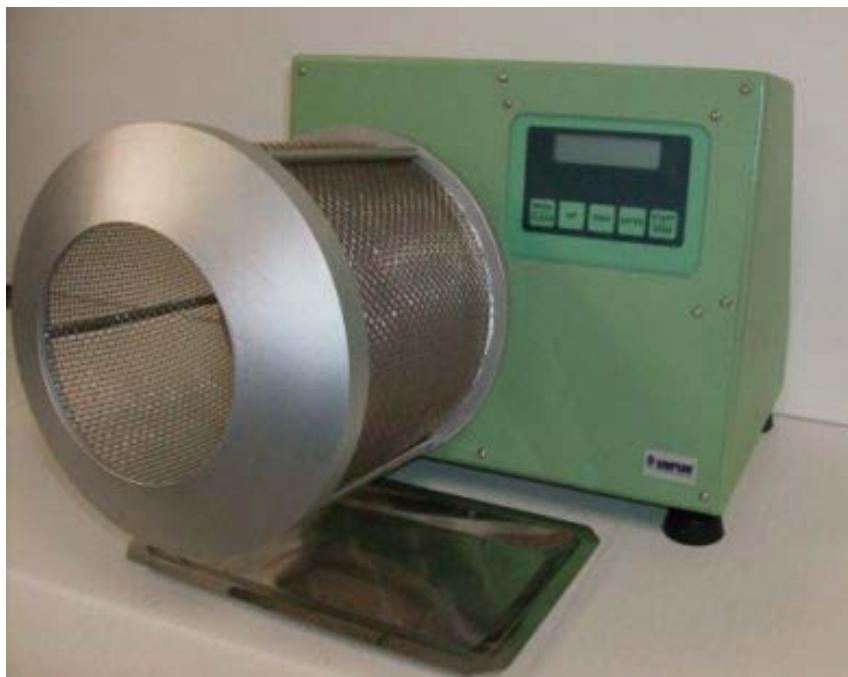


# Operating Instructions

## Friability Tester

Model 42141



**Type:**

Friability Tester

**Model No.:**

42141

**Part No.:**

0042141-A-ASM  
0042141-M-ASM

**Serial Number:**

Name and address of manufacturer:

Simpson Technologies  
2135 City Gate Lane Suite 500  
Naperville, IL 60563

For other Simpson Technologies offices around the world and for our contact information please visit us on the internet at [simpsongroup.com](http://simpsongroup.com) on the Contacts page.

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### 1 Introduction

Congratulations, you have just purchased an extremely reliable sand testing instrument that is backed by the professional technical support and years of proven sand technology experience of Simpson Technologies .

This laboratory equipment is constructed of quality materials and is the result of unsurpassed craftsmanship. The Friability Tester should be operated only when it is in perfect condition, in accordance with its designed purpose and being aware of possible hazards. Observe the safety instructions in Section 2 and operating instructions in Section 5.

#### 1.1 Application and Designated Use

The Friability Tester, Model 42141 is intended exclusively for determining the friability (surface integrity) of clay bonded foundry molding sand. Any other application outside the intended usage will be regarded as use not in accordance with its purpose, and, therefore, the manufacturer / supplier will not be held liable for any damage that might arise thereunder. The risk in this case will be exclusively that of the User.

# 1 Introduction

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## 1.2 Organizational Measures

The operating instructions should be readily available at the place of operation. In addition to the operating instructions, the general legal regulations or other mandatory rules for prevention of accidents and environmental protection should be made known and be observed!

The personnel instructed to use this apparatus, before beginning work, should have studied and fully understood these Operating Instructions, in particular the "Safety" chapter.

No modifications, extensions or changes of design of the device that would impact safety requirements should be put into effect without prior consent of the supplier! Spare parts must conform to the technical specifications defined by the manufacturer. This is always guaranteed when using original spares.

## 2 Safety

### **NOTICE**

*Before operating and/or performing maintenance or repair on Simpson Technologies designed and/or manufactured equipment, it is required that all personnel have read and understood the entire Operation Maintenance manual. If any questions exist, you must contact your supervisor or Simpson Technologies before taking further action.*

If properly operated and maintained, your Simpson Technologies supplied equipment can provide many years of dependable and safe operation. Please follow all recommended safety, operating, and maintenance instructions. Furthermore, the introduction of any non-Simpson Technologies manufactured and/or approved parts to the equipment may create a hazardous situation. Never alter the equipment without prior consultation with Simpson Technologies .



