SoMachine configuration software

Catalog

December 2015

Schneider Electric

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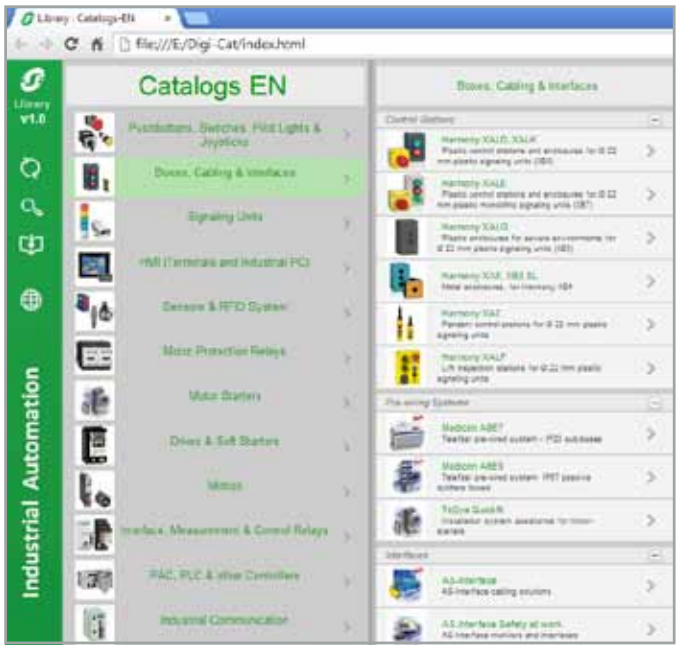

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General contents

SoMachine Basic programming software

For Modicon M221 and M221 Book logic controllers

Compatibility of offers

SoMachine Basic programming software

- Modicon M221 logic controllers
- Modicon M221 Book logic controllers
- Modicon TM3 expansion modules
- Modicon TM2 expansion modules

SoMachine Basic software

Presentation

SoMachine Basic programming software is a user-friendly tool designed to develop projects on Modicon M221 or Modicon M221 Book logic controllers. It can convert applications created on TwidoSuite and TwidoSoft.

- SoMachine Basic is organized according to the project development cycle: navigation of the software is easy and intuitive.
- SoMachine Basic offers a modern interface, so that getting started is:
  - User-friendly and fast: The simplified interface helps you find the information you need in two or three clicks maximum
  - Efficient, due to the functions available
- SoMachine Basic creates an operator interface for remote graphic display **TM2GDB**

Connecting a PC to the controller

There are several ways of connecting a PC to Modicon M221 logic controllers during the programming, debugging and maintenance phases.

Link via connection cables

The PC is connected to the M221 controller via the USB-B port, using cable **TCSXCNAMUM3P** (mini-USB to USB).

Link via modem or router

Modems can reduce the frequency of on-site visits for certain maintenance operations.

- The modem connected to the M221 logic controller must be declared in the hardware configuration. It will be initialized by the controller automatically (Hayes initialization string).
- At the PC end, the SoMachine Basic software will associate a special modem connection that will be memorized in the project (including the telephone number to use).

Ethernet network link

With their integral Ethernet port, TM221●●E●● logic controllers can be connected to a PC using the Ethernet network and the Modbus TCP/IP protocol.

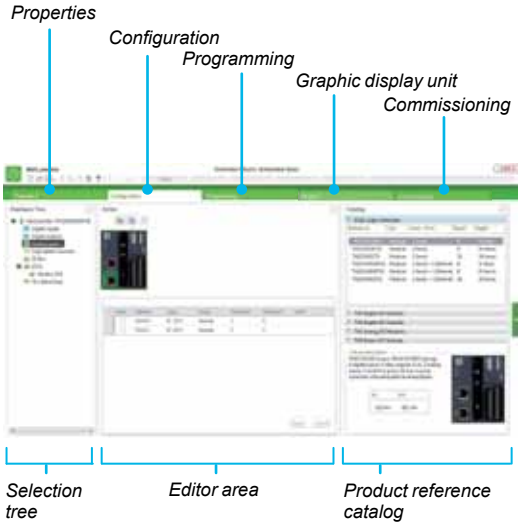
Bluetooth® wireless link

The Bluetooth® wireless link enables complete freedom of movement within a radius of 10 m around the controller.
Schneider Electric offers Bluetooth® wireless adapters both for the controller side and PC side. Please consult our website: www.schneider-electric.com.

