

# TITANIUM PLUS 2R-SCR

## DC POWER SUPPLY SYSTEMS

DC UPS - double branch Rectifier - SCR type



TITANIUM PLUS 2R-SCR rectifier series belongs to the Double Branch category thus provided with two independent AC/DC converters, one powering the direct current loads with stabilized voltage and the other dedicated to the battery charging.

Cabinet and open frame versions are available, combined with vented/sealed Lead Acid and Ni/Cd batteries.

An input insulation transformer for each converter is present while the AC/DC power converter is of the removable type and made with SCR full controlled technology in order to improve the efficiency and contain the ripple at the output. In this way the MTBF is high and MTTR extremely low.

## APPLICATIONS

- Oil & Gas
- Energy production and distribution
- Process controls
- Transportation
- Safety
- Telecommunications
- Tertiary

The **SYSTEM CONTROL** is now based on an expandable Industrial PLC, characterized therefore by a very high reliability as well as by a considerable flexibility, it allows to satisfy a greater number of technical needs and consequent applications. This section, which constitutes the "intelligent" heart of our system, is now made in a special drawer located on the inside of the main door of the cabinet and **FULLY REMOVABLE** thanks to the presence of a polarized connector. This solution introduces a very important advantage, in fact it is possible to replace this assembly while hot, with the machine running, without turning off the system.

This is possible as the AC / DC conversion units recognize the loss of communication with the drawer and set themselves up in "**AUTOMATIC SAFE MODE**", actually working independently and guaranteeing continuity of operation.

Once the drawer has been replaced and the connection re-established, the **AC/DC** units will return to operate under the automatic control of the PLC, resuming normal and complete operation. The HMI (Human Machine Interface) system has also been renewed, which now includes a touch panel, capacitive, 7 "with excellent visibility characteristics, mechanical resistance to wear and connectivity with the outside world. Finally, a great deal of space was reserved for **REMOTE CONNECTION**, in fact now it is possible to control, parameterize and manage these systems in absolute safety through the **INTERNET** network thanks to the standard presence of the **WEB SERVER** function.

This has an undoubted advantage that significantly improves the maintenance and technical assistance aspects in critical installations.

## MAIN FEATURES

- Input insulation transformer at mains frequency, with an electrostatic shield
- **SCR** Power Bridge Rectifier Total-controlled **ON REMOVABLE UNITS**
- Control type: **SCR with phase-cutting regulation**
- System control with industrial **PLC ON REMOVABLE UNITS**
- Charge curve for each type of battery (AGM - GEL - PB - NI-CD) 3 charging levels including manual charging complete with safety timer
- HMI - Digital control panel with touchscreen display 7" with integrated Web server
- High efficiency and reliability
- Easy maintenance with access from the front and removable power units
- Extended frequency range accepted as input
- Low residual ripple as output and on batteries (RIPPLE)
- Automatic and manual battery test (performing a true discharge battery test)
- DC polarity on the ground sensor
- MODUBUS TCP/IP communication (slave – server)
- Alarm cards with 3 fixed relays and 4 completely programmable by user
- Temperature compensation with PT100 sensor and correction coefficient (Vel/°C) settable by the user
- **AUTOMATIC SAFE MODE function to ensure continuity of power supply even in case of control failure**
- **Reversibility of operation between the two branches**
- **POWER BOOST function (parallel of power between the two branches)**

