Data Sheet

IQ41x Series Controllers

IQ41x Series Controllers

Description

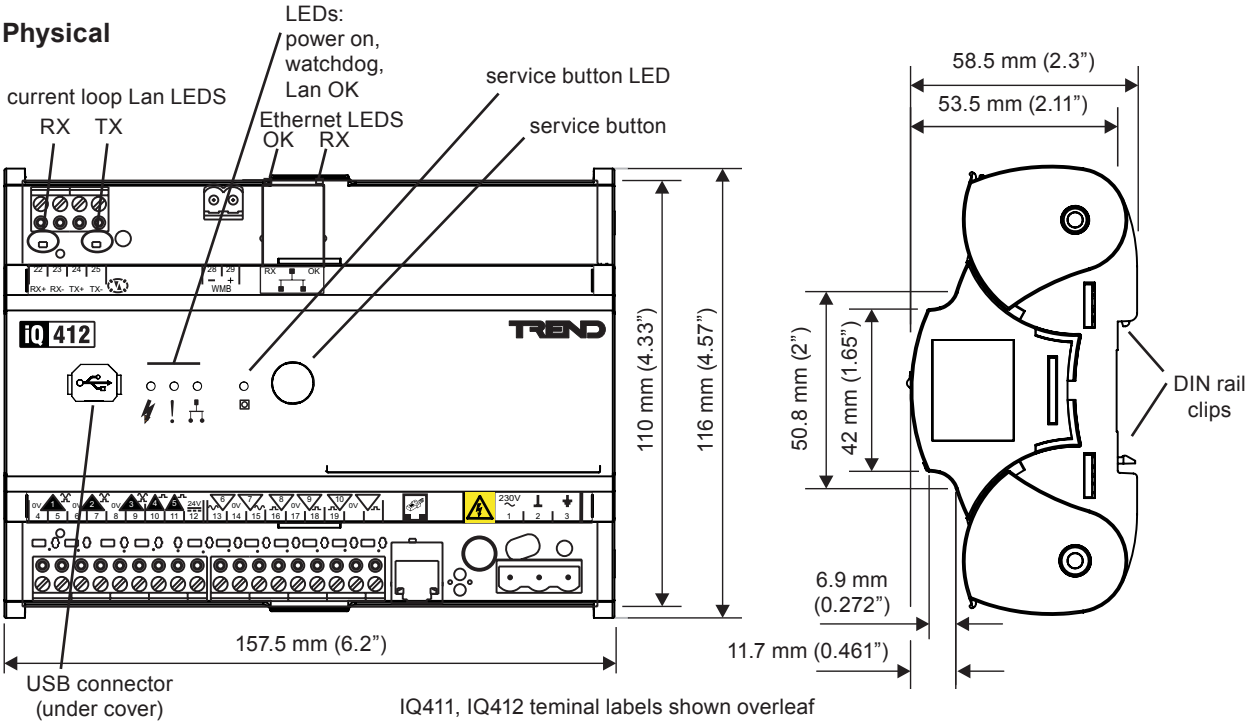
The IQ41x series of intelligent controllers are designed for use as unitary controllers in building control systems. Full compatibility with other Trend IQ controllers enables the IQ41x to integrate the local environmental needs with the bulk air conditioning system in order to optimise both comfort and running costs. The controllers have 5 inputs and 6 outputs. The IQ411 has 6 solid state digital outputs, and the IQ412 has 4 solid state digital outputs and two 0 to 10 V outputs.

The IQ41x series use Ethernet and TCP/IP networking technologies with embedded XML. Trend current loop Lan, and BACnet over IP communications are available as options.

Features

- 230 Vac or 24 Vac input power supply options
- Ethernet 10/100 Mbps main network with TCP/IP protocol
- Embedded XML Web Services as standard
- Trend current loop Lan option
- BACnet over IP option
- Small footprint with DIN rail mounting
- RS232 and USB local supervisor ports
- Features to replace IQ211, IQ212, and IQ7x Series controllers
- Retrofit mounting plate and cable extender accessories
- DIN43880 standard enclosure

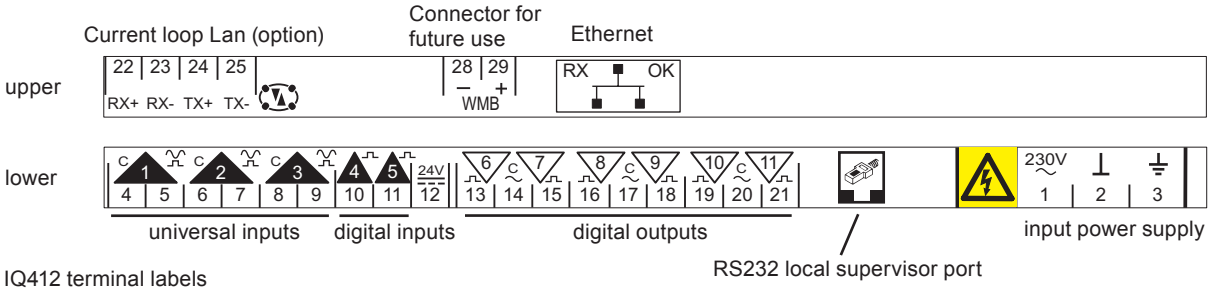
Physical



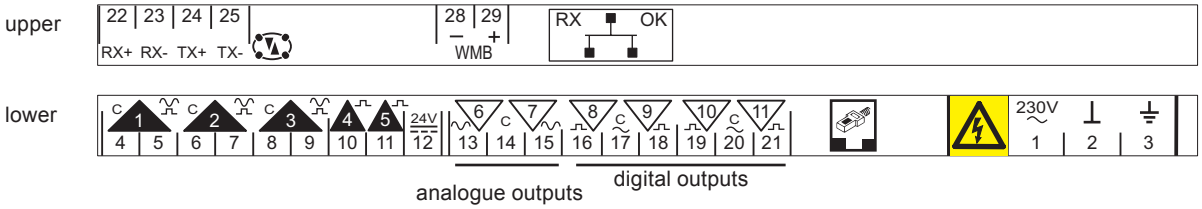
IQ411, IQ412 teminal labels shown overleaf

Physical (continued)

