



INSULATED CONDUCTOR SYSTEM

U 10



INSULATED CONDUCTORS U 10

Index	Page
Basic description	3
Insulated conductors	4
Snap-in joint splice	5
Expansion section	5
Feed terminal	5
Isolating assembly	5
Transfer guide	6
Compact hanger	7
Locating clamp	7
Transfer funnels, Collectors	8, 9
Double Collector, Copper-graphite brush assembly, Springs	10
Connecting cable, Terminal boxes, brush wear indicator	11
Installation tools	12
Application photos	2, 4, 13
Questionnaire	14, 15
Product line	16

Slipring units made up from U 10
see leaflet no. 102 s.



VAHLE serves the international automotive industry

General

VAHLE insulated conductors U 10 are designed in accordance with today's international safety requirements. They fully meet VDE 0100 and are finger safe to VDE 0470, part 1, protection code IP 21.

The adjacent picture demonstrates that the VDE test finger cannot reach live conductors – finger safety is guaranteed.

The shroud which envelops the various conductors is an excellent insulator. Therefore our unipole insulated conductors guarantee utmost safety in operation.

Any number of conductors can be installed side by side at minimum space requirement.

Standard rail sections are 6 m long, shorter sections are available.

The ground conductor is identified by international colour coding.

For obvious safety reasons phase and ground collectors are not interchangeable.

Approved and listed by:

UL. Consult factory label service.

Hangers

Bolted, snap-in and quarter turn type hangers are available. Standard support distance for U 10 is 600 mm, in curves 300 mm.



Joints

Snap-in joint splices provide mechanical and electrical continuity. They include insulated protection covers.

Expansion joint sections are only required in case of expansion joints in the monorail track.

Feed terminals

Joint assembly and mid-rail assembly feeds are available.

Furthermore transfer guides and isolating assemblies allow for spade connectors.

Transfer guides

Transfer guides serve as an end protection of system runs and accomplish smooth collector transfer in case of switches, drop sections etc. They can be supplied with or without feed clip.

Isolating assemblies

Conductor isolating assemblies are available for sectionalizing control circuits, maintenance bays etc. They can be supplied with or without feed clip.

Curves

Insulated conductors U 10 can be used for horizontal or vertical curves. A special curve tool for individual field preparation is available.

Collectors

The current collectors are made of reinforced polyamide and stainless steel parts. These spring loaded units provide positive contact with the conductor bars and have double pick-up brushes.

Engineering data of shroud

	standard shroud color green	high temp. shroud color gray
Electrical properties:		
Di-electric strength DIN 53481	30-40 kV/mm	45 kV/mm
Specific resistance DIN 53482	$5 \times 10^{15} \text{ Ohm} \times \text{cm}$	$5 \times 10^{15} \text{ Ohm} \times \text{cm}$
Surface resistance DIN 53482	10^{12} Ohm	10^{12} Ohm
Leakage resistance IEC 112/VDE 0303	CTI 600 - 1.1	CTI 600 - 1.1
Mechanical properties:		
Flexible strength	$75 \text{ N/mm}^2 \pm 10 \%$	$95 \text{ N/mm}^2 \pm 10 \%$
Tensile strength	$50 \text{ N/mm}^2 \pm 10 \%$	$50 \text{ N/mm}^2 \pm 10 \%$
Temperature resistance:		
Flame test proof per DIN 4102 – part 1	class B1 – no flaming particles, self-extinguishing	
Resistance to chemicals:*	gasoline mineral oil grease	hydrochloric acid, concentr. caustic soda solution 25% and 50%, sulphuric acid to 50%

* Consult factory when synthetic oil and grease involved.



INSULATED CONDUCTORS U 10



Conductor code:

U = unipole insulated conductor
 10 = shroud size
 25 = conductor cross sectional area (mm²)
 C = copper conductor
 F = galvanized steel conductor
 E = stainless steel conductor

Length:

6 m is standard length,
 shorter lengths are available

Support spacing:

for straight runs 0.6 m
 for curves 0.3 m

Conductor spacing:

on compact hangers 14 mm or variable

Curves:

factory prepared, min. radius 400 mm, or in the field with curve tools BVU 10/15 (min. R = 0.4 m)

Application:

indoor use only

See page 3

for shroud properties

Type	U 10/25 C	U 10/25 F	U 10/25 E
Weight kg/m	0.267	0.245	0.246
Standard shroud, color green			
Cat.-No. phase *	167 00 •	167 01 •	167 02 •
Cat.-No. ground *	167 06 •	167 07 •	167 08 •
High temperature shroud, color gray			
Cat.-No. phase *	167 03 •	167 04 •	167 05 •
Cat.-No. ground *	167 09 •	167 10 •	167 11 •