SoMachine Basic programming software

For Modicon M221 and M221 Book logic controllers

Navigation, Project management, Properties, Configuration



Properties

Configuration

Functions

Navigation

SoMachine Basic offers intuitive and visual navigation.

- ☐ The presentation is optimized for selecting the development cycle stage of the project (Properties, Configuration, Programming, Display, Commissioning).
- ☐ Each screen is divided into 3 zones:
  - A Selection tree
  - An Editor area: a streamlined workspace to carry out what is necessary and relevant to the current task, without any superfluous information
  - A Product reference catalog organized by range

Project management

The Project management function is used to:

- ☐ Create a new project
- ☐ Open a project from the PC (hard disk, CD-ROM, USB key, etc.)
- ☐ Retrieve a project from an M221 logic controller
- ☐ Open a Twido project, with automatic conversion
- ☐ Create a new project based on an existing project "template"
- ☐ Print a project

Properties

Screens enabling entry of identification data for a new project, such as:

- ☐ Details of the project creator
- ☐ Details of their company
- ☐ Information relating to the project
- ☐ Project protection information
- ☐ Application protection information

Configuration

Configuration allows:

- ■ Creation of the hardware configuration corresponding to the application by selecting from a "catalog":
- ☐ The logic controller (Modicon M221)
- ☐ The I/O expansion modules (Modicon TM2, Modicon TM3)
- ☐ The standard and application cartridges

A graphic editor enables easy assembly of the various elements using simple drag & drop.

- ■ And configuration of all the hardware functions selected for the application:
- ☐ Discrete, analog I/O
- ☐ High Speed Counter inputs
- ☐ High speed outputs:
  - Pulse Width Modulation (PWM)
  - Pulse generator (PLS)
  - Pulse Train Output (PTO)
  - Frequency generator
- ☐ And the communication ports (Ethernet, serial links):
  - Ethernet: EtherNet/IP, Modbus TCP client and server, Exchange table
  - Serial links: Modbus RTU or ASCII, ASCII protocol, Display

SoMachine Basic programming software

For Modicon M221 and M221 Book logic controllers

Programming, Display, Commissioning

Programming

Grafcet graphic language

Display

Commissioning

Functions

Programming

- The program is organized in POUs (Program Organization Units) or sections. These sections consist of RUNGs (networks) to simplify both reading and navigation within the program.
- The POUs are associated with various tasks of the application: master, periodic, events.
  They can be programmed in:
  - Instruction List (IL) language
  - LADDER (LD) language
  - Grafcet graphic language
- Rungs define all the connectable elements in the application.

- The LADDER editor provides intuitive and high-performance programming:
- Drag & drop operation
- Undo/Redo function
- Choice of keyboard shortcuts and toolbar according to the user profile
- Easy connection of LADDER elements using the “Pencil” and “Rubber” tools
- Assistance with connection of LADDER elements when creating rungs
- Easy linking of variables to the LADDER elements
- Context-sensitive online help
- Project backup, even if the LADDER networks are not complete
- Automatic analysis and compilation
- Modification online and in Run mode: this mode allows the connected controller program to be modified.
- Animation tables
- Search and replace function with Trace function.

Grafcet graphic language

Grafcet (Command Step-Transition Functional Graphic) is the French acronym for “**GRA**phe **F**onctionnel de **C**ommande **E**tape-**T**ransition”.
Grafcet has been standardized under the classification index NF C 03-190. The corresponding European standard is EN 60848.

Grafcet language is based on a graphic representation that is easy to understand:

- Step: the step represents a partial system state, in which an action has been performed. The step can be active or inactive. The associated action is executed when the step is active, and remains dormant when the step is inactive.
- Transition: this links one or more previous steps to one or more previous subsequent steps. It describes a change of state.

Two conditions are monitored while moving to the next step:

- Each step preceding the transition must be active (and the actions must have been executed).
- The Boolean condition associated with the transition is “True”.