IQ411 terminal labels

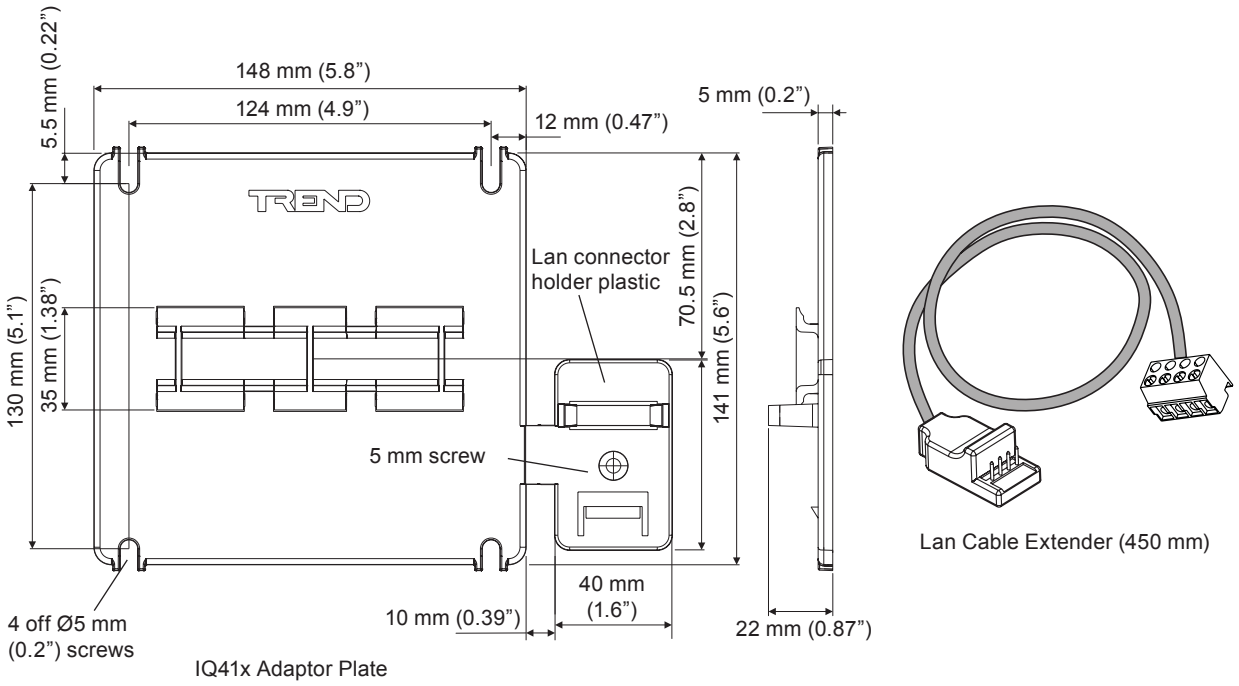


IQ412 terminal labels



Note that the IQ412 differs from the IQ411 only in the output types available

Retrofit Accessories



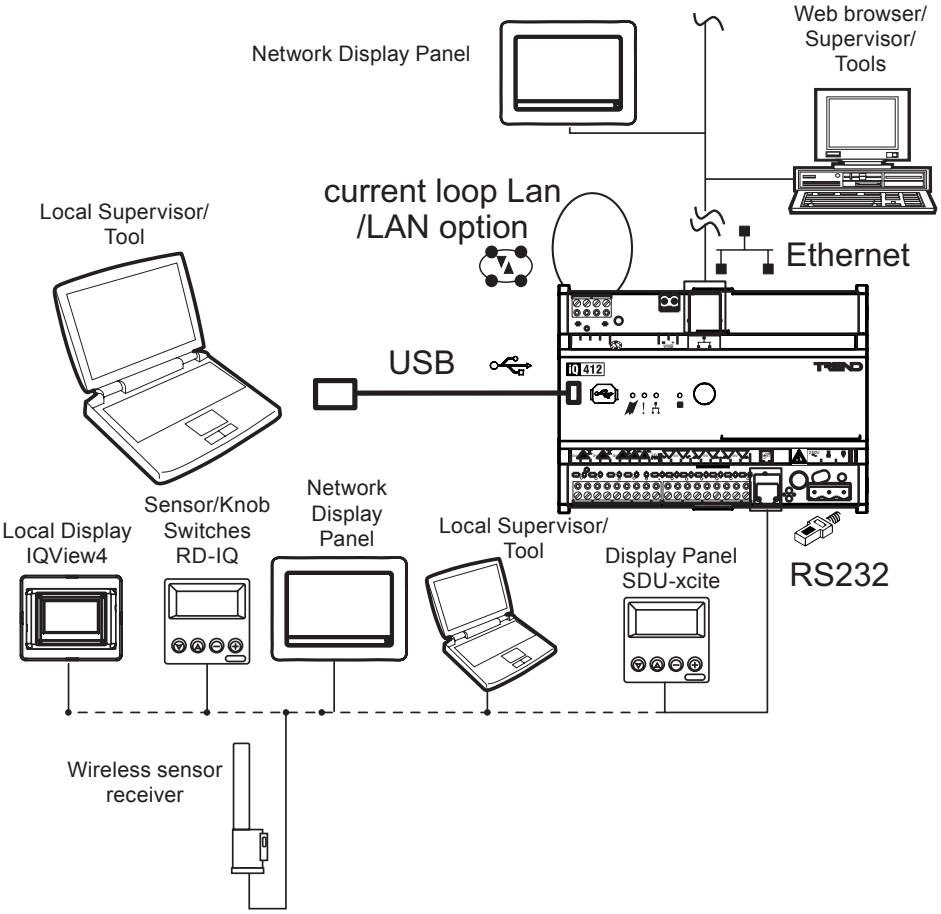
FUNCTIONALITY

The IQ41x's functionality can be divided into four sections: system, hardware, firmware, and strategy.

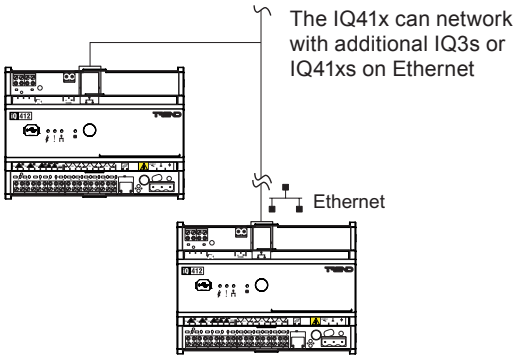
SYSTEM

Standard Communications

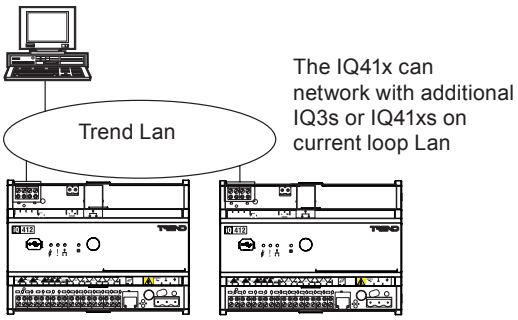
The full standard IQ41x has Ethernet, USB, and RS232 ports. The /LAN option provides connection to the Trend current loop Lan .



Without the Lan option (or with Lan option and Lan option disabled) the IQ41x can form a Trend network over Ethernet (but not over the current loop Lan).



If the IQ41x is fitted with the Lan option (and the Lan option is enabled), it can form network over the Trend Current loop Lan, (but not over Ethernet)



Ethernet: This is the main network for the IQ41x controller. It enables PCs to connect directly to Ethernet and communicate with the IQ41x using IP addressing. Remote PCs can communicate through standard IT networks (e.g. the Internet) using IP, enabling communication from anywhere in the world. The IP connection will support a web browser (thin client) running in a PC. Communication with the Trend network by an IQ System supervisor or tool (thick client e.g. 963, IQView) will require the use of the virtual CNC embedded in the IQ41x controller (or another CNC on the network).

The strategy and backdrop configuration files may be downloaded to the IQ41x from SET (System Engineering Tool) across Ethernet.

Ethernet without Trend Lan option: In this case the IQ41x will become part of the Trend network over Ethernet. It can communicate with other controllers using Inter-Controller Communications (IC Comms - peer to peer communications over Ethernet).

Ethernet with Trend Lan option: If the IQ41x has the Trend current loop Lan option fitted, and the Trend current loop Lan is enabled (enabled by default), it cannot join a Trend Lan over Ethernet. If the current loop Lan is disabled it will behave as Ethernet without Trend Lan option described above.

Trend Lan (option): This option enables the IQ41x to join a Trend current loop Lan. The strategy configuration file (but not backdrop or language files) may be downloaded to the IQ41x from SET (System Engineering Tool) across Trend current loop Lan. It can communicate with other controllers using Inter-Controller Communications (IC Comms - peer to peer communications over current loop Lan).

RS232 local supervisor port: A sensor/display (RD-IQ), 4 line display panel (SDU-xcite), network display (IQView or IQView4), a wireless sensor receiver (XW/R/IQ) or a local PC running a supervisor or a software tool may be connected to the RS232 port. Only one device may be connected.
The strategy configuration file (but not backdrop or language files) may be downloaded to the IQ41x from SET (System Engineering Tool) by way of the RS232 port.
This port can communicate directly with the IQ41x (address 0) or to the IQ system network using the local supervisor CNC (sCNC1, see below).
The RD-IQ or SDU-xcite communicates only with the local IQ41x, so for the RS232 port to operate with RD-IQ or SDU-xcite, its address module local supervisor port address must be set to zero.

USB local engineering port: A PC running SET system tools may be connected to an IQ41x by way of its USB port. The strategy configuration file (but not backdrop or language files) may be downloaded to the IQ41x from SET (System Engineering Tool) by way of the USB port.

BACnet Communications (option): The IQ41x/BAC controller is designed to be a BACnet Application Specific Controller. It supports BACnet over IP (Ethernet). BACnet is an open protocol that enables the products of a number of different manufacturers of building automation and control equipment to communicate with each other.

BACnet Alarms: IQ41x/BAC is able to send alarms using BACnet protocol.

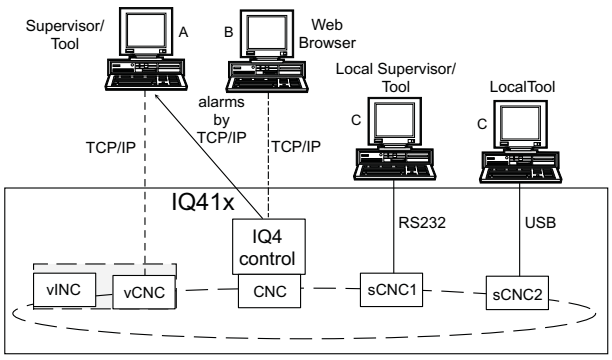
BACnet IC Comms: IQ41x/BAC controllers support BACnet IC comms. This enables it to send IC Comms to a BACnet device using BACnet protocol.

A full specification of the objects, properties, and BIBBS (BACnet Interoperability Building Blocks) supported by the IQ41x are given in the IQ4 PICS document (Product Implementation Conformance Statement), TP201248. The mapping of the BACnet properties to the Trend parameters is covered in the IQ3/4 Configuration Manual, TE200768.

XML Web Services: XML is a general purpose specification for creating custom markup languages. It helps developers create web pages and also provides a basic syntax that enables information to be shared by different computers and applications. The IQ41x XML syntax is described in the IQ3/4 Configuration Manual.
XML web services are fitted as standard in the IQ41x.

Networking

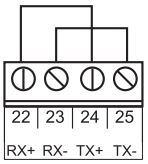
The IQ41x will create its own internal Lan which includes a node for its own controller, a CNC for its local RS232 supervisor port (sCNC1 - if supervisor port address is set non-zero), a virtual CNC (vCNC), and a virtual INC (vINC - address 126).



There can also be an additional sCNC (sCNC2) for the USB local engineering port.

A PC running SET is able to use an IQ41x's local engineering port (USB) to communicate with the entire Trend system to which the IQ41x is connected. If the USB port address in the IQ41x is set to 0 (default), a supervisory CNC (sCNC2) at address 125 is dynamically created for the period of the SET session. When the PC is removed the sCNC times out and no longer exists on the network. If the sCNC address is configured to be non-zero, the sCNC2 remains on the network map when the SET PC is removed.

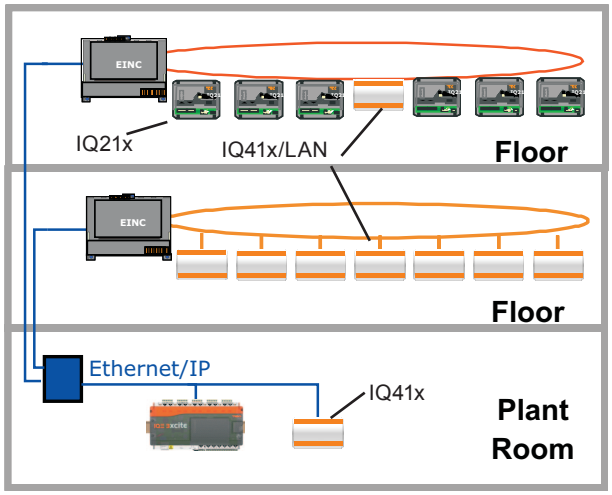
With the current loop Lan option fitted and the Lan enabled the Lan must be intact for the Lan communications to operate; if the Lan is not connected a loop back connector should be fitted.



Loop back connector

When the IQ41x joins an Ethernet Lan, the controller with the lowest IP address assumes the INC functionality, and vINCs in other controllers disappear. The vINC does not exist on a current loop Lan.

