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APPLICATION NOTE: ACB-3000 Redundancy Static Transfer Switch

INTRODUCTION

This document summarizes the performance of Premium PSU's ACB-3000 redundancy static transfer switch. We have recently carried out tests on the ACB-3000 that prove that the device switches in less than 2 milliseconds from one input to the other in an error situation.

ACB-3000 Redundancy Static Transfer Switch

The ACB-3000 is an ultrafast two lines static transfer switch. It selects the appropriate line in case one of them fails.

The device constantly monitors the evolution of the waveform of both lines. If the selected line goes out of the specifications, the system changes the line in less than 2 milliseconds, which is possible due to its fully digital control and the power switches used: SiC MOS.

The ACB-3000 is suitable for the Premium PSU's ODS-750, ODS-1500 and ODS-3000 inverter families, which have been designed to operate in both industrial and railway environments.

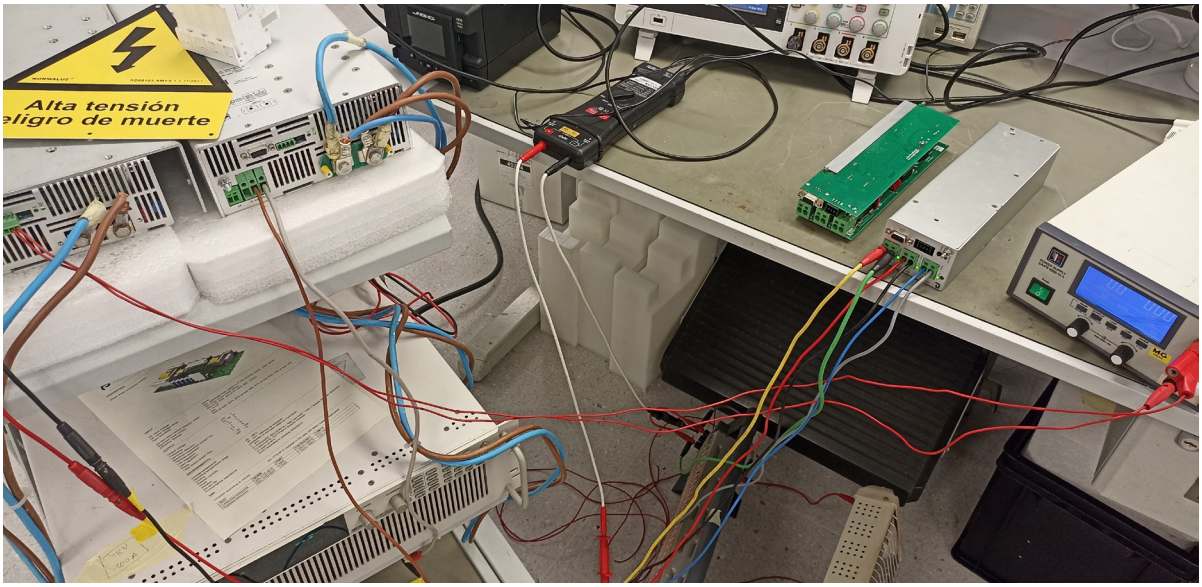
In case of failures, the unit can signal locally using a LED, and also remotely by a solid-state signalling relay and a CANopen bus port. The ACB-3000 is also protected against overloads and short circuits through a current-limiting circuit.

METHODS

We used two ODS-3000 for the measurement and exposed them to different situations to cover as many scenarios as possible. We also used:

- A Tektronic TBD 2000 oscilloscope, calibrated at 21/01/2020
- A Xantrex XDC 60-100 as the source that supplies the ODS
- An ElektroAutomatik EA-PS 5200 10A used as a second DC source to supply the remote control of the ODS

All tests were carried out in a full load situation.



Testing set-up

RESULTS

Image 2 shows the SiC Mosfet drivers' signal difference between the deactivation of the first one and the activation of the second one is exactly 2 ms. Since the microcontroller detects an error from the first line, it takes 2 ms to check the other input and decides if it can switch to the other line.

