I/O Modules UI-8/AO-4 and UI-8/AO-4-H

8 channel universal input and 4 channel analog output

Introduction

The UI-8/AO-4 and UI-8/AO-4-H are universal input, 8 channel and analog output, 4 channel I/O modules. The UI-8/AO-4 and UI-8/AO-4-H I/O modules are ideal when an application requires a mix of point types.

The universal inputs are ideal for any mix of temperature, pressure, flow, status points, and similar point types in a building control system. As counter inputs they are commonly used in energy metering applications. As supervised inputs they are used for security applications where it is critical to know whether or not a wire has been cut or shorted. These events provide a separate indication of alarms and trouble conditions to the system.

The analog outputs are capable of supporting analog voltage or current point types. Therefore, analog outputs support a wide range of devices, such as actuators.

Function

Modular and scalable system

The modules are part of a modular system that delivers power and communications on a common bus. Connecting modules is a one-step process: just slide the modules together using the built-in connectors.

Patented two-piece design

Each module can be separated from its terminal base to allow the site to be wired prior to the installation of the electronics. The patented locking mechanism serves as handles for removing the module from its base. All critical components have a protective cover that permits convection cooling to occur.

03-14007-03-en July 2014

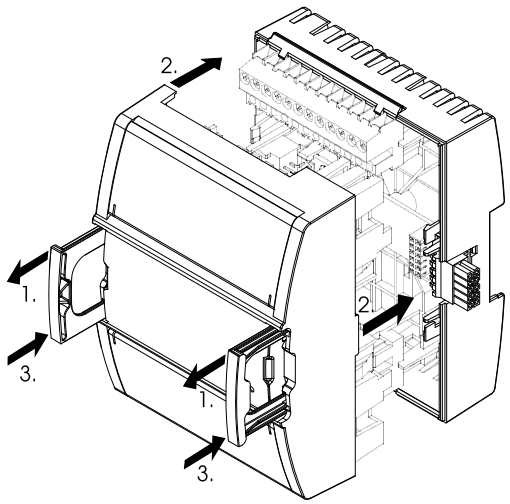


Figure: Two-piece design

Hot-connect and Hot-swap

Because critical applications require 24-hour operation, Schneider Electric designed the I/O modules for hot-connection of terminal bases and hot-swapping of the modules to their bases. This design ensures continuous power and communication during service operations.

Auto-addressing

The auto-addressing feature eliminates the need for setting DIP switches or pressing commission buttons. With the Automation Server family, each module automatically knows its order in the chain and assigns itself accordingly – significantly reducing engineering and maintenance time.

Simple DIN-rail installation

Fasteners easily snap into a locked position for panel installation. The fastener has a quick-release feature for easy DIN-rail removal.

Efficient terminal management

The I/O module terminals are clearly labelled and protected by transparent covers. The input and output terminals are at the top and bottom of each module and are accessible for maintenance without removing the module. The StruxureWare Building Operation WorkStation software can generate custom as-built labels for each module. Pre-perforated letter and A4 size label sheets are available as an accessory.

Accommodates multiple row panel installations

The Automation Server module family uses built-in connectors for single row connectivity, side by side. If a panel size requires multiple rows, extension cords are available.

LED status indicators

The I/O module has a status indicator that denotes the health and status of the module.

Each input channel has a dedicated two color status LED. The LED can be configured to display either red or green for each input state.

Hand/Off/Auto switches

The front panel of the UI-8/AO-4-H includes Hand/Off/Auto (HOA) switches to provide override control of the analog outputs.

Each output also has a potentiometer to modulate the output signal when the switch is in the Hand position.

The position of the HOA switch is readable through user interfaces, such as the StruxureWare Building Operation WorkStation software, enabling more precise monitoring and control.

Protection

Protection components on the inputs and the outputs protect against high-voltage short-duration transient events.

The current inputs are protected against over current.

The analog outputs have current limits to protect against permanent short-circuit to ground.

