ELECTRICAL
SAFETY
SOLUTIONS

Sécheron

AC/DC VOLTAGE SENSOR & AC CURRENT SENSOR

Type **TMS**

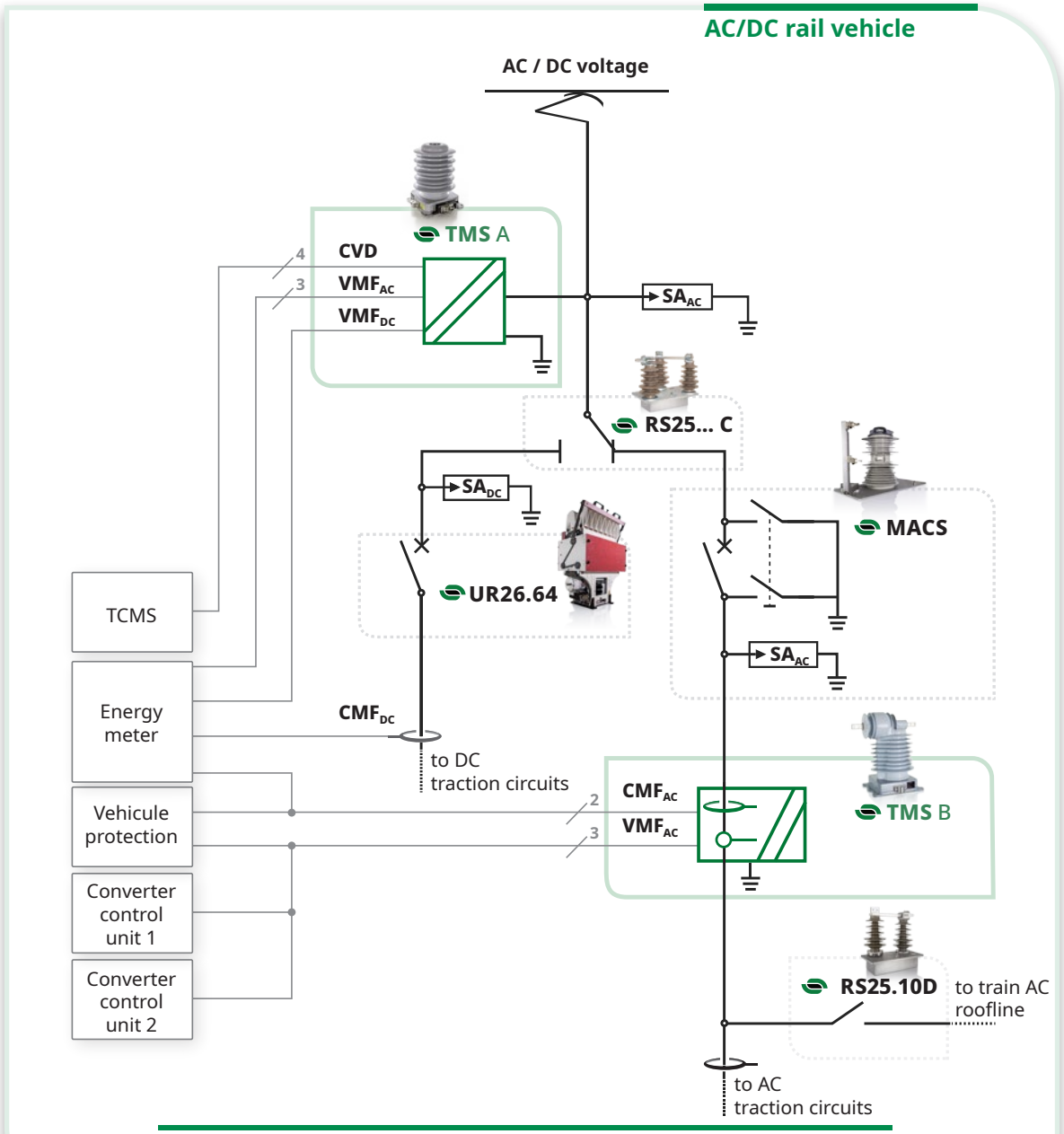
RAIL VEHICLES

GENERAL INFORMATION

Sécheron **TMS** is a medium voltage and current measuring sensor dedicated to rolling stock applications. It is used to deliver voltage and current signals to various on-board equipment such as energy meter, converter control units, vehicle control unit and vehicle protection devices. Its voltage detection capability allows the TMS to identify any AC or DC line voltage and transmit this information to the Train Control and Management System (TCMS).

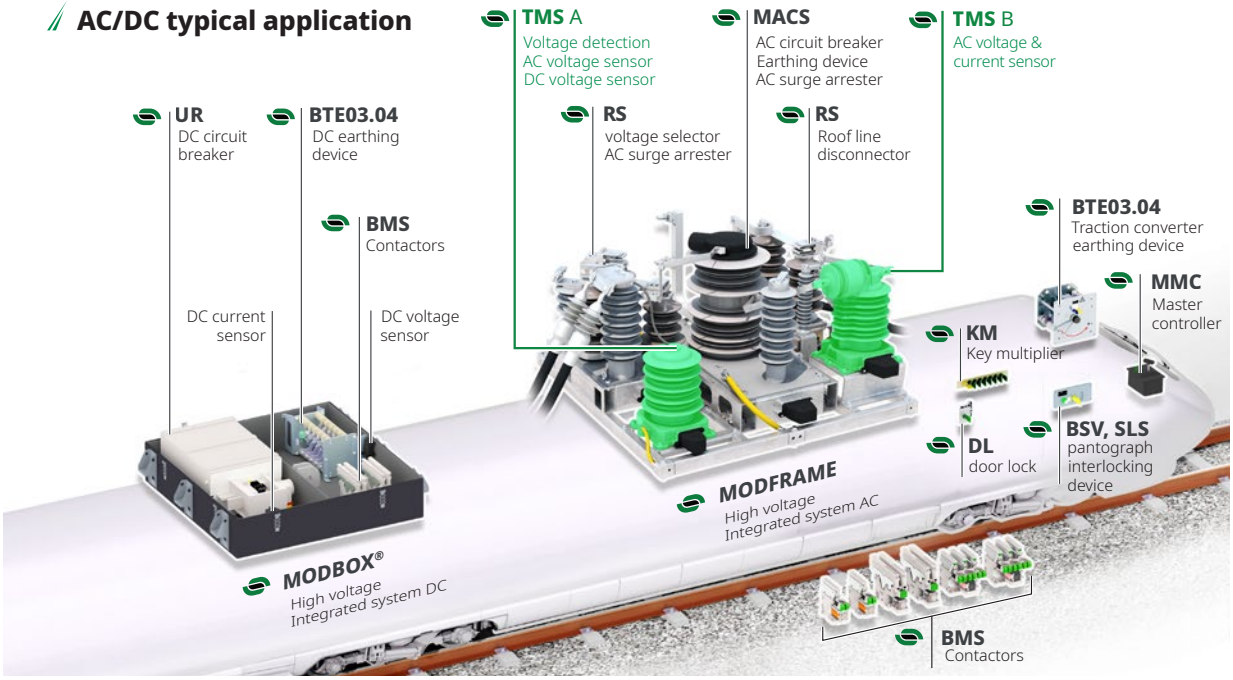
TMS measures any AC or DC line supply voltage and transmits safe isolated and accurate signals class 0,5 R. When delivered with the current measurement function, TMS also measures the vehicle AC input current with an accuracy class 0,5 R for the on-board energy measurement or class 0,5 for other on-board functions. TMS complies with EN 50463-2/IEC 62888-2 standards for on-board energy measurement and with IEC 61869-2 for other applications

APPLICATIONS, TYPICAL EXAMPLE



TMS A	Voltage sensor	**MACS**	AC vacuum circuit breaker with earthing device and surge arrester
TMS B	Voltage & current sensor	**UR26.64**	High-speed DC circuit breaker
CVD	Catenary Voltage Detection	**RS25...C**	AC/DC voltage roof selector
VMF$_{DC}$	DC Voltage Measurement Function	**RS25.10D**	Roof line disconnector
VMF$_{AC}$	AC Voltage Measurement Function	**SA**	Surge arrester
CMF$_{AC}$	AC Current Measurement Function		
CMF$_{DC}$	DC Current Measurement Function		

AC/DC typical application



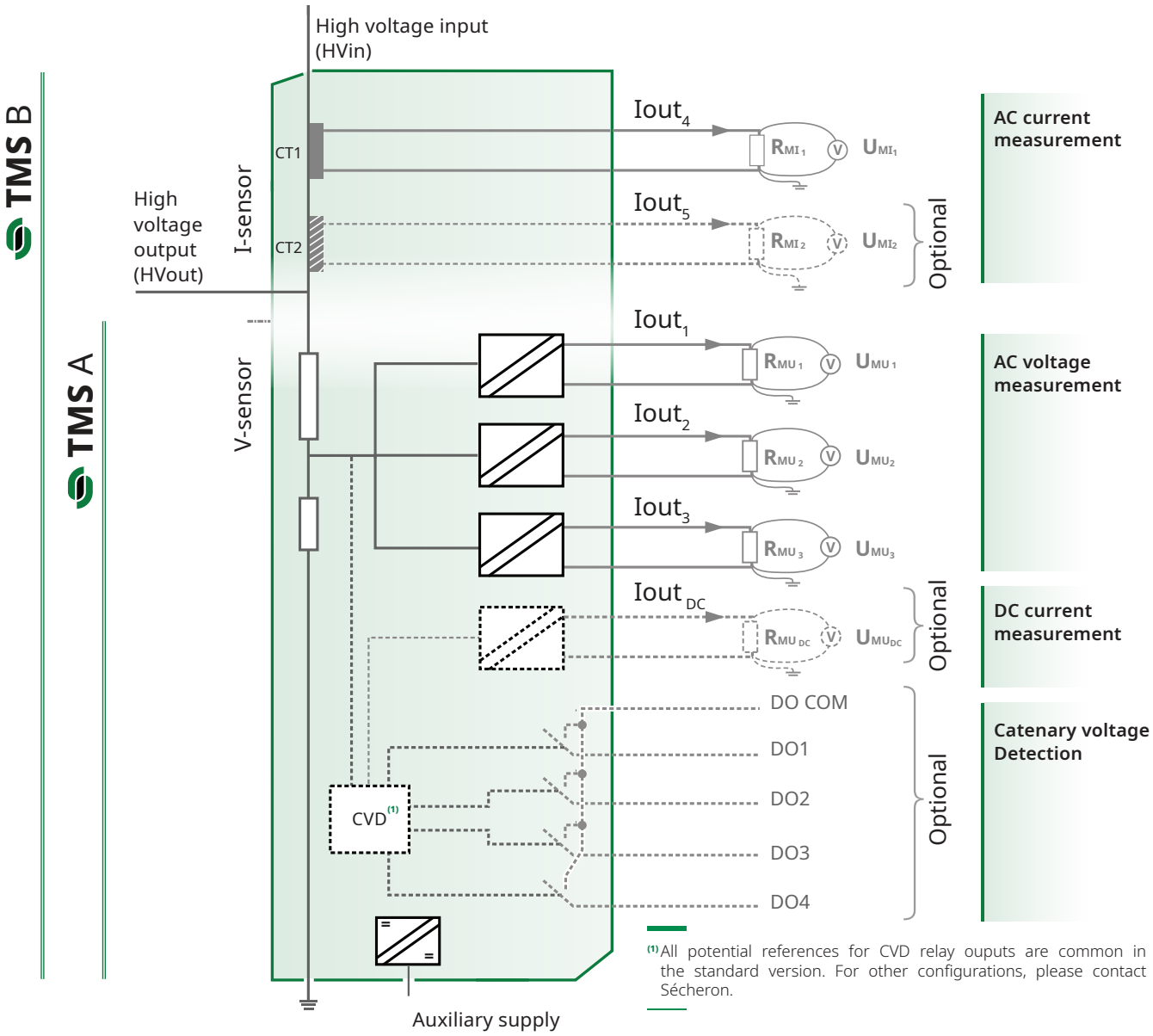
MAIN FEATURES

- Measurement of any AC catenary voltage between 11 kV and 25 kV with frequency between 16.7 and 60 Hz.
- Measurement of any DC catenary voltage between 750 V and 3 kV
- Measurement of vehicle input current from 100 A to 630 A (15 kV_{AC}) and from 60 A to 400 A (25 kV_{AC}). Other values on request.
- Catenary voltage detection function
- Insulation voltage 31.5 kV_{AC}.
- Impulse withstand voltage 170 kV.
- Suitable for indoor or outdoor installation.
- Suitable for energy measurement function (accuracy class 0,5 R) or other applications
- 1 or 3 outputs for AC voltage measurement
- 1 output for DC voltage measurement.
- 1 or 2 outputs for AC current measurement.
- 4 digital outputs for Catenary Voltage Dectection.
- Reference standards:
  EN 50463-2/ IEC 62888-2, IEC 61869-2,
  EN/IEC 60044-7, EN 50124-1/ IEC 62497-1,
  EN/IEC 61373, EN 50155, EN 45545-2.

MAIN BENEFITS

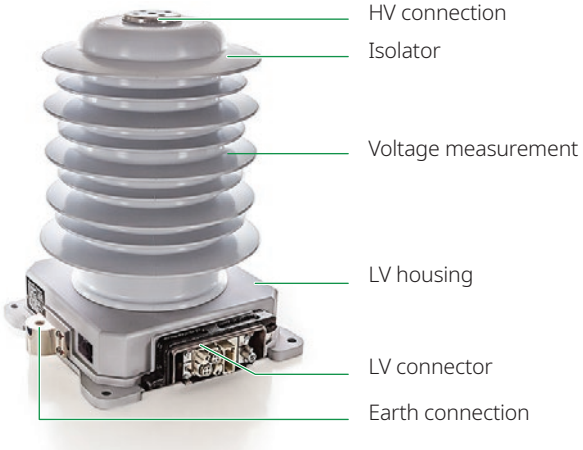
- Certified TSI Loc&Pas according to EN 50463-2.
- Multifunctional and multi-application device.
- Specific version dedicated only to energy measurement.
- No delay between input and output signals.
- Suitable for traction control and protection.
- Current loop transmission for noise immunity.
- Insulated outputs.
- Outputs compatible with Sécheron MACS AC circuit breaker for switching synchronization and protection functions.
- AC Voltage measurement output signals with optional offset for safety critical applications.
- Simple electronic architecture without embedded software.
- Inductive technology for current measurements.
- Compact & lightweight.
- Safe against internal arcs.
- Horizontal or vertical mounting.
- Thoroughly tested, including life time aging tests .
- Sécheron high experise in AC & DC medium voltage components and systems.
- Can also be delivered integrated in Sécheron's medium voltage integrated systems MODBOX and MODFRAME.

PRODUCT STRUCTURE & FUNCTIONAL SCHEME

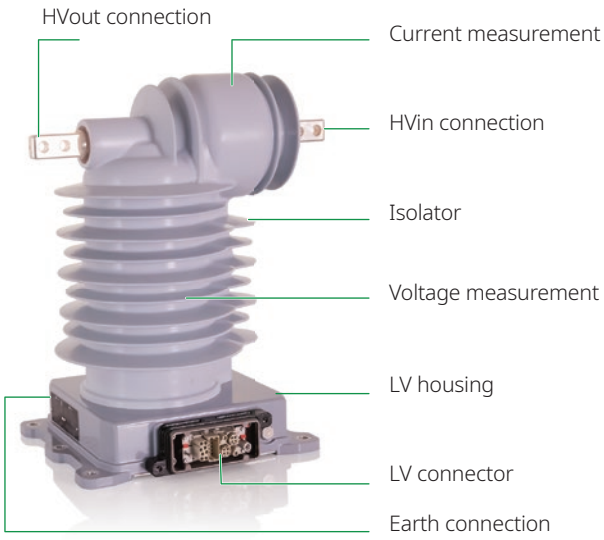


(1) All potential references for CVD relay ouputs are common in the standard version. For other configurations, please contact Sécheron.

TMS A – Voltage measurement



TMS B – Voltage & current measurements



REPLACING VOLTAGE TRANSFORMER (VT) BY SECHERON TMS

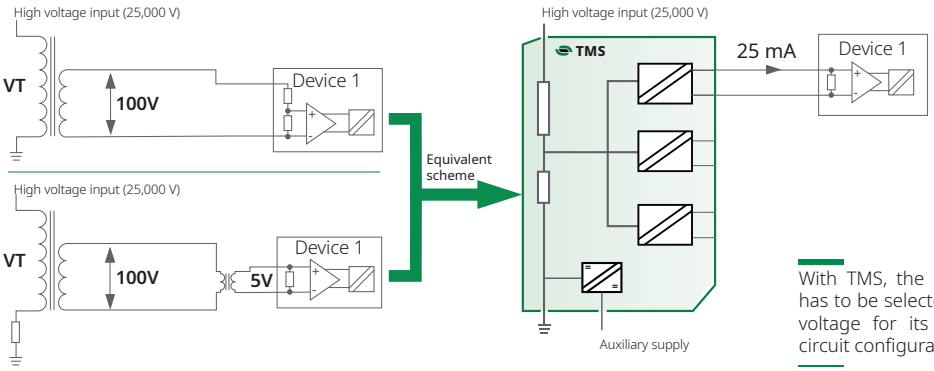
Customers accustomed to use voltage transformer (VT) will find at Sécheron appropriate support to adapt their measurement circuits using Sécheron TMS instead of voltage transformers.

Typical examples of measurement circuits using VT and their equivalent using TMS are shown below. For other circuit configurations, please contact Sécheron.

One voltage sensor output connected to a single device

Solutions with VT

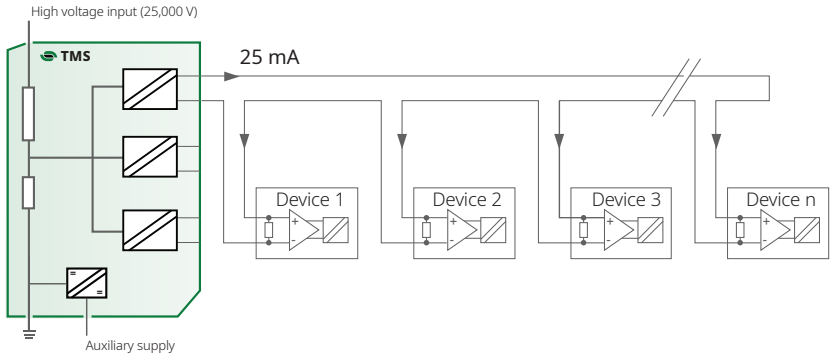
Solution with TMS



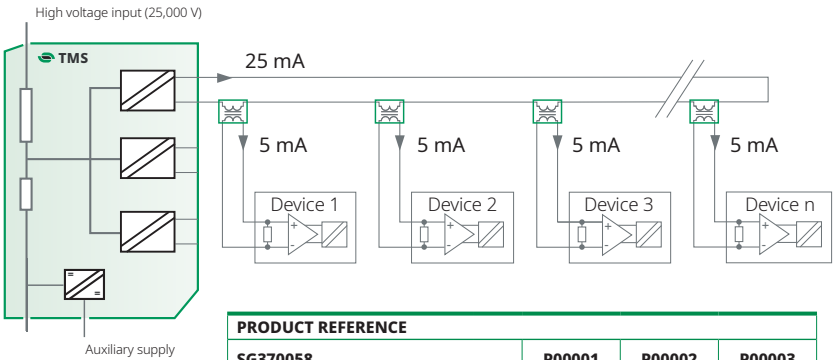
With TMS, the input resistor of Device 1 has to be selected keeping the same input voltage for its electronic circuits as for circuit configuration with VT.

One voltage sensor output connected to several devices

Solution with TMS



The beside scheme is the most simple and efficient way to supply several consumers (Device 1 to Device n) with one TMS output.



Individual isolating transformers

PRODUCT REFERENCE				
SG370058...		**P00001**	**P00002**	**P00003**
Nominal input current	[mA]	25		
transformation ratio		5:1 or 1:5	3:1 or 1:3	2:1 or 1:2
Frequency	[Hz]	16.7; 50; 60		
Power frequency voltage	[kV]	1.5		
Dimensions	[mm]	84x63x40		
Installation		Indoor		

If the consumers have to be isolated from each others, Sécheron proposes the following solution with individual isolating transformers for each consumer.

On request, Sécheron can also deliver such isolating transformers.

The value of 5 mA indicated on the scheme is just an example.

DATA FOR PRODUCT SELECTION

	Symbol	Unit	AC Measurement [1] 15 kV	AC Measurement [1] 25 kV	DC Measurement [2] 1.5 kV	DC Measurement [2] 3.0 kV
MAIN HIGH VOLTAGE CIRCUIT						
Rated voltage	$U_{n,\ VMF}$	[kV]	15	25	1.5	3.0
Rated frequencies	f_n	[Hz]	16.7	50, 60	DC	
Highest permanent voltage	U_{max1}	[V]	17.25	31.5	2.25	4.5
Highest non-permanent voltage	U_{max2}	[V]	19	32	2.25	4.5
Lowest non-permanent voltage	U_{min2}	[V]	11	17.5	1.0	2.0
Rated insulation Voltage	U_{Nm}	[kV]	31.5		31.5	
Maximum peak measured voltage	$U_{MAX,\ VMF}$	[kV]	50		2.25	4.5
Rated impulse voltage	U_{Ni}	[kV]	170 [3]			
Rated power frequency voltage (50Hz/60s)	U_a	[kV]	80			
Overvoltage category	OV		4			
Clearance distances		[mm]	≥ 310			
Creepage distances		[mm]	830 (TMS A) / 794 (TMS B)		830 (TMS A) / 794 (TMS B)	
Rated primary current for Current Measurement Function	$I_{n,\ CMF}$	[A]	100 to 630 [4]	60 to 400 [4]	Not applicable	
Rated continuous thermal current	$I_{CMF,\ cth}$	[A]	756 [4]		Not applicable	
Rated short-time thermal current (rated short-time current)	$I_{CMF,\ th}$	[kA/s]	25 / 1 and 40 / 0.1		Not applicable	
Rated dynamic current (rated peak short-time current)	$I_{CMF,\ dyn}$	[kA]	63		Not applicable	

[1] Other rated primary voltages also possible: 12 kV/25 Hz, 12.5 kV/60 Hz. [2] Other rated primary voltage also possible: 0.75 kV.
[3] Also tested successfully at 185 kV for TMS A. [4] For other values, please contact Sécheron.

LOW VOLTAGE CIRCUITS

Analog outputs for AC voltage measurement

Number of output			3 insulated outputs	
Current loop output type		[mA]	B (Bipolar) or O (Offset)	
Output current (refer to graphics page 4)			Bipolar output type	Offset output type
- DC offset		[mA]	0 ± 0.1	30 ± 0.08
- Factor k (output/input ratio)		[mA/kV]	1	0.4
Measuring resistance	R_{MU}	[Ω]	10 to 200	
Maximum peak voltage on measuring resistance		[V]	±10	
Accuracy			Class 0,5 R (EN 50463-2 / IEC 62888-2) & Class 1 (EN/IEC 60044-7)	
Bandwidth at -3 dB		[Hz]	≥ 2,500	
Rated power frequency voltage (50Hz/60s) (against earth and between outputs)	U_a	[kV]	1.5	
Fault protection			Protected against short-circuits and open circuits	
Maximum inductance in series with measuring resistance		[mH]	1	
Maximum capacitance in parallel to measuring resistance		[nF]	33	
Earth potential reference EN50155:2017			Shall not be allowed to float	

Analog output for DC voltage measurement (combined with CVD function)

