COMPANY MAIN TOPIC [PRODUCT]

TracFeed® SCM

English

Stray Current Monitoring

GENERAL INFORMATION

DC Traction system negative return is the running rail and is connected to the negative side of the diode rectifier at the TPSS. Rail vehicle load variation during acceleration and deceleration will cause a current flow along the rail track which in turn will cause a potential difference between rail and the Ground. Rail track resistance can be minimized but not eliminated. This will cause a current leakage from the rail to the Ground. This current, which is referred to as Stray Current will flow back to the rail via underground utility metallic conduits.

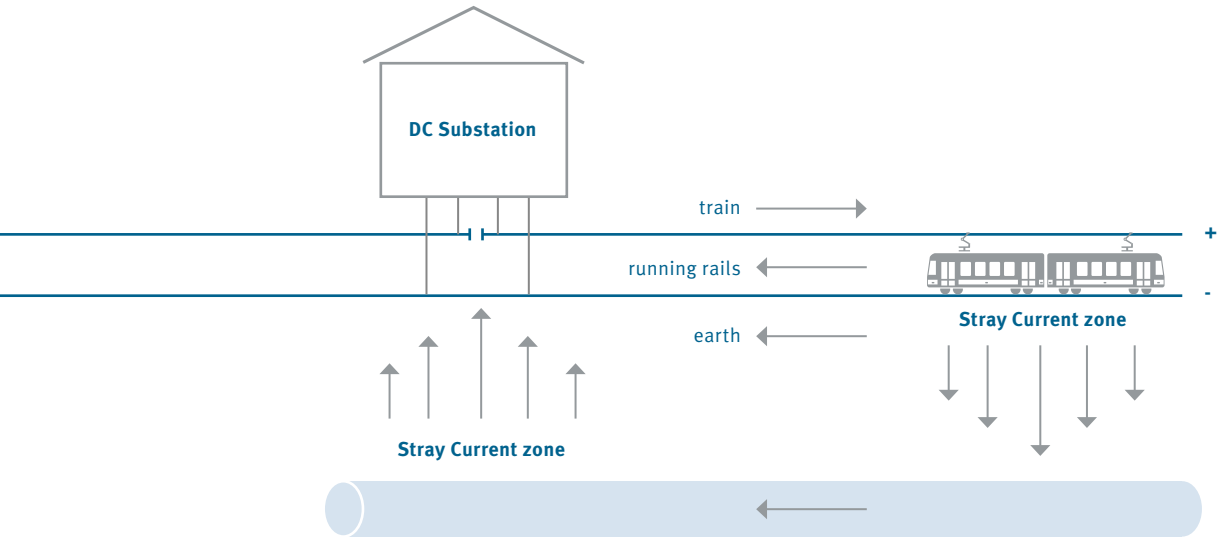
For the DC rail systems, DC Stray Current will exist but needs to be managed. Stray current will vary depending on Traction Load and infrastructure condition such as Track Bonding and rail insulation. Stray Current must be considered at the design level and has to become part of the infrastructure maintenance routine. Stray current control measuring and monitoring equipment shall be installed to the traction power and track work systems to obtain minimal flow of DC stray current into the surrounding environment. Protection measures shall be applied to assure that stray earth currents are maintained within acceptable ranges to avoid deterioration of buried utilities such as bridge metallic structures, underground water and Gas pipelines as well as electrical conduits. Stray current monitoring is to ensure that the permissible levels are not exceeded.

Design life cycle of Rail infrastructure such as Light Rail, Subway and Regional transit systems can be drastically optimized by avoiding premature failure caused by stray current and corrosion which in turn will minimize annual operating and maintenance cost associated by material deterioration.

Standards

RPS product development process is in compliance with EN50126 to ensure Quality and Safety. RPS DCP3/DCP3L-VLD controller controlling SCM is in compliance with EN50126. Design of DC Rail infrastructure TPSS complies with EN50163 “Supply Voltage for Traction System” defines the designated line nominal voltages.

