Double-articulated current collector B1426-01

Operating manual

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1. General

1.1. Explanation of symbols

In this manual, warning notices are highlighted by symbols. Warnings are introduced by signal words which express the magnitude of the danger.
It is paramount that the warnings are observed and they must be treated with caution in order to avoid accidents and injury to persons or objects.

Danger!
... indicates a potentially dangerous situation which could result in death or serious injury if it is not avoided.

Electrical hazard!
... indicates a potentially dangerous situation which could result in death or serious injury if it is not avoided.

Caution!
... indicates a potentially dangerous situation which could lead to damage to objects if not avoided.

Note!
... emphasises useful tips, recommendations and information for efficient and fault-free operation.

1.2. Information on the manual

This manual describes the safe and correct assembly and operation of the product described. The safety instructions and information given must be observed, along with the local accident prevention regulations and general safety regulations which apply to the area of application.

Before commencing any work on the product, carefully read through and make sure you understand the manual from start to finish, in particular the chapter entitled "Safety" and the related safety advice.

1.3. Liability limitation

All information and notes in this manual were composed with consideration to the statutory standards and regulations, the present state of technology, as well as our many years of knowledge and experience.

The manufacturer will not be liable for damages due to:

- Non-observance of this manual
- Lack of comprehension of this manual
- Use of the product outside the intended purpose
- Negligent treatment
- Incorrect connection
- Modification of the product

1.4. Copyright

This manual must be treated as confidential. It is intended for exclusive use by persons who use the product. Passing it on to third parties without written consent from the manufacturer is prohibited.

Note!
The informational content, texts, drawings, images and other illustrations are protected by copyright law.

1.5. Replacement parts

Only use original replacement parts from the manufacturer!

Danger!
Incorrect or defective spare parts can cause damage, incorrect functioning or complete failure, as well as have an impact on safety.

1.6. Disposal

Always dispose of old products, especially electronic products, batteries and accumulators, at the appropriate collection points. This facilitates the recycling of material resources.

Note!
In some cases, there are additional instructions for disposal on the product, which must be observed accordingly.

2. Safety

2.1. Correct use

The product is only suitable for the use described in this manual.

Danger!
Any application and/or use of the product other than the intended use can result in dangerous situations.

2.2. Staff

The following qualification is specified in the manual:

- **Qualified personnel / expert**
  Is able to carry out work correctly and without risk of injury due to technical training, knowledge and experience along with knowledge of the relevant provisions. The responsibility for this lies with the operator.

Danger!
Risk of injury to insufficiently qualified persons! Improper handling can result in serious damage.

2.3. Personal protective clothing

Wearing personal protective gear is a requirement at work in order to minimise health risks.

- Always wear the necessary protective gear while working
- Observe the signs about personal protective gear in the work area
- Wear a helmet and well-marked protective work clothing

Protective work clothing
Is well-fitting work clothing with a low tear resistance, with tight sleeves and without any protruding sections. It primarily serves as protection against becoming caught in moving machine parts. Do not wear any rings, necklaces or other jewellery. A protective coat against arc flash risks in accordance with EN 50354 is a requirement when working with or in the vicinity of electrical installations.

Protective gloves
To protect the hands from friction, abrasions, cuts or more profound injuries. Special gloves in accordance with DIN 407 are a requirement when working with or in the vicinity of electrical installations.

Protective glasses / visor
To protect from flying splinters. Open or closed model customised to the work.

Safety helmet
To protect from falling objects. A special safety helmet with a protective shield against arc flashes as well as reflective strips is a requirement when working with or in the vicinity of electrical installations.

3. Transport and storage

3.1. Safety instructions for transport

Caution!
Improper transportation can cause considerable material damage.

