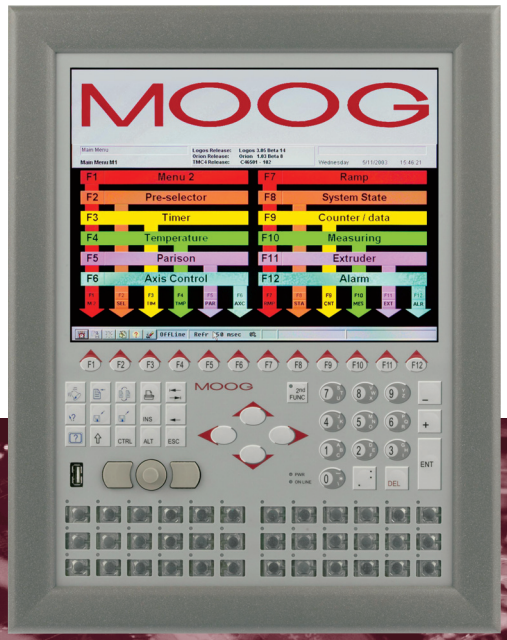
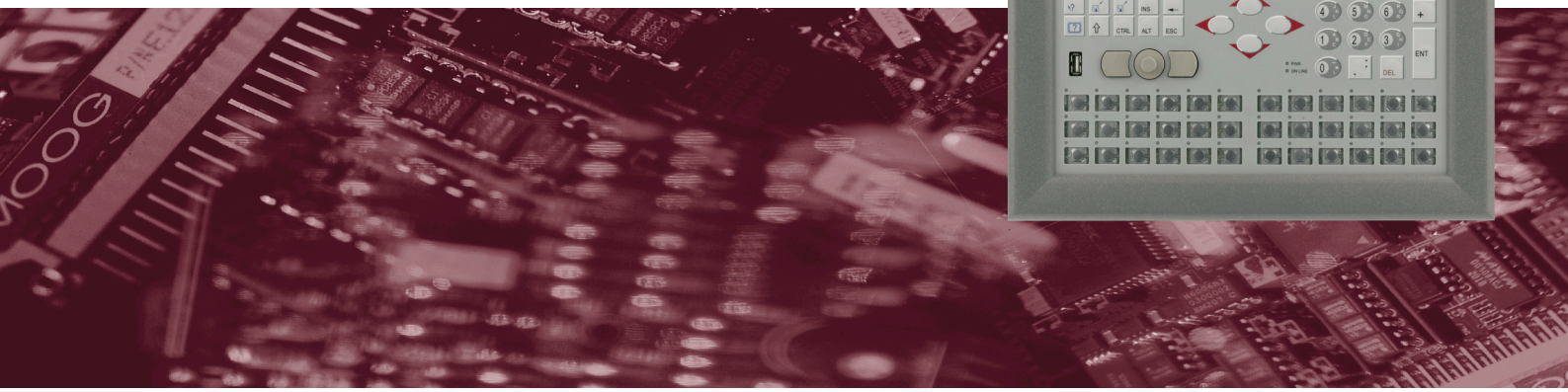
TMC-4
Total Machine Controller
Generation 4

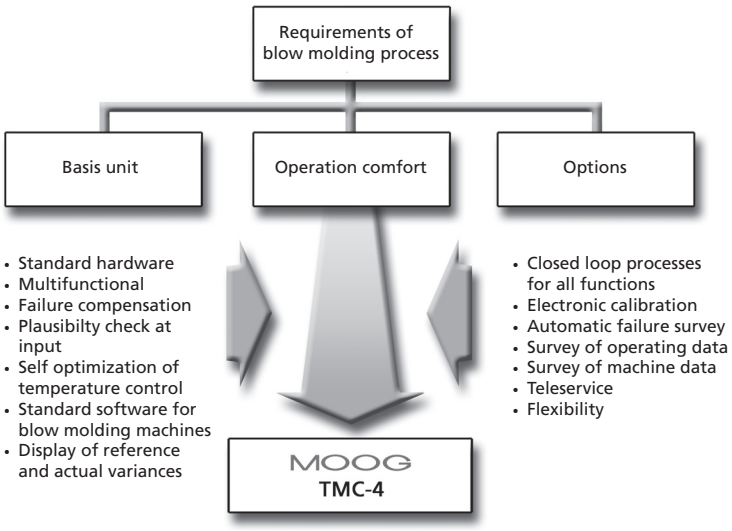




Description

System for easy operation, visualization and control of blow molding machines for a variety of plastic packaging and container applications.

