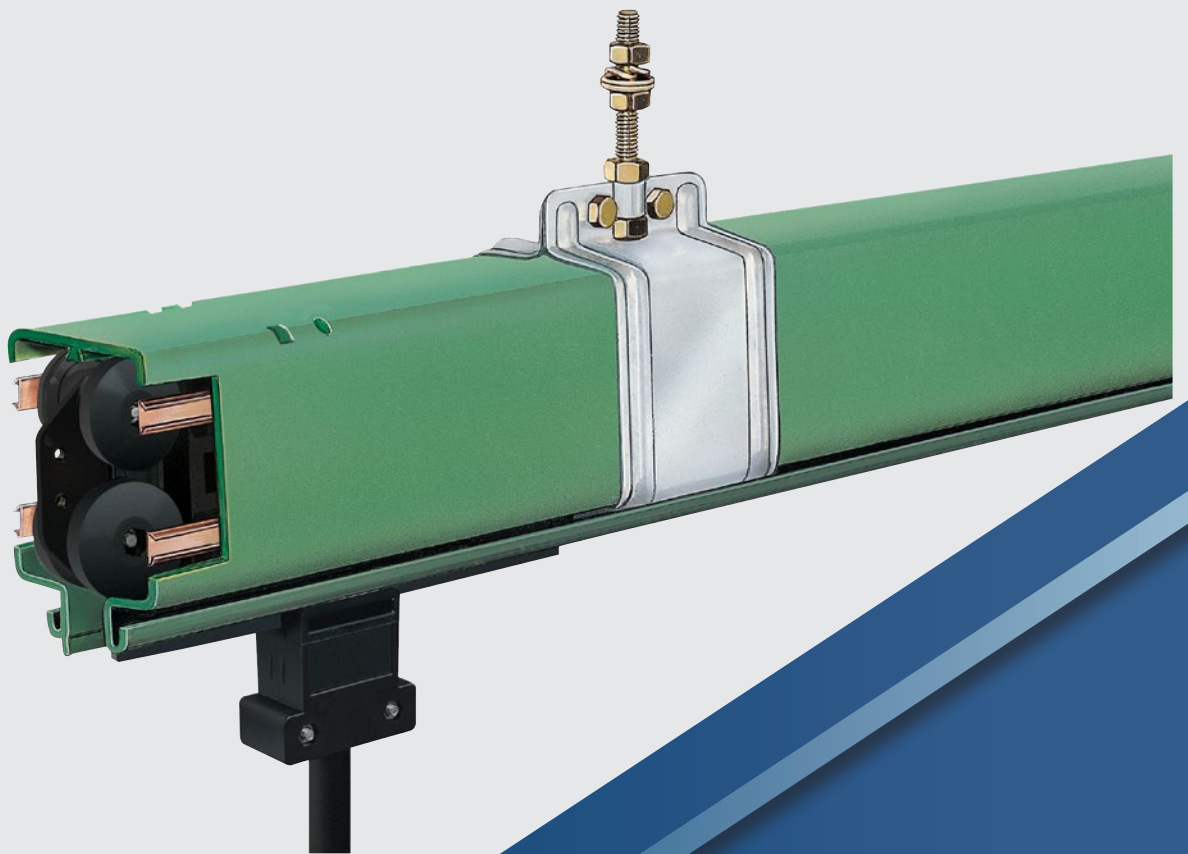




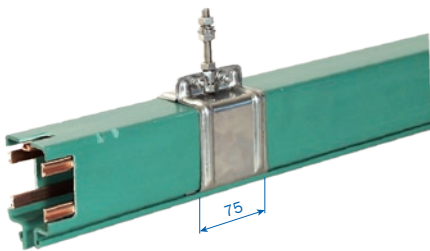
ENCLOSED CONDUCTOR SYSTEMS
KSL | KBSL



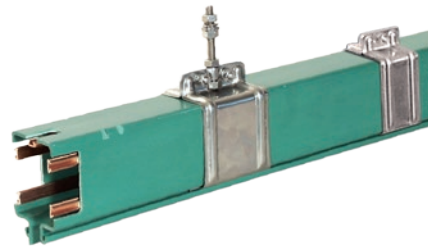
ENCLOSED CONDUCTOR SYSTEMS KSL AND KBSL

INDEX

Basic description.....	2	Removing section.....	18
Technical data	5	Expansion joint section.....	19
Standard sections and curves	6	Collectors.....	20
Jointing material.....	7	Double collectors	21
Brackets.....	10	Tow arms.....	22
End feeds.....	11	Spare parts.....	23
Line feeds	12	Examples for ordering.....	24
End caps and rail separations	13	KTW system incl. KBSL.....	26
Contact sections, turntables and switches	14	Arrangement examples, spring entrainment.....	28
Transfer guides.....	15	Questionnaire.....	29
Transfer funnels	16	Notes.....	30
Anti-condensation section	17		



Type KBSL,
color green



Type KSL,
color green

TECHNICAL DATA

GENERAL

VAHLE enclosed conductor systems of the types KBSL and KSL are touch-protected conductor rails for trolley and longitudinal travel of cranes, EMS, electric hoists, power tools, AS/RS systems as well as many other application areas of power supply for mobile consumers. Low space requirements, corrosion resistance and uncomplicated assembly are essential features. VAHLE safety enclosed conductor systems comply with VDE and accident prevention regulations. Other cross-section combinations, as shown on page 5, are possible. If an N conductor is used, VDE 0100 Part 430 must be observed.

APPROVALS

KSL: UL-approved

Please contact us before ordering.

HOUSING

Color green, plastic housing for 4 or 5 conductors.

Suitable for indoor applications. Standard sections are 1, 2, 3 or 4 m long. The KBSL is without, type KSL is equipped with stiffener clamps. Other sections and curves are available. The ground conductor is identified by international color code. Hase reversing prevented by design of the collector and housing. Larger number of poles due to several conductor lines next to each other or 6–10 poles for MKH (see catalogue 4c).

COUPLINGS

The KBSL and KSL can be supplied from 40–100A alternatively with bolted joints or plug-in joints. With 140 and 200A bolted joints are always needed. The sections for plug-in and bolted joints are constructed identically.

JOINT COVER

The housing of the KBSL and KSL are connected by plastic joint covers.

MAIN POWER SUPPLY

The conductor systems can be fed either by line feeds or end feeds. When selecting the overcurrent protection devices, the selectivity according to DIN VDE 0100 Part 530 must be observed.

CONTINUITY OF THE GROUND CONDUCTOR

The continuity of the ground conductor has to be guaranteed as per regulation EN60204-32 for conductor systems.

Runways of lifting devices may not be used as ground conductor, only an additional connection is permissible. Therefore a continuous ground conductor is required.

END CAPS

The open ends of conductor system are closed by end caps.

HANGERS

Support bracket at the crane track (see page 8).

Max. support distance with the following ambient

temperatures of the conductor:	$\leq 35^{\circ}\text{C} = 2.00\text{ m}$
	$> 35^{\circ}\text{C} = 1.33\text{ m}$

It is necessary to provide at least one additional hanger on the sections of the feeds (line feeds), removing sections, anti-condensation sections and expansion sections (1 m sections). This prevents any sagging of the conductor conductor system.

EXPANSION DURING TEMPERATURE FLUCTUATION

The expansion sections are required to compensate the different expansions between copper conductors and steel- or concrete structures, in varying temperatures without interrupting electrical power. The different expansions between the plastic housing and the copper conductors will be compensated in every joint.

ANTI-CONDENSATION SECTIONS

These sections are used for transfer of the conductor system to outdoor areas to avoid condensation. The conductor system is not separated electrically.

CONTACT SECTIONS, TURNTABLES AND SWITCHES

Conductor sections for working areas and transfer applications see page 14.

SECTIONALIZING

Conductor dead sections are electrical interrupts of the conductor. Under normal operating conditions a cross over with collectors to switch the voltage off or on is only allowed with low power ratings (control current). Available in air gap version (5 mm), where the collector carbon bridges the gap, e.g. for mains. Also available in insulating piece version (30 mm). In this case the insulating piece is longer than the carbon and each conductor section can be separated electrically, e.g. for control.

COLLECTOR

The collectors are made of impact-resistant plastic. The current is transmitted by spring-loaded coals. The electrical connection is made by connecting cables. The mechanical connection with the consumer is provided by flexible towing arms. Double collectors are to be used for the following applications:

- Transfers with switches and turntables
- low voltages, frequency controlled drives
- Transmission of data- and/or emergency stop signals
- high electrical loads

The length of the collector cable may not exceed 3 m if the added overcurrent protection device is not designed for the load capacity of this cable. Please refer also to regulations VDE 0100, part 430 and EN 60204-32. (Note: this might happen in case of several collector running in one system). The connecting cables are sufficiently dimensioned for the indicated continuous current ratings.

(Note: The above often occurs with several pantographs per system.)

The supplied connecting cables are sufficiently dimensioned for the specified rated currents. Consider reduction factors for different kinds of installation as per VDE 0298-4.

PLEASE NOTE

For use in galvanizing and pickling plants, under aggressive conditions and low voltage applications we would appreciate receiving detailed information, especially of the environmental conditions. For quotations and order processing including Conductor systems with curves, dead sections, turntables, switches etc. we require your drawings or sketches. Please use our questionnaire, page 29.

ELECTRICAL DATA

max. continuous current	Nominal voltage (UL)	Dielectric strength	Specific resistance	Surface resistance	Leakage resistance
200 A (80% DC)	690 V (600 V)	IEC 60243-1-3 30–40 kV/mm	IEC 60093 $5 \times 10^{15} \Omega/\text{cm}$	IEC 60093 $10^{13} \Omega$	EN 60112 CTI 400–2.7

MECHANICAL DATA

Flexible strength	Tensile strength	Ambient temperature	Flammability	Housing resistance to chemicals (at 45 °C)
75 N/mm ² ±10%	40 N/mm ² ±10%	–30 °C to +60 °C	no flaming particles DIN 41 02 – Class B 1 self extinguishing part 1	Gasoline, mineral Oil, grease, acid sulfur up to 50%, caustic soda up to 50% and hydrochloric acid, concentrated

VOLTAGE DROP FOR THE CONDUCTOR

The voltage drop must be checked for systems with large feed-in sections and high load!

$$\text{AC} \quad \Delta U = \sqrt{3} \cdot I \cdot l \cdot Z$$

l = L end feed

ΔU_1 = voltage drop in Volt

l = L/2 center feed

ΔU_2 = voltage drop in %

$$\text{DC} \quad \Delta U_1 = 2 \cdot I \cdot l \cdot R$$

l = L/4 Power supply at both ends

I = starting current in Ampere

l = L/6 feed per L/6 from the end

R = resistor in Ohm/1000 m

$$\Delta U_1 = \frac{\Delta U_1 \cdot 100}{V}$$

Z = impedance in Ohm/1000 m

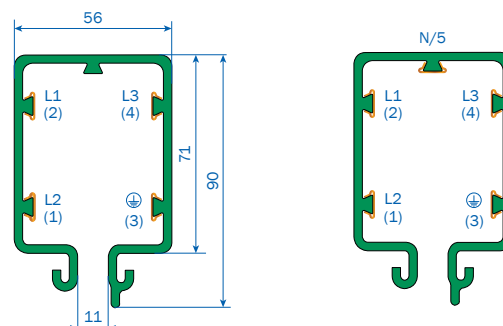
l = feed length in m


V = operating voltage in Volt

L = conductor line length in m

The total ampere load is determined from the nominal rated current of all motors working simultaneously on the same feed section of your electrification system. A diversity factor of 0.5–0.9 can be considered. If the voltage drop is too high (>3%), the copper cross-section of the conductor system or the number of feeds should be increased (reduction of the feed length). Parallel cables to the conductor system can also be laid.

