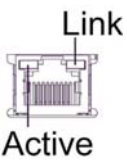


Part	Name	Description
F	Ethernet Interface ^{*2}	Ethernet transmission interface (10BASE-T/100BASE-TX) Connector: Modular jack (RJ-45) x 1. Ethernet Interface is not attached to HMIGTO1300.
G	Power Plug Connector	-
H	Serial Interface (COM2)	HMIGTO1300: RS-485 Serial Interface. Connector: Modular jack (RJ-45) x 1.

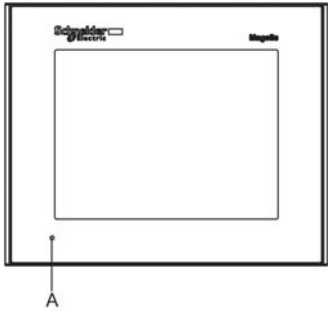
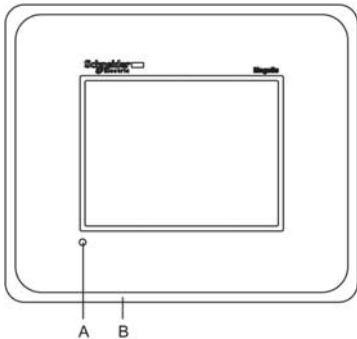
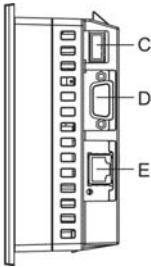
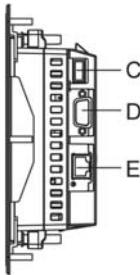
^{*1} Status LED operations are as shown below:

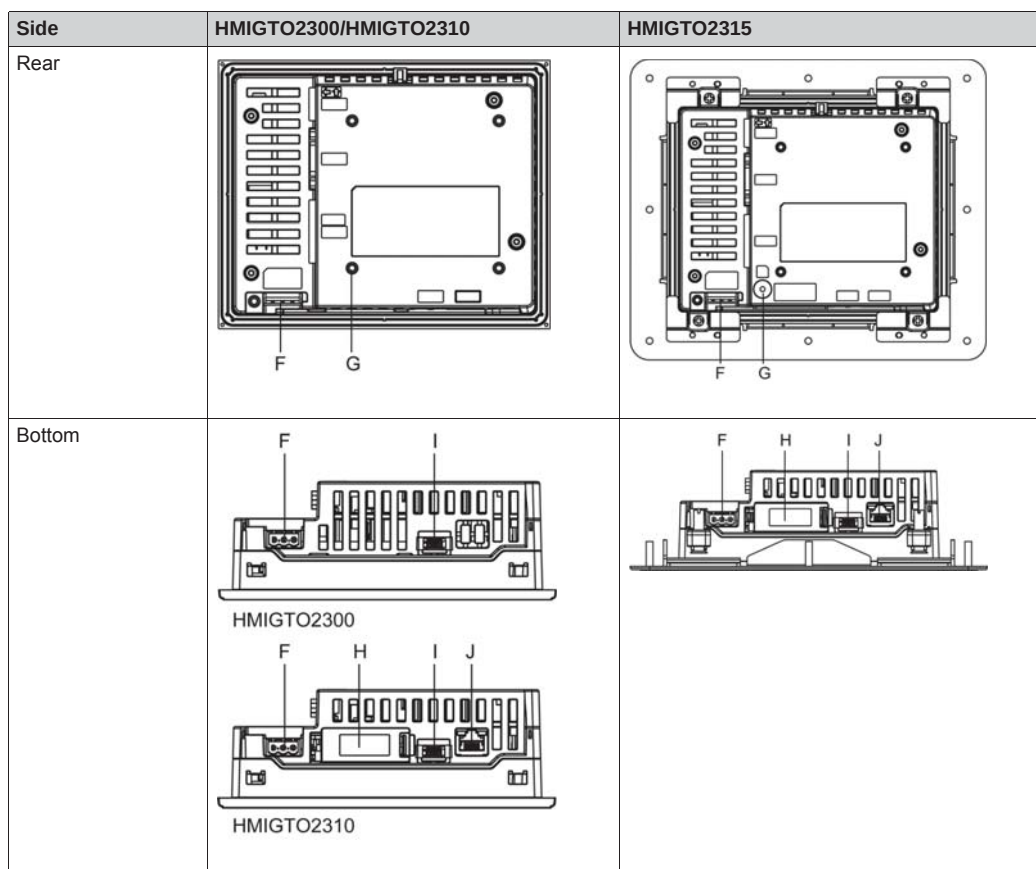
Color	Indicator	Description
Green	ON	Offline
		In operation
Orange	Flashing	Software starting up.
Red	ON	Power is turned ON.
-	OFF	Power is turned OFF.

^{*2} Ethernet LED operations are as shown below.

	Color	Indicator	Description
	Green (Active)	Flashing	Data transmission is occurring.
		OFF	No data transmission.
	Green (Link)	ON	Data transmission is available in 10BASE-T/100BASE-TX.
		OFF	No connection or subsequent transmission failure.

HMIGTO2300/2310/2315 Parts Identification

Side	HMIGTO2300/HMIGTO2310	HMIGTO2315
Front		
Right		



Part	Name	Description
A	Status LED	*1
B	Stainless Steel Bezel	HMIGTO2315 only.
C	USB (Type A) Interface	Conforms to USB2.0 (Type A) x 1. Power supply voltage: 5Vdc $\pm$ 5%. Output Current: 500 mA or less. Maximum communication distance: 5 m (16.4 ft).
D	Serial Interface (COM1)	RS-232C Serial Interface. Connector: D-Sub 9 pin (plug) x 1.
E	Serial Interface (COM2)*2	RS-485 Serial Interface. Connector: Modular jack (RJ-45).
F	Power Plug Connector	-
G	SD Card Access LED *3	This lamp lights up when SD Card is inserted. For more information, refer to SD Card Insertion/Removal (see page 131). NOTE: SD Card Access LED is not available on HMIGTO2300.
H	SD Card Interface Cover/Replacement Battery Insertion Cover	For information on how to open the cover, and insert or remove the SD Card, refer to SD Card Insertion / Removal (see page 131). For information on how to open the cover and replace the battery, refer to Replacing the Primary Battery (see page 146). NOTE: This cover is not on HMIGTO2300.
I	USB (mini-B) Interface	Conforms to USB2.0 (mini-B) x 1. Communication Distance: 5 m (16.4 ft) or less.
J	Ethernet Interface *4	Ethernet transmission interface (10BASE-T/100BASE-TX) Connector: Modular jack (RJ-45) x 1. NOTE: Ethernet Interface is not available on HMIGTO2300.

*1 Status LED operations are as shown below:

Color	Indicator	Description
Green	ON	Offline
		In operation
Orange	Flashing	Software starting up.
Red	ON	Power is turned ON.
-	OFF	Power is turned OFF.

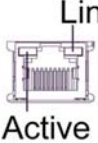
*2 COM2 LED operations are as shown below.

Color	Indicator	Description
Yellow	ON	Communication (sending or receiving data) is occurring.
	OFF	No communication.

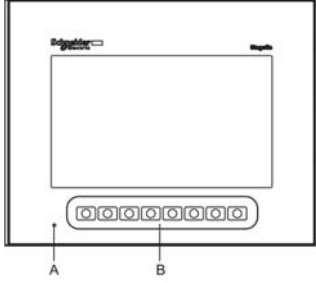
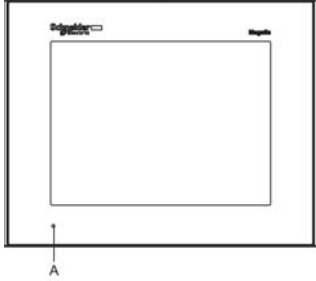
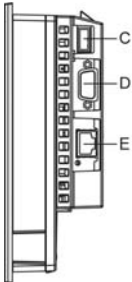
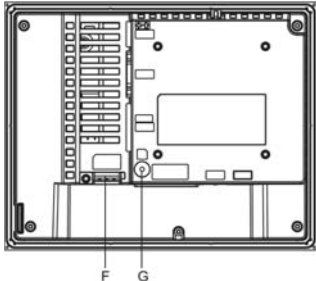
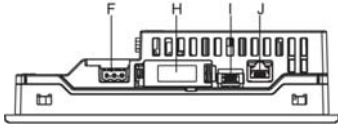
*3 SD Card Access LED operations are as shown below.

Color	Indicator	Description
Green (Active)	ON	The SD Card is inserted.
	OFF	The SD Card is not inserted or is not being accessed.

*4 Ethernet LED operations are as shown below.

	Color	Indicator	Description
	Green (Active)	Flashing	Data transmission is occurring.
		OFF	No data transmission.
	Green (Link)	ON	Data transmission is available in 10BASE-T/100BASE-TX.
		OFF	No connection or subsequent transmission failure.

HMIGTO3510/4310 Parts Identification

Side	HMIGTO3510/4310
Front	HMIGTO3510  A B HMIGTO4310  A
Right	 C D E
Rear	 F G
Bottom	 F H I J

Part	Name	Description
A	Status LED	*1
B	Function Switches	HMIGTO3510 only. Eight switches (F1 to F8). You can define operations for these switches using Vijeo Designer.
C	USB (Type A) Interface	Conforms to USB2.0 (Type A) x 1. Power supply voltage: 5 Vdc+/-5%. Output Current: 500 mA or less. Maximum communication distance: 5 m (16.4 ft).
D	Serial Interface (COM1)	RS-232C Serial Interface. Connector: D-Sub 9 pin (plug) x 1.
E	Serial Interface (COM2)*2	RS-485 Serial Interface. Connector: Modular jack (RJ-45) x 1.
F	Power Plug Connector	-
G	SD Card Access LED *3	This lamp lights up when SD Card is inserted. For more information, refer to SD Card Insertion / Removal (see page 131).
H	SD Card Interface Cover/Replacement Battery Insertion Cover	For information on how to open the cover, and insert or remove the SD Card, refer to SD Card Insertion / Removal (see page 131). For information on how to open the cover and replace the battery, refer to Replacing the Primary Battery (see page 146).
I	USB (mini-B) Interface	Conforms to USB2.0 (mini-B) x 1. Communication Distance: 5 m (16.4 ft) or less.
J	Ethernet Interface *4	Ethernet transmission interface (10BASE-T/100BASE-TX) Connector: Modular jack (RJ-45) x 1.

*1 Status LED operations are as shown below:

Color	Indicator	Description
Green	ON	Offline
		In operation
Orange	Flashing	Software starting up.
Red	ON	Power is turned ON.
-	OFF	Power is turned OFF.

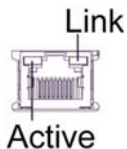
*2 COM2 LED operations are as shown below.

Color	Indicator	Description
Yellow	ON	Communication (sending or receiving data) is occurring.
	OFF	No communication.

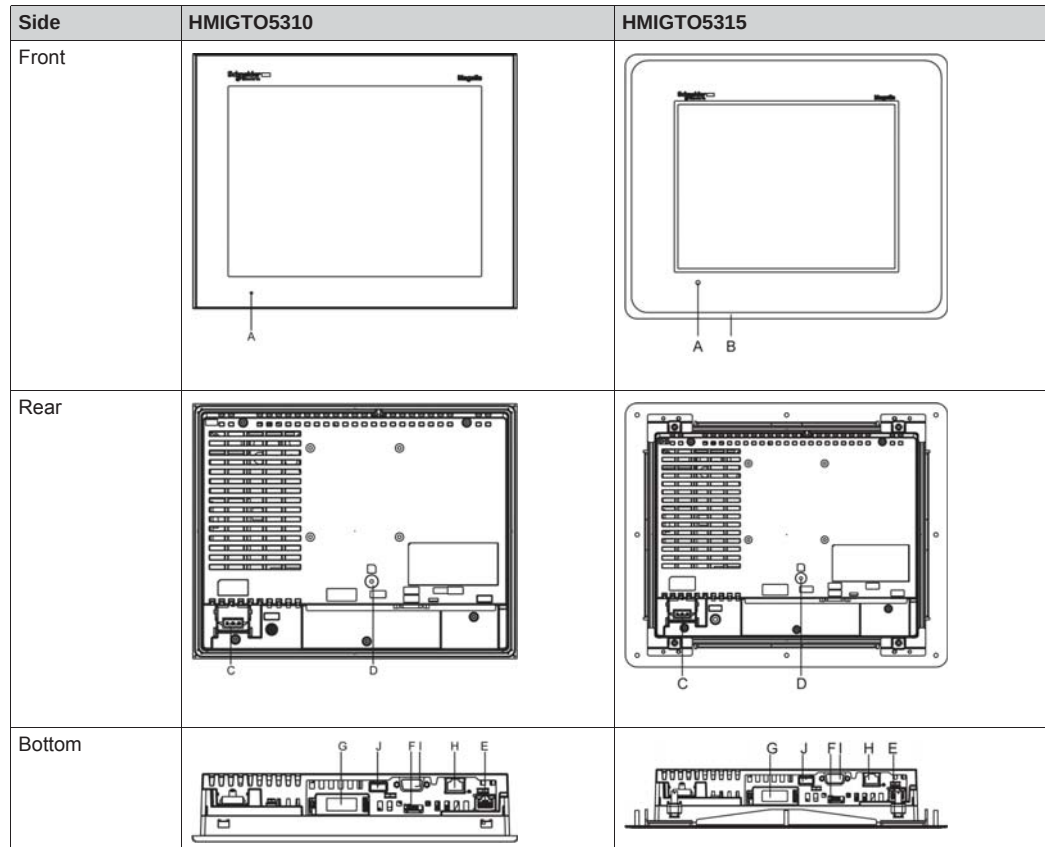
*3 SD Card Access LED operations are as shown below.

Color	Indicator	Description
Green (Active)	ON	The SD Card is inserted.
	OFF	The SD Card is not inserted or is not being accessed.

*4 Ethernet LED operations are as shown below.

	Color	Indicator	Description
	Green (Active)	Flashing	Data transmission is occurring.
		OFF	No data transmission.
	Green (Link)	ON	Data transmission is available in 10BASE-T/100BASE-TX.
		OFF	No connection or subsequent transmission failure.

HMIGTO5310/5315 Parts Identification



Part	Name	Description
A	Status LED	*1
B	Stainless Steel Bezel	HMIGTO5315 only.
C	Power Plug Connector	-
D	SD Card Access LED *2	This lamp lights up when SD Card is inserted. NOTE: Do not remove or insert the SD Card when the LED lamp is on. Doing so may damage data on the SD Card.
E	Ethernet Interface *3	Ethernet transmission interface (10BASE-T/100BASE-TX) Connector: Modular jack (RJ-45) x 1.
F	USB (mini-B) Interface	Conforms to USB2.0 (mini-B) x 1. Communication Distance: 5 m (16.4 ft) or less.
G	SD Card Interface Cover/Replacement Battery Insertion Cover	For information on how to open the cover, and insert or remove the SD Card, refer to SD Card Insertion/Removal (see page 131). For information on how to open the cover and replace the battery, refer to Replacing the Primary Battery (see page 146).
H	Serial Interface (COM2)*4	RS-485 Serial Interface. Connector: Modular jack (RJ-45).
I	Serial Interface (COM1)	RS-232C Serial Interface. Connector: D-Sub 9 pin (plug) x 1.
J	USB (Type A) Interface	Conforms to USB2.0 (Type A) x 1. Power supply voltage: 5Vdc+/-5%. Output Current: 500 mA or less. Maximum communication distance: 5 m (16.4 ft).

*1 Status LED operations are as shown below:

Color	Indicator	Description
Green	ON	Offline
		In operation
Orange	Flashing	Software starting up.
Red	ON	Power is turned ON.
-	OFF	Power is turned OFF.

*2 SD Card Access LED operations are as shown below.

Color	Indicator	Description
Green (Active)	ON	The SD Card is inserted.
	OFF	The SD Card is not inserted or is not being accessed.

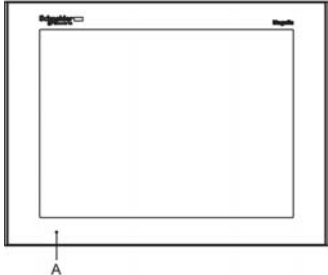
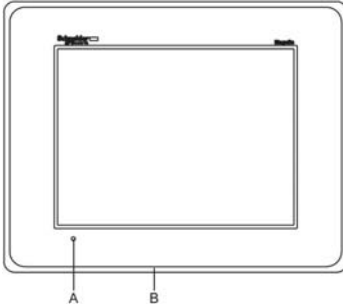
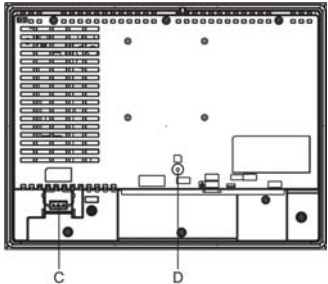
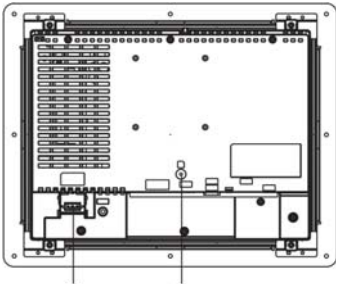
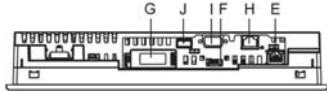
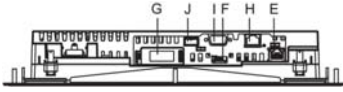
*3 Ethernet LED operations are as shown below.

	Color	Indicator	Description
	Green (Active)	Flashing	Data transmission is occurring.
		OFF	No data transmission.
	Green (Link)	ON	Data transmission is available in 10BASE-T/100BASE-TX.
		OFF	No connection or subsequent transmission failure.

*4 COM2 LED operations are as shown below.

Color	Indicator	Description
Yellow	ON	Communication (sending or receiving data) is occurring.
	OFF	No communication.

HMIGTO6310/6315 Parts Identification

Side	HMIGTO6310	HMIGTO6315
Front		
Rear		
Bottom		

Part	Name	Description
A	Status LED	*1
B	Stainless Steel Bezel	HMIGTO6315 only.
C	Power Plug Connector	-
D	SD Card Access LED *2	This lamp lights up when SD Card is inserted. NOTE: Do not remove or insert the SD Card when the LED lamp is on. Doing so may damage data on the SD Card.
E	Ethernet Interface *3	Ethernet transmission interface (10BASE-T/100BASE-TX) Connector: Modular jack (RJ-45) x 1.
F	USB (mini-B) Interface	Conforms to USB2.0 (mini-B) x 1. Communication Distance: 5 m (16.4 ft) or less.
G	SD Card Interface Cover/Replacement Battery Insertion Cover	For information on how to open the cover, and insert or remove the SD Card, refer to SD Card Insertion/Removal (see page 131). For information on how to open the cover and replace the battery, refer to Replacing the Primary Battery (see page 146).
H	Serial Interface (COM2)	RS-485 Serial Interface. Connector: Modular jack (RJ-45)
I	Serial Interface (COM1)	RS-232C Serial Interface. Connector: D-Sub 9 pin (plug) x 1.
J	USB (Type A) Interface	Conforms to USB2.0 (Type A) x 1. Power supply voltage: 5Vdc+/-5%. Output Current: 500 mA or less. Maximum communication distance: 5 m (16.4 ft).

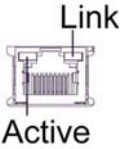
*1 Status LED operations are as shown below:

Color	Indicator	Description
Green	ON	Offline
		In operation
Orange	Flashing	Software starting up.
Red	ON	Power is turned ON.
-	OFF	Power is turned OFF.

*2 SD Card Access LED operations are as shown below.

Color	Indicator	Description
Green (Active)	ON	The SD Card is inserted.
	OFF	The SD Card is not inserted or is not being accessed.

*3 Ethernet LED operations are as shown below.

	Color	Indicator	Description
	Green (Active)	Flashing	Data transmission is occurring.
		OFF	No data transmission.
	Green (Link)	ON	Data transmission is available in 10BASE-T/100BASE-TX.
		OFF	No connection or subsequent transmission failure.

*4 COM2 LED operations are as shown below.

Color	Indicator	Description
Yellow	ON	Communication (sending or receiving data) is occurring.
	OFF	No communication.

Chapter 4

Specifications

Overview

This chapter presents the HMIGTO specifications.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	HMIGTO1300/1310	36
4.2	HMIGTO2300/2310/2315	50
4.3	HMIGTO3510/4310	68
4.4	HMIGTO5310/5315	84
4.5	HMIGTO6310/6315	101

Section 4.1

HMIGTO1300/1310

What Is in This Section?

This section contains the following topics:

Topic	Page
Electrical Specifications	37
Environmental Specifications	38
Structural Specifications	39
Display Specifications	40
Memory, Clock, Touch Panel and Function Switches	41
Interface Specifications	42
Specifications of Serial Interface COM1	43
Specifications of Serial Interface COM2	45
Dimensions	46

Electrical Specifications

Power Supply	Rated Input Voltage		24 Vdc	
	Input Voltage Limits		19.2...28.8 Vdc	
	Voltage Drop		2 ms or less	
	Power Consumption		9.6 W or less	
			When power is not supplied to external devices	5.2 W or less
			Backlight OFF (Standby Mode)	4.2 W or less
			Backlight Dimmed (Brightness: 20%)	4.3 W or less
	In-Rush Current		30 A or less	
Voltage Endurance		1,000 Vac 20 mA for 1 minute (between charging and FG terminals)		
Insulation Resistance		500 Vdc, 10 MΩ or more (between charging and FG terminals)		

Environmental Specifications

Physical Environment	Surrounding Air Temperature	0...50 °C (32...122 °F)
	Storage Temperature	-20...60 °C (-4...140 °F)
	Surrounding Air and Storage Humidity	10%...90% RH (Non condensing, wet bulb temperature 39 °C [102.2 °F] or less)
	Dust	0.1 mg/m ³ (10 ⁻⁷ oz/ft ³) or less (non-conductive levels)
	Pollution Degree	For use in Pollution Degree 2 environment
	Corrosive Gases	Free of corrosive gases
	Atmospheric Pressure (Operating Altitude)	800...1,114 hPa (2,000 m [6,561 ft] or lower)
Mechanical Environment	Vibration Resistance	IEC/EN 61131-2 compliant 5...9 Hz Single amplitude 3.5 mm (0.14 in.) 9...150 Hz Fixed acceleration: 9.8 m/s ² X, Y, Z directions for 10 cycles (approx. 100 min.)
	Concussion Resistance	IEC/EN 61131-2 compliant 147 m/s ² , X, Y, Z directions for 3 times
Electrical Environment	Noise immunity	Noise Voltage: 1,000 Vp-p Pulse Width: 1 µs Rise Time: 1 ns (via noise simulator)
	Electrostatic Discharge Immunity	Contact Discharge Method: 6 kV (IEC/EN 61000-4-2 Level 3)

Air quality requirements

Do not operate or store the panel where chemicals evaporate, or where chemicals are present in the air:

- Corrosive chemicals: Acids, alkalines, liquids containing salt.
- Flammable chemicals: Organic solvents.

 CAUTION
INOPERATIVE EQUIPMENT Do not allow water, liquids, metal, and wiring fragments to enter the panel case. Failure to follow these instructions can result in injury or equipment damage.

Structural Specifications

Grounding	Functional grounding: Grounding resistance of 100Ω , 2mm ² (AWG 14) or thicker wire, or your country's applicable standard. (Same for FG and SG terminals)
Cooling Method	Natural air circulation
Structure ^{*1}	IP65f NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure)
External Dimensions	W132 x H106 x D42 mm (W5.2 x H4.17 x D1.65 in.)
Panel Cut Dimensions	W118.5 x H92.5 mm (W4.67 x H3.64 in.) ^{*2} Panel thickness area: 1.6...5 mm (0.06...0.2 in) ^{*3}
Weight	0.4 kg (0.9 lb) or less (main unit only)

^{*1} The front face of the HMIGTO, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification. Even though the HMIGTO's level of resistance is equivalent to these standards, oils that should have no effect on the HMIGTO can possibly harm the panel. This can occur in areas where either vaporized oils are present, or where low viscosity cutting oils are allowed to adhere to the panel for long periods of time. If the panel's front face protection sheet peels off, these conditions can lead to the ingress of oil into the panel and separate protection measures are suggested.

Also, if non-approved oils are present, they may cause deformation or corrosion of the front panel's plastic cover. Therefore, prior to installing the panel, be sure to confirm the type of conditions that will be present in the panel's operating environment. If the installation gasket is used for a long period of time, or if the panel and its gasket are removed from the panel, the original level of protection cannot be kept. To maintain the original protection level, be sure to replace the installation gasket regularly.

^{*2} For dimensional tolerance, everything +1/-0 mm (+0.04/-0 in.) and R in angle are below R3 (R0.12 in.)

^{*3} Even if the installation wall thickness is within the recommended range for the "Panel Cut Dimensions", depending on wall's material, size, and installation location of the panel and other devices, the installation wall could warp. To prevent warping, the installation surface may need to be strengthened.

The front face of the panel, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification.

CAUTION

EQUIPMENT DAMAGE

Ensure that the panel is not in permanent and direct contact with oils.

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

NOTICE

STORAGE AND OPERATION OUTSIDE OF SPECIFICATIONS

- Store the panel in areas where temperatures are within the panel's specifications.
- Do not restrict or block the panel's rear-face ventilation slots.

Failure to follow these instructions can result in equipment damage.

NOTICE

GASKET AGING

- Inspect the gasket periodically as required by your operating environment to keep the initial IP level.
- Change the gasket at least once a year, or as soon as scratches or dirt become visible.

Failure to follow these instructions can result in equipment damage.

Display Specifications

		HMIGTO1310	HMIGTO1300
Display Type		TFT Color LCD	
Display Size		3.5"	
Resolution		320 x 240 pixels (QVGA)	
Effective Display Area		W70.56 x H52.92 mm (W2.78 x H2.08 in.)	
Display Colors		65,536 colors (No blink) / 16,384 colors (Blink)	
Backlight		White LED (Not user replaceable. When replacement is required, contact your local distributor.)	
Backlight Service Life		50,000 hours or more (continuous operation at 25 °C [77 °F] before backlight brightness decreased to 50%)	
Brightness Control		16 levels (Adjusted with touch panel or software)	
Language Fonts		ASCII: (Code page 850) Alphanumeric (including European characters) Chinese: (GB2312-80 codes) Simplified Chinese fonts Japanese (except for XBT GT1000 series): ANK 158, Kanji: 6,962 (JIS Standards 1 & 2) (including 607 non-kanji characters) Korean: (KSC5601 - 1992 codes) Hangul fonts Taiwanese: (Big 5 codes) Traditional Chinese fonts	
Character sizes		8 x 8, 8 x 16, 16 x 16 and 32 x 32 pixel fonts	
Font sizes		You can expand width up to 8 times, and expand height up to 8 times.* ¹	
Text	8 x 8 pixels	40 characters per row x 30 rows	
	8 x 16 pixels	40 characters per row x 15 rows	
	16 x 16 pixels	20 characters per row x 15 rows	
	32 x 32 pixels	10 characters per row x 7 rows	

*¹ You can set up other font sizes using the software.

Memory, Clock, Touch Panel and Function Switches

Memory

	HMIGTO1310	HMIGTO1300
Application Memory *1	FLASH EPROM 96 MB	FLASH EPROM 64 MB
Application run DRAM	128 MB	128 MB
Data Backup	SRAM 512 KB (Rechargeable lithium battery for data backup)	SRAM 128 KB (Rechargeable lithium battery for data backup)

*1 Capacity available for user application.

NOTE:

- When the message "Battery level is low" is displayed, supply power to the panel and fully charge the battery. In 24 hours the battery charges to a level that allows backup operation. Completing a full charge requires about 120 hours (5 days).
- The lifetime of the rechargeable lithium battery is 10 years when the battery's ambient temperature is 40 °C (104 °F) or less, 4.1 years when the battery's ambient temperature is 50 °C (122 °F) or less, and 1.5 years when the battery's ambient temperature is 60 °C (140 °F) or less.

When used for backup:

Approximately 100 days with a fully charged battery.

Approximately 6 days with a half-charged battery.

Clock

Clock Accuracy*1	±65 seconds/month (deviation at room temperature and power is OFF).

*1 Depending on the operating temperature and age of panel, the clock can deviate from -380 to +90 sec/month. For systems where this level of precision is insufficient, the user should monitor and make adjustments when required.

NOTE:

- When the message "Battery level is low" is displayed, supply power to the panel and fully charge the battery. In 24 hours the battery charges to a level that allows backup operation. Completing a full charge requires about 120 hours (5 days).
- The lifetime of the rechargeable lithium battery is 10 years when the battery's ambient temperature is 40 °C (104 °F) or less, 4.1 years when the battery's ambient temperature is 50 °C (122 °F) or less, and 1.5 years when the battery's ambient temperature is 60 °C (140 °F) or less.

When used for backup:

Approximately 100 days with a fully charged battery.

Approximately 6 days with a half-charged battery.

Touch Panel

Touch Panel Type	Resistive Film (analog)
Touch Panel Resolution	1,024 x 1,024
Touch Panel Service Life	1 million times or more

Function Switches

Six switches (F1 to F6).

Interface Specifications

Serial Interface COM1

	HMIGTO1310	HMIGTO1300
Asynchronous Transmission	RS-232C / RS-485	RS-232C
Data Length	7 or 8 bits	
Stop Bit	1 or 2 bits	
Parity	None, odd or even	
Data Transmission Speed	2,400...115,200 bps, 187,500 bps (MPI)	2,400...115,200 bps
Connector	Modular jack (RJ-45)	D-Sub 9 pin (plug)

Serial Interface COM2

	HMIGTO1300
Asynchronous Transmission	RS-485
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps, 187,500 bps (MPI)
Connector	Modular jack (RJ-45)

USB Interface

	USB (Type A) Interface	USB (mini-B) Interface
Connector	USB 2.0 (Type A) x 1	USB 2.0 (mini-B) x 1
Power Supply Voltage	5 Vdc $\pm$ 5%	-
Maximum Current Supplied	500 mA	-
Maximum Transmission Distance	5 m (16.4 ft)	

Ethernet Interface

	HMIGTO1310
Ethernet (LAN)	IEEE802.3i / IEEE802.3u, 10BASE-T/100BASE-TX
Connector	Modular jack (RJ45) x 1

NOTE: HMIGTO1300 does not have an Ethernet interface.

Specifications of Serial Interface COM1

Introduction

⚠ CAUTION

LOSS OF POWER

- Make sure all connections to the communication ports on the bottom and sides of the panel do not put excessive stress on the ports.
- Securely attach communication cables to the panel or cabinet.
- Use only D-Sub 9 pin cables with a locking system in good condition.

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

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

⚠ ⚠ DANGER

ELECTRIC SHOCK

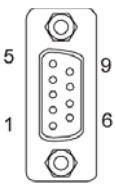
When using the SG terminal to connect an external device to the panel:

- Verify that a short-circuit loop is not created when you set up the system.
- For HMIGTO1300, connect the #5 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #5 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.
- For HMIGTO1310, connect the #8 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #8 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM1

HMIGTO1300: D-Sub 9 pin plug connector via an RS-232C cable.

Pin Connection	Pin No.	RS-232C		
		Signal Name	Direction	Meaning
 (Magelis GTO side)	1	CD	Input	Carrier Detect
	2	RD(RXD)	Input	Receive Data
	3	SD(TXD)	Output	Send Data
	4	ER(DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR(DSR)	Input	Data Set Ready
	7	RS(RTS)	Output	Request to Send
	8	CS(CTS)	Input	Send possible
	9	CI(RI)/VCC	Input/-	Called Status Display +5V±5% Output 0.25A
	Shell	FG	-	Frame Ground (Common with SG)

You can switch pin #9 between RI and VCC via software.

NOTICE

EQUIPMENT DAMAGE

Use only the rated current.

Failure to follow these instructions can result in equipment damage.

Interfit bracket is #4-40 (UNC).

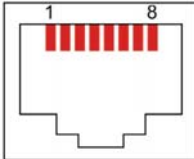
⚠ CAUTION

LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only D-Sub 9 pin cables with a locking tab in good condition.

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

HMIGTO1310: RJ-45 connector via an RS-232C or RS-485 cable.

Pin Connection	Pin No.	RS-232C/RS-485		
		Signal Name	Direction	Meaning
	1	RD(RXD)	Input	Receive Data (RS-232C)
	2	SD(TXD)	Output	Send Data (RS-232C)
	3	NC	–	–
	4	D1	Input/Output	Transfer Data (RS-485)
	5	D0	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request to Send
	7	NC	–	–
	8	SG	–	Signal Ground
	Shell	FG	–	Frame Ground (Common with SG)

⚠ CAUTION

LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only RJ45 with a locking tab in good condition.

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

Specifications of Serial Interface COM2

Introduction

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

DANGER

ELECTRIC SHOCK

When using the SG terminal to connect an external device to the panel:

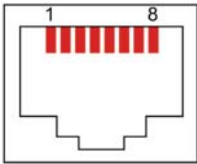
- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #8 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #8 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM2

HMIGTO1300: RJ-45 connector via an RS-485 cable

NOTE: When setting up RS-485 communication, the cable diagram for some equipment may require polarization on the terminal side. This terminal does not require any special setting as it handles polarization automatically.

Pin Connection	Pin No.	RS-485		
		Signal Name	Direction	Meaning
	1	NC	–	–
	2	NC	–	–
	3	NC	–	–
	4	Line A	Input/Output	Transfer Data (RS-485)
	5	Line B	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request to Send
	7	NC	–	–
	8	SG	–	Signal Ground

CAUTION

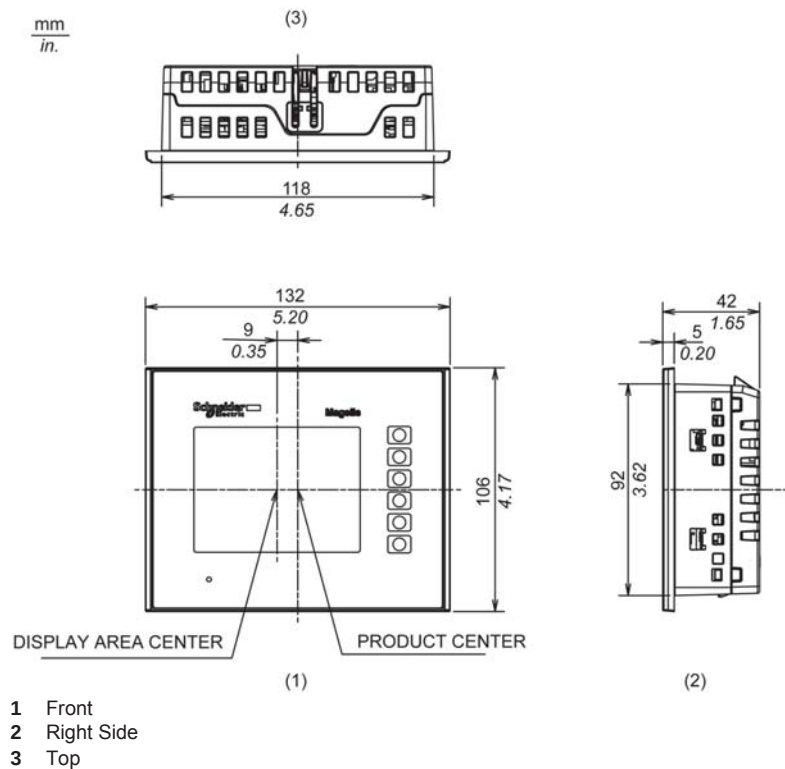
LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only RJ45 with a locking tab in good condition.

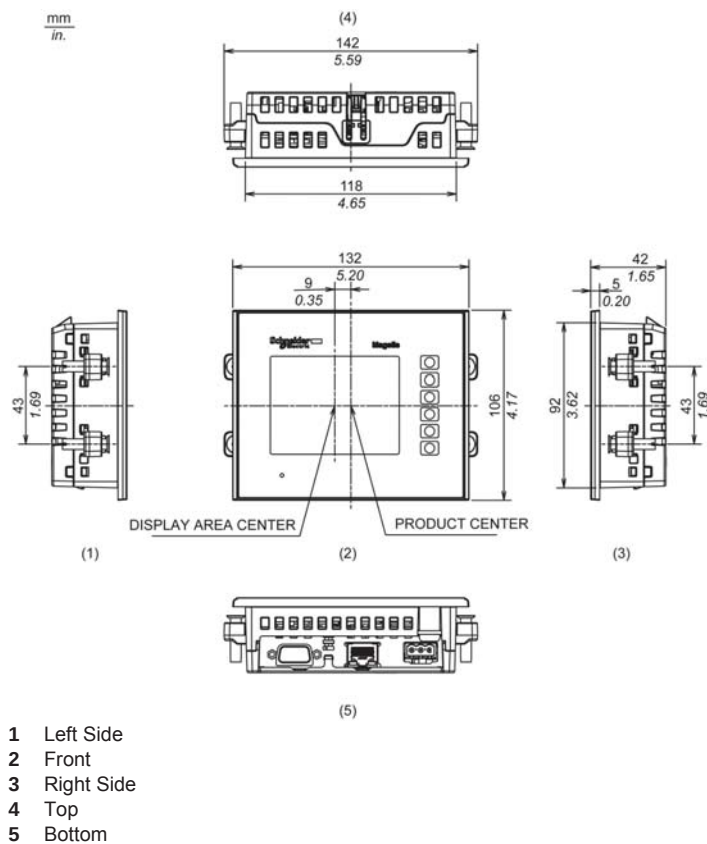
Failure to follow these instructions can result in injury or equipment damage.

Dimensions

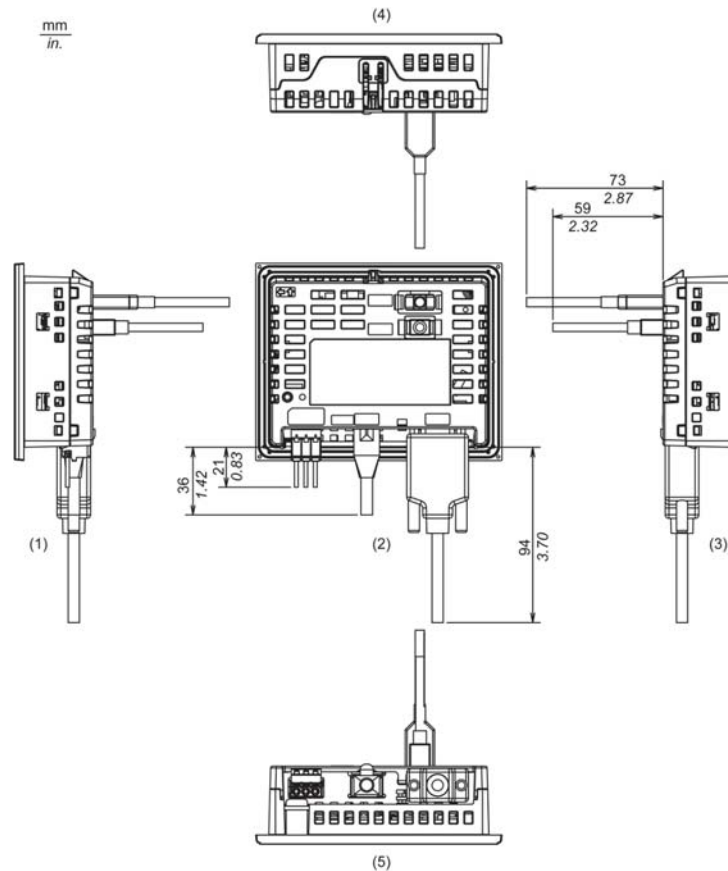
External Dimensions



Installation with Installation Fasteners



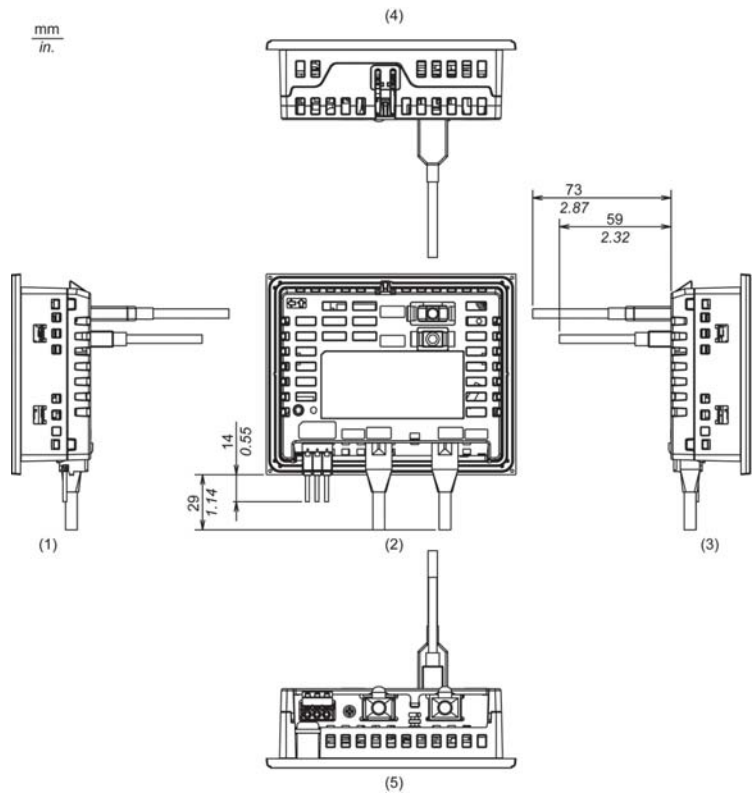
Dimensions with Cables: HMIGTO1300



- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Dimensions with Cables: HMIGTO1310

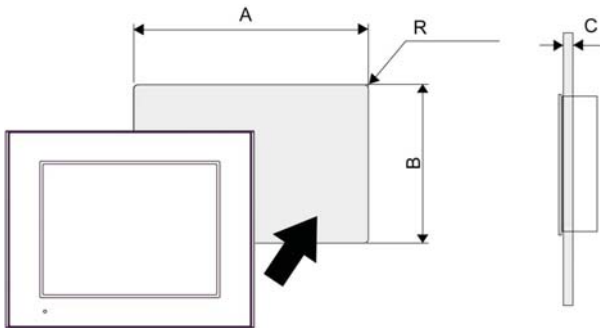


- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Panel Cut Dimensions

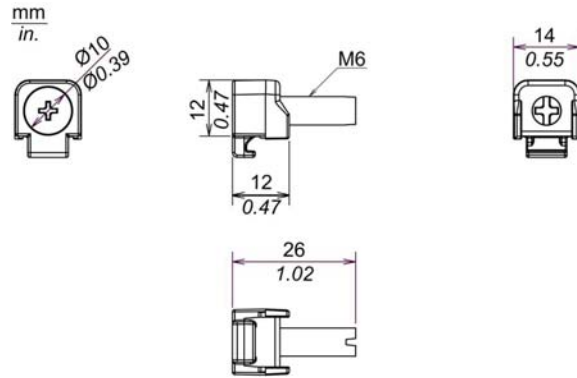
Create a panel cut and insert the panel into the opening from the front.



A	B	C	R
118.5 mm (+1, -0 mm) (4.67 in. [+0.04, -0 in.])	92.5 mm (+1, -0 mm) (3.64 in. [+0.04, -0 in.])	1.6...5 mm (0.06...0.2 in)	3 mm (0.12 in.) maximum

NOTE: Before designing the panel cut, refer to Installation ([see page 120](#)).

Installation Fastener Dimensions



Section 4.2

HMIGTO2300/2310/2315

What Is in This Section?

This section contains the following topics:

Topic	Page
Electrical Specifications	51
Environmental Specifications	52
Structural Specifications	53
Display Specifications	55
Memory, Clock, and Touch Panel	56
Interface Specifications	57
Specifications of Serial Interface COM1	58
Specifications of Serial Interface COM2	60
Dimensions	61

Electrical Specifications

Power Supply	Rated Input Voltage		24 Vdc
	Input Voltage Limits		19.2...28.8 Vdc
	Voltage Drop		5 ms or less
	Power Consumption		10.5 W or less
		When power is not supplied to external devices	6.5 W or less
		Backlight OFF (Standby Mode)	4.5 W or less
		Backlight Dimmed (Brightness: 20%)	5 W or less
		In-Rush Current	30 A or less
Voltage Endurance			1,000 Vac, 20 mA for 1 minute (between charging and FG terminals)
Insulation Resistance			500 Vdc, 10 MΩ or more (between charging and FG terminals)

Environmental Specifications

		HMIGTO2310 / HMIGTO2315	HMIGTO2300
Physical Environment	Surrounding Air Temperature	0...55 °C (32 °F...131 °F)	0...50 °C (32...122 °F)
	Storage Temperature	-20...60 °C (-4...140 °F)	
	Surrounding Air and Storage Humidity	10...90% RH (Non condensing, wet bulb temperature 39 °C [102.2 °F] or less)	
	Dust	0.1 mg/m ³ (10 ⁻⁷ oz/ft ³) or less (non-conductive levels)	
	Pollution Degree	For use in Pollution Degree 2 environment	
	Corrosive Gases	Free of corrosive gases	
	Atmospheric Pressure (Operating Altitude)	800...1,114 hPa (2,000 m [6,561 ft] or lower)	
Mechanical Environment	Vibration Resistance	IEC/EN 61131-2 compliant 5...9 Hz Single amplitude 3.5 mm (0.14 in.) 9...150 Hz Fixed acceleration: 9.8 m/s ² X, Y, Z directions for 10 cycles (approx. 100 min)	
	Concussion Resistance	IEC/EN 61131-2 compliant 147 m/s ² , X, Y, Z directions for 3 times	
Electrical Environment	Noise Immunity	Noise Voltage: 1,000 Vp-p Pulse Width: 1 µs Rise Time: 1 ns	
	Electrostatic Discharge Immunity	Contact Discharge Method: 6 kV (IEC/EN 61000-4-2 Level 3)	

Air quality requirements

Do not operate or store the panel where chemicals evaporate, or where chemicals are present in the air:

- Corrosive chemicals: Acids, alkalines, liquids containing salt.
- Flammable chemicals: Organic solvents.

CAUTION

INOPERATIVE EQUIPMENT

Do not allow water, liquids, metal, and wiring fragments to enter the panel case.

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

Structural Specifications

	HMIGTO2300/HMIGTO2310	HMIGTO2315
Grounding	Functional grounding: Grounding resistance of 100Ω, 2mm ² (AWG 14) or thicker wire, or your country's applicable standard. (Same for FG and SG terminals)	
Cooling Method	Natural air circulation	
Structure ^{*1}	IP65f NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure)	IP66k NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure) ^{*2}
External Dimensions	W169.5 x H137 x D59.5 mm (W6.67 x H5.39 x D2.34 in.)	W213.5 x H181 x D59.5 mm (W8.41 x H7.13 x D2.34 in.)
Panel Cut Dimensions	W156 x H123.5 mm (W6.14 x H4.86 in.) ^{*3} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*4}	W195 x H162.5 mm (W7.68 x H6.40 in.) ^{*3} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*4}
Weight	0.8 kg (1.8 lbs) or less (main unit only)	1.2 kg (2.6 lbs) or less (main unit only)

NOTE: ^{*1} The front face of the HMIGTO, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification. Even though the HMIGTO's level of resistance is equivalent to these standards, oils that should have no effect on the HMIGTO can possibly harm the panel. This can occur in areas where either vaporized oils are present, or where low viscosity cutting oils are allowed to adhere to the panel for long periods of time. If the panel's front face protection sheet peels off, these conditions can lead to the ingress of oil into the panel and separate protection measures are suggested.

Also, if non-approved oils are present, they may cause deformation or corrosion of the front panel's plastic cover. Therefore, prior to installing the panel, be sure to confirm the type of conditions that will be present in the panel's operating environment. If the installation gasket is used for a long period of time, or if the panel and its gasket are removed from the panel, the original level of protection cannot be kept. To maintain the original protection level, be sure to replace the installation gasket regularly.

^{*2} When installing the HMIGTO in a panel, you may not be able to mount the HMIGTO flush with the panel. This occurs due to the thickness of the gasket. The difference in level between the HMIGTO and panel depends on how much the gasket is compressed.

NOTICE

EQUIPMENT DAMAGE

For food and beverage and pharmaceutical industries, when the HMIGTO is not flush with panel, use silicon to form a seal to prevent water, chemicals, or food from lodging into place. Otherwise, the panel face could leak.

Failure to follow these instructions can result in equipment damage.

^{*3} For dimensional tolerance, everything +1/-0 mm (+0.04/-0 in.) and R in angle are below R3 (R0.12 in.)

^{*4} Even if the installation wall thickness is within the recommended range for the "Panel Cut Dimensions", depending on wall's material, size, and installation location of the panel and other devices, the installation wall could warp. To prevent warping, the installation surface may need to be strengthened.

CAUTION

EQUIPMENT DAMAGE

Ensure that the panel is not in permanent and direct contact with oils.

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

NOTICE

STORAGE AND OPERATION OUTSIDE OF SPECIFICATIONS

- Store the panel in areas where temperatures are within the panel's specifications.
- Do not restrict or block the panel's rear-face ventilation slots.

Failure to follow these instructions can result in equipment damage.

NOTICE

GASKET AGING

- Inspect the gasket periodically as required by your operating environment to keep the initial IP level.
- Change the gasket at least once a year, or as soon as scratches or dirt become visible.

Failure to follow these instructions can result in equipment damage.

Display Specifications

Display Type		TFT Color LCD
Display Size		5.7"
Resolution (pixels)		320 x 240 pixels (QVGA)
Effective Display Area		W115.2 x H86.4 mm (W4.54 x H3.40 in.)
Display Colors		65,536 colors (No blink) / 16,384 colors (Blink)
Backlight		White LED (Not user replaceable. When replacement is required, contact your local distributor.)
Backlight Service Life		50,000 hours or more (continuous operation at 25 °C [77 °F] before backlight decreases to 50%.)
Brightness Control		16 levels (Adjusted with touch panel or software)
Language Fonts		ASCII: (Code page 850) Alphanumeric (including European characters) Chinese: (GB2312-80 codes) Simplified Chinese fonts Japanese (except for XBT GT1000 series): ANK 158, Kanji: 6,962 (JIS Standards 1 & 2) (including 607 non-kanji characters) Korean: (KSC5601 - 1992 codes) Hangul fonts Taiwanese: (Big 5 codes) Traditional Chinese fonts
Character Sizes		8 x 8, 8 x 16, 16 x 16 and 32 x 32 pixel fonts
Font Sizes		You can expand the width up to 8 times, and expand the height up to 8 times. ^{*1}
Text	8 x 8 pixels	40 characters per row x 30 rows
	8 x 16 pixels	40 characters per row x 15 rows
	16 x 16 pixels	20 characters per row x 15 rows
	32 x 32 pixels	10 characters per row x 7 rows

^{*1} You can set up other font sizes using the software.

Memory, Clock, and Touch Panel

Memory

	HMIGTO2310 / HMIGTO2315	HMIGTO2300
Application Memory *1	FLASH EPROM 96 MB	FLASH EPROM 64 MB
Application run DRAM	128 MB	128 MB
Data Backup	SRAM 512 KB (Replaceable lithium battery for data backup)	SRAM 128 KB (Rechargeable lithium battery for data backup)

*1 Capacity available for user application.

NOTE:

- When the message "Battery level is low" is displayed on the HMIGTO2300, supply power to the panel and fully charge the battery. In 24 hours the battery charges to a level that allows backup operation. Completing a full charge requires about 120 hours (5 days).
- The lithium battery's lifetime is: 10 years when the battery's ambient temperature is 40 °C (104 °F) or less, 4.1 years when the battery's ambient temperature is 50 °C (122 °F) or less, and 1.5 years when the battery's ambient temperature is 60 °C (140 °F) or less.
When used for backup:
Approximately 100 days, with a fully charged battery.
Approximately 6 days, with a half-charged battery.

Clock

Clock Accuracy*1	±65 seconds/month (deviation at room temperature and power is OFF).

*1 Depending on the operating temperature and age of panel, the clock can deviate from -380 to +90 sec/month. For systems where this level of precision is insufficient, the user should monitor and make adjustments when required.

NOTE:

- When the message "Battery level is low" is displayed on the HMIGTO2300, supply power to the panel and fully charge the battery. In 24 hours the battery charges to a level that allows backup operation. Completing a full charge requires about 120 hours (5 days).
- The lithium battery's lifetime is: 10 years when the battery's ambient temperature is 40 °C (104 °F) or less, 4.1 years when the battery's ambient temperature is 50 °C (122 °F) or less, and 1.5 years when the battery's ambient temperature is 60 °C (140 °F) or less.
When used for backup:
Approximately 100 days, with a fully charged battery.
Approximately 6 days, with a half-charged battery.

Touch Panel

Touch Panel Type	Resistive Film (analog)
Touch Panel Resolution	1,024 x 1,024
Touch Panel Service Life	1 million times or more

Interface Specifications

Serial Interface COM1

Asynchronous Transmission	RS-232C
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps
Connector	D-Sub 9 pin (plug)

Serial Interface COM2

Asynchronous Transmission	RS-485
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps, 187,500 bps (MPI)
Connector	Modular jack (RJ-45)

USB Interface

	USB (Type A) Interface	USB (mini-B) Interface
Connector	USB 2.0 (Type A) x 1	USB 2.0 (mini-B) x 1
Power Supply Voltage	5 Vdc $\pm 5\%$	-
Maximum Current Supplied	500 mA	-
Maximum Transmission Distance	5 m (16.4 ft)	

Ethernet Interface

	HMIGTO2310 / HMIGTO2315
Ethernet (LAN)	IEEE802.3i / IEEE802.3u, 10BASE-T/100BASE-TX
Connector	Modular jack (RJ45) x 1

SD Card Interface

HMIGTO2310/HMIGTO2315: SD Card slot x 1 (maximum 32 GB SD/SDHC Card)

NOTE: HMIGTO2300 does not have an SD Card interface.

Specifications of Serial Interface COM1

Introduction

⚠ CAUTION

LOSS OF POWER

- Make sure all connections to the communication ports on the bottom and sides of the panel do not put excessive stress on the ports.
- Securely attach communication cables to the panel or cabinet.
- Use only D-Sub 9 pin cables with a locking system in good condition.

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

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

⚠ ⚠ DANGER

ELECTRIC SHOCK

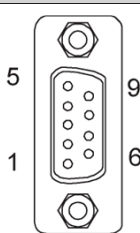
When using the SG terminal to connect an external device to the panel:

- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #5 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #5 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM1

HMIGTO2300 / HMIGTO2310/ HMIGTO2315: D-Sub 9 pin plug connector via an RS-232C cable.

Pin Connection	Pin No.	RS-232C		
		Signal Name	Direction	Meaning
 (Magelis GTO side)	1	CD	Input	Carrier Detect
	2	RD(RXD)	Input	Receive Data
	3	SD(TXD)	Output	Send Data
	4	ER(DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR(DSR)	Input	Data Set Ready
	7	RS(RTS)	Output	Request to Send
	8	CS(CTS)	Input	Send possible
	9	CI(RI)/VCC	Input/-	Called Status Display +5V±5% Output 0.25A ^{*1}
	Shell	FG	-	Frame Ground (Common with SG)

NOTE: ^{*1} You can switch pin #9 between RI and VCC via software.

NOTICE

EQUIPMENT DAMAGE

Use only the rated current.

Failure to follow these instructions can result in equipment damage.

Interfit bracket is #4-40 (UNC).

 CAUTION**LOSS OF COMMUNICATION**

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only D-Sub 9 pin cables with a locking tab in good condition.

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

Specifications of Serial Interface COM2

Introduction

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

DANGER

ELECTRIC SHOCK

When using the SG terminal to connect an external device to the panel:

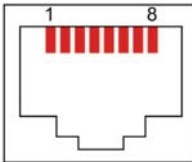
- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #8 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #8 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM2

HMIGTO2300 / HMIGTO2310/ HMIGTO2315: RJ45 connector via an RS-485 cable.

NOTE: When setting up RS-485 communication, the cable diagram for some equipment may require polarization on the terminal side. This terminal does not require any special setting as it handles polarization automatically.

