PIPE WEAR PROTECTION
Wear protection in the toughest of operating conditions

Conventional materials reach their limits in many industrial areas. Entirely new perspectives often arise when ceramic high-performance materials are used. Ceramics can be deployed to an advantage everywhere where wear and corrosion resistance and high temperature stability are needed.

As the technological market leader for ceramic lined industrial valves and pipeline components, we continually open up new areas of application together with our customers. Our range of services consists of the design, testing, production and delivery of such systems. An optimum customer service is in place thanks to our after sales service. Our system solutions enable a great economic benefit in many applications.

Due to the fact that our products are used in almost all industrial sectors, our application engineers understand the different problems and are usually already aware of the customer-specific solution. Our standard products are designed for use in extreme conditions. If particular fields of application cannot be covered by our delivery programme, we develop new solutions in close cooperation with our customers.

• **Our products have a joint-free, ceramic lining.**
  Ceramic materials display a high level of wear resistance against abrasive wear but less resistance against impact wear. A lining without joints and butt joints minimises impact wear, thus ensuring significantly greater service lives. Our systems are fundamentally compact and ceramically lined without joints.

• **We supply the best wear protection with a low weight.**
  Ceramic that is not thick achieves the best wear protection. In fact, it is important to prevent the onset of wear with a good and suitable ceramic. The reason for this is the fact that hard substances with steep angles of impact have a much greater erosion than flat angles of impact. With our thin-walled ceramic, we supply pipelines that conform with the nominal sizes and, as a result, also achieve a weight advantage.

• **We guarantee nominal size conformity.**
  Our wear-protected components fit into every existing pipe system. They can also be replaced at a later date with little effort. As a result, wear-related production losses are effectively minimised.

There is a comprehensive range of tried and tested standard products available to our customers. Many of our ceramic lined products can be delivered economically and at short notice.
**Steel / stainless steel pipe elbows**
The ceramic lined pipe elbows are used in highly-abrasive media. A monolithic curved ceramic segment is threaded into a steel jacket with respective flange connections and specially attached with putty. Thanks to the thin-walled ceramic, it is possible to manufacture these pipe elbows with nominal size conformity. Leg extensions adjust the components so that they meet the required installation dimensions.

**Pipe elbows coated in HALAR**
We produce pipe elbows with a HALAR coated steel shell that can be used with abrasive and corrosive substances. This option is only available with fixed flanges.

**Pipe elbows with GRP casing**
The monolithic curved ceramic segment is wrapped in a glass fibre reinforced polyester resin (GRP). Respective connecting units (flanges, couplings, clamping pieces, etc.) can also be ceramically lined and wrapped. An ideal level of wear protection is ensured thanks to the use of premium engineering ceramics and an appropriate dimensioning of the radius. Such pipe elbows are characterised by their low weight.

**Ceramic hoses**
The patented ceramic conveying hose comprises of ceramic rings that are cured together with special rubber materials. Due to the geometry of the ceramic rings, the rubber joint remains away from the area of flow and is therefore protected. The excellent service life is primarily achieved by the fact that the ceramic lining does not have any joints along the conveying direction.

**Pipe elbows coated in HALAR**
We produce pipe elbows with a HALAR coated steel shell that can be used with abrasive and corrosive substances. This option is only available with fixed flanges.

**Conveying shoes**
Ceramic lined conveying shoes have a significantly longer wear resistance. Thanks to our technology, the infeed curve, which is the main element of the conveying shoe can be monolithically manufactured from one piece of ceramic.

**Ceramic system solutions**
We provide ceramic solutions for system components exposed to particular strain as well as complete system solutions. Comparable loads, such as those in pipe elbows and T pieces can be found in distribution devices such as V boxes, feeder shoes and jet distributors as well as in throttle systems, in mixing systems such as static mixers and flotation mixing chambers, in cyclones and nozzles for the spraying of suspensions.

**Pipe wear protection**
Wear-resistant, corrosion-proof, joint-free and nominal size-compliant design

**Nominal size range:**
DN 20 to DN 250 (3/4” to 10”)

**Pressure range:**
PN 10 up to PN 40, ANSI class 150, class 300
Other nominal pressure ranges on request

**Temperature range:**
-25 °C to +950 °C / -13 °F to +482 °F possible

Many system solutions for ceramic wear protection require engineering experience and technological knowledge of the processes. Please ask our sales engineers for the ideal technical and economic solutions for your particular requirements.
CERAMIC PIPE ELBOWS WITH STEEL JACKET

MATERIALS/MATERIAL OPTIONS:

FUNCTION:
The ceramic lined pipe elbows are used in highly-abrasive media. A monolithic curved ceramic segment is threaded into a steel jacket with respective flange connections.

