



# PORTLAND TOOL & DIE

MDT-4000

Angular Positioning Stage

User Manual



*Original Instructions*



For your safety, read and understand manual before use.

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## 1. Product Overview

The MDT-4000 is a motorized rotation stage that can be controlled remotely via USB, RS-232 or LAN interfaces or locally with dedicated physical push buttons. It can be used to rotate devices such as speakers or microphones to measure the output amplitude or receive sensitivity versus rotation angle. The device under test can be rotated at a constant velocity or in incremental steps. When at rest, the device is acoustically silent.

The system can be controlled by the local front panel as well as remotely by either USB, RS-232 or LAN interfaces. An embedded webserver allows the system to be controlled remotely from any device that can run a web browser such as a cell phone or tablet computer.

The Emergency Stop function can be activated either from the dedicated front panel button or remotely by connecting a remote emergency stop switch to the rear panel terminals. When activated, the emergency stop function safely decelerates the system if it is currently in motion and then removes power from the motor to prevent any additional motion.

A high precision gearbox and encoder allow the system to be accurately positioned. The position of the platter is maintained across power cycles. The platter position is also maintained if the system is unable to reach the target position.

The drive system is maintenance free and can support or suspend loads up to 100 kg (220 lb).







To aid with cable routing, there is a 50 mm center hole that can be used to cleanly route cables from below the turntable to the device under test.

## 2. Safety Considerations


### 2.1. Safety standard compliance statement

This device has been designed and tested in accordance with the safety standard *IEC/EN/BS 60204-1:2006: Safety of Machinery – Electrical Equipment of Machines*. This manual contains information and warnings that must be followed to ensure safe operation.

### 2.2. Safety symbols

	This symbol is used to indicate potential hazards and warnings. Refer to the associated warning statement in the manual.
	This symbol indicates that the machine may start unexpectedly. Exercise caution near and around the platform when the system is controlled remotely.
	If the hazardous situation is not avoided, death or serious injury will occur.
	If the hazardous situation is not avoided, a serious injury may occur.
	If the hazardous situation is not avoided, a minor injury may occur.
	Important safety information for situations where no personal injury is possible.

### 2.3. Explosion Hazard

	The equipment is not designed to be used in potentially explosive environments. It must not be operated in the presence of flammable liquids or gases.
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### 2.4. Description of intended use

The turntable is intended to be use in an indoor laboratory type environment. Only personnel trained in the use of the turntable should be allowed to install, configure, and operate the system.

The turntable is designed to rotate rigid objects that are positioned so the center of gravity is aligned with the center of the turntable platter. Avoid placing test objects that have a non-fixed movable mass because the moving mass can shift the center of gravity as the device rotates and this could lead to a potential for the system to tip or it can generate a high stress load on the edge of the platform.

When testing small, light objects the turntable can be operated on a level surface when the adjustable leveling legs are installed. For heavier objects, the turntable should be firmly secured to the floor or other support structure. If the turntable is attached inverted to a ceiling or other support structure, ensure that the bolts and support structure can hold the total weight of the turntable plus the device under test and any fixturing required to attach the device under test to the turntable.

If the turntable is mounted inverted in a location where someone could move under the turntable, clearly mark the area under the turntable to warn of the overhead hazard. If possible, place guardrails around the area under the turntable to prevent someone from entering that area.

## 2.5. List of prohibited uses

- Do not stand or sit on the turntable.
- Do not allow the turntable to move a human in any way.
- Do not use the turntable in an explosive environment.
- Do not allow any part of the turntable to be submerged in water or any other liquid.

## 2.6. Warnings



- This device is intended to be used by skilled operators with technical background who are familiar with its operation.
- Always remove power from the system before installing or removing test devices and fixturing from the platform.
- Do not submerge the turntable in water or any other liquid.
- Remove the device under test and any test fixtures before transporting or re-locating the turntable.
- Route cables near the turntable in conduit or other protective enclosure to avoid trip hazards.
- When routing cables that connect to the device under test, ensure there is enough slack to allow the cable to move and twist when the turntable moves.
- Use caution when placing or removing heavy objects to avoid placing all of the weight on the edge of the turntable platter. Lift the device on/off the platter in a vertical direction then raise or lower the test device onto the platter.

## 2.7. Personal Protective Equipment



Wear eye protection when working around the turntable if there is any kind of device under test attached to the turntable platter. When there is nothing attached to the platter, there is no eye hazard.

### 3. Regulatory Markings

	<p>The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.</p>
	<p>This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.</p>

## 4. System Specifications

### 4.1. Mechanical Specs

Parameter	Value	Notes
Length, Width	437 mm (17.2 in)	Enclosure dimensions.
Height	100 mm (3.9 in)	Bottom of enclosure to top of platter.
Platter diameter	400 mm (15.7 in)	
Center Bore	50 mm (1.9 in)	
System Weight	11.67 kg (25.7 lb) 11.97 kg (26.4 Lb)	Without leveling legs. With 4 leveling legs installed.
Max Load Weight		
- Centered	100 kg (220 lb)	
- On edge	25 kg (55 lb)	

### 4.2. Motion

Parameter	Value	Notes
Drive Torque	[5 – 20] Nm, [3.7 – 14.7] lb-ft	Electronically limited.
Torque Accuracy	+/- 15%	
Max Speed	3 RPM (18 °/s)	Electronically limited.
Angle Accuracy	0.5 deg	
Angle Resolution	0.1 deg	

Note: The maximum torque that can be applied to the turntable is 130 Nm (96 lb-ft). The internal drive system may be permanently damaged if excessive torque is applied to the system. Please use caution to avoid high torque conditions when installing or removing fixtures.

### 4.3. Electrical Specs

Parameter	Value	Notes
Voltage		
- Typical	24 Vdc	
- UVLO	12 Vdc	Internal E-Fuse, automatic reset.
- OVLO	30 Vdc	Internal E-Fuse, automatic reset.
- Absolute maximum	35 Vdc	Applying voltages above this level will result in permanent damage to the device.
Current		
- Max	3 A	Internal E-Fuse, automatic reset.
- Idle	0.1 A	
Power		
- Max	72 W	
- Idle	2.4 W	
Power Connector	Barrel Connector	2.5 mm I.D., 5.5 mm O.D.



#### 4.4. Environmental Specs

Parameter	Value	Notes
Temperature (operating) - Min - Max	+5 °C (41 °F) +50 °C (122 °F)	IEC 60068-2-1 & IEC 60068-2-2: Environmental Testing. Cold and Dry Heat.
Temperature (storage) - Min - Max	+5 °C (41 °F) +50 °C (122 °F)	
Humidity	0 – 90 %RH	IEC 60068-2-78: Damp Heat 0 to 90% RH (5°C to 40°C), non-condensing at 40°C
Acoustic noise level - Operating o <= 5 deg/sec o > 5 deg/sec - Idle	< 60 dBPa(A) < 50 dBPa(A) < 30 dBPa(A)	Max torque and speed. Power on, no motion.
Enclosure	IEC 529: IP 23	
Shipping	IEC 60068-2-31:2008	

#### 4.5. EMC Emission

- EN/IEC 61000-6-3: Generic emission standard for residential, commercial, and light industrial environments.
- CISPR 32: Radio disturbance characteristics of information technology equipment. Class B Limits.
- FCC Rules, Part 15: Complies with the limits for a Class B digital device.

#### 4.6. EMC Immunity

- EN/IEC61000-4-3: Generic standards - Immunity for heavy industrial environments.
- EN/IEC 61326-1: Electrical equipment for measurement, control, and laboratory use
- NOTE: The above is only guaranteed using accessories listed in this Product Data Sheet.

#### 4.7. Electrostatic Discharge (ESD)

- EN/IEC 61000-4-2: ± 4 kV contact and air discharge.

