cataract & Refractive Surgery, Volume 39, Issue 6, June 2013
In a recent clinical study, led by Prof. Dr. Magda Rau, 10 multifocal toric LENTIS® MplusXtoric intraocular lenses were examined with respect to their optical performance. The study confirms very good functional results with a very high patient satisfaction and a maximum spectacles independence post-OP for this advanced IOL. The toric MIOL was bilaterally implanted without complications and distinguished itself by the prescribed inferior placement of the multifocal near segment and the correspondingly adjusted torus. These factors simplify the alignment and therefore lead to a simplified implantation behavior.
Do you need after the operation continues glasses?

- **LENTIS® Mplus**
  - 100% completely independent
  - 30% only in special cases
  - 5% only for the far vision
  - 25% only for the near vision

- **LENTIS® Mplus**
  - 0% completely independent
  - 0% only in special cases
  - 0% only for the far vision
  - 0% only for the near vision

Average correction: 0.53D
Average correction: +0.25D

Source:
What do the professionals say about the Mplus technology?

"Just like the LENTIS® Mplus, the LENTIS® MplusX IOL has excellent contrast sensitivity. Additionally, this new lens provides patients with significantly better intermediate vision and, on average, 1 more line of near visual acuity. In addition to the benefit of providing a wide range of functional vision, the MplusX lens design addresses the minimal drawbacks of the first-generation design. Although it is not a trifocal lens, the results are probably better than what we can achieve with a trifocal." **Prof. Dr. Sundi Shah, MD, FRCS (Ophth), FRCS (Ed), 02/2014.**

"Initial outcomes are marvelous, and the IOL provides very clear vision from far to near distances. Due to its design, the loss of light is minimal and, therefore, my patients do not complain about night driving problems or waxy vision. I acknowledge the advantage of the LENTIS® Mplus X IOL and, therefore, at the moment it is my first choice among multifocal IOLs." **Nireyuki Arai, MD, PhD, 02/2014.**

What do the professionals say about the LENTIS® MplusXtoric?

"The MplusXtoric IOL provides good visual acuity for all ranges of vision. In comparison with the first-generation LENTIS® Mplus IOL, the near visual acuity has improved with the MplusXtoric, and my patients no longer require spectacles for reading small print or computer use. Additionally, because of the reduction in the incidence of glare and halos with the MplusXtoric IOL in comparison to some rotationally symmetric multifocal IOLs I have previously implanted, I am able to implant the Mplus Xtoric lens also in my demanding male patients. The improvement in near visual acuity that this lens provides makes it a great choice for my female patients as well. As a result, I am now able to offer one lens—the LENTIS® MplusXtoric IOL—to all of my patients, regardless of gender."

**Magda Rau, MD, is the Head of the Augenklinik Cham and Refractive Privatklinik Dr. Rau, Cham, Germany, and Eye Centre Prag, Czech Republic and a Visiting Professor at the Bulgarian-American Eye Institute ProLight, 02/2014.**

"The new IOL design seems to improve intermediate vision and minimize the incidence of halos and glare, especially with large pupils in younger patients. As another important point, the near segment works well in eyes with small pupils, which is common in cataract patients. Patients already had no major complaints with the LENTIS® Mplus, but with the new MplusX lens design, patient satisfaction seems to be even higher. The LENTIS® MplusXtoric is a great tool for our presbyopic patients to achieve spectacle independence.** **Ruediger Schmid, MD, FEBO, practices at the AugenAllianz Zentren Ettlingen, Germany, 02/2014.**

What do the professionals say about the LENTIS® Mplus toric?

"I have to say that, of all the multifocal toric IOLs on the market, the best experience we have had, has been with the Mplus toric. The loss of light is the lowest among all of the multifocal lenses, and the accuracy of the IOL manufacturing is excellent. Another good thing about the Mplus toric is that the lens is always implanted in the same position; there is no need to rotate the lens toward the axis of astigmatism. You just implant it at the 12-o'clock position (90°), and it always fits well in the eye. I have yet to see a case in which the lens decenters, and this is much more than I can say for competing lenses from other companies."

**Prof. Dr. Gerd U. Auffarth, MD, PhD in LENTIS® Mplus and LENTIS® Mplus toric - Advanced multifocal IOL technology for the treatment of presbyopia, astigmatism, and cataract, supplement to CRST Europe 02/2012.**

"We started implanting the Mplus in October 2010. To date, we have implanted this lens in more than 2,000 eyes. We then started with the Mplus toric in February 2011 and have already implanted this lens in approximately 350 eyes. The main feeling across our centers is that the Mplus and the Mplus toric are really good lenses. We have no buts anymore; there simply are not the side effects we have seen with other multifocal IOLs."

**Anders Granberg, MD, PhD in LENTIS® Mplus and LENTIS® Mplus toric - Advanced multifocal IOL technology for the treatment of presbyopia, astigmatism, and cataract, supplement to CRST Europe 02/2012.**

"Wir implantieren die LENTIS® Mplus toric seit November 2010 und haben bisher sehr gute Erfahrungen gemacht, was auch daran liegt, dass wir ausschließlich die „customised“ Variante implantieren. Bei der praktischen Anwendung bzw. beim Implantationsverhalten zeichnet sich diese MIOL eindeutig durch die gute Erkenntbarkeit der Position der Zylinderachse und die dadurch vereinfachte Implantation aus, auch gerade mit der zusätzlich gelieferten Folie für den OP-Monitor." **Lutz Bauer, MD, PhD in LENTIS® Mplus toric – Erfahrungsbericht aus der Praxis, Oculents NEWS 02/2011.**
### LENTIS® mplus-x toric

The best combination of two high-tech solutions: with the multifocal-toric LENTIS® mplus-x®, the innovative presbyopia correction of the advanced LENTIS® mplus-x® and the optimal astigmatism treatment of the new LENTIS® mplus-x® were combined in one intracocular lens.

