



Paul N. Gardner Company



USER MANUAL

Information and instructions for GARDCO
distributed products.

COPLEY



Powder Testing Workstation

PTW



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Contents

Section 1. – Introduction	6
Section 1.1 – Document Safety Symbols	6
Section 1.2 – General Description	7
Section 2. – Part Descriptions & Package Contents	8
Section 2.1 – PTW & Modules	8
Section 2.1.1 – Powder Testing Workstation - PTW	8
Section 2.1.2 – Angle of Repose Module for PTW	10
Section 2.1.3 – Cylinder Module for PTW	12
Section 2.1.4 – Funnel Module for PTW	14
Section 2.1.5 – Shear Cell Module for PTW	16
Section 2.1.6 – Scott Volumeter - PTW	18
Section 2.1.7 – Metal Powder Testing Apparatus - PTW	20
Section 2.2 – Optional Accessories	22
Section 2.2.1 – Timer for PTW or Powder Testing Assistant - PTA 100i	22
Section 2.2.2 – Manual Stirrer Attachment for PTW	24
Section 3. – Unpacking & Assembly	26
Section 3.1 – Powder Testing Workstation - PTW Assembly	26
Section 3.2 – Angle of Repose Module Assembly	27
Section 3.2.1 – Manual Stirrer Attachment for Angle of Repose Assembly (Optional)	29
Section 3.3 – Cylinder Module Assembly	30
Section 3.4 – Funnel Module Assembly	32
Section 3.5 – Timer Attachment for Cylinder or Funnel Module Assembly (Optional)	33
Section 3.6 – Shear Cell Module Assembly	35
Section 3.7 – Scott Volumeter - PTW Assembly	37
Section 3.7.1 – Glassware Assembly	37
Section 3.7.2 – Apparatus Assembly	39
Section 3.8 – Metal Powder Testing Apparatus - PTW Assembly	43
Section 3.8.1 – Flowability Assembly	43
Section 3.8.2 – Bulk Density Assembly	45
Section 4. – Operation	49
Section 4.1 – Angle of Repose	49
Section 4.1.1 – General Description	49
Section 4.1.2 – Operation	50
Section 4.2 – Flowability via Cylinder	53
Section 4.2.1 – General Description	53
Section 4.2.2 – Intrinsic Flowability	54
Section 4.2.3 – Flow Through an Orifice (Fixed Mass)	55
Section 4.2.4 – Flow Through an Orifice (Fixed Time)	55
Section 4.3 – Flowability via Funnel	56
Section 4.3.1 – General Description	56
Section 4.3.2 – Flow Through an Orifice (Fixed Time)	56



Section 4.3.3 – Flow Through an Orifice (Fixed Time)	57
Section 4.4 – Shear Cell	58
Section 4.4.1 – General Description	58
Section 4.4.2 – Test Procedure	59
Section 4.5 – Bulk Density	65
Section 4.5.1 – General Description	65
Section 4.5.2 – Test Procedure	65
Section 4.6 – Flowability & Bulk Density of Metal Powder	67
Section 4.6.1 – General Description	67
Section 4.6.2 – Flowability Test Procedure	67
Section 4.6.3 – Bulk Density Test Procedure	68
Section 5. – PTA 100i	69
Section 5.1 – Connect Shutter	69
Section 5.2 – Switching On	70
Section 5.3 – Operation	71
Section 5.3.1 – Angle of Repose	71
Section 5.3.2 – Bulk Density	74
Section 5.3.3 – Orifice Flow (Fixed Mass)	77
Section 5.3.4 – Orifice Flow (Fixed Time)	81
Section 5.3.5 – Shear Cell	86
Section 5.4 – Settings	89
Section 5.4.1 – Clock	89
Section 5.4.2 – General	90
Section 5.4.3 – Reporting	90
Section 5.4.4 – System Information	91
Section 6. – Verification	92
Section 6.1 – Verification of Height Gauge (Angle of Repose)	92
Section 6.2 – Verification of Flow Duration (PTA 100i)	92
Section 6.3 – Verification of Time Duration (PTA 100i)	92
Section 7. – Maintenance & Cleaning	93
Section 7.1 – Maintenance	93
Section 7.1.1 – Cleaning	93
Section 8. – Accessories & Configurations	94
Section 8.1 – Accessories	94
Section 8.2 – Configurations	95
Section 9. – Specification	97
Section 9.1 – Physical Dimensions	97
Section 9.1.1 – PTW	97
Section 9.1.2 – PTA 100i	98
Section 9.2 – Electrical	98
Section 10. – External Connection Specification	99
Section 10.1 – 'PRINTER'	99
Section 10.2 – 'PC'	100



Section 10.3 – 'RS-232'	100
Section 10.4 – 'Balance'	101
Section 10.5 – 'SHUTTER'	101
Section 10.6 – Setting-Up USB Communications with PC & RS-232	102
Section 10.6.1 – Command Set.....	103
Section 11. – Test Reports.....	104
Section 11.1 – Angle of Repose Test Report	104
Section 11.2 – Bulk Density Test Report	105
Section 11.3 – Orifice Flow (Fixed Mass) Test Report	106
Section 11.4 – Orifice Flow (Fixed Time) Test Report	107
Section 11.5 – Shear Cell Test Report	108
Section 12. – Conformance.....	109
Section 12.1 – Pharmacopoeia Declaration of Conformity	109
Section 12.2 – ISO Declaration of Conformity	110
Section 12.3 – ASTM Declaration of conformity.....	111
Section 12.4 – UKCA Declaration of Conformity	112
Section 12.5 – CE Declaration of Conformity	113
Section 13. – Decommissioning, Dismantling, Disabling, & Scrapping	114
Section 14. – Technical Support	115
Section 15. – Passcode.....	117



Section 1. – Introduction

Thank you for purchasing a Copley Powder Testing Workstation.

To assure functionality and operation, Copley Scientific confirms that a Factory Acceptance Test (FAT) has been performed on this instrument at the site of manufacture prior to shipment.

Section 1.1 – Document Safety Symbols



WARNING

Highlights a hazard that has the potential to cause physical injury



CAUTION REQUIRED

Highlights a hazard that has the potential to cause damage to the Powder Testing Workstation, or a hazardous situation where the Powder Testing Workstation could be used



INFORMATION

Important information for the correct use of the Powder Testing Workstation



Section 1.2 – General Description

The Powder Testing Workstation, model PTW, is a comprehensive and flexible family of powder testing apparatus that enables users to carry out a wide range of powder characterisation tests in accordance with common industry standards.

The PTW can support the following powder property tests with its corresponding attachments and modules:

- **Flowability test via Funnel**
- **Flowability test via Cylinder**
- **Flowability test of Metal Powder**
- **Bulk Density test of Metal Powder**
- **Angle of Repose**
- **Bulk Density (Scott Volumeter)**
- **Shear Cell**
- **Compressibility Index and Hausner Ratio***

*A Tapped Density Tester is also required.

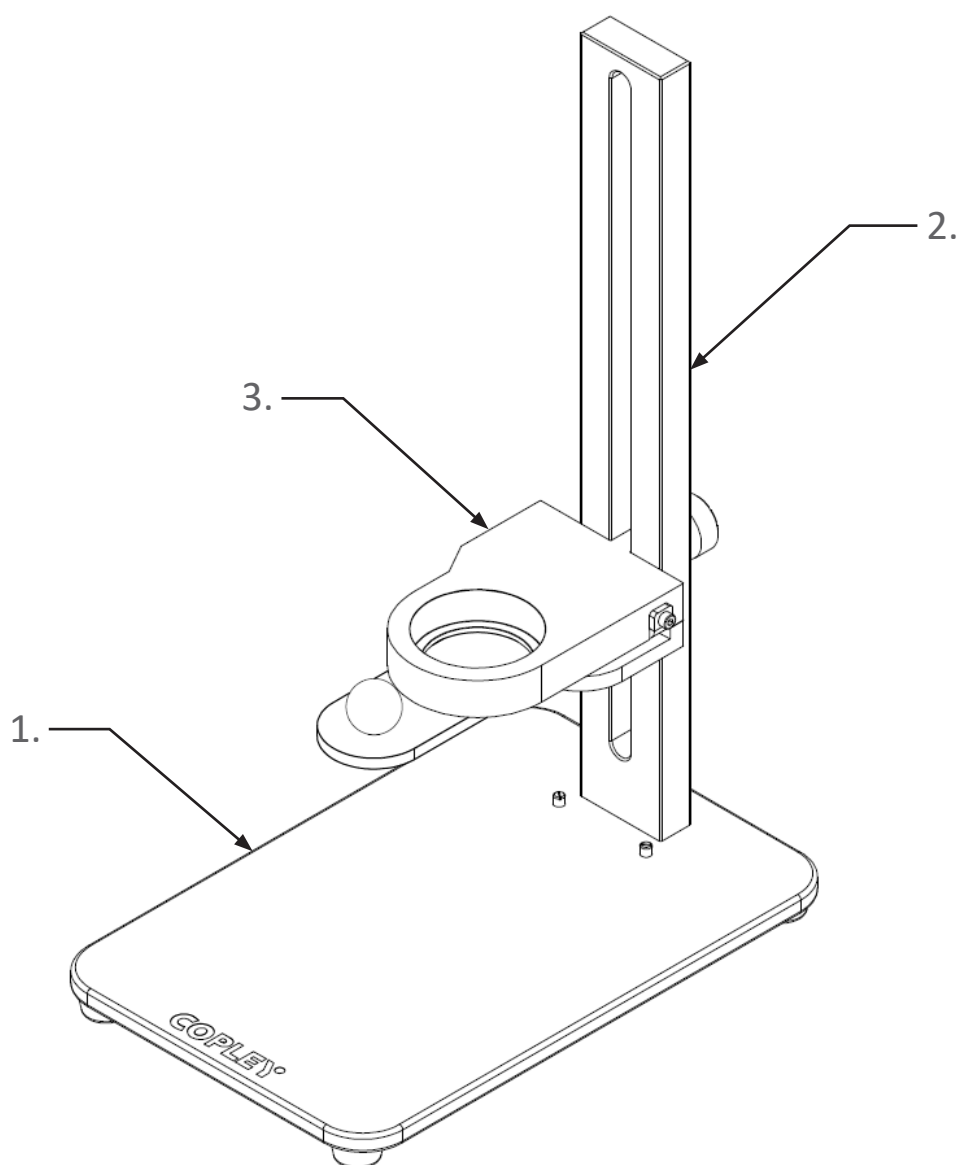


Section 2. – Part Descriptions & Package Contents

Check the individual parts presented against the list of components in the relevant table. If any parts are not accounted for, please contact your supplier immediately.

Section 2.1 – PTW & Modules

Section 2.1.1 – Powder Testing Workstation - PTW



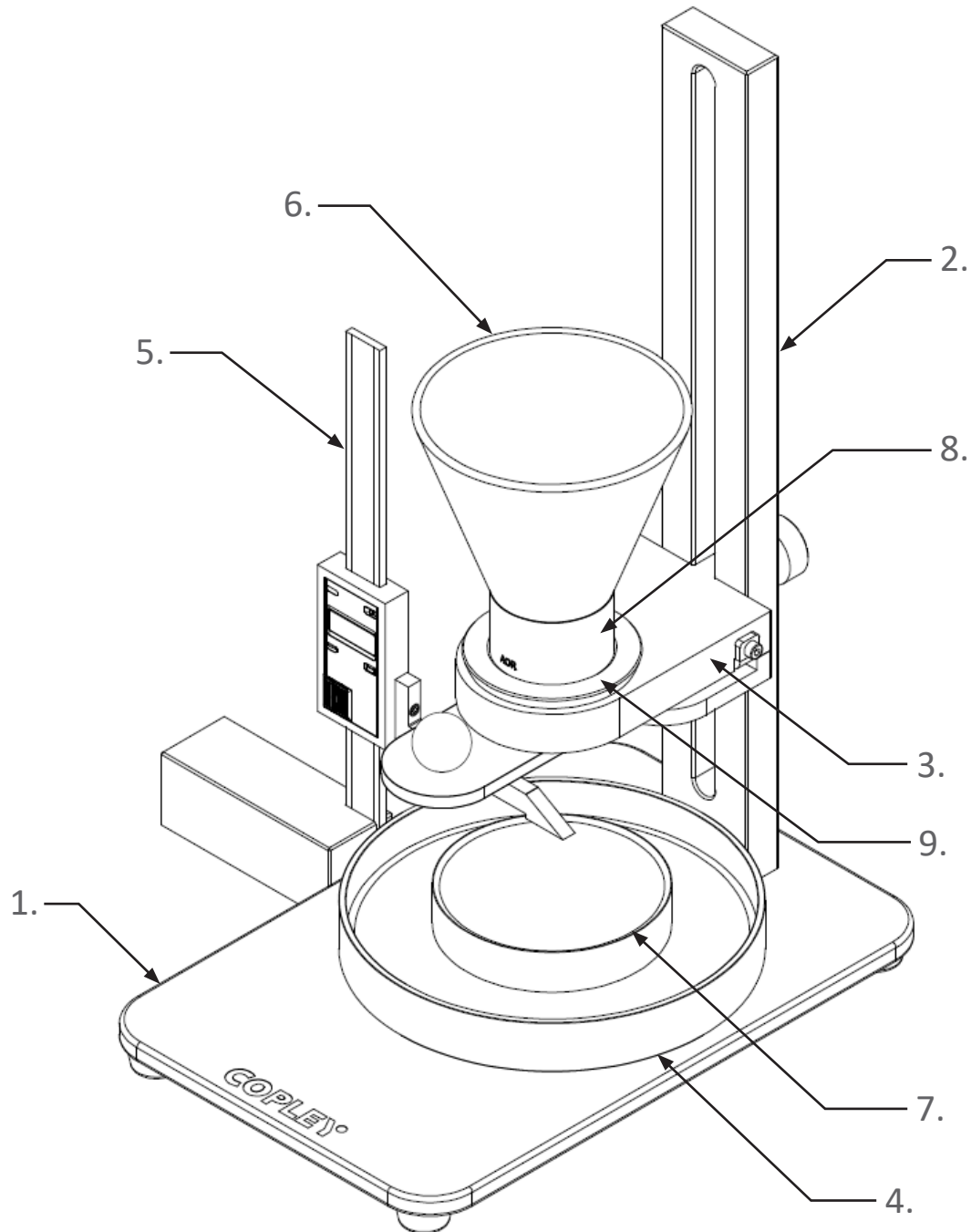
PTW Parts



Model:	Powder Testing Workstation - PTW (Cat. No. 1670)	
Item No.	Item Description	Quantity
1.	Baseplate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws & 4 x M5 Washers)	1
3.	Shutter Module (supplied with 1 x Washer and 1 x Thumbscrew)	1
N/A	Hex Key, 4 mm	1



Section 2.1.2 – Angle of Repose Module for PTW



Angle of Repose & PTW Parts

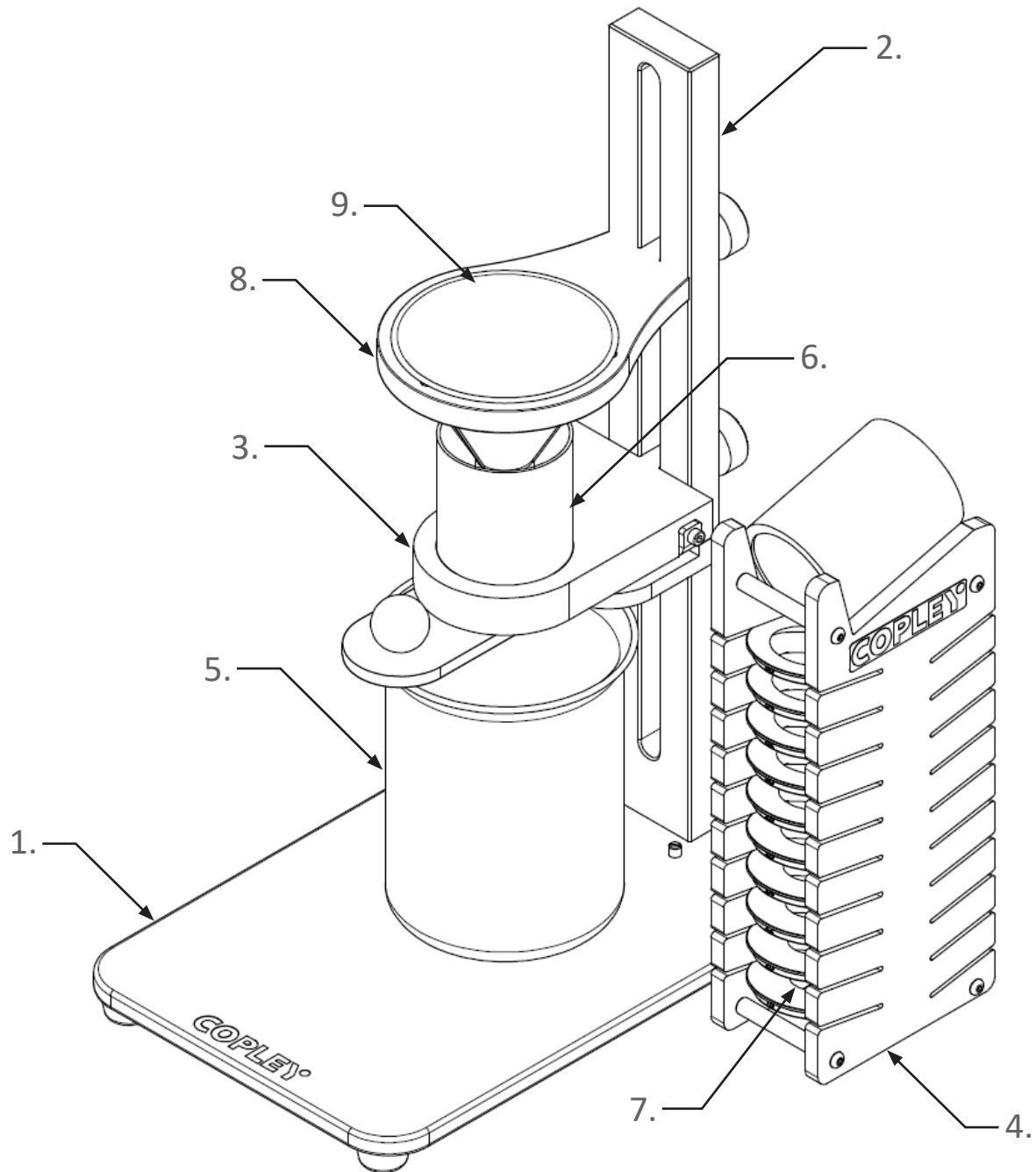


Model:	Powder Testing Workstation - PTW (Cat. No. 1670)	
Item No.	Item Description	Quantity
1.	Baseplate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws & 4 x M5 Washers)	1
3.	Shutter Module (supplied with 1 x Washer and 1 x Thumbscrew)	1
N/A	Hex Key, 4 mm	1

Model:	Angle of Repose Module for PTW (Cat. No. 1674)	
Item No.	Item Description	Quantity
4.	Powder Retaining Tray	1
5.	Height Gauge	1
6.	Stainless Steel Funnel	1
7.	100 mm AoR Base	1
8.	AoR Nozzle	1
9.	Funnel Adaptor	1