*DO NOT use this machine for purposes other than that for which it was intended. Improper use could result in death or serious injury.*

### 2.1 Safety Signs and Labels

Simpson Technologies has incorporated the ANSI Z535.6 / ISO 3864-1-2 safety symbol only label format on all of its laboratory equipment.

The harmonized ANSI Z535.6 format became an established safety label format since it not only fully meets the current ANSI Z535 standards, but also incorporates ISO 3864-2 symbology and hazard severity panels and thus, can be used for both the U.S. and international markets.

## 2 Safety

### 2.1.1 Safety Alert Symbols



*This is the safety alert symbol. It is used to alert you to potential personal injury hazards. OBEY all safety messages that follow this symbol to avoid possible injury or death.*



**DANGER!** *Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*



*The safety alert symbol used without a signal word to call attention to safety messages indicates a potentially hazardous situation which, if not avoided, could or may result in death or minor to serious injury.*

**NOTICE**

*NOTICE indicates information used to address practices not related to personal injuries but may result in property damage.*



This symbol indicates information containing important instructions concerning the use of the machine or directions for further procedures. Ignoring this information can lead to malfunction of the machine.



### 2.1.2 Safety Symbol Labels



#### **ELECTRICAL SHOCK / ELECTROCUTION (STC #214043)**

This label is located on the lower right hand front panel of the tester. With any panels removed from the Friability Tester, the electrical power supply and electrical terminals are exposed. A hazardous voltage is present that can cause electric **shock** or **burn**, and will result in serious injury. Follow **Lockout and Tagout** procedures before servicing.



**READ AND UNDERSTAND ALL SERVICE MANUAL INSTRUCTIONS!  
(STC #214042)**

This label is located on the lower right hand front panel of the tester. Before operating and/or performing any maintenance or repair on Simpson Technologies designed and/or manufactured equipment, it is required that all personnel read and understand the entire Operating Instructions manual. All protective guards and covers shall be installed and all doors closed before operating the equipment. If any questions exist, you must contact your Supervisor or Simpson Technologies before taking further action. Follow Lockout and Tagout procedures before servicing.

### 2.2 Lockout and Tagout System Procedure

#### **NOTICE**

*Whenever performing any type of maintenance or repair, whether in the form of cleaning, inspection, adjustment, mechanical or electrical maintenance, the equipment must be rendered into **Zero Mechanical State (ZMS)**.*

Prior to any maintenance (routine or otherwise) or repair of equipment, a safety procedure should be established and maintained. This procedure should include training of personnel, identification and labeling of all equipment which is interlocked mechanically, electrically, through hydraulics, pneumatics, levers, gravity or otherwise, and a listing of the established lockout procedures posted on each piece of equipment.

"Lockout and Tagout" refers to specific practices and procedures to safeguard personnel from the unexpected energizing of machinery and equipment, or the release of hazardous energy during service or maintenance activities. This requires, in part, that a designated individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance, and that the authorized employee(s) lock or tag the energy-isolating device(s) to prevent the release of hazardous energy and take steps to verify that the energy has been isolated effectively.

## 2 Safety

---

### 2.2.1 Lockout and Tagout Devices

When attached to an energy-isolating device, both lockout and tagout devices are tools used to help protect personnel from hazardous energy. The lockout device provides protection by holding the energy isolating device in the safe position, thus preventing the machine or equipment from becoming energized. The tagout device does so by identifying the energy-isolating device as a source of potential danger; it indicates that the energy-isolating device and the equipment being controlled may not be operated until the tagout device is removed.

### 2.2.2 Glossary:

**Authorized Person(s)** - Personnel who have been designated by his/her department to perform maintenance or service on a piece(s) of equipment, machinery or system, and are qualified to perform the work through proper training on the Lockout/Tagout procedures for the equipment, machinery or system.

