

Powders: Bulk and Tapped Density

The bulk density of a powder is expressed in terms of grams per mL by dividing the weight of a given “untapped” powder sample by its volume.

It is important to ensure that no settlement occurs during preparation such that the density of the powder concerned is “as poured” and therefore includes the contribution made by the volume of the interparticulate void.

Tapped Density, on the other hand, is the density attained after “tamping down”. This is normally measured using an instrument that lifts and then drops a measuring cylinder or similar vessel containing the powder through a fixed distance.

The Tapped Density in grams per mL can now be calculated by dividing the sample weight by the final tapped volume.

Compressibility Index and Hausner Ratio

Measures of the ability of the powder to flow and its compressibility can now be given in the form of (a) the Hausner Ratio or (b) the Compressibility Index” (see below).

a. Hausner Ratio

= Tapped Density/Bulk Density

b. Compressibility Index

$$= \frac{\text{Tapped Density} - \text{Bulk Density}}{\text{Tapped Density}} \times 100$$

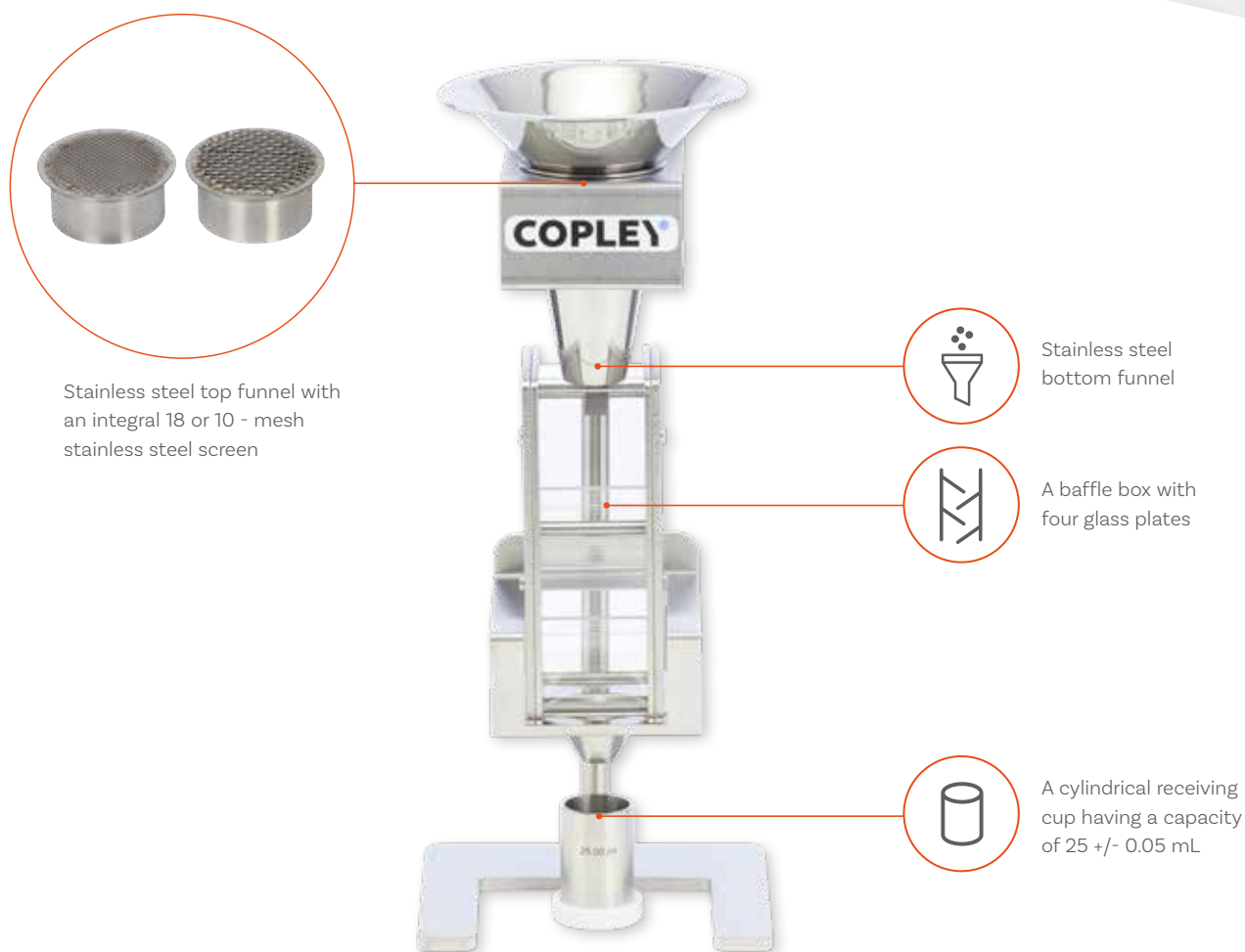
In a free flowing powder, inter-particulate interaction is less significant and unsettled and tapped densities will be closer in value. In poorly flowing powders, the inverse is to be expected. It follows that the closer the Hausner ratio is to 1, the better the flow. Powders with poor flow generally have a ratio of greater than 1.25.

