Modicon TM172SI• Secure Interface

User Guide

Original instructions

EIO0000004649.00
06/2022

Schneider Electric

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As part of a group of responsible, inclusive companies, we are updating our communications that contain non-inclusive terminology. Until we complete this process, however, our content may still contain standardized industry terms that may be deemed inappropriate by our customers.

Table of Contents

Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Qualification of Personnel

Only appropriately trained persons who are familiar with and understand the contents of this manual and all other pertinent product documentation are authorized to work on and with this product.

The qualified person must be able to detect possible hazards that may arise from parameterization, modifying parameter values and generally from mechanical, electrical, or electronic equipment. The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

Intended Use

The products described or affected by this document, together with software, accessories, and options, are controllers, intended for commercial HVAC machines according to the instructions, directions, examples, and safety information contained in the present document and other supporting documentation.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements, and the technical data.

Prior to using the product, you must perform a risk assessment in view of the planned application. Based on the results, the appropriate safety-related measures must be implemented.

Since the product is used as a component in an overall machine or process, you must ensure the safety of persons by means of the design of this overall system.

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in unanticipated hazards.

Prohibited Use

Any use other than that expressed above under Permitted use is strictly prohibited.

The relay contacts supplied are of an electromechanical type and subject to wear. Functional safety protection devices, specified in international or local standards, must be installed externally to this device.

Liability and Residual Risks

The liability of Schneider Electric is limited to the proper and professional use of this product under the guidelines contained in the present and other supporting documents, and does not extend to damages caused by (but not limited to):

- Unspecified installation/use and, in particular, in contravention of the safety requirements of established legislation or specified in this document;
- Use on equipment which does not provide adequate protection against electrocution, water and dust in the actual installation conditions;
- Use on equipment in which dangerous components can be accessed without the use of specific tools;
- Installation/use on equipment which does not comply with established legislation and standards.

Disposal

The appliance (or the product) must be disposed of separately in compliance with the local standards in force on waste disposal.

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About the Book

Document Scope

This document describes the Modicon TM172 Secure Interface , including installation and wiring information.

> **NOTE:** Read and understand this document and all related documents before installing, operating, or maintaining your device.

Validity Note

This document has been updated for the release of EcoStruxure Machine Expert — HVAC V1.5.0.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to www.se.com/ww/en/work/support/green-premium/.

The technical characteristics of the devices described in the present document also appear online. To access the information online, go to the Schneider Electric home page www.se.com/ww/en/download/.

Related Documents

Title of documentation	Reference number
EcoStruxure Machine Expert - HVAC - Operating Guide	EIO0000003412 (ENG)
TM172SI• Secure Interface - Instruction Sheet	9IS54844.00

You can download these technical publications, the present document and other technical information from our website www.se.com/en/download/.

Product Related Information

⚠⚠ **DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

This equipment has been designed to operate outside of any hazardous location, and exclusive of applications that generate, or have the potential to generate, hazardous atmospheres. Only install this equipment in zones known to be free, at all times, of hazardous atmospheres.

⚠ DANGER

POTENTIAL FOR EXPLOSION

- Install and use this equipment in non-hazardous locations only.
- Do not install and use this equipment in applications capable of generating hazardous atmospheres, such as those applications employing flammable refrigerants.

Failure to follow these instructions will result in death or serious injury.

For information concerning the use of control equipment in applications capable of generating hazardous materials, consult your local, regional, or national standards bureau or certification agency.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive* (*2006/42/EC*) and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Overview

M172 Range Overview

What's in This Chapter

Modicon TM172 Secure Interface Offer Overview

General Description

Modicon TM172 Secure Interface is suitable for all type of applications where it is not possible to establish a secure internet connection.

Modicon TM172 Secure Interface is a controller useful to connect unsafe devices to a secure Ethernet network.

The connection with other devices is made through RS485 serial port for TM172SIG (Secure Interface Gateway) and through TTL communication port for TM172SIP (Secure Interface Plug-in).

Modicon TM172 Secure Interface is programmed to perform different types of operations:

- to have a website, where can be recovered resources from Modicon TM172 Secure Interface or other devices connected;
- to send files to an FTP server;
- to reply to an FTP client, since it has an FTP server;
- to send e-mails to providers using secure encryption algorithms;
- to manage SNMP protocol, that allows to exchange Object ID information relating to SNMP protocol in an Ethernet network;
- to manage MQTT protocol, that allows to exchange data in a bidirectional connection with an external broker;
- to create, using programmable logic, programs within Modicon TM172 Secure Interface that allow the PLC to be able to find variables or parameters in connected devices, and to save files through micro SD, USB memory key or in the NAND flash memory of Modicon TM172 Secure Interface, formatted as FAT32

Programming Software

In association with the controllers hardware, the EcoStruxure Machine Expert - HVAC development tool is available to program and customize applications.

You can download EcoStruxure Machine Expert - HVAC - Programming software for Modicon M172 Logic Controller from Schneider-electric web site download centerEliwell web site download center.

Controller Range Overview

Type Code

Controller type code:

Type code description			
TM172SIG	TM172	SI	G
Product family	TM172		
Complementary product family		SI = Secure Interface	
Physical feature			G = Gateway
			P = Plug-in

Controller References

Reference	Complementary product family	Micro SD card	USB		Communication	
			USB A	USB Mini-B	RS-485	Ethernet
TM172SIG	Secure Interface	✓	✓	✓	✓	✓
TM172SIP					-	

The Modicon TM172 Secure Interface runs on 24 Vac ± 10% 50/60 Hz or 20…38 Vdc power supply.

TM172SI• Delivery Content
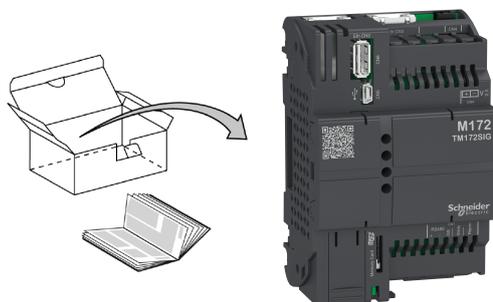
NOTE: Terminal blocks are provided with the product.

Global Features

What's in This Part

Before Starting

What's in This Chapter

Before Starting

Before Starting

Read and understand this chapter before beginning the installation of your system.

Pay particular attention in conforming to any safety information, different electrical requirements, and normative standards that would apply to your machine or process in the use of this equipment.

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safeties and interlocks which can be effectively and properly used. When selecting automation and control equipment, and any other related equipment or software, for a particular application, you must also consider any applicable local, regional or national standards and/or regulations.

⚠ WARNING

REGULATORY INCOMPATIBILITY

Ensure that all equipment applied and systems designed comply with all applicable local, regional, and national regulations and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Disconnecting Power

All options and modules should be assembled and installed before installing the control system on a mounting rail, onto a mounting plate or in a panel. Remove the control system from its mounting rail, mounting plate or panel before disassembling the equipment.

⚡⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

Programming Considerations

The products described in this manual have been designed and tested using Schneider Electric programming, configuration, and maintenance software products.

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
• Only use software approved by Schneider Electric for use with this equipment.
• Update your application program every time you change the physical hardware configuration.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Operating Environment

This equipment has been designed to operate outside of any hazardous location, and exclusive of applications that generate, or have the potential to generate, hazardous atmospheres. Only install this equipment in zones known to be free, at all times, of hazardous atmospheres.

⚠ DANGER
POTENTIAL FOR EXPLOSION
• Install and use this equipment in non-hazardous locations only.
• Do not install and use this equipment in applications capable of generating hazardous atmospheres, such as those applications employing flammable refrigerants.
Failure to follow these instructions will result in death or serious injury.

For information concerning the use of control equipment in applications capable of generating hazardous materials, consult your local, regional, or national standards bureau or certification agency.

In addition to the Environmental Characteristics, refer to Product Related Information in the beginning of the present document for important information regarding installation in hazardous locations for this specific equipment.

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
Install and operate this equipment according to the conditions described in the Environmental Characteristics.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Installation Guidelines

Introduction

TM172SI• is assembled by connecting it to another controller.

The controllers can be installed on a top hat section rail (DIN rail), or vertical surface.

Mounting Position and Minimum Clearances

The mounting position and minimum clearances of the controller must conform with the rules defined for the appropriate hardware system. Refer to the Installation chapter.

⚠**WARNING**

UNINTENDED EQUIPMENT OPERATION

- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Install and operate this equipment in an enclosure appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.
- Place devices dissipating the most heat at the top of the cabinet and ensure adequate ventilation.
- Avoid placing this equipment next to or above devices that might cause overheating.
- Install the equipment in a location providing the minimum clearances from all adjacent structures and equipment as directed in this document.
- Install all equipment in accordance with the specifications in the related documentation.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions unless the equipment is otherwise designated as functional safety equipment and conforming to applicable regulations and standards.
- Do not disassemble, repair, or modify this equipment.
- Do not connect any wiring to unused connections, or to connections designated as No Connection (N.C.).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Care must be taken to avoid damage from electrostatic sources when handling this equipment. In particular exposed connectors and, in some cases, exposed printed circuit boards are exceptionally vulnerable to electrostatic discharge.

⚠**WARNING**

UNINTENDED EQUIPMENT OPERATION DUE TO ELECTROSTATIC DISCHARGE DAMAGE

- Keep equipment in the protective conductive packaging until you are ready to install the equipment.
- Only install equipment in approved enclosures and / or locations that prevent casual access and provide electrostatic discharge protection.
- Use a conductive wrist strap or equivalent field force protective device attached to an earth ground when handling sensitive equipment.
- Always discharge yourself by touching a grounded surface or approved antistatic mat before handling the equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For more information about enclosures, refer to the definition found in IEC 1000-4-2.

Wiring Best Practices

What's in This Chapter

Wiring Best Practices

Wiring Best Practices

The following information describes the wiring guidelines and associated best practices to be respected when using a Modicon M172 Logic Controller.

⚡⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

Wiring Guidelines

The following rules must be applied when wiring M172 offer product range:

- I/O and communication wiring must be kept separate from the power wiring. Route these two types of wiring in separate cable ducting.

- Verify that the operating conditions and environment are within the specification values.

- Use proper wire sizes to meet voltage and current requirements.

- Use copper conductors (required).

- Use twisted pair, shielded cables for analog, and/or fast I/O.

- Use twisted pair, shielded cables for networks, and fieldbus.

Use shielded, properly grounded cables for all analog and high-speed inputs or outputs and communication connections. If you do not use shielded cable for these connections, electromagnetic interference can cause signal degradation. Degraded signals can cause the controller or attached modules and equipment to perform in an unintended manner.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for all fast I/O, analog I/O and communication signals.

- Ground cable shields for all analog I/O, fast I/O and communication signals at a single point[1].

- Route communication and I/O cables separately from power cables.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

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[1] Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

> **NOTE:** Surface temperatures may exceed 60 °C (140 °F). Route primary wiring (wires connected to power mains) separately and apart from secondary wiring (extra low voltage wiring coming from intervening power sources). If that is not possible, double insulation is required such as conduit or cable gains.

Rules for Screw Terminal Block

The following table presents the cable types and wire sizes for a 3.81 mm (0.15 in.) or 3.50 mm (0.14 in.) pitch screw terminal block:

mm/in. (9 / 0.35)	⊏▭	⊏▭>	⊏▭⊐	⊏▭⊐>	⊏═	⊏≈	⊏≋	⊏⊐>
mm²	0.14…1.5	0.14…1.5	0.25…1.5	0.25…0.5	2 x 0.08…0.5	2 x 0.08…0.75	2 x 0.25…0.34	2 x 0.5
AWG	26…16	26…16	22…16	22…20	2 x 28…20	2 x 28…20	2 x 24…22	2 x 20

Ø 2,5 mm (0.1 in.)	C	N•m	0.22…0.25
		lb-in	1.95…2.21

The use of copper conductors is required.

<table>
<tr><td>

⚠⚠DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCK

- Tighten connections in conformance with the torque specifications.
- Do not insert more than one wire per connector of the terminal block unless using the cable ends (ferrules) specified above.

Failure to follow these instructions will result in death or serious injury.

</td></tr>
</table>

<table>
<tr><td>

⚠WARNING

FIRE HAZARD

- Use only the recommended wire sizes for the current capacity of the I/O channels and power supplies.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

</td></tr>
</table>

Special Handling Considerations

Care must be taken to avoid damage from electrostatic sources when handling this equipment. In particular exposed connectors and, in some cases, exposed printed circuit boards are exceptionally vulnerable to electrostatic discharge.

<table>
<tr><td>

⚠WARNING

UNINTENDED EQUIPMENT OPERATION DUE TO ELECTROSTATIC DISCHARGE DAMAGE

- Keep equipment in the protective conductive packaging until you are ready to install the equipment.
- Only install equipment in approved enclosures and / or locations that prevent casual access and provide electrostatic discharge protection.
- Use a conductive wrist strap or equivalent field force protective device attached to an earth ground when handling sensitive equipment.
- Always discharge yourself by touching a grounded surface or approved antistatic mat before handling the equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

</td></tr>
</table>

Assembling TM172SI• to a Controller

Introduction

The following information describes how to assemble TM172SI• to a controller or other modules.

After connecting the TM172SI• to the controller, update, download and reinstall your application program before placing the system back in service. If you do not update your application program to reflect the addition of the controller, TM172SI• may no longer operate correctly.

⚠ **WARNING**

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.

- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Installation

What's in This Chapter

Modicon TM172 Secure Interface Mounting Positions

Correct Mounting Position

TM172SI• must be mounted horizontally on a vertical plane, or on a horizontal plane as shown in the figure below:
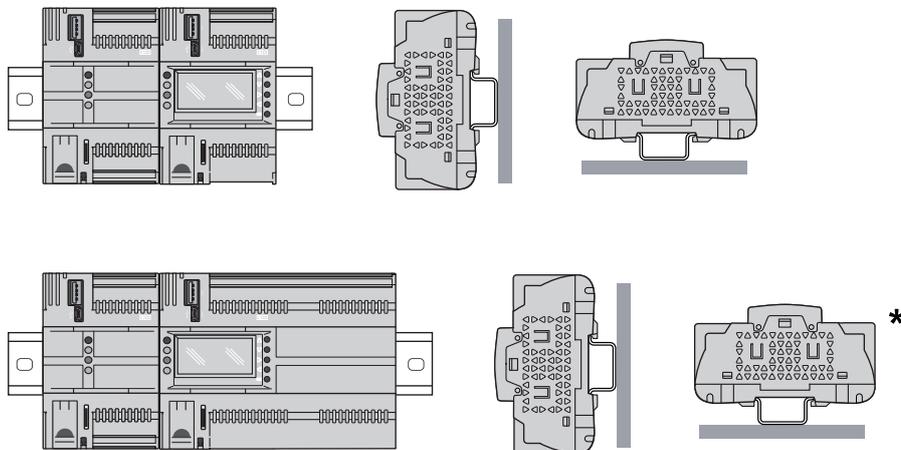
NOTE: *configuration is allowed for TM172SIG and TM172SIP only with TM172P•G28•I / TM172O•M28R / TM172P•G42•I / TM172O•M42R

Incorrect Mounting Position

TM172SI• cannot be mounted neither vertically, nor horizontally backward:
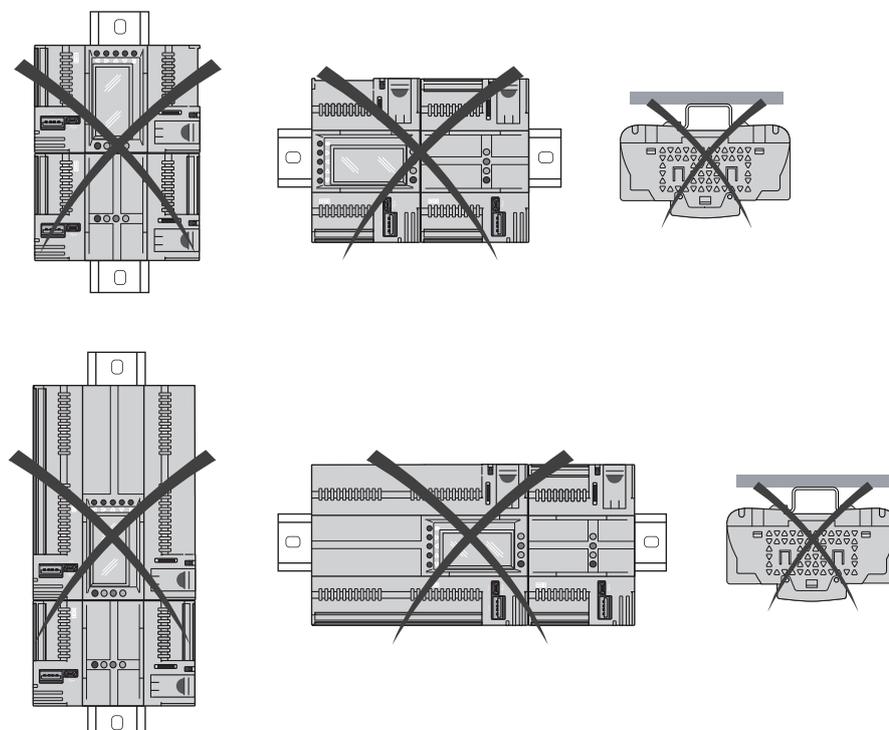
Modicon TM172 Secure Interface Clearances

Minimum Clearances

<div style="border:1px solid">

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Place devices dissipating the most heat at the top of the cabinet and ensure adequate ventilation.
- Avoid placing this equipment next to or above devices that might cause overheating.
- Install the equipment in a location providing the minimum clearances from all adjacent structures and equipment as directed in this document.
- Install all equipment in accordance with the specifications in the related documentation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

</div>

TM172SI• has been designed as IP20 products and must be installed in an enclosure appropriately rated for its intended environment and secured by a keyed or tooled locking mechanism.

There are 3 types of clearances between:

- The TM172SI• controller and the sides of the cabinet (including the panel door).
- The TM172SI• controller terminal blocks and the wiring ducts. This distance reduces electromagnetic interference between the controller and the wiring ducts.
- The TM172SI• controller and other heat generating devices installed in the same cabinet.

The following figure shows the minimum clearances that apply to TM172SI• references:
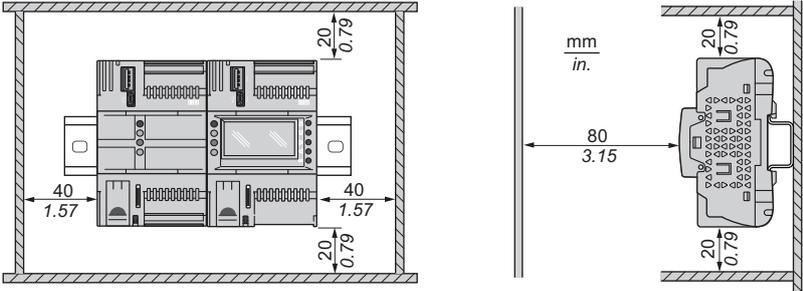
Top Hat Section Rail (DIN Rail)

Dimensions of Top Hat Section Rail (DIN Rail)

You can mount the controller and expansion module on a 35 mm (1.38 in.) top hat section rail (DIN rail). It can be attached to a smooth mounting surface or suspended from a EIA rack or mounted in a NEMA cabinet.

Symmetric Top Hat Section Rails (DIN Rail)

The following illustration and table show the references of the top hat section rails (DIN rail) for the wall-mounting range:
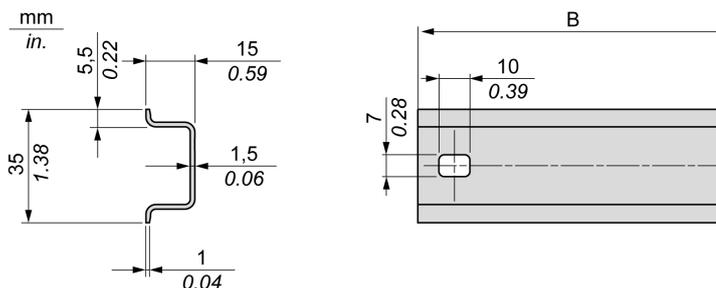
Reference	Type	Rail length (B)
NSYSDR50A	A	450 mm (17.71 in.)
NSYSDR60A	A	550 mm (21.65 in.)
NSYSDR80A	A	750 mm (29.52 in.)
NSYSDR100A	A	950 mm (37.40 in.)

The following illustration and table show the references of the symmetric top hat section rails (DIN rail) for the metal enclosure range:
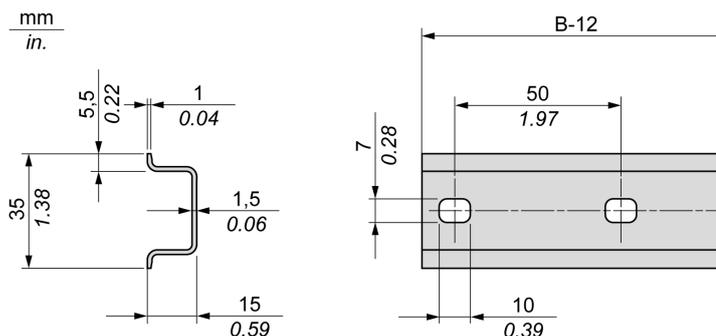
Reference	Type	Rail length (B-12 mm)
NSYSDR60	A	588 mm (23.15 in.)
NSYSDR80	A	788 mm (31.02 in.)
NSYSDR100	A	988 mm (38.89 in.)
NSYSDR120	A	1188 mm (46.77 in.)

