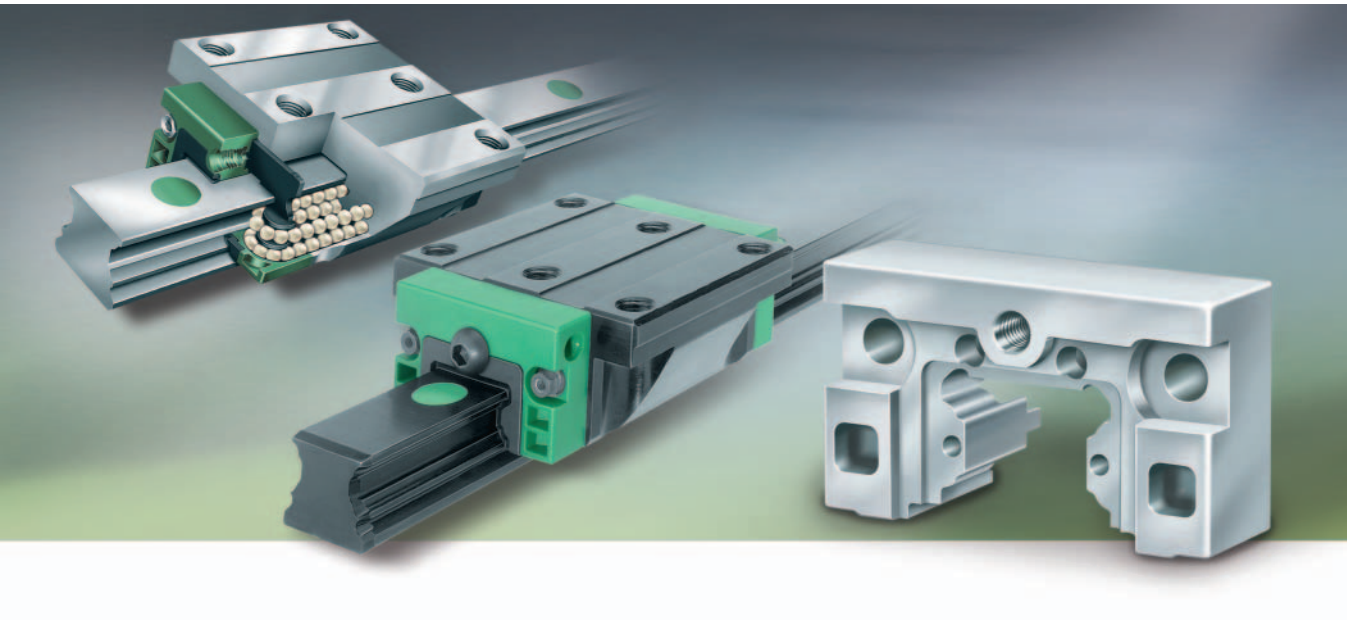
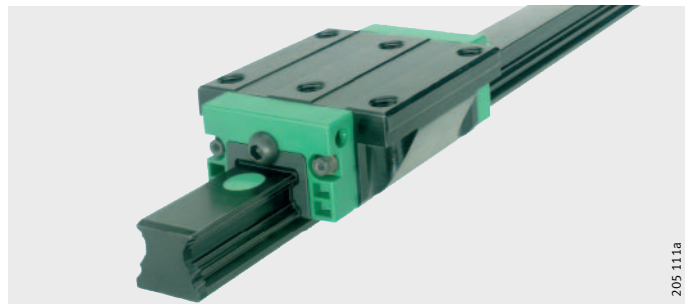