## DATA SHEET

### MODEL

### TITANIUM PLUS 2R-SCR

<b>GENERAL</b>	BATTERY TYPE	Suitable for Sealed (VRLA) Lead Acid - Vented Lead Acid - Ni/Cd			
	CHARGING CHARACTERISTICS	IU (according to DIN 41773) floating, boost and manual charging			
<b>OUTPUT</b>	NOMINAL VOLTAGE (V)	24	48	110	220
	CURRENT RANGE	60 ÷ 500 A			60 ÷ 250 A
	MAXIMUM POWER (W)	12000	24000	55000	55000
	RIPPLE NOISE (RMS)	1%			
	V <sub>out</sub> SETTING RANGE	+/- 5%			
	STABILITY	+/- 1%			
	V <sub>in</sub> VARIATION SETTING	+/- 1%			
	LOAD VARIATION SETTING	+/- 1%			
	START-UP TIME	10 sec.			
<b>INPUT</b>	VOLTAGE RANGE	three-phase 400Vac ±10%			
	INPUT FREQUENCY	50 ÷ 60 +/-5%			
	EFFICIENCY ( T <sub>yp.</sub> )	≥ 90 %			
	I/O INSULATION	4kV BY TRANSFORMER			
<b>PROTECTIONS</b>	INPUT	circuit breaker			
	BATTERY	Fuses			
	OUTPUT	Switch			
	OVERLOAD	<120% for 20 min., >150% for 5 sec.			
	CURRENT CURVE	COSTANTE			
	OVERVOLTAGE	+ 10% V <sub>n</sub>			
	UNDERVOLTAGE	- 50% V <sub>n</sub>			
	OVERTEMPERATURE	Shut down; automatic restart after temperature reset			
<b>ALARMS</b>	ALARM CARD WITH NO. 3 RELAY SPDT 5A/250VAC	AC MAINS PRESENCE, GENERAL FAILURE, LOW BATTERY VOLTAGE			
	NO. 4 USER PROGRAMMABLE RELAYS VIA HMI PANEL				
<b>ENVIRONMENTAL DATA</b>	OPERATING TEMPERATURE	-10 .....+40°C			
	OPERATING HUMIDITY	< 95% without condensation			
	STORAGE TEMPERATURE	-20 .....+70°C			
	NOISE LEVEL	according to EN50091 < 60 dBA (typical value with forced ventilation in operation)			
<b>STANDARDS</b>	MARKING	CE			
	DEGREE OF PROTECTION	IEC 60529			
	EMC	EN 61000-6-2 EN 61000-6-4			
	TATIC CONVERTERS	EN 60146			
	DC UPS (performance, routine test, requirements)	IEC 62040-5-3			
<b>DEGREE OF PROTECTION</b>		Standard IP31, others on demand			
<b>COLOUR</b>		RAL 7035 cabinet - RAL7012 roof and base			

\* = Relay normally operating in positive safety



## STANDARD FUNCTIONS

- AC mcb with cont. aux.

## BATTERY CHARGE BRANCH - RCB

- Floating charge
- Boost charge
- Manual charge
- Emergency operating voltage
- Temperature compensation
- BATTERY TEST function

## SERVICE BRANCH - RS

- Normal operating voltage
- Emergency operative voltage

## SYSTEM

- Power boost function
- Relay alarm card
- DC EARTHED sensor

## COMMUNICATION (Modbus slave TCP/IP)

Word individual for electrical parameters:

- Output voltage to loads
- Output current to loads
- Battery voltage
- Battery recharge current
- Battery temperature

DoubleWord allarms:

- Showing all the signals present on the HMI

## MEASUREMENTS HMI

- Output voltage
- Output current
- Battery voltage
- Current battery charge
- Battery temperature

## SIGNALS AND MEASURES

- AC MAINS - ON
- AC/DC RS - ON
- AC/DC RCB - ON
- Voltage output rectifier High
- RS output voltage High/Low
- RCB output voltage High/Low
- RCB Floating charge (x)
- RCB Boost charge (x)
- RCB Manual charge (x)
- Temperature Compensation ON (x)
- Battery charging current limitation ON (x)
- Positive pole on the ground
- Negative pole on the ground
- Output Overload
- Battery testing in progress
- Battery test failed
- Operating from batteries
- Low battery voltage
- End of battery drain
- High battery temperature (x)
- AC input MCB OFF

(x) HMI - enable function

### DC POLARITY ON THE GROUND SENSOR

There is a fixed-threshold sensor (about 15mA, referring to the system's output terminals) that detects possible loss of insulation of the output poles and batteries present in the system. This sensor is **NOT similar** to an **INSULATION CONTROL** instrument but is provided to give an initial indication of any abnormality.

The circuit detects the loss of insulation of the **POSITIVE** pole or the **NEGATIVE** pole differentiated.

**FROM HMI you can:**

Activate and deactivate the function

### FLOATING CHARGE

This recharge has two different phases:

- Phase 1: the current is constant and the voltage increases
- Phase 2: The current decreases and the voltage is constant

When the recharging current falls below a certain value, the batteries are considered charged and the cycle is over. In this situation the output goes to the floating value which is the minimum value necessary for correct recharging maintenance battery.

