ProfiDAT®
Data Transmission System
Program 0514

CONDUCTIX wampfler

DELACHAUX GROUP

Contents

System Description

General Information

ProfiDAT® is a system for transmitting data between fixed and moving consumers on crane systems. The ProfiDAT® system is installed in parallel with the electrification system (the conductor rail system).
The data transmission system consists of at least one fixed and one mobile transceiver, one feed-in unit, and collector antennas. The mobile collector antenna can continuously receive and transmit data. In addition to data transmission, the ProfiDAT® profile can simultaneously be used as a ground conductor rail (PE). The antenna for data transfer is an integral part of the current collector head in the PE profile.

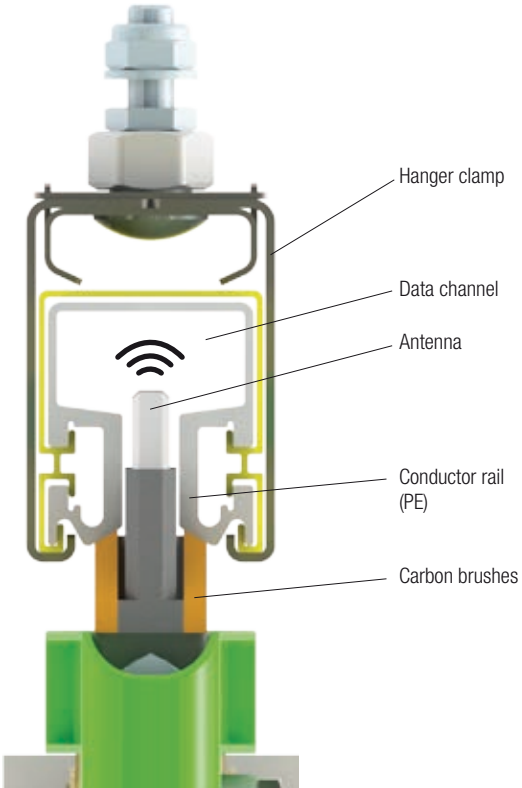
0813 Conductor Rail system without ProfiDAT®

0813 Conductor Rail system with ProfiDAT® PE rail

The illustration above shows that the dual function of the ProfiDAT® ground rail and communications link combination results in a compact and fully integrated solution. Also note that an existing ground conductor rail (PE) can be replaced by the ProfiDAT® system without additional space requirements or attachments.

The contactless slotted waveguide system for data transmission allows data (video, audio, and control data) to be transferred through a slotted hollow conductor reliably and at very high data rates (real-time data). Data rates up to 100 Mbit/s with an average latency of 3 ms can be transferred safely and reliably. The special design of the conductor profile and the mobile antenna tranfers data in a shielded system which works flawlessly even in difficult radio environments, such as container seaports and terminals. The ProfiDAT® data transmission system can be combined with numerous Conductix-Wampfler conductor rail ranges.

- The unified data and grounding profile allows the data transmission system to be fully integrated into the conductor rail system.
- Using the minimum number of parts and components has a positive effect on the space requirement in a complete supply system (power and data).
- The data antenna is reliably guided in the profile slot by the staggered carbon brushes. No additional antenna guide is required.



System Description

Main Applications

- STS (ship-to-shore) cranes
- RTG/E-RTG (rubber-tired/electrified-rubber-tired gantry) cranes
- Process cranes
- Other mobile machines

Benefits of ProfiDAT®

- Secure and reliable wireless transmission method due to slotted waveguide technology
- Real-time data transfer by prioritization of PROFINET data packets
- PROFIsafe compatible
- Optional expansion and separation points
- Cost savings and space reduction by dual usage of the ProfiDAT® profile for data transmission and grounding (PE conductor rail)
- Compact design and full integration into conductor rail systems
- Support for various protocol types
- Reliable communications even in harsh environmental conditions, such as ports, mills, and bulk facilities

Product Data

Data rate:	Up to 100 Mbit/s
Real-time capable:	Yes (PROFINET)
Average latency:	3 ms
Transmission distance:	Up to 500 m (without intermediate amplification)
Secure transmission:	Yes (PROFIsafe)
Utilization as a ground conductor rail (PE):	Yes
Max. number of participants:	5 in one segment (more after technical clarification)
Profile length:	5000 mm
External dimensions (profile):	48 × 56 mm
Area of use:	Indoor and outdoor areas
Temperature range:	-25 °C to +50 °C
Installation orientation:	Antennas/current collectors engaging from below

Note

- The slotted waveguide profile must not be used as a power (phase) conductor
- Not suitable for vertical applications
- Only suitable for straight runs

System Description

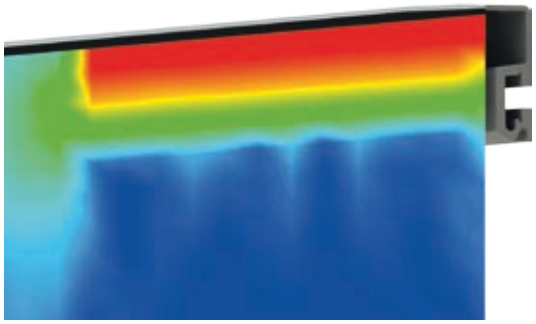
Functional Principle of the Slotted Waveguide

A waveguide is a hollow, rectangular or circular profile with conducting walls, inside which electromagnetic waves can be sent. How the electromagnetic waves propagate in the waveguide depends on the geometry and the excitation of the wave. The geometry determines a lower frequency threshold above which a wave can propagate.

The underlying principle of a slotted waveguide is based on a rectangular waveguide. A radio wave is fed into this and travels at a right angle to the antenna through the profile. The slotted waveguide has a longitudinal slot on one side. A coupling element (antenna) is inserted into the rectangular waveguide through the slot such that the inserted coupling element can move along the slot. By mechanical means, the slotted waveguide is dimensioned such that the radio wave inside the slot will not couple with electromagnetic waves in the vicinity of the slotted waveguide.

System Advantages

The greatest advantage of the system is that the radio wave inside the slotted waveguide (SWG) is electromagnetically decoupled from other waves in the vicinity of the SWG. This provides almost 100% protection against interference with the electromagnetic environment of the SWG, so the available frequency spectrum can be more efficiently used. Furthermore, the attenuation of the signal over the run length significantly less than with comparable communication systems, so that large signal transmission ranges and longer segment lengths are achievable.

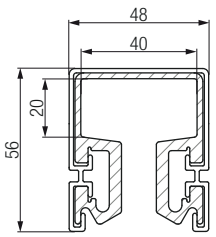


- No emissions of the radio wave to the outside
- Immune to potential interference from external sources

Electromagnetic emissions from a slotted waveguide

The field distribution image above shows the exponential decay in the area outside of the slot. A feature of the slot design is that it prevents the electromagnetic emission of the radio wave into the surroundings of the slotted waveguide.

Technical Specifications

ProfiDAT® Profile Type	051411
	
Area of use	Container handling (STS cranes and RTG/E-RTG cranes) and process cranes
Environment	Harsh outdoor conditions (seaports) as well as indoor applications
Installation orientation	Horizontal, indoor and outdoor
Max. distance between supports [m]	2.5/3 (for E-RTG)
Rail length [mm]	5000 (196.9 inch) (nominal size at 20 °C/tolerance ±3 mm)
System length [m]	up to 500 per segment
External dimensions [mm]	48 × 56
Nominal rail spacing [mm]	80 (3.15 inch) (minimum spacing, expandable as required)
Traversing speed [m/min]	300 (straight, uninterrupted stretches)
Max. nominal current [A]	1000
Expansion/expansion joints	Compensation for up to 200 m (565 feet) system length, above 200 m the use of expansion elements is necessary
Permitted ambient temperature	-25 °C to 50 °C (85 °C for heat-resistant version/PPE + SB)
Maximum conductor temperature	+85 °C (115 °C for heat-resistant version/PPE + SB, briefly 125 °C)
Storage temperature	-25 °C to 50 °C (store in a dry place, avoid condensation)
Conductor material	Aluminum with surface coating
Rail insulation	Stabilized rigid PVC (standard material) and PPE + SB (heat-resistant version for indoor applications)
Flammability/fire protection	Compliant with requirements for insulating materials in accordance with UL94 V-0; flame-retardant and self-extinguishing (IEC DIN EN 60895-11-10B); PPE + SB halogen free
Local approvals	CR
Coloring	Rail insulation in security warning color RAL 1018 Lemon yellow, or RAL 1021 Rape yellow for the heat-resistant version; green stripe (PE rail) in RAL 6025 Fern green

Relevant standards	
DIN EN 60664-1, VDE 0110-1:2008-1	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests (IEC 60664-1:2007); German version EN 60664-1:2007
DIN EN 60204-1, VDE 0113-1:2007-06	Safety of machines – electrical equipment of machines – Part 1: General requirements (IEC 60204-1:2005, modified); German version EN 60204-1:2006
DIN EN 60529, VDE 0470-1:2000-09	Degrees of protection provided by enclosures (IP-code) (IEC 60529:1989 + A1:1999); German version EN 60529:1991 A1:2000
DIN EN 60204-32, VDE 0113-32:2009-03	Safety of machines – electrical equipment of machines – Part 32: Requirements for hoisting machines (IEC 60204-32:2008); German version EN 60204-32:2008

Technical specifications subject to change without notice.