#### 4.8. Expected Service Life

- 10 Years when used 8 hr. per day, 5 days per week, intermittent operation.
- 1,000,000 platter rotations

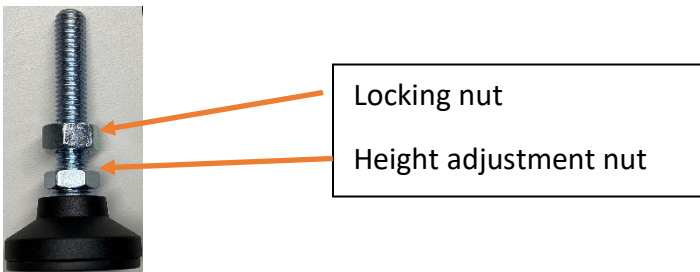
## 5. Installation

### 5.1. Unpacking and initial setup instructions

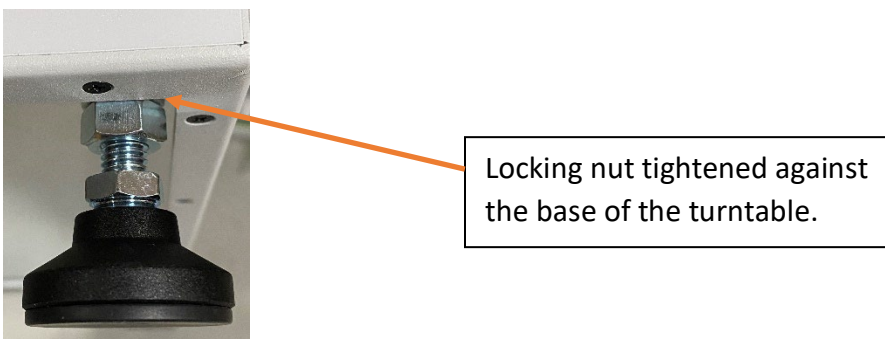
The power supply, power cord, leveling legs, and USB cable are packed in a foam tray that is held in place by a cardboard sleeve. Please remove this accessory package before attempting to remove the turntable from the shipping container.

After removing the accessories, remove the turntable from the shipping container. The turntable weighs approximately 11 kg (25 lb). It is recommended to have two people lift the turntable out of the shipping container. After removing the turntable, please retain the shipping container and internal foam inserts for future transport.

To install the leveling legs, invert the turntable onto a padded surface, then screw the leveling legs into the threaded holes near the corners of the turntable base plate. You should be able to twist the leveling legs by hand. Each leveling leg is shipped with a locking nut installed near the leveling foot as shown below:



After threading the leveling legs into the base plate of the turntable, tighten the locking nut against the base plate. This will hold the leveling leg firmly in place so it cannot vibrate and generate acoustic noise. See the following picture that shows the locking nut correctly positioned.



**⚠ CAUTION** Ensure that the leveling legs are adjusted so the maximum distance from the bottom of the leveling leg to the bottom of the turntable is no more than 65 mm (2.5 inch) as shown in the following picture.



After the leveling legs have been installed, invert the turntable again and level the system using the spirit level.

Verify the turntable is in working condition by following sequence below:

1. Turn off the rear-panel power switch.
2. Reset the front-panel emergency-stop switch. See section 6.7.1.
3. Connect the power supply to the turntable, then connect the power supply to the AC power line.
4. Turn on the rear-panel power switch.
5. Verify the front-panel GUI touch panel operation by pressing the “About” button.
6. Verify the system can move by pressing and holding either of the JOG buttons on the front panel. The system will continue to rotate while the button is held down. The motion will stop when you release the JOG button.
7. Return the turntable to the zero position by pressing either of the front-panel HOME buttons.
8. Press the emergency stop button and verify that the display shows a warning about the activation of the emergency stop system. Press either of the JOG

buttons and verify that the system does not move while the emergency stop is activated.

9. Reset the emergency stop button and press the “reset” button on the touchscreen to re-enable motion.

## 5.2. AC mains disconnect

The AC mains power supply can be disconnected by:

- Unplugging the IEC power cable from the mains wall supply socket
- Unplugging the IEC power cable from the AC/DC power supply

## 5.3. Installation configuration: Freestanding using leveling legs

When using the leveling legs, adjust the leveling legs until the bubble in the integrated spirit level is inside the center ring. This will help ensure that any device attached to the turntable is rotating around the vertical axis and will help prevent tip-over hazards.

If the device under test has an offset center of gravity or needs to be positioned away from the center vertical axis, ensure that the device is firmly attached to the platter so it will not slide off the platter when the system begins to rotate.

If the device under test is tall or a tall test fixture is attached to the platter, the potential for toppling increases as the height of the center of gravity is increased.

In all cases, keep the center of gravity of the device under test as close to the turntable platter as possible.

## 5.4. Installation configuration: Bolted to Floor

Bolting the turntable to the floor will help prevent tip over hazards and will ensure that the turntable remains in a fixed location in the test environment.

Because the turntable is in a fixed position, large twisting or bending forces applied to the turntable will be coupled to the platter drive system. Forces greater than the maximum rated specifications can cause permanent damage to the drive system

If any test fixturing is attached to the platter, ensure that there are no points around the perimeter of the path of the DUT or the test fixture that could potentially pin someone between the DUT or the test fixture and any other fixed structure.

If the DUT or any part of the fixture overhangs the turntable it is recommended to mark the floor around the turntable to indicate the hazard zone.

## 5.5. Installation configuration: Inverted on Ceiling.

When mounting the turntable suspended from a ceiling ensure that the structure can support the weight of the turntable plus the weight of the device under test as well as any additional test fixturing. All brackets and fasteners used to attach the turntable to

the structure must also be able to support the total weight of the turntable and any other devices attached to the turntable platter.

**⚠ DANGER** Exceeding the turntables max load limit may cause the suspended device(s) to fall creating a potential hazard to anyone standing under or near the system.

It is recommended to clearly mark a danger zone on the floor under the suspended turntable. If possible, place a barrier around the danger zone to prevent anyone from accidentally entering the danger zone.

**⚠ CAUTION** Do not use the spirit level when the turntable is inverted.

The spirit level will not indicate a level condition when the turntable is inverted. If possible, cover the spirit level with tape to obscure the level when the turntable is mounted in an inverted position.

## 5.6. Additional Installation Warnings

### 5.6.1. Vertical mounting with long, unbalanced lever arm

If the turntable is mounted vertically and a long lever arm is attached to the platter, the lever arm could generate a large rotation torque that could damage the internal drive system.

