

CV-IV Probe Station

Operational Manual

October 2015

CV-IV probe station

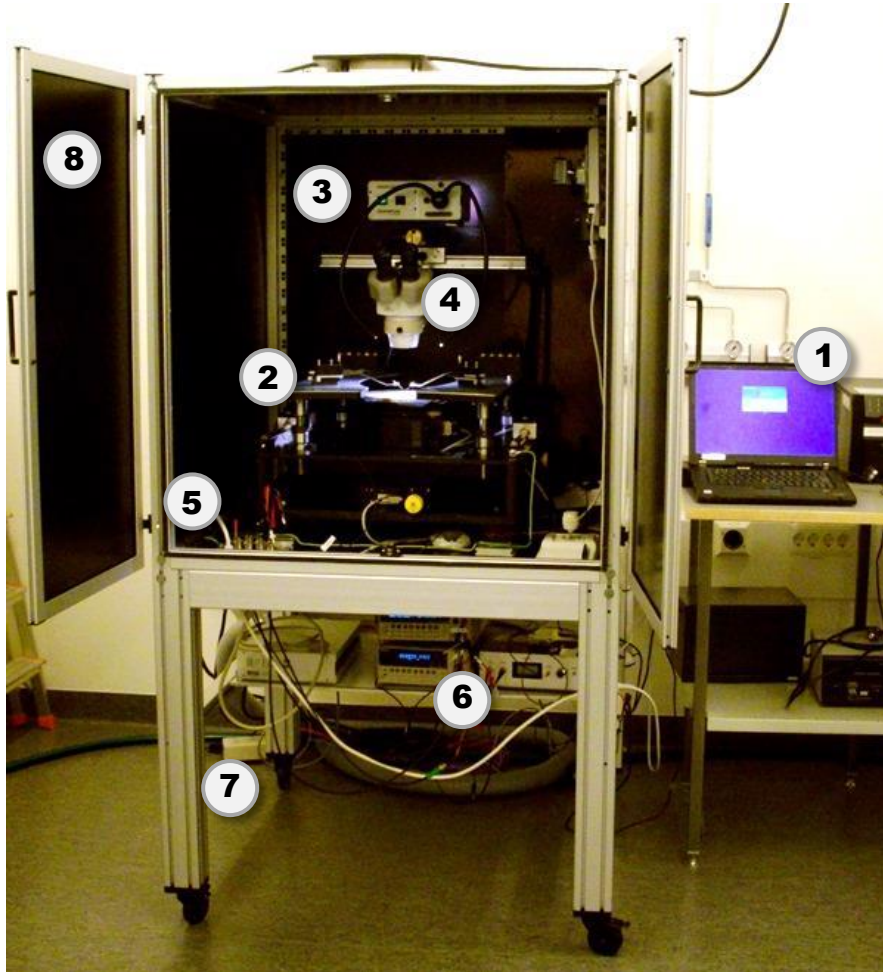


Fig.I. Overview of the probe station

- (1) PC with control and data acquisition software
- (2) Platform with probe needles
- (3) Light source
- (4) Microscope
- (5) Cable connection pad
- (6) Measuring devices: SourceMeter Unit, Picoammeter, Capacitance meter
- (7) Vacuum pump
- (8) Dark box

1. Turn the probe station on

1.1. Check the air humidity. High voltage tests are not recommended in higher than 70% environment.

1.2. Turn on the laptop (1)

1.3. Turn on the vacuum pump (7).
The switch of the pump is on the floor behind the dark box.



1.4. Open the dark box and turn on the light source inside (the green switch on the light source box (3)).



1.5. Turn on the measuring devices.

For IV measurements turn on both Keithleys (6a) and (6b).

For CV measurements turn on both Keithleys (6a), (6b) and the capacitance meter (6c).

