INVERTED PANTOGRAPH CONNECTION

SPECIFICATION

PROTERRA

General	
Model	Inverted Pantograph
Part Number	SLS 201.106
Required system components	- 125KW or 500KW PCS - Inv. Pantograph Dispenser

Charging Electrical Characteristics	
Input Voltage	750 -1500 VDC
Nominal Current	500 A
Max Current (<10min)	600 A

Electric Drive Unit	
Deploy Time (To Max Extension)	4 – 5 seconds
Retraction Time (Max Extension to Buffer Position)	4 – 5 seconds
Retraction to Resting Position (From Buffer to Resting Position)	10-12 seconds (For soft retraction)

Mechanical		
Weight	175 kg	
Contact Force	500 (±20%) N	
Dimensions (Retracted)	Width	2100 mm
	Depth	760 mm
	Height	600 mm
Mechanical Working Range	Vertical	1500 mm
	Horizontal	±300 mm
	Front-to-Back	±300 mm
	Angular Tolerance	±5%

Mounting Height Requirements*		
SAE J3105 - 4.5 m Clearance Above Road When Retracted - Charge Rails as Low as 3.0 m Above Road	**Maximum Mounting Height**	5275 mm
	Charging Range	3000 - 4495 mm
	Retracted Road Clearance	4655 mm
	Recommended Mounting Height	5120 mm
	Charging Range	2845 - 4340 mm
	Retracted Road Clearance	4500 mm
Minimum Required Mounting Height (Non - J3105)	**Mounting Height**	4275 mm
	Charging Range	2000 - 3495 mm
	Retracted Road Clearance	3655 mm

Environmental	
Ambient Temperature	-30°C to +65°C

*REFERENCE DRAWING 045359 FOR ADDITIONAL MOUNTING SPECIFICATIONS

Transit Systems

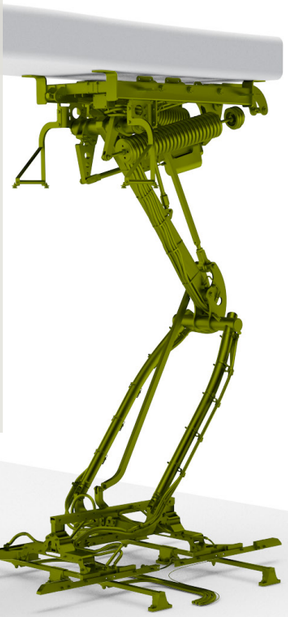
Technical Data Sheet

Inverted Pantograph SLS 201.106

Part no. SB-035533

Example illustration

CONTENTS



01 General

Manufacturer: Schunk Transit Systems
Designation: Inverted Pantograph SLS 201.106
Part no. SB-035533

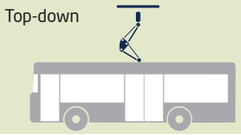
The exact product-specifications depend on the application and customer specifications. Detailed technical coordination with Schunk is necessary before the selection of the final configuration.

The product images shown serve as a reference and may differ from the product, due to special device configurations.

General features

- Reliable contact to the charging station by inverted pantograph
- Multipole design for a safe and reliable charging process
- High-power transmission up to 600 KW
- Imperessive spring drive system: Compensation of vehicle movements during the charging process without contact interuption
- Extremely fast contacting in just a few seconds
- Maximum lifespan of the product via robust frame construction
- Low-maintenance design of the complete system
- Soft Stop function for reducing the docking volume and reducing vibrations

Application information

Application	- Electric vehicles in local public transport - Battery-powered and automated guided vehicles		
System components	- Inverted Pantograph - Contact Rails - Optional Contact Rails	(road side infrastructure) (onboard) (onboard)	Part no. SB-035533 Part no. 10.01.5005.03 Part no. 10.01.5005.02 (HPC)
Contacting principle	Top-down 		

02 Technical data

Mechanical lifetime of the lifting/lowering system	400.000 cycles
Contact force ¬ Upper/lower limit	500 N ±20 %
Resting force	40 ÷ 50 N
Raising time (from resting position)	~ 5 sec
Environmental conditions ¬ Protection Class o Drive unit ¬ Working temperature (min. ÷ max.)	 IP 65 -30 °C ÷ +65 °C

