ELECTRICAL
SAFETY
SOLUTIONS

Sécheron

PANTOGRAPH INTERLOCKING DEVICES

Type **BSV** & **SLS**

RAIL VEHICLES

GENERAL INFORMATION

To perform inspections and maintenance operations on high voltage equipment of rail vehicles, there can be no compromise with Human Safety. To protect operators against electric hazards, each car builder develops its own concept based on its own safety philosophy and relevant applicable standards (EN50153, UIC533, UIC612-0).

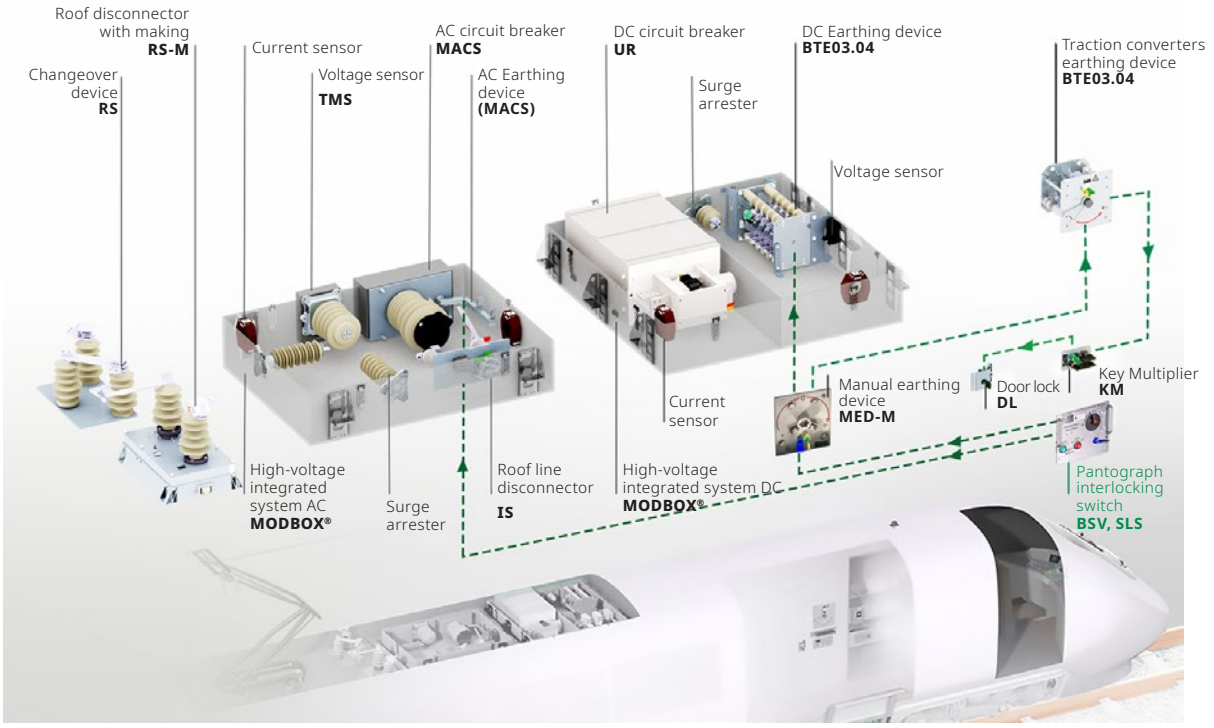
Protective measures include a safety interlocking chain incorporating many Sécheron devices to isolate and earth the high-voltage equipment. With a simple, step-by-step approach where one safety device is triggered only after the previous device in the traction chain has been locked in the earthed position, the highest safety level is guaranteed.

After the main switch in the driver's cab has been switched OFF and locked, the main circuit breaker opens, followed by the lowering of the pantograph. To secure the pantograph in its down position and avoid any unintended raising, the valve of the pantograph interlocking switch is installed in the pneumatic circuit providing air supply to the pantograph. During maintenance operations, this valve is manually switched in the OFF position, interrupting the air supply and releasing the air pressure in the pneumatic circuit of the device it operates. In this safety position, removal of the interlocking key(s) prevents inappropriate operation of the pneumatic operated devices.

The selection of the appropriate pantograph interlocking switch within Sécheron portfolio depends on the type of operation used by the earthing device to ground both poles of the AC or DC main circuit breaker.

BSV switch is be used with a manually operated earthing switch for AC or DC circuit breaker, while **SLS** is selected when the AC circuit breaker is grounded with an electrically operated earthing device.

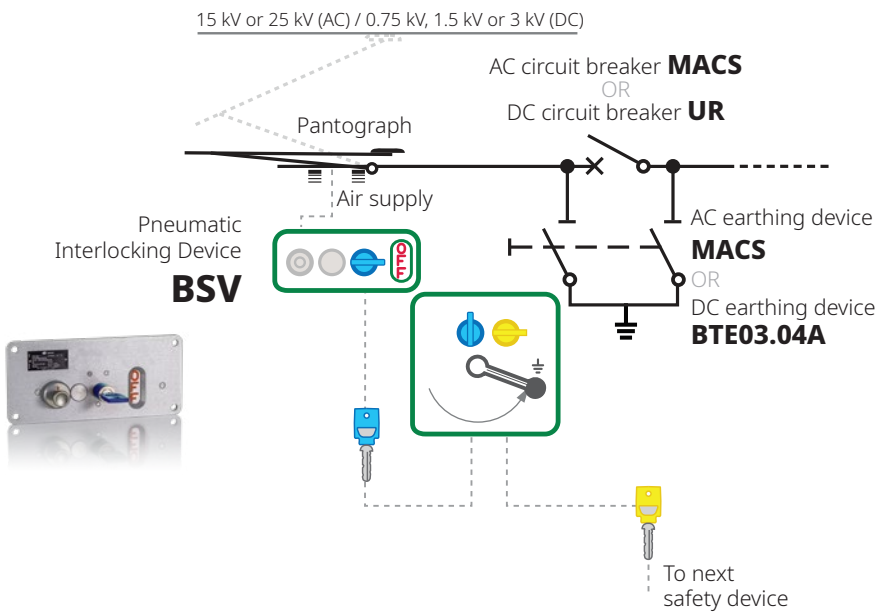
APPLICATIONS



All equipment indicated with a product name are in Sécheron's scope of supply.

BSV TYPE

SAFETY SCHEME



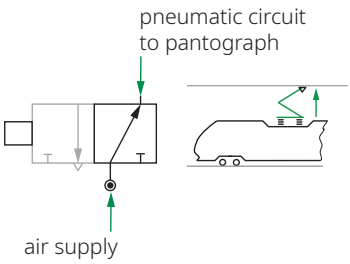
BSV switch is used to interlock the position of the manual earthing with the position of the pantograph.

This interlocking scheme refers to AC or DC rail vehicles having a single pantograph and AC or DC circuit breaker. Vehicles with 2 pantographs and 2 AC or DC circuit breakers will have a different interlocking scheme.

OPERATING PRINCIPLE

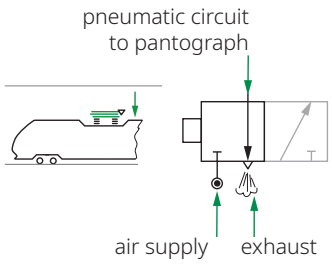
POSITION ON

Air is supplied to the pantograph through the BSV's valve.



POSITION OFF
(MAINTENANCE OPERATIONS)

Key turned in the OFF position, the pantograph is disconnected from the air supply and air escapes through the exhaust.



