MFU TESTING PROCEDURE STEP BY STEP

Contents

1   Introduction

This document describes step by step the testing procedure for all the Multifunctional Unit (MFU). The goal is to execute, in the proper way, each item reported in the testLogMFU_SE_FG660_xxx_xxxxxxxx.pdf file table and this document gives the instruction to do it.

NOTE!!: in order to perform all the tests listed in the file above mentioned, it is necessary to use a real power converter test bench.

NOTE!!: Before starting the test, please pay attention to the Electrostatic Discharge Protection (ESD) equipment.

- Be sure that your Device Under Test (DUT) lays always over a dissipative work surface.
- Don't forget to connect yourself to ground through the Wrist Strap device.

Your testing area should look like the picture below.
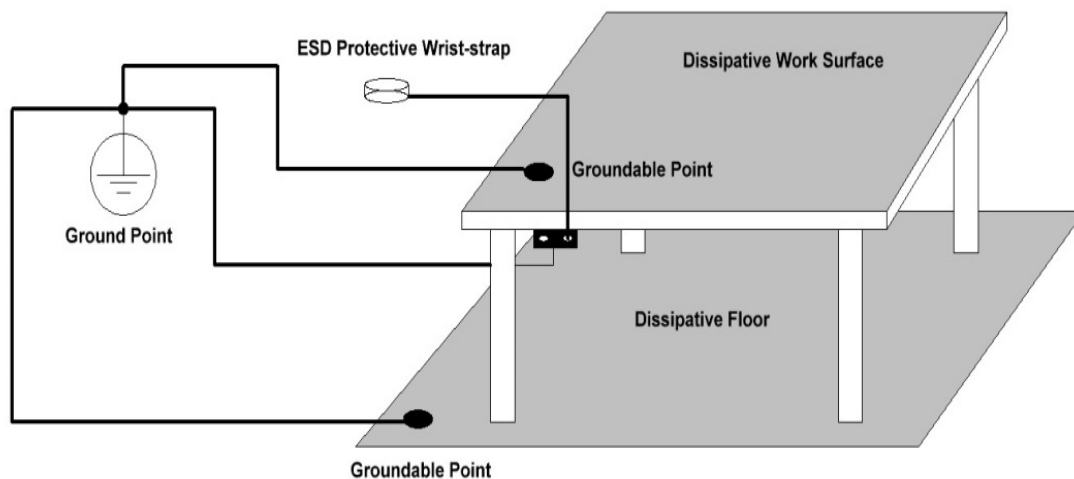
2   STEPS DESCRIPTION

2.1 Supply

a. Proceed with a board visual inspection in order to find out some missing components or damaged ones then connect the MFU to the ACU frame and finally turn on the power supply.
b. Execute a visual test of the required voltage supplies (2,5; 3,3; 5; +12; -12) checking the related LEDS.
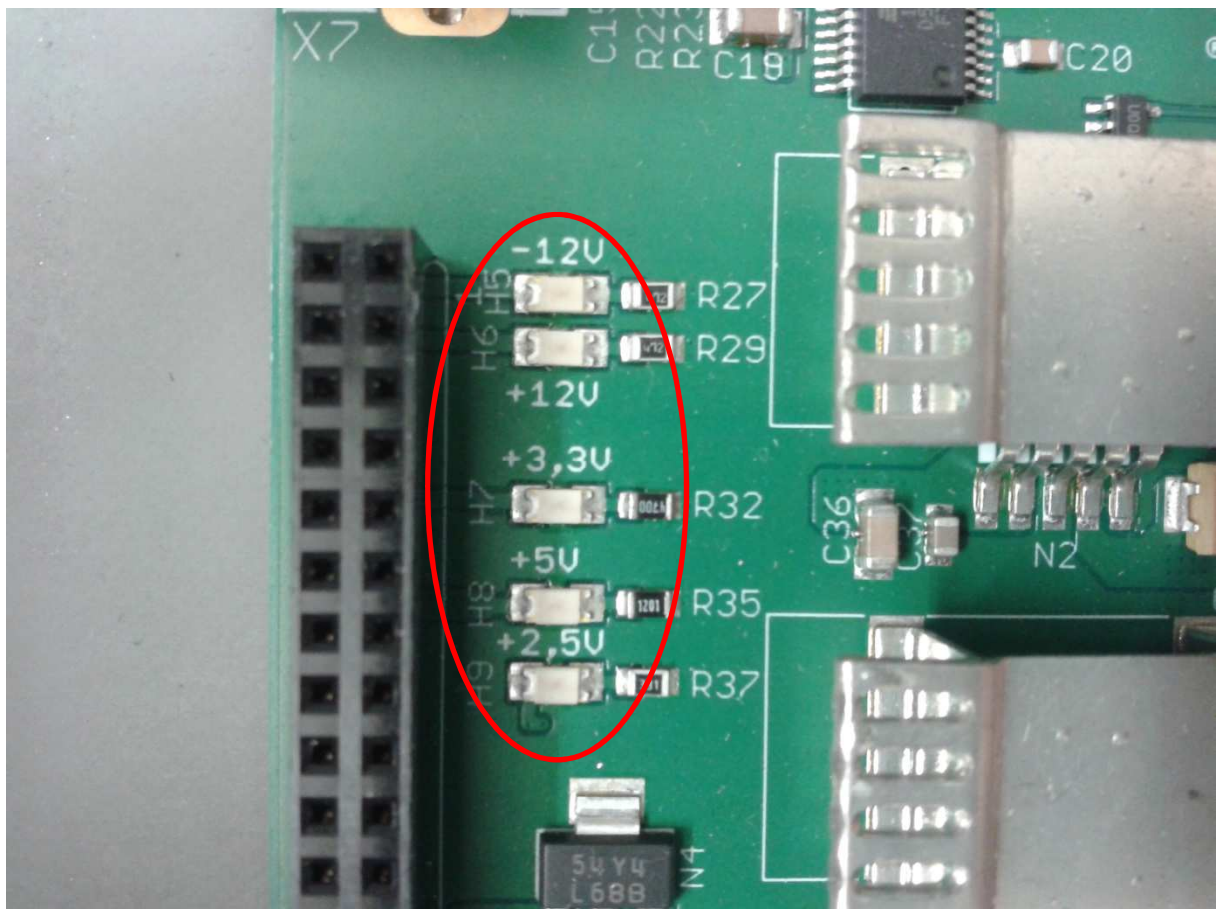

2.2 Firmware Downloading:

Configure the FPGA with the provided Firmware and Software. For more info about the MFU programming procedure, please check out the *MFU_ProgrammingProcedure.pdf* file.

