
# VisuMax

Defining the pulse rate in refractive surgery

ZEISS

We make it visible.

// VisuMax
MADE BY CARL ZEISS

## **Its remarkable features are its precision and innovative detail.**

New trends in modern corneal surgery.

With the VisuMax®, Carl Zeiss is significantly shaping the world of refractive surgery. This ground-breaking laser system employs high-performance femtosecond laser technology and is characterized by its outstanding cutting precision, unsurpassed speed and gentle treatment technique. The VisuMax is thus the ideal platform for therapeutic and refractive applications of cutting-edge corneal surgery, including Flap, Keratoplasty, Incision for ICR and ReLEx®.

With ReLEx, VisuMax heralds a paradigm shift in refractive surgery: minimally invasive laser vision correction. It completes the unparalleled range of innovative surgical possibilities and creates the ideal preconditions for tapping into new patient groups.

VisuMax is the logical enhancement of the product range for refractive surgeons – and marks another step into the future of corneal surgery, the progress of which Carl Zeiss has been shaping for more than 20 years.

# VisuMax applications

## Precision in all facets

The VisuMax® is extraordinary in all major applications of state-of-the-art corneal surgery. The innovative femtosecond laser system brings together perfectly coordinated components to provide maximum cutting precision, efficiency, predictability and comfort.

**ReLEx**

With the minimally invasive refractive procedure, ReLEx® smile, VisuMax enables a new, flapless technique. In a single step, the femtosecond laser creates the refractive lenticule, and the access through which the lenticule is extracted. Without ablation and without a flap.

**Flap**

In Femto-LASIK and Laser Blended Vision for treating presbyopic patients, the VisuMax stands out as a flap cutter. It provides predictable flap thickness and adjustable geometries.

**Keratoplasty**

VisuMax offers a broad spectrum of corneal transplant procedures, including lamellar and penetrating keratoplasty. High-precision cutting quality and rapid incision progress enable the preparation of precision corneal grafts and ideal preparation of the recipient's cornea.

**Incision for ICR**

The VisuMax also impresses with its femtosecond laser technology for the implantation of intracorneal rings. It even permits inclined cutting geometries and ring tunnels smaller than 360° and offers a previously unachieved degree of flexibility when defining the tunnel parameters.

# VisuMax strengths

## Building blocks of state-of-the-art femtosecond technology

***A contact glass as ingeniously designed as the cornea***

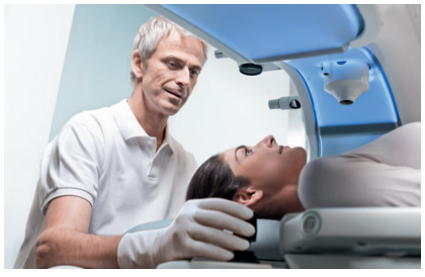
*The surface of the human cornea is curved. Thus, Carl Zeiss contact glasses are curved way, too. The three different sizes available (S, M, L) ensure an optimal fit to the anatomy of the eye. The cornea is not forced into a deformed planar, non-physiological shape – and artifacts are avoided in the cutting result, as is unnecessarily high IOP.*

***Maximum cutting precision***

*High-precision optics from Carl Zeiss provide an extremely focused laser beam. The result: minimum laser pulse energy at a high pulse frequency for hitherto unsurpassed incision control – at precisely the desired depth in the cornea, even with three-dimensional, curved incisions.*

***Brilliant visual control***

*The integrated, high-quality ZEISS surgical microscope, including digital video camera for live recording of the surgical procedure ensures precise and complete control of each treatment step.*



***A smart unit***

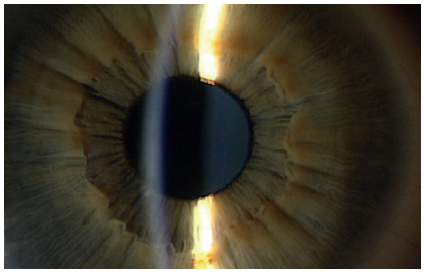
*The ergonomically pivoting patient supporting system ensures maximum comfort. The patient's position is continuously monitored during treatment and the sturdy yet comfortable patient supporting system is automatically adjusted during surgery.*

***Achieving objectives with intuition***

*The VisuMax can be easily controlled via its touch-screen and intuitive software. An interactive wizard supports the surgeon during all steps.*

***Efficiency paying off***

*With a laser pulse frequency of 500 kHz, the VisuMax realizes short treatment times. This means more comfort for both physician and patient. In addition, the user benefits from a more efficient workflow and a higher throughput of satisfied patients.*



***Slit illumination for greater detail***

*As a universal workstation for corneal surgery, the VisuMax features integrated slit illumination for monitoring and control immediately after the respective treatment, without the patient having to switch places or change position.*

# ReLEx

## For a new flapless treatment

With ReLEx®, the VisuMax® enables the fusion of cutting-edge femtosecond technology and precise lenticule extraction to provide minimally invasive vision correction. A refractive lenticule is created in the intact cornea and removed via a small incision. Without ablation. Without a flap. The treatment is thus a **flapless**, **all-femto** and **single-step** procedure.