TECHNICAL DATA



Type ⁽¹⁾ HS with PE SS without PE	No. of poles	Copper cross section in mm ²				Ampacity at 35 °C and 100% DC	Nominal voltage V ⁽⁴⁾	Impedanz at 50 Hz and 20 °C Ω/1000 m	Resistance at 20 °C Ω/1000 m	Creepage path mm	Weight kg/m	Order No.
		Phase L1, L2, L3		N/5 ⁽²⁾	Control line							
KBSL4/40 ... HSA	4	10	10	-	-	40	690	1.762	1.751	30	1.728	25296 •
KBSL4/40 ... SSB ⁽¹⁾	4	-	-	-	10	40	690	1.762	1.751	30	1.728	25655 •
KBSL4/63 ... HSA	4	15	15	-	-	63	690	1.290	1.276	30	2.032	25321 •
KBSL4/63 ... SSB ⁽¹⁾	4	-	-	-	15	63	690	1.290	1.276	30	2.032	25325 •
KBSL4/100 ... HSA	4	25	25	-	-	100	690	0.763	0.741	30	2.240	25323 •
KBSL4/140 ... HSA	4	35	35	-	-	140	690	0.571	0.541	30	2.576	25268 •
KBSL4/200 ... HSA	4	50	50	-	-	200 ⁽²⁾	690	0.408	0.372	30	3.164	25269 •
KBSL5/40 ... HSA	5	10	10	10	-	40	690	1.762	1.751	30	1.825	25613 •
KBSL5/40 ... SSB ⁽¹⁾	5	-	-	-	10	40	690	1.762	1.751	30	1.825	25656 •
KBSL5/63 ... HSA	5	15	15	15	-	63	690	1.290	1.276	30	2.205	25322 •
KBSL5/63 ... SSB ⁽¹⁾	5	-	-	-	15	63	690	1.290	1.276	30	2.205	25326 •
KBSL5/100 ... HSA	5	25	25	25	-	100	690	0.763	0.741	30	2.465	25324 •
KBSL5/140 ... HSA	5	35	35	25	-	140	690	0.571	0.541	30	2.885	25270 •
KBSL5/200 ... HSA	5	50	50	25	-	200 ⁽²⁾	690	0.408	0.372	30	3.164	25271 •
KSL4/40 ... HSA	4	10	10	-	-	40	690	1.762	1.751	30	1.728	25736 •
KSL4/40 ... SSB ⁽¹⁾	4	-	-	-	10	40	690	1.762	1.751	30	1.728	25764 •
KSL4/63 ... HSA	4	15	15	-	-	63	690	1.290	1.276	30	2.032	25000 •
KSL4/63 ... SSB ⁽¹⁾	4	-	-	-	15	63	690	1.290	1.276	30	2.032	25146 •
KSL4/100 ... HSA	4	25	25	-	-	100	690	0.763	0.741	30	2.240	25001 •
KSL4/140 ... HSA	4	35	35	-	-	140	690	0.571	0.541	30	2.576	25069 •
KSL4/200 ... HSA	4	50	50	-	-	200 ⁽²⁾	690	0.408	0.372	30	3.164	25404 •
KSL5/40 ... HSA	5	10	10	10	-	40	690	1.762	1.751	30	1.825	25693 •
KSL5/40 ... SSB ⁽¹⁾	5	-	-	-	10	40	690	1.762	1.751	30	1.825	25765 •
KSL5/63 ... HSA	5	15	15	15	-	63	690	1.290	1.276	30	2.205	25002 •
KSL5/63 ... SSB ⁽¹⁾	5	-	-	-	15	63	690	1.290	1.276	30	2.205	25147 •
KSL5/100 ... HSA	5	25	25	25	-	100	690	0.763	0.741	30	2.465	25003 •
KSL5/140 ... HSA	5	35	35	25	-	140	690	0.571	0.541	30	2.885	25073 •
KSL5/200 ... HSA	5	50	50	25	-	200 ⁽²⁾	690	0.408	0.372	30	3.164	25405 •

... Suffix types e.g. 2m KBSL 4/60 with PE KBSL 4/60-2 HS Order.-No. 253212, shorter lengths are made up from the next larger standart lengths.

(1) w/o stiffener clamps. KSL and KSG are c/w stiffener clamps (see page 6).

(2) 80% intermittent = PE

(3) Please refer to page 2 for use as N-conductor see page 2.

(4) Nominal voltage UL= 600 V

(*) In case of using a conductor as N.

• Add last number (1, 2, 3, 4 length suffix) in accordance to bars required. Description in brackets for control.

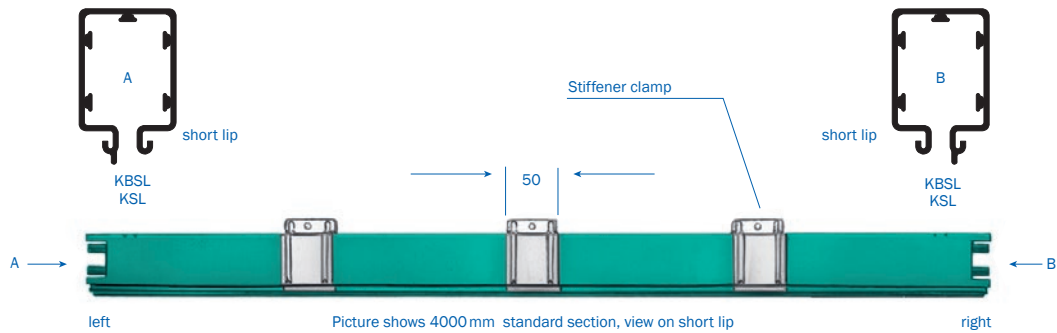
STANDARD SECTIONS AND CURVES

SECTIONS MAX. 4 M⁽¹⁾

The KSL is supplied with stiffener clamps.

With the KBSL the stiffener clamps are not necessary.

Parts for plug-in joints and bolted joints are identical in construction.



Type	Index K (stainless steel)		Index I (63 A) copper conductors with stainless steel cap	
	4-pole	5-pole	4-pole	5-pole
KSL	250830	250830	258301	258302

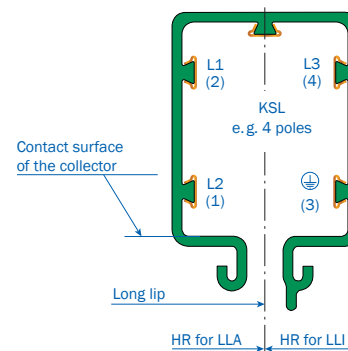
Index K and I for special environmental conditions.

CURVES⁽²⁾

Production corresponding to customer drawing



Support spacing: 750 up to max. 2000 mm, depending on the radius max. L = 3600 mm, max. α 120°



Min. vertical bending radius (VR) for KSL = 1800 mm

Min. bending radius horizontal in mm (KSL)

Type	63 A	100 A	140 A	200 A
4-pole	600	600	900	900
5-pole	750	750	900	900

Surcharge 4-pole for bending	Order No.
horizontal curve	251500
vertical curve	251490

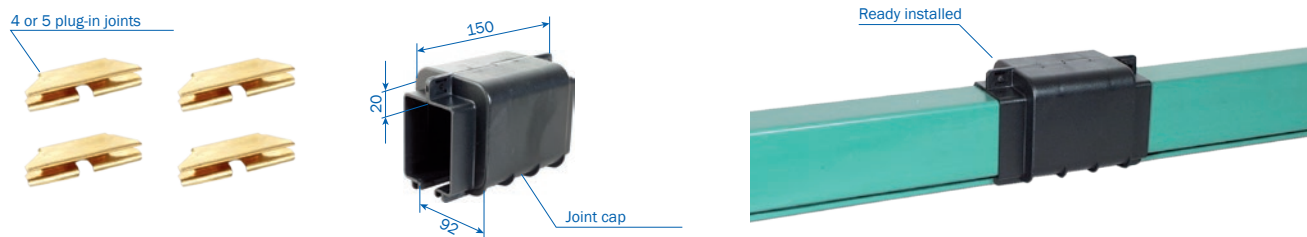
Surcharge 5-pole for bending	Order No.
horizontal curve	259424
vertical curve	259426

(1) Shorter sections see page 5.

(2) Long lip side of conductor system should always be mounted facing the track (see page 8). Notify exceptions for replacements and/or extensions and determine correct curves.

JOINT MATERIAL (1)

