**Testing procedure for STEVAL-CTM001V1 and STEVAL-CTM002V1**

**Equipments needed:**

* n.1 ac three-phase power supply 400V AC up to 10Apk
* n.1 dc power supply 12V DC up to 1.5A
* n.4 electrolytic capacitors 470uF-450V
* RL load (n.3 power resistors R=0.4 ÷ 0.8Ω, P=200W; n.3 power inductors L=0.2 ÷ 0.4 mH, Ic.c.=15Arms, Isat=≥20Apk)
* n.1 heatsink (e.g. [AAVID THERMALLOY](http://it.rs-online.com/web/b/aavid-thermalloy/) EM/B/150 or equivalent) to be drilled (in order to be connected to the power module)
* thermal insulation material (e.g. [Bergquist](http://it.rs-online.com/web/b/bergquist/) SP900S-0.009-00-1212 or equivalent)
* n.1 oscilloscope
* n.3 current probes up to 20A
* n.1 ST-LINK/V2 in-circuit debugger/programmer
* n.1 USB to serial converter
* a serial cable DB9 female to female
* ST Motor Control Workbench (software for motor control provided by ST: STSW-STM32100 http://www.st.com/en/embedded-software/stsw-stm32100.html)
* STM32 ST-LINK utility (provided by ST <http://www.st.com/content/st_com/en/products/embedded-software/development-tool-software/stsw-link004.html>)

**Steps to execute**:

1. To screw the STEVAL-CTM002V1 to the heatsink by inserting the thermal insulation material between the power module and the heatsink (see Fig. 1)

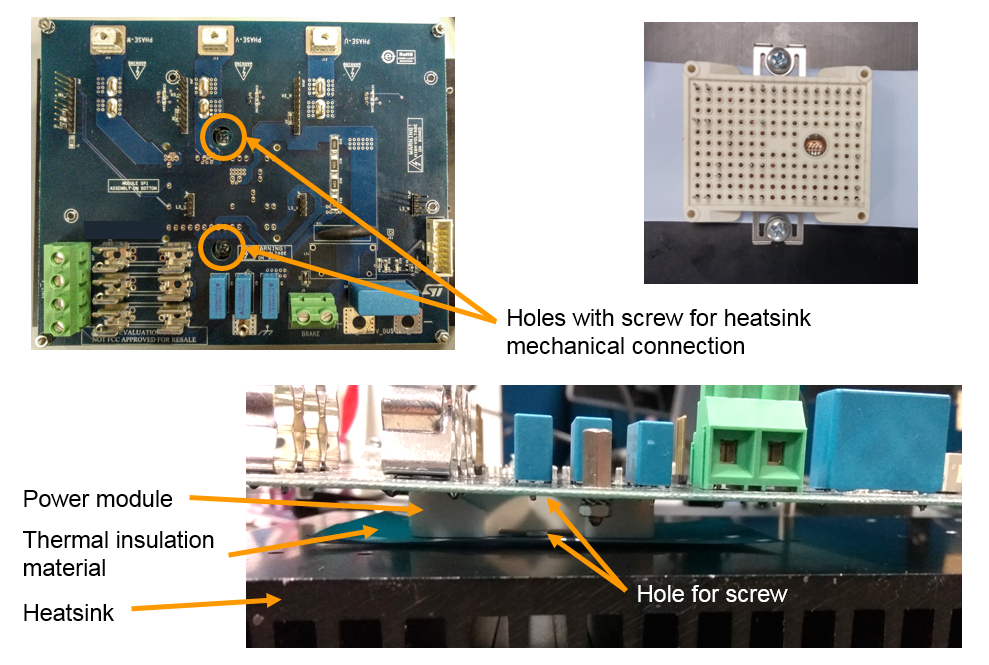


Fig. 1 Mechanical connection among power module, thermal insulation material and heatsink

