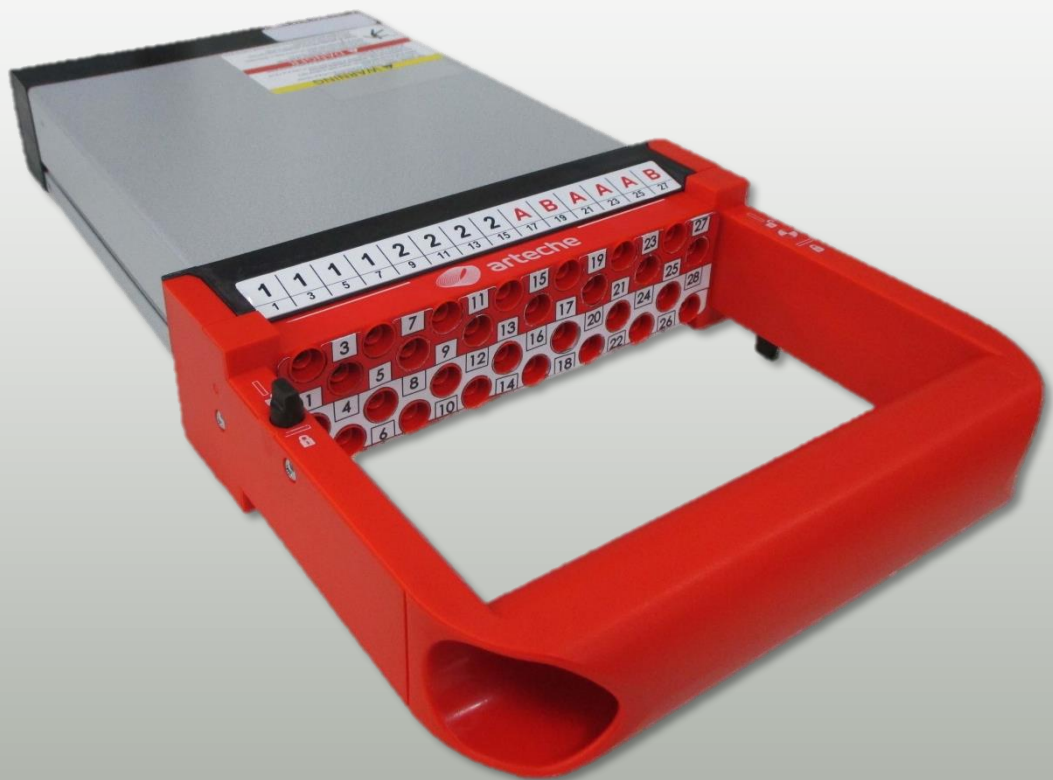


arteche

## Test Block saTECH TSB-14

User Manual





The test block manual contains instructions for installation, commissioning and operation. However, the manual cannot cover all conceivable circumstances or include detailed information on all topics.

In case of questions or specific problems do not take any action without proper authorization.

Please contact the technical sales of Arteche and request the necessary information.

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This manual is for informational purposes and is subject to change without notice.

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## Chapter 1. Supply features

saTECH TSB test blocks facilitate secondary testing load of any power system, allowing rapid monitoring, insulation and testing of the field elements.

Today the Satech TSB range includes blocks of 14 test circuit: Satech TSB-14. The Satech TSB-14 and TSB-14RC (Henceforth, TSB14 shall include both lines unless otherwise specified).product line is formed by TSB-14 test blocks and associated TSB-14-P test plug. They are supplied independently.

In the case of saTECH TSB-14 tests block, its corresponding package contains:

- Kit of cabinet fixing screw
- Kit of rear block connection screw.
- Kit of earth connections screw.
- Block tests saTECH TSB-14 of the requested model, with its corresponding front cover

In the case of saTECH TSB-14-P tests block, its corresponding package contains:

- saTECH TSB-14-P Test Plug
- TSB-P Protector for transport
- Instructions for Test Plug insertion and extraction
- Kit (14 units) plug plastic covers that cover the full spectrum of contacts 1, 2, A and B

The line of 14 circuits blocks and plugs in the range saTECH TSB, is available for installation in horizontal and vertical positions respectively. The selection of each model is shown later in other chapters of this manual.

**saTECH TSB 14-H/V (TEST BLOCK)**



**TSB-14-H**



**TSB-14-V**

**saTECH TSB-14-P-H/V (TEST PLUG )**



**TSB-14-P-H**



**TSB-14-P-V**

**saTECH TSB-14RC-H (TEST BLOCK)**

**saTECH TSB-14RC-P-H (TEST PLUG)**



**Chapter 2. Main features**

The ARTECHE saTECH test block allows the isolation of circuits and corresponding IEDs in a safe and easy way, separating fully the IEDs equipment and / or circuits of the system from the field elements, thereby eliminating any risk to the user.

