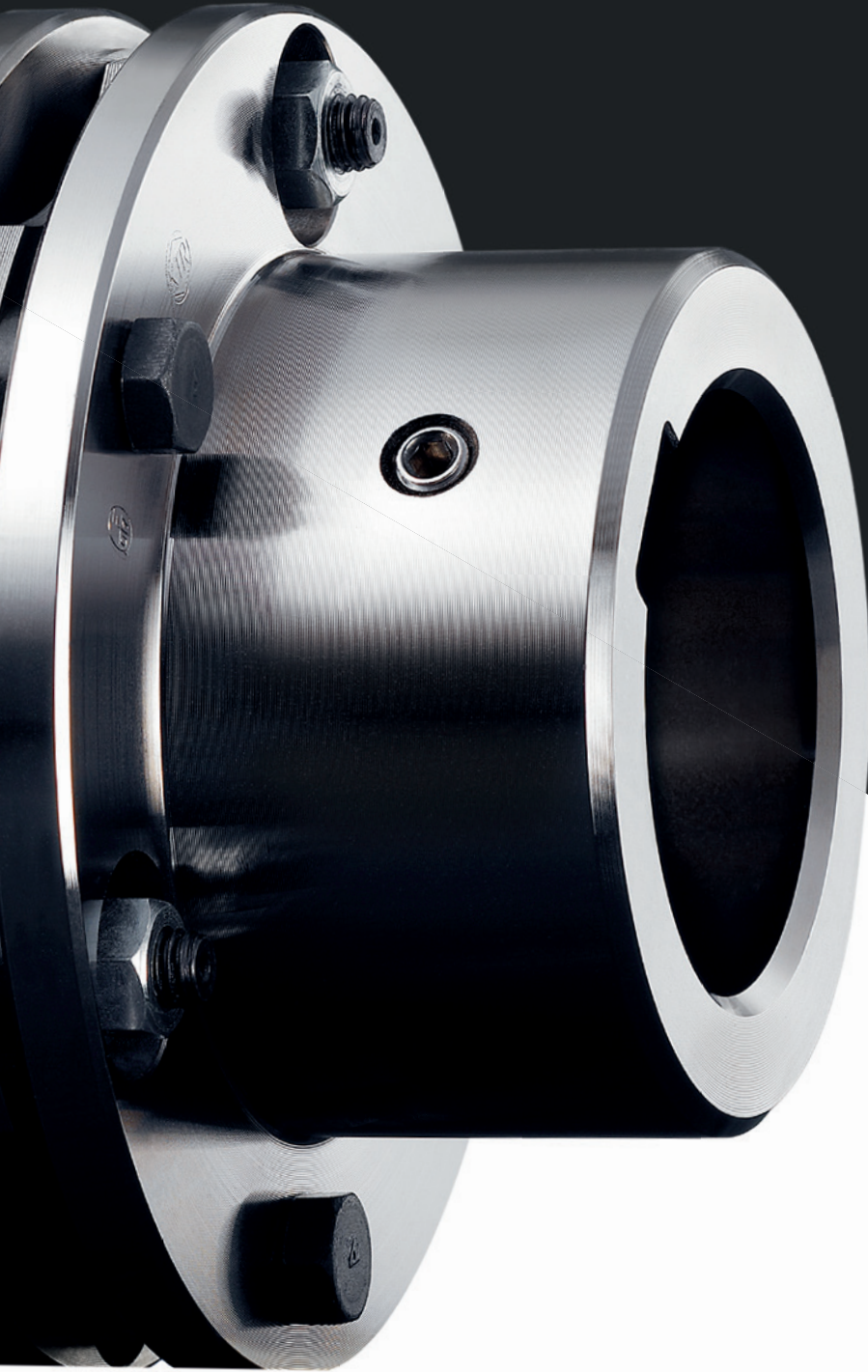


Made for Motion



Explosion Protection

The explosion protection directives and the KTR product range for applications with potentially explosive atmospheres



Caution: Explosive atmospheres!

There are many aspects to consider when you are designing drive systems for potentially explosive atmospheres. How do the explosion protection directives and standards affect your selection 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 explosion protection products directives 2014/34/EU (ATEX) and SI 2016 No. 1107 (UK) have far-reaching consequences on 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 explosion protection directives 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 explosion protection directives – 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 explosion protection directive. It includes torsionally flexible jaw as well as pin and bush couplings, backlash-free servo couplings, gear, flange, steel laminae and magnetic couplings, and also oil/air coolers.

On the following pages we first of all set out the requirements of the explosion protection directives and standards, 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 pleased 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.

Explosion protection according to directives 2014/34/EU and SI 2016 No. 1107.

Specifications:

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. For Great Britain this is regulated by the UK directive SI 2016 No. 1107 after the Brexit. 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 explosion protection. 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.

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

 = Potential use of KTR components

Zones:

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.

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

 = Potential use of KTR components

Equipment group:

EN ISO 80079-36 and EN IEC 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 potentially explosive atmosphere while the second letter defines the actual protection level.

