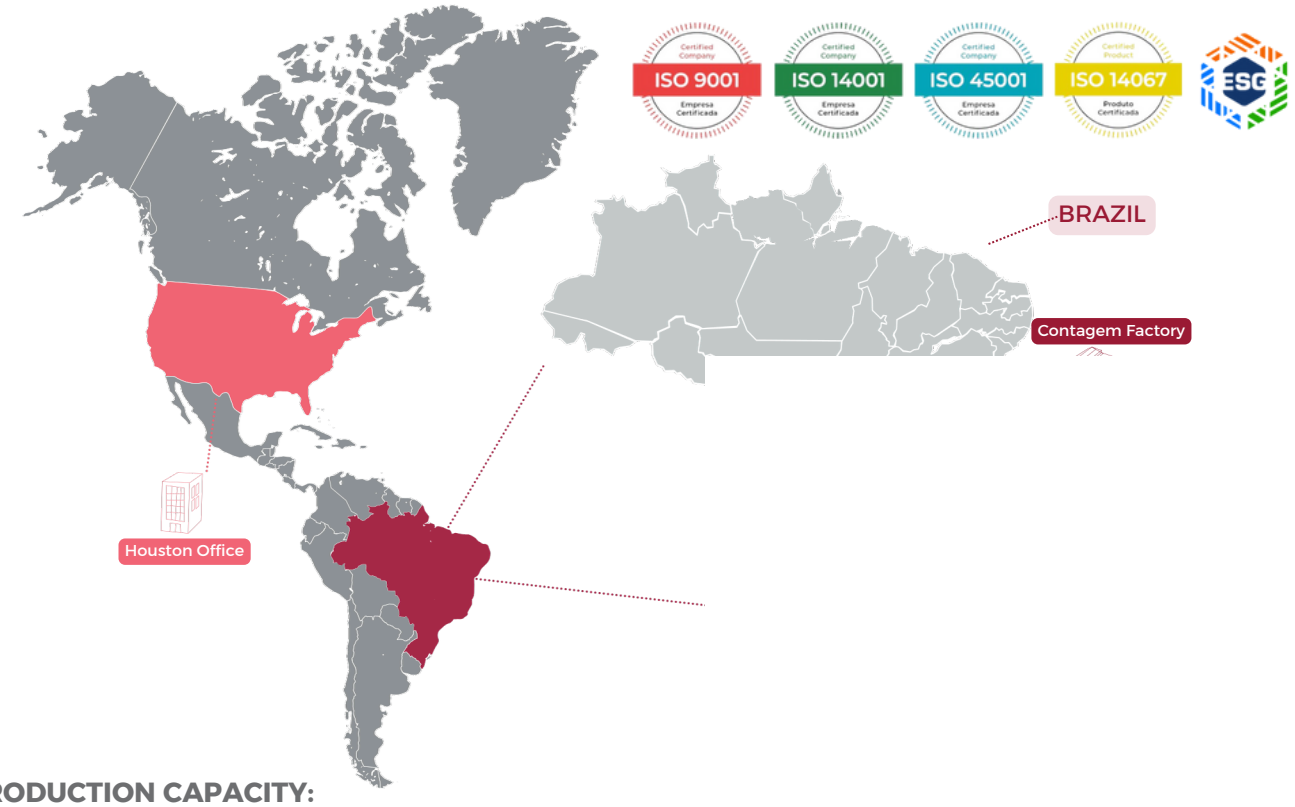
TSEA energia

SINGLE-PHASE VOLTAGE REGULATORS

ABOUT TSEA ENERGIA

QUALITY, RELIABILITY, INNOVATION, AND RESPECT FOR CUSTOMERS. TSEA ENERGIA, **OVER 55 YEARS TRANSFORMING ENERGY INTO VALUE**.