The main features of the line of blocks and plugs of 14 circuits in TSB SaTECH range are the following:

- **14 circuits**, versatile selection, with different configuration (trips, voltages and currents, contact type 1, 2, A and B, with the alphabetical designating currents). This configuration should be defined prior to the order, because afterwards this configuration can't be modified.
- **Safe for the user**, the user will never have access to live parts during insertion or extraction of the test plug, and any field connection is located on safety connectors.
- **Safe insertion sequence, (make before break)**. The trip circuits are opened in the first place, avoiding undesired operation and later on, the voltage and current circuits are opened, ensuring that transformer circuits are shorted before opening the current circuits.
- **Safe extraction sequence**, the defined extraction sequence assures to have enough time to stabilizing the system. The first step connects the voltage and the current circuits, later on, the user must act specifically on the test plug before being able to extract it completely.
- **Unique test plug for different** test block configuration for the same number of circuits (14).
- **Installation Orientation**, there are two options: vertical and horizontal, the user is able to choose the installation orientation.
- **Avoid errors in the maneuver**: Using the cover plugs available in the plug:, User errors are avoided blocking access to field voltages and currents.. (plug odd terminals in case of model 14, terminal pairs in the case of model 14RC) in type contacts 2, A and B, and / or avoiding the injection of other power sources in type 1 contact. Cover plugs are compatible for all test plug terminals.

Type 1 contacts are referenced to circuits that open in the first phase (trips, signals and protection power supply).

Type 2 contacts are referenced to circuits that open in the second phase (voltage).

Type A contacts correspond to the current circuits with automatic short-circuited.

Type B contacts are referenced to current circuits with automatic short-circuited, indicating the end of the shot-circuit group.

## Chapter 3. Safety Basic Measures and Recommendations

This manual doesn't replace the procedures for operation and security that are currently valid and adopted by electric / operators companies for field installation works. Please read all of the instructions of this manual before installing the saTECH TSB-14.

→ Safety symbols:

The following symbols are located on different parts of the equipment and this manual:



Paragraphs marked with this symbol contain information which, if not properly followed, may cause damage to equipment and / or installation.



Paragraphs marked with this symbol contain information which, if not properly followed, may cause personal injury or even death.

→ General Safety instructions:

The installation and operation of the products described in this manual can be made only by trained personnel who have expertise in substation protection, automation and control.



The test blocks are electrical equipment. Therefore, wrong installation or wrong connection can lead to malfunction or permanent equipment failure or equipment connected to it, therefore it is recommended to follow the instructions listed below:

- The assembly of the test block should be done on disconnected and de-energized wires.
- The test block must be connected rigidly to the ground.
- Check that the secondary windings of the current transformers are grounded through one of its terminals.
- Check that the connections are correctly tightened and that the contact surfaces are clean.
- Check the correct polarity of the connections.
- Check the correct external wiring. The secondary of the current transformers must be wired to intensity terminals A and B.
- Do not disassemble the test block or test plug. Correct installation of internal parts is critical to warrant the insulation and avoid internal arcs.

The ARTECHE guarantee ceases when, without express authorization of ARTECHE SMART GRID S.L, external personnel to ARTECHE SMART GRID S.L. makes any changes or reparation in the product. There are not included the failures by normal use out of the guarantee period, neither by inappropriate use, carelessness or negligence of the user.



All secondary of a current transformer that is not loaded should be short-circuited; otherwise, the voltage between open circuit and secondary terminals can reach dangerous levels, even to destroy the equipment.



It's absolutely necessary to connect the equipment to earth according with the information defined on chapter 5.



Test Block has a sticker DANGER which should take into account during installation.

## Chapter 4. Principle of Operation

### Test Block Cover



The test block saTECH includes 14 circuits, which can be accessed by removing the front cover. The front cover guarantees an IP50 and its removal allows access to the internal circuitry to enable testing operations. . This construction guaranteed that you will never be in direct contact with active parts of the system.

### Type of circuits

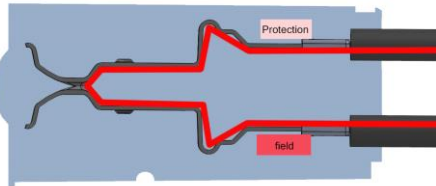


In the test block there are different types of circuits, they can be classified as trip, voltage, current or circuits type contacts 1, 2, A and B respectively.



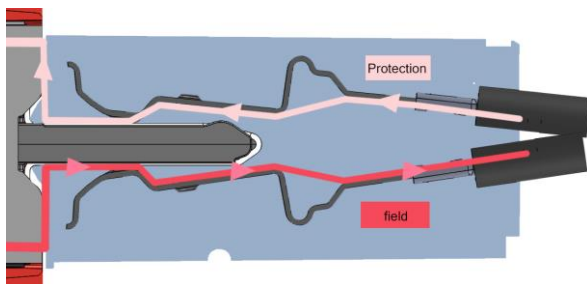
In the front of the block will be identified by two tag (upper and lower) and in the back will be associated with the front by Labels with the same legend, where those that are within a circle will correspond to the field part and those not to the relay part. As a mnemonic rule, the idea of © circle  $\leftarrow \rightarrow$  Field can be used.

### Closed Circuit



In normal state the test block circuits are closed contacts. While the field terminals (identified by numbers inside circles) connected to transformers and the equipment (Protection) terminals connected to the equipment.

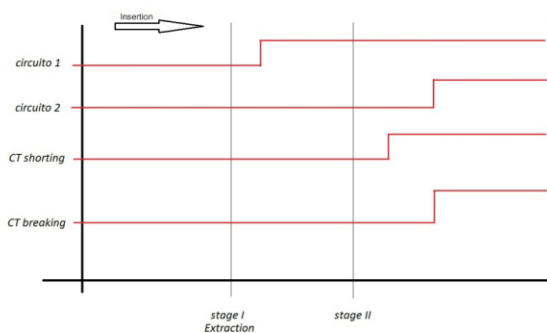
### Open Circuit



The opening of circuits is achieved inserting the test plug inside the test block. With this maneuver the field and protection circuits are pull apart.

