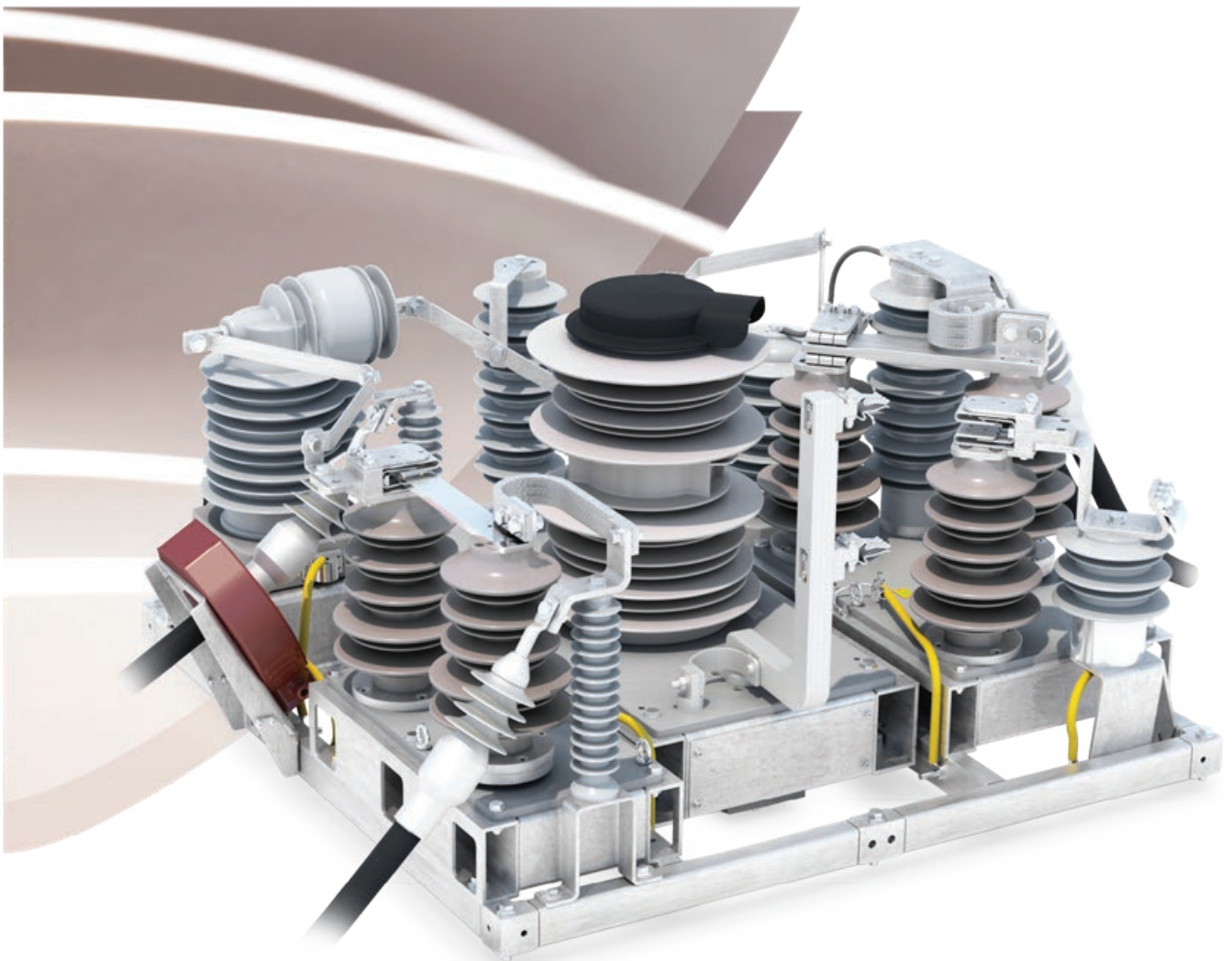


INTEGRATED SOLUTION FOR AC HIGH VOLTAGE ROOF EQUIPMENT

Type **MODFRAME**

RAIL VEHICLES

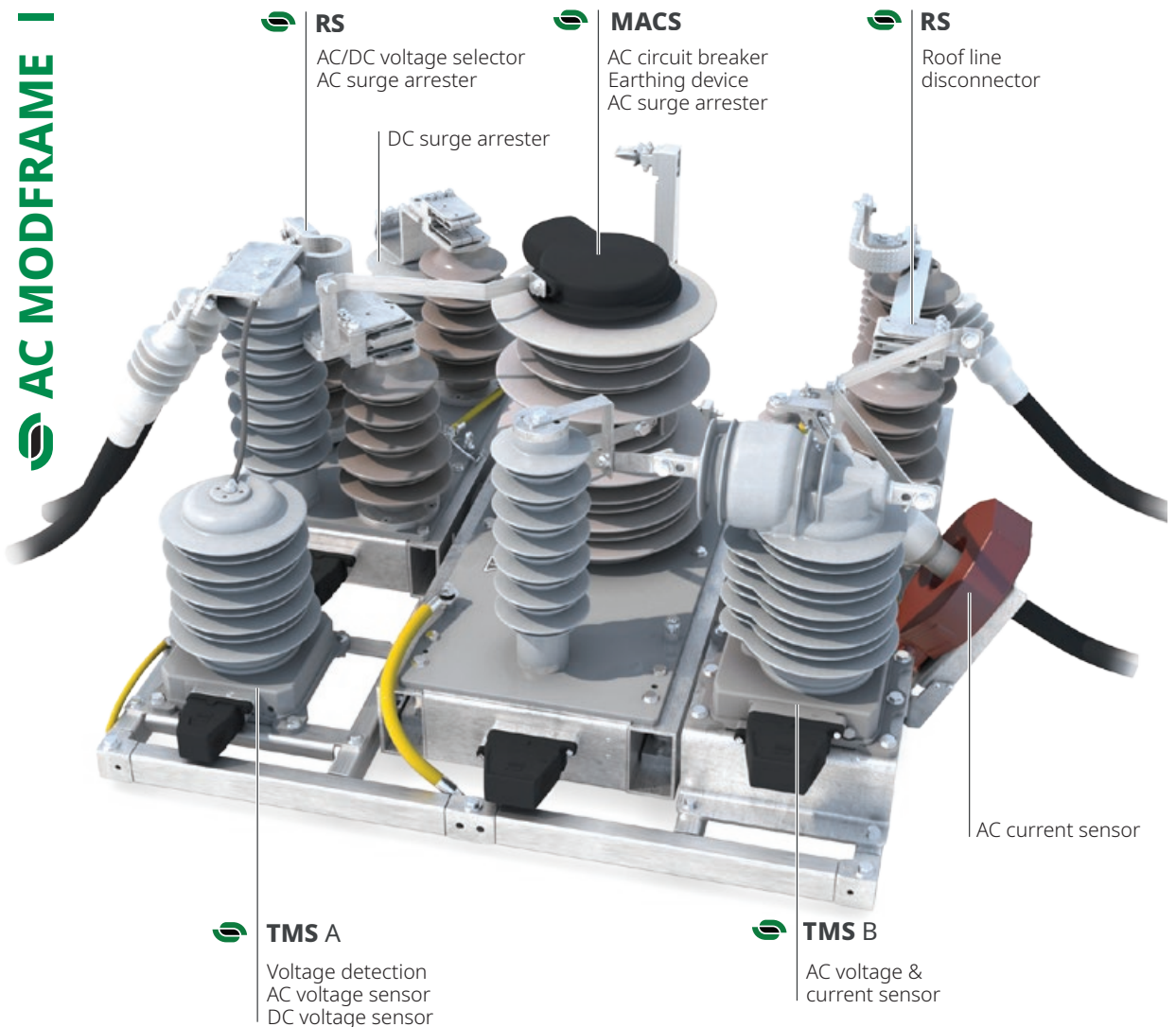


GENERAL INFORMATION

Over the years, Sécheron has developed an impressive portfolio of components and platforms for high voltage solutions. These cover most of the needs for AC rail vehicles, regardless of where these components are installed, on the roof, under the vehicle's frame or inside the vehicle.