The standards EN 50162 and EN 50122-2, set out the principles of passive and active protection of steel reinforcements along rail structures (Bridge and Tracks). Both are part of rail infrastructure design against corrosion caused by the effects of stray currents. RPS Stray Current devices (SCM) pick up sensors are compliant with the railway standards and for protective provision according to EN 50122-1 standard. SCM concept complies with EN 50122-2 Railway Applications - Fixed Installations Electrical safety, Grounding and bonding- part 2; provisions against the effects of stray currents caused by DC traction systems



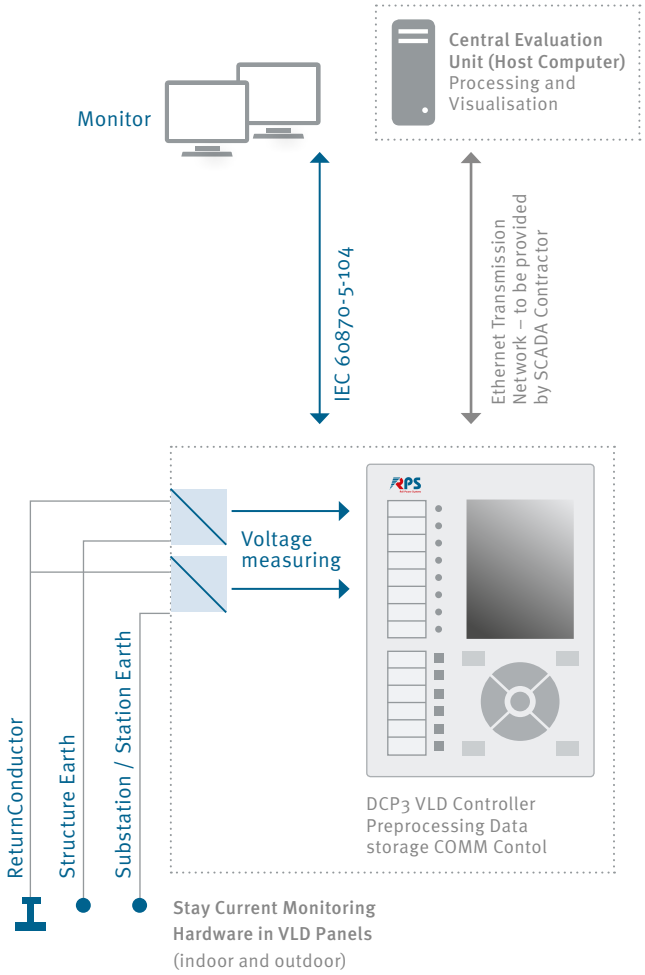
OPERATION

Stray Current Monitoring (SCM) as a System

RPS Voltage Limiting Device (VLD) pick up sensors will be installed during rail infrastructure construction work. The number of RPS VLD sensors is specific to the project requirements.

Track voltage variation data is transferred to the DCP3/ DCP3L-VLD main control unit installed either in the TPSS or Passenger Station. Data transmission from each DCP3/ DCP3L-VLD location to the Central Evaluation PC can be done using either network communication protocol such as Ethernet and IEC 60870-5-104. Stray current values to setup the reference points will vary depending on Traction Load. The behavior of stray current is monitored during infrastructure integration phase simulating everyday rail vehicle operation. This will create reference points measuring stray currents; upper, middle and lower reference points. These points are also referred to as stray current upper and lower limits. These reference points are part of the stray current monitoring system and based on the alignment information.

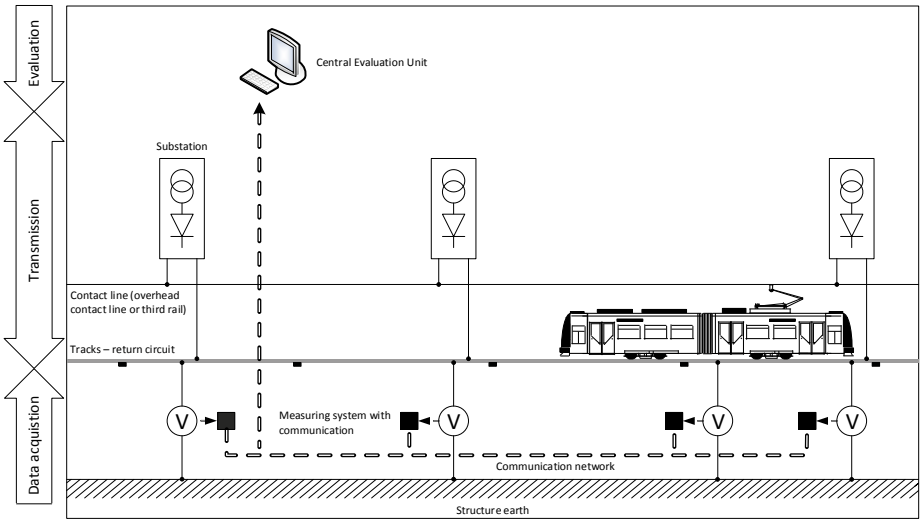
Data collected from the alignment contains; duration, average values and average period of operation. Data collection duration are determined by the project design specifications and agreement between RPS and stakeholder's Grounding and Bonding engineer.



