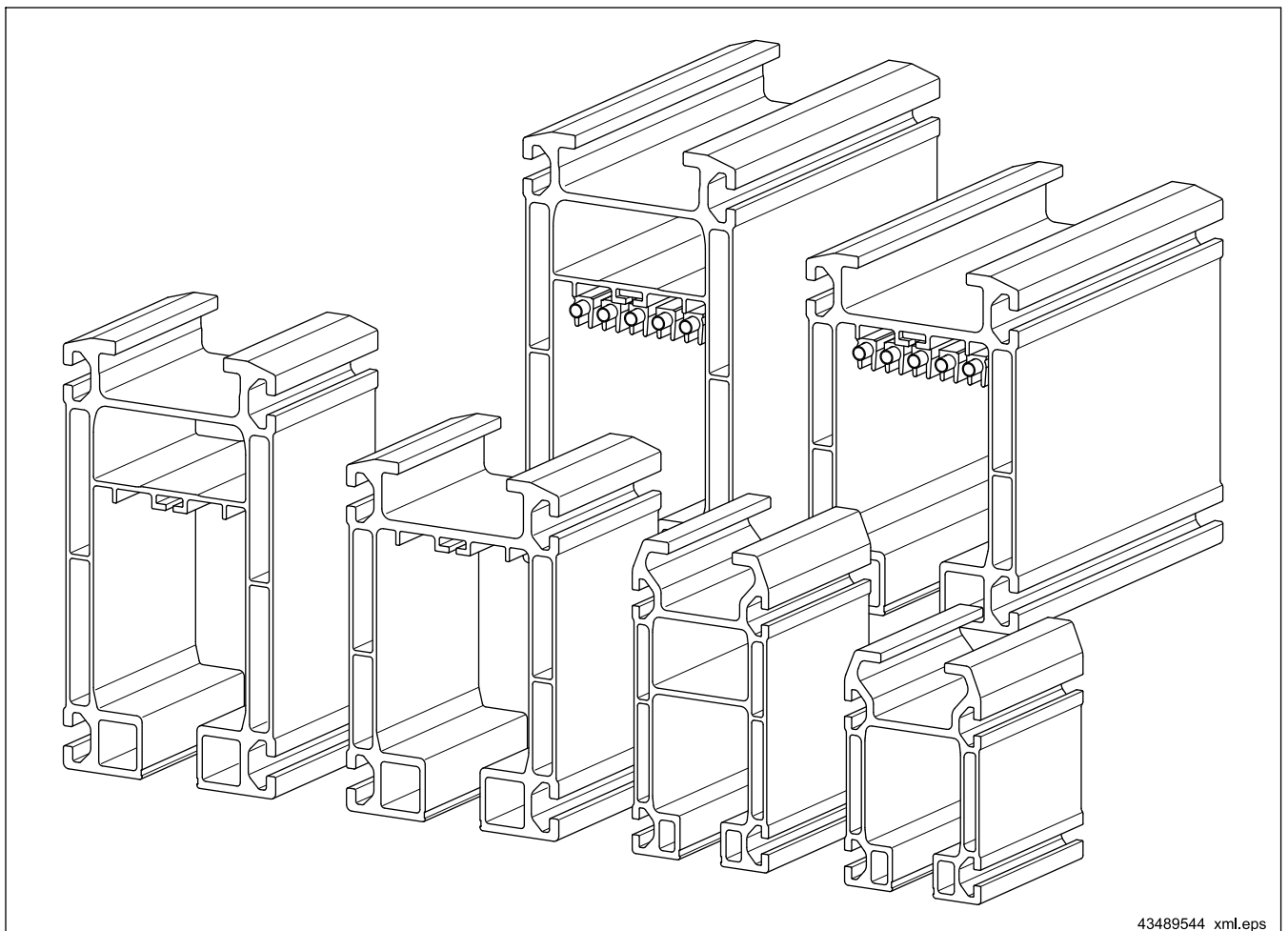


Operating instructions/component parts

KBK Aluline
Suspension monorails and cranes



43489544_xml.eps

Original operating instructions

Manufacturer

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Cleveland, Ohio 44139
Telephone: (440) 248-2400
Fax: (440) 248-3086
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Further documents are available for sub-assemblies/components in addition to these operating instructions. The corresponding documents are supplied as necessary or can be ordered separately – also for special designs or if additional options are ordered which differ from these operating instructions.

Owner _____

Where in use _____

Crane type _____

Year of manufacture _____

Load capacity _____

Crane serial number _____

Chain hoist model code _____

Chain hoist serial number _____

Drawing number _____

Operating voltage _____

Control voltage _____

Frequency _____

Wiring diagram number _____

Contactor control/direct control _____

Supplier _____

Assembled by _____

Signature _____ Date _____

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 General

1.1 KBK modular system

The KBK modular system consists of components that can be combined in the form of various parts and sub-assemblies to meet a wide range of application requirements. Our branch offices are pleased to advise you on use of the components and, together with you, can compile an installation that offers maximum benefits.

Our "KBK Aluline crane construction kit" document ⇒ Tab. 2, Page 7 and the data sheets provide information on combining individual components and assemblies (cranes and runways). This document and – where relevant – the data sheets are constituent parts of these operating instructions.

The ordered components are supplied individually packed or in groups. The components are assembled and commissioned on site. Assembly can be carried out by the customer or by our customer service.

1.2 KBK documents

Further documents are available for sub-assemblies/components in addition to these operating instructions. The corresponding documents are supplied as necessary or can be ordered separately – also for special designs or if additional options are ordered which differ from these operating instructions.

Documents ¹⁾	Order no.
KBK 0, 25, 100 trailing cable power supply line	202 617 44
KBK crane construction kit, project engineering and components	202 976 44
KBK suspensions, upper suspension bracket H, S, clamp S, V	203 072 44
DS 1 winch	203 123 44
Technical data/catalogues	
KBK Aluline crane construction kit	203 813 44
KBK anchor bolt connection	203 276 44
Redundant systems in the KBK crane construction kit	203 334 44
DCL-Pro conductor line	203 751 44
DKK conductor line	202 540 44
DCL arrangement on KBK	203 510 44
Operating instructions/component parts	
DRF 200 travel drive	214 395 44
DC-Pro 1-15 chain hoist	214 741 44
DC-Com chain hoist	214 802 44
D-BP rope balancers	214 421 44
Assembly – Adjustment – Dimensions	
KBK disengaging device	206 854 44
E11-E34 DC travel drive (I)	214 810 44
E11-E34 DC travel drive (II) (circuit diagrams)	211 229 44
Test and inspection booklet	
KBK installations (only in German)	206 020 44

Tab. 2

1.3 Symbols/signal words

Important safety information and instructions are marked by corresponding symbols and signal words in these instructions.

The safety instructions must be followed. Exercise particular caution to ensure that accidents, injuries and damage are avoided in such cases.

Locally applicable accident prevention regulations and general safety regulations must also be followed.

The following symbols and instructions warn against possible injuries or damage and are intended to assist you in your work.

DANGER



This symbol indicates an immediate hazard which can result in serious injury or death.

- Follow these instructions at all times and be particularly careful and cautious.

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

WARNING



This symbol indicates a possibly hazardous situation which might result in serious injury or death.

- Follow these instructions at all times and be particularly careful and cautious.

CAUTION



This symbol indicates a possibly hazardous situation which might result in medium to light injury or damage.

- Follow these instructions at all times and be particularly careful and cautious.



Operating hazard for the machine.

- This symbol indicates information on the appropriate use of the machine.
- This symbol in the operating instructions indicates all warnings which, if not complied with, may result in malfunctions or damage.

1.4 Information on the operating instructions

These operating instructions are designed to provide the owner and operator with useful instructions for transportation, erection, putting into service, operation and maintenance of KBK suspension monorail/suspension crane installations. These operating instructions are an integral part of the KBK suspension monorail/suspension crane installation.

Persons entrusted with the various types of work must know and comply with the safety regulations and the operating instructions.

The KBK suspension monorail/suspension crane installation may only be operated by personnel who are fully familiar with the operating instructions. In particular, they contain the "Safety" section and the relevant safety instructions in the working sections of these operating instructions.

The operating instructions must be available to operating personnel at all times to prevent operating errors and to ensure smooth and trouble-free operation of our products. They must be kept in the immediate vicinity.

Complete machine



Based on Machinery Directive 2006/42/EC, the KBK suspension monorail/ suspension crane installation is also designated as a machine in the sense of a complete machine in the following.

For a KBK suspension monorail/suspension crane installation delivered ready for operation in the sense of a complete machine, we confirm conformity with the requirements of Directive 2006/42/EC by means of the attached EC declaration of conformity.

Partly completed machinery

These instructions provide the manufacturer of a KBK suspension monorail/suspension crane installation with information on:

- basic technical information,
- some typical risks,
- the assembly and operation of the KBK suspension monorail/suspension crane installation.

The instructions contained in this document may be used as the basis for the risk assessment and operating instructions which must be compiled by the manufacturer of the installation in compliance with the Machinery Directive.

For operation of the installation, the manufacturer of the installation must provide additional operating instructions as the result of the risk assessment, as required, and inform the owner about any remaining hazards.

The owner must carry out additional measures to satisfy the safety requirements for the installation of a KBK suspension monorail/suspension crane installation supplied as partly completed machinery which is assembled with additional parts to form a machine that is ready for operation.

Installation of a partly completed or non-assembled KBK suspension monorail/suspension crane installation to create machinery ready for operation must be carried out in compliance with the information provided by the manufacturer for the KBK suspension monorail/suspension crane installation. The information for assembly and operation of the KBK suspension monorail/suspension crane installation contained in these instructions must be complied with.

A conformity inspection in accordance with the Machinery Directive must be carried out for the assembled KBK suspension monorail/suspension crane installation when it is ready for operation and a declaration of conformity must be produced.

1.5 Liability and warranty

All information included in these instructions has been compiled on the basis of the relevant regulations, state-of-the-art engineering principles and our many years of experience.



These instructions must be read carefully before starting any work on and with the installation, especially before it is put into service for the first time. The manufacturer assumes no liability for any damage which results from the following:

- non-compliance with the instructions,
- inappropriate use,
- untrained personnel,
- unauthorized conversions,
- technical modifications.

Wearing parts are not subject to liability for defects.

We reserve the right to incorporate technical modifications within the scope of improving the operating characteristics and further development of the product.

1.6 Copyright

These instructions are only intended to be used by people who work with or on the installation.

Any and all content, texts, drawings, images and any other information are protected within the sense of copyright law and are subject to further industrial rights. Any misuse is an offence.

No part of this documentation, in whole or in part, may be reproduced, distributed, shown in public or used in any other way without specific prior consent. Infringements are an offence resulting in obligatory compensatory damages. Further rights reserved.

All industrial rights reserved.

1.7 Use of spare parts

We urgently recommend that only spare parts and accessories approved by us be used. Only then can we ensure the safety and normal service life of the installation.

Spare parts not approved by us may cause unpredictable hazards, damage, malfunctions or complete failure of the installation.

The use of unauthorized spare parts may render null and void any claims for warranty, service, damages or liability against the manufacturer or his appointed personnel, dealers and representatives.

1.8 Definition of personnel

The **manufacturer** is the person who:

1. manufactures the equipment under his or her own name and places it on the market for the first time;
2. resells other manufacturers' equipment under his or her own name, whereby the reseller is not considered to be the manufacturer provided the name of the manufacturer (as in 1.) appears on the equipment;
3. imports the equipment into the country and places it on the market for the first time or
4. exports equipment to another member state of the European Union and hands it over direct to a user in that country.

Owner

Owners (employer, company) are defined as persons who own the machine and who use it as intended or allow it to be operated by suitable and trained persons.

Operating personnel/operator

Operating personnel or machine operators are defined as persons assigned by the owner of the machine to operate the machine. This person must be trained by the owner in accordance with the tasks to be performed.

Trained person

Trained persons are defined as persons who have been instructed and trained for the tasks assigned to them and on the possible hazards resulting from inappropriate conduct. Personnel must be informed about the required protective devices, protective measures, relevant regulations, codes of practice, accident prevention regulations and operating conditions and must provide verification of their competence. This person must be trained by the owner in accordance with the tasks to be performed.

Specialist personnel

Specialist personnel are defined as persons assigned by the owner of the machine to carry out special tasks, such as installation, setting-up, maintenance and fault elimination. This person must be trained by the owner in accordance with the tasks to be performed.

Qualified electrician

Qualified electricians are defined as persons who, owing to their technical training, knowledge and experience of electric machines as well as knowledge of the relevant valid standards, codes of practice and regulations, are able to assess the tasks given to them and to identify and eliminate potential hazards. This person must be trained by the owner in accordance with the tasks to be performed.

Experienced technician

Experienced technicians are defined as persons who, owing to their technical training and experience, have sufficient knowledge in the field of the machine. They must be familiar with the relevant national industrial safety regulations, codes of practice, accident prevention regulations, directives and generally accepted engineering standards enabling them to judge the safe operating condition of machines.

Assigned expert engineer (in the Federal Republic of Germany according to BGV D8, Section 23, for determining the S.W.P.)

An assigned expert engineer is defined as an experienced technician specifically assigned by the manufacturer to determine the remaining duration of service (service life) of the machine (S.W.P. = safe working period) and to carry out a general overhaul of the machine.

Authorized expert engineer (according to BGV D6, Section 28 in the Federal Republic of Germany)

In addition to the expert engineers of the Technical Supervisory and Inspection Board, an authorized expert engineer for the inspection of machines is defined as an expert engineer authorized by the Industrial Employers' Mutual Insurance Association.

1.9 Test and inspection booklet

A test and inspection booklet filled in with all details must be available for every crane installation (according to BGV D6, Section 28 in the Federal Republic of Germany). The results of the regular tests and inspections must be entered into the test and inspection booklet and must be certified by the inspector. Test and inspection booklet order no., see ⇒ Tab. 2, Page 7.

1.10 After-sales service

If you have any questions on our products or need technical information, please contact our after-sales service. Please keep the serial or order number (see test and inspection booklet, load capacity plate on the crane) for any correspondence or spare part orders. Specifying this data ensures that you receive the correct information or the required spare parts.

Terex MHPS Corp.

Telephone: +49 (0)180 5741268

Internet: <http://www.demag-us.com>

2 Safety

2.1 General information on safety

The "Safety" chapter provides an overview of all important safety aspects for optimum protection of personnel as well as safe and trouble-free operation of the installation.

When it is placed on the market, the installation is built according to generally accepted engineering standards and is considered to be safe to operate. It may still be a cause of danger if it is not used correctly or as intended by suitably trained personnel.

Knowledge of the contents of the operating instructions are one of the requirements necessary to protect personnel from hazards and to avoid malfunctions and, therefore, to operate the installation safely and reliably.

Any conversions, modifications or additions to the installation are prohibited unless approved by Demag in writing.

2.2 Safety signs on the installation

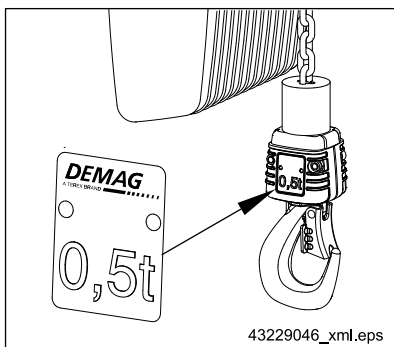


Fig. 1 Example: Capacity plate

Any pictograms, signs or labels on the installation must be obeyed and must not be removed. Pictograms, signs or labels that are damaged or no longer legible must be replaced immediately.

2.3 Intended use

The installation may only be used as intended and in compliance with the requirements for the owner and the following limitations as specified in these operating instructions. Any other use may result in a danger to life and limb and/or cause damage to the machine and/or load.

- KBK suspension monorails/suspension cranes are only intended for lifting, lowering and moving loads and may be used as stationary or traveling equipment.
- The installation must be designed for loads resulting from operation. The maximum safe working load is the load capacity specified on the capacity plate. This must not be exceeded. The maximum permitted load includes the load and any load handling attachment.
- The installation may only be installed, used, operated, maintained and removed by trained personnel when it is in perfect working order. Personnel must meet the requirements according to ⇒ "Operating personnel requirements", Page 14.
- Intended use includes compliance with the safety instructions as well as any other instructions on assembly and disassembly, commissioning, function and operation, maintenance and fault elimination as well as compliance with the instructions on the machine safety devices, any possible remaining hazards and protection against hazards.
- The installation may only be used subject to the permissible technical data, ⇒ "Technical data", Page 16.
- The installation must be maintained regularly and appropriately by trained personnel in line with the specified deadlines and checked according to ⇒ "Maintenance schedule", Page 89. Wearing parts must be replaced in good time.
- UVV/BGV D8 and BGV D6 guidelines must not be ignored.

No liability for inappropriate use

The manufacturer is exempt from any liability for use other than the purpose which is technically possible and acceptable according to these operating instructions. In particular, the manufacturer assumes no liability for damage due to inappropriate or any other prohibited use of the installation in the sense of the "Intended use" section.

No liability for structural modifications

The manufacturer is not liable for any unauthorized structural modifications which have not been agreed with him. This applies, for example, if profile sections are shortened. This includes incorrect connection of the installation to

devices or equipment that do not belong to our scope of delivery, or the installation or use of third-party accessories, equipment or sub-assemblies that are not approved by the manufacturer.

Depending on the type and scope of the installation, it may be necessary to have an inspection carried out by an expert engineer before it is handed over to the owner.

The KBK suspension monorail/suspension crane may only be used subject to the permissible "Technical data" and "Operating conditions". At extreme temperatures and in aggressive atmospheres or conditions differing from those specified in the "Operating conditions" section, the owner must implement special measures after consulting Demag.

2.4 Hazards that can be caused by the installation

The installation 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.

KBK suspension monorail/suspension crane installations are industrial equipment which is designed to be operated with a rated voltage of up to 1000 V from low-voltage mains supply networks. Power feed is via power supply lines: mobile cables, open or enclosed power conductor systems. These systems are live up to the terminals of the isolating switch. During operation or when the mains connection switch is not switched off, electrical components inside enclosures, motors, switchgear cabinets, terminal boxes, etc., carry dangerous voltages.

DANGER



Live components

Danger to life and limb.

Electric energy may cause very severe injuries. Danger of death caused by electric current if the insulation or individual components are damaged.

- Switch the installation off and secure it against restoration of the power supply before any maintenance, cleaning or repair work is carried out.
- Switch the power supply off before any work is carried out on the electric equipment. Check to ensure that the components to be replaced are de-energized.
- If work has to be carried out on live parts, a second person must be available to actuate the emergency stop button or mains connection switch to disconnect the power supply in an emergency.
- Before disconnecting and connecting electrical plug-and-socket connections, always disconnect them from the supply (this does not apply to mains connections, provided they do not represent a dangerous contact voltage in the sense of the safety regulations).
- Do not remove any safety equipment or render it inoperative by modifications.

WARNING



Crushing hazard

There is a risk of injury due to parts of the body being crushed/sheared or clothing or hair becoming entangled.

Protective devices must be provided if the installation is fitted at a suspension height within normal reach.

WARNING



Crushing hazard

Body parts can be crushed when loads are lifted, lowered or moved.

Ensure that nobody is present in the immediate danger zone when loads are lifted or lowered.

WARNING



Suspended load. Falling parts.

Danger to life and limb if lifted loads are dropped.

Keep out of the danger zone at all times

- Keep a sufficient safety distance.
- Never step under a suspended load.

Certain work and practices are prohibited when using the machine as they may involve danger to life and limb and result in lasting damage to the installation. Observe the safety instructions in the sections:

- ⇒ "Assembly", Page 22
- ⇒ "Putting into service for the first time", Page 76
- ⇒ "Operation", Page 79
- ⇒ "Maintenance work", Page 85

2.5 Responsibility of the owner

Information on safety at work refers to the regulations of the European Union that apply when the installation is manufactured. The owner is obliged to ensure that the specified industrial safety measures comply with the latest rules and regulations and to observe new regulations during the entire service life of the installation. Local industrial safety legislation and regional regulations and codes of practice applicable at the site of operation of the installation must be observed outside the European Union.

General safety, accident prevention and environmental protection regulations that apply where the installation is in operation must be observed and complied with in addition to the safety instructions contained in these operating instructions.

The owner and any personnel authorized by him are responsible for correct operation of the installation and for clearly defining responsibilities for installation, operation, maintenance and cleaning. The operating instructions must be followed in full and without any limitations.

Special local conditions or applications may lead to situations which are not considered in these operating instructions. In such cases, the required safety measures must be defined and implemented by the owner. Necessary measures may also relate, for example, to the handling of hazardous materials or tools and the provision/wearing of personal protection equipment. The operating instructions must, if required, be supplemented by the owner with instructions relating to organization of work, working procedures, authorized personnel, supervising and reporting obligations, etc. For further information, see ⇒ "Safety instructions for operation", Page 79.

Furthermore, the owner must ensure that

- any further working and safety instructions resulting from the risk assessment of the workplaces at the installation are specified in operating procedures.
- personnel who work with or on the installation are provided with appropriate first-aid equipment. Personnel must be trained in the use of the first-aid equipment.
- the operating instructions are always kept available in the immediate vicinity of the installation for installation, operating, maintenance and cleaning personnel.
- personnel are trained in accordance with the work to be performed.
- the installation is only operated when in safe and proper working order.
- safety devices are always kept freely accessible and are checked regularly.
- national regulations for the use of cranes and lifting appliances are observed.
- any specified regular checks and inspections are carried out on time and are documented.

The owner is urged to develop procedures and guidelines for any malfunctions, to instruct users and to affix these instructions at a suitable place where they can be easily seen.

2.6 Operating personnel requirements

Only authorized and trained personnel may work on the installation. The personnel must have received instruction on the installation functions and any hazards that may occur.

Every individual given the task of working on or with the installation must have read and understood the instructions before any work starts.

Persons under the influence of drugs, alcohol or medicines which affect their reactions must not work on or with the installation.

Age and job-specific regulations relevant at the place where the installation is operated must be observed for the selection of any personnel.

Personnel are obliged to report to the owner without delay any changes to the installation that impair safety.

For independent operation (crane operator) or maintenance (trained maintenance fitter) of the KBK installation, the owner may only employ persons

- who are at least 18 years of age,
- who are mentally and physically suitable,
- who have been instructed in the operation and maintenance of the KBK installation and who have proven their qualification to the owner in this respect.

2.7 Personal protection equipment

When work is carried out on or with the installation, the following protective equipment is recommended to be worn according to the owner's hazard assessment:

- Protective clothing, closely fitting working clothes (low tear strength, no loose sleeves, no rings or any other jewelry, etc.);
- Safety shoes to protect against falling parts and against slipping;
- Safety helmet to be worn by everybody in the danger zone.

2.8 Emergency-stop device

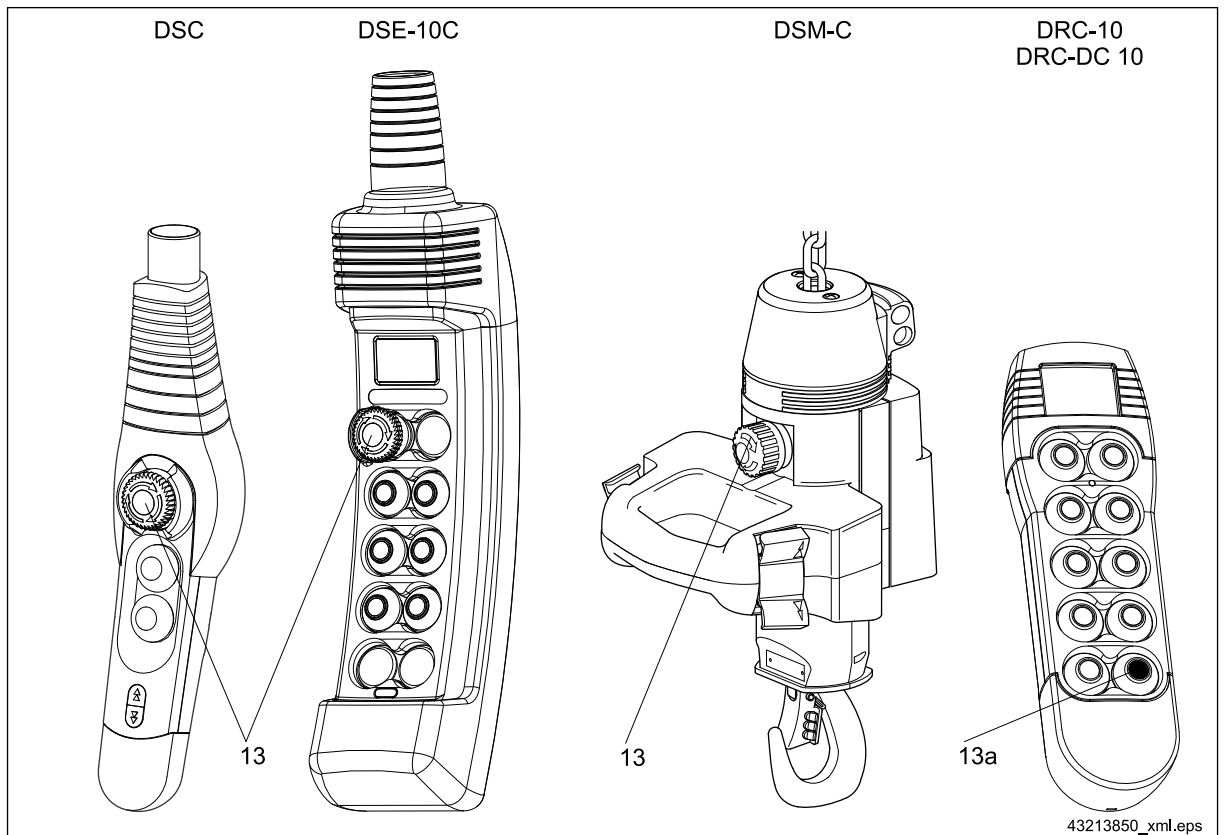


Fig. 2 Position of emergency stop (13)

The installation is fitted with an emergency-stop device (13) to prevent damage and injuries. This is located on the control unit. The emergency-stop operating function must be checked regularly.

2.9 Regular inspections

The owner of the installation may be obliged to carry out regular inspections by national industrial safety legislation and regional regulations. In Germany, this is specified by the accident prevention regulations for winches, hoists and towing devices (BGV D8) and the accident prevention regulations for cranes (BGV D6), for example. These specify that

- the installation must be inspected before it is put into operation,
- the installation must be inspected regularly,
- the elapsed share of the theoretical safe working period must be calculated,
- a record of tests and inspections must be kept.

The owner is obliged to ensure that the installation complies with the latest rules and regulations and to observe new regulations at all times.

If no comparable inspection regulations or requirements apply at the place where the installation is operated, we recommend compliance with the above-mentioned regulations.

3 Technical data

3.1 KBK runways/crane girders

Please refer to our "KBK ALuline crane construction kit" document for all technical data such as dimensions, weights, permitted loads and temperature ranges, see ⇒ Tab. 2, Page 7.

Structural dimensions for cranes, crane runways and suspension monorails as well as load capacities and span dimensions are specified in the approval drawing and in the test and inspection booklet.

3.2 Hoist unit

Please refer to the hoist document for all technical data such as dimensions, weights, permitted loads and temperature ranges.

3.3 Control system

A direct or contactor control system is used for control purposes.

In suspended operating position, the control pendant is rated to IP65 according to DIN VDE.

3.4 Noise emission/sound pressure level

Please refer to the hoist unit or travel drive operating instructions.

3.5 Transport, packing, scope of delivery, storage

Safety instructions

WARNING



Falling parts

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

- Do not walk under the suspended load. Keep a sufficient safety distance.
- Cordon off a large area around the working zone.

WARNING



Damage caused during transport

The KBK installation may be damaged or destroyed by inappropriate transport.

Attach lifting and handling equipment only at the correspondingly marked points.

Transport inspection

- Check the delivery to ensure it is complete and 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 may 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, utilize 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.

Bearing

Until they are installed, parts of the installation and accessories must be kept closed and may 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, if supplied with hoists or travel drives, the instructions for these components must also be complied with.
- 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).

3.6 Operating conditions

CAUTION



Operational safety risk

Safe operation is only possible under the specified conditions. Contact the manufacturer if the operating conditions differ from those specified ⇒ "After-sales service", Page 10.

The KBK suspension monorail/suspension crane installation can be operated at:

Ambient temperature:	-20 °C to +50 °C ²⁾
Humidity:	max. 80% relative humidity

Tab. 3

For operation outdoors, special measures may have to be taken to ensure safe operation, e.g. trolleys may have to be locked against the wind.



Installations operated outdoors should be provided with a cover for protection against the weather or the installation should be kept under a canopy when it is not being used.

²⁾ Refer to the corresponding operating instructions for differing temperature ranges for drives and hoists.

4 Technical description

4.1 General information on the technical description

Our modular KBK crane construction kit enables you to build complete crane systems quickly and easily. The basic elements of KBK installations are special track sections available in sizes designated Aluline A12, A16, A18 and A22.

Profile sections with internal conductor rails are designated KBK ...-R.

All KBK components are produced as standardized series assemblies.

Standardized connection dimensions guarantee simple conversion or extension of your crane installation, regardless of when it was made. The simple pin and bolted connections between the individual elements facilitate rapid assembly.

All components and assemblies of the crane construction kit are described and their dimensions are specified in the "KBK Aluline crane construction kit" document and in the technical data sheets, see ⇒ Tab. 2, Page 7. This document contains a general description of the crane construction kit, information for project drafting and selection tables for suspension monorails and cranes. It also includes part numbers and details for ordering these parts.

The possible sub-assemblies and components used in a KBK installation are listed below.

Please refer to the "KBK Aluline crane construction kit" document for further information, see ⇒ Tab. 2, Page 7.

Example of a single-girder crane

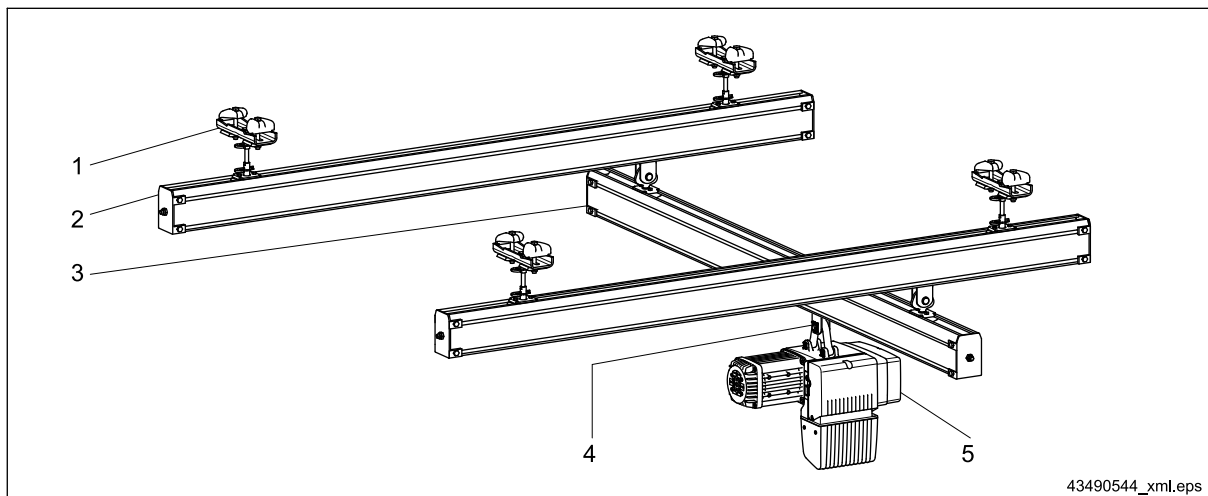


Fig. 3

Item	Designation	Item	Designation	Item	Designation
1	Track suspension	3	Crane bridge	5	Control system
2	Crane runway	4	Traveling hoist		

Tab. 4

4.2 KBK suspension monorail/suspension crane components

Traveling hoist

The traveling hoist assembly can consist of the following sub-assemblies:

Sub-assembly	Available components
Load handling attachments	See installation, as required
Hoist unit	See Demag chain hoist/rope hoist operating instructions
Crab frame (steelwork)	Crab frame
Cross-travel unit	Crab trolleys
	Special load bars, spacer bars
	Special trolleys
	Low-headroom monorail hoist
	Trolley combinations
	Link and spacer bars
	Articulated spacer bar
	KBK spacer bar
	Buffers on trolleys
Travel drives	

Tab. 5

Crane bridge

The crane bridge assembly can consist of the following sub-assemblies:

Sub-assembly	Available components
Crane main girder	Crane girder straight section track elements
	Bolted connection, busbar connection
	Internal buffer stop
	End cap with buffer
	Crane suspension eye
	KBK extending cranes
Crane trolleys	Information plates
	Crane trolleys, flexible/with articulated link
	Rigid crane trolleys
	KBK cranes with raised girders
	Travel drive for crane
	Trolley combinations
Crane trolleys	Link and spacer bars
	Buffers on cranes

Tab. 6

Main group	Available components
Control system	KBK standard electrical equipment, selection table
	Cable arrangements and cable clamps
Safety equipment	Internal buffer stop
	End cap with buffer
	Spacer bar
	Buffers
	Spring clips and split sleeves on suspensions
	Split sleeve retainer for pins on trolleys, traverses, crab frames, limit switches
Power supply	BoClip retainer for pins on trolleys, traverses, crab frames, limit switches
	Trailing cable power supply
	Integrated conductor line
	External busbar
	Power supply components and attachments
	Powerfeed end cap
	Maintenance section
Current collector trolley	
Crane runway	Track elements, straight sections
	Joint bolts
	Internal buffer stop
	End cap with buffer
	Information plates
Suspension monorail	Track elements, straight sections
	Bolted connection, rail connection
	Internal buffer stop
	End cap with buffer
	Information plates
Track suspension	Suspension from structural beams
	Short suspension fitting
	Suspension from U-bolt
	Suspension from ceiling rail sections
	Suspension from solid ceilings
	Track suspension from sloping superstructure, stiffeners, V-type suspension arrangement, V-type suspension/stiffener arrangement
	Components for ceiling suspension
Miscellaneous	See relevant documents
	Further "KBK Aluline crane construction kit" documents ⇒ Tab. 2, Page 7

Tab. 7

5 Assembly

5.1 General assembly information

These instructions enable the owner to install, re-install or replace KBK components and assemblies himself. The owner must appoint a coordinator who is authorized to issue instructions before assembly work commences.



