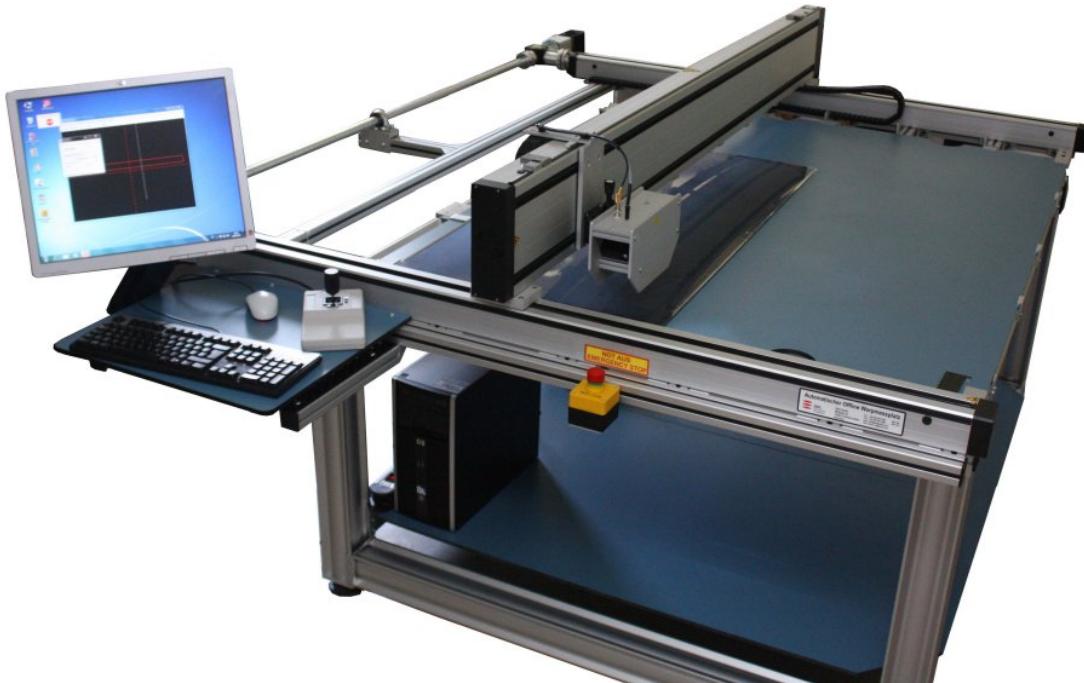


# WARP-MESSSYSTEM



## General

The system is designed for the contactless, optical measurement of the curvature (Warp) horizontal, coated float glass substrates. For that measurement the heights on different measuring points is evaluated.

The Warp is calculated as difference between the highest and lowest point.

## Hardware

The measuring system has a base plate as contact face for the specimen. The maximum substrate size is 1600 mm x 1200 mm.

The non-flatness of the base plate is 100 micron. The construction of the base plate allows the easy loading and unloading of the specimen. Stop pins serving for the exact end reproducible position of the substrate.

Due to inhomogeneous reflection of the coating, the software is able to process as well high and low reflecting areas on the surface.

The warp measurement runs fully automatic software controlled after starting the measuring procedure. The measuring system can scan the complete substrate area. The equipment is insensitive against vibration and can be used under production conditions.

The operation of the equipment is controlled by a computer, which belongs to the scope of supply.

The software offers many options for data acquisition and -evaluation. Different measuring routines can be created and saved.

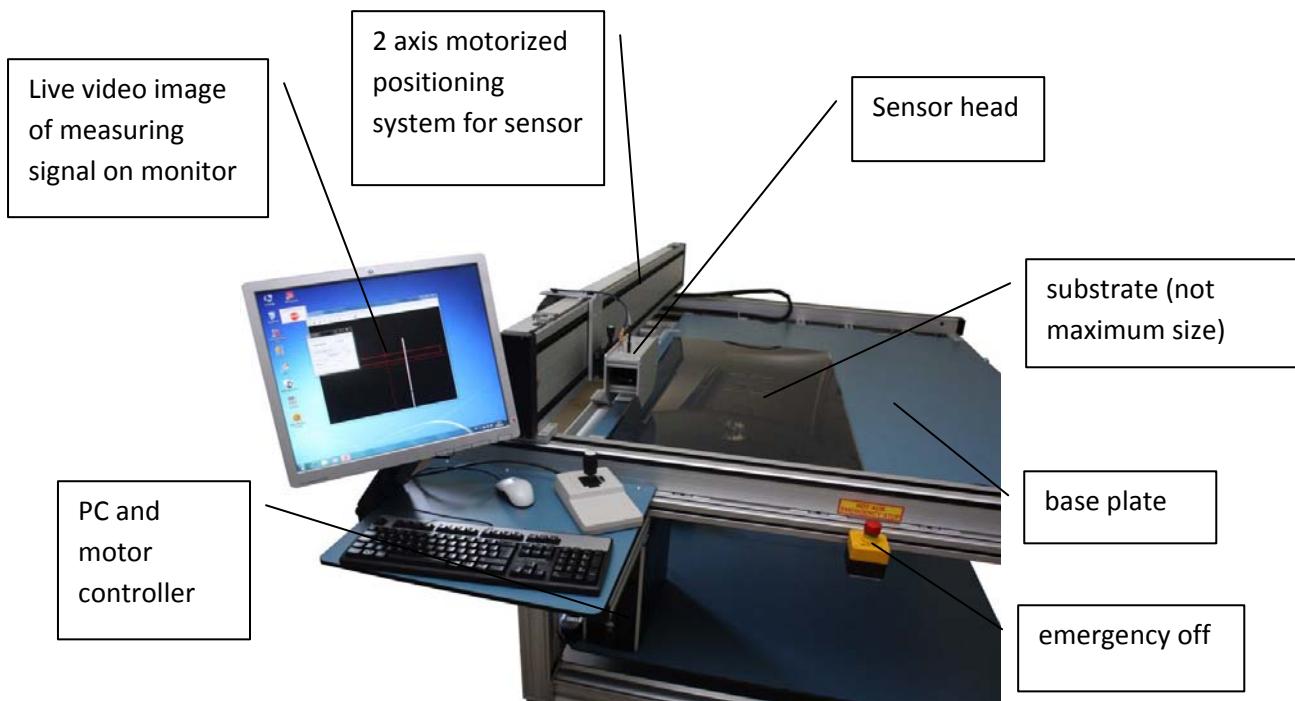
After the measurement the substrate surface is evaluated and displayed graphically.

## Software

The software controls the positioning of the measuring head and the data acquisition. The motor controller provides the position of the measuring head from which the warp and the graphic of the substrate surface is calculated.

The measuring program allows the creation of different measuring routines with any sample rate (distance of measuring points).

The most important data of a measurement can be transferred directly to an Excel table. The measuring results are displayed with a resolution of 0,01mm and the measuring positions with a resolution of 1mm.



## Technical Data

Maximum substrate size:	1600mm x 1200mm
Unflatness of base plate for specimen:	$\leq 100 \mu\text{m}$
Resolution for warp measurement:	10 $\mu\text{m}$
AResolution of measuring position:	1 mm
Standard deviation of reproducibility:	$\leq 20 \mu\text{m}^*$
Reproducibility of measuring results:	$\leq 100 \mu\text{m}^{**}$

\* The reproducibility is determined by 50 measurements of one and the same substrate without movement of the substrate

\*\* The reproducibility of the measuring results is determined by measurement of at least 11 substrates in randomized order at least 3 times