Equipment group and equipment protection level (EPL) in accordance with EN ISO 80079-36

Explosion range	Equipment group	Zone	Equipment protection level (EPL) marking
Mining	I	-	Ma
		-	Mb or Ma
Gases/vapours	II	0	Ga
		1	Gb or Ga
		2	Gc or Gb or Ga
Dusts	II	20	Da
		21	Db or Da
		22	Dc or Db or Da

Operating range	Marking	Equipment protection level
Underground mines susceptible to firedamp	Ma	Equipment with high protection level that can be operated with an explosive atmosphere.
	Mb	Equipment with high protection level that has to be switched off with an explosive atmosphere.
Explosive gas atmospheres	Ga	Equipment with very high protection level
	Gb	Equipment with high protection level
	Gc	Equipment with normal protection level
Flammable dust atmosphere	Da	Equipment with very high protection level
	Db	Equipment with high protection level
	Dc	Equipment with normal protection level

 = Potential use of KTR components

Explosion protection according to directives 2014/34/EU and SI 2016 No. 1107.

Protection principle: Ignition protection type

Ignition protection types for nonelectric equipment in potentially explosive atmospheres

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

Dust groups:

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

Explosion group (dust group)		
IIIA	IIIB	IIIC
Flammable lints and fibres	Non-conductive dust, e. g. carbon dust, grain dust	Conductive dust, e. g. flammable metal dust

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

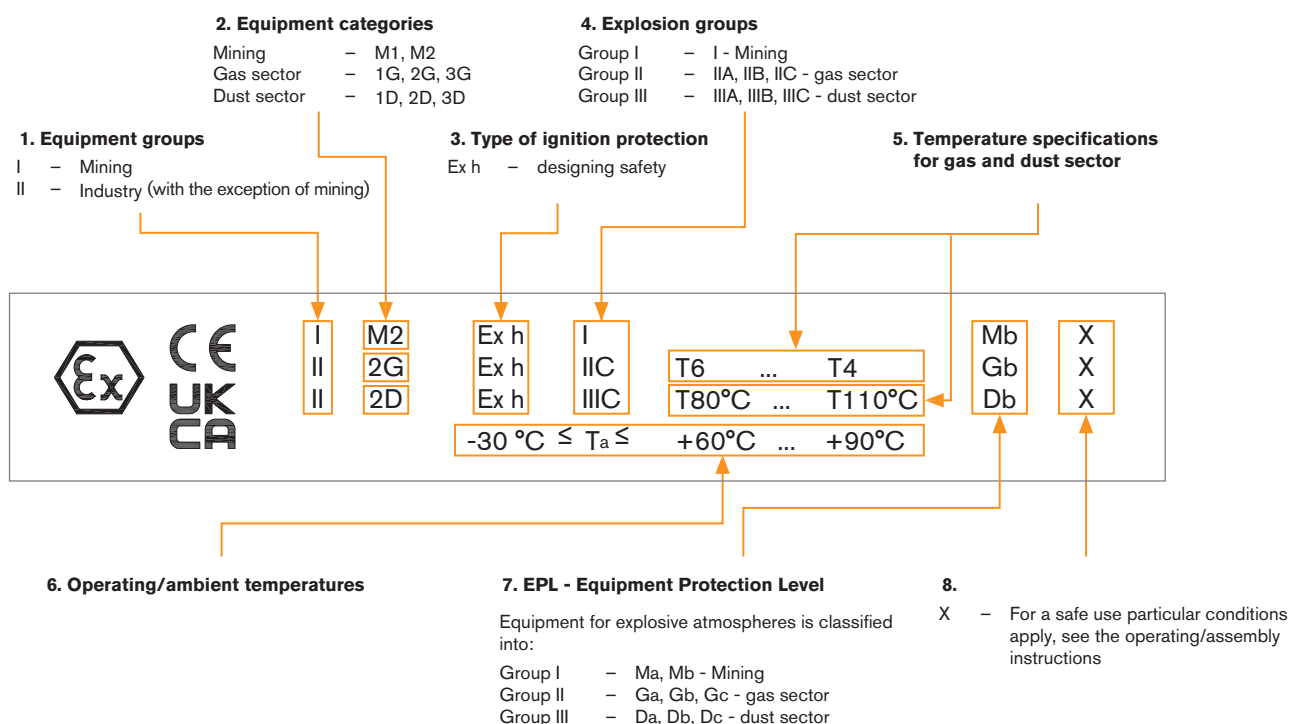
Gases and vapours are classified into explosion groups depending on their ignitability. As an example, the permissible size of insulating surfaces depends on the explosion groups, with standards rising from IIA to IIC. The temperature class does not correspond to the operating temperature of the equipment, 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 group (gas group)			Temperature class	Max. surface temperature	Perm. temperature class
II A	IIB	IIC			
Methane, ethane, propane, ammonia	Town gas, acryl nitrite	Hydrogen	T1	450 °C	T1 to T6
Ethyl alcohol, jet fuel	Ethylene, ethylene oxid	Ethyne (acetylene)	T2	300 °C	T2 to T6
Petrols in general, jet fuel, n-hexane	Ethylene glycol, hydrogen sulfide		T3	200 °C	T3 to T6
Acetaldehyde	Ethyl ether		T4	135 °C	T4 to T6
			T5	100 °C	T5 to T6
		Carbon disulfide	T6	85 °C	T6

Please note:

Couplings that correspond to a higher temperature class, e. g. T6, are also permissible for those applications that require a lower temperature class, e. g. T2.

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



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 the explosion protection directions and must protect against

- access with a little finger
- falling down of solid foreign objects.

