



## SMG - SLOTTED MICROWAVE GUIDE



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SMG-Data Transmission with VAHLE Conductor System for AS/AR warehouse

## 1.1 General Description



### **S**lotted **M**icrowave **G**uide - Data Transmission System

The SMG data transmission system is highly suitable for automation applications as it transmits free of interference high rates of data to tracked machinery.

SMG was originally developed by MBB (Messerschmitt-Boelkow-Blohm), now EADS, to transmit data to the magnetic levitation train traveling at speeds of up to 250 mph. VAHLE acquired this product by the end of 1994 and now has worldwide over 3000 installations successfully in operation.

VAHLE has embarked on an extensive development program to increase the SMG application range. Presently there are already data interfaces available for the most commonly used bus systems.

Heavy-duty construction makes it possible to install SMG in arduous and environmentally difficult locations; for instance a great number of SMG

waveguide systems are functioning reliably in steel mills and foundries.

The SMG data transmission system operates economically already with single channel transmission and low data rates. Modular design easily expands the system to handle at relatively low cost medium and high data rates as well as multi-channel configurations.

When combined with VAHLE conductor systems for the current supply, SMG data transmission systems become a reliable high-performance component package capable of handling a wide variety of applications as demanded by current and future automation technology.



# 1 INTRODUCTION

## 1.2 Areas of Application



Port Container Terminal



Airport Cargo Terminal



AS/AR Warehouse



People Mover

**The SMG system provides 100% immunity from all EMI and RFI sources and opens a wide range of applications:**

- Crane installations
  - automatic cranes
  - portal cranes
  - container cranes
- Automated material handling systems
  - AS/AR warehouse
  - robotics
  - production lines
- Transit systems
  - people movers
  - automated feeder-lines
- Elevator systems
  - passenger elevators
  - inclinators
- Freight transfer
  - airport cargo
  - container terminals
- Security systems
  - mobile video transmission
  - target range
- Entertainment
  - parks & racetracks
  - stadiums & arenas



## 1.3 Features

The SMG data transmission system transmits digital serial data as commonly used with data transmission networks; additionally, video signal transmission is possible.

Special transceivers (transmitters/receivers) with interface modules for the most commonly used bus systems employ frequency modulation to prepare the digital serial signals for transmission.

To transmit in full duplex two carrier frequencies at approx. 2.4 GHz are available. The microwave signal propagates within an slotted, hollow aluminum extrusion (waveguide) between the transceivers.

A transparent structure and the support of numerous data protocols simplify the integration of the SMG data transmission system into an existing bus system. If required, VAHLE can provide engineering support for this task.

### The following characteristics distinguish VAHLE SMG data transmission technology:

- No interference as microwave is completely contained by SMG waveguide.
- Simple integration into existing bus systems and upgrade possibility is facilitated by modular design.
- Non-contact transmission technology offers maintenance free operation.
- E-stop capability as per stop category 1, protection stage 3, with TÜV certification.
- SMG directly combines with all VAHLE conductor systems and may be installed simultaneously.
- Safety related transmission capability e.g. PROFISAFE, SafetyNET p
- Multiple vehicles on one waveguide.
- Faultless transmission of high data rates, up to 10 Mbit/sec.
- Uninterrupted data transmission independent of operating speed.
- Large bandwidth allows full duplex transmission of six data channels simultaneously.
- Environment such as temperature, rain, fog, dust etc. does not degrade the quality of the transmission.
- Dynamically very efficient transceivers permit transmission up to 1000 m without amplification.
- SMG is also suitable for systems with curves, track switches, interruptions, etc.



# 1 INTRODUCTION

## 1.3 Features

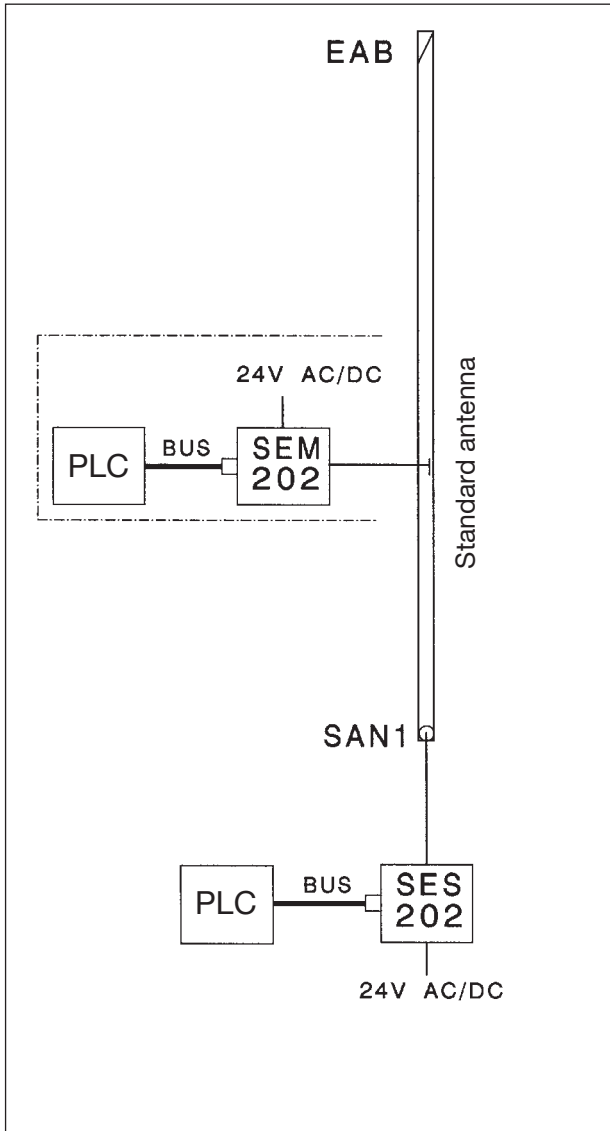
The SMG Data Transmission provides interfaces for all common databus systems as well as special interfaces for video, audio, control and emergency-stop signals. All interfaces are plug-in modules for easy adaptation to the existing communication structure.

The following data interfaces are available:

Interface	maximum communication rate (kbit/s)	typical applications
TTY/20 mA	20	Sinec L 1-Bus, Programmable Unit
RS 232 C	20	PC, scanner, scales, etc.
RS 422 point to point	1.500	InterBus-S according to EN 50254 Vol. 2, other 4-wire connection, measurement signal transmission
Interbus - S	2000	Interbus - S communication via SUP1 3 OPC with optical and electrical connector
RS 485	1.500	Profibus EN 50170 Volume 2, Profisafe
DH 485	9,6	Allen-Bradley DH 485 - Databus
A-B DH+ A-B RIO	57,6 230	Allen-Bradley Data Highway Plus Allen-Bradley Remote I/O
GE Genius	153,6	General Electric™ - Datenbus standard/extended
Audio	0,3-3,4 kHz	Intercom 600 Ω , 1 Vss
Ethernet wired	10.000	Industrial Ethernet, 10 Base-T acc. IEEE 802.3
Ethernet optical	10.000	Industrial Ethernet, 10 Base-FL acc. IEEE 802.3
Video	5 MHz	Video CCIR standard
Emergency-stop	-	Stop-category 1 security level 3, two transmission channels

## 1.4 Application Examples

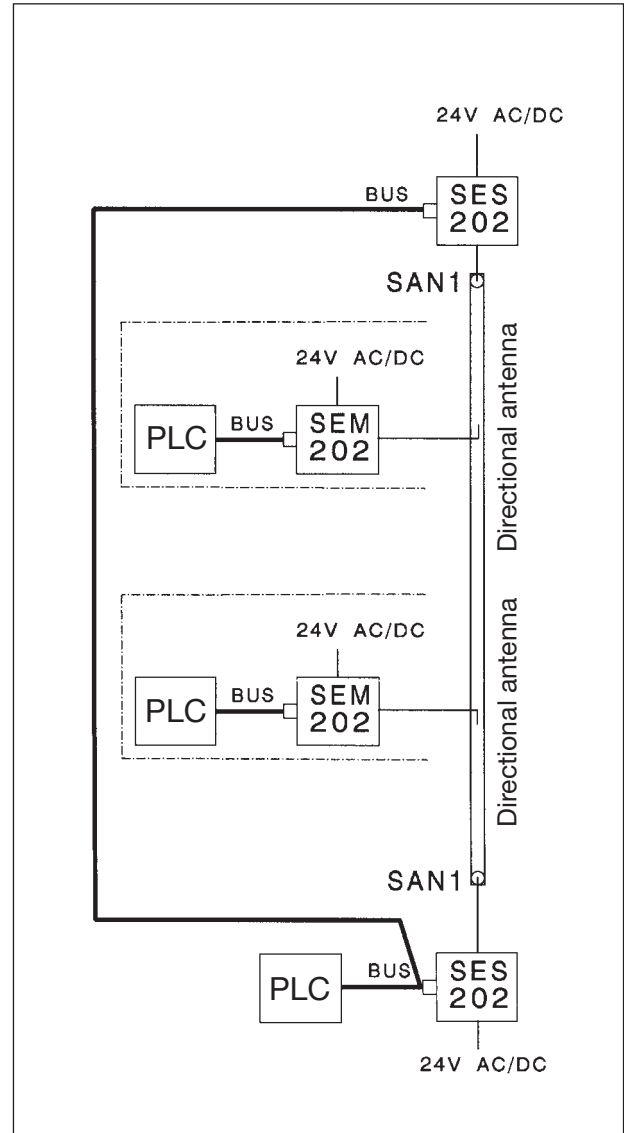
... data communication for industrial automation



### Example 1

Communication with one vehicle connected to the SMG System. The supply of the RF signal is made at the end of the SMG waveguide section.