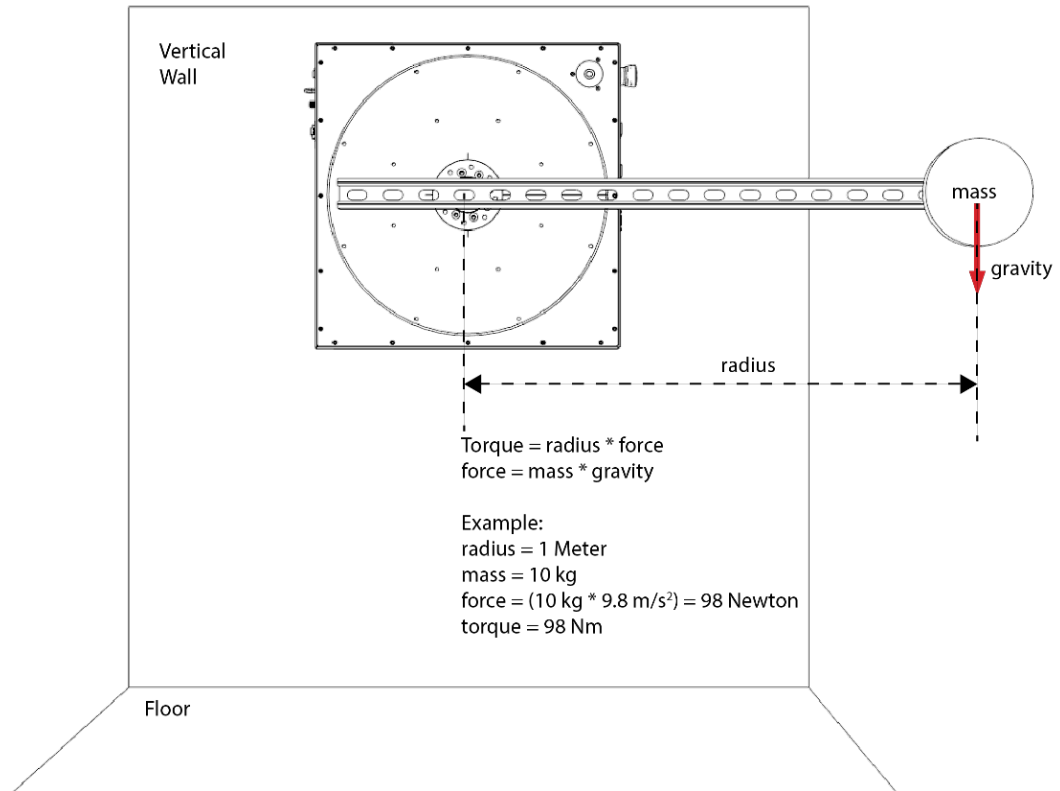
**⚠ DANGER** If the torque is large enough, the turntable may not be able to withstand the torque and the platter could rotate freely and the weight on the arm could fall. This uncontrolled movement could pose a hazard to anyone in the path of the falling weight.

Clearly mark a danger zone on the floor in the area where the DUT could potentially swing if the turntable drive system fails and allows the DUT to rotate freely. If possible, place a barrier around the danger zone to prevent anyone from accidentally entering the danger zone.

In this configuration, ensure that the system mounted on the platter is balanced to minimize the amount of static torque generated due to gravity.

Use caution when mounting or un-mounting the loads in a balanced configuration. If the mounting arm is in a horizontal position and one of the weights is removed, the system will no longer be balanced, and the remaining weight will immediately generate a torque on the turntable.

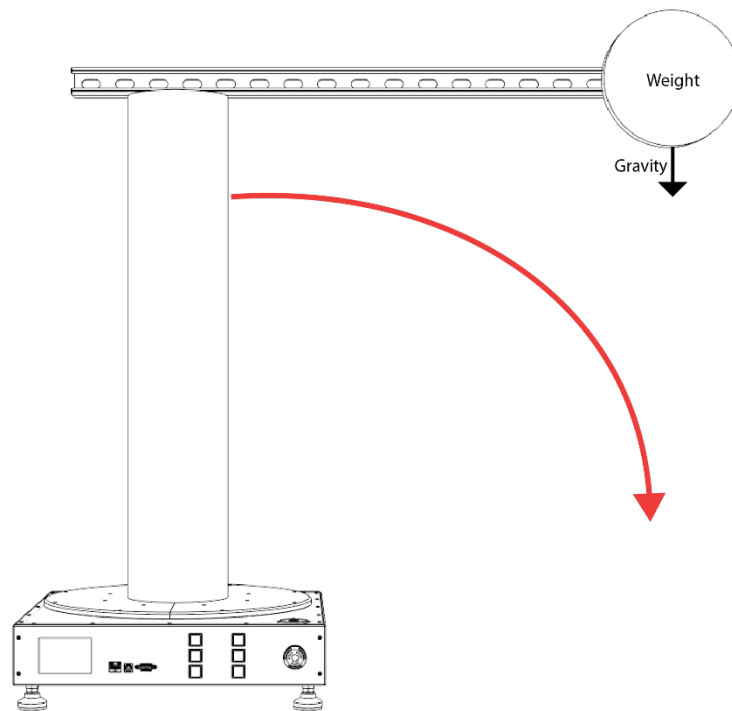
The diagram below shows how a large torque can be generated by an off-center load.



## 5.6.2. Offset weights that generate a large bending moment

**⚠ WARNING** When mounted horizontally, if a fixture is attached to the platter that allows a weight to overhang the edge of the turntable, the system could potentially tip over. In this situation, the turntable should be securely attached to the floor or test fixture in such a way that the turntable and attached fixture cannot tip over.

If the turntable is attached to the floor, ensure that the fixturing plus the DUT do not exceed the maximum bending moment for the system, otherwise the internal drive system could be permanently damaged.



### 5.7. Cable routing guidelines

Cables connected directly to the turntable like the power cable or other remote-control cables should be routed to minimize trip hazards. If possible, protect these cables in floor mounted cable guards. The following picture shows an example of one possible type of floor mounted cable guard.



Cables that are connected to the moving portion of the turntable or any fixturing attached to the turntable need to have enough slack to avoid binding as the system turns. The following guidelines should be considered when routing the cables:

- Whenever possible, route the cable through the center of the turntable. This will help avoid wrapping the cable around the system as the turntable rotates.
- If the cable cannot be routed through the center of the turntable, make sure to leave enough slack in the cable to allow the cable to freely move with the turntable movement.
- Ensure that there are no sharp edges along the path of the cable that could cut into the cable as the system moves.

### 5.8. Safety guidelines for fixturing attached to the turntable

Any fixturing attached to the turntable should be evaluated to ensure that it complies with the safety guidelines set out in the IEC 61010-1 standard with particular attention focused on section 7 titled *Protection against mechanical HAZARDS*.

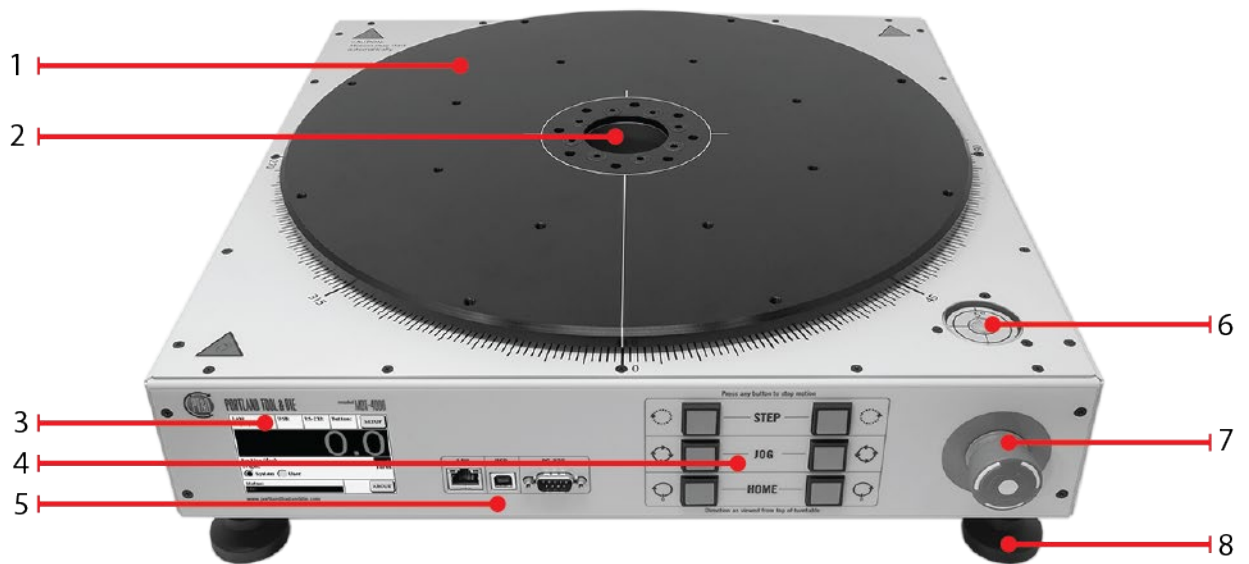
The following list covers some of the general guidelines that should be considered when designing fixturing that will be attached to or used near the turntable.