The IQ41x has design features which enable it to replace or extend systems which include old IQ21x and IQ7x controllers



The diagram above shows IQ41x/LAN replacing/extending an IQ21x system on the Trend current loop Lans, and an IQ41x connected to a Trend Ethernet Lan.

IC Comms: The IQ41xs may communicate with each other and IQ3, IQeco and earlier IQ (and IQL) controllers using Inter Controller Communications (peer to peer communications). This will use Trend Lan/node addressing (not direct IP addressing).

Alarm Delivery: Alarms can be delivered to the local supervisor port or to a supervisor making a permanent connection to the virtual CNC by normal IQ system comms. Alarms can be delivered to supervisors making temporary connections to the virtual CNC using TCP/IP by setting the supervisor's IP address and port number in the alarm destination module (i.e. IP alarms). Alarms may also be sent by email.
Note that network alarms are sent to any connected port (e.g. supervisors connected to local supervisor port, USB port, or supervisor connected to virtual CNC).

System Configuration

The IQ41x can operate in similar system configurations to the IQ3. These are described in detail in the IQ3/4 configuration manual, TE200768.

Ethernet Routers: The IQ41x can construct an internetwork across a router.

Internet Access: Because the Internet uses TCP/IP addressing, the 963/IQ41x communication can operate over the Internet. This may require a firewall to be set up to allow messages through the port addresses being used for sending and receiving IQ System messages.
Note that IQ41x to IQ41x networking communications will not operate across a firewall (i.e. virtual networks cannot be built across firewalls).

EINC, 3xtend/EINC L: The IQ41x can be used with EINC or 3xtend/EINC L. These both enable the Trend network to be extended from Ethernet over the Trend current loop Lan (see diagram above). The 3xtend/EINC L also allows its extension over Trend Lan on LonWorks (i.e communication with IQLs).
The 3xtend/EINC L (and not EINC) can operate in an automatic IP addressing environment (e.g with DHCP) - see below.

IQ3/BINC: The IQ3/BINC can extend the Trend network over MS/TP BACnet to enable the IQ41x to communicate with IQecos.

TMN: The IQ41x can use a TMN for PSTN, ISDN or GSM telephone services. The TMN should be connected to a Trend current loop internetwork (or internetwork section). However, this will only give normal IQ System Communications (i.e. text communications), it cannot provide web pages.

Automatic IP Addressing Mode: The IQ41x is able to operate in a system where the IP addresses are automatically allocated by a DHCP (Dynamic Host Configuration Protocol) server (i.e. the IP addresses are not fixed).

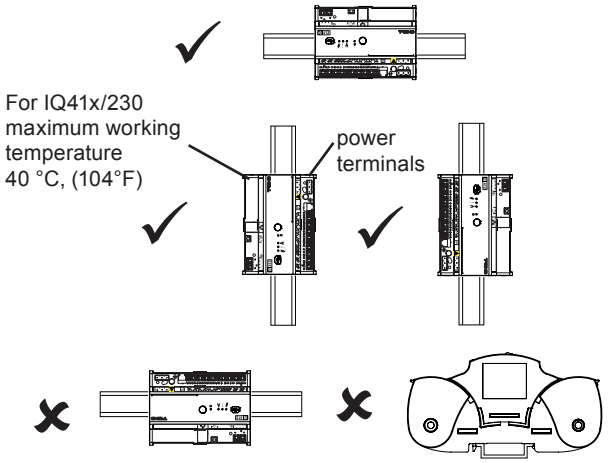
HARDWARE

Box: The controller box is DIN rail mounting. It has sprung DIN rail clips enabling it to be clipped on and unclipped from the DIN rail. The /230 version must be installed inside an enclosure rated to at least IP20 or equivalent. The /24V version should be installed in an enclosure or outside normal reach (e.g. in a plenum).

The units have a plastic housing with rotating clear polycarbonate covers for the top and bottom terminal rows. The current loop Lan LEDs (TX, RX) can be viewed through one cover. The Ethernet LEDs (RX, OK) are fitted into the end of the Ethernet connector.

The USB connector in centre of the cover is protected by a retained flexible plastic plug. The cover is pierced with holes to expose the power, watchdog and service button LEDs, and the service button is fitted alongside.

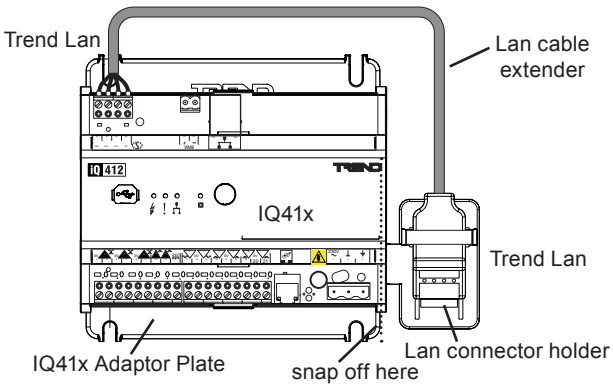
The unit may be mounted vertically in a panel,or vertically side on, but not vertically upside down nor flat on its base. Note that if IQ41x/230 is mounted vertically side on with the power connector end at the top the maximum working temperature must be derated to 40 °C, (104°F)



IQ41x Adaptor Plate: The IQ41x is a of a similar size to the IQ21x and has the same I/O terminal allocation. The IQ41x Adaptor Plate accessory has the same mounting points as the IQ21x controller and provides DIN rail clips for the IQ41x. These IQ41x features along with the adaptor plate facilitate its use as an IQ21x replacement. It is supplied with a screw fixing cable tie to be used as the supply cable restraint.

The I/O terminals can be unplugged from the IQ21x and plugged into the IQ41x terminal position. It is the same for the input power terminals except they need to be twisted through 180°.

The Lan cable extender will enable the Lan connections to be made by the side of the IQ41x unit. The Lan connector holder plastic on the mounting plate may be snapped off and mounted in a more convenient position (with single 5 mm screw fixing)



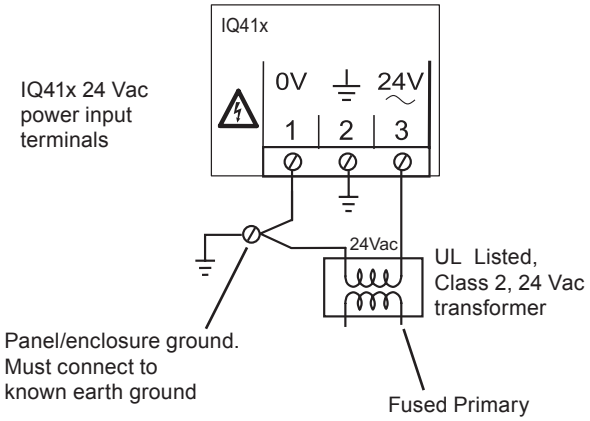
The IQ41x may also be used as replacement for the IQ7x series controllers. The I/O connections are reasonably compatible except for the IQ78. The input terminals can be unplugged from the IQ7x and plugged into the IQ41x terminal position,and the same with the output terminals for the IQ71 although IQ72, 73 will need the wiring to cross-connected. The 24 Vac supply connector will need to be changed. The IQ41x Adaptor Plate accessory mounting points are slightly different to the IQ7x's, and but the slots are elongated to take either. The Lan cable extender must be used in the same way as for the IQ21x, enabling the Lan terminals to be unplugged from the IQ7x and plugged into the IQ41x terminal position.

Power Input

The IQ41x has both 230 Vac and 24 Vac input power options.

/230: This option requires 230 Vac ±10%, 50 Hz. The IQ41x input power earth (ground) terminal is isolated from the input power neutral, and must be separately earthed (grounded) locally; this ground terminal is internally connected to the IQ41x electronics earth (ground).
The 230 V supply must include a dedicated 5A fuse complying with BS1632 and a suitably rated switch in close proximity and be clearly marked as the disconnecting device for the unit. A 5 A circuit breaker with high breaking capacity may be used as an alternative.

/24: This option requires 24 Vac ±15%, 50/60 Hz. The 24 Vac uses an half wave rectifier internal power supply unit. Multiple controllers with half wave power supplies may be powered from a single grounded transformer but the supply polarity must be maintained across all units supplied from the same transformer. The 24 Vac input power neutral must be earthed (grounded) at the transformer secondary.



The 24 V supply must include a suitably rated switch in close proximity and be clearly marked as the disconnecting device for the unit.
The ac input power ground terminal must be earthed (grounded) at the controller.
Under normal conditions it is adequate to connect the local earth terminal (2) to the 24 Vac supply return terminal (1). This assumes the 24 Vac return has been earthed at the transformer secondary.

Trend Current Loop Lan

The Trend current loop Lan is an optional feature (IQ41x/LAN). The current loop Lan is enabled as prime network in the IQ LAN network module, otherwise Ethernet is the prime network.
Address/Baud rate: The address on the Lan is soft-configured in the Address module to be unique on the Lan. The address and Lan number are set up in the factory on a rolling basis, so in a batch of IQ41xs, each will have a different default address (printed on the unit's label).
By default the baud rate is auto-detected in the range 1k2, 4k8, 9k6, 19k2, 38k4 (where 4k8 = 4.8 kilobaud). Automatic baud rate detection (Autobaud) may be disabled, in which case the baud rate must be soft configured to be the same as the rest of the Lan.
Autobaud should be disabled if:

- The Lan consists of all IQ4s, and this IQ4 is set to be the baud rate master; it must have its baud rate fixed by setting it manually.
- The IQ4 has problems detecting the baud rate indicated by the Lan OK green LED flashing for longer than 30 s.

Network terminals: The network terminals facilitate connection of 2 wire cables.
Indicators: The standard TX and RX LEDs are fitted adjacent to the network terminals .The current loop OK condition is indicated by the network OK LED (located in the centre of the cover) when the current loop Lan is enabled.
Bypass relays: The board contains 2 changeover relays which bypass the receive and transmit circuitry and maintain network integrity during power fail.