Number of outputs			1 insulated output
Current loop output type		[mA]	B (Bipolar)
Output current for nominal input voltage		[mA]	
0.75 kV			20
1.5 kV			20 mA (in case of single voltage 1.5 kV) / 10 mA (in case of dual voltage 1.5 kV/3. kV)
3.0 kV			20
Measurement resistance	R_{MU}	[Ω]	10 to 330
Maximum peak voltage on measuring resistance		[V]	±10
Accuracy			Class 0,5 R (EN 50463-2 / IEC 62888-2)
Bandwidth at -3 dB		[Hz]	≥ 2,500
Rated power frequency voltage (50Hz/60s) (against earth and between outputs)	u_a	[kV]	1.5
Fault protection			Protected against short-circuits and open circuit
Maximum inductance in series with R_{MU}		[mH]	1
Maximum capacitance in parallel with R_{MU}		[nF]	33
Earth potential reference EN50155:2017			Shall not be allowed to float

DATA FOR PRODUCT SELECTION (suite)

	Symbol	Unit	
LOW VOLTAGE CIRCUITS (suite)			
Analog outputs for AC current measurement			
Number of currents outputs			1 or 2 (insulated floating outputs)
Designation			CT1 / CT2
Accuracy class			0,5R [6] / 0,5 [6]
			EN 50463-2/IEC 62888-2 / EN/IEC 61869-2
Rated transformation ratio ($I_{n, CMF}$ / I_{ouput})	k_r		400 [6]
Rated resistive burden	R_b	[Ω]	2 [6]
Burden range		[Ω]	0 to 2 [6]
Rated output power, Rb x ($I_{n, CMF}$ / kr)^2		[VA]	2 (for $I_{n, CMF}$ = 400 A) [6]
		[VA]	5 (for $I_{n, CMF}$ = 630 A) [6]
Rated power-frequency voltage (50 Hz / 60 s)	U_a	[kV]	3
Fault protection			Protected against short-circuits and open circuit
Earth potential reference EN50155:2017			Shall not be allowed to float

[6] For other values, please contact Sécheron.

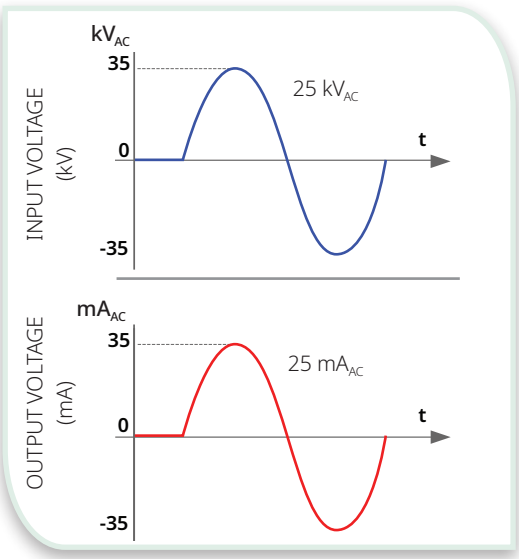
Digital outputs for CVD (Catenary Voltage Detection)			
Number of digital outputs			4 individual relays (Form A)
Minimum switching current		[mA]	1
Rated current		[A]	2.0
Insulation resistance		[MΩ]	> 100
Rated power-frequency withstand voltage to ground (50 Hz)	U_a	[V]	1,500
Auxiliary supply			
Auxiliary supply voltage	U_n	[V_{DC}]	24 to 110
Auxiliary supply voltage range		[V_{DC}]	0.7 U_n - 1.25 U_n
Auxiliary supply power		[W]	<10
Rated power frequency voltage (50 Hz / 60 s)	U_a	[kV]	1.5
Low voltage interface			
Connector type			Harting Han® HPR

OPERATING CONDITIONS			
Installation			Indoor / Outdoor
Altitude		[m]	≤ 2,000
Working ambient temperature	T_{amb}	[°C]	-40 to +70
Pollution degree			PD4
Protection Index (low voltage circuit)		[IP]	66 and 67

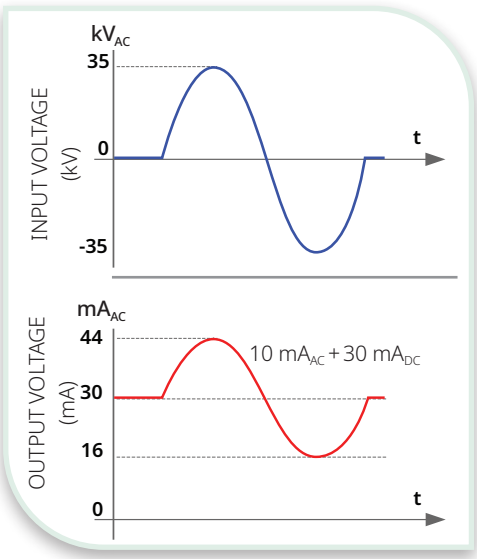
ANALOG OUTPUT CONFIGURATION FOR AC VOLTAGE MEASUREMENT

For DC voltage measurement refer to page 12.

Bipolar type current output



Offset type current output

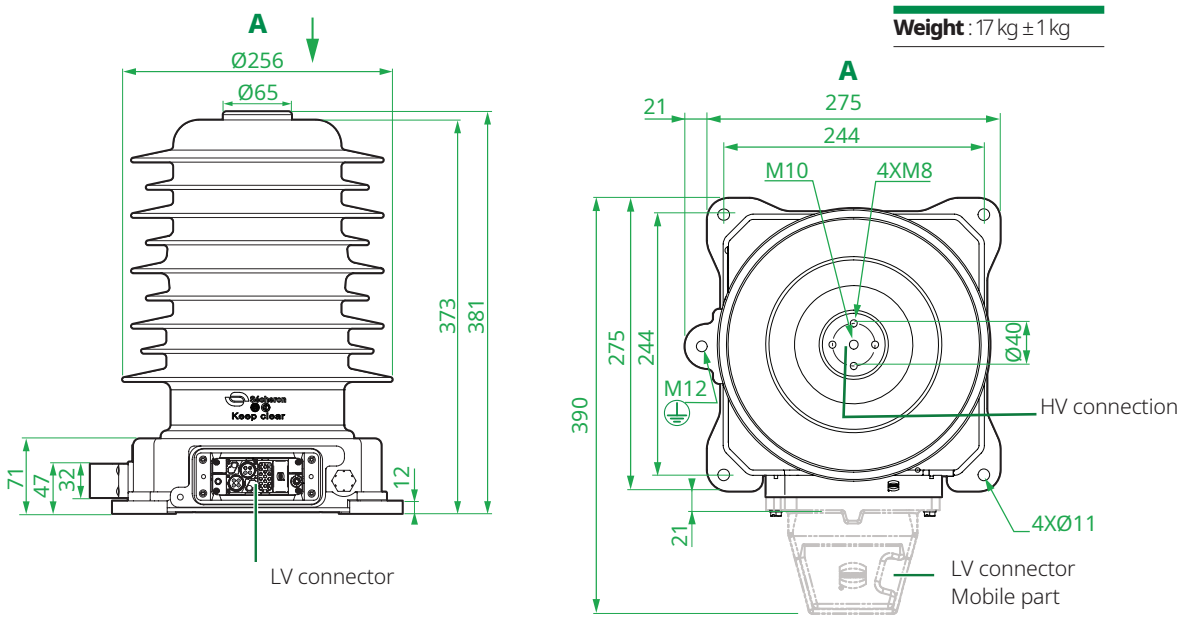


PRODUCT INTEGRATION

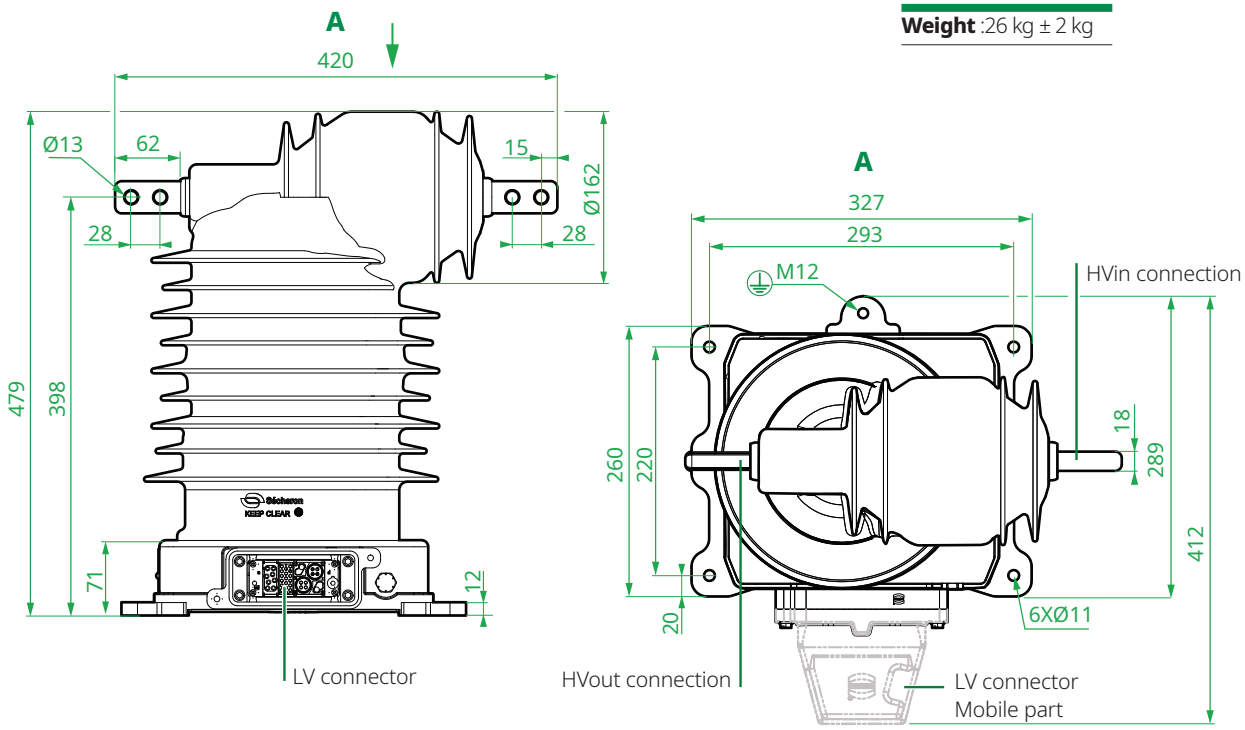
DIMENSIONS

Dimensions without tolerances are indicative.
All dimensions are in mm. The maximum allowed flatness deviation of the support frame is 1 mm.

TMS – Voltage measurement (vertical or horizontal installation)



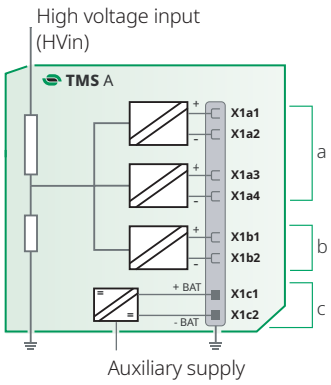
TMS – Voltage & current measurements (vertical installation)



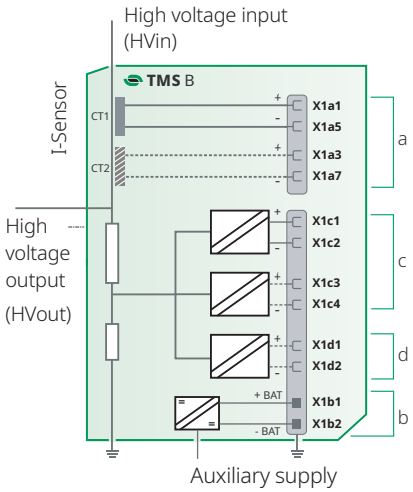
LOW VOLTAGE WIRING DIAGRAM

(HARTING HAN® CONNECTOR)

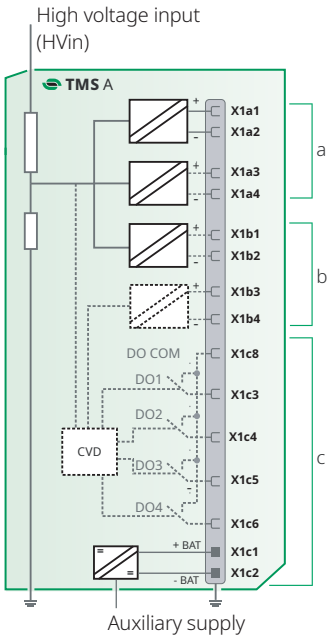
TMS – Voltage measurement



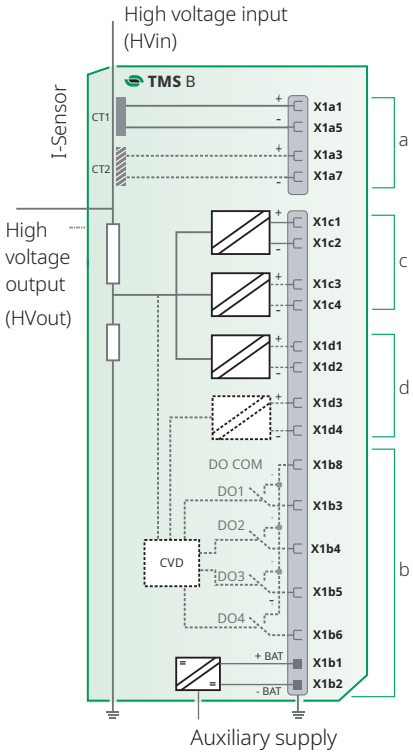
TMS – Voltage & current measurements

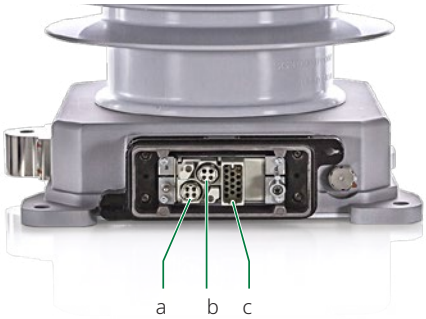


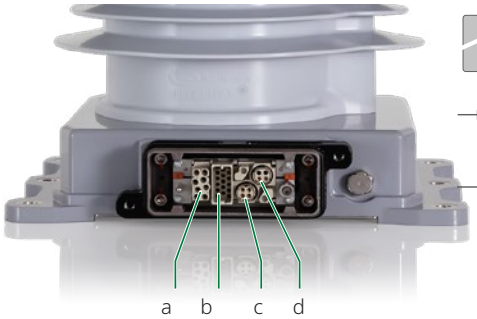
TMS A – Voltage measurement + CVD function



TMS B – Voltage & current measurements + CVD function







LV connector

LV connector female pin

LV connector male pin

LV MOBILE CONNECTOR (SEPARATELY ORDERED ITEM)

Mobile connector - Kits references for ordering for **TMS** A **(Voltage measurement)**										
Type	Number of pin						Cable gland	Cable entry	Sécheron's reference	
	Supply (X1c)	**VMF** (X1a, X1b)	**VMF (DC)** (X1b)	**CMF** (Not Applicable)		**CVD** (X1c)				
	Size 1.5 mm²			Size 1.5 mm²	Size 2.5 mm²	Size 1.5 mm²				
Harting Han® HPR 16B	2	6	-	0	0	-	M32	Straight	SG370027R10001	
								Side	SG370027R10002	
							M40	Straight	SG370027R10003	
								Side	SG370027R10004	
Harting Han® HPR 16B	2	6	2	0	0	5	M32	Straight	SG370027R10011	
								Side	SG370027R10012	
							M40	Straight	SG370027R10013	
								Side	SG370027R10014	

Mobile connector - Kits references for ordering for **TMS B (Voltage & current measurement)**										
Type	Number of pin						Cable gland	Cable entry	Sécheron's reference	
	Supply (X1b)	**VMF** (X1c, X1d)	**VMF (DC)** (X1d)	**CMF** (X1a)		**CVD** (X1b)				
	Size 1.5 mm²			Size 1.5 mm²	Size 2.5 mm²	Size 1.5 mm²				
Harting Han® HPR 16B	2	6	-	4	4	-	M32	Straight	SG370032R10001	
								Side	SG370032R10002	
							M40	Straight	SG370032R10003	
								Side	SG370032R10004	
Harting Han® HPR 16B	2	6	2	4	4	5	M32	Straight	SG370032R10011	
								Side	SG370032R10012	
							M40	Straight	SG370032R10013	
								Side	SG370032R10014	

For CMF output signals, the cable size will depends on the output current that is function of the primary current value. Therefore the LV connector kits includes 4 pins (2 for CT1 and 2 for CT2) of each sections to enable the car builder to select the one suited to its project.