2.3 Interlocks Displayed:

In one of the module connected to the MFU, trigger some interlocks of different nature (optical/electrical) and check if they are reported correctly

on the TFT display. They have to match in terms of interlock number and of USI number to the expected ones. For example, if I trigger the first optical interlock in the ICM module connected to the MFU through the USI number 3, on the TFT Display has to be reported something like in the pictures below.
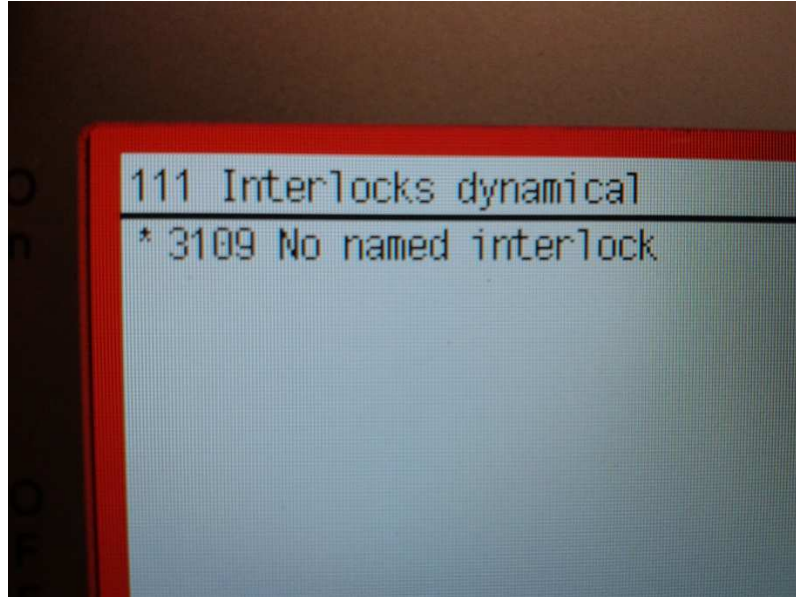
If the **111 Interlocks dynamical** Window is not displayed automatically, in order to check the activated interlock, press the incremental encoder, select first **1 System Overview** then **11 Interlocks** and finally **111 Interlocks dynamicals.**

2.4 Power Converter Operation Mode Test

This test consists to try to turn on the power converter test bench with the MFU under test part of the ACU System. The other ACU System modules (ICM and ADC card) have to be in advance and individually tested. Please follow the steps below:

a. Turn the power converter on.

b. Listen the main and secondary switches to commutate.

c. Check if the ICM LEDs (H63 to H68) over the optical outputs (D56 to D63) are on or blinking.

d. Trigger an interlock and check if the power converter switches automatically off.

e. Apply manually using the incremental encoder a set value and check if the actual value follows the set value (this has to be done for positive and negative values).

2.5 Local/Remote switch test:

Move the Local/Remote switch to Remote and try to turn on the power converter manually. It should be not possible. Try now to turn on the power converter via Power Config Advance (PCA) as following described: in the **Remote Control** tab, push first the **RESET** button, then the **ON**. When the power converter is on, turn it off pushing the **OFF** button. Repeat the test in the other way round moving the Local/Remote switch to Local.
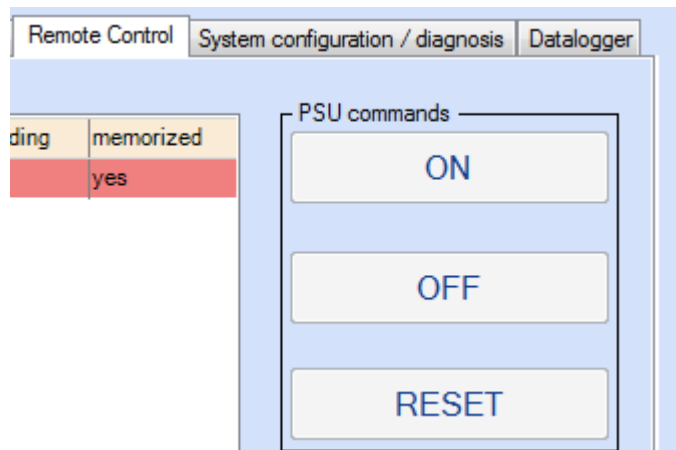

2.6 Incremental encoder check:

This test is in part already performed in the step 3 and 4, nevertheless it is useful to check if every menu session on the TFT display is reachable.

## 2.7 External Inputs/Outputs and DAC test:

These two tests are verified together because they can be related each other. The idea is to generate in PCA a digital ramp up/down signal converted then from all four DAC channels (down in red). To check the analog converted ramp up/down signal, an oscilloscope is used. The ramp up/down signal generation is driven by two lemo input connector X3 and X4 (in yellow). X3 defines, with the logic level 0/1 (3.3V), the ramp direction (up/down), while X4 defines the ramp incremental step command. On X3 it is connected in an alternative way the signal coming from X1 and X2 (lemo output connector (in light blue)).
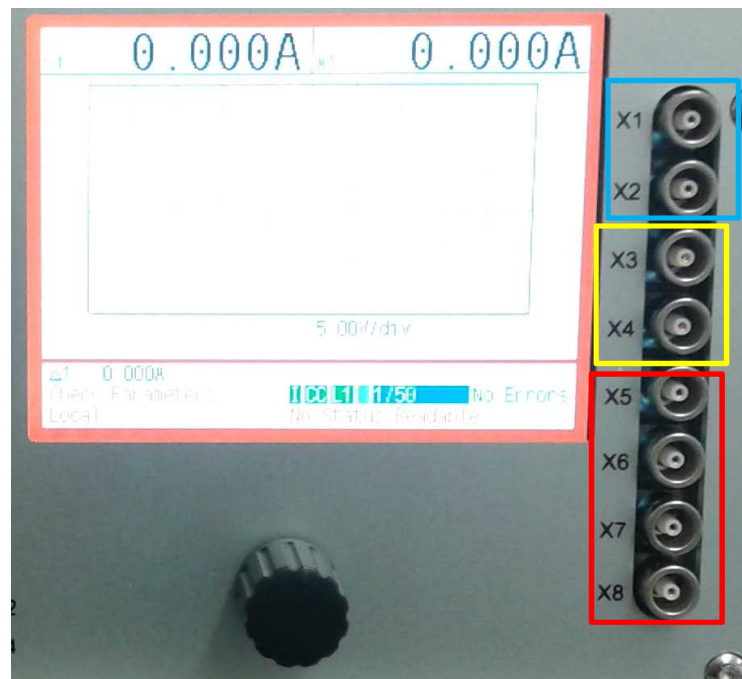