<table>
<thead>
<tr>
<th>Product</th>
<th>LENTIS® mplus-x® LU-313 MF30T</th>
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</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>One-piece multifocal-toric acrylic IOL</td>
</tr>
<tr>
<td>**Optic Size</td>
<td>Overall Length**</td>
</tr>
<tr>
<td><strong>Haptic Angulation</strong></td>
<td>0°</td>
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<tr>
<td><strong>Optic Design</strong></td>
<td>Biconvex</td>
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<tr>
<td></td>
<td>Aspherical and toric surface - posterior, sectorshaped nearvision segment - anterior: +3.0D</td>
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<tr>
<td><strong>Design</strong></td>
<td>Optic and haptics with square edges</td>
</tr>
<tr>
<td></td>
<td>Posterior 360° continuous barrier effect</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>HydroSmart® - a copolymer, consisting of acrylates with hydrophobic surface, UV absorbing</td>
</tr>
<tr>
<td></td>
<td>Also available with violet light filter (LU-313 MF30TY)</td>
</tr>
<tr>
<td><strong>Available Diopters</strong></td>
<td>sph. ±0.0D to +36.0D (0.01D)</td>
</tr>
<tr>
<td></td>
<td>cyl. +0.25D to +12.0D (0.01D)</td>
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<tr>
<td></td>
<td>(sph. ± cyl. &lt; 40.0D)</td>
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<td></td>
<td>optic axis (1°-scaling)</td>
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<td><strong>Refractive Index</strong></td>
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<tr>
<td><strong>Estimated A-Factor</strong></td>
<td>nominal</td>
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<tr>
<td></td>
<td>A = 118.0</td>
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<tr>
<td></td>
<td>ACD = 4.97</td>
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<td></td>
<td>Haigis</td>
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<tr>
<td></td>
<td>a0 = 0.87</td>
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<td>pACD = 5.11</td>
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<td>Holl.1</td>
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<tr>
<td></td>
<td>sf = 1.33</td>
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<tr>
<td></td>
<td>SRK/T</td>
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<tr>
<td></td>
<td>A = 118.2</td>
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<td></td>
<td>SRK II</td>
</tr>
<tr>
<td></td>
<td>A = 118.2</td>
</tr>
<tr>
<td><strong>Anterior Chamber Depth</strong></td>
<td>4.97 mm</td>
</tr>
<tr>
<td><strong>Recommended Incision Size</strong></td>
<td>2.4 mm</td>
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<tr>
<td><strong>Recommended Injector [reusable]</strong></td>
<td>Injector: Viscoject-1-hand: L604205</td>
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<tr>
<td></td>
<td>Cartridges: Viscoject B10 2.2 Cartridge-Set: LP604240C</td>
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<tr>
<td></td>
<td>Viscoject-2-hand: L604215</td>
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<tr>
<td><strong>Recommended Injector-Set [disposable]</strong></td>
<td>Viscoject B10 2.2 Injector-Set: LP604340C</td>
</tr>
</tbody>
</table>

Source: ULIB (User Group for Laser Interference Biometry)  [www.augenklinik.uni-wuerzburg.de/ulib](http://www.augenklinik.uni-wuerzburg.de/ulib)

References:  [www.augenklinik.uni-wuerzburg.de/ulib/const.htm](http://www.augenklinik.uni-wuerzburg.de/ulib/const.htm)

The given constants are to be seen as a guide value and basis for the calculation of the IOL refractive power. Detailed information on the calculation of own constants can be found at [www.augenklinik.uni-wuerzburg.de/ulib/relat.htm](http://www.augenklinik.uni-wuerzburg.de/ulib/relat.htm).
**Product** | **LENTIS\textsuperscript{®} M\textsuperscript{plus}\textsuperscript{™} toric - LU-313 MF1ST**
--- | ---
**Type** | One-piece multifocal-toric acrylic IOL
**Optic Size | Overall Length** | 6.0 mm | 11.0 mm
**Haptic Angulation** | 0°
**Optic Design** | Biconvex
Aspherical and toric surface - posterior, sector-shaped near vision segment - anterior: +1.5D
**Design** | Optic and haptics with square edges
Posterior 360° continuous barrier effect.
**Material** | HydroSmart\textsuperscript{®} - a copolymer, consisting of acrylates with hydrophobic surface, UV absorbing
Also available with violet light filter (LU-313 MF1STY)
**Available Diopeters** | sph. ±0.0D to +36.0D (0.01D)
cyl. ±0.25D to +12.0D (0.01D)
(sph. + cyl. < 40.0D)
optic axis (1°-scaling)
**Refractive Index** | 1.46
**Estimated A-Factor** | **nominal**
A = 118.0
ACD = 4.97
| **Haigis**
a0 = 0.87
a1 = 0.40
a2 = 0.10
| **HofferQ**
pACD = 5.11
| **Holl.1**
 sf = 1.33
| **SRK/T** | A = 118.2
| **SRK II** | A = 118.2

**Anterior Chamber Depth** | 4.97 mm
**Recommended Incision Size** | 2.4 mm
**Recommended Injector** [reusable] | **Injector:** Viscoject: 1-hand: LI604205
Viscoject: 2-hand: LI604215

**Cartridges:** Viscoject BIO 2.2
Cartridge-Set: LP604240C
**Recommended Injector-Sets** [disposable] | Viscoject BIO 2.2 Injector-Set: LP604340C

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