AC VACUUM CIRCUIT BREAKER
Type MACS

RAIL VEHICLES
MACS is Sécheron’s main circuit breaker platform for installation on AC rail vehicles. It offers car builders a highly modular platform which is ideally suited to their various applications and requirements.

MACS can be mounted vertically on the roof of EMUs and Trains, as well as inside the high voltage compartment of locomotives. To limit roof cut-outs, as well as noise transmission, MACS can also be supplied with optional roof box. Another option is horizontal installation inside Sécheron’s high-voltage compact modular enclosure, AC MODBOX®, either on the roof or under the chassis.

MACS is a fully electrically operated circuit breaker, designed to automatically open through spring release if the low voltage supply is interrupted. This fail-safe concept is a key safety benefit for electrically operated rolling stock circuit breakers.

The MACS lightweight platform with its modularity and compact dimensions, as well as the AC MODBOX® allowing MACS to be integrated with other high voltage functions such as current and voltage measurements, disconnect switch, filters, and transient inductors in a compact aluminium housing, are perfect solutions for your rolling stock running on 15 kV ac and/or 25 kV ac networks.

APPLICATIONS
Switching and protection of main and auxiliary electric circuits for locomotives, trains and EMUs running on 15 kV ac and/or 25 kV ac networks. Sécheron can supply all equipment listed below.

PRODUCT RANGE

- AC circuit breaker
- Earthing switch
- Voltage sensor
- Wheel flange lubricator
- Current sensor
- Roof making switch
- Surge arrester
- AC circuit breakers with earthing switch
- & with surge arrester
- Key multiplier
- Energy meter
- Master controller
- Door lock
- Pantograph interlocking switch
- Wheel flange lubricator
- Current sensor
- Voltage sensor
- Wheel flange lubricator
- Impulse withstand voltage $U_{im}$ [kV]
- MACS (M5...) Rated current 1,000 A
- MACS (M6...) Rated current 1,000 A
- MACS (M7...) Rated current 1,000 A
- Rated operational voltage $U_r$ [kV]
- 17.25 (16.7 Hz)
- 27.5 (50/60 Hz)
- 31.5 (50/60 Hz)
MAIN BENEFITS

- Indoor or outdoor installation.
- Vertical or horizontal mounting.
- Specific version ($U_{ni} = 185$ kV) with increased insulation level for outdoor operation in harsh environmental conditions (pollution, humidity, etc.).
- High level of safety thanks to automatic opening via spring release (no need for stored auxiliary electrical energy).
- Wide range of configurations and options to suit all operating conditions and requirements.
- Optional roof box to limit roof cut-outs and structural noise transmission.
- Can be supplied with other high- and low- voltage components inside MODBOX® to mitigate operational risks from harsh environmental conditions (ice, sand, etc.).
- Compliant with LOC & PAS TSI, 1302/2014/EU.
- Specific configurations can also be developed for particular environments.
- Experts with a comprehensive understanding of working environments and coordination of protective devices.

For integration of roof disconnect switch, contact Sécheron.

AC CIRCUIT-BREAKER

- Suitable for 15 kVAC and/or 25 kVAC networks.
- Conventional free air thermal current 1,000 A.
- Rated impulse withstand voltage ($1.2 / 50$ µs): $U_{ni} = 125$ kV, 170 kV and 185 kV.
- External creepage distances:
  > 1,000 mm ($U_{ni} = 125$ kV and 170 kV)
  > 1,250 mm ($U_{ni} = 185$ kV).
- Electric operation (closing and holding).
- Operation in ambient temperature from -40 °C to +70 °C (-50 °C to +70 °C in option).
- Reference standards: IEC/EN 60077-4, IEC/EN 61373, EN 50121-3-2, EN 45545.

EARTHING SWITCH

- Integrated earthing switch with manual or electric operation.
- Safe manual operation guaranteed through interlocking keys.
- Ice breaking capability (20 mm ice).

SURGE ARRESTER

- Optional integrated surge arrester (to be defined by Sécheron upon customer’s specifications).

MAIN FEATURES

- Compact multi-functional switch incorporating: AC circuit breaker, earthing switch and optional surge arrester on a single 940 mm x 430 mm footprint.