The gap between the steel jacket and the ceramic is filled with temperature-resistant putty and has a dampening effect. An ideal level of wear protection is ensured thanks to the use of premium engineering ceramics and an appropriate dimensioning of the radius. Thanks to thin-walled ceramic, it is possible to manufacture these pipe elbows with nominal size conformity.

As a result, the ceramic pipe elbows can be retrofitted into existing plants without the need to make pipeline adjustments. Radii can be adjusted by means of respective leg extensions.

NOMINAL SIZE RANGE:
• DN 20 (3/4˝) to DN 250 (10˝)

TYPE OF CONNECTION:
• R250 – R2000 Fixed flange – flush and lose flange
• D4/D6 Fixed flange – flush and lose flange

PRESSURE RANGE:
• PN 10 to PN 40
• ANSI class 150 and class 300
• Other nominal pressure ranges on request

TEMPERATURE RANGE:
• -30 °C to +75 °C / -22 °F to +167 °F for PUR
• up to +230 °C / 446 °F for silicon putty
• up to +350 °C / 662 °F for cement putty

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Putty materials:
• Cement mortar
• PUR, silicon
• HT putty

TYPICAL APPLICATION AREAS:
Pneumatic transportation of:
• Flue dust in power stations and waste incineration plants
• Titanium oxide and iron oxide in pigment production
• Ores (e.g. copper) in mining
• Rutile (blast furnace), sinter dust (sinter plants), Coal dust (EAF+PCI), lime + magnesium (pig iron desulphurisation), substitute fuels in steel works and blast furnaces
• Moulding sand in foundries
• Shards in glass plants
• Mineral animal feed in the feed industry
• Sanding material in the timber industry
• Clinker dust, lime, cement, slag sand, flue dust in cement plants

Substitute for deflection pots:
• Pipe elbows with small radii (4D, 6D, R250)

Steel jacket with flanges Carbon Steel P235GH (St 35.8) – priming paint
Ceramic liner Aluminium oxide
Putty Cement

Steel jacket with flanges Stainless Steel 1.4301 or 1.4571
Ceramic liner Silicon carbide
Putty Silicon, PUR (Polyurethane), HT putty

Options
Standard
Steel jacket with flanges Carbon Steel P235GH (St 35.8) – priming paint
Ceramic liner Aluminium oxide
Putty Cement

O3-Stahl-jacket
Steel jacket with flanges Stainless Steel 1.4301 or 1.4571
Ceramic liner Silicon carbide
Putty Silicon, PUR (Polyurethane), HT putty

FUNCTION: OPTIONs:
• Leg extension (single and dual sided)
• Various connection types (Kamlok, Storz coupling; dairy pipe connection; binding clamps; etc.)
• Nominal size steps
• Wall thickness monitoring
• Electrically-conductive ceramic (silicon carbide)
• Oil and grease-free design (oxygen)
• Lance design
• Other materials for the steel jacket available on request
• High-temperature designs with inner insulations

Putty materials:
• Cement mortar
• PUR, silicon
• HT putty
CERAMIC PIPE ELBOWS WITH COATED STEEL JACKET

MATERIALS/MATERIAL OPTIONS:

FUNCTION:
The ceramic lined pipe elbows are used in highly-abrasive and corrosive media. A monolithic curved ceramic segment is threaded into a HALAR-coated steel jacket with fixed flanges. The gap between the steel jacket and the ceramic is filled with temperature and chemical-resistant putty and has a dampening effect. An ideal level of wear protection is ensured thanks to the use of premium engineering ceramics and an appropriate dimensioning of the radius. Thanks to thin-walled ceramic, it is possible to manufacture these pipe elbows with nominal size conformity. As a result, the ceramic pipe elbows can be retrofitted into existing plants with the need to make pipeline adjustments. Radii can be adjusted by means of respective leg extensions.

TYPE OF CONNECTION:
• Fixed flange

PRESSURE RANGE:
• PN 10 to PN 40
• ANSI class 150 and class 300
• Other nominal pressure ranges on request

TEMPERATURE RANGE:
• -30 °C to +75 °C / -22 °F to +167 °F for PUR
• up to +160 °C / 320 °F for silicon or cement putty

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Standards:
- Steel jacket with flanges
- Ceramic liner
- Putty

Options:
- Ceramic liner: Silicon carbide
- Putty: Silicon, PUR (Polyurethane)

Options:
- Leg extension (single and dual sided)
- Nominal size steps
- Wall thickness monitoring
- Electrically-conductive ceramic (silicon carbide)

Putty materials:
- Cement mortar
- PUR, silicon

TYPICAL APPLICATION AREAS:
- Dye production:
  • Titanium oxide suspension
  • Iron oxide suspension
- Waste incineration plants:
  • Suspension in the HCL prewasher

Standard Steel jacket with flanges: Carbon Steel P235GH (St 35.8) – HALAR-coated
Ceramic liner: Aluminium oxide
Putty: Cement

Ceramic liner Options:
- Silicon carbide

Putty Options:
- Silicon, PUR (Polyurethane)
CERAMIC PIPE ELBOWS WITH GRP CASING

MATERIALS/MATERIAL OPTIONS:

Standard Casing GRP
Connecting units Stainless Steel 1.4301
Ceramic liner Aluminium oxide

Options

Casing GRP-conductive
Connecting units Stainless Steel 1.4571, PP
Ceramic liner Silicon carbide

FUNCTION:

These ceramic-lined pipe elbows can be used with very abrasive and corrosive media. The monolithically curved ceramic segment is sheathed in glass fiber reinforced plastic. Corresponding connection pieces (flanges, couplings, clamps etc.) can also be ceramic-lined and sheathed. By using high-quality engineered ceramic and the right radius, we guarantee optimum wear protection. Thanks to thin-walled ceramics, pipe elbows can be manufactured that conform to standard nominal pipe sizes. This means that ceramic elbows can be retrofitted into existing systems without having to make changes to the pipeline. Radii can be adapted using shank extensions. This model is characterized by its lightweight design.

TYPICAL AREAS OF APPLICATION:

Plastics industry:
• Pneumatic transportation of glass fiber reinforced plastics

Food industry:
• Pneumatic transportation of rice and muesli
• Pneumatic transportation of mineral feed

Sanitation:
• Pneumatic transportation of enamel

Metal industry:
• Suction systems (e.g. metal swarf)

Blast furnaces:
• Pneumatic transportation of substitute fuels (plastics)

OPTIONS:

• Shank extension (single and double sided)
• Various types of connections (Kamlok, Storz couplings; dairy pipe connection; flange; etc.)
• Nominal width jumps
• Wall thickness monitoring
• Electrically conductive ceramics (silicon carbide)
• Electrically conductive glass fiber reinforced plastic

NOMINAL SIZES:

• DN 20 (3/4”) to DN 250 (10”)

Standard nominal sizes

PRESSURE RANGE:

• PN 10
• ANSI class 150
• Other standard pressure ranges available upon request

TEMPERATURE RANGE:

• max. 80 °C / 176 °F

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### Pipes and Reducers

#### Materials/Material Options:

**Function:**
- Pipes with ceramic lining are used in highly-abrasive media.
- Points that are particularly exposed are:
  - Points downstream of pipe elbows
  - Points downstream of control valves
  - Extensions downstream of pumps
  - Branches

A ceramically-lined calming section of 10 x D (pipe nominal size) should be provided at this point. As the pipes with ceramic lining are manufactured with nominal size conformity, it is possible to perform retrofitting without the need to make pipeline adjustments. Reducers serve as a central transition between two pipe sizes in order to reduce or extend. Additional turbulent flow occurs as a result of the nominal size transitions, which can lead to a high level of wear when solid-laden media is used. The ceramic lining protects the pipeline at these points and ensures long operating service lives.

Two lengths are offered as standard. The short length is the shortest possible transition with a gradient angle of below 15°. The long length is primarily recommended for cases where a smaller resistance is required or where there is a risk of the media being crushed or destroyed.

#### Nominal Size Range:

- Flange connections DN 15 (1/2") up to DN 400 (16")

**Pressure Range:**
- PN 10 to PN 40
- ANSI class 150 and class 300
- up to PN 160 / ANSI class 900 on request

**Temperature Range:**
- -30°C to +75°C / -22°F to +167°F for PUR
- up to +180°C / +356°F for HALAR coating
- up to +230°C / +446°F for silicon putty
- up to +350°C / +662°F for cement putty

**Options:**
- Various connection types (Kamlok, Storz coupling; dairy pipe connection; binding clamps; etc.)
- Nominal size steps
- Wall thickness monitoring
- Electrically-conductive ceramic (silicon carbide)
- Oil and grease-free design (oxygen)
- Other materials for the steel jacket available on request
- High-temperature designs with inner insulations

**Putty materials:**
- Cement mortar
- PUR, silicon
- HT putty

**Typical Application Areas:**
- Following pumps as an extension
- At system transition points
- Points downstream of throttle sections as an extension