### AC/DC - THYRISTOR

It consists of a rectifier bridge in a fully controlled configuration.

### WIRING

- Power cables AC and DC sections = FS17 CPR Cca-s3,d1,a3
- Signaling and control cables = FRO-HP CPR Cca-s3,d1,a3
- FLAT CABLE = Flame Classification FT1,FT2
- Data transmission cables = Cavo RJ45 - CAT5 FTP

### ALARMS RELAY CARD

There is a board consisting of 7 alarm relays with SPDT type contact shown on removable and polarized printed circuit terminals. The electrical contacts have a range of 5Amp to 250Vac.

There are three fixed alarms respectively:

- **AC MAINS PRESENCE** - wired in positive logic
- **GENERAL FAILURE** - wired in positive logic
- **LOW BATTERY VOLTAGE**

While it is possible to configure the remaining 4 from the HMI.

**FROM HMI you can:**

Configure 4 alarms depending on the menu on HMI.

### INPUT TRANSFORMER

The power transformer is made with a core of first choice laminations (optional the solution with oriented crystals) and an electrostatic screen between primary and secondary.

It produces the reduction of the input voltage to the most appropriate value for the operation of the conversion system and isolation from the network (4kV).

The transformer is made with class F supports and insulators (155 ° C) while the windings are in electrolytic copper class H double insulation (220 ° C). There is an electrostatic shield connected to earth between primary and secondary. The transformers comply with the Standard CEI EN 61558-2-4-file 4971 classification CEI 96-7.

## POWERBOOST FUNCTION

In case of RS overload, the RCB branch activates automatically connecting itself in parallel with the load and with the entire battery bank. The device automatically turns its configuration from **DOUBLE BRANCH** to **SINGLE BRANCH** with **TWO UNITS IN PARALLEL**, only for the overload status duration; in this condition, the output voltage of the entire system will be set to the "charge conservation" voltage value to allow also the battery bank simultaneous charging.

The function can be permanently activated by the user via the appropriate keys on **HMI** in the password-protected area. It is important to notice that both the branches must have the same power and the same characteristics.

With this type of system, a configuration of "**REDUNDANCY AND PARALLEL of POWER**" is obtained in order to increase system reliability and to ensure a high degree of safety towards the load.

## REVERSIBILITY OF OPERATION BETWEEN THE TWO BRANCHES

Titanium rectifier series includes two units of AC/DC conversion which work independently when input power is present. The converter "battery branch" charges the battery independently from the load; contemporarily the "system branch" will independently supply the load to a voltage threshold with tolerance  $\pm 1\%$  from the voltage of charge the batteries.

In order to avoid the power interruption to the load in case of failure of the System Branch (RS) or the Battery Branch (RCB) the following solution is performed:

**STANDARD OPERATION:** during network operation, the two converters operate independently; The Battery Branch charges the battery with voltage dependent on the type of battery provided while the System Branch powers the load with stabilized nominal voltage  $\pm 1\%$ .