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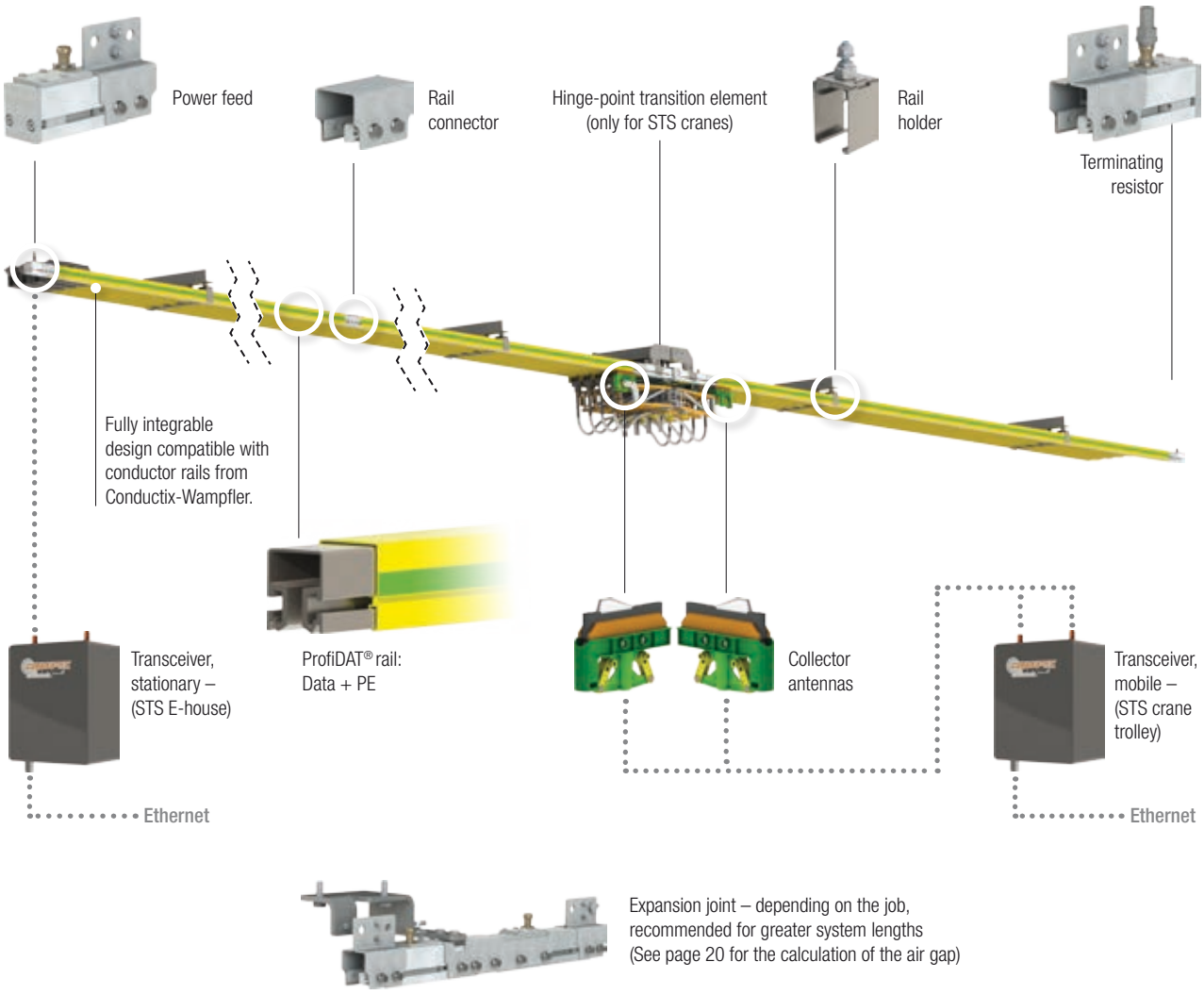
System Structure
ProfiDAT® for EOT/STS Cranes

System Overview



The ProfiDAT® data transmission system for EOT or STS cranes is a variable length system used to provide communication between a stationary data network and a mobile transceiver. In addition to data transmission, the ProfiDAT® profile can simultaneously be used as a ground conductor rail. The system consists of at least one fixed and one mobile transceiver, the feed-in unit, and the collector antennas. The profiles, or the conductor rails, are attached to the steel construction with rail clamps, which are provided by the customer. The profiles are connected mechanically with the help of connectors, which ensures stability and a secure connection of the profiles. The Feed-in unit at one end of the system is used to feed data from the stationary transceiver into the profile. With a central feed-in, the infeed point is located in the middle of the system and therefore distributes the signal to the left and right. The mobile collector antenna can continuously receive and transmit data. The hinge-point transition element is mounted at the interface of the crane hinge, where it serves to provide uninterrupted data transfer whether the crane boom is up or down. The data is fed out on one side of the hinge-point transition element and fed in at the other side.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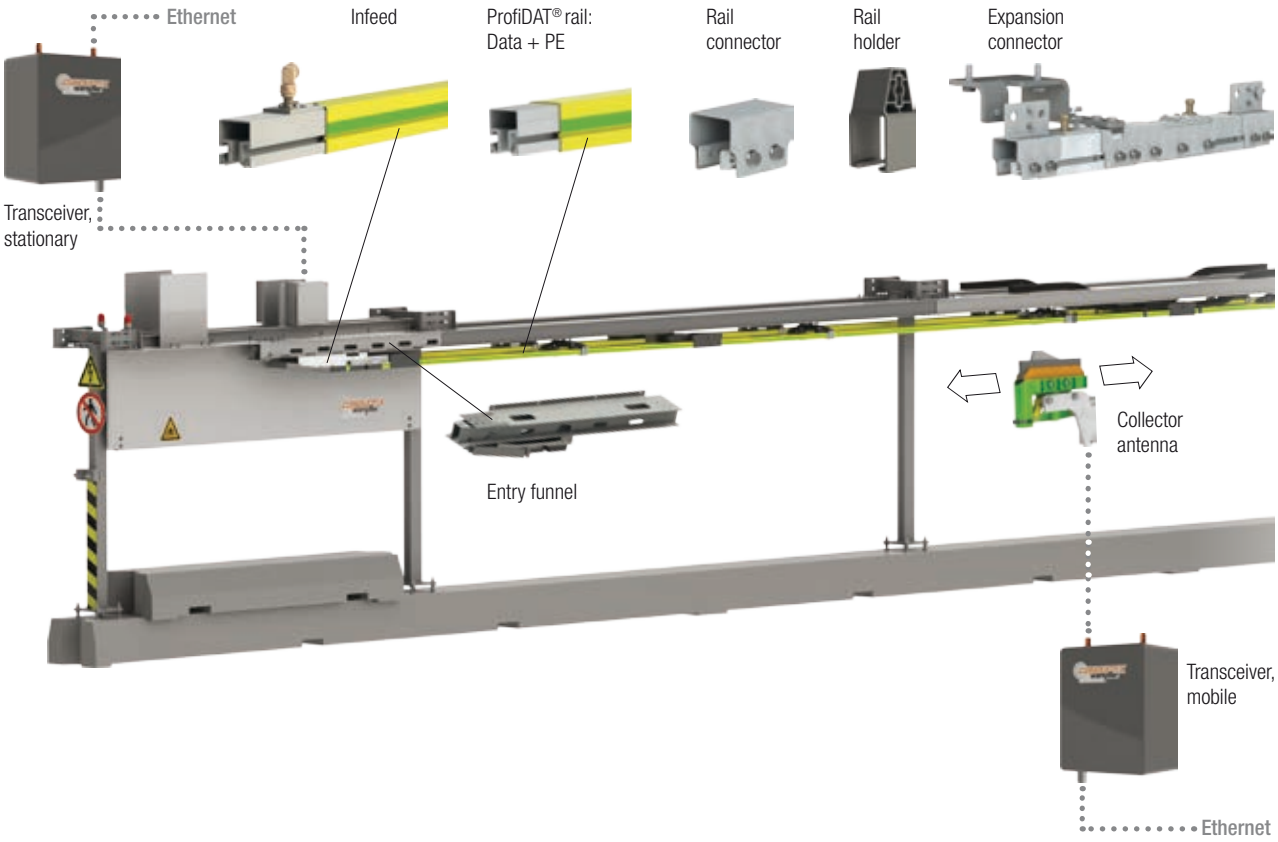
153

System Structure
ProfiDAT® for E-RTG Cranes

System Overview



The ProfiDAT® data transmission system for E-RTG cranes is a variable length system used to provide communication between the stationary feed point and the mobile drive-in unit of RTG container cranes. The ProfiDAT® system is installed in parallel with the E-RTG/RTG electrification system, which is a current collector system for container-stacking cranes.
In addition to data transmission, the ProfiDAT® profile can simultaneously be used as a ground conductor rail. The system consists of at least one fixed and one mobile transceiver, the feed-in antenna, and the collector antenna. The profiles or conductor rails are attached to the steel structure by the hanger clamps. The profiles are connected mechanically with the help of connectors, which ensures stability and a secure connection of the profiles. Data is fed into and out of the profile by a feed-in unit/terminating resistance at the two ends of the system. The mobile collector antenna can continuously receive and transmit data.

The connection trolley on the drive-in unit supplies the crane with power. The connection trolley picks up the power from conductor rails permanently installed on a steel structure along a container corridor. To bring the current collector into contact with the conductor rails, there is an entry/exit zone at each end of the container corridor. In the entry zone, a driven extension and vertical unit positions the connection trolley. Once the connection trolley is completely driven into the conductor rails, the crane can be supplied with power while traveling along the container corridor.

E-RTG drive-in unit with
ProfiDAT® collector antenna

System Components

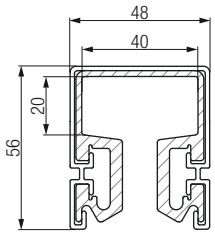
ProfiDAT® Profile

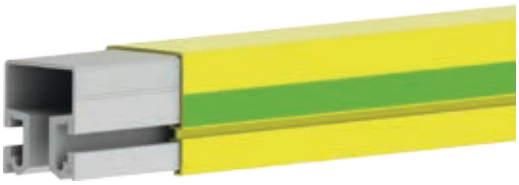
Part No.: 051411-3512

The slotted waveguide profiles are used as data channels. They are electrically conductive and are simultaneously used as a protective conductor (PE).
The standard length of a profile is 5000 mm. The outer dimensions are 48 × 56 mm (width × height). The conductor cross section is at least 585 mm².
For the insulating material, PVC is used in standard areas, and halogen-free PPE + SB is used for higher ambient temperatures. The overall profile consists of the aluminum slotted waveguide and the PVC insulating profile.

Color: Safety warning color RAL 1018 (PVC) /
RAL 1021 (PPE+SB) / RAL 6025 Fern green (stripes)
Material: Aluminum

Optionally available with heating.





Over time, the profile surface can change color.
This does not degrade the functionality of the components.

Technical Specifications – rail length 5000 mm ± 3 mm

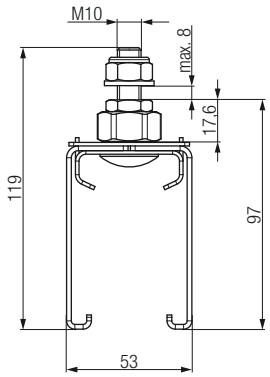
DC resistance [Ω/1000m] 20 °C	0.092
DC resistance [Ω/1000m] 35 °C	0.097
Impedance [Ω/1000m] 20 °C/50Hz	0.152
Impedance [Ω/1000m] 35 °C/50Hz	0.157
Weight [kg]	6.920

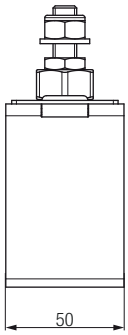
Hanger Clamps

Part No.: 051414-03

The hanger clamps are attached to the supporting structure with nuts and bolts, which are provided by the customer. The hanger clamps are pushed onto the profiles. Two hanger clamps are used per profile. The distance between the hanger clamps is 2500 mm.

Material: Aluminum, stainless steel





System Components

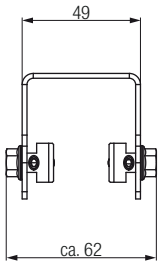
Rail Connectors

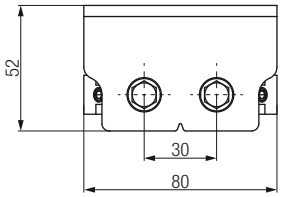
Part No.: 051412-01
Part No.: 051412-02
Two types of connectors are provided:
- Connector, simple (051412-01)
- PE connector, with a connection to the ground cable (051412-02) **to be used every 25 meters.**

The rail connector joins two profiles together and is mounted onto the profile with screws. The ground cable is attached to the lug on the PE connector.

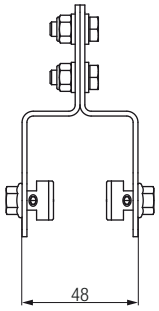
Material: Aluminum, stainless steel

The grounding cable and mounting material are not included.

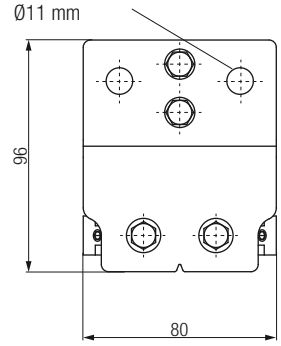




051412-01



Grounding cable connection Ø11 mm



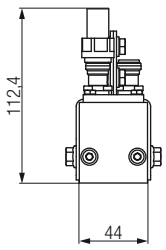
051412-02

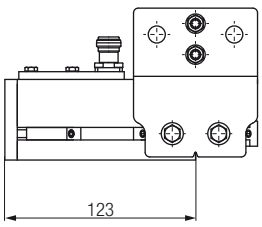
Feed-in/Feed-out Unit (for End Feeding of Signals)

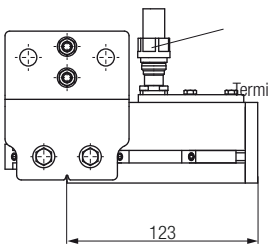
Part No.: 051415-01
The Feed-in/Feed-out unit is attached to the profile at both ends of the system using screws. It is used to feed data signals in and out. At the end of the ProfiDAT® run there is a terminating element with a terminating resistor that attenuates the signal so strongly that no interference with other devices in the vicinity of the data-transmission system occurs.

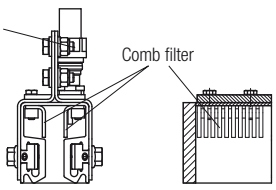
Including cable: Ecoflex® 10
Length: 10 m
Diameter: 10.2 mm
Impedance: 50 Ω
Attenuation @ 5GHz/100 m: 37 dB
Max. frequency: 6 GHz

Material: Aluminum, stainless steel
For system lengths up to 250 m
Including terminating resistor







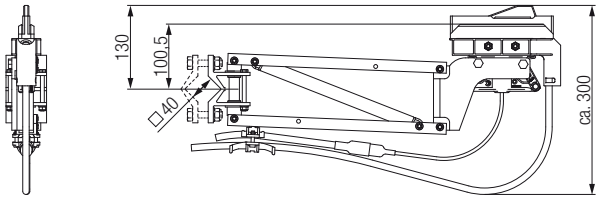


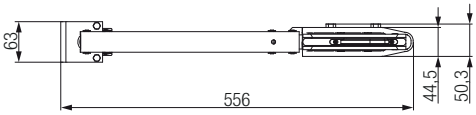
System Components

Current Collector S (Single)

Part No.: 051410-1011
For cable Ø 16 mm² –
other cross-sections can be configured

Use:
- If there are no transitions in the system
- If the system contains no expansion joints
- When the Feed-in is at the end

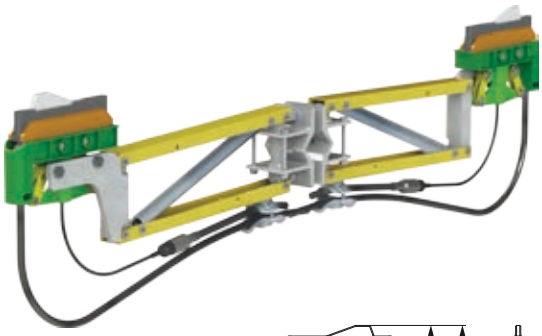




Current Collector D (Double)

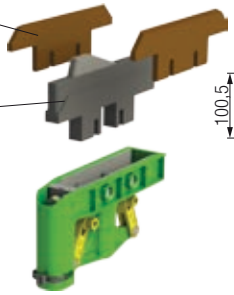
Part No.: 051410-1012
For cable Ø 16 mm² –
other cross-sections can be configured

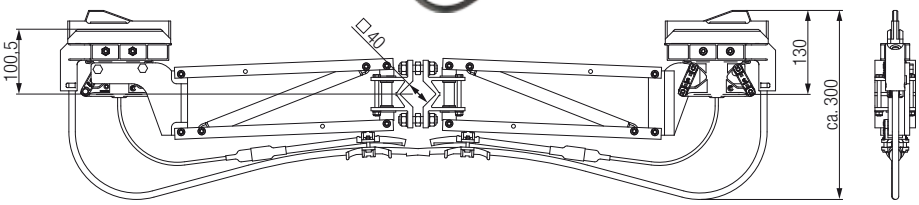
Two divided carbon brushes guide the current collector in the ProfiDAT® profile. The antennas are inserted into the slot of ProfiDAT® profile and are electrically insulated from the carbon brushes.



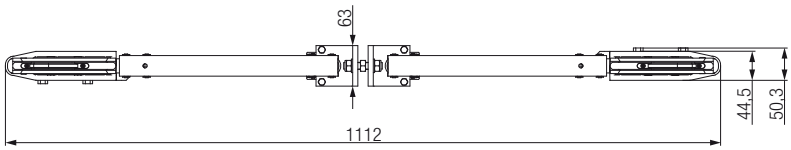
Carbon brushes
Part No.:
05-K154-0001

Antenna
Part No.:
05-A150-0002





Use:
- If there are transitions in the system
- When using expansion joints
- For higher current loads



Technical Specifications	Single Collector 051410-1011	Double Collector 051410-1012
Maximum current load	The determining factors for the maximum current are the type of conductor used, the cross section, the installation method and the ambient temperature. The threshold for the conductor and the reduction factors must be considered in design and construction (for aluminum rails at standstill at 100% duty cycle: 50% of the maximum current load).	
Max. traversing speed	300 m/min; higher traversing speeds on request	300 m/min; higher traversing speeds on request
Contact force	28 N	2 × 28 N
Lateral displacement	± 100 mm	± 100 mm
Working stroke in the direction of insertion	± 40 mm	± 40 mm
Connector cable	70/35/16 mm², length configurable, highly flexible; longer connecting cable on request	70/35/16 mm², length configurable, highly flexible; longer connecting cable on request
Distance between the towing arm and the and the contact surface of the rail (nominal dimension on installation)	125 mm	125 mm
	(SAP CONFIG 3192047)	**(SAP CONFIG 3192070)**

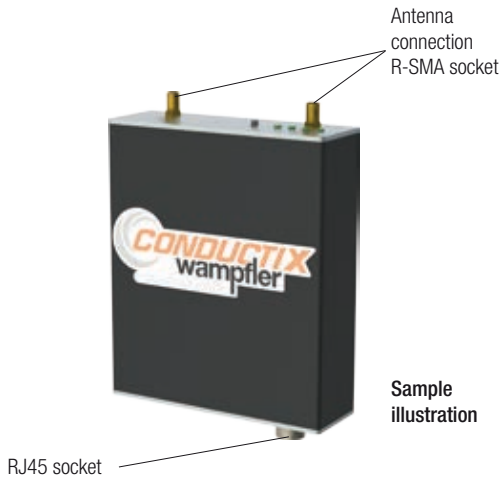
System Components

Transceiver

The ProfiDAT® transceiver sends and receives data via MAC-based (mandatory access control) data communication. The transceiver provides the interface for the Ethernet connection for wireless data transmission in the ProfiDAT® profile. In addition, the ProfiDAT® transceiver coordinates communication between devices configured as access point and client. There are at least two transceivers installed in a system: a stationary transceiver for feeding in the signal, and one mobile transceiver for each movable node. Prioritization of the PROFINET (PROFIsafe) protocols guarantees real-time data communication and the highest security and reliability in transmission.

The ProfiDAT® transceiver may only be used in combination with the patented ProfiDAT® profile.

SIEMENS ProfiDAT® transceivers are configured specifically for the application.
Industrial WLAN devices from SIEMENS are specifically configured for use in ProfiDAT® slotted waveguides.



Sample illustration

Standard Transceiver

Access point and client modules for use in a control cabinet.

Space-saving integration – in the control cabinet, for example – by DIN-rail mounting.
Metal housing, protection class IP30.
This transceiver is used for standard applications with a double current collector.

Transceiver for use in the Control Cabinet (Single)

Cost-effective solution for use in a control cabinet.
Plastic housing, protection class IP20.

This transceiver can only be used in connection with the ProfiDAT® current collector (single), Part No.: 051410-1011.

Outdoor Transceiver

Protection class IP65 for high climatic requirements from -40 °C to +70 °C indoors and outdoors; salt-spray resistance permits usage in ports, for offshore installations and for container logistics,

- Destruction resistant; ideal for solutions in railway stations, public places or on local public transport. There are no breakable parts on the outside of the product, thereby providing savings in terms of replacement parts, maintenance costs and additional mechanical protective devices.
- Variants designed for use with the Hipath WLAN controller
- Flexible use for 12-24 V DC or 110-230 V AC
- Fiber-optic connection for large distances

(SAP CONFIG 3188984)

System Components

Transceivers

	Standard Application CXW734 and CXW774	Use in Control Cabinets CXW721 and CXW761	Outdoor Applications CXW786
Transmission rate for WLAN/maximum	100 Mbit/s	100 Mbit/s	100 Mbit/s
Number of electrical connections			
for network components or terminals	2	1	2
for voltage supply	1	1	1
for redundant voltage supply	1	0	1
Design of the electrical connection for network components or terminals	RJ45 socket	RJ45 socket	RJ45 socket Fiber-optic LC
for voltage supply	3-pin screw terminal; PoE	3-pin screw terminal	2-pin connector (24 V DC) and optional power-supply adapter (4-pin 24 V DC or 3-pole 110-230 V AC)
Removable media type: C-PLUG	Yes	No	Yes
Removable media type: KEY-PLUG	Yes	No	Yes
Number of wireless cards, permanently installed	1	1	up to 2
Supply type, supply voltage 1	DC	DC	DC
from terminal block	19.2 V	19.2 V	19.2 V
Supply voltage 2 from terminal block	28.8 V	28.8 V	28.8 V
Power supply from Power over Ethernet in accordance with IEEE802.3at with Type 1 and IEEE802.3af	48 V	-	48 V
from optional integrated power supply with AC	-	-	100 ... 240 V
from optional integrated power supply with DC	-	-	12 ... 24 V
Current consumption with DC at 24 V, typical	0.25 A	0.15 A	0.45 A
Current consumption with AC at 230 V, typical	-	-	0.05 A
with Power over Ethernet in accordance with IEEE802.3at with Type 1 and IEEE802.3af, typical	0.125 A	-	0.22 A
Power loss [W] with DC at 24 V, typical	6 W	3.6 W	10.7 W
Power loss [W] with AC at 230 V, typical	-	-	10.7 W
with Power over Ethernet in accordance with IEEE802.3at with Type 1 and IEEE802.3af, typical	6 W	-	10.7 W
Permissible ambient temperature during operation	20 ... +60 °C	0 ... +55 °C	-40 ... +60 °C
Permissible ambient temperature during storage	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
Permissible ambient temperature during transport	-40 ... +85 °C	-40 ... +85 °C	-40 ... +85 °C
Relative humidity / at 25 ° C / without condensation / during operation / maximum	95%	95%	100%

System Components

Transceivers (cont.)

	Standard Application CXW734 and CXW774	Use in Control Cabinets CXW722 and CXW761	Outdoor Applications CXW786
IP protection class	IP30	IP20	IP65
Width	26 mm	50 mm	251 mm
Height	156 mm	114 mm	251 mm
Depth	127 mm	74 mm	72 mm
Net weight	0.52 kg	0.13 kg	2.24 kg
Mounting type	Profile-rail mounted/ wall mounted		An additional mounting plate is required for mast mounting, 35 mm, DIN-rail mounting S7-300 profile-rail mounting
Radio frequencies for WLAN in the 5-GHz frequency band	4.9 ... 5.8 GHz	4.9 ... 5.8 GHz	4.9 ... 5.8 GHz

Product characteristics, functions, components/general

product function/access-point mode	Yes (only CXW774)	Yes (only CXW761)	Yes
Product function/client mode	Yes	Yes (CXW722 and CXW761)	Yes
Number of SSIDs	4	-	up to 16
Dual client	No	No	No
iPCF client	Yes, only in combination with the KEY-PLUG W780 iFeatures or KEY-PLUG W740 iFeatures Not an iPCF-MC access point.	Yes (only W722)	Yes, only in combination with the KEY-PLUG W780 iFeatures or KEY-PLUG W740 iFeatures
iPCF-MC access point		No	
iPCF-MC client		Yes (only W722)	
Number of iPCF-capable wireless modules	1	1 (only W722)	up to 2

Standards, specifications and approvals

for FM	FM 3611: Class I, Division 2, Groups A,B,C,D, T4 / Class 1, Zone 2, Group IIC, T4	FM 3611: Class I, Division 2, Groups A,B,C,D, T4 / Class 1, Zone 2, Group IIC, T4	FM 3611: Class I, Division 2, Groups A,B,C,D, T4 / Class 1, Zone 2, Group IIC, T4
for safety/CSA and UL	UL 60950-1 CSA C22.2 No. 60950-1	UL 60950-1 CSA C22.2 No. 60950-1	UL 60950-1 CSA C22.2 No. 60950-1
Proof of suitability			
EC conformity declaration	Yes	Yes	Yes
CE mark	Yes	Yes	Yes
C-tick	Yes	Yes	Yes

