

Modicon M660 Motion Controller

Hardware Guide

EIO0000005519.00
12/2024

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Table of Contents

Safety Information.....	5
Qualification of Personnel	5
Intended Use.....	6
Before You Begin.....	6
Start-up and Test	7
Operation and Adjustments	8
About the Book.....	9
System Overview	13
Introduction.....	13
Overview	14
Type Code	17
Accessories and Spare Parts.....	18
Technical Data.....	19
General Data.....	19
Environmental Data	21
Mechanical Data.....	25
Electromagnetic Compatibility	27
Power Supply	28
Digital Inputs	29
Input for Controlling Power On/Power Off/Standby	30
Status Output (Watchdog).....	31
Ethernet Ports	32
USB Ports.....	33
DisplayPort	33
SD Card Slot.....	34
Installation.....	35
Mechanical Installation.....	35
Prerequisites and Requirements	35
Mounting.....	38
Electrical Installation	41
Electromagnetic Compatibility.....	41
Grounding	42
Wiring the Power Supply	44
Wiring the Digital Inputs.....	47
Wiring the Status Output (Watchdog).....	49
Wiring the Input for Controlling Power On/Power Off/Standby.....	52
Installation of Accessories	54
Installation of a Fan Kit	54
Installation of a Buffer Battery	56
Installation of a USB Security Key	59
Commissioning.....	61
Commissioning	61
Operation	63
Introduction.....	63
Powering On/Powering Off/Setting to Standby	64
Watchdog and Status Output.....	67
Hardware Diagnostics.....	68

Maintenance	71
Maintenance	71
Index	73

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 as well as all documentation of all components and equipment of the machine/process 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 configurations, settings, and wiring, and generally from mechanical, electrical, or electronic equipment.

If the product described in the present document is used to implement functions related to functional safety, the qualified person must be a certified expert in functional safety.

The qualified person must be familiar with and understand the contents of the risk assessment as per ISO 12100-1 and/or any other equivalent assessment as well as all documents related to such risk assessment or equivalent assessments for the machine/process.

The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing, implementing, and maintaining the machine/process.

The qualified person must be thoroughly familiar with the safety-related applications and the non-safety-related applications used to operate the machine/process.

Intended Use

The products described or affected by the present document are, together with software, accessories and options, motion controllers (referred to herein as “controller”). Depending on the product version, the motion controllers described in the present document are equipped with an integrated industrial PC (referred to herein as “industrial PC”). The products are intended for industrial use in industrial environments in accordance with 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 as per ISO 12100 and/or other equivalent 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 your overall machine or process.

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.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not install, use, maintain or service the controller products in any manner or in any environment other than that which is specified herein.

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

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING**UNGUARDED EQUIPMENT**

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

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

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

Start-up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check are made and that enough time is allowed to perform complete and satisfactory testing.

⚠ WARNING**EQUIPMENT OPERATION HAZARD**

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

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

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995:

(In case of divergence or contradiction between any translation and the English original, the original text in the English language will prevail.)

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

Document Scope

This manual describes technical characteristics, installation and maintenance of the motion controller M660.

Validity Note

This user guide is valid for the standard products listed in the Type Code, page 17.

The characteristics of the products described in this document are intended to match the characteristics that are available on www.se.com. As part of our corporate strategy for constant improvement, we may revise the content over time to enhance clarity and accuracy. If you see a difference between the characteristics in this document and the characteristics on www.se.com, consider www.se.com to contain the latest information.

Available Languages of the Document

The document is available in these languages:

- English (EIO0000005519)

Related Documents

Title of documentation	Reference number
M660 Programming - User Guide	EIO0000005527 (eng)
M660 Libraries - Library Guide	EIO0000005535 (eng)
Cybersecurity Guidelines for EcoStruxure Machine Expert, Modicon and PacDrive Controllers and Associated Equipment User Guide	EIO0000004242 (eng)
Cybersecurity Best Practices	CS-Best-Practices-2019-340

To find documents online, visit the Schneider Electric download center (www.se.com/ww/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 equipment.
- 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. Only install this equipment in zones known to be free of a hazardous atmosphere.

DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

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

WARNING

LOSS OF CONTROL

- Perform a Failure Mode and Effects Analysis (FMEA), or equivalent risk analysis, of your application, and apply preventive and detective controls before implementation.
- Provide a fallback state for undesired control events or sequences.
- Provide separate or redundant control paths wherever required.
- Supply appropriate parameters, particularly for limits.
- Review the implications of transmission delays and take actions to mitigate them.
- Review the implications of communication link interruptions and take actions to mitigate them.
- Provide independent paths for control functions (for example, emergency stop, over-limit conditions, and error conditions) according to your risk assessment, and applicable codes and regulations.
- Apply local accident prevention and safety regulations and guidelines.¹
- Test each implementation of a system for proper operation before placing it 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.

The controller is intended for operation in an industrial environment as specified by IEC 61000-6-2 and IEC 61000-6-4, and in zone B as specified by IEC 61131-2. Operating the controller in non-industrial environments such as residential, commercial and light-industrial environments as specified in IEC 61000-6-3 can result in radio interference.

⚠ WARNING**RADIO INTERFERENCE**

- Only install and operate the controller in an industrial environment as specified by IEC 61000-6-2 and IEC 61000-6-4, and in zone B as specified by IEC 61131-2.
- Do not install and operate the controller in public low-voltage mains power networks.

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

Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in the information contained herein, 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 13849-1:2023	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2020	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

Standard	Description
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 62061:2021	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 61784-3:2021	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.

System Overview

Introduction

Overview

The M660 controller family consists of two types.

MN660C devices are purpose-built motion controllers. Features include:

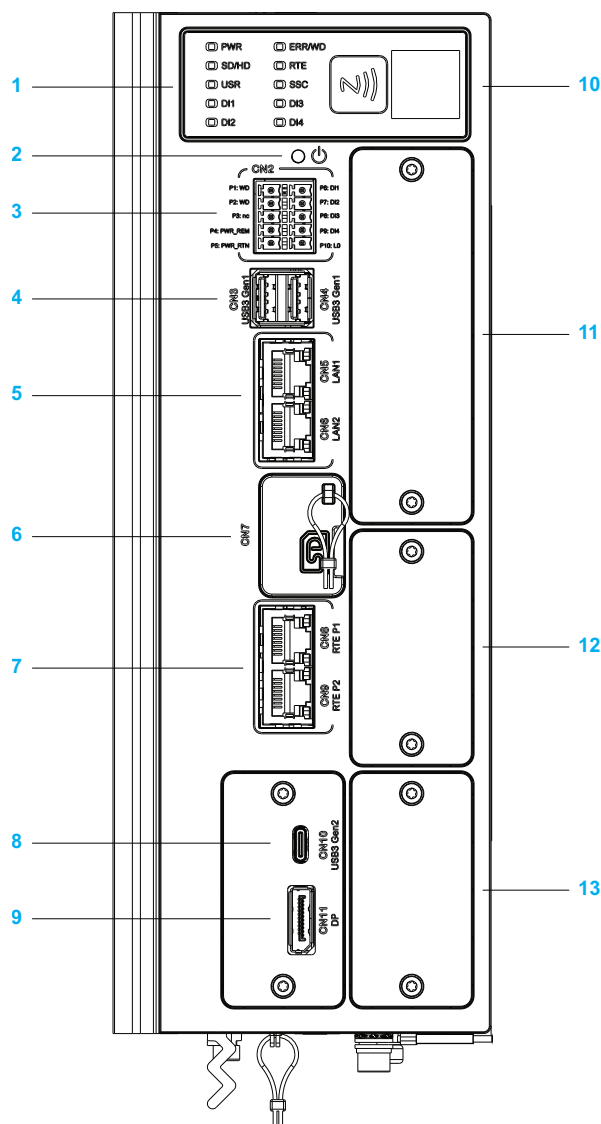
- Up to 130 axes with Sercos
- I/O cycle time as low as 125 μ s
- Intel Raptor Lake-P processors

MN660P controllers also includes the capabilities of an industrial PC. The industrial PC opens up opportunities to implement, for example:

- Data acquisition and processing at the edge instead of at a remote, centralized host
- OS virtualization (Windows)
- Extensive logging, analytics and diagnostics
- Visualization, dashboards

Overview

Front View

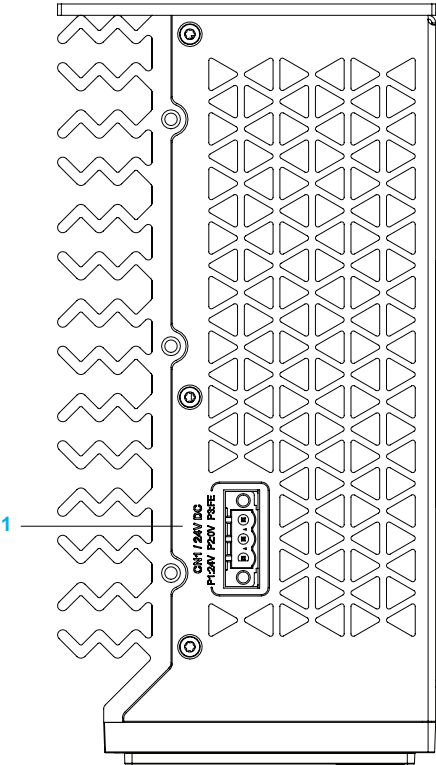


Item number	Item
1	Status LEDs
2	Power button
3	Digital I/Os (CN2): 4 digital inputs (D1 to D4 and L0) - Status output, watchdog (WD, WD) - Input for controlling power on/off/standby (PWR_REM, PWR_RTN)
4	USB3 ports, Gen 1, Type-A (CN3, CN4)
5	Ethernet ports LAN (CN5, CN6)
6	SD card slot (CN7), sealable (sealing wire and seal not included)
7	Real-Time Ethernet ports RTE (CN8, CN9)
8	USB3 port, Gen 2, Type-C (CN10)
9	DisplayPort (CN11)
10	NFC interface
11	Slot for modules

Item number	Item
12	Slot for modules
13	Slot for modules

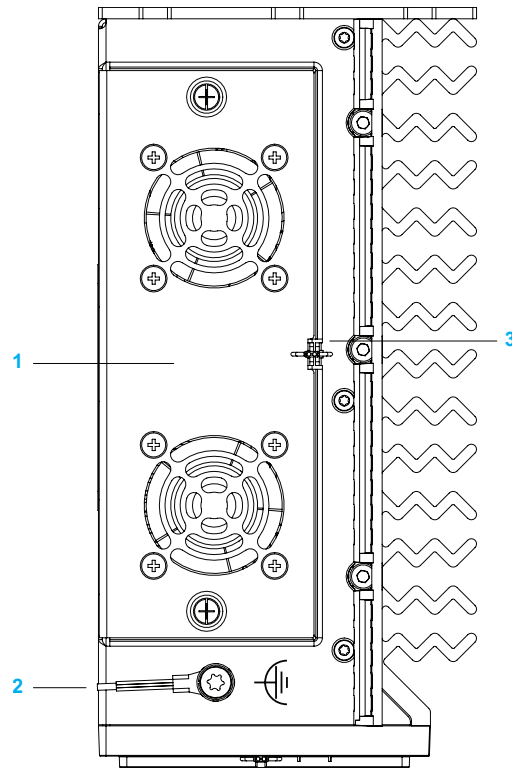
The illustration shows a controller without equipment installed in slots 11, 12 and 13. Your controller may have less or additional interfaces, depending on the controller version. Refer to *Type Code*, page 17 for details on M660 controller versions.

Top View



Item number	Item
1	Power supply connector 24 Vdc (CN1)

Bottom View



Item number	Item
1	Fan kit
2	Grounding screw
3	Sealing lug, sealable (sealing wire and seal not included)

The illustration shows a controller with fan kit. Your controller may not be equipped with a fan kit. Refer to [Type Code](#), page 17 for details on M660 controller versions. Refer to [Accessories](#), page 18 for the fan kit.

