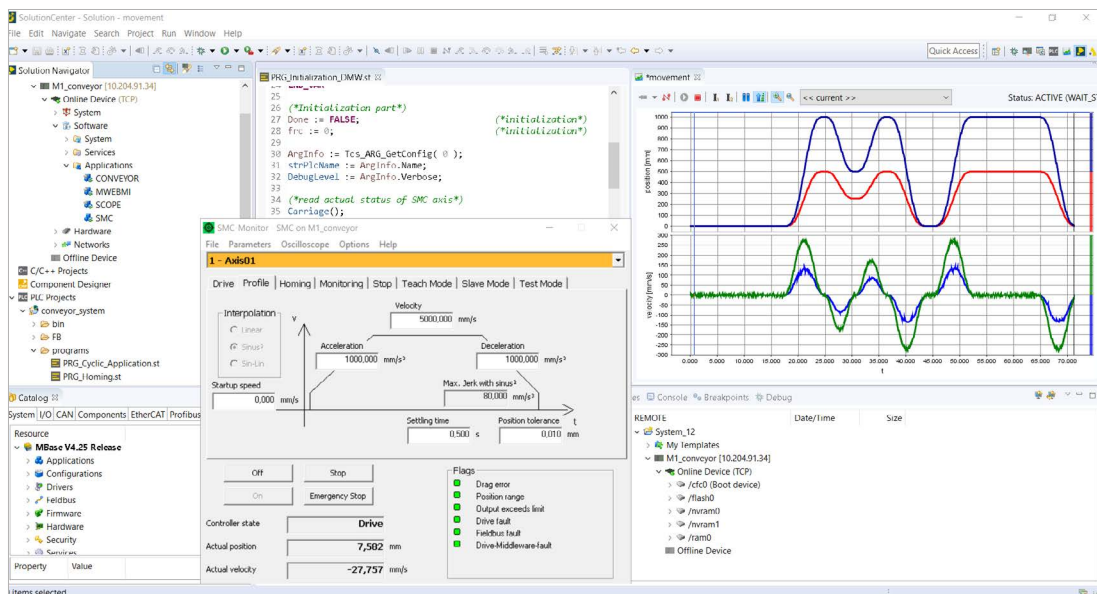## M-SMC
Software Motion Controller

When synchronous rotary and linear motions are needed, the following question has to be answered: How shall the individual axes be coordinated?

The M-SMC software module offers a solution for this task. M-SMC calculates the position and speed profiles and controls the drive axes. Thereby, considered gear ratios enable synchronous movements. Moreover, individual synchronous slave axes can be stopped and started again during machines' operation. This enables an electronic gear system to be implemented in the shortest possible time.

- Software module for open and closed loop control as well as monitoring of motion axes
- Operation of individual axes or synchronized multi-axes motions
- Jerk-optimized motion profiles
- Several methods for axes synchronization (gearing)
- Configuration and diagnostic via the SolutionCenter
- Commissioning user interface (SMC-Monitor)
- Library for IEC 61131-3 PLC programs

Item	Item-No.
M-SMC Download	00016959-90
M-SMC RT	00016959-63

Position synchronization by design

Production processes often require the position synchronized motion of all drive axes involved. Variable speeds and different roller diameters also increase complexity. M-SMC provides a solution for this task by design. Master-slave relations including the required synchronization method can be defined by means of a configuration.

During operation the slave axis can be synchronized at any time and stopped again. This enables applications such as a flying saw to be implemented in only a few steps.
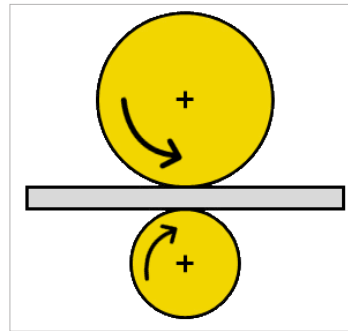
Optimized motion profiles

When approaching a new target position, minimum travel time and low occurring jerk seem to exclude each other. The Sin-Lin interpolation function enables M-SMC to offer a solution that combines the benefits of both previous characteristics. This therefore makes it possible to achieve high production cycles while reducing wear on mechanical components at the same time.
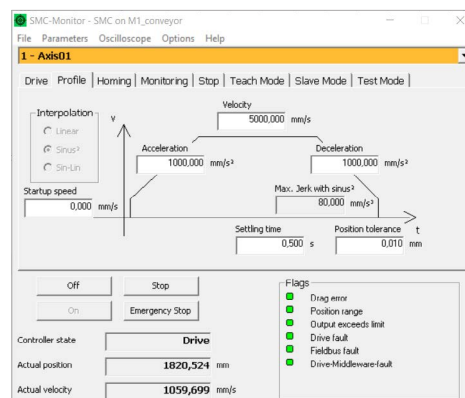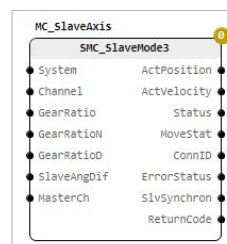
M-SMC also permits to adjust the target position of a motion axis even after movement has been started. Therefore, no braking and restarting is required. In this way, permanently executed motion sequences can still be adjusted to workpiece tolerances during the runtime without any loss in production time.
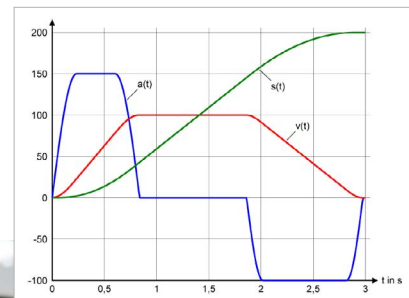
Creating applications easily

