[1] # TYPE EXAMINATION CERTIFICATE

[2] **for non-electrical equipment and components of the Equipment Groups I and II, Categories M2 and 2 as well as 3**
(Translation)

[3] Type Examination Certificate Number: **IBExU06ATEXB009 X**

[4] Equipment / Component: **REVOLEX® KX - Torsionally flexible pin & bush couplings**
in the designs
- KX (Standard)
- KX-D (pins alternately arranged)
- KX-AB (with limitation of axial clearance)
- KX-TB (with taper clamping hub)

in the sizes to 370

[5] Manufacturer: KTR Kupplungstechnik GmbH

[6] Address: Rodder Damm 170
48432 Rheine
Germany

[7] The design of the product mentioned in [4] and any acceptable variations thereto is specified in the schedule to this Type Examination Certificate.

[8] IBExU Institut für Sicherheitstechnik GmbH certifies that the product mentioned in [4] has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of the product intended for use in potentially explosive atmospheres given in Annex II to the Directive 94/9/EC.
The test results are recorded in the Test Report IB-06-4-007 of 8 May 2007.

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 1127-1:1997, EN 1127-2:2002, EN 13463-1:2001 and EN 13463-5:2003.

[10] If the sign "X" is placed after the certificate number and / or the marking mentioned in [12], it indicates that the product is subject to special conditions for safe use specified in [17] in the schedule to this Type Examination Certificate.

[11] This Type Examination Certificate relates only to the design and construction of the specified product. If applicable, further requirements of this Directive apply to the manufacture and supply of this product (see for example [19]).

[12] The marking of the REVOLEX® KX - Torsionally flexible pin & bush couplings of the designs mentioned in [4] can be as follows:

⟨Ex⟩ **II 2GD c IIC T X**

⟨Ex⟩ **I M2 c X**

According to the maximum permissible ambient temperatures resp. operating temperatures T_a and Temperature Classes or maximum surface temperatures considering a temperature rise of ΔT = 20 K [see 16] the marking can also be:

⟨Ex⟩ **II 2G c IIC T6 resp. T5 X**
-30 °C ≤ T_a ≤ +65 °C resp. +80 °C

⟨Ex⟩ **II 2D c T 100 °C X**
-30 °C ≤ Ta ≤ +80 °C

⟨Ex⟩ **I M2 c X**
-30 °C ≤ T_a ≤ +80 °C

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Freiberg, 8 May 2007

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(Prof. Dr. Redeker)

Certificates without signature and stamp are not valid.
Certificates may only be duplicated completely and unchanged.
In case of dispute, the German text shall prevail.

Schedule

[13] **Schedule**

[14] to **Type Examination Certificate IBExU06ATEXB009 X**

[15] **Description**

The REVOLEX® KX - Torsionally flexible pin & bush couplings mentioned in [4] are torsionally flexible, failsafe pin & bush couplings. They consist of two hub parts; one pin hub with the corresponding pins and one bush hub. The transmission of torque is carried out via the steel pins with their taper elastomer rings which mesh with the corresponding bores in the bush hub. Pins and bores of the design REVOLEX® KX-D are alternately arranged in the two coupling hubs. The pins are tightly screwed together with the coupling flange by means of nuts or screws.
Grey cast iron EN GJL-250 is used as standard material for the coupling flanges. They can also be constructed of steel S355J2G3, cast steel or ductile cast iron EN GJS 400. The surfaces are phosphated respectively primed. The standard material for the pins is steel C40 (EN8) and 42CrMo4.
The elastomer rings are mainly manufactured of NBR – acrylonitrile-butadiene-caoutchouc (hardness 80Sh-A). For special applications also other materials can be used, e.g. PUR or CR.

The couplings are designed by the manufacturer for use in the temperature range T_a from -30 °C to +80 °C (permanent load).

The REVOLEX® KX - Torsionally flexible pin & bush couplings are capable of compensating shaft misalignments of all kinds within the specified limits. They compensate vibrations and shocks by means of the elastomer rings arranged on the pins.