Display

- Configuration of the remote graphic display
- Configuration of the Alarm list
- Creation and configuration of an operator interface from pre-defined pages (menu, monitor, control, bar graph, gauge)

Commissioning

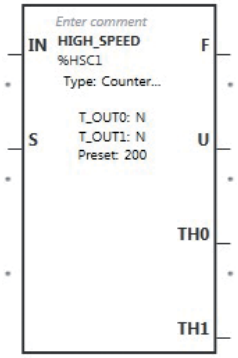
Tasks that are available and can be carried out during application commissioning:

- Connection:
- Automatic discovery of the controller connected to the PC, according to the type of connection port: USB, Ethernet, Bluetooth®
- Transfer of application between PC and logic controller
- Firmware update of the logic controllers
- Backup and restoration of all the PLC data: memory area and SD card management
- Information about the PLC (logic controller)
- Real-time clock management

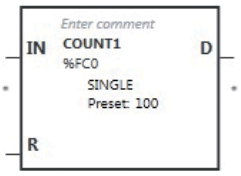
SoMachine Basic programming software

For Modicon M221 and M221 Book logic controllers

Counting, PTO, Communication



High speed counting HSC



Fast counting FC

Functions

Counting

SoMachine Basic provides two high speed counting software functions for Modicon M221 logic controllers.

■ High Speed Counting HSC

The counter is accessed via the %HSCi 32-bit function block. It is programmed for execution of one of the following functions:

- Up/Down counter
- Bi-phase Up/Down counter
- Frequency meter

The pulses to be counted can come from an incremental encoder or proximity sensors (upcounting/downcounting) connected to inputs I0 and I1 of the M221 logic controller.

■ Fast counting FC

The 16-bit %FCi fast counter enables upcounting or downcounting of pulses (rising edge) on the fast inputs of the M221 logic controller.

PTO

18 function blocks are used to manage the fast outputs (PTO) as outputs of the following type:

- Speed
- Position
- S curve profile
- Execution of a points table (Multi-segment)

Communication

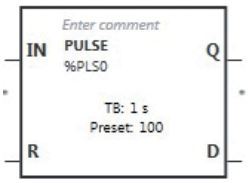
4 function blocks exist to facilitate the implementation of communication:

- Modbus serial link
- Modbus Ethernet link
- Exchanging messages over serial link
- Sending and receiving SMS messages

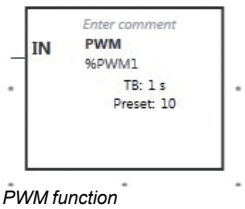
SoMachine Basic programming software

For Modicon M221 and M221 Book logic controllers

Position control, Event processing, Process control (PID)



PLS function



PWM function

Functions

Position control

SoMachine Basic provides three positioning software functions for the Modicon M221 logic controllers used. For example, stepper motor control.

■ PLS function

The PLS function block generates pulses of fixed ratio. In some cases, the frequency can be fixed and in others it is variable (as in control of slopes when driving a stepper motor). The %PLS function block can be programmed to generate a specific number of pulses.
The %PLS function blocks are assigned to the %Q0.0 or %Q0.1 outputs of M221 logic controllers *(1)*.
The pulse generator signal has a variable period, but with a constant duty cycle which establishes an ON to OFF ratio of 50% of the period.

■ PWM function

The PWM function block generates pulses of fixed frequency, with a variable ON to OFF ratio for the output signal. The ON to OFF duration ratio is a dynamic variable called %PWM.R, with a range from 1% to 100%.
The PWM function blocks are assigned to the %Q0.0 or %Q0.1 outputs of M221 logic controllers *(1)*.
The %PWM function block, defined by the user, generates a signal on output %Q0.0 or %Q0.1 of M221 logic controllers.

■ Frequency generator function (FREQGEN)

The Frequency generator function generates a square wave signal on the outputs of M221 logic controllers *(1)* with a fixed duty cycle (50%).
The frequency can be configured from 0.1 Hz to 100 kHz with intervals of 0.1 Hz.

■ PTO function

The PTO function enables position control by pulse train - pulse/direction (P/D) or CW/CCW signals, depending on the type of servo drive.
These pulses are generated on outputs %Q0.0 and %Q0.1 of M221 logic controllers *(1)*.

Event processing

Event management by the application.

- ■ Source types:
  - □ Events on embedded inputs
  - □ Threshold events on the high speed counter (HSC)
  - □ Periodic event (Timer)
- ■ Each event executes a single subroutine.