- Avoid sharp edges that are exposed to the user
- Ensure the fixturing can support its own weight plus any additional equipment attached to it
- Consider the physical space surrounding any moving part and avoid situations that could crush or pin a person against the wall, floor, or any other solid surface
- **⚠ DANGER** Mechanical systems that are stable when they are not moving may become unstable when the system begins to rotate. Carefully consider any off-axis mass that will be moved by the system and ensure that the system will not tip over due to the centripetal force generated by the mass when in motion.



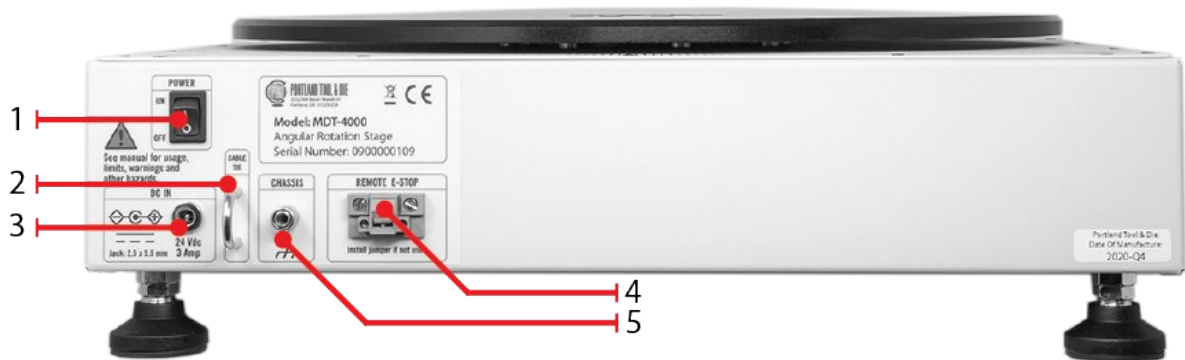
## 6. System Operation

### 6.1. Front Panel Elements



1. Turntable platform with bolt holes for attaching the DUT.
2. Center thru-hole for routing cables from under the turntable to the DUT.
3. Color display with touch panel.
4. Buttons for manual control.
5. Computer interfaces for remote control (LAN, USB, RS-232).
6. Level indicator (spirit bubble type).
7. Emergency Stop Button.
8. Adjustable leveling legs with rubber pads.

## 6.2. Rear Panel Elements



1. System power switch.
2. Cable tie-down loop.
3. System power input.
4. Remote Emergency Stop input connector.
5. Chassis ground terminal.

## 6.3. Emergency Stop System

The emergency stop system can be used to stop motion quickly and safely from either the front panel Emergency Stop button or from a remote emergency stop button connected to the rear panel. When either emergency stop switch is activated the system will rapidly decelerate any current motion and then power will be removed from the motor within 1 sec of the activation of the emergency stop system. Once the emergency stop system has been activated, the user must reset the physical emergency stop switch and re-enable motion from either the GUI or by sending an explicit command through one of the remote-control interfaces.



When the emergency stop system is active, the GUI will display a warning message in the Status: readout location. Motion cannot be started from either the front panel buttons or the remote-control interfaces until the emergency stop switch(s) have been reset and the motion system is re-enabled by pressing the “RESET” button on the GUI or by issuing the “SET MOTIONENABLE” command through the remote-control interface.

### 6.3.1. Front panel Emergency Stop button

Pressing the front panel emergency stop button will activate the emergency stop system. The button has a positive snap-type activation, and the button will remain in the activated state until it is manually reset. To reset the button, twist the red portion of the button in a clockwise direction until it extends and the black ring directly under the red cap becomes visible.


#### **▲WARNING**

The emergency stop button is designed to be used only in case of an actual emergency. Do not use the emergency stop button to stop motion for non-emergency situations.

	<p>Emergency-Stop button in the released, non-asserted state. Push to activate the emergency stop system. Note the Black ring just behind the red cap is visible.</p>
	<p>Emergency-Stop button in the active, asserted state. Twist clockwise to reset button. Note there is no Black ring visible behind the red cap.</p>

### 6.3.2. Rear panel remote Emergency-Stop station connection

The emergency stop system can be activated by connecting the “Remote Emergency-Stop Station” accessory to the rear panel. The button on the Remote Emergency-Stop Station functions the same as the front panel Emergency-Stop button. When the Remote Emergency-Stop Station is not connected, a jumper wire must be installed in rear panel connector.

	<p>The rear-panel Emergency-Stop connector must only be used with the Remote Emergency-Stop Station accessory. Do not connect any other safety circuit to this connector. Doing so may damage or disable the internal Emergency-Stop function.</p>
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### 6.4. Current angle readout

The angle readout on the front panel as well as the remote-control interfaces report the angle with respect to the current system zero reference. The factory default zero reference is aligned with the zero mark on the enclosure. By pressing the “Set 0.0” button on the touchscreen, you can set the zero reference to the current position.

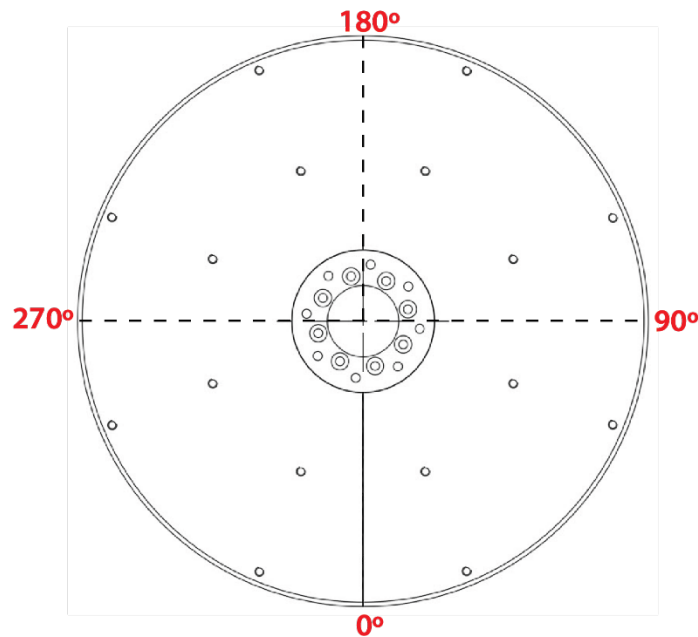
The zero-reference position can be reset to align with the chassis zero mark by any of the following methods:

- Press the “Reset 0.0” button on the main touchscreen menu
- Restoring the system to factory default settings by:
  - Pressing MENU -> Factory Defaults button on the touchscreen
  - Sending the “Restore Factory Defaults” command from any of the remote-control interfaces.

The current angle is always displayed as a positive number. Rotating the platter in a counterclockwise direction will cause the angle to increase towards +359 degrees. Rotating in the clockwise direction will cause the angle to decrease towards 0 degrees.

Each time the system crosses the zero position, the “turns” counter is incremented or decremented depending on the direction of rotation. The total number of turns is displayed in the lower right corner of the local display and can also be queried over the remote-control interfaces.