The output values of X1 and X2 are configurable in PCA. On X4 it is connected a square waveform 0/+3.3V with a frequency of 20 KHz generated by a function generator. Let's proceed step by step:
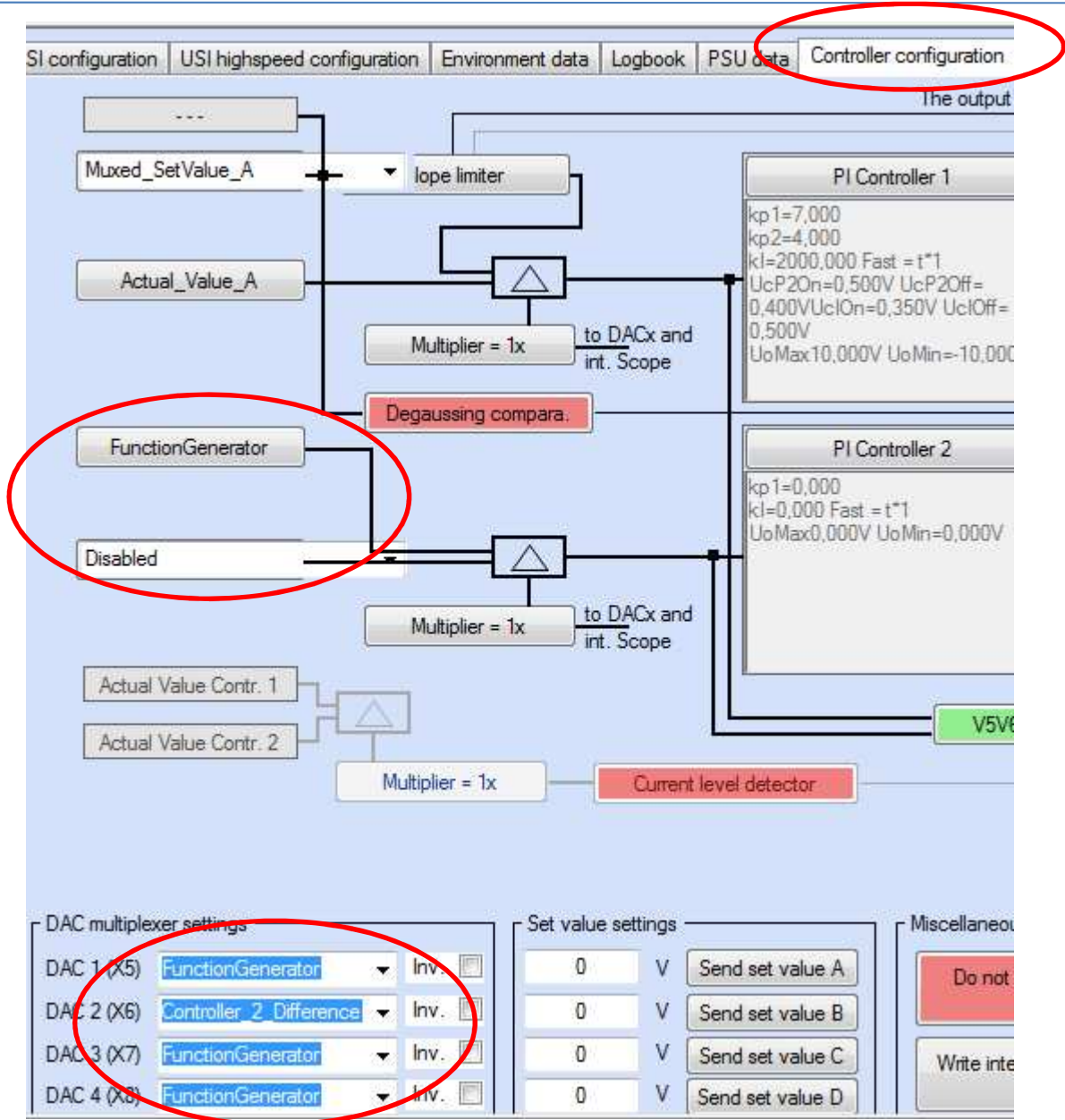
a. In the MFU **Controller configuration** tab select as set value of the PI controller number two the function generator and leave the actual value disabled. in the **DAC multiplexer settings** select the signal as shown below:
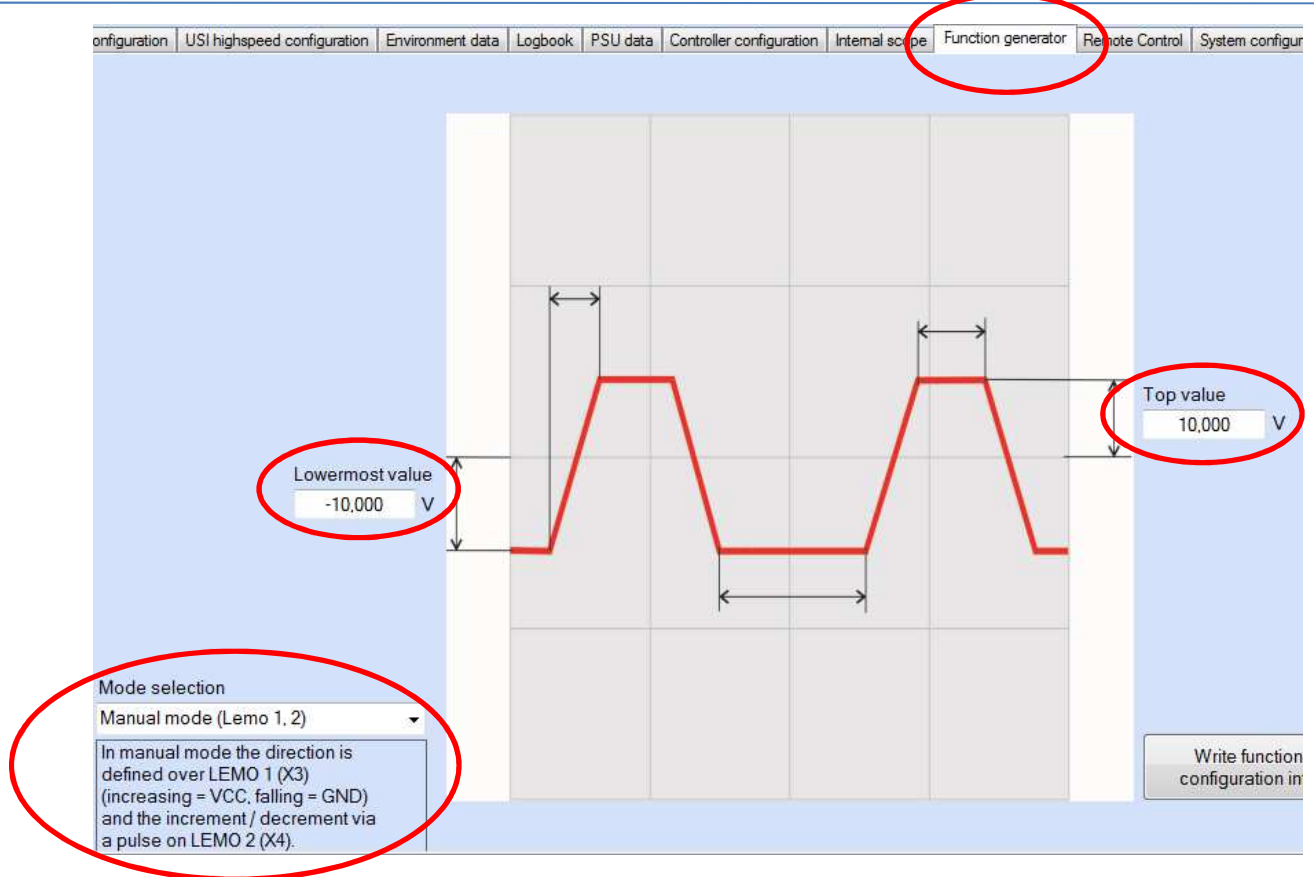
b. In the MFU *Function generator* tab select as **Mode selection** the item *Manual mode (Lemo 1,2)* and set as max and min wave value +10 and -10 V.
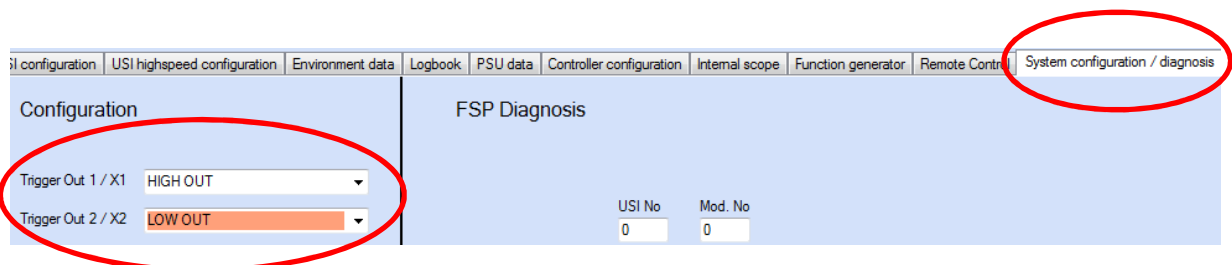