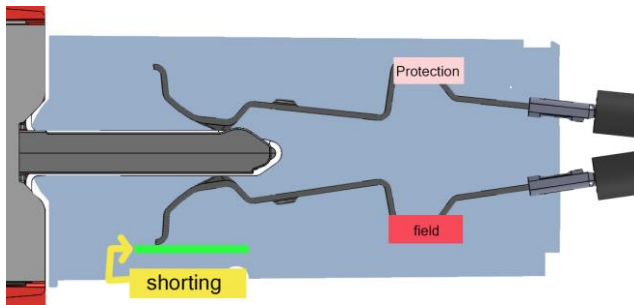
### Opening sequence (Test Plug Insertion)

During the insertion of the test plug the circuits are ready to be able to test the protection relay, according to the next ordered sequence:



1. Opening of the trip circuits and signal.
2. Shorting current transformers circuits
3. Open voltage and current circuit.

### Current Circuit



It is not required externally short-circuit of the current transformers in the test plug. The circuits include a mechanism for ensuring the short current transformers before proceeding to open the corresponding contact test block. Arteche offers the possibility to select from various types of shorted, depending on the

application. On the front side of the block, you can see which of those circuits are shorted, also from identification shown on labels frame. This identification is visible even when the test plug is inserted.

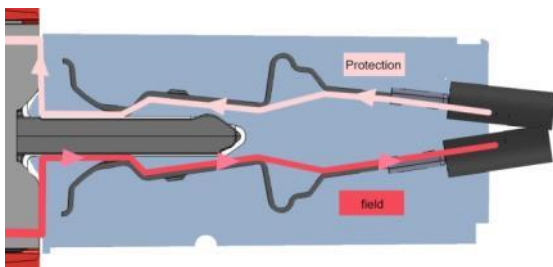
### Lock & Unlock Test Plug



Once the test plug is inserted, it can be locked to prevent involuntary extractions, turning the black buttons of the test block.

For test plug removal is necessary to unlock it, turning the **two buttons** and unlocking the retention mechanism.

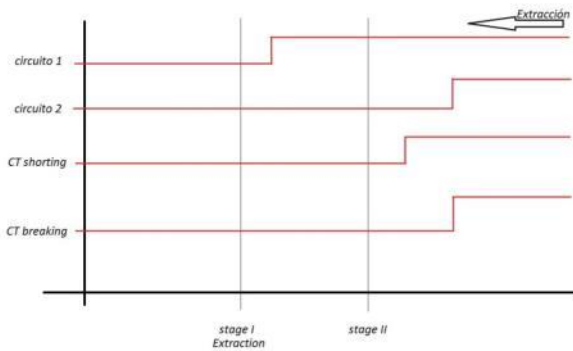
### Signal Injection



Once the Test Plug is fully inserted tests signal injections can be performed with bananas by the Test Plug. With Test Plug inserted the field elements are automatically isolate, shorting current transformers and opening voltage / trip circuits.

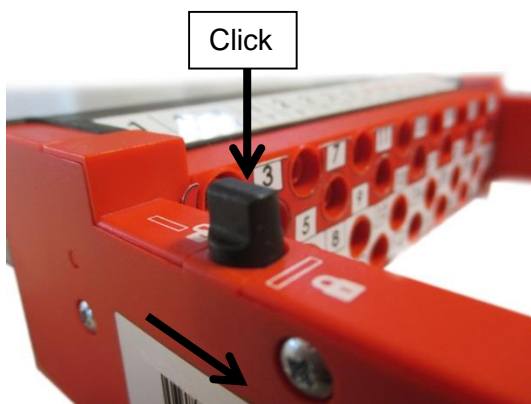
### Closing sequence (Test Plug Extraction)

The retention system force to do the extraction of the test plug, with the following sequence:



1. Connect current and voltage circuits
2. Open current transformers short circuit
3. Unlock Test Plug
4. Connect trigger circuits.

### Stabilization system in the extraction



In the test plug extraction, before trip circuit connection, it is necessary to stop and press the **two buttons** to unlock the latching mechanism.

This operation will allow voltage and current values to stabilize after transients during the connection, and will avoid unwanted tripping during the trigger circuit connection.

### Guided and poka-yoke

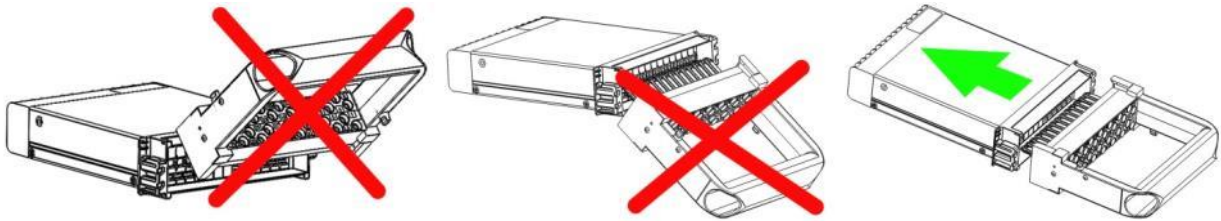


The test plug includes a guides and a poka-yoke system (Prevents improper connections), to make easier the insertion into the test block in the proper position and ensuring the opening of all contacts, of the same type simultaneously.