**Flapless**

ReLEx is turning the world of refractive surgery on its head. In ReLEx smile, a small incision is sufficient to extract the lenticule. The minimally invasive incision also implies fewer transected nerves and significantly reduced incidence of dry-eye syndrome. The risk of infections, epithelial ingrowths or flap complications can be reduced. The smaller incisions enable better healing of the epithelium.

**All-femto**

With the VisuMax, ReLEx relies completely on femtosecond technology. The unique laser vision correction procedure creates the pre-calculated lenticule in the cornea with precision and predictability. Nomograms or fluence tests are not required, intraoperative ambient conditions or individual corneal characteristics have virtually no influence on the reproducibility of the lenticule. Physicians benefit from excellent predictability, particularly when correcting higher refraction values.

**Single-step**

With ReLEx, both the lenticule and the access incision are created in a single treatment step. Unlike Femto-LASIK, therefore, only one surgical procedure needs to be planned. There is no need for the patient to switch places. The result is more efficient workflows and shorter treatment times. For patients, the procedure is a much less stressful experience.

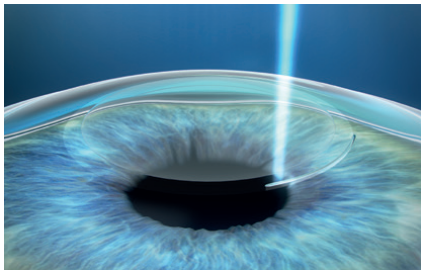
**ReLEx is not intended for sale in the United States.**

**Outstanding results**

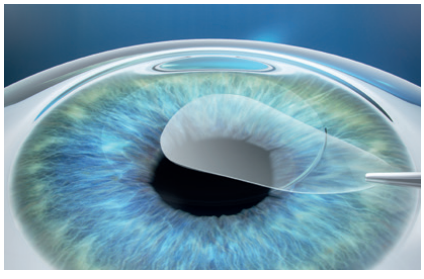
- Small incision of less than 4 mm
- Side-cut length up to 80 % shorter and
- Cap incision area up to 30 % smaller than for a Femto-LASIK flap
- Implies lower incidence of dry eye syndrome and less nerve transection due to smallest of incisions with no flap
- Less risk of infections, epithelial ingrowths and flap complications
- Reproducibility of the lenticule, irrespective of individual corneal characteristics and ambient conditions
- Excellent predictability, particularly when correcting higher refraction values
- Efficient treatment process without patient having to switch places

# ReLEx smile

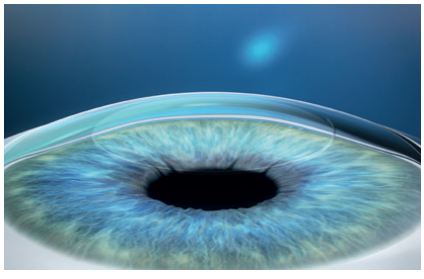
Small Incision Lenticule Extraction



*In a single step, the VisuMax creates a refractive lenticule and a small incision of less than 4 mm in the otherwise intact cornea - almost irrespective of the ambient conditions or corneal structure.*



*The lenticule is removed through the small incision. The disruption to the biomechanics of the cornea is minimal. No flap is cut.*



*The removal of the lenticule alters the shape of the cornea, thus achieving the desired refractive change.*

# Flap

## For best possible conditions

For Femto-LASIK and the treatment with Laser Blended Vision, VisuMax® means above all one thing: high-precision flaps. Combined with the excimer laser MEL 80™ and the treatment planning station CRS-Master®, it offers an optimally coordinated system solution for refractive laser surgery – for a convenient workflow, efficient patient management and the best possible results.

