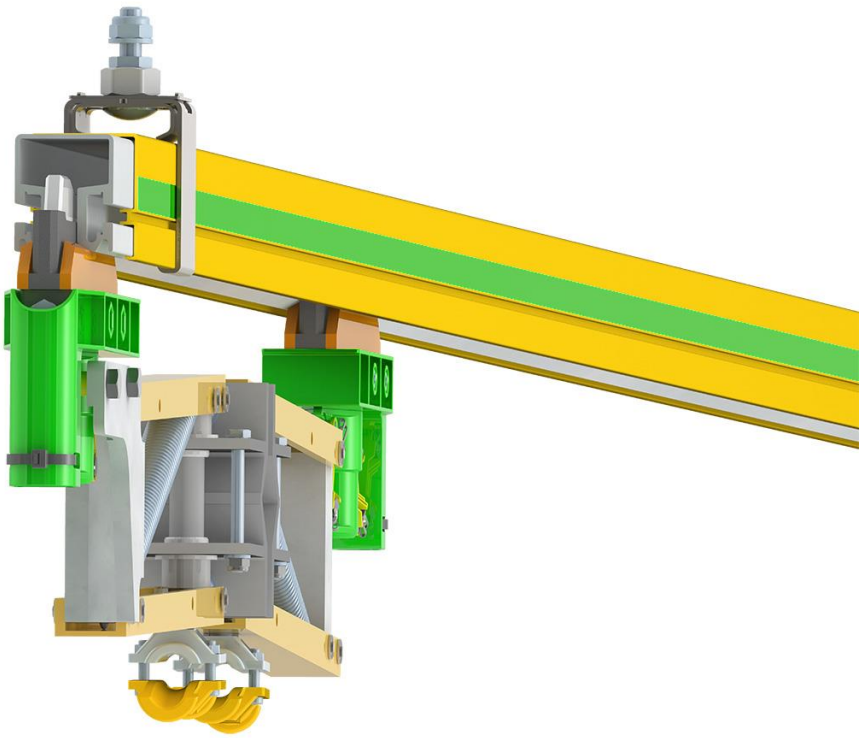
Technical Data Sheet

ProfiDAT® Data Transmission System

TDB0514-0002-EN



Fields of Application

ProfiDAT® is a system for data communication between fixed and mobile consumers on crane systems or mobile machinery. The installation is made in parallel to the electrification system. The existing grounding conductor rail can be replaced without need for more space and without additional attachment parts, since the ProfiDAT®-System combines a grounding conductor rail (PE) and a data transmission channel (slotted hollow conductor).

- STS-cranes (Ship-to-Shore)
- RMG (rail mounted gantry) cranes/RTG (rubber tired gantry)
- Process cranes
- High storage systems and people mover

Your benefit:

- Safe and reliable radio transmission method by slotted hollow conductor technology
- Real-time data transmission due to prioritization of PROFINET data packages
- PROFIsafe-compatible
- Realization of expansion and separating joints is possible
- Cost saving and installation space reduction due to double use of the ProfiDAT®-profile for data transmission and grounding (PE conductor rail)
- Compact construction and full integration in conductor rail systems
- Supports various protocol types
- Utilization also possible on rough ambient conditions (harbor)

Contents

1 Description, Construction and Functionality

1.1 Construction

The data transmission system ProfiDAT® is a system which allows the communication between the base station and the mobile equipment. The ProfiDAT® system is installed in parallel to the electrification system.

The data transmission system consists of at least a fixed and a mobile transceiver, a feed-in antenna and a pick-up antenna. Due to the mobile pick-up antenna data can be received and sent continuously. The antenna of the data transmission is an integral part of the collector head in the profile. Besides for data transmission the ProfiDAT® profile can be used as grounding conductor rail (PE) as well. By means of the hanger clamps the profiles are attached to the customer-specific steel or support structure. The profiles are mechanically connected by means of connectors, which ensure stability and a safe connection of the profiles.