03 Electrical configuration

Inverted Pantograph SLS 201

Number of poles	4
Contact sequence	1. PE 2. DC+ / DC- 3. CP

Main-Power (electronic load)

Nominal operating votlage ¬ Upper limit	750 V DC 1.500 V DC
Charge current ¬ Fast charging ¬ Fast charging max	 500 A (non-stop) 600 A (10 min)

Lowering drive

Operating voltage ¬ Upper / lower limit	24 V DC +30 % ÷ -15 %
Max. operating current	40 A for 1 sec / 16 A in further operation
Max. power-on time	20 % at 25 °C
Limit switches	WB2; WB3 – rest position WB1; WB4 – maximum extension position
Proximity switch	WB5 – soft stop
Fail-Safe-Function	Yes (integrated in electrical drive)

Contact rails

Number of poles	4

Heating elements

Max. operating votlage	24 V DC
Power-on time	100 %
Max. power consumption	224 W (56 W per rail)

TECHNICAL DATA SHEET
Inverted Pantograph SLS 201.106 – SB-035533

04 Electrical interfaces

Inverted Pantograph SLS 201

Main-power circuit (electric load)

PE	Connection lug (2 x 11 mm Ø – M10)
DC+ / DC-	Connection lug (2 x 11 mm Ø – M10)

Control power

CP (Control pilot)	Terminal box	(terminal block up to 4 mm²)
Drive unit	**HARTING HAN- electrical plug.**	
	¬ Socket housing:	1x Han 2Mod agg — 09 14 002 0301
	¬ Male insert:	1x Han E module, crimp male — 09 14 006 3001 2x Han E M Crimp Contact Ag 2.5 mm - 14AWG — 09 33 000 6102 1x Han DD module, crimp male — 09 14 012 3001 11x R 15-STI-C-0,14-0,37 QMM-AWG26-22 — 09 15 000 6104
	Recommendation for customer interface:	
	¬ Housing:	1x Han 2Mod-gg-M20 — 19 14 002 0400 1x Han 2Mod Carrier Hood — 09 14 002 0311
	¬ Female insert:	1x Han E module, crimp female — 09 14 006 3101 2x Han E F Crimp Contact Ag 2.5 mm - 14AWG — 09 33 000 6202 1x Han DD module, crimp female — 09 14 012 3101 11x R 15-BU-C-0,75 QMM — 09 15 000 6205

Contact rails 10.01.5005.03

Main-power circuit (electric load)

DC+ / DC-	Connection lug (1 x M10) **Recommendation for customer interface:** ¬ Cable lug M10
PE	Connection lug (1 x M10) **Recommendation for customer interface:** ¬ Cable lug M10

Control power

CP (Control pilot)	Connection lug (1 x M5) **Recommendation for customer interface:** ¬ Cable lug M5
Heating elements	**TE HDSCS – electrical plug.** ¬ Socket housing for male terminals: 1-1703841-1 ¬ Male insert (Tab 2.8): 1-962915-1

Contact rails with other configuration available.
Detailed technical coordination with Schunk is necessary before the selection of the final configuration.

05 Dimensions

Inverted Pantograph SLS 201

Main dimensions

Total length ¬ Upper / lower limit	2180 mm ± 20 mm
Total width ¬ Upper / lower limit	817 mm ± 10 mm
Height in resting position ¬ Upper / lower limit	588 mm ± 30 mm
Working range (min. ÷ max.)	779 mm ÷2277 mm
Maximum height (extended)	2377 mm

