Explosion Protection

The ATEX Directive and the KTR programme for applications with potentially explosive atmospheres
Caution: explosive atmospheres!

There are many things that have to be taken into account when you are designing drive systems for potentially explosive atmospheres. How does the ATEX Directive influence your choice of couplings and cooling systems or hydraulic components and clamping sets? For example, can a selected component be used for the temperature class stipulated? And how should couplings be protected in potentially explosive atmospheres? This brochure provides the answers.

The ATEX Products Directive 2014/34/EU has far-reaching consequences for the selection, installation, operation and maintenance of equipment in potentially explosive atmospheres. In this context, mechanical equipment and components, among other things, are considered and evaluated with regard to potential risk of explosion.

As a leading manufacturer of drive components for the mechanical and plant engineering sectors, we examined the requirements of the ATEX Directive early on and had relevant series from our overall product range inspected by an independent institute with regard to their usability in potentially explosive atmospheres.
A safe bet:
KTR’s support for you

Not only do we provide you with information about the specifics of the ATEX Products Directive – we also provide products that allow you to safely plan, design and build your machines and plants.

KTR’s comprehensive product range has been examined and evaluated as compliant with the ATEX Directive. It includes torsionally flexible jaw as well as pin and bush couplings, backlash-free servo couplings, gear, flange, steel lamina and magnetic couplings, and also oil/air coolers.

On the following pages we first of all set out the requirements of ATEX Directive 2014/34/EU, introduce the equipment categories and the zoning and show the standardised marking for components that are used in atmospheres potentially at risk of gas or dust explosions. We then present our products for potentially explosive atmospheres, with their key features and their explosion protection conformity marking.

In addition, we are happy to help you to conform with all other safety standards and advise you about all the required markings.

The relevant type examination certificates and assembly instructions can be found at www.ktr.com.
Appendix II of the European Products Directive 2014/34/EU, requires adherence to general safety and health specifications on those machines operating in potentially explosive atmospheres within the EU. These specifications have to be met during the development and production of the products by the manufacturer and be supported by the respective literature, e.g. operating and assembly instructions.

KTR manufactures and supplies a number of couplings and cooling systems that conform to the ATEX standard. However, a basic condition of their explosion-proof operation is the intended use of the products in accordance with the operating and assembly instructions.

Explosion hazard:

Only a few mechanisms are required for an explosion to occur: a flammable material such as gas, mist, vapour or dust in an ignitable concentration, sufficient oxygen and an ignition source such as sparks or a hot surface.

Thus, explosion protection measures are always necessary if:
- flammable materials exist
- the distribution of the air may produce a hazardous mixture
- the production of a dangerous and hazardous atmosphere is possible.

Typical ignition sources:

Ignition hazard can be generated by sparks from impact, friction or grinding, by temperature increase or as a result of electrostatic charge and can initiate explosions.

Equipment groups and categories:

The equipment used in potentially explosive atmospheres is classified in groups I and II. Group I includes underground and surface mining and group II includes gas and dust explosion protection in every other application.

<table>
<thead>
<tr>
<th>Equipment group</th>
<th>Category</th>
<th>Material group</th>
<th>Suitable zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (includes equipment intended for use in underground mines and their above-ground facilities)</td>
<td>M1 (corresponds to very high safety)</td>
<td>G (gases)</td>
<td>0, 1, 2</td>
</tr>
<tr>
<td></td>
<td>M2 (corresponds to high safety)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II (includes equipment intended for use in other areas)</td>
<td>1 (corresponds to very high safety)</td>
<td>D (dusts)</td>
<td>20, 21, 22</td>
</tr>
<tr>
<td></td>
<td>2 (corresponds to high safety)</td>
<td>G (gases)</td>
<td>1, 2</td>
</tr>
<tr>
<td></td>
<td>3 (corresponds to safety with normal operation)</td>
<td>D (dusts)</td>
<td>21, 22</td>
</tr>
</tbody>
</table>

= Potential use of KTR components
The classification of potentially explosive atmospheres into zones depends on the probability of how often and of how long a hazardous explosive atmosphere may occur. The zones are differentiated between flammable gases, mists, vapours and dusts.