Specifications

Input channels	8
Output channels	4
DC input supply power	3.2 W
DC input supply voltage	24 VDC

03-14007-03-en July 2014

Environment

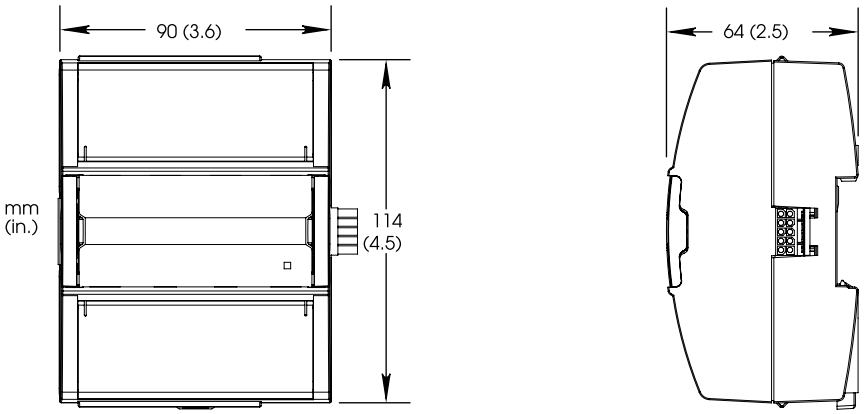
Ambient temperature, operating .....0 to 50 °C (32 to 122 °F)
Ambient temperature, storage .....-20 to +70 °C (-4 to +158 °F)
Maximum humidity.....95 % RH non-condensing

Material

Plastic rating.....UL94-5VB
Enclosure.....Eco Friendly ABS/PC
Enclosure rating.....IP 20

Mechanical

Dimensions including terminal base .....90 W x 114 H x 64 D mm (3.6 W x 4.5 H x 2.5 D in.)



Weight including terminal base .....0.276 kg (0.61 lb)
Weight excluding terminal base .....0.152 kg (0.34 lb)
Terminal base TB-IO-W1

Part numbers

UI-8/AO-4, I/O module
8 universal inputs, 4 analog voltage/current outputs SXWUI8A4X10001

UI-8/AO-4-H, I/O module with HOA switches
8 universal inputs, 4 analog voltage/current outputs with Hand/Off/Auto override switches
.....SXWUI8A4H10001

TB-IO-W1, terminal base for I/O module
(Required for each I/O module).....SXWTBIOW110001

Accessory part numbers

DIN-RAIL-CLIP, DIN-rail end clip
package of 25 pieces SXWDINEND10001

PRINTOUT-A4-W1, printout sheets for terminal labels
A4 sheet size, 100 sheets, 18 labels per sheet.....SXWTERLBL10011

PRINTOUT-LTR-W1, printout sheets for terminal labels
Letter sheet size, 100 sheets, 16 labels per sheet SXWTERLBL10012

S-CABLE-L, S-cable extension cord for Automation Server I/O bus L shaped connectors
1.5 m.....SXWSCABLE10002

S-CABLE-L, S-cable extension cord for Automation Server I/O bus L shaped connectors
0.75 m.....SXWSCABLE10003

Universal inputs

The universal inputs of the UI-8/AO-4 and UI-8/AO-4-H I/O modules are designed to read several different types of inputs.

Input types:

- Digital
- Counter
- Supervised
- Voltage
- Current
- Temperature
- Resistive

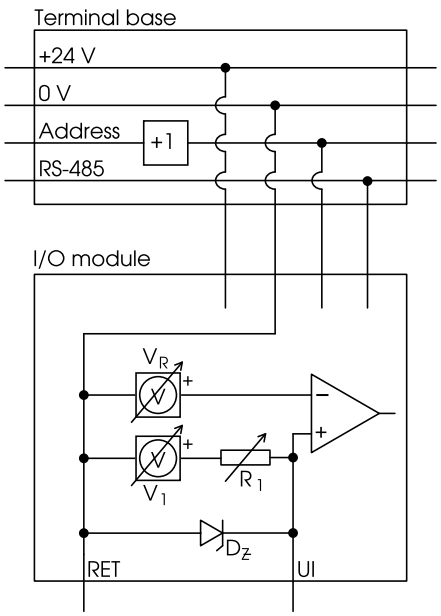


Figure: Universal input internal configuration

Applied signals beyond the absolute maximum ratings will cause over current in the protection component D_Z.