Despite detailed information, errors cannot be excluded when the installation is assembled by the customer. For this reason, we recommend that this work be carried out by our trained specialists or by persons authorized by us.

The wiring of the KBK installation complies in all respects with current DIN VDE and accident prevention regulations. Unauthorized intervention and modifications eliminate compliance with these regulations.

The item numbers shown in the diagrams correspond to the those given in our "KBK Aluline crane construction kit" document, see ⇒ Tab. 2, Page 7. This document also contains notes and diagrams that may be useful for assembly of the installation.

A drawing – at least a good sketch – must be available for assembly of each installation. This drawing/approval drawing (with the owner's approval stamp or signature) contains a diagram of the crane installation with easily legible symbols and all structural dimensions. If required, refer to the KBK documents for guidelines on the technical design.

The approval drawing is the basis for the test and inspection booklet to be compiled for the crane installation. Modifications, additions and extensions must be entered in the installation diagram (assembly drawing) and in the test and inspection booklet.

The operator of the crane installation must supply proof of the load bearing capacity of the superstructure which the crane installation is suspended from.

5.2 Safety instructions for assembly

DANGER



Incorrect assembly

Danger to life and limb.

Incorrect installation may result in severe injury and/or damage to property. Therefore, this work may only be carried out by authorized, instructed personnel who are familiar with the principle of operation of the installation in compliance with all safety regulations.

- Ensure sufficient working clearance before starting assembly work.
- Secure and fence off the working and danger zone.
- If an elevating work platform is used for assembly, only use appropriate attachments for the lifting of persons which ensure that work is carried out in a safe and stable position.
- Only suitable, tested and calibrated tools and accessories may be used for assembly or disassembly work.
- Wear protective equipment.
- Be careful when working on open components that have sharp edges. Risk of injury.
- Keep the working area clean and tidy. Store any unneeded machine or installation parts and tools in such a way that there is no risk of them falling.
- Fit components correctly and as intended. Comply with specified bolt tightening torques. Incorrectly fitted components may fall and cause severe injuries.
- Structural changes compared to the original configuration can result in a reduced load capacity of the components/installation.
- Welding work may only be carried out by persons who are specially qualified. DIN welding work requirements must be fulfilled. The electrode holder and earth must always be connected to the same assembly when welding work is carried out as otherwise serious damage may be caused to the installation.
- Only carry out installation work when all requirements regarding the installation location are met (see ⇒ "Technical data", Page 16).
- Customer-specific regulations must be observed.

DANGER



Live components

Danger to life and limb.

Work on electric equipment may only be carried out by qualified specialist personnel (⇒ "Definition of personnel", Page 9) in compliance with the safety regulations.

It must be possible to switch off the power supply by means of a device to disconnect the power supply (e.g. mains connection or isolating switch with a padlock).

Switch off the electric power supply before starting work. The mains connection or isolating switch must be protected against unauthorized or accidental restoration of the power supply by means of a padlock.

DANGER



Crushing hazard

Danger to life and limb.

Stop all moving parts and ensure that they cannot start moving while assembly work is being carried out.

Mechanical safety

All bolted connections must be correctly tightened, see also the "Tightening torques" section.

Self-locking nuts must not be replaced by other types of nut. Self-locking nuts must be replaced when they have been tightened and untightened five times. The clamping torque of a self-locking nut must not be lower than the loosening torque specified by EN ISO 2320.

A sufficiently secure connection can only be guaranteed by tightening to the specified tightening torque.

Bolted connections must not be lubricated as otherwise the specified tightening torque values will be too high.

Pre-assembled parts (e.g. crane suspension and short suspension) must not be disassembled or modified.

Crane suspension fittings must not be used as swivel joints.

All assembly work must be completed in accordance with the operating instructions.

Any change or modification which prejudices safety must be reported to the nearest person responsible immediately. Repairs may only be carried out by experienced technicians.

Ensure that all attachment points are freely accessible for checks and servicing or that free access can be provided.

The control device (e.g. control pendant) must be marked in such a way that the direction of movement is clear and distinct. The arrow symbol on the switching elements must correspond to the direction of movement.

Electric safety

The electrical equipment for KBK suspension monorails and cranes meet the requirements of relevant electrical (VDE in Germany) and accident prevention regulations in full.

Protective earth conductor

The protective earth conductor in insulated leads and cables must be colored green and yellow along its entire length.

The protective earth conductor must not be connected to mounting bolts or screws.

Earth junctions and connections must be protected against accidental loosening (e.g. by using serrated lock washers to DIN 6798). It must be possible to disconnect each individual connection.

Protective earth conductors must not carry any current in normal operation.

The same number of protective earth connection points must be provided as electric power infeed and outfeed points.

Continuity of the PE conductor connection must be checked.

Mains connection switch

A mains connection switch must always be provided for the main power supply line to suspension monorails and cranes. The mains connection switch must be arranged to disconnect all poles of the KBK installation from the mains supply.

Ensure that the mains connection switch is installed in an easily accessible position near the KBK installation and clearly marked.

Isolating switch

If two or more lifting appliances are fed from a common supply line, each one should be provided with an isolating switch. This makes it possible to carry out maintenance work on individual units, without affecting operation of the rest of the system.

Power supply

Cold-resistant PVC-sheathed flat cables are used exclusively as trailing cables.
 KBK ...-R, DEL, DCL-Pro and DKK-AL are safety busbar lines. Type of enclosure: IP 23 to DIN 40050.

Compressed air supply

Every KBK installation in which pneumatically operated equipment is used must be fitted with a stop valve. If two or more pneumatically operated units are fed from a common connection point, each one must be provided with a separate stop valve.

Crane switch

Each crane must be provided with a crane switch so that all movements in the crane installation can be stopped from the control point.

The crane switch may be omitted on cranes where only the lifting equipment is electrically operated and on mono-rail trolleys which have a travel motor output up to 0.5 kW.

KBK Ergo

In contrast to KBK classic trolleys, the load is always rigidly connected to KBK Ergo trolleys.

Due to the design specifications of KBK Ergo trolleys and KBK Ergo suspensions, it is not always necessary to prevent the cranes or tracks from tilting.

If forces acting in the opposite direction to gravity are exerted on the trolleys, KBK Ergo trolleys must always be used at the corresponding points.

If forces acting in the opposite direction to gravity exerted on the suspensions can be balanced by the deadweight of the rail, KBK classic suspensions may also be used, otherwise KBK Ergo suspensions must be selected.

5.3 Tightening torques

M6	10 Nm	KBK Aluline A12/A16 suspension clamp
M8	25 Nm	KBK Aluline A18/A22 suspension clamp KBK Aluline A18/A22 buffer stop KBK Aluline end cap
	45 Nm	KBK Aluline A12/A16 bolted connection
M10	20 Nm	KBK Aluline A12/A16 buffer stop
	45 Nm	KBK Aluline A12/A16 suspension KBK Aluline A12/A16 trolley fittings
	85 Nm	KBK Aluline A18/A22 bolted connection
M12	80 Nm	KBK Aluline A18/A22 trolley fittings
M16	120 Nm	KBK Aluline A18/A22 suspension

Tab. 8

CAUTION



Loose connections

Loose connections are a danger to life and limb and a risk of damage to the machine.

Metal nuts featuring a locking element (self-locking nuts) are mainly used for KBK installations.

- They must not be replaced by normal nuts.
- Self-locking nuts must be replaced when they have been tightened and untightened five times.

5.4 Assembly checklist

Order no.:	
Responsible for assembly:	Name
	Date
	Dept.
1. Documents	<input type="checkbox"/> Installation/assembly drawing, circuit diagrams <input type="checkbox"/> Operating/maintenance instructions, function description ⇒ Tab. 2, Page 7 <input type="checkbox"/> Shipping lists/schedule/assembly checklist <input type="checkbox"/> Test and inspection booklets/conformity declaration ⇒ Tab. 2, Page 7 <input type="checkbox"/> Verification of support structure/foundation suitability

2. Tools	<input type="checkbox"/> Toolbox (standard) with set of HSSE drills
	<input type="checkbox"/> Voltage tester/extension cable
	<input type="checkbox"/> Hand drill/hand saw/G clamps
	<input type="checkbox"/> Torque wrench
	<input type="checkbox"/> Suspension rod drilling jig, part no.: 982 017 44
	<input type="checkbox"/> Spirit level, hose water level, laser
	<input type="checkbox"/> Spray paint can/1 kg paint (brush, thinners)
	Depending on the site:
	<input type="checkbox"/> Scaffolding/ladders/forklift/elevating platform
	<input type="checkbox"/> Material storage area fencing
	<input type="checkbox"/> Tool/office container
3. Preparation	<input type="checkbox"/> Services provided by the customer, e.g. steelwork/foundations
	<input type="checkbox"/> Accessibility to the assembly area
	<input type="checkbox"/> All material complete according to shipping list
	<input type="checkbox"/> Pre-assembly of suspensions, trolleys and cranes
	<input type="checkbox"/> Assembly of the installation in the following order
	- Suspensions, runways
	- Cranes, trolleys
	- Power supply line/electrical fittings
4. Execution	Track/suspension fittings
	<input type="checkbox"/> Bolted connections uniformly tightened
	<input type="checkbox"/> Level track
	<input type="checkbox"/> Parallel crane runways $l_{kr} =$
	<input type="checkbox"/> Distances between suspensions as specified $l_w =$
	<input type="checkbox"/> Suspension fittings equally loaded (no vertical play)
	<input type="checkbox"/> Spring clips properly fitted through suspension rods and ball head suspension rods
	<input type="checkbox"/> Specified distances of joints from suspensions s_t
	<input type="checkbox"/> No displacement between rails at joints (run finger over to test) and no distortion
	<input type="checkbox"/> Opening angle of stiffener arrangements as specified
	<input type="checkbox"/> End caps and buffers
	<input type="checkbox"/> For KBK ...-R: correct assignment of phases (continuous)
	<input type="checkbox"/> Safety distances to neighbouring works/equipment
	<input type="checkbox"/> Test run/function check
	<input type="checkbox"/> If anchor bolts are used: Record of anchor bolt installation work
	Trolleys/cranes
	<input type="checkbox"/> Bolted connections uniformly tightened
	<input type="checkbox"/> Crane/trolley travel drive assembly and adjustment
	<input type="checkbox"/> Crane girder suspension distance $l_{kr} =$ as specified (as for crane runway)
	<input type="checkbox"/> Easy movement and no unwanted forces at connections between components
	<input type="checkbox"/> Component connections secured, e.g. BoClip pin retaining device
	<input type="checkbox"/> Buffers/buffer plates
	<input type="checkbox"/> Function check
	Power supply/control
	<input type="checkbox"/> Trailing cable moves easily and is not twisted
	<input type="checkbox"/> Safe and reliable current collector contact
	<input type="checkbox"/> Terminal designations/arrangement of the phases
	<input type="checkbox"/> All installation control fittings are firmly attached
	<input type="checkbox"/> Leads/cables laid properly
	<input type="checkbox"/> Switches, microswitches, correct fuse links
	5. Finalisation
<input type="checkbox"/> Demonstration of installation functions under realistic conditions (verification of cycle times, if required)	
<input type="checkbox"/> Acceptance and handover (verified by signature)	
<input type="checkbox"/> Instruction of the operating personnel	
<input type="checkbox"/> Hand over complete documentation	
	<input type="checkbox"/> Forward any changes to the design department so that the actual status of the installation is documented

Tab. 9

5.5 Component designations

The components of the crane construction kit are all numbered. The component item numbers are used to identify them in some of the texts in these operating instructions. A list of all item numbers is provided below.

Item no.	Index	Component designation	Item no.	Index	Component designation
1		Straight section	39		Hexagon nut for suspension rod
2		Track joint bolt set	40		Ball-head suspension rod
3		Conductor joint set	41		Suspension rod
	a	Conductor connector	42		Track suspension clamp
	b	Joint connector		a	Ball socket
4		Curved section		b	Suspension clamp side section/pressure clamp
5		Drilling jig/drill		c	Bolt
6		Internal buffer stop	43		Spring clip
7		End cap	44		Ball-head bolt
	a	End cap bolted connection	45		Suspension, short (not adjustable)
	b	End cap for busbar	46		V-type upper suspension bracket
	e	ergo end cap	47		V-type suspension bracket
8		Powerfeed end cap		a	Filler plate for sloping surface
9		Line powerfeed	48		Suspension rod strainer
10		Power pick-up guide	49		Hinged block
11		Maintenance section	50		Coupling for suspension rod
	b	Reinforcing section	51		Packing plate for upper suspension bracket
	c	Protective cover	52		KBK II/M10 suspension clamp
	d	Swivel-lock pin	53		Trolley attachment bracket with pin
	f	Clamp	54		Pin
	g	Center busbar section	55		Trolley
	h	Warning plate		a	Side cheek
12		Current collector/housing		b	Travel roller
	a	DEL protective frame		c	Supporting washer
	e	Engaging stirrup for ergo current collector trolley		d	Retaining ring
	h	Coupling		e	Ergo trolley
13		Emergency stop/emergency off		f	Travel wheel
14		Manufacturer's plate		g	Socket head bolt
15		Capacity plate		h	Sleeve
16		Name plate		i	Crossbar
20		Track switch		j	Hexagon bolt
21		Turntable		k	Lock nut
22		Drop section		l	Washer
23		Latching device		m	Washer
25		Upper suspension bracket		n	Split sleeve
26		Upper suspension clamp		s	Brake tape
27		U-bolt	56		Pre-assembled double trolley
28		Roof truss	57		Load bar
29		Anchor bolt sets	58		Load bar suitable for curves
30		Complete suspension with suspension rod	59		Load bar for travel on straight track
31		Complete suspension short adjustable	60		Load bar 600 with trolleys
	e	ergo suspension fitting	61		Single-trolley link
32		Packing plate	62		Rigid crane end carriage
33		Lock nut		a	Connecting member
34		Wall fixture		b	Clamp connection
35		Floor slab		e	Ergo crane end carriage
36		Cover for floor fixture plate	63		Frame for Aluline double-girder crane
37		Split sleeve	64		Light-duty trolley, steel
38		Suspension rod drilling jig	65		Light-duty trolley, plastic

Tab. 10

Item no.	Index	Component designation	Item no.	Index	Component designation
66		Traverse for double-girder crane	90		Switch mounting plate
67		Raised crane traverse	91		Cable bracket
68		Load bar for special hoists		a	Shortened conductor bracket
69		Tractor trolley	92		Mounting bracket for terminal box complete
	b	Pin, long/inserted bolt for Aluline A18/A22 trolley	93		Mounting bracket for terminal box
	c	Link bar	94		Terminal box
	f	Pin, short	95		Mounting plate
70b		Friction wheel travel drive/travel drive	96		Stacker crabs
	a	RF PN counterweight	98		End stop/buffer
	b	Dished washer pack		a	M10 hexagon screw
	c	Sleeve		b	Buffer extension
	d	Nut	100		Protective sleeve for cable
	e	Eye bolt	101		End sleeve for protective hose
	f	Fork carrier	102		Compressed air plastic hose
71		Link bar	103		Mounting bracket with hose clip
	a	Link bar 120	104		Cable trolley with hose clip
	e	RF ergo hinged block	105		Hose clip set 1 and 2
72		Hinged end piece, hinged block	106	a	Balancer angle connection
73		Articulated spacer bar		b	Bulkhead gland
74		Spacer bar for crane trolleys		c	Angle connector
75		Crane suspension eye	107		Maintenance unit
	a	Suspension eye/ball socket	108		Angle for bulkhead gland
	b	Suspension clamp/pressure clamp	110		Steel anchorage bracket
76		Spacer bar for straight track	113		RF pneumatic equipment base block
77		Raised crab frame	114		Pneumatic valve
78		Crab frame	115		Electric control
	e	KBK ergo crab frame	117		Extending frame A1/1
79		Bracing frame	118		Extending frame B1/1
80		Crane bridge cable clamp	119		Extending frame B2/1
81		Crab frame cable clamp	121		DEL straight section
82		RF trolley cable clamp	122		DEL curved section
83		Rail end cable clamp, end clamp with clamping plate	123		Stop plate
84		Lines and cables	125		Isolating section
85		Slider	128		Equipotential bonding
86		Cable trolleys	130		Redundant arrangement for suspension
	a	Trolley	131		Redundant arrangement for trolley
	b	Clamping plate	132		Redundant crane suspension feature
	c	Clamping plate	135		RF 125 rocker
	d	Cable bracket	137		Mechanical disengaging device
	e	Cable strap	138		Electric disengaging device
87		Stirrup with clamping plate	141		Limit switch
88		Mains connection switch/isolating switch	142		Limit switch switching vane
	a	C-rail	150		Canopy
	b	Bolt			
89		Rail attachment			
	a	Mounting bracket			
	b	Bolted bracket			
	c	Clamp section			

Tab. 11

5.6 Pin retaining devices

Examples

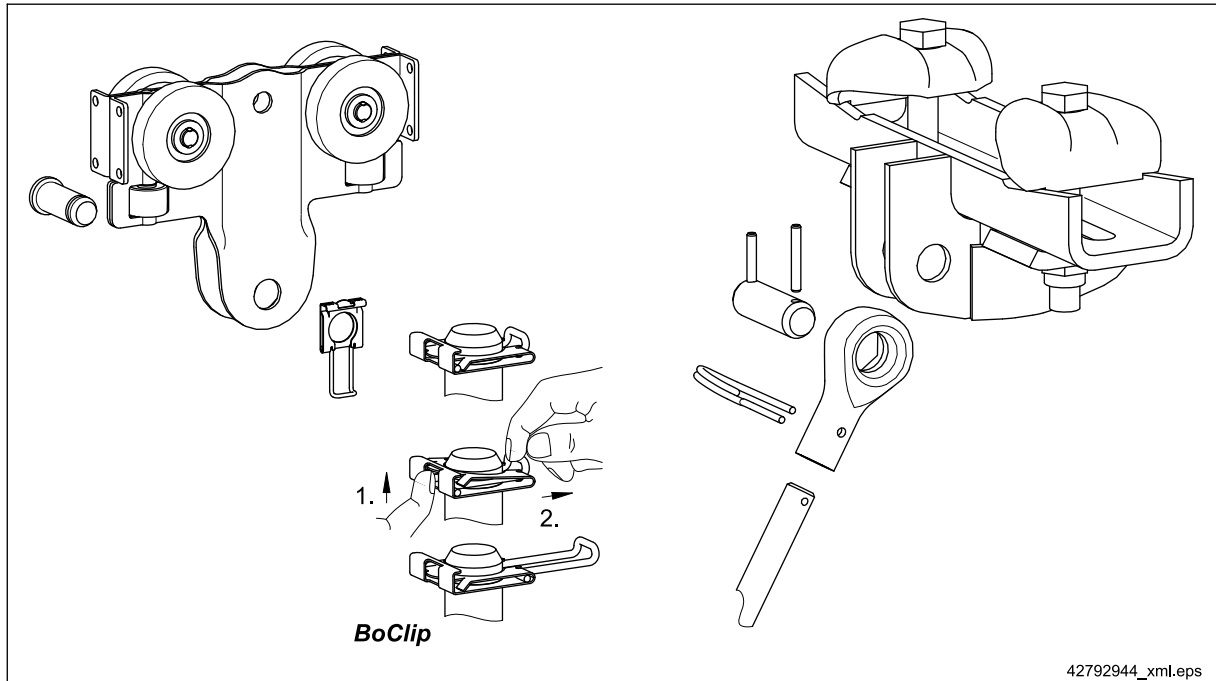


Fig. 4

Either split sleeves or a BoClip pin retainer must be used as a pin retaining device.



Ensure that the slots in split sleeves point outwards since otherwise they cause wear.

The BoClip can be fitted by hand without the need for any tools. Pull the wire loop to check the BoClip is securely fitted.

5.7 Assembling a runway

5.7.1 Notes

CAUTION



Attachment

Parts may become loose if they are not secured appropriately.

Tighten to the specified tightening torque.

We recommend pre-assembling KBK suspension fittings before attaching them to the steelwork.

The ball sockets of upper suspension brackets, track suspension clamps and the joints of V-type and lateral stiffeners must be well greased. Use resin-free anti-friction bearing greases, do not use any lubricants containing MoS₂.



All bolted connections must be tightened to the torques specified in ⇒ "Tightening torques", Page 24 of these operating instructions.

5.7.2 Vertical suspension

5.7.2.1 General information on the vertical suspension

Profile section size: KBK Aluline	Tools needed	
	A12 and A16	A18 and A22
G clamp (only to help assembly)	X	X
Torque wrench	X	X
Wrench	SW 10 (open or ring type)	SW 13 (open or ring type)
	2x SW 17 (open or ring type)	2x SW 24 (open or ring type)

Tab. 12

5.7.2.2 Fastening upper suspension bracket (25) with clamps (26) to I-beam flange

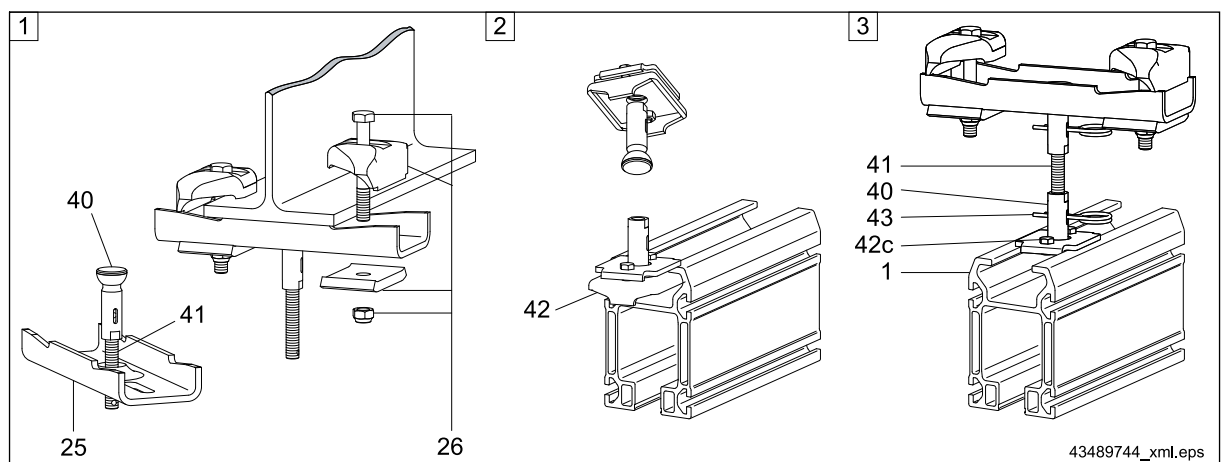


Fig. 5 Assembling track suspensions

- Vertical suspension fittings must be aligned vertically.
- Maximum permissible girder gradient $\pm 1.5^\circ$.



The bolts must be in contact with the side of the girder flange and aligned vertically or for very narrow girders centred as close as possible to the girder flange. (Maximum distance 8 mm). In borderline cases, the spring clip may collide with the clamp screws on very narrow girder flanges. In these cases, we recommend the use of split sleeves, as shown in \Rightarrow Fig. 11, Page 31. It may also be possible to insert the bolts of clamp (26) from below, thus preventing the bolts from colliding with spring clip (43).

1. Tighten clamp fastening arrangements (26) uniformly on each side.
Use G clamps to hold the upper suspension brackets, as necessary.
M10 tightening torques: 45 Nm; M16: 120 Nm
2. Slide suspension bracket (42) from the end of the rail section into the specified position.
3. Screw threaded rod (41) into ball head suspension rod (40) until spring clip (43) can be pushed through the hole in the ball head suspension rod and through the hole in the suspension rod.
Fasten rail section (1) to the pre-assembled suspension fittings and secure suspension bracket (42) by tightening bolts (42c) in position.
Tightening torques M6: 10 Nm; M8: 25 Nm

5.7.2.3 Shortening the suspension rod

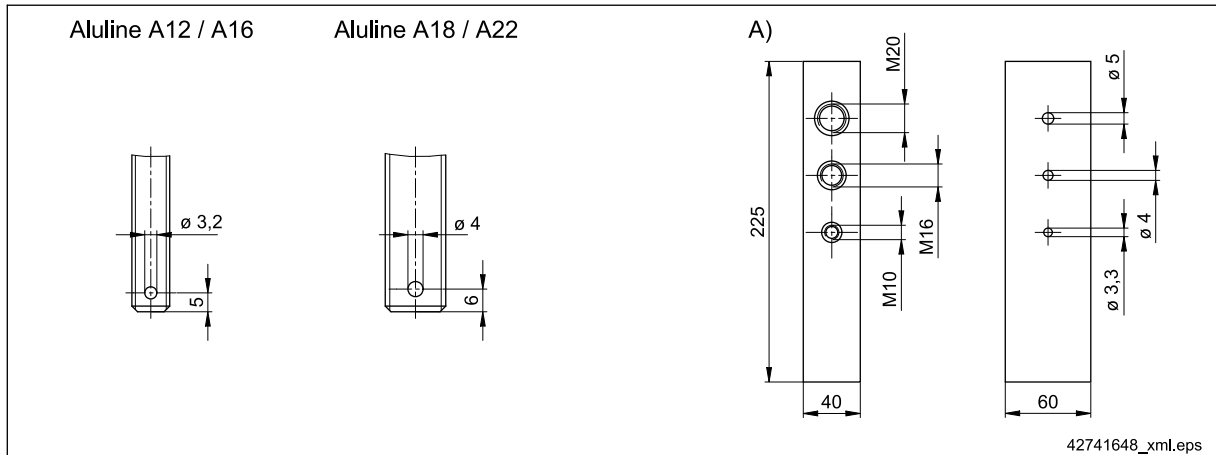


Fig. 6

Item	Designation	Order no.
A)	Drilling jig	982 017 44

Tab. 13

If standard threaded suspension rods have to be shortened for spring clips, a new transverse hole must be drilled at the end of the threaded rod. The drilling jig can be used for this purpose.

5.7.2.4 Extension of threaded rods

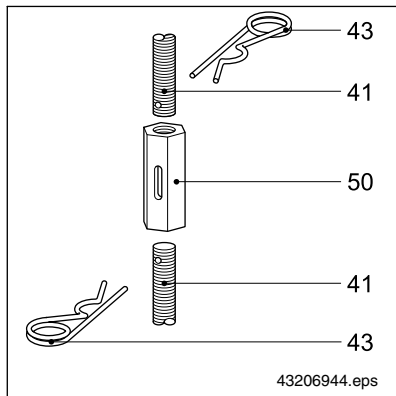


Fig. 7 Extension of threaded rods

Two spring clips are required for each coupling when using the coupling for threaded rod with spring clip.

Screw suspension rods (41) into coupling (50) and fit spring clips (43)

- through the elongated hole of the coupling and
- through the bore holes of the suspension rods.

5.7.2.5 U-bolts cast into solid ceilings

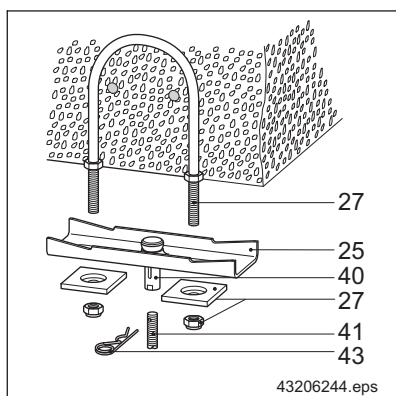


Fig. 8 U-bolts cast into solid ceilings

The flat nuts which are screwed onto the end of the thread must be flush with the concrete ceiling. Only upper suspension brackets A (25) can be used with this bolted connection.

To make it possible to align the track, the U-bolt should be cast in at right angles to the direction of the track.

M10 tightening torques: 45 Nm; M16: 120 Nm

5.7.2.6 Suspension from ceiling section rails

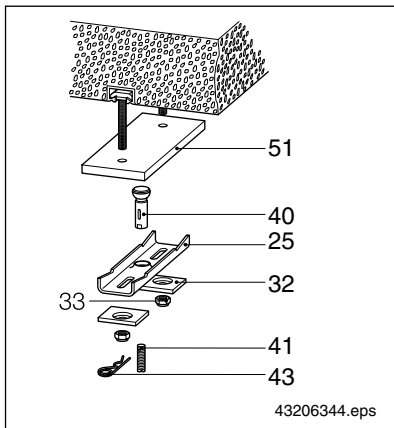


Fig. 9 Suspension from ceiling section rails

These suspension arrangements require special building authority approval (oscillatory load). Only upper suspension bracket A (25) can be used in connection with packing plate (51) and the required special bolts supplied by the ceiling section rail manufacturer. Packing plate (51) must rest against the channel section. Remove concrete with a chisel if necessary.

Tightening torques according to manufacturer's specifications.

We also supply special upper suspension brackets for ceiling section rails, see ⇒ "Special attachments for suspensions (to technical data sheet 203 072 44)", Page 33. The load bearing capacities of both arrangements must be checked when planning the installation.

5.7.2.7 Fastening upper suspension bracket A with threaded rods and counterplates to solid ceilings

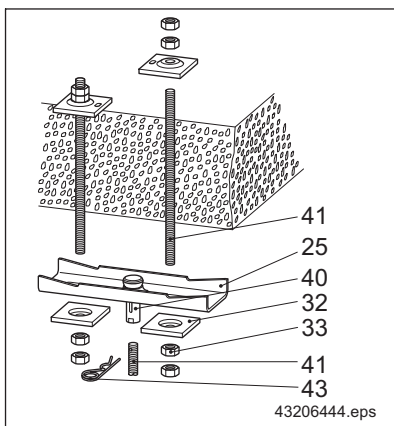


Fig. 10 Upper suspension bracket fastening

The upper suspension bracket must be arranged at right angles to the direction of the track to enable the track to be adjusted.

The connection must be securely tightened and locked during assembly. Only then is the load bearing capacity adequate.

M10 tightening torques: 45 Nm; M16: 120 Nm

5.7.2.8 Floor fixture plates

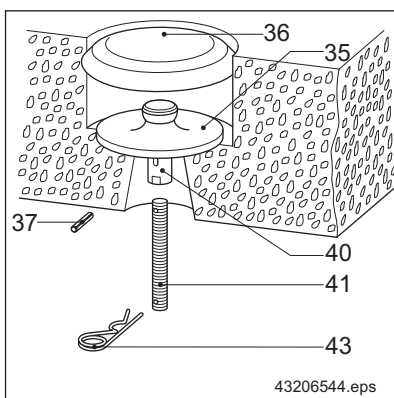


Fig. 11 Floor fixture plate arrangement

If floor connection plates (35) are used, the connection between the upper ball head suspension rod and threaded rod is secured with a heavy-duty split sleeve (37) instead of a spring clip.

5.7.2.9 Suspension with anchor bolt connection

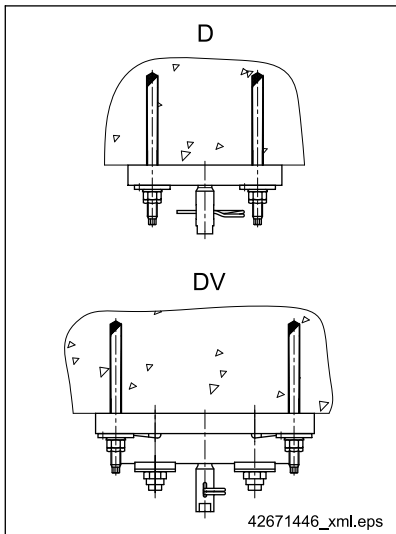


Fig. 12 Anchor bolt connection

KBK installations may be attached to concrete superstructures by anchor bolts. Anchor bolts must be used that are approved for use with dynamic loads.

DANGER



**Incorrect assembly causes loads to be dropped
Hazard for life and limb**

They must be installed by trained personnel and an installation report must be compiled.

Please refer to the "KBK anchor bolt connection" data sheet ⇒ Tab. 2, Page 7.

5.7.2.10 Suspension from inclined steelwork

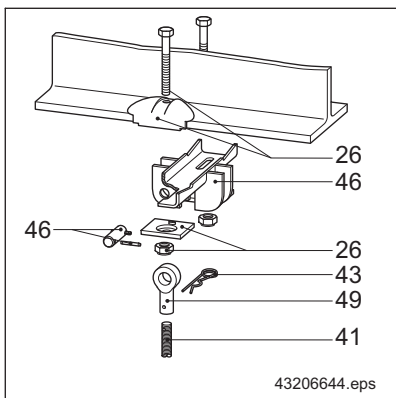


Fig. 13 Suspension from inclined steelwork

Weld on a stop to prevent upper suspension bracket (46) from slipping.

The surface may only be inclined to the extent that the horizontal position of the pin axis is maintained. For installation instructions, refer to ⇒ "Transverse and longitudinal lateral stiffeners/V-type stiffeners", Page 36.

5.7.2.11 Short suspension arrangement with height adjustment

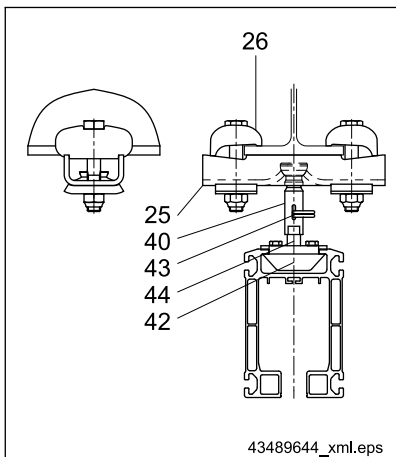


Fig. 14 Short suspension arrangement with height adjustment

With this arrangement, screw ball-headed bolt (44) into suspension rod (40) to such a depth that spring clip (43) can be pushed

- through the elongated hole in the suspension rod and
- through the hole in the ball-headed bolt.

