Composite Router Endmill

Router Endmill Series for Machining Composite Materials

- **High Quality Machining**
  Minimized machining troubles with our new design, inhibiting delamination, splintering and burrs

- **Excellent Tool Life**
  The nano-crystalline diamond coating provides exceptional resistance to wear and flaking

- **Composite Materials: CFRP/GFRP**
Composite Router Endmills for Machining Composite Materials (CFRP/GFRP)

Composite Router Endmill

With a growing number of environmental regulations and the increasing demands for higher efficiency and lighter weight, more and more composite materials have been used in various industrial fields such as automotive, aerospace, wind power and energy industries.

A composite material is combined materials of two or more kinds for better machining properties. Typical examples are CFRP\(^1\) consisting of carbon fiber and resin, and GFRP\(^2\) consisting of glass fiber and resin. They are light and have excellent mechanical properties featuring strong resistance to corrosion and fatigue.

Unlike general metals, CFRP and GFRP generate large amounts of chips in the form of scraps. Due to the high hardness and low thermal conductivity of the fiber-reinforced materials, high-temp cutting heat is generated during machining and tools wear out rapidly. In addition, their high strength, high elastic modulus, and inhomogeneity between dissimilar materials cause excessive vibrations, and the composite structures cause machining troubles such as delamination, splintering and burrs.

KORLOY’s diamond-coated grade ND2100 features a nano-crystalline diamond coating that has strong resistance to wear and friction, resulting in outstanding tool life.

CCDR is a dual-helix-type finishing endmill, which is designed to inhibit flaking from upper and lower faces of workpieces in compression cutting, so that high quality contouring and slotting can be achieved with excellent surface finish.

CCR is a roughing endmill with down-cut blade design of low vibrations and low cutting resistance, which is suitable for contouring, slotting and parting off thin sheet metals.

CCLR/CCRR are low-helix-type finishing endmills with low axial cutting resistance that inhibits fiber tears and burrs, excelling in contouring and slotting with superior surface finish.

**Advantages**

- Excellent surface finish
  - Blade design to inhibit burr and delamination
  - High rake cutting edges for low cutting load

- Long tool life
  - Nano-crystalline diamond coating with strong resistance to wear and built-up edges

- Improved productivity
  - Tooling solution provided for each machining area

---

\(^{1}\) CFRP: Carbon Fiber Reinforced Plastic

\(^{2}\) GFRP: Glass Fiber Reinforced Plastic
ND2100 (Diamond-coated grade for machining composite materials)

Problems When Machining Carbon Fiber Composite Materials

- Relief surface is quickly worn out due to carbon fiber reinforcing agents.
- Coating films flake off due to impact on cutting edges caused by cut carbon fiber chips.
- Machining troubles are caused by worn-out and dulled cutting edges.

1. Wear on relief surface
2. Coating flaking
3. Machining troubles

Development of ND2100
(Diamond-coated grade for machining composite materials)

- High-hardness nano-crystalline diamond coating ideally suited for machining composite materials
- Stable tool life due to excellent resistance to wear and flaking

Coating surface of ND2100
Coating surface of ND3000
Cutting edges of ND2100

- Nano-crystalline structure
- Excellent wear resistance and surface finish

For composite materials

- Substrate specialized for diamond coating
- Excellent flaking resistance

For graphite and ceramic

- Cutting edges stay sharp
- Excellent cutting performance

Development Effect

1. Inhibited wear on relief surface
2. Inhibited flaking
3. Inhibited machining troubles

Excellent wear resistance
Excellent flaking resistance
Excellent surface finish

[ ND2100 ]
[ ND2100 ]
[ ND2100 ]

[ Competitor ]
[ Competitor ]
[ Competitor ]
Router Endmills for Machining Composite Materials

Features

- Router endmills optimized for machining composite materials (CFRP/GFRP)
- High-hardness nano-crystalline diamond coating for excellent tool life
- Blade design to inhibit delamination, burr and splintering

CCDR (Dual Helix Router Endmill)

- Cutting force is directed toward the center of workpieces
- Burr and delamination around upper and lower faces of workpieces are inhibited

CCR (Router Endmill)

- Diamond-cut edges for low cutting load
- Down-cut blade design prevents workpiece release and strengthens the vacuum clamping force.
**CCLR (Low Helix Router Endmill)**

- Excellent machinability and high rigidity due to high rake cutting edges and large core web
- Low helix design to reduce the axial force and inhibit burr creation
- Large core web - High rigidity