Pin Connection	Pin No.	RS-422/RS-485		
		Signal Name	Direction	Meaning
	1	NC	-	-
	2	NC	-	-
	3	NC	-	-
	4	Line A	Input/Output	Transfer Data (RS-485)
	5	Line B	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request To Send
	7	NC	-	-
	8	SG	-	Signal Ground

CAUTION

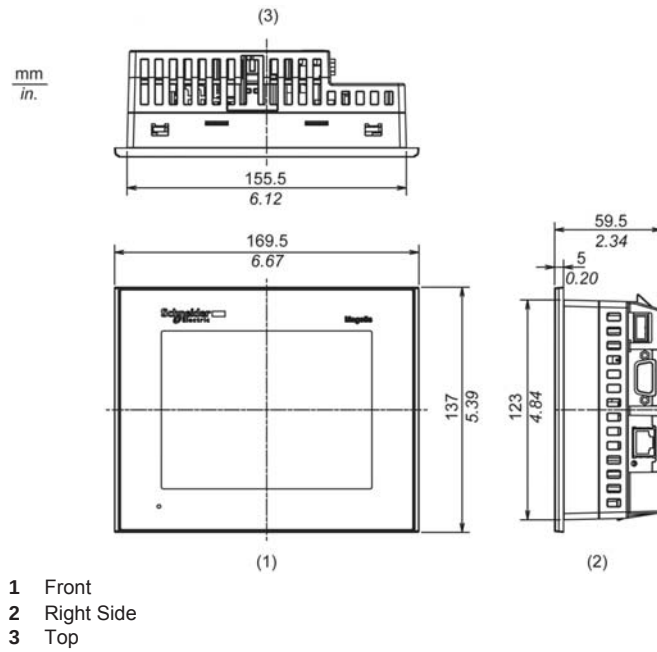
LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only RJ45 with a locking tab in good condition.

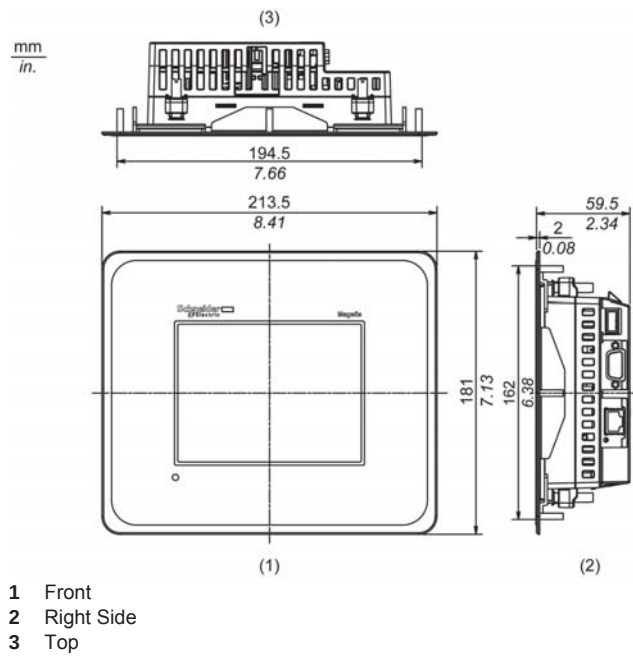
Failure to follow these instructions can result in injury or equipment damage.

Dimensions

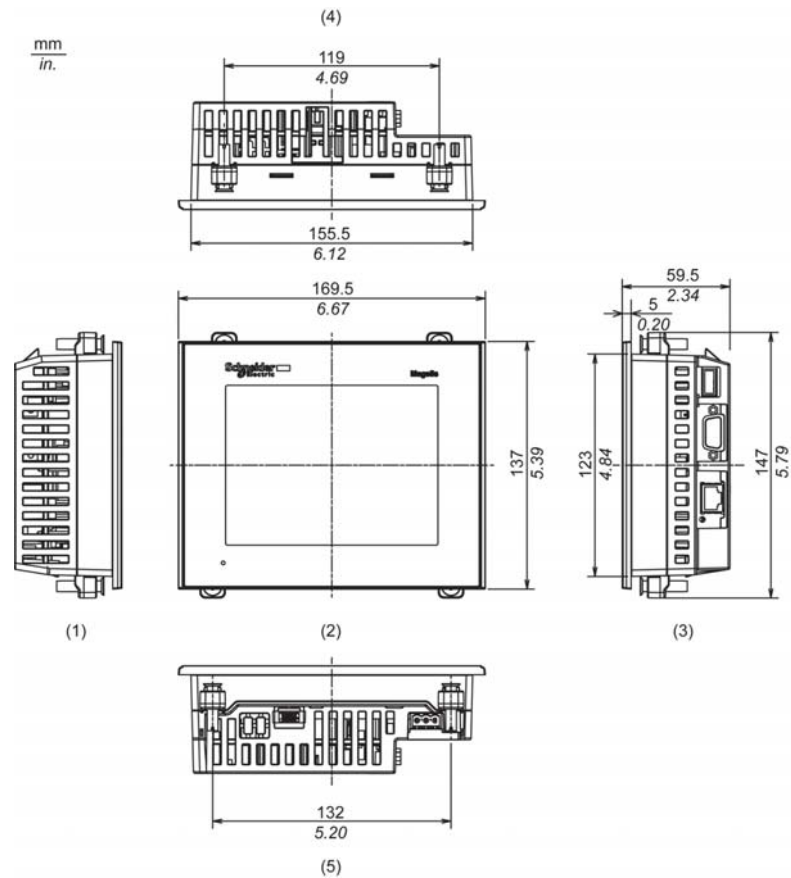
External Dimensions: HMIGTO2300/HMIGTO2310



External Dimensions: HMIGTO2315

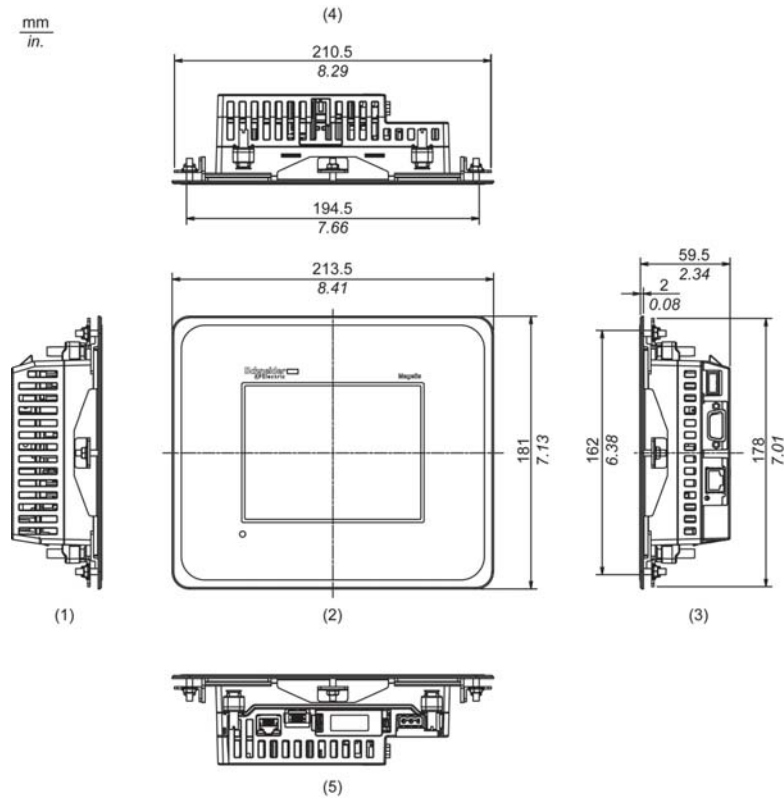


Installation with Installation Fasteners: HMIGTO2300/HMIGTO2310



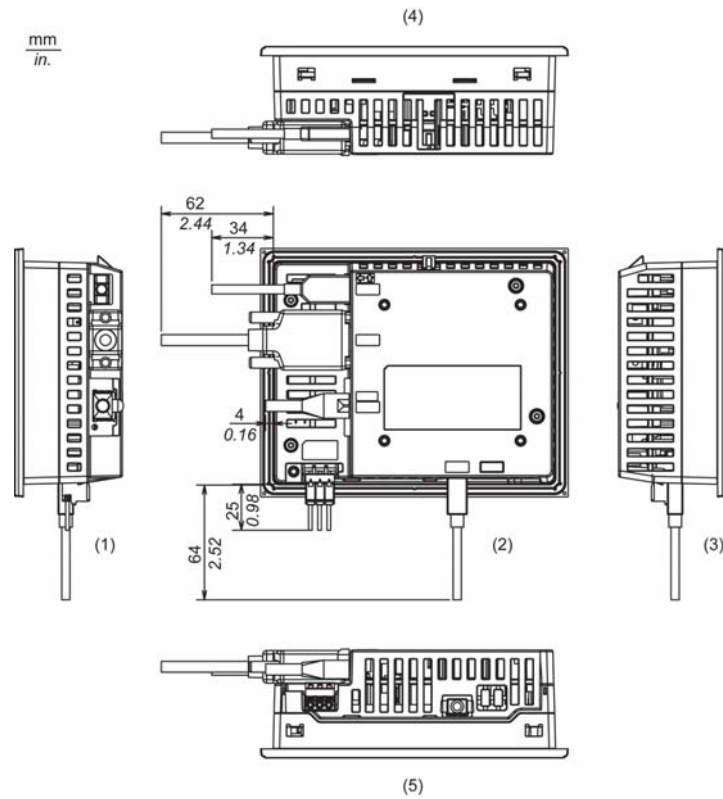
- 1 Left Side
- 2 Front
- 3 Right Side
- 4 Top
- 5 Bottom

Installation with Installation Fasteners: HMIGTO2315



- 1 Left Side
- 2 Front
- 3 Right Side
- 4 Top
- 5 Bottom

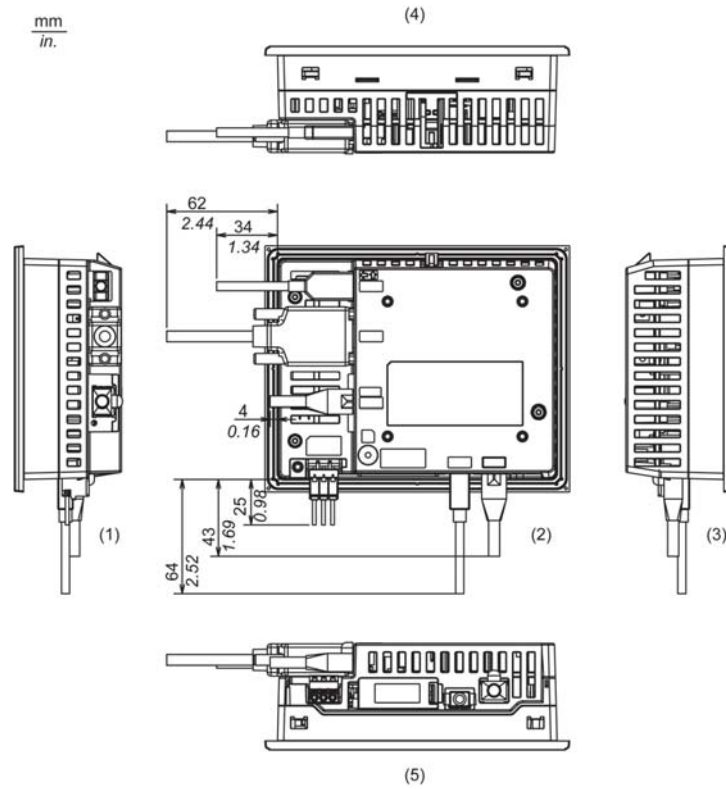
Dimensions with Cables: HMIGTO2300



- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

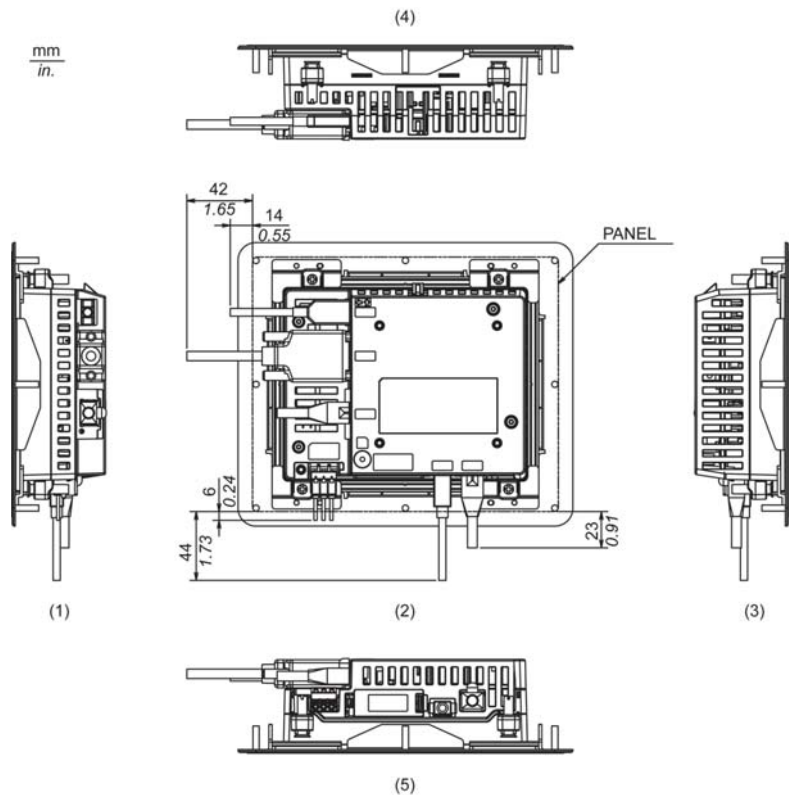
Dimensions with Cables: HMIGTO2310



- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Dimensions with Cables: HMIGTO2315

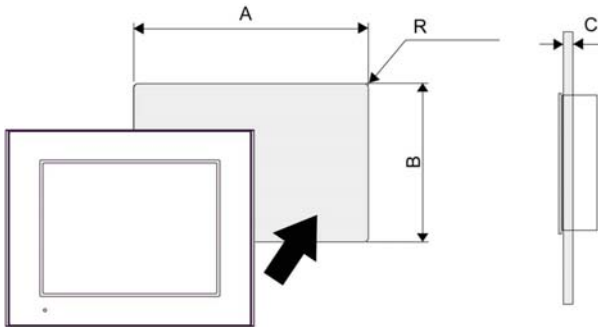


- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Panel Cut Dimensions

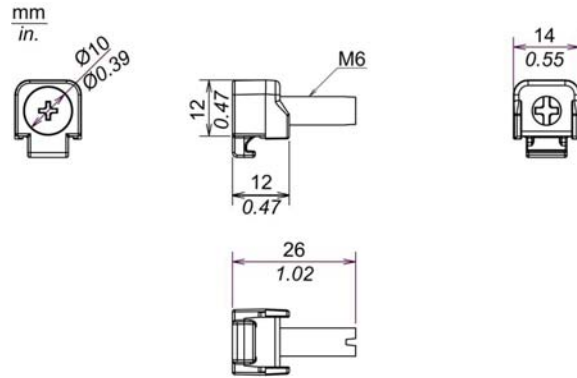
Create a panel cut and insert the panel into the opening from the front.



	A	B	C	R
HMIGTO2310 HMIGTO2300	156 mm (+1/-0) mm (6.14 in [+0.04, -0 in.])	123.5 mm (+1, -0 mm) (4.86 in [+0.04, -0 in.])	1.6...5 mm (0.06...0.2 in.)	3 mm (0.12 in.) maximum
HMIGTO2315	195 mm (+1/-0) mm (7.68 in [+0.04, -0in.])	162.5 mm (+1/-0) mm (6.40 in [+0.04, -0in.])		

NOTE: Before designing the panel cut, refer to Installation (see page 120).

Installation Fastener Dimensions



Section 4.3

HMIGTO3510/4310

What Is in This Section?

This section contains the following topics:

Topic	Page
Electrical Specifications	69
Environmental Specifications	70
Structural Specifications	71
Display Specifications	72
Memory, Clock, Touch Panel, and Function Switches	73
Interface Specifications	74
Specifications of Serial Interface COM1	75
Specifications of Serial Interface COM2	77
Dimensions	78

Electrical Specifications

Power Supply	Rated Input Voltage		24 Vdc
	Input Voltage Limits		19.2...28.8 Vdc
	Voltage Drop		5 ms or less
	Power Consumption		12 W or less
		When power is not supplied to external devices	8 W or less
		Backlight OFF (Standby Mode)	5 W or less
		Backlight Dimmed (Brightness: 20%)	5.5 W or less
	In-Rush Current		30 A or less
Voltage Endurance			1,000 Vac, 20 mA for 1 minute (between charging and FG terminals)
Insulation Resistance			500 Vdc, 10 MΩ or more (between charging and FG terminals)

Environmental Specifications

		HMIGTO4310	HMIGTO3510
Physical Environment	Surrounding Air Temperature	0...55 °C (32...131 °F)	0...50 °C (32...122 °F)
	Storage Temperature	-20...60 °C (-4...140 °F)	
	Surrounding Air and Storage Humidity	10...90% RH (Non condensing, wet bulb temperature 39 °C [102.2 °F] or less)	
	Dust	0.1 mg/m ³ (10 ⁻⁷ oz/ft ³) or less (non-conductive levels)	
	Pollution Degree	For use in Pollution Degree 2 environment	
	Corrosive Gases	Free of corrosive gases	
	Atmospheric pressure (Operating Altitude)	800...1,114 hPa (2,000 m [6,561 ft] or lower)	
Mechanical Environment	Vibration Resistance	IEC/EN 61131-2 5...9 Hz Single amplitude 3.5 mm (0.14 in.) 9...150 Hz Fixed acceleration: 9.8 m/s ² X, Y, Z directions for 10 cycles (approx. 100 min)	
	Concussion Resistance	IEC/EN 61131-2 compliant 147 m/s ² , X, Y, Z directions for 3 times	
Electrical Environment	Noise Immunity	Noise Voltage: 1,000 Vp-p Pulse Width: 1 µs Rise Time: 1 ns	
	Electrostatic Discharge Immunity	Contact Discharge Method: 6 kV (IEC/EN 61000-4-2 Level 3)	

Air quality requirements

Do not operate or store the panel where chemicals evaporate, or where chemicals are present in the air:

- Corrosive chemicals: Acids, alkalines, liquids containing salt.
- Flammable chemicals: Organic solvents.

CAUTION

INOPERATIVE EQUIPMENT

Do not allow water, liquids, metal, and wiring fragments to enter the panel case.

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

Structural Specifications

Grounding	Functional grounding: Grounding resistance of 100 Ω , 2 mm ² (AWG 14) or thicker wire, or your country's applicable standard. (Same for FG and SG terminals)
Cooling Method	Natural air circulation
Structure ^{*1}	IP65f NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure)
External Dimensions	W218 x H173 x D60 mm (W8.58 x H6.81 x D2.36 in.)
Panel Cut Dimensions	W204.5 x H159.5 mm (W8.05 x H6.28 in.) ^{*2} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*3}
Weight	1.2 kg (2.6 lb) or less (main unit only)

NOTE: ^{*1} The front face of the HMIGTO, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification. Even though the HMIGTO's level of resistance is equivalent to these standards, oils that should have no effect on the HMIGTO can possibly harm the panel. This can occur in areas where either vaporized oils are present, or where low viscosity cutting oils are allowed to adhere to the panel for long periods of time. If the panel's front face protection sheet peels off, these conditions can lead to the ingress of oil into the panel and separate protection measures are suggested.

Also, if non-approved oils are present, they may cause deformation or corrosion of the front panel's plastic cover. Therefore, prior to installing the HMIGTO, be sure to confirm the type of conditions that will be present in the panel's operating environment. If the installation gasket is used for a long period of time, or if the HMIGTO and its gasket are removed from the panel, the original level of protection cannot be kept. To maintain the original protection level, be sure to replace the installation gasket regularly.

^{*2} For dimensional tolerance, everything +1/-0 mm (+0.04/-0 in.) and R in angle are below R3 (R0.12 in.)

^{*3} Even if the installation wall thickness is within the recommended range for the "Panel Cut Dimensions", depending on wall's material, size, and installation location of the panel and other devices, the installation wall could warp. To prevent warping, the installation surface may need to be strengthened.

CAUTION

EQUIPMENT DAMAGE

Ensure that the panel is not in permanent and direct contact with oils.

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

NOTICE

STORAGE AND OPERATION OUTSIDE OF SPECIFICATIONS

- Store the panel in areas where temperatures are within the panel's specifications.
- Do not restrict or block the panel's rear-face ventilation slots.

Failure to follow these instructions can result in equipment damage.

NOTICE

GASKET AGING

- Inspect the gasket periodically as required by your operating environment to keep the initial IP level.
- Change the gasket at least once a year, or as soon as scratches or dirt become visible.

Failure to follow these instructions can result in equipment damage.

Display Specifications

		HMIGTO4310	HMIGTO3510
Display Type		TFT Color LCD	
Display Size		7.5"	7.0"
Resolution		640 x 480 pixels (VGA)	800 x 480 pixels (WVGA)
Effective Display Area		W153.7 x H115.8 mm (W6.05 x H4.56 in.)	W152.4 x H91.44 mm (W6.0 x H3.6 in.)
Display Colors		65,536 colors (No blink) / 16,384 colors Blink)	
Backlight		White LED (Not user replaceable. When replacement is required, contact your local distributor.)	
Backlight Service Life		50,000 hours or more (continuous operation at 25 °C [77 °F] before backlight brightness decreases to 50%)	
Brightness Control		16 levels (Adjusted with touch panel or software)	
Language Fonts		ASCII: (Code page 850) Alphanumeric (including European characters) Chinese: (GB2312-80 codes) Simplified Chinese fonts Japanese (except for XBT GT1000 series): ANK 158, Kanji: 6,962 (JIS Standards 1 & 2) (including 607 non-kanji characters) Korean: (KSC5601 - 1992 codes) Hangul fonts Taiwanese: (Big 5 codes) Traditional Chinese fonts	
Character sizes		8 x 8, 8 x 16, 16 x 16 and 32 x 32 pixel fonts	
Font sizes		You can expand the width up to 8 times, and expand the height up to 8 times.*1	
Text	8 x 8 pixels	80 characters per row x 60 rows	100 characters per row x 60 rows
	8 x 16 pixels	80 characters per row x 30 rows	100 characters per row x 30 rows
	16 x 16 pixels	40 characters per row x 30 rows	50 characters per row x 30 rows
	32 x 32 pixels	20 characters per row x 15 rows	25 characters per row x 15 rows

*1 You can set up other font sizes using the software.

Memory, Clock, Touch Panel, and Function Switches

Memory

	HMIGTO4310	HMIGTO3510
Application Memory *1	FLASH EPROM 96 MB	FLASH EPROM 96 MB
Application run DRAM	128 MB	128 MB
Data Backup	SRAM 512 KB (Replaceable lithium battery for data backup)	SRAM 128 KB (Replaceable lithium battery for data backup)

*1 Capacity available for user application.

NOTE:

- When the message "Battery level is low" is displayed, supply power to the panel and fully charge the battery.

Clock

Clock Accuracy*1	±65 seconds/month (deviation at room temperature and power is OFF).

*1 Depending on the operating temperature and age of panel, the clock can deviate from -380 to +90 sec/month. For systems where this level of precision is insufficient, the user should monitor and make adjustments when required.

Touch Panel

Touch Panel Type	Resistive Film (analog)
Touch Panel Resolution	1,024 x 1,024
Touch Panel Service Life	1 million times or more

Function Switches

HMIGTO3510: Eight switches (F1 to F8).

Interface Specifications

Serial Interface COM1

Asynchronous Transmission	RS-232C
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps
Connector	D-Sub 9 pin (plug)

Serial Interface COM2

Asynchronous Transmission	RS-485
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps, 187,500 bps (MPI)
Connector	Modular jack (RJ-45)

USB Interface

	USB (Type A) Interface	USB (mini-B) Interface
Connector	USB 2.0 (Type A) x 1	USB 2.0 (mini-B) x 1
Power Supply Voltage	5 Vdc $\pm$ 5%	-
Maximum Current Supplied	500 mA	-
Maximum Transmission Distance	5 m (16.4 ft)	

Ethernet Interface

Ethernet (LAN)	IEEE802.3i / IEEE802.3u, 10BASE-T/100BASE-TX
Connector	Modular jack (RJ45) x 1

SD Card Interface

SD Card slot x 1 (maximum 32 GB SD/SDHC Card)

Specifications of Serial Interface COM1

Introduction

⚠ CAUTION

LOSS OF POWER

- Make sure all connections to the communication ports on the bottom and sides of the panel do not put excessive stress on the ports.
- Securely attach communication cables to the panel or cabinet.
- Use only D-Sub 9 pin cables with a locking system in good condition.

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

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

⚡⚠ DANGER

ELECTRIC SHOCK

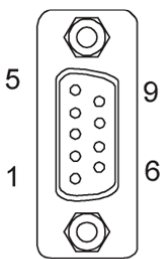
When using the SG terminal to connect an external device to the panel:

- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #5 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #5 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM1

HMIGTO3510 / HMIGTO4310: D-Sub 9 pin plug connector via an RS-232C cable.

Pin Connection	Pin No.	RS-232C		
		Signal Name	Direction	Meaning
 (Magelis GTO side)	1	CD	Input	Carrier Detect
	2	RD(RXD)	Input	Receive Data
	3	SD(TXD)	Output	Send Data
	4	ER(DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR(DSR)	Input	Data Set Ready
	7	RS(RTS)	Output	Request to Send
	8	CS(CTS)	Input	Send possible
	9	CI(RI)/VCC	Input/–	Called Status Display +5V±5% Output 0.25A ^{*1}
	Shell	FG	–	Frame Ground (Common with SG)

NOTE: ^{*1} You can switch pin #9 between RI and VCC via software.

NOTICE

EQUIPMENT DAMAGE

Use only the rated current.

Failure to follow these instructions can result in equipment damage.

Interfit bracket is #4-40 (UNC).

 CAUTION

LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only D-Sub 9 pin cables with a locking tab in good condition.

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

Specifications of Serial Interface COM2

Introduction

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

DANGER

ELECTRIC SHOCK

When using the SG terminal to connect an external device to the panel:

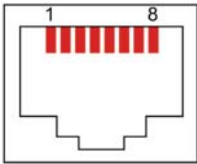
- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #8 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #8 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM2

HMIGTO3510 / HMIGTO4310: RJ45 connector via a RS-485 cable.

NOTE: When setting up RS-485 communication, the cable diagram for some equipment may require polarization on the terminal side. This terminal does not require any special setting as it handles polarization automatically.

Pin Connection	Pin No.	RS-485		
		Signal Name	Direction	Meaning
	1	NC	-	-
	2	NC	-	-
	3	NC	-	-
	4	Line A	Input/Output	Transfer Data (RS-485)
	5	Line B	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request To Send
	7	NC	-	-
	8	SG	-	Signal Ground

CAUTION

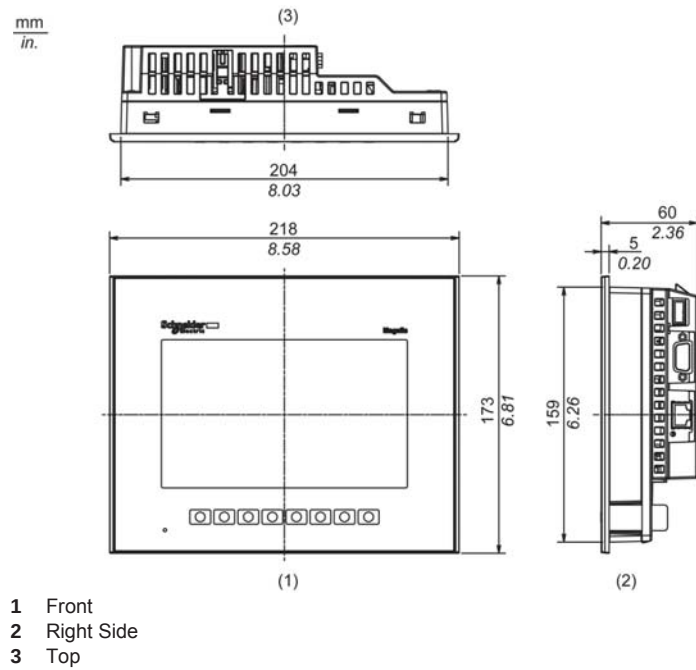
LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only RJ45 with a locking tab in good condition.

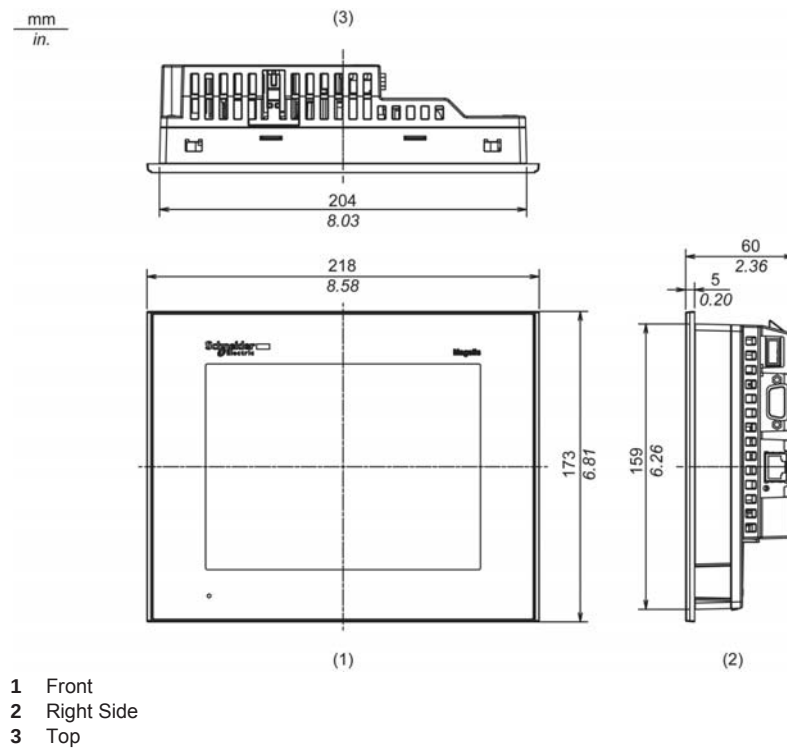
Failure to follow these instructions can result in injury or equipment damage.

Dimensions

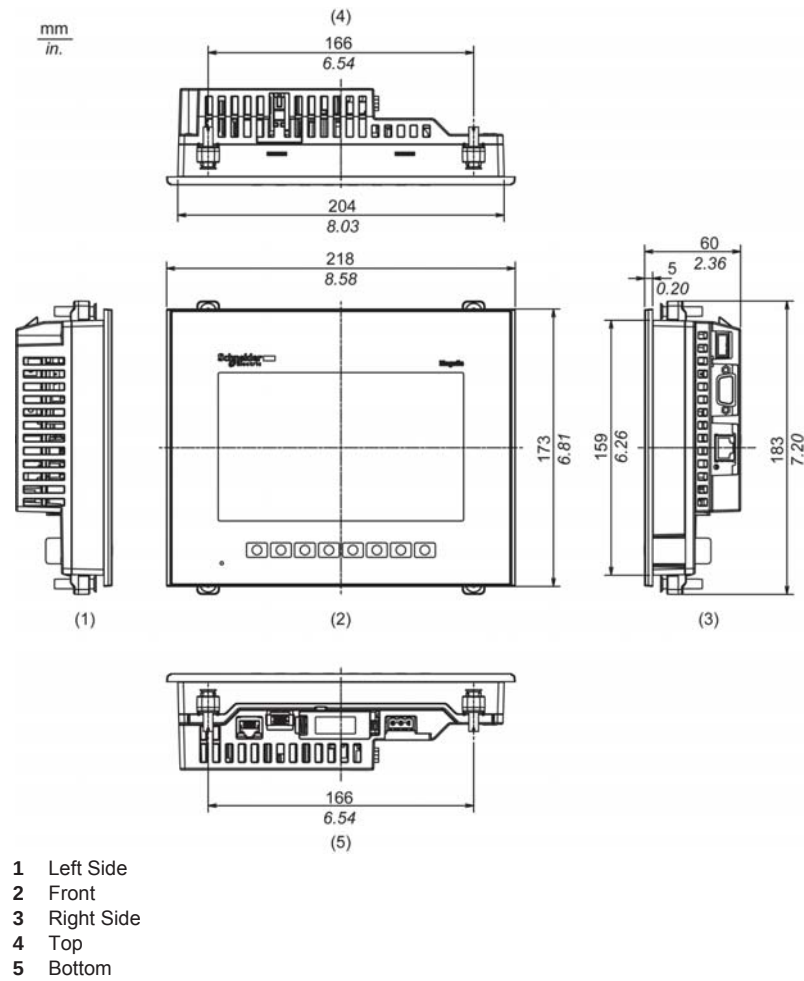
External Dimensions: HMIGTO3510



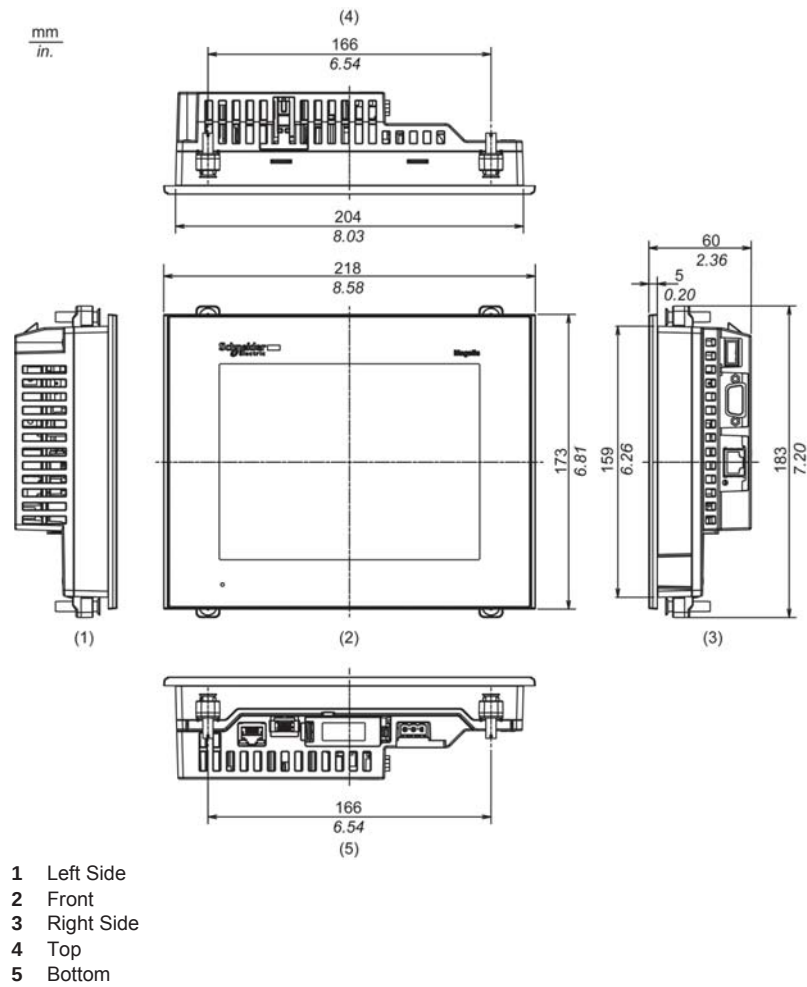
External Dimensions: HMIGTO4310



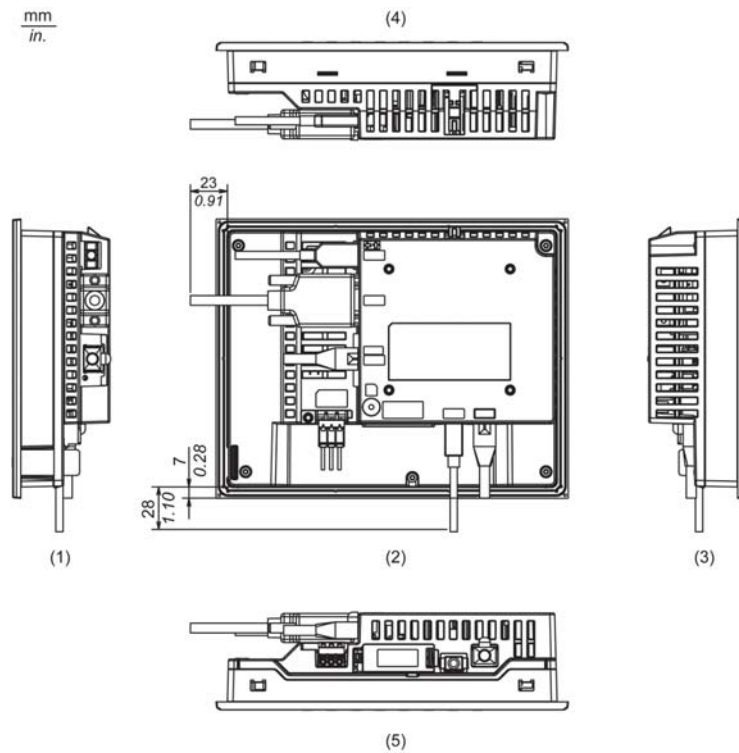
Installation with Installation Fasteners: HMIGTO3510



Installation with Installation Fasteners: HMIGTO4310



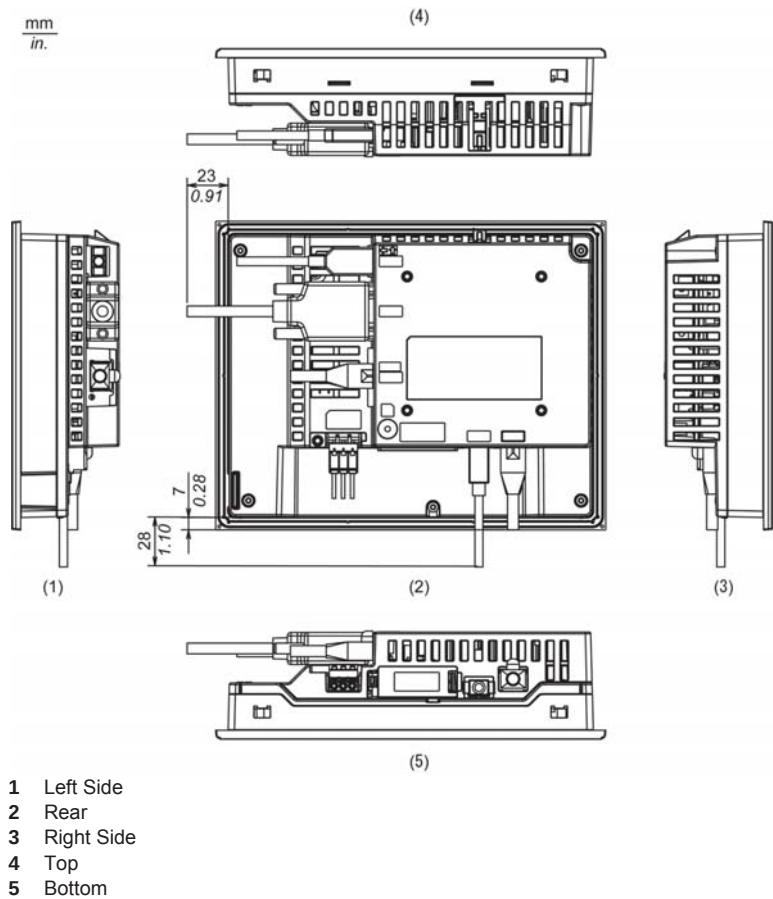
Dimensions with Cables: HMIGTO3510



- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

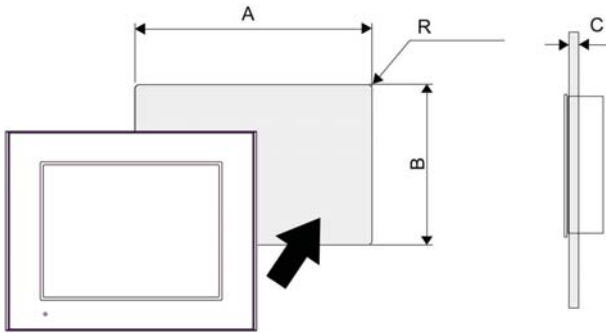
Dimensions with Cables: HMIGTO4310



NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Panel Cut Dimensions

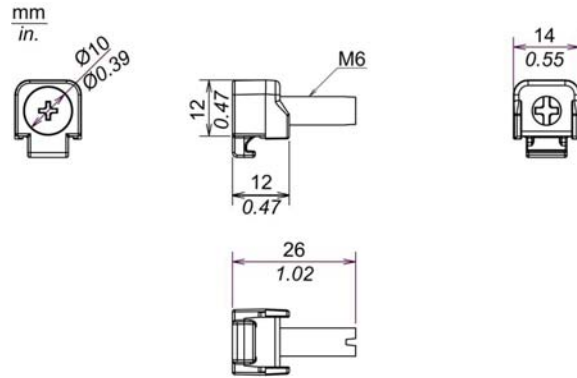
Create a panel cut and insert the panel into the opening from the front.



A	B	C	R
204.5 mm (+1, -0 mm) (8.05 in. [+0.04, -0 in.])	159.5 mm (+1, -0 mm) (6.28 in. [+0.04, -0 in.])	1.6...5 mm (0.06...0.2 in.)	3 mm (0.12 in.) maximum

NOTE: Before designing the panel cut, refer to Installation ([see page 120](#)).

Installation Fastener Dimensions



Section 4.4

HMIGTO5310/5315

What Is in This Section?

This section contains the following topics:

Topic	Page
Electrical Specifications	85
Environmental Specifications	86
Structural Specifications	87
Display Specifications	89
Memory, Clock, and Touch Panel	90
Interface Specifications	91
Specifications of Serial Interface COM1	92
Specifications of Serial Interface COM2	94
Dimensions	95

Electrical Specifications

Power Supply	Rated Input Voltage	24 Vdc
	Input Voltage Limits	19.2...28.8 Vdc
	Voltage Drop	10 ms or less
	Power Consumption	17 W or less
	When power is not supplied to external devices	12 W or less
	Backlight OFF (Standby Mode)	7 W or less
	Backlight Dimmed (Brightness: 20%)	8 W or less
	In-Rush Current	30 A or less
	Voltage Endurance	1500 Vac, 20 mA for 1 min. (between charging and FG terminals)
Insulation Resistance		500 Vdc, 10 MΩ or more (between charging and FG terminals)

Environmental Specifications

Physical Environment	Surrounding Air Temperature	0...55 °C (32...131 °F)
	Storage Temperature	-20...60 °C (-4...140 °F)
	Surrounding Air and Storage Humidity	10...90% RH (Non condensing, wet bulb temperature 39 °C [102.2 °F] or less)
	Dust	0.1 mg/m ³ (10 ⁻⁷ oz/ft ³) or less (non-conductive levels)
	Pollution Degree	For use in Pollution Degree 2 environment
	Corrosive Gases	Free of corrosive gases
	Atmospheric Pressure (Operating Altitude)	800...1,114 hPa (2,000 m [6,561 ft] or lower)
Mechanical Environment	Vibration Resistance	IEC/EN 61131-2 compliant 5...9 Hz Single amplitude 3.5 mm (0.14 in.) 9...150 Hz Fixed acceleration: 9.8 m/s ² X, Y, Z directions for 10 cycles (approx. 100 min.)
	Concussion Resistance	IEC/EN 61131-2 compliant 147 m/s ² , X, Y, Z directions for 3 times
Electrical Environment	Noise Immunity	Noise Voltage: 1,000 Vp-p Pulse Width: 1 µs Rise Time: 1 ns
	Electrostatic Discharge Immunity	Contact Discharge Method: 6 kV (IEC/EN 61000-4-2 Level 3)

Air quality requirements

Do not operate or store the panel where chemicals evaporate, or where chemicals are present in the air:

- Corrosive chemicals: Acids, alkalines, liquids containing salt.
- Flammable chemicals: Organic solvents.

CAUTION

INOPERATIVE EQUIPMENT

Do not allow water, liquids, metal, and wiring fragments to enter the panel case.

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

Structural Specifications

	HMIGTO5310	HMIGTO5315
Grounding	Functional grounding: Grounding resistance of 100Ω, 2mm ² (AWG 14) or thicker wire, or your country's applicable standard. (Same for FG and SG terminals)	
Cooling Method	Natural air circulation	
Structure ^{*1}	IP65f NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure)	IP66k NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure) ^{*2}
External Dimensions	W272.5 x H214.5 x D57 mm (W10.73 x H8.44 x D2.24 in.)	W316.5 x H258.5 x D57 mm (W12.44 x H10.18 x D2.24 in.)
Panel Cut Dimensions	W259 x H201 mm (W10.2 x H7.91 in.) ^{*3} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*4}	W298 x H240 mm (W11.73 x H9.45 in.) ^{*3} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*4}
Weight	2.0 kg (4.4 lb) or less (main unit only)	2.5 kg (5.5 lb) or less (main unit only)

NOTE: ^{*1} The front face of the HMIGTO, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification. Even though the HMIGTO's level of resistance is equivalent to these standards, oils that should have no effect on the HMIGTO can possibly harm the panel. This can occur in areas where either vaporized oils are present, or where low viscosity cutting oils are allowed to adhere to the panel for long periods of time. If the panel's front face protection sheet peels off, these conditions can lead to the ingress of oil into the panel and separate protection measures are suggested.

Also, if non-approved oils are present, they may cause deformation or corrosion of the front panel's plastic cover. Therefore, prior to installing the HMIGTO, be sure to confirm the type of conditions that will be present in the panel's operating environment. If the installation gasket is used for a long period of time, or if the HMIGTO and its gasket are removed from the panel, the original level of protection cannot be kept. To maintain the original protection level, be sure to replace the installation gasket regularly.

^{*2} When installing the HMIGTO in a panel, you may not be able to mount the HMIGTO flush with the panel. This occurs due to the thickness of the gasket. The difference in level between the HMIGTO and panel depends on how much the gasket is compressed.

NOTICE

EQUIPMENT DAMAGE

For food and beverage and pharmaceutical industries, when the HMIGTO is not flush with panel, use silicon to form a seal to prevent water, chemicals, or food from lodging into place. Otherwise, the panel face could leak.

Failure to follow these instructions can result in equipment damage.

^{*3} For dimensional tolerance, everything +1/-0 mm (+0.04/-0 in.) and R in angle are below R3 (R0.12 in.)

^{*4} Even if the installation wall thickness is within the recommended range for the "Panel Cut Dimensions", depending on wall's material, size, and installation location of the panel and other devices, the installation wall could warp. To prevent warping, the installation surface may need to be strengthened.

CAUTION

EQUIPMENT DAMAGE

Ensure that the panel is not in permanent and direct contact with oils.

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

NOTICE

STORAGE AND OPERATION OUTSIDE OF SPECIFICATIONS

- Store the panel in areas where temperatures are within the panel's specifications.
- Do not restrict or block the panel's rear-face ventilation slots.

Failure to follow these instructions can result in equipment damage.

NOTICE

GASKET AGING

- Inspect the gasket periodically as required by your operating environment to keep the initial IP level.
- Change the gasket at least once a year, or as soon as scratches or dirt become visible.

Failure to follow these instructions can result in equipment damage.

Display Specifications

Display Type		TFT Color LCD
Display Size		10.4"
Resolution		640 x 480 pixels (VGA)
Effective Display Area		W211.2 x H158.4 mm (8.31 x 6.24 in.)
Display Colors		65,536 colors (No blink) / 16,384 colors (Blink)
Backlight		White LED (Not user replaceable. When replacement is required, contract your local distributor.)
Backlight Service Life		50,000 hours or more (continuous operation at 25 °C [77 °F] before backlight brightness dimmed to 50%)
Brightness Control		16 levels (Adjusted with the touch panel or software)
Language Fonts		ASCII: (Code page 850) Alphanumeric (including European characters) Chinese: (GB2312-80 codes) Simplified Chinese fonts Japanese: ANK 158, Kanji: 6,962 (JIS Standards 1 & 2) (including 607 non-kanji characters) Korean: (KSC5601 - 1992 codes) Hangul fonts Taiwanese: (Big 5 codes) Traditional Chinese fonts
Character Sizes		8 x 8, 8 x 16, 16 x 16 and 32 x 32 pixel fonts
Font Sizes		You can expand the width up to 8 times, and expand the height up to 8 times. ^{*1}
Text	8 x 8 pixels	80 characters per row x 60 rows
	8 x 16 pixels	80 characters per row x 30 rows
	16 x 16 pixels	40 characters per row x 30 rows
	32 x 32 pixels	20 characters per row x 15 rows

^{*1} You can set up other font sizes using the software.

Memory, Clock, and Touch Panel

Memory

Application Memory *1	FLASH EPROM 96 MB
Application run DRAM	128 MB
Data Backup	SRAM 512 KB (Replaceable lithium battery for data backup)

*1 Capacity available for user application.

NOTE:

- When the message "Battery level is low" is displayed, supply power to the panel and fully charge the battery.

Clock

Clock Accuracy*1	±65 seconds/month (deviation at room temperature and power is OFF).

*1 Depending on the operating temperature and age of panel, the clock can deviate from -380 to +90 sec/month. For systems where this level of precision is insufficient, the user should monitor and make adjustments when required.

Touch Panel

Touch Panel Type	Resistive Film (analog)
Touch Panel Resolution	1,024 x 1,024
Service Life	1 million times or more

Interface Specifications

Serial Interface COM1

Asynchronous Transmission	RS-232C
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps
Connector	D-Sub 9 pin (plug)

Serial Interface COM2

Asynchronous Transmission	RS-485
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps, 187,500 bps (MPI)
Connector	Modular jack (RJ-45)

USB Interface

	USB (Type A) Interface	USB (mini-B) Interface
Connector	USB 2.0 (Type A) x 1	USB 2.0 (mini-B) x 1
Power Supply Voltage	5 Vdc $\pm$ 5%	-
Maximum Current Supplied	500 mA	-
Maximum Transmission Distance	5 m (16.4 ft)	

Ethernet Interface

Ethernet (LAN)	IEEE802.3i / IEEE802.3u, 10BASE-T/100BASE-TX
Connector	Modular jack (RJ45) x 1

SD Card Interface

SD Card slot x 1 (maximum 32 GB SD/SDHC Card)

Specifications of Serial Interface COM1

Introduction

⚠ CAUTION

LOSS OF POWER

- Make sure all connections to the communication ports on the bottom and sides of the panel do not put excessive stress on the ports.
- Securely attach communication cables to the panel or cabinet.
- Use only D-Sub 9 pin cables with a locking system in good condition.

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

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

⚡ ⚠ DANGER

ELECTRIC SHOCK

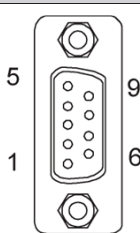
When using the SG terminal to connect an external device to the panel:

- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #5 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #5 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM1

HMIGTO5310 / HMIGTO5315: D-Sub 9 pin plug connector via an RS-232C cable.

Pin Connection	Pin No.	RS-232C		
		Signal Name	Direction	Meaning
 (Magelis GTO side)	1	CD	Input	Carrier Detect
	2	RD(RXD)	Input	Receive Data
	3	SD(TXD)	Output	Send Data
	4	ER(DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR(DSR)	Input	Data Set Ready
	7	RS(RTS)	Output	Request to Send
	8	CS(CTS)	Input	Send possible
	9	CI(RI)/VCC	Input/–	Called Status Display +5V±5% Output 0.25A ^{*1}
	Shell	FG	–	Frame Ground (Common with SG)

NOTE: ^{*1} You can switch pin #9 between RI and VCC via software.

NOTICE

EQUIPMENT DAMAGE

Use only the rated current.

Failure to follow these instructions can result in equipment damage.

Interfit bracket is #4-40 (UNC).

 CAUTION**LOSS OF COMMUNICATION**

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only D-Sub 9 pin cables with a locking tab in good condition.

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

Specifications of Serial Interface COM2

Introduction

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

DANGER

ELECTRIC SHOCK

When using the SG terminal to connect an external device to the panel:

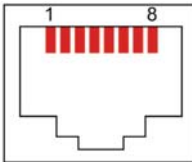
- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #8 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #8 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM2

HMIGTO5310 / HMIGTO5315: RJ45 connector via a RS-485 cable.

NOTE: When setting up RS-485 communication, the cable diagram for some equipment may require polarization on the terminal side. This terminal does not require any special setting as it handles polarization automatically.

Pin Connection	Pin No.	RS-485		
		Signal Name	Direction	Meaning
	1	NC	-	-
	2	NC	-	-
	3	NC	-	-
	4	Line A	Input/Output	Transfer Data (RS-485)
	5	Line B	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request To Send
	7	NC	-	-
	8	SG	-	Signal Ground

CAUTION

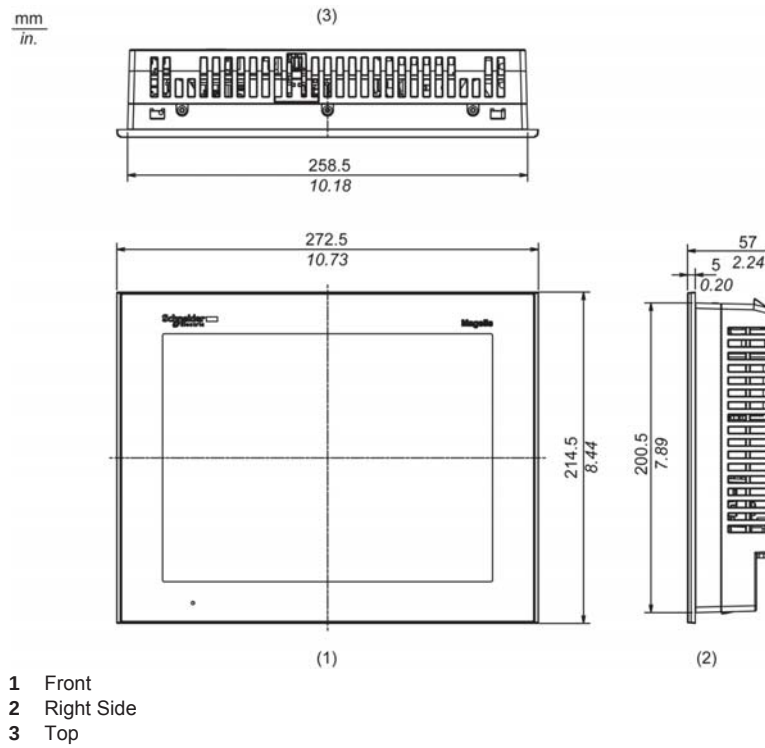
LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only RJ45 with a locking tab in good condition.

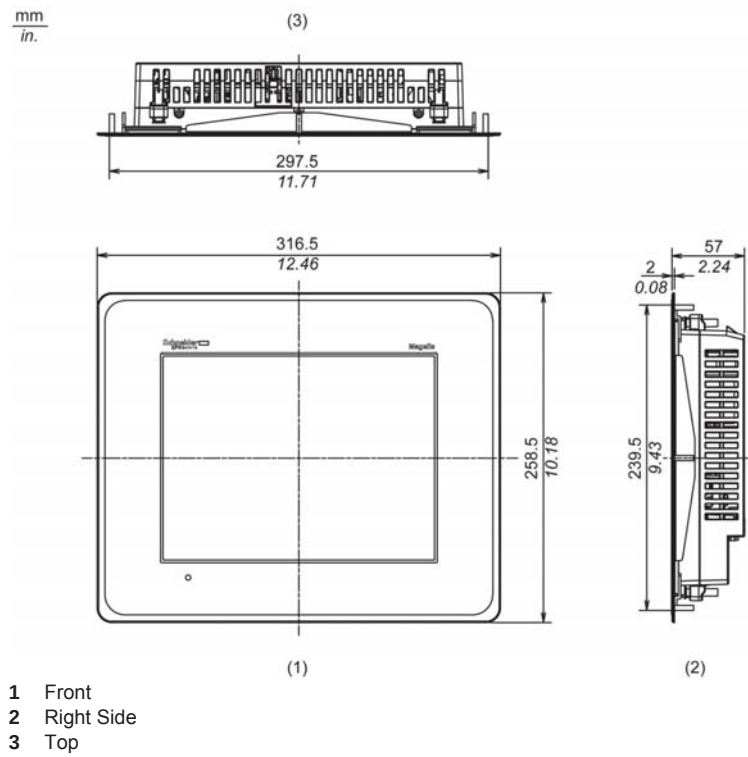
Failure to follow these instructions can result in injury or equipment damage.