DESIGN/SYSTEM DESCRIPTION OF THE TOTAL MACHINE CONTROLLER (TMC)



WHAT DOES THE NEW GENERATION OF TMC-4 OFFER?

- Completely new field proven hardware with state-of-the-art processor technology.
- Standard Screen: The control unit is based on an industrial PC. The Windows® XP embedded operating system operates without hard drive so that it is not susceptible to vibrations from the surrounding machinery.
- The keyboard is tailored to the operation of a blow molding machine. It features a clear and logical design. Besides the graphical display, the control unit features a section that is intended for freely assignable function keys by the customer.
- An interface for an external standard keyboard (to allow for convenient text changes of the help menus and Ethernet interfaces to connect the TMC-4 to the company network) is available. All the interfaces of a standard PC are integrated. The front panel features a USB 2.0 interface that allows for easy saving of the machine and product parameters, as well as screen prints (hard copy).
- Compact dimensions allow for integrating the control panel in existing terminal systems.
- Each regulated axis, whether wall thickness or movement, features a service page. The integrated digital voltmeter with bar display allows for quick localizing of the interference source – not only during commissioning, but in the event of malfunctions or general troubleshooting.
- Customized Upgradability: If the functions provided by Moog in the TMC-4 are not sufficient, they can be modified or expanded with additional functions programmed by the customer. The necessary programming tool can be purchased upon request.

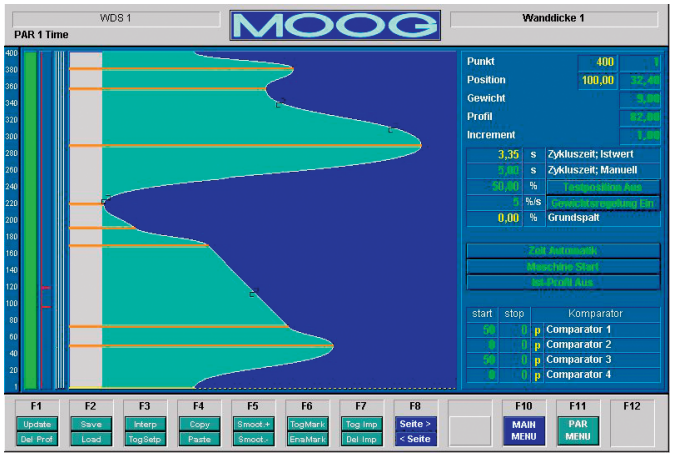
THE NEW TMC-4 - HIGHER QUALITY AND PRODUCTIVITY

Product quality that remains constant requires that the most important operational sequences in blow molding are executed in a regulated and not a controlled way. This leads to a high level of reproducibility, quality consistency, process acceleration and, therefore, productivity improvement. The flexible design of the new TMC-4 allows it to be used for all types of machines and products. Simple visualization true to the motto "less is more" renders the TMC-4 in an organized and easy-to-read form for the different user levels – the operator or the shift manager. Hardware and software were revised. Even though the software was completely revised compared to previous versions, proven and protected concepts were taken over. This allows the operator to recognize the functionality of the earlier versions so that he can operate his machine as easily as he did before. The parameters are saved to state-of-the-art external storage media. If maintenance or service is needed, a remote function allows for quickly providing help without any extended standstill times. The acquisition of operating data and machine data can be handled via remote queries. An integrated weight control allows for additional savings of material.

TECHNICAL DATA

Wall thickness

The TMC-4 can always be upgraded to a maximum of 12 wall thickness axes. The basic equipment contains 4 freely definable axes. In general, they are essentially assigned to wall thickness, blow mandrel positioning and mold-closing movement.



400-point tube profile

Each point can be a control point, but does not have to be one.

Interpolation

The interpolation is freely selectable from control point to control point. Subranges of the profile can be freely marked and can be changed or moved at random.

Tube markings

Tube markings can be easily activated and set in the commissioning menu for product optimization and control, and are changeable.

