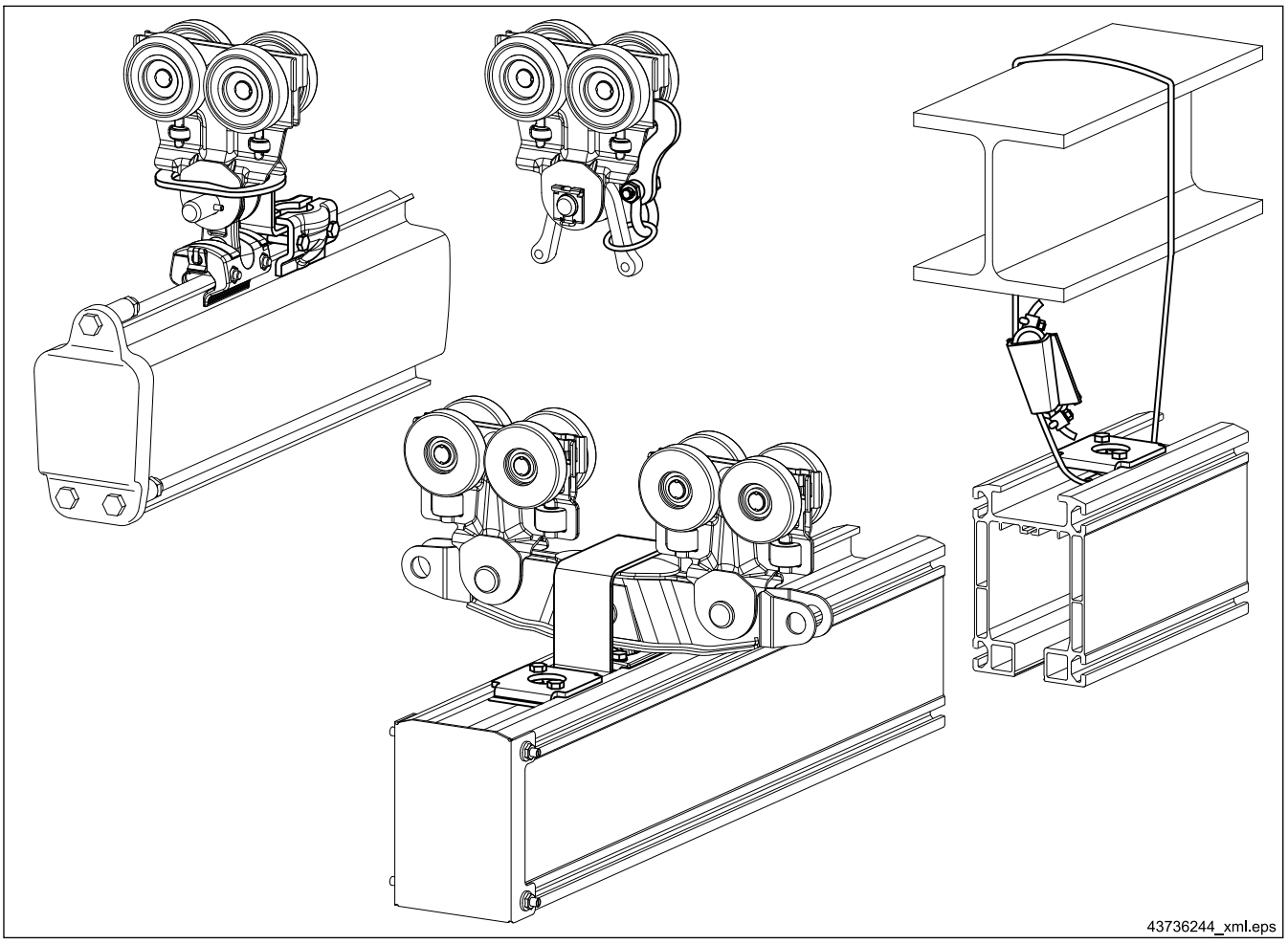
Assembly instructions

Redundant features in KBK installations



Original assembly instructions

Manufacturer

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Further documents are available for sub-assemblies/components in addition to these assembly instructions. If required, the corresponding documents are supplied or can be ordered separately, even if special designs or additional options differing from these assembly instructions are ordered.

Documents [1]		Part no.
Technical data/catalogues	KBK crane construction kit, project engineering and components	202 976 44
	KBK Aluline	203 813 44
Operating instructions – Assembly – Adjustment – Dimensions	Redundant features in the KBK crane construction kit	211 232 44
	Operating instructions/component parts, KBK installations	206 076 44
	KBK Aluline	211 259 44

Tab. 1

The metric system is used in this document and all figures are shown with a comma as the decimal separator.

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 [1] The documents can be ordered from the relevant Demag office.

Table of contents

1 Foreword

1.1 General

Redundant features in KBK equipment are supplied as component parts, partly packed in bags. Before beginning assembly, check that the delivery is complete using the enclosed shipping papers. These assembly instructions are intended to provide the user with instructions for safe and appropriate assembly.

Every individual given the task of transporting, installing, commissioning, maintaining and repairing the equipment must have read and understood

- the assembly instructions,
- the safety regulations and
- the safety warnings in the individual chapters and sections.

The operating instructions of the installation must be available to the owner/operator at all times in order to prevent operating errors and to ensure smooth and trouble-free operation of our products.

Our "KBK crane construction kit, project engineering and components technical data/catalogue" and "KBK Aluline technical data/catalogue" documents ⇒ Tab. 1, Page 2 provide information on combining individual components and assemblies to create cranes and runways. In particular it includes the technical description of the KBK systems.

