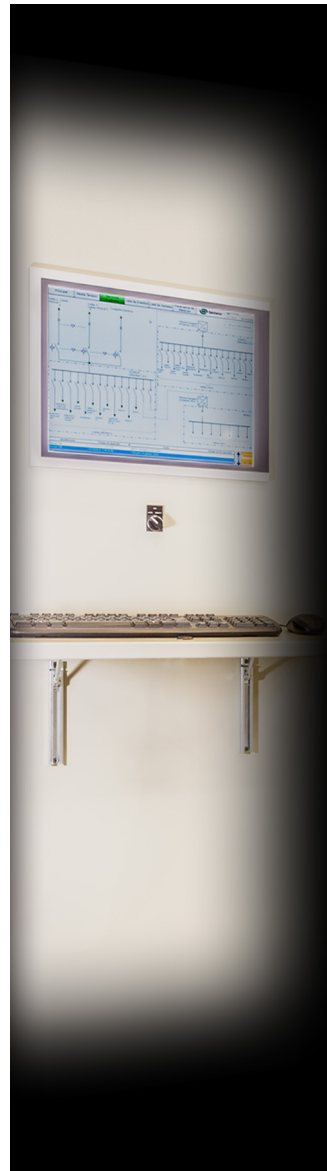


TRACTION POWER SYSTEMS /

# SUPPLY PROGRAM

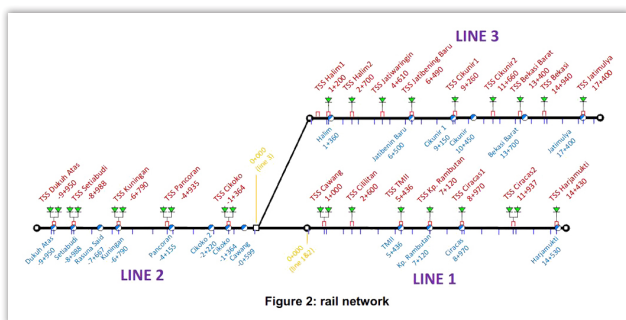


## Sécheron offers an **extensive** range of products for **DC** electrification of public **transport**

This document is intended to give a brief idea of our **services**, **cubicles** and **systems** in the field of DC traction substations.

*Detailed brochures are available for all products.*

# ENGINEERING SERVICES



### /// COMPUTER AIDED SIMULATIONS AND CALCULATIONS

- Dynamic simulation of power consumption and complete network analysis, taking into consideration all characteristics of the vehicles and the network.
- Substation positioning and total energy consumption including energy storage and/or inverter solutions.
- Conformity study with applicable standards.

### /// DESIGN AND CONSULTANCY SERVICES

- Harmonic filter design for DC networks.
- Concepts of protection (overhead lines, earthing, bounding, selectivity, etc.).
- Consultancy service to define technical specifications including transformers and medium voltage switchgear design.

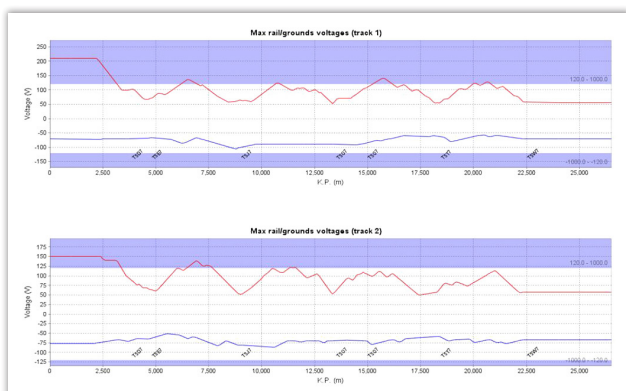
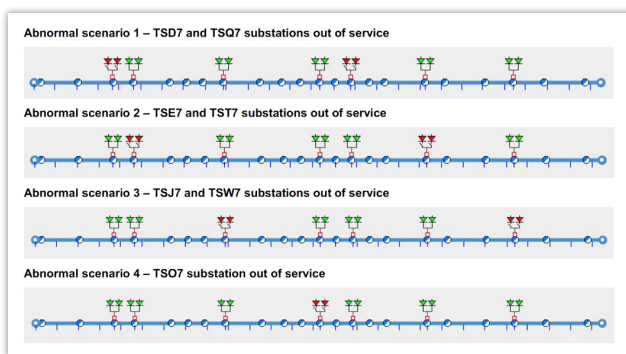
### /// PROJECT MANAGEMENT