Fastening upper suspension bracket (25) with clamps (26) to I-beam flanges ⇒ Fig. 5, Page 29.

5.7.2.12 Vertical suspension from U-sections

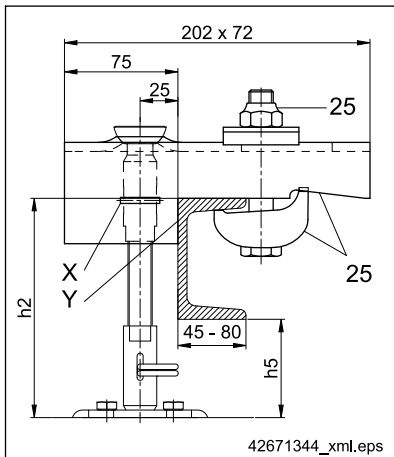


Fig. 15 Vertical suspension from U-sections

Upper U-type suspensions can be used on U-shaped steel profile sections (DIN 1024) in sizes U80 to U220.

The free swing angle of the suspension fitting may be limited by the girder profile. Use stiffeners, as required, to avoid any collision during operation.

Secure the connection between the upper ball head suspension rod and the threaded rod with the enclosed split sleeve (see "X").

Edge "Y" of the suspension bracket must be in close contact with the profile section.

M10 tightening torques: 45 Nm; M16: 120-150 Nm

5.7.3 Special attachments for suspensions (to technical data sheet 203 072 44)

5.7.3.1 Upper suspension bracket H for ceiling section rails (Halfen)

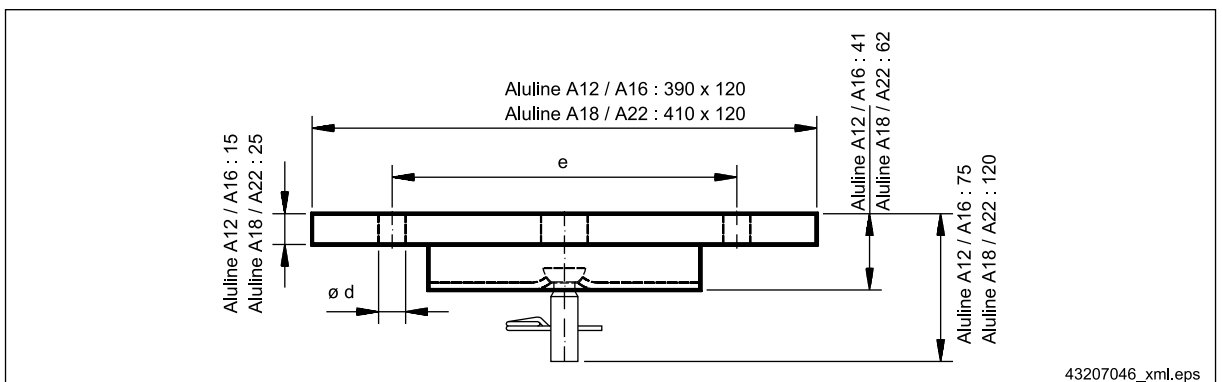


Fig. 16 Ceiling section rails (Halfen)

The information given applies for vertical suspensions.

Halfen rail	Halfen bolt ³⁾	dia. d [mm]	Aluline A12/A16		Aluline A18/A22	
			Permissible load on suspension G_{AB} [kN]	e [mm]	Permissible load on suspension G_{AB} [kN]	e [mm]
HTA 40/22 - Q	M 16	17.5	4	250	4	250
HTA 50/30 - Q	M 16	17.5	4.8	250	4.8	250
HTA 52/34 - Q	M 20	22	7.5	280	14	300
HTA 72/48 - Q	M 24	26	7.5	280	14	300

Tab. 14



Only use genuine Halfen bolts. Clamping thickness and tightening torque must be considered. Tightening torques for 4.6 Halfen bolts:

- M 16: 60 Nm
- M 20: 120 Nm
- M 24: 200 Nm

³⁾ 2 off per suspension bracket

5.7.3.2 Upper suspension brackets A, B and S

Suspension arrangement types and use

The information given applies for vertical suspensions. Particular consideration must be given to the arrangement and quantity of packing plates supplied with the clamps.

Selection

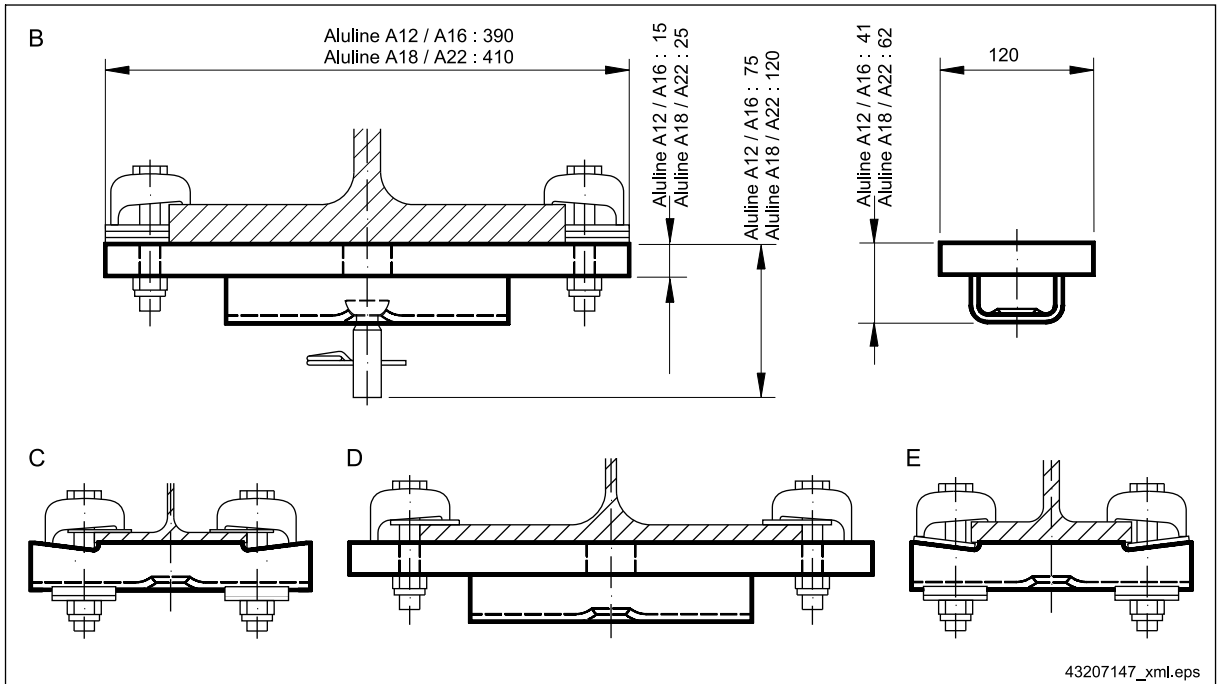
Type		Profile		Packing plates
B	Aluline A12/A16	IPE	550 – 600	1
			220 – 320	-
		HE-A	340 – 450	1
			500 – 650	2
			700 – 1000	3
		HEB	220 – 320	1
			340 – 450	2
			500 – 650	3
			700 – 1000	4
		HE-M	200	2
	220		3	
	240 – 280		4	
	300 – 1000		5	
	Aluline A18/A22	I	475 – 500	1
			550 – 600	2
		IPE	550	-
			600	1
		HE-A	230 – 360	-
			400 – 500	1
550 – 800			2	
HE-B		900 – 1000	3	
		220 – 280	-	
		300 – 360	1	
	400 – 500	2		
HE-M	550 – 800	3		
	900 – 1000	4		
	220	2		
	240 – 280	3		
	300 – 1000	5		
C	Aluline A12/A16	HE-A	100 – 200	1
	Aluline A18/A22	HE-A	100 – 120	1
		HE-A	140 – 200	2
D	Aluline A18/A22	HE-A	220 – 260	1
E	Aluline A12/A16	I	280 – 400	1
			425 – 550	2
	Aluline A18/A22	HE-M	100 – 180	2
		HE-M	100 – 200	1

Tab. 15



Verification of the load bearing capacity for the additional loads due to the clamp arrangement and the application of forces to the outer edge of the flange of profile girder sections is particularly important for wide profile girder sections. The customer must have this verified by a structural engineer.

Dimensions



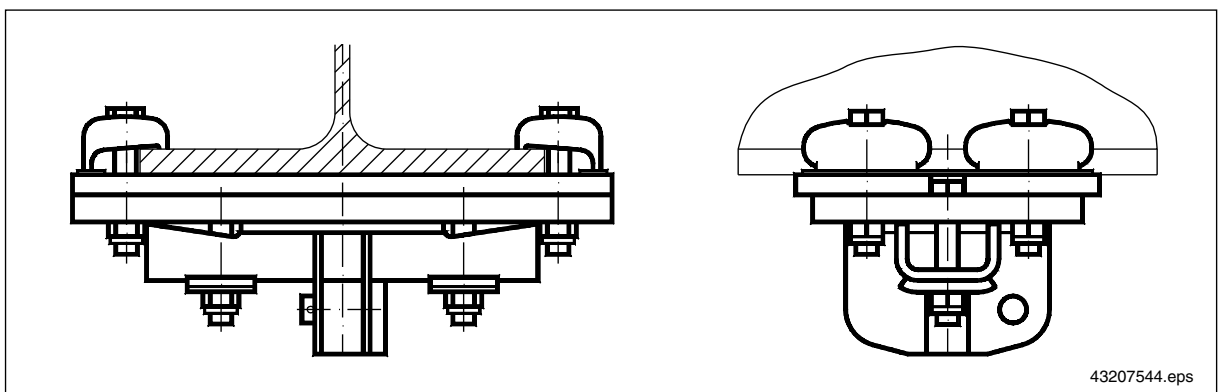
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Fig. 17

Type	Description
B	Upper suspension bracket S, clamp S
C	Upper suspension bracket A and B, clamp S
D	Upper suspension bracket S, clamp S
E	Upper suspension bracket A and B, clamp S

Tab. 16

Clamp section with V-type suspension bracket B



43207544.eps

Fig. 18

A special intermediate fastening arrangement is supplied for the special fastening of V-type upper suspension brackets and lateral stiffeners. The specially designed part is attached by means of 4 clamps.

5.7.4 Transverse and longitudinal lateral stiffeners/V-type stiffeners

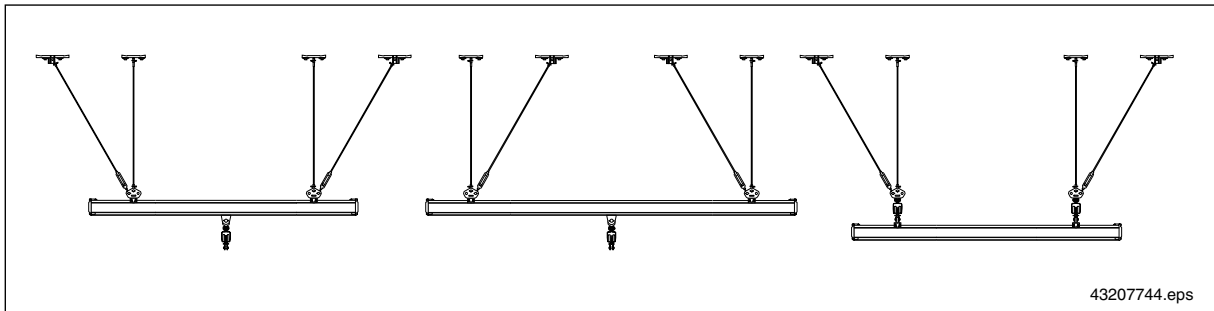


Fig. 19 Lateral stiffeners

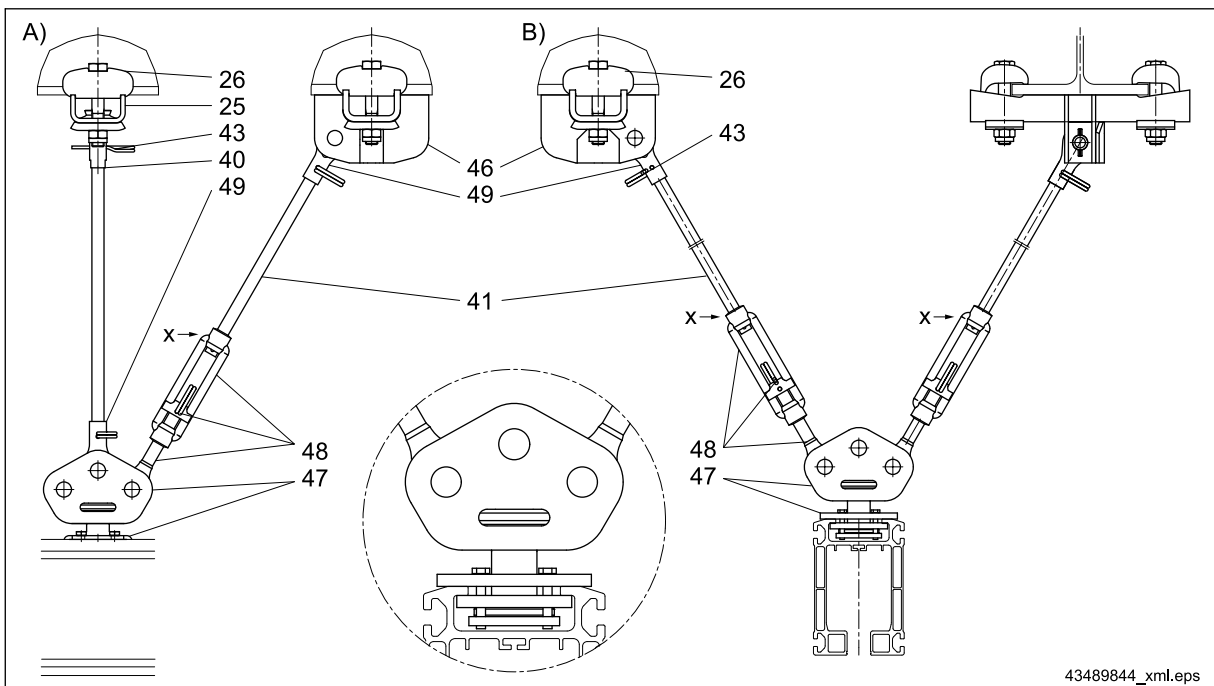


Fig. 20 V-type stiffener

A)	Stiffener, parallel or perpendicular	B)	V-type suspension fitting, parallel or perpendicular	x	no spring clip
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Tab. 17

Construction of lateral stiffeners as in ⇒ Fig. 19, Page 36.

The threaded rods must be subjected to tensile stress only and they must, therefore, be arranged in pairs.

In order to avoid pressure forces and deformation, lateral stiffener arrangements must only be provided on the outside of crane runways.

V-type suspension fittings may also be used to replace missing suspension points in vertical suspension arrangements. In such cases, the V-type suspension fittings must be arranged symmetrically to the vertical suspensions. Select an opening angle between 30° and 90°.

Fit the V-type upper suspension bracket ((46), dimensions as for B-type upper suspension bracket) to the superstructure in the same way as vertical suspensions.

The V-type upper suspension bracket is only designed for connecting one suspension rod. If two or more connections are fitted, a corresponding number of V-type upper suspension brackets must be fitted next to each other.

The pin axis of the V-type upper suspension bracket must always:

- be horizontal,
- be parallel to the pin axis of the V-type hinged suspension bracket and
- perpendicular to the suspension rod axis.

On sloping superstructures the surface may only be inclined to the extent that the horizontal position of the pin axis is maintained.

The V-type upper suspension brackets must be secured against slipping by means of stops if tensile forces act on steel sections in the longitudinal direction.

If the V-type upper suspension bracket is not fitted to steel sections, the packing plate must be used.

V-type suspension bracket assembly

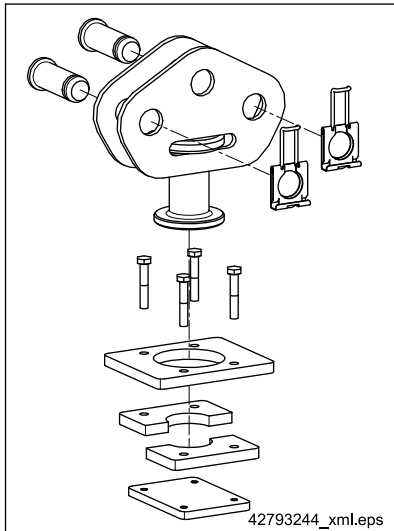


Fig. 21

V-type suspension brackets are rigidly connected to the profile section with the plates.

The V-type hinged suspension bracket is designed for a maximum of three suspension rod connections (suspension rod strainer or hinged end piece).

On a V-type suspension arrangement, the rods are fitted to the outer holes, on a lateral stiffener to the center and one outer hole.

The V-type hinge can be adjusted in the suspension bracket to any angle in relation to the track, however, the pin axis must always be perpendicular to the suspension rod axis.

Further assembly of lateral stiffeners

See also ⇒ Fig. 20, Page 36:

1. Attach hinged end piece (49) to the V-type upper suspension bracket. To do this, remove the pin and secure it again after assembly.
2. Screw threaded rod (41) into hinged end piece (49) until spring clip (43) can be pushed through the hole in the hinged end piece and through the hole in the suspension rod.
3. Screw the following parts into suspension rod strainer (48) to a depth of 45 mm (Aluline A12/A16) or 60 mm (Aluline A18/A22) in each case:
 - the threaded rod with right-hand thread on the one side and,
 - the hinged end piece with left-hand thread into the other side of the suspension rod strainer.
 The side with the left-hand thread is marked with an "L".
4. Fit the hinged end piece of the suspension rod strainer to the V-type suspension rod bracket by means of a pin, secure and align it.
5. After alignment, turn the suspension rod strainer nut to tighten the bolted connection so that any play in the threaded rod is avoided. Then secure the suspension rod strainer nut with the spring clip and lock on one side.

A spring clip is not required at the point marked (x).
6. Screw the hinged end piece onto the vertical threaded rod so that the spring clip can be pushed through the hole in the hinged end piece and through the hole in the suspension rod.

One spring clip is required for every connection between a hinged end piece and suspension rod.

Only the connection between the suspension rod strainer and suspension rod (x) is not provided with a spring clip.

5.7.5 KBK Aluline ergo track suspensions

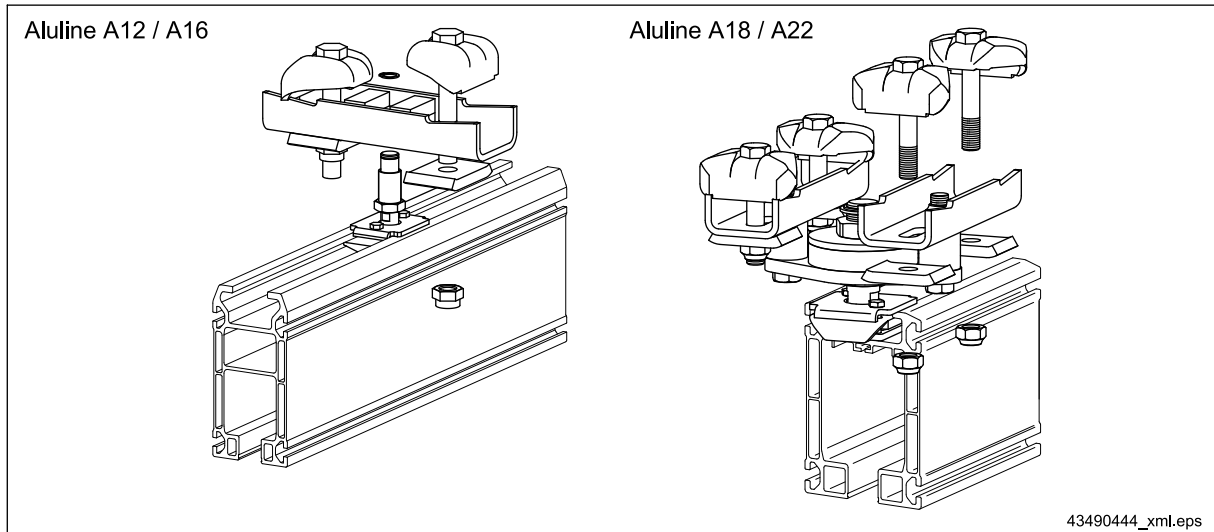


Fig. 22

Profile section size: KBK Aluline	Tools needed	
	A12 and A16	A18 and A22
Torque wrench	X	X
Wrench	SW 10 (open type)	SW 13 (open or ring type)
	SW 14 (open type)	SW 22 (open type)
	2x SW 16 (open or ring type)	2x SW 24 (open or ring type)

Tab. 18

First check to establish if the suspensions are at the same level and check the height of the support superstructure. The maximum permissible deviations are only ± 4 mm for Aluline A12/A16 and ± 12 mm for Aluline A18/A22 (possible adjustment of the suspension).

KBK Aluline ergo suspensions are pre-assembled.

- Insert the required number of suspensions into the rail.
- Lift the rail up to the steelwork.
- Attach the suspensions to the steelwork using clamps as described in \Rightarrow "Fastening upper suspension bracket (25) with clamps (26) to I-beam flange", Page 29.
- Tighten the suspension clamp bolts by hand.

Tightening torque 25 Nm

Loosen the counter-nut on the threaded pin to adjust the height. Undo the suspension clamp screws until the threaded pin can be turned.

Adjust the height by turning the threaded pin. Re-tighten the counter nuts and the suspension clamp screws following adjustment.

KBK Aluline ergo suspensions can be combined with short height-adjustable KBK Aluline classic suspensions. In KBK Aluline A12/A16 installations, ensure that an upper suspension bracket type A modified with a rubber element from the KBK Aluline A18/A22 range is installed.

5.7.6 Connecting track sections

5.7.6.1 General remarks on connecting track sections

When several track sections are suspended, they must first be aligned on one level.

- Screw the threaded rod into the upper and lower ball head rod to the required depth. Pay attention to the minimum depth (see \Rightarrow "Track and crane alignment", Page 50).
- Align the suspended track sections to one level (see \Rightarrow "Track and crane alignment", Page 50).

Connecting track sections

CAUTION



Incorrect assembly

Incorrect assembly of the rails is dangerous.

- The track sections must be bolted together in such a way that there are no shoulders on the running surface or on the sides of the opening at the track joints. There must be no resistance when a trolley is pushed across the joint.

5.7.6.2 Track section bolted joint

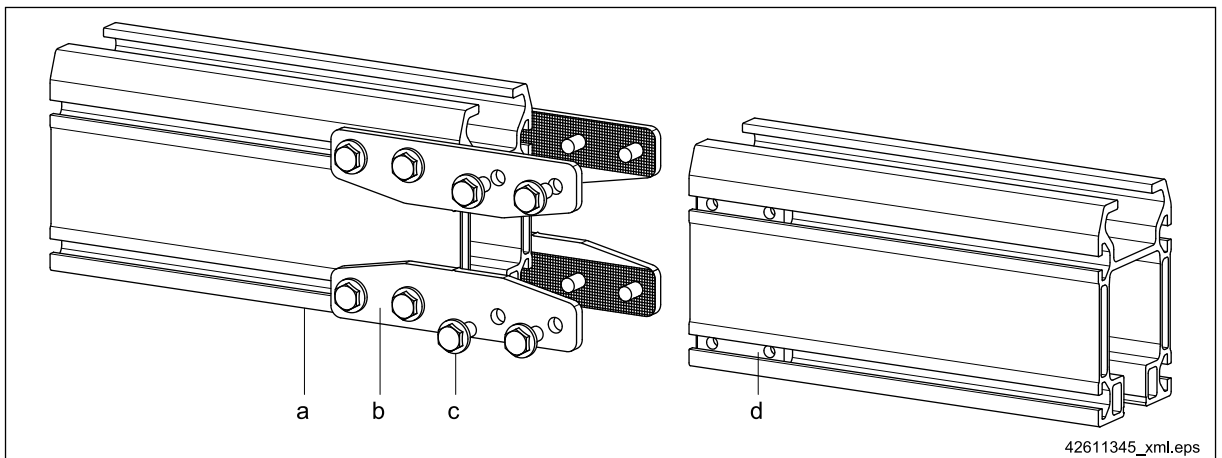


Fig. 23

Item	Designation	Item	Designation	Item	Designation	Item	Designation
a	Profile	b	Bolting plate	c	Hexagon bolt	d	Slot nut

Tab. 19

Tools needed		
Profile section size: KBK Aluline	A12 and A16	A18 and A22
Wrench	SW 13 (open or ring type)	SW 15 (open or ring type)

Tab. 20

- Slide slot nuts (d) into profile sections (a).
- Connect the profile sections to each other by means of bolting plates (b) and hexagon bolts (c). Position bolting plates (b) so that they are centred on the joint.
- Tighten bolts (c) to the correct tightening torque:
Aluline A12 and A16: 45 Nm
Aluline A18 and A22: 85 Nm.

5.7.7 Buffer stop, end cap with buffer

5.7.7.1 General

1. Insert the trolley combination, the sliders or cable trolleys and the buffer stop into the track section.
2. Install the internal buffer stop on the power-supply side in accordance with the length of the accumulated sliders (buffer stop design dimension). An internal buffer stop can be fitted to protect the accumulated sliders or trolleys.
A buffer must also be fitted on the travel-drive side if electric travel drives are used.
3. Close the ends of the track with an end cap with buffer.
4. On the power-supply side, attach the rail end cable clamp together with the end cap with buffer to fix the cable at the end of the rail.

Tools needed for the buffer stop		
Profile section size: KBK Aluline	A12 and A16	A18 and A22
Drill with drill bit	dia. 10.5 mm	dia. 8.5 mm

Tools needed for end cap with buffer, shock absorber		
Profile section size: KBK Aluline	A12 and A16	A18 and A22
Wrench	SW 13 (open or ring type)	SW 13 (open or ring type)

Tab. 21

5.7.7.2 Internal buffer stop

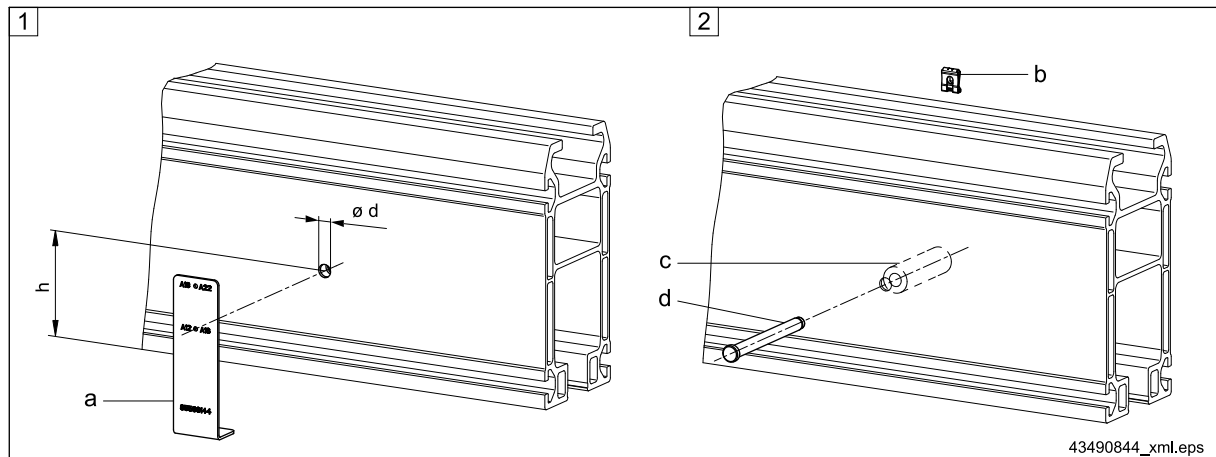


Fig. 24

Profile section size: KBK Aluline	A12 and A16	A18 and A22
dia. d [mm]	8.0	10.5
H [mm]	65.0	91.0

Tab. 22

1. Mark a bore hole at the specified distance using drilling template (a). Drill hole through the side walls with a drill.
2. Secure buffer stop (c) with pin (d) and retaining clip (b).

5.7.7.3 End cap with buffer, shock absorber

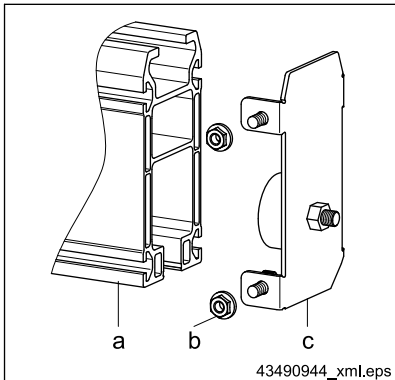


Fig. 25

End cap with buffer

- Place pre-assembled end cap (c) on profile section (a) in such a way that the buffer points into the rail section.
Insert the T-head bolts into the slots of the rail section.
- Tighten nuts (b) with a tightening torque of 25 Nm.

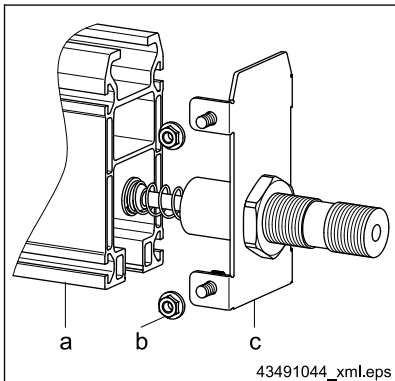


Fig. 26

Shock absorbers

- Fit in the same way as for the "cap with buffer".

5.8 Internal conductors

5.8.1 General

In addition to the information given in ⇒ "Assembling a runway", Page 28, attention must be paid to the details in the following sections.

5.8.2 Track section bolted joint

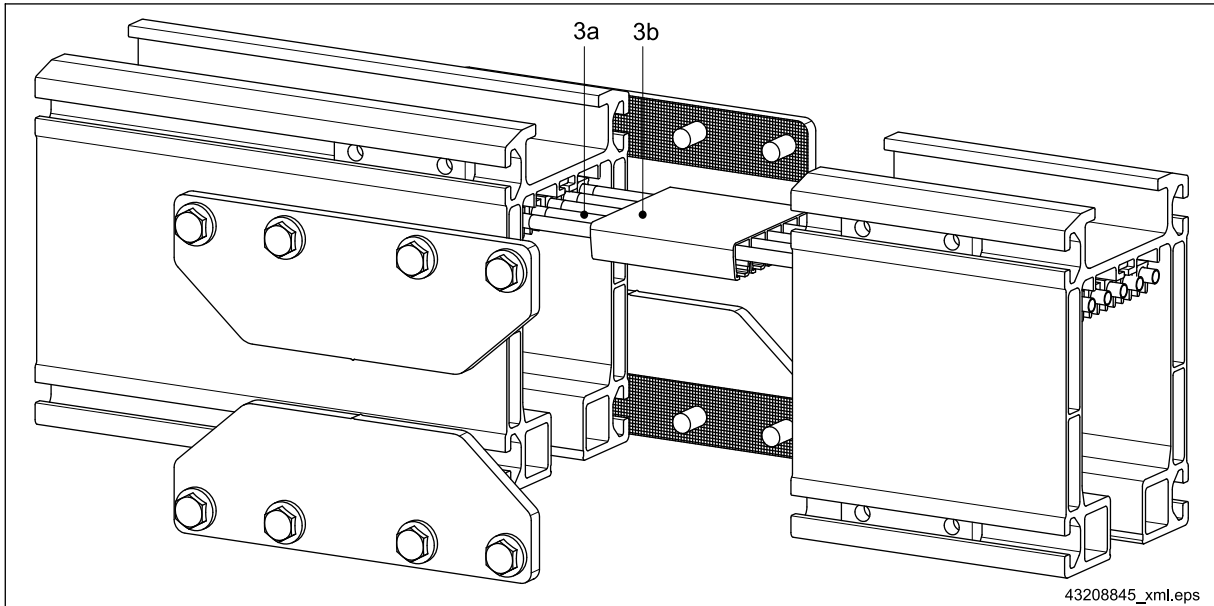


Fig. 27

Connect the track sections as shown.

The busbar joint set consists of busbar connectors (3a) and joint connector (3b).

5.8.3 Powerfeed end cap

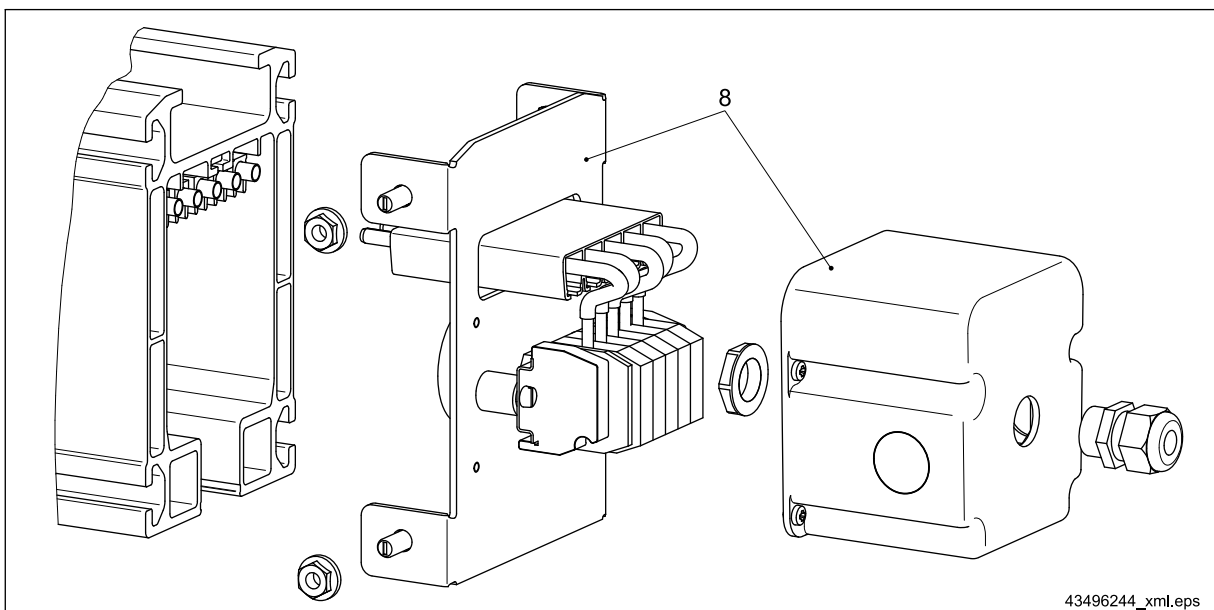


Fig. 28

- All necessary parts for powerfeed end cap (8) are contained in the terminal box. Assemble as shown above.
- Connect the conductors to the correct phases L1 to L4.

