

IQeco31, 35, 38 BACnet MS/TP Terminal Unit Controllers

IQeco31, 35, 38 BACnet Controllers



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212205

Description

The IQ^{eco}31, 35 and 38 are terminal unit controllers for use with BACnet over MS/TP. They can communicate with other IQecos over the BACnet MS/TP network, and with Trend networked devices by way of an IQ4NC.

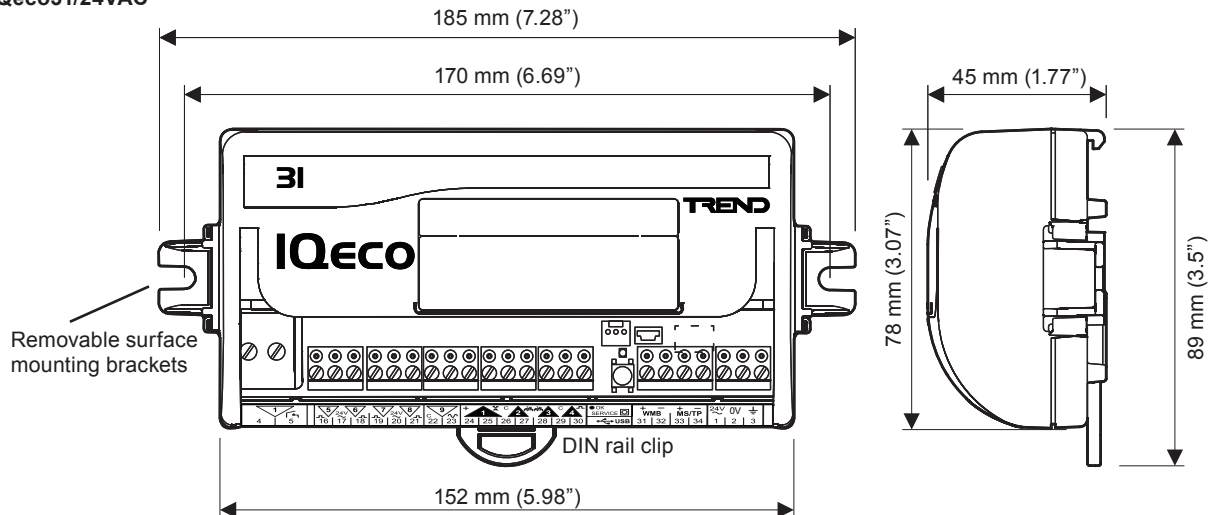
They have from 10 to 18 I/O channels, and can be supplied either fully programmable or with a fixed strategy.

Features

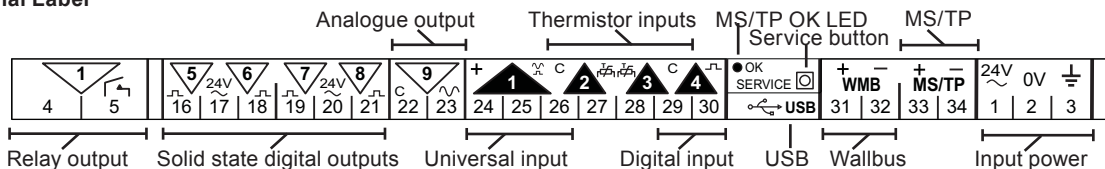
- Fully compatible with the Trend system
- BACnet over MS/TP (WSP certified)
- Non-volatile memory, no battery required
- 230 Vac or 24 Vac input power versions
- Inputs configurable by software (no links)
- Energy efficient strategies available
- eu.bac certified strategies available

Physical

IQeco31/24VAC

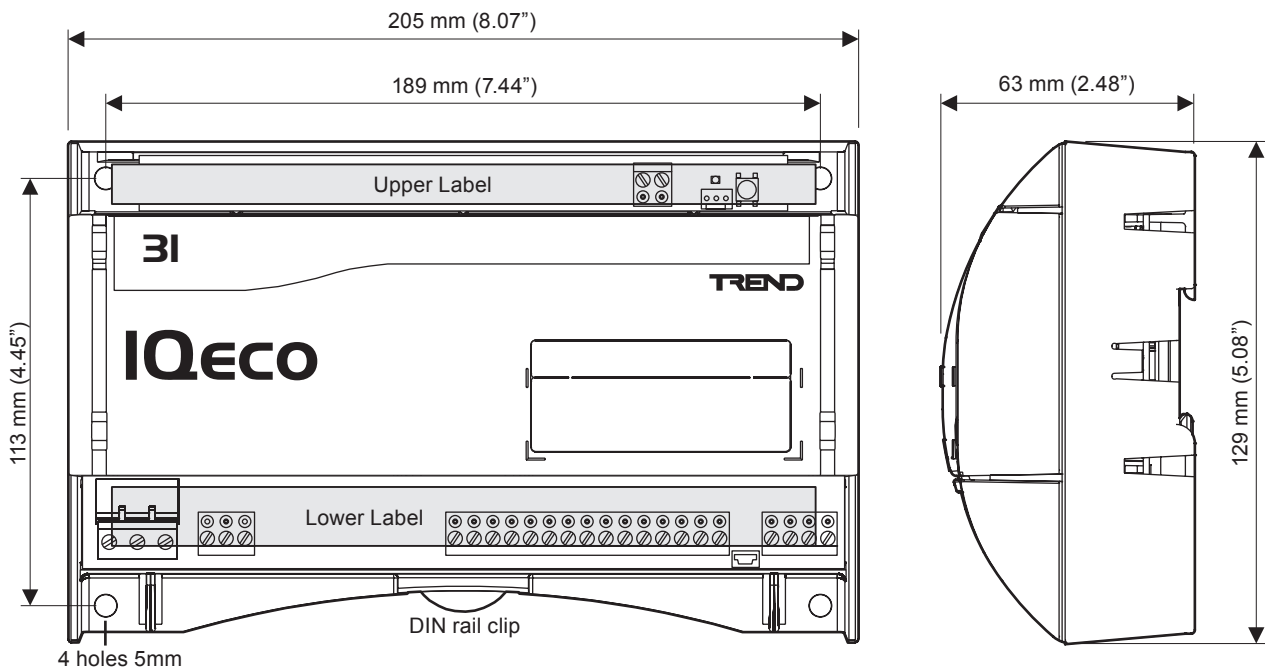


Terminal Label

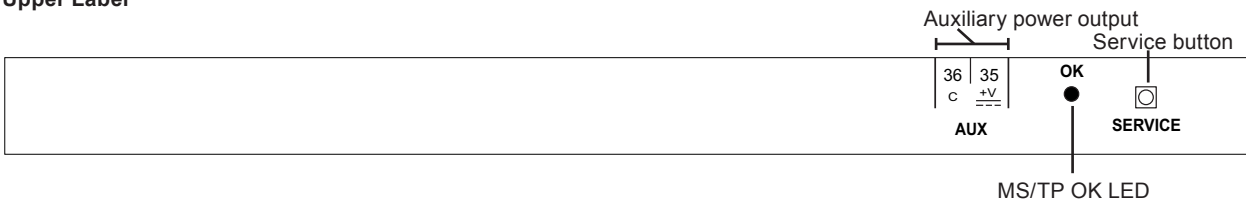


Physical (continued)

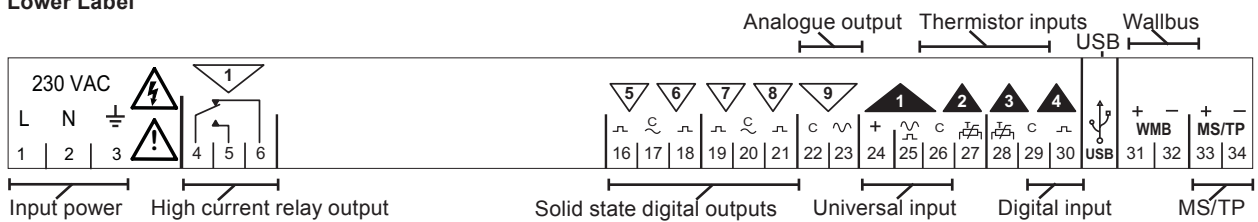
IQeco31/230



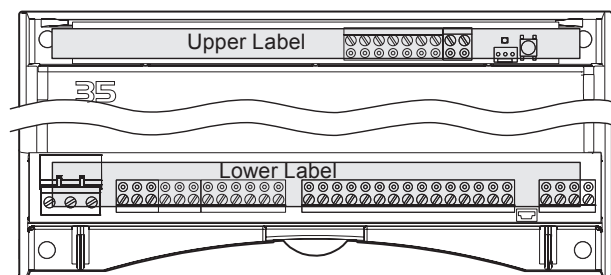
Terminal Labels
Upper Label



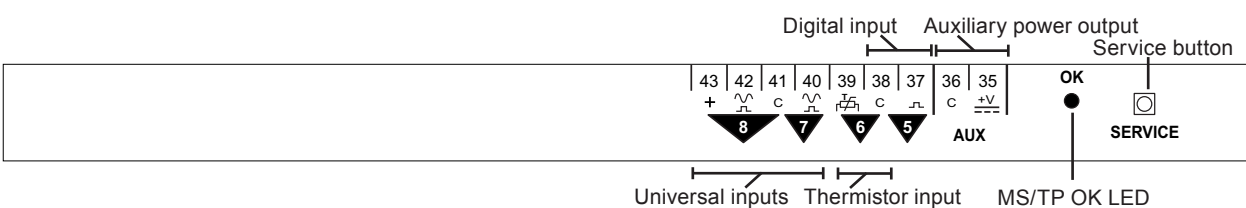
Lower Label



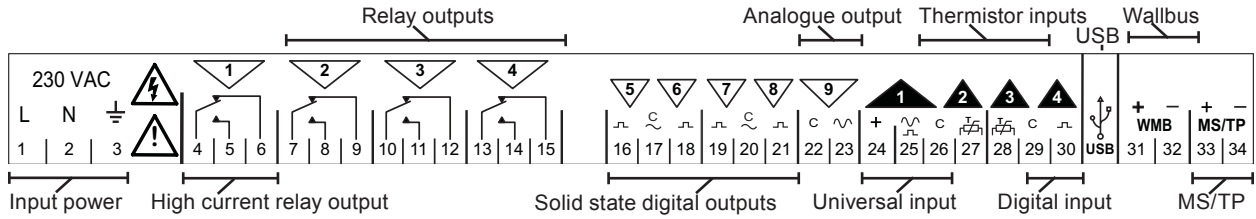
IQeco35 (dimensions the same as IQeco31/230)



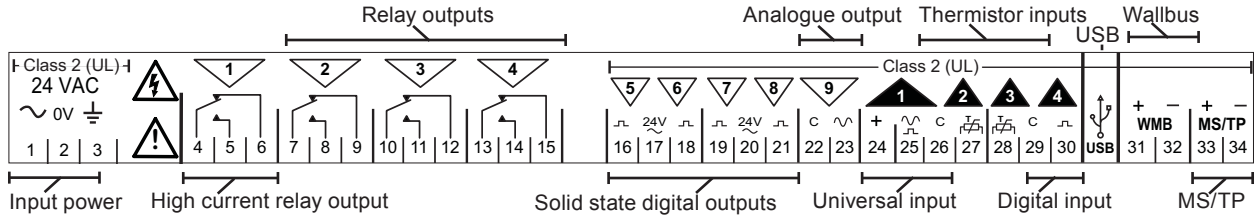
Terminal Labels
Upper Label



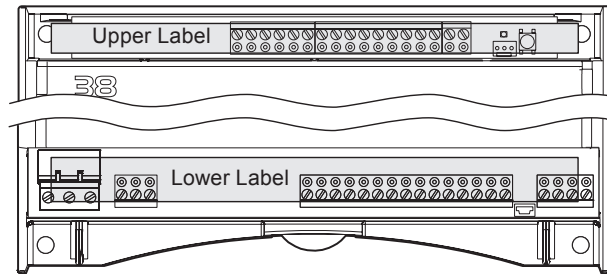
Lower Labels
IQeco35/230



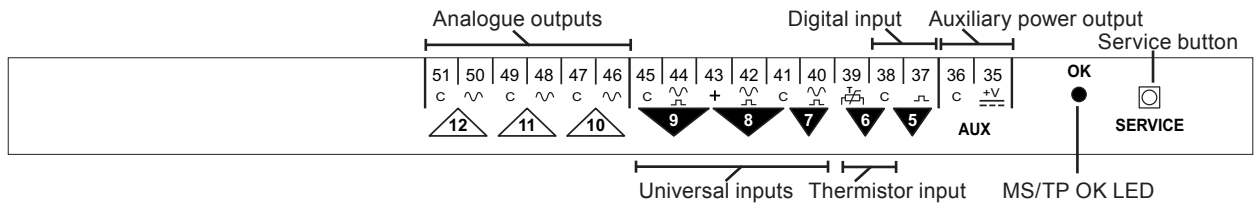
IQeco35/24VAC



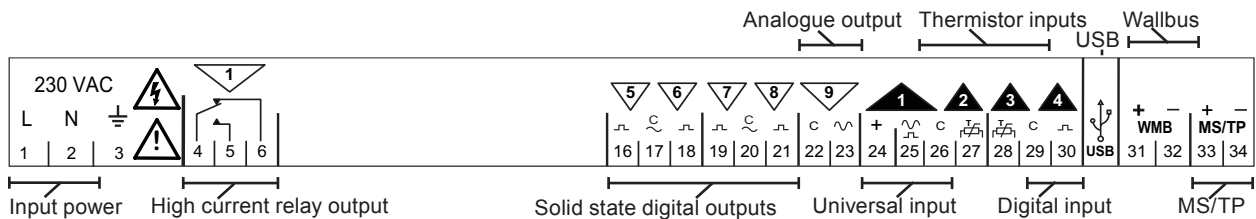
IQeco38 (dimensions the same as IQeco31/230)