Contact rails

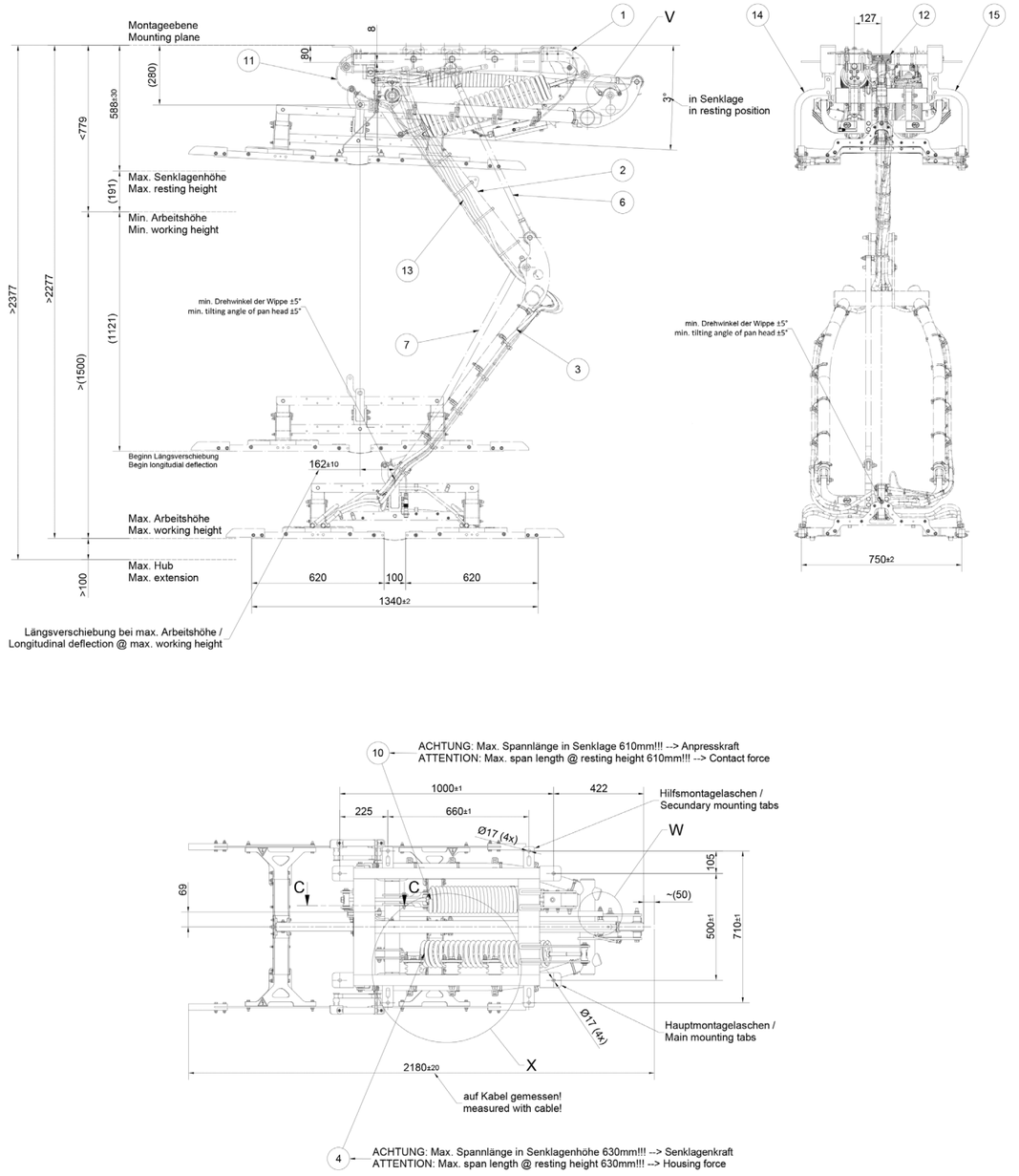
Main dimensions

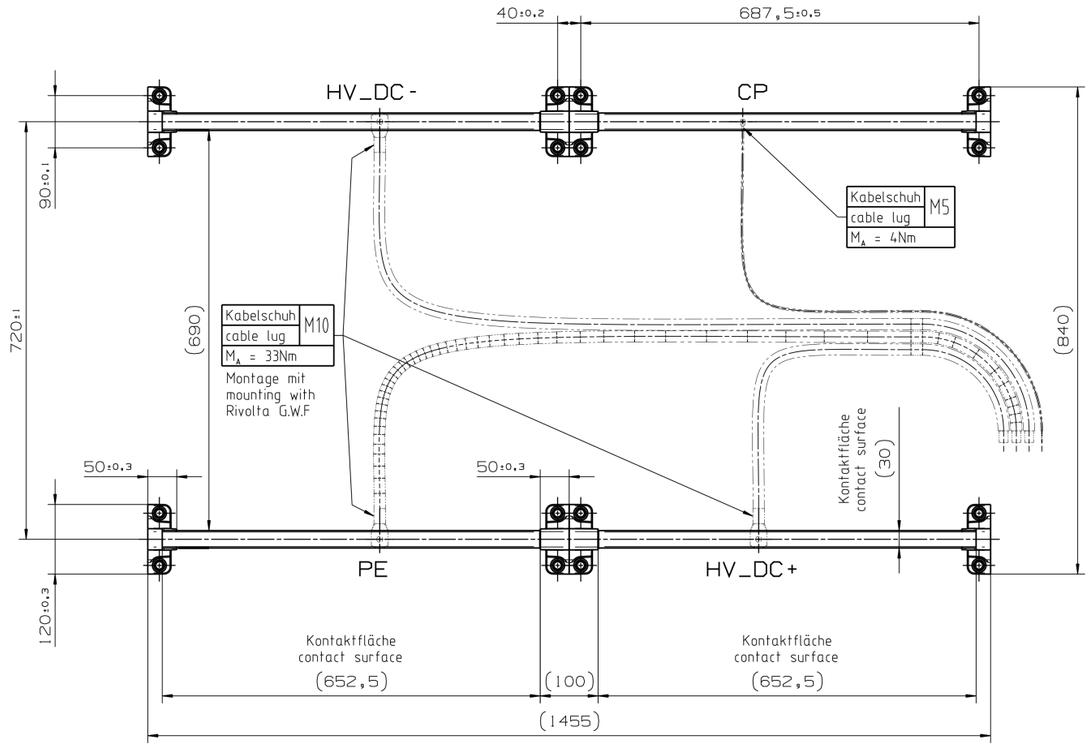
Total length	1455 mm
Total width	840 mm
Height	83.4 mm

06 Weight

Inverted Pantograph SLS 201 ¬ Upper / lower limit	approx. 185 kg ± 10 %
