INSULATED CONDUCTOR SYSTEM U 10
MOUNTING INSTRUCTIONS FOR U 10 FOR CATALOG 2a/E

1. Installation tools

No special tools are needed for simple systems; conductors will be supplied ready for installation.

For complex layouts with switches and curves the following tools are required:

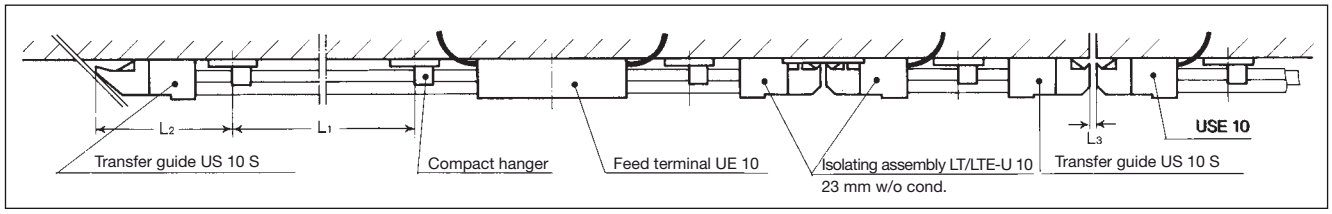
Curve tool	BVU 10/15	
Filler rod	FU 10 FU 10 VP FU 10 S VP	
Table saw	KS 10	for cutting of conductors.
Punch tool	LZ 10	for punching square holes in conductor ends.
	LZ 10-VP	for punching square holes in end of ground conductors
Deburring tool Half-round file	EGM HRF	for burr removal on conductor cuts
Adjustment jig	ST 10	for making short conductor sections, see 5.1
Assembling tool	MG 10	combination tool for installing joint splice clips, joint covers and for checking/adjusting conductor slot width
Locking pin driver	ED 10	for inserting locking pins into BFU alu anchor bar.
Dismantle tool	DMW 10	for dismantling conductor bars from supports.

2. Layout symbols

Support beam track (monorail)	
Conductor rails	
Feed-in joint	UEV 10 / UEV 10 PE-VP
Feed terminal	UES 10 / UES 10 PE-VP
Compact hanger	
Compact hanger & locating clamps locating clamps	
Transfer guide, straight	US 10 / US 10 PE-VP
Transfer guide, oblique	US 10 S / US 10 SPE-VP
Transfer guide, oblique	US 10 SP-PE-VP
Transfer guide, straight w/feed	USE 10 / USE 10-PE-VP
Transfer guide, oblique w/feed	USE 10 S / USE 10 S-PE-VP
Transfer guide, oblique w/feed	USE 10 SP-PE-VP
Isolating assembly	LT/LT-U 10
Isolating assembly w/one feed	LT/LTE-U 10
Isolating assembly w/two feeds	LTE/LTE-U10
Expansion section	UDV 10/25

with BFU each

3. System layout



Sketch 1

L = Standard lengths of conductor:	6 m	L_2 = permissible overhang	0,2 m
L_1 = max. support spacing		L_3 = air gap between transfer guides at switches or drop sections	3-6 mm
for straight runs	0,6 m		
for curves	0,3 m		

Installation procedure

4. Compact hanger

The compact hangers must be installed at exactly right angle with the track beam or hanger bracket.

Compact hanger, bolted type KA (photo1)

Each compact hanger is supplied complete with two M5 Thead bolts, nuts, washers and lock washers.

– Drill holes for 5 mm bolts.
  Install compact hanger.

Compact hanger, special design KD, KK and KS
To be used preferably for monorail systems.
Special compact hangers and attachment depending on monorail track.

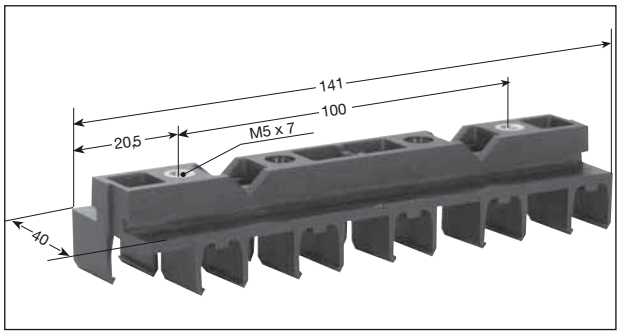


Photo 1: Compact hanger KA 10–10 N

MANAGEMENTSYSTEM
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DIN EN ISO 9001:2000
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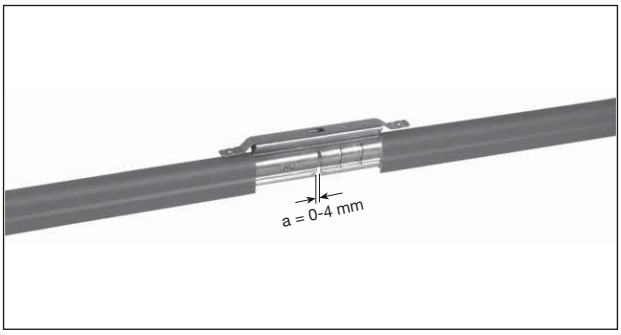