The following illustration and table shows the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):
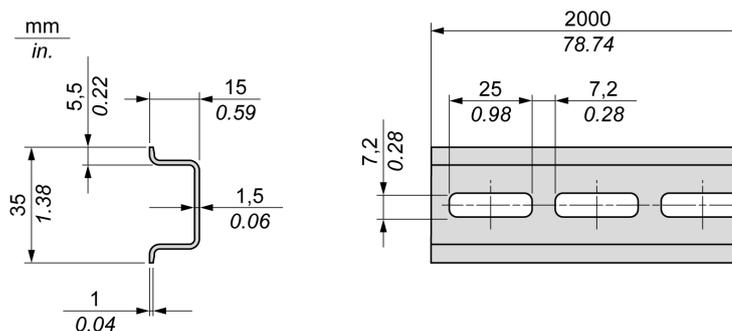
Reference	Type	Rail length
NSYSDR200[1]	A	2000 mm (78.74 in.)
NSYSDR200D[2]	A	
1 Unperforated galvanized steel		
2 Perforated galvanized steel		

Double-Profile Top Hat Section Rails (DIN Rail)

The following illustration and table show the references of the double-profile top hat section rails (DIN rails) for the wall-mounting range:
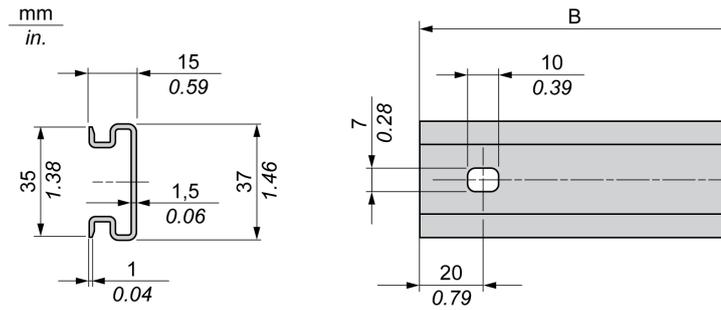
Reference	Type	Rail length (B)
NSYDPR25	W	250 mm (9.84 in.)
NSYDPR35	W	350 mm (13.77 in.)
NSYDPR45	W	450 mm (17.71 in.)
NSYDPR55	W	550 mm (21.65 in.)
NSYDPR65	W	650 mm (25.60 in.)
NSYDPR75	W	750 mm (29.52 in.)

The following illustration and table show the references of the double-profile top hat section rails (DIN rail) for the floor-standing range:
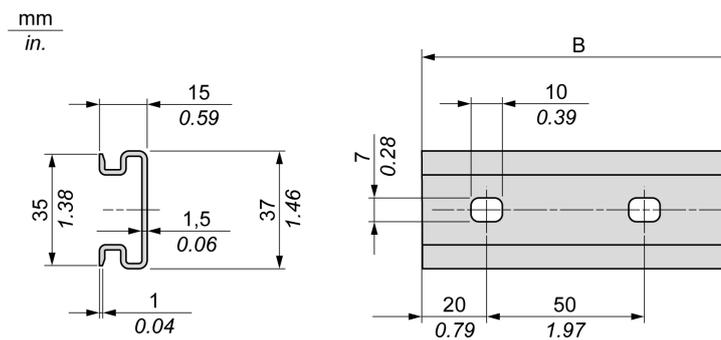
Reference	Type	Rail length (B)
NSYDPR60	F	588 mm (23.15 in.)
NSYDPR80	F	788 mm (31.02 in.)
NSYDPR100	F	988 mm (38.89 in.)
NSYDPR120	F	1188 mm (46.77 in.)

Modicon TM172 Secure Interface Installation

Overview

This section describes how to install and remove a TM172SI• from a top hat section rail (DIN rail).

Installing on a Top Hat Section Rail (DIN Rail)

The following procedure describes how to install TM172SI• on a top hat section rail (DIN rail):

Step	Action
1	Move the two spring docking devices to their standby position (use a screwdriver to press against the relative compartments).
2	Position the top groove of the controller on the top edge of the Top Hat Section Rail (DIN rail).
3	Press the assembly against the Top Hat Section Rail (DIN rail).
4	Press the spring docking devices to put them into the locked position.
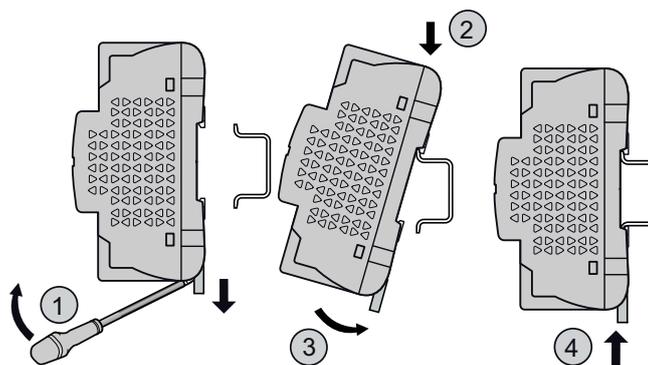
Removing from a Top Hat Section Rail (DIN Rail)

The following procedure describes how to remove a controller from a top hat section rail (DIN rail):

Step	Action
1	Remove the power from the controller or the expansion module.
2	Insert a flat screwdriver into the spring docking devices.
3	Pull down the spring docking device to move it to its standby position.
4	Pull the controller from the top hat section rail (DIN rail) from the bottom.

Panel Installation

To install the controller on a panel it is necessary to use clip-on locks.

NOTE: Upper clip-on locks are not provided with the logic controllers and must be ordered separately. Only one additional upper clip-on lock is necessary for TM172SI•.

The following procedure shows how to install a TM172SI• on a panel using the clip-on locks:

Step	Action
1	Install the upper clip-on lock
2	Move the lower clip-on lock to its standby position
3	Secure the controller in position with 2 screws. Refer to the mounting holes layout, page 32.
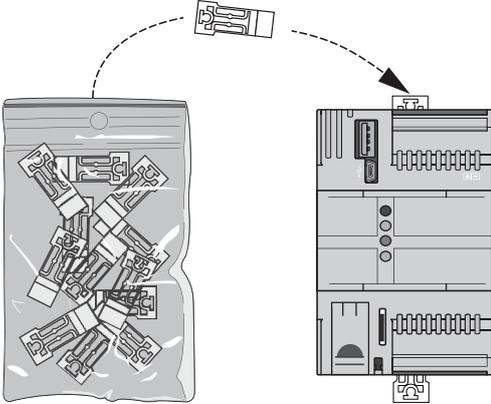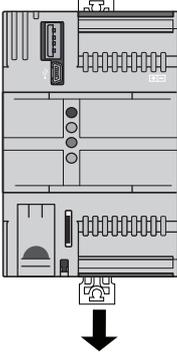
Mounting Holes Layout
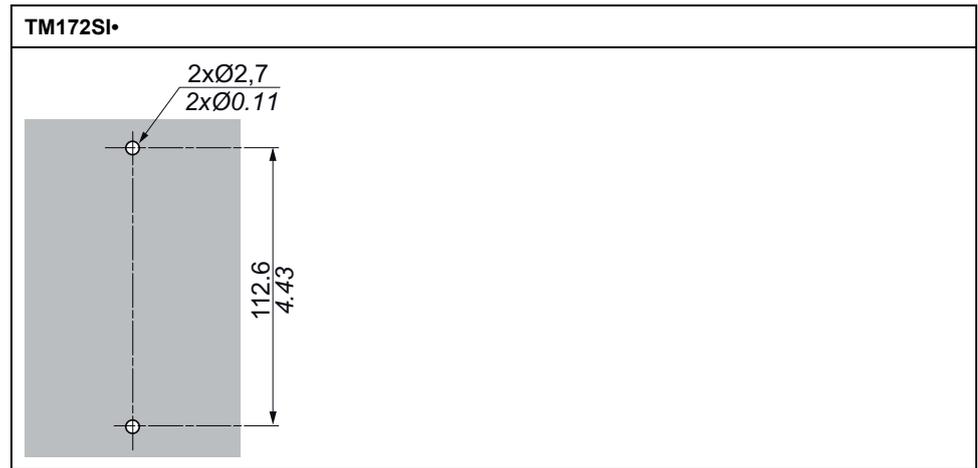
Modicon TM172 Secure Interface

What's in This Part

Environmental Characteristics

What's in This Chapter

Environmental Characteristics

Technical Data

The Modicon TM172 Secure Interface offer components meet European Community (CE) requirements for open equipment. You must install them in an enclosure or other location designed for the specific environmental conditions and to minimize the possibility of unintended contact with hazardous voltages. Use metal enclosures to improve the electromagnetic immunity of your M172 system. This equipment meets CE requirements as indicated in the following tables.

⚠ **WARNING**
UNINTENDED EQUIPMENT OPERATION
Do not exceed any of the rated values specified within this chapter.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Controller Specifications

Characteristics	Specification	TM172SIG	TM172SIP
The product complies with the following harmonized Standards	EN 60730-1 / EN 60730-2-9	✓	
Construction of control	Electronic automatic Incorporated Control	✓	
Purpose of control	Operating control (non-safety related)	✓	
Mounting	Top Hat Section Rail (DIN rail)	✓	
	Optional panel mounting (with accessories	✓	
Type of action	1	✓	
Type of disconnection or suspension for each circuit	Micro disconnection	✓	
Pollution degree	2 (normal)	✓	
Overvoltage category	I	✓	
Rated impulse voltage	330 V	✓	
Power supply	24 Vac (+/- 10 %) 50 Hz / 60 Hz 20…38 Vdc (UL/CSA) 24 Vdc (IEC)	✓	
Power Draw	8 W / 11 VA	✓	
Insulation class	II	✓	
Ambient operating conditions	-20…55 °C (-4…131 °F) 5…95 % [1]	✓	

Characteristics	Specification	TM172SIG	TM172SIP
Transportation and storage temperature	-30…70 °C (-22…158 °F) 5…95 % [1]	✓	
Temperature for ball pressure test	125 °C (257 °F)		✓
Software class and structure	A	✓	
Degree of protection by enclosure	IP20		✓
Operating altitude	0...2000 m (0...6560 ft)	✓	
Storage altitude	0...3000 m (0...9843 ft)		✓

(1) Non condensing.

Modicon TM172 Secure Interface Description

What's in This Chapter

TM172SI•

Overview

Reference	Description
TM172SIP	Modicon TM172 Secure Interface Plug-in
TM172SIG	Modicon TM172 Secure Interface Gateway

Physical Description

The following illustration presents the TM172SIP and TM172SIG:
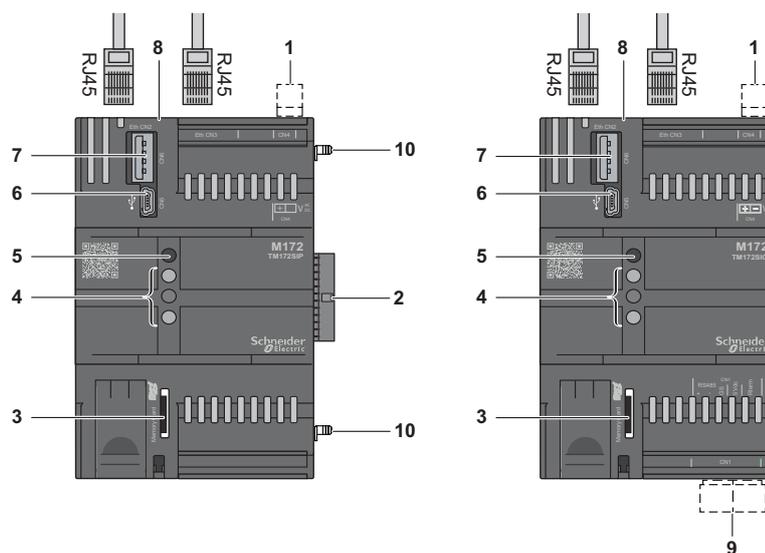
Number	Name	Description
1	CN4	24 Vac/dc power supply.
2	—	Plug to controller [1].
3	—	Memory card slot (Micro SD).
4	—	Programmable LEDs (red / yellow / green).
5	—	Power LED (green).
6	CN5	USB mini-B port.
7	CN6	USB A port.
8	CN2, CN3	Ethernet ports (RJ45).
9	CN1	Serial line port (RS485)[2].
10	—	Connection clip.
(1) Only for TM172SIP model.		
(2) Only for TM172SIG model.		

NOTE: The controller is delivered with removable screw terminal blocks.

Insert the connection clips.
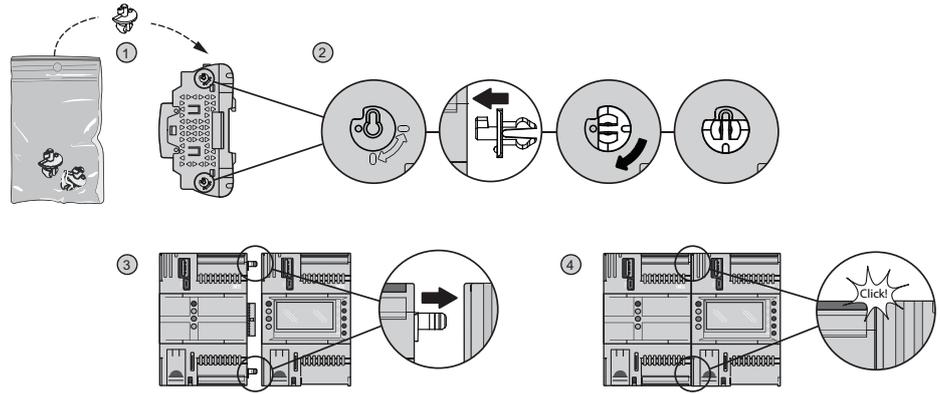
Dimensions
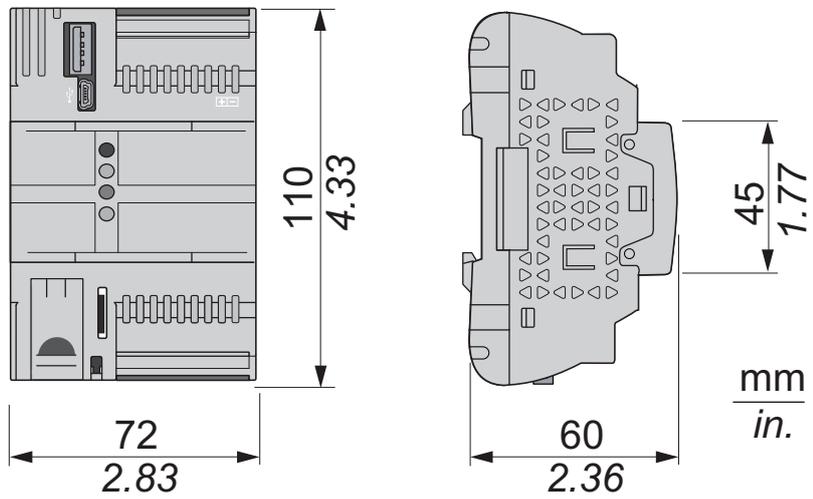
Mounting Holes Layout
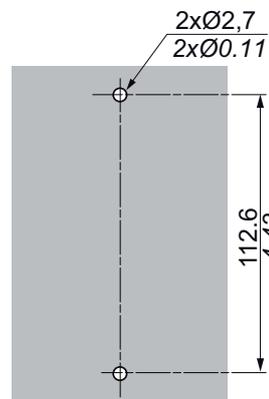
Electrical Characteristics and Wiring Diagrams

What's in This Chapter

From time to time, new input modules, output modules, or other devices are made available that are not documented in the present documentation. For information on new devices, contact your local Schneider Electric representative.

NOTICE
INOPERABLE EQUIPMENT
Update the controller firmware to the latest version every time you install a newly released Input/Output expansion module or other device to this equipment.
Failure to follow these instructions can result in equipment damage.

NOTE: For more information on how to update the controller firmware, contact your local Schneider Electric representative.

Power Supply

Power Supply

TM172SI• Power Supply

References	Power supply characteristics	Maximum power consumption
TM172SI•	24 Vac (+/- 10 %) - 50/60 Hz	11 VA
	20…38 Vdc (UL/CSA)	8 W
	24 Vdc (IEC)	8 W

Power supply wiring diagram:

24 Vac	24 Vdc
(1) Type T fuse 3 A.	
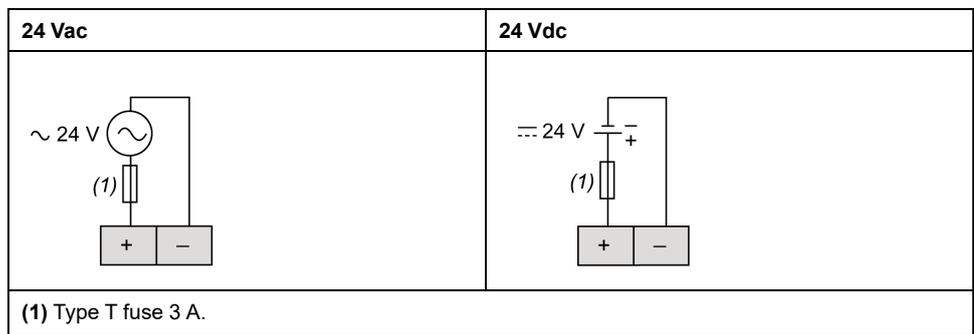
The negative terminal of the power supply connection and the signal reference for RS485 (indicated as GS on the TM172SIG) are not internally DC connected.

Pitch of the terminal block	Cabling length
3.50 mm (0.14 in.)	10 m (32.8 ft)

NOTICE

INOPERABLE EQUIPMENT

Do not connect a power cable longer than 10 m (32.8 ft).

Failure to follow these instructions can result in equipment damage.

Power connections for TM172SI• and related controller may be isolated or not-isolated as in the following picture:
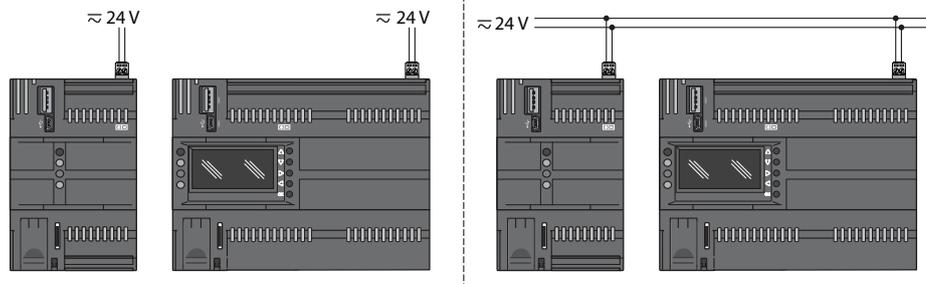
⚠**DANGER**

GROUND LOOP CAUSING ELECTRIC SHOCK AND/OR INOPERABLE EQUIPMENT

- Do not connect the 0 V power supply/transformer connection supplying this equipment to any external ground (earth) connection.
- Do not connect any 0 V or ground (earth) of the sensors and actuators connected to this equipment to any external ground connection.
- If necessary, use separate power supplies/transformers to power sensors or actuators isolated from this equipment.

Failure to follow these instructions will result in death or serious injury.

In all cases, if the specified voltage range is not maintained, the products may not function as intended. Use appropriate safety interlocks and voltage monitoring circuits.

⚠**WARNING**

POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the equipment directly to line voltage.
- Use only isolating SELV, Class 2 power supplies / transformers to supply power to this equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Communication

RS-485 Serial Ports

Overview

Each TM172SIG is equipped with a RS-485 serial port.

This port permits user to communicate between the controllers via:

- A Modbus RTU connection

Connector of TM172SIG

The TM172SIG is equipped with a RS-485 terminal:
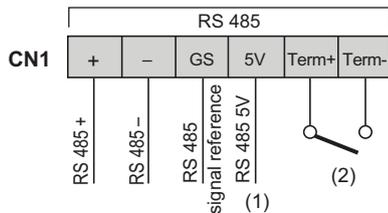
NOTE: GS pin is not directly DC connected to the "—" pin of power supply of the controller.
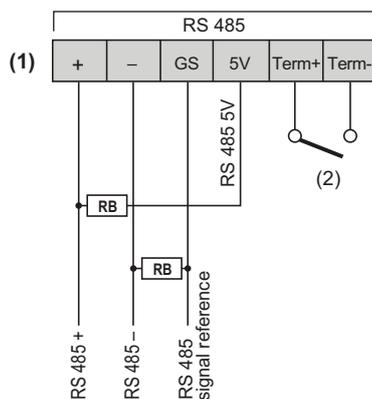
(1) (**CN1**) 5V power supply for BIAS external resistors (RB). Max current: 10mA.
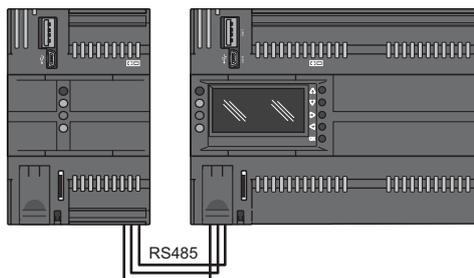
(2) (**CN1**) if switch closed internal terminal resistor 120 Ohm is applied between RS485+ and RS485–. Apply if it is the end device of the bus.

Cables

Use a shielded and "twisted pair" cable with two 0.5 mm^2 section conductors (AWG 20), plus braid (characteristic impedance 120 Ω) with PVC sleeve, nominal capacity between conductors 36 pF/m, nominal capacity between conductor and shielding 68 pF/m.

Alternatively use a shielded and "twisted pair" cable with two 0.5 mm^2 section conductors (AWG 20), plus braid with PVC sleeve, nominal capacity between conductors 89 pF/m, nominal capacity between conductor and shielding 161 pF/m. See EN 50174 standard on IT cabling for indications on how cables must be routed.

Always follow regulations applicable to the routing and connection of cables. Separate data transmission circuits from power lines.

RS-485 network up to 1200 m in length with a maximum of 32 devices can be connected directly to the controller. This length can be extended and the number of devices for each channel increased using appropriate repeater modules.

Single terminal strip with 3 conductors: use the 3 conductors ("+", "-" for the signal and "GS" for the braid).

Attach the 120 Ω 1/4 W resistors between the "+" and "-" terminals of the interface and the last controller in each branch of the network.

Maximum settable speed 115200 baud.

RS-485 physical layer can be used for Modbus SL, as well as for BACnet MS/TP communication. Concurrent communication of different protocols on the same serial port is not allowed.

