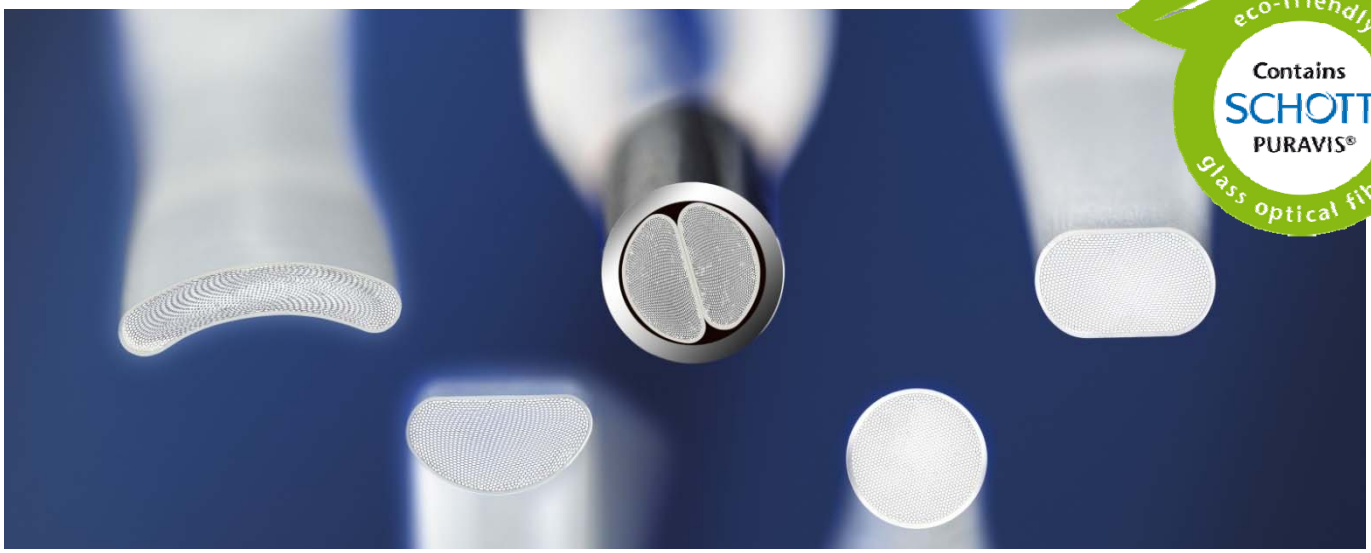
PURAVIS® High Performance Shaped Fiber Rods

High Precision Light Guides for Dental Handpieces, Turbines and Instruments



Examples of end configurations of shaped fiber rods

PURAVIS® premium quality shaped fiber rods are highly efficient light guides bringing the light from the light source in the back of the instrument to the tip to ensure perfect light at the area of treatment. Consisting of a plurality of fused core/clad systems, the Multi Core Rod type MCR-85S features excellent forming properties, allowing for complex 2D and 3D geometries precisely fitting into your instrument.

PURAVIS® glass features excellent transmission due to purest raw materials. The remarkable acceptance angle of up to 85° takes advantage of the full directional characteristic of your light source, thus allowing for premium light performance at the place of operation. The excellent mechanical and chemical stability guarantee a long lifetime and robustness of the shaped fiber rods.

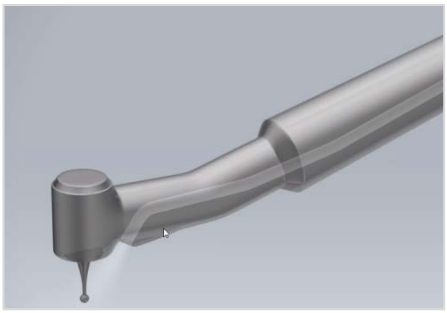
The enhanced transmission band improved for wavelengths below 400 nm allows for the integration of new diagnostic applications based on fluorescence diagnostics (e.g. caries detection) turning your instrument into a multi-functional tool.

The proprietary production process of SCHOTT enables PURAVIS® shaped fiber rods to be the world's most eco-friendly rigid light guides. They not only comply with the EU directives RoHS and REACH today but are ready for future environmental regulations – worldwide. This guarantees security of supply and makes regulatory accreditation of your instrument easy.

