

### IQ500 Controller



#### Description

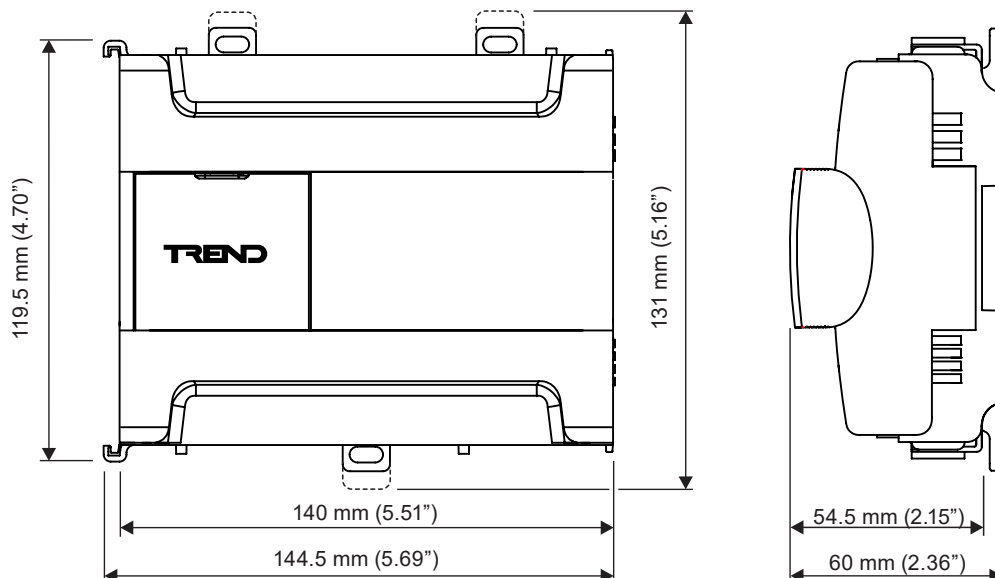
The IQ500 controller provides a secure and versatile control platform for building and energy management systems. With three onboard Ethernet ports and three RS-485 ports the IQ500 not only enables the creation of a powerful Trend network but provides the ability to interface with a wide range of third party devices using BACnet, Modbus, M-Bus, MSTP and many more.

The IQ500 integrates with the latest IQ5-IO input/output modules over a high-speed T1L bus. A separate bus is also provided for use with IO modules from the IQ4 and XCITE ranges. Flexible licensing options allow the IQ500's functionality and number of IO channels to be easily configured to match your application.

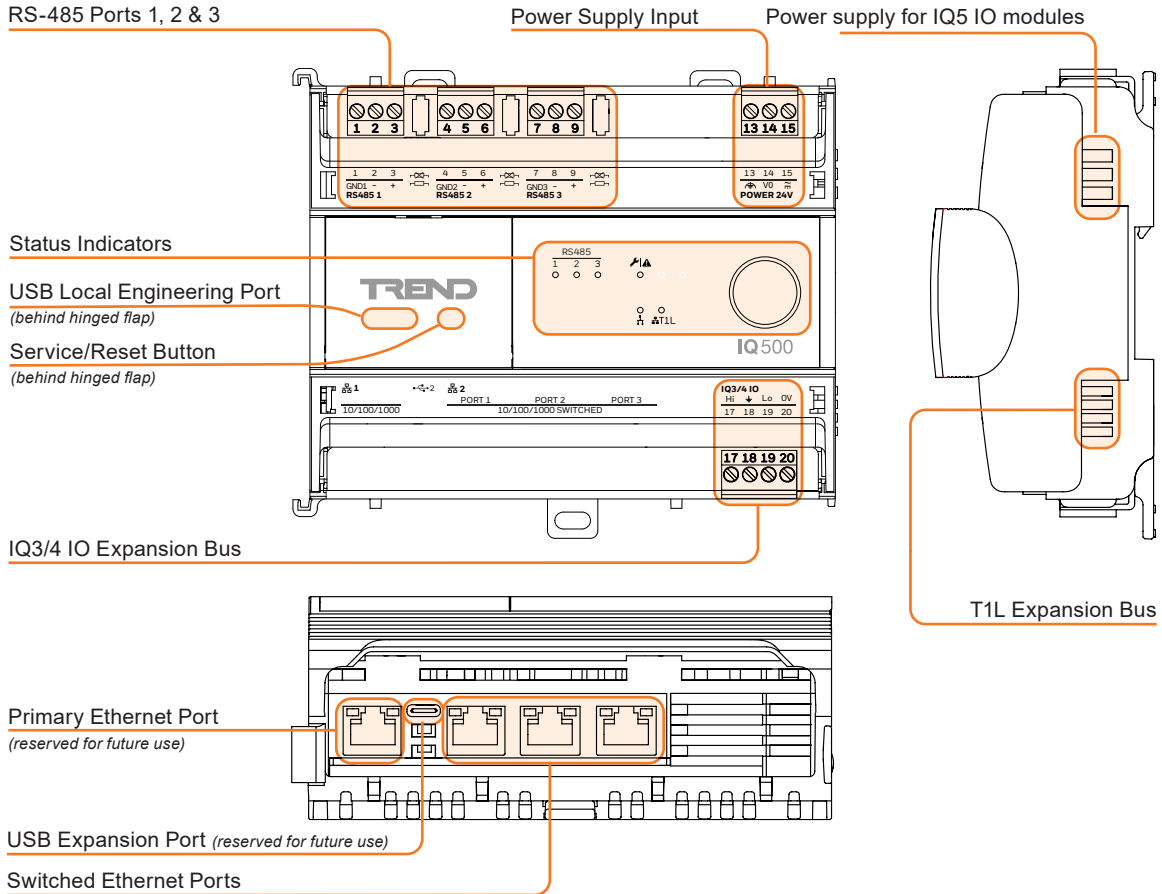
#### Features

- IQ500 is designed to meet ISA ISA/IEC 62443-4-2, and has been developed using processes that are fully certified to ISA/IEC 62443-4-1.
- T1L high-speed secure bus for IQ5 I/O modules
- Compatible I/O bus for IQ4 and XCITE (IQ3) I/O modules
- Compatibility mode for incorporating into existing Trend systems
- 3 Switched Gigabit Ethernet Ports
- 3 onboard RS-485 ports for Modbus, M-Bus, MSTP and XNC
- BACnet over IP
- Automatic time synchronisation and daylight saving via SNTP
- Embedded XML Web Services
- DIN rail mounting, DIN 19 size 2 standard enclosure
- USB local supervisor/engineering port
- 24 Vac/dc input power supply

#### Physical



**Physical** (continued)



*Note: An RJ-11 socket is located on the left hand side of the IQ500 and is reserved for future use.*

**FUNCTIONALITY**

**COMPATIBILITY WITH EXISTING SYSTEMS**

From v1.10 firmware the IQ500 is able to coexist on the same Trend network as pre IQ5 controllers (IQ1, IQ2, IQ3, IQ4, IQECO). To allow this the IQ500 can be configured to operate in one of two modes:

- IQ5 Mode
- Compatibility Mode

**IQ5 Mode:** When in IQ5 Mode the IQ500 is only able to communicate with other IQ5s in IQ5 mode and IQECO controllers, it will have the latest functionality and will comply with the latest security standards.

**Compatibility Mode:** When in Compatibility Mode the IQ500 acts as like an IQ4 controller and is able to communicate with IQ1, IQ2, IQ3, IQ4, and IQECO controllers, and other IQ5 controllers provided they are also in Compatibility Mode. Its security system will operate in the same way as an IQ4 controller to ensure it is compatible with the existing controllers.

*Note: Compatibility mode should be used to transition a site to IQ5 Mode, and a plan should be put into place with the building owner for this purpose.*

The table below provides a comparison between the two modes:

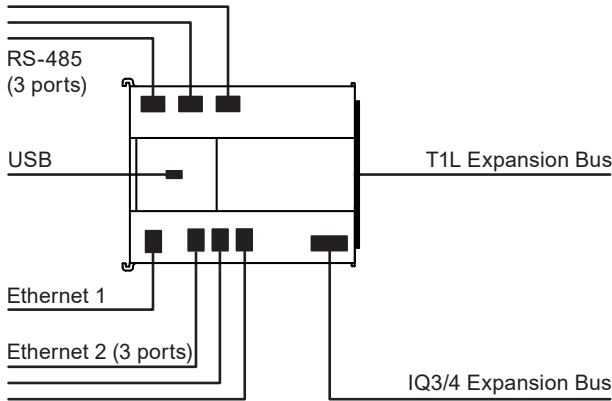
Feature	IQ5 Mode	Compatibility Mode
Compatible IQ1, 2, 3 and 4 systems	x	✓
System Accounts	✓	x
Synchronised Account Management	✓	x
Encrypted Trend communications	✓	x
IQ5 IO Modules	✓	✓
*IQ4/IO/.. I/O Expansion Modules	✓	✓
*XCITE/IO/.. I/O Expansion Modules	✓	✓
*Use all RS-485 ports for interfacing	✓	✓
*IQ Interfacing (ModBus, M-Bus, XNC)	✓	✓
*MSTP router (NC)	✓	✓
BACnet	✓	✓
Password recovery via email	✓	x
IQVIEW SCD for IQ5	✓	✓
**802.1x	✓	x
**Trend LAN Current Loop	x	✓
**Isolated Ethernet port	✓	x

\*Requires Licence  
\*\*Future releases

For more details see the IQ5 Configuration Manual (TE201485).

**SYSTEM**

The IQ500 has communication ports for Ethernet, RS-485 and USB, together with T1L and IQ3/4 IO expansion buses:



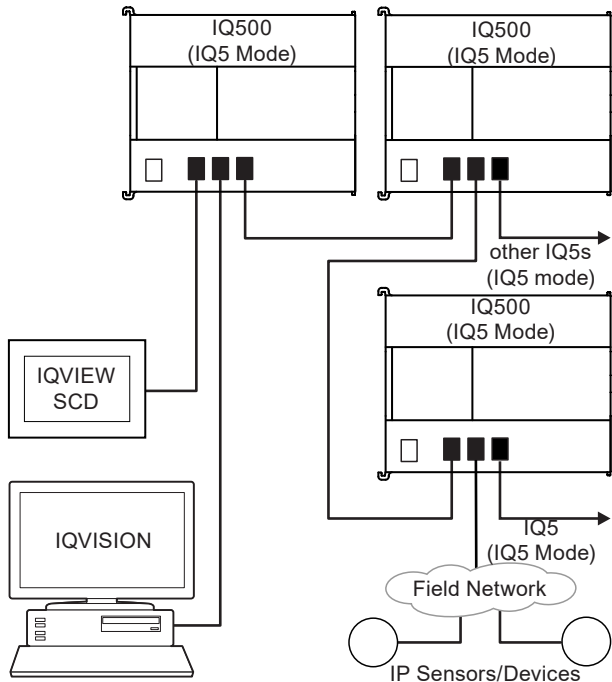
**Ethernet Ports**

The IQ500 has a single network adapