

IQ5-IO I/O Modules



Description

The IQ®5-IO range of I/O modules are designed for use with IQ5 controllers, to provide input and output channel connection points.

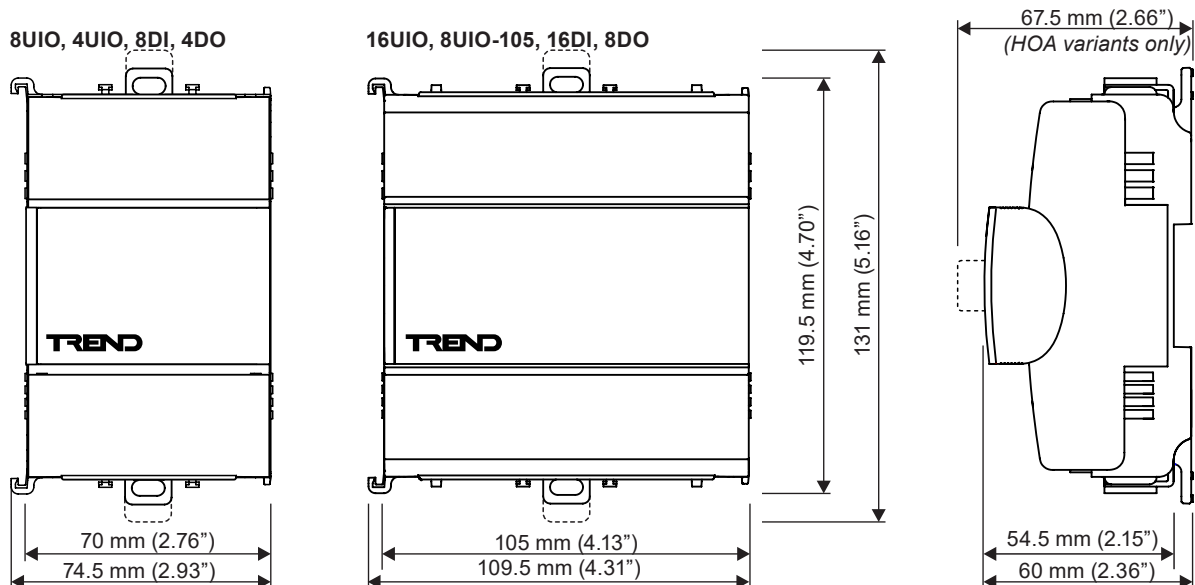
A comprehensive choice of I/O types is available including universal inputs/outputs (UIO), digital inputs (DI) and digital/relay outputs (DO). There are two 'hand-off-auto' variants (8DO-HOA and 8UIO-HOA) offering manual override of module outputs.

Integral T1L bus connectors allow easy and convenient 'side-by-side' installation or, by using wiring adapters, modules can be installed up to 300 metres apart.

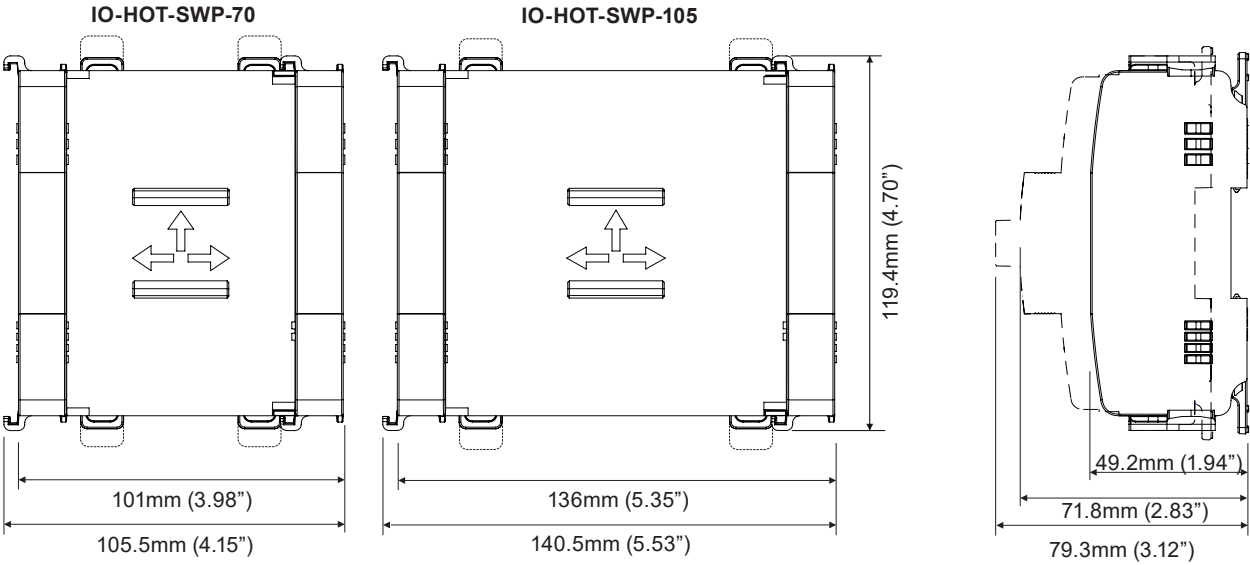
Features

- Secure T1L high-speed bus connection to controller
- Universal input/output, digital input, digital output variants
- Hand-off-auto option (on 8DO-HOA, 8UIO-HOA)
- Up to 300 I/O channels per controller (subject to licence)
- Up to 300 metres (1000 ft) between cable connected modules
- Powered from the controller's T1L bus separate PSU
- Two part I/O connectors for easy installation/commissioning
- Side-by-side or remote connection options
- DIN rail mounting, DIN 19 size 2 standard enclosure

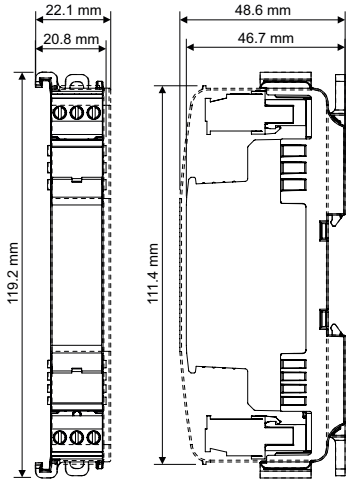
Physical



Physical (Continued)



IQ5-IO-ADPT

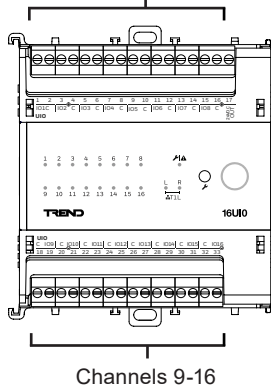


FUNCTIONALITY

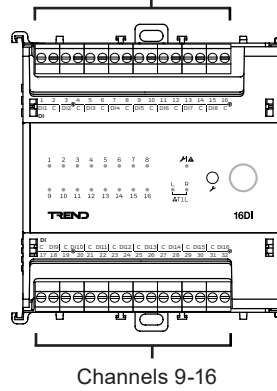
HARDWARE

The range of IQ5-IO Modules comprises the following variants:

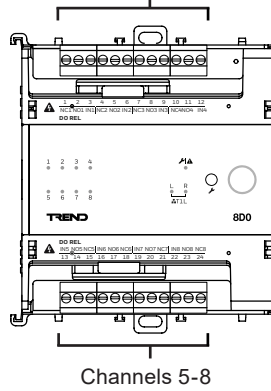
16UIO
16 Universal Inputs/Outputs
Channels 1-8



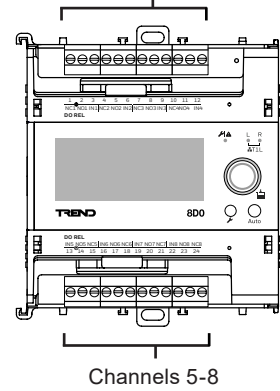
16DI
16 Digital Inputs
Channels 1-8



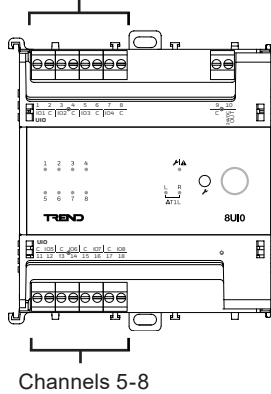
8DO
8 Digital/Relay Outputs
Channels 1-4



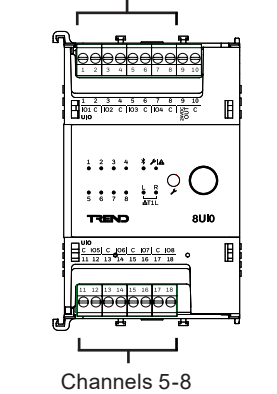
8DO-HOA
8 Digital/Relay Outputs, HOA
Channels 1-4



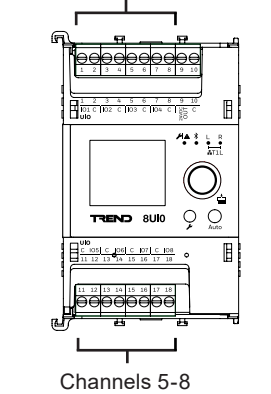
8UIO-105
8 Universal Inputs/Outputs
Channels 1-4



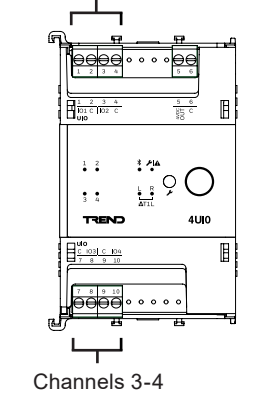
8UIO
8 Universal Inputs/Outputs
Channels 1-4



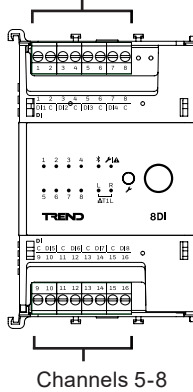
8UIO-HOA
8 Universal Inputs/Outputs, HOA
Channels 1-4



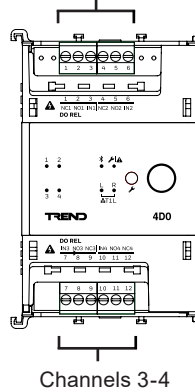
4UIO
4 Universal Inputs/Outputs
Channels 1-2



8DI
8 Digital Inputs
Channels 1-4



4DO
4 Digital/Relay Outputs
Channels 1-2



Note: All modules are shown with the terminal covers removed.

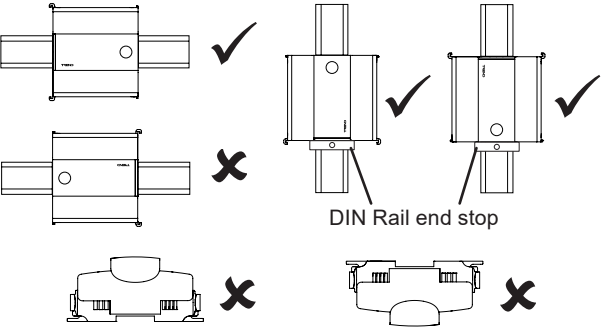
Enclosure

Each IQ5-IO Module is housed in a polycarbonate enclosure compatible with the DIN43880 and DIN 19 size 2 standard and with a complimentary styling to the IQ5 controller. The modules come in one of two widths – 70 mm or 105 mm – depending on the variant.

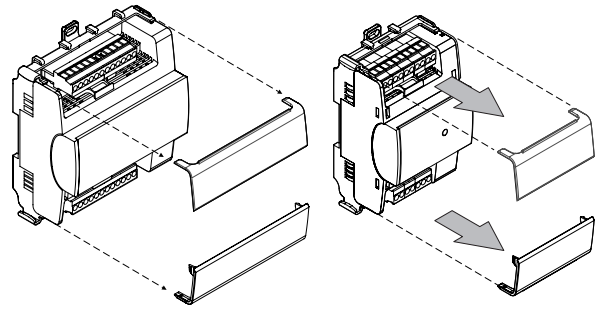
Integral clips on the back of the case enable the unit to be clipped on to (and released from) a standard TS35 DIN rail.

IQ5-IO Modules must be installed in a secondary enclosure with a minimum protective rating of IP20 (or equivalent) or mounted outside normal reach (e.g. in a plenum).

A module may be mounted horizontally or vertically but not upside down or on its back:



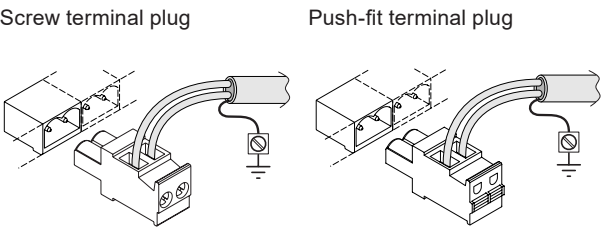
Removable clip-on polycarbonate covers provide access to the various onboard terminal connections.



Spare covers are available (see “Order Codes” on page 14)

Terminal Connectors

Connections for the various I/O channels are via two-part plugable screw terminal connectors which are supplied as standard with the modules and available in packs for spares. Optional connectors with push-fit terminals are also available (see “Order Codes” on page 14).

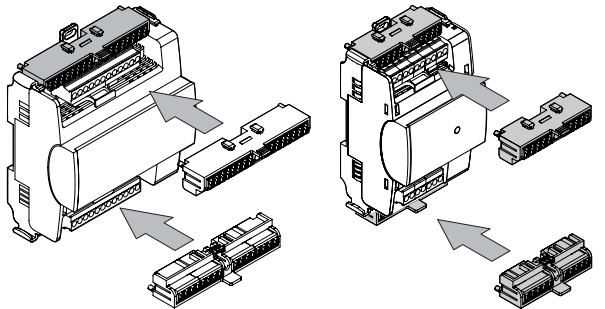


Function	Connector Type
Universal Input/Output (UIO)	2-way*
Digital Input (DI)	2-way
Digital/Relay Output (DO)	3-way

*On the 16UIO, input IO8 uses a 3-way connector with the extra terminal providing a connection to the 24 Vdc supply output.

Auxiliary Terminal Block

Optional terminal blocks are available that can be clipped on to an IQ5-IO module to provide additional common terminals. These can be used (for example) to provide multiple 24 Vdc connections from the single 24 Vdc terminal on UIO type modules, or to provide ground/earth connections for cable screens.