- IPMA<sup>(1)</sup> Certified project managers

### /// RAMS<sup>(2)</sup> STUDIES

### /// OTHER SERVICES

- Supervision of installation.
- Commissioning.
- After-sales service.
- Maintenance.



<sup>(1)</sup> IPMA = International Project Management Association

<sup>(2)</sup> RAMS = Reliability, Availability, Maintainability and Safety

# EFFICIENT POWER CONVERSION

## TRANSFORMERS

Based on a strong experience, Sécheron provides an engineering and consulting support service for the transformers, including specification, monitoring during the manufacturing process and assistance. Sécheron is also able to calculate the main characteristics of traction transformers. They are adapted to the client network configuration, being 1 or 2 secondary windings, cast-resin or oil-immersed transformers, self cooled or forced air, with a 6, 12 or 24 pulses system. The transformer core and windings are manufactured in accordance with the best modern practice to withstand the stresses of heavy traction cyclic loading and track faults.

To ensure a good harmonization, Sécheron is able to provide the complete transformer-rectifier group.

## RECTIFIERS

REC



Type / Design	Power	Rated voltage
Diode rectifiers REC-D	Fixed mounting	900 to 6000 kW
	Withdrawable	900 to 5000 kW
	Special design	Up to 10 MW
Controlled rectifiers REC-C	Up to 6 MW	750 to 3000 VDC

### /// MAIN FEATURES

- Variety of connections (3 phase bridge, 2 x 3 phase bridge, 6 / 12 / 24 pulses output).
- Protection (RC over voltage protection, Snubbers, Diode fuses, Over current protection).
- Cooling: Natural air.
- Mounting: Fixed or withdrawable.
- Possibility to integrate Inter-Phase coils.

## INVERTERS

INV



Type	Rated power	Rated voltage
IGBT inverters INV-I	500 to 3000 kW	750 to 2000 VDC
Thyristor inverters INV-T	500 to 4000 kW	750 to 3900 VDC

### /// MAIN FEATURES

- Cost savings through recovery of the excess braking electrical energy.
- Reduction of heat in tunnels and substations → Reduction of cooling requirements → Further cost savings.
- Compatible with existing systems.
- Minimisation of CO2 footprint.
- Harmonization and integration with SEPCOS and Sécheron DC switchgear for protection, diagnostics and control.

## REVERSIBLE CONTROLLED CONVERTERS

REV

Based on the combination of our rectifier technology and our inverter technology, we are able to provide reversible controlled converters.

# ESTRA DC SWITCHGEAR & DISTRIBUTION BOARD

## /// DESIGN

The cubicles can be combined in various ways to complete substations, offering the systems engineer the greatest possible implementation flexibility. According to their design, they can be used as feeders, bus tie cubicles and for other applications.

## /// HSCB CUBICLE RANGE

- Full conformity and type tested according to EN 50123, IEC 61992 and IEEE Std C37.14 and C37.20.1.
- Integration of protection and control relays made by Sécheron (SEPCOS).
- Various configurations available: Rectifier Breaker, Feeder Breaker, By-Pass, Breaker...
- Possibility to integrate disconnecting or change-over switches.

## HIGH-SPEED CIRCUIT BREAKER PANELS MBS-HD



Rated operational voltage	Rated output current	Rated current busbar
900 / 1800 V	Up to 6000 A	Up to 11000 A
900 V	8000 A	Up to 11000 A
3600 V	4000 A	Up to 11000 A

## /// DESIGN

- Compartmented metal enclosed cubicles with high speed circuit breaker mounted on a withdrawable trolley.
- Suitable for feeding applications for heavy DC railways networks.

