IO-AI4-AO2

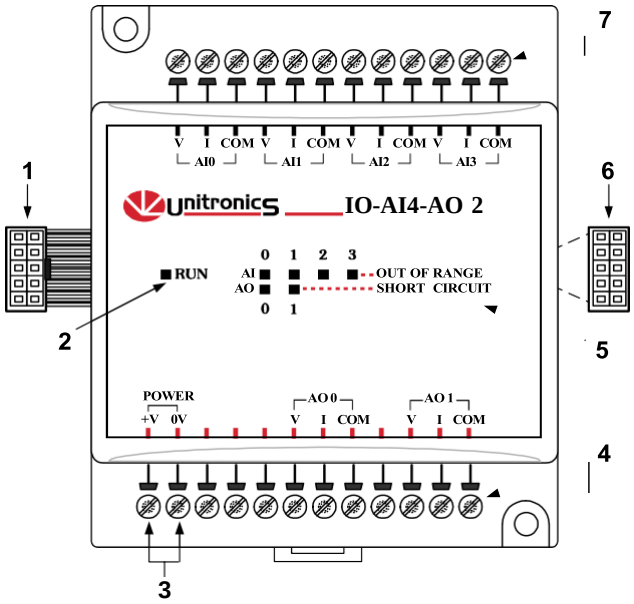
I/O Expansion Module 4 Analog Inputs, 2 Analog Outputs

The IO-AI4-AO2 is an I/O expansion module that can be used in conjunction with specific Unitronics OPLC controllers.

The module offers 4 12-bit analog inputs; functioning at 0-10V, 0-20mA, 4-20mA; and 2 12-bit +sign analog outputs; functioning at ±10V, 0-20mA, 4-20mA.

The interface between the module and the OPLC is provided by an adapter.

The module may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.



	Component identification
1	Module-to-module connector
2	Communication status indicator
3	Connection points for power supply to analog unit
4	Output connection points
5	Input/Output status indicators
6	Module-to-module connector port
7	Input connection points

- Before using this product, it is the responsibility of the user to read and understand this document and any accompanying documentation.
- All examples and diagrams shown herein 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 in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent personnel in the installation of this equipment as defined by the European directives for machinery, low voltage, and EMC. Only a technician or engineer trained in the local and national electrical standards should perform tasks associated with the device's electrical wiring.

Symbols are used to highlight information relating to the user's personal safety and equipment protection throughout this document. When these symbols appear, the associated information must be read carefully and understood fully.

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

- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.

- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Install an external circuit breaker and take appropriate safety measures against short-circuiting in external wiring.

Environmental Considerations

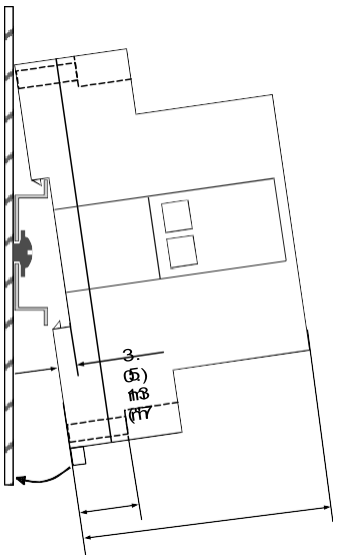
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

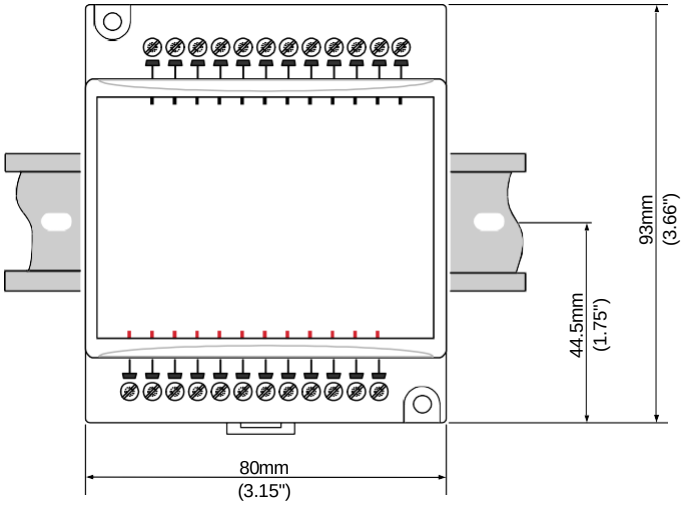
- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

Mounting the Module

DIN-rail mounting

Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.