Section 2.1.3 – Cylinder Module for PTW



Cylinder Module & PTW Parts

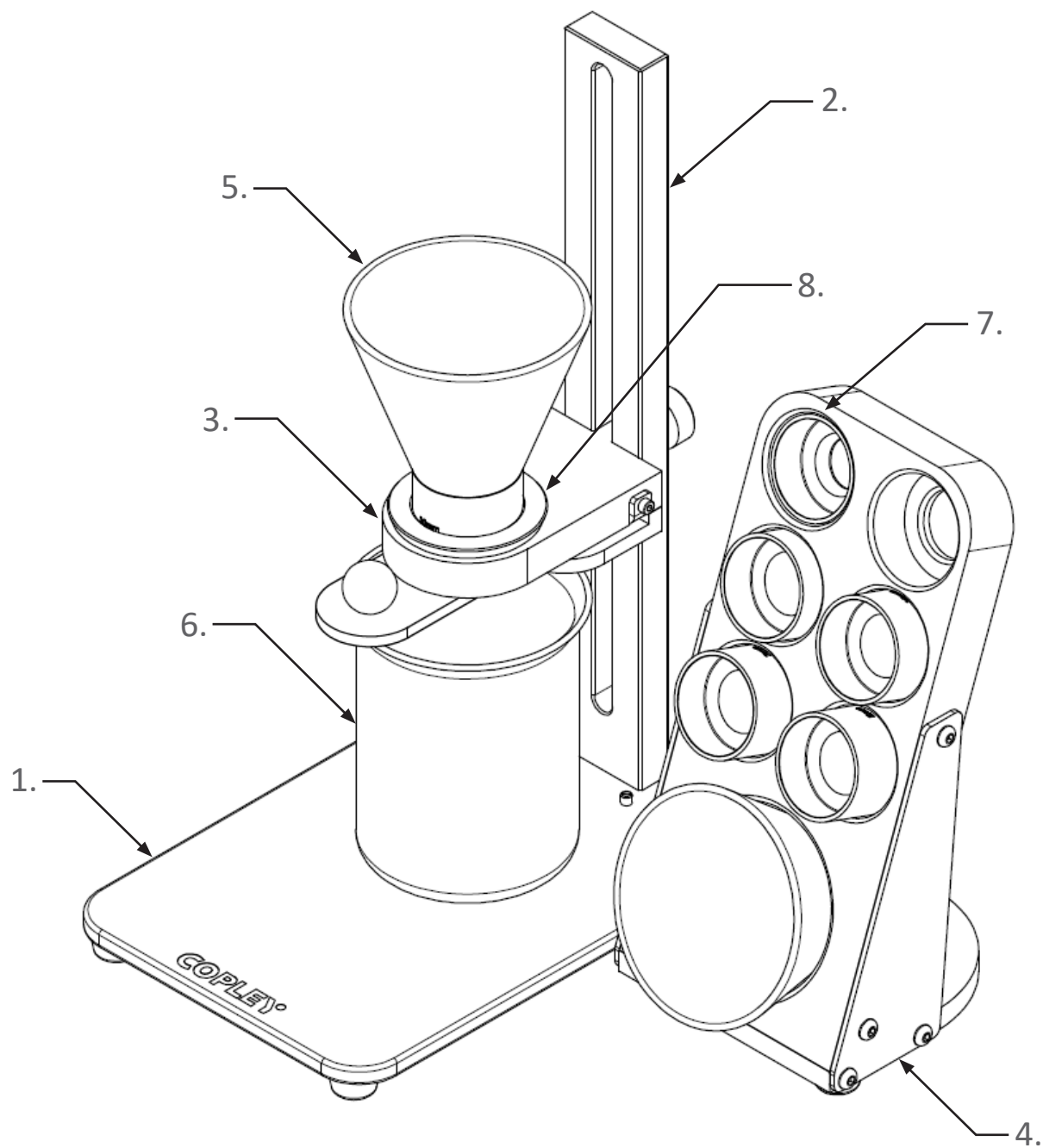


Model:	Powder Testing Workstation - PTW (Cat. No. 1670)	
Item No.	Item Description	Quantity
1.	Baseplate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws & 4 x M5 Washers)	1
3.	Shutter Module (supplied with 1 x Washer and 1 x Thumbscrew)	1
N/A	Hex Key, 4 mm	1

Model:	Cylinder Module for PTW (Cat. No. 1671)	
Item No.	Item Description	Quantity
4.	Cylinder Aperture Rack	1
5.	1000 mL Beaker	1
6.	Stainless Steel Cylinder	1
7.	Cylinder Aperture Disc Set with 20 Discs (4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36 mm)	1
8.	Powder Funnel Ring (supplied with 1 x Washer and 1 x Thumbscrew)	1
9.	Plastic Powder Funnel	1



Section 2.1.4 – Funnel Module for PTW



Funnel Module & PTW Parts

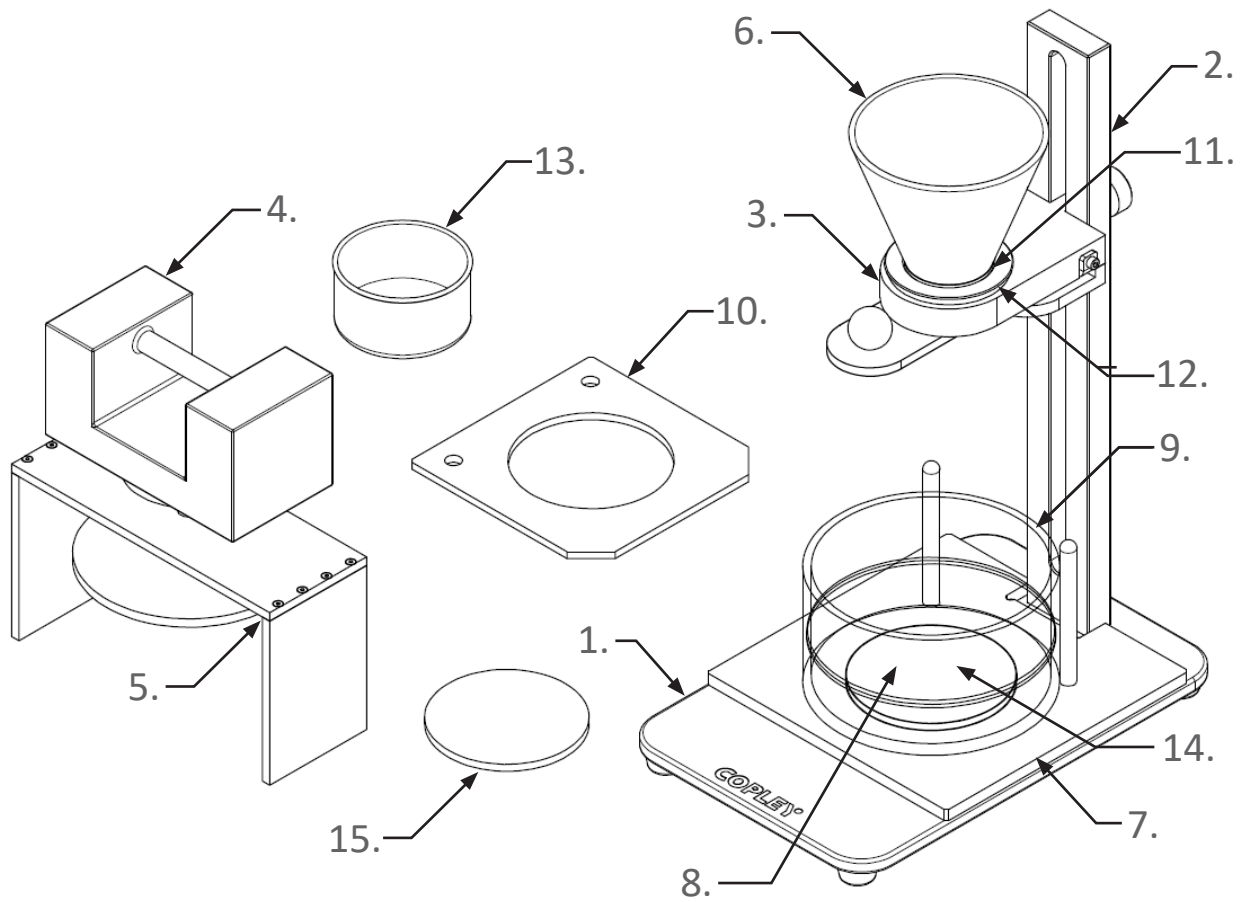


Model:	Powder Testing Workstation - PTW (Cat. No. 1670)	
Item No.	Item Description	Quantity
1.	Baseplate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws & 4 x M5 Washers)	1
3.	Shutter Module (supplied with 1 x Washer and 1 x Thumbscrew)	1
N/A	Hex Key, 4 mm	1

Model:	Funnel Module for PTW (Cat. No. 1672)	
Item No.	Item Description	Quantity
4.	Nozzle & Funnel Rack	1
5.	Stainless Steel Funnel	1
6.	1000 mL Beaker	1
7.	Nozzle Set with 5 Nozzles (5, 7, 10, 15, 25 mm)	1
8.	Funnel Adaptor	1



Section 2.1.5 – Shear Cell Module for PTW



Shear Cell Module & PTW Parts

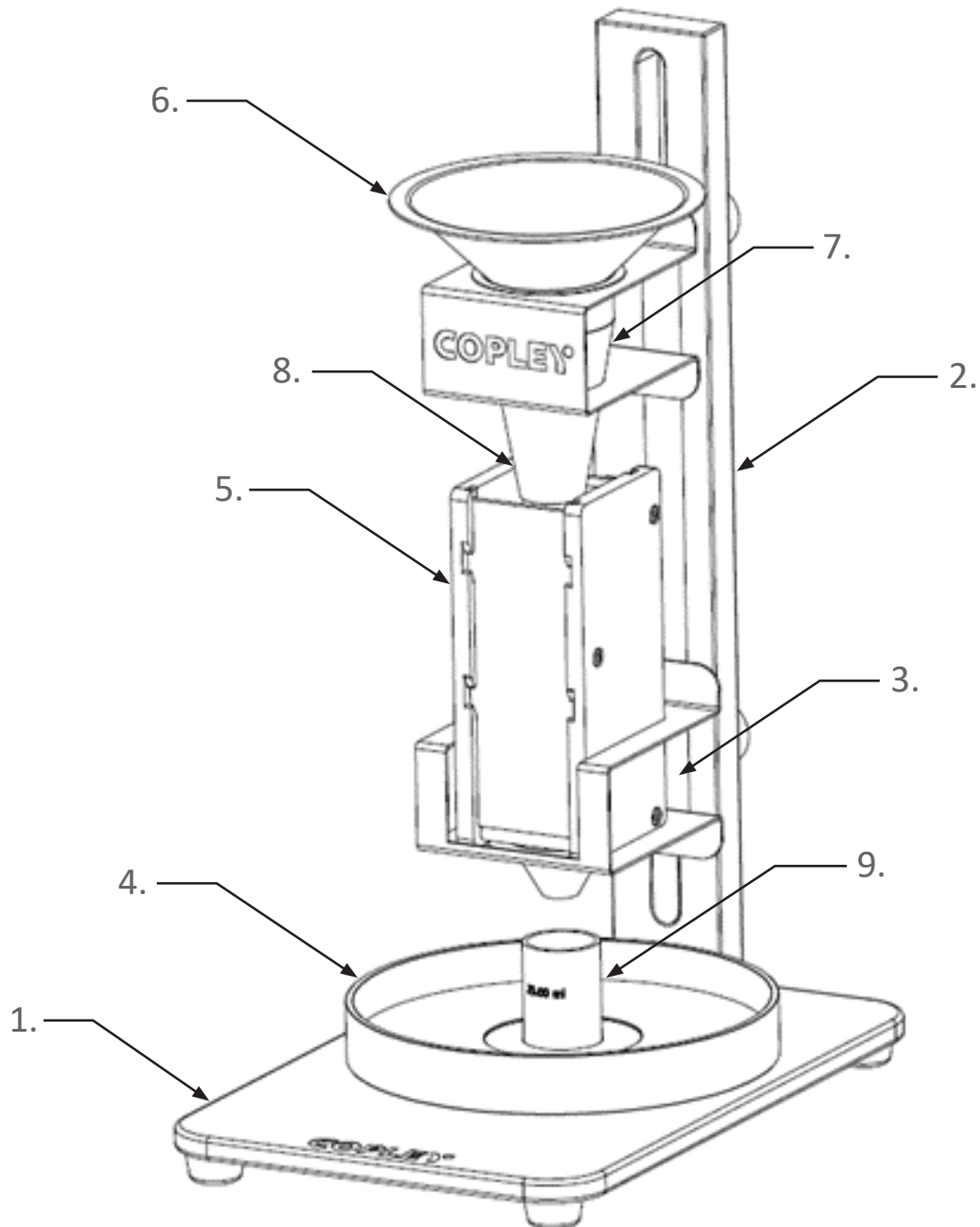


Model:	Powder Testing Workstation - PTW (Cat. No. 1670)	
Item No.	Item Description	Quantity
1.	Baseplate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws & 4 x M5 Washers)	1
3.	Shutter Module (supplied with 1 x Washer and 1 x Thumbscrew)	1
N/A	Hex Key, 4 mm	1

Model:	Shear Cell Module for PTW (Cat. No. 1675)	
Item No.	Item Description	Quantity
4.	5 kg Flat Cast Iron Mass	1
5.	Consolidation Rig	1
6.	Stainless Steel Funnel	1
7.	Shear Cell Base	1
8.	Test Chamber	1
9.	Support Collar	1
10.	Alignment Plate	1
11.	25 mm Nozzle	1
12.	Funnel Adaptor	1
13.	Loading Vessel	1
14.	Consolidation Disc, 99 mm	1
15.	Loading Disc, 96 mm	1



Section 2.1.6 – Scott Volumeter - PTW



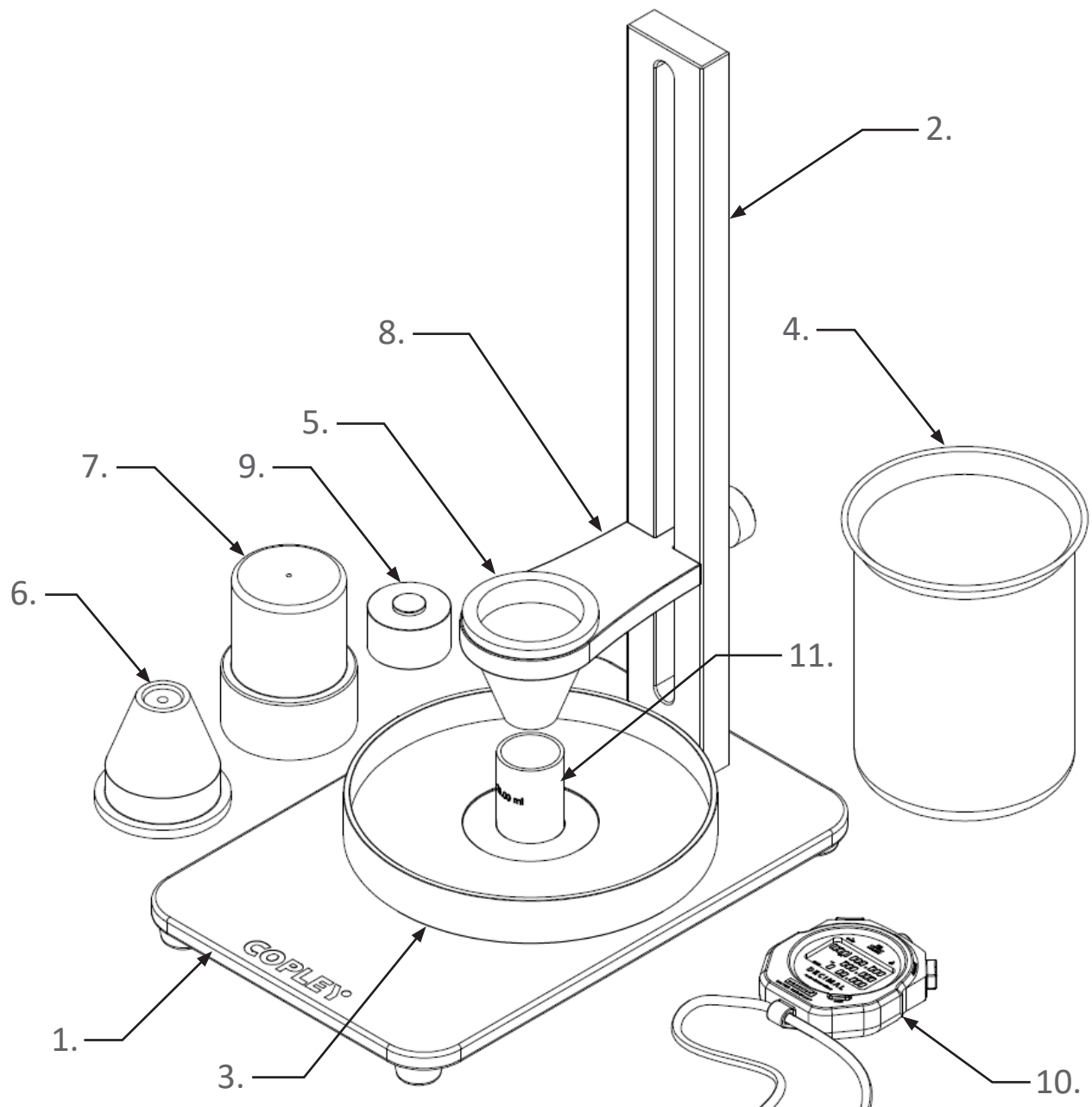
Scott Volumeter - PTW Parts



Model:	Scott Volumeter - PTW (Cat. No. 6310)	
Item No.	Item Description	Quantity
1.	Base Plate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws and 4 x M5 Plain Washers)	1
3.	Rack (supplied with 2 x Thumbscrews and 2 x Washers)	1
4.	Powder Retaining Tray	1
5.	Baffle Box	1
5.	Front and Rear Baffle Glass	2
5.	Front Baffle Glass	2
5.	Rear Baffle Glass	2
6.	Filter Insert with 18-mesh	1
6.	Top Funnel	1
7.	Middle Funnel	1
8.	Bottom Funnel	1
9.	25 mL Density Cup	1
N/A	Hex Key, 4 mm	1



Section 2.1.7 – Metal Powder Testing Apparatus - PTW



Metal Powder Testing Apparatus - PTW Parts

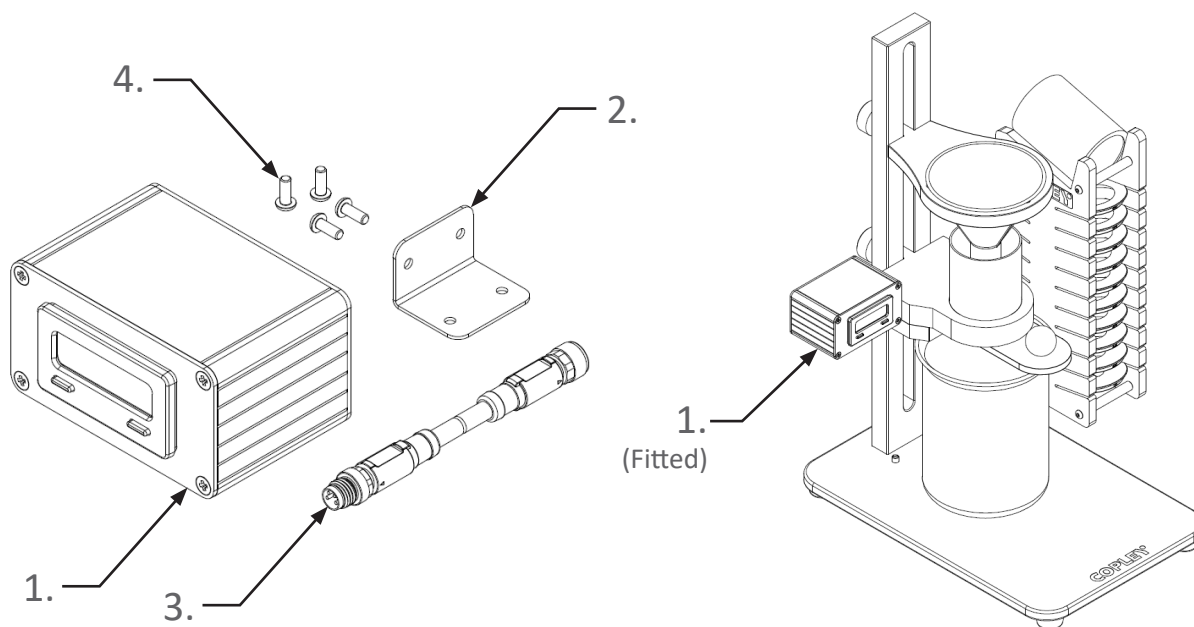


Model:	Metal Powder Testing Apparatus - PTW (Cat. No. 1681)	
Item No.	Item Description	Quantity
1.	Base Plate	1
2.	Upright (supplied with 4 x M5 x 20 mm Socket Head Cap Screws and 4 x M5 Plain Washers)	1
3.	Powder Retaining Tray	1
4.	1000 mL Beaker	1
5.	Hall Funnel (supplied with Mensuration Certificate)	1
6.	Carney Funnel (supplied with Mensuration Certificate)	1
7.	Gustavsson Funnel (supplied with Mensuration Certificate)	1
8.	Metal Powder Funnel Holder (supplied with 1 x Thumbscrew and 1 x Washer)	1
9.	Height Block	1
10.	Stopwatch (supplied with UKAS Calibration Certificate)	1
11.	25 mL Density Cup	1
N/A	Hex Key, 4 mm	1

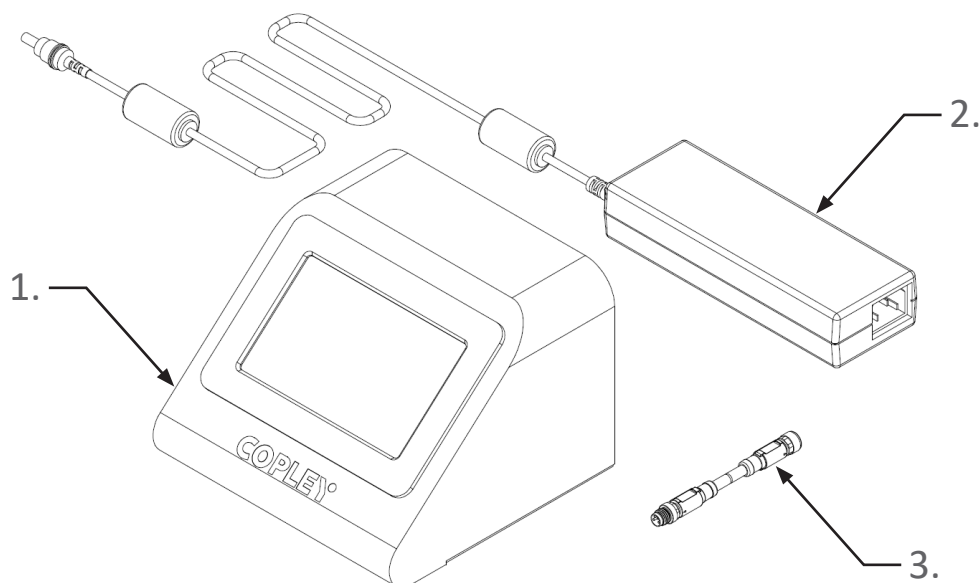


Section 2.2 – Optional Accessories

Section 2.2.1 – Timer for PTW or Powder Testing Assistant - PTA 100i



Timer for PTW Parts



Powder Testing Assistant - PTA 100i Parts



Model:	Timer for PTW (Cat. No. 1678)	
Item No.	Item Description	Quantity
1.	Timer Attachment	1
2.	Connection Bracket for Timer	1
3.	Connection Lead for Timer	1
4.	M3 x 6 mm Button Head Screw	4
N/A	Hex Key, 2 mm	1