**CCRR (Reverse Helix Router Endmill)**

- Multi-flute design (6F, 8F) enables highly efficient finishing.
- Down-cut blade design prevents workpiece release and strengthens the vacuum clamping force.
## Application Examples

### CFRP Beam

- **Cutting conditions**: vc (m/min) = 200, fz (mm/t) = 0.05, ap (mm) = 6, ae (mm) = 2, dry
- **Tool**: CCR2080-075

#### CCR (Router)

- **Tool**: Over 20M machining
- **Competitor**: 8.5M machining

### CFRP Plate

- **Cutting conditions**: vc (m/min) = 200, fz (mm/t) = 0.08, ap (mm) = 20, ae (mm) = 0.3, dry
- **Tool**: CCRR805000

#### CCRR (Reverse helix)

- **Tool**: 40M machining
- **Competitor**: 20M machining

### CFRP Plate

- **Cutting conditions**: vc (m/min) = 200, fz (mm/t) = 0.08, ap (mm) = 20, ae (mm) = 0.3, dry
- **Tool**: CCDR605000

#### CCDR (Dual helix)

- **Tool**: 150M machining
- **Competitor**: 125M machining

- 100% longer cutting time compared to the competitor
- 20% longer cutting time compared to the competitor
## Recommended Cutting Conditions (CCDR)

<table>
<thead>
<tr>
<th>Division</th>
<th>CCDR (Shoulder roughing)</th>
<th>CCDR (Shoulder finishing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CFRP</td>
<td>GFRP</td>
</tr>
<tr>
<td>Workpiece</td>
<td>RPM (n (\text{min}^{-1}))</td>
<td>Feed (\text{vf (mm/min)})</td>
</tr>
<tr>
<td>Tool diameter (Ø)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>7,960</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>5,970</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>4,770</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>3,980</td>
</tr>
</tbody>
</table>

**Application tip (shoulder roughing)**

- \(ap = 1D\)
- \(ae = 0.4D\)

**Application tip (shoulder finishing)**

- \(ap = 1D\)
- \(ae = 0.02D\)

<table>
<thead>
<tr>
<th>Division</th>
<th>CCDR (Slotting)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CFRP</td>
</tr>
<tr>
<td>Workpiece</td>
<td>RPM (n (\text{min}^{-1}))</td>
</tr>
<tr>
<td>Tool diameter (Ø)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

**Application tip (slotting)**

- \(CFRP, ap = 1D\)
- \(GFRP, ap = 0.8D\)

**Notice**

- Please adjust the recommended cutting conditions properly, according to the types of CFRP or GFRP, the workpiece shapes, clamping conditions, and the rigidity of your machines.
- In case of machining troubles such as peeling, burrs and flaking, reduce feed rate by the same ratio.
- It is highly recommended to use purified water for high-pressure wet machining because cutting heat may cause troubles.
- Please provide against dust before machining begins.
### Recommended Cutting Conditions (CCR)

<table>
<thead>
<tr>
<th>Division</th>
<th>CCR (Shoulder roughing)</th>
<th>CCR (Slotting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>CFRP</td>
<td>GFRP</td>
</tr>
<tr>
<td>Tool diameter (Ø)</td>
<td>RPM n (min⁻¹)</td>
<td>Feed vf (mm/min)</td>
</tr>
<tr>
<td>4</td>
<td>15,920</td>
<td>1,020</td>
</tr>
<tr>
<td>5</td>
<td>12,730</td>
<td>1,270</td>
</tr>
<tr>
<td>6</td>
<td>10,610</td>
<td>1,270</td>
</tr>
<tr>
<td>8</td>
<td>7,960</td>
<td>1,340</td>
</tr>
<tr>
<td>10</td>
<td>6,370</td>
<td>1,530</td>
</tr>
<tr>
<td>12</td>
<td>5,310</td>
<td>1,720</td>
</tr>
</tbody>
</table>

