



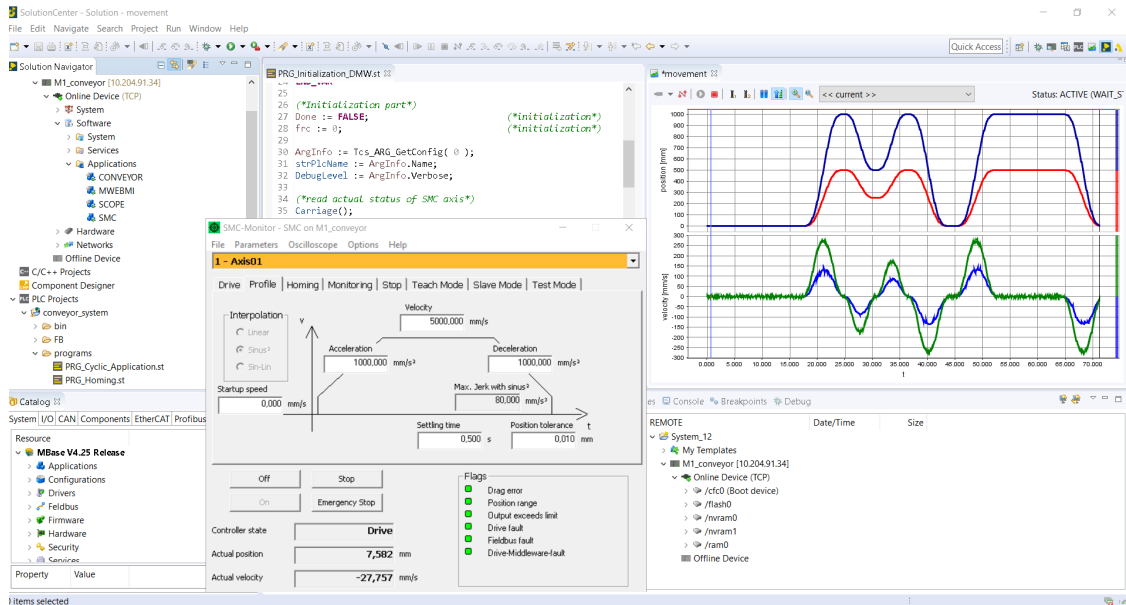
## M-SMC Software Motion Control

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 velocity profiles of the drive axes and regulates them. For synchronization of motions the required gear ratios are taken into account and the axes are also accelerated and decelerated during the runtime. This enables an electronic gearbox to be implemented in the shortest possible time.

### Features

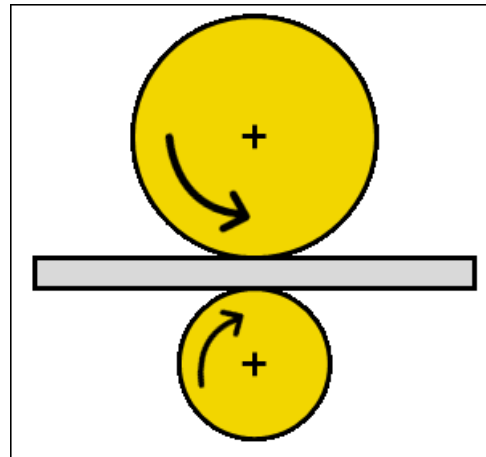
- Software module for control, regulation and monitoring of motion axes
- Operation of individual axes or synchronized multi-axis motions
- Jerk-optimized motion profiles
- Several methods for axis synchronization (gearing)
- Configuration and diagnostics via the SolutionCenter
- Commissioning user interface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

Part type designation	Part number
M-SMC Download	00016959-90
M-SMC RT	00016959-63



## Position synchronization by design

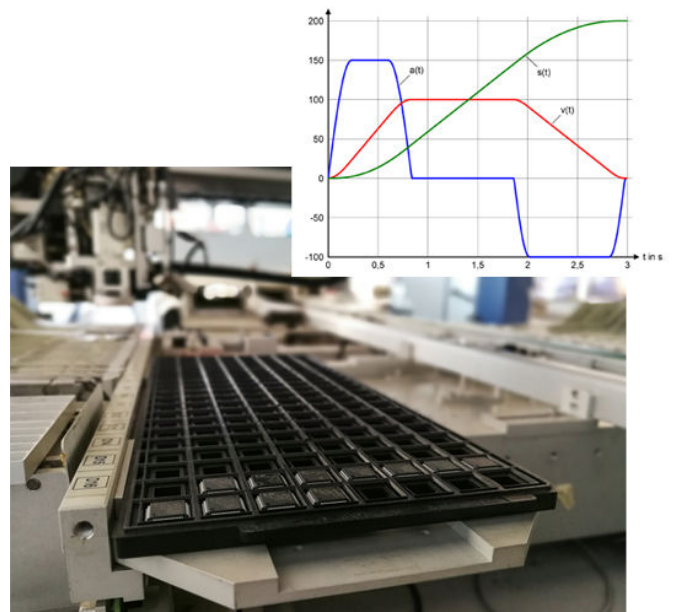
Production processes often require the position synchronized motion of all drive axes involved. Variable speeds and different roller diameters also increase complexity. M-SCM provides a solution for this task by design. Master-slave relations including the required synchronization method can be defined by means of a configuration. During operation the slave axis can be synchronized at any time and stopped again. This enables application programs such as a flying saw to be implemented in only a few steps.