The vehicle is equipped with a standard antenna.



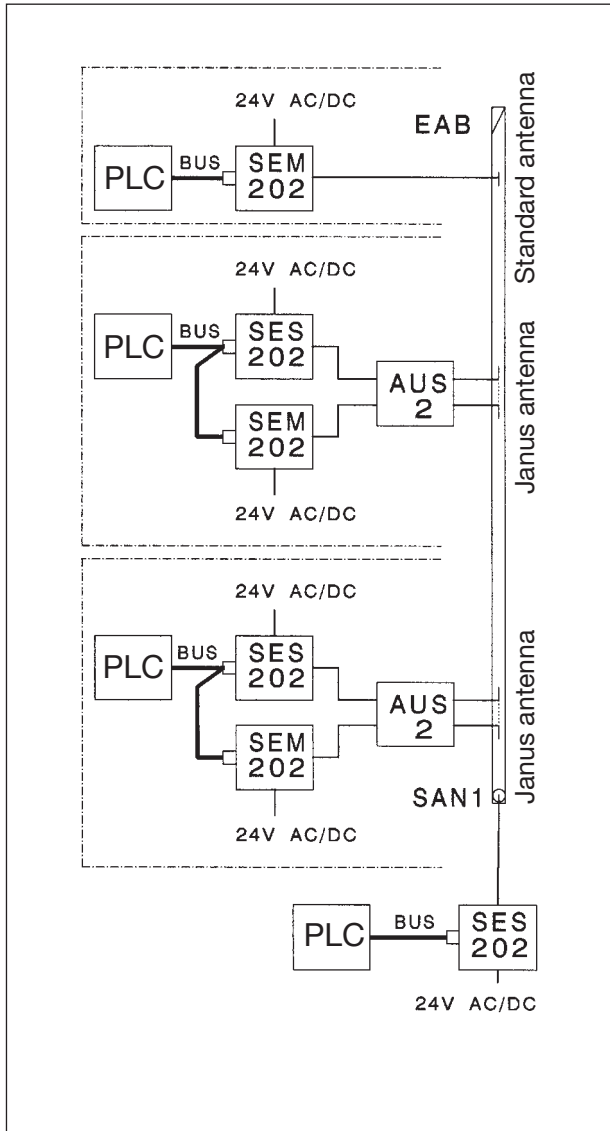
### Example 2

Communication with two vehicles connected to the SMG System. The supply of the RF signal is made at both ends of the SMG waveguide section.

For the separation of the two RF links, the system is equipped with directional antennas.

## 1.4 Application Examples

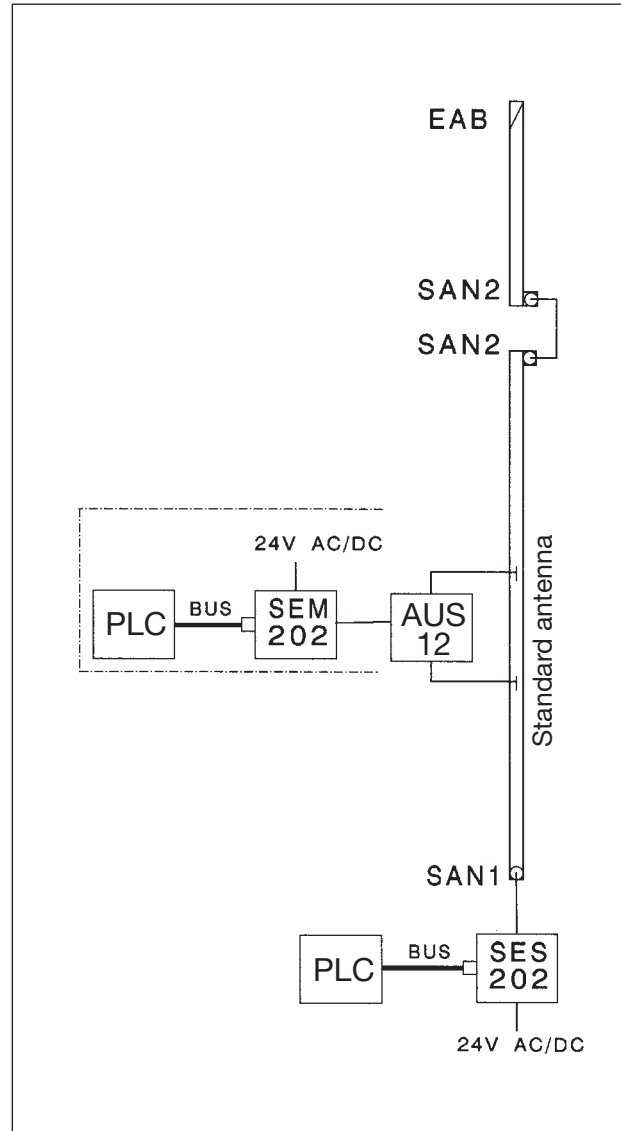
... in data communication for industrial automation



### Example 3

Communication with two or more vehicles connected to the SMG System by using two transceivers for each vehicle (SES/SEM) and Janus antennas.

If one vehicle of the transmission line is shut down, the automatic antenna switch AUS-2 provides the transmission of the RF signal to the remaining vehicles.



### Example 4

Communication with one vehicle if the SMG waveguide is interrupted by gap.

By using the antenna switch AUS-1 and two antennas installed at an adequate distance, the SMG waveguide gap can be passed without communication loss.



## 1.5 Module Configuration



Transceiver **SMG-SES/SEM**

The **Transceiver Unit SMG-SES/SEM** is equipped with the RF module and the 18-32V AC/DC power supply module. It is prepared to accept the Data module SMG-DM ..

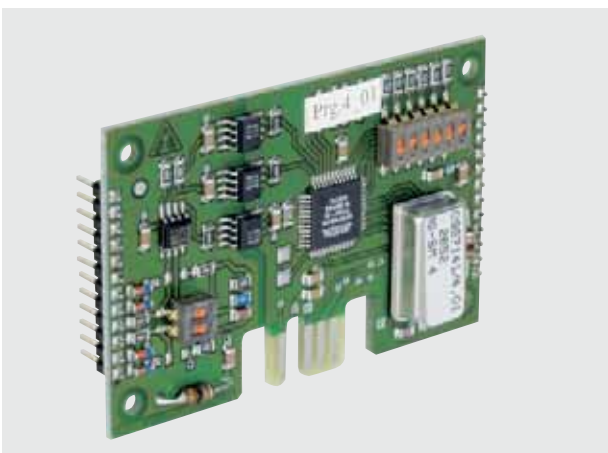


Data module **SMG-DM..**

The **Data module SMG-DM..** is prepared to accept the interface module SMG-SM.. and is equipped with a connector for the external communication system.

For available modules see page 26.

Further technical description on request.



Interface module **SMG-SM..**

The **Interface modul SMG-SM..** is made for adaption to the serial data signals of the external communication system.

For available modules see page 26.

Further technical description on request.

### 2.1 SMG Transceiver



SMG Transceiver - SES/SEM



Transceiver with protective cover

A basic data transmission arrangement requires two transceivers; type SMG-SES will be stationary and type SMG-SEM will be installed at the moving equipment.

The standard transceiver configuration consists of a RF module type RFM11 (SES) and type RFM12 (SEM) and a power supply module.

Two transceiver specifications are available; type 202 with two data module plug-in slots and type 203 with three slots.

A protective cover is available to protect the front side of the transceiver in an dusty environment. Connection to the transceiver is made through openings at the bottom of the cover.

Adjustable installation brackets are included to facilitate the installation of the transceiver.

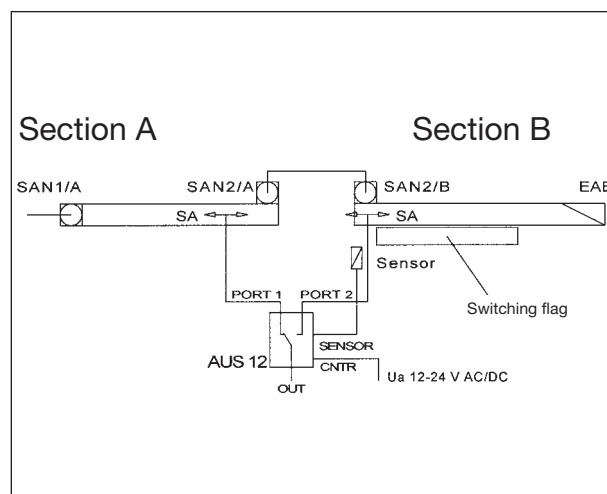
Specification	
Type	SES / SEM
Dimensions - type 202 - type 203	153 x 276 x 281mm 153 x 328 x 281mm
Protection class with cover	IP 50 IP 53
Operating temperature Storage temperature	-10 to +50°C <sup>(1)</sup> -20 to +70°C (moisture condensation and direct sun heat inadmissible)
Power supply	24 VAC/DC
Power consumption	approx. 24 VA
Housing and cover	Steel sheet coated RAL 7032

<sup>(1)</sup> Climate controlled enclosures are available.