Dimensions

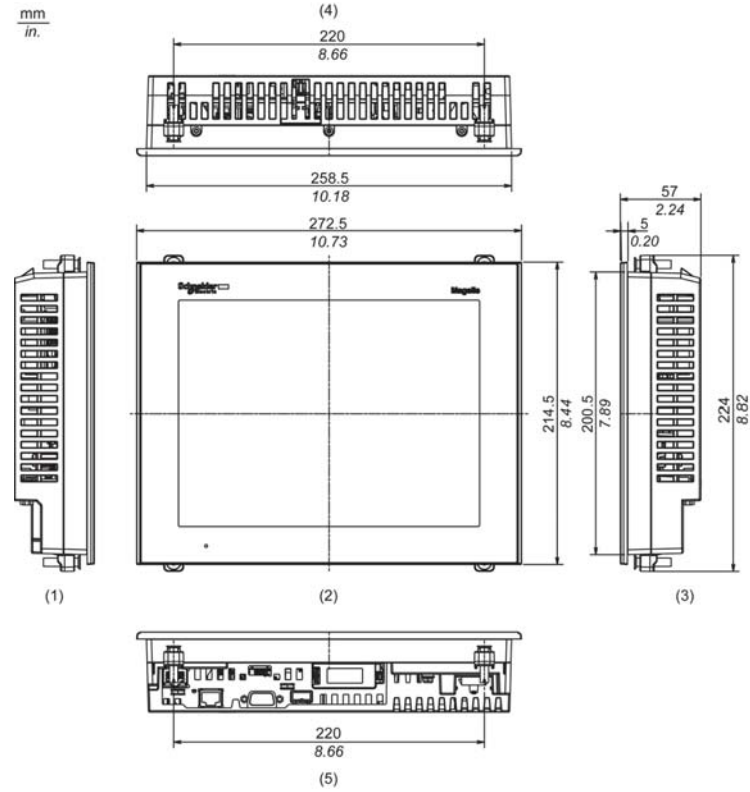
External Dimensions: HMIGTO5310



External Dimensions: HMIGTO5315

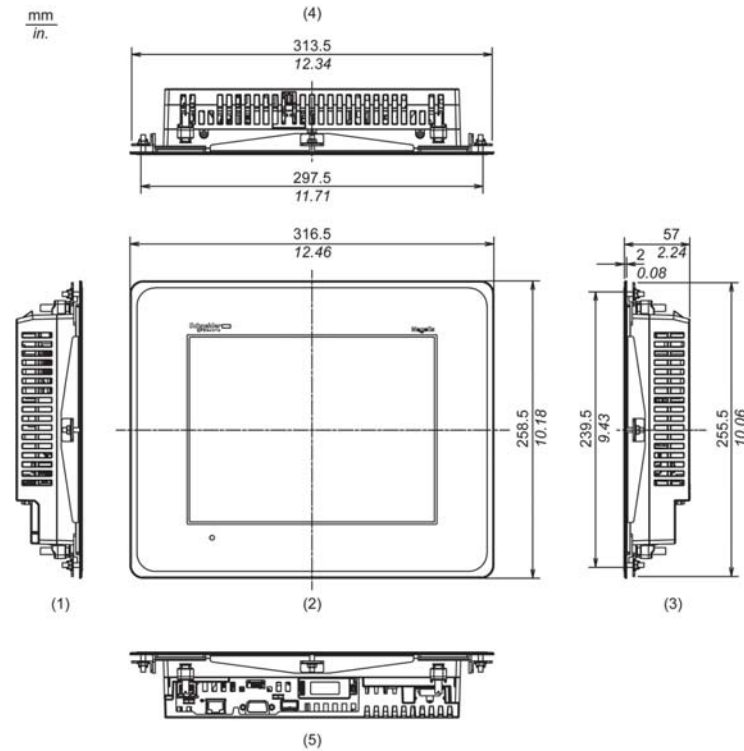


Installation with Installation Fasteners: HMIGTO5310



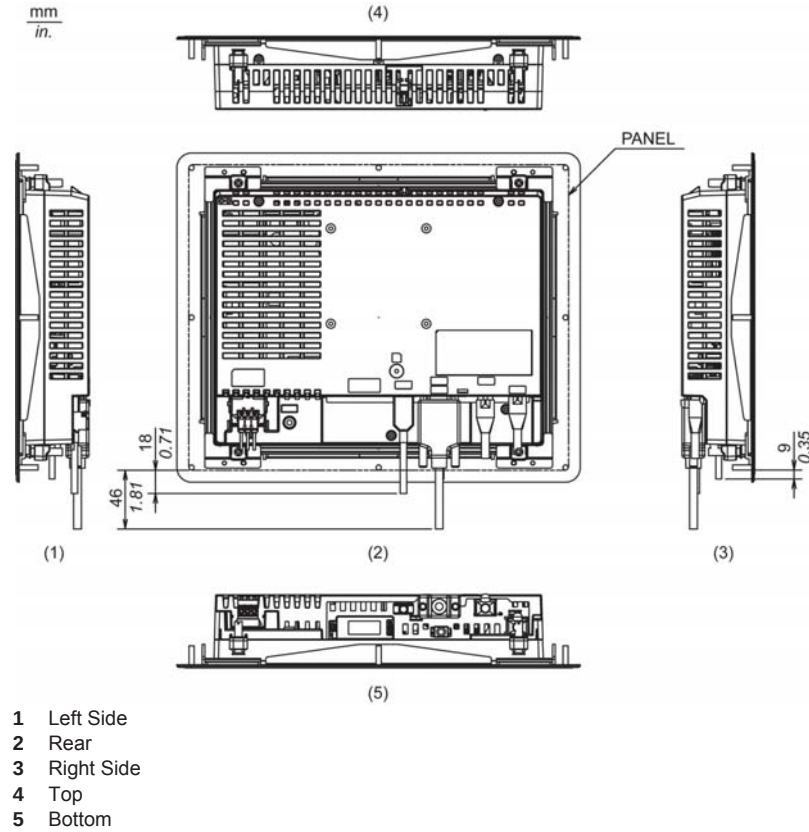
- 1 Left Side
- 2 Front
- 3 Right Side
- 4 Top
- 5 Bottom

Installation with Installation Fasteners: HMIGTO5315



- 1 Left Side
- 2 Front
- 3 Right Side
- 4 Top
- 5 Bottom

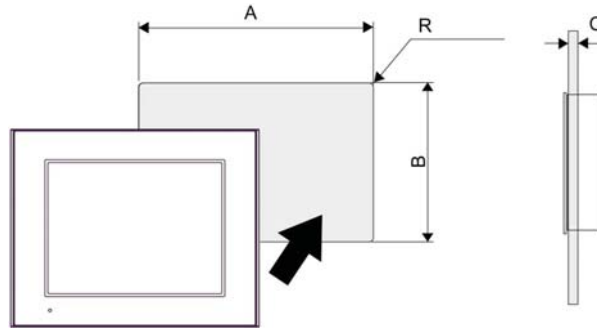
Dimensions with Cables: HMIGTO5315



NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Panel Cut Dimensions

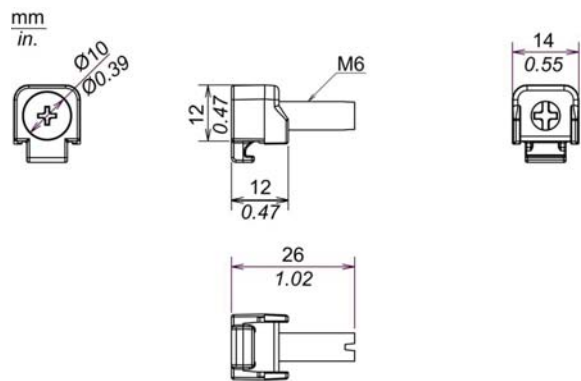
Create a panel cut and insert the panel into the opening from the front.



	A	B	C	R
HMIGTO5310	259 mm (+1, -0 mm) (10.2 in. [+0.04, -0 in.])	201 mm (+1, -0 mm) (7.91 in. [+0.04, -0 in.])	1.6...5 mm (0.06...0.2 in.)	3 mm (0.12 in.) maximum
HMIGTO5315	298 mm (+1, -0 mm) (11.73 in. [+0.04, -0 in.])	240 mm (+1, -0 mm) (9.45 in. [+0.04, -0 in.])		

NOTE: Before designing the panel cut, refer to Installation ([see page 120](#)).

Installation Fastener Dimensions



Section 4.5

HMIGTO6310/6315

What Is in This Section?

This section contains the following topics:

Topic	Page
Electrical Specifications	102
Environmental Specifications	103
Structural Specifications	104
Display Specifications	106
Memory, Clock, and Touch Panel	107
Interface Specifications	108
Specifications of Serial Interface COM1	109
Specifications of Serial Interface COM2	111
Dimensions	112

Electrical Specifications

Power Supply	Rated Input Voltage	24 Vdc
	Input Voltage Limits	19.2...28.8 Vdc
	Voltage Drop	10 ms or less
	Power Consumption	17 W or less
	When power is not supplied to external devices	12 W or less
	Backlight OFF (Standby Mode)	7 W or less
	Backlight Dimmed (Brightness: 20%)	8 W or less
	In-Rush Current	30 A or less
Voltage Endurance		1,500 Vac, 20 mA for 1 minute (between charging and FG terminals)
Insulation Resistance		500 Vdc, 10 MΩ or more (between charging and FG terminals)

Environmental Specifications

Physical Environment	Surrounding Air Temperature	0...55 °C (32...131 °F)
	Storage Temperature	-20...60 °C (-4...140 °F)
	Surrounding Air and Storage Humidity	10...90% RH (Non condensing, wet bulb temperature 39 °C [102.2 °F] or less)
	Dust	0.1 mg/m ³ (10 ⁻⁷ oz/ft ³) or less (non-conductive levels)
	Pollution Degree	For use in Pollution Degree 2 environment
	Corrosive gases	Free of corrosive gases
	Atmospheric Pressure (Operating Altitude)	800...1,114 hPa (2,000 m [6,561 ft] or lower)
Mechanical Environment	Vibration Resistance	IEC/EN 61131-2 compliant 5...9 Hz Single amplitude 3.5 mm (0.14 in.) 9...150 Hz Fixed acceleration: 9.8 m/s ² X, Y, Z directions for 10 cycles (approx. 100 minute)
	Concussion Resistance	IEC/EN 61131-2 compliant 147 m/s ² , X, Y, Z directions for 3 times
Electrical Environment	Noise immunity	Noise Voltage: 1,000 Vp-p Pulse Width: 1 µs Rise Time: 1 ns
	Electrostatic Discharge Immunity	Contact Discharge Method: 6 kV (IEC/EN 61000-4-2 Level 3)

Air quality requirements

Do not operate or store the panel where chemicals evaporate, or where chemicals are present in the air:

- Corrosive chemicals: Acids, alkalines, liquids containing salt.
- Flammable chemicals: Organic solvents.

CAUTION

INOPERATIVE EQUIPMENT

Do not allow water, liquids, metal, and wiring fragments to enter the panel case.

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

Structural Specifications

	HMIGTO6310	HMIGTO6315
Grounding	Functional grounding: Grounding resistance of 100 Ω , 2 mm ² (AWG 14) or thicker wire, or your country's applicable standard. (Same for FG and SG terminals)	
Cooling Method	Natural air circulation	
Structure ^{*1}	IP65f NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure)	IP66k NEMA #250 TYPE 4X/13 (on the front panel when properly installed in an enclosure) ^{*2}
External Dimensions	W315 x H241 x D56 mm (W12.4 x H9.49 x D2.2 in.)	W359 x H285 x D56 mm (W14.13 x H11.22 x D2.2 in.)
Panel Cut Dimensions	W301.5 x H227.5 mm (W11.87 x H8.96 in.) ^{*3} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*4}	W340.5 x H266.5 mm (W13.41 x H10.49 in.) ^{*3} Panel thickness area: 1.6...5 mm (0.06...0.2 in.) ^{*4}
Weight	2.5 kg (5.5 lb) or less (main unit only)	3 kg (6.6 lb) or less (main unit only)

NOTE: ^{*1} The front face of the HMIGTO, installed in a solid panel, has been tested using conditions equivalent to the standards shown in the specification. Even though the HMIGTO's level of resistance is equivalent to these standards, oils that should have no effect on the HMIGTO can possibly harm the panel. This can occur in areas where either vaporized oils are present, or where low viscosity cutting oils are allowed to adhere to the panel for long periods of time. If the panel's front face protection sheet peels off, these conditions can lead to the ingress of oil into the panel and separate protection measures are suggested.

Also, if non-approved oils are present, they may cause deformation or corrosion of the front panel's plastic cover. Therefore, prior to installing the HMIGTO, be sure to confirm the type of conditions that will be present in the panel's operating environment. If the installation gasket is used for a long period of time, or if the HMIGTO and its gasket are removed from the panel, the original level of protection cannot be kept. To maintain the original protection level, be sure to replace the installation gasket regularly.

^{*2} When installing the HMIGTO in a panel, you may not be able to mount the HMIGTO flush with the panel. This occurs due to the thickness of the gasket. The difference in level between the HMIGTO and panel depends on how much the gasket is compressed.

NOTICE

EQUIPMENT DAMAGE

For food and beverage and pharmaceutical industries, when the HMIGTO is not flush with panel, use silicon to form a seal to prevent water, chemicals, or food from lodging into place. Otherwise, the panel face could leak.

Failure to follow these instructions can result in equipment damage.

^{*3} For dimensional tolerance, everything +1/-0 mm (+0.04/-0 in.) and R in angle are below R3 (R0.12in.)

^{*4} Even if the installation wall thickness is within the recommended range for the "Panel Cut Dimensions", depending on wall's material, size, and installation location of the panel and other devices, the installation wall could warp. To prevent warping, the installation surface may need to be strengthened.

CAUTION

EQUIPMENT DAMAGE

Ensure that the panel is not in permanent and direct contact with oils.

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

NOTICE**STORAGE AND OPERATION OUTSIDE OF SPECIFICATIONS**

- Store the panel in areas where temperatures are within the panel's specifications.
- Do not restrict or block the panel's rear-face ventilation slots.

Failure to follow these instructions can result in equipment damage.

NOTICE**GASKET AGING**

- Inspect the gasket periodically as required by your operating environment to keep the initial IP level.
- Change the gasket at least once a year, or as soon as scratches or dirt become visible.

Failure to follow these instructions can result in equipment damage.

Display Specifications

Display Type		TFT Color LCD
Display Size		12.1"
Resolution		800 x 600 pixels (SVGA)
Effective Display Area		W246.0 x H184.5 mm (W9.69 x H7.26 in.)
Display Colors		65,536 colors (No blink) / 16,384 colors (Blink)
Backlight		White LED (Not user replaceable. When replacement is required, contact your local distributor.)
Backlight Service Life		50,000 hours (continuous operation at at 25 °C [77 °F] before backlight brightness decreases to 50%)
Brightness Control		16 levels (Adjusted with touch panel or software)
Language Fonts		ASCII: (Code page 850) Alphanumeric (including European characters) Chinese: (GB2312-80 codes) Simplified Chinese fonts Japanese: ANK 158, Kanji: 6,962 (JIS Standards 1 & 2) (including 607 non-kanji characters) Korean: (KSC5601 - 1992 codes) Hangul fonts Taiwanese: (Big 5 codes) Traditional Chinese fonts
Character Sizes		8 x 8, 8 x 16, 16 x 16 and 32 x 32 pixel fonts
Text	8 x 8 pixels	100 characters per row x 75 rows
	8 x 16 pixels	100 characters per row x 37 rows
	16 x 16 pixels	50 characters per row x 37 rows
	32 x 32 pixels	25 characters per row x 18 rows

*1 You can set up other font sizes using the software.

Memory, Clock, and Touch Panel

Memory

Application Memory ^{*1}	FLASH EPROM96 MB
Application run DRAM	128 MB
Data Backup	SRAM 512 KB (Replaceable lithium battery for backup memory)

^{*1} Capacity available for user application.

NOTE:

- When the message "Battery level is low" is displayed, supply power to the panel and fully charge the battery.

Clock

Clock Accuracy ^{*1}	±65 seconds/month (deviation at room temperature and power is OFF).

^{*1} Depending on the operating temperature and age of the panel, the clock can deviate from -380 to +90 sec/month. For systems where this level of precision is insufficient, the user should monitor and make adjustments when required.

Touch Panel

Touch Panel Type	Resistive Film (analog)
Touch Panel Resolution	1,024 x 1,024
Touch Panel Service Life	1 million times or more

Interface Specifications

Serial Interface COM1

Asynchronous Transmission	RS-232C
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps
Connector	D-Sub 9 pin (plug)

Serial Interface COM2

Asynchronous Transmission	RS-485
Data Length	7 or 8 bits
Stop Bit	1 or 2 bits
Parity	None, odd or even
Data Transmission Speed	2,400...115,200 bps, 187,500 bps (MPI)
Connector	Modular jack (RJ-45)

USB Interface

	USB (Type A) Interface	USB (mini-B) Interface
Connector	USB 2.0 (Type A) x 1	USB 2.0 (mini-B) x 1
Power Supply Voltage	5 Vdc $\pm$ 5%	-
Maximum Current Supplied	500 mA	-
Maximum Transmission Distance	5 m (16.4 ft)	

Ethernet Interface

Ethernet (LAN)	IEEE802.3i / IEEE802.3u, 10BASE-T/100BASE-TX
Connector	Modular jack (RJ45) x 1

SD Card Interface

SD Card slot x 1 (maximum 32 GB SD/SDHC Card)

Specifications of Serial Interface COM1

Introduction

⚠ CAUTION

LOSS OF POWER

- Make sure all connections to the communication ports on the bottom and sides of the panel do not put excessive stress on the ports.
- Securely attach communication cables to the panel or cabinet.
- Use only D-Sub 9 pin cables with a locking system in good condition.

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

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

⚠ ⚠ DANGER

ELECTRIC SHOCK

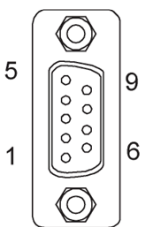
When using the SG terminal to connect an external device to the panel:

- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #5 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #5 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM1

HMIGTO6310 / HMIGTO6315: D-Sub 9 pin plug connector via an RS-232C cable.

Pin Connection	Pin No.	RS-232C		
		Signal Name	Direction	Meaning
 (Magelis GTO side)	1	CD	Input	Carrier Detect
	2	RD(RXD)	Input	Receive Data
	3	SD(TXD)	Output	Send Data
	4	ER(DTR)	Output	Data Terminal Ready
	5	SG	-	Signal Ground
	6	DR(DSR)	Input	Data Set Ready
	7	RS(RTS)	Output	Request to Send
	8	CS(CTS)	Input	Send possible
	9	CI(RI)/VCC	Input/-	Called Status Display +5V±5% Output 0.25A ^{*1}
	Shell	FG	-	Frame Ground (Common with SG)

NOTE: ^{*1} You can switch pin #9 between RI and VCC via software.

NOTICE

EQUIPMENT DAMAGE

Use only the rated current.

Failure to follow these instructions can result in equipment damage.

Interfit bracket is #4-40 (UNC).

 CAUTION

LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only D-Sub 9 pin cables with a locking tab in good condition.

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

Specifications of Serial Interface COM2

Introduction

The serial port is not isolated. The SG (signal ground) and FG (frame ground) terminals are connected inside the panel.

DANGER

ELECTRIC SHOCK

When using the SG terminal to connect an external device to the panel:

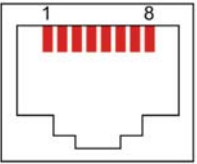
- Verify that a short-circuit loop is not created when you set up the system.
- Connect the #8 SG terminal to remote equipment when the host (PLC) unit is not isolated. Connect the #8 SG terminal to a known reliable ground connection to reduce the risk of damaging the circuit.

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

Serial Interface COM2

HMIGTO6310 / HMIGTO6315: RJ45 connector via a RS-485 cable.

NOTE: When setting up RS-485 communication, the cable diagram for some equipment may require polarization on the terminal side. This terminal does not require any special setting as it handles polarization automatically.

Pin Connection	Pin No.	RS-485		
		Signal Name	Direction	Meaning
	1	NC	-	-
	2	NC	-	-
	3	NC	-	-
	4	Line A	Input/Output	Transfer Data (RS-485)
	5	Line B	Input/Output	Transfer Data (RS-485)
	6	RS(RTS)	Output	Request To Send
	7	NC	-	-
	8	SG	-	Signal Ground

CAUTION

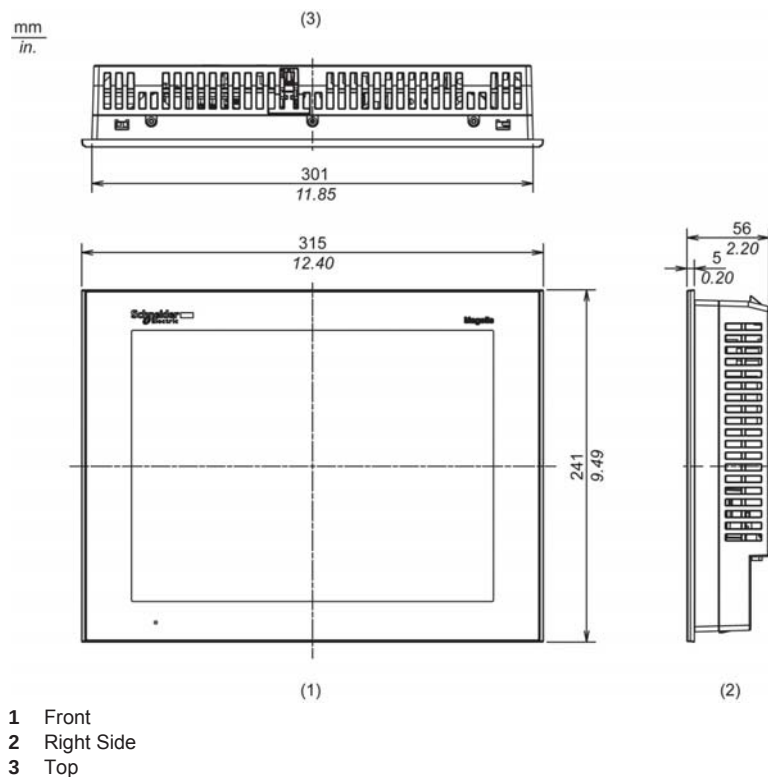
LOSS OF COMMUNICATION

- All connections to the communication ports must not put excessive stress on the ports.
- Securely attach communication cables to the panel wall or cabinet.
- Use only RJ45 with a locking tab in good condition.

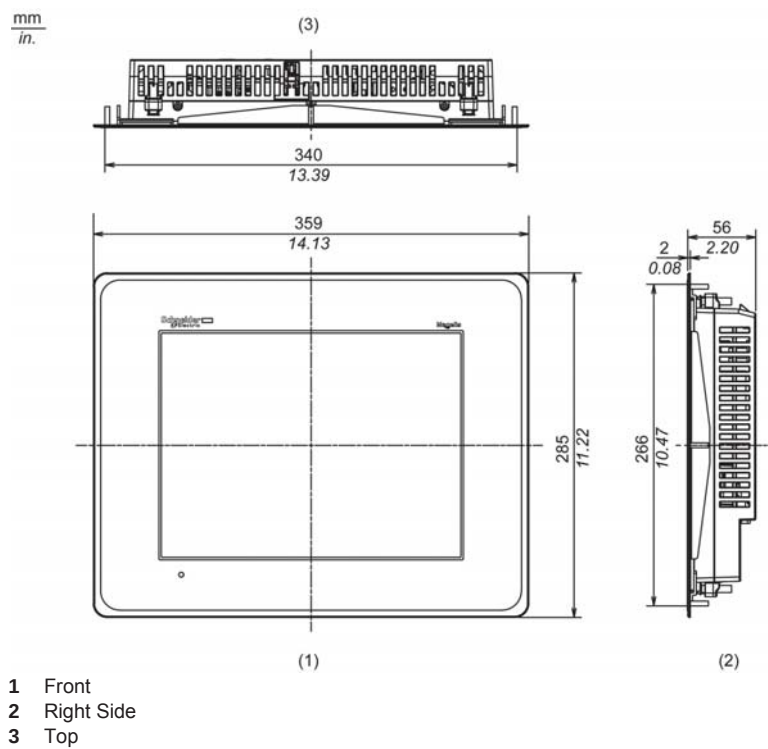
Failure to follow these instructions can result in injury or equipment damage.

Dimensions

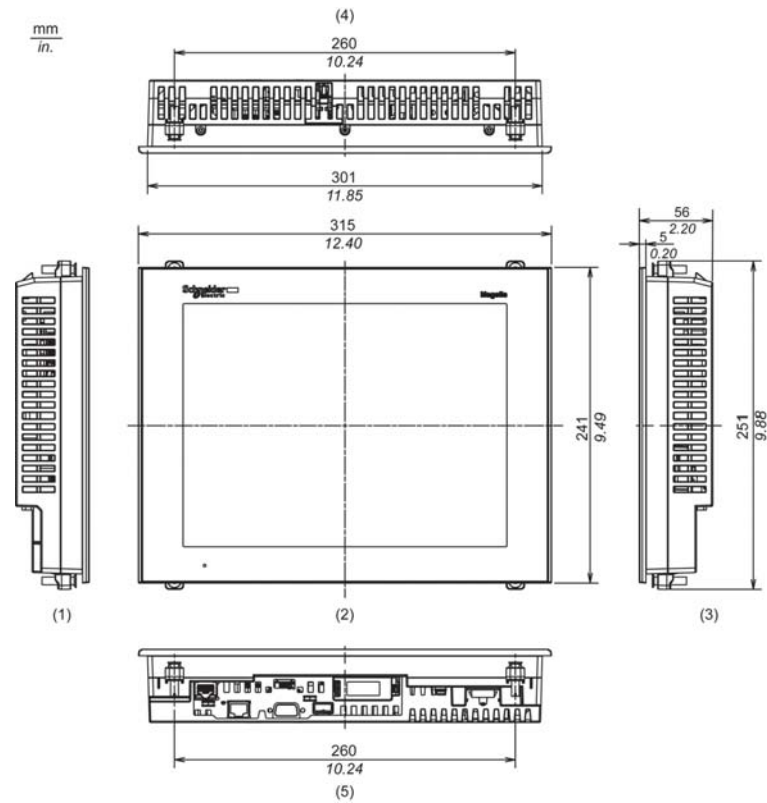
External Dimensions: HMIGTO6310



External Dimensions: HMIGTO6315

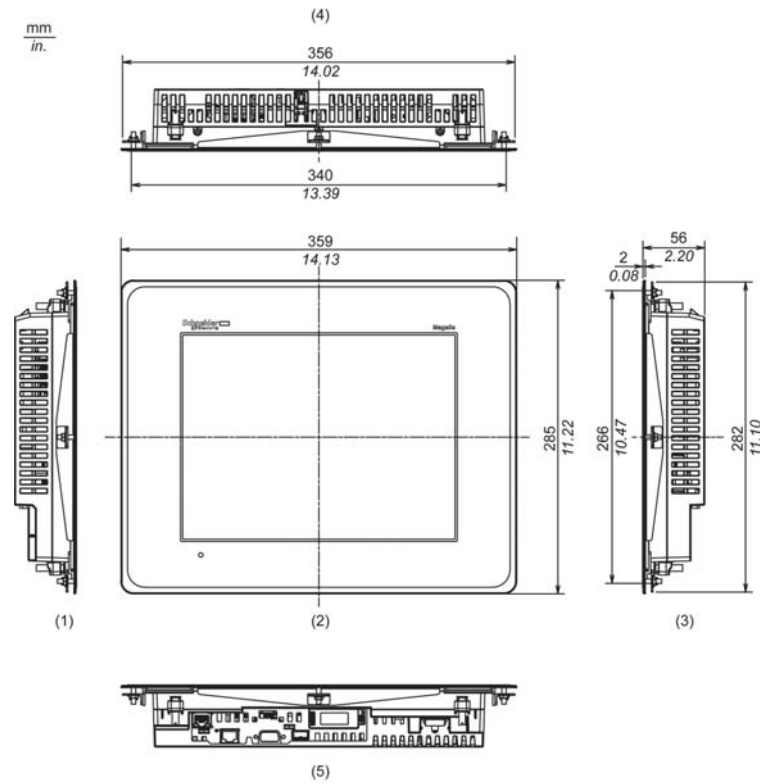


Installation with Installation Fasteners: HMIGTO6310



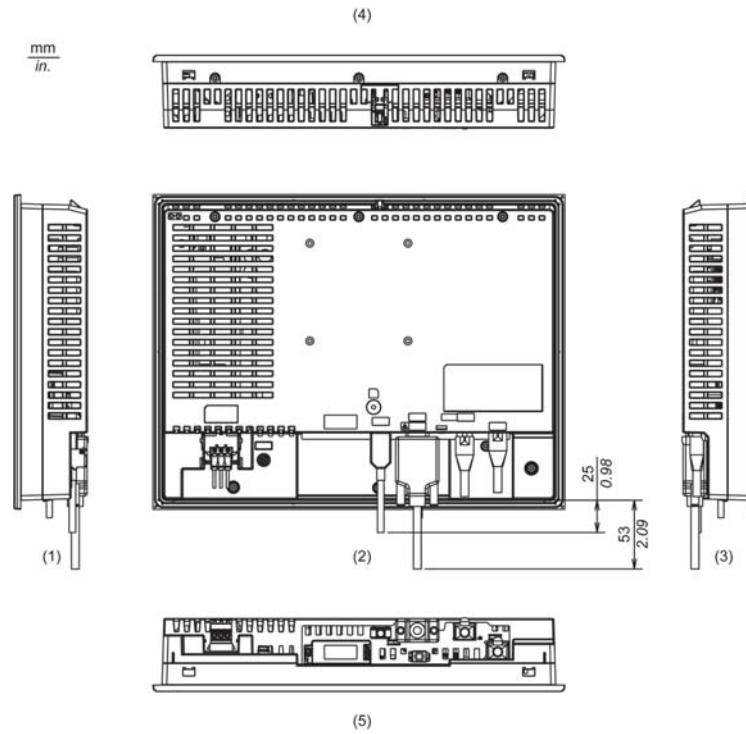
- 1 Left Side
- 2 Front
- 3 Right Side
- 4 Top
- 5 Bottom

Installation with Installation Fasteners: HMIGTO6315



- 1 Left Side
- 2 Front
- 3 Right Side
- 4 Top
- 5 Bottom

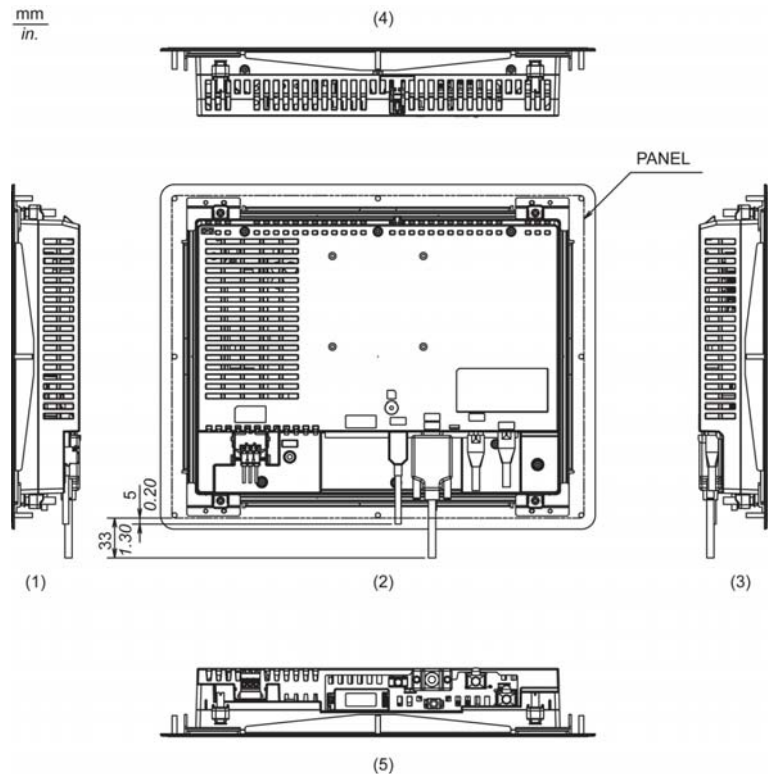
Dimensions with Cables: HMIGTO6310



- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Dimensions with Cables: HMIGTO6315

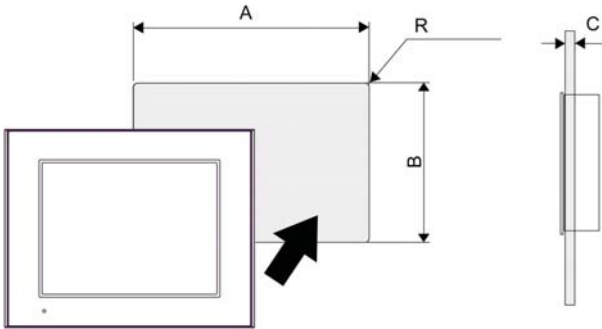


- 1 Left Side
- 2 Rear
- 3 Right Side
- 4 Top
- 5 Bottom

NOTE: All the above values are designed with cable bending in mind. The dimensions given here are representative values depending on the type of connection cable in use. Therefore, these values are intended for reference only.

Panel Cut Dimensions

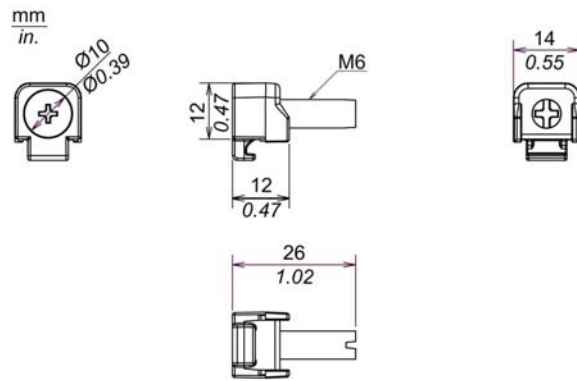
Create a panel cut and insert the panel into the opening from the front.



	A	B	C	R
HMIGTO6310	301.5 mm (+1, -0 mm) (11.87 [+0.04, -0 in.])	227.5 mm (+1, -0 mm) (8.96 in. [+0.04, -0 in.])	1.6...5 mm (0.06...0.2 in.)	3 mm (0.12 in.) maximum
HMIGTO6315	340.5 mm (+1, -0 mm) (13.41 [+0.04, -0 in.])	266.5 mm (+1, -0 mm) (10.49 in. [+0.04, -0 in.])		

NOTE: Before designing the panel cut, refer to Installation ([see page 120](#)).

Installation Fastener Dimensions



Chapter 5

Installation and Wiring

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
5.1	Installation	120
5.2	Wiring Principles	125
5.3	SD Card Insertion/Removal	131
5.4	USB Cable Clamp	136

Section 5.1

Installation

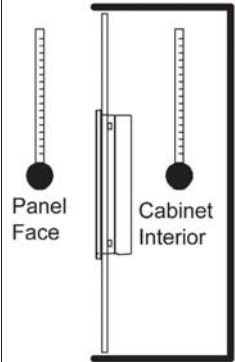
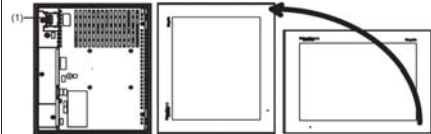
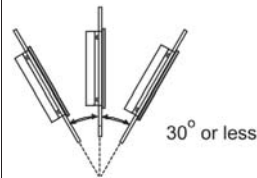
Installation Procedures

Introduction

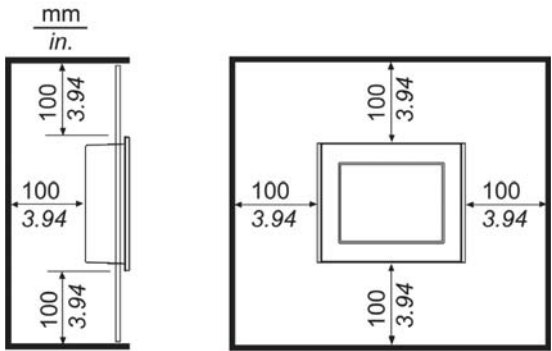
The installation fasteners are required when installing the panel.

Mount the panel in an enclosure that provides a clean, dry, robust and controlled environment. (HMIGTO except HMIGTO2315/HMIGTO5315/HMIGTO6315: IP65, Type 1, Type 4X [Indoor Use Only] or Type 13 Enclosure. HMIGTO2315/HMIGTO5315/HMIGTO6315: IP66k, Type 1, Type 4X [Indoor Use Only] or Type 13 Enclosure.)

Installation Requirements

Check that the installation wall or cabinet's surface is flat, in good condition and has no jagged edges. Metal reinforcing strips may be attached to the inside of the wall, near the panel-cut, to increase its rigidity.	
Decide on the thickness of the enclosure wall, based on the level of strength required: 1.6...5 mm (0.06...0.2 in.).	
Be sure that the surrounding air temperature and the ambient humidity are within their designated ranges. Surrounding air temperature: 0 to 50 °C (32 to 122 °F) or 0 to 55 °C (32 to 131 °F) (please see the Environment Specifications for your HMIGTO); ambient humidity: 10 to 90%RH; wet bulb temperature: maximum 39 °C [102 °F]. When installing the panel in a cabinet or enclosure, the surrounding air temperature is the cabinet's or enclosure's internal temperature.	
	
Be sure that heat from surrounding equipment does not cause the panel to exceed its standard operating temperature.	
When mounting the panel vertically, ensure that the right side of the unit faces up. In other words, the power connector should be at the top.	
	1 Power connector
When installing the panel in a slanted position, the panel face should not incline more than 30°.	
	
When installing the panel in a slanted position with an incline more than 30° , the ambient temperature must not exceed 40 °C (104 °F). You may need to use forced air cooling (fan, A/C) to ensure the ambient operating temperature is 40° C or less (104 °F or less).	

For easier maintenance, operation and improved ventilation, install the panel at least 100 mm (3.94 in.) away from adjacent structures and other equipment as shown in the following illustration:



The holes on the rear of the panel (except HMIGTO1300/1310) do not correspond to VESA 75 mm standards. Do not attach the panel to a commercial-type VESA arm.

Panel Mounting Procedure: (except HMIGTO2315/HMIGTO5315/HMIGTO6315)

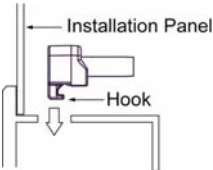
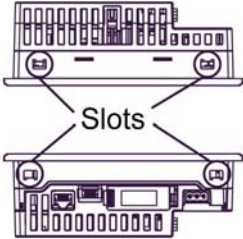
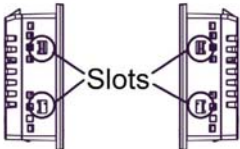
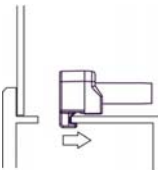
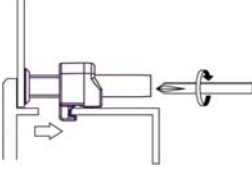
NOTICE

PANEL UNSTEADY WHEN UNSECURED

Keep HMIGTO stabilized in the panel-cut while you are installing or removing the screw fasteners.

Failure to follow these instructions can result in equipment damage.

Step	Action
1	Place the panel on a clean and level surface with the display facing downward.
2	Check that the panel's gasket is seated securely into the gasket's groove, which runs around the perimeter of the panel frame.
3	Cut a hole in the installation panel as defined by the HMIGTO's panel cutout dimensions. HMIGTO1300/HMIGTO1310 (see page 48) HMIGTO2300/HMIGTO2310 (see page 66) HMIGTO3510/HMIGTO4310 (see page 82) HMIGTO5310 (see page 99) HMIGTO6310 (see page 116)
4	Insert the HMIGTO into the panel-cut.

Step	Action
5	Insert the installation fasteners into the HMIGTO's insertion slots on the top and bottom sides (left and right sides for the HMIGTO1300/1310). Slide the fasteners to the back. If the fasteners are not correctly attached, the HMIGTO may shift or fall out.  Installation Panel Hook HMIGTO2310  Slots HMIGTO1310  Slots
6	Insert each of the fasteners shown below. Make sure you pull the fastener back until it is flush with the rear of the attachment hole insert. 
7	Use a Phillips screwdriver to tighten each fastener screw and secure the panel in place. The necessary torque is 0.5 Nm (4.4 lb•in). 

NOTICE

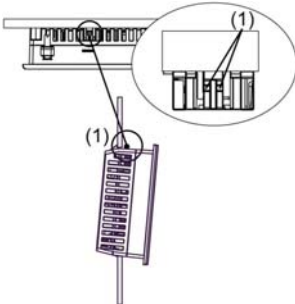
BROKEN ENCLOSURE

- Do not exert more than 0.5 Nm (4.4 lb•in) of torque when tightening the fastener's screws.
- Use on flat surface of a Type 1, Type 4X (Indoor Use Only) or Type 13 Enclosure.

Failure to follow these instructions can result in equipment damage.

Removal Procedure: (except HMIGTO2315/HMIGTO5315/HMIGTO6315)

Step	Action
1	Loosen the installation fasteners (4) from the HMIGTO.
2	Remove the HMIGTO slowly from the panel while pressing the projections on the top of the HMIGTO.



1 Projections

NOTE:

- You could damage the HMIGTO if you try and remove it without holding down the projections.
- Watch your fingers so they do not get caught when holding down the projections.

⚠ CAUTION**RISK OF INJURY**

Do not drop the HMIGTO when you remove it from the panel.

- Hold the HMIGTO in place after removing the fasteners.
- Use both hands.

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

HMIGTO2315/HMIGTO5315/HMIGTO6315 Panel Mounting Procedure**⚠ CAUTION****RISK OF INJURY**

Do not drop the HMIGTO when you install or remove it from the panel.

- Hold the HMIGTO in place after removing the M4 Hex nuts and brackets.
- Use both hands.

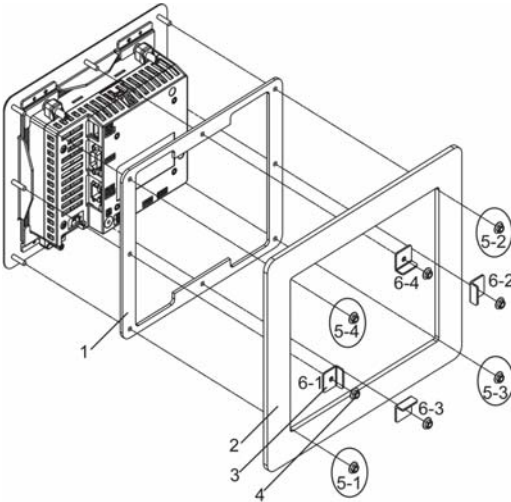
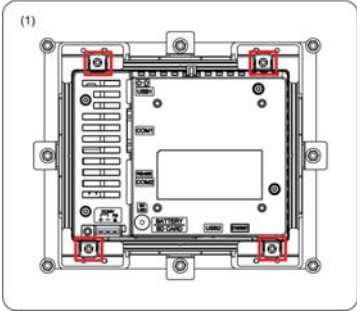
Failure to follow these instructions can result in injury or equipment damage.

NOTICE**PANEL UNSTEADY WHEN UNSECURED**

Keep panel stabilized in the panel-cut while you are installing or removing the M4 Hex nuts and brackets.

Failure to follow these instructions can result in equipment damage.

Step	Action
1	Place the panel on a clean and level surface with the display facing downward.
2	Confirm that the panel's gasket is seated properly on the rear of the panel.
3	Cut a hole in the panel as defined by the HMIGTO panel cutout dimensions. HMIGTO2315 (see page 66) HMIGTO5315 (see page 99) HMIGTO6315 (see page 116)

Step	Action
4	Insert the HMIGTO into the panel-cut.  1 Gasket 2 Panel 3 Brackets 4 M4 Hex Nut 5 Please read Step 5. 6 Please read Step 6.
5	Tighten the four corners of the rear of the panel with the M4 Hex nuts, in the order shown in the example in Step 4. Use an M4 box-type screwdriver to tighten each M4 Hex nut and secure the panel in place. The necessary torque is 0.5 Nm (4.4 lb•in). If the M4 Hex nuts are not correctly attached, the panel may shift or fall out.
6	Attach the bracket onto the screws in the middle between the M4 Hex nuts in the order shown in the example in Step 4. Use an M4 box-type screwdriver to tighten each M4 Hex nut and secure the panel in place. The necessary torque is 0.5 Nm (4.4 lb•in). If the M4 Hex nuts are not correctly attached, the panel may shift or fall out.
7	Tighten all the M4 Hex nuts again. The necessary torque is 0.5 Nm (4.4 lb•in). NOTE: Do not loosen the installation fasteners, marked with red squares below.  1 Panel

NOTICE

BROKEN ENCLOSURE

- Do not exert more than 0.5 Nm (4.4 lb•in) of torque when tightening the M4 Hex nuts.
 - Use on flat surface of a Type 1, Type 4X (Indoor Use Only) or Type 13 Enclosure.
- Failure to follow these instructions can result in equipment damage.**

Section 5.2

Wiring Principles

Overview

This section presents the HMIGTO wiring principles.

What Is in This Section?

This section contains the following topics:

Topic	Page
Connecting the Power Cord	126
Connecting the Power Supply	128
Grounding	130

Connecting the Power Cord

⚠ WARNING

EXCESSIVE ELECTROMAGNETIC INTERFERENCE

- When the functional ground (FG) terminal is connected, be sure the wire is grounded. Not grounding the HMIGTO can result in excessive Electromagnetic Interference (EMI). Grounding is required to meet EMC level immunity.
- Remove power before wiring the HMIGTO's power terminals.
- The DC model uses only 24 Vdc power. Using any other level of power can damage both the power supply and the HMIGTO.
- Since the HMIGTO is not equipped with a power switch, be sure to connect a power switch to the power supply.
- Be sure to ground the HMIGTO's FG terminal.
- Replace and secure all elements of the system before applying power to the HMIGTO.

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

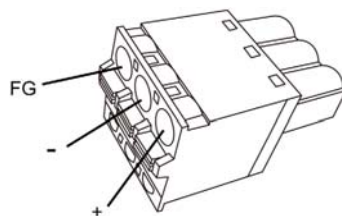
NOTE: The shield ground (SG) and FG terminals are connected internally in the panel.

DC Power Cord Preparation

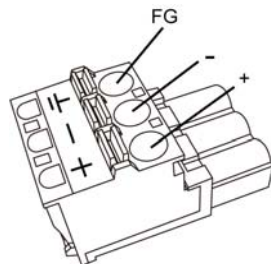
- Make sure the ground wire is either the same or heavier gauge than the power wires.
- Do not use aluminum wires in the power supply's power cord.
- If the ends of the individual wires are not twisted correctly, the wires may create a short circuit.
- Wherever possible, use wires that are 0.75 to 2.5 mm² (AWG 18 - 13) for the power cord, and twist the wire ends before attaching the terminals.
- The conductor type is solid or stranded wire.
- Field wiring terminal marking for wire type (75 °C [167 °F] copper conductors only).

DC Power Supply Connector (Plug) Specifications: Spring Clamp Terminal Blocks

HMIGTO1300/1310 / HMIGTO2300/2310/2315 / HMIGTO3510/4310

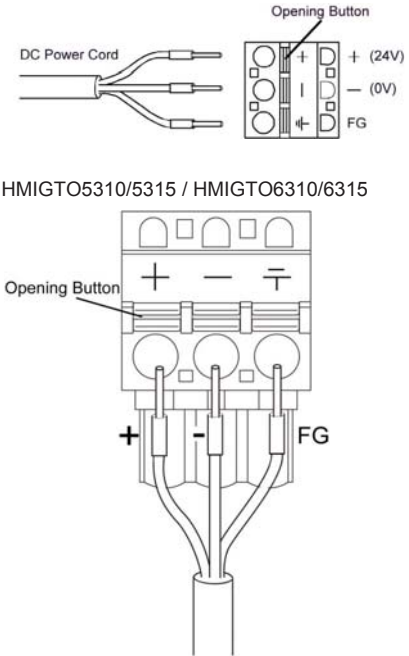


HMIGTO5310/5315 / HMIGTO6310/6315



Connection	Wire
+	24 Vdc
-	0 Vdc
FG	Grounded terminal connected to the panel chassis.

How to connect the DC Power Cord

Step	Action
1	Confirm the power cord is not connected to the power supply.
2	Check the rated voltage and remove the "DC24V" sticker on the DC power supply connector.
3	Remove 10 mm (0.39 in.) of the vinyl membrane off the ends of the power cord wires.
4	If using stranded wire, twist the ends. Tinning the ends with solder reduces risk of fraying and ensures good electrical transfer.
5	Push the Opening button with a small and flat screwdriver to open the desired pin hole.
6	Insert each pin terminal into its corresponding hole. Release the Opening button to clamp the pin in place. HMIGTO1300/1310 / HMIGTO2300/2310/2315 / HMIGTO3510/4310  HMIGTO5310/5315 / HMIGTO6310/6315
7	After inserting all three pins, insert the power plug into the power connector on the panel.

NOTE:

- Do not solder the wire directly to the power receptacle pin.
- To prevent the possibility of a terminal short, use a pin terminal that has an insulating sleeve.
- You can connect the DC power supply connector for HMIGTO1300/1310, HMIGTO2300/2310/2315, or HMIGTO3510/4310 to HMIGTO5310/5315 or HMIGTO6310/6315 units. However, the reverse is not possible. You cannot connect the DC power supply connector for HMIGTO5310/5315 or HMIGTO6310/6315 to HMIGTO1300/1310, HMIGTO2300/2310/2315, or HMIGTO3510/4310 units.

Connecting the Power Supply

Precautions

- You must use a 24 Vdc input unit with a Class 2 power supply.
- To increase the electromagnetic noise resistance, make sure you twist the ends of the power cord wires before connecting them to the power plug.
- The panel's power supply cord should not be bundled with or kept close to main circuit lines (high voltage, high current), or input/output signal lines.
- Connect a lightning surge absorber to handle power surges.
- To reduce electromagnetic noise, make the power cord as short as possible.

⚠ WARNING

SHORT CIRCUIT, FIRE, OR UNINTENDED EQUIPMENT OPERATION

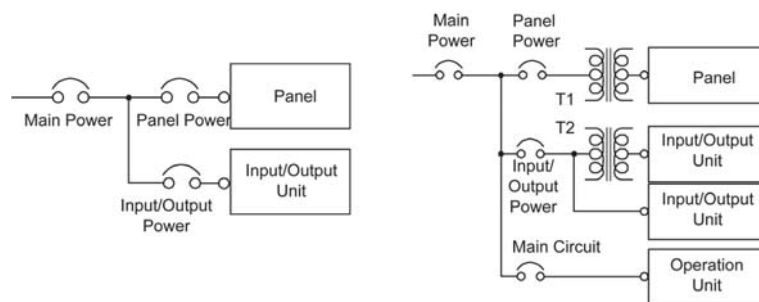
Avoid excessive force on the power cable to prevent accidental disconnection

- Securely attach power cables to the HMIGTO or cabinet.
- Use the designated torque to tighten the unit terminal block screws.
- Install and fasten the HMIGTO on installation panel or cabinet prior to connecting power supply and communication lines.

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

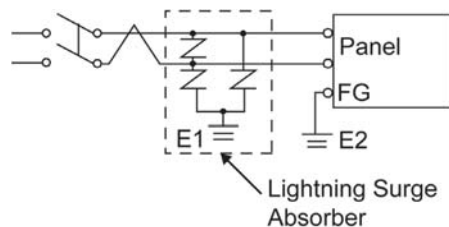
Power Supply Connections

When supplying power to the panel, separate the input/output and power lines, as shown.



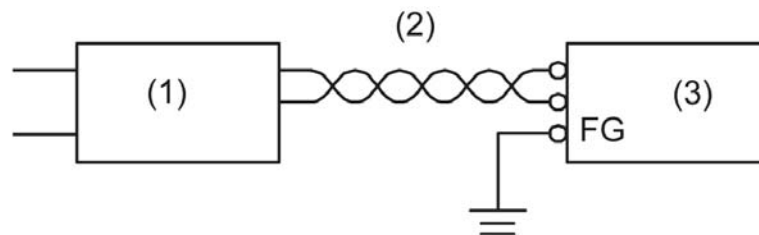
NOTE:

The following shows a lightning surge absorber connection:



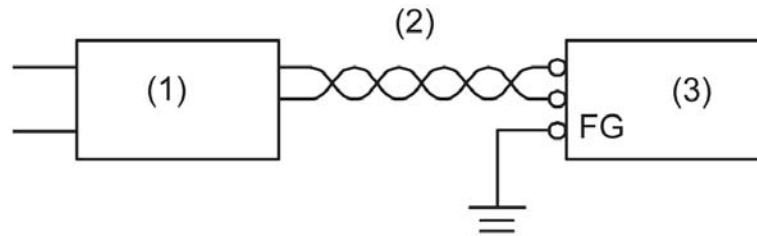
- Ground the surge absorber (E1) separately from the panel (E2).
- Select a surge absorber that has a maximum circuit voltage greater than that of the peak voltage of the power supply.

If the supplied voltage exceeds the panel range, connect a constant voltage transformer.



- 1 Constant voltage transformer
- 2 Twisted-pair cord
- 3 panel

Select a power supply low in noise for between the line and ground. If there is an excess amount of noise, connect an insulating transformer.



- 1 Insulating transformer
- 2 Twisted-pair cord
- 3 panel

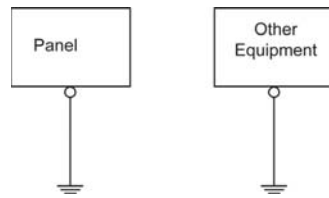
NOTE: Use constant voltage and insulating transformers with capacities exceeding the Power Consumption value.

Grounding

Exclusive Grounding

When supplying power to the panel, separate the input/output and power lines as shown below.

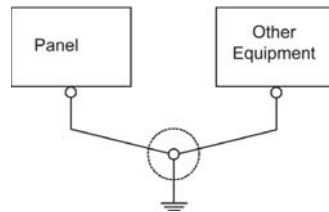
Connect the frame ground (FG) terminal on the power plug to an exclusive ground.



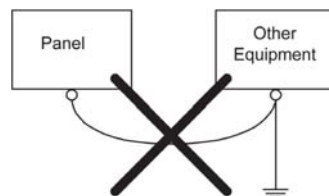
Precautions

Electromagnetic Interference (EMI) can be created if the devices are improperly grounded. EMI can cause loss of communication. Do not use common grounding, except for the authorized configuration described below. If exclusive grounding is not possible, use a common grounding point.

Correct grounding



Incorrect grounding



- Check that the grounding resistance is 100 Ω or less.^{*1}
- The FG wire should have a cross sectional area greater than 2 mm² (AWG 14) ⁽¹⁾. Create the connection point as close to the panel as possible, and make the wire as short as possible. When using a long grounding wire, replace the thin wire with a thicker wire, and place it in a duct.
- FG and SG terminals are internally connected in the panel. When connecting an external device to the panel using the SG terminal, check that you do not create a short-circuit loop when you set up the system.

^{*1} Observe local codes and standards. Ensure the ground connection has a resistance of 100 Ω and that the ground wire has a cross-section of at least 2 mm² or AWG 14.

Section 5.3

SD Card Insertion/Removal

What Is in This Section?

This section contains the following topics:

Topic	Page
Introduction	132
Inserting the SD Card	133
Removing the SD Card	134
SD Card Data Backup	135

Introduction

NOTICE

LOSS OF DATA

When using the HMIGTO and a SD Card, observe the following to avoid losing valuable data:

- Since accidental data loss can occur at any time, back up HMIGTO screen and SD Card data regularly. Once HMIGTO data is lost, it cannot be recovered.
- While a SD Card is accessed, do not turn OFF or reset the HMIGTO, and do not insert or remove the SD Card. Doing so could damage the SD Card, or corrupt its data.
- Before using the SD Card, familiarize yourself with the SD Card's front and rear face orientation, as well as the position of the SD Card connectors. If the SD Card is not positioned correctly when inserted into the HMIGTO, the card's internal data and HMIGTO could become damaged.

Failure to follow these instructions can result in equipment damage.

NOTICE

LOSS OF DATA

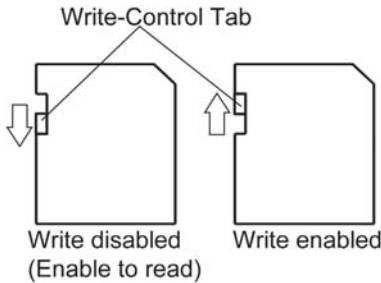
When handling the SD Card, follow the instructions below to prevent internal data on the SD Card from being destroyed or a SD Card malfunction from occurring:

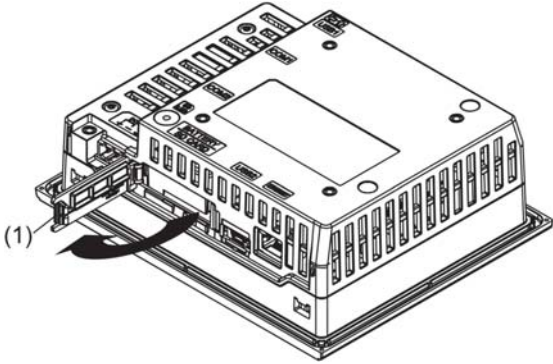
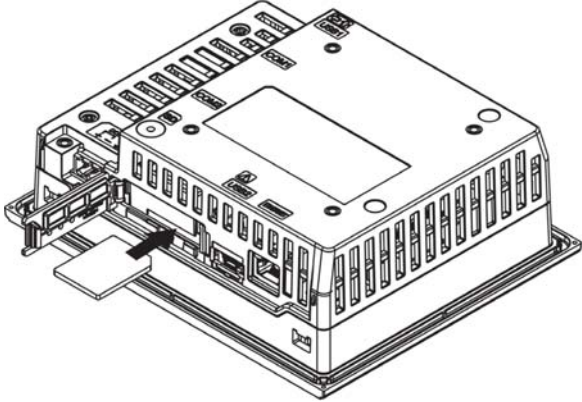
- Avoid storing the SD Card where there is static electricity or electromagnetic waves.
- Avoid storing the SD Card in direct sunlight, near a heater, or other locations where high temperatures can occur.
- Do not bend the SD Card.
- Do not drop or strike the SD Card against another object.
- Keep the SD Card dry.
- Do not touch the SD Card connectors.
- Do not disassemble or modify the SD Card.
- Use only SD Cards formatted using FAT or FAT32. The HMIGTO does not recognize NTFS formatted SD Cards. Format the SD Card on your computer using FAT or FAT32.

