



Installation and Operation Manual

IED Automatic Impulse Device



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Installation and Operation Manual

IED Automatic Impulse Device

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1. Introduction

ATCP Physical Engineering equipment and products were projected and manufactured to provide a long-lasting and top-rated performance. This Installation and Operation Manual contains all necessary information regarding the use and maintenance of this equipment.



Carefully read this manual before using the equipment. Improper use may damage the product and affect its performance.

2. Definitions

Impulse Excitation Technique: The Impulse Excitation Technique is a non-destructive technique to determine the elastic moduli and damping of materials by the resonance frequencies of test specimens. ASTM E1876 is the main standard related to the Impulse Excitation Technique.

Resonance Frequencies: Specimen natural frequencies of vibration.

Elastic modulus: Elastic modulus or Young's modulus is defined as the slope of the stress-strain curve at the elastic region, as described by Hooke's Law. The elastic modulus determined by Impulse Excitation Technique is also termed as dynamic elastic modulus.

Damping: Damping is the phenomenon by which mechanical energy is dissipated in dynamic systems. It is directly linked to the presence of defects and to the material microstructure.

3. Application and features

IED Impulse Device is a mechatronic system employed in automatic excitation of specimens for non-destructive characterization of Young's modulus and damping of materials by Impulse Excitation Technique, in agreement with ASTM E1876 and correlated standards.

IED Impulse Device consists of control unit model IED-USBPW and an electromagnetic impulse device (there are three impulse device models available). The IED is remotely operated by the Sonelastic® Software via USB interface.

The IED Impulse Device should be used in with one of the specimens supports options of Sonelastic® Systems.

4. Parts identification

4.1 RTS Impulse Device



1. Impact tip

Tip that is shoot against the specimen to excite it by impact.

2. Support

Impact tip support.

3. Support and adjustment column

Support column of the support + impact tip set; allows vertical positioning.

4. Adjusting nut

Element that adjusts the support column vertical position and, consequently, the distance between the impact tip and the specimen.

5. Threaded fitting

Coupling element for articulated arm.

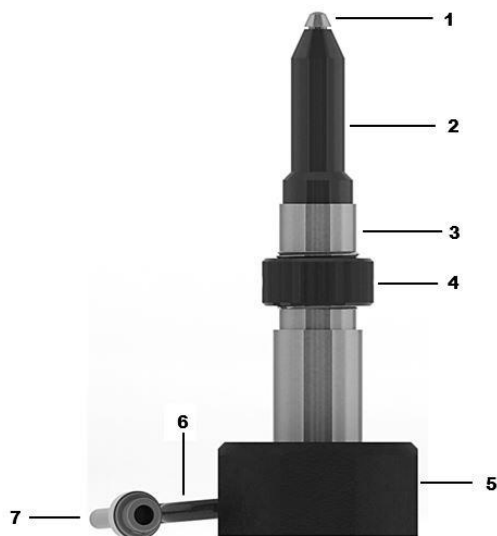
6. Cable

Connection cable to the control unit.

7. Plug

To be connected to the control unit output connector.

4.2 Medium RT Impulse Device



1. Impact tip

Tip that is launched against the specimen to excite it by impact.

2. Support

Impact tip support.

3. Support and adjustment column

Support column of the support + impact tip set; allows vertical positioning.

4. Adjusting nut

Element that adjusts the support column vertical position and, consequently, the distance between the impact tip and the specimen.

5. Base

Device stabilization element.

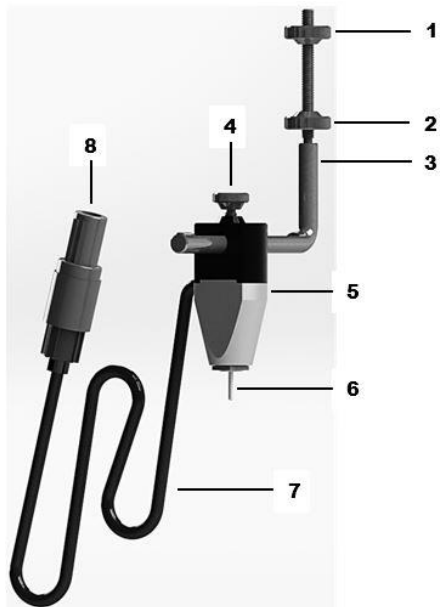
6. Cable

Connection cable to the control unit.

7. Plug

To be connected to the control unit output connector.