## Optimized motion profiles

The approach to a new set position can mostly only be focused on either a minimum travel time or a minimally occurring jerk. The Sin-Lin interpolation function enables M-SCM to offer a solution that combines the benefits of both previous processes. This therefore makes it possible to achieve high production cycles while reducing wear on mechanical components at the same time.

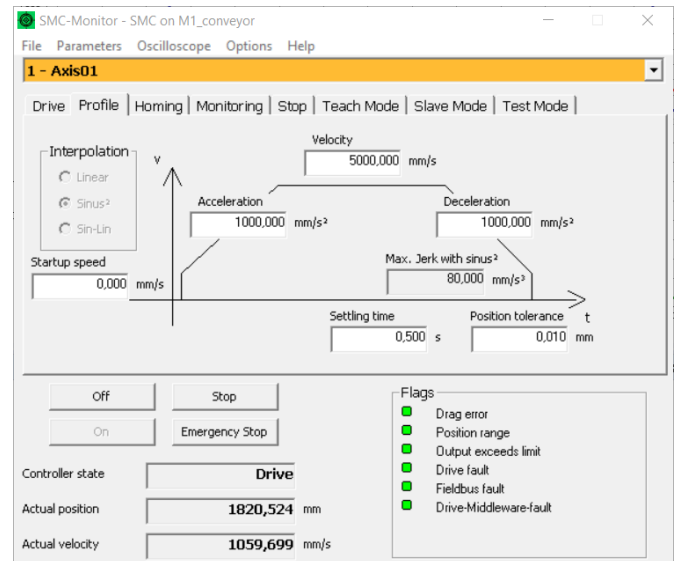
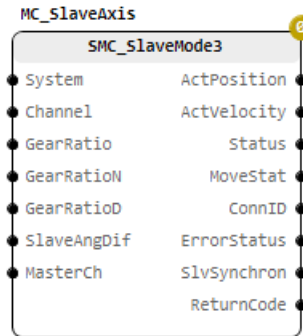
M-SCM also makes it possible to adjust the target position of a motion axis even after it has been started. Therefore no deceleration and restarting is required. In this way, permanently set motion sequences can still be adjusted to workpiece tolerances during the runtime without any loss in production time.



## Creating application programs easily

M-SMC is integrated directly in the higher-level sequence program via the IEC 61131-3 library. This is where set positions are specified, motions are started and axes synchronized if required. Entries made via an HMI are also processed in this program.

The SMC-Monitor commissioning interface enables the full parameterization, operation and diagnosis of the software module. Highly dynamic processes are recorded directly on the controller by the Scope 3 software oscilloscope 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 core	Software module on the M200 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 M200 controller	No limit
Sampling time	200 µs to 20 ms
General functions	
Supported drive axes	<ul style="list-style-type: none"> <li>Rotational motions</li> <li>Linear motions</li> </ul>
Velocity interpolation types	<ul style="list-style-type: none"> <li>Linear interpolation between two set values</li> <li>Sin<sup>2</sup> interpolation between two set values</li> <li>Sin-Lin interpolation enables short travel times in spite of jerk optimization</li> </ul>
Profile setting and control	Depending on the motion axis M-SMC can perform various tasks: <ul style="list-style-type: none"> <li>The M-SMC software module performs the calculation of the set position and setpoint velocity including control</li> <li>The M-SMC software module performs the calculation of the set position and setpoint velocity, the control is carried out in the drive</li> </ul>
Controller structure	PID controller with feed forward branch as <ul style="list-style-type: none"> <li>Velocity controller</li> <li>Position controller with/without subordinate velocity controller</li> </ul>
Setting controller parameter	Test functions in the SMC-Monitor enable the function verification with the selected controller parameters.
Referencing of the axes	Various methods are available depending on the drive, encoder and initiator used.
Monitoring of the movement range	Checking of the actual axis position in relation to the set travel limit and protection through hardware limit switch
Monitoring of the drag errors	This ensures that a motion axis reliably follows its set value.
Diagnostics	<ul style="list-style-type: none"> <li>Commissioning user interface SMC-Monitor</li> <li>Scope 3 software oscilloscope</li> </ul>
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 continuous axis to be projected onto a rotational motion with 0° to 360°. This enables a simple synchronization of axes with cyclically recurring motions.
Master/Slave operation	
Master axis	<ul style="list-style-type: none"> <li>Any M-SMC axis can be defined as master axis</li> <li>The set position or setpoint velocity is defined via the application program</li> </ul>
Slave axis	<ul style="list-style-type: none"> <li>Any M-SMC axis can be defined as slave axis and linked to a master axis</li> <li>An individual synchronization method is selected for each slave axis</li> <li>During operation slave axes can be synchronized at any time and stopped again</li> <li>The gear ratio can be defined for each axis</li> </ul>

Master/Slave operation	
Synchronization methods	<ul style="list-style-type: none"> <li>• Velocity synchronization</li> <li>• Position synchronization               <ul style="list-style-type: none"> <li>– Synchronization to a relative position for linear motions</li> <li>– Synchronization to a recurring position for rotating motions</li> </ul> </li> </ul>
Drive connection	
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	
By M200 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 application programs 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 M200 controller	License file depending on hardware
System requirements	
Engineering PC	Microsoft Windows 7, 8.1, 10, hard disk 512 MB free memory
M1 real-time system	Bachmann M200 processor modules of the MX, MC, and MH series, M-Base from V3.95R

## Order data

Part type designation	Part number	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 file to operate the M-SMC software module on an M200 controller.