Contact rails	approx. 12.25 kg

07 Dimension drawing (dimensions in mm)

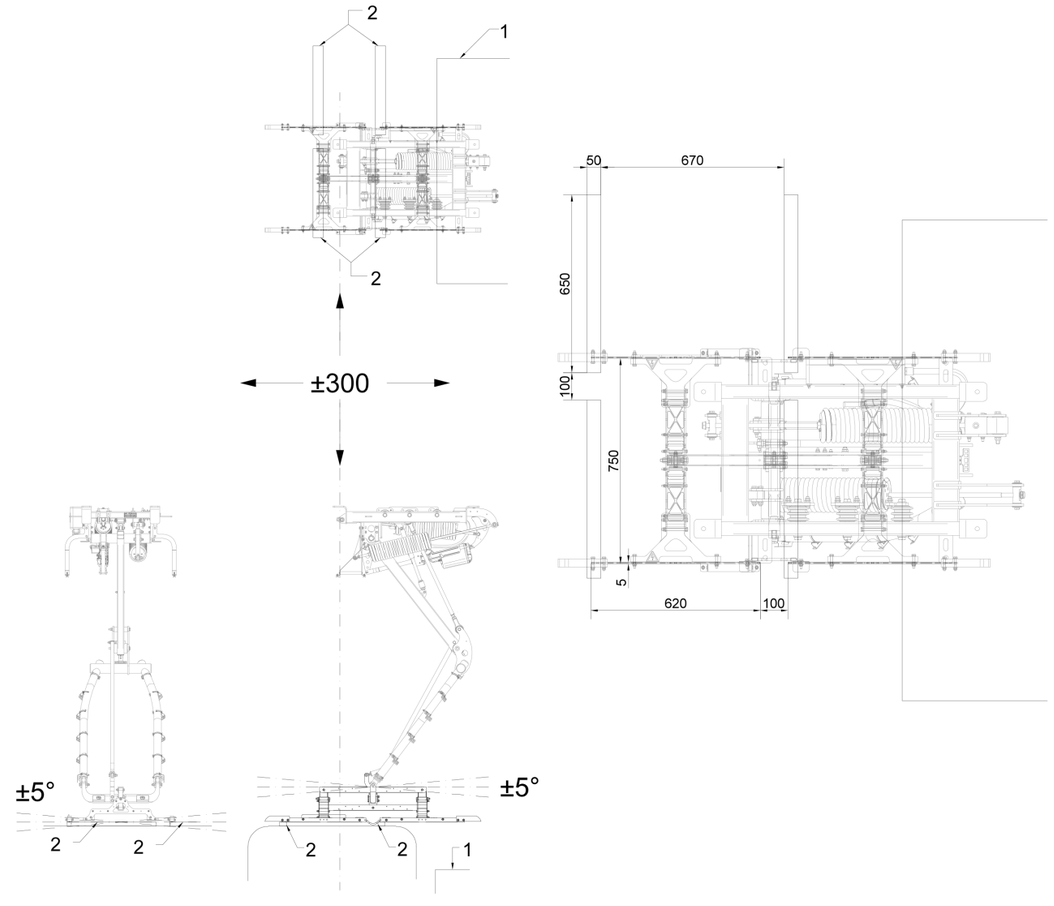




Subject to technical changes; separate dimension drawing available on request.