Today, Sécheron delivers the most complete range of roof-installed high voltage individual components and integrated solutions. These cover the requirements and constraints of almost all vehicles.

The **AC MODFRAME** is an integrated solution developed for AC and AC/DC Electrical Multiple Units (EMU). It integrates most of the high voltage roof components required for the operation and protection of AC rail vehicles on a single outdoor frame. The main components installed are from Sécheron's range, supplemented by other devices from leading third party suppliers.



All components installed on the MODFRAME are connected together with busbars, cables and braids, offering the car builder a simple and easy interface for high voltage connections between the MODFRAME and the vehicle. Low voltage cables are directly connected to the individual components through easily accessible outdoor type low voltage connectors. The installation of the MODFRAME on the roof does not require any roof cut-out except if the manual operation is selected for the earthing device.

The frame is made of painted structural steel, designed and manufactured according to EN 15085

standards in our highly certified welding factor. It is designed according to EN 12663 standards for the structural requirements of railway vehicles. The customizable frame allows adaptation of the MODFRAME to different types of roof architecture and fixation.

The AC MODFRAME perfectly complements the AC MODBOX range where the same type of high voltage components can be integrated horizontally in a compact aluminium enclosure for installation on high speed trains and rail vehicles with a restricted roof gauge, or vehicles operated in harsh environmental conditions.