USB Serial Ports

Overview

An USB type Mini-B (DEVICE) connector placed on the top-left side of the front view of the controller is used to connect the controller to a PC via Mini-B/A USB cable for debugging, commissioning, downloading, uploading with EcoStruxure Machine Expert - HVAC.

An additional USB type A (HOST) connector is used to connect a USB memory key.

For further information, refer to the commissioning part, page 51.

Connector of TM172SI•
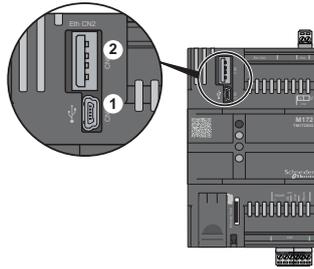
1 USB type Mini-B

2 USB type A

Cabling length
30 cm (11.8 in)

Connection

The TM172SI• cannot be supplied through the Mini-B USB cable.

Compatibility

It is not required to install the USB driver for the RNDIS profile, which configures the USB connection as a virtual Ethernet port.

Following operating systems are compatible:
- Windows 10 64 bit

Ethernet Ports

Overview

Each TM172SI• is equipped by two RJ45 Ethernet ports, sharing the same MAC address, so they can be used alternatively for the same functionalities.

Description

The Ethernet ports allows user to connect the controller to:

- Different controllers and/or applications exchanging variables and/or parameters (network).
- Supervision systems using Modbus TCP/IP protocol.
- An IEC 61131-3 EcoStruxure Machine Expert - HVAC development system.
- Web Browsers
- Email providers
- SNMP Managers
- FTP server
- FTP client
- MQTT Brokers

Concurrent communication of different protocols using the same Ethernet port is allowed (use of a web browser in addition to another Ethernet Fieldbus connection for example).

Web Functionalities

The TM172SI• also features Web functionalities, offering makers of machinery and systems integrators remote access. Having a web-based connection in machines reduces support and maintenance by minimizing call-out charges. End users also benefit, as they can monitor their own systems both locally and from distance, using the graphics interface of any browser.

Main Web functionalities:

- Web-based access.
- Remote reading and support.
- Local and remote system control, including alarms management.
- Preventive and predictive maintenance.
- Email alarm alerts.

Care must be taken and provisions made for use of this product as a control device to avoid inadvertent consequences of commanded machine operation, controller state changes, or alteration of data memory or machine operating parameters.

Bridge

EcoStruxure Machine Expert - HVAC allows monitoring of Modbus/RTU slaves, where TM172SI• is the master Modbus/RTU.

In Bridge functionality TM172SI• is used as a Modbus TCP to Modbus/RTU protocol conversion element for the following Modbus commands:

- 03h - read holding register
- 04h - read input register
- 10h - write multiple registers
- 06h - write single register
- 01h - read coils
- 02h - read discrete inputs
- 0Fh - write multiple coils
- 05h - write single coil
- 2Bh - read device identification

Set the connection with the device as Modbus TCP, using as IP address the TM172SI• IP address and as Address the Modbus/RTU address of the slave device.

Connector

RJ45 Ethernet pin assignment
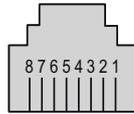
Pin number	Signal
1	TX_D1+
2	TX_D1–
3	RX_D2+
4	BI_D3–
5	BI_D3+
6	RX_D2–
7	BI_D4+
8	BI_D4–

NOTE: The controller supports the MDI/MDIX auto-crossover cable function. It is not necessary to use special Ethernet crossover cables to connect devices directly to this port (connections without an Ethernet hub or switch).

Cabling length
100 m (328 ft)

Status LED

RJ45 Ethernet status LED
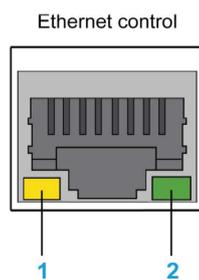
Label	Signal	LED		
		Color	Status	Description
1	Ethernet activity	Yellow	Off	No activity
			Flashing	Activity
2	Ethernet link	Green	Off	No link
			Green On	Linked

Ethernet connection

Ethernet connectors has same MAC address, they can be used to realize a daisy-chain connection:
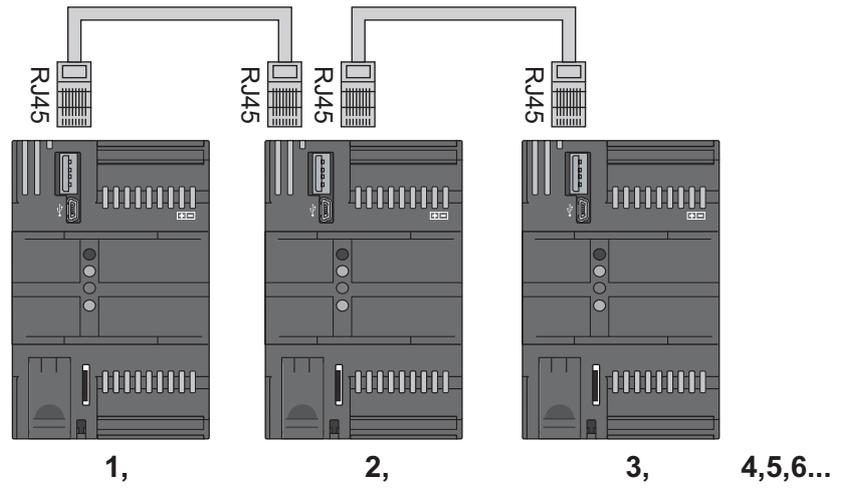
User Interface

What's in This Chapter

TM172SI• User Interface

Overview

The user interface of the TM172SI• has 4 LEDs.

The TM172SI• has no display.

LEDs
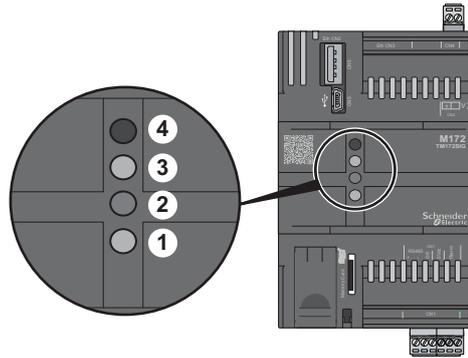
Number	Color	Function
1	Green	Programmable from the controller application
2	Yellow	
3	Red	
4	Green	ON when the controller is powered

Commissioning

What's in This Part

Controller Connection Types

What's in This Chapter

Connection with a PC through USB

Connecting the PC to the Controller

Direct connection between the PC and the controller:
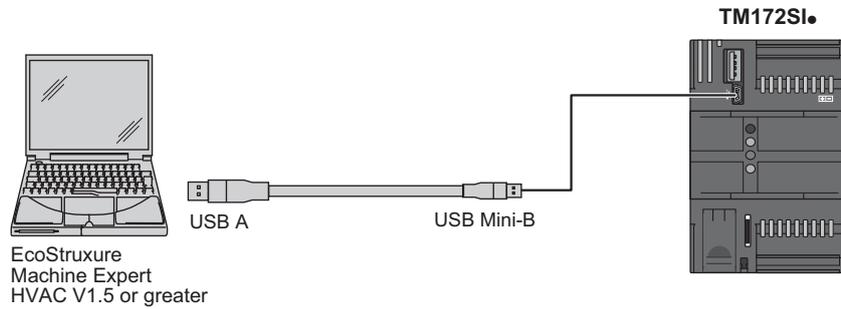
To connect the PC to the controller, use a type A / type Mini-B USB cable.

NOTICE

CURRENT LOOP CAUSING INOPERABLE EQUIPMENT

Never connect to the PC via USB a TM172SIG and the connected Modicon TM172 logic controller at the same time.

Failure to follow these instructions can result in equipment damage.

For further information on first commissioning refer to chapters First Commissioning with EcoStruxure Machine Expert — HVAC , page 68 and First Commissioning with Webapp, page 56.

Connection with a USB memory key

Connecting a USB Memory Key to the Controller

Connection of the USB memory key to the TM172SI•:
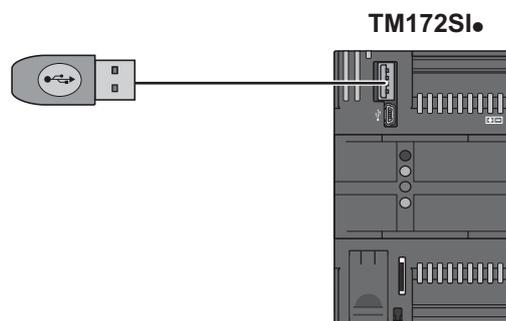
The USB memory key is connected on the type A USB port of the controller.

Connection with a MicroSD Memory Card

Connecting a MicroSD Memory Card to the Controller

Connection of the Micro SD Memory Card to the TM172SI•:

TM172SI•
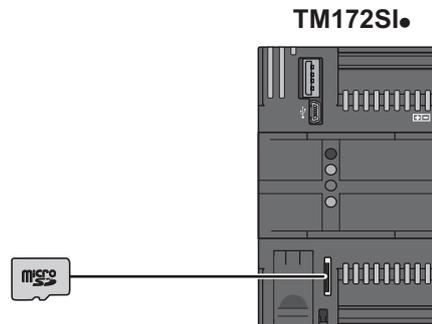
The MicroSD Memory Card is connected on the memory card slot of the controller.

Any MicroSD that supports Legacy only 3.3V physical interface and DS & HS speeds are supported (UHS-I & UHS-II).

Connection with a PC through Ethernet

Connecting the PC to the Controller

Direct connection between the PC and the TM172SI•:

RJ45

EcoStruxure
Machine Expert
HVAC V1.5 or greater
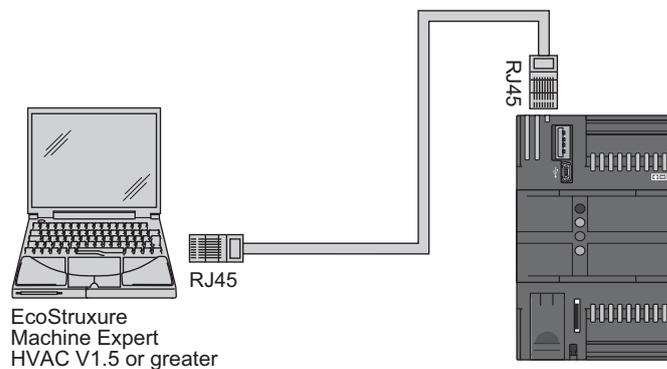
To connect the PC to the controller, use a RJ45 Ethernet cable.

For further information on first commissioning refer to chapters First Commissioning with EcoStruxure Machine Expert — HVAC , page 68 and First Commissioning with Webapp, page 56.

First Commissioning

What's in This Chapter

Overview

There are several processes to connect the PC to the TM172SI•:

Protocol	Protocol	Factory status	Connector
Mini-B/A USB cable	HTTPS over USB	Enable	CN5
Ethernet cable	HTTPS over Ethernet cable	Enable	CN2/CN3

First Commissioning with Webapp

Accessing Webapp via USB or Ethernet

Webapp is reachable via USB or via Ethernet (change IP address to connect to).

TM172SI• can be connected to the PC through the USB port even if the PC remains connected with Ethernet on the network. The RNDIS connection does not impact the network connection of the PC through Ethernet or Wi-fi, and related company restrictions and security policies. It is managed as a separate, point-to-point TCP/IP connection, for example on a different, virtual LAN.

The use of the USB controller connection in the form of Ethernet also allows to always have the possibility of accessing the configuration web page because the IP address of that port cannot be changed, nor subject to a DHCP (Dynamic Host Configuration Protocol), it is therefore certain that the TM172SI• will correspond to that IP address. Instead, if the static IP address of the machine is changed on the standard Ethernet connection or DHCP is enabled, it is necessary to know the IP address of the controller to connect.

IP Address

Ethernet port of TM172SI• has a default IP address (192.168.1.3) and a default Subnet mask (255.255.255.0) to which it is possible to connect via browser. A window dialog appears with the message "Your connection is not private".
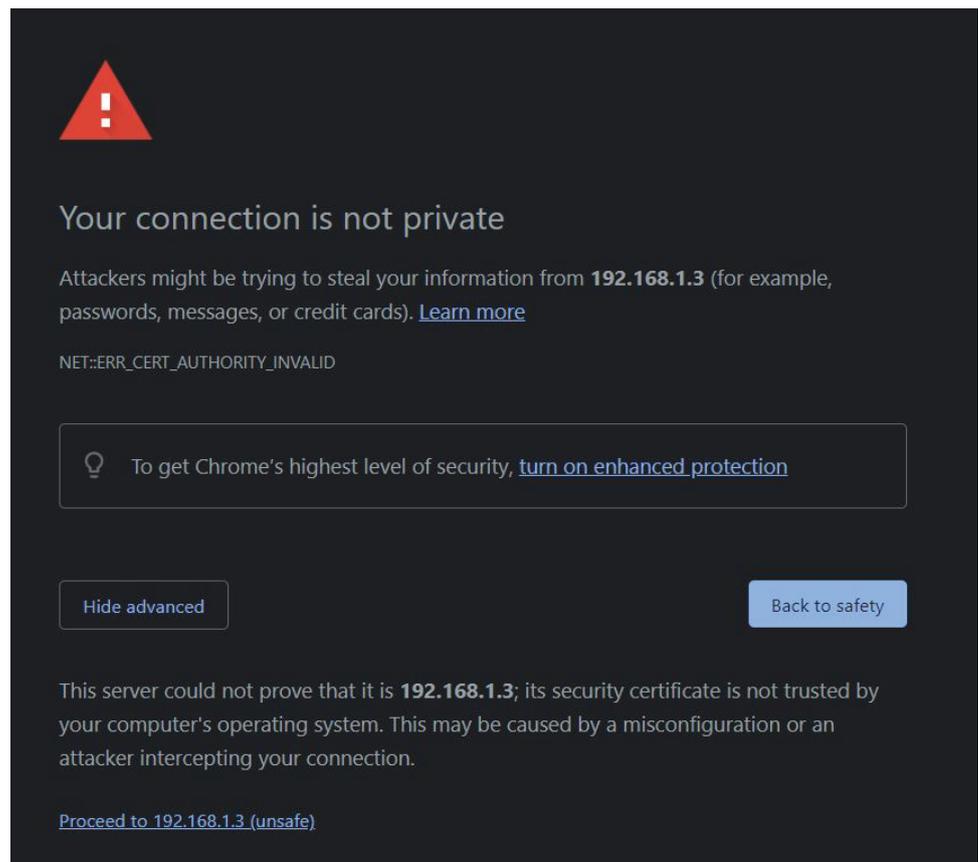
The controller is provided with a self-signed certificate, which is by default not accepted by the browser, although it is secure. Access by clicking on proceed to display the home page for accessing the Webapp.

Brand-new controller

In a brand-new controller, the first step required is to change the default password (refer to Replace the default password section).

Network protected & unprotected

In a protected network, where there are no devices with IP address 192.168.1.3, it is necessary to set the IP address on the PC with the first three octets at 192.168.1. The 4th octet must have a value in the range 0..2 or 4...255, that value must be unique in the protected network.

Then connect in Ethernet with 192.168.1.3 via Webapp.

RNDIS driver

Remote NDIS (RNDIS) eliminates the need of an NDIS device driver for a Network device connected to the USB bus.

The USB mini-B port on TM172SI• will be detected by a Windows PC as an Ethernet port, instead of a virtual COM.

When the controller is connected via USB it will be automatically created a new virtual Ethernet connection in the settings of the network card of the PC. This Ethernet connection must be manually configured with a fixed IP address (for example 192.168.254.**x**, where **x** must be a number between 0 and 253) and a subnet mask (255.255.255.0) aligned and coherent with the one of the TM172SI• (which has the IP address 192.168.254.254).

Replace the Default Password

Once the first connection between PC and TM172SI• starts, Webapp asks you to enter the default password (USER: admin — PASSWORD: SE_SecureInterface) of the web-server and to replace it by a new different one.

Change the default password upon first use. In addition, consider carefully the implications for giving any access to other people.

Difference in privileges between administrator and config is that only the administrator can update the firmware. The administrator can also change the configurator password.

⚠ **WARNING**
UNAUTHORIZED DATA ACCESS
• Immediately change any and all default passwords to new, secure passwords.
• Do not distribute passwords to unauthorized or otherwise unqualified personnel.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: A secure password is one that has not been shared or distributed to any unauthorized personnel and does not contain any personal or otherwise obvious information. Further, a mix of upper and lower case letters and numbers offer greater security. You should choose a password length of at least seven characters.

Restore Password

If the actual password has been forgotten it is possible to restore it by clicking on the button **"Forgot your password?"**.
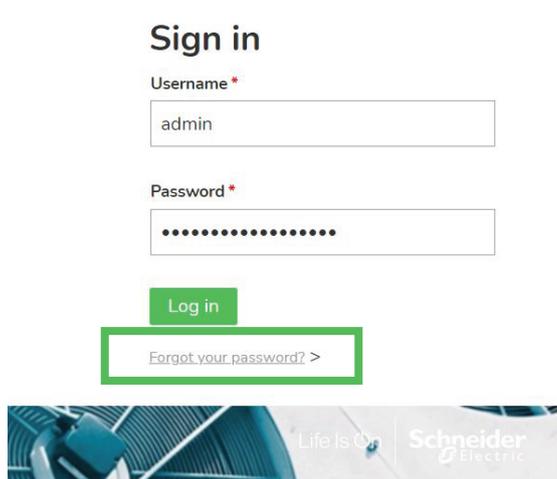
A file **unlock.txt** will be downloaded from TM172SI•. That file must be put in the root folder of a memory key, and then the memory key must be inserted in TM172SI•. Start the procedure to reset the password and wait for the completion.

The password will be reset as default, to change the password refer to Replace the Default Password, page 57.

⚠ **WARNING**
UNAUTHORIZED DATA ACCESS
• Immediately change any and all default passwords to new, secure passwords.
• Do not distribute passwords to unauthorized or otherwise unqualified personnel.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

CyberSecurity Defense-in-Depth

NOTE: Schneider Electric adheres to industry best practices in the development and implementation of control systems. This includes a "Defense-in-Depth" approach to secure an Industrial Control System. This approach places the controllers behind one or more firewalls to restrict access to authorized personnel and protocols only.

> ### ⚠ WARNING
>
> **UNAUTHENTICATED ACCESS AND SUBSEQUENT UNAUTHORIZED MACHINE OPERATION**
>
> - Evaluate whether your environment or your machines are connected to your critical infrastructure and, if so, take appropriate steps in terms of prevention, based on Defense-in-Depth, before connecting the automation system to any network.
> - Limit the number of devices connected to a network to the minimum necessary.
> - Isolate your industrial network from other networks inside your company.
> - Protect any network against unintended access by using firewalls, VPN, or other, proven security measures.
> - Monitor activities within your systems.
> - Prevent subject devices from direct access or direct link by unauthorized parties or unauthenticated actions.
> - Prepare a recovery plan including backup of your system and process information.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Webapp Interface

WEBapp port configuration
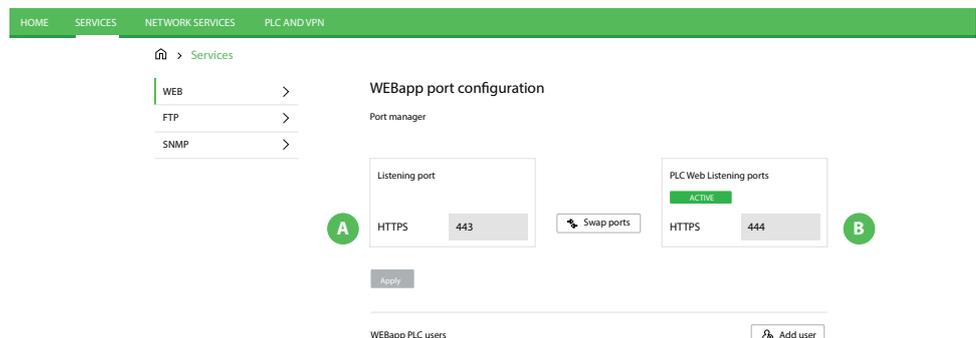
A. Default port for HTTPS: 443

B. PLC website port (TM172SI• proprietary pages, programmed by the development system): 444.

After the connection of a PC to TM172SI•, a web browser addressed at the controller IP address (for example 192.168.1.3 on Ethernet RJ45 connector or 192.168.254.254 on USB mini-B connector), without any port specification, will open by default the pages at 443 port. Factory 443 assignment is to the Webapp pages, which are displayed by default. So, the "Swap ports" button will toggle the assignment of 443 port in turn to the Webapp or the website created by PLC programmer. The other "non default" port is 444. User shall specify the address with port, for example 192.168.1.3:444 to access to the alternative pages. With the swap ports button the user's website assumes port 443, then after typing the default IP address the configuration web page will not appear but the PLC programmer web site will appear, useful for having the ports blocked and being able to enter the customer web page directly instead of the Webapp.

At the bottom of the page, with the button "add user" it's possible to add the users, max 3 users. This feature helps define users username and password.

FTP service
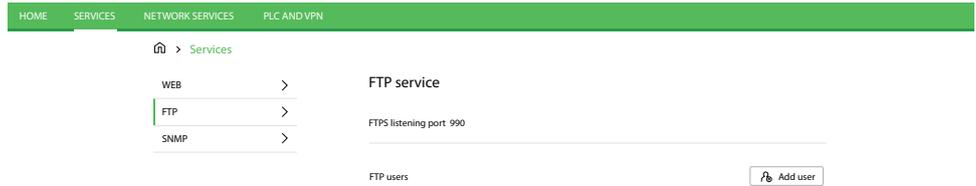
Default port for FTPS: 990.

At the bottom of the page, the list of FTP users, where it is possible to add a maximum of three more users to have access to the FTP server.