The I/O bus in the terminal base provides the I/O module with power and an address.

The address value in the I/O bus is increased by one for each terminal base. The I/O bus also enables RS-485 communication between the I/O module and the Automation Server.

Digital inputs

The external connection of a digital input is shown in the following figure.

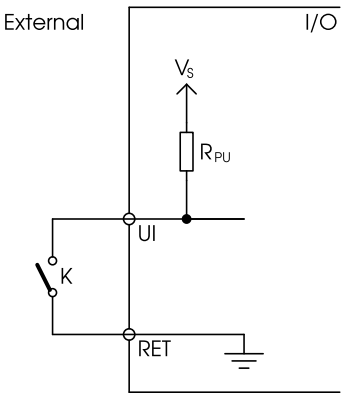


Figure: Digital input external connection

K is the monitored external switch.

V_S = 24 V

R_{PU} = 10 kohm

Counter inputs

A counter input utilizes the same hardware configuration as the digital input as shown in the figure above.

Supervised inputs

Supervised inputs are contact closing inputs supplemented with the supervision of the field wiring integrity. This supervision is a required feature in many security system applications. The supervised inputs provide the ability to detect specific forms of tampering or trouble with the wire connections to the field contacts. The supervision is achieved with a combination of 1 or 2 resistors attached to the contact in the field. The resistor combination creates continuous current flow through the field contact loop and presents a defined set of expected resistance values for each of the defined conditions. If someone is attempting to defeat the monitoring of the field contact by short circuiting the wire with a jumper or cutting the wire, the objective is to detect and indicate such a condition. The resistors need to be located at the end of the cable close to the field contact, so that the point where there is a risk that the circuit is defeated is between the resistors and the I/O module.

Three different types of supervised input connections are supported:

- Series only
- Parallel only
- Series and parallel

Each type of supervised input connection provides a different capability in regards to what form of tamper/trouble can be detected regardless of switch contact open or closed condition.

A single resistor, which is connected in series with the switch, can only detect tamper/trouble in the form of a short circuit across the wire pair. The external connection of a series only supervised input connection is shown in the following figure.

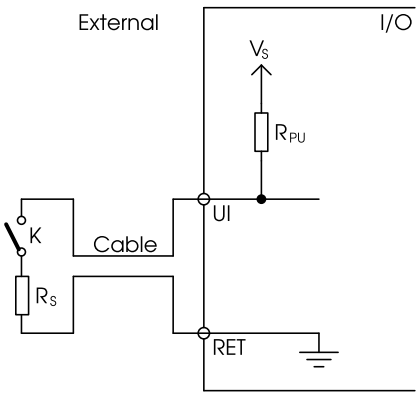


Figure: Series only external connection

K is the monitored external switch.

V_S = 5 V

R_{PU} = 10 kohm

A single resistor, which is connected in parallel with the switch, can only detect tamper/trouble in the form of an open circuit in the field wiring loop. The external connection of a parallel only supervised input connection is shown in the following figure.

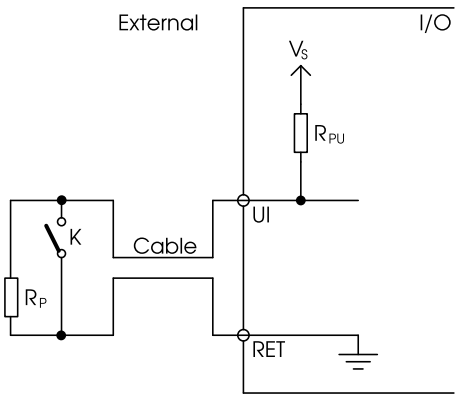


Figure: Parallel only external connection

K is the monitored external switch.