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<td>DN 80 / 150</td>
</tr>
<tr>
<td>DN 15 / 40</td>
<td>67,5</td>
<td>200</td>
<td>DN 80 / 175</td>
</tr>
<tr>
<td>DN 15 / 50</td>
<td>82,5</td>
<td>230</td>
<td>DN 100 / 150</td>
</tr>
<tr>
<td>DN 25 / 32</td>
<td>47,5</td>
<td>180</td>
<td>DN 100 / 200</td>
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<td>DN 25 / 40</td>
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<td>DN 25 / 50</td>
<td>72,5</td>
<td>230</td>
<td>DN 125 / 200</td>
</tr>
<tr>
<td>DN 25 / 65</td>
<td>102,5</td>
<td>290</td>
<td>DN 125 / 250</td>
</tr>
<tr>
<td>DN 40 / 50</td>
<td>76,5</td>
<td>230</td>
<td>DN 150 / 200</td>
</tr>
<tr>
<td>DN 40 / 65</td>
<td>106,5</td>
<td>290</td>
<td>DN 150 / 250</td>
</tr>
<tr>
<td>DN 40 / 80</td>
<td>116,9</td>
<td>310</td>
<td>DN 150 / 300</td>
</tr>
<tr>
<td>DN 50 / 65</td>
<td>99,5</td>
<td>290</td>
<td>DN 150 / 400</td>
</tr>
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<td>DN 50 / 70</td>
<td>129,5</td>
<td>310</td>
<td>DN 200 / 250</td>
</tr>
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<td>DN 200 / 300</td>
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<td>DN 50 / 125</td>
<td>174,5</td>
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<td>DN 65 / 80</td>
<td>92</td>
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<td>DN 250 / 300</td>
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<td>DN 65 / 100</td>
<td>112</td>
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<td>DN 250 / 400</td>
</tr>
<tr>
<td>DN 65 / 125</td>
<td>137</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

**Steel Jacket with Flanges**
- Carbon Steel P235GH (St 35.8) — priming paint
- Stainless Steel 1,4301 or 1,4571 — HALAR coated

**Ceramic Liner**
- Aluminium oxide
- Silicon carbide

**Putty**
- Cement
- Silicon, PUR (Polyurethane)

**Options**
- Steel jacket with flanges
  - Carbon Steel P235GH (St 35.8) — priming paint
  - Stainless Steel 1,4301 or 1,4571 — HALAR coated
- GRP, GRP-conductive
- Silicon carbide
- Silicon, PUR (Polyurethane)
T and Y Pieces
Materials/Material Options:

**Function:**
For technological reasons, pipe branches and junctions at different angles are used. Depending upon the angle, they are called T pieces (90°) or Y pieces. Additional, severe turbulences occur in the event of a flow deflection, which can lead to enormous signs of wear when solid-laden media is used. Ceramic lined T and Y pieces can resist this wear and ensure a long service life.

**Nominal Size Range:**
- DN 10 (3/8˝) to 200 (8˝)
- Flange shapes can be manufactured according to the wishes of the customer

**Pressure Range:**
- PN 10 to PN 40
- ANSI class 150 and class 300
- up to PN 160 / ANSI class 900 on request

**Temperature Range:**
- -30°C to +75°C / -22°F to +167°F for PUR
- up to +180°C / +356°F for HALAR coating
- up to +230°C / +446°F for silicon putty
- up to +350°C / +662°F for cement putty

**Options:**
- Various connection types (Kamlok, Storz coupling; dairy pipe connection; binding clamps; etc.)
- Nominal size steps
- Wall thickness monitoring
- Electrically-conductive ceramic (silicon carbide)
- Oil and grease-free design (oxygen)
- Other materials for the steel jacket available on request
- High-temperature designs with inner insulations

**Putty Materials:**
- Cement mortar
- PUR, silicon
- HT putty

**Typical Application Areas:**
- At system transition points

**Available Lengths:**

### T Pieces PN 16

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>T</th>
<th>Ceramic</th>
<th>PN 2848</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 10</td>
<td>33,7</td>
<td>10/20</td>
<td>190/95</td>
</tr>
<tr>
<td>DN 15</td>
<td>48,3</td>
<td>17/27</td>
<td>190/95</td>
</tr>
<tr>
<td>DN 20</td>
<td>48,3</td>
<td>20/31</td>
<td>190/95</td>
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<td>DN 25</td>
<td>48,3</td>
<td>25/36</td>
<td>220/110</td>
</tr>
<tr>
<td>DN 32</td>
<td>60,3</td>
<td>32/43</td>
<td>260/130</td>
</tr>
<tr>
<td>DN 40</td>
<td>76,1</td>
<td>42/54</td>
<td>280/130</td>
</tr>
<tr>
<td>DN 50</td>
<td>88,9</td>
<td>50/62</td>
<td>240/120</td>
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<tr>
<td>DN 65</td>
<td>108,0</td>
<td>65/77</td>
<td>300/150</td>
</tr>
<tr>
<td>DN 80</td>
<td>114,3</td>
<td>80/92</td>
<td>130/165</td>
</tr>
<tr>
<td>DN 100</td>
<td>139,7</td>
<td>102/116</td>
<td>205/205</td>
</tr>
<tr>
<td>DN 125</td>
<td>168,3</td>
<td>125/140</td>
<td>490/245</td>
</tr>
<tr>
<td>DN 150</td>
<td>193,7</td>
<td>150/166</td>
<td>570/285</td>
</tr>
<tr>
<td>DN 175</td>
<td>219,1</td>
<td>175/191</td>
<td>600/300</td>
</tr>
<tr>
<td>DN 200</td>
<td>244,5</td>
<td>200/216</td>
<td>600/300</td>
</tr>
</tbody>
</table>