## CIRCUIT BREAKER PANELS MBS-SECUB



	Rated operational voltage	Rated output current	Rated current busbar
With UR15	900 V	1500 A	4000 A
With UR26	900 V	2500 A	4000 A

## /// DESIGN

- Compartmented metal enclosed cubicles with high-speed circuit-breaker mounted on a withdrawable drawer. Delivered with trolley for maintenance purposes.
- Especially suited to all feeding applications for LRT, LRV and trolleybuses.

## DISCONNECT SWITCH PANELS PADS



Rated operational voltage	Rated output current	Rated current busbar
900 / 1800 V	2000 to 8000 A	Up to 11000 A
3600 V	2000 to 6000 A	Up to 11000 A

## /// DESIGN

- Compartmented metal enclosed cubicles with one or more disconnecting switches.
- Suitable for all feeding applications for DC railway networks.
- Possibility to integrate a variety of protection: Frame leakage protection (64), Negative-earth protection (59), Return current detection (32).

# ESTRA DC SWITCHGEAR & DISTRIBUTION BOARD

## VOLTAGE LIMITING DEVICES VGUARD

During normal operation of railway system, dangerous voltage can occur across accessible points of the return circuit and earth due to the voltage drops along the return circuit caused by the current train traffic or insulation fault. In order to limit these voltages below the admissible values defined in EN 50122-1 standard, a voltage limiting device must be used as a short-circuiter between negative and earth.

Sécheron's voltage limiting devices (VGUARD) are recoverable devices which are compliant with the railway standards: EN 50526-2 (for voltage limiting device) and EN 50122-1 (for protective provision about electrical safety).



### /// MAIN FEATURES

- Combined protection of personnel, passengers and installation.
- Prevention and elimination of dangerous voltage.
- Bidirectional operation and protection.
- Continuous monitoring of the potential of the return circuit.

### /// TWO MAIN VARIANTS

- VGUARD-B: Basic VGUARD with contactor.
- VGUARD-H: Hybrid VGUARD with contactor and thyristors.

## WAYSIDE PANELS



Sécheron has designed its own range of outdoor wayside panels.

These cubicles are designed to integrate one or several devices such as disconnect switches, load break switches, contactors or DC high speed circuit breakers.

Depending on the customer specification, Sécheron can propose either steel or polyester wayside panels with a protection degree up to IP65.

Two basic cooling methods can be applied: natural convection or forced convection.

## ISOLATED AMPLIFIERS & RELAYS MIU, VM & VP



The MIU10 isolated amplifier is suitable for measuring high DC currents in power distribution systems for public transport networks.

The VM10 and VM12 isolated amplifiers are suitable for measuring DC voltages in power distribution systems for public transport networks.

### /// MIU & VM10/12 MAIN FEATURES

High voltage isolation, wide supply voltage range, low non-linearity error, very high immunity, high galvanic isolation, compact solutions, fuseless solution.

The VP10 isolated relay is suitable for the detection of DC voltages in power distribution systems for public transport networks.

### /// VP10 MAIN FEATURES

High voltage isolation, adjustable threshold, high galvanic isolation, intrinsic safety functioning, fuseless solution, diagnostic signal.

# STELLA PROTECTION & SUPERVISION

## CONTROL & PROTECTION RELAYS SEPCOS



SEPCOS is a micro-processor based equipment which satisfies the most demanding safety requirements applicable to DC traction distribution networks.

Used as a control and protection unit, SEPCOS integrates the necessary functions for the protection, the control and the measurement of DC traction equipment related to transportation systems (streetcars, underground railways, commuter trains or trolley buses).

Moreover, SEPCOS is stand alone, modular, extending, easily adaptable by software and widely open to modern communication equipment (IEC 61850, IEC 62439-3 (PRP/HSR), IEC 60870-5-104 (-5-101), DNP 3.0, Modbus-TCP, Profinet, Modbus-RTU, Profibus-DP).

SEPCOS range includes different versions in order to offer the most appropriate functionality: SEPCOS Basic, SEPCOS PLC, SEPCOS Gateway, SEPCOS RTU, SEPCOS Compact and SEPCOS PRISM.