Technical Data	
Description	**MCR-85S**
Core Type	Multi
Material Core / Cladding	High Purity Optical Glass **without lead, arsenic, antimony** Fully RoHS compliant
Color of Outer Clad	Clear
Numerical Aperture	0.68
Eff. Acceptance Angle according to DIN 58 141 Part 3 Theoretical value at λ 587.6 nm	85°
Biocompatibility According to DIN ISO 10993-5	Yes
Temperature • **Operational** (glass rod only) • **Storage/transport**	- 20°C/-4°F …+350°C/662°F - 20°C/-4°F …+ 70°C/158°F

Applications

- Dental handpieces
- Dental scalers
- Caries detection
- Oral cancer screening



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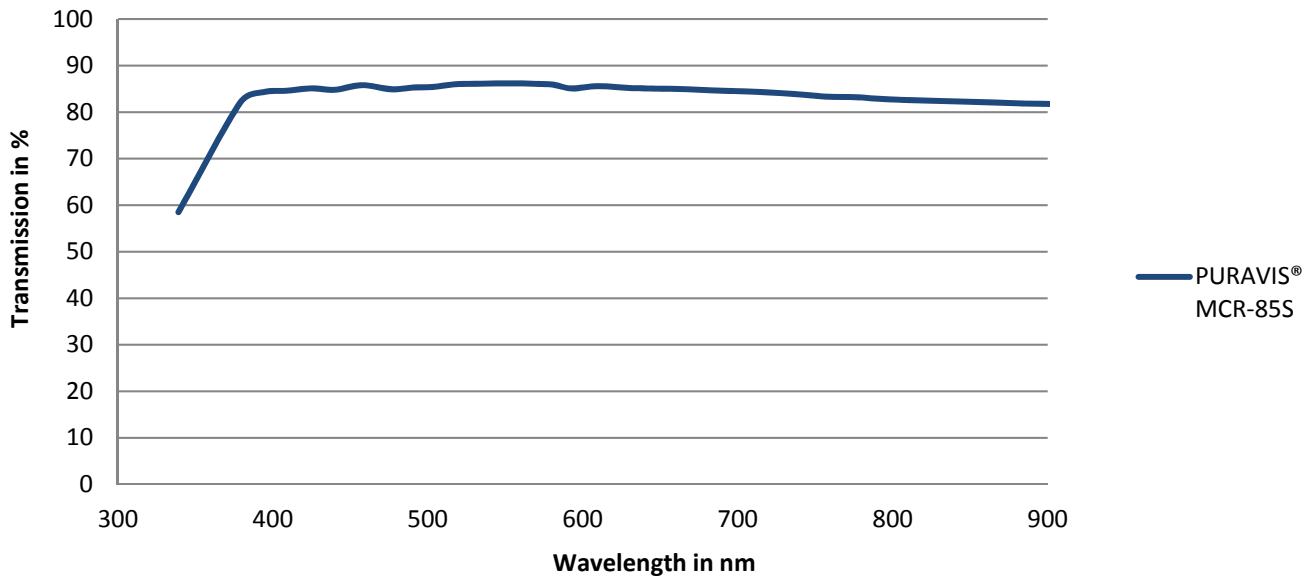
Typical Spectral Transmission MCR-85S

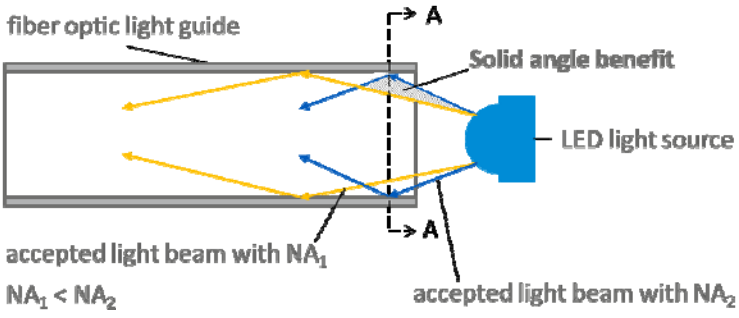
The transmission curve displayed below represent SCHOTT's typical manufacturing level for SCHOTT PURAVIS® MCR-85S and is monitored in the wavelenth range between 460 and 660 nm.

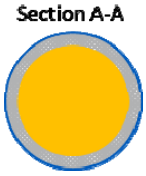


When further processed into the final shape the transmission may change, depending on the geometrical transformation

Numerical Aperture

The numerical aperture or respectively the acceptance angle of the basic rod is calculated by the ratio of the refractive indices of core and cladding. The large acceptance angle of up to 85° allows for maximum illumination.





The shown areas in Section A-A represent the ratio of total luminous flux of PURAVIS® (blue) compared to conventional fiber rods (yellow)

The numerical aperture of the shaped fiber rod is influenced by the design of the rod. In particular bends, angles, and transformations of the cross section will influence the final aperture of the rod. Due to plurality of different influences the aperture can not be predetermined, but needs to be evaluated in the final shaped rod.

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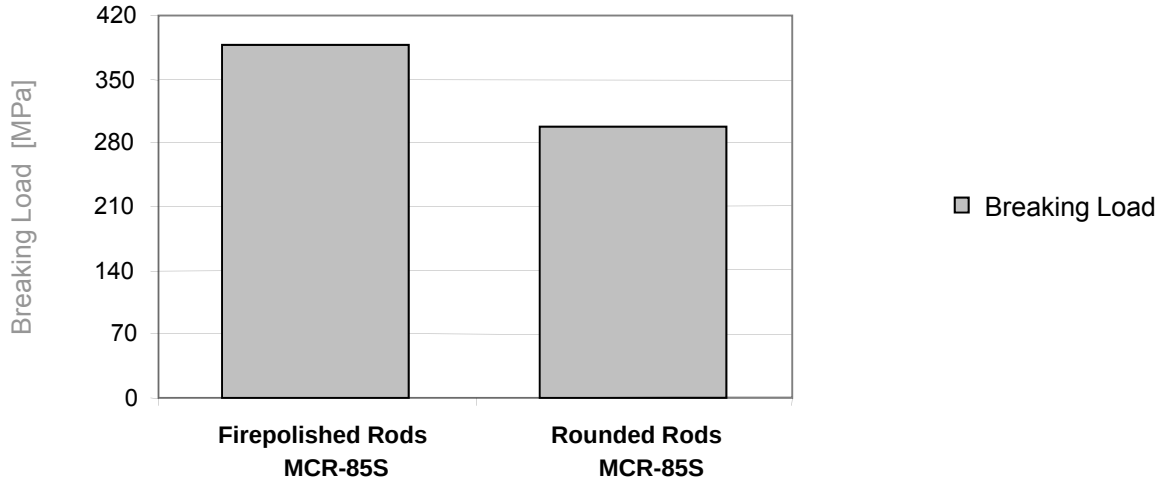
Mechanical Strength of Shaped Rods

Fire-polished MCR-85S rods have the original surface condition resulting from the initial rod drawing process. Diameter tolerances of the unprocessed rod are in the range of ± **0.03 mm**. This raw material tolerance will change during the shaping process. Fire-polished round rods feature the highest breaking resistance with slightly better deflection than rounded rods.

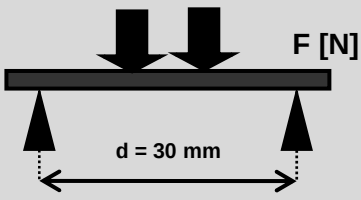
For higher requirements concerning mechanical tolerances the originally fire-polished MCR-85S rods can be **rounded**. These rods feature an improved diameter tolerance by mechanically grinding the outer diameter of the unprocessed rod to precise dimensions up to **+0/-0.02 mm**. This raw material tolerance will change during the shaping process. Since the common outer cladding is partially removed by the process, the breaking load resistance, is lower in comparison to fire-polished rods.

Mechanical Strength Measurements



Mechanical Strength of Shaped Rods

Test Conditions:	**4 Point Bending Test**
Sample geometry	• Round rods of diameter 2.5 mm
No. of samples	• 20 per type
Feed rate	• 2 MPa/s



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Design Guidelines for Shaped Rods

SCHOTT's shaping process enables a variety of different shapes and cross-sections to be realized.
The original circular shape of the basic rod can be transformed into flat, half-round or kidney-shaped designs. The straight rod can be angled in different shapes, realizing 2D as well as 3D configurations. Thus, the shape of the rod can be custom-tailored to the space requirements in the customer's application.

Quality Inspection

The precise dimensions of the shaped rods can be verified by an optical inspection system.

Some dimensions, i.e. angles or bends cannot be measured on the final rod, since reference edges are not accessible. In this case check dimensions will be agreed upon (see check dimension "ZZ" in the design guidelines on next page).