The data transmission system ProfiDAT® can be combined with a variety of Conductix-Wampfler conductor rail programs. Entries into conductor rail systems and passages within the profiles can be easily realized by special components (entrance funnel, expansion unit, transition element). The system can be expanded and modified in length by segmentation.

The contactless radio system for data transmission allows to transmit data (video, audio and control data) with very high data rates (real-time data) reliably via a slotted hollow conductor (ProfiDAT® profile). Due to a special design of the conductor profile and the mobile antenna the date will be safely transmitted within a screened system, even in most difficult radio environments (i.e. harbor surroundings). The coexistence of other radio-based systems does not have any influence onto the ProfiDAT® system and can therefore be neglected.

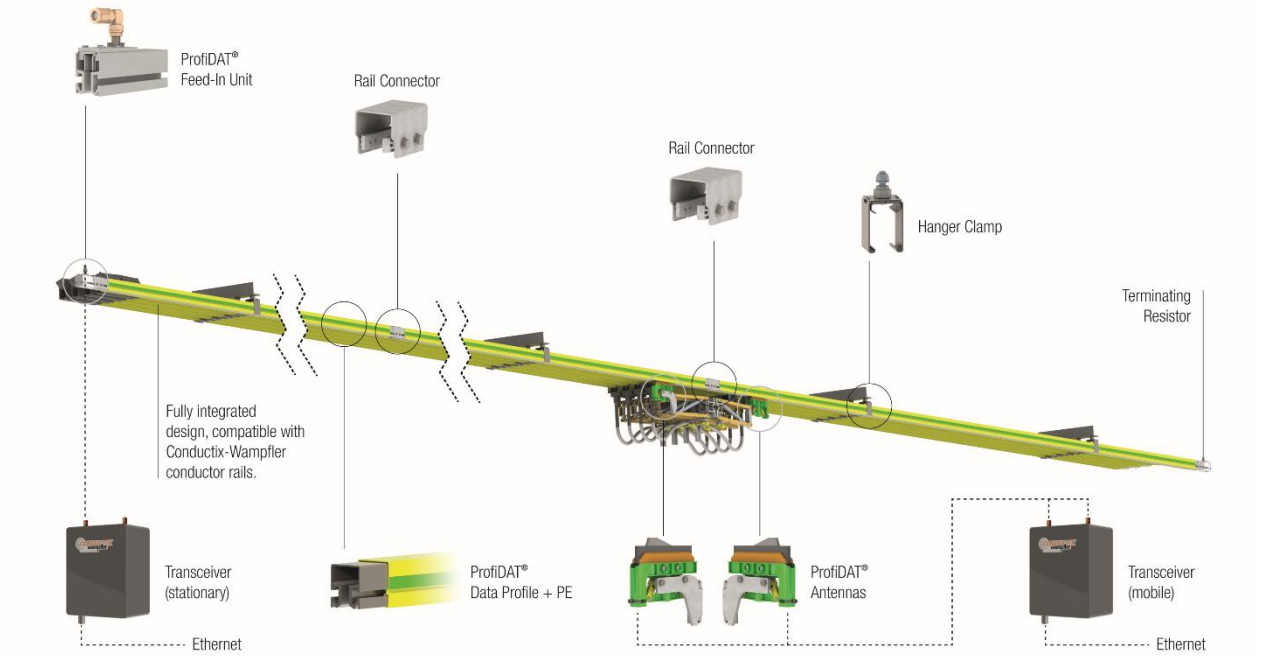


Fig. 1: System overview

1.2 Operating Mode

A radio wave is coupled into the slotted hollow conductor (ProfiDAT®profile, **Fehler! Verweisquelle konnte nicht gefunden werden.**), which moves through the profle orthogonally to the stationary antenna. A coupling element (mobile antenna), that immersed into the hollow conductor via the elongated slot of the profile, can be moved along the profile. The date transmission takes place in real time by prioritizing PROFINET data packages. Data rates of up to 100 Mbit/s with average latency periods of 3 ms can be transmitted safely and reliably. Due to the dimensioning of the slotted hollow conductor, the radio wave can be uncoupled from electromagnetic waves. This excludes any kind of interference.

