# INTERNATIONAL STANDARD 705

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## Natural rubber latex — Determination of density

*Latex de caoutchouc naturel — Détermination de la masse volumique*

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# Natural rubber latex — Determination of density

## 0 INTRODUCTION

Density determinations are used to calculate the mass of a measured volume of latex in locations where it is not possible to weigh directly. For such purposes it is essential that the density be determined on a latex sample containing the same amount of air as it contained when the volume was measured. Before sampling, the latex is therefore allowed to stand for a minimum period of 24 h to ensure the removal of air bubbles. The density determination is made at the same temperature as the volume measurement, otherwise a correction should be applied.



## 1 SCOPE AND FIELD OF APPLICATION



This International Standard specifies a method for the determination of the density of natural rubber latex which contains preservative agents and has a total solids content up to 63 %.

The method is not necessarily suitable for latices from natural sources other than *Hevea brasiliensis*, or for latices of synthetic rubber, compounded latex, vulcanized latex or artificial dispersions of rubber.

## 2 REFERENCES

ISO 123, *Rubber latex — Sampling.*

ISO 124, *Rubber latex — Determination of total solids content.*[1)]

## 3 DEFINITION

For the purposes of this International Standard the following definition applies :

**density** : Mass divided by the volume at a stated temperature.

Density is expressed in megagrams per cubic metre.

## 4 APPARATUS

**4.1 Density bottle,** 50 $cm^3$ capacity, having a ground glass stopper perforated by a capillary tube and a ground glass cap and, if desired, an evacuated jacket.

**4.2 Constant temperature bath,** accurate to within ± 0,2 °C and adjustable to a temperature above or below ambient temperature.

**4.3 Balance,** accurate to the nearest 0,001 g.

**4.4 Two conical flasks,** of at least 200 $cm^3$ capacity, each fitted with a rubber stopper, a short glass inlet tube with a rubber blowing-ball at the external end and a glass outlet tube reaching nearly to the bottom of the flask.

## 5 SAMPLING

Carry out the sampling in accordance with one of the methods specified in ISO 123.

## 6 PROCEDURE

If the total solids content of the latex is not known, determine it in accordance with ISO 124.

Adjust the temperature of the constant temperature bath to the desired temperature. Stir the sample of latex gently without introducing air bubbles. Fill one of the conical flasks with a suitable amount of the latex and place in the bath. Likewise, partly fill the second conical flask with freshly boiled distilled water and place in the bath. Weigh the clean and dry density bottle to the nearest 0,001 g and immerse up to its neck in the bath with the ground glass stopper in place but not the cap. Allow the density bottle and the latex and water in the two conical flasks to come to the temperature of the constant temperature bath. This will require a minimum of about 3 h in the case of a jacketed bottle, and 20 min in the case of an unjacketed bottle.

1) At present at the stage of draft (revision of ISO/R 124).

First blow a few cubic centimetres of latex from the conical flask containing the latex and discard. Then blow sufficient latex from the conical flask into the density bottle to fill it completely. Put the stopper in place and wipe clean the top surface immediately, taking care not to remove any latex from the capillary tube. Remove the bottle from the bath and put in place the ground glass cap immediately. Dry the outside with the minimum of handling and then weigh the bottle to the nearest 0,001 g.

Empty the density bottle and wash free from latex with distilled water. Immerse the bottle in the bath as before. Fill the density bottle with distilled water by blowing from the second conical flask and allow to stand for 5 min. While still immersed in the bath, empty and completely refill by the same procedure.

Put the stopper in place and wipe dry the top surface immediately, taking care not to remove any water from the capillary tube. Remove the density bottle from the bath and place the ground glass cap on immediately. Dry the outside with the minimum of handling and then weigh the bottle to the nearest 0,001 g.

## 7 EXPRESSION OF RESULTS

The density $\rho$ of the latex, at the temperature of the constant temperature bath, is given, in megagrams per cubic metre by the following formula :

$$\rho = \frac{m_L \, \rho_W}{m_W}$$

where

$m_L$ is the mass, in grams, of latex in the density bottle;

$m_W$ is the mass, in grams, of water in the density bottle;

$\rho_W$ is the density, in grams per cubic centimetre, of water at the bath temperature.

The results of duplicate determinations shall agree within 0,001 Mg/m$^3$.

If the temperature of the density determination differs from that of the measured volume of the latex, a correction shall be applied by calculation, using the formula

$$\rho = A + B - C$$

where

$A$ is the density of latex measured at the temperature of test;

$B$ is the correction value from the table corresponding to the temperature of test and the dry rubber content of the latex;

$C$ is the correction value from the table corresponding to the temperature of the measured volume of latex and its dry rubber content;

$\rho$ is the corrected density of the latex.



## 8 TEST REPORT

The test report shall include the following particulars :

a) the reference of the method used;

b) the results and the method of expression used;

c) any unusual features noted during the determination;

d) any operation not included in this International Standard, or regarded as optional.