### 2.2 SMG Antenna switch for crossover function



Antenna switch SMG-AUS 12



Function diagram SMG-AUS 12

#### Function

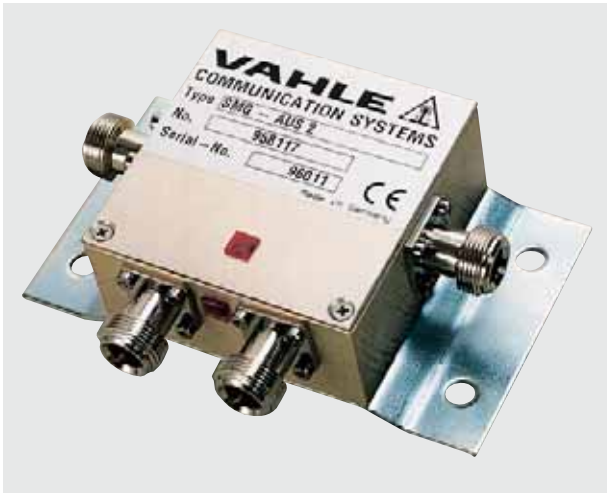
The antenna switch SMG-AUS 12 is always required when the waveguide has a gap due to system's specifications and data transmission can not be interrupted when the vehicle is traversing this gap.

The antenna switch is installed between antennas and mobile transceiver (SEM). 12 VDC is required which may be supplied externally or from the interface module SM 10 (see also Electronic Components page 14). In either case, the connecting cable must be a shielded twisted pair.

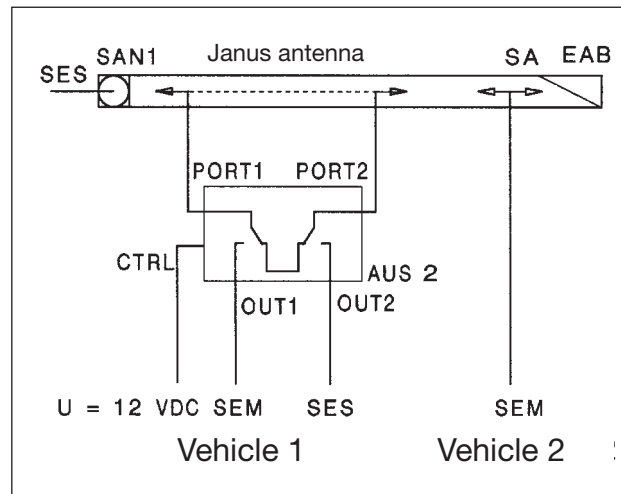
An inductive sensor which activates the antenna switch depending on the position of the antennas is included. The SMG-AUS 12 contains a LED which indicates the current RF status.

Specification	
Typ	SMG - AUS 12
Dimensions in mm (H x B x T)	48 x 120 x 68
Protection class	IP 50
RF-connector	3 x N-Type (female)
Power connector	9 -pol Sub-D (male)
Sensor connector	M 12 (E 2)
Consumption	max. 100 mA w/o Sensor
Power supply	12V-24 V AC/DC floating

### 2.3 SMG Antenna switch for bypass function



Antenna switch SMG-AUS 2



Function diagram SMG-AUS 2

#### Function

When communicating with two or more vehicles on a SMG waveguide the antenna switch SMG-AUS 2 automatically bridges the switched off SES / SEM transceiver pair by disconnecting the power supply (e.g. when one vehicle is inoperative).

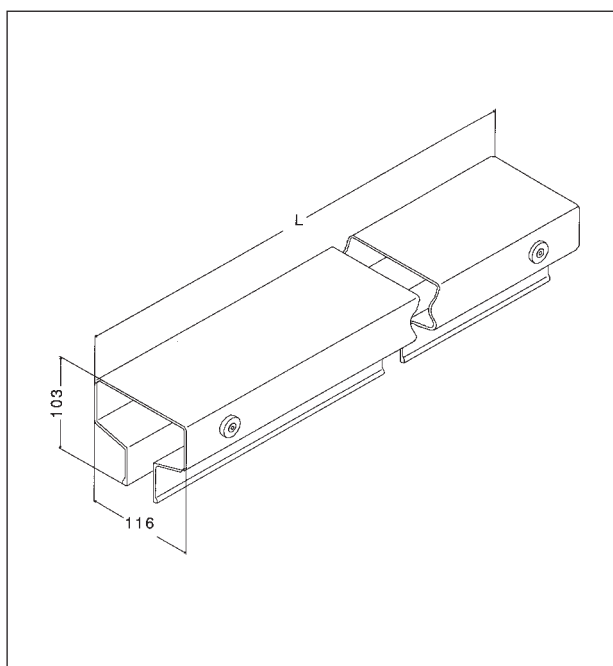
For external 12 VDC power supply always use shielded twisted pair cable.

The antenna switch status is indicated by LED.

Specification	
Type	SMG - AUS 2
Dimensions	31 x 68 x 68 mm
Protection class	IP 50
RF connection	4 x N-Type (female)
Connection for sensoric and power supply	9 - pole Sub-D (male)
Power supply	+12 VDC
Consumption	max. 100 mA



## 3.1 SMG Waveguide



SMG Waveguide section

### Function

The SMG waveguide, manufactured of extruded aluminum, serves as the RF transmission medium. The specific shape of the waveguide is configured for the use with a frequency of approx. 2.4 GHz, its design also assures minimum attenuation of signal propagation. Also, the waveguide shape provides the necessary interference shielding from the outside and towards the outside.

Standard length of SMG waveguide section is  $L = 6$  m. Shorter sections to conform with system's requirements can be supplied (see order information chapter 5, page 32).

SMG waveguide curve sections for horizontal or vertical curves are also available, minimum radius 900 mm.

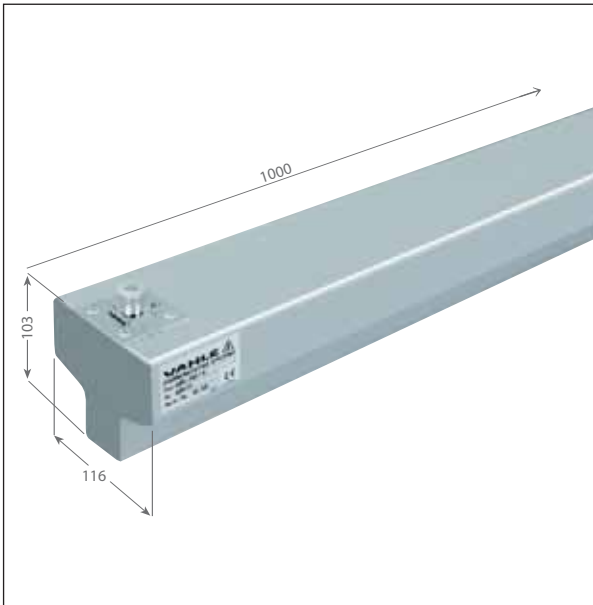
Depending on environmental demands, three types of surface treatment are available for the waveguide sections:

Surface Treatment	Designation	Environmental Requirements
SMG Waveguide bright	SMG/B	No surface treatment to aluminum section, for indoor installation without environmental problems.
SMG Waveguide anodized	SMG/E	Anodized aluminum waveguide for outdoor installations with medium environmental conditions and at oceanside installations.
SMG Waveguide epoxy coated	SMG/SB	Epoxy coated aluminum waveguide for installation with severe environmental conditions, such as: <ul style="list-style-type: none"> <li>● Sulfuric acid</li> <li>● Potassium hydroxide</li> <li>● Deicing solution</li> <li>● Decontamination solution</li> <li>● Fuel</li> </ul>



## 3 MECHANICAL COMPONENTS

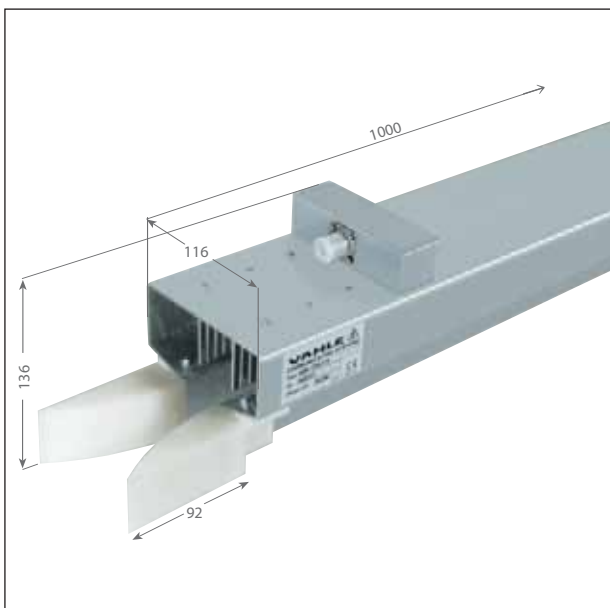
### 3.2 RF Connection



RF Connection **SMG-SAN 1** (not traversable)

The RF Signal, provided by the Transceiver, is connected to the SMG Waveguide by the RF Connector **SMG-SAN 1**.

The RF Connector has a total length of 1 m and has to be mounted generally at the beginning of the SMG-Waveguide section. It is not traversable by the SMG antenna. The RF Connector is equipped with a coax N-connector (female).