**Lockout** - The placement of a lockout device on an energy isolating device, in accordance with an established procedure, to ensure that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

**Lockout Device** - Any device that uses positive methods, such as a lock (either key or combination type), to hold an energy isolating device in a safe position, thereby preventing the energizing of machinery or equipment. When properly installed, a blank flange or bolted slip blind are considered equivalent to lockout devices.

**Tagout** - The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

**Tagout Device** - Any prominent warning device, such as a tag and a means of attachment, that can be securely fastened to an energy isolating device in accordance with an established procedure. The tag indicates that the machine or equipment to which it is attached is not to be operated until the tagout device is removed in accordance with the energy control procedure.

**Zero Mechanical State** - The mechanical potential energy of all portions of the equipment or machine is set so that the opening of pipes, tubes or hoses, and the actuation of any valve, lever or button, will not produce a movement which could cause injury.

## 3 Short Description & Specifications

---

### 3 Short Description & Specifications

#### 3.1 Application

The Friability Tester, Model 42141, is used to determine the friability (surface integrity) of a clay bonded foundry molding sand. The instrument consists of a rotating wire mesh cage which causes two standard 2" x 2" AFS sand specimens or 50mm x 50mm metric sand specimens to be abraded. The machine is easy to operate via the digital user interface and requires very little maintenance due to the totally enclosed drive system.

#### 3.2 Description

The Friability Tester, Model 42141, measures the ability of compacted molding sand to resist abrasion or scuffing within the first few millimeters at the surface of a prepared mold. Two standard AFS or Metric specimens are placed side-by-side in a cylindrical screen and rotated against one another. While rotating within the cylindrical screen, sand is removed from the two sand specimens. The dislodged sand drops through the wire mesh cage into a catch pan positioned directly below the rotating cylindrical screen. After rotating the sand specimens for one minute, the screen will automatically stop. The sand that collected in the catch pan is weighed. The weight of sand removed, divided by the original weight of the specimens and multiplied by 100 is reported as the molding sand friability in percent. A high molding sand friability can indicate a tendency to produce sand inclusions on the finish castings and loss of casting quality.

**3.3 Specifications, Dimensions and Weights (Approximate)**

<b>Specifications</b>	<b>Friability Tester (42141)</b>
Length	400 mm (15.75 in.)
Width	292 mm (11.5 in.)
Height	254 mm (10 in.)
Weight	10 kgs (22 lbs.)
Power	115/230VAC 50/60 Hz

## 4 Unpacking and Installation

---

### 4 Unpacking and Installation

#### 4.1 Unpacking

**NOTICE**

*Your new Laboratory Equipment has been closely inspected before being shipped to your plant. However, damage can occur en route, so it is wise to inspect all equipment on arrival. Notify both the carrier and Simpson Technologies of any damage at once. Damage should be noted on the shipper's receipt before signing for receipt of the shipment.*

The Friability Tester, Model 42141, is shipped in two pieces with the rotating drum assembly removed for shipping. The instrument will require some basic assembly before use. No lifting equipment for handling is required; its weight, 10 kg (22 lb.), is easy to handle.



*ONLY authorized personnel may unload and install this equipment. Two people may be required to unpack this instrument due to the bulky dimensions and tight fitting packing crate.*

1. Carefully remove the rotating drum assembly from the package and gently place on a stable bench.
2. Next, carefully remove main apparatus from the packing crate and place on stable bench. This step may require two people because of bulky dimensions of machine and tight fitting crate. Once removed from the crate, proceed in removing any protective wrap and unpack the included accessories.
3. The packaging remains the property of the Customer and may be used for returning the apparatus if some repair is required.



### 4.2 Components

Included with your new Friability Tester are the following:

- Friability Tester Unit
- Rotating Drum Assembly
- Catch Pan
- Power Cord
- 2.5 mm Allen Wrench

If any of the above components are missing, contact your local Simpson Technologies office.

#### **NOTICE**

*Do not store the device in the open and unprotected from atmospheric conditons. If this instruction is not followed, claims under warranty will no longer be considered.*

### 4.3 Installation

The installation of the apparatus is the responsibility of the Client to include procuring and preparing the material required for this purpose.

Place the apparatus on a stable bench. The machine should be in a level condition. The machine can be leveled by making adjustments to the four adjustable rubber feet located at each bottom corner of the tester (Item 3, Figure 6 and 9).

