Samba™ PLC+HMI Installation Guide

SM35-J-RA22/SM43-J-RA22
SM70-J-RA22

- **12 Digital Inputs, including 1 HSC/Shaft-encoder Inputs, 2 Analog Inputs, 2 PT100/TC inputs**
- **8 Relay Outputs**
- **2 Analog Outputs**

General Description

All of the controllers covered in this guide are micro-PLC+HMI, rugged programmable logic controllers that comprise built-in operating panels and on-board I/Os.

Item	SM35-J-RA22	SM43-J-RA22	SM70-J-RA22
On-board I/O	Model Dependent		
Screen	3.5" Color Touch	4.3" Color Touch	7" Color Touch
Keypad or Function Keys	None		
Programming Com Port, Built-in			
RS232	Yes	None	None
USB device, mini-B	None	Yes	Yes
Com Ports, separate order, user-installed	The user may install a CANbus module (V100-17-CAN), and **one** of the following: • RS232/RS485 port (V100-17-RS4/V100-17-RS4X) • Ethernet (V100-17-ET2)		

Standard Kit Contents

Item	SM35-J-RA22	SM43-J-RA22	SM70-J-RA22
Controller	Yes		
Terminal Blocks	Yes		
Battery	Yes (installed)	Yes (installed)	Yes
Mounting Brackets	Yes (2 parts)	Yes (4 parts)	Yes (6 parts)
Rubber Seal	Yes		

Alert Symbols and General Restrictions

When any of the following symbols appear, read the associated information carefully.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger could cause physical and property damage.
Caution	Caution	Use caution.

- Before using this product, the user must read and understand this document.
- All examples and diagrams are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product according to local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

 Failure to comply with appropriate safety guidelines can cause severe injury or property damage.



- Do not attempt to use this device with parameters that exceed permissible levels.
- To avoid damaging the system, do not connect/disconnect the device when power is on.

Environmental Considerations



- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration, in accordance with the standards given in the product's technical specification sheet.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

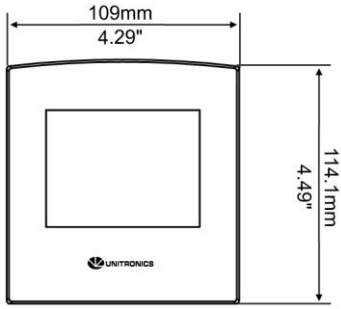


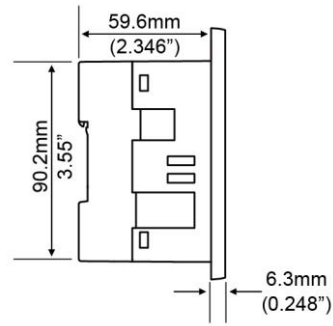
- Ventilation: 10mm space required between controller's top/bottom edges & enclosure walls.
- Install at maximum distance from high-voltage cables and power equipment.