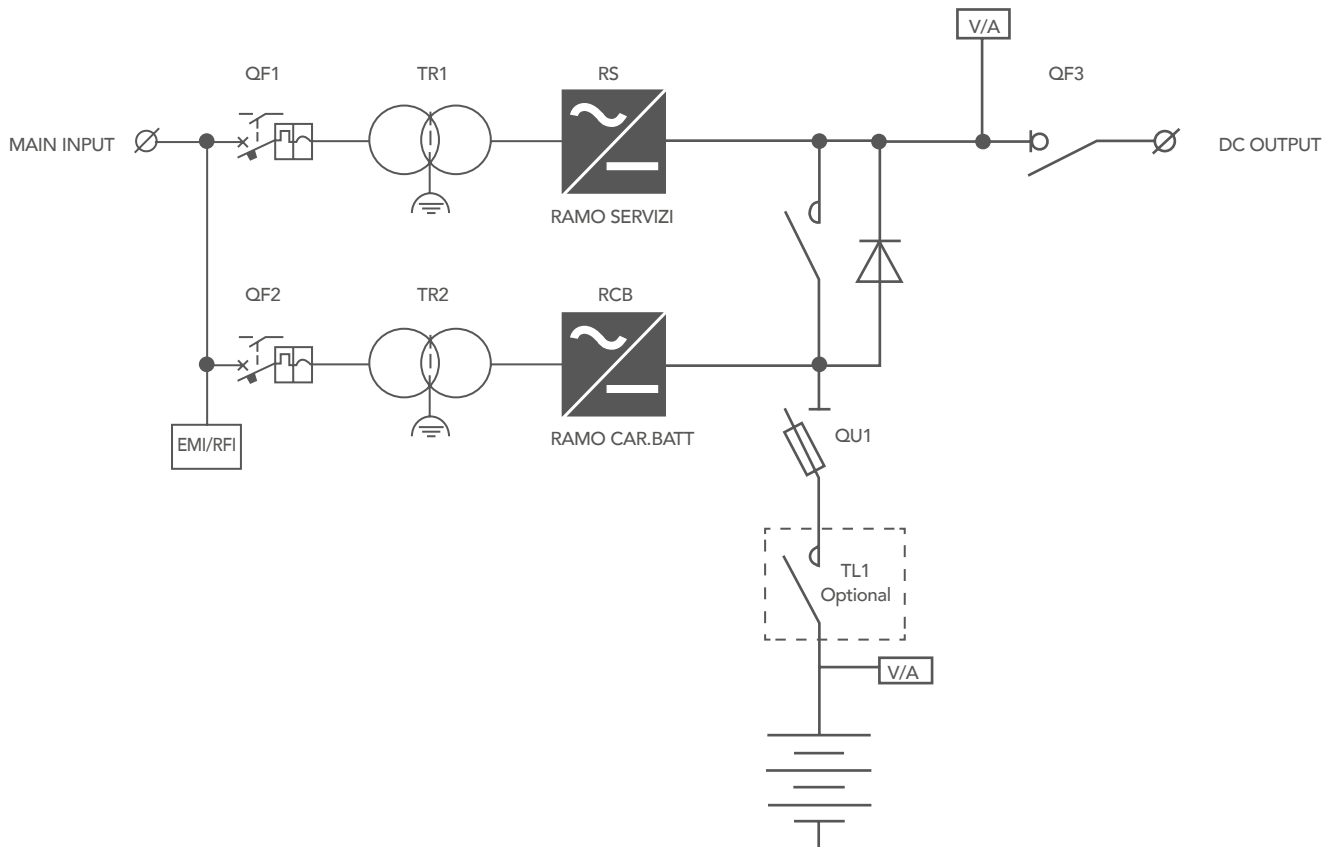
**BLACKOUT OPERATION:** In case of total loss of line or breakdown of both rectifiers, a sequence of operations in order to connect the load directly to the battery (without voltage drops) is activated.

**RS FAILURE (System Branch):** The System Branch failure activates the automatic and simultaneous switch on the branch battery, thus powering the load and simultaneously charging the battery in buffer. In this case, the voltage at the load is contained in the range  $V_n + 10\%$  (adjustable).

**RCB FAILURE (Battery Branch):** in case of battery branch failure the branch battery, the switch to activate the service branch to power the loads and ensure battery charging with emergency voltage equal to  $V_n + 10\%$  (adjustable) is automatically activated. After failure recovery, the system automatically starts to operate again restoring the original function to each of the converters.

## BASIC SINGLE-LINE DIAGRAM

### DOUBLE PARALLEL BRANCH - COD.2R



## OPTIONS

- Battery MCB with cont.aux reported on HMI
- Output MCB with cont.aux reported on HMI
- Dropped diodes
- Load side- static DC/DC converter
- Battery End discharge power contactor
- Communication - protocol IEC61850 - server
- Communication - protocol SNMP - server
- Communication - IoT
- Communication - protocol CANOPEN – SLAVE 485
- Communication - MODBUS RTU 485 - SLAVE
- Communication - protocol PROFINET-SLAVE-TCPIP
- Communication - protocol ETHERNETIP
- Departur from battery-Timed- CEI 0-16
- Battery Reverse Polarity Control Unit
- Manual Bypass for Battery End Discharge Power Contactor - cod.20-104
- Protection degree up to IP54 (for external)
- Special RAL colors for cabinet
- Block diode on DC output
- Operating temperature up to 55 °C
- Cables input from above
- Internal light and heaters
- Output Distribution
- Discharge resistor for battery test - is inserted during the battery test to impart a discharge current of appropriate value to the batteries



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