During test plug insertion and extraction there are not bounces that could damage current transformers.

During test plug insertion and extraction maneuvers care should be taken to align and insert properly the test plug in the block, one uniform movement should be done to avoid misalignment between plug and block.

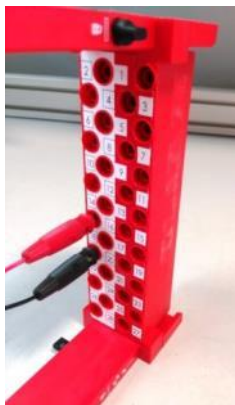


**Reference lines**

When the test plug is inserted into the test block, the user should push it until there is no gap between the test block and the test plug, in order to guarantee that the retention system is working during the safety extraction operation. To verify this, two lines have been arranged in the plug. Once they are aligned with the framework of the block, they will help us to check visually whether the plug is properly inserted or not.



**Banana Connection**



There are 28 banana plugs in the test plug, which allow the use of safety banana plugs: 14 banana plugs of 4mm are used for the test injection of the relay protection, and the other 14 to provide access to field elements.

All the banana plugs of the test plug are identified by a number that corresponds to the same number in the test block.

In cases where a multiple plug banana connection in series is required, the

use of bent bananas is necessary to avoid the handle of the test plug. From our experience we recommend using the security strap of the Stäubli Electrical Connectors Multi-Contact Right-angle adapter XWA-4/19 Ref. 66.9694. Page 71.



### Plug Covers



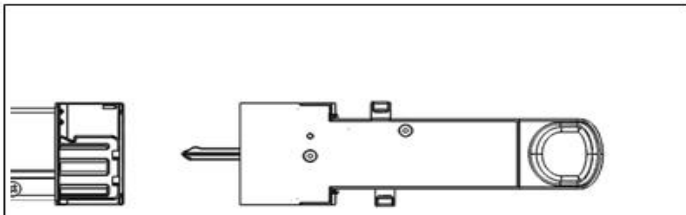
A set of plug plastic covers is supply with the test plug, which is recommended to place in the plugs where you want to avoid banana connections. These covers are compatible for all the plugs.

It is advisable to place covers on the circuits that are used for protection supply, to avoid errors in the protection power supply. These can be removed if in the protection a new power supply is required.

These plug covers must be removed or put by qualified personnel.

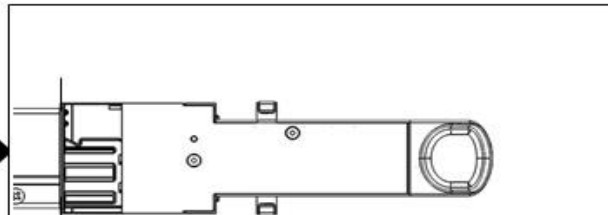


INSTRUCTIONS



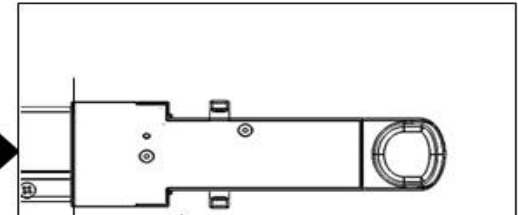
1. Connect the Test plug taking into account the existence of poka-yoke. Make sure the buttons are in unlocked position.