Type Code

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Type code (example)	M	N	6	6	0	P	3	5	4	N	2	0	1	3	W	0	-	-

Item	Meaning
1 ... 5	Product family MN660 = Controller
6	Controller type C = Purpose-built motion controller P = Motion controller with industrial PC for Edge computing
7	Processor 1 = Intel U300E Raptor Lake 2 = Intel Core™ i3-1320PRE Raptor Lake 3 = Intel Core™ i5-1350PRE Raptor Lake
8	Function 5 = Motion control
9	Ethernet 3 = 2 LAN ports, 2 RTE ports 4 = 2 LAN ports, 4 RTE ports
10	Integrated safety controller N = No integrated safety controller
11	RAM 1 = 4 GB 2 = 8 GB
12	Extension module for upper slot 0 = No extension module
13	Housing size and number of PCIe slots 1 = Narrow housing, no PCIe slots
14	Solid State Drive (SSD) 0 = No SSD 1 = 1 SSD with 256 GB 3 = 2 SSD with 512 GB each
15	General purpose operating system (GPOS) for industrial PC N = None (MN660C) W = Windows (MN660P)
16	Software package 0 = Preconfigured
17	Reserved -
18	Reserved -

If you have questions concerning the type code, contact your local Schneider Electric service representative.

Accessories and Spare Parts

Mounting and Installation Accessories and Spare Parts

Description	Commercial Reference
Fan kit	MNAH6AFS01
Kit for rear wall mounting, spare part	MNAH6MBS
Kit for side wall mounting, spare part	MNAH6MF
Complete set of spring connectors CN1 and CN2	MNAH6ACS01

Cables and Cable Adapters

Description	Commercial Reference
Sercos cable, 0.5 m (1.64 ft), patch cable, green	VW3E3001R005
Sercos cable, 1.0 m (3.29 ft), patch cable, green	VW3E3001R010
Sercos cable, 1.5 m (4.92 ft), patch cable, green	VW3E3001R015
Sercos cable, 2.0 m (6.56 ft), patch cable, green	VW3E3001R020
Sercos cable, 3.0 m (9.84 ft), patch cable, green	VW3E3001R030
Sercos cable, 5.0 m (16.40 ft), patch cable, green	VW3E3001R050
Sercos cable, 10.0 m (32.80 ft), patch cable, green	VW3E3001R100
Sercos cable, 15.0 m (49.21 ft), patch cable, green	VW3E3001R150
Sercos cable, 20.0 m (65.62 ft), patch cable, green	VW3E3001R200
Sercos cable, 25.0 m (82.02 ft), patch cable, green	VW3E3001R250
Sercos cable, 30.0 m (98.43 ft), patch cable, green	VW3E3001R300
Sercos cable, 40.0 m (131.23 ft), patch cable, green	VW3E3001R400
Sercos cable, 50.0 m (164.04 ft), patch cable, green	VW3E3001R500
DP-DVI cable for connection of Harmony P6 and Harmony FP6 displays	HMIYFPCBDPDV5M
DP-DVI adapter for connection of Harmony P6 and Harmony FP6 displays	HMIYADDPDVI11

Miscellaneous Accessories

Description	Commercial Reference
Buffer battery, 3 V	VW3E6020

Technical Data

General Data

Processors and RAM

M660 controllers are equipped with Intel Raptor Lake processors with a hybrid architecture using performance cores (P-Cores) and efficient cores (E-Cores):

Processor	Cores (P-Cores/E-Cores)	Threads	Cache MB	Base frequency (turbo P-Core/turbo E-Core) GHz	RAM GB
Intel U300E Raptor Lake	5 (1/4)	6	8	1.1 (4.3/3.2)	4 (LPDDR5)
Intel Core™ i3-1320PRE Raptor Lake	8 (4/4)	12	12	1.7 (4.5/3.2)	4 or 8 (LPDDR5)
Intel Core™ i5-1350PRE Raptor Lake	12 (4/8)	16	18	1.8 (4.6/3.4)	8 (LPDDR5)
Intel Core™ i7-1370PRE Raptor Lake	14 (6/8)	20	24	1.9 (4.8/3.7)	8 (LPDDR5)

Item 7 of the type code indicates the type of processor of the controller. Item 11 of the type code indicates the amount of RAM. Refer to [Type Code](#), page 17 for details on M660 controller types and versions.

Solid State Drive (SSD)

MN660P controllers are equipped with Solid State Drives (SSD). The following SSD configurations are available:

- 256 GB (one 256 GB drive)
- 1024 GB (two 512 GB drives)

Item 14 of the type code indicates the equipment of the controller with SSDs. Refer to [Type Code](#), page 17 for details on M660 controller types and versions.

Operating Systems

MN660C controllers:

- VxWorks for motion control part

MN660P controllers:

- VxWorks for motion control part
- Windows for industrial PC part

Fieldbuses, Automation Communication Protocols

- Sercos

Motion Control Performance and Network Characteristics

Characteristic	MN660•1	MN660•2	MN660•3	MN660•4
Maximum number of synchronized axes via Sercos	16	64	130	130
Minimum cycle time for axes	1 ms			
Minimum cycle time for I/Os	125 µs			

Environmental Data

Environmental Conditions for Long-Term Storage (in Transportation Packaging)

The controller complies with class 1K21 as per IEC 60721-3-1 (climatic conditions):

Characteristic	Unit	Value
Ambient temperature (no icing, no condensation)	°C	-40 ... 70
	(°F)	(-40 ... 158)
Rate of change of temperature	°C/min	0.5
	(°F/min)	(0.9)
Relative humidity (non-condensing)	%	5 ... 95

The controller complies with class 2M4 as per IEC 60721-3-2 (mechanical conditions):

Characteristic	Unit	Value
Stationary vibration random, acceleration power spectral density, 2 ... 3 Hz	m ² /s ³	10
Stationary vibration random, acceleration power spectral density, 10 ... 20 Hz	m ² /s ³	1
Stationary vibration random, acceleration power spectral density, 50 ... 2000 Hz	m ² /s ³	0.5
Stationary vibration random, test time	min	30 Each axis (± x / ± y / ± z)
Shock response spectrum, Shock 1 - Curve 4, peak acceleration, 11 ms	m/s ²	100
Shock response spectrum, Shock 2 – Curve 2, peak acceleration, 6 ms	m/s ²	300
Number of shocks	-	100 Each axis (± x / ± y / ± z) and direction
Free fall, weight < 20 kg	m (ft)	0.25 (0.82)
Number of free falls	-	2
Toppling, weight < 20 kg	-	Over all edges
Steady-state acceleration	m/s ²	20
Static load	kPa	5

The controller complies with IEC 61131-2 (mechanical conditions):

Characteristic	Unit	Value
Free fall, weight < 10 kg	m (ft)	1 (3.28)
Number of free falls	-	Once on each face Once on each edge Once on each corner

Environmental Conditions for Transportation

The controller complies with class 2K12 as per IEC 60721-3-2 (climatic conditions):

Characteristic	Unit	Value
Ambient temperature (no icing, no condensation)	°C (°F)	-40 ... 70 (-40 ... 158)
Change of temperature, air/air	°C (°F)	-25 ... 30 (-13 ... 86)
Relative humidity (non-condensing)	%	5 ... 95

The controller complies with class 2M4 as per IEC 60721-3-2 (mechanical conditions):

Characteristic	Unit	Value
Stationary vibration random, acceleration power spectral density, 2 ... 3 Hz	m ² /s ³	10
Stationary vibration random, acceleration power spectral density, 10 ... 20 Hz	m ² /s ³	1
Stationary vibration random, acceleration power spectral density, 50 ... 2000 Hz	m ² /s ³	0.5
Stationary vibration random, test time	min	30 Each axis (± x / ± y / ± z)
Shock response spectrum, Shock 1 - Curve 4, peak acceleration, 11 ms	m/s ²	100
Shock response spectrum, Shock 2 – Curve 2, peak acceleration, 6 ms	m/s ²	300
Number of shocks	-	100 Each axis (± x / ± y / ± z) and direction
Free fall, weight < 20 kg	m (ft)	0.25 (0.82)
Number of free falls	-	2
Toppling, weight < 20 kg	-	Over all edges
Steady-state acceleration	m/s ²	20
Static load	kPa	5

The controller complies with IEC 61131-2 (mechanical conditions):

Characteristic	Unit	Value
Free fall, weight < 10 kg	m (ft)	1 (3.28)
Number of free falls	-	Once on each face Once on each edge Once on each corner

Environmental Conditions for Operation

The controller has the degree of protection IP 20. It may only be operated in a control cabinet/enclosure. Refer to [Control Cabinet/Enclosure](#), page 35 for details.

Characteristic	Unit	Value
Installation altitude above mean sea level	m (ft)	< 2000 (< 6562)

Ambient temperatures:

Controller	Condition	Unit	Value
MN660C153-N1010	With or without fan kit	°C (°F)	0 ... 55 (32 ... 131)
MN660C253-N1010	With fan kit	°C (°F)	0 ... 55 (32 ... 131)
	Without fan kit	°C (°F)	0 ... 45 (32 ... 113)
MN660P253-N1011W0	With fan kit	°C (°F)	0 ... 55 (32 ... 131)
	Without fan kit	°C (°F)	0 ... 45 (32 ... 113)
MN660P354-N2013W0	With fan kit	°C (°F)	0 ... 55 (32 ... 131)
	Without fan kit	°C (°F)	0 ... 45 (32 ... 113)

NOTE: In the case of high, application-driven loads, the fan kit or external air condition equipment may be required.

The following conditions apply with regard to the ambient temperatures:

Characteristic	Unit	Value
Rate of change of temperature	°C/min (°F/min)	0.5 (0.9)
Relative humidity (non-condensing)	%	5 ... 95

The controller complies with class 3M12 as per IEC 60721-3-3 (mechanical conditions):

Characteristic	Unit	Value
Stationary vibration random, acceleration power spectral density, 5 ... 200 Hz	(m/s ²) ² /Hz	0.1
Stationary vibration random, test time	min	30 Each axis (± x / ± y / ± z)
Shock	m/s ²	20
Number of shocks	-	100 Each axis (± x / ± y / ± z)

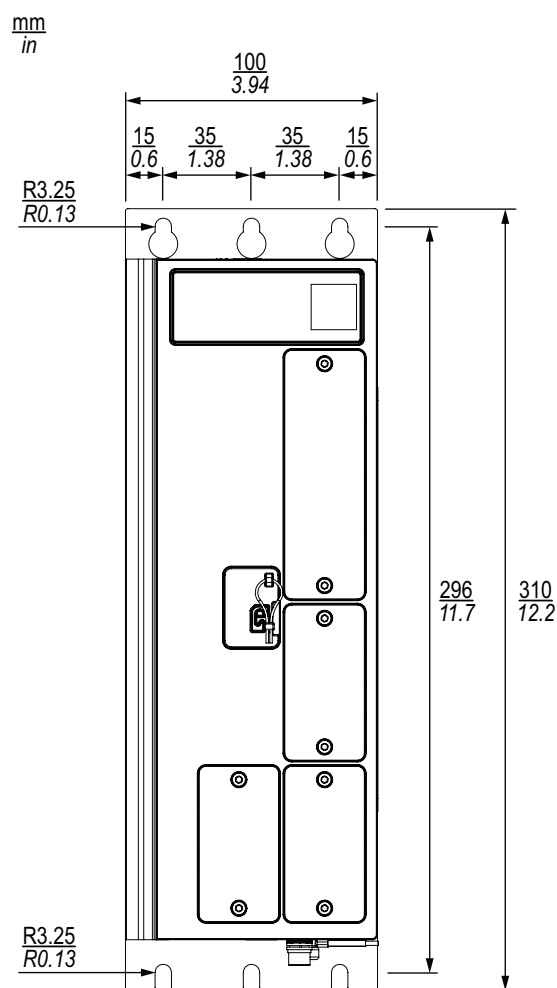
The controller complies with IEC 61131-2 (mechanical conditions):