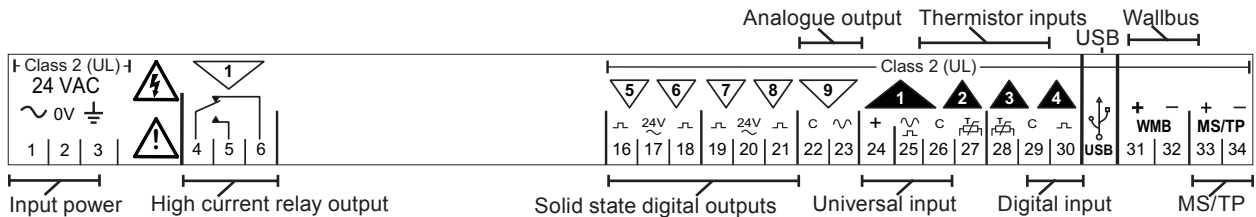
Upper Label



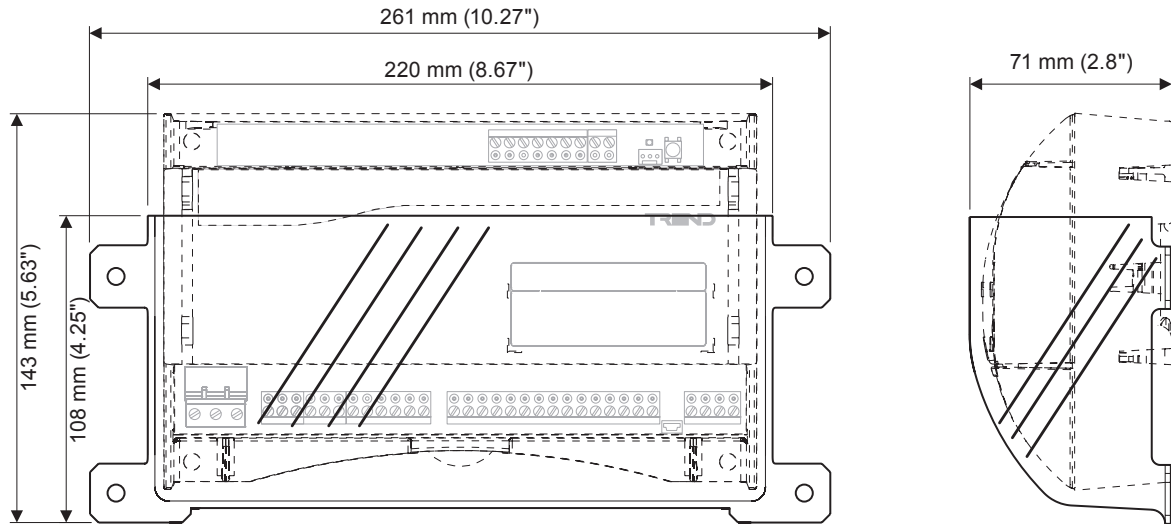
Lower Labels
IQeco38/230



IQeco38/24VAC



IQeco/IQL Secondary Terminal Cover



This accessory can be used with IQeco31/230, IQeco35, IQeco38 to enable the unit to comply with EN61010-1 without installation in an enclosure.

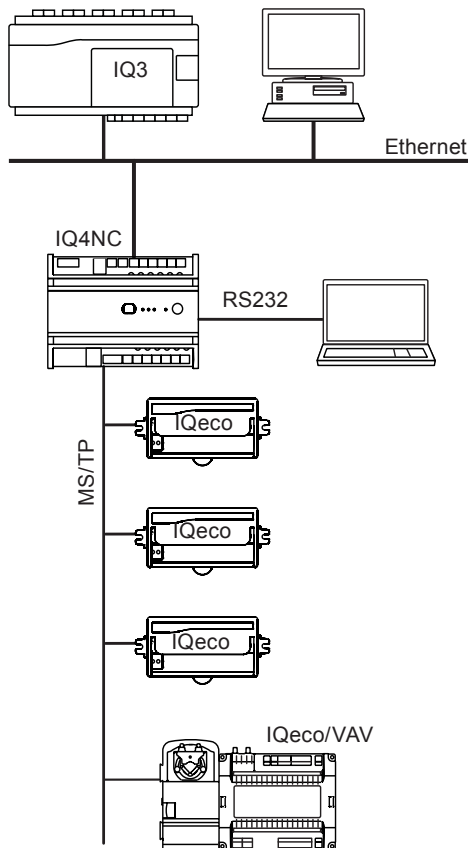
FUNCTIONALITY

The IQeco can be purchased either as a fully programmable unit, or with a fixed strategy. The strategy defines its HVAC equipment interaction. Fixed strategy units can be reconfigured with a different strategy from a defined class of strategies within the strategy library. The IQeco functionality can be divided into four sections: System, Hardware, Firmware, and Strategy.

The IQecos will connect together using an MS/TP trunk. The MS/TP trunk extends from an IQ4NC (set to an appropriate communication mode) which acts as a router between Ethernet and the MS/TP trunk. The IQ4NC allows IQecos to communicate with other Trend devices on the Trend network that are operating on other network media. There can only be 1 IQ4NC on the trunk.

SYSTEM

Trend System



The IQ4NC may be configured to obtain values from the IQecos and display them on web pages.

BACnet Communications

The IQeco controller is certified as a BACnet Application Specific Controller (B-ASC) by WSP Cert. It uses the BACnet trunk as its communications network. It will support the following BACnet communications:

- BACnet devices (workstations, controllers) can communicate with the IQecos using BACnet protocol.
- BACnet IC Comms Data From modules can receive unconfirmed COV messages from another BACnet device.

However, IQeco cannot provide BACnet alarm and event notification (BACnet alarms), nor can it provide BACnet trending (plots).

A full specification of the supported objects, properties, and BIBBS (BACnet Interoperability Building Blocks) supported by the IQeco is given in the IQeco Product Implementation Conformance Statement (TP201091).

Out of the Box Operation

The IQeco can operate on the MS/TP trunk without the IQ4NC being present. It will try to form a network with any other Trend device on the MS/TP trunk. If other IQecos are present they will try to form a network together. As a result attribute type IC comms set up for communication between controllers will operate successfully, and any pre-configured IQeco will run its control strategy. Although BACnet comms will work with default settings, the IQ4NC and SET can be used temporarily to set up addresses (e.g. avoid duplicate addresses) and other parameters, and then be removed. For IQeco 31, 35, 38 a PC running SET can be connected by way of an IQeco's USB port.

Out of the Box Operation (continued)

If IQecos and an IQ4NC are connected as a system 'out of the box' they will form a network; the IQ4NC will give the IQecos its default Lan address (9), and the controllers will all be accessible to a supervisor or tool using the IQ4NC's Ethernet connection or RS232 or USB serial port connections (although there is a remote chance of an address clash as described in the IQeco Configuration Manual (TE2010089)).

IQeco Addresses

The IQeco controllers will build a Trend Lan with the IQ4NC as its INC (Internetwork Node Controller). There can only be one Lan on the BACnet trunk and the Lan number is configured in the IQ4NC. The Lan number is read-only in the IQeco and is set up when it is installed by the IQ4NC.

There can be only one IQ4NC on the BACnet trunk, and the IQ4NC cannot be on the same Lan as an IQ3 on the Ethernet internetwork.

The IQeco's Trend device address is set up in the factory on a rolling basis in the range 11 to 119. So in a batch of IQecos, each will have a different device address (printed on the unit's label along with its unique serial number).

An IQeco may be re-addressed by the Addresser Applet (running on a PC connected to the Trend network).

New addresses should be written on the unit's label which has a tear-off adhesive label strip with the 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 second large adhesive label is supplied to be mounted outside the metal work containing the IQeco with similar information. This will also have the serial number as text and a barcode with the unique Serial Number; this can be read by a barcode reader from a distance.

A PC running SET is able to use an IQeco's local engineering port to communicate with the entire Trend system to which the IQeco is connected. If the supervisor port address in the IQeco is set to 0 (default), a supervisory CNC (sCNC) 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 sCNC remains on the network map when the SET PC is removed. The sCNC's address should be set non-zero if it is likely that software tools could be connected to more than one IQeco simultaneously on the same MS/TP trunk. (This will prevent an address clash at address 125). It can be changed using the Monitor Applet IQecoDiagnostics_Strategy template or by SET Device View.

There can be the IQ4NC with up to 64 IQeco controllers or other BACnet devices on the BACnet trunk. The IQecos should use Trend device addresses in the range of 11 to 119. (The **IQ4NC** defaults to Lan 9, device address 9 with its vCNCs at addresses 1 and 4).

The IQeco's BACnet MAC address will be the same as its Trend device address. Note that the IQ4NC (with Trend device address 126) will have a default BACnet MAC address of zero (it can be changed, but is recommended to be left at zero).

Other non-Trend MS/TP master and slave devices can be added to the trunk, but their presence may compromise the physical network loading and bandwidth. Care must be taken to avoid a BACnet MAC address clash. Master devices are required to use BACnet MAC addresses in the range 0 to 127, and slave devices are required to use BACnet MAC addresses 128 to 254.

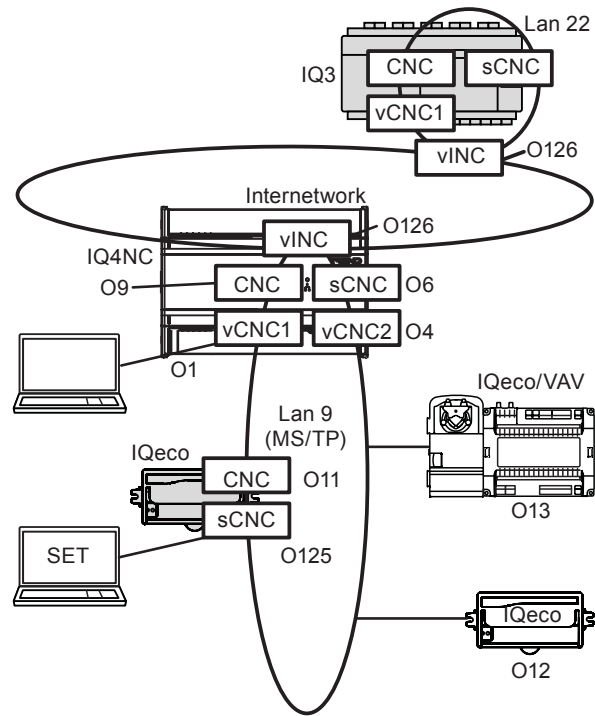
Using BACnet comms the IQeco is either addressed by its BACnet Device Instance, or by its BACnet Network Number and BACnet MAC address.

The IQeco's BACnet Device Instance will default to a function of the IQeco's Trend Lan Number and Device Address (Lan number x 1000 + Device Address), but may be changed in the IQeco's BACnet Application network module.