These assembly instructions are a supplement to the documents ⇒ Tab. 1, Page 2.

2 Safety

2.1 General

The "Safety" section provides an overview of all important safety aspects for safe and trouble-free assembly of redundant features in KBK equipment.
At the time of their development and manufacture, redundant features in KBK equipment were built according to generally accepted engineering standards and are considered to be safe to operate. However, redundant features in KBK equipment can still be a cause of danger if they are not installed correctly or as intended by suitably trained personnel.
Knowledge of the contents of the assembly instructions is one of the requirements necessary to protect personnel from hazards and to avoid malfunctions and, therefore, to install redundant features safely in KBK equipment.
Any conversions, modifications or additions to redundant features in KBK equipment are prohibited unless approved by Demag in writing.

2.2 Intended use

Redundant features in KBK can be used wherever they are intended to prevent an immediate fall if parts break or become loose.

Please also note the information in the operating instructions of the installation.

No liability for structural modifications
The manufacturer is not liable for any unauthorised structural modifications which have not been agreed with him. This also includes incorrect connection of the installation to devices or equipment which are not part of our scope of delivery and services.

2.3 Hazards that can be caused by redundant features

The redundant feature system has been subjected to a risk assessment. The design and execution based on this analysis corresponds to state-of-the-art engineering principles. However, residual risks remain.

WARNING

Crushing hazard, shearing hazard

Adjustment work may be necessary when redundant features are installed; parts of the body may be crushed or sheared.

Installation work may only be performed by trained specialist personnel.

3 Technical description

3.1 Description

Redundant features
Redundant features prevent items from falling immediately if components break or become loose.

Quasi-redundant features
The majority of KBK components already have redundant features when they form part of a larger assembly. Other components can perform additional load bearing functions if an accident occurs, partially with overloads, however, without anything falling.
In principle, multiple bolted connections can be considered to be redundant features, since the emergency properties of the other bolts can be utilised if a bolt fails or becomes loose.
Locknuts which provide good protection against working loose are mainly used in the KBK system.

Operating principle
If a redundant feature is utilised (failure of a component), the installation is no longer operational.
In this case, the entire installation must be checked.
It is sufficient for the accident to be noticed, that nothing is dropped and that no injury occurs.

Inspection and maintenance
Redundant system components are subject to the same inspection and maintenance schedules as the other KBK components.
In particular, wire ropes must be regularly inspected for damage.

3.2 Transport, packing, scope of delivery, storage

Safety warnings

WARNING

Falling parts

Risk of injury from falling parts during transport, loading and unloading operations.

– Do not step under suspended loads. Keep a sufficient safety distance.

– Cordon off a large area around the working zone.

WARNING

Damage caused in transit

Redundant features in KBK equipment can be damaged or destroyed by inappropriate transport.

Transport sub-assemblies and parts with appropriate care.

Transport inspection

- Check that the delivery is complete and check it for any transport damage immediately on receipt.
- If any transport damage is visible from the outside, do not accept the delivery or only on condition. Note the scope of damage in the shipping documents/delivery note of the forwarding company. Lodge a claim.
- Lodge a claim for any defects as soon as they are detected, since claims for damages can only be asserted within the relevant claim notification periods.

Packing

If no agreement has been made on the return of the packing material, separate the materials according to type and size and make them available for further use or recycling.

Environmental protection:

- Always dispose of packing materials in an environmentally compatible way and according to locally applicable disposal regulations.
- If required, utilise the services of a recycling company.

Scope of delivery

If special designs or additional options are ordered or the latest technical modifications are incorporated, the actual scope of supply may differ from the data and information as well as from the illustrations described here. If you have any questions, please contact the manufacturer.

Storage

Until they are installed, redundant features in KBK equipment must only be stored under the following conditions:

- Do not store outdoors.
- Store in dry and dust-free places, relative air humidity: max. 60%.
- Do not expose to aggressive media.
- Protect against direct sunlight.
- Avoid mechanical vibrations.
- Storage temperature: -20 to +70 °C.
- Avoid strong temperature fluctuations (condensation).
- Oil all bare machine parts (rust protection).
- Check the general condition of all parts of the packing at regular intervals. If required, refresh or renew rust protection.
- If stored in a damp location, the installation parts must be packed tight and protected against corrosion (desiccant).