Failure to follow these instructions can result in equipment damage.

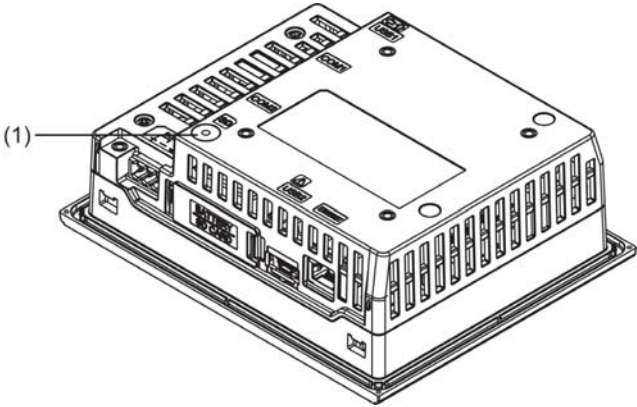
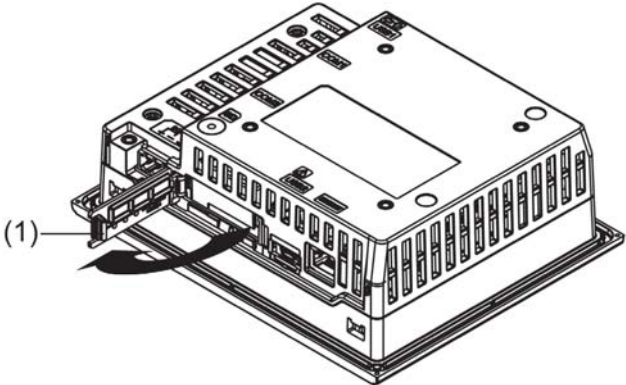
Inserting the SD Card

NOTE: As shown in the image below (example on the left-hand side), you can set the Write-Control Tab to prevent write operations to the SD Card. Push the tab up, as shown in the example on the right-hand side, to release the lock and enable writing to the SD Card. Before using a commercial-type SD Card, read the manufacturer’s instructions.



Step	Action
1	Pull on the tab and open the SD Card cover.  1 Tab
2	Insert the SD Card into the SD Card interface, and push until you hear it “click”. 
3	Close the SD Card cover.

Removing the SD Card

Step	Action
1	Make sure the SD Card Access LED is off.  1 SD Card Access LED
2	Push down the tab on the SD Card cover, then pull open the cover.  1 Tab
3	Push the SD Card once to release, and pull out the card. After removing the card, close the cover. NOTE: After using the SD Card, store the SD Card in its case or other safe location.

SD Card Data Backup

To make your backups, you can either insert the SD Card directly into the SD Card interface on your computer, or use a commercially available SD Card reader.

Section 5.4

USB Cable Clamp

Overview

This section presents the USB cable clamp.

What Is in This Section?

This section contains the following topics:

Topic	Page
USB Cable Clamp for USB (Type A)	137
USB Holder for USB (mini-B)	139

USB Cable Clamp for USB (Type A)

Introduction

When using a USB device, attaching a USB cable clamp to the USB interface to prevent the USB cable from being disconnected.

⚠ DANGER

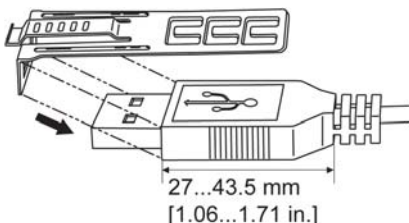
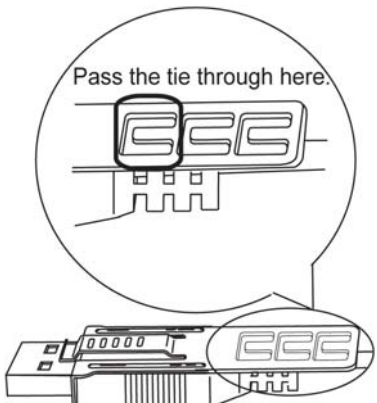
POTENTIAL FOR EXPLOSION

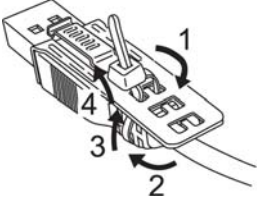
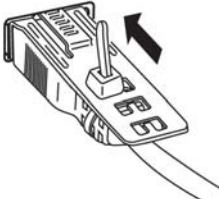
- Verify the power, input, and output (I/O) wiring are in accordance with Class I, Division 2 wiring methods.
- Substitution of any components may impair suitability for Class I, Division 2.
- Confirm that the USB cable has been fixed with the USB cable clamp before using the USB interface.
- Remove power before attaching or detaching any connectors to or from the unit.

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

Attaching the USB Cable Clamp

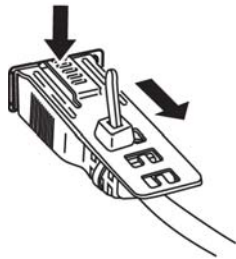
NOTE: Watch your fingers. The edge of the clip is sharp.

Step	Action
1	Mount the clip to the USB mark  connector shell so that it overlaps. The clip matches the 27 to 43.5 mm [1.06 to 1.71 in.] length of the USB connector. 
2	Align the clip and the USB cable connector shell. Adjust the position of the holes where the clip is attached. To ensure stability, select the clip-hole position that is closest to the base of the connector shell. 

Step	Action
3	As shown, pass the tie through the clip hole. Next, turn the tie and pass it through the head so that the USB cable can pass through the center of the tie loop. The clip is now attached to the USB cable.  NOTE: • Check the direction of the head beforehand. Make sure the USB cable is through the center of the tie loop and that the tie can pass through the head. • You can substitute the tie provided with commercially available ties with a width of 4.8 mm [0.19 in.] and thickness of 1.3 mm [0.05 in.].
4	While pressing the grip on the clip, insert the cable from step 3 all the way into the USB host interface. Make sure that the clip tab is secured to the USB cable attached to the HMIGTO. 

Removing the USB Cable

Remove the USB cable while pushing the grip section of the clip.



USB Holder for USB (mini-B)

Introduction

When using a USB device, you can attach a USB holder to the USB (mini-B) interface to prevent the USB cable from being disconnected.

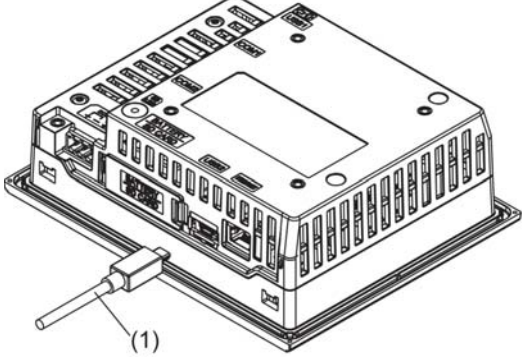
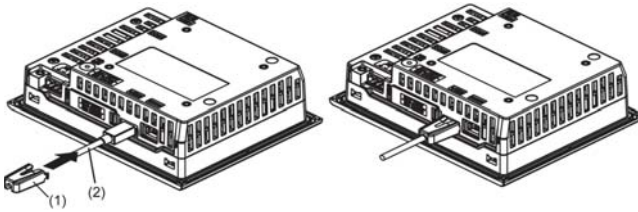
⚠ DANGER

POTENTIAL FOR EXPLOSION

- Verify the power, input, and output (I/O) wiring are in accordance with Class I, Division 2 wiring methods.
- Substitution of any components may impair suitability for Class I, Division 2.
- Confirm that the USB cable has been fixed with the USB cable clamp before using the USB interface.
- Remove power before attaching or detaching any connectors to or from the unit.

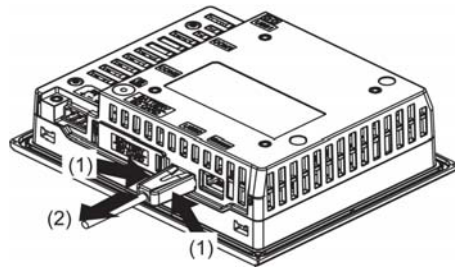
Failure to follow these instructions will result in death or serious injury.

Attaching the USB Holder

Step	Action
1	Insert the USB cable into the USB (mini-B) interface.  1 USB cable
2	Attach the USB holder to fix the USB cable in place. Insert the USB holder into the USB (mini-B) interface.  1 USB holder 2 USB cable

Removing the USB Holder

Remove the USB holder by pressing the tabs from the sides.



- 1 USB holder
- 2 USB cable

Chapter 6

Maintenance

Overview

This chapter explains how to maintain your panel.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Regular Cleaning	142
Replacing the Installation Gasket	143
Periodic Check Points	145
Replacing the Primary Battery	146

Regular Cleaning

Cleaning the display

<i>NOTICE</i>

EQUIPMENT DAMAGE

- | |
|---|
| <ul style="list-style-type: none">• Power off the panel before cleaning it.• Do not use hard or pointed objects to operate the touch panel as you may damage the panel surface.• Do not use paint thinner, organic solvents, or a strong acid compound to clean the unit. |
|---|

Failure to follow these instructions can result in equipment damage.

When the surface or the frame of the display gets dirty, soak a soft cloth in water with a neutral detergent, wring the cloth tightly and wipe the display.

Replacing the Installation Gasket

Overview

The installation gasket provides protection against dust and moisture.

NOTICE

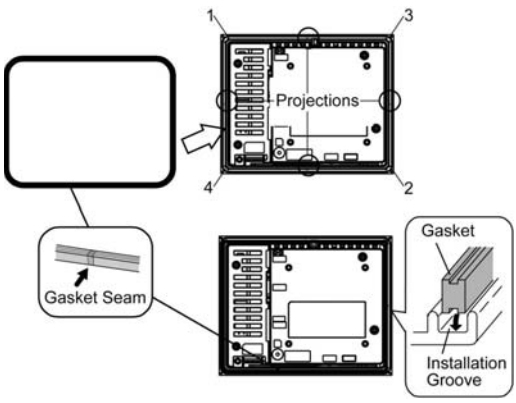
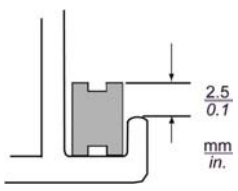
GASKET AGING

- Inspect the gasket periodically as required by your operating environment to keep the initial IP level.
- Change the gasket at least once a year, or as soon as scratches or dirt become visible.

Failure to follow these instructions can result in equipment damage.

Installing the Installation Gasket

NOTE: For instructions on how to install the installation gasket when using HMIGTO2315/HMIGTO5315/HMIGTO6315, see HMIGTO2315/HMIGTO5315/HMIGTO6315 Panel Mounting Procedure ([see page 123](#)).

Stage	Description
1	Place the panel on a flat, level surface, with the display face pointing down.
2	Remove the gasket from the panel.
3	Attach the new gasket to the panel. Position the gasket in the installation groove so that the gasket seam is at the bottom of the panel. First, insert the gasket into the 4 corners, in the order shown in the image below. Then, insert the rest of the gasket into the installation groove. NOTE: • The center of the panel bezel's installation groove is ribbed. Make sure you insert the gasket all the way in without catching the ribbed sections. • When using a tool to insert the gasket, make sure the tool does not catch the rubber gasket and cause a tear. 
4	The upper surface of the gasket should protrude approximately 2.0 mm (0.06 in.) from the groove. Check the gasket is inserted correctly before installing the HMIGTO into a panel. 

The gasket must be inserted correctly into the groove for IP65f moisture resistance for the panel. (IP66k moisture resistance for HMIGTO2315/HMIGTO5315/HMIGTO6315.)

 CAUTION

EQUIPMENT DAMAGE

- Since the gasket is flexible but not elastic, be careful not to stretch it unnecessarily.
- Make sure the gasket seam is not inserted into any of the panel corners.
- Insert the gasket in the installation groove

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

Periodic Check Points

Operation Environment

- Is the operating temperature within the allowable range? Refer to Environmental Specifications ([see page 38](#)), ([see page 52](#)), ([see page 70](#)), ([see page 86](#)), ([see page 103](#)).
- Is the operating humidity within the specified range? (10%RH to 90%RH, dry bulb temperature of 39 °C [102.2 °F] or less)
- Is the operating atmosphere free of corrosive gasses?

When the HMIGTO is inside a panel, the ambient environment refers to the interior of the panel.

Electrical Specifications

Is the input voltage appropriate?

- 100 Vac to 240 Vac 50/60 Hz
- 19.2 Vdc to 28.8 Vdc

Related Items

- Are all power cords and cables connected properly? Are there any loose cables?
- Are all mounting brackets holding the unit securely?
- Are there scratches or traces of dirt on the installation gasket?

Replacing the Primary Battery

Introduction

The replacement battery HMI ZGBAT (sold separately) for the primary battery in the HMIGTO is available from Schneider Electric.

NOTE: The HMIGTO1300/1310 and HMIGTO2300 are not equipped with a primary battery.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Follow the procedures step by step to replace the battery correctly and safely.
- Before replacing the battery, turn OFF the HMIGTO's power.

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

DANGER

EXPLOSION, FIRE, OR CHEMICAL HAZARD

- Use only the replacement battery HMI ZGBAT manufactured by Schneider Electric.
- Do not cause a short circuit.
- Recycle or properly dispose of used batteries.

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

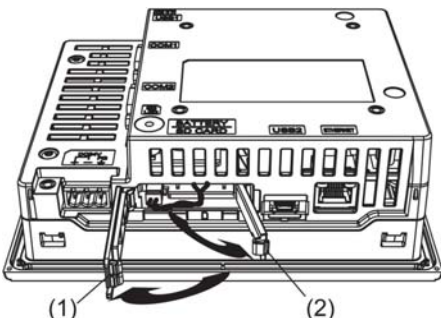
NOTICE

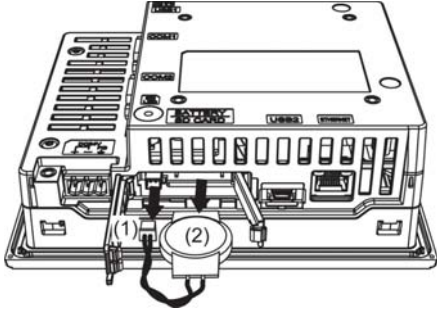
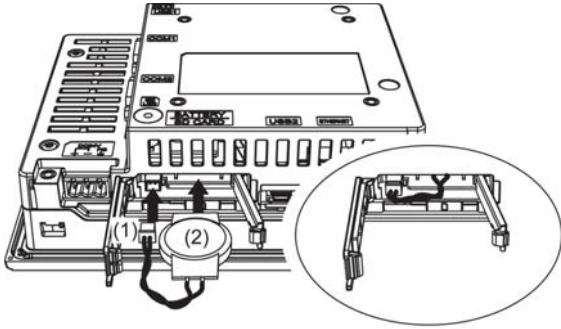
LOSS OF DATA

The primary battery is non-rechargeable, and is used for data backup of memory and the internal clock. If the primary battery is depleted, the backup data is lost. One month before the primary battery is completely depleted, a message will appear to indicate it is time to replace the primary battery.

- Replace the battery within one month after the message appears. Otherwise, backup data may be lost.
- Complete replacing the battery within ten minutes of shutting down the HMIGTO.
- The primary battery replacement time (within a month after the message appears) is only a guideline. When backup SRAM data and clock data is lost after the message appears, Schneider Electric does not perform data recovery/retrieval. Schneider Electric does not accept any responsibility for the loss of data.
- Replace the primary battery regularly every five years after you purchase the HMIGTO.

Failure to follow these instructions can result in equipment damage.

Step	Action
1	Disconnect the power supply from the HMIGTO.
2	Touch the housing or ground connection (not the power supply) to discharge any electrostatic charge from your body.
3	Open the SD Card Interface Cover by pressing its tab. Next, open the Replacement Battery Insertion Cover by pressing its tab.  1 SD Card Interface Cover / Tab 2 Replacement Battery Insertion Cover / Tab

Step	Action
4	Remove the primary battery and connector.  1 Connector 2 Primary battery
5	Attach the new primary battery and connector. 
6	First close the replacement battery cover, then close the SD Card Interface Cover. NOTE: Make sure the cables are inserted completely inside the enclosure. Otherwise, you can damage the cables when you close the cover.
7	Reconnect the power supply to the HMIGTO.



A

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LS	19279	Switch, Level, Mech Float, Narrow Angle, N.C., YEL	N/C, Yellow float
LS	M1343	Switch, Level, Mech Float, Narrow Angle, N.O., Blue	Tilt Float Level Switch w 40' cable
LS-101/2/3	19279	Switch, Level, Mech Float, Narrow Angle, N.C., YEL	N/C, Yellow float
LSHH- 101.102/103 LSHH-301 LSHH-401 LSHH-501 LSHH-502 LSHH-601/602	19279	Switch, Level, Mech Float, Narrow Angle, N.C., YEL	N/C, Yellow float
LSLL-301/401/ 501/502	M1108	Switch, Level, Mech Float, Wide Angle, N.O., Red	13A, SPST, N/O, Red



Warrick®

Series M Mechanical Tilt Float Switch

Installation and Operation Bulletin

Specifications

Cord	16 gauge, 2 or 3 conductor SJOW, Oil Resistant CPE
Contact Rating	13 amp @ 120/240 VAC, 1/2hp
Contact Design	SPST, Normally Open or Normally Closed, Common with N.O. & N.C. (Form C)
Temperature Rating	32°F (0°C) to 194°F (90°C) Dry and 140°F (60°C) Water Resistant
Overall Weight	1.0 lbs. (not including weight)
Tether Method	Tie-wrap nylon, weight: 2.5 lbs.
Approvals	U.L. Recognized, CSA Certified

Installation

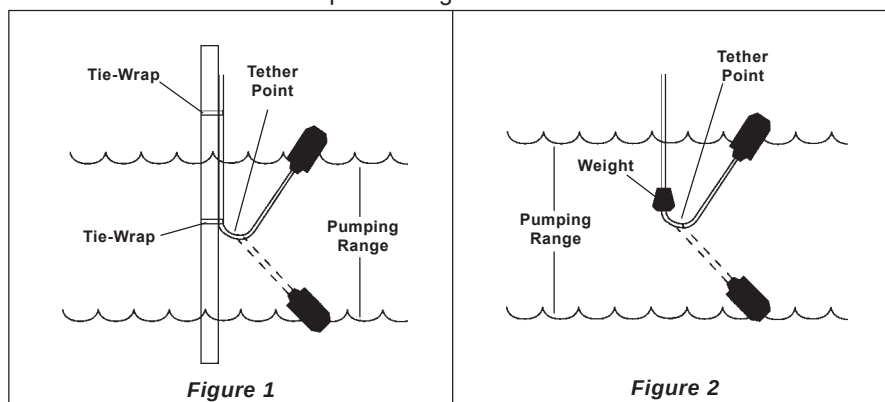
Tether Tie-Wrap (Fig 1)

Attach cord, using a tie-wrap, to a stationary structure. This is known as the tether point, it will determine the pumping range. The farther the float is placed from the tether point, the greater the pumping range. The minimum distance that the float should be placed from the tether point is 3 inches.

Tether-Weight (Fig 2)

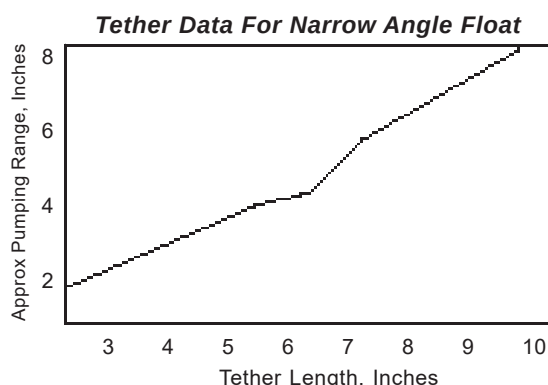
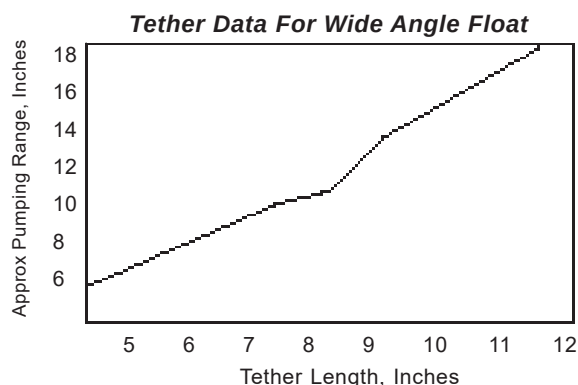
Place tension-brand over the cord before installation. Place the weight at the desired position and secure with the tension-band. This position will determine the pumping range. The farther the float is placed from the tether point, the greater the pumping range. The minimum distance that the float should be placed from the tether point is 3 inches.

Determine tether point using charts below as a reference



Notes:

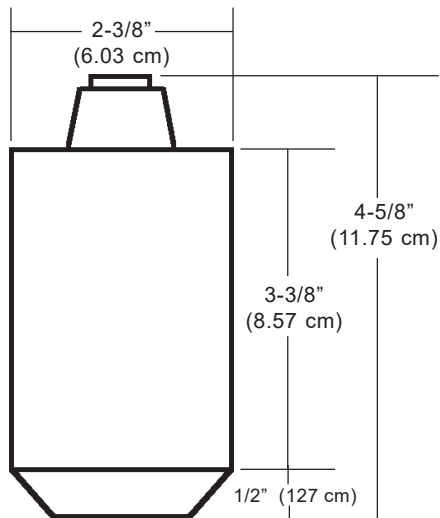
1. To Prevent Motor Burnout - In a pumpdown application make sure the turn-off level is at least 2 inches above the intake of the submersible pump.
2. Securing Tether Points - Make sure levels are correct and that floats are free from any obstructions before securing tether points.



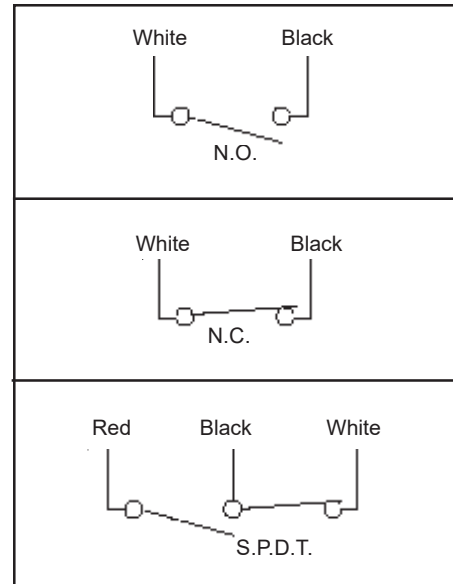
Notes:

1. Narrow angle pumping range is approximately 2 In. to 8 In.
2. Wide angle pumping range is approximately 5 In. to 18 In.

Dimensions



Contact Configurations



Important Points:

- Gems products must be maintained and installed in strict accordance with the National Electrical Code and the applicable Gems Product Instruction Bulletin that covers installation, operation and proper maintenance. Failure to observe this information may result in serious injury or damages.
- For hazardous area applications involving such things as, but not limited to, ignitable mixtures, combustible dust and flammable materials, use an appropriate explosionproof enclosure or intrinsically safe interface device.
- Please adhere to the pressure and temperature limitations shown throughout this catalog for our level and flow sensors. These limitations must not be exceeded. These pressures and temperatures take into consideration possible system surge pressures/temperatures and their frequencies.
- Selection of materials for compatibility with the media is critical to the life and operation of Gems products. Take care in the proper selection of materials of construction, testing is required.
- NSF-approved sensors are made of materials approved for potable water applications according to Standard 61.
- Stainless steel is generally regarded as safe by NSF and FDA.
- Life expectancy of switch contacts varies with application. Contact Gems if life cycle testing is required.
- Ambient temperature changes do affect switch set points, since the gravity of a liquid can vary with temperature.
- Our sensors have been designed to resist shock and vibration. However, shock and vibration should be minimized.
- Filter liquid media containing particulate and/or debris to ensure the proper operation of our products.
- Electrical entries and mounting points in an enclosed tank may require liquid/vapor sealing.
- Our sensors must not be field-repaired.
- Physical damage sustained by product may render it unserviceable.

Return Policy

Returns are accepted on stock items up to 30 days from date of order. You must contact our Returns Department for a Return Authorization (RA) number. Return the goods - freight prepaid - in the original container and include original packing slip. C. O. D. returns are not accepted. Gems reserves the right to apply restocking charges.

Tel: 860-793-4357
Fax: 860-793-4563



Gems Sensors Inc.
One Cowles Road
Plainville, CT 06062-1198
Tel: 860-793-4579
Fax: 860-793-4580

LSHH - Switch, Level, Almeg, Vertical, ATB3-48B
LSHH-7901 - "LSLL-301/401/ 501/502" M1108 Switch, Level, Mech Float,
Wide Angle, N.O., Red13A, SPST, N/O, Red
Switch, Level, Almeg, Vertical, ATB3-48B

ATB 3 and ATS3 Series Spec Sheet

Level Switch - Small Size - Heavy Duty



The ATB3 is designed for high or low level alarm or switch point applications in rugged situations similar to oil tank reservoirs or industry vessels that require a more robust level switch. Notice the larger brass one piece machined hex to get a wrench on - this model also has an optional brass set screw locking collar in place of the clip.

Internal reed switch selection is the same Almeg quality standard but we've beefed up the external part as well as fully encapsulated the reed switch to maintain a complete moisture free environment. The leads are wire wrapped (not clipped) soldered and heat shrink sealed to the reed switch before encapsulating.

The TRUE closed cell Buna float will not swell or take on moisture - even if cut or drilled. It is designed like a tight bee hive or honey comb construction.

100% of our controls are tested before shipping.

The ATB3 is available in a single order or OEM applications.

LT-301/501 - Transmitter, Pressure, KPSI 750 series 0-10ft H2O Part
Number 750S14D4A004.334000.000B10015B

KPSI®

Level Transducers



KPSI® User's Manual

18th Edition

February 2010

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Our Company

Pressure Systems is an ISO9001:2000 certified U.S. manufacturer of submersible and non-submersible (above ground) pressure transducers for environmental, industrial and municipal applications. Our KPSI™ Level and Pressure Transducers have been specified in thousands of projects throughout the United States, Canada and Europe by geologists, system integrators, national engineering firms and a variety of government agencies. Typical applications include, but are not limited to, pump control, tank level monitoring, sewage lift station operation, reservoirs, weirs, flumes, site remediation, watershed management, storm water/well monitoring, pump/pipeline pressures and compressor pressures.

Website and E-Mail

You may visit our website at www.PressureSystems.com to look at our latest new product releases, application notes, product certifications and specifications, as well as Intrinsic Safety control installation drawings. E-mail your questions and comments to us: sales@PressureSystems.com.

E-commerce

Orders may be placed on-line by visiting our e-commerce site (www.LEVELandPRESSURE.com) or by contacting the factory or local representative.

Applicable Products

This manual provides information applicable to the use of the following KPSI Level and Pressure Transducers:

Level Transducers (Submersible)

Series 700/710/720/730/735

Series 320/330/335/340

Series 300DS

Series 705

Series 750

Please note: Series 500 and Series 550 (waterMONITOR) have separate manuals.

Pressure Transducers (Non-submersible)

Series 27/28/30

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1.0 Product Description

General Characteristics

KPSI™ Level and Pressure Transducers use isolated-diaphragm sensors that are specifically designed for use with hostile fluids and gases. These sensors utilize a silicon pressure cell that has been fitted into a stainless steel or titanium package with an integral, compliant stainless steel or titanium barrier diaphragm. This sensor assembly is housed in a rugged 316 stainless steel or titanium case which provides for a variety of level ranges from 2.3 ft (0.75 m) H₂O through 4614 ft (1408 m) H₂O and pressure inputs from 0-1 (7 kPa) through 0-15000 psi (103 mPa). Our devices feature internal signal conditioning. Standard outputs are 4-20 mA and VDC.

All units containing active electronic components have surge and reverse polarity protection. For ease of use in the field, our transducers are permanently laser engraved with our logo and name, wiring information, part number (P/N), serial number (S/N), date of manufacture (DOM), range, excitation and output. Transducers are offered in diameters of 1.0 (25 mm) and 0.75 inches (19 mm).

Care and Handling

Our transducers are designed for rugged use. However, they need protection from over pressure and sharp impact. When lowering them into a liquid, penetrate the surface slowly and only to the depth necessary. Avoid dropping the unit from above the surface. Clean all transducers by rinsing them in a mild detergent. Direct probing of the diaphragm or attempts to remove protective screens will damage the sensor, voiding the warranty.

Calibration

All transducers are shipped with calibration information unique to each transducer. Make sure you keep each calibration report. However, should you misplace your calibration sheet, you can contact the factory and request a duplicate. All KPSI™ Transducer calibrations are traceable to the National Institute of Standards and Technology (NIST).

Approvals

Most of our products have UL and FM certification for intrinsic safety. Their respective installation control drawings can be downloaded from our website. Several of our product lines also carry ABS approval. Most products are CE compliant to EN 61326-1:2006 and EN 61326-2-3:2006. CE compliant units are labeled accordingly.

2.0 Product Accessories and Options



Nose Caps

There are several different user-installable nose caps for the 700, 710, 720, 730, 735 submersible level transducers. The ported nose cap (Delrin) with #8-32UNC-2B threaded hole is best used where weights are required and for those installations where users may encounter sharp, protruding objects. The open-face nose cap which allows maximum contact with the liquid media is ideal for wastewater and "greasy" applications where clogging of the sensor is a concern. The piezometer nose cap allows the unit to be buried in saturated soil without damage to the sensor diaphragm. The 1/4" male NPT pressure nose cap is not only useful for calibration purposes but also allows the device to be used as a submersible or above ground pressure transducer.



810 SuperDry™ Vent Filter or 815 Aneroid Bellows

All submersible transducers with vented gauge format are supplied with a protective barrier that guards against moisture buildup in the cable vent tube. The 810 SuperDry™ vent filter is installed free of charge and is guaranteed to operate maintenance free for one year. We also offer the 815 Aneroid Bellows as a maintenance free option that can be used on submersibles with accuracies of: $\pm 1\%$, $\pm 0.5\%$, or $\pm 0.25\%$ FSO. These barriers ensure reliable operation and long life as they protect sensitive electronic components from mildew and prevent the formation of a liquid column in the vent tube. Any such liquid column directly affects calibration of the transducer.

Sacrificial Anodes

Our sacrificial anodes are made from a special zinc alloy formulated to guarantee continued effectiveness over long periods. Because the anodes are 95% galvanic, they will not corrode unless there is an electrolytic demand. The anode maintains a high driving potential throughout its 12 month life, is self-sluffing and always exposes new zinc for the best possible protection. For those applications where cable buoyancy is a problem, the sacrificial anode can be substituted for hanging weights.

Sacrificial Anodes provide cathodic protection against galvanic corrosion for our submersible pressure transducers. Galvanic corrosion occurs when dissimilar metals are placed in contact with an electrolyte. This condition causes a potential difference to exist between the two metals, causing electron flow between them. Corrosion of the less corrosion-resistant metal is increased and attack of the more resistant metal is decreased. The 820 Sacrificial Anode is clamped to the exterior of a one-inch bore submersible transducer. We also offer a 1" diameter pencil anode, the 825, that attaches to the nose cap of either a 3/4" or 1" bore submersible transducer.

Absolute/Sealed Gage Transducer

The sealed gage option for submersible transducers eliminates the need for a vent filter. The standard output of a sealed gauge transducer is 4 mA at 14.70 psia. Before ordering a sealed gauge transducer, the customer should determine the altitude (above sea level) of the installation and inform PSI's Customer Service of this value before order entry. During manufacture, the output of the transducer will be adjusted to compensate for the altitude difference, if applicable.

Polyurethane & ETFE Jacketed Cable

Most installations of our submersible level transducers connect our polyurethane or ETFE cable to a junction box. From this junction box (P/N 840), users typically run their own cable to the required instrumentation. Polyurethane-jacketed cable is used for most applications while ETFE material is recommended for more aggressive environments.

Specifications for our standard polyurethane and ETFE jacketed cable are as follows:

Specifications	Standard Submersible Cable	Standard Non-Submersible Cable
Weight	0.05 lbs/ft (0.07 kg/m)	0.025 lbs/ft (0.035 kg/m)
Min. OD	0.28" (7.10 mm)	0.189" (4.8 mm)
Max OD	0.31" (7.87 mm)	0.19" (4.9 mm)
Conductors	4 - 22 AWG	22 AWG
Insulation Conductors Outer jacket	PVC Polyurethane or ETFE	Color coded PVC
Shield	36 gauge spiral tinned copper wire foil shield with drain wire	Aluminum/polyester foil facing outward
Vent Tube	Polyethylene, .060" ID (1.52 mm)	Drain wire 7/32 tinned copper

- Chemical resistance of polyurethane:** Potable Water, Wastewater, Borax, Butane, Animal Fat, Carbonic Acid, Citric Acid, Cod Liver Oil, Corn Oil, Glycerin, Glycol, Mineral Oils, Potassium Nitrate, Potassium Sulfate, Silicone Oils, Stoddard Solvent, Tannic Acid (10), Tartaric Acid, Turbine Oil.

- **Chemical resistance of ETFE:** Acetic Acid (Glacial), Acetic Anhydride, Acetone, Aluminum Chloride, Anti-Freeze, Bromine, Calcium Chloride, Calcium Hydroxide, Chlorine, Copper Chloride, Ferrous Chloride, Hydrochloric Acid, Ketones, Lacquer Thinners, Sulfuric Acid.

The vented cable termination end is specially prepared at the factory to eliminate the potential for moisture migration. Where the lead wires emerge from under the jacket, there's potting material and a shrink tube "boot", every effort should be made to leave this feature intact. Should the cable be longer than needed for the installation, it is recommended that the excess length be accommodated in a service loop and that the potted end of the cable **NOT** be shortened.

The cable attached to this instrument is specifically engineered for submersible applications. The polyurethane outer jacket provides long term reliability under most conditions. The cable should be handled carefully, however, as the jacket may be subject to cutting should it be "raked" over extremely sharp edges. To guard against water incursion should an inadvertent minor cut occur, we have incorporated an exclusive "water block" feature immediately beneath the jacket. The cable is fully shielded, with the shield connected to the metal housing at the transducer end and terminated in a drain wire at the termination or user end. The shield should always be terminated to a good earth ground, unless the transducer is installed in an area where galvanic corrosion is known to be a serious problem.

Lightning Protection

Lightning and surge protection for VDC, SDI-12 and 4-20 mA output are available. This is achieved through the use of 2 protectors, one is integral to the transducer housing and one is provided for the outside line located at the surface and grounded to a DIN-Rail. Please remember this option must be factory installed at the time of order entry or as a factory upgrade. **This option cannot be installed in the field.** Lightning protection is also available for unit only. Contact customer service for details.

Featuring quick response and low clamping voltages, these devices protect against fast rising voltage transients as well as severe current surges associated with lightning discharges up to 20,000 amperes. Following a surge, the protector automatically restores the line to normal operation and awaits the next surge without having to reset a breaker or replace a fuse. The power supply needs to be limited to 150 mA to avoid lock up of the gas tube after a suppression event. **Transducers installed with this option have a lifetime warranty against damage due to voltage surge.**

Please note: When using the lightning protection option on 4-20 mA products, users should take into account the additional series resistance of this option when selecting the loop power supply. This option will increase total loop resistance by 88 Ohms.

½" Male NPT Conduit Fitting

Submersible level transducers can be attached to a rigid conduit and the cable run through the conduit. To achieve this, all of our submersible transducers can be fitted with an optional ½" NPT male conduit fitting (specify "Electrical Connection Option 4" when ordering) where the cable exits the transducer. This fitting can be mated to a standard rigid conduit.

Electrical Outputs

We offer the industry standard 0-5 VDC and 4-20 mA outputs. In addition we also offer a variety of voltage output ranges.

Reverse Signal Output

For some applications, it is important to know how far the water is from the top of the tank or the surface of the ground. If specified by the customer, our factory can set the transducer so that zero pressure reads full scale electrical output and maximum pressure reads zero electrical output.

Temperature Output

A temperature output option is available for most transducers having 4-20 mA pressure output. The temperature sensor requires an excitation of 9-28 VDC and is calibrated for a temperature range of -20 to 60°C with an accuracy of $\pm 4^\circ\text{C}$.

Output Option 6 (4-20mA output for -20 to 60°C) $(\text{mA Reading} \times 5) - 40 = \text{Temperature } ^\circ\text{C}$

Example:	Reading is 20mA	$(20 \times 5) - 40 = 60^\circ\text{C}$
	Reading is 12mA	$(12 \times 5) - 40 = 20^\circ\text{C}$
	Reading is 4mA	$(4 \times 5) - 40 = -20^\circ\text{C}$

Cable Hanger

We can supply an optional cable hanger (P/N 12-90-0931) to help end users secure the cable. The cable hanger can be positioned anywhere on the cable by pushing the ends together. Once positioned, the cable hanger expands and provides a snug grip on the cable.

When mounting the transducer in a well casing, the cable hanger can be secured to a hook on the well plate or an eye bolt may be attached to the side of the well casing. The cable hanger loop is then secured to the eye bolt by using any number of types of fasteners. A similar technique can be used when working in stilling wells for surface water level measurement. In this case, the loop-end of the cable hanger can be attached directly to a screw or bolt bored into the still well shelf.

Submersible Cable Splicing Kit

Our field-installable cable splice kit (P/N 830) allows you to splice polyurethane and ETFE submersible cable. It is most commonly used for well applications where the more expensive ETFE cable is required for suspension in corrosive media where the liquid level is fairly shallow, but the well is hundreds of feet in depth. It is also used in emergency situations where cable must be spliced together to get an application up and running.

3.0 Installation & Maintenance Tips



General Installation Procedures

The following is important installation and preventive maintenance information. Our Customer Service or Applications Engineering Support staff can provide additional instruction.

1. **Transducer Anchors:** Most users either suspend our submersible transducers in stilling wells or attach them to rigid conduit. This is done to prevent damage to the transducer from shock caused by water turbulence. It is not advisable to tie your transducer to a pump or to piping, as any problem with the transducer could require that the pump be pulled from the installation. This could prove to be *very expensive*. (Please refer to the Cable Anchoring Schemes drawing in **Appendix A.**)

Some applications use our optional bracket (P/N 49-06-00PC) to clamp the transducer to a fixed object (i.e., wall, ladder, step) or require the unit to be suspended without any protective still well or attachment device. In all installations, care should be taken to ensure no damage occurs to the cable.

2. **Transducer Submersion:** Damage to submersible cable is one of the most frequent causes of transducer failure. Lower your transducer into the liquid slowly, making sure the cable does not drag over sharp edges and only to the depth necessary. Avoid dropping the unit from the surface. This does not apply to Series 27, 28, and 30 transducers.
3. **SuperDry™ Vent Filter (Desiccant) or Aneroid Bellows Installation** (For submersible transducers vented gage pressure format only) **Always** install a desiccant vent filter or aneroid bellows immediately after transducer installation. Failure to use one or the other could result in premature failure of the transducer; which would not be covered by warranty. If you use a desiccant filter, you should establish a regular maintenance schedule. You should change your vent filter when it is 75% spent (pink color). Replacement filters are available at a nominal cost from the factory. Do not remove the old vent filter until a new one is available. The most common failure mode of our transducers is moisture and corrosion damage due to lack of use or maintenance of the vent filter. This will allow air into the desiccant filter and allows the transducer to properly vent with changes in barometric pressure.

To install/replace either the aneroid bellows or the vent filter, simply unplug the old unit from the vent tube and plug the 0.062" x 1" stainless steel connector tube (supplied with each filter or bellows) into the vent tube. (Installation and mounting instructions are supplied with each aneroid bellows and vent filter.) The diagram on page 16 shows typical vent filter and aneroid bellows hookups.

4. **Cable Protection** An inexpensive way to protect the cable from damage is to order the submersible pressure transducer with a ½" conduit attachment. Connect an inexpensive flexible 5/8" garden hose to the ½" conduit fitting with an equally inexpensive female PVC ½" NPT x 3/4" NHT swivel fitting, available at your local hardware store
5. **Bending of Cable** Our polyurethane and ETFE jacketed cables are quite flexible. Care needs to be taken to ensure that when bending the cable to suit your installation you do not crimp the vent tube inside the cable. Consequently, do not bend the cable more than a radius of 1 inch.
6. **Cable Compression** Many users require a compression fitting to secure our ETFE and polyurethane jacketed cable as it enters a junction box. Care needs to be taken that you do not over-tighten the fitting so as to damage the cable.
7. **4-20 mA Wiring** When connecting a 2-wire 4-20 mA transducer to a typical power supply and mA meter, verify that the meter has an input impedance of at least 10 Ohms. If you are unsure of the input impedance, then a 10 Ohm resistor may be placed in series with the meter and transducer. Connect the + (red) lead of the transducer to the + terminal of the power supply. If the 10 Ohm resistor is required, connect it to the - (black) lead of the transducer. Use a short length of 22 AWG or heavier wire to connect the + terminal of the meter to the resistor (if it is required) or the - (black) wire of the transducer. Connect the - terminal of the meter to the - terminal of the power supply with a length of 22 AWG or heavier wire. Connect the drain wire from the transducer to a good earth ground. (See **Appendix**, page **14** for wiring diagram.) Please refer to "**Maximum Cable Lengths and Minimum Supply Voltage**" in **Appendix C**, page **22** to verify minimum loop supply voltage requirements.
8. **VDC Wiring** To connect a 3 wire VDC output transducer to a typical power supply and the voltmeter, connect the - terminal of the power supply to the - input terminal of the meter with a length of 22 AWG or heavier wire. Connect the - excitation (black) lead of the transducer to the - input terminal of the meter. Connect the + input terminal of the meter to the signal lead (white) of the transducer. Connect the + terminal of the power supply to the + lead (red) of the transducer. Connect the drain wire to a good earth ground. (See **Appendix A**, page **14**.)
9. **The Model 750** comes standard with a field removable diaphragm protector (one-inch or 25 mm standoff). The diaphragm protector can easily be taken off by removing six (6) fasteners located on the bottom of the unit.
10. **Sealed-Gage Transducer Configured For Altitude Above Sea Level** Since sealed-gauge transducers are normally calibrated at sea level, there may be considerable error induced when used at a higher elevation. If the transducer was calibrated without taking into consideration the difference in atmospheric pressure at sea level and the higher elevation, an offset error will occur. In order to eliminate error due to this difference, the customer must identify the elevation where the transducer will be installed. The nominal atmospheric pressure at the location is calculated and the transducer will be ranged accordingly. Not all KPSI Transducers are available in a sealed pressure format. Please refer to the appropriate datasheet for availability.
11. **Position Sensitivity** The transducer should be installed so that the diaphragm located behind the nose cap is oriented in a vertical position, otherwise the unit could exhibit an offset.

General Maintenance Tips for Submersible Transducers

1. Desiccant Maintenance



If you use a desiccant vent filter, you should establish a regular maintenance schedule. You should change your vent filter when it is 75% spent (pink color). Replacement filters are available at a nominal cost from the factory. Do not remove the old vent filter until a new one is available. Remember that Pressure Systems' improved 810 SuperDry™ Vent Filter are designed to be effective for at least one year before requiring replacement.

2. Clogged Nose Piece or Dirty Diaphragm

Either of these conditions could result in erroneous readings from your transducer.



Your transducer may be cleaned in accordance with the procedures listed in step 4, below.

3. Cleaning your transducer

Materials required:

- Plastic bowls 8-12 inches (200-300 mm) in diameter and 4-6 inches (100 - 150 mm) deep
- Supply of clean, lint-free cleaning rags
- 32 ounce bottle of "The Works-Tub and Shower Cleaner" (a mild detergent) manufactured by Lime-O-Sol Company in Ashley, IN 46705 and available locally through Wal-Mart, K-Mart, Target, and Ace Hardware stores at \$2 to \$4 per bottle

Preparation: Prior to cleaning your pressure transducer, ensure that all procedures have been followed in the proper cleaning of the cable and transducer to remove any hazardous materials. The vent filter (or bellows) must be properly attached. The cable should be coiled to ensure ease of handling and it must be protected against the possibility of accidental abrasion and/or penetration of the cable jacket by sharp objects. A lead length of 1 to 1 ½ feet (0.3 - 0.45 m) of cable from the transducer should be allowed to facilitate handling during cleaning. The protective covering (or similar protective device) that is shipped with each transducer should be attached to the transducer at all times. It should only be removed prior to installation or cleaning.

Your work surface needs to be clean and free of clutter and large enough to accommodate all materials required in addition to the transducer and cable. Fill one of the bowls with fresh water, one with a mild detergent mixed with water and the last with 16 ounces (0.45 kg) of "The Works".

Cleaning:

- Step 1:** Holding the cable 6 inches (150 mm) from the transducer, immerse the unit in the bowl containing the mild detergent and stir for 20-30 seconds. Remove and rinse in the bowl containing the fresh water, using the same stirring motion used in the mild detergent. Rinse and wipe dry.
- Step 2:** Holding the body of the transducer with one hand so that you are looking at the retaining screen protecting the sensor, carefully remove the sensor nose piece by simply unscrewing it from the transducer body. *Do not touch the sensor diaphragm with your finger or any other object. Also, do not try to dry the inside portion of the transducer, as you risk damaging the pressure sensor.*
- Step 3:** Place the transducer in a vertical position with the sensing end facing downward in the bowl containing "The Works" solution for approximately 15-20 seconds. Rinse in the bowl containing clean water and wipe dry the external casing only. Place the protective screen in the same solution for 15-20 seconds, rinse and wipe dry.
- Step 4:** Holding the transducer in a vertical position so that you can see the face of the sensor, screw the protective nose piece back into place.

4. Cleaning the Lightning Protection Data Line Protector

4.0 Warranty and Product Return Procedure

Any transducer/transmitter that is less than 2 years old (see DOM) which does not meet the product's specifications and exhibits **no obvious physical damage to the housing, sensor, or cable (cuts)**, will be replaced under warranty.

Units 2-3 years old: Units that fall within this age group and exhibit no obvious physical damage to the housing, sensor, or cable (cuts), may be replaced at a discounted list price.

Units greater than 3 years old: Units that fall within this age group are not replaced under warranty.

Merchandise Return Procedures

Contact the **Applications Support Group** or the **Customer Service Department** at Pressure Systems if your transducer is not operating properly. Our staff is available for troubleshooting at **(757) 865-1243** or toll free at **1-800-328-3665** during normal working hours, Eastern time. If your transducer or accessory needs to be returned to Pressure Systems, obtain a *Returned Merchandise Authorization* (RMA) from the Customer Service Department prior to shipment. Be prepared to supply the following information when requesting the RMA:

- Part number
- Serial number
- Complete description of problems/symptoms
- **Bill To** and **Ship To** address
- Purchase order number (not required for warranty repairs)
- Customer contact and telephone number

The above information, including the RMA number, must be on the customer's shipping documents that accompany the equipment to be repaired. Pressure Systems also requests that the outside of the shipping container be labeled with the RMA number to assist in tracking the repairs. All equipment should be sent to the following address:

ATTN: KPSI TRANSDUCER REPAIR DEPARTMENT (7-digit RMA number)
Pressure Systems, Inc.
34 Research Drive
Hampton, Virginia 23666

Prior to returning to Pressure Systems, the transducer and cable must be cleaned per instructions provided on the cleaning certificate supplied when the transducer was delivered. The certificate can also be found on Pressure Systems website:

www.PressureSystems.com/cleaning.html

The completed certificate must accompany the transducer when shipped to Pressure Systems. If the transducer has been used in media other than potable water, PSI customer service must be notified at the same time an RMA number is requested. PSI reserves the right to reject any shipment deemed to be unsanitary or environmentally unsafe to handle. If these guidelines are not met, the package will be sent back unopened and at the customer's expense. **Please**

include the attached vent filter or aneroid bellow with each returned vented gage submersible transducer.

Pressure Systems will return warranty items prepaid via UPS GROUND. If the customer desires another method of return shipment, Pressure Systems will prepay and add the shipping charges to the repair bill.

Incoming freight charges are the customer's responsibility. The customer is also responsible for shipping charges to and from Pressure Systems for all equipment not under warranty.

Once the return is received, it typically takes 5-10 working days for the technician to make a fault determination.

A cable reconnect fee will be charged when the customer requests a different length of cable.

Restocking Policy

Pressure Systems does allow standard products to be returned for credit in the event it is no longer required, providing the products are in new and unused condition. A restocking fee will be assessed depending on the model type and variety.

A **25% restocking fee** applies to the following models, providing they are vented-gage reference format and [pressure ranges above 3 psig (20 kPa) and below 100 psig (690 kPa)].

27	320	700	710
28	342	705	720
Display Meters - all models			750

A **50% restocking fee** applies to the following models. This also applies to all other models with sealed-gage and absolute pressure formats as well as vented-gage reference formats with [pressure ranges below 3 psig (20 kPa) and above 100 psig (690 kPa)].

30	335
300DS	730
330	735

NOTE: Expedite premiums and shipping charges are non-refundable.

Please consult the individual manuals for the Series 500 and Series 550 (waterMONITOR) for the restocking policy.

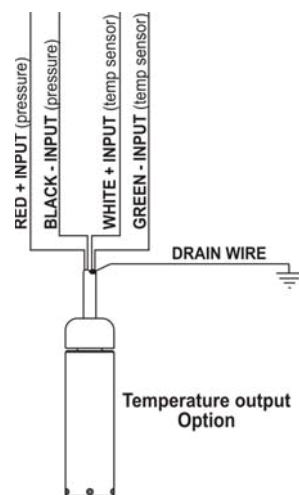
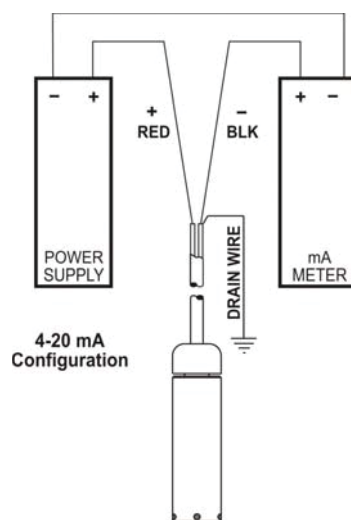
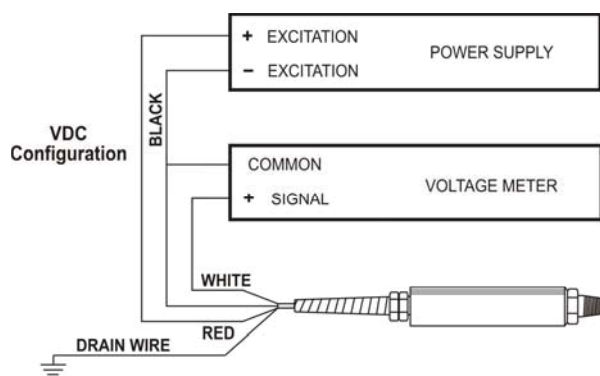
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Appendix A

Drawings and Diagrams

Wiring Diagram VDC, mA, and Temp Output	14
Cable Anchoring Schemes	15
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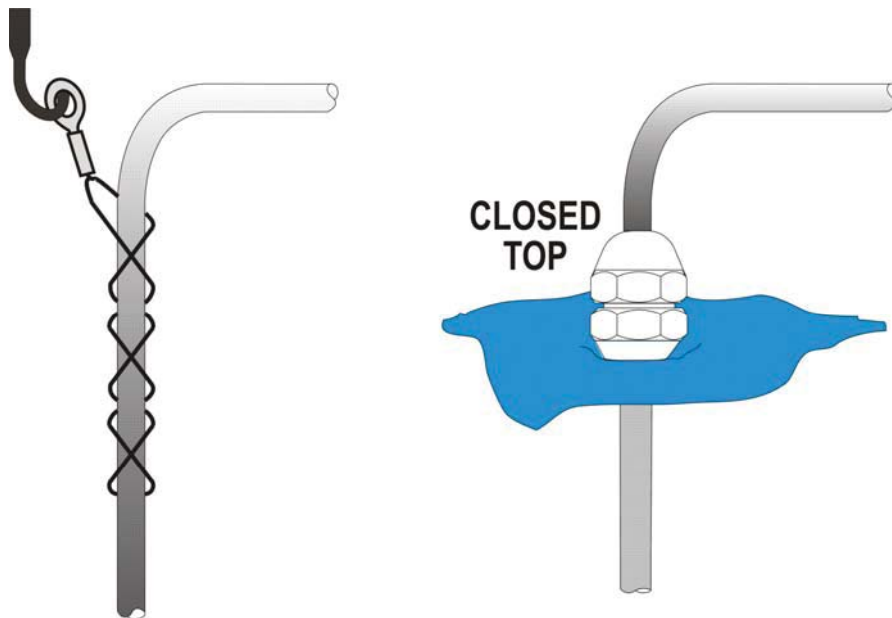
Wiring Diagram VDC, mA, and Temp Output



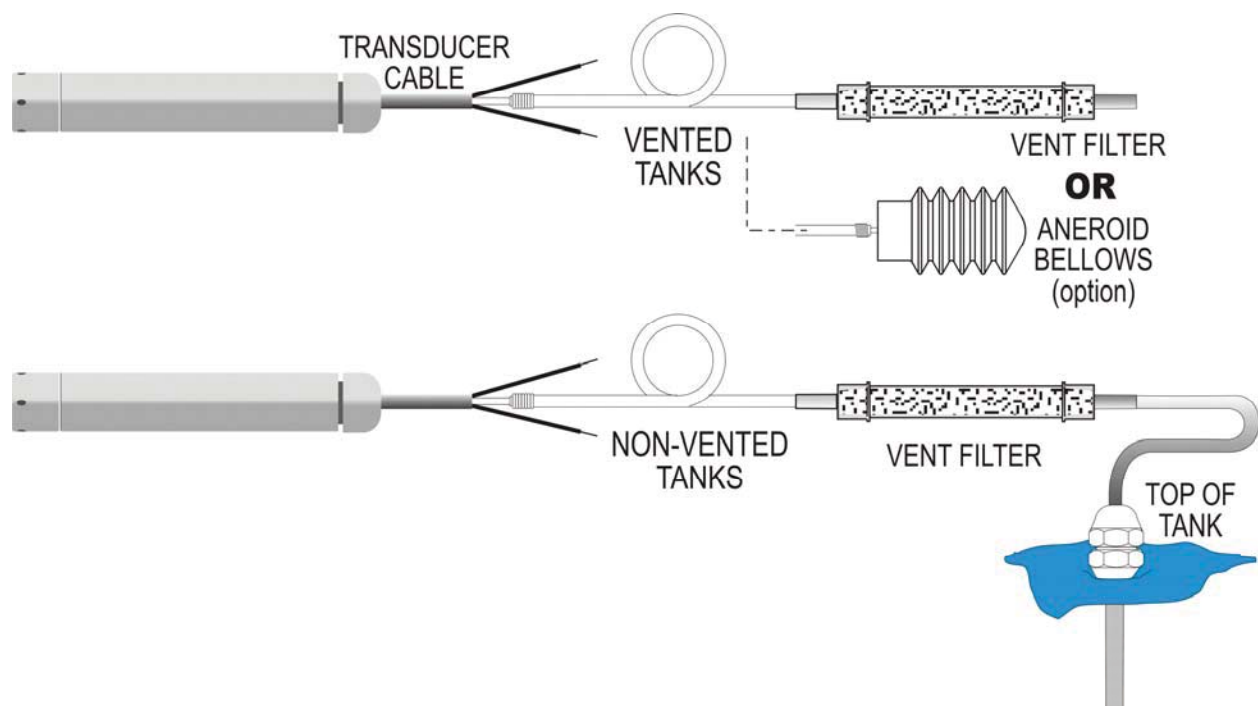
Notes:

1. These diagrams depict typical installations. Refer to your power supply and instrumentation Manufacturer for the specifics of your application.

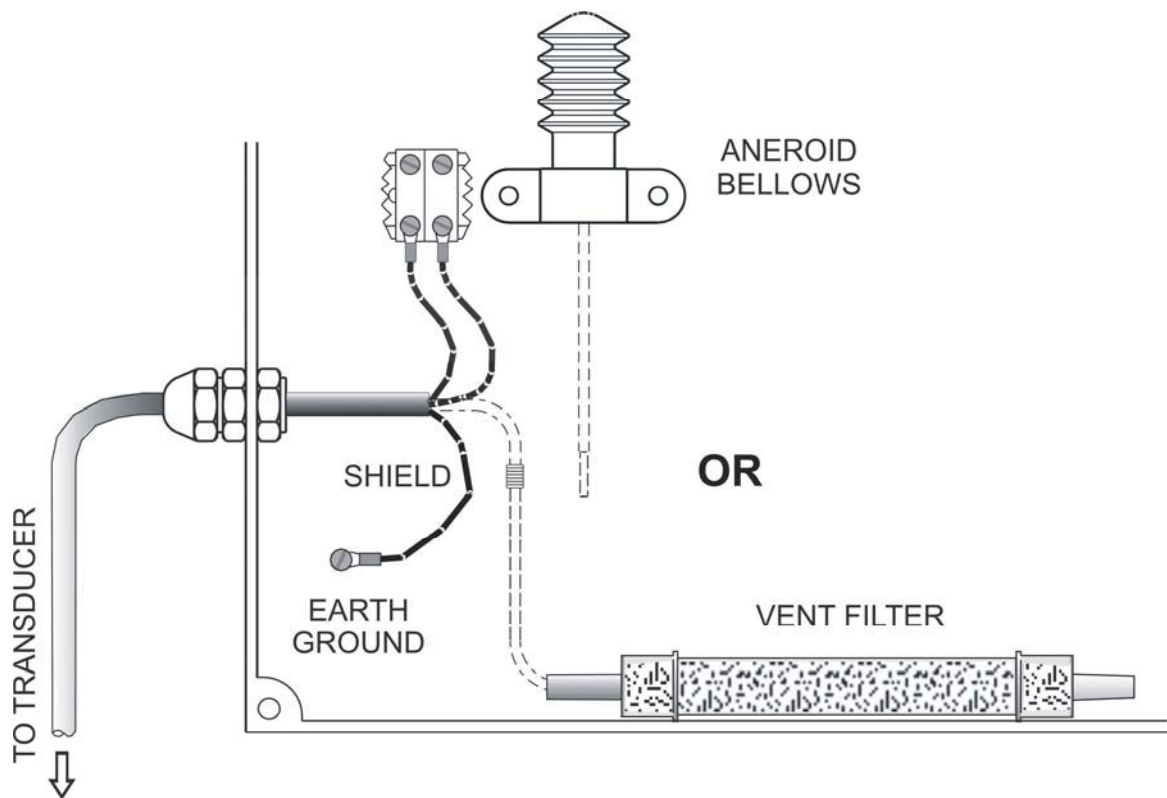
Cable Anchoring Schemes



Reference Connection Schemes



Submersible Cable Termination



Appendix B

- 1. Question:** What installation ideas do you have to help me get rid of electrical noise interfering with the signal?

Answer: An ounce of prevention goes a long way. Either try to eliminate the source of noise or move the transducer as far away from it as possible. We strongly encourage you to secure our cable shield to a good earth ground and that you use a 4-20 mA signal output. Armed with these precautions and the fact that many of our transducers are CE approved for electromagnetic interference, you should have few problems.
- 2. Question:** The cable on the submersible transducer always seems to get cut and damaged. What am I doing wrong?

Answer: This is the most common problem that our users encounter. Make sure that all of your colleagues and staff understand the importance of handling the cable with care. The cable should not be bent around rough or sharp edges. Always use a cable reel during transport. Where possible, suspend the unit in a perforated 2" (50 mm) PVC pipe and thread the cable through protective conduit to the nearest junction box.
- 3. Question:** I have an application where the transducer is frequently damaged by voltage spikes. What can be done to prevent this?

Answer: At a minimum, make sure the cable shield is connected to an earth ground as near as possible to the transducer. We can provide a surge protection kit for both our submersible and non-submersible transducers. See page 4. These kits will handle typical spikes that might come in through the power lines as well as surges that travel through the ground due to nearby lightning strikes
- 4. Question:** How much impact shock can your submersible transducers withstand?

Answer: Our transducers are not shock tested and the lower pressure ranges can be damaged if dropped from several feet onto an unforgiving surface like concrete. We recommend that the protective shipping foam remain in place until the unit is installed.
- 5. Question:** What is the response time of your transducer?

Answer: From initial power up, the transducer output will stabilize within a fraction of a second. The frequency response is rather low, probably less than 1 kHz, but it depends on the application, the media, plumbing, etc. Call our factory for application assistance if frequency response is critical in your application.

6. **Question:** How do I attach your vent filter or aneroid bellows to my cable vent tube?
- Answer:** The vent filter can be mounted anywhere convenient, preferably out of the weather. It can be mounted in any position and connects to the cable vent tube via the extension tube with metal connector tube provided. The aneroid bellows must be mounted in a way that its movement is not encumbered. It is provided with a mounting base.
7. **Question:** What is the best way to mark my cable?
- Answer:** Use white vinyl marking tape available from your local hardware or electronic stores. These same stores may also sell cable marking kits.
8. **Question:** Any ideas for preventing marine growth on your submersible transducers?
- Answer:** You might want to try waterproof grease. Remove the threaded nose cap to facilitate applying the grease. **Take care not to damage the diaphragm when applying the grease and not to trap air bubbles against the sensing diaphragm.**
9. **Question:** How many measurements can you make before the diaphragm on the sensor fails?
- Answer:** In normal operation - millions of cycles. We find that sensor failure is rarely due to diaphragm fatigue.
10. **Question:** What is the turnaround time on repairs?
- Answer:** Once we receive a unit into our facility it takes less than 10 working days to complete an evaluation.
11. **Question:** What is the longest length of cable you have attached to a submersible transducer?
- Answer:** Two thousand feet (610 meters).
12. **Question:** Why do you use 316 SS housings and sensors for your standard transducers?
- Answer:** It offers a good combination of corrosion resistance and reasonable cost. As an option, we do offer titanium for more aggressive environments.
13. **Question:** What wire gauge should I limit myself to when connecting to your 22 AWG wire?
- Answer:** Use 22 AWG or heavier.
14. **Question:** Does it make any difference if I mount the transducer in a vertical or horizontal position?
- Answer:** Yes. Our units will experience a certain amount of position sensitivity. You should mount it in a vertical position throughout the measurement cycle. If you lay the transducer down, the user must realize that an offset will occur.

15. Question: What happens when you freeze your transducer in a column of water?

Answer: We have frozen our transducers in a container of water in a home freezer, with no resulting damage. However, depending on the level range of the unit, over pressure of the unit is possible. In harsh environments where debris is common and ice shifts, you might expect damage to both the transducer and cable.

16. Question: Why would I choose a KPSI Transducer versus a competitor?

Answer: Reliable, long lasting products
Rapid delivery
Lightning protection lifetime warranty
Excellent pre & post sales/application support
No hassle service

Appendix C

Troubleshooting Techniques

Quick Check Procedure

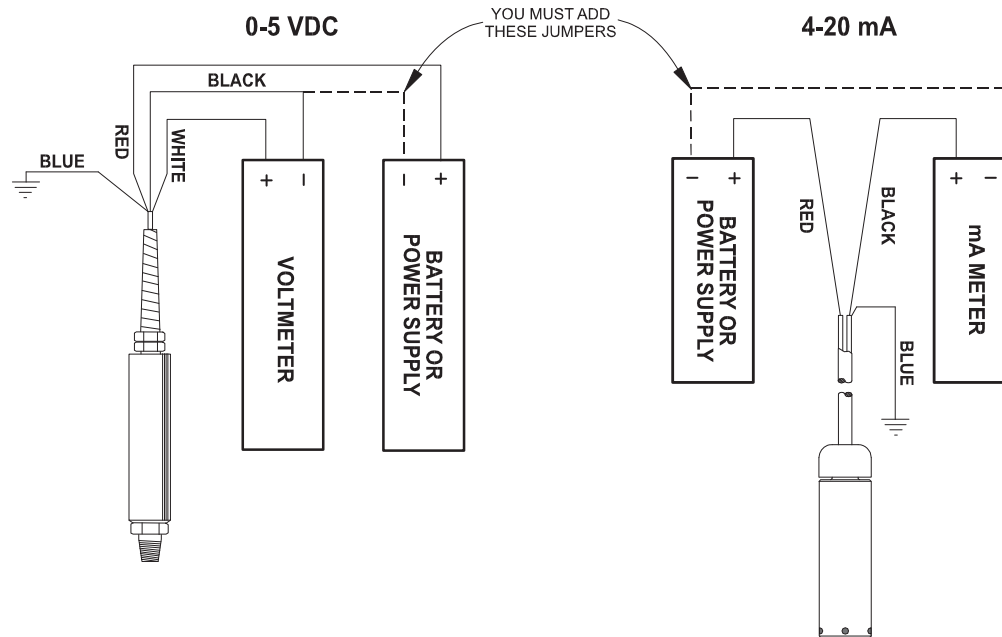
The following is a quick field checkout procedure for KPSI Level and Pressure Transducers. It will be referred to throughout the troubleshooting section.

Should a problem be encountered with a transducer or transmitter, it is sometimes helpful to test the transducer independently from the rest of the system, thereby establishing where to concentrate the troubleshooting effort.

On the next page is a simple hookup diagram for the most common types of electrical output, a 0-5 VDC transducer and a 4-20 mA transmitter. In either case, the “power supply” can be a common 12 volt lantern battery, or even a 9 volt transistor radio battery, although the lifetime of a 9 volt battery will be limited. The meter should be a digital type capable of reading at least 2 digits to the right of the decimal point. Use 22 gage or heavier hookup wire or clip leads for jumpers. If your unit has other than a 0-5 VDC or 4-20 mA output, please call Applications Support at **(800) 328-3665** for assistance.

Once your transducer is correctly configured per one of the diagrams below, orient the transducer in a vertical position with the pressure port down and then read the zero output on your meter. For a 0-5 VDC output, the zero should be between 0 and 0.10 volts, and for a 4-20 mA output, between 3.80 and 4.20 mA. For Series 300, the values do not change for VDC output but the values for mA are between 3.80 and 4.20 mA. If the output is outside of these limits, you may, at your option, choose to troubleshoot the transducer per the suggested measurements shown below. Otherwise, contact our Customer Service Department at **(800) 328-3665** for a Return Material Authorization number (RMA).

If the zero output is within these limits, the problem will more than likely be found elsewhere in your system.



When an error is observed at a customer's installation, it is important to determine if the fault lies in the transducer or the instrument reading the transducer signal, ie. digital panel meter, programmable logic controller, etc. . To do this, a second instrument should be used to confirm the observations. The second instrument may be a handheld DMM (Digital Multi-Meter) or a dedicated milliammeter capable of reading 4-20 mA of current to a resolution of at least 0.1 mA. The diagram above illustrates the attachment of the meter in series with the black (negative signal) wire of the transducer using a 9-28 VDC power supply for transducer excitation. Some suggested power supplies are:

- 1 - 12 VDC automotive battery.
- 2 - 6 VDC lantern batteries connected in series (for a total of 12 VDC).
- 2 - 9 VDC transistor batteries connected in series (for a total of 18 VDC).

Batteries are suggested to power the transducer during testing to eliminate the possibility that line noise is passing through an improperly filtered, grounded, or damaged power supply. All measurements should be recorded and sent to Pressure Systems along with the transducer to assist in the evaluation process.

Further Measurements:

0-5 VDC	Should read:	4-20 mA	Should read:
+Excitation (white) to Shield (drain)	> 2.5 Mohms	+Excitation (red) to Shield (drain)	> 2.5 Mohms
-Excitation (black) to Shield (drain)	> 2.5 Mohms	-Excitation (black) to Shield (drain)	> 2.5 Mohms
+Output (red) to Shield (drain)	> 2.5 Mohms	Shield (drain) to Housing	< 2 ohms
Shield (blue) to Housing	< 2 ohms		

Maximum Cable Lengths and Minimum Supply Voltage

The maximum length of cable to be used with our submersible transducers is largely dependent upon the type of electrical output of the transducer. For a 0-5 VDC output, a maximum cable length of 100 feet (30 m) is recommended. A voltage output is more susceptible to electrical interference than a 4-20 mA signal. A 4-20 mA signal can be transmitted much longer distances, depending upon such factors as temperature, wire size, length of the wire, power supply, and voltage requirements of any devices to be powered. At 25°C the 22 AWG conducting copper wire used in our polyurethane jacketed cable has a resistance of 16.45 ohms per 1000 feet (304 m).

Using Ohms Law ($E=IR$) where E =voltage, I =current and R =resistance, one finds that a 20 mA signal requires .329 volts to drive it along 1000 feet (304 m) of 22 AWG copper wire ($E=16.45 \times .020$). This drop is seen on both the supply and return wire for a total loop voltage drop of 0.658 volts

To find out how much voltage is required to drive our Series 700 submersible level transducer's 4-20 mA signal 10,000 feet, just add the minimum power requirement of the 700 (9 VDC) to the resistance offered by 10,000 feet (3048 m) of our polyurethane jacketed cable ($10,000 \div 1000 \times .658=6.58$). The resulting power requirement is 15.58 VDC ($9 + 6.58$).

Connect the cable shield (drain wire) to a good earth ground. This will protect the transducer from relatively minor transient voltages. The only exception to this rule is if high rates of electrolytic corrosion have been previously experienced with grounded submersible devices. In this case it may be better to leave the shield disconnected.

Please note: When using products with the lightning protection option on 4-20 mA products, users should take into account the additional series resistance of this option when selecting the loop power supply. This option will increase total loop resistance by 88 Ohms.

Troubleshooting Techniques

1. **Symptom:** *Transducer fails to give output of any kind.*

Procedure: Isolate the problem to either the transducer or the power supply/readout. See the Quick Check Procedures (above) for this check. If it can be determined that the transducer is no longer operable, remove it from service for further analysis. If the transducer output falls within the limits described above, the fault lies somewhere else in your system.

2. **Symptom:** *Transducer has failed and has been removed for analysis.*

Procedure: Inspect the cable for physical damage. Cuts in the cable jacket can result in liquid incursion into the transducer housing, which can cause permanent damage. If operational, the cable can be repaired by using a splice kit (P/N 830) supplied by Pressure Systems.

Inspect the transducer housing. It should be intact and free of corrosion. If the outer surface of the transducer is pitted, this could be an indication of galvanic corrosion caused by stray ground currents. If this is the case, the transducer will probably require replacement. If the external case exhibits none of these characteristics, carefully unscrew the nosepiece and look into the pressure sensing end of the transducer. The concentric rings of the sensing diaphragm should be visible. If they are not, it could be that residue has accumulated on the diaphragm, preventing it from responding properly to pressure changes. The transducer can be cleaned by gently swishing the transducer back and forth in a bucket of warm, soapy water until the residue softens and washes off. (See **Cleaning Your Transducer**, page 8.) ***Under no circumstances should any object or tool be used to remove residue from the sensing diaphragm or else permanent damage will be done.*** If cleaning the diaphragm does not solve the problem, the transducer should be returned to the factory for repair or replacement.

3. **Symptom:** *Transducer develops a negative offset and gets worse over time (actual level exceeds specified level).*

Procedure: This may be a sign that moisture has entered the reference (vent) tube in the cable and is inside the transducer housing. This is usually the result of not maintaining the desiccant vent filter or of operating the transducer without a desiccant filter or aneroid bellows. If caught early enough, the transducer can be saved by coiling the cable and transducer in a pan and baking it in an oven at 50°C (122°F) for a minimum of 2 hours. *Be careful that the oven temperature does not exceed 50°C (122°F) or both the transducer and the cable can be damaged.* **Alternatively**, suspend both the cable and transducer in a vertical position (with vent tube down), overnight to allow water to drain from the transducer and vent tube.

4. **Symptom:** *Transducer suddenly fails during or just after a nearby lightning event.*

Procedure: This failure is usually caused by overvoltage due to ground transients resulting from a direct or indirect lightning event. These transients can travel

distances of a mile or more. The transducer may be returned to the factory for repair and optional retrofit of our ***lightning protection system***. This system carries a lifetime warranty against transducer damage due to lightning.

5. **Symptom:** ***Transducer response to pressure/level input changes becomes sluggish.***

Procedure: This is usually a sign that the sensing end of the transducer has become fouled with residue. The transducer must be removed from service and the sensing diaphragm cleaned as described in Item 2, (warm, soapy water). If fouling persists, the transducer may be replaced with a Series 705 or Series 750 (non-fouling) transducer, which is specifically designed for trouble-free operation in a high residue environment.

6. **Symptom:** ***Output reading is within limits but "freezes" at one point.***

Procedure: In certain environments "crust" may form over the sensing diaphragm, preventing the sensor from identifying change in level. Removing the transducer from service and cleaning it (as described in Item 2) will generally solve the problem. To combat marine growth, you might try wrapping the transducer with copper wire similar to that found in wire scouring pads for cleaning dishes. Marine growth occurs on the copper and eventually erodes the copper and drops off or the copper is manually removed during routine maintenance. Alternatively, there are various companies that will impregnate/coat the 316 stainless steel with anti-fouling chemicals or coatings. Level transducers temporarily removed from the well or sump should not be stored dry, but should be stored in a bucket of fresh water in order to prevent "crust" formation.

7. **Symptom:** ***Readings increase very slowly over time.***

Procedure: Our cable is shipped coiled and consequently takes time to straighten when installed. Attaching a weight to the transducer (e.g., one of our sacrificial anodes) will help. To prevent cable stretch with lengths greater than 200 feet (60 m), secure the Kevlar fibers (just under the cable jacket) to your junction box or other secure object.

8. **Symptom:** ***No electrical output from your transducer.***

Procedure: Check all electrical connections to ensure they are correct and secure. Double check your power supply or use a battery (as described previously) to ensure the transducer is getting power. If all checks OK, the problem could be a circuit board or the sensor in your transducer. The unit must be returned to the factory for evaluation. The most probable cause of this type of failure is damage to the submersible cable jacket allowing water to leak down the cable and into the transducer housing or lightning damage.

9. **Symptom:** ***Formation of marine growth on a submersible transducer.***

Procedure: Certain transducer construction materials, for example, 316 stainless steel, attract marine life (snails) and algae. Clean the transducer diaphragm by

soaking it in a bucket of warm water with a non-aggressive cleaning solution. You can also coat the transducer with marine grease. This may be the most effective and inexpensive way to protect your transducer.

10. Symptom: *Submersible transducer exhibits corrosion or pitting on body or diaphragm*

Procedure: Dissimilar metals (for example, your transducer housing and your pump housing) in an electrolytic environment (fluid in your well) can lead to *galvanic corrosion* of the metal that is nearer the anodic end of the galvanic series. Likewise, a voltage potential between the ground wire of the transducer and the ground of other equipment in the well can lead to *galvanic corrosion*. Installation of a P/N 820 or 825 sacrificial anode will help protect your transducer from *galvanic corrosion*. Our sacrificial anodes are made of a zinc alloy that, being nearer the anodic end of the galvanic series than the 316 stainless steel or titanium housing of the transducer, will corrode before the transducer.

11. Symptom: *The transducer is buried in dirt or silt and the readings seem to be erroneous.*

Procedure: Use of a piezometer nosepiece in this application would help. This nosepiece can be easily installed in the field and features a very fine screen to keep dirt from fouling the diaphragm, but allows the diaphragm to sense moisture levels.

12. Symptom: *Transducer has an offset error.*

Procedure: Our submersible transducers perform best when the sensing end is pointing in a downward manner. Keep in mind that you can experience offset error due to the position sensitivity or orientation change of the sensor. Offset errors are more prominent in low pressure applications with the sensing end of the transducer lying flat or pointing upward.

- 13. Symptom:** *I am testing a Series 700 4-20mA sensor for use with our data logger. On page A-2 of the KPSI Level and Pressure Transducers User's Manual, I see the standard 4-20mA configuration. Does the recording channel of my data logger become the mA meter?*

Procedure: Most data loggers cannot measure current (mA) directly. When this is the case a load resistor must be used to convert the current (mA) output into an appropriate voltage. If the User's Manual for your particular instrument does not illustrate a preferred method for recording current (mA) data then you should attach your transducer signal wires to your data logger in the following manner.

Transducer red wire - Data Logger Excitation Terminal
(The minimum excitation for a Series 700 Transducer is 9VDC)
Transducer black wire – Data Logger signal input (+) terminal

Attach a Load resistor between the Data Logger signal input (+) terminal and the Data Logger signal input (-) terminal.

Attach a separate piece of wire between the Data Logger signal input (-) and analog ground.

In this configuration you will turn your data logger into a milliammeter. The size of your load resistor can be calculated in the following manner.

$$D/0.02=R$$

Where:

Data logger input range = D
Full scale output of transducer = 0.02 A (20 mA)
Load Resistor Value = R

Pick an appropriate standard value

250 Ohms results in 1 to 5 VDC at 4 and 20 mADC
125 Ohms results in 0.5 to 2.5 VDC (500 to 2500 mVDC) at 4 and 20 mADC

At this point the discussion needs to address IR loss (voltage drop) in series circuits. Note that Series 700 transducers need a minimum of 9 VDC to operate correctly. When the transducer is operating correctly it will output a current which, when driven through a resistor, will generate some amount of voltage drop. If the resistor value is 250 Ohms then the voltage measured across that resistor will be $0.004 \text{ A} \times 250 \text{ Ohms} = 1.000 \text{ VDC}$ and $0.020 \text{ A} \times 250 \text{ Ohms} = 5 \text{ VDC}$. Notice that, if the available voltage from the data logger is 12 VDC then $12 \text{ VDC} - 5 \text{ VDC} = 7 \text{ VDC}$ which is less than the voltage required by the transducer to operate. If this scenario were to occur the transducer would actually stop functioning correctly when its output reached 12 mADC (50% of transducer full scale range). In this case the appropriate choice for a load resistor value is 125 Ohms.

- 14. Symptom:** *I have a Series 700 4-20mA transducer rated for 7.5 PSIG attached to a pressure source that is outputting 7.5 PSIG. With 20VDC being supplied I am getting 19.94 mA. I can't find the upper range allowance for the sensor, but this seems low to me. Does this mA reading fall into the acceptable range for the transducer with the settings I've specified?*

Procedure: When evaluating a transducer it is sometimes convenient to make some broad generalizations in order to rapidly determine the condition of the unit. In general, transducers that output a 4-20 mADC signal have a 16 mADC span ($4 - 20 = 16$). If the transducers accuracy is reported as being some percentage of its full-scale range then the following table could be used in conjunction with the instructional notations to determine whether a more detailed analysis of data quality is required.

Model	Accuracy	Accuracy in mADC
700	1.00%FS	±0.16 ma
710	0.50%FS	±0.08 ma
720	0.25%FS	±0.05 ma
730	0.10%FS	±0.016 ma
735	0.05%FS	±0.008 ma

In order to approximately determine how many milliamps a transducer should output at a given depth.

1. Determine the depth (in feet) at which the transducer is sited.
2. Divide the depth value (from step 1) by the transducer full-scale range (in feet). - Record the value.
3. Multiply the value calculated in step 2 by 16 (the transducer span in milliamps).
4. Add 4 to the product of step 3. This is the approximate value in milliamps that should be output by the transducer at its current depth.

In order to approximately determine the depth of a transducer (in feet) using a given value of milliamps.

1. Divide the full-scale range of the transducer (in feet) by 16.
Record this value.
2. Subtract 4 from the milliamp output of the transducer.
Record this value
3. Multiply the result of step one by the result of step 2.
This is the approximate depth at which the transducer is sited.

If the resulting numbers are reasonably close to some verified value for current water depth, then the unit is functioning. In order to determine the quality of measurement, additional steps need to be performed.

Appendix D

Calibration Calculations

Pressure Systems ships a calibration sheet with every KPSI™ Transducer. This sheet lists the actual values that were output by the transducer, when it was being manufactured, at several different pressures. In addition, two coefficients are provided that can be used to calculate the actual depth from any given mA output value. These coefficients are derived from a Least Squares Best Fit Straight Line (BFSL) calibration using the data listed on the datasheet. Our accuracy specification is referenced to the line described by the BFSL coefficients and so the transducer may not output exactly 4 mADC at zero pressure and 20 mADC at full-scale. As an example here is an example of data for a typical transducer.

Calibration Report					
Test Date: 02/28/08			Test Temps: ROOM = 25.3 DegC		
Test Time: 13:02:57					
Model No: 320T14B0A008.670000.000B100308					
Serial No: 0802048					
Pressure Range: 0.00 to 8.67 PSIG					
Excitation: 9-28 VDC					
Output: 4-20 mA			PCU Serial No: TRF048		
		----- Run #1 -----		----- Run #2 -----	
Target Test Pressure	BFSL Rm Temp Outputs	Rm Temp Outputs	Error %FSO	Rm Temp Outputs	Error %FSO
0.00	4.0017	3.9995	-0.0134	3.9981	-0.0222
1.73	7.2050	7.2003	-0.0295	7.2066	0.0098
3.47	10.4096	10.4111	0.0091	10.4144	0.0297
5.20	13.6133	13.6182	0.0305	13.6207	0.0461
6.94	16.8176	16.8158	-0.0114	16.8174	-0.0014
8.67	20.0219	20.0173	-0.0290	20.0190	-0.0184
6.94	16.8171	16.8162	-0.0057	16.8172	0.0006
5.20	13.6127	13.6176	0.0305	13.6175	0.0299
3.47	10.4083	10.4131	0.0298	10.4110	0.0167
1.73	7.2049	7.2067	0.0115	7.2059	0.0065
0.00	4.0020	4.0001	-0.0118	4.0000	-0.0124
Maximum Static Error: 0.0523 %FSO					
Maximum Non-repeatability: -0.0393 %FSO					
Electrical termination: RED: +SUPPLY BLACK: -SUPPLY BLUE: SHIELD		Slope1: 0.5411 PSIG/mA Zero Offset1: 0.0000 PSIG		Slope2: 1.8479 mA/PSIG Zero Offset2: 4.0017 mA	
Notes:		Conversion Factor: 1.0000			
Calculations:					
Method 1: Calculate pressure in desired units, using sensor's output as independent variable. $PSIG = 0.5411(mA - 4.0017) + 0.0000$					
Method 2: Calculate predicted sensor output in desired units using pressure as the independent variable. $mA = 1.8479(PSIG - 0.0000) + 4.0017$					

In this case, even though the offset or 0 PSIG output was 4.0017 mADC and the full-scale point was 20.0219 mADC the unit actually performed better than its specified accuracy of $\pm 0.25\%$ of full-scale range as indicated in the Error % FS column.

The calculation for pressure is illustrated below:

$$\text{PSIG} = (\text{Span} * \text{Output (in mA)}) + \text{Offset}$$

And, to convert to feet of water

$$\text{Feet H}_2\text{O} = \text{PSIG} * 2.3073$$

measurement

SPECIALTIES



34 Research Drive, Hampton, VA 23666 USA
757-865-1243, Toll Free 800-328-3665
Fax 757-865-8744
E-mail sales@PressureSystems.com
www.PressureSystems.com
online orders www.LevelandPressure.com



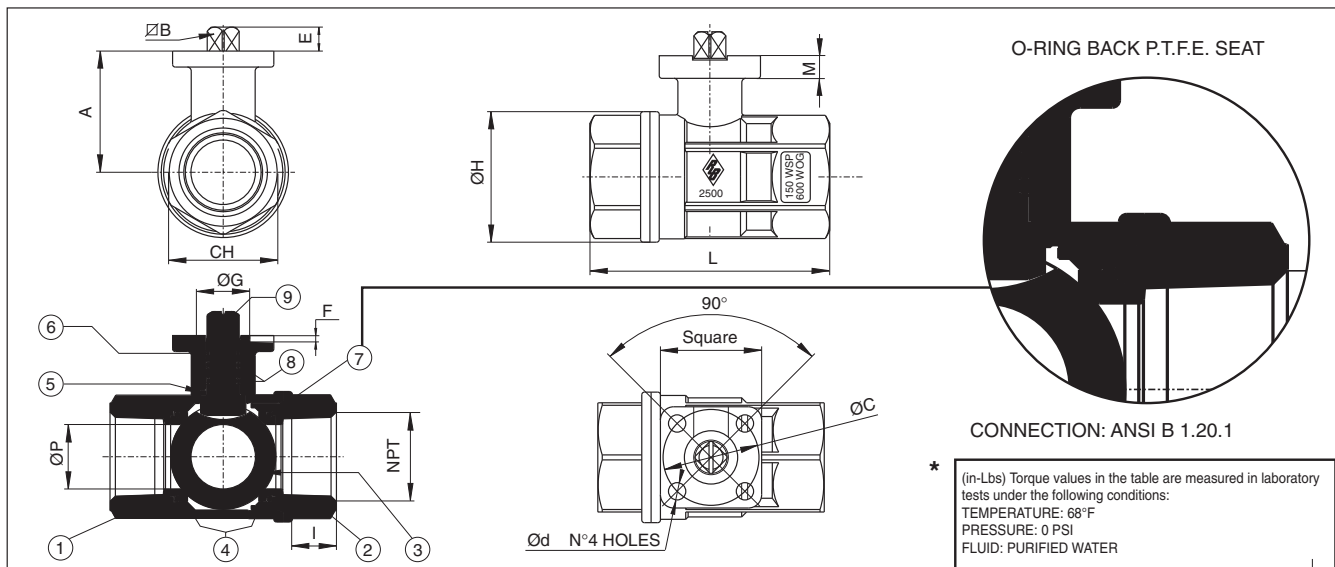
SERIES 250N - 253N DIRECT MOUNT 2 WAY BALL VALVE

Brass ball valve, female/female, with ISO 5211 pad for actuator.

- Full port from 1/4" to 4".
- Pressure rating 600 WOG - 150 WSP.
- Temperature to 366°F.
- Blow out proof stem, chrome plated brass ball.
- P.T.F.E. seats with O-RING backing for low operating torque.
- P.T.F.E. seats and double O-RING stem packing.
- 100% electronically tested in the open and closed position at 80 psi.

250N: WITH BRASS BALL AND STEM - size up to 4".

253N: WITH STAINLESS STEEL BALL AND STEM - size up to 2".



QTY	DESCRIPTION	MATERIAL	QTY
1	BODY	BRASS CW 617N UNI EN 12165	1
2	END CONNECTION	BRASS CW 617N UNI EN 12165	1
3	BALL	BRASS CW 617N UNI EN 12165	1
4	BALL SEAT	P.T.F.E	2
5	THRUST WASHER	P.T.F.E	1
6	STEM SEAL	P.T.F.E	1
7	O-RING	FKM (Viton®)	2
8	O-RING	FKM (Viton®)	2
9	STEM	BRASS CW 614 NUNI EN 12164	1

1/4"	1.49	1.28	0.35	1.42 (ISO F03)	0.24	0.35	0.08	0.98	1.32	0.39	2.64	1.06	0.22	0.39	5.4	600	0.82	53.10
3/8"	1.49	1.28	0.35	1.42 (ISO F03)	0.24	0.35	0.08	0.98	1.32	0.40	2.64	1.06	0.22	0.39	6	600	0.79	53.10
1/2"	1.49	1.28	0.35	1.42 (ISO F03)	0.24	0.35	0.08	0.98	1.32	0.53	2.64	1.06	0.22	0.56	16.3	600	0.66	53.10
3/4"	1.49	1.36	0.35	1.42 (ISO F03)	0.24	0.35	0.08	0.98	1.57	0.55	3.00	1.26	0.22	0.75	29.5	600	0.91	53.10
1"	1.49	1.79	0.35	1.42 (ISO F03)	0.24	0.35	0.12	0.98	1.93	0.66	3.35	1.61	0.24	0.95	43	600	1.55	53.10
1"1/4	1.49	1.93	0.35	1.42 (ISO F03)	0.24	0.35	0.12	0.98	2.30	0.68	3.66	1.97	0.24	1.18	89	600	2.14	53.10
1"1/2	1.96	2.52	0.43	1.97 (ISO F05)	0.27	0.43	0.12	1.38	2.87	0.68	4.13	2.16	0.39	1.49	230	600	3.71	150.46
2"	1.96	2.88	0.43	1.97 (ISO F05)	0.27	0.43	0.12	1.38	3.60	0.70	4.80	2.75	0.31	1.97	265	600	5.52	150.46
2"1/2	2.75	3.48	0.55	2.76 (ISO F07)	0.35	0.59	0.12	2.16	4.51	0.93	6.10	3.54	0.35	2.52	540	600	8.83	274.37
3"	2.75	3.85	0.55	2.76 (ISO F07)	0.35	0.59	0.12	2.16	5.35	1.01	6.89	4.13	0.35	3.00	873	600	13.29	274.37
4"	2.75	4.59	0.67	2.76 (ISO F07)	0.35	0.69	0.12	2.16	6.53	1.09	8.03	5.12	0.33	3.74	1390	600	21.54	646.05



OM ELECTRIC ACTUATOR

OPERATION AND MAINTENANCE MANUAL

◆ PERFORMANCE

【12V / 24V】

Model No.	Torque (Nm)	Speed (90°)	Motor Power	Motor Speed		12V DC/ AC			24V DC/ AC		
				12 V	24 V	Run	Start	Lock	Run	Start	Lock
OM-A	50	20 s	10 W	3600/min	3600/min	0.5A	3.0A	3.0A	0.7A	0.8A	1.4A
OM-1	35	15 s	10 W	3600/min	3600/min	0.5A	3.0A	3.0A	0.6A	0.8A	1.4A
OM-2	90	15 s	70 W	1800/min	1800/min	3.4A	5.0A	8.5A	3.0A	5.0A	13.0A
OM-3	150	22 s	70 W	1800/min	1800/min	3.4A	5.0A	8.5A	3.0A	5.0A	13.0A
OM-4	400	16 s	180W	1800/min	1800/min	12.0A	8.5A	30.0A	6.0A	8.0A	30.0A
OM-5	500	22 s	180W	1800/min	1800/min	13.0A	8.5A	30.0A	6.5A	8.0A	30.0A
OM-6	650	28 s	180W	1800/min	1800/min	14.0A	8.5A	30.0A	7.5A	8.0A	30.0A
OM-7									7.0A	8.0A	30.0A
OM-8									7.5A	8.0A	30.0A
OM-9									7.0A	8.0A	30.0A
OM-10									7.5A	8.0A	30.0A
OM-11									10.0A	10.0A	26.0A
OM-12									15.0A	15.0A	26.0A

【Single-Phase】

Model No.	Torque (Nm)	Speed (90°)		Motor Power	Motor Speed		110V Current			220V-240V Current		
		60 Hz	50 Hz		60 Hz	50 Hz	Run	Start	Lock	Run	Start	Lock
BM-2	120	8 s	10 s	40W	1720/min	1450/min	1.3A	3.0A	1.8A	0.5A	1.5A	0.9A

M-A	50	20s	24s	10W	3600/min	3000/min	0.5A	1.5A	0.6A	0.3A	1.0A	0.5A
OM-1	35	12s	13s	10W	3600/min	3000/min	0.5A	1.5A	0.6A	0.3A	1.0A	0.5A
OM-2	90	15s	17s	40W	1720/min	1450/min	1.0A	3.0A	1.8A	0.5A	1.5A	0.9A
OM-3	150	22s	26s	40W	1720/min	1450/min	1.0A	3.0A	1.8A	0.5A	1.5A	0.9A
OM-4	400	16s	18s	120W	1720/min	1420/min	1.3A	3.1A	3.6A	0.6A	1.5A	1.8A
OM-5	500	22s	25s	120W	1720/min	1450/min	1.5A	3.0A	3.6A	0.7A	1.5A	1.8A
OM-6	650	28s	31s	120W	1720/min	1450/min	1.8A	3.0A	3.6A	0.8A	1.5A	1.8A
OM-7	1000	46s	55s	180W	1720/min	1450/min	3.2A	12.0A	10.0A	1.6A	4.0A	4.0A
OM-8	1500	46s	55s	220W	1720/min	1450/min	4.0A	14.0A	10.0A	2.0A	3.6A	5.0A
OM-9	2000	58s	70s	180W	1720/min	1450/min	3.2A	12.0A	6.0A	1.6A	5.0A	4.0A
OM-10	2500	58s	70s	220W	1720/min	1450/min	4.0A	12.0A	6.0A	2.0A	4.0A	3.0A
OM-11	3000	58s	70s	250W	1720/min	1450/min	3.0A	10.0A	5.0A	1.6A	4.0A	3.0A
OM-12	3500	58s	70s	300W	1720/min	1420/min	4.0A	14.0A	5.0A	2.0A	4.0A	3.0A

◆ PERFORMANCE

【Three-Phase】

Model No.	Torque (Nm)	Speed (90°)		Motor Power	Motor Speed		220V Current			380V Current			440V Current		
		60Hz	50Hz		60Hz	50Hz	Run	Start	Lock	Run	Start	Lock	Run	Start	Lock
BM-2	120	8 s	10 s	40W	1720/min	1450/min	06A	1.8A	1.1A	0.3A	1.0A	0.7A	0.4A	1.3A	0.7A
OM-2	90	15 s	17 s	40W	1720/min	1450/min	0.6A	1.8A	1.1A	0.3A	1.0A	0.7A	0.4A	1.3A	0.7A
OM-3	150	22 s	26 s	40W	1720/min	1450/min	0.6A	1.8A	1.1A	0.3A	1.0A	0.7A	0.4A	1.3A	0.7A
OM-4	400	16 s	18 s	120W	1720/min	1450/min	1.0A	3.0A	3.5A	0.7A	2.2A	2.0A	0.8A	2.5A	2.0A
OM-5	500	22 s	25 s	120W	1720/min	1450/min	1.0A	3.0A	3.5A	0.7A	2.2A	2.0A	0.8A	2.5A	2.0A
OM-6	650	28 s	31 s	120W	1720/min	1450/min	1.0A	3.0A	3.5A	0.7A	2.2A	2.0A	0.8A	2.5A	2.0A
OM-7	1000	46 s	55 s	180W	1720/min	1450/min	0.6A	0.8A	1.8A	0.4A	0.6A	1.0A	0.4A	0.6A	1.0A
OM-8	1500	46 s	55 s	220W	1720/min	1450/min	0.8A	1.0A	2.8A	0.6A	0.8A	1.6A	0.6A	0.8A	1.2A
OM-9	2000	58 s	70 s	180W	1720/min	1450/min	0.4A	0.6A	2.0A	0.4A	0.6A	1.0A	0.4A	0.6A	1.0A
OM-10	2500	58 s	70 s	220W	1720/min	1450/min	0.8A	1.0A	1.5A	0.4A	0.6A	1.0A	0.4A	0.6A	1.0A
OM-11	3000	58 s	70 s	250W	1720/min	1450/min	1.2A	1.2A	3.0A	0.6A	0.8A	1.5A	0.6A	0.8A	1.5A
OM-12	3500	58 s	70 s	300W	1720/min	1450/min	1.2A	1.4A	2.5A	0.6A	0.8A	1.5A	0.6A	0.8A	1.5A

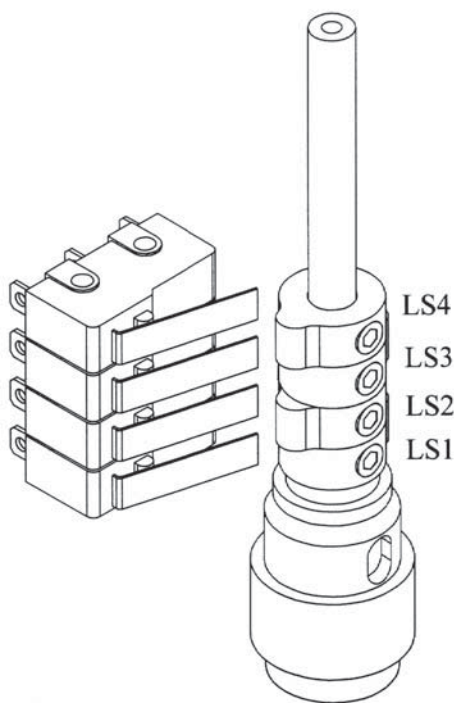
◆ TRAVEL CAM & LIMIT SWITCHES ADJUSTMENT

The travel cams are set to control the open and closed position of the valve. The position is set to stop the travel of the actuator when the travel cams activate the limit switch.

Standard is two limit switches, one for open, one for closed. The bottom limit switch is normally the open position (full CCW); the top limit switch is normally the closed position (full CW). 2-Auxiliary switches are available and are set independent of the two primary control limit switches.

The travel cams can be adjusted by 2.5mm Hex. Spanner.

Adjust Travel Cam (O M - 1)



LS4 "LS4" Synchronous turn with LS2(Optional)

LS3 "LS3" Synchronous turn with LS1(Optional)

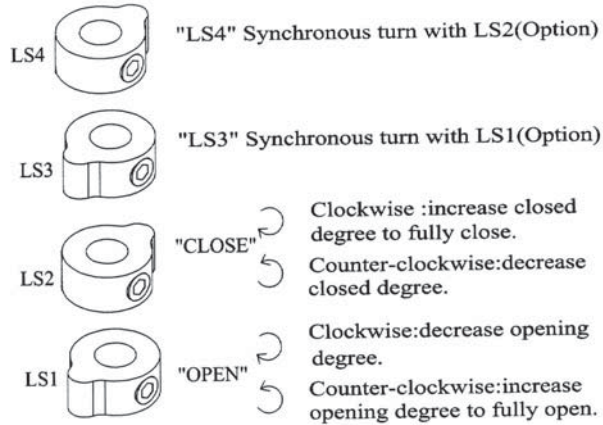
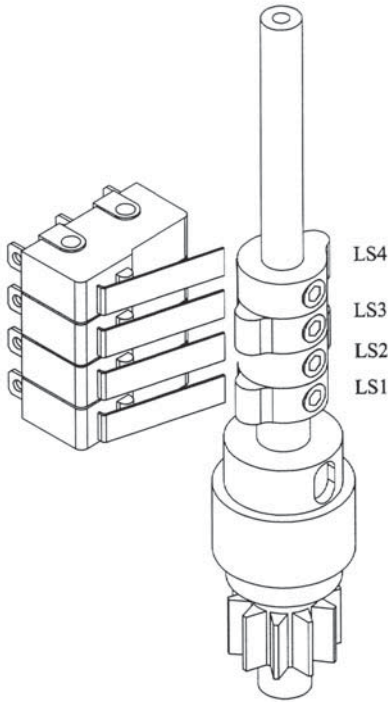
LS2 "CLOSE" ⤵ Clockwise :decrease closed degree.
⤴ Counter-clockwise:increase closed degree to fully close.

LS1 "OPEN" ⤵ Clockwise:increase opening degree to fully open.
⤴ Counter-clockwise:decrease opening degree .

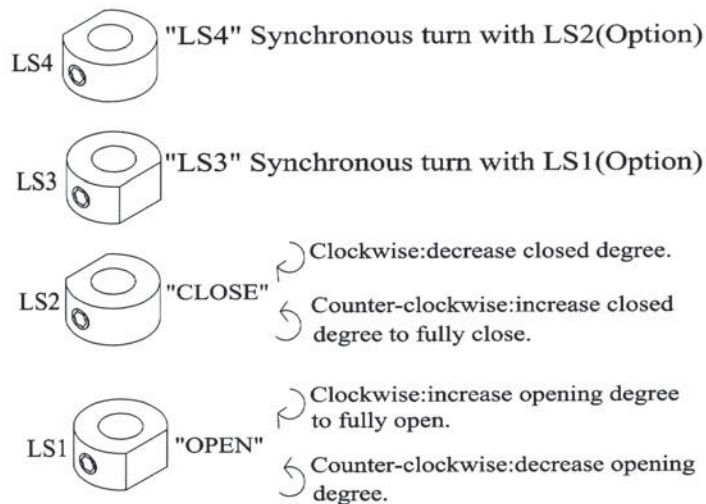
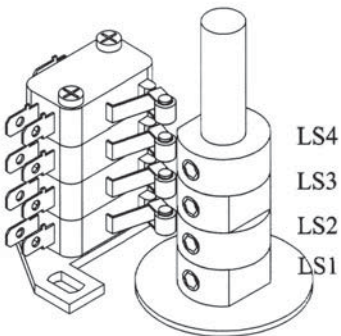
Clockwise = Closes
Counter Clockwise = Opens

TRAVEL CAM & LIMIT SWITCHES ADJUSTMENT

Adjust Travel Cam (O M - A)

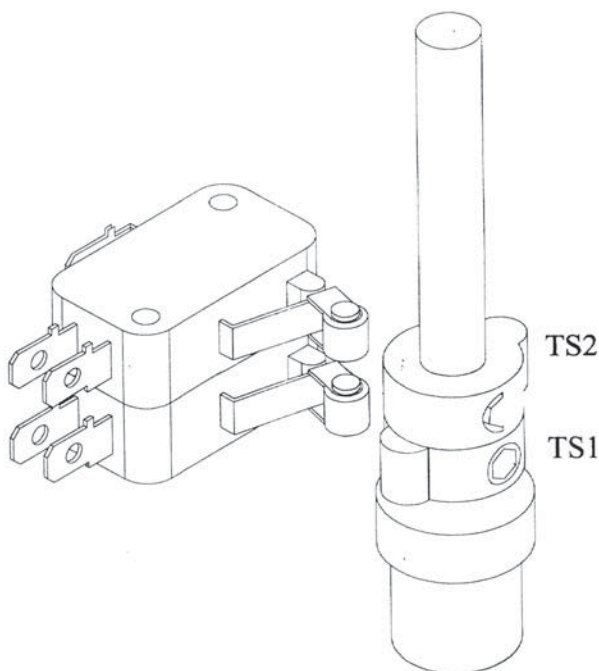


Adjust Travel Cam (BM-2) (OM-2~12)



◆ TRAVEL CAM & TORQUE SWITCHES ADJUSTMENT

Adjust Travel Cam (OM-2~OM-8)



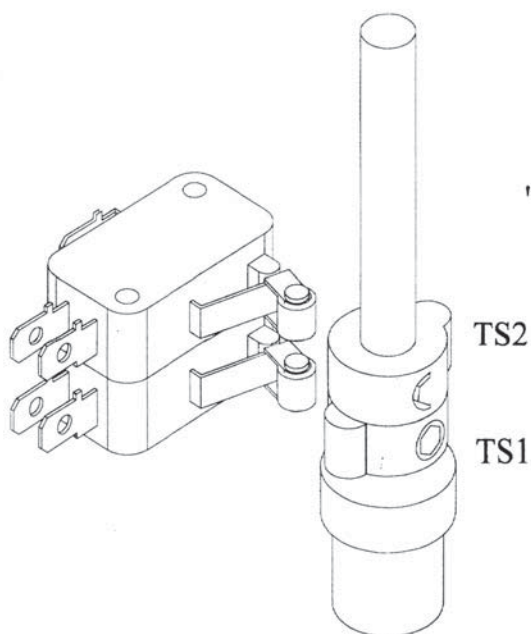
TS2
"CLOSE" ↺ Counter-clockwise: Decrease the degree of torque setting.

↻ Clockwise: Increase the degree of torque setting.

TS1
"OPEN" ↺ Counter-clockwise: Decrease the degree of torque setting.

↻ Clockwise: Increase the degree of torque setting.

Adjust Travel Cam (OM-9~OM-12)



TS2
"CLOSE" ↺ Counter-clockwise: Increase the degree of torque setting.

↻ Clockwise: Decrease the degree of torque setting.

TS1
"OPEN" ↻ Clockwise: Increase the degree of torque setting.

↺ Counter-clockwise: Decrease the degree of torque setting.

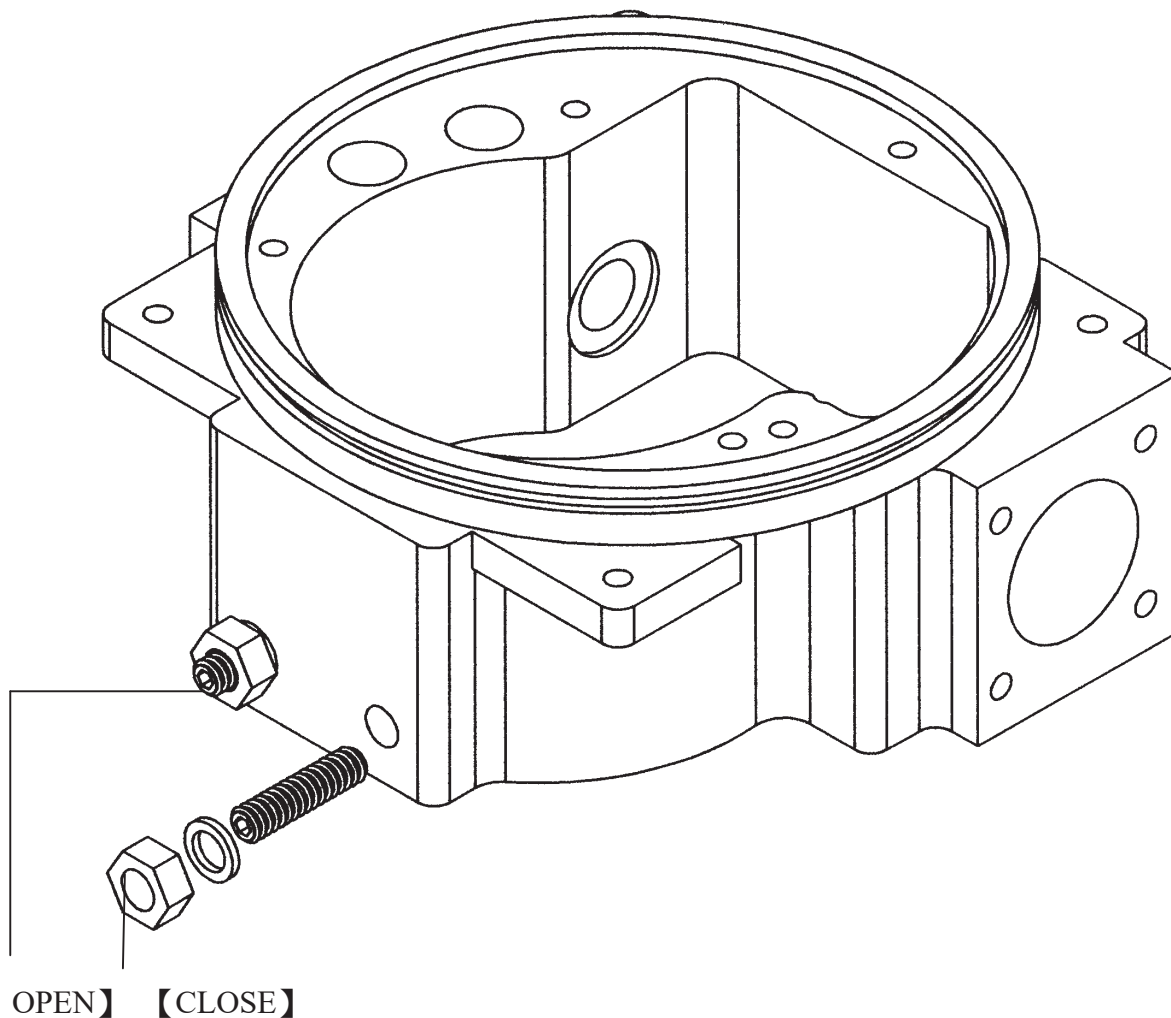
◆ MECHANICAL STOPS

(1) For Electric Operation

Please refer to “Travel Cam & Limit Switches Adjustment “.

(2) For Manual Operation

1. To loosen the screws.
2. To adjust limit switches & travel cams.
3. To adjust the screws.
4. To reverse one cycle.



◆ POTENTIOMETER

Potentiometers turn with transmission shafts, and can provide a feedback signal for position indication.

Potentiometer points 1, 2, 3 are wired to terminal blocks 5, 6, 7.

When a valve is closed: 5, 6 → 1K Ohm.

6, 7 → 0K Ohm.

When a valve is opened: 5, 6 → 0K Ohm

6, 7 → 1K Ohm.

For modulating controllers, potentiometer points 1, 2, 3 are wired to terminal blocks 8, 9, 10.

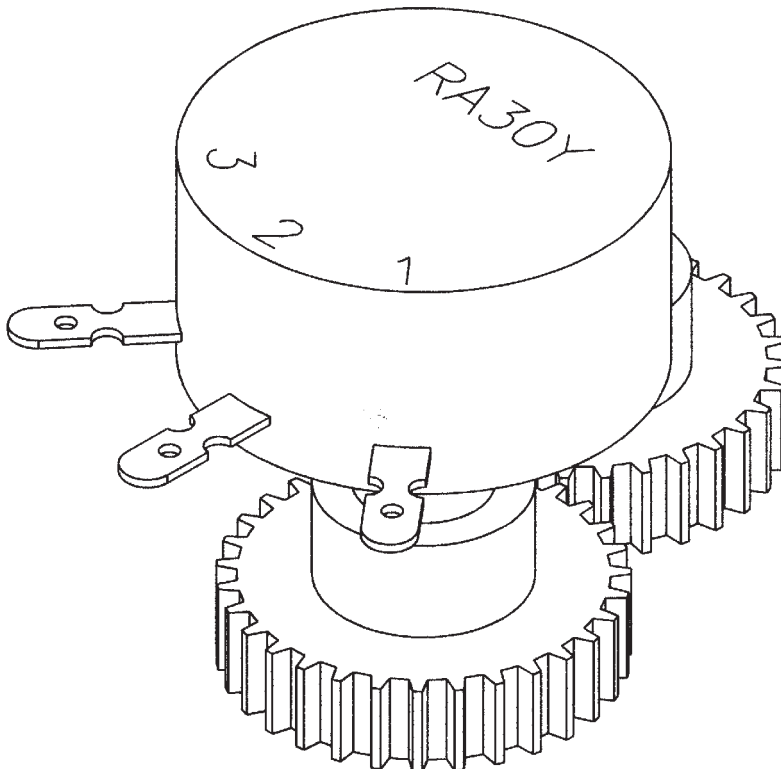
When a valve is closed: 8, 9 → 5K Ohm.

9, 10 → 0K Ohm.

When a valve is opened: 8, 9 → 0K Ohm

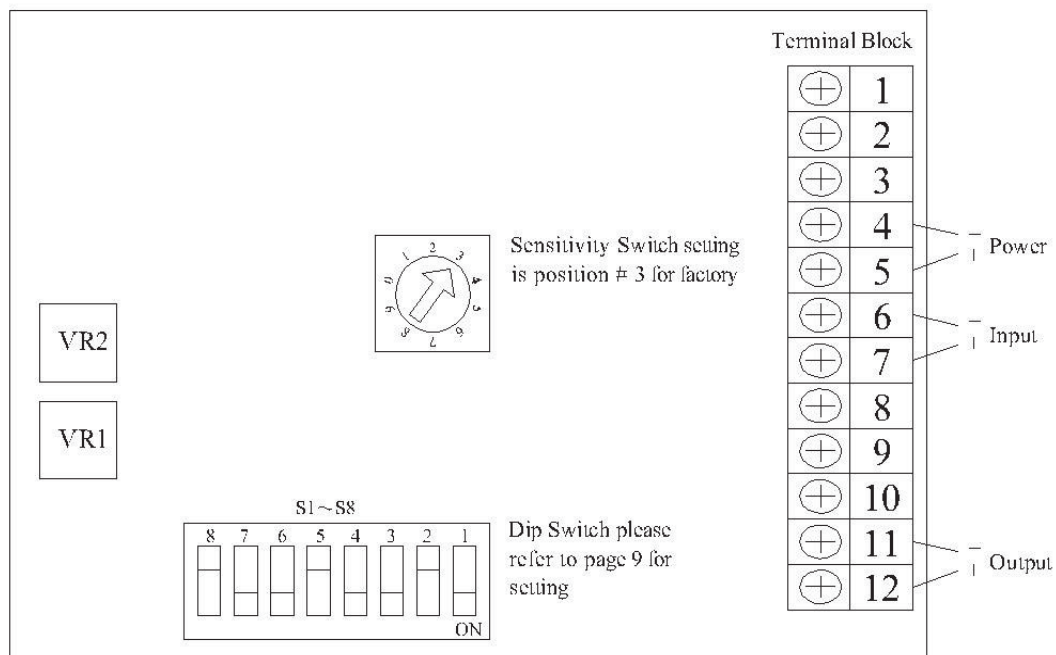
9, 10 → 5K Ohm.