The BACnet Network Number is held in the IQ4NC, and is normally equal to the IQ4NC's Trend Lan number, but may be changed in the IQ4NC's BACnet MSTP network module.

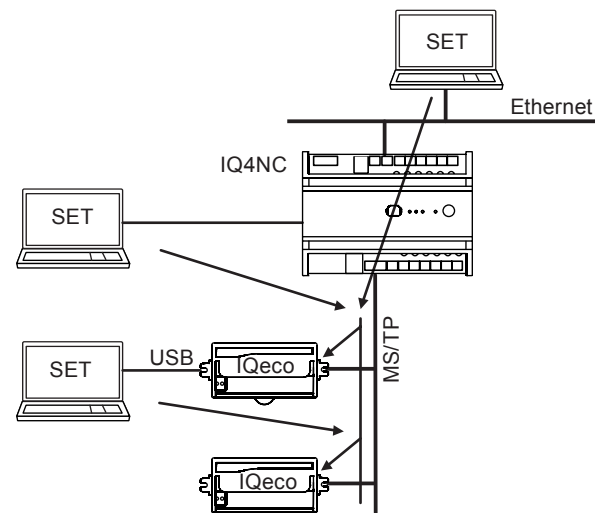
Note that if communicating with an IQeco through a BACnet router, communication with the IQeco is only possible using BACnet protocol. Trend communications will not work unless the router is an IQ4NC.

The diagram below shows an example logical network with the INCs in the IQ4NC and IQ3 forming an internetwork. The IQecos on the MS/TP trunk form a single Lan. The PC is connected by way of the vCNC in the IQ4NC.



System Engineering Tool (SET)

SET can communicate with the IQecos over the Trend network by way of the IQ4NC or over RS232 using the IQ4NC's supervisor port or by way of an IQeco over USB using the IQeco's Local Engineering Port.



System Engineering Tool (SET) (continued)

The Addresser Applet facilitates the addressing of a Lan of IQecos on an MS/TP trunk. It enables the discovery of the IQecos, either manually (by pressing their service buttons or scanning the barcode label) or automatically. It also facilitates resolving duplicate addresses.

The Monitor Applet can be used to monitor or change strategy parameters. Templates have been provided for the standard strategies (solutions) which show the key parameters relevant to the strategy in various views. The user should create templates for a custom (user-created) strategies.

The Firmware Upgrade Applet will upgrade the firmware in one or many IQecos. It may be necessary to upgrade the strategy in which case it strategy should be uploaded first and upgraded by SET, and downloaded back to the IQeco after the firmware upgrade.

The Licence Requester is used to request a licence to change from fixed function to programmable controller. This enables a licence request to be created that can be emailed to Trend; upgrades must be purchased.

The Licence Committer enables the licence received back from Trend to be sent to the IQeco to enable the change from fixed to programmable controller.

HARDWARE

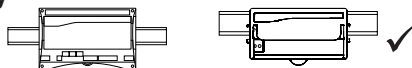
Box

The controller is designed for surface or DIN rail mounting. A surface mounted IQeco31/24VAC will comply with EN61010-1. A DIN rail mounted IQeco31/24VAC or IQeco31/230, IQeco35, IQeco38 must be mounted inside an enclosure rated to at least IP20 or equivalent; to eliminate the need to install in an enclosure the IQeco/IQL Secondary Terminal Cover can be installed over these units. IQeco31/24 cannot be used with the secondary terminal cover, so if it is DIN rail mounted it can only be fitted inside an enclosure. For UL rating all IQeco/24VAC controllers must be mounted inside an enclosure.

The IQeco/230, IQeco35, IQeco38 have 4 point surface mounting and the IQeco31/24VAC version has two removable surface mount brackets. All units have a plastic housing with a hinged clear polycarbonate terminal cover. The units are the same size and have the same mounting points as the equivalent IQL controller, but note that the cabling requirements of MS/TP are different to LONWORKS.

The units may be mounted vertically in a panel, on the base or vertically side on, but not vertically upside down. *Note if IQeco31/230, IQeco35 or 38s are mounted vertically side on the maximum working temperature is derated to 40 °C, (104°F).*

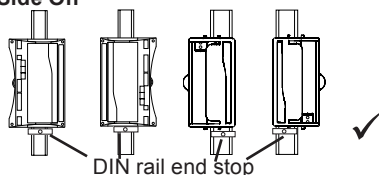
Vertically



Vertically Upside Down



Vertically Side On



Flat on Base

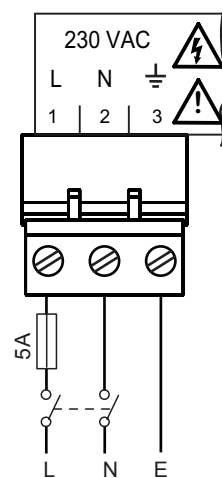


Power Supply

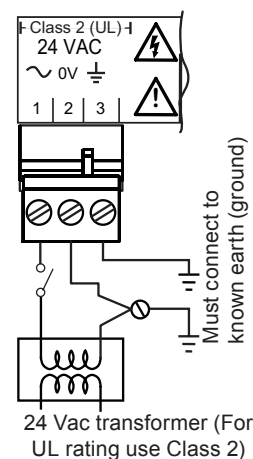
The IQeco has both 230 Vac and 24 Vac input power options.

/230: This option requires 230 Vac $\pm 15\%$, 50/60 Hz at up to 45 VA, which consists of up to 7 VA internal power, plus the power required by the solid state digital (valve or damper) outputs and the Combined Supply Outputs (wall bus, and analogue outputs see page 7). The IQeco input power earth (ground) terminal (terminal 3) is isolated from the input power neutral, and must be separately earthed (grounded) locally; this ground terminal is internally connected to the IQeco electronics earth (ground).

The 230 V supply must include a dedicated 5 A fuse complying with IEC60269 (BS1362) 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. Do not position the equipment so that the disconnecting device is difficult to operate.



/24VAC: This option requires 24 Vac $\pm 15\%$, 50/60 Hz, at up to 26 VA, which consists of up to 10 VA internal power, plus the power required by the solid state digital (valve or damper) outputs and the Combined Supply Outputs (wall bus, and analogue outputs see page 7). The 24 Vac uses a 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 24Vac input power 0V is not internally connected to the earth (ground) terminal, therefore both the transformer secondary and the earth(ground) terminal (terminal 3) must be connected to earth as shown in the diagram. For UL rating the input power connections must be made using 18 AWG or larger wire rated at least 90°C (194 °F). The 24 V supply must include a suitably rated switch in close proximity and be clearly marked as the disconnecting device for the unit. Do not position the equipment so that the disconnecting device is difficult to operate.



Combined Supply Outputs

IQecos provide 21 Vdc supply terminals for use with the wallbus (WMB), analogue outputs (AO), loop power to the sensors, and the auxiliary output supplies (AUX and '+' terminals 24 and 43).

Note: IQeco 31/24VAC does not have an AUX terminal.

The maximum current available from each terminal varies according to the IQeco model and ambient operating temperature, as shown in the following tables:

Terminal	-40°C to +40°C -40°F to +104°F	+40°C to +60°C +104°F to +140°F
IQeco 31/24VAC		
23 AO	20 mA	10 mA
24 Loop power	20 mA	
31 WMB	10 mA	
IQeco 31/230		
23 AO	20 mA	10 mA
24 Loop power	20 mA	
31 WMB	10 mA	
35 AUX power	10 mA	
IQeco 35/24VAC		
23 AO	20 mA	10 mA
24 Loop power	20 mA	
43 Loop power	40 mA	
31 WMB	10 mA	
25 AUX power	30 mA	
IQeco 35/230		
23 AO	20 mA	10 mA
24 Loop power	20 mA	
43 Loop power	40 mA	20 mA
31 WMB	10 mA	
35 AUX power	30 mA	10 mA
IQeco 38/24VAC		
23 AO	20 mA	10 mA
46 AO	20 mA	10 mA
48 AO	20 mA	10 mA
50 AO	20 mA	10 mA
24 Loop power	20 mA	
43 Loop power	60 mA	
31 WMB	10 mA	
35 AUX power	5 mA	
IQeco 38/230		
23 AO	20 mA	10 mA
43 AO	20 mA	10 mA
48 AO	20 mA	10 mA
50 AO	20 mA	10 mA
24 Loop power	20 mA	
43 Loop power	60 mA	20 mA
31 WMB	10 mA	
35 AUX power	5 mA	

The IQeco can only communicate with one wallbus device. If the wallbus device requires in excess of 10 mA, this must be catered for by reducing supplies to other terminals which use the combined supply.

BACnet MS/TP

The IQeco behaves as a master on the MS/TP trunk. MS/TP (master-slave token passing) is based on the two wire RS485 network. It can operate at speeds from 9k6 baud to 76k8 baud; 76k8 baud is recommended for best performance. The baud rate is set in the IQ4NC, and the IQeco automatically sets itself to the same baud rate. All devices on the trunk must use the same baud rate.

Note that the MS/TP network has different requirements to the IQL LonWorks® network.

All MS/TP devices (e.g. IQecos, or third party devices) must have their power supply neutral or ground terminal connected to earth, in conjunction with normal safety practices.

The MS/TP trunk should be wired as a straight bus (not loop or star). It should use tinned copper, screened, twisted-pair cable with characteristic impedance between 100 and 130 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot).

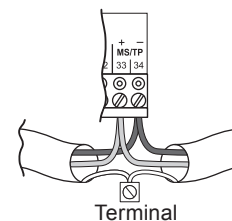
Distributed capacitance between conductors and screen shall be less than 200 pF per meter (60 pF per foot). Foil or braided screens are acceptable.

The maximum recommended length of an MS/TP segment is 1200 meters (4000 feet) with AWG 18 (0.82 mm²) cross section area cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485. Cables of a smaller gauge will result in shorter maximum distances. Details of cables are given in the TP/... Twisted Pair Cable Data Sheet (TA200541).

Matched terminating resistors ($\pm 1\%$, ¼ Watt, range 100 to 130 ohms) are required.

The IQ4NC provides network biasing (470 ohms); a maximum of two devices on the network can provide network biasing.

Up to 3 repeaters may be used. Each MS/TP segment must have a single point screen ground. Do not ground the MS/TP screen using a controller terminal. Do not ground both ends of the screen. At connecting points, tie the screen through a terminal.



Failure to comply with these practices will result in significant impairment of the communication performance.

For detailed information about wiring the MS/TP trunk see the IQeco31/230 Controller Installation Instructions - Mounting (TG201224), IQeco31/24VAC Controllers Installation Instructions - Mounting (TG201223) or IQeco35, 38 Controllers Installation Instructions - Mounting (TG201177).

There may be the IQ4NC and up to 64 IQecos or other manufacturer's devices on the trunk.

A separate limitation is that the IQeco presents a ¼ BACnet 'unit' load (ref. EIA-485), as does the IQ4NC. Other manufacturer's devices should be considered as an entire 'unit' load unless otherwise specified. The MS/TP segment supports up to 32 'unit' loads.

Service Button

The service button is used to identify the IQeco to the Addresser Applet, to reset the IQeco, and to enter service button mode.

Identify the IQeco to the Addresser Applet: Pressing the IQeco's service button generates a message which identifies the IQeco by means of its unique serial number; this can be interpreted by system tools and can be used to find the IQeco's device address and Lan number. An alternative method of identifying the IQeco is to use a barcode scanner.

Reset the IQeco: Holding down the button as the unit is powered up will cause a strategy clear down. If the button is held down between 5 s and 15 s the IQeco is returned to factory defaults (RTFD) and after the reset it will start running its 'out of the factory' strategy. If the button is held down between 15 s and 30 s then there will be no running strategy (although a subsequent RTFD would restore the 'out of the factory' strategy). The IQeco should be then be reconfigured from scratch.

Either reset will set Address module parameters as follows: Local Address to 119; Identifier, Attributes (E, F) and the Supervisor Port Address cleared. For details of these procedures see the IQeco Configuration Manual (TE201089).

Service Button Mode: Holding down the service button for 2 to 5 s when the unit is already powered up will cause the IQeco to enter service button mode.

This mode makes use of virtual input channels (IN101 to IN108). The real input channels, (IN1 to IN9), have external connections, whereas the virtual input channels have no external connections but can be set to a digital state as a result of the service button presses. The virtual input channels can be connected to external type digital input modules in the same way as for the real input channels and then the module outputs may be used in the strategy.