Service Button

Pressing the IQ41x Service Button generates a message which identifies the IQ41x by means of its unique serial number; this can be interpreted by system tools and can be used to find the IQ41x's device address and Lan number.

The IQ4 can be restored to defaults by holding down the service button for greater than 2 s (but less than 15 s) as the IQ4 is powered up. Note that this will clear the strategy; the data cleared down is defined in the Firmware/Strategy section below. The IQ41x should be then be reconfigured from scratch.

Labels

A small two part label is attached to the unit. It has a tear-off adhesive label strip with Serial Number (both as text and as a small barcode), and address information which can be used for a paper record e.g. a log book. A configured address should be written on this label. A second large adhesive label is supplied to be mounted outside the metal work containing the IQ41x with similar information. This will also have the serial number as text and as a barcode; this can be read by a barcode scanner from a distance (e.g. scanning a unit mounted in the ceiling from the floor).

Barcode Scanner

The large barcode label described above is intended to be mounted on the outside of the metal work containing the IQ4; this will enable the label to be scanned at a distance by a barcode scanner (note that the small barcode labels can be collected together and scanned in when required).
The scanner should conform to the following requirements:

- It needs to be a laser scanner
- It has to be able to read "code 128 auto"
- It must be able to work close up and from about 3.5 m (12 ft) away
- The distance it can read depends on the user requirements (e.g. scanning a unit mounted in the ceiling from the floor).

Indicators:

Note that all LEDs illuminate for several seconds after switch on.

General LEDs (in centre of cover)

Power (⚡): (green) ON when input power supply is connected. Flashes briefly at 1 second intervals if input power supply fault; return unit to supplier.

Watchdog (!): (red) ON if controller has a software fault (i.e. strategy or firmware). Note that the watchdog LED flashes momentarily on power up.

Lan OK (⇅): (green) Operational on LAN option only. ON if current loop Lan is operating. Flashes while trying to auto-set baud rate. If lasts longer than 30 s, set baud speed manually to known baud rate. If still flashing, check Lan connections.

Service Button (◘): (yellow) For future use.

Trend Current Loop Lan (adjacent to Lan connector - operational on LAN option only)

RX :(yellow) ON if current is entering the network receiver.

TX :(yellow) ON if current is flowing from network transmitter.

Ethernet (on end of Ethernet connector)

OK : (green) Normally called LINK on Ethernet systems. ON indicates a good Ethernet connection. If OFF indicates faulty Ethernet connection.

RX: (yellow) Flashes when packet of data is being received across the Ethernet.

Backup

A ‘supercap’ is used to maintain the real time clock (time and date). In the event of power failure this will support the clock for 8 days (typically).

The data (firmware, strategy, parameters) is stored in flash memory which is non-volatile in the case of power failure. Changes to the address module are stored immediately. Changes are generally stored around midnight, in addition structural changes (e.g. module interconnections) are stored 15 s after the last change, and critical data changes (e.g strategy values), are stored on power failure or other similar fault condition .
The tools (e.g. SET Live Adjustment. IQTool) will send the archive instruction after the parameter changes.

Engineering Port (USB)

The IQ41x’s USB port uses a Micro B USB connector (USB 2.0 full speed); it is located in the centre of the cover and is protected by a retained flexible plastic plug. This port is the IQ41x’s local engineering connection. By using this port, SET and its software tools including strategy download are able to access the complete Trend network.

As explained above in the Networking section, a supervisory CNC (sCNC2) is either is dynamically created at address 125 or the it can be made permanent by configuring it with a non-zero address.

Connection to a PC would normally be made by using an adaptor cable with a USB connector appropriate to the PC on one end and a Micro B USB cable on the other (maximum cable length is 5 m).

RS232 Local Supervisor Port:

This port can be used for local supervisor, engineering tool, displays etc. (see above in System section). It has a RJ11 connector which contains a 24 Vdc supply connection (as available on all recent IQ RS232 connections). This will supply up to 80 mA from -40 °C (-40 °F) to +40 °C (104 °F), and 60 mA from +40 °C (104 °F) to +60 °C (140 °F)

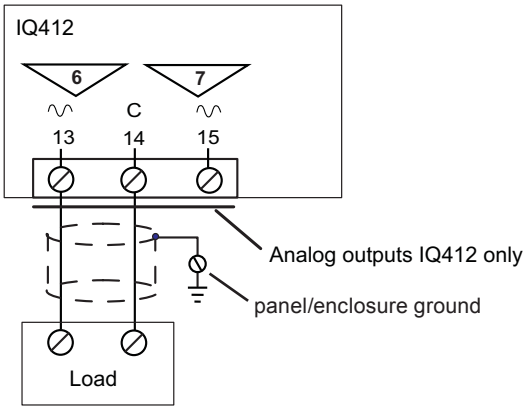
Inputs and Outputs

The I/O channels available vary with the IQ41x type as shown in the table below:

			IQ411/24	IQ411/230	IQ412/24	IQ412/230
Outputs	Solid State Digital	24 Vac	6	0	4	0
		24 Vac Synthesised	0	6	0	4
	Analog		0	0	2	2
	24 Vdc auxiliary output supply		1	1	1	1
Inputs	Universal		3	3	3	3
	Digital		2	2	2	2

Analogue Outputs
IQ411: no channels
IQ412: (OUT6, OUT7) 2 channels

0 to 10 Vdc at up to 20 mA, reduce to 18 mA maximum above +40 °C (+104 °F).

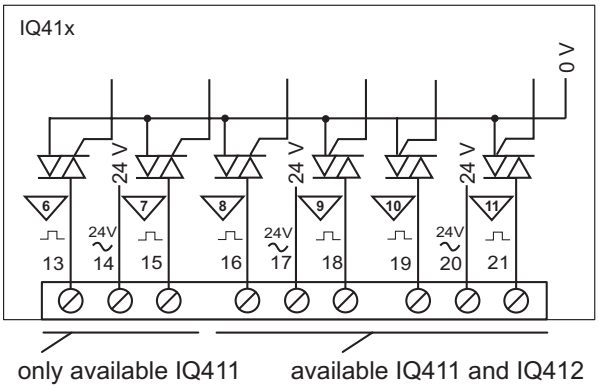


If screened cable is used the screen must be connected to the panel/enclosure ground and unterminated at far end. Connect the return to the C terminal (terminal 14) not to an input common. The above diagram shows wiring for OUT6.

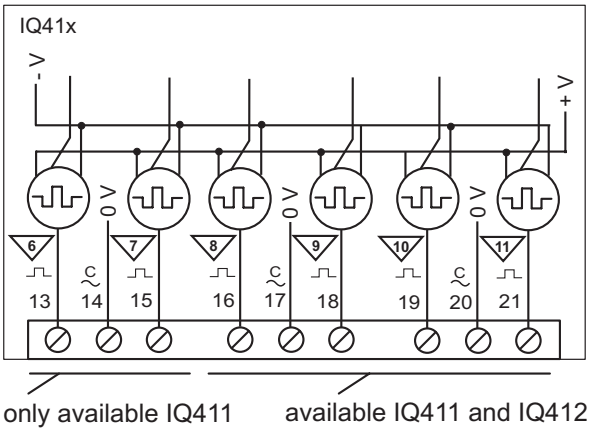
Solid State Digital Outputs
IQ411: (OUT6 to OUT11) 6 channels
IQ412: (OUT8 to OUT11) 4 channels

These outputs are suitable for use with 24 Vac thermal type actuators, 24 Vac synchronous motors, and 24 Vac relays.

IQ41x/24: Switch 24 Vac, 500 mA maximum for a channel, 500 mA maximum shared between all (4 or 6) channels.

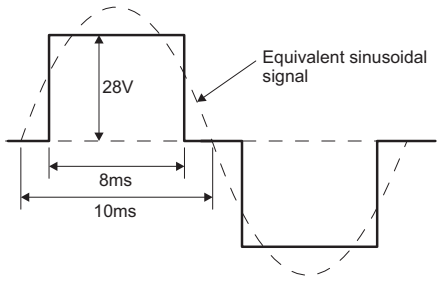


IQ41x/230: Switch 24 Vac (synthesised), 300 mA maximum for a channel, 300 mA maximum shared between all (4 or 6) channels.



Each output provides an independent 24Vac feed for driving 24Vac loads, such as thermoelectric (thermic) actuators, and raise lower actuators, (e.g. Trend range of thermic actuators).

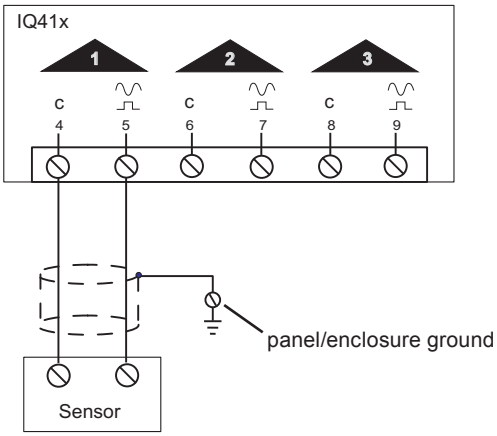
The electrical characteristic of this output is approximately as shown below. Loads should be assessed against this before they are used with IQ41x/230V.



These two types of output are equivalent, the only difference is the power on the common terminal.
Note that 24 Vac is not available from the IQ41x/230Vac, so that certain types of actuator which require a direct 24 Vac supply (e.g. spring return) cannot be powered from the IQ41x/230, and will require a separate 24 Vac supply.

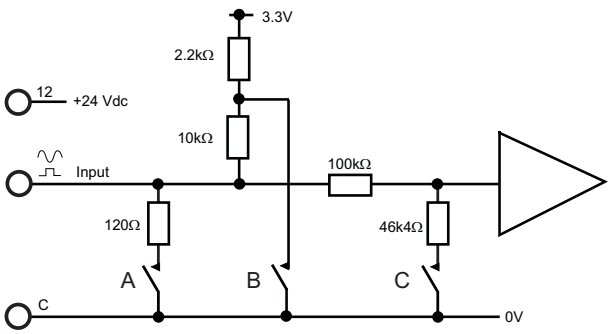
24 Vdc Auxiliary Supply Out
24 Vdc (+0%, -20%) at 90 mA max. available from the (⎓, terminal 12). Used to supply I/O devices e.g. sensors.

