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## TMC400 Series Total Machine Controller



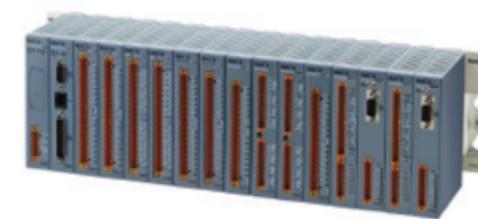
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TMC400 SERIES TOTAL MACHINE CONTROLLER  
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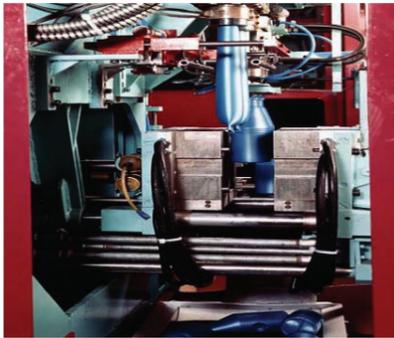
# TMC400 SERIES TOTAL MACHINE CONTROLLER

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## TOTAL CONTROL

### INTEGRATION

Moog's new total machine controller provides the way to seamlessly manage blow moulding machinery. All the machine parameters and machine sequencing set and controlled by a single control unit. The TMC400 features all the software you need to drive Moog's first class hydraulic and integrates in a single system wall thickness control, axes control, temperature control, machine sequence program, production data, etc. Paired with an open development platform it can be easily customized to perfectly suit your requirements.



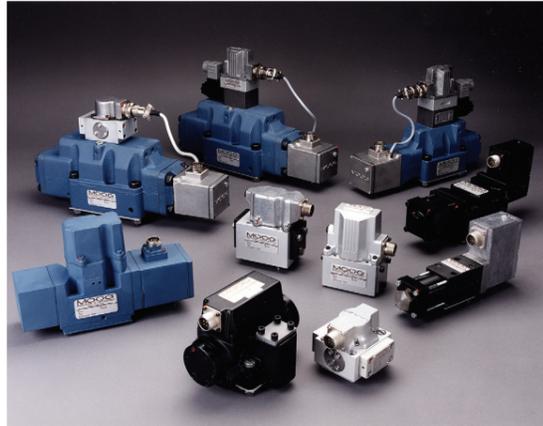
### SCALABILITY

Thanks to its modular design the controller can be expanded or shrunk to exactly match the machine design. Modules can be chosen to control as many axes as you need, up to 32 temperature zones, the required number of independent parison heads and so on. For example, you can easily upgrade your system to work with a PWDS system just using three independent parison channels and synchronising them to the same accumulator. Best results are achieved when the controller works with Moog's vast array of products, such as servovalves, motor drives, motors, electromechanical actuators, etc.,



### EXPERTISE

Moog is globally recognised as a market leader in advanced motion controls for Blow Moulding applications. Our hydraulic servo and servo-proportional valves and actuators are respected worldwide. The value of parison wall thickness control was



recognised when the industry was young and Moog is proud to have been involved since early days. Our know-how in closed-loop control improves the control of the parison axis and Moog's controller provides improved part quality, higher production rates, and increased profits.

With 30 year experience designing and building many successful parison programmers and total machine controllers (TMC, analog 25 point, digital Bloc 64, DigiPack, ParCon, etc.) this controller comes with all the features a machine might need, like the control of both continuous extrusion and accumulator machines. High resolution digital converters guarantee precise control of wall thickness and a new 400 points editor allows to define very accurate profiles.

Committed to forerun the technological shift towards electromechanical technology, Moog can offer innovative EMA and drive solutions specifically developed for Blow Moulding.

Building on such a remarkable expertise and thanks to its openness, the new TMC400 is ready to be customized and meet your demanding expectations.



### MODULE LIST

#### MAIN PROCESSORS

- IMI220-400A001: Main CPU 256 Kb RAM 21 MHz
- IMI220-400A002: Main CPU 1 Mb RAM 21 MHz
- IMI220-401A001: Main CPU 2,256 Mb RAM 25 MHz
- IMI220-401B001: Main CPU 2,256 Mb RAM 25 MHz

#### PERIPHERALS

- IMI220-440A001: CAN controller
- IMI220-442A001: RS232 + PARALL.
- IMI220-442B001: RS232 + PARALL. (for printers)
- IMI220-443A001: BUS EXP. (send)
- IMI220-443B001: BUS EXP. (send)
- IMI220-444A001: BUS EXP. (receive)
- IMI220-445A001: FDC
- IMI220-446A001: RS232 + PARALL. (for third parts terminals)
- IMI220-450A001: ENC + COMP
- IMI220-481A001: CAN + CPU
- IMI220-482A001: DSP