The virtual input channels will normally be off, but by pressing the button in a defined sequence, one of the channels may be set on for one pass of the sequence table.

On entry into service button mode the 'MS/TP OK' LED will flash rapidly for 1 s; when the flashing stops this indicates the start of selection phase 1.

There are 3 selection phases in succession; in each phase the button may be pressed or not pressed. At the end of each phase the LED will flash once to confirm no press, and twice to confirm a press. The virtual input channel is selected as shown in the table below where a tick refers to a button press and a cross means no press.

	101	102	103	104	105	106	107	108
Phase 1	x	✓	x	✓	x	✓	x	✓
Phase 2	x	x	✓	✓	x	x	✓	✓
Phase 3	x	x	x	x	✓	✓	✓	✓

For example, to select channel 106, the button must be pressed during phases 1 and 3.

After selection phase 3 the LED will flash rapidly and the service button must be pressed to confirm the selection made during phases 1 to 3; if the button is not pressed no action will occur. If the button is pressed, the selected virtual input channel will switch on for one pass of the sequence table.

Although the use of the service button in service button mode is determined by the strategy, all the IQeco standard strategy solutions make consistent use of the service button as follows:

	Function
IN101	Switch on Water Balancing for Lan
IN102	Switch off Water Balancing for Lan

	Function
IN103	Switch on Water Balancing for Unit
IN104	Switch off Water Balancing for Unit
IN105	Switch on Occupation for Lan
IN106	Switch off Occupation for Lan
IN107	Switch on Occupation for Unit
IN108	Switch off Occupation for Unit

The strategy will record the 'on' input to set the function and clear it when the appropriate 'off' input is selected.

Indicators

MS/TP OK: On power up the green LED flashes for 100 ms each time a message is transmitted by the IQeco, after which it stays on indicating that the IQeco has successfully communicated with at least one other Trend device on the MS/TP network. If the IQeco does not receive any messages (i.e. a deaf IQeco), it will flash every 800 ms for 700 ms.

This indicator is also used in service button mode see 'Service Button' on page 8.

Backup

The data (shell 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 but for other parameter changes, in order to prolong the life of the flash memory, they are written to flash: every 2 hours starting at midnight, after an archive instruction, on data entry by RD-WMB (wallbus), or on service button operation.

The tools (e.g. SET) will send the archive instruction after the parameter changes. Changes from IC Comms will get stored as described above.

Barcode Scanner

A large barcode label is supplied with the unit. This is intended to be mounted on the outside of the metal work containing the IQeco; 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:

- Laser scanner able to read 'code 128 auto'.
- It must be able to work close up and from about 3.5 m (12') away. The distance it can read depends on the user requirements.

Inputs and Outputs

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

			IQeco31/24VAC	IQeco31/230	IQeco35/24VAC	IQeco35/230	IQeco38/24VAC	IQeco38/230
Outputs	Relay	HC	0	1	1	1	1	1
		LC	1	0	3	3	0	0
	Solid State Digital	24 Vac	4	0	4	0	4	0
		24 Vac synthesised	0	4	0	4	0	4
Analogue			1	1	1	1	4	4
24 Vdc auxiliary output supply			0	1	1	1	1	1
Inputs	Universal		1	1	3	3	4	4
	Digital		1	1	2	2	2	2
	Thermistor		2	2	3	3	3	3

Inputs and Outputs (continued)

Although a programmable IQeco is completely flexible, the table below shows typical applications for the available channels.

Application	IQeco31	IQeco35	IQeco38
Fan Control On/Off	on/off (1RO)	3 speed (3RO)	on/off (1RO)
Variable Speed	AO	AO	AO
Valve Control (Raise/lower or Thermic)	2 (4DO or 2DO)	2 (4DO or 2DO)	2 (4DO or 2DO)
Electric Heater	-	RO	-
Room Controls	-	-	3 AO
Discharge Air Temp.	UI	UI	UI
Space Temp.	TI	TI	TI
Setpoint	TI	TI	TI
Window contact	DI	DI	DI
Fan speed selection	-	UI	-
PB/PIR	-	DI	-
Other remote sensors	-	UI	3UI
Motor feedback	-	-	DI

Key: RO = Relay Output, AO= Analogue Output, DO= Digital Output, TI= Thermistor Input, DI= Digital Input, UI= Universal Input.

The fixed function standard strategy solutions map the standard inputs as follows:

Discharge temp	IN1 (UI)
Space Temp	IN2 (TI)
Setpoint	IN3 (TI)
Window Contact	IN4 (DI)
PB/PIR	IN5 (DI)
Fan Speed Selection	IN7 (UI)
Flow/safety	IN8 (UI)

IQeco standard solutions provide a consistent user interface in that the presentation modules used (sensors, knobs, digital inputs switches, and drivers) will be the same across all the solutions where appropriate. Similarly the input and output channels are consistent. This enables a user to become familiar with which adjustment modules to use and what I/O should be connected as he moves from strategy to strategy.

E.g.

- W1 'Unit Bypass Request 1=Active' is used across the solutions.
- W2 'Electric Heat 1=Enabled' will only be used with solutions with an electric heat output

Each strategy is described by its strategy data sheet; these are listed in the 'Order Codes' section on page 18.

Relay Outputs

IQeco31, 38: 1 channel (OUT1)
IQeco35: 4 channels (OUT1, OUT2, OUT3, OUT4)

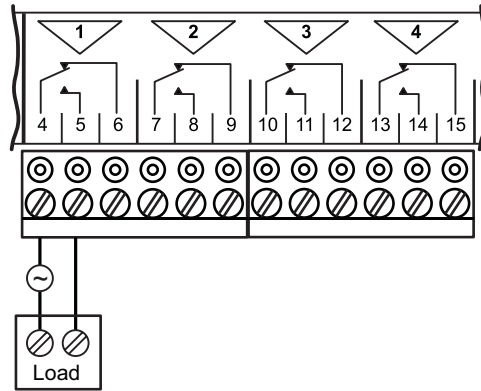
All relays are changeover except IQeco31/24VAC which is make only (using terminals 4, 5).

All relays rated at 250 Vac. OUT1 is rated at 5 A on IQeco31/24VAC and 8 A on IQeco31/230, 35, 38. OUT2, 3, 4 are rated at 5 A.

Note that to meet safety requirements, for the 4 relays (OUT1 to OUT4) on IQeco35, those being used must all be switching either low voltage or mains and not a mixture of low voltage and mains. If switching mains, they must all switch the same phase and polarity.

Arc suppression is recommended, see Relay Output Arc Suppression Installation Instructions (TG200208).

Example wiring



Solid State Digital Outputs

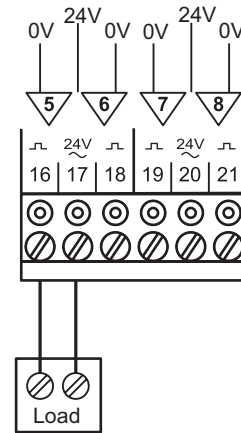
4 channels (OUT5, OUT6, OUT7, OUT8)

Each output provides an independent 24 Vac feed for driving 24 Vac loads, such as thermoelectric (thermic) actuators, and raise lower actuators, for example those in the Trend range of products.

The maximum total current available on all IQeco variants with all four outputs energised is 400 mA at temperatures between -40°C (-40°F) and +40°C (+104°F), and 300 mA at temperatures between +40°C (+104°F) and +60°C (+140°F).

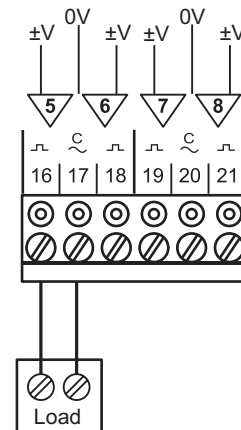
/24VAC: All /24VAC controllers have four 24 Vac outputs.

Terminals and example wiring



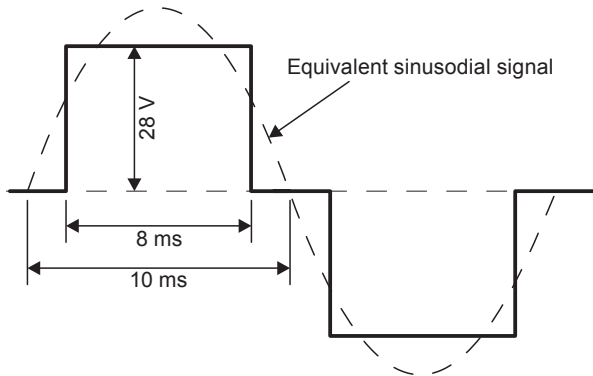
/230: All /230 controllers have four synthesised 24 Vac outputs.

Terminals and example wiring



Solid State Digital Outputs (continued)

The electrical characteristic of the synthesised 24Vac output is approximately as shown below. Loads should be assessed against this before they are used with /230 controllers.



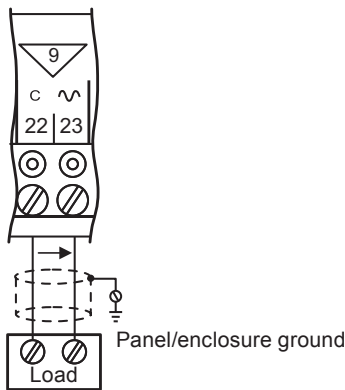
For time proportioning drivers (in power managed mode) a 'soft start' of the above waveform is implemented to allow for the large inrush currents of thermic actuators.

Note that certain types of actuator which require a direct 24 Vac supply (e.g. spring return) may not be suitable for powering from IQeco /230 units and may require a separate 24 Vac supply.

Analogue Outputs

IQeco31, 35: 1 channel (OUT9)
 IQeco38: 4 channels (OUT9, OUT10, OUT11, OUT12)

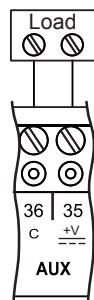
Provides 0 to 10 Vdc, see 'Combined Supply Outputs' on page 7 for maximum current. Example wiring (wiring for OUT9).



Use 2-wire twisted screened cable for wiring the outputs, with the screen connected to the panel/enclosure ground and unterminated at far end. Connect the return to the C terminal (e.g. 22 C) not to an input common.

Auxiliary Supply Output (AUX)

Available on all units except IQeco31/24VAC. Provides 21 Vdc ±10%, see 'Combined Supply Outputs' on page 7 for maximum current. Example wiring

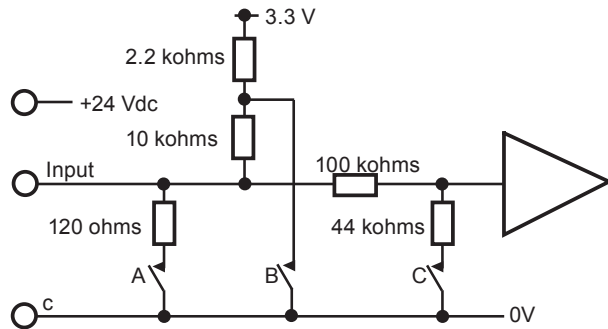


Note: All '+' terminals (terminals 24 and 43) also provide a 21 Vdc auxiliary supply.

Universal Inputs

IQeco31: 1 channel (IN1)
 IQeco35: 3 channels (IN1, IN7, IN8)
 IQeco38: 4 channels (IN1, IN7, IN8, IN9)

The universal input channels can either be voltage input (0 to 10 V), thermistor input (0 to 200 kohm), digital input (voltage 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).



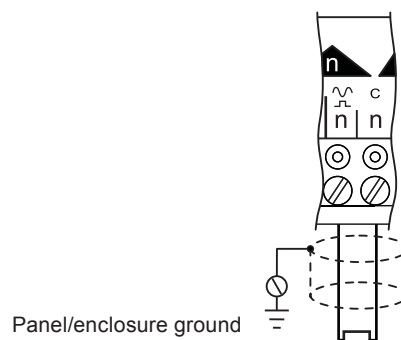
The switches are automatically selected as shown in the table below:

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

For thermistor, voltage, and current use 2-wire twisted screened cable for wiring the inputs, with the screen connected to the panel/enclosure ground and unterminated at far end.

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.