Scale of Flowability		
Compressibility Index (%)	Flow Character	Hausner Ratio
< 10	Excellent	1.00 - 1.11
11 - 15	Good	1.12 - 1.18
16 - 20	Fair	1.19 - 1.25
21 - 25	Passable	1.26 - 1.34
26 - 31	Poor	1.35 - 1.45
3 - 37	Very poor	1.46 - 1.59
> 38	Very, very poor	> 1.60

Powders: Bulk Density Tester

The Bulk Density Tester (Scott Volumeter) is described in Ph. Eur. and USP and is designed for measuring the bulk density of fine powders and similar products.

The bulk density of powders can be extremely difficult to measure since the slightest disturbance may result in a change in the results. This is the result of the relationship between the particles that constitute the powder bulk. This same relationship affects the ability of the powder to flow. The Scott Volumeter obviates this problem.



Scott Volumeter

Cat. No.	Description
6301	Scott Volumeter with 18-mesh screen (USP <616> Method 2)
6302	Alternative filter insert with 10-mesh screen
6303	Volume Certification of the Receiving Cup
6305	Spare Receiving Cup
6306	Spare set of Glassware (4 x Baffles + 1 Front and Rear Plate)

Powders: Tapped Density Testers

A high reliability solution for routine measurement of the tapped density of powders, granules and similar products, the Copley JVi testers are the only single tapped density systems on the market that offer all three methods specified in Eur. Ph. and USP.

Available with either one or two test stations, the JVi tapped density series provides detailed reports, including Hausner ratio calculations for a wide range of industrial standards.



Ph. Eur. and USP
Compliant



Adjustable stroke frequency
control for accelerated or
high sensitivity testing



Intuitive touchscreen
control to simplify
operation



One to two test station
unit configurations



Supports Methods
1, 2 and 3



Extensive data
reporting output
options



Integrated calculation
of bulk density,
tapped density,
Hausner ratio and
compressibility index



Option to automate
and remotely control
JVi systems



JVi Series: Key Features



Various cylinder sizes available



Easily removable platforms for changing between methods



Supports Methods 1, 2 and 3



Intuitive touchscreen control with icon-based menu structure simplifies operation and clearly displays test parameters throughout run



Small footprint saves precious benchtop space



Robust metal case with advanced corrosion protective coating

JVi Series: Touchscreen User Interface



Key Features:

- **Intuitive menu structure** enables users to locate features quickly and easily
- **Easy-set** user-configurable **test parameters:**
 - Test speed
 - Number of taps
 - Test duration
- Status of 'Actual' v 'Set' test **parameters clearly displayed** throughout testing
- **Test progress bar** provides clear and constant indication on run status
- Resistive touchscreen interface can be **operated with gloves on**
- Hygienic **wipe-clean** screen
- High productivity - **easy system set-up and operation** minimises training burden.
- **Calculation of:**
 - Bulk Density
 - Tapped Density
 - Hausner Ratio
 - Compressibility Index

A

Setting a test parameter

B

Calculation screen (before data entry)

C

Set v Actual test parameters
(before test run)

D

Set v Actual test parameters (during test
run), with test progress bar

E

Calculation screen (after data entry)

F

Settings menu

G

Report output settings menu

H

Motor speed (TPM) verification



Reporting

Extensive data output options are available as standard, including direct reporting to a printer or PC.