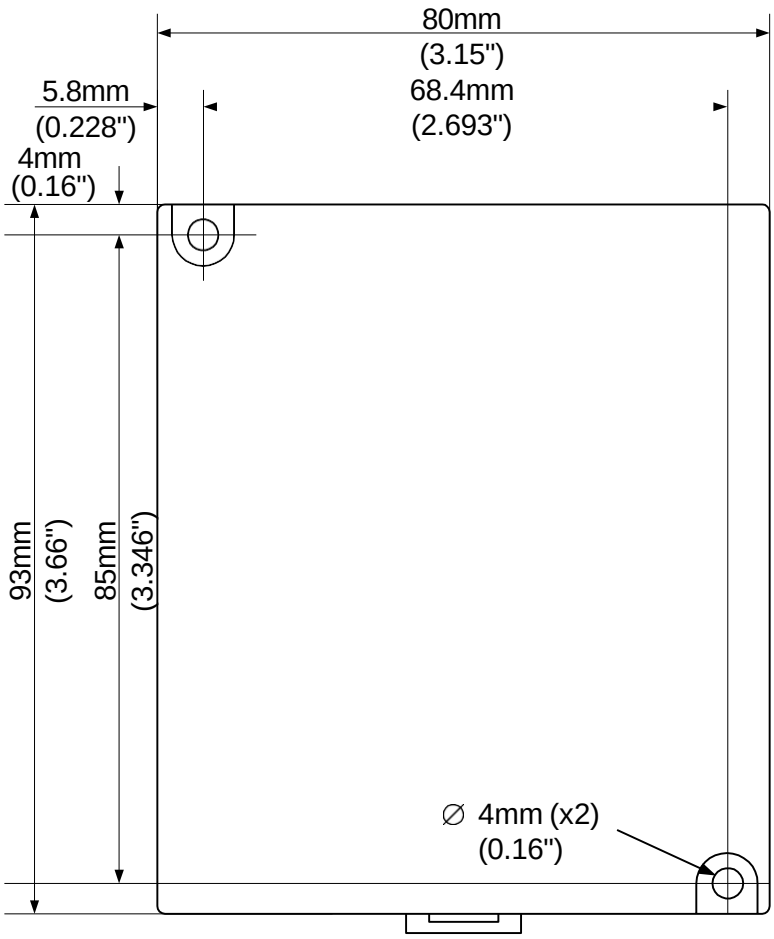




Screw-Mounting

The figure on the next page is drawn to scale. It may be used as a guide for screw-mounting the module.

Mounting screw type: either M3 or NC6-32.


80mm
(3.15")
68.4mm
(2.693")
5.8mm
(0.228")
4mm
(0.16")
93mm
(3.66")
85mm
(3.346")
∅ 4mm (x2)
(0.16")

Connecting Expansion Modules

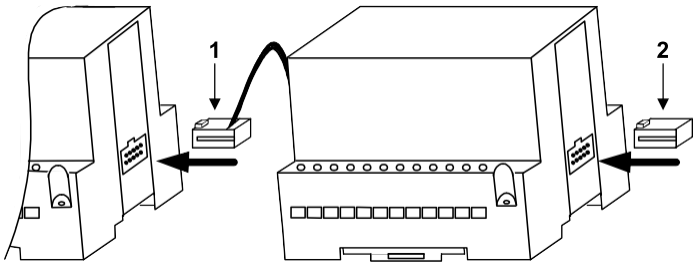
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

1 Push the module-to-module connector into the port located on the right side of the device.

Note that there is a protective cap provided with the adapter. This cap covers the port of the **final** I/O module in the system.

- To avoid damaging the system, do not connect or disconnect the device when the power is on.

Component identification	
1	Module-to-module connector
2	Protective cap



Wiring

- Do not touch live wires.
- Unused pins should not be connected. Ignoring this directive may damage the device.
- Do not connect the 'Neutral or 'Line' signal of the 110/220VAC to the device's 0V pin.
- Double-check all wiring before turning on the power supply.

Wiring Procedures

Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm ^{2}–3.31 mm^2) for all wiring purposes.

1. Strip the wire to a length of 7±0.5mm (0.250–0.300 inches).
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure that a proper connection can be made.
4. Tighten enough to keep the wire from pulling free.