Example wiring

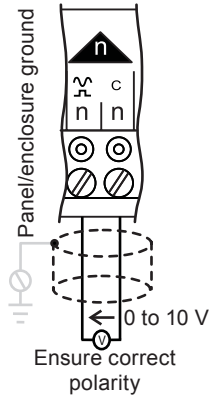


Universal Inputs (continued)

Voltage input: Provides a 0 to 10 Vdc input.

Note that the input resistance of the IQeco analogue voltage input configuration is 9k4 kohm as opposed to 208 kohm in the equivalent IQ3 input so that the scaling for a potential divider input will be different (e.g. TB/TS/KOSF). Sensor type 111 has the correct scaling.

Example wiring

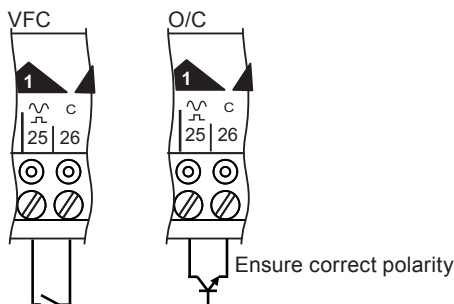


If screened cable is used the screen must be connected to the panel/enclosure ground and unterminated at far end.

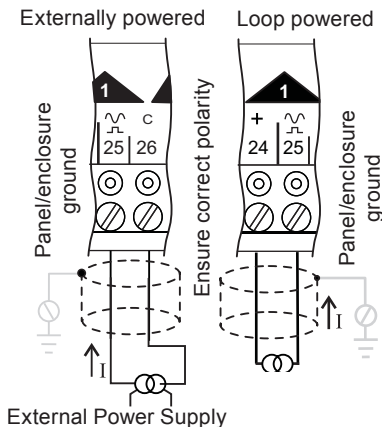
Digital input: Can be used for a volt free contact, or for an open collector. For digital inputs no sensor type is selected so all three switches (A, B, C) are de-energised as required for digital input signal conditioning.

- The volt free contact has a nominal wetting current of 270 μ A. 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 μ A. When the transistor or FET conducts, the digital input will be on. Polarity must be observed.

Example wiring



Current input: Supports 4 to 20 mA. May be either loop powered or external powered; the type is selected by connecting the sensor to different terminals. Example wiring



Note for IQeco31, IQeco35 and IQeco38 the 24 Vdc auxiliary supply output (AUX and +) also can be used to supply loop powered inputs.

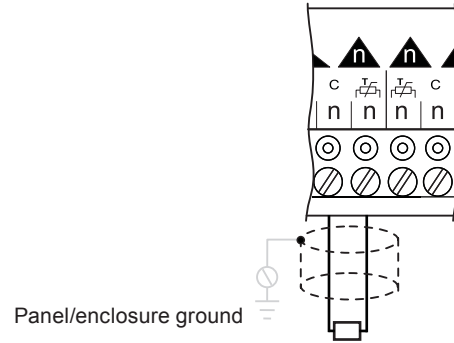
See 'Combined Supply Outputs' on page 7 for maximum current available from the '+' and 'AUX' auxiliary supply outputs.

Thermistor Inputs

IQeco31, 35: 2 channels (IN2, IN3)
IQeco38: 3 channels (IN1, IN3, IN6).

The thermistor input can be used for a thermistor or a potentiometer. The thermistor bridge resistor is 10 kohm with a bridge supply 3.3 V.

Example wiring



2-wire twisted screened cable for wiring the inputs, with the screen connected to the panel/enclosure ground and unterminated at far end.

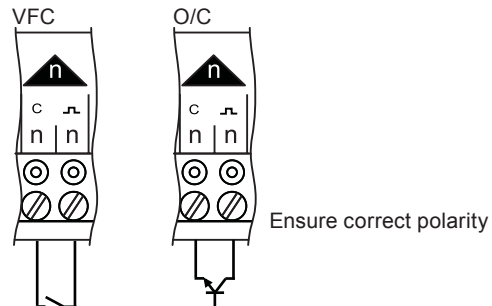
Digital Inputs

IQeco31 1 channel (IN4), IQeco35, 38 2 channels (IN4, IN5).

The digital input can be used for a volt free contact, or for an open collector:

- The Volt Free Contact has a nominal wetting current of 3 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 3 mA. When the transistor or FET conducts, the digital input will be on. Polarity must be observed.

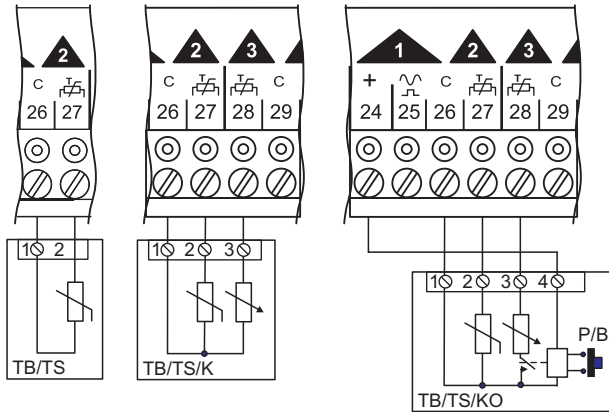
Example wiring



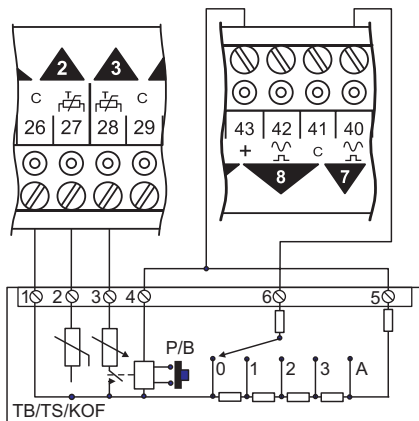
Sensors

TB/TS Series: The TB/TS provides a wall mounting thermistor space sensor that can be connected to an IQeco 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.

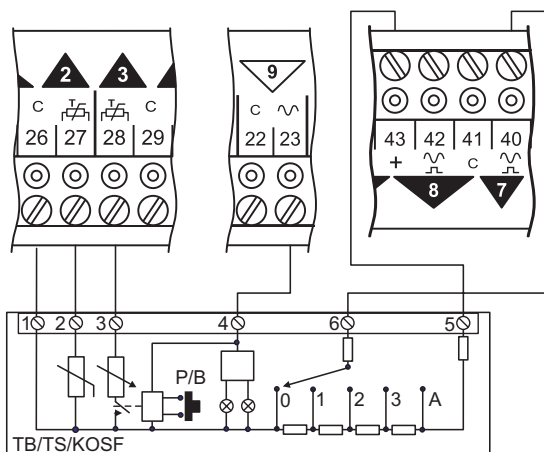
Examples of connecting the TB/TS series using the standard strategy mapping to the inputs are shown in the diagrams below:



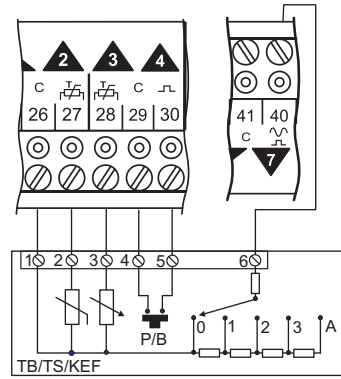
The standard strategy mapping connects the TB/TS/KOF fan speed switch to IN7 which is only present on IQeco35, IQeco38



The TB/TS/KOSF or TB/TS/KOS are not used in the standard strategies but TB/TS/KOSF would be wired as below (the TB/TS/KOS would be wired similarly but without the fan speed switch wiring).

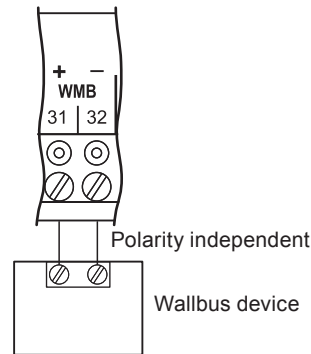


The TB/TS/KEF is used in the standard strategies and wired as shown below (IQeco 35 and 38 only):



Wallbus

The wallbus facilitates the connection of a wallbus device (e.g. room sensor or display). It is polarity independent; it should be wired with twisted pair cable, and will operate up to 60 m (200 ft).



Note: Refer to the Combined Supply Outputs section for the maximum available wallbus current.

The IQeco can only communicate with one wallbus device. See the device's data sheet for details.

USB Port

The IQeco's USB port uses a Micro B USB connector (USB 2.0 full speed). It is the IQeco's local engineering connection. By using this port, SET and its software tools are able to access the complete Trend network.

As explained on page 5, with the default supervisor port address (0), a supervisory CNC (sCNC) 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.

Connection to a PC would 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).

FIRMWARE

The IQeco firmware may be upgraded over the network by way of the IQ4NC using the Firmware Upgrade Applet.

STRATEGY

The IQeco's strategy modules are based on the traditional IQ paradigm with minor changes to increase capability and efficiency. The strategy file (.IQe) 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 SET's simulation mode.

The strategy file upload or download is performed by SET either by way of the IQ4NC (using either the Ethernet port or the RS232 Supervisor port) or by way of the IQeco's Local Engineering port.

SET will allow Live Adjustments on an IQeco which enables viewing the current module values, and changing knobs and switches. It will also allow changes to parameters but not structural changes to the strategy (creating/deleting modules, changing module types, and changing connections).

As explained in 'Service Button' on page 8, the IQeco 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).

Strategy Modules

In the IQeco the number of each type of module may be adjusted to match the requirements of the application within the memory capacity of the controller. The IQeco has an absolute limit of 300 modules (excluding alarm log, sequence table and option module) of which 200 maximum can be sequenced. An empty IQeco contains address, time, program, and two network modules which reduce the additional number of modules to 295.

The available memory capacity is measured in ecobrIQs (IQeco ecobrIQs use different amounts of memory to IQ3 brIQs and should not be compared).

In addition the plot memory allows a maximum of 10,000 log points (2,000 records) shared between up to twenty plot modules (synchronised type only).

Although in most cases the number of modules is limited only by the memory capacity some module types have maximum number regardless of memory capacity.

The table below lists the modules available in the IQeco firmware and, where limits apply, the maximum number available.

Module	Number
Address	1 (fixed)
Digital Input	Internal Flexible External Flexible
Alarm Destination	Trend Lan Flexible (max 2)
Alarm Group	Flexible
Alarm Route	Flexible
*Alarm Log	1 (fixed)
Analogue Node	Flexible
Digital Byte	Flexible
Directory	Flexible
Display	Flexible
Driver	Digital Flexible
	Analogue Flexible
	Time Proportional Flexible
	Raise/Lower End Flexible
	Multistage Flexible

Module	Number
Function	Filter Flexible
	Rescale From Flexible
	Rescale To Flexible
	Square root Flexible
	Adder/Scaler Flexible
	Multiplier Flexible
	Analogue Gate Flexible
	Comparator Flexible
	Hysteresis Flexible
	A to D Converter Flexible
	Divider, Proximity Flexible
	Heatmeter Flexible
	Integrator Flexible
	Minimum Flexible
	Maximum Flexible
	Average Flexible
	Power Flexible
	‡IC Comms
Global To Flexible (max 30)	
Data From (analogue, bit, or byte) Flexible (max 30)	
†I/O Module	1 (fixed)
Knob	Flexible
Logic	Combination Flexible
	Timer Flexible
	Hours Run Flexible
	Counter Flexible
	D to A Flexible
Loop	Flexible
Network	MS/TP 1 (fixed)
	BACnet Application 1 (fixed)
NTD	Flexible (max 32)
Option	1
††Plot	Synchronised Flexible (max 20)
Program	1 (fixed)
Sensor	External Flexible
	Internal Flexible
Sensor type	Fixed 12 (fixed)
	Configurable Flexible (max 100)
‡‡Sequence	1 (fixed)
Switch	Flexible
Time	1 (fixed)
User	1 (fixed)

Flexible indicates the only limit is available ecobrIQ capacity.

* Holds up to 10 alarms

‡ Includes BACnet comms and BACnet U-COV support.

† For IQeco/Display

†† The maximum number of records for a plot is 1,000 (5,000 log points), but maximum total records shared between all plot modules is 2,000. The plot modules can record values between -32767 to + 32767.

‡‡ Contains 200 steps

For more details of individual modules see the IQeco Configuration Manual (TE201089).

Strategy Modules (continued)

The 12 fixed sensor types are accessed by setting up the appropriate sensor type module number in the sensor module:

Sensor Type Module No.	Name	Description
101	10kTherm DegC TBTS	Scales standard Trend thermistor (10kohm at 25°C).for working range 0 to 40 °C
102	Knob TB 0.5 deg trim	For standard TB sensor knob (1k to 10kohm, -0.5 to +0.5)
103	Fan TBTS/ KEF	TB/TS/KEF fan speed scaled to enumeration (0, 1, 2, 3, 4 for off, Lo, Med., Hi, Auto respect.)
104	Current 4-20ma	Scales 4 to 20 mA to 2 to 10
105	Volts 0-10V	Scales 0 to 10 V to 0 to 10
106	Onboard DP 1.5inwc	IQecoVAV differential pressure sensor output scaled to 0 to 1.5 inwc
107	Onboard DP 375Pa	IQecoVAV differential pressure sensor output scaled to 0 to 375 Pa
108	10kTherm DegF TBTS	Scales standard Trend thermistor (10 kohm at 25 °C). for working range 23 to 122 °F
109	10kTherm DegC OAT	Scales standard Trend thermistor (10kohm at 25 °C) for working range -29 to +104 °C
110	10kTherm DegF OAT	Scales standard Trend thermistor (10 kohm at 25°C) for working range -20 to +220 °F
111	Fan TBTS/ KOF	TB/TS/KOF fan speed scaled to enumeration (0, 1, 2, 3, 4 for Off, Lo, Med., Hi, Auto respect.)
112	WMB Prescaled	For RD space sensor passes value into strategy unchanged

In SET, as the modules are created, a count is maintained of the module count, ecobriQs, and log points used (1 plot record = 5 log points). An indication is given of the amount remaining. If a limit is exceeded, then SET will prohibit the creation of further modules as appropriate. It is possible to create modules which are not numerically sequential so module lists can be non-continuous (e.g. L1, L2, L5, L7...).

Inter-Controller Communications

The IQecos may communicate with each other and IQ2, IQ3 IQ4, and IQL controllers using Inter Controller Communications (peer to peer communications) using Trend Lan/node addressing.

The IQeco is capable of initiating Data To, Global To, or Data From IC Comms. It will respond to Data To, Global To, Data From, and Max, Min Sum and Average comms. The IQeco is 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 a Non Trend Device (NTD) module which is set up with BACnet device's BACnet address information. The table below specifies the types of IC Comms with which the IQeco will operate.

Direction	Variable	Initiated by IQxx to this IQeco	Initiated in this IQeco to IQx
Data From	Analogue	Yes	Yes
Data From	Digital Byte	Yes	Yes
Data From	Digital Bit	Yes	Yes
Data To	Analogue	Yes	Yes
DataTo	Digital Byte	Yes	Yes

Direction	Variable	Initiated by IQxx to this IQeco	Initiated in this IQeco to IQx
Data To	Digital Bit	Yes	Yes
Global To	Analogue	Yes	Yes
Global To	Digital Byte	Yes	Yes
Global To	Digital Bit	Yes	Yes
Minimum	Analogue	Yes	No
Maximum	Analogue	Yes	No
Sum	Analogue	Yes	No
Average	Analogue	Yes	No

IQeco can only send IC Comms to sensors, analogue nodes, knobs, digital inputs digital bits, switches, and digital bytes. IQeco will not send alarm status bits with an analogue IC Comms but can process any that it receives.

Identification

The IQeco will identify itself as an IQeco to w comms.

Alarms

The IQeco Configuration Manual (TE201089) fully describes alarms. The following alarms can be generated if the appropriate alarm modules are set up (group, route, destination modules):

Sensor alarms

Alarm	Code
SENSOR FAIL occurred	OUTL
SENSOR FAIL cleared	COUT
INPUT ERROR occurred	READ
INPUT ERROR cleared	O/K
HIGH VALUE occurred	HIGH
HIGH VALUE cleared	CHIH
LOW VALUE occurred	LOW
LOW VALUE cleared	CLOW

Digital Input Alarms

Alarm	Code
DIGIN OFF occurred	DI=0
DIGIN OFF cleared	CDI0
DIGIN ON occurred	DI=1
DIGIN ON cleared	CDI1

Loop

Alarm	Code
Setpoint Deviation	SDEV
Setpoint Clear	CSDV

They are same format as IQ alarms.

Note the MS/TP network alarms are generated by the IQ4NC.

Security

The IQeco can be protected by setting up a PIN in the module. If the user forgets their PIN, a 'PIN of the day' may be obtained from Trend Technical Support.

Alternatively, the IQeco can be cleared down using the service button (see page 8).

Time

The IQeco time module is supported by a software clock. It will respond to time synchronisation from an IQ3 or IQ4 timemaster (not from IQ2). It will request time synchronisation when it powers up, and the timemaster will synchronise all its time followers (e.g. IQeco) at midnight, when its time is edited, or when it performs a daylight saving time change.

Plots

The IQeco has up to 20 plot modules each of which can be connected to any connectable module output (analogue or digital). IQeco only has synchronised plot modules.

The total maximum number of records is 2,000 (10,000 log points) which can be shared amongst the plot modules as required. The maximum number of records in one plot module is 1,000 (5,000 log points).

The plots can be retrieved either as either single (max error 1%) or double (max error 0.01%) precision. The 963 (v3.1 or greater) allows the precision to be selected.

I/O Module

I/O module 2 is used to install the RD-WMB into the strategy. The RD-WMB sensor will appear as channel 1 on I/O module 2.

Power Management

Power Management is used to minimise the effect of thermic actuator inrush currents on the IQeco's peak current consumption. It is applied to time proportional driver modules and will stagger the turn on times of the pulse modulated waveforms between the drivers so that power will be applied to the outputs in sequence, and not at the same time.

In addition for /230 variants of IQeco 31, 35, and 38 only, if this feature is selected, power will not be applied to time proportional driven solid state output channels immediately but will be ramped up over the first 12 s.

The Address module's 'Power Managed' parameter is used to enable or disable the power management feature.

R/L Sync Mode

Raise lower synchronisation is used to ensure that the actuator without any positional feedback is at a defined position. The raise lower driver will attempt to do this in normal running by driving for the calculated time to reach the appropriate end stop plus full scale drive time when the input is either zero or 100%.

The address module 'R/L Sync Mode' parameter enables further synchronisation for all raise/lower drivers in the IQeco to occur at midnight, power on, or soft restart by driving the actuator closed for 1.5 times its full scale drive time to ensure it's fully closed. The address module 'R/L Sync Mode' parameter can be set to either 'Disabled', 'Automatic', or 'Automatic Address Staggered'.

If 'Automatic Address Staggered' is selected, in order that all VAV units in a system do not operate their valves and dampers simultaneously, the controllers on the Lan will stagger their raise lower driver synchronisation according to their Lan device address. This will delay the synchronisation between 0 s to about 11 minutes 26 s according to the address. See the IQeco Configuration Manual (TE201089) for details.

Each raise lower driver module has a 'Position Sync' parameter. The raising edge of this input will cause that driver to perform synchronisation immediately. This enables the synchronisation to occur under strategy control whenever it is required.

Water Balancing

This feature is used on water side systems for balancing and flushing; it shouldn't be used on airside systems. The raise/lower (floating point) and time proportional outputs are set to 100% until the water balancing is complete. In IQeco this feature has to be engineered in the strategy.

The standard strategies include this feature. They make use of service button mode (see page 8) with a virtual input channel to switch water balancing on and another virtual input channel to switch water balancing off.

Library/Programmable Strategies

The strategy defines the IQeco's HVAC equipment interaction. The IQeco can be purchased either as a fully programmable unit, or with a fixed strategy. A fixed strategy controller may be upgraded to a programmable controller using the Licence Requester and Licence Committer applets (there will be a charge for this). A programmable controller can be purchased with a strategy installed.

Fixed Strategy

The fixed strategy IQeco has the fixed strategy option installed (the fixed function option module will be present). Fixed strategy units can be re-configured with a different strategy from a defined library of strategies within the SET standard strategy solutions. Each standard strategy has both imperial and metric versions. There are three libraries of strategy: Entry, Basic, and Plus and the fixed strategy controller is tagged with the library it is allowed to run. The library a particular controller is able to use is displayed in SET's Device View.

In SET the strategies that can be downloaded to a particular controller are found by selecting Device>Device Details/Select Solution.

When a strategy is downloaded to a fixed strategy controller, the old strategy is stopped while the new strategy is validated. If the strategy validation fails, the old strategy is restarted; if the new strategy is validated, then it is loaded as the new running strategy. The validation checks that the strategy is from the correct library and that it has not been structurally modified.

The strategy has a 'fingerprint' which defines its designated modules and the connections between modules. Upon validation if this fingerprint has changed the strategy will be rejected.

To maintain the same fingerprint, module types cannot change. Some modules are excluded from the fingerprint: Address, Alarm log, I/O module, Networks, Non-Trend Device (NTD), Options, Program, Sequence Table, Time, Users. Connections to alarm groups, routes, and destinations can be changed.

Programmable

This IQeco version is fully programmable using SET. A programmable controller may be supplied with a standard strategy, or with no strategy. The standard strategies are available as solutions and can be downloaded directly or modified as required in the normal way.

Custom

The IQeco can be supplied with a strategy written by the customer. Trend will supply the strategy already downloaded into a programmable IQeco controller saving time on site. For this option the customer strategy must be supplied with the order; Trend will not test the strategy it will only ensure that the strategy supplied with the order can be successfully loaded into the controller.

Standard Strategy Solution Compatibility

Fixed strategy controllers can be re-configured using a standard strategy solution from the same library by downloading from SET. Programmable controllers may also be re-configured using any of the strategy solutions. In both cases the solution may not be compatible with the controller variant.

The table below shows the compatibility of the standard solutions with both with the IQeco variants, and which library the solution is in. † indicates combinations that can be ordered from the factory see 'Order Codes' on page 18. Other valid combinations may be downloaded using SET.

Strategy	eu.bac	Library			IQeco's		
		Entry	Basic	Plus	31	35	38
FCU 1 Speed Fan AR2			†✓	✓	†✓	✓	✓
FCU 1 Speed Fan WR2	✓		†✓	✓	†✓	✓	✓
FCU 1 Speed Fan WR4	✓		†✓	✓	†✓	✓	✓
FCU 1 Speed Fan WT2	✓		†✓	✓	†✓	✓	✓
FCU 1 Speed Fan WT4	✓		†✓	✓	†✓	✓	✓
*FCU 3 Speed Fan AR2		†✓	✓	✓		†✓	
FCU 3 Speed Fan WR2	✓	†✓	✓	✓		†✓	
FCU 3 Speed Fan WR4	✓	†✓	✓	✓		†✓	
FCU 3 Speed Fan WT2	✓	†✓	✓	✓		†✓	
FCU 3 Speed Fan WT4	✓	†✓	✓	✓		†✓	
FCU 3 Speed Fan AR2 AUX			†✓	✓		†✓	
FCU 3 Speed Fan WR2 AUX	✓		†✓	✓		†✓	
FCU 3 Speed Fan WR4 AUX	✓		†✓	✓		†✓	
FCU 3 Speed Fan WT2 AUX	✓		†✓	✓		†✓	
FCU 3 Speed Fan WT4 AUX	✓		†✓	✓		†✓	
FCU 3 Speed Fan AR2 E			†✓	✓		†✓	
FCU 3 Speed Fan WR2 E	✓		†✓	✓		†✓	
FCU 3 Speed Fan WR4 E	✓		†✓	✓		†✓	
FCU 3 Speed Fan WT2 E	✓		†✓	✓		†✓	
FCU 3 Speed Fan WT4 E	✓		†✓	✓		†✓	
FCU 3 Speed Fan AR2 E99			†✓	✓		†✓	
FCU 3 Speed Fan WR2 E99			†✓	✓		†✓	
FCU 3 Speed Fan WR4 E99			†✓	✓		†✓	
FCU 3 Speed Fan WT2 E99			†✓	✓		†✓	
FCU 3 Speed Fan WT4 E99			†✓	✓		†✓	
FCU Electronically Commutated Fan AR2				†✓	†✓	✓	✓
FCU Electronically Commutated Fan WR2	✓			†✓	†✓	✓	✓
FCU Electronically Commutated Fan WR4	✓			†✓	†✓	✓	✓
FCU Electronically Commutated Fan WT2	✓			†✓	†✓	✓	✓
FCU Electronically Commutated Fan WT4	✓			†✓	†✓	✓	✓
Chilled Ceiling WR2	✓	†✓	✓	✓	†✓	✓	✓
Chilled Ceiling WT2	✓	†✓	✓	✓	†✓	✓	✓
Chilled Ceiling WR4	✓	†✓	✓	✓	†✓	✓	✓
Chilled Ceiling WT4	✓	†✓	✓	✓	†✓	✓	✓
FCU Electronically Commutated Fan WR2 - Seasonal Heating	✓			†✓		†✓	

Strategy	eu.bac	Library			IQeco's		
		Entry	Basic	Plus	31	35	38
FCU Electronically Commutated Fan WT2 - Seasonal Heating	✓			†✓		†✓	
FCU Electronically Commutated Fan WR4 - Seasonal Heating	✓			†✓		†✓	
FCU Electronically Commutated Fan WT4 - Seasonal Heating	✓			†✓		†✓	
FCU 3 Speed Fan WR2 - Seasonal Heating	✓		†✓	✓		†✓	
FCU 3 Speed Fan WT2 - Seasonal Heating	✓		†✓	✓		†✓	
FCU 3 Speed Fan WR4 - Seasonal Heating	✓		†✓	✓		†✓	
FCU 3 Speed Fan WT4 - Seasonal Heating	✓		†✓	✓		†✓	

The IQeco variant compatibility applies to both fixed and programmable controllers. The 3 Speed Fan strategies are only compatible with IQeco35 (because they use the 3 standard relay outputs); however, they can be downloaded into IQeco 31 or 38 where the 3 fan control outputs will be ignored.

Fixed strategy controllers can only use strategies from their library. However, there is a version of each strategy in the libraries superior to its own. For example, the FCU 3 speed fan AR2 strategy can only be purchased as an entry level strategy, but can be downloaded into an IQeco fixed for either a basic or plus library. On the other hand the electronically commutated fan strategies are purchased as a plus level strategy and cannot be loaded into an IQeco fixed for either a entry or basic library.

All the above strategies use metric units. If one of the above IQecos is intended for use with imperial units (e.g. for USA), the IQeco should be reprogrammed with the equivalent strategy in imperial units; these can be installed in SET by selecting a custom installation.

For example, IQE31/<Prog>/BAC/1SFANAR2B/<Power> has the FCU 1 Speed Fan AR2 strategy solution (b= basic library) in the 1 Speed Fan - English section. This should be reprogrammed by the standard solution which has the same name (but with a # suffix) from the basic library in the 1 Speed Fan - Imperial section.

eu.bac Certified Strategies

Most strategies, are eu.bac certified and tested to EN15500. The eu.bac certification is only valid for 230Vac IQecos. For more details of eu.bac certification refer to the 'IQeco EUBac Information Sheet' (TP201336).

COMPATIBILITY

Supervisor:	916 v1.3, IQView8, IQView v1.4 or greater, 963 v3.4 or greater	BACnet:	The IQeco controller is certified as a BACnet Application Specific Controller (B-ASC) by WSP Cert. Compatibility defined in the IQeco Product Implementation Conformance Statement, (TP201091).
Tools:	SET v6.6 or greater. If using the USB engineering port for the first time, install the Trend USB driver which will have been installed on the PC as part of the SET installation, see the SET Manual (TE200147).	Wallbus device:	RS-WMB, RD-WMB, RV-WMB (Check power requirements, see Combined Supply on page 7).
IQ:	IQ4NC gateway. IQ3, IQ4, IQ2, IQL (IC Comms compatible). IQ3 timemaster only.		

INSTALLATION

The IQeco can be mounted either on DIN rail or flat surface (IQeco31/24 has 2 hole mounting, IQeco31/230, IQeco35, IQeco38 have 4 hole mounting.). A surface mounted IQeco31/24VAC will comply with EN61010-1. A DIN rail mounted IQeco31/24VAC or IQeco31/230, IQeco35, or IQeco38 must be mounted inside an enclosure rated to at least IP20 or equivalent; to eliminate the need to install in an enclosure the IQeco/IQL Secondary Terminal Cover can be installed over these units.

Note IQeco31/24 cannot be used with the secondary terminal cover, so if it is DIN rail mounted it can only be fitted inside an enclosure.

All /24VAC units are UL rated as 'UL916, listed open energy management equipment'. For UL rating all IQeco controllers must be mounted inside an enclosure.

The IQeco units are the same size and have the same mounting points as the equivalent IQL controller, but please note that the cabling requirements of MS/TP are different to LonWORKS.

The installation procedure involves:

- Mounting the controller in position
- Connecting power input, do not power up
- Earthing (grounding) controller
- Connecting USB if required for tool
- Connecting MS/TP BACnet network
- Terminating the I/O channels, leave unconnected.
- Powering up
- Setting up address using Addresser Applet
- Checking network
- Configuring the strategy (programmable controllers only)
- Testing strategy by using controller simulation mode in SET
- Downloading strategy (fixed strategy controllers to change for alternative strategy, or programmable controllers only)
- Connecting I/O
- Configuring strategy parameters if required
- Testing controller
- Checking BACnet communications using SET
- Configuring rest of system and test system

A full description of installing the unit is given in the IQeco31/24VAC Installation Instructions - Mounting (TG201223), IQeco31/230 Installation Instructions - Mounting (TG201224), IQeco35, 38 Installation Instructions - Mounting (TG201177), and IQeco31, 35, 38 Installation Instructions - Configuration (TG201222).

Installation of the secondary terminal cover is given in the IQeco/IQL Secondary Terminal Cover Installation Instructions (TG201243).

If supplied with an installed strategy, also see appropriate strategy data sheet.

ORDER CODES

CONTROLLERS

[Controller Type]/[Prog]/BAC/[Strat]/[Power]

Where [Strat]=[Fan][Type][Relay][Library], 'CUSTOM' or 'NOSTRATEGY'

[Controller Type]	IQE31	IQeco31 controller	
	IQE35	IQeco35 controller	
	IQE38	IQeco38 controller	
[Prog]	C	Supplied with custom strategy	
	F	Supplied with fixed strategy as specified by [Strat]	
	P	Full programmable	
[Strat]	[Fan]	3SFAN	3 Speed Fan
		ECFAN	Electronically Commutable Fan
		1SFAN	1 Speed Fan
		CC	Chilled Ceiling
	[Type]	AR2	Airside Heat/Cool Damper
		WR2	Water side Raise/Lower 2 pipe
		WT2	Water side Thermic 2 pipe
		WR4	Water side Raise/Lower 4 pipe
		WT4	Water side Thermic 4 pipe
	[Relay]	Null	No additional output
		E	Electric heater output
		E99	Electric heater >99% demand
		AUX	Auxiliary output relay
		ES	Electric Seasonal Heating
	[Library]	E	Entry
		B	Basic
		P	Plus
	NOSTRATEGY		Specified controller with no strategy. Only available on fixed strategy and programmable controllers. If ordered as fixed the controller will be able to use all strategies from the 'Plus' library.
	CUSTOM		The name of the custom strategy.
[Power]	230	230 Vac input power supply	
	24VAC	24 Vac input power supply	

AVAILABLE ORDER CODES

The following are available as programmable ([Prog]=P) or fixed ([Prog]=F):

IQE31/<Prog>/BAC/ECFANAR2P/<Power>	See FCU EC Fan AR2 Strategy Data Sheet (TA201209)
IQE31/<Prog>/BAC/ECFANWR2P/<Power>	See FCU EC Fan WR2 Strategy Data Sheet (TA201210)
IQE31/<Prog>/BAC/ECFANWT2P/<Power>	See FCU EC Fan WT2 Strategy Data Sheet (TA201211)
IQE31/<Prog>/BAC/ECFANWR4P/<Power>	See FCU EC Fan WR4 Strategy Data Sheet (TA201212)
IQE31/<Prog>/BAC/ECFANWT4P/<Power>	See FCU EC Fan WT4 Strategy Data Sheet (TA201213)
IQE31/<Prog>/BAC/1SFANAR2B/<Power>	See FCU 1S Fan AR2 Strategy Data Sheet (TA201214)
IQE31/<Prog>/BAC/1SFANWR2B/<Power>	See FCU 1S Fan WR2 Strategy Data Sheet (TA201215)
IQE31/<Prog>/BAC/1SFANWT2B/<Power>	See FCU 1S Fan WT2 Strategy Data Sheet (TA201216)
IQE31/<Prog>/BAC/1SFANWR4B/<Power>	See FCU 1S Fan WR4 Strategy Data Sheet (TA201217)
IQE31/<Prog>/BAC/1SFANWT4B/<Power>	See FCU 1S Fan WT4 Strategy Data Sheet (TA201218)
IQE35/<Prog>/BAC/3SFANAR2E/<Power>	See FCU 3S Fan AR2 Strategy Data Sheet (TA201189)
IQE35/<Prog>/BAC/3SFANWR2E/<Power>	See FCU 3S Fan WR2 Strategy Data Sheet (TA201190)
IQE35/<Prog>/BAC/3SFANWT2E/<Power>	See FCU 3S Fan WT2 Strategy Data Sheet (TA201191)
IQE35/<Prog>/BAC/3SFANWR4E/<Power>	See FCU 3S Fan WR4 Strategy Data Sheet (TA201192)
IQE35/<Prog>/BAC/3SFANWT4E/<Power>	See FCU 3S Fan WT4 Strategy Data Sheet (TA201193)
IQE35/<Prog>/BAC/3SFANAR2EB/<Power>	See FCU 3S Fan AR2 E Strategy Data Sheet (TA201194)
IQE35/<Prog>/BAC/3SFANWR2EB/<Power>	See FCU 3S Fan WR2 E Strategy Data Sheet (TA201195)
IQE35/<Prog>/BAC/3SFANWT2EB/<Power>	See FCU 3S Fan WT2 E Strategy Data Sheet (TA201196)
IQE35/<Prog>/BAC/3SFANWR4EB/<Power>	See FCU 3S Fan WR4 E Strategy Data Sheet (TA201197)
IQE35/<Prog>/BAC/3SFANWT4EB/<Power>	See FCU 3S Fan WT4 E Strategy Data Sheet (TA201198)
IQE35/<Prog>/BAC/3SFANAR2E99B/<Power>	See FCU 3S Fan AR2 E99 Strategy Data Sheet (TA201199)
IQE35/<Prog>/BAC/3SFANWR2E99B/<Power>	See FCU 3S Fan WR2 E99 Strategy Data Sheet (TA201200)
IQE35/<Prog>/BAC/3SFANWT2E99B/<Power>	See FCU 3S Fan WT2 E99 Strategy Data Sheet (TA201201)
IQE35/<Prog>/BAC/3SFANWR4E99B/<Power>	See FCU 3S Fan WR4 E99 Strategy Data Sheet (TA201202)
IQE35/<Prog>/BAC/3SFANWT4E99B/<Power>	See FCU 3S Fan WT4 E99 Strategy Data Sheet (TA201203)
IQE35/<Prog>/BAC/3SFANAR2AUXB/<Power>	See FCU 3S Fan AR2 Aux Strategy Data Sheet (TA201204)
IQE35/<Prog>/BAC/3SFANWR2AUXB/<Power>	See FCU 3S Fan WR2 Aux Strategy Data Sheet TA201205
IQE35/<Prog>/BAC/3SFANWT2AUXB/<Power>	See FCU 3S Fan WT2 Aux Strategy Data Sheet (TA201206)
IQE35/<Prog>/BAC/3SFANWR4AUXB/<Power>	See FCU 3S Fan WR4 Aux Strategy Data Sheet (TA201207)

AVAILABLE ORDER CODES (continued)