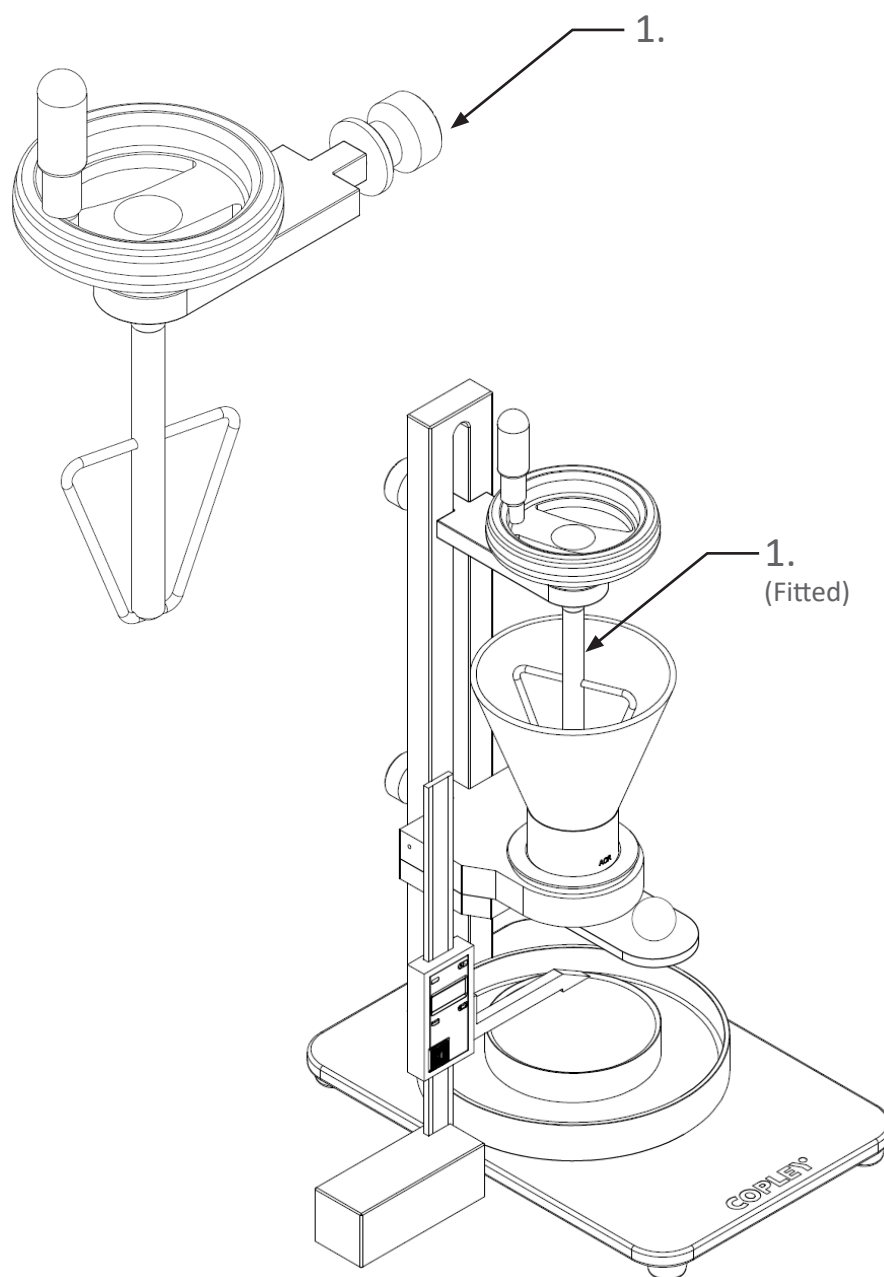
Model:	Powder Testing Assistant - PTA 100i (Cat. No. 1680)	
Item No.	Item Description	Quantity
1.	PTA 100i	1
2.	Powder Supply Unit	1
3.	Connection Lead for Timer	1
N/A	Mains Cable	1



Copley recommends using either the Timer for PTW or the PTA 100i for Flowability via Funnel or Cylinder test applications.



Section 2.2.2 – Manual Stirrer Attachment for PTW



Manual Stirrer Attachment



Model:	Manual Stirrer Attachment for PTW (Cat. No. 1676)	
Item No.	Item Description	Quantity
1.	Manual Stirrer Attachment (supplied with 1 x Thumbscrew and 1 x Washer)	1



The Manual Stirrer Attachment is intended for the Angle of Repose.



For more information on Additional Accessories, refer to "Section 8.1 – Accessories" on page 94.



For an overview of the supported configurations for the Powder Testing Workstation, refer to "Section 8.2 – Configurations" on page 95.

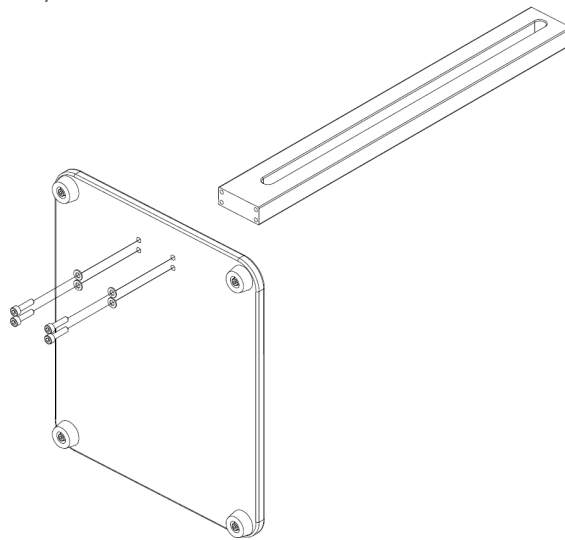


Section 3. – Unpacking & Assembly

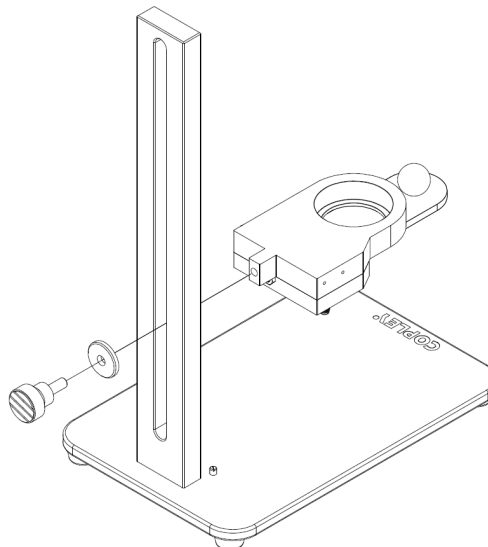
Unpack the equipment carefully, report any damage to the PTW immediately. Current practice is to report any inconsistencies to the carrier through a delivery note and an email to your supplier.

Section 3.1 – Powder Testing Workstation - PTW Assembly

1. Assemble the Upright to the Baseplate with M5 x 20 mm Socket Head Cap Screws and M5 Washers (Hex Key provided).



2. Install the Shutter Module onto the Upright and lock it into position using the Thumbscrew and Washer provided.



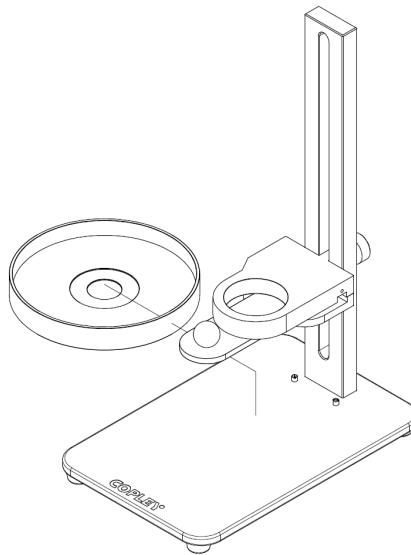
3. Lock the Shutter Module into position on the Upright using the Thumbscrew and Washer provided
Note: The height will be set later according to the desired application.

The PTW assembly is now complete.

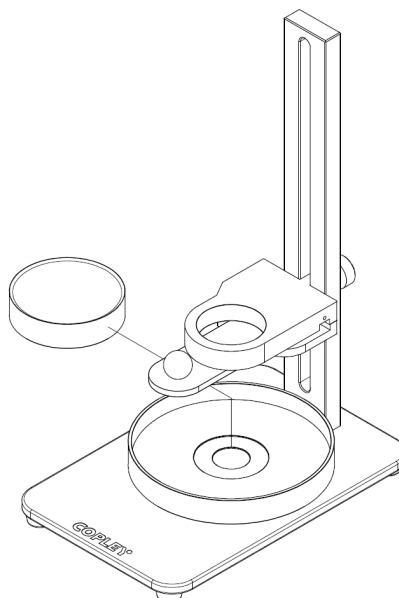


Section 3.2 – Angle of Repose Module Assembly

1. Complete the steps provided in Section 3.1 for assembling the PTW.
2. Place the Powder Retaining Tray onto the Baseplate, using the two locating pins on the base to align with the recess on the bottom of the Powder Retaining Tray.

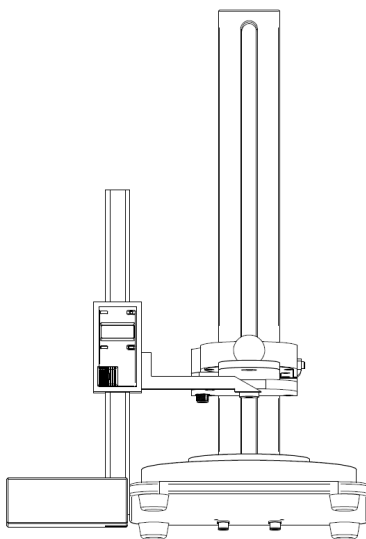


3. Place the 100 mm AoR Base into the recess on the Powder Retaining Tray.

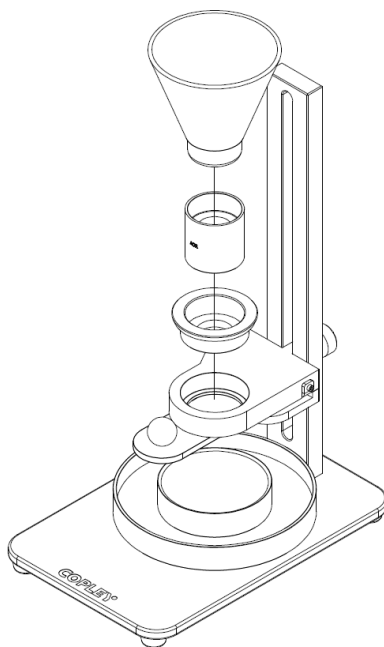




4. Using the Height Gauge, set the Shutter Module at the required height and then lock it into position.



5. As shown, assemble the Funnel Adapter, AoR Nozzle and Stainless Steel Funnel onto the Shutter Module.

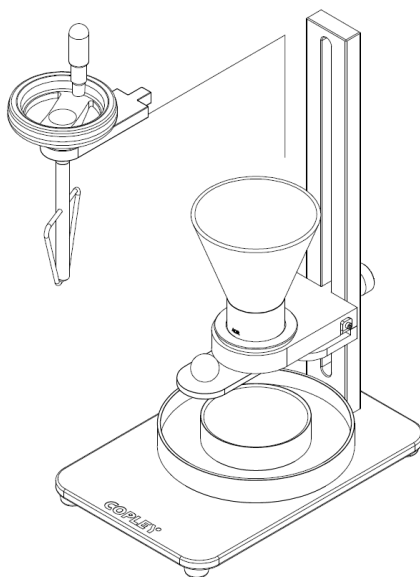


The Angle of Repose Module setup is now complete.

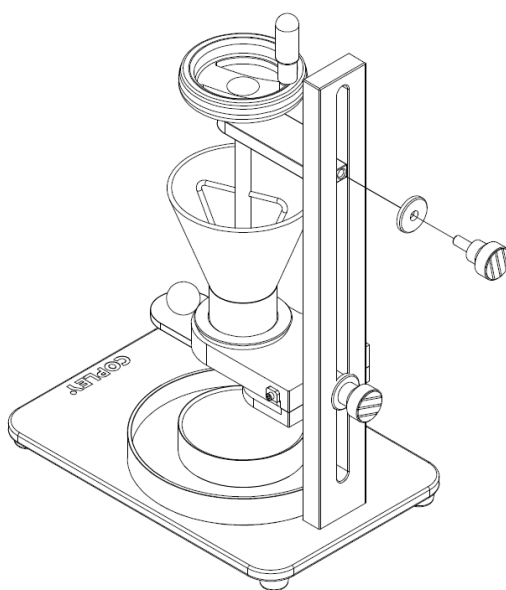


Section 3.2.1 – Manual Stirrer Attachment for Angle of Repose Assembly (Optional)

1. Complete the steps provided in Section 3.2 for assembling the Angle of Repose.
2. Install the Manual Stirrer Attachment to the Upright within the Funnel.



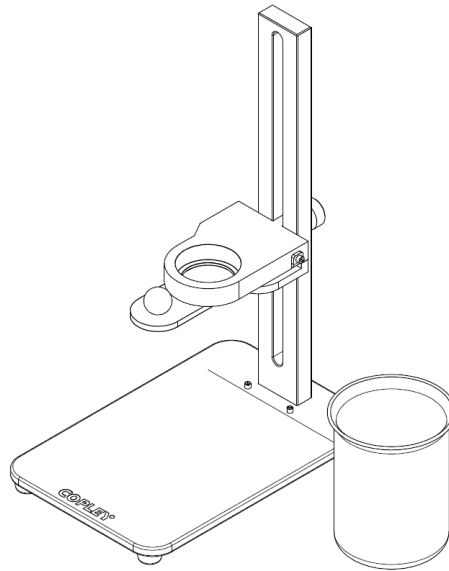
3. Lock the Manual Stirrer Attachment into position on the Upright using the Thumbscrew and Washer provided.



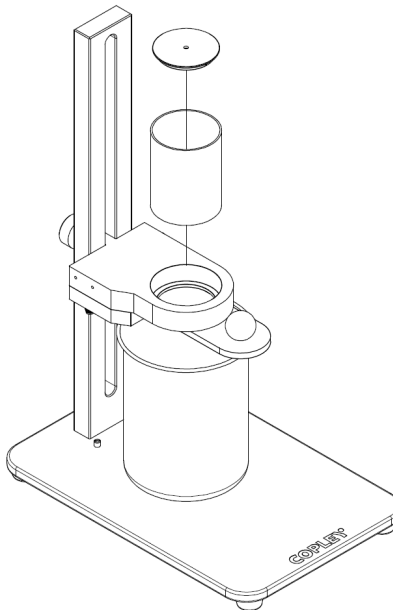


Section 3.3 – Cylinder Module Assembly

1. Complete the steps provided in Section 3.1 for assembling the PTW.
2. Position the 1000 mL Beaker onto the Baseplate.

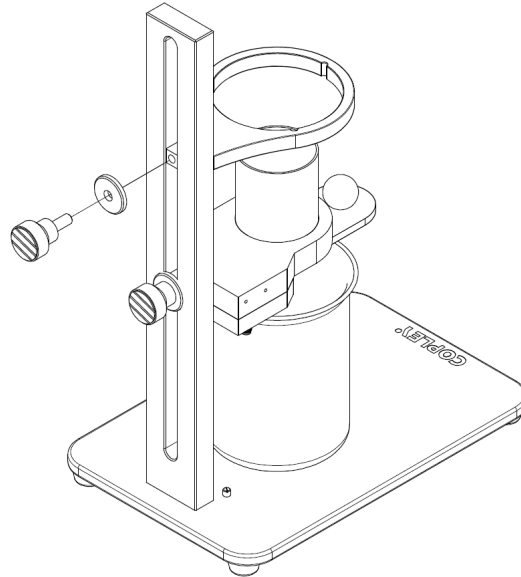


3. Place the required Aperture Disc into the Stainless Steel Cylinder. Copley recommends starting with the 16 mm disc for powders not previously tested.
4. Load the assembled Cylinder into the Shutter Module.

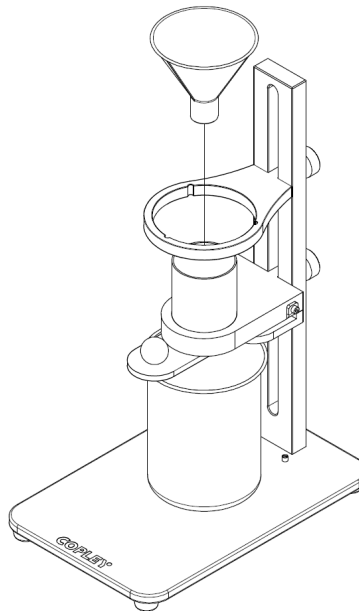




5. Install the Funnel Ring to the Upright and lock it in position using the Thumbscrew and Washer provided.



6. Place the Powder Funnel into the Powder Funnel Ring.

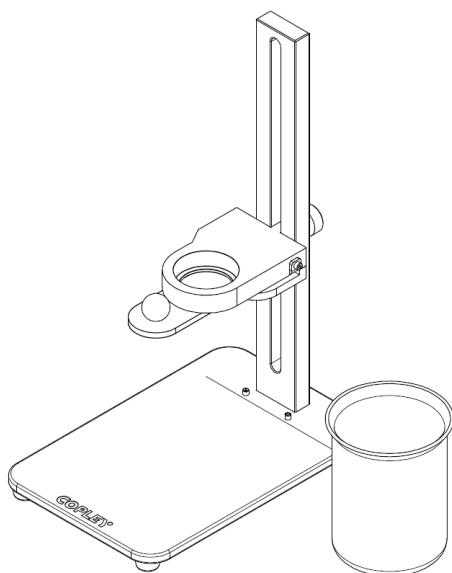


The Cylinder Module setup is now complete.

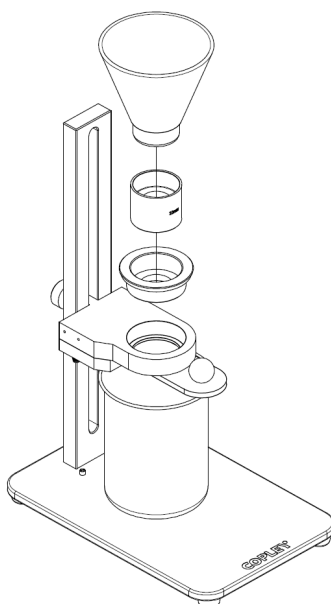


Section 3.4 – Funnel Module Assembly

1. Complete the steps provided in Section 3.1 for assembling the PTW.
2. Position the 1000 mL Beaker onto the Baseplate.



3. As shown, assemble the Funnel Adapter, the required Nozzle and the Funnel into the Shutter Module. Copley recommends starting with the 10 mm Nozzle for powders not previously tested.



The Funnel Module setup is now complete.

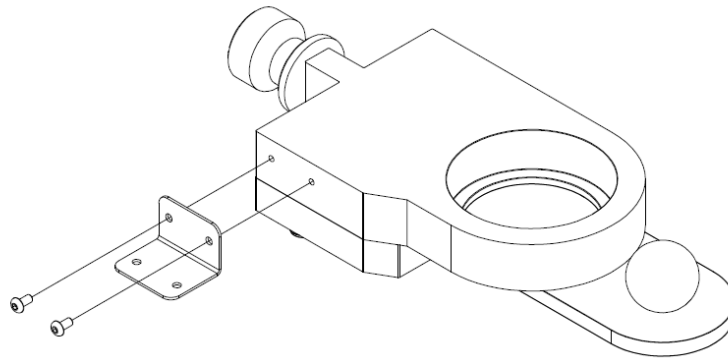


Section 3.5 – Timer Attachment for Cylinder or Funnel Module Assembly (Optional)

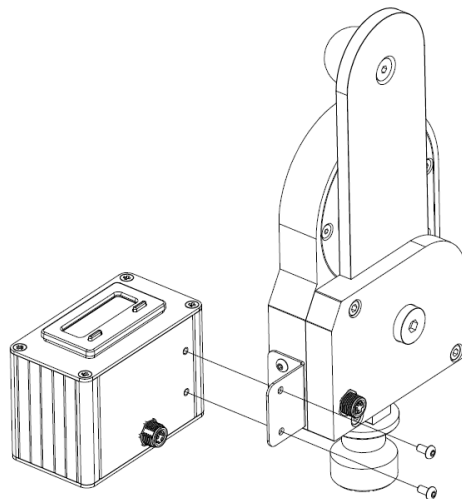


Copley recommends using the PTA 100i or Timer Attachment for powder flowability applications. Refer to "Section 5. – PTA 100i" on page 69 for more information.