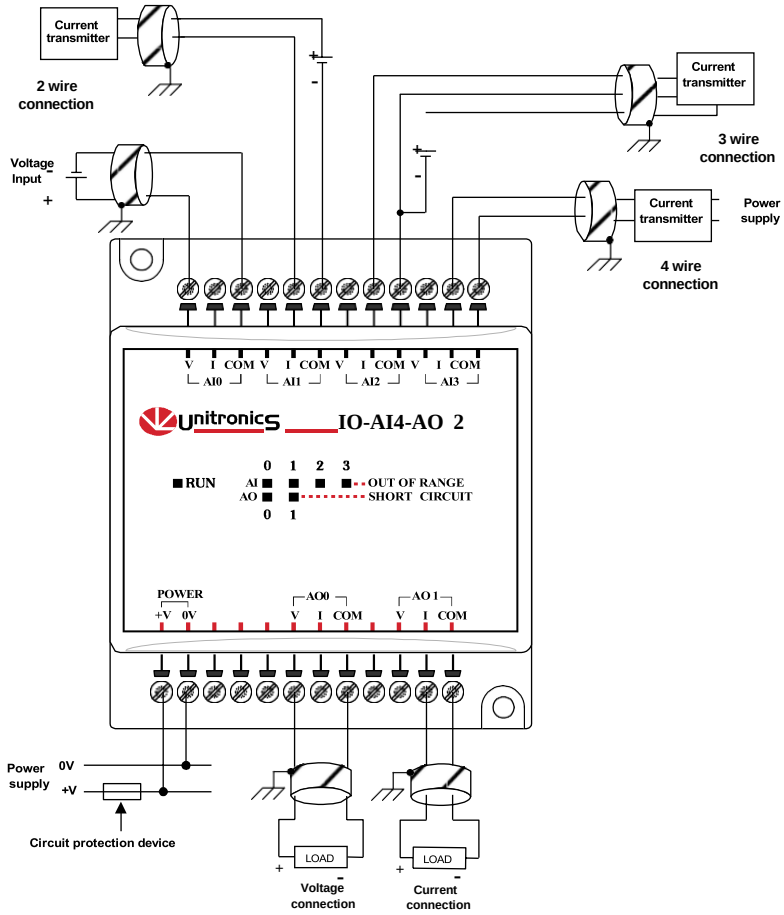
- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·m).
- Do not use tin, solder, or any other substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

I/O Wiring—General

- 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 input lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter, I/O signals, and module's power supply must be connected to the same 0V signal.
- The COM signals of each I/O are internally connected to the module's 0V.

Analog Inputs

- Shields should be connected at the signal source.
- Inputs may be wired to work with either current or voltage.



Output Wiring

- Shields should be earthed, connected to the earth of the cabinet.
- Do not connect unused outputs.
- An output can be wired to either current or voltage.
- Do not use current and voltage from the same source channel.

Wiring the Analog Power Supply

1. Connect the "positive" cable to the "+V" terminal, and the “negative” to the "0V" terminal.

- The analog 0V signal must be the same 0V used by the controller’s power supply.
- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the ‘Neutral’ or ‘Line’ signal of the 110/220VAC to the 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.

The 24VDC power supply must be turned on and off simultaneously with the controller’s power supply.

IO-AI4-AO2 Technical Specifications

Max. current consumption	30mA maximum from the adapter's 5VDC
Typical power consumption	0.1W @ 5VDC
Status indicator	
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.
Analog Inputs	
Number of inputs	4 (single-ended)
Input range	0-10V, 0-20mA ,4-20mA. See Note 1.
Conversion method	Successive approximation
Resolution (except at 4-20mA)	12-bit (4096 units)
Resolution at 4-20mA	819 to 4095 (3277 units)
Conversion time	20msec
Input impedance	1MΩ—voltage 121.5Ω—current
Galvanic isolation	None
Absolute maximum rating	±20V—voltage ±40mA—current
Full-scale error	±4 LSB (0.1%)
Linearity error	±1 LSB (0.025%)
Operational error limits	±0.4%
Status indicators (OUT OF RANGE)	Red LEDs—Lit when the corresponding input is receiving current or voltage in excess of the input range. See Note 2.
Analog Outputs	
Number of outputs	2 (single-ended)
Output range	±10V, 0-20mA, 4-20mA. See Note 1.
Resolution (except at 4-20mA)	12- bit (4096 units) + sign
Resolution at 4-20mA	819 to 4095 (3277 units)
Load impedance	1kΩ minimum—voltage 500Ω maximum—current
Galvanic isolation	None
Conversion time	5msec
Linearity error	±0.1%
Operational error limits	±0.2%
Status Indicators	
(SHORT CIRCUIT)	Red LED—Lit when an output wired to deliver a positive voltage is short-circuited. See Note 3.
Analog Power Supply	24VDC
Permissible range	20.4 to 28.8VDC
Max. current consumption	75mA@24VDC
Environmental	IP20/NEMA1
Operating temperature	0° to 50°C (32 to 122° F)
Storage temperature	-20° to 60°C (-4 to 140° F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15 x 3.66 x 2.362")
Weight	146.3g (5.15oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

Notes:

1. Note that the range of each I/O is defined both by wiring and within the controller's software.
2. The analog value of an input may also indicate when the input is functioning out of range. If an analog input exceeds the permissible range, its value will be 409**6**.
3. When an output that is delivering positive output voltage is connected to a load that short-circuits, the SHORT CIRCUIT LED lights up on the module. The short circuit is also identified by the software program within the controller connected to the module.
   Within the M90 OPLC, for example, SB 5 turns ON. SI 5 contains a bitmap indicating the module containing the affected output.
   For more information, refer to the on-line help supplied with the programming package of your controller.