Mounting

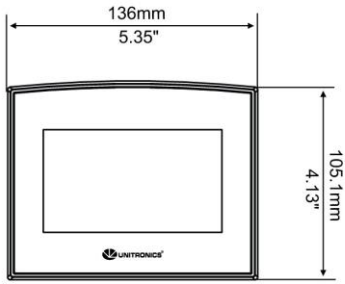
Dimensions

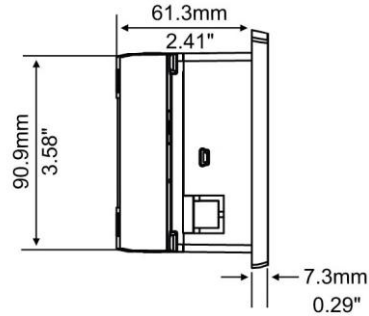
SM35



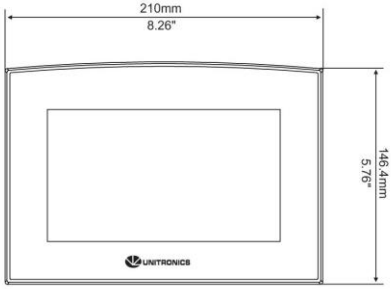


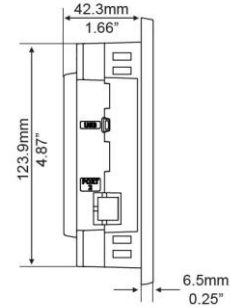
SM43





SM70





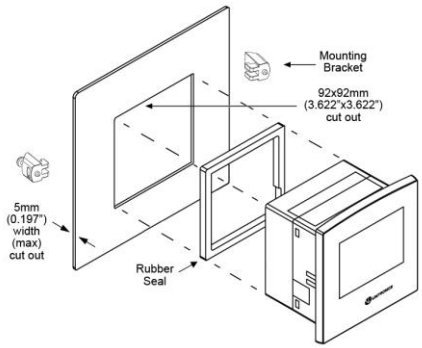
Panel Mounting

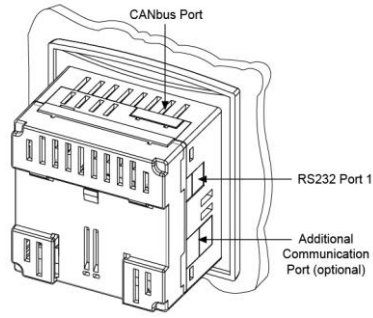
Before you begin, note that the mounting panel cannot be more than 5 mm thick.

UL listed models:
To meet the UL508 standard, panel-mount the device on the flat surface of a Type 1 enclosure.

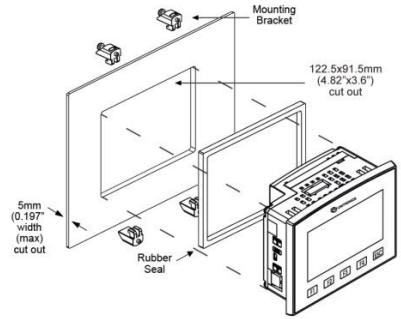
1. Make a panel cut-out of the appropriate size:
   - SM35: 92x92mm (3.622”x3.622”).
   - SM43: 122.5x91.5mm (4.82”x3.6”).
   - SM70: 193x125mm (7.59”x4.92”).
2. Slide the controller into the cut-out, ensuring that the rubber seal is in place.
3. Push the mounting brackets into their slots on the sides of the panel as shown in the figure below.
4. Tighten the bracket’s screws against the panel. Hold the bracket securely against the unit while tightening the screw.
5. When properly mounted, the controller is squarely situated in the panel cut-out as shown in the accompanying figures.

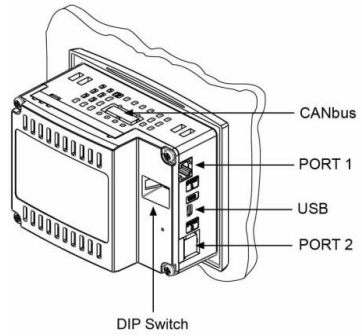
SM35



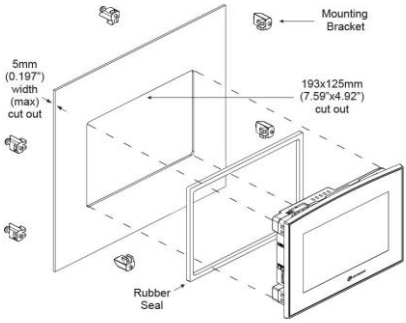


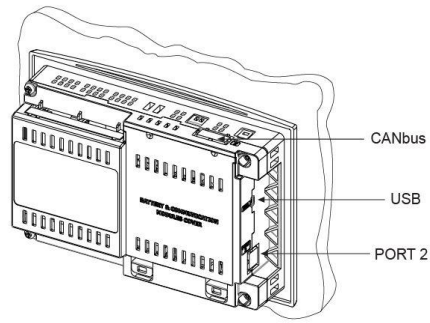
SM43





SM70





Wiring

- Do not touch live wires.

- Install an external circuit breaker. Guard against short-circuiting in external wiring.
- Use appropriate circuit protection devices.
- Unused pins should not be connected. Ignoring this directive may damage the device.
- Double-check all wiring before turning on the power supply.

Caution

- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·cm).
- Do not use tin, solder, or any substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

Wiring Procedure

Use crimp terminals for wiring; use 3.31 mm² –0.13 mm² wire (12-26 AWG):

1. Strip the wire to a length of 7±0.5mm (0.270–0.300“).
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure a proper connection.
4. Tighten enough to keep the wire from pulling free.

- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with I/O lines used over an extended distance. Use wire that is properly sized for the load.
- The controller and I/O signals must be connected to the same 0V signal.

I/Os

SM35/43/70-J-RA22 comprises a total of 12 inputs and 8 relays and 2 analog outputs.
Input functionality can be adapted as follows:

12 inputs may be used as digital inputs. They may be wired, in a group, and set to either npn or pnp via a single jumper.

In addition, according to jumper settings and appropriate wiring:

- Inputs 5 and 6 can function as either digital or analog inputs.
- Input 0 can function as high-speed counter, as part of a shaft-encoder, or as normal digital input.
- Input 1 can function as either counter reset, as part of a shaft-encoder, or as normal digital input.
- If input 0 is set as high-speed counters (without reset), input 1 can function as normal digital input.
- Inputs 7-8 and 9-10 can function as digital, thermocouple, or PT100 inputs; Input 11 can also serve as the CM signal for PT100.

Input Jumper Settings

The tables below show how to set a specific jumper to change input functionality. To access the I/O jumpers, you must open the controller according to the instructions on page 11.

⚠ ▪ Incompatible jumper settings and wiring connections may seriously damage the controller.

Digital Inputs 0-11: Set Type	
Set to	**JP12 (all Inputs)**
npn (sink)	A
pnp (source)*	B

Inputs 7/8: Set Type - Digital or RTD/TC #1			
Set to	**JP1**	**JP2**	**JP3**
Digital*	A	A	A
Thermocouple	B	B	B
PT100	B	A	B

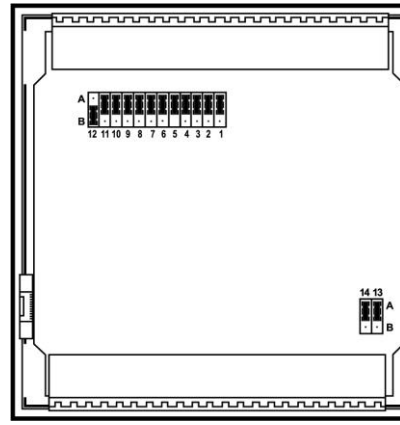
Inputs 9/10: Set Type - Digital or RTD/TC #0			
Set to	**JP5**	**JP6**	**JP7**
Digital*	A	A	A
Thermocouple	B	B	B
PT100	B	A	B

Input 11: Set Type - Digital or CM for PT100	
Set to	**JP11**
Digital*	A
CM for PT100	B

Input 5: Set Type - Digital or Analog #3		
Set to	**JP4**	**JP10**
Digital*	A	A
Voltage	B	A
Current	B	B

Input 6: Set Type - Digital or Analog #2		
Set to	**JP8**	**JP9**
Digital*	A	A
Voltage	B	A
Current	B	B

*Default settings



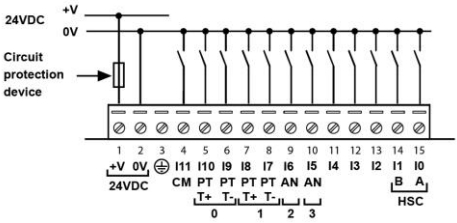
Analog Output 0: Set to Voltage/Current		
Set to	**JP13**	
Voltage*	A	
Current	B	