3.2. Storage

The product must be stored as follows:

- Store in a protected area
- Store in a dry and dust-free area
- Do not expose to aggressive media
- Store in original packaging

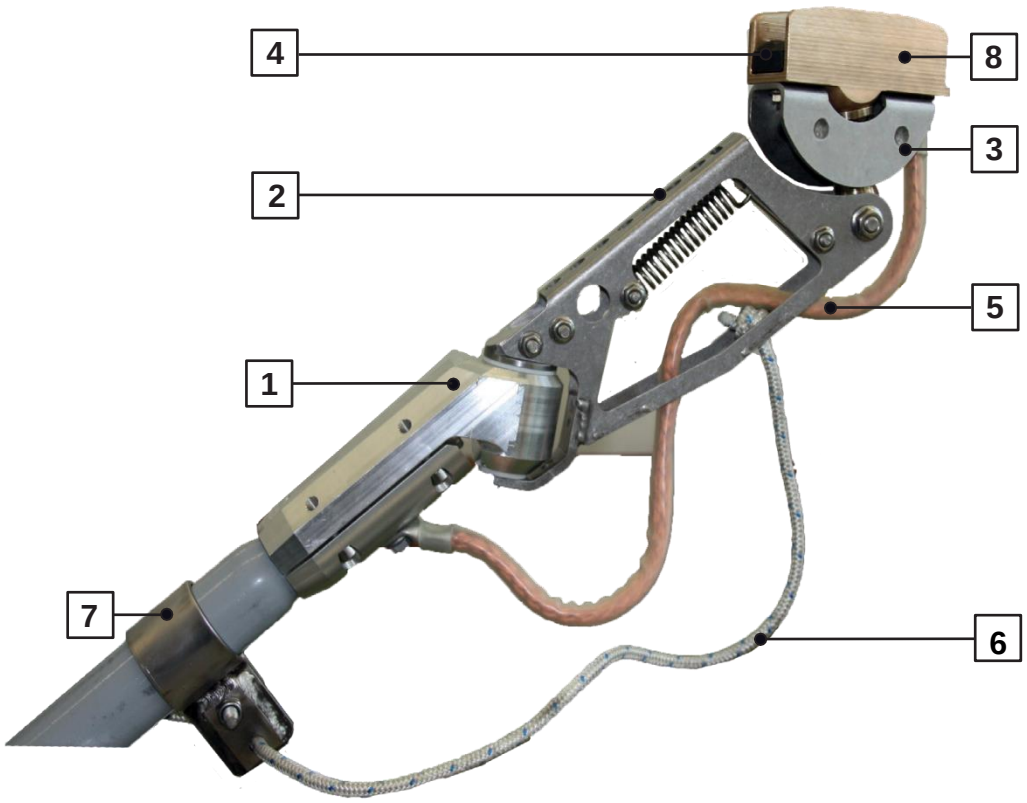
4. Design

4.1. Design and function

The current collector is part of a trolleybus current collector system. It contains the collector shoe with a carbon insert, which is made from graphite-containing carbon brush of differing degrees of hardness and creates the sliding contact to the live contact wire.

The current collector has a moving design so that the trolleybus can deviate by several metres to the left or right of the ideal line determined by the overhead contact line. The current collector can be assembled directly on a trolley pole (straight or offset) made from aluminium (e.g. of the type Kummler+Matter) with a diameter of 25mm. It is structured in such a way that it is almost impossible for it to become entangled in the overhead contact line in the case of dewiring. If this does nevertheless occur, the collector shoe folds rearwards into a position which prevents further damage. If the collector shoe still comes free from the pole, it is held by the existing safety rope. The folded down collector shoe can be moved back and latched into the original position without tools.

The bearing in the collector shoe has an insulated design so that the entire power current flows through the power connector. A vehicle with a broken power connector cannot carry on driving, which is intended to avoid consequential damage from driving with a defective power connector. The wire arrangement used has a significantly longer service life than older current collectors.



1. Clamping part
2. Current collector body with spring element
3. Collector shoe support
4. Carbon brush
5. Power connector
6. Safety rope
7. Safety bracket (optional)
8. Collector shoe

Note!
According to accepted standards, when driving backwards it must be ensured that the carbon brush does not slip out of the sliding shoe. The current collector does not have a carbon brush fuse.