#### DIGITAL INPUTS/OUTPUTS

- Input:
- IMI220-410A001: 16 DI
- IMI220-411A001: 24 DI
- IMI220-411A002: 24 DI high speed
- Output:
- IMI220-415A001: 16 DO 24 VDC 0.5 A
- IMI220-416A001: 24 DO 24 VDC 100 mA

- IMI220-417A001: 16 DO 24 VDC 1 A
- IMI220-418A001: 12 DO 24 VDC 2 A

Input/Output:  
IMI220-412A001: 8 DI + 8 DO 0.5 A

#### ANALOG INPUTS/OUTPUTS

- Input:
- IMI220-420A001: 8 AI 12 bit
- IMI220-422A001: 8 Thermoregulation zones
- Output:
- IMI220-425A001: 4 AO 12 bit
- Input/Output:
- IMI220-423A001: 8 AI/O 16/14 bit
- IMI220-483A001: 8 AI/O + 8 DI/O + CPU

#### POWER SUPPLY

- IMI220-405A001: PSU 24 VDC 15 W
- IMI220-406A001: Adapter for ext. PSU
- IMI220-498A001: External PSU for Mars 400
- IMI220-498A001: External PSU for Mars 400 & rack expansion

#### BUS

- IMI220-499A008: BUS 8 slots
- IMI220-499A012: BUS 12 slots
- IMI220-499A016: BUS 16 slots
- IMI220-499A020: BUS 20 slots
- IMI220-499A024: BUS 24 slots

### BASE CONFIGURATIONS FOR...

- DI: a. Main CPU + PSU + BUS + IMI220-410A001
- b. Main CPU + PSU + BUS + IMI220-411A001
- c. Main CPU + PSU + BUS + IMI220-411A002
- d. Main CPU + PSU + BUS + IMI220-412A001
- e. Main CPU + PSU + BUS + IMI220-483A001

- DO: a. Main CPU + PSU + BUS + IMI220-412A001
- b. Main CPU + PSU + BUS + IMI220-415A001
- c. Main CPU + PSU + BUS + IMI220-416A001
- d. Main CPU + PSU + BUS + IMI220-417A001
- e. Main CPU + PSU + BUS + IMI220-418A001
- f. Main CPU + PSU + BUS + IMI220-483A001

- AI: a. Main CPU + PSU + BUS + IMI220-420A001
- b. Main CPU + PSU + BUS + IMI220-423A001
- c. Main CPU + PSU + BUS + IMI220-483A001

- AO: a. Main CPU + PSU + BUS + IMI220-423A001
- b. Main CPU + PSU + BUS + IMI220-425A001
- c. Main CPU + PSU + BUS + IMI220-483A001

- PID: a. Main CPU + PSU + BUS + IMI220-420A001 + IMI220-425A001
- b. Main CPU + PSU + BUS + IMI220-450A001 + IMI220-425A001
- c. Main CPU + PSU + BUS + IMI220-423A001
- d. Main CPU + PSU + BUS + IMI220-483A001

#### Axis control:

- a. Main CPU + PSU + BUS + IMI220-420A001 + IMI220-425A001
- b. Main CPU + PSU + BUS + IMI220-450A001 + IMI220-425A001
- c. Main CPU + PSU + BUS + IMI220-423A001
- d. Main CPU + PSU + BUS + IMI220-483A001

#### IDB loop:

- a. Main CPU + PSU + BUS + IMI220-420A001 + IMI220-425A001
- b. Main CPU + PSU + BUS + IMI220-423A001
- c. Main CPU + PSU + BUS + IMI220-483A001

#### Thermoregulation:

- a. Main CPU + PSU + BUS + IMI220-422A001 + IMI220-412A001
- b. Main CPU + PSU + BUS + IMI220-422A001 + IMI220-415A001
- c. Main CPU + PSU + BUS + IMI220-422A001 + IMI220-416A001
- d. Main CPU + PSU + BUS + IMI220-422A001 + IMI220-417A001
- e. Main CPU + PSU + BUS + IMI220-422A001 + IMI220-418A001

#### Parison: (utilize terminal VGA or terminal PC)

- a. Main CPU + PSU + BUS + IMI220-420A001 + IMI220-425A001
- b. Main CPU + PSU + BUS + IMI220-423A001
- c. Main CPU + PSU + BUS + IMI220-483A001

#### CANopen:

- a. Main CPU + PSU + BUS + IMI220-481A001

#### PLC networks: (multipoint)

- a. Main CPU + PSU + BUS + IMI220-440A001

# TMC400 SERIES TOTAL MACHINE CONTROLLER

## TOTAL CONTROL

### COMPLETENESS

The wide range of modules available in the M400 family allows you to easily customize and extend your TMC400 system:

Digital Inputs:

- Normal or High Speed (100KHz)
- up to 24 DI per module
- Hardware frequency meter and direct interrupt generation