4.3 Light RT Impulse Device



1&2. Handles for fixation rod adjustment

Handle for securing and adjusting the height of the fixation rod.

3. Fixation rod

Rod for positioning the Light RT Impulse Device.

4. Impulse device handle

Handle to lock the Light RT Impulse Device in the fixation rod.

5. Frame

Impulse device frame.

6. Impact tip

Tip that is launched against the specimen to excite it by impact.

7. Cable

Connection cable to the control unit.

8. Plug

To be connected to the control unit output connector.

4.4 Control unit left side



Status LED

This LED lights up when the equipment is ON and blinks when it is communicating with the Sonelastic® Software.

USB port

USB port for computer communication. Note: The equipment includes a USB cable.

4.5 Control unit right side

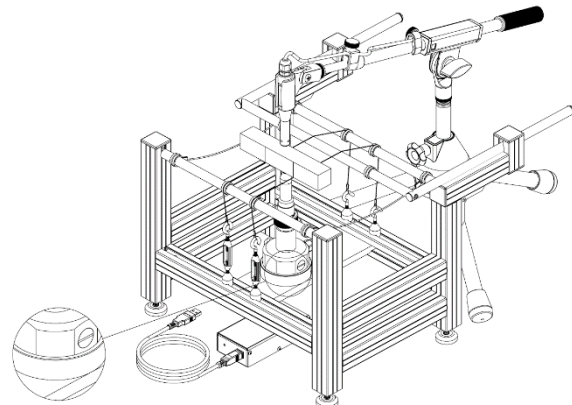
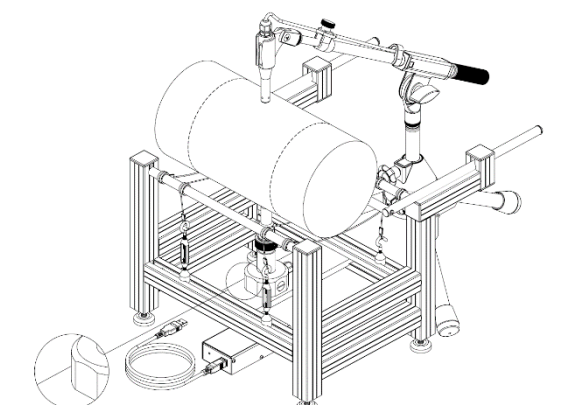
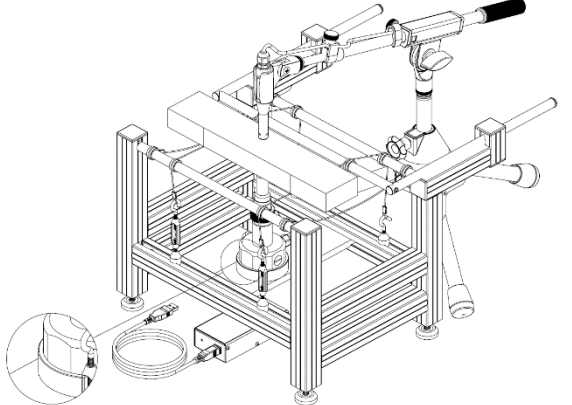


Output connector

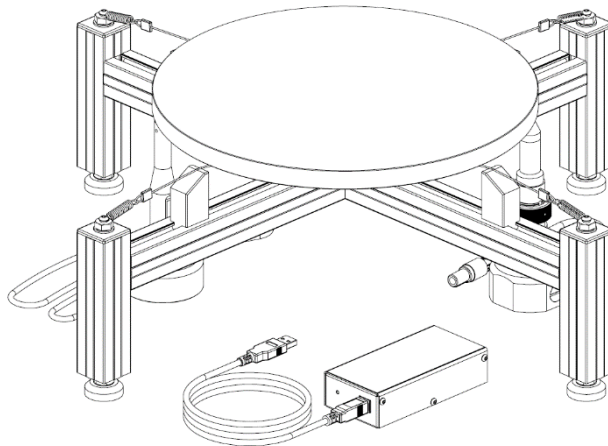
Output connector to the impulse device.

5. Supports configurations with IED Impulse Devices

Typical supports configurations employing IED Automatic Impulse Device are presented next:

SA-BC adjustable support for bars and cylinders	
 <p>[1]</p>	<p>Configuration: Automatic.</p> <p>Excitation: Automatic.</p> <p>Specimen: Light-weight.</p> <p>Acoustic sensor: Using the Sturdy Tripod.</p> <p>Impulse device: Medium RT Impulse Device with height-adjusting disc.</p>
 <p>[2]</p>	<p>Configuration: Automatic.</p> <p>Excitation: Automatic.</p> <p>Specimen: Heavy-weight.</p> <p>Acoustic sensor: Using a Sturdy Tripod.</p> <p>Impulse device: Medium RT Impulse Device.</p>
 <p>[3]</p>	<p>Configuration: Automatic.</p> <p>Excitation: Automatic.</p> <p>Specimen: Medium-weight.</p> <p>Acoustic sensor: Using a Sturdy Tripod.</p> <p>Impulse device: Medium RT Impulse Device with height-adjusting disc.</p>

SX-PD adjustable support for discs and rings



[1]

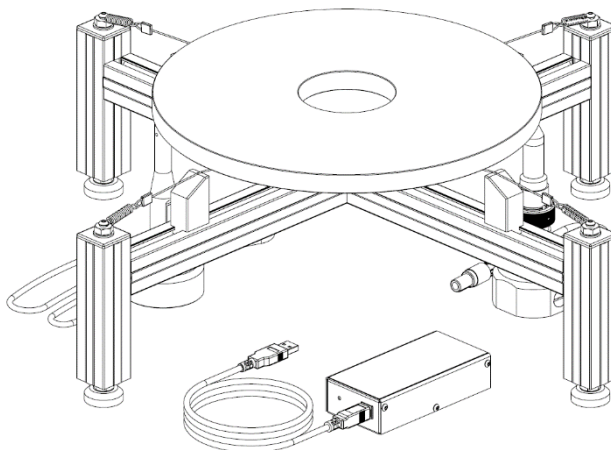
Configuration: Automatic.

Excitation: Automatic.

Specimen: Disc.

Acoustic sensor: Using vertical mounting base.

Impulse Device: Medium RT Impulse Device.



[2]

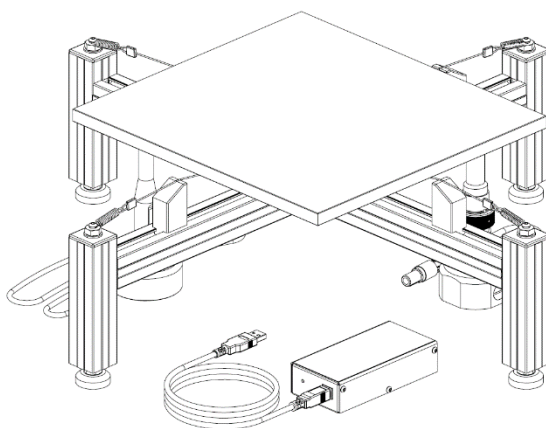
Configuration: Automatic.

Excitation: Automatic.

Specimen: Ring.

Acoustic sensor: Using vertical mounting base.

Impulse Device: Medium RT Impulse Device.



[3]

Configuration: Automatic.

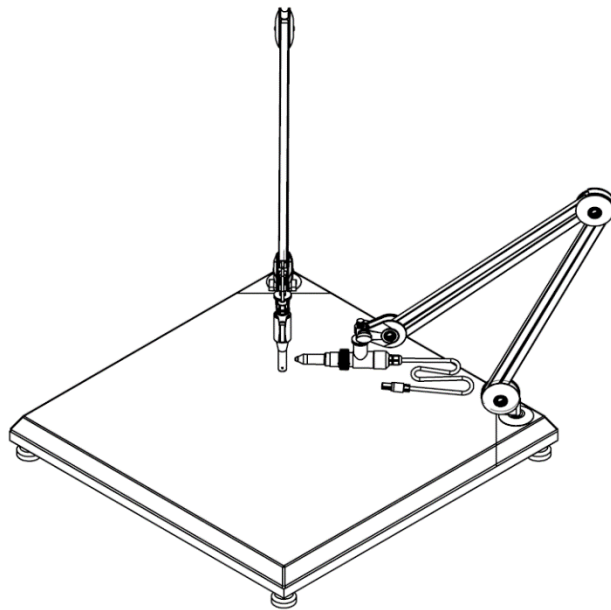
Excitation: Automatic.

Specimen: Rectangular plate.

Acoustic sensor: Using vertical mounting base.

Impulse Device: Medium RT Impulse Device.

SP-HZ Support for complex geometry specimens



[1]

Configuration: Automatic.