INS

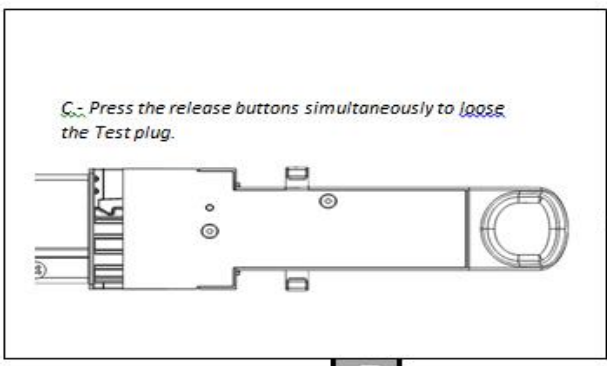


2. Once funneled each finger, insert constantly and unique maneuver.

INS

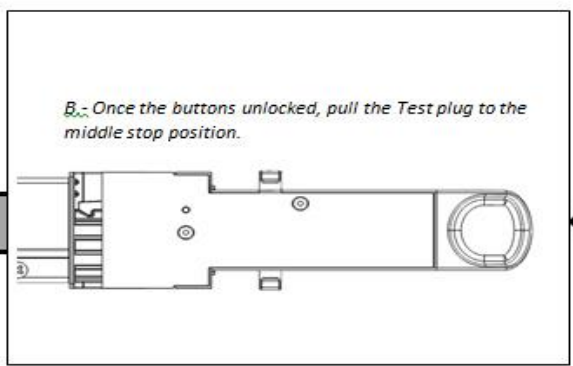


3. Insert up to match the total insertion white lines of the Test plug with the frame.



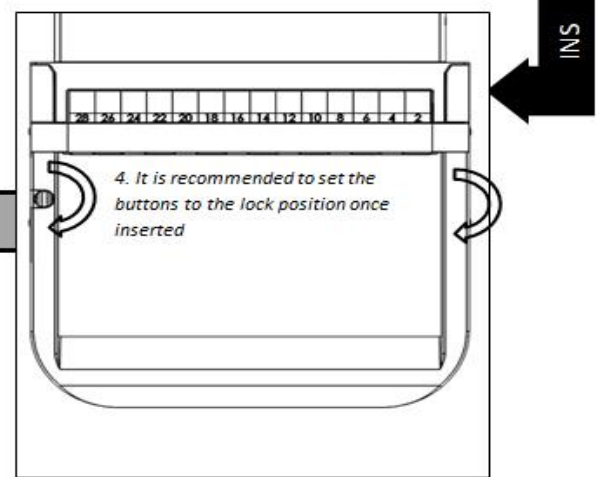
4. Press the release buttons simultaneously to loose the Test plug.

EXT



5. Once the buttons unlocked, pull the Test plug to the middle stop position.

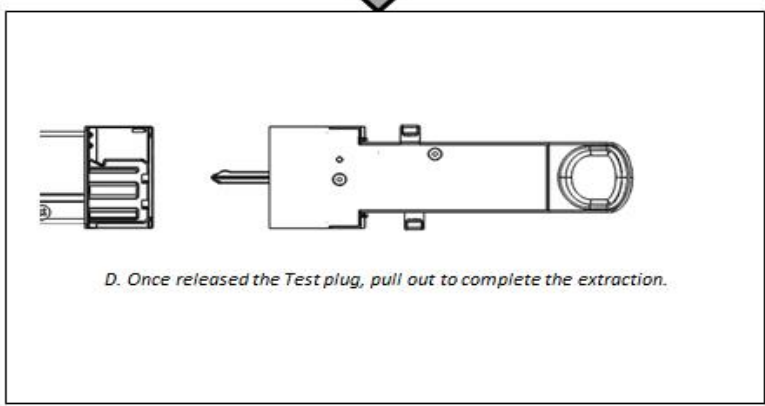
EXT



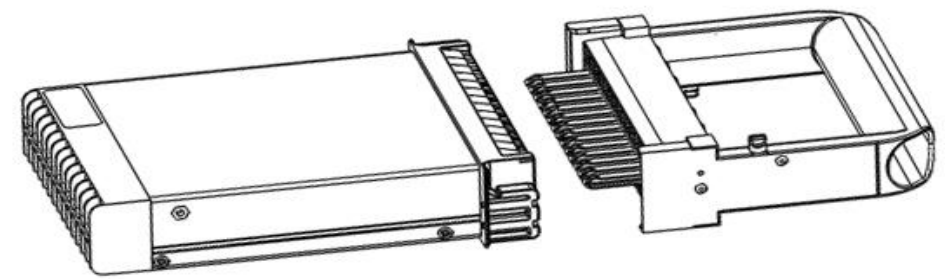
6. It is recommended to set the buttons to the lock position once inserted

INS

A. Turn buttons to the unlocked position to proceed with the extraction.



7. Once released the Test plug, pull out to complete the extraction.



To download the complete user manual visit: <http://www.artech.com/en/centro-documentacion>

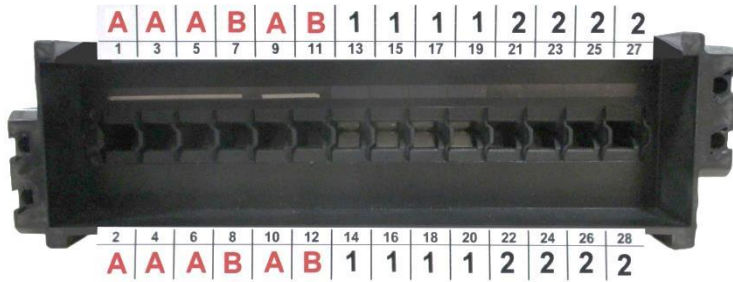
## Chapter 5. Technical Data

Technical data		
Dielectric strength IEC 60255-27	saTECH TSB & TSB-P IEC 60255-5	2kV between input and output contacts
		2kV open contacts, test plug inserted
		5 kV rms for 1 minute between all terminals connected together and the ground terminal
		2 kV rms for 1 minute between any pair of contacts, including contacts adjacent
Step current	saTECH TSB saTECH TSB-P IEC 60947-7-1	All circuits 20A allow continuously or 400A for 1s All circuits 10A allow continuously or 250A for 1s.
Maximum operating voltage	saTECH TSB & TSB-P	300 volts ac or dc continuously IEC 60255
Environmental conditions	Temperature	Storage -25 ° C to + 70 ° C operation -25°C a +55°C
		IEC 60068-2-1 Cold IEC 60068-2-2 Dry heat
	Humidity	IEC 60068-2-78 56 days a 93% Relative Humidity and +40°C
		IEC 60529-1: TSB with front cover IP50 TSB without front cover IP20 TSB-P connected IP20
mechanical characteristics	Vibration	60255-21-1 IEC Class II 60255-21-2 IEC Class II



saTECH TSB-14 Rear View

# Chapter 6. Model Selection



1-. Horizontal position (Reading from left to right)



2-. Vertical position (Reading from top to bottom)