Characteristic	Unit	Value
Vibration, sinusoidal, displacement amplitude, 5 ... 8.4 Hz	mm	3.5
Vibration, sinusoidal, acceleration amplitude, 8.4 ... 150 Hz	m/s ²	10
Vibration, sinusoidal, duration	Cycles	10 1 cycle = 2 sweeps each axis and direction (± x / ± y / ± z)
Shock, peak acceleration	m/s ²	150
Shock, duration of nominal pulse	ms	11
Shock, number of shocks	-	3 Each axis (± x / ± y / ± z)

Mechanical Data

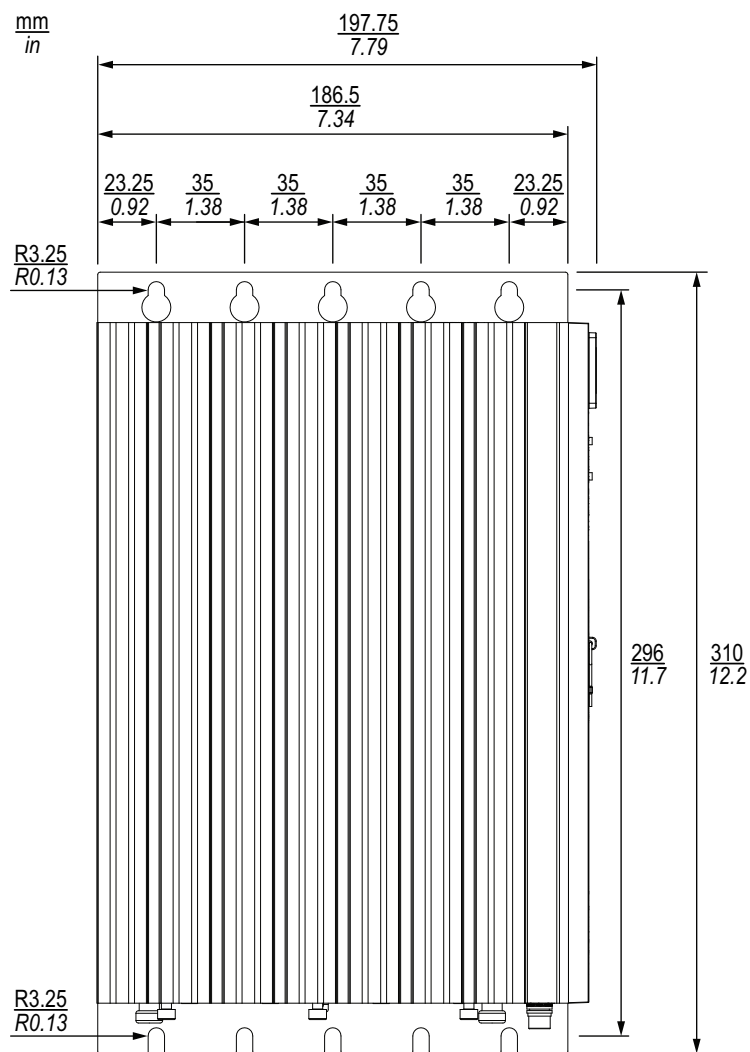
Dimensions MN660.....1

Front view with mounting plate shown for rear wall mounting:



The thickness of the mounting plate is 4 mm (0.16 in).

Side view with mounting plate shown for side wall mounting:



The thickness of the mounting plate is 4 mm (0.16 in).

Weight

Characteristic	Unit	Value
Maximum weight MN660C without fan kit and without mounting plate (actual weight depends on controller version)	kg (lb)	4.65 (10.25)
Maximum weight MN660P without fan kit and without mounting plate (actual weight depends on controller version)	kg (lb)	6.0 (13.23)

Electromagnetic Compatibility

Immunity

The controller meets the requirements of IEC 61000-4-2 (electrostatic discharge immunity), performance criterion B, for equipment operated in zone B as specified by IEC 61131-2.

The controller meets the requirements of IEC 61000-4-3 (radiated, radio-frequency, electromagnetic field immunity), performance criterion A, for equipment operated in zone B as specified by IEC 61131-2.

The controller meets the requirements of IEC 61000-4-4 (electrical fast transient/burst immunity), performance criterion B, for equipment operated in zone B as specified by IEC 61131-2.

The controller meets the requirements of IEC 61000-4-5 (surge immunity), performance criterion B, for equipment operated in zone B as specified by IEC 61131-2.

The controller meets the requirements of IEC 61000-4-6 (immunity to conducted disturbances, induced by radio-frequency fields), performance criterion A, for equipment operated in zone B as specified by IEC 61131-2.

Emissions

The controller meets the requirements regarding radiated emission in industrial environments as per IEC 61000-6-4.

The controller meets the requirements regarding conducted emission in industrial environments as per IEC 61000-6-4.

Power Supply

The controller is supplied by an external 24 V PELV power supply unit.

Characteristic	Value
Input voltage	24 V (-15 % ... +25 %)
Input current	<8 A (during operation) <15 mA (no operation)
Maximum AC ripple	+/- 5 %
Maximum inrush current	<15 A for a maximum of 1/240 s
Immunity to input voltage interruption	10 ms (for severity level PS2 as per IEC 61131-2)
Isolation between DC power supply and internal logic	750 Vdc
Isolation between DC power supply and ground	750 Vdc
Overcurrent protection	Yes
Reverse polarity protection	Yes
Surge protection	Yes
Immunity to voltage dips	Yes (slow and fast variation)
Undervoltage detection	Yes (voltage threshold for undervoltage detection is less than or equal to 19 V)
Input monitoring	Yes (voltage and current)
Maximum cable length	30 m (98,43 ft)

Refer to [Electrical Installation - Power Supply](#), page 44 for details on installing the power supply.

Digital Inputs

Characteristic	Value
Number of inputs	4
Type of input as per IEC 61131-2	Type 1
Isolated	Yes (up to 550 V _{rms})
Filter	15 µs
Logic type	Sink
Overvoltage protection	Yes (surge protection up to 40 V)
Input voltage	24 Vdc (-15% ... +25%)
Input current	~2.5 mA at 24 Vdc nominal
U _{IN} low voltage	Typically <12.5 V
U _{IN} high voltage	Typically >13.5 V
Protection against reverse polarity	Yes
Maximum cable length	30 m (98.43)

Refer to Electrical Installation - Wiring the Digital Inputs, page 47 for details on wiring.

Input for Controlling Power On/Power Off/Standby

Characteristic	Value
Number of inputs	1
Type of input as per IEC 61131-2	Type 1
Isolated	Yes (up to 550 V _{rms})
Filter	15 µs
Logic type	Sink
Overvoltage protection	Yes (surge protection up to 40 V)
Input voltage	24 Vdc (-15% ... +25%)
Input current	~2.5 mA at 24 Vdc nominal
U _{IN} low voltage	Typically <12.5 V
U _{IN} high voltage	Typically >13.5 V
Protection against reverse polarity	Yes
Maximum cable length	30 m (98.43)
Designation on housing	CN2: P4 PWR_REM, P5 PWR_RTN

Status Output (Watchdog)

Characteristic	Value
Number of outputs	1
Type of output	Relay contact
Isolated	Yes (up to 550 V _{rms})
Switching voltage	24 V
Switching current	2 A maximum
Protection	Internal, resettable multifuse Switching inductive loads requires external protection circuits. Refer to Electrical Installation - Wiring the Status Output (Watchdog), page 49 for details on switching inductive loads.
Maximum cable length	30 m (98.43)
Designation on housing	CN2: P1 WD, P2 WD
Hardware indication of state of output	Via LED ERR/WD

Refer to Electrical Installation - Wiring the Status Output (Watchdog), page 49 for details on wiring.

Ethernet Ports

Ethernet Ports (LAN)

Characteristic	Value
Number of ports	2 (single port, 2 distinct Ethernet endpoints)
Connector type	RJ45
Maximum cable length	100 m (328.1 ft)
Transmission speed	10BASE-Te 100BASE-TX 1000BASE-T 2.5GBASE-T
Status LED	1 x link/activity 1 x transmission speed
Features	Autonegotiation Auto-MDI/MDIX
Designation on housing	CN5 (LAN1), CN6 (LAN2)

All M660 controllers are equipped with these two Ethernet ports LAN1 and LAN2.

Ethernet Ports for Real-Time Ethernet Communication (RTE)

Characteristic	Value
Number of ports	2 or 4, depending on the controller version (dual port, switched, each pair of RTE P1 and RTE P2 is one Ethernet endpoint)
Function	Sercos
Connector type	RJ45
Maximum cable length	100 m (328.1 ft)
Transmission speed	10BASE-Te 100BASE-TX 1000BASE-T
Status LED	1 x link/activity Additional status LED RTE on LED panel (for CN8/CN9) or next to ports (for CN20/CN21)
Features	Sercos Autonegotiation Auto-MDI/MDIX
Designation on housing	• CN8 (RTE P1) • CN9 (RTE P2) • CN20 (RTE P1) • CN21 (RTE P2)

RTE ports are only available for MN660P controllers. The number of ports is determined by item 9 of the type code. Refer to [Type Code](#), page 17 for details on M660 controller versions.

USB Ports

Characteristic	Value
Types	• USB 3.2 Gen 1 Type-A • USB 3.2 Gen 2 Type-C • USB 2.0 Type-A (internal port, for security keys such as CodeMeter from Wibu with MN660P controllers; internal, reserved in the case of MN660C controllers)
Maximum cable length	1 m (3,28 ft) 3 m (9,84 ft) for USB 3.2 Gen 2 Type-C port in DisplayPort alternate mode
Number of ports	MN660C: • 2 x USB 3.2 Gen 1 Type-A • 1 x USB 2.0 Type-A (internal, reserved: no function) MN660P: • 2 x USB 3.2 Gen 1 Type-A • 1 x USB 3.2 Gen 2 Type-C • 1 x USB 2.0 Type-A (internal)
Designation on housing	• CN3 (USB3 Gen1) • CN4 (USB3 Gen1) • CN10 (USB3 Gen2)
DisplayPort alternate mode	Yes, on CN10
Power	USB 3.2 Gen 2 Type-A: 5 Vdc, 1000 mA USB 3.2 Gen 2 Type-C: 5 Vdc, 12 Vdc, 2500 mA USB 2.0 Type-A: 5 Vdc, 500 mA

DisplayPort

Controllers of type MN660P provide a DisplayPort™. Refer to Type Code, page 17 for details on M660 controller types.

Characteristic	Value
Connector type	1 x full size DisplayPort™ connector
Designation on housing	CN11 (DP)
Maximum cable length	3 m (9.84 ft)
Specifications	DisplayPort™ V1.4 Embedded DisplayPort™ V1.4b
Resolutions	1 display 5K at 120 Hz HDR or 8K at 60 Hz HDR 2 displays 8K at 60 Hz SDR or 5K at 60 Hz HDR 3 displays 4K at 60 Hz HDR 4 displays 4K at 60 Hz HDR

NOTE: The USB 3.2 Type-C port (CN10) provides DisplayPort™ Alternate Mode.

SD Card Slot

Characteristic	Value
Number of SD card slots	1
Size of SD card	Standard SD card (32.0 × 24.0 × 2.1 mm (1.27 × 0.95 × 0.08 in))
Supported SD cards	SDHC (SD2.0) up to 32 GB
Transfer rate	Up to 50 MByte/s
File system	FAT32
Write protection support	Yes

Installation

Mechanical Installation

Prerequisites and Requirements

Inspecting the Product

Verify the product version by means of the nameplate and the type code, page 17.

Inspect the product for visible damage.

Damaged products may cause electric shock or unintended equipment operation.

 DANGER
ELECTRIC SHOCK OR UNINTENDED EQUIPMENT OPERATION • Do not use damaged products. • Keep foreign objects (such as chips, screws or wire clippings) from getting into the product. Failure to follow these instructions will result in death or serious injury.

Contact your local Schneider Electric service representative if you detect any damage whatsoever to the products.