UL Compliance

The following section is relevant to Unitronics' products that are listed with the UL.

The following models: IO-AI4-AO2, IO-AO6X, IO-ATC8, IO-DI16, IO-DI16-L, IO-DI8-RO4, IO-DI8-RO4-L, IO-DI8-TO8, IO-DI8-TO8-L, IO-RO16, IO-RO16-L, IO-RO8, IO-RO8L, IO-TO16, EX-A2X are UL listed for Hazardous Locations.

The following models: EX-D16A3-RO8, EX-D16A3-RO8L, EX-D16A3-TO16, EX-D16A3-TO16L, IO-AI1X-AO3X, IO-AI4-AO2, IO-AI4-AO2-B, IO-AI8, IO-AI8Y, IO-AO6X, IO-ATC8, IO-D16A3-RO16, IO-D16A3-RO16L, IO-D16A3-TO16, IO-D16A3-TO16L, IO-DI16, IO-DI16-L, IO-DI8-RO4, IO-DI8-RO4-L, IO-DI8-RO8, IO-DI8-RO8-L, IO-DI8-TO8, IO-DI8-TO8-L, IO-DI8ACH, IO-LC1, IO-LC3, IO-PT4, IO-PT400, IO-PT4K, IO-RO16, IO-RO16-L, IO-RO8, IO-RO8L, IO-TO16, EX-A2X, EX-RC1 are UL listed for Ordinary Location.

UL Ratings, Programmable Controllers for Use in Hazardous Locations, Class I, Division 2, Groups A, B, C and D

These Release Notes relate to all Unitronics products that bear the UL symbols used to mark products that have been approved for use in hazardous locations, Class I, Division 2, Groups A, B, C and D.

Caution

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D, or Non-hazardous locations only.
- Input and output wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.
- WARNING—Explosion Hazard—substitution of components may impair suitability for Class I, Division 2.
- WARNING – EXPLOSION HAZARD – Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- WARNING – Exposure to some chemicals may degrade the sealing properties of material used in Relays.
- This equipment must be installed using wiring methods as required for Class I, Division 2 as per the NEC and/or CEC.

Relay Output Resistance Ratings

The products listed below contain relay outputs:

Input/Output expansion modules, Models: IO-DI8-RO4, IO-DI8-RO4-L, IO-RO8, IO-RO8L

- When these specific products are used in hazardous locations, they are rated at 3A res, when these specific products are used in non-hazardous environmental conditions, they are rated at 5A res, as given in the product's specifications.

Certification UL des automates programmables, pour une utilisation en environnement à risques, Class I, Division 2, Groups A, B, C et D.

Cette note fait référence à tous les produits Unitronics portant le symbole UL - produits qui ont été certifiés pour une utilisation dans des endroits dangereux, Classe I, Division 2, Groupes A, B, C et D.

Attention

- Cet équipement est adapté pour une utilisation en Classe I, Division 2, Groupes A, B, C et D, ou dans Non-dangereux endroits seulement.
- Le câblage des entrées/sorties doit être en accord avec les méthodes de câblage selon la Classe I, Division 2 et en accord avec l'autorité compétente.
- AVERTISSEMENT: Risque d'Explosion – Le remplacement de certains composants rend caduque la certification du produit selon la Classe I, Division 2.
- AVERTISSEMENT - DANGER D'EXPLOSION - Ne connecter pas ou ne débranche pas l'équipement sans avoir préalablement coupé l'alimentation électrique ou la zone est reconnue pour être non dangereuse.
- AVERTISSEMENT - L'exposition à certains produits chimiques peut dégrader les propriétés des matériaux utilisés pour l'étanchéité dans les relais.
- Cet équipement doit être installé utilisant des méthodes de câblage suivant la norme Class I, Division 2 NEC et /ou CEC.

Certification de la résistance des sorties relais

Les produits énumérés ci-dessous contiennent des sorties relais:

- Modules d'Extensions d'E/S, modèles: IO-DI8-RO4, IO-DI8-RO4-L, IO-RO8, IO-RO8L.

- Lorsque ces produits spécifiques sont utilisés dans des endroits dangereux, ils supportent un courant de 3A charge résistive, lorsque ces produits spécifiques sont utilisés dans un environnement non dangereux, ils sont évalués à 5A res, comme indiqué dans les specifications du produit Plages de températures.