

# The automatic Ring Shear Tester RST-01.pc

## Capabilities

The Ring Shear Tester RST-01.pc provides computer-controlled measurement of the flow properties of powders and other bulk solid materials, under conditions which duplicate handling situations. Such properties are useful for many applications:

- Product development
- Product characterization
- Quality control
- Comparative tests
- Troubleshooting
- Silo design

## Why are flow properties important?

A material's flow properties determine how it will behave in bins, hoppers, feeders, and other handling equipment. Knowing these properties is essential in product development, so that flow problems can be avoided.

Flow properties are also important for quality control. By checking the relative flow properties of a given bulk solid before it is placed into your system, you can reject and recycle unsatisfactory batches, thereby preventing costly handling problems from occurring downstream.

## What flow properties need to be measured?

The most important properties are cohesive strength and its increase with time, internal and wall friction, bulk density, and compressibility. While each of these parameters is affected by the material's particle size distribution, particle shape, surface characteristics, and moisture content, there is no direct correlation which allows these variables to be used to calculate the material's flow properties. Therefore, only those testers which directly measure the properties listed above should be considered.

## Why choose the Ring Shear Tester RST-01.pc?

First, this is a **real shear tester**. This is important, since shear testers are the only internationally recognized means to measure the flow properties of powders and bulk solids.

Second, this tester is **easy to use**, requiring minimal operator training and skill. In addition, the time required to test a material and analyze the results is also minimal.

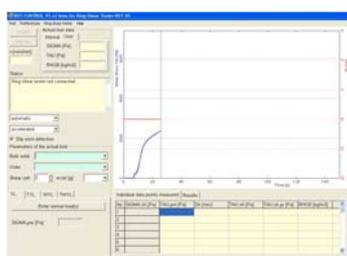
Third, this tester is **extremely versatile**. Materials which are free flowing, very poor flowing, or require large shear deformation can all be tested. The applied stress level can be varied over a wide range, consistent with how your material is being handled. Shear cells of different volumes allow the testing of limited quantities of your material. The tester can even be used to measure the attrition properties of materials such as granules, flakes and pellets.



○ Ring Shear Tester RST-01.pc

## Testing procedure

The testing procedure follows ASTM-D6773 ("Schulze Ring Shear Tester"). The powder specimen is contained in an annular trough. A vertical load is applied through an annular lid. To shear the powder, the shear cell rotates relative to the lid, and the torque necessary for shearing is measured. As with the Jenike shear tester, which has been used since the 1960's, yield loci, wall yield loci and time yield loci can be measured, whereby the Ring Shear Tester RST-01.pc performs all steps automatically. Usually, a yield locus test requires less than 20 minutes.



○ RST-CONTROL 95 (screen shot)

The Ring Shear Tester RST-01.pc is controlled by the new software RST-CONTROL 95 for MS Windows\*. The software provides several modes of operation. Standard procedures can be used, where test parameters such as the consolidation stress are entered once. Thus, the operator can start a test just with some mouse clicks. For special applications a semi-automatic test mode is provided. Here the operator observes the measured data on the screen and controls the test via the PC keyboard or the mouse.

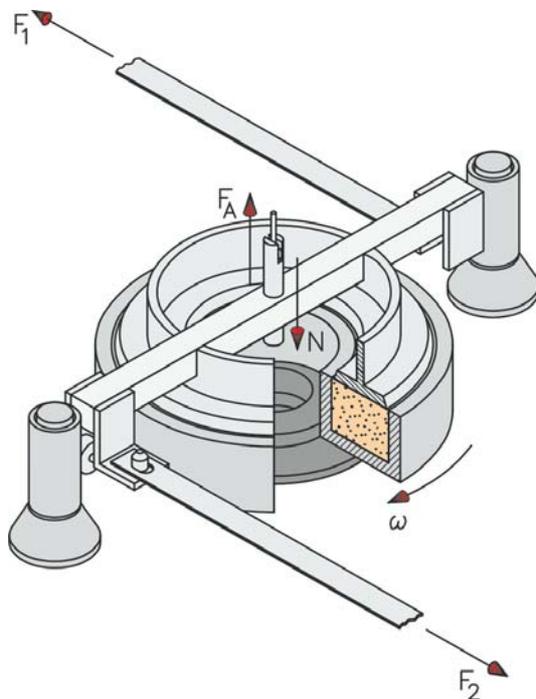
In contrast to shear testers where weight pieces are used for the adjustment of the normal load, the Ring Shear Tester RST-01.pc with the computer-controlled adjustment of the normal load makes possible to enter the normal load as normal stress (e.g. in Pascals or in psi).