System Components

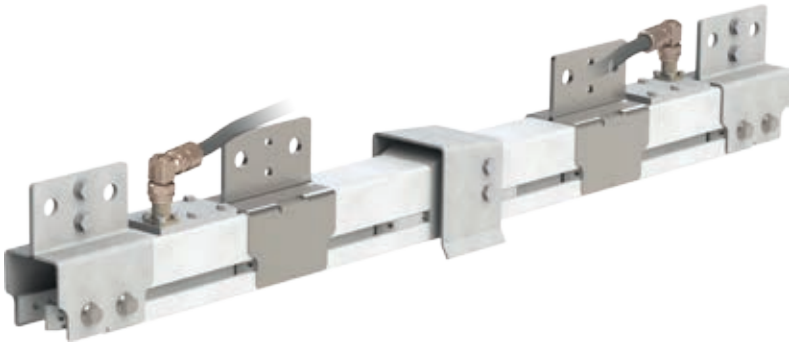
Hinge-Point Transition Element (for STS Cranes)

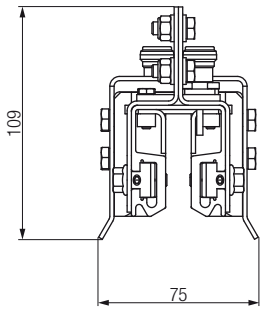
Part No.: 051413-01

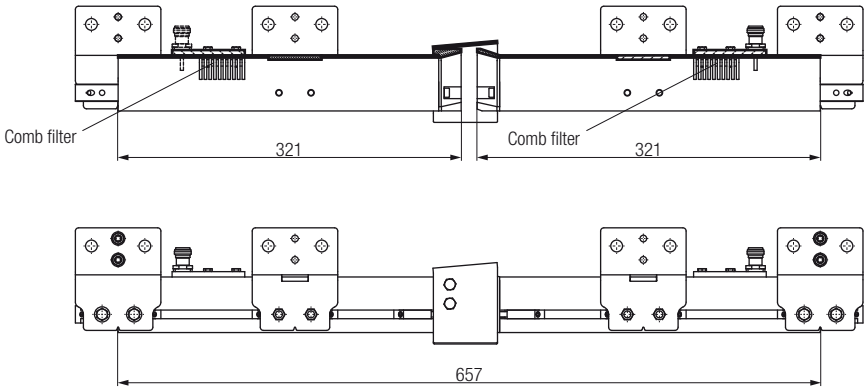
The hinge-point transition element secures the data connection between the folding and the fixed parts of the crane.
The hinge-point transition element is fastened to the support structure by screw at the two fixing points.

Including cable: Ecoflex® 10
- **Length:** 20 m
- **Diameter:** 10.2 mm
- **Impedance:** 50 Ω
- **Attenuation @ 1GHz/100 m:** 14.2 dB
- **Max. frequency:** 6 GHz

Includes 2 × angled connectors







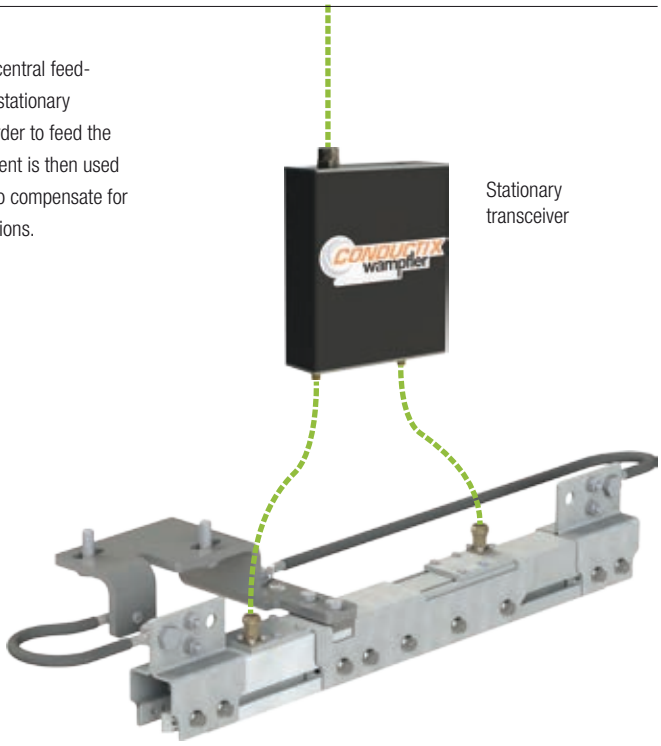
Central Signal Feed-In

Part No.: 051415-04

To extend the maximum system length from 250 m to 500 m in one segment, a central feed-in can be used instead of an end feed-in. In this case, the signal feed-in point or stationary transceiver (access point) is positioned in the middle of the traversing range. In order to feed the wireless signal from the transceiver into the ProfiDAT® profile, an expansion element is then used to feed the signal in. This means that the expansion element, which is designed to compensate for the temperature-dependent changes in the profile length, is performing two functions.

Including cable: Ecoflex® 10
- **Length:** 2 × 10 m
- **Diameter:** 10.2 mm
- **Impedance:** 50 Ω
- **Attenuation @ 5GHz/100 m:** 37 dB
- **Max. frequency:** 6 GHz

Material: Aluminum, stainless steel
For system lengths greater than 250 m

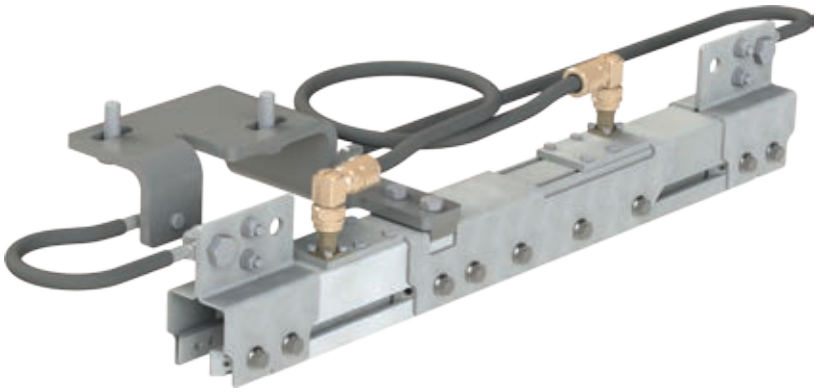


System Components

Expansion Element (for E-RTG Cranes)

Part No.: 051416-01

The aluminum expansion element connects two ProfiDAT® profiles together, compensating for changes in the length of profiles due to temperature fluctuations.



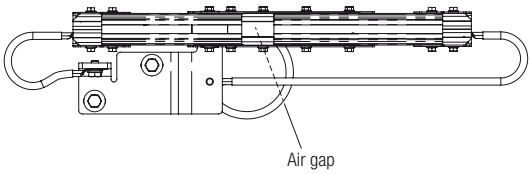
Including cable: Ecoflex® 10

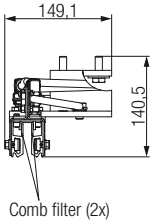
- **Cable length:** 500/502/165 mm
- **Diameter:** 10.2 mm
- **Impedance:** 50 Ω
- **Attenuation @ 5GHz/100 m:** 37 dB
- **Max. frequency:** 6 GHz

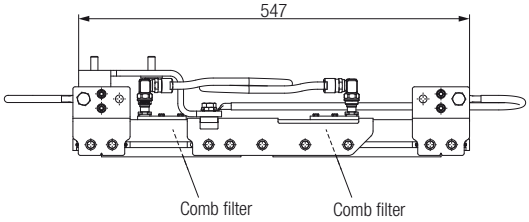
Expansion: 0–45 mm

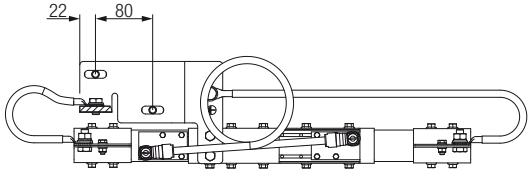
Includes 2 × angled connectors

Used for system lengths of 200 m or more



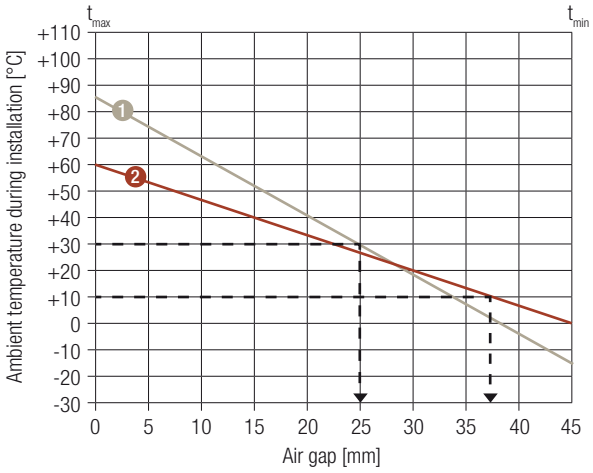






System Components
Calculating the Air Gap/Expansion Elements

Determining the Air Gap



Instructions:

t_{min} lowest temperature occurring in the given application

t_{max} highest possible temperature in the given application

1. Enter a tie line from t_{min} to t_{max}.
2. Enter a horizontal line at the ambient temperature during installation.
3. Drop a line down from the intersection of the two lines, and read off the air gap to be installed.

