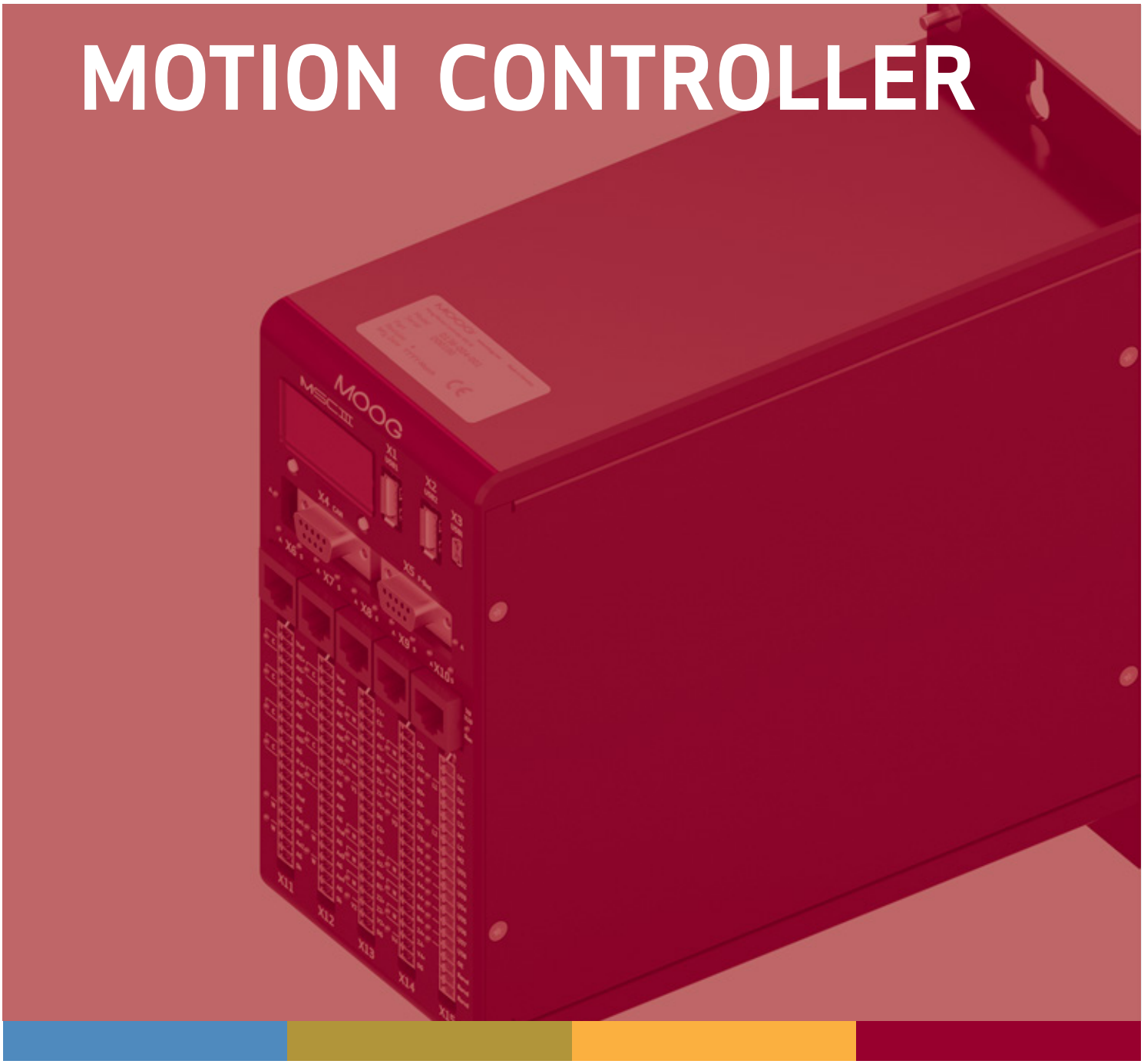
MOTION CONTROLLER



Rev. A, November 2018

OFFERING HIGH PERFORMANCE MOTION CONTROL FOR DEMANDING HYDRAULIC AND ELECTRIC APPLICATIONS

WHAT MOVES YOUR WORLD

MOOG

Whenever the highest levels of motion control performance and design flexibility are required, you'll find Moog expertise at work. Through collaboration, creativity and world-class technological solutions, we help you overcome your toughest engineering obstacles. Enhance your machine's performance. And help take your thinking further than you ever thought possible.