Processing by the Central Evaluation Unit

Transmission of data from each measuring location to the Central Evaluation Unit

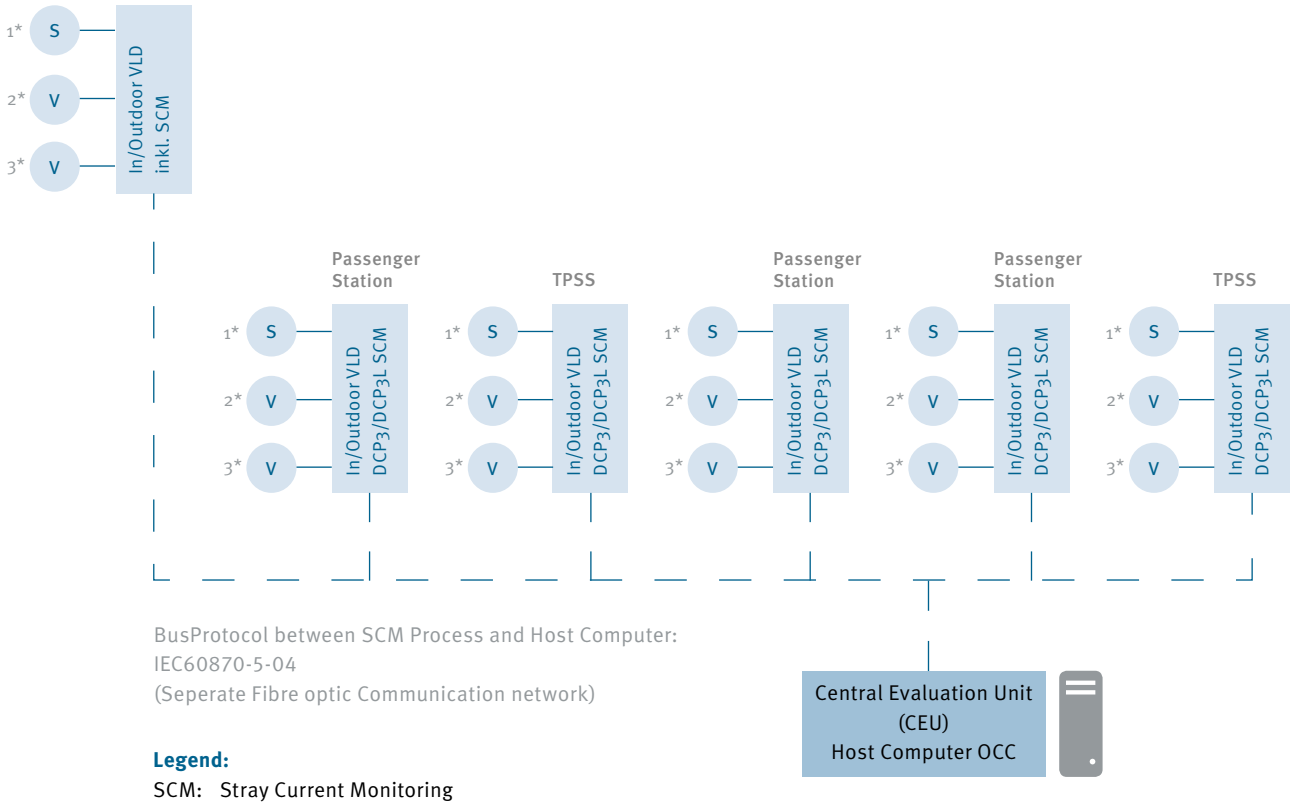
Local acquisition and preprocessing of rail voltages



DATA COLLECTION AND EVALUATION:

Potential difference from Rail to Ground are picked up by SCM VLD pick up sensors. SCM sensor readings are transferred to the RPS DCP3/DCP3L-VLD controller using current signals as defined during the design phase. Signal received by the DCP3/DCP3L-VLD controller will be stored, analyzed, and communicated with PC based Central Evaluation Unit (CEU) located either at TPSS or Operation Control Center (OCC). The CEU will manage and display the overall SCM system configuration and events using graphical representations generating alarms and warning messages. Depending on the project specification, a standalone DCP3/DCP3L controller can be installed and used anywhere along the rail alignment to control and collect rail to ground voltage data.