Comparator functions

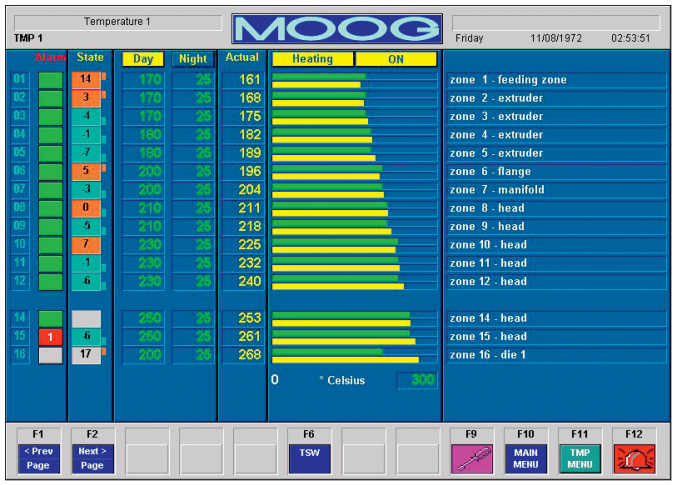
The function is freely configurable for continuous extrusion. The functions for position extrusion or accumulator head operation during filling as well as ejection are also freely configurable.

Weight control

The weight control is already integrated in the basic equipment and allows for integrating existing weighing devices with appropriate interface in the system. Presently, it is possible to set the basic gap.

Temperatures

Up to 16 heating zones can be regulated in the basic equipment. The system can be expanded up to 80 heating zones using additional hardware.



Heating, cooling and measuring

Each heating zone can be operated as a 2 or 3-point controller or as a pure measuring zone. The temperature sensor is freely selectable in its specification.

Self-optimization

The complete temperature control process is self-optimizing by means of fuzzy logic algorithms and allows for optimized heating.

Timer operation

The integrated timer can be conveniently used during rest periods.

Heating current monitoring

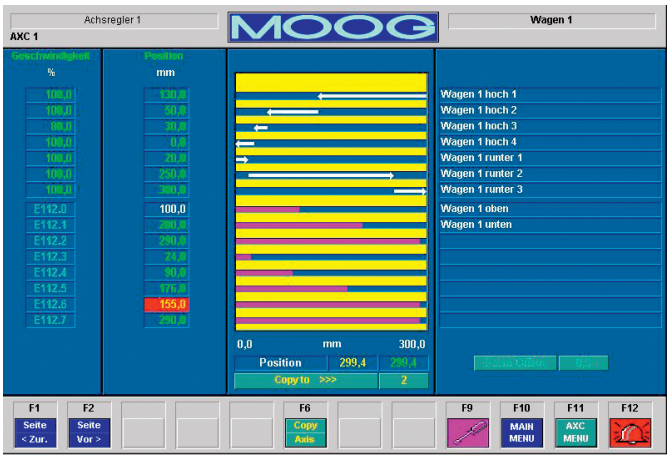
It measures the current to the heating band and allows for automatically monitoring the individual heating bands.

Movements

The target control ensures exact positioning of each movement. The basic equipment allows for controlling 3 movements. These are generally the closing movement of the mold, the movement of the blow mandrel and the traversing of the carriage. A hardware expansion allows for motion-controlled positioning of up to 18 axes.

TECHNICAL DATA

Movements



Cam group

Up to 7 trip cams can be set for each axis. They can be set directionally with freely selectable hysteresis.

PID controller

The control parameters of the PID controllers of the respective axes can be set directionally. The P, I or D portions can be adjusted for each parameter entry. A dead-band setting of the control parameters is available.

Movements – commissioning with control parameters

Measuring

The basic version allows for monitoring 8 analog measured values from 0 to 10 volt. They can be expanded to 16 measured values using hardware expansion. The measured values can be further processed using a comparator function or as threshold value. The measured values are shown on the screen via bar graph and as absolute value in mV.
Specified and actual values are displayed in different colors for ease of recognition.

Additional functions

Numerous additional functions allow for an individual adaptation of the TMC-4 to customer requirements.

Additional functions – Menu 1

Times and counters

Up to 128 process times can be set, changed and displayed.
Up to 128 customized count values can be displayed, if needed.

Specified-value output

This is the output of analog values over time. 8 Values can be displayed in the base function and 16 in the expansion stage.

Additional functions – Menu 2

Extrusion controls

Up to four extruders can be controlled, either dependent on each other or independently.

Preselectors

Product-relevant machine sequences can be defined via preselector.

Production Data

They can be easily captured and analyzed using external software.

Language selection

The basic version features five permanent languages – English, French, German, Italian and Spanish – that can be selected by the operator via a menu.
The permanently defined languages can always be overwritten by other languages using the programming tool.

Error messages

Up to 8 pages with 32 lines each can be filled with error messages.

If an error message appears in the menu, the user can call it up with function key F12. This function key then displays the corresponding error message in plain text with the stored log. Help texts with instructions can be stored for each error message, although they must be entered by the customer.