4 Assembly

4.1 Track suspensions

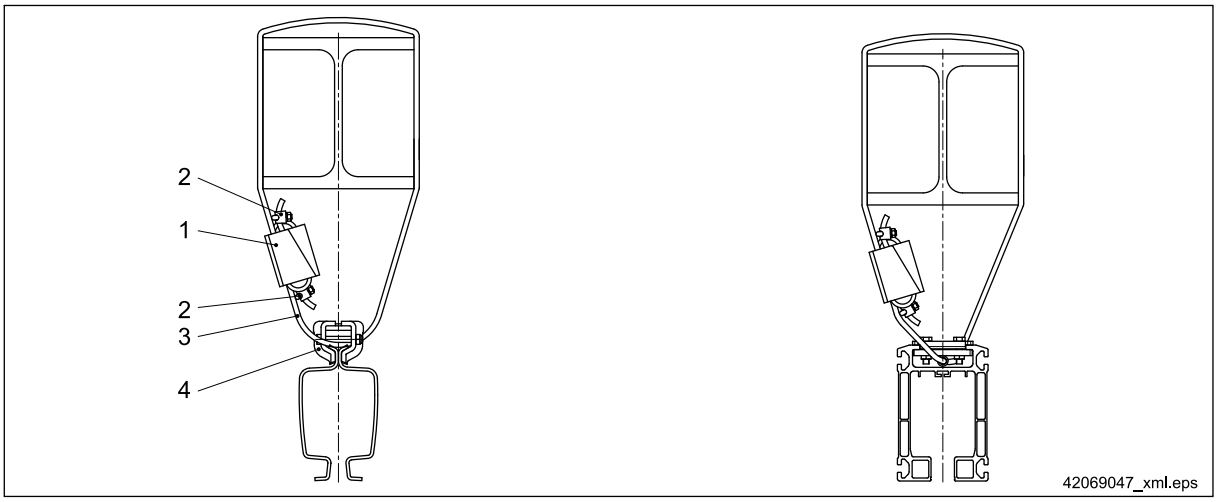

Fig. 1

Designation		KBK 100	KBK I	KBK II-L, II	KBK III	A12/A16	A18/A22
	Load capacity [kg]	max. 1700 kg					
Rope connector complete	Weight [kg]	0,59					
	Part no.	984 428 44					
Wire rope 6,5 8x19 + SES SZ	Weight [kg]	0,18/m					
	Part no.	715 455 46					
Track suspension clamp	Weight [kg]	0,37	0,25	0,70	2,85	0,19	0,53
	Part no.	984 550 44	980 260 44	982 260 44	850 260 44	855 380 44	855 580 44

Tab. 2

The redundant feature for a track suspension consists of:

- Rope connector (1) with two rope sockets (1a) and rope wedges (1b),
- Rope clamps (2),
- Wire rope (3),
- Suspension clamp (4).

A safety rope (3) is tightly laid over the supporting structure and through suspension clamp (4) (max. drop height 50 mm).
A special rope connector (1) connects the two rope ends and can act as an additional damping element in the redundant system if any damage occurs. Rope clamps (2) on the dead ends of the rope prevent the rope connection from opening. Distance between rope clamp and rope connection: 20 mm.
The catching rope must be fitted close to the suspension.
The wire rope length must be determined according to the required loop length.

Wire rope length	=	2 x length of suspension rod	+	2 x girder height	+	Flange width	+	500 mm

Tab. 3

- First fit the suspension clamp on the rail close to the track suspension fitting – max. distance 300 mm.
- Then lead one end of the wire rope over the supporting structure, while the other end
  - must be inserted under the bolts of the suspension clamp for KBK I and II.
  - must be inserted under the suspension clamp for KBK III.
  - must be inserted through the small tube under the suspension clamp for Aluline.

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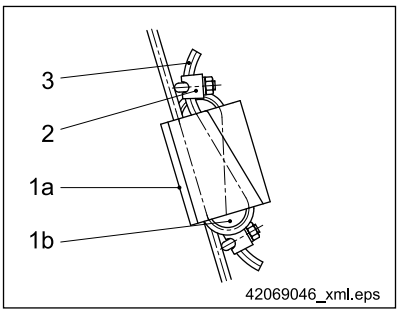

Fig. 2

- Push the first end of the rope through the small opening in the rope socket, place it around the rope wedge and push it through the large opening in the same rope socket.

  Now press the rope wedge with the wire rope wrapped around it into the rope socket.

  The free end must protrude from the rope socket by at least 50 mm.
- Carry out the same procedure with the other end of the rope on the other side of the rope socket.

When you adjust the length, ensure that the wire rope is loose enough to avoid any restriction of the movement of flexible suspensions and that the wire rope is kept short enough to allow a maximum drop height of 50 mm.
As a final step, attach the rope clamps to the free ends of the wire rope at a distance of 20 mm to the rope socket. Tightening torque 3 – 5 Nm.

CAUTION

Danger of falling caused by incorrect assembly

The rope clamps must not be attached to the load-bearing part of the wire rope.