Photo 2: Installed joint splice UEV 10, without cover

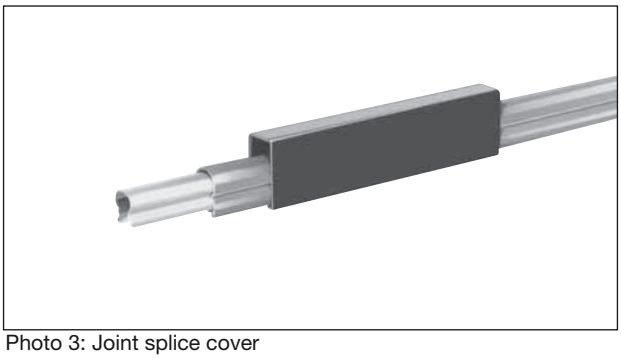


Photo 3: Joint splice cover

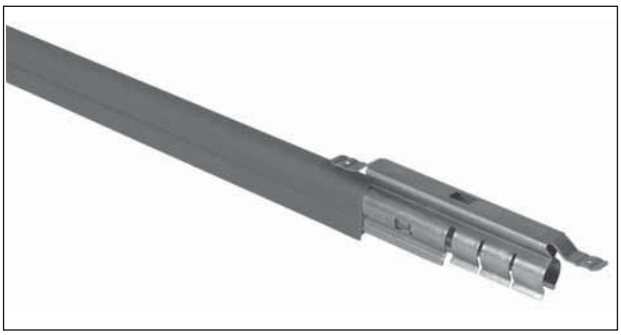


Photo 4: Feed-in joint splice UV 10

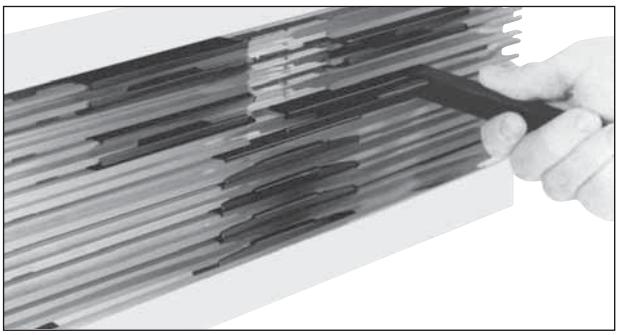


Photo 5: Installation toolMG 10

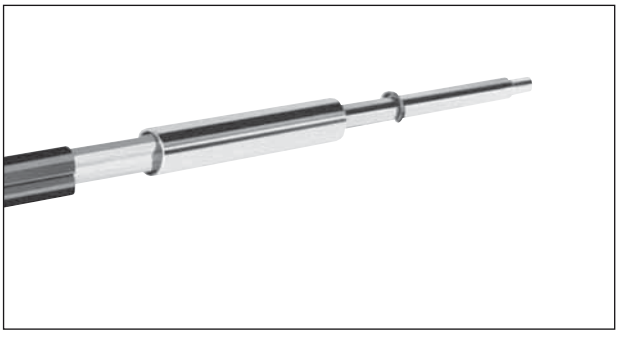


Photo 6: Adjustment jig ST 10

5. Conductors

Conductor sections are connected with feed-in joint splices (photo 2). It is important for good electrical contact that the conductor ends are clean and free of residue and that any burrs are removed. The feed-in joint splices compensate the expansion and contraction of the conductors (see instructions 6 and photo 2). The joint splice is protected by an insulating cover.

Standard conductor sections are supplied ready for the installation of the joint splice. If a section has to be cut during installation, the end has to be prepared as shown under instructions 5.1.

Installation sequence, when conductor is installed starting on the left and progressing towards the right, is as follows:

- Start installation at an anchor point (switch or end of system).
- Install standard length conductor sections.
- For system with curves refer to instr. 11.
- Make and install short conductor sections (see instr. 5.1). Maintain correct air gap between each conductor section (see instr. 6).
- Push joint splice cover onto the left end of the conductor bar. Push in splice cover far enough so that the conductor becomes accessible (see photo 3).
- Snap-in metal splice clip at the right end of the conductor (see photo 4).
- Install conductor section into compact hanger and push left end of conductor into the splice clip of the already installed conductor section.
- Use installation tool MG 10 to push joint splice cover over joint splice, tap lightly if required (see photo 5).
- Maintain correct air gap between each conductor section (see instr. 6 and photo 2).
- Impress joints with installation tool MG-ST 10. Press plastic part to the bottom of the conductor. (photo 5).

5.1 Preparing conductor end for joint splice

Prepare short sections in an efficient way. For preparation proceed as follows (fig 3):

- Measure exact length required.
- Use adjustment jig ST 10 and pull conductor approx. 80 - 100 mm out of insulating shroud.
- Use hollow end of ST 10 and push back conductor to stop (70 mm, see photo 6).