*do not correspond to Standard DIN 2848

### Y Pieces PN 16

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>Y</th>
<th>Ceramic</th>
<th>Angle</th>
<th>PN 2848</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 10</td>
<td>33,7</td>
<td>10/20</td>
<td>30°, 45°, 60°</td>
<td>95/95</td>
</tr>
<tr>
<td>DN 15</td>
<td>48,3</td>
<td>17/27</td>
<td>30°, 45°, 60°</td>
<td>95/95</td>
</tr>
<tr>
<td>DN 20</td>
<td>48,3</td>
<td>20/31</td>
<td>30°, 45°, 60°</td>
<td>95/95</td>
</tr>
<tr>
<td>DN 25</td>
<td>48,3</td>
<td>25/36</td>
<td>30°, 45°, 60°</td>
<td>110/110</td>
</tr>
<tr>
<td>DN 32</td>
<td>60,3</td>
<td>32/43</td>
<td>30°, 45°, 60°</td>
<td>130/130</td>
</tr>
<tr>
<td>DN 40</td>
<td>76,1</td>
<td>42/54</td>
<td>30°, 45°, 60°</td>
<td>150/150</td>
</tr>
<tr>
<td>DN 50</td>
<td>88,9</td>
<td>50/62</td>
<td>30°, 45°, 60°</td>
<td>120/120</td>
</tr>
<tr>
<td>DN 65</td>
<td>108,0</td>
<td>65/77</td>
<td>30°, 45°, 60°</td>
<td>140/140</td>
</tr>
<tr>
<td>DN 80</td>
<td>114,3</td>
<td>80/92</td>
<td>30°, 45°, 60°</td>
<td>130/130</td>
</tr>
<tr>
<td>DN 100</td>
<td>139,7</td>
<td>102/116</td>
<td>30°, 45°, 60°</td>
<td>205/205</td>
</tr>
<tr>
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<td>168,3</td>
<td>125/140</td>
<td>30°, 45°, 60°</td>
<td>245/245</td>
</tr>
<tr>
<td>DN 150</td>
<td>193,7</td>
<td>150/166</td>
<td>30°, 45°, 60°</td>
<td>285/285</td>
</tr>
<tr>
<td>DN 175</td>
<td>219,1</td>
<td>175/191</td>
<td>30°, 45°, 60°</td>
<td>330/165</td>
</tr>
<tr>
<td>DN 200</td>
<td>244,5</td>
<td>200/216</td>
<td>30°, 45°, 60°</td>
<td>330/165</td>
</tr>
</tbody>
</table>

*do not correspond to Standard DIN 2848

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**Standard**
- Steel jacket with flanges: Carbon Steel P235GH (St 35.8) – priming paint
- Ceramic liner: Aluminium oxide
- Putty: Cement

**Options**
- Steel jacket with flanges: Stainless Steel 1,4301 or 1,4571
- ST 37 / HALAR coated
- GRP, GRP-conductive
- Ceramic liner: Silicon carbide
- Putty: Silicon, PUR (Polyurethane)
**FUNCTION:**
When it comes to pneumatic conveying systems for solids, the task is always to move the material that is to be conveyed from a silo and into a central continuous conveying line. When deflecting the conveyed material from the vertical fall direction and into the horizontal conveying direction, the conveyed material rubs against the pipe wall and causes wear at that point. A heavy stress caused by the pipe material also occurs in this area due to the turbulences where the solid enters the main conveying flow.

The lining of the conveying shoes with ceramic achieves a significant extension of the service life. Thanks to our technology, the infeed curve, which is the main element of the conveying shoe can be monolithically manufactured from one piece of ceramic. The ceramic linings are either completely joint-free or the joints are only arranged transversely to the direction of flow. As a result, there are no points of attack located in the critical area where wear could set in. The sheer hardness of the ceramic lining also ensures that no material erosion caused by the conveyed material could occur.

