



Operating Manual

PT-SV110

Scott Volumeter to test Bulk Density,
USP <616>, EP <2.9.34>, ISO <3923>



Version 1.0

Pharma Test Apparatebau AG

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The Documentation

This document describes the set-up, operation and general maintenance of the instrument. It should be used by the operators and the technical support staff responsible for the installation and set-up of equipment.

All attached equipment and parts must be used in compliance with the manufacturer's manuals and papers supplied.

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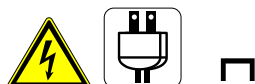
We reserve all rights.

This manual should be used by the owner of the instrument only. He is allowed to copy the manual for his own use. It is forbidden to supply any copy of this document for any other purpose other than the instrument use without previous approval from Pharma Test Apparatebau AG.

How to Use the Manual

To understand the different information we use different formatting:

- **Use any key (i.e. 1 or STOP)**
- Display information
- *Information entries*
- **Select from a menu**
- Note: informs about special use or possibility



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Document History

Version	Valid from	Author	Change	Remark
1.0	29.07.2024	Pharma Test	N	First release

Table 1: Document History

Index Information - Change:

N = New Document

C = Correction

R = Revision

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1 About the PT-SV110

The PT-SV110 manual powder tester is used to measure the bulk density of powders in compliance with the Pharmacopoeias EP <2.9.34> Method II and USP <616> Method II, DIN ISO <2923-2>, GOST <19440-94> and ASTM <B329> (optionally!) standards.

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the interparticulate void volume. Hence, the bulk density depends on both the density of powder particles and the spatial arrangement of particles in the powder bed. The bulk density is expressed in grams per mL (g/mL) although the international unit is kilograms per cubic meter (1 g/mL = 1000 kg/m³) because the measurements are made using cylinders. It may also be expressed in grams per cubic centimeter (g/cm³).

The bulking properties of a powder are dependent upon the preparation, treatment, and storage of the sample, i.e., how it was handled. The particles can be packed to have a range of bulk densities; however, the slightest disturbance of the powder bed may result in a changed bulk density. Thus, the bulk density of a powder is often very difficult to measure with good reproducibility and, in reporting the results, it is essential to specify how the determination was made.

The bulk density of a powder is determined by measuring the volume of a known weight of powder sample, that may have been passed through a sieve, into a graduated cylinder (Method I), or by measuring the mass of a known volume of powder that has been passed through a volumeter into a cup (Method II) or a measuring vessel (Method III).

The instrument consists of a solid base plate with a stand, a stainless-steel funnel with an integrated 18-mesh sieve (10-mesh optional), a baffle box, a powder collection tray and a powder receiving cup. The height of baffle box and funnel can easily be adjusted and locked into place without a risk of twisting and without using any tools. The baffle box can be swung in and out to make it easy to insert and remove the receiving cup. The base plate with integrated spirit level can be adjusted via three points to ensure a level installation.

To start the test, the powder is inserted into the stainless-steel funnel, flows through the baffle box via four glass plates, where the powder becomes decelerated to a unique flow speed, and is collected in the receiving cup. The bulk density is calculated externally by weighing the empty cup prior to the test and the filled cup afterwards. The difference of the two weighings is the weight of the powder in the cup. The inner volume of the cup is very exactly 25ml. So the bulk density will be calculated by net weight [g] divided by 25 [ml]. The result unit is [g/ml].

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Technical Data

Parameter	Specification
Material	Stainless Steel, POM, Glass
Net Dimensions W x D x H	PT-SV110: 23 x 29 x 43
Dimensions (Packaging) W x D x H	60 x 33 x 42cm
Net Weight	PT-SV110: appr. 5 kg
Gross Weight	Approximately 9 kg