– Cut conductor to exact length required; use hacksaw or table saw KS (fine teeth blades only).
– Use punch tool LZ 10 PE-VP to punch square holes into each end of conductor (see photo 7 and fig. 2).
Attention: avoid two punched holes (prolongation of opening)

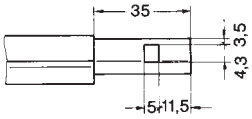


fig. 2:

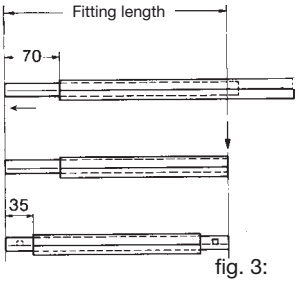


fig. 3:

– Remove burr from cut
→ outside the conductor profile with half-round file HRF (photo 8)
→ inside the conductor profile with half-file RF (photo 9)
– Use hollow end of ST 10, short setting, and push plastic shroud into center of conductor, (photo 6).

6. Conductor expansion and contraction

The special design of the feed-in joint splice UEV 10 compensates for expansion and contraction of the conductors due temperature difference.

The conductors have to be anchored with locating clamps USK 10 to assure controlled expansion and contraction and to avoid a push-along effect by dragging collectors. A fixpoint should be provided every 36 m for long, straight systems (see instr. 10).

Expansion section UDV 10/25 C-PE-VP (see photo 10) with expansion capability of max. 30 mm should be installed on systems with expansion joints in the track beam and/or in the building. Use locating clamps on each side of expansion section (see instr. 10,).

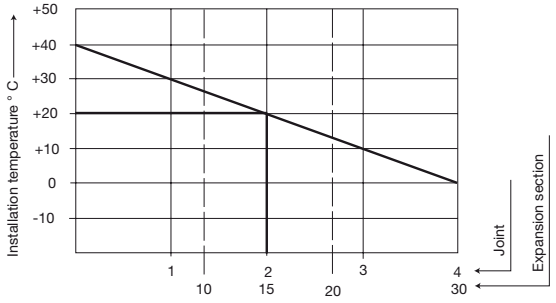
Dependent on the expected temperature difference an air gap “a” has to be set during installation (photo 2). Set air gap “a” according to the graph below for sections of max. 6 m.

Max. expected temperature = 40 °C.
Min. expected temperature = 0 C.

Example (graph below):

Installation temperature 20 °C
Air gap „a“ = 2 mm (joint)
15 mm (expansion joint)

According to the expected temperature difference of the above example, conductor bars installed at 20° C ambient temperature should have an air gap of 2 mm; expansion joints 15 mm.



If the temperature is higher than 40° C or lower than 0 °C consider more joint sand conductor sections that are shorter than 6 m.

In case of expansion joints in buildings use more joints or expansion sections.

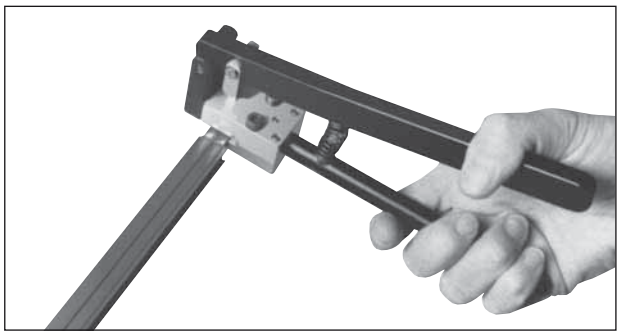


Photo 7: Punch tool LZ 10 PE-VP

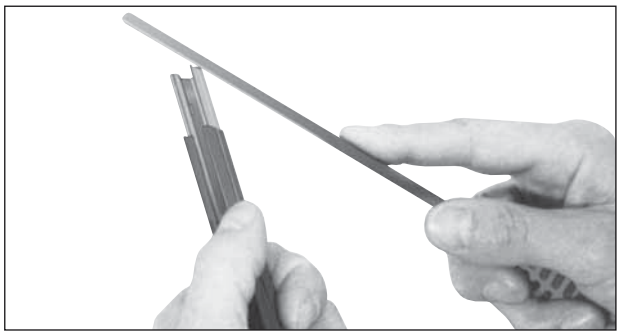


Photo 8: Remove outside burr and bevel with half-round file

Photo 9: Remove inside burr with round file

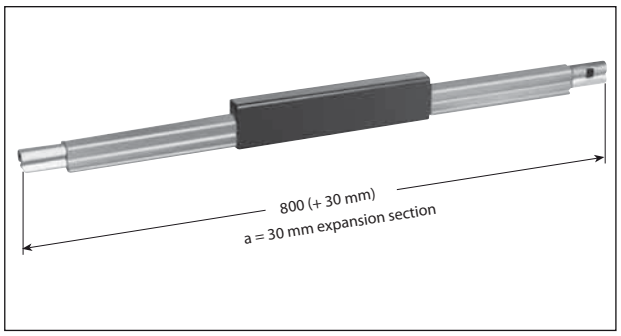


Photo 10: Expansion section

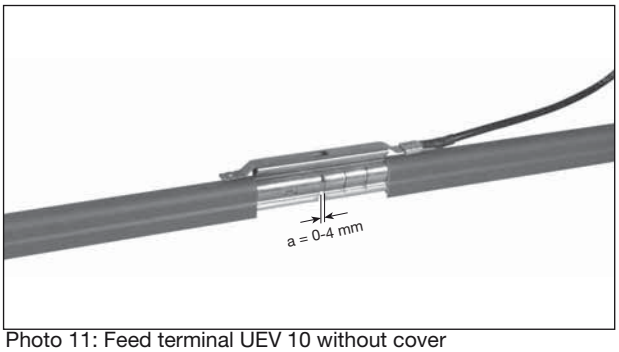


Photo 11: Feed terminal UEV 10 without cover

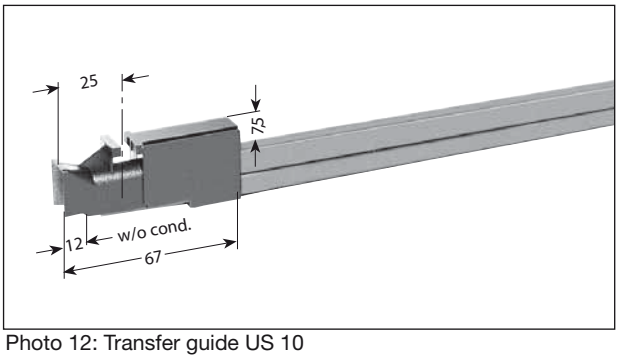


Photo 12: Transfer guide US 10

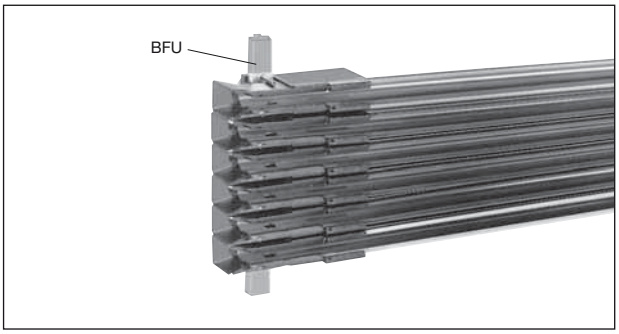
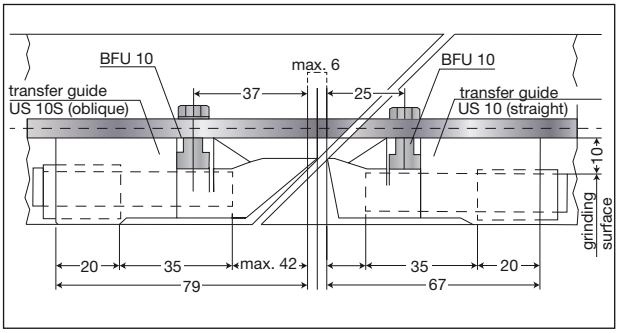
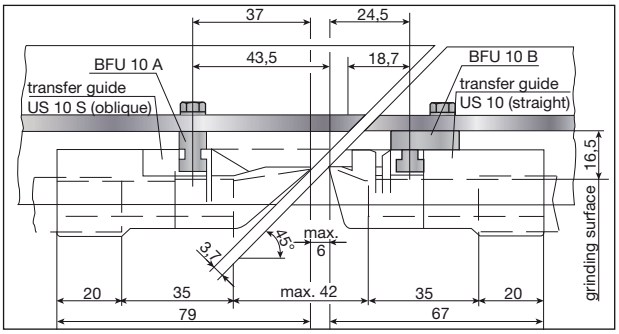


Photo 13: Transfer guide, compact arrangement, 6poles



Sketch 5: oblique rail cut with BFU 10



Sketch 6: oblique rail cut VP with BFU 10

7. Feed terminals

Install feed terminals close to the mains (refer to photo 11 and instr. 5).

- If required, preparation of conductor bar as shown under instructions 5.1.
- Max. two cables can be connected using a spade connector dim. 6.3 x 0.8 mm.
- Provide tension relief for feed-in cables.
- Impress feed terminal as per instr. 5

Make certain that connecting cables do not restrict movement of conductors or collectors and impede longitudinal expansion of conductors during temperature fluctuation.

8. Transfer guide (photo 12) and transfer guide with feed-point

Transfer guides are used with switches, drop sections, turntables and air gaps; they are also used as end caps.

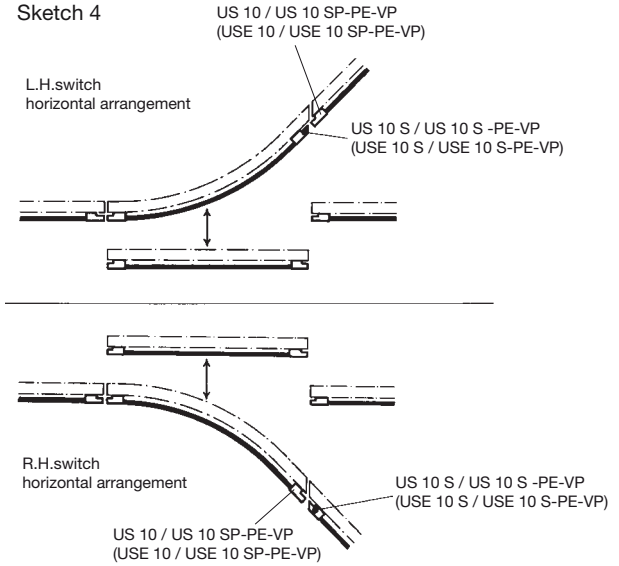
Installation procedure:

1) Chamfer conductor at punched side properly to allow easy push-over of the detent of the transfer guide.
2) Push transfer guides onto anchor bar BFU (photo 13).
3) Push conductor rails into transfer guides. Detents must fit properly.
4) Bolt anchor bars BFU to the appropriate attachment surface.
5) Impress transfer guides in the same way than joints (instr. 5, photo 5)

8.1 Placement of transfer guide

Straight transfer guides are used with straight track beam cuts. Oblique transfer guides are used on one side of an oblique cut track beam (see fig. 4, 5 and 6).

Sketch 4



8.2 Conductor bar preparation

To install joint caps on top of each other, the PE-VP rail has to be cutted at one materail group (e.g. switch or lifter).

8.2.1 Preparation of conductor bar for phase and earth as shown under instructions 5.1.

8.2.2 For PE-VP (only for transfer guides)

- Cut section to length, if necessary.
- Pull conductor profile 90 – 100 mm out of the isolating profile with adjustment jig ST 10.
- Push back conductor profile by 80 mm.

- Cut conductor to exact length required; use hacksaw or table saw KS (fine teeth blades only).
- Use punch tool LZ 10 to punch square holes into each end of conductor (see photo 7 and fig. 2)
- **Attention:** avoid two punched holes (prolongation of opening).

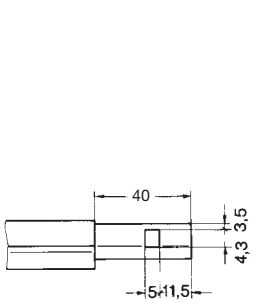


fig. 7:

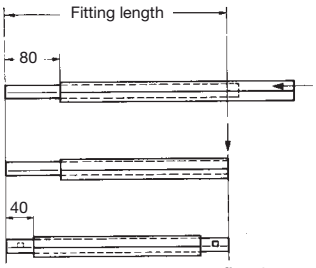


fig. 8:

- Remove burr from cut.
  →outside the conductor profile with half-round file HRF (photo 8).
  → inside the conductor profile with half-file RF (photo 9).
- Use hollow end of ST 10, short setting, and push plastic shroud into center of conductor (photo 6).

8.2.3 For phase, PE and PE-VP

- for transfer guides with end feed:
  fix feed-in clamp to conductor profile (photo 14), leave the square hole open (fig. 2 and 7).
- Push transfer guides on front side of the conductor profile until they snap into place (photo 12).
- for USE 10: flat terminal plug 6,3 x 0,8 mm

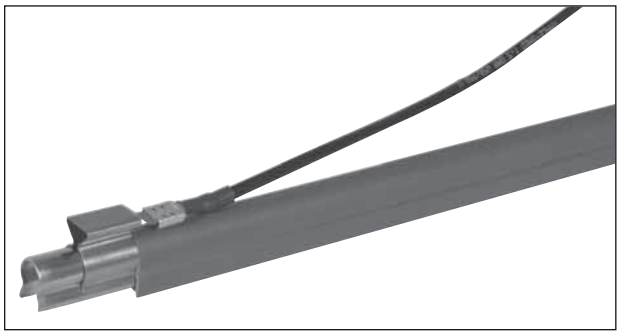


Photo 14: Feed clip SE 10 installed

8.3 Installation of anchor bars

– Mark drilling holes for BFU on attachment surface (see fig. 5 and 6). **Caution**: Make sure transfer guides have sufficient clearance when switch moves.
– Drill through-holes M 5 into attachment surface.
– Push transfer guides onto anchor bar BFU.
– Bolt anchor bar BFU to attachment surface.
– Insert locking pins to fix position of transfer guides. (Use pin driver ED 10).
– Make sure that the head of a fixing screw does not coincide with the track beam cut when having an oblique cut for switches.

Facing transfer guides must be accurately aligned with each other to ensure smooth collector passage.

Permissible max. gap between transfer guides is 6 mm, max. offset in both directions is ± 3 mm.

Track beams of switches and drop sections must be properly aligned before starting the installation of conductor rails.

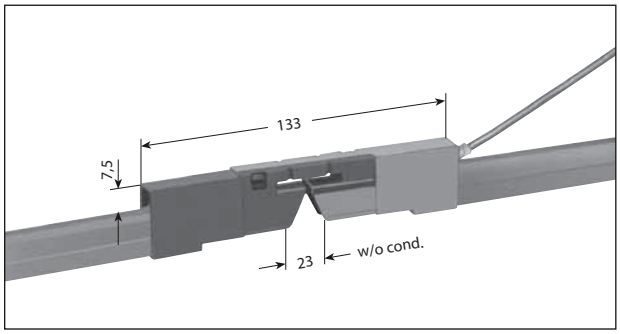


Photo 15: Isolating assembly LT/LTE-U 10 with feed on one side

9 Isolating assembly

9.1 For phase and earth (photo 15)

- prepare conductor bar as shown under 5.1
  in addition: chamfer conductor at punched side properly to allow easy push-over of the detent of the isolating assembly.

The following combinations are possible:

= LT/LT- U 10 without feed terminals
= LT/LTE- U 10 with feed terminal on one side
= LTE/LTE- U 10 with feed terminal on both sides

After the two pieces have been pushed each onto a conductor they must be pressed together to interlock.
For impressing the isolating assembly refer to instr. 5.
If system hangers do not permit the isolating assembly to support against the track beam (distance contact surface to track beam more then 10 mm), additional compact hangers must be installed at approx. 100 mm distance left and right of the isolating assembly for stabilization.