TECHNICAL DATA

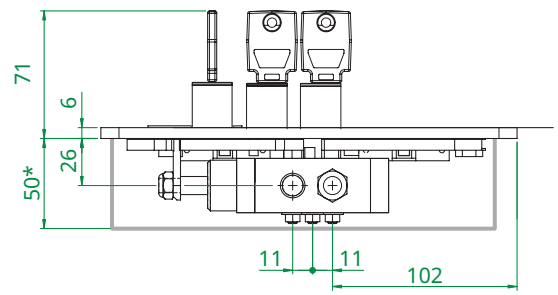
	Unit	Value
Air inlet		G1/4"
Maximum air pressure	[bar]	10
Minimun air pressure	[bar]	4
Nominal pressure	[bar]	6
Air flow for nominal pressure and Δp=1bar	l/min	1360
Temperature range	[C]	-30°C to +75°C

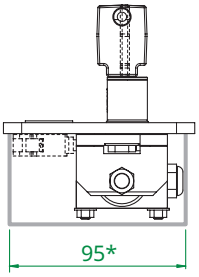
MAIN BENEFITS

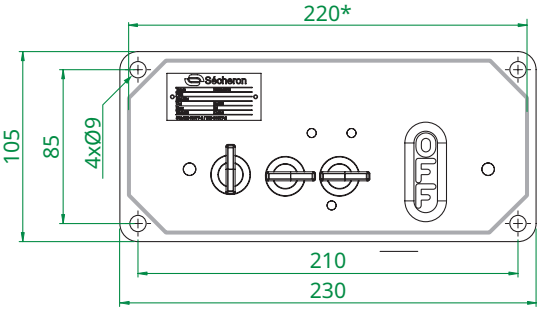
- Safety interlocking device.
- Manual operation through one or several interlocking key(s).
- Protects people
- Extensive factory reliability testing
- Low maintenance
- Reference standards EN/IEC 61373, EN 45545.

PRODUCT INTEGRATION

MAIN DIMENSIONS







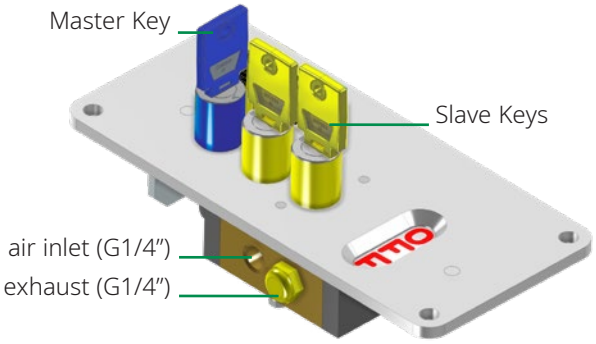
Weight : 1.2 kg ± 0.25 kg

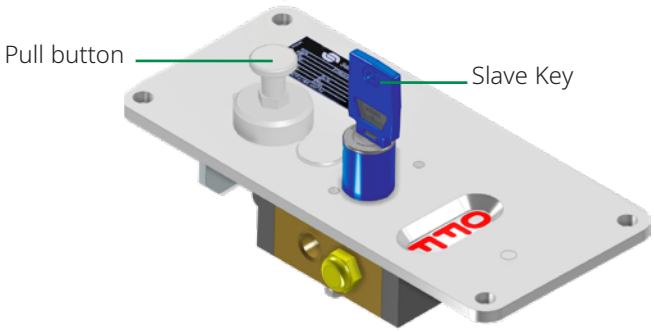
Dimensions without tolerances are indicative. All dimensions are in mm. The maximum allowed flatness deviation of the support frame is 0.5 mm.

(*) Space needed for installation..

Remark: BSV is equipped with a pull button in case only one key is selected on the BSV.