Special coatings
Special materials

SCHAEFFLER GROUP
INDUSTRIAL

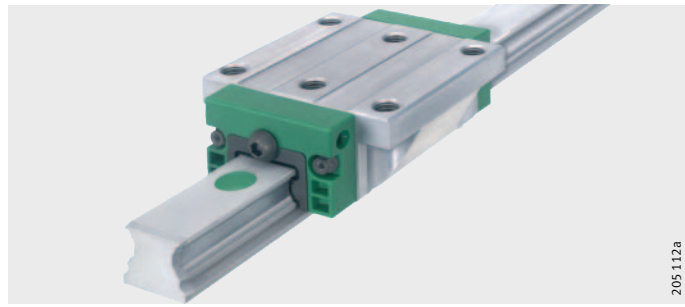
Corrotect®

Anti-corrosion protection



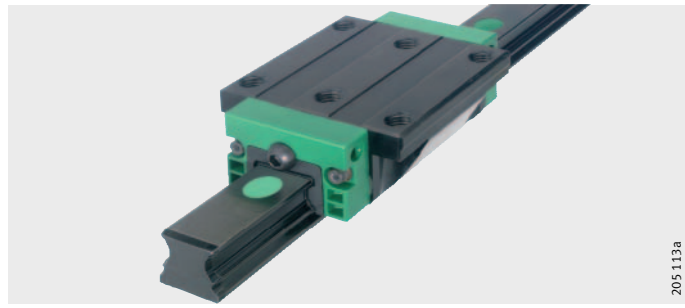
Protect A

Anti-corrosion and anti-wear protection



Protect B

Anti-corrosion and high anti-wear protection



Special coatings

Features

In order that standard components can function for long periods, without maintenance and reliably even under extreme operating conditions, the Schaeffler Group has developed various coatings for such requirements.

These coatings increase the corrosion resistance and/or wear resistance of the surface. The selection of the coating is always dependent on the area of operation and the application.

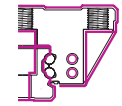
Components at risk of corrosion are protected by:

- the zinc alloy Corrotect®
- the thin layer chromium plating Protect A
- the thin layer chromium plating Protect B.

The surface of the thin layer chromium plating holds a certain amount of lubricant. This gives protection against wear.

Particularly high wear resistance is provided by the chromium mixed oxide layer LC in Protect B. Even under highly unfavourable environmental conditions, the coating still acts in a supportive capacity to the lubricant. Since the coating increases the wear resistance of the base material, the preload is maintained over an extended period.

For use in the food industry, compliance with exacting environmental and health conditions must be achieved. The coating Protect A is free from chromium VI and can therefore be used in this sector.



Note

TPI 133 replaces MAI 104.
Any information in previous versions is thus invalid.

Special coatings

Corrotect® – Anti-corrosion protection

Corrotect® is an electroplated surface coating. It is an extremely thin anti-corrosion coating with cathodic protection and black chromate passivation. Under load, it is compacted into the surface roughness profile and partially worn away.

In parts coated with Corrotect®, running-in occurs in the area of the seal and an optically bright area develops as a result. Due to the remote cathodic protection mechanism, formation of rust in this area can also be prevented.

Advantages of the Corrotect® plating

The special coating Corrotect®:

- is resistant to moisture, salt spray mist, contaminated water and weak alkaline or weak acidic cleaning agents
- does not influence the load carrying capacity and operating life of the products
- does not impair the load carrying capacity, in contrast to the use of corrosion-resistant steels
- is extremely resistant to corrosion
- offers protection against rust on all surfaces
- gives protection against rust even on smaller bright spots due to the cathodic protection effect
- gives protection against EP additives
- has good thermal conductivity.

Applications

Corrotect® coated components are particularly suitable where extremely high corrosion resistance is the most important factor. It has the best anti-corrosion protection of all special coatings offered by the Schaeffler Group. The coating is also used very successfully to prevent adhesion of weld spray.

The following products in the field of linear motion are available with the Corrotect® coating:

- linear recirculating roller bearing and guideway assemblies RUE..-E (-E-KT)
- linear recirculating ball bearing and guideway assemblies KUVE..-B (-B-KT)
- shafts W
- hollow shafts WH
- guideways LFS..-R
- track rollers with profiled outer ring LFR
- linear ball bearings KB, KS, KH.