PLUG-IN JOINTS 40–100 A



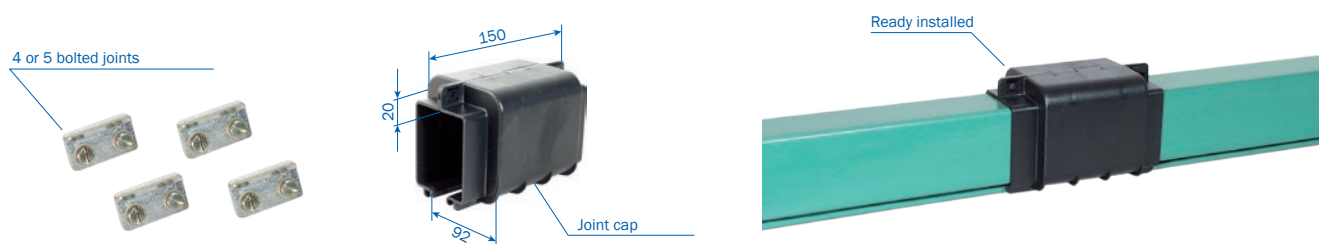
FOR KBSL AND KSL 4-POLE

Type	Weight kg	Order No.
VM-VBK4	0.188	257907

FOR KBSL AND KSL 5-POLE

Type	Weight kg	Order No.
VM-VBK5	0.196	257908

BOLTED JOINTS 40–200 A



FOR KBSL AND KSL 4-POLE

Type	Weight kg	Order No.
VM-VBS4	0.260	258818

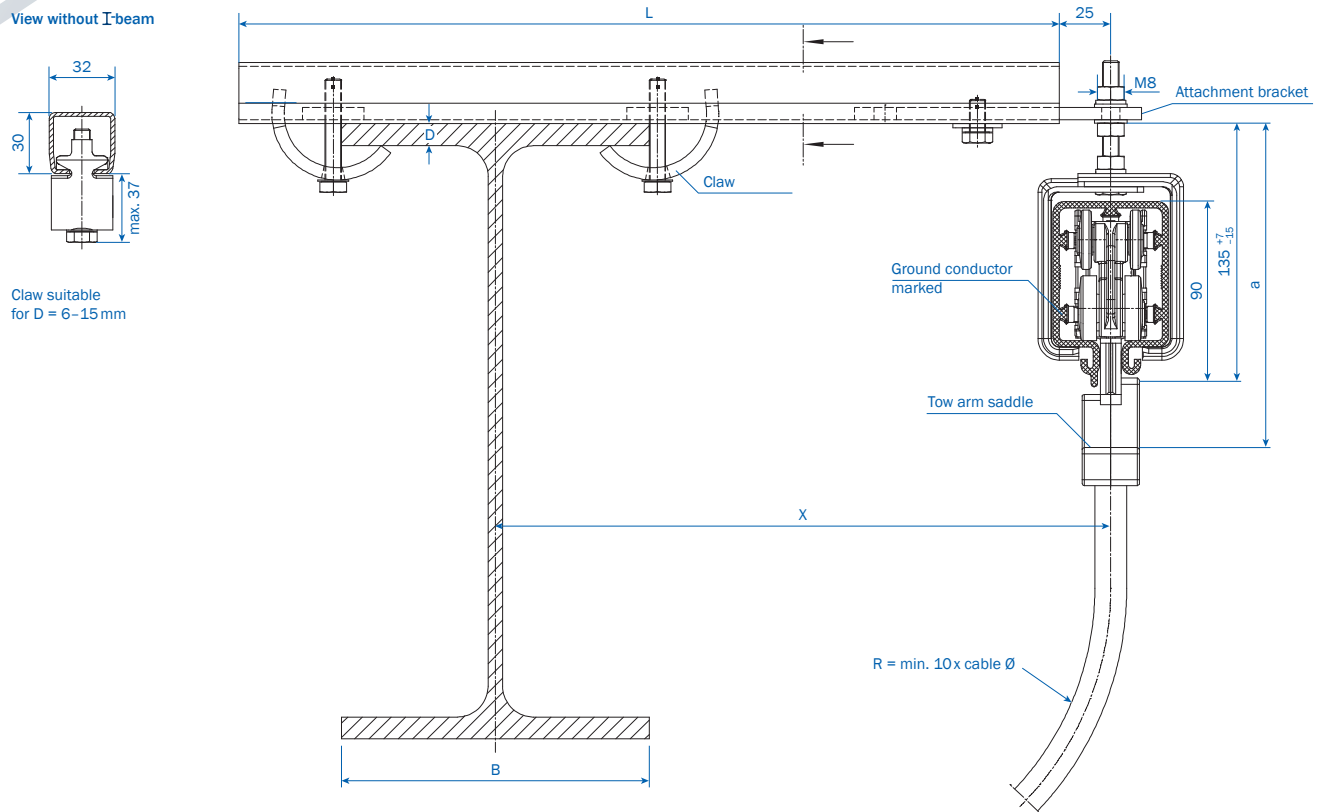
FOR KBSL AND KSL 5-POLE

Type	Weight kg	Order No.
VM-VBS5	0.286	258819

(1) Identically constructed for main current and control line.

BRACKETS KBSL AND KSL

THESE BRACKETS ARE EASILY BOLTED TO ANY TYPE OF STANDARD I-BEAM.



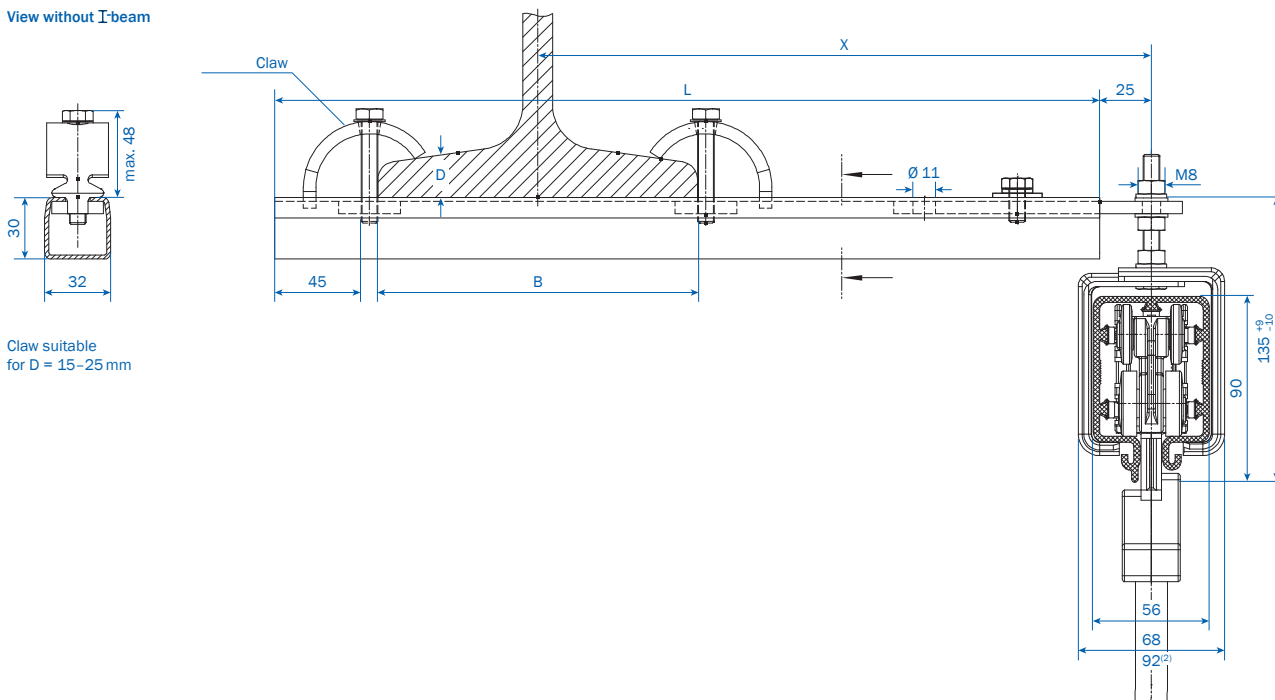
FOR KBSL AND KSL

Collector	Measure a
SKR	161 $^{+7}_{-15}$
SKN	165 $^{+7}_{-15}$
SKNT	175 $^{+7}_{-15}$

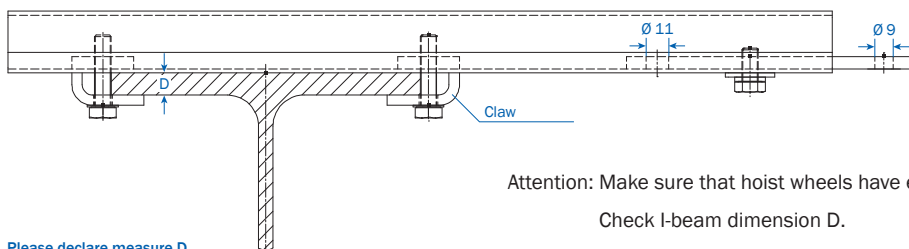
BRACKETS KBSL AND KSL

THESE BRACKETS ARE EASILY BOLTED TO ANY TYPE OF STANDARD I-BEAM.

View without I-beam



EHK SMALL CLAW VERSION



Attention: Make sure that hoist wheels have enough clearance. Use small claw if necessary.
Check I-beam dimension D.

rail of EHK is identical to type S 1, Cat. 8a.

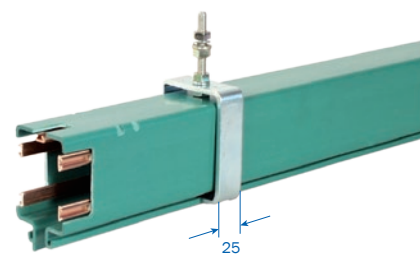
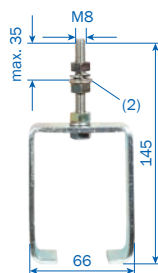
Type ⁽¹⁾	X mm	L mm	B max mm	Weight kg	Order No. for standard brackets	Order No. ⁽¹⁾ with small claw
EHK250	250	350	170	0.895	251600	251720
EHK300	300	400	170	0.979	251610	251730
EHK400	400	500	170	1.313	251620	251740
EHK500	500	600	170	1.510	251630	251750
EHK600	600	700	170	1.639	251640	251760
EHK700	700	800	170	1.804	251650	251770
EHK750	750	850	170	1.798	251660	251780
EHK800	800	900	170	2.026	251670	251790

Select next larger size bracket when I-beam dimension B is between 170 mm and 300 mm.

(1) e. g. HK-EHK250-KS12 → Order No. 251720-12 for clamping claw with D = 12 mm
For beam widths B over 170 to 300 mm, use the next larger EHK.

HANGERS

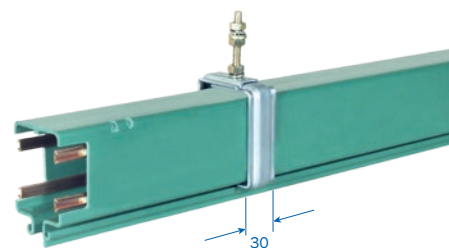
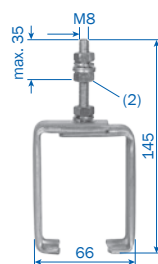
SLIDING HANGER FOR KBSL



Sliding hanger mounted to conductor-section.

Type	Weight kg	Order No.
AH-KGB	0.235	259001

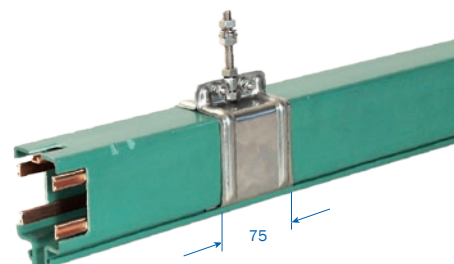
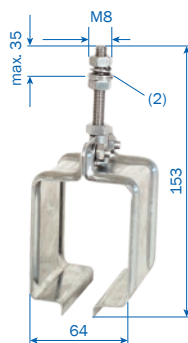
SLIDING HANGER FOR KBSL AND KSL



Sliding hanger mounted to conductor-section.

Type	Weight kg	Order No.
AH-KSH	0.218	252894
AH-KSH/K ⁽¹⁾	0.238	250660

FIXPOINT HANGER FOR KBSL AND KSL



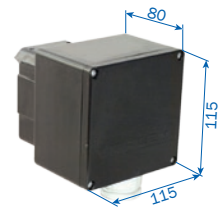
Fixpoint hanger mounted to conductor section.
Hanger consists of steel clamp and bolt M 8.

Type	Weight kg	Order No.
AH-KF	0.215	258806
AH-KF/K ⁽¹⁾	0.219	258807

(1) stainless steel

(2) Flat washers only be used in slotted holes.