All dimensions in mm (in)

PRODUCT OVERVIEW

Moog Motion Control

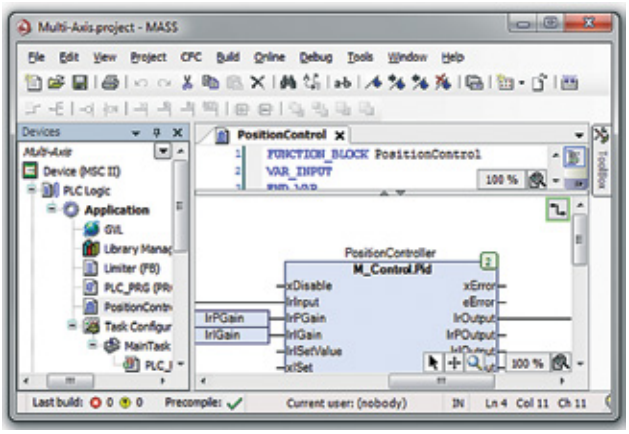
Moog offers a variety of freely programmable Motion Controllers, each of them designed with specialized functionality to meet a range of customer requirements. Regardless of your application, we have a Motion Controller that will meet your requirements.

MSC III Motion Controller

The MSC III Motion Controller is a high performance Motion Controller with PLC functionality that is ideal for complex centralized and decentralized applications.

The MSC III Motion Controller offers several fieldbus interfaces, high resolution analog inputs/outputs, position sensor interfaces and digital inputs/outputs.

It is designed for fast and accurate closed-loop control of multiple hydraulic and electric actuators.



MASS (Moog Application Software Suite)

The IEC 61131-3 is an integrated development environment based on CODESYS 3.

MASS offers full programming, debugging, simulation, parameterization, visualization and tracing capabilities.

It helps you to achieve enhanced machine performance via special Moog libraries of pre-programmed function blocks, and enables users to solve advanced control problems.

The MASS is designed to improve machine control by providing powerful, advanced capabilities for closed-loop and open-loop control, as well as PLC functionality.