The AUX-TRM-16 has 16 push-fit terminals, configured as two common groups of 8 and suitable for all 105mm wide modules. The AUX-TRM-10 has 10 push-fit terminals, configured as two common groups of 5 and suitable for all 70mm wide modules. Both blocks can carry a maximum load of 12 A.

If more terminals are needed the connectors can be ‘double-stacked’.

Input/Output Channels

The following types of input and output channel are supported:

- Universal Input/Output (UIO)
- Digital Inputs (DI)
- Digital/Relay Output (DO)

Cable Screening

The use of screened cable for input and/or output connections is optional and not generally required unless the cable passes through electrically noisy environments.

If screened cable is used the screen must be connected to the local panel/enclosure ground and left unterminated at the far end.

Universal Input/Output (UIO)

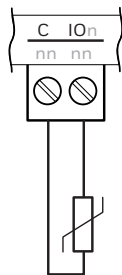
These channels will function in one of the following modes:

- thermistor input,
- voltage input,
- digital input,
- current input, or
- analogue output.

The input/output mode of each channel is set by the strategy configuration in the controller.

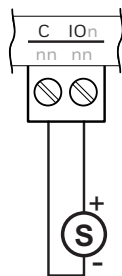
Thermistor input: Used for a thermistor (e.g. NTC (2K, 3K, 10K, 20K), PT100, PT1000, NI1000), potentiometer (0 to 300 k Ω) or fan speed control. The thermistor bridge resistor is 12 k Ω with a bridge supply 3.3 V.

Example wiring



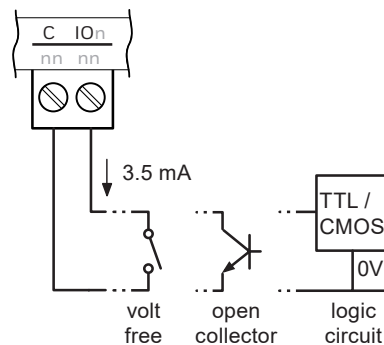
Voltage input: Used with a 0 to 10 Vdc or 2 to 10 Vdc source.

Example wiring



Digital input: Used for a volt free contact, logic circuit (e.g. TTL, CMOS), open collector (transistor), open drain (FET) or external voltage.

Example wiring



	volt-free input	external voltage
Input Inactive (OFF)	$\geq 3 \text{ k}\Omega$	$\geq 4 \text{ Vdc (max 40V)}$
Input Active (ON)	$\leq 500 \Omega$	$\leq 2 \text{ Vdc (min 0V)}$

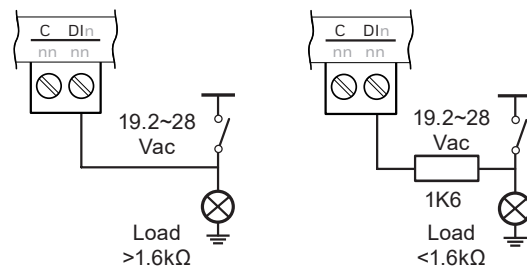
The input has a nominal wetting current of 3.5 mA.

Note: Voltage levels or resistances outside the values above may cause indeterminate operation.

The input can be configured for pulse count operation (maximum 100 Hz with 50% / 50% duty cycle, 5 ms ON / 5 ms OFF).

Digital inputs can also be used to monitor the state of a 24 Vac circuit (e.g. to determine if a relay or actuator is on or off).

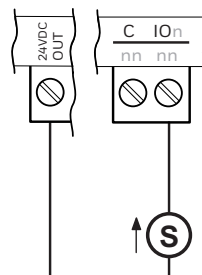
Example wiring



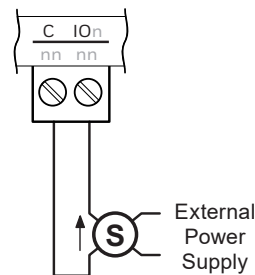
In the above example the input will be ON when the load is powered. If the load impedance is less than 1.6 k Ω (e.g. a filament lamp or relay coil) then a 1.6 k Ω resistor must be fitted in series with the input.

Current input: Used for 0 to 20 mA or 4 to 20 mA sources. May be either loop powered (from onboard 24VDC OUT terminal) or externally powered.

Example wiring - loop



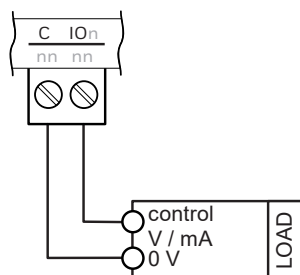
Example wiring - external



Note: The 24VDC OUT terminal can source up to 75 mA.

Analogue output: Provides a variable voltage output (0 to 10 Vdc, 1 to 10 Vdc or 2 to 10 Vdc, 0 to 20mA, 4 to 20mA)

Example wiring

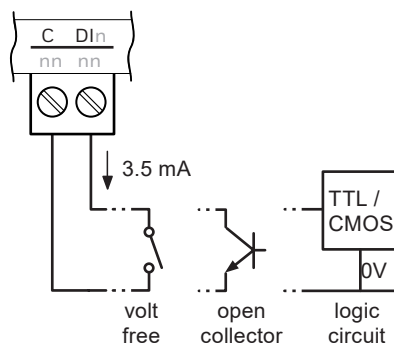


Digital Input (DI)

These channels are compatible with the following input devices:

- volt free contact (e.g. switch or relay),
- logic circuit (e.g. TTL, CMOS),
- open collector (transistor) or open drain (FET)
- external voltage.

Example wiring



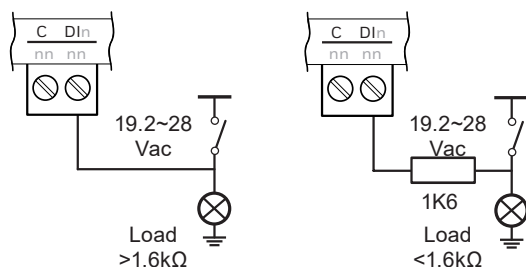
	volt-free input	external voltage
Input Inactive (OFF)	$\geq 3 \text{ k}\Omega$	$\geq 4 \text{ Vdc (max 40V)}$
Input Active (ON)	$\leq 500 \Omega$	$\leq 2 \text{ Vdc (min 0V)}$

The input has a nominal wetting current of 3.5 mA.

Note: Voltage levels or resistances outside the values above may cause indeterminate operation.

The input can be configured for pulse count operation maximum 100 Hz pulse width $\geq 5 \text{ ms}$ (both logic high and logic low). Digital inputs can also be used to monitor the state of a 24 Vac circuit (e.g. to determine if a relay or actuator is on or off).

Example wiring

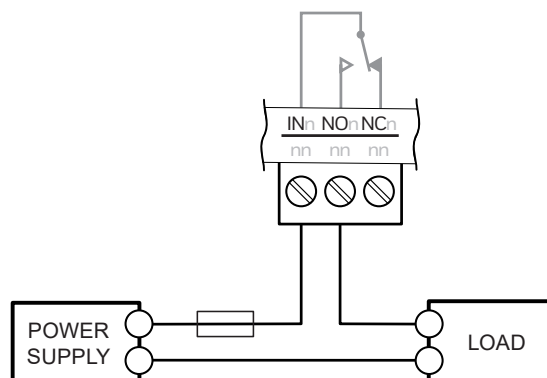


In the above example the input will be ON when the load is powered. If the load impedance is less than 1.6 kΩ (e.g. a filament lamp or relay coil) then a 1.6 kΩ resistor must be fitted in series with the input.