**NOMINAL SIZE RANGE:**
- DN 25 (1”) to DN 150 (6”)
- Flange shapes can be manufactured according to the wishes of the customer
- Nominal sizes of the individual connections can be designed differently on request

**PRESSURE RANGE:**
- PN 10 to PN 40
- ANSI class 150 and class 300
- up to PN 160 on request

**TEMPERATURE RANGE:**
- -30°C to +75°C for PUR
- up to +230°C for silicon putty
- up to +350°C for cement putty

**OPTIONS:**
- Housing:
  - Leg extension (single and dual sided)
  - Various connection types (Kamlok; Storz coupling; dairy pipe connection; flanges etc.)
  - Nominal size steps
  - Wall thickness monitoring
  - Electrically-conductive ceramic (silicon carbide)
  - Oil and grease-free design (wall thicknesses for oxygen application)
  - Other materials for the steel jacket available on request
  - High-temperature designs with inner insulations

- Putty materials:
  - Cement mortar
  - PUR, silicon
  - HT putty

**TYPICAL APPLICATION AREAS:**
- At silo infeed points into the main conveying line
- As an injector conveying shoe

**AVAILABLE DIMENSION:**
Other lengths and special shapes on request

<table>
<thead>
<tr>
<th>Conveying shoe</th>
<th>Nominal size</th>
<th>R</th>
<th>L</th>
<th>L1</th>
<th>Di</th>
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<td>180</td>
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<td>DN 50</td>
<td>210</td>
<td>420</td>
<td>350</td>
<td>50</td>
<td>62</td>
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</tr>
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<td>DN 65</td>
<td>255</td>
<td>510</td>
<td>420</td>
<td>65</td>
<td>77</td>
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<td>550</td>
<td>460</td>
<td>80</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>DN 100</td>
<td>335</td>
<td>670</td>
<td>560</td>
<td>102</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>DN 125</td>
<td>395</td>
<td>790</td>
<td>660</td>
<td>125</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>DN 150</td>
<td>500</td>
<td>1000</td>
<td>820</td>
<td>150</td>
<td>168</td>
<td></td>
</tr>
</tbody>
</table>
**CERAMIC HOSE**

**MATERIALS / MATERIAL OPTIONS:**

The patented ceramic conveying hose comprises of ceramic rings that are cured together with special rubber materials. The ceramic rings have a slight conical shape so that rubber joint remains protected away from the area of flow.

Up to 3 layers of reinforcement fabric are inserted into the rubber layers in order to achieve the appropriate pressure resistance. CeraFlex is manufactured in three pressure stages, also for vacuum. In order to prevent electrostatic charging in the media, antistatic types of rubber are used. Furthermore, electrically-conductive ceramic rings are used for media that are heavily prone to charge separation.

When it comes to this type of construction, it is primarily hoses with a small diameter that can be manufactured inexpensively. The weight of the hoses is amazingly low and the flexibility is equivalent to rubber conveyor hoses. The possible bending radius amounts to ten times the diameter.

The excellent service life of Cera Flex is primarily achieved by the fact that the ceramic lining does not have any joints along the conveying direction. The medium is always guided back into the centre by the conically arranged ceramic rings. The transition to the connection is metallic complete with ceramic lining. In order to exclude wear in the coupling, the required connecting unit is also ceramically lined.

**FUNCTION:**

<table>
<thead>
<tr>
<th>NOMINAL SIZE RANGE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• DN 20 (3/4”) to 80 (3”)</td>
</tr>
</tbody>
</table>

**BENDING RADIUS:**

| • Greater or equal to 10xD |

**HOSE LENGTHS:**

| • At customer request |
| • Standard length 2 m / 6.5 ft |

**PRESSURE RANGE:**

| • PS 3 (also for vacuum conveying), PS 6 and PS 10 44 psi (also for vacuum conveying), 87 psi and 145 psi |

**TEMPERATURE RANGE:**

| • -10°C to +90°C / 14°F to +197°F for SBR |
| • -10°C to +180°C / 14°F to +356°F for FPM |

**OPTIONS:**

| • Various connection types (Kamlok, Storz coupling); dairy pipe connection; flanges threaded connection |
| • Optional conductive and non-conductive rubber compounds |
| • Conductive ceramic |
| • Wear monitoring |

**TYPICAL APPLICATION AREAS:**

**Pigments:**

| • Titanium oxide, iron oxide |

**Steel works, blast furnaces:**

| • Rutile, substitute fuels, plastics (blast furnace) |
| • Sinter dust (sinter plant) |
| • Coat dust (PCI+EAF), |
| • Lime, magnesium (pig iron desulphurisation) |

**Foundries:**

| • Moulding sand |

**Glass plants:**

| • Shards, sand, quartz |

**Cement plants:**

| • Clinker dust, lime, cement, slag, flue dust, plaster |

**Standard:****

<table>
<thead>
<tr>
<th>Casing</th>
<th>SBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic rings</td>
<td>Aluminium oxide</td>
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</tbody>
</table>

**Options:**

<table>
<thead>
<tr>
<th>Casing</th>
<th>FPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic liner</td>
<td>Silicon carbide</td>
</tr>
</tbody>
</table>
FUNCTION AND DESCRIPTION:
Understandably, individual components such as pipe elbows and T pieces are only used in combination with many others in the system. It is therefore obvious that respective solutions are offered for such systems.

