30 KN SERVO-HYDRAULIC UNIVERSAL TESTING MACHINE

UTM-30 User manual

Politecnico di Torino

Silvana Cordoba Valencia

Professors:
Davide Dalmazzo
Lucia Tsantilis
Ezio Santagata

Politecnico di Torino

1859

Country road photo created by wirestock from https://www.freepik.com/photos/country-road

UTM-30 User manual

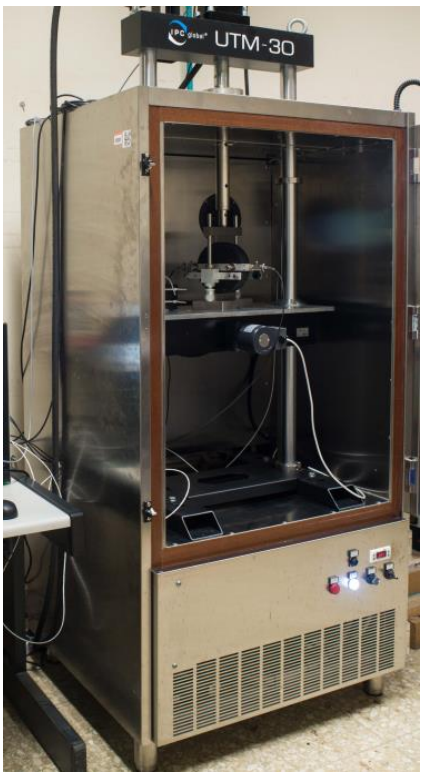
INTRODUCTION

This user manual will describe the process, step by step, of performing the Indirect Tensile Strength (ITS) and Indirect Tensile Stiffness Modulus (ITSM) tests with the 30 kN servo-hydraulic Universal Testing Machine (UTM-30). The machine is located at the Politecnico di Torino, specifically in the DIATI department in the Road Materials Laboratory. The processes of turning on and off the system will be described to ensure its correct behavior.

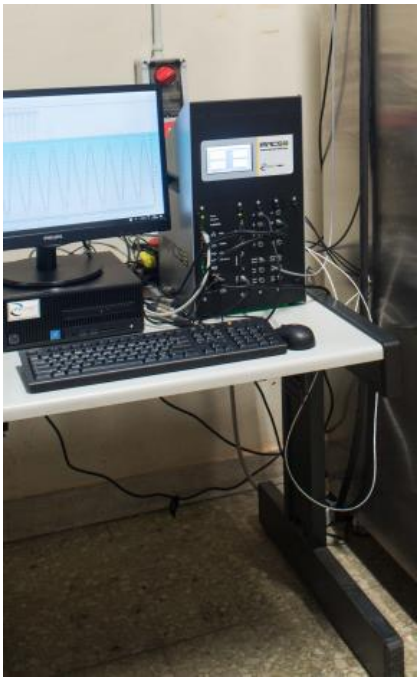
SYSTEM'S COMPONENTS

The machines that will be used are:

1. The UTM-30 Environmental Chamber



2. The UTM-30 workstation
    a. Computer

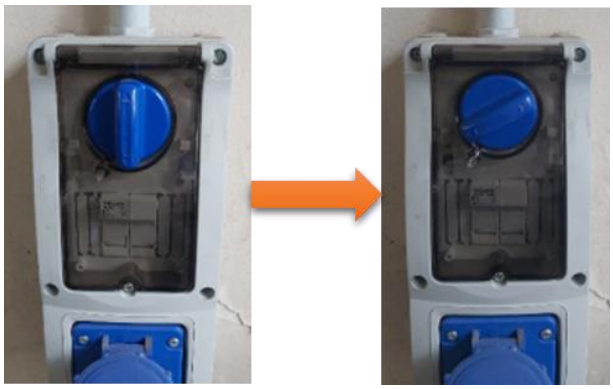


b. Integrated Muti-Axis Control System (IMACS)

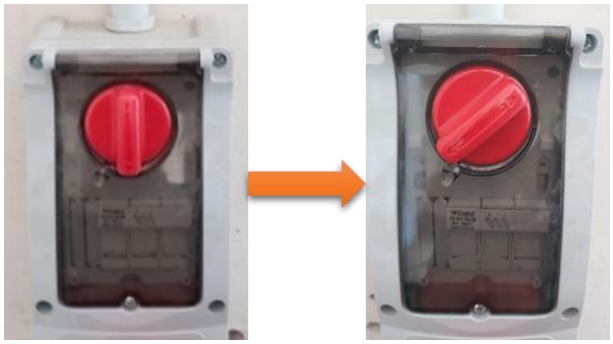
3. The Hydraulic Power Supply (HPS)

