[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 of 4 March 2010)**

[3] Type Examination Certificate Number: **IBExU03ATEXB002_05 X**

[4] Equipment / Component: **ROTEX® GS Backlash-free shaft couplings** in the designs

a) Hubs with keyway or CLAMPEX-clamping set or clamping ring hubs
- 1.0 hub with keyway and fixing screw
- 2.1 clamping hub simple slotted with keyway
- 2.6 clamping hub double slotted with keyway
- 4.0 with CLAMPEX®-clamping set KTR 250
- 5.0 with CLAMPEX®-clamping set KTR 200
- 6.0 clamping ring hub
- 6.0 P precision clamping ring hub
- 6.5 clamping ring hub

b) Hubs without keyway
- 1.1 hub without keyway, with setscrew
- 2.0 clamping hub simple slotted without keyway
- 2.5 clamping hub double slotted without keyway

including the type DKM with hubs according to the aforementioned designs

[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 Reports IB-02-4-815 of 14 April 2003, IB-04-4-016/2 of 24 October 2005 and IB-06-4-008 of 18 April 2006.

[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 ROTEX® GS Backlash-free shaft couplings of the designs mentioned in [4] can be in dependence on the metallic materials of which the couplings or parts of the couplings are manufactured:

a1) Couplings according to [4] a), constructed of steel, semiproducts of aluminium or semi-products with comparable physical properties resp. made from a combination of parts of the mentioned materials

II 2GD c IIC T X

or

II 2G c IIC T6, T5 resp. T4 X
-30 °C ≤ T_a ≤ +65 °C, +80 °C resp. +90 °C

II 2D c T 110 °C X
-30 °C ≤ T_a ≤ +90 °C

a2) Couplings according to [4] a), whose parts are constructed exclusively of steel, can be marked in addition:

I M2 c X

or

I M2 c X
-30 °C ≤ T_a ≤ +90 °C

b) Couplings according to [4] b) can be marked as follows:

II 3GD c IIC T X

or

II 3G c IIC T6, T5 resp. T4 X
-30 °C ≤ T_a ≤ +65 °C, +80 °C resp. +90 °C

II 3D c T 110 °C X
-30 °C ≤ T_a ≤ +90 °C

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Freiberg, 18 April 2006

By order

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(Dr. Wagner) - Stamp -

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 IBExU03ATEXB002_05 X**

[15] **Description**

ROTEX® GS Backlash-free shaft couplings are torsionally flexible jaw-type couplings. They are designed for positive torque transmission. They are fail-safe.
The two congruent coupling halves with concave claws on the inside are periphally offset in relation to one another by half a pitch. They are designed in such a way as to enable an involute spider to be located between them. The spacer parts arranged between two involute spiders are connected electrically conductive with one hub at least.
ROTEX® GS Backlash-free shaft couplings are capable of compensating axial, radial and angular displacements of the shafts to be connected within the specified limits. The various designs of the couplings differ in the hub design and the arrangement of different spacer parts.

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

The couplings are designed by the manufacturer for use in the temperature range T_a from -30 °C to +90 °C (permanent load). However, spiders for special applications can also be used at lower and higher operating temperatures.

The designs of the ROTEX® GS Backlash-free shaft couplings mentioned in [4] a) are produced in the following sizes and materials (table 1):

Design	Size	Material)*	Annotation
1.0	Size 7 - Size 75	to size 38 semiproducts of aluminium EN AW-6023 T6 from size 42 steel S355J2G3	Hub with keyway and fixing screw
2.1 and 2.6	Size 7 - Size 75	to size 38 semiproducts of aluminium EN AW-6023 T6 from size 42 steel S355J2G3	Clamping hub with keyway and cylinder head screw to size19 simple slotted (des. 2.1) from size 24 double slotted (des. 2.6)
6.0 and 6.5	Size 14 - Size 75	to size 38 hub of semiproducts of aluminium EN AW-6023 T6; clamping ring of 42CrMo4V from size 42 hub of S355J2G3 / 42CrMo4V; clamping ring of 42CrMo4V	Clamping ring hub - screw fitting on elastomer side (des. 6.0) - clamping screws from the outside (des. 6.5)
6.0 P	Size 14 - Size 75	hubs of S355J2G3/42CrMo4V clamping ring of 42CrMo4V	P-clamping ring hub according to DIN 69002
DKM	Size 5 - Size 55	to size 38 hubs and spacer part of semiproducts of aluminium EN AW-6023 T6 from size 42 hubs of steel (St-H) and spacer parts of semiproducts of aluminium EN AW-6023 T6	Hubs as afore-mentioned
4.0	Size 42 - Size 180	Coupling: steel S355J2G3 Clamping set: steel S355J2G3 and C45	with clamping set CLAMPEX® KTR 250
5.0	Size 42 - Size 180	Coupling: steel S355J2G3 Clamping set: steel S355J2G3 and C45	with clamping set CLAMPEX® KTR 200