Control Cabinet/Enclosure

 WARNING
UNINTENDED EQUIPMENT OPERATION • Install and operate the controller in a control cabinet or enclosure that is secured by a keyed or tooled locking mechanism. • Verify that the control cabinet or enclosure meets all requirements necessary to operate the controller in the environment and under the conditions specified in the present document. Failure to follow these instructions can result in death, serious injury, or equipment damage.

Install the controller in a metal control cabinet or enclosure that is secured by a keyed or tooled locking mechanism.

The pollution degree of the controller is 2 and the degree of protection is IP 20. The control cabinet or enclosure must be designed in such a way as to meet the corresponding requirements.

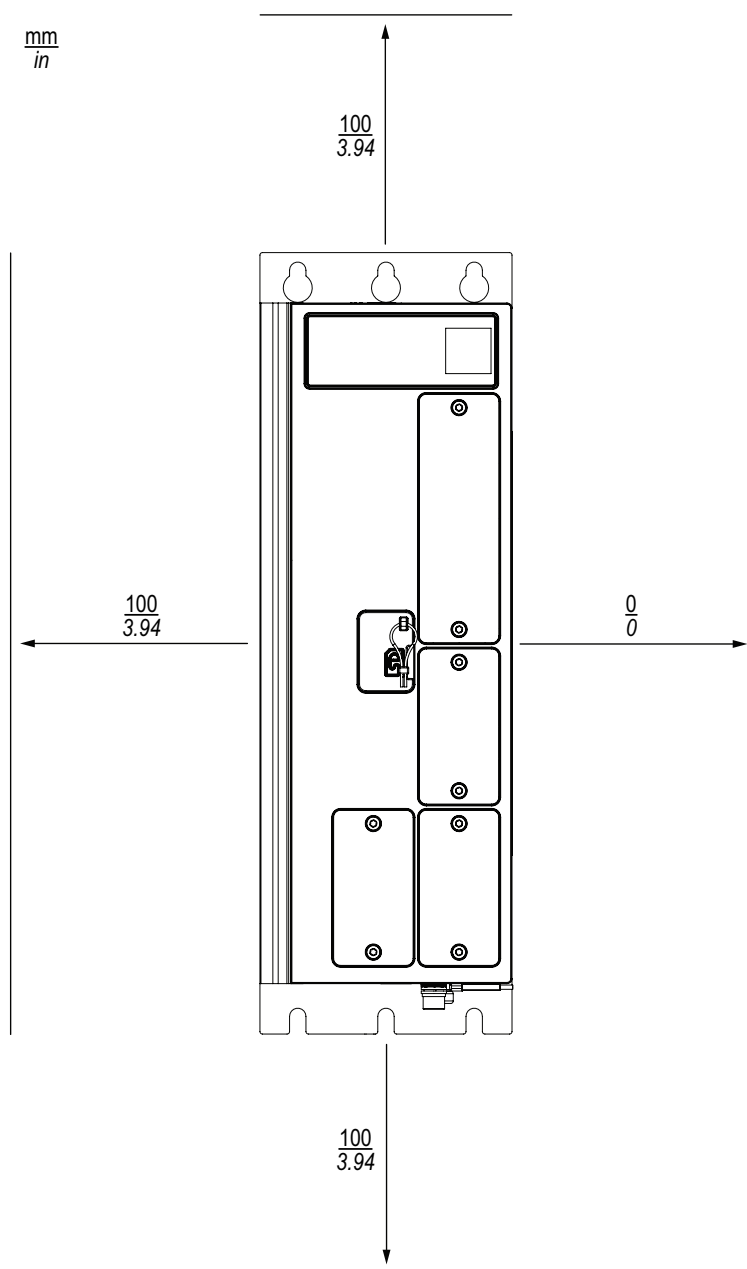
The mounting surface in the control cabinet or enclosure must be plane (planarity tolerance: 0.5 mm (0.019 in)) and sufficiently rigid to support the controller under all operating conditions.

The ventilation or air conditioning of the control cabinet or enclosure must be sufficient so that the specified ambient conditions for the controller and the other equipment operated in the control cabinet or enclosure are complied with under all operating conditions. If additional cooling is required, use the optional fan kit (refer to Accessories, page 18).

The efficiency of convection cooling is slightly better if the controller is mounted via its rear wall as compared to its side wall. Refer to Mounting Types, page 38 for details.

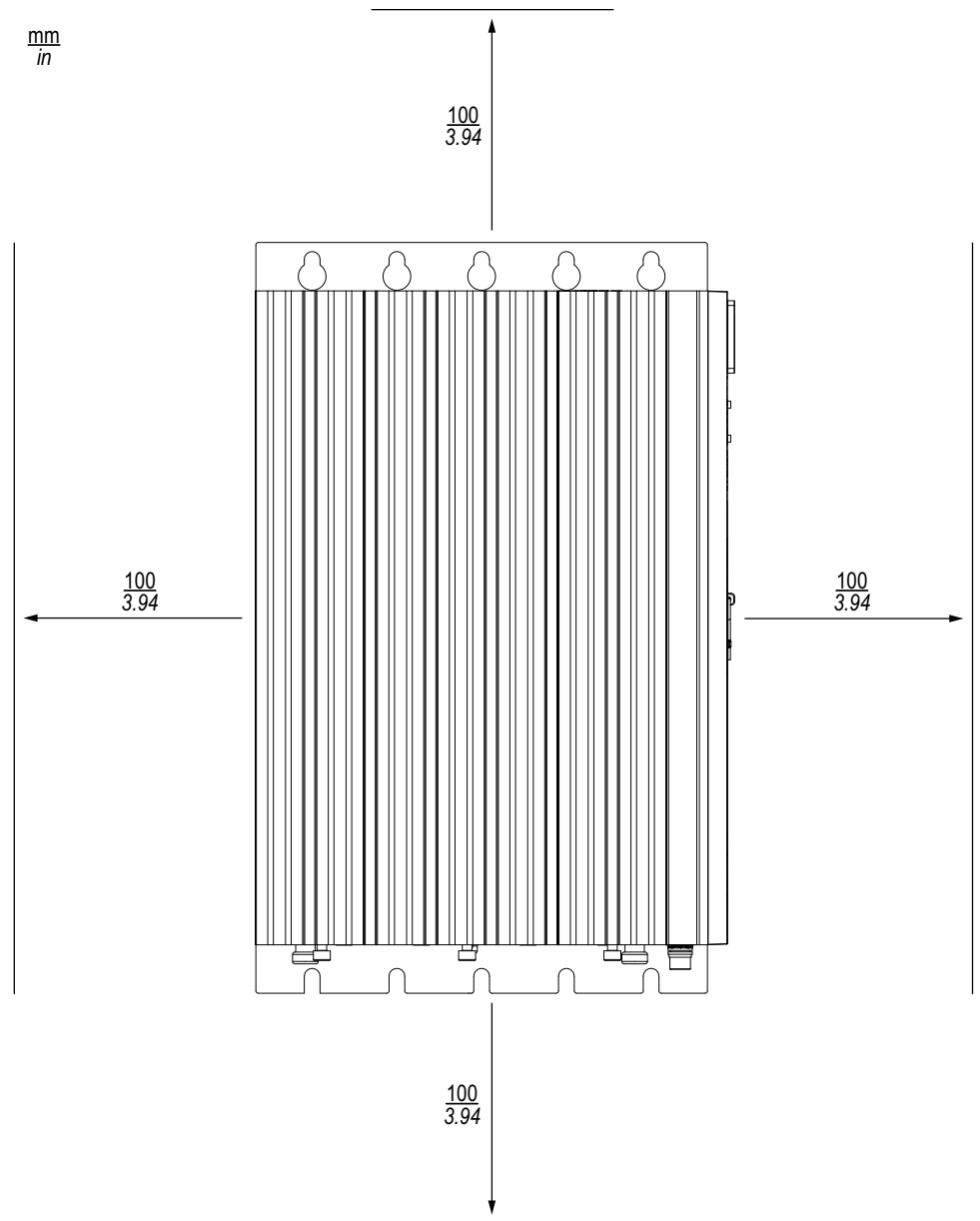
Clearances

The following minimum clearances between the controller and adjacent structures or other equipment are required for rear wall mounting:



A distance of at least 100 mm (3.94 in) is required between the controller and the door of the control cabinet or enclosure in the case of rear wall mounting.

The following minimum clearances between the controller and adjacent structures or other equipment are required for side wall mounting:

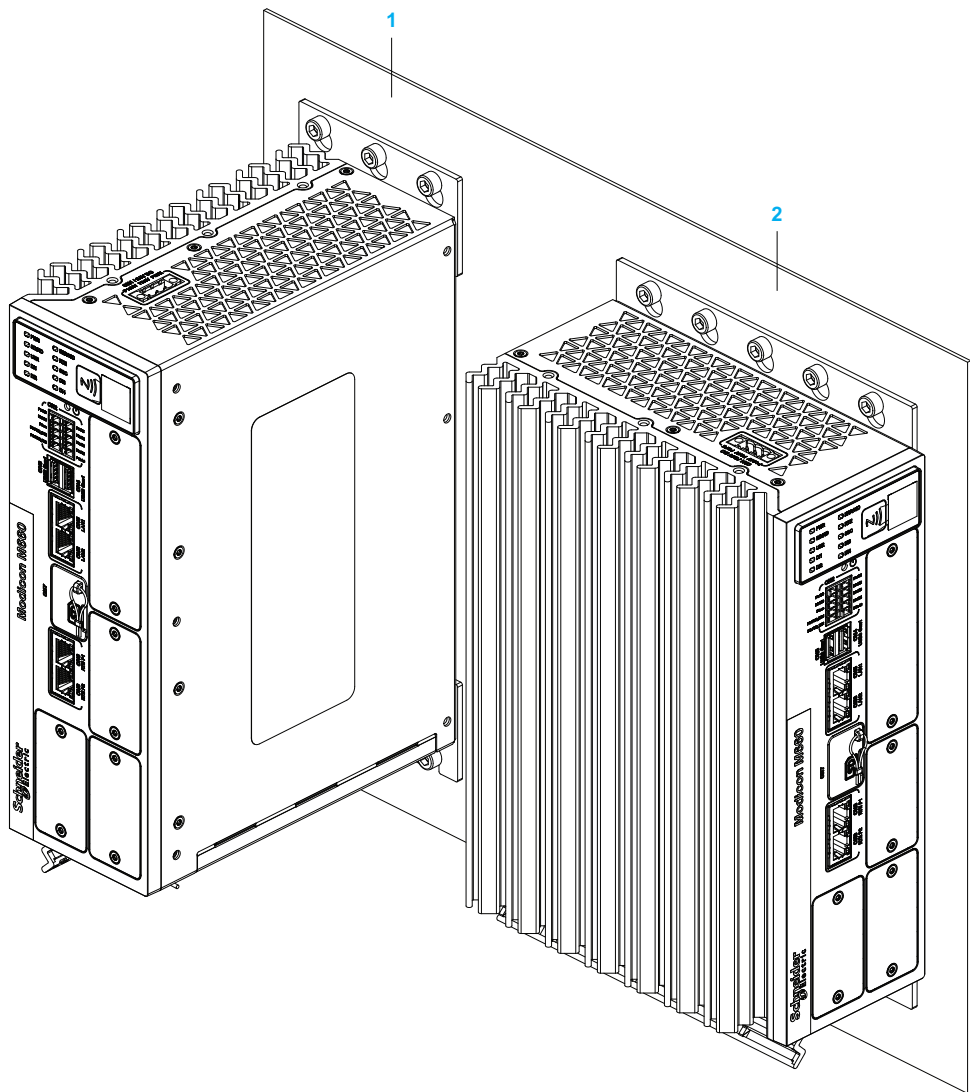


A distance of at least 100 mm (3.94 in) is required between the controller and the door of the control cabinet or enclosure.

Mounting

Mounting Types

The controller must be mounted vertically (power supply connector CN1 at the top), regardless of the type of mounting. The controller can be mounted to the mounting surface with its rear wall or its side wall:



Item	Type of mounting
1	Rear wall mounting
2	Side wall mounting

NOTE: The efficiency of convection cooling is slightly better if the controller is mounted via its rear wall as compared to its side wall.