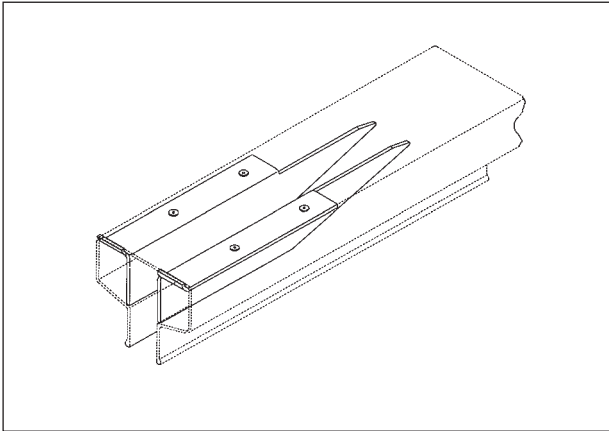
RF Conector **SMG-SAN 2** with mounted antenna connection (traversable)

If the SMG Waveguide is interrupted by gaps into several sections, the **SMG-SAN 2** - Connector has to be used to enable the SMG antenna to pass the gap.

The RF Connector SMG-SAN 2 is equipped with a coax N-connector (female) for the coax cable.

The RF Connectors SMG-SAN 1 and SAN 2, are available with three different surface coatings untreated, anodized and special-coated to accommodate different environmental conditions.

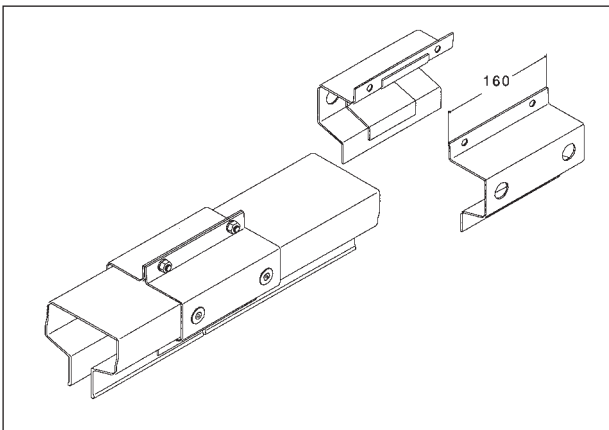
### 3.3 RF Termination



RF Termination **SMG-EAB**

To provide the necessary electrical termination of the SMG Waveguide, it is imperative to mount the RF Termination element **SMG-EAB** into the final waveguide section of the transmission link. This should be done on site with the included mounting components.

### 3.4 Joint Splice Clamp



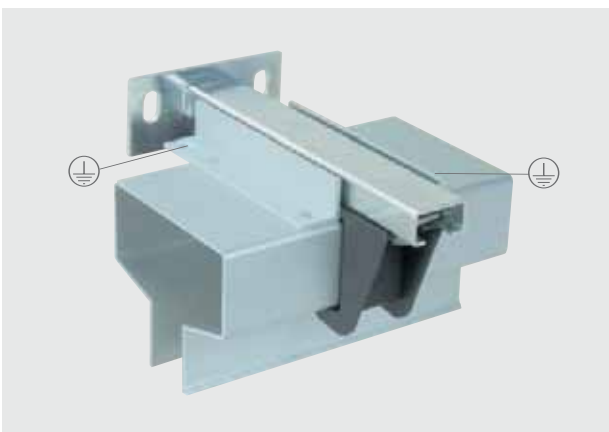
Joint Splice Clamp **SMG-PV**

The Joint Splice Clamp **SMG-PV** provides a safe mechanical and electrical connection of the SMG Waveguide sections.

It is available in galvanized and special-coated versions.

The Splice Clamp includes installation hardware.

### 3.5 Waveguide Anchor Bracket



Waveguide Anchor Bracket **SMG-FL**

To provide the mechanical anchoring of the SMG Waveguide, the Anchor Bracket **SMG-FL** has to be installed in the middle of the Waveguide Section.

The Anchor Bracket ensures that the Waveguide Section can expand due to temperature influences.

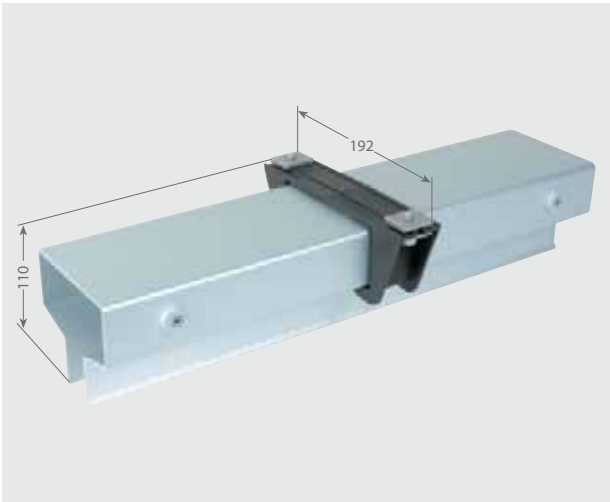
The Anchor Bracket should also be used as a grounding connection. It is available in bright, anodized and special-coated versions.

Mounting hardware for easy installation is included.



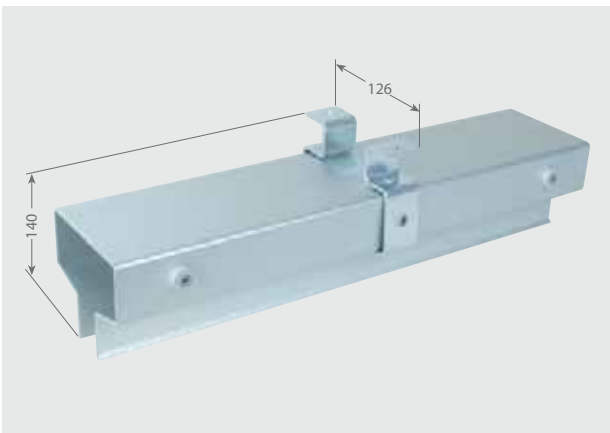
## 3 MECHANICAL COMPONENTS

### 3.6 Support Bracket / 3.7 Support Arm



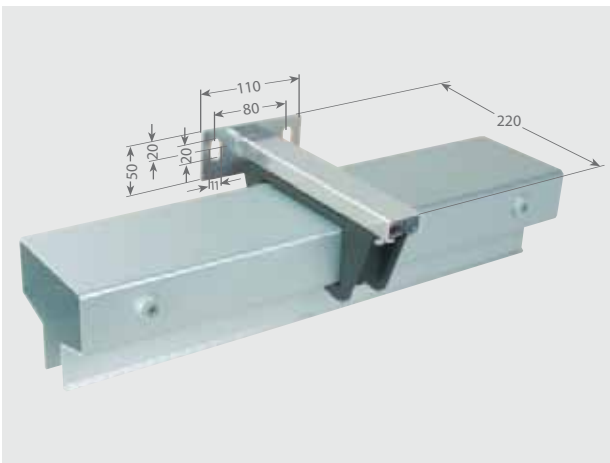
Support Bracket **SMG-HBP 4/...**

The Support Bracket **SMG-HBP 4**, is used for a sliding suspension of the SMG Waveguide Section. It is delivered in pairs including sliding parts and installation hardware. The Support Bracket is available in galvanized and special-coated versions.



Support Bracket **SMG-HBP 2/...**

The Support Bracket **SMG-HBP 2/0** (and 2/12, 2/18) is similar in function to the Support Bracket HBP 4, but it is narrower and thus recommended for applications with limited space.

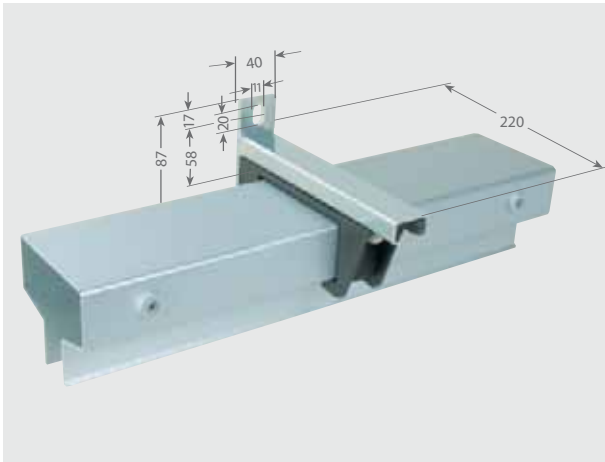


Support Arm **SMG-HT 1/220**

The Support Arm **SMG-HT 1/220** is used in combination with the Support Bracket HBP 4 and HBP 2/18 (see chapter 3.6 Support Bracket). The max. support distance of the SMG Waveguide Section is limited to 3 m. It is necessary to use at least two supporting points for each Waveguide Section.

The length of the Support Arm is 220 or optionally 420 mm. It is delivered in galvanized or special-coated versions.

### 3.7 Support Arm



Support Arm **SMG-HT 2/220**

The Support Arm **SMG-HT 2/220** is similar in function to the Support Arm type HT 1/220. It is equipped with a vertical flange for mounting.

The length of the support arm is 220 or optionally 420 mm. It is delivered in galvanized or special coated version.