5.8.4 End cap

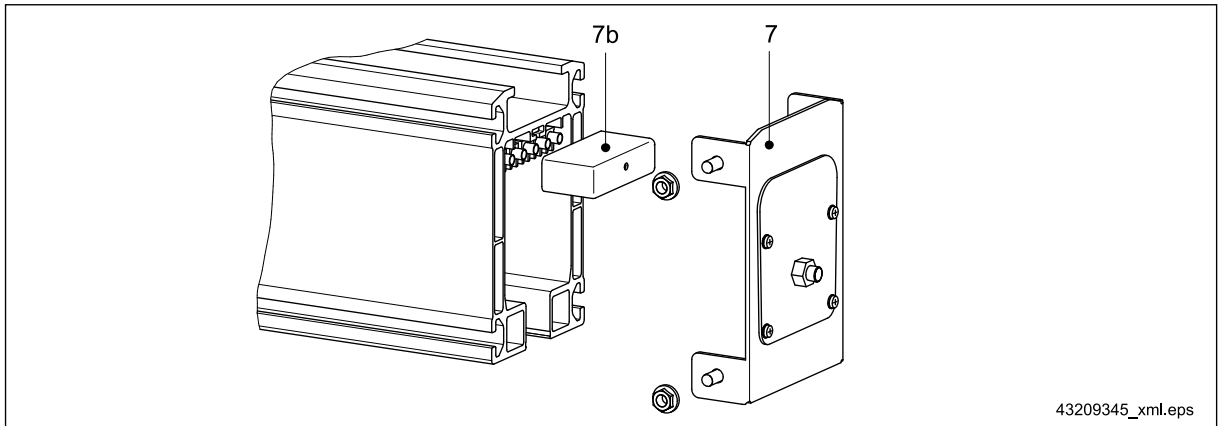


Fig. 29 Example: KBK II-R end cap

Slide end cap (7b) onto the busbar at the end of the track. Then close the track with end cap with buffer (7).

5.8.5 Current collector trolley

The current collector trolley must always be located between two trolleys or between a tractor trolley and trolley. This protects it against collisions with other trolleys or buffer stops. Ensure that phases L1 to L4 are connected correctly when the collector trolley is placed in the track section.

Assembly:

1. Insert the collector trolley link between the side plates of the load trolley. Place the coupling in the slot and secure it.
2. Connect the load trolley and the protection trolley using the long link bar and two single-trolley links. Replace the trolley pin with the longer link pin and insert it in the unused link hole.

When used with a crab frame, couple the collector trolley between the crab frame axles with a trolley. Only use KBK II-R5 collector trolleys in installations that have a 5-conductor busbar along the entire track.

5.8.6 Retrofitting conductors

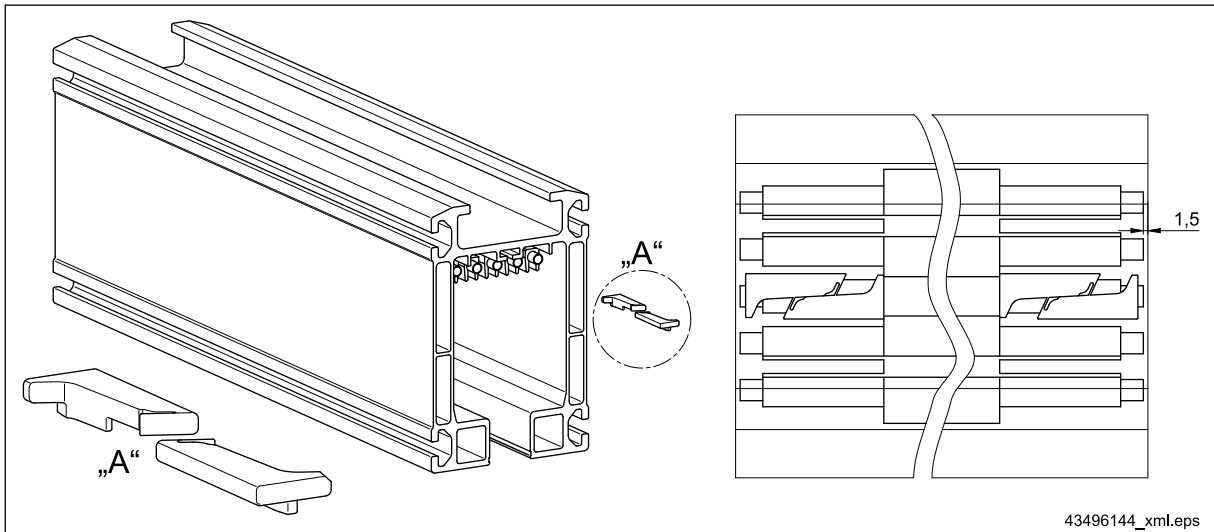


Fig. 30

To add DFL conductor lines at a later date, the conductor straight section in the required length and 4 fixed points must be ordered for each profile section.

Insert the conductor line and position it against a limit stop at a distance of 1.5 mm from one end. Insert two fixed points from the other end and wedge them as shown. Then insert the fixed points at the other end and wedge them.

5.9 External busbar

5.9.1 Use

If flat cables cannot be used with Aluline A12/16 or Aluline A18/A22 track sections, a compact conductor line can be attached to the Aluline section.

5.9.2 DCL-Pro compact conductor line

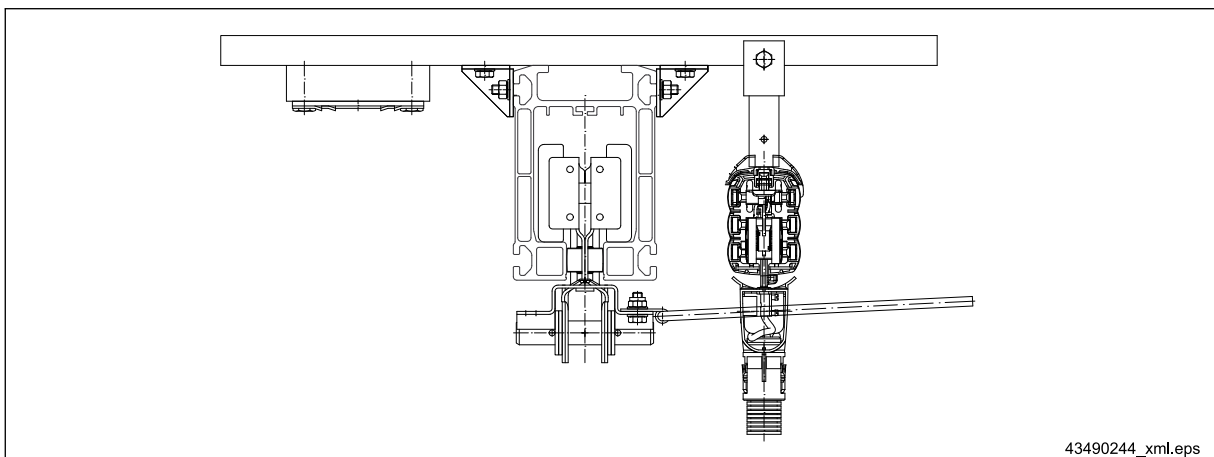


Fig. 31

Please refer to the "DCL arrangement on KBK" document for further information, selection table and assembly instructions, see ⇒ Tab. 2, Page 7.

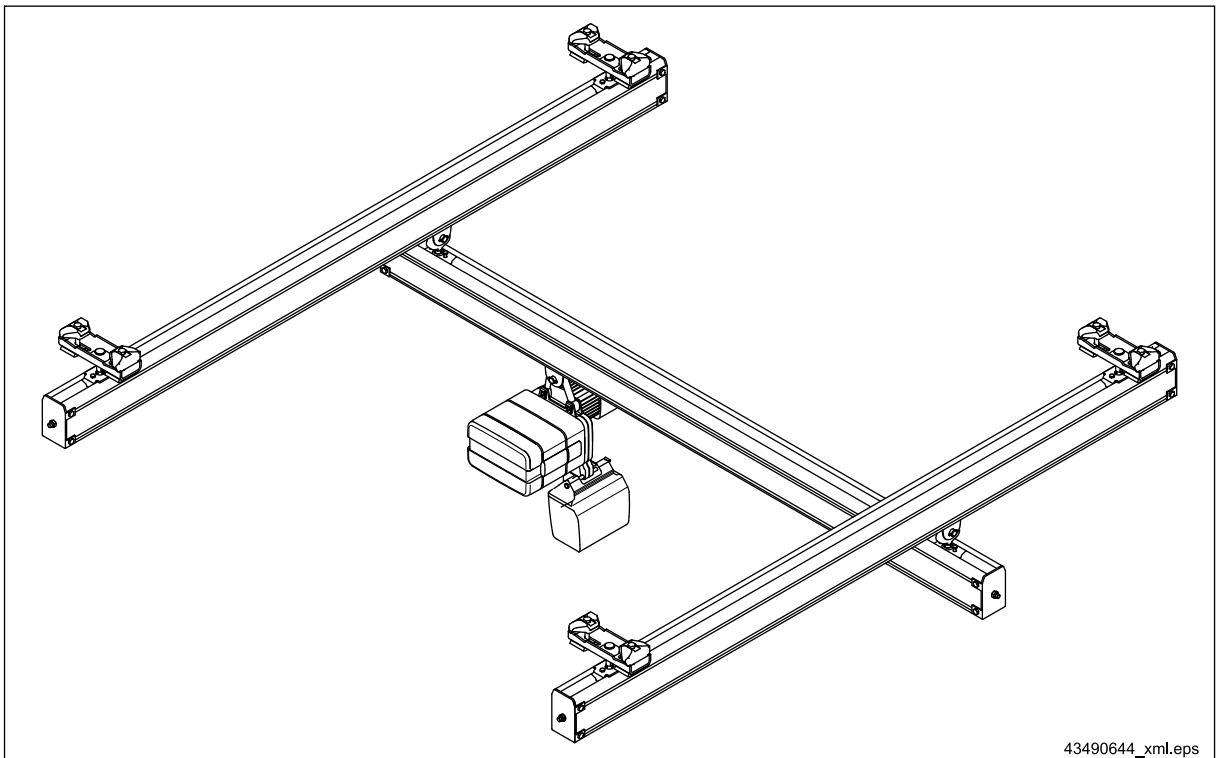
5.10 Assembling suspension cranes

5.10.1 Preparation work

Crane runways are assembled as described in ⇒ "Assembling a runway", Page 28. All crane runways must be at the same height and level, ⇒ "Track and crane alignment", Page 50.

5.10.2 Single-girder crane with articulated crane suspension

5.10.2.1 General



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Fig. 32



Articulated crane suspensions are only used for single-girder cranes in the KBK Aluline classic system.

Profile section size: KBK Aluline	Tools needed	
	A12 and A16	A18 and A22
Torque wrench	X	X
Wrench	SW 10 (open type)	SW 13 (open or ring type)

Tab. 23

5.10.2.2 Assembly

Type until mid 2014

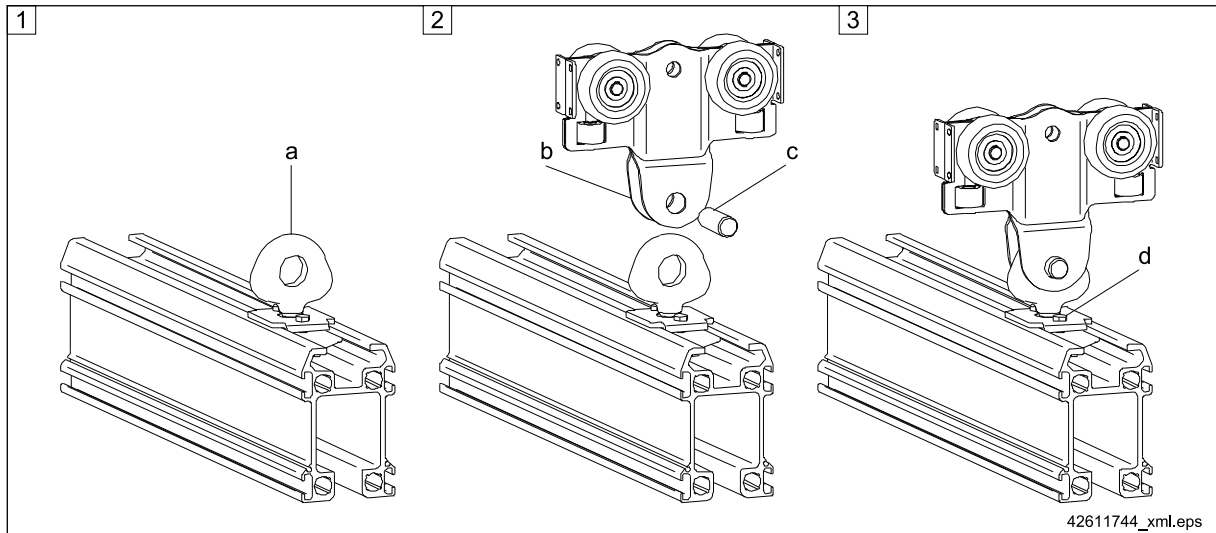


Fig. 33

Type as of mid 2014

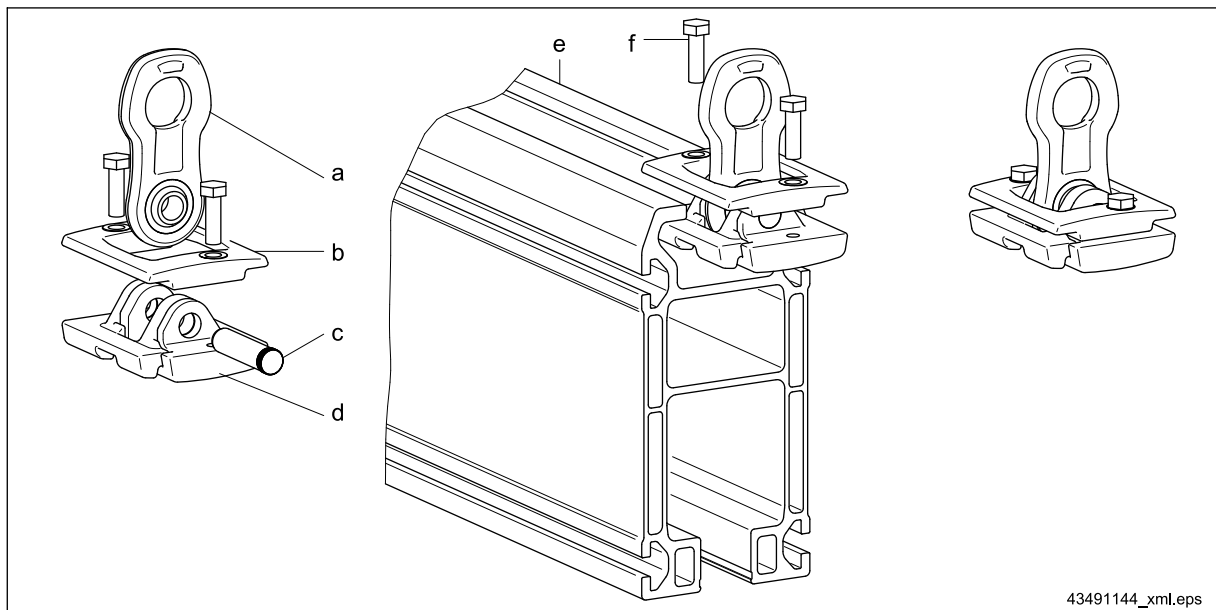


Fig. 34

Parts can be installed by inserting them into the end of the profile section or by inserting the halves of suspension clamp (d) into the profile section at any point from above.

- Place both halves of suspension clamp (d) together.
- Secure suspension eye (a) between the two halves of suspension clamp (d) with knurled pin (c).
- Slide the crane suspension into profile section (e) and position it.



Pay attention to overhangs and the crane span dimension.

- Place clamping plate (b) over suspension eye (a) and secure it with bolts (f).
- Tighten bolts (f) to the correct tightening torque:
Aluline A12 and A16: 10 Nm
Aluline A18 and A22: 25 Nm.

5.10.3 Rigid cranes

Profile section size: KBK Aluline	Tools needed	
	A12 and A16	A18 and A22
Torque wrench	X	X
Wrench	SW 10 (open type)	SW 13 (open or ring type)

Tab. 24

Frame for double-girder crane

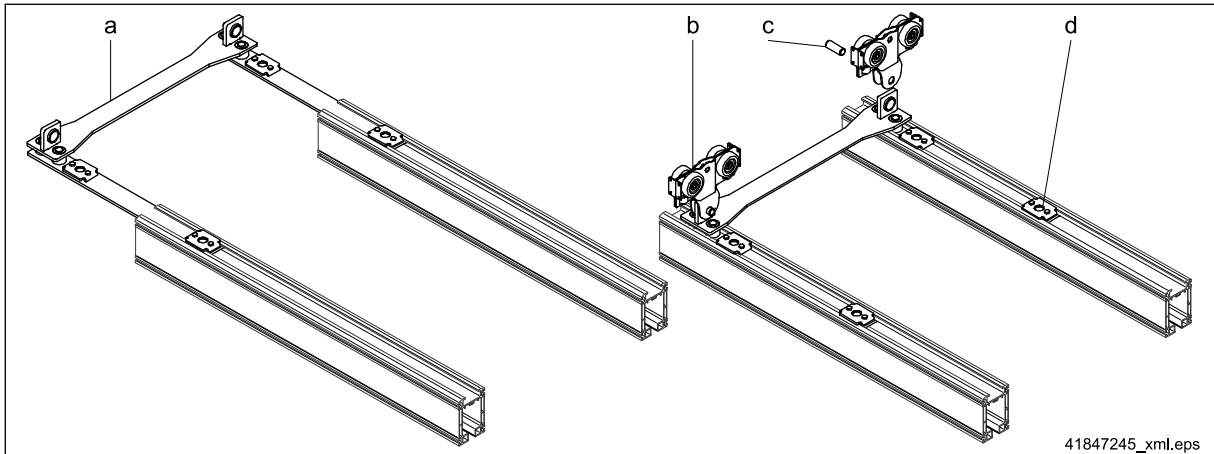


Fig. 35 Example: KBK Aluline classic A12

- Slide frame (a) into the crane girder and position it.
- Lift the frame into crane trolleys (b) and secure with pin (c) and pin retainer.
- Align the crane taking overhangs into consideration.
- Tighten the bolts of pressure plates (d) with the correct tightening torque:
Aluline A12 and A16: 10 Nm
Aluline A18 and A22: 25 Nm.

Rigid crane traverse for single and double-girder cranes

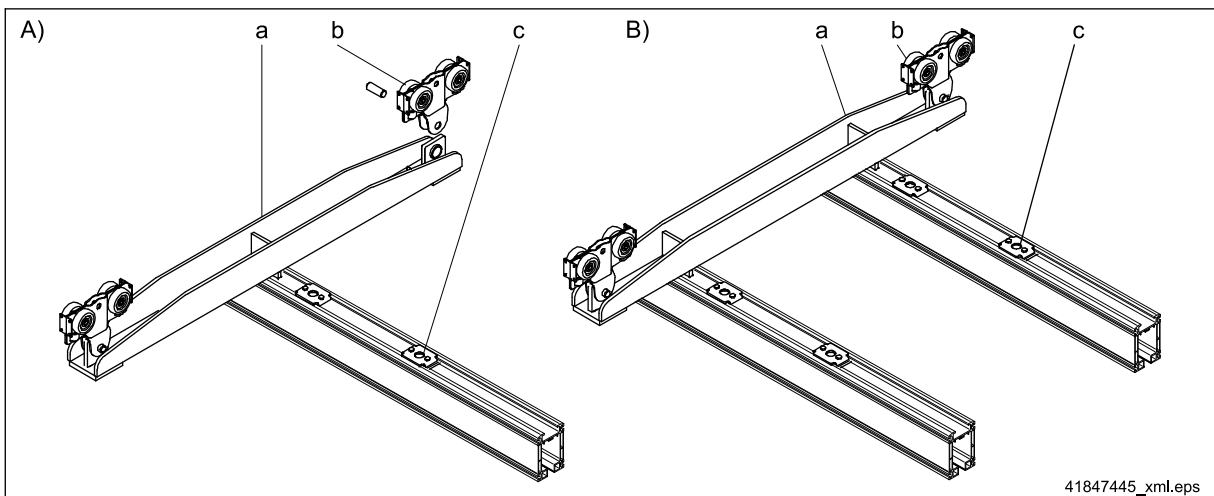


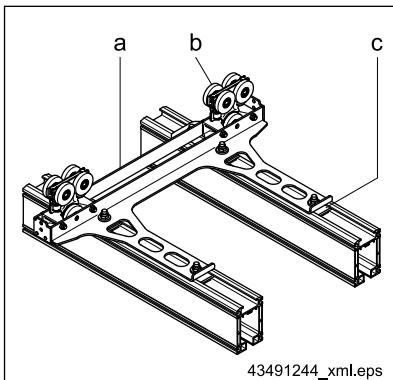
Fig. 36 Example: KBK Aluline classic A12

A)	Rigid single-girder crane traverse	a	Crane end carriages	c	Pressure plate
B)	Rigid double-girder crane traverse	b	Crane end carriage		

Tab. 25

Assemble as for "Frame for double-girder crane".

Crane traverse for KBK Aluline ergo double-girder crane



- Slide traverse (a) with trolleys (b) into the crane girder and position it.
- Align the crane taking overhangs into consideration.
- Tighten the bolts of pressure plates (c) with the correct tightening torque:
 Aluline A12 and A16: 10 Nm
 Aluline A18 and A22: 25 Nm.

Fig. 37 Example: KBK Aluline ergo 180

5.10.4 Crab frame

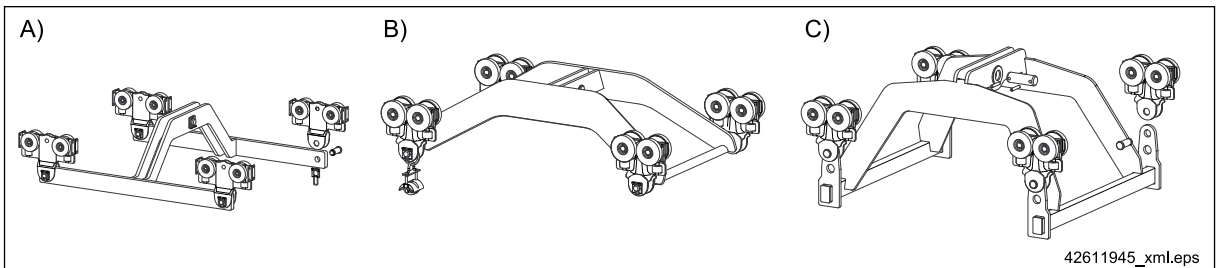


Fig. 38

Item	Designation	Item	Designation	Item	Designation
A)	Aluline A12/A16	B)	Aluline A18/A22 up to 1200 kg	C)	Aluline A18/A22 up to 2600 kg

Tab. 26

- Complete the crab frame with the trolleys.
- Slide the trolleys over the axles and/or support plates.
- Secure the trolleys with pins and pin retainers.

5.11 Track and crane alignment

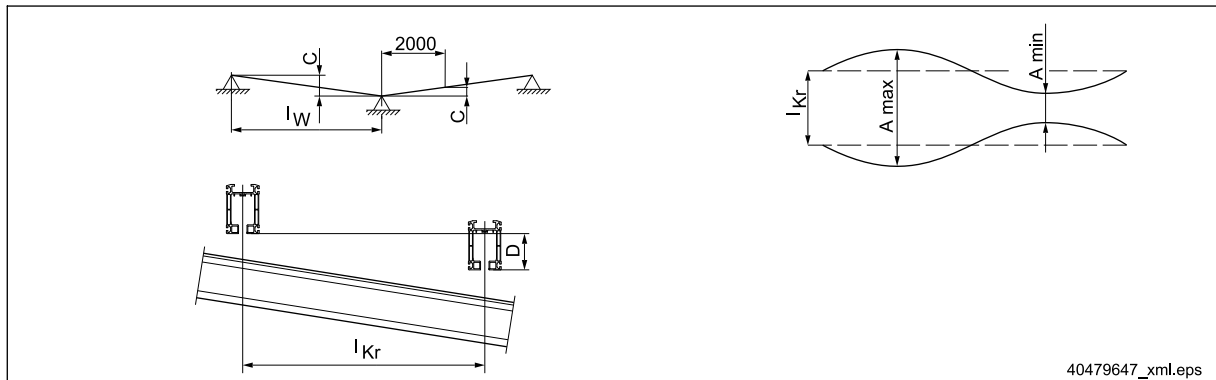


Fig. 39

Dimension	Designation
C	Height difference between runway suspension points: ± 10 mm, but not more than $C = \pm 2$ mm over 2 m
l_w	Distance between track suspension points
A	Permissible limits of crane span: KBK Aluline classic $\rightarrow A_{max} = l_{Kr} + 12$ mm; $A_{min} = l_{Kr} - 12$ mm KBK Aluline ergo $\rightarrow A_{max} = l_{Kr} + 1$ mm; $A_{min} = l_{Kr} - 1$ mm
l_{Kr}	Crane span dimension
D	Height difference between the crane runway tracks: $\pm 1\%$ of l_{Kr} however, max. ± 5 mm

Tab. 27

Only carefully assembled crane runways will guarantee smooth and problem-free long and cross travel and a long trolley service life.

CAUTION



Danger resulting from incorrect assembly

There is a risk that the crane and trolley may move under their own weight.

Unloaded crane tracks must not exceed the limit values given above. If these values are exceeded, the crane and trolley may move along the tracks under their own weight.

The crane runway suspended as described \Rightarrow "Assembling a runway", Page 28 may have to be aligned. Suitable for this are:

- levelling instrument,
- spirit level,
- transparent plastic tube filled with water to replace the spirit level,
- install a loaded trolley and observe the way it travels.

The threaded suspension rods with spring clip allow the following height adjustments to be made:

- ± 9 mm for KBK Aluline A12/A16 classic
- ± 14 mm for KBK Aluline A18/A22 classic

Ensure that all threaded suspension rods hang vertically and equally bear the deadweight of the crane runway. After any adjustment, there must be no vertical play in the threaded rods.

Suspension rod strainers (48) enable stiffeners to be aligned \Rightarrow Fig. 20, Page 36:

- ± 30 mm for KBK Aluline A12/A16
- ± 40 mm for KBK Aluline A18/A22

Following adjustment of the stiffener, there must be no vertical play in the threaded rods.

Following alignment, check that the trolleys of the cranes and monorail hoists can be moved freely by hand over the entire length of the rail section without jamming.

Any deviations from the specified crane span dimension must be smaller for KBK Aluline ergo than for KBK Aluline classic (perm. ± 1 mm).

Turn the threaded pin to adjust the height of a rigid suspension. Height differences of ± 4 mm (Aluline A12/A16) and ± 12 mm (Aluline A18/A22) can be compensated.

After adjusting the height, use the counter-nut to secure the threaded pin against turning.

Following alignment, check that the trolleys of the cranes and monorail hoists can be moved freely by hand over the entire length of the rail section without jamming.

5.12 Trolleys, electric travel drives

5.12.1 Trolleys, trolley combinations

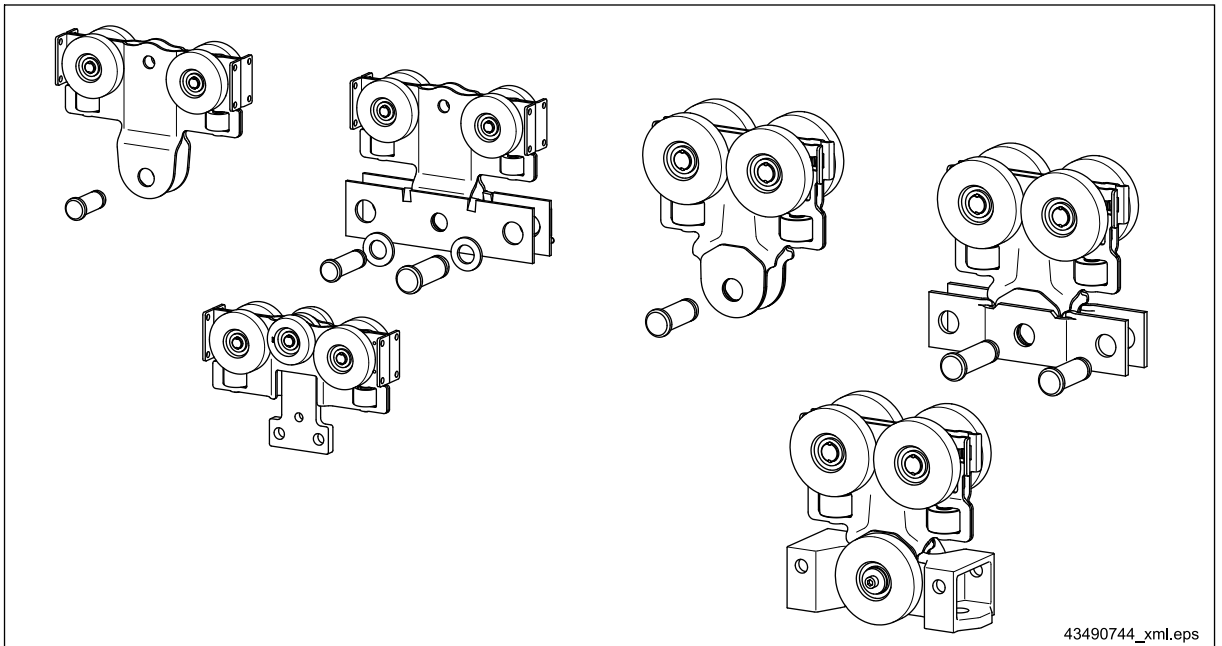


Fig. 40

If a single-trolley link is used for KBK Aluline A18/A22 single trolleys: replace the pin of the trolley with the longer pin of the single-trolley link. Fit the trolley pin in the vacant hole in the link.

Assemble tandem crane end carriages from two single-girder crane end carriages and one spacer bar.

- To make up multiple trolleys from single trolleys and load bars and/or traverses, remove the relevant pins.
- Replace and secure the pins after assembly.

KBK Aluline ergo trolleys

KBK Ergo trolleys are provided with bore holes to connect end carriages and crab frames. They must always be tightly bolted together with these sub-assemblies.

KBK Ergo trolleys must not be used as single trolleys.

For KBK Aluline A18/A22 ergo, the end carriages are provided with connection bore holes. Buffer plates, spacer bars, drive units, etc., can be connected to the connection bore holes of the end carriages.

Assemble tandem crane end carriages from two single-girder crane end carriages and one spacer bar.

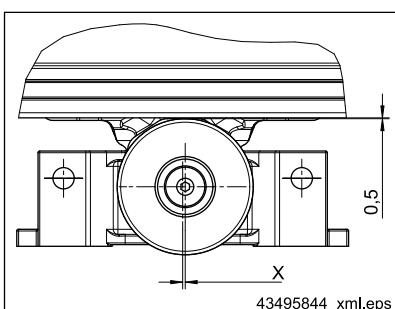


Fig. 41

KBK Aluline ergo A18/A22 trolley

The distance between the counter-pressure roller and the bottom edge of the profile section can be adjusted on KBK Aluline ergo A18/A22 trolleys.

The counter-pressure roller and the load-bearing rollers inside the profile section should not be in contact with the rail at the same time. The counter-pressure roller must be adjusted in such a way that there is an air gap of approx. 0.5 mm when there is no load on the trolley.

This can be adjusted by loosening the bolt via the hexagon socket on the eccentric axle.

Tighten the bolt again after adjustment. Tightening torque: 10 Nm.

5.12.2 Travel drives

5.12.2.1 General

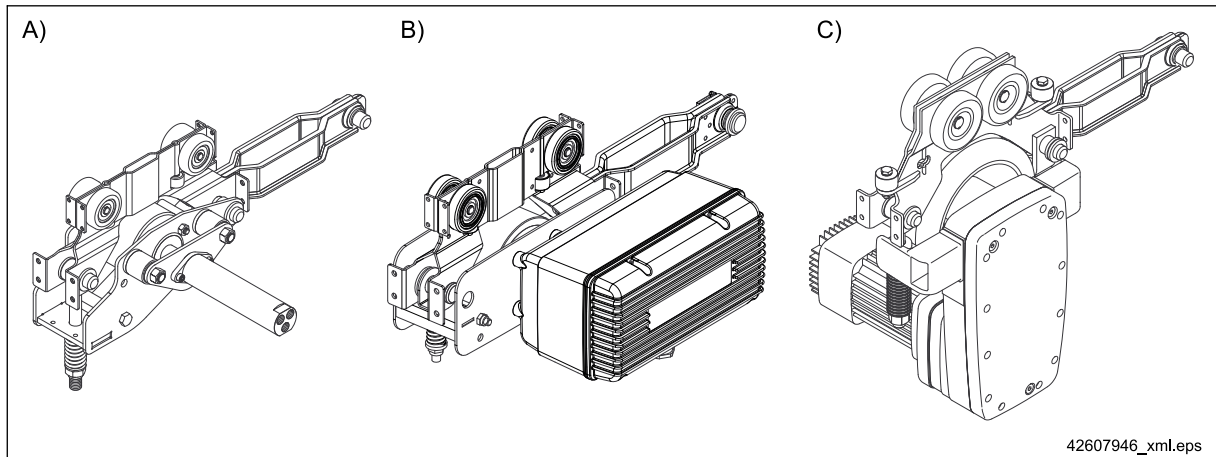


Fig. 42

Item	Designation	Item	Designation	Item	Designation
A)	RF 100 travel drive pneumatically driven	B)	RF 125 trolley electrically driven	C)	DRF 200 travel drive electrically driven

Tab. 28

Connect the friction wheel travel drive with:

- a single trolley using single-trolley link (61).
- a double trolley by directly attaching link bar (69c) ⇒ Fig. 53, Page 59 of the trolley with load bar (57).
- crab frame (78) by pushing link bar (69c) ⇒ Fig. 53, Page 59 onto the crab frame axle together with a trolley.

