



Operating Manual

PTG-M100

Manual Powder Flowability and Angle of Repose Tester



Version 1.0

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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 have to be used in compliance with the manufacturer's manuals and papers supplied.

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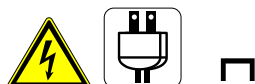
We reserve all rights.

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	21.06.2024	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 PTG-M100

The PTG-M100 manual powder tester is used to measure the flow behavior of granules and powders in compliance with the EP <2.9.36>, EP <2.9.16>, USP <1174> Pharmacopoeia and ISO 4324 standards. This instrument is used to determine the powder flow time and the powder's angle of repose. By using a laboratory balance also weight, density and the volume of the powder cone can be calculated. Furthermore, the EP "flowability" result can be calculated by measuring the flow time of 100g of sample through a specified pouring nozzle according to the flow through an orifice with funnel method.

The instrument consists of a solid base plate with a stand and a conical funnel, which can be equipped with different pouring nozzles. The optional PTG-M manual stirrer may be used for powders which do not flow well. The height of the stirrer and funnel can be adjusted freely up and down and locked into place without a risk of twisting and without using any tools. The instrument includes a powder collecting tray, which can be easily removed for cleaning. The base plate with integrated spirit level can be adjusted via three points to ensure a level installation.

To start the test, insert the powder into the funnel and open it by using the shutter. To measure the angle of repose, the product flows through the funnel and is collected on a 100mm diameter dish forming a cone. Once the powder flow stops, use the supplied digital height gauge to measure the height of the cone at its tip. Since the surface of the collecting dish is completely filled, the cone angle can easily be calculated. To measure the flowability, a stopwatch and a laboratory balance are used to check the time it takes for 100g of sample to flow through the funnel and to be collected inside a plastic beaker. Changing between these modes of operation is easy and does not require the use of any tools.

Technical Data

Parameter	Specification
Material	Stainless Steel, POM
Net Dimensions W x D x H	PTG-M100: 25 x 30 x 70 Gauge: 12 x 25 x 55
Dimensions (Packaging) W x D x H	80 x 40 x 55cm
Net Weight	PTG-M100: 6.5kg Gauge 7.0kg
Gross Weight	Approximately 15kg

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2 Setup of the PTG-M100



Figure 1: Overview PTG-M100 in the Configuration for Flow Measurement, with Manual Stirrer

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2.1 Components of the PTG-M100

The PTG-M100 consists of these major components:

- 496-0500 – Bottom plate with adjustable feet, vertical stand and platform with shutter for funnel & nozzle
- 412-0100 – stainless steel Powder overflow saucer
- 496-7100 – Conical funnel
- 496-7210 – Nozzle 10mm
- 496-7215 – Nozzle 15mm
- 496-7225 – Nozzle 25mm
- 412-1401 – Powder receipt dish 100mm (short form) for Flow test
- 412-1400 – Powder receipt dish 100mm (long form) for Angle test
- 496-7155 – Height Measuring Gauge, 300mm, with extended tip

Optional:

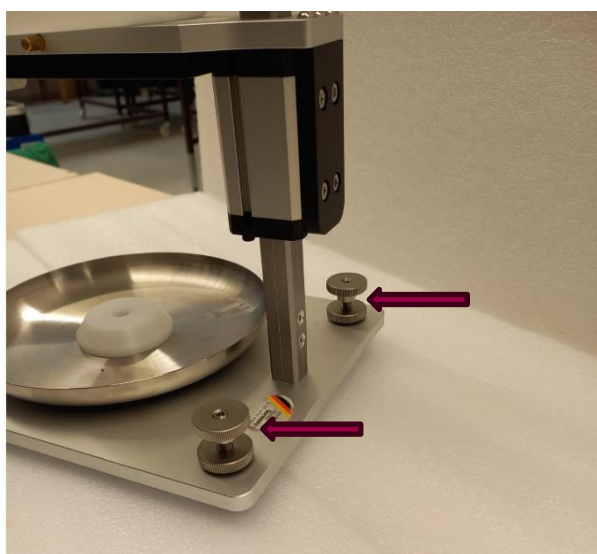
- 496-7000 – manual Stirrer

2.2 Placing the PTG-M100

The PTG-M100 comes almost completely mounted. Only a minimum of accessories must be attached or changed.