FEATURES AND BENEFITS

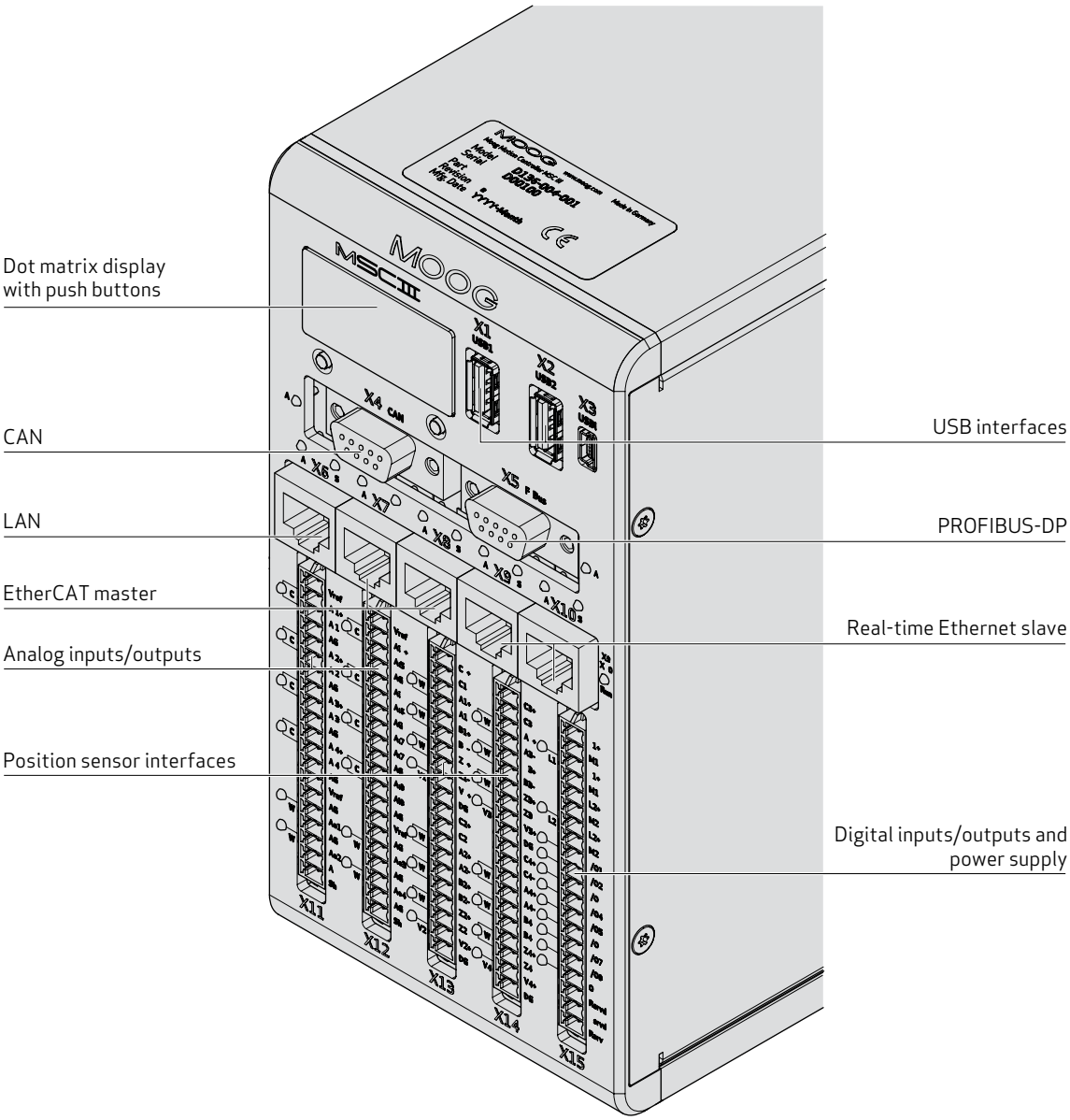
Feature	**Benefit**
Short cycle times	Higher machine productivity
Easy-to-use software and flexible hardware	Fast start-up commissioning
Support of user-defined open control structures	Maximum flexibility
Special Moog libraries of pre-programmed function blocks	Solve advanced control problems quickly
Multiple connectivity options	Quick integration
Remote servicing and debugging	Convenience

MSC III MOTION CONTROLLER

Overview

The MSC III Motion Controller is a freely programmable multi-axis Motion Controller that facilitates rapid and precise control of process variables such as position, speed and force. It is suitable for use with both hydraulic and electric motion control.