The collector head (**Fehler! Verweisquelle konnte nicht gefunden werden.**) in the ProfiDAT® profile fulfills a double function. The current collector is guided at the ProfiDAT® profile via two divided collector brushes. The collector brushes ensure the electrical connection to the grounding conductor rail (ProfiDAT® profile), while the data transmission is realized via the installed antenna. The antenna immerses into the elongated slot in the profile and is electrically isolated against the collector brushes.

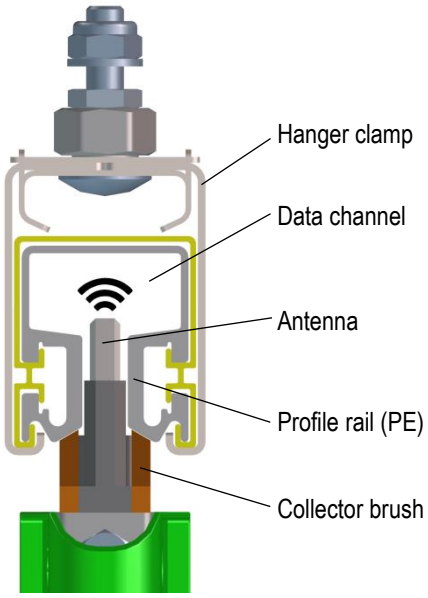


Fig. 2: View slotted hollow conductor

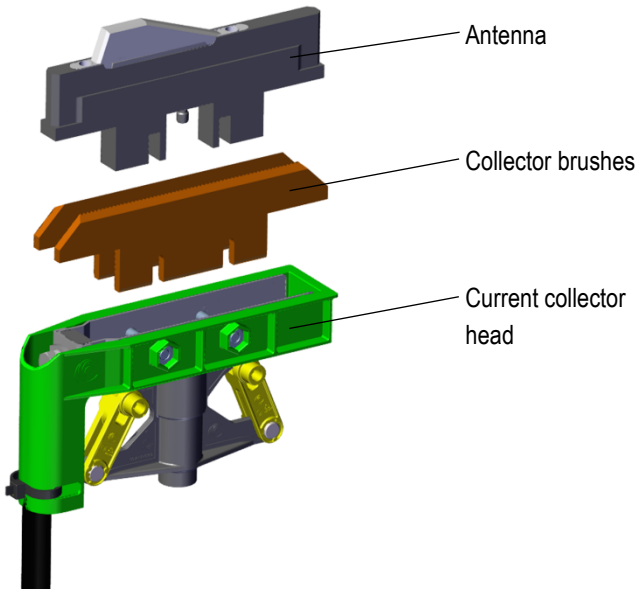


Fig. 3: Antenna in the current collector head

1.3 Function of the Transceiver

The transceiver is a PROFINET (PROFIsafe) compatible communication device that is based on the IEEE 802.11n standard. The communication with PROFINET-IO is made via a layer 2 tunneling protocol (L2TP). The transceiver is an interface from the Ethernet connection to the radio data transmission in the ProfiDAT® profile. Moreover the ProfiDAT® transceiver coordinated the communication between devices that are configured as access point and client.

There are at least two transceivers installed in a system, a stationary transceiver for the feed of the signals and a mobile transceiver for each mobile participant.

2 Technical Data and Interfaces

2.1 Technical Data

ProfiDAT®	Value, unit
System length (without segmentation)	500 m*
Profile length	5000 mm
Dimensions profile outside (width x height)	50 x 56mm
Voltage supply: ProfiDAT®-Transceiver	24 VDC**
Maximum data transmission rate	100 Mbit/s
Maximum travel speed of the mobile transceiver (current collector)	5 m/s***
Interface	Ethernet (as a standard RJ45)
Lifetime system (except wear parts and electrical components)	10 years

* expandable by segmentation (roaming)

** deviations possible

*** after technical clarification also for higher speeds

Transceiver	Value, unit
Ethernet	1 x 100 Mbit/s RJ45*
Supply voltage	24 VDC*
Data rate	up to 100 Mbit/s
Operating frequency	4,9 – 5,8 GHz**

* deviations possible

** country-specific deviations possible

For further technical details see our product catalog „ProfiDAT® Data Transmission System - Program 0514“.