A tongue and groove joint is normally planned between coupling hub and shaft. The coupling hubs are fixed on the shaft with at least one threaded pin. But also other joints are possible such as joints with taper clamping hub.

The coupling hubs are finish-bored as per the manufacturer's documents.

Further details are contained in the documents of the manufacturer which are part of the Test Report IB-06-4-007.

[16] **Test Report**

The test results are recorded in detail in the Test Report IB-06-4-007 of 8 May 2007.

A temperature increase of ΔT = 20 K against the ambient temperatures resp. operating temperatures T_a must be taken into account for the specification of the maximum surface temperatures. The temperature increase results from the self-heating plus a safety margin of +5 K.

Summary of test results:

The REVOLEX® KX - Torsionally flexible pin & bush couplings of the designs mentioned in [4] meet the requirements for non-electrical equipment / components

- of Equipment Group II, Category 2G.
  Taking into account the temperature increase of ΔT = 20 K, the couplings meet in dependence on the maximum permissible ambient temperatures resp. operating temperatures T_a the requirements for Temperature Class T6 (for T_a = 65 °C), for Temperature Classes T5 to T1 (for T_a = 80 °C, is also the maximum permissible temperature for permanent use).
  They fulfil the requirements for use in Explosion Group IIC. So the couplings meet also the requirements for the Explosion Groups IIB and IIA.
- of Equipment Group II, Category 2D.
  The maximum surface temperature is +100 °C at a maximum permissible ambient temperature resp. operating temperature T_a of +80 °C.
- of Equipment Group I, Category M2.
  The surface temperature which is permissible for Category M2 is not reached at the maximum permissible ambient temperature resp. operating temperature T_a of +80 °C.

The following ambient temperatures resp. operating temperatures are permitted: -30 °C ≤ T_a ≤ +80 °C

The couplings are protected by the type of protection "c" (Protection by constructional safety).

[17] **Special conditions for safe use**

The marking with "T X" means that for the specification of the maximum surface temperature at the coupling the user has to take into account a temperature increase of ΔT = 20 K compared to the ambient temperature resp. operating temperature T_a.

REVOLEX® KX - Torsionally flexible pin & bush couplings may only be used if their materials resist the mechanical and/or chemical influences resp. corrosion under the respective operating conditions, in such a way, that the explosion protection is always guaranteed.

Only pins and screws specified by the manufacturer are allowed for the assembly of screw connections. When tightening the screws, the torque specified by the manufacturer has to be kept. All screw connections have to be protected against self-loosening.

All metallic parts of the couplings must be connected to each other electrically conductively. They must be grounded via the respective hub and shaft joint.

The user has to provide the REVOLEX® KX - Torsionally flexible pin & bush couplings with protective devices in order to protect the couplings against falling objects.
The protective devices must be electrically conductive. They must be included in the compensation of potential.
The protective devices must be installed in a sufficient distance to the couplings so that the couplings cannot rub at the protective devices at simple damages.
Protective devices of couplings intended for use in the mining industry (Equipment Group I) must accept higher mechanical loads than the protective devices of couplings intended for use in other industries (Equipment Group II). They must not be constructed of light metal.

If the couplings are used in dust explosion hazardous areas and in mines, where coal dust deposits must be expected, the operator has to observe that no dusts in dangerous quantities can accumulate between protective device and coupling. The coupling must not run in a dust deposit.

For the use of the couplings in the mining industry, the user is obliged to observe the specifications of the national regulations for mining industry, which are valid for the respective operating area.

[18] **Essential safety and health requirements**

Confirmed by compliance with standards (see [9]).

[19] **Confirmation of the deposit of documents according to Annex VIII of Directive 94/9/EC**

It is confirmed that the documents pursuant to Annex VIII of the Directive 94/9/EC for the non-electrical product of the Category 2 mentioned in [4] are deposited under No. IB-06-4-007 at the NOTIFIED BODY IBExU (EC-Identification No 0637). The deposit of the documents is carried out according to the regulations of Directive 94/9/EC, item 8 (1) b) ii).

Freiberg, 8 May 2007

(Prof. Dr. Redeker)