Selección de Modelos / Model Selection

Opciones / Options

Circuito que abre en la primera fase (disparos, señalizaciones y alimentación de la protección) / First Open (trip, signal and protection power supply circuits)

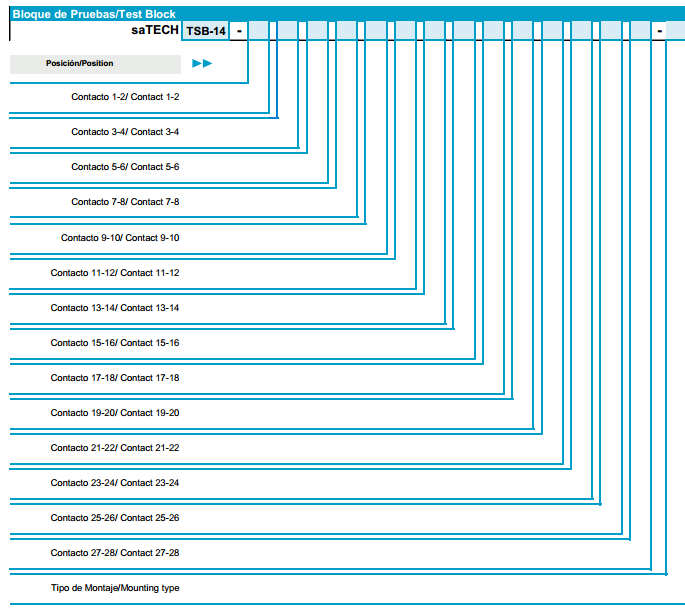
Circuito que abre en la segunda fase (tensiones) / Second open (voltage circuits)

Circuito de corriente con cortocircuitado automático / Current circuits with automatic short circuit on CT side

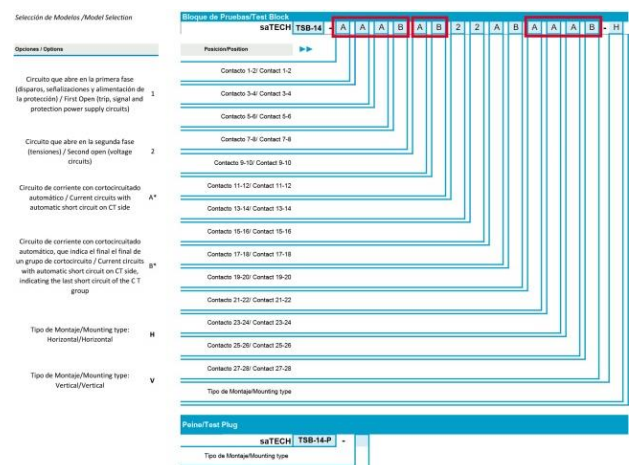
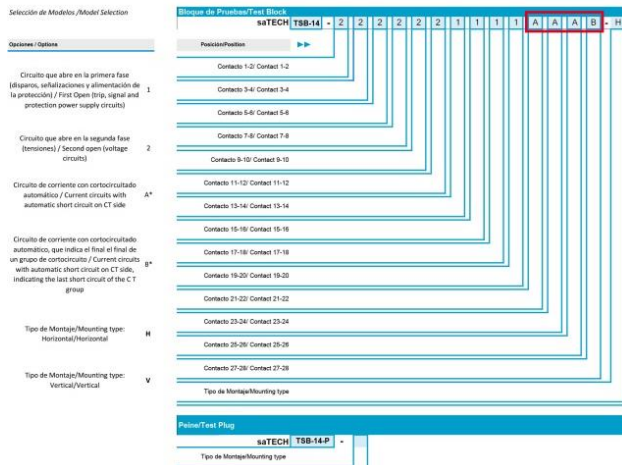
Circuito de corriente con cortocircuitado automático, que indica el final de un grupo de cortocircuito / Current circuits with automatic short circuit on CT side, indicating the last short circuit of the CT group

Tipo de Montaje/Mounting type: Horizontal/Horizontal

Tipo de Montaje/Mounting type: Vertical/Vertical



\* Current circuits to be short-circuited must be placed Contiguously, i.e.:





## Chapter 7. Dimensions, installation and connections

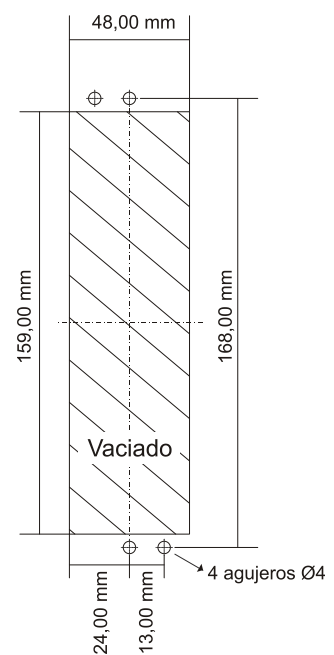
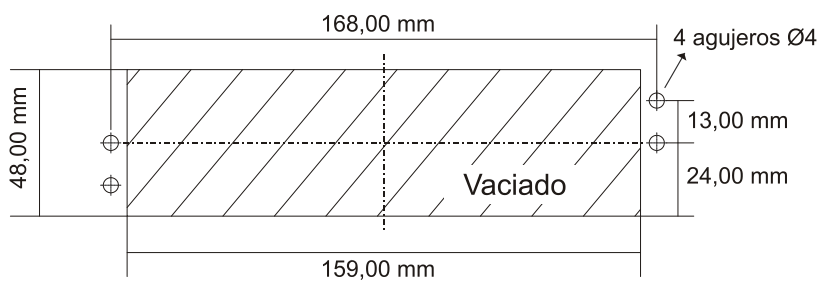
### DIMENSIONS