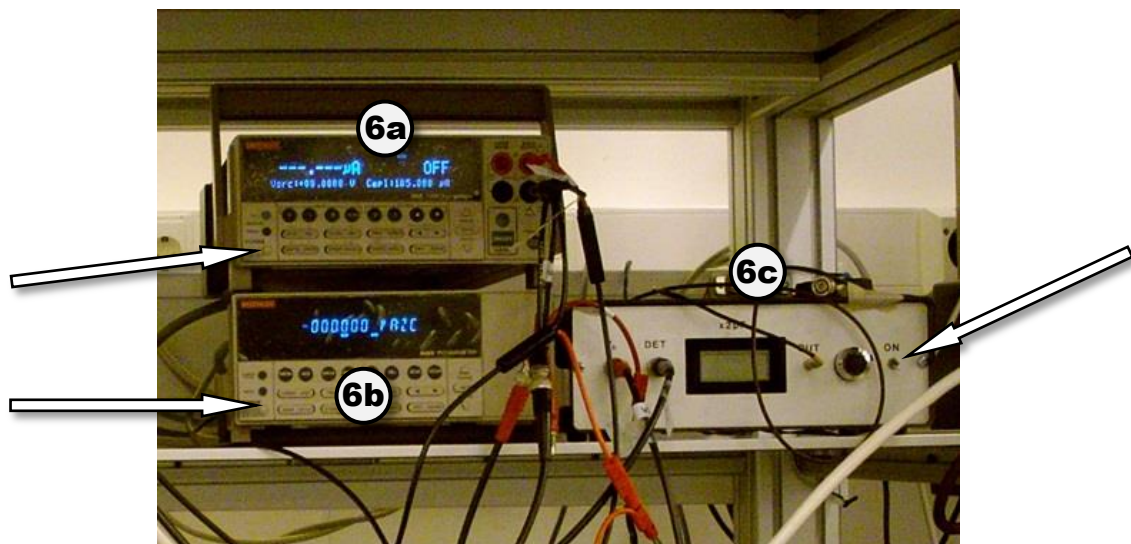


Fig.II. Measuring units: (6a) Keithley 6585 - Picoampermeter, (6b) Keithley 2410 - 1100V SourceMeter Unit and (6c) Capacitance meter

2. Place the sample

2.1. Put the sample diode on the platform (1) in the area visible through the microscope (4).



Use plastic tweezers to hold the diodes.

Do not put your hands on top of the probe station platform. Your weight will cause downwards movement of the platform and once the weight is realised the platform will return into its initial position. As a result, connection to sample will be withdrawn and the sample might be damaged by the needles.

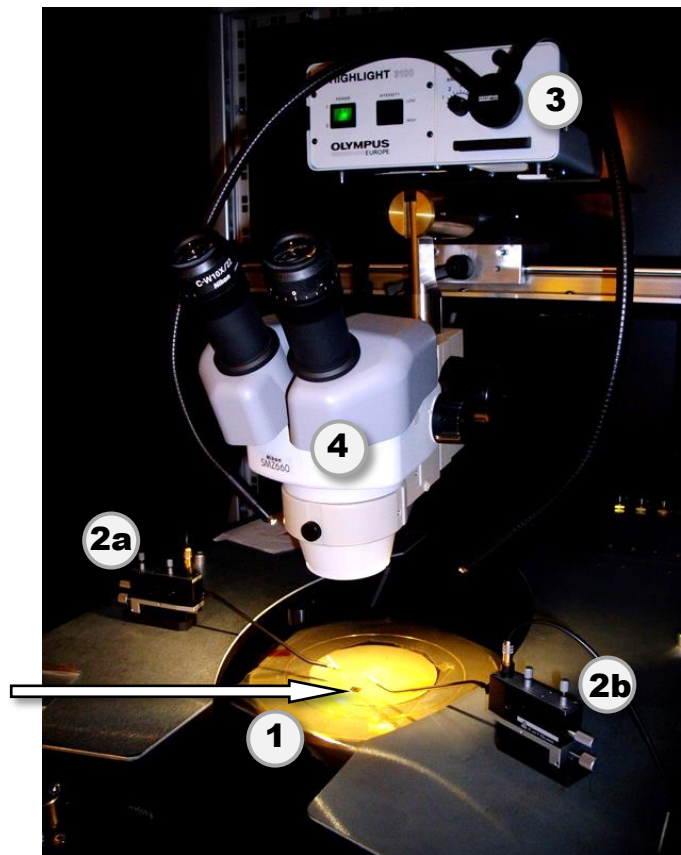


Fig.III. Probe station platform inside the dark box: (1) platform (backplane); (2a), (2b) – probe needles; (3) light source; (4) microscope

2.2. Place the probe needles (2a) and (2b) onto the sample.

The left needle (2a) should be connected to the guard ring, and the right needle (2b) should be connected to square contact pad of the diode.

If there is a surface passivation, connection should be done to the small rectangular contact openings.

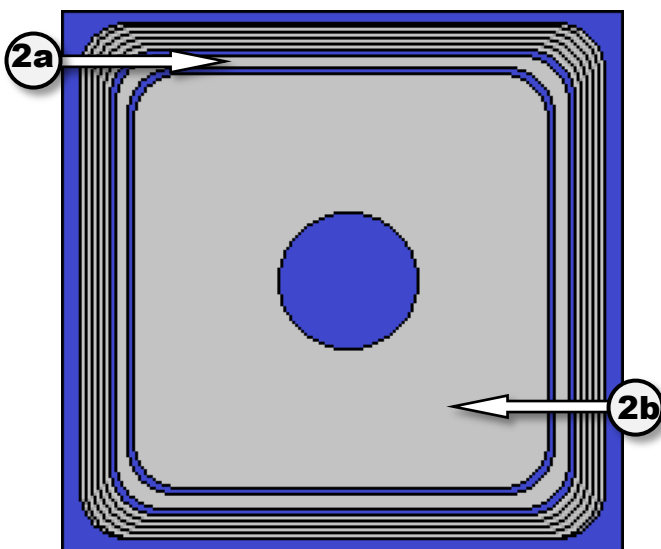


Fig.IV. Needles position for diode without passivation

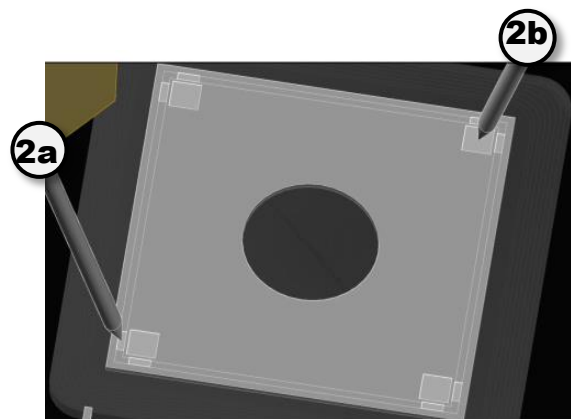


Fig.V. Needles position for diode with surface passivation. [1]

The position of probe needle can be adjusted with the knobs (4), (5) and (6).