Comparable conditions and therefore comparable loads, such as those in pipe elbows and T pieces can be found in distribution devices such as V boxes, feeder shoes and jet distributors as well as in throttle systems (perforated plates and orifice plates) in mixing systems such as static mixers and flotation mixing chambers, in cyclones and nozzles for the spraying of suspensions (full cone nozzles).

Therefore, Cera System provides ceramic solutions for system components exposed to particular strain as well as complete system solutions.

This includes:
- Trace heating and cooling
- Inner and outer insulations
- Support systems for the compensation of thermal expansion

NOMINAL SIZE RANGE:
- DN 10 (3/8”) to DN 400 (16”)
- Flange shapes can be manufactured according to the wishes of the customer

PRESSURE RANGE:
- PN 10 to PN 40
- ANSI class 150 and class 300
- up to PN 160 / ANSI class 900 on request

SIZES:
In monolithic form, ceramic parts can be realised up to a diameter of 900 mm / 3 ft and a length of 2000 mm / 6.5 ft. Larger dimensions are possible when combined.

OPTIONS:
- Housing: Housing materials at customer request
- High-temperature design with inner insulations
- Putty materials: Cement mortar
WEAR MONITORING
As all components belonging to the Cera Pipe system are either equipped with a steel jacket or are wrapped with GRP or CFK, a wire can be applied directly onto the ceramic that, in the event of a rupture or the transmission of the ceramic, can be evaluated by means of a resistance measurement.

ELECTRICALLY-CONDUCTIVE CERAMIC
When dealing with electrostatic charging and heated pipelines, we also offer a conductive "silicon carbide" ceramic as an alternative to the "aluminium oxide" standard ceramic.

WEIGHT INDICATIONS FOR CERAMIC PIPE SECTIONS
Approximate weight indications for 1 running metre / 3.3 ft of wear-protected pipe sections (without flange)

<table>
<thead>
<tr>
<th>Nominal size</th>
<th>P225G/Alumina oxide/cement</th>
<th>GRP/Alumina oxide</th>
</tr>
</thead>
<tbody>
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<td>DN20 3/4˝</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>DN25 1˝</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>DN32 1 1/4˝</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>DN40 1 1/2˝</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>DN50 2˝</td>
<td>16</td>
<td>35</td>
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<td>DN65 2 1/2˝</td>
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<td>DN80 3˝</td>
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<td>DN125 5˝</td>
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<td>DN150 6˝</td>
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<td>61</td>
<td>134</td>
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<tr>
<td>DN200 8˝</td>
<td>71</td>
<td>157</td>
</tr>
<tr>
<td>DN250 10˝</td>
<td>127</td>
<td>280</td>
</tr>
</tbody>
</table>

LEG EXTENSIONS
Extensions (leg extensions) can be made to each component belonging to the Cera Pipe system by attaching an appropriate pipe section. When dealing with pipe elbows, all levels of radii can be produced using appropriate leg extensions in combination with pipe elbows with available standard radii.
As a result, it is possible to retrofit our wear-protected components into every “normally” constructed pipe system without having to perform any changes or adjustments.

KAMLOK COUPLING AND CLAMP CONNECTION
When dealing with pipes in a metal jacket, it is usually the case that flange connections in all standard dimensions are installed as are special flanges according to the wishes of the customer and all types of couplings.
On GRP pipe systems, simple metallic pipe ends are often laminated and are then connected with clips. The couplings are fully lined with ceramic on all systems.

TRACE HEATERS COOLING JACKETS / HEATING JACKETS
Electric trace heating systems are also offered with metal shell models either in the putty itself or as a simple attached heating system. Liquid heating and cooling is, naturally, also available with the double shell design.
CERAMIC MATERIALS

PROPERTIES – ADVANTAGES AND DISTINCTIVE FEATURES

HARDNESS AND WEAR RESISTANCE

The wear resistance of pipelines and pipeline components is significantly influenced by the respective type of strain. Thanks to their extremely high hardness, ceramic materials have a wear resistance against friction that is many times higher than metals. However, this advantage can only be used if the particles do not hit the ceramics at too great an angle, i.e. the pipe elbow radii are sufficiently large enough, no or few joints are installed and the components have been constructed in such a manner that the particles belonging to the solid can only hit the ceramic wall or ceramic fitted part with as low an angle as possible.