Universal Inputs
IQ411, IQ412: (IN1 to IN3) 3 channels



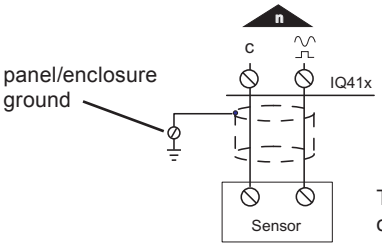
If screened cable is used the screen must be connected to the panel/enclosure ground and unterminated at far end as shown for IN1 in the diagram above.

The universal input channels can either be voltage input (0 to 10 V), thermistor input (0 to 200 kohm), digital input (volt free contact/open collector), or a current input (0 to 20 mA). The input type is set automatically by strategy configuration (rather than having to also set hardware links) and this will switch in the required resistors using switches A, B, and C. These switches are set appropriately by connecting the channel in the strategy to a digital input module or a sensor module (the sensor type defines the switch settings).



The switches are automatically selected as shown in the table below:

Input type	Switch A	Switch B	Switch C
Current	ON	ON	off
Voltage	off	ON	ON
Thermistor	off	off	off
Digital	off	off	off



Thermistor, Voltage, or Digital Input sensor

The **thermistor input** (0 to 200 kohm) can be used for a thermistor or a potentiometer. The thermistor bridge resistor is 12 kohm with a bridge supply 3.3 V

The **voltage input** is for 0 to 10 Vdc input.
Note that the input resistance of the IQ41x analogue voltage input configuration is 9.4 kohm as opposed to 208 kohm in the equivalent IQ3 input so that the scaling for a potential divider input will be different; the selection is facilitated by SET.

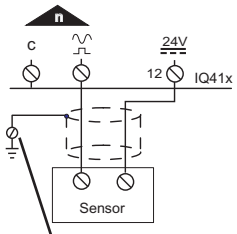
The **digital input** an be used for a volt free contact, or for an open collector. For digital inputs no sensor type is selected so all three switches (A, B, C) are de-energised as required for digital input signal conditioning.

The volt free contact has a nominal wetting current of 270 µA. The input is on when the contact is closed. There is no polarity

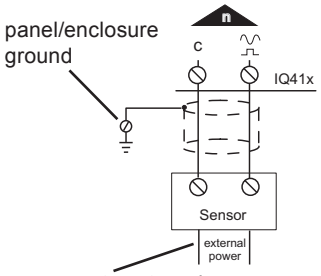
The open collector or open drain (FET) must be able to sink 270 µA. When the transistor or FET conducts, the digital input will be on. Polarity must be observed.

The **current input** supports 4 to 20 mA. The current input may be either loop powered or external powered; the type is selected by connecting the sensor to different terminals as shown in the diagrams below.

loop powered

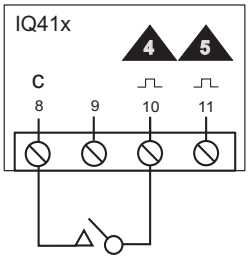


externally powered



A loop powered sensor current can be connected to the 24 Vdc auxiliary output supply (⎓, terminal 12).

Digital Inputs
IQ411, IQ412: (IN4, IN5) 2 channels



The **digital input** an be used for a volt free contact, or for an open collector.

The volt free contact has a nominal wetting current of 2.5 mA. The input is on when the contact is closed. There is no polarity

The open collector or open drain (FET) must be able to sink 2.5 mA. When the transistor or FET conducts, the digital input will be on. Polarity must be observed.

Sensors

TB/TS Series: The TB/TS provides a wall mounting thermistor space sensor that can be connected to an IQ41x input. The TB/TS/K also provides setpoint adjustment as a potentiometer input. The TB/TS/KO has the TB/TS/K features plus an occupation override push button. The TB/TS/KOF is similar to the TB/TS/KO but also has fan speed control. The TB/TS/KOSF is similar to the TB/TS/KOF but also has additional occupation status LEDs. The TB/TS/KOS is similar to the TB/TS/KO but also has occupation status LEDs.

Displays

The IQ41x controller can be used with IQView, IQView4, SDUxcite, and RD-IQ displays.

IQView: The IQView is a touch screen network display (colour or mono) which can be either surface mounted or rear panel mounted. In addition to showing all the normal strategy items, it can access directories, timezones, and alarms, and users can be set up with configurable access rights. It can be connected to the IQ4 either by Ethernet or by RS232. The Ethernet connection can either be by the IQView's own virtual CNC or by an external vCNC (e.g. the IQ4's). The RS232 connection enables the IQView to communicate either only with that IQ4 (if local supervisor port address is zero), or with the network (if local supervisor port address is non-zero).

IQView4: The IQView4 is a touch screen colour display panel for rear panel mounting with a front cover. It can access inputs, outputs, alarms, and plots, and allows knobs, switches, timezones, and time to be adjusted. Users can be set up with configurable access rights. It connects to the IQ4 by its RS232 port, and it can communicate only with that IQ4, so the local supervisor port address must be set to zero.

SDU-xcite: The SDU-xcite is a wall mounting 4 line display. In addition to showing all the normal strategy items, it can access directory modules and the IQ41x's alarm log. It connects to the IQ4 by its RS232 port, and it can communicate only with that IQ4, so the local supervisor port address must be set to zero.

RD-IQ: The RD-IQ is a wall mounting temperature sensor and 3 digit display. It has the following variants:

RD-IQ/K: Room display with local temperature sensor and setpoint control

RD-IQ/KOS: As RD/K plus occupation override and occupation status display.

RD-IQ/KOSF: As RD-IQ/KOS plus fan speed control.

It connects to the IQ41x by its RS232 port, and it can communicate only with that IQ41x, so the local supervisor port address must be set to zero. By default it accesses fixed strategy items (although these can be changed using the front panel buttons or SD configuration software, SDU Tool):

Local temperature S9
Setpoint K1
Occupation status K6
Fan speed status K7

FIRMWARE

Upgrade

The firmware in the IQ4 CPU board and baseboard can be upgraded over Trend current loop Lan or Ethernet (Ethernet recommended for speed).

Strategy

The IQ4 strategy modules are based on the traditional IQ paradigm with minor changes to increase capability and efficiency.
The .IQ4 strategy file is created and downloaded using SET.
SET facilitates strategy creation by providing an indexed library of pre-configured strategy blocks or custom solutions (entire controller strategies); these may be viewed, printed, or edited to suit the user.

Once the strategy is complete it can be tested prior to download by using the SET controller simulator mode.

The strategy file and the other configuration files (language and backdrop) can be downloaded or uploaded across Ethernet (FTP), Only the strategy file (and not back drop or language files) can be downloaded over Trend current loop Lan (IQ41x/LAN only - a baud rates 9k6 or greater), RS232 local supervisor port, and USB local engineering port. Note that Lan, RS232, and USB port upload/downloads will be slower than Ethernet.

An Ethernet download requires the PC running SET to be connected to Ethernet, and to communicate with the IQ4 using the IQ4's IP address (SET will actually obtain the IP address from the IQ4 using the IQ System Lan number and device addresses). Downloads using the other interfaces are performed over the Trend network (using CNCs).

As explained in the hardware section above, the IQ4 can be restored to defaults by pressing the Service Button (e.g. to recover from a lost PIN when the user hasn't recourse to Trend Technical Support). This will clear down strategy files. It will restore the following strategy data to defaults (Lan number, outstation address, IP addressing mode, IP address, subnet mask, UDP port, identifier, Router 1, remote Trend devices, vCNC). It will clear all user modules (passwords, PINs etc), alarm logs, and plots. It will leave untouched the backdrop and language files, and leave Time and Date at their current settings. After the reset the IQ4 should be reconfigured from scratch and the strategy downloaded.

The IQ4 web server provides pages (HTML) which enable limited configuration from a web browser; most module parameters may be viewed and adjusted, but the strategy structure (module interconnections, adding or deleting a module) cannot be modified from a web browser.

Addressing

As stated above the Trend device Address is set up in the factory on a rolling basis in the range 11 to 119. The Lan number is set to 20 by default.

If the IQ41x has an Ethernet connection the Ethernet addressing parameters should be set up. Each IQ4 has a unique MAC (Media Access Control) address allocated to its Ethernet node. The IPTool (SET auxiliary application) enables the IQ4 IP address (and other Ethernet parameters), and the Trend Lan number and device address to be set up.

The IPTool can automatically fetch the details of all the Trend IP devices (3xtend/EINC Ls, IQ3s, and IQ4s) on its own segment of Ethernet; it can also fetch details from devices the other side of a router by reading the remote Trend Device modules from an IQ3, IQ4, or 3xtend/EINC L (alternatively the user can enter the remote device's IP address by hand).
The IPTool also enables the virtual CNCs to be configured.

For IQ4s on a Trend current loop Lan without an Ethernet connection, IQTool can be used for addressing.
If the current loop Lan contains other controllers (e.g. IQ3s, IQ2s) then IQTool (SET auxiliary application) can discover these automatically, but the IQ4s should be added to the grid by entering the serial numbers; IQTool can then re-address the IQ4s if required.
If the current loop Lan consists exclusively of IQ41xs, the IQTool can be used to automatically discover them, and resolve the addresses. Alternatively they can be discovered manually either by pressing their service buttons, or by using a barcode scanner to scan their barcodes on either of the labels.
The Lan number should be set up using the SET Device View.

Strategy Modules

In the IQ4 the number of each type of module may be adjusted to match the requirements of the application as long as the memory capacity of the controller is not exceeded. The IQ4 has an absolute limit of 4000 modules of which 300 may be sequenced.