**TSB-14**  
 Net weight: 1500 gr  
 Gross weight: 1850 gr  
 Package: 263 x 230 x 82

**TSB-P**  
 Net weight: 500 gr  
 Gross weight: 720 gr  
 Package: 263 x 230 x 82

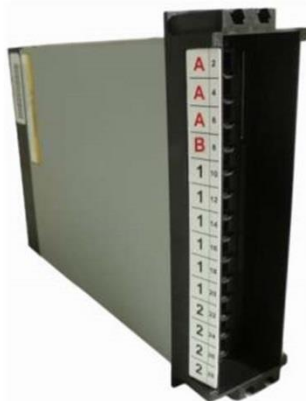


### CUT OUT



**ASSEMBLY AND INSTALLATION**

There are two options for the installation of the Test Block: horizontally and vertically. The installation of equipment will be made according to the following indications:



**Vertical option**



**Horizontal option**

For the basic TSB-14 model (not RC), In the vertical option, the field circuits must be located in the right side and the numbers / letters disposition will be top down.

In the horizontal option, the same thing happens for each model, the field circuits must be at the top and the equipment circuits at the bottom.

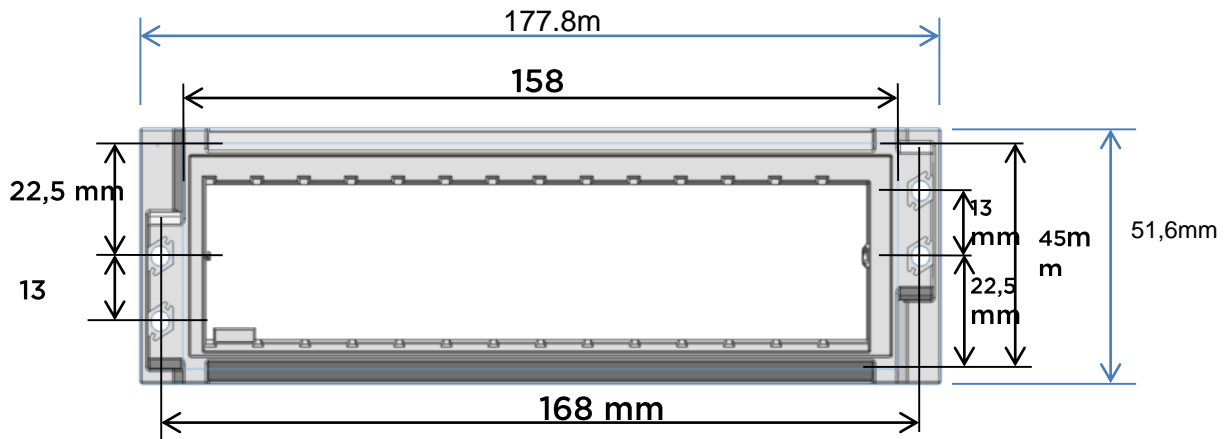
The connection of the Test Plug is conditioned by the installation of the Test Block, because it has a poka-yoke for the correct insertion. The TSB-14 model looks like this:



**Vertical option**



**Horizontal option**



Note: The maximum dimensions correspond to the front frame of the block, with the comb inserted or without it.

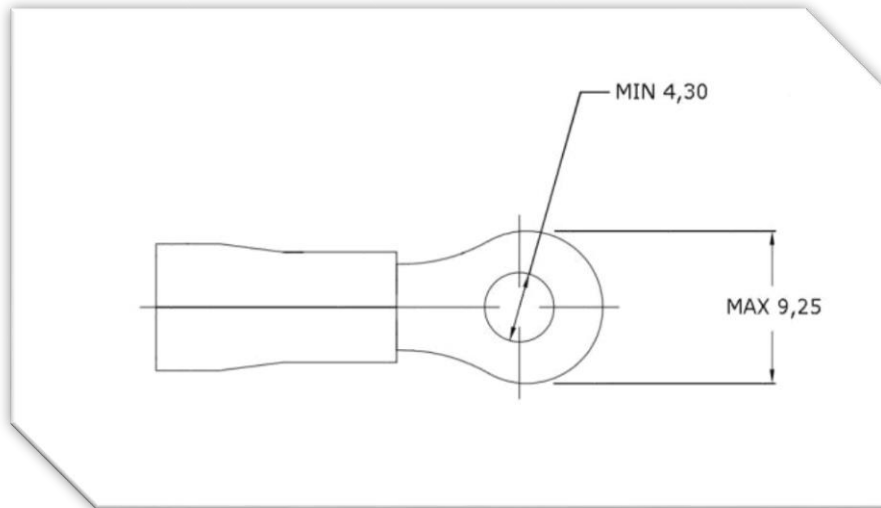
- Screw and washers: The wiring operation will be performed with the screws supplied with each equipment.
- Tools needed: 6mm hex wrench tube.
- Rear connection:
  1. Maximum number of ring terminals that can be connected: 2.
  2. Cable up to 4mm<sup>2</sup> or 12 AWG.
  3. Maximum outer diameter of annular connector: 9mm.
  4. With block-type tests are supplied Phillips head M4 screws.
  5. The maximum torque for the screws is 2.5N.