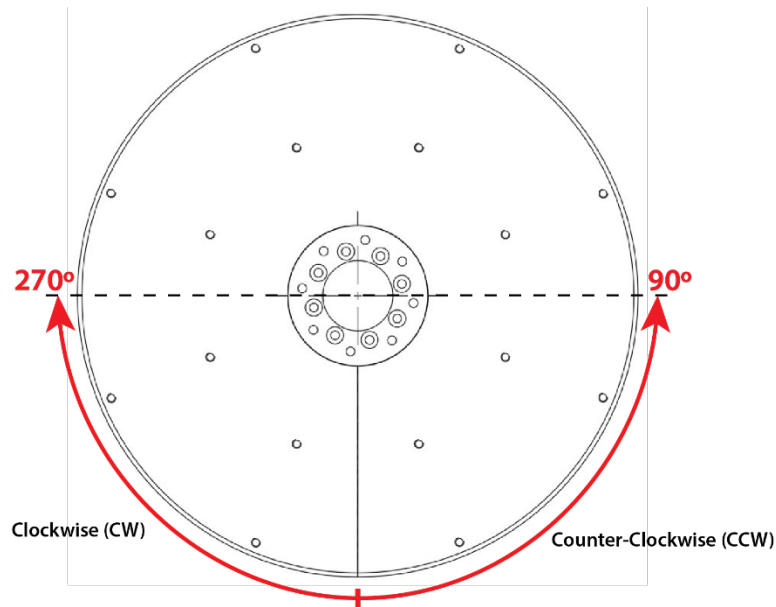
The following diagram shows the factory default angle positions:



When the platter is positioned at the factory default 0 deg position, the zero mark on the platter will be pointed towards the front of the turntable.

### 6.5. Direction of rotation

The direction of rotation is defined to be as viewed from the top side of the rotating platform. Rotation in the Clockwise (CW) direction moves the platform in the negative direction with respect to the current position. Rotation in the Counter-Clockwise (CCW) direction moves the platform in the positive direction with respect to the current position. For example, if the current position is at 0° and the platform is rotated CW by 90°, the final readout position will be 270°.



## 6.6. Description of control interfaces

### 6.6.1. Front Panel

The GUI can be used to configure the system parameters. Motion can be started and stopped by using the front panel press buttons. When the system is in motion, pressing any of the press buttons will stop the motion regardless of which interface was used to start the motion.

### 6.6.2. Serial Interfaces (USB and RS-232)

Both the RS-232 and USB emulated com port can be used to configure and control the turntable using the commands described in section 6.12. The USB interface can also be used to update the system firmware.

### 6.6.3. LAN

By default, the LAN interface is configured to use DHCP, which will automatically configure the IP settings if the host network also supports DHCP. When the system has been configured by the DHCP server, the local IP address will be displayed on the touchscreen under the MENU->LAN screen. If the IP settings have not yet been configured by the DHCP server, the IP settings will be displayed as all dashes. The LAN can also be configured to use a static IP address by using the LAN setup under the system setup menu on the GUI.

The turntable can be configured and controlled by browsing to the system IP address. The computer used to browse to the turntable must be on the same network as the turntable.

The LAN interface also supports a set of REST API endpoints that can be used to configure and control the turntable. Description of the motion profiles

#### 6.6.4. Jog

The Jog function allows the platter to be positioned to an arbitrary position. When the Jog motion begins, the system moves at a slow speed for several seconds, then the system accelerates to the maximum slewing speed. The system will continue to rotate while the user continues to hold the Jog button. As soon as the Jog button is released, the system will quickly decelerate to zero velocity.

The Jog motion profile can be accessed from either the front panel buttons or the LAN web user interface.

#### 6.6.5. Step

The Step motion profile will move the platter a fixed amount each time the Step motion is started. When started, the platter will accelerate, then move at a constant speed, then decelerate and stop at the start position plus the step size. For example, if the initial position is 0 deg, and the step size is set to 10 deg, after Stepping once, the platter will be at 10 deg. Stepping again, will cause the system to move to 20 deg.

The Step motion profile can be accessed from any of the control interfaces.

#### 6.6.6. Home

The Home motion profile moves the platter back to the current system zero position. By default, the system zero position is aligned with the 0-degree mark on the graticule on the top panel of the enclosure. The zero-reference position can be set to an arbitrary position by pressing the “Set 0.0” GUI button or through any of the remote-control interfaces.

The Home motion can be configured to either unwind towards zero or to take the shortest path to the nearest zero position. This behavior can be configured from the GUI.

The Home motion can be started from the dedicated front-panel buttons or by using the remote-control interfaces to move the system to the zero position.

#### 6.7. Setting the system zero position.

The current platter position is always measured with respect to the current zero position, which is aligned with the zero-degree mark on the system enclosure. The offset from the absolute system zero is measured by an internal position encoder. By default, the current position is calculated with respect to the absolute zero position.

The user can also set any position to be the current “user” zero position. This feature can be used to align the turntable position to the local environment zero position. The user zero offset value is stored across power cycles. For example, if the zero-reference is set to “system” and the current position is +45 deg, then the user changes the zero-

reference to “user” and then “zeros” the position, the system will calculate the user zero offset as 45 deg and the current position readout will become zero.

## 6.8. Use of the maximum torque setting.

The turntable electronically limits the maximum torque generated by the drive system. The user can set the maximum generated torque from either the GUI or the remote-control interfaces. If the system attempts to accelerate the DUT and the system cannot reach the desired velocity using the max torque limit, the motor will stall, and the motion will stop. If the motor stalls, the GUI will display an error message and the user must re-enable motion by pressing the Reset button on the GUI or by issuing a motion re-enable command from one of the remote-control interfaces before the system will accept any new motion commands.

There primary reason for reducing the maximum generated torque level is for safety. When there is a DUT or test fixture attached to the Turntable that has any kind of sharp edge or point that could injure a person, using a lower torque level will help reduce the possibility of the edge or point generating enough force to injure someone near the Turntable. A lower torque level will also reduce acoustic noise generated by the drive system.

As the angular inertia of the DUT increases, the torque required to accelerate the DUT also increases. If the Turntable stalls while accelerating the DUT, either lower the acceleration rate or increase the max torque limit.

## 6.9. Remote control interfaces

### 6.9.1. USB and RS-232 Commands

The turntable can be configured and controlled by sending ASCII commands to the RS-232 serial port or the USB emulated serial port. Both the USB and RS-232 interfaces support the same set of commands.

The serial commands provide backwards compatibility with the *LinearX LT-360* turntable system.

Please refer to the “*UsbAndRs232SerialCommands*” document for command details.

### 6.9.2. Command Line Utility (mdt4000utility.exe)

The mdt4000utility.exe utility is a command line interface program that runs on a PC and controls the turntable over the USB interface. This program can be used directly by running it from a command line terminal window, or it can be called by other programs or scripts.

This utility is bundled with the MDT-4000 windows setup program.

A list of the supported options can be listed by running the program using the following option:

CMD:> mdt4000utility.exe --help

### 6.9.3. LAN Webserver and REST API details

The turntable has an embedded webserver that allows a remote web browser to download a webpage that emulates the look and feel of the front panel touchscreen and hard-key interface. The IP address of the turntable can be found on the touchscreen by pressing the MENU button and then the LAN button.

The web control interface can be used at the same time as any of the other control interfaces.

The REST API endpoints can be accessed by using URLs like *http://<ip\_addr>/api/<function>*. Please refer to the “MDT-4000-REST-API” document for additional details.