IQE35/<Prog>/BAC/3SFANWT4AUXB/<Power>	See FCU 3S Fan WT4 Aux Strategy Data Sheet (TA201208)
IQE31/<Prog>/BAC/CCWR2E/<Power>	See Chilled Ceiling WR2 Strategy Data Sheet (TA201281)
IQE31/<Prog>/BAC/CCWT2E/<Power>	See Chilled Ceiling WT2 Strategy Data Sheet (TA201282)
IQE31/<Prog>/BAC/CCWR4E/<Power>	See Chilled Ceiling WR4 Strategy Data Sheet (TA201283)
IQE31/<Prog>/BAC/CCWT4E/<Power>	See Chilled Ceiling WT4 Strategy Data Sheet (TA201284)
IQE35/<Prog>/BAC/ECFANWR2ESP/<Power>	See FCU Electronically Commutated Fan WR2 - Seasonal Heating Strategy Data Sheet (TA201287)
IQE35/<Prog>/BAC/ECFANWT2ESP/<Power>	See FCU Electronically Commutated Fan WT2 - Seasonal Heating Strategy Data Sheet (TA201288)
IQE35/<Prog>/BAC/ECFANWR4ESP/<Power>	See FCU Electronically Commutated Fan WR4 - Seasonal Heating Strategy Data Sheet (TA201289)
IQE35/<Prog>/BAC/ECFANWT4ESP/<Power>	See FCU Electronically Commutated Fan WT4 - Seasonal Heating Strategy Data Sheet (TA201290)
IQE35/<Prog>/BAC/3SFANWR2ESB/<Power>	See FCU 3 Speed Fan WR2 - Seasonal Heating Strategy Data Sheet (TA201291)
IQE35/<Prog>/BAC/3SFANWT2ESB/<Power>	See FCU 3 Speed Fan WT2 - Seasonal Heating Strategy Data Sheet (TA201292)
IQE35/<Prog>/BAC/3SFANWR4ESB/<Power>	See FCU 3 Speed Fan WR4 - Seasonal Heating Strategy Data Sheet (TA201293)
IQE35/<Prog>/BAC/3SFANWT4ESB/<Power>	See FCU 3 Speed Fan WT4 - Seasonal Heating Strategy Data Sheet (TA201294)
*IQE31/<Prog>/BAC/NOSTRATEGY/<Power>	
*IQE35/<Prog>/BAC/NOSTRATEGY/<Power>	
*IQE38/<Prog>/BAC/NOSTRATEGY/<Power>	

*If these are ordered with fixed ([Prog]=F), they will have a licences for the 'Plus' library.

The following are available with [Prog]=C

§IQE31/C/BAC/<Custom>/<Power>
§IQE35/C/BAC/<Custom>/<Power>
§IQE38/C/BAC/<Custom>/<Power>

§These controllers are supplied with a custom strategy; they are programmable only.

An example full order code is:

IQE31/F/BAC/1SFANAR2B/24VAC :This is an IQeco31 with a fixed strategy from the basic library requiring a 24 Vac supply. The fixed strategy is 1 speed fan airside with heat/cool damper.

In order to simplify the selection of compatible strategies for a particular controller type it is recommended that the IQeco Selector Tool is used. Use the following link or QR code to access the tool: https://pnet.trend-controls.com/trendproducts/cd/en/psearch/psspececo_fs.html.

**UPGRADE TO PROGRAMMABLE CONTROLLER**

IQE/PROG/UP :Upgrade licence to convert a fixed strategy controller to a programmable controller

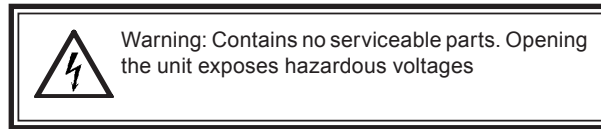
ACCESSORIES

IQeco/IQL Secondary Terminal Cover :Plastic cover that can be fitted over the IQeco31/230, IQeco35, 38 so that they comply with EN61010-1 without the need to fit them in a panel.

FIELD MAINTENANCE

The IQeco Controller requires no routine maintenance. Other than opening the hinged flaps to gain access to terminals and the service button, the unit should not be opened.

The unit should be cleaned occasionally with a cloth moistened with water in order to avoid buildup of dust or other contaminants. Disconnect power before carrying out any cleaning.

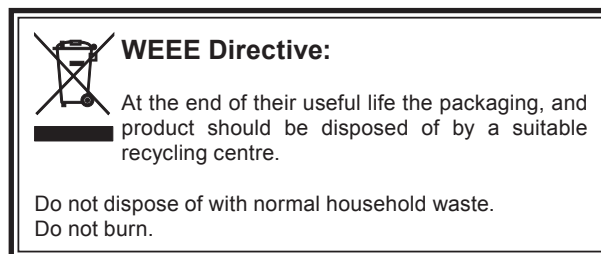


DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government 2002) ASSESSMENT FOR DISPOSAL OF IQeco CONTROLLER. No parts affected.

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.



SPECIFICATIONS

ELECTRICAL

Input power supply voltage	
IQeco /24VAC	:24 Vac \pm 15%, 50/60 Hz
IQeco /230	:230 Vac \pm 15%, 50/60 Hz
Power Consumption	:Up to 45 VA @230 Vac or 26 VA @24 Vac which consists of 7 VA @230 Vac or 10 VA @24 Vac internal power plus power to solid state digital outputs and the Combined Supply Outputs (auxiliary outputs, wall bus, and analogue outputs).
Fusing	:No replaceable fuses required.
Power fail protection	:Data stored in flash memory
Clock accuracy	:Software clock (1 second resolution)
Cycle time	:Sequence table <1s.
BACnet MS/TP	
Distance	:Dependent on cable type and wire gauge as specified in EIA-485.
Load	1/4 BACnet 'unit' load
Signalling	:RS-485 signalling transceiver standard
Baud rate	:9k6 to 76k8 baud.
Termination	:100 to 130 ohms matched each end
Addresses	:Recommended address range 11 to 119.

Note that the MS/TP network has different requirements to the IQL LONWORKS network.

Service Button	:Identification message generation, strategy clear down facility, and service button mode to initiate strategy functions
Wallbus	:Two wire bus for connection of a wallbus device (e.g room sensor or display). For maximum current see 'Combined Supply Outputs' on page 7. Polarity independent. Use twisted pair cable, up to 60 m (200 ft).
USB	:Micro B connector. USB 2.0. Maximum cable length 5 m.

Inputs/Outputs

Number of channels	:See table on page 8.
Universal inputs	:IQeco31 IN1, IQeco35 IN1, IN7, IN8, IQeco38 IN1, IN7, IN8, IN9. Can be set by software to voltage input (0 to 10 V), thermistor input (0 to 200 kohms), current input (4 to 20 mA) 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 \pm 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 μ A). Can connect either loop powered or external powered sensors. Supply to loop powered sensors by '+' terminal, for maximum current available see 'Combined Supply Outputs' on page 7.
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 12.2 kohms, accuracy \pm 0.5% typical at 25 °C (1 kohms to 20 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	:Wetting current = 270 μ A nominal. (ON = closed contact.)
Open collector (or drain):	:Must be able to sink 270 μ A. Must be earthed (grounded) to same earth (ground) as IQeco. Polarity dependent. (ON = transistor/FET conducts.)
Digital inputs	:IQeco31 IN4, IQeco35 and 38 IN4 and IN5. 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:	Wetting current = 3 mA nominal. (ON = closed contact.)
Open collector/drain:	Must be able to sink 3 mA. Must be earthed (grounded) to same earth (ground) as IQeco. Polarity dependent. (ON = transistor/FET conducts.)
Thermistor inputs:	:IQeco31 and 35 IN2, IN3, IQeco38 IN2, IN3, IN6. (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 10 kohms, accuracy \pm 0.5% typical at 25 °C (1 kohms to 20 kohms). Bridge supply 3.3 V.
Analogue outputs	:IQeco31, 35 OUT9. IQeco38 OUT9, OUT10, OUT11, OUT12. 0 to 10 Vdc for maximum current see 'Analogue Output (OUT9)' on page 18. Accuracy \pm 0.5% of span.
Solid state digital outputs	:OUT5, OUT6, OUT7, OUT8 suitable for use with 24 Vac thermal type actuators, 24 Vac synchronous motors, and 24 Vac relays.
IQeco /24VAC	:Solid state digital outputs equivalent to 24 Vac solid state relays. 24 Vac; for maximum current see 'Solid State Digital Outputs' on page 9.
IQeco /230	:Solid state digital outputs equivalent to 24 Vac solid state relays. 24 Vac synthesised; for maximum current see 'Solid State Digital Outputs' on page 9.
Relay outputs	Arc suppression circuit (RC) should be fitted for inductive loads, see Relay Output Arc Suppression Installation Instructions (TG200208). UL rating applies up to 30V.
Standard IQeco31/24VAC OUT1.	Normally open, make only, single pole relay contacts. 250 Vac at 5 A maximum.
Standard IQeco35 OUT2, OUT3, OUT4	Relay output standard current. Changeover relay contacts. 250 Vac at 5 A maximum.
High current	:IQeco31/230, IQeco35 and IQeco38 OUT1. Relay output high current Changeover relay contacts. 250 Vac at 8 A maximum.
<i>Note that to meet safety requirements, for the 4 relays (OUT1 to OUT4) on IQeco35, those being used must all be switching either low voltage or mains and not a mixture of voltages. If switching mains, they must all switch the same phase and polarity.</i>	
Auxiliary Supply Outputs	'+' terminal on all IQecos, and 'AUX' terminal on IQeco 31/230, IQeco35, 38. 21 Vdc \pm 10%, for maximum current see 'Combined Supply Outputs' on page 7.

INDICATORS

MS/TP OK :Green LED

MECHANICAL**Dimensions**

IQeco31/24VAC :170 mm (6.69") x 89 mm (3.5") x 45 mm (1.77")

IQeco31/230, IQeco35, 38 :205 mm (8.07") x 129 mm (5.08") x 63 mm (2.48")

Material

Box :Flame retardant ABS

Terminal Cover :Clear polycarbonate flap

Weight

IQeco31/24VAC :209 g (7.4 oz)

IQeco31/230 :494 g (1 lb 1.5 oz)

IQeco35 :554 g (1 lb 3.5 oz)

IQeco38 :514 g (1 lb 2 oz)

Connectors

Power For UL compliance the input power connections must be made using 18 AWG or larger wire rated at least 90°C (194 °F).

IQeco31/230 and IQeco35 and IQeco38

:2 part connectors with rising clamp screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical.

IQeco31/24VAC

:2 part connectors with wire protection screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical.**Relay**:2 part connectors with rising clamp screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical. For UL use copper cable only.**I/O**:2 part connectors with wire protection screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical. For UL use copper cable only.**MS/TP**:2 part connectors with wire protection screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical.**USB**

:Micro B connector. USB 2.

AUX:2 part connectors with wire protection screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical.**WMB**:2 part connectors with wire protection screw terminals for 0.14 to 2.5 mm² (22 to 12 AWG) cable; 0.82 mm² (18 AWG) typical.**ENVIRONMENTAL****EMC**

:EN61326-1: 2006

Immunity

:Table 2 - for equipment intended for use in industrial locations

Emission

:Class B

Safety**/24VAC**

:EN61010-1: 2010

/230 only

:EN61010-1: 2010, EN 60730-1: 2010

USA

:/24VAC controllers are UL rated as 'UL916, listed open energy management equipment.

Canada

:/CSA22.2 No. 205-M1983 - Signal Equipment

Ambient limits**Storage**

:-40 °C (-40 °F) to +60 °C (140 °F)

Operating

:-40 °C (-40 °F) to +60 °C (140 °F). For IQeco35/24VAC and IQeco38/24VAC for UL rating operating temperature range is reduced to -40 °C (-40 °F) to +55 °C (131 °F).

Humidity

:0 to 95 %RH non-condensing

Altitude

:< 2000 m (6562')

Pollution degree

:2 (Only non-conducting pollution occurs)

Protection

:IP20, NEMA 1.

/230

:IP20 if mounted in an enclosure rated at IP20 or equivalent

/24VAC

:IP20

Control Details (60730-1)**Control purpose**

:Automatic control

Construction

:Independently mounted control

Action

:Type 1B action

Impulse voltage

:2500V

CERTIFICATION CERTIFICATES**CB certificate numbers**

IQeco31/230 :NO74015

IQeco35/230 :NO74016

IQeco38/230 :NO74014

IQeco31/24VAC :NO78731

IQeco35/24VAC :NO78732

IQeco38/24VAC :NO78733

Bacnet

:TBA

eu.bac certificates

IQeco31/230 212206

IQeco35/230 212205

IQeco38/230 212207

*Note eu.bac certification only applies to /230VAC versions*Please send any comments about this or any other Trend technical publication to techpubs@trendcontrols.com

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