It is possible, using a FTP Client on a PC, to upload files from the following TM172SI• resources using its FTP client service:

- USB Memory Key (if present)
- MicroSD Memory Card (if present)
- SHARED_FS folder : folder of the embedded filesystem
- REMOTE_FS folder : it is a "virtual folder" where it is possible to see the filesystem of TM172SIP connected to TM172SIG RS-485 Serial port or TM172SIP Plug connector.

  REMOTE_FS can have subfolders. Subfolder 001 correspond to TM172SIP with Modbus RTU address 1, 002 correspond to TM172SIP with Modbus RTU address 2 and so on. User can reach this only if he set into TM172SI• EcoStruxure Machine Expert - HVAC project this functionality in **External Parameters**, clicking on the tips **Mount remote file system**.

See Configuration, page 70

SNMP service
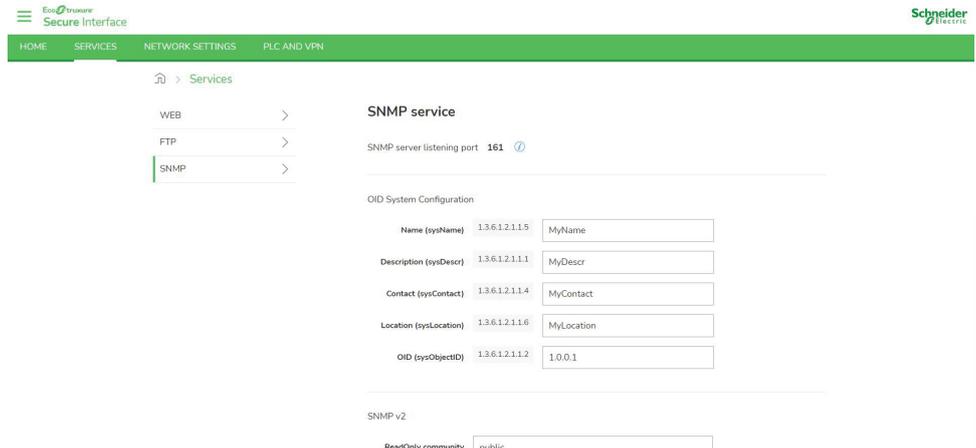
SNMP protocol is typically used in datacenters and in customer devices.

Fill in the fields with the various data on the configuration page.

As the protocol requires, only the first part of code is always the same.

After changing connection parameters it is necessary to reboot the controller and not only the SNMP service to check if changes have been applied. A pop-up will show asking the user to restart the system.

Secure connect VPN
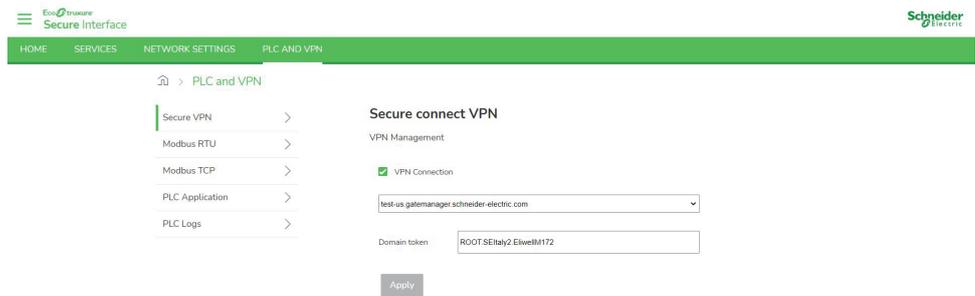
The controller is able to establish a VPN connection with the Schneider "Secure connect" encryption system based on the connection between PC, controller and cloud, thus making communication secure. This system is useful for the use of protocols, including those that are not secure, for example modbus TCP. A licence provided by Schneider Electric is required. For more information contact your SE Sales representative.

"Secure Connect" is a Schneider Electric product to enable secure access to field devices. Secure Connect helps ensure a secure channel between the Operator PC and the Machine, it's a cloud based service.

Modbus RTU settings
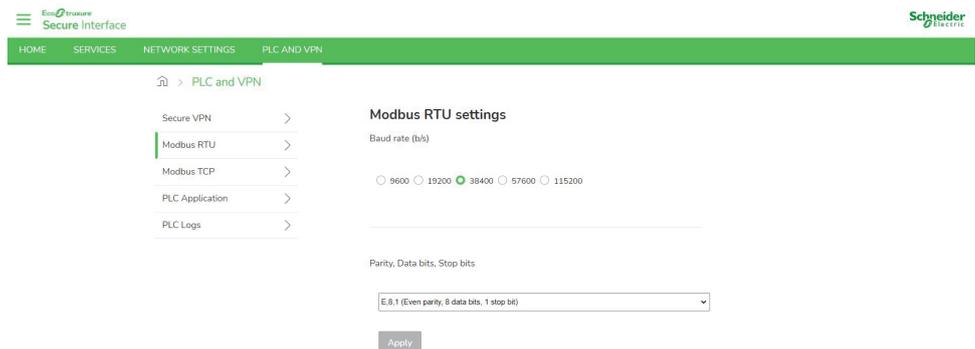
NOTE:
- Configuration only for TM172SIG
- For TM172SIP has a fixed setting

Modbus TCP settings
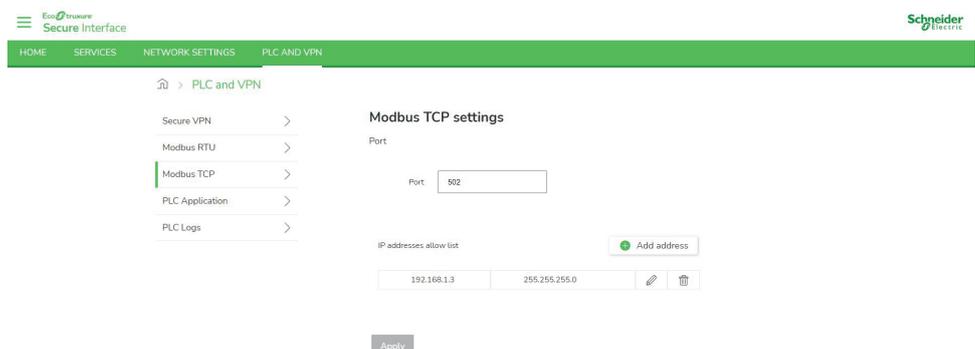
Default port for Modbus TCP: 502.

At the bottom of the page, there is the IP addresses allowlist, initially empty, a list of IP addresses, including for example the IP address of the PC with which you

want to connect to TM172SI•, to which you can connect via modbus TCP to make TCP communication as secure as possible. This configuration is not necessary in case you connect with USB RNDIS port, because communication is already secure, in this case the allowlist does not deny consent, it is therefore not necessary to enter the corresponding IP address in the allowlist.

The allowlist can be extended to countless devices, based on how many you want to connect.

PLC application
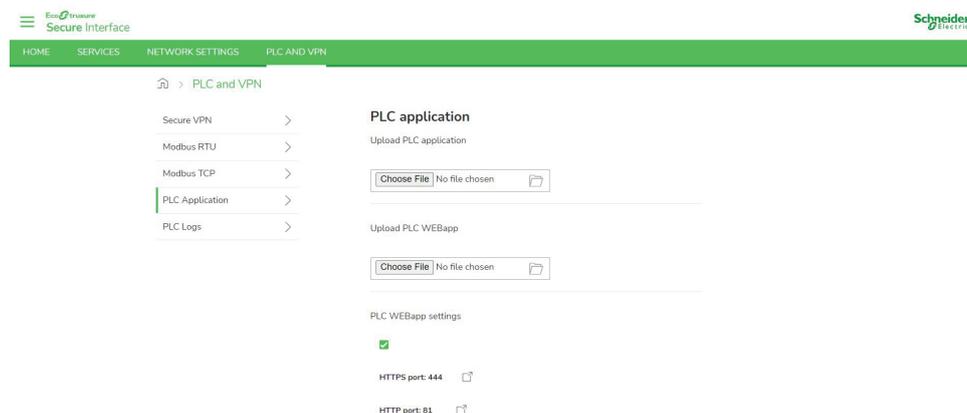
Through this window, you can download the PLC application to the TM172SI• and download the website of the user who programmed the PLC.

Settings: Data and time / Profile settings / Admin password update / Config password update
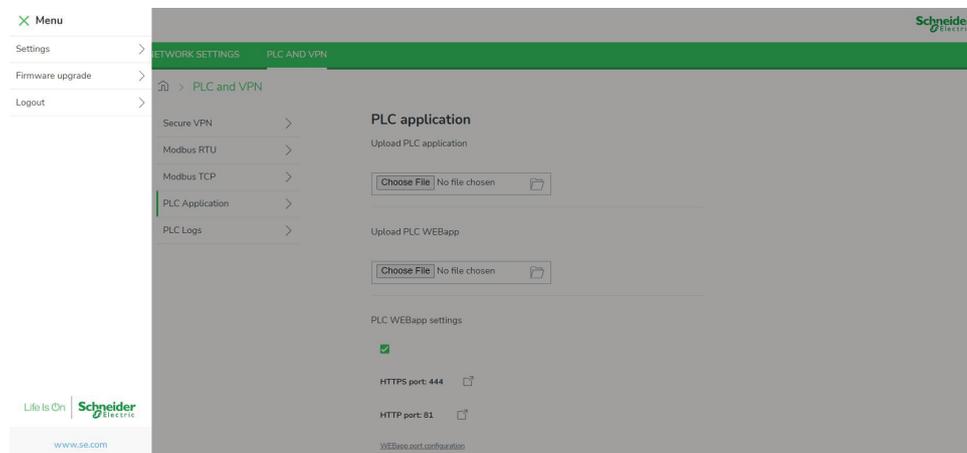
Data and time
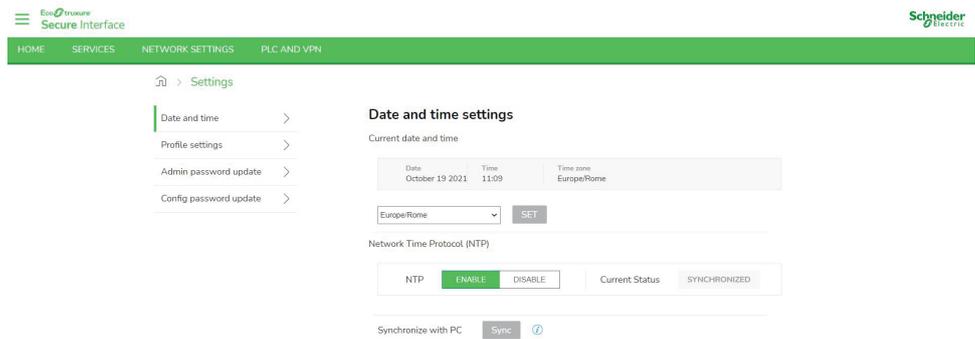
Page to set date and time manually.

NTP protocol is always enabled by default.

Profile settings
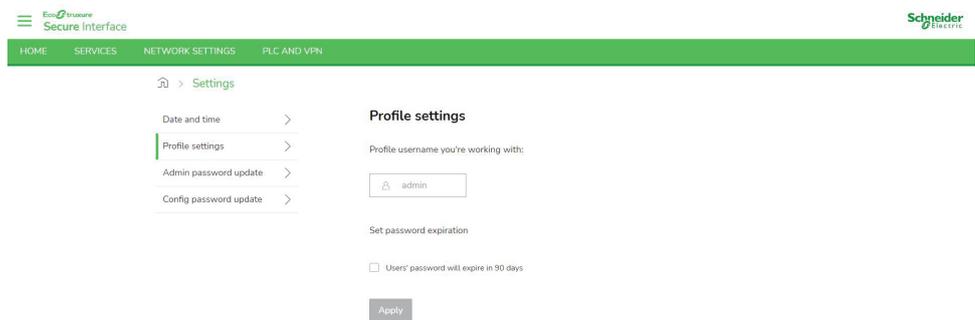
In Profile settings it's possible to check with which profile the login has been done.

It's possible to set the option "User's password will expire in 90 days" which will continuously set an expiration date for the login password on 90 days.

Change "admin" password
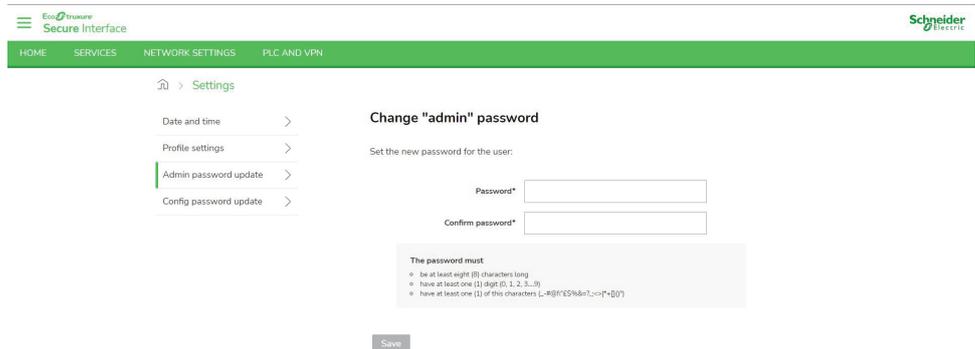
Page to update admin profile password.

Change "config" password

Page to update config profile password.

Firmware upgrade

In this page it's possible to check the current firmware version and the latest updates.

To update the controller firmware, use a USB key or a micro SD.

TM172SI• checks if it is connected to a USB key or if there is a micro SD and shows the files contained in the USB/SD recognized for the installation of updates in the drop-down list. After choosing the file to install, press the "Install this version" button and wait for the complete installation to continue browsing.

If the installation file is not already in USB/SD, it is possible to choose the file from the left drop-down menu from the PC and then download it to the media available (USB/SD). At the end it will be possible to choose the file in the right drop-down menu (USB partition or SD partition), then install the version of the file.

Logout
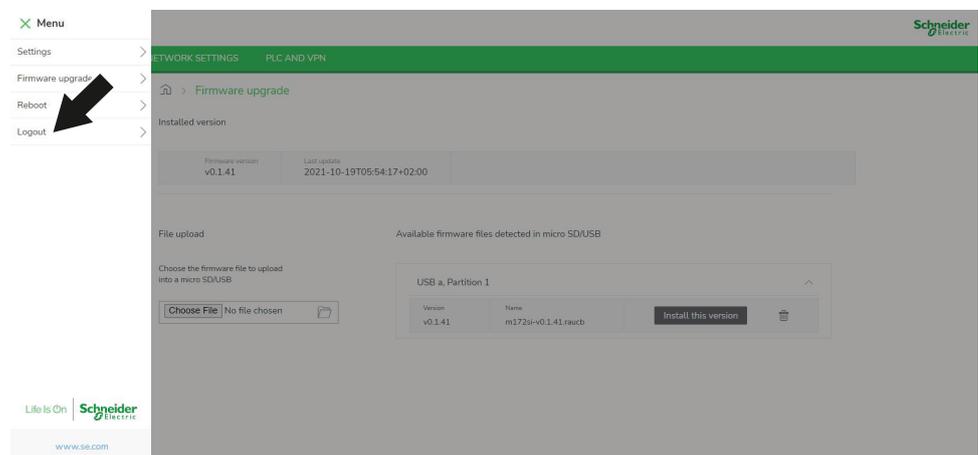
Go to **Menu > Logout** to log out of the Webapp.

Reboot
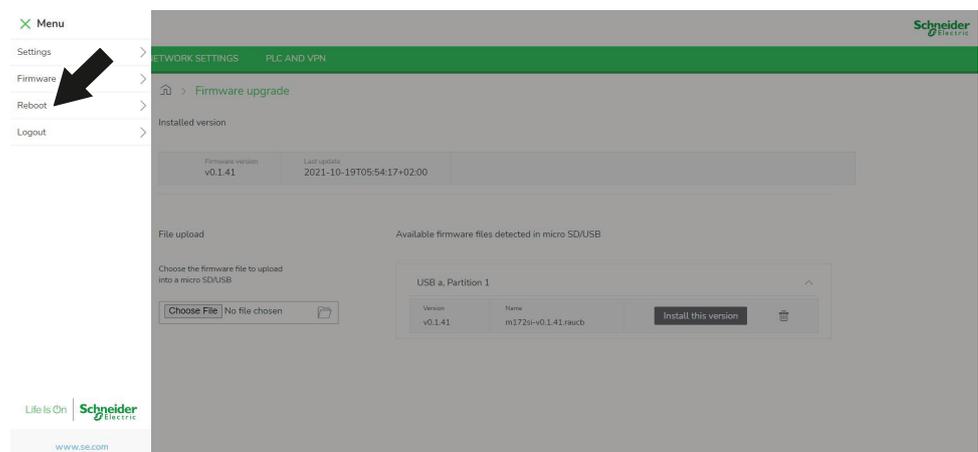
Pressing "Reboot" the system will show a pop-up with text: "The Secure Interface will reboot immediately. Are you sure you want to continue?". Select "Reboot now" to reboot the Secure Interface.
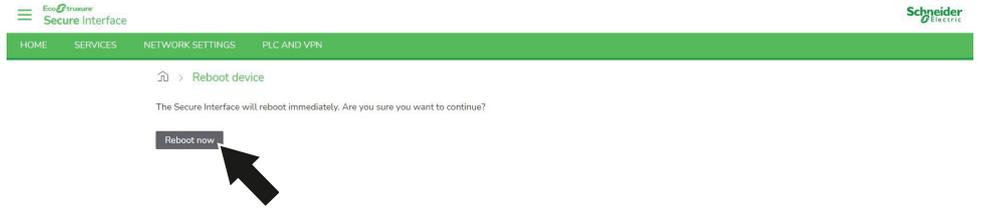
First Commissioning with EcoStruxure Machine Expert — HVAC

Refer to EcoStruxure Machine Expert — HVAC software - Operating Guide for more information.

Once the first connection between PC and TM172SI• starts, launch EcoStruxure Machine Expert — HVAC or EcoStruxure Machine Expert — HVAC Installer and load the PLC project:

• EcoStruxure Machine Expert — HVAC - Installer (PLC download and parameter or setting update)