1. Install the Upright to the Baseplate in Section 3.1.
2. Assemble the Connection Bracket to the Shutter Module using 2 off M4 x 6 mm Button Head Screws.

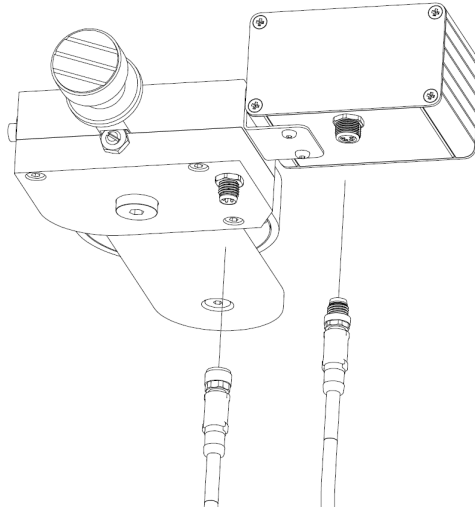


3. Place the Timer Attachment onto the Connection Bracket and secure it with the remaining 2 off M3 x 6 mm Button Head Screws.





4. Complete the assembly steps provided in either Section 3.3 for the Cylinder Module or Section 3.4 for the Funnel Module.
5. Install the Connection Lead to the Timer Attachment and to the Shutter Module.

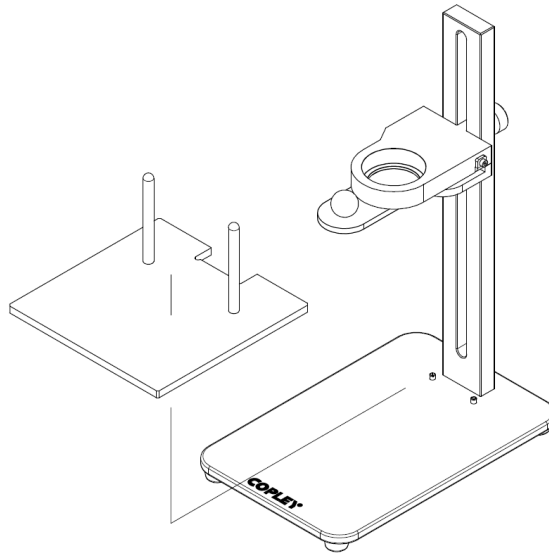


The Timer Attachment is now complete.

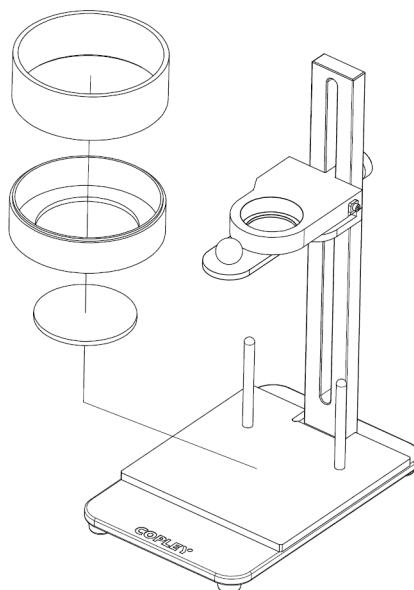


Section 3.6 – Shear Cell Module Assembly

1. Complete the steps provided in Section 3.1 for assembling the PTW.
2. Locate the Shear Cell Base onto the alignment pegs on the Baseplate.

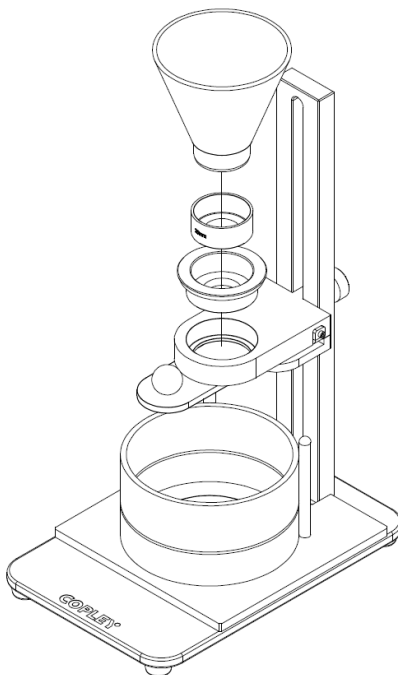


3. In the order shown, place the Consolidation Disc, Test Chamber and Support Collar up to the alignment pins on the Shear Cell Base.





4. In the order shown, assemble the Funnel Adapter, 25 mm Nozzle and Stainless Steel Funnel onto the Shutter Module.



The Shear Cell Module setup is now complete.



Section 3.7 – Scott Volumeter - PTW Assembly

Section 3.7.1 – Glassware Assembly



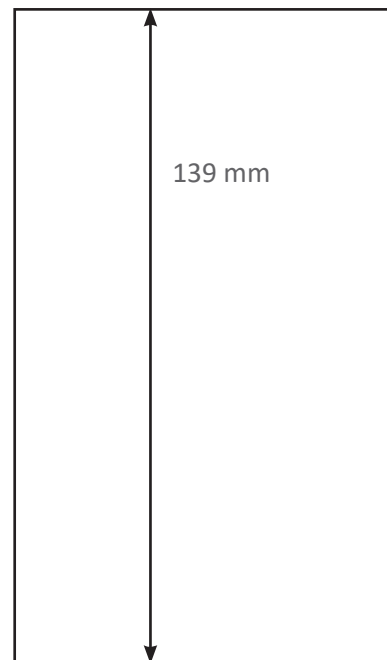
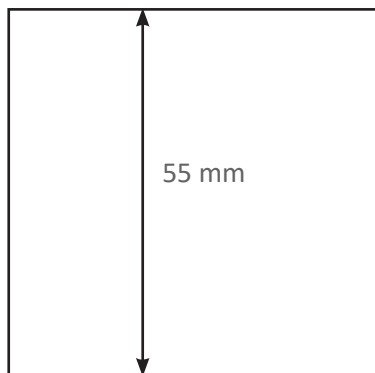
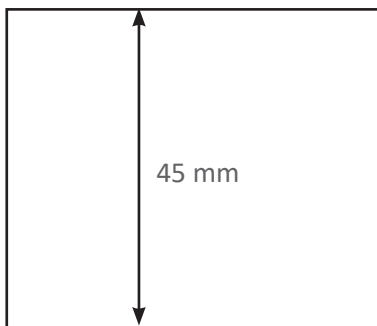
Attention! - The Glass Baffles are fragile, handle them with care when removing them from the protective packaging.



Attention! - The Glass Baffles are cut with ground edges. While edge grinding should remove sharp edges, remain alert while handling the glass.

The glassware is packed separately from the Baffle Box to help ensure that these components are best protected during the shipping and unpacking of the Scott Volumeter.

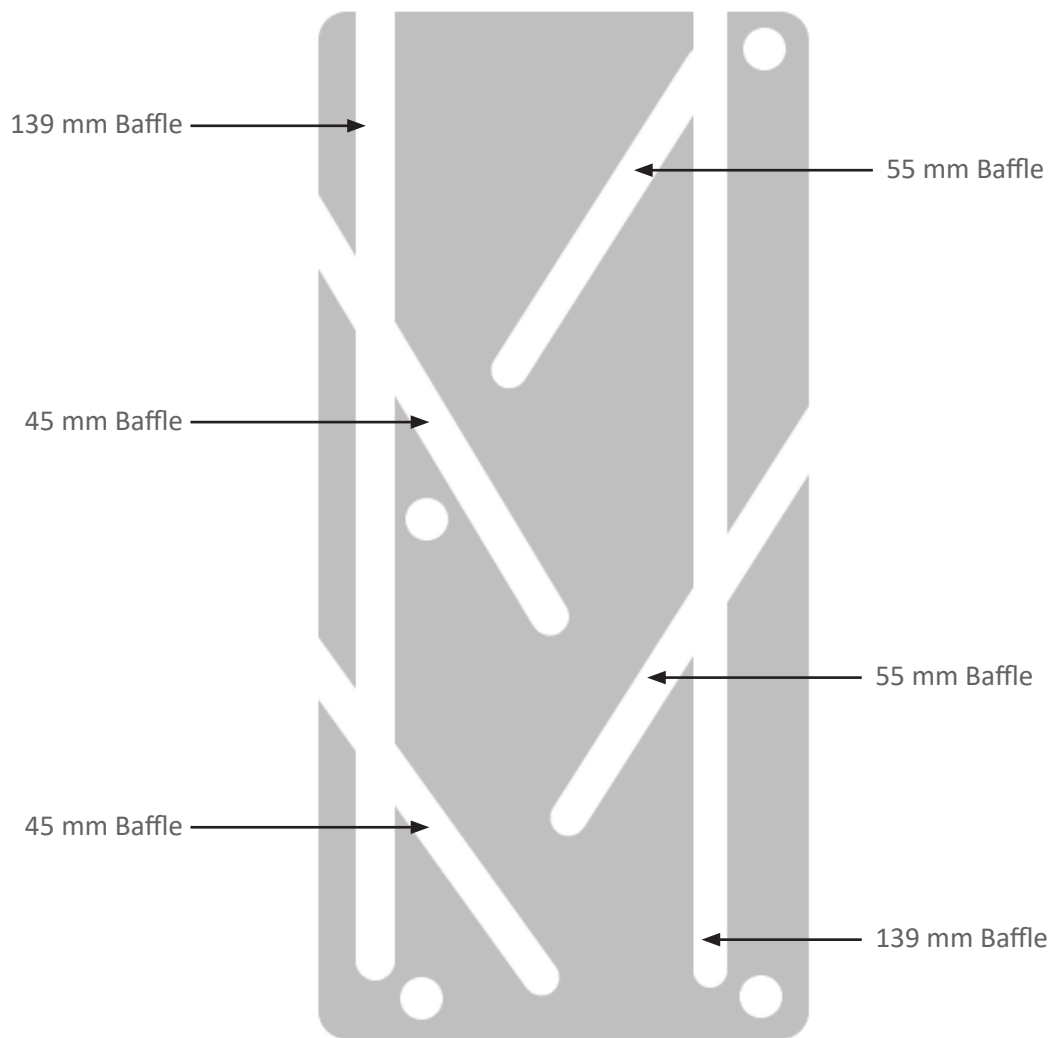
The glassware set contains two pieces of each length (six in total) to be inserted into the baffle box. All pieces provided are 50 mm wide however, as shown in the image below, their lengths vary.





Position the Baffle Box upright so that the top slots are facing upwards.

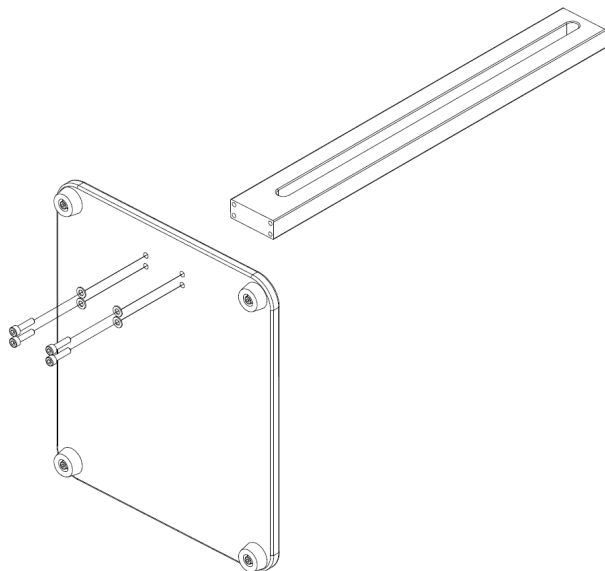
Slide the Glass Baffles into the slots as indicated in the diagram provided below, ensure that the 45 mm and 55 mm lengths of glass are fitted first.



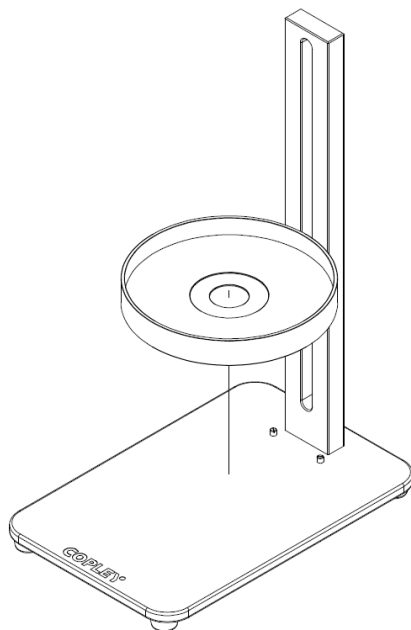


Section 3.7.2 – Apparatus Assembly

1. Assemble the Upright to the Baseplate with M5 x 20 mm Socket Head Cap Screws and M5 Washers (Hex Key provided).

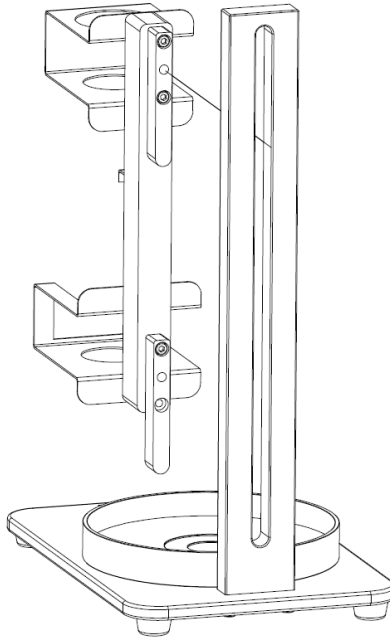


2. Position the Powder Retaining Tray onto the Baseplate.

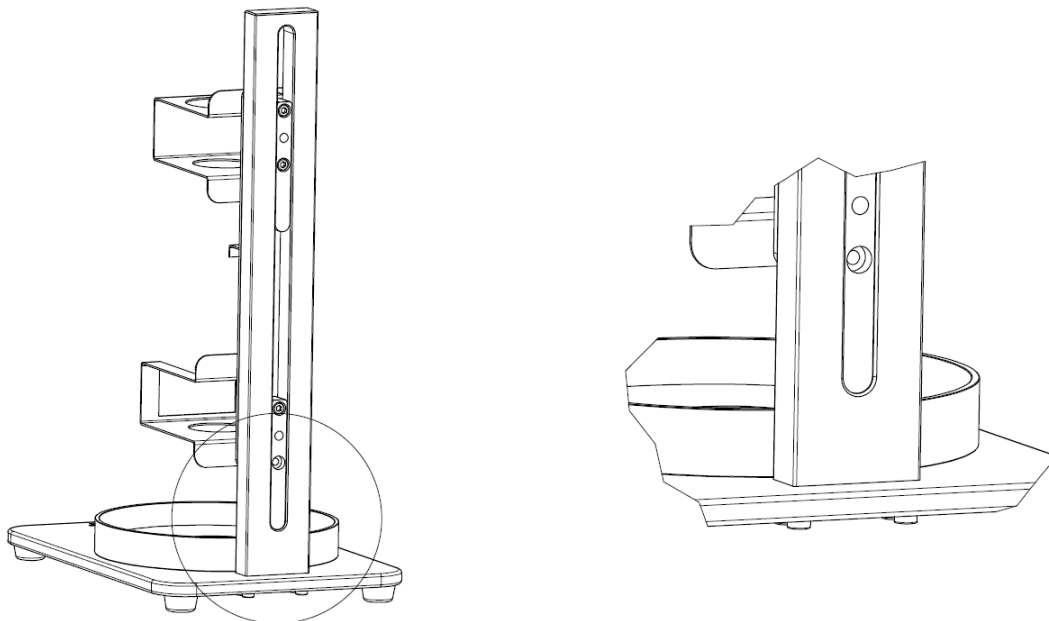




3. Insert the Rack into the slot on the Upright.

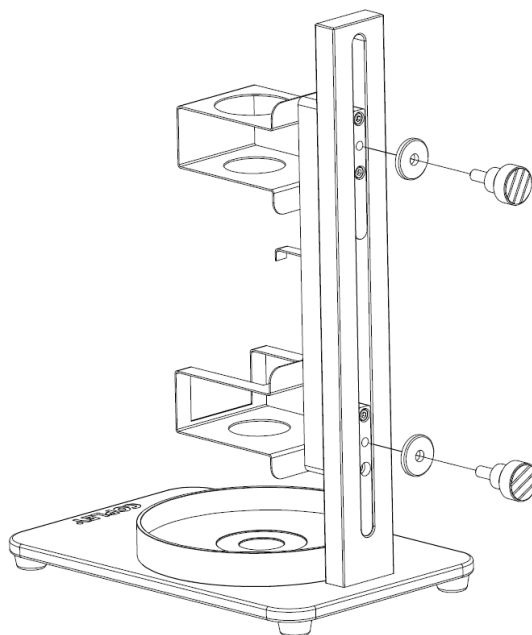


4. Align the Rack lug to the bottom curvature on the Upright.

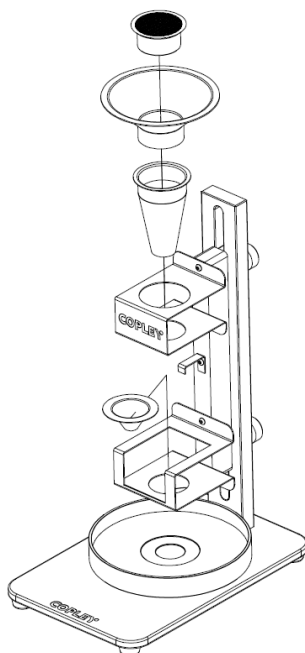




5. Lock the Rack into position with the Thumbscrews and Washers provided.

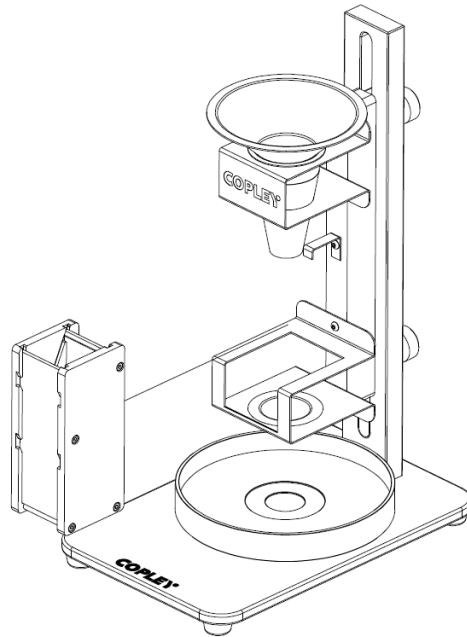


6. Place the Middle Funnel into the top bracket, slot the Top Funnel into the Middle Funnel and then position The Mesh Insert into the Top Funnel. Fit the Bottom Funnel into the Bottom Bracket.





7. Load the assembled Baffle Box (from Section 3.7.1) into the bottom bracket.



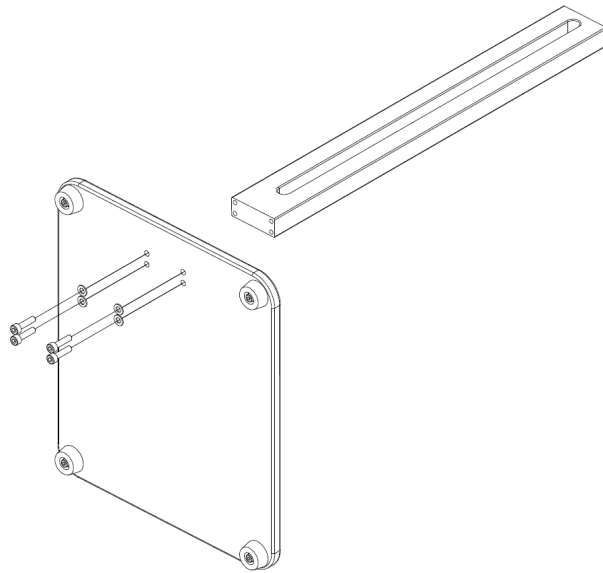
The Scott Volumeter setup is now complete.