Design Details

Some basic values of dimensions and tolerances are listed in the table, as well as in the principle sketches of a shaped rod below. The design guidelines can only give a brief overview about general tolerances and angles, which can be realized. A combination of different requirements may result in variations basic numbers in the table below, which need to be agreed upon by the SCHOTT engineering department

Design Details

Light Input End

The light input end usually maintains a round shape to gather as much light as possible from the light source, usually a small footprint halogen bulb or a light emitting diode - LED. The maximum diameter of a shaped fiber rod is 3.0 mm. If the light path needs to be split into 2 arms, two half-round rods can be combined to a full circle.

Light Output End

The light output ends can have different shapes depending on the requirements. Round, flat or kidney-shapes are common, usually with a sharp bend right before the end surface

Diameter Tolerances

The tolerances of specified diameters depend on the shape of the component. In bent sections the outer diameters are slightly larger than the diameter of the basic rod, due to material bulging slightly sideways.

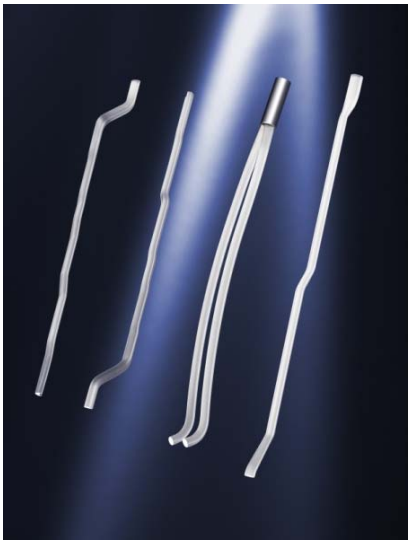
Angles

The shaping process allows the fiber rods to be bent in narrow bend radii. Standard values are ± 1°. Depending on the overall design smaller bend radii down to ± 0.5 mm are also possible.

Metal Ferrules

If required, metal ferrules can be attached to the final rod according to customer specifications.

Design examples



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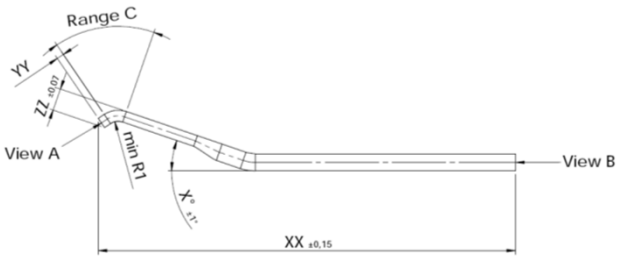
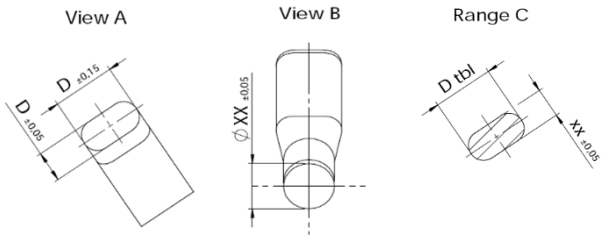
Design Guidelines for PURAVIS® Shaped Fiber Rods		
Characteristics	**Recommendation**	**Comment**
Diameter of basic rod before shaping	1.0 …3.0 mm	Reference view “B“
Diameter tolerance of shaped rod in round section	Fire-polished: ± 0.05 mm Rounded: ± 0.03 mm	Reference view “B“
Diameter tolerance of shaped rod in bent sections	Width: approx. 0.2 mm larger than maximum nominal diameter Height ≥ ± 0.05 mm	Reference range “C“
Minimum bending radii	Standard: ≥ 2.0mm Optional: ≥ 1.0mm	Informal dimension only
Bending angle tolerance	Standard: ≥ ± 1° Optional: ≥ ± 0.5°	Informal dimension only
Installation height bend to light output tolerance	± 0.07 mm	Reference length “ZZ“ Length ZZ is check dimension
Straight length between bend and light output area	Length: ≥ 1.0 mm	Reference length “YY“
Cross-sectional shape at light output	Standard: round, half-round, oval/flat Optional: kidney shape	See picture on page 1 of this datasheet for reference
Cross-section at light output	Should be perpendicular to the axis of the rod	Non-perpendicular cross-sections bear a high risk of chipped edges. In addition, the NA of the rod changes.
Tolerances at light output	Width: ≥ ± 0.15 mm Height: ≥ ± 0.05 mm	Reference view “A“
Overall length of shaped rod	30 mm … 150 mm	Reference length XX
Overall length tolerance	± 0.15 mm	Reference length XX