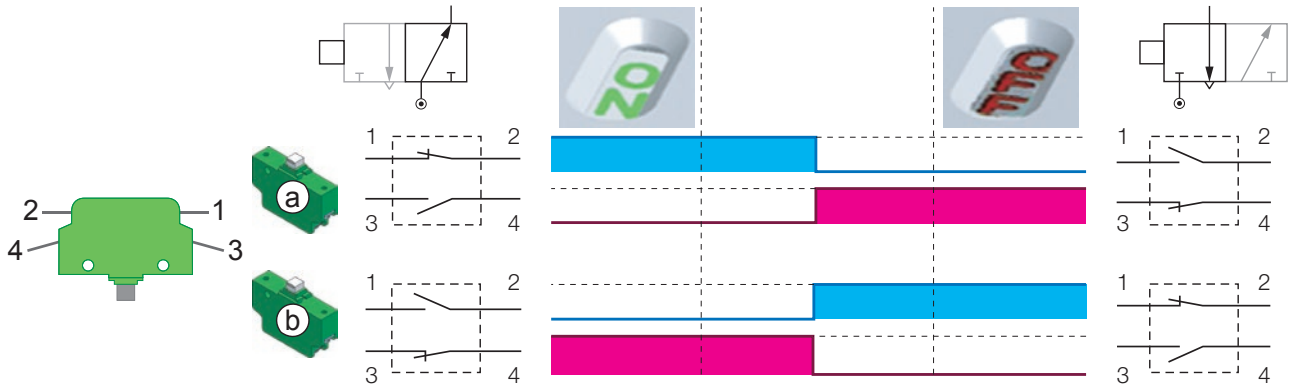
The pull button unlocks the rotation of the slave key for disconnecting the pantograph from the air supply. In this safe position for maintenance, the slave key can be released to operate the next safety device.





OPTIONS (SUBJECT TO ADDITIONAL COSTS)

AUXILIARY SWITCHES



SLS TYPE

DESCRIPTION

An electrically operated earthing device is sometimes required for long train configurations equipped with several AC circuit breakers type MACS. This configuration is used to limit the travel time necessary to ground manually and one by one each MACS.
When the MACS is installed on the roof in the AC MODBOX®, the accessibility to the earthing device manual operating handle is no longer possible making necessary the use of the electrically operated version. In configurations with an electrically operated earthing device, the specific device **SLS** has been designed by Sécheron to secure the down position of the pantograph and control the electrically operated earthing device of the AC circuit breaker type MACS. **SLS** prevents unauthorized and unintentional changes of the position of both the pantograph and the earthing device.

Remark: a version of SLS with a padlock instead of key is also available.

Backside items

- Electromagnet to unlock valve actuating handle (OFF to ON).
- Electromagnet unlocking key rotation
- Position device of valve actuating handle
- position device of key lock
- Pneumatic valve
- Terminals

Front panel

Pnematic valve actuating handle

Safety blocking button (ON to OFF)