M-SMC is integrated in a machine controlling sequence program directly via the IEC 61131-3 library. Within this program, target positions are set, movements are started, and axes are synchronized as required. Command input via a HMI are also processed here.

The SMC-Monitor commissioning interface enables the full parameterization, operation and diagnosis of the software module. Utilizing Scope 3 software oscilloscope, highly dynamic processes are recorded directly on the controller and fully visualized on the PC. In this way, a complete overview is always ensured. This not only shortens the time required for the initial commissioning, but also enables fast troubleshooting during operation.

M-SMC

General

Controller representation	Software module on the M1 controller
Configuration	SolutionCenter
Parameterization	SMC-Monitor
Operation	SMC-Monitor Application integration via library for IEC 61131-3

Product Features

Number of available axes per M-SMC module	16 axes
Number of M-SMC modules on one M1 controller	No limit
Sampling time	200 µs to 20 ms

General Functions

Supported drive axes	• Rotational motions • Linear motions
Velocity interpolation types	• Linear interpolation between two set values • Sin² interpolation between two set values • Sin-Lin interpolation enables short travel times in spite of jerk optimization
Profile setting and control	Depending on the motion axis M-SMC performs various tasks: • The M-SMC software module performs the calculation of the set position and set speed including closed loop control • The M-SMC software module performs the calculation of the set position and set speed, the closed loop control is carried out in the drive
Controller structure	PID controller with feed forward control as • Velocity controller • Position controller with / without minor velocity controller
Adjusting controller parameters	Test functions, accessible via SMC-Monitor, enable function verification of selected controller parameters.
Referencing of the axes	Various methods are available depending on the drive, sensor and encoder used.
Monitoring of the movement range	Checking of the actual axis position in relation to the set travel range and protection including hardware limit switches.
Monitoring of the drag errors	This ensures that a motion axis reliably follows its set value.
Diagnostics	• SMC-Monitor commissioning user interface • Software oscilloscope Scope 3

Special Functions

Adjustment of the target position	The target position can be changed during a motion that has already started (move in move).
Projection of a linear motion onto a rotational motion	This enables a path segment of a linear axis to be projected onto a rotational motion from 0° to 360°. This enables a simple synchronization of axes with cyclically recurring movements.

M-SMC

Master / Slave Operation

Master axis	• Any M-SMC axis can be defined as master axis • The target position or set speed is defined via the application
Slave axis	• Any M-SMC axis can be defined as slave axis and linked to a master axis • An individual synchronization method is selected for each slave axis • During operation slave axes can be synchronized at any time and stopped again • The gear ratio can be defined for each axis

Synchronization methods	• Synchronized speed
	• Synchronized position
	  - Synchronization to a relative position for linear motions
	  - Synchronization to a recurring position for rotating motions

Drive Interface

Analog	Via Bachmann hardware modules (e.g. ISI222, GIO212)
Fieldbus	By means of DriveMiddleware or another user-specific drive integration
Step motor	Via Bachmann hardware modules (ACR222) Profiles are generated by M-SMC

Position Detection

From M1 via rotary encoder	The actual position is determined with Bachmann hardware modules (e.g. ISI222, CNT204).
By the drive via rotary encoder	The actual position is determined in the drive and transferred to M-SMC via the fieldbus.

Software Interfaces

Process communication	Internal values are provided as SVI variables and are directly available for other applications or the visualization.
Application interface	IEC 61131-3 library for parameter assignment, operation and diagnostics of the M-SMC software module

Installation

Installation medium for engineering PC	Installer, available by download
License protection on the M1 controller	Hardware-dependent license file

System Requirements

Engineering PC	Microsoft Windows 7, 8.1, 10, hard disk 512 MB free memory
M1 real-time system	Bachmann M1 processor modules of the series MH, MC, MX; M-Base from V3.95R

Order Codes M-SMC

Item	Item-No.	Description
M-SMC Download	00016959-90	Software, PLC library, commissioning tool and user documentation for M-SMC. Requires M-Base.
M-SMC RT	00016959-63	License to operate M-SMC software modules on a M1 controller