FEEDS



Cable gland M 32,
Cable-Ø 17 - 26 mm
for cable cross section max. 10 mm²

END FEEDS

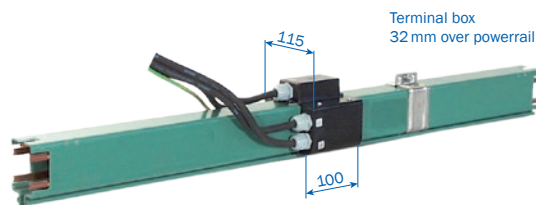
End feed comes loose without conductor section.

It can be mounted on the left or right end.

Type ⁽³⁾	Weight kg	A	Order No.
ES-KEK4/40-63HS	0.410	40-63	258421
ES-KEK5/40-63HS	0.427	40-63	258422
ES-KEK4/40-63SS	0.410	40-63	258423
ES-KEK5/40-63SS	0.427	40-63	258424

LINE FEEDS⁽¹⁾

with 2 m cables incl. 1 m section



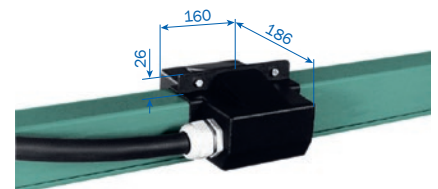
A	Cable-Ø mm	Cable cross section mm ²
40	9.5	6
60	11.5	10
100	13.5	25
140	14.5	35

Type ⁽²⁾	Weight kg	A	Order No.
ES-KNKL4/40HSA-1000-2	2.901	40	259209
ES-KNKL4/40SSB-1000-2	3.033	40	259205
ES-KNKL4/63HSA-1000-2	3.729	63	259211
ES-KNKL4/63SSB-1000-2	3.913	63	259207
ES-KNKL4/100HSA-1000-2	5.289	100	259213
ES-KNKL4/140HSA-1000-2	6.451	140	259215
ES-KNKL5/40HSA-1000-2	3.280	40	259221
ES-KNKL5/40SSB-1000-2	3.414	40	259217
ES-KNKL5/63HSA-1000-2	4.435	63	259223
ES-KNKL5/63SSB-1000-2	4.513	63	259219
ES-KNKL5/100HSA-1000-2	6.494	100	259225
ES-KNKL5/140HSA-1000-2	7.586	140	259227

JOINT FEED

The joint feed KNS is without powerail.

It can only be used with KBSL and KSL 4-pole

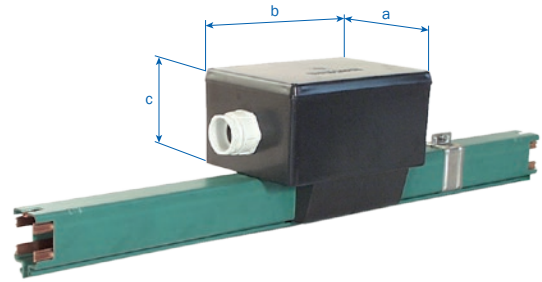


Type ⁽²⁾	Weight kg	A	Order No.
ES-KNS4/40-63 HS-L	0.550	40-63	258001
ES-KNS4/40-63 SS-L	0.550	40-63	258002

(1) The powerail section is part of the system length (see example of ordering page 20 & 21).

(2) For full type designation add suffix of Powerail section, e. g. ES-KEK 4/60 w/ PE → ES-KEK 4/60 HS Order No. 258421.

LINE FEEDS



LINE FEED⁽¹⁾

with terminal box incl. 1 m powerail section

Type ⁽²⁾	Weight kg	A	Order No.
ES-KNK4/40HSA-1000	2.292	40	258254
ES-KNK4/40SSB-1000	2.292	40	258256
ES-KNK4/63HSA-1000	2.596	63	258258
ES-KNK4/63SSB-1000	2.428	63	258260
ES-KNK5/40HSA-1000	2.327	40	258262
ES-KNK5/40SSB-1000	2.323	40	258264
ES-KNK5/63HSA-1000	2.576	63	258250
ES-KNK5/63SSB-1000	2.463	63	258252
ES-KNKS4/40HSA-1000	2.779	40	258266
ES-KNKS4/63HSA-1000	2.802	63	258268
ES-KNKS4/100HSA-1000	3.346	100	258270
ES-KNKS4/140HSA-1000	3.670	140	258272
ES-KNKS4/200HSA-1000	5.200	200	258612
ES-KNKS5/40HSA-1000	2.922	40	258274
ES-KNKS5/63HSA-1000	3.093	63	258276
ES-KNKS5/100HSA-1000	3.563	100	258278
ES-KNKS5/140HSA-1000	3.900	140	258280
ES-KNKS5/200HSA-1000	5.280	200	258616

CABLE SCREW JOINTS FOR THE FEEDS

Type	Screw Joints	Line-Ø in mm	Current in A	Side
KEK	M 32	15-21	40-63 HS	11
KEK	M 25	9-17	40-63 SS	11
KNS	M 40	19-28	40-63 HS/SS	11
KNK	M 25	9-17	40 HS/SS	12
KNK	M 32	15-21	63 HS	12
KNK	M 25	9-17	63 SS	12
KNKS	M 25	9-17	40 HS	12
KNKS	M 32	15-21	63 HS	12
KNKS	M 50	23-35	100-140 HS	12
KNKS	M 50	30-38	200 HS	12

Maß	KNK 40-63 A	KNKS 40-140 A	KNKS 200 A
a	115	156	206
b	115	196	286
c	70	100	140

(1) Above sections come factory assembled on a 1 m conductor section (Please refer to ordering example on page 24, 25).

END CAPS AND CONDUCTOR DEAD SECTIONS



END CAPS

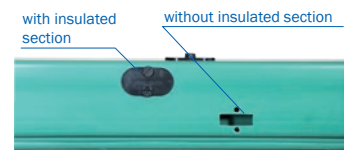
End cap assembled on conductor section

Type	Weight kg	Order No.
EK-MEK	0.084	256527

CONDUCTOR DEAD SECTIONS

It is to be indicated, which copper rails are to be separated and which type of current collector is used (see page 5).

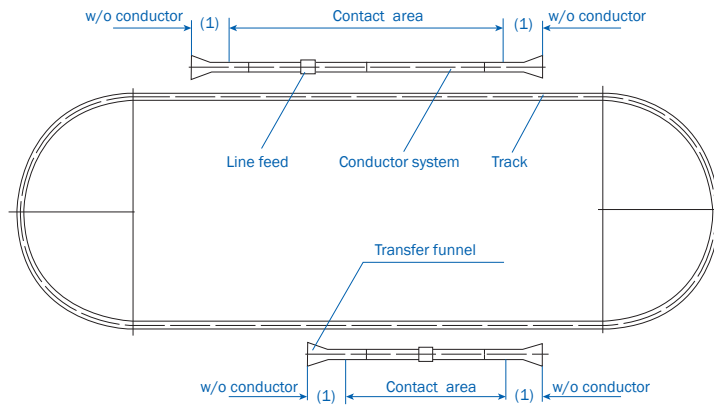
Installation factory-assembled.



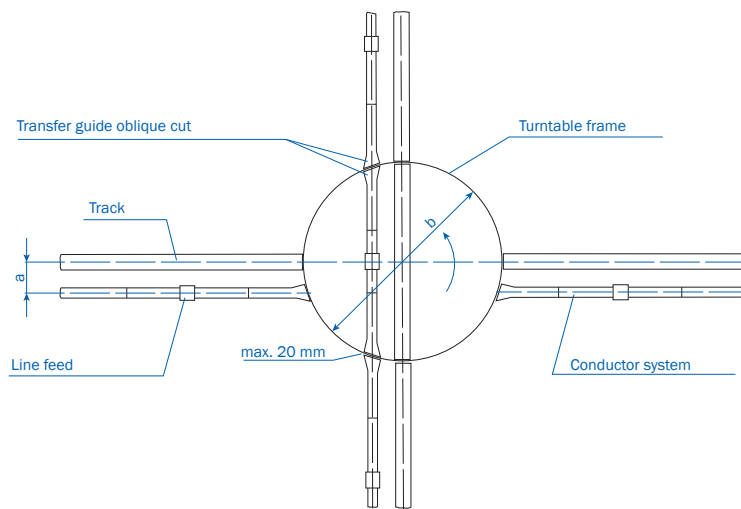
Type with air gap 5 mm	Order No.	Type with insulation section 30 mm	Order No.
ST-STLA1	251860	ST-STLI1	250220
ST-STLA2	251870	ST-STLI2	250590
ST-STLA3	251880	ST-STLI3	250600
ST-STLA4	251890	ST-STLI4	250610
ST-STLA5	251900	ST-STLI5	250620

CONTACT SECTIONS, TURNTABLES AND SWITCHES

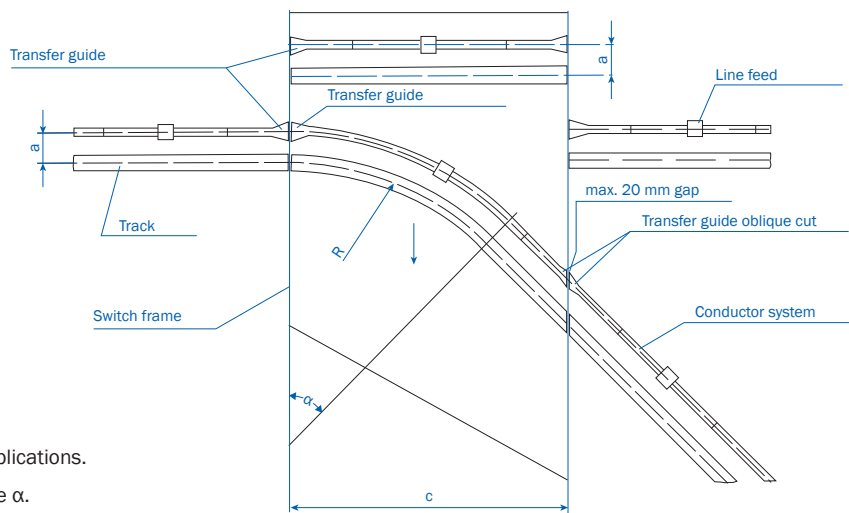
CONTACT SECTION⁽¹⁾



TURNTABLE



SLIDING SWITCH



Please submit drawings of transfer applications.

Specify dimensions a, b, c, R and angle α .

$\alpha = 50^\circ$

Max. 20 mm air gap between transfer guides.

To create all parts for contact sections, turntables and switches we require detailed construction drawings.

(1) Contact sections must not be activated before collectors are fully engaged.

TRANSFER GUIDES

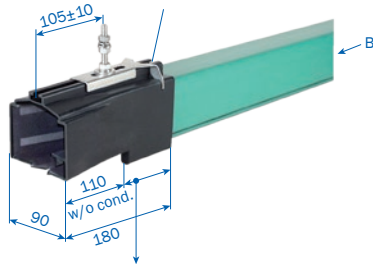
TRANSFER GUIDES, STRAIGHT

incl. fixpoint hanger

4- and 5-poles, 40 to 200A

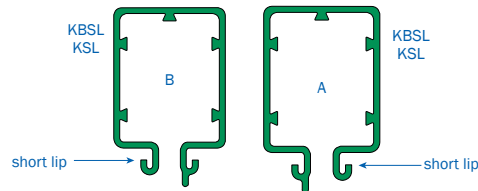
Staggered arrangement of the transfer guides to each other: horizontal max. 8 mm; vertical max. 3 mm

The support plate grabs in oblique rivets (45°), 50 mm from the leading edge, each 4 mm, 2 mm deep.