08 Maximum permissible position deviation

X-axis (vertical axis)	1498 mm
Y-axis (transverse axis)	± 300 mm
Z-axis (longitudinal axis)	± 300 mm
angle position - bus in longitudinal axis	-5 ° / +5 °
Kneeling process (lateral lowering of the bus including angle position)	-5 ° / +5 °
angle position - bus to the curb	min. - 2 ° / +2 ° For example, if parking tolerance in longitudinal axis is ± 200 mm, the angel position - bus to the curb is - 10 ° / +10 °



(1) Curb
(2) Contacting Rail

The precise maximum position deviations depend on the positioning of the pantograph on the road side infrastructure and measurements of the contact rails on the bus roof. Detailed technical coordination with Schunk is necessary before the selection of the final configuration.

Schunk – A worldwide success
Always at your side

With its globally active business unit Transit, Schunk is one of the world's leading providers of efficient power transmission and charging systems for local and long-distance transportation. Its pioneering developments set technological milestones.

With Schunk Smart Charging, the intelligent charging systems for electric buses and other electrically powered vehicles, Schunk is a leading technology partner on the way to emission-reduced local transport.

Within the highly specialized technology portfolio for the railway industry, Schunk offers current collectors (pantographs) for overhead wire and third-rail systems, grounding contacts, shaft grounding systems and wheel flange lubrication systems as well as perfectly matched carbon collector strips, carbon collector shoes and carbon brushes including brush holders.

Schunk Group

The Schunk Group is a globally operating technology company with a global business unit structure. The company is a leading supplier of products made of high-tech materials – such as carbon, technical ceramics and sintered metal – as well as machines and systems – from environmental simulation and air conditioning to ultrasonic welding and optical machines. The Schunk Group has more than 9,500 employees in 29 countries and achieved sales of €1.28 billion in 2018.

Part No. SB-035533/2020

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schunk-carbontechnology.com

Join us on LinkedIn

Montageebene
Mounting plane

in Senklage
in resting position

Max. Senklagenhöhe
Max. resting height

Min. Arbeitshöhe
Min. working height

Max. Arbeitshöhe
Max. working height

Max. Hub
Max. extension

min. Drehwinkel der Wippe ±5°
min. tilting angle of pan head ±5°

Beginn Längsverschiebung
Begin longitudial deflection

Strombandverlegung entlang Oberschere und Unterschere /
Power cable installation along upperframe and lower frame

Längsverschiebung bei max. Arbeitshöhe /
Longitudinal deflection @ max. working height

C-C (1 : 5)

Erdung (⏚)
Earthing (⏚)

Y (1 : 2)

Einfederung Anschlag /
Deflection limit stop

Z (1 : 2)

Spalt / Gap

A (1 : 5)

Anschluss +/- Pol (jeder 2x50mm²) /
Connection +/- pole (each 2x50mm²)

Erdungsanschluss (1x50mm²) /
Earthing connection (1x50mm²)

Protective earth

V (1 : 5)

W (1 : 5)

X (1 : 5)

ACHTUNG: Max. Spannlänge in Senklage 610mm!!! --> Anpresskraft
ATTENTION: Max. span length @ resting height 610mm!!! --> Contact force

Hilfsmontagelaschen /
Secundary mounting tabs

Hauptmontagelaschen /
Main mounting tabs

auf Kabel gemessen!
measured with cable!