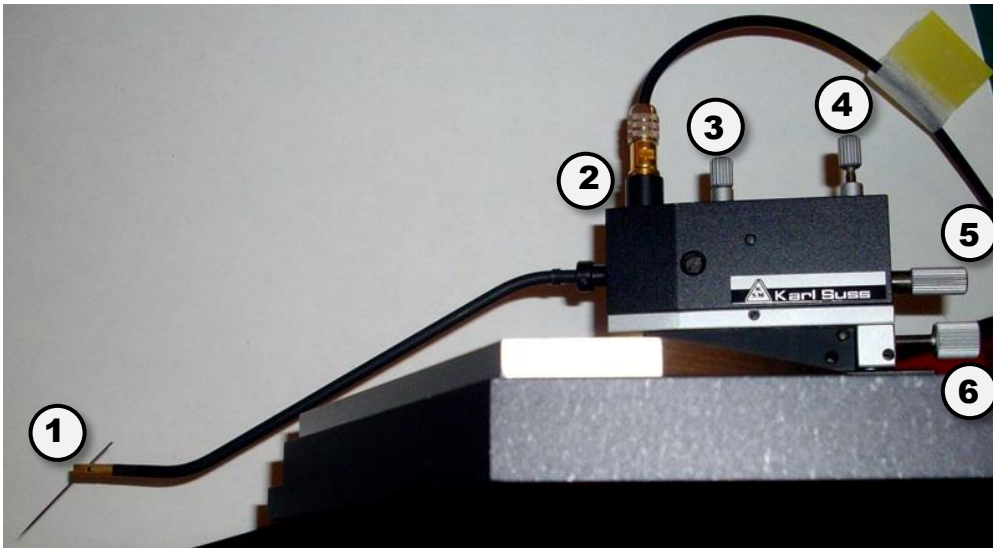

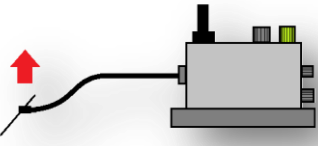
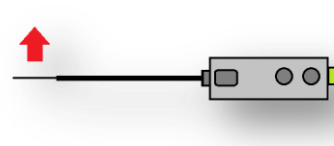
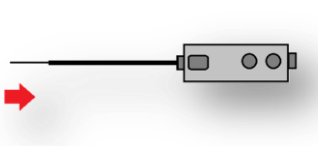

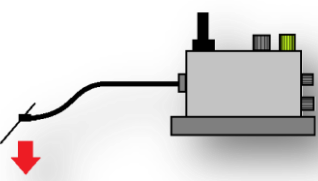
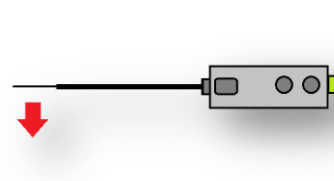
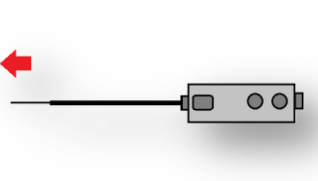


Fig.VI. Probe needle:
 (1) The needle. DO NOT TOUCH!
 (2) Electric connector
 (3) Knob for adjusting the force. DO NOT USE!
 (4) Knob for vertical movement
 (5) Knob for horizontal movement
 (6) Knob for horizontal movement

The directions of movement according knobs and directions of turning are listed in table 1.

Table 1.

	Knob (4)	Knob (5)	Knob (6)
Direction: clockwise 			
Direction: Counter clockwise 			



- Probe needles are identical and for the same movement similar knobs should be turned in same direction, not mirrored.
- Needle and its tip are very gentle and easily damaged. Please avoid touching them.

2.3 Switch off the light source (Fig. I.3) and close the dark box (Fig. I.8).

2.4 Close the dark box.

3. Set the measurement configuration

3.1 Set the cables connectors on the pad (Fig. I.5) inside the dark box according to the measurement type – IV or CV. Use table 2 for reference.

There are two cables you are allowed to change. The cable connected to backplane (Fig. III.1) should be plugged in socket [I] or socket [C] depending the type of measurement, IV or CV respectively. The cable connected to the right probe needle (Fig. III.2b) marked with label [Diode] can be connected to socket [D] or [common ground], depending the type of measurement, IV or CV respectively. There are other cables connected to common ground, do not remove them. Use the available slot connector.

Table 2.