Table 2: Technical Data

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2 Setup of the PT-SV110

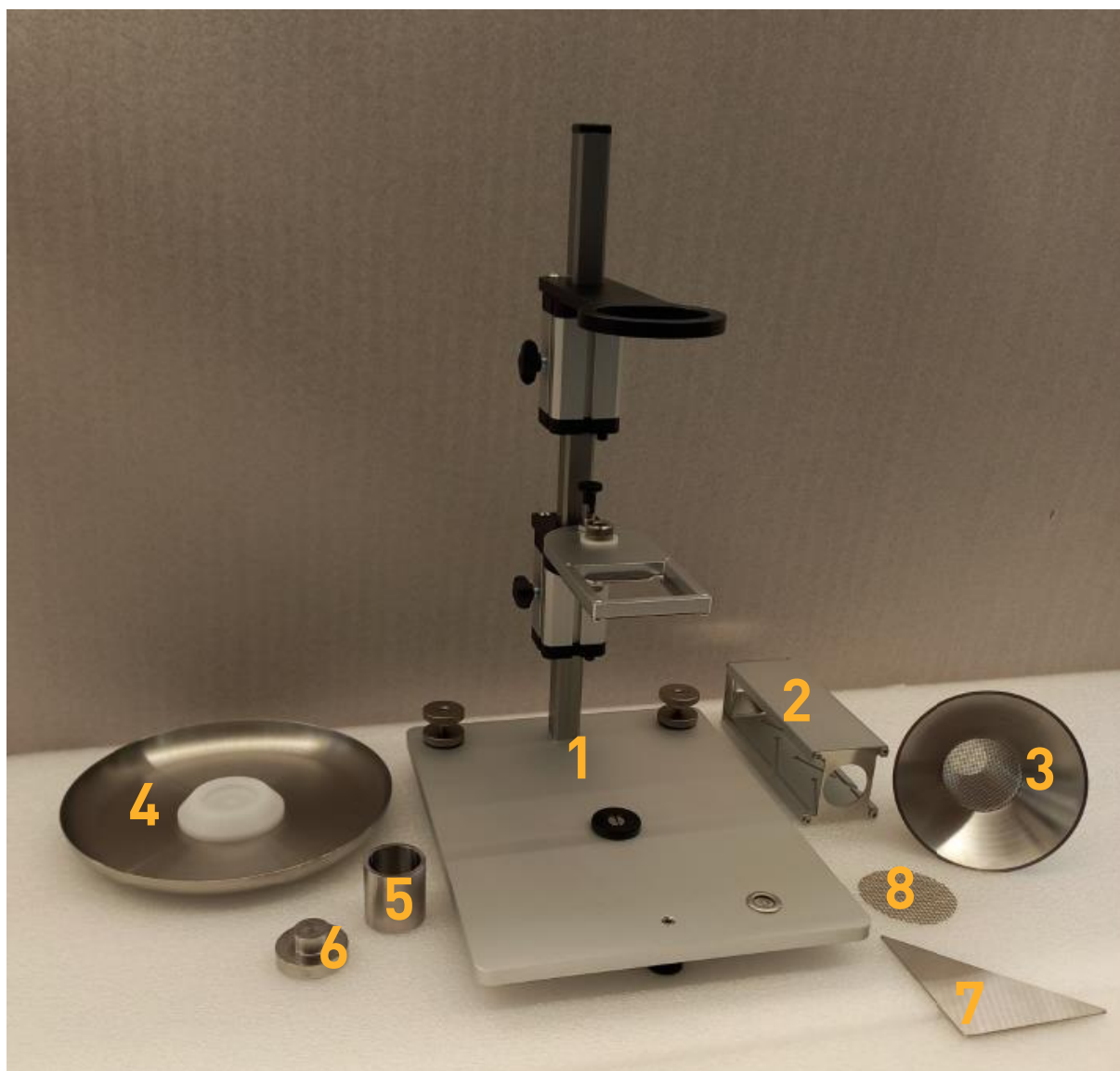


Figure 1: Overview major components of the PT-SV110

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2.1 Components of the PT-SV110

The PT-SV110 consists of these major components:

1. 496-0100 – Bottom plate with adjustable feet, vertical stand and platforms
2. 496-0200 – Baffle Box including Glass Plates
3. 496-0300 – Conical funnel, complete (upper and lower funnel including sieve disc)
4. 412-0100 – Overflow Saucer
5. 496-0405 – Receiving Cup 25ml
6. 496-0400 – Distance Gauge 19mm for correct height adjustment
7. 495-0030 – Stainless-steel Scraper
8. 496-0325 – Optional Sieve Disc with 10 Mesh size

Further Standard Scope (not illustrated):

- 002-6025 – Allen Key 2.5mm
- 002-6005 – Allen Key 5mm
- 495-0021 – Set of Spatulas for loading the Powder
- 285-1771 – Cleaning Brush for Powder Residues
- 495-0010 – Storage box, made from plastic

Optional equipment:

- 495-0037 – Receiving cup with smaller tolerances to fulfill ASTM regulations

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2.2 General Warning from wrong Usage



General warning from wrong usage:

The vertical rod, including the two adjustable platforms, comes already mounted like this.

Usually, it is never needed to remove the platform sliders from the rod!

As long as the sliders are attached to the rod, all is secured!