### Zones:

<table>
<thead>
<tr>
<th>Explosion range</th>
<th>Zone</th>
<th>Explosive atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas (G)</strong></td>
<td>0</td>
<td>Permanent, long-term or frequent use</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Occasional use</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>No or rare and if so only short-term use</td>
</tr>
<tr>
<td><strong>Dust (D)</strong></td>
<td>20</td>
<td>Permanent, long-term or frequent cloud of dust in the air (except for dust deposit: no zone 20)</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Occasionally, dust deposits exist in general</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Should not be expected with normal operation, if so, only short-term</td>
</tr>
</tbody>
</table>

### Equipment group:

EN ISO 80079-36 and IEC EN 60079-0 define permissible equipment groups and equipment protection levels (EPL) for gases and vapours as well as dusts. The first letter of the marking signifies the explosive atmosphere while the second letter defines the actual protection level.

Equipment group and equipment protection level (EPL) in accordance with EN 13463-1 et seq. and EN ISO 80079-36

<table>
<thead>
<tr>
<th>Explosion range</th>
<th>Equipment group</th>
<th>Zone</th>
<th>Equipment protection level (EPL) marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>I</td>
<td>-</td>
<td>Ma</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>Mb or Ma</td>
</tr>
<tr>
<td><strong>Gases/vapours</strong></td>
<td>II</td>
<td>0</td>
<td>Ga</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Gb or Ga</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Gc or Gb or Ga</td>
</tr>
<tr>
<td><strong>Dusts</strong></td>
<td>III</td>
<td>20</td>
<td>Da</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
<td>Db or Da</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22</td>
<td>Dc or Db or Da</td>
</tr>
</tbody>
</table>

### Operating range

<table>
<thead>
<tr>
<th>Marking</th>
<th>Equipment protection level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ma</td>
<td>Equipment with high protection level that can be operated with an explosive atmosphere.</td>
</tr>
<tr>
<td>Mb</td>
<td>Equipment with high protection level that has to be switched off with an explosive atmosphere.</td>
</tr>
<tr>
<td><strong>Explosive gas atmospheres</strong></td>
<td></td>
</tr>
<tr>
<td>Ga</td>
<td>Equipment with very high protection level</td>
</tr>
<tr>
<td>Gb</td>
<td>Equipment with high protection level</td>
</tr>
<tr>
<td>Gc</td>
<td>Equipment with normal protection level</td>
</tr>
<tr>
<td><strong>Flammable dust atmosphere</strong></td>
<td></td>
</tr>
<tr>
<td>Da</td>
<td>Equipment with very high protection level</td>
</tr>
<tr>
<td>Db</td>
<td>Equipment with high protection level</td>
</tr>
<tr>
<td>Dc</td>
<td>Equipment with normal protection level</td>
</tr>
</tbody>
</table>
Ignition protection types for nonelectric equipment in potentially explosive atmospheres

### Protection principle: Ignition protection type

<table>
<thead>
<tr>
<th>Ignition protection type</th>
<th>Marking</th>
<th>Protection principle</th>
<th>Applications</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>General specifications</td>
<td>+</td>
<td>-</td>
<td>All applications</td>
<td>EN ISO 80079 EN IEC 60079-0</td>
</tr>
<tr>
<td>Designing safety</td>
<td>Ex h</td>
<td>The protection principle ensures that an ignition source cannot occur.</td>
<td>Coupling, belt drives, agitators, fans</td>
<td>EN ISO 80079-37</td>
</tr>
<tr>
<td>Monitoring of ignition source</td>
<td>Ex h</td>
<td>The protection principle prevents an ignition source from becoming operative.</td>
<td>Plain bearing, pump, agitators, centrifuge</td>
<td>EN ISO 80079-37</td>
</tr>
<tr>
<td>Liquid immersion</td>
<td>Ex h</td>
<td>The protection principle prevents the explosive atmosphere from arriving at the ignition source.</td>
<td>Gearbox</td>
<td>EN ISO 80079-37</td>
</tr>
<tr>
<td>Pressurized enclosure</td>
<td>Ex h</td>
<td>The protection principle prevents the explosive atmosphere from arriving at the ignition source.</td>
<td>Compressors, centrifuge, gear motors</td>
<td>EN ISO 80079-36</td>
</tr>
<tr>
<td>Protection by housing</td>
<td>Ex h</td>
<td>The protection principle prevents the explosive atmosphere (dusts) from arriving at the ignition source.</td>
<td>Grinders, gear motor, sophisticated subassemblies</td>
<td>EN ISO 80079-36</td>
</tr>
<tr>
<td>Pressurized encapsulation</td>
<td>Ex h</td>
<td>The protection principle prevents flame propagation by housing</td>
<td>Brakes</td>
<td>EN ISO 80079-36</td>
</tr>
</tbody>
</table>

= applies with KTR couplings/equipment

### Dust groups:

As with gas and vapours, dusts are classified into explosion groups. The classification depends on type and electrical conductivity

<table>
<thead>
<tr>
<th>Explosion group (dust group)</th>
<th>III A</th>
<th>IIIB</th>
<th>IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable lints and fibres</td>
<td>Non-conductive dust, e. g. carbon dust, grain dust</td>
<td>Conductive dust, e. g. flammable metal dust</td>
<td></td>
</tr>
</tbody>
</table>
Gases and vapours are classified into explosion groups depending on their ignitability. As an example, the permissible size of insulating surfaces depends on the explosion groups, with standards rising from IIA to IIC. The temperature class does not correspond to the operating temperature of the equipment, for example of a coupling, as wrongly supposed sometimes, but the maximum permissible surface temperature on the equipment. The ignition temperature of the gases and vapours classified into temperature classes must exceed the maximum surface temperature.

### Explosion groups gases and vapours max. surface temperature and temperature classes:

<table>
<thead>
<tr>
<th>Explosion group (gas group)</th>
<th>Temperature class</th>
<th>Max. surface temperature</th>
<th>Perm. temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>II A Methane, ethane, propane, ammonia</td>
<td>Town gas, acryl nitride</td>
<td>Hydrogen</td>
<td>T1</td>
</tr>
<tr>
<td>II B Ethyl alcohol, jet fuel</td>
<td>Ethylene, ethylene oxide</td>
<td>Ethyne (acetylene)</td>
<td>T2</td>
</tr>
<tr>
<td>II C Petrols in general, jet fuel, n-hexane</td>
<td>Ethylene glycol, hydrogen sulfide</td>
<td>T3</td>
<td>200 °C</td>
</tr>
<tr>
<td>II C Acetaldehyde</td>
<td>Ethyl ether</td>
<td>T4</td>
<td>135 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T5</td>
<td>100 °C</td>
</tr>
<tr>
<td></td>
<td>Carbon disulfide</td>
<td>T6</td>
<td>85 °C</td>
</tr>
</tbody>
</table>

= Potential use of KTR components

### Explanation of the identification marking one would find on a ROTEX® coupling:

2. Equipment categories
- Mining – M1, M2
- Gas sector – 1G, 2G, 3G
- Dust sector – 1D, 2D, 3D

3. Type of ignition protection
   - Ex h – designing safety

4. Explosion groups
   - Group I – I - Mining
   - Group II – IIA, IIB, IIC - gas sector
   - Group III – IIIA, IIIB, IIIC - dust sector

5. Temperature specifications for gas and dust sector
   - Group I
   - Group II
   - Group III

7. Operating/ambient temperatures
   - Group I
   - Group II
   - Group III

6. EPL - Equipment Protection Level
   Equipment for explosive atmospheres is classified into:
   - Group I – Ma, Mb - Mining
   - Group II – Ga, Gb, Gc - gas sector
   - Group III – Da, Db, Dc - dust sector
Component protection in potentially explosive atmospheres.

Covers: If the products are used in areas subject to dust explosion and in mining the user must make sure that there is no accumulation of dust in a dangerous volume between the cover and the component. The component must not operate in an accumulation of dust.

For covers with unlocked openings on the top face no light metals should be used if the products are used as equipment of equipment group II (if possible, from stainless steel).

If the products are used in mining (equipment group I, category M2), the cover must not be made of light metal. In addition, it must be resistant to higher mechanical loads than with use as equipment of equipment group II.

The cover is required in accordance with DIN EN ISO 12100 (Safety of Machinery) and directive 2014/34/EU and must protect against:
- access with a little finger
- falling down of solid foreign objects.

The cover may provide for openings intended for necessary heat dissipation. These openings have to comply with DIN EN ISO 13857.

The cover must be electrically conductive and included in the equipotential bonding.

Painting/coating: If coated (priming, paintings, etc.) components are used in potentially explosive atmospheres, the requirements on conductivity and coating thickness must be considered. In case of insulating paintings up to 200 µm electrostatic load does not have to be expected. Multiple coatings that are thicker than 200 µm are prohibited for explosion group IIIC.

Maintenance: The respective maintenance intervals of the equipment or components must be observed. During the operation of the machine, any changes to running noise of the coupling, or vibration that may arise, must be respected.

Design modifications: Components with attachments which may produce heat, sparks and static load (e.g. combinations with brake drums or disks, overload systems such as torque limiters, fans, etc.) are not permitted for use in potentially explosive atmospheres. A separate inspection must be performed.
The customer bears the sole responsibility for all machining processes performed subsequently on unbored or pilot bored as well as finish machined components and spare parts. KTR supplies unbored or pilot bored components and spare parts only upon explicit request of the customer. These parts are additionally marked with the symbol (>). KTR does not assume any warranty claims resulting from insufficient remachining. Mechanical remachining on components used in potentially explosive atmospheres must be coordinated with KTR.

### Shaft-hub-connection:

If used in potentially explosive atmospheres clamping ring hubs and clamping hubs without feather key must be selected such that there is a minimum safety factor of $s = 2$ between the peak torque of the machine including all operating parameters and the nominal torque and frictional locking torque of the coupling. Clamping hubs without feather key only permissible for use in category 3. The responsibility for the shaft-hub-connection is subject to the customer. Please review the connection carefully.

### Component selection:

Select the components with sufficient service factor and choose suitable materials.

### Screw connections:

Secure all screw connections using a screw lock solution and closely adhere to the recommended tightening torque of the screws.

### ATEX marking:

KTR components bear an ATEX marking as follows:

![Example of ATEX marking on the POLY-NORM® shaft coupling](image)
# KTR products for potentially explosive atmospheres

## Product

<table>
<thead>
<tr>
<th>Product</th>
<th>ROTEX®</th>
<th>ROTEX® SP (Non Sparking)</th>
<th>POLY-NORM®</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Fail-safe, torsionally flexible jaw coupling</td>
<td>Fail-safe, torsionally flexible jaw coupling (maintenance-free in potentially explosive atmospheres)</td>
<td>Short, fail-safe, torsionally flexible jaw coupling</td>
</tr>
<tr>
<td><strong>ATEX marking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubs/spacer without aluminium only</td>
<td>type standard, AFN, BFN, CF, CFN, DKM, A-H, S-H, ZS-DKM, ZS-DKM-H and TB with feather keyway</td>
<td>type GN, EN, GND, E4-DKM and ZS-DKM-C with feather keyway</td>
<td>type AR, ADR, ADR-K, AVR, AZR, AR/ARZ, AZVR and AR with taper clamping sleeve</td>
</tr>
<tr>
<td>Hubs/spacer made of aluminium only</td>
<td>type standard, AFN, BFN, CF, CFN, DKM, A-H, S-H, ZS-DKM and ZS-DKM-H with feather keyway (no ATEX approval with aluminium diecast)</td>
<td>type GN, EN, GND, E4-DKM and ZS-DKM-C with feather keyway (no ATEX approval with aluminium diecast)</td>
<td>type standard, AFN, BFN, CF, CFN, DKM, ZS-DKM and ZS-DKM-H with feather keyway (no ATEX approval with aluminium diecast)</td>
</tr>
<tr>
<td><strong>Marking</strong></td>
<td>The ATEX marking of the ROTEX® coupling is applied on the outer sheath or on the front side. The flexible spider is excluded.</td>
<td>The ATEX marking of the POLY-NORM® coupling is applied on the outer sheath or on the front side. The elastomer ring is not marked.</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Products which do not allow for complete marking (§148 of the ATEX product directive 2014/34/EU) due to size or quality may reduce marking to ☢️. For complete marking refer to the operating/assembly instructions and/or the delivery note/package.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) With the BoWex® coupling the demand for explosion protection is only ensured with the use of the electrically conductive polyamide sleeve type C. The coupling hubs made of steel correspond to the standard design and can be combined with various sleeve materials which do not generally comply with the ATEX requirements. For that reason the explosion protection marking is only shown on the respective outer sleeve made of polyamide.
<table>
<thead>
<tr>
<th>REVOLEX® KX /KX-D</th>
<th>POLY</th>
<th>BoWex®</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short, fail-safe, torsionally flexible pin &amp; bush coupling</td>
<td>Shear type, torsionally flexible jaw coupling</td>
<td>Shear type curved-tooth gear coupling** in the material combination nylon/steel**</td>
</tr>
<tr>
<td><strong>type KX and KX-D, KX-AB and KX-TB</strong></td>
<td><strong>type PKN, PKZ, PKD and PKA</strong></td>
<td></td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>The ATEX marking of the REVOLEX® KX / KX-D coupling is applied on the outer sheath or on the front side. The elastomers are not marked.</td>
<td>The ATEX marking of the POLY coupling is applied on the outer sheath or on the front side. The elastomers are not marked.</td>
<td>The ATEX marking of the BoWex® coupling is applied on the outer sheath or on the front side.</td>
</tr>
</tbody>
</table>