## 7. Factory Default Configuration

The system settings can be restored to the factory value by the following methods:

- From the touchscreen: Setup -> Factory Rest -> Confirm YES.
- From the USB or RS-232 interfaces: Send the “FactoryReset” command.
- From the LAN REST API: Post a value of 1 to the “/api/cmd/reset\_configs” endpoint

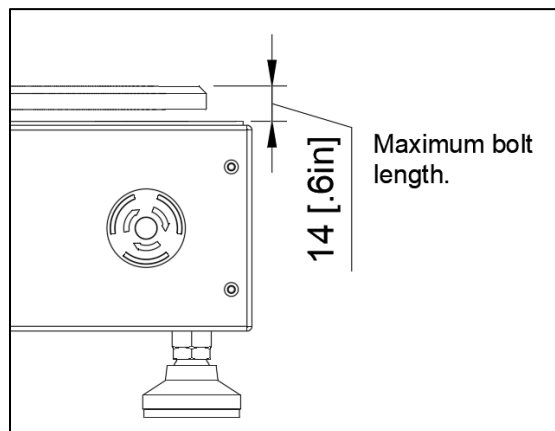
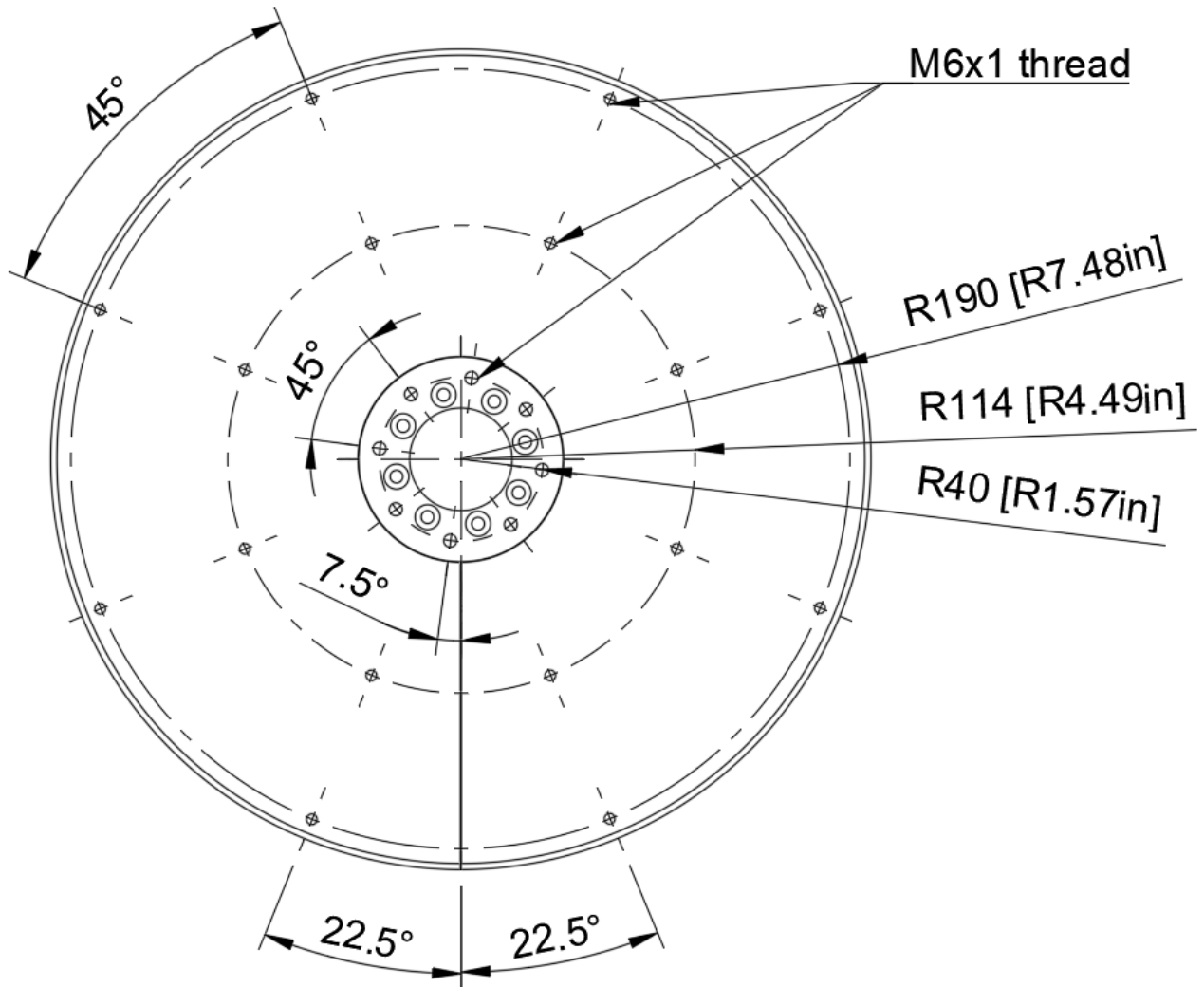
The following table describes the default values for the various system settings.

SETTING	DEFAULT VALAUE
Step size	5.0 deg
Step acceleration	10 deg/sec
Step max speed	10 deg/sec
Jog slow speed	0.5 deg/sec
Jog slow time	3 sec
Jog acceleration	5 deg/sec
Jog max speed	18 deg/sec
Home acceleration	20 deg/sec
Home max speed	18 deg/sec
Home mode	Nearest
System max torque	10 Nm