APPLICATION, TYPICAL EXAMPLE

AC/DC typical application

SAFETY FUNCTIONS

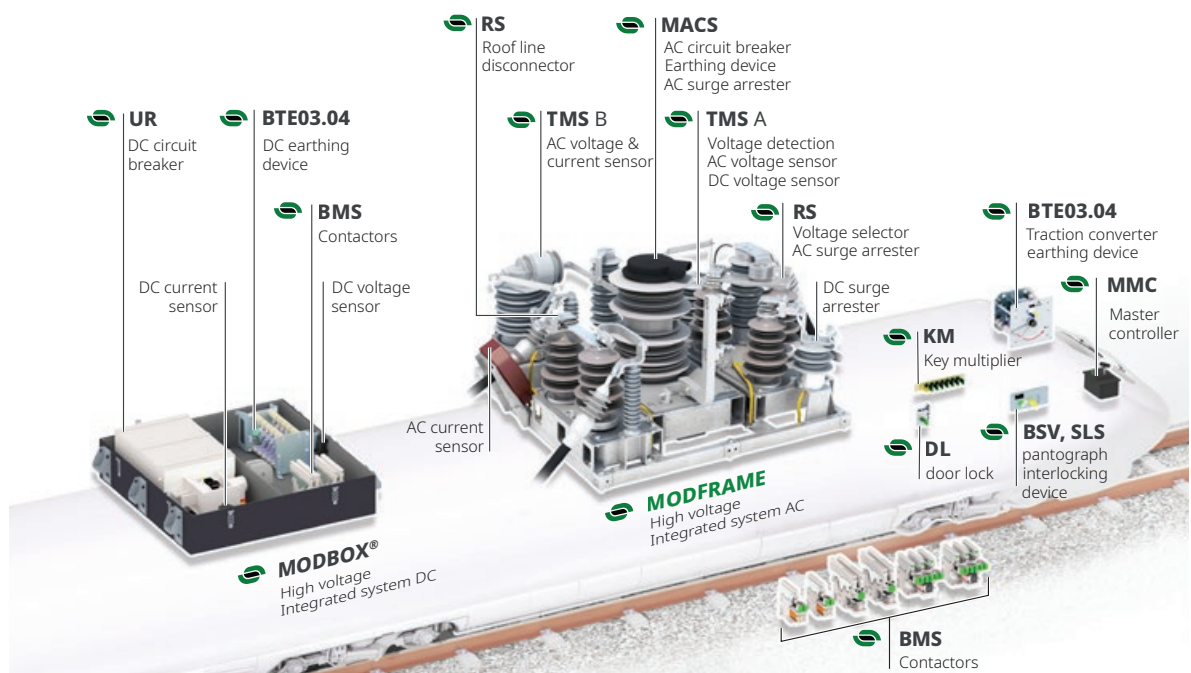
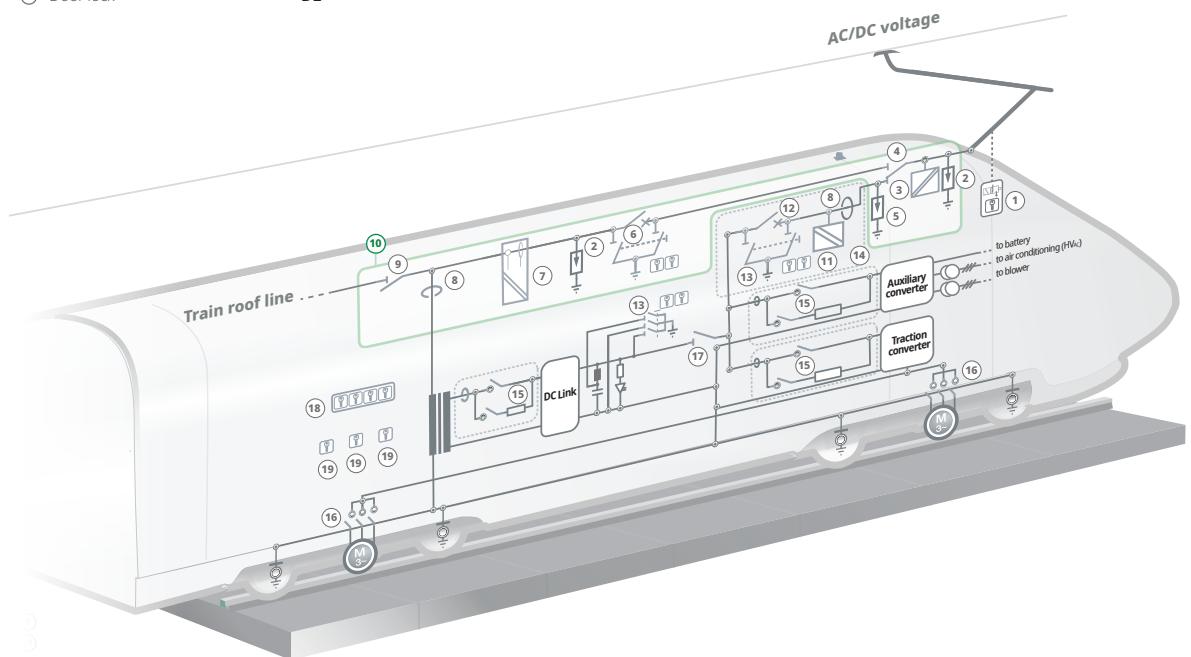
- ① Pantograph interlocking device **BSV, SLS**
- ② AC surge arrester
- ⑤ DC surge arrester
- ⑥ AC circuit breaker & earthing device **MACS**
- ⑩ High voltage integrated system AC **MODFRAME**
- ⑫ DC circuit breaker **UR**
- ⑬ Earthing device **BTE03.04**
- ⑭ High voltage integrated system DC **MODBOX®**
- ⑮ Key multiplier **KM**
- ⑲ Door lock **DL**