#### **NOTICE**

*The tester must be leveled from both left to right and front to back.*

## 4 Unpacking and Installation

The Friability Tester would likely be occupied by one operator at a time. It is used in a foundry sand laboratory, with its operation display and control buttons placed at about eye level for the operator. It should also be placed in an ergonomically correct position to allow the operator to comfortably handle the sand specimens as well as the control buttons.

### 4.4 Rotating Drum Assembly

The Friability Tester is shipped in two pieces to avoid damage to the rotating drum. After placing the base of the Friability Tester on a stable bench, the rotating drum assembly should be attached to the base of the Friability Tester using the following procedure.

1. Locate flat area on shaft located on the front of Friability Tester base (Figure 1).

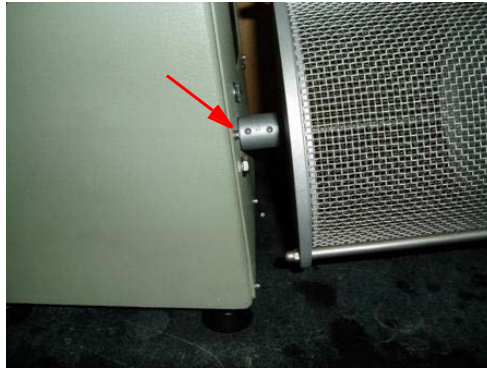


**Figure 1: Flat Area on Shaft**

2. Gently slide the rotating drum assembly onto the Shaft (Item 1, Figure 6) with set screws over flat area on Shaft. (Figure 2).



This step may require loosening the two (2) set screws located on the drum assembly to increase the hole clearance. The set screws should not be removed from drum assembly.



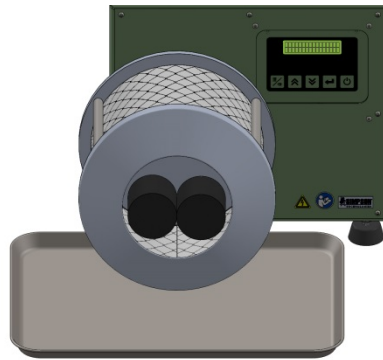
**Figure 2: Drum on Shaft**

3. Gently tighten the set screws onto flat area on shaft using a 2.5mm Allen wrench. (Figure 3)



**Figure 3: Allen Wrench Tightening Set Screws**

4. The assembly of the Friability Tester is now complete. (Figure 4).



**Figure 4: Rotating Drum Assembly Mounted on Tester**

### 4.5 Electrical Power Connection

Electrical Requirements: 100 - 240 Volts, 50-60 Hz + Ground (5 $\Omega$  or less).



Connect the equipment to a grounded electrical outlet.



*Verify that the voltage marked on the serial number nameplate is the same as the electrical outlet to be used for the machine. Outlet must be properly grounded! Failure to follow safety procedures could result in serious injury.*

### 4.6 Connecting the Power and Set-Up

1. Verify the voltage on the specification plate located on the back of the Friability Tester. Connect the power cable supplied with the tester into the power plug receptacle (Item 7, Figure 9) located on the back of the Friability Tester.



Some areas may require an electrical plug that is not supplied with the power cord to properly conform to the specific electrical outlet. These special electrical plugs will need to be purchased separately by the customer.

2. Verify the proper voltage of the electrical outlet before plugging the power cord into the outlet. Connect power cord to an AC electrical outlet that is free of disturbances/fluctuation and is properly grounded.

### **NOTICE**

*It is highly recommended that a voltage stabilizer/filter (line conditioner) is installed between the electrical outlet and the inlet of the Friability Tester. This device will help to ensure the proper performance of the Friability Tester.*

3. Place the provided catch pan (Item 5, Figure 8) under the rotating drum.
4. The AFS (American Foundry Society) standard friability test time and RPM are 60 seconds and 57 RPM. These settings are pre-programmed into the Friability Tester at the factory.



Please refer to Section 5.3 in this manual for detailed instructions to change both the test time and test RPM.

5. Verify the test parameter settings before starting a test by pressing ENTER on the control panel. Each time ENTER is pressed, the display will scroll from TO GO to RPM to SET then back to TO GO.
6. The equipment is ready to start operation.