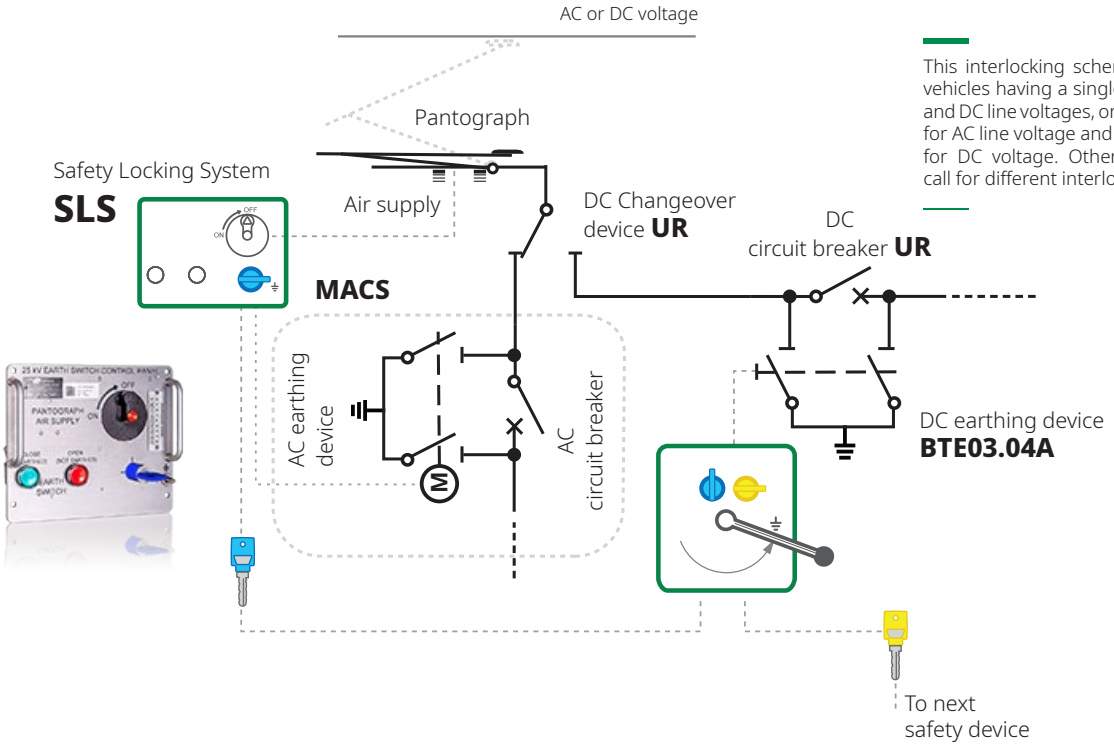
Earth connection

Interlocking key/lock

Push button (red LED) to open MACS' electric earthing device.

Push-button(green LED) to close MACS' electric earthing device.

SAFETY SCHEME



This interlocking scheme refers to AC rail vehicles having a single pantograph for AC and DC line voltages, or a single pantograph for AC line voltage and a single pantograph for DC voltage. Other configurations will call for different interlocking schemes.

SAFETY INTERLOCKING ACHIEVED WITH SLS

SLS switch is a combination of both mechanical and electrical interlocking between the pantograph and the electrically operated earthing device. It also includes the control function to CLOSE and OPEN the electrically operated earthing switch installed on MACS AC circuit breaker.

- The electrically operated earthing device can be closed to ground the vehicle's power line only if the pantograph is locked in its lowered position.
- The pantograph's air supply can get ON, only if the SLS is unlocked with the key and if the earthing device is in the OPEN state.
- The earthing device can be put in the OPEN state only of the SLS is unlocked with the key.

REQUIREMENTS FOR PANTOGRAPH AND EARTHING WHEN USING SLS

For the highest safety when using SLS, the following requirements must be fulfilled by the car builder.

- The pantograph must be equipped with a position switch that gives the information that the pantograph is physically in the lowered position.
- The electrically operated earthing device must be equipped with position switches for the detection of its CLOSED and OPEN positions.

INSTALLATION OF SLS

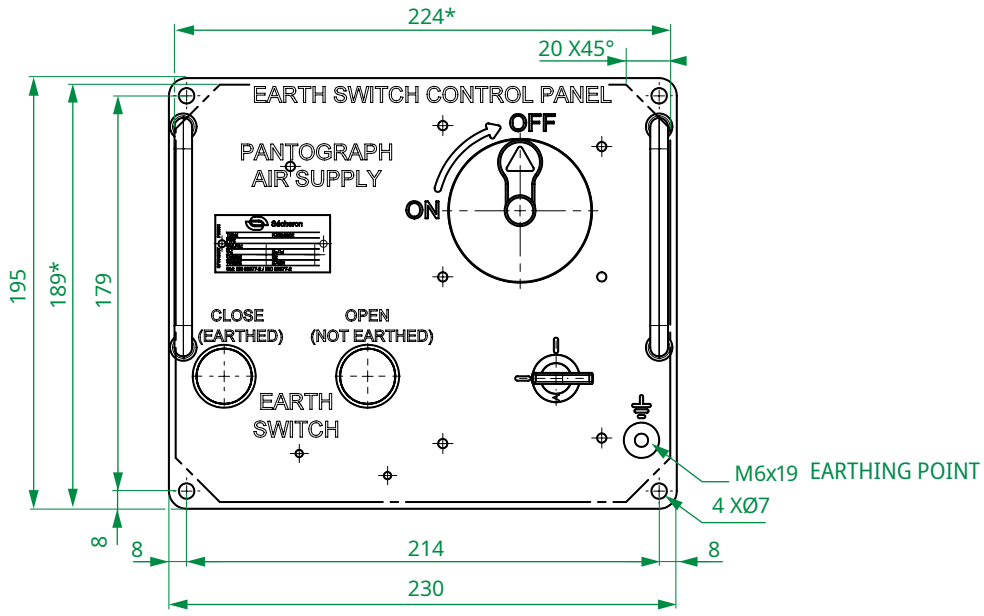
As the SLS does not include any interlocking master lock, the car builder shall ensure that SLS is installed in a safe and limited access area, to prevent unauthorized and unintentional SLS operation.