If you need to remove the sliders from the rod (for cleaning or trouble-shooting purposes), note the following steps:

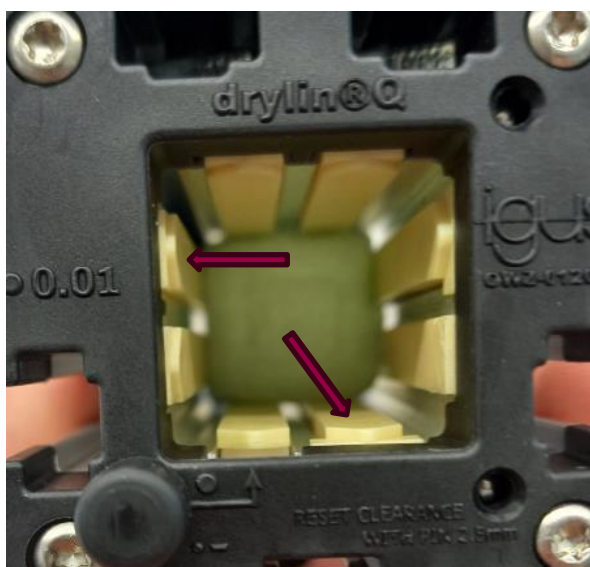


Inside the slider are 8 Teflon pieces for guiding the slider on the rod.

These sliders are not secured separately.

As long as the slider is attached to the rod, they are fixed.

If you remove the slider from the rod, the Teflon pieces may fall out and it is hard to introduce them again!



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So, in case removing the slider from the rod, use a piece of Styrofoam or some other suitable material and simultaneously with lifting the slider over the upper end of the rod, push the piece of foam **into** the slider to keep the inner hole **filled**!

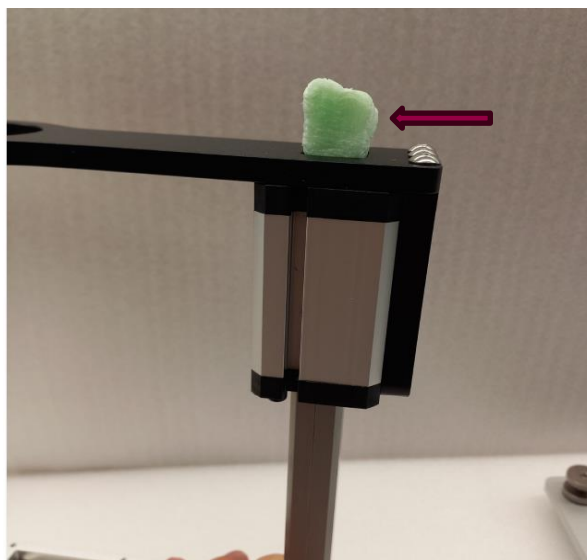
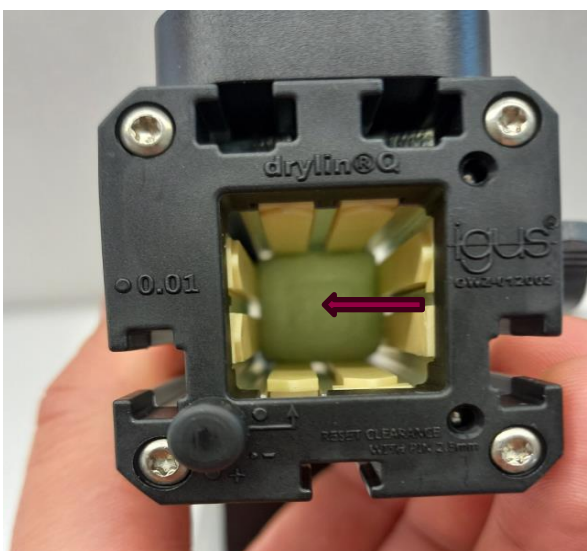


Illustration: slider lifted half the way from the vertical rod, piece of Styrofoam pushed to the inside.



Illustration: slider removed completely; Teflon pieces held in position by a piece of Styrofoam in the inner hole.



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2.3 Assembling the PT-SV110

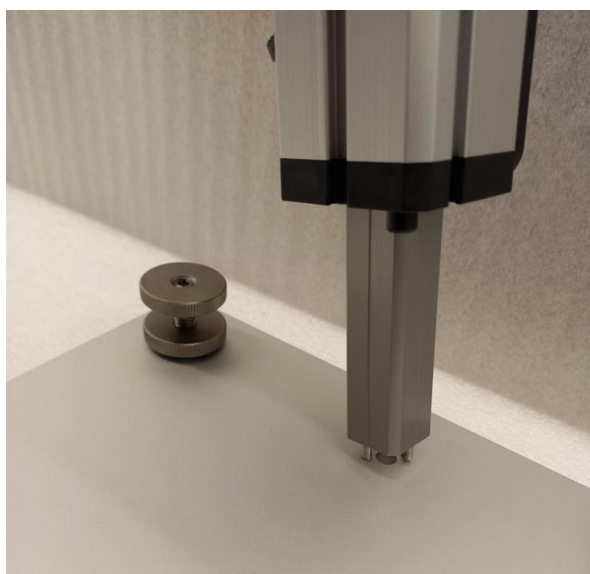
The PT-SV110 comes partially disassembled. Follow the next steps to setup the PT-SV110.