The controller is shipped with two mounting plates for rear wall mounting. An optional mounting kit allows for side wall mounting (refer to [Accessories](#), page 18).

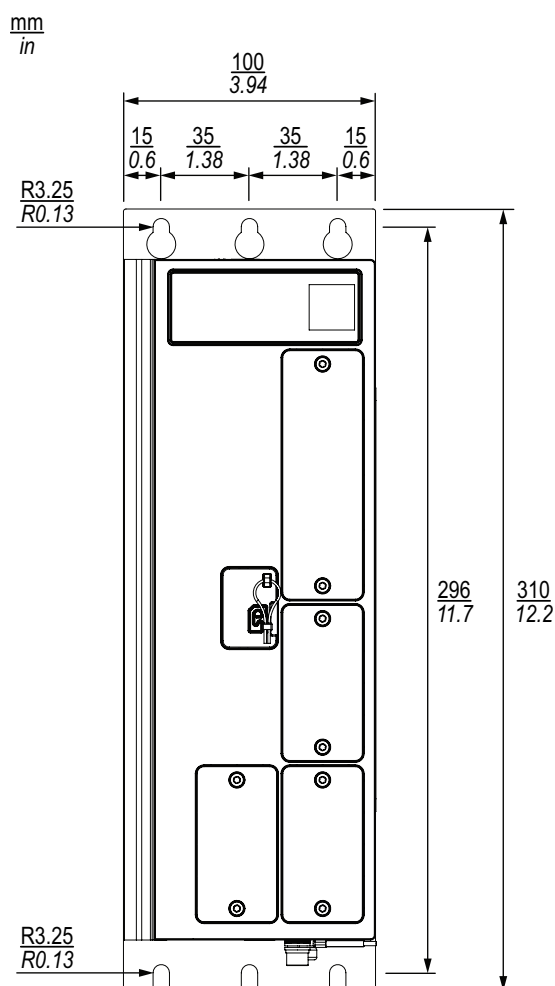
Preparing the Controller for Mounting

Procedure:

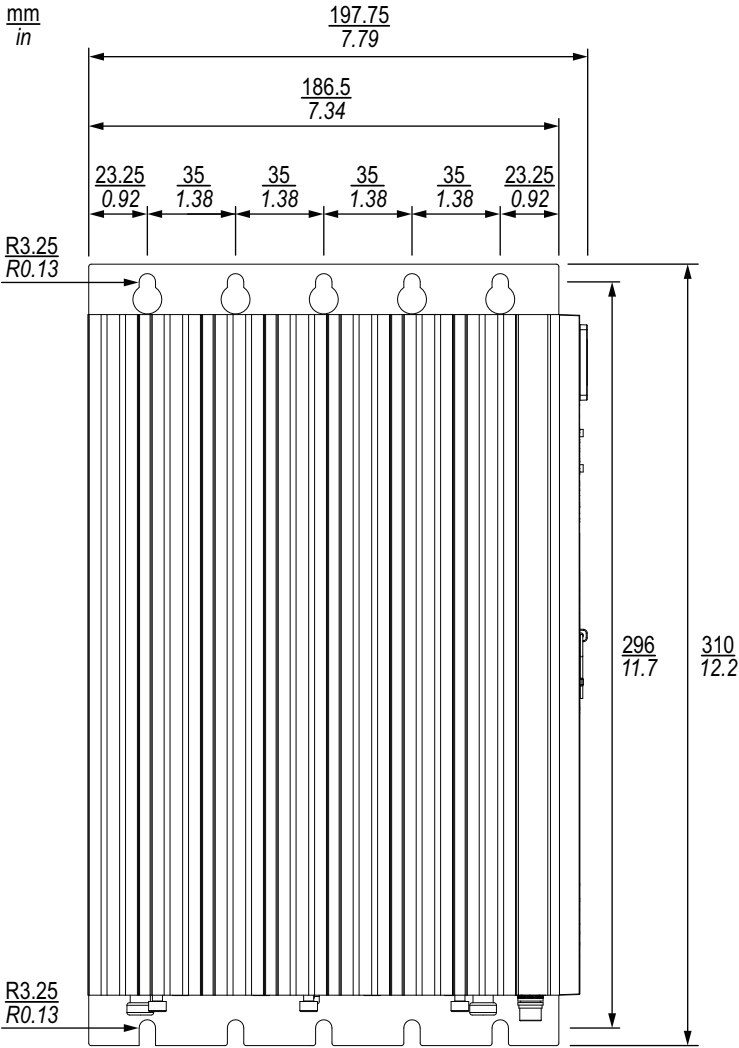
Step	Action
1	Rear wall mounting: - Fit the mounting plate with the holes to the top rear wall of the controller, and align the holes in the mounting plate with the threads in the controller. - Fit the mounting plate with the slots to the bottom rear wall of the controller, and align the holes in the mounting plate with the threads in the controller. Side wall mounting: - Fit the mounting plate to the side wall of the controller with the slots pointing down, and align the holes in the mounting plate with the threads in the controller.
2	Screw the mounting plate(s) to the controller using the M4 (TX20) screws supplied with the controller or with the side wall mounting plate with a tightening torque of 2.2 Nm (19.47 lb.in).
3	Verify that you have used screws for all holes in the mounting plate(s).

Mounting the Controller

The following illustration shows the grid for the drill holes in the mounting surface for rear wall mounting:



The following illustration shows the grid for the drill holes in the mounting surface for side wall mounting:



Procedure:

Step	Action
1	Drill holes with a diameter of 6.3 mm into the mounting surface at all positions indicated by the grid illustrations.
2	Screw the controller to the mounting surface using M6 (TX30) screws and M6 nuts. Secure the nuts with washers (ISO 7093). Use a tightening torque of 5 Nm (44.25 lb.in). The screw length depends on the thickness of the mounting surface.
3	Verify that you have used screws, nuts and washers for all holes.
4	Verify that you have not used washers between the mounting plate of the controller and the mounting surface.
5	If you have used a separate mounting surface, mount the assembly to the rear wall of your control cabinet or enclosure.
6	Verify the mechanical strength and rigidity of the entire assembly.

Electrical Installation

Electromagnetic Compatibility

⚠ WARNING

INSUFFICIENT ELECTROMAGNETIC COMPATIBILITY

- Verify compliance with all EMC regulations and requirements applicable in the country in which the controller and all connected equipment is to be operated, and with all EMC regulations and requirements applicable at the installation site.
- Implement all required interference suppression measures and verify their effectiveness.

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

The controller is intended for operation in an industrial environment as specified by IEC 61000-6-2 and IEC 61000-6-4, and in zone B as specified by IEC 61131-2. Operating the controller in non-industrial environments such as residential, commercial and light-industrial environments as specified in IEC 61000-6-3 can result in radio interference.

⚠ WARNING

RADIO INTERFERENCE

- Only install and operate the controller in an industrial environment as specified by IEC 61000-6-2 and IEC 61000-6-4, and in zone B as specified by IEC 61131-2.
- Do not install and operate the controller in public low-voltage mains power networks.

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

The specified compliance values for electromagnetic compatibility (refer to [Technical Data - Electromagnetic Compatibility, page 27](#)) are only reached in an environment that meets the corresponding requirements. The following best practices are intended to support you in reducing potential electromagnetic interference in your machine/process. These measures are not exhaustive. Your specific scenario and equipment may require adapted or additional measures.

- Install and operate the controller in a metal control cabinet or enclosure.
- Do not install equipment with high conducted and/or radiated emissions in the same control cabinet or enclosure as the controller.
- Do not install equipment with a susceptibility to conducted and/or radiated emissions that is lower than that of the controller in the same control cabinet or enclosure.
- Ground the control cabinet and its components such as doors, plates, rails, etc.
- Ground the other equipment in the control cabinet as specified
- Route power cables and communication cables in separate ducts.
- Use shielded cables where specified.
- Ground the shield of communication cables and signal cables where specified.
- Keep cables as short as possible. Do not install unnecessary cable loops.
- If equipotential bonding is required, use conductors with stranded wires.

NOTE: Refer to IEC 61131-4 for a list of installation rules that may be able to optimize EMC-related aspects in your machine/process.

Grounding

Insufficient or improper grounding can cause Electromagnetic Interference (EMI). EMI can lead to communication interruptions and have other adverse effects on the operation of your machine/process.

⚠ WARNING

INSUFFICIENT OR IMPROPER GROUNDING

- Verify that you have properly connected the grounding screw of the controller to an independent grounding point in your system.
- Verify that you have properly connected pin FE of connector CN1 of the controller to an independent grounding point in your system.
- Do not connect grounding wires or grounding cables from the controller to grounding connections of other equipment in your system.
- Verify that there are no ground loops in your system.
- Verify compliance of the grounding of your system with all pertinent codes, standards and regulations applicable at the site of installation of your system.

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

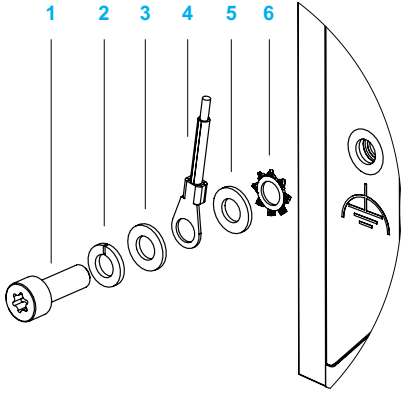
Multipoint grounding is permissible if connections are made to an equipotential ground plane.

Grounding Requirements

Characteristic	Value
Connections to be grounded	• Grounding screw (designation: ground symbol) via separate grounding cable • Pin P3:FE of CN1
Conductor material grounding cable	Copper, 75 °C (167 °F)
Minimum cross section of grounding conductor	2.5 mm ² (AWG 14)
Maximum grounding resistance	5 Ω

Grounding Procedure

Step	Action
1	Connect the other end of the conductor connected to pin P3:FE of CN1 to a separate grounding point in the control cabinet or enclosure.
2	Crimp an M5 cable lug to the controller end of the grounding cable. Use a cable lug of the appropriate size at the other end of the grounding cable.
3	Remove the grounding screw and the washers from the controller.

Step	Action
4	Connect the M5 cable lug to the controller using the grounding screw and the washers (tightening torque 2.5 Nm (8.85 lb-in) as shown below:  1. Grounding screw M5 2. Spring washer 3. Washer 4. Cable lug M5 5. Washer 6. Serrated lock washer
5	Connect the other end of the grounding cable to a separate grounding point in the control cabinet or enclosure.

Wiring the Power Supply

Overview

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 equipment.
- 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

POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the controller directly to mains voltage.
- Use only isolated PELV power supply units and circuits to supply power to the controller¹.
- Verify that the wire cross sections and the length of the power supply cable are suitable for the currents specified in the present document and on the nameplate of your controller.

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

¹ For compliance with UL requirements, the power supply unit must also conform to the criteria of NEC Class 2, and be inherently current-limited to a maximum power output availability of less than 100 VA (approximately 4 A at nominal voltage), or not inherently limited but with an additional protection device such as a circuit breaker or fuse meeting the requirements of clause 9.4 Limited-energy circuit of UL 61010-1. In all cases, the current limit must not exceed that of the electric characteristics and wiring diagrams for the equipment described in the present document. In all cases, the power supply unit must be grounded, and you must separate Class 2 circuits from other circuits. If the indicated rating of the electrical characteristics or wiring diagrams are greater than the specified current limit, multiple Class 2 power supply units may be used.

Insufficient or improper grounding can cause Electromagnetic Interference (EMI). EMI can lead to communication interruptions and have other adverse effects on the operation of your machine/process.

⚠ WARNING

INSUFFICIENT OR IMPROPER GROUNDING

- Verify that you have properly connected the grounding screw of the controller to an independent grounding point in your system.
- Verify that you have properly connected pin FE of connector CN1 of the controller to an independent grounding point in your system.
- Do not connect grounding wires or grounding cables from the controller to grounding connections of other equipment in your system.
- Verify that there are no ground loops in your system.
- Verify compliance of the grounding of your system with all pertinent codes, standards and regulations applicable at the site of installation of your system.