**Notes:**
- **type KX and KX-D, KX-AB and KX-TB**
- **type PKN, PKZ, PKD and PKA**
- **type M with standard sleeve (light), sizes M-14 and M-19**
- **type M with conductive sleeve (black), sizes M-14C to M-19C**
- **type S-..St with standard sleeve (light), sizes S14-St to S24-St inclusive**
- **type GT**
- **type M with standard sleeve (light), sizes M-24 to M-65**
- **type S-..St with standard sleeve (light), sizes S24-St to S45-St inclusive**
- **type SSR with Seeger circlips with standard sleeve (light), sizes 24 SSR to 45 SS inclusive**
- **type standard, AFN, BFN, CF, CFN, CF, S-H, ZS-DKM and ZS-DKM-H**
- **type GN, EN, GND, E4-DKM and ZS-DKM-C**
- **type standard, AFN, BFN, CF, CFN, DKM, ZS-DKM and ZS-DKM-H**
- **type GN, EN, GND, E4-DKM and ZS-DKM-C**
- **type M with standard sleeve (light), sizes M-14 and M-19**
- **type M with conductive sleeve (black), sizes M-14C to M-19C**
- **type S-..St with standard sleeve (light), sizes S14-St to S24-St inclusive**
- **type GT**
- **type standard, AFN, BFN, CF, CFN, CF, S-H, ZS-DKM and ZS-DKM-H**
- **type GN, EN, GND, E4-DKM and ZS-DKM-C**
- **type M with standard sleeve (light), sizes M-24 to M-65**
- **type S-..St with standard sleeve (light), sizes S24-St to S45-St inclusive**
- **type SSR with Seeger circlips with standard sleeve (light), sizes 24 SSR to 45 SS inclusive**
- **type standard, AFN, BFN, CF, CFN, CF, S-H, ZS-DKM and ZS-DKM-H**
- **type GN, EN, GND, E4-DKM and ZS-DKM-C**
- **type M with standard sleeve (light), sizes M-24 to M-65**
- **type S-..St with standard sleeve (light), sizes S24-St to S45-St inclusive**
- **type SSR with Seeger circlips with standard sleeve (light), sizes 24 SSR to 45 SS inclusive**

**Marking:**
- The ATEX marking of the ROTEX® coupling is applied on the outer sheath or on the front side. The elastomers are not marked.
- The ATEX marking of the POLY coupling is applied on the outer sheath or on the front side. The elastomers are not marked.
- The ATEX marking of the BoWex® coupling is applied on the outer sheath or on the front side.
## KTR products for potentially explosive atmospheres