V_S = 5 V

R_{PU} = 10 kohm

Two resistors, where one is connected in series with the switch and one is connected in parallel with the switch, can detect tamper/trouble conditions in the form of both an open and a shorted circuit. The external connection of a series and parallel supervised input connection is shown in the following figure.

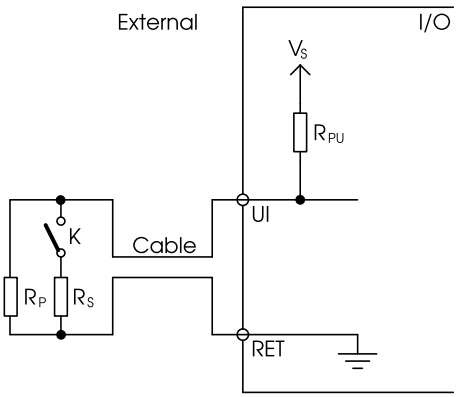


Figure: Series and parallel external connection

K is the monitored external switch.

V_S = 5 V

R_{PU} = 10 kohm

Voltage inputs

The external connection of a voltage input is shown in the following figure.

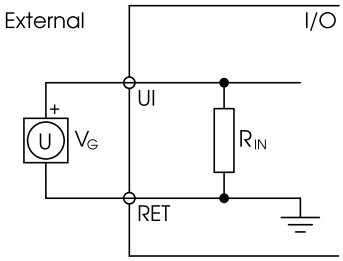


Figure: Voltage input external connection

V_G is the monitored external voltage.

R_{IN} = 100 kohm

Current inputs

The external connection of a current input is shown in the following figure.

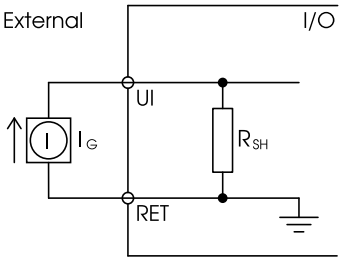


Figure: Current input external connection

I_G is the monitored external current.

R_{SH} = 47 ohm

In the internal configuration of the current input, there is a current limit circuit in order to protect the shunt resistor from over load. The input current is limited to 60 mA with a serial connected FET transistor. If this limit is reached for 0.5 s, the transistor is turned off. When 5 s has elapsed, the transistor is turned on again to make a new start attempt.

Temperature inputs

The external connection of a temperature input is shown in the following figure.

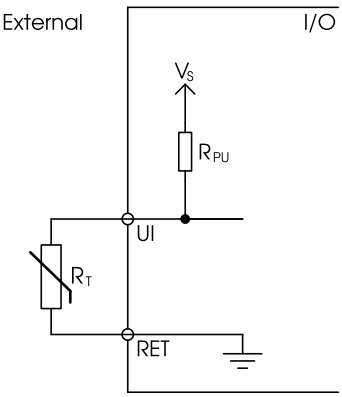


Figure: Temperature input external connection

R_T is the monitored external thermistor.

When a universal input is used as a temperature input, V_S and R_{PU} in the internal configuration of the universal input are used according to the following table.

Thermistor type	**V_S**	**R_{PU}**
20 kohm	5 V	10 kohm
10 kohm	5 V	10 kohm
2.2 kohm	1 V	1.5 kohm
1.8 kohm	1 V	1.5 kohm
1 kohm	1 V	1.5 kohm

The resulting voltage across the thermistor is measured and a temperature is calculated dependent on the selected thermistor type.

Resistive inputs

The external connection of a resistive input is shown in the following figure.