Analog Output 1: Set to Voltage/Current		
Set to	**JP14**	
Voltage*	A	
Current	B	

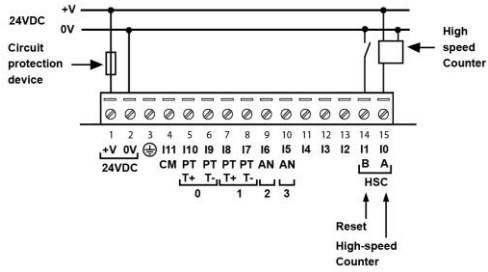
I/O Wiring

npn (sink) Input

Input wiring

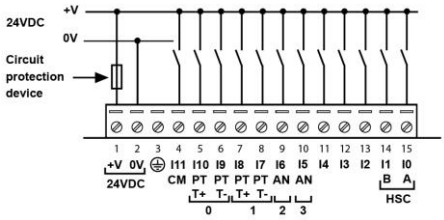


HSC input wiring

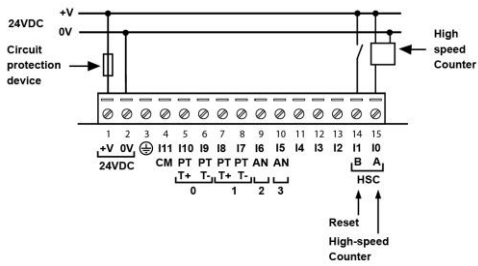


pnp (source) Input

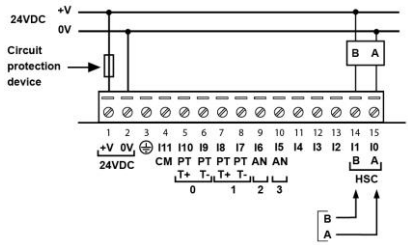
Input wiring



HSC input wiring

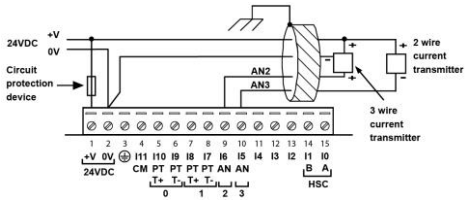


Shaft-encoder

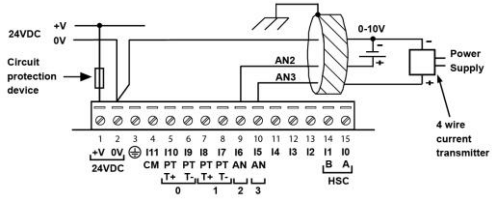


Analog Input

Analog input wiring, current (2/3 wire)

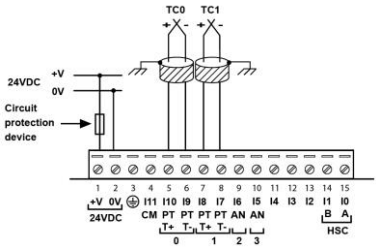


Analog input wiring, current (4-wire), and voltage



- Shields should be connected at the signal's source.
- The 0V signal of the analog input must be connected to the controller's 0V.

Thermocouple

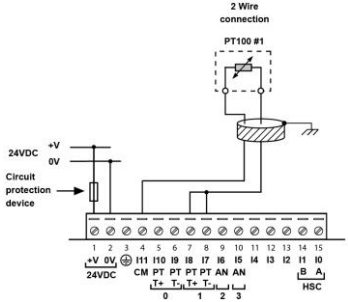


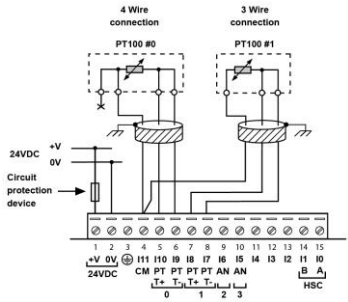
- Thermocouple 0: use Input 9 as negative input and 10 as positive.
- Thermocouple 1: use Input 7 as negative input and 8 as positive.

Type	Temp. Range	Wire Color	
		ANSI (USA)	BS1843 (UK)
mV	-5 to 56mV		
B	200 to 1820˚C (300 to 3276˚F)	+Grey -Red	+None -Blue
E	-200 to 750˚C (-328 to 1382˚F)	+Violet -Red	+Brown -Blue
J	-200 to 760˚C (-328 to 1400˚F)	+White -Red	+Yellow -Blue
K	-200 to 1250˚C (-328 to 2282˚F)	+Yellow -Red	+Brown -Blue
N	-200 to 1300˚C (-328 to 2372˚F)	+Orange -Red	+Orange -Blue
R	0 to 1768˚C (32 to 3214˚F)	+Black -Red	+White -Blue
S	0 to 1768˚C (32 to 3214˚F)	+Black -Red	+White -Blue
T	-200 to 400˚C (-328 to 752˚F)	+Blue -Red	+White -Blue

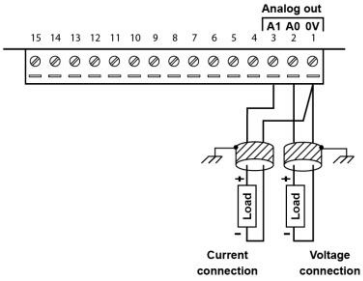
RTD

- PT100 (Sensor 0): use Input 9 and 10, related to CM signal.
- PT100 (Sensor 1): use Input 7 and 8, related to CM signal.
- 4 wire PT100 can be used by leaving one of the sensor leads unconnected.