Note!
This manual only deals with the current collector (B1426-01). All safety and evaluation aspects which relate to the system are the responsibility of the operator.

4.2. Area of application

The current collector including collector shoe was developed for trolleybuses with a declared overhead line voltage (U_n) of 600 V to 750 V DC. It can be used with offset and straight poles.
The weight could be reduced by approx. 30% by the consistent lightweight design. The sloped outlet of the carbons could be reduced and through this, the service life of the carbon brushes increased by approx. 14% (carbon of the type Morganite, MY259.)
The consequential damage in the case of dewiring is significantly lower. The maximum operating speed of 60 km/h applies to drives on straight roads.

The significant advantages of the current collector are:

- Lower weight than conventional double-articulated current collectors
- Lower carbon brush wear
- Fewer cases of dewiring and therefore a lower amount of consequential damage
- Fault-free functioning at a maximum driving speed of 60 km/h (on a straight road)
- Low maintenance

4.3. Technical specifications

Main dimensions L / W / H:	434 mm / 50 mm / 344 mm
Weight:	2.8 kg
Maximum driving speed:	60 km/h (straight road)
Permissible ambient temperature:	-20°C to 40°C
Maximum permissible temperature of collector shoe:	100°C
Operational angle horizontal:	max. 55°
Operational angle vertical (pole angle):	5° to 45°
Maximum contact pressure:	120 N
Release force, fold-down mechanism:	500N
Pole diameter:	25 mm +0 / -0.5
Tightening torque of assembly screws:	9 Nm
Power connector:	35 mm^2 (copper wire)
Maximum continuous current:	100A (limited by power connector)
Maximum peak current:	700 A
Safety rope:	Nylon, D=6mm, L=650mm
Standards:	DIN CLC/TS 50502 VDE V 0115-502:2009-08:2009-08

5. Assembly / Disassembly

5.1. General notes on assembly

Assembly must only be carried out by qualified personnel (see chapter 2.2). Protective clothing must be worn during all work (see chapter 2.3). Before assembly on the trolley pole, the most important components and functions must be checked (see chapter 6).

Danger!
Before working on the current collector system, it must be disconnected from the power.

Collector shoe

- Contact area to carbon brush clean and burr-free
- Lubricate collector shoe and support bolt surfaces
- Lubricant Staburags NBU 12 ALTEMP

Current collector body with locking device

- Lock the locking lever according to functional check

Current collector body with spring element

- Check mobility according to functional check
- Smooth pin on the trolley pole

Carbon brush

- Contact area to collector shoe free of cracks.

Power connector

- No broken individual wires
- Clean the contact areas

Safety rope

- Check for visible damage

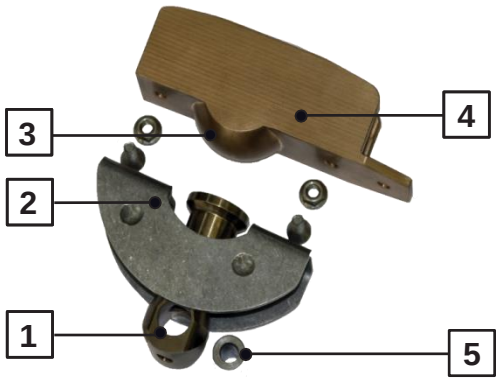
Safety bracket

- Check for tight clamping

Screw connections

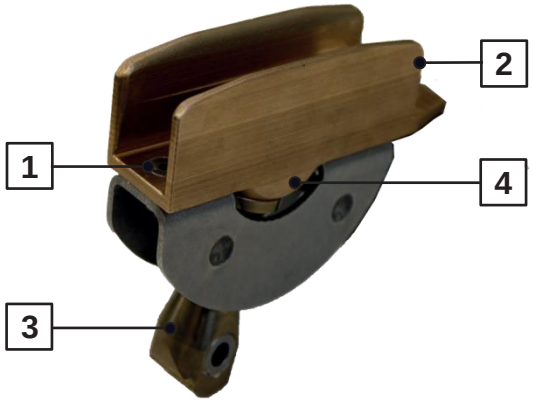
- Assembly paste with friction coefficient $\mu = 0.12$ (e.g. Klüber Lubrication Duotempi PMY 45)
- Secure tightly with threadlocker (e.g. Loctite 270)
- Tightening torques M6 = 9Nm, M8 = 24Nm