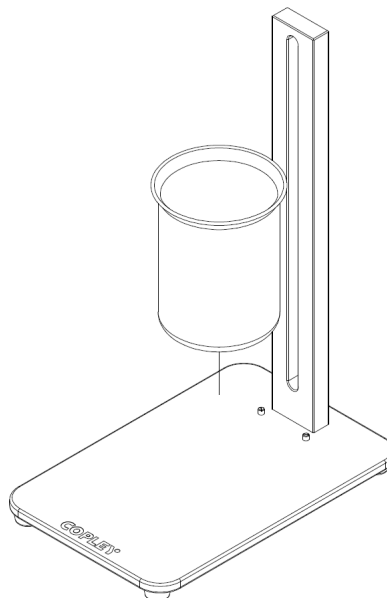
Section 3.8 – Metal Powder Testing Apparatus - PTW Assembly

Section 3.8.1 – Flowability Assembly

1. Assemble the Upright to the Baseplate with M5 x 20 mm Socket Head Cap Screws and M5 Washers (Hex Key provided).

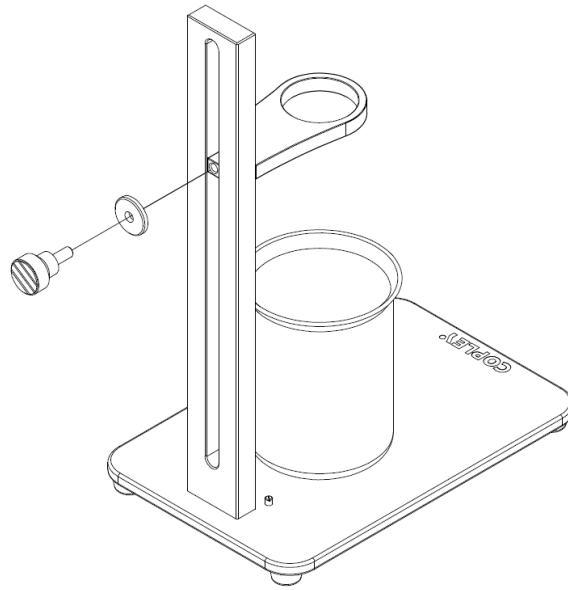


2. Place the 1000 mL Beaker onto the Baseplate.

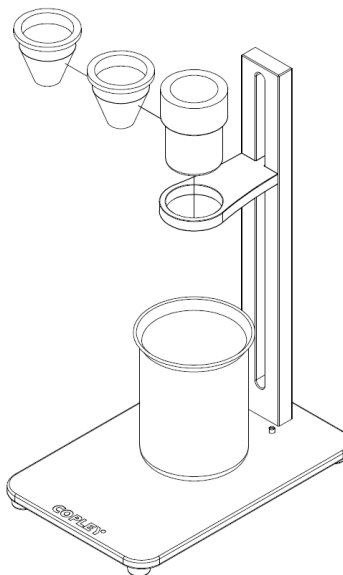




3. Install the Funnel Ring onto the Upright and lock it into position using the Thumbscrew and Washer provided.



4. Select either the Carney, Hall or Gustavsson Funnel and place this into the Funnel Ring.

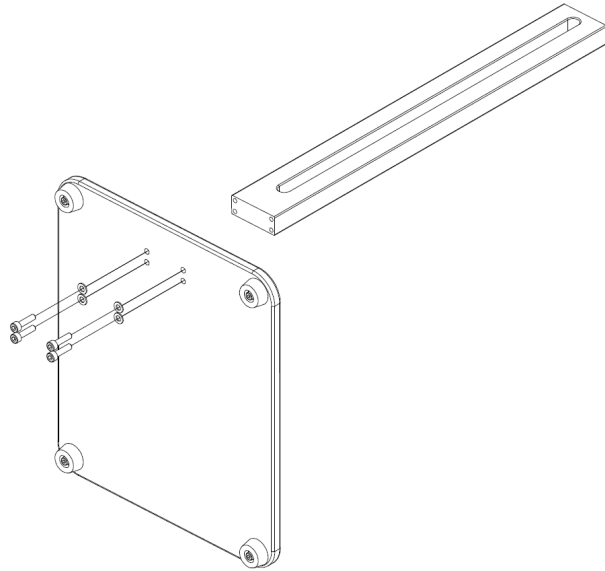


The Metal Powder Testing for Flowability setup is now complete.

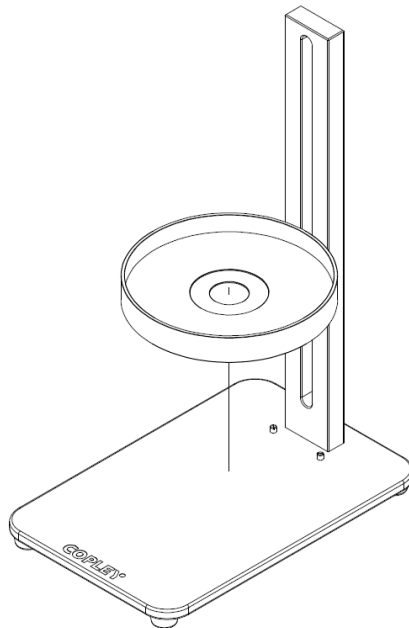


Section 3.8.2 – Bulk Density Assembly

1. Assemble the Upright to the Baseplate with M5 x 20 mm Socket Head Cap Screws and M5 Washers (Hex Key provided).

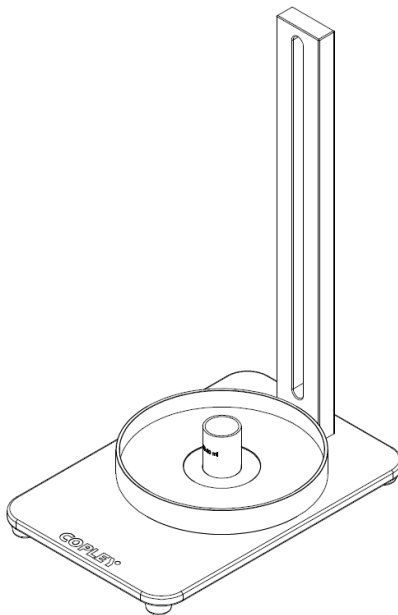


2. Position the Powder Retaining Tray onto the Baseplate.

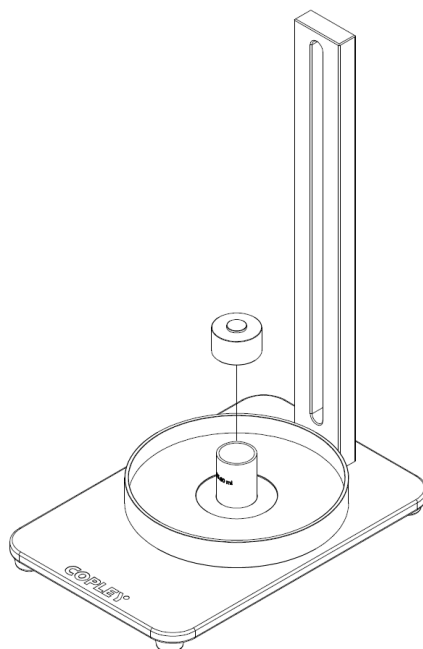




3. Weigh the empty, dry Stainless Steel Density Cup and record the mass.
4. Place the Density Cup into the recess on the Powder Retaining Tray.

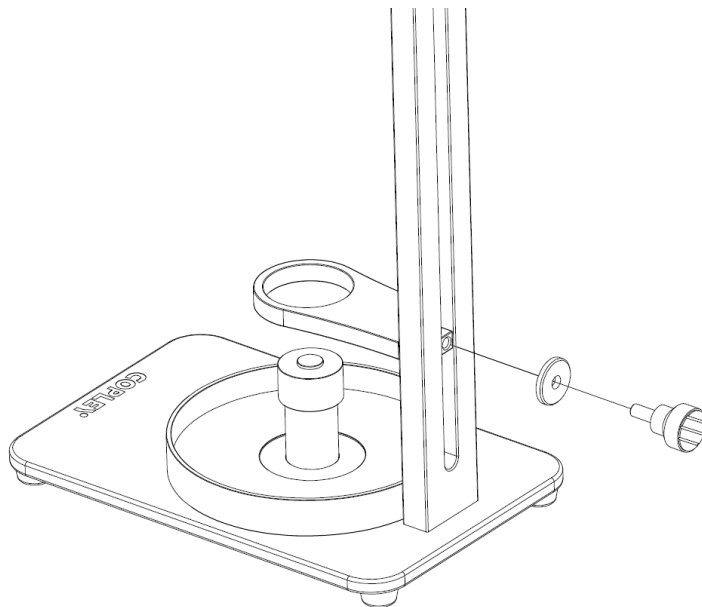


5. Place the Height Block onto the Density Cup with the flat side positioned downwards.

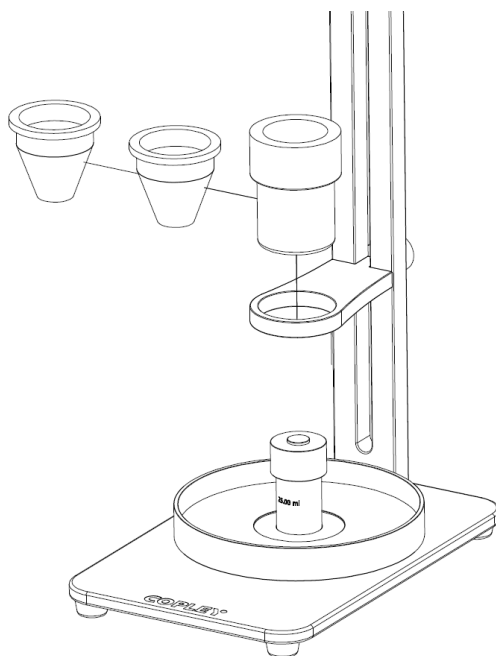




6. Install the Funnel Ring onto the Upright and lock it into position using the Thumbscrew and Washer provided.

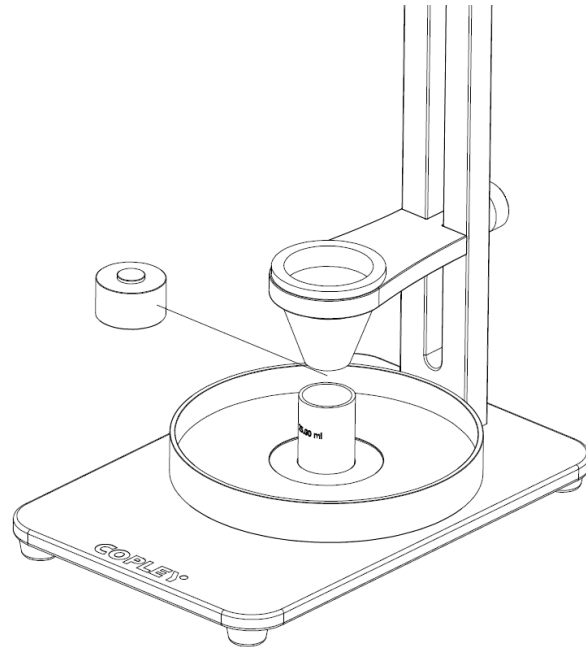


7. Select either the Carney, Hall or Gustavsson Funnel and place this into the Funnel Ring.





8. Set the funnel height by sliding the Funnel Ring onto the Height Block. Re-tighten the Thumbscrew to set the height and then remove the Height Block from the apparatus.



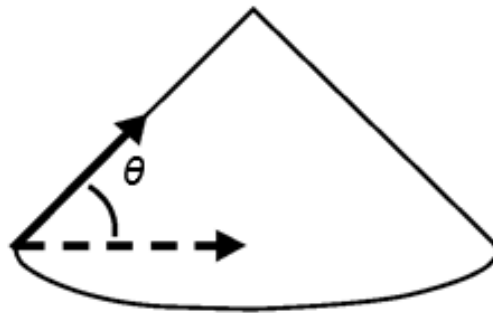
The Metal Powder Testing for Bulk Density setup is now complete.

Section 4. – Operation

Section 4.1 – Angle of Repose

Section 4.1.1 – General Description

The Angle of Repose is the angle (relative to the horizontal base) of the conical pile produced when a granular material is poured onto a horizontal surface. It is related to the density, surface area and coefficient of friction of the material concerned.

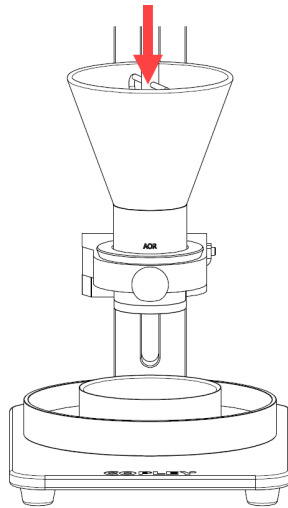


The Angle of Repose Module for PTW comprises a 100 mm diameter circular test platform together with a digital height gauge. The test platform has a protruding outer lip in order to retain a layer of powder upon which the cone is formed. The surplus powder is collected in a tray below the test platform.

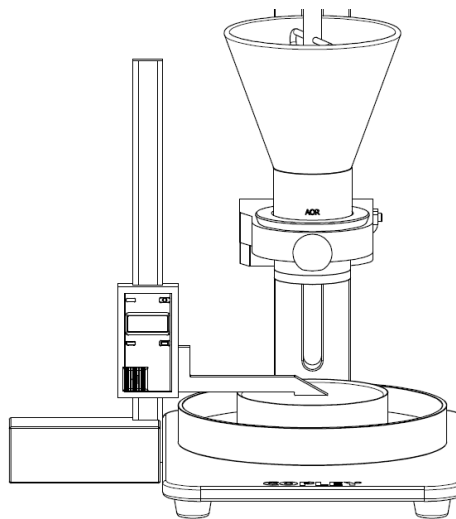


Section 4.1.2 – Operation

1. Ensure the apparatus has been assembled as instructed in Section 3.2.
2. With the Shutter Module in the closed position, load the test powder into the Stainless Steel Funnel. Copley recommends using 100 g or more of powder.



3. Zero the Height Gauge on the 100 mm AoR Base.

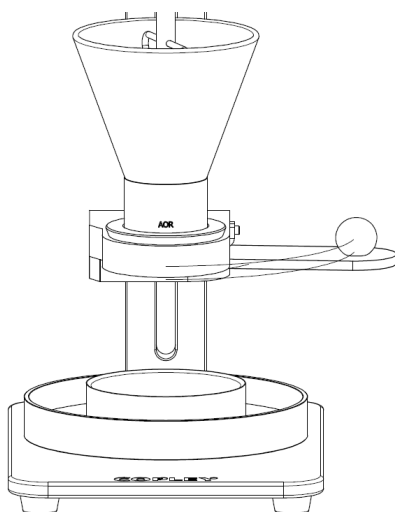




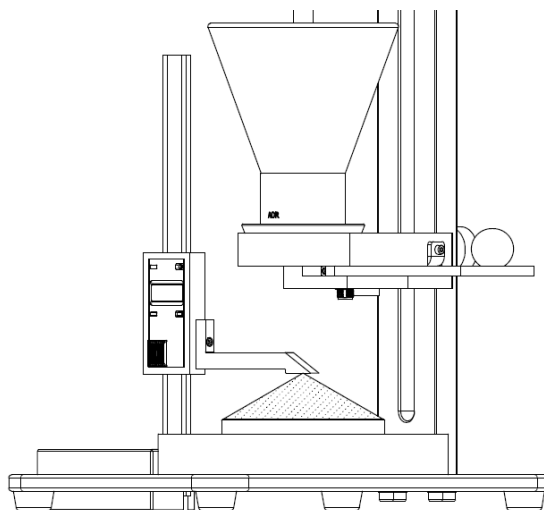
4. Open the arm of the Shutter Module in a smooth and gentle motion to allow the powder to flow freely through the nozzle such that it forms a conical pile on the AoR Base.



The Manual Stirrer Attachment (Cat. No. 1676) can assist with this procedure on more difficult test powders.



5. Find the height of the powder cone (in mm) by using the height gauge.





6. Calculate the Angle of Repose of the test powder.

The equation to determine the Angle of Repose is:

$$\text{Angle of repose (degree)} = \tan^{-1} (\text{Height reading (mm)}) / (\text{Base Radius (mm)})$$



The table provided below is Carr's classification of flow properties which can serve as a reference to the powder's performance in this test.

Flow Property	Angle of Repose (degrees)
Excellent	25-30
Good	31-35
Fair - aid not required	36-40
Passable - may hang up	41-45
Poor - must agitate, vibrate	46-55
Very poor	56-65
Very, very poor	>66

Section 4.2 – Flowability via Cylinder

Section 4.2.1 – General Description

The Pharmacopoeia suggests the use of a circular cylinder as this powder container encourages powder over the powder flow as opposed to powder over container wall flow, thus minimising any effect brought about by the container itself.

Furthermore, providing that (a) the height of the powder bed (the 'head') is much greater than the orifice, (b) the diameter of the opening is greater than 6 times the diameter of the particles and (c) the diameter of the cylinder is greater than 2 times the diameter of the opening. Then, any differences in results brought about by either the powder bed or the orifice can be considered negligible.

The Cylinder Module for PTW has been designed to meet this criteria (with the exception of the 30 mm and 32 mm Aperture Discs).



Attention! - The Cylinder Module is only suitable for materials that flow, not for cohesive materials.

The Cylinder Module comprises a Stainless Steel Cylinder, having a capacity of approximately 200 mL, combined with a flat-face bottom plate to accommodate various orifice diameters.

Twenty precision drilled stainless steel Aperture Discs are supplied as part of this module and each contains a hole in the centre of the disc of the following sizes:

4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34 and 36 mm.

Each disc can be attached to the base of the cylinder to form a bottom plate having an orifice of known diameter in the centre. The Shutter Module covers the hole during the filling operation which then can be opened to allow the powder to flow through the selected hole.



Section 4.2.2 – Intrinsic Flowability

1. Ensure the apparatus has been assembled as instructed in Section 3.3.
2. Prepare a powder sample for test, ensure there is enough to fill the Cylinder approximately 10 mm from the top (a 50-gram sample is usually suitable). If the sample is lumpy, mesh sieve (not supplied) can be used to sieve the powder beforehand.



For unknown test powders, Copley recommends starting with the 16 mm Aperture Disc.

3. Carefully load the powder into the Powder Funnel to fill the Cylinder, tapping lightly if required to avoid packing.



In the case of poorly flowing powders, it may be necessary to spoon in small amounts of the sample into the Powder Funnel.

4. Open the arm of the Shutter Module in a smooth and gentle motion to release the powder from the Cylinder.

The test is positive if the hole in the disc is visible from the top. If the test is positive, repeat the previous steps using smaller discs until the smallest one to achieve a positive result is ascertained.

If the test is negative, repeat the previous steps using larger discs.

The flowability index is the diameter of the smallest hole through which the sample will give three successive positive results. Free-flowing powders will generally form an inverted cone with a consistent plane.

Section 4.2.3 – Flow Through an Orifice (Fixed Mass)

1. Ensure the apparatus has been assembled as instructed in Section 3.3 & Section 3.5. Determine the correct Aperture Disc size as described in the Intrinsic Flowability Test as being the most appropriate to that particular product.
2. Prepare a powder sample for test, ensure there is enough to fill the Cylinder approximately 10 mm from the top. If the sample is lumpy, a mesh sieve (not supplied) can be used to sieve the powder beforehand. Weigh the powder sample to a suitable resolution.
3. Carefully load the powder into the Powder Funnel to fill the Cylinder, tapping lightly if required to avoid packing.



In the case of poorly flowing powders, it may be necessary to spoon in small amounts of the sample into the Powder Funnel.

4. Zero the Timer.
5. Open the arm of the Shutter Module in a smooth and gentle motion to release the powder from the Cylinder.
6. Close the Shutter once all the powder has been drained from the Cylinder.
7. Record the reading displayed on the Timer.

Section 4.2.4 – Flow Through an Orifice (Fixed Time)

1. Follow the procedure for steps 1,2 and 3 in "Section 4.2.3 – Flow Through an Orifice (Fixed Mass)".
2. Choose a suitable time for the test, e.g. 10 seconds.
3. Open the arm on the Shutter Module to allow the powder to flow.
4. Close the arm on the Shutter Module once the set time has elapsed.
5. Weigh the mass of powder that has flowed in the set time.



Section 4.3 – Flowability via Funnel

Section 4.3.1 – General Description

In certain instances, where for example, the purpose of the test is to simulate flow in a hopper or other production situation, it may be preferable to use a funnel in the form of a Truncated Cone.

The Funnel Module for PTW is based on the Stainless Steel Flow Funnel and Nozzle described in the Ph. Eur. Chapter 2.9.16 - Flowability.

The Funnel Module is supplied with five Nozzles corresponding to aperture sizes of 5, 7, 10, 15 and 25 mm. Both the Funnel and Nozzles are manufactured from 316 Stainless Steel.

Section 4.3.2 – Flow Through an Orifice (Fixed Time)

1. Ensure the apparatus has been assembled as instructed in Section 3.4 & Section 3.5.



For unknown test powders, Copley recommends starting with the 10 mm Nozzle.

2. Prepare a powder sample for test, typically 100 grams. If the sample is lumpy, a mesh sieve (not supplied) can be used to sieve the powder beforehand. Weigh the powder sample to a suitable resolution.
3. Carefully load the powder into the Funnel, tapping lightly if required to avoid packing.



In the case of poorly flowing powders, it may be necessary to spoon in small amounts of the sample into the Funnel.

4. Zero the Timer.
5. Open the arm of the Shutter Module in a smooth and gentle motion to release the powder from the Funnel.
6. Close the Shutter once all the powder has been drained from the Funnel.
7. Record the reading displayed on the Timer.



If the test is negative (the entire sample does not flow out of the funnel), repeat the test using a larger Nozzle.

