Marmalade Gel Strength, Rupture Force & Elasticity by Penetration

**TVT Texture Analyzer**
The TVT Texture Analyzer (Figure 1) offers rapid and objective analysis for different products. The following parameters can be characterized for your product category:

- Hardness
- Rupture force
- Elasticity
- Stickiness
- Adhesiveness

Both international standard methods as well as customer tailor-made profiles are available.

![Figure 1: TVT Texture Analyzer](image1.png)

### Scope
- Determination of gel strength, rupture force & elasticity in marmalade by single cycle penetration test

### Method Description
The recording of the measurement data commences once the probe reaches the pre-set trigger force. The probe will then penetrate the sample to a pre-defined distance. After penetration, the probe returns to its starting position.

### Calibration
Make sure the instrument is correct calibrated before the measurements. How to perform the calibration can be found in the User’s Manual.

<table>
<thead>
<tr>
<th>Load cell (recommended)</th>
<th>5 - 10 kg</th>
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**Probe**
Cylinder probe 25 mm diameter, stainless steel
Part number: 67.30.26 (Figure 2)

![Figure 2: 67.30.26 (P-CY25R)](image2.png)
Profile Settings

Setting Parameter
Single Cycle Compression

Sample height [mm] 60.0
Starting distance from sample [mm] 5.0
Compression [mm] 20.00

Initial speed [mm/s] 3.0
Test speed [mm/s] 2.0
Retract speed [mm/s] 10.0

Trigger force [g] 10
Data rate [pps] 200
Adhesiveness Marked ✗

Sample preparation
Prepare the gels according to a pre-defined standard. Make sure to use the same type of containers filled with the same amount of sample each time. Let the samples relax under same conditions before the measurements. Place the container centrally under the probe and attach it to the support if needed.

Curve Description
In Figure 3 a typical Force-Distance curve is illustrated. The Maximum Peak’ Force, at the penetration depth, is here defined as the hardness/rupture force of the marmalade. The gel strength of a sample is taken at an initial stage where only a small deformation has occurred (3 mm). The irregularities of the curve are due to fruit pieces in the marmalade. The Area+ is the total work of penetration.
Data Analysis

The force required for penetrating the sample can be measured in the units [g] or [N]. The elasticity is measured in [mm]. Except raw data (force, time and distance) the program also directly provides calculated results such as mean value and standard deviation.