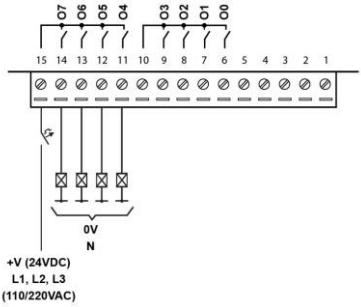




Analog Outputs



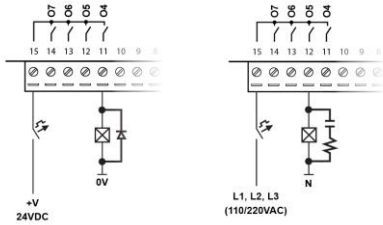
Relay Outputs



Increasing Contact Life Span

To increase the life span of the relay output contacts and protect the device from potential damage by reverse EMF, connect:

- A clamping diode in parallel with each inductive DC load
- An RC snubber circuit in parallel with each inductive AC load

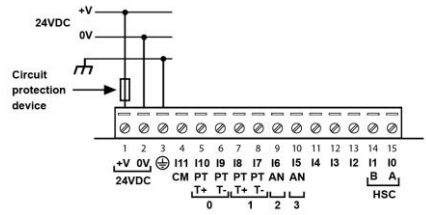


Power Supply

The controller requires an external 24VDC power supply.

- The power supply must include double insulation. Outputs must be rated as SELV/PELV/Class2/Limited Power.

- Use separate wires to connect the functional earth line (pin 3) and the 0V line (pin 2) to the system earth ground.
- Install an external circuit breaker. Guard against short-circuiting in external wiring.
- Double-check all wiring before turning on the power supply.
- Do not connect either the 'Neutral' or 'Line' signal of the 110/220VAC to device's 0V pin
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.



Earthing the PLC+HMI

To maximize system performance, avoid electromagnetic interference by:

- Mounting the controller on a metal panel.
- Connect each common and ground connection directly to the earth ground of your system.
- For ground wiring uses the shortest and thickest possible wire.

Communication Port

- Turn off power before making communications connections.

Caution

- Always use the appropriate port adapters.

SM43/SM70-J-RA22

This series comprises a USB port.

Caution

- The USB port in SM43 Series is not isolated. Make sure that the PC and the controller are grounded to same potential.

The USB port may be used for programming, OS download and PC access.

SM35-J-RA22

This series comprises a build-in RS232 port.

Caution

- Signals are related to the controller's 0V; the same 0V is used by the power supply.
- The serial port is not isolated. If the controller is used with a non-isolated external device, avoid potential voltage that exceeds ± 10V.

Use RS232 to download programs from a PC, and to communicate with serial devices and applications, such as SCADA.

Pinouts

The pinouts below show the PLC port signals.

RS232	
Pin #	Description
1	Not connected
2	0V reference
3	TXD signal
4	RXD signal
5	0V reference
6	Not connected

Opening the Controller

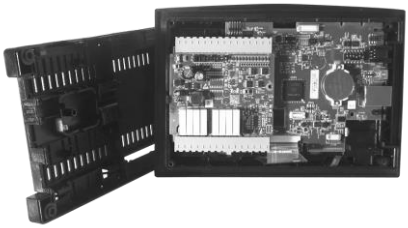
⚠
- Before performing these actions, touch a grounded object to discharge any electrostatic charge.
- Avoid touching the PCB board directly. Hold the PCB board by its connectors.

1. Turn off the power supply, disconnects, and dismounts the controller.
2. The back cover of the controller comprises 4 screws, located in the corners. Remove the screws, and pull off the back cover.

Changing I/O Settings

The I/O board of the controller is now exposed, enabling you to change I/O settings (module dependent) according to the jumpers setting above.

Note: Photo is for illustration purposes only. (Using SM70)



Closing the Controller

Replace the back cover of the controller and fasten the corner screws.

Note that you must replace the back cover securely before powering up the controller.