5.2. Assembly of collector shoe



Slide support bolt (1) into collector shoe duct (2).
Lubricate the spherical surface on the collector shoe (3)
Insert collector shoe (4) while making sure that the front side of the collector shoe (4) is assembled on the same side as the support bolt handle (1). Bolt the collector shoe duct (2) down with the countersunk screws M6x 16 and serrated locknuts
Lubricate bush (5) and insert into the support bolt (1).

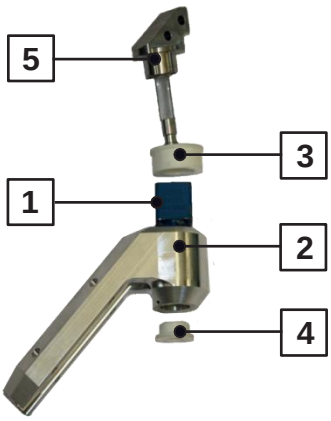
5.3. Check collector shoe



Check whether the screwheads (1) are countersunk in the collector shoe (2).
Check whether the support bolt (3) on the sphere (4) can be smoothly moved in all directions.

5.4. Assembly of clamping part

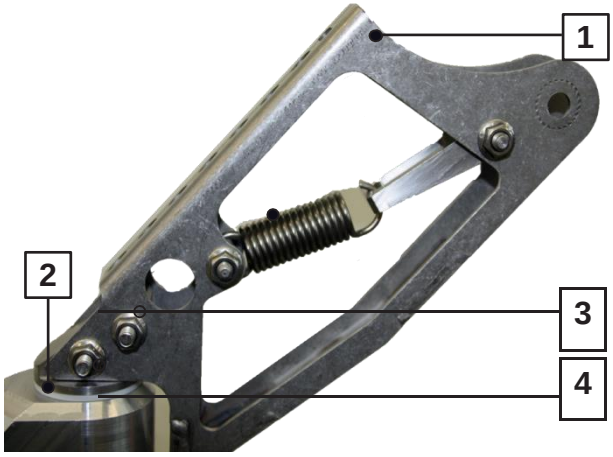
Note!
A bush which only presses on the outer ring must be used to press in the elastic spring element. The bearing element must not be lubricated.



Press elastic spring element (1) into clamping part (2).

Press in flush bearing bush large (3) and small (4).
Insert main shaft (5). This must be possible without physical effort!

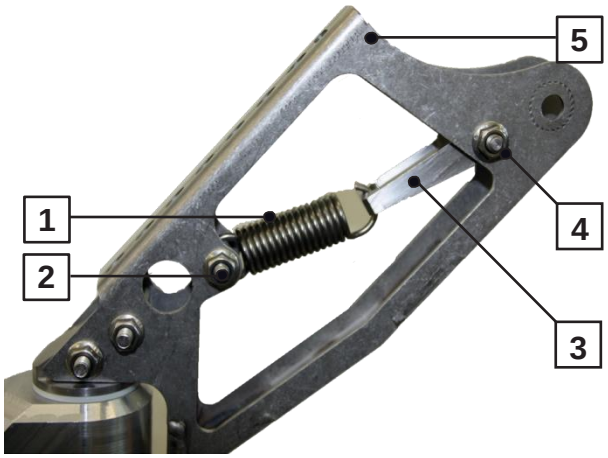
5.5. Mounting of arm



Slide arm (1) completely on so that the support is firmly on the main shaft (2). Bolt down the arm with the M6x40 screws (3) and bolt down the selflocking nuts with serrated bearings (4) and tighten by 9 Nm.

