Stella-SEPCOS
Control & protection relays
SEPCOS represents a high-tech equipment which satisfies the most demanding safety requirements applicable to DC traction distribution networks. It is made of a powerful electronic system based on advanced technology (with several microprocessors).

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).

SEPCOS is stand alone, modular, extending and easily adaptable by software. It is equipped with a programmable logic unit which allows to freely define the operating logic functions, in order to match the requirements of the unit or the system to supervise.

Moreover, SEPCOS is widely open to modern communication equipment. It delivers network communication or serial line monitoring facilities.

Sécheron is the pioneer in the field of IEC 61850 adapted for DC traction power and has already successfully commissioned many projects worldwide using this standard.

**MAIN BENEFITS**

- Key strengths = Modularity and adaptability.
- Certified IEC 61850 server level A.
- Full network redundancy implemented according to IEC 62439-3 (PRP/HSR).
- Fully approved in railway substation environment according to IEC 60255-22.
- Conform to PLC standard programming according to IEC 61131-3.
- Application adapted to each project and functionality.
- Numerous functions (control, protection and recording).
- External synchronization (NTP).
- Monitoring of analog measurements.
- Simple, user-friendly and modern communication tools.
- High resolution 7" graphic color Display.
- High accuracy and very good noise immunity thanks to a high sampling rate based on high performance 16-bit A/D converter.
MAIN FEATURES

SEPCOS is made of several modules - power supply (PWR), processor (CPU), protection (PRO), digital inputs/outputs (DIO) - that can be adapted in order to meet the needs of each customer.

**Power module (PWR):**
- 60-220 VDC (50 W)
- 24-48 VDC (35/50 W)

**Control and Processing Unit module (CPU):**
- Microprocessor VORTEX86MX

**Protection module (PRO):**
- 4 digital inputs / 3 digital outputs
- 4 analog inputs / 1 analog output

**Digital Inputs/Outputs module (DIO):**
- 16 digital inputs / 8 digital outputs

- USB ports (A&B): Update and collect of data
- Oled display screens: Indication of I/O status and diagnostic (troubleshooting)

**Applications**

With many control/command and protection functions, SEPCOS satisfies the needs of DC power traction networks such as outgoing feeder cubicle or rectifier breaker.

SEPCOS is used for monitoring traction network segments and for logging events. It analyses the current gradient and voltages through cyclic measurements at the feeding point of the substation to the catenary. The measurements are made through an electrically isolated transducer (i.e. Sécheron’s VM10/VM12 or MIU10 measuring amplifiers).
All connections (power supply, analog and digital signals, network, etc.) are placed on the front panel. The power unit is modular and is chosen according to the input voltage. Different options are available for the CPU module in order to meet the customer specific needs regarding network, protocols and even redundancy. SEPCOS can include up to 5 DIO modules.
PROTECTIONS

MAIN FEATURES

- For each detection, 1 set of 3 curves memorized:
  - current (I),
  - voltage (U),
  - di/dt.
- Curve memorized pitch: 200 μs to 5 s.
- Sampling Rate: ~ 20 μs per analog input (total = 80 μs).
- Time stamps: 1 ms.
- Availability of the last 5000 events and 1000 curves.

LIST OF PROTECTION FUNCTIONS

- DDL+ Delta I
- DDL+ Delta T
- DDL- Delta I
- DDL- Delta T
- Imax+ / Imax++
- Imax- / Imax--
- Load transfer
- Thermic
- Interrupted arc
- IDMT Level 1
- IDMT Level 2
- IDMT Level 3
- Ufeeder Min
- Ufeeder Max
- Track alive
- Falling voltage
- Umin+
- Energy+ / Energy-
- Umax+ / Umax++
- Umax- / Umax--
- Amp monitoring
- Cable insulation fault
- HSCB maintenance
- Incomplete sequence

RATE OF RISE PROTECTION FUNCTIONS (DI/DT)

/// DDL+ DELTA T
If the value of the Delta T measured is higher than the parameter Tmax and the value of Delta I measured is higher than the parameter Delta Imin, the function declares a detection by DDL+ Delta T and a tripping is initiated.

/// DDL+ DELTA I
If the current rise Delta I measured is higher than the parameter Delta Imax during a time higher or equal to the parameter Delta Imax, the function declares a detection by DDL+ Delta I and a tripping is initiated.