1. To stack up the board STEVAL-CTM001V1 with STEVAL-CTM002V1 by using the connectors from “JP2” to “JP7” on the STEVAL-CTM001V1 and the connectors from “JP8” to “JP13” on the STEVAL-CTM002V1
2. On the STEVAL-CTM001V1
   1. To set the switch “SW1” to “INT\_SENSE” position, the D23 LED turns on as soon as the board will be supplied (step 3f)
   2. To mount the jumper “S7”
   3. To mount the jumper “SW5” in default position indicated near the switch
   4. To connect the ST-LINK to “CON14” connector
   5. To connect the USB to serial converter to “P2” connector by using serial cable DB9 female to female
   6. To connect the 12V DC power supply to “JP1” connector and turn on the power supply
3. To launch the tool STM32 ST-LINK utility in order to flash the microcontroller (see Fig. 2). Once launched the tool:
   1. To click on “File🡪Open file…” and select the file “testing\_procedure.bin” provided by ST
   2. To click on “Target🡪Connect”
   3. To click on “Target🡪Program” and click on “Start” in the next window

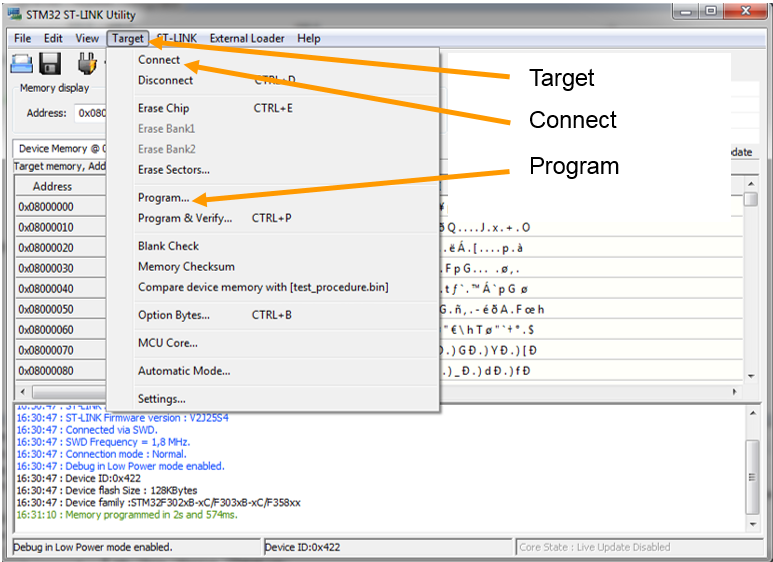


Fig. 2 STM32 ST-LINK Utility

1. To launch “ST Motor Control Workbench” tool (STMCWB). Once launched the tool:
   1. To click on “File🡪Open project…” and select the file “STEVAL-CTM001V1 \_testing\_procedure.stmcx” provided by ST
   2. To connect the serial interface by clicking on “Monitor” (see Fig. 3)