2.3.1 Assemble the base plate and the vertical rod.

Push the vertical rod, guided by the two pins at the downside, into the prepared holes at the back part of the base plate. The platforms on the sliders must point to the front!

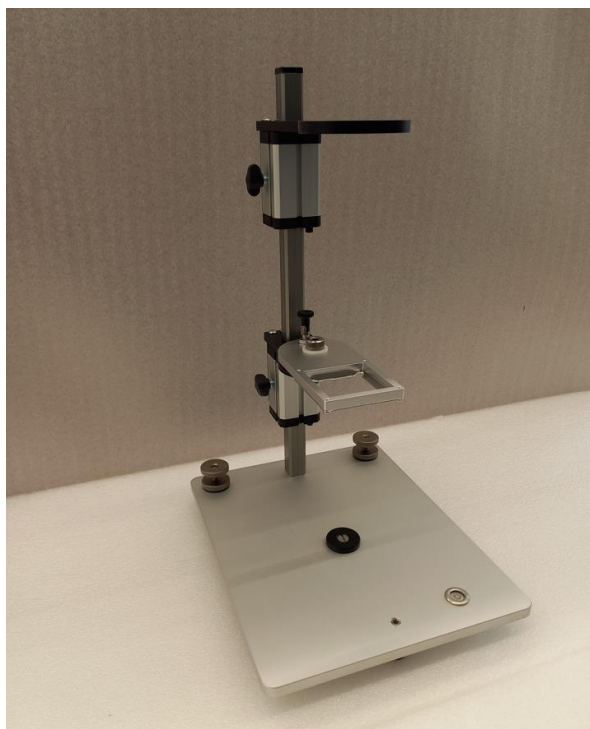
Use the 5mm Allen Key (part of the supply scope) and the M6 x 25mm cylindrical screw with washer and tighten the rod from the downside of the base plate.

Don't tighten the screw too hard! The vertical rod is just made from Aluminium.



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Illustration: PT-SV100 main frame correctly assembled.



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2.3.2 Assemble the baffle box



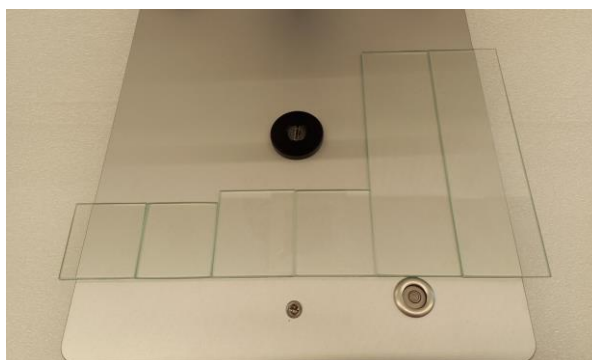
The glass plates can be cracked quite easily.

Handle the glass plates carefully to avoid damages and injuries!



There are three pairs of glass plates delivered to the instrument:

- Two short plates 496-0235
- Two medium plates 496-0225
- Two long plates. 496-0230

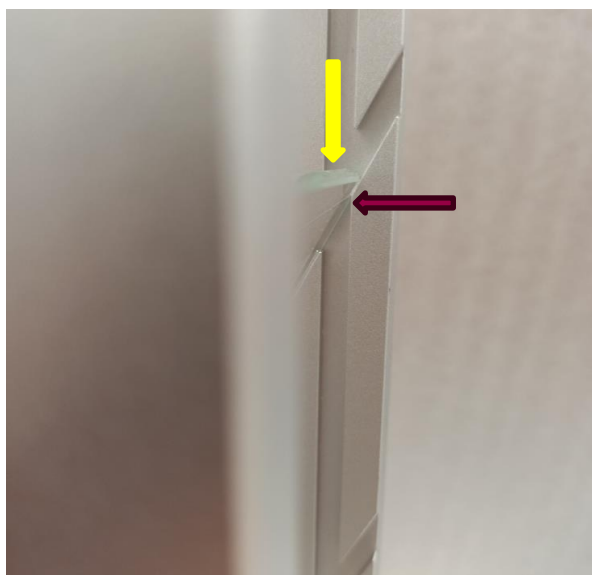


Please note: there are also slits in different lengths in the metal part of the baffle box.

The glasses and the slits match to each other if the glasses are inserted to the correct position.