Digital/Relay Output (DO)

These channels provide a single pole dry contact changeover relay.

Example wiring

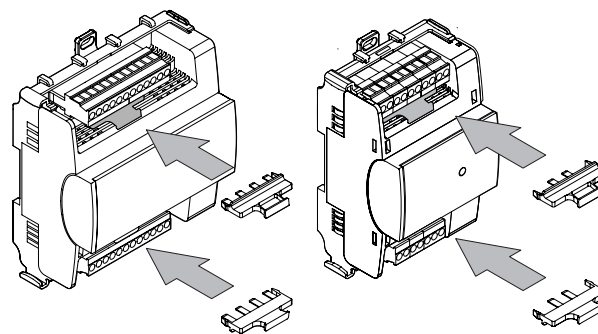


Ensure that external circuits are suitably protected against fault currents that would exceed the ratings for the switching circuits provided in this product.

The relay contacts close (i.e. NO makes with IN) when the output channel is ON.

Note: The relay on channel 5 on the 8DO and 8DO/HOA has a higher contact rating than the other channels. All relays on the 4DO-G variant have gold plated contacts suitable for switching low voltage/current. (see "Digital/Relay Outputs (DO)" on page 15 for further details).

An optional jumper can be inserted adjacent to the connectors which will link the IN terminals. The IO-JUMPER-4 can be used on the 8DO modules, enabling a common supply to be used on channels 1 to 4 or 5 to 8. The IO-JUMPER-2 can be used on the 4DO modules, enabling a common supply to be used on channels 1 and 2 or 3 and 4:



Jumpers are supplied with the modules and are also available as spares.

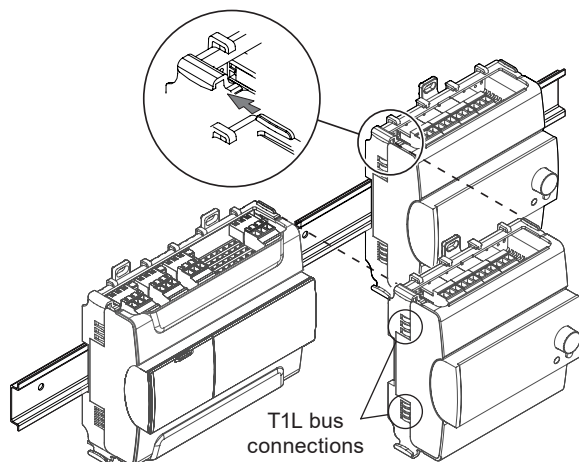
Note: If required, pins can be removed from the 4-way jumper to prevent a certain channel from being linked. For example, remove the pin from channel 4 position to only have channels 1, 2 and 3 linked.

Caution: Mains and low voltage must not be mixed within relay block 1 (ch.1-4 on 8DO, ch.1-2 on 4DO) or relay block 2 (ch.5-8 on 8DO, ch.3-4 on 4DO). If both mains and low voltages are to be switched, connect mains to block 1 and low voltage to block 2, or vice versa. If switching mains, all relays must switch the same phase and polarity. Arc suppression circuit (RC) recommended for inductive loads (see TG200208). UL rating applies up to 240 Vac (120 VA) maximum.

T1L Bus

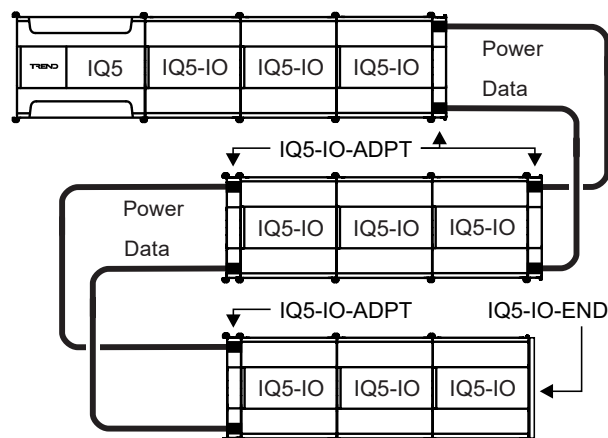
IQ5-IO modules interconnect with each other, other T1L devices (IQ5-LAN-ADPT), and the IQ5 controller via the T1L bus.

T1L devices can be slotted together, adjacent to the controller (or other T1L devices) with inter-device connections being made via integral spring connectors.



Note: T1L devices can easily be removed without disturbing adjacent devices.

Alternatively, IQ5-IO modules and other T1L devices can also be mounted remotely from the controller (or from neighbouring T1L devices) and connected to the T1L bus by using IQ5-IO-ADPT wiring adapters and suitable cable.



Note: The IQ5-IO-ADPT wiring adapter includes a self-resetting fuse and transient voltage suppression that protects the T1L bus from over-current and over-voltage conditions caused by electrical transients or incorrect wiring. No protection is provided against accidental connection of mains voltages.

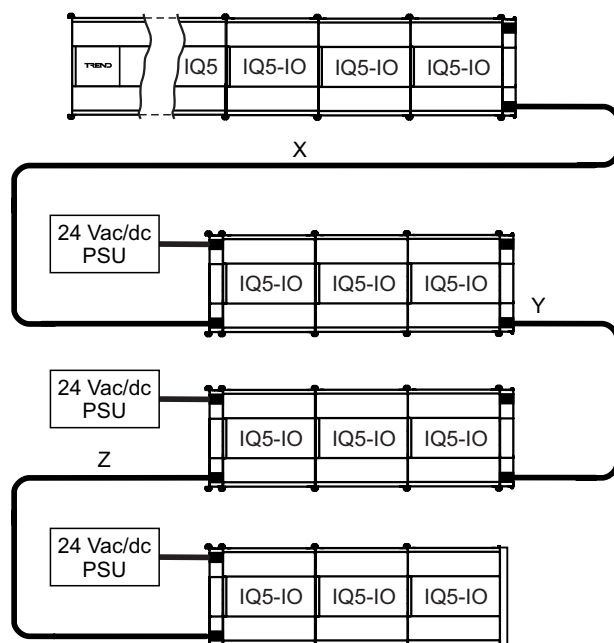
Cabling between devices on the T1L bus may be wired from right to left side, right to right or left to left, as long as correct bus polarity is maintained. Spurs are not permitted.

A cover plate (IQ5-IO-END) must be fitted to the last T1L device on the bus, to protect the exposed bus connectors.

Note: A cover is supplied with each IQ5 controller which can be used for this purpose. A pack of spare covers is also available.

Maximum T1L Bus Length

When designing a system with remote IO you need to be aware that separately powered panels with T1L devices may be switched off and hence the distance between T1L devices may now be X + Y or even X + Y + Z. For this reason, we recommend the distance between panels of IO be no more than the 1/3 of the distance (10 devices off) shown in the table.



The table below identifies cables that have been tested and the distances which can be achieved between active devices assuming up to 10 offline devices are between them.