Process control (PID)

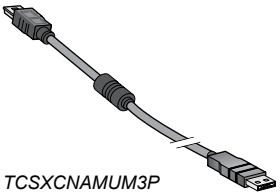
- ■ 14 PID programming loops
- ■ Auto-tuning algorithm
- ■ Analog/PWM output
- ■ Linear conversion of measurement input
- ■ 2 alarm levels (high and low) on the measurement
- ■ Control output limits
- ■ Forward and reverse action

(1) On TM221C●40U logic controllers, up to 4 outputs support the function (PLS, PWM, frequency generator or PTO).

SoMachine Basic programming software

For Modicon M221 and M221 Book logic controllers

SoMachine Basic software



TCSXCNAMUM3P

References

SoMachine Basic software

- ■ SoMachine Basic software runs on the following configurations:
- □ Microsoft Windows® XP Professional SP3 (Service Pack 3) 32 and 64-bit, Microsoft Windows® 7 Professional Edition 32 and 64-bit, Microsoft Windows® 8 Professional Edition 32 and 64-bit, and Microsoft Windows® 8.1 32 and 64-bit
- □ 1 GHz Premium type processor, 1 GB hard disk and 1 GB RAM minimum
- □ Minimum screen resolution of 1,280 x 800 pixels recommended
- ■ The software product is available:
- □ On our website www.schneider-electric.com
- □ or on CD (see below)

Description	■ Programming languages □ User languages	Version/ Media	Reference	Weight kg/ *lb*
SoMachine Basic	■ Instruction List (IL) language, Ladder (LD) language, Grafcet graphic language □ Languages available: English, French, German, Italian, Spanish, Brazilian Portuguese, Simplified Chinese and Turkish	V1.4/ CD	**SOMBASAP14**	–

Cable for connecting a PC to the M221 logic controller

Description	For use		Length	Reference	Weight kg/ *lb*
	From	To			
Programming cable	Type A USB port of programming and firmware update PC	Mini-B USB port of M221 and M221 Book logic controllers	3 m *9.84 ft*	**TCSXCNAMUM3P**	0.065/ *0.143*

Link via modem or router

Modem, VPN industrial router	Remote access for Modicon M221 and Modicon M221 Book logic controllers, Please consult on our website: www.schneider-electric.com

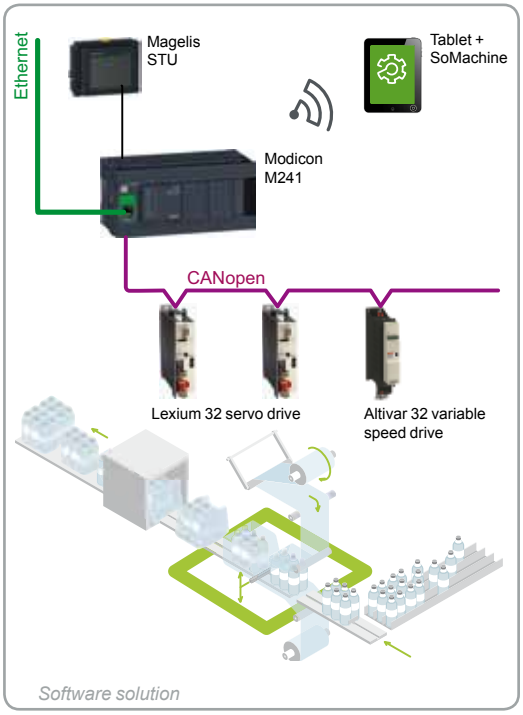
Bluetooth® wireless link

Please consult on our website: www.schneider-electric.com

SoMachine software

Simplify machine programming and commissioning

SoMachine software platform



Software solution

Presentation

SoMachine is the machine builder's solution software for developing, configuring, and commissioning the entire machine in a single software environment, including logic, motion control, HMI, and related network automation functions.
SoMachine allows you to program and commission all the elements in Schneider Electric's Flexible and Scalable Control Platform, the comprehensive solution-oriented offer for machine builders, which helps you achieve the optimum control solution for each machine's requirements.