The designs of the ROTEX® GS Backlash-free shaft couplings mentioned in [4] b) are produced in the following sizes and materials (table 2):

Design	Size	Material)*	Annotation
1.1	Size 5 - Size 14	to size 14 semiproducts of aluminium EN AW-6023 T6	Hub without keyway, with fixing screw
2.0 and 2.5	Size 7 - Size 75	to size 38 semiproducts of aluminium EN AW-6023 T6 from size 42 steel S355J2G3	Clamping hub without keyway, with cylinder head screw to size19 simple slotted (des. 2.0) from size 24 double slotted (des. 2.5)
DKM	Size 5 - Size 55	to size 38 hubs and spacer part of semiproducts of aluminium EN AW-6023 T6 from size 42 hubs of steel (St-H) and spacer part of semiproducts of aluminium EN AW-6023 T6	Hubs as afore-mentioned

)* Remark: The material semiproducts of aluminium EN AW-6023 T6 mentioned in the tables can also be replaced by other semiproducts with comparable physical properties ($R_{p0,2} \geq$ 250 N/mm²).

Further details are contained in the documents of the manufacturer which are part of the Test Reports mentioned in [8] and [16].

[16] **Test Report**

The test results which comply with newer knowledge regarding the temperature behaviour of the couplings form the basis for this Type Examination Certificate. They are recorded in the Test Reports IB-04-4-016/2 of 24 October 2005 and IB-06-4-008 of 18 April 2006.

Summary of test results:

The designs of the ROTEX® GS Backlash-free shaft couplings mentioned in [4] a) meet, without any restrictions regarding the materials specified in [15], table 1, 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 Class T5 (for T_a = 80 °C) and for the Temperature Classes T4 to T1 (for T_a = 90 °C, is also the maximum permissible temperature for permanent use).
  They fulfil the requirements for use in the 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 +110 °C at a maximum permissible ambient temperature resp. operating temperature T_a of +90 °C.

The designs of the ROTEX® GS Backlash-free shaft couplings mentioned in [4] a), whose metallic parts are produced exclusively from steel (S355J2G3, 42CrMo4V, St-H9), meet also the requirements for non-electrical equipment / components

- of Equipment Group I, Category M2.
  The permissible surface temperature of 150 °C is not reached at a maximum permissible ambient temperature resp. operating temperature T_a of +90 °C.

The designs of the ROTEX® GS Backlash-free shaft couplings mentioned in [4] b) meet, without any restrictions regarding the materials specified in [15], table 2, the requirements for non-electrical equipment / components of Equipment Group II, Categories 3G and 3D.

Regarding Temperature Class, maximum surface temperature and Explosion Group, the couplings mentioned in [4] b), fulfil the same requirements as the couplings mentioned in [4] a).

The permissible ambient temperatures resp. operating temperatures T_a of the couplings depend on the materials of the inserted involute spiders. They are specified in the respective operating/installation instruction.

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

Please note:

This Type Examination Certificate IBExU03ATEXB002_05 X is a revised new version of the Type Examination Certificates IBExU03B002 X of 14 April 2003 and IBExU03B003 X of 14 April 2003 and summarizes the results of the two Type Examination Certificates in one certificate. Compared to the afore-mentioned certificates, the temperature range T_a was extended and, because of new knowledge, the value of the temperature rise ΔT, which has to be taken into account owing to the self-heating by mechanical processes, was reduced to 20 K.

It is not necessary to withdraw the certificates issued till now. Products with markings specified in the previous certificates can be supplied as before.

[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.