4.2 Crane suspensions

4.2.1 Selection table

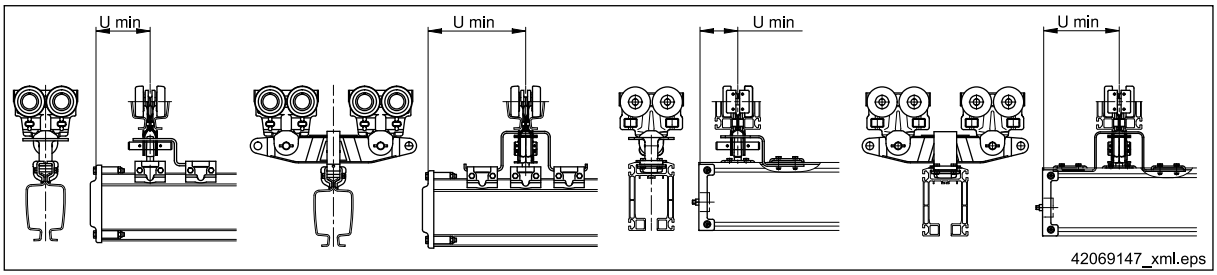

Fig. 3

Trolley	Crane	Crane runway	Overhang umin [mm]	Weight [kg]	Part no.	See ⇒ Tab. 5, Page 10
E	I	I/A12/A16	70	0,70	517 580 46	x1
	I	II-L/II/II-H/A18/A22	70	0,80	517 581 46	x2
	II-L/II	I/A12/A16	120	1,32	517 582 46	x1
	II-L/II	II-L/II/II-H/A18/A22	120	1,42	517 583 46	x2
	III	III	155	4,50	517 590 46	
	A12/A16	I/A12/A16	40	0,62	715 807 46	x1
	A12/A16	II-L/II/II-H/A18/A22	40	0,80	715 827 46	x1
	A18/A22	I/A12/A16	50	0,87	715 808 46	x2
	A18/A22	II-L/II/II-H/A18/A22	50	1,16	715 828 46	x2
D	I	I/II-L/II/A12/A16/A18/A22	180	1,04	517 584 46	
	II-L/II	I/II-L/II/A12/A16/A18/A22	240	1,82	517 585 46	
	III	III	315	7,51	517 592 46	
	A12/A16	I/II-L/II/A12/A16/A18/A22	150	0,62	715 805 46	
	A18/A22	I/II-L/II/A12/A16/A18/A22	185	1,74	715 806 46	

Tab. 4

E = single trolley, D = double trolley
The breaking strength has been determined in free-fall tests.
Redundant features for single-girder crane end carriages on request.

Wearing parts

Designation	Qty	See ⇒ Tab. 4, Page 10	x1	x2
Pin	1	Weight [kg]	0,18	0,28
		Part no.	335 568 99	335 569 99
Spring pin	2	Weight [kg]	-	-
		Part no.	345 008 99	345 033 99

Tab. 5

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4.2.2 Crane suspension on single trolley

KBK I, KBK II, Aluline

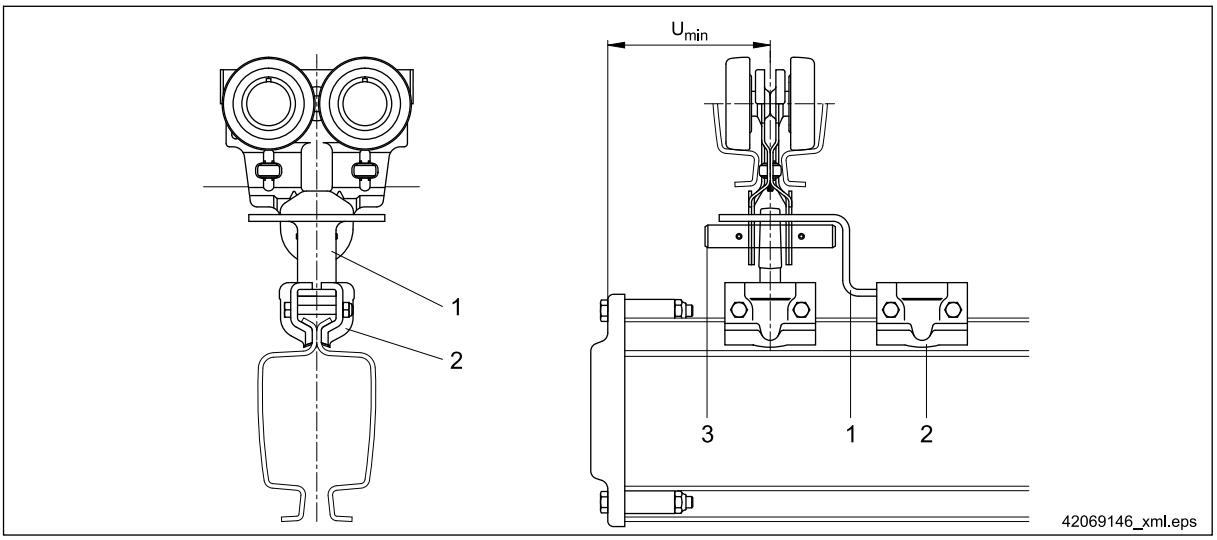

Fig. 4

Item	Designation	Item	Designation	Item	Designation
1	Catching plate	2	Track suspension clamp	3	Long pin for single trolley

Tab. 6

The redundant feature for a crane suspension on KBK I, KBK II or Aluline single trolleys consists of:

- Catching plate (1),
- Suspension clamp (2),
- Long pin (3) for single trolley.

The standard trolley pin is not needed.
For Aluline, first insert the catching plate into the crane girder in such a way that it is located within the crane track following assembly. Attach the crane suspensions to the crane girder according to the operating instructions. Insert the trolley through the opening of catching plate (1) and insert long pin (3) into the trolley. The two spring pins serve as pin retainers.
Then fix the free end of the catching plate with suspension clamp (2) on the crane girder between the crane runway rails in such a way that the catching plate surrounds the single trolley and the pin without making contact with them.

CAUTION

Wear caused by incorrect assembly

Following assembly, check that the crane bridge, crane suspension and trolley can move freely to ensure that the redundant feature functions correctly.