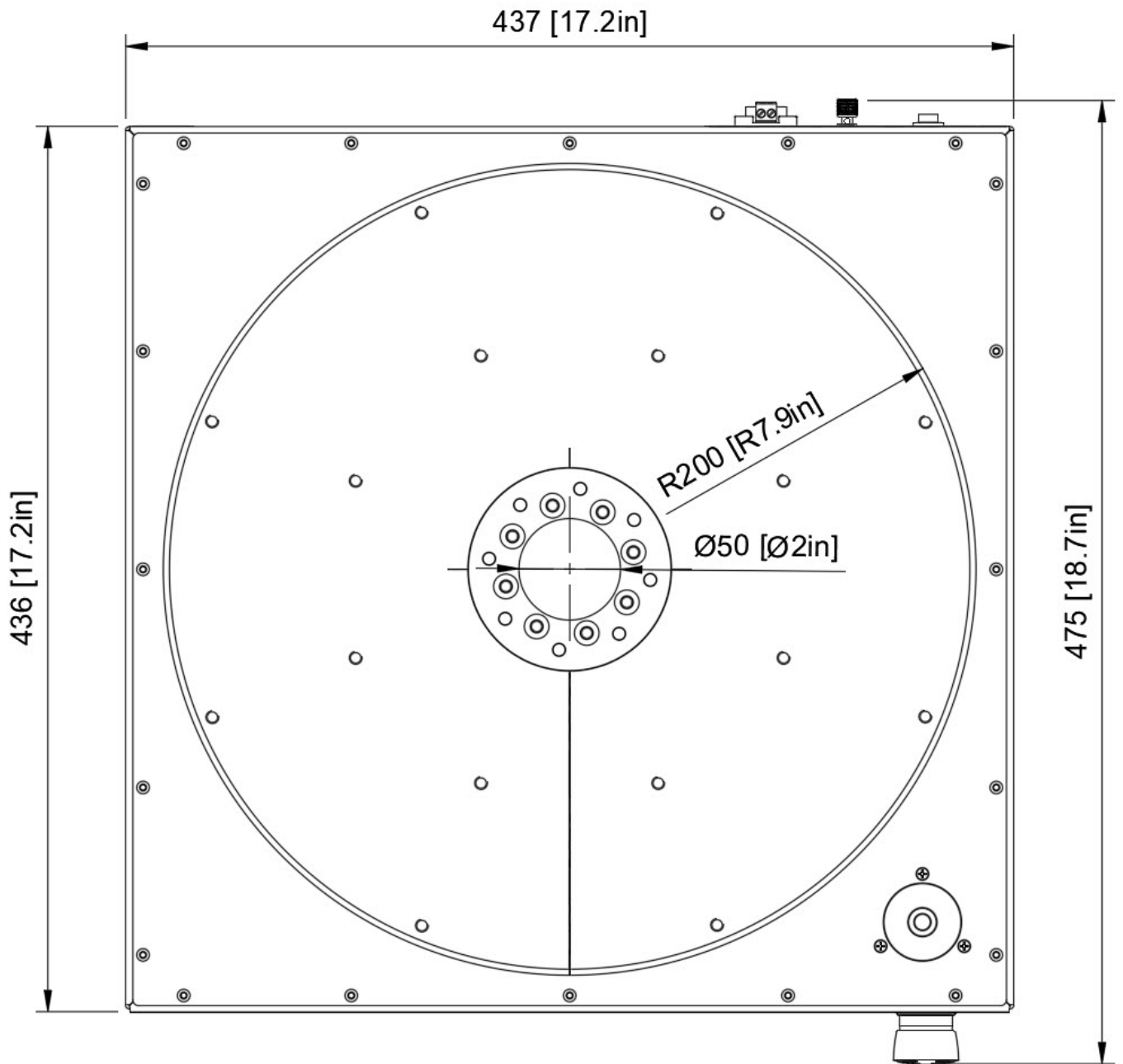


## 8. Mechanical Drawings and Dimensions

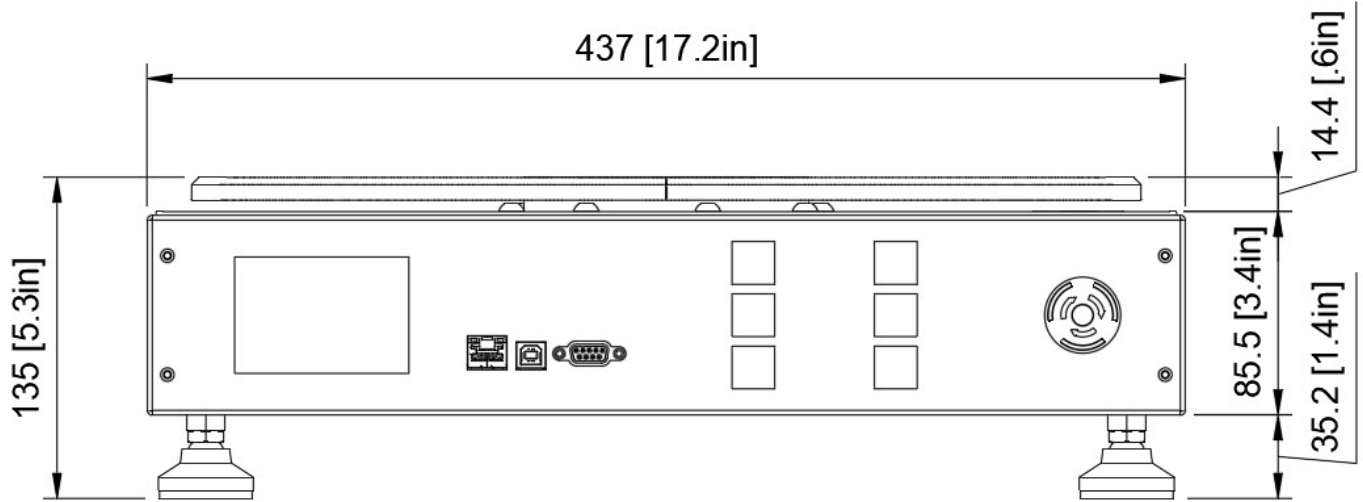
### 8.1. Platter details



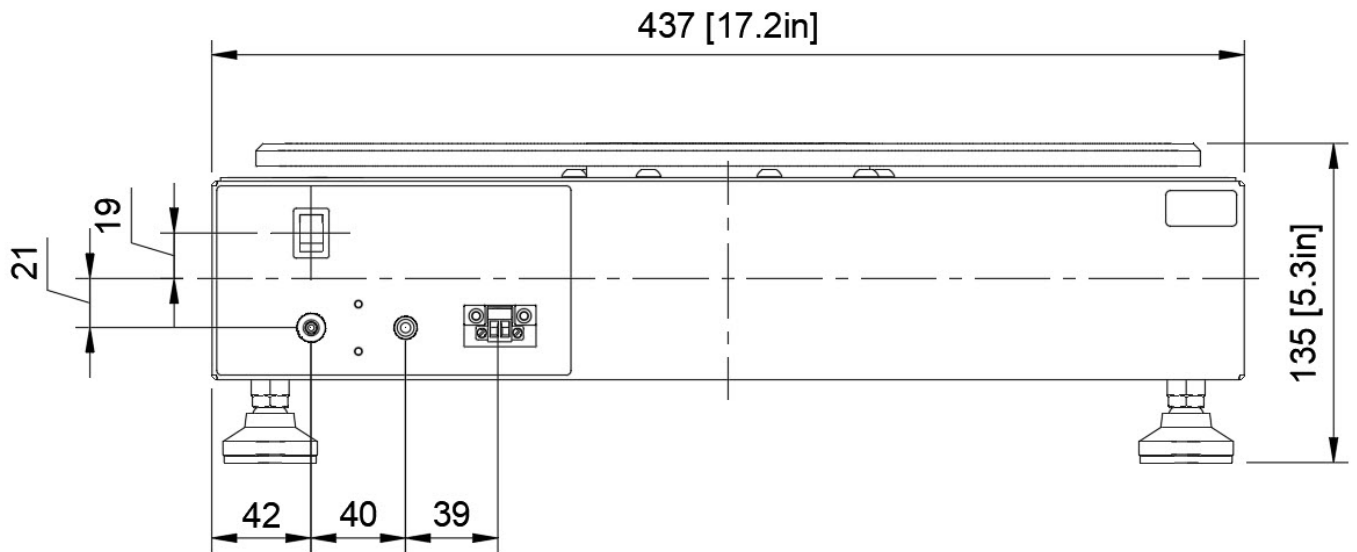
## 8.2. Top outline



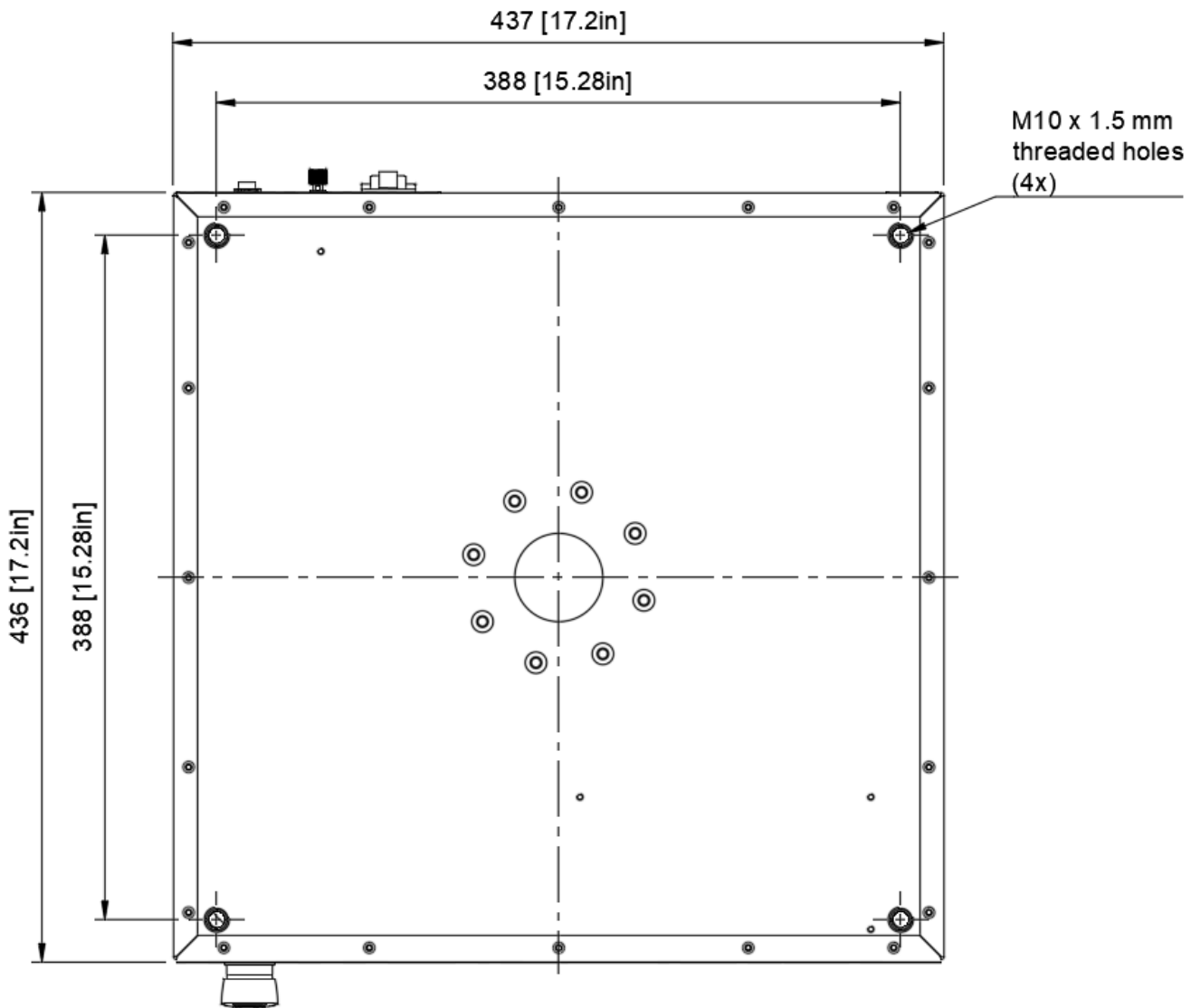
### 8.3. Front outline



### 8.4. Back outline



### 8.5. Bottom outline



## 9. Maintenance

- The system is designed to be maintenance free. The internal drive system requires no lubrication and there are no user replaceable parts inside the enclosure.
- Disconnect power from the turntable when working near the turntable to avoid unexpected motion.

### 9.1. Cleaning instructions:

- The exterior of the system may be cleaned by using a soft cloth and non-acidic cleaning solutions. Isopropyl alcohol can be used to clean all external surfaces.

<b>⚠ WARNING</b>	<ul style="list-style-type: none"><li>• Always remove power from the system before cleaning.</li></ul>
<b>⚠ CAUTION</b>	<ul style="list-style-type: none"><li>• Do not allow cleaning solution to enter the enclosure. Avoid spraying cleaning solution directly onto the enclosure, instead apply the cleaning solution to the cloth and then clean the surface.</li><li>• Do not submerge any part of the enclosure in cleaning solution, or any other liquid.</li></ul>

## 10. Accessories

### 10.1. Remote Emergency-Stop Station

The Remote Emergency-Stop Station can be used to activate the emergency stop function from a remote position up to 15 meters (50 feet) away from the turntable.



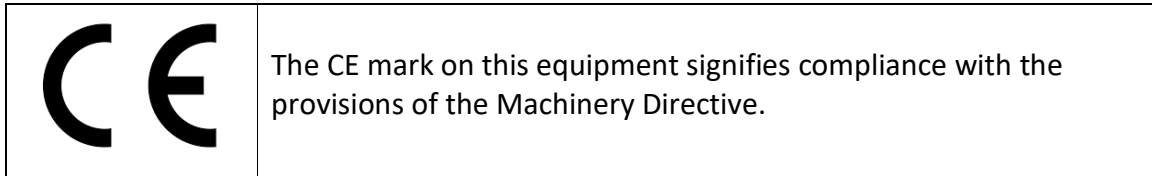
If the included cable is longer than required, do not cut off the extra cable. Please loop the extra cable and secure with a zip tie. This will allow the remote e-stop to be re-positioned in the future.

If the included cable is not long enough, please contact PTD or your local distributor for instructions on how to add additional cable.

## 11. Declarations

### 11.1. Machinery Directive

This equipment has been evaluated and found to comply with the essential safety requirements of the Machinery Directive (2006/42/EC).



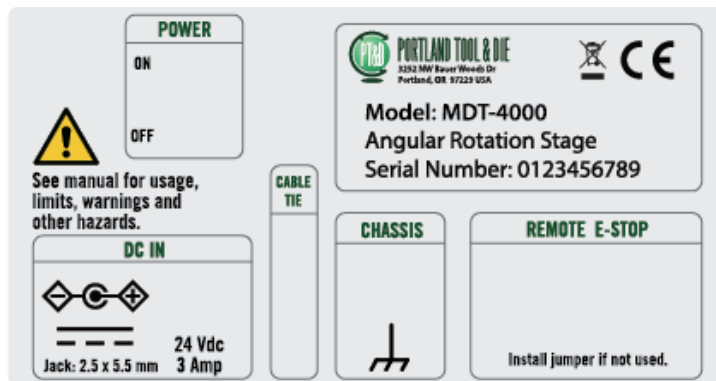
You are advised to read and follow the supplementary instructions and caution statements given below. The notes are intended as guidelines and should be observed in conjunction with any statutory health and safety obligations, any local codes of practice or safety directives and the instruction manual.

#### 11.1.1. Machine Designation (as marked on device)

- Angular Rotation Stage

#### 11.1.2. Nameplate identification

The serial number show in the picture below is for example only. Each turntable has a unique serial number printed on the rear panel label.



## 11.2. EC Declaration of Conformity

### *EC Declaration of Conformity*



**We:**

**(Manufacturer)**

Name: Portland Tool & Die, Inc.  
Address: 3252 NW Bauer Woods Drive, Portland, Oregon, U.S.A.  
Country: United States of America

**(Authorized Representative)**

Name: Certification Experts  
Address: Amerlandseweg 7, 3621 ZC Breukelen  
Country: The Netherlands