TABLE – **Density conversion values for natural rubber latex**

| Temperature | Density of water | Correction for dry rubber content of | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 20 % | 25 % | 30 % | 35 % | 40 % | 45 % | 50 % | 55 % | 60 % | 65 % |
| °C | g/cm³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ | Mg/m³ |
| 0 | 0,999 87 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 | 0,000 0 |
| 2 | 0,999 97 | 0,000 2 | 0,000 3 | 0,000 4 | 0,000 4 | 0,000 5 | 0,000 6 | 0,000 6 | 0,000 7 | 0,000 8 | 0,000 8 |
| 4 | 1,000 00 | 0,000 5 | 0,000 6 | 0,000 8 | 0,000 9 | 0,001 0 | 0,001 2 | 0,001 3 | 0,001 4 | 0,001 6 | 0,001 7 |
| 6 | 0,999 97 | 0,000 8 | 0,001 0 | 0,001 2 | 0,001 4 | 0,001 6 | 0,001 8 | 0,002 0 | 0,002 2 | 0,002 4 | 0,002 6 |
| 8 | 0,999 88 | 0,001 1 | 0,001 4 | 0,001 7 | 0,001 9 | 0,002 2 | 0,002 5 | 0,002 7 | 0,003 0 | 0,003 2 | 0,003 5 |
| 10 | 0,999 73 | 0,001 5 | 0,001 9 | 0,002 2 | 0,002 5 | 0,002 8 | 0,003 2 | 0,003 5 | 0,003 8 | 0,004 1 | 0,004 4 |
| 12 | 0,999 52 | 0,002 0 | 0,002 4 | 0,002 8 | 0,003 1 | 0,003 5 | 0,003 9 | 0,004 2 | 0,004 6 | 0,004 9 | 0,005 3 |
| 14 | 0,999 27 | 0,002 5 | 0,002 9 | 0,003 4 | 0,003 8 | 0,004 2 | 0,004 6 | 0,005 0 | 0,005 4 | 0,005 8 | 0,006 2 |
| 16 | 0,998 97 | 0,003 0 | 0,003 5 | 0,004 0 | 0,004 5 | 0,004 9 | 0,005 4 | 0,005 9 | 0,006 3 | 0,006 8 | 0,007 2 |
| 18 | 0,998 62 | 0,003 5 | 0,004 1 | 0,004 6 | 0,005 2 | 0,005 7 | 0,006 2 | 0,006 7 | 0,007 2 | 0,007 7 | 0,008 2 |
| 20 | 0,998 23 | 0,004 1 | 0,004 7 | 0,005 3 | 0,005 9 | 0,006 5 | 0,007 0 | 0,007 6 | 0,008 1 | 0,008 6 | 0,009 2 |
| 22 | 0,997 80 | 0,004 8 | 0,005 4 | 0,006 0 | 0,006 6 | 0,007 3 | 0,007 9 | 0,008 5 | 0,009 0 | 0,009 6 | 0,010 2 |
| 24 | 0,997 32 | 0,005 4 | 0,006 1 | 0,006 8 | 0,007 4 | 0,008 1 | 0,008 7 | 0,009 4 | 0,010 0 | 0,010 6 | 0,011 2 |
| 26 | 0,996 81 | 0,006 1 | 0,006 8 | 0,007 5 | 0,008 2 | 0,008 9 | 0,009 6 | 0,010 3 | 0,010 9 | 0,011 6 | 0,012 2 |
| 28 | 0,996 26 | 0,006 8 | 0,007 6 | 0,008 3 | 0,009 0 | 0,009 8 | 0,010 5 | 0,011 2 | 0,011 9 | 0,012 6 | 0,013 3 |
| 30 | 0,995 67 | 0,007 6 | 0,008 4 | 0,009 1 | 0,009 9 | 0,010 7 | 0,011 4 | 0,012 2 | 0,012 9 | 0,013 6 | 0,014 3 |
| 32 | 0,995 05 | 0,008 3 | 0,009 2 | 0,010 0 | 0,010 8 | 0,011 6 | 0,012 4 | 0,013 1 | 0,013 9 | 0,014 6 | 0,015 4 |
| 34 | 0,994 40 | 0,009 1 | 0,010 0 | 0,010 8 | 0,011 7 | 0,012 5 | 0,013 3 | 0,014 1 | 0,014 9 | 0,015 7 | 0,016 4 |
| 36 | 0,993 71 | 0,009 9 | 0,010 8 | 0,011 7 | 0,012 6 | 0,013 4 | 0,014 3 | 0,015 1 | 0,015 9 | 0,016 7 | 0,017 5 |
| 38 | 0,992 99 | 0,010 8 | 0,011 7 | 0,012 6 | 0,013 5 | 0,014 4 | 0,015 3 | 0,016 1 | 0,017 0 | 0,017 8 | 0,018 6 |
| 40 | 0,992 24 | 0,011 7 | 0,012 6 | 0,013 5 | 0,014 5 | 0,015 4 | 0,016 3 | 0,017 2 | 0,018 1 | 0,018 9 | 0,019 7 |