The coupling protection is not part of KTR's scope of delivery and is the customer's responsibility. It must have sufficient distance to the rotating components to avoid contact safely. Depending on the outside diameter DH of the coupling, we recommend the following minimum distance: $\text{ØDH to } 50 \text{ mm} = 6 \text{ mm}$, $\text{ØDH } 50 \text{ mm to } 120 \text{ mm} = 10 \text{ mm}$, $\text{ØDH from } 120 \text{ mm} = 15 \text{ mm}$.

Please check if a proper enclosure (ignition protection, coupling protection, contact protection) has been mounted and the operation of the coupling is not affected by the enclosure. The same applies for test runs and rotational direction inspections.

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. If thicker paintings resp. coatings up to a layer thickness of a maximum of 2.0 mm are applied, the components are not permissible for gases or vapours of category IIC in potentially explosive areas, but only for gases and vapours of category IIA and IIB. It also applies for multiple coatings exceeding an overall thickness of 200 μm . Make sure with painting or coating that the coupling components are conductively connected with the device/devices to be connected so that the equipotential bonding is not impeded by the paint or coat applied.

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 generate 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.

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.

Explosion protection marking:

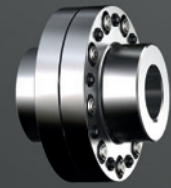
KTR components bear an explosion protection marking as follows:



Example of explosion protection marking on the ROTEX® jaw coupling

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 U . 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.

KTR products for potentially explosive atmospheres



Product	ROTEX®	POLY-NORM®	REVOLEX® KX /KX-D
Description	Fail-safe, torsionally flexible jaw coupling	Compact, fail-safe, torsionally flexible jaw coupling	Compact, fail-safe, torsionally flexible pin & bush coupling
Explosion protection marking	<p>Hubs/spacer without aluminium</p> <p>Standard, AFN, BFN, CF, CFN, DF, DFN, DKM, AH, SH, ZS-DKM, ZS-DKM-H, SP and TB with feather keyway with hub type 1.0, 1.3, 1.4, 2.1, 2.3, 2.6, 7.1, 7.6, 7.6</p> <p>CE I M2 Ex h I Mb X UK II 2G Ex h IIC T6 ... T4 Gb X CA II 2D Ex h IIIC T80 °C ... T110 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +90 °C</p> <p>Standard, AFN, BFN, CF, CFN, DKM, AH, SH, ZS-DKM, ZS-DKM-H and SP without feather keyway with hub type 2.0, 2.5, 2.8, 7.0, 7.5, 7.8</p> <p>CE I M2 Ex h I Mb X UK II 3G Ex h IIC T6 ... T4 Gc X CA II 3D Ex h IIIC T80 °C ... T110 °C Dc X -30 °C ≤ Ta ≤ +60 °C ... +90 °C</p> <p>Hubs/spacer made of aluminium only</p> <p>Standard, AFN, BFN, CF, CFN, DF, DFN, DKM, ZS-DKM, ZS-DKM-H and SP with feather keyway with hub type 1.0, 1.3, 1.4, 2.1, 2.3, 2.6, 7.1, 7.6, 7.9 (no explosion protection approval with aluminium diecast)</p> <p>CE II 2G Ex h IIC T6 ... T4 Gb X UK II 2D Ex h IIIC T80 °C ... T110 °C Db X CA -30 °C ≤ Ta ≤ +60 °C ... +90 °C</p> <p>Standard, AFN, BFN, CF, CFN, DKM, ZS-DKM, ZS-DKM-H and SP without feather keyway with hub type 2.0, 2.5, 2.8, 7.0, 7.5, 7.8 (no explosion protection approval with aluminium diecast)</p> <p>CE II 3G Ex h IIC T6 ... T4 Gc X UK II 3D Ex h IIIC T80 °C ... T110 °C Dc X CA -30 °C ≤ Ta ≤ +60 °C ... +90 °C</p>	<p>with feather keyway</p> <p>CE I M2 Ex h I Mb X UK II 2G Ex h IIC T6 ... T5 Gb X CA II 2D Ex h IIIC T80 °C ... T95 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +75 °C</p>	<p>with feather keyway</p> <p>CE I M2 Ex h I Mb X UK II 2G Ex h IIC T6 ... T5 Gb X CA II 2D Ex h IIIC T80 °C ... T95 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +75 °C</p>
Marking	The explosion protection marking of the ROTEX® coupling is applied on the outer sheath or on the front side. The flexible spider is not marked.	The explosion protection marking of the POLY-NORM® coupling is applied on the outer sheath or on the front side. The elastomer ring is not marked.	The explosion protection marking of the REVOLEX® KX / KX-D coupling is applied on the outer sheath or on the front side. The elastomers are not marked.
Other	Products which do not allow for complete marking (§148 of the explosion protection products directives 2014/34/EU and SI 2016 No. 1107) due to size or qu		

⁽⁴⁾ 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 explosion protection standards. For that reason the explosion protection marking is only shown on the respective outer sleeve made of polyamide.