TURNING ON THE SYSTEM

1. Turn the blue rotary switch on the right side of the HPS, rotating it clockwise.



2. In the same way as the previous step, turn the red rotary switch behind the IMACS.



3. Turn on the Hydraulic Power Supply to activate the pump:
    a. Turn on the black rotary switch.

b. Press the ‘power on’ green button.

4. Press the turn-on switch at the back of the IMACS.
5. Turn on the computer.
6. Depending on the test that will be executed, connect the appropriate transducers.
7. Turn on the ‘test’ switch at the bottom of the Environmental Chamber.

SETTING THE TEMPERATURE

To set the temperature:

1. Leave the switch in the A position.

2. Press the 'set' button for a few seconds until the SP-A message appears, and press it again.

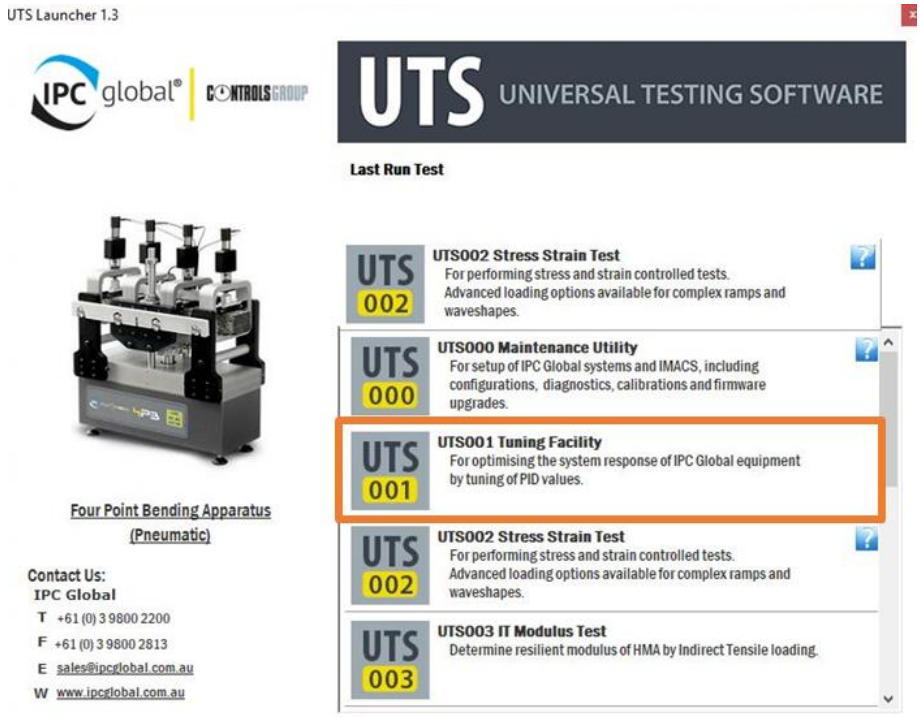
3. Select the wanted temperature by pressing the up and down arrows

4. Press the 'set' button again.
5. Press the 'esc' button.

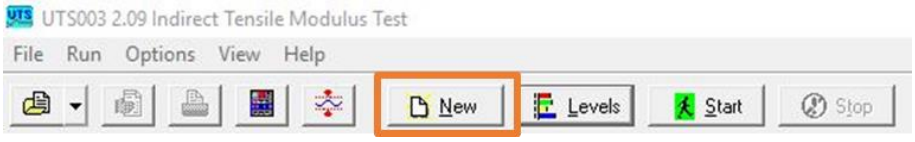
TUNNING FACILITY

Before starting any test, the system needs a cycle of conditioning for about 10 minutes to “For optimizing the system response of IPC Global equipment by tuning of PID values”. For this purpose, it is used the tool ‘UTS001 Tunning Facility’ present in the ‘UTS UNIVERSAL TESTING SOFTWARE’:

1. Select ‘UTS001 Tuning Facility’.

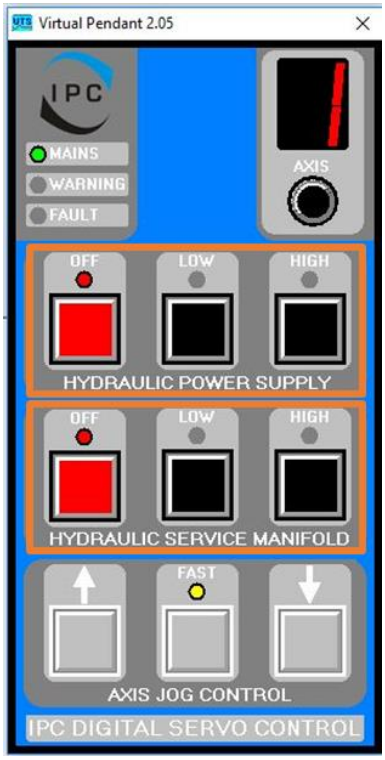


2. Press the ‘New’ button in the toolbar.



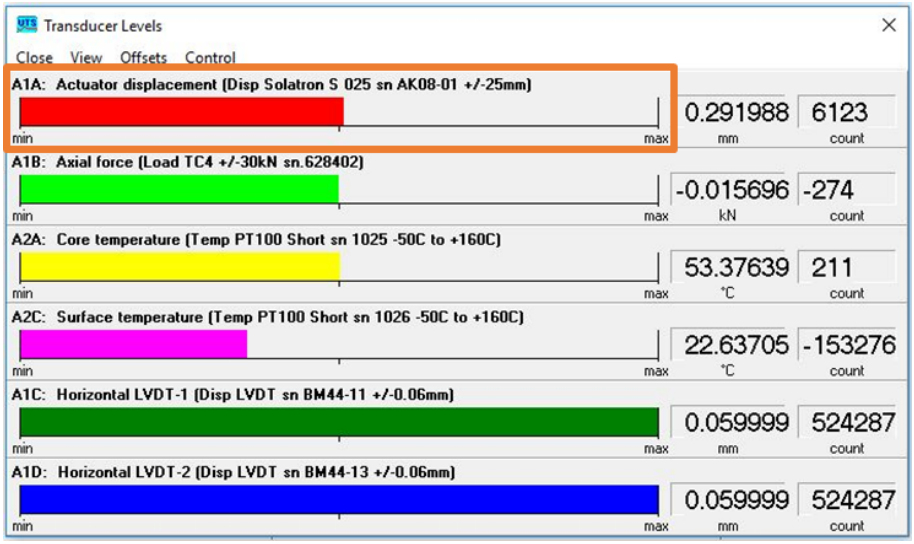
3. Press the ‘Virtual Pendant’ button in the toolbar.

4. Select the following values:
   a. HYDRAULIC POWER SUPPLY: press ‘LOW’, wait some seconds, press ‘HIGH’, and wait again some seconds.
   b. HYDRAULIC SERVICE MANIFOLD: press ‘LOW’, wait some seconds, press ‘HIGH’, and wait again some seconds.

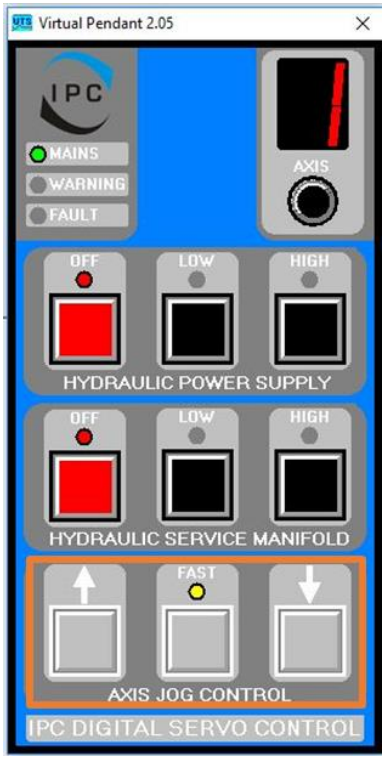


5. Press the 'Levels' button in the toolbar

6. Verify that the 'A1A: Actuator displacement' (red bar) is at half of the entire level.



If not, press the arrows in the 'AXIS JOG CONTROL' in the 'Virtual Pendant' panel to set the correct value.