Reported parameters

- **Speed (taps per minute)**

Set
Average
Maximum
Minimum



RS 232

- **Number of taps**

Set
Actual



USB A

- **Calculations**

Start weight/volume (g/mL)
End weight/volume (g/mL)
Bulk Density (g/mL)
Tapped Density (g/mL)
Hausner Ratio
Compressibility Index (%)



USB B

Compliance & Maintenance



- ✓ Certificate of compliance to Ph. Eur./USP provided as standard
- ✓ Comprehensive IQ/OQ/PQ documentation packages and toolkits available

Choose your JVi Tapped Density System



JV 100i

Cat Number
1631

Test Station Capacity
1 Cylinder

Eur. Ph and USP Test Methods Supported
1, 2, 3

Unit Dimensions (w x d x h)
260 x 347 x 562 mm (with 250 mL cylinder)



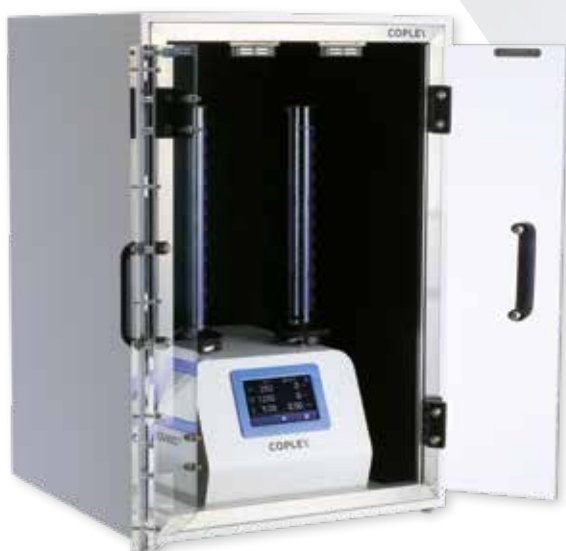
JV 200i

Cat Number
1632

Test Station Capacity
2 Cylinders

Eur. Ph and USP Test Methods Supported
1*, 2, 3
* Only one station available for this method

Unit Dimensions (w x d x h)
260 x 347 x 562 mm (with 250 mL cylinders)



Acoustic Cabinet
reduces the noise level
produced by the JVi series unit



JV 200i with Method 3 platform

JVi Series: Technical Specifications

Pharmacopoeial Compliance	Ph. Eur. 2.9.34 USP <616>
User Interface	Resistive touchscreen
Test Duration Parameters	Time or Taps
Testing Run Time	Up to 99 hours, 59 minutes, 59 seconds
Test Station Capacity	Up to 2 stations (1 left, 1 right)
Data Output	RS 232 USB Type A (for a USB printer) USB Type B (for communications with a PC)
Methods Supported Details	Method 1: 14 mm @ 300 taps/min Method 2: 3 mm @ 250 taps/min Method 3: 3 mm, 14 mm - 50/60 taps/minute
Alarm	End of testing (audible)

JVi Series

Cat. No.	Description	Cat. No.	Description
1631-1	Tapped Density Tester JV 100i – Method 1, 250 mL Cylinder	1604	250 mL Measuring Cylinder (spare)
1631-2	Tapped Density Tester JV 100i – Method 2, 250 mL Cylinder	1605	100 mL Measuring Cylinder (option)
1631-3	Tapped Density Tester JV 100i – Method 3 - 3mm Drop	1635	Tapped Density Method 3 Cup
1631-4	Tapped Density Tester JV 100i – Method 3 - 14mm Drop	1643	Platform for use with 250 mL Cylinder – Method 1
1632-2	Tapped Density Tester JV 200i – Method 2, 250 mL Cylinders	1644	Platform for use with 250 mL Cylinder – Method 2
1632-3	Tapped Density Tester JV 200i – Method 3 - 3mm Drop	1641	Platform for use with 100 mL Cylinder – Method 1
1632-4	Tapped Density Tester JV 200i – Method 3 - 14mm Drop	1642	Platform for use with 100 mL Cylinder – Method 2
1603	IQ/OQ/PQ Documentation Pack	1645	Platform for use with Cup – Method 3 - 3mm Drop
1616	Qualification Tools	1646	Platform for use with Cup – Method 3 - 14mm Drop
1617	Re-calibration of Qualification Tools	1636	Acoustic Cabinet for JV100i / 200i
		1609	50 mL Measuring Cylinder Kit
		1610	25 mL Measuring Cylinder Kit
		1611	10 mL Measuring Cylinder Kit
		1612	5 mL Measuring Cylinder Kit