On commissioning of the transceiver devices, please observe that the cycle periods for the ProfiDAT® communication distances must be adapted.

The cycle period must be at least 32 ms (but can differ depending on the application) and must be adjusted accordingly in the superior control assembly group.

2.2 Interfaces

The data transmission system ProfiDAT® is integrated into the customer's system via several interfaces.

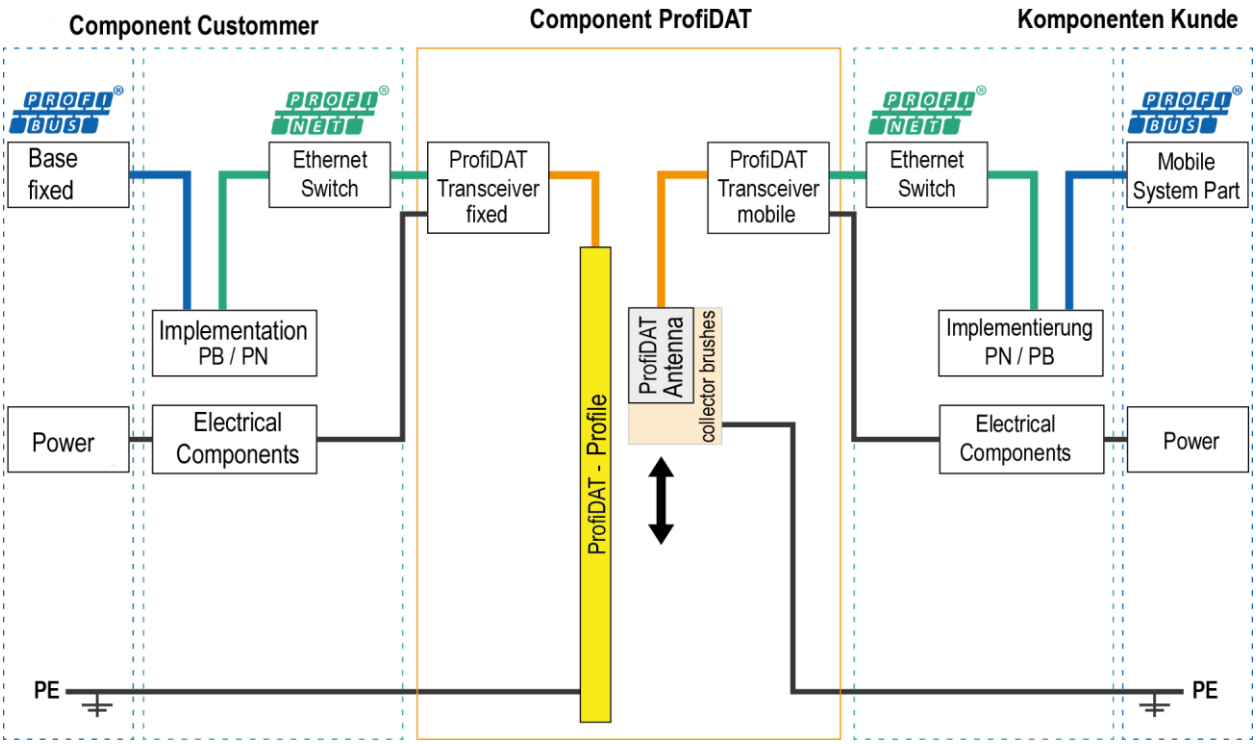


Fig. 4: Several interfaces

Data Interfaces

The data interfaces are located in the transceivers and are connected with the customer's systems via Ethernet (Profinet). The transceiver is connected with the Ethernet Switch via a RJ45-plug or optionally LC (LWL). If Ethernet is not available, the data signal must be converted by means of appropriate components.