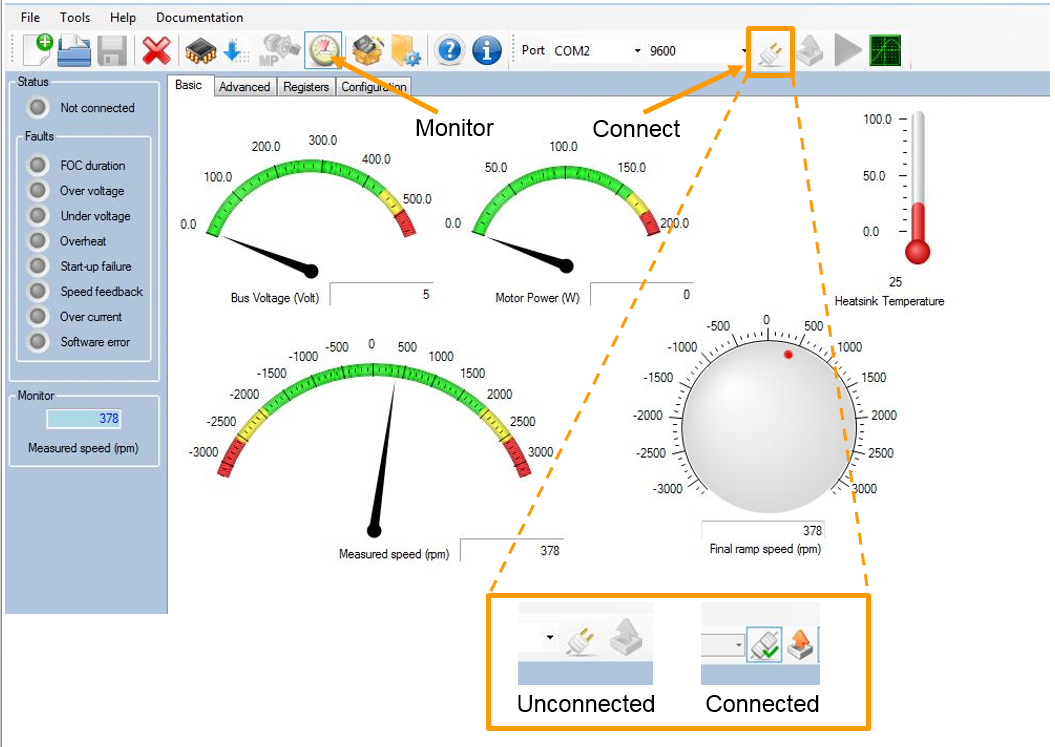


Fig. 3 Monitor section of the ST Motor Control Workbench tool

* 1. To click on “Connect”. Once connected you can see the icon related to the serial communication (Fig. 3)

Since the power supply voltage is still OFF the red light “Status🡪Fault now” and the orange light “Faults🡪 Under voltage “ will turn on in the “Status” part of the monitor section to indicate an “Under voltage” condition

1. To connect the flat cable between “CON8” on the STEVAL-CTM001V1 and “CON1” on the STEVAL-CTM002V1
2. To connect the bulk capacitor bank, made by the series of two parallel capacitors 470uF-450V (four capacitors), as shown in Fig. 4, between the + and – of the V\_BUS connections (STEVAL-CTM002V1)
3. Once more on STEVAL-CTM002V1:
   1. To connect the three-phase RL load (connected in star configuration, as shown in Fig. 5) to the “J7, J8 e J9” connections and put the current probes on each cable
   2. To connect the three-phase ac power supply 400V AC to “J5” connector, by including the earth cable