Cable	Typical Uses	Cable Characteristics	Max Distance (between working nodes)	Max Distance (10 devices off)	Recommended $\frac{1}{3}$ Distance (10 devices off)
74040NH – Belden	T1L- Long distance harsh environments	2 core solid 18AWG,SF/ UTP Shielded and foil, unshielded twisted pair.	1000m	900m	300m
8471 – Belden	LON	2 core stranded/tinned 16AWG, unshielded cable.	560m	504m	168m
9841 – Belden TP/1/1/24/200/HF-600V	MSTP (Serial)	2 core stranded/tinned 24AWG, Foil shield & drain wire, twisted pair.	400m	360m	200m
8723NH – Belden TP/2/2/22/200/HF-600V	Trend 4 wire LAN	4 core, 2 pairs, stranded/ tinned, 22AWG, Foil shield & drain wire, twisted pairs.	160m	144m	48m
8761NH – Belden TP/1/1/22/200/HF-600V	Trend 2 wire LAN	2 core stranded/tinned, 22 AWG, Foil shield & drain wire, twisted pairs.	320m	288m	96m
5501UE 0081000 – Belden/BAV	Security, speaker, PA, & telephone systems	3 core stranded bare copper, 22 AWG, no shield or twist.	600m	540m	180m
82836 – Helukabel	Profibus - Industrial Ethernet	2 core solid, 18AWG Foil + braided screen twisted pair.	800m	720m	240m
3076F – Belden	Harsh environment digital and serial two way communication	2 core solid 18AWG, Shielded and foil, unshielded twisted pairs.	428m	385m	128m
Helukabel J-Y(ST)YLG	Telecommunications & Fire Alarm Cable (Fire Warning Cable)	Multicore solid bare copper, 20AWG (0.8mm), foil wrapped.	320m	288m	96m
Cat5/Cat6	Standard wired IT network cable	8 core, 4 pairs, solid bare copper, 23AWG, twisted pairs.	720m	648m	217m

Power Supply

IQ5-IO modules and other T1L devices can typically be powered from the controller via the T1L bus supply. This supply is derived from the controller's 24 Vac/dc supply and, therefore, the maximum current available to the T1L bus depends upon other current demands placed on the controller.

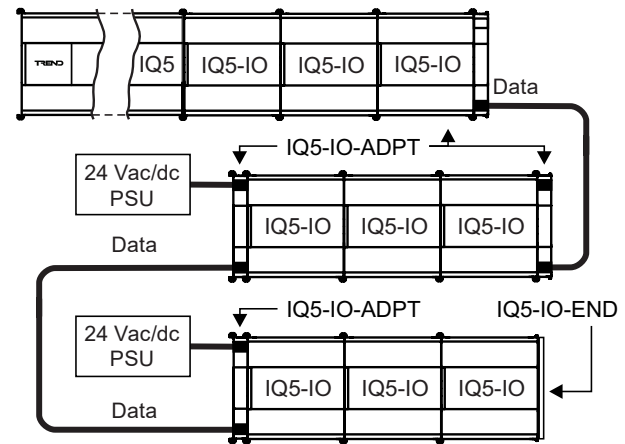
The maximum current required by each type of IQ5-IO module is listed in the table below – these values can be used to estimate the total current required by the T1L bus:

Module	Input/Outputs Status	Maximum Current Consumption from All Channels including the IO Module			
		Current (Max)		Power (Max)	
		24 Vac (A)	24 Vdc (A)	24 Vac (VA)	24 Vdc (W)
16UIO	All channels AO/DO (max 10V and 20mA)	1	0.5	24	12
	All channels AI (Thermistor/ Voltage sensor/ Current sensor)	0.76	0.34	18.3	8.2
	All channels DI - Inputs ON	0.76	0.34	18.3	8.2
8UIO-105 8UIO 8UIO-HOA	All channels AO/DO (max 10V and 20mA)	0.72	0.34	17.3	8.2
	All channels AI (Thermistor/ Voltage sensor/ Current sensor)	0.6	0.26	14.4	6.2
	All channels DI - Inputs ON	0.6	0.26	14.4	6.2
4UIO	All channels AO/DO (max 10V and 20mA)	0.58	0.26	14	6.2
	All channels AI (Thermistor/ Voltage sensor/ Current sensor)	0.52	0.22	12.5	5.3
	All channels DI - Inputs ON	0.52	0.22	12.5	5.3
16DI	All inputs ON	0.38	0.12	9.2	3
8DI	All inputs ON	0.215	0.085	5.2	2
8DO 8DO-HOA	All outputs ON	0.33	0.12	8	3
4DO	All outputs ON	0.235	0.08	5.6	2

For details of the power consumption of other T1L devices see the appropriate data sheet.

Where the total current requirement of the T1L bus exceeds the maximum available from the controller, one or more additional 24 Vac/dc power supplies may be installed. Additional supplies may also be required in the following circumstances:

- at the end of a long T1L bus cable run, to prevent voltage drop on the bus supply (minimum 19V supply required),
- where the current flow through the power line of any one T1L device would exceed the maximum of 2 A, thus requiring the T1L bus power line to be split or segmented.



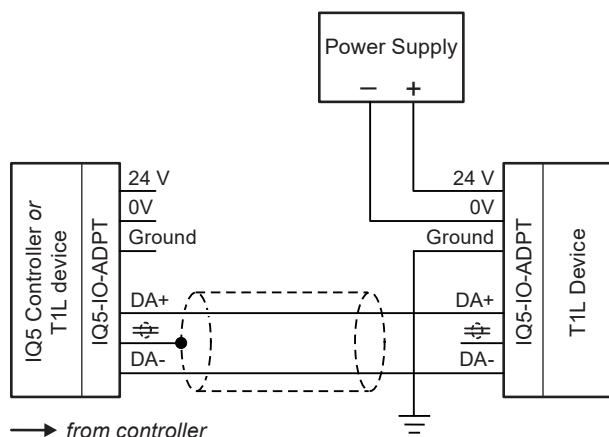
Additional Power Supplies

Important: Not permitted for UL compliant installations.

Where it is necessary to install an additional power supply along the T1L bus, the supply output must be isolated from earth (ground). The supply unit must also comply with the relevant EMC and safety standards.

Note: Trend offer a range of DIN rail mounted auxiliary power supplies that are suitable for this purpose.

The I/O wiring adapter (IQ5-IO-ADPT) is used to make the connection of external power supply units to the T1L bus as shown below:



Important: The 24 Vdc connection from the previous T1L device must not be made. The 0 V connection must be made when an external supply is used and the 0 V line must be continuous for the entire length of the T1L bus.

Earthing/Grounding Arrangements

It is important that correct earthing/grounding is provided for the controller and devices on the T1L bus.

The T1L bus ground is connected to earth/ground via the controller. T1L devices located within the same secondary enclosure are earthed/grounded via the T1L bus ground connection.

Where T1L devices are located in different secondary enclosures or where T1L bus cables exceed 1 m (39"), a local earth/ground connection must be provided. For further details refer to the IQ5-IO Modules Installation Instructions - Mounting (TG201484).

All DIN rails must be earthed/grounded.

I/O Module Addressing

Each I/O module (IQ5-IO or IQ3/4 I/O module) or T1L device must be assigned a unique address between 1 and 284.

Note: If a mix of IQ5-IO (or other T1L devices) and IQ3/4 I/O modules is used, it is recommended that the IQ5-IO and T1L devices use address range 31 to 284, with 1 to 30 being reserved for IQ3/4 I/O modules.

The controller will automatically attempt to match each physical I/O module or T1L device with its corresponding strategy I/O module and set its address accordingly.

Addresses can be configured within the controller strategy, or manually changed using IQ®SET or the controller's web page interface. Refer to the IQ5 Configuration Manual (TE201486) for further details on addressing.

Indicators

Various indicators are provided to give user feedback on the operational status of the module and its inputs/outputs.

General Indicators (all variants):

Indicator	Colour	Function
	Green Amber Red	Device status. Green indicates normal operation. Amber or Red indicates an issue that needs resolving.
	Green Yellow	Service status. Normally OFF.
	Green Red	Status of the T1L bus connected to the left (L) or right (R) side of the module.

Input/Output Indicators (depending on module type):

Indicator	Colour	Function
1 - 16 (16UIO) 1 - 8 (8UIO) 1 - 4 (4UIO)	Green	State of associated universal input/output: unlit = OFF, fully lit = ON.
1 - 16 (16DI) 1 - 8 (8DI)	Green	State of associated digital input: unlit = OFF, lit = ON.
1 - 8 (8DO) 1 - 4 (4DO)	Green	State of associated digital output: unlit = OFF (IN connected to NC), lit = ON (IN connected to NO).

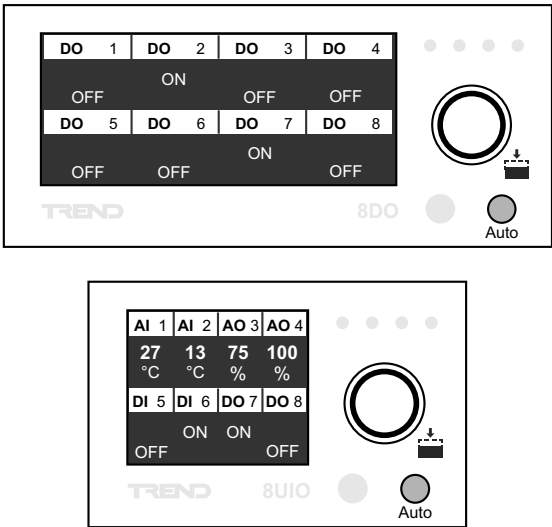
Service Button

This is a multi-function button located on the front of the module and can be used to:

- assign an unaddressed module to a strategy module (or next available bus address if a strategy module does not exist),
- display the module's address by flashing the T1L bus indicator, or
- perform a module reset.

Hand-Off-Auto (HOA) Control

The HOA variants have a rotary/push-button control and a back-lit LCD screen shows the current state of each channel.



The modules can operate in one of two modes:

- Online
- Offline

Online mode

The Online configuration requires the module to be connected to an IQ5. When in this mode rotary/push-button control allows the normal channel operation (Auto Mode) to be manually overridden.

While in Manual Mode, the rotary control can be used to select a particular output channel and change/override its current state.

Pressing the **Auto** button returns outputs to Auto Mode (short press for selected output, long press for all outputs). In Auto Mode the outputs behave as follows:

Connected to Controller?	Strategy Defined?	DO Output	AO Output
Yes	Yes	set by strategy	set by strategy
Yes	No	OFF	0%
No	–	OFF	0%

Important: All outputs on a new (factory-set) module will power up in Auto Mode. Outputs of a previously used module power up in the mode selected when the module was powered down.

Warning: Manual operation of the HOA module does not provide a safe environment for working on electrical equipment, and must not be used as a substitute for appropriate lockout-tagout procedures during maintenance operations.

The language of the display is set to be the same as the controller’s language.

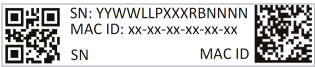
Offline mode

Offline configuration enables the outputs to be driven for pre-commissioning. It does not require the IQ5-IO module to be connected to an IQ5. When in this mode rotary/push-button control allows the channel type/value to be manually specified.

The language of the display is set when the module is switched on for the first time.

Labelling

Two removable self-adhesive labels detailing the module’s serial number (SN) and its T1L MAC address (MAC ID) are supplied which can adhered to plant room panels, cabinets or schematic plans as required:



The serial number is also provided as a QR code, and the MAC ID is provided as a Data Matrix (2D barcode) such that both can be read using a suitable hand-held scanner.

A non-removable label containing both of these codes is fixed to the front panel of the module.

FIRMWARE

The firmware in each IQ5-IO module controls its basic functionality.

New versions of firmware may be made available from time to time to change or add functionality or to provide support for new products.

New firmware will be installed as part of an upgrade to the IQ5 controller. Once the controller has been upgraded it will automatically update the firmware of any attached IQ5-IO modules using the T1L bus.

HOT SWAP BASE

The optional hot swap base is available for both 105 mm and 70 mm T1L devices. It enables T1L devices to be replaced without affecting other devices on the T1L bus, and helps maintain the functionality of other T1L devices should the connected T1L device fail.

Note: When a module is removed from the hot swap base, there will be a communication delay of a few seconds (1 -6 s) between the IQ5 and downstream T1L devices modules while the T1L network is rebuilt.

FIELD MAINTENANCE

The IQ5-IO Modules require no routine maintenance.



WARNING: Contains no serviceable parts. Do not attempt to open the unit. Failure to comply may cause damage to the unit.

DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulations 2002) ASSESSMENT FOR DISPOSAL OF .

RECYCLING

All plastic and metal parts are recyclable. The printed circuit board may be sent to any PCB recovery contractor to recover some of the components for any metals such as gold and silver.



WEEE Directive:

At the end of their useful life the packaging, and product, and battery (if fitted) should be disposed of by a suitable recycling centre.

Do not dispose of with normal household waste.
Do not burn.

COMPATIBILITY

Controllers: IQ500 and IQ528

To ensure compatibility and follow cyber security best practices, when installing an IQ5 controller or adding / replacing IQ5-IO Modules on an existing controller, always ensure that the IQ5 is running the latest version of firmware available from PNet. (<https://partners.trendcontrols.com>).

INSTALLATION

The IQ5-IO Modules are designed to be clipped on to a standard TS35 DIN rail or be screwed directly to a flat surface. They must be installed inside an enclosure rated to at least IP20 (or equivalent) or mounted outside normal reach (e.g. in a plenum). The modules are UL rated as 'UL60730 listed open energy management equipment'. The installation procedure involves:

Mounting the IQ5-IO module(s) in position
Connecting the T1L bus to remote modules (if required)
Connecting additional PSUs (if required)
Connecting universal inputs/outputs (UIO modules only)
Connecting digital inputs (DI modules only)

Connecting relay outputs (DO modules only)
Isolating all I/O connections
Downloading strategy to controller
Reconnecting all inputs and checking operation
Reconnecting all outputs and checking operation

A full description of installing the IQ5-IO modules is given in the IQ5-IO Modules Installation Instructions - Mounting (TG201484) and IQ5, IQ5-IO Installation Instructions - Configuring (TG201483).