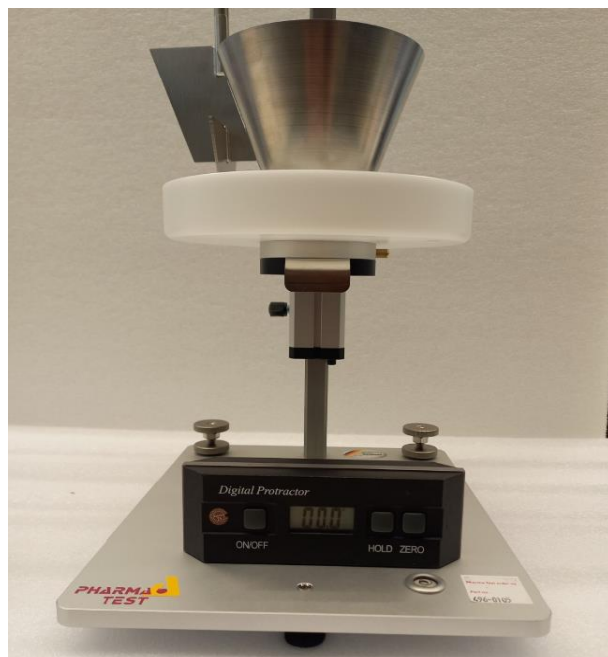
Place the PTG-M100 instrument on a levelled bench.

Use the adjustable feed to level the instrument horizontally.



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



2.3 Setting up the Height Measurement Gauge

Unpack the height measurement gauge.



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The height measurement gauge comes with a short, angled tip, a long, straight tip, and a rectangle connector.



Attach the long tip to the gauge as shown here:



Use the screwdriver (scope of the height gauge) to open the battery compartment.



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Insert the button cell (type LR44, respectively type AG13, respectively type 357 - scope of the height gauge) into the battery compartment.



Close the battery compartment again.



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2.4 Using the Height Measurement Gauge

The gauge can be turned on with the "ON/ZERO" button and turned off with the "OFF" button.

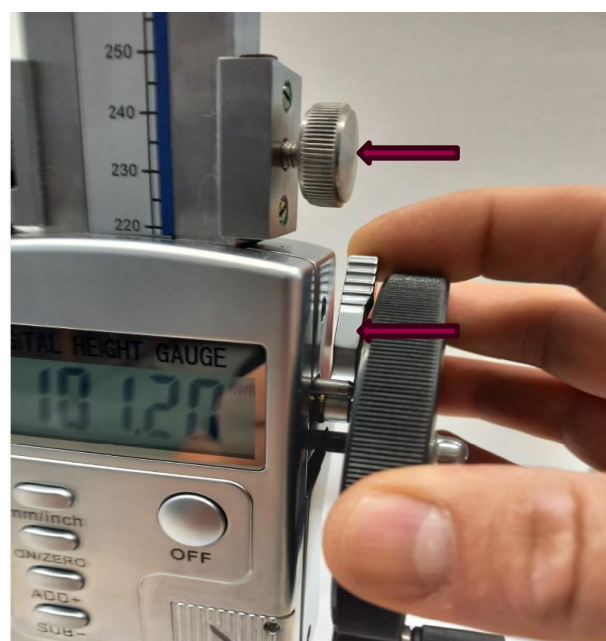
While turned on, the display shows numbers.



The height gauge can be tared to zero anytime by pressing the "ON/ZERO"-button.



The gauge has two stoppers to prevent it from moving by mistake! A metal lever (lower arrow) and a knurled screw (upper arrow). To move the gauge on the vertical pile, both stoppers must be released.



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Main stopper (lever) pushed to the back:
locked.



Main stopper (lever) pushed to the front:
unlocked.



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Fine stopper (Knurled screw):
tightened = locked,
loosened = unlocked.



While both stoppers are unlocked, the height gauge can be moved up/down by turning the large, black wheel.