CORROSION RESISTANCE

Compared to other materials, the corrosion resistance of the ceramic materials is significantly more universal and higher. Ceramics are completely resistant against the majority of solvents. Aqueous brines are generally no problem. The advantage of ceramic linings primarily bears fruit where the particles belonging to the solid destroy the corrosion protection.

THERMO SHOCK RESISTANCE

In contrast to the maximum operating temperature, the thermo shock resistance must be closely observed. Ceramic components maintain their shape and strength as well as their further physical characteristics up to extremely high temperatures. In addition to the material dependency, the thermo shock resistance is also highly dependent upon the geometry. Simple geometric shapes such as pipes are less sensitive than such parts that have highly differing wall thicknesses for example.

ANTI-STATIC

Electrostatic charging (=charge separation) can occur due to the friction of the conveying material on the wall and the friction within the media itself when solids and liquids are conveyed through chargeable pipes (Al₂O₃) and hoses.

Essentially, the standard lining manufactured from Al₂O₃ is installed in a conductive, metallic housing or, in the event of GRP casing, is equipped with protective earthing. The GRP casing can also be implemented as an electrically-conductive component (black colour).

When dealing with ceramic materials in the form of a lining, it is important to select the correct ceramic material that can prevent or severely delay the onset of wear.

THE CORRECT CERAMIC!

It is a common mistake that it is necessary to mainly use extremely thick-walled ceramic. When dealing with ceramic pipe wear protection, it is of great importance to use ceramic in such a manner that its advantages can be taken full advantage of. Therefore, the correct approach is to use a ceramic that can prevent or severely delay the onset of wear. When dealing with pneumatic transport lines, the primary consideration should be the consequences of blast wear. Furthermore, it must also be taken into consideration that many substances become electrically charged during pneumatic transport. Flow turbulences and possible cavitations must also be taken into consideration when dealing with lines for hydraulic transport.

When working at high temperatures, it must be investigated and observed how high possible thermal shocks can be and whether a temperature gradient can also occur.
Cera System develops and produces customer-specific ceramic precision components in small batch sizes through to series production for the most diverse areas of application. Focal points are sealing and control discs for air conditioning, sanitary fittings as well as many other applications. Ceramic components for the sensor, food engineering and building services sectors round off our portfolio.

**CERAMIC COMPONENTS**
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**CERTIFICATES**
ISO 9001:2008 • TA Luft 2000 • Pressure equipment directive 97/23/EC Module H • Fire-safe according to EN ISO 10497:2004 • Safety shut-off device according to DIN EN ISO 23553-1 • Rostechnadsor • GOST R

**CERAMIC HOSES**
Cera System supplies wear resistant flexible solutions. Ceramic hoses manufactured by Cera System can be used everywhere where hoses regularly wear and must be replaced. The hose consists of ceramic rings that are vulcanised together with special reinforced rubber materials. Pressures of up to 10 bar / 145 psi are permitted.

**BALL VALVES**
Cera System offers wear and corrosion resistant ball valves for open / close and control function. The use of ceramic lined valves is sensible in all cases where standard valves reach their limits (abrasion, corrosion, temperature and pressure). A large range of metallic and ceramic materials permits solutions for almost all industrial sectors. Special applications are solved in close cooperation with our customers.

**SLIDING DISC VALVE**
Cera System offers wear and corrosion resistant disc slide valves for open / close and control function. With this type of construction just the ceramic are wetted by the fluid. It is therefore suitable for highly corrosive media. Further advantages: Excellent control of small amounts containing solids - completely cavity free.
The slide valve is available from DN 2 (¼”) up to DN 50 (2”).

**PIPE WEAR PROTECTION**
Cera System offers wear resistant pipe elbows, Y and T parts as well as other shaped pieces. The most diverse of ceramics are used. The ceramic is solid (wall thickness approx. 6 mm (¼”)). All solutions are nominal size conformant, they can be assembled problem-free without having to adjust the pipelines. The clear width corresponds to the flange connection. Our specialty: the ceramic pipe elbows are actually curved (no opposition of straight sections).

**SLIDING DISC VALVE**
Cera System offers wear and corrosion resistant disc slide valves for open / close and control function.

**CERAMIC SYSTEM SOLUTIONS**
Cera System offers system solutions with ceramic components.
In-house development and sales engineers ensure for the complete design of ceramic systems and create economical, customer-specific complete solutions all over the world. Product developments in the coal gasification and photovoltaic sector are only examples of numerous other industry-specific applications.