

MAXI GRIP 750S Bi-Axial Stretching Frame

German and international patents pending



This worldwide unique stretching frame provides you:

Highest possible gripping force (800 N per clip)
due to a new clip design

Maximum sample thickness before stretching up to 3.5 mm

Separate clip heating system

Film heating system up to 400 °C for high temperature polymers

MAXI GRIP 750S Bi-Axial Stretching Frame

Advantages of the New Design of the MAXI GRIP 750S

Clamping force	Up to 800 N per clip which is significantly higher than with existing technology
Stretching force	Up to 5 kN in each direction for stretching of extremely thick films, combined with extreme stretching speed of 1 m/sec and acceleration up to 6 m/sec.
Film thickness	100 µm up to 3500 µm – which makes a new generation of stretching frame capabilities
Clip Surface	Exchangeable inserts for different thickness and polymers allow optimal processing of any material
Clip heating	Separate clip heating with electric system up to 400°C
Film heating	Separate Film heating with highly efficient IR-system allows for stretching of all technical polymers
Air cooling	Separate air cooling system allows to integrate cooling cycles into a stretching sequence
Number of clips	5, 7 or 9 clips on each side are available for different stretching ratios and stretching forces
PLC control	The new designed Touch screen central system for optimal data processing and analysis of test results.

Advantages of the MAXI GRIP 750S in Processing

Stretching process	MDO or TDO stretching in any direction Biaxial stretching simultaneous at segmental
Sample size	Any sample size to be selected which is like the minimum dimension or bigger. Maximum stretching length of 750 x 750 mm gives large samples for further investigations (like optical preparations).
Sample positioning	The opening for positioning the sample is near to the operator.
Optical control	Transparent windows in the protecting allow control of the process also in closed position. An IR-Pyrometer controls the surface temperature of the film.
Reproducibility	The whole production process can be preset and controlled in all parameters with an excellent reproducibility.
Short test time	The summary of the mentioned advantages reduce testing time per sample at least by 50 % which saves personal costs and time in development.

Basic Design Elements

Stretching Frame

The stretching frame is designed in a fixed position in the machine and needs not be moved. Four sets of clips are quadratically placed and guided on moveable rails. A pantograph system synchronizes movement. All linear movements are based on roller bearings with low friction. This allows extremely high stretching speeds.

Clip system

The clips are the essential elements in a bi-axial stretching machine. The COLLIN design features:

- Clamping force adjustable up to 800 N
- Safe clamping up to 3.5 mm thickness
- Easy-to-change clip inserts for adapting to polymer and thickness

Clip heating system

Clip heating for each single clip is effected electrically with extremely low tolerances. In this way the clip temperature can be regulated completely independent from the film temperature through the whole process. This system gives freedom in setting any heating or cooling process and saves testing time

Stretching process

After closing the door an automatically program will run until stretching is finished and IR-fields moved in standing position.

Sample take out

After opening the door the cold stretched sample can be taken out by hand. A sample tablet is moved up and prevents sample from falling down.

Heating System

The upper and lower sides of the clamped film are heated by two IR heating arrays. The IR arrays can be moved individually or together from a standby position into the heating position by starting the programmed sequence. The IR heaters and the special clip design ensure optimal temperature uniformity.

Drives

Two separate A.C. Servo drives are designed for the MD and TD direction. Each stretching direction can have its own acceleration, speed and stretching ratio. Automatic force control protects the mechanism against unforeseen overloads.



Clips and table ready for deposition of the sample

Clips and table ready for take out the stretched sample



Setting Parameters for a stretching program

The following types of basic steps are defined:

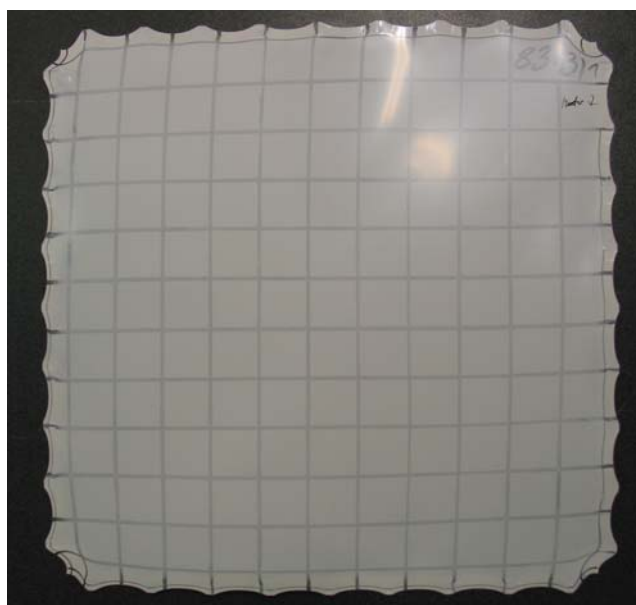
- Clip Heating** Heating in a controlled mode, set value is the film temperature on the upper side and the lower side (measured by pyrometer). The user can choose to heat either with the upper IR array or with the lower IR array or with both arrays.
- Holding time** Holding time at a given temperature level. It operates in the controlled mode, because the film temperature has to be held constant. This step is important especially with thicker samples to assure that they are well-heated throughout and the temperature distribution over the thickness is homogeneous.
- Stretching** MD, TD simultaneous and sequential stretching, or in only one direction up to a ratio of 600 % at a speed of 1 m/s.
- Annealing** Also negative stretching – annealing ratio can be programmed either MDO or TDO direction
- Cooling** Cooling of the sample down to a user-defined level is accomplished by means of an air knife installed in front of the upper and lower IR heating arrays.
- Test program** Out of this basic functions a combination of up to 32 steps can be programmed sequentially. This gives a wide range of different test possibilities like stretching sequentially, simultaneously, only one direction, but also all kinds of heat treatment such as heating, holding temperature or cooling.

