SAINT-GOBAIN PERFORMANCE CERAMICS & REFRACTORIES

CERAMIC SYSTEMS FOR KILNS & FURNACES
SAINT-GOBAIN TODAY

TOP 100 GLOBAL INNOVATORS

1 product out of 4 sold by Saint-Gobain today didn’t exist 5 years ago

3700 Researchers

Nearly 400 patents filed in 2019

One of the top 100 industrial groups in the world

Present in 68 countries

2019 turnover €42.6 Billion

PERFORMANCE CERAMICS & REFRACTORIES

Saint-Gobain Performance Ceramics & Refractories leads the industry in design, development and production of engineered ceramics and refractory products for extreme operating conditions and high temperature applications. Every product and material is designed to maximize performance and durability while minimizing environmental impact.

We strive to deliver value through our global technical expertise in material science, manufacturing technology, design engineering and the long-term partnerships we form with our customers. Our employees are committed to delivering the best solutions and services to meet the unique material and engineering needs of our customers.

Our ability to deliver custom-made solutions for every application is further enhanced by our R&D centers, manufacturing plants, sales and application engineering specialists who are positioned strategically across the globe.

TOGETHER, WE MAKE THE MATERIAL DIFFERENCE.
Ceramic Systems

The products and solutions for kilns & furnaces under Saint-Gobain Ceramic Systems are designed and developed for many applications to facilitate consistent and long-term performance.

Our products are designed to withstand high temperatures (up to 1800°C) and severe operating conditions.

Developed and manufactured to suit all types of kilns & furnaces that are typically used in various industry segments.

Smart Design
In-depth understanding of customer application & processes, science, design engineering / mathematical modeling and R&D

Performing Products
Customized product design, shape & material for every application & industry, manufacturing & quality consistency

Your Partner
Worldwide sales & application team, installation supervision services, OEM collaboration, energy & emission assessment

KEY MARKETS & APPLICATIONS

WHITEWARE
SANITARY & DINNER INDUSTRIES

AUTOMOTIVE
HOT STAMPING, PARTICLE FILTERS, SPARK PLUGS, OXYGEN SENSORS

TECHNICAL CERAMICS

ELECTRONICS & SEMICONDUCTOR
BATTERY / LI-ION

CHEMICAL
POWDER / PHARMACEUTICALS

ABRASIVES & GRINDING MEDIA
SANITARY & DINNERWARE

Our kiln furniture systems are designed and constructed of advanced silicon carbide (SiC) materials. Thinner, lighter and significantly stronger than traditional kiln furniture for meeting improved energy efficiencies in high temperature applications.

- Constructed of advanced silicon carbide
- Improved energy efficiencies
- Minimize mass
- Maximize strength
- Greater kiln capacity
- Reduced firing cycles

LO-MASS® SYSTEMS

LO-MASS® components are customizable and flexible for whiteware and porcelain tableware firing systems.

Expertise in product design and customization for every type of kiln.

- Energy efficiencies in high temperature applications
- Minimize mass while maximizing strength
- Increased automation compatibility for loading and unloading

For more information
THINNER, LIGHTER, STRONGER

- LAVI SETTER
- PLATE SETTER TRIO
- PLATE SETTER DUO
- PLATE SETTER SINGLE
- PLATE SETTER QUATTRO
- SUPPORTS
- PLATES
- PROFILE BEAMS & U-PROFILE PLATE

WHITEWARE
In order to meet the constantly growing challenges of our customers, our innovative XXL plate size guarantees more products and less kiln furniture for your system. We offer this solution in the following key markets:

- Whiteware
- Automotive
- Technical Ceramics
- Abrasives & Grinding Media

\[(XXL) \text{ PLATES}\]

Saint-Gobain offers individual designs that are available up to approximately 1250 x 900 x 10 mm. They are approximately two times larger than other advanced silicon carbide plates currently offered on the market.

**BENEFITS**

- Increased setting space
- Further reduction of structural supports and kiln furniture
- Eliminate joints/seams underneath product
- Flatness retention over large setting area
Our most trusted kiln furniture technology delivers increased productivity in manufacturing and processing various automobile components while reducing energy consumption. Our design services are key to optimizing individual requirements.