Each type of module has memory requirement in brIQs as listed below; SET also limits the number of modules as shown in the adjacent column.

Module	brIQs	SET maximum
Address	24	1 (fixed) §
Digital Input	28	1000
Alarm Destn	14	(8)
Alarm Group	9	500
Alarm Route	9	500
Alarm Log‡	0	1 (fixed) (up to 300 alarms) §
Analog Node	16	510
Digital Byte	16	1012
Digital Input#	28	1000
Directory	13	500
Display	19	500
Driver#	57	500
Function#	19	500
IC Comms#	19	250
Knob	13	1000
Logic#	19	500
Loop	55	500
Network	0	§
NTD	30	†††
Option	0	§
OSS	34	500
Page	4	500
Plot	12	500 ††
Program	0	1 (fixed) §
Schedule	21	500
Sensor#	76	1000
Sensor type	12	99
Sequence	106†	1 (fixed) (300 steps) §
Switch	10	1000
Time	38	1 (fixed)
Time Zone*	566	100
User	12	500
Virtual CNC	9	1 §

The available capacity is measured in brIQs (the same size as IQ3 brIQs). The total available capacity in an IQ41x is 10,000 brIQs with 1000,000 log points of plot memory.

For synchronised plots each plot record requires 5 log points, so IQ4 can have up to 200,000 synchronised plot records. For triggered or periodic plots, each record requires 10 log points, so IQ4 can have up to 100,000 triggered or periodic plot records.

SET imposes the limit of 4000 modules. The IQ4 limits the number of destination modules to 8 as shown in the table. Alarm log, Network, Option, and Program modules have zero brIQs.

In SET, as the modules are created, a tally is kept of the brIQs used and the amount available to be used; an indication of this can be viewed. If the limit is exceeded, then SET will prohibit the creation of further modules.
It is possible to create modules which are not numerically sequential so module lists can be non-continuous (e.g. L1, L2, L5, L7...).

Notes:
For these modules the actual size (numbers of brIQs) varies with module type. The largest size is shown here.
* The time zone brIQ count allows for an average of 20 exceptions.
§ These modules are always in the IQ41x (not optional), but the number of Network modules (1 - Ethernet, 2 - IQ Lan, 3 - BACnet IP, BACnet Application etc), and Option modules (BACnet etc) depends on the IQ4 option build.
† The sequence table takes 106 brIQs; the table includes 300 steps.
†† The maximum number of records for a plot is 1000 (5000 log points), but maximum total records varies with the type of plots used as explained above. The maximum number of plots which can occur in 1 s is 100 so there could be 100 off 1 s plots (but no others). This is calculated on the average plots service in 1 s, so a 1 minute plot would contribute a 1/60. For example 90 off 1s, +360 off 1 min would give 90+6= plots/s on average. The periodic and triggered plots must also be counted and it's up to the engineer to make his best estimate.
†††The number of NTDs in the IQ4 is only limited by the available brIQs
‡The alarm log can record up to 300 alarms after which the next alarm will overwrite the first alarm (FIFO). They can be viewed on the IQ4 webpages (up to 6 pages of 50 alarms)

Identification

The IQ4 will identify itself as an IQ4 to w comms (with SET 6.7).

IC Communications:

The IQ4s may communicate with each other and IQ2, IQ3, IQeco, and IQL controllers using Inter Controller Communications (peer to peer communications) using Trend Lan/node addressing.
The IQ41x/BAC also able to communicate with BACnet devices using IC Comms; the 'Protocol' parameter specifies either Trend or BACnet protocol. The remote controller in the BACnet IC Comms module specifies an NTD (Non-Trend Device) module which is set up with BACnet device's BACnet address information.

The table below specifies the types of IC Comms with which the IQ4 will operate.

IC Comms Type		Configured in IQ2 to IQ3/4	Configured in IQ3/4 to IQ2	Configured in IQ3/4 to IQ3/4	Configured in IQ3/4 to BACnet
Data From	Analogue	*Yes	†Yes	†Yes	†Yes
	Digital Byte	*#Yes	†Yes	†#Yes	No
	Digital Bit	*#Yes	†Yes	†#Yes	†Yes
Data To	Analogue	Yes	Yes	Yes	†Yes
	Digital Byte	Yes	*Yes	*Yes	No
	Digital Bit	Yes	Yes	Yes	†Yes
Global To	Analogue	Yes	Yes	Yes	†Yes
	Digital Byte	Yes	*Yes	*Yes	No
	Digital Bit	Yes	Yes	Yes	†Yes
Visitor Comms (max, min, sum, average)		*Yes	Yes	*Yes	No

*Only available on v1.2 or greater firmware.
†Only available on v2.0 or greater firmware.
#Although the IQ3/IQ4 will respond to these requests, the digital byte module in the IQ3/IQ4 cannot be set up by the strategy. However, Digital Bit Data From IC Comms using switch or digital input status as the parameter value being transferred works fine.

Note that IC Comms with IQ1v3 controllers are similar to those with IQ2 controllers except the IQ3/IQ4 can only receive messages (i.e. Data To from IQ1), not send them. However, IC Comms with IQ1v4.1 or greater controllers can be considered to be the same as those with IQ2 controllers.

The receipt of IC Comms by an analogue node or digital bit/byte is implemented by creating analogue node or digital byte modules during the strategy creation process on SET.

Alarms

The IQ4 will generate Network, General, and Item alarms. Network alarms are generated by the Trend Network nodes, General alarms are generated when the IQ4 detects a problem within its own hardware or program, and Item alarms are generated by the strategy, and are normally due to a faulty plant condition.

Network alarms are sent to supervisors or tools connected to the RS232 local supervisor port, USB local engineering port, or to the controller's vCNC

Network, General, and Item alarms can either be sent in text, coded, or attribute format, and can be sent either to a designated Trend Lan address, to an IP address, as an email, or to a BACnet device (IQ4/BAC only). They are also stored locally in the Alarm Log.
Only sensor, digital input, digital driver readback, and plot alarms can be sent to a BACnet device.
For coded alarms the protocol limits the item number to 255 maximum. For text alarms the maximum item label length is 20 characters (although the 963 can be setup to use labels previously learnt).
Sending an Email alarm requires the Email Server Address to be set up in the address module. The Email Server Address can be set up as an IP address, an internet domain name, or a host name; the internet domain name or host name require a DNS server address or a WINS server address respectively to be set up in the network module so that the name can be resolved.

Timemaster

The IQ4 can act as a Timemaster similar to an IQ3, but unlike IQ3 it doesn't have the battery-backed real time clock option to support it in case of power failure. However, the supercap will support the clock for 8 days (typical) in the case of power failure.

Language

The user can specify which language the IQ4 uses for the display of web pages and for transmitted alarms. All the required text is separately stored as a text file in SET and can be translated to form a language file. The standard language files are stored in the controller as supplied, but new files or updated files can be downloaded from SET. In the controller the Address module has a language parameter which will be set by default to the default language, but can be changed to any one of the other available language files or English (e.g. change to English by setting the language parameter to 'english' on the address module webpage). The IQ4 can use languages which require 8 bit code (i.e. special or accented characters) and can also operate with right to left languages (e.g. Chinese, Arabic).

Plots

The IQ4 plot modules can plot any connectable module output (analogue or digital). There are three types of plot module: synchronised, triggered, and periodic. Although all three types are BACnet interoperable, only periodic plots can be BACnet compliant. All plot modules can generate a buffer ready alarm when the number of records equals the notification threshold.

Web Pages

Information from an IQ4 controller can easily be accessed using a Web browser (e.g. Internet Explorer v6.0), over any TCP/IP network (e.g. the company Intranets, or the Internet). All that is required is the IP address or host name of the controller, and a valid user name and password (if users are set up in the controller). Once connection to the controller has been made, it is possible to view and adjust occupation times, view the alarm history, and view/adjust/graph individual module parameters.

Web pages may also be accessed by mobile smart phones (Windows Mobile 2003 Second Edition), and PDAs (Windows CE4); note that Mobile smart phones and PDAs cannot display graphs and right to left languages

Note that the operating system environment in which Internet Explorer runs must support Java; A Sun Java runtime environment v1.4 or greater can be downloaded from Java.com.

Module parameters may be monitored and changed using web pages but module creation, deletion, and linking can only be done using SET.

The IQ4 is provided with a standard set of web pages which covers all accessible modules (see the example below of the list of knobs, and their current settings).

Graphical display pages (GraphIQs) which are configured using IQ4 display and directory modules, can also be accessed. They can be shown over backdrop files which are separately downloaded

For further details of web pages see the the IQ3/4 Configuration Reference Manual TA200768, the IQ4 Web User Guide, TC201256, and the Graphical Display Pages Editor Manual, TE200629.

FIELD MAINTENANCE

WARNING: Contains no serviceable parts.
Opening the unit exposes hazardous voltages

The IQ41x Series Controllers requires virtually no routine maintenance.

DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulations 2002) ASSESSMENT FOR DISPOSAL OF IQ41x Series Controllers.

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 should be disposed of by a suitable recycling centre.
Do not dispose of with normal household waste.
Do not burn.

COMPATIBILITY

Browsers: Internet Explorer 8, Firefox. Mobile smart phones (Windows Mobile 2003 Second Edition), and PDAs (Windows CE4); note that Mobile smart phones and PDAs cannot display graphs and right to left languages
Note that IQ4 has not been tested with all devices and Trend cannot guarantee a particular device's compatibility.
Note that the operating system environment in which Internet Explorer runs must support Java; currently Windows 98, 2000, and ME do support Java, but XP SP1 doesn't. For Windows XP, a Sun Java runtime environment JSE5.0 or greater must be installed (this can be downloaded from Java.com).

Supervisors: 963v3.5 (for full compatibility), 915MDS >v3, 916, IQView, IQView4

Utility software: SET v6.7 for full compatibility (includes IP Tool auxiliary software)

Displays: IQView touch screen network display, IQView4 touch screen display, RD-IQ, SDU-xcite 4 line display.
Note that the NDP is not compatible with IQ4; it will not recognise an IQ4 connected to its network.