SWITCHING FUNCTIONS

- ④ Voltage selector **RS**
- ⑧ Roof line disconnector **RS, IS**
- ⑯ Contactors & modules **BMS, SEC, PCC, HS, PCM**
- ⑰ Permanent magnet synchronous motor isolating contactor **BMS**
- ⑱ Disconnector **XMS**

MEASUREMENT FUNCTIONS










- ③ AC & DC voltage sensor, voltage detection **TMS**
- ⑦ AC voltage & current sensor **TMS**
- ⑧ Current sensor (AC or DC)
- ⑪ DC voltage sensor



MAIN BENEFITS

- ✓ Reduced engineering work and risks
- ✓ More efficient logistics and installation
- ✓ Eliminates the need for roof cut-outs
- ✓ Reduced structural noise
- ✓ Great flexibility to adapt the MODFRAME's structure to the required roof components
- ✓ Great flexibility to adapt the MODFRAME's fixation to the roof constraints
- ✓ Limited additional weight and height compared to solutions with individual components
- ✓ One-stop shop for all components
- ✓ Key components of the Sécheron brand
- ✓ High expertise degree in electrical safety-switching-measuring components
- ✓ Reduced project overall costs
- ✓ Expert customer support
- ✓ Worldwide after-sales service

AC MODFRAME-TYPICAL INTEGRATED FUNCTIONS

FUNCTIONS	VOLTAGE [kV _{Ac}]	PRODUCTS	
Surge arrester	15 or 25 or 15 & 25 (Dual Voltage)		AC (and DC surge arrester if used on an AC/DC vehicle)
Measurement			Voltage sensor with optional voltage detection (also DC voltage sensor if used on an AC/DC vehicle)
			Voltage & current sensor with optional voltage detection (also DC voltage sensor if used on an AC/DC vehicle)
			Current sensor
AC circuit breaker			MACS
Earthing			2-pole earthing device (electric or manual)
Disconnecter			Voltage selector RS25...C (in case of AC/DC vehicle)
			Roof line disconnecter RS25.10D
			Roof line disconnecter and earthing RS25.10E

The quality and the reliability of the **AC MODFRAME** rely on several key factors. These include the deep know-how needed to integrate together high voltage components, as well as the quality and performances of the integrated components. In both areas and for decades, Sécheron has

developed unique expertise, highly valued by our customers worldwide. Naturally, Sécheron standard proven components are firstly used in **AC MODFRAME**, supplemented with equipment from first class suppliers

/// SÉCHERON COMPONENTS

AC vacuum circuit breaker
MACS Type

Brochure reference
SG325101Bxx



Roof disconnector
RS Type

Brochure reference
SP1870125Bxx



AC voltage and current sensors
TMS Type

Brochure reference
SA004770Bxx



/// THIRD PARTY COMPONENTS

AC surge arrester

Continuous voltage:
up to 35 kV



AC current measurement

Rated current up to
630 A (15 kV, 16.7 Hz)
or 400 A
(25 kV, 50/60 Hz)