Interfaces

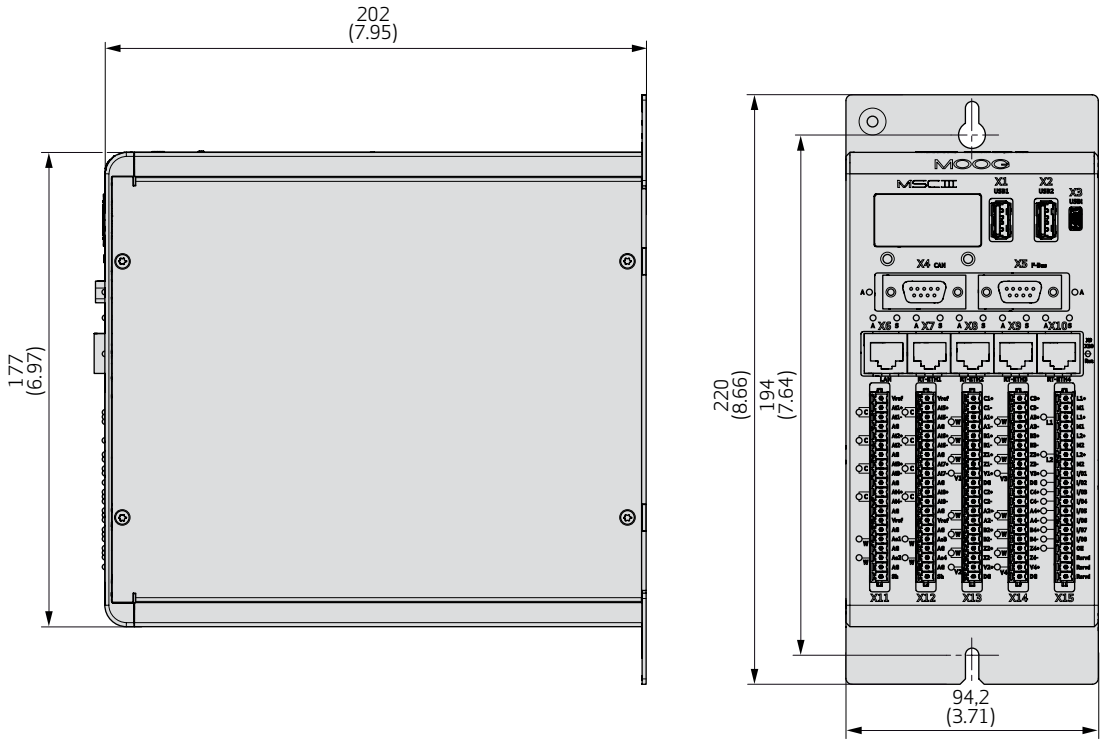


MSC III MOTION CONTROLLER

Designation	**MSC III**
Ordering number	D136-004-001
Integrated interfaces	
Ethernet	1
EtherCAT master	2
Real-time Ethernet slave	2
CAN/CANopen	1
PROFIBUS-DP slave	1
USB	2
Processor	
Processor	1,000 MHz
Processor type	i.MX6 Quad core CPU
Memory	
Flash-EEPROM	1 GB
RAM	1 GB
Nonvolatile RAM for retain variables	32 KB
Data maintenance	>10 years
General technical data	
Connection technique	Plug-in terminal strips with push-in spring connection
Mounting	On backing plate (DIN rail mounting kit available as accessory)
Dimensions W x H x D	94.2 x 202 x 220 mm (3.71 x 7.95 x 8.66 in)
Environmental data	
Operating temperature range	+5 to +55 °C (+41 to +131 °F)
Maximum mean temperature in operation for 24 hours	+50 °C (+122 °F)
Storage temperature range (in original packaging)	-25 to +70 °C (-13 to +158 °F)
Relative air humidity	10 to 95% (non condensing)
Maximum operation height	2,000 m (6,500 ft)
Maximum storage height	3,000 m (9,800 ft)
Air pressure for transportation	≥ 70 kPa (corresponds to an elevation of ≤ 3,000 m (9,800 ft))
Protection class	III
Degree of protection	IP20