### **4.7 Airborne Noise Emission**

The equivalent continuous A-weighted sound pressure level at the workstation does not exceed 70db(A).

## 5 Operating Instructions

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### 5 Operating Instructions



For more information on how to use and care for your Simpson Analytics equipment and accessories visit our Simpson Technologies channel on YouTube and search our library of videos. Subscribe to our channel to keep updated on new releases.

#### 5.1 Preparing the Sand Specimens

The friability test requires two (2) standard 2 in. x 2 in. AFS sand specimens (50mm x 50mm metric sand specimens). Manufacture a standard (AFS or metric) sand specimen using a standard sand rammer or pneumatic sand squeezer. (Simpson Technologies Model numbers; 42100, 42100-M, 42117, 42117-M, 42160 and 42160-M).



Detailed sand specimen preparation instructions can be found in the operation manual for the sand rammer or sand squeezer being used. Follow the step by step procedure in the operation manual to prepare the proper sand specimen.

### 5.2 Test Procedure

1. Turn on the Friability Tester using the power switch located on rear of machine (Item 6, Figure 9). The digital display will show the messages indicated in Graphic 1.



**Graphic 1: Initial Display Screens on Start-up**

2. Ram two standard AFS or Metric sand specimens, one after the other, and strip the specimens from the tube using a stripping post.

## 5 Operating Instructions

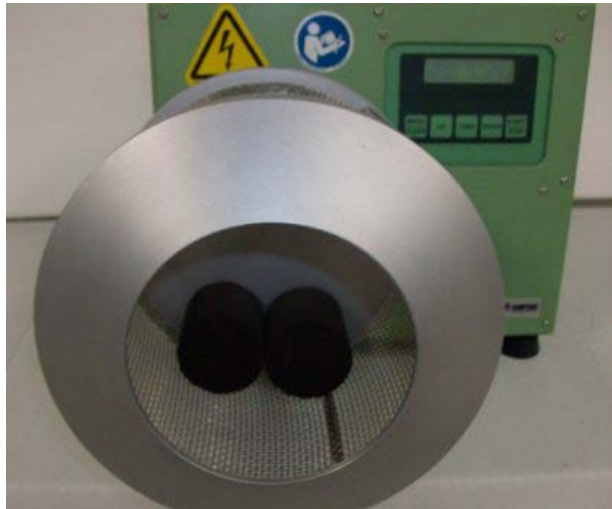


See Section 5.1 for information regarding the preparation of a standard 2 in. X 2 in. (50mm x 50mm) sand specimen.

### **NOTICE**

*These steps must be carried out as quickly as possible to prevent moisture loss. The friability of molding sand increases rapidly as moisture and compactability decrease.*

3. Immediately after ramming, strip the sand specimen from the specimen tube using a stripping post. Quickly weigh and record the weight of each sand specimen. Then gently place the specimens side by side in the rotary drum (see Figure 5). The sides of the sand specimens will be touching and the ends of the specimens should be in contact with the back support plate of the rotating drum.



**Figure 5: Samples Placed in Rotary Drum**

4. Push the START/STOP button located on the control panel (Figure 7) to start the friability test.

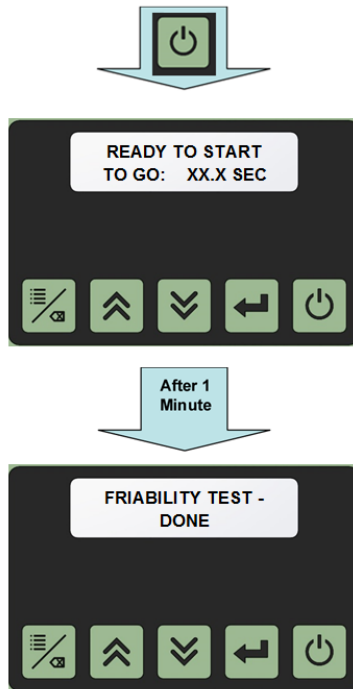


5. The rotating drum will start up slowly and increase to the preset RPM. The TO GO time will start to count down when the rotating drum reaches the preset RPM. The test timer begins when the rotating drum reaches the preset test RPM.
6. The specimens should rotate side by side without tumbling over one another. If at any time during the test, the sand specimens tumble over the top of each other, the test must be aborted and started again with two new specimens.
7. To abort a test, press START/STOP. This will stop machine and the display will go back to the screen as shown in Graphic 2.