/// AC CIRCUIT BREAKER

/// EARTHING SWITCH

/// SURGE ARRESTER
# DATA FOR PRODUCT SELECTION

## MAIN HIGH VOLTAGE CIRCUIT

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Single &amp; dual voltage</th>
<th>Harsh environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MACs designation code</td>
<td></td>
<td>M7</td>
<td>M6</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>Un</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Rated operational voltage</td>
<td>Ur</td>
<td>17.25</td>
<td>27.5</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>Um</td>
<td>27.5</td>
<td>31.5</td>
</tr>
<tr>
<td>Rated operational frequency</td>
<td>f</td>
<td>16.7</td>
<td>50 &amp; 60</td>
</tr>
<tr>
<td>Rated impulse withstand voltage (1.2/50 μs)</td>
<td>Ua</td>
<td>125</td>
<td>170</td>
</tr>
<tr>
<td>Rated power-frequency withstand voltage (50 Hz, 1 mn)</td>
<td>Ua</td>
<td>- Pole-pole</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Pole-earth</td>
<td>75</td>
</tr>
<tr>
<td>Conventional free air thermal current</td>
<td>Ith</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Rated operational current</td>
<td>Ie</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Operational category</td>
<td>C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak short-circuit making current</td>
<td>Is</td>
<td>62.5</td>
<td>50</td>
</tr>
<tr>
<td>Rated short-circuit breaking current</td>
<td>Is</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>DC component for asymmetrical breaking current</td>
<td>%</td>
<td>≤ 50</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Peak and rated short-time withstand current (1 s)</td>
<td>(ka)/Icw</td>
<td>62.5/25</td>
<td>62.5/25</td>
</tr>
<tr>
<td>Short-time withstand current (0.1 s)</td>
<td>Icw</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Minimum creepage distances</td>
<td>(mm)</td>
<td>&gt; 1,000</td>
<td>&gt; 1,000</td>
</tr>
</tbody>
</table>

(1) For other values, please contact Sécheron. • (2) At Tamb = +40 °C and tested with high voltage connections according to standard IEC/EN 60943.

## Earthing switch

- Peak and rated short-time withstand current (0.1 s) | (ka)/Icw | 62.5/25 | 62.5/25 | 62.5/25 |

## LOW VOLTAGE AUXILIARY CIRCUIT

### Control circuit

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Single &amp; dual voltage</th>
<th>Harsh environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage (power supply and control order)</td>
<td>Un</td>
<td>24 to 110</td>
<td></td>
</tr>
<tr>
<td>Range of voltage (power supply and control order)</td>
<td>(0.7 - 1.25) Un</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum power (loading and holding)</td>
<td>Pmax</td>
<td>≤ 100</td>
<td></td>
</tr>
<tr>
<td>Nominal holding power</td>
<td>Pn</td>
<td>≤ 35</td>
<td></td>
</tr>
<tr>
<td>Opening power</td>
<td>[W]</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mechanical opening time</td>
<td>Tp</td>
<td>≤ 50</td>
<td></td>
</tr>
<tr>
<td>Mechanical closing time</td>
<td>Tr</td>
<td>≤ 65</td>
<td></td>
</tr>
</tbody>
</table>

### Earthing switch (electrically operated version)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Single &amp; dual voltage</th>
<th>Harsh environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>Un</td>
<td>24, 32, 36, 48/50, 72, 110</td>
<td></td>
</tr>
<tr>
<td>Operating power</td>
<td>[W]</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Commutation time</td>
<td>[s]</td>
<td>≤ 3</td>
<td></td>
</tr>
</tbody>
</table>

(4) Loading time < 12 seconds. • (5) At Un and Tamb = +23 °C.

### Auxiliary contacts

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Single &amp; dual voltage</th>
<th>Harsh environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of contacts</td>
<td></td>
<td>Potential free</td>
<td></td>
</tr>
<tr>
<td>Rated voltage</td>
<td>Vcc</td>
<td>24 to 110</td>
<td></td>
</tr>
<tr>
<td>Conventional thermal current</td>
<td>Ith</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Switching categories according to EN60947 (silver contacts)</td>
<td></td>
<td>AC - 15 230 Vcc 1.0 A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC - 13 110 Vcc 0.5 A</td>
<td></td>
</tr>
<tr>
<td>Minimum let-through current at 24 Vcc</td>
<td>(mA)</td>
<td>≥ 10 (silver contacts) or 4 ≤ I &lt; 10 (gold contacts)</td>
<td></td>
</tr>
</tbody>
</table>

(6) Refer to page 6. • (7) For a dry and clean environment.