• EcoStruxure Machine Expert — HVAC (development environment where PLC logic is programmed, gives higher level information)
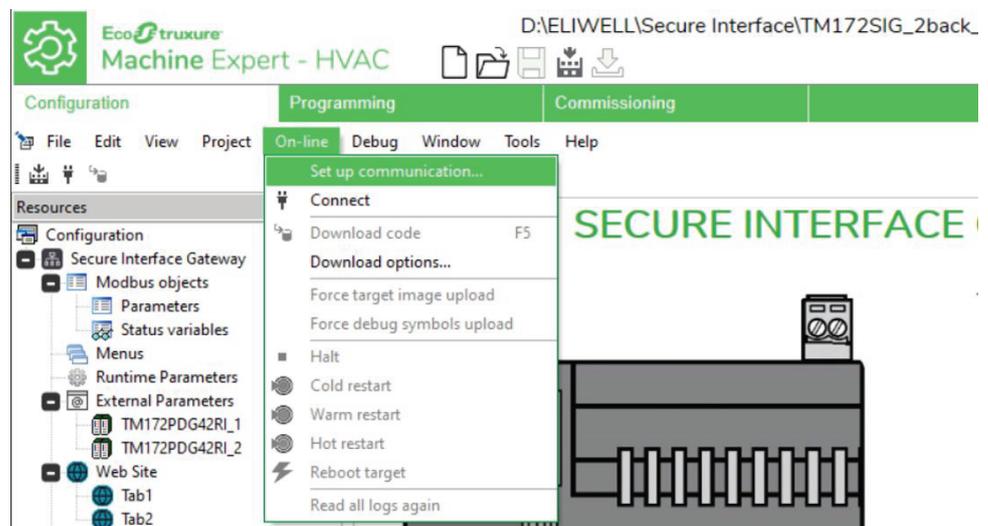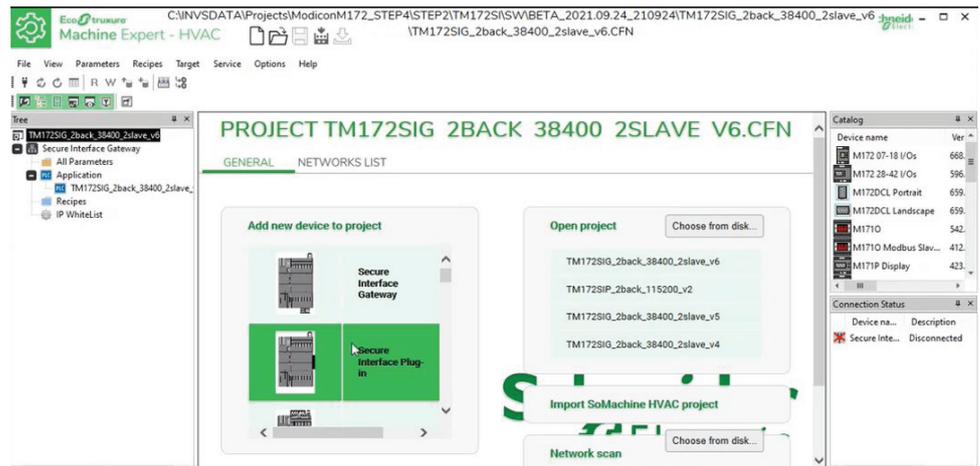
From the page Configuration go to On-line and set up the communication type between Modicon TM172 Secure Interface and PC.
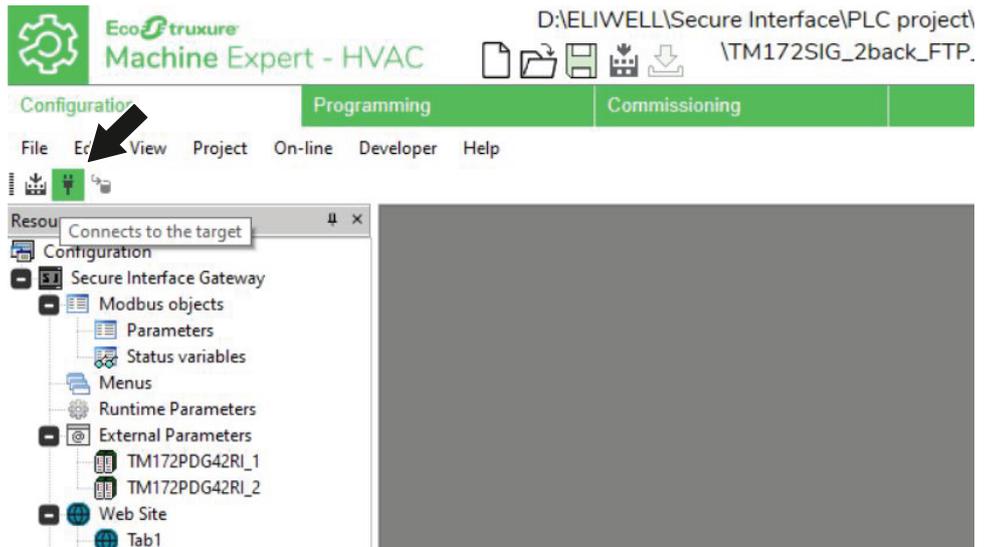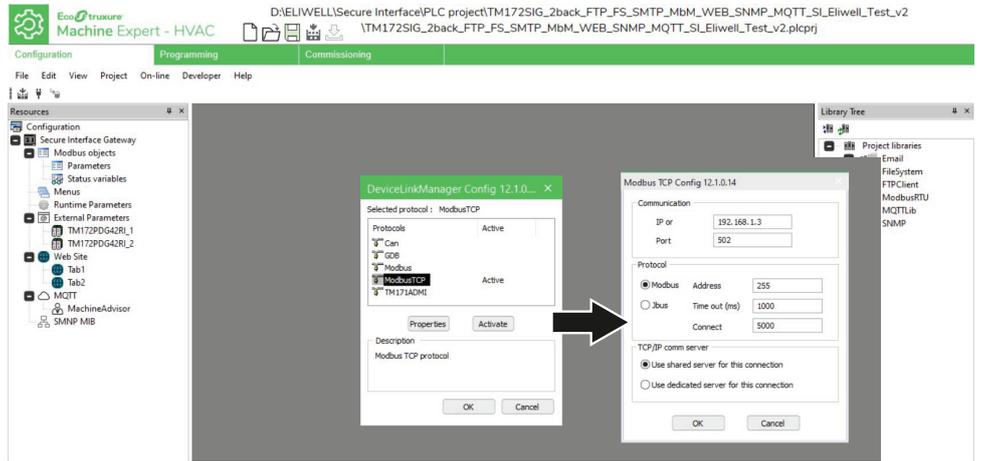
After setting the communication connect the secure interface by clicking the icon "Connects to the target".
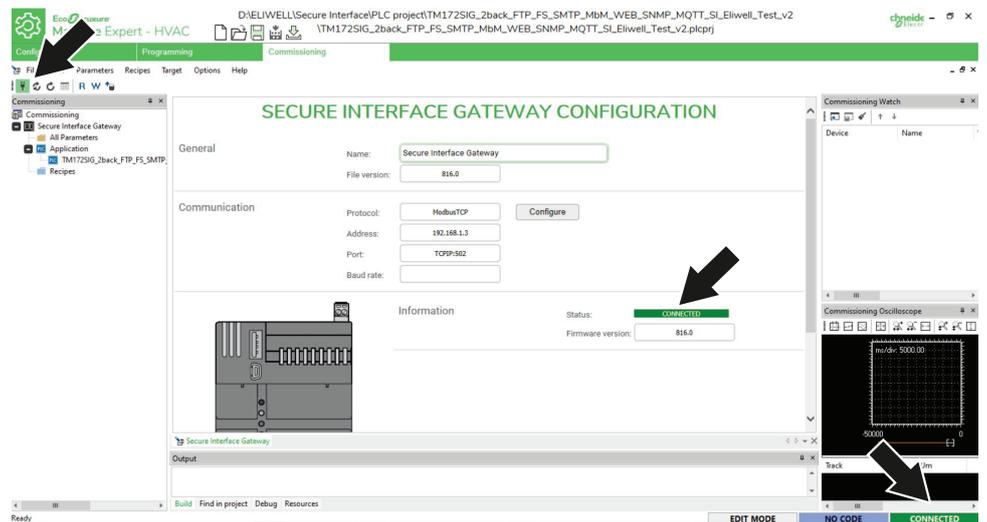
Secure Interface is connected.
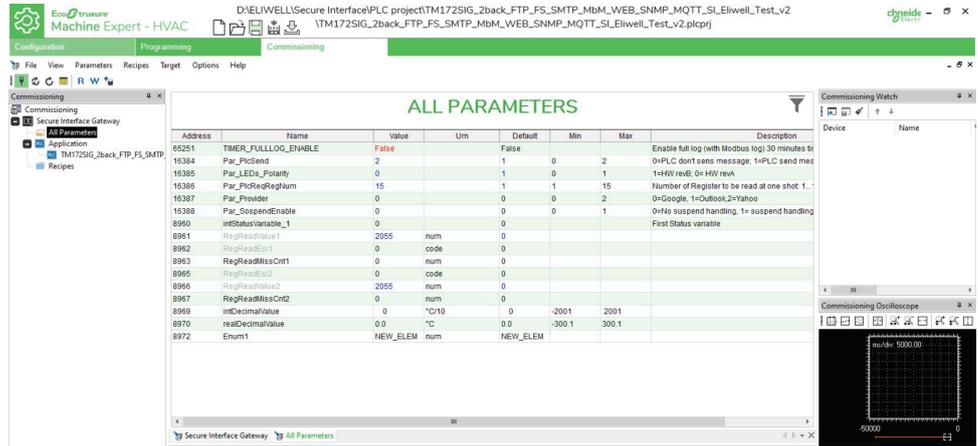
Parameters update page allows the configuration of Modicon TM172 Secure Interface parameters.
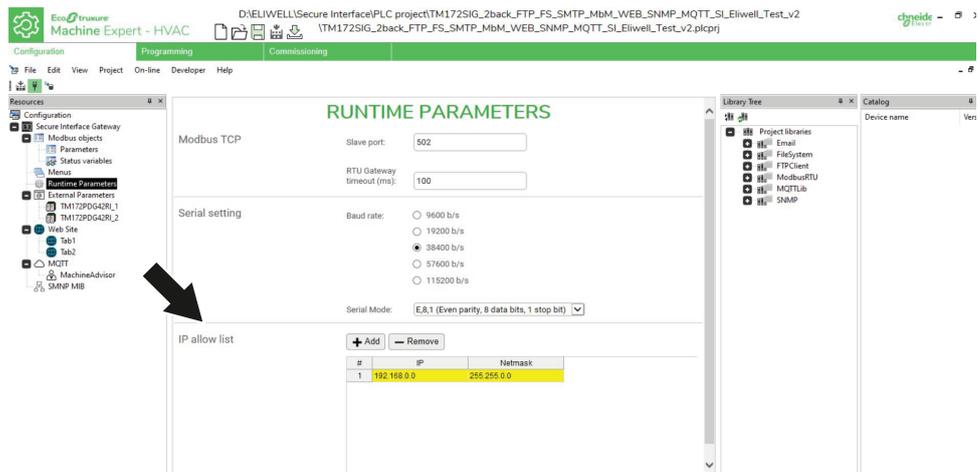
IP allow list is the list of IP secure addresses; from this menu is possible to make changes (the same list will be automatically aligned with the allow list displayed by Webapp).
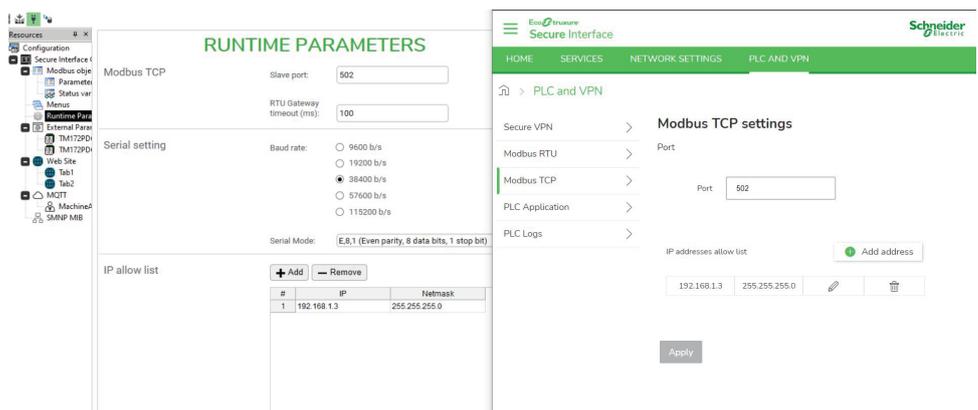
Configuration

Parameters and Retain Variables

Secure Interface allows to define Parameters (Configuration perspective) and **Retain variables** (Programming using Retain attribute).

Those **Parameters** have a Modbus address and allow to define a Scale and Offset with respect to the IEC variable. Secure Interface does not have EEprom or Ram memories retained by battery, both **Parameters** and **Retain variables** are stored in internal files which can be updated by the Linux operating system.

In case of several changes of variables the update may not be synchronous with each variable change because there are some delays in writing those values:

- **Parameters** update delay: 0.5 s

- Maximum inhibit time in case continuous writes for **Parameters**: 10 s

- **Retain variables** update delay: 1s.

- Maximum inhibit time in case continuous writes for **Retain variables**: 60 s

In case of Data Corruption an automatic program will restore **Parameters**, starting from a *.bak file, and **Retain variables**, with two files.

The **Retain variables** area is reset in case of cold restart or in case of a change in the layout of the **Retain variables** area

External Parameters
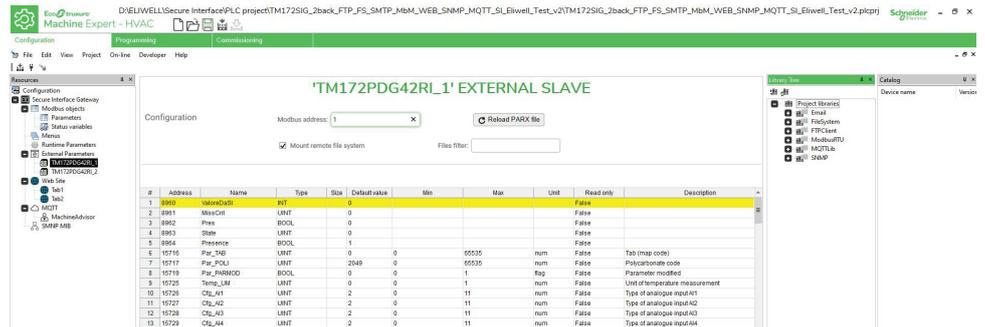
External parameters represents the database of devices that are connected with the RS485 serial.

In the plug-in model, the number of external parameters databases is only one, because only one object can be linked.

Here a PARX file is imported (resources descriptor file of the M172 controller connected to the Secure Interface) to display the parameters in a table.
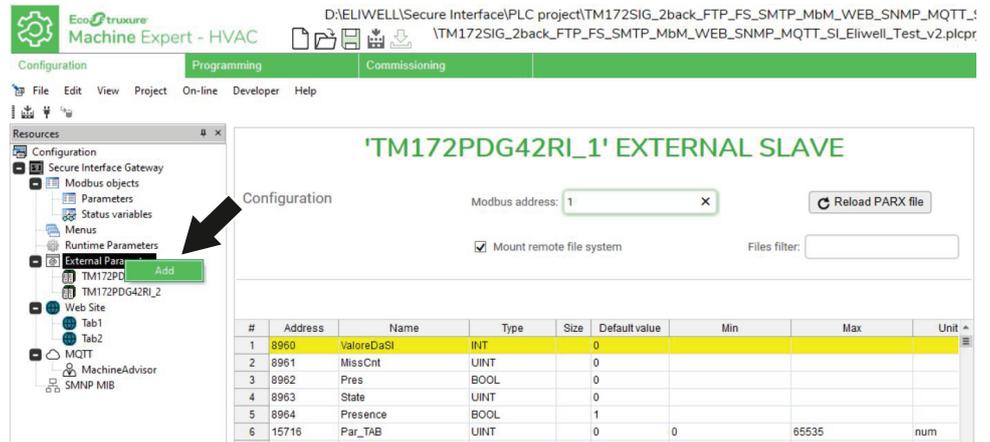
To import a PARX: click on External parameters in the menu on the left > Add

Enable the option "Mount remote file system" to have the possibility from the FTP client to view these files of the remote device.

External parameters are identified by @ in front of name, see following example:
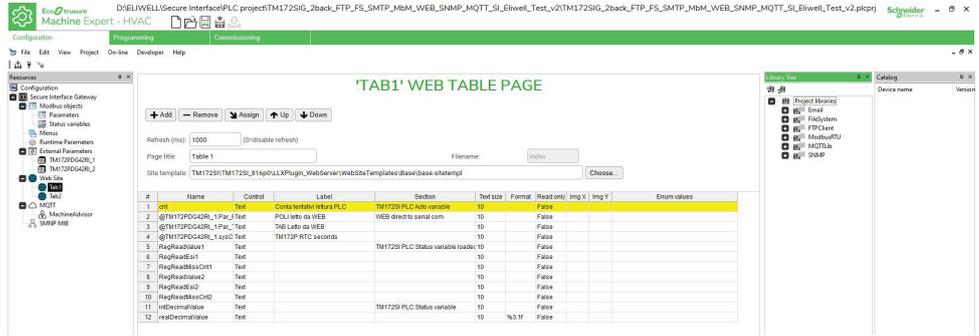
Management of the website created by the application

In the nodes under the Web Site tree on the left, it is possible to create new pages that will be displayed by the web browser, to make available on a secure protocol the tables of parameters or variables of the other connected controllers. Clicking on the "Web site preview" button, it is possible to see the preview (graphic representation of what is then displayed by the website).
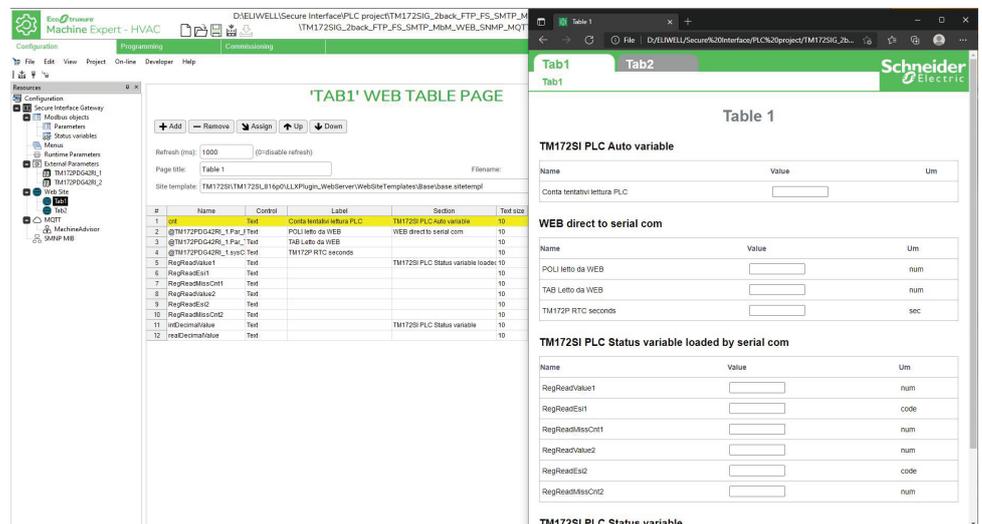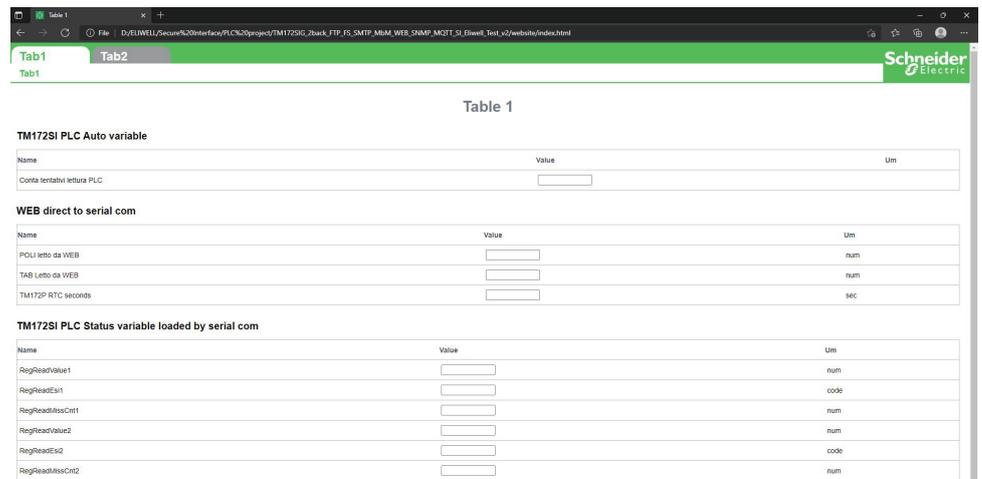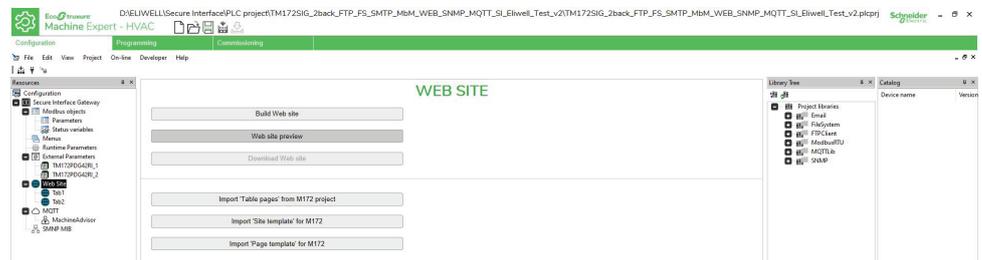
It is also possible to connect directly to the website, using the S.I. IP address and proper port, to check the pages of variables set by the application.
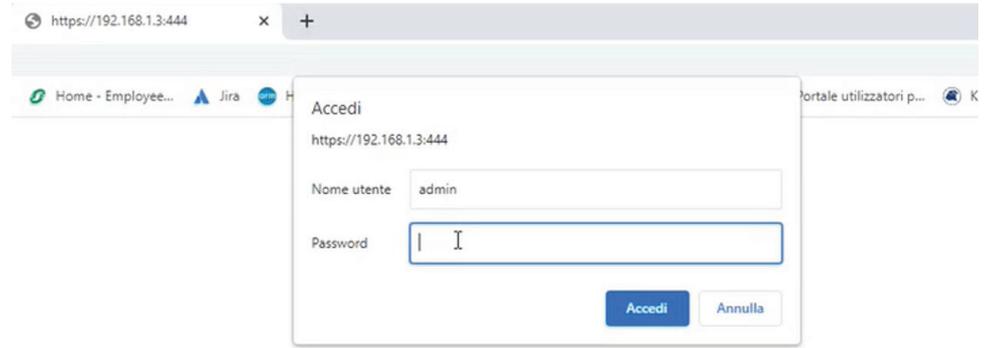
Enumerative Management in Website

Within Secure Interface project, the management of the enumerative in Web site has been improved.

Now it is possible to select an image for each different value of the enumerative variable.

<div align="center" style="color:green">'TAB' WEB TABLE PAGE</div>

#	Name	Control	Label	Section	Text size	Format	Read only	Img X	Img Y	Enum values
1	Enum1	Text		Enumerative example	10		False			
2	Enum1	Select					False			
3	Enum1	Button								
4	Enum1	Radio					False			0:svalore 0, 1:valore 1, 2:valore 2
5	Enum1	Image					False	0	0	0:stop.png, 1:play.png, 2:reload.png

User must click on the **Enum values** column in an enum set up as Image to open the modal window and select the image for each value.

Select images ✕

Value	Name	Image file	
0	NEW_ELEM	stop.png	...
1	NEW_ELEM1	play.png	...
2	NEW_ELEM2	reload.png	...

OK   Cancel
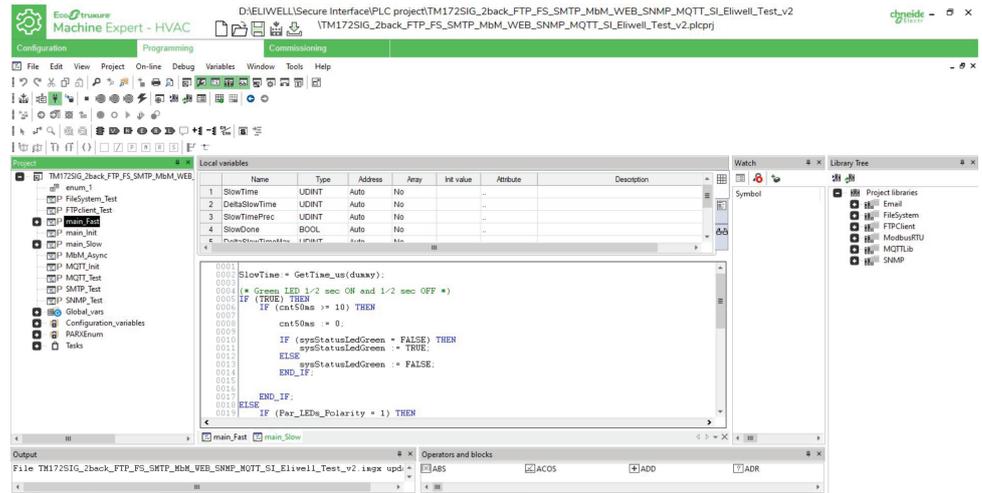
Programming

The Programming Tab has the same purpose of creating in applications in IEC-61131-3 environment, as illustrated in the Operating Guide (refer to EIO0000003412). Some specific features are related to the Modicon TM172 Secure Interface target, which are described in this document.