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

Multipoint grounding is permissible if connections are made to an equipotential ground plane.

The controller is supplied by an external 24 V power supply unit. The power supply unit must meet the following requirements:

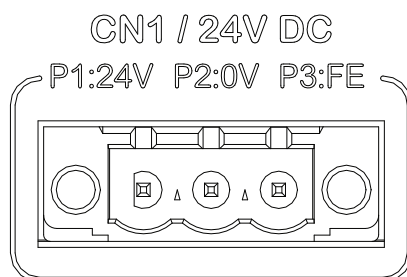
- Protective Extra Low Voltage (PELV) power supply unit
- Isolated power supply unit
- Regulated power supply unit if the AC input current is not constant
- No switching elements between the secondary side of the power supply unit and the controller

The power supply input of the controller is equipped with a non-replaceable internal 10 A fuse. If you want to install an additional fuse in the power supply, refer to the nameplate of the controller for the input current of your controller to rate your fuse according to your requirements.

Wiring Requirements, Wire Cross Sections, Stripping Length

Characteristic	Value
Shielded cable	No
Twisted pair cable	No
Conductor material	Copper, rated for temperatures of 105 °C (221 ° F) or higher
Maximum cable length	30 m (98,43 ft)
Stripping length	10 mm (0.35 in)
Wire cross section, single wire (solid or stranded) without wire ferrule	1.3 ... 2.5 mm ² (AWG 16 ... 14)
Wire cross section, single wire (stranded) with insulated or uninsulated wire ferrule	1.3 ... 2.5 mm ² (AWG 16 ... 14)
Wire cross section, two wires (stranded) with insulated twin wire ferrule	2 x 1.3 ... 1.5 mm ² (AWG 2 x 16)

Wiring the Power Supply Connector CN1



Pins of connector CN1:

Designation	Function
P1:24V	24 Vdc in
P2:0V	0 Vdc in
P3:FE	Functional ground

You can remove the terminal block from the controller to connect the power supply cable. To do so, remove the two screws using a screwdriver with a blade width of 3.5 mm (0.14 in) and remove the terminal block. After connecting the wires of the power supply cable to the terminal block, push the terminal block back into the controller and tighten the two screws with a tightening torque of 0.3 Nm (2.66 lb-in).

NOTE: Verify that the power supply cable is not connected to the power supply unit when you connect the other end of the power supply cable to connector CN1 of the controller.

Refer to Power supply - Technical Data, page 28 for additional information.

Wiring the Digital Inputs

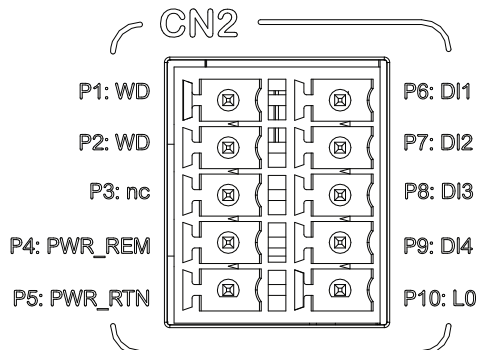
⚠ WARNING

INSUFFICIENT AND/OR INEFFECTIVE SAFETY-RELATED FUNCTIONS

- In your risk assessment, verify that the controller meets all requirements regarding the safety-related requirements and capabilities applicable to your machine/process.
- Verify that your risk assessment takes into account all potential consequences that can arise from the controller becoming inoperative.
- Do not use the inputs or the output of the controller to implement functions related to functional safety (for example, as per ISO 13849), or as a safety function (for example, as per IEC 61800-5-2).
- Use only equipment expressly intended and certified for safety-related purposes to implement safety-related functions.
- During the design as well as during commissioning or recommissioning of the machine/process, verify the correct operation and effectiveness of all safety-related functions and non-safety-related functions by performing comprehensive tests for all operating states, for the defined safe state of your machine/process, and for all potential error situations.
- Verify that your overall machine/process in which the controller is used is properly certified and/or approved according to all standards, regulations, and directives applicable at the installation site of the machine/process.

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

Connector Overview CN2



Pin Designation	Signal/Function
P1 WD	Status output (watchdog)
P2 WD	Status output (watchdog)
P3 nc	Do not connect
P4 PWR_REM	Input for controlling power on/off/standby, 24 V
P5 PWR_RTN	Input for controlling power on/off/standby, 0 V
P6 DI1	Digital input 1
P7 DI2	Digital input 2
P8 DI3	Digital input 3
P9 DI4	Digital input 4
P10 L0	Common for digital inputs

Wiring Requirements, Wire Cross Sections, Stripping Length

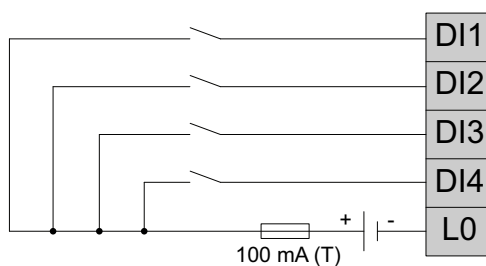
Characteristic	Value
Shielded cable	No
Twisted pair cable	No
Conductor material	Copper, 75 °C (167 °F)
Maximum cable length	30 m (98.43 ft)
Stripping length	9 mm (0.35 in)
Wire cross section, single wire (solid or stranded) without wire ferrule	0.5 ... 1.5 mm ² (AWG 20 ... 16)
Wire cross section, single wire (stranded) with uninsulated wire ferrule	0.5... 1.5 mm ² (AWG 20 ... 16)
Wire cross section, single wire (stranded) with insulated wire ferrule	0.5 ... 0.75 mm ² (AWG 20 ... 18)

Wiring the Digital Inputs DI1 ... DI4

Connect the following pins of CN2:

- P6 DI1
- P7 DI2
- P8 DI3
- P9 DI4
- P10 L0

Ensure proper fusing with a 100 mA type T fuse according to the following wiring diagram:



After you have completely wired connector CN2, properly secure the wires in the control cabinet.

Wiring the Status Output (Watchdog)

⚠ WARNING

INSUFFICIENT AND/OR INEFFECTIVE SAFETY-RELATED FUNCTIONS

- In your risk assessment, verify that the controller meets all requirements regarding the safety-related requirements and capabilities applicable to your machine/process.
- Verify that your risk assessment takes into account all potential consequences that can arise from the controller becoming inoperative.
- Do not use the inputs or the output of the controller to implement functions related to functional safety (for example, as per ISO 13849), or as a safety function (for example, as per IEC 61800-5-2).
- Use only equipment expressly intended and certified for safety-related purposes to implement safety-related functions.
- During the design as well as during commissioning or recommissioning of the machine/process, verify the correct operation and effectiveness of all safety-related functions and non-safety-related functions by performing comprehensive tests for all operating states, for the defined safe state of your machine/process, and for all potential error situations.
- Verify that your overall machine/process in which the controller is used is properly certified and/or approved according to all standards, regulations, and directives applicable at the installation site of the machine/process.

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

Inductive Loads

Inductive loads can cause contact welding of relay contacts.

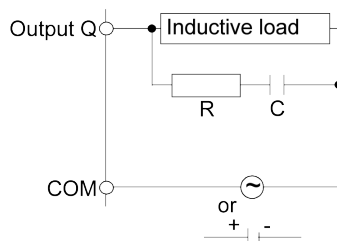
⚠ WARNING

CONTACT WELDING OF RELAY CONTACTS

- Protect the relay output from damage caused by inductive loads using an appropriate external protective circuit or device such as a peak limiter, RC circuit or flyback diode.
- Do not connect the relay output to capacitive loads.

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

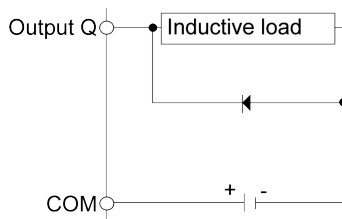
RC element: This circuit can be used for both AC and DC load power circuits.



C Value from 0.1 to 1 μF

R Resistor of approximately the same resistance value as the load

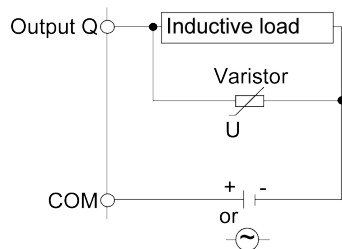
Diode: This circuit can be used for DC load power circuits.



Use a diode with the following ratings:

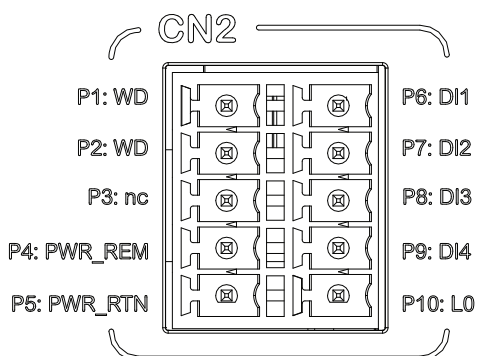
- Reverse withstand voltage: power voltage of the load circuit x 10.
- Forward current: more than the load current.

Varistor: This circuit can be used for both AC and DC load power circuits.



In applications where the inductive load is switched on and off frequently and/or rapidly, ensure that the continuous energy rating (J) of the varistor exceeds the peak load energy by 20 % or more.

Connector Overview CN2



Pin Designation	Signal/Function
P1 WD	Status output (watchdog)
P2 WD	Status output (watchdog)
P3 nc	Do not connect
P4 PWR_REM	Input for controlling power on/off/standby, 24 V
P5 PWR_RTN	Input for controlling power on/off/standby, 0 V
P6 DI1	Digital input 1
P7 DI2	Digital input 2
P8 DI3	Digital input 3
P9 DI4	Digital input 4
P10 L0	Common for digital inputs

Cable Requirements, Wire Cross Sections, Stripping Length

Characteristic	Value
Shielded cable	No
Twisted pair cable	No
Conductor material	Copper, 75 °C (167 °F)
Maximum cable length	30 m (98.43 ft)
Stripping length	9 mm (0.35 in)
Wire cross section, single wire (solid or stranded) without wire ferrule	1.0 ... 1.5 mm ² (AWG 17 ... 16)
Wire cross section, single wire (stranded) with uninsulated wire ferrule	1.0 ... 1.5 mm ² (AWG 17 ... 16)

Wiring the Status Output (Watchdog)

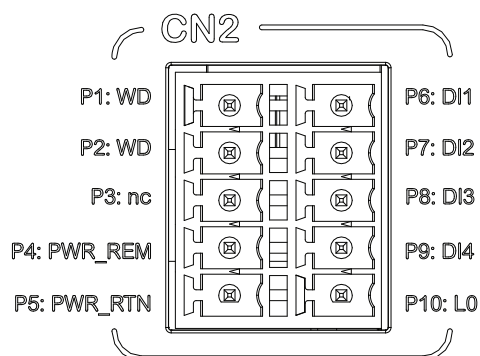
Connect the following pins at CN2 to an appropriate output device:

- P1 WD
- P2 WD

After you have completely wired connector CN2, bundle the cables connected to CN2 and secure them properly in the control cabinet.

