IOL Con - Interface to Optical Biometer
(version 1.6)

To whom it may concern,

The following document contains the information required for manufacturers of biometry devices and medical software developers to create the necessary interfaces to download intraocular lens data and upload surgical results as Extensible Markup Language or Comma Separated Values file.

Contact: admin@iolcon.org

Specification of the Extensible Markup Language: http://www.w3.org/XML

Updates are marked green for new, yellow for changed, red for removed.

1. Login

User login at iolcon.org is performed by a HTTP-POST method at

https://iolcon.org/login.php

You have to provide attributes “username” and “password”. IOL Con will then try to set a session cookie, named “sid”, which is used to identify the user.

2. Surgical Results Upload

Results uploads may be performed by a HTTP-POST method after login and with the session cookie provided at

https://iolcon.org/parseResultsFile.php

Description of all tags in the surgical results file to upload:

Element / *Attribute*	Description	Type / Unit
<?xml … ?>	XML declaration of the data format	
IOLCon	Root tag contains all uploaded results	
fileVersion	Version of this file format	text
Result	Root tag of a surgical result	
Institution	Name/identifier of the clinic	text
Surgeon	Name/identifier of the surgeon	text
Biometer	Type of the biometer	text
Keratometer	Type of keratometer *(optional)*	text
Patient	Root tag of patient data	
CaseID / CaseUUID	Case unique identifier *(optional)*	text
Ethnicity	Specific ethnicity *(optional)*, needed to filter constants, e.g. “caucasian”, “hispanic”	text
Eye	Left / right *(optional)*	text
VisualAcuity / Visus	Best corrected visual acuity *(optional)*	decimal
Lens	Root tag of lens data	
Manufacturer	Manufacturer name/identifier	text
Name	Lens name/identifier	text
Position	Intended implant position *(optional)*: capsular bag *(default)* / sulcus ciliaris / retro iridal / pre iridal / anterior chamber	text
PowerEquivalent	Give either spherical equivalent or sphere and cylinder. If both are given, then PowerEquivalent will be preferred	dioptre
PowerSphere		dioptre
PowerCylinder		dioptre
CylinderAxis	Angle of cylinder axis (optional)	degree
Biometry / Measures	Root tag of biometry related data	
KeratometryIndex	Based on the biometer to convert dioptre to millimetre, e.g. 1.3375	decimal
AxialLength	Axial length	millimetre
AnteriorChamberDepth	Anterior chamber depth	millimetre

Element / *Attribute*	Description	Type / Unit
LensThickness	Central lens thickness *(optional)*	millimetre
KeratometryFlat	Flat meridian of keratometric radius of curvature	millimetre
KeratometrySteep	Steep meridian of keratometric radius of curvature	millimetre
FlatAxis	Angle of flat axis *(optional)*	degree
PostOp	Root tag of post-surgical data	
RefractionSphere	Manifest spherical equivalent refraction sphere	dioptre
RefractionCylinder	Manifest spherical equivalent refraction cylinder, if negative it is interpreted as minus cylinder notation, otherwise as plus cylinder notation	dioptre
CylinderAxis	Angle of cylinder axis *(optional)*	degree

Example results file:

```
<?xml version="1.0" encoding="UTF-8" ?>
<IOLCon fileVersion="1.6">
    <Result>
        <Institution>Saarland University</Institution>
        <Surgeon>Dr. Smith</Surgeon>
        <Biometer>OA-2000</Biometer>
        <Patient>
            <CaseID></CaseID>
            <Ethnicity>european</Ethnicity>
            <Eye>left</Eye>
            <VisualAcuity>0.9</VisualAcuity>
        </Patient>
        <Lens>
            <Manufacturer>XO test</Manufacturer>
            <Name>iLens 1000</Name>
            <Position></Position>
            <PowerSphere>19.25</PowerSphere>
            <PowerCylinder>4.75</PowerCylinder>
            <CylinderAxis></CylinderAxis>
        </Lens>
        <Biometry>
            <AxialLength>23.77</AxialLength>
            <AnteriorChamberDepth>3.64</AnteriorChamberDepth>
            <LensThickness>3.88</LensThickness>
            <KeratometryFlat>8.03</KeratometryFlat>
            <KeratometrySteep>7.65</KeratometrySteep>
            <FlatAxis></FlatAxis>
        </Biometry>
        <PostOp>
            <RefractionSphere>0.25</RefractionSphere>
            <RefractionCylinder>-0.75</RefractionCylinder>
            <CylinderAxis></CylinderAxis>
        </PostOp>
    </Result>
</IOLCon>
```