OPTIONAL FUNCTION: CABLE INSULATION FAULT

In DC traction applications, power cables built with metal shields must be protected against high touch voltage. This protection must be active when a dangerous contact voltage or a high current appear on the shield in case of insulation fault. The system is designed to detect a leak current either between shield and conductor or between shield and earth. If a fault occurs, actuation of intertripping out signal can be selected. The settings for this function can be adjusted with the S-Web tool.
BUS CONNECTIONS

Modularity and adaptability are the key strengths of SEPCOS.
Sécheron developed this control and protection relay with the objective of getting the closest match to their clients needs. Sécheron can provide engineering support while elaborating a network regardless the type of communication and its architecture.
SEPCOS is indeed open to all customers networks and protocols.

/// A WIDE CHOICE OF COMMUNICATION BUS
- Modbus-TCP
- Modbus-RTU
- Profibus-DP
- Profinet

/// ETHERNET PROTOCOLS
- IEC 60870-5-104 (-5-101)
- IEC 61850, including GOOSE
- IEC 62439-3 PRP/HSR
- DNP 3.0 (Serial/Ethernet)

/// FLEXIBLE CONNECTIVITY
- Copper cable (RS485, RJ45)
- Optical fiber

/// REDUNDANCY
- Dual independent networks
- Parallel Redundancy Protocol (PRP) / High Availability Seamless (HSR)
- Bonding/Teaming network

BONDING/TEAMING REDUNDANCY STAR NETWORK

The bonding feature provides an interesting solution of redundancy network without huge infrastructure.
Only one network interface is active while the other is simply waiting for a failure in the link (interface down or unplugged) to the primary network interface card: it will keep the network traffic up and alive.
The source sends the same frame over both networks (LANs). The destination receives it from both LANs within a certain time, consumes the first frame and discards the duplicate.

HSR provides zero recovery time in case of failure of one component. It is suited for applications that demand high availability and very short reaction time that requested for protection of electrical substation.
A user-friendly interface is associated through a high resolution 7” graphic color display, capacitive dual touch screen allowing easy and intuitive navigation.

This device is equipped with 8 LEDs related to dynamic labels (color and text) for the visualization of the state of the PLC (position, type of fault, etc.).

Display allows a complete visualization, control and setting of the equipment and collects the information available from SEPCOS. It includes the modification of SEPCOS parameters (setting protections, command parameters, etc.). Control and configuration actions are protected by password levels.

**MAIN FEATURES**

- Control of the equipment (orders IN, OUT, Reset, etc.).
- Display of the last 5000 events recorded by SEPCOS and time-stamped.
- Multilingualism (the languages can be adapted on request).
- Different administration modes (Root, Admin, PowerUser, Operator and User).
- Backup and export of settings, curves, events or log information on a USB key.
S-WEB TOOL AND TRENDS

The S-Web tool is an integrated web-server within each SEPCOS. This interface is used to configure, visualize, analyze and retrieve various data. The connection with the S-Web tool is done either through Ethernet cable or Wi-Fi to access through a PC, a tablet computer or a smartphone. **The S-Web tool does not require any software installation** on a computer, its operation only requires a web browser.

**MAIN FEATURES**

- Reading and modification of the protection and command functions settings.
- Collection of data recorded by SEPCOS and download on a PC.
- Upload of information (parameters) from a PC to one or more SEPCOS.
- Real-time visualization of analog inputs values, detection results and events.
- Continuous recording of trends and visualization for a given period.
- Display of detection curves (di/dt, U and I) of protection functions.
- Application software upgrade.

The trends of the 4 analog inputs are available for the last 30 days.

All functions of the Display (i.e. opening and closing of the HSCB, switching from “Local” to “Remote” mode and inversely, etc.) are available on the S-Web tool.
ENVIRONMENTAL CONDITIONS

Environment must comply the following conditions:

/// TRANSPORT AND STORAGE TEMPERATURE
- -40 °C to +85 °C / According to IEC 61992-1; Annex B
- -30 °C to +65 °C / According to IEEE Standard C37.90

/// OPERATING TEMPERATURE
- -25 °C to +70 °C / According to IEC 61992-1; Annex B
- -20 °C to +55 °C / According to IEEE Standard C37.90

/// MAXIMUM RELATIVE HUMIDITY (WITHOUT CONDENSATION)
- 93% at 55 °C / According to IEC 60068-2-30 Db test V2

/// ALTITUDE
- < 3'000 m (= 700 mbar) / According to RTCA D0160F section 4
MECHANICAL FEATURES

SEPCOS

The modules are integrated in aluminium frames.

Electrical connections are located behind front flaps of the housing in order to be protected.

* The total width of a SEPCOS depends on the number of modules. The width of one module is 60 mm.

OPTIONAL DISPLAY

Protection degree: IP40 / IK05.
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