ORDER CODES

IQ5-IO-16UIO	IQ5-IO Module with 16 universal input/output channels
IQ5-IO-8UIO-105	IQ5-IO Module with 8 universal input/output channels (105mm wide enclosure)
IQ5-IO-8UIO	IQ5-IO Module with 8 universal input/output channels (70mm wide enclosure)
IQ5-IO-8UIO-HOA	IQ5-IO Module with 8 universal input/output channels with LCD and hand-off-auto controls
IQ5-IO-4UIO	IQ5-IO Module with 4 universal input/output channels
IQ5-IO-16DI	IQ5-IO Module with 16 digital input channels
IQ5-IO-8DI	IQ5-IO Module with 8 digital input channels
IQ5-IO-8DO	IQ5-IO Module with 8 digital/relay output channels
IQ5-IO-8DO-HOA	IQ5-IO Module with 8 digital/relay output channels with LCD and hand-off-auto controls
IQ5-IO-4DO	IQ5-IO Module with 4 digital/relay output channels
IQ5-IO-4DO-G	IQ5-IO Module with 4 digital/relay output channels with gold plated relay contacts

ACCESSORIES

IQ5-IO-ADPT-2	Pack of 2 wiring adapters (for IQ5 controller and IQ5-IO modules)
IQ5-IO-END-10	Pack of 10 spare end covers (for IQ5 controller and IQ5-IO modules)
IQ5-TCVR-105-10	Pack of 10 spare 105mm terminal covers (for 105 mm IQ5-IO modules)
IQ5-TCVR-70-10	Pack of 10 spare 70mm terminal covers (for 70 mm IQ5-IO modules)
DIN-CLIP-10	Spare DIN Clip (pack of 10)
AUX-TRM-16-10	Auxiliary Terminal Block 16-way (pack of 10)
AUX-TRM-10-10	Auxiliary Terminal Block 10-way (pack of 10)
IO-JUMPER-4-10	4 Pin Relay Output Jumper (pack of 10)
IO-JUMPER-2-10	2 Pin Relay Output Jumper (pack of 10)
SCRW-TB-3-BLK-50	3-Way Screw Terminal Plug Black (Pack of 50)
SCRW-TB-3-GRY-50	3-Way Screw Terminal Plug Grey (Pack of 50)
SCRW-TB-2-PUR-50	2-Way Screw Terminal Plug Purple (Pack of 50)
SCRW-TB-3-PUR-50	3-Way Screw Terminal Plug Purple (Pack of 50)
SCRW-TB-2-BLK-50	2-Way Screw Terminal Plug Black (Pack of 50)
SCRW-TB-2-YEL-50	2-Way Screw Terminal Plug Yellow (Pack of 50)
SCRW-TB-R-3-ORN-50	3-Way Screw Line Voltage Terminal Plug Orange (Pack of 50)
PUSH-TB-3-BLK-50	3-Way Push Terminal Plug Black (Pack of 50)
PUSH-TB-3-GRY-50	3-Way Push Terminal Plug Grey (Pack of 50)
PUSH-TB-2-PUR-50	2-Way Push Terminal Plug Purple (Pack of 50)
PUSH-TB-3-PUR-50	3-Way Push Terminal Plug Purple (Pack of 50)
PUSH-TB-2-BLK-50	2-Way Push Terminal Plug Black (Pack of 50)
PUSH-TB-2-YEL-50	2-Way Push Terminal Plug Yellow (Pack of 50)
PUSH-TB-R-3-ORN-50	3-Way Push Line Voltage Terminal Plug Orange (Pack of 50)

Note: Spare connectors are not pre-marked with terminal numbers.

IO-HOT-SWP-105-10	Pack of 10 hot swap bases (105mm) for use with 105mm T1L devices
IO-HOT-SWP-70-10	Pack of 10 hot swap bases (70mm) for use with 70mm T1L devices

SPECIFICATION

IQ5-IO MODULES

Electrical

Supply Voltage	24 Vac/dc $\pm 20\%$, derived from T1L bus on IQ5 controller or optional external isolated output power source.
Supply Current	dependant on module type and input/output usage (see page 9). Maximum current flow through device on T1L bus = 2 A.

T1L Bus

Transmission Compatibility	10BASE-T1L (IEEE802.3cg). IQ5-IO modules, IQ5 Controller, IQ5-LAN-ADPT
Protocol	MQTT compatible.
Maximum T1L devices	64
Bus Supply	As per main power input.
Data Cable Type	Screened twisted pair. (requires IQ5-10-ADPT wiring adapters)
Cable Length	See - 'Maximum T1L Bus Length' on page 8.

Inputs/Outputs

Universal Input/Output (UIO)

Function	Measuring voltage, current, thermistor or digital input, or provide analogue control output (function set by strategy).
Input Noise Rejection	Minimum 60 dB series mode rejection at input power supply frequency.
Analogue Resolution	
Input modes	16 bit (65,536 steps)
Output modes	13 bit (5019 steps)
Voltage Input	
Input range	0 to 10 Vdc, 2 to 10 Vdc.
Input resistance	9.4 k Ω .
Accuracy	$\pm 0.5\%$ of full scale range (50 mV).
Current Input	
Input range	0 to 10 mA, 4 to 10 mA, 0 to 20 mA,
Input resistance	120 Ω .
Accuracy	$\pm 0.5\%$ of full scale range (100 μ A).
Thermistor Input	
Input range	0 to 1 M Ω .
Accuracy	0 to 80 Ω = 0.5% ± 0.5 Ω ; 80 to 200 Ω = 0.3%; 200 to 10 k Ω = 0.2%; 10 k Ω to 20 k Ω = 0.3%; 20 k Ω to 100 k Ω = 0.8%; 100 k Ω to 200 k Ω = 1%; 200 k Ω to 1 M Ω = 8%.
Bridge resistor	12.2 k Ω .
Bridge supply	3.3 V.
Digital Input	
Volt-free input	
Wetting current	3.5 mA (typical)
ON state	≤ 500 Ω .
OFF state	≥ 3 k Ω (or open circuit)
AC voltage	0 to 28 Vac
ON state	19.2 ~ 28 Vac with frequency 50~60Hz.
OFF state	0 ~ 1.4 Vac.
DC voltage	0 to 40 Vdc,
ON state	0 to 2 Vdc.
OFF state	4 to 40 Vdc.
Pulse rate	100 Hz max. Pulse width ≥ 5 ms (both logic high and logic low).
Analogue Output	
Range	0 to 10 Vdc, 1 to 10 Vdc, 2 to 10 Vdc, 0 to 20mA, 4 to 20mA
Current	0 to 20 mA, 4 to 20 mA.
Accuracy	$\pm 0.5\%$ of span (50 mV).

Digital Inputs (DI)

Function	On/off state (or pulse count) to strategy from volt free contact, logic circuit (e.g. TTL, CMOS), open collector (transistor) or open drain (FET), or 24 Vac input.
Volt-free input	
Wetting current	3.5 mA (typical)
ON state	≤ 500 Ω .
OFF state	≥ 3 k Ω (or open circuit)
AC voltage	0 to 28 Vac
ON state	19.2 ~ 28 Vac with frequency 50~60Hz.
OFF state	0 ~ 1.4 Vac.
DC voltage	0 to 40 Vdc,
ON state	0 to 2 Vdc.
OFF state	4 to 40 Vdc.
Pulse rate	100 Hz max. Pulse width ≥ 5 ms (both logic high and logic low).