KBK III

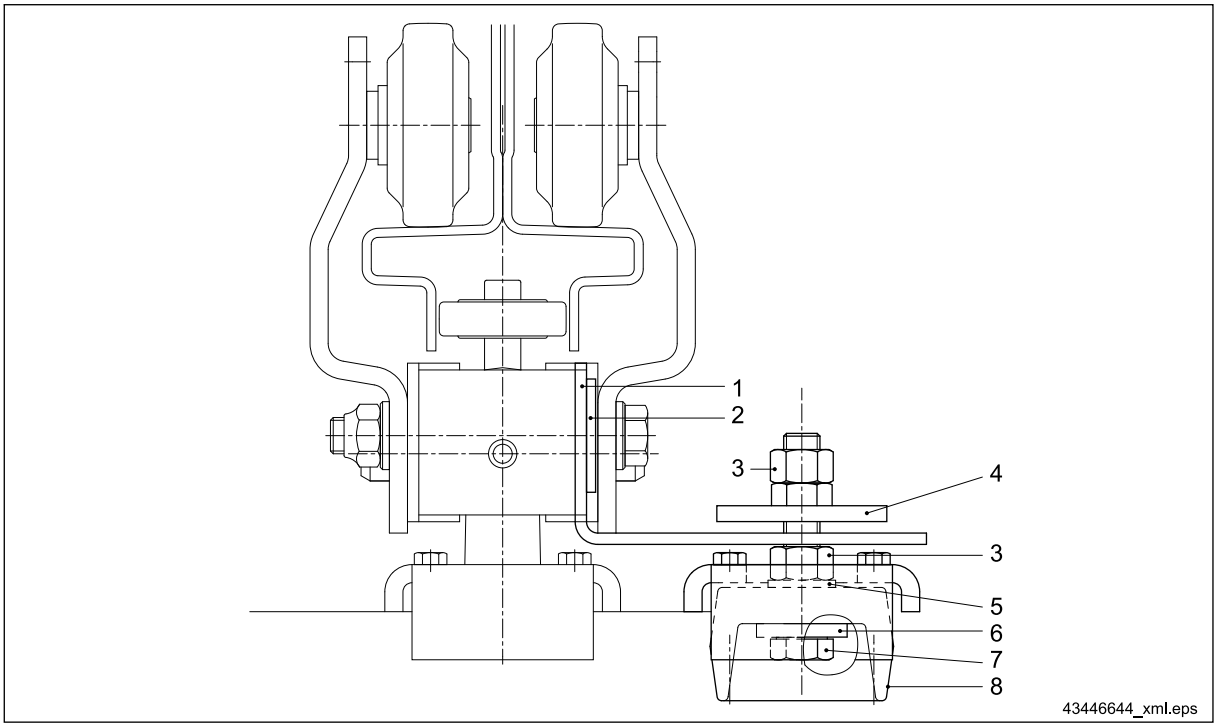

Fig. 5

Item	Designation	Item	Designation	Item	Designation
1	Catching plate	4	Nut with plate	7	M16 bolt
2	30x45x5 washer	5	17x30x3 washer	8	Track suspension clamp
3	M16 nut	6	17x40x6 washer		

Tab. 7

The redundant feature for a crane suspension on KBK III single trolleys consists of:

- Catching plate (1) and
- Suspension clamp (8) with component parts.

First fix M16 bolt (7) in suspension clamp (8) with a tightening torque of 120 Nm. Pay attention to the order of washers (5+6).
In the second step, loosely pre-assemble the suspension clamp with catching plate (1) as shown in the drawing and then slide it into the crane girder in such a way that it is positioned within the crane track. Then install the crane suspension according to the operating instructions.
Connect the trolley with the two installed assemblies by means of the load pin. Make sure that the crane suspension fitting is suspended centrally on the trolley while you push catching plate (1) with washer (2) through one of the two smaller outer openings on the trolley.
The suspension clamp of the redundant feature can then be aligned on the crane girder and tightened with the M8 bolts to a tightening torque 25 Nm. Finally screw the nut with plate (4) and nut (3) to the bolt thread and counterlock the nuts. The plate should not come into contact with the catching plate.

CAUTION

Wear caused by incorrect assembly

Following assembly, check that the crane bridge, crane suspension and trolley can move freely to ensure that the redundant feature functions correctly.

