

Demetalization Reactor

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1 Introduction

This manual offers comprehensive guidance on operating the industrial-scale demetalization reactor designed for removing metal films from polymer film, by trembling the composite inside a solvent which fills the drum. The manual covers reactor setup, operating procedures and safety protocols. The usage of this reactor is completely generic. It can be used whenever a liquid is required to be tumbled around a horizontal axis that is transverse to the axis of the drum.

2 System Overview

2.1 Construction

The reactor unit consists of a UPVC tank housed in a sturdy metal frame, offering chemical resistance and structural support. A gear motor provides low-speed, high-torque, controlled by an external unit (a variable frequency drive) with oscillation regulation and safety features. Rubber pads are installed to absorb vibrations, reduce noise, and enhance stability during operation.

2.1.1 Features

1. Chemical resistive UPVC material drum
2. Geared motor with speed control
3. Operation time control
4. Metal body for durability
5. Rubber pads for stability

2.2 Mechanical Diagram

1. Motor drive box
2. Drain valve
3. Tank lid
4. Electrical Control unit
5. UPVC reactor tank
6. Metal body

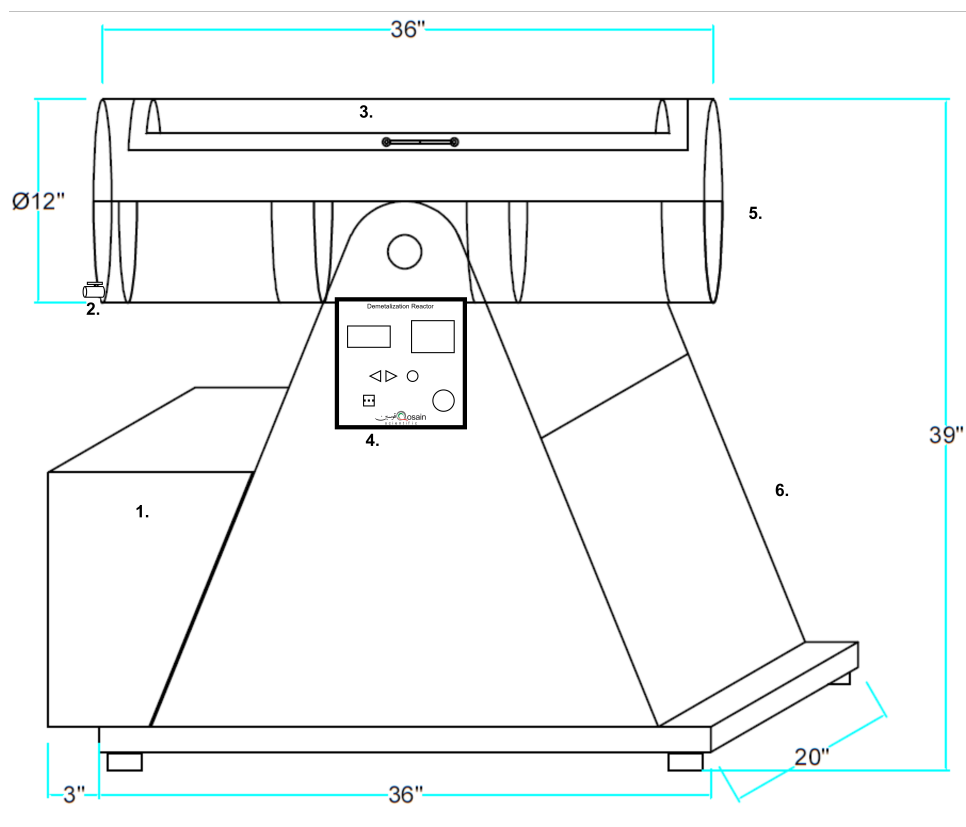


Figure 1: Schematic of the demetalization reactor. All dimensions are in inches.

2.3 Electrical Control unit

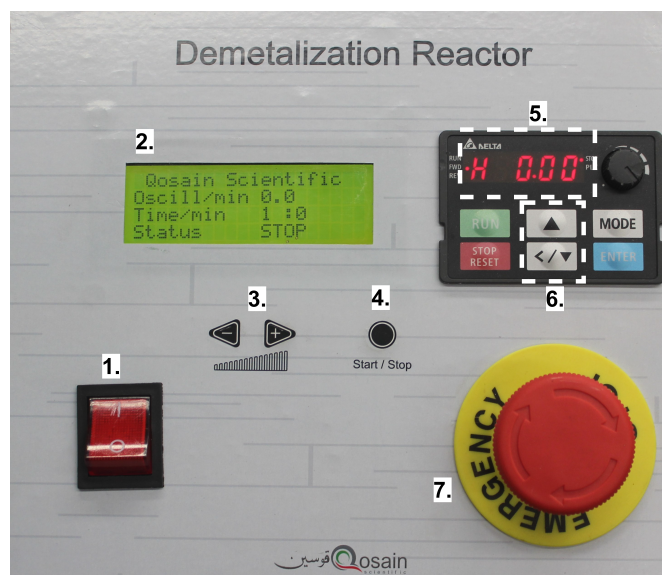


Figure 2: Snapshot of the control unit.

1. Power ON/OFF switch
2. LCD display to show oscillations of tank, time of operation and status of reactor

3. Buttons to adjust time of operation
4. Start/Stop button
5. LCD display to show motor speed
6. Motor speed control buttons
7. Emergency stop button

3 Technical Specifications

Volume of drum	4071 in ³
Dimensions of drum	Diameter 12 in, Height 36 in
Total tank capacity of drum	67 liters
Liquid capacity	40 liters
Power Supply	220V AC
Material of Construction	Steel and UPVC
Other specifications	<ol style="list-style-type: none">1. Oscillation control2. Time of operation control3. Emergency stop button4. Fitted with mesh for confining liquid

4 Operating Procedure

4.1 Startup

1. Check all connections for tightness and leaks.
2. Keep the area close to the reactor and the rotatory tank clear of any obstacles or fragile objects.
3. Set oscillations to desired setpoint using control unit.

4.2 Operation

1. Add required quantity of liquid in the tank. Do not overfill beyond to 40 liters.
2. Add the material to be demetalized.
3. Monitor tank oscillations and make sure that the liquid does not over flow.
4. Follow the steps to initiate the operation through control unit:
 - (a) Switch ON the power button (1.)

- (b) Set the time of operation using buttons **(3.)** and initial speed of motor using buttons **(6.)**. The speed can also be changed during operation as well if needed.
- (c) Start the oscillation using button the **(4.)**

4.3 Shutdown

1. Stop the tank movement.
2. Remove the demetalized films.
3. Using drain valve, empty the liquid in the tank.
4. Unplug and thoroughly clean the reactor.

5 Safety Precautions

- Always wear gloves, goggles, and lab coat.
- Ensure proper ventilation.
- Handle metal surfaces and electrical equipment with gloves.
- Keep a fire extinguisher nearby.
- Follow proper chemical disposal procedures.
- Thorough cleaning in between cycles is necessary.