To create a new enumerative:
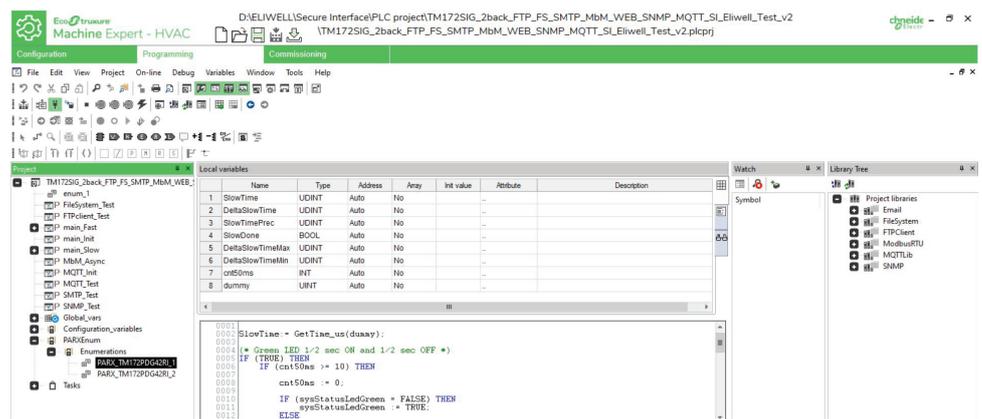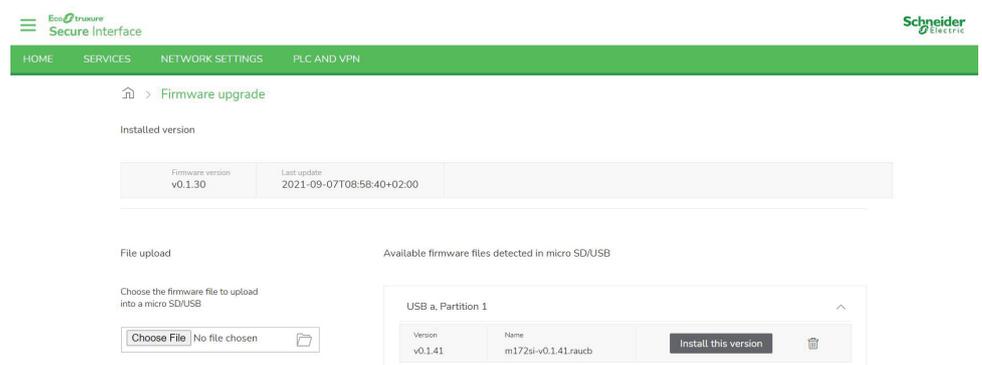
Through PARXEnum it is possible to see how the resources expressed by other parts in the table here are expressed as numbers. Used in PARX functions, help with generic modbus functions that allow you to communicate with devices on the 485 or plug-in.

For a program to run, it must be associated to a task.

The following types of task are available:

1. Boot task is executed only once at PLC start up.

2. Init task executed at each download of the application and on starting up the system (after Boot).

3. Fast (faster task, with higher precision, set by default to 10 ms), typically including no suspensive type function

4. Slow (called by the Fast task, so with execution time that is multiple of the value associated with Fast, more deterministic than the background tasks) - both suspensive and non-suspensive modbus functions can be included

5. Background 1 and 2 (indicative cyclic time of 100 ms) - including functions that can be suspended without negatively impacting on other tasks - typically, including those that cannot be included in Slow and Fast tasks

Unlike the other PLC targets, tasks in Modicon TM172 Secure Interface target have not priority on each other, but a background management tries to keep constant the average timing, compensating delays and advances.

Activities are divided in a task dependent manner.

Library functions are collected in Library Tree (Email, FileSystem, FTP Client, ModbusRTU, MQTT, SNMP).
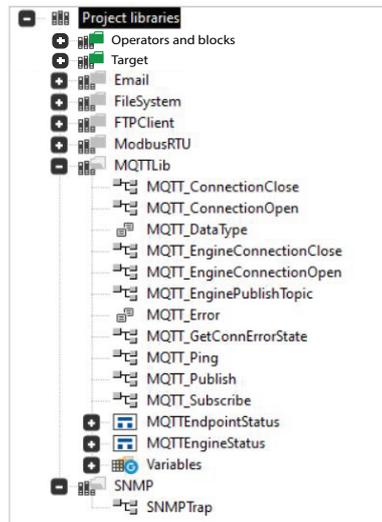
See Project Libraries, page 85 for more information on functions and function blocks in libraries.

MQTT Protocol

MQTT is a network protocol used in industry to connect devices to cloud services for sharing information in two directions from device to broker and viceversa. Modicon TM172 Secure Interface can connect to different clouds through the programmable broker configuration. To receive information on the Machine Advisor broker provided by Schneider Electric, refer to the related documentation.

To use the Machine Advisor broker you need to buy a license from Schneider Electric.

From the menu on the left it is possible to add a new broker by right clicking MQTT > Add broker
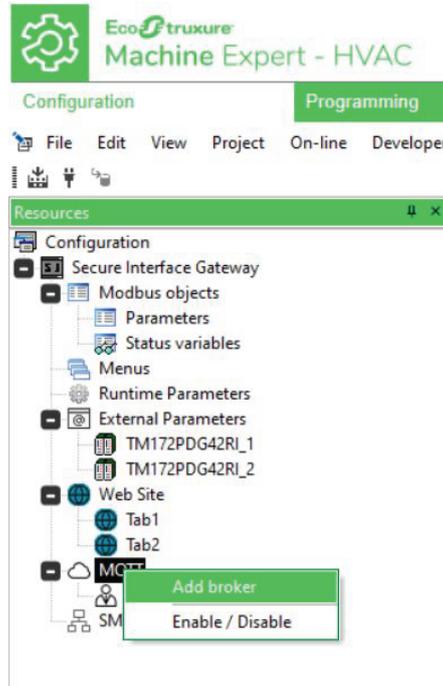
On the connection page you must enter the data for configuring the new broker.

Broker address field can be filled with the **IP** or the **URL** of the broker. If **IP** is used, in **Common name server** the **URL** must be filled. Otherwise if the **URL** is filled in **Broker address**, **Common name server** can be left empty.

Client ID, **Username** and **Password** fields can be filled in static or parametric way.

Parametric configuration allows system configuration to be modified in field.

Parametric configuration is managed by STRING type parameters which control the connection.
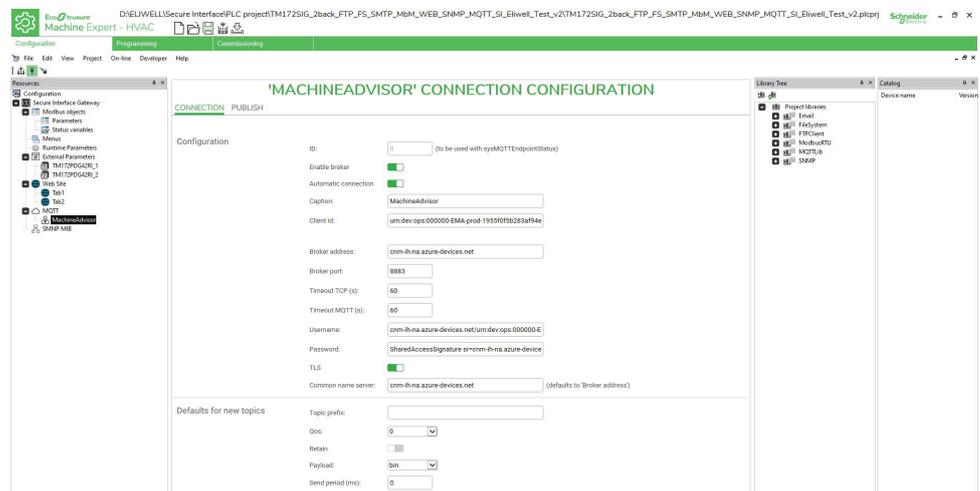
NOTE: When one between **Client ID**, **Username** or **Password** fields are set to parametric, the **Automatic connection** flag is automatically disabled and the subsequent connection establishing must be done trough **MQTT_ EngineConnectionOpen()**.

To support AWS (Amazon Web Server) cloud connection, flag **TLS** must be enabled. When activated it will be shown the **Certificates cfg** button which allows to link AWS files to the Broker.

NOTE: The files:

- **Client certificate**
- **Client private key**
- **Broker root CA certificate** (if empty MQTT engine will search the certificate in the system certificates)

are provided by Amazon during cloud allocation for that specified TM172SI•. Amazon could provide certificates and key with an additive extension (*.crt and *.key), those extensions must be removed to achieve *.pem as the only extension.
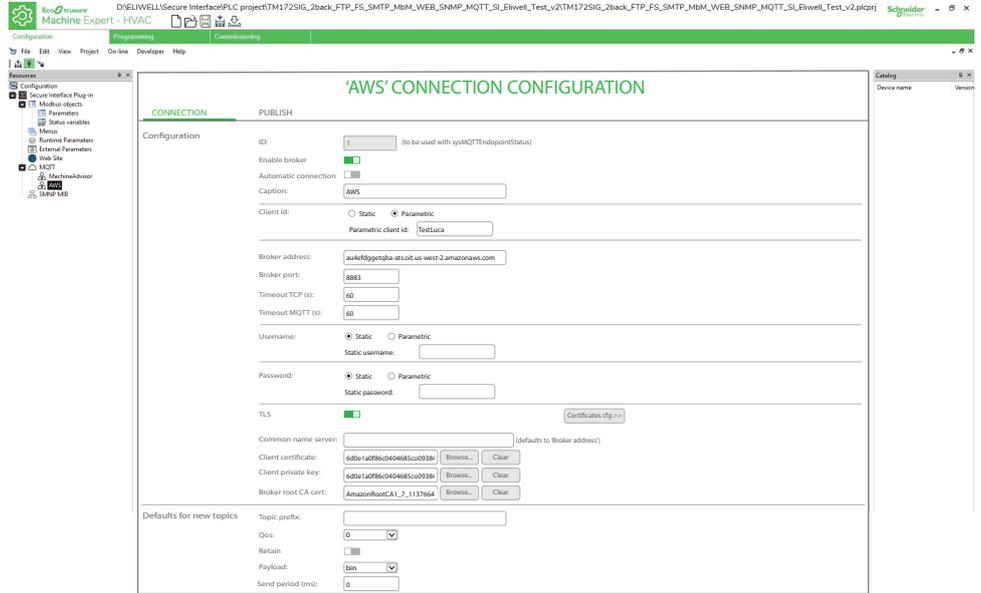
In case the programmer prefers establishing the cloud connection directly from IEC code, it is possible to upload AWS files *.pem, *.crt and *.key in the TM172SI•.

Connection will be established through **MQTT_ConnectionOpen2()**. **MQTT_ConnectionOpen2()** is an extension of **MQTT_ConnectionOpen()**, in which it is possible to use just the name of the files, without the path, to connect to AWS cloud.

The publish page defines the variables that will be sent to the cloud.

Topic field can be filled in static or parametric way. To be filled parametric, in **Connection page** also **Client ID** must have been defined as Parametric. Syntax **<ClientId>** must be used as shown below.

To add variables click to the right of the variable names cell and choose PLC variable to add. In this way the topic to be transmitted will be defined.

Through the **JSON preview** button it is possible to view how the transmitting topic is formatted.
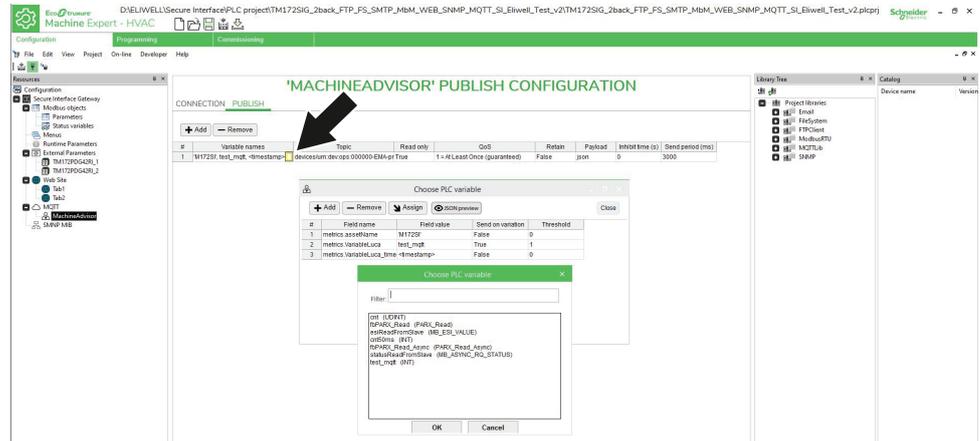
For AWS connection **Topic** field must contain the **Client ID** value. Using AWS cloud the topic is not related to format limitations.
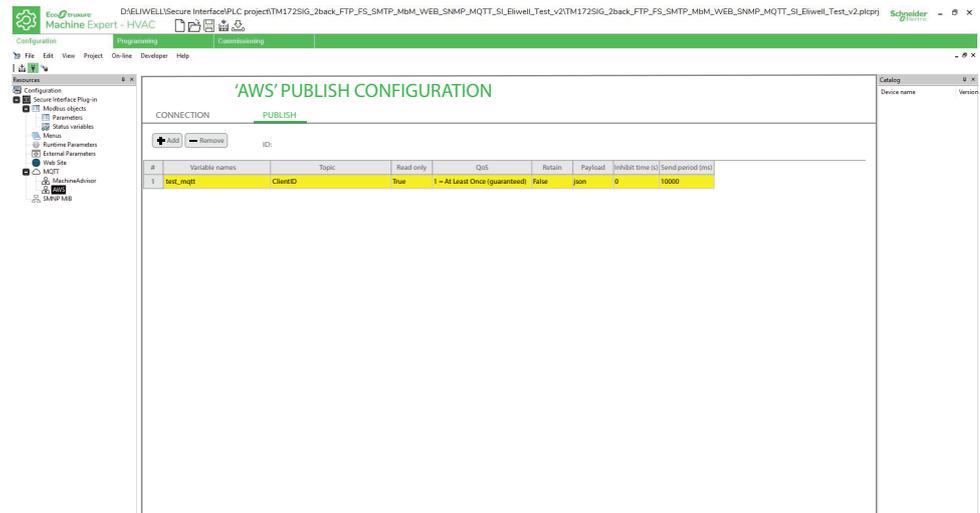
In the programming page it is possible to manually configure the MQTT connection using the functions collected in the Library Tree (Refer to Appendix).
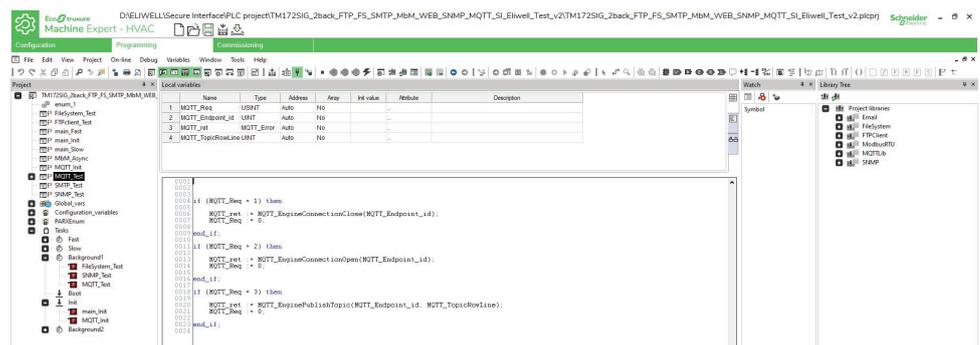
The manual configuration allows you to adapt the MQTT variables to the machine, without having to reprogram it. This is useful in the case of multiple machines, since if all the connected machines were configured in the same way, the origin of the data would not be recognized.

MQTT vs Machine Advisor

Modicon TM172 Secure Interface support MQTTs as form of libraries that can be configured inside **EcoStruxure Machine Expert — HVAC** . Modicon TM172 Secure Interface can connect to Machine Advisor through the programmable broker configuration.

To configure the machine in use through the configurator it is necessary to set it in Machine Advisor:
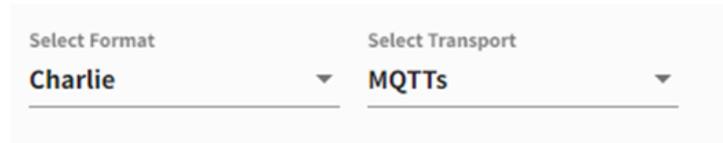
It is mandatory to use the ready configurator, if it is preferred to use Tango format, the TM172SI• must be specifically programmed.

Modicon TM172 Secure Interface MQTT connection can be configured directly in EcoStruxure Machine Expert — HVAC as follows.

In Configuration page, click on MQTT and enable it.
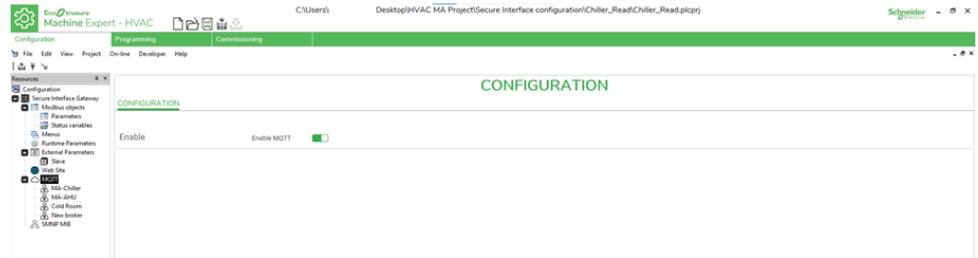
From the menu on the left it is possible to add a new broker by right clicking **MQTT > Add broker** .
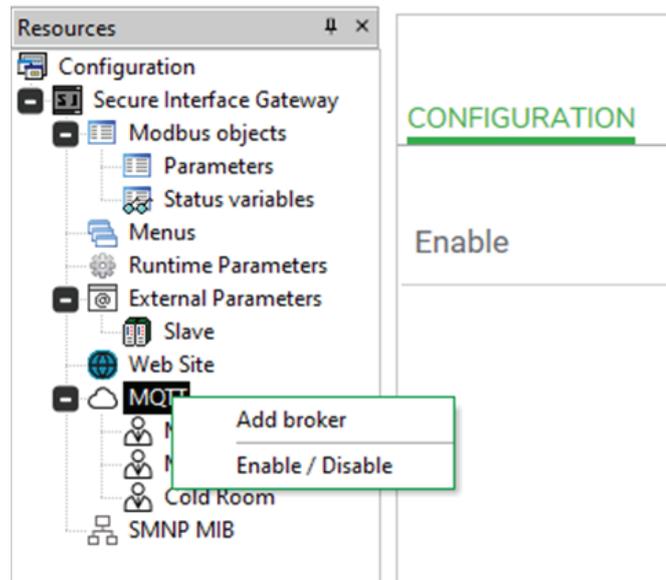
Open the just created broker. In connection page, the broker has to be configured to send data to Ecostruxure Machine Advisor.
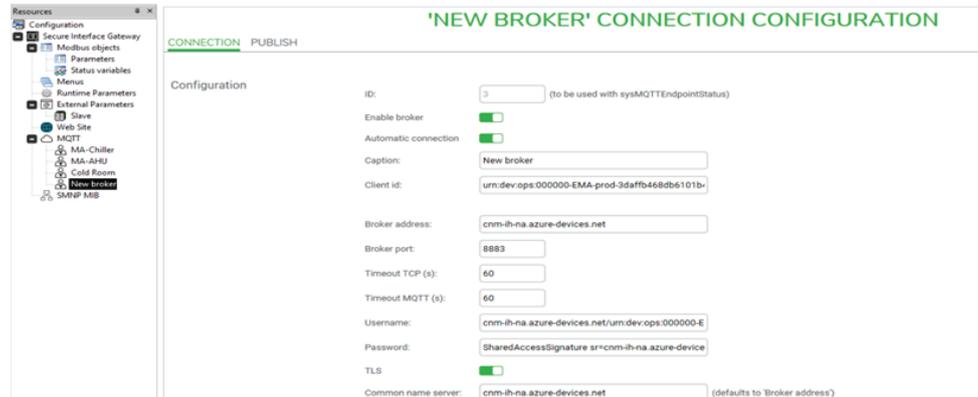
Copy **Generated Configuration** voices written in **Machine Advisor Monitor Configuration** and paste it in the broker configurator.

1. Client ID: can be "Static", fixed text modified only in case of a new compiling of the project, or "Parametric", linked to a STRING variable of PLC project.

2. Broker URL

3. Username: can be "Static", fixed text modified only in case of a new compiling of the project, or "Parametric", linked to a STRING variable of PLC project.

4. New Token: can be "Static", fixed text modified only in case of a new compiling of the project, or "Parametric", linked to a STRING variable of PLC project.

Below an example of parametric settings:

Machine Advisor Static Configuration

The publish page defines the variables that will be sent to the cloud.

The structure of the topic is: **<Topic.context.account-name>/<Client-ID>/ messages/events/**as the following example.

Topic
devices/urn:dev:ops:000000-EMA-prod-3daffb468db6101b4b2916e7/messages/events/

> **NOTE:** Payload must be set on json to send data to Ecostruxure Machine Advisor.

Machine Advisor "On—Field"/"Parametric" Configuration

The publish page shows some changes, with a new pointer added to <timestamp>, which is the <ClientId> who allows to link the Topic value to the ClientId parametric configuration.

The structure of the topic is: **<Topic.context.account-name>/<Client-ID>/ messages/events/**as the following example.

Variable names	Topic
TM172SI, <timestamp>	devices/<ClientId>/messages/events/

> **NOTE:** Payload must be set on json to send data to Ecostruxure Machine Advisor.

Now, user must select data to send in MA, so the publisher needs to be set up. In order do it, click in **Variable Names**, and respecting the **Charlie** format, select the variables to send.

More than one publisher with more variables inside can be made.

Here is also possible to set the "Send on variation" option.

When set on **TRUE**, if there will be more than one variable inside the publisher, all the variables will be pushed in Machine Advisor after the variation.