5.6. Installation of locking lever

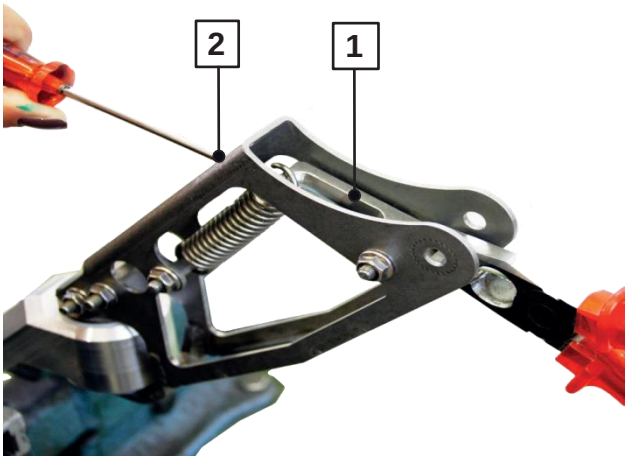
Danger!
Danger of injury if the spring flies out under tension.



Position the spring end (1) with the small eyelet opening (the opening will point downwards), insert the bearing bolt (2) through and
tighten the selflocking nuts with serrated bearings by 9 Nm. Lubricate the hole of the locking lever (3) and the second bearing bolt (4).
Mount the locking lever with handle upwards into the spring, insert into the arm (5), insert bearing bolts through and tighten by 9 Nm with the selflocking nuts with serrated bearings.

5.7. Tensioning of spring

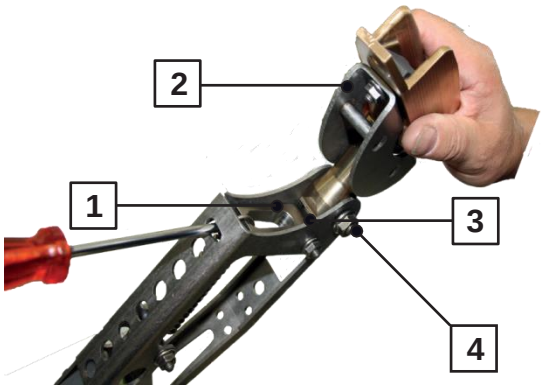
Danger!
The screwdriver must not be released!



Grip the locking lever (1) with pliers, turn to the position displayed and hold firmly.
Introduce a screwdriver through the slit in the arm (2) and lock the locking lever in place – carefully release the pliers until no more tension can be felt.

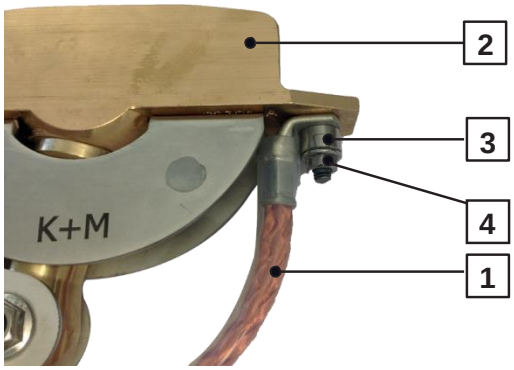
5.8. Assembly of collector shoe

Danger!
Danger of injury if the spring flies out under tension.

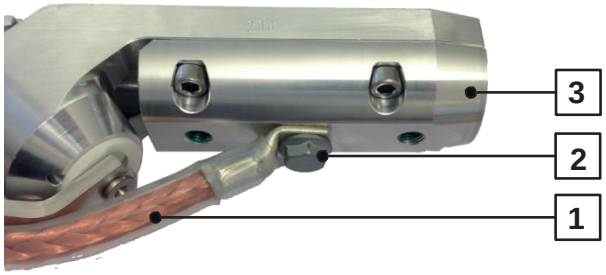


With the locking lever (1) locked in place, position the prepared collector shoe (2). The recess (3) in the support bolt must be aligned with the handle of the locking lever.
Insert screw M8x40 (4) through the holes in the bush and arm.
Release the screwdriver carefully! Fit screw M8 with selflocking nuts with serrated bearings and tighten by 24 Nm.