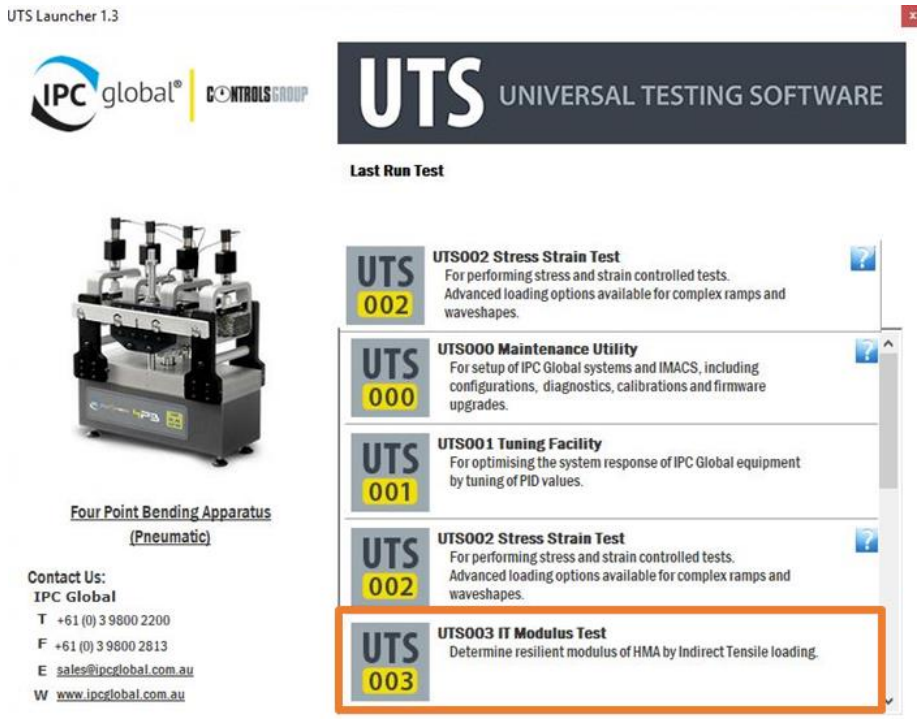
7. Press the ‘Start’ button in the toolbar, and let it run for more or less 10 minutes until the Environmental Chamber reaches the test temperature.

8. Press the ‘Stop’ button in the toolbar.

9. Repeat step 6 to ensure that the piston is at half the level.
10. Close it.

INDIRECT TENSILE STIFFNESS MODULUS (ITSM) TEST

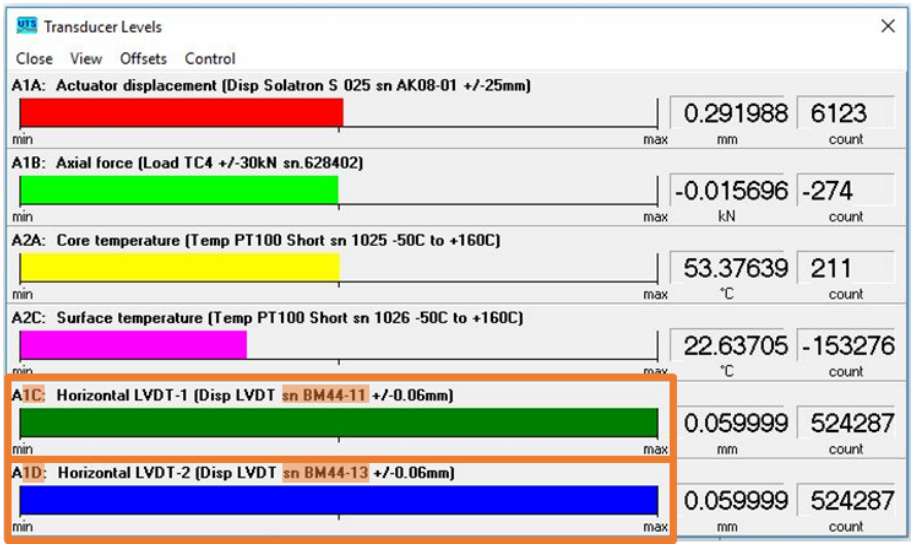
1. Select 'UTS003 IT Modulus Test'.