9.2 For PE and VP

Isolating assemblies are formed by two transfer guides. Preparation of conductors as under instr. 8.
The following combinations are possible:

= 2x US 10 PE-VP
U 10 without feeding
= 1x US 10 PE-VP, 1x USE 10 PE-VP
U 10 with feeding at one side
= 2x USE 10 PE-VP
U 10 with feeding at both sides

Impress transfer guides as under instr. 5

10. Anchor points (Photo 16)

To prevent the conductor sections from sliding anchor points must be provided (see fig. 9).

Anchor Points

No.	Position	Consisting of
①	Switches and drop sections	Transfer guide and BFU (see instructions 8.3)
②	Continuouse long runs	USK 10 / USK 10 A locating clamps left and right of bolted-on compact hanger
③	Expansion sections at building or track expansion joints	

The distance between two anchor points should not exceed 36 m (120‘).
Sequence of work: (Locating clamps)
- Bolt on compact hangers.
- Mark the position of the locating clamp before pushing the conductor into the bolted compact hanger.
- Bolt locating clamps on the conductors staggered left and right to the compact hanger. (image 16).
- Push the conductors into the hanger.

Phase and PE
- Install conductor bars, mark position of locating clamps before pushing conductor sections into compact hanger.
- Install locating clamps as marked on conductor sections and tighten securely; stagger locating clamps as shown in photo 16.
- Push conductor bars into compact hanger.

PE-VP
- Provide two borings diam. 3,2 at the back side of the conductor with the drilling template BS 10 A. Distance of borings as per instr. 10.
- Push a safety clamp USK 10 A in each boring and engage conductor in fixed compact hanger.