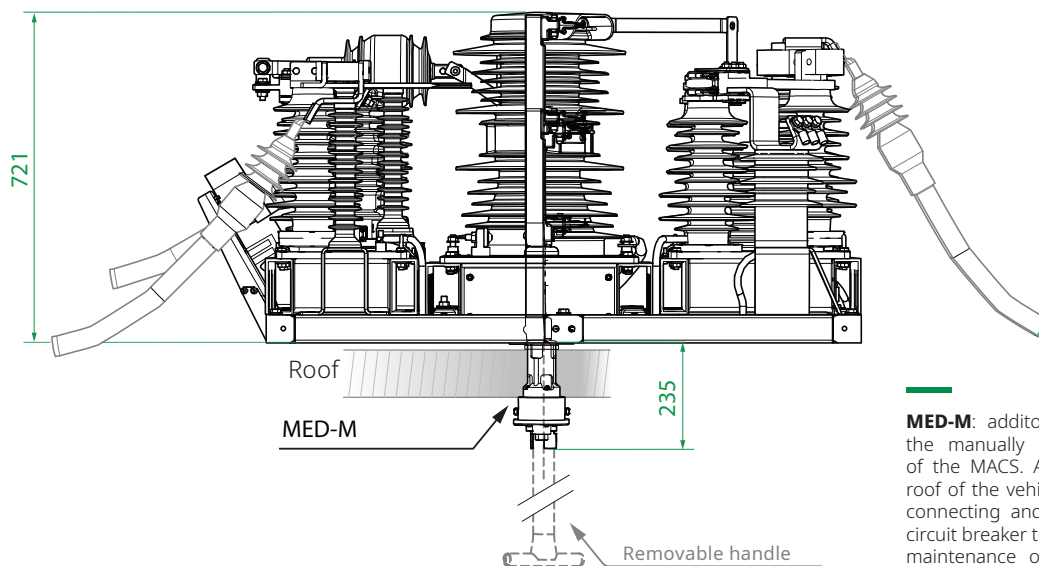
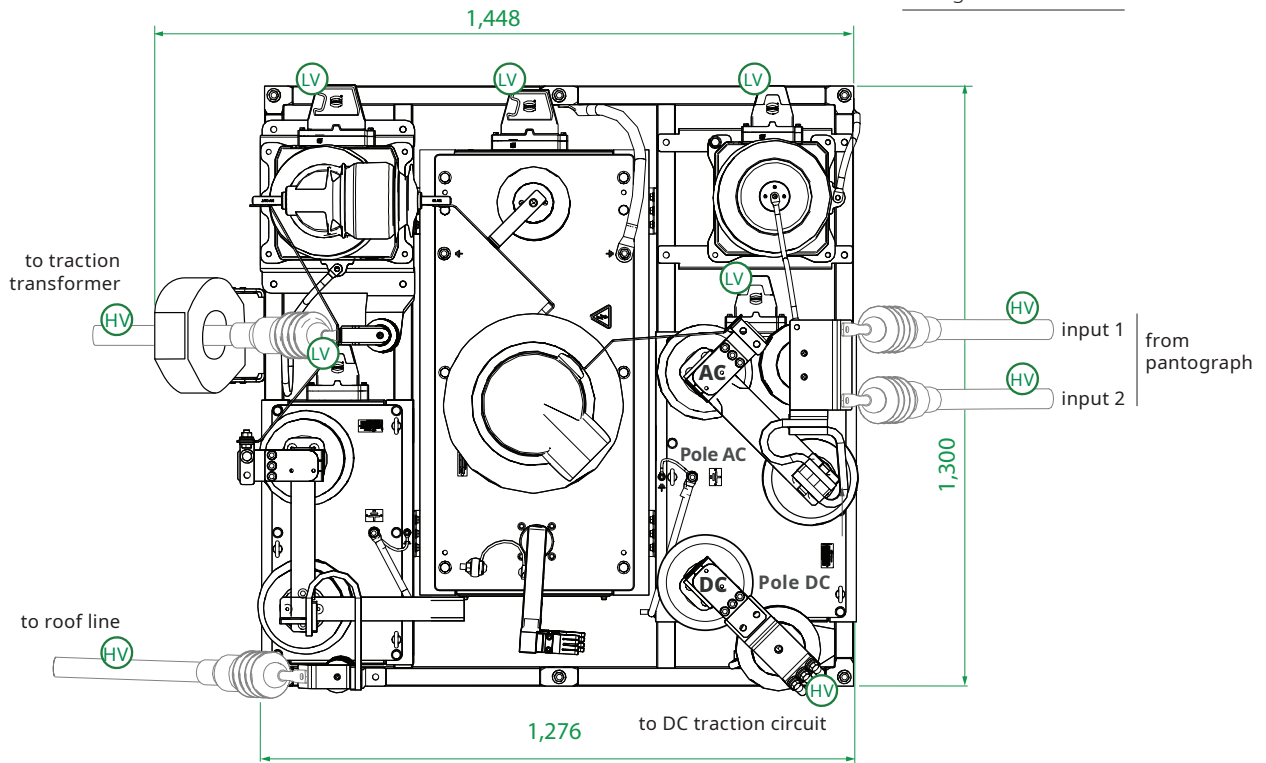
TYPICAL TECHNICAL DATASHEET

	Symbol	Unit	Single voltage		Dual voltage	
MAIN HIGH VOLTAGE CIRCUIT						
Nominal voltage	U_n	[kV]	15	25	15	25
Rated operational voltage	U_r	[kV]	17.25	27.5 or 31.5	17.25	27.5 or 31.5
Rated insulation voltage	U_{Nm}	[kV]	17.25	30 or 31.5	17.25	30 or 31.5
Rated operational frequency	f_r	[Hz]	16.7	50 or 60	16.7	50
Overtoltage category	OV		4	3 or 4	4	3 or 4
Rated impulse withstand voltage (1.2/50 μ s)	U_{Ni}	[kV]	125	125 or 170	125 or 170	
Rated power-frequency withstand voltage (50 Hz, 1 min)	U_a	[kV]	75	75 or 80	75 or 80	
Conventional free air thermal current ⁽¹⁾	I_{th}	[A]	up to 630	up to 400	up to 400 630	
Rated short-time withstand current (1 s)	I_{cw}	[kA]	25	20	25 20	
Short-time withstand current (0.1 s)	I_{cw}	[kA]	40	-	40	-
⁽¹⁾ at $T_{amb}=+40^{\circ}C$.						
HIGH VOLTAGE INTERFACE						
Cable plates for 15/25 kV insulated cable heads			Input: 1 Outputs: 1 or 2 ⁽²⁾			
⁽²⁾ For AC/DC rail vehicles where the AC MODFRAME can also integrate the DC surge arrester, a third output cable plate for the DC traction circuits is included.						
LOW VOLTAGE AUXILIARY CIRCUIT						
Nominal voltage	U_n	[Vdc]	24 to 110			
Voltage range			[0.7 - 1.25] U_n			
LOW VOLTAGE INTERFACE						
Connector type	Harting Han HPR					
OPERATING CONDITIONS						
Installation	Outdoor					
Minimum protection index for low voltage part	IP		65			
Altitude		[m]	$\leq 2,000$			
Working ambient temperature		[$^{\circ}C$]	-40 to +50			
Pollution index	PD		4			
APPLICABLE STANDARDS						
Insulation coordination	EN 50124-1 / IEC 62497-2					
Vibration & shock	IEC 61373: 2010 (Category 1 - Class A)					
EMC	EN 50121-3-2 / IEC 62236-3-2					
Environmental conditions	EN 50125 / IEC 62498					
Fire safety	EN 45545-2					
EXECUTION						
AC MODFRAME Colour	RAL 7046					

EXAMPLE OF DIMENSIONS

AC MODFRAME

Approximate weight :
406 kg



MED-M: additional equipment used with the manually operated earthing device of the MACS. Accessible from under the roof of the vehicle, it is used for manually connecting and disconnecting the MACS circuit breaker to its earthing device during maintenance operations, as well as for securing it in the safety position by means of key interlocks.

OVERVIEW OF AC ROOF SOLUTIONS

For the same functions to be installed on the roof of AC rail vehicles, Sécheron offers four different types of solutions, depending on the constraints of the vehicle, on the car builder's profile and on the support and partnership expected from Sécheron.