<table>
<thead>
<tr>
<th>Product</th>
<th>GEARex®</th>
<th>COUNTEX®</th>
<th>RIGIFLEX®-N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Gear coupling made of steel with grease lubrication type FA, FB and FAB as well as DA, DB and DAB</td>
<td>Short, shear type, backlash-free, torsionally stiff and double-cardanic shaft encoder coupling</td>
<td>Backlash-free, torsionally stiff steel lamina coupling (The coupling complies with the standards of API 610 and optionally API 671.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ATEX marking</th>
<th>with feather keyway with hub type 1.0 and 1.3</th>
<th>with feather keyway with hub type 1.0 and 1.3</th>
<th>type A, A-I and A-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hubs without aluminium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>type FA, FB and FAB as well as DA, DB and DAB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubs made of aluminium only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubs made of aluminium only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hubs made of aluminium only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marking</strong></td>
<td>The ATEX marking of the GEARex® coupling is applied on the outer sheath or on the front side.</td>
<td>The ATEX marking of the COUNTEX® coupling is applied on the outer sheath or on the front side. The spacer is not marked.</td>
<td>The ATEX marking of the RIGIFLEX®-N coupling is applied on the outer sheath or on the front side. The lamina sets are not marked.</td>
</tr>
</tbody>
</table>

| Other | Products which do not allow for complete marking (§148 of the ATEX product directive 2014/34/EU) due to size or quality may reduce marking to ☻ ☻ ☻. For complete marking refer to the operating/assembly instructions and/or the delivery note/package. |

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For temperature classes T3 and T1 the max. permissible ambient and operating temperature is $T_a = 280 \ ^\circ C$. It is also the max. permissible permanent operation temperature. If necessary, all sizes of RADEX®-N can be designed complying with the standards of API 610 or API 671.
<table>
<thead>
<tr>
<th>RADEX®-N</th>
<th>ROTEX® GS / ROTEX® GS P</th>
<th>RADEX®-NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail-safe, backlash-free, torsionally stiff steel lamina coupling (1)</td>
<td>Fail-safe, torsionally flexible jaw coupling backlash-free under prestress</td>
<td>Shear type, backlash-free, torsionally stiff servo lamina coupling</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RADEX®-N</th>
<th>ROTEX® GS / ROTEX® GS P</th>
<th>RADEX®-NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hubs without aluminium</td>
<td>Hubs/spacer without aluminium with feather keyway</td>
<td>Hubs/spacer without aluminium with feather keyway</td>
</tr>
<tr>
<td>Hubs without aluminium type standard and DKM with feather keyway</td>
<td>Hubs/spacer without aluminium type standard and DKM with feather keyway</td>
<td>Hubs/spacer without aluminium type standard and DKM with feather keyway</td>
</tr>
<tr>
<td>Hubs/spacer made of aluminium only</td>
<td>Hubs/spacer made of aluminium only with feather keyway</td>
<td>Hubs/spacer made of aluminium only with feather keyway</td>
</tr>
<tr>
<td>Hubs/spacer made of aluminium only type standard and DKM with feather keyway</td>
<td>Hubs/spacer made of aluminium only type standard and DKM with feather keyway</td>
<td>Hubs/spacer made of aluminium only type standard and DKM with feather keyway</td>
</tr>
<tr>
<td>Hubs/spacer made of aluminium only type standard and DKM without feather keyway</td>
<td>Hubs/spacer made of aluminium only type standard and DKM without feather keyway</td>
<td>Hubs/spacer made of aluminium only type standard and DKM without feather keyway</td>
</tr>
</tbody>
</table>

The ATEX marking of the RADEX®-N coupling is applied on the outer sheath or on the front side. The lamina sets are not marked.

The ATEX marking of the ROTEX® GS coupling is applied on the outer sheath or on the front side. The spider is not marked.

The ATEX marking of the RADEX®-NC coupling is applied on the outer sheath or on the front side. The spacer is not marked.
### KTR products for potentially explosive atmospheres