The ambient temperatures resp. operating temperatures Ta are normally between -30 °C and +90 °C. Spiders for special applications can be used also at lower and higher ambient temperatures resp. operating temperatures T_a.
For example, the spiders produced from the material PEEK (PPEK 450G) can permanently be used at temperatures up to 160 °C. Under consideration of the temperature rise of ΔT = 20 K mentioned in [16], no temperatures above 180 °C result at the coupling at permanent use at maximum temperatures T_a of 160 °C. The requirements for Temperature Class T3 are fulfilled with these operating conditions.

ROTEX® GS Backlash-free shaft couplings may only be used if their materials resist the mechanical and/or chemical influences resp. corrosion under the current operating conditions, in such a way, that the explosion protection is always guaranteed.

The user has to provide the ROTEX® GS Backlash-free shaft couplings with stable covers in order to protect the couplings against falling objects. Openings for necessary heat discharging can be arranged in these protective covers. Protective covers of couplings intended for use in the mining industry (Equipment Group I) have to accept higher mechanical loads than the protective covers of couplings intended for use in other industries (Equipment Group II). Details about the design of the protective cover are given in the operating-/installation instructions.
The protective cover must be electrically conductive. It must be included in the compensation of potential.

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

Only 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 to fasten the hubs on the shafts have to be protected against self-loosening.

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 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-06-4-008 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).

By order

Freiberg, 18 April 2006

Wagner

(Dr. Wagner)

[1] **1st Addition to**
TYPE EXAMINATION CERTIFICATE IBExU03ATEXB002_05 X
(Translation)

[2] Equipment/Component: **ROTEX® GS Backlash-free shaft couplings**
Designs:
a) **Hubs with keyway or clamping ring hubs**
2.9 clamping hub with axial slots with keyway
6.0 clamping ring hub light (hub incl. ring of semiproducts of aluminium)
6.5 clamping ring hub light (hub incl. ring of semiproducts of aluminium)
7.6 split clamping hub with feather keyway for double-cardanic connections
7.9 split clamping hub with feather keyway for simple-cardanic connections
b) **Hubs without keyway**
2.8 clamping hub with axial slot without keyway
7.5 split clamping hub without feather keyway for double-cardanic connections
7.8 split clamping hub without feather keyway for simple-cardanic connections
c) **Hubs with keyway or clamping ring hub**
4.1 with CLAMPEX®-clamping set KTR 200 (5.0 renamed in 4.1)
4.2 with CLAMPEX®-clamping set KTR 250 (4.0 renamed in 4.2)

[3] Manufacturer: KTR Kupplungstechnik GmbH

[4] Address: Rodder Damm 170
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[5] **Addition/Modification**
The hubs mentioned in [2] a) and b) of the designs of the ROTEX® GS Backlash-free shaft couplings are completed resp. renamed.

The marking of the designs mentioned in a) shall include the following:

II 2G c IIC T4, T5 resp. T6
-30 °C ≤ T_a ≤ +80 °C, 60 °C resp. 45 °C

or

II 2D c T 110 °C
-30 °C ≤ T_a ≤ +80 °C

The marking of the designs mentioned in b) shall include the following:

II 3G c IIC T4, T5 resp. T6
-30 °C ≤ T_a ≤ +80 °C, 60 °C resp. 45 °C

or

II 3D c T 110 °C
-30 °C ≤ T_a ≤ +80 °C

The marking of the equipment/component mentioned in [2] c) remains unchanged.

The special conditions for safe use of the equipment/component mentioned in [2] a), b) resp. c) of this 1st Addition correspond to the special conditions given in the Type Examination Certificate. They remain unchanged.

[6] **Test report**
The proof of the explosion protection of the equipment/components mentioned in [2] a) and b) is explained in the Test Report IB-09-4-024 of 17 December 2009. The test documents are part of the Test Report.

[7] **Test result**
IBExU certifies that the equipment mentioned in [2] has been found to comply with the Essential Health and Safety Requirements given in Annex II of the Directive 94/9/EC by compliance with EN 13463-1:2009 and EN 13463-5:2003.

This addition is only valid in combination with the Type Examination Certificate IBExU03ATEXB002_05 X of 18 April 2006.

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(Dr. Wagner)

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- Stamp -

Freiberg, 18 December 2009

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