Carry out three determinations, the results can be expressed as:

- The mean of determinations, if none of the individual values deviate from the mean by more than 10 %
- As a range, if the individual values deviate from the mean by more than 10 %
- As an infinite time, if the entire sample fails to flow through the Funnel

Section 4.3.3 – Flow Through an Orifice (Fixed Time)

1. Follow the procedure for steps 1,2 and 3 in "Section 4.3.2 – Flow Through an Orifice (Fixed Time)".
2. Choose a suitable time for the test, e.g. 10 seconds.
3. Open the arm on the Shutter Module to allow the powder to flow.
4. Close the arm on the Shutter Module once the set time has elapsed.
5. Weigh the mass of powder that has flowed in the set time.



Section 4.4 – Shear Cell

Section 4.4.1 – General Description

The Shear Cell Module for PTW measures the force required to shear a circular disc through a prepared sample of bulk material.

The Shear Cell Module comprises a cylindrical chamber (manufactured from clear acrylic) measuring 140 mm I.D., 2.5 mm high and is capable of holding 500 mL of sample. In the floor of the chamber, there is a 100 mm hole which can be sealed during the consolidation process, the acrylic disc is provided for this purpose.

The test is based on measuring the force required to shear a circular disc through a prepared sample of bulk material. It comprises two stages, (a) sample consolidation and (b) failure inducement (shear strength).

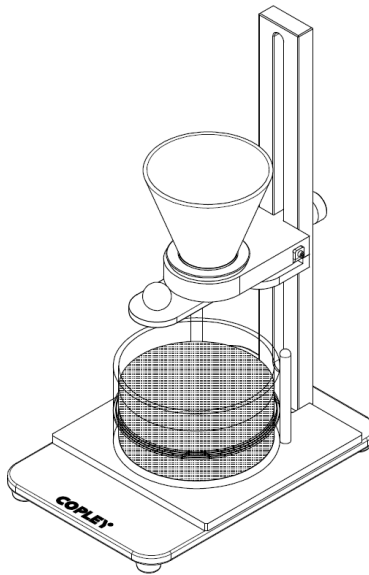
The sample is first subjected to a consolidated load ideally, this should be similar to the loads experienced by the material in practice. Alternatively, a standard reference can be employed, e.g. 10 kilos.

The acrylic disc sealing the bottom of the test cell is now removed and the load is steadily applied to the test sample by pouring sand or a similar through the funnel into a container resting on top of the sample until such a time as the sample fails/shears.

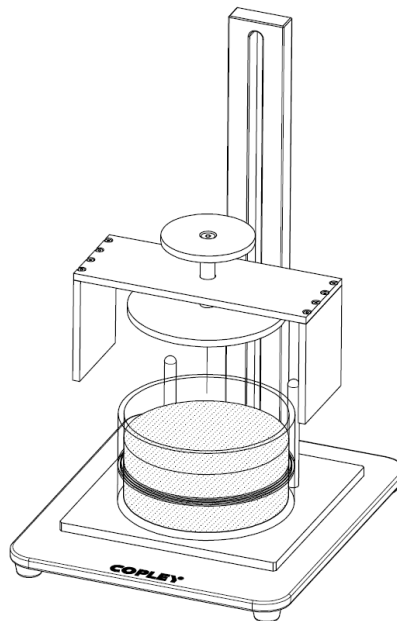


Section 4.4.2 – Test Procedure

1. Ensure the apparatus has been assembled as instructed in Section 3.6.
2. Load the test chamber with the powder sample via the Stainless Steel Funnel. Load the powder beyond the test chamber into the Support Collar for compression.

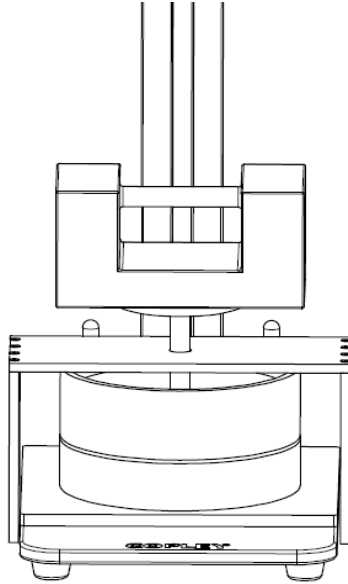


3. Remove the Stainless Steel Funnel, the Support Collar and Shutter Module from the apparatus.
4. Place the Consolidation Rig onto the powder surface.

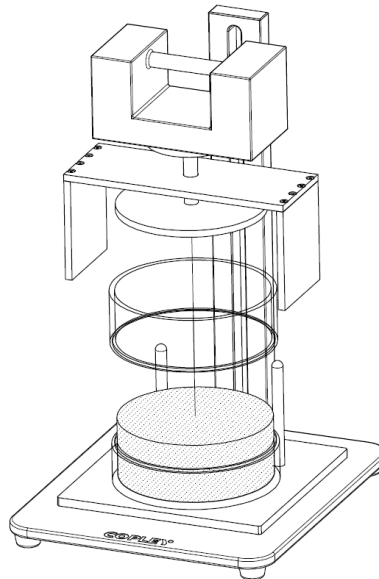




5. Pack the powder with the Mass.

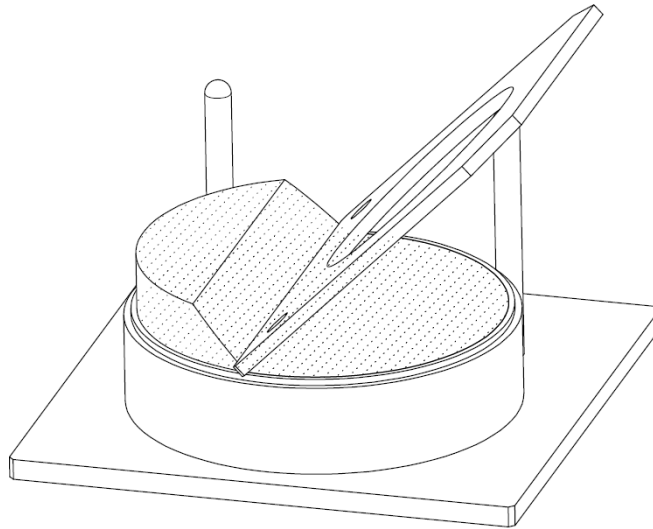


6. Remove the Mass, Consolidation Rig and Support Collar from the apparatus.

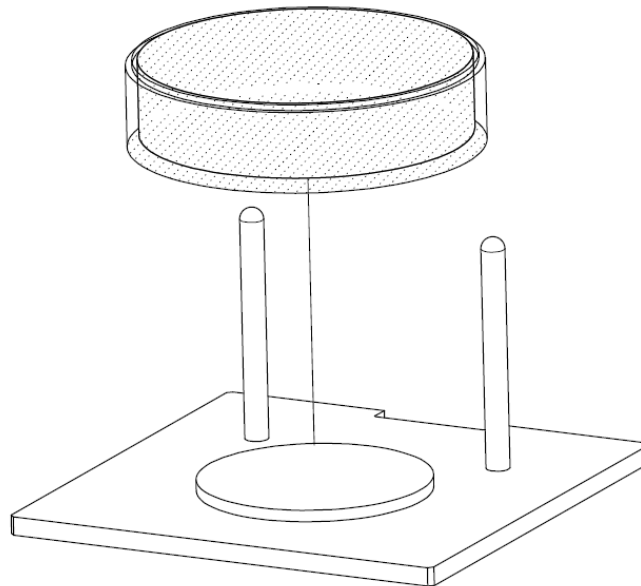




7. Use the Alignment Plate to remove any excess powder above the test chamber.

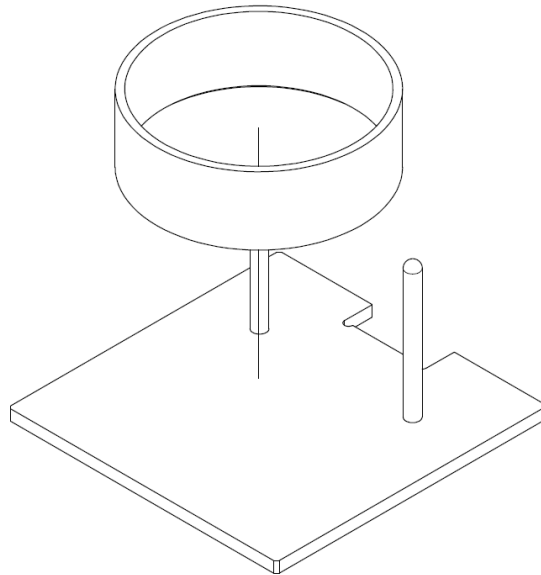


8. Lift the Test Chamber to remove the Consolidation Disc.

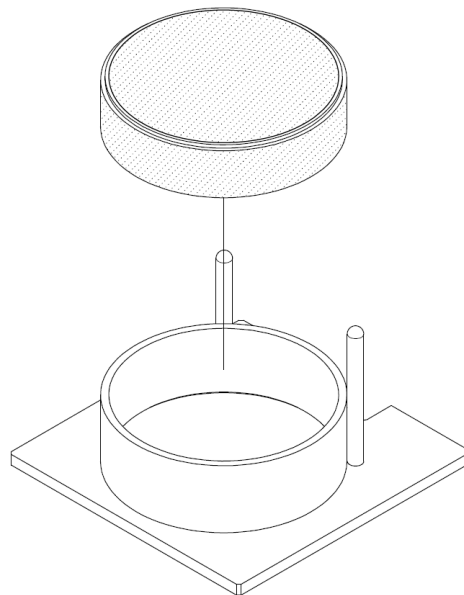




9. Place the Packing Ring onto the Shear Cell Base.



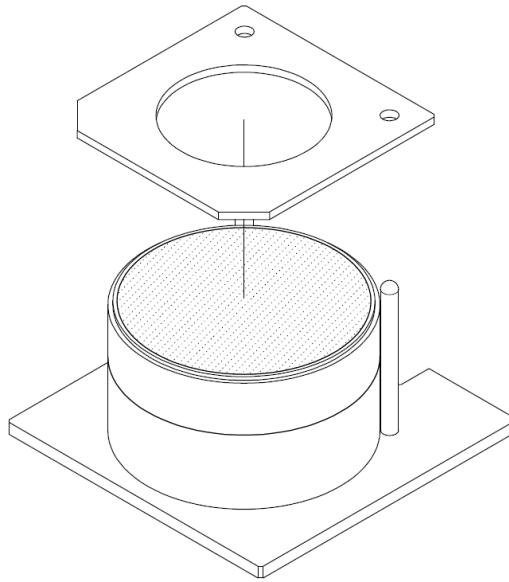
10. Place the Test Chamber with compressed powder onto the Packing Ring.



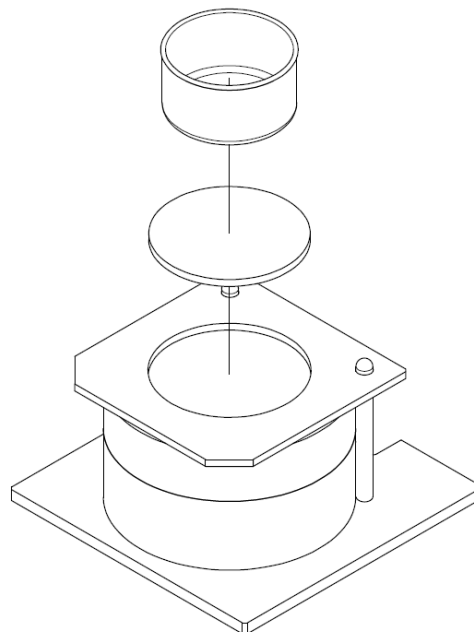


11. Measure the mass of the Loading Disc and Consolidation Disc.

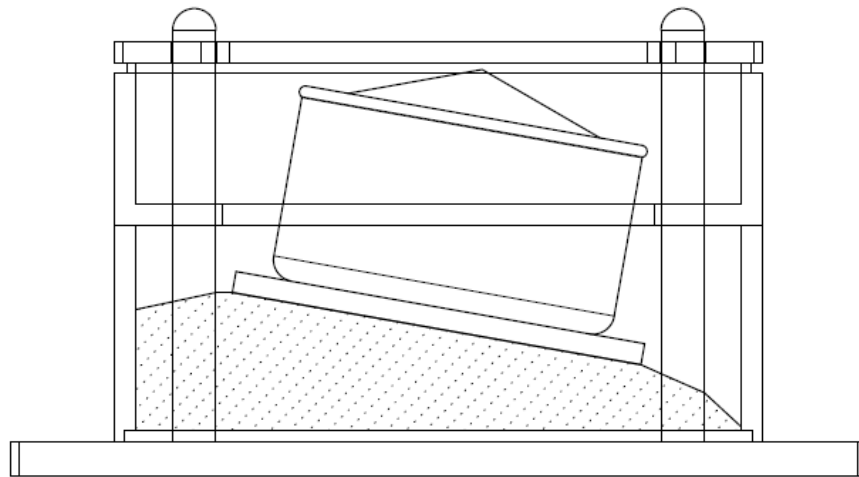
12. Locate the holes on the Alignment Plate to the studs on the Shear Cell Base and then place the Alignment Plate onto the Test Chamber.



13. Place the Loading Disc and Loading Vessel onto the packed powder surface.



14. Load the mass gradually into the Loading Vessel until the packed powder shears and drops onto the Shear Cell Base.



Measure the mass of the Glass Cylinder and the loading mass.

Calculate the total mass loaded onto the powder when it sheared:

$$\text{Total mass (kg)} = \text{Loading Vessel (kg)} + \text{Loading Disc (kg)} + \text{loading mass (kg)}$$

Calculate the Shear Strength:

$$\text{Shear Strength (Pa)} = (g) (\text{Total Mass (kg)}) / (\text{surface area (cm}^2\text{)})$$

Record the following conditions:

- Consolidation Condition
- Consolidation Load (Mass)
- Consolidation Time
- Yield Mass



Section 4.5 – Bulk Density

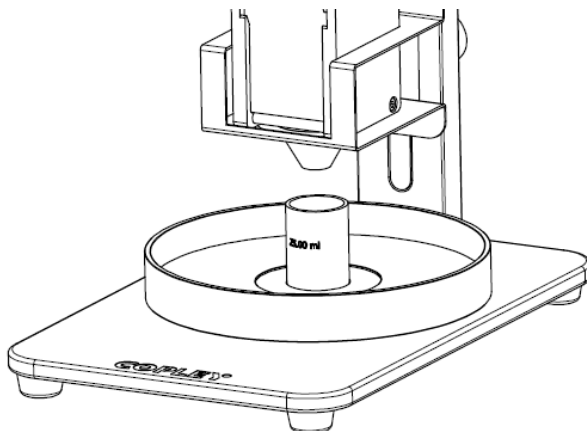
Section 4.5.1 – General Description

The Scott Volumeter - PTW is used for the determination of bulk density of free-flowing fine powders according to the methods described in:

- European Pharmacopoeia (Ph. Eur.) 2.9.34 Bulk Density & Tapped Density of Powders (Method 2)
- United States Pharmacopoeia (USP) Chapter <616> Bulk Density of Powders (Method 2)

Section 4.5.2 – Test Procedure

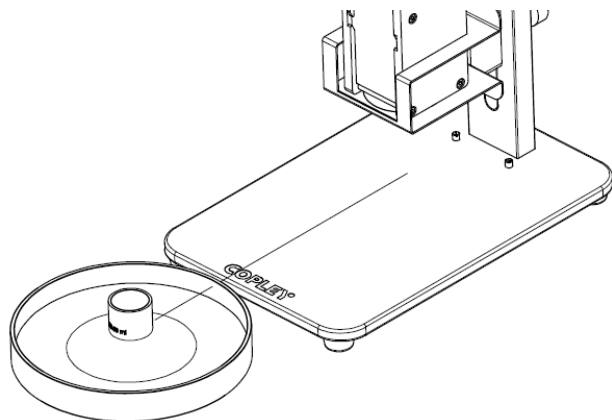
1. Ensure that the apparatus has been assembled as instructed in Section 3.7.
2. Weigh and record the mass of the empty Density Cup.
3. Place the Density Cup into the recess of the Powder Retaining Tray.



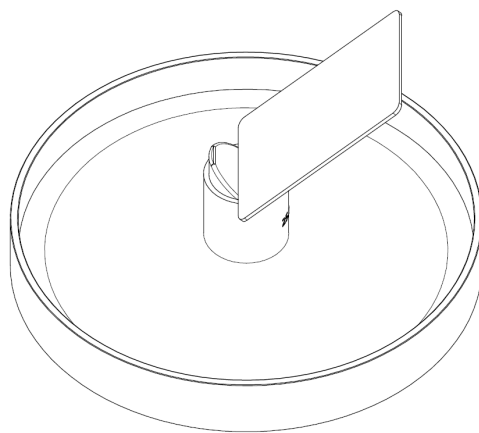
4. Slowly pour the sample into the Top Funnel on the Scott Volumeter. Stop pouring the sample once the Density Cup is overflowing.



5. Remove the Density Cup and the Powder Retaining Tray from the Base Plate of the Scott Volumeter.



6. Level the powder sample with a blade or spatula (not provided) to ensure that it is exactly full, taking care not to compress or shake the material in the Density Cup.



7. Weigh and record the mass of the filled Density Cup.
8. Calculate the bulk density by dividing the weight of the powder by the volume of the cup.

The equation to determine the bulk density is:

$$\text{Untapped Bulk Density (g/mL)} = \text{Mass of powder in Density Cup (g)} / \text{Density Cup Volume (mL)}$$



Section 4.6 – Flowability & Bulk Density of Metal Powder

Section 4.6.1 – General Description

Flowability and Bulk Density for Metal Powder Modules are compliant with the following standards:

- ISO 3923:2018
- ISO 4490:2018
- ISO 13517:2020
- ISO 2768-1
- ASTM B213-13
- BR17-2
- B964-23

Section 4.6.2 – Flowability Test Procedure

1. Ensure that the apparatus has been assembled as instructed in Section 3.8.1.
2. Weigh a known mass of powder (recommended to be at least 50 g).
3. Use a finger to block the exit port of the Funnel. Slowly pour the powder sample into the Funnel.
4. At the same time, start the Timer and allow the powder to flow through the Funnel and fill the Beaker.
5. Stop the Timer once all the powder has passed through the Funnel.
6. Record the measured time to the nearest 0.1 s.
7. Repeat the test to obtain 3 timer readings and then calculate the mean of these readings.



Section 4.6.3 – Bulk Density Test Procedure

1. Ensure that the apparatus has been assembled as instructed in Section 3.8.2.
2. Weigh and record the mass of the empty Density Cup.
3. Use a finger to block the exit port of the Funnel. Slowly pour the powder sample into the Funnel.
4. Allow the powder to flow through the Funnel and fill the Density Cup. If the powder does not flow through the Funnel, switch to the Carney Funnel and then restart the test.
5. Remove the Density Cup from the Baseplate.
6. Level the powder sample with a blade or spatula (not provided) to ensure that it is exactly full, taking care not to compress or shake the material in the Density Cup.
7. Weigh and record the mass of the filled Density Cup.
8. Calculate the bulk density by dividing the weight of the powder by the volume of the cup.
9. Repeat the test to obtain 3 density readings and then calculate the mean of these readings.

The equation to determine the bulk density is:

$$\text{Untapped Bulk Density (g/mL)} = \text{Mass of Powder in Density Cup (g)} / \text{Density Cup Volume (mL)}$$



Section 5. – PTA 100i

The Powder Testing Assistant, model PTA 100i, assists with carrying out powder characterisation tests by guiding the user through the test process, performing the necessary calculations and providing test reports.

The PTA 100i can capture mass readings directly from a connected balance to minimise transcription errors.

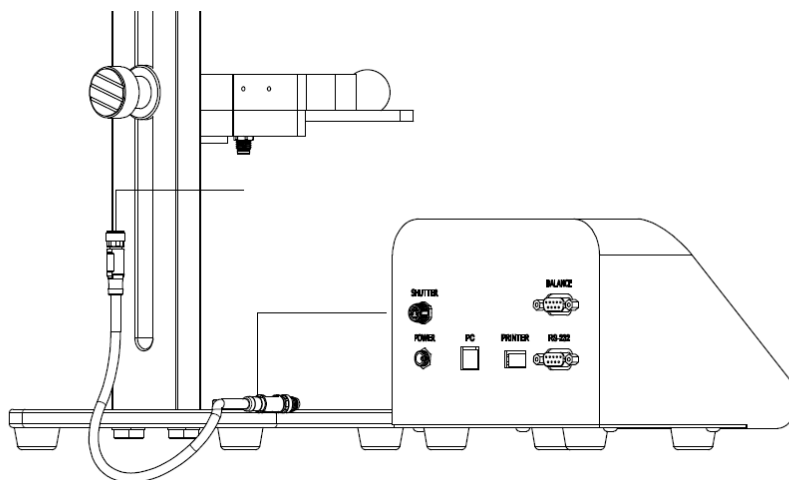
Section 5.1 – Connect Shutter

Complete the steps provided in Section 3.1 for assembling the PTW.

Insert the male end of the Connection Lead in the rear port of the PTA 100i labelled 'SHUTTER', connect the female end to the port on the Shutter Module of the PTW.