MSC III MOTION CONTROLLER

Dimensions



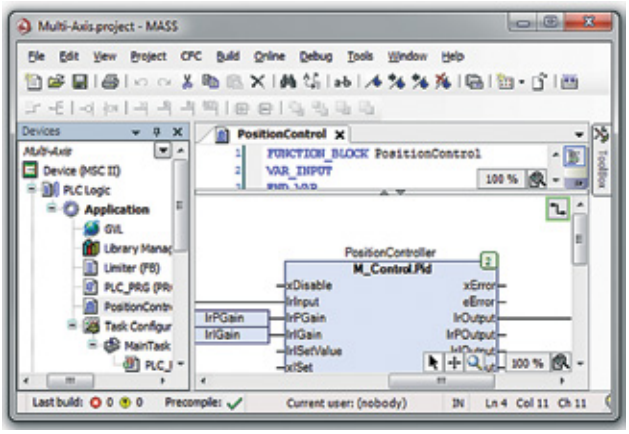
MSC III MOTION CONTROLLER

Standards	
Operating equipment requirements and tests	IEC 61131-2
EMC emission standard for industrial equipment	EN 61000-6-4
EMC immunity standard for industrial equipment	EN 61000-6-2
Shock resistance	IEC 60068-2-27
Vibration resistance	IEC 60068-2-6
Insulation strength	IEC 61131-2, test voltage 500 V_{DC}
Power supply	
Voltage supply of module electronics	24 V_{DC} (18 to 36 V), SELV according to EN 60950-1
Current consumption of module electronics	
Idling	0.7 A
Full load	2 A
Potential separation	Separate potentials for: • Ethernet • CAN/CANopen • PROFIBUS-DP slave • Analog Inputs/outputs • Digital Inputs/outputs
Internal voltages	Generated via internal DC/DC converters
Behavior at voltage failure/cut-off of supply voltage	Necessary data is permanently stored. If the supply voltage fails (<18 V), buffer capacitors provide the necessary energy.
Display	
Display type	Dot matrix display with 2 push buttons
Real-time clock	
Real-time clock	Real-time clock buffered by internal capacitor
Interfaces	
Ethernet	100/1,000 MBit/s with 8-pole RJ45 connector (100/1,000 Base-T)
EtherCAT master	2 x 100 MBit/s interfaces
Real-time Ethernet slave	2 x Real-time Ethernet fieldbus slave interfaces with RJ45 connectors
CAN/CANopen	CAN interface, transmission rate adjustable from 50 kBit/s to 1 MBit/s
PROFIBUS-DP slave	Maximum 12 MBit/s
USB	2 x USB 2.0 host, USB-A connectors
Digital inputs/outputs	
Type of digital inputs	Type 1 (current consuming) according to IEC 61131-2
Number of digital inputs/outputs	8
Configuration	Individually configurable as input or output
Voltage supply 24 V_{DC}	(18 to 36 V), SELV according to EN 60950-1
Maximum current capacity of single output	0.5 A

MSC III MOTION CONTROLLER

Protection	
Sustained short cicuit	Yes
Thermal overload	Yes
Overvoltage	Up to ±36 V
Analog inputs/outputs	
Voltage Supply	Via internal DC/DC converter
Analog inputs	
Type of analog inputs	Each analog input is configurable as ±10 V, ±10 mA or 4 to 20 mA.
Number of analog inputs	8
Resolution of analog inputs	16 Bit
Overvoltage protection	Up to ±36 V
Analog outputs	
Type of analog outputs	Each analog output is configurable as ±10 V, ±10 mA, ±20 mA or 4 to 20 mA.
Number of analog outputs	4
Resolution of analog outputs	16 Bit
Protection	
Short circuit	Yes
Overvoltage	Up to ±36 V
Reference voltage outputs	
Reference output voltage	+10 V_{DC}
Maximum current	5 mA
Sensor interfaces	
Number of sensor interfaces	4
Type of signal	Corresponding to EIA-422 with protection against 24 V
Wire fault monitoring	Inputs
Configuration	Each sensor configurable as incremental encoder or SSI
Incremental encoder interface	
Maximum pulse frequency	8 MHz
Edge evaluation	4-edge evaluation
SSI interface	
SSI Sensor data format	Gray or binary
Data bits	Up to 32 bit including diagnostic information
Transmission frequency	78 kHz to 5 MHz
Diagnostics	
Watchdog output: Outputs enabled signal	Analog and digital outputs in operation. In the event of a fault, the analog, digital and position sensor outputs are switched off (high impedance state)

MASS MOOG APPLICATION SOFTWARE SUITE



MASS (Moog Application Software Suite)

General

The Moog Axis Application Software Suite (MASS) offers a state of-the-art development environment for implementing demanding motion control functions using the IEC 61131 standard for development.

MASS includes tools for:

- Programming
- Testing and optimizing
- Debugging Documentation
- Visualization
- Configuration

Interfaces

- Ethernet (TCP/IP and UDP/IP)
- EtherCAT
- CAN/CANopen
- PROFIBUS-DP

Features

Extensive libraries with Moog function blocks, based on 50 years of experience in electric and hydraulic motion control.

- Freely programmable controller structures
- Maximum flexibility by offering a complete scope of functions in all IEC 61131 programming languages
- Simultaneous realization of control, regulation and PLC applications in one application program
- Open standard interfaces for communication with machine and process levels

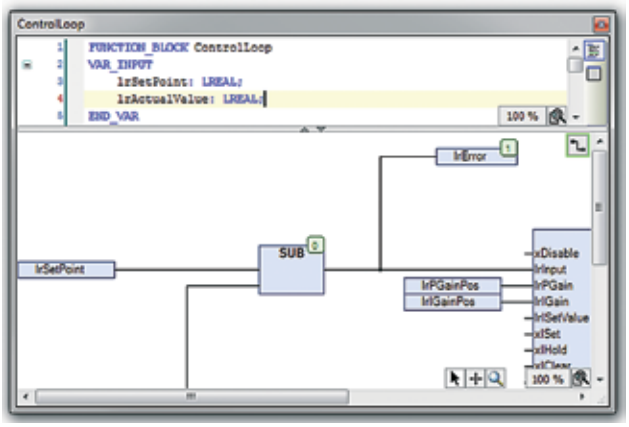
Benefits

- Quick project realization
- Low programming efforts
- One tool for programming, visualizing and documentation

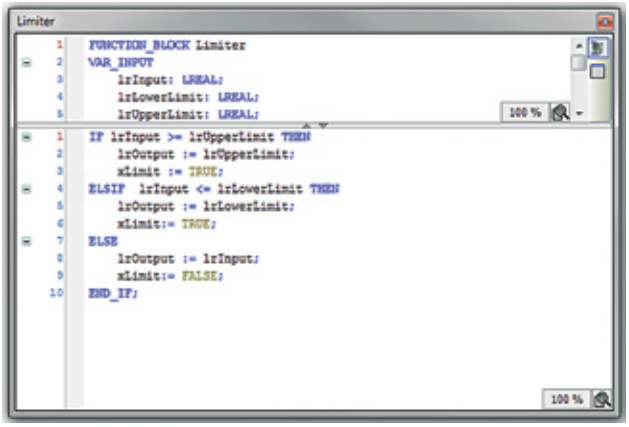
MASS MOOG APPLICATION SOFTWARE SUITE

Programming Languages

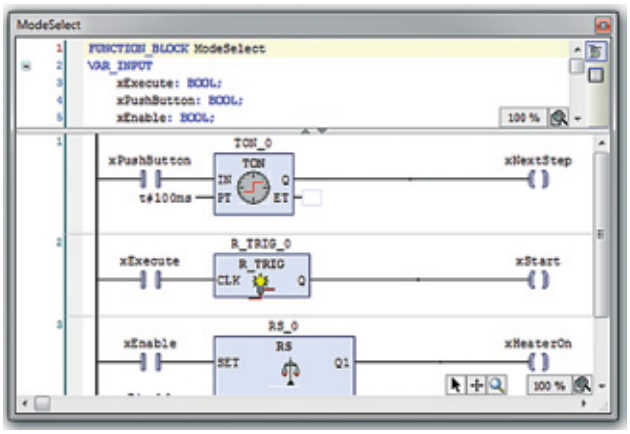
- All IEC 61131 programming languages and CFC (Continuous Function Chart)
- Full scope of functionality in all programming languages, provides maximum flexibility in creation of user programs
- Each module can sequence other modules regardless of their programming language



Continuous Function Chart (CFC)



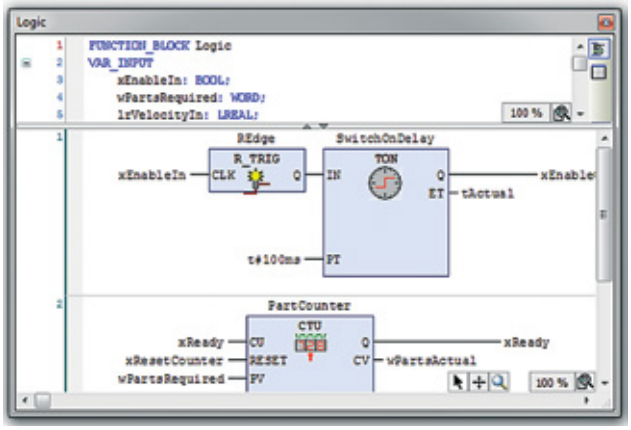
Structured Text (ST)



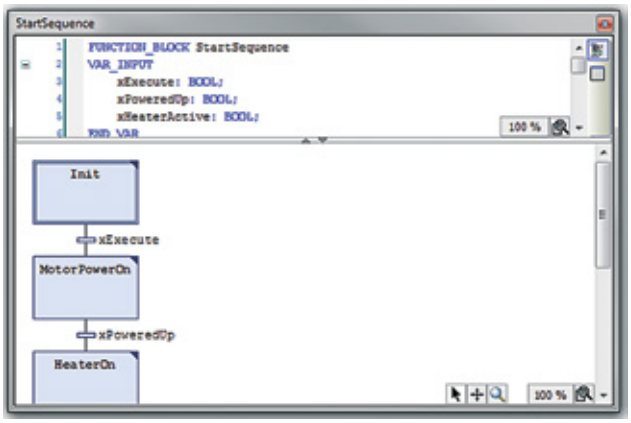
Ladder Diagram (LD)