POLY

BoWex®

BoWex-ELASTIC®

Shear type, torsionally flexible jaw coupling

Shear type curved-tooth gear coupling® in the material combination nylon/steel ⁽¹⁾

Highly flexible flange and shaft coupling

with feather keyway

I M2 Ex h I Mb X
 II 2G Ex h IIC T6 ... T5 Gb X
 II 2D Ex h IIIC T80 °C ... T95 °C Db X
 -30 °C ≤ Ta ≤ +60 °C ... +75 °C

- type M with standard sleeve (light), sizes M-14 and M-19
- type M with conductive sleeve (black), sizes M-14C to M-80C
- type S.-St with standard sleeve (light), sizes S14-St to S24-St inclusive
- type GT

- type HE
- type HEW
- type HEW Compact

II 2G Ex h IIB T6 ... T4 Gb X
 II 2D Ex h IIIC T80 °C ... T115 °C Db X
 -30 °C ≤ Ta ≤ +45 °C ... +80 °C

I M2 Ex h I Mb X
 II 2G Ex h IIC T6 ... T4 Gb X
 II 2D Ex h IIIC T80 °C ... T120 °C Db X
 -30 °C ≤ Ta ≤ +60 °C ... +100 °C

- type M with standard sleeve (light), sizes M-24 to M-65
- type S.-St with standard sleeve (light), sizes to S28-S inclusive
- type SSR with Seeger circlips with standard sleeve (light), sizes 24 SSR to 45 SS inclusive

I M2 Ex h I Mb X
 II 2G Ex h IIB T6 ... T4 Gb X
 II 2D Ex h IIIC T80 °C ... T120 °C Db X
 -30 °C ≤ Ta ≤ +60 °C ... +100 °C

The explosion protection marking of the POLY coupling is applied on the outer sheath or on the front side. The elastomers are not marked.









The explosion protection marking of the BoWex® coupling is applied on the outer sheath or on the front side.

The explosion protection marking of the BoWex-ELASTIC® coupling is applied on the polyamide flange of the elastomer part.



Availability may reduce marking to . For complete marking refer to the operating/assembly instructions and/or the delivery note/package.


KTR products for potentially explosive atmospheres



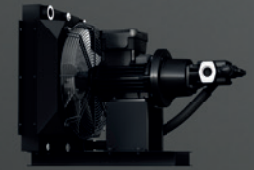
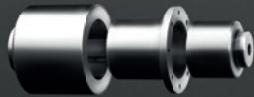
Product	GEARex®	COUNTEx®	RIGIFLEX®-N
Description	Gear coupling made of steel with grease lubrication	Compact, shear type, backlash-free, torsionally stiff and double-cardanic shaft encoder coupling	Backlash-free, torsionally stiff steel laminae coupling (The coupling complies with the standards of API 610 and optionally API 671.)
Explosion protection marking	<p>Standard: Marking for unpainted resp. coated or painted couplings with a layer thickness < 200 µm, applying for the following stypes/sizes:</p> <ul style="list-style-type: none"> FA, FB, FAB (sizes 10 - 70) DA, DB, DAB (sizes 20 - 150) FH and DH as well as FR and DR (sizes 10 - 150) <p>  I M2 Ex h I Mb X II 2G Ex h IIC T6 ... T4 Gb X II 2D Ex h IIIC T80 °C ... T110 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +90 °C </p>	<p>Hubs without aluminium</p> <p>with feather keyway with hub type 1.0 and 1.3</p> <p>  I M2 Ex h I Mb X -40 °C ≤ Ta ≤ +120 °C II 2G Ex h IIC T6 ... T3 Gb X II 2D Ex h IIIC T80 °C ... T190 °C Db X -40 °C ≤ Ta ≤ +50 °C ... +160 °C </p> <p>without feather keyway with hub type 1.1 and 1.2</p> <p>  I M2 Ex h I Mb X -40 °C ≤ Ta ≤ +120 °C II 3G Ex h IIC T6 ... T3 Gc X II 3D Ex h IIIC T80 °C ... T190 °C Dc X -40 °C ≤ Ta ≤ +50 °C ... +160 °C </p>	<p>Standard: with feather keyway Marking for unpainted resp. coated or painted couplings with a layer thickness < 200 µm</p> <p>  I M2 Ex h I Mb X -40 °C ≤ Ta ≤ +130 °C II 2G Ex h IIC T6 ... T2 Gb X II 2D Ex h IIIC T80 °C ... T250 °C Db X -40 °C ≤ Ta ≤ +60 °C ... +230 °C </p>
	<p>Special: Marking for painted couplings with a layer thickness of 0.2 mm to max. 2.0 mm, applying for the following types/sizes:</p> <ul style="list-style-type: none"> FA, FB, FAB (sizes 10 - 70) DA, DB, DAB (sizes 20 - 150) FH and DH as well as FR and DR (sizes 10 - 150) <p>  I M2 Ex h I Mb X II 2G Ex h IIB T6 ... T4 Gb X II 2D Ex h IIIC T80 °C ... T110 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +90 °C </p>	<p>Hubs made of aluminium only</p> <p>with feather keyway with hub type 1.0 and 1.3</p> <p>  II 2G Ex h IIC T6 ... T3 Gb X II 2D Ex h IIIC T80 °C ... T190 °C Db X -40 °C ≤ Ta ≤ +50 °C ... +160 °C </p> <p>without feather keyway with hub type 1.1 and 1.2</p> <p>  II 3G Ex h IIC T6 ... T3 Gc X II 3D Ex h IIIC T80 °C ... T190 °C Dc X -40 °C ≤ Ta ≤ +50 °C ... +160 °C </p>	<p>Special: with feather keyway Marking for painted couplings with a layer thickness of 0.2 mm to max. 2.0 mm</p> <p>  I M2 Ex h I Mb X -40 °C ≤ Ta ≤ +130 °C II 2G Ex h IIB T6 ... T2 Gb X II 2D Ex h IIIC T80 °C ... T250 °C Db X -40 °C ≤ Ta ≤ +60 °C ... +230 °C </p>
Marking	The explosion protection marking of the GEARex® coupling is applied on the outer sheath or on the front side.	The explosion protection marking of the COUNTEx® coupling is applied on the outer sheath or on the front side. The spacer is not marked.	The explosion protection marking of the RIGIFLEX®-N coupling is applied on the outer sheath or on the front side. The laminae sets are not marked.
Other	Products which do not allow for complete marking (§148 of the explosion protection products directives 2014/34/EU and SI 2016 No. 1107) due to size or qu		