The picture at the right **shows a wrong condition**: the medium plate (red arrow) is inserted to the slit for the short plate. So it is protruding into the vertical slit (yellow arrow) and the long plate can't be introduced!

Solution: insert the medium plate to the opposite side of the baffle box!



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If all six glass plates are inserted correctly, there is no relevant gap between the vertical and diagonal plates and the baffle box is completely closed at the 4 side walls.

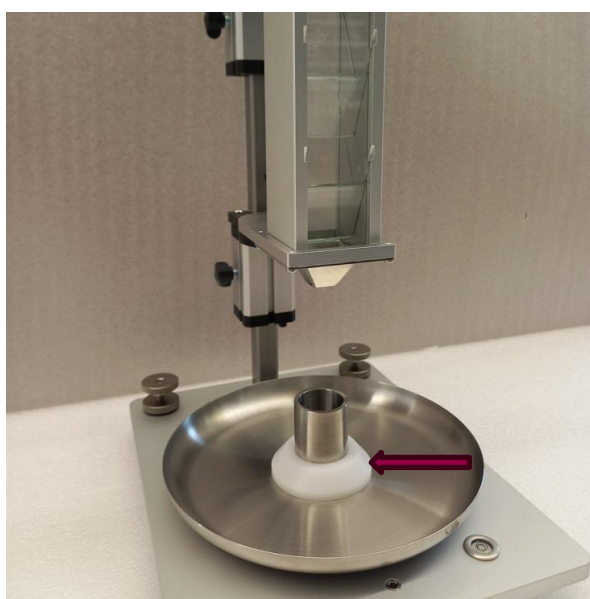
Place the baffle box onto the lower platform as shown here:



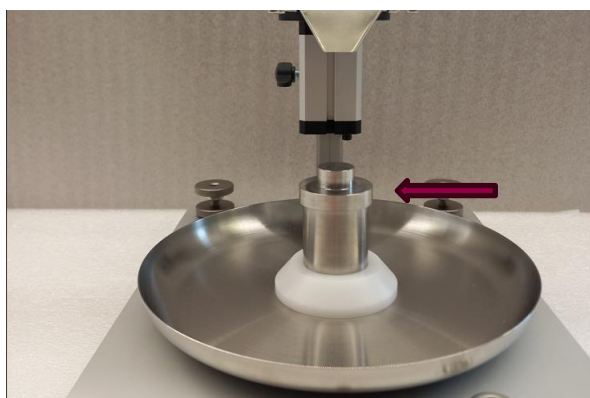
2.3.3 Adjust the dropping height

Information: the dropping height is not ruled in the EP/USP, but it is common practise to adjusted it to 19mm as defined in the ASTM standard.

Put the overflow saucer onto the base plate and place the receiving cup in the center of the saucer.



Place the distance gauge 496-0400 onto the receiving cup as shown here:
tall end upwards!



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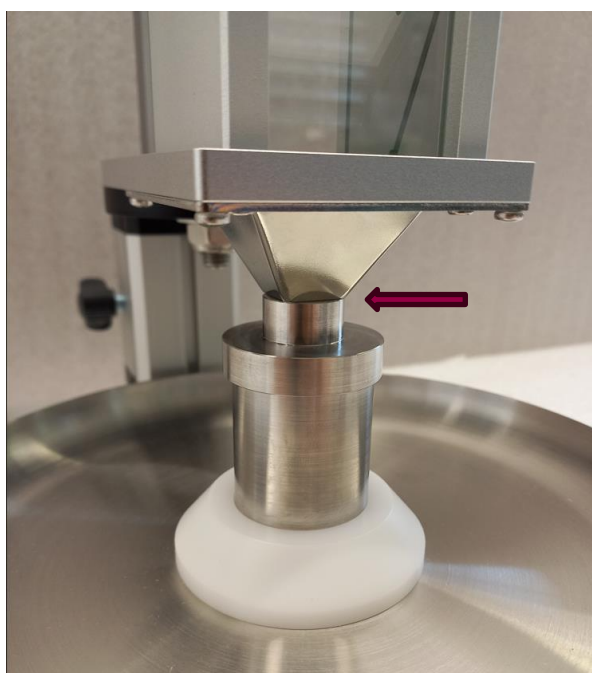
Now loosen the locking screw at the lower slider and...



... adjust the lower platform in this position:

The lower end of the baffle box outlet funnel must slightly touch the upper end of the distance gauge.

Tighten the locking screw at the slider again.



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The distance gauge should not be blocked after the adjustment. It should be easy to remove it sideways.

Now the dropping height of 19mm according to ASTM has been adjusted.



2.3.4 Changing the sieve disc

The funnel comes already mounted with the 18 mesh sieve disc inserted.