- Application tip (Shoulder roughing)
  - CFRP, ap = 2D
  - ae = 0.35D

- Application tip (Slotting)
  - CFRP, ap = 1D
  - ae = 1D

### Recommended Cutting Conditions (CCLR/CCRR)

<table>
<thead>
<tr>
<th>Division</th>
<th>CCLR/CCRR (Shoulder roughing)</th>
<th>CCLR/CCRR (Shoulder finishing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workpiece</td>
<td>CFRP</td>
<td>GFRP</td>
</tr>
<tr>
<td>Tool diameter (Ø)</td>
<td>RPM n (min⁻¹)</td>
<td>Feed vf (mm/min)</td>
</tr>
<tr>
<td>4</td>
<td>15,920</td>
<td>1,530</td>
</tr>
<tr>
<td>5</td>
<td>12,730</td>
<td>1,530</td>
</tr>
<tr>
<td>6</td>
<td>10,610</td>
<td>1,530</td>
</tr>
<tr>
<td>8</td>
<td>7,960</td>
<td>1,530</td>
</tr>
<tr>
<td>10</td>
<td>6,370</td>
<td>1,530</td>
</tr>
<tr>
<td>12</td>
<td>5,310</td>
<td>1,530</td>
</tr>
</tbody>
</table>

- **Notice**
  - Please adjust the recommended cutting conditions properly, according to the types of CFRP or GFRP, the workpiece shapes, clamping conditions, and the rigidity of your machines.
  - In case of machining troubles such as peeling, burrs and flaking, reduce feed rate by the same ratio.
  - It is highly recommended to use purified water for high-pressure wet machining because cutting heat may cause troubles.
  - Please provide against dust before machining begins.
**Composite Router Endmill**

**CCDR4000/6000 (Flat)**

<table>
<thead>
<tr>
<th>Designation</th>
<th>ØD</th>
<th>Ød</th>
<th>(l_1)</th>
<th>(l_2)</th>
<th>L</th>
<th>Fig</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCDR 4060-065</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>18</td>
<td>65</td>
<td>1</td>
</tr>
<tr>
<td>CCDR 4080-075</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>24</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>CCDR 6100-085</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>30</td>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>CCDR 6120-100</td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>36</td>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>

**Helix Angle** 30°/30°

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

**ØD Tolerance**

- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500
- Ø0.250 ~ Ø0.500

**Grade** ND2100

**h5 shank**

**Tolerance** Ø6–Ø12 0.00–0.03 mm

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

<table>
<thead>
<tr>
<th>ØD</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>Ø0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>
### CCR2000 (Flat)

<table>
<thead>
<tr>
<th>Designation</th>
<th>ØD (mm)</th>
<th>Ød (mm)</th>
<th>ø1 (mm)</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR2040-050</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>2050-050</td>
<td>5</td>
<td>5</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>2060-065</td>
<td>6</td>
<td>6</td>
<td>18</td>
<td>65</td>
</tr>
<tr>
<td>2080-075</td>
<td>8</td>
<td>8</td>
<td>24</td>
<td>75</td>
</tr>
<tr>
<td>2100-085</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>85</td>
</tr>
<tr>
<td>2120-100</td>
<td>12</td>
<td>12</td>
<td>36</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designation</th>
<th>ØD (inch)</th>
<th>Ød (inch)</th>
<th>ø1 (inch)</th>
<th>L (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR202500</td>
<td>1/4</td>
<td>0.250</td>
<td>0.750</td>
<td>2.500</td>
</tr>
<tr>
<td>202500L</td>
<td>1/4</td>
<td>0.250</td>
<td>1.500</td>
<td>4.000</td>
</tr>
<tr>
<td>203750</td>
<td>3/8</td>
<td>0.375</td>
<td>1.000</td>
<td>3.250</td>
</tr>
<tr>
<td>203750L</td>
<td>3/8</td>
<td>0.375</td>
<td>1.500</td>
<td>4.000</td>
</tr>
<tr>
<td>205000</td>
<td>1/2</td>
<td>0.500</td>
<td>1.000</td>
<td>3.250</td>
</tr>
<tr>
<td>205000L</td>
<td>1/2</td>
<td>0.500</td>
<td>1.500</td>
<td>4.000</td>
</tr>
</tbody>
</table>

### Workpiece

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

*Metal: Aluminum or titanium, etc.

### Endface Tooth

- 2F, Standard type
- Without an endface tooth (For shouldering)*
- With 4–6F endface teeth (For facing and Blind-hole machining)*

* Inserts marked with an asterisk (*) are available for a custom-made order.
## CCLR4000 (Flat)

**Helix Angle:** 15°

**Grade:** ND2100

**Tolerance:** ØD 0.00~0.03 mm

<table>
<thead>
<tr>
<th>Designation</th>
<th>ØD (mm)</th>
<th>Ød (mm)</th>
<th>ℓ1 (mm)</th>
<th>L (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCLR4000-050</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>50</td>
</tr>
<tr>
<td>CCLR4000-100</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>85</td>
</tr>
</tbody>
</table>