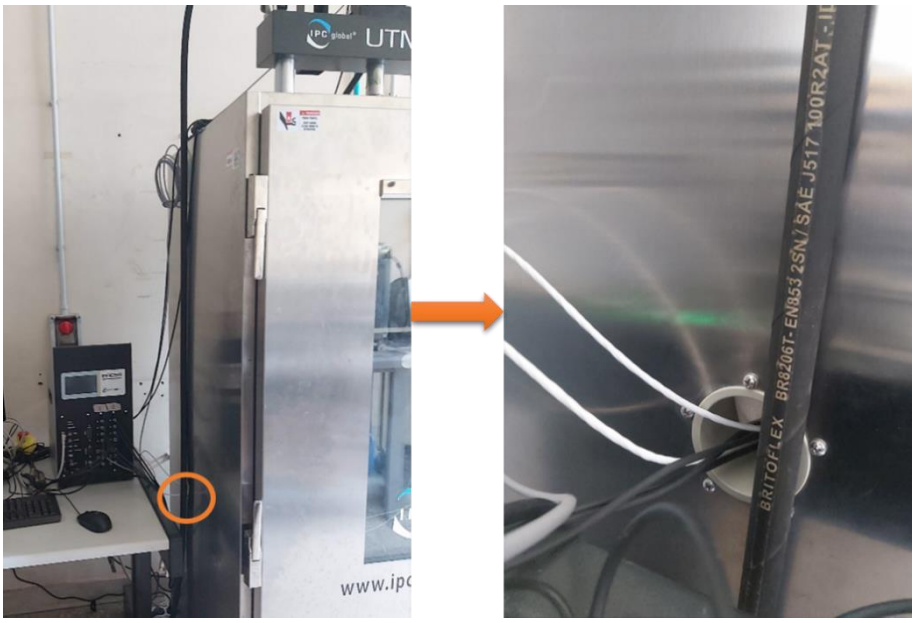
2. Press the 'New' button in the toolbar.

3. Press the 'Levels button in the toolbar.

4. According to the serial number printed in each transducer, connect it with the serial port in the IMACS indicated in the 'Transducer Levels' panel.

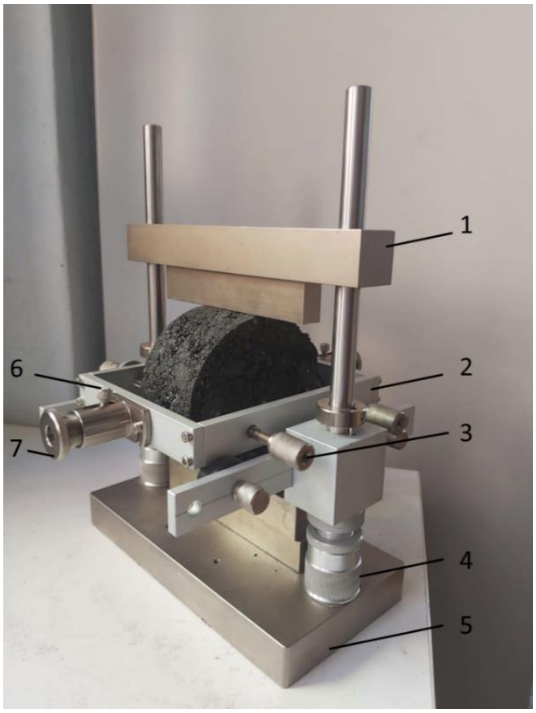


5. Close the hole at the left wall of the Environmental Chamber where the transducers pass through to avoid temperature loss.



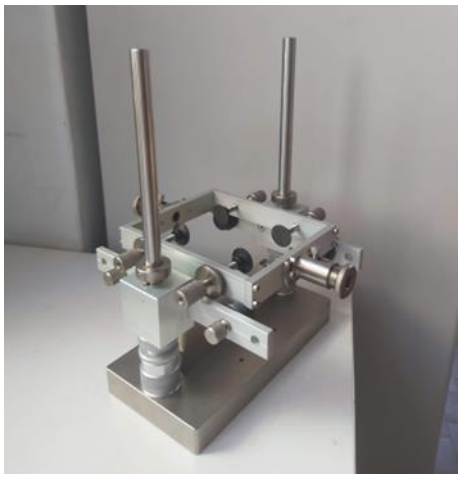
6. Mounting the specimen:

The image below shows the configuration for the ITSM test equipment to be placed in the environmental chamber.