Test Results

Grid Distribution

Sample size: 135X135 mm, thickness 2.2 mm
Heating: 100°C upper and lower film side
Holding: 90 s at 100°C
Stretching: MD ratio 3.7
Speed: 100 mm/s
Stretching: TD ratio 3.7
Speed: 100 mm/s
Cooling: 60°C
Total cycle time: 7min

The equal spacing of the grid lines after stretching shows the high accuracy of the stretching mechanism and the uniform temperature distribution.



Operation



Sample deposition

When the protection door can be opened the IR arrays move in its standby position and the sample can easily be positioned in the clips. All movements are done manually by the operator from the manual control pad. After closing the clips and closing the protection door, the process will be started from the touch screen and the programmed sequence starts working.

- 1. IR-heater array in standby position
- 2. Sample deposition
- 3. Manual pad control
- 4. PLC with touch screen

Control System

Touch Screen

Besides the manual control pad for all manual operations during deposition or removal of the sample, the machine features a touch screen. It functions as HMI and visualizes the entire process and all measured data for test evaluation. All administrative data for the test series, general machine parameters (i. e. clip temperature), and the

sequence of the steps during the test are entered here. All data can be saved as a recipe so that they are available for use again at a later date. After the program sequence has been started, test parameters such as film temperatures, clip temperature, stretching forces are shown in a trend diagram. The machine itself is controlled by a high-performance PLC with a PC.



Data Processing

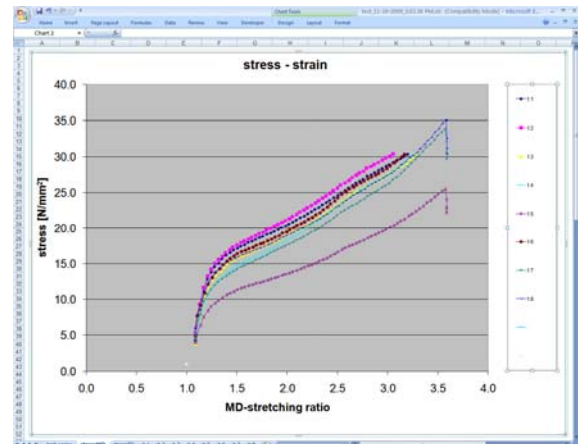
Test Evaluation

After the test is finished, all data are transferred automatically to an independent evaluation and analysis program based on Excel. Here, the individual test runs are collected in the form of a test series. The test results are shown

as diagrams that can be selected for each single step of the trial. The curves for one parameter (e.g. stretching force) within a test series are collected in one diagram, so that differences in the test runs can be analyzed easily and quickly.

Metered values

- Stretching size
- Stretching speed
- Stretching force
- Clamping force
- Film temperature
- Clip temperature
- IR-field temperature



Technical data

Maximum Clamping Force	800N	Dimensions (L x W x H): 200 x 350 x 200 cm
Maximum Stretching Force MD	5000 N	Electrical Power: 100 kW
Maximum Stretching Force TD	5000 N	Current: 3 x 160 A
Film Thickness Range	100 - 3500 µm	Pressurized Air: 6 - 8 bar; 250 - 360 m³/h
Maximum Stretching Speed	1 m/s	
Maximum Acceleration	6 m/s²	
Maximum Film Temperature	400 °C	
Sample Sizes:	5 Clips 85 x 85 mm	Weight: 3500 kg
	7 Clips 112 x 112 mm	Bearing capacity of floor: 2000 kg/m²
	9 Clips 135 x 135 mm	
Maximum Stretch Size	750 x 750 mm	
Stretching ratio:	5 Clips 10 : 1	
	7 Clips 7.5 : 1	
	9 Clips 6 : 1	

Technical modifications reserved.