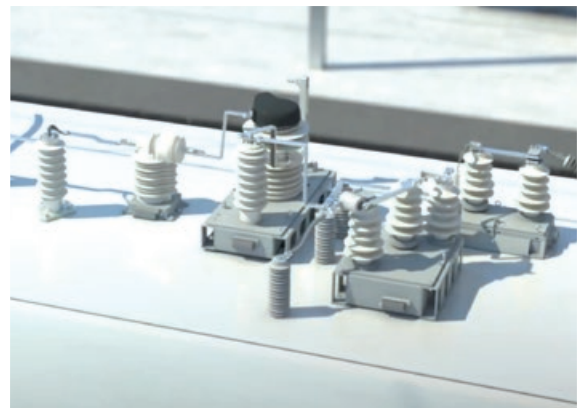
An attempt at comparative assessment of the different solutions and their benefits for the car builder and operator is proposed on page 8, on the basis of the components integrated on the MODFRAME as shown on page 2.

INDIVIDUAL COMPONENTS

// **Solution with roof cut-out**

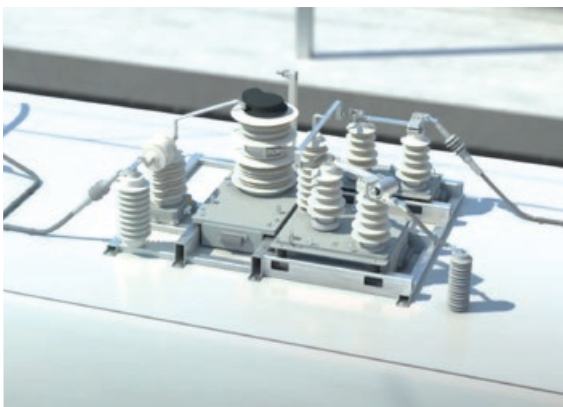


// **Solution with no roof cut-out**

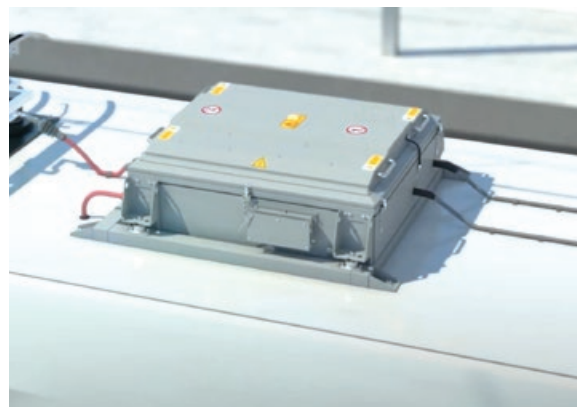


INTEGRATED SYSTEMS





// **AC MODFRAME**



// **AC MODBOX®**



AC ROOF SOLUTIONS - COMPARATIVE ASSESSMENT

CRITERIA		INDIVIDUAL COMPONENTS		INTEGRATED SYSTEMS	
		With roof cut-out	With no roof cut-out	AC MODFRAME	AC MODBOX
					
Approximate weight ⁽¹⁾	kg	A	A+15%	A+30%	A+50%
Maximum roof height for MACS (U _{Ni} = 125 kV)	mm	551	708	721	545
Approximate roof footprint ⁽²⁾	mm ²	S	S	S	S*2 ⁽²⁾
Noise confort	dB	☹️	😊	😊	😊😊
Installation flexibility		😊	😊	😊	☹️
Car builder's engineering costs	€	☹️	😊	😊😊	😊😊
Car builder's installation costs	€	☹️	😊	😊😊	😊😊
Car builder's manufacturing costs	€	☹️	😊	😊😊	😊😊
Maintenance costs	€	☹️	☹️	☹️	😊
Factory transit time	hours	☹️	☹️	😊😊	😊😊
Aerodynamic drag		☹️	☹️	☹️	😊
Protection against harsh environmental conditions		☹️	☹️	☹️	😊😊

Signature:

Name:

Place and date:

⁽¹⁾ Based on components integrated on the AC MODFRAME as shown on page 2.

⁽²⁾ Minimum estimate, as the largest AC MODBOX cannot integrate as many components as shown on the AC MODFRAME of page 2.



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SA016148BEN_A00-06.22