Suffixes

Components with the Corrotect® coating have the suffix RRF; see Ordering designation and table Technical/physical data for Corrotect®.

Ordering designation

The ordering designation for a Corrotect®-coated ball monorail guidance system KUVE25-B with two carriages, accuracy G3 and preload class V1 is:

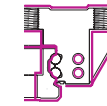
- KUVE25-B-W2-G3-V1-RRF/

Technical/physical data for Corrotect®

The table shows technical/physical data for the special coating Corrotect®.

Corrotect® data

	Data
Suffix	RRF
Colour	Black/chromium
Layer thickness[1)]	0,5 µm – 3,0 µm
Number of layers	1
Composition	Zinc alloyed with iron and cobalt
Coating hardness	300 HV
Anti-corrosion protection[2)]	96 hours
Anti-wear protection	–
Maximum length	3 500 mm
Contains Cr(VI)[3)]	yes



1) Thickness in functional area.

2) Salt spray test to DIN 50 021.

3) Parts containing Cr(VI) are not suitable for the food industry.

Special coatings

Protect A – Anti-corrosion and anti-wear protection

Protect A is a pure chromium coating with a columnar surface structure.

The coating is applied by electroplating. The parts to be coated are heated to approx. +50 °C. Since no changes occur in the structure of the parts, they remain fully stable in dimensional terms.

The matt grey chromium layer with its columnar structure retains a certain amount of lubricant between the columns. As a result, effective anti-wear protection is achieved even under mixed friction or slippage conditions.

During running-in, the rolling elements and seals burnish the surface. This leads to reduced friction coefficients.

The operating temperature range of coated guidance systems is –10 °C to +100 °C.

Advantages of the Protect A coating

This coating:

- is resistant to various chlorides, various oils, sulphur compounds, chlorine compounds and weak acidic media
- does not influence the load carrying capacity and operating life of the coated products
- has higher wear resistance due to its high hardness
- ensures effective anti-wear protection even under mixed friction conditions
- offers good protection against EP additives
- has good thermal conductivity
- is moderately resistant to corrosion
- prevents false brinelling under vibration while stationary.

Applications

Protect A does not contain Cr(VI). Components with this coating are therefore particularly suitable for use in the food industry, medical equipment, etc. This coating is recommended for particularly short stroke lengths and vibration while stationary.

The following products in the field of linear motion are available coated with Protect A:

- linear recirculating roller bearing and guideway assemblies RUE..-E (-E-KT)
- linear recirculating ball bearing and guideway assemblies KUVE..-B (-B-KT).

Other products in the shaft and track roller range are available by agreement with the Protect A coating.

Suffixes

Components with the Protect A coating have the suffix KD; see Ordering designation and table Technical/physical data for Protect A.

Ordering designation

The ordering designation for a ball monorail guidance system KUVE25-B with two carriages, accuracy G3 and preload class V1 coated with Protect A is:

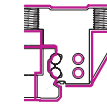
- KUVE25-B-W2-G3-V1-KD/

Technical/physical data for Protect A

The table shows technical/physical data for the special coating Protect A.

Protect A data

	Data
Suffix	KD
Colour	Matt grey
Layer thickness[1)]	0,5 µm – 4,0 µm
Number of layers	1
Composition	Pure chromium layer with columnar surface
Coating hardness	900 HV – 1 300 HV
Anti-corrosion protection[2)]	8 hours
Anti-wear protection	Under mixed friction
Maximum length	4 000 mm
Contains Cr(VI)[3)]	no



1) Thickness in functional area.

2) Salt spray test to DIN 50 021.

3) Parts containing Cr(VI) are not suitable for the food industry.

Special coatings

Protect B – Anti-corrosion and high anti-wear protection

Protect B comprises two layers: a thin layer chromium plating (Protect A) is covered by chromium mixed oxide.