Examples:

1 Temperature range: -15 °C to +85 °C
Ambient temperature during installation: +30 °C
Air gap: 25 mm

2 Temperature range: 0 °C to +60 °C
Ambient temperature during installation: +10 °C
Air gap: 37 mm

Number of Expansion Elements for Systems over 200 m

For conductor rail systems longer than 200 m, expansion elements must be placed at certain intervals in accordance with Diagrams 1 & 2. Specific distances must be observed for special systems and when the fixed point is located at the end of the system. Please contact us if you have a query.

Number of Expansion Elements (open end)

Number of Expansion Elements		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Inter-mediate length [z]
		Total length of the conductor rail [m]																
Δt_{tot}	**10**	300	500															**189**
	20	295	389	484	500													**95**
	30	263	326	389	452	515												**63**
	40	247	295	342	389	436	484	531										**47**
	50	238	276	313	351	389	427	465	503									**38**
	60	232	263	295	326	358	389	421	452	484	515							**32**
	70	227	254	281	308	335	362	389	416	443	470	497	524					**27**
	80	224	247	271	295	318	342	365	389	413	436	460	484	507				**24**
	90	221	242	263	284	305	326	347	368	389	410	431	452	473	494	515		**21**
	100	219	238	257	276	295	313	332	351	370	389	408	427	446	465	484	500	**19**

Maximum length: 500 m

Max. expansion possible for expansion element: 45 mm

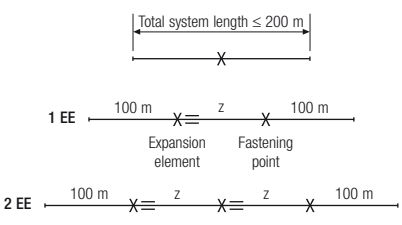
Expansion coefficient of aluminum: 0.0000238 1/K

Gap:

$$G = L \times \Delta t \times \alpha$$

$$L = \frac{G}{\Delta t \times \alpha}$$

Diagram 1 – Open ends:



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System Components
Calculation of Expansion Elements

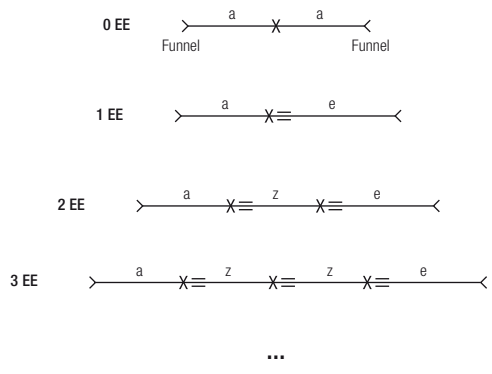
Number of Expansion Elements (limited end/funnel)

No. of expansion elements		0	1	2	3	4	5	6	7	8	9	10	Initial length, a	Intermediate length, z	End length, e
			Total length of the conductor rail [m]												
Δt_{tot}	10	189	195	295	395	495							95	100	100
	20	95	147	242	336	431	500						47	95	100
	30	63	126	189	252	315	378	441	500				32	63	95
	40	47	95	142	189	236	284	331	378	425	473	520	24	47	71
	50	38	76	113	151	189	227	265	303	340	378	416	19	38	57
	60	32	63	95	126	158	189	221	252	284	315	347	16	32	47
	70	27	54	81	108	135	162	189	216	243	270	297	14	27	41
	80	24	47	71	95	118	142	165	189	213	236	260	12	24	35
	90	21	42	63	84	105	126	147	168	189	210	231	11	21	32
	100	19	38	57	76	95	113	132	151	170	189	208	9	19	28

Number of expansion elements		11	12	13	14	15	16	17	18	19	20	Initial length, a	Intermediate length, z	End length, e
		Total length of the conductor rail [m]												
Δt_{tot}	10											95	100	100
	20											47	95	100
	30											32	63	95
	40											24	47	71
	50	454	492	500								19	38	57
	60	378	410	441	473	500						16	32	47
	70	324	351	378	405	432	459	486	500			14	27	41
	80	284	307	331	355	378	402	425	449	473	496	12	24	35
	90	252	273	294	315	336	357	378	399	420	441	11	21	32
	100	227	246	265	284	303	321	340	359	378	397	9	19	28

Maximum length: 500 m
Max. expansion possible for expansion element: 45 mm
Max. expansion possible for funnel: 22.5 mm
Expansion coefficient of aluminum: 0.0000238 1/K

Diagram 2 – Limited ends/funnels (minimum distance to limit = 50 m):



Note

- No heating by the current load as this is a ground conductor rail
- Total systems lengths greater than 500 m only after consultation

Description of Interfaces

Maximum length of the feed cable	10 m
Profile length	5000 mm
Outer dimensions of the profile (width × height)	48 mm × 56 mm
Distance between poles	80 mm
Power supply: ProfiDAT® transceiver	24 V DC
Maximum data transmission rate	100 Mbit/s
Maximum traversing speed of the mobile transceiver	300 m/min
Interface	100 Mbit/s, RJ45 or LC
Permissible rated current for the conductor-rail system (L, N)	1000 A
Maximum suspension interval for hanger clamps	2.5 m (for E-RTG: 3 m)

Electrical Interfaces

- **Data interface**
- **Power supply/control voltage**
- **Power feed to conductor rails**
- **PE**
- **PE connector cable at the hinge point**

Data interface:
ProfiDAT® 100 Mbit/s, RJ45 connection. At both ends of the ProfiDAT® system, customers must provide an RJ45 connector to connect the ProfiDAT® with their system.
- 1 × RJ45 socket
- TCP IP signal transmission (Ethernet protocol)
- PLC communication + safety-related control-signal communication
- Only data transmission of safety-related signals; additional safety equipment + controllers (PROFIsafe devices, etc.) are not included.
- Video/audio signals in digital Ethernet format
- Analog video signals converted into a digital format (by a multiplexer, for example)

PE interface:
The interface for the customer's grounding cable is located at the PE rail connector (Part No.: 051412-02). At the flap (M10 drilled hole), the PE cable must be connected according to the applicable standards.

Power supply / control voltage:
The controller of the ProfiDAT® data-transmission system requires the following power supply:
AC power supply for the feed-in control cabinet: 100–500 V, 50/60 Hz
DC control voltage for transceivers: 24 V

Mechanical Interface

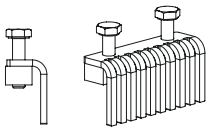
- **Current collector**

The current collector on the ProfiDAT® profile performs a dual function. Two divided carbon brushes guide the current collector in the ProfiDAT® profile.
The carbon brushes guarantee the connection to the ground cable (ProfiDAT® profile), while the two built-in antennas support the data transmission.
The antennas are inserted into the slot in the ProfiDAT® profile and are electrically isolated from the carbon brushes.

Description of Interfaces

Comb Filter

A Comb filter filters certain frequencies from signal groups.
This prevents the radio wave from escaping from the profile.
No interference with surrounding radio systems.



Central Feed-in

For system lengths greater than 250 m or when segmenting the data path, the signal is fed in over stretches or by central feed-in. To this end, the signal is fed through an expansion element, in which case the maximum system length of the data path is 250 m per side.

Ethernet

"Industrial Ethernet" is the generic term for all efforts to make the Ethernet standard usable for networking devices used in industrial production. The characteristics of pure Ethernet technology include the following points:

- Standardization according to IEEE 802.3
- Transmission over a twisted-pair or fiber-optic cable
- Connectors for copper wiring: RJ45 (see Figure on the right)
- Maximum cable length of 100 m for twisted-pair cables

Industrial Ethernet encompasses many different protocols, of which the well-known PROFINET is only one.

Transmittable protocol types:

Industrial Ethernet protocol Direct transmission	Indirect transmission
EtherNet/IP	ProfiBUS
PROFINET IO	
Modbus TCP	

Further protocols are possible after technical clarification.

PROFINET

PROFINET technology is used by Siemens and the ProfiBUS User Organization. It is the implementation of ProfiBUS for networking technology, bringing together the advantages of Ethernet and the successful fieldbus. It is used for applications where fast data communication is required in combination with industrial IT functions.