Attach link bar (69c) ⇒ Fig. 53, Page 59 to the outer holes in the spacer bar or load bar on electrically driven double-girder cranes.

5.12.2.2 RF 125 trolley and DRF 200 friction wheel travel drive

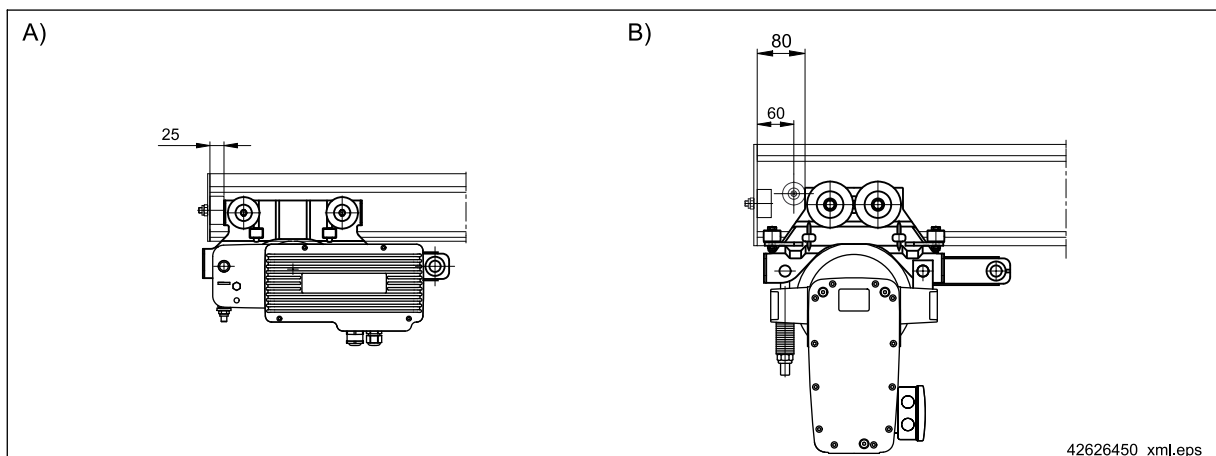


Fig. 43

A)	Aluline A12/A16 with RF 125 trolley and E11-E34 DC travel drive	B)	Aluline A18/A22 with DRF 200 friction wheel travel drive
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Tab. 29

For KBK Aluline A18/A22, fit an internal buffer stop 40 mm from the end of the track to protect end cap (7) ⇒ "End cap with buffer, shock absorber", Page 41 from collisions with RF trolleys.

5.12.2.3 Fitting an RF 100 PN unit

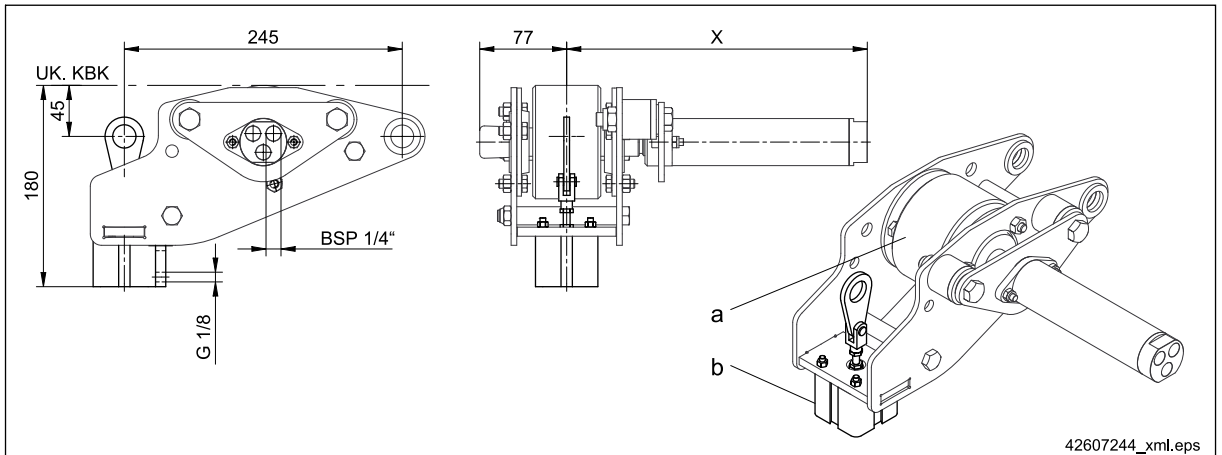


Fig. 44

Item	Designation	Item	Designation	Dimension	Designation
a	Friction wheel	b	Disengaging cylinder	X	265 (295 with control)

Tab. 30

The friction wheel is pressed against the bottom flange of the rail by means of a pneumatic cylinder only when the motor is also supplied with compressed air. This enables the connected trolley to be moved by hand when no pressure is applied.

The drive is controlled pneumatically or electrically and is mainly intended to be used as a starting help.

Motor technical data

Travel speed	Rated speed	Output	Operating pressure	Recommended operating pressure	Air demand at 4 bar	CDF	Max. displaceable load
[m/min]	[m/min]	[W]	[bar]	[bar]	[l/s]	[%]	[kg]
approx. 10 - 50	20	80	3 - 6	approx. 4	4.5	50	500

Tab. 31

Fitting the travel drive

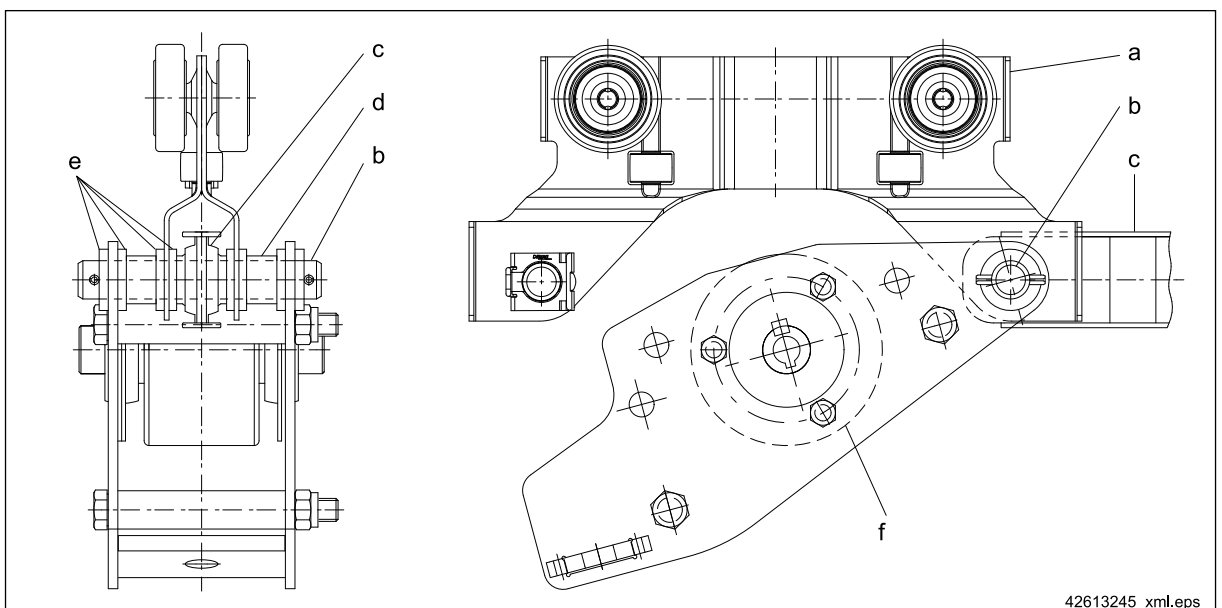


Fig. 45

Item	Designation	Item	Designation	Item	Designation
a	Trolley	c	Link bar	e	Supporting washers
b	Long pin	d	Spacer sleeves for long pin	f	Friction wheel travel drive

Tab. 32

1. Remove the longer of the 2 pins (b) from trolley (a) on the coupling side.
2. Connect the trolley to friction wheel travel drive (f) using pin (b).
3. The arrangement of link bar (c), supporting washers (e) and spacer sleeves (d) can be seen in ⇒ Fig. 45, Page 53 (shown without motor and tensioning element).



Ensure that the slots in split sleeves point outwards since otherwise they cause wear.

Fitting the pressure cylinder

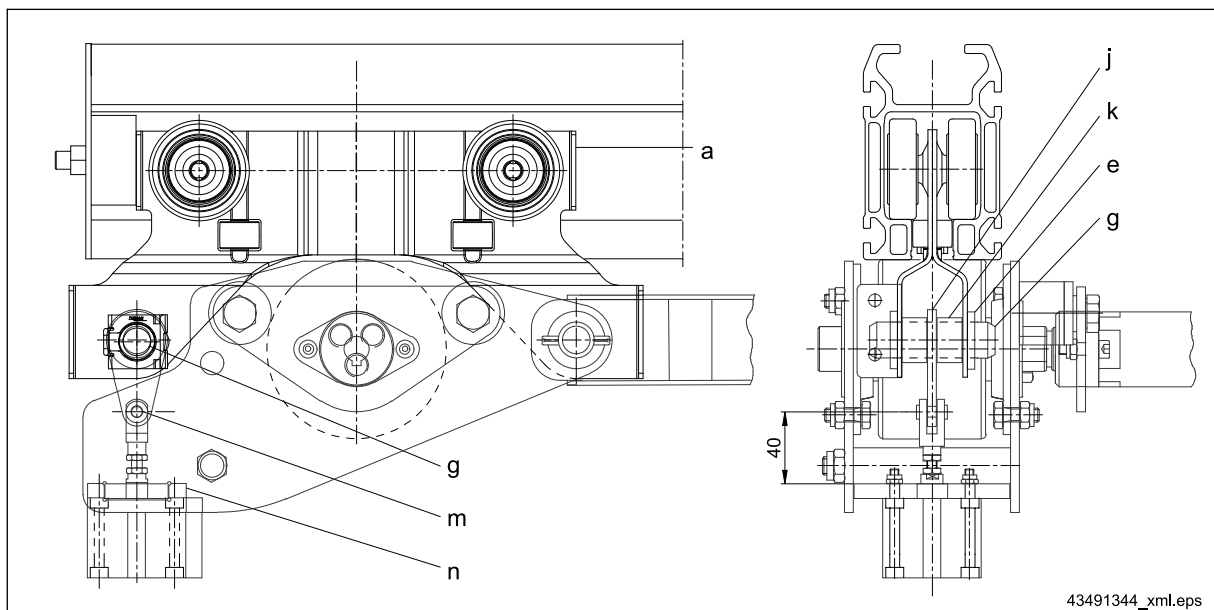


Fig. 46

Item	Designation	Item	Designation	Item	Designation
a	Trolley	j	Connecting element	m	Fork head pin
e	Supporting washers	k	Spacer sleeves for short pins	n	Retaining plate
g	Short pin				

Tab. 33

1. Remove short pin (g) from trolley (a).
2. Connect connecting element (j) and the trolley using short pin (g). The arrangement of connecting element (j), supporting washers (e) and spacer sleeves (k) can be seen in ⇒ Fig. 46, Page 54.
3. Adjust the distance between fork head pin (m) and retaining plate (n) of the tensioning element (factory setting $l = 40$ mm).
4. Ensure that there is no pressure in the cylinder.
5. Slide the friction wheel travel drive into the KBK profile section.



Ensure that the slots in split sleeves point outwards since otherwise they cause wear.

Fitting a counterweight

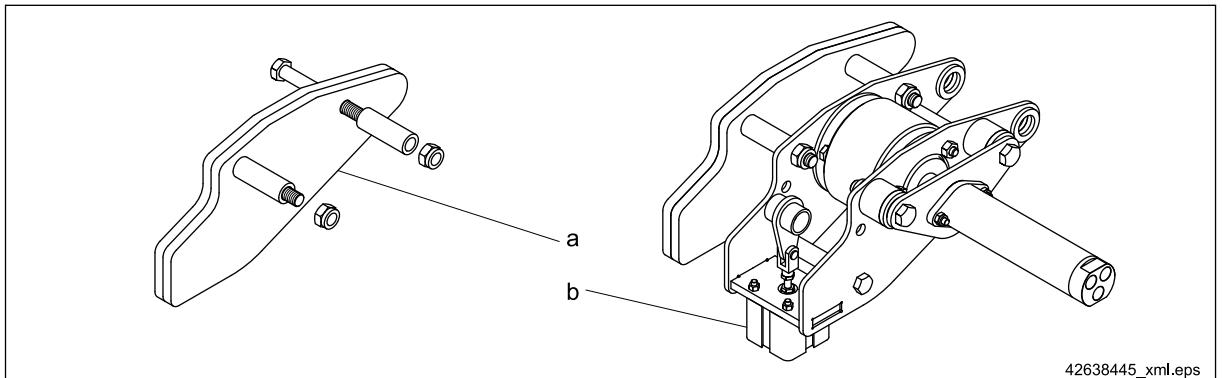


Fig. 47

Item	Designation	Item	Designation
a	Counterweight	b	Disengaging cylinder

Tab. 34

RF 100 PN travel drives fitted with disengaging cylinder (b) and an articulated link bar require a counterweight (a).

- Assemble the component parts for the counterweight (a).
- Fit counterweight (a) to the side cheek of the RF 100 PN travel drive. The tightening torque is 40 Nm.

Fitting RF pneumatic equipment base block

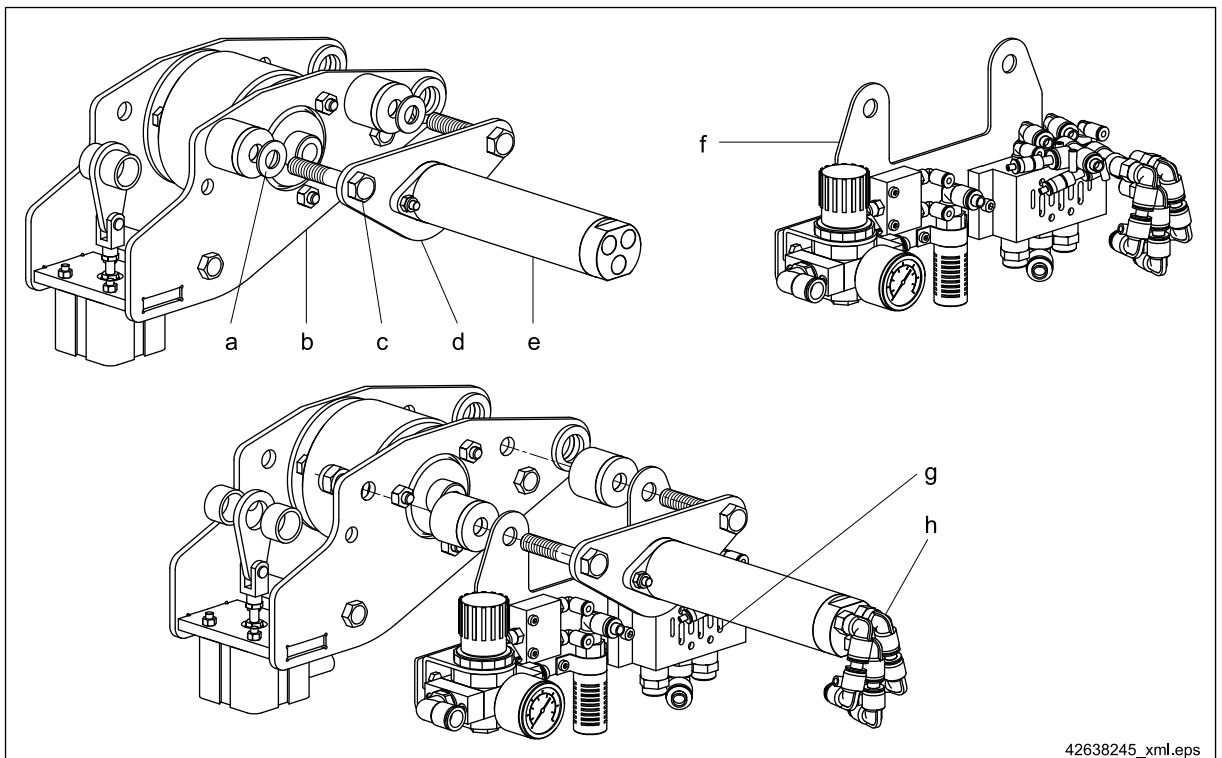


Fig. 48

Item	Designation	Item	Designation	Item	Designation
a	Washer	d	Torque bracket	g	Standard connection plate for ISO 1 valves
b	Travel drive	e	Motor	h	Elbow couplings
c	Hexagon bolt	f	base block		

Tab. 35

The pneumatic equipment base block can be fitted on either side of the friction wheel travel drive.

- Loosen both hexagon bolts (c) and remove motor (e) together with torque bracket (d).

- Remove the 13x20x2 washers (a).
- Replace washers (a) with base block (f).
- Bolt motor (e) with torque bracket (d) back on. The tightening torque is 40 Nm.
- Fit elbow couplings (h).

Fitting the directional control valve/control block

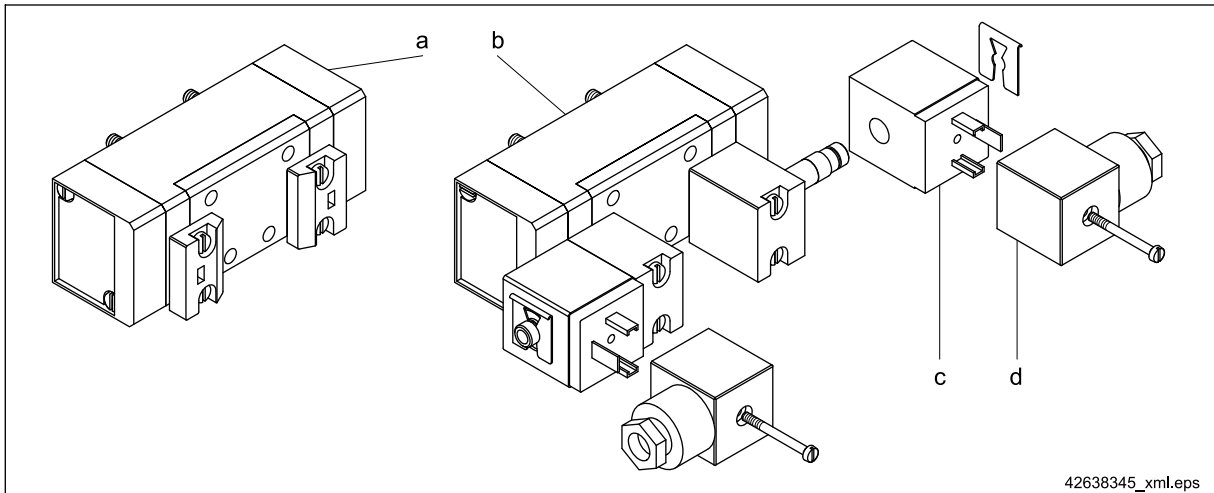


Fig. 49

Item	Designation	Item	Designation
a	Directional control valve	c	Magnet coil
b	24 V DC or 230 V AC control block	d	Socket

Tab. 36

Directional control valve

- Fit directional control valve (a) to the standard connection plate for ISO 1 valves of the pneumatic base block using the four screws (M5).
Use a size 4 hexagon socket key.

Control block

- Fit control block (b) as shown.
- Fit control block (b) to the standard connection plate for ISO 1 valves of the pneumatic base block using the four screws (M5).
Use a size 4 hexagon socket key.

5.12.2.4 Fitting an RF 125 with an E22 drive

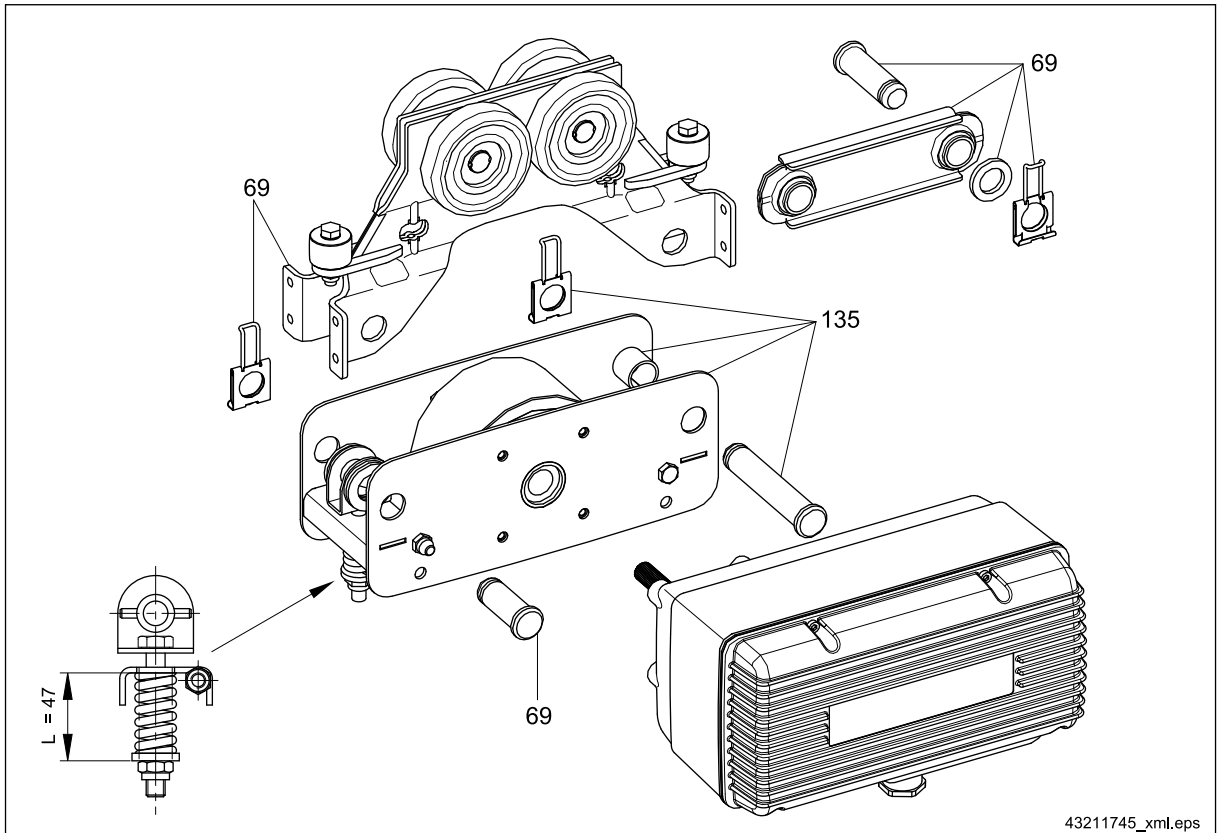


Fig. 50

Please also refer to the "E11-E34 DC travel drive" document ⇒ Tab. 2, Page 7.

1. Remove the pins from the trolley.
2. Connect rocker assembly (135) with tractor trolley (69). Use the long collared pin of the rocker assembly. The long support pin of the trolley is not needed. Place the flat head on the side to which the drive is to be attached. Insert the spacer sleeves.
3. Undo the nut on the pressure spring to allow the rocker assembly to swing down.
4. Connect the fork section with the bolt to the tractor trolley using the short pin. Ensure that the distance washers are correctly fitted.
5. Swing the rocker assembly back up into position and hand tighten the pressure spring and nut.
6. Slide the friction wheel travel drive into the KBK rail.
7. Open the E 22 drive. Slide the drive shaft into the hub of the friction wheel and secure the drive using the bolts provided.
8. Tension the pressure spring to a length of 47 mm.
9. Refer to the "E11-E34 DC travel drive" document ⇒ Tab. 2, Page 7 for electrical connection and commissioning.
10. The crane enclosure can be attached to the rocker assembly using the relevant mounting plate.

Beware of collisions.

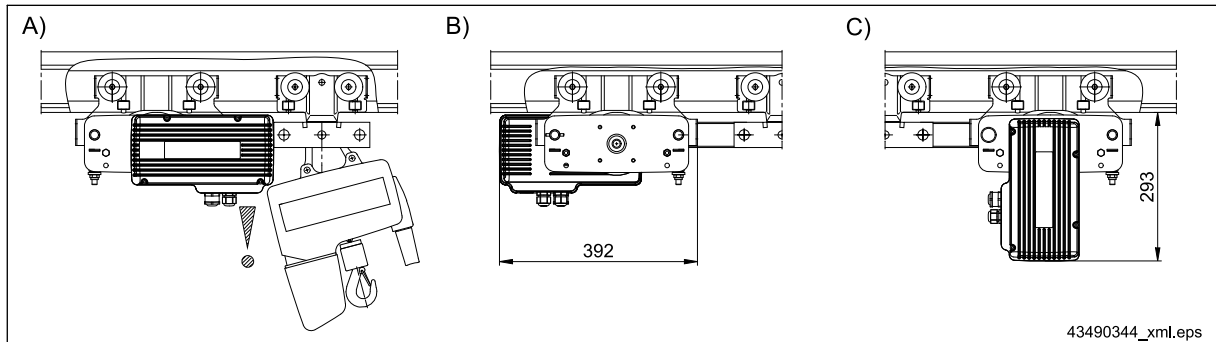


Fig. 51

A)	Long link bar required	B)	Consider approach dimension	C)	Consider overall height
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Tab. 37

5.12.2.5 Fitting DRF 200

Position of the shims

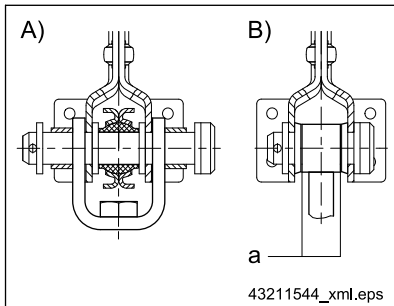


Fig. 52

A)	Coupling side
B)	Eye bolt side
a	Shims

Tab. 38

WARNING



Risk of damage to the machine if incorrectly fitted

Pay special attention to correct arrangement of the distance washers and shims as shown in ⇒ Fig. 52, Page 59 and ⇒ Fig. 53, Page 59.

Assembly of RF friction wheel travel drive with KBK Aluline trolleys

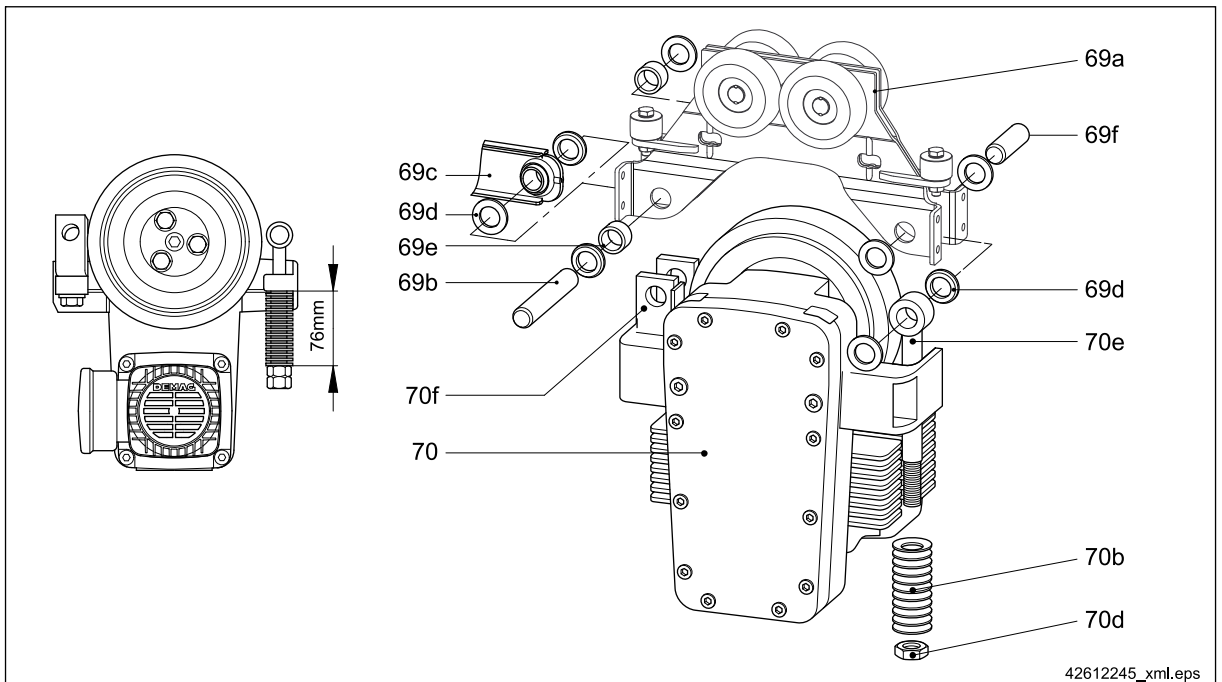


Fig. 53

1. Remove the 2 pins (69b and 69f) of trolley (69a).
2. Connect the trolley to the friction wheel travel drive (70) using longer pin (69b).
3. Connect eye bolt (70e) which guides the spring to the trolley using short pin (69f).
4. Undo nuts (70d) to loosen dished washer pack (70b).
5. Slide the friction wheel travel drive into the KBK Aluline profile section.
6. Set the length of the dished washer pack to $L = 76$ mm, see "DRF 200 travel drive" document ⇒ Tab. 2, Page 7.

5.12.3 RF 125 manual disengaging device

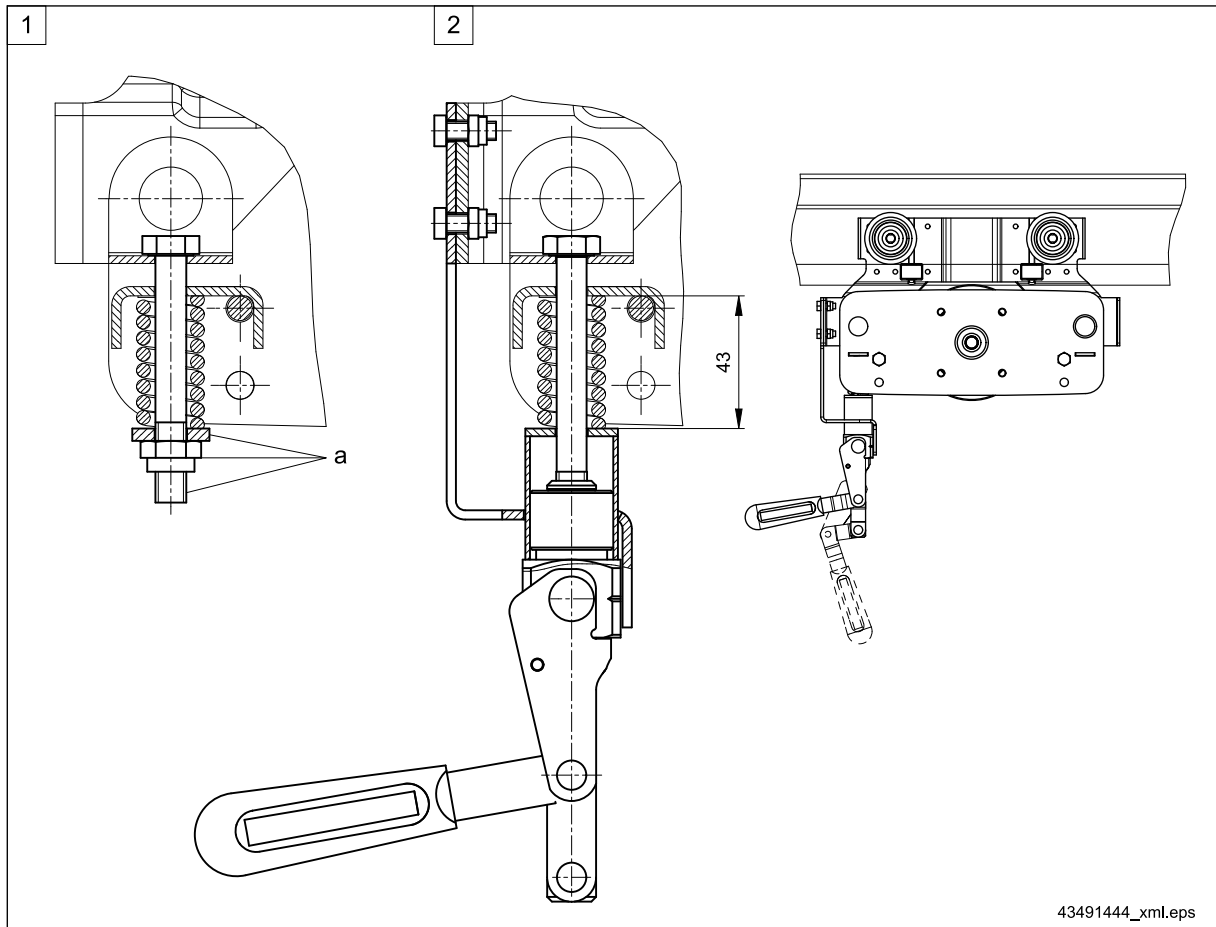


Fig. 54

1. Remove the nut, bolt and washer (a) from the trolley.
2. Fit the manual disengaging device.

5.12.4 RF 125 travel limit switches

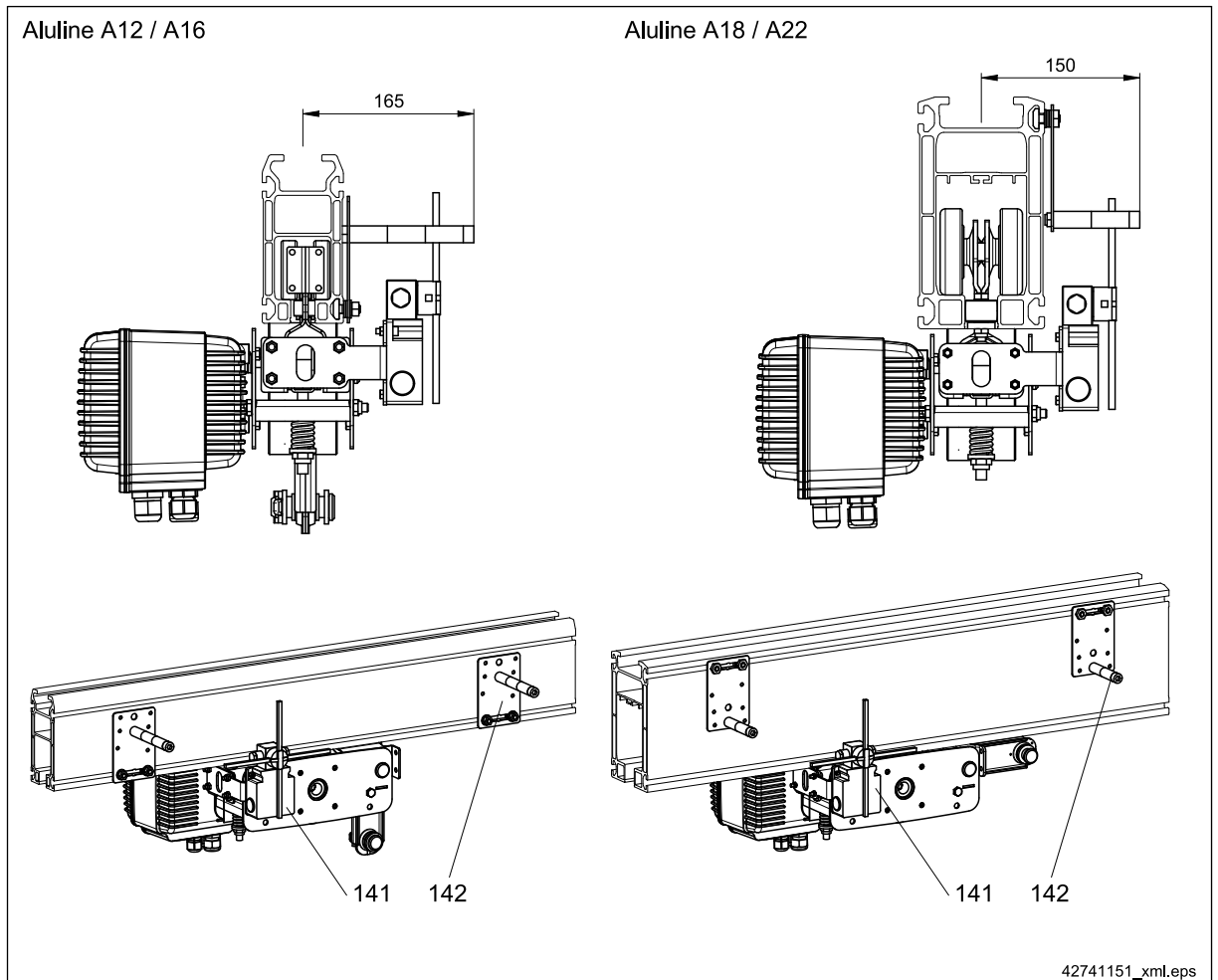


Fig. 55

Item	Designation	Item	Designation
141	Limit switch, cpl.	142	Switching vane, cpl.