3. Lens Upload / Download

Lens downloads may be retrieved by a HTTP-GET method via

https://iolcon.org/downloadLenses.php

or e.g.

https://iolcon.org/downloadLenses.php?action=download&constants=optimized&ethnicity=all&biometer=all&institution=all&surgeon=all&lenses[]=170&lenses[]=186

Parameter	Allowed values
action	download
constants	nominal, optimized
ethnicity	all, caucasian, asian, hispanic, …
biometer	all, iolmaster, lenstar, oa2000, pentacamaxl, …
institution	all, unique institution name
surgeon	all, display name or user name of the surgeon
lenses / selectedLenses	ID number of selected lens

The selected lenses may be provided as one comma separated list (***lenses***) or multiple times as array elements (***lenses[]***) with the unique lens identifier as value. If the unique lens identifier is unknown, you have to skip this parameter to get all lenses with their ID and name.

If the request returns no results, then the constants in the downloaded XML file will be empty.

Description of all tags in the downloaded lens file:

Element / *Attribute*	Description	Type / Unit
<?xml … ?>	XML declaration of the data format	
IOLCon	Root tag contains all downloaded lenses	
fileVersion	Version of this file format	text
downloaded	Download date of this file	date
Lens	Root tag of an intraocular lens	
id	Unique lens identifier in the IOLCon database	number
lastChanged	Last update of the lens constants in this file	date
Manufacturer	Name of the intraocular lens manufacturer/reseller	text
Name	Lens name given by the manufacturer/reseller	text
Specifications	Root tag of technical parameters	
SinglePiece	True for monobloc / single piece IOL, otherwise false	boolean
OpticMaterial	PMMA, acrylic, silicone	text

Element / *Attribute*	Description	Type / Unit
HapticMaterial	PMMA, acrylic, silicone, PVDF	text
Preloaded	True for preloaded IOL, otherwise false	boolean
Foldable	True for foldable IOL, otherwise false	boolean
IncisionWidth	Minimum required incision width	millimetre
InjectorSize	Minimum required tip size of the injector	millimetre
Hydro	hydrophilic or hydrophobic	text
Filter	Filter information, e.g. ”Blue light filter”, “Blue blocking”, “AcrySof Natural”	text
RefractiveIndex	Refractive index of the lens material @ 589 nm	decimal
AbbeNumber	Abbe number (optional)	decimal
Achromatic	True for IOL with chromatic aberration, otherwise false	boolean
OpticDiameter	Optic diameter	millimetre
HapticDiameter	Haptic (full) diameter	millimetre
OpticConcept	Optical concept, e.g. “multifocal”, “bifocal”, “monofocal”, “EDOF”	text
HapticDesign	Design of the haptic, e.g. “modified C-loop”	text
IntendedLocation	Intended location of the IOL, e.g. “posterior chamber”	text
OpticDesign	Design of the optical surfaces, e.g. “sphere” or “asphere”	text
Aberration	Spherical Aberration type of the IOL, e.g. “none”, “correcting” or “neutral”	text
saCorrection	Amount of correction of spherical aberration Z(4,0)	micrometre
Toric	True for IOL with toric design, otherwise false	boolean
Availability	Root tag of available powers, interpreted as plus cylinder notation	
RefractivePower	For toric lenses, either “sphere” or “spherical equivalent”	
Sphere	Spherical power	dioptre
range	Number of range set	
From	Minimum available power for this set	dioptre
To	Maximum available power for this set	dioptre
Increment	Power increment for this set	dioptre
Cylinder	Cylinder power	dioptre
range	Number of range set	
From	Minimum available power for this set	dioptre
To	Maximum available power for this set	dioptre

Element / *Attribute*	Description	Type / Unit
Increment	Power increment for this set	dioptre
Addition	Addition power in diopters	dioptre
distance	Distance information for this addition value, either “near”, “intermediate” or “edof”	text
Constants	Root tag of lens constants	
type	Type of constant set, either “nominal” (manufacturer), “optimized” or “personalized” (IOL Con)	text
results	Number of results found with the given filters	
ethnicity	Ethnicity of the patient for the optimized constants or “all”	text
biometer	Name/type of the optical biometer which the constants are based on or “all”	text
institution	Name/identifier of the Institution/clinic of the ophthalmologist which contributed the data for the optimization or “all”	text
surgeon	Name/identifier of this ophthalmologist, if personalized constants or “all”	text
Ultrasound	Ultrasound A-constant	
SRK2	A-constant for the SRK2 formula	
SRKt	A-constant for the SRK/T formula	
Haigis	Root tag for the Haigis constant triplet	
a0	a0 constant	
a1	a1 constant or default value 0.4	
a2	a2 constant or default value 0.1	
HofferQ	pACD for the HofferQ formula	
Holladay1	Surgeon factor for the Holladay 1 formula	
Olsen	C constant for Olsen formula	
Barrett	Barrett formula *(not yet implemented)*	