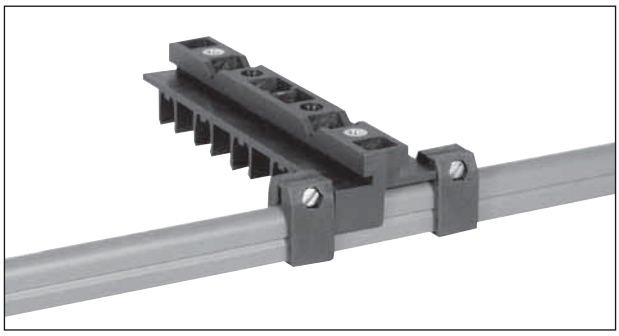


Photo 16: Compact hanger with staggered locating clamps USK 10

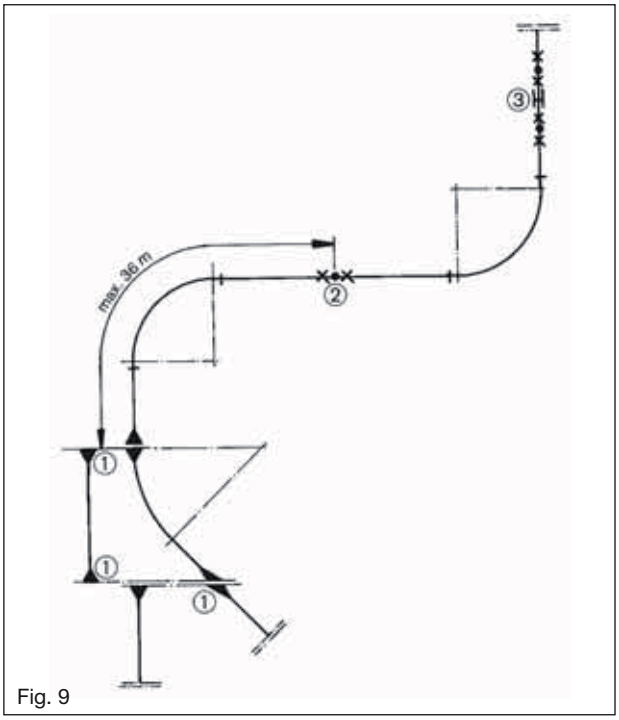


Fig. 9

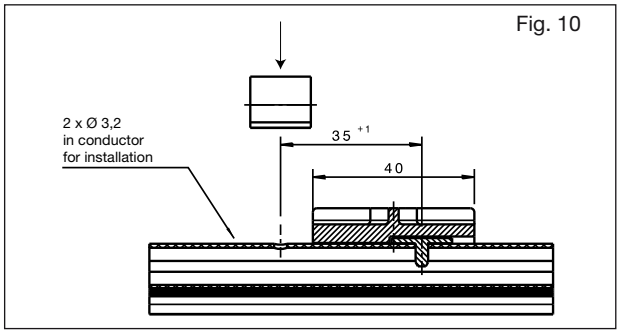


Fig. 10

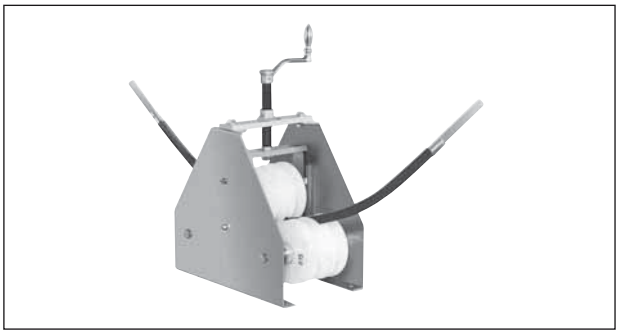


Photo 17: Curve tool BVU 10 VP

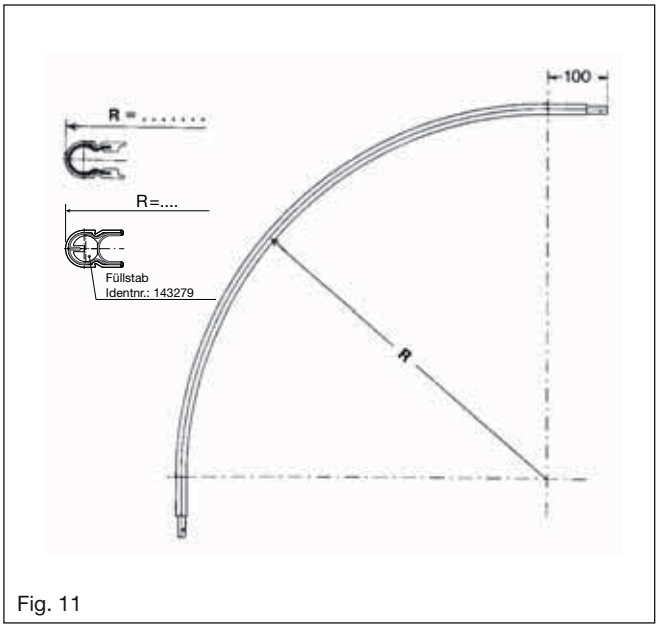


Fig. 11

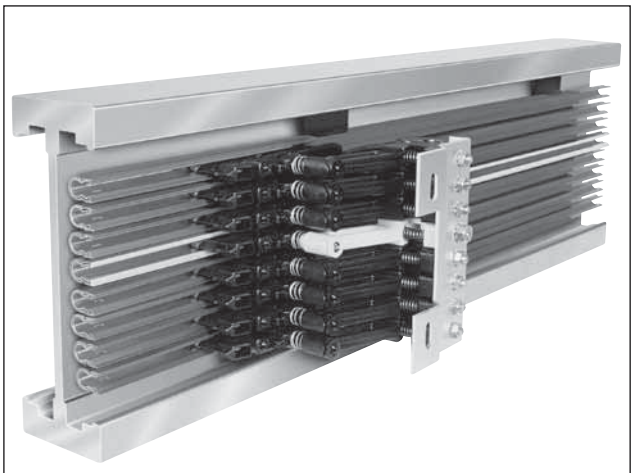


Photo 18

11. Bending of conductors

Horizontal or vertical curves can be supplied ready for installation. For curves to be made at the job site curve tool BVU 10 VP (photo 17) and filler rod FU 10 is required.

Bending procedure:

- Draw radius of curve on a floor or flat surface (fig. 11)
- Determine required length of curve (stretched length) and mark it on conductor section.
- Cut conductor section approx. 500 mm longer as required.
- Insert filler rod into conductor section.
- Turn handle on curve tool to lift upper roller. Insert conductor section with filler rod into the correct groove of lower rollers.
- Sligthly increase pressure with upper rollers and push conductor back andforth.
- To avoid kinks, start each back-and forth movement of the conductor an inchcloser to the center of the curve.
- Repeat this procedure until the radius is obtained.
- Remove filler rod.
- Cut the conductor to the required length.
- On curves with smaller radii than 0,7 m a straight section of approx. 0,1 m on each end is required to assure a good splice (fig. 8).
- Pass through the curves with test collector and check conductor slot width (5 - 5,5 mm)

Attention:

Use the slotted conductor type U10/25 C PE-VP-G only for horizontal inner curves. Alternativly cut the non-slotted conductor at the back every 30 mm considering a depth of 11 mm and a slot width of 1 – 2 mm.

12. Collectors

Use collectors preferebly only for one travel direction (photo 18). Use the collector type KDS 2/40 for travel in both directions. Compact collectors that swivel in and out must be adjusted vertically at right angle to the conductors. Example: carriers in monorail systems for maintenance reasons.

Make certain that connecting cables are high flexible and do not restrict movement of the collectors. Avoid formation of cable loops.

12.1 Collector brackets

Collector brackets must be installed exactly parallel and right angle to the conductor bars. Installation height from bracket to contact surface of the conductor is shown in the following table:

Collector type	Bolt holes Ø	Working height of collector mm
KST 2/40	phase M 5 ground M 6	80
KUFU 25-2 thru 10	2 x slotted holes 7 x 15	88
KDS 2/40-1 thru 12-14	2 x slotted holes 7 x 15	98

Holes for single collector installation must be on 14 mm centers if standard compact hangers are used.

13. Installation inspection

After installation has been completed inspect all components for correct fit, distance, line-up etc. Make trial runs and pay special attention to collector tracking.

14. Commissioning

Safety instructions

The conductor system U 10 and its components are designed in accordance with VDE 0100 and are touchproof according to VDE 0470, part 1. After installation the touch-proofness must not be restricted, e.g. make sure a maximum conductor slot opening of 5,5 mm.