c. In the MFU *System configuration / diagnosis* tab select as *Trigger out 2 / X2* the item *LOW OUT* and *send the parameter to the MFU RAM*.

d. The pictures below describe how to perform the connection between the lab instruments and the MFU. In the first picture is possible to see how the MFU Input/output lemo connectors are connected.
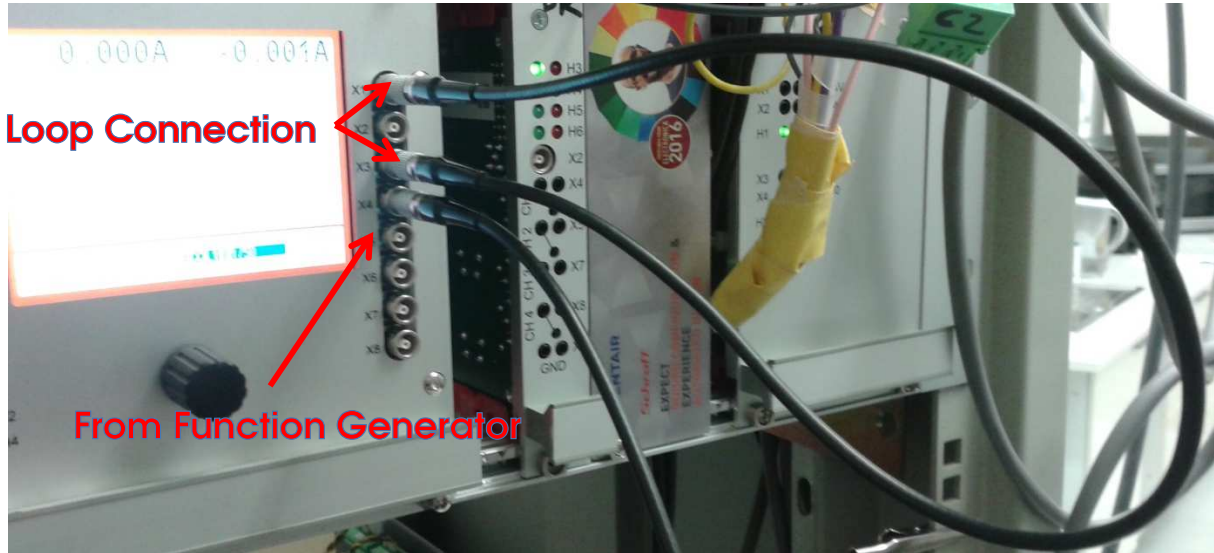