## Low voltage interface

### Type of connection

- AC VCB with manual earthing switch
- AC VCB with electric earthing switch

(8) Refer to page 7 for mobile connector information.

### Insulation

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Single &amp; dual voltage</th>
<th>Harsh environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power-frequency withstand voltage (50 Hz, 1 mn)</td>
<td>Um</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

## OPERATING CONDITIONS

### Installation

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Unit</th>
<th>Single &amp; dual voltage</th>
<th>Harsh environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altitude</td>
<td>[m]</td>
<td>Indoor or outdoor</td>
<td></td>
</tr>
<tr>
<td>Working ambient temperature</td>
<td>Tamb</td>
<td>-40 to -50 to +70</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>Class 5K2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution degree</td>
<td>PD4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum mechanical durability</td>
<td>N</td>
<td>250,000</td>
<td></td>
</tr>
</tbody>
</table>
PRODUCT INTEGRATION

MAIN DIMENSIONS

Dimensions without tolerances are approximate only. All dimensions given in mm. The maximum permissible flatness deviation of the support frame is 0.5 mm. HV and earth connections: M12 screws.

( FOLLOWING SCHEMES REFERRED TO MACS M7)

/// AC CIRCUIT BREAKER 15/25 kV<sub>AC</sub> - U<sub>IN</sub> = 125 kV

<table>
<thead>
<tr>
<th>Weight</th>
<th>103 kg</th>
</tr>
</thead>
</table>

For top view, roof opening and frame dimensions, please refer to above model for U<sub>IN</sub> = 125 kV.

/// AC CIRCUIT BREAKER 15/25 kV<sub>AC</sub> & 25 kV<sub>AC</sub> - U<sub>IN</sub> = 170 kV

<table>
<thead>
<tr>
<th>Weight</th>
<th>104 kg</th>
</tr>
</thead>
</table>

Space needed for operation and maintenance.
MOUNTING POSSIBILITIES

/// VERTICAL MOUNTING ON THE ROOF (WITH ROOF CUT-OUT)

With this solution a roof cut-out is required for the MACS low voltage compartment as well as for the manual operating mechanism of the earthing switch.

/// VERTICAL MOUNTING ON THE ROOF (WITHOUT ROOF CUT-OUT)

To avoid roof cut-out while reducing structural noise transmission, MACS can also be delivered together with Sécheron's optional roof box.
The representation below depicts **MACS** in standard configuration (4a+4b – switch PF), with optional additional auxiliary switches (4a+4b – switch PF) and optional manual earthing switch (2a+2b – switch PF).

- The auxiliary switches' state is represented for the MACS in open position.
- The auxiliary switches' state is represented for the earthing switch in position not grounded and locked in this position.

For electric earthing switch, please contact Sécheron.
OPTIONS (SUBJECT TO ADDITIONAL COSTS)

EARTHING SWITCH - ELECTRIC OPERATION

Weight:
+5 kg versus manual operation

AC CIRCUIT BREAKER AND SURGE ARRESTER

For safe and efficient protection against lightning and switching overvoltages, Sécheron strongly recommends the use of two surge arresters SA1 and SA2 in the vehicle's high voltage circuit.

In order to effectively protect the AC circuit breaker, the distance between each surge arrester and the AC circuit breaker must not be too long.

Customers wishing to add a surge arrester to the MACS can rely on Sécheron's specialists to specify the most appropriate type.

/// AC CIRCUIT BREAKER AND SURGE ARRESTER CONNECTIONS

Surge arrester connections: M12 screws.

The connection between the AC circuit breaker and the surge arrester is not shown on the drawing but can also be delivered by Sécheron.

Weight and height of surge arresters depend on selected type.
LV MOBILE CONNECTOR FOR AC CIRCUIT BREAKER  
(SEPARATELY ORDERED ITEM)

<table>
<thead>
<tr>
<th>MACS configurations</th>
<th>Mobile connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxilliary Switches</td>
<td>Fixed connector type</td>
</tr>
<tr>
<td>Device (1)</td>
<td>Number</td>
</tr>
<tr>
<td>AC VCB + ES</td>
<td>4a + 4b</td>
</tr>
<tr>
<td></td>
<td>0a + 0b</td>
</tr>
<tr>
<td></td>
<td>AC VCB + ES</td>
</tr>
<tr>
<td></td>
<td>2a + 2b</td>
</tr>
<tr>
<td></td>
<td>AC VCB + ES</td>
</tr>
<tr>
<td></td>
<td>0a + 0b</td>
</tr>
<tr>
<td></td>
<td>AC VCB + ES</td>
</tr>
<tr>
<td></td>
<td>2a + 2b</td>
</tr>
</tbody>
</table>

(1) AC VCB : AC vacuum circuit breaker
ES : earthing switch.
P F : potential free.