4.2.3 Crane suspension on double trolley (KBK I, KBK II, KBK III, Aluline)

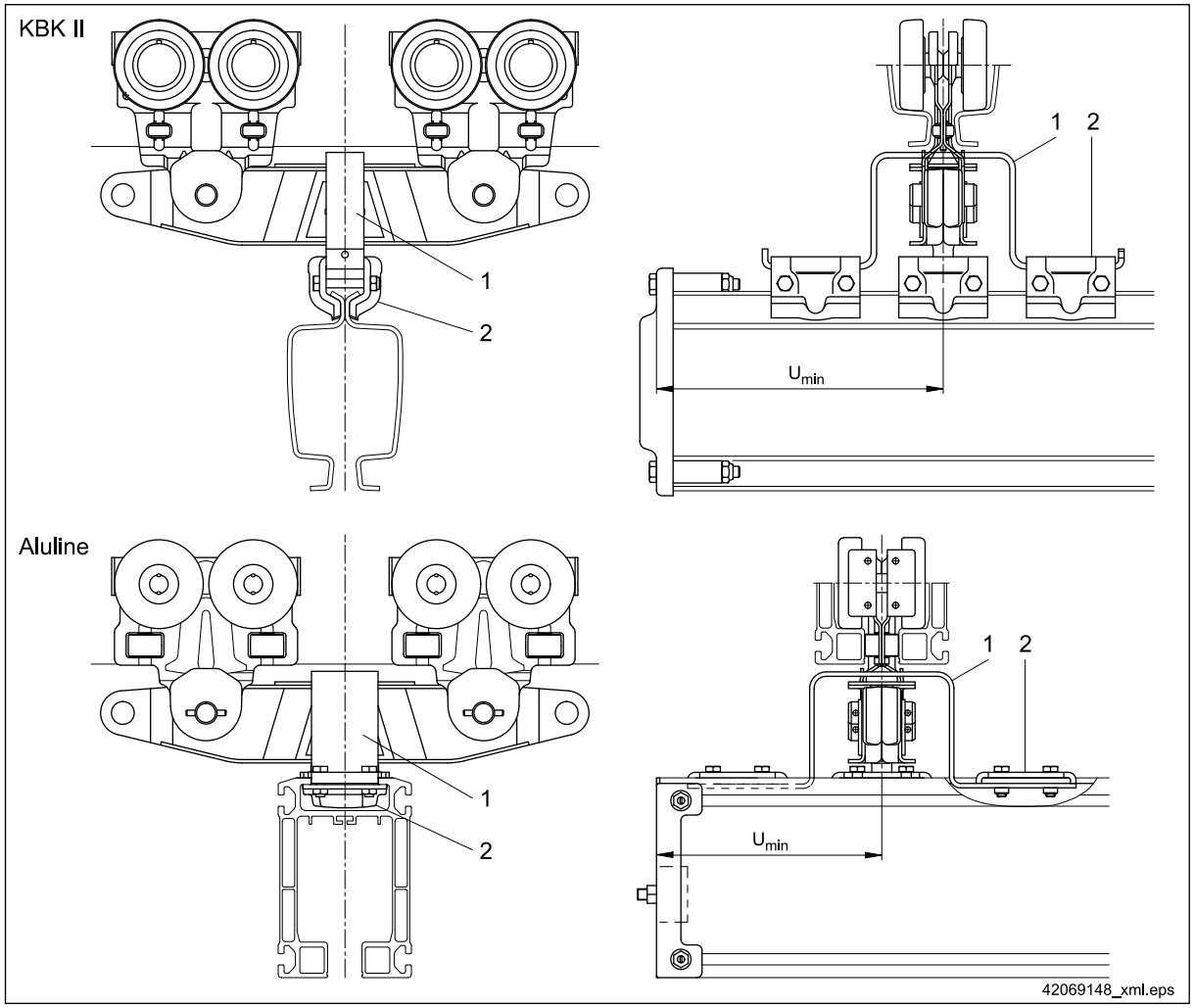

Fig. 6

Item	Designation	Item	Designation
1	Catching bracket	2	Track suspension clamp

Tab. 8

The redundant feature for a crane suspension on double trolleys consists of:

- Catching bracket (1),
- 2 suspension clamps (2).

Before the trolley is inserted into the crane runway, first suspend the crane suspension fitting from the double trolley and then attach it to the crane girder.
On Aluline systems, ensure that catching bracket (1) is also inserted into the profile section.
Assemble according to the operating instructions.
Then attach the catching bracket on the crane girder in such a way that the centre of the catching bracket is positioned above the centre of the double trolley without making contact with it. Refer to the operating instructions for the suspension clamp tightening torques.
The trolley can then be moved into the crane runway.

CAUTION

Wear caused by incorrect assembly

Following assembly, check that the crane bridge, crane suspension and trolley can move freely to ensure that the redundant feature functions correctly.

4.3 Redundant feature for a single trolley

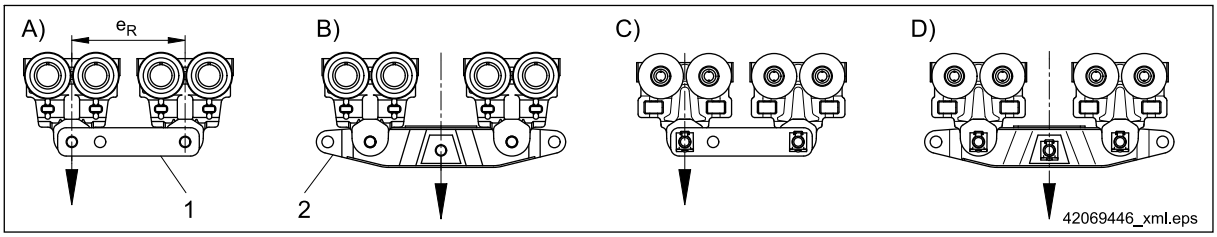

Fig. 7 (A) KBK II single trolley with redundant link bar, (B) KBK II articulated frame, (C) Aluline A18/A22 single trolley with redundant link bar, (D) Aluline A18/A22 articulated frame

Designation		KBK I	KBK II-L, II, II-H	A12/A16	A18/A22
Redundant feature link bar (1)	Weight [kg]	0,63	1,23	0,60	1,23
	Part no.	517 587 46	517 589 46	517 774 46	517 589 46
Trolley	Weight [kg]	0,74	2,00	1,20	1,95
	Part no.	980 610 44	982 110 44	855 250 44	855 280 44
Dimension e_R	[mm]	170	200	200	200

Tab. 9

The single trolley can become a redundant feature through the creation of a double trolley. This can be done by using redundant feature link bar (1) or via articulated frame (2).