The corrosion resistance is provided by the chromium mixed oxide layer. The chromium mixed oxide layer acts in a supportive capacity to the lubricant when used in aggressive atmospheres and at high temperatures.

The operating temperature range of coated guidance systems is –10 °C to +100 °C.

Advantages of the Protect B coating

This coating:

- is resistant to various chlorides, various oils, sulphur compounds, chlorine compounds and weak acidic media
- does not influence the load carrying capacity and operating life of the coated products
- improves the running-in behaviour
- offers effective anti-wear protection under inadequate lubrication
- offers good protection against EP additives
- acts in a supportive capacity to the lubricant by means of the second layer in aggressive atmospheres and at high temperatures
- has good thermal conductivity
- offers high anti-wear protection together with high anti-corrosion protection
- prevents false brinelling under vibration while stationary.

Applications

Where high requirements for anti-corrosion protection are present and continuous lubrication cannot be ensured, Protect B is the suitable coating.

The following products in the field of linear motion are available coated with Protect B:

- linear recirculating roller bearing and guideway assemblies RUE..-E (-E-KT)
- linear recirculating ball bearing and guideway assemblies KUVE..-B (-B-KT).

Other products in the shaft and track roller range are available by agreement.

Suffixes

Components with the Protect B coating have the suffix KDC; see Ordering designation and table Technical/physical data for Protect B.

Ordering designation

The ordering designation for a ball monorail guidance system KUVE25-B with two carriages, accuracy G3 and preload class V1 coated with Protect B is:

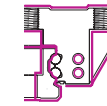
- KUVE25-B-W2-G3-V1-KDC/

Technical/physical data for Protect B

The table shows technical/physical data for the special coating Protect B.

Protect B data

	Data
Suffix	KDC
Colour	Black
Layer thickness[1)]	0,5 µm – 5,0 µm
Number of layers	2
Composition	Thin layer chromium plating (Protect A) with coating of chromium mixed oxide
Coating hardness	950 HV
Anti-corrosion protection[2)]	96 hours
Anti-wear protection	Under inadequate lubrication
Maximum length	4 000 mm
Contains Cr(VI)[3)]	yes



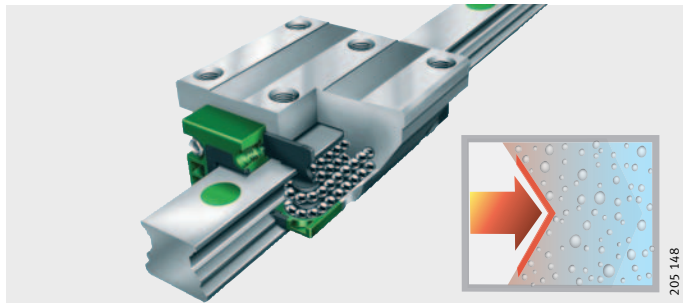
1) Thickness in functional area.

2) Salt spray test to DIN 50 021.

3) Parts containing Cr(VI) are not suitable for the food industry.