* Remark: OM-A is opposite. (i.e. 1,2,3 wired to 7,6,5; 1,2,3 wired to 10,9,8)

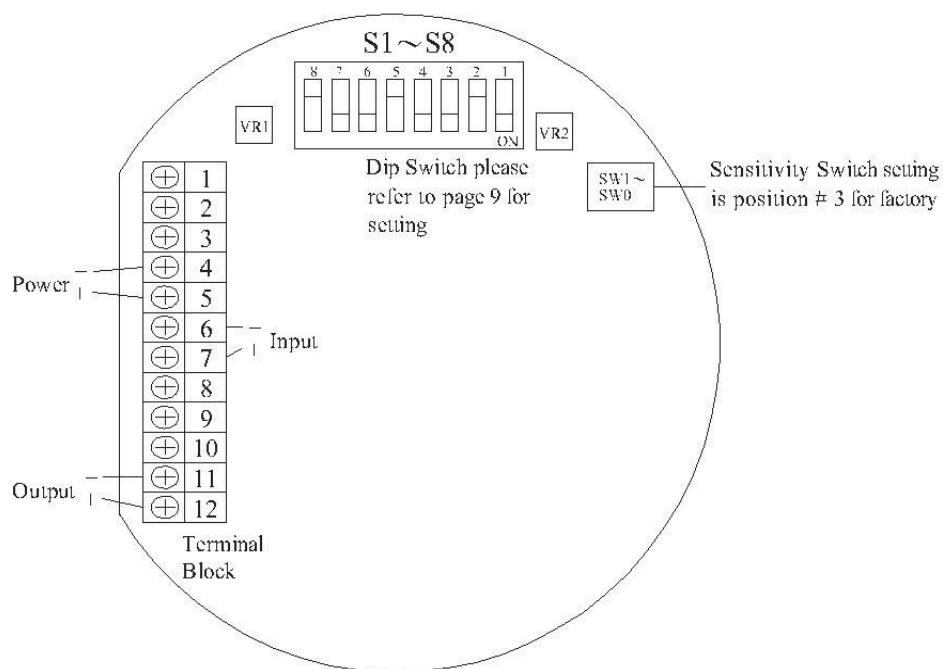


◆ MODULATING CONTROL BOARD : Interface

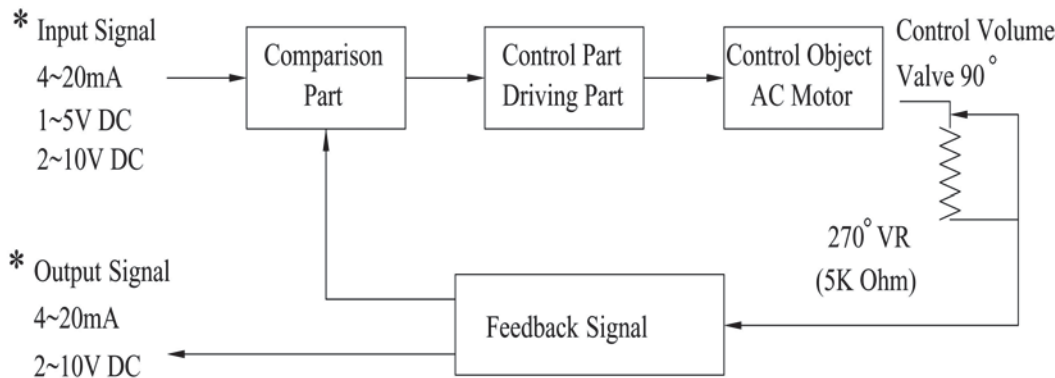
Modulating Control Board for OM2~12



Modulating Control Board for OM1,OMA



◆ MODULATING CONTROL BOARD



★**Attention: TURN POWER OFF BEFORE CHANGING THE FOLLOWING SETTINGS:**

S1,2: INPUT SIGNAL SELECT “4~20mA” set 1-ON / 2-OFF.

“1~5V” set 1-OFF / 2-OFF.

“2~10V” set 1-OFF / 2-ON.

S3,4,5: OUTPUT SIGNAL SELECT “2~10V” set 3-ON / 4-OFF / 5-ON.

“4~20mA” set 3-OFF / 4-ON / 5-OFF.

S6: Valve is fully-open when the input signal is 4mA, 2V or 1V and valve is fully-closed when the input signal is 20mA, 10V or 5V, set 6-ON.

S7,8: POSITION SELECT (When the feedback signal fails) “valve fully-closed” set 7-ON / 8-OFF ; “valve fully-open” set 7-OFF / 8-ON ; “valve stops” set 7-ON / 8-ON.

S6: Valve is fully-closed when the input signal is 4mA, 2V or 1V and valve is fully-open when the input signal is 20mA, 10V or 5V, set 6-OFF.

S7,8: POSITION SELECT (When the feedback signal fails) “valve fully-closed” set 7-OFF / 8-ON ; “valve fully-open” set 7-ON / 8-OFF ; “valve stops” set 7-ON / 8-ON.

SW1~0: Sensitivity switch:-

When switch to “1”, the 0~90 degree can be divided up to around 80 times movement.

When switch to “0”, the 0~90 degree can be divided up to around 17 times movement.

The sensitivity decreases 7 times movement by sectors from SW1 to SW2, SW2 to SW3, SW3 to SW4 and so on.

◆ LUBRICATION

The gearbox of the SUN YEH actuator is enclosed, and it has already been lubricated sufficiently with high temperature lubricant at the factory sufficient for use for up to two years.

◆ IMPORTANT NOTICES & MAINTENANCE

* Notices:

1. Make sure the voltage is correct before wiring.
2. Turn off before power for maintenance purposes.
3. Seal the casing and conduit entrance after wiring to prevent dusting or water contamination.
4. The angle of electric actuator installation must between 0~180 degree. Do not install upside down or below the horizontal.
5. Do not install when hazardous or explosive gases may be present.
6. The frequency of open and close is restricted to every 5 minutes. Avoid too high frequency.
7. When more than one electric actuator needs to operate simultaneously, please connect with the individual cables.
8. Please connect the ground wire to PE inside the electric actuator.
9. The warranty period of our product is for one year.

* Storage:

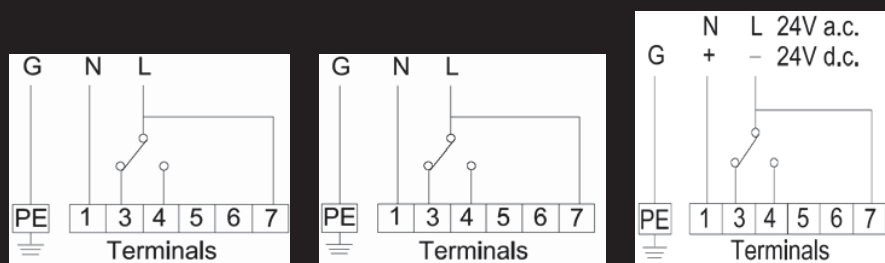
1. The actuator should be placed in a clean and dry place, and protected from the weather and extreme vibration.
2. If actuator needs be stored outside, it must be protected from excess moisture, dust, and weather.

◆ TROUBLE SHOOTING

Conditions	Possibilities	Solutions
Motor does not operate	1. Is the supplied power and voltage correct? 2. Any blisters on the capacitor? 3. Are the gear trains free?	1. Checking by meter. 2. If so replace. 3. Remove motor to check.
Motor stops running	1. Is power supply short circuited? 2. Any foreign objects in flow stream?	1. Check wiring. 2. Check for obstructions.
Unable to fully open/close	1. Loose/Misaligned cam? 2. Bent valve stem? 3. Mechanical stop adjustment incorrect?	1. Adjust/Tighten using spanner. 2. Replace valve stem. 3. Check position of stops.
Valve stops operating when motor is running.	1. Gear worn out? 2. Sleeve adapter worn out or broken? 3. Broken valve stem or actuator transmission shaft?	1. Replace gear. 2. Replace sleeve adapter. 3. Replace valve stem or actuator transmission shaft.
Abnormal control for operating two or more actuators simultaneously.	1. Controlling circuit connects in tandem or parallel?	1. Please refer to the wiring diagram.
Motor overheats.	1. Is the voltage correct? 2. Is valve too tight to operate? 3. High working frequency? 4. Is motor stem or bearing binding?	1. Checking by meter. 2. Replace valve. 3. Check duty cycle. 4. Replace the binding parts.
Abnormal on/off angle on 3-phase voltage.	1. Wrong phase wiring?	1. Change phase wiring.
Occasional on/off actuator failure.	1. Simultaneous input power on/off.	1. Check if the selection switch is normal.
Vibration when valve is closed.	1. Motor brake spring fatigued or Teflon worn?	1. Replace spring or Teflon.

OM-1 ~ OM-13, OM-A, OM-A-M, BM-2 110/220/24V Actuator (ON/OFF, 3 Point Control)

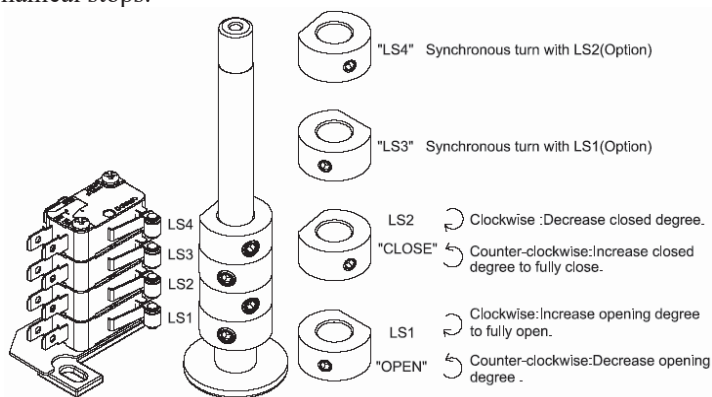
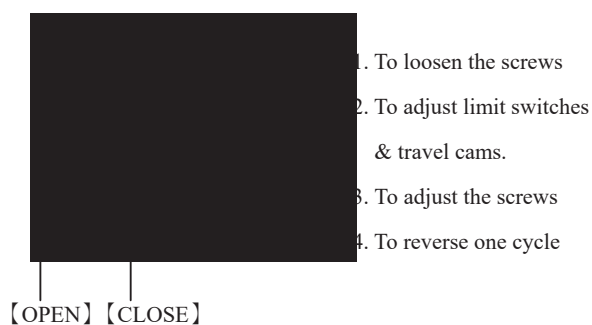
Wiring Diagram



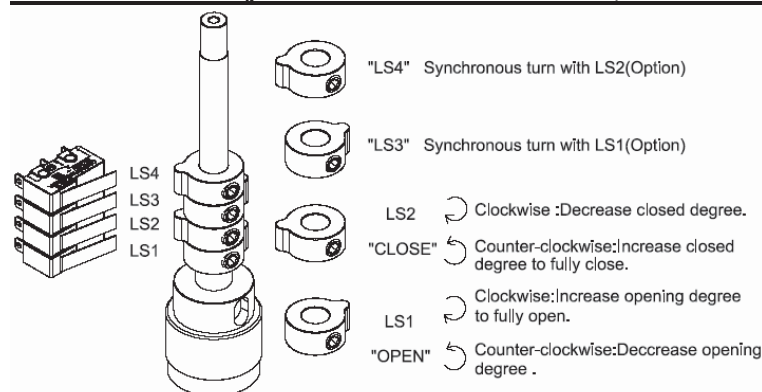
Travel switches adjustment for OM-2~OM-13

The quarter-turn actuator is provided with a limiting of manual rotation device to avoid over-travel with the hand-wheel. Before setting the limit switches, please adjust the mechanical stops.

Mechanical Stops adjustment



Travel switches adjustment for OM-1 & OM-A, OM-A-M

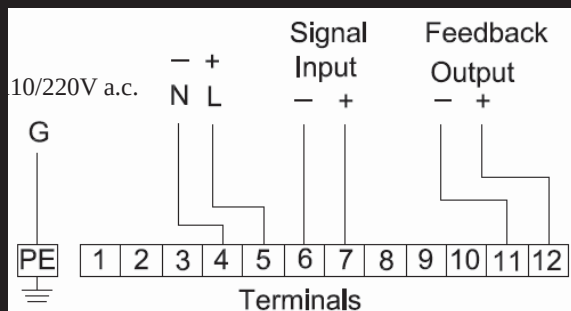


Important Notices & Maintenance

- Make sure if the voltage is correct before wiring.
- Power off before distribution or for maintenance purpose.
- Lock tight the casting and conduit entrance after power distribution to prevent from dusting or water spoiling.
- The angle of electric actuators must not be below the horizon or stands upside down.
- When electric actuators need two sets of unit for simultaneously, please connect with the individual cable.
- Don't install in complete vacuum space directly.
- Actuator should be placed at clean and dry place for storage, and protected with outer carton from being affected by great temperature difference or serious vibration.

OM-1~ OM-13, OM-A, OM-A-M 110/220/24V Actuator (Modulating , 30% & 75% duty cycle)

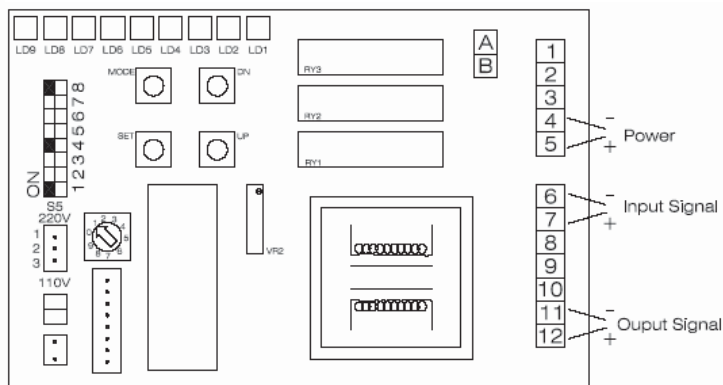
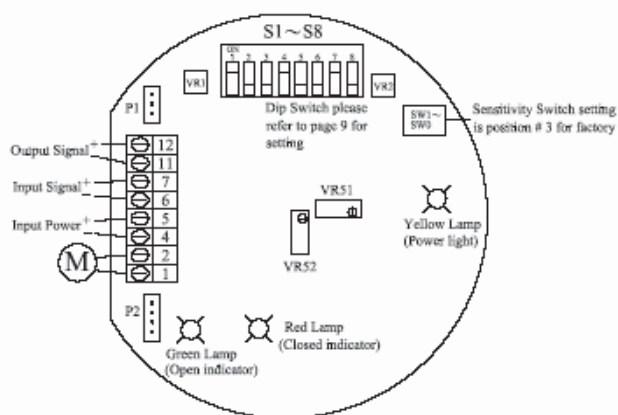
Wiring Diagram



Modulating Board Set Up

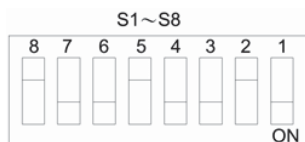
OM-1 & OM-A, OM-A-M

OM-2 ~ OM-13



▲ Disconnect power supply before changing the following settings.

Dip Switch setting



* S1, S2 for input signal

Input Signal	S1	S2
2-10V	OFF	ON
4-20mA	ON	OFF
1-5V	OFF	OFF

* S3, S4 & S5 for out put signal

Output Signal	S3	S4	S5
2-10V	ON	OFF	ON
4-20mA	OFF	ON	OFF

* S7 & S8-Actuator response to the loss of control signal.

When signal fails	S7	S8
Full closed	OFF	ON
Full open	ON	OFF
Stops	ON	ON

* S6 - Direction of travel in response to the control.

(Factory setting is OFF.)

S6	Symbol
OFF	90° Signal
ON	90° Signal

sensitive switch: (Factory setting is position "3")



Position "0" : Lowest Sensitive, 0-90 divided into 17 steps.

Position "1" : Highest Sensitive, 0-90 divided into 70 steps.

Setting for OPEN and CLOSE

- Keep pressing "SET" for 3 seconds, then LED9 comes on, it will enter the manual mode.
- Keep pressing "UP" until LED2 comes on (fully-open), then supplies the input signal (5V or 10V or 20mA) and presses "MODE" once.
- Keep pressing "Down" until LED1 comes on (fully-close), then supplies the input signal (1V or 2V or 4mA) and presses "MODE" once.
- After finishing the above settings, press "SET" once.

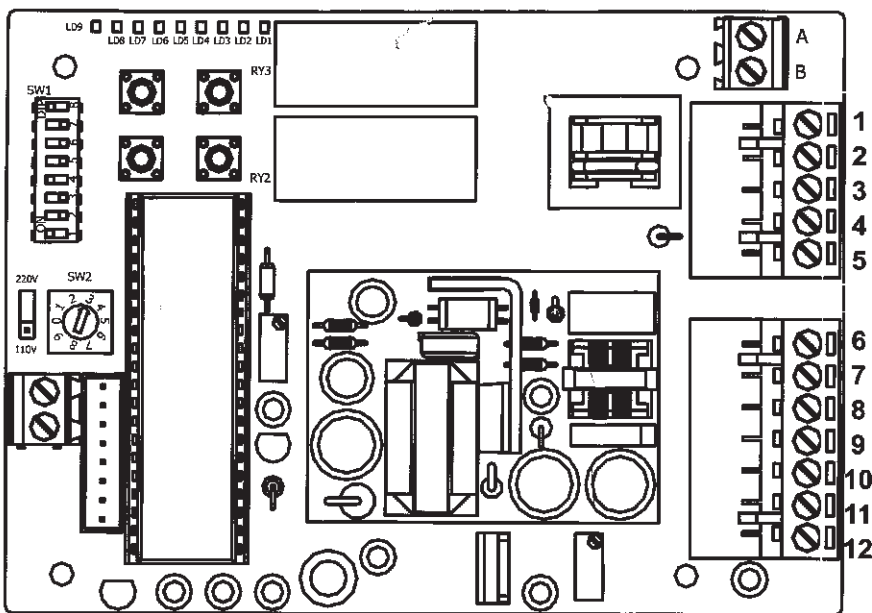
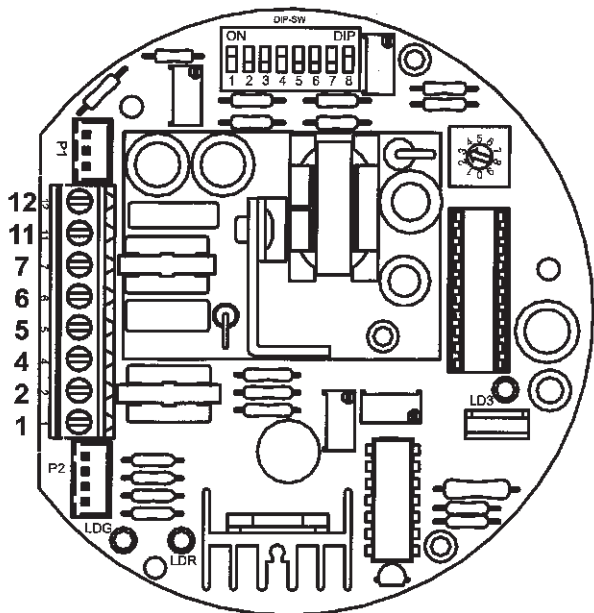
To reset and return to the original status – Please power off and get troubleshooting, then power on.

⚠ To avoid functional failure due to statics, do not touch any components on the PCB with metal tools or bare hands.

Modulating Board Set Up

OM-1 & OM-A, OM-A-M

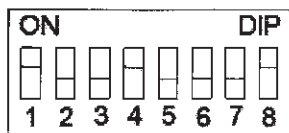
OM-2 ~ OM-13



▲ To adjust the following settings, turn power off **FIRST**.

Dip Switch setting

Factory setting: 1,4,8 ON



* S1, S2 for input signal

Input Signal	S1	S2
2-10V	OFF	ON
4-20mA	ON	OFF
1-5V	OFF	OFF

* S3, S4 & S5 for output signal

Output Signal	S3	S4	S5
2-10V	ON	OFF	ON
4-20mA	OFF	ON	OFF

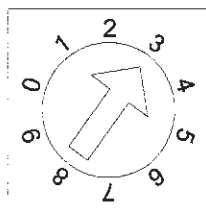
* S7 & S8-Actuator response to the loss of control signal.

When signal fails	S7	S8
Fully closed	OFF	ON
Fully open	ON	OFF
Stops	ON	ON

* S6 - Direction of travel in response to the control.

S6	Symbol
OFF	90° Signal
ON	90° Signal

Sensitivity Switch Setting: (Factory setting is position "3")



When switch to "1": The Highest Sensitive and the 0-90 degree can be divided up to around 50 times movement.

When switch to "0": The Lowest Sensitive and the 0-90 degree can be divided up to around 10 times movement.

The sensitivity decreases 7 times movement by sectors from SW1 to SW2, SW2 to SW3, SW3 to SW4 and so on.

Settings for OPEN and CLOSE

Keep pressing "**SET**" for 2 seconds, then LD9 comes on, it will enter the manual mode.

OPEN setting

- Keep pressing "**UP**" until actuator runs to fully-open position, LD2 comes on, then supplies the input signal. (5V or 10V or 20mA).
- Press "**MODE**" once. The OPEN setting is completed.

CLOSE setting

- Keep pressing "**DOWN**" until actuator runs to fully-closed position, LD1 comes on, then supplies the input signal. (1V or 2V or 4mA).
- Press "**MODE**" once. The CLOSE setting is completed.

Press "**SET**" once and back to electric mode.

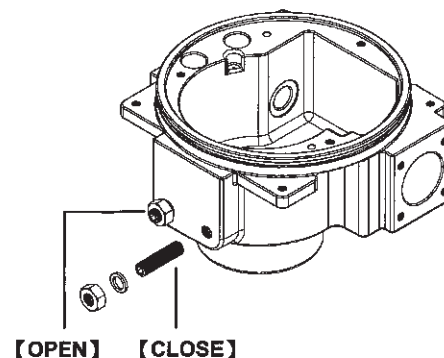
LD1 : Fully - closed	LD6 : Motor thermostat turn off
LD2 : Fully - open	LD7 : Output signal short circuit
LD3 : Power	LD8 : Motor current is excessive
LD4 : Abnormal voltage	LD9 : Manual mode
LD5 : Wrong Input signal	

Operating Instruction

The quarter-turn actuator is provided with a limiting of manual rotation device to avoid over-travel with the hand-wheel. Please follow below adjusting procedures carefully to avoid the damage of the mechanical stops.

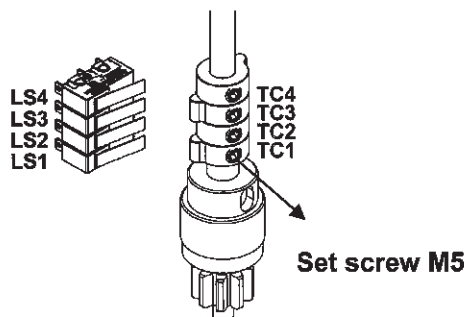
Mechanical Stops adjustment

1. Loosen mechanical stop screws.
2. For modulating type, loosen the set screw on the sector gear.
3. Follow below travel switches adjustment procedure for angle calibration.
4. For modulating type, rotate sector gear clockwise to the end. Then tighten the set screw.
5. Tighten the mechanical stop screw until it reaches the shaft, then reverse one cycle.



Travel switches adjustment

【OM-A & OM-A-M】



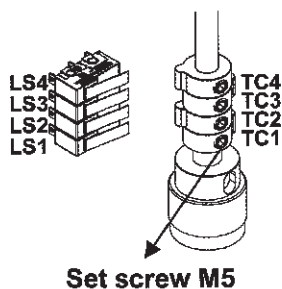
TC4 Synchronous turn with TC2 (optional)

TC3 Synchronous turn with TC1 (optional)

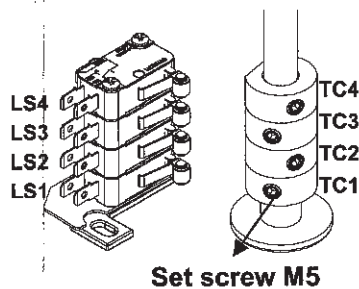
TC2 "CLOSE" ⤴ Clockwise : increase closing degree to fully closed.
⤵ Counter Clockwise : decrease closing degree.

TC1 "OPEN" ⤴ Clockwise : decrease opening degree.
⤵ Counter Clockwise : increase opening degree to fully open.

【OM-1】



【BM-2, OM-2~13】



TC4 Synchronous turn with TC2 (optional)

TC3 Synchronous turn with TC1 (optional)

TC2 "CLOSE" ⤴ Clockwise : decrease closing degree.
⤵ Counter Clockwise : increase closing degree to fully closed.

TC1 "OPEN" ⤴ Clockwise : increase opening degree to fully open.
⤵ Counter Clockwise : decrease opening degree.

Important Notices & Maintenance

- Check for correct voltage prior to wiring.
- Turn power off before servicing or for maintenance purpose.
- Use sealant to seal conduit connections after wiring to prevent dusting or water contamination.
- The angle of electric actuator installation must be between 0~180 degree. Do not install upside down or below the horizontal.
- When more than one electric actuator needs to operate simultaneously, please connect with the individual cables.
- Please connect the ground wire to PE inside the electric actuator.
- Not intended for vacuum spaces and avoid installing near explosive atmospheres.
- The standard actuator is 30% duty cycle and optional for 75% duty cycle. Avoid too high frequency for the rated duty cycle.

PLC, TM251MESE

Modicon M251 Logic Controller

Hardware Guide

04/2014



EIO0000001486.00

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, 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 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 an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

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

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can 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.

About the Book



At a Glance

Document Scope

Use this document to:

- Install and operate your M251 Logic Controller.
- Connect the M251 Logic Controller to a programming device equipped with SoMachine software.
- Interface the M251 Logic Controller with I/O expansion modules, HMI and other devices.
- Familiarize yourself with the M251 Logic Controller features.

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

Validity Note

This document has been updated with the release of SoMachine V4.1.

The technical characteristics of the devices described in this manual also appear online.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
Modicon M251 Logic Controller - Programming Guide	EIO0000001462 (ENG), EIO0000001463 (FRE), EIO0000001464 (GER), EIO0000001465 (SPA), EIO0000001466 (ITA), EIO0000001467 (CHS)
Modicon TM3 Digital I/O Modules - Hardware Guide	EIO0000001408 (ENG), EIO0000001409 (FRE), EIO0000001410 (GER), EIO0000001411 (SPA), EIO0000001412 (ITA), EIO0000001413 (CHS), EIO0000001375 (TUR), EIO0000001374 (POR)

Title of Documentation	Reference Number
Modicon TM3 Expert I/O Modules - Hardware Guide	EIO0000001420 (ENG), EIO0000001421 (FRE), EIO0000001422 (GER), EIO0000001423 (SPA), EIO0000001424 (ITA), EIO0000001425 (CHS), EIO0000001381 (TUR), EIO0000001380 (POR)
Modicon TM3 Transmitter and Receiver Modules - Hardware Guide	EIO0000001426 (ENG), EIO0000001427 (FRE), EIO0000001428 (GER), EIO0000001429 (SPA), EIO0000001430 (ITA), EIO0000001431 (CHS), EIO0000001383 (TUR), EIO0000001382 (POR)
Modicon TM4 Expansion Modules - Hardware Guide	EIO0000001796 (ENG); EIO0000001797 (FRE); EIO0000001798 (GER); EIO0000001799 (SPA); EIO0000001800 (ITA); EIO0000001801 (CHS)
M251 Logic Controller - Instruction Sheet	HRB59604

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

 **DANGER**

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

This equipment has been designed to operate outside of any hazardous location. 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

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

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

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

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Part I

Modicon M251 Logic Controller Introduction

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
1	M251 General Overview	13
2	M251 Features	35
3	M251 Installation	45

Chapter 1

M251 General Overview

Overview

This chapter provides general information about the M251 Logic Controller system architecture and its components.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
M251 Logic Controller Description	14
Maximum Hardware Configuration	16
TM4 Expansion Modules	19
TM3 Expansion Modules	20
TM2 Expansion Modules	28
Accessories	32

M251 Logic Controller Description

Overview

The M251 Logic Controller has various powerful features and can service a wide range of applications.

Software configuration, programming, and commissioning are achieved with the SoMachine software described in the SoMachine Programming Guide and in the M251 Logic Controller Programming Guide.

Programming Languages

The M251 Logic Controller is configured and programmed with the SoMachine software, which supports the following IEC 61131-3 programming languages:

- IL: Instruction list
- ST: Structured text
- FBD: Function block diagram
- SFC: Sequential function chart
- LD: Ladder diagram

SoMachine software can also be used to program this controller using CFC (continuous function chart) language.

Power Supply

The power supply of the M251 Logic Controller is 24 Vdc ([see page 68](#)).

Real Time Clock

The M251 Logic Controller includes a Real Time Clock (RTC) system ([see page 36](#)).

Run/Stop

The M251 Logic Controller can be operated externally by the following:

- a hardware Run/Stop switch ([see page 40](#))
- a SoMachine software command

Memory

This table describes the different types of memory:

Memory Type	Size	Used
RAM	64 Mbytes, of which 8 Mbytes available for the application	To execute the application.
Flash	128 Mbytes	To save the program and data in case of a power interruption.

Removable Storage

M251 Logic Controllers include an embedded SD card slot ([see page 41](#)).

The main uses of the SD card are:

- Initializing the controller with a new application
- Updating the controller firmware
- Applying post configuration files to the controller
- Applying recipes
- Receiving data logging files

Embedded Communication Features

The M251 Logic Controller native communication ports include (depending on the controller reference):

- CANopen Master ([see page 88](#))
- Ethernet ([see page 90](#))
- USB Mini-B ([see page 96](#))
- Serial Line ([see page 97](#))

M251 Logic Controllers

Reference	Digital Inputs	Digital Outputs	Communication Ports
TM251MESC	0	0	1 serial line port 1 USB mini-B programming port 1 dual port Ethernet switch 1 CANopen port
TM251MESE	0	0	1 serial line port 1 USB mini-B programming port 1 dual port Ethernet switch 1 Ethernet port for fieldbus

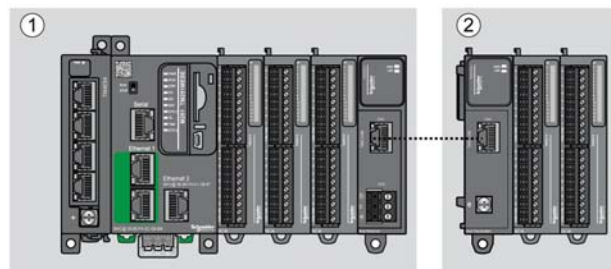
Maximum Hardware Configuration

Introduction

The M251 Logic Controller is a control system that offers an scalable solution with optimized configurations and an expandable architecture.

Local and Remote Configuration Principle

The following figure defines the local and remote configurations:



- (1) Local configuration
- (2) Remote configuration

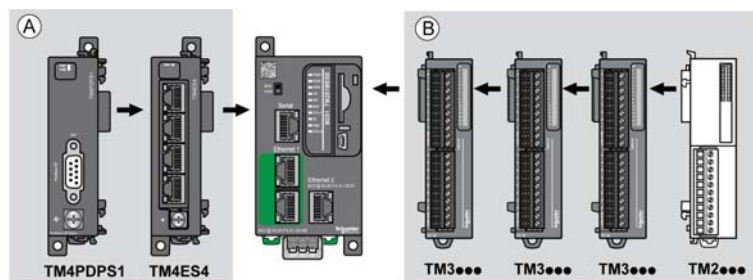
M251 Logic Controller Local Configuration Architecture

Optimized local configuration and flexibility are provided by the association of:

- TM4 expansion modules
- M251 Logic Controller
- TM3 expansion modules
- TM2 expansion modules

Application requirements determine the architecture of your M251 Logic Controller configuration.

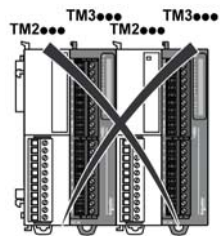
The following figure represents the components of a local configuration:



(A) Expansion modules (3 maximum)

(B) Expansion modules (7 maximum)

NOTE: It is prohibited to mount a TM2 module before any TM3 module as indicated in the following figure:



M251 Logic Controller Remote Configuration Architecture

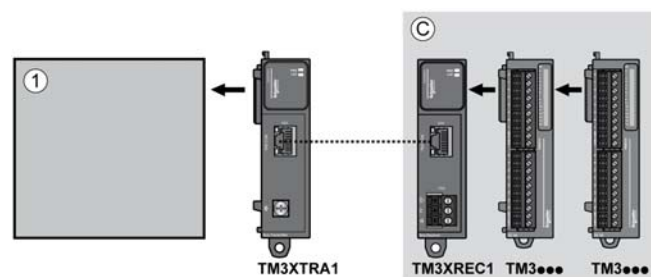
Optimized remote configuration and flexibility are provided by the association of:

- TM4 expansion modules
- M251 Logic Controller
- TM3 expansion modules
- TM3 transmitter and receiver modules

Application requirements determine the architecture of your M251 Logic Controller configuration.

NOTE: You cannot use TM2 modules in configurations that include the TM3 transmitter and receiver modules.

The following figure represents the components of a remote configuration:



- (1) Logic controller and modules
(C) Expansion modules (7 maximum)

Maximum Number of Modules

The following table shows the maximum configuration supported:

References	Maximum	Type of Configuration
TM251....	7 TM3 / TM2 expansion modules	Local
TM251....	3 TM4 expansion modules	Local
TM3XREC1	7 TM3 expansion modules	Remote
NOTE: TM3 transmitter and receiver modules are not included in a count of the maximum number of expansion modules.		

NOTE: The configuration with its TM4, TM3, and TM2 expansion modules is validated by SoMachine software in the **Configuration** window.

NOTE: In some environments, the maximum configuration populated by high consumption modules, coupled with the maximum distance allowable between the TM3 transmitter and receiver modules, may present bus communication issues although the SoMachine software allows for the configuration. In such a case you will need to analyze the consumption of the modules chosen for your configuration, as well as the minimum cable distance required by your application, and possibly seek to optimize your choices.

TM4 Expansion Modules

Introduction

The range of TM4 expansion modules includes communication modules.

For more information, refer to the TM4 Expansion Modules Hardware Guide.

TM4 Expansion Modules

The following table shows the TM4 expansion module features:

Module reference	Type	Terminal type
TM4ES4	Ethernet communication	4 RJ45 connectors 1 screw for functional ground connection
TM4PDPS1	PROFIBUS DP slave communication	1 SUB-D 9 pins female connector 1 screw for functional ground connection
NOTE: If the controller has more than one embedded Ethernet port, the module works as a standalone Ethernet switch.		

TM3 Expansion Modules

Introduction

The range of TM3 expansion modules includes:

- Digital modules, classified as follows:
 - Input modules ([see page 20](#))
 - Output modules ([see page 21](#))
 - Mixed input/output modules ([see page 23](#))
- Analog modules, classified as follows:
 - Input modules ([see page 24](#))
 - Output modules ([see page 25](#))
 - Mixed input/output modules ([see page 26](#))
- Expert modules ([see page 27](#))
- Transmitter and Receiver modules ([see page 27](#))

For more information, refer to the following documents:

- TM3 Digital I/O Modules Hardware Guide
- TM3 Analog I/O Modules Hardware Guide
- TM3 Expert I/O Modules Hardware Guide
- TM3 Transmitter and Receiver Modules Hardware Guide

TM3 Digital Input Modules

The following table shows the TM3 digital input expansion modules, with corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DI8A	8	Regular inputs	120 Vac 7.5 mA	Removable screw terminal block / 5.08 mm
TM3DI8	8	Regular inputs	24 Vdc 7 mA	Removable screw terminal block / 5.08 mm
TM3DI8G	8	Regular inputs	24 Vdc 7 mA	Removable spring terminal block / 5.08 mm
TM3DI16	16	Regular inputs	24 Vdc 7 mA	Removable screw terminal blocks / 3.81 mm
TM3DI16G	16	Regular inputs	24 Vdc 7 mA	Removable spring terminal blocks / 3.81 mm
TM3DI16K	16	Regular inputs	24 Vdc 5 mA	HE10 (MIL 20) connector
TM3DI32K	32	Regular inputs	24 Vdc 5 mA	HE10 (MIL 20) connector

TM3 Digital Output Modules

The following table shows the TM3 digital output expansion modules, with corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DQ8R	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	Removable screw terminal block / 5.08 mm
TM3DQ8RG	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	Removable spring terminal block / 5.08 mm
TM3DQ8T	8	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable screw terminal block / 5.08 mm
TM3DQ8TG	8	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable spring terminal block / 5.08 mm
TM3DQ8U	8	Regular transistor outputs (sink)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable screw terminal block / 5.08 mm
TM3DQ8UG	8	Regular transistor outputs (sink)	24 Vdc 4 A maximum per common line/0.5 A maximum per output	Removable spring terminal block / 5.08 mm
TM3DQ16R	16	Relay outputs	24 Vdc / 240 Vac 8 A maximum per common line / 2 A maximum per output	Removable screw terminal blocks / 3.81 mm
TM3DQ16RG	16	Relay outputs	24 Vdc / 240 Vac 8 A maximum per common line / 2 A maximum per output	Removable spring terminal blocks / 3.81 mm
TM3DQ16T	16	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line / 0.5 A maximum per output	Removable screw terminal blocks / 3.81 mm

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DQ16TG	16	Regular transistor outputs (source)	24 Vdc 4 A maximum per common line / 0.5 A maximum per output	Removable spring terminal blocks / 3.81 mm
TM3DQ16U	16	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.4 A maximum per output	Removable screw terminal blocks / 3.81 mm
TM3DQ16UG	16	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.4 A maximum per output	Removable spring terminal blocks / 3.81 mm
TM3DQ16TK	16	Regular transistor outputs (source)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connector
TM3DQ16UK	16	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connector
TM3DQ32TK	32	Regular transistor outputs (source)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connectors
TM3DQ32UK	32	Regular transistor outputs (sink)	24 Vdc 2 A maximum per common line / 0.1 A maximum per output	HE10 (MIL 20) connectors

TM3 Digital Mixed Input/Output Modules

This following table shows the TM3 mixed I/O modules, with corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel Type	Voltage Current	Terminal Type / Pitch
TM3DM8R	4	Regular inputs	24 Vdc 7 mA	Removable screw terminal block / 5.08 mm
	4	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM3DM8RG	4	Regular inputs	24 Vdc 7 mA	Removable spring terminal block / 5.08 mm
	4	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM3DM24R	16	Regular inputs	24 Vdc 7 mA	Removable screw terminal blocks / 3.81 mm
	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM3DM24RG	16	Regular inputs	24 Vdc 7 mA	Removable spring terminal blocks / 3.81 mm
	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	

TM3 Analog Input Modules

The following table shows the TM3 analog input expansion modules, with corresponding resolution, channel type, nominal voltage/current, and terminal type:

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3AI2H	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 5.08 mm
TM3AI2HG	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 5.08 mm
TM3AI4	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 3.81 mm
TM3AI4G	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal blocks / 3.81 mm
TM3AI8	12 bit, or 11 bit + sign	8	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 3.81 mm
TM3AI8G	12 bit, or 11 bit + sign	8	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal blocks / 3.81 mm
TM3TI4	16 bit, or 15 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable screw terminal block / 3.81 mm
TM3TI4G	16 bit, or 15 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable spring terminal blocks / 3.81 mm

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3TI8T	16 bit, or 15 bit + sign	8	inputs	Thermocouple NTC/PTC	Removable screw terminal block / 3.81 mm
TM3TI8TG	16 bit, or 15 bit + sign	8	inputs	Thermocouple NTC/PTC	Removable spring terminal blocks / 3.81 mm

TM3 Analog Output Modules

The following table shows the TM3 analog output modules, with corresponding resolution, channel type, nominal voltage/current, and terminal type:

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3AQ2	12 bit, or 11 bit + sign	2	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 5.08 mm
TM3AQ2G	12 bit, or 11 bit + sign	2	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 5.08 mm
TM3AQ4	12 bit, or 11 bit + sign	4	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable screw terminal block / 5.08 mm
TM3AQ4G	12 bit, or 11 bit + sign	4	outputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	Removable spring terminal block / 5.08 mm

TM3 Analog Mixed Input/Output Modules

This following table shows the TM3 analog mixed I/O modules, with corresponding resolution, channel type, nominal voltage/current, and terminal type:

Reference	Resolution	Channels	Channel Type	Mode	Terminal Type / Pitch
TM3AM6	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc	Removable spring terminal block / 3.81 mm
		2	outputs	0...20 mA 4...20 mA	
TM3AM6G	12 bit, or 11 bit + sign	4	inputs	0...10 Vdc -10...+10 Vdc	Removable spring terminal block / 3.81 mm
		2	outputs	0...20 mA 4...20 mA	
TM3TM3	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable screw terminal block / 5.08 mm
	12 bit, or 11 bit + sign	1	output	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	
TM3TM3G	16 bit, or 15 bit + sign	2	inputs	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA Thermocouple PT100/1000 NI100/1000	Removable spring terminal block / 5.08 mm
	12 bit, or 11 bit + sign	1	output	0...10 Vdc -10...+10 Vdc 0...20 mA 4...20 mA	

TM3 Expert Module

The following table shows the TM3 expert expansion module, with corresponding terminal type:

Reference	Description	Terminal Type / Pitch
TM3XTYS4	TeSys module	4 front connectors RJ-45 1 power supply connector / 5.08 mm

TM3 Transmitter and Receiver Modules

The following table shows the TM3 transmitter and receiver expansion modules:

Reference	Description	Terminal Type / Pitch
TM3XTRA1	Data transmitter module for remote I/O	1 front connector RJ-45 1 screw for functional ground connection
TM3XREC1	Data receiver module for remote I/O	1 front connector RJ-45 Power supply connector / 5.08 mm

TM2 Expansion Modules

Overview

You can expand the number of I/Os of your M251 Logic Controller by adding TM2 I/O expansion modules.

The following types of electronic modules are supported:

- TM2 digital I/O expansion modules
- TM2 analog I/O expansion modules

For more information, refer to the following documents:

- TM2 Digital I/O Expansion Modules Hardware Guide
- TM2 Analog I/O Expansion Modules Hardware Guide

NOTE: TM2 modules can only be used in the local configuration, and only if there is no TM3 transmitter and receiver modules present in the configuration.

NOTE: It is prohibited to mount a TM2 module before any TM3 module. The TM2 modules must be mounted and configured at the end of the local configuration.

TM2 Digital Input Expansion Modules

The following table shows the compatible TM2 digital input expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel Type	Voltage Current	Terminal Type
TM2DAI8DT	8	Regular inputs	120 Vac 7.5 mA	Removable screw terminal block
TM2DDI8DT	8	Regular inputs	24 Vdc 7 mA	Removable screw terminal block
TM2DDI16DT	16	Regular inputs	24 Vdc 7 mA	Removable screw terminal block
TM2DDI16DK	16	Regular inputs	24 Vdc 5 mA	HE10 (MIL 20) connector
TM2DDI32DK	32	Regular inputs	24 Vdc 5 mA	HE10 (MIL 20) connector

TM2 Digital Output Expansion Modules

The following table shows the compatible TM2 digital output expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel type	Voltage Current	Terminal type
TM2DRA8RT	8	Relay outputs	30 Vdc / 230 Vac 2 A max	Removable screw terminal block
TM2DRA16RT	16	Relay outputs	30 Vdc / 230 Vac 2 A max	Removable screw terminal block
TM2DDO8UT	8	Regular transistor outputs (sink)	24 Vdc 0.3 A max per output	Removable screw terminal block
TM2DDO8TT	8	Regular transistor outputs (source)	24 Vdc 0.5 A max per output	Removable screw terminal block
TM2DDO16UK	16	Regular transistor outputs (sink)	24 Vdc 0.1 A max per output	HE10 (MIL 20) connector
TM2DDO16TK	16	Regular transistor outputs (source)	24 Vdc 0.4 A max per output	HE10 (MIL 20) connector
TM2DDO32UK	32	Regular transistor outputs (sink)	24 Vdc 0.1 A max per output	HE10 (MIL 20) connector
TM2DDO32TK	32	Regular transistor outputs (source)	24 Vdc 0.4 A max per output	HE10 (MIL 20) connector

TM2 Digital Mixed Input/Output Expansion Modules

The following table shows the compatible TM2 digital mixed I/O expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel type	Voltage Current	Terminal type
TM2DMM8DRT	4	Regular inputs	24 Vdc 7 mA	Removable screw terminal block
	4	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	
TM2DMM24DRF	16	Regular inputs	24 Vdc 7 mA	Non-removable spring terminal block
	8	Relay outputs	24 Vdc / 240 Vac 7 A maximum per common line / 2 A maximum per output	

TM2 Analog Input Expansion Modules

The following table shows the compatible TM2 analog input expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel type	Voltage Current	Terminal Type
TM2AMI2HT	2	High-level inputs	0...10 Vdc 4...20 mA	Removable screw terminal block
TM2AMI2LT	2	Low-level inputs	Thermocouple type J,K,T	Removable screw terminal block
TM2AMI4LT	4	Analog inputs	0...10 Vdc 0...20 mA PT100/1000 Ni100/1000	Removable screw terminal block
TM2AMI8HT	8	Analog inputs	0...20 mA 0...10 Vdc	Removable screw terminal block
TM2ARI8HT	8	Analog inputs	NTC / PTC	Removable screw terminal block
TM2ARI8LRJ	8	Analog inputs	PT100/1000	RJ11 connector
TM2ARI8LT	8	Analog inputs	PT100/1000	Removable screw terminal block

TM2 Analog Output Expansion Modules

The following table shows the compatible TM2 analog output expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel type	Voltage Current	Terminal Type
TM2AMO1HT	1	Analog outputs	0...10 Vdc 4...20 mA	Removable screw terminal block
TM2AVO2HT	2	Analog outputs	+/- 10 Vdc	Removable screw terminal block

TM2 Analog Mixed Input/Output Expansion Modules

The following table shows the compatible TM2 analog mixed I/O expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

Reference	Channels	Channel type	Voltage Current	Terminal Type
TM2AMM3HT	2	Analog inputs	0...10 Vdc 4...20 mA	Removable screw terminal block
	1	Analog outputs	0...10 Vdc 4...20 mA	
TM2AMM6HT	4	Analog inputs	0...10 Vdc 4...20 mA	Removable screw terminal block
	2	Analog outputs	0...10 Vdc 4...20 mA	
TM2ALM3LT	2	Low-level inputs	Thermo J,K,T, PT100	Removable screw terminal block
	1	Analog outputs	0...10 Vdc 4...20 mA	

Accessories

Overview

This section describes the accessories and cables.

Accessories

Reference	Description	Use	Quantity
TMASD1	SD Card (see page 41)	Use to update the controller firmware, initialize a controller with a new application or clone a controller, manage user files.	1
TMAT2PSET	Set of 5 removable screw terminal block	Connects 24 Vdc power supply.	1
AB1AB8P35	End brackets	Help secure the logic controller or receiver module and their expansion modules on a top hat section rail (DIN rail).	1
TM2XMTGB	Grounding Bar	Connects the cable shield and the module to the functional ground.	1
TM200RSRCMC	Shielding take-up clip	Mounts and connects the ground to the cable shielding.	25 pack

Cables

Reference	Description	Details	Length
TCSXCNAMUM3P	Terminal port/USB port cordset	From the USB mini-B port on the M251 Logic Controller to USB port on the PC terminal.	3 m (10 ft)
TCSMCN3M4F3C2	RS-232 serial link cordset 1 RJ45 connector and 1 SUB-D 9 connector	For DTE terminal (printer)	3 m (9.84 ft)
TCSMCN3M4M3S2	RS-232 serial link cordset 1 RJ45 connector and 1 SUB-D 9 connector	For DCE terminal (modem, converter)	3 m (9.84 ft)

Reference	Description	Details	Length
490NTW000••	Ethernet shielded cable for DTE connections	Standard cable, equipped with RJ45 connectors at each end for DTE. CE compliant	2,5,12,40, or 80 m (6.56,16.4, 39.37, 131.23, or 262.47 ft)
490NTW000••U		Standard cable, equipped with RJ45 connectors at each end for DTE. UL compliant	2,5,12,40, or 80 m (6.56,16.4, 39.37, 131.23, or 262.47 ft)
TCSECE3M3M••S4		Cable for harsh environment,, equipped with RJ45 connectors at each end. CE compliant	1, 2, 3, 5, or 10 m (3.28, 6.56, 9.84, 16.4, 32.81 ft)
TCSECU3M3M••S4		Cable for harsh environment, equipped with RJ45 connectors at each end. UL compliant	1, 2, 3, 5, or 10 m (3.28, 6.56, 9.84, 16.4, 32.81 ft)

Chapter 2

M251 Features

Overview

This chapter describes the Modicon M251 Logic Controller features.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Real Time Clock (RTC)	36
Run/Stop	40
SD Card	41

Real Time Clock (RTC)

Overview

The M251 Logic Controller includes an RTC to provide system date and time information, and to support related functions requiring a real-time clock. To continue keeping time when power is off, a non-rechargeable battery is required (see reference below). A battery LED on the front panel of the controller indicates if the battery is depleted or absent.

This table shows how RTC drift is managed:

RTC Characteristics	Description
RTC drift	Less than 60 seconds per month without any user calibration at 25 °C (77 °F)

Battery

The controller has one battery.

In the event of a power interruption, the backup battery maintains the RTC for the controller.

This table shows the characteristics of the battery:

Characteristics	Description
Use	In the event of a transient power outage, the battery powers the RTC and user data.
Backup life	At least 2 years at 25 °C max (77 °F). At higher temperatures, the time is reduced.
Battery monitoring	Yes
Replaceable	Yes
Controller battery type	Lithium carbon monofluoride, type Panasonic BR2032

Installing and Replacing the Battery

While lithium batteries are preferred due to their slow discharge and long life, they can present hazards to personnel, equipment and the environment and must be handled properly.

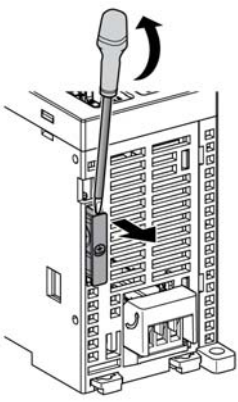
⚠ DANGER

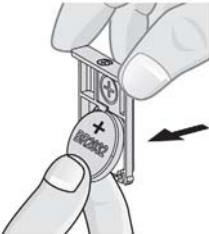
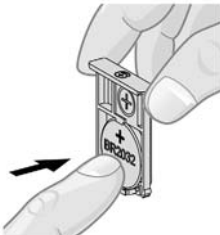
EXPLOSION, FIRE, OR CHEMICAL BURNS

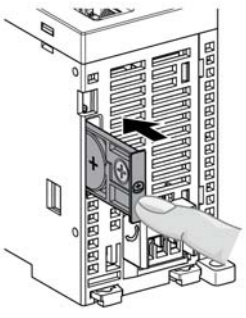
- Replace with identical battery type.
- Follow all battery manufacturer's instructions.
- Remove all replaceable batteries before discarding unit.
- Recycle or properly dispose of used batteries.
- Protect battery from any potential short-circuit.
- Do not recharge, disassemble, heat above 100 °C (212 °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.

To install or replace the battery, follow these steps:

Step	Action
1	Remove power from your controller.
2	Use an insulated screw-driver to pull out the battery holder. 
3	Slide out the battery holder of the controller

Step	Action
4	Remove the battery from the battery holder. 
5	Insert the new battery into the battery holder in accordance with the polarity markings on the battery. 
6	Replace the battery holder on the controller and verify that the latch clicks into place. 

Step	Action
7	Slide in the battery holder of the controller. 
8	Power up your M251 Logic Controller.
9	Set the internal clock. For further details on the internal clock, refer to M251 Logic Controller Programming Guide (see <i>Modicon M251 Logic Controller, Programming Guide</i>).

NOTE: Replacement of the battery in the controllers other than with the type specified in this documentation may present a risk of fire or explosion.

WARNING

IMPROPER BATTERY CAN PROVOKE FIRE OR EXPLOSION

Replace battery only with identical type: Panasonic Type BR2032.

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

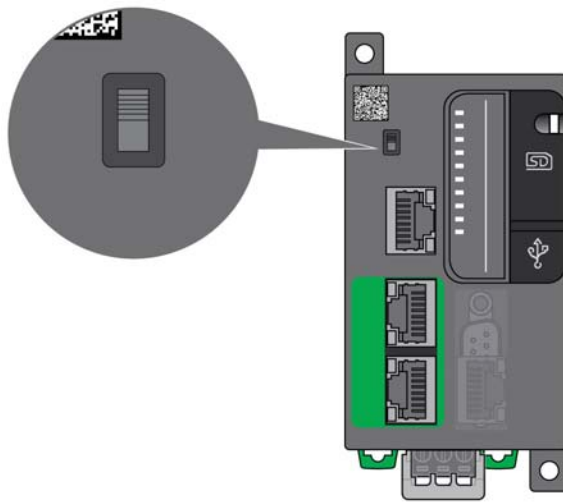
Run/Stop

Run/Stop

The M251 Logic Controller can be operated externally by the following:

- a hardware Run/Stop switch
- a SoMachine software command.

The M251 Logic Controller has a Run/Stop hardware switch, which puts the controller in a RUN or STOP state.



SD Card

Overview

When handling the SD card, follow the instructions below to help prevent internal data on the SD card from being corrupted or lost or a SD card malfunction from occurring:

NOTICE

LOSS OF APPLICATION DATA

- Do not store the SD card where there is static electricity or probable electromagnetic fields.
- Do not store the SD card in direct sunlight, near a heater, or other locations where high temperatures can occur.
- Do not bend the SD card.
- Do not drop or strike the SD card against another object.
- Keep the SD card dry.
- Do not touch the SD card connectors.
- Do not disassemble or modify the SD card.
- Use only SD cards formatted using FAT or FAT32.

Failure to follow these instructions can result in equipment damage.

The M251 Logic Controller does not recognize NTFS formatted SD cards. Format the SD card on your computer using FAT or FAT32.

When using the M251 Logic Controller and a SD card, observe the following to avoid losing valuable data:

- Accidental data loss can occur at any time. Once data is lost it cannot be recovered.
- If you forcibly extract the SD card, data on the SD card may become corrupted.
- Removing an SD card that is being accessed could damage the SD card, or corrupt its data.
- If the SD card is not positioned correctly when inserted into the controller, the data on the card and the controller could become damaged.

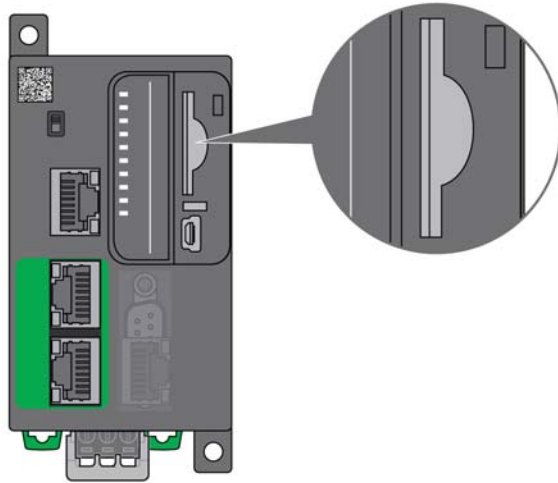
NOTICE

LOSS OF APPLICATION DATA

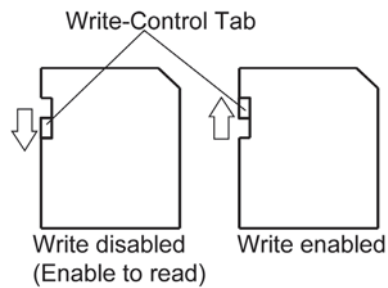
- Backup SD card data regularly.
- Do not remove power or reset the controller, and do not insert or remove the SD card while it is being accessed.
- Become familiar with the proper orientation of the SD card when inserting it into the controller.

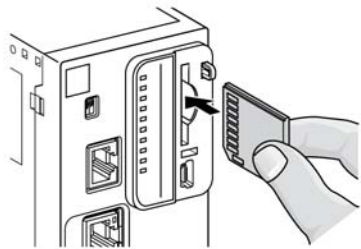
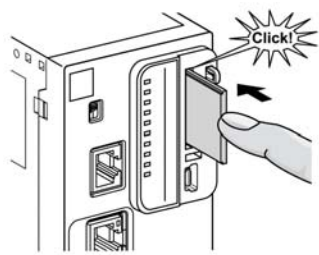
Failure to follow these instructions can result in equipment damage.

This figure shows the SD card slot:



It is possible to set the Write-Control Tab to prevent write operations to the SD card. Push the tab up, as shown in the example on the right-hand side, to release the lock and enable writing to the SD card. Before using an SD card, read the manufacturer's instructions.



Step	Action
1	Insert the SD card into the SD card slot: 
2	Push until you hear it "click": 

SD Card Slot Characteristics

Topic	Characteristics	Description
Supported type	Standard Capacity	SD (SDSC)
	High Capacity	SDHC
Global memory	Size	32 GB max.

TMASD1 Characteristics

Characteristics	Description
Card removal durability	Minimum 1000 times
File retention time	10 years @ 25 °C (77 °F)
Flash type	SLC NAND
Memory size	512 MB
Ambient operation temperature	–10 ... +85° C (14...185 °F)
Storage temperature	–25 ... +85° C (–13...185 °F)
Relative humidity	95% max. non-condensing
Write/Erase cycles	3,000,000 (approximately)

NOTE: The TMASD1 has been rigorously tested in association with the logic controller. For other commercially available cards, please consult your local sales representative.

NOTE: The SD card can be used directly on your PC.

Chapter 3

M251 Installation

Overview

This chapter provides installation safety guidelines, device dimensions, mounting instructions, and environmental specifications.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
3.1	M251 Logic Controller General Rules for Implementing	46
3.2	M251 Logic Controller Installation	51
3.3	M251 Electrical Requirements	64

Section 3.1

M251 Logic Controller General Rules for Implementing

What Is in This Section?

This section contains the following topics:

Topic	Page
Environmental Characteristics	47
Certifications and Standards	50

Environmental Characteristics

Enclosure Requirements

M251 Logic Controller system components are designed as Zone B, Class A industrial equipment according to IEC/CISPR Publication 11. If they are used in environments other than those described in the standard, or in environments that do not meet the specifications in this manual, the ability to meet electromagnetic compatibility requirements in the presence of conducted and/or radiated interference may be reduced.

All M251 Logic Controller system components meet European Community (CE) requirements for open equipment as defined by IEC/EN 61131-2. You must install them in an enclosure designed for the specific environmental conditions and to minimize the possibility of unintended contact with hazardous voltages. Use metal enclosures to improve the electromagnetic immunity of your M251 Logic Controller system. Use enclosures with a keyed locking mechanism to minimize unauthorized access.

Environmental Characteristics

All the M251 Logic Controller module components are electrically isolated between the internal electronic circuit and the input/output channels within the limits set forth and described by these environmental characteristics. For more information on electrical isolation, see the technical specifications of your particular controller found later in the current document. This equipment meets CE requirements as indicated in the table below. This equipment is intended for use in a Pollution Degree 2 industrial environment.

 WARNING
UNINTENDED EQUIPMENT OPERATION Do not exceed any of the rated values specified in the environmental and electrical characteristics tables. Failure to follow these instructions can result in death, serious injury, or equipment damage.

The following table shows the general environmental characteristics:

Characteristic		Specification
Standard compliance	IEC/EN 61131-2	
	IEC/EN 61010-2-201	
Ambient operating temperature	Horizontal installation	−10...55 °C (14...131 °F)
	Vertical installation	−10...35 °C (14...95 °F)
Storage temperature		−25...70 °C (−13...158 °F)

Characteristic		Specification
Relative humidity	Transport and storage	10...95 % (non-condensing)
	Operation	10...95 % (non-condensing)
Degree of pollution	IEC/EN 60664-1	2
Degree of protection	IEC/EN 61131-2	IP20 with protective covers in place
Machine Safety conformance	IEC/EN 61010-2-201	Yes
Corrosion immunity		Atmosphere free from corrosive gases
Operating altitude		0...2000 m (0...6560 ft)
Storage altitude		0...3000 m (0...9843 ft)
Vibration resistance	IEC/EN 61131-2 Panel mounting or mounted on a top hat section rail (DIN rail)	3.5 mm (0.13 in) fixed amplitude from 5...8.5 Hz 29.4 m/s ² or 96.45 ft/s ² (3 g _n) fixed acceleration from 8.7...150 Hz
Mechanical shock resistance		147 m/s ² or 482.28 ft/s ² (15 g _n) for a duration of 11 ms

Electromagnetic Susceptibility

The M251 Logic Controller system meets electromagnetic susceptibility specifications as indicated in the following table:

Characteristic	Designed to specification	Range	
Electrostatic discharge	IEC/EN 61000-4-2	8 kV (air discharge) 4 kV (contact discharge)	
Radiated electromagnetic field	IEC/EN 61000-4-3	10 V/m (80...1000 MHz) 3 V/m (1.4...2 GHz) 1 V/m (2...3 GHz)	
Magnetic field	IEC/EN 61000-4-8	30 A/m 50 Hz, 60 Hz	
Fast transients burst	IEC/EN 61000-4-4	–	CM ¹ and DM ²
		AC/DC Power lines	2 kV
		Relay Outputs	–
		24 Vdc I/Os	–
		Analog I/Os	–
		Communication line	1 kV

Characteristic	Designed to specification	Range		
Surge immunity	IEC/EN 61000-4-5 IEC/EN 61131-2	–	CM ¹	DM ²
		DC Power lines	1 kV	0.5 kV
		AC Power lines	–	–
		Relay Outputs	–	–
		24 Vdc I/Os	–	–
		Shielded cable (between shield and ground)	1 kV	–
Induced electromagnetic field	IEC/EN 61000-4-6	10 Vrms (0.15...80 MHz)		
Conducted emission	IEC/EN 55011 (IEC/CISPR Publication 11)	AC power line: ● 0.15...0.5 MHz: 79 dBµV/m QP / 66 dBµV/m AV ● 0.5...300 MHz: 73 dBµV/m QP / 60 dBµV/m AV		
		AC/DC power line: ● 10...150 kHz: 120...69 dBµV/m QP ● 150...1500 kHz: 79...63 dBµV/m QP ● 1.5...30 MHz: 63 dBµV/m QP		
Radiated emission	IEC/EN 55011 (IEC/CISPR Publication 11)	Class A, 10 m distance: ● 30...230 MHz: 40 dBµV/m QP ● 230...1000 MHz: 47 dBµV/m QP		
¹ Common Mode				
² Differential Mode				

Certifications and Standards

Introduction

The M251 Logic Controllers are designed to conform to the main national and international standards concerning electronic industrial control devices:

- IEC/EN 61131-2
- UL 508
- CSA 22.2 n° 142
- CSA E61131-2

The M251 Logic Controllers have obtained, or in the process of obtaining, the following conformity marks:

- CE
- cULus pending
- CSA pending

The M251 Logic Controllers comply with the main national and international Directives and Regulations concerning electronic industrial control devices:

- Europe RoHS, exemption annex III 7(a)



- China RoHS regulations
- REACH v9

Section 3.2

M251 Logic Controller Installation

What Is in This Section?

This section contains the following topics:

Topic	Page
Installation and Maintenance Requirements	52
M251 Logic Controller Mounting Positions and Clearances	55
Top Hat Section Rail (DIN rail)	58
Installing and Removing the Controller with Expansions	61
Direct Mounting on a Panel Surface	63

Installation and Maintenance Requirements

Before Starting

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

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

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

Disconnecting Power

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

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

Programming Considerations

WARNING

UNINTENDED EQUIPMENT OPERATION

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

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

Operating Environment

This equipment has been designed to operate outside of any hazardous location. 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

UNINTENDED EQUIPMENT OPERATION

Install and operate this equipment according to the conditions described in the Environmental Characteristics.

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

Installation Considerations

WARNING

UNINTENDED EQUIPMENT OPERATION

- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Install and operate this equipment in an enclosure appropriately rated for its intended environment.
- Use the sensor and actuator power supplies only for supplying power to the sensors or actuators connected to the module.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions.
- Do not disassemble, repair, or modify this equipment.
- Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).

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

NOTE: JDYX2 or JDYX8 fuse types are UL-recognized and CSA approved.

M251 Logic Controller Mounting Positions and Clearances

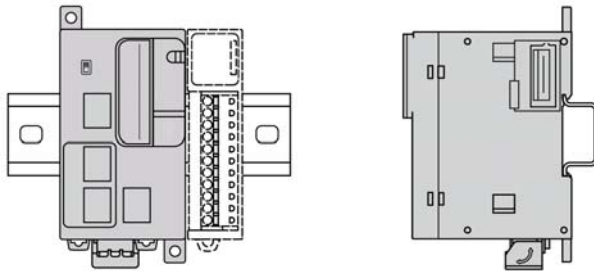
Introduction

This section describes the correct mounting positions for the M251 Logic Controller.

NOTE: Keep adequate spacing for proper ventilation and to maintain the operating temperature specified in the Environmental Characteristics ([see page 47](#)).

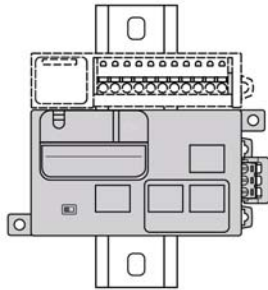
Correct Mounting Position

To obtain optimal operating characteristics, the M251 Logic Controller should be mounted horizontally on a vertical plane as shown in the figure below:



Acceptable Mounting Positions

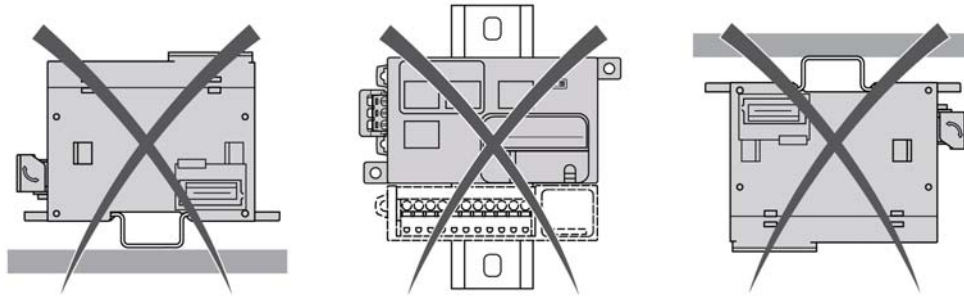
The M251 Logic Controller can also be mounted vertically on a vertical plane as shown below.



NOTE: Expansion modules must be mounted above the controller.

Incorrect Mounting Position

The M251 Logic Controller should only be positioned as shown in the Correct Mounting Position figure. The figures below show the incorrect mounting positions.



Minimum Clearances

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

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

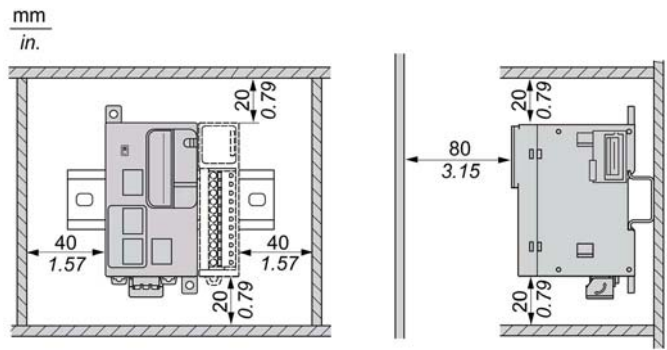
Failure to follow these instructions can result in death, serious injury, or equipment damage.

The M251 Logic Controller has been designed as an IP20 product and must be installed in an enclosure. Clearances must be respected when installing the product.

There are 3 types of clearances to consider:

- The M251 Logic Controller and all sides of the cabinet (including the panel door).
- The M251 Logic Controller terminal blocks and the wiring ducts to help reduce potential electromagnetic interference between the controller and the duct wiring.
- The M251 Logic Controller and other heat generating devices installed in the same cabinet.

The following figure shows the minimum clearances that apply to all M251 Logic Controller references:



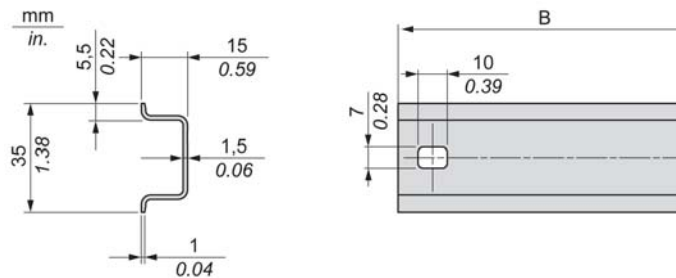
Top Hat Section Rail (DIN rail)

Dimensions of Top Hat Section Rail DIN Rail

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

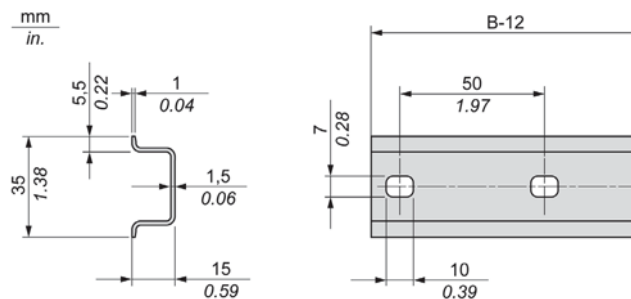
Symmetric Top Hat Section Rails (DIN Rail)

The following illustration and table show the references of the top hat section rails (DIN rail) for the wall-mounting range:



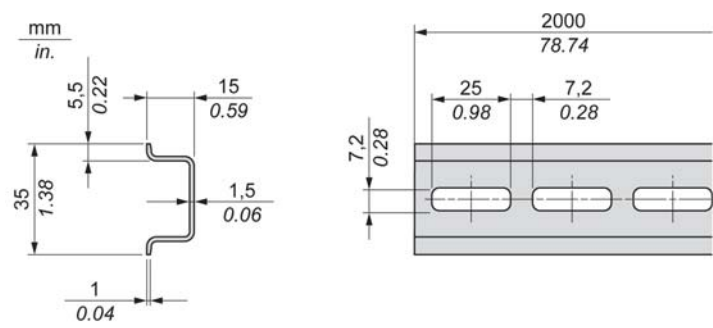
Reference	Type	Rail Length (B)
NSYSR50A	A	450 mm (17.71 in.)
NSYSR60A	A	550 mm (21.65 in.)
NSYSR80A	A	750 mm (29.52 in.)
NSYSR100A	A	950 mm (37.40 in.)

The following illustration and table show the references of the symmetric top hat section rails (DIN rail) for the metal enclosure range:



Reference	Type	Rail Length (B-12 mm)
NSYSDR60	A	588 mm (23.15 in.)
NSYSDR80	A	788 mm (31.02 in.)
NSYSDR100	A	988 mm (38.89 in.)
NSYSDR120	A	1188 mm (46.77 in.)

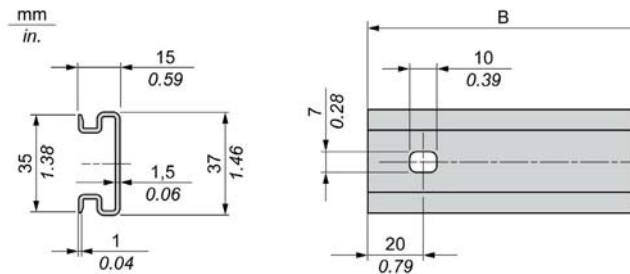
The following illustration and table shows the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):



Reference	Type	Rail Length
NSYSDR200 ¹	A	2000 mm (78.74 in.)
NSYSDR200D ²	A	
1 Unperforated galvanized steel		
2 Perforated galvanized steel		

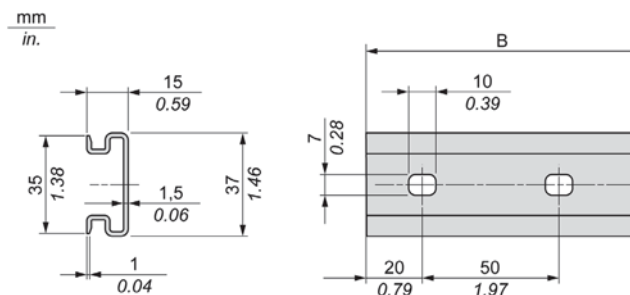
Double-Profile Top Hat Section Rails (DIN rail)

The following illustration and table show the references of the double-profile top hat section rails (DIN rails) for the wall-mounting range:



Reference	Type	Rail Length (B)
NSYDPR25	W	250 mm (9.84 in.)
NSYDPR35	W	350 mm (13.77 in.)
NSYDPR45	W	450 mm (17.71 in.)
NSYDPR55	W	550 mm (21.65 in.)
NSYDPR65	W	650 mm (25.60 in.)
NSYDPR75	W	750 mm (29.52 in.)

The following illustration and table show the references of the double-profile top hat section rails (DIN rail) for the floor-standing range:



Reference	Type	Rail Length (B)
NSYDPR60	F	588 mm (23.15 in.)
NSYDPR80	F	788 mm (31.02 in.)
NSYDPR100	F	988 mm (38.89 in.)
NSYDPR120	F	1188 mm (46.77 in.)

Installing and Removing the Controller with Expansions

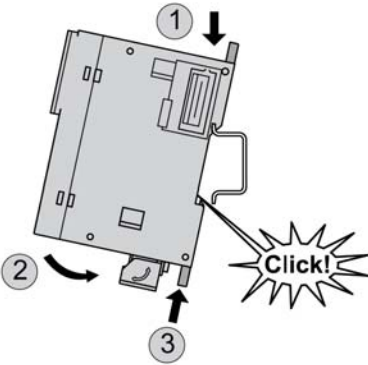
Overview

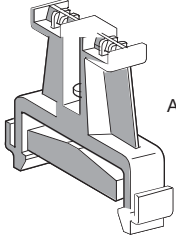
This section describes how to install and remove the controller with its expansion modules from a top hat section rail (DIN rail).

To assemble expansion modules to a controller or receiver module, or to other modules, refer to the respective expansion modules hardware guide(s).

Installing a Controller with its Expansions on a DIN Rail

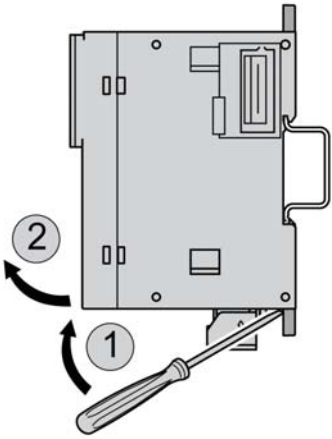
The following procedure describes how to install a controller with its expansion modules on a top hat section rail (DIN rail):

Step	Action
1	Fasten the top hat section rail (DIN rail) to a panel surface using screws.
2	Position the top groove of the controller and its expansion modules on the top edge of the DIN rail and press the assembly against the top hat section rail (DIN rail) until you hear the top hat section rail (DIN rail) clip snap into place. 

Step	Action
3	Place 2 terminal block end clamps on both sides of the controller and expansion module assembly.  AB1AB8P35 NOTE: Type ABB8P35 or equivalent terminal block end clamps help minimize sideways movement and improve the shock and vibration characteristics of the controller and expansion module assembly.

Removing a Controller with its Expansions from a Top Hat Section Rail (DIN Rail)

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

Step	Action
1	Remove all power from your controller and expansion modules.
2	Insert a flat screwdriver into the slot of the top hat section rail (DIN rail) clip. 
3	Pull down the DIN rail clip.
4	Pull the controller and its expansion modules from the top hat section rail (DIN rail) from the bottom.

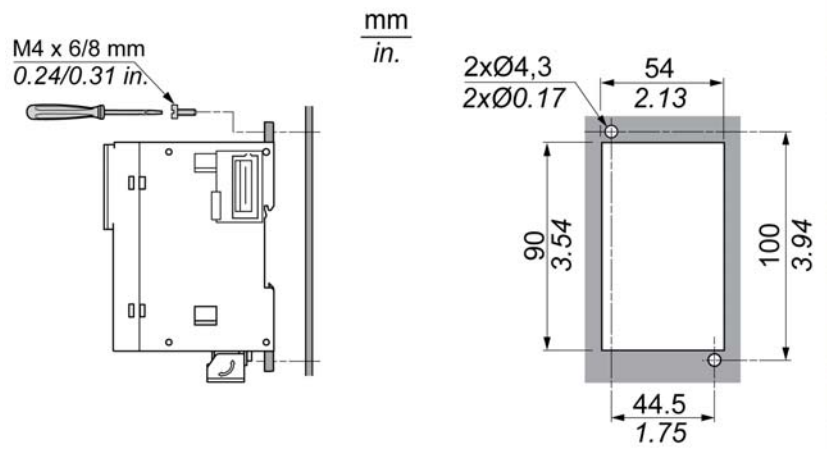
Direct Mounting on a Panel Surface

Overview

This section shows how to install M251 Logic Controller on a panel surface using the mounting holes.

Mounting Hole Layout

This diagram shows the mounting hole layout for M251 Logic Controller:



Section 3.3

M251 Electrical Requirements

What Is in This Section?

This section contains the following topics:

Topic	Page
Wiring Best Practices	65
DC Power Supply Characteristics and Wiring	68
Grounding the M251 System	72

Wiring Best Practices

Overview

This section describes the wiring guidelines and associated best practices to be respected when using the M251 Logic Controller system.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

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

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

WARNING

LOSS OF CONTROL

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

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

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

Wiring Guidelines

This rules must be applied when wiring a M251 Logic Controller system:

- Communication wiring must be kept separate from the power wiring. Route these 2 types of wiring in separate cable ducting.
- Verify that the operating conditions and environment are within the specification values.
- Use proper wire sizes to meet voltage and current requirements.
- Use copper conductors (required).
- Use twisted pair, shielded cables for networks, and fieldbus.

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

WARNING

UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for all communication signals.
- Ground cable shields for all communication signals at a single point¹.
- Route communication separately from power cables.

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

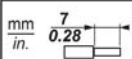
¹Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

For more details, refer to Grounding Shielded Cables ([see page 73](#)).

NOTE: Surface temperatures may exceed 60° C. To conform to IEC 61010 standards, route primary wiring (wires connected to power mains) separately and apart from secondary wiring (extra low voltage wiring coming from intervening power sources). If that is not possible, double insulation is required such as conduit or cable gains.

Rules for Removable Screw Terminal Block

The following tables show the cable types and wire sizes for a **5.08 pitch** removable screw terminal block (power supply):

								
mm ²	0.2...2.5	0.2...2.5	0.25...2.5	0.25...2.5	2 x 0.2...1	2 x 0.2...1.5	2 x 0.25...1	2 x 0.5...1.5
AWG	24...14	24...14	23...14	23...14	2 x 24...17	2 x 24...16	2 x 23...17	2 x 20...16
 Ø 3,5 mm (0.14 in.)				N•m	0.5...0.6			
				lb-in	4.42...5.31			

The use of copper conductors is required.

⚠ DANGER

LOOSE WIRING CAUSES ELECTRIC SHOCK

- Tighten connections in conformance with the torque specifications.
- Do not insert more than one wire per connector of the terminal block without the cable ends specified above.

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

⚠ DANGER

FIRE HAZARD

Use only the recommended wire sizes for the current capacity of the power supplies.

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

DC Power Supply Characteristics and Wiring

Overview

This section provides the characteristics and the wiring diagrams of the DC power supply.

DC Power Supply Voltage Range

If the specified voltage range is not maintained, outputs may not switch as expected. Use appropriate safety interlocks and voltage monitoring circuits.

DANGER

FIRE HAZARD

- Use only the recommended wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm² (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm² (AWG 16) with a temperature rating of at least 80 °C (176 °F).

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

WARNING

UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

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

DC Power Supply Requirements

The M251 Logic Controller and associated I/O (TM2, TM3) require power supplies with a nominal voltage of 24 Vdc. The 24 Vdc power supplies must be rated Safety Extra Low Voltage (SELV) or Protective Extra Low Voltage (PELV) according to IEC 61140. These power supplies are isolated between the electrical input and output circuits of the power supply.

WARNING

POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the equipment directly to line voltage.
- Use only isolating PELV or SELV power supplies to supply power to the equipment¹.

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

¹For compliance to UL (Underwriters Laboratories) requirements, the power supply must also be of a type Class II with a maximum power output availability of less than 100 VA (approximately 4 A at nominal voltage). A Class II circuit requires dry indoor use only in non-hazardous locations, and must be grounded. You must separate Class II circuits from other circuits. If a non-Class II power source is used, either power supply or transformer, you must impose a current limiting device such as a fuse or a circuit breaker with a maximum rating of 4 A, but never exceeding the limits indicated in the electric characteristics and wiring diagrams for this equipment. If the indicated rating of the electrical characteristics or wiring diagrams are greater than 4 A, multiple Class II power supplies may be used.

Controller DC Characteristics

This table shows the characteristics of the DC power supply required for the controller:

Characteristic		Value
Rated voltage		24 Vdc
Power supply voltage range		19.2...28.8 Vdc
Power interruption time		10 ms at 24 Vdc
Maximum inrush current		50 A
Continuous output power		typical 32.6 W max. 40.4 W
Isolation	between DC power supply and internal logic	Not isolated
	between DC power supply and protective earth ground (PE)	500 Vac

Power Interruption

The duration of power interruptions where the M251 Logic Controller is able to continue normal operation varies depending upon the load to the power supply of the controller, but a minimum of 10 ms is maintained as specified by IEC standards.

When planning the management of the power supplied to the controller, you must consider the power interruption duration due to the fast cycle time of the controller.

There could potentially be many scans of the logic and consequential updates to the I/O image table during the power interruption, while there is no external power supplied to the inputs, the outputs or both depending on the power system architecture and power interruption circumstances.

WARNING

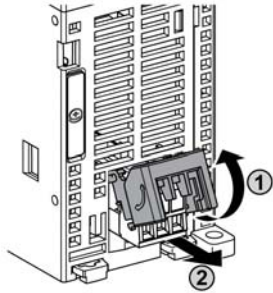
UNINTENDED EQUIPMENT OPERATION

- Individually monitor each source of power used in the controller system including input power supplies, output power supplies and the power supply to the controller to allow appropriate system shutdown during power system interruptions.
- The inputs monitoring each of the power supply sources must be unfiltered inputs.

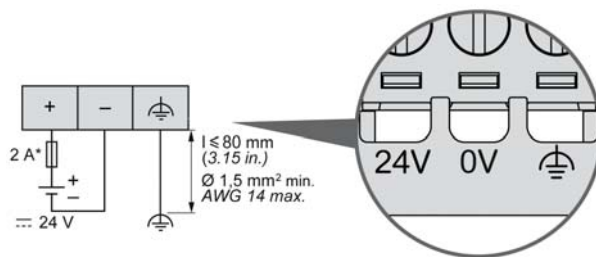
Failure to follow these instructions can result in death, serious injury, or equipment damage.

DC Power Supply Wiring Diagram

This figure shows the power supply terminal block removal procedure:



The following figure shows the wiring of the DC power supply:



* Type T fuse

For more information, refer to the 5.08 pitch Rules for Removable Screw Terminal block ([see page 67](#)).

Grounding the M251 System

Overview

To help minimize the effects of electromagnetic interference, cables carrying fieldbus communication signals must be shielded.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for communication signals.
- Ground cable shields for communication signals at a single point ¹.
- Always comply with local wiring requirements regarding grounding of cable shields.

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

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

The use of shielded cables requires compliance with the following wiring rules:

- For protective ground connections (PE), metal conduit or ducting can be used for part of the shielding length, provided there is no break in the continuity of the ground connections. For functional ground (FE), the shielding is intended to attenuate electromagnetic interference and the shielding must be continuous for the length of the cable. If the purpose is both functional and protective, as is often the case for communication cables, the cable must have continuous shielding.
- Wherever possible, keep cables carrying one type of signal separate from the cables carrying other types of signals or power.

Protective Ground (PE) on the Backplane

The protective ground (PE) should be connected to the conductive backplane by a heavy-duty wire, usually a braided copper cable with the maximum allowable cable section.

Shielded Cables Connections

Cables carrying fieldbus communication signals must be shielded. The shielding must be securely connected to ground. The fieldbus communication cable shields must be connected to the protective ground (PE) with a connecting clamp secured to the conductive backplane of your installation.

WARNING

ACCIDENTAL DISCONNECTION FROM PROTECTIVE GROUND (PE)

- Do not use the TM2XMTGB Grounding Bar to provide a protective ground (PE).
- Use the TM2XMTGB Grounding Bar only to provide a functional ground (FE).

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

The shielding of the Modbus cable must be connected to the protective ground (PE).

DANGER

HAZARD OF ELECTRIC SHOCK

- The grounding terminal connection (PE) must be used to provide a protective ground at all times.
- Make sure that an appropriate, braided ground cable is attached to the PE/PG ground terminal before connecting or disconnecting the network cable to the equipment.

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

Part II

Modicon M251 Logic Controller

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
4	TM251MESC	77
5	TM251MESE	81

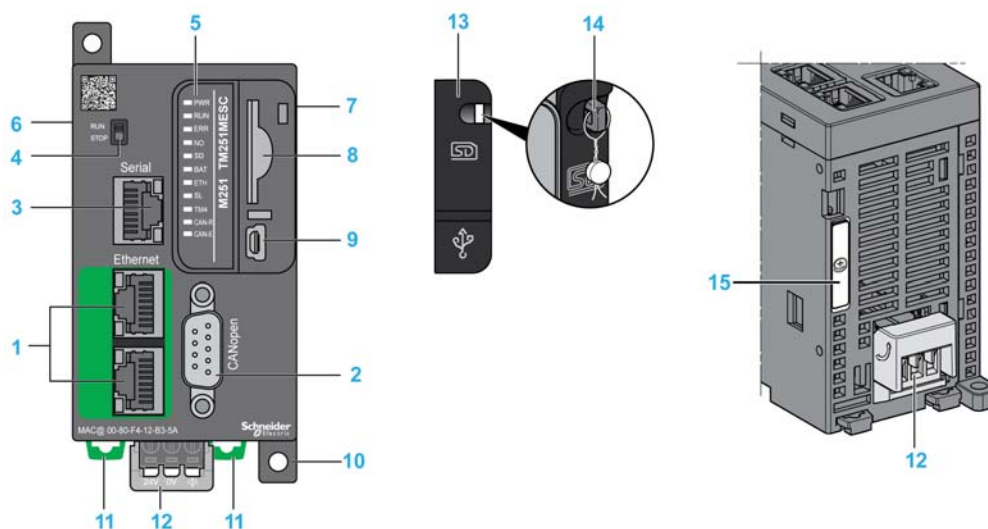
Chapter 4

TM251MESC

TM251MESC Presentation

Description

This figure shows the different components of the TM251MESC logic controller:



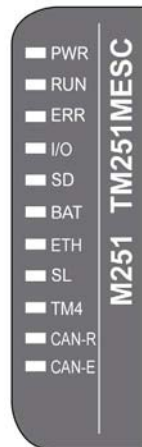
N°	Description	Refer to
1	Dual port Ethernet switch	Ethernet port (see page 90)
2	CANopen port	CANopen port (see page 88)
3	Serial line port / Type RJ45 (RS-232 or RS-485)	Serial Line (see page 97)
4	Run/Stop switch	Run/Stop (see page 40)
5	Status LEDs	—
6	TM4 bus connector	TM4 Expansion Modules (see page 19)
7	TM3/TM2 bus connector	TM3 Expansion Modules (see page 20)
8	SD card slot	SD Card (see page 41)
9	USB mini-B programming port / For terminal connection to a programming PC (SoMachine)	USB Mini-B Programming Port (see page 96)

TM251MESC

N°	Description	Refer to
10	Surface mounting lugs	—
11	Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)	Top Hat Section Rail (see page 58)
12	24 Vdc power supply	DC Power supply Characteristics and Wiring (see page 68)
13	Protective cover (SD card slot and USB mini-B programming port)	—
14	Locking hook (Hook not included)	—
15	Battery holder	Real Time Clock (RTC) (see page 36)

Status LEDs

This figure shows the status LEDs:



The following table describes the system status LEDs:

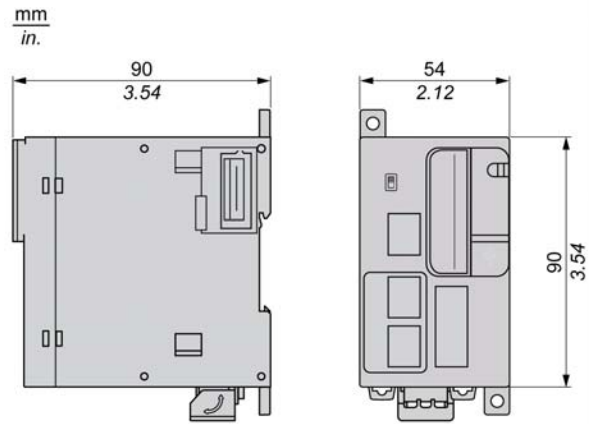
Label	Function Type	Color	Status	Description
PWR	Power	Green	On	Indicates that power is applied.
			Off	Indicates that power is removed.
RUN	Machine status	Green	On	Indicates that the controller is running a valid application.
			Flashing	Indicates that the controller has a valid application that is stopped.
			1 flash	Indicates that the controller has paused at BREAKPOINT.
			Off	Indicates that the controller is not programmed

Label	Function Type	Color	Status	Description
ERR	Internal Error	Red	On	Indicates that an operating system error has been detected
			Fast flashing	Indicates that the controller has detected an internal error
			Slow flashing	Indicates either that a minor error has been detected if RUN is ON or that no application has been detected
I/O	I/O error	Red	On	Indicates device errors on the serial line, SD card, TM4 bus, TM3 bus, Ethernet port(s) or CANopen port.
SD	SD card access	Green	On	Indicates that the SD card is being accessed
BAT	Battery	Red	On	Indicates that the battery needs to be replaced.
			Flashing	Indicates that the battery charge is low.
ETH	Ethernet port status	Green	On	Indicates that the ethernet port is connected and the IP address is defined.
			3 flashes	Indicates that the ethernet port is not connected.
			4 flashes	Indicates that the IP address is already in used.
			5 flashes	Indicates that the module is waiting for BOOTP or DHCP sequence.
			6 flashes	Indicates that the configured IP address is not valid.
SL	Serial line	Green	On	Indicates the status of serial line (see page 99)
			Off	Indicates no serial communication
TM4	Error on TM4 bus	Red	On	Indicates that an error has been detected on the TM4 bus
			Off	Indicates that no error has been detected on the TM4 bus
CAN-R	CANopen running status	Green	On	Indicates that the CANopen bus is operational.
			Off	Indicates that the CANopen master is configured.
			Flashing	Indicates that the CANopen bus is being initialized.
			1 flash per second	Indicates that the CANopen bus is stopped.
CAN-E	CANopen error	Red	On	Indicates that the CANopen bus is stopped (BUS OFF).
			Off	Indicates no CANopen detected error.
			Flashing	Indicates that the CANopen bus is not valid.
			1 flash per second	Indicates that the controller has detected that the maximum number of error frames has been reached or exceeded.
			2 flashes per second	Indicates that the controller has detected either a Node Guarding or a Heartbeat event.

NOTE: All the LEDs flash when the logic controller is being identified. For more details, refer to the SoMachine Programming Guide.

Dimensions

This figures shows the external dimensions of the logic controller:



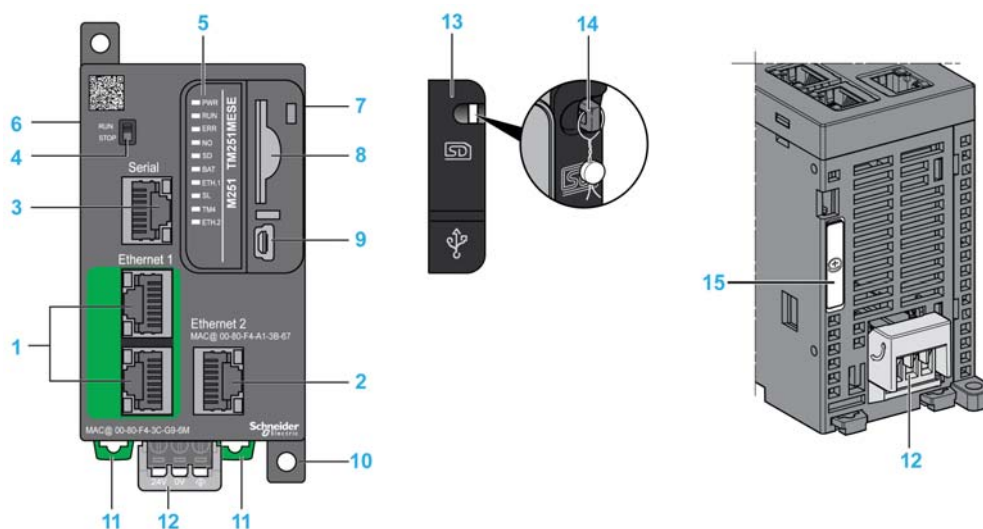
Chapter 5

TM251MESE

TM251MESE Presentation

Description

This figure shows the different components of the TM251MESE logic controller:

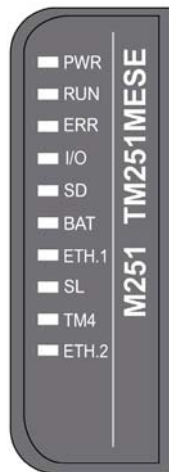


N°	Description	Refer to
1	Dual port Ethernet switch	Ethernet port (see page 90)
2	Ethernet port 2	Ethernet ports (see page 93)
3	Serial line port / Type RJ45 (RS-232 or RS-485)	Serial Line (see page 97)
4	Run/Stop switch	Run/Stop (see page 40)
5	Status LEDs	—
6	TM4 bus connector	TM4 Expansion Modules (see page 19)
7	TM3/TM2 bus connector	TM3 Expansion Modules (see page 20)
8	SD card slot	SD Card (see page 41)
9	USB mini-B programming port / For terminal connection to a programming PC (SoMachine)	USB Mini-B Programming Port (see page 96)

N°	Description	Refer to
10	Surface mounting lugs	—
11	Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)	Top Hat Section Rail (see page 58)
12	24 Vdc power supply	DC Power supply Characteristics and Wiring (see page 68)
13	Protective cover (SD card slot and USB mini-B programming port)	—
14	Locking hook (Hook not included)	—
15	Battery holder	Real Time Clock (RTC) (see page 36)

Status LEDs

This figure shows the status LEDs:



The following table describes the system status LEDs:

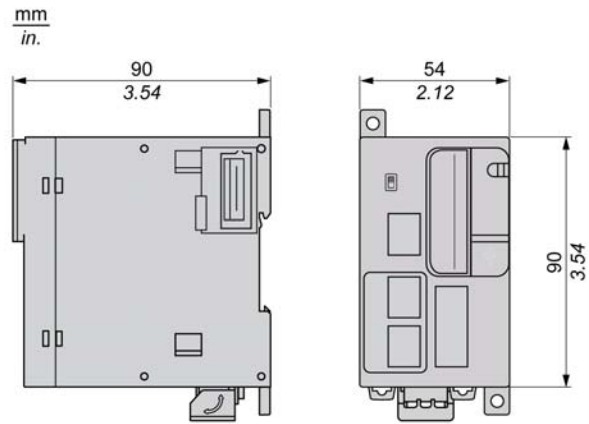
Label	Function Type	Color	Status	Description
PWR	Power	Green	On	Indicates that power is applied.
			Off	Indicates that power is removed.
RUN	Machine status	Green	On	Indicates that the controller is running a valid application.
			Flashing	Indicates that the controller has a valid application that is stopped.
			1 flash	Indicates that the controller has paused at BREAKPOINT.
			Off	Indicates that the controller is not programmed

Label	Function Type	Color	Status	Description
ERR	Internal Error	Red	On	Indicates that an operating system error has been detected
			Fast flashing	Indicates that the controller has detected an internal error
			Slow flashing	Indicates either that a minor error has been detected if RUN is ON or that no application has been detected
I/O	I/O error	Red	On	Indicates device errors on the serial line, SD card, TM4 bus, TM3 bus, Ethernet port(s) or CANopen port.
SD	SD card access	Green	On	Indicates that the SD card is being accessed
BAT	Battery	Red	On	Indicates that the battery needs to be replaced.
			Flashing	Indicates that the battery charge is low.
ETH.1 ETH.2	Ethernet port status	Green	On	Indicates that the ethernet port is connected and the IP address is defined.
			3 flashes	Indicates that the ethernet port is not connected.
			4 flashes	Indicates that the IP address is already in used.
			5 flashes	Indicates that the module is waiting for BOOTP or DHCP sequence.
			6 flashes	Indicates that the configured IP address is not valid.
SL	Serial line	Green	On	Indicates the status of serial line (see page 99)
			Off	Indicates no serial communication
TM4	Error on TM4 bus	Red	On	Indicates that an error has been detected on the TM4 bus
			Off	Indicates that no error has been detected on the TM4 bus

NOTE: All the LEDs flash when the logic controller is being identified. For more details, refer to the SoMachine Programming Guide.

Dimensions

This figure shows the external dimensions of the logic controller:



Part III

Modicon M251 Logic Controller Communication

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
6	Integrated Communication Ports	87
7	Connecting the M251 Logic Controller to a PC	101

Chapter 6

Integrated Communication Ports

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
CANopen Port	88
Ethernet Port	90
TM251MESE Specific Considerations	93
USB Mini-B Programming Port	96
Serial Line	97

CANopen Port

CANopen Capabilities

The Modicon M251 Logic Controller CANopen master has the following features:

Maximum number of slaves on the bus	63 CANopen slave devices
Maximum length of CANopen fieldbus cables	According to the CAN specification (see cable length and transmission speed).
Maximum number of PDO managed by the master	252 TPDOs + 252 RPDOs

For each additional CANopen slave,

- the application size increases by an average of 10 Kbytes which conceivably could result in exceeding memory limits.
- the configuration initialization time at the startup increases which conceivably could result in a watchdog timeout.

Although SoMachine does not restrict you from doing so, we recommend that you not exceed more than 63 CANopen slave modules (and/or 252 TPDOs and 252 RPDOs) in order to have a sufficient performance tolerance and to avoid any performance degradation.

WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect more than 63 CANopen slave devices to the controller to avoid system overload watchdog condition.

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

NOTICE

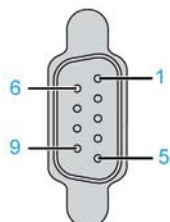
DEGRADATION OF PERFORMANCE

Do not exceed more than 252 TPDOs and 252 RPDOs for the Modicon M251 Logic Controller.

Failure to follow these instructions can result in equipment damage.

CANopen Wiring Diagram

The CANopen plug is a male sub-D9 terminal block:



Pin	Signal	Description
1	–	Reserved
2	CAN_L	CAN_L bus line
3	CAN_GND	CAN ground
4	–	Reserved
5	(CAN_SHLD)	Optional CAN shield
6	GND	Ground
7	CAN_H	CAN_H bus line
8	–	Reserved
9	(CAN_V+)	Optional CAN external positive supply

Cable Length

Transmission speed is limited by the bus length and the type of cable used.

This table describes the relationship between the maximum transmission speed and the bus length (on a single CAN segment without a repeater).

Maximum Transmission baud Rate	Bus Length
1000 Kbps	20 m (65 ft)
800 Kbps	40 m (131 ft)
500 Kbps	100 m (328 ft)
250 Kbps	250 m (820 ft)
125 Kbps	500 m (1,640 ft)
50 Kbps	1000 m (3280 ft)
20 Kbps	2500 m (16,400 ft)

Ethernet Port

Overview

The M251 Logic Controller is equipped with Ethernet communications ports:

Reference	Number of Ports	Port Name
TM251MESC	2 (one dual Ethernet port switch)	Ethernet
TM251MESE	2 (one dual Ethernet port switch)	Ethernet 1
	1	Ethernet 2

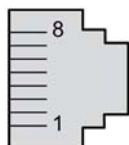
Characteristics

This table describes the different Ethernet characteristics:

Characteristic	Description
Function	Modbus TCP/IP, SoMachine protocol, EtherNet I/P
Connector type	RJ45
Auto negotiation	from 10 M half duplex to 100 M full duplex
Cable type	Shielded
Automatic cross-over detection	Yes

Pin Assignment

This figure shows the RJ45 Ethernet connector pin assignment:



This table describes the RJ45 Ethernet connector pins:

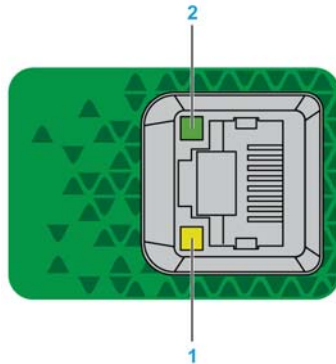
Pin N°	Signal
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-

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

NOTE: Ethernet cable disconnection is detected every second. In case of disconnection of a short duration (< 1 second), the network status may not indicate the disconnection.

Status LED

This figure shows RJ45 connectors status LED:



This table describes the Ethernet status LEDs:

Label	Description	LED		
		Color	Status	Description
1	Ethernet link	Green/Yellow	Off	No link
			Solid yellow	Link at 10 Mbit/s
			Solid green	Activity at 100 Mbit/s
2	Ethernet activity	Green	Off	No activity
			On	Transmitting or receiving data

TM251MESE Specific Considerations

Ethernet Ports

The TM251MESE has 2 different Ethernet networks. Each one get its own and unique IP and MAC address.

The 2 Ethernet networks are called Ethernet 1 and Ethernet 2:

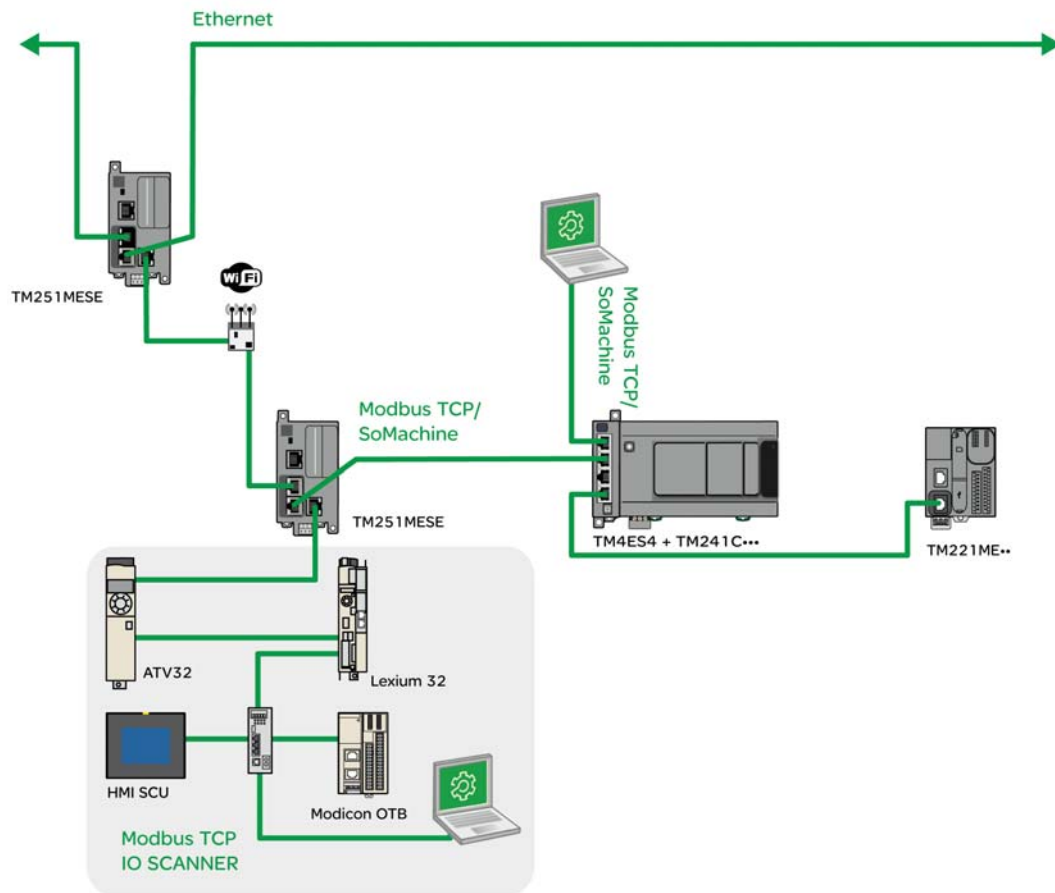
- Ethernet 1 is made of 2 switched Ethernet ports dedicated to communication between machines or with the factory network.
- Ethernet 2 is made of 1 Ethernet port dedicated to fieldbus device connections.

For example, you can:

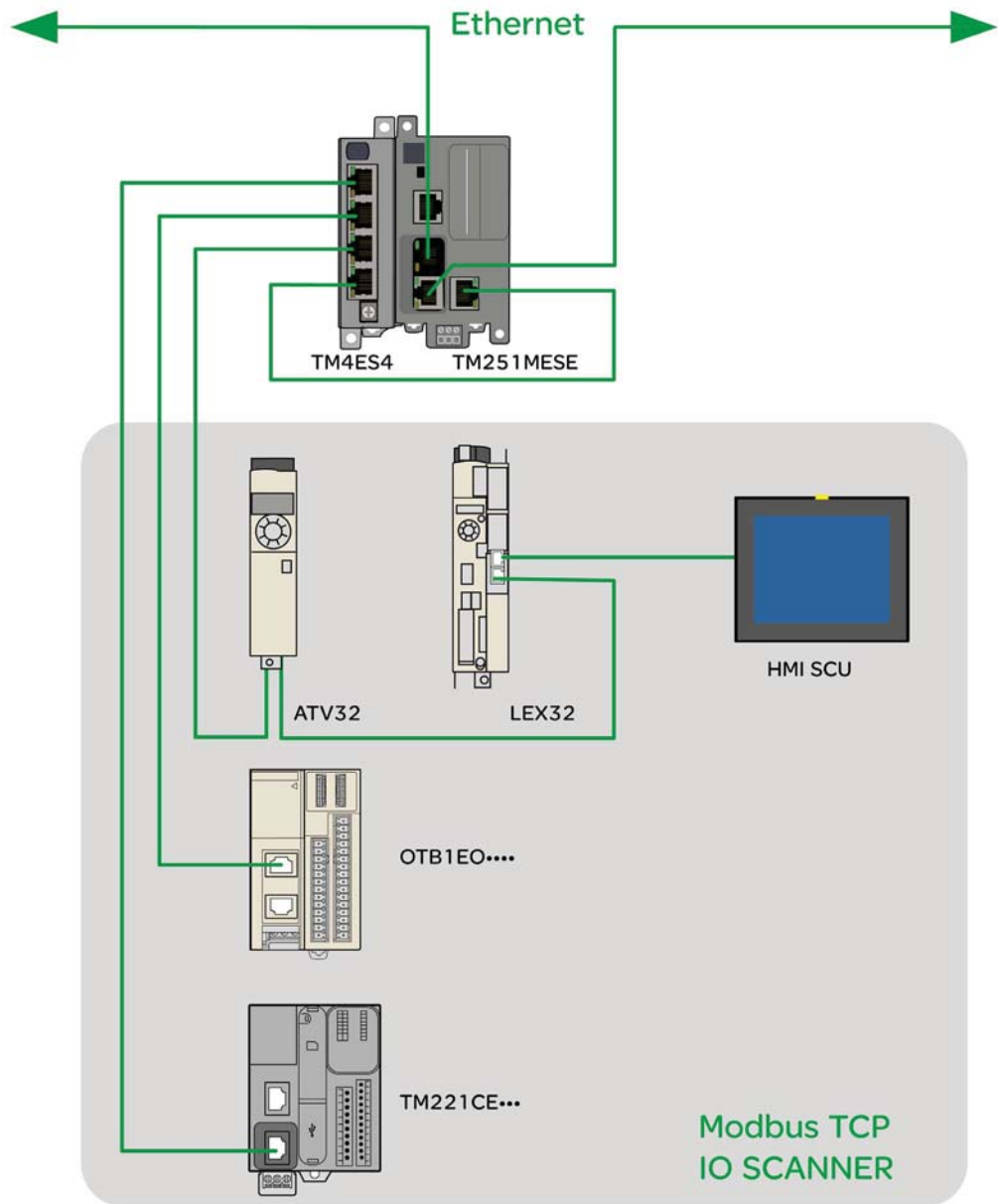
- Connect your PC to the Ethernet 1.
- Use a Modbus TCP I/O scanner with the Ethernet 2.

System Architecture

This figure is an example of an Ethernet architecture with 2 TM251MESE.



This figure is an example of an Ethernet architecture with TM251MESE and TM4ES4.



USB Mini-B Programming Port

Overview

The USB Mini-B Port is the programming port you can use to connect a PC with a USB host port using SoMachine software. Using a typical USB cable, this connection is suitable for quick updates of the program or short duration connections to perform maintenance and inspect data values. It is not suitable for long-term connections such as commissioning or monitoring without the use of specially adapted cables to help minimize electromagnetic interference.

WARNING

INOPERABLE EQUIPMENT OR UNINTENDED EQUIPMENT OPERATION

- You must use a shielded USB cable such as a BMX XCAUSBH0** secured to the functional ground (FE) of the system for any long-term connection.
- Do not connect more than one controller at a time using USB connections.

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

Characteristics

This table describes the characteristics of the USB Mini-B programming port:

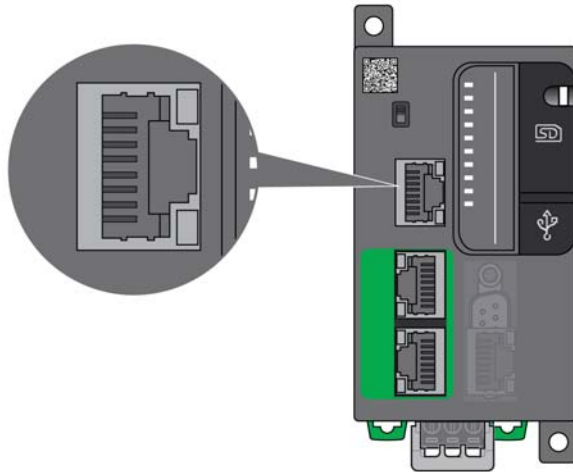
Parameter	USB Programming Port
Function	Compatible with USB 2.0
Connector type	Mini-B
Isolation	None
Cable type	Shielded

Serial Line

Overview

The serial line:

- Can be used to communicate with devices supporting the Modbus protocol as either master or slave, ASCII protocol (printer, modem...) and SoMachine Protocol (HMI,...).
- provides a 5 Vdc power distribution.



Characteristics

Characteristic		Description
Function		RS485 or RS232 software configured
Connector type		RJ45
Isolation		Non-isolated
Maximum baud rate		1200 up to 115 200 bps
Cable	Type	Shielded
	Maximum length	15 m (49 ft) for RS485 3 m (9.84 ft) for RS232
Polarization		Software configuration is used to connect when the node is configured as a master. 560 Ω resistors are optional.
5 Vdc power supply for RS485		Yes

NOTE: Some devices provide voltage on RS485 serial connections. It is necessary to avoid connection of these voltage lines to your controller as they may damage the controller serial port electronics and render the serial port inoperable.

<i>NOTICE</i>

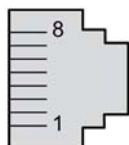
INOPERABLE EQUIPMENT

Use only the VW3A8306R•• serial cable to connect RS485 devices to your controller.

Failure to follow these instructions can result in equipment damage.

Pin Assignment

The following figure shows the pins of the RJ45 connector:



This table describes the pin assignment of the RJ45 connector:

Pin	RS232	RS485
1	RxD	N.C.
2	TxD	N.C.
3	N.C.	N.C.
4	N.C.	D1 (A +)
5	N.C.	D0 (B -)
6	N.C.	N.C.
7	N.C. *	5 Vdc
8	Common	Common

*: 5 Vdc delivered by the controller, do not connect.

N.C.: No connection

RxD: Received data

TxD: Transmitted data

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N.C.)”.

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

Status LED

This table describes the serial line status LED:

Label	Description	LED		
		Color	Status	Description
SL	Serial line	Green	On	Indicates the activity of the serial line.
			Off	Indicates no serial communication.

Chapter 7

Connecting the M251 Logic Controller to a PC

Connecting the Controller to a PC

Overview

To transfer, run, and monitor the applications, connect the controller to a computer, that has SoMachine installed, using either a USB cable or an Ethernet connection (for those references that support an Ethernet port).

<i>NOTICE</i>

INOPERABLE EQUIPMENT

Always connect the communication cable to the PC before connecting it to the controller.

Failure to follow these instructions can result in equipment damage.

USB Powered Download

In order to execute limited operations, the M251 Logic Controller has the capability to be powered through the USB Mini-B port. A diode mechanism avoids having the logic controller both powered by USB and by the normal power supply, or to supply voltage on the USB port.

When powered only by USB, the logic controller executes the firmware and the boot project (if any) and the I/O board is not powered during boot (same duration as a normal boot). USB powered download initializes the internal flash memory with some firmware or some application and parameters when the controller is powered by USB. The preferred tool to connect to the controller is the **Controller Assistant**.

The controller packaging allows easy access to USB Mini-B port with minimum opening of the packaging. You can connect the controller to the PC with a USB cable. Long cables are not suitable for the USB powered download.

WARNING
INSUFFICIENT POWER FOR USB DOWNLOAD Do not use a USB cable longer than 3m (9.8 ft) for USB powered download. Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: It is not intended that you use the USB Powered Download on an installed controller. Depending on the number of I/O expansion modules in the physical configuration of the installed controller, there may be insufficient power from your PC USB port to accomplish the download.

USB Mini-B Port Connection

TCSXCNAMUM3P: This USB cable is suitable for short duration connections such as quick updates or retrieving data values.

BMXXCAUSBH018: Grounded and shielded, this USB cable is suitable for long duration connections.

NOTE: You can only connect 1 controller or any other device associated with SoMachine and its component to the PC at any one time.

The USB Mini-B Port is the programming port you can use to connect a PC with a USB host port using SoMachine software. Using a typical USB cable, this connection is suitable for quick updates of the program or short duration connections to perform maintenance and inspect data values. It is not suitable for long-term connections such as commissioning or monitoring without the use of specially adapted cables to help minimize electromagnetic interference.