<table>
<thead>
<tr>
<th>Product</th>
<th>MINEX®,S</th>
<th>BoWex-ELASTIC®</th>
<th>OAC Oil/air cooler</th>
<th>OPC cooling-pump-unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent-magnetic synchronous coupling for contactless torque transmission by magnetic forces between internal and external rotor; sizes 22 to 165(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ATEX marking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with containment shroud made of stainless steel or Hastelloy® Magnet material: Sm2Co17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II 2G Ex h IC T6 ... T3 Gb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40 °C ≤ Ta ≤ +60 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with containment shroud made of stainless steel or Hastelloy® Magnet material: NdFeB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II 2G Ex h IC T6 ... T2 Gb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40 °C ≤ Ta ≤ +100 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with containment shroud made of oxide ceramics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II 2G Ex h RC T6 ... T2 Gb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40 °C ≤ Ta ≤ +100 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>with containment shroud made of PEEK CFK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II 2G Ex h RC T6 ... T3 Gb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40 °C ≤ Ta ≤ +110 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ATEX marking of the BoWex-ELASTIC® coupling is applied on the polyamide flange of the elastomer component.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Products which do not allow for complete marking (§148 of the ATEX product directive 2014/34/EU) due to size or quality may reduce marking to ☑️_CE=./. For complete marking refer to the operating/assembly instructions and/or the delivery note/package.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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(1) For the safe operation of MINEX®,S in potentially explosive atmospheres the temperature during operation must be constantly monitored. Temperature monitoring must automatically switch off the drive before the respective maximum permissible surface temperature is reached. The heat generated on the MINEX®,S magnetic coupling, resulting from eddy current losses, must be permanently dissipated (e.g. by partial current of the pumping medium with pumps or sealing liquid).
Items that are not covered by directive 2014/34/EU.

The ATEX Product Directive applies for machines and protection systems. Driving components are not part of this directive.

Definition of equipment and components:

- Machines, operating equipment, stationary or mobile equipment, controlling and equipment parts, as well as warning and preventive systems serving to generate, transmit, store, measure, control or convert energy and process materials, either individually or in combination, which have an individual potential ignition source and, as a result, may cause an explosion, are described as “equipment”.
- Components that are necessary for safe operation of equipment, and protection systems with no independent function, are described as “components”.

CLAMPEX® clamping sets:

Use in potentially explosive atmospheres
The power transmission of CLAMPEX® clamping elements is based on the principle of two taper rings twisted into each other. An axial force generated on the rings (by means of several screws) produces surface pressure inside the shaft and outside the hub which allows for frictionally engaged transmission of the torque. Considering all operating data (intended use) a potential source of ignition does not exist. That is why clamping elements do not come within the scope of directive 2014/34/EU. Due to the aforementioned design of CLAMPEX® clamping elements a failure of components does not have to be expected. A risk only arises if friction heat is generated with slipping of a clamping connection (improper assembly/tightening torques).

Selection of clamping ring hubs, clamping hubs and clamping sets:

If used in potentially explosive atmospheres, the type of clamping set, clamping ring hub (clamping hubs without feather keyway only for use in category 3) and size must be selected such that there is a minimum safety factor of $s = 2$ between the peak torque of the machine including all operating parameters and the nominal torque of the coupling.

Hydraulic components:

KTR bellhousings and foot flanges made of aluminium and cast iron, damping rings type D and DT made of aluminium NBR and damping rods made of steel NR are permissible as connection elements between pump and electric motor (bellhousing and tank). The magnesium share in aluminium is less than 7.5%.

The user has to observe the following:

- All components have to be included in the equipotential bonding.
- The cover is required in accordance with DIN EN ISO 12100 (Safety of Machinery) and directive 2014/34/EU and must protect against – access with a little finger – falling down of solid foreign objects.
- The disassembly of the components is only permitted at standstill.
- The KTR mounting instructions for bellhousings (KTR standard 41010), damping rings (KTR standard 43010) and foot flanges (KTR standard 41110) have to be observed.
- For mining applications, cast iron or steel bellhousings must be used.
- For marine applications we also recommend cast iron or steel bellhousings.
Summary of literature

No matter if a perfect drive, a brake that takes effect, space-saving cooling or accurate hydraulics is required, if on land, by sea or at an airy height - KTR’s product portfolio is just as manifold as its applications. The following catalogues and leaflets provide an overview. Available at www.ktr.com

Product catalogues

Drive Technology
- Couplings
- Torque Limiters
- Clamping Sets
- Torque Measuring Shafts

Brake Systems
- KTR-STOP
- EMB-STOP

ATEX leaflet

Company leaflet

Explosion Protection
The ATEX certified and the KTR programme for explosion-proof applications

Achieving Great Things Together
A Company Introduction leaflet
For all representatives and sales partners please refer to www.ktr.com.

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