AC circuit breaker with manual or electric (2) earthing switch

Case 1
AC VCB + ES 4a + 4b 0a + 0b PF Harting HAN® Modular 51 pins Harting HAN® Modular 51 pins 2 21 M25 2 29 M32 SG325249R00303 SG325249R00403

Case 2
AC VCB + ES 4a + 4b 2a + 2b PF Harting HAN® Modular 51 pins Harting HAN® Modular 51 pins 2 29 M32 2 37 M32 SG325249R00302 SG325249R00402

Case 3
AC VCB + ES 8a + 8b 0a + 0b PF Harting HAN® Modular 51 pins Harting HAN® Modular 51 pins 2 37 M32 2 45 M32 SG325249R00301 SG325249R00401

Case 4
AC VCB + ES 8a + 8b 2a + 2b PF Harting HAN® Modular 51 pins Harting HAN® Modular 51 pins 2 45 M32 2 45 M32 SG325249R00304 SG325249R00404

For the electric earthing switch the additional low voltage mobile connector indicated below must be considered.

Additional low voltage mobile connector for electric earthing switch

<table>
<thead>
<tr>
<th>Device</th>
<th>Number</th>
<th>Type</th>
<th>Fixed connector type</th>
<th>Mobile connectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>2a + 2b</td>
<td>PF</td>
<td>Harting HAN® 24 DD</td>
<td>Harting HAN® 24 DD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- Harting Han® Modular 51-pin connector composed of 3 Harting HAN® DDD17 modules (each module supplied with 17 pins).
- The above references are given for mobile connectors assuming that all the auxiliary contacts are wired, with an external wire diameter of 2.8 mm for a 2.5 mm² conductor size and 2.3 mm for a 1.5 mm² conductor size. If the conditions differ from these, the above references may change. In this case, please inform Sécheron accordingly.
**Main dimensions:**
Refer to the table below.

<table>
<thead>
<tr>
<th>MACS designation code</th>
<th>M7</th>
<th>M6</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_e$ [kV]</td>
<td>125</td>
<td>170</td>
<td>185</td>
</tr>
<tr>
<td>A (mm)</td>
<td>691</td>
<td>716</td>
<td>766</td>
</tr>
<tr>
<td>B (mm)</td>
<td>275</td>
<td>300</td>
<td>325</td>
</tr>
<tr>
<td>C (mm)</td>
<td>251</td>
<td>251</td>
<td>276</td>
</tr>
</tbody>
</table>

Roof box dimensions are only indicative.

Selecting the optional electrically operated earthing switch together with the roof box, will limit the roof crossing to the low voltage connections.

In case the manual earthing switch is selected with the optional roof box, a roof crossing for the earthing switch manual operation as well as for the low voltage connections is to be foreseen.

**Main Benefits**

- No roof cut-out required to install the AC circuit breaker.
- No roof cut-out if the optional electric version for earthing switch is selected.
- Reduced size hole in roof for the operating mechanism of the manual earthing switch.
- Substantial reduction in noise transmission through the car body structure.
- Structural validation according to EN12663.
- Validated for vibrations & shocks according to IEC/EN 61373.
The Sécheron AC MODBOX® enclosure includes our AC circuit breaker type MACS and various high- and low-voltage components. The compact, smart enclosure ensures safe and efficient integration of high-voltage components in vehicle roof or vehicle under-frame installations. Each AC MODBOX® is engineered and configured to meet the needs of your project, taking into account integrated functions and interfaces with the vehicle. We primarily use Sécheron components and can include other devices from best-in-class suppliers to provide you with a turnkey solution.

With its limited height (535 mm) and a shape designed to meet aerodynamic requirements, AC MODBOX® offers efficient solutions to roof space, insulation and speed constraints. It also provides the high-voltage AC components with protection from the most severe environmental conditions in their operation. AC MODBOX® simplifies project management, logistics, and installation tasks for the car builder.