Engineering data

Conductor rail type	Gross sectional area mm ²			Leakage distance of covers mm	max. voltage V	Continuous ampere capacity A	Resistance Ohm/1000 m	Impedance ** Ohm/1000 m
	Copper	steel	stainless					
U 10/25 C	25			30	600	100	0.744	0.748
U 10/25 F		25		30	600	40	5.411	5.412
U 10/25 E			25	30	600	10	31.328	31.328

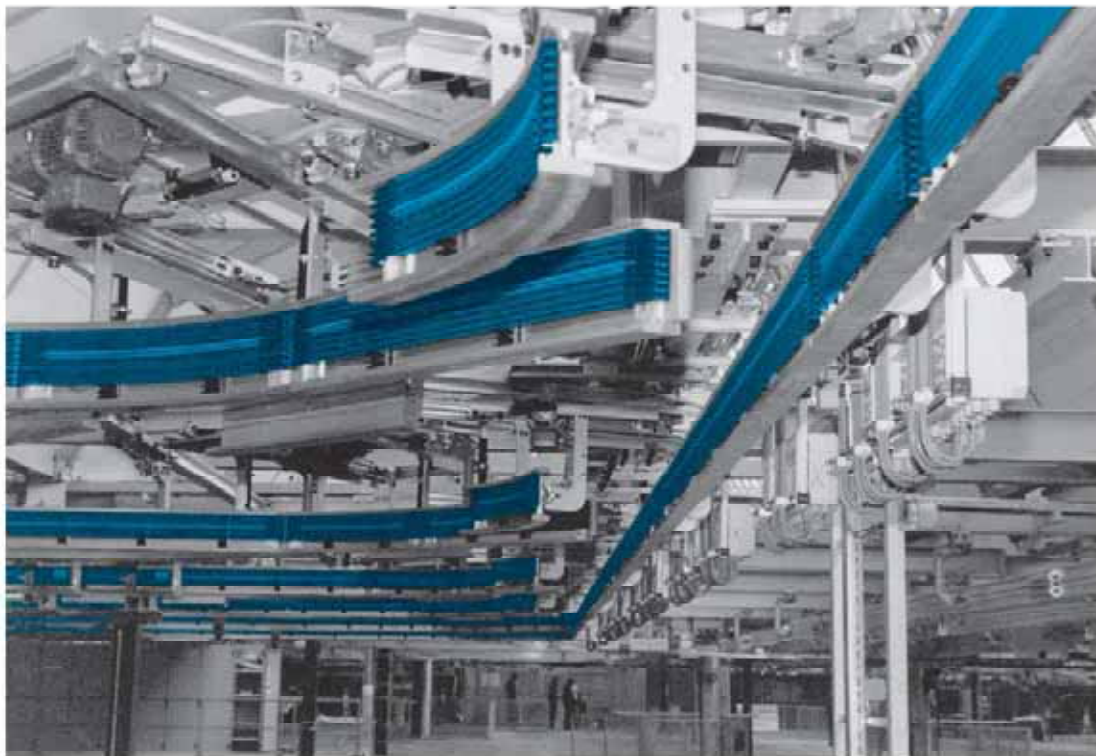
Selection of Conductors

in accordance to ampere load and environmental conditions

U 10/25 C copper conductor for power-, control- and data-transmission.

U 10/25 F galvanized steel conductor for non-corrosive environment.

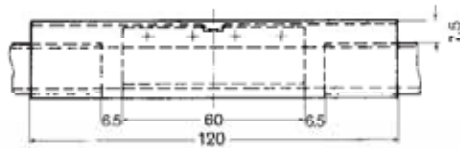
U 10/25 E stainless steel conductor for control and data-transmission in corrosive atmospheres.



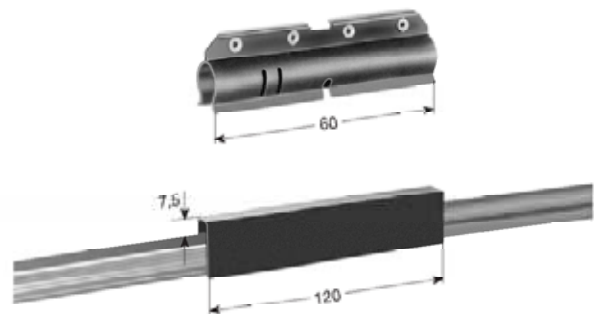
VAHLE U 10 conductors provide power, control and data transmission for automated monorail systems (AMS) in the automotive industry.