**The combination of precision and efficiency**

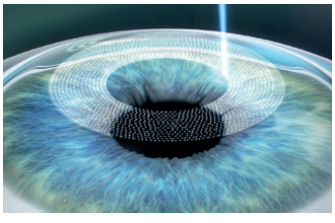
- High-precision flaps due to high-performance femtosecond technology
- High reproducibility and consistency of flap thickness
- Easy repositioning of the flap
- Optimum workflow due to perfectly coordinated system components
- Smooth, finely structured surface of the stromal bed
- Prevents unnecessarily raised IOP and thus temporary losses of vision and trauma, due to the anatomically curved contact glass and the non-scleral suction.

**Pivotable patient supporting system – Optimum workflows for greater comfort**

The shared use of the pivotable patient supporting system by the VisuMax and the MEL 80 saves the patient from having to move from one treatment location to another. The patient experiences the surgery as an integrated process. Unnecessary waiting periods are minimized and treatment efficiency increased.


## Femto-LASIK

Laser-in-situ-Keratomileusis



*The VisuMax femtosecond laser creates the flap.*

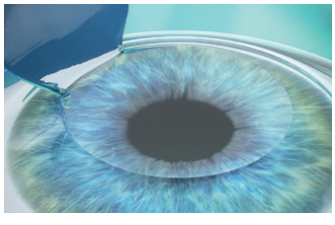
**MEL 80 –**
**All you need for optimum results**

All the parameters of this high-precision excimer laser are geared to increasing efficiency, achieving optimum treatment results and rapid visual recovery. Key factors here are the extremely high ablation speed, customized treatment planning with the optional CRS-Master, the high-performance eyetracker system and eye registration.

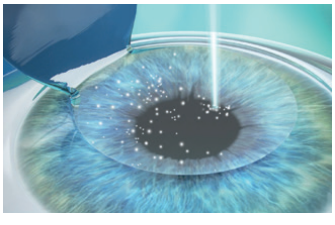
**CRS-Master – For a truly individual treatment**

As a state-of-the-art treatment planning tool, the CRS-Master transfers data from the wavefront diagnosis and corneal topography into the MEL 80. This additional incorporation of patient-related data makes it possible to create a complete, individual eye profile for Femto-LASIK or Laser Blended Vision that is perfectly tailored to the patient.

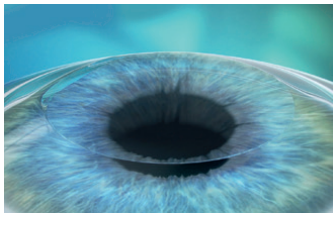
*The patient moves to the MEL 80 excimer laser.*



*The flap is manually opened and folded back to expose the deeper corneal layer (stroma) beneath.*



*The MEL 80 excimer laser ablates the pre-calculated corneal tissue point by point.*



*The upper corneal layer is then repositioned following the refractive correction.*

# Keratoplasty

## For high-precision tissue grafts

With the Keratoplasty option, the VisuMax® quickly converts into a state-of-the-art workstation for corneal grafts. The excellent cutting quality and laser control enable smooth lamellar and circular incision areas for high-precision results.

**Broad spectrum for keratoplasty**

The Keratoplasty option for the VisuMax comprises functions specially developed for corneal grafts and their optimization. High-precision and rapid incision progress, combined with a high level of reproducibility, mean that the VisuMax can be used for the three most important corneal graft procedures:

- Penetrating Keratoplasty (PKP)
- Deep Anterior Lamellar Keratoplasty (DALK)
- Descemet's Stripping Endothelial Keratoplasty (DSEK)

**Perfect tissue grafts**

The unique adapter attached to the headrest of the patient supporting system serves as an ideal work platform for preparing the corneal donor graft as well as the recipient's cornea.

*The practical adapter provides a robust and sterile work surface for preparing the corneal graft.*

**Specially developed contact glass (type KP)**

The curved contour of the contact glass prevents any unnecessary compression of the corneal tissue. It is also compatible with most artificial anterior chambers.

*Contact glass (type KP) for preparing the donor cornea*

**The option "Endothelial Keratoplasty" is not intended for sale in the United States.**

**Precise results**

- High-precision cutting quality in anterior lamellar and endothelial Keratoplasty
- Penetrating Keratoplasty with perfect fit for donor and recipient cornea
- Precisely predictable incision pattern for greater reliability when preparing thin grafts
- Small spot distance for excellent cutting quality and easy separation of the tissue
- Flexible adjustment of the cutting parameters on the VisuMax