- Earth connection.
- After the test block is placed in the cabinet, the earth connection must be made. The saTECH TSB. Has two earth connections, one of them has to be done, It is not necessary to ground both ends. The wiring and earth (Din 933 cabeza hexagonal) connection screw set are included with the test block. The tool to be used with grounding screws is a 7mm wrench.

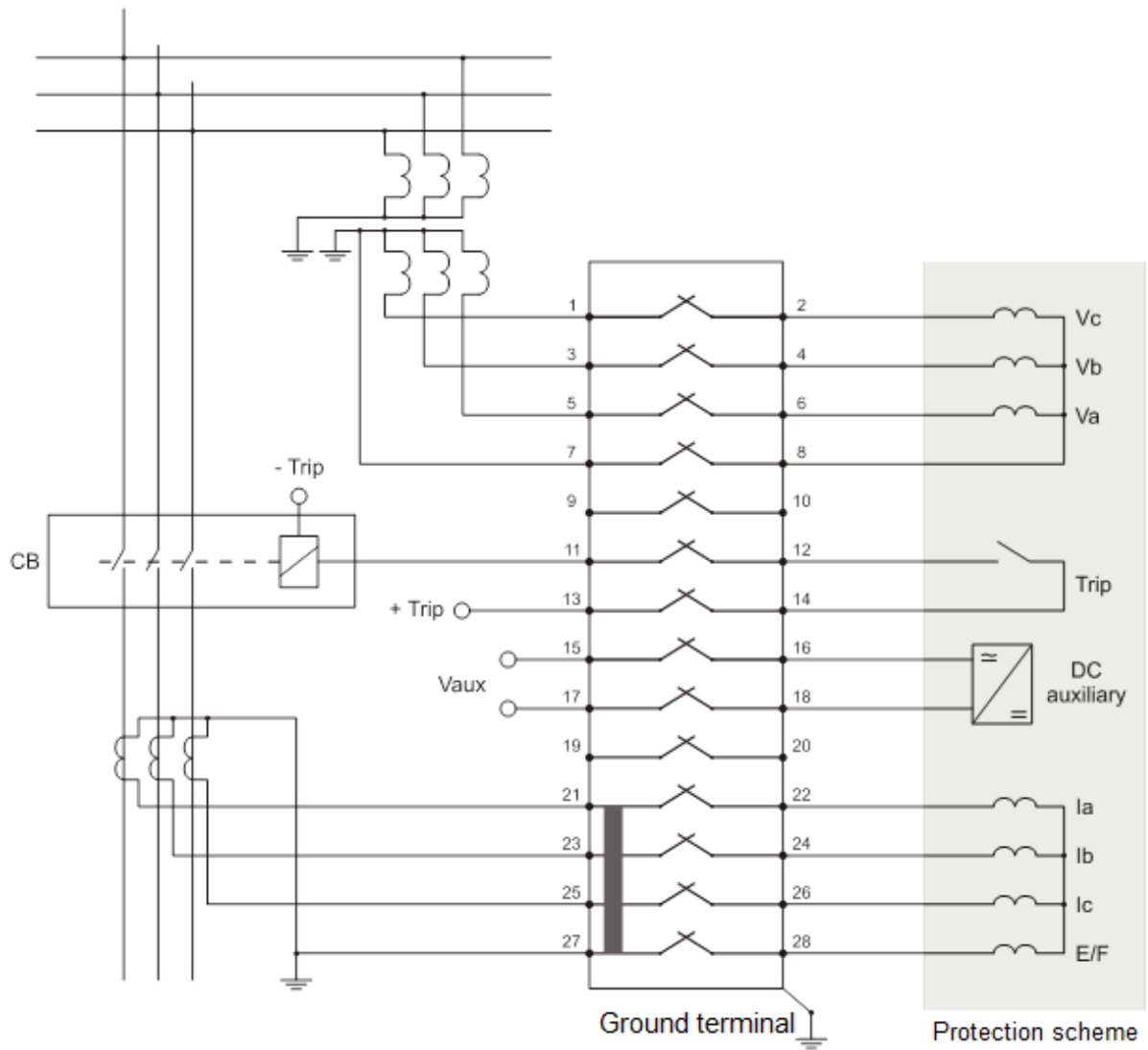


## CONNECTIONS

The maximum and minimum dimensions of annular connectors recommend to be used in the back of the test block are:



**APPLICATION EXAMPLE TSB-14(No RC)**



■ Contact short circuit

## Chapter 8. Maintenance

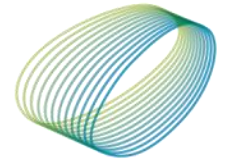
It is advisable to make periodic cleaning, due to the deposition of metal particles in the interruption plastic zone of the circuits.

The following picture shows fingers which have not been cleaned and serviced, and where the deposition of material can be appreciated.



Cleaning should be done in a simple way on contacts, with a clean cloth that leaves no residue. Do not use liquids for cleaning.

On the other hand, the number of operations supported by the test plug can limit the functionality of the test blocks, the test plug operation (insertions – extractions), life has been determined in 4000 operations. (4000 insertions and 4000 extractions)



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Moving together