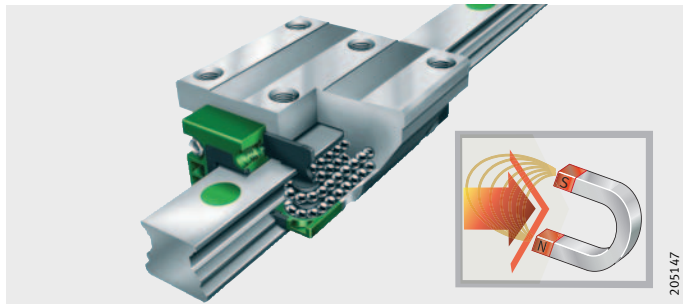
Corrosion-resistant steel

KUVE..-B-RB



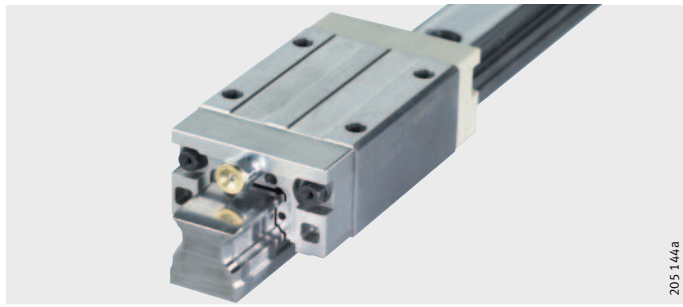
Amagnetic steel

KUVE..-B-AM



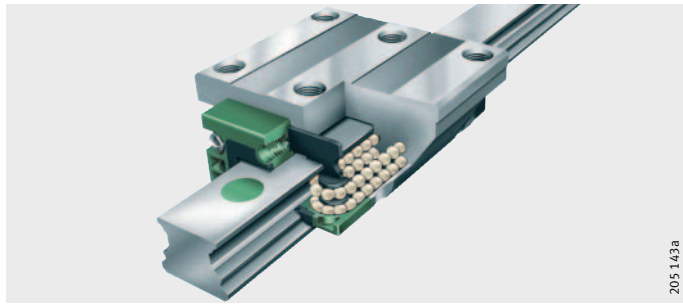
Metal end pieces

KUVE..-B-MKS



Ceramic rolling elements

KUVE..-B-HCB



Special materials

Features

For our four-row linear recirculating ball bearing and guideway assemblies, we offer not only special coatings but also the following special materials:

- corrosion-resistant steel
- amagnetic steel
- metal end pieces
- ceramic rolling elements.

The decision to use standard or special materials is dependent on the specific application.

Corrosion-resistant steel – Four-row ball monorail guidance system

KUVE..-B-RB is made from corrosion-resistant martensitic steel.

Due to the special quench and tempering process and surface treatment, this material has high corrosion resistance. It is therefore also suitable for use in aqueous media, heavily diluted acids, alkalines or salt solutions.

Advantages of the corrosion-resistant material

The material has the following advantages:

- all metal parts are manufactured from corrosion-resistant steel
- guidance systems made from the corrosion-resistant material are available in all accuracy and preload classes
- corrosion-resistant carriages can be used in any combination with the standard guideways, allowing replacement without any restrictions
- the existing range of accessories can be used to its full extent
- the complete sealing arrangement is already integrated
- the basic load ratings achieved are 70% of the standard values.

Applications

Since no additional anti-corrosion coating is necessary, RB linear guidance systems are highly suitable for use in clean rooms and the manufacture of electronic components as well as in the pharmaceutical and food industries.

Suffixes

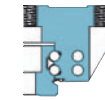
Products made from corrosion-resistant martensitic steel have the suffix RB; see Ordering designation.

Ordering designation

The ordering designation for a corrosion-resistant ball monorail guidance system KUVE25-B with two carriages, accuracy G3, preload class V1 and a guideway length of 1 300 mm is:

- KUVE25-B-W2-G3-V1-RB/1 300.

Sizes 15 and 25; further sizes available by agreement.



Special materials

Amagnetic steel – Four-row ball monorail guidance system

KUVE..-B-AM is made from corrosion-resistant amagnetic steel. Due to the special hardening processes, this material achieves a hardness suitable for use in rolling bearings without developing a material structure that creates magnetic properties.

Advantages of the amagnetic material

The material has the following advantages:

- all metal parts are manufactured from corrosion-resistant steel
- the basic load ratings achieved are 60% of those of the standard guidance system
- the magnetic permeability is very low ($\mu r < 1{,}02$)
- it is available for all accuracy and preload classes
- amagnetic guidance systems can be used in any combination with the standard guideways, allowing replacement without any restrictions (standard versus corrosion-resistant)
- the existing range of accessories can be used to its full extent
- the complete sealing arrangement is already integrated.

Applications

Since no additional anti-corrosion coating is necessary, amagnetic linear guidance systems are highly suitable for use in clean rooms and the manufacture of electronic components as well as in the medical and food industries.