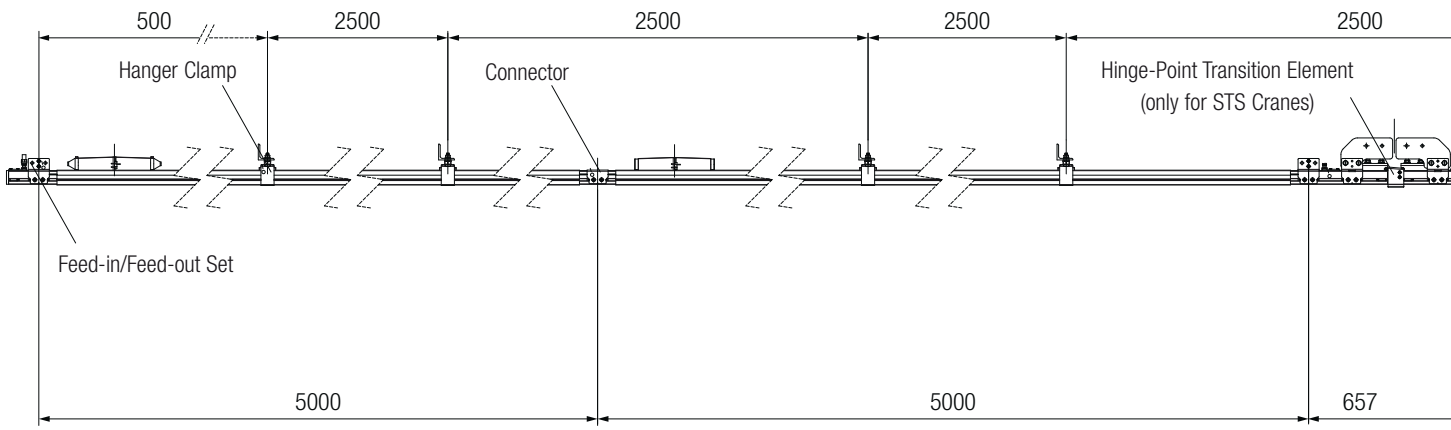
Performance classes:

- TCP/IP: Open communication via Ethernet TCP/IP without real-time requirements
- RT: Real-time communication for I/O data transfer in automation technology
  - Reaction times of up to 10 ms for time-critical applications
  - RT data has a higher priority than TCP/IP data
- IRT: Isochronous real-time communication specifically for motion-control applications
  - Reaction times < 1 ms for demanding time-critical applications, such as the control of drive axles
  - IRT telegrams have their own time range in PROFINET communication, so there is no interference from standard communication
  - Special hardware required

The specified connectors are the RJ45 connector for data and the M12 connector for electrical transmission over copper wires, and the LC connector for optical transmission via optical fibers.

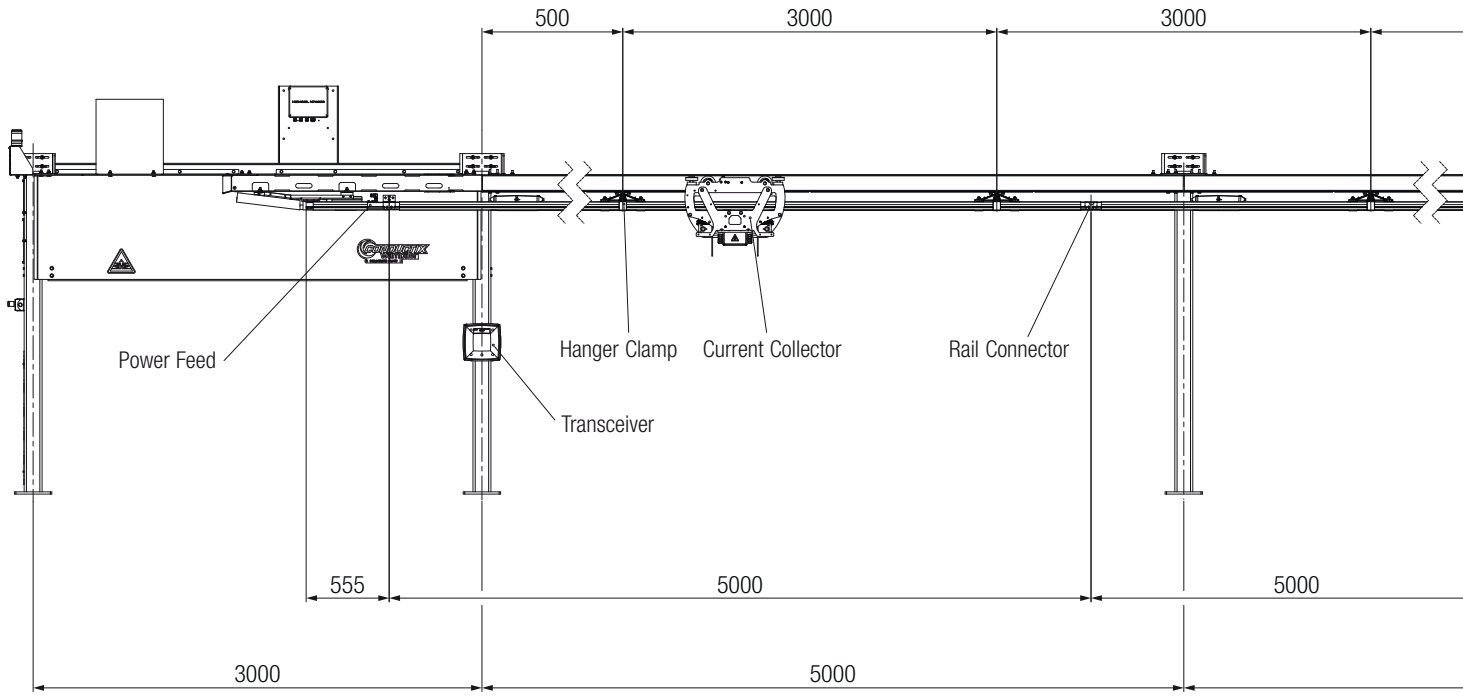
- ProfiSAFE defines safety-related automation tasks up to SIL3 (Safety Integrity Level 3). It provides secure communication through a profile, i.e., via a special user-data format and a special protocol. PROFIsafe is specified in the IEC 61784-3 standard for PROFIBUS and PROFINET.