SMG in action for Ethernet data transmission for coking machinery



## 3 MECHANICAL COMPONENTS

### 3.8 Antenna



Antenna **SMG-SAE-XY-3**

The Antenna **SMG-SAE- (RAE, JAE) -XY-3** consists of the antenna element and the antenna support arm.

With this device, it is possible to compensate lateral (x-axis) and vertical (y-axis) movements of the vehicle. The maximum permissible tolerances are shown in the lower chart.

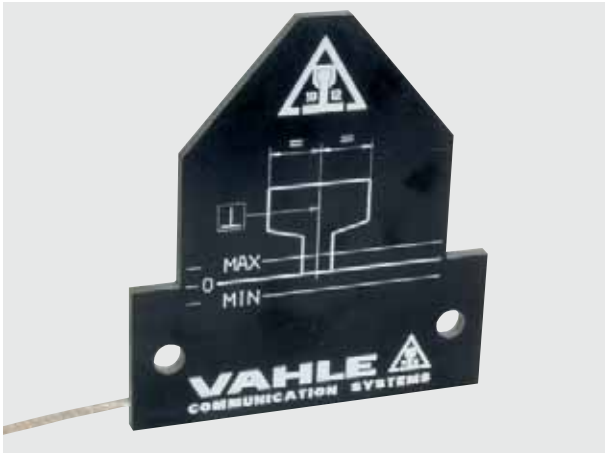
The antenna with support arm is factory assembled. The flange has two elongated holes for easy adjustment and installation to the vehicle.

#### Chart of the max. permissible tolerances

Description		Type	Permissible Tolerances (mm)	
Antenna	Model		x - Axis	Y - Axis
Standard-	01	SMG-SAE-XY-3	± 20	+5 – 5
	02		± 40	+5 – 5
Directional-	01	SMG-RAE-XY-3	± 20	+5 – 5
	02		± 40	+5 – 5
Janus-	01	SMG-JAE-XY-3	± 20	+5 – 5
	02		± 40	+5 – 5

Antennas for larger permissible tolerances on request.

### 3.9 Mobile Antennas (Spare parts only)



Standard antenna **SMG-SA**

The standard antenna **SMG-SA** is used for basic SMG data transmission installations such as bus or point-to-point connection with a mobile unit. Two standard antennas, installed at a given distance from each other and connected with an antenna switch SMG-AUS 1, form a double antenna to bridge gaps in the Waveguide caused by system's requirements (see chapter 2.4, page 15, SMG antenna switch).

The antenna has a flexible, 0.6 m long RF connecting cable with N-plug.



Directional antenna **SMG-RA**

The directional antenna **SMG-RA**, for instance, is used when there are two mobile participants on the waveguide and the RF connection is on each end of the waveguide (see also system's diagram 2, page 7).

Also, the directional antenna may be utilized with double transceivers (SES/SEM) and with two or more participants on the waveguide (similar to system's diagram 3, page 8).

The antenna has a flexible, 0.6 m long RF connecting cable with N-plug.

### 3.10 Special Antenna assembly



Directional antenna **SMG-RAE-XY 6**

Antenna assembly **SMG-RAE-XY 6** for large cranes, coking machinery and other material handling systems with tolerances of  $\pm 150$  mm in X-Y-direction.



## 3 MECHANICAL COMPONENTS

### 3.11 RF cables with Accessories



HF Connecting cable **SMG-HF**

The RF Connecting cable **SMG-HF** is required to connect the stationary transceiver (SMG-SES) with the SMG Waveguide or to connect the transceiver and the antennas with the antenna switch SMG-AUS 1 and SMG-AUS 2.

SMG-HF is a specially made cable with low attenuation, minimum bending radius of 100 mm and can only be used for fixed (non-flexing) installation. The cable has an OD of 10 mm with factory installed N-type connectors at each end, available in lengths of 1 m, 2 m, 3 m, 4 m and 5 m.



N-type Connector straight, and right angle

If a RF Connecting cable has to be lengthened an additional connecting cable can be added with the straight N-type connector **SMG-HF-N-VBB**.

The N-type angle connector **SMG-HF-N-WV** enables a space saving cable connection arrangement to the transceiver. The connector is tightened with a hexnut, use a torque setting of 0.7 to 1.1 Nm. If the protective cover IP 53 is installed with a transceiver, an angle connector is included with the shipment and it must be used.



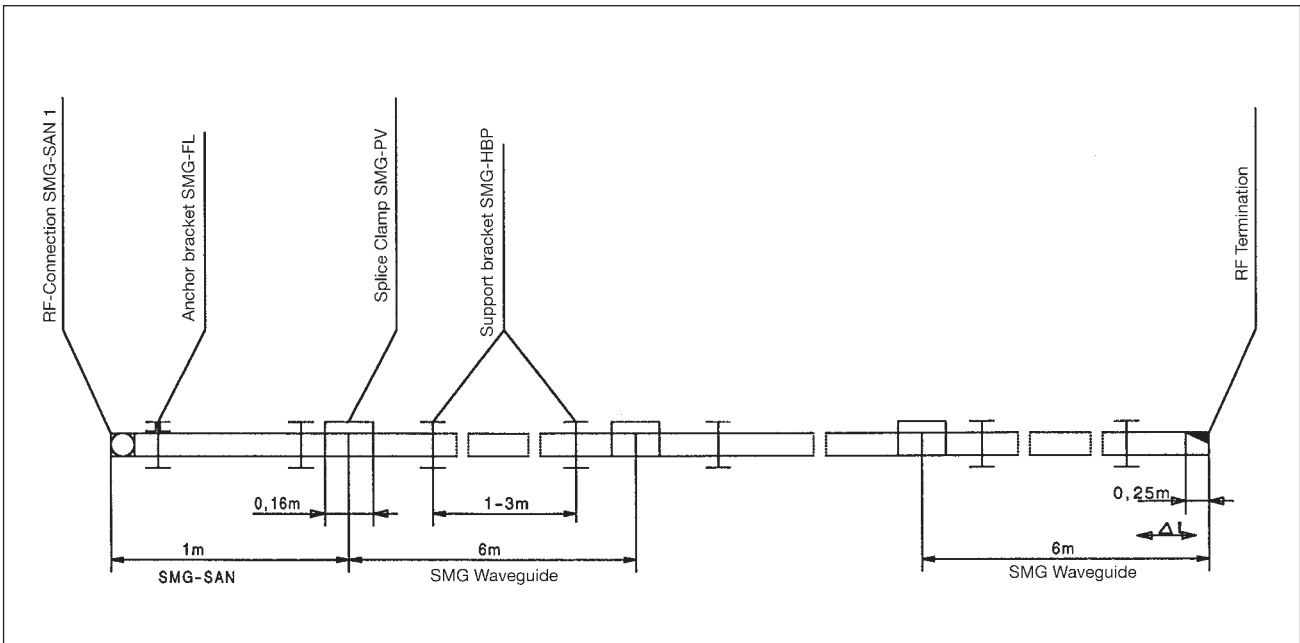
RF Rotating coupler **SMG-HF-DK**

If axial transmission is desired a rotating coupler **SMG-HF-DK** can be used in place of the waveguide.

The SMG-HF-DK has two N-type sockets so the transceiver can be directly connected with our standard RF cable SMG-HF.

Sufficient equalization of potentiality between the rotating and the fixed components must be assured.

## 4.1 Constructional design of the SMG waveguide



SMG Waveguide components

### Installation of SMG Waveguide

SMG Waveguide is installed parallel with the vehicle track, slot opening pointing downward. The waveguide is supported with sliding hanger bracket on 3 m centers and may be installed together with the conductor system.

Standard length for a SMG Waveguide section is 6 m. Sections are joined with bolted joint splice clamps to make the required system's length. Be certain to have at least 200 mm clearance between joint splice clamp and hanger bracket.

The support hanger permits the waveguide to slide freely during thermal expansion or contraction. Systems up to 200 m long may be anchored anywhere along the system with the included anchor bracket so that controlled expansion/contraction is assured.

Installations exceeding 200 m and having large temperature variations must be anchored at the center of the system. The very last sliding hanger bracket should be positioned approx. 500 mm from the end of the system.