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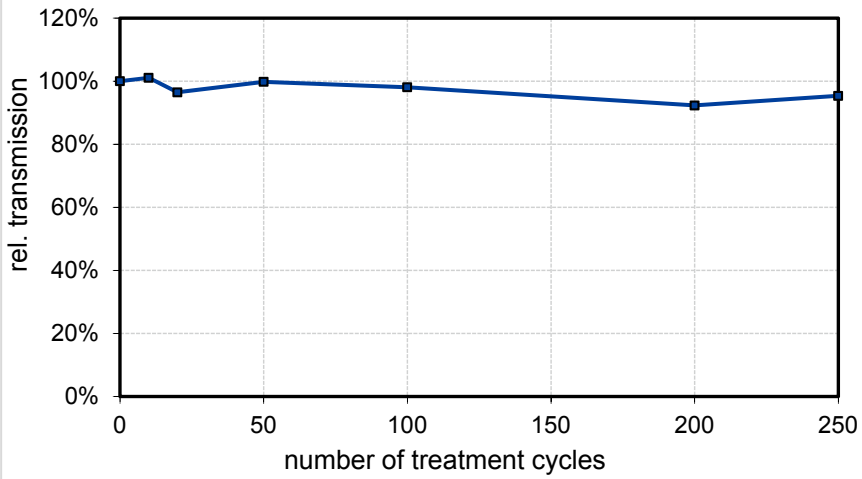
Chemical Resistance of Shaped Rods

MCR-85S rods feature excellent chemical resistance. Core and cladding glasses have high chemical resistance classes, which ensure long-term stability over their lifetime under repeated reprocessing cycles.

Resistance validated by optical measurement of relative transmission

- Measured in accordance with DIN 58 141 Part 2
- Aperture of light beam: 0.1
- Measurement wavelength: λ = 535 nm
- Prior to optical measurement cleaning of end surface with cloth and ethanol
- Autoclaving tests performed with un-mounted glass rods

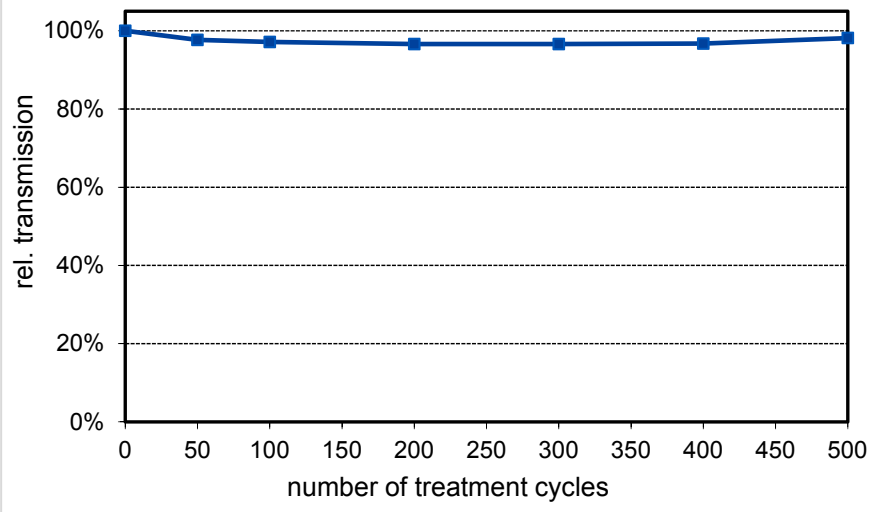
Thermal Disinfection Resistance MCR-85S



Thermal Disinfection Resistance

Test Conditions	
Unit	Miele Disinfector Automatic PG8535
Cleaning program	Standard program according recommendation of AKI (www.a-k-i.org)
Detergent	Neodisher Mediclean Forte 0,5% V/V

Autoclave Durability MCR-85S



Autoclave Durability

Test Conditions	
Autoclave	Standard laboratory autoclave
Autoclaving program	134 °C, 10 min. sterilization time, 40 min. cycle time

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