Wiring the Input for Controlling Power On/Power Off/Standby

Connector Overview CN2



Pin Designation	Signal/Function
P1 WD	Status output (watchdog)
P2 WD	Status output (watchdog)
P3 nc	Do not connect
P4 PWR_REM	Input for controlling power on/off/standby, 24 V
P5 PWR_RTN	Input for controlling power on/off/standby, 0 V
P6 DI1	Digital input 1
P7 DI2	Digital input 2
P8 DI3	Digital input 3
P9 DI4	Digital input 4
P10 L0	Common for digital inputs

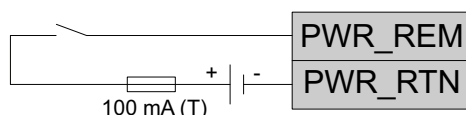
Wiring Requirements, Wire Cross Sections, Stripping Length

Characteristic	Value
Shielded cable	No
Twisted pair cable	No
Conductor material	Copper, 75 °C (167 °F)
Maximum cable length	30 m (98.43 ft)
Stripping length	9 mm (0.35 in)
Wire cross section, single wire (solid or stranded) without wire ferrule	0.5 ... 1.5 mm ² (AWG 20 ... 16)
Wire cross section, single wire (stranded) with uninsulated wire ferrule	0.5... 1.5 mm ² (AWG 20 ... 16)
Wire cross section, single wire (stranded) with insulated wire ferrule	0.5 ... 0.75 mm ² (AWG 20 ... 18)

Connect the following pins at CN2 to an appropriate input device:

- P4 PWR_REM
- P5 PWR_RTN

Ensure proper fusing with a 100 mA type T fuse according to the following wiring diagram:



After you have completely wired connector CN2, bundle the cables connected to CN2 and secure them properly in the control cabinet.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Verify that your machine/process is in a defined safe state before changing the power state of the controller.
--

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

Installation of Accessories

Installation of a Fan Kit

General 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 equipment.
- 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.

⚠ CAUTION

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Verify that the heat sink has cooled down before performing work on the controller.

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

NOTICE

ELECTROSTATIC DISCHARGE

Take the necessary protective measures against electrostatic discharge before attempting to open the housing of the controller.

Failure to follow these instructions can result in equipment damage.

The fan kit is available as an accessory (refer to [Accessories and Spare Parts](#), page 18). It allows you to improve the heat dissipation in the controller.

The fan kit consists of a fan plate with two fans attached to it. This fan plate replaces the bottom plate of the controller.

Installing a Fan Kit

Procedure:

Step	Action
1	Remove power from the controller and from all connected equipment.
2	Touch the housing or ground connection of the controller (not the power supply) to discharge electrostatic charge from your body.
3	If the housing has been sealed via the sealing lug, cut the sealing wire and remove the seal.
4	Remove the two knurled screws at the bottom plate of the controller.

Step	Action
5	Remove the bottom plate.
6	Carefully push the connectors of the fans into the white connector sockets on the printed circuit board. No specific order is required because both fans are switched simultaneously.
7	Fit the fan plate into position.
8	Fasten the fan plate with the two knurled screws.
9	Mount a new housing seal, if required.

After installing the fan kit, make the fan-related settings in Ecostruxure Automation Expert - Motion. Refer to the [M660 Programming Guide](#), page 9 for details.

Installation of a Buffer Battery

General 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 equipment.
- 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.

DANGER

EXPLOSION, FIRE, OR CHEMICAL BURNS

- Replace with identical battery type.
- Follow all the instructions of the battery manufacturer.
- Remove all replaceable batteries before discarding unit.
- Recycle or properly dispose of used batteries.
- Protect battery from any potential short-circuit.
- Do not recharge, disassemble, heat above 100 °C (212 °F), or incinerate.
- Use your hands or insulated tools to remove or replace the battery.
- Maintain proper polarity when inserting and connecting a new battery.

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

CAUTION

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Verify that the heat sink has cooled down before performing work on the controller.

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

NOTICE

ELECTROSTATIC DISCHARGE

Take the necessary protective measures against electrostatic discharge before attempting to open the housing of the controller.

Failure to follow these instructions can result in equipment damage.

A capacitor in the controller is used to buffer the CMOS (BIOS settings), the real-time clock and the non-volatile memory for a period of up to 14 days. An optional buffer battery extends this period to at least three years. If these periods elapse without the controller having been powered on, the corresponding data is lost.

NOTICE

LOSS OF DATA

- If the controller will be powered off for more than 14 days, install the optional buffer battery.
- Verify that the settings of the real-time clock and the values in the non-volatile memory are correct each time you power on the controller before you start the application.

Failure to follow these instructions can result in equipment damage.

The buffer battery is available as an accessory (commercial reference VW3E6020 refer to [Accessories and Spare Parts](#), page 18).

The lithium metal cell is used as a buffer for the CMOS (BIOS settings), the real-time clock and the non-volatile memory. If no buffer battery is installed, a capacitor in the controller provides the energy to keep the data for a period of up to 14 days. If the buffer battery is used, this period is extended to at least three years. A monitoring function alerts you to an empty buffer battery.

Installing/Replacing a Buffer Battery

Procedure:

Step	Action
1	Verify that the buffer battery you are going to install is a genuine Schneider Electric accessory, commercial reference VW3E6020.
2	Remove power from the controller and from all connected equipment.
3	Touch the housing or ground connection of the controller (not the power supply) to discharge electrostatic charge from your body.
4	If the housing has been sealed via the sealing lug, cut the sealing wire and remove the seal.
5	Remove the two knurled screws at the bottom of the controller.
6	Controller without fan kit: • Remove the bottom plate. Controller with fan kit: • Remove the fan plate with the fan assembly and disconnect the two fan cables.
7	To install a buffer battery, align it with the slot in the battery holder and slide it into the slot. To replace a buffer battery, first pull out the empty buffer battery. Then align the new buffer battery with the slot in the battery holder and slide it into the slot.
8	Controller without fan kit: • Refit the bottom plate into position. Controller with fan kit: • Reconnect the two fan cables. Ensure the connectors are securely inserted in their connectors. • Refit the fan plate with the fan assembly into position.
9	Refit and tighten the two knurled screws at the bottom of the controller.
10	Mount a new housing seal, if required.

After installing or replacing the buffer battery, make the battery-related settings in Ecostruxure Automation Expert - Motion. Verify that the settings for the real-time clock on the tab *Services* of the controller are correct. Verify that the settings for

the buffer battery are correct. Refer to the M660 Programming Guide, page 9 for details.

Installation of a USB Security Key

General Information

M660 controllers are equipped with an internal USB 2.0 Type-A port (refer to Technical Data - USB Ports, page 33 for details).

The USB 2.0 Type-A port is available after you have removed the bottom plate of the controller. It is intended for security or licensing keys such as CodeMeter from Wibu for the industrial PC of an MN660P motion controller. Such keys allow you to implement security or software licensing features on the industrial PC of the controller. Do not use the USB 2.0 Type-A port for other purposes.

Installing a USB Security Key

⚠️⚠️ 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 equipment.
- 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.

⚠️ CAUTION

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Verify that the heat sink has cooled down before performing work on the controller.

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

NOTICE

ELECTROSTATIC DISCHARGE

Take the necessary protective measures against electrostatic discharge before attempting to open the housing of the controller.

Failure to follow these instructions can result in equipment damage.

Procedure:

Step	Action
1	Remove power from the controller and from all connected equipment.
2	Touch the housing or ground connection of the controller (not the power supply) to discharge electrostatic charge from your body.
3	If the housing has been sealed via the sealing lug, cut the sealing wire and remove the seal.

Step	Action
4	Remove the two knurled screws at the bottom of the controller.
5	Controller without fan kit: - Remove the bottom plate. Controller with fan kit: - Remove the fan plate with the fan assembly and disconnect the two fan cables.
6	Insert the USB key into the USB 2.0 Type-A port.
7	Controller without fan kit: - Refit the bottom plate into position. Controller with fan kit: - Reconnect the two fan cables. Ensure the connectors are securely inserted in their connectors. - Refit the fan plate with the fan assembly into position.
8	Refit and tighten the two knurled screws at the bottom of the controller.
9	Mount a new housing seal, if required.

Commissioning

Commissioning

General Information

Commissioning is the process of putting a machine/process into operation for production purposes. It includes, among other things, verifying the mechanical mounting and electrical installation, the hardware and software configuration and the application, and verifying the correct operation of the entire system with all connected equipment. This includes comprehensive tests for all operating states, the defined safe state, and all potential error conditions. Such tests must be performed and the results be documented and/or certified according to your risk assessment as well as the regulations, standards, and process definitions that are applicable to your machine/process.

Commissioning is an iterative process. After you have mounted and installed the controller, you are ready for the first iteration of the commissioning procedure which consists of applying and removing power for the first time.

The following sections describe the parts of the commissioning procedure to the extent they are immediately related to the controller hardware after mechanical mounting and electrical installation. Refer to the appropriate user guides for information on additional commissioning steps related your configuration, application and additional equipment used in your machine/process.

Initial Commissioning Steps

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 equipment.
- 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

UNINTENDED EQUIPMENT OPERATION

- Commission or recommission the machine/process in which the controller is used before it is operated for the first time and after each modification whatsoever.
- Commission or recommission the machine/process in which the controller is used pursuant to all regulations, standards, and process definitions applicable to your machine/process.
- Only start the machine/process if there are no persons or obstructions in the zone of operation.
- Verify correct operation and effectiveness of all functions by performing comprehensive tests for all operating states, the defined safe state, and all potential error situations.
- Document all modifications and the results of the commissioning procedure in compliance with all regulations, standards, and process definitions applicable to your machine/process.

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

⚠ CAUTION

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Verify that the heat sink has cooled down before performing work on the controller.

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

Procedure:

Step	Action
1	Verify correct mechanical installation, page 35 and electrical installation, page 41 of the controller.
2	Verify that all conditions specified in the present Hardware Guide, such as, but not limited to, ambient and electrical requirements, are met.
3	Verify that no equipment is connected to the inputs and the output (CN2).
4	Apply power to the controller.
5	Observe the LEDs, page 68 of the controller.
6	Disconnect the controller from power.
7	Document the results in accordance with the regulations, standards, and process definitions that are applicable to your machine/process

NOTE: Refer to the appropriate user guides for information on connecting to the controller from a PC and, if applicable, on starting the operating system of the industrial PC for the first time.

If you decide to connect to the controller during initial commissioning, ensure to include the following in the first steps:

- Verify that the settings for the real-time clock on the tab *Services* of the controller are correct.
- Verify that the settings for the buffer battery are correct.
- If you have installed a fan, verify that the settings for fan monitoring are correct.

Refer to the M660 Programming Guide, page 9 for details.

Operation

Introduction

The following sections describe the operation of the controller to the extent it is immediately related to the controller hardware after mechanical mounting and electrical installation. Refer to the appropriate user guides for information on additional aspects related to the operation of your configuration, application and additional equipment used in your machine/process.

The following topics are covered:

- Powering on/off and setting the controller to standby via the button and the input
- Hardware diagnostics via LEDs
- Watchdog and status output

Powering On/Powering Off/Setting to Standby

⚠ WARNING

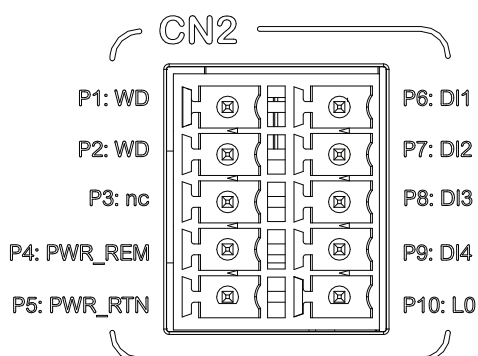
UNINTENDED EQUIPMENT OPERATION

Verify that your machine/process is in a defined safe state before changing the power state of the controller.

