

RICOS

Measurement and Evaluation of the profile of ironing rings in beverage can manufacture

1. Measuring task

The measuring and evaluation system RICOS serve the profile measurement and the tolerance evaluation of ironing rings for beverage can manufacture.

In the production employment of the ironing ring the profile and the position of the edge (land) in dependence of the wear changes. RICOS serve for the measurement of the form and the position of the land.

By tolerance patterns the rings can be classified regarding their employment fitness.

It proved as sufficient to work with a profile only relatively measured in y-direction since the associated absolute position of the edge is to be determined easily and comfortably over a measurement with the "RINGMASTER".

The measurement of the profile takes place via a mechanical tracer, driving during the measuring procedure into x direction (measuring length 2-6mm) with very high resolution in the Y-coordinate (order of magnitude 1 µm).

Because of the high resolution of the tracer the surface roughness is measured additionally. This "noise" is filtered away by suited mathematical methods.

The measured values are seized, stored as pairs of x/y values and supplied to the evaluation.

The figures show the RICOS-measuring instrument and a schematic representation of the measurement.

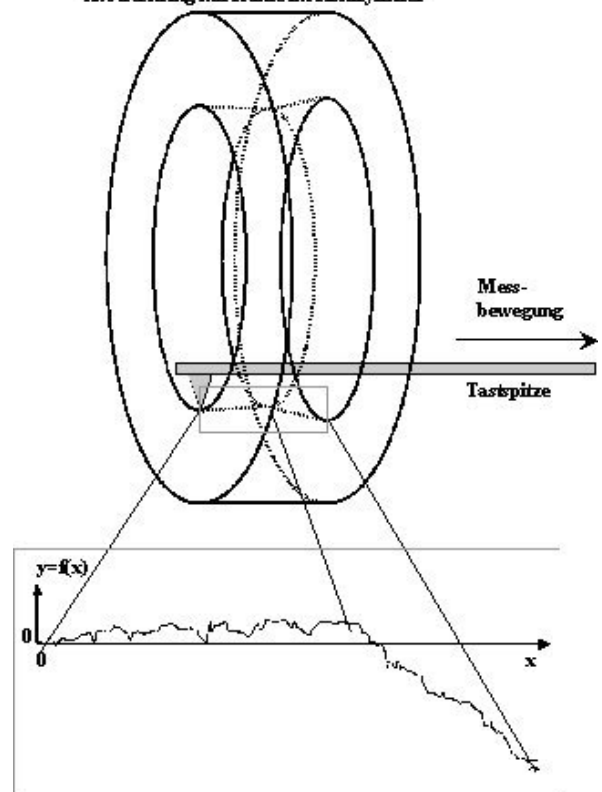
2. Tolerance models

The examination of the fitting in barness in tolerance patterns forms the core of the evaluation of the profile measuring curves.

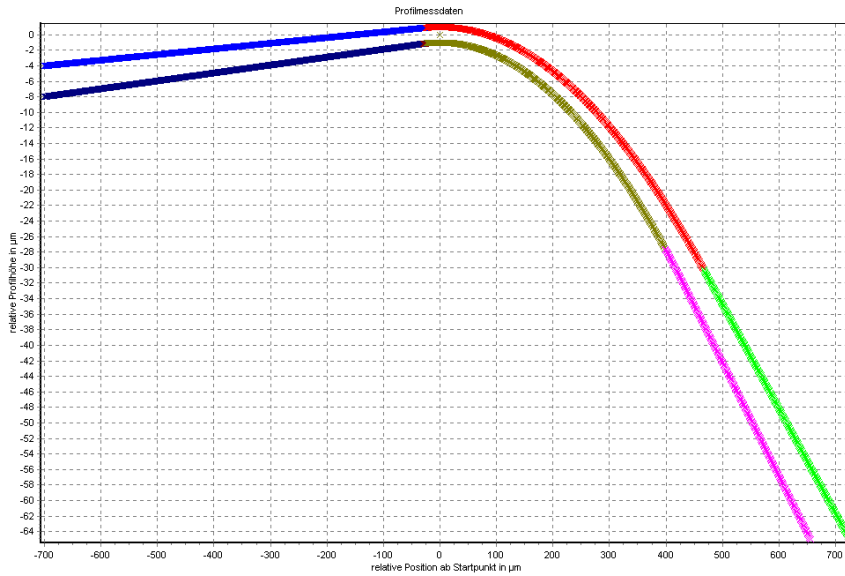
For each type of ring a tolerance model exists. With the help of the model measured profiles can be divided in "good" or "badly".