After installation has been completed make test runs considering the following aspects:

First test run with low speed.

Collectors must run in conductors without vibration.

All transfer applications require special attention for proper passing over and re-tracking of collectors. If necessary open out the slot of the shrouding with the conductor joint assembly tool MG-SW 10.

Avoid sparking at collector carbons (sparking is caused by dirty and oxidised conductor surfaces.

Take care of proper passing over of collectors especially at transfer guides.

15. Maintenance instructions

Under normal working conditions the conductor system does require little maintenance.

We recommend to carry out the following maintenance work in regular intervalls:

1. Inspection of conductors:
   Visual inspection in 4 weeks intervals. Control conductor expansion and look for burned spots.

   Remove carbon dust deposits especially in transfer guide and isolating assembly areas.

   Procedure:

   a) Manual cleaning with comercial vacuum cleaner.

   b) Additional adjustment of a cleaning collector (same design than collector).

   c) Use of additional automated vacuum cleaner in regular maintenance intervals.

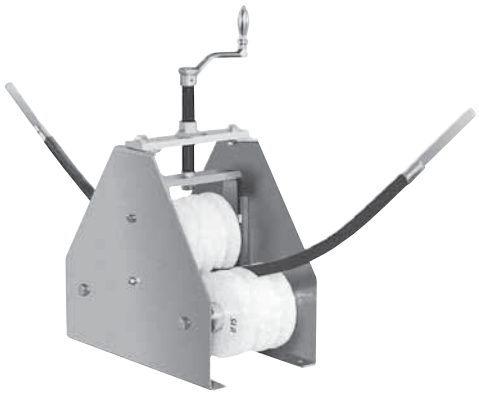
   Adhere to the maximum vertical and horizontal offset of 3 mm at transfer sections for switches, lifting devices etc. The max. airgap between the two alternate transfer guides is 6 mm.

2. Inspection of collectors

   a) Mechanical control:
   Flexibility of links, bearings and support stems; check for mechanical wear and damages.

   b) Electrical control:
   Check the abrasion of brushes, the tightness of contact screws and cable fixings.

   c) Contact pressure:
   Use spring-scale to pull the collectors out of the conductor bar. The contact pressure must be approx. 3,5 N per brush.



Curve tool

to bend the conductor U10 and U10 PE-VP vertical and horizontal. The filling rod has to be ordered seperatly.

Type	Weight kg	Order- No.
BVU 10 VP	10,000	143 318
Filler rod **FU 10** (4 m long)	0,340	165 234
Filler rod **FU 10 S-VP** (4 m long)	0,340	143 279

Table saw

to cut isolating- and conductor profiles with length supplement. Connection: 220 V, 50 Hz.

Type	Weight kg	Order-No.
KS	6,500	165 276
Spare blade **SB**	0,070	165 263

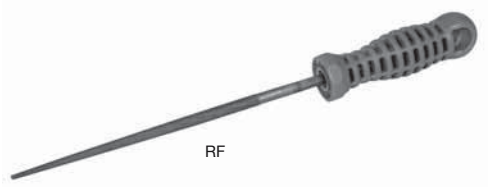
Conductor punch tool

To stamp the joint notch into the conductor profile at short lengths. Combitool U10 and U10-VP

Type	Weight kg	Order-No.
LZ 10 PE-VP	2,400	143 223

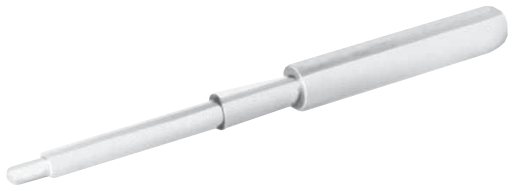
Deburring tool

Round file RF for deburring the inner side of short length of conductor profile



Half-round file HRF for deburring the outer side of short lenght of conductor profile

Type	Weight kg	Order-No.
RF	0,085	143 330
HRF	0,085	165 264



Adjustment jig

to adjust short length of condctor and isolating profile

Type	Weight kg	Order-No.
ST 10	0,150	165 091

Conductor joint assembling tool

1. to impress the conductor profile into the joint
2. to open out the conductor slot
3. to close the joint cover

Type	Weight kg	Order-No.
MG-SW 10	0,125	165 093

Locking pin driver

for BFU aluminium anchor bars for transfer guides

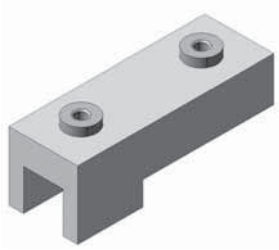
Type	Weight kg	Order-No.
ED 10	0,010	165 277

Conductor dismantle tool

to desmantle the conductors out of the compact hanger

Type	Weight kg	Order-No.
DMW 10	0,039	165 119

Boring template for fixpoints



Type	Weight kg	Order-No.
BS 10 A	0,150	282 3266

Twist drill

for preparation of borings for saftey clamps
USK 10 A at fixpoints

Type	Weight kg	Order-No.
Twist drill Ø 3,2 mm	0,003	110 0162

Mounting instructions for catalog No. 2a/E 2010

MANAGEMENTSYSTEM

certified by DQS according to
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OHSAS 18001 (Reg.-Nr. 003140 QM OH)

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