OPTIONS
(SUBJECT TO ADDITIONAL COSTS)

CATENARY VOLTAGE DETECTION (CVD)

When this function is selected, the TMS is equipped with an additional module that includes 4 switching relays. The combination of the relay's output signals provides the information related to the line voltage detected by the TMS as shown in the below table.

The thresholds for activation and deactivation of these relays are configurable, as well as their reaction time to get adapted to the projects' needs.

STATE	Description	D01	D02	D03	D04
NO POWER	TMS CVD not supplied	0	0	0	0
NO NETWORK	No valid network recognized	1	1	1	1
15 kV - 16.7 Hz (AC network 1)	15 kV_{AC} – 16.7 Hz detected as valid	1	0	0	1
25 kV - 50/60 Hz (AC network 2)	25 kV_{AC} - 50 / 60 Hz detected as valid	0	1	1	0
DC 1.5 kV [1] (DC network 1)	1.5 kV_{DC} system detected as valid	0	0	1	1
DC 3.0 kV (DC network 2)	3 kV_{DC} system detected as valid	1	1	0	0
DOx = 0 means relay is OPEN ; DOx = 1 means relay is CLOSED					
Any other combination of relay outputs than the one indicated in this table should be considered as a system error.					

[1] Can also be used to detect DC 0.75 kV in case of dual AC/DC (0.75 kV) vehicle.

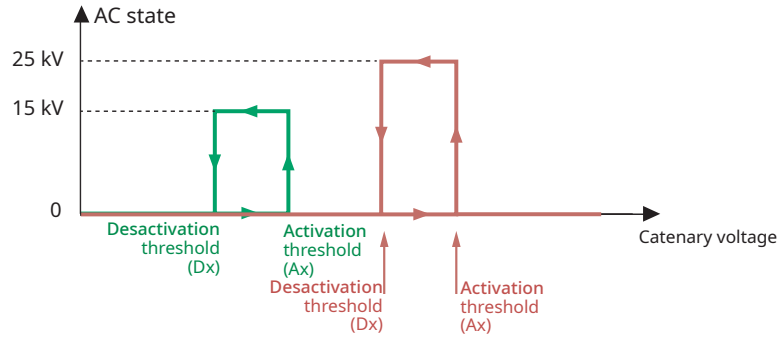
When USA mode is configured

STATE	Description	D01	D02	D03	D04
NO POWER	TMS CVD not supplied	0	0	0	0
NO NETWORK	No valid network recognized	1	1	1	1
12 kV - 25 Hz (AC network 1)	12 kV_{AC} – 25 Hz detected as valid	1	0	0	1
12.5 kV - 60 Hz (AC network 2)	12.5 kV_{AC} – 60 Hz detected as valid	1	1	0	0
25 kV - 60 Hz (AC network 3)	25 kV_{AC} – 60 Hz detected as valid	0	1	1	0
DC 0.75 kV (DC network 1)	0.75 kV_{DC} – system detected as valid	0	0	1	1
DOx = 0 means relay is OPEN ; DOx = 1 means relay is CLOSED					
Any other combination of relay outputs than the one indicated in this table should be considered as a system error.					

Digital outputs technical data

- Rated insulation 1.5 kV, 50 Hz
- Rated current 2 A
- Min switching current 1 mA
- Configurable thresholds
- Configurable switching reaction time
- In case of detection of 1.5 kV_{DC} or 3 kV_{DC}, the DC voltage measurement function class 0,5 R (VMF_{DC}) and related output are automatically activated, if this function is selected.

Relays activation and deactivation thresholds for AC voltage detection



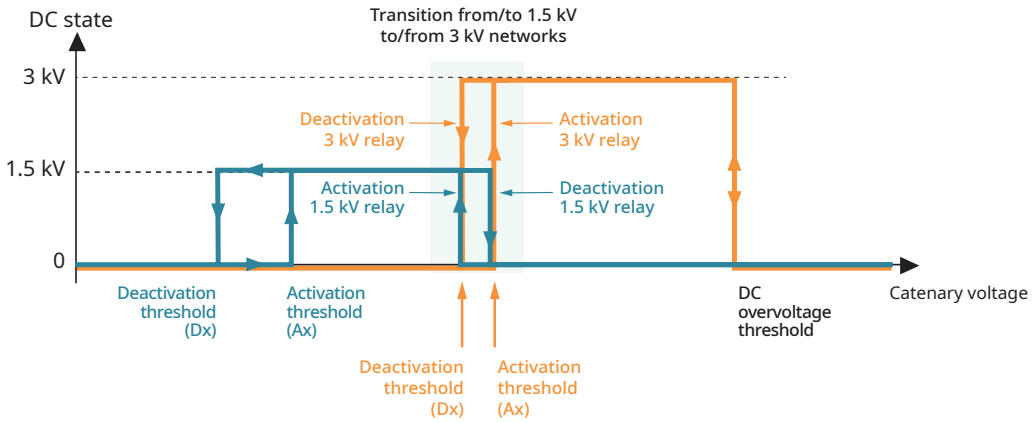
For AC voltage, both the voltage and frequency are detected.

Network nominal voltage	Activation threshold "Ax"	Deactivation threshold "Dx"	Measurement duration before activation/ deactivation of relays
	Ax selection range [kV]	Dx selection range [kV]	Selection range T_{Ax}, T_{Dx} [ms]
15 kV (16.7 Hz)	7 to 12	(0.75 to 0.98)*Ax	300 to 3,000
25 kV (50/60 Hz)	12 to 19		
12/12.5 kV (25/60 Hz)	7 to 12		

Digital outputs technical data

- AC threshold accuracy 500 V (over the entire temperature range)
- Activation/deactivation time calibrated at network nominal voltage

Relays activation and deactivation thresholds for DC voltage detection



Network nominal voltage	Activation threshold "Ax"	Relay activation threshold "Dx"	Measurement duration before activation/ deactivation of relays
	Ax selection Range [kV]	Dx selection Range [kV]	selection Range T_{Ax}, T_{Dx} [ms]
0.75 kV_{DC}	0.4 to 1.0	(0.75 to 0.98)xAx	300 to 3,000
1.5 kV_{DC}	0.4 to 1.0		
3.0 kV_{DC}	1.8 to 2.3	(0.75 to 0.99)xAx	

Digital outputs technical data

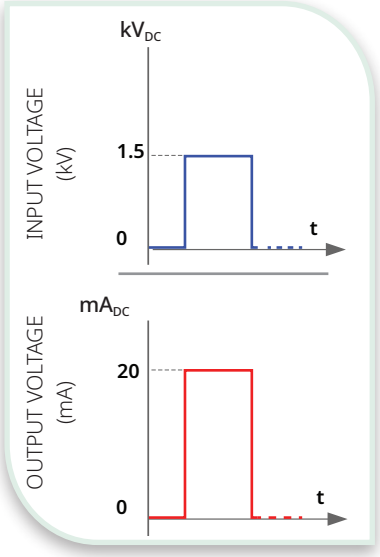
- DC threshold accuracy 50 V (over the entire temperature range)
- Activation/deactivation time calibrated at network nominal voltage

DC VOLTAGE MEASUREMENT CLASS 0,5 R (VMF_{DC})

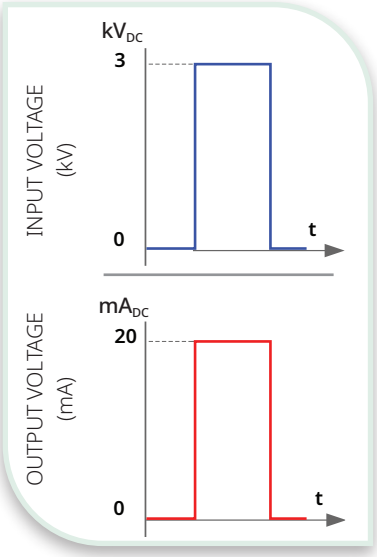
This function can be selected only if the previous Catenary Voltage Detection function (CVD) has been selected. This function is intended for energy measurement and complies to the requirements of standards EN 50463-2 / IEC 62888-2.