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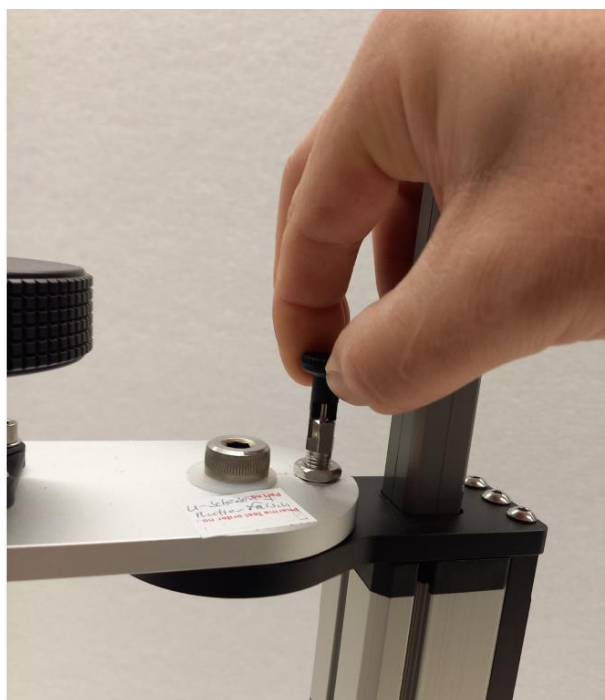
2.5 Setting up the PTG-M100

Section 2.5.1 About the Stirrer

If the PTG-M100 is equipped with a manual stirrer, the stirrer can freely be lifted by hand.



If the stirrer is not needed or you need clearance at the funnel, pull the lock pin upwards and...



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...simply turn the entire stirrer platform to the side.

Later, when using the stirrer, simply return it into the funnel and lower the locking pin again.



The immersion depth of the stirrer blade into the funnel can be adjusted by loosening the locking screw for the stirrer platform, placing the stirrer higher/lower and tightening the locking screw again.



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Section 2.5.2 Funnel & Nozzle

The funnel & nozzle assembly is locked by a pin in the platform on the lower slider.



To remove the funnel & nozzle assembly, push the locking pin to the inside and...



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...lift the assembly vertically upwards.



Now the plastic powder saucer can be removed as well. (for cleaning purposes or in case it is not needed.)



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The funnel & nozzle assembly consists of 3 parts:

- Funnel
- Nozzle
- Union nut



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Loosen the union nut to split the parts.



The standard scope of the PTG-M100 contains three nozzles in different sizes:

- 10mm hole
- 15mm hole
- 25mm hole



Insert the needed nozzle to the funnel.
In this picture: the 25mm nozzle.



Secure the parts by the union nut.



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Whenever assembling funnel & nozzle, check the inside of the assembly for a flat surface (no gap!)



Now insert the chosen funnel & nozzle assembly to the platform by pushing the locking pin, insert the assembly and...



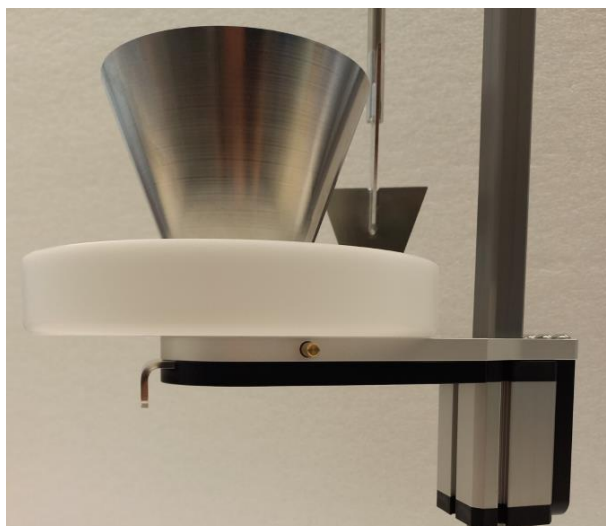
...release the pin again.

This illustration shows the insertion of the funnel & nozzle assembly without the plastic powder saucer.



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In case of using the plastic powder saucer, put on the saucer to the funnel & nozzle assembly before inserting it to the platform and insert both together in the same way as described above.



Section 2.5.3 About the Shutter

The shutter must be moved manually. It opens /closes the nozzle.

This illustration shows the shutter pushed to the inside. The nozzle (not present here!) would be closed.



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This illustration shows the shutter pulled to the outside. The nozzle (not present here!) would be opened.



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3 Using the PTG-M100

3.1 Flow Test

Setup for flow test:

Fix the lower platform in a sufficient height to place the beaker below the platform. The total height does not matter for the flow test.