Snap-in joint splice

(system controls expansion and contraction)



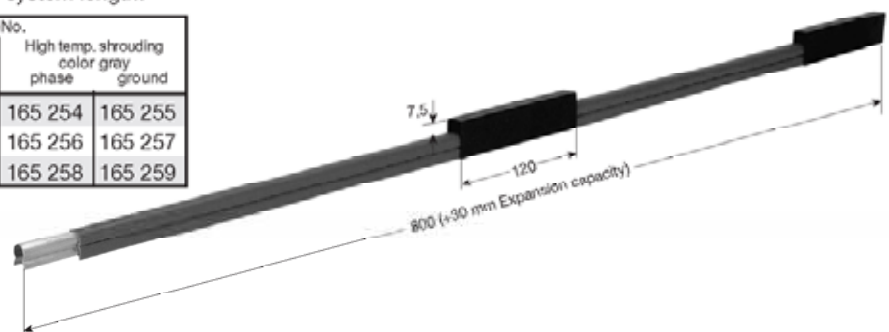
Type	Weight /kg	Cat.-No.
UV 10	0.020	165 006



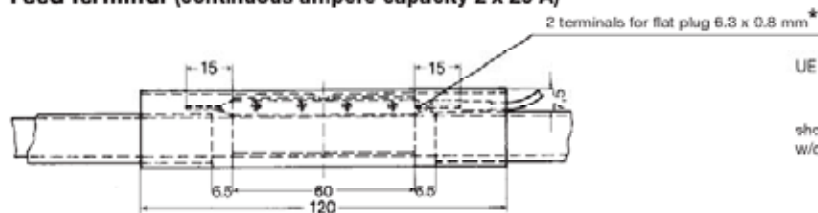
Expansion section

factory assembled to 0.8 m long conductor section incl. one joint splice.
The 0.8 m expansion assembly is part of the system length.

Type	Weight kg	Cat.-No.			
		Standard shrouding color green phase	ground	High temp. shrouding color gray phase	ground
UDV 10/25 C	0.254	165 192	165 193	165 254	165 255
UDV 10/25 F	0.236	165 250	165 251	165 256	165 257
UDV 10/25 E	0.237	165 252	165 253	165 258	165 259

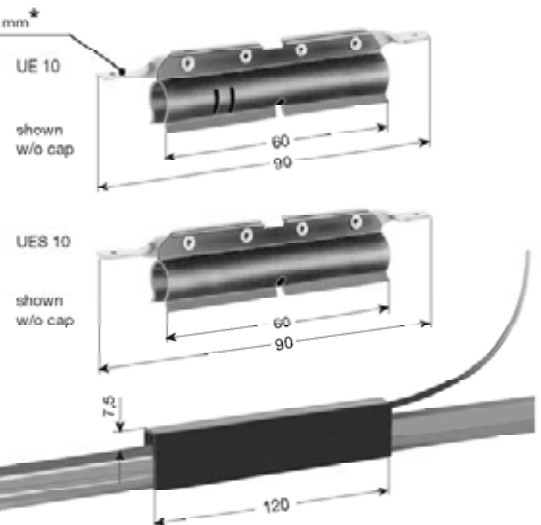


Feed terminal (continuous ampere capacity 2 x 25 A)



Type	Weight/kg	Cat.-No.
UE 10 joint assembly*	0.023	165 007
UES 10 mid-rail assembly*	0.023	165 212

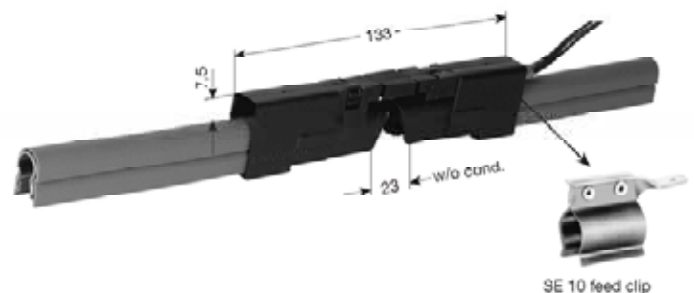
Application: UE 10 mounted instead of snap-in joint splice.
UES 10 mounted between snap-in joint splice.



Isolating assembly Connecting cable with feed cable FLA
(see page 11) is to be ordered separately.

Type	symbol	Weight kg	comprising	Cat.-No.
LT /LT -U 10		0.010	2 x LT/U 10 units w/o feed	165 025
LT /LTE-U 10		0.015	2 x LT/U 10 units w/1 feed	165 114
LTE/LTE-U 10		0.020	2 x LTU 10 units w/2 feeds	165 026
separately available: SE 10 feed clip		0.005	1x	165 178

The two transfer button elements are pressed together to form a rigid, well aligned unit.



Isolating assembly LT/LTE-U 10

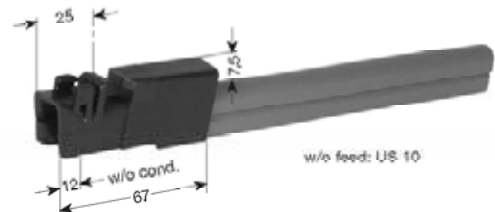
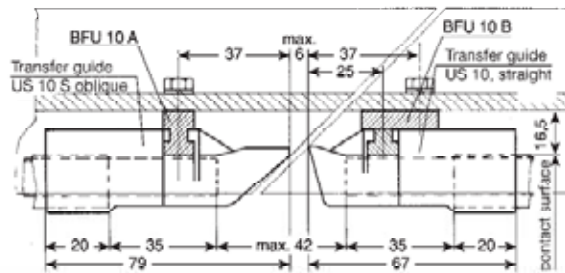
* For ordering feed cable FLA see page 11.



COMPONENTS

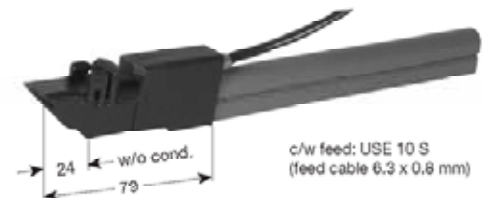
Transfer guide

with or without feed terminal (also serving for **end cap** and for anchor point in conjunction with BFU).



max. vertical and horizontal offset: ± 3 mm

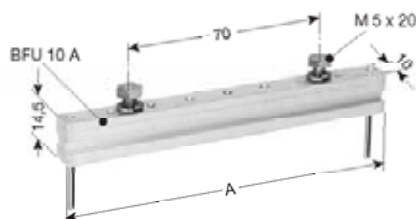
Type	Weight kg	feed clip	Cat.-No.
US 10	0.004	w/o	165 008
US 10 S	0.005	w/o	165 009
USE 10 **	0.009	c/w	165 010
USE 10 S **	0.010	c/w	165 011
Feed clip only SE 10	0.005		165 178



Anchor bar for transfer guide (Aluminium)

for bolting to the track, consisting of 1 aluminium profile bar, 2 hex. screws M 5 w/washer, 2 locking pins 2 x 20.

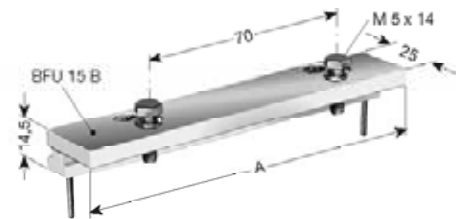
used in conjunction with bolted hangers



(16.5 mm distance between conductor-surface and track)

Type	poles	A/mm	Weight kg	Cat.-No.
BFU 10 A- 8	1- 8	118	0.042	165 168
BFU 10 A-10	1-10	143	0.052	165 176

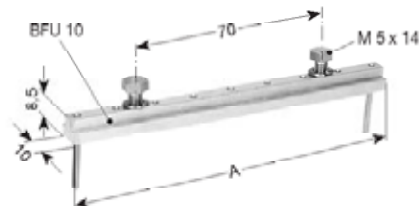
used in conjunction with bolted hangers for oblique cut tracks (see sketch above left).*



(16.5 mm distance between conductor-surface and track)

Type	poles	A/mm	Weight kg	Cat.-No.
BFU 10 B- 8 *	1- 8	118	0.067	165 272
BFU 10 B-10 *	1-10	143	0.101	165 274

used in conjunction with snap-in and quarter turn hangers



(10 mm distance between conductor-surface and track)

Type	poles	A/mm	Weight kg	Cat.-No.
BFU 10- 8	1- 8	118	0.022	165 115
BFU 10-10	1-10	143	0.026	165 123

Any number of conductors can be assembled by combining the compact hangers.

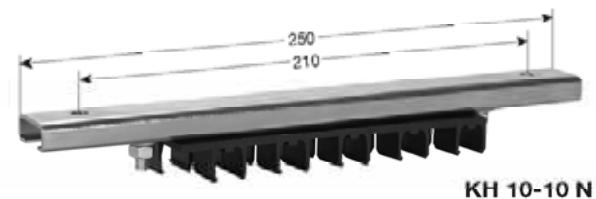
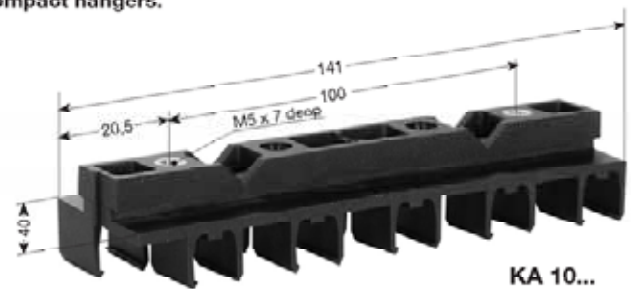
Compact hanger with hardware, for up to 10 conductors

Conductor spacing 14 mm

Hanger KA 10 is for direct bolting

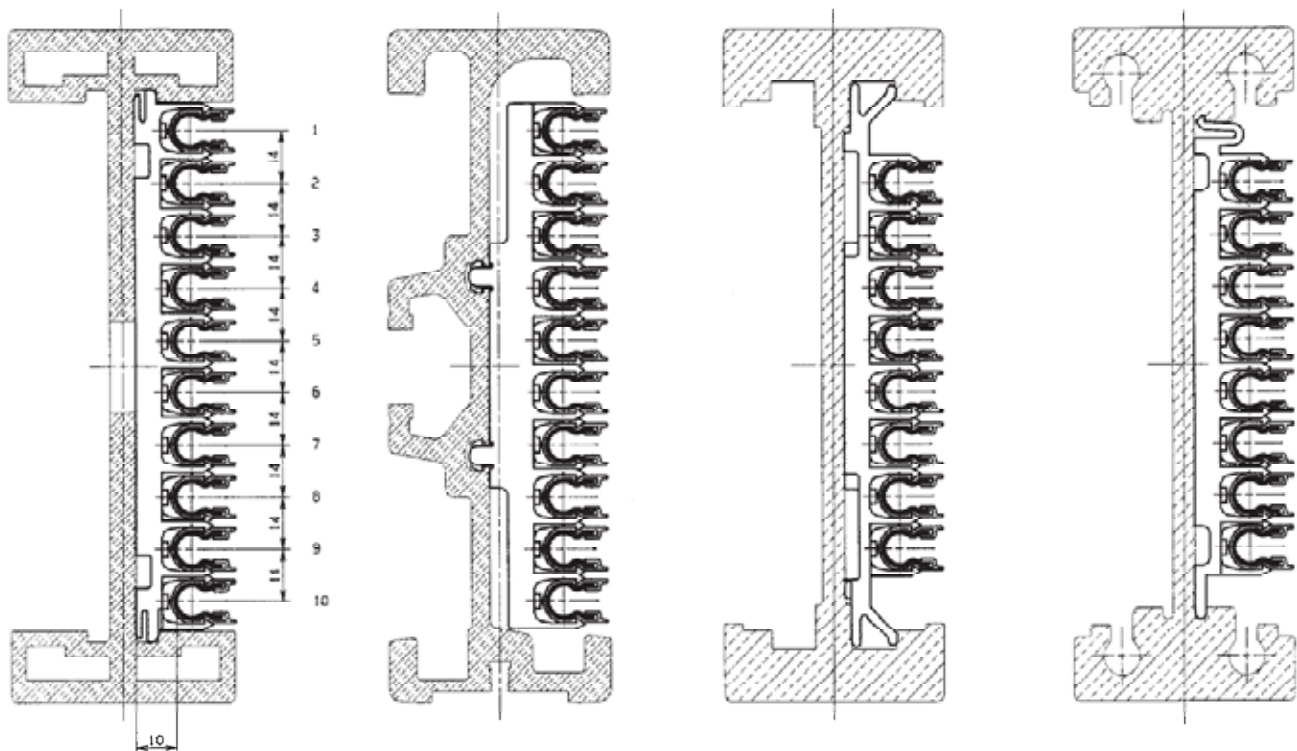
Hanger KH 10 to go with bracket profile

Type	Poles engaged	Weight/kg	Cat.-No.
KH 10-10 N	10	0,295	142 077
KA 10- 2 N	26	0,012	142 072
KA 10- 4 N	4	0,024	142 073
KA 10- 6 N	6	0,033	142 074
KA 10- 8 N	8	0,045	142 075
KA 10-10 N	10	0,056	142 076



Conductor spacing: 14 mm standard
other spacing on special order

Compact hanger, self-locking, for up to 10 conductors on special order to fit your monorail track

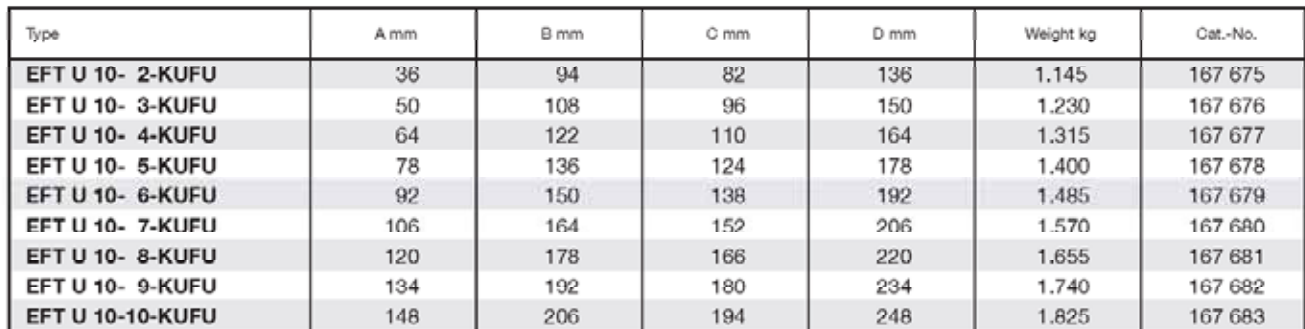


snap-in & quarter turn type hangers for typical monorail track electrification

Locating clamp

Type	Weight/kg	Cat.-No.
USK 10	0.030	165 645



[illegible]8



COLLECTOR & COMPONENTS FOR U 10

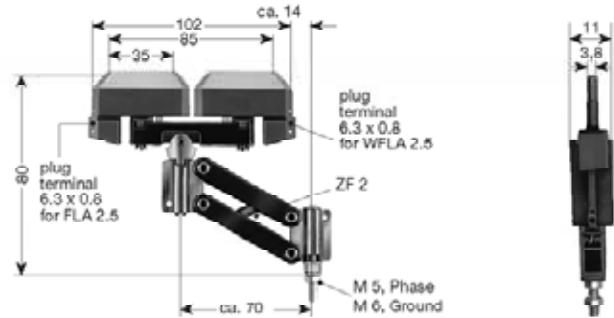
Double Collector *

Ampacity: 1 Plug terminal 25 A
2 Plug terminals 2 x 20 A

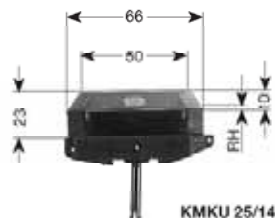
swivel + 10 mm · lift + 10 mm;
contact pressure 3.5 N per brush

feed cable FLA 2.5 or WFLA 2.5 is to be ordered separately.
(see page 11)

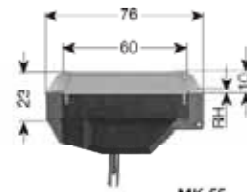
Type	Weight kg	Cat.-No.	
		phase black	ground yellow
KST 2/40	0.080	168 137	168 138



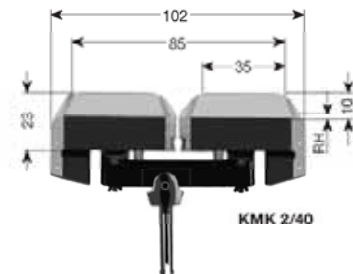
Copper-graphite brush assembly



KMKU 25/14



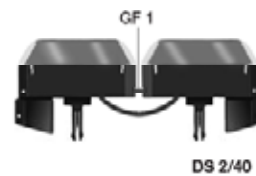
MK 55



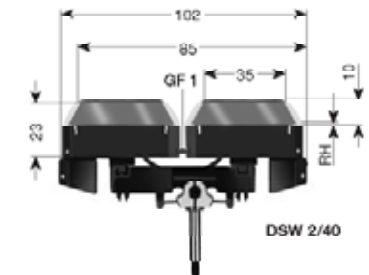
KMK 2/40

Dim. RH = allowed rest of height
3,8 mm width of all copper-graphite brushes

Type	for collectors	RH/mm	Weight kg	Cat.-No.
KMKU 25/14	KUFU 25	3.00	0.035	168 000
MK 55	KESR 32-55	3.00	0.042	168 225
KMK 2/40	KST 2/40	3.00	0.050	168 135
DS 2/40	KDS 2/40	3.00	0.050	168 065
DSW 2/40**	KDS 2/40	3.00	0.050	168 151

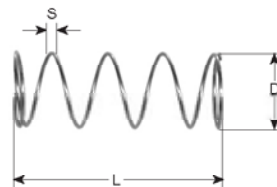


DS 2/40



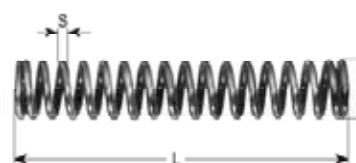
DSW 2/40

Springs

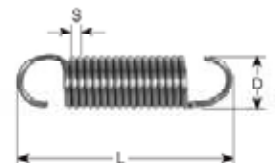


Pressure Spring DF 3

Type	for collectors	S mm	D mm	L mm	Cat.-No.
DF 1	KDS 2/40	1.00	7.00	38.00	153 847
DF 2	KESR	0.90	7.70	43.00	153 848
DF 3	KDS 2/40	0.55	9.55	24.00	152 011
RF 1	KSTF 2/40-2 to 10	0.50	7.70	18.00	153 779
ZF 2	KST 2/40, KSTF 2/40	0.85	6.45	24.00	153 515
GF 1	KDS, KSTF	0.35	2.00	22.00	153 850



Pressure Spring DF 1
Guiding Spring GF



Tension Spring ZF / RF

Connecting cable, high flexible

for collectors, feed terminals, transfer guides and isolating assemblies (for collector KDS, connecting cable WFLA 2.5)



Heavy double insulation

Type	cross section mm ²	A Ø mm	Weight kg	Cat.-No. phase black	Cat.-No. ground green/yellow
FLA 1.5	1.5	4.0	0.014	166 555	166 556
FLA 2.5	2.5	4.4	0.080	165 049	165 050
FLA 4	4.0	6.4	0.100	165 051	165 052
WFLA 2.5	2.5	4.4	0.080	168 107	168 108

Plug only

Type	for cable Ø mm ²	Cat.-No.
FH 2.5	2.5	165 120
FH 4	4.0	165 121
WFH 2.5	2.5	168 109

Simple insulation (not for collectors)

Type	cross section mm ²	A Ø mm	Weight kg	phase black	Cat.-No. ground green/yellow
FKA 1.5	1.5	3.0	0.014	166 557	166 558
FKA 2.5	2.5	3.5	0.026	166 238	166 239
FKA 4	4.0	5.0	0.040	166 240	166 241
FKA 6	6.0	6.0	0.060	166 242	166 243

Terminal box AKE

for feeding and sectionalizing
(max. 7 terminals 6 mm² plus 2 idem for ground)



Type	Weight kg	Cat.-No.
AKE	0.445	169 462

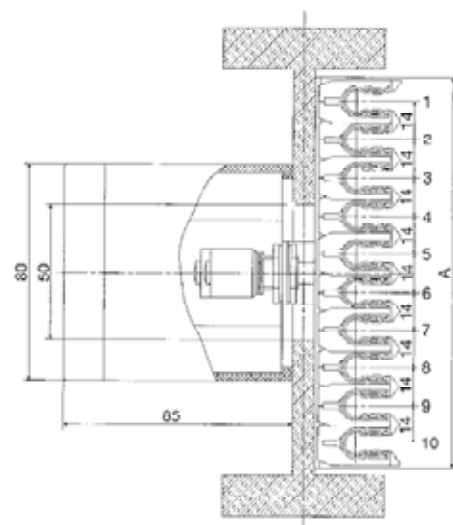
Terminal box AKB

for process-zones control



Type	Weight kg	Cat.-No.
AKB	0.469	169 481

Brush wear indicator KVT 10 N



Shown is KVT 10 N-10

The brush wear indicator will automatically check the brush wear and indicate necessary brush replacement. A continuous axle connected to an enclosed microswitch is equipped with steel feeler pins, arranged between the conductor bars and adjustable to the maximum brush wear level.

Current collectors with worn down brushes will depress the feeler pins, rotating the axle and activating the microswitch to promote a signal or a control function to route for example a carrier thru a track switch into a maintenance bay area.

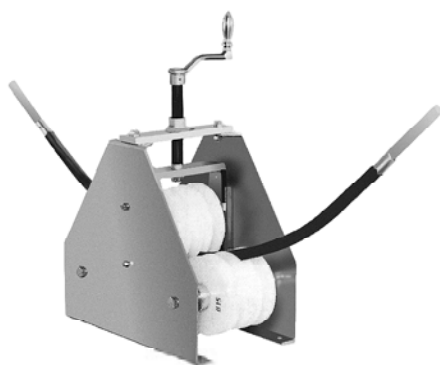
Track- and vehicle-drawings will be useful for a smooth coordination. Opening in the track, length: 120 mm, height: 50 mm.

Brush wear indicator for U 10 with microswitch

Type	poles	dim. A	Weight kg	Cat.-No.	Cat.-No. high temp. shroud
KVT 10 N- 4	4	60	0.809	166 957	142 452
KVT 10 N- 5	5	88	0.957	167 440	142 453
KVT 10 N- 6	6	88	1.104	166 895	142 454
KVT 10 N- 7	7	116	1.252	167 441	142 455
KVT 10 N- 8	8	116	1.400	166 896	142 456
KVT 10 N- 9	9	144	1.546	167 442	142 457
KVT 10 N-10	10	144	1.694	166 897	142 458
KVT 10 N-11	11	172	1.842	167 443	142 459
KVT 10 N-12	12	172	1.990	167 444	142 460



INSTALLATION TOOLS



Curve tool

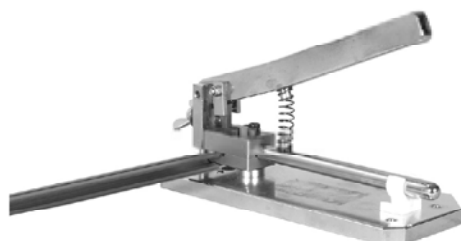
Filler rod is to be ordered separately.