For more information about the MODBOX® program, please refer to brochure SG580044B.

---

**Functional scope**

**MACS**: Main AC switch

**AC VCB**: AC vacuum circuit breaker (MACS)

**ES**: Earthing switch (MACS)

**SA**: Surge arrester

**Imes**: Current sensor (TMS™)

**TMS**: AC Voltage measurement

**RS**: Roof switch

*if combined with with voltage sensor.*

---

**AC MODBOX®**

To traction equipments

To roof line
## DESIGNATION CODE FOR ORDERING

- Be sure to establish the designation code from the latest version of our brochure by downloading it from the website: www.secheron.com
- Be careful to write down the complete alphanumerical designation code with 12 characters when placing your order
- For technical reasons some variants and options indicated in the designation code might not be combined
- For other configurations not described in the brochure, please contact Secheron.

<table>
<thead>
<tr>
<th>Line</th>
<th>Description</th>
<th>Designation</th>
<th>Standard</th>
<th>Options</th>
<th>Customer’s choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Product type</td>
<td>MACS</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Nominal voltage</td>
<td>15 kV or/and 25 kV (U&lt;sub&gt;n&lt;/sub&gt; = 125 kV)</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 kV or/and 25 kV (U&lt;sub&gt;n&lt;/sub&gt; = 170 kV)</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 kV - Harsh environment (U&lt;sub&gt;n&lt;/sub&gt; = 185 kV)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Mechanical interface</td>
<td>Standard base plate / vertical mounting</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Version for optional roof box <em>(1)</em></td>
<td></td>
<td></td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Earthing switch</td>
<td>with manual operation</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>with electric operation</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Surge arrester</td>
<td>No</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes - For surge arrester type and code, please contact Secheron</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Control voltage</td>
<td>24 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>48/50 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>72 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>110 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Auxiliary contacts on the AC circuit breaker</td>
<td>4&lt;sup&gt;a&lt;/sup&gt; + 4&lt;sup&gt;b&lt;/sup&gt; (switch PF) - silver type</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4&lt;sup&gt;a&lt;/sup&gt; + 4&lt;sup&gt;b&lt;/sup&gt; (switch PF) - gold type</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8&lt;sup&gt;a&lt;/sup&gt; + 8&lt;sup&gt;b&lt;/sup&gt; (switch PF) - silver type</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8&lt;sup&gt;a&lt;/sup&gt; + 8&lt;sup&gt;b&lt;/sup&gt; (switch PF) - gold type</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Auxiliary contacts on the earthing switch</td>
<td>None <em>(2)</em></td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2&lt;sup&gt;a&lt;/sup&gt; + 2&lt;sup&gt;b&lt;/sup&gt; (switch PF) - silver type</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2&lt;sup&gt;a&lt;/sup&gt; + 2&lt;sup&gt;b&lt;/sup&gt; (switch PF) - gold type</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Interlocking keys for earthing switch</td>
<td>(Electric operation) Not applicable</td>
<td>Z</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 blue (master) + 1 yellow (slave)</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 blue (master) + 1 yellow (slave)</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 yellow (master) + 1 green (slave)</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 yellow (master) + 2 green (slave)</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 yellow (master) + 1 green (slave)</td>
<td>L</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Key / locks delivered by customer</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Key and lock codification for each unit</td>
<td>(Electric operation) Not applicable</td>
<td>Z</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Ambient temperature range</td>
<td>-40 °C to +70 °C</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-50 °C to +70 °C</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(1)* The roof box kit must be ordered separately. *(2)* For manual switch only.

The low voltage connector must be ordered separately (refer to page 9).
- LV mobile connector for the AC circuit breaker with manual earthing switch: [☐] SG325249R00[...][select the last 3 digits in the table page 9 function of your selection]
- Additional LV mobile connector for the electric earthing switch: [☐] SG325249R00521 [☐] SG325249R00520
- Optional roof box kit: [☐] for MACS with electrically operated earthing switch [☐] for MACS with manual earthing switch

This document is not contractual and contains information corresponding to the level of technology at the date of printing. Sécheron reserves the right to modify and/or improve the product, whose characteristics are described in these documents, as required by new technology at any time. It is the purchaser’s responsibility to inform himself, no matter what the circumstances, of the product’s maintenance conditions and requirements. Sécheron reserves all rights, especially those arising from our “General Delivery Conditions”.

Copyright© 2019 Sécheron SA