Because of its specific assignment, this signal is only provided as bipolar output type.
The DC voltage measurement function is activated only in case a DC line voltage is detected by the CVD function.

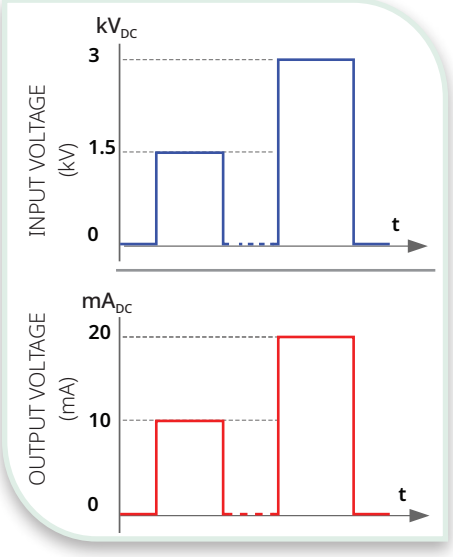
Single DC voltage vehicle
1.5 kV network configuration



Single DC voltage vehicle
3 kV network configuration



Bipolar type current output
1.5 & 3 kV network configuration

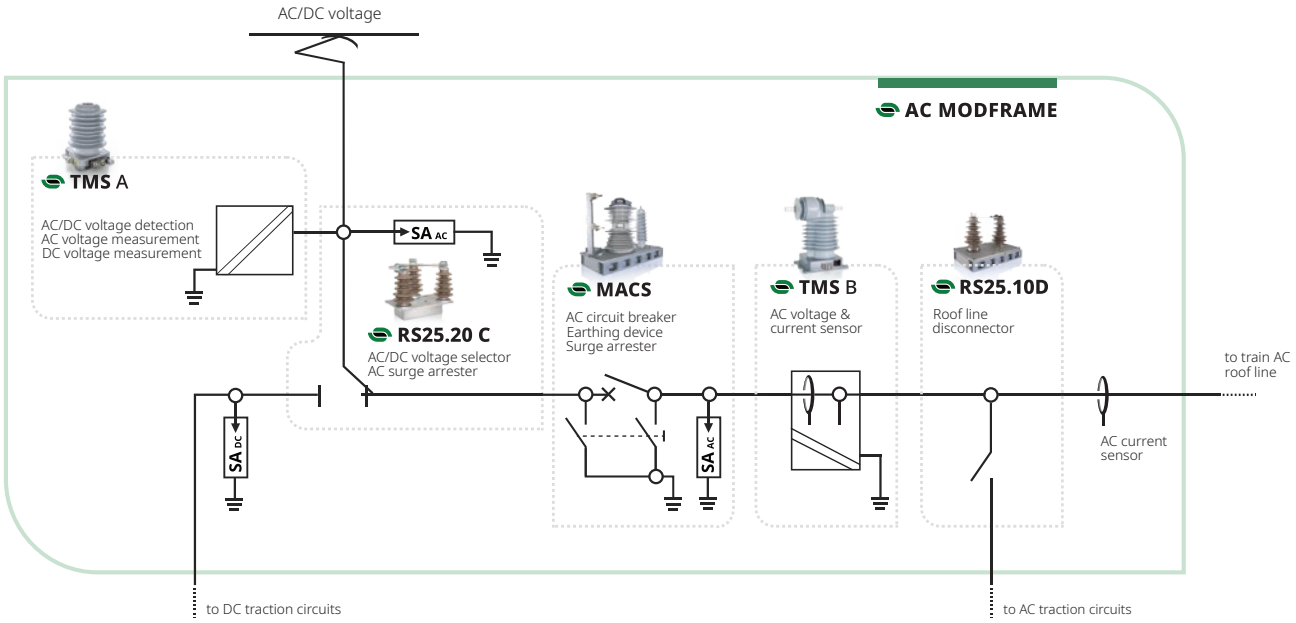


INTEGRATION OF TMS IN SECHERON AC HIGH VOLTAGE SYSTEMS

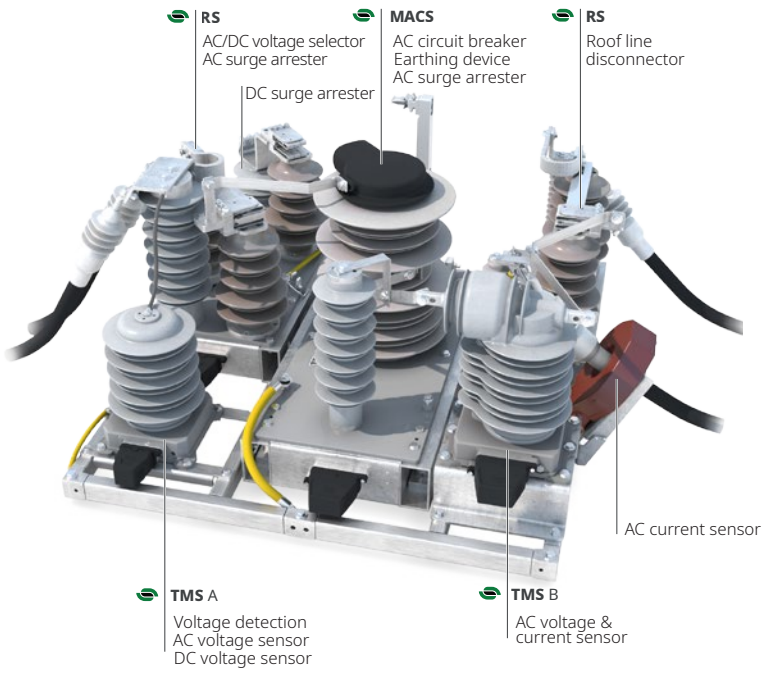
AC MODFRAME

The **AC MODFRAME** is an integrated solution developed for open-air rooftop installation on 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.

Typical applications



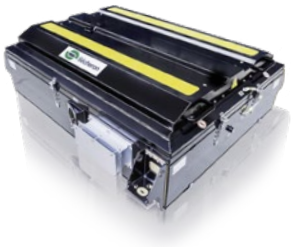
AC MODFRAME



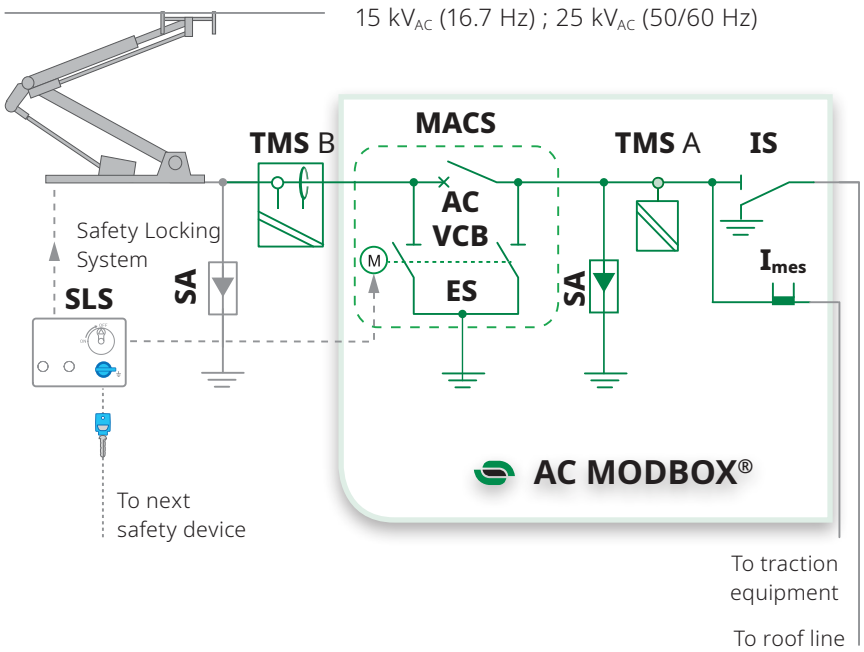
AC MODBOX®

Car builders looking for solutions to protect roof-mounted high-voltage equipment from harsh environmental conditions, or wishing to reduce the aerodynamic drag of vehicles on their high-speed train platforms consider our **AC MODBOX®.**

The Sécheron AC MODBOX® compact metal enclosure ensures a safe and efficient integration of our AC circuit breakers and various high- and low-voltage components, among which the voltage sensor type TMS. AC MODBOX can also be installed inside the vehicle or under its chassis.