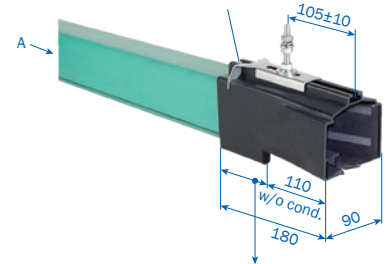


70 mm overlapping conductor section

Sketch shows left hand version (with conductor section)



The support plate grabs in oblique rivets (45°), 50 mm from the leading edge, each 4 mm, 2 mm deep.



70 mm overlapping conductor section

Sketch shows right hand version (with conductor section)

Type ⁽¹⁾	Weight kg	Order No.
UE-AUN	0.392	257455

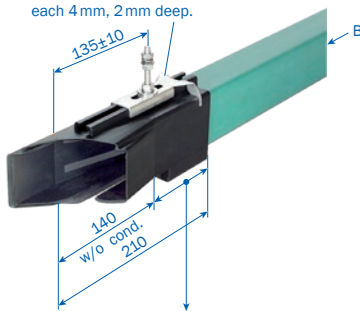
TRANSFER GUIDES, OBLIQUE

incl. fixpoint hanger

4- and 5-poles, 40 to 200A

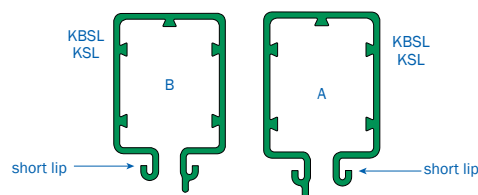
Staggered arrangement of the transfer guides to each other: horizontal max. 8 mm; vertical max. 3 mm

The support plate grabs in oblique rivets (45°), 50 mm from the leading edge, each 4 mm, 2 mm deep.

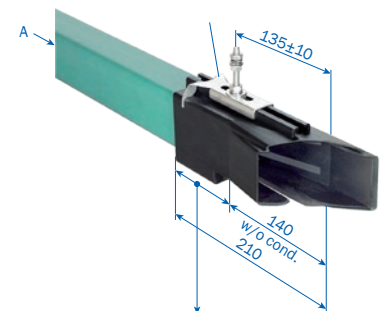


70 mm overlapping conductor section

Sketch shows left hand version (with conductor section)



The support plate grabs in oblique rivets (45°), 50 mm from the leading edge, each 4 mm, 2 mm deep.



70 mm overlapping conductor section

Sketch shows right hand version (with conductor section)

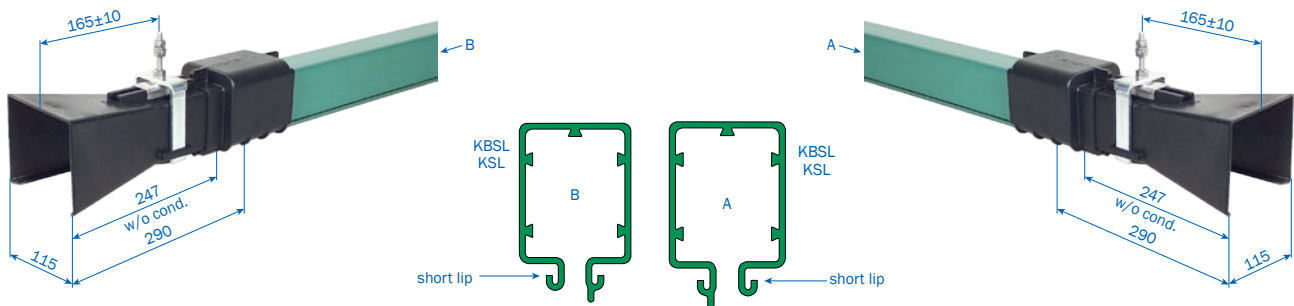
Type ⁽¹⁾	Weight kg	Order No.
UE-AUNS	0.482	257459

(1) With KBSL and KSL left and right execution, as well as control line are identically constructed. Always use double collectors or two collectors for transfer applications (see page 20 and 21).

TRANSFER FUNNELS (1)

FOR KBSL AND KSL

Side offset: max. 15 mm, height offset: max. 10 mm



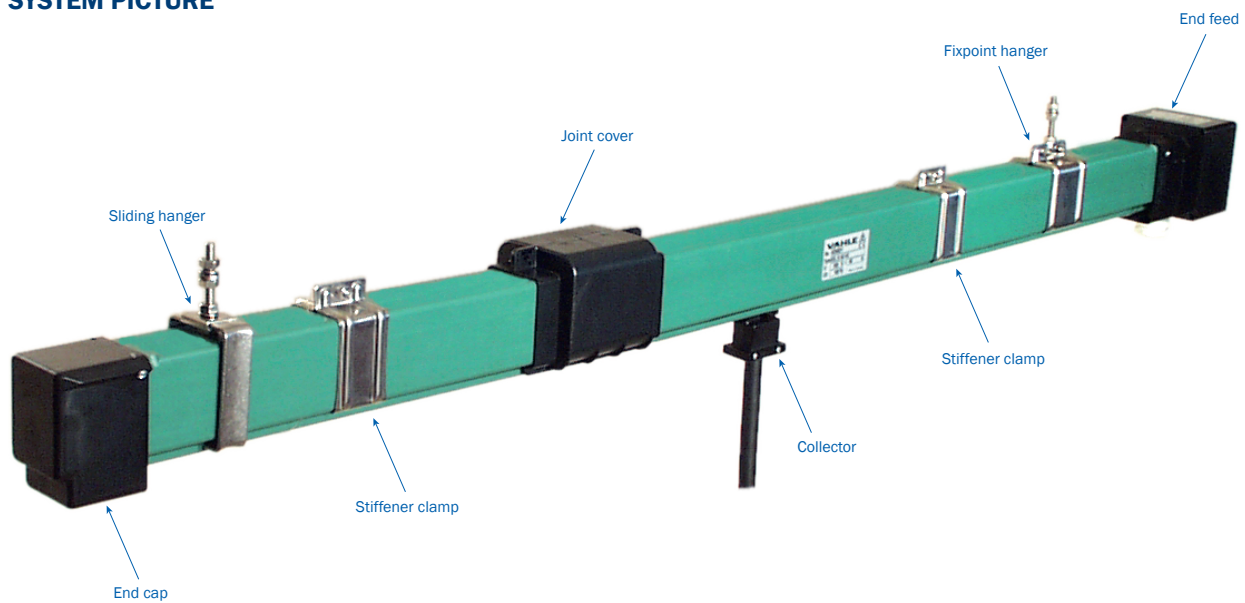
Left hand version

Type	Weight kg	Order No. HS with PE	Order No. SS with PE
ET-ESTN4-L	0.860	256164	256166
ET-ESTN5-L	0.878	256172	256174

Right hand version

Type	Weight kg	Order No. HS with PE	Order No. SS with PE
ET-ESTN4-R	0.860	256163	256165
ET-ESTN5-R	0.878	256171	256173

SYSTEM PICTURE



(1) Funnels must not be activated before collectors are fully engaged.
Suffix types e.g. ET-ESTN 4 L with earth → ET-ESTN 4 L ref.no. 256164.

ANTI-CONDENSATION SECTIONS ⁽¹⁾

(incl 1 m section)

This anti-condensation-section consists of 1 m conductor rail with openings covered by a protection hood. The anti-condensation section does not disconnect the conductor system electrically.

APPLICATION OF ANTI-CONDENSATION SECTION

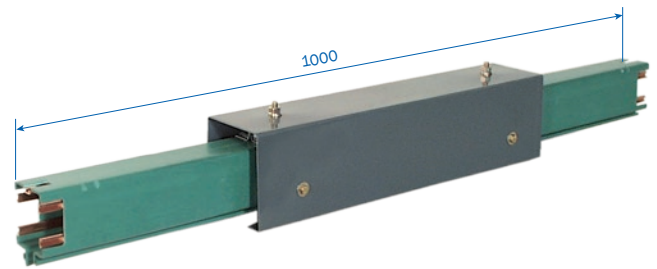
At transitions of the conductor line from a heated to an unheated part of the hall. This prevents icing of the external conductor line, as the hot air escaping escapes and does not condense in the line (see sketch).

FEEDING

No extra feeds required as the conductor system is not interrupted.

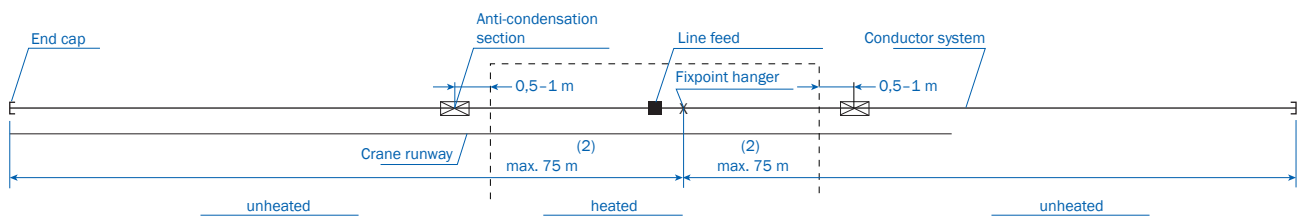
COLLECTORS

No extra collectors required.



INSTALLATION

The anti-condensation section is to be placed directly (0.5 m–1 m max.) at the transfer point from heated to unheated part of the factory floor. See sketch.



Type power line HS with PE ⁽²⁾	Order No.
BT-BTK4/40HSA-1000	257679
BT-BTK4/63HSA-1000	258652
BT-BTK4/100HSA-1000	258653
BT-BTK 4/140 HSA-1000	258654
BT-BTK4/200HSA-1000	258655
BT-BTK5/40HSA-1000	257680
BT-BTK5/63HSA-1000	258656
BT-BTK5/100HSA-1000	258657
BT-BTK5/140HSA-1000	258658
BT-BTK5/200HSA-1000	258659

Type control line SS with PE ⁽²⁾	Order No.
BT-BTK4/40SSB-1000	257681
BT-BTK4/63SSB-1000	258725
BT-BTK5/40SSB-1000	257682
BT-BTK5/63SSB-1000	258726

(1) Above sections come ready assembled on 1 m Powerail and are a part of the system length.

(2) For longer runs use Expansion joint section (see page 19).