Founded in 1968, TSEA energia specializes in developing a wide range of products & services designed to meet the demanding needs of the electricity generation, transmission, and distribution markets. With factories in Contagem (BR - MG), Betim (BR- MG), Curitiba (BR - PR), and offices in São Paulo (BR - SP)and Houston (USA-TX),and with businessin more than 40 countries, we are present in various segments. Our focus is to serve the electricity sector by offering the market complete solutions, contributing to the economic growth of the markets where we operate. TSEA's commitment is to deliver high-quality products and services throughrobust, state-of-the-art production lines and highly qualified professionals.



PRODUCTION CAPACITY:
Transformers: 200/year
Voltage Regulators: 3.500/year
Refurbishments and Repowering: 50/year
Protection and Control Panels & Telecommunications:
Mobile & Compact Substations: 40/year

VOLTAGE REGULATORS

With a production capacity of Single-Phase Voltage Regulators, with a nominal current of up to 1200A and nominal voltage of up to 36.2kV, we are recognized for superior performance. TSEA energia´s products stand out in the market for their technical advantages.

Special sensors, developed by TSEA, ensure high precision in indicating the position of the TAP, providing total reliability in the dynamic operation of electronic control.

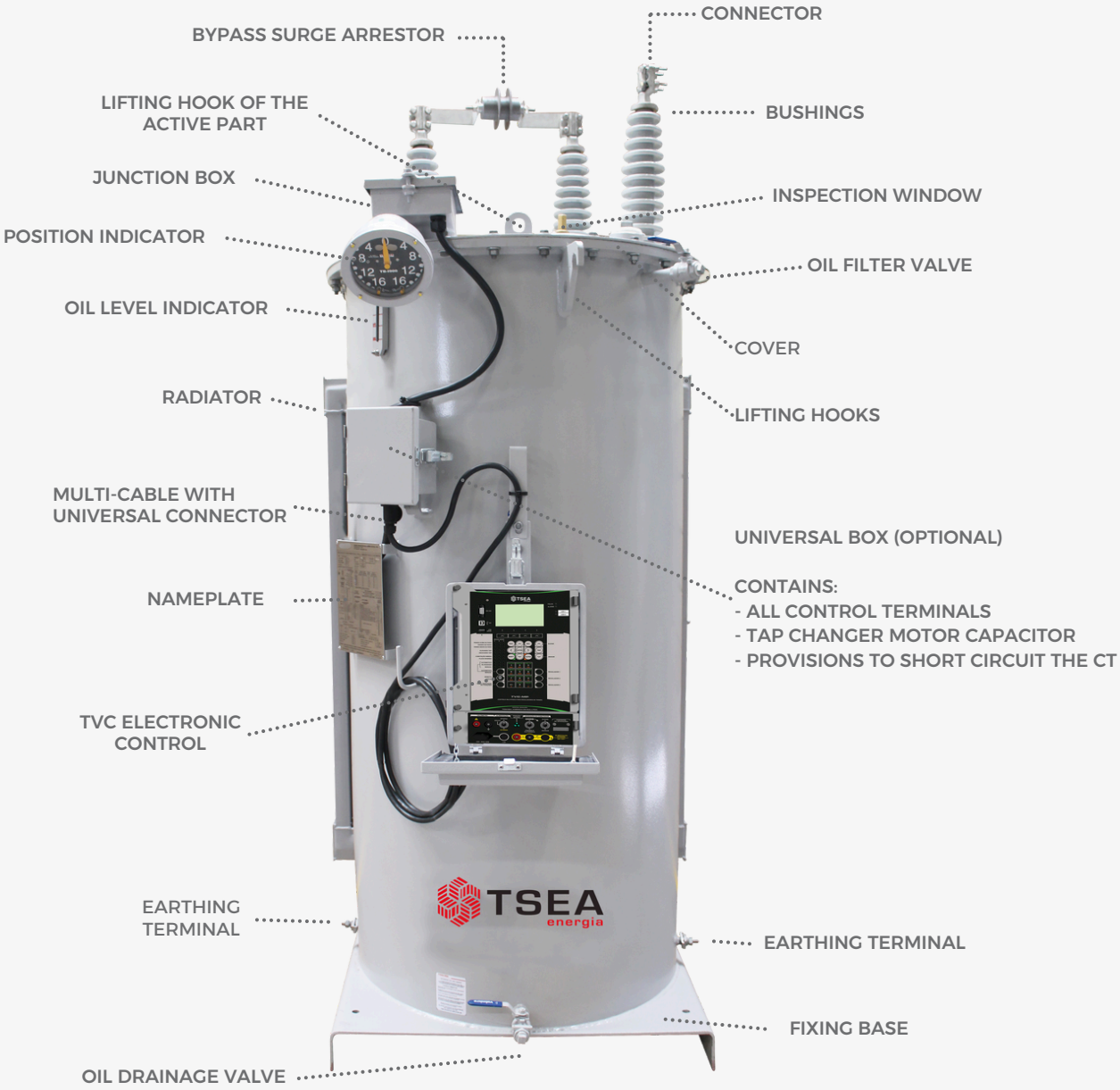
During maintenance services, solutions developed by TSEA allow for quick replacement of electronic control, carried out without interrupting the regulator's operation. TSEA provides worldwide technical support.