5.9 Assembly of power connector



Attach the power connector (1) directly to the sliding block
(2) and assemble with countersunk screw M6x25 and slotted spring pin (3). Assemble the selflocking nuts with serrated bearings (4) with tightening torque 9 Nm.

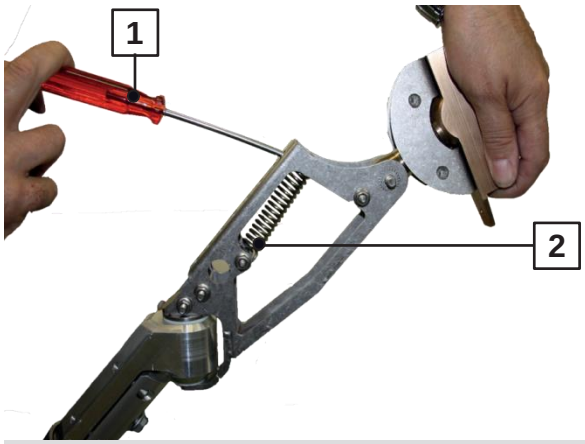


Assemble the power connector (1) on the clamping part (2) with hexagon screw M8x12, with an integrated Ripplock fuse (3), and tightening torque 24 Nm.

6. Functional check

The fold-down mechanism and mobility are checked in the functional check.

6.1. Functional check of the locking device

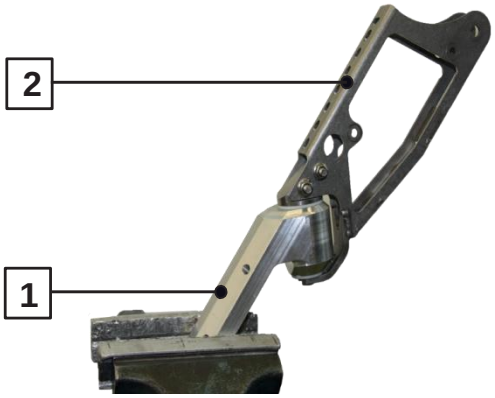


Using a screwdriver (1), lock the spring (2) in place.
Fold the collector shoe backwards – this action should feel smooth!
Release the screwdriver and press the collector shoe back into the starting position.

Danger!
Danger of injury upon sudden loosening of the spring under tension!

Note!
The locking into place sound must be audible.

6.2. Functional check of the mobility of the elastic spring element



Clamp the current collector at the clamping part (1) in the vice with aluminium jaws. Push the current collector (2) back and forth at right angles.

Note!
The current collector must not stick and must independently return to the central position.

7. Maintenance

The entire current collector is maintenance-free.

7.1. Periodic check

The following must be checked on a daily basis:

- Condition of wires
- Condition of carbon brush (according to operator specifications)
- Visual inspection of the entire head for serious damage

The following must be checked every 6 months:

- Functional check of lock according to chapter 6.1
- Check of the elastic spring element installed according to chapter 7.14.
- If a defect is discovered, the entire current collector must be replaced.

7.2. Examination

After approx. 13,000 operational hours or 140,000 km travelled, or after 2 years of use at the latest, the entire current collector must be examined.

7.3. Check and maintenance of the most important components

7.4. Collector shoe

Sand down contact areas to carbon brush and power connector with a file and sandpaper.
Check sphere (contact area) for damage and buff (polishing cloth P0).
Check double cone – carbon brush with gauge. The gauge must protrude 0-3 mm over the front corner.
Buff collector shoe flanges according to chapter 7.5

7.5. Buff the collector shoe flange

Protect double cone by insertion of protective block. Grind the flanges of the collector shoes and the upper radius with the Korn 120 grinding wheel until they are smooth.
Buff the flanges and radius with the SUNPRESS grinding wheel until they correspond roughly to the picture.