ACHTUNG: Max. Spannlänge in Senklagenhöhe 630mm!!! --> Senklagenkraft
ATTENTION: Max. span length @ resting height 630mm!!! --> Housing force

Einstellungen / Adjustments		
Maß / Dimension	In Senklagenhöhe / @ resting height	In max. Arbeitshöhe / @ max. working height
v	4 mm	0 mm
w	0 mm	0 mm

Technische Daten / Technical data		
Normalspannung	Nominal voltage	750 VDC
Maximalspannung	Max. voltage	1500 VDC
Normalstrom	Ratetd current	500 A (2x50mm²)
Maximalstrom	Max. current	600 A (<10 min)
Versorgungsspannung Senkantrieb	Actuator supply voltage	24 VDC (+30%,-15%)
Max. Stromaufnahme Senkantrieb	Actuator max. current consumption	40 A (@24 VDC)
Max. Einschaltdauer	Max. duty cycle	20 %
Anpresskraft	Contact force	500 N (+20% / - 30%)
Senklagenkraft	Housing force	40-50 N @ min./max.
Gewicht	Weight	~185kg (+/- 10%)
Min. Umgebungstemp.	Min. ambient temperature	-30 °C
Max. Umgebungstemp.	Max. ambient temperature	+65 °C
Hub- / Senkgeschwindigkeit	Raising- / Lowering speed	~ 350 mm/sec
Zeit bis volle Anpresskraft	Time to full contact force	~ 5 sec
Fahrbahnquerneigung / Kneeling = rot X	Cross slope / Kneeling = rot X	max. +/-5°
Fahrbahnlängsneigung = rot Y	Slope = rot Y	max. +/-5°

y....Stromuebergangsstellen vor der Montage reinigen und mit Kontaktfett fetten!
y....Clean current conduction places before assmbly and grease with contact grease!

Hierzu Schaltplan / Hereto circuit diagram: SB-035183

Schraubverbindungen nach Schunk Bahntechnik GmbH Anweisung 6T10120 ausfuehren!
Screw connections acc. Schunk Bahntechnik GmbH work order 6T10120e established!

Index	Änderungsnummer	Datum	Name
-	Erstausg./1st Edition		
A	Schaltplan	01.04.2019	MFE

Allgemeintoleranzen: DIN ISO 2768-mK
DIN EN ISO 13920 A,E
Oberflächen: DIN ISO 1302

SB-030391

1 : 10	Erstellt	25.01.2019	MFE
	Geprüft	25.01.2019	FRB
	Freigeg.	25.01.2019	FRB
	Datum		Name
	DE/EN		

Schunk
Bahn- und Industrietechnik GmbH, Salzburg

Stromabnehmer SLS 201.106
Pantograph SLS 201.106

SB-035533 | Mat.Nr: 10868378 | A | 1 / 1

ACAD

Spannungsversorgung
Power supply

+20,4...30VDC 0VDC

-F...
max.T16A

-F...
max. T4A

Vorschlag der Steuerung auf der Ladestationsseite
proposal of control on charging station side

Anforderung heben
Request raise

Anforderung senken
Request lower

Signal SA gehoben / raised
<max. 100mA DC1

Signal SA unten / lowered
<max. 100mA DC1

Signal SA Warteposition / wait position
<max. 100mA DC1

PE

Signal SA Ruhelage / resting position
<max. 100mA DC1
(20,4...30,0VDC)

Signal CP +
max. 50V / 10A

-X0 1 2 4 8 9 6 7 3 10 5 PE

-X6/1 1 4 3

Stromabnehmer
pantograph
SB-028815

Elektrische Steuerung
Electric control
SB-025164

1,5mm²

-T1
SB-031215

X1:1 Spannungsversorgung Motor / Power supply motor
X1:2 GND
X1:4 DI: heben / raise
X1:8 DI: senken / lower
X1:9 PNP-DO: SA gehoben / raised
X1:6 PNP-DO: SA unten / lowered
X1:7 Spannungsversorgung Magnetsensor S1 / Power supply magnetic sensor S1
X1:3 X1:10
X1:5 PNP-DO: Warteposition / wait position

-F1
T12,5A

X2:1 X2:2 X2:8 X2:9 X2:4 X2:6 X2:7 X2:3 X2:5 X2:10

11 12 18 19 14 16 17 13 15 20

-X3 1 2 8 9 4 6 7 3 5 10

RADOX GKW-LW 4x1,00mm²
1 2 3 4

RADOX GKW-LW 6x0,50mm²
1 2 3 4 5 6 SH

PUR 3x0,14mm²
BN BK BU

-X11/1 5 4 2 1

-X11/2 1 2 3 4 5 6

-M1
In=10,3A
Imax=13A

DI: einfahren / retract

DI: ausfahren / extend

GND

DO: eingefahren / retracted

DO: ausgefahren / extended

-S1
+ NO -
NO

Wartepos.
wait pos.