⁽¹⁾ For temperature classes T2 and T1 the max. permissible ambient resp. operating temperature is Ta = 280 °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.

		
<p align="center">RADEX®-N</p>	<p align="center">ROTEX® GS / ROTEX® GS P</p>	<p align="center">RADEX®-NC</p>
<p>Fail-safe, backlash-free, torsionally stiff steel laminae coupling ⁽¹⁾</p>	<p>Fail-safe, torsionally flexible jaw coupling backlash-free under prestress</p>	<p>Shear type, backlash-free, torsionally stiff servo laminae coupling</p>
<p>Standard: with feather keyway Marking for unpainted resp. coated or painted couplings with a layer thickness < 200 µm</p> <p>  I M2 Ex h I Mb X -40 °C ≤ Ta ≤ +130 °C II 2G Ex h IIC T6 ... T2 Gb X II 2D Ex h IIIC T80 °C ... T250 °C Db X -40 °C ≤ Ta ≤ +60 °C ... +230 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer without aluminium</p> <p>Standard and DKM <u>with</u> feather keyway with hub type 1.0, 2.1, 2.6, 2.9, 7.6, 7.9 and additionally hub type 4.1, 4.2, 6.0, 6.5</p> <p>  I M2 Ex h I Mb X II 2G Ex h IIC T6 ... T4 Gb X II 2D Ex h IIIC T80 °C ... T110 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +90 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer without aluminium</p> <p>EK and DK <u>with</u> feather keyway with hub type 1.0, 2.6, 3.6 and additionally hub type 6.0, 6.5</p> <p>  I M2 Ex h I Mb X -30 °C ≤ Ta ≤ +130 °C II 2G Ex h IIC T6 ... T3 Gb X II 2D Ex h IIIC T80 °C ... T195 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +175 °C </p>
<p>Special: with feather keyway Marking for painted couplings with a layer thickness of 0.2 mm to max. 2.0 mm</p> <p>  I M2 Ex h I Mb X -40 °C ≤ Ta ≤ +130 °C II 2G Ex h IIB T6 ... T2 Gb X II 2D Ex h IIIC T80 °C ... T250 °C Db X -40 °C ≤ Ta ≤ +60 °C ... +230 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer without aluminium</p> <p>Standard and DKM <u>without</u> feather keyway with hub type 1.1, 2.0, 2.5, 2.8, 7.5, 7.8</p> <p>  I M2 Ex h I Mb X II 3G Ex h IIC T6 ... T4 Gc X II 3D Ex h IIIC T80 °C ... T110 °C Dc X -30 °C ≤ Ta ≤ +60 °C ... +90 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer without aluminium</p> <p>EK and DK <u>without</u> feather keyway with hub type 2.5, 3.5</p> <p>  I M2 Ex h I Mb X -30 °C ≤ Ta ≤ +130 °C II 3G Ex h IIC T6 ... T3 Gc X II 3D Ex h IIIC T80 °C ... T195 °C Dc X -30 °C ≤ Ta ≤ +60 °C ... +175 °C </p>
<p>Standard: Composite (type NANA 4 CFK) Marking for unpainted resp. coated or painted couplings with a layer thickness < 200 µm</p> <p>  II 2G Ex h IIC T6 ... T5 Gb X II 2D Ex h IIIC T80 °C ... T95 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +75 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer made of aluminium only</p> <p>Standard and DKM <u>with</u> feather keyway with hub type 1.0, 2.1, 2.6, 2.9, 7.6, 7.9 and additionally hub type 4.1, 4.2, 6.0, 6.5</p> <p>  II 2G Ex h IIC T6 ... T4 Gb X II 2D Ex h IIIC T80 °C ... T110 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +90 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer made of aluminium only</p> <p>EK and DK <u>with</u> feather keyway with hub type 1.0, 2.6, 3.6 and additionally hub type 6.0, 6.5</p> <p>  II 2G Ex h IIC T6 ... T3 Gb X II 2D Ex h IIIC T80 °C ... T195 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +175 °C </p>
<p>Special: Composite (type NANA 4 CFK) Marking for painted couplings with a layer thickness of 0.2 mm to max. 2.0 mm</p> <p>  II 2G Ex h IIB T6 ... T5 Gb X II 2D Ex h IIIC T80 °C ... T95 °C Db X -30 °C ≤ Ta ≤ +60 °C ... +75 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer made of aluminium only</p> <p>Standard and DKM <u>without</u> feather keyway with hub type 1.1, 2.0, 2.5, 2.8, 7.5, 7.8</p> <p>  II 3G Ex h IIC T6 ... T4 Gc X II 3D Ex h IIIC T80 °C ... T110 °C Dc X -30 °C ≤ Ta ≤ +60 °C ... +90 °C </p>	<p align="center" style="writing-mode: vertical-rl; transform: rotate(180deg);">Hubs/spacer made of aluminium only</p> <p>EK and DK <u>without</u> feather keyway with hub type 2.5, 3.5</p> <p>  II 3G Ex h IIC T6 ... T3 Gc X II 3D Ex h IIIC T80 °C ... T195 °C Dc X -30 °C ≤ Ta ≤ +60 °C ... +175 °C </p>
<p>The explosion protection marking of the RADEX®-N coupling is applied on the outer sheath or on the front side. The laminae sets are not marked.</p>	<p>The explosion protection marking of the ROTEX® GS coupling is applied on the outer sheath or on the front side. The spider is not marked.</p>	<p>The explosion protection marking of the RADEX®-NC coupling is applied on the outer sheath or on the front side. The spacer is not marked.</p>