The implementation is realized via:

- DP/DP coupler
- Profinet/Profibus converter
- PLC (Packet Loss Concealment)
- Fail Safe CPU/IOs (for emergency stop)
- Video (over IP)
- Audio (VOIP)

Electrical Interface

The ProfiDAT® profile must be connected with the PE of the customer's equipment by a PE cable. The PE interface is installed at the profile (connector PE) and at the current collector. The earthing connection of the mobile system part with the profile is achieved by their collector brushes.

The current supply of the transceiver must also be achieved via the customer's supply system.

2.2.1 ProfiBUS – ProfiNET – Coupler (optional)

There is an option to execute the Profibus connection (DP/DP coupler) via specifically developed transmission components. In this case the customer's ProfiBUS protocol is transmitted with transparency and is therefore directly transferable for the ProfiDAT® standard transceiver.

For this purpose a ProfiBUS Master Module is directly connected to a Transceiver Access Point Module and on the opposite side a ProfiBUS Slave Module is connected to a Client-Transceiver.

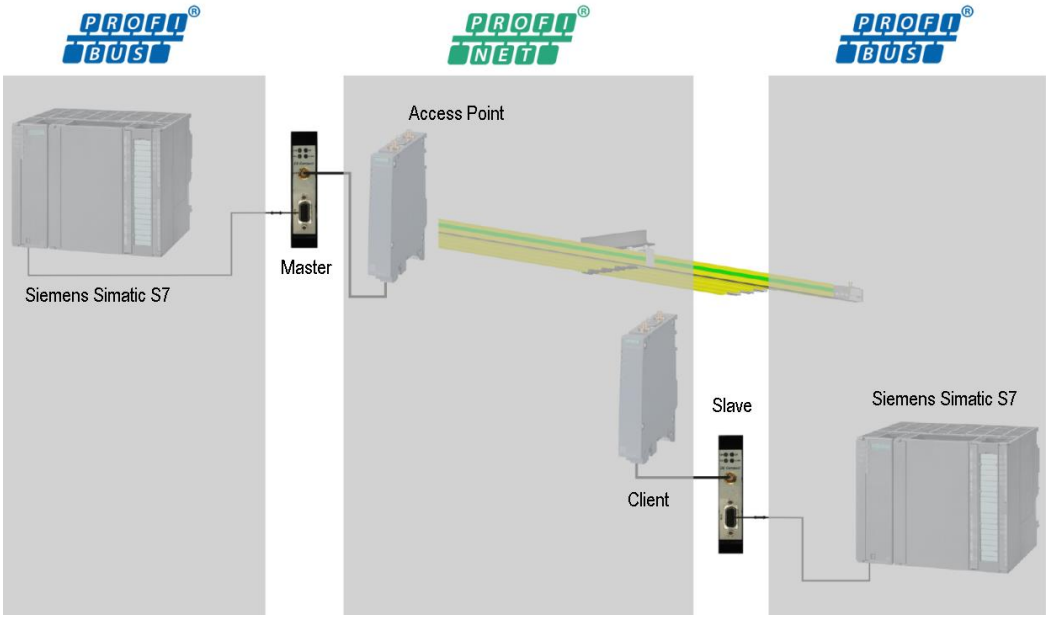


Fig. 5: ProfiBUS – ProfiNET – Coupler

The installation is simple:

1. **Install Coupler on a Cap Rail**
   Install the factory-made configured coupler on a cap rail in the switch cabinet.
   Connect the coupler to a Profibus plug and a voltage supply.

2. **Connect the Coupler with the Transceiver**
   Connect the coupler with the transceiver via an industrial Ethernet Cable (RJ45-plug).
   The coupler can be put into operation immediately.

3. **Connect Profibus Cable**
   Connect the Profibus cable to the D-SUB of the coupler.
   Use a Profibus plug with integrated bus terminating.