Caution!
The SUNPRESS grinding wheel must only be used with a regulated grinding machine at a slow setting!

Note!
After the buffing process, clean the grinding shoe. Lubricate the contact areas of the sphere and power connector with contact lubricant!

7.6. Support bolt

Check for damage and replace in the case of defects.
Carefully hone side areas.
Check spherical surface for damage and buff (polishing cloth P0).
Buff hole with a reamer Ø15- E11
Only clean the handle with wire brushes – honing is not permitted!

Caution!
Mechanical reconditioning of the support bolt is not permitted.

Note!
Clean support bolts after buffing. Lubricate the contact area on the sphere surface with contact lubricant!

7.7. Locking lever

Check for damage, replace in case of defects.
Carefully hone side areas.
Buff hole with reamer Ø8-D11. Only clean the handle with wire brushes.

Caution!
Mechanical reconditioning of the locking lever is not permitted.

Note!
Clean the locking lever. Lubricate the contact area on the handle with contact lubricant!

7.8. Bush

Check for damage and replace in case of defects.
Buff the running surface (polishing cloth P0).
The side areas must not be mechanically altered or honed!

7.9. Bearing bolts

Check for damage and replace in case of defects.
Buff the running surface (polishing cloth P0).

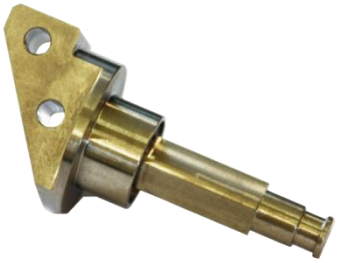
Note!
Bearing bolts with damaged running surfaces can be used to install the springs.

7.10. Current collector body

Check for damage and replace in cases of burn-off, pronounced deformation, impairment of fold-down mechanism or bent supports. Carefully hone the support bolt flanges. Clean the support contact point with a wire brush. Honing is prohibited!

Caution!
Mechanical reconditioning of the current collector body is not permitted.

7.11. Main shaft



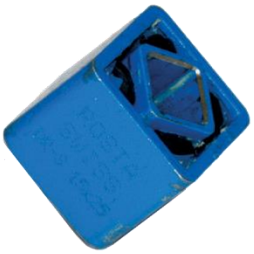
Check for damage and replace in case of defects.

Buff bearing points and contact areas (polishing cloth P0).

7.12. Clamping part

Disassemble the lower bearing from above with a drift punch.
The upper bearing is pressed with a drift punch through the lower hole upwards together with the electric spring element.
Clean the clamping part and check for damage, replace in the case of serious defects.
Clean the clamping surface of the current collector pole with a wire brush.