Editors

- Context-sensitive input help
- Automatic formatting
- Context menus in all editors
- Multi-level undo/redo
- Display of current values of all variables in online operation



Function Block Diagramm (FBD)



Sequential Function Chart (SFC)

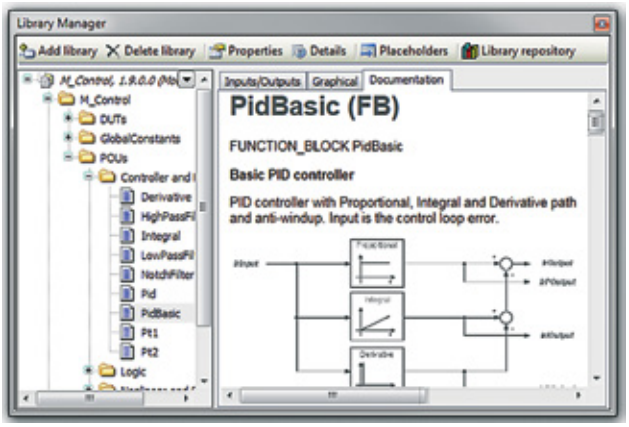
MASS MOOG APPLICATION SOFTWARE SUITE

MASS Functionality

MASS is based on CODESYS 3 which is the standard for IEC 61131 programming. It has been enhanced by Moog by adding motion control functionality. In this way, even complex automation projects can be simplified. MASS includes the following functionality:

Motion control technology

- Controller: I, D, PID standard/extended
- Filter: High-pass, low-pass, notch
- Non-linear functions: Dead band, nonlinear, dual-gain, look-up table
- Simulation of the process: PT1, PT2
- Function generator
- Signal delay
- Counter
- Timer
- Transfer functions: Continuous, time discrete



Library Manager

Hardware

- Signal conditioning for analog inputs/outputs and position sensors
- Diagnostics wire fault, power fault etc.
- Time evaluation
- Watchdog

Communication

Graphical configurator for:

- EtherCAT master
- CAN open master
- CAN open slave
- PROFIBUS-DP slave

Visualization

- Web based visualization: MASS visualization pages can be displayed on a web browser
- Support of CODESYS HMI

MASS MOOG APPLICATION SOFTWARE SUITE
Modules

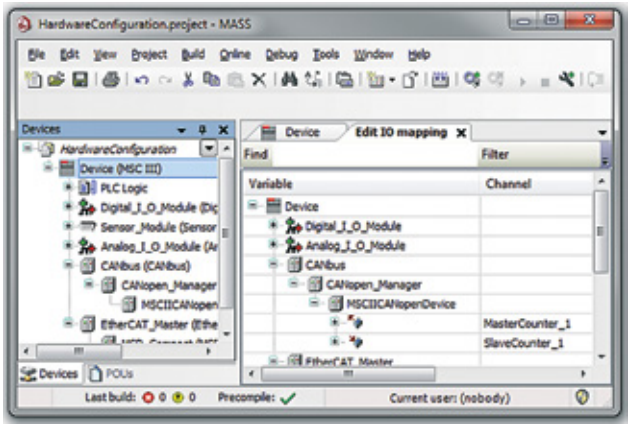
Visualization

- Commissioning tool
- Creation of visualizations for end users

Visualization

Hardware Configuration

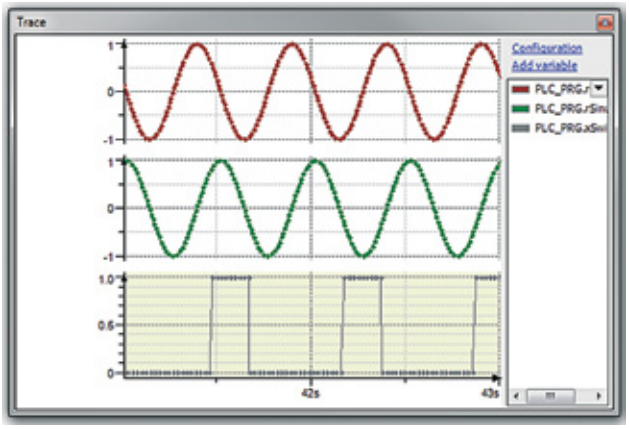
- Configuration of all modules on one screen