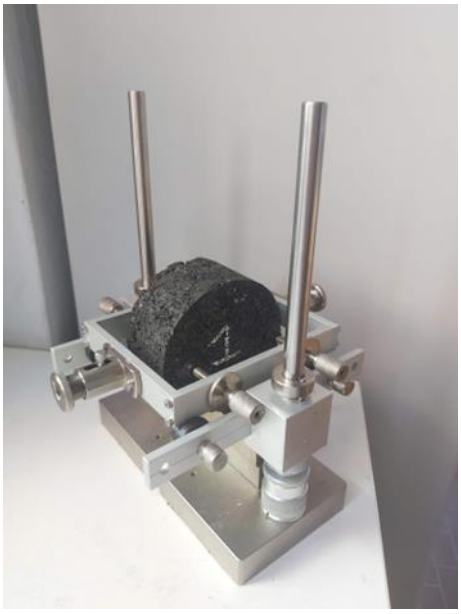


Key
1 - *Upper loading strip*
2 - *Transducer's mounting frame*
3 - *Securing clamps adjuster*
4 - *Mounting frame bearing nut*
5 - *Lower loading strip*
6 - *Secure transducer bolt*
7 - *Transducer adjuster*

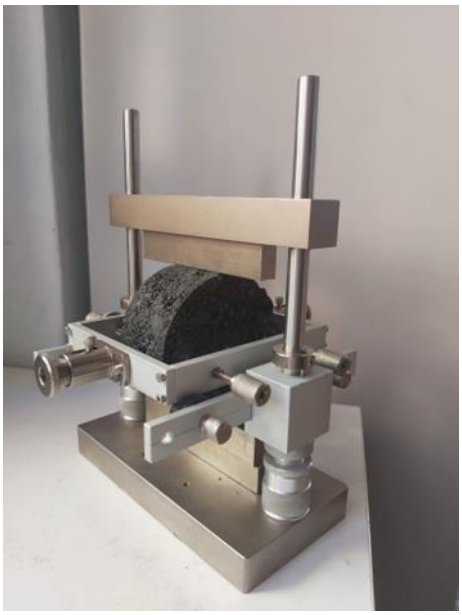
a. First, the *transducer's mounting frame* must be placed above the *lower loading strip*. Rotate the *mounting frame bearing nut* to raise the alignment frame where the *transducer's mounting frame* is supported.



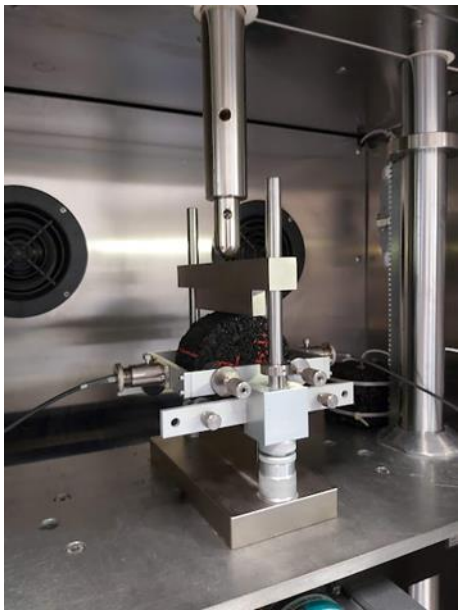
b. Place the specimen into the *transducer's mounting frame* and fix it using the *securing clamp adjuster,* taking care to not over-tight it. The specimen must be uniformly centered and supported in the *lower loading strip*. Verify that the specimen is axially centered in the three dimensions.