Availability may reduce marking to . For complete marking refer to the operating/assembly instructions and/or the delivery note/package.

KTR products for potentially explosive atmospheres



Product	MINEX®-S	OAC oil/air cooler	OPC cooling-pump-unit
Description	Permanent-magnetic synchronous coupling for contactless torque transmission by magnetic forces between internal and external rotor; sizes 22 to 165 ⁽¹⁾	Oil/air cooler type OAC with electric or hydraulic drive motor	Cooling-pump-unit type OPC with electric drive motor and hydraulic pump
Explosion protection marking	Containment shroud: stainless steel resp. Hastelloy® Magnet material: Sm2Co17 Ex II 2G Ex h IIC T6 ... T2 Gb -40 °C ≤ Ta ≤ +60 °C ... +200 °C	type OAC Ex II 2G Ex h IIC T6 ... T3 Gb Ex II 3D Ex h IIIC T68 °C ... T110 °C Dc -20 °C ≤ Ta ≤ +55 °C	type OPC Ex II 2G Ex h IIC T6 ... T3 Gb Ex II 3D Ex h IIIC T68 °C ... T110 °C Dc -20 °C ≤ Ta ≤ +55 °C
	Containment shroud: stainless steel resp. Hastelloy® Magnet material: NdFeB Ex II 2G Ex h IIC T6 ... T3 Gb -40 °C ≤ Ta ≤ +60 °C ... +150 °C		
	Containment shroud: oxide ceramics Ex II 2G Ex h IIC T6 ... T2 Gb -40 °C ≤ Ta ≤ +60 °C ... +200 °C		
	Containment shroud: PEEK CFK Ex II 2G Ex h IIC T6 ... T4 Gb -40 °C ≤ Ta ≤ +60 °C ... +110 °C		
Marking			
Other	Products which do not allow for complete marking (§148 of the explosion protection products directives 2014/34/EU and SI 2016 No. 1107) due to size or quality may reduce marking to Ex Cc . For complete marking refer to the operating/assembly instructions and/or the delivery note/package.		

⁽¹⁾ For safe operation of MINEX®-S in potentially explosive atmospheres the temperature must be constantly monitored during operation. 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 directives 2014/34/EU and SI 2016 No. 1107.

The explosion protection products directives apply for equipment and protection systems. Driving components are not part of these directives.

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) generates surface pressure inside the shaft and outside the hub which allows for frictionally engaged transmission of the torque. Considering all operating data (intended use), there is no potential source of ignition. Clamping elements do not come within the directives 2014/34/EU and SI 2016 No. 1107.

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 directives 2014/34/EU and SI 2016 No. 1107 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-N 41010), damping rings (KTR-N 42410 and KTR-N 43010) and foot flanges (KTR-N 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



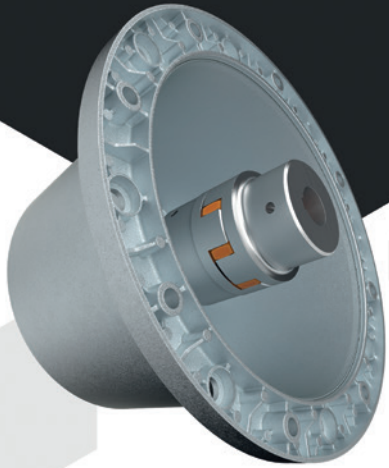
ATEX leaflet



Company leaflet



Made for Motion **KTR**



Hydraulic components

- Bellhousings
- Damping elements
- Cooling systems
- Oil tanks

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Cooling systems

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www.ktr.com

KTR Germany:

Headquarters:

KTR Systems GmbH

Carl-Zeiss-Straße 25

D-48432 Rheine

Phone: +49 5971 798-0

Fax: +49 5971 798-698 oder 798-450

E-Mail: mail@ktr.com

Internet: www.ktr.com

KTR Brake Systems GmbH

Competence Center for Brake Systems

Zur Brinke 14

D-33758 Schloß Holte-Stukenbrock

Phone: +49 5207 99161-0

Leiter Vertrieb Bremsen Wind

Lino Gioroglou

Zur Brinke 14

D-33758 Schloß Holte-Stukenbrock

Phone: +49 5207 991 61-72

Mobile: +49 160 90 58 97 41

E-Mail: l.gioroglou@ktr.com

Leiter Vertrieb Bremsen Industrie

Thomas Wienkotte, Dipl.-Ing. (FH)