Below there are the DAC lemo outputs connection to the oscilloscope.
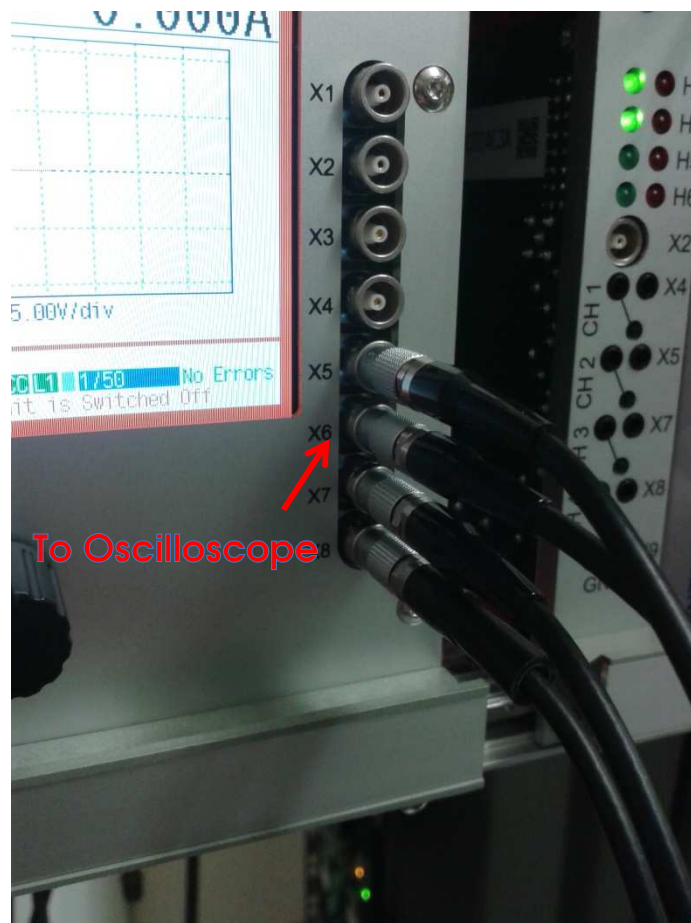
e. Below are reported the pictures related to the complete MFU front Lemo connections one with X3 and X1(ramp up direction) and the other with X3 and X2 together connected (ramp down direction).