**BENEFITS**

- Excellent thermal conductivity
- Shape stability and strength
- Outstanding thermal shock behavior
- Defined flatness and surface finish

**CHASSIS COMPONENTS**

- HOT STAMPING ROLLERS
- SPARK PLUGS
- SAGGERS
- OXYGEN SENSORS
- WAFFLE SLABS
- ELECTRONIC STABILITY PROGRAMS

**ANTI-LOCK BRAKING SYSTEMS**

- HOT STAMPING ROLLERS
- WAFFLE SLABS
- SAGGERS
- SPARK PLUGS
- OXYGEN SENSORS
- ELECTRONIC STABILITY PROGRAMS

**CATALYTIC CONVERTERS**

- KILN FURNITURE ASSEMBLIES

**DIESEL/GAS PARTICLE FILTERS**

- KILN FURNITURE ASSEMBLIES

**BUMPERS**

- HOT STAMPING ROLLERS
- BUMPERS
KILN FURNITURE ASSEMBLIES

Our most trusted material technology delivers increased productivity for DPF & GPF, filters and substrate manufacturing while reducing energy consumption.

Customers have always benefited from our design services as it is optimized to individual requirement.
HOT STAMPING ROLLERS

Our rollers offer distinctive mechanical, thermal & corrosion resistant characteristics, which makes them best in class and delivers unmatched benefits.

For steel hardening and hot forming processes, our hot stamping rollers are the best solution for your roller hearth kiln challenges. They provide longer life and require less maintenance.

AUTOMOTIVE

SiC rollers after 12 months – Superficial contamination with no penetration into the body

BENEFITS

- **Significant longer life time**
- **No breakage**
- **No diffusion into the roller material**
- **Easy removable contaminations**
- **Reduced maintenance needs**
Our innovative materials offer high temperature stability, thermal shock and corrosion resistance along with other application tailored properties.

REFRACTORY BRICK LININGS

High alumina, mullite and zirconia brick linings for high temperature kilns and atmosphere furnaces ensure optimal thermal processing.

Our engineered ceramics provide solutions for the production of technical (fine) ceramics in highly specialized and diverse applications. We help our customers to produce technical ceramics with unique mechanical, electrical, thermal and chemical properties and property combinations.

We offer a large selection of silicon carbide, high purity alumina, high alumina-mullite, mullite, zirconia refractory and kiln furniture products.

REFRACTORY SHAPES

High temperature stability and strength
Excellent thermal shock resistance
Optimum rate of capacity utilization
Chemical compatibility
Superior size capability
Engineered ceramics are used in the production of electronic ceramics, including alumina substrates, capacitors, ferrites, titanates, glass, quartz and crystals.

Hexoloy® sintered silicon carbide is used in the production of semiconductor components and sputtering targets. Our complete product range extends to alumina/mullite and zirconia kiln furniture.

**Engineered Ceramics for electronic ceramics:**

- Titanates
- Glass
- Quartz
- Crystals
- Ferrites
- Capacitors
- Substrates
- Insulators
- Varistors

**BENEFITS**

- Chemical compatibility
- High stability and strength
- Excellent thermal shock resistance
- Outstanding thermal conductivity
- High productivity
- Superior size capability
SETTERS

Our engineered ceramics are used in the production of electronic ceramics, including alumina substrates, capacitors, ferrites, titanates, glass, quartz and crystals.

- Excellent thermal shock resistance
- Shape stability and strength
- Defined flatness and surface finish

WAFFLE SLABS

- Porous material
- Enables stable de-binding
- Maintains high stability and strength
Our ability to manufacture a wide range of silicon carbide, alumina and mullite products caters to a wide spectrum of powder and pigment types and processes.