### RF Connection and termination

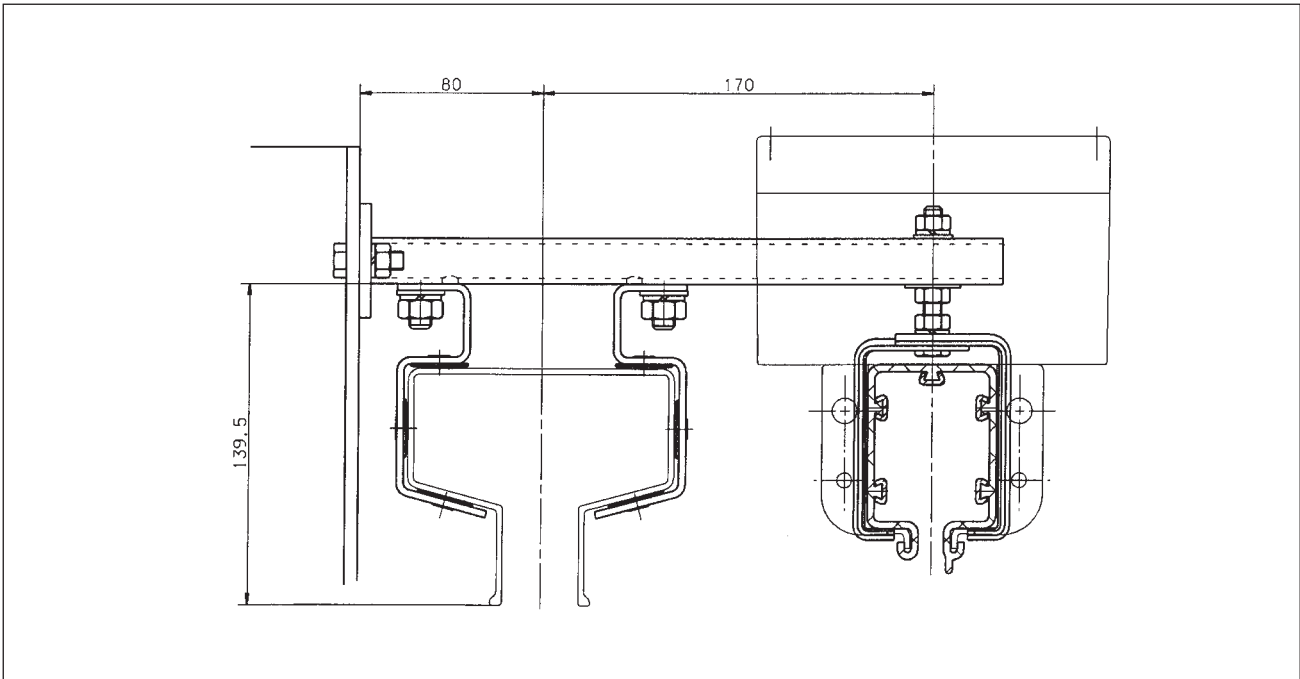
The waveguide section SMG-SAN 1 must be installed at one of the ends of the waveguide. Here the connection is made to the stationary transceiver SES with the use of the special RF Connecting cable SMG-HF.

RF Termination SMG-EAB is installed at the other end of the waveguide unless a SAN-SAN 1 connection is also required as shown on system's diagram 2, page 7.

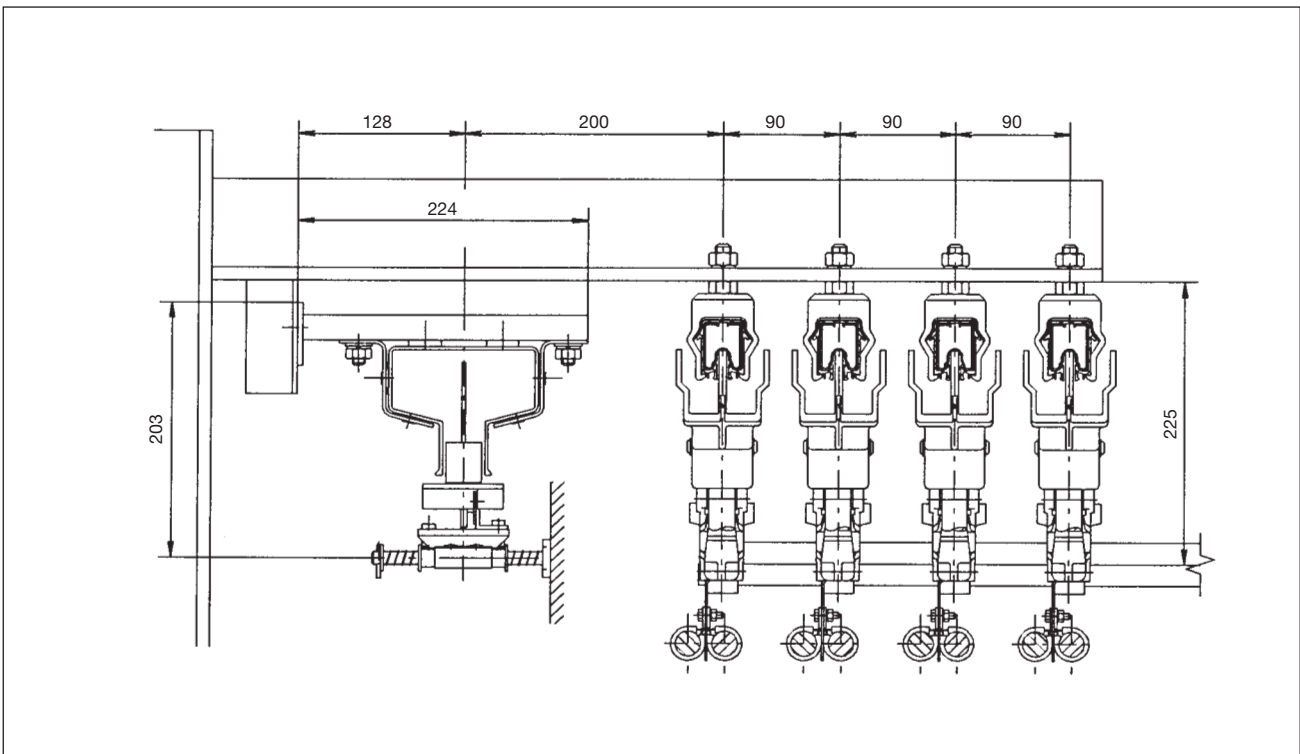


## 4 CONFIGURATION SUPPORT

### 4.1 Constructional Design of the SMG Waveguide



Typical arrangement of the SMG Waveguide and Conductor Rail



Typical arrangement of the SMG Antenna and unipole insulated conductor U 35



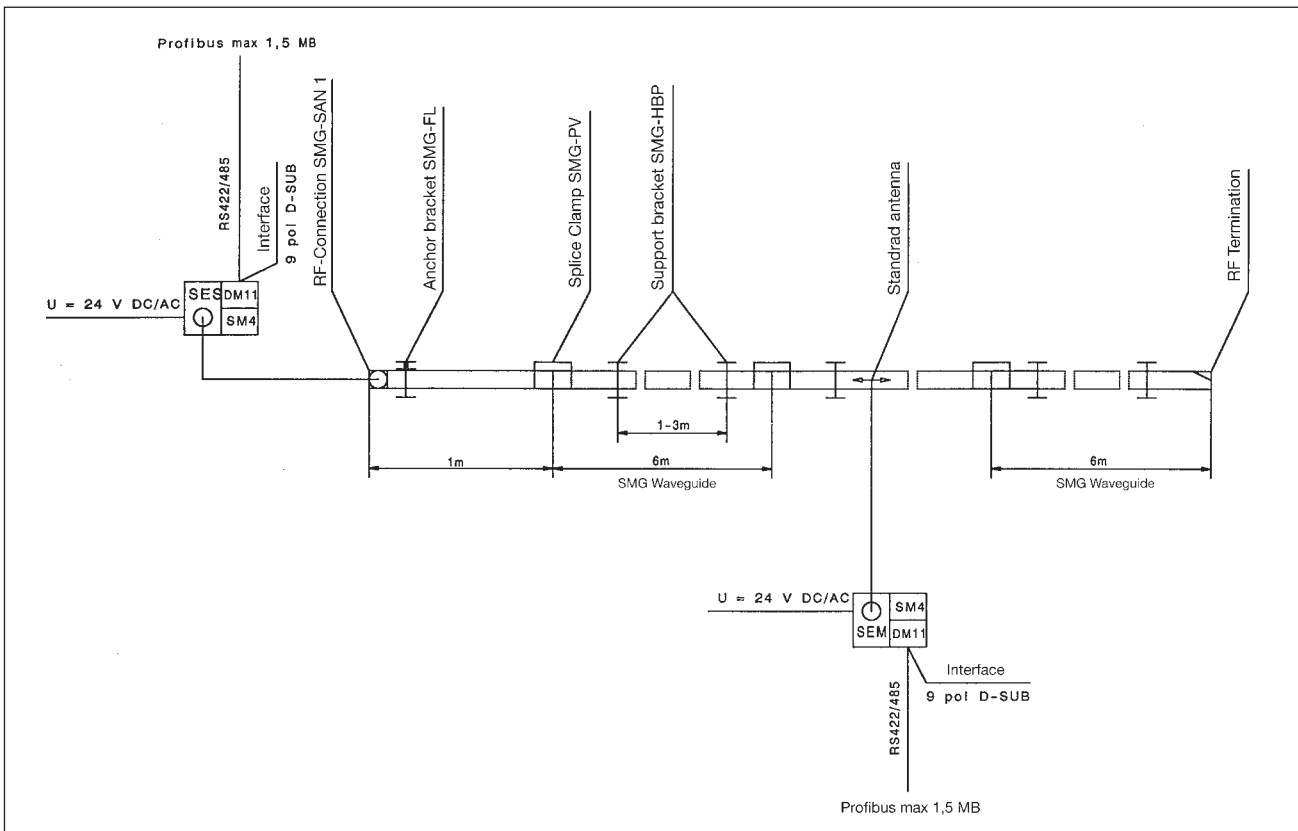
## 4.2 Configuration Example

System length (Transmission Link): 100 m  
 Number of users: 1  
 Communication Interface: Profibus (RS 485 - Interface)

The following components are available:

Description	Type	Number	Cat.-No.
SMG Waveguide, untreated, 6 m long	SMG/B-6	16	951 116
SMG Waveguide, untreated, 3 m long	SMG/B-3	1	951 113
RF-Connection, 1 m long	SMG-SAN 1B	1	952 111
Anchor Bracket (Installation set)	SMG-FL/B	1	952 410
Clamping Sleeve galvanized	SMG-PV	17	952 711
RF Termination (Installation set)	SMG-EAB	1	952 400
Support Bracket, galvanized	SMG-HBP 4	36	952 541
Support Arm 1/220	SMG-HT 1/220	36	952 551
Transceiver Unit stationary	SMG-SES 202	1	955 111
Transceiver Unit mobile	SMG-SEM 202	1	955 211
Data module 1-channel	SMG-DM 11	2	955 311
Interface module RS 485	SMG-SM 4	2	957 141
Antenna Device	SMG-SAE-XY 3	1	958 161
RF Connecting cable 2 m long	SMG-HF 2	1	958 312
RF Connecting cable 1 m long	SMG-HF 1	1	958 311
RF N-Connector, straight	SMG-HF-N-VBB	1	958 391

## 4.2 Configuration example



System's diagram for the configuration example

**Please consider the following aspects when designing a system:**

- Position the stationary transceiver SES as closely as possible to the RF Connection SMG-SAN 1 and the mobile transceiver SEM as closely as possible to the antenna (SMG-SAE-XY3) to keep the RF connecting cable as short as possible (5 m max. length).
- The antenna (SMG-SAE-XY3) used with the example above permits maximum X-axis tolerance of +/- 20 mm and maximum Y-axis tolerance of + 5 mm / - 10 mm. This tolerance should be adhered to if at all possible to assure non-contact movement of the antenna. Select antenna type 02 (see page 22) when greater XY-axis tolerance is exceeded.
- The for the example selected hanger brackets require a defined available space to be installed. If the available space is limited, special hanger brackets are available (please see page 20 and 21). It is also possible to install the waveguide on the same bracket which supports the conductor system (see page 26).
- If frequency inverters are used please follow the instructions of the manufacturer with reference to interference elimination, cable support and cable shielding. Data cables and power cables must be separated by at least 100 mm.



## 4.3 Questionnaire

For a detailed quotation, please complete this page and send it by fax. For special applications which cannot be covered by this questionnaire, please contact our Head Office in Germany or our local office in your area.

PAUL VAHLE GmbH & Co. KG  
D-59172 Kamen  
Fax: 0 23 07/70 44 44  
E-Mail: info@vahle.de  
Internet: www.vahle.de

Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Tel./Fax: \_\_\_\_\_

Date: \_\_\_\_\_

1. Type of vehicle or mobile device?

a) crane  b) material handling  c) AS/RS warehouse

d) monorails

e) others \_\_\_\_\_

2. Length of runway (s): \_\_\_\_\_ m

3. Number of vehicles on runway: \_\_\_\_\_

4. Type of communication interface:

\_\_\_\_\_  
\_\_\_\_\_

5. Transmission of E-Stop needed? yes  no

6. Max. needed data rate \_\_\_\_\_ kbit/s

7. Ambient temperature: \_\_\_\_\_°C min. \_\_\_\_\_°C max.

8. What environmental conditions have to be expected?

a) Outdoor system  b) Indoor system  c) Dust  d) Electromagnetic influence

e) Acid  f) Humidity  g) Oils

h) Others: \_\_\_\_\_

9. Additional Notes: \_\_\_\_\_  
\_\_\_\_\_



## 5 TECHNICAL DESCRIPTION FOR ORDERING

Description	Type	Weight kg/pc.	Cat.-No.
<b>SMG-Transceiver and accessories</b>			
Transceiver stationary, with 2 slots	SMG-SES 202	5.000	955 111
mobile, with 2 slots	SMG-SEM 202	5.000	955 211
stationary, with 3 slots	SMG-SES 203	5.500	955 121
mobile, with 3 slots	SMG-SEM 203	5.500	955 221
Protective cover for model 202 model 203 }	SMG-SCHH 202	1.000	955 911
	SMG-SCHH 203	1.200	955 921
Transformer 230/115-24 VAC	SMG-NT	0.820	954 124
Emergency-Stop Relay Box	SMG-NARB	0.500	954 324
<b>SMG Data module</b>			
Data module 1-channel	SMG-DM 11	0.195	955 311
2-channel	SMG-DM 12	0.214	955 321
4-channel	SMG-DM 13	0.214	955 331
2-channel extension	SMG-DM 14	0.180	955 341
	Option 5 V SMG-ODM 14-5	0.012	957 342
	Option 12 V SMG-ODM 14-12	0.012	957 341
2-channel extension	SMG-DM 15	0.192	955 351
6-channel for model 203	SMG-DM 131	0.214	955 322
6-channel extension for DM 131	SMG-DM 141	0.180	955 344
Interbus fiber optic IN	SMG-DM 42 FO	0,170	955 620/0-FO-I
Interbus fiber optic OUT	SMG-DM 42 FO	0,170	955 620/0-FO-O
Interbus electrical IN	SMG-DM 42 CO	0,170	955 620/0-CU-I
Interbus electrical OUT	SMG-DM 42 CO	0,170	955 620/0-CU-O
Ethernet fiber optic	SMG-DM 20	0.180	955 401
Video input + Data	SMG-DM 23	0.208	955 431
Video output + Data	SMG-DM 24	0.209	955 441
Emergency-Stop	SMG-DM 14-SM 16	0.250	955 346
Emergency-Stop	SMG-DM 141-SM 16	0.250	955 347
Emergency-Stop	SMG-DM 15-SM 16	0.260	955 356
<b>SMG Interface module</b>			
Interface module TTY/20 mA	SMG-SM 1	0.020	957 111
RS 232 C	SMG-SM 2	0.020	957 121
RS 422 Point-to-Point	SMG-SM 3	0.030	957 131
RS 485	SMG-SM 4	0.030	957 141
RS 485 enable	SMG-SM 5	0.020	957 151
Allen Bradley DH+/RIO	SMG-SM 6	0.035	957 161
Allen Bradley DH 485-Bus	SMG-SM 41	0.030	957 142
GE Genius Databus	SMG-SM 13	0.030	957 231
Audio	SMG-SM 7	0.060	957 171
Ethernet for DM 21	SMG-SM 8	0.020	957 181
Ethernet for DM 22	SMG-SM 9	0.030	957 191
Ethernet for DM 20	SMG-SM 20	0.060	957 301
Ethernet for DM 20	SMG-SM 21	0.060	957 311
Power supply 12 V DC	SMG-SM 10	0.020	957 112
<b>SMG Antenna switch</b>			
Antenna switch for crossover	SMG-AUS 1	0.460	958 118
for bypass	SMG-AUS 2	0.460	958 117

## 5 TECHNICAL DESCRIPTION FOR ORDERING



Description	Type	Weight kg/pc.	Cat.-No.
<b>Antenna</b>			
Standard antenna mit 0.6 m cable, model 01	SMG-SAE-XY-3	1.630	958 161
model 02	SMG-SAE-XY-3	1.635	958 161-2
Directional antenna, 0.6 m cable model 01	SMG-RAE-XY-3	2.000	958 162
model 02	SMG-RAE-XY-3	2.005	958 162-2
Janus antenna, 0.6 m cable model 01	SMG-JAE-XY-3	2.180	958 163
model 02	SMG-JAE-XY-3	2.185	958 163-2
<b>Antenna (for spare only)</b>			
Standard antenna, 0.6 m cable	SMG-SA	0.160	958 111
Directional antenna, 0.6 m cable	SMG-RA	0.530	958 112
Janus antenna, 0.6 m cable	SMG-JA	0.710	958 113
<b>RF Cable and Accessories</b>			
RF cable with N-connector, 1 m	SMG-HF-1	0.225	958 311
2 m	SMG-HF-2	0.450	958 312
3 m	SMG-HF-3	0.675	958 313
4 m	SMG-HF-4	0.900	958 314
5 m	SMG-HF-5	1.125	958 315
RF N-connector, straight with cable clamp	SMG-HF-N-VBB	0.034	958 394
RF N-connector, right angle	SMG-HF-N-WV	0.080	958 390
RF Rotary coupler	SMG-HF-DK	1.000	958 395
<b>RF Connectors and Accessories</b>			
SMG-RF connector, untreated, 1 m	SMG-SAN 1 B	1.100	952 111
as before, but traversable	SMG-SAN 2 B	1.200	952 121
SMG-RF connector, anodized, 1 m	SMG-SAN 1 E	1.100	952 131
as before, but traversable	SMG-SAN 2 E	1.200	952 141
SMG-RF connector, special coated, 1 m	SMG-SAN 1 SB	1.200	952 151
as before, but traversable	SMG-SAN 2 SB	1.300	952 161
SMG antenna guiding (installation kit)	SMG-EK	0.250	952 405
<b>RF Termination</b>			
SMG-RF Termination (installation kit)	SMG-EAB	0.150	952 400