The following steps must only be followed if it is necessary to insert the sieve disc with 10 mesh size (larger holes).



The funnel assembly consists of 3 main parts:

- The narrow lower funnel part
- The broader upper funnel part (loading funnel)
- The sieve disc



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Loosen all four screws from the downside of the funnel rim using the 2.5mm Allen key (part of the supply scope).



Split the two funnel parts.

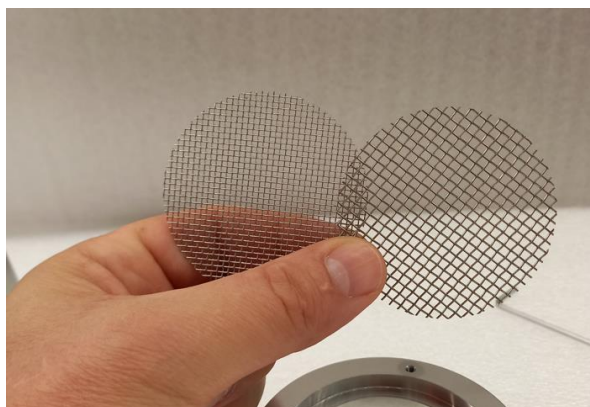


Remove the not needed sieve from the loading funnel.

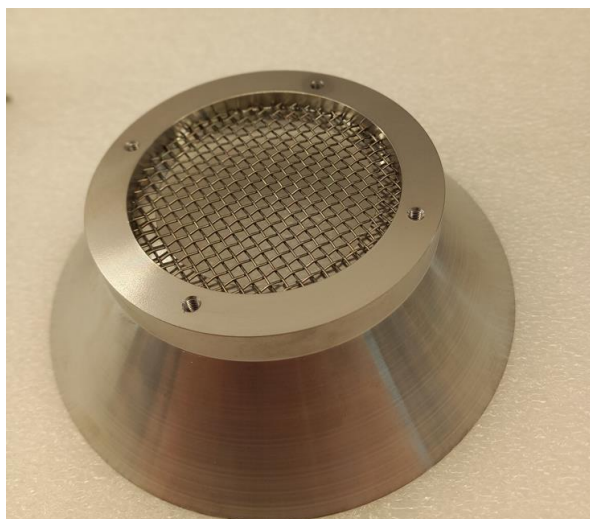


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Use the respective other sieve (part of the standard scope).



Insert it into the loading funnel.



Carefully assemble the funnel again.



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2.3.5 Insert the funnel into the PT-SV110

Introduce the funnel into the hole in the upper platform of the PT-SV110.



Loosen the locking screw of the upper slider.



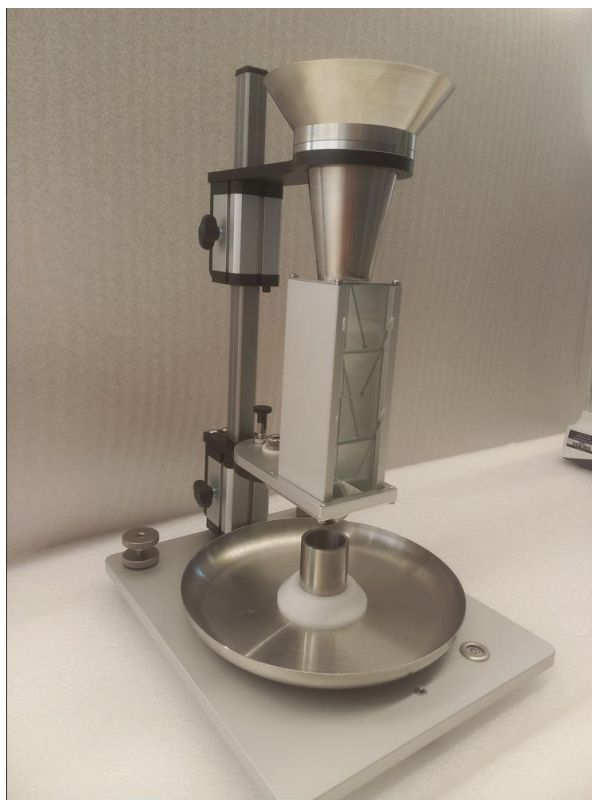
Adjust the height of the upper slider as shown here: the lower rim of the funnel assembly should rest completely in the corresponding hole on top of the baffle box, but without applying pressure to the baffle box.

Tighten the locking screw again.