MAIN BENEFITS

- Used when AC circuit breaker MACS is equipped with electrically operated earthing device
- Integrated functional safety interlocking device
- Protects people against electric hazards
- Interlocks the safety positions of both the pantograph and the electrically operated earthing device.
- Locking of the safety position "Pantograph down" and "Earthing switch closed" either through a padlock or a key lock.
- Extensive factory reliability testing
- Low maintenance
- Low Total Cost of Ownership (TCO)

PRODUCT INTEGRATION

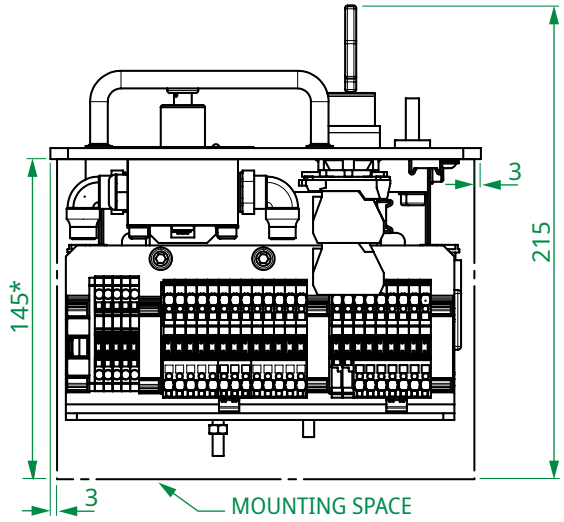
MAIN DIMENSIONS



Weight : 4.2 kg ± 0,3 kg

Dimensions without tolerances are indicative. All dimensions are in mm. The maximum allowed flatness deviation of the support frame is 0.5 mm.

(*) Space needed for installation..



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/products-solutions/ess/earthing-safety/earthing-switches/
- Be careful to write down the complete alphanumerical designation code with 7 characters for BSV and 6 for SLS 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 Sécheron.
- The bold characters of the designation code define the device type.

BSV TYPE

Example of customer's choice:	**BSV**2	B	Ø	Ø
Line:	10	11	12	13

Line	Description	Designation	Standard	Options	Customer's choice
10	Product type	Pneumatic interlocking valve	**BSV**2		**BSV**2
11	Key configuration [1]	1A (blue key) (slave)	A	-	
		1A (blue key) (master) + 1B (yellow key) (slave)	B	-	
		1A (blue key) (master) + 2B (yellow key)s (slave)		C	
12	Individual key/lock codification per train units [2]	No	Ø		
		Yes		1	
13	Auxiliary contacts	None	Ø		
		Aux1 — 1a + 1b - (switch PF) - silver type		1	
		Aux1 — 1a + 1b - (switch PF) - gold type		2	
		Aux1 and Aux2 — 2a + 2b - (switch PF) - silver type		3	
		Aux1 and Aux2 — 2a + 2b - (switch PF) - gold type		4	

[1] A–blue, B–yellow; different key colors can be ordered.
The offered key system is of type Kaba 8. For any other request, please contact Sécheron.
[2] Codification is used on request, each code is unique, tipically incremental numbering.

SLS TYPE

Example of customer's choice:	**SLS**	K	A	1
Line:	10	11	12	13

Line	Description	Designation	Standard	Options	Customer's choice
10	Product type	Pantograph Interlocking Device - SLS	**SLS**		**SLS**
11	Locking type	Padlock		P	
		Key lock	K		
12	Key/Locks configuration	Not Applicable (Padlock)	Z		
		1A (blue key - slave)		A	
		1B (yellow key - slave)		B	
13	Individual key/lock codification per train unit [1]	No	Ø		
		Yes		1	

[1] Codification is used on request, each code is unique, tipically incremental numbering.

Signature:

Name:

Place and date:

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