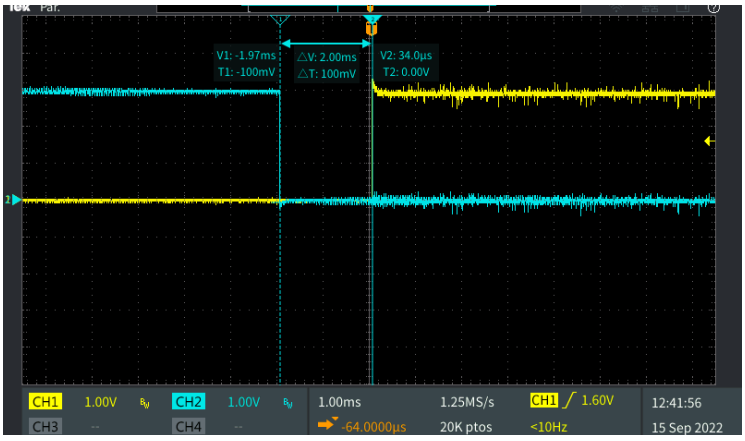


Image 2: Gate signal of channel 2: yellow – Gate signal of channel 1: blue

Image 3 shows the output signal of the ACB in a switching situation. In this case, we supplied both inputs with the same ODS to ensure the inputs were in phase. To force an error situation, we used a simple circuit breaker in priority input.

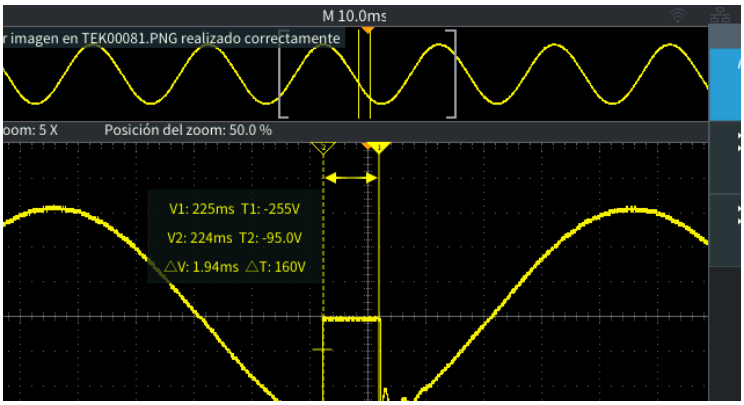


Image 3: Output signal in a switching situation when input signals are in phase

Image 4 shows switching operations when lines aren't synchronized.

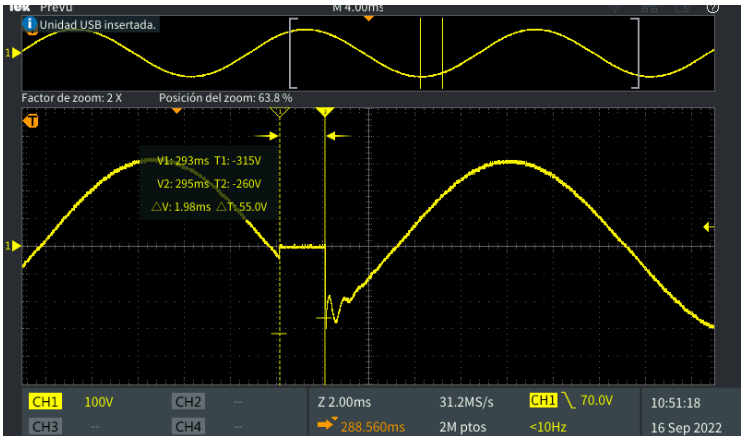


Image 4: Output signal in a normal switching situation, where input lines are not in phase.

The ACB-3000 can detect different types of defects in line and switch to the other in less than 2 ms, a priceless amount of time for most of the loads. During the 2 ms, the unit samples both lines, processes the data and decides changing or not the input line. In case of a line failure, the present strategy is to apply a blanking during the 2 ms at the output to avoid unknown transients.

At Premium PSU, we are currently working on improving the ACB-3000's switching alogrithm in order to reduce the switching time or eliminate the blanking time.

ABOUT PREMIUM PSU

Premium PSU is one of the largest power supply companies in Europe, offering solutions to the industrial market in high-tech machinery, transportation, energy, or extreme environment applications. Founded in 1981, Premium PSU designs and manufactures power conversion systems for customers all around the world.

Premium PSU's power conversion system range includes DC/DC converters, uninterrupted power supplies, DC/AC inverters, AC/DC power supplies and any solution that requires high reliability from 50W to 60kW.

All products comply with the specifications and regulations that each application requires and all projects, from the concept and design until the homologation of the product, are carried out in Barcelona under strict quality controls.

Custom is Premium PSU's standard, so any current product variation or new development can be done by our R&D department, a team of over 50 engineers with wide know-how.

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