**Graphic 2: Aborting Test**

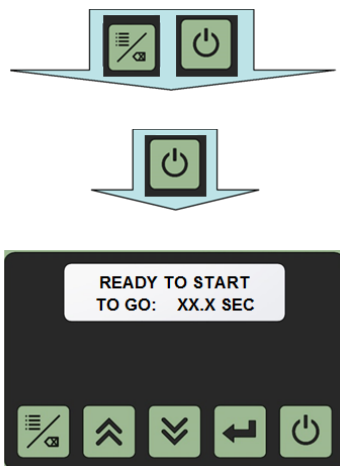
8. After 1 minute (or programmed test time), the rotating drum will stop and the display will indicate the test is done as shown in Graphic 3.



**Graphic 3: Friability Test**

9. After the rotating drum stops, lift the catch pan and carefully brush the sand collected into a balance pan and record the weight in grams of sand that has been removed from the two sand specimens.
10. To determine the percent friability of the sand sample, divide the sand weight measured in the catch pan by the starting weight (sum of the two specimen weights) and multiply by 100. Record the value as percent friability after 1 minute (or programmed test time).

11. To start another test, either press MENU/CLEAR and then START/STOP or press the START/STOP button and the display will go to the Ready to Start screen as shown in Graphic 4.



**Graphic 4: Starting on a New Test**



The effect of line down time, or the effect of time lapse after mold preparation on the erosion characteristics of sand may be simulated by testing for friability at various time intervals after specimen preparation.

## 5 Operating Instructions

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### 5.3 Changing the RPM or TO GO Time

Use the following procedure to change the RPM of the rotating drum or the friability test time.



The AFS (American Foundry Society) Standard RPM and test time are 57 RPM for one minute. The friability is preset to these standard test parameters.

1. Turn on power with toggle power switch on rear of machine (Item 6, Figure 9). Display will read and then change as shown in Graphic 1 above.
2. Press MENU/CLEAR button. Display will go to the RPM Programming screen as shown in Graphic 5.