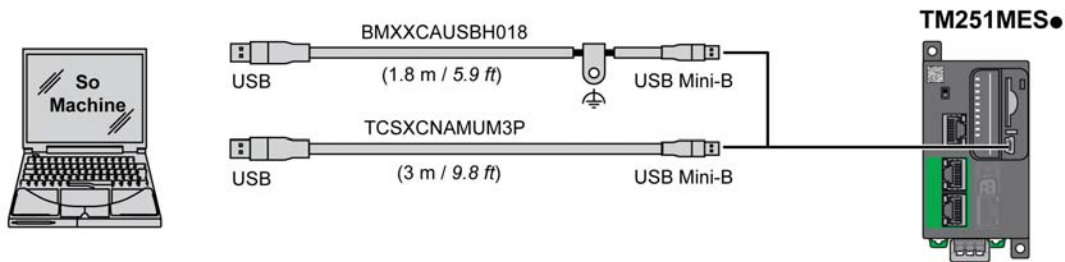
⚠ WARNING

INOPERABLE EQUIPMENT OR UNINTENDED EQUIPMENT OPERATION

- You must use a shielded USB cable such as a BMX XCAUSBH0•• secured to the functional ground (FE) of the system for any long-term connection.
- Do not connect more than one controller at a time using USB connections.

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

The communication cable should be connected to the PC first to minimize the possibility of electrostatic discharge affecting the controller.

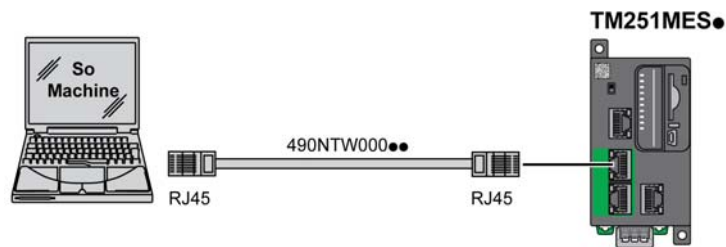


To connect the USB cable to your controller, follow the steps below:

Step	Action
1	1a If making a long-term connection using the cable BMXXCAUSBH018, or other cable with a ground shield connection, be sure to securely connect the shield connector to the functional ground (FE) or protective ground (PE) of your system before connecting the cable to your controller and your PC. 1b If making a short-term connection using the cable TCSXCNAMUM3P or other non-grounded USB cable, proceed to step 2.
2	Connect your USB cable to the computer.
3	Open the hinged access cover.
4	Connect the Mini connector of your USB cable to the controller USB connector.

Ethernet Port Connection

You can also connect the controller to a PC using an Ethernet cable.



To connect the controller to the PC, do the following:

Step	Action
1	Connect your Ethernet cable to the PC.
2	Connect your Ethernet cable to the Ethernet port on the controller.

Glossary



A

ASCII

(*American standard code for Information Interchange*) A protocol for representing alphanumeric characters (letters, numbers, certain graphics, and control characters).

B

bps

(*bit per second*) A definition of transmission rate, also given in conjunction with multiplier kilo (kbps) and mega (mbps).

C

CANopen

An open industry-standard communication protocol and device profile specification (EN 50325-4).

CFC

(*continuous function chart*) A graphical programming language (an extension of the IEC 61131-3 standard) based on the function block diagram language that works like a flowchart. However, no networks are used and free positioning of graphic elements is possible, which allows feedback loops. For each block, the inputs are on the left and the outputs on the right. You can link the block outputs to the inputs of other blocks to create complex expressions.

continuous function chart language

A graphical programming language (an extension of the IEC 61131-3 standard) based on the function block diagram language that works like a flowchart. However, no networks are used and free positioning of graphic elements is possible, which allows feedback loops. For each block, the inputs are on the left and the outputs on the right. You can link the block outputs to inputs of other blocks to create complex expressions.

D

DIN

(*Deutsches Institut für Normung*) A German institution that sets engineering and dimensional standards.

E

EIA rack

(*electronic industries alliance rack*) A standardized (EIA 310-D, IEC 60297, and DIN 41494 SC48D) system for mounting various electronic modules in a stack or rack that is 19 inches (482.6 mm) wide.

EN

EN identifies 1 of many European standards maintained by CEN (*European Committee for Standardization*), CENELEC (*European Committee for Electrotechnical Standardization*), or ETSI (*European Telecommunications Standards Institute*).

F

FBD

(*function block diagram*) One of 5 languages for logic or control supported by the standard IEC 61131-3 for control systems. Function block diagram is a graphically oriented programming language. It works with a list of networks, where each network contains a graphical structure of boxes and connection lines, which represents either a logical or arithmetic expression, the call of a function block, a jump, or a return instruction.

FE

(*functional Earth*) A common grounding connection to enhance or otherwise allow normal operation of electrically sensitive equipment (also referred to as functional ground in North America).

In contrast to a protective Earth (protective ground), a functional earth connection serves a purpose other than shock protection, and may normally carry current. Examples of devices that use functional earth connections include surge suppressors and electromagnetic interference filters, certain antennas, and measurement instruments.

H

HE10

Rectangular connector for electrical signals with frequencies below 3 MHz, complying with IEC 60807-2.

I

IEC

(*international electrotechnical commission*) A non-profit and non-governmental international standards organization that prepares and publishes international standards for electrical, electronic, and related technologies.

IEC 61131-3

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

IL

(*instruction list*) A program written in the language that is composed of a series of text-based instructions executed sequentially by the controller. Each instruction includes a line number, an instruction code, and an operand (refer to IEC 61131-3).

instruction list language

A program written in the instruction list language that is composed of a series of text-based instructions executed sequentially by the controller. Each instruction includes a line number, an instruction code, and an operand (see IEC 61131-3).

IP 20

(*ingress protection*) The protection classification according to IEC 60529 offered by an enclosure, shown by the letter IP and 2 digits. The first digit indicates 2 factors: helping protect persons and for equipment. The second digit indicates helping protect against water. IP 20 devices help protect against electric contact of objects larger than 12.5 mm, but not against water.

L**ladder diagram language**

A graphical representation of the instructions of a controller program with symbols for contacts, coils, and blocks in a series of rungs executed sequentially by a controller (see IEC 61131-3).

LD

(*ladder diagram*) A graphical representation of the instructions of a controller program with symbols for contacts, coils, and blocks in a series of rungs executed sequentially by a controller (refer to IEC 61131-3).

M**master/slave**

The single direction of control in a network that implements the master/slave mode.

Modbus

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

N

NEMA

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

P

PDO

(*process data object*) An unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

PE

(*protective Earth*) A common grounding connection to help avoid the hazard of electric shock by keeping any exposed conductive surface of a device at earth potential. To avoid possible voltage drop, no current is allowed to flow in this conductor (also referred to as *protective ground* in North America or as an equipment grounding conductor in the US national electrical code).

R

RJ-45

A standard type of 8-pin connector for network cables defined for Ethernet.

RPDO

(*receive process data object*) An unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

RS-485

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

RxD

The line that receives data from one source to another.

S

SFC

(*sequential function chart*) A language that is composed of steps with associated actions, transitions with associated logic condition, and directed links between steps and transitions. (The SFC standard is defined in IEC 848. It is IEC 61131-3 compliant.)

ST

(*structured text*) A language that includes complex statements and nested instructions (such as iteration loops, conditional executions, or functions). ST is compliant with IEC 61131-3.

T**terminal block**

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

TPDO

(*transmit process data object*) An unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

TxD

The line that sends data from one source to another.

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Installation Guide

IG 022 / Rev. 1.5

eWON COSY 131

This installation guide describes the hardware of the eWON COSY 131 and explains how to get started with the embedded web site.



support.ewon.biz

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1. Product Summary

1.1. Introduction

The present Installation Guide describes the hardware of the **eWON COSY 131** family.

The eWON Cosy 131 family is a set of 3 industrial gateways/routers.

The eWON Cosy 131 is fully compatible with the Talk2M cloud connectivity services (www.talk2m.com).

1.2. Concept of the eWON COSY 131 Family

The Cosy 131 is available in 3 different versions depending on their communication interface:

- Ethernet Switch **Cosy 131 Ethernet**
- WiFi & Ethernet Switch **Cosy 131 WiFi**
- 3G+ & Ethernet Switch **Cosy 131 Cellular 3G+**

1.3. General specification of the hardware platform

Characteristic	Value
Design	Industrial design (24 VDC power supply, DIN Rail mounting, extended temperature)
Processor	ARM9
Clock	Backed up real time clock (RTC) Backup battery lifetime has 10 years expectancy
Ethernet Interface	LAN Ethernet port 10/100 Mbps
Digital Input	2
Digital Output	1
Mounting	Latch for DIN rail EN50022-compliant

1.4. Typical applications

- Remote Access of Ethernet devices using Talk2M connection
- Industrial VPN router

1.5. Type and Part Numbers

The available part numbers are:

Part Number	Type	Description
EC61330_00MA	COSY 131	LAN/WAN – Ethernet Only Switch 4-Ports
EC6133C_00MA	COSY 131	LAN/WAN, WIFI – Ethernet Switch + WiFi
EC6133D_00MA	COSY 131	LAN/WAN -3G+ Penta - Ethernet Switch + 3G+

Table: List of the available part numbers

- Note -

The MA suffix means Multiple languages A (ENG, FR, DE, SP)

The part number syntax is explained in [3.1. Label](#)

2. Safety, Environmental & Regulatory Information

2.1. Scope

The present heading addresses Safety, Environmental & Regulatory Information for the eWON Cosy 131 family.

2.2. Power supply

The external power supply is a third party device that is not part of this certification.

The device shall be supplied by a LPS power supply certified according to IEC/UL60950-1 or Class 2 per NEC (See annex [A.2. Specification of the External Power Supply](#) for detailed information).

2.3. Applicable Directives, Standards and Compliance

The product described in the present Installation Guide complies with the CE, R&TTE directives and the FCC regulations related to the wireless modems.

The product described in the present Installation Guide belongs to class A Information Technology Equipment (ITE). In a domestic environment this product may cause radio interference in which case the user may be required to take appropriate measures.

2.3.1. Applicable European Directives

The product described in the present Installation Guide is in conformity with the following EC directives:

- RoHS Directive 2011/65/EU
- EMC Directive 2004/108/EC
- R&TTE Directive 1999/5/EC (for versions including RF modems)
The product conforms to the corresponding R&TTE articles:
RF spectrum efficiency (Art 3.2); EMC (Art. 3.1b); Safety (Art. 3.1a)
- REACH Directive 2006/121/EC
- For COSY 131, Cellular 3G+ only: to comply with R&TTE directive
 - Antenna must be mounted on a grounded plate
 - RFI suppressors must be mounted on the power supply cable in the following order, starting at 3cm of the connector and going to the power supply:
 - Würth Elektronik 742-717-33
 - Würth Elektronik 742-716-22
 - Würth Elektronik 742-711-11

2.3.2. Applicable Safety Standards

The product described in the present Installation Guide is in conformity with the following safety standards:

- IEC/EN 60950-1
- UL 60950-1
- CSA-C22.2 No 60950-1-07

2.3.3. FCC Compliance

The product described in the present Installation Guide complies with Part 15 of the FCC Rules. Operating is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

2.3.4. Certifications

The product described in the present Installation Guide has been certified by authorized bodies:

- UL Certificate Of Compliance (CoC) for Ordinary Locations # E350576 for a TMRA of 60°C
- CB certificate # DK-42240-UL

These certificates can be downloaded as PDF files on the eWON Support web site:
<http://support.ewon.biz/official-documents>

2.4. Field implementation & environmental conditions

2.4.1. Ingress Protection

The eWON COSY 131 has an IP20 protection grade. Therefore, the eWON COSY is NOT suited for outdoor mounting. It has to be integrated in an electrical cabinet, protected from excessive heat, humidity and dust. Do not push any sharp object into the air vents or openings of the equipment.

2.4.2. Mounting Recommendations

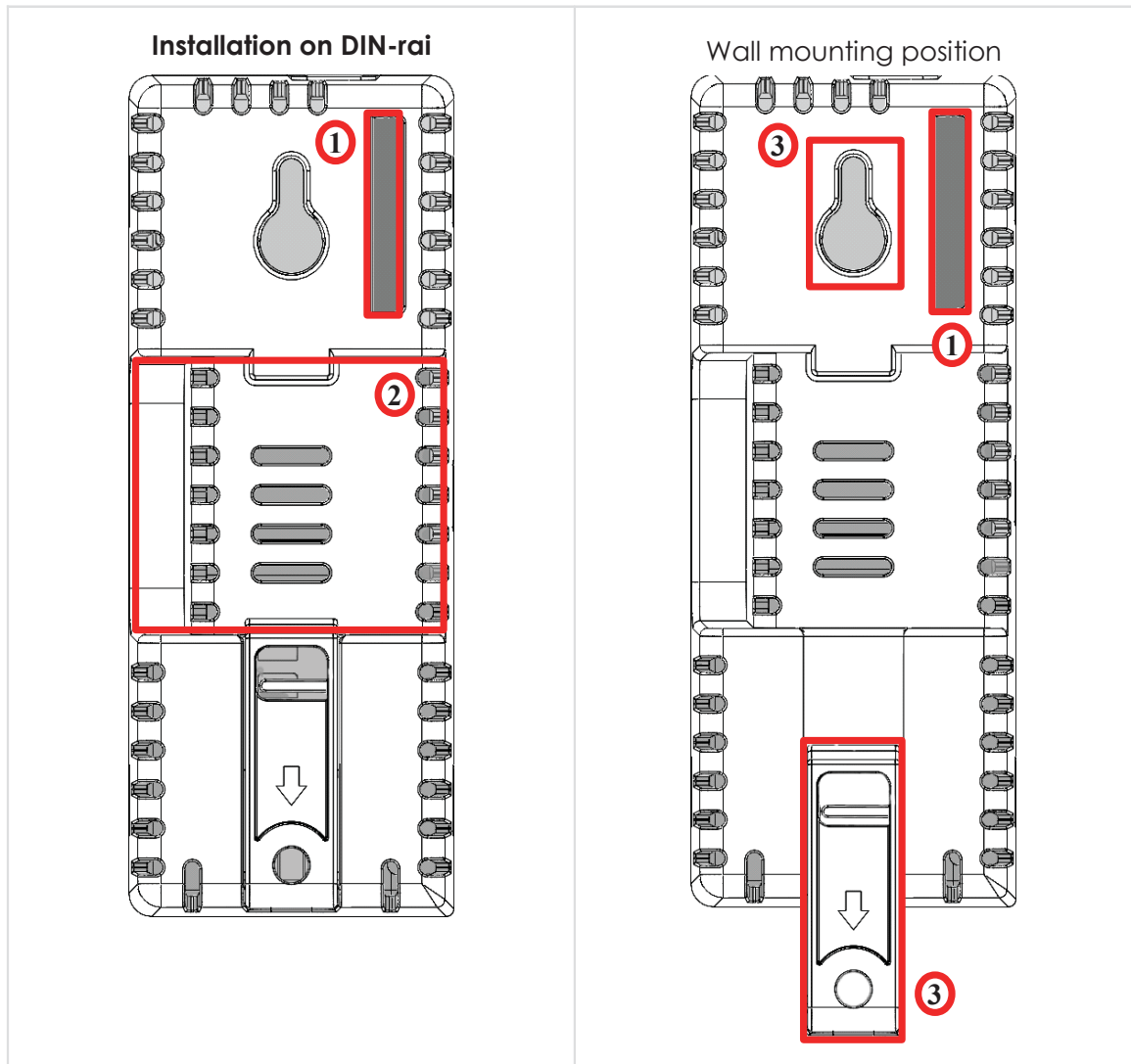
The normal mounting position of the eWON COSY is wall mounted on a horizontal [Omega type DIN-rail \(EN 50022\)](#).

- **Mounting the unit on DIN-rail**
Pull the slide lock (located at the bottom of the unit's back-side) downwards and present the unit in front of the DIN rail. Tilt the eWON upwards in order to hang it on the upper edge of the DIN rail by its hook. Gently tilt the unit downwards until it finds its original position. Pull the slide lock upwards to fix and lock the unit on the DIN rail.

- **Removing the unit from DIN-rail**

Release the unit by pulling the slide lock downwards while gently tilting the unit upwards. Free the unit by unhooking it from the upper rail edge. See [2.4.2 Mounting instructions](#)

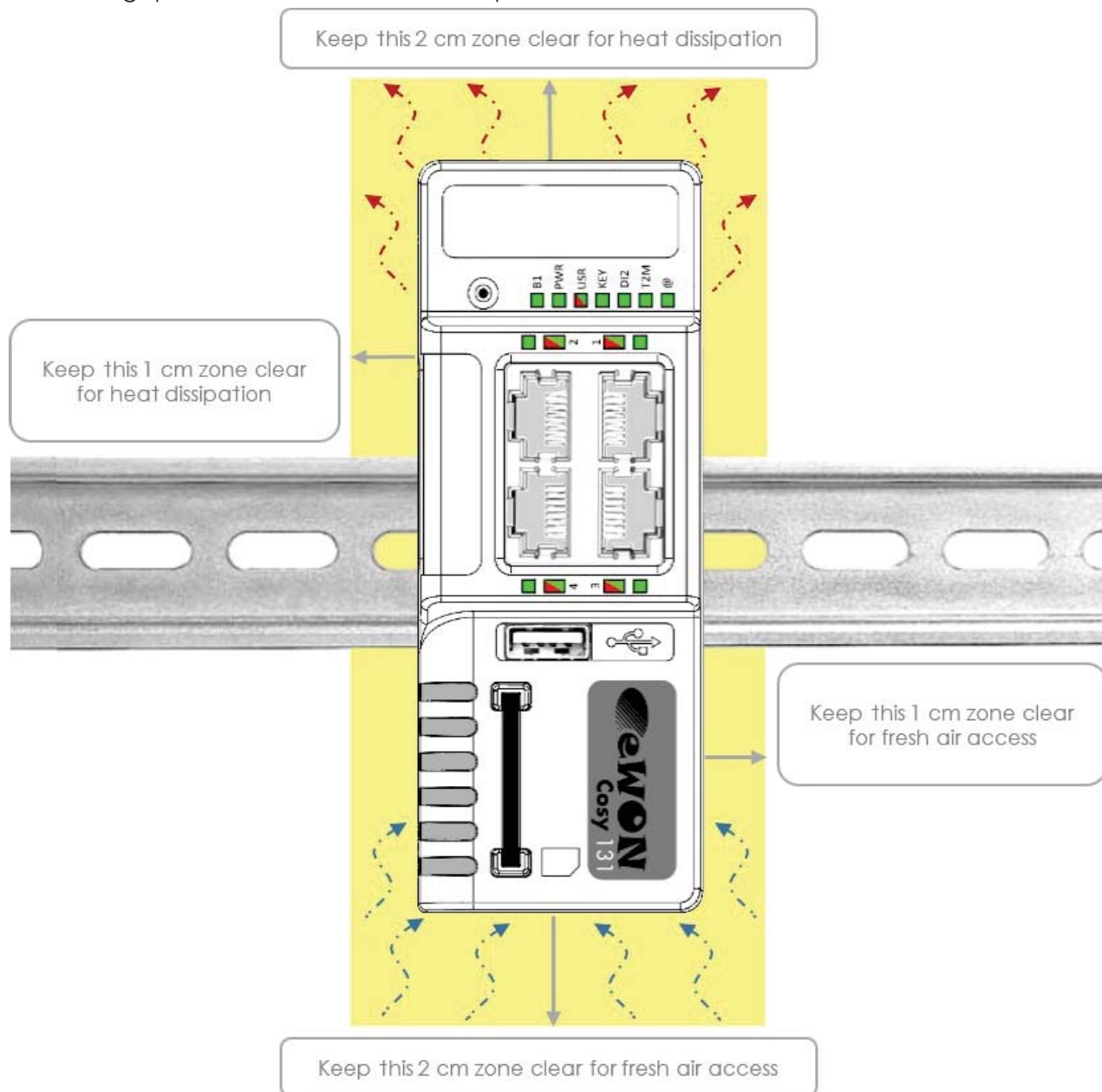
The product is intended to be mounted vertically, label on the right side



1	SIM card slot
2	DIN rail mounting bracket
3	Screw holes intended to receive M4 screws with an 8mm diameter head

To ensure a proper ventilation of the equipment, a free gap of at least 2 cm must be respected in front of all upper & lower ventilation openings of the unit.

A free gap of at least 1 cm must be respected on each side of the unit.



- Caution -

In any other mounting position than the one explained here above, the specified temperature has to be derated to -25°C to +40°C.

2.4.3. Cabling rules

Shielded cables must be used for Ethernet and USB connectivity to comply with the EMC requirements.

USB cable must be

- shorter than 3m;
- USB 2.0 type
- Maximum current per contact : 0.5A (or better)
- "A" plug connected to the eWON

2.4.4. Environmental conditions

The equipment will operate properly within the following environmental limits if it has been correctly mounted according to the above mentioned recommendations:

Operating T°	-25°C to +70°C
Relative Humidity	10 to 95% non-condensing
Operating altitude	Up to maximum 2000m
Storage temperature	-40 to +70 °C
Storage Humidity	10 to 95% non-condensing
Storage altitude	Up to maximum 3000m

2.4.5. Earthing

Earthing the eWON is necessary to eliminate unwanted transients (lightning protection) and to conform to the EMC requirements. Therefore, a functional earth (FE) terminal is available on the main connector as shown in [A.2. Specification of the External Power Supply](#). Connect this terminal directly to allow impedance ground. Shielded cables have to be used for Ethernet and USB to comply with the EMC requirements.

2.5. Battery

The COSY contains a CR2032 battery. This battery is used to maintain the real time clock up-to-date even when the unit is not powered.

- Caution -

Risk of explosion if battery is replaced by an incorrect type.

The battery is not attended to be replaced on consumer's side. The product shall be returned to manufacture for replacement.

3. Hardware description

3.1. Label

The identification label of the eWON COSY 131 is placed on the right hand side of the housing. The different parts of the label are described below:

eWON COSY 131 Ethernet	Label	Description
	PN	Part Number (see syntax table below)
	SN	Serial number on the form YYWW-SSSS-PP YY = Year of production WW = Week of production SSSS = sequential mfg order PP = product type
	MAC	MAC address of the Ethernet adapter
	Rating	Power supply requirements
	Marks	CE, UL,... logos if applicable

Marks	Description
	Conformité Européenne or European Conformity (EC)
0682	Notified Body Number, warrantor of the CE Mark validation
	UL Listed (<i>Underwriters Laboratories</i>)
	FCC <i>Federal Communications Commission</i>

Label can have variant marks depending of models



eWON COSY 131 WIFI

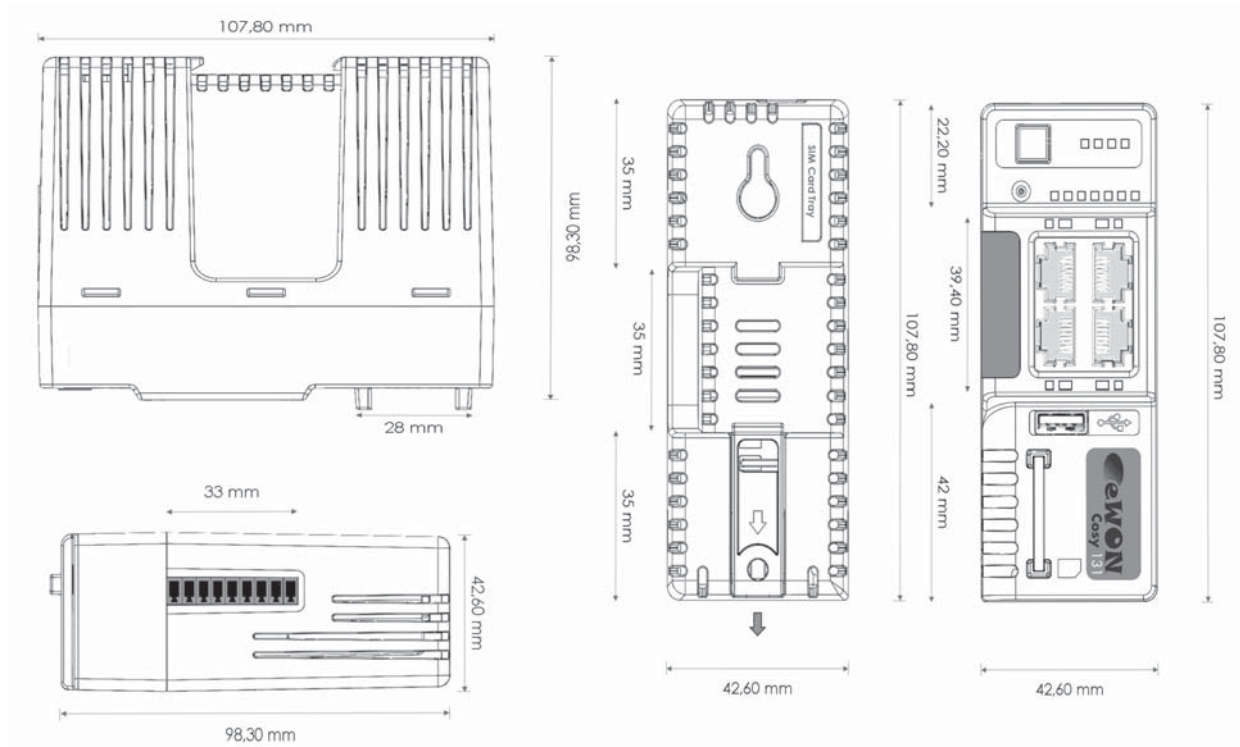


eWON COSY 131 – 3G Penta

EC6133m_ccLL[suffix]

Position(s)	Description	Acceptable values	
EC	name of the family	EC for eWON COSY	
6	number corresponding to the HW platform.	6	for "Cosy 131" platform
1	is communication options 1.	1	One Ethernet
3	Is communication options 2.	3	Three Ethernet
3	field communication option.	3	USB
m	modem communication option.	0	No modem
		C	WiFi
		D	HSUPA Modem
cc	is one or more digits or letters that correspond to software options	00 = no software option	
LL	Defines the firmware language	MA	UK + FR + DE + SP
[suffix]	can have an optional "/" character Defines the compliances of the unit	S	compliance with the UL/IEC/EN 60950 standard

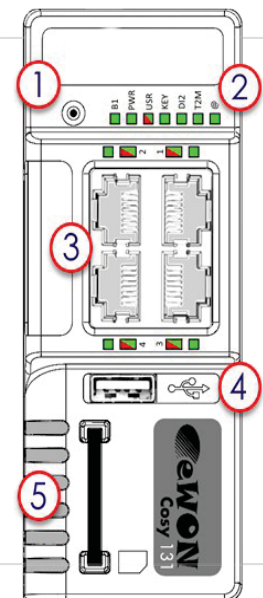
3.2. Mechanical dimensions



3.3. Overall description

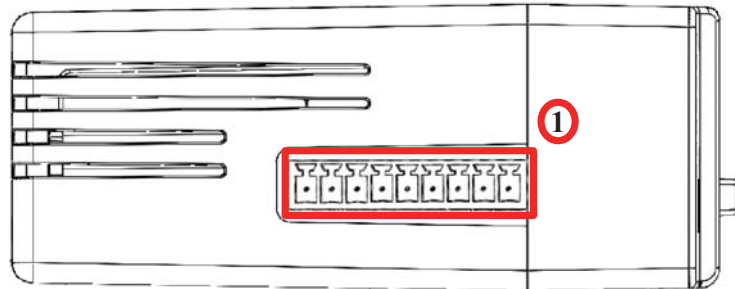
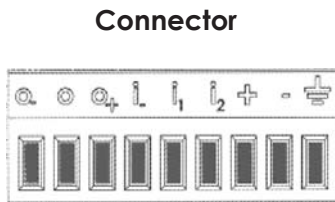
3.3.1. Front

#	Description
1	Reset button
2	Status LEDs panel
3	LAN/WAN Ethernet ports and corresponding status LEDs (Red: WAN / Green: LAN)
4	USB slot
5	SD card slot *



- SD Card is not supported for the moment

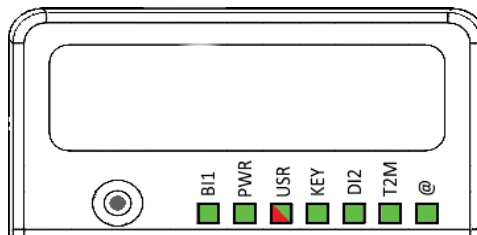
3.3.2. Upper side



- 1 Main connector including power input terminal, 1DO and 2 DI

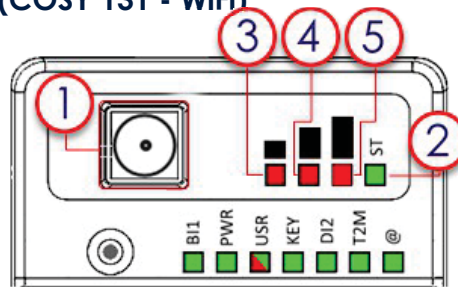
For more information about the connector see in [A.1. Main Connector](#)

3.3.2. Status LED panel (COSY 131 – All version):



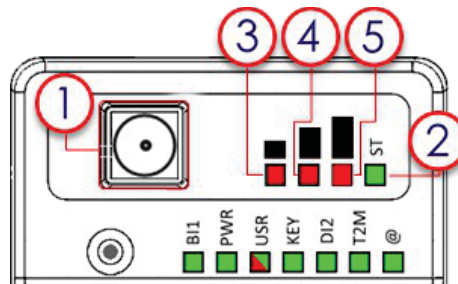
Label	Description
BI1	Button BI1 input Green ON = Reset being pressed
PWR	Power Green ON = Power is present
USR	User Green ON+OFF slowly = Unit is OK RED pattern = special attention required
KEY	Digital IN 1 – Green = ON: Signal on input 1 detected See. Digital Output & Digital Inputs
DI2	Digital IN 2 – Green = ON: Signal on input 2 detected See. Digital Output & Digital Inputs
T2M	Talk2M - Green ON = Talk2M VPN connection established See. Digital Output & Digital Inputs
@	Internet Green ON = Internet is configured on the eWON COSY

3.3.3.1. Status LED panel (COSY 131 - WiFi)



#	Mark	Description
1	/	SMA male connector for WIFI antenna
2	ST	Modem status Green ON = WiFi connected
3		Reception signal level Red ON = Poor signal
4		Reception signal level Red ON = Signal is OK
5		Reception signal level Red ON = Good signal

3.3.3.2. Status LED panel (COSY 131 - Cellular 3G+)



#	Mark	Description
1	/	SMA female connector for GSM antenna
2	ST	Modem status Green ON = Modem connected
3		Reception signal level Red ON = Poor signal
4		Reception signal level Red ON = Signal is OK
5		Reception signal level Red ON = Good signal

3.4. Radio communication models

- Warning -

This device is intended to be used in fixed or mobile applications only (not for portable applications). The antenna used for this transmitter has to be installed in a space providing a safe distance of at least 20 cm without encountering any person and must not be co-located or operating in conjunction with any other antenna or transmitter.

3.4.1. COSY 131 with internal WiFi modem

Cosy 131 – Wifi		
Item	Value(s)	
Protocols and Frequencies	IEEE802.11b/g/n, 2.4GHz - Channels: 1 to 11 (inclusive)	
Antenna Connector	Type RP-SMA	
Antenna (included in the delivery)	Charact.	Value(s)
	Impedance	50 Ohms
	Input Power	> 17 dBm, IEEE 802.11b > 15 dBm, IEEE 802.11g/n
	Tightening Torque	0.5 Nm. <i>In the absence of a torque wrench, a soft manual tightening is sufficient.</i>

Device conformity has been tested with the reference antenna: Pulse W1030.

- The product complies with the R&TTE directive, the FCC, the IC and Japan regulations related to the Wifi communications.
- Absolute maximum antenna gain as per FCC's rules and regulations, 47CFR:
 - Part 15C : 2.14dBi
- Modifications cannot be made by the user if it influences the normal behavior of the device.
- The user shall be informed about modem identification numbers according to their national authorities.
This product contains part identified as follows by national authorities:
 - FCC ID: QOQWF111
 - IC ID: 5123A-BGTWF111
 - RRA ID: KCC-CRM-BGT-WF111
 - GITEKI (MIC) ID: 209-J00061

3.4.2. COSY 131 with internal 3G+ Penta modem

Cosy 131 – Cellular 3G+		
Item	Value(s)	
Protocols and Frequencies	GSM/GPRS/EDGE - 850, 900, 1800, 1900 MHz UMTS/HSUPA - 800/850, 900, AWS 1700, 1900, 2100 Mhz	
Class	5 bands GPRS/EDGE Class 33	
Antenna Connector	Type SMA	
Antenna (not included in the delivery*)	Charact.	Value(s)
	Impedance	50 Ohms
	VSWR	<= 5:1 Absolute max. to avoid permanent damage <= 2:1 Limit to fulfill all regulatory requirements
	Input Power	> 33 dBm (2W) peak power in GSM > 24 dBm average power in WCDMA
	Tightening Torque	0.5 Nm. <i>In the absence of a torque wrench, a soft manual tightening is suffice</i>

Device conformity has been tested with the reference antenna: Taoglas TG.09.0113

As see in [2.4.1 Mounting instructions](#) SIM Card Tray is at the rear of the COSY 131

(*) 3G antenna has to be purchased separately, 3G penta band antenna is available from eWON with FAC90501_0000 as reference

- The product complies with the R&TTE directive, the FCC, the IC and Japan regulations related to the GSM modems.
- Absolute maximum antenna gain as per FCC's rules and regulations, 47 CFR :
 - – Part 22H : 5.22dBi;
 - – Part 27 : 3.31dBi;
 - – Part 24E : 6.45dBi.
- Modifications cannot be made by the user if it influences the normal behavior of the device.
- The user shall be informed about modem identification numbers according to their national authorities:
This product contains part identified as follows by national authorities:
 - FCC ID: R17HE910
 - IC ID: 5131A-HE910
 - GITEKI (MIC) ID: 005-100269
 - JATE ID: AD12-0318001

3.5. LAN Switch Specifications

3.5.1. Boot process

During the (re)boot process, the eWON prevents the switch feature from working. This means that it might require little time starting from the power on (or the reboot request) to get the LAN switch to be fully operational.

When an eWON router is configured to operate a certain way, it is part of the strategy, if no other method worked, to reboot itself. This is the ultimate eWON strategy to try restoring the requested communication channels and be consistent with requested configuration.

4. COSY IP Address & Access to the Web Configuration

4.1. Factory Default IP settings

Characteristics	Value(s)
LAN IP Address	10.0.0.53
LAN Subnet Mask	255.255.255.0
Gateway	0.0.0.0

4.2. Powering ON

Power on the unit and wait approximately 25 sec. until the boot process is finished.

After a successful boot process the **USR** LED is flashing green ON & OFF slowly.

If the **USR** LED is flashing RED according to a given pattern, it indicates that the boot process was interrupted due to a problem. Most frequent problems include :

- a duplicate IP address was detected on the LAN Network
USR LED flashing pattern is RED 1x short, 1x long

For the other LED patterns in case of error, please refer to the General Reference Guide RG-001.

4.3. Setting the eWON COSY LAN IP Address

You can easily establish your first communication with your eWON COSY by using our companion tool **eBuddy** which can be downloaded from <http://support.ewon.biz/software>

Connect one of the LAN-ports (by default, port No. 1 is always a LAN port) of your COSY with your PC point-to-point or through a network where there is no risk that the eWON's default IP-address (10.0.0.53) would conflict with another connected device.

Start the eBuddy application. This one scans the network through the Ethernet adapter and retrieves the connected eWON, including its IP address, Subnet Mask and serial number. The application also allows you to change the default IP address without being necessarily in the same network range.

Chapter 4

COSY IP Address & Access to the Web Configuration

Start the **eBuddy** utility on your PC

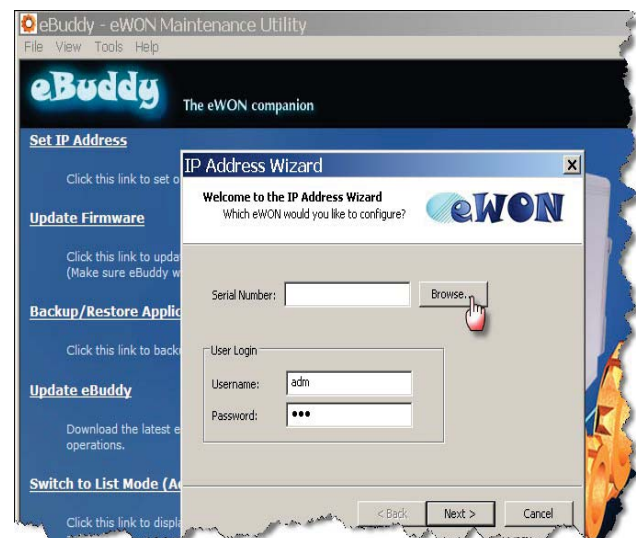
In the home page,
select **Set IP Address**



Fill in the Serial Number of your COSY
or click on **Browse** and select it.

The Serial Number of the COSY is on
its label, see in [3.1.Label](#)

Click **Next**



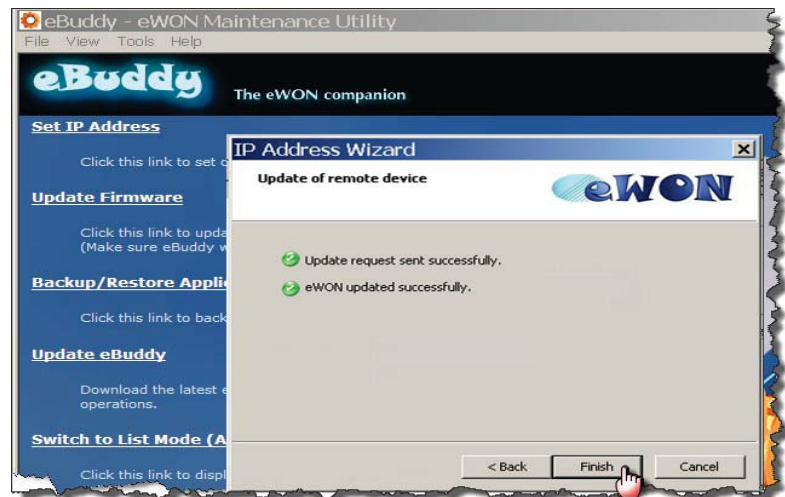
Enter a new LAN IP address
and Subnet Mask.

Click **Next**



Wait until the address is updated and the device has rebooted.

Click **Finish**.



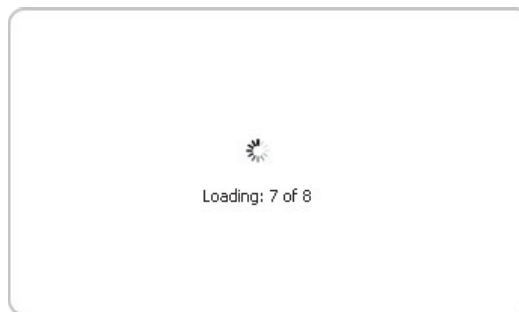
4.4. eWON COSY's Web Interface

To access the web pages of your eWON COSY proceed as follows:

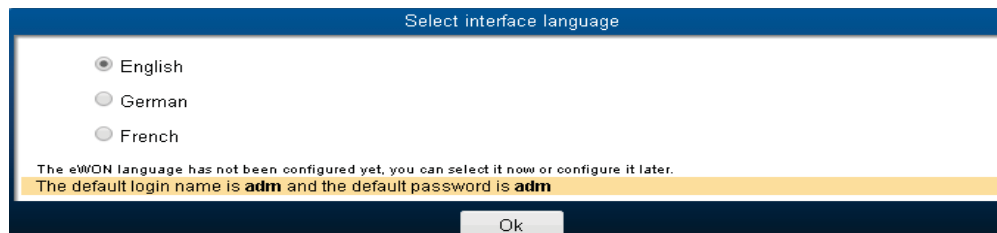
Connect the PC to one of the LAN port of the eWON COSY.

Open your Internet browser and access the eWON COSY internal Web page by entering the LAN IP address in the URL field (the default address is <http://10.0.0.53>).

You arrive on a loading page



If this is the first boot of the eWON COSY (or after a level 2 reset), you will be asked for a default language.



Before configuring your eWON COSY, an authentication is required.

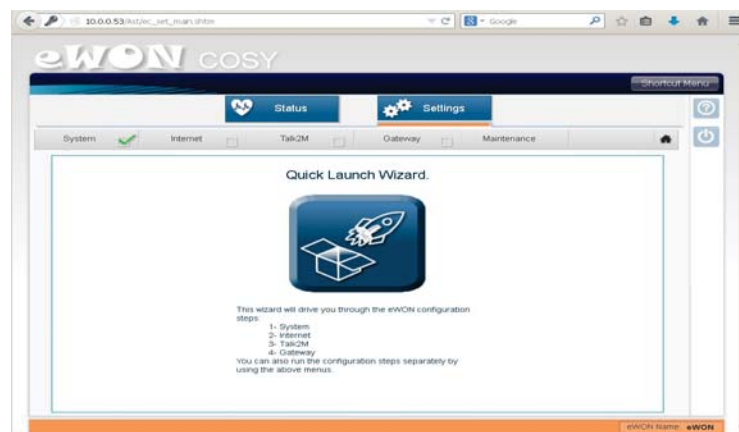
For a first boot, the default login & password are both “adm”.



- Warning -

*For security reasons, changing the default password “**adm**” is absolutely required.*

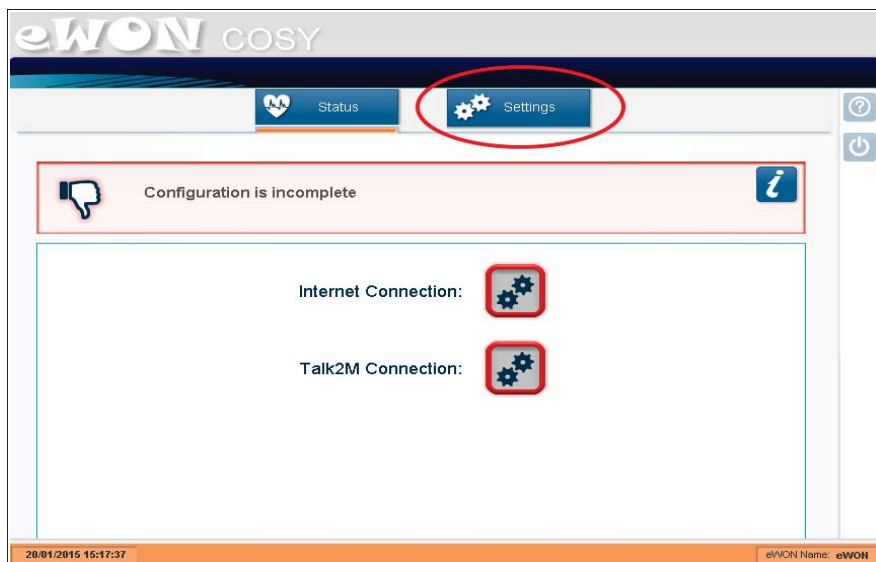
You will be automatically redirected to the Quick Launch Wizard page:



You can follow the **Quick Start Guide** as an aid to configure your eWON COSY.

Can be downloaded on <http://support.ewon.biz/cosy-131>

To reconfigure your eWON COSY, you can easily rerun the wizard by clicking on the Settings button on top of the page.



5. Troubleshooting

5.1. Normal Boot Process

The normal boot process of the eWON COSY takes approximately 25 seconds to complete. During this process, all LEDs are shortly ON, except BI1 as long as the RESET button is not pressed. During this boot sequence, the **USR** LED is orange. As soon as the boot process is finished and the unit is ready to be used, the **USR** LED flashes GREEN slowly.

5.2. Resetting the eWON COSY 131

The reset button B1 is located on the front of the COSY unit (see in [3.3.1.Front](#)). The reset function of this button is active only if pressed while powering on. The eWON COSY features two type of reset levels. A table follows with the impacted configuration zones per reset level.

5.3. First Level Reset (user reset)

The first level reset consists in formatting only the « **user files** » part of the non volatile memory. This type of reset does not modify the communication parameters of the eWON COSY.

How do I generate a first level reset?

- Power the unit OFF and ON again
- **Immediately press and maintain** the reset button. The LED labeled BI1 turns ON.
- Wait approximately 30 seconds until the **USR** LED flashes RED 1x per second.
- Immediately release the button (if you don't, you would reach the second level reset phase). The LED labeled BI1 turns OFF.
- Wait approximately 30 secs until the reset procedure is completed.
- The eWON restarts automatically and the unit is ready to be used, the **USR** LED flashes GREEN slowly.

5.4. Second Level Reset (factory reset)

This second level reset formats the entire non volatile memory and returns the eWON to its factory settings. This operation consists in 3 steps:

- Formats the entire non volatile memory, including all COM parameters and IP addresses
- Full hardware auto-test with result shown by the **USR** LED
- Return to ex-factory configuration (default config)

How do I generate a second level reset?

- Power the unit OFF and ON again
- **Immediately press and maintain** the reset button. The LED labeled BI1 turns ON.
- Wait approximately 35 seconds until the **USR** LED remains RED steady.
- When this state is reached, release the button. The LED labeled BI1 turns OFF.
- It takes no longer than 2 seconds to complete.
- Check if the auto test is successful, the **USR** LED flashes RED with a pattern of 200ms ON and 1,5 sec OFF¹. The eWON COSY **does NOT restart in normal mode** by itself and remains running in this diagnostic mode.
- You have to power the eWON COSY OFF and ON again to reboot the unit in normal mode. As described before, the eWON returns to its default COM parameters and factory IP addresses (like LAN 10.0.0.53) after this level 2 reset is performed.

5.5. Reset Impact Matrix

	Erased or Reset	Preserved
Impact Reset Level 1 (user reset)		LAN IP address + mask
	adm password	Internet access
		Language settings
	eWON Identification	Modem/ Wifi settings
	User Web site	Talk2M config
		Proxy configuration
Impact Reset Level 2 (factory reset)	adm password	Nothing
	eWON Identification	
	User Web site	
	LAN IP address + mask	
	Internet access	
	Language settings	
	Modem/ Wifi settings	
	Talk2M config	
	Proxy configuration	

¹ Any other pattern reflects a problem. The pattern will start with 200ms ON (opening of the pattern) followed by OFF and a certain number of times of a 1 sec ON allowing to identify the nature of the detected problem. If you were to be confronted with an error pattern on the **USR** LED, please write down the pattern you observed and contact your distributor.

Appendix A - Connector Pinout & Related Specifications

A.1 - Main Connector

As shown in the picture, the female mating connector is labeled with the appropriate symbols.

Characteristic	Value
Connector type	MINICONNEC MC model Type MC 1,5/9-ST-3,5 Pitch = 3.50 mm 9-pin female
Connector pinout	

PIN	ICON	ID	Description
1	O.	DO_COM	Output signal (0V ground) connected to the emitter of the MOSFET transistor
2	O	DO	Output signal connected to the drain of the MOSFET transistor
3	O+	DO_VDC	Common of the external predrive power supply (between +12 et +24 VDC)
4	iL	DI_COM	Ground of the input (isolated)
5	i ₁	DI1	Input signal 1
6	i ₂	DI2	Input signal 2
7	+	Power in VDD +	between +12 et +24 VDC
8	-	Power in GND -	0V
9		Functional Earth	

A.2 - Specification of the External Power Supply

The eWON COSY must be powered by a safety Low Power Supply (LPS) in accordance with clause 2.5 of UL/IEC 60950-1 Ed2. Standard, 12-24Vdc, 30W min. Certified for 60°C and for altitudes up to 2000m. The safety LPS power supply is not part of the delivery.

Suggested power supply:

SIEMENS SITOP logo power 24V 2.5A 60W - Siemens order ref: 6EP1332-1SH43.

Equivalents are available on the market.

Power Supply	
Characteristic	Value
Power supply voltage	external 12-24 VDC +/- 19%
Max COSY input power	30W max.
Internal voltage protection	max 30V
Input protection	protected against polarity inversion

A.3 - Digital Output & Digital Inputs

Digital Inputs	
Characteristic	Value
Type of digital output ²	Open drain MOSFET
Max. current (ext,source)	200 mA
Isolation (both DI & DO)	1,5 kV
DI voltage range	0 to 24 VDC
DI protection	33 VDC Max
DI OFF state input voltage range	0 to 5 VDC
DI ON state input voltage range	10 to 30 VDC
DI ON state current range	From 3,8 mA @ 12 VDC to 8,2 mA @ 24 VDC

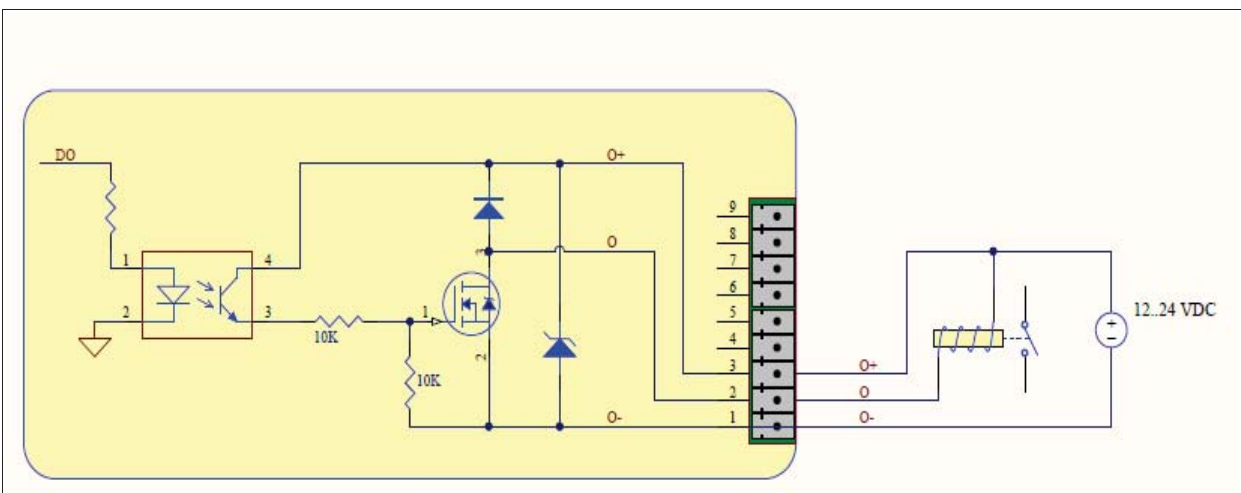
² When the eWON COSY reboots, a short phase of ON state is part of the starting process.

The digital output is activated by an open drain MOSFET transistor driven by an optocoupler. The maximum current flow inside this transistor has a value above the one specified in the eWON, in order to cope with the switching power losses.

The transistor used is in an open drain type with predrive. This means the relay power supply has to be supplied from an external source to the predrive electronics. The diagram below shows the external wiring needed for proper operation of the digital output. A relay has been chosen for this sample application but any load within the specifications can be used instead.

- Note -

This is a sink only output to ground (the transistor acts like a switch ground).



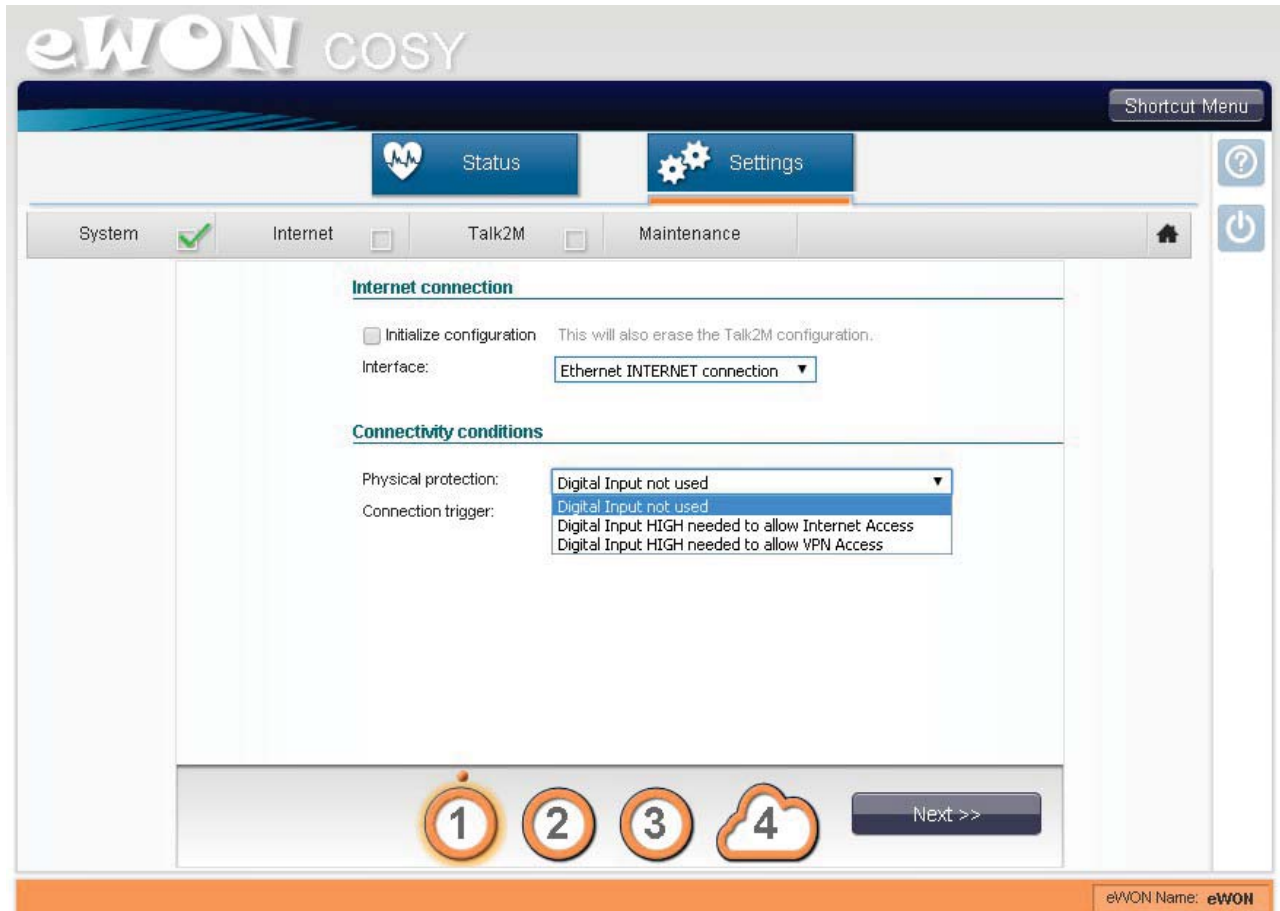
Possible features :

Digital Output & Inputs can be used on the COSY 131, some features can be externalized by wiring the main connector.

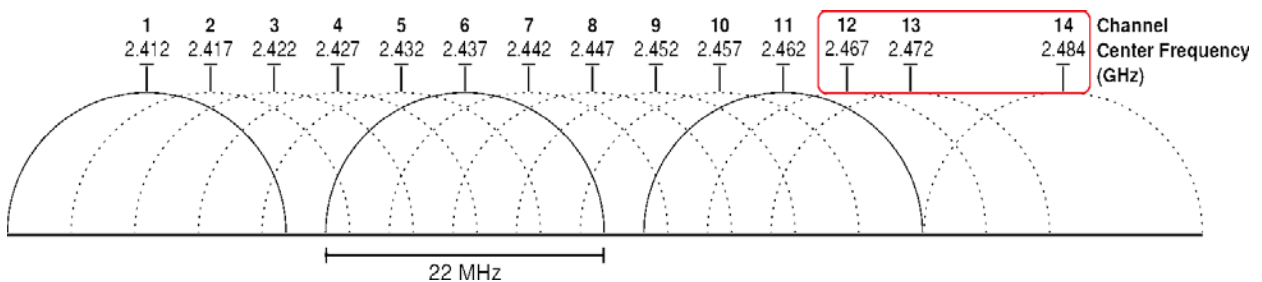
LED	Connector	Description
KEY	DI1	On a key switch to authorize or prevent the Internet connection.
		On a key switch to authorize or prevent the VPN connection.
DI2	DI2	Not supported.
T2M	DO	Can be wired to an external device to propagate the Talk2M status. If the VPN connection is active, the DO is set to 1.

Digital Input (DI1) can be used as a connectivity condition.

The configuration of this condition has to be done during the Internet Wizard where you define if the digital input is used or not and for which purpose.



A.4 - Used Wireless Frequencies



- **Channels 12, 13 & 14 are not supported**

Used channels and frequencies are between: Channel 1 - 2,412 Ghz and 11 - 2,462 Ghz

Revision

Revision History

Revision	Date	Description
1.0	22/01/2015	Original Document
1.1	04/02/2015	Pictures modifications
1.2	27/04/2015	WiFi & DI/DO Updates (3.4.1 A.3 , A.4)
1.3	30/06/2015	Added Cabling rules (#2.4.3.Cabling rules)
1.4	17/11/2015	Added section 3.5: LAN Switch Specifications
1.5	11/01/2016	Modified DO Diagram

Document build number: 86

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