4.4 Redundant feature for the load pin

4.4.1 Redundant feature for KBK 100, KBK I, Aluline A12/A16 single trolley

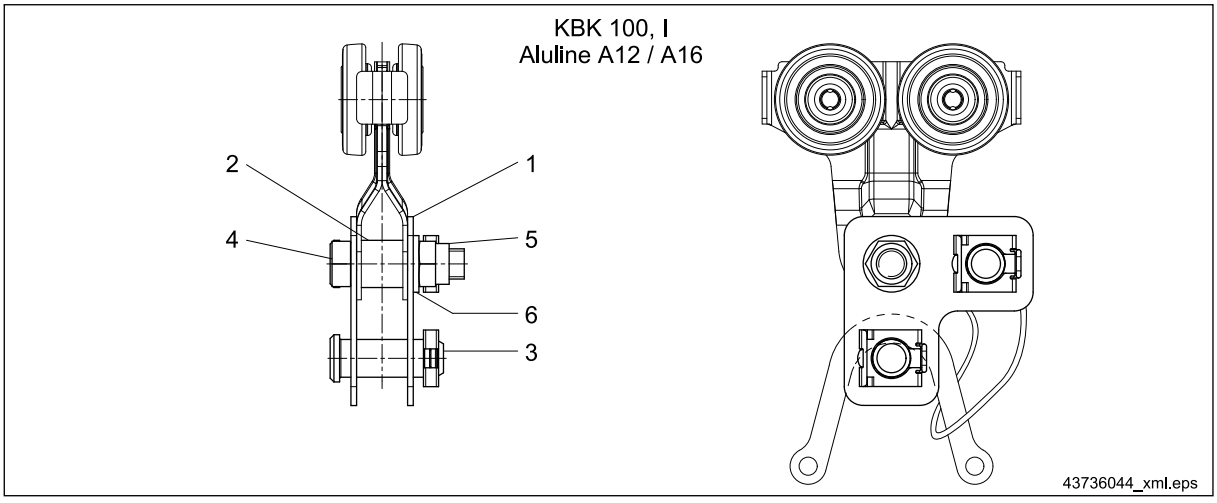

Fig. 8

Item	Designation	Item	Designation	Item	Designation
1	Redundant section	3	Pin with BoClip	5	M16 8 locknut
2	Sleeve	4	M16 8.8 hexagon bolt	6	Washer 16

Tab. 10

The redundant feature for a trolley pin consists of:

- Redundant section (1),
- Sleeve (2),
- Pin with BoClip (3),
- M16 8.8 hexagon bolt (4),
- M16 8 locknut (5),
- Washer 16 (6).

The component parts for the redundant feature are packed loose in a flat bag.

The safety rope for the chain hoist consists of:

- Wire rope,
- Wire rope clamps.

The redundant feature can be installed in the profile section before or after the trolley is inserted.
To do this, bolt both redundant sections (1) and sleeve (2) to the trolley with M16 hexagon bolt (4) and tighten them to a tightening torque of 170 Nm.
One pin must be arranged vertically below the bolt, the other horizontally next to the bolt.
Attach the chain hoist to the lower pin as described in the operating instructions.
Then guide the safety rope over the second pin and through the chain hoist suspension bracket.
The safety rope must be connected by the wire rope clamps to form a ring. The ring must be as small as possible without restricting free movement of the chain hoist.
Protruding ends of the rope must be cut off and protected against unravelling.

4.4.2 Redundant feature for KBK II-L, KBK II, KBK II-H, Aluline A18/A22 single trolley

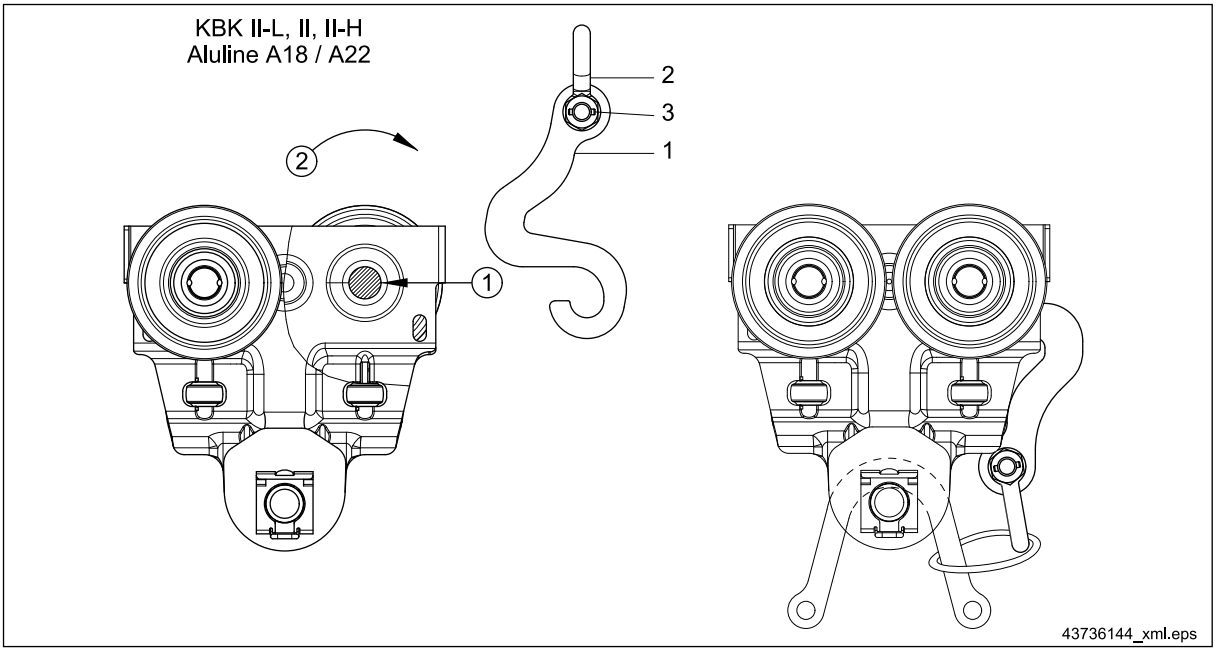

Fig. 9

Item	Designation	Item	Designation	Item	Designation
1	Hook plate	2	Shackle	3	Spring pin

Tab. 11

The redundant feature for a trolley pin consists of:

- Hook plate (1),
- Shackle (2),
- Spring pin (3),

  The shackle and spring pin are pre-assembled on the hook plate.