**Helix Angle:** 15°

**Grade:** ND2100

**Tolerance:** ØD 0.0000~0.0012 inch

<table>
<thead>
<tr>
<th>Designation</th>
<th>ØD (inch)</th>
<th>Ød (inch)</th>
<th>ℓ1 (inch)</th>
<th>L (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCLR402500</td>
<td>1/4</td>
<td>0.250</td>
<td>0.750</td>
<td>2.500</td>
</tr>
<tr>
<td>CCLR402500L</td>
<td>1/4</td>
<td>0.250</td>
<td>1.500</td>
<td>4.000</td>
</tr>
<tr>
<td>CCLR403750</td>
<td>3/8</td>
<td>0.375</td>
<td>1.000</td>
<td>3.250</td>
</tr>
<tr>
<td>CCLR403750L</td>
<td>3/8</td>
<td>0.375</td>
<td>1.500</td>
<td>4.000</td>
</tr>
<tr>
<td>CCLR405000</td>
<td>1/2</td>
<td>0.500</td>
<td>1.000</td>
<td>3.250</td>
</tr>
<tr>
<td>CCLR405000L</td>
<td>1/2</td>
<td>0.500</td>
<td>1.500</td>
<td>4.000</td>
</tr>
</tbody>
</table>
## CCRR6000/8000 (Flat)

![Image of CCRR6000/8000 (Flat)]

### Designation

<table>
<thead>
<tr>
<th>Designation</th>
<th>ØD</th>
<th>Ød</th>
<th>ℓl</th>
<th>L</th>
<th>Fig</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCRR 6060-065</td>
<td>6</td>
<td>6</td>
<td>18</td>
<td>65</td>
<td>1</td>
</tr>
<tr>
<td>CCRR 6080-075</td>
<td>8</td>
<td>8</td>
<td>24</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>CCRR 8100-085</td>
<td>10</td>
<td>10</td>
<td>30</td>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>CCRR 8120-100</td>
<td>12</td>
<td>12</td>
<td>36</td>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>

### Workpiece

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

* Metal: Aluminum or titanium, etc.

### Tolerance

**ØD**

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø6–Ø12</td>
<td>0.00–0.03 mm</td>
</tr>
</tbody>
</table>

**ØD**

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>(inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250–Ø0.500</td>
<td>0.0000–0.0012 inch</td>
</tr>
</tbody>
</table>

### Helix Angle

- -25°

### Grade

- ND2100

### Shank

- h5

### Helical milling

<table>
<thead>
<tr>
<th>Workpiece</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFRP</td>
</tr>
<tr>
<td>GFRP</td>
</tr>
<tr>
<td>CFRP/Metal stacks</td>
</tr>
<tr>
<td>Honey-combs</td>
</tr>
</tbody>
</table>

---

**Helix Angle**

- -25°

**Grade**

- ND2100

**ØD**

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.00~Ø0.500</td>
<td>0.0000~0.0012</td>
</tr>
</tbody>
</table>

**ØD**

<table>
<thead>
<tr>
<th>Tolerance</th>
<th>(inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø0.250~Ø0.500</td>
<td>0.0000~0.0012</td>
</tr>
</tbody>
</table>

---

**Workpiece**

- CFRP
- GFRP
- CFRP/Metal stacks
- Honey-combs

* Metal: Aluminum or titanium, etc.

---

**Contact Information**

- **KORLOY AMERICA**
  - 620 Maple Avenue, Torrance, CA 90503, USA
  - Tel: +1-310-782-3800
  - Fax: +1-310-782-3885
  - www.korloyamerica.com
  - E-mail: sales@korloy.us

- **KORLOY EUROPE**
  - Gablonzer Str. 25-27, 61440 Oberursel, Germany
  - Tel: +49-6171-277-83-0
  - Fax: +49-6171-277-83-59
  - www.korloyeurope.com
  - E-mail: sales@korloyeurope.com

- **KORLOY INDIA**
  - Plot NO.415, Sector 8, IMT Manesar, Gurgaon 122051, Haryana, INDIA
  - Tel: +91-124-4391790
  - Fax: +91-124-4050022
  - www.korloyindia.com
  - E-mail: sales.kip@korloy.com

- **KORLOY BRASIL**
  - Av. Aruana 280, conj.12, WLC, Alphaville, Barueri, CEP06460-010, SP, Brasil
  - Tel: +55-11-4193-3810
  - E-mail: vendas@korloy.com

---

TN62-EM-01 / 20180330