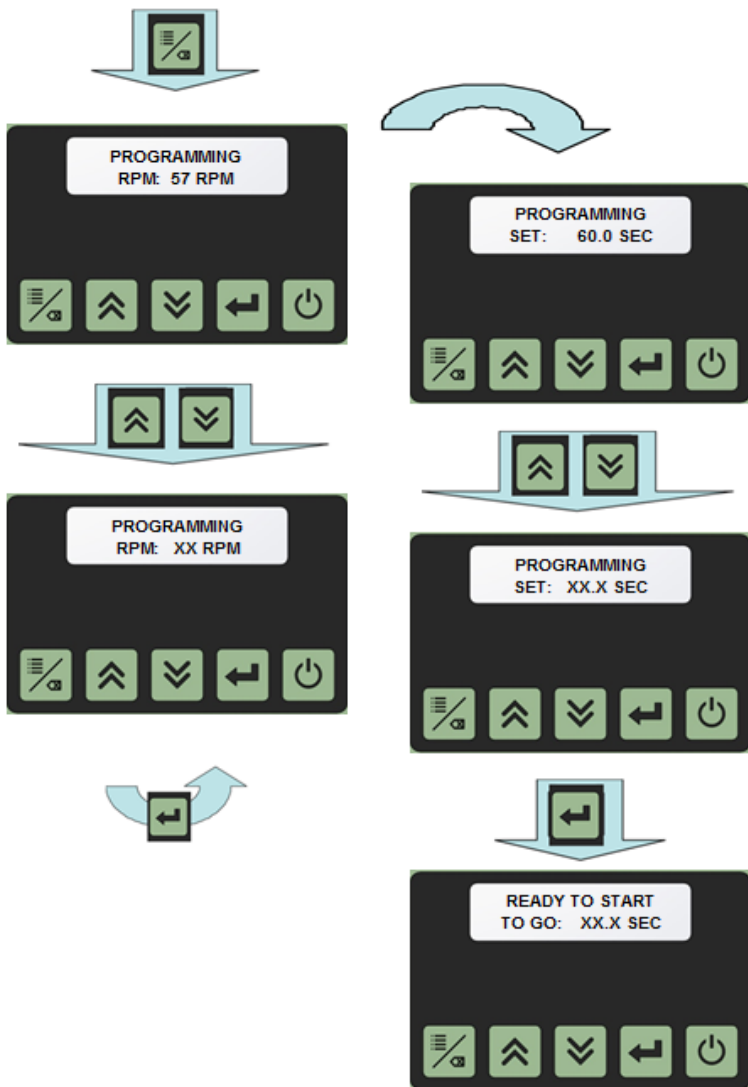
#### **NOTICE**

*Pressing the Menu/Clear button twice will set the RPM value at 15; the RPM must be set to an RPM that is between 17 and 65. Setting the RPM below 17 will cause the motor to stall.*

3. Press the UP or DOWN button to change the RPM of the rotating drum. Press ENTER to save the selected RPM.
4. The Display will change to the Programming mode for setting the test TO GO Timer as shown in Graphic 5.
5. Press the UP or DOWN button to change the test time. Press ENTER to save the selected time.
6. The display will show "READY TO START" as shown in Graphic 5.



The parameters you set will remain until you change them. Turning off the power will not lose the settings.



Graphic 5: Changing the RPM/Testing Time

### 6 Maintenance



For more information on how to use and care for your Simpson Analytics equipment and accessories visit our Simpson Technologies channel on YouTube and search our library of videos. Subscribe to our channel to keep updated on new releases.

The motor is permanently lubricated and requires no maintenance. Keep the unit clean of sand and dirt by brushing off excess sand. Brush any adhering molding sand from the mesh of the rotating drum. The cabinet can be occasionally wiped with a damp cloth.

7 Apparatus Layout

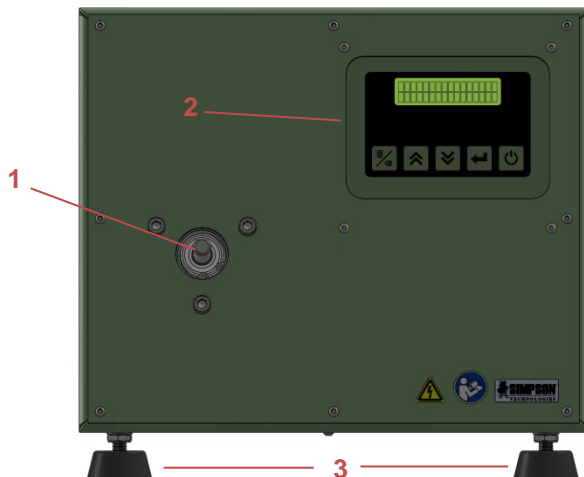


Figure 6: Front View of Tester without Rotating Drum Assembly

Item	Description
1	Shaft
2	Control Panel
3	Leveling Feet

## 7 Apparatus Layout

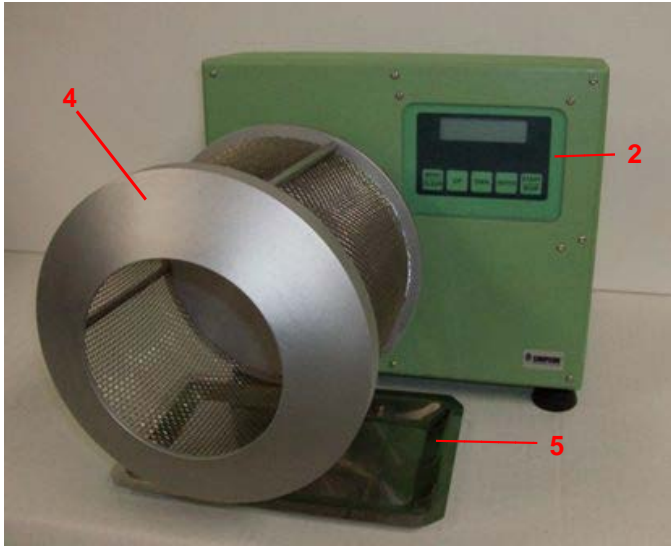


**Figure 7: Item 2 Control Panel Close-Up**

2A	Menu/Clear Button
2B	Up Button
2C	Down Button
2D	Enter Button
2E	Start/Stop Button