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

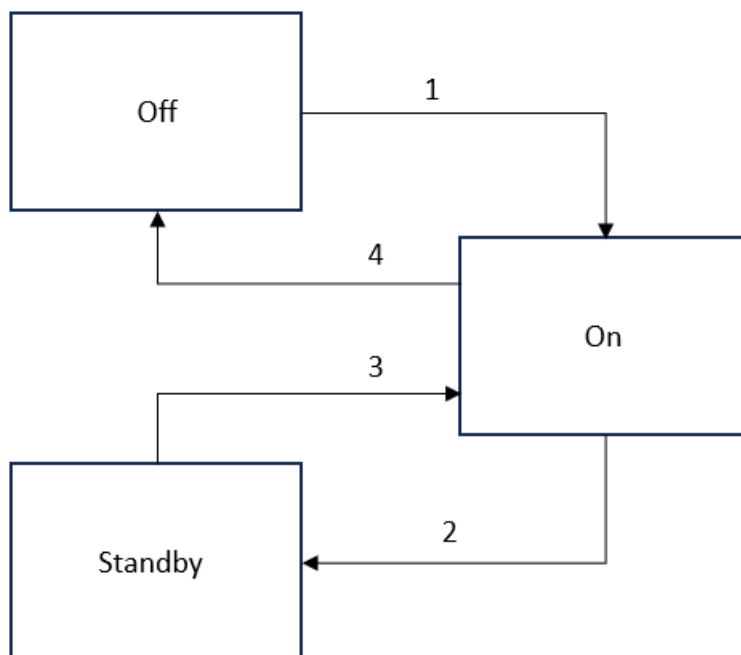
Introduction

You can power the controller on and off or set it to standby using either the power button on the front face of the controller or the input PWR_REM, PWR_RTN (pins P4 and P5) of connector CN2:



Power States and Power State Transitions

The following figure presents the power states and power state transitions of the controller:



Power states of the controller:

Power State	Description
Off	This is the power off state of the controller. In this state, the controller still draws an input power of approximately up to 0.3 W.
On	This is the power on state of the controller.
Standby	This is the standby power state of the controller. In this state, the RAM context for the operating system of the industrial PC (MN660P only) is maintained. Windows is in sleep mode. VxWorks (motion control) is disabled.

Power state transitions of the controller:

Power state transition	Description
1	Off to On Button: - Press for less than two seconds. Input: - Set to HIGH and back to LOW within less than two seconds. The controller boots.
2	On to Standby Button: - Press for less than two seconds. Input: - Set to HIGH and back to LOW within less than two seconds. The controller is set to the power state Standby. The condition of the RAM is maintained. VxWorks (motion control) is disabled. Windows (MN660P only) goes to sleep mode.
3	Standby to On Button: - Press for less than two seconds. Input: - Set to HIGH and back to LOW within less than two seconds. The industrial PC (MN660P only) restores the condition of Windows and/or Linux of the last power on state without going through the boot routine.
4	On to Off Button: - Press for longer than three seconds. Input: - Set to HIGH for longer than three seconds and then back to LOW.

Boot Sequence

M660 controllers scan the hardware for a bootable medium in the following default order:

1. SD card
2. USB drive(s)
3. Solid State Disk (SSD, hard drive)

SD card

If an SD card is found (MN660C), the controller starts the hypervisor and boots VxWorks for motion control from the SD card. VxWorks can only be booted from the SD card.

The controller then searches for a bootable operating system for the industrial PC on the USB drives and the SSD.

USB drives

If no SD card is found or if it does not contain a bootable operating system, the controller searches the USB drives for a bootable operating system for the industrial PC. Sequence:

1. USB 3.2 Gen 1 Type-A
2. USB 3.2 Gen 2 Type-C

It is not possible to boot from the internal USB 2.0 Type-A.

SSD

If no SD card and no USB drive are found or if these storage media do not contain a bootable operating system and if the controller is equipped with SSDs (MN660P), the controller searches the SSDs for a bootable operating system for the industrial PC.

You can modify the boot sequence via the BIOS.

NOTE: The SD card is referred to as USB port 7 in the BIOS.

Watchdog and Status Output

⚠ WARNING

INSUFFICIENT AND/OR INEFFECTIVE SAFETY-RELATED FUNCTIONS

- In your risk assessment, verify that the controller meets all requirements regarding the safety-related requirements and capabilities applicable to your machine/process.
- Verify that your risk assessment takes into account all potential consequences that can arise from the controller becoming inoperative.
- Do not use the inputs or the output of the controller to implement functions related to functional safety (for example, as per ISO 13849), or as a safety function (for example, as per IEC 61800-5-2).
- Use only equipment expressly intended and certified for safety-related purposes to implement safety-related functions.
- During the design as well as during commissioning or recommissioning of the machine/process, verify the correct operation and effectiveness of all safety-related functions and non-safety-related functions by performing comprehensive tests for all operating states, for the defined safe state of your machine/process, and for all potential error situations.
- Verify that your overall machine/process in which the controller is used is properly certified and/or approved according to all standards, regulations, and directives applicable at the installation site of the machine/process.

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

The tasks of the watchdog of the controller include, among other things, monitoring of the real-time process (cycle time) and of the memory allocation. Potential root causes of errors detected by the watchdog include:

- Operations in the application that cannot be completed within the cycle time
- Operations in the application that result in incorrect memory allocation

If an error is detected by the watchdog, the following error response is initiated:

- The ERR/WD LED, page 69 lights solid red.
- The status output WD switches (relay contact opens).
- The CPU of the controller is stopped.
- The Sercos core is reset. Subordinated Sercos devices do not receive data and stop operation after two Sercos cycles. Such subordinated devices trigger their own error response as defined by the application.
- The event “watchdog triggered” is saved to the message logger (available after reboot of the controller).

The response of the watchdog to a detected error is neither a function related to functional safety (for example, as per ISO 13849) nor a safety function (for example, as per IEC 61800-5-2). You can, for example, connect the status output WD to the Enable input of a drive or use it to remove power from a drive. However, you must ensure that your machine/process transitions to a safe state as defined in your risk assessment using dedicated equipment expressly intended and certified for safety-related purposes such as, but not limited to, safety controllers and mechanical brakes.

If the watchdog has detected an error, restart the controller. If the error persists, verify your application. If the error still persist, contact your local Schneider Electric service representative.

Hardware Diagnostics

Overview

M660 controllers provide an LED panel with 10 LEDs:

- PWR
- SD/HD
- USR
- DI1 ... DI4
- ERR/WD
- RTE
- SSC

In addition, the RJ45 sockets for LAN and RTE are equipped with two LEDs each for indicating connection state and data traffic.

Each of the dual port RTE sockets beyond CN8 and CN9 is equipped with separate RTE LEDs.

Hardware Diagnostics through the PWR LED

The PWR LED provides information on the state of the power supply to the controller.

State	Description
Off	Controller off
Flashing green	Controller in standby
Solid green	Controller on (operation)
Solid red	Hardware error detected

Hardware Diagnostics through the SD/HD LED

The SD/HD LED provides information on the access state of the SSD drive or drives.

State	Description
Off	No access to SSD drive or SD card
Flashing yellow	Access to SSD drive or SD card

Hardware Diagnostics through the USR LED

You can configure the USR LED to your requirements via EcoStruxure Automation Expert - Motion. It provides the colors green and red and the states off, flashing and solid on. Refer to the M660 Programming Guide, page 9 for details.

Hardware Diagnostics through the DI1, DI2, DI3, DI4 LEDs

The LEDs DI1, DI2, DI3, DI4 provide information on the states of the digital inputs.

State	Description
Off	The corresponding digital input is not activated.
Solid green	The corresponding digital input is activated.

Hardware Diagnostics through the ERR/WD LED

The ERR/WD LED provides information on detected errors.

State	Description
Off	Controller off
Solid green	No error detected.
Flashing red	Error detected. The error was detected at the automation system level (for example, application, motion bus, connected devices). It is not an error detected by the watchdog of the controller. Refer to the M660 Programming Guide, page 9 for details on remedying the condition.
Solid red	The LED lights solid red during booting. If the LED continues to light solid red after booting or if it lights up solid red during operation, an error has been detected by the watchdog. If this type of error is detected, the status relay output opens. Restart the controller. If the error persists, verify your application. If the error still persists, contact your local Schneider Electric service representative.

Refer to Watchdog and Status Output, page 67 for additional information.

Hardware Diagnostics through the RTE LED

The RTE LED provides information on the state of the real-time Ethernet communication via the RTE ports CN8 and CN9.

State	Description
Off	No Sercos communication
Orange	The controller is in a Sercos communication phase between CP0 and CP3.
Green	The controller is in Sercos communication phase CP4.
Red	A communication error has been detected.

NOTE: The RTE LED on the LED panel relates to the dual RTE ports CN8 and CN9. Additional dual RTE ports are equipped with separate RTE LEDs between the two ports.

Hardware Diagnostics through the SSC LED

Reserved. The LED has no function regardless of its state.

Hardware Diagnostics through the LEDs at LAN and RTE RJ45 Sockets

The LEDs at LAN and RTE RJ45 sockets provide information on the network communication state and transmission speeds.

LEDs at LAN sockets:

State	Description
LED 1 off	Transmission speed 10 MB or 100 MB
LED 1 solid yellow	Transmission speed 1 GB
LED 1 solid green	Transmission speed 2.5 GB
LED 2 off	No link
LED 2 solid green	Link established, no activity
LED 2 flashing green	Activity

LEDs at RTE sockets:

State	Description
LED 1 off	Reserved (always off)
LED 2 off	No link
LED 2 solid green	Link established, no activity
LED 2 flashing green	Activity

Maintenance

Maintenance

Overview

The equipment may only be repaired by a Schneider Electric customer service center.

For all service matters, contact your local Schneider Electric service representative.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with this equipment.
- Do not attempt to service this equipment outside of authorized Schneider Electric service centers.
- 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.

Use only the accessories and mounting parts specified in the documentation and no third-party devices or components that have not been expressly approved by Schneider Electric. Do not modify the equipment.

Create a maintenance plan for your machine/process that includes the following maintenance activities for the controller.

Maintenance Activities

Maintenance activities to be performed at regular intervals:

- Inspect the wiring and the connections.
- Tighten the threaded connections.
- Clean dust and dirt off the controller.
- Verify that all requirements with regard to the ambient conditions are met at all times.
- If you have installed a battery, verify its condition. Replace the battery, if necessary. Refer to *Installation of a Buffer Battery*, page 56 for details.

As a machine designer or system integrator, include this information in the maintenance plan for your customer.

Index

A

accessories	18
ambient temperature	23

B

battery	56
boot sequence	65
bottom view	14
buffer battery	56

C

cleaning	71
clearances	36
CodeMeter	59
commissioning	61
control cabinet	35

D

degree of protection	35
diagnostics	68
digital inputs	29, 47
dimensions	25
DIn LED	68
DisplayPort	33

E

electrical installation	41
electromagnetic compatibility	27, 41
EMC	27
enclosure	35
environmental data	21
ERR/WD LED	68
Ethernet ports	32

F

fan kit	54
front view	14

G

general data	19
grounding	42

H

hardware diagnostics	68
----------------------------	----

I

inductive loads	49
input for controlling power on/power off/standby	30, 52
inspection	71
installation	
buffer battery	56

digital inputs	47
electromagnetic compatibility	41
fan kit	54
grounding	42
input for controlling power on/power off/standby	52
power supply	44
security key	59
status output	49
intended use	6
interfaces overview	14
introduction	13
IP rating	35

L

LAN ports	32
LEDs	68

M

maintenance	71
mechanical data	25
mechanical installation	35
mounting	38
mounting preparation	38
mounting prerequisites and requirements	35
mounting procedure	39
mounting type	38

O

operating systems	19
operation	63
boot sequence	65
diagnostics via LEDs	68
powering on/off	64
standby	64
status output	67
watchdog	67
overview	14

P

pollution degree	35
power states/transitions	64
power supply	28, 44
powering on/off	64
processor	19
PWR LED	68

Q

qualification of personnel	5
----------------------------------	---

R

RAM	19
real-time clock	56, 61
RTC	56, 61
RTE ports	32

S

SD card slot	34
SD/HD LED	68

SD/SSC LED	68
security key	59
spare parts	18
standby	64
status output	31, 49, 67
storage	21
system overview	13

T

technical data	19
ambient temperature	23
digital inputs	29
dimensions	25
DisplayPort	33
electromagnetic compatibility	27
environmental data	21
Ethernet ports	32
input for controlling power on/power off/standby ...	30
LAN ports	32
mechanical data	25
operating systems	19
power supply	28
processor	19
RAM	19
RTE ports	32
SD card slot	34
status output	31
storage	21
technical data	19
transportation	22
USB ports	33
weight	25
top view	14
transportation	22
type code	17

U

USB ports	33
USR LED	68

W

watchdog	67
weight	25

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