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Illustration:
completely assembled PT-SV110



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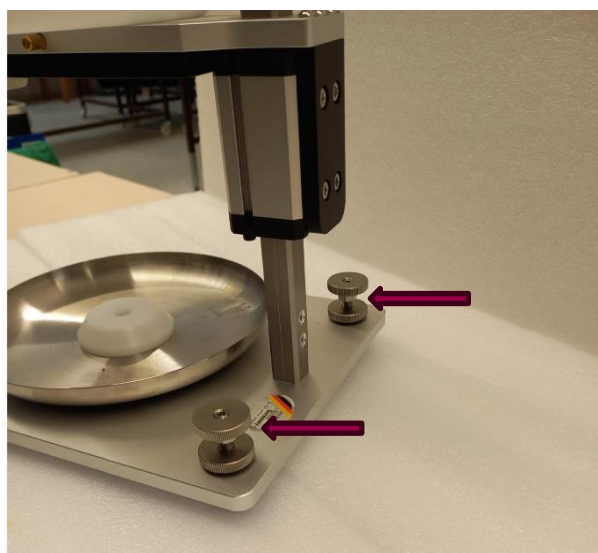
2.4 Placing the PT-SV100

Place the PT-SV110 instrument on a levelled bench.

Use a digital goniometer for levelling (not included in the standard scope). The spirit level on the base plate is only for approximate alignment.



Use the adjustable feed to level the instrument horizontally.



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Level the instrument horizontally also in front-back orientation, not only in left-right-orientation.

Pharma Test recommends an inclination of maximum 0.1° in every direction.



Finally check the levelling on top of the funnel. Here a maximum inclination of 0.2° is recommended.

If it is much more, check all screws for correct tightness.



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3 Using the PT-SV110

The PT-SV100 is fully assembled, equipped with the necessary parts, and correctly levelled as described in section 2.3 and 2.4.

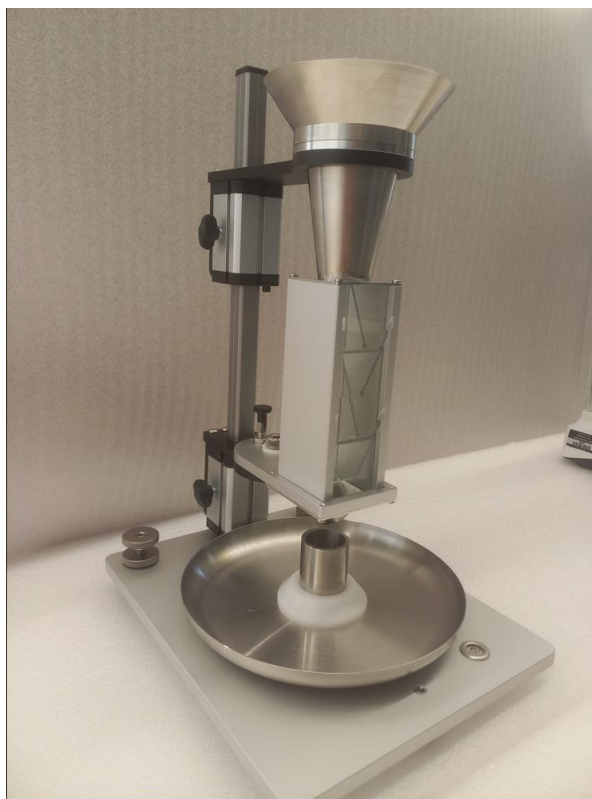


Figure 2: PT-SV100 correctly installed

Use an analysis balance (not part of the standard scope!) and determine the weight of the empty receiving cup.

Pharma Test recommends a balance with 3 decimals (1mg resolution).

2 decimals (10mg resolution) are not exact enough, 4 and more decimals (0.1mg or less) don't affect the final result significantly anymore.

Return the receiving cup back into the PT-SV110!



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Fill minimum 35 ml sample into the loading funnel in one go.

The set of spatulas (content of the standard scope) helps you to measure the correct volume.



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The sample falls through the baffle box, becomes decelerated to a reproducible speed by the 4 diagonal glass plates, and arrives in the receiving cup.

It is important that the sample overflows the receiving cup! For this reason, you must use minimum 35ml for the 25ml cup. It is allowed to use even more than 35ml.

Please note: For comparable repeated tests, the amount of sample should be equal more or less!

Pharma Test Apparatebau recommends to not differ more than 1ml within the tested volumes!



From now on it is important to shake the PT-SV110 as less as possible!

Every shake / bump / vibration will lead to a more compressed sample in the cup, influencing the result!

Use the brush (content of the supply scope) to brush sample residues from the loading funnel into the baffle box.



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Carefully remove the funnel assembly from the instrument.