## 5 TECHNICAL DESCRIPTION FOR ORDERING

Description	Type	Weight kg/pc.	Cat.-No.
<b>SMG Waveguide untreated</b>			
SMG Waveguide 1 m	SMG/B-1	2.500	951 111
2 m	SMG/B-2	5.000	951 112
3 m	SMG/B-3	7.500	951 113
4 m	SMG/B-4	10.000	951 114
5 m	SMG/B-5	12.500	951 115
6 m	SMG/B-6	15.000	951 116
<b>SMG Waveguide anodized</b>			
SMG Waveguide 1 m	SMG/E-1	2.500	951 131
2 m	SMG/E-2	5.000	951 132
3 m	SMG/E-3	7.500	951 133
4 m	SMG/E-4	10.000	951 134
5 m	SMG/E-5	12.500	951 135
6 m	SMG/E-6	15.000	951 136
<b>SMG Waveguide epoxy coated</b>			
SMG Waveguide 1 m	SMG/SB-1	2.600	951 151
2 m	SMG/SB-2	5.200	951 152
3 m	SMG/SB-3	7.800	951 153
4 m	SMG/SB-4	10.400	951 154
5 m	SMG/SB-5	13.000	951 155
6 m	SMG/SB-6	15.600	951 156
<b>SMG Joint Splice Clamp</b>			
SMG Joint Splice Clamp galvanized	SMG-PV	1.000	952 711
special-coated	SMG-PV/SB	1.100	952 751
<b>SMG Support Bracket</b>			
pair of support brackets	SMG-HBP 4	0.250	952 541

## 5 TECHNICAL DESCRIPTION FOR ORDERING



Description	Type	Weight kg/pc.	Cat.-No.	
<b>SMG Support Bracket</b>				
pair of support brackets	2/0 galvanized	SMG-HBP 2/0	0.400	952 521
	special-coated	SMG-HBP 2/0 SB	0.400	952 522
	2/12 galvanized	SMG-HBP 2/12	0.400	952 523
	special-coated	SMG-HBP 2/12 SB	0.400	952 524
	2/18 galvanized	SMG-HBP 2/18	0.400	952 525
	special-coated	SMG-HBP 2/18 SB	0.400	952 526
<b>SMG Support Arm</b>				
support arm	1/220 galvanized	SMG-HT 1/220	0.500	952 551
	special-coated	SMG-HT 1/220 SB	0.550	952 552
	1/420 galvanized	SMG-HT 1/420	0.850	952 651
	special-coated	SMG-HT 1/420 SB	0.950	952 652
	2/220 galvanized	SMG-HT 2/220	0.500	952 553
	special-coated	SMG-HT 2/220 SB	0.550	952 554
<b>SMG Anchor Bracket</b>				
SMG anchor bracket, installation kit	untreated	SMG-FL/B	0.200	952 410
	anodized	SMG-FL/E	0.200	952 430
	special-coated	SMG-FL/SB	0.200	952 450



Antenna support arm assembly for a large crane application.



# 6 CERTIFICATION

**CETECOM ICT Services GmbH**  
EC Identification number 0682

authorized by the German Government



with decree Vfg 28/2000, issued in the Official Journal 6/2000 of the Regulierungsbehörde für Telekommunikation und Post, in act as Notified Body in accordance with the R&TTE Directive 1999/5/EC, of 09. March 1999.

## CERTIFICATE EXPERT OPINION

Registration-No.: EM1185M-EO  
Certificate Holder: Paul Vahle GmbH & Co. KG  
Westtöcker Straße 52  
D-59174 Kamen

Product Designation: SMG-SES 202/203; SMG-SEM 202/203  
Product Description: Short Range Device  
Product Manufacturer: Paul Vahle GmbH & Co. KG  
Westtöcker Straße 52  
D-59174 Kamen

Essential requirements	Specifications / Standards	Submitted documents
Safety (R&TTE, Article 3.1a)	-	Not assessed
Health (R&TTE, Article 3.1a)	-	Not assessed
EMC (R&TTE, Article 3.1b)	ETS 300 683, June 1997	Test Report
Radio spectrum (R&TTE, Article 3.2)	Draft EN 300 440, April 1999	Test Report

**CE 0682**



Marking: The product shall be signed with CE, our notified body number and the Class II identifier (Aurt sign) as shown right.

The certificate is only valid in cooperation with the following number of annexes:  
Number of annexes: **1**  
Saarbrücken, 11.07.00  
Place, Date of Issue  
Signed by Ernst Hünigler  
Notified Body

CETECOM ICT Services GmbH, Untertürkheimer Straße 64/0, D-66617 Saarbrücken, Germany

**CETECOM ICT Services GmbH**



## CERTIFICATE OF CONFORMITY

Registration-No.: EM1185M-CC  
Certificate Holder: Paul Vahle GmbH & Co. KG  
Westtöcker Straße 52  
D-59174 Kamen  
Number of annexes: ---

Product Designation: SMG-SES 202/203; SMG-SEM 202/203  
Product Description: Short Range Device  
Product Manufacturer: Paul Vahle GmbH & Co. KG  
Westtöcker Straße 52  
D-59174 Kamen

Specifications and test reports:	Test report no. & date	Name of test laboratory	Notes
Specification Draft EN 300 440, April 1999	2-11485/00 dated 31.05.2000	CETECOM GmbH	confirms
ETS 300 683, June 1997	2-11485/00 dated 31.05.2000	CETECOM GmbH	confirms

Statement: This equipment fulfills the requirements or parts thereof in the above mentioned specifications.

By decree Vfg 28/2000, issued in the Official Journal 6/2000 of the Regulierungsbehörde für Telekommunikation und Post, CETECOM ICT Services is authorized to act as Notified Body in accordance with the R&TTE Directive 1999/5/EC, of 09. March 1999



Signed by Ernst Hünigler  
Notified Body

Saarbrücken, 11.07.00  
Place, Date of Issue

CETECOM ICT Services GmbH, Untertürkheimer Straße 64/0, D-66617 Saarbrücken, Germany



**FCC ID: KKVSMG – 202 – 203**

This device complies with part 15 of the FCC Rules.  
 Operation is subject to the following two conditions:  
 (1) This device may not cause harmful interference; and  
 (2) This device must accept any interference received,  
 including interference that may cause undesired  
 operation.

**SES/SEM 202/3 SMG DATA TRANSMISSION**

FCC Certificate for use in North America

**Certificate**  
**No.: U 96 12 23217 001**



Paul Vahle GmbH & Co. KG  
 Westicker Str. 52  
 59174 Kamen

TÜV Certificate for Emergency - Stop

**Physikalisch-Technische Bundesanstalt**

Braunschweig und Berlin

Prüfschein



Test certificate

Nr. D09-96.29

PTB Certificate for measurement signal transmission

**Negativ-Bescheinigung NB- 96 / 00165**

Beweismittel im Sinne des § 10 Abs. 1 Satz 2 der Außenwirtschaftsverordnung (AWV)

- Aufgrund Ihres Antrages und des zur Spezifikation eingereichten technischen Datenmaterials wird Ihnen zwecks Vorlage bei der Zollstelle bescheinigt, daß folgende Waren:

Stat. Waren-Nr.	Genauere Warenbeschreibung	Hersteller	Typ
86080030	SMG-Datenübertragungssys. Serie 202, gemäß Anlage	VAHLE	
86080030	SMG-Datenübertragungssys. Serie 203, gemäß Anlage	VAHLE	

Federal Office Export Control Certificat



## Products and Service

Catalog no.

Powerails	1 a
Battery Charging Systems	1 b
Insulated Powerails U 10	2 a
Insulated Powerails U 20 - U 30 - U 40	2 b
Insulated Powerails U 15 - U 25 - U 35	2 c
Aluminum 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 Systems 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 Flatarm Cables on I beams	8 bF
Cable Carriers for Round Cables on I beams	8 bR
Cable Carriers and Accessories for ◇ tracks	8 c
Conductor Cables and Fittings	8 L
Spring Operated Cable Reels	9 a
VAHLE POWERCOM <sup>®</sup> Digital Transmission Systems	9 c
CPS <sup>®</sup> Contactless Power Supply	9 d
SMG - Slotted Microwave Guide	9 e
Position Encoding Systems	9 f
Motor Powered Cable Reels	10
Installations/Commissioning	
Spare Parts/Maintenance Service	





## Products and Service

	Catalog no.
Powerails	1 a
Battery Charging Systems	1 b
Insulated Powerails U 10	2 a
Insulated Powerails U 20 - U 30 - U 40	2 b
Insulated Powerails U 15 - U 25 - U 35	2 c
Aluminum 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 Systems 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 Flatpam Cables on I beams	8 bF
Cable Carriers for Round Cables on I beams	8 bR
Cable Carriers and Accessories for ◇ tracks	8 c
Conductor Cables and Fittings	8 L
Spring Operated Cable Reels	9 a
VAHLE POWERCOM <sup>®</sup> Digital Transmission Systems	9 c
CPS <sup>®</sup> Contactless Power Supply	9 d
SMG - Slotted Microwave Guide	9 e
Position Encoding Systems	9 f
Motor Powered Cable Reels	10
Installations/Commissioning	
Spare Parts/Maintenance Service	



**POWERAIL LTD.**

WORKING FOR THE FUTURE WITH

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E-mail: enquiries@powerailtd.com





## Products and Service

Catalog no.

Copperhead Conductor Systems	1 a
Battery Charging Systems	1 b
Insulated Powerails U 10	2 a
Insulated Powerails U 20 - U 30 - U 40	2 b
Insulated Powerails U 15 - U 25 - U 35	2 c
Aluminum 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 Systems MKLD - MKLF - MKLS	4 c
Powerail Enclosed Conductor Systems VKS 10	4 d
Powerail Enclosed Conductor Systems KBH	4 e
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