LENTIS® Mplus™

Extend your Vision!
**LENTIS® mplusX**

Revolution first, evolution now

The neXt generation of the world's unique multifocal Mplus-IOL-technology

The unique optical design of the rotationally asymmetric LENTIS® Mplus has revolutionised the multifocal IOL market worldwide. Well over 200,000 Mplus implantations in 4 years and a significant number of clinical studies prove the superiority of this patented technology to conventional diffractive multifocal lenses (see also page 4 et seqq.).

With the LENTIS® MplusX Oculentis goes a step further and presents an advanced and improved version of the previous Mplus model. For even better visual results and happier patients and doctors!

**Technical evolution of the optical mode of action**

- **LENTIS® MplusX 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® MplusX 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

Perfected path of light rays for more depth of focus and visual acuity
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 maximized and thus creating a balanced and natural vision.

See also Shah S., Buckhurst PJ et al.
Advantages of the new $M_{\text{plus}}^X$-technology compared to LENTIS$^\text{®}$ $M_{\text{plus}}$:

- Extended depth of focus for all ranges of vision
- Maximised light efficiency of >95%
- Increased pupil independence, now also for very small pupils
- Minimal to no halo and glare
- Very good twilight vision

Proven benefits of the $M_{\text{plus}}$-technology compared to rotationally symmetric MIOLs:

- Excellent visual acuity results for the near, intermediate and distance ranges
- High pupil independence
- +3.0D addition
- Proven HydroSmart*-Acrylat
- Optimised image quality
- Minimal loss of light
- Aberration neutrality for better depth of focus
- Genuine 360° sharp optic edge
- Short adaptation phase
- Natural contrast and colour perception

Patient surveys confirm:

- Very high level of spectacle independence in all distances
- Above average patient satisfaction

Simply implant

LENTIS$^\text{®}$ $M_{\text{plus}}^X$
**LENTIS® Mplus**

**Mplus success story: Convincing clinical results!**

4 years on the market, about 200,000 implants worldwide, peerless to date. The unique multifocal IOL technology of the Mplus series has convinced doctors and patients with above average visual acuity results. In the following we will present several of the clinical results obtained so far.

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

**Excellent contrast sensitivity results**

The question raised by Prof. Sunil Shah’s presented graphics focuses on contrast sensitivity. The charts compare the contrast sensitivity of multifocal IOLs with those of the rotationally asymmetric LENTIS® Mplus MIOLs. Conventional, rotationally symmetric multifocal IOLs are known for their problems with contrast sensitivity due to the technologically induced high loss of light. In comparison, the sector shaped Mplus-MIOL, with its very good light efficiency, shows a naturally high contrast sensitivity equal to those of multifocal IOLs.

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**More than 200,000 Mplus-implantations worldwide!**
Visual acuity results of almost 10,000 LENTIS® Mplus IOLs clinical evaluated: in a large comparative study, carried out by Professor Jan Venter between November 2009 and September 2011, 9,366 eyes of 4,683 patients were treated with LENTIS® Mplus intraocular lenses. During a 6-month follow-up study, the near, intermediate and distance visual acuity results of 4,240 LENTIS® LS-312 MF30 IOL models (C-loop design) and 5,126 LENTIS® LS-313 MF30 IOL models (plate haptic design) were compared with each other, before and after surgery, and evaluated. The visual acuity of the patients was excellent for all distances for both lens models.

In addition, a patient survey was carried out. 98% of the patients were happy with the results after surgery and 86% had no problems reading very small print. Almost all patients would therefore unreservedly recommend the LENTIS® Mplus!
The subjective defocus graph of the LENTIS® Mplus, provided by Dr. Pierre-Jean Pisella, shows the above-average intermediate visual acuity of this rotationally asymmetric multifocal IOL compared to two concentric ring MIOL types currently available on the market.

Far visual acuity: All investigated MIOL show very good visual acuity results for the far distance range and show no significant differences.

Near visual acuity: The optimally usable near vision distance differs due to the actual addition of the tested MIOLs. At the average reading distance of 40 cm (defocus at -2.5D) all evaluated MIOLs achieve a very good near visual acuity of approximately 0.1 logMAR. The diffractive MIOL (type B) provides sharp vision at very short distances, e.g. at 33 cm, but with a greatly reduced visual acuity in the entire intermediate range. The performance of the concentric ring refractive MIOL (type A) is highly dependent on the existing light conditions and the resulting pupil size. A longer reading time is only possible under daylight conditions due to the usable areas of this IOL optic and the physiological miosis.

Intermediate visual acuity: Most of every days visual tasks are mastered, however, in the so-called intermediate region, which is why the intermediate visual performance of a MIOL is of a particularly high importance. At the viewing distance of 60 cm to 2 m almost all daily activities take place, such as computer and office work, driving a car, shopping at the supermarket or watching television. Therefore, a modern MIOL should offer an excellent intermediate vision to ensure that patients’ needs of glasses are substantially reduced. The comparative study shows clearly that only the LENTIS® Mplus offers very good intermediate visual acuity over this important visual range. These results are significantly better than those achieved by the concentric rings MIOLs.