If just the variation of one variable is needed it must be created a specific publisher for each variable. For each asset it is possible to set an **inhibit** time to give a delay to each variation.

In case the programmer prefers establishing the cloud connection directly from IEC code it is possible to use **MQTT_ConnectionOpen2()** function without using any certificate or key file.

In Programming page, it is possbile to verify the connection thanks to the MQTT library.

Add the **MQTTEndPointStatus** and **MQTTEngineStatus** in watch window.

*   **MQTTEndPointStatus** refer to the status of the network of each broker numbered by the ID.
*   **MQTTEngineStatus** refer to the whole MQTT network

Appendices

Appendices

What's in This Chapter

What's in This Chapter

Project Libraries

Listed below are the functions available in the **Library Tree > Function blocks** section of EcoStruxure Machine Expert — HVAC software.
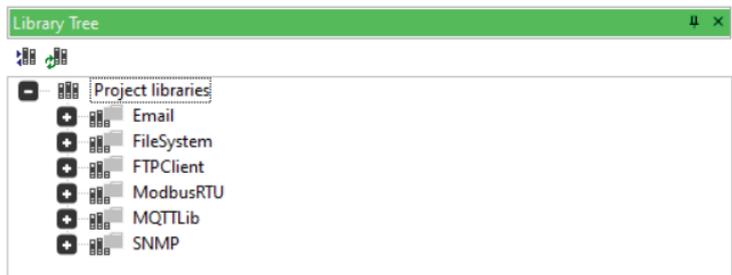
Email Folder

Email_SendMessage Function Block

This function sends automatically email messages.

Function Block: Email_SendMessage (ver.1.0.0, EMBEDDED)

Creation date: ...
Last modified date: ...

Input:

Name	Type	Description
Subject	STRING[100]	Subject of the message
From	STRING[100]	Sender address
Recv	STRING[100]	Recipient address
Body	STRING[1000]	Message body
Server_Name	STRING[100]	SMTP server name or IP address.
Host_Name	STRING[100]	Hostname of the local machine.
Server_Port	UINT	SMTP server port.
Server_User	STRING[100]	SMTP server username.
Server_Password	STRING[100]	SMTP server user password.
Server_TLS	BOOL	Use TLS encription with SMTP server.
Server_STARTTLS	BOOL	Use STARTTLS encription with SMTP server.
Server_AuthMethod	Auth_Method	Authorization Method

Output:

Name	Type	Description
res	Email_Errors	

Email Functions

Email_AddAttachment	Add a file to actual attachments list, max file size 5MB
Email_ClearAttachments	Clear all attachments
Email_ GetAttachmentNumber	Get number of currently attached files

Filesystem Folder

Filesystem Functions

FS_CloseFile	Close the specified file. The function returns a BOOL with the following meaning: TRUE = File closed. FALSE = An error occurred or invalid calling task.
FS_CopyFile	Copy a file
FS_CopyFileSync	Copy a file with SYNC mode on (every segment write ends with sync)
FS_CreateDir	Create specified directory if not exists. The function returns a BOOL with the following meanings: TRUE = Specified directory created. FALSE = Cannot create directory or directory already exists or invalid calling task.
FS_DeleteFile	Delete a file. The function returns a BOOL with the following meaning: TRUE = File deleted. FALSE = Cannot delete file or invalid calling task.
FS_DirExists	Check if the specified directory exists or not The function returns a BOOL with the following meanings TRUE = Specified directory exists. FALSE = Specified directory does not exists or invalid calling task.
FS_FileEOF	Test if end of file is reached. The function returns a BOOL with the following meaning: TRUE = End of file reached. FALSE = End of file not reached yet.
FS_FileExists	Check if the specified file exists or not The function returns a BOOL with the following meanings TRUE = Specified file exists. FALSE = Specified file does not exists or invalid calling task.
FS_FileTell	Returns the actual position of the file: -1 in case of error.
FS_Find_GetFileName	Returns the name of a matching file of a search
FS_Find_GetFileSize	Returns the size of a matching file of a search
FS_Find_GetFileTime	Returns the date and time of a matching file of a search
FS_Find_IsDirectory	Returns if matching file is a directory
FS_Find_IsWritable	Returns if matching file is writable
FS_FindClose	Close a search handle
FS_FindFirstFile	Searches for files on the disk, starting on path and using the specified filter with wildcard. Returns an handle that can be passed to FS_Find* functions, or 0 if no files found; returns -1 for invalid calling task
FS_FindNextFile	Searches the next matching file. Returns FALSE if no more files are found or invalid calling task
FS_Flush	Force writing on specified handle.

	The function returns a BOOL with the following meaning: TRUE = flush ok FALSE = An error occurred or invalid calling task
FS_GetFreeSpace	Returns the free space in Kbytes of the volume path specified: -1 in case of error.
FS_MoveFile	Move or rename a file
FS_OpenFile	Open a file in the specified mode. The function returns an UDINT with the following meaning: 0 = No file found or Invalid calling task Otherwise = handle of the file.
FS_ReadFile	Read binary data from the specified file. The function returns the number of bytes read, or 0 = Error reading -1 = Invalid calling task
FS_ReadString	Read a STRING from the specified file. Returns FALSE if error or invalid calling task
FS_SeekFile	Seek a position into the file. TRUE = Cursor position set. FALSE = An error occurred or invalid calling task
FS_Sync	Sync all modifies on external drivers (only POSIX compatible targets)
FS_Unmount	Unmount the mount point specified NOTE: Function for safe disconnection. If the USB Memory Key or MicroSD Memory Card extracted from the Modicon TM172 Secure Interface is not correctly disconnected, it may be that connecting it to a PC gives an error, in this case a window will appear with the request to correct the error, answer ok.
FS_WriteFile	Write binary data to the specified file. The function returns the number of bytes written, or 0 = Error writing -1 = Invalid calling task
FS_WriteString	Write a STRING to the specified file. Returns FALSE if error or invalid calling task
FS_OpenFileSync	Open a file with SYNC mode on (every write ends with sync) The function returns an UDINT with the following meaning: 0 = No file found. -1 = Invalid calling task Otherwise = handle of the file.

FTPClient Folder

FTP Client Functions

FTP_AbortAsyncOperation	Aborts the current async operation (Upload/Download)
FTP_Connect	Connects to the specific FTP serve (by IP or hostname). Use 'host:port' syntax can be used to specify an alternate TCP port (default is 21)
FTP_Connect2	

FTP_ConnectAsync	
FTP_DeleteDir	Deletes a folder from the FTP server
FTP_DeleteFile	Deletes a file from the FTP server
FTP_Disconnect	Disconnects from the FTP server
FTP_DownloadFile	Downloads a file from the FTP server
FTP_DownloadFile_Async	Downloads asynchronously a file from the FTP server
FTP_FileExists	Verify if filename exists
FTP_GetAsyncOperationStatus	Returns the status of last asynchronous operation
FTP_GetLastServerResponse	Gets the last response string from FTP server
FTP_Login	Login into FTP server
FTP_MakeDir	Creates a folder from the FTP server. Fails if the folder already exists
FTP_NegotiateEncryption	Secure the ftp communication channel (to be called after FTP_Connect and before FTP_Login)
FTP_PathExists	Checks if a folder exists on the FTP server
FTP_RenameFile	Rename a file on the FTP server
FTP_UploadFile	Upload a file to the FTP server
FTP_UploadFile_Async	Uploads asynchronously a file to the FTP server

ModbusRTU Folder

Modbus RTU PARX Function Blocks

PARX_Read Function Block

Function Block: PARX_Read (ver.1.0.0, ST)

Creation date:	2021-06-03, 10.49
Last modified date:	2021-06-03, 12.04

Input:

Name	Type	Description
parxEnum	DINT	Parx enum value
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataOut	DWORD	Address of the output buffer
sizeIn	UDINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
sizeOut	UINT	Number of bytes of data received stored in pdataOut
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

PARX_Read_Async Function Block

Function Block: **PARX_Read_Async** (ver.1.0.0, ST)

Creation date:	2021-06-03, 10.49
Last modified date:	2021-06-03, 12.04

Input:

Name	Type	Description
parxEnum	DINT	Parx enum value
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataOut	DWORD	Address of the output buffer
sizeIn	UDINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
sizeOut	UINT	Number of bytes of data received stored in pdataOut
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

PARX_Write Function Block

Function Block: **PARX_Write** (ver.1.0.0, ST)

Creation date:	2021-06-03, 10.49
Last modified date:	2021-06-03, 12.04

Input:

Name	Type	Description
parxEnum	DINT	Parx enum value
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataIn	DWORD	Address of the output buffer
sizeIn	UDINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

PARX_Write_Async Function Block

Function Block: **PARX_Write_Async** (ver.1.0.0, ST)

Creation date:	2021-06-03, 10.49
Last modified date:	2021-06-03, 12.04

Input:

Name	Type	Description
parxEnum	DINT	Parx enum value
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataIn	DWORD	Address of the output buffer
sizeIn	UDINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Modbus RTU commands Function Blocks

ModbusRTU_ReadCoils Function Block

Function Block: ModbusRTU_ReadCoils (ver.1.0.0, EMBEDDED)		
Creation date:		2019-11-26, 14.05
Last modified date:		2019-12-02, 09.05
Read multiple coils - FC 01 modbus function		

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
coilAddrStart	UINT	Coil start address
coilsNum	UINT	Number of coils to read
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
sizeIn	UINT	Size in bytes of the receiveing coils buffer pDataOut. Set 0 if pDataBoolOUT is provided
sizeBoolIn	UINT	Size in bytes of the receiveing coils buffer pDataBoolOUT. Set 0 if pDataOut is provided
pDataOut	DWORD	Address of the output buffer (coils will be packed as bit)
pDataBoolOut	@BOOL	Address of the output buffer (each coil requires a BOOL)

Output:

Name	Type	Description
sizeOut	UINT	Size in bytes of the data in the pDataOut buffer
sizeBoolOut	UINT	Size in bytes of the data in the pDataBoolOut buffer
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Read coils from target using FC 01 modbus function.

It is possible to get received data in a buffer in two different ways:

A. bit packed: sizeIn of the pDataOut buffer must be specified in bytes

   for example:

   to read 16 coils and put value into a WORD var coilsInAWordVar:

   coilsNum := 16;

   pDataOut := ADR(coilsInAWordVar);

   sizeIn := 2;

B. array of BOOL: sizeIn of the pDataBoolOut buffer must be specified in bytes

   for example:

   to read 16 coils and put values into an array of BOOL var coilsBoolArray:

   coilsNum := 16;

   pDataOut := ADR(coilsBoolArray[0]);

   sizeIn := 16;

ModbusRTU_ReadCoils_Async Function Block

Function Block:	ModbusRTU_ReadCoils_Async (ver.1.0.0, EMBEDDED)
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read multiple coils - FC 01 modbus function - Async call	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
coilAddrStart	UINT	Coil start address
coilsNum	UINT	Number of coils to read
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
sizeIn	UINT	Size in bytes of the receiveing coils buffer pDataOut. Set 0 if pDataBoolOut is provided
sizeBoolIn	UINT	Size in bytes of the receiveing coils buffer pDataBoolOut. Set 0 if pDataOut is provided
pDataOut	DWORD	Address of the output buffer (coils will be packed as bit)
pDataBoolOut	@BOOL	Address of the output buffer (each coil requires a BOOL)

Output:

Name	Type	Description
sizeOut	UINT	Size in bytes of the data in the pDataOut buffer
sizeBoolOut	UINT	Size in bytes of the data in the pDataBoolOut buffer
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Read coils from target using FC 01 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When **asyncRqStatus** is **MB_ASYN_RQ_STATUS_DONE**, esi field can be checked and received data are filled into provided buffer.

It is possible to get received data in a buffer in two different ways:

A. bit packed: sizeIn of the pDataOut buffer must be specified in bytes

for example:

to read 16 coils and put value into a WORD var **coilsInAWordVar**:

coilsNum := 16;

pDataOut := ADR(**coilsInAWordVar**);

sizeIn := 2;

B. array of BOOL: sizeIn of the pDataBoolOut buffer must be specified in bytes

for example:

to read 16 coils and put values into an array of BOOL var **coilsBoolArray**:

coilsNum := 16;

pDataOut := ADR(**coilsBoolArray[0]**);

sizeIn := 16;

ModbusRTU_ReadDiscrInputs Function Block

Function Block: **ModbusRTU_ReadDiscrInputs** (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read discrete inputs - FC 02 modbus function	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
discrInputStart	UINT	Discrete input start address
discrInputsNum	UINT	Number of discrete inputs to read
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
sizeIn	UINT	Size in bytes of the receiveing coils buffer pDataOut. Set 0 if pDataBoolOut is provided
sizeBoolIn	UINT	Size in bytes of the receiveing coils buffer pDataBoolOut. Set 0 if pDataOut is provided
pDataOut	DWORD	Address of the output buffer (coils will be packed as bit)
pDataBoolOut	@BOOL	Address of the output buffer (each coil requires a BOOL)

Output:

Name	Type	Description
sizeOut	UINT	Size in bytes of the data in the pDataOut buffer
sizeBoolOut	UINT	Size in bytes of the data in the pDataBoolOut buffer
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Read discrete inputs from target using FC 02 modbus function.

It is possible to get received data in a buffer in two different ways:

A. bit packed: sizeIn of the pDataOut buffer must be specified in bytes

    for example:

    to read 16 coils and put value into a WORD var **coilsInAWordVar**:

    coilsNum := 16;

    pDataOut := ADR(**coilsInAWordVar**);

    sizeIn := 2;

B. array of BOOL: sizeIn of the pDataBoolOut buffer must be specified in bytes

    for example:

    to read 16 coils and put values into an array of BOOL var **coilsBoolArray**:

    coilsNum := 16;

    pDataOut := ADR(**coilsBoolArray[0]**);

    sizeIn := 16;

ModbusRTU_ReadDiscrInputs_Async Function Block

Function Block: ModbusRTU_ReadDiscrInputs_Async (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read discrete inputs - FC 02 modbus function - Async call	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
discrInputStart	UINT	Discrete input start address
discrInputsNum	UINT	Number of discrete inputs to read
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
sizeIn	UINT	Size in bytes of the receiveing coils buffer pDataOut. Set 0 if pDataBoolOut is provided
sizeBoolIn	UINT	Size in bytes of the receiveing coils buffer pDataBoolOut. Set 0 if pDataOut is provided
pDataOut	DWORD	Address of the output buffer (coils will be packed as bit)
pDataBoolOut	@BOOL	Address of the output buffer (each coil requires a BOOL)

Output:

Name	Type	Description
sizeOut	UINT	Size in bytes of the data in the pDataOut buffer
sizeBoolOut	UINT	Size in bytes of the data in the pDataBoolOut buffer
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Read discrete inputs from target using FC 02 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When **asyncRqStatus** is **MB_ASYN_RQ_STATUS_DONE**, esi field can be checked and received data are filled into provided buffer

It is possible to get received data in a buffer in two different ways:

A. bit packed: sizeIn of the pDataOut buffer must be specified in bytes

for example:

to read 16 coils and put value into a WORD var **coilsInAWordVar**:

coilsNum := 16;

pDataOut := ADR(**coilsInAWordVar**);

sizeIn := 2;

B. array of BOOL: sizeIn of the pDataBoolOut buffer must be specified in bytes

for example:

to read 16 coils and put values into an array of BOOL var **coilsBoolArray**:

coilsNum := 16;

pDataOut := ADR(**coilsBoolArray[0]**);

sizeIn := 16;

ModbusRTU_ReadHoldingRegs Function Block

Function Block: ModbusRTU_ReadHoldingRegs (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read holding registers - FC 03 modbus function	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
regAddrStart	UINT	Register start address
regNum	UINT	Number of registers
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataOut	DWORD	Address of the output buffer
sizeIn	UINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
sizeOut	UINT	Number of bytes of data received stored in pDataOut
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Read registers from target using FC 03 modbus function.

External buffer must be provided to put received data in.

A. sizeIn of the pDataOut buffer must be specified in bytes

for example:

to read 16 registers and put values into **dwordArray**[0..7] OF DWORD array:

regNum := 16;

pDataOut := ADR(**dwordArray[0]**);

sizeIn := 32;

ModbusRTU_ReadHoldingRegs_Async Function Block

Function Block: ModbusRTU_ReadHoldingRegs_Async (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read holding registers - FC 03 modbus function - Async call	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
regAddrStart	UINT	Register start address
regNum	UINT	Number of registers
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataOut	DWORD	Address of the output buffer
sizeIn	UINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
sizeOut	UINT	Number of bytes of data received stored in pDataOut
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Read registers from target using FC 03 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When asyncRqStatus is MB_ASYN_RQ_STATUS_DONE, esi field can be checked and received data are filled into provided buffer

External buffer must be provided to put received data in.

A. sizeIn of the pDataOut buffer must be specified in bytes

for example:

to read 16 registers and put values into **dwordArray**[0..7] OF DWORD array:

regNum := 16;

pDataOut := ADR(**dwordArray[0]**);

sizeIn := 32;

ModbusRTU_ReadInputRegs Function Block

Function Block: ModbusRTU_ReadInputRegs (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read input registers - FC 04 modbus function	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
regAddrStart	UINT	Register start address
regNum	UINT	Number of registers
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataOut	DWORD	Address of the output buffer
sizeIn	UINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
sizeOut	UINT	Number of bytes of data received stored in pDataOut
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Read input registers from target using FC 03 modbus function.

External buffer must be provided to put received data in

A. sizeIn of the pDataOut buffer must be specified in bytes

for example:

to read 16 registers and put values into **dwordArray**[0..7] OF DWORD array:

regNum := 16;

pDataOut := ADR(**dwordArray[0]**);

sizeIn := 32;

ModbusRTU_ReadInputRegs_Async Function Block

Function Block: **ModbusRTU_ReadInputRegs_Async** (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 14.05
Last modified date:	2019-12-02, 09.05
Read input registers - FC 04 modbus function - Async call	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
regAddrStart	UINT	Register start address
regNum	UINT	Number of registers
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms
pDataOut	DWORD	Address of the output buffer
sizeIn	UINT	Max size in bytes of the output buffer

Output:

Name	Type	Description
sizeOut	UINT	Number of bytes of data received stored in pDataOut
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Read input registers from target using FC 03 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When asyncRqStatus is MB_ASYN_RQ_STATUS_DONE, esi field can be checked and received data are filled into provided buffer

External buffer must be provided to put received data in

A. sizeIn of the pDataOut buffer must be specified in bytes

for example:

to read 16 registers and put values into **dwordArray**[0..7] OF DWORD array:

regNum := 16;

pDataOut := ADR(**dwordArray[0]**);

sizeIn := 32;

ModbusRTU_WriteMultCoils Function Block

Function Block: ModbusRTU_WriteMultCoils (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 16.46
Last modified date:	2019-12-02, 09.05
Write multiple coils - FC 15 modbus function	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
_reserved	WORD	
coilStart	UINT	First coil address
coilsNum	UINT	Number of coils
sizeIn	UINT	Size in bytes of the writing coils buffer pDataIn. Set 0 if pDataBoolIn is provided
sizeBoolIn	UINT	Size in bytes of the receiveing coils buffer pDataBoolIn. Set 0 if pDataIn is provided
pDataIn	DWORD	Address of the input buffer (coils are packed as bit)
pDataBoolIn	@BOOL	Address of the input buffer (each coil is on a BOOL array element)
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Write multiple coils into target using FC 15 modbus function.

It is possible to set data in a buffer in two different ways:

A. bit packed: sizeIn of the pDataIn buffer must be specified in bytes

for example:

to write 12 coils and put value into a WORD var **coilsInAWordVar**:

coilsNum := 12;

pDataOut := ADR(**coilsInAWordVar**);

sizeIn := 2;

B. array of BOOL: sizeIn of the pDataBoolIn buffer must be specified in bytes

for example:

to write 12 coils and put values into an array of BOOL var **coilsBoolArray**:

coilsNum := 12;

pDataIn := ADR(**coilsBoolArray[0]**);

sizeIn := 12;

ModbusRTU_WriteMultCoils_Async Function Block

Function Block: **ModbusRTU_WriteMultCoils_Async** (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 16.46
Last modified date:	2019-12-02, 09.05
Write multiple coils - FC 15 modbus function - Async call	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
_reserved	WORD	
coilStart	UINT	First coil address
coilsNum	UINT	Number of coils
sizeIn	UINT	Size in bytes of the writing coils buffer pDataIn. Set 0 if pDataBoolIn is provided
sizeBoolIn	UINT	Size in bytes of the receiveing coils buffer pDataBoolIn. Set 0 if pDataIn is provided
pDataIn	DWORD	Address of the input buffer (coils are packed as bit)
pDataBoolIn	@BOOL	Address of the input buffer (each coil is on a BOOL array element)
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Write multiple coils into target using FC 15 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When asyncRqStatus is MB_ASYN_RQ_STATUS_DONE, esi field can be checked and received data are filled into provided buffer

It is possible to set data in a buffer in two different ways:

A. bit packed: sizeIn of the pDataIn buffer must be specified in bytes

   for example:

   to write 12 coils and put value into a WORD var **coilsInAWordVar**:

   coilsNum := 12;

   pDataOut := ADR(**coilsInAWordVar**);

   sizeIn := 2;

B. array of BOOL: sizeIn of the pDataBoolIn buffer must be specified in bytes

   for example:

   to write 12 coils and put values into an array of BOOL var **coilsBoolArray**:

   coilsNum := 12;

   pDataIn := ADR(**coilsBoolArray[0]**);

   sizeIn := 12;

ModbusRTU_WriteMultRegs Function Block

Function Block: ModbusRTU_WriteMultRegs (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 16.46
Last modified date:	2019-12-02, 09.05
Write multiple registers - FC 16 modbus function	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
_reserved	WORD	
regAddrStart	UINT	Register start address
regNum	UINT	Number of registers
_reserved1	UINT	
sizeIn	UINT	Max size in bytes of the output buffer
pDataIn	DWORD	Address of the output buffer with registers values to transmit
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Write multiple registers into target using FC 16 modbus function.