Below represents the local data acquisition and pre-processing of rail voltages by local DCP3/DCP3L-VLD units and transmission to CEU located in OCC for analyze and evaluation. The CEU will initiate a process for each measuring location by recording track to earth voltages over a certain time periods under normal operating condition. This could be few days.



Legend:

SCM: Stray Current Monitoring
VLD: Voltage Limiting Device
OCC: Operaion Control Centre
TSS: Traction Substation
*1: VLD Status
*2: Voltage measuring value 1 (Structure Earth)
*3: Voltage measuringvalue 2 (Substation / Station Earth)

TECHNICAL DATA DCP3L CONTROLLER

Dimension	Compact housing	265 x 185 x 120 mm (H x W x D)
Model	Installation	Front door/wall mounting
Weight	Approx 5.0 kg	
Ingress protection rating	IP 30 complete device IP 54 front-door mounting	
Ambient Temperature	Operation	-20 to +55 deg C
	Transport and storage	-30 to +85 deg C
	Min. start up	-40 deg C
	Relative humidity	5 to 95%
Power supply	VDC	24, 48/60, 110
Input/Output	Connector X1	7 Binary Inputs (24 VDC, 48/60, 110VDC)
		11 Binary Output (24 VDC, 48/60, 110VDC)
	Connector X2	24 Binary Inputs (24 VDC, 48/60, 110VDC)
		13 Binary Output (24 VDC, 48/60, 110VDC)
	Connector X3	6 Analog Inputs (20mA/10V)
		2 Analog Output (20mA/10V)
Connector type	Cage clamp/connector	0.25….2.5 mm2
Interfaces	On screen local touch keys	Colored display functions with soft keys
	9 main menu touch keys	2 switching control keys (ON/OFF), 4 function keys, 16 function LEDs
	COM Interface	3 - RJ45
		1 – PROFIBUS
		1 RS485 (half Duplex)
		1 IRIG-B DC
	Maintenance	1 Sub D
External Interface & storage	USB 2.0 & SSD card (optional)	
EMI/EMC	Compliance with; EN610004-3, EN61000-4-3, EN61000-4-4 EN61000-4-5, EN61000-4-6, EN50121-5	
Electrical Isolation	Compliance with EN 61010	

Corrosion damage due to stray currents, at a sleeper screw.
Top affected, bottom new
© Ulrich Bette, Institut für Beeinflussungsfragen Wuppertal

Corrosion damage due to stray currents at a pipework
© Ulrich Bette, Institut für Beeinflussungsfragen Wuppertal

DCP3L AND VLD LOCKER

Customer advantages of
RPS Stray Current Monitoring System

- SCM Software and Hardware can be customized to operators track specification
- Real time measurements, detection and response time
- Quick disconnect and movable VLD sensor connections to by-pass and isolate the equipment during test or maintenance work
- Alarm activation and fault location detection by extensive monitoring capabilities for detailed analysis to identify the fault location and understand the cause of stray currents leakage
- Real time Data acquisition and transmission to OCC through the SCADA communication network over Communication protocols such as IEC 61850, IEC 60870-5-104 (-5-101), Modbus TCP
- Continues and ongoing automatic/manual analysis of recorded values by CEU
- Depending on the project requirements, up to unlimited control points on the alignment, passenger stations and TPSS
- Ease of access to download Diagnostic data
- Download and Backup data and values from CEU using SCADA
- Intelligent algorithm suitable for any type of network communication
- SCM will provide compliance with touch voltage limits

- Capable of fast response with capacity for higher current limits
- Trigger the protection circuit breaker by providing safe ground fault clearance for return path and alarms
- Intelligent watch dog logic to prevent unnecessary stray currents triggering by hardware failure such as cable failure, time and voltage selectivity to avoid unnecessary SCM operation during and or at the end of passenger revenue service hours
- Minimal maintenance for VLD, DCP3/DCP3L controller and VLD sensors
- Local data acquisition and analysis to improve SCM equipment protective maintenance
- VLD isolated amplifiers are capable of handling fast rising voltages and large fault currents
- Software watch dog and DCP3/DCP3L controller hardware backup to ensure fail-safe operation providing fast software reboot in case of control power failure
- DCP3L ease of access to avoid accessing the power compartments for safe and easy maintenance accessibility
- Manual or Remote Bypass lock out during maintenance
- Preprogrammed voltage trigger points for either polarity to optimize the grounding capabilities

REFERENCES

RPS has delivered Stray Current monitoring System for Taiwan Danhai Light Rail. RPS is committed to its Quality, customer support and services. RPS provides continues maintenance and improvements to its products and systems. The quality of RPS products are based on past experiences and direct communication with the valued stakeholders and Operators. Excellent references regarding previous RPS projects are available upon request.