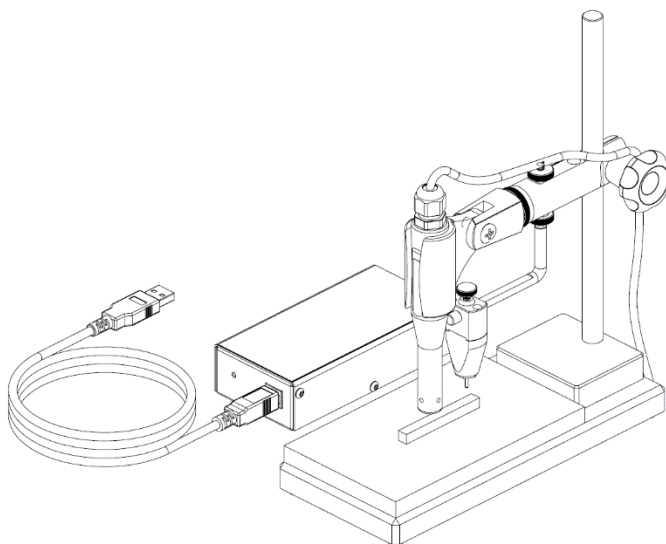
Impulse: Automatic.

Specimen: With complex geometry.

Acoustic sensor: Mounted on articulated arm.

Impulse Device: RTS mounted on articulated arm.

SB-AP support for small specimens



[1]

Configuration: Automatic.

Impulse: Automatic.

Specimen: Small rectangular bars.

Acoustic sensor: Mounted on the SB-AP clip.

Impulse Device: Light RT Impulse Device.

6. Specifications

Model	IED-USBPW
Adjustable voltage range for the electrical pulse	1 - 11 V
Adjustable duration range for the electrical pulse	1 - 60 ms
Protection against electric shock.....	Class I
Level of IP protection	IP30
USB port current consumption	Up to 500 mA
Output voltage	11 Vdc (max)
Output current (maximum).....	1.25 A
Working temperature range	10 - 40°C (50 - 104 °F)
Impulse Excitation Driver dimensions (L x P x A).....	125 x 60 x 36 mm
RT IMPULSE DEVICE (Ø x A) maximum dimensions	63 x 162 mm
LIGHT RT IMPULSE DEVICE maximum dimensions (L x P x A).	26 x 80 x 117mm
Total weight of the equipment.....	250 g

7. Equipment installation

7.1 Requirements

- A workbench flat and leveled with a free space of at least 60 x 120 cm (depth and width). This space is enough to fit the IED control unit, computer and support.
- A 127 or 220 VAC three-pin ground wired electrical mains plug. This plug is needed to power the computer up.

The equipment installation consists essentially of coupling the impulse device to the control unit and the control unit to the computer.

7.2 Connecting the impulse device

Step 01 – Connect the impulse device cable to the IED-USBPW control unit red output jack, observing the correct angular alignment, as shown next.



Connecting the cable to the control unit.

7.3 Mounting the impulse device in the support

The information with regards the supports installation and operation, as well as the information about the correct positioning of specimens and of the impulse device, is found in the support respective installation and operation manual.

8. Equipment operation

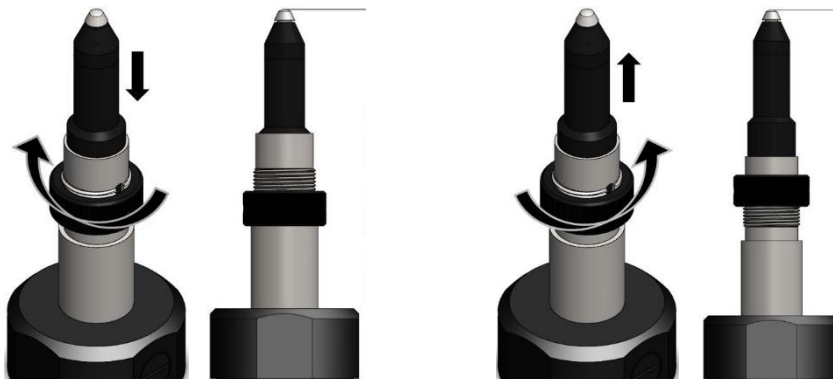
Before using the equipment, verify if all the points below have been properly followed:

- Install the Sonelastic® Software as described in its Installation and Operation Manual.
- Correctly install and position the specimen according to the specific support's Installation and Operation Manual. The support will be used together with IED Automatic Impulse Device.