- Rollers and saggers for processing lithium-ion battery cathode powders
- Kiln furniture and refractory for processing powder metal (PM) and metal injection molded (MIM) parts in atmosphere furnaces
- Various material selections during firing process of different pigments and powder types for the best performance

**BENEFITS**

- High stability and strength
- Excellent thermal conductivity
- Extended life time
- Very good chemical resistance
- Outstanding thermal shock resistance

### FIRING, SINTERING, HEAT TREATING

**SAGGERS**

- Various materials and shapes available
- High temperature stability
- Defined flatness, shape stability and strength
## MATERIAL CHOICES

Our kiln furniture systems are designed and constructed of advanced silicon carbide (SiC) materials. Thinner, lighter and significantly stronger than traditional kiln furniture for meeting improved energy efficiencies in high temperature applications - minimize mass while maximizing strength.

We can provide traditional SiC as well as advanced SiC with LO-MASS® kiln furniture benefits.

### BENEFITS

#### TRADITIONAL SiC
- High shape stability and creep resistance
- Very good thermal conductivity
- Excellent thermal shock resistance
- High oxidation resistance

#### ADVANCED SiC LO-MASS®
- Reduced energy consumption
- Optimum rate of capacity utilization
- High flexibility
- Excellent product quality
- Very good thermal shock behavior

### PLATES /BATTs

Saint-Gobain offers a wide range of sizes for plates or batts. To find the best solution for your system, please speak to our experienced engineers. They understand your needs and will help you make the right product selection for your application.
ENGINEERED CERAMICS

Horizontal tempering of large glass plates for flat screens or glass ceramic cooktops. For roller hearth kilns, high temperature zones are predominantly equipped with silicon carbide rollers. Co-development of innovative muffles that have steadily increased the size and quality of LCD display glass.

BENEFITS

- Excellent thermal conductivity
- High strength and shape stability
- No deformation over the whole temperature range
- Outstanding temperature stability

ZIRCONIA PRODUCTS

- Calcia and yttria stabilized zirconia brick and shapes
- Dense and insulating
- For extreme high temperature applications

ROLLERS

- Shape stability
- Long lengths, different diameters available
- Tight tolerances in MD and TIR
<table>
<thead>
<tr>
<th></th>
<th>Mulnorite® / Mullfrax®</th>
<th>Alundum®</th>
<th>AnnaCarbid®</th>
<th>Cryston®</th>
<th>AnnaSicon® RTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beams</td>
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<tr>
<td>Plates</td>
<td>X</td>
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<td>XXL plates</td>
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<td>Rollers</td>
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<td>Lug posts</td>
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<td>Lavi setters</td>
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<td></td>
</tr>
<tr>
<td>Supports</td>
<td></td>
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<td>X*</td>
<td>X</td>
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<tr>
<td>Saggers</td>
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<table>
<thead>
<tr>
<th></th>
<th>Silit® SK</th>
<th>Silit® SKD</th>
<th>N-Durance®</th>
<th>Crystar®</th>
<th>Hexoloy®</th>
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</thead>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>HL beams</td>
<td></td>
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<td>X</td>
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<td>Plates</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>XXL plates</td>
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<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
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<td>Tubes</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Plate setters</td>
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<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
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<td>Lavi setters</td>
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<td>X</td>
</tr>
<tr>
<td>Supports</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Saggers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

* details on request
* for plate setters (setter posts, round/oval supports)
### AnnaMullit® Alundum® AH 191 A Mulnorite® KN Mullfrax® EM 27

<table>
<thead>
<tr>
<th>Properties</th>
<th>Unit</th>
<th>AnnaMullit®</th>
<th>Alundum® AH 191 A</th>
<th>Mulnorite® KN 176</th>
<th>Mullfrax® EM 27</th>
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</thead>
<tbody>
<tr>
<td><strong>Al₂O₃-content</strong></td>
<td>%</td>
<td>74</td>
<td>86</td>
<td>82</td>
<td>91</td>
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<tr>
<td><strong>Max. service temperature</strong></td>
<td>°C</td>
<td>1500</td>
<td>1500</td>
<td>1750</td>
<td>1750</td>
</tr>
<tr>
<td><strong>Bulk density</strong></td>
<td>kg/dm³</td>
<td>2.5</td>
<td>2.65</td>
<td>2.75</td>
<td>2.9</td>
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<tr>
<td><strong>Apparent porosity</strong></td>
<td>Vol. %</td>
<td>21</td>
<td>22</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td><strong>Modulus of rupture</strong></td>
<td></td>
<td></td>
<td>15</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td><strong>Thermal expansion α</strong></td>
<td></td>
<td></td>
<td>10⁻⁶/K</td>
<td>5.5</td>
<td>6.1</td>
</tr>
</tbody>
</table>

1) Dependent on the corresponding operation conditions.  2) Ambient temperature.