The Flexible and Scalable Control Platforms offer includes:

- Controllers:
  - Modicon logic controllers: M238, M241, M251 and M258
  - Modicon motion controllers: LMC058, LMC078
  - HMI controllers: Magelis SCU, XBTGC, XBTGT/GK
  - Drive controller: Altivar IMC
- I/O:
  - Modicon I/O modules: TM2, TM3, TM5, and TM7 offers
- HMI:
  - Magelis™ STO/STU Small Panels
  - Magelis™ GH/GK/GT Advanced Panels
  - Magelis™ GTO Optimum Advanced Panels
  - Magelis™ GTU Universal terminals

Scalability

- SoMachine allows flexible and scalable use of controllers in the SoMachine context: it is easy to integrate the M221 logic controllers from SoMachine Basic into a SoMachine project.
- The Flexible Control feature allows you to replace a controller with another one, while retaining the logic and the configuration. Several versions of SoMachine can run in parallel in a system to help ensure compatibility.

SoMachine is a professional, intuitive, and open software solution integrating Vijeo Designer. It also integrates the configuring and commissioning tool for motion control devices. It supports all the IEC 61131-3 languages, integrated fieldbus configurators, expert diagnostics and debugging, as well as multiple capabilities for maintenance and visualization including web visualization.
SoMachine integrates tested, validated, documented, and supported expert application libraries dedicated to pumping, packaging, hoisting, and conveying applications.
SoMachine is a single software environment with:

- One software package
- One project file
- One connection
- One download operation

Visual graphic user interface

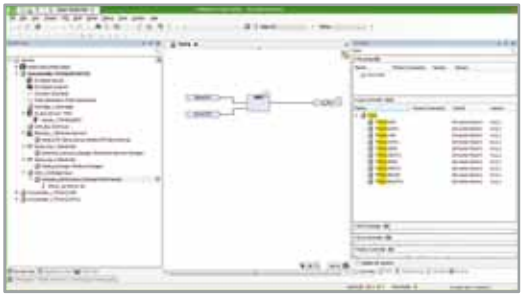
Navigation within SoMachine is intuitive and highly visual. Presentation is optimized in such a way that selecting the development stage of the desired project makes the appropriate tools available. The user interface suggests the tasks to be performed throughout the project development cycle so that nothing is overlooked. The workspace has been streamlined, so only that which is necessary and relevant to the current task is featured, without any superfluous information.

Learning center

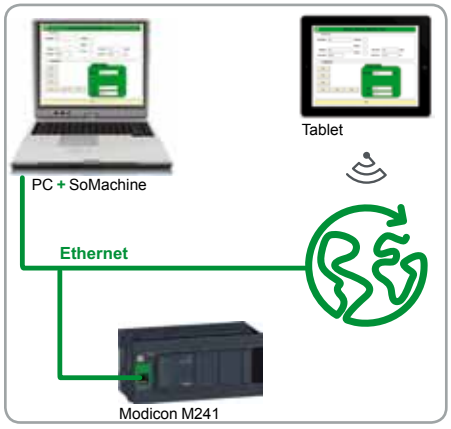
From the home menu, the learning center provides several tools to help you get started with SoMachine. An animated file explains the SoMachine interface and concept in brief. An e-learning section gives you the opportunity to teach yourself about SoMachine and its new features. A third section provides links to several documented examples of simple coding with SoMachine.
An intuitive and efficient online help is also available to answer your questions.

SoMachine software
Simplify machine programming and commissioning

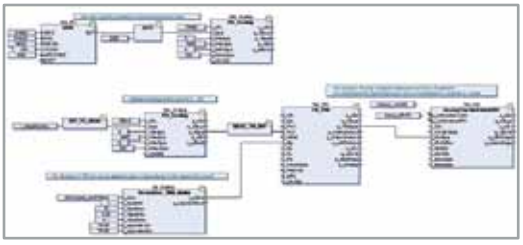
Project management



"Catalog"



Web visualization



Application Function Blocks

Project management

The software's project management functionality lets you browse through existing projects quickly to gather the relevant information without needing to open each project individually.
There are several ways of creating a new project: using tested, validated, documented architectures (TVDA), using the examples provided, using an existing project or starting with an empty project. There is quick access to the most recently used projects.
You can also create a project from a standard project taking advantage of a preconfigured program (task, library, etc.).

Project properties

You can define additional information for each project using simple forms. It is also possible to attach documents and custom or configuration pictures. The software also supports automatic versioning.