Digital Outputs:

- 100mA, 0.5A, 1A, 2A
- up to 24 DO per module

Analogue Input/Output:

- 4AI 12 bit, 4AO 12 bit, 4AI 12bit + 4AO 12bit, 4AI 16bit + 4AO 16bit
- Software selectable current/voltage output

Encoder/Counter:

- 24 bit resolution absolute or differential, 4 Encoder Input + 4 AO 12 bit

Temperature input: 8 inputs 0-50mV

Communication: RS232, Parallel, USB, CANOpen, Ethernet

Printing: Ink jet and dot matrix (HP, Epson, Canon, IBM)

Intelligent Modules: CPU + 4AI 16bit + 4AO 14bit + 4DI + 4DO + RS232

File Storage: Floppy disk, SecureDigital, Memory stick (USB)



Benefit from the power and flexibility of the PC HMI, featuring:

- Resistive touch screen for easy and fast navigation through the modern graphic interface.
- Keyboard and touchpad for quick setup.
- Low power fanless processor up to 800Mhz. Best performance with minimal power consumption.



- 512Mb Flash memory disk for ultimate storage reliability in any kind of environment.
- USB and Ethernet interface for easy and fast transfer of data.
- Windows XP Embedded operating system for maximum stability and flexibility.

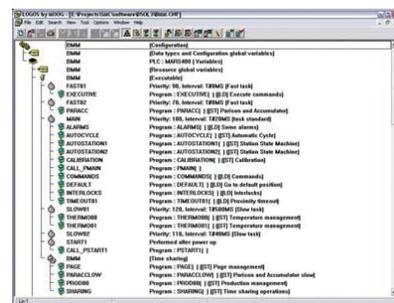
### POWER

Exploit the bare power of CPU equipped modules. You can improve the performance of your system adding "intelligent" modules to your configuration. Each M483 module hosts a dedicated CPU with four analogue inputs and four analogue outputs. While the main CPU takes control of the general functions of the machine another one is dedicated to control closed loop axes, like parison's, carriage's and so on. It's not a problem anymore to extend your basic application for open loop machines to more advanced and performing closed loop systems.



### DEVELOPMENT

Take control of your machine! You can benefit from Moog's development environment with its intuitive yet powerful Logos(R) IDE. You can choose whether you want to keep your system closed or want to try experiment yourself. You'll be able to easily understand and upgrade your application. All the software running at application level has been written with the same tool and it is therefore uniform and easily extensible. The programming environment includes, besides others, tools for editing your source code in one of the 61131 standards and tools for editing the application's pages and easily manage internationalization.



# TMC400 SERIES TOTAL MACHINE CONTROLLER

## WALL THICKNESS CONTROL



- Edit graphically the 400 point interpolated profile with display of total die gap (weight + profile\*range).
- Choose the interpolation that best suits the needs between linear, flat, parabolic and Bezier.
- Display the feedback curve and deviation.
- Use the “smooth” tool to finely adjust the profile.
- Set markers along profile to quickly evaluate the product and adjust the wall thickness. Easily allow sections of the profile to shift up and down.
- Set serial markers and comparators to synchronise with any part of machine
- Easily select whether the profile to be time based (continuous extrusion) or position based (accumulator).
- With continuous extrusion, choose to auto adjust the cycle time to keep machine synchronised.
- With the accumulator, choose its velocity profile and whether you want pressure limit control during the injection and back pressure control during the filling.

## AXIS CONTROL



- Reduce cycle time with fast mould opening and closing motions. Combine them with rapid mould movement between the parison receiving and cooling stations and achieve improved production rates.
- Add to fast and precise motions the stability of closed loop control to guarantee high repetitiveness independently from environmental variations.
- Select acceleration and deceleration profiles that best suit machine.
- Make blow pin motion faster and more repetitive, improving quality and production rates.

## TEMPERATURES



- Control up to 32 temperatures.
- Quickly assess temperature with set points and actual values displayed numerically and graphically.
- Enable and disable individually each temperature zone heating and cooling.
- Read the status of each zone to immediately understand if any is outside the tolerance range.
- If needed, set manually a direct value to command the zone.
- Set independent upper and lower tolerance thresholds.
- Select a standby temperature and manage it with the weekly schedule page
- Choose among 9 thermocouple types
- Perform tuning of the PID parameters using auto tuning algorithms.

## TIMERS, SELECTIONS, PRODUCTION DATA, I/O MONITORING, AUTOMATIC CALIBRATION, ETC.



- Manage production with information on working shifts, production batches, material weight, production time, etc.
- Take control of machine production schedule and process with user-friendly set-up screens.
- Check status of the machine’s I/O with the overview pages.
- Choose how to perform the calibration of parison head and accumulator cylinder. Manual, semi-automatic and automatic modes are provided.