Abstreifung mit Kante im Hohlzylinder



Ausschnittsvergrößerung des abgetasteten Profils

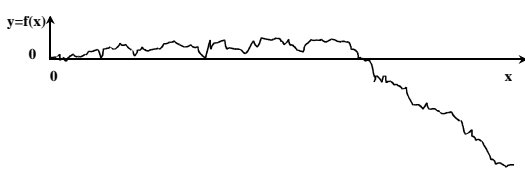
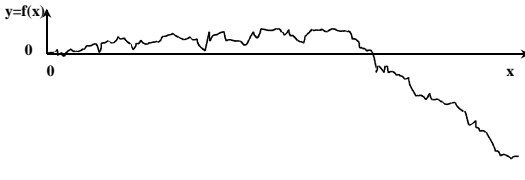
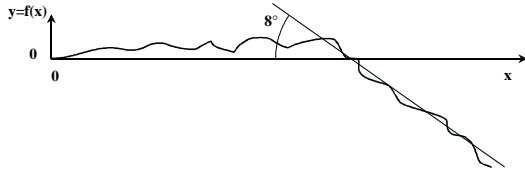



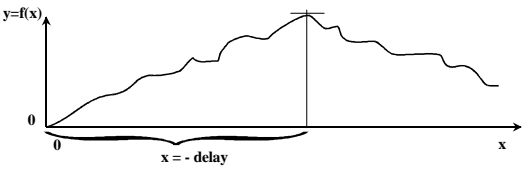
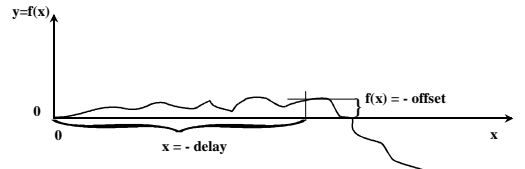
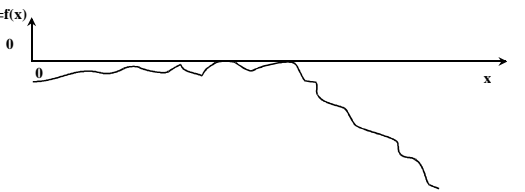
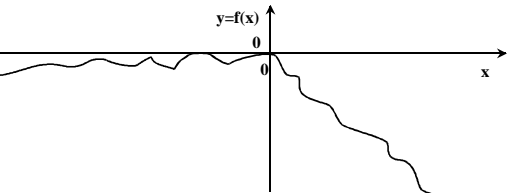
Tolerance models can be given by CAD-data and by a manually input.

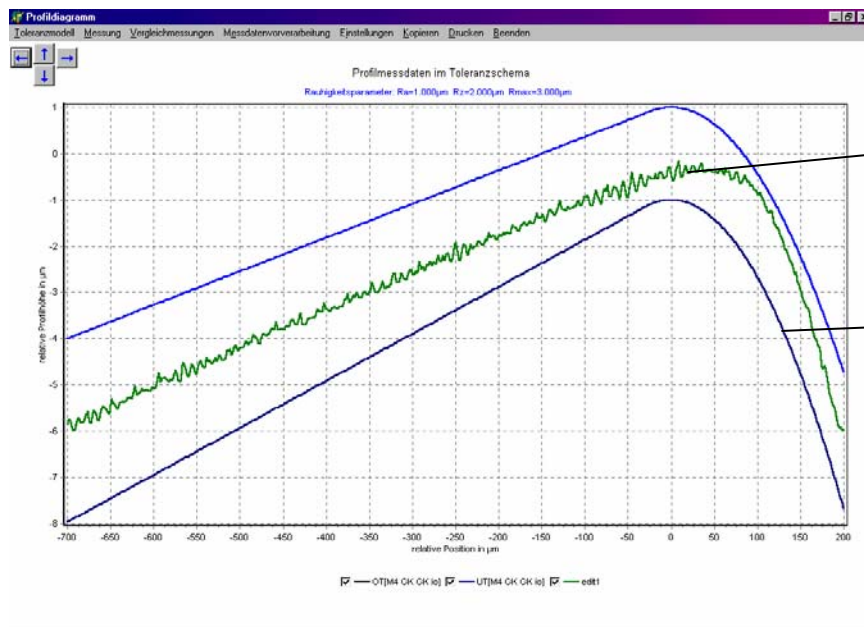
Fig.: Tolerance model

During the measuring process by the software it is examined automatically whether the ring form lies still within the tolerance model.

Description of the measurement data processing

Processing step	Description	Schematic diagram
Original measuring data	Measurement of the profile and production of the original measuring data, 1st measuring point has coordinates [0,0], both axles in μm	
Angle compensation	Angle compensation of the original measuring data, compensation angles $\ll 1^\circ$ was won during angle calibration with even reference ring (straight profile orthogonal to the piston area).	
Measuring data preprocessing step 1	Result data from angle compensation are again computed with ripple filter.	
Measuring data preprocessing step 2	Tilt (around 4°) in mathematically positive direction, thus lefthand side of the sloping profile segment becomes automatic the maximum value of the general profiles.	

<p>Measuring data preprocessing step 3</p>	<p>The x-coordinates of the profile edge certainly by a maximum search in the result data of step 2 (computation Delay)</p>	
<p>Measuring data preprocessing step 4</p>	<p>The function value of the measuring data is determined at the x-value of the professional edge from the result data of step 1 (computation offset).</p>	
<p>Measuring data preprocessing step 5</p>	<p>The result data made of step 1 are again computed with the offset (offset compensation).</p>	
<p>Measuring data preprocessing step 6</p>	<p>The result data made of step 5 are again computed with the Delay (Delaykompensation). Now the measuring data in the correct standardisation are available for fitting in into the tolerance pattern.</p>	



Measured Profile (green)

Tolerance field (light- and darkblue)

Operation flowchart also in tolerance curve of fit in profile measuring curve.