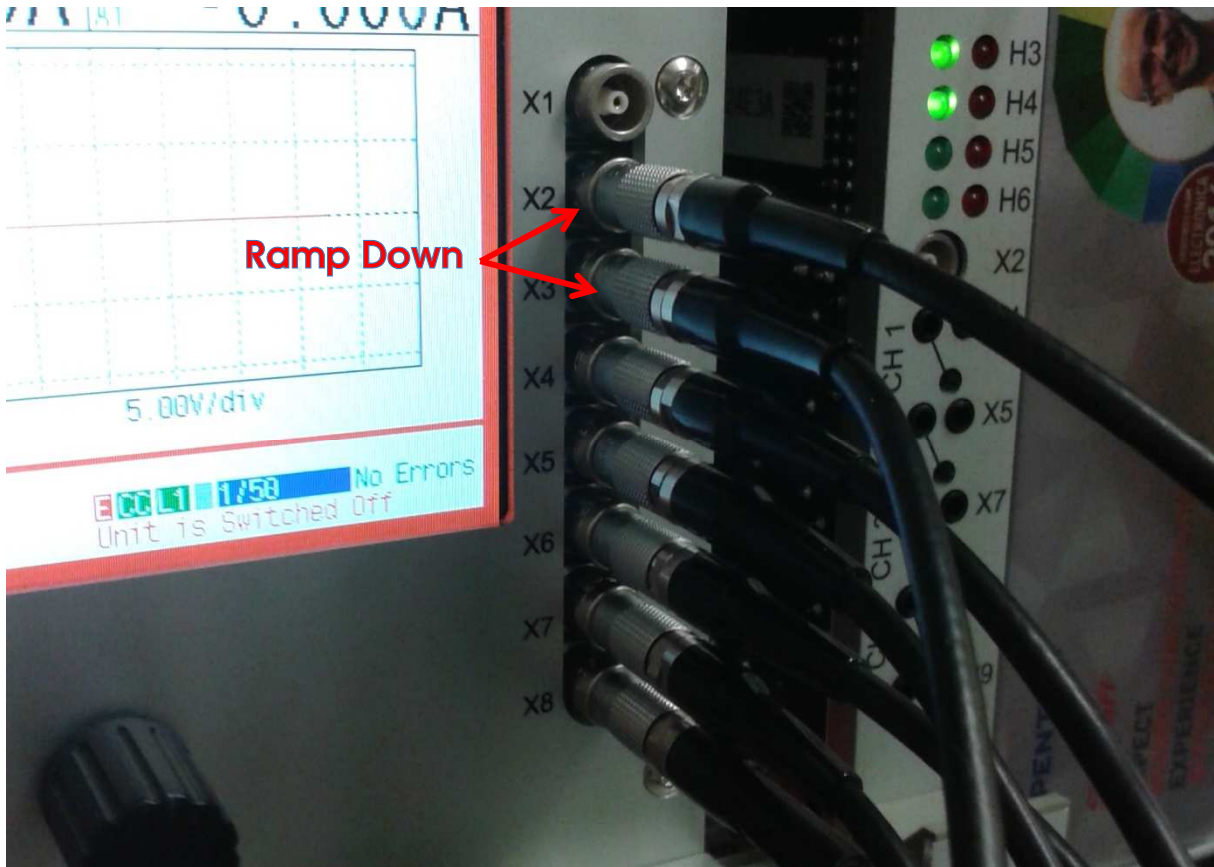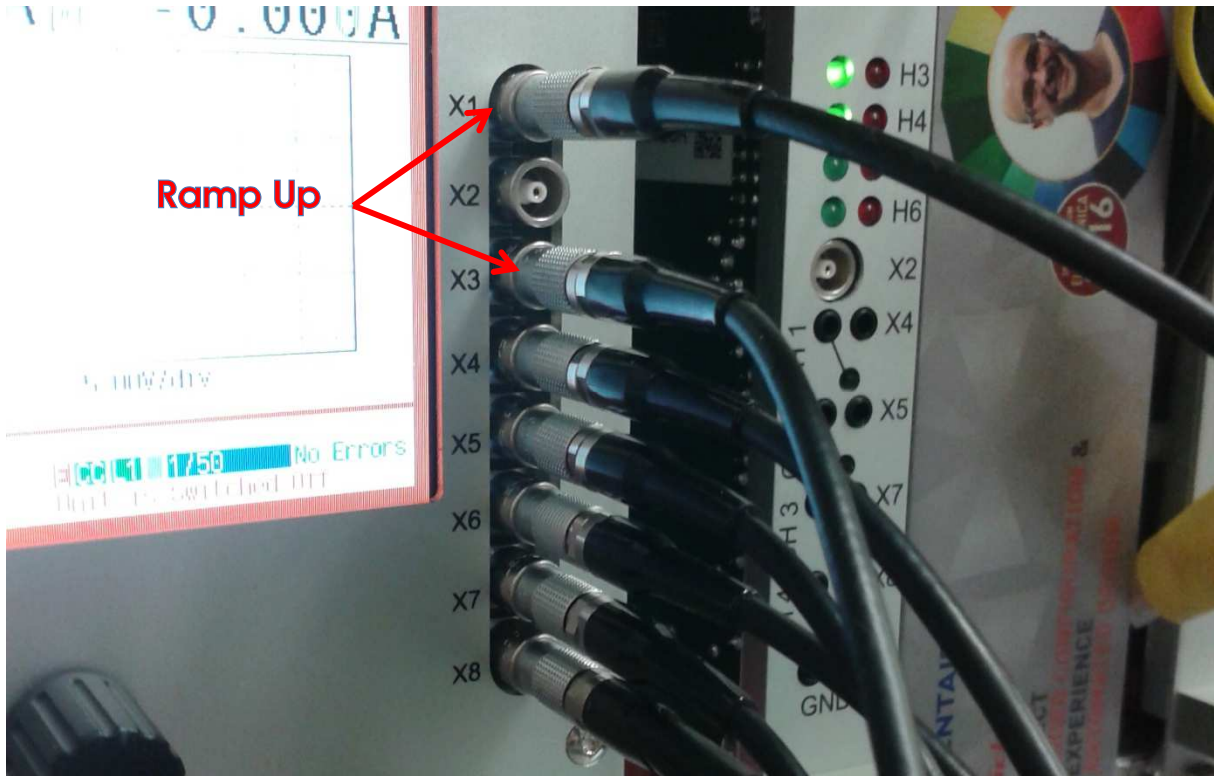
f. Changing the X3 connection between X1 and X2 should produce on the oscilloscope four signals ramping up to +10 V and ramping down to -10V respectively.
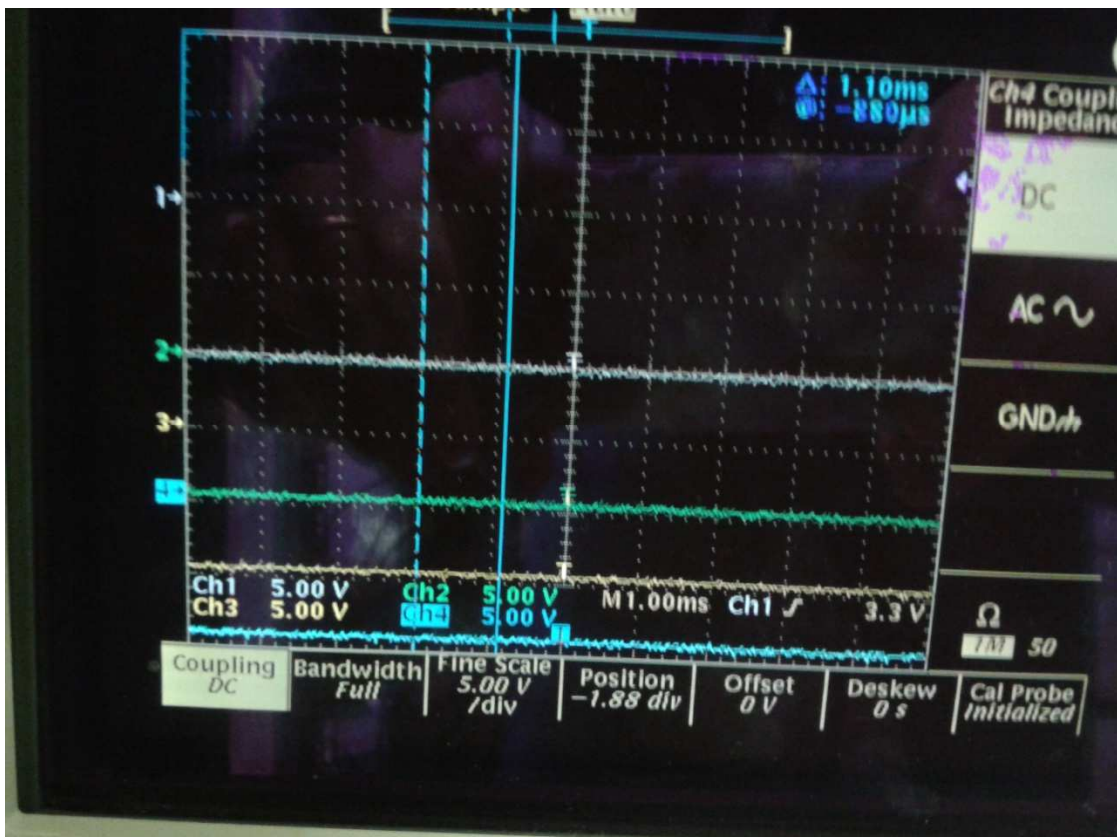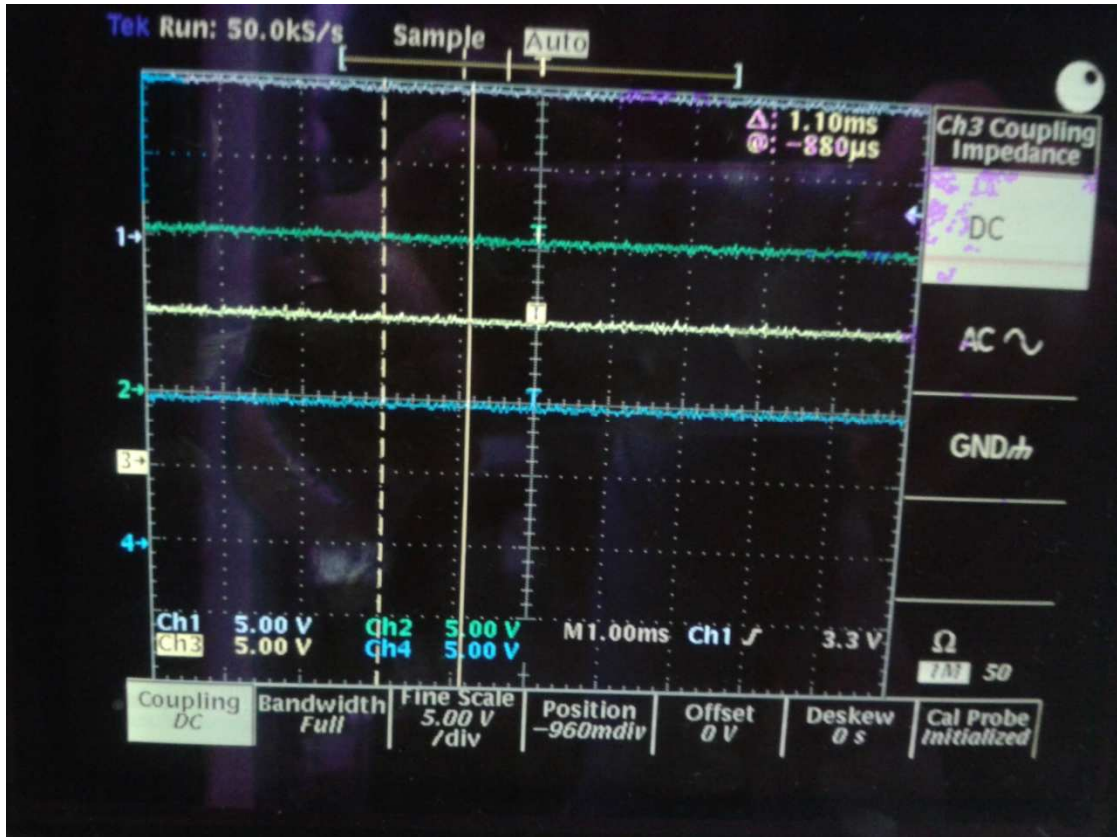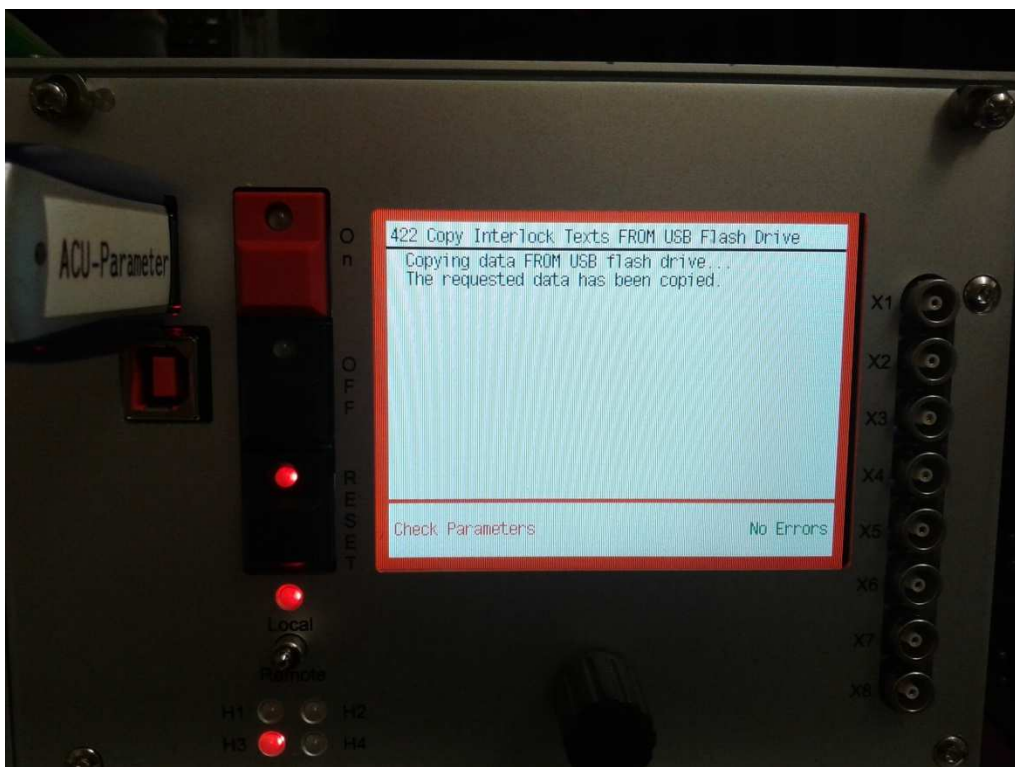
2.8 Vinculum:

Connect an authorized USB stick, with an interlock text file inside, on the dedicated MFU slot on the front plane. Using the incremental encoder perform the following actions:

a. ***Save / Copy / Load*** -> ***Interlock texts*** -> ***Copy Interlock Texts FROM the USB Flash Drive***.
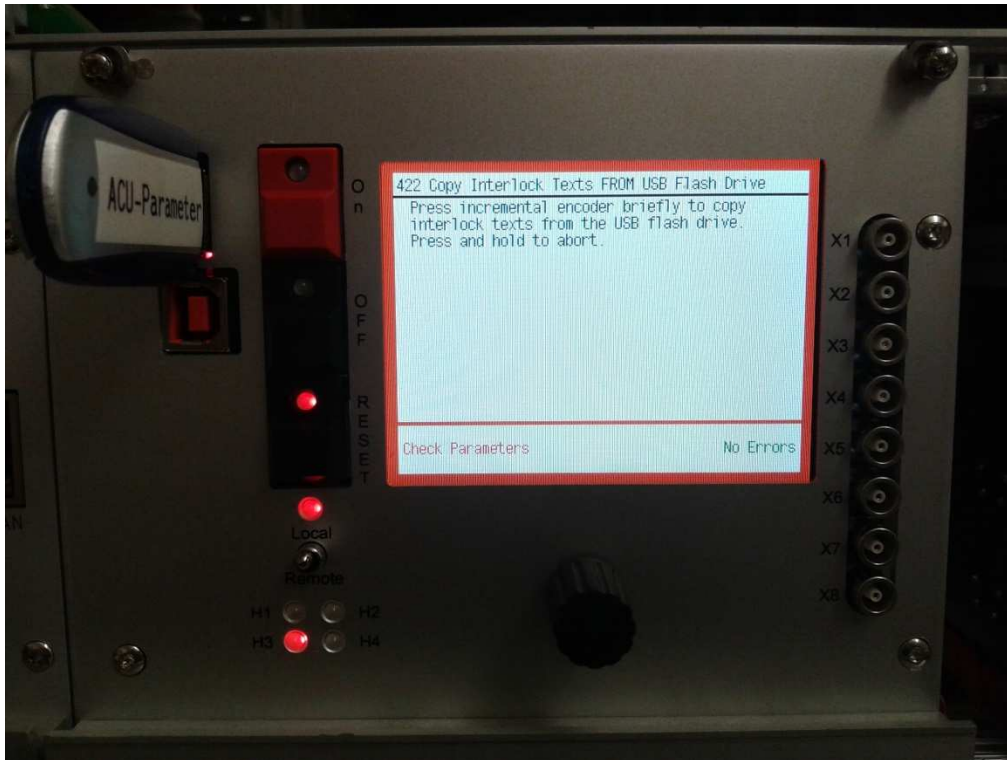
b. Press the incremental encoder briefly.

c. ***Save / Copy / Load*** -> ***Interlock texts*** -> ***Copy Interlock Texts TO the USB Flash Drive***.

NOTE!!: It is normal that the Interlock text file is already present on the USB stick and there is no problem to overwrite it because it will be the same loaded in the step a above.

d. Press the incremental encoder briefly.
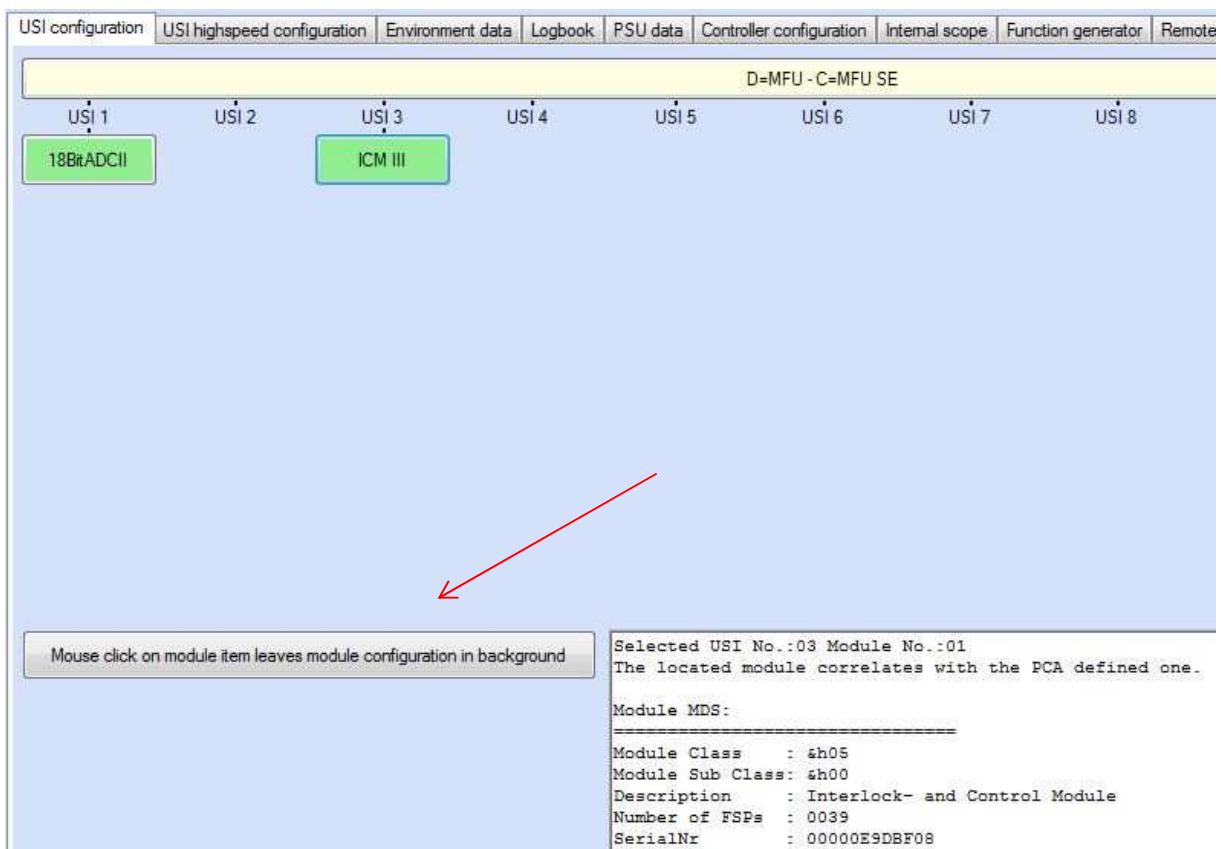
Testing Procedure
MFU

2.9   Power converter-MFU USB connection:

This test can be executed performing the step 10 below. Opening PCA, even without any configuration file loaded, if the indication bar on the bottom is green the test is successful.