Controllers: IQ3/IQ4 directly and IQ1, IQ2, IQL by way of 3xtend/EINC L. /LAN communicates with IQ2, IQ1 directly. IQeco by way of IQ3/BINC.

IC Comms: IQeco, IQ3, IQ2 (including IQL, IQ1 (v3 onwards)).
IQ1, IQ2, IQ3 strategies: These can be imported into SET, converted into IQ4 strategies, and then downloaded into an IQ4. If the strategy file accesses I/O channels beyond those available in the IQ4, the strategy will be rejected.
Ethernet Nodes: Compatible with 3xtend/EINC L. NXIP or EINC must not be used in an automatic IP addressing environment. NXIP cannot be used as cross router master.
BACnet Devices: IQ4/BAC only. Being tested as a BACnet Application Specific Controller (B-ASC). Compatibility defined in IQ4 PICs document, (Product Implementation Conformance Statement), TP201248.

INSTALLATION

The IQ41x is installed on a DIN rail by using the DIN rail clip. The /230 version must be installed inside an enclosure rated to at least IP20 or equivalent. The /24V version should be installed in an enclosure or outside normal reach (e.g. in a plenum).

For /230 version, a suitably rated switch or circuit breaker must be included in the supply to the unit and be in close proximity to it, and must be clearly marked as the disconnecting device for the unit.

The installation procedure involves:

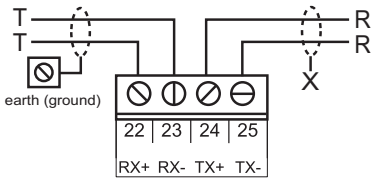
mount the controller in position
connect power, do not power up
connect Ethernet if required
connect RS232 if required (Supervisor/Tool PC, IQView, IQView4, RD-IQ, or SDU-xcite)
connect USB if required (Tool PC)
connect IQ system Lan (IQ4/LAN only)
terminate the I/O channels, leave unconnected
power up
set up IP address parameters (if Ethernet used) using IPTool
setup Lan number and Device address,
check Ethernet network (not IQ4/LAN), current loop Lan network (IQ4/LAN only)
configure the strategy (using SET)
test strategy by using Controller Simulation Mode in SET
download strategy file and other configuration files
check BACnet communications using SET (IQ4/BAC only)
connect inputs and check operation
connect outputs and check operation
check web pages using a browser

These installation procedures are covered as follows: IQ41x Installation Instructions - Mounting, TG201250; IQ41x Installation Instructions - Configuration, TG201251

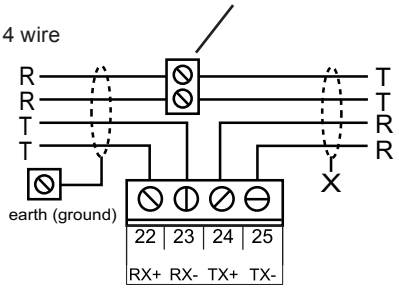
CONNECTIONS

Trend Current Loop Lan

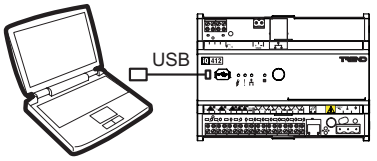
2 wire polarity independent

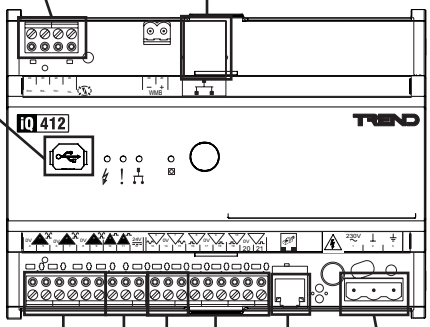


4 wire additional terminals

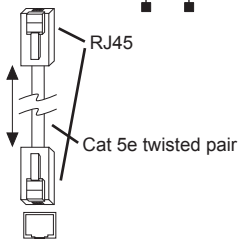


USB (local engineering port)





Ethernet Port

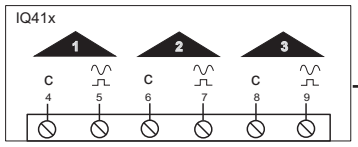


Ethernet hub or switch e.g. EDS-205

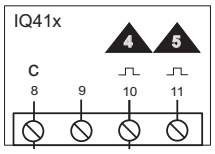
A local supervisor (Ethernet) can be connected to an adjacent port on the hub or connected directly via a standard Ethernet cable (no crossover adapter is required).

Universal Inputs

0 to 10 V, 0 to 20 mA, thermistor, or digital

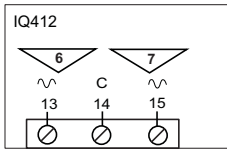


Digital Inputs



Analogue Outputs

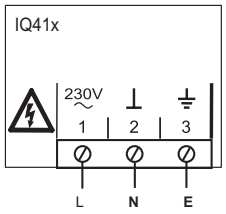
IQ412 only



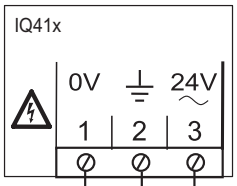
Input Power

polarity dependent

230 Vac

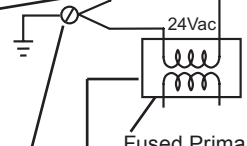


24 Vac



For 24 Vac supply under normal conditions it is adequate to connect the local earth terminal (2) to the 24 Vac supply return terminal (1).

Panel/enclosure ground. Must connect to known earth ground



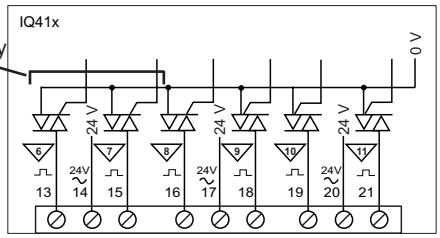
UL Listed, Class 2, 24 Vac transformer

Solid State Digital Outputs

IQ411: OUT6 to OUT11 **IQ412**: OUT8 to OUT11

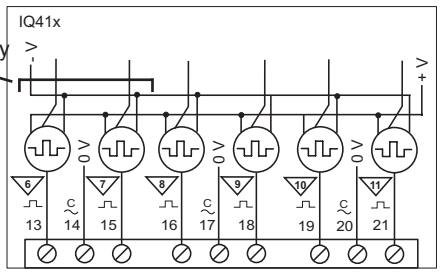
IQ41x/24: switch 24 Vac

IQ411 only



IQ41x/230: switch 24 Vac (synthesised)

IQ411 only



RS232 Local Supervisor Port

RJ11 (FCC68)

RJ11 to 9 way 'D type' female cable CABLE/EJ101442

PC (e.g. 916, 963, SET)

RJ11 to RJ11

RD/SDU-IQ2COMMSCABLE/**n**M (**n**=3, 3m; **n**=10, 10m) connects to RD-IQ, SDU-xcite, IQView4

ORDER CODES

IQ41x Basic Order Code Structure:

IQ41<x>/LAN/BAC/<Power>

IQ41<x>	LAN	BAC	<Power>
IQ411: IQ41x controller with 3 universal inputs, 2 digital inputs, 6 solid state digital outputs	LAN: Trend current loop Lan option fitted	BAC: BACnet over IP protocol capability option included	230: 230 Vac input power supply
IQ412: IQ41x controller with 3 universal inputs, 2 digital inputs, 2 analogue outputs, 4 solid state digital outputs	blank: No Trend current loop Lan	blank: No BACnet protocol	24: 24 Vac input power supply

Note that XML web services are fitted as standard in the IQ41x.

Available Order Codes

IQ411/230 :IQ411 with 230 Vac supply with Ethernet
IQ411/LAN/230 :IQ411 with 230 Vac supply with Trend current loop Lan and Ethernet
IQ411/24 :IQ411 with 24 Vac supply with Ethernet
IQ411/LAN/24 :IQ411 with 24 Vac supply with Trend current loop Lan and Ethernet
IQ412/230 :IQ412 with 230 Vac supply with Ethernet
IQ412/LAN/230 :IQ412 with 230 Vac supply with Trend current loop Lan and Ethernet
IQ412/24 :IQ412 with 24 Vac supply with Ethernet
IQ412/LAN/24 :IQ412 with 24 Vac supply with Trend current loop Lan and Ethernet
IQ41x/xx/BAC/<Power> :Any of the above with IP BACnet option

IQ4/BAC/UP :Upgrade to add BACnet over IP option

IQ41x ADAPTOR PLATE/20 :Retrofit mounting plate to facilitate replacement of IQ21x or IQ7x - Pack of 20
LAN CABLE EXTENDER/20 :Lan cable extender to facilitate replacement of IQ21x or IQ7x - Pack of 20

CABLE/EJ101442 :Adaptor cable to connect PC to RS232 local supervisor port
RD/SDU-IQ2COMMSCABLE/3M :3 m, 3 yds 10” cable to connect RD-IQ, SDU-xcite, IQView4 to IQ4 (supplied with IQView4)
RD/SDU-IQ2COMMSCABLE/10M :10 m, 11 yds cable to connect RD-IQ, SDU-xcite, IQView4 to IQ4

Sensors/Displays:

RD-IQ :Room display series with temperature sensor, setpoint control, occupation override, status display, and fan speed control options - see RD-IQ data sheet.
SDU-xcite :Smart display series with 4 line display can show all normal strategy items plus directories and alarm log. See SDU-xcite data sheet.
TB/TS :Wall mounting thermistor space temperature sensor series with setpoint control, occupation override, occupation status display, and fan speed control options. See TB/TS data sheet.
WSA/10/USA :Pack of 10 wall sensor adaptor plates to facilitate mounting TB/TS, RD-IQ, SDU on US or Danish electrical back boxes. Each plate complete with 2 plastic covers, 2 back box screws, and two 3.5 mm TB/TS screws
IQView4 :Touch screen colour display giving access to modules, graphs, alarms, and timezones. See IQview4 data sheet.