ADVANTAGES OF TSEA ENERGIA'S SINGLE-PHASE VOLTAGE REGULATORS

- TSEA energia voltage regulators offer robust construction and operational reliability.
- They provide a stable voltage output, ensuring that the power distribution system and other electrical equipment operate efficiently and reliably.
- Protects sensitive electrical devices from voltage fluctuations, reducing the risk of damage and extending the life of the equipment.
- They guarantee energy efficiency, minimizing losses and increasing the reliability of the distribution system.
- It has a monitoring system that allows users to remotely adjust the settings and monitor the performance of the voltage regulators in a convenient way.
- They adapt efficiently to different load levels and can be considered more versatile and suitable for a variety of applications.
- The incorporation of advanced technologies, such as digital control and intelligent protections, guarantees us performance and efficiency.

TSEA ENERGIA IS THE LARGEST PRODUCER OF VOLTAGE REGULATORS IN LATIN AMERICA

SINGLE-PHASE VOLTAGE **REGULATOR COMPONENTS**



DEVICES AND ACCESSORIES AVAILABLE:

- Pressure relief valve (for all equipment);
- Pole mounting bracket (for equipment up to 288KVA);
- Tanks and radiators can be made of stainless steel;
- Tanks and radiators made of carbon steel can be galvanized and/or painted;
- Shunt lightning arrester.
- Shielded control cable, when requested.
- Configurable control box according to customer's request.
- Vegetable oil.

PERFORMANCE AND TECHNICAL FEATURES

SUPERIOR PERFORMANCE IN SHORT CIRCUIT TESTING

IMPEDANCE VARIATION

IEEE ANSI C57.15/2009; IEC 60076-21:2011 NBR 11809/1991	TSEA energia
Maximum: 22,5%	Maximum: 12%
	Typical <= 8%

EXCITATION CURRENT VARIATION

IEEE ANSI C57.15/2009; IEC 60076-21:2011 NBR 11809/1991	TSEA energia
Maximum: 25%	Maximum: 5%
	Typical <= 3%

WHEN REQUIRED, THE REGULATOR CAN BE DESIGNED AND SPECIFIED TO WITHSTAND 40 TIMES THE RATED CURRENT

HIGH SERVICE LIFE OF THE ACTIVE PART

INSULATION POWER FACTOR	MARKET	TSEA
Guaranteed Value	<=2%	<=1%
Typical Value		0,5%

LOW INSULATION POWER FACTOR VALUES INDICATE A TENDENCY TOWARDS HIGH USEFULL LIFE

HIGH ACCURACY IN INDICATION OF THE TAP POSITION

SPACIAL SENSORS DEVELOPED BY TSEA, ASSURING:

- Use of the Position Sensor device as a redundant indication means to confirm the current position of the on-load tap changer makes the operation safer by providing means so the control device identifies the correct position (TAP) in which the tap changer is located, thus assuring the right decision is made. It becomes especially advantageous during the operation of voltage regulators in reverse flow, where the regulator does not measure the voltage on the source side, since the voltage on the load is calculated and requires the correct TAP position to execute the calculation.