External buffer must be provided.

A. sizeIn of the pDataIn buffer must be specified in bytes

for example:

to write 12 registers from a **wordArray**[0..11] OF WORD var:

regNum := 12;

pDataIn := ADR(**coilsInAWordVar**);

sizeIn := 24;

ModbusRTU_WriteMultRegs_Async Function Block

Function Block: ModbusRTU_WriteMultRegs_Async (ver.1.0.0, EMBEDDED)	
Creation date:	2019-11-26, 16.46
Last modified date:	2019-12-02, 09.05
Write multiple registers - FC 16 modbus function - Async call	

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
_reserved	WORD	
regAddrStart	UINT	Register start address
regNum	UINT	Number of registers
_reserved1	UINT	
sizeIn	UINT	Max size in bytes of the output buffer
pDataIn	DWORD	Address of the output buffer with registers values to transmit
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Write multiple registers into target using FC 16 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When asyncRqStatus is MB_ASYN_RQ_STATUS_DONE, esi field can be checked and received data are filled into provided buffer

External buffer must be provided.

A. sizeIn of the pDataIn buffer must be specified in bytes

for example:

to write 12 registers from a **wordArray**[0..11] OF WORD var:

regNum := 12;

pDataIn := ADR(**coilsInAWordVar**);

sizeIn := 24;

ModbusRTU_WriteSingleCoil Function Block

> Function Block: **ModbusRTU_WriteSingleCoil** (ver.1.0.0, EMBEDDED)
> Creation date: 2019-11-26, 16.46
> Last modified date: 2019-12-02, 09.05
>
> Write single coil - FC 05 modbus function

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
coilAddr	UINT	Coil address
coilValue	UINT	Coil value. 0 or 1 value
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Description:

Write single coil into target using FC 05 modbus function.

If coil value is 0, value 0 is sent as coil value IF coil value is != 0, value 0x00FF is sent as coil value.

Write single coil into target using FC 05 modbus function.

If coil value is 0, value 0 is sent as coil value IF coil value is != 0, value 0x00FF is sent as coil value.

ModbusRTU_WriteSingleCoil_Async Function Block

> Function Block: **ModbusRTU_WriteSingleCoil_Async** (ver.1.0.0, EMBEDDED)
> Creation date: 2019-11-26, 16.46
> Last modified date: 2019-12-02, 09.05
>
> Write single coil - FC 05 modbus function - Async call

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
coilAddr	UINT	Coil address
coilValue	UINT	Coil value. 0 or 1 value
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Write single coil into target using FC 05 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When **asyncRqStatus** is **MB_ASYN_RQ_STATUS_DONE**, esi field can be checked and received data are filled into provided buffer

If coil value is 0, value 0 is sent as coil value IF coil value is != 0, value 0x00FF is sent as coil value.

ModbusRTU_WriteSingleReg Function Block

Function Block: ModbusRTU_WriteSingleReg (ver.1.0.0, EMBEDDED)		
Creation date:		2019-11-26, 16.46
Last modified date:		2019-12-02, 09.05
Write single register - FC 06 modbus function		

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
regAddr	UINT	Register address
regValue	UINT	Register value
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE

Write single register into target using FC 06 modbus function.

ModbusRTU_WriteSingleReg_Async Function Block

Function Block: ModbusRTU_WriteSingleReg_Async (ver.1.0.0, EMBEDDED)		
Creation date:		2019-11-26, 16.46
Last modified date:		2019-12-02, 09.05
Write single register - FC 06 modbus function		

Input:

Name	Type	Description
netId	MB_RTU_NETWORK_ID	Network id
modbusAddr	UINT	Modbus network node address
regAddr	UINT	Register address
regValue	UINT	Register value
_reserved	WORD	
timeoutMs	UINT	Timeout in ms
waitBeforeSendMs	UINT	Wait before send in ms

Output:

Name	Type	Description
esi	MB_ESI_VALUE	Result of the command. One of the MB_ESI_VALUE
asyncRqStatus	MB_ASYNC_RQ_STATUS	Async request result

Write single register into target using FC 06 modbus function.

Function block must be run the first time to set the request, then must be executed to check if request is completed.

asyncRqStatus can be used to check the status of the request.

When **asyncRqStatus** is **MB_ASYN_RQ_STATUS_DONE**, esi field can be checked and received data are filled into provided buffer

MQTTLib Folder

MQTT Function Blocks

MQTT_Ping Function Block

Function Block: MQTT_Ping (ver.1.0.0, EMBEDDED)	
Creation date:	2020-06-04, 09.53
Last modified date:	2020-06-30, 10.53
Ping	

Input:

Name	Type	Description
connHandle	INT	Connection Handle

Output:

Name	Type	Description
error	MQTT_Error	Error code
done	BOOL	Done flag
busy	BOOL	Busy flag

Ping a broker to check the connection state.

MQTT_Publish Function Block

Function Block: MQTT_Publish (ver.1.0.0, EMBEDDED)	
Creation date:	2020-06-04, 09.57
Last modified date:	2021-10-27, 10.04
Publish	

Input:

Name	Type	Description
connHandle	INT	Connection Handle
topic	STRING[255]	Single topic
dataType	MQTT_DataType	Data Type
dataSize	UINT	Size needed for type MQTTDT_RAW
dataInBool	BOOL	Input boolean value
dataInInt	ULINT	Input int value
dataInReal	LREAL	Input real value
dataInString	STRING[255]	Input string value
dataInAddr	ULINT	Input RAW address
QoS	USINT	Quality of Service (0,1,2)
retained	BOOL	
timeout_s	UINT	Optional MQTT timeout

Output:

Name	Type	Description
error	MQTT_Error	Error code
done	BOOL	Done flag
busy	BOOL	Busy flag

Publish a single MQTT topic value.

MQTT Functions

MQTT_ConnectionClose	Close an MQTT Connection
MQTT_ConnectionOpen	Establish a connection with a mqtt broker,

	needs username, password and a unique connection name
MQTT_ConnectionOpen2	Establish a connection with a mqtt broker based on AWS style which require certificates for connection, needs *.pem, *.crt and *.key files
MQTT_ EngineConnectionClose	-
MQTT_ EngineConnectionOpen	-
MQTT_EnginePublishTopic	-
MQTT_GetConnErrorState	Open connections gets MQTTE_Ok

NOTE: You can use "MQTT_" functions manually in the manual configuration, instead "MQTT_Engine" functions are functions to decide the sending of data to the broker (time and topic to be sent).

NOTE: a variable **sysMQTTLastJsonSent** shows the data of the last topic sent to broker

SNMP Folder

SNMP Function Blocks

SNMP Trap

Function Block: **SNMP Trap** (ver.1.0.0, EMBEDDED)
Creation date: 2021-06-16, 12.45
Last modified date: 2021-06-17, 09.31
Sends SNMP Trap

Input:

Name	Type	Description
serverAddr	STRING[64]	IP address of SNMP Manager
trap_OID	STRING[64]	OID of the Trap message
var1_OID	STRING[64]	OID of context variable 1
var1_value	DINT	Value of context variable 1
var2_OID	STRING[64]	OID of context variable 2
var2_value	DINT	Value of context variable 2
var3_OID	STRING[64]	OID of context variable 3
var3_value	DINT	Value of context variable 3
var4_OID	STRING[64]	OID of context variable 4
var4_value	DINT	Value of context variable 4
var5_OID	STRING[64]	OID of context variable 5
var5_value	DINT	Value of context variable 5

Output:

Name	Type	Description
result	BOOL	Result

Sends an SNMP Trap to specified server with max 5 content variables (only integer type supported)

Target Folder

New Target Blocks Function

New functions for Modicon TM172 Secure Interface to allow for NTC configuration.

If NTC is enabled

sysGetTime ()	Reads the timezone
sysGetTimezone	Reads date and time of the selected timezone
sysSetTime()	Sets the timezone value
sysSetTimezone()	Gets FAULT value and do not modifies time and date

If NTC is disabled

sysGetTime ()	Reads the timezone
sysGetTimezone	Reads date and time of the selected timezone
sysSetTime()	Sets the timezone value
sysSetTimezone()	Gets TRUE value and modifies manually time and date

NOTE: sysSetTimezone(), sysGetTimezone() e sysSetTime() get FALSE value or EMPTY string if not inserted in Background tasks.

Timezone managed by **sysGetTimezone** function:

- Africa/Abidjan
- Africa/Accra
- Africa/Algiers
- Africa/Bissau
- Africa/Cairo
- Africa/Casablanca
- Africa/Ceuta
- Africa/El_Aaiun
- Africa/Johannesburg
- Africa/Juba
- Africa/Khartoum
- Africa/Lagos
- Africa/Maputo
- Africa/Monrovia
- Africa/Nairobi
- Africa/Ndjamena
- Africa/Sao_Tome
- Africa/Tripoli
- Africa/Tunis
- Africa/Windhoek
- America/Adak
- America/Anchorage
- America/Araguaina
- America/Argentina/Buenos_Aires
- America/Argentina/Catamarca
- America/Argentina/Cordoba
- America/Argentina/Jujuy
- America/Argentina/La_Rioja
- America/Argentina/Mendoza
- America/Argentina/Rio_Gallegos
- America/Argentina/Salta
- America/Argentina/San_Juan
- America/Argentina/San_Luis
- America/Argentina/Tucuman
- America/Argentina/Ushuaia
- America/Asuncion
- America/Atikokan
- America/Bahia
- America/Bahia_Banderas
- America/Barbados
- America/Belem
- America/Belize
- America/Blanc-Sablon
- America/Boa_Vista
- America/Bogota
- America/Boise

- America/Cambridge_Bay
- America/Campo_Grande
- America/Cancun
- America/Caracas
- America/Cayenne
- America/Chicago
- America/Chihuahua
- America/Costa_Rica
- America/Creston
- America/Cuiaba
- America/Curacao
- America/Danmarkshavn
- America/Dawson
- America/Dawson_Creek
- America/Denver
- America/Detroit
- America/Edmonton
- America/Eirunepe
- America/El_Salvador
- America/Fort_Nelson
- America/Fortaleza
- America/Glace_Bay
- America/Goose_Bay
- America/Grand_Turk
- America/Guatemala
- America/Guayaquil
- America/Guyana
- America/Halifax
- America/Havana
- America/Hermosillo
- America/Indiana/Indianapolis
- America/Indiana/Knox
- America/Indiana/Marengo
- America/Indiana/Petersburg
- America/Indiana/Tell_City
- America/Indiana/Vevay
- America/Indiana/Vincennes
- America/Indiana/Winamac
- America/Inuvik
- America/Iqaluit
- America/Jamaica
- America/Juneau
- America/Kentucky/Louisville
- America/Kentucky/Monticello
- America/La_Paz
- America/Lima
- America/Los_Angeles

- America/Maceio
- America/Managua
- America/Manaus
- America/Martinique
- America/Matamoros
- America/Mazatlan
- America/Menominee
- America/Merida
- America/Metlakatla
- America/Mexico_City
- America/Miquelon
- America/Moncton
- America/Monterrey
- America/Montevideo
- America/Nassau
- America/New_York
- America/Nipigon
- America/Nome
- America/Noronha
- America/North_Dakota/Beulah
- America/North_Dakota/Center
- America/North_Dakota/New_Salem
- America/Nuuk
- America/Ojinaga
- America/Panama
- America/Pangnirtung
- America/Paramaribo
- America/Phoenix
- America/Port-au-Prince
- America/Port_of_Spain
- America/Porto_Velho
- America/Puerto_Rico
- America/Punta_Arenas
- America/Rainy_River
- America/Rankin_Inlet
- America/Recife
- America/Regina
- America/Resolute
- America/Rio_Branco
- America/Santarem
- America/Santiago
- America/Santo_Domingo
- America/Sao_Paulo
- America/Scoresbysund
- America/Sitka
- America/St_Johns
- America/Swift_Current

- America/Tegucigalpa
- America/Thule
- America/Thunder_Bay
- America/Tijuana
- America/Toronto
- America/Vancouver
- America/Whitehorse
- America/Winnipeg
- America/Yakutat
- America/Yellowknife
- Antarctica/Casey
- Antarctica/Davis
- Antarctica/DumontDUrville
- Antarctica/Macquarie
- Antarctica/Mawson
- Antarctica/Palmer
- Antarctica/Rothera
- Antarctica/Syowa
- Antarctica/Troll
- Antarctica/Vostok
- Asia/Almaty
- Asia/Amman
- Asia/Anadyr
- Asia/Aqtau
- Asia/Aqtobe
- Asia/Ashgabat
- Asia/Atyrau
- Asia/Baghdad
- Asia/Baku
- Asia/Bangkok
- Asia/Barnaul
- Asia/Beirut
- Asia/Bishkek
- Asia/Brunei
- Asia/Chita
- Asia/Choibalsan
- Asia/Colombo
- Asia/Damascus
- Asia/Dhaka
- Asia/Dili
- Asia/Dubai
- Asia/Dushanbe
- Asia/Famagusta
- Asia/Gaza
- Asia/Hebron
- Asia/Ho_Chi_Minh
- Asia/Hong_Kong

- Asia/Hovd
- Asia/Irkutsk
- Asia/Jakarta
- Asia/Jayapura
- Asia/Jerusalem
- Asia/Kabul
- Asia/Kamchatka
- Asia/Karachi
- Asia/Kathmandu
- Asia/Khandyga
- Asia/Kolkata
- Asia/Krasnoyarsk
- Asia/Kuala_Lumpur
- Asia/Kuching
- Asia/Macau
- Asia/Magadan
- Asia/Makassar
- Asia/Manila
- Asia/Nicosia
- Asia/Novokuznetsk
- Asia/Novosibirsk
- Asia/Omsk
- Asia/Oral
- Asia/Pontianak
- Asia/Pyongyang
- Asia/Qatar
- Asia/Qostanay
- Asia/Qyzylorda
- Asia/Riyadh
- Asia/Sakhalin
- Asia/Samarkand
- Asia/Seoul
- Asia/Shanghai
- Asia/Singapore
- Asia/Srednekolymsk
- Asia/Taipei
- Asia/Tashkent
- Asia/Tbilisi
- Asia/Tehran
- Asia/Thimphu
- Asia/Tokyo
- Asia/Tomsk
- Asia/Ulaanbaatar
- Asia/Urumqi
- Asia/Ust-Nera
- Asia/Vladivostok
- Asia/Yakutsk

- Asia/Yangon
- Asia/Yekaterinburg
- Asia/Yerevan
- Atlantic/Azores
- Atlantic/Bermuda
- Atlantic/Canary
- Atlantic/Cape_Verde
- Atlantic/Faroe
- Atlantic/Madeira
- Atlantic/Reykjavik
- Atlantic/South_Georgia
- Atlantic/Stanley
- Australia/Adelaide
- Australia/Brisbane
- Australia/Broken_Hill
- Australia/Darwin
- Australia/Eucla
- Australia/Hobart
- Australia/Lindeman
- Australia/Lord_Howe
- Australia/Melbourne
- Australia/Perth
- Australia/Sydney
- Europe/Amsterdam
- Europe/Andorra
- Europe/Astrakhan
- Europe/Athens
- Europe/Belgrade
- Europe/Berlin
- Europe/Brussels
- Europe/Bucharest
- Europe/Budapest
- Europe/Chisinau
- Europe/Copenhagen
- Europe/Dublin
- Europe/Gibraltar
- Europe/Helsinki
- Europe/Istanbul
- Europe/Kaliningrad
- Europe/Kiev
- Europe/Kirov
- Europe/Lisbon
- Europe/London
- Europe/Luxembourg
- Europe/Madrid
- Europe/Malta
- Europe/Minsk

- Europe/Monaco
- Europe/Moscow
- Europe/Oslo
- Europe/Paris
- Europe/Prague
- Europe/Riga
- Europe/Rome
- Europe/Samara
- Europe/Saratov
- Europe/Simferopol
- Europe/Sofia
- Europe/Stockholm
- Europe/Tallinn
- Europe/Tirane
- Europe/Ulyanovsk
- Europe/Uzhgorod
- Europe/Vienna
- Europe/Vilnius
- Europe/Volgograd
- Europe/Warsaw
- Europe/Zaporozhye
- Europe/Zurich
- Indian/Chagos
- Indian/Christmas
- Indian/Cocos
- Indian/Kerguelen
- Indian/Mahe
- Indian/Maldives
- Indian/Mauritius
- Indian/Reunion
- Pacific/Apia
- Pacific/Auckland
- Pacific/Bougainville
- Pacific/Chatham
- Pacific/Chuuk
- Pacific/Easter
- Pacific/Efate
- Pacific/Enderbury
- Pacific/Fakaofo
- Pacific/Fiji
- Pacific/Funafuti
- Pacific/Galapagos
- Pacific/Gambier
- Pacific/Guadalcanal
- Pacific/Guam
- Pacific/Honolulu
- Pacific/Kiritimati

- Pacific/Kosrae
- Pacific/Kwajalein
- Pacific/Majuro
- Pacific/Marquesas
- Pacific/Nauru
- Pacific/Niue
- Pacific/Norfolk
- Pacific/Noumea
- Pacific/Pago_Pago
- Pacific/Palau
- Pacific/Pitcairn
- Pacific/Pohnpei
- Pacific/Port_Moresby
- Pacific/Rarotonga
- Pacific/Tahiti
- Pacific/Tarawa
- Pacific/Tongatapu
- Pacific/Wake
- Pacific/Wallis

Glossary

A

application:

A program including configuration data, symbols, and documentation.

AWG:

(*American wire gauge*) The standard that specifies wire section sizes in North America.

B

BIOS:

(*basic input output system*) Part of the firmware used during the booting process.

BOOL:

(*boolean*) A basic data type in computing. A `BOOL` variable can have one of these values: 0 (`FALSE`), 1 (`TRUE`). A bit that is extracted from a word is of type `BOOL`.

C

controller:

Automates industrial processes (also known as programmable logic controller or programmable controller).

E

EEPROM:

(*electrically erasable programmable read-only memory*) A type of non-volatile memory to store required data even when power is removed.

EIA:

(*electronic industries alliance*) The trade organization for establishing electrical/electronic and data communication standards (including RS-232 and RS-485) in the United States.

EMC:

(*electromagnetic compatibility*)

EN:

EN identifies one of many European standards maintained by CEN (*European Committee for Standardization*), CENELEC (*European Committee for Electrotechnical Standardization*), or ETSI (*European Telecommunications Standards Institute*).

F

firmware:

Represents the BIOS, data parameters, and programming instructions that constitute the operating system on a controller. The firmware is stored in non-volatile memory within the controller.

flash memory:

A non-volatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

H

HVAC&R:

(*heating, ventilation, and air conditioning and refrigeration*)

I

ID:

(*identifier/identification*)

IEC 61131-3:

Part 3 of a 3-part IEC standard for industrial automation equipment. IEC 61131-3 is concerned with controller programming languages and defines 2 graphical and 2 textual programming language standards. The graphical programming languages are ladder diagram and function block diagram. The textual programming languages include structured text and instruction list.

IP20:

(*ingress protection*) The protection classification according to IEC 60529 offered by an enclosure, shown by the letter IP and 2 digits. The first digit indicates 2 factors: helping protect persons and for equipment. The second digit indicates helping protect against water. IP20 devices help protect against electric contact of objects larger than 12.5 mm, but not against water.

L

LAN:

(*local area network*) A short-distance communications network that is implemented in a home, office, or institutional environment.

LED:

(*light emitting diode*) An indicator that illuminates under a low-level electrical charge.

M

Modbus SL:

(*Modbus serial line*) Implementation of the protocol over a RS-232 or RS-485 serial connection.

Modbus:

The protocol that allows communications between many devices connected to the same network.

ms:

(*millisecond*)

N

NC:

(*normally closed*) A contact pair that closes when the actuator is de-energized (no power is applied) and opens when the actuator is energized (power is applied).

NEMA:

(*national electrical manufacturers association*) The standard for the performance of various classes of electrical enclosures. The NEMA standards cover corrosion resistance, ability to help protect from rain, submersion, and so on. For IEC member countries, the IEC 60529 standard classifies the ingress protection rating for enclosures.

network:

A system of interconnected devices that share a common data path and protocol for communications.

NO:

(*normally open*) A contact pair that opens when the actuator is de-energized (no power is applied) and closes when the actuator is energized (power is applied).

NTC:

(*Negative Temperature Coefficient*)

P

PLC:

(*programmable logic controller*) An industrial computer used to automate manufacturing, industrial, and other electromechanical processes. PLCs are different from common computers in that they are designed to have multiple input and output arrays and adhere to more robust specifications for shock, vibration, temperature, and electrical interference among other things.

power supply terminals:

The power supply is connected to these terminals to provide power to the controller.

protocol:

A convention or standard definition that controls or enables the connection, communication, and data transfer between 2 computing system and devices.

R

RS-485:

A standard type of serial communication bus, based on 2 wires (also known as EIA RS-485).

RTC:

(*real-time clock*) A battery-backed time-of-day and calendar clock that operates continuously, even when the controller is not powered for the life of the battery.

S

SELV:

(*safety extra low voltage*) A system that follows IEC 61140 guidelines for power supplies is protected in such a way that voltage between any 2 accessible parts (or between 1 accessible part and the PE terminal for class 1 equipment) does not exceed a specified value under normal conditions or under inoperable conditions.

sink input:

A wiring arrangement in which the device provides current to the input electronic module. A sink input is referenced to 0 Vdc.

SL:

(*serial line*)

SPDT:

(*single-pole, double-throw*)

SPST:

(*single-pole, single-throw*)

SSR:

(*solid-state relay*)

T

terminal block:

(*terminal block*) The component that mounts in an electronic module and provides electrical connections between the controller and the field devices.

U

UL:

(*underwriters laboratories*) A US organization for product testing and safety certification.

W

WORD:

A type encoded in a 16-bit format.