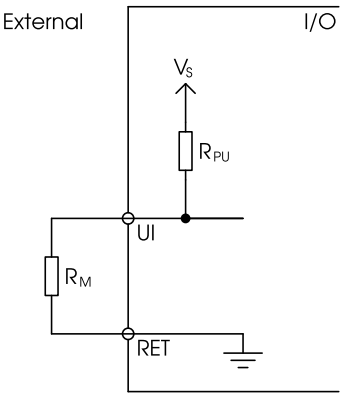


Figure: Resistive input external connection

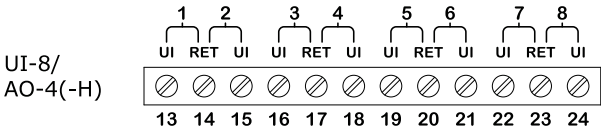
R_M is the monitored external resistance.

V_S = 5 V

R_{PU} = 10 kohm

Specifications

Universal inputs



Absolute maximum ratings .....-0.5 to +24 VDC

Digital

Range .....Dry contract switch closure or open collector/open drain, 24 VDC, 2.4 mA
Minimum pulse width .....120 ms
LED polarity .....Software selectable, if the LED is activated when the input is high or low
LED color .....Red or green, software selectable

Counter

Range .....Dry contract switch closure or open collector/open drain, 24 VDC, 2.4 mA
Minimum pulse width .....20 ms
Maximum frequency .....25 Hz
LED polarity .....Software selectable, if the LED is activated when the input is high or low
LED color .....Red or green, software selectable

Supervised

5 V circuit, 1 or 2 resistors
Monitored switch combinations.....Series only, parallel only, and series and parallel
Resistor range.....1 to 10 kohm
For a 2-resistor configuration, each resistor is assumed to have the same value +/- 5 %

Voltage

Range.....0 to 10 VDC
Accuracy .....+/-(7 mV + 0.2 % of reading)
Resolution.....12 bit, 2.7 mV
Impedance.....100 kohm
Reliability check .....Yes

Current

Range.....0 to 20 mA
Accuracy .....+/-(0.03 mA + 0.4 % of reading)
Resolution.....12 bit, 5.6 µA
Impedance .....47 ohm
Reliability check .....Yes

Resistive

10 ohm to 10 kohm accuracy .....+/-(7 + 4 x 10^{-3} x R) ohm
R = Resistance in ohm

10 to 60 kohm accuracy.....+/-(4 x 10^{-3} x R + 7 x 10^{-8} x R^2) ohm
R = Resistance in ohm

Reliability check .....Yes

Temperature

Range .....-50 to +150 °C (-58 to +302 °F)
Resolution.....12 bit
Reliability check .....Yes

Supported thermistors

Honeywell .....20 kohm
Type I (Continuum) .....10 kohm
Type II (I/NET).....10 kohm
Type III (Satchwell).....10 kohm
Type IV (FD)..... 10 kohm
Type V (FD w/ 11k shunt).....Linearized 10 kohm
Satchwell D?T .....Linearized 10 kohm
Johnson Controls.....2.2 kohm
Xenta .....1.8 kohm
Balco .....1 kohm

Thermistor accuracy

20 kohm, 10 kohm, 2.2 kohm, and 1.8 kohm.....-50 to -30 °C: +/-1.5 °C (-58 to -22 °F: +/-2.7 °F)
.....-30 to 0 °C: +/-0.5 °C (-22 to +32 °F: +/-0.9 °F)
..... 0 to 50 °C: +/-0.2 °C (32 to 122 °F: +/-0.4 °F)
..... 50 to 100 °C: +/-0.5 °C (122 to 212 °F: +/-0.9 °F)
..... 100 to 150 °C: +/-1.5 °C (212 to 302 °F: +/-2.7 °F)

Linearized 10 kohm .....-50 to -30 °C: +/-3.0 °C (-58 to -22 °F: +/-5.4 °F)
.....-30 to 0 °C: +/-1.0 °C (-22 to +32 °F: +/-1.8 °F)
..... 0 to 50 °C: +/-0.3 °C (32 to 122 °F: +/-0.5 °F)
..... 50 to 100 °C: +/-0.5 °C (122 to 212 °F: +/-0.9 °F)
..... 100 to 150 °C: +/-2.0 °C (212 to 302 °F: +/-3.6 °F)

1 kohm .....-50 to +150 °C: +/-1.5 °C (-58 to +302° F: +/-2.7 °F)

Analog outputs

The analog outputs of the UI-8/AO-4 and UI-8/AO-4-H I/O modules are designed to be used for voltage or current outputs.