Tab. 39

General

Limit switch fittings are designed to be used with RF 125 travel drives on KBK systems. They can be used for reliable switch-over from fast to slow travel, or from slow travel to the stop function.

Crane application

When a limit switch is used with a crane long-travel drive, the signal from the switch must also be sent to the second travel drive.

Contents

The limit switch cpl. includes the switch, the trolley fitting and the pre-assembled electric cable to the drive. The switching vane cpl. includes **two** switching vanes to actuate the switch incl. the fittings for attachment to the rail.

Assembly

Attach the switching vane to the profile section using the enclosed bolted bracket.
Attach the limit switch to the tractor trolley using the four M6 bolts.

Connect the travel drive as described in the "E11-E34 DC travel drive" document, see "KBK documents".

5.12.5 Installing travel drives on KBK ergo end carriages

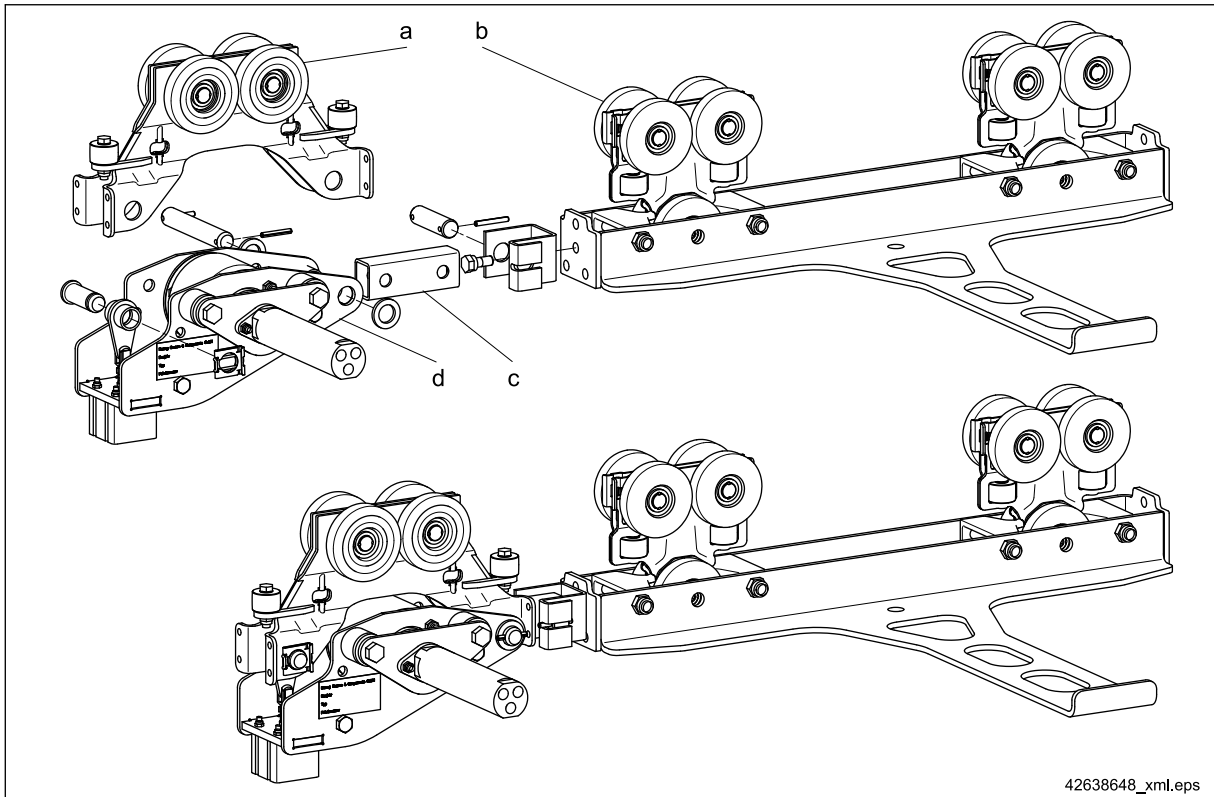


Fig. 56 Example: RF 100 PN

Item	Designation	Item	Designation	Item	Designation
a	RF trolley	b	KBK ergo trolley	c	Rigid link bar, cpl.
d	RF 100 PN travel drive				

Tab. 40

No counterweight and no pin set are needed if rigid link bars are used.

- Bolt the articulated part of link bar (c) to the end carriage.
Connect rigid link bar (c) to the articulated section.
- Connect RF trolley (a) to RF 100 PN travel drive (d) and rigid link bar (c) using the corresponding pin. Ensure that the distance washers and spacer sleeves are fitted in the correct order.
- Slide the unit into the crane section girder.
- Correctly adjust the counter-pressure roller.

5.12.6 Link and spacer bars

Articulated spacer bar components

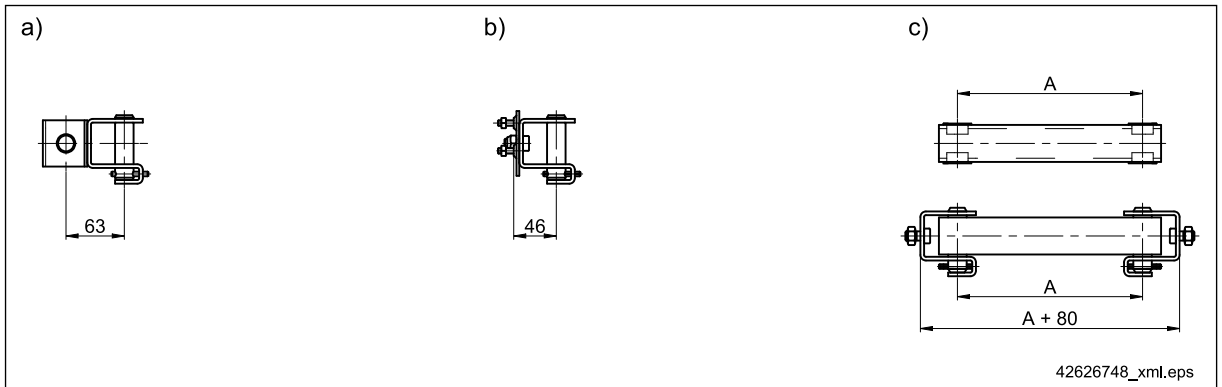


Fig. 57 Articulated spacer bar components

a)	Hinged block	b)	RF hinged block	c)	Articulated spacer bar
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Tab. 41

Articulated spacer bar examples

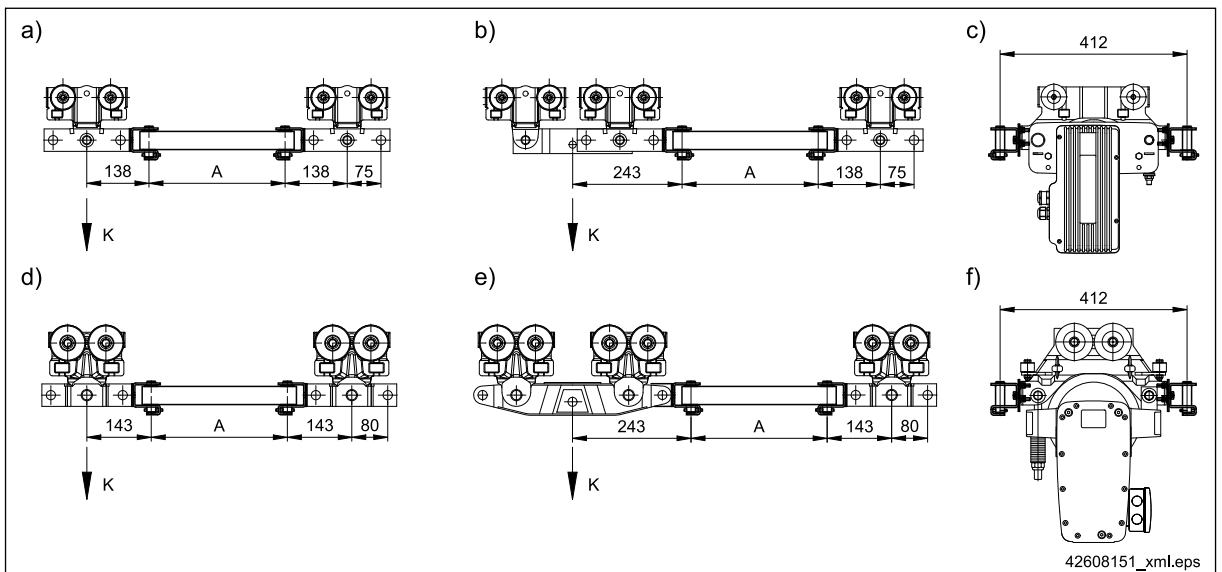


Fig. 58 Articulated spacer bar examples

a)	Spacer bar on single trolley for Aluline A12/A16	b)	Spacer bar on double trolley for Aluline A12/A16	c)	Spacer bar on RF trolley (one or both sides) for Aluline A12/A16
d)	Spacer bar on single trolley for Aluline A18/A22	e)	Spacer bar on double trolley for Aluline A18/A22	f)	Spacer bar on DRF 200 friction wheel travel drive (one or both sides) for Aluline A18/A22

Tab. 42

Spacer bar for Aluline A18/A22 straight track components

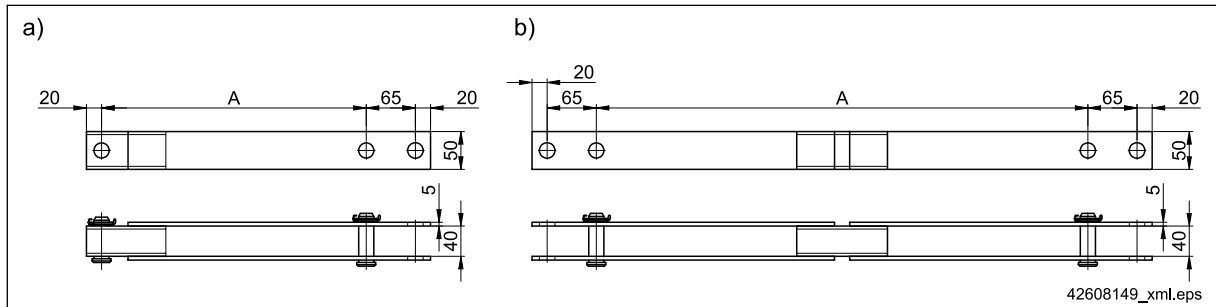


Fig. 59 Spacer bar for Aluline A18/A22 straight track components

a)	Spacer bar with one open end	b)	Spacer bar with two open ends
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Tab. 43

Examples of spacer bars for Aluline A18/A22 straight track components

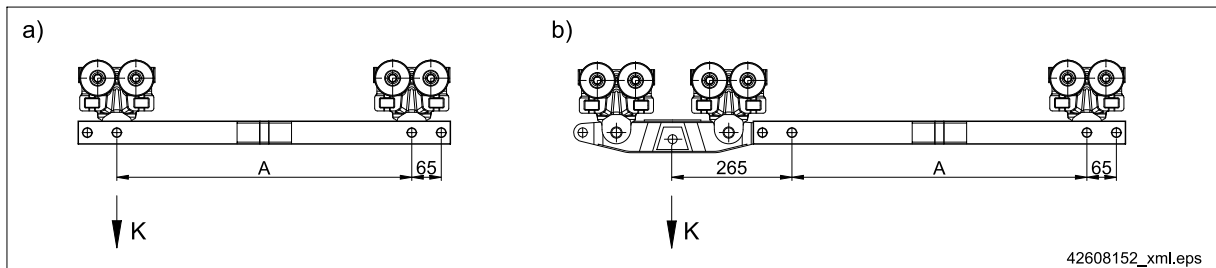


Fig. 60 Examples of spacer bars for Aluline A18/A22 straight track components

a)	Spacer bar on single trolley for double-girder crane with two open ends	b)	Spacer bar on double trolley for double-girder crane with two open ends
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Tab. 44

For details, see "KBK Aluline crane construction kit" document ⇒ Tab. 2, Page 7. Assemble by means of pin or bolted connections.

5.12.7 Buffers on KBK classic crabs and cranes

KBK buffer components

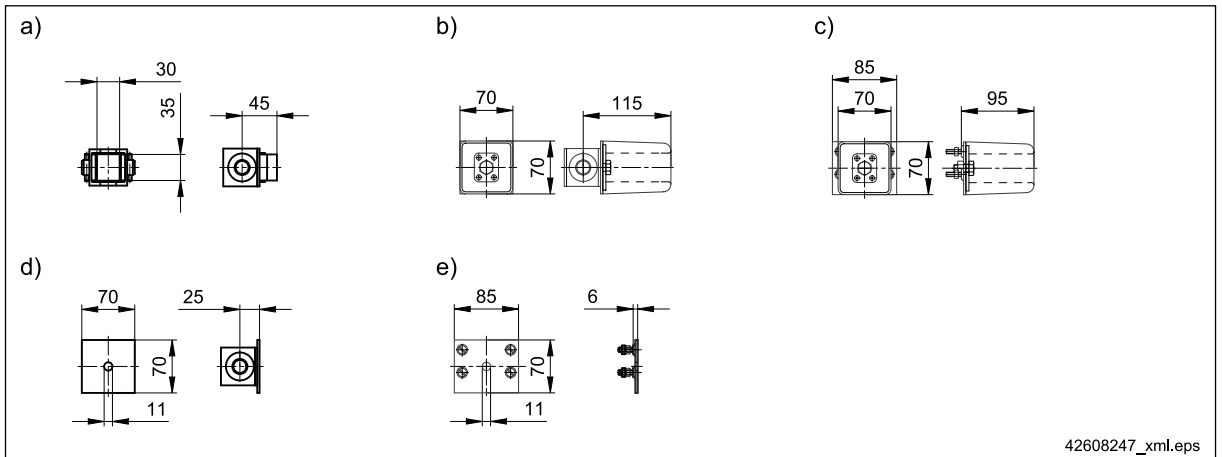


Fig. 61 KBK buffer components

a)	Rubber end stop	b)	Buffer fitting (foamed plastic)	c)	RF buffer fitting (foamed plastic)
d)	Buffer plate	e)	RF buffer plate		

Tab. 45

KBK buffer examples

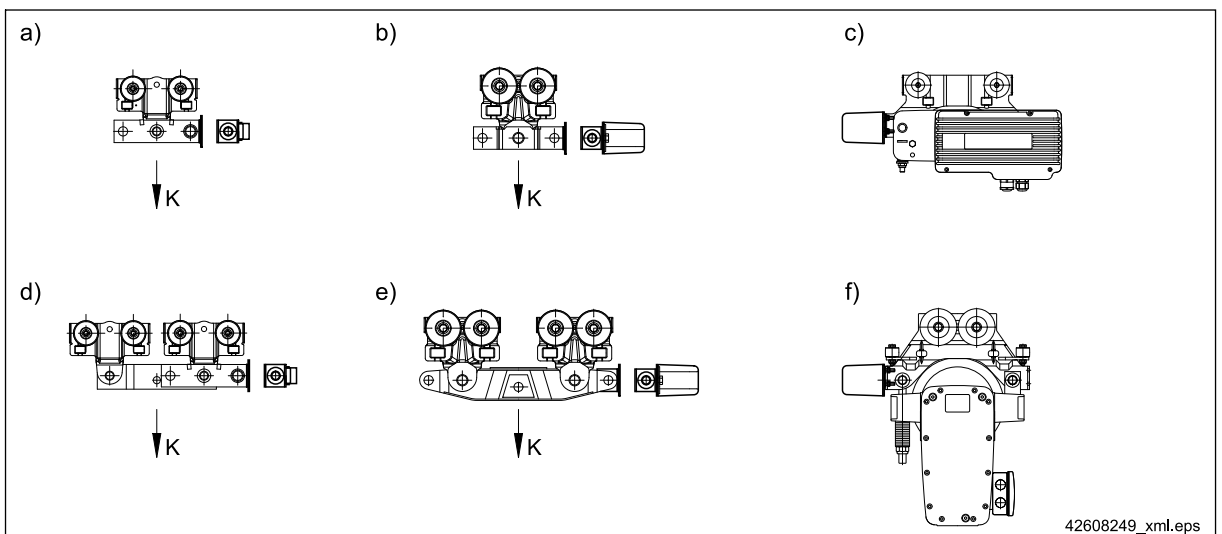


Fig. 62 KBK buffer examples

a)	Buffer plate or buffer fitted to Alu-line A12/A16 single-trolley link	b)	Buffer plate or buffer fitted to Alu-line A18/A22 single-trolley link	c)	RF buffer fitted to RF trolley
d)	Buffer plate or buffer fitted to Alu-line A12/A16 double-trolley link	e)	Buffer plate or buffer fitted to Alu-line A18/A22 load bar	f)	RF buffer fitted to DRF trolley

Tab. 46

5.12.8 Buffer and impact plate on A18/A22 single trolley

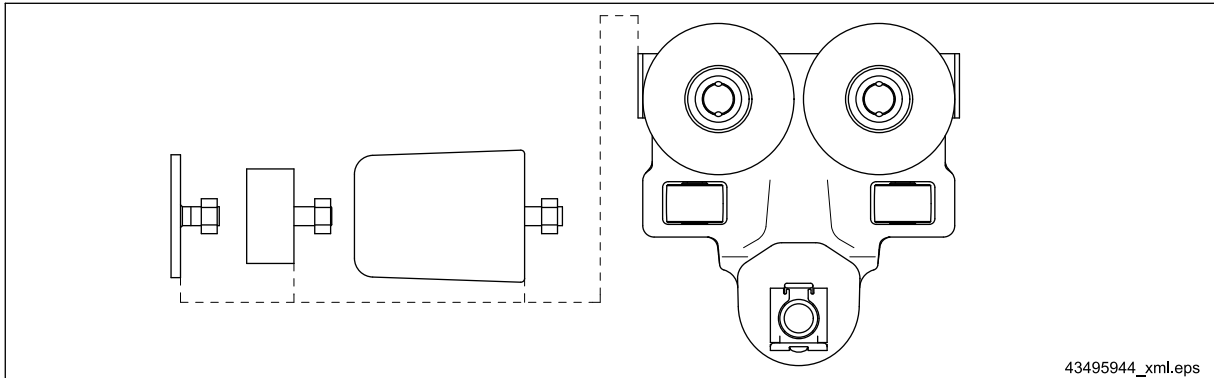


Fig. 63

The following parts can be attached direct to a A18/A22 single trolley:

- the stop plate.
- the rubber buffer,
- the cellular plastic buffer,

The assembly to be installed on the trolley can be pre-assembled and introduced into the gap from above. The nut is retained in position by its shape and the assembly can be secured.

Tighten the rubber buffer by hand.

Tighten the cellular plastic buffer and stop plate to a tightening torque of 45 Nm.

5.13 Cable power supply lines

5.13.1 Aluline power supply

5.13.1.1 Fitting the trailing cable power supply

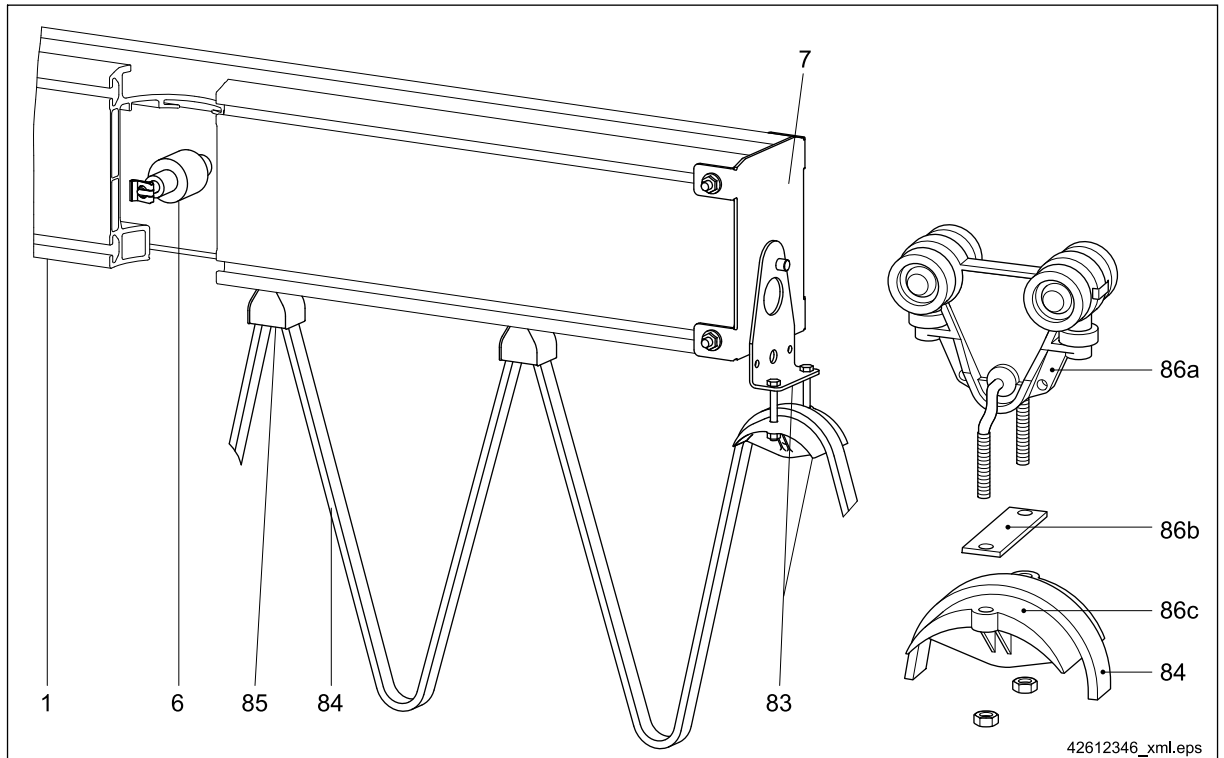


Fig. 64

A power supply system (between mains connection and hoist appliance) consists of:

- mains on/off switch/isolator (88) ⇒ Fig. 70, Page 70, fuses with inserts, if required,
- flat cable (84),
- cable sliders (85) or cable trolleys (86),
- cable clamps at rail end (83), on crane girder (80) ⇒ Fig. 66, Page 68, on crab frame (81) ⇒ Fig. 67, Page 69, on trolley for RF(82) ⇒ Fig. 68, Page 69,
- round cable for wiring on the crane bridge.

The following items of equipment are included in the basic electrical equipment for standard KBK electrics:

- equipment sets,
- terminal boxes and their fittings,
- connecting cables,
- cable entries (twist-type cable entry glands, nuts),
- connecting elements (wire end sleeves, cable lugs, sockets).

Ensure that the flat cable is not twisted along its length during assembly. Firmly tighten all nuts and bolts at the cable fixing points.

1. Select a cable length such that no additional tensile forces can act on the cable except where cable carriers (cable sliders (85) or cable trolleys (86)) are fitted.
2. Space the cable carriers at equal distances along the length of the cable. The distance between the cable supports should be approx. twice the length of the required sag of the cables.
3. Tighten the nuts on the cable trolleys so that flat cable (84) does not slip through the cable supports.
4. Place the cable supports in track section (1).

Connect the cable trolleys with strain relief cords to obtain good running characteristics. Fix the cords in the trolley bore holes. The cord length must be shorter than the cable.

Fitting the trailing cable power supply to cable trolleys with snap locks

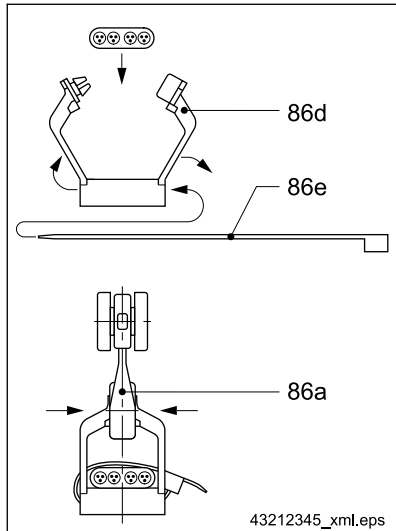


Fig. 65



Note that cable brackets (86d) and cable straps (86e) are designed to be used only once. Multiple use, e.g. in the case of incorrect fitting, is not possible.

- Pull a cable strap (86e) through the two lower slots of cable bracket support (86d).
- Space out cable brackets at equal distances over the entire length of the cable.
- Place the cable(s) on the cable straps and tighten them.
- Snap the cable brackets into trolley (86a).

5.13.1.2 Fitting buffer stops

To prevent collisions with the cable supports, fix an internal buffer stop (6) ⇒ Fig. 64, Page 67 in the track section on the power supply side (for crane tracks and double-girder cranes in both track sections, so that the crane or trolley is buffered on both sides simultaneously).

- See ⇒ "Internal buffer stop", Page 40

Distance "a": end of track to hole center = number of cable supports x max. length of one cable support with cable(s). When a friction wheel travel drive is used, dimension a is increased by 150 mm.

- Secure the flat cable on the power supply side using rail end cable clamp (83) at the end of the track/girder.

5.13.1.3 Fitting flat cables

Crane bridge cable clamp

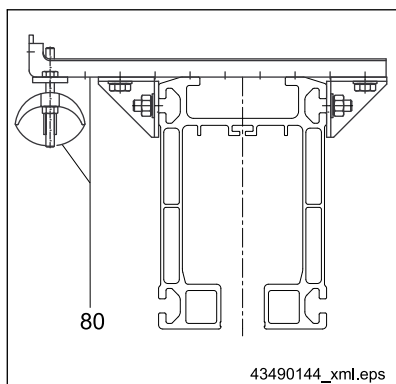


Fig. 66

For push travel single or double-girder cranes:

- fix the flat cable to the crane girder directly next to the crane suspension eye with crane bridge cable clamp (80). This ensures that the cable is securely held in place. From this fixed point, arrange the flat cable to the rail end clamp via a loop.

Attach to the crane long-travel drive for contactor control for electric travel movement with crane switch contactor.

For electrically driven double-girder cranes, connect both friction wheel travel drives with a round cable.

Crab frame cable clamp, double trolley

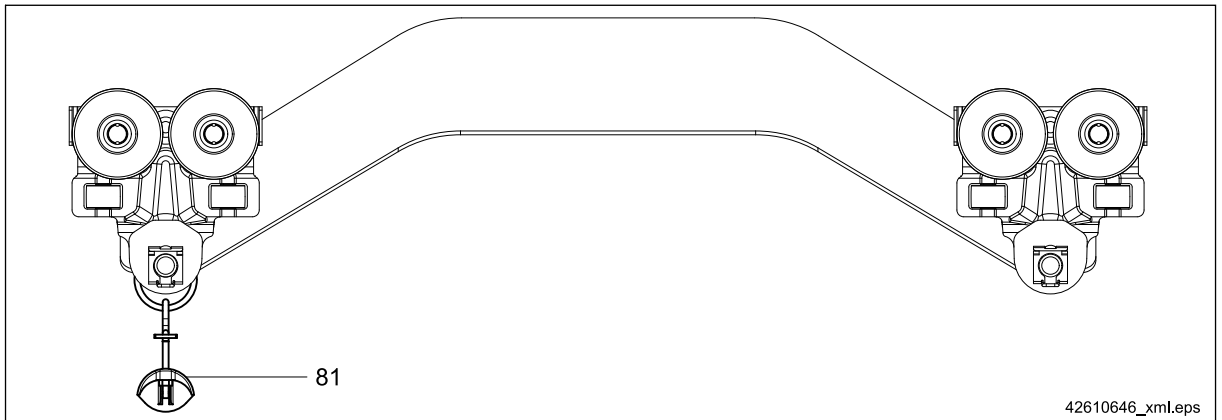


Fig. 67

- Attach the flat cable using crab frame cable clamp (81) to the trolley to take the strain from the terminal connections.

RF trolley cable clamp

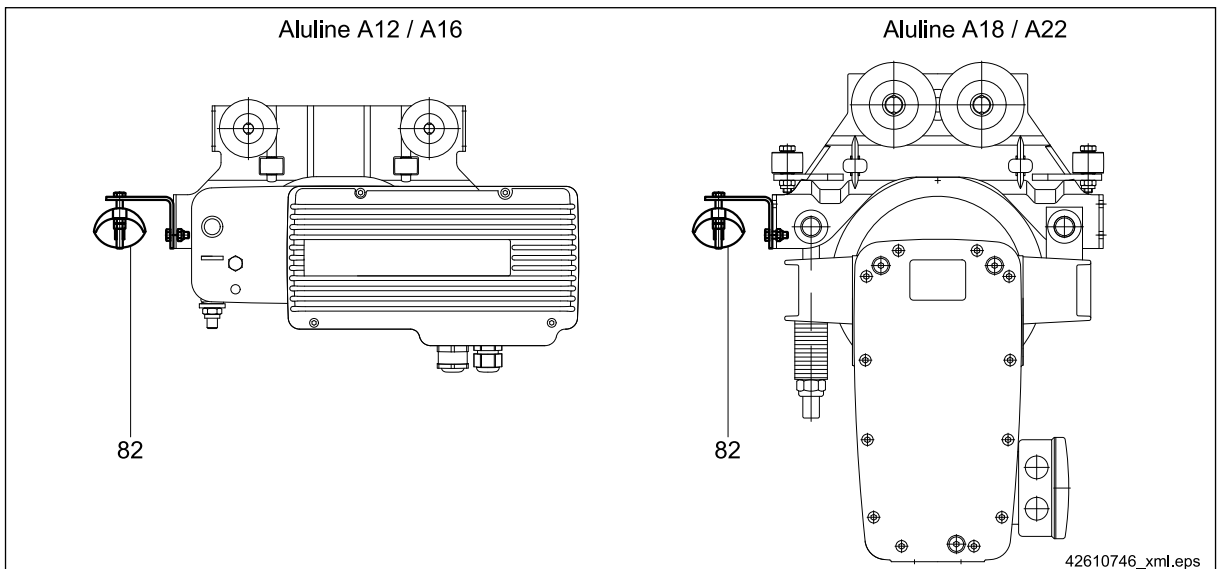


Fig. 68

On electrically operated crabs or cranes:

- run the cable to the terminal box under the friction wheel travel drive via RF trolley cable clamp (82) or via the crab frame cable clamp.

5.13.1.4 Fitting round cable

The round cable to connect the two long-travel drives lies in the upper channel of the profile section for KBK Aluline.