Configuration

The user interface allows you to configure devices and architectures in a hierarchical order.
The various elements of the configuration can be easily assembled by selecting from a device "catalog" (controllers, expansion modules, etc.) with a simple drag & drop.
The catalog can be searched and filtered as required.
Device templates are available to easily add preconfigured equipment.

Programming and debugging

Programming is an essential step, and the user has to carefully design it to be as efficient as possible. Advanced control and HMI functions cover all the needs of machine builders in terms of creating the control and visualization systems.
Powerful tools allow debugging and functional tests such as simulation, step-by-step execution, breakpoints, and traces.

Documentation

SoMachine allows you to customize and generate a project report for printing:
- Select the items to be included in the report
- Organize the sections
- Define the page layout
- Print the report

Transparency

SoMachine is an FDT (Field Device Tool) container and supports DTM (Device Type Manager) files.
SoMachine manages remote devices via DTM files, providing direct communication with each device.
Communication is transparent via SoMachine, the controller, and the fieldbus (Modbus serial link, Modbus TCP, CANopen, and EtherNet/IP).
SoMachine also supports FDT/DTM connections directly from the PC to the devices via Modbus serial link or Modbus TCP.

Application Function Block (AFB) libraries for dedicated solutions

SoMachine includes application function block libraries for selected machines. Their simple configuration speeds up design, commissioning, installation, and troubleshooting.
These libraries cover the following applications:
- Packaging
- Hoisting
- Handling
- Pumping
- Material working

Tested Validated Documented Architectures (TVDA)

SoMachine provides a variety of preset projects with ready-to-use architectures you can adapt to individual requirements. Some of them are generic TVDAs based on controller configurations. Others can be dedicated to specific solutions by application-oriented TVDAs.

SoMachine software
Simplify machine programming and commissioning

SoMachine characteristics

IEC 61131-3 programming languages	■ IL (Instruction List) ■ LD (Ladder Diagram) ■ SFC (Sequential Function Chart) ■ ST (Structured Text) ■ FBD (Function Block Diagram) **and** CFC (Continuous Function Chart)
Controller programming services	■ Multi-tasking: Mast, Fast, Event ■ Functions (Func) and function blocks (FBs) ■ Data Unit Type (DUTs) ■ Online changes ■ Watch windows ■ Graphical monitoring of variables (trace) ■ Breakpoints, step-by-step execution ■ Simulation ■ Visualization for application and machine setup
HMI-based services	■ Graphics libraries containing more than 4,000 2D and 3D objects ■ Simple drawing objects (points, lines, rectangles, ellipses, etc.) ■ Preconfigured objects (button, switch, bargraph, etc.) ■ Recipes (32 groups of 256 recipes with max. 1,024 ingredients) ■ Action tables ■ Alarms ■ Printing ■ Java scripts ■ Multimedia file support: wav, png, jpg, emf, bmp ■ Variable trending
Motion services	■ Configuration and commissioning of embedded devices ■ CAM profile editor ■ Sample application trace ■ Motion and drive function block libraries for variable speed drives, servo drives and stepper drives ■ Visualization screens ■ Logical encoder
Global services	■ User access and profile ■ Project documentation printing ■ Project comparison (control) ■ Variable sharing based on publish/subscribe mechanism ■ Library version management ■ Machine energy efficiency monitoring
Integrated fieldbus configurators	■ Control network: □ Modbus serial link □ Modbus TCP □ Modbus TCP I/O Scanner ■ Fieldbus: □ CANopen □ Sercos III ■ CANopen protocols supported: □ J1939 □ CANmotion ■ Connectivity: □ Profibus-DP □ EtherNet/IP ■ Web visualization: display the SoMachine controller visualization screens in a web browser
Expert and solutions libraries	■ PLCopen function blocks for motion control □ Example: MC_MoveAbsolute, MC_CamIn, ServoDrive, etc. ■ Packaging function blocks □ Example: analog film tension control, rotary knife, integration of PackML (Packaging Machine Language), etc. ■ Handling function blocks □ Example: tracking, turntable, conveyor, etc. ■ Hoisting functions □ Hoisting function blocks: anti-sway, anti-crab, hoisting position synchronization, etc. □ Application template for industrial crane ■ Pumping application □ Pumping function blocks: cavitation protection, friction loss, PID, stage/destage functions, etc. □ Application template for booster ■ Material processing application □ Application templates ■ Material working □ Rotary knife, flying shear, temperature monitoring, etc ■ Energy efficiency library
Tools	■ Controller assistant □ Manage the firmware and application without opening SoMachine □ Create images and backup of the controller ■ Software configuration manager □ Manage the installed versions and components of SoMachine ■ License manager □ Activate and manage licenses for all Schneider Electric licensed products □ Support registration and license transfer ■ Schneider Electric Software Update (SESU) □ Online notification of all available updates and news about the installed Schneider Electric software products □ Download and install updates, patches, and extensions from the web ■ Diagnostics (available on Modicon LMC078 motion controllers) □ Be informed of the machine status, including save operations, device parameters, the state of the I/O, and a graphic view of the Sercos ring architecture