The safety rope for the chain hoist consists of:

- Wire rope,
- Wire rope clamps.

Before the trolley is inserted into the profile section, the redundant feature must be attached to one of the two trolley axles.
To do this, hook plate (1)

1. must be inserted into the trolley and attached to a travel wheel pin
2. and hook plate (1) must be folded down.

Attach the chain hoist as described in the operating instructions.

Then thread the safety rope through shackle and den suspension bracket.
The safety rope must be connected by the wire rope clamps to form a ring. The ring must be as small as possible without restricting free movement of the chain hoist.
Protruding ends of the rope must be cut off and protected against unravelling.

4.4.3 Redundant feature for a double trolley

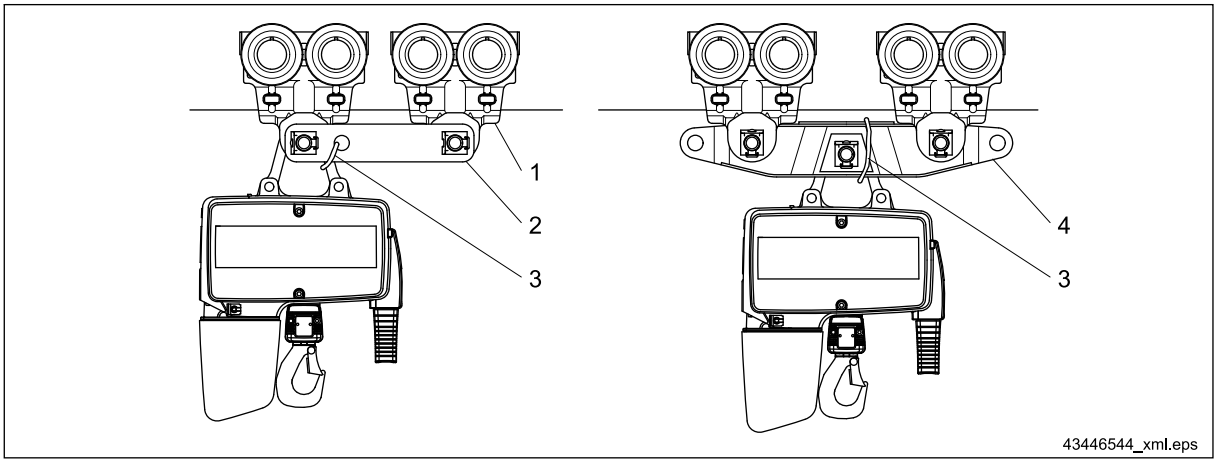

Fig. 10

Item	Designation	Item	Designation
1	Single trolley	3	Redundant safety rope
2	Redundant link bar	4	Articulated frame

Tab. 12

Thread redundant rope (3) of the chain hoist either through redundant link bar (2) for single trolleys (1) or over articulated frame (4) and secure it according to ⇒ Fig. 2, Page 9. If it used in a crab frame, the chain hoist can be secured in a similar way

CAUTION

Wear of the redundant rope can result in loss of the additional safety function.

To maintain the function of the redundant feature, the following must be observed:

– During assembly, ensure that the wire rope cannot be damaged by contact with the KBK rail or the edges of sheet metal parts.
– Check the redundant rope for damage at regular intervals and replace it, as required.

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5 Putting into service for the first time

5.1 Safety warnings when equipment is put into service for the first time

WARNING

Unauthorised operation

Danger to life and limb if KBK equipment is operated without previous inspection.

Carry out the inspection only in compliance with all safety regulations.

Please also note the information in "Operating instructions/Component parts, KBK installations" ⇒ Tab. 1, Page 2.

5.2 Inspection regulations

Please also note the information in "Operating instructions/Component parts, KBK installations" ⇒ Tab. 1, Page 2.

6 Maintenance/repair

6.1 Safety warnings for maintenance and repair work

WARNING

Unauthorised operation

Danger to life and limb if KBK equipment is operated without any maintenance.

Carry out maintenance work only in compliance with all safety regulations.

Comply with inspection intervals and requirements as specified in the documentation for the equipment.

Please also note the information in the "Operating instructions/Component parts, KBK installations" and "KBK Aluline operating instructions" ⇒ Tab. 1, Page 2.

6.2 Maintenance schedule

Inspections must also include a check of redundant components for:

- correct fit, secure attachment,
- tightening torques,
- wear, in particular of all wire ropes.
- pin retainers.

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7 Disassembly and disposal

7.1 General information on disassembly and disposal

Assembly and disassembly are quite simple owing to the modular design of the crane construction kit.

WARNING

Before disassembly, follow the safety instructions in the operating instructions of the installation, in particular those with reference to protecting the ends of rail sections to be disconnected from dropping.

Refer to the operating instructions of the installation for information on removing track sections, trolleys and current collector trolleys. Other parts are removed in reverse order to assembly.
Waste materials left over from maintenance, repair and disassembly work must be disposed of correctly and appropriately in accordance with relevant regulations and codes of practice.

The current addresses of our sales offices, subsidiaries and agencies worldwide can be found on the homepage

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