**Maximum efficiency for optimum workflows**

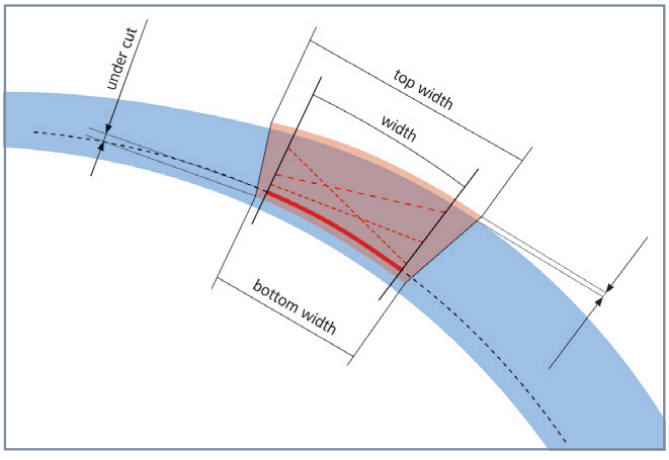
- 500 kHz laser pulse frequency for faster, more precise treatments and shorter cutting times (typically less than 60 seconds), even for very deep cuts
- High-quality surgical microscope for all treatment phases
- Practical adapter for preparing the donor cornea
- Special contact glass (type KP) compatible with most artificial anterior chambers

*View through the surgical microscope of the VisuMax: Separation of the cut lamellae from the recipient cornea*

# Incision for ICR

## For flexible access

When implanting intracorneal ring (ICR) segments, surgeons benefit from the unique advantages of the VisuMax® femtosecond laser. The Incision for ICR option offers the possibility, for the first time, to create even inclined cutting geometries and tunnel segments between 90° and 270°. The repeatedly proven femtosecond laser technology ensures not only high-precision cutting quality but also previously unattainable degrees of freedom when defining the tunnel parameters.




*Freely variable cutting parameters: for the first time, an incision can even be created parallel to the posterior surface of the cornea.*

**Degrees of freedom redefined**

The VisuMax allows the corneal tunnels for the implantation of intracorneal ring (ICR) segments to be prepared quickly and easily, in the precise position and depth required. The wide range of adjustable parameters and the various combinations thereof give surgeons a unique degree of flexibility.

**Tailor-made segments**

For the first time, it is also possible to create tunnels with an arc angle of less than 360° using a femtosecond laser: With segments of between 90° and 270° partial tunnels can be designed individually, with precision and a high degree of flexibility. This means that individual intracorneal ring segments can also be implanted, without creating unnecessary incisions in the corneal tissue. Thus, tunnels can also be created for mixed ring segments with different geometries.


**New treatment alternatives offer individual benefits**

- The option to select between 0, 1 or 2 trapezoidal access incisions facilitates flexible tunnel access
- Width and inclination of the tunnel can be freely defined and precisely adjusted to the individual corneal shape and the applied ring geometry
- Seamlessly integrated into the user interface of the VisuMax, the ICR option provides maximum ease of use
- Rapid and intuitive entry of the necessary parameters
- The possibility to save user-defined cutting geometries as reusable templates increases workflow efficiency
- Reliability enhancement by graphic visualization of the parameter selection and automatic consistency check of the input parameters
- The unique contact glass is modelled on the natural shape of the corneal surface and thus contributes to patient-friendly treatment methods.
- Excellent control of tunnel preparation and ICR implant insertion as well as complete video documentation using the high-quality ZEISS surgical microscope

**All common ICR products are supported.**
**The option Incision for ICR is not intended for sale in the United States.**

# Technical data

## Installation and operating instructions

| VisuMax femtosecond laser system | | |
|---|---|---|
| **System components** | Patient supporting system, including platform<br>Integrated uninterruptible power supply (UPS)<br>Surgical microscope with additional slit illumination<br>Integrated with digital recording video camera | |
| **Laser parameters** | Wavelength<br>Pulse duration<br>Laser pulse rate | 1043 nm<br>220–580 fs<br>500 kHz |

| Installation and set-up conditions | |
|---|---|
| **Weight** | 870 kg (including patient supporting system, platform, UPS) |
| **Recommended space requirement** | 4.40 m x 3.80 m (standalone) |
| **Electrical connection** | 100–240 V, 50/60 Hz, max. 16 A<br>Separately fused circuit |

| Operating conditions | |
|---|---|
| **Room temperature** | 18 to 25 °C |
| **Atmospheric humidity** | 30 to 70 % |
| **Accessories** | Single-use contact glasses Treatment Pack (sizes S / M / L and type KP)<br>Keratoplasty adapter for patient supporting system |

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