SoMachine software
Simplify machine programming and commissioning

Product offer

SoMachine software is supplied on a DVD whose features are available for a 21-day trial. Afterwards a license is required to continue to benefit from SoMachine.

- SoMachine is available in 8 languages: English, French, German, Italian, Portuguese, Simplified Chinese, Spanish, and Turkish
- Operating systems for engineering PC: Microsoft Windows® 7 Professional 32-bit/64-bit, Microsoft Windows® 8.1 Professional 32-bit/64-bit
- Documentation is supplied in electronic format: complete online help with complementary documentation in pdf version

References

SoMachine software

Supported controllers	Reference	
	DVD *(1)*	**License** *(2)*/number & type
■ Logic controllers: Modicon M238, Modicon M241, Modicon M251, Modicon M258 ■ Motion controllers: Modicon LMC058, Modicon LMC078 ■ HMI controllers: Magelis SCU, XBTGC, XBTGT/GK ■ Drive controller: Altivar IMC	**SOMNACS41** + Trial V4.1 license V4.1 (21 days)	**SOMNACCZXSPAZZ**/1 (Single) **SOMNACCZXTPAZZ**/10 (Team) **SOMNACCZXEPAZZ**/100 (Entity)

Dedicated application libraries for SoMachine software

Supported controllers	Application Expert library	Reference	License
■ Logic controllers: Modicon M238, Modicon M241, Modicon M251, Modicon M258 ■ Motion controllers: Modicon LMC058, Modicon LMC078 ■ HMI controllers: Magelis SCU, XBTGC, XBTGT/GK ■ Drive controller: Altivar IMC	Hoisting	**SOMAAECZXSPAZZ**	Single **license**
		SOMAAECZXTPAZZ	Team **license**

License updating from V3.0 and V3.1 to V4.1

Supported controllers	SoMachine reference (V3.0/V3.1)	Reference update to SoMachine V4.1	
■ Logic controllers: Modicon M238, Modicon M258 ■ Motion controllers: Modicon LMC058 ■ HMI controllers: Magelis SCU, XBTGC, XBTGT/GK ■ Drive controller: Altivar IMC	MSDCHNLMUA (individual)	**SOMNADCZXSPAZZ**	Single license
	MSDCHNLMTA (collective)	**SOMNADCZXTPAZZ**	Team license
	MSDCHNLMFA (site)	**SOMNADCZXEPAZZ**	Entity license
■ Each controller for solution (S type controllers)	MSDCHLLMUV3●S0, MSDCHLLMTV3●S0	**SOMNSDCZXTPAZZ**	–

SoMachine software compatibility with hardware control platforms

Controller type	SoMachine software version
Modicon M238, Magelis XBTGC	≥ V1.0
Modicon M258	≥ V2.0
Modicon LMC058, Modicon TM5 CANopen Interface, Modicon TM7 CANopen Interface, Altivar IMC	≥ V3.0
Magelis SCU	≥ V3.1 (and Vijeo Designer V6.1 SP3)
Modicon M241, Modicon M251, Modicon LMC078 (from V4.1 SP1)	≥ V4.1

(1) The DVD is mandatory and supplied with a trial license.
(2) One of the 3 types of license is mandatory.

Product reference index

SoMachine Basic programming software
SoMachine programming software

The Next Generation

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www.schneider-electric.com/msx

Design: Schneider Electric
Photos: Schneider Electric

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