Figure 2: Setup for Flow Measurement

The platform position can be adjusted simply by loosening the locking screw and move the platform up/down



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The PTG-M100 offers enough space to even place a standard laboratory balance (not included to the standard scope!) plus beaker below the nozzle.

A balance can be used for advanced analysis of the flow characteristics.

Ask your local balance supplier if the balance can record a "weight over time" characteristics and maybe print a graph accordingly.



Close the shutter.



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Fill the funnel with at least 100 grams of powder. The exact amount of must be well known.



Open the shutter and start a stop watch (not included to the standard scope!) simultaneously.



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Measure the time until the powder has flown completely through the nozzle into the beaker. The time must be measured in seconds and tenth of seconds.



Calculate the Flowability expressed in seconds and tenth of seconds related to 100 grams of sample.

The results can be expressed as the following:

- a) the mean of the determinations, if none of the individual values deviates from the mean value by more than 10 per cent;
- b) as a range, if the individual values deviate from the mean value by more than 10 per cent;
- c) as a plot of the mass against the flow time;
- d) as an infinite time, if the entire sample fails to flow through.

Figure 3: Result evaluation according to EP 2.9.16 (Edition 10.3)

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3.2 Angle of Repose

For the Angle of Repose measurement, place the powder collecting table with the vertical extension (412-1400) in the PTG-M100.

Differently to the Flow Measurement, a consistent fall height is needed for comparable results.

An exact height isn't specified in the EP/USP.

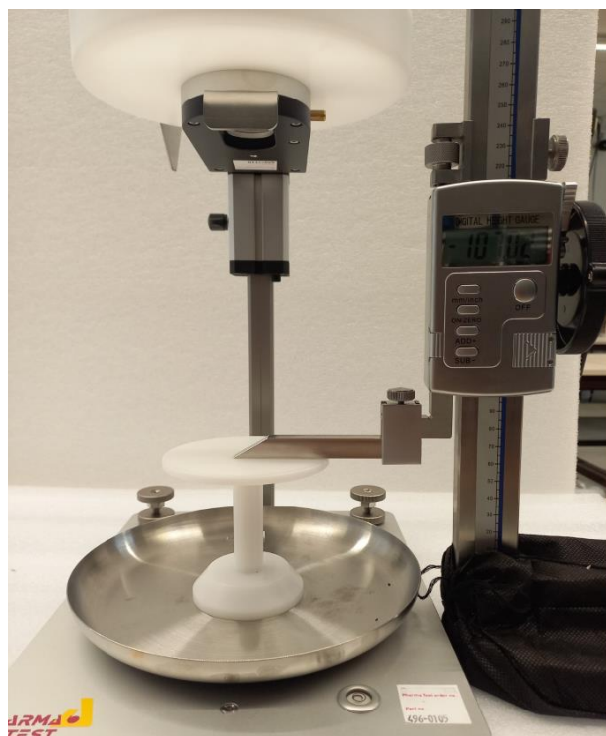
Pharma Test recommends a height of 100mm, but you can also use any other height you are used to.

The following pictures show a setup to a falling height of 100mm!



Figure 4: Setup for Angle of Repose Measurement

Use the height measurement gauge and detect the upper surface of the powder collecting table.



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Push the “ON/ZERO” button to tare the gauge to zero.

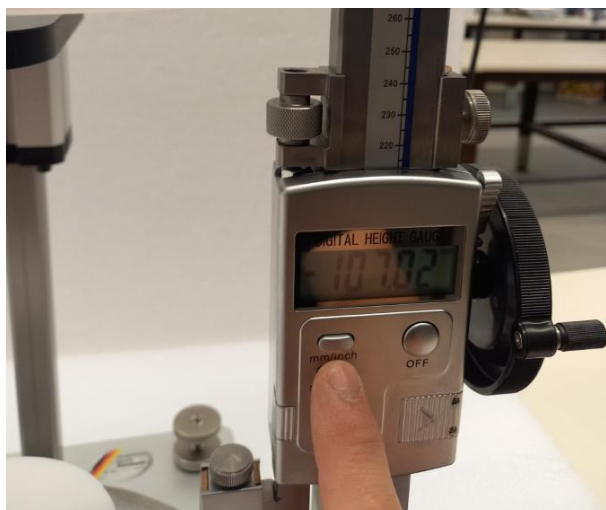


Illustration: gauge tared to zero.



From this point move the gauge upwards to approximately 100mm.