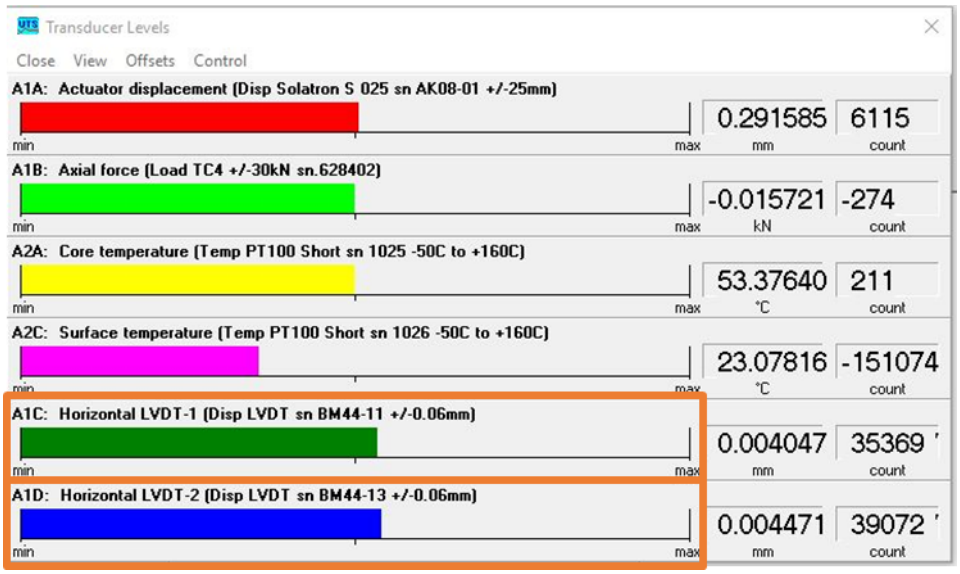
c. Put the *upper loading strip* over the previously mentioned configuration.



d. Put the sample configuration inside the environmental chamber centered with the loading cell. Plug the transducers into the mounting frame and use the *secure transducer bolt* to fix it to the specimen. Rotate the mounting frame bearing nut again to remove the support of the *transducer's mounting frame* and ensure that it is only supported by the clamps fixed to the specimen.



7. Then use the *transducer adjuster* to obtain the desired value corresponding to half of the level bars in the 'Transducer Levels' panel.

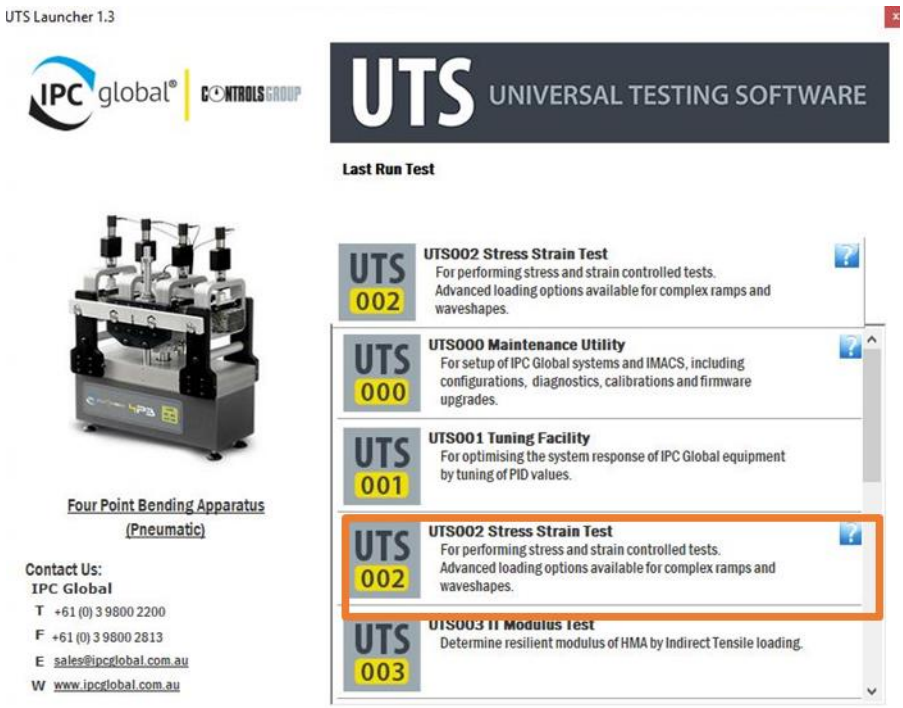


8. Open the ‘File’ menu and select ‘open template’.
9. Verify the template’s configuration, and define the name of the sample and its dimensions.
10. Press the ‘Start’ button in the toolbar.