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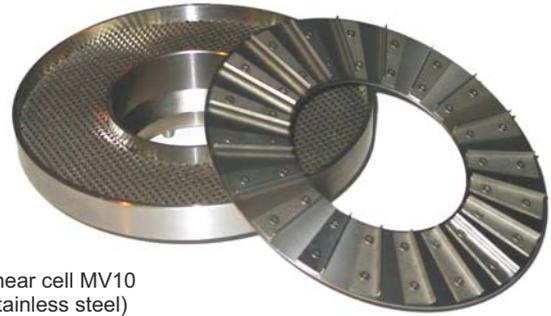


## Primary operational components

- Automated load application** - The vertical load,  $N$ , as shown in the cut-away view, acting on the bulk solid sample is adjusted via computer commands, which direct a motor to shift weights on a lever arm (max. 450 Newton; normal stress depends on shear cell dimensions). No weights need to be handled by the operator
- Digitally controlled motor drive for shear cell rotation** - Cell rotation,  $\omega$  (see cut-away view), is also computer-controlled, providing flexibility particularly when conducting particle attrition tests.
- Twin load beam shear force measurement** - The shear force,  $F_1$  and  $F_2$  (see cut-away view), is automatically measured and the output is viewed in real time via a computer (diagram).
- Counterweight system** - Testing at very low pressures is accomplished with a counterweight system to reduce the weight of the lid and other parts connected to the lid. Thus, tests at stresses  $< 500$  Pa are possible.
- Inductive displacement transducer measures sample height** - Bulk density is calculated and displayed during shear testing and compressibility testing.
- Shear cell** - With the Ring Shear Tester RST-01.pc a standard shear cell is delivered. For wall friction tests a specially designed wall friction cell is available. Additionally cells with volumes of about  $85 \text{ cm}^3$  to  $900 \text{ cm}^3$  are available made from aluminum or stainless steel.



○ Cut-away view of the shear cell



○ Shear cell MV10 (stainless steel)

## Software

The control software RST-CONTROL 95 for Microsoft Windows\* (with speech output for supporting the operator) serves for controlling the Ring Shear Tester ("Test on a mouseclick") as well as for the automatic evaluation of the test results. The software package additionally contains the program RSV 95 for the detailed analysis of the test data and for the output of the results, e.g. as diagram, table or report, with the possibility to export the data/diagrams to other applications (e.g. word processor, spreadsheet).

### PC specifications for RST-CONTROL 95 software

- Microsoft Windows XP/Vista/7/8/10\*
- Serial communication port (optimum) or USB port

### Ring shear tester RST-01.pc specifications

- Approx. 1300 mm x 1040 mm x 410 mm (H x W x D)
- Weight: approx. 115 kg
- Power requirements: 110V-240V, 50-60Hz, 80 W
- Normal stress up to 20 kPa with standard shear cell M, 55 kPa with small shear cell S
- Shear velocity approx. 0.005 to 30 mm/min (standard shear cell)
- Maximum particle size of specimen: Dependent on shear cell; with standard shear cell about 10 mm for broad particle size distributions; about 5 mm for narrow particle size distributions

### Small Ring Shear Tester RST-XS.s

An alternative to the Ring Shear Tester RST-01.pc is the small automatic Ring Shear Tester RST-XS.s with specimen volumes from 3.5 ml to 70 ml.

### Powder testing service

If you need to analyze a limited number of materials or solve a specific handling problem, but do not have the time or budget to develop your own lab capabilities, we can still help and arrange qualified powder lab services.

### Further information

Detailed information on our products and some general information about powder and bulk solids you will find on our website [www.dietmar-schulze.de](http://www.dietmar-schulze.de).

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**Dr.-Ing. Dietmar Schulze**  
Schüttgutmesstechnik

Dr. Dietmar Schulze, Am Forst 20, D-38302 Wolfenbüttel  
Phone +49 5331 935 490, Fax +49 5331 978 001  
mail@dietmar-schulze.de, Web: [www.dietmar-schulze.de](http://www.dietmar-schulze.de)