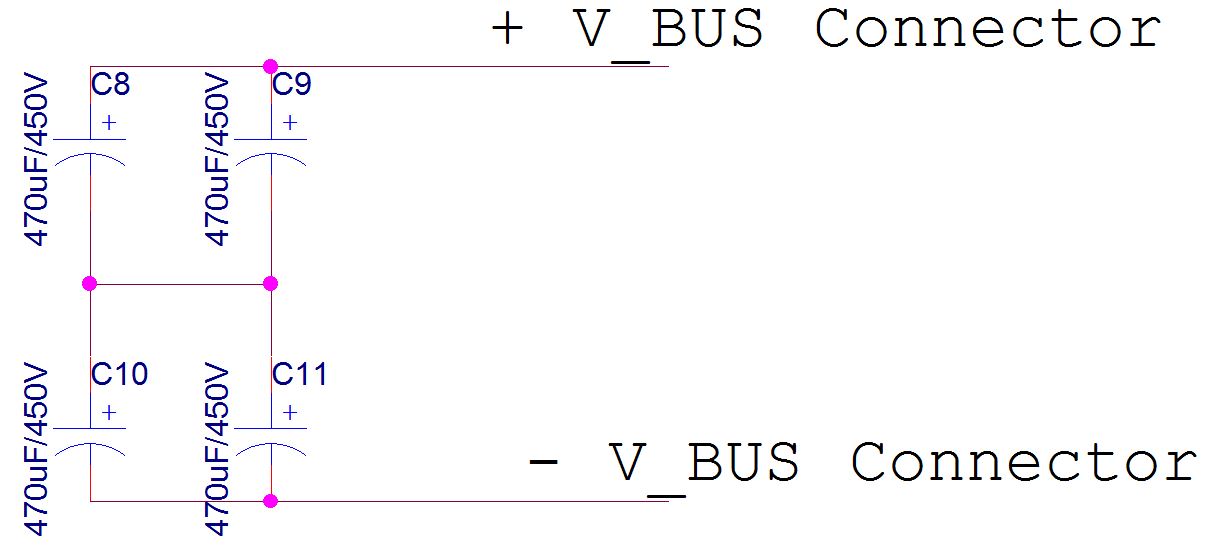


Fig. 4 Bulk capacitor bank

* 1. To turn on the power supply at 400V AC and limit the current to 10Apk. The D4 LED will turn on.

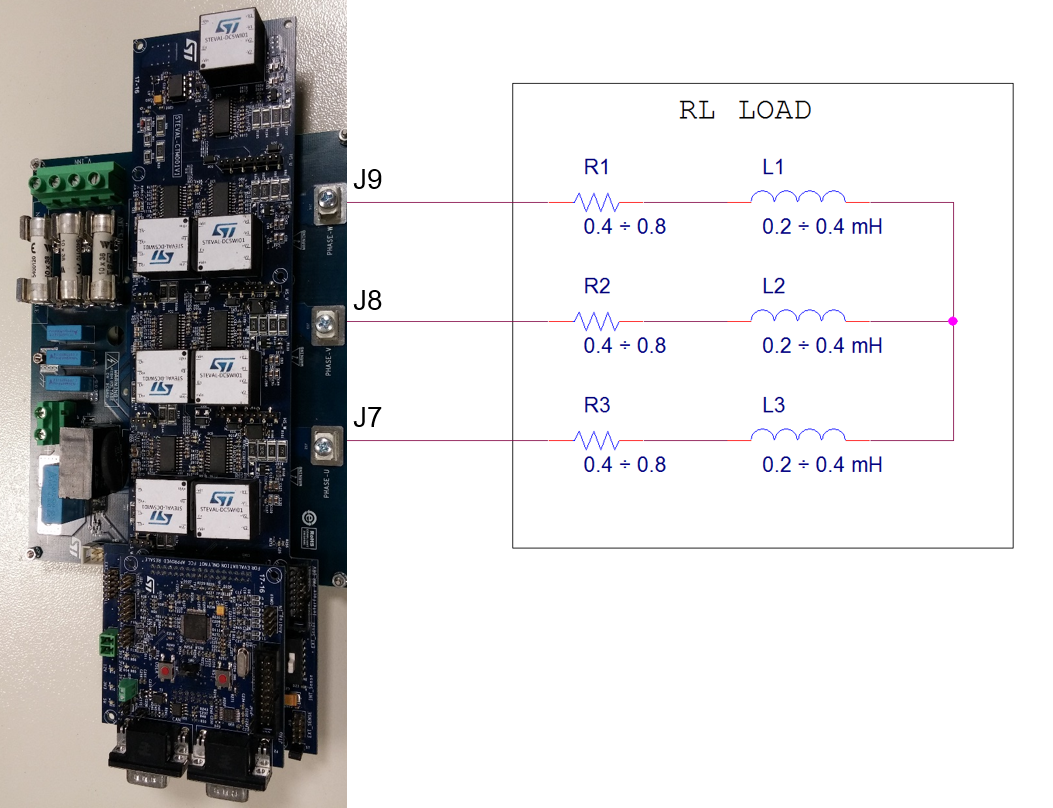


Fig. 5 RL load connection (200W power resistors)

1. To click on “Fault Ack” (see Fig. 6) to cancel the “Under voltage” fault occurred at step 5, so the new status will be “Status🡪Idle”. To verify that the 560V ± 10% voltage value is shown in the “bus voltage” field of the “monitor” (STMCWB), as shown in Fig. 7
2. At this moment the system is ready to work but, before to go ahead, please check again that D23 LED is turned on (see step 3a). Now, to click on “Start Motor” (See Fig. 6)