2.10 Check the MFU and TFT display chip IDs and print out labels:

a. in PCA go in the *USI configuration* tab window and click on the Mouse mode button till you get the text label as shown below.

b. Click on the MFU button and copy the SerialNr. Repeat the same action for the TFT Display
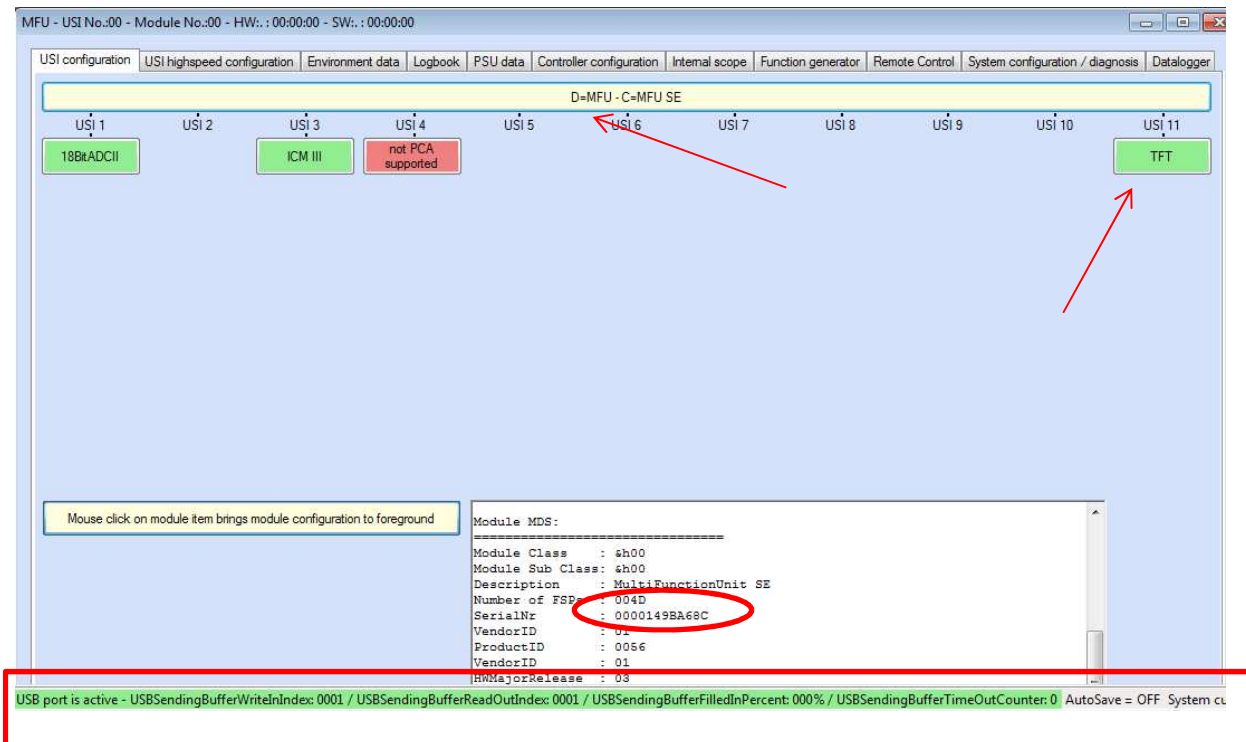
c. Launch P-Touch-Editor tool and open the label template from the eet-common folder (Arbeitsordner ACU\labels\ACU-Labels\Etiketten-MFU_SE-Mainboard.lbx; Arbeitsordner ACU\labels\ACU-Labels\Etiketten-TFT_Display-Klein.lbx)

d. Change the serial number and if necessary the FG number as well.
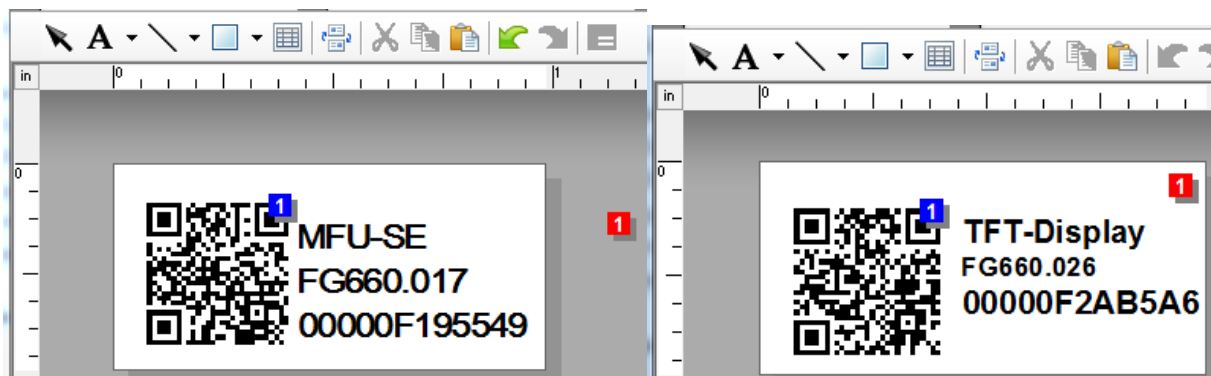
e. Print out four labels; one has to be stick on the board and the other on the metal chassis that will contain the MFU.

a. Double check with the scanner if the code in the QR-Code is matching with the expected one and save the chip-ID code in the following excel file:
eet-common\ Arbeitsordner ACU\Bestellungen & Angebote\ACU-IncomingComponentsList.xlsx

2.11 Test Log file generation

Generate the testLogMFU_SE_FGxxx_xxx_xxxxxx.docx file and save it in pdf format in the dedicated eet-common folder (Arbeitsordner ACU\ACU - outgoing).

FOR ANY DOUBT, EVEN THE SMALLEST ONE, PLEASE CONTACT YOUR SUPERVISOR!