After verifying the previous points, IED Automatic Impulse Device will be ready for the characterization process. The necessary information to operate the equipment is presented next.

8.1 Positioning the Medium RT Impulse Device

- Step 01* – To position the Medium RT Impulse Device, follow the instructions contained in the Installation and Operation Manual of each support.
- Step 02* – To change the distance of the impact tip to the specimen surface, turn the adjusting nut. To lower it down, turn the nut clockwise, and to rise it, turn the nut anti-clockwise.



8.2 Using the IED Automatic Impulse Device

To use IED, it is necessary to have the Sonelastic® software installed in a computer and then follow the steps described herein:

- Step 01* – Once Software Sonelastic® is installed, connect the USB cable supplied along with the equipment to its USB port, and then connect the cable other end to the computer's USB port.



- Step 02* – The LED should light up, indicating that the equipment is turned on.
- Step 03* – Position the RT or Light RT Impulse Device as indicated by the Installation and Operation Manual supplied along with the chosen support.
- Step 04* – To change the distance of the RT Impulse Device impact tip from the specimen's surface, turn the adjusting nut on the RT pillar clockwise – to lower it down – or anticlockwise, to rise it up, as illustrated in 8.1 - Step 3.
- Step 05* – After position the RT Impulse Device and place the impact tip at approximately 3 mm from the specimen's surface, it is necessary to configure the Sonelastic® software for the operation of the device. Information regarding the configuration and operation of IED-USBPW using the Sonelastic® software can be found within its Installation and Operation Manual. The intensity should be 30-40% for Medium RT Impulse Device and 1% for Light RT Impulse Device.

Notes: a) In Sonelastic® Software, duration and intensity adjustment is usually customized to around 3 Volts and 15 ms for the Light RT Impulse Device. b) As for the RT Impulse Device, the adjustment is usually around 35% on the basic scale.

9. Warnings and equipment transportation

- ▲ Reading all the information contained in this Installation and Operation Manual is compulsory for the correct use of the equipment;
- ▲ The electricity network where the optional items and accessories will be connected for use must have a functional ground system;
- ▲ Do not use this equipment for other purposes apart from the ones specified by this Manual;
- ▲ The non-compliance with the instructions provided by this manual in what regards the use of the equipment may reduce or invalidate warranty time.

Equipment Transportation:

- Transport the equipment with care;
- Avoid impacts and falls when transporting the equipment;
- Do not transport the equipment under the rain or snow, even when wrapped in its original packaging.

10. Maintenance

- To avoid deterioration and to always keep the equipment under satisfactory condition of use, clean it regularly using a slightly damp cloth with water and neutral soap;
- If using the Impulse Device to characterize abrasive materials, clean all removable parts of the device at the end of each experiment;
- Keep the threads of the adjusting nut always well lubricated with industrial Vaseline;
- To keep the equipment in good conditions and extend its life span, keep its accessories and optional items always clean.

11. Troubleshooting

Problem	Possible cause	Solution
The LED is on, but the impulse device does not work with the software.	The USB cable is not properly connected.	Reconnect the USB cable certifying it is correctly connected. Restart the Software.
	The Software has not been correctly configured.	Configure the software according to the supplier's instructions. Reinstall the impulse device driver from the "Drivers Sonelastic" folder, which would have been generated after the software installation.
The tap against the specimen causes it to move from its original position.	The excitation is too high.	Lower the excitation level in the Software.
	Inadequate support to the specimen under test (specimen is too small for it).	Use a adequate specimen support.

12. Symbology



USB Port



Attention! Risk of danger.

13. Technical support and warranty

If the equipment presents any abnormality, verify first if the problem is listed in *11 - Troubleshooting*. If the problem persists, contact ATPC.

ATCP Physical Engineering offers a 12-month warranty for this equipment, starting from the date of purchase. It covers manufacturing defects or materials defects, but some factors may cause the loss of warranty:

- 1 - The non-compliance with the recommended care regarding the installation and operation of this equipment, as describe herein;
- 2 - Accidents, falls, inadequate installation or any other damage cause by incorrect use or action of natural agents;
- 3 - Violation, repair or any other modification or alteration done in the equipment or parts of the equipment carried out by non-authorized agents (non-authorized by ATPC Physical Engineering).

After the 12 months of warranty, parts, expenses and services shall be charged.

14. Statement of responsibility

ATCP Physical Engineering takes total technical and legal responsibility over the IED Automatic Electromagnetic Impulse Device and guarantees that all information here provided are true.

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