Example lens file:

```
<?xml version="1.0" encoding="UTF-8" ?>
<IOLCon fileVersion="1.6" downloaded="2018-06-01">
     <Lens id="123">
          <Manufacturer>XO test</Manufacturer>
          <LensName>First Lens</LensName>
          <Specifications>
               <OpticMaterial>PMMA</OpticMaterial>
               <Preloaded>no</Preloaded>
               <IncisionWidth>7.5</IncisionWidth>
               <Filter>clear</Filter>
               <OpticDiameter>6</OpticDiameter>
               <HapticDiameter>12</HapticDiameter>
               <OpticConcept>monofocal</OpticConcept>
               <OpticDesign>asphere</OpticDesign>
               <Aberration>neutral</Aberration>
               <Toric>no</Toric>
          </Specifications>
          <Availability>
               <Sphere range="1">
                    <From>0</From>
                    <To>20</To>
                    <Increment>0.25</Increment>
               </Sphere>
          </Availability>
          <Constants type="nominal">
               <Ultrasound>118.9</Ultrasound>
               <SRKt>118.7</SRKt>
               <Haigis>
                    <a0>2.8</a0>
                    <a1>0.4</a1>
                    <a2>0.1</a2>
               </Haigis>
               <HofferQ>5.43</HofferQ>
               <Holladay1>1.23</Holladay1>
               <Olsen></Olsen>
          </Constants>
     </Lens>
     <Lens id="456">
          <Manufacturer>XO test</Manufacturer>
          <LensName>Second Lens</LensName>
          <Specifications>
               <OpticMaterial>Acryl</OpticMaterial>
               <Preloaded>yes</Preloaded>
               <IncisionWidth>2.5</IncisionWidth>
               <Filter>clear</Filter>
               <OpticDiameter>5</OpticDiameter>
               <HapticDiameter>11</HapticDiameter>
               <OpticConcept>bifocal</OpticConcept>
               <OpticDesign>sphere</OpticDesign>
               <Toric>no</Toric>
          </Specifications>
          <Availability>
               <Sphere range="1">
                    <From>0</From>
                    <To>20</To>
                    <Increment>0.5</Increment>
               </Sphere>
               <Sphere range="2">
```

```
                    <From>20</From>
                    <To>30</To>
                    <Increment>1</Increment>
               </Sphere>
               <Addition distance="near">1.7</Addition>
          </Availability>
          <Constants type="optimized" results="783">
               <SRKt>118.7</SRKt>
               <Haigis>
                    <a0>1.53</a0>
                    <a1>0.41</a1>
                    <a2>0.07</a2>
               </Haigis>
               <HofferQ>5.43</HofferQ>
               <Holladay1>1.23</Holladay1>
          </Constants>
     </Lens>
     <Lens id="789">
          <Manufacturer>XO test</Manufacturer>
          <LensName>Third Lens</LensName>
          <Specifications>
               <OpticMaterial>Acryl</OpticMaterial>
               <Preloaded>yes</Preloaded>
               <IncisionWidth>2.5</IncisionWidth>
               <Filter>clear</Filter>
               <OpticDiameter>5</OpticDiameter>
               <HapticDiameter>11</HapticDiameter>
               <OpticConcep>monofocal</OpticConcept>
               <OpticDesign>sphere</OpticDesign>
               <Toric>yes</Toric>
          </Specifications>
          <Availability>
               <Sphere range="1">
                    <From>0</From>
                    <To>20</To>
                    <Increment>0.5</Increment>
               </Sphere>
               <Cylinder range="1">
                    <From>0</From>
                    <To>10</To>
                    <Increment>1</Increment>
               </Cylinder>
          </Availability>
          <Constants type="personalized" results="137" ethnicity="all" biometer="all"
               instituition="UKS" surgeon="Dr. Schmidt">
               <SRKt>118.7</SRKt>
               <Haigis>
                    <a0>1.67</a0>
                    <a1>0.4</a1>
                    <a2>0.1</a2>
               </Haigis>
               <HofferQ>5.43</HofferQ>
               <Holladay1>1.23</Holladay1>
          </Constants>
     </Lens>
</IOLCon>
```