

TITANIUM PLUS 2R-CH

DC POWER SUPPLY SYSTEMS

DOUBLE BRANCH Rectifier - IGBT type

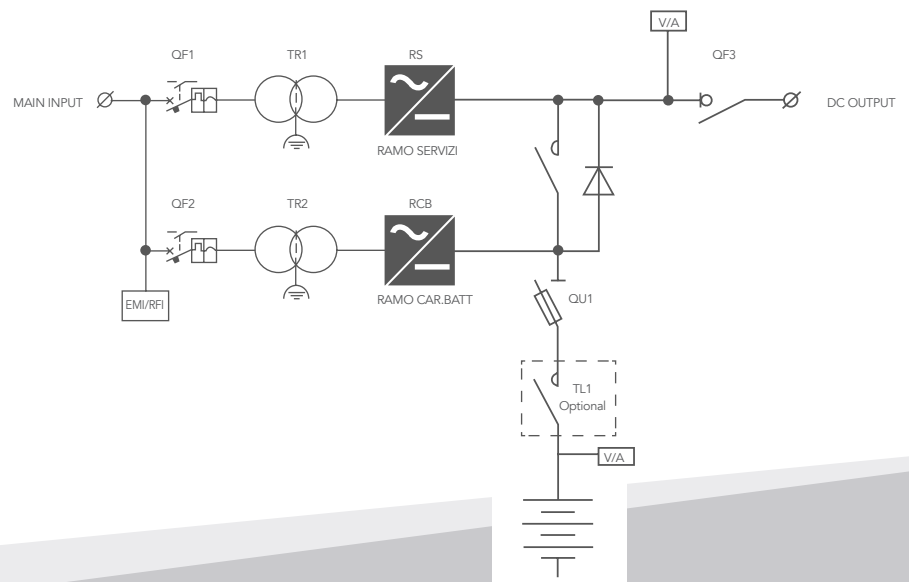
TITANIUM PLUS 2R-IGBT is a Double Branch rectifier, provided with two independent IGBT-based AC/ DC conversion units, one powering the DC loads with stabilized voltage and the other one dedicated to charge the battery. The rectifier is assembled in an industrial cabinet 2000mm height and can be supplied with sealed or vented Lead Acid and NiCd batteries. The AC/DC conversion units are removable, in order to improve the efficiency and obtain an high MTBF with an extremely low MTTR. Further, the rectifier is provided with two input insulation transformers (one for each branch), in order to contain the output voltage ripple, and features our latest HMI, including a touchscreen display 7" with integrated web server and MODBUS TCP/IP communication protocol.



MAIN FEATURES

- Input insulation transformer at mains frequency, with an electrostatic shield
- Bridge rectifier Chopper **IGBT on REMOVABLE UNITS**
- Control type: **High frequency PWM**
- System control with industrial **PLC on REMOVABLE UNITS**
- Charge curve for each type of battery (AGM - GEL - PB - NICD)
- 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)
- **BEA** Function (Battery Efficiency Analysis)
- DC polarity on the ground sensor
- MODBUS 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

SINGLE LINE DIAGRAM



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.



STANDARD FUNCTIONS

- AC mcb with cont. aux.

BATTERY BRANCH - RCB

- Floating charge
- Boost charge
- Manual charge
- Emergency operating voltage
- Temperature compensation
- Test battery function
- **BEA** function (Battery Efficiency Analysis)

SERVICE BRANCH - RS

- Normal operating voltage
- Emergency operating voltage

SYSTEM

- Poweboost function
- Relay alarm card
- DC earth pole sensor

SIGNALS AND MEASURES

- AC Mains ON
- AC/DC RS ON
- AC/DC RCB ON
- RS Rectifier High voltage output
- RCB Rectifier High voltage output
- RS Rectifier Low voltage output
- RCB Rectifier Low voltage output
- RCB Floating charge
- RCB Boost charge (x)
- RCB Manual charge (x)
- Active temperature compensation (x)
- Battery charging current limitation ON
- Positive grounded pole
- Negative grounded pole
- Output overload
- Battery test in progress
- Battery test failed
- Operating from batteries
- Low battery voltage
- End of battery drain
- High battery temperature (x)
- AC input MCB OFF AC

(x) HMI - enable function

HMI PANEL

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

COMMUNICATION

(Modbus slave TCP/IP)

Individual word for electrical parameters:

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

DoubleWord alarms:

- Showing all the signals present on the HMI

TITANIUM PLUS 2R-CH

GENERAL	BATTERY	Suited for sealed (VRLA) or vented Lead Acid or NiCd battery		
	CHARGING CHARACTERISTICS	IU (according to DIN 41773) floating, boost and manual charging		
OUTPUT	NOMINAL VOLTAGE (V)	24	48	110
	CURRENT RANGE	10 +100 A		
	MAXIMUM POWER (W)	2400	4800	11000
	RIPPLE NOISE (RMS)	1%		
	V _{out} SETTING RANGE	+/- 5%		
	VOLTAGE STABILITY	+/- 1%		
	V _{in} VARIATION SETTING	+/- 1%		
	LOAD VARIATION SETTING	+/- 1%		
	START-UP TIME	2 sec.		
INPUT	VOLTAGE RANGE	single-phase 230 Vac +/- 10% or three-phase 400Vac +/- 10%		
	INPUT FREQUENCY	50 ÷ 60 +/-7%		
	EFFICIENCY (Typ.)	≥ 90 %		
	I7O INSULATION	4kV by transformer		
PROTECTIONS	INPUT	Automatic circuit breaker		
	BATTERY	Fuses		
	OUTPUT	Switch		
	OVERLOAD	2In x 5mS Shut down for 250mS - restart aut.		
	CURRENT CURVE	Constant		
	OVERVOLTAGE	+ 10% V _n		
	UNDERVOLTAGE	- 50% V _n		
	OVERTEMPERATURE	Shut down. Automatic restart after temperature reset		
ALARMS	ALARM CARD WITH N.3 RELAYS SPDT 5A/250VAC	AC Mains presence, General Failure, Low Battery voltage		
	N. 4 USER PROGRAMMABLE RELAYS VIA HMI PANEL			
AMBIENT	OPERATING TEMPERATURE	-10+40°C		
	OPERATING HUMIDITY	< 95% without condensation		
	STORAGE TEMPERATURE	-20+70°C		
	NOISE LEVEL	according EN50091 < 60 dBA (typical value with forced ventilation in operation)		
STANDARDS	MARKING	CE		
	PROTECTION DEGREE	IEC 60529		
	EMC	EN 61000-6-2 EN 61000-6-4		
	STATIC CONVERTERS	EN 60146		
	DC-UPS (performance, routine test, requirements)	IEC 62040-5-3		
PROTECTION DEGREE (closed door)		IP31 standard, others on demand		
COLOR		RAL 7035 cabinet - RAL7012 roof and base		

* Relay normally operating in positive safety

DC POLARITY GROUNDED 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.

AC/DC - IGBT - CHOPPER

It consists of a High Frequency regulator in configuration IGBT STEP-DOWN with PWM technology control.

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.

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 insulation 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.

BATTERY EFFICIENCY ANALYSIS "B.E.A."

Advanced feature that determines the state of efficiency of the battery through the mathematical comparison between the real trend of the voltage during the discharge of the battery and the theoretical curve based on **Peukert's law**.

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.



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