Do not push “ON/ZERO” again!



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Now lock the Fine Stopper (not the lever for the main stopper!).



Use the vertical screw on the left to adjust the gauge to 100 mm exactly. (It is not needed to adjust even the hundredth of Millimeter! Tenth of Millimeter is sufficient!)



It is no necessity at this point, but if you want, you can lock the main stopper right now.



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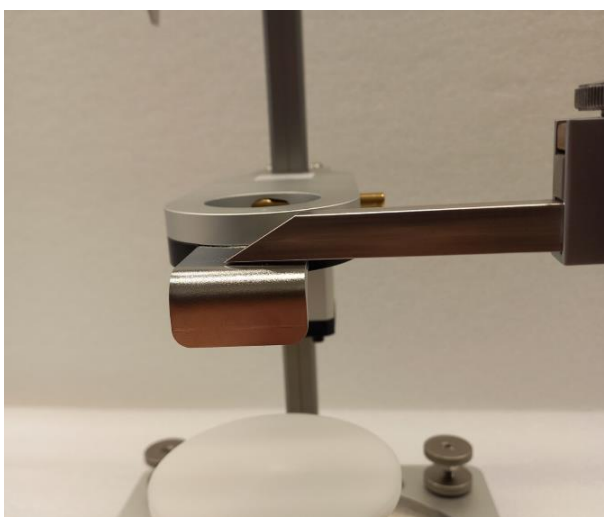
The platform position can be adjusted simply by loosening the locking screw and move the platform up/down



Adjust the lower platform to this position.

The upper surface of the shutter (pull the shutter to the outside for easier measurement) corresponds to the lower surface of the nozzle.

So, this way the fall height is adjusted to 100mm.



Close the shutter and attach the funnel & nozzle if not already done.



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Fill the funnel with testing powder.

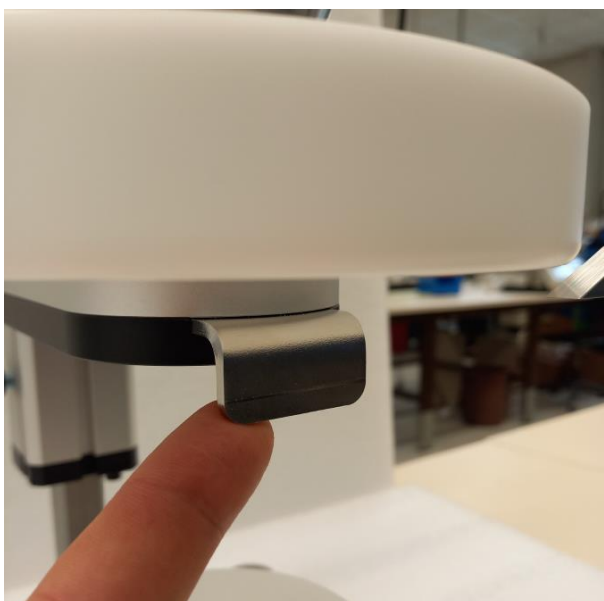
Please note: the Angle of Repose Measurement works reliable only when using enough powder.

It is necessary that the powder overflows the powder receipt table after building a cone and some overflow arrives in the stainless steel overflow saucer!

Pharma Test recommends an amount of approximately 140 grams.



For test start, open the shutter.



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The powder flows through the nozzle onto the powder receipt table and builds a cone.



Once the complete powder has flown through, use the Height Measurement Gauge (the zero value is still adjusted to the table surface!) and measure the height of the cone.



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For this, use the experience you earned above in fine adjustment of the Gauge and carefully detect the tip of the powder cone!

Attention: Every vibration or touch of the cone will lead to a collapsing tip!



The Gauge shows the height of the cone.



The angle of repose is calculated simply by the “Tangens” formula:

$$\tan(\alpha) = \frac{\text{height}}{0.5 \times \text{base}}$$

The base (diameter of the Powder Receipt Table) is 100mm!

So, the angle of repose in the example above is:

$$\alpha = \tan^{-1} \left(\frac{30.84 \text{ mm}}{0.5 \times 100 \text{ mm}} \right) = 31,7^{\circ}$$

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Evaluate the result according to the EP/USP or by a criteria of your own choice.

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

Figure 5: Flow property according to EP 2.9.36 (Edition 10.3)

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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