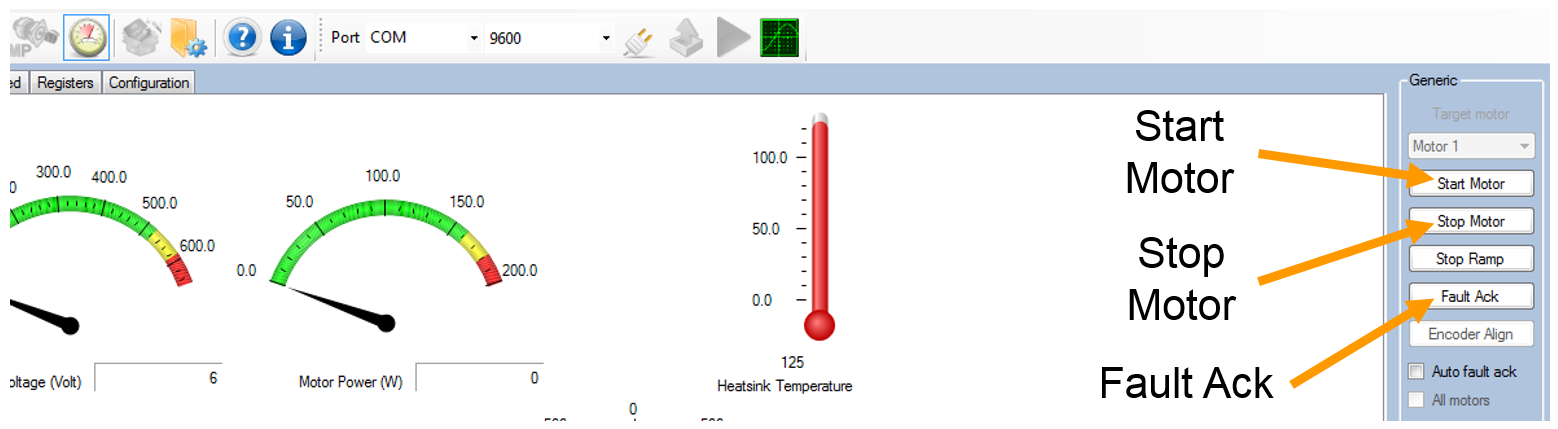


Fig. 6 Fault ack, start and stop motor commands

1. To capture and store (pics image) the three current waveforms at the oscilloscope after 20s. The three current waveforms should have a peak value of 15A and should be shifted by 120°
2. To click on “Stop Motor” (See Fig. 6)

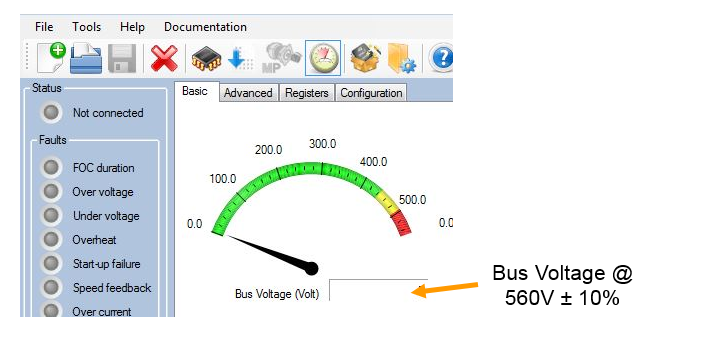


Fig. 7 Bus voltage field

1. Each board shall be labelled with a progressive identification number YEAR\_WEEK\_PROGRESSIVENUMBER (e.g. second board tested in week 45 of 2015 should be: 2015\_45\_2).
2. For each board it is requested to receive the image of point 11 in a file named with the same label of point 13 (sent by email or printed and shipped together with the board)