### AnnaCarbid® AnnaSicon®

<table>
<thead>
<tr>
<th>Properties</th>
<th>Unit</th>
<th>AnnaCarbid®</th>
<th>AnnaSicon® 25</th>
<th>NSiC</th>
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<tbody>
<tr>
<td>SiC-content</td>
<td>%</td>
<td>40</td>
<td>65</td>
<td>84</td>
</tr>
<tr>
<td><strong>Max. service temperature</strong></td>
<td>°C</td>
<td>1430</td>
<td>1450</td>
<td>1500</td>
</tr>
<tr>
<td><strong>Bulk density</strong></td>
<td>kg/dm³</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Apparent porosity</strong></td>
<td>Vol. %</td>
<td>20</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td><strong>Modulus of rupture</strong></td>
<td></td>
<td>20</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td><strong>Thermal expansion α</strong></td>
<td></td>
<td>10⁻⁶/K</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

1) Dependent on the corresponding operation conditions.  2) Ambient temperature.

### AnnaSicon® RTH Silit® N-Durance® Crystar® Hexoloy®

<table>
<thead>
<tr>
<th>Properties</th>
<th>Unit</th>
<th>AnnaSicon® 25</th>
<th>Si Nitride SK SKD</th>
<th>N-Durance* 2000</th>
<th>Crystar* 3000</th>
<th>Hexoloy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiC-content</td>
<td>%</td>
<td>70</td>
<td>85</td>
<td>85</td>
<td>70</td>
<td>&gt; 99</td>
</tr>
<tr>
<td><strong>Max. service temperature</strong></td>
<td>°C</td>
<td>1450</td>
<td>1380</td>
<td>1380</td>
<td>1450 - 2642</td>
<td>1600</td>
</tr>
<tr>
<td><strong>Bulk density</strong></td>
<td>kg/dm³</td>
<td>2.8</td>
<td>3</td>
<td>3</td>
<td>2.75</td>
<td>2.7</td>
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<tr>
<td><strong>Apparent porosity</strong></td>
<td>Vol. %</td>
<td>&lt; 1</td>
<td>0</td>
<td>0</td>
<td>≤ 1</td>
<td>15</td>
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<tr>
<td><strong>Modulus of rupture</strong></td>
<td></td>
<td>160</td>
<td>260</td>
<td>260</td>
<td>170 - 190</td>
<td>80</td>
</tr>
<tr>
<td><strong>Thermal expansion α</strong></td>
<td></td>
<td>10⁻⁶/K</td>
<td>4.4</td>
<td>4.5</td>
<td>4.4</td>
<td>4.8</td>
</tr>
</tbody>
</table>

1) Dependent on the corresponding operation conditions.  2) Ambient temperature.
**STANDARD DIMENSIONS FOR BEAMS**

Below listed dimensions cover the majority of standard sizes. Larger sizes and tighter tolerances on request.

Feasible dimensions and tolerances of SILIT® SK beams*:

<table>
<thead>
<tr>
<th>Height H ± X mm</th>
<th>Width B ± X mm</th>
<th>Wall Thickness s ±1/-0.5 mm</th>
<th>Max Length ± 2 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20</td>
<td>± 1.0</td>
<td>6</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
<td>± 1.0</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
<td>± 1.0</td>
<td>6</td>
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<tr>
<td>30</td>
<td>30</td>
<td>± 1.0</td>
<td>6</td>
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<tr>
<td>35</td>
<td>35</td>
<td>± 1.0</td>
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<td>40</td>
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<td>± 1.0</td>
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<td>40</td>
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<td>± 1.0</td>
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<tr>
<td>50</td>
<td>40</td>
<td>± 1.0</td>
<td>6</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>± 1.0</td>
<td>6</td>
</tr>
<tr>
<td>60</td>
<td>40</td>
<td>± 1.2</td>
<td>6,8</td>
</tr>
<tr>
<td>60</td>
<td>50</td>
<td>± 1.2</td>
<td>6,8</td>
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<tr>
<td>60</td>
<td>60</td>
<td>± 1.2</td>
<td>7,3</td>
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<tr>
<td>70</td>
<td>40</td>
<td>± 1.4</td>
<td>7,5</td>
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<td>70</td>
<td>50</td>
<td>± 1.4</td>
<td>7,5</td>
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<td>70</td>
<td>60</td>
<td>± 1.4</td>
<td>7,5</td>
</tr>
<tr>
<td>80</td>
<td>40</td>
<td>± 1.4</td>
<td>8</td>
</tr>
<tr>
<td>80</td>
<td>60</td>
<td>± 1.4</td>
<td>8,5</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>± 1.4</td>
<td>9</td>
</tr>
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</table>

Feasible dimensions and tolerances of N-Durance® beams*:

<table>
<thead>
<tr>
<th>Height H ≤ 1.5 mm</th>
<th>Width B ≤ 1.5 mm</th>
<th>Wall Thickness s ±3/-0.5 mm</th>
<th>Max Length ± 2 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20</td>
<td>4</td>
<td>1300</td>
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<tr>
<td>30-40</td>
<td>20-30</td>
<td>5</td>
<td>2000</td>
</tr>
<tr>
<td>40-80</td>
<td>40-50</td>
<td>6</td>
<td>3200</td>
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<tr>
<td>80-110</td>
<td>50-80</td>
<td>7</td>
<td>3200</td>
</tr>
</tbody>
</table>

Maximum deflection in relation to the length is 2‰.

Feasible dimensions and tolerances of CRYSTAR® beams*:

<table>
<thead>
<tr>
<th>Height H ≤ 1.5 mm</th>
<th>Width B ≤ 1.5 mm</th>
<th>Wall Thickness s ±3/-0.5 mm</th>
<th>Max Length ± 2 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20</td>
<td>4</td>
<td>2000</td>
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<tr>
<td>20-40</td>
<td>20-30</td>
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<td>2000</td>
</tr>
<tr>
<td>80-110</td>
<td>40-60</td>
<td>8</td>
<td>3000</td>
</tr>
<tr>
<td>110-270</td>
<td>40-80</td>
<td>10 5/0.5</td>
<td>3000</td>
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</table>

Maximum deflection in relation to the length is 2‰.

Maximum deflection MD and side deflection SD of SILIT® SK beams:

<table>
<thead>
<tr>
<th>Length [mm]</th>
<th>MD [mm]</th>
<th>SD [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2000</td>
<td>≤ 2</td>
<td>≤ 3</td>
</tr>
<tr>
<td>≤ 2500</td>
<td>≤ 3</td>
<td>≤ 5</td>
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<tr>
<td>≤ 3000</td>
<td>≤ 5</td>
<td>≤ 8</td>
</tr>
<tr>
<td>≤ 3650</td>
<td>≤ 7</td>
<td>≤ 9</td>
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</table>

*Technical data, right of modification reserved.
### STANDARD DIMENSIONS FOR TUBES

Below listed dimensions cover the majority of standard sizes. Larger sizes and tighter tolerances on request.