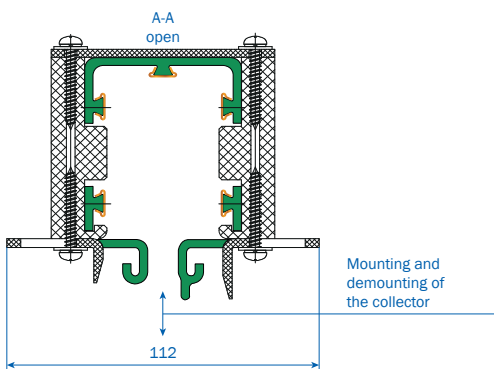
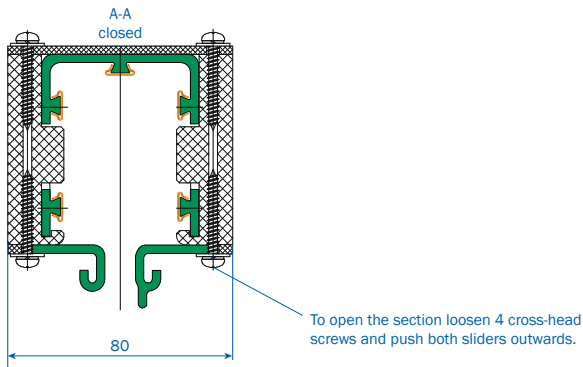
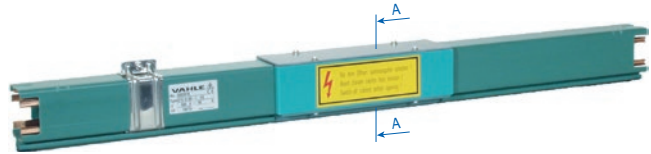
(3) Suffix types e.g. BT-BTK 4/60 with PE → BT-BTK 4/60 HS Order No. 258652

REMOVING SECTIONS ⁽¹⁾

(incl. 1 m section)

Assembly and disassembly of the collector is possible at the end of the track as well as at the removing section.

With plants with frequent maintenance procedures or several current collectors in a system (e.g. test plants) removing sections are to be planned.



By opening and closing the sliders at the bottom of the conductor housing the collector can be mounted and demounted easily.

Before opening disconnect mains. The removing section does not disconnect the conductor system electrically.

FOR SINGLE COLLECTORS KBSL / KSL

Type power line HS with PE ⁽²⁾	Order No.
AT-ATK4/40HSA-1000	257988
AT-ATK4/63HSA-1000	252811
AT-ATK4/100HSA-1000	252812
AT-ATK4/140HSA-1000	252813
AT-ATK4/200HSA-1000	252814
AT-ATK5/40HSA-1000	257990
AT-ATK5/63HSC-1000	252816
AT-ATK5/100HSA-1000	252817
AT-ATK5/140HSA-1000	252818
AT-ATK5/200HSA-1000	252819
Type control line SS ohne PE ⁽²⁾	Order No.
AT-ATK4/40SSB-1000	257989
AT-ATK4/63SSB-1000	252815
AT-ATK5/40SSB-1000	257991
AT-ATK 5/63 SSA-1000	252820

FOR DOUBLE COLLECTORS KBSL / KSL

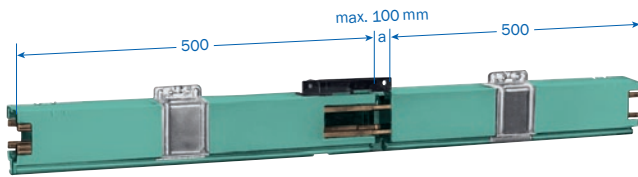
Type power line HS with PE ⁽²⁾	Order No.
AT-ATKD4/40HSA-1000	257992
AT-ATKD4/63HSA-1000	252831
AT-ATKD4/100HSA-1000	252832
AT-ATKD4/140HSA-1000	252833
AT-ATKD4/200HSA-1000	252834
AT-ATKD5/40HSA-1000	257994
AT-ATKD5/63HSA-1000	252836
AT-ATKD5/100HSA-1000	252837
AT-ATKD5/140HSA-1000	252838
AT-ATKD5/200HSA-1000	252839
Type control line SS ohne PE ⁽²⁾	Order No.
AT-ATKD4/40SSB-1000	257993
AT-ATKD4/63SSB-1000	252835
AT-ATKD5/40SSB-1000	257995
AT-ATKD5/63SSB-1000	252840

(1) Above sections come ready assembled on 1m Powerail and are a part

(2) Suffix types e.g. AT-ATK 4/40 with PE → AT-ATK 4/40 HS Order No. 257988

EXPANSION JOINT SECTIONS (1)

(incl 1 m section)



The 1 m expansion sections absorb the changes in length with temperature fluctuations without electrical interruption.

RANGE OF APPLICATION

The expansion section is used if the length of the conductor line between bends, transfer lines or other fixed points is longer than 20 m (with large temperature fluctuations longer than 10 m).

The max. length is for temperature differences:

- $\Delta t 20^{\circ}\text{C} = 100\text{ m}$
- $\Delta t 40^{\circ}\text{C} = 50\text{ m}$
- $\Delta t 80^{\circ}\text{C} = 25\text{ m}$
- $\Delta t 30^{\circ}\text{C} = 68\text{ m}$
- $\Delta t 60^{\circ}\text{C} = 34\text{ m}$

For larger lengths or temperature differences, several expansion sections must be used. Please ask for our advice. See sketch 1–3 for arrangement of fixed points. The remaining conductor line must be laid in sliding suspensions.

FEEDING

Additional feeds are not necessary as the conductor line is not interrupted electrically.

CURRENT COLLECTOR

No special or extra collector required.

EXPANSION JOIN SECTIONS KBSL / KSL

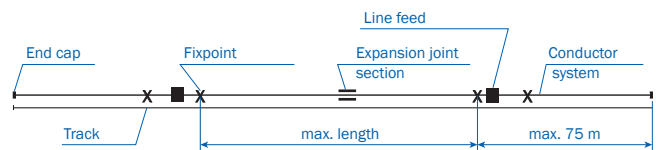
Type power line HS with PE ⁽²⁾	Weight kg	Order No.
DT-DVK4/40HSA-1000	3.099	257054
DT-DVK4/63HSA-1000	3.211	252430
DT-DVK4/100HSA-1000	3.493	252440
DT-DVK4/140HSA-1000	3.779	252450
DT-DVK4/200HSA-1000	4.819	250249
DT-DVK5/40HSA-1000	3.214	257687
DT-DVK5/63HSA-1000	3.264	252470
DT-DVK5/100HSA-1000	3.624	252480
DT-DVK5/140HSA-1000	4.070	252490
DT-DVK5/200HSA-1000	5.115	250250
Type control line SS with PE ⁽²⁾	Weight kg	Order No.
DT-DVK4/40SSB-1000	3.099	257688
DT-DVK4/63SSB-1000	3.209	252460
DT-DVK5/40SSB-1000	3.124	257689
DT-DVK5/63SSB-1000	3.264	252500

MOUNTING

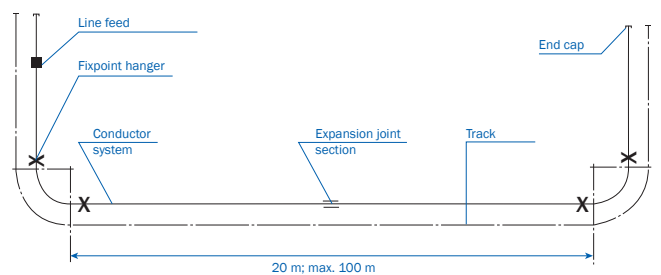
The expansion section is installed in the middle between 2 fixed points. The remaining conductor line is laid in sliding suspensions according to the assembly instructions. The distance dimension "a" depends on the ambient temperature during installation. Determine dimension "a" from the diagram below.

Example: mounting temperature 18 °C

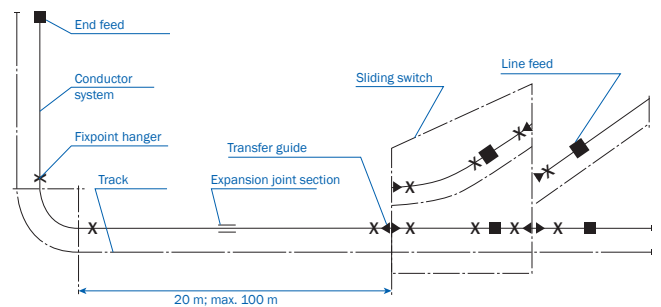
Dimension "a" according to diagram ~50 mm.



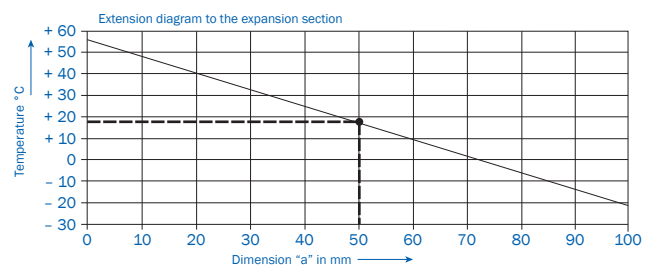
Sketch 1



Sketch 2

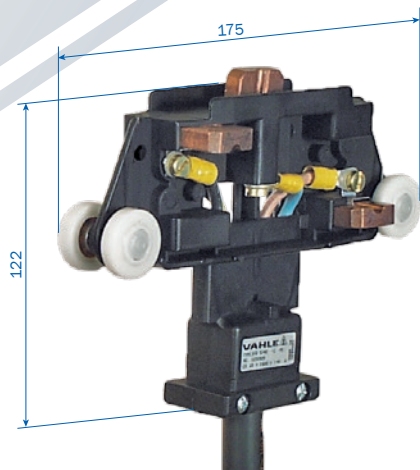


Sketch 3

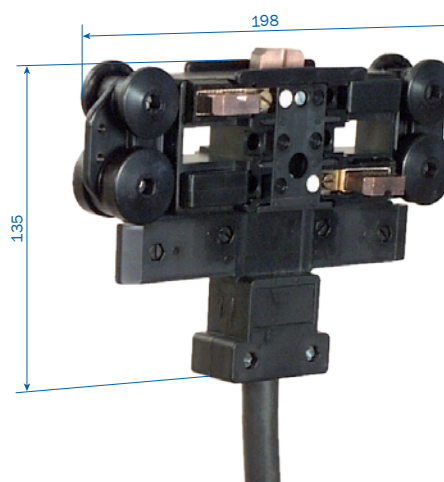


(1) Above sections come ready assembled on 1 m Powerail and are a part of the system length.
 (2) Suffix types e.g. DT-DVK 4/60 with PE → DT-DVK 4/60 HS Order No. 252430.