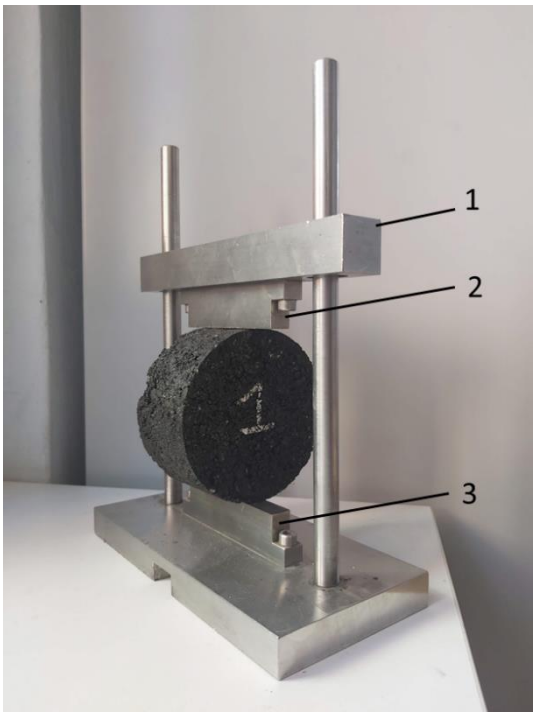
11. When the ‘Transductor Levels’ panel opens after the initial conditioning cycles, close the panel to continue the test.
12. To save the results, click on ‘File’ -> ‘Export’ -> ‘Save’.
13. Rotate the sample to have results for 2 different diameters and repeat from step number 6.
14. Verify that both peaks are similar.
15. Disconnect transducers

INDIRECT TENSILE STRENGTH (ITS) TEST

1. Select 'UTS002 Stress Strain Test'.



2. Mounting the specimen: The image below shows the configuration for the ITS test equipment to be placed in the environmental chamber.

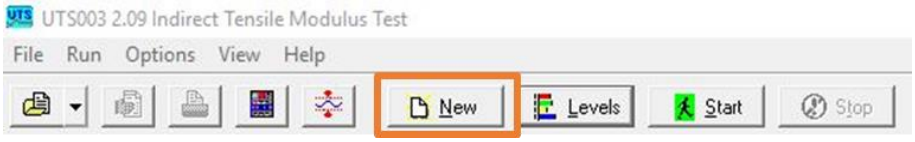


Key
1 - *testing head*
2 - *upper loading strip*
3 - *lower loading strip*

To ensure it is loaded diametrically, the specimen must be centered and aligned with the *upper* and *lower loading strip*, as shown in the figure below.

Put the sample configuration inside the environmental chamber centered with the loading cell.

3. Open the ‘File’ menu and select ‘open template’.
4. Press the ‘New’ button in the toolbar.

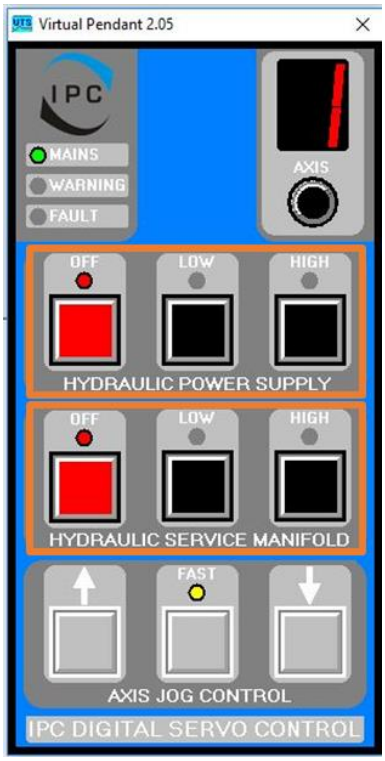


5. Verify the template’s configuration, and define the name of the sample and its dimensions.
6. Press the ‘Start’ button in the toolbar.

7. Press the ‘Stop’ button in the toolbar when the peak load is reached and your sample fails or breaks.
8. To save the results, click on ‘File’ -> ‘Export’ -> ‘Save’.

TURNING OFF THE SYSTEM

1. Turn off the 'Virtual pendant' following instructions (inverse of the turning-on process):
   a. HYDRAULIC SERVICE MANIFOLD: press 'LOW', wait some seconds, press 'OFF', and wait again some seconds.
   b. HYDRAULIC POWER SUPPLY: press 'LOW', wait some seconds, press 'OFF', and wait again some seconds.



2. Turn off the computer
3. Turn off the IMACS by pressing the turn-off switch at its back.
4. Turn off the 'test' switch at the bottom of the Environmental Chamber.

5. Turn off the red rotary switch located behind the IMACS counterclockwise.

6. Turn off the Hydraulic Power Supply with the black rotary switch.