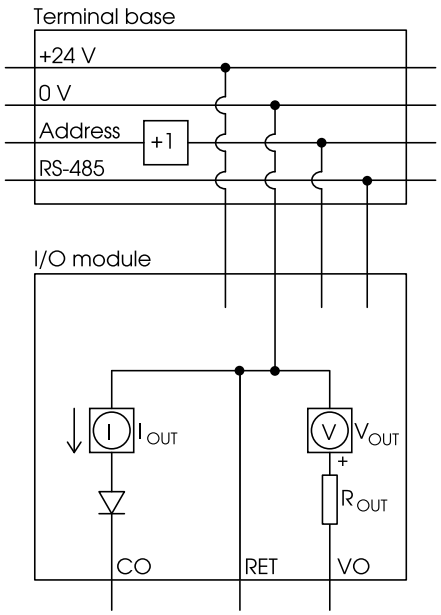


Figure: Analog output internal configuration

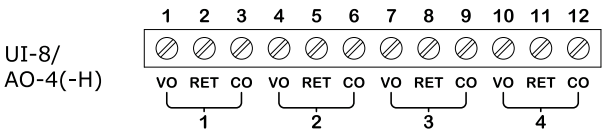
R_{OUT} is approximately equal to 10 ohm.

The I/O bus in the terminal base provides the I/O module with power and an address.

The address value in the I/O bus is increased by one for each terminal base. The I/O bus also enables RS-485 communication between the I/O module and the Automation Server.

Specifications

Analog outputs



Voltage

Range.....0 to 10 VDC
Accuracy .....+/-100 mV
Resolution .....42 mV
Minimum load resistance .....5 kohm
Load range .....-1 to +2 mA
Reliability check .....Yes
Terminals.....Voltage Output (VO), Return (RET)

Current

Range.....0 to 20 mA
Accuracy .....+/-0.2 mA
Resolution .....0.1 mA
Load range .....0 to 650 ohm

Reliability check .....Yes
Terminals .....Current Output (CO), Return (RET)

For protection from excess current that could be produced by field wiring, follow these instructions:

- Connect one RET terminal on each of the I/O modules to a common chassis/power ground rail in the control panel using a size 16 AWG, 1.3 mm, or larger wire.
- Individual 24 VDC power sources to the field must be current limited to maximum of 4 amps for UL compliant installations, and no more than 6 amps in other areas.
- For more information on wiring, see Automation Server Family Hardware Guide.

Regulatory Notices

Federal Communications Commission
FCC Rules and Regulations CFR 47, Part 15, Class B
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference. (2) This device must accept any interference received, including interference that may cause undesired operation.

Industry Canada
ICES-003
This is a Class B digital device that meets all requirements of the Canadian Interference Causing Equipment Regulations.

N1831 **C-Tick (Australian Communications Authority (ACA))**
AS/NZS 3548
This equipment carries the C-Tick label and complies with EMC and radio communications regulations of the Australian Communications Authority (ACA), governing the Australian and New Zealand (AS/NZS) communities.

CE - Compliance to European Union (EU)
2004/108/EC Electromagnetic Compatibility Directive
This equipment complies with the rules, of the Official Journal of the European Union, for governing the Self Declaration of the CE Marking for the European Union as specified in the above directive(s) per the provisions of the following standards: IEC/EN 61326-1 Product Standard, IEC/EN 61010-1 Safety Standard.

WEEE - Directive of the European Union (EU)
This equipment and its packaging carry the waste of electrical and electronic equipment (WEEE) label, in compliance with European Union (EU) Directive 2002/96/EC, governing the disposal and recycling of electrical and electronic equipment in the European community.

UL 916 Listed products for the Unites States and Canada, Open Class Energy Management Equipment.

03-14007-03-en July 2014