7.13. Elastic spring element disassembled



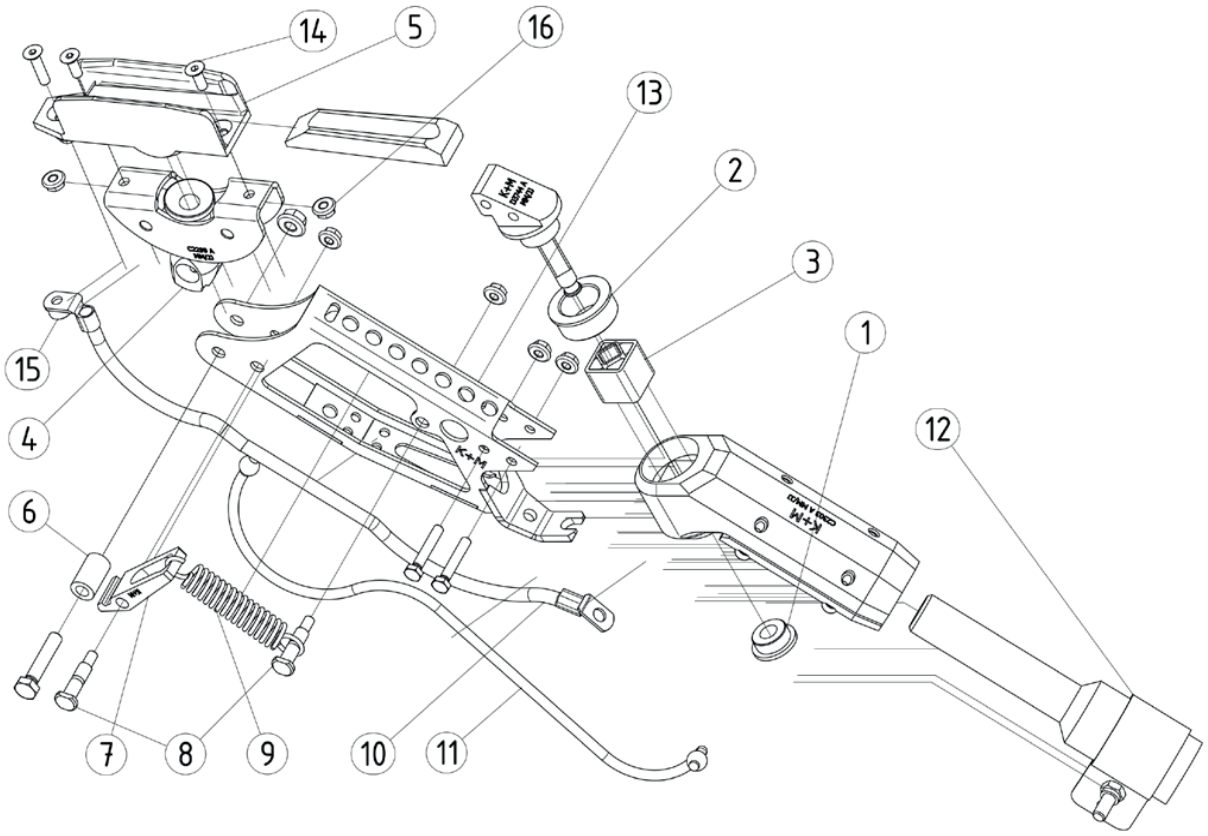
Check rubber and metal parts for damage, replace in case of defects.
The rubber must not be porous or cracked.
Check whether the inner part of undamaged or new elements protrudes to the same amount on each side and, if it does not, level with a compactor.

7.14. Functional check, elastic spring element installed

Pull back the arm of the collector shoe with a spring balance at a right angle.
The angle of deflection of the arm with a force of 12 to 14 kg can be up to 45°. After releasing the force, the arm should obviously return to the central position, otherwise the elastic spring element is defective and needs replacing.

8. Replacement parts

The following replacement parts can be requested if required:



No.	Pcs.	Description	Item no.	Chapter
1	1	Bearing brush small D28x10	D3734-01	5.4
2	1	Bearing brush large D40x16	D3734-02	5.4
3	1	Elastic spring element	D3736-01	5.4
4	1	Support bolt	D3740-01	7.6
5	1	Collector shoe	C2301-01	7.4
6	1	Bush 15x24	E3998-01	5.2
7	1	Locking lever	D3742-01	7.8
8	2	Bearing bolts	E3996-01	7.9
9	1	Spring D18, L 63 rework	E3995-01	5.7
10	1	Power connector 35mm^2	D3738-01	4.1
11	1	Nylon rope D 6mm; L=650mm	300515	4.1
12	1	Safety bracket	E2233-01	4.1
13	1	Current collector body	B1462-01	7.10
14	1	Countersunk screw M6x25	352769	5.9
15	1	Slotted spring pin	E4000-01	5.9
16	1	Locknut M6	353007	5.9