4. **Connect Power Supply**
   Connect the power supply according to Fig. 6. The 24 V supply of the control cabinet can be used.
   Connect the PE cable to the coupler

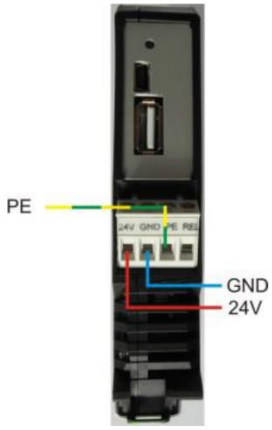


Fig. 6: Connect Power Supply

3 Operating Conditions

3.1 Installation Details

- The slotted hollow conductor profile must not be used as energy pole (phase).
- Exclusively appropriate for horizontal applications and with intervention opening to the bottom
  (After previous technical inspection and approval by the manufacturer, lateral intervention can be implemented as well.)
- Only suitable for straight track layout
  (After previous technical inspection and approval by the manufacturer, curved tracks can be implemented as well.)
- Maximum permissible travel speed of the mobile transceiver 5 m/s.
  (After previous technical inspection and approval by the manufacturer, curved tracks can be implemented as well.)
- Not suitable for explosive zones (ex-zones).
- The length of the connecting cable of the HF-cables is max. 10 m on the pickup and feeding side.

3.2 Ambient Conditions

Data	Value		
	Minimum	Maximum	Conditions
Ambient temperature (in operation)	-25	+50 °C	with relative humidity [100 % at +20 °C]
Storage temperature	+15 °C	+35 °C	with relative humidity [60 % at +20 °C]
Wind speed in operation		25 m/s (10 Bft)	
Wind speed at standstill		32,7 m/s (12 Bft)	
Irradiance (with direct solar irradiation)		1120 W/m²	

3.3 Grounding

The date transmission system ProfiDAT® must be integrated into the plant's grounding system. The plant operator must ensure sufficient grounding of the steel or support construction. Various applications, such as network configuration (TT, TN) lightning protection and protection against electric shock must be considered.
Grounding must always be according to the national safety regulations and directives for grounding of electric installations.

General Hints for Grounding

- Connect the slotted hollow conductor profile at the beginning and at the end and also at each 5. profile joint to the steel/support construction
- Cross section of the connecting cable: Min. 16 mm²
- Locally applicable standards and regulations for grounding resistances must be observed

3.4 Profile Heating (optional)

The data transmission system ProfiDAT® is appropriate for application in rough environment. Condensate, hoarfrost or ice might however cause insulation faults and oxidation of the rail that will increase the wear on the collector brushes. A profile heating prevents the formation of weather-related deposits. The profile heating consists of heating conductor, the wiring components and the temperature-related feed. The required heating power depends on a number of parameters. It has to be observed that it depends on the assembly situation of the profile and its environment, if ice will be formed on a profile or not.

A heating conductor is inserted in the slotted hollow conductor, which as a power loop is supplied with external auxiliary power. The heating conductor is a resistance heating wire used in various nominal sizes. It is inserted into the hollow space between profile rail and profile insulation (**Fehler! Verweisquelle konnte nicht gefunden werden.**).

The control unit of the profile heating is equipped with a temperature and dew point sensor (**Fehler! Verweisquelle konnte nicht gefunden werden.**). If the temperature falls below a certain value and reaches the dew point, the profile heating will be switched on.

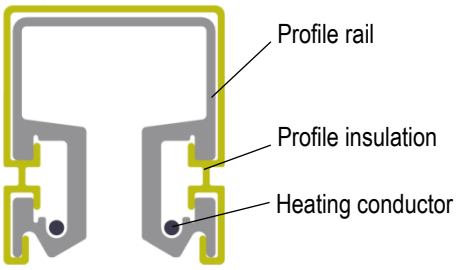


Fig. 7: View heating conductor

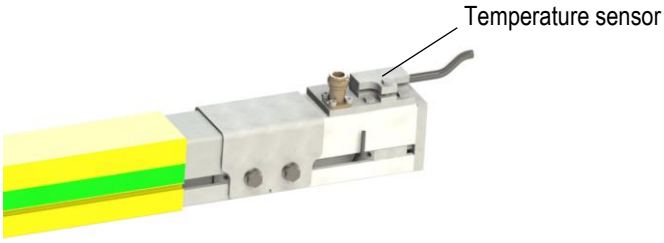


Fig. 8: Temperature at the profile

3.5 Maintenance

The ProfiDAT® system require little maintenance. Only the collector brushes of the current collectors require regular inspections (min. every 4 weeks).