Digital/Relay Outputs (DO)

Function	Single pole changeover control from strategy for general purpose use.
Contact Rating	

Module Type		8DO		4DO		4DO-G	
Channel Number		1-4, 6-8	5	1,2,4	3	1,2,4	3
Voltage	Vac	19 to 250		19 to 250		19 to 250	
	Vdc	12 to 30		12 to 30		2 to 30	
Current	resistive	5 A	10 A	5 A	10A	5 A	10A
	inductive	3 A	6 A	3 A	6 A	3 A	6 A
	inrush (max)	7.5A	15 A	7.5 A	15A	7.5 A	15 A
	minimum	10 mA		10 mA		2 Vdc @ 2.5 mA	

Maximum Total Load 12 A (across all channels).

Minimum Cable Size 1.5mm² (16 AWG).

Caution: Mains and low voltage must not be mixed within relay block 1 (ch.1-4 on 8DO, ch.1-2 on 4DO) or relay block 2 (ch.5-8 on 8DO, ch.3-4 on 4DO). If both mains and low voltages are to be switched, connect mains to block 1 and low voltage to block 2, or vice versa. If switching mains, all relays must switch the same phase and polarity. Arc suppression circuit (RC) recommended for inductive loads (see TG200208). UL rating applies up to 240 Vac (120 VA) maximum.

Controls

All variants	
Service Button	Momentary action push-release.
HOA variants	
Control	Rotary/push-button.
Display	Backlit monochrome LCD panel.

Mechanical

Dimensions (overall WxHxD)	
105 mm modules	109.5 x 131 x 60 mm (4.31 x 5.16 x 2.36").
HOA modules	109.5 x 131 x 67.5 mm (4.31 x 5.16 x 2.66").
70 mm modules	74.5 x 131 x 60 mm (2.93 x 5.16 x 2.36").
HOA modules	74.5 x 131 x 67.5 mm (2.93 x 5.16 x 2.66").
Material (enclosure)	Flame Retardant Polycarbonate.
Weight	
16UIO	0.344 kg (0.76 lb);
8UIO-105	0.306 kg (0.68 lb);
16DI	0.336 kg (0.74 lb);
8DO	0.363 kg (0.80 lb);
8DO-HOA	0.382 kg (0.84 lb);
8UIO	0.225 kg (0.5 lb);
8UIO-HOA	0.245 kg (0.54 lb);
4UIO	0.219 kg (0.48 lb);
8DI	0.207 kg (0.45 lb);
4DO	0.215 kg (0.47 lb);
Mounting (DIN Rail)	IEC/EN 60715 TH35x7.5 or TH35x15 (1.5 mm maximum thickness).

Connectors

T1L Bus	Integral spring contacts for inter-device connection. IQ5-IO-ADPT wiring adapter required for cable connection.
Inputs/Outputs	2 part connectors (5 mm pitch) with rising cage clamp screw terminals.
Cable size	0.2 to 2.5 mm ² (24 to 12 AWG). <i>For UL compliance the input power connections must be made using 18 AWG or larger wire rated at least 90°C (194°F).</i>

Environmental

This device is suitable for indoor use only.

Approvals and Certifications

- UL 60730-1, Standard for Automatic Electric Controls for Household and Similar Use, Part 1: General Requirements;
- UL 60730-2-9;
- CAN/CSA-E60730-1:13, Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements;
- CAN/CSA-E60730-2-9;
- CAN ICES-3 (B)/NMB-3(B);
- Complementary listing for UL916, CSA C22.2 No. 205;
- SASO-approved;
- CE-approved;
- FCC part 15B and 15C;
- RSS-247 Issue 3;
- RSS-Gen Issue 5.

Note: To maintain compliance with the RF exposure requirement, a separation distance of 20 cm between the device and the human should be maintained.

Classification According to EN60730-1 and UL60730-1

Environmental conditions	Equipment intended for use in industrial environments.
Construction	Independently mounted electronic control unit with fixed wiring; panel-mounted on DIN rail.
Action	type 1.B.
Rated impulse voltage	24 V circuits: 330 V; Relay outputs (DO): 2500 Vac.
Pollution degree	2.
Protection against shock	Class 0 (without terminal covers); Class II (with terminal covers).
Software class	A.

Energy Performance of Buildings

EN ISO 52120-1	This controller, when used as part of a complete Trend Controls system AND when programmed with an appropriate application/strategy can support compliance with EN ISO 52120-1. This enables buildings to achieve up to 30% energy cost savings (Energy classification "A") alongside maximizing comfort and well being.
EN12098-1	This control equipment complies with the performance specification defined in EN12098-1. With an appropriate application/strategy it can make use of operation modes, scheduling, optimum start/stop, outside air temperature and frost protection to enhance the energy performance of buildings.

Please send any comments about this or any other Trend technical publication to techpubs@trendcontrols.com

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Ambient Environmental Limits

Humidity	5 to 95%RH non-condensing.
Temperature	
Storage	-40 to +70°C (-40 to +158°F).
Operating	
HOA modules	-20 to +65.5°C (-4 to +150°F).
All other items	-40 to +65.5°C (-40 to +150°F).

Note: For temperatures below 0°C (32°F) special care must be taken that there is no condensation on or within the unit.

Altitude	≤4000 m (13124 ft).
Pollution Degree	2 (only non-conducting pollution occurs).
Protection	IP20 if mounted in an enclosure rated at IP20 or equivalent.

HOT SWAP BASES**Mechanical**

Dimensions (overall WxHxD)	
105 mm base	140.5 x 130 x 49.2 mm (5.53 x 5.12 x 1.94").
70 mm base	105.5 x 130 x 49.2 mm (4.15 x 5.12 x 1.94").
Depth with module	70.5mm (2.77")
Depth with HOA module	78.25mm (3.08")
Material	Flame Retardant Polycarbonate.
Weight	
105 mm base	190g (6.7oz);
70 mm base	160g (5.6oz);
Mounting (DIN Rail)	IEC/EN 60715 TH35x7.5 or TH35x15 (1.5 mm maximum thickness).

Environmental

This device is suitable for indoor use only.

Approvals and Certifications

- UL 60730-1, Standard for Automatic Electric Controls for Household and Similar Use, Part 1: General Requirements;

Ambient Environmental Limits

Humidity	5 to 95%RH non-condensing.
Temperature	
Storage	-40 to +70°C (-40 to +158°F).
Operating	
Non-HOA SKUs	-40 to 65.5 C (-40 to 150 F)
HOA SKUs	-20 to 65.5 C (-4 to 150 F).
Altitude	≤4000 m (13124 ft).
Protection	IP20

IQ5-IO-ADPT**Mechanical**

Dimensions (overall WxHxD)	
IQ5-IO-ADPT	20.8 x 119.2 x 46.6mm (0.82 x 4.69 x 1.83").
Withend cover	22.1 x 130 x 48.6 mm (0.87 x 5.12 x 1.91").
Depth with module	70.5mm (2.77")
Depth with HOA module	78.25mm (3.08")
Material	Flame Retardant Polycarbonate.
Weight	70g (0.15 lb)
Mounting (DIN Rail)	IEC/EN 60715 TH35x7.5 or TH35x15 (1.5 mm maximum thickness).