- Quick replacement of the electronic control, with no need to return to the neutral position during any maintenance with the regulator in operation.

CONTROLS

TSEA Controls meet the accuracy, climate, dielectric and magnetic compatibility requirements or IEEE and IEC standards

TVC - MP

The TVC - MP control line offers flexible modes for single-phase and multi-phase systems, measuring voltage on both the source and load sides. It seamlessly integrates with supervisory systems via standard communication protocols. The user-friendly interface includes a display, keypad, and shortcut keys, with protection against vandalism and operating errors, such as the automatic short-circuiting of the CT in case of circuit opening. A comprehensive and efficient solution.

Configuration: One controller per regulator + interconnection between them via optical fiber. **Regulation:** Individual (per phase) + Three-phase (Master/Slave; Master/Follower and Management of position differences between regulators).

TB-R1000

TB-R1000 Control Line (Single-phase). The TB-R1000 controls bring reliability to the system, adapting to the needs of customers across the board.

Description: Standard control. Configuration: One control per regulator.
Traditional Regulation: Each regulator with its control (no connection between controls).

OUR REGULATOR IS COMPATIBLE WITH CONTROLS FROM OTHER BRANDS, BUT TSEA MUST BE CONSULTED TO ENSURE PROPER INTEGRATION.

SEL-2431

The SEL-2431 Voltage Regulator Control is compatible with most 32-step, single-phase voltage regulators. Use various hinge and wiring kits to easily upgrade existing controls without removing the regulator from service. Quickly integrate the SEL-2431 into Ethernet or serial communications networks using fiber or copper options.

M-6200A

The M-6200A is a Digital Voltage Regulator Control by Beckwith designed for single-phase voltage regulation. It offers extensive communication options with wired or wireless networks, including standard RS-232, RS-485, and optional fiber optic port. The regulator supports various protocols such as DNP3.0, MODBUS, and Cooper 2179, features event recording, Ethernet support, cyber security tools, harmonics detection, and smart flash SD card slot for configurations and upgrades without the need for a battery backup.

VOLTAGE REGULATOR SIMULATOR

SIM-VOLT

At TSEA energia, we are committed to bring innovation and excellence to the electrical energy industry and proud to present our latest technological advancement: the **SIM-VOLT** Voltage Regulator Simulator.

SIM-VOLT is a true revolution in the world of voltage regulators and electrical network control testing. Fitted with unique technology, this equipment will allow you to perform a wide range of essencial voltage control tasks efficiently accurately and safely.

BENEFITS OF SIM-VOLT

- **Electronic Controls Testing:** Conducting tests without field installation.
- **Firmware Update Validation:** SIM-VOLT allows for efficient and effective validation of electronic control firmware updates.
- **Enhanced Communication:** Facilitates communication between electronic controls in the power grid.
- **Unmatched Accuracy:** Precise and reliable results in voltage control tests.
- **Ease of Use:** Intuitive and user-friendly interface, making SIM-VOLT operation simple, even for novice users.
- **Safety First:** Use of advanced safety technology. Ensures all tests are conducted with total safety, minimizing risks for operators.

TAP CHANGERS

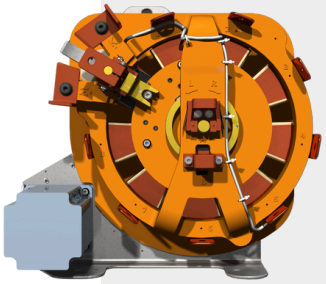
Tap changer is sized for a specific range of current and voltage applications. Our Tap changers meet IEC and NBR standards for mechanical, thermal, and dielectric requirements.