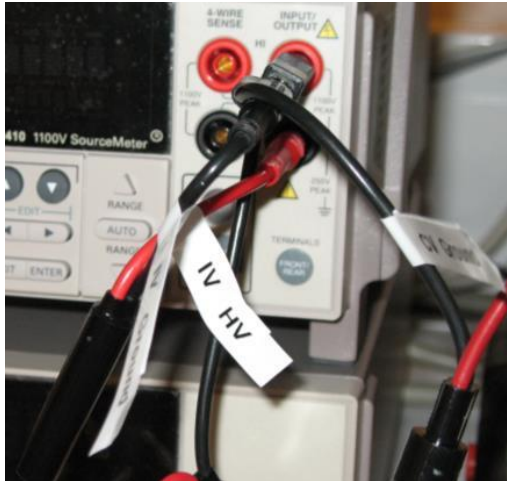

	For IV measurements	For CV measurements
Backplane	To socket [I]	To socket [C]
Probe needle (2b)	To socket [D]	To socket [common ground]
Schematic view of the connectors		
Picture of the connected cable positions [2]		
Wiring diagram (n-type samples) [1]		

3.2 Check the position of input/output cables according the type of samples and the type of measurements.

Cables providing high voltage for IV and CV measurements are labelled as [IV HV] and [CV HV] respectively. Cables connected to ground are labelled as [IV ground] and [CV ground]. Do not move any other cables!

Table 3 below summarize possible configurations of the cabling [2].

Table. 3

	For IV	For CV
n-type	<p>[IV HV] to red input/output slot of Keithley</p> <p>[IV ground] to black input/output slot of Keithley</p> 	<p>[CV HV] to red input/output slot</p> <p>[CV HV] to black input/output slot</p> 
p-type	<p>[IV HV] to black input/output slot</p> <p>[IV ground] to red input/output slot</p> 	<p>[CV HV] to black input/output slot</p> <p>[CV ground] to red input/output slot</p> 