Hardware Configuration

Oscilloscope

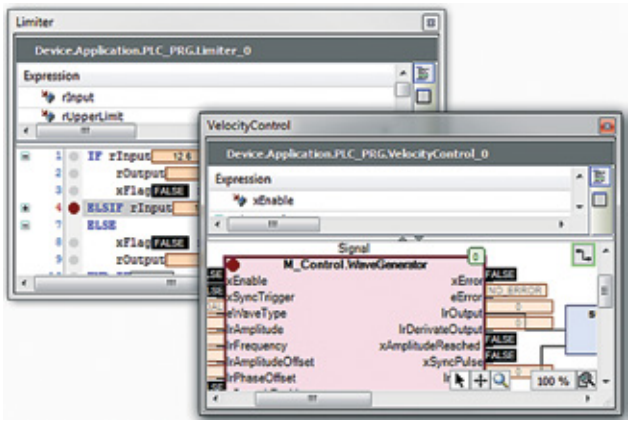
- Recording of multiple channels
- Various triggering possibilities



Oscilloscope

Debugging

- Break points
- Single step/single cycle
- Writing and forcing of variables
- Simulation possible without hardware
- Display of all the current values



Debugging

LICENSE KEY

The MSC III Motion Controller ´s license key contains the runtime license for the Moog Application Software Suite (MASS). Plug the license key to a USB connector of the MSC III. Depending on which license key is used, the MASS assigned functionality is enabled for usage.

Designation	Description	Ordering number
License key 'White'	MASS runtime license with basic functionality: • Moog control technology library	D138-030-001
License key 'Green'	All functions of license key 'White' and additionally: • EtherCAT • CANopen • PROFIBUS-DP slave • Web visualization	D138-030-002
License key 'Black'	All functions of license key 'Green' and additionally: • Generation of motion profiles, caming, gearing: Soft motion	D138-030-003
License key 'Red'	Program parts and/or complete application programs specifically upon customer request	Specific to the order

ORDERING INFORMATION

Designation	Description	Ordering number
MSC III Motion Controller	MSC III with 1x LAN, 2x EtherCAT master, 2x real-time Ethernet slave, 1x CAN, 2x USB, 1x PROFIBUS-DP slave, 4 x position sensor, 8 x analog input, 4 x analog output	D136-004-001
DIN rail mounting kit	For mounting the MSC III on a DIN top hat rail. To be screwed onto the back plate of the MSC III.	CC39899-001
Terminal connector	Plug component, number of positions: 20, pitch: 3.5 mm, color: gray, 5 terminal connectors are requiered for MSC III. Phoenix FMC 1,5/20-STZ4-3,5 RF GY- 1702670	CC44534-020
MASS Software Development Suite (Company/Subsidiary multiuser license)	This multi user license is valid for all users in one company at one location/site. Companies with multiple subsidiaries/sites need to purchase a multi user license per subsidiary/site. The software suite allows developing, debugging, visualizing and optimizing complex motion control applications. The package includes CODESYS 3 and allows IEC 61131 compliant programming in all IEC 61131 languages. One year MASS Software Maintenance Agreement (D138-020-001) is already included which includes priority hotline support and free MASS software updates for one year. IMPORTANT! Registration of the MASS Software Maintenance Agreement is necessary at MASS-support@moog.com to receive the software updates.	D138-010-001
MASS Software Maintenance agreement (Company/Subsidiary software maintenance agreement)	This maintenance agreement is valid for all users in one company at one location/site. Companies with multiple subsidiaries/sites need to purchase a multi user maintenance agreement per subsidiary/site. Renewing the MASS Software Maintenance Agreement needs to be done by the user. It can also be renewed in advance of the maintenance agreement expiration. It includes priority hotline support (email & phone) and free MASS software updates for one year. IMPORTANT!: Registration of the MASS Software Maintenance Agreement is necessary at MASS-support@moog.com to receive the software updates.	D138-020-001

MORE PRODUCTS. MORE SUPPORT.

Moog designs a range of motion control products to complement those featured in this document.
Moog also provides service and support for all of our products. For more information, contact the Moog facility closest to you.

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For service information, visit **www.moogglobalsupport.com**

Motion Controller
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