CR -3

- Activation of the mechanism through Spring Drive
- Operating time for each position: 4s
- Operating time from neutral to maximum position: 64s
- Current capacity up to 668A

CR-10

- Activation of the mechanism through Spring Drive
- Operating time for each position: 6s
- Operating time from neutral to maximum position: 96s
- Current capacity up to 1100A



CR-20

Generation of tap changers with direct drive

- New generation of high-speed tap changers
- Activation of the mechanism through Spring Drive
- Operating time for each position: 0,35s
- Operating time from neutral to maximum position: 5,6s
- Current capacity up to 668A

FUNCTION/ELEMENT	DESCRIPTION	TB-R1000	TVC-MP
USB-A	Port intended for data collection	NA	V
USB-B / RS-232	Local communication portal	RS-232	USB e RS-232
Graphic display	Easy-to-view alphanumeric liquid crystal display and parameterization adjustment	V	V
Alphanumeric keyboard		NA	V
Navigation keyboard		V	V
Communication ports	· DNP 3.0 (nível3) · IEC 60870-5-101 · IEC 60870 -5-104 · MOD – BUS	DNP 3.0	V
Communication ports	· RS – 232 · RS - 485 · FIBER OPTICS	Optional	Optional
	· Industrial Bluetooth	Optional	Optional
	· Ethernet RJ – 45	NA	Optional
Signaling	· Configurable fault or alarm	NA	V
	· Indication of overcurrent / short current in the load	NA	V
	· Programmable outputs	NA	V
Keyboard	· Two keys for configurable functions (shortcut)	NA	V
	· Key to configure destination TAP	NA	V
	· Six keys for preset shortcuts	NA	V
Universality	Enables the use of TVC control on regulators from other manufacturers. Note: The assembly and wiring "retrofit kit" (optional) provides all parts required for easy adaptation and replacement for using the TVC control in regulators of all existing brands on the market	NA	V
Operation counter	Six digit electromechanical	Optional	Optional
Position sensor	High fidelity in the indication of TAP position via special sensors developed by TSEA energia, assuring EXTRA reliability in the dynamic operation of the decisions made by the electronic control, in the adequate voltage regulation of the distribution network	V	V
Nobreak	Enables single-phase voltage return to a TAP to be parameterizable (for example: zero TAP) when the distribution network is disconnected due to adverse factors	NA	Query
Accuracy		0,50%	0,30%
Self-protection	Avoids the consequences of vandalism (theft/cutting of the multi-cable) or operating error, providing automatic short-circuit of the CT in case the circuit is unduly opened	NA	V
Master/Follower	Enables bank operation via Master/Follower system	NA	V
Master/Slave	Enables bank operation via Master / Slave system	NA	V
Management by between bank regulators	The Master / Slave function can be set in the control, enabling the regulator bank regulation is managed in relation to: · Average Voltage · Regulator Phase 1 · Regulator Phase 2 · Regulator Phase 3	NA	V