- Components must be cleaned depending on their degree of contamination.
- Conductor brushes must be checked for wear and damage at regular intervals and must be replaced if required.

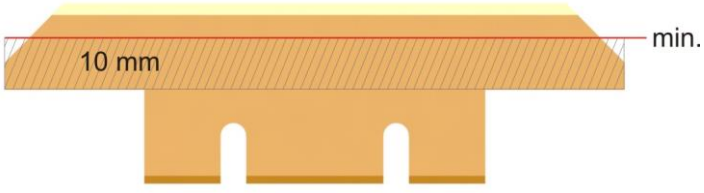


Fig. 9: Wear Limits for Conductor Brushes

3.5.1 Replacement of the Conductor Brushes at the Current Collector

After having reached the wear limit (see **Fehler! Verweisquelle konnte nicht gefunden werden.**) the collector brushes must be replaced, since a proper contact with the profile is no longer guaranteed. This can result in an interruption of the PE-connection (grounding), i.e. in case of short-circuit the system is not grounded.

The replacement of the collector brushes can be performed quickly and with just a few steps:

1. Pull current collector head down and out of the profile.

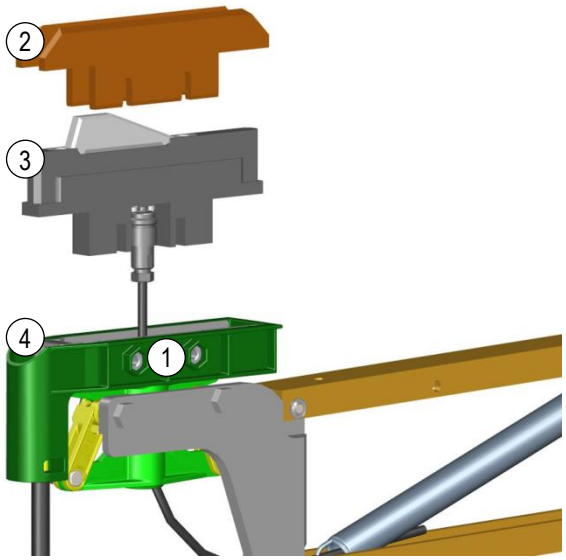


Fig. 10: Replacement of the Conductor Brushes

2. In case of socket head screws (1) detach them with an Allen wrench SW5 (do not unscrew them!).
3. Pull both collector brushes (2) and the antenna (3) upward to remove. The cable at the antenna must not be dismounted.
4. Clean current collector head (4) with a clean cloth.
5. Insert two new collector brushes (2) from above into the current collector head.
6. Insert the antenna (3) from above between the collector brushes and tighten both hexagon socket screws (1).
7. Replace the current collector head into the profile from the bottom.

4 Product Labeling

The data transmission system, including all associated components has been constructed in accordance with the latest state in technology, tested adequately and has left the factory in perfect condition.
The data transmission system complies with the applicable standards and prescriptions as listed in the EC Declaration of Conformity. It thus fulfills the legal requirement and EC directives.

The Declaration of Conformity for this product can be obtained on request from Conductix-Wampfler.

5 Additional Product Documents

5.1 Complementary documents

- ProfiDAT® data transmission system program 0514
  MAL0514-0005-DE
- Operating instructions Industrial Wireless LAN SCALANCE W760/W720
  C79000-G8900-C322-03
- Operating instructions Industrial Wireless LAN SCALANCE W770/W730
  C79000-G8900-C325-04
- Operating instructions Industrial Wireless LAN SCALANCE W786-x
  A5E03678337-09
- Mounting and commissioning instructions radio data system DATAEAGLE® 3XXX Compact

5.2 Certificates

- Declaration of conformity

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