#### Feasible dimensions and tolerances of SILIT® SK tubes*

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Max Length ± 2 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside D [mm]</td>
<td>Inside d [mm]</td>
</tr>
<tr>
<td>20</td>
<td>± 0.3</td>
</tr>
<tr>
<td>20</td>
<td>± 0.3</td>
</tr>
<tr>
<td>25</td>
<td>± 0.3</td>
</tr>
<tr>
<td>25</td>
<td>± 0.3</td>
</tr>
<tr>
<td>30</td>
<td>± 0.4</td>
</tr>
<tr>
<td>31.7</td>
<td>± 0.4</td>
</tr>
<tr>
<td>34</td>
<td>± 0.4</td>
</tr>
<tr>
<td>35.5</td>
<td>± 0.5</td>
</tr>
<tr>
<td>38.1</td>
<td>± 0.5</td>
</tr>
<tr>
<td>40</td>
<td>± 0.5</td>
</tr>
<tr>
<td>42</td>
<td>± 0.5</td>
</tr>
<tr>
<td>45</td>
<td>± 0.6</td>
</tr>
<tr>
<td>50.8</td>
<td>± 0.6</td>
</tr>
<tr>
<td>55</td>
<td>± 0.9</td>
</tr>
<tr>
<td>60</td>
<td>± 1.0</td>
</tr>
<tr>
<td>63.5</td>
<td>± 1.2</td>
</tr>
<tr>
<td>65</td>
<td>± 1.2</td>
</tr>
<tr>
<td>70</td>
<td>± 1.2</td>
</tr>
<tr>
<td>76</td>
<td>± 1.4</td>
</tr>
<tr>
<td>80</td>
<td>± 1.4</td>
</tr>
<tr>
<td>90</td>
<td>± 1.6</td>
</tr>
</tbody>
</table>

#### Maximum deflection MD of SILIT® SK tubes:

<table>
<thead>
<tr>
<th>Length [mm]</th>
<th>MD [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2000</td>
<td>≤ 5</td>
</tr>
<tr>
<td>≤ 3500</td>
<td>≤ 7</td>
</tr>
<tr>
<td>&gt; 3500</td>
<td>≤ 3 ‰</td>
</tr>
</tbody>
</table>

#### Feasible dimensions and tolerances of N-Durance® tubes*

<table>
<thead>
<tr>
<th>Outer Diameter [mm]</th>
<th>Wall Thickness [mm]</th>
<th>Max Length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20</td>
<td>4</td>
<td>1000</td>
</tr>
<tr>
<td>21-30</td>
<td>5</td>
<td>2500</td>
</tr>
<tr>
<td>31-40</td>
<td>5</td>
<td>2800</td>
</tr>
<tr>
<td>41-50</td>
<td>5</td>
<td>3000</td>
</tr>
<tr>
<td>51-100</td>
<td>6</td>
<td>3000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>-2</th>
<th>-6</th>
</tr>
</thead>
</table>

#### Maximum deflection MD of N-Durance® tubes:

<table>
<thead>
<tr>
<th>Length [mm]</th>
<th>MD [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2000</td>
<td>≤ 5</td>
</tr>
<tr>
<td>2001-3000</td>
<td>≤ 7</td>
</tr>
</tbody>
</table>

#### Feasible dimensions and tolerances of CRYSTAR® tubes*

<table>
<thead>
<tr>
<th>Outer Diameter [mm]</th>
<th>Wall Thickness [mm]</th>
<th>Max Length [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20</td>
<td>4</td>
<td>1000</td>
</tr>
<tr>
<td>21-30</td>
<td>5</td>
<td>2500</td>
</tr>
<tr>
<td>31-40</td>
<td>5</td>
<td>2800</td>
</tr>
<tr>
<td>41-50</td>
<td>5</td>
<td>3000</td>
</tr>
<tr>
<td>51-60</td>
<td>6</td>
<td>3000</td>
</tr>
<tr>
<td>61-70</td>
<td>6</td>
<td>3000</td>
</tr>
<tr>
<td>71-80</td>
<td>6</td>
<td>3000</td>
</tr>
<tr>
<td>81-90</td>
<td>6</td>
<td>3000</td>
</tr>
<tr>
<td>91-100</td>
<td>6</td>
<td>3000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>+/-0.5</th>
<th>+/-0.5</th>
</tr>
</thead>
</table>

#### Maximum deflection MD of CRYSTAR® tubes:

<table>
<thead>
<tr>
<th>Length [mm]</th>
<th>MD [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2000</td>
<td>≤ 5</td>
</tr>
<tr>
<td>2001-3000</td>
<td>≤ 7</td>
</tr>
</tbody>
</table>

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