Suffixes

Products made from amagnetic material have the suffix AM; see Ordering designation.

Ordering designation

The ordering designation for an amagnetic ball monorail guidance system KUVE25-B with two carriages, accuracy G3, preload class V1 and a guideway length of 500 mm is:

- KUVE25-B-W2-G3-V1-AM/500.

The maximum single-piece length of the guideways is 750 mm.

Sizes 20 and 25; further sizes available by agreement.

Metal end pieces – Four-row ball monorail guidance system

In KUVE..-B-MKS, end pieces made from corrosion-resistant steel are used.

Advantages of the metal end pieces

These end pieces have the following advantages:

- they can be combined with amagnetic guidance systems
- due to their high strength compared to plastic designs, they can be used in applications where a particularly robust construction is required
- they are resistant to gamma radiation
- their temperature resistance up to +150 °C is very good
- they are suitable for vacuum and clean room use
- they are available for all accuracy and preload classes
- the existing range of accessories can be used to its full extent
- an integrated complete sealing arrangement is feasible; this is dependent on the operating temperature.

Applications

Due to the increased strength of the end pieces, the guidance system is particularly suitable for extreme applications. Wherever the guidance system is subjected to high temperatures or radiation, KUVE with metal end pieces can be used.

Suffixes

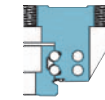
The metal end pieces have the suffix MKS; see Ordering designation.

Ordering designation

The ordering designation for a ball monorail guidance system KUVE25-B with one carriage, accuracy G2, preload class V1, a guideway length of 1500 mm and metal end pieces is:

- KUVE25-B-W1-G2-V1-MKS/1500.

Sizes 15 and 25; further sizes available by agreement.



Special materials

Ceramic rolling elements – Four-row ball monorail guidance system

In combination with coatings or special materials, ceramic rolling elements are increasingly used in so-called hybrid bearings.

Ceramic as a rolling element material is light, has a long operating life and offers significant advantages in many applications. Ceramic balls are characterised by their low inherent mass together with high hardness, rust resistance and electrical insulation.

Ceramic rolling elements are used in KUVE..-B-HCB.

Advantages of ceramic balls

Ceramic rolling elements have the following advantages:

- depending on the application conditions, they extend the life of the guidance system
- lower bearing temperatures
- lower lubricant requirement
- the guidance systems are corrosion-resistant when used in combination with corrosion-resistant or coated saddle plates and guideways
- they are heat-resistant
- no magnetism occurs between the rolling elements
- they do not conduct electrical current
- they allow higher speeds when used in combination with appropriate guidance system components
- the existing range of accessories can be used to its full extent
- guidance systems with ceramic rolling elements are interchangeable with the standard range
- the basic load ratings achieved are 70% of the standard values.

Applications

Due to their amagnetic characteristics, linear recirculating ball bearing and guideway assemblies with ceramic rolling elements are used in many medical and laboratory applications.
Due to the advantages described, ceramic rolling elements are frequently also used in clean room applications and the extensive field of electronic component manufacture.

Suffixes

Guidance systems with ceramic rolling elements have the suffix HCB; see Ordering designation.

Ordering designation

The ordering designation for a ball monorail guidance system KUVE25-B with ceramic rolling elements, two carriages, accuracy G3, preload class V1 and a guideway length of 250 mm is:

- KUVE25-B-W2-G3-V1-HCB/250.

MATNR 031132910-0000 / TPI 133 / GB-D / 2007062.5 / Printed in Germany by Mandelkow

Schaeffler KG

Linear Technology Division
Berliner Strasse 134
66424 Homburg/Saar (Germany)
Internet www.ina.com
E-Mail info.linear@schaeffler.com

In Germany:
Phone 0180 5003872
Fax 0180 5003873

From Other Countries:
Phone +49 6841 701-0
Fax +49 6841 701-2625

TPI 133 GB-D