COLLECTORS



SKR, 5-pole



SKN, 5-pole

Type Power line HS with PE ⁽²⁾	A ⁽¹⁾	Poles	Weight kg	Max. speed m/min.		General	Order No.
				Normal	Transfer		
SKR4/25-1	25	4	0.575	100	-	For straight runs and curves R > 0.6m ball bearing wheels Not to be used for transfer guides and transfer funnels	256773
SKR5/25-1	25	5	0.667	100	-		257690
SKR4/40-1	40	4	0.721	100	-		255926
SKR5/40-1	40	5	0.859	100	-		255929
SKN4/40-1	40	4	0.854	180	80	for straight runs and curves R > 1.2 m ball wearing wheels	257130
SKN5/40-1	40	5	0.958	180	80		257140
SKN4/40K-1	40	4	0.837	180	80	for curved runs R 0.6-1.2 m ball bearing wheels	257150
SKN5/40K-1	40	5	0.941	180	80		257160

Type Contol line HS without PE ⁽²⁾	A ⁽¹⁾	Poles	Weight kg	Max. speed m/min.		General	Order No.
				Normal	Transfer		
SKR4/25-1	25	4	0.449	100	-	For straight runs and curves R > 0.6m ball bearing wheels Not to be used for transfer guides and transfer funnels	255928
SKR5/25-1	25	5	0.566	100	-		255931
SKN4/25-1	25	4	0.720	180	80	For straight runs and curves R > 1.2m ball wearing wheels	257170
SKN5/25-1	25	5	0.720	180	80		257180
SKN4/25K-1	25	4	0.549	180	80	For curved runs R 0.6-1.2m ball bearing wheels	257190
SKN5/25K-1	25	5	0.641	180	80		259200

Collectors for higher speed and cleaning trolleys on request.

CONNECTING LEAD

for 25A with 2.5 mm² / pole, for 40A with 4 mm² / pole

1m long, longer length available

Ordering example for cable length of 2 m

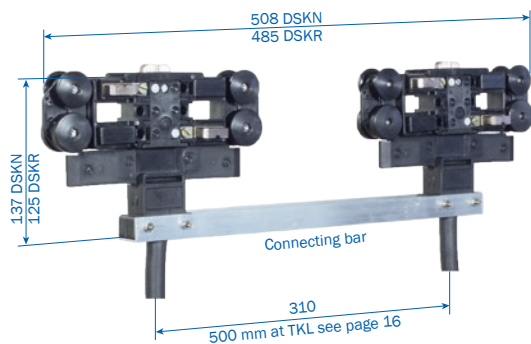
Order No. 0257130/00-2 for current collectors SA-SKN4/40-2HS28-60

(1) 60% ED (duty cycle). For the KSL with CU-Inox rails, the electrical load values A are halved.

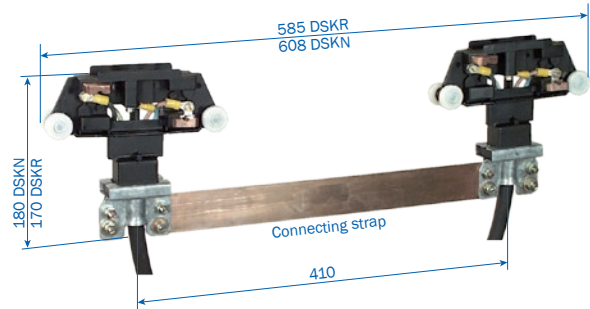
(2) Add types e.g. SKR 4/25-1 with PE → SKR 4/25-1 HS Order No. 256773

SKR 4/25-1 without PE → SKR 4/25-1 ST Order No. 255928

DOUBLE COLLECTORS



DSKN, 5-pole, execution S



DSKR, 5-pole, execution F

Execution F = flexible strap connection for curves⁽²⁾

Execution S = rigid bar connection for straight runs

Type Power line HS with PE	A ⁽¹⁾	Poles	Weight kg	Order No.
DSKR4/50 F-1	50	4	1.591	257691
DSKR5/50 F-1	50	5	1.934	257692
DSKR4/50 S-1	50	4	1.257	257693
DSKR5/50 S-1	50	5	1.441	257694
DSKR4/80 F-1	80	4	1.083	256473
DSKR5/80 F-1	80	5	2.058	256479
DSKR4/80 S-1	80	4	1.549	255944
DSKR5/80 S-1	80	5	1.824	256370
DSKN4/80 F-1	80	4	2.076	257780
DSKN5/80 F-1	80	5	2.276	257790
DSKN4/80 S-1	80	4	1.924	258385
DSKN5/80 S-1	80	5	2.132	258387

Type Control line ST without PE	A ⁽¹⁾	Poles	Weight kg	Order No.
DSKR 4/50 F-1	50	4	1.339	256485
DSKR 5/50 F-1	50	4	1.166	256491
DSKR 4/50 S-1	50	5	1.005	256371
DSKR 5/50 S-1	50	4	1.238	256372
DSKN 4/50 F-1	80	5	1.800	257880
DSKN 5/50 F-1	80	4	1.800	257890
DSKN 4/50 S-1	80	5	1.656	258386
DSKN 5/50 S-1	80	4	1.656	258388

CONNECTING LEAD

for 25A with 2.5 mm² / pole, for 40A with 4 mm² / pole

1 m long, longer length available

Ordering example for cable length of 2 m

Order No. 0257130/00-2 for current collectors SA-SKN4/40-2HS28-60

(1) 60% ED (duty cycle). For the KSL with CU-Inox rails, the electrical load values A are halved.

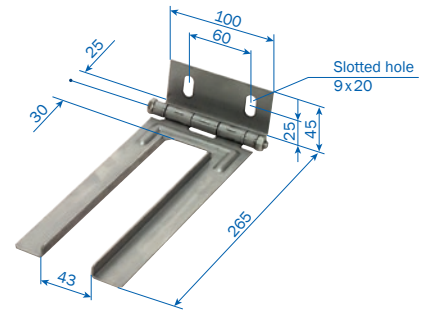
(2) For radii < 1200 mm and angles $\alpha > 45^\circ$ use 2 single pantographs (see page 14).

(3) Add types e.g. SKR 4/25-1 with PE → SKR 4/25-1 HS Order No. 256773
SKR 4/25-1 without PE → SKR 4/25-1 ST Order No. 255928

TOW ARM

For single and double collector⁽²⁾.

Mounting dimensions see pages 8 and 9.



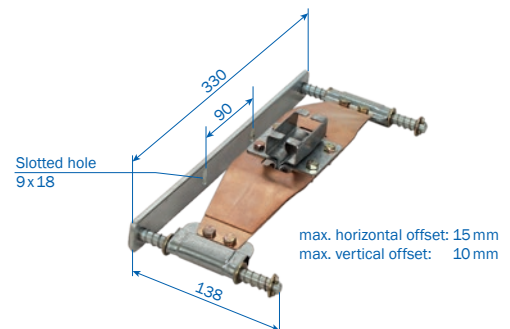
Type	Weight kg	Order No.
MN-KWS	0.444	250380
MN-KWS/K ⁽²⁾	0.451	252340

FLEXIBLE TOW ARMS

Flexible support type, with single collector for transfer funnels (see page 16).

Mounting dimensions see page 28.

If you are going to use the flexible towing arm in system with curves please contact us.



Type	Weight kg	Order No.
MN-KFMLN (für SKN)	1.108	259506

(1) In case of installing 2 Powerail systems in parallel use one towing arm each per collector unit.
 (2) Stainless steel

SPARE PARTS

PLASTIC CONDUCTOR LINE

Type	Description	Order No.	
		KBSL	KSL
VM-ZB-SK-KSL-KBSL-KSB-K-150-P	Joint cap, 150 mm long (clipable)	257921	257921
VK-KSL-S-50-P	Reinforcement clamp, 50 mm long	-	258797
VK-KSL-R-50-P	Stainless steel reinforcing clip	-	258812
VM-STV40-100A-KSL/T-KBSL-KSB	Spring plug connector max. 100 A	259274	259274
VM-SCHV40-200A-KSL/T-KBSL-KSB	Screw connector 40-200 A	258796	258796
VM-ZB-AD-KSL/T-S	Adapter for butt cap and transfer guide (with old KSL)	258822	258822

Type	Description	Order No.	
		KBSL	KSL
SK-SKN/T-SWN/T-SWNG/T-PH/S-28	Carbon brush phase incl. carbon socket (lateral)	257600	254890
SK-SKN/T-SWN/T-SWNG/T-PH/PE/O-28	Carbon brush 5 pole incl. carbon socket (top)	257600	254891
SK-SKN/T-SWN/T-SWNG/T-PE/S-28	Carbon brush Protective conductor incl. carbon socket (sideways)	257601	254892
SA-KF-SKN/T-SWN/T-SWNG/T-SS	Carbon spring. Standard (approx. 5 N)	258758	258757
SA-KF-SKN/T-SWN/T-SWNG/T-VS	Carbon spring, reinforced version (approx. 8.5 N)	258761	258760
SA-ZB-SFG-SKN-SWN-SWM-P	Slot guide straight ahead (SKN)	-	254893
SA-ZB-SFK-SKN/K-SWN/K-P	Slot guidance curved (SKN/K)	-	254894
SA-ZB-LR-SKN/T/K-SWN/T-SWM/T-S	Impeller (bottom)	-	254895
SA-ZB-FR-SKN/T/K-SWN/T-SWM/T-S	Guide wheel (top)	-	254903
TR-DSWK/SRKA/SKR-DSKN/T-DSWN/M/T-FF410	Spring cross bar for double pantographs	258379	258379
TR-DSKN/T-DSWN/T-DSWMT-SF310	Rigid traverse for double pantographs	258430	258431
SA-ZB-KWZL-SKN/T-SWN/T-SWMT-S	Mounting clamp KWZL	-	254897
SA-ZB-KWZ-SKR-SWK-SRKA-S	Mounting clamp KWZ	250310	-
SA-ZB-RB-SKN/T-SWN/T-S	Cleaning brushes complete set (2 pieces)	-	252851

EXAMPLES FOR ORDERING

RUNWAY ELECTRIFICATION (40 M OVERALL LENGTH)

Qty.	Description	Type	Order No.	Type	Order No.
9	Powerail, 4 m	KBSL4/63-4000HSA	253214	KSL4/63-4000HSA	250004
1	Powerail, 3 m	KBSL4/63-3000HSA	253213	KSL4/63-3000HSA	250003
1	Line feed incl. 1 m powerail	ES-KNKS4/63HSA-1000	258268	ES-KNKS4/63HSA-1000	258268
10	Join kits	VM-VBK4	257907	VM-VBK4	257907
2	Fixpoint hanger	AH-KF	258806	AH-KF	258806
19	Sliding hanger	AH-KGB	259001	KSH	250050
2	End caps	EK-MEK	256527	EK-MEK	256527
1	Double collector	SA-DSKN4/80S-1HS28-60	258385	SA-DSKN4/80S-1HS28-60	258385
1	Tow arm	MN-KWS	250380	MN-KWS	250380

CRANE TROLLEY ELECTRIFICATION (12 M OVERALL LENGTH)

Qty.	Description	Type	Order No.	Type	Order No.
2	Powerail, 4 m	KBSL4/63-4000HSA	253214	KSL4/63-4000HSA	250004
1	Powerail, 4 m to make up 1x3.89 m	KBSL4/63-4000HSA	253214	KSL4/63-4000HSA	250004
1	End feed	ES-KEK4/40-63HS	258421	ES-KEK4/40-63HS	258421
1	Transfer guide, 0.11 m	UE-AUN	257455	UE-AUN	257455
2	Joint kits	VM-VBK4	257907	VM-VBK4	257907
1	Fixpoint hanger	AH-KF	258806	AH-KF	258806
5	Sliding hanger	AH-KGB	259001	AH-KSH	252844
1	Double collector	SA-DSKN4/80S-1HS28-60S	258385	SA-DSKN4/80S-1HS28-60	258385
1	Tow arm	KWS	250380	MN-KWS	250380