Type	Weight kg	Cat.-No.
BVU 10/15	10.000	160 147
FU 10 Filler rod, 4 m long	0.340	165 234



Table saw

Type	Weight kg	Cat.-No.
KS	6.500	165 276
SB Spare blade	0.070	165 263



Conductor punch tool

Type	Weight kg	Cat.-No.
LZ 10	2.400	165 867

Deburring tool EGM

for inside of conductor



Half-round file HRF

for deburring and bevelling of conductor outside

Type	Weight	Cat.-No.
EGM	0.018	165 275
HRF	0.085	165 264



Adjustment jig

Type	Weight kg	Cat.-No.
ST 10	0.150	165 091



Conductor joint assembling tool

Type	Weight kg	Cat.-No.
MG-SW 10	0.125	165 093



Locking pin driver

for BFU anchor bar

Type	Weight kg	Cat.-No.
ED 10	0.010	165 277



Conductor dismantle tool

Type	Weight kg	Cat.-No.
DMW 10	0.039	165 119

Automated monorail system equipped with insulated conductor U 10, EHC.



Photo: Eisenmann



Insulated conductor U 10 in an automated warehouse, woolworth.

Photo: Eisenmann



QUESTIONNAIRE FOR INSULATED CONDUCTOR SYSTEMS

Fa. _____ Date: _____

Tel: _____ Fax: _____

Internet: _____ e-mail: _____

1. No. of conductor systems: _____

2. Type of crane/machinery to be electrified: _____

3. Voltage: _____ Volts. $\sim/\equiv$ ☐ Phases: _____ c/s: _____
(Three phase current)

4. Length of conductor systems: _____

5. Number of conductors: _____ (power lines: _____ control lines: _____ neutral (ground): _____)

6. Arrangement of conductors:

- ☐ Conductor rails suspending / Collectors standing
☐ Conductor rails resp. current collectors lateral
☐ Others: _____

7. Number of cranes or machines electrified from the one system: _____

8. Indoor: ☐ Outdoor: ☐

9. Special site conditions (humidity, dust, chemical effects etc.):

10. Temperature conditions: _____ °C min. _____ °C max.

11. Expansion gaps of building: _____ pieces in max distance: _____ mm

12. Number and position of feeder points: _____

13. Number and position of isolating sections (e.g. for maintenance areas): _____

14. Mounting position envisaged: _____
(prints and sketches should be submitted whenever obtainable)

15. Travelling speed of machinery: _____

16. Ampere load of each crane/machine: _____
(Use table on page 15).

17. Max. voltage drop from feeder point to current collectors 3% ☐ or _____ % ☐ of voltage rating

Other important data: _____

Please submit prints or sketches for curved tracks, discontinuous.

QUESTIONNAIRE FOR INSULATED CONDUCTOR SYSTEMS



To our nearest local agency:

Date:

Motordata	Crane 1						Crane 2					
	Power kW	Nominal current		% ED	Starting current		Power kW	Nominal current		% ED	Starting current	
		A	$\cos\varphi_N$		A	$\cos\varphi_A$		A	$\cos\varphi_N$		A	$\cos\varphi_A$
Hoist motor												
Auxiliary hoist												
Long travel												
Cross travel												

Motordata	Crane 3						Crane 4					
	Power kW	Nominal current		% ED	Starting current		Power kW	Nominal current		% ED	Starting current	
		A	$\cos\varphi_N$		A	$\cos\varphi_A$		A	$\cos\varphi_N$		A	$\cos\varphi_A$
Hoist motor												
Auxiliary hoist												
Long travel												
Cross travel												

Mark motors * which can operate simultaneously.

Mark motors Δ which can start simultaneously.

Further remarks: e.g.

Signature: _____



Catalog No.

Copperhead Conductor Systems	1 a
Battery Charging Systems	1 b
Insulated Conductor Systems U 10	2 a
Insulated Conductor Systems U 20 – U 30 – U 40	2 b
Insulated Conductor Systems U 15 – U 25 – U 35	2 c
Aluminium Enclosed Conductor Systems LSV – LSVG	3 a
Powerail Enclosed Conductor Systems KBSL – KSL – KSLT	4 a
Powerail Enclosed Conductor Systems VKS – VKL	4 b
Powerail Enclosed Conductor System MKLD – MKLF – MKLS	4 c
Powerail Enclosed Conductor Systems VKS 10	4 d
Powerail Enclosed Conductor Systems KBH	4 e
Heavy Enclosed Conductor Systems	5
Trolley Wire and Accessories	6
Cable Tenders	7
Cable Carriers for □-tracks	8 a
Cable Carriers for Flatform Cable on I-beams	8 bF
Cable Carriers for Round Cable on I-beams	8 bR
Cable Carriers for ◇-tracks	8 c
Conductor Cables and Fittings	8 L
Spring Operated Cable Reels	9 a
VAHLE POWERCOM® – Data Transmission Systems	9 c
CPS® – Contactless Power Supply	9 d
SMG – Slotted Microwave Guide	9 e
WCS – Position Encoding System	9 f
Motor Powered Cable Reels	10