PE
Montageplatte Stecker / mouting plate connector

Elektrischer Senkantrieb
El. lowering drive unit
SB-024155

Klemmgehäuse
Terminal housing
SB-044877

BN BK BU

X1:1 2 3 4 5

-WB6
PUR
3x0,14mm²
BN BK BU

-WCP1
TPE
(1x2,5mm²) C
BK

-XB6/2 1 4 3

-B6
+ NO -
NO

SA Ruhelage
resting position

control pilot CP

Die unbefugte bzw. bestimmungswidrige Verwendung dieser Unterlage ist nicht gestattet und wird gerichtlich verfolgt.

Index	Änderungsnummer	Datum	Name
-	Erstausg./1st Edition		
A	X0, X3	03.10.2016	TGA
B	Änderung Hörl	08.03.2017	SRI
C	Sensor B6, diverses	15.04.2021	JUE

Allgemeintoleranzen:
DIN ISO 2768-mK
DIN EN ISO 13920 A,E
Oberflächen:
DIN ISO 1302

- ---- kg A1 SBI-S 0045 EK

1:10	Erstellt	12.08.2015 Hörl
	Geprüft	13.04.2016 TGA
	Freigeg.	13.04.2016 HFI
	Datum	Name
	DE/EN	

Schunk
Bahn- und Industrietechnik GmbH, Salzburg

Elektrischer Schaltplan
Circuit diagram

SB-027549 | Mat.Nr. 10760391 | C | 1 / 1

schunk

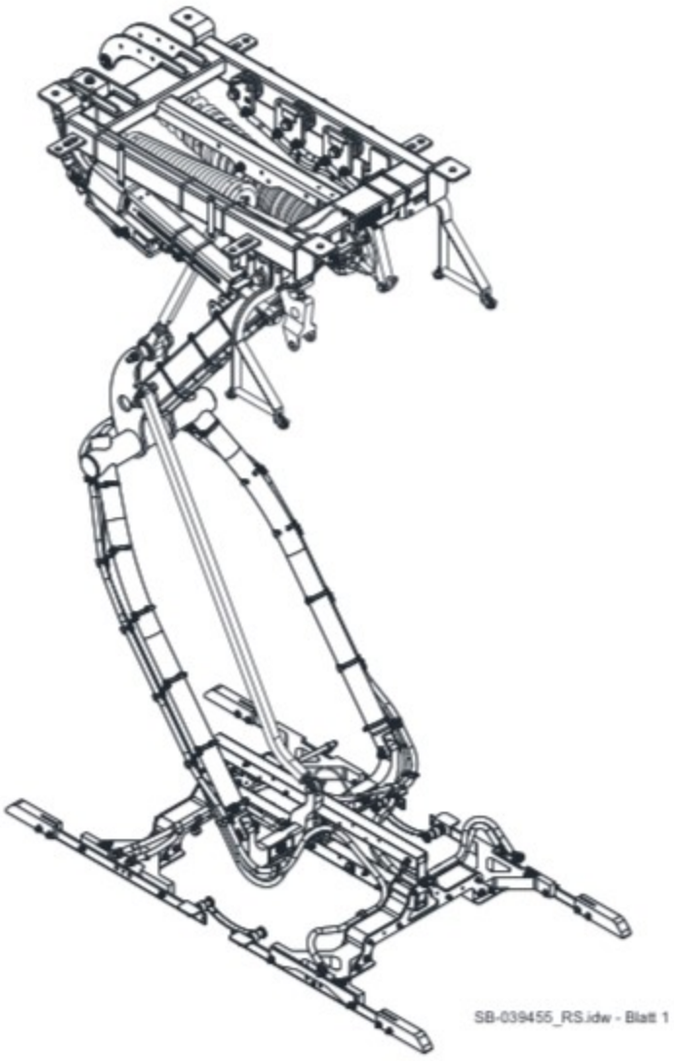
Carbon Technology

Charging Pantograph

Type: SLS 201.106

Dwg.-No.: SB-035533

Spare Part No: 10868378



Description
Maintenance and
Operating Instructions