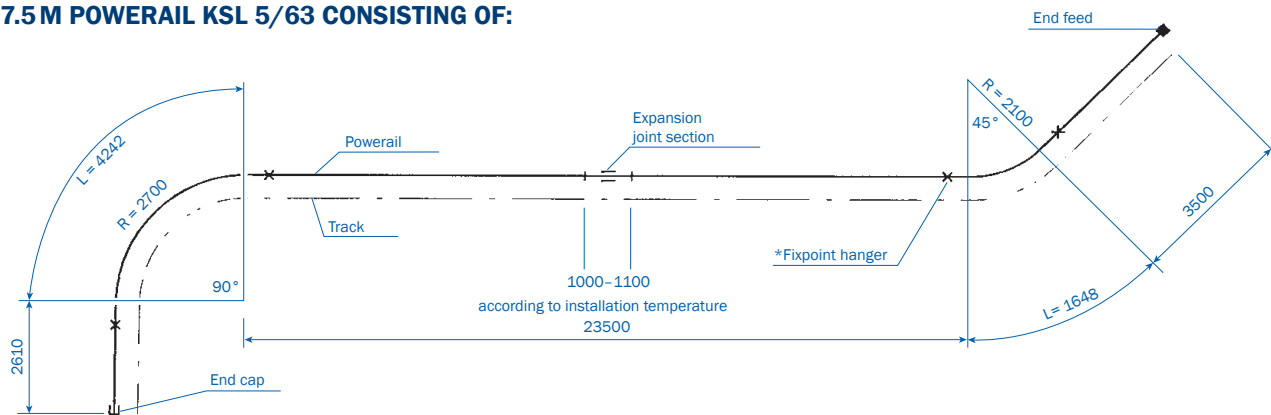
SPUR RAIL ELECTRIFICATION (30 M OVERALL LENGTH)

Qty.	Description	Type	Order No.	Type	Order No.
7	Powerail, 4 m	KSL4/63-4000HSA	253214	KSL4/63-4000HSA	250004
1	Powerail, 1 m to make up 1x 0.89 m	KSL4/63-1000HSA	253211	KSL4/63-1000HSA	250001
1	Line feed, incl. 1 m Powerail	ES-KNK4/63-HS	258258	ES-KNK4/63HSA-1000	258258
1	Transfer guide 0.11 m	UE-AUN	257455	UE-AUN	257455
8	Joint kits	VM-VBK4	257907	VM-VBK4	257907
1	Fixpoint hanger	AH-KF	258806	AH-KF	258806
14	Sliding hanger	AH-KGB	259001	AH-KGB	259001
1	End cap	MEK	256527	MEK	256527



EXAMPLE FOR ORDERING

37.5 M POWERRAIL KSL 5/63 CONSISTING OF:



*Rest of powerail to be installed with sliding hangers

Qty.	Description	Type	Order No.
5	Powerail, 4 m	KSL5/63-4000HSA	250024
1	Powerail, 4 m for overlength 1x3500 mm	KSL5/63-4000HSA	250024
2	Powerail, 3 m for overlength 1x2610 mm and 1x2500 mm	KSL5/63-3000HSA	250023
1	Powerail, 2 m for horizontal curve 45°, R = 2100 mm, L = 1648 mm, LLA	KSL5/63-2000HSA	250022
2	Powerail, 3 m to make up horizontal curve 2x45°, R = 2700 mm, L = 2121 mm, LLI	KSL5/63-3000HSA	250023
3	Surcharge for bending, horizontal	-	251500
1	End feed	ES-KEK5/40-63HS	258422
1	Expansion joint	DT-DVK5/63HSA-1000	252470
11	Joint kits	VM-VBK5	257908
4	Fixpoint hanger	AH-KF	258806
18	Sliding hanger	AH-KSH	252894
1	End cap	EK-MEK	256527
1	Collector	SA-SKN5/40-1HS28-60	257140
1	Tow arm	MN-KWS	250380

KTW-SYSTEM WITH KBSL

KTW-SYSTEMS

Type	Weight kg/m	Order No.
KTW4/40	4.926	270607
KTW4/63	4.960	270000
KTW4/100	5.350	270010
KTW4/140	5.640	270040
KTW4/200	6.240	270050
KTW5/40	5.050	270608
KTW5/63	5.090	270020
KTW5/100	5.580	270030
KTW5/140	5.860	270280
KTW5/200	6.460	270070

COLLECTOR SKR WITH CARRIER TROLLEY & TOW ARM

Type	Weight kg/m	Order No.
TW-STW4/40-1HS-SKR-S2-P-M	2.380	270080
TW-STWL4/40-1HS-SKR-S2-P-M	2.480	270610
TW-STW5/40-1HS-SKR-S2-P-M	2.480	270100
TW-STWL5/40-1HS-SKR-S2-P-M	2.540	270611

LINE FEEDS ⁽⁴⁾

Type	Weight kg/m	Order No.
ES-KNK4/40HS-L	2.464	258255
ES-KNK4/63HS-L	2.600	258259
ES-KNKS4/100HS-L	3.800	258271
ES-KNKS4/140HS-L	4.100	258273
ES-KNKS4/200HS-L	5.400	254080
ES-KNK5/40HS-L	2.631	258263
ES-KNK5/63HS-L	2.800	258251
ES-KNKS5/100HS-L	4.150	258279
ES-KNKS5/140HS-L	4.450	259130
ES-KNKS5/200HS-L	5.800	254090

END FEED

Type	Weight kg/m	Order No.
ES-KEK4/40-63HS	0.400	258421
ES-KEK5/40-63HS	0.400	258422

KTW-SYSTEM WITH KBSL

SPARE PARTS LIST

Type	Description	Weight kg/m	Order No.
S2-4000-K	C-track	2.490	316634
VM-VS2-K	Joint	0.680	315050
EK-40-K	End cap for track	0.009	316449
PG-PS 2/1-K	Bumper	0.150	317000
BM-TK-W-KTW/T	Mounting bracket	0.350	270130
AH-FBS 2-K	Fixpoint for C-track (2 pieces)	0.380	315150
AH-ABS 2-K	Sliding Hanger for C-track	0.370	315140
TW-TW-S2-P	Carrier trolley w/attachment plate (short)	1.700	270190
TW-TWL-S2-P	Carrier trolley w/attachment plate (long)	1.800	270609
MN-TMN	Tow arm for STW	0.180	270313

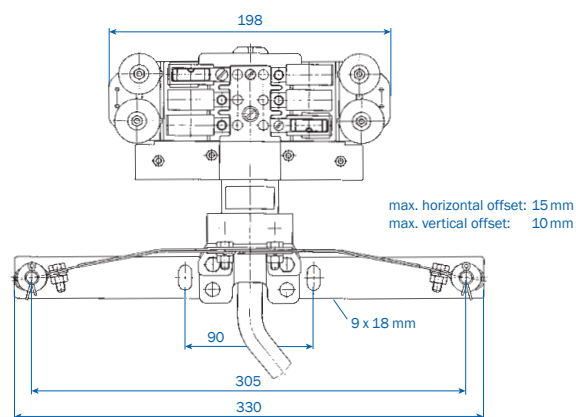
Spare parts list for Powerail KBSL see page 19.

TWL specially suited for systems with side pull.

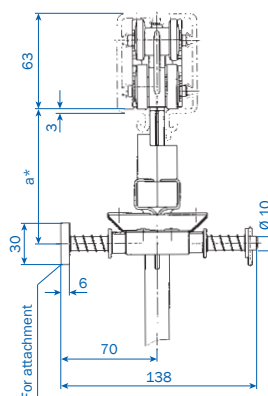
SPARE PARTS LIST

Type	Description	Order No.
KTW 4 / 100 HS	100m KTW-System 4-pole	270010
ES-KNKS4/100HS-L	Line Feed 4-pole	258271
TW-STW4/40-1HS-SKR-S2-P-M	Collectors with carrier trolleys	270080

ARRANGEMENT EXAMPLES, FLEXIBLE TOW ARMS



Flexible Tow arm KFML with collector SKN



Collector SKN
Dim. a⁽¹⁾ = 95

(1) Adjust standard gauge during installation.

QUESTIONNAIRE

Company: _____ Date: _____

For: _____ Fax: _____

E-mail: _____ Internet: _____

1. Number of conductor system installations: _____
2. Type of equipment to be powered: _____
3. Operating voltage: _____ Volt Frequency: _____ Hz
 Three-phase voltage AC voltage DC voltage
4. Track length: _____
5. Number of conductors: _____ neutral: _____ control: _____ ground: _____
6. Mounted position of conductor system:
 Conductor system pendant, collector cable facing to the bottom Conductor system pendant, lateral payout of conductor cable⁽¹⁾
 Support distance _____ m (max. 2 m) Other: _____
7. Number of consumers per system: _____
8. Indoor system Outdoor system
9. Other operating conditions (humidity, dust, chemical influence, etc.) _____
10. Ambient temperature: _____ °C min. _____ °C max.
11. Hall expansion joints _____ pieces _____ expansion max.
12. Position and number of feeding points⁽¹⁾: _____
13. Position and number of isolating sections (e.g. for maintenance)⁽¹⁾: _____
14. How will the conductor be arranged?⁽¹⁾: _____
15. Brackets required: Yes No c/c distance beam/conductor system: _____
16. Travel speed: _____ m/min. in curves: _____ m/min. at transfers: _____ m/min.
17. Max. voltage drop from the conductor system feed point to the consumer considering starting current. _____
18. Power consumption of the individual consumer loads: _____

Motor data	Crane 1						Crane 2							
	Power kW	Nominal current			Starting current		Type of motors ⁽²⁾	Power kW	Nominal current			Starting current		Type of motors ⁽²⁾
		A	cos φ _N	% duty	A	cos φ _A			A	cos φ _N	% duty	A	cos φ _A	
Hoist motors														
Auxiliary hoist														
Long travel														
Cross travel														

Mark with * those motors which can run simultaneously.

Mark with Δ those motors which can start up simultaneously.

Further remarks: _____

Signature: _____

(1) Sketches required for quotation preparation


(2) Enter drive type: K for squirrel-cage rotor, S for slip-ring rotor, F for frequency-regulated motor.

We reserve the right to make technical changes due to further developments.

NOTES

A large grid of small dots for taking notes, covering the majority of the page. The dots are arranged in a regular, repeating pattern.

NOTES



A large grid of small dots for taking notes, covering most of the page. The dots are arranged in a regular pattern, forming a grid that is approximately 30 columns wide and 40 rows high. The grid is intended for writing notes.



Paul Vahle GmbH & Co. KG

Westicker Str. 52
59174 Kamen
Germany

Tel.: +49 2307 704-0
Fax: +49 2307 704-444
info@vahle.de

www.vahle.com