Am Rott 18

D-50171 Kerpen

Phone: +49 2237 971796

Mobile: +49 172 5859448

E-Mail: t.wienkotte@ktr.com

Außendienst Norddeutschland für Hydraulik-

Komponenten

Gunnar Ehlers

Finkenstieg 4b

21629 Neu Wulmstorf

Mobile: +49 174 3301536

E-Mail: g.ehlers@ktr.com

Außendienst Bayern, Baden-Württemberg und Österreich für Hydraulik-Komponenten

Klaus-Peter Sprödhuber

Blumenstraße 6

95499 Harsdorf

Phone: +49 9203 9739450

Mobile: +49 172 1096496

E-Mail: k.sproedhuber@ktr.com

Schleswig-Holstein, Nord-Niedersachsen, Hamburg, Bremen

Martin Lau, Maschinenbautechniker

KTR Ingenieurbüro Hamburg

Geschwister-Scholl-Allee 44

25524 Itzehoe

Phone: +49 4821 4050812

Mobile: +49 172 5310014

E-Mail: m.lau@ktr.com

NRW: Ruhrgebiet, Großraum Düsseldorf, Köln, Aachen

John Wein,

B. Sc. Wirtschaftsingenieurwesen

Carl-Zeiss-Straße 25

48432 Rheine

Phone: +49 5971 798 7437

Mobile: +49 151 62489605

E-Mail: j.wein@ktr.com

Emsland, Mitte- und Süd-Niedersachsen, Ostwestfalen

Rainer Lüttmann

KTR Systems GmbH

Carl-Zeiss-Straße 25

48432 Rheine

Phone: +49 5971 798-340

Mobile: +49 172 5322164

E-Mail: r.luettmann@ktr.com

NRW: Süd, Westfalen und Nordhessen

René Szabó,

Techniker u. techn. Betriebswirt (IHK)

Waldstr. 67

57080 Siegen-Niederschelden

Phone: +49 5971 798 7777

Mobile: +49 175 81 64844

E-Mail: r.szabo@ktr.com

Hessen, Rheinland-Pfalz, Saarland

Martin Dietrich, Ingenieur Maschinenbau

KTR Ingenieurbüro Frankfurt

Schorbachstr. 9

35510 Butzbach

Phone: +49 6033 9248494

Mobile: +49 172 5329968

E-Mail: m.dietrich@ktr.com

Berlin, Mecklenburg-Vorpommern Südost, Sachsen-Anhalt, Brandenburg

Thüringen Nord, Sachsen

Norman Schlag, Tech. BW (IHK)

KTR Ingenieurbüro Leipzig

Hauptstraße 101

04416 Markkleeberg

Phone: +49 341 35416467

Mobile: +49 173 4716266

E-Mail: n.schlag@ktr.com

Baden-Württemberg Nord

Eberhard Maier, Dipl.-Ing. (FH)

Hortensienweg 1

70374 Stuttgart, Sommerain

Phone: +49 711 65842957

Mobile: +49 172 5355056

E-Mail: e.maier@ktr.com

Baden-Württemberg Süd

Jochen Glöckler, Maschinenbautechniker

KTR Ingenieurbüro Balingen

Hölzlestraße 44

72336 Balingen

Phone: +49 7433 91381

Mobile: +49 172 5310049

E-Mail: j.gloeckler@ktr.com

Bayern-Nord, Thüringen Süd

Alexander Ennulat, Dipl.-Ing.

KTR Ingenieurbüro Römerstein

Grabenstetter Str. 28

72587 Römerstein

Phone: +49 7382 9369226

Mobile: +49 162 4160354

E-Mail: a.ennulat@ktr.com

Bayern-Süd, Baden-Württemberg Ost

Peter Benkard, Dipl.-Ing. (FH)

KTR Ingenieurbüro Adelsried

Am Mittelfeld 13

86477 Adelsried

Phone: +49 8293 9605-04

Mobile: +49 172 5313059

E-Mail: p.benkard@ktr.com

Alle aktuellen Vertretungen und Handelspartner finden Sie auf www.ktr.com.

KTR worldwide:

Algeria

KTR Algérie

Phone: +213 661 92 24 00
Phone: +33 4 78 64 54 66
E-Mail: ktr-dz@ktr.com

Brazil

KTR do Brasil Ltda.

Rua Jandaia do Sul 471 -
Bairro Emiliano Perneta
Pinhais - PR - Cep: 83324-440
Phone: +55 41 36 69 57 13
E-Mail: ktr-br@ktr.com

Chile

KTR Systems Chile SpA
Calle Bucarest 17
Oficina 32 Providencia
Santiago de Chile

Phone: +56 23 22 46 674
Mobile: +56 9 44 75 57 02
E-Mail: ktr-cl@ktr.com

China

KTR Power Transmission Technology
(Shanghai) Co. Ltd.
Building 1005, ZOBON Business Park,
Gate 2, 1005 Wangqiao Road
Pudong
Shanghai 201201