Programming Button	Icon
MENU/CLEAR	
UP	
DOWN	
ENTER	
START/STOP	





**Figure 8: Front View with Rotating Drum & Catch Tray**

Item	Description
2	Control Panel
4	Rotating Drum
5	Catch Tray



**Figure 9: Back View of Tester**

Item	Description
3	Leveling Feet
6	Power Switch
7	Power Cord Receptacle
8	Specifications Nameplate

## **8 Spare Parts / Ordering Parts / Returns**

### **8.1 Spare Parts**

Simpson maintains a large inventory of common spare parts for all current Simpson Analytics products. The following table provides part numbers for common spare parts for this device. Contact Simpson Technologies with the part number and description when ordering.

### **8.2 Ordering Replacement / Spare Parts**

The source of replacement parts for your Simpson Analytics equipment is just as important as the make of the equipment you purchase. ALWAYS order parts for your Simpson Analytics equipment directly from Simpson Technologies. To find the Simpson office closest to you please visit us on the internet at [simpsongroup.com](http://simpsongroup.com) on the “Contact Us” page.

Parts may be ordered from the sales department via e-mail at [parts@simpsongroup.com](mailto:parts@simpsongroup.com): When contacting our sales department to obtain a quotation on replacement parts or service please always include the equipment serial number, the description of the part and the part number. Your Simpson Technologies sales team representative will provide you with a quote on the items with current price and delivery times. When ordering, please always refer to the quote number on your order.

To arrange for calibration support or repair assistance please contact our customer service department at [service@simpsongroup.com](mailto:service@simpsongroup.com).

## 8 Spare Parts / Ordering Parts/ Returns

---

### 8.3 Returned Goods Policy

Simpson Technologies strives to provide their customers with maximum follow up support and, in order to offer the most practical flexibility, the following conditions apply to returned goods. Adherence to these procedures will assure the most prompt and efficient service.

#### **RETURNS WILL BE CONSIDERED IN THE FOLLOWING SITUATIONS:**

- Products ordered in error by customer (subject to a restocking charge).
- Incorrect or defective products shipped to customer.
- The return of existing products for factory repair or upgrade.
- Products ordered correctly but which are unwanted or unsuitable (subject to a restocking charge).
- A Safety Data Sheet (SDS) must accompany material that is sent to Simpson Technologies for testing purposes. Simpson Technologies will NOT authorize the return of hazardous materials.

### RETURN PROCEDURE:

- **The customer must obtain a Return Material Authorization Number (RMA#) from Simpson Technologies prior to returning the goods.**
- To obtain an RMA#, the customer should contact the Customer Service department by phone, fax, e-mail to [service@simpsongroup.com](mailto:service@simpsongroup.com). The material being returned must be identified and the reason for its return clearly specified. Once approved for return, Simpson Technologies will issue the customer an RMA form to be included with the shipment and with instructions on where and how to ship the goods.
- All returned goods are to be shipped with transportation charges PREPAID, unless otherwise agreed when the RMA# is assigned. If it has been predetermined that return goods are to be shipped COLLECT, Simpson Technologies will specify the desired routing.
- All returned shipments will be subject to inspection upon arrival at Simpson Technologies.
- Material returned without an RMA# may be refused and returned at customer's expense.

## 9 Decommissioning

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### 9 Decommissioning



*Before doing any work, review the Safety Procedures in Section 2 and Lockout/Tagout all the power sources to the machine and peripheral equipment.*

*Failure to follow safety procedures could result in serious injury.*

Use qualified personnel and follow safety procedures, applicable local policies and regulations in decommissioning the Friability Tester and peripheral equipment.

**Electrical Power:** Disconnect the electrical power source and verify there is no power on for all components being decommissioned.

#### WASTE DISPOSAL

The Machinery and Controls Consists of:

- Iron
- Aluminum
- Copper
- Plastic
- Electronic Components and Circuit Boards

Dispose of the parts in accordance with the applicable regulations.

**SIMPSON**

A Norican Technology

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