4. Run CV-IV measurements

4.1 Start the “CIVility_New” software.

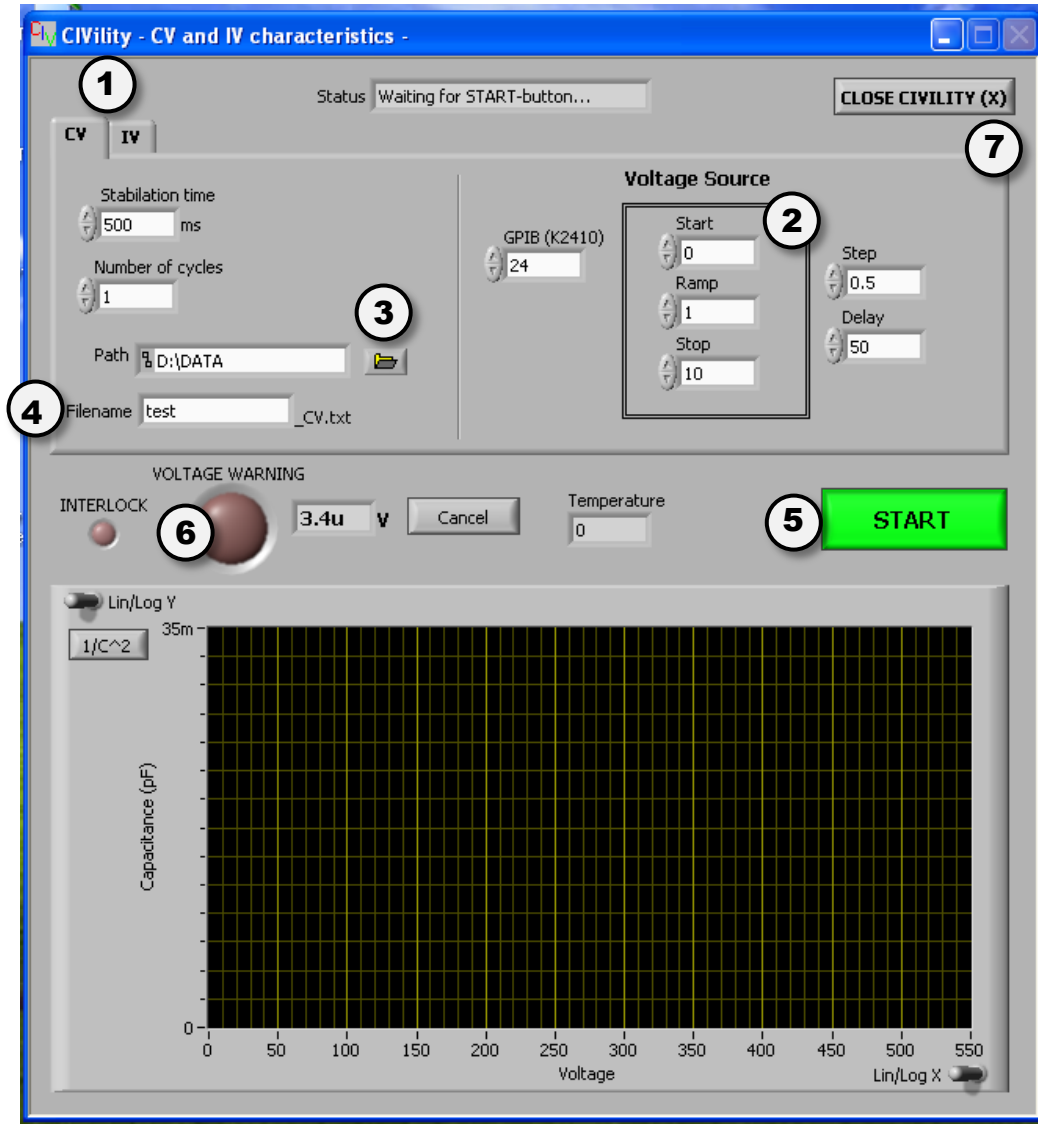


Fig.VII. Main screen of CV-IV software.

4.2 Choose the proper type of measurements – IV or CV (Fig.VII.1).

4.3 Input voltage settings for your measurements (Fig.VII.2):

[Start] is the initial voltage. Put 1 V or more, do not start at 0 to avoid undefined results.

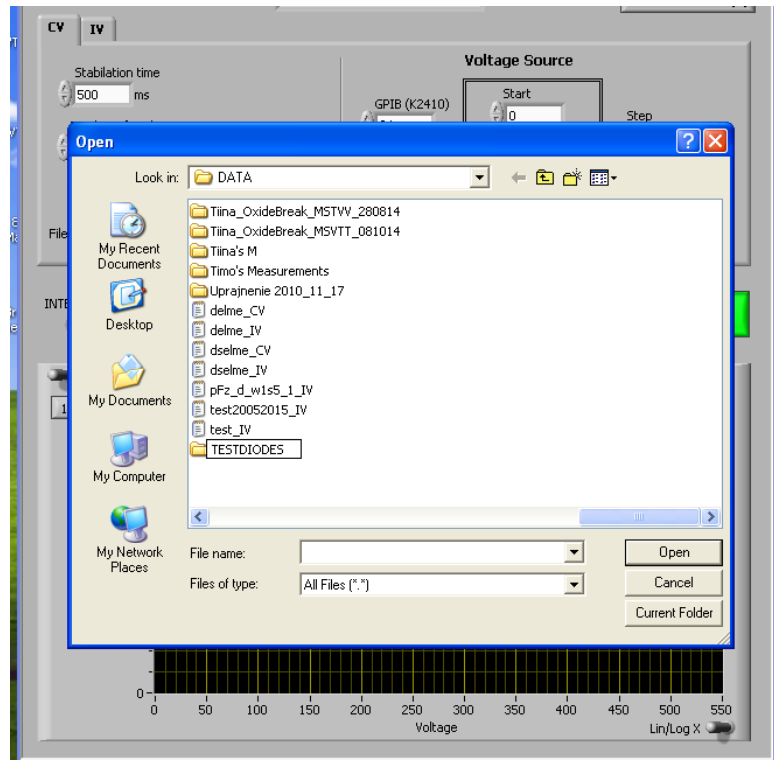
[Ramp] is the interval between measured points. If you put 5 here, measurements will be done at each 5 V.