Phone: +86 21 58 38 18 00
Fax: +86 21 58 38 19 00
E-Mail: ktr-cn@ktr.com

Czech Republic

KTR CR, spol. s r.o.
Brněnská 559
569 43 Jevíčko
Czech republic

Phone: +420 461 325 014
E-Mail: ktr-cz@ktr.com

Denmark

KTR Systems Danmark ApS
Vejlsovej 51, Bygning N
8600 Silkeborg

Phone: +45 39 39 10 50
E-Mail: ktr-dk@ktr.com

Finland

KTR Finland OY
Tiistiniityntie 4
FIN-02230 Espoo

Phone: +358 2 07 41 46 10
E-Mail: ktr-fi@ktr.com

France

KTR France SAS
5 Chemin de la Brocardière
CS 71359
F-69573 DARDILLY CEDEX
Phone: +33 4 78 64 54 66
Fax: +33 4 78 64 54 31
E-Mail: ktr-fr@ktr.com

India

KTR Couplings (India) Pvt. Ltd.,
T - 36 / 37 / 38 / 39, MIDC Bhosari,
Pune Maharashtra 411026

Phone: +91 20 27 12 73 24 / 25
Fax: +91 20 27 12 73 23
E-Mail: ktr-in@ktr.com;
india.sales@ktr.com

Italy

KTR Systems GmbH
Sede Secondaria Italia
Via Giacomo Brodolini, 8
I - 40133 Bologna (BO)

Phone: +39 051 613 32 32
Fax: +39 051 298 55 77
E-Mail: ktr-it@ktr.com

Japan

KTR Japan Co., Ltd.
c/o The Sumitomo Warehouse Co., Ltd.
Kobe Branch, Chuo Logistics Center L-6
7-14 Minatojima, Chuo-ku, Kobe City,
Hyogo 650-0045 Japan

Phone: +81 78 381 84 01
Fax: +81 78 945 85 60
E-Mail: ktr-jp@ktr.com

Korea

KTR Korea Ltd.
#604, Songwon bldg., 89-10,
Galmaejungang-ro, Guri-si,
Gyeonggi-do, 11901 Korea

Phone: +82 3 15 69 45 10
Fax: +82 3 15 69 45 25
E-Mail: ktr-kr@ktr.com

Netherlands and Belgium

KTR Benelux B. V.
Postbus 87
Oosterveldsingel 3
NL-7558 PJ Hengelo (O)

Phone: +31 74 2553680
E-Mail: ktr-nl@ktr.com

Norway

KTR Systems Norge AS
Lahaugmoveien 81
N-2013 Skjetten

Phone: +47 64 83 54 90
E-Mail: ktr-no@ktr.com

Poland

KTR Polska Sp. z o.o.
ul. Czerwone Maki 65
PL-30-392 Kraków

Phone: +48 12 267 28 83
E-Mail: ktr-pl@ktr.com

Singapore

KTR Systems Singapore Pte. Ltd.
2 Venture Drive
#13-02 Vision Exchange
Singapore 608526

Phone: +65 69 04 12 32
Mobile: +65 96 33 66 92
E-Mail: a.low@ktr.com

South Africa

KTR Couplings SA (Pty) Ltd.
28 Spartan Road, Kempton Park,
Spartan Ext. 21, Johannesburg, Gauteng

Phone: +27 87 260 6263/4
Fax: +27 82 922 4365
E-Mail: ktr-za@ktr.com

Spain and Portugal

KTR Systems GmbH
Estartetxe, n° 5—Oficina 322
E-48940 Leioa (Vizcaya)

Phone: +34 9 44 80 39 09
Fax: +34 9 44 31 68 07
E-Mail: ktr-es@ktr.com

Sweden

KTR Sverige AB
Kivra: 556585-4071
S-106 31 Stockholm

Phone: +46 8 6250290
E-Mail: info.se@ktr.com

Switzerland

KTR Systems Schweiz AG
Bahnstr. 60
CH-8105 Regensdorf

Phone: +41 43 311 15 55
Fax: +41 43 311 15 56
E-Mail: ktr-ch@ktr.com

Taiwan

KTR Taiwan Ltd.
No. 30-1, Gongyequ 36th Rd., Xitun Dist.,
Taichung City 40768, Taiwan (R.O.C)

Phone: +886 4 23 59 32 78
Fax: +886 4 23 59 75 78
E-Mail: ktr-tw@ktr.com

Turkey

KTR Turkey
Güç Aktarma Sistemleri San. ve Tic. Ltd.
Sti. Kayışdağı Cad. No: 117/2
34758 Atasehir -Istanbul

Phone: +90 216 574 37 80
E-Mail: ktr-tr@ktr.com

United Kingdom

KTR U.K. Ltd.
Robert House
Unit 7, Acorn Business Park
Woodseats Close
Sheffield
United Kingdom, S8 0TB

Phone: +44 11 42 58 77 57
Fax: +44 11 42 58 77 40
E-Mail: ktr-uk@ktr.com

USA

KTR Corporation
122 Anchor Road
Michigan City, Indiana 46360

Phone: +1 2 19 8 72 91 00
Fax: +1 2 19 8 72 91 50
E-Mail: ktr-us@ktr.com





Headquarters

KTR Systems GmbH

Carl-Zeiss-Straße 25

D-48432 Rheine

Phone: +49 5971 798-0

Fax: +49 5971 798-698 or 798-450

E-mail: mail@ktr.com

Internet: www.ktr.com

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The logo for KTR is a stylized orange hexagon with a white outline. Inside the hexagon, the letters "KTR" are written in a bold, orange, sans-serif font.