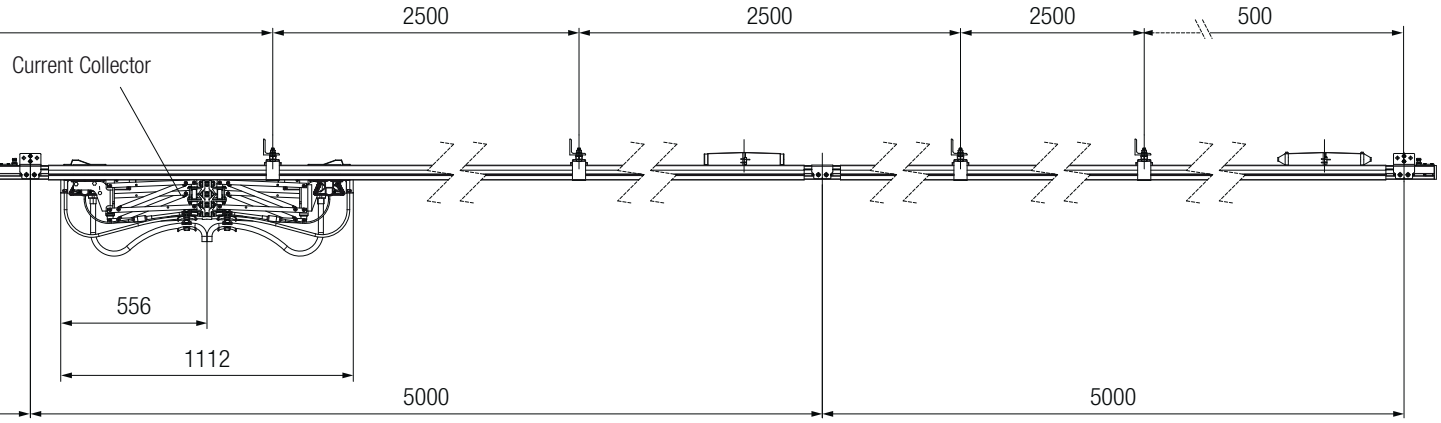
System Layout EOT/STS Crane

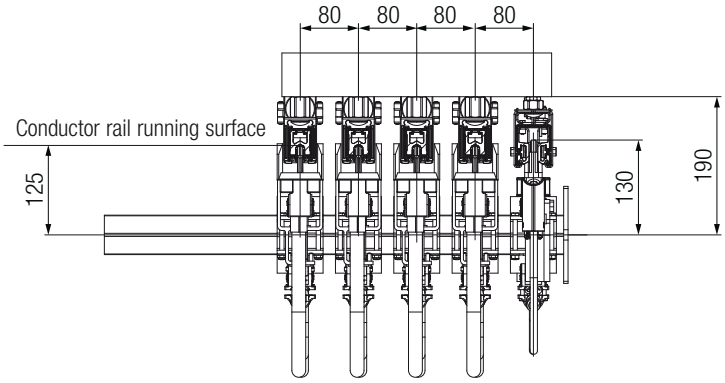


Current Collector
Front view

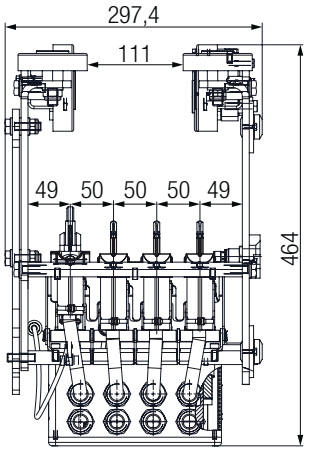
System Layout E-RTG Crane

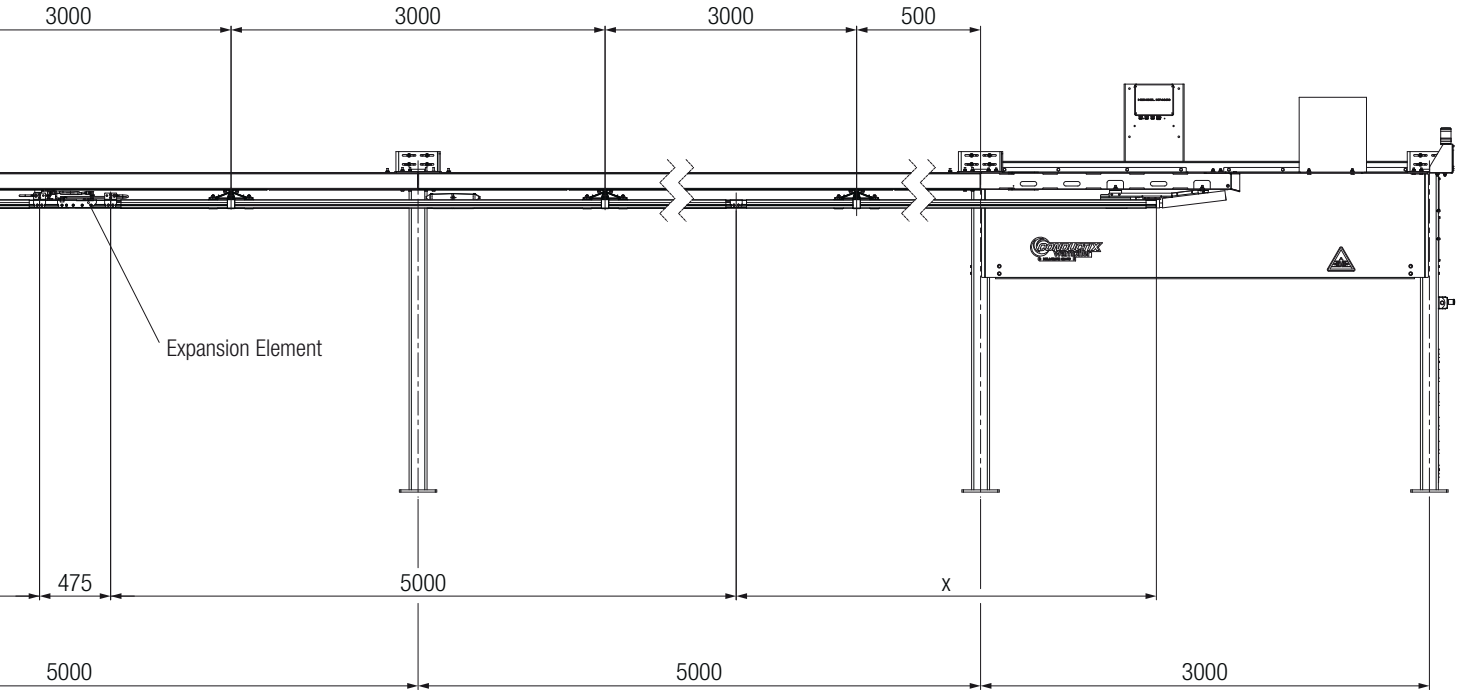






Current-Collecting Trolley
Front view





Example of the System Composition

Sample Order – Required Information for the Quotation

Application:	Data-transmission system for an automatic gantry crane
System length:	150 m
Number of systems:	1
Number of vehicles/systems:	1
Arrangement:	Horizontal (opening facing down [required!])
Number of pins:	1 × data transmission including PE (replaces PE in the 0813 energy system)
Voltage:	400 V / 50 Hz
Feed:	End Feed-in
Traversing speed:	Approx. 60 m/min
Existing PLC system:	SIEMENS S7-400
Protocol:	Ethernet (TCP/IP; layer 2)
Bus system:	PROFINET® & PROFIsafe
Interface:	RJ45
Safety PLC integrated:	Yes (on site)
Data to be transferred:	Control-signal data (yes) Safety-signal data (emergency stop, etc.) Video signals; digital signals (Analog signals are to be converted into the digital Ethernet format) Audio signals (telephone, video, etc.)
Environmental conditions:	Metal dust (scrap-metal shredder on adjacent site); proximity to water (German inland port); grain dust
Ambient temperatures:	Approx. -20 °C to approx. 45 °C
Energy supply:	Yes, already installed (0813 series – 500 A – 150 m – 4-pin; 3 × PH+PE)
Fastening:	Suggestion: fasten to structure already installed on site. Support interval: max. 2500 mm
Max. traversing speed:	5 m/s (300 m/min; 18 km/h) for ProfiDAT®
Cable length:	10 m transceiver to antenna; 10 m antenna cable

Part No.:	Quantity	Description	Comment
051411-3512	30	ProfiDAT® conductor rail, PVC PE 5 m	–
051414-03	62	ProfiDAT® hanger clamps	Oversupply of two items
051412-01	15	ProfiDAT® connector	The feed-in/feed-out set includes connectors (2 pcs), take into account the number of PE connectors
051412-02	13	ProfiDAT® PE connector	Used every 25 meters
051415-01	1	Feed-in/feed-out set 0514	Use of end feed-in
051410-1011	1	ProfiDAT® S collector	Since there is 1 consumer/traversing range without interruption
–	1	Transceiver access point, standard set	Can be selected/customized to customer's requirements
–	1	Transceiver client, standard set	Can be selected/customized to customer's needs requirements
–	1	Spare parts kit	–
–	1	Commissioning	–

Other Products from Conductix-Wampfler

The products described in the this catalog represent a few of the products from the broad spectrum of Conductix-Wampfler components and systems for the transfer of energy, data, gases, and fluids. The solutions we deliver for your applications are based on your specific requirements. In many cases, a combination of several different Conductix-Wampfler products are needed to fill the application. You can count on all of Conductix-Wampfler's business units for hands-on engineering support - coupled with the perfect solution to meet your energy management and control needs.

Motor driven cable reels

Motor driven reels by Conductix-Wampfler are the perfect solution for managing long lengths of heavy cable and hoses in very demanding industrial applications. Monospiral, level wind, and random wind spools.

Slip ring assemblies

Whenever powered machinery needs to rotate 360^0, field proven slip ring assemblies by Conductix-Wampfler can flawlessly transfer energy and data. Here, everything revolves around flexibility and reliability.

Conductor bar

Whether they are enclosed conductor rails, expandable single-pole bar systems, or high amperage bar for demanding steel mill use up to 6000 amps. Conductix-Wampfler's conductor bar is the proven solution to reliably move people and material.

Spring driven cable reels

We have 60 years experience and trusted brands such as Insul-8, Wampfler, and IER. We offer small cord reels all the way to large multi-motor units, a wide range of accessories, and hazardous location reels.

Cable Festoon systems

It's hard to imagine Conductix-Wampfler cable trolleys not being used in virtually every industrial application. They are reliable and robust and available in an enormous variety of sizes and models.

Push Button Pendants

Our ergonomic pendants are ideally suited for industrial control applications. They are available in a wide range of configurations for overhead cranes and other machinery.

Radio remote controls

Safe, secure, and reliable radios use the latest in microprocessor technology. Available in several models for overhead crane control and other types of machinery.

Inductive Power Transfer IPT®

The contact-less system for transferring energy and data. For all tasks that depend on high speeds and absolute resistance to wear.

Energy guiding chains

The "Jack of all Trades" when it comes to managing energy and data cables and air and fluid hoses. A wide range of energy guiding chains are available for many industrial applications.

Air hoists and balancers

ENDO Air hoists accurately place delicate loads and continuously vary the speed for precise positioning. They run cool in continuous operations.

Bumpers

Conductix-Wampfler offers a complete range of bumpers for the auto industry, cranes, and heavy machinery. These include rubber, rubber/metal, and cellular types.

Spring balancers and retractors

ENDO spring balancers by Conductix-Wampfler are rugged, reliable high-precision positioning devices that reduce operator fatigue and assist with accurate tool placement.

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