5.13.1.5 Terminal box

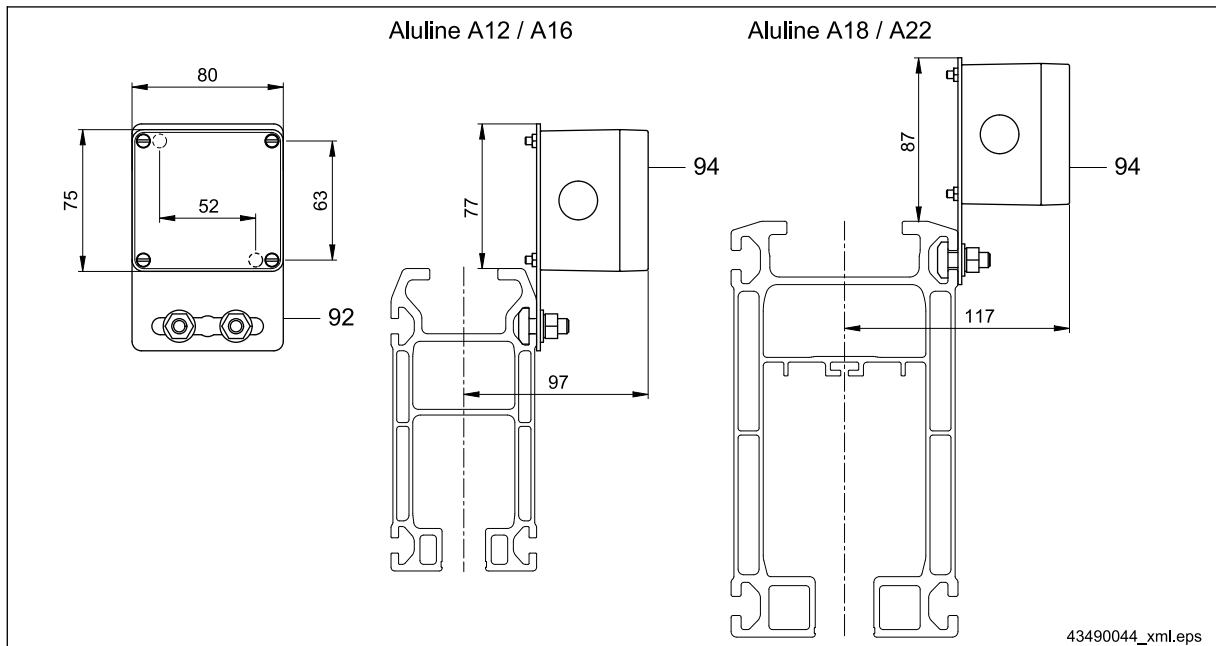


Fig. 69

A terminal box (94), part no. 504 650 44, can be fitted at the end of the track using mounting bracket (92) and a bolted bracket as a transition from flat cable to round cable.

5.13.1.6 Isolating switch

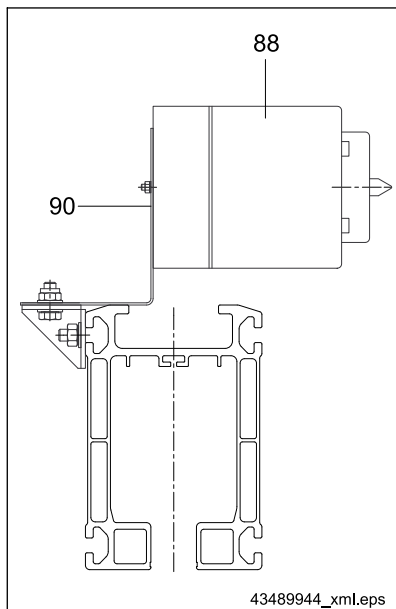


Fig. 70

If several cranes operate with a common power supply on one track, an on/off switch with lock (88) must be fitted on every crane. Attach the on/off switch to the track section with switch mounting plate (90).

Arrange and connect the cables in accordance with our circuit diagrams.

WARNING



Electric shock, live components

Contact with live components may result in danger to life and limb.

Ensure that the isolating switch is installed in an easily accessible position near the KBK installation and clearly marked and can be reached quickly if a dangerous situation occurs.

Cables must only be connected in accordance with Demag Cranes & Components circuit diagrams. Installation work must only be carried out by skilled personnel.

For further important information regarding power supply, refer to our "KBK Aluline crane construction kit", "KBK 0, 25, 100 trailing cable power supply", "DKK conductor line" and "DCL-Pro conductor line" documents ⇒ Tab. 2, Page 7.

5.13.2 Pneumatic power supply

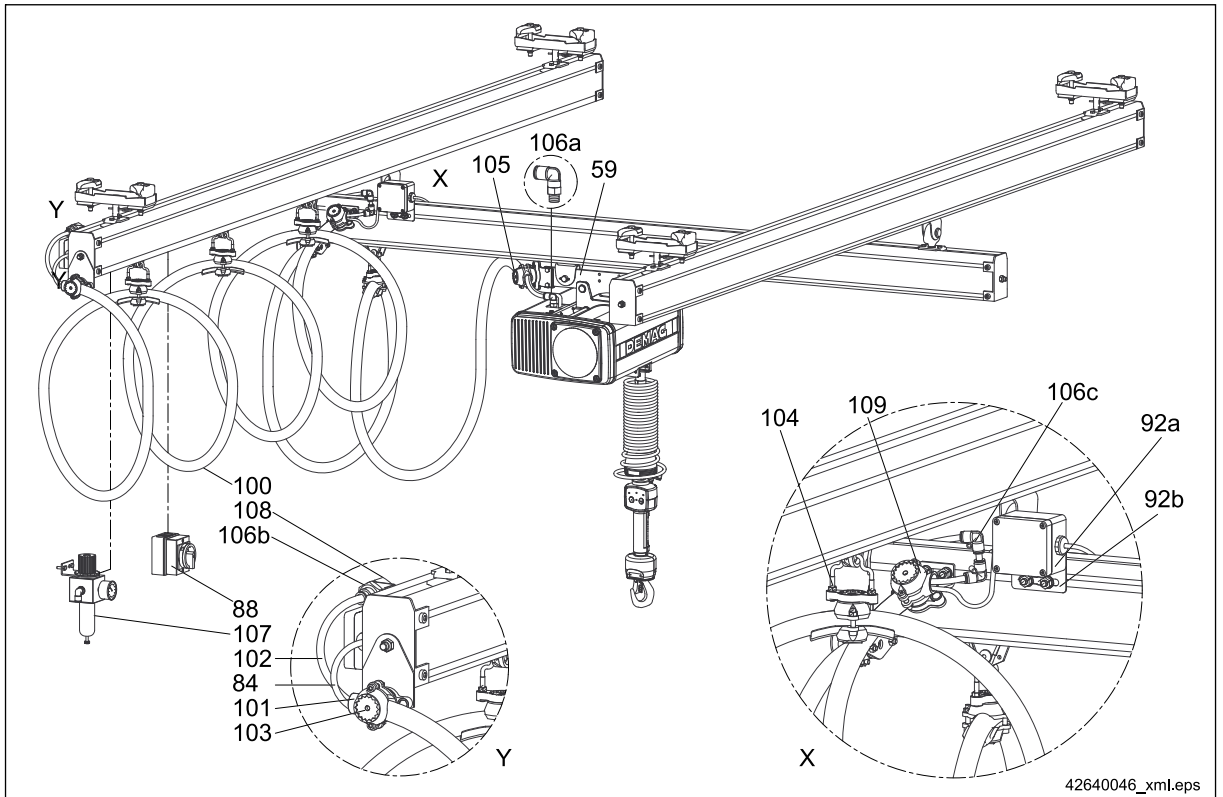


Fig. 71 Example: Single-girder crane

Detail X: Power supply separated at transfer point → crane bridge/crane track
 Detail Y: Power supply interface at end of crane track

Supply lines are preferably laid in a protective hose and attached to special fixed points on the crane runway and to the crane girder as well as to cable trolleys. The helical protective hose is always right-handed and has a sag of approx. 500 mm.

Length of protective hose = travel path [m] x 1.3 + connecting length on both sides [m]

Quantity of cable trolleys = length of travel path (rounded off to full meters) - 1

Length of cable accumulating section = (quantity of cable trolleys + reserve) x length of cable trolley

For further details, see "KBK Aluline crane construction kit" and "KBK 0, 25, 100 trailing cable power supply" documents ⇒ Tab. 2, Page 7.

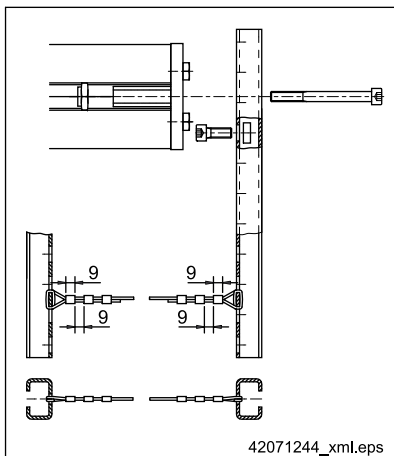


Fig. 72

Compressed air can also be supplied via a spiral hose which is supported by a wire cord stretched alongside the rail section. For push-travel cranes and trolleys, the travel distance is limited to a maximum of 4 m. The wire cord must be stretched tight between two C-rails. Wind the wire cord around the web of the C-rail once at each end as shown in ⇒ Fig. 72, Page 71.

Hose clip set 1

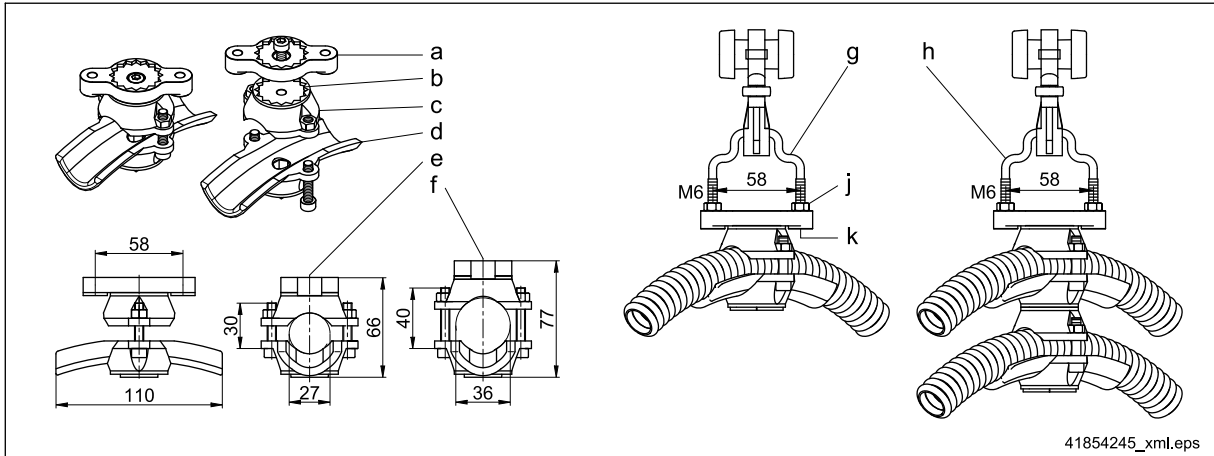


Fig. 73

a	Retaining plate	d	Hose clip	g	KBK cable trolley with 1x hose clip set 1
b	22.5° interval	e	for PG21 (AD27)	h	KBK cable trolley with 2x hose clip set 1
c	Clamp section	f	for PG29 (AD36)	j	Upper nut
				k	Lower nut

Tab. 47

Hose clip set 1 can be used to attach hoses to all KBK cable trolleys which have (M6) threaded pins at a distance of 58 mm apart. Up to two hose clips can be fitted to a cable trolley. Adjustment is possible at intervals of 22.5° if retaining plates (a) are used. Hose clip sets have a clamping range for hose diameters from 18 mm to 36 mm.

1. Turn upper nuts (j) up to fit hose clip set 1 to a KBK cable trolley.
2. Raise retaining plate (a) and screw nuts (k) onto the ends of the threaded pins.
3. Push retaining plate (a) against lower nuts (k).
4. Turn upper nuts (j) against it from above.

Hose clip set 2

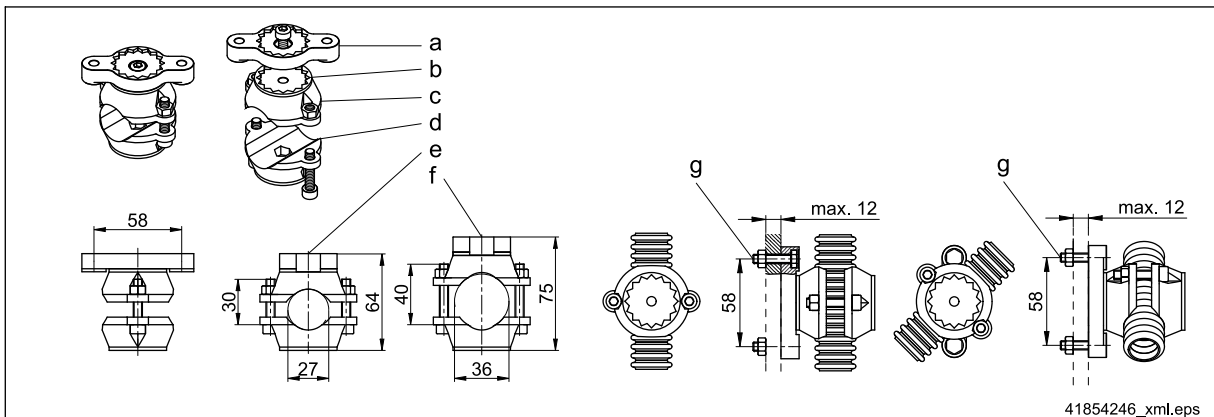


Fig. 74

a	Retaining plate	c + d	Clamp section	f	for PG29 (AD36)
b	22.5° interval	e	for PG21 (AD27)	g	M6x25 hexagon head bolts

Tab. 48

Hose clip set 2 can be used to attach hoses to brackets or walls. Adjustment is possible at intervals of 22.5° if retaining plates (a) are used. Hose clip sets have a clamping range for hose diameters from 18 mm to 36 mm. The enclosed M6x25 hexagon head bolts (g) are suitable for a clamping range up to 12 mm.

5.14 Suspending the hoist

5.14.1 Safety instructions for suspending the hoist

WARNING



Overload

Danger to life and limb if the components are overloaded.

- Select the correct load capacity for the hoist unit to ensure that the installation is not overloaded.

DANGER



Incorrect direction of movement

Danger to life and limb if the direction of movement is wrong.

The control devices must be checked for correct and proper operation following work on the main power supply and before work begins. If the phases are not correctly connected, the switching elements and limit switches may not function as intended.

The control device (e.g. control pendant) must be marked in such a way that the direction of movement is clear and distinct. The arrow symbol on the switching elements must correspond to the direction of movement.

5.14.2 Chain hoist

If the KBK installation is operated with a Demag chain hoist, the corresponding chain hoist assembly and operating instructions (see ⇒ Tab. 2, Page 7) must be observed. In particular, the safety instructions must be observed and followed.

Attach the hoist correctly as follows:

1. The hoist unit must be suspended in such a way that the opening for the electric supply line on the hoist unit points in the longitudinal direction of the track.
2. Position the eyebolt between the trolley side plates, insert the pin and secure it.

WARNING



Danger of falling load.

Premature wear of the KBK installation.

The hoist unit, load handling attachment and load must be flexibly suspended. Rigid connections cause uncontrolled forces to be transmitted and lead to fatigue fracture.

5.14.3 Load bar for D-BP

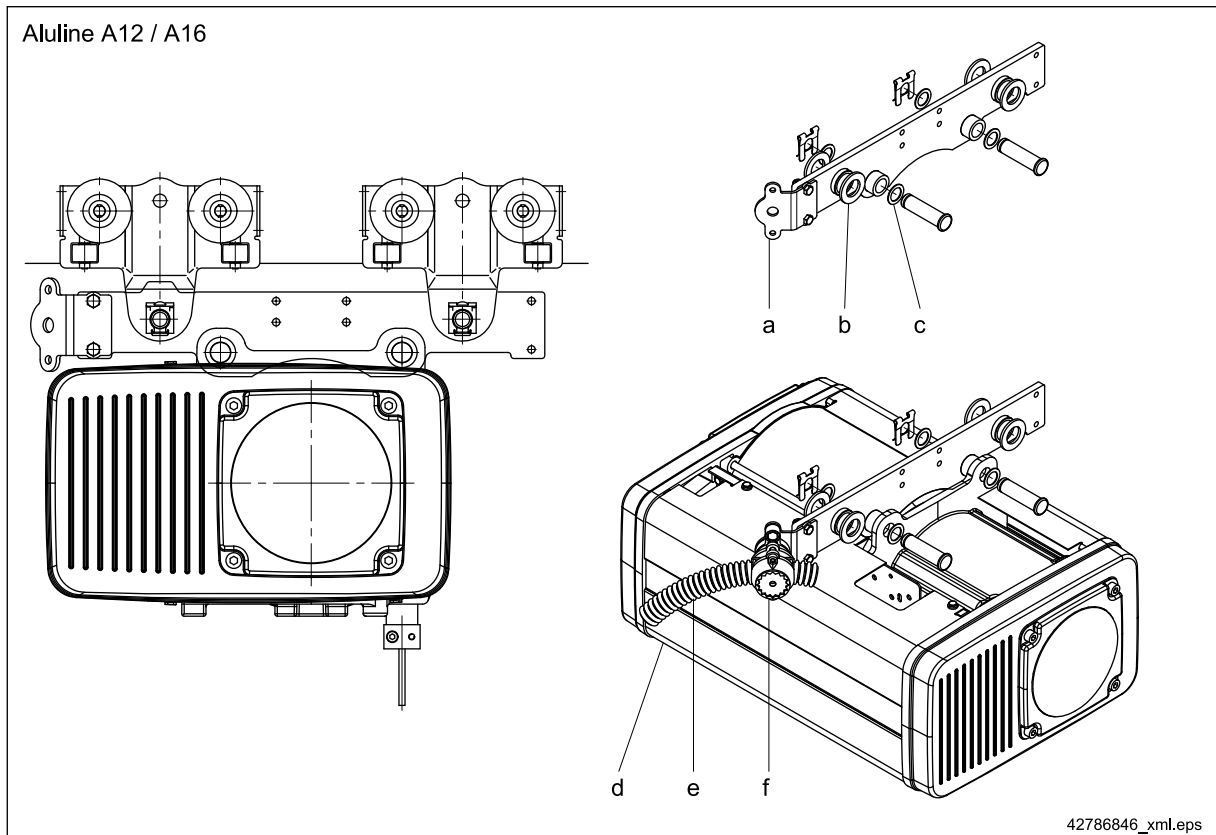


Fig. 75

Item	Designation	Item	Designation	Item	Designation
a	Load bar (fixed point connector pre-fitted on the left as standard)	b	Washer	c	Supporting washers
d	Balancer	e	Protective tube AD 27 or AD 36	f	Hose clip set 2

Tab. 49

1. Position load bar (a) and secure it to rope balancer (d).
Pay attention to the position of shims (c).
2. Connect the trolleys (not included in the scope of delivery of the load bar).
Fit hose clip set 2 (f).
3. Secure protective hose (e) AD 27 or AD 36 for the supply lines.

5.14.4 Handling device

Depending on the model and size, the handling equipment is fitted to a mounting plate which is bolted to the crab frame. This work can be carried out when the crab is installed and before it is installed. Refer to ⇒ "Tightening torques", Page 24 for the tightening torques.

5.15 Maker's plate and load capacity plate

WARNING



Overload

Danger to life and limb.

Higher loads than those specified on the load capacity plate must not be handled.

The load capacity specified on the crane bridge must match the load capacity of the hoist unit.

The load capacity plates must be attached to both sides of the crane bridge.

The permitted load capacity must be specified on the bottom block of monorail traveling hoists.

One maker's plate must be attached to each traveling hoist unit and one to each crane bridge. For push-travel hoist units, the maker's plate on the hoist is sufficient.

Apply the adhesive load capacity and maker's plates to the track and press them firmly onto the rail section.

Safety and warning information in the form of signs, labels and markings on the crane installation must not be removed or defaced. They must be maintained in complete and legible condition.

5.16 Inspection following assembly

WARNING



Falling parts.

Danger to life and limb if parts to be fitted are dropped.

Keep out of the danger zone at all times

- Keep a sufficient safety distance.
- Wear protective equipment.

Check that spring clips are correctly fitted to the suspensions. The spring clip must pass through the holes in the suspension rod and ball head suspension rod. Only then is the connection secured against loosening. If the suspension rod and ball head suspension rod can be turned, the spring clip is not correctly fitted.

Check to ensure that pin connections are correctly fitted. The slots in split sleeves must face outwards, otherwise they will cause wear.

The ball sockets of upper suspension brackets, suspension clamps and the hinges of hinge sockets must be well greased. Use resin-free anti-friction bearing grease, lubricants containing molybdenum disulphide (MoS₂) must not be used. The free movement of joints (ball head rods, hinged block, short suspension hangers, crane suspension fittings) must not be restricted. Lifting appliances, load handling devices and loads must be flexibly suspended from the trolleys. Rigid connections cause uncontrolled forces to be transmitted and lead to fatigue fracture.

Check that the cranes do not tilt when the load is suspended from an overhang section.

Ensure that all attachment points are freely accessible for inspections and servicing or that free access can be provided.

The control device (e.g. control pendant) must be marked in such a way that the direction of movement is clear and distinct. The arrow symbol on the switching elements must correspond to the direction of movement.

A clearance check must be carried out after completing assembly.

Check for:

- smooth travel over track joints,
- safe and reliable current collector contact,
- smooth running of the trailing cable,
- safety distances to adjacent parts of the building, machinery and similar items.

6 Putting into service for the first time

6.1 Safety instructions when putting into service for the first time

The installation may only be handed over when its safety has been verified by means of a corresponding check
⇒ "Checks on entering service, handover", Page 77.

WARNING



Safe operation of the installation is not yet ensured when it is first put into operation.

KBK installations may only be put into service if they have been installed/assembled according to the operating instructions.

- Machines may only be put into operation by qualified personnel.
- Check installation/operation of the safety devices before commissioning.
- Check all safety distances.
- Check to ensure that the mains voltage and frequency match the details specified on the rating plate.
- Check to ensure that the pressure of the compressed air supply system matches the details specified on the rating plate.
- Ensure sufficient working clearance before starting assembly work.
- Secure and fence off the working and danger zone.
- Wear protective equipment.
- Move the trolleys by hand and check that they can be moved without resistance by hand over the entire length of the track section (if fitted).

Only trained personnel may be employed when the installation is first put into operation since:

- it may be necessary to render safety devices or features inoperative when adjustments or function checks are carried out,
- work may need to be performed in the danger zone when the installation is first put into operation.

CAUTION



Overload, incorrect specification

When under load - with the hoist trolley on the crane overhang - cranes must not tilt on the crane suspension on the opposite side of the crane.

The following measures must be taken if the crane tilts:

- Check the maximum permissible load capacity and the suspended load.
- Compare the distances between the suspensions and the crane span dimension with the dimensions given on the project-engineering drawing.
- Compare the crane girder length and any overhangs with the dimensions given on the project-engineering drawing.

A check may need to be carried out by a planning engineer.

6.2 Inspection regulations

WARNING



Non-compliance with operating and maintenance regulations

Danger to life and limb.

Compliance with all inspection regulations is essential to ensure safe operation of the installation.

Required tests and inspections must be carried out.

All inspections must be arranged and documented by the owner at the specified intervals/points of time.

- Inspection in accordance with relevant national regulations, e.g. UVV/BGV D6 for cranes; UVV/BGV D8 for winches, hoists and towing devices in Germany.

The owner is responsible for ensuring that power-driven cranes (electric travel drives) are inspected by an expert engineer before they are first put into service and before they are put into service again after major modifications have been carried out. This also applies to cranes that are not fitted with travel drives and which have a load capacity of more than 1000 kg.

- Adjustment, maintenance and inspection activities and inspection deadlines including specifications concerning the replacement of parts/assemblies prescribed in the operating instructions must be observed.
- Please refer to the chain hoist and, if necessary, the trolley operating instructions for values for noise pressure level measurement to DIN 45635.

This work may only be carried out by specialist personnel.

6.3 Inspections before putting into service for the first time

The owner is obliged to carry out the following checks before the unit is put into operation for the first time:

- Check continuity of the PE conductor connection;
- Check emergency stop device;
- Check direction of movement;
- Check operation of the brake.

6.4 Checks on entering service, handover

WARNING



Unauthorized operation

Danger to life and limb if the installation is operated without previous inspection.

KBK installations may only be put into service if they have been checked for compliance with the corresponding accident prevention regulations.

By means of suitable measures carried out by the owner or on his behalf, the owner must ensure that the load handling attachments and machinery ready for operation function in complete safety before they are first put into service. The specified measures must allow for the static and dynamic features of the installation. Since KBK installations are assembled and/or installed at the place of operation, this inspection must be performed on site.

The following checks must be carried out when the installation enters service:

- The supporting structure must be in good condition and the load capacity of the KBK installation must be checked.
- Safety devices must be complete and effective.
- Clearances and safety distances must be maintained.
- The emergency-stop device must be checked by actuating the emergency stop.
- A clearance check must be carried out when the installation enters service.
 - Smooth travel over track joints.
 - Safe and reliable current collector contact
 - The trailing cable must run smoothly.

When the unit is first put into operation, it must be checked to ensure that it is used as intended in all possible applications, in each case with the maximum permissible load. Operation of the safety devices must be checked (e.g. by lifting an overload). At the same time, the behaviour of the installation must be checked when it is not used correctly.

Various checks of the machine must be carried out before it is handed over:

- Check to ensure it is suitable for operation,
- Acceptance inspection.

The test and inspection records can be compiled as soon as safe operation of the installation is ensured.

The test and inspection records (test and inspection booklet; observe relevant national regulations) must be handed over when the installation is handed over.

The installation may be used as intended after it has been handed over.

7 Operation

7.1 Safety instructions for operation

WARNING



Incorrect operation

Risk of injury due to incorrect operation.

Incorrect operation may result in severe injury or damage to property. The installation may only be operated by authorized and instructed personnel in compliance with all accident-prevention and safety regulations. National regulations for the use of cranes and lifting appliances must be observed and followed.

- The owner must arrange for operating personnel to be trained.

WARNING



Danger of crushing and shearing, drawing-in or entanglement

There is a risk of injury due to parts of the body being crushed/sheared or clothing or hair becoming entangled when loads are moved, lifted or lowered.

If the installation is suspended at a height within normal reach, there is a risk of injury between moving and stationary parts.

- Protective devices must be provided.
- Do not touch the supporting means.
- Do not reach between the upper and lower entry point of the supporting means.
- Do not reach between the load and the load handling attachment when loads are lifted.
- There must be nobody present in the immediate danger zone when the load is set down.
- Safety distances must be maintained.
- The tilting moment must not be exceeded when loads are picked up and moved.

WARNING



Suspended load. Falling parts. Impact hazard.

Danger to life and limb if lifted loads are dropped.

Keep out of the danger zone at all times

- Keep a sufficient safety distance.
- Never step under a suspended load.
- Loads must not be lifted above persons.
- Wear protective equipment.

WARNING



Non-compliance with operating regulations/industrial safety regulations

Danger to life and limb if relevant regulations are disregarded.

KBK installations may only be operated in compliance with relevant national operating regulations, e.g. BGV D6 for cranes in Germany.

- If required, apply a copy of the relevant operating regulations, part no. 214 748 44, at a suitable place where operators can read them at any time (e.g. at the mains connection switch).

The KBK installation must not be put into operation or must be taken out of service immediately if any defects or irregularities are detected with reference to its operating safety and reliability or function. Safety devices must not be rendered inoperative or modified contrary to their intended use.

Special local conditions or special applications may lead to situations which were not known when this chapter was written. In this case, the owner must ensure safe operation or take the installation out of service until measures for safe operation have been clarified and implemented in agreement with Demag or other relevant bodies. In the event of a stoppage (e.g. if defects regarding safe and reliable operation are detected, in emergency situations, in the event of operating malfunctions, for repairs and maintenance purposes, if damage is detected or after finishing work), the operator must carry out all prescribed safety measures or observe that they are automatically carried out.

Work on electric equipment may only be carried out by qualified electricians.

Avoid naked flames, extreme heat (e.g. welding) and sparks when using cleaning agents and in the vicinity of flammable parts or parts liable to deformation (e.g. wood, plastic parts, oil, grease in electric equipment); non-compliance may result in a fire hazard, harmful gases may evolve or insulation may be damaged.

Cooling devices, such as ventilation openings, may not be rendered permanently inoperative (e.g. covered or closed).

7.2 Switching on

7.2.1 Checks when starting work

Before starting work, the operator must be satisfied that the installation is in safe and correct operating condition. Ensure that nobody is endangered by operation of the KBK installation before it is switched on or put into operation. If the operator notices persons who may be exposed to a risk to their health or personal safety by operation of the installation, he must stop operation immediately and may not resume operation until the persons are outside the danger zone.

If there are any defects which endanger safe and reliable operation, the KBK installation must be taken out of service without delay. Defects relevant to safety in this sense are, for example:

- Damage to electric devices, cables or insulation,
- Delayed operation or failure of brakes and safety devices,
- Missing covers or housing parts or
- Damage to the supporting means or load bearing parts.

Anybody who identifies an immediate danger of personal injury must actuate the emergency stop without delay. This also applies if damage occurs to parts of machinery or equipment which makes an immediate stoppage necessary.

If the KBK installation has been stopped by an emergency stop due to safety-relevant defects, it must be secured against being returned to operation until an experienced technician is satisfied that the cause of the hazard situation has been eliminated and that operation of the installation is possible without any hazard.

Before starting work:

- Wear protective equipment.
- Ensure that nobody is present in the danger zone of the equipment.

7.2.2 Function checks

Instructions for users where BGV D06 accident prevention regulations apply:

In accordance with BGV D06, the crane operator must also check operation of the emergency stop device when starting work. This does not apply to slipping clutches used as an emergency-stop device which do not need to be checked when starting work (BGV D06, Section 30).

The following main functions of the installation must be tested before work begins:

Component	Function check
Control devices	Unlatch the emergency-stop button on the control panel to enable the crane switch.
Limit switches	Check the limit switch functions by carefully approaching the switching positions. This applies for the lifting motion limit switches (see corresponding operating instructions) and for the long and cross-travel limit switches (if fitted).
Brakes	Check the run-on paths of hoist unit brakes and travel drive brakes. The brakes must be adjusted if the brake paths noticeably increase. See the corresponding operating instructions for brake adjustment.
Safety equipment	Check emergency limit-stop and emergency-stop devices. Safety devices do not relieve the crane operator of his obligation to work with due care. Only correct functioning of the safety devices can guarantee the necessary level of safety in the event of a crane operator error.
Control unit (pendant control – wireless control)	Care must be taken to treat the control unit appropriately. The crane operator selects the lifting and travel motions using the control unit. Recharge the rechargeable batteries of wireless control units in good time.
Buffers	The crane, crab, adjacent cranes and adjacent crabs are fitted with appropriate elastic buffers. The buffers reduce the forces transmitted when the crane runs against the crane runway limit stops/cross travel limit stops and/or adjacent cranes/adjacent crabs. The crane/crab buffers must not be approached in normal operation. The buffers must be checked regularly for correct operation. Cracks and lasting deformation indicate poor operating characteristics.

Tab. 50

DANGER



Malfunction following assembly work

Danger to life and limb if assembly work has not been carried out appropriately.

The control devices must be checked for correct and proper operation following work on the main power supply and before work begins. If the phases are not correctly connected, the switching elements and limit switches may not function as intended.

7.3 Operation

7.3.1 Safety during operation

WARNING



Overload

Danger to life and limb.

Higher loads than those specified on the load capacity plate must not be handled.

- Do not exceed the maximum permissible load capacity of the crane.
- Only use load handling attachments which are adequately dimensioned.
- Only use load handling attachments for their intended purpose.

Important information for operation

Observe the following during operation:

- Take the crane installation out of service immediately if functional defects or irregularities are detected.
- The operator is obliged to check the crane installation for any visible damage at least once per shift and to report any damage immediately.
- Do not render safety devices inoperative.

- Do not approach limit stops in normal operation, e.g.: emergency-stop devices (emergency limit switches), emergency limit stop devices (slipping clutch or emergency limit switch), track and limit buffers to stop movement of the crab or crane, hook assembly or bottom block against limit stops.
- Pay attention to all regulations regarding the correct loading of chains and ropes.
- Do not reach into rotating parts and maintain a sufficient safety distance to prevent clothing, parts of the body or hair becoming entangled.

7.3.2 Load pick-up

- Load handling devices and loads must be flexibly suspended from **KBK classic trolleys**. Rigid connections cause uncontrolled forces to be transmitted and lead to fatigue fracture.
The connection between the load and the load handling attachment may be rigid in **KBK Ergo installations**.
- When attaching the load, ensure that loads do not fall over, fall apart, slip or roll off when they are picked up or deposited.
- Transporting people is not permitted unless the lifting devices are specifically approved for transporting people.
- Do not exceed the maximum load specified on the load capacity plate.

7.3.3 Moving the load

- For lifting and travel motions, adopt a position that provides a clear view of the danger zone or use a second person who can observe the danger zone.
- Push-travel hoists/trolleys/cranes may only be moved by pulling or pushing the load, bottom block or load hook assembly. Never pull on the control pendant.
- Push-travel loads must be guided by hand. The load must never be thrown or hurled.
- Do not handle suspended loads above persons.
- Do not pull or drag suspended loads at an angle.
- Do not pull free fixed or obstructed loads with the hoist.
- Do not leave suspended loads unsupervised.
- Do not allow the chain to pass over edges and do not use the chain as a load bearing sling.
- Do not allow loads to drop when the chain is in a slack condition.
- Vibration from the load being transported (e.g. when the load is deposited on vibrating machinery) must not be transmitted to the lifting equipment.
- Do not pick the load up at full speed.
- Avoid inching (e.g. giving short pulses to the motor).