Typical applications



SLS	:	Safety Locking System
SA	:	Surge arester
TMS A	:	AC voltage measurement
TMS B	:	AC voltage measurement & current sensor
MACS	:	Main AC switch
AC VCB	:	AC vacuum circuit breaker (MACS)
ES	:	Earthing device (MACS)
IS	:	Disconnect switch

COMPONENTS FOR AC VEHICLES

REFERENCE BROCHURES

HIGH VOLTAGE INTEGRATED SYSTEM

AC MODFRAME
SA016148BEN

AC MODBOX®
SG580044BEN

AC CIRCUIT BREAKER

MACS
SG325101BEN

OFFLOAD SWITCHES

RS
SP1870125BEN

XMS
SG200998BEN

BTE
SP1880136BEN

CONTACTORS

BMS..08-10
SG202168BEN

BMS..15-18
SG202454BEN

BSV_SLS
SP1880129BEN

KM-DL
SA004770BEN

BMS..08 FOR PMSM MOTOR
SA003724BEN

BMS 36.10
SA015795BEN

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.
- The bold characters of the designation code define the device type.

Example of customer's choice:	**TMS**	B	2	Z	E	1	01	ZZ	2
Line:	10	11	12	13	14	15	16	17	18

DESIGNATION CODE

(*) Options are subject to additional costs

Line	Description	Designation	standard	Options*	Customer's choice
10	Product type	Traction Measurement - TMS	**TMS**		**TMS**
11	Configuration	Voltage sensor	A		
		Voltage & current sensor	B		
12	AC input voltage for measurement function (class 0,5 R)	25 kV / 50-60 Hz & 15 kV / 16.7 Hz		1	
		25 kV / 50 Hz	2		
		25 kV / 60 Hz	3		
		15 kV / 16.7 Hz	4		
		25 kV / 50 Hz & 15 kV / 16.7 Hz		6	
		25 kV / 50-60 Hz		7	
		12 kV / 25 Hz; 12.5 kV / 60 Hz; 25 kV / 60 Hz		A	
13	DC input voltage for measurement function (class 0,5 R) - In case "2" is selected line 18				
		For other selection than "2" line 18 - Not Applicable	Z		
		1.5 kV		1	
		3.0 kV		2	
		Dual DC voltage 1.5 kV and 3.0 kV		3	
		0.75 kV		4	
14	Voltage Measurement Function - output configuration				
	Single or dual AC voltage	1B (Bipolar) (1)	E		
		1B (Bipolar) + 2O (Offset)	A		
		2B (Bipolar) + 1O (Offset)		B	
		3B		C	
		3O		D	
15	Low Voltage connector type	Harting Han® HPR	1		
16	Current Measurement Function CT1 (2) (3)	Not Applicable	ZZ		
	Class 0,5 or 0,5 R | $I_{n,CMF}$: 60-400 A at 25 kV/50-60 Hz | $I_{n,CMF}$= 100-630 A at 15 kV/16.7 Hz		01		
		Other characteristics (4)		_	
17	Current Measurement Function CT2 (2) (3)	Not Applicable	ZZ		
	Class 0,5 or 0,5 R| $I_{n,CMF}$: 60-400 A at 25 kV/50-60 Hz | $I_{n,CMF}$= 100-630 A at 15 kV/16.7 Hz		01		
		Other characteristics (4)		_	
18	Integrated Catenary Voltage Detection (CVD)	Not Applicable	Z		
		Yes - Mutisystem AC (5)		1	
		Yes - Multisystem AC & DC (5)		2	

_

(1) Only for TMS (voltage & current sensor) with one current measurement (CT1 - Code 01 digit 16) and class 0,5 R. • (2) Current measurement function only possible if "Voltage & current sensor " selected line 11. • (3) The nominal current value within the selected range must be indicated on the next page for the test calibration purpose. • (4) In case "other characteristics" is selected, please define precisely the requirements for each CT: applicable standards, class of precision, frequencies, nominal current, rated output power and other important characteristics. • (5) Activation and deactivation data to be indicated at the following page, if the catenary voltage detection function is selected.

Mobile connector kit to be ordered separetely refer to page 10:

- TMS A (without CVD) : ☐ SG370027R10002 TMS A (with CVD) : ☐ SG370027R10012 Other references : ☐ SG370027R100___
- TMS B (without CVD) : ☐ SG370032R10002 TMS B (with CVD) : ☐ SG370032R10012 Other references : ☐ SG370032R100___

Optional isolating transformers for TMS voltage outputs according to page 5 :

- Ratio 5:1 or 1:5 : ☐ SG370058P00001 Ratio 3:1 or 1:3 : ☐ SG370058P00002 Ratio 2:1 or 1:2 : ☐ SG370058P00003

DESIGNATION CODE FOR ORDERING (SUITE)

Accuracy class & nominal current value for CT1, CT2

(relates to note [3] of the designation code table page 15)

Data for CT1 (if line 16 is selected)

Accuracy class: ☐ 0,5 R ☐ 0,5

____ A @ ____ Hz

____ A @ ____ Hz (second value in case multisystem application is selected line 12)

Data for CT2 (if line 17 is selected)

Accuracy class: ☐ 0,5 R ☐ 0,5

____ A @ ____ Hz

____ A @ ____ Hz (second value in case multisystem application is selected line 12)

Settings for catenary voltage detection

(relates to note [5] of the designation code table page 15, if this function is selected)

Activation thresholds (Ax), Deactivation thresholds (Dx) and times before activation/deactivation

(For selection range refer to info page 11-12)

Please indicate the threshold settings required for voltage detection of your project vehicles, for each of the AC and/or DC networks on which these vehicles will operate. If there is no particular customer's requirement for the activation threshold, Sécheron recommends this value to be ≤ to 80% of the minimum network voltage.

All world railway networks except US market

AC network 1 - f_n : 16.7 Hz
Threshold "A_1" ____ kV
Threshold "D_1" ____ kV

AC network 2 - f_n : ____ Hz (50 or 60 Hz)
Threshold "A_2" ____ kV
Threshold "D_2" ____ kV

DC network 1 - ____ kV (1.5 or 0.75 kV)
Threshold "A_3" ____ kV
Threshold "D_3" ____ kV

DC network 2 - 3 kV
Threshold "A_4" ____ kV
Threshold "D_4" ____ kV

Required times for relays activation and deactivation

T_A before activation ____ ms

T_D before deactivation ____ ms

Specific US networks

AC network 1 : 12 kV - 25 Hz
Threshold "A_1" ____ kV
Threshold "D_1" ____ kV

AC network 2 : 12.5 kV - 60 Hz
Threshold "A_2" ____ kV
Threshold "D_2" ____ kV

AC network 3 : 25 kV - 60 Hz
Threshold "A_3" ____ kV
Threshold "D_3" ____ kV

DC network 1 - 0.75 kV
Threshold "A_4" ____ kV
Threshold "D_4" ____ kV

Required times for relays activation and deactivation

T_A before activation ____ ms

T_D before deactivation ____ ms

Signature:

Name:

Place and date:

Sécheron

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