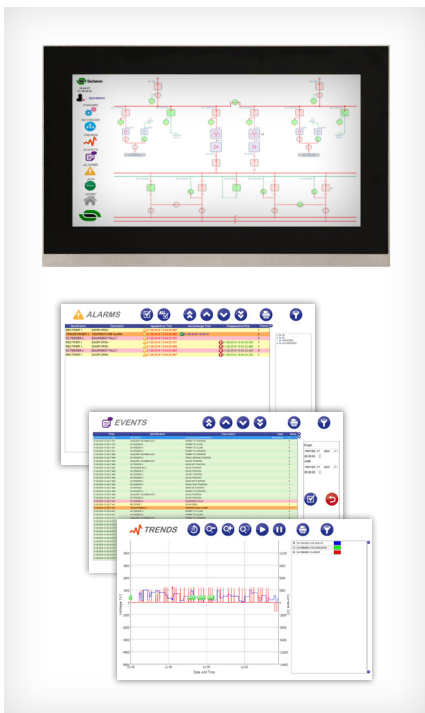
### /// DISPLAY

The Display allows a complete visualization, control and parameterization of the equipment and collects the information available from the SEPCOS. Control and configuration actions are protected by password levels.

### /// S-WEB

S-Web is an integrated web server within each SEPCOS. This interface is used to configure, visualize and analyze the data. This tool only requires a web browser and does not require any software installation on a computer.

## CONTROL COMMAND & LOCAL SCADA KEOPS



The solution provided by Sécheron for local control and monitoring of traction substations is a significant step in supporting operations and maintenance of the power supply network. In order to meet high demands in reaction time and cost efficiency, the powerful control and supervision system is based on modern communication protocols and combined with user-friendly interface.

In addition, all information, events, detection curves, substation history, diagnostic and documents are available to be transmitted to the centralized SCADA system of the network.

The control command and local SCADA developed by Sécheron is a modular system designed for communication and/or control of each part of traction power substations. It allows required interactions between different panels of a substation using specific power network protocols and/or standard industrial network protocols.

### /// MAIN FEATURES

- Supervision of the complete substation: Graphical display of measurement values, positions of breakers, alarm management, trending management, disturbance.
- Command: Command of all motorized devices including MV breakers and DC breakers.
- Parameterization: Parameter setting of all protection relays.
- Control: Possibility to define special control sequences.
- Wide range of communication protocols.

# STELLA PROTECTION & SUPERVISION

## STRAY CURRENT MONITORING SYSTEMS SCMS



The operation of DC traction systems requires suitable measures to prevent corrosion caused by stray currents on railway and non-railway installations. In this scope, the European standard EN 50122-2:2011 (Annex B) recommends a continuous supervision of the rail insulation.

Sécheron's Stray Current Monitoring System (SCMS) is a straightforward and efficient method of stray current monitoring avoiding manual repetitive measurement and any interference with the stray current collecting system.

The system measures continuously the rail-to-earth potential under operational conditions, complete with central analysis, visualization, signalling and archiving capacities.

### /// MAIN FEATURES

- Data collection from VGUARD (real-time measurements).
- Alarm and localization of the detected insulation fault.
- Data acquisition and transmission through the communication network.
- Permanent automatic analysis of recorded values and manual analysis possible.
- Set up of network lines and stations, up to 100 control points.
- Determination on data reference.
- Integration of specific algorithm depending on the type of network.
- Export and backup of measured and recorded values.
- Communication with SCADA system.

## E-HOUSE ELECTRICAL HOUSES



Sécheron is able to provide customized and complete DC traction substations in containers ready for use (transportable cabins or prefabricated buildings) that are built to withstand severe weather conditions and to shelter the equipment from any environmental influence.

Providing the highest security conditions to the operating personnel, Sécheron uses perfectly the internal space of the container substations by incorporating equipment such as AC/MV equipment and traction transformers, DC equipment, rectifiers, DC switchgear, control command and other additional equipment. These containers require minimum installation and commissioning time. Depending on the customer specification, Sécheron can propose different versions of the container construction: either metallic or concrete prefabricated solutions.

Our expertise and equipment also meet the needs of other industrial DC distribution applications, such as data centers or smart grids.

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