Conclusion: With the LENTIS® Mplus multifocal IOL ophthalmologists can offer their patients a balanced intraocular MIOL-solution: It guarantees a high level of spectacle independence in the distance range, throughout the whole intermediate range and in a reasonable reading distance of 40 cm.
LENTIS® Mplus

Prof. Dr. Gerd U. Auffarth, University Ophthalmology Clinic Heidelberg, Germany

A multi-centre study under the management of Prof. Dr. Gerd U. Auffarth die LENTIS® Mplus were implanted in 134 eyes of 79 patients with an average age of 68 ± 12 years, confirmed that the MIOLs produced very good functional results with a very high patient satisfaction rate of 95%. The IOLs were implanted both unilaterally and bilaterally without any complications. The mean IOL strength was 21.00 ± 2.01D. Twelve months after surgery, a best-corrected distance visual acuity level of -0.03 logMAR was measured. The uncorrected near visual acuity level came to 0.08 logMAR. This corresponds to, on average, a distance visual acuity level of 1.10 and a near visual acuity level of 0.83.

**Figure:** Compared to other multifocal IOL technologies, the LENTIS® Mplus minimises the loss of light remarkably below 7%! This gain of light for the actual visual acuity guarantees better contrast sensitivity and image quality for the patients.

**Visual acuity: LENTIS® Mplus - up to 12 months after implantation**

- **UCVA:** uncorrected near visual acuity
- **BCDVA:** best-corrected distance visual acuity
What do the professionals say about the LENTIS® Mplus™?

"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. Sunil Shah, MD, FRCOphth, 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® MplusX IOL and, therefore, at the moment it is my first choice among multifocal IOLs."  

Hiroyuki Arai, MD, PhD, 02/2014

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

"I think that what we have to remember is that diffractive multifocal lenses have been available for 20 years, with a typical energy loss of approximately 20%. If we compare this to 7% (with the Mplus), the difference is not the 14% or 15% we showed in our study—the difference is a 66% less loss of energy. I think if you look at it from this perspective, then you can understand the big difference between this and other multifocal IOLs."

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

"There are 40 Optical Express clinics in the United Kingdom, and each clinic performs laser vision correction as well as refractive lens exchange/cataract procedures. [...] Ninety-five percent of all patients who are treated at one of our centers will receive the Mplus. [...] We have so much confidence in the Mplus that the surgeon sees the patient on the day of surgery for the first time."

Prof. Dr. Jan A. Ventes, MD in LENTIS® Mplus and LENTIS® Mpluss™ - Advanced multifocal IOL technology for the treatment of presbyopia, astigmatism, and cataract, supplement to CRST Europe 02/2012.

"My results were so good that I moved to implanting only this lens, without particular discrimination in terms of patient selection."

Prof. Dr. Jorge L. Alió, MD, PhD in LENTIS® Mplus – The only Presbyopia Lens with HD Vision, supplement to CRST Europe 05/2010.
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Sunil Shah, MD, FRCOphth, FRCS(Ed), Management of Mplus Problems, Midland Eye Institute, 2013, Data on File.

**Product**

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<th>Type</th>
<th>LENTIS®&lt;sup&gt;m&lt;/sup&gt;plusX</th>
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<tr>
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<tr>
<td>Overall Length</td>
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<td>Haptic Angulation</td>
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<td>Optic Design</td>
<td>Dioptric: Convex-concave, Biconvex, Aspherical surface - posterior, Sector shaped near vision segment - anterior: +3.0 D</td>
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<td>Design</td>
<td>Optic and haptics with square edges, Posterior 360° continuous barrier effect</td>
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<tr>
<td>Material</td>
<td>HydroSmart&lt;sup&gt;®&lt;/sup&gt; - a copolymer, consisting of acrylates with hydrophobic surface, UV absorbing</td>
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**Estimated A-Factor**

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<th>Haigis</th>
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<td>A</td>
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<td>a0 = 0.95</td>
<td>pACD = 5.21</td>
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<td>ACD</td>
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<td>a2 = 0.10</td>
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**Anterior Chamber Depth**

4.97 mm

**Recommended Incision Size**

2.0 mm / 2.4 mm

**Recommended Injector**

[reusable]
- Injector: Viscoject-1-hand: L60420S, Viscoject-2-hand: L60421S
- Cartridges: Viscoject B/IO 1.8 Cartridge-Set: L604250C<sup>*</sup>, Viscoject B/IO 2.2 Cartridge-Set: L604240C

**Recommended Injector-Set**

[disposable]
- Viscoject B/IO 1.8 Injector-Set: L604350C<sup>*</sup>, Viscoject B/IO 2.2 Injector-Set: L604340C

* max. 25.00

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

References: 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.
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