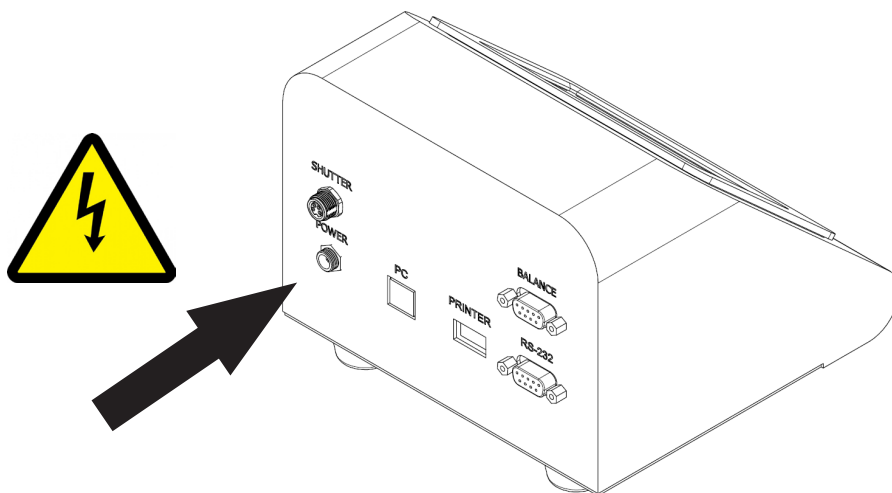
The shutter connection is not required for Angle of Repose testing.





Section 5.2 – Switching On

Insert the power cable (supplied) in the rear of the PTA, connected to a suitable power supply and power on (see "Section 9. – Specification" on page 97).



Once the PTA has initialised, the home screen will become available.

The PTA is now ready for use.



Section 5.3 – Operation

Section 5.3.1 – Angle of Repose

Complete the steps provided in Section 3.2 for assembling the Angle of Repose Module to the PTW.

Follow the procedure provided in Section 4.1 alongside the information presented below for operating the PTA 100i.

Select the 'Angle of Repose' tab on the home screen.



Select the 'Test Platform Diameter' icon and enter the diameter of the 100 mm AoR Base, press the 'Accept' button to continue.





Proceed with the test to determine the height of the powder cone.

Select the '*Measured Powder Cone height*' icon and enter the height of the powder cone, press the '*Accept*' button to continue.



Once entered, the PTA will automatically calculate the Angle of Repose and highlight the flow performance of the test on the display.





Press the '*Print*' button to print a test report from a connected printer (sold separately).



Refer to Section 11.1 for a test report example.



Section 5.3.2 – Bulk Density

Complete the assembly steps provided in either Section 3.7 or Section 3.8.2 for Bulk Density.

Follow the procedure provided in either Section 4.5 or Section 4.6.3 alongside the information presented below for operating the PTA 100i.

Select the 'Bulk Density' tab on the home screen.



Select the 'Density Cup Volume' icon and enter the volume of the Density Cup, press the 'Accept' button to continue.





Proceed with the test to determine the weight of the filled Density Cup.

Select the '*Bulk Mass*' icon and enter the weight of the filled Density Cup, press the '*Accept*' button to continue.



If using a connected balance, the weight will automatically be entered, refer to Section 8.2 for compatible balance models.



Once entered, the PTA will automatically calculate the Bulk Density highlighted on the display.





Press the '*Print*' button to print a test report from a connected printer (sold separately).



Refer to Section 11.2 for a test report example.



Section 5.3.3 – Orifice Flow (Fixed Mass)

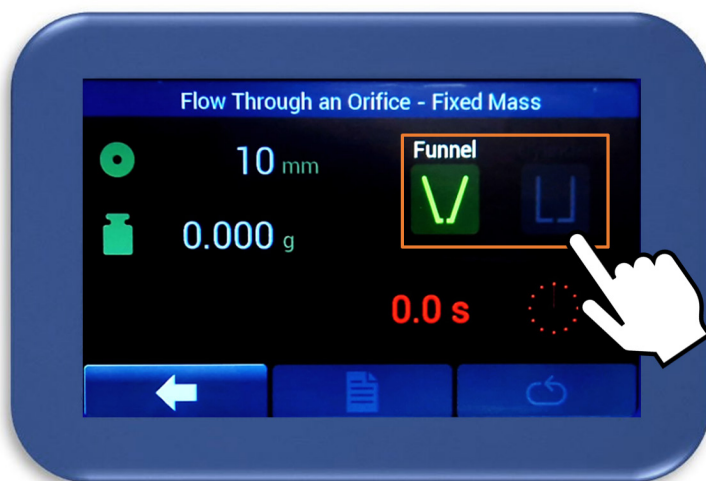
Complete the steps provided in either Section 3.3 or Section 3.4 for Flowability.

Follow the procedure provided in either Section 4.2.3 or Section 4.3.2 alongside the information presented below for operating the PTA 100i.

Select the 'Orifice Flow (Mass)' tab on the home screen.



Select either the 'Funnel' or 'Cylinder' icon depending on the test setup.





Select the '*Orifice Diameter*' icon and enter the diameter of the Nozzle/Aperture Disc, press the '*Accept*' button to continue.



Select the '*Mass of Powder*' icon and enter the weight of the powder sample, press the '*Accept*' button to continue.



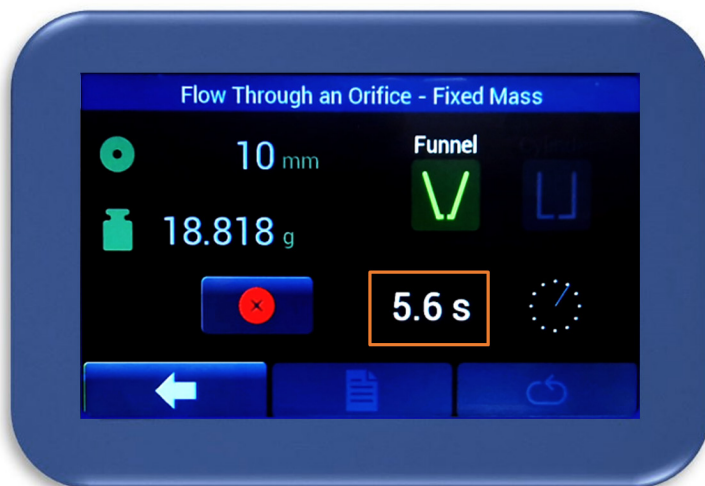
If using a connected balance, the weight will automatically be entered, refer to Section 8.2 for compatible balance models.





Pour the powder sample into the Funnel/Cylinder.

Open the arm of the Shutter Module to allow the powder sample to flow into the Beaker, the timer on the display of the PTA will then automatically start once the shutter is open.

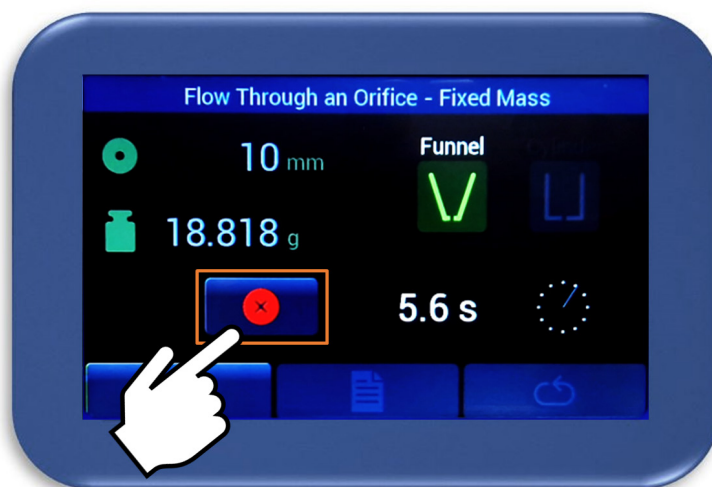


Close the Shutter Module once the flow has ended, the timer on the display of the PTA will then stop.

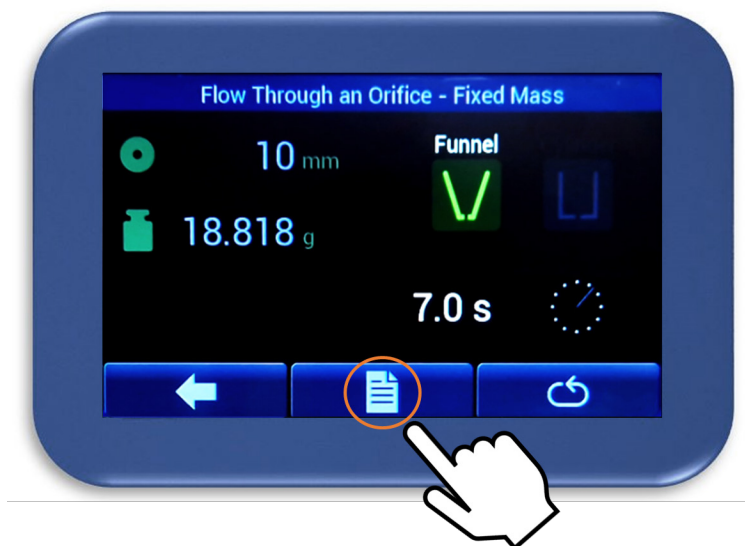




If there is no flow through of powder during the test, select the 'Cancel' icon to abort the test.



Press the 'Print' button to print a test report from a connected printer (sold separately).



Refer to Section 11.3 for a test report example.

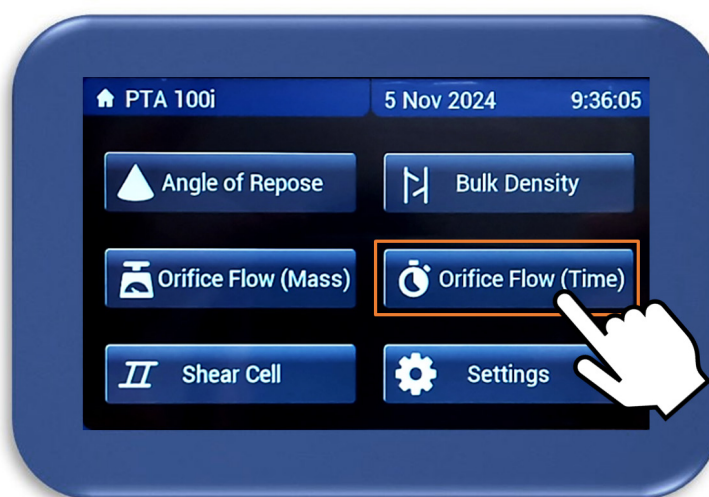


Section 5.3.4 – Orifice Flow (Fixed Time)

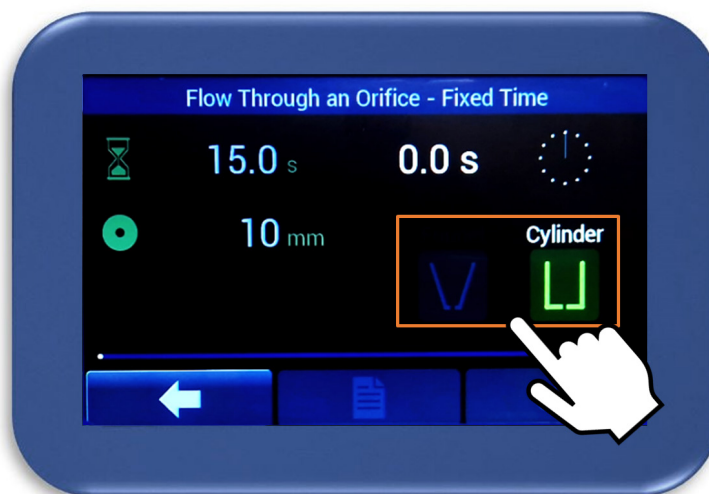
Complete the steps provided in either Section 3.3 or Section 3.4 for Flowability.

Follow the procedure provided in either Section 4.2.3 or Section 4.3.2 alongside the information presented below for operating the PTA 100i.

Select the 'Orifice Flow (Time)' tab on the home screen.



Select either the 'Funnel' or 'Cylinder' icon depending on the test setup.





Select the '*Target Test Time*' icon and enter the desired test time, press the '*Accept*' button to continue.



Select the '*Orifice Diameter*' icon and enter the diameter of the Nozzle/Aperture Disc, press the '*Accept*' button to continue.





Pour the powder sample into the Funnel/Cylinder.

Open the arm of the Shutter Module to allow the powder sample to flow into the Beaker, the timer on the display of the PTA will then automatically start once the shutter is open.



Close the Shutter Module once the timer has reached the predetermined test time.





Select the '*Conveyed Mass*' icon and enter the weight of the powder sample within the Beaker, press the '*Accept*' button to continue.



The '*Conveyed Mass*' icon will only be enabled once a test time has been reached and the shutter is in the closed position.

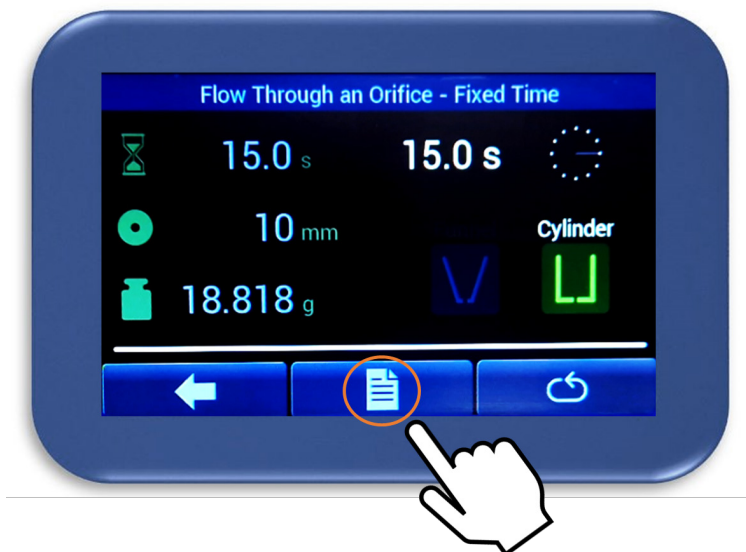


If using a connected balance, the weight will automatically be entered, refer to Section 8.2 for compatible balance models.





Press the 'Print' button to print a test report from a connected printer (sold separately).



Refer to Section 11.4 for a test report example.



Section 5.3.5 – Shear Cell

Complete the steps provided in Section 3.6 for assembling the Shear Cell Module to the PTW.

Follow the procedure provided in Section 4.4 alongside the information presented below for operating the PTA 100i.

Select the 'Shear Cell' tab on the home screen.



Select the 'Consolidated Powder Volume' icon and enter the volume of the Test Chamber, press the 'Accept' button to continue.





Select the 'Disc Diameter' icon and enter the recorded diameter of the disc, press the 'Accept' button to continue.



Select the 'Yield Mass' icon and enter the recorded mass applied to shear the powder cake, press the 'Accept' button to continue.

Yield Mass = mass of Loading Vessel + mass of Loading Disc + Applied mass





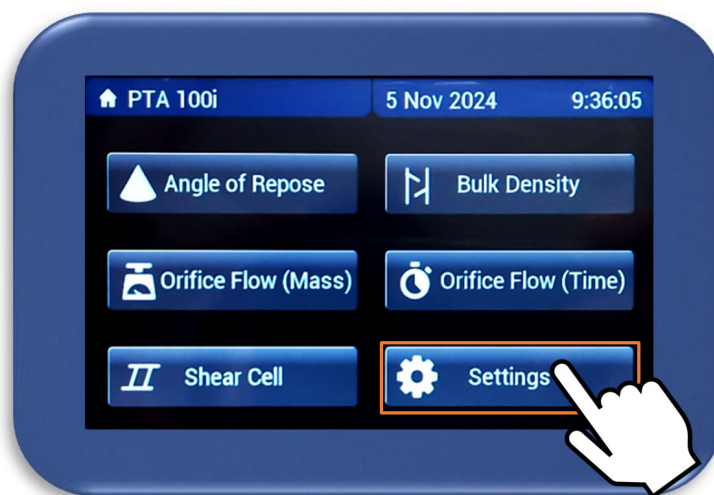
Press the '*Print*' button to print a test report from a connected printer (sold separately).



Refer to Section 11.5 for a test report example.

Section 5.4 – Settings

Select the 'Settings' icon on the home screen to go to the settings menu.

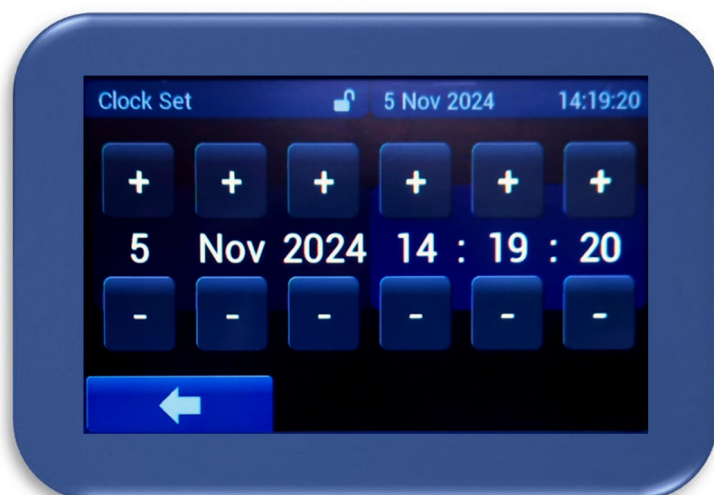


Section 5.4.1 – Clock

Select the 'Clock Settings' icon to change the date and time.



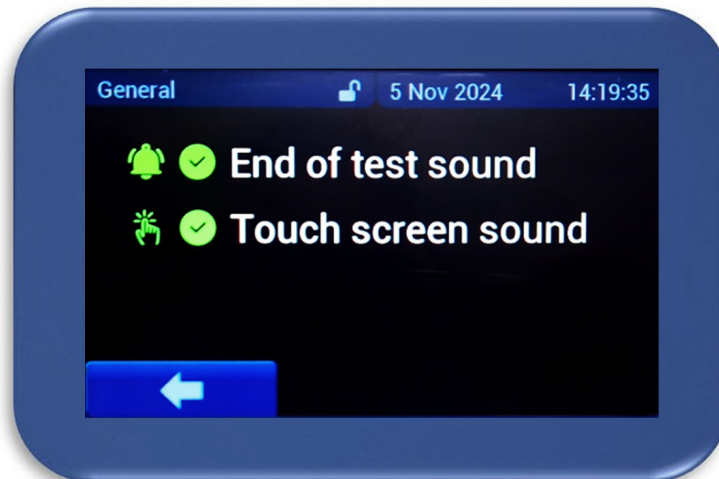
This screen is passcode protected, refer to "Section 15. – Passcode" on page 117.





Section 5.4.2 – General

Select this sub-menu option to enable/disable the end-of-test sound and the touch screen sound.



Section 5.4.3 – Reporting

Select this sub-menu option to enable/disable a report target.





Section 5.4.4 – System Information

In this sub-menu option, the system information is available.





Section 6. – Verification

Section 6.1 – Verification of Height Gauge (Angle of Repose)

The accuracy of the height gauge reading can be checked using the height gauge blocks provided in the qualification tool set.

Section 6.2 – Verification of Flow Duration (PTA 100i)

The accuracy of the flow duration from the PTA 100i can be checked using the certified stopwatch provided in the qualification tool set.

Section 6.3 – Verification of Time Duration (PTA 100i)

The accuracy of the time duration from the PTA 100i can be checked using the certified stopwatch provided in the qualification tool set.



Section 7. – Maintenance & Cleaning

Section 7.1 – Maintenance

Regular inspection of the parts to avoid contamination between test powders is recommended.

For the PTA 100i:

Regular inspection of the mains lead and power supply is recommended.

If any part of the equipment is found to be damaged, it should be removed from service until the damage is repaired.

Please contact Copley Scientific for maintenance issues.

Section 7.1.1 – Cleaning

Only use cleaning liquids that are compatible with Stainless Steel for the metal apertures, Funnel, Nozzles and Funnel Adapter.

The Shutter Module should be cleaned with a damp cloth, taking extra care to ensure that no liquid enters the internal environment of this device.

Dry immediately after cleaning, no internal cleaning is required.



Attention! - Copley will accept no responsibility for any damage to the PTW caused by the use of aggressive solvents or by non-approved cleaning materials.

For the PTA 100i:



Attention! - Disconnect the PTA 100i from the mains power supply before cleaning.

The enclosure and the display screen should be cleaned with a damp cloth, taking extra to ensure that no liquid enters the internal environment of the PTA 100i.



Attention! - Copley will accept no responsibility for any damage to the PTA 100i caused by the use of aggressive solvents or by non-approved cleaning materials.



Section 8. – Accessories & Configurations

Section 8.1 – Accessories

Additional accessories are available for the PTW, refer to the table provided below:

Cat. No.	Description
1677	Anti-Static Grounding Kit
1673	Kern Balance (1 D.P Readable, 10000 g Max.)
1664	Kern Balance (2. D.P Readable, 400 g Max.)
1665	Ohaus Balance (3 D.P Readable, 420 g Max.)
1679	IQ/OQ Documentation Pack for PTW
1682	PTW Qualification Tools
1683	Re-calibration of PTW Qualification Tools
6302	Filter Insert with 10-mesh screen for Scott Volumeter
6303	Volume Certification of the Density Cup
6305	Spare Density Cup
6306	Spare set of Glassware for Scott Volumeter



Section 8.2 – Configurations

Application							
Cat. No.	Description	Angle of Repose	Flowability via Cylinder	Flowability via Funnel	Shear Cell	Bulk Density	Flowability & Bulk Density of Metal Powder
1670	Powder Testing Workstation - PTW	✓	✓	✓	✓		
1674	Angle of Repose for PTW	✓					
1671	Cylinder Module for PTW		✓				
1672	Funnel Module for PTW			✓			
1675	Shear Cell Module for PTW				✓		
6310	Scott Volumeter - PTW					✓	
1681	Metal Powder Testing Apparatus - PTW						✓
Optional Accessories							
1680	Powder Testing Assistant - PTA 100i	✓	✓	✓	✓	✓	✓
1678	Timer Attachment for PTW		✓	✓			
1677	Anti-Static Grounding Kit for PTW		✓	✓			✓
1676	Manual Stirrer Attachment for PTW	✓					

Application							
Cat. No.	Description	Angle of Repose	Flowability via Cylinder	Flowability via Funnel	Shear Cell	Bulk Density	Flowability & Bulk Density of Metal Powder
Optional Accessories							
1673	Kern Balance (1 D.P Readable, 1000 g Max.)		✓	✓	✓	✓	✓
1664	Kern Balance (2 D.P Readable, 400 g Max.)		✓	✓	✓	✓	✓
1665	Ohaus Balance (3 D.P Readable, 440 g Max.)		✓	✓	✓	✓	✓
1679	IQ/OQ Documentation Pack for PTW	✓	✓	✓	✓	✓	
1682	PTW Qualification Tools	✓	✓	✓	✓	✓	
1683	Re-calibration of PTW Qualification Tools	✓	✓	✓	✓	✓	
6302	Filter Insert with 10-mesh screen for Scott Volumeter					✓	
6303	Volume Certification of the Density Cup					✓	✓
6305	Spare Density Cup					✓	✓
6306	Spare set of Glassware for Scot Volumeter					✓	



Section 9. – Specification

Section 9.1 – Physical Dimensions

Section 9.1.1 – PTW

Dimensions for Powder Testing Workstation - PTW (w x d x h) (mm)	200 x 300 x 440
Dimensions for Scott Volumeter - PTW (w x d x h) (mm)	200 x 300 x 440
Dimensions for Scott Volumeter - PTW (w x d x h) (mm)	200 x 300 x 440
Weight (kg)	
Powder Testing Workstation - PTW	3.4
Angle of Repose Module for PTW	2.8
Cylinder Module for PTW	2.8
Funnel Module for PTW	4.9
Shear Cell Module for PTW	8.5
Scott Volumeter - PTW	5.6
Metal Power Testing Apparatus - PTW	5.5
Timer Attachment for PTW	0.2
Ant-Static Ground Kit for PTW	0.2
Stirrer Attachment for PTW	0.5



Section 9.1.2 – PTA 100i

Dimensions (w x d x h) (mm)	200 x 200 x 150
Weight (kg)	1.6

Section 9.2 – Electrical

Voltage	24 V DC
Power Consumption	60 W Max



Section 10. – External Connection Specification

Additional devices can be connected to the PTA 100i to enable certain functions. All of the following connections are optional.



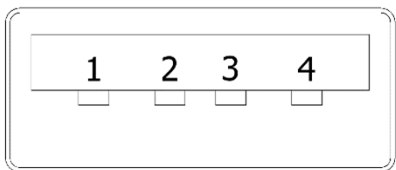
All cables that connect to the PTA 100i must be less than 3 m long.

Section 10.1 – 'PRINTER'

Compatible USB printers can be connected to the PTA 100i using the USB Type-A connector on the rear panel of the unit. Limited models of the following printer types are compatible with this device.

- Hewlett Packard (HP) Office-jet ink-jet (USB)
- Epson WorkForce (USB)

Please contact Copley Scientific to check which specific models are compatible.



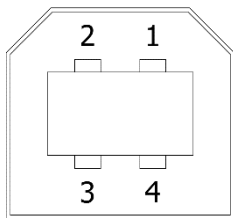
Pin	Function	Level	Description
1	VBUS	5 V	USB Power
2	D-	0 V to 5 V	USB Data-
3	D+	0 V to 5 V	USB Data+
4	GND	0 V	Signal Ground



Section 10.2 – 'PC'

This enables the PTA 100i to communicate with a host PC for the following functions via the USB Type-B connector on the rear panel:

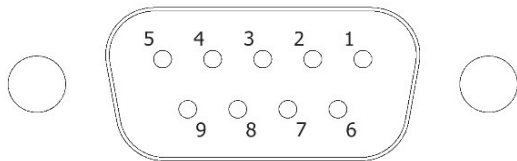
- Report data can be transmitted to a PC for data recording purposes
- The PC can be used to initiate the commands stated in Section 10.6.1



Pin	Function	Level	Description
1	VBUS	5 V	USB Power
2	D-	0 V to 5 V	USB Data-
3	D+	0 V to 5 V	USB Data+
4	GND	0 V	Signal Ground

Section 10.3 – 'RS-232'

The RS-232 enables the PTA 100i to communicate with a Label Printer, host PC or external system.



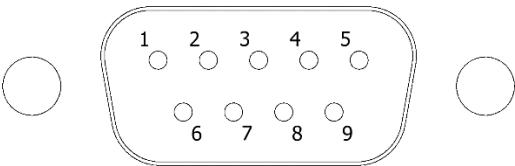
Pin	Function	Level	Description
1	N/C	N/C	Not Connected
2	RS-232 Tx	- 15 V to + 15 V	RS-232 Transmit
3	RS-232 Rx	- 15 V to + 15 V	RS-232 Receive
4	N/C	N/C	Not Connected
5	GND	0 V	Signal Ground
6	N/C	N/C	Not Connected
7	N/C	N/C	Not Connected
8	N/C	N/C	Not Connected
9	N/C	N/C	Not Connected



Section 10.4 – 'Balance'

A compatible Balance can be connected to the PTA 100i using the Balance connector on the rear of the unit. The following models are compatible with this device.

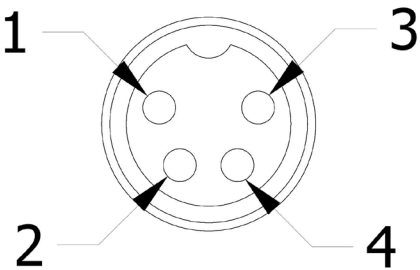
- Kern
- Ohaus



Pin	Function	Level	Description
1	N/C	N/C	Not connected
2	RS-232 Rx	- 15 V to + 15 V	RS-232 Receive
3	RS-232 Tx	- 15 V to + 15 V	RS-232 Transmit
4	N/C	N/C	Not Connected
5	GND	0 V	Signal Ground
6	N/C	N/C	Not Connected
7	N/C	N/C	Not Connected
8	N/C	N/C	Not Connected
9	N/C	N/C	Not Connected

Section 10.5 – 'SHUTTER'

This allows the PT 100i to be connected to the Shutter Module supplied with the PTW.



Pin	Function	Level	Description
1	VDC	0 - 1.5 V	LV Input
2	R	0 - 1.5 V	Reset
3	GND	0 V	Common
4	N/C	N/C	Not Connected



Section 10.6 – Setting-Up USB Communications with PC & RS-232

1. Connect the PTA 100i to a USB socket on the PC using a screened USB-A to USB-B cable, a USB to RS-232 adapter may be required for the RS-232.
2. Wait for the PC to install the drivers automatically. If the PC does not install the drivers automatically, please contact Copley Scientific for details on how the drivers can be installed manually.
3. On the PC, go to '*Devices and Printers*'.
4. The PTA 100i will appear as a device name '*FT232 USB UART*' or '*USB Serial Port*'.
5. Double-click on the icon.
6. Go to the '*Hardware*' tab.
7. Note the COM port number which should appear as '*COM3*' for example.



The COM port number may change when the connection is lost e.g. if the PC is turned off and on again, if the PTA 100i is turned off and on again, or if the USB cable is unplugged and plugged in again.

8. Open a terminal emulation program, such as Hyper-terminal. Contact Copley Scientific for details of alternative emulation programs.



9. In the terminal emulation program, set up a connection using the following settings:

USB Communication Settings	
Baud rate	PC (USB): 19200 bps, RS-232: 9,600 bps
Data bits	8
Stop bits	1
Parity	None
Flow control	None
Data output format	ASCII
Transmitted text	Append CR & LF

10. When the USB communication has been set up, set the PTA 100i to output data to a PC (see Section 5.4.3).

11. Reports will now be sent to the PC and should appear in the terminal emulation program window.



Commands are not case sensitive.
Commands must end in CR or LF (or both).
All responses end with a CR.

Section 10.6.1 – Command Set

Command	Action
DATE	Show the clock date and time
H	Show this command list
MODEL	Set the instrument model
SN	Show the machine serial number
TSCAL code	Touchscreen calibration (passcode)
V	Show the firmware version



Section 11. – Test Reports

Section 11.1 – Angle of Repose Test Report

Copley Scientific Angle of Repose Report
Test started: 11 Oct 2024, 9:17:11

Instrument:	Powder Testing Assistant
Model:	PTA 100i
Serial Number:	123456
Firmware Version:	1.4 Orc1
Test Platform Diameter (mm):	100
Measure Powder Cone Height (mm):	30.00
Calculated Angle of Repose (Degrees):	16.7

Notes

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Performed by Signature

Position Date

Checked by Signature

Position Date



Section 11.2 – Bulk Density Test Report

Copley Scientific Bulk Density Report
Test started: 11 Oct 2024, 9:18:11

Instrument:	Powder Testing Assistant
Model:	PTA 100i
Serial Number:	123456
Firmware Version:	1.4 Orcl
Density Cup Volume (mL):	25.0
Bulk Mass (g):	60.000
Bulk Density (g/mL):	2.4

Notes

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Performed by Signature

Position Date

Checked by Signature

Position Date



Section 11.3 – Orifice Flow (Fixed Mass) Test Report

Copley Scientific Flow Through an Orifice Report - Fixed Mass
Test started: 11 Oct 2024, 9:20:11

Instrument:	Powder Testing Assistant
Model:	PTA 100i
Serial Number:	123456
Firmware Version:	1.4 Orcl

Straight Cylinder Selected	
Orifice Diameter (mm):	15
Mass of Powder (g):	100.000
Test Time (s):	17.3

Notes

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Performed by Signature

Position Date

Checked by Signature

Position Date



Section 11.4 – Orifice Flow (Fixed Time) Test Report

Copley Scientific Flow Through an Orifice Report - Fixed Time
Test started: 11 Oct 2024, 9:25:11

Instrument:	Powder Testing Assistant
Model:	PTA 100i
Serial Number:	123456
Firmware Version:	1.4 Orcl

Conical Funnel Selected	
Orifice Diameter (mm):	15
Target Test Time (s):	10.0
Actual Test Time (s):	10.3
Conveyed Mass (g):	34.000

Notes

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Performed by Signature

Position Date

Checked by Signature

Position Date



Section 11.5 – Shear Cell Test Report

Copley Scientific Shear Cell Report
Test started: 11 Oct 2024, 9:30:11

Instrument:	Powder Testing Assistant
Model:	PTA 100i
Serial Number:	123456
Firmware Version:	1.4 Orcl
Consolidated Powder Volume (mL):	100.0
Disc Diameter (mm):	96.0
Yield Mass (g):	450.000

Notes

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.....

Performed by Signature

Position Date

Checked by Signature

Position Date



Section 12. – Conformance

Section 12.1 – Pharmacopoeia Declaration of Conformity



Copley Scientific Limited
Colwick Quays Business Park
Private Road No. 2, Colwick
Nottingham NG4 2JY
United Kingdom

Tel: +44 (0)115 961 6229
Fax: +44 (0)115 961 7637
Email: sales@copleyscientific.co.uk
Web: www.copleyscientific.com
Company No.: 1390012

DECLARATION OF CONFORMITY

We, Copley Scientific Limited, at the above address declare that the instrument described below, with regards to conception, construction, and execution of bringing to market by us, conforms with the relevant Pharmacopoeia requirements stated below:

Description of the Instrument:	Powder Testing Workstation
Model (Catalogue Number):	Powder Testing Workstation -PTW (Cat. No. 1670) Angle of Repose Module for PTW (Cat. No. 1674) Cylinder Module for PTW (Cat. No. 1671) Funnel Module for PTW (Cat. No. 1672)
Serial Number:	55,700 to 80,000
Followed Pharmacopoeia Requirements:	United States Pharmacopeia Section <1174> Powder Flow European Pharmacopoeia Section 2.9.16 Flowability Section 2.9.36 Powder Flow
Model (Catalogue Number):	Scott Volumeter -PTW (Cat. No. 6310)
Serial Number:	55,700 to 80,000
Followed Pharmacopoeia Requirements:	United States Pharmacopeia Section <616> Bulk Density of Powders European Pharmacopoeia Section 2.9.34 Bulk Density of Powders

This declaration will become invalid if alterations are made to the instrument described above without authorisation of the manufacturer.

Signed for and on behalf of the manufacturer:

Signatory: Jamie Clayton

Position of Signatory: Director

Date: 1st November 2024

Signature: 



Section 12.2 – ISO Declaration of Conformity



Copley Scientific Limited
Colwick Quays Business Park
Private Road No. 2, Colwick
Nottingham NG4 2JY
United Kingdom

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Fax: +44 (0)115 961 7637
Email: sales@copleyscientific.co.uk
Web: www.copleyscientific.com
Company No.: 1390012

DECLARATION OF CONFORMITY

We, Copley Scientific Limited, at the above address declare that the instrument described below, with regards to conception, construction, and execution of bringing to market by us, conforms with the ISO standards requirements stated below:

Description of the Instrument:	Powder Testing Workstation
Model (Catalogue Number):	Scott Volumeter -PTW (Cat. No. 6310)
Serial Number:	55,700 to 80,000
Followed ISO Standards Requirements:	3923-2 Metallic powders – Determination of apparent density
Model (Catalogue Number):	Metal Powder Testing Apparatus -PTW (Cat. No. 1681)
Serial Number:	55,700 to 80,000
Followed ISO Standards Requirements:	4490 Metallic powders – Determination of flow rate by means of a calibrated funnel (Hall flowmeter) 3923-1 Metallic powders – Determination of apparent density 13517 Metallic powders – Determination of flow rate by means of a calibrated funnel (Gustavsson flowmeter) *Funnels are mensurated according to the drawings on the standards

This declaration will become invalid if alterations are made to the instrument described above without authorisation of the manufacturer.

Signed for and on behalf of the manufacturer:

Signatory:	Jamie Clayton
Position of Signatory:	Director
Date:	1 st November 2024
Signature:	



Section 12.3 – ASTM Declaration of conformity



Copley Scientific Limited
Colwick Quays Business Park
Private Road No. 2, Colwick
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United Kingdom

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Email: sales@copleyscientific.co.uk
Web: www.copleyscientific.com
Company No.: 1390012

DECLARATION OF CONFORMITY

We, Copley Scientific Limited, at the above address declare that the instrument described below, with regards to conception, construction, and execution of bringing to market by us, conforms with the ASTM standards requirements stated below:

Description of the Instrument: **Powder Testing Workstation**

Model (Catalogue Number): **Scott Volumeter -PTW (Cat. No. 6310)**

Serial Number: **55,700 to 80,000**

Followed ASTM Standards Requirements:

B329 Apparent Density of Metal Powders and
Compounds Using the Scott Volumeter

Model (Catalogue Number): **Metal Powder Testing Apparatus -PTW (Cat. No. 1681)**

Serial Number: **55,700 to 80,000**

Followed ASTM Standards Requirements:

B212 Apparent Density of Free Flowing Metal Powders
Using the Hall Flowmeter Funnel

B213 Flow Rate of Metal Powder Using the Hall
Flowmeter Funnel

B417 Standard Test Method for Apparent Density of
Non-Free-Flowing Metal Powders Using the Carney
Funnel

B964 Standard Test Methods for Flow Rate of Metal
Powders Using the Carney Funnel

*Funnels are mensurated according to the drawings on
the standards

This declaration will become invalid if alterations are made to the instrument described above
without authorisation of the manufacturer.

Signed for and on behalf of the manufacturer:

Signatory: **Jamie Clayton**

Position of Signatory: **Director**

Date: **1st November 2024**

Signature:



Section 12.4 – UKCA Declaration of Conformity

	Copley Scientific Limited Colwick Quays Business Park Private Road No. 2, Colwick Nottingham NG4 2JY United Kingdom	Tel: +44 (0)115 961 6229 Fax: +44 (0)115 961 7637 Email: sales@copleyscientific.co.uk Web: www.copleyscientific.com Company No.: 1390012
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DECLARATION OF CONFORMITY

Document Number: Form 118-1680 UKCA DoC – PTA 100i Rev 01

We, Copley Scientific Limited, at the above address declare under our sole responsibility that the product(s) detailed below complies with the essential requirements of the following UK regulation(s) and their amendments:

- Electromagnetic Compatibility Regulations 2016
- RoHS Regulations 2012

Equipment Description:	Powder Testing Assistant
Make/Brand:	Copley Scientific Ltd
Model (Catalogue Number):	PTA 100i (Cat. No. 1680)
Serial Number:	55,700 to 80,000

Compliance of the equipment has been demonstrated by assessment against the essential requirements of the UK regulations and the following UK designated standards:

- EN 61326-1:2013 Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements
- EN 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

A technical file for this equipment is retained at the above address, by the signatory.



Signed for and on behalf of the manufacturer:

Signatory:	Jamie Clayton
Position of Signatory:	Director
Date:	1 st November 2024
Signature:	



Section 12.5 – CE Declaration of Conformity



Copley Scientific Limited
Colwick Quays Business Park
Private Road No. 2, Colwick
Nottingham NG4 2JY
United Kingdom

Tel: +44 (0)115 961 6229
Fax: +44 (0)115 961 7637
Email: sales@copleyscientific.co.uk
Web: www.copleyscientific.com

EU Authorised Representative:
Authorised Representative Service
77 Camden Street Lower
Dublin, D02 XE80, Ireland

EU DECLARATION OF CONFORMITY

Document Number: Form 65-1680 CE DoC – PTA 100i Rev 01



We, Copley Scientific Limited, at the above address declare under our sole responsibility that the product(s) detailed below complies with the essential requirements of the following EU directive(s):

- Electromagnetic Compatibility Directive 2014/30/EU
- RoHS Directive 2011/65/EU

Equipment Description:	Powder Testing Assistant
Make/Brand:	Copley Scientific Ltd
Model (Catalogue Number):	PTA 100i (Cat. No. 1680)
Serial Number:	55,700 to 80,000

Compliance of the equipment has been demonstrated by assessment with reference to the following harmonised European standards:

- EN 61326-1:2013 Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 1: General requirements
- EN 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

A technical file for this equipment is compiled and retained by Copley Scientific Ltd at the address above and is available through Authorised Representative Service at the address above.

Signed for and on behalf of the manufacturer:

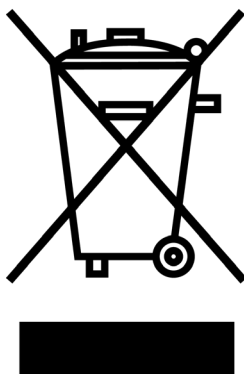
Signatory:	Jamie Clayton
Position of Signatory:	Director
Date:	1 st November 2024
Signature:	



Section 13. – Decommissioning, Dismantling, Disabling, & Scrapping

Electrical and Electronic Equipment (EEE) contains materials, components, and substances that may be hazardous. This can present a risk to human health and the environment when this waste is not handled correctly.

Equipment marked with the crossed-out wheeled bin symbol indicates that waste of electrical and electronic equipment should not be discarded together with unseparated municipal waste, but must be collected separately. As a consumer, you have an important role in recycling this equipment and contributing to the protection of the environment.



Copley Scientific is registered as a WEEE Producer with the UK Environment Agency and our WEE registration number is: WEEE/CKO300UX.

Copley Scientific meets its obligations to the WEEE Directive in the UK through membership of a Government Approved Producer Compliance Scheme and by providing its customers with a Recycling Program for end-of-life products.

When a Copley product reaches its end of life within the United Kingdom or European Union, please contact us at support@copleyscientific.co.uk to arrange its recycling. Copley Scientific Limited will then proceed to work with you on the correct actions to be taken for that product.



Section 14. – Technical Support

Should you have any queries or require technical information and support regarding the Powder Testing Work Station, or any other equipment Copley Scientific supplies, please do not hesitate to contact us.

Tel: +44 (0) 115 961 6229

Fax: +44 (0) 115 961 7637

Email: support@copleyscientific.co.uk

For details on your local distributor please consult our website:

www.copleyscientific.com



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Section 15. – Passcode



The passcode access will remain unlocked until you return to the home screen, this is indicated by the padlock symbol shown at the top of the display.

Set time and date menu:



479165



If desired, remove this page to restrict access to the '*Set date & time*' menu.



NOTES



NOTES

COPLEY

Manufacturer

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Colwick Quays Business Park, Road No.2,
Nottingham, NG4 2JY, United Kingdom

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EU Authorised Representative

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