**Declare under our sole responsibility for the following machinery:**

Generic denomination: Turntable  
Function: Angular Positioning Stage  
Model: MDT-4000  
Type: Laboratory instrument  
Serial number: <serial number generated per device>  
Commercial Name: MDT-4000




**That all the relevant provisions of the Machinery Directive are fulfilled; that the machinery also complies with the provisions of the following European Directives:**

- DIRECTIVE 2006/42/EC (Machinery)
- DIRECTIVE 2014/30/EU (EMC)
- DIRECTIVE 2011/65/EU (RoHS)
- DIRECTIVE 2012/19/EU (WEEE)





## 12. Disposal

	<ul style="list-style-type: none"><li>• The WEEE symbol on the product indicates that the product must not be disposed of with normal unsorted municipal waste.</li><li>• Such equipment must be disposed of by arranging to return to a designated collection point for the recycling of waste electrical and electronic equipment.</li><li>• If a local electronic equipment recycling program is not available, the product may be returned to your local Portland Tool &amp; Die representative or to the Portland Tool &amp; Die Headquarters for disposal.</li></ul>
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### 12.1. Instruction for disposal the turntable.

- For systems located in the U.S.A. return the system to PTD for recycling and disposal.
- For all other regions return the system to the local distributor.

## 13. Trouble shooting and debugging guide

13.1. ISSUE: System reports that Emergency-Stop function is active when the Front-Panel button has been reset.

- Verify that the remote Emergency-Stop button has been reset.
- If the Remote Emergency-Stop Station is not used, verify that a jumper wire is installed in the rear-panel Remote Emergency-Stop connector.

## 14. Limited Warranty

Seller warrants its goods to be free from defects in material and/or workmanship under normal use and service for a period of 24 months from the date of purchase, subject to the terms and conditions set forth below (the "Express Warranty"). Seller does not warrant its goods against any defect except as set forth above, and Seller is not responsible for, and it does not warrant against, any defect or damage caused by transportation, storage, improper installation, maintenance, internal or external hostile environment, misuse, abuse, negligence, accident, modification, tampering, the attachment of any unauthorized accessory, alteration to the goods, or any other conditions whatsoever that do not constitute a defect in material and/or workmanship. Seller's sole responsibility under this Express warranty shall be, at its option, to either repair or replace any goods which fail during the warranty period, provided that Buyer has promptly reported same to Seller in writing and complies with the provisions of this Express Warranty.

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## 15. Revision History

Date	Rev	Changes
5-Aug-2022	1.0	- Initial version.

## 16. Contact Information

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