[Stop] is the final voltage at which the measurement will be finished.

4.4 Set up a folder for your results: Click on the folder icon (Fig.VII.3).

Click [Open] and create a new folder.

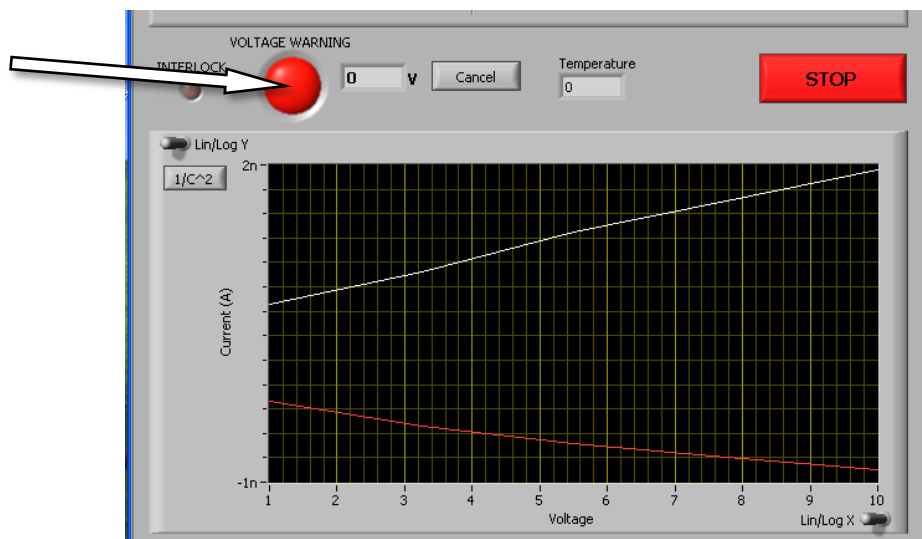
Open it and press the [Current Folder] button. Only after this the system will recognize it as a storage place for your measurement files. The name of the folder should contain your name and the type of samples and performed measurements.



4.5 Insert the name of your sample and number of run in [Filename] (Fig.VII.4). Include the number and type of diode. There is no need to mark the type of measurements because the system will add “_IV” or “_CV” to the name of each file. The final file with this name will be created in the folder you set as current at 4.4.

4.6 Press the start measurements button (Fig.VII.5).

The red light [VOLTAGE WARNING] (Fig.VII.6) and red colour of button [STOP] means the measuring is ongoing. Do not touch anything until the run will be finished! If you need to interrupt measurement, press red round circle [VOLTAGE WARNING].



It is recommended to make 3 runs for each sample and calculate the average later. The system is ready for next run when the button [start] is green and text on it is [start].

4.7 Change the number of run in the filename and start the measurements again.

5. Change the sample

5.1 Open the dark box.

Attention! Do not open the probe station dark box before the measurement is over. Also Do this only if there is no blue light on SourceMeter Unit.



5.2 Turn on light inside the dark box.

5.3 Lift the needles up. Remember to turn knobs on both needles in **same** direction. Otherwise you'll push the needle further into the sample and damage both.



5.4 Remove the measured sample from the platform.

5.5 Place another sample and repeat from 2.2.

6. Take your data and turn off the probe station

6.1 Turn off the light source inside the dark box

6.2 Close the dark box and lock it.

6.3 Turn off the vacuum pump.

6.5 Turn off measuring devices.

6.6 Copy your data from the controlling laptop. Files with measured data are stored at D/Data/...

6.7 Write a brief summary of your work in the notebook near the probe station.

Remember to write: the date and time, your name, what measurements were performed and the directory with your results.



6.8 Click [Close CiVility] (Fig.VII.7) to close the software and turn off the laptop.