PREFERRED RATINGS FOR 60HZ VOLTAGE REGULATORS

RATED VOLTAGE	STANDARD RATED VOLTAGES (1)	RATED KVA	RATED CURRENT AT +/-10%	CATALOG NUMBER
7620/13200Y 95/110kV BIL	7967 / 7620 / 7200 / 6 930 / 6582	38,1 76,2 114,3 167 250 333 416 500 667 833	50 100 150 219 328 438 546 656 875 1093	HCMR-60-7.62-50 HCMR-60-7.62-100 HCMR-60-7.62-150 HCMR-60-7.62-219 HCMR-60-7.62-328 HCMR-60-7.62-438 HCMR-60-7.62-546 HCMR-60-7.62-656 HCMR-60-7.62-875 HCMR-60-7.62-1.093
13800 95/110kV BIL	13800 / 13200 / 12600 / 12000 / 7967 / 7620	69 138 207 276 414 552 667 833	50 100 150 200 300 400 483 604	HCMR-60-13.8-50 HCMR-60-13.8-100 HCMR-60-13.8-150 HCMR-60-13.8-200 HCMR-60-13.8-300 HCMR-60-13.8-400 HCMR-60-13.8-483 HCMR-60-13.8-604
14400 / 24940Y 150kV BIL	14400 / 13800 / 13200 / 12000 / 7967 / 7620	72 144 288 333 432 576 667 833	50 100 200 231 300 400 463 578	HCMR-60-14.4-50 HCMR-60-14.4-100 HCMR-60-14.4-200 HCMR-60-14.4-231 HCMR-60-14.4-300 HCMR-60-14.4-400 HCMR-60-14.4-463 HCMR-60-14.4-578
19920 / 34500Y 150kV BIL	19920 / 14400/ 13800 / 13200 / 7967 / 7620	100 200 333 400 667 833	50 100 167 201 334 418	HCMR-60-19.92-50 HCMR-60-19.92-100 HCMR-60-19.92-167 HCMR-60-19.92-201 HCMR-60-19.92-334 HCMR-60-19.92-418
23000 150kV BIL	23100 / 23000 / 19920 / 14400 / 13800 / 13200	230 460 690	100 200 300	HCMR-60-23-100 HCMR-60-23-200 HCMR-60-23-300
34500 200kV BIL	34500 / 33000 / 30000 / 19920 / 14400 / 13800	173 345 518 690	50 100 150 200	HCMR-60-34.5-50 HCMR-60-34.5-100 HCMR-60-34.5-150 HCMR-60-34.5-200

(1) Standard voltage options must be marked on the identification plate.

Notes: Regulators are designed and built to withstand 12% of nominal overload current and winding temperature rise of 55°/65°C.

Other voltage and nominal current options may be available upon request.

SUPPLEMENTARY CONTINUOUS RATED CURRENT

REGULATION RAGE (%)	CONTINUOS RATED CURRENT (%)
10	100
8.75	110
7.50	120
6.25	135
5.00	160

This table should be used for continuous rated current up to 668A.

PREFERRED RATINGS FOR 50HZ VOLTAGE REGULATORS

RATED VOLTAGE	STANDARD RATED VOLTAGES (1)	RATED KVA	RATED CURRENT AT +/-10%	CATALOG NUMBER
6600 95/110kV BIL	6600 / 6350 / 6000 / 5500	33 66 99 132 198 264 330 396 462 528	50 100 150 200 300 400 500 600 700 800	HCMR-50-6.6-50 HCMR-50-6.6-100 HCMR-50-6.6-150 HCMR-50-6.6-200 HCMR-50-6.6-300 HCMR-50-6.6-400 HCMR-50-6.6-500 HCMR-50-6.6-600 HCMR-50-6.6-700 HCMR-50-6.6-800
11000 95/110kV BIL	11000 / 10000 / 6600 / 6350 / 6000 / 5500	55 110 165 220 330 440 550 660	50 100 150 200 300 400 500 600	HCMR-50-11-50 HCMR-50-11-100 HCMR-50-11-150 HCMR-50-11-200 HCMR-50-11-300 HCMR-50-11-400 HCMR-50-11-500 HCMR-50-11-600
15000 150kV BIL	15000 / 14400 / 13800 / 11000 / 10000 / 6600	75 150 225 300 450 600 750 900	50 100 150 200 300 400 500 600	HCMR-50-15-50 HCMR-50-15-100 HCMR-50-15-150 HCMR-50-15-200 HCMR-50-15-300 HCMR-50-15-400 HCMR-50-15-500 HCMR-50-15-600
22000 150kV BIL	22000 / 19920 / 14400 / 13800 / 11000 / 10000	110 220 330 440 660 880	50 100 150 200 300 400	HCMR-50-22-50 HCMR-50-22-100 HCMR-50-22-150 HCMR-50-22-200 HCMR-50-22-300 HCMR-50-22-400
33000 200kV BIL	33000 / 30000 / 22000 / 19920 / 15000 / 11000	165 330 495 660	50 100 150 200	HCMR-50-33-50 HCMR-50-33-100 HCMR-50-33-150 HCMR-50-33-200