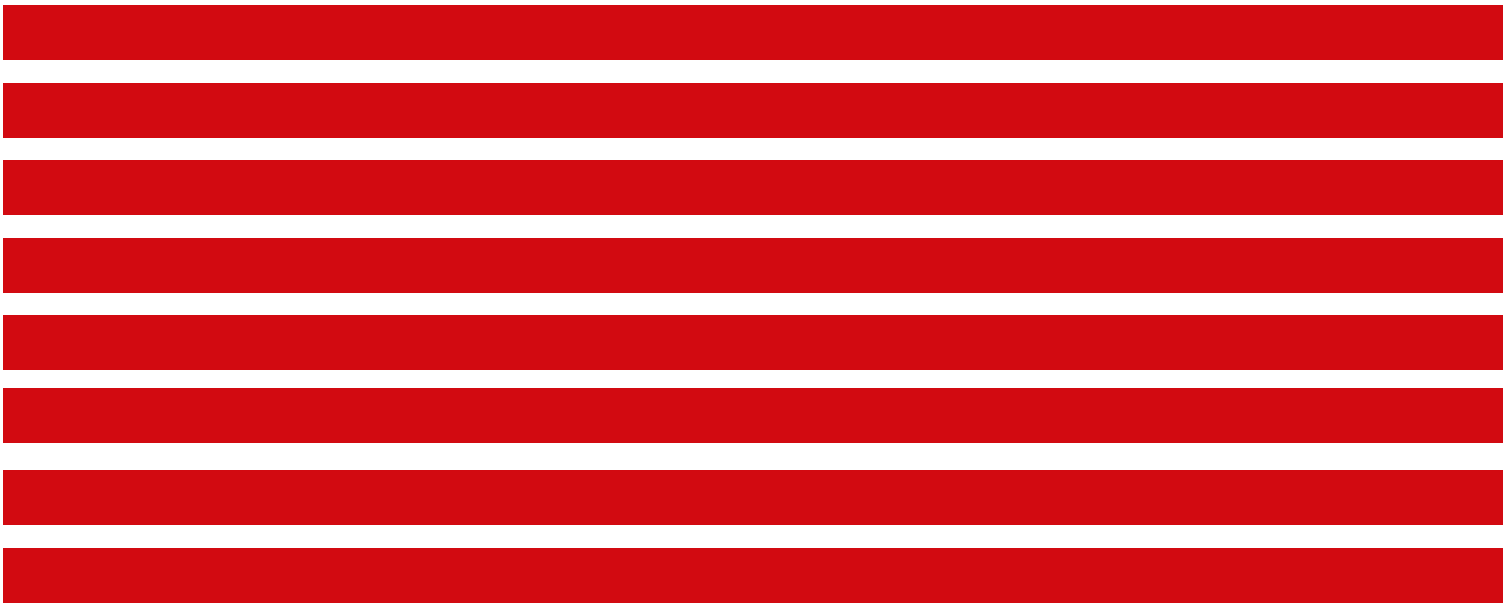
RPS additional services to provide excellent onsite support for SCM integration

RPS can support rail projects by providing the right set-up for the SCM system. RPS provides expertise and support to the Operators Grounding and Bonding engineer throughout the project design and integration phase to ensure the track Grounding and Bonding installation requirements are compliant with the EN50122-2. Provide know how to check and measure track conductance and resistance during various project phase including integration test.

RPS provides engineering support to setup the communication network for the SCM equipment, integration of DCP3/DCP3L software and user interfaces accompanied by CEU setup.

Considering detailed and complicated topic of the stray current, RPS can provide onsite stray current training sessions.

RPS/EN/430/0721



The specifications set out in this document apply to popular applications. They do not represent performance limits. This means that divergent specifications may be attained in specific applications. The contractually agreed specifications alone shall apply. We reserve the right to effect technical modifications. TracFeed® is a registered trademark of Rail Power Systems GmbH.

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