7.4 Emergency stop

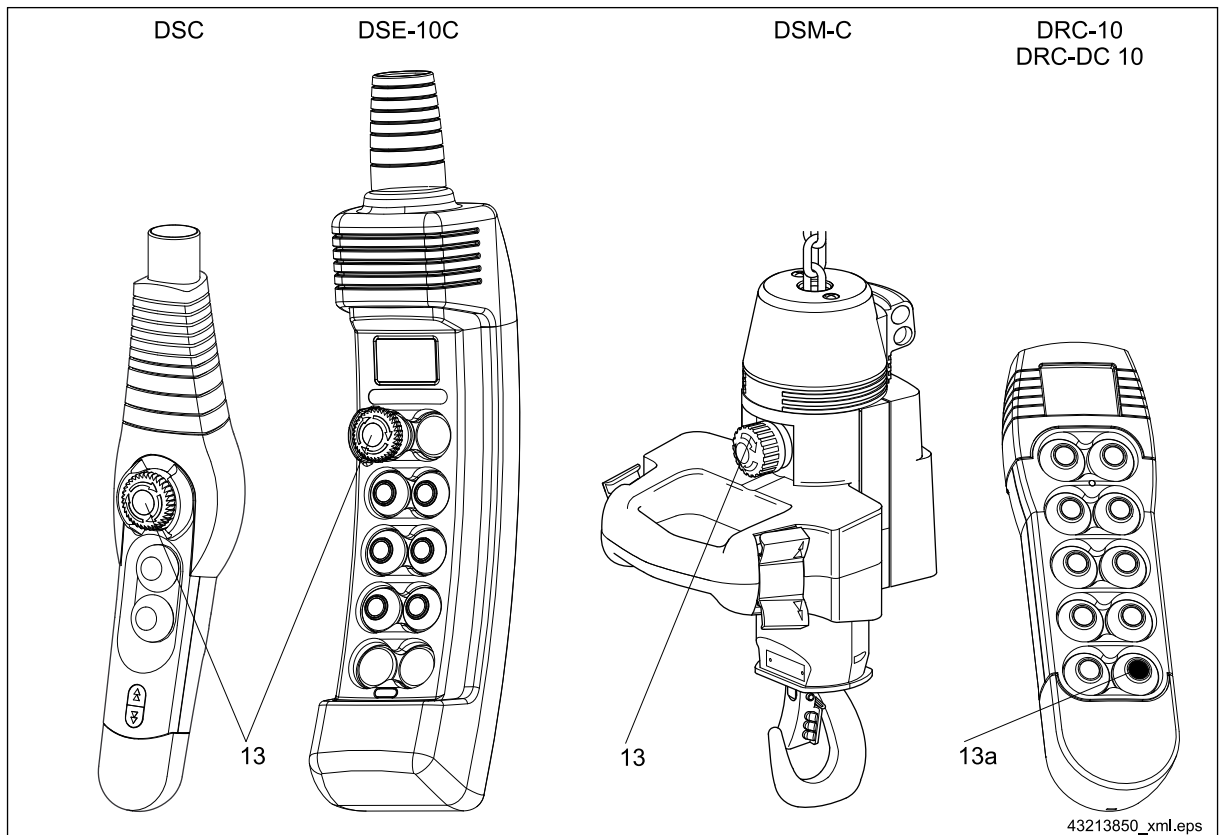


Fig. 76 Position of emergency stop (13)

WARNING



Unauthorized, negligent or accidental switching-on.

Danger to life and limb.

Check to ensure that the reason for the emergency stop has been eliminated before the machine is switched on again.

The emergency-stop device must not be used to switch the machine off in normal operation.

The emergency-stop switch is arranged in a clearly visible position on the control pendant, see also the chain hoist operating instructions. Anybody who identifies an immediate danger of personal injury must actuate the emergency stop without delay. This also applies in the case of damage that occurs to parts of the installation and equipment which makes it necessary to stop and secure the installation immediately.

- To actuate the emergency stop, press the button until it reaches the end stop. It then locks automatically and the hoist unit is shut down.
- To unlock the actuated emergency stop, turn the pushbutton in the direction of the arrows (clockwise) and release it.

Following an emergency stop, do not switch the installation on again until a trained person is satisfied that:

- the cause which led to actuation of this function has been rectified and
- continued operation of the machine constitutes no further hazard.

7.5 Taking the equipment out of operation

7.5.1 Taking the equipment out of service when faults occur

The machine must be switched off immediately if the following faults occur:

- If electric devices and cables as well as parts of the insulation are damaged.
- Brake and safety device failure.

7.5.2 Taking the equipment out of service at the end of the shift

The following measures must be taken when finishing work or leaving the working area:

- Position the hoist unit outside the travel area.
Deposit any load handling attachments, such as grabs or magnets.
- Run the crane to the rest position if grabs or magnets are fitted.
- Actuate the emergency stop.
- Switch the hoist unit power supply off at the mains connection or isolating switch.

7.5.3 Taking the equipment out of service for maintenance and repairs

1. Switch off the mains connection switch or isolating switch before commencing maintenance work.
2. Secure the mains connection switch with a padlock to prevent unauthorized or accidental reconnection to the supply.
3. Only carry out maintenance work on the crane when the load has been removed.
4. Stop all moving parts and ensure that they cannot start moving while maintenance work is being carried out.
5. Observe the relevant accident prevention regulations, instructions concerning intended use and statutory regulations for operation and maintenance.
6. Observe the relevant safety regulations when repairing electric equipment.

8 Maintenance work

8.1 Safety instructions for maintenance and repair work

The following sections contain a description of maintenance work that is necessary for optimum and uninterrupted operation of the installation.

DANGER



Live components

Danger to life and limb.

Work on electric equipment may only be carried out by qualified specialist personnel (⇒ "Definition of personnel", Page 9) in compliance with the safety regulations.

Switch off the electric power supply before starting work. The mains connection or isolating switch must be protected against unauthorized or accidental restoration of the power supply by means of a padlock.

Compressed air-powered equipment must be disconnected from the compressed air supply by means of a stop valve.

WARNING



Inappropriate maintenance work

Danger to life and limb. Risk of material damage.

Maintenance and repair work may only be carried out by authorized, instructed personnel (⇒ "Definition of personnel", Page 9) in compliance with the safety regulations.

- Secure and fence off the working and danger zone.
- If an elevating work platform is used for maintenance work, only use appropriate attachments for the lifting of persons which ensure that work is carried out in a safe and stable position.
- Only suitable, tested and calibrated tools and accessories may be used for maintenance work.
- Only use approved spare parts, see also ⇒ "Use of spare parts", Page 9.
- Wear protective equipment.
- Be careful when working on open components that have sharp edges. Risk of injury.
- Keep the working area clean and tidy. Store any unneeded machine or installation parts and tools in such a way that there is no risk of them falling.
- Fit components correctly and as intended. Comply with specified bolt tightening torques. Incorrectly fitted components may fall and cause severe injuries.
- Welding work may only be carried out by persons who are specially qualified. DIN welding work requirements must be fulfilled. The electrode holder and earth must be connected to the same assembly when welding work is carried out. Otherwise serious damage may be caused to the hoist. Trolleys must not be welded or drilled.
- Customer-specific regulations must be observed.

CAUTION



Loose connections

Loose connections are a danger to life and limb and a risk of damage to the machine.

Metal nuts featuring a locking element (self-locking nuts) must not be replaced by normal nuts.

They must be replaced when they have been connected and disconnected five times.

CAUTION



Risk of injury.

Oils and lubricants may pose a health hazard.

Contact with these media may result in serious damage to health (poisoning, allergies, skin irritations, etc.).

CAUTION



Risk of injury.

Leaking oils and lubricants are hazards due to the increased risk of slipping.

Spilt oils and lubricants must be absorbed immediately by means of sawdust or oil absorbent and disposed of in an environmentally compatible way.

8.2 Service

KBK suspension monorails and KBK suspension cranes require little maintenance under normal operating conditions.



If required, our trained specialists can carry out maintenance work for you, either as a special order or as part as an inexpensive inspection agreement, see ⇒ "After-sales service", Page 10. Our experts are highly experienced and are equipped with the latest overhaul and maintenance tools. They carry common wearing parts with them or can obtain them quickly from local service centres.

Only trained personnel may carry out maintenance work on the installation. Ensure that persons who carry out maintenance work on cranes are suitable and authorized. Have maintenance work carried out by a Demag partner as far as possible.

8.3 Basic maintenance requirements

General information on maintenance/repairs

The specified inspection and maintenance intervals (⇒ "Maintenance schedule", Page 89) apply to normal KBK installation operating conditions. All wearing parts must be checked in the course of the annual inspection.

If routine maintenance reveals that the intervals are too long, they should be adapted to the specific operating conditions.

Electric components

Only fuse links with the specified amperage and tripping characteristics may be used in the electric circuits. Defective fuse links must not be bridged.

Pay attention to the following when working on machinery or machine equipment:

1. Wear personal protection equipment.
2. Before starting any maintenance work, switch off the mains connection switch and protect it against unauthorized or accidental reconnection to the power supply by locking it with a padlock.
3. Only carry out maintenance work on the crane when the load has been removed.
4. Mark off the working area with a red/white safety chain or safety tape and warning signs.
5. Ensure that there is sufficient freedom of movement. Keep the working area clean and tidy. Loose parts or tools left lying around may cause accidents.
6. Stop all moving parts and ensure that they cannot start moving while maintenance work is being carried out.
7. Observe the relevant accident prevention regulations, instructions concerning appropriate use and statutory regulations for operation and maintenance.
8. Observe the relevant safety regulations when repairing electric equipment.
9. When removing a track section: secure both track ends at a rail joint with ropes against dropping before loosening a bolted connection.
10. Reinstall safety devices as required by relevant regulations and check them for correct operation after finishing maintenance work.

Maintenance work which is not possible from the ground may only be carried out from work stands or platforms. The danger zone below the crane must be fenced off if there is a risk of falling objects.

Instructions for maintenance work in the course of operation

If maintenance work has to be carried out on the installation in the course of operation, special safety precautions must be taken depending on the operating situation. In each individual case, the owner or the person assigned by him must check whether the maintenance work may be carried out in the course of operation without risk of personal injury and, taking into account the local conditions, must implement all necessary safety precautions. Replace damaged or deformed spring clip fasteners and retaining elements such as split sleeves or BoClips. Split pin slots must face outwards. Defective bolted connections must be replaced. Self-locking nuts must not be replaced by other types of nut. Self-locking nuts must be replaced when they have been tightened and untightened five times. Load-bearing parts and trolleys must not be welded or drilled. Ensure that operating and auxiliary materials and replaced parts are disposed of in an environmentally friendly manner.

8.4 Regular inspections

8.4.1 Required tests and inspections

WARNING



Non-compliance with operating and maintenance regulations

Danger to life and limb.

Required tests and inspections must be carried out.

- An annual inspection, e.g. as specified in German accident prevention regulations UVV/BGV D8 Section 23 (2) and BGV D6 (1) must be carried out.
- Adjustment, maintenance and inspection activities and inspection deadlines including specifications concerning the replacement of parts/assemblies prescribed in the operating instructions must be observed.

This work may only be carried out by specialist personnel.

Cranes and equipment must be inspected by a specialist at least once a year. Regular inspections mainly consist of a visual inspection and a function check which should include a check to determine the condition of components and equipment regarding damage, wear, corrosion and any other safety devices. Regular inspections must be carried out in accordance with BGV D6 and BGG 905 "Principles for the inspection of cranes" in Germany. The results of inspections must be entered in a test and inspection booklet. It may be necessary to remove parts in order to inspect wearing parts. Load-bearing media and suspensions must be inspected along their entire length, including those parts which cannot normally be seen. Defective parts and components and parts close to failure must be replaced.

Please also note ⇒ "S.W.P. measures for achieving safe working periods", Page 87 and ⇒ "Maintenance schedule", Page 89.

All inspections must be arranged and documented by the owner.

8.4.2 S.W.P. measures for achieving safe working periods

The safety and health provisions of the EC Machinery Directive make it a legal requirement to eliminate special hazards which may be caused, for example, by fatigue and ageing. KBK crane and monorail installations are dimensioned on the basis of the DIN 15018 Cranes, DIN 4132 Crane runways and DIN 18800 Steel structures standards. Cranes are designed for a limited service life, as is all other machinery.

This is influenced by:

- fatigue,
- corrosion,
- accidents during operation and installation,
- overloads and
- insufficient maintenance.

Therefore, pay particular attention to the instructions and information in ⇒ "Maintenance work", Page 85.

KBK cranes are classified in lifting class H1 and loading group B3 to DIN 15018. Various operating cycle ranges result for the loading groups depending on the stress spectrum (S0 – S3, see table).

The following table with an explanation of the S0 – S3 stress spectra will help you to assess the classification of the crane installation in practical terms:

Stress spectra

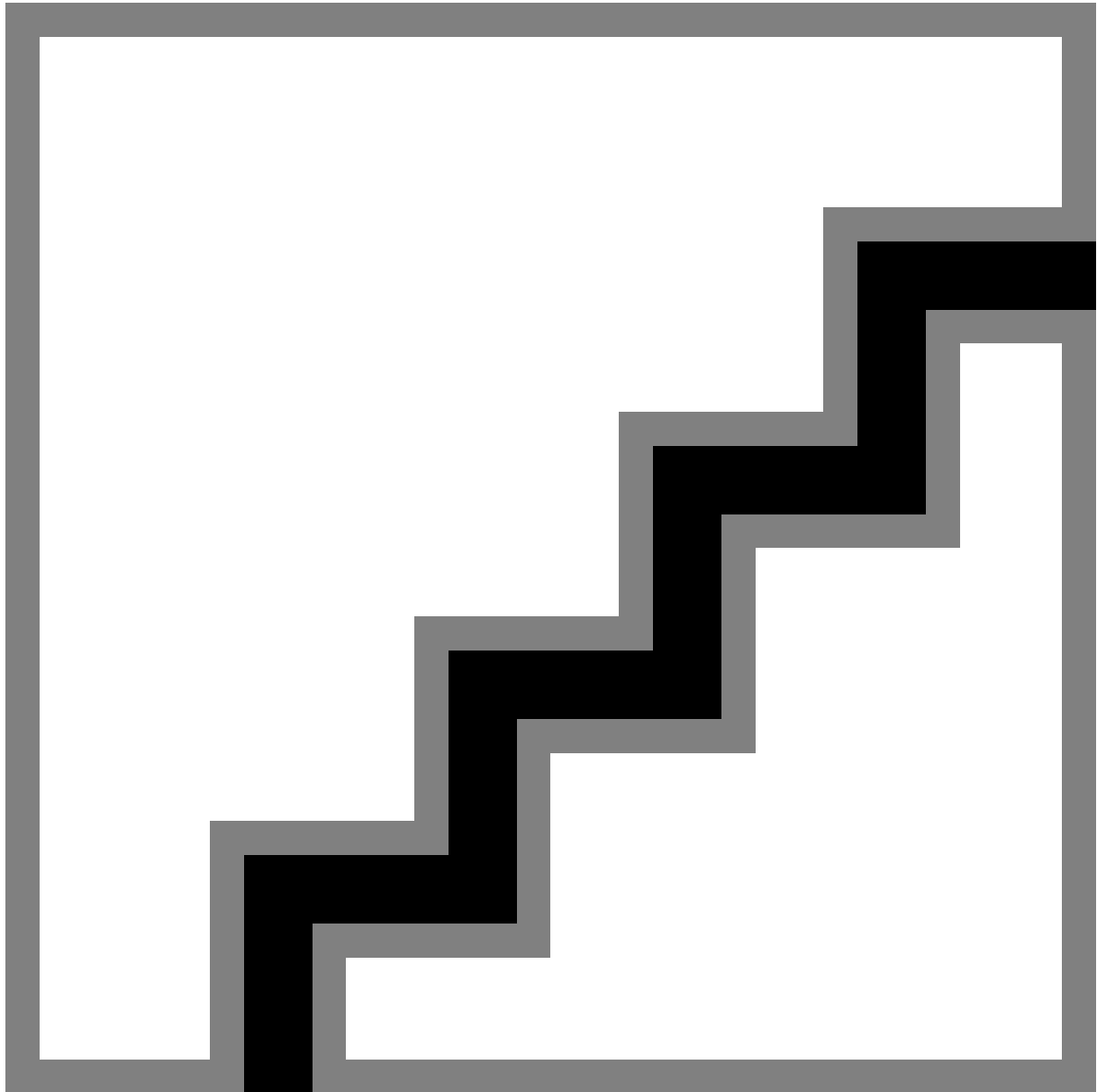


Fig. 77

Item	Designation	Item	Designation	Item	Designation
L	Load	LZ	Operating time	a	Full load
b	Medium partial load	c	Small to medium partial load	d	Small dead load
e	Small to medium dead load	f	Heavy dead load	g	Very heavy dead load

Tab. 51

Max. stress cycles per day (to DIN 15018, table 14) crane operating period: 10 years; 250 working days per year			
Stress spectrum	Loading group		
	B1	B2	B3
S0 very light	80	240	800
S1 light	-	80	240
S2 medium	-	-	80
S3 heavy	-	-	-

Max. stress cycles per day (to DIN 15018, table 14) crane operating period: 10 years; 250 working days per year				
Stress spectrum		Loading group		
An average cycle time of 3 mins. = 20 cycles/h (hook-up, lift, cross travel, long travel, lower, deposit and back) results in an operating period in hours per day of:	S0	4	12	24
	S1	-	4	12
	S2	-	-	4
	S3	-	-	-

Tab. 52

A stress cycle for the crane structure corresponds to a crane operating cycle. Information on the hoist service life can be found in the corresponding operating instructions.

8.5 Maintenance schedule



The inspection intervals specified below apply for KBK installations in normal single-shift operation. If routine maintenance reveals that the intervals are too long, they should be shortened according to the specific operating instructions. Shorter inspection intervals are necessary for cranes used in continuous extreme operation or in multi-shift operation and under special operating conditions such as casting shops and hot applications.

KBK installations are normally classified in loading group B3 to DIN 15018 and DIN 4132. This means that the stress cycle range is from 2×10^5 load cycles for heavy duty to 2×10^6 load cycles for very light duty. The table below is intended to assist in identifying faults liable to affect regular operation of the installation. It may be used as a basis for preventive maintenance and to compile an overall service schedule. This table does not contain regular inspections and checks, some of which must be carried out daily. Additional information can be found in the chain hoist and friction wheel travel drive instructions.

Within one to two months of the installation being put into operation and during regular inspections, all bolted connections of the following components must be checked and, if necessary, tightened or secured to compensate for the settling which always occurs in bolted connections and any reduction in initial tension:

- suspension fittings,
- track joint bolt sets and end caps,
- spring clip fasteners on suspension fittings,
- pin connections between hoist and trolley,
- pin connections between crane girder and track trolley,
- track trolley.

See ⇒ "Tightening torques", Page 24 for bolted connection tightening torques.

Check and/or ensure that the sliding shells are present for each ball head suspension rod, ball head bolt, short suspension fitting and crane suspension fitting.

Item no.	Component	Details to be checked	Inspection intervals in months		
			3	6	12
1	Complete installation	Overall impression, general condition, talk with operators		■	
		Information plates			■
2	Track system				

Item no.	Component	Details to be checked	Inspection intervals in months		
			3	6	12
2.1	Suspension components	Mounting, damage, wear			■
	Track suspensions Crane suspensions	Bolted connections on support structure (e.g. clamps)			■
		Bolted connections between (KBK Ergo): - Trolley and end carriage, - End carriage and stiffener plate			■
		Fit of spring clips (see items 2.5 and 5.1)			■
		Depth to which suspension rods are screwed in (check holes) and correct fit of springs clips			■
		Fit and wear of sliding shells, possibly loosen suspension clamps for inspection			■
		Short suspension arrangement without height adjustment: replace the complete suspension fitting if sliding shells are worn			■
		Bolted connections on track clamping fixtures and hinge sockets			■
		Load on suspension rods (vertical play)			■
		Crane suspension with sliding shell: fit, wear, lubrication of sliding shell, for high load cycles or special conditions, e.g. casting shop, hot installations, replace the complete crane suspension fitting if sliding shells are worn	■		■
		Crane suspension with pivot bearing			■
		Retaining pins on stiffeners and V-type suspensions, wear			■
	Lubrication of articulated joints (resin-free grease)			■	
2.2	Straight and curved sections	Dirt accumulation			■
		Wear on the track			■
		Wear of edges in rail section gap			■
		Rail gap width Aluline A12/A16: 23 ±0.5 mm Aluline A18/A22: 31 ±0.5 mm Replacement is necessary when the measured values are exceeded			■
2.3	Track bolted joint	Bolted connections (retighten, as required), fit of the adjusting pins			■
	End caps, track buffers, buffers on trolleys and cranes	Alignment of track joints			■
		Secure attachment, wear, replace if worn			■
Shock absorbers	Secure attachment, wear, replace if worn			■	
3	Conductor rail system				
3.1	Supporting section	Deposits		■	
		Fixed point		■	
		Maximum vertical and horizontal misalignment of 1 mm		■	
3.2	Busbars	Wear		■	
		Burnt spots		■	
		Corrosion		■	
		Tight fit in PVC supporting channel		■	
3.3	Busbar connectors	Correct and tight fit of busbar, connector and PVC supporting channel		■	
3.4	Suspension	Attachment		■	
3.5	Power pick-up guides	Maximum horizontal misalignment 1 mm		■	
		Attachment		■	
3.6	Power feed	Cable connection		■	
		Fit of plug connectors		■	
3.7	End cap	Attachment		■	
3.8	Isolating section	Wear		■	
		Dirt deposits		■	
4	Current collector trolley				
4.1	Sliding contacts and arms	Wear (max. 7 mm, up to the insulation)		■	
		Contact pressure		■	
		Centring		■	
		Mobility		■	
		Attachment		■	
4.2	Terminal strip	Cable connection		■	
4.3	Connection cable	Broken strands		■	
		Insulation		■	
		Strain relief		■	

Item no.	Component	Details to be checked	Inspection intervals in months		
			3	6	12
4.4	Travel wheels and guide rollers	Wear, tightness, mobility		■	
4.5	Coupling	Attachment		■	
5	Trolleys, crabs and cranes				
5.1	Trolley and trolley for DRF 200, RF 125	Smooth operation, wear and damage to the wheels			■
		Retaining pins			■
		Suspension bolt wear (max. 1 mm); Side cheek wear (max. 0.5 mm) Must be replaced when dimension value is exceeded			■
		Smooth running and wear of support rollers		■	
		Sealing cover of guide rollers, load bars, crane trolleys, crab frames		■	
		Wear of link bars, coupling elements, spacer bars			■
		Free movement			■
		Secure fit of the split sleeves			■
5.2	DRF 200, RF 125 friction wheel travel drives	see friction wheel drive operating instructions		■	■
		Friction wheel contact pressure		■	■
5.3	Hoist unit	See hoist unit operating instructions			■
5.4	Current collector trolley	See item 4		■	
6	Electrical equipment on trolleys/crabs				
6.1	Contact control	Burnt contactor contacts	■		
6.2	Run-up limit switch	Switching distance (approx. 25 mm for proximity switches)	■		
6.3	Lead connections on terminal strip	Tight fit		■	
6.4	Fittings	Tight fit of bolted connections		■	
7	Electrical equipment on tracks				
7.1	Contact control	Burnt contactor contacts	■		
7.2	Proximity switches	Switching distance approx. 15 to 25 mm	■		
7.3	Emergency stop buttons	By actuation	Daily		
7.4	Hoist/crab spacing on runway	2 traveling hoists		■	
7.5	Lead connections on terminal strip	Tight fit		■	
8	Trailing cable power supply, compressed air hose	Condition of cable (kinks)			■
		Wear of cable trolleys and cable sliders			■
		Spacing of cable trolleys or cable sliders			■
		Cable damage			■
		Wear of the compressed air hose Attachment and tension of the guide rope			■
9	Steel superstructure	Bolts and bolt-locking arrangements, corrosion	As specified by the manufacturer		

Tab. 53

8.6 Maintenance work

8.6.1 General remarks on maintenance work

WARNING



Performing maintenance work

Danger to life and limb. Loose parts may fall.

Use every possibility to work safely when doing inspection work.

- Before starting any maintenance work, switch off the mains connection switch and protect it against unauthorized or accidental reconnection to the power supply by locking it with a padlock.
- Cordon off a large area around the working zone.

Replace factory-assembled parts (crane suspension eye, short suspension fitting) only as complete units when they are worn. These parts must not be dismantled and reassembled with new components.

8.6.2 Removing and replacing rail sections

- Protect **both** ends of the rail against dropping (e.g. by ropes) at the track joint when a rail section is removed.
- Undo the bolted connection of this rail joint.
- Pull the joint apart. The articulated suspensions make this possible without having to dismantle the suspension assemblies.

KBK ...-R: Pull the track sections apart until the busbar connectors protrude freely from the busbars.

- Push the track section to be removed to one side until the rail section ends are located next to each other.

KBK ...-R: Remove the busbar connectors.

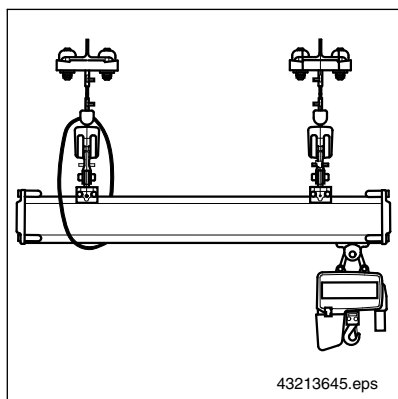
- Undo the bolted connection of the second rail joint.

KBK ...-R: Pull the rail section off the busbar connectors in the direction of the track.

- Install in reverse order.

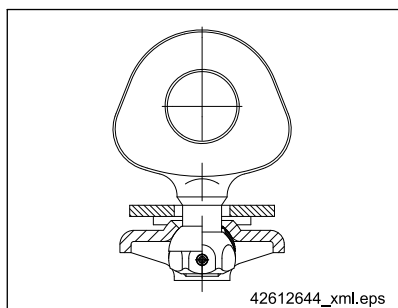
Please also note ⇒ "General remarks on connecting track sections", Page 38

8.6.3 Crane suspension fittings with sliding shell, track suspension fittings



Secure the crane girder against dropping (e.g. with a rope).

Fig. 78



Check the connection between the eye bolt and the ball socket on the crane suspension eye for: correct fit, wear, lubrication (approx. 1 cm³ of anti-friction bearing grease) and defective or missing sliding shells.

For crane suspension fittings on KBK Aluline, the suspension clamps must be removed from the rail and the suspension eye must be pulled down for inspection.

The ball nut or ring nut must not be even be undone for inspection purposes on any crane suspension fittings.

These checks must also be carried out for all track suspensions.

Fig. 79

8.6.4 Electric cabling and wiring

On the electric equipment, collector trolleys and cable sliders must be checked for wear and the isolators, terminal boxes and cables must be checked for damage. If an electrical lead is damaged, it must be replaced immediately.

8.6.5 Hoists units and travel drives

The hoist must be checked according to the relevant operating instructions, and the travel drives in accordance with the DRF 200, RF 125 friction wheel travel drive and E11-E34 DC travel drive operating instructions, see documents ⇒ Tab. 2, Page 7.

8.6.6 Removing trolleys and similar items from long or closed tracks

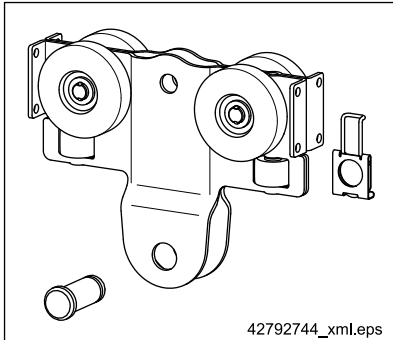


Fig. 80

The trolleys are fitted with travel wheels that have bearings which are lubricated for life. They cannot be disassembled. Replace complete trolleys if the trolley side cheeks or travel wheels are defective. All pins can be replaced.

If this cannot be done by simply removing an end cap, a travel unit can also be removed at a rail joint.

- Open a rail joint as described in ⇒ "Removing and replacing rail sections", Page 92.
- Pull the trolley out of the track.
- Install in reverse order.

8.6.7 KBK Ergo

The following tightening torques must be checked when maintenance work is carried out:

Bolted connection	Size	Tightening torque [Nm]
Trolley – end carriage	KBK Aluline A12/A16	45
	KBK Aluline A18/A22	130
End carriage – stiffener plate		80
End carriage – L-shaped steel crossbar for fitting the mast		80
Track suspension clamps	KBK Aluline A12/A16	10
	KBK Aluline A18/A22	25
Suspension clamp		120

Tab. 54

9 Malfunctions

9.1 Safety instructions in the event of malfunctions

WARNING



Inappropriate fault elimination

Danger to life and limb. Risk of damage to the machine.

Faults may only be eliminated by qualified instructed personnel (⇒ "Definition of personnel", Page 9) in compliance with the safety regulations.

DANGER



Live components

Danger to life and limb.

Work on electric equipment may only be carried out by qualified specialist personnel (⇒ "Definition of personnel", Page 9) in compliance with the safety regulations.

Switch off the electric power supply before starting work. The mains connection or isolating switch must be protected against unauthorized or accidental restoration of the power supply by means of a padlock.

WARNING



Risk of burns

Risk of burns from contact with the motors after operation of the installation.

Do not touch hot motor housings. Allow the motor to cool down before eliminating the fault.

Conduct when malfunctions occur

1. Bring the installation to an immediate standstill by actuating the emergency stop without delay if malfunctions occur that result in an immediate danger of personal injury, damage and/or an operating hazard.
2. Disconnect the installation from the power supply and secure it against reconnection.
3. Inform the person responsible at the location about the malfunction.
4. Have the malfunction and the cause of the malfunction identified and eliminated by authorized specialist personnel.

Conduct after a malfunction is eliminated

WARNING



Check for correct assembly

Before reconnecting the power supply, ensure that

- the malfunction and the cause of the malfunction have been eliminated.
- all safety devices have been fitted properly and are in perfect working order.
- nobody is present in the danger zone of the equipment.

10 Disassembly/disposal

10.1 General information on disassembly/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 ⇒ "Safety instructions for assembly", Page 22 of these operating instructions, in particular those with reference to protecting the ends of rail sections from dropping before they are disconnected .

Refer to ⇒ "Assembly", Page 22 of these operating instructions for information on removing components. Remove parts in the opposite order to assembly.

Unless a return or disposal agreement has been concluded, separated components must be recycled after proper removal:

- Scrap any remaining metallic material,
- Dispose of plastic elements for recycling,
- Separate and dispose of any other components by material type.



Electric scrap, electronic components, lubricants and other auxiliary materials are subject to special disposal regulations and may only be disposed of by certified companies.

National disposal regulations must be considered regarding environmentally friendly disposal. Further information can be obtained from corresponding local authorities.

11 Spare parts

11.1 General information on spare parts

Please refer to our "KBK Aluline crane construction kit" document ⇒ Tab. 2, Page 7 when ordering KBK component and spare parts. To facilitate rapid delivery, kindly quote the following numbers in your order:

- our order number for the crane delivery and
- the order no. of the component/spare part.

See separate assembly instructions for component parts lists for stacker crabs, monorail hoists and disengaging mechanisms.

11.2 Overview

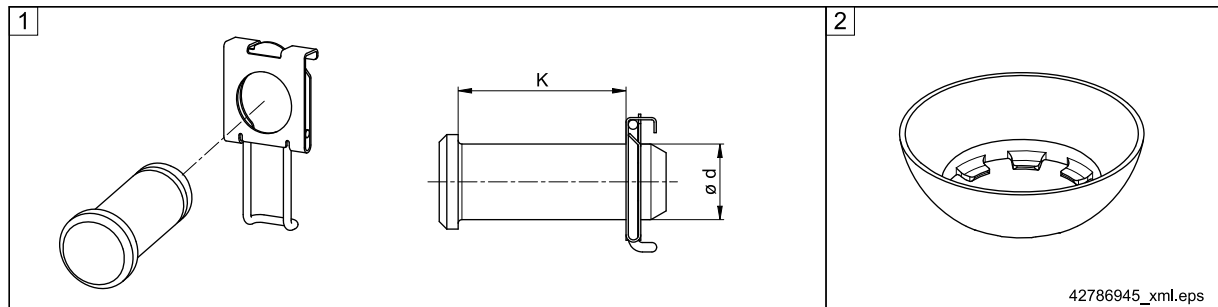


Fig. 81

Item	Designation		dia. d [mm]	K [mm]	Order no.	
1	BoClip pin retaining device, used in	Aluline A12/A16	Trolley	16	31	851 305 44
			Load bar			
			V-type suspension bracket			
			Crab frame suspension			
			Double-girder crane spacer bar			
			Redundant single trolley feature			
		Aluline A18/A22	Load bar suitable for curves	20	44	851 317 44
			Buffer fitting	20	54	851 318 44
			Spacer bar			
			Crab frame			
			Single-trolley link	16	41	851 306 44
				20	44	851 317 44
		130/270 tractor trolley	20	44	851 317 44	
		Aluline A18/A22	Trolley	20	44	851 317 44
			Load bar			
			V-type suspension bracket			
			Single-trolley link			
			Double-girder crane spacer bar			
			Link bar 270			
			Link bar 130	20	54	851 318 44
Buffer fitting						
Spacer bar						
Crab frame						
Redundant single trolley feature	20		64	851 319 44		
220 ergo load bar						
ergo buffer plate	20		97	851 320 44		
RF 125 rocker	20		44	851 317 44		
130/270 tractor trolley						
2	Sliding shell for ball-head suspension rod, 25 off (not for crane suspension, short suspension; only replace complete units)	Aluline A12/A16		980 815 44		
		Aluline A18/A22		851 394 44		

Tab. 55

The current addresses of the sales offices in Germany and the subsidiaries and agencies worldwide can be found on the Demag Cranes & Components homepage at www.demagcranes.com/Contact and Demag worldwide