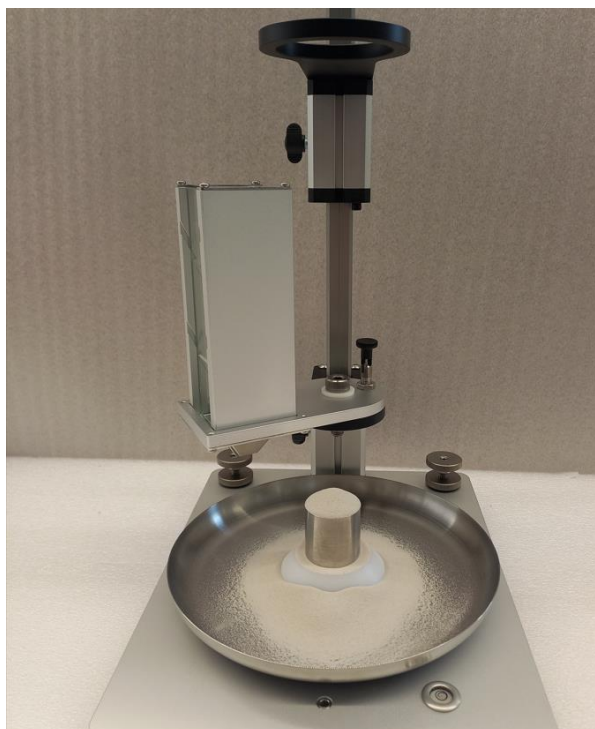


Pull the locking pin at the backside of the lower platform upwards to release it,



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Turn the lower platform to the side to have clearance above the receiving cup.



Use the stainless-steel scraper and...



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... scrape off the excess powder so that the powder forms a flat surface with the top edge of the cup.



From this condition on it is not necessary to be as sensitive as before: Now the amount of sample in the cup is constant.

If the powder compresses during the following steps, it has no impact on the result anymore.



Remove the cup from the saucer without spilling any content. Use the brush and clean the outside of the cup from sticking powder excess.



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Now weigh the filled cup with the analysis balance.



For calculation of the bulk density you can either

- use the Pharma Test Excel sheet (provided in the documentation link, following the QR-code on the type plate)
- or
- calculate it manually:

Pharma Test PT-SV110 Test Report									
Test No.	Date	Product	Lot No.	Performed by	Mass (M) empty cup	Mass (M) filled cup	Mass (M) of sample	Cup Volume (V)	Density (ρ)
1	13.02.2024	Sea sand	20010092	PT	114.32g	147.162g	32.842g	25ml	1.314g/ml
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
Statistics					Performed by: PT				
Mean Value					Date: 13.02.2024				
Standard Deviation									
Maximum									
Minimum									
					Approved by:				
					Date:				

Filename: CA-49-11000_PT-SV110_test_report.xlsx

In the example shown above:

Filled cup: **148.883g**

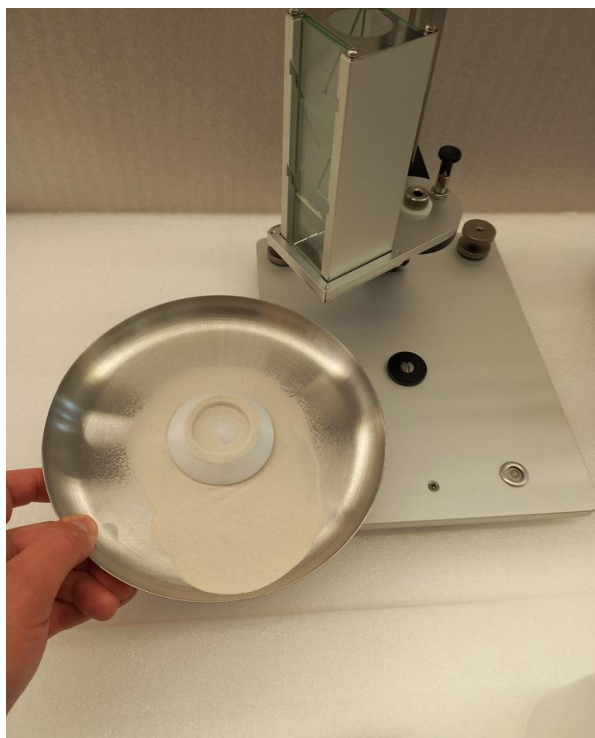
Empty cup: **115.840g**

Weight of the powder: Filled cup – Empty cup = 148.883g – 115.840g = **33.043g**

Bulk density = Weight / Volume = 33.043g / 25ml = **1.322 g/ml**

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Finally: remove saucer and baffle box and clean it, as well as the funnel assembly and the receiving cup, from the excess powder before starting a new test.



4 Maintenance and Cleaning

Clean the instrument after each preferably by using compressed air or similar means.

The instrument does not include any other parts which the user can maintain or repair. Repair work should be done by authorised service agents only.

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