Accessories:

TP/1/1/22/HF/200 :200 m of screened single twisted pair 0.34 mm^2 (22AWG) (Belden equivalent 8761NH), for use on current loop Lan (IQ4/LAN version), input/output channel wiring (not USA).
TP/2/2/22/HF/200 **:**200 m of screened twin twisted pair 0.34 mm^2 (22AWG) (Belden equivalent 8723NH), for use on current loop Lan (IQ4/LAN version) (not USA).
EDS-205 :Unmanaged Ethernet switch with 5 off 10/100BaseT(X) ports (not USA).
EDS-305-M-SC :Unmanaged Ethernet switch with 4 off 10/100BaseT(X) ports, 1 multimode100BaseFX (fibre optic) port (not USA).
IMC-101-M-SC :1 channel 10/100BaseT(X) to multimode 100BaseFX (fibre optic) converter (not USA).

SPECIFICATIONS

Electrical

Input power supply voltage
- /230 :230 Vac ±10% 50 Hz at up to 40 VA
- /24 :24 Vac ±15% 50/60 Hz

Fusing :No replaceable fuses required.

Power failure protection :All strategy and data in nonvolatile memory. Supercap maintains real time clock for up to 8 days (typical).

Clock accuracy :10 s per month (typical).

Display panel :IQView4, or SDU-xcite to RS232 local supervisor port (also see wallbus below)

Ethernet :main bus, 10BASE-T, 100BASE-T (IEEE 802.3). Supports TCP/IP, FTP. IQ41x supports auto MDI/MDI-X which eliminates need for crossover adaptor

- Virtual CNC address :vCNC address to be configured in strategy.

RS232 Local Supervisor Port
- Transmission :RS232, EIA/TIA/232E, V28 supports IQ System comms
- Distance :15 m, 16 yds
- Baud rate :9k6.
- Address :Selectable by software, 116 nodes addressable (1, 4 to 119 excluding 2,3,10) set to be unique on Lan.

USB Local Engineering Port :Micro B connector. USB 2.0. Supports 480 Mbits/s (Hi-Speed). Maximum cable length 5 m

Trend Current Loop Lan :(IQ41x/LAN only)
- Transmission :20 mA two wire current loop, opto-isolated, polarity independent receiver, balanced transmitter
- Distance :Dependent on cable type, see table below:

Cable	1k2 baud	4k8 baud	9k6 baud	19k2 baud	38k4 baud	No. of Wires
Belden 9182	1000 m (1090 yds)	1000 m (1090 yds)	1000 m (1090 yds)	700 m (765 yds)	500 m (545 yds)	2
Belden 9207	1000 m (1090 yds)	1000 m (1090 yds)	1000 m (1090 yds)	500 m (545 yds)	350 m (380 yds)	2
Trend TP/1/1/22/HF/200 (Belden 8761)	1000 m (1090 yds)	1000 m (1090 yds)	700 m (765 yds)	350 m (380 yds)	250 m 270 yds	2
Trend TP/2/2/22/HF/200 (Belden 8723)	1000 m (1090 yds)	1000 m (1090 yds)	500 m (545 yds)	250 m (270 yds)	125 m (135 yds)	4

- Baud rate :Auto-detected in range 1k2, 4k8, 9k6, 19k2, 38k4 - set to be same as other nodes on Lan.
- Address :The IQ41x address on Lan is set software. Set to be unique on network; 116 nodes addressable (1 to 119 excluding addresses 2,3, and 10

Inputs/Outputs
- IQ411 :3 universal inputs, 2 digital inputs, 6 solid state digital outputs
- IQ412 :3 universal inputs, 2 digital inputs, 2 analogue outputs, 4 solid state digital outputs
- Signal Cable :Universal inputs, and analogue voltage outputs; TP/1/1/22/HF/200 recommended (Belden 8761)

Universal inputs :Input channels 1, 2, 3. Can be set by software to voltage input (0 to 10 V), current input (0 to 20 mA), thermistor input (0 to 200 kohms), or digital input (volt free contact/open collector).
- Voltage input :12 bit resolution. Minimum 60 dB series mode rejection at input power supply frequency. 0 to 10 V, input resistance 9.4 kohms, accuracy 50 mV equivalent to ±0.5% of span.
- Current input :12 bit resolution (4096 steps - effective). Minimum 60 dB series mode rejection at input power supply frequency. 4 to 20 mA, input resistance 120 ohms, accuracy 0.5% of span (i.e. 100 µA). Can connect either loop powered or external powered sensors. Supply to loop powered sensors by '+' terminal, uses part of part of combined supply defined above.
- Thermistor input :(potentiometer, thermistor, fan speed control). 0 to 200 kohms 12 bit resolution. Minimum 60 dB series mode rejection at input power supply frequency. Thermistor bridge resistor 12 kohms, accuracy 0.5% (200 ohms to 200 kohms). Bridge supply 3.3 V.
- Digital input :(volt free contact, open collector (or drain)). Count rate 30 Hz (minimum pulse width of 16.6 ms). 3.3 V supply through 12 kohms.
  - Volt free contact input :Wetting current = 270 µA nominal. (ON = closed contact.)
  - Open collector (or drain) input :Must be able to sink 270 µA . Must be earthed (grounded) to same earth (ground) as IQ41x. Polarity dependent. (ON = transistor/FET conducts.)

Digital Inputs :Input channels 4, 5. (volt free contact, open collector (or drain)). Count rate 30 Hz (minimum pulse width of 16.6 ms). 5 V supply through 1.5 kohms.
- Volt free contact input :Wetting current = 2.5 mA nominal. (ON = closed contact.)
- Open collector (or drain) input :Must be able to sink 2.5 mA . Must be earthed (grounded) to same earth (ground) as IQ41x. Polarity dependent. (ON = transistor/FET conducts.)

Analogue Outputs :Output channels 6, 7 (IQ412 only). 11 bit resolution (2048 steps). 0 to 10 Vdc at up to 20 mA, reduce to 18 mA maximum above +40 °C (+104 °F). Accuracy ±0.5% of span.

Solid State Digital Outputs :Output channels 6 to 11 (IQ411), channels 8 to 11 (IQ411).
- IQ41x/24VAC :Digital outputs equivalent to 24 Vac solid state relays. 24 Vac; 500 mA maximum for a channel, 500 mA maximum shared between all (4 or 6) channels.
- IQ41x/230 :Digital outputs equivalent to 24 Vac solid state relays. 24 Vac synthesised; 300 mA maximum for a channel, 300 mA maximum shared between all (4 or 6) channels.

24 Vdc Auxiliary Supply Out :24 Vdc (+0%, -20%) at 90 mA maximum.

SPECIFICATIONS (continued)

Indicators

Note that all LEDs illuminate for several seconds after switch on.

General LEDs (in centre of cover)

Power (⚡)	:(green) ON when input power supply is connected. Flashes briefly at 1 second intervals if input power supply fault; return unit to supplier.
Watchdog (!)	:(red) ON if controller has a software fault (i.e. strategy or firmware). Note that the watchdog LED flashes momentarily on power up.
Lan OK (品)	:(green) Operational on LAN option only. ON if current loop Lan is operating. Flashes while trying to auto-set baud rate. If lasts longer than 30 s, set baud speed manually to known baud rate. If still flashing, check Lan connections.
Service Button (⊡)	:(yellow) For future use.

Trend Current Loop Lan (adjacent to Lan connector - operational on LAN option only)

RX	:(yellow) ON if current is entering the network receiver.
TX	:(yellow) ON if current is flowing from network transmitter

Ethernet (on end of Ethernet connector at top)

OK	:(green) Normally called LINK on Ethernet systems. ON indicates a good Ethernet connection. If OFF indicates faulty Ethernet connection.
RX	:(yellow) Flashes when packet of data is being received across the Ethernet.

Mechanical

Dimensions	:116 mm (4.57”) x 157.5 mm (6.2”) x 58.5 mm (2.3”) max.
Material	
Main body	:PCABS FR
Terminal covers	:translucent PC FR
Weight	:
/24	:300 gm (0.66 lb)
/230	:350 gm (0.77 lb)
Connectors	
Power, I/O, Trend current loop Lan	:2 part connectors with rising cage clamp screw terminals for 0.5 to 2.5 mm^2 cross section area (20 to 14 AWG) cable.
Supervisor port	:RJ11 (FCC68), for IQ System utility software, supervisor, RD-IQ, SDU-xcite, or TW/x wireless sensor. Connected by adaptor cable (see order codes section). Can also supply power to SDU, RD, and TW/x wireless sensor (not to IQView, IQView4).
Ethernet	:RJ45 connector, unshielded or shielded twisted pair (UTP or FTP) cable 10 Mbps, 100 m (109 yds), 10 BASE-T/100 BASE T. Cable and connectors are available (see product codes). Connect local supervisor (Ethernet) by way of adjacent hub or directly using standard Ethernet cable. No need for crossover adaptor as unit self-corrects for cable polarity.
USB	:Micro B connector. USB 2.0. Use adaptor cable appropriate to laptop or PC being used.

Environmental

EMC	:EN61326-1:2006
Immunity	:Table 2 - for equipment intended for use in industrial locations
Emissions	:Class B
Safety	:EN61010-1:2010
Protection	
/230	:IP20 if mounted in an enclosure rated at IP20 or equivalent
/24	:IP20
Ambient limits	
storage	:-40 °C (-40 °F) to +60 °C (+140 °F)
operating	:-25 °C (-13 °F) to +55 °C (+131 °F)

Note that if IQ41x/230 is mounted vertically end on with the power connector end at the top the maximum working temperature is 40°C (104°F) - see page 5.

Note that for temperatures below zero special care must be taken that there is no condensation on or within the unit

humidity	:0 to 95 %RH non-condensing
Altitude	:<2000 m (6562’)

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

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