



DENSITY BALL Model 475



testing equipment for quality management



Technical Description and Operating Instructions

DIN 53 217, Part 2
VDA 621-113
ISO 2811, Part 2

**A Simple Method
for Determining the
Density of Liquids**

Purpose and Application

The **Density Ball, Model 475**, is a rapid method of determining the density of paints, coating materials and other (non-pasty) fluids.

Test Principle

A body immersed in a liquid produces an upward force from which the density of the liquid can be calculated on the basis of the known volume of the body.

Design and Function

The Density Ball, Model 475, consists of a spherical body (made of stainless steel, material no. 1.4035) and a holding rod with neck section.

The following versions are available:

- ◆ **Model 475/I**, with a volume of 100 ml ± 0.1% (at 20 °C)
- ◆ **Model 475/II**, as above but with conformity assessment (instead of official calibration certificate, according to the new calibration law dated 01.01.2015)
- ◆ **Model 475/III**, with a volume of 10 ml ± 0.1 % (at 20 °C)
- ◆ **Model 475/IV**, as above but with conformity assessment (instead of official calibration certificate, according to the new calibration law dated 01.01.2015)

The spheres can be fixed to a laboratory balance or a table stand with swivel arm by using a slewable holding device.

Test Procedure and Evaluation

The specimen material is filled into a glass beaker which must be large enough to enable the density ball to be immersed up to the middle of the neck section of the holding rod. The density ball and specimen material are then heated to a temperature of 20 ± 0,5°C using either a temperature-controlled chamber or a water bath. The beaker with the specimen material is then placed on a laboratory balance. The holding rod of the density ball is clamped onto the support in such a way that the ball can easily be moved upwards and downwards by hand. The beaker with contents must be weighed to an accuracy of ± 10 mg in the case of Model 475/I, or ± 1 mg in the case of Model 475/III. The beaker with the specimen material remains on the balance whilst the sphere is slowly lowered into the liquid by hand and immersed up to the middle of the holding rod neck. The weighing procedure is then repeated.

The following equation is applied to calculate the density ρ of the specimen in g/ml at test temperature t:

$$\rho = \frac{W_2 - W_1}{V} + \rho_L$$

W_1 : Weight in g of beaker filled with specimen material prior to immersing the sphere

W_2 : Weight in g shown on balance after the sphere has been immersed

V : Volume in ml of the spherical body up to the middle of the neck of the holding rod

ρ_L : Air density = 0.0012 g/ml

The determined density should be specified to an accuracy of 0.001 g/ml and the reference temperature stated.

Note:

Care should be taken that air bubbles in the test liquid are eliminated by allowing it to stand or by stirring it carefully. Bubbles on the sphere can be removed by rotating the same.

The density ball method is not suitable for testing specimens with rapid sedimentation properties. In such cases the density should be determined by using a Pycnometer, Model 290.

Important Notice:

Due to the relatively high weight of approx. 780 g of the balls (the balls are turned on a lathe from solid material) the holding rod with the ball should always be held in a vertical position to avoid an unnecessary stress of the neck section. For the same reason do not shake off the liquid measured from the ball or charge the ball laterally, e.g. when cleaning it with a brush.

Reference Class:

All versions of Model 475 are supplied with a Manufacturer's Certificate M in accordance with DIN 55 350-18 that includes among others the following information:

Test temperature, ball's volume, product identification, test equipments used with calibration status, date, name of inspector.

It is proved that the deviation of the ball's volume from the setting value is less than 0.1 %. The density balls can also be supplied with a conformity assessment.

| Order Information | |
|-------------------|---|
| Order No. | Name of Product |
| 0010.01.31 | Density Ball, Model 475/I , Volume 100 ml ± 0.1 % (at 20°C) |
| 0010.03.31 | Density Ball, Model 475/II , as Order No. 0010.01. but with conformity assessment (instead of official calibration certificate, according to the new calibration law dated 01.01.2015) |
| 0010.02.31 | Density Ball, Model 475/III , Volume 10 ml ± 0.1 % (at 20°C) |
| 0010.04.31 | Density Ball, Model 475/IV , as Order No. 0010.02.31, but with conformity assessment (instead of official calibration certificate, according to the new calibration law dated 01.01.2015) |

| Accessories | |
|-------------|-----------------------------|
| Order No. | Name of Product |
| 0020.02.32 | Holding device |
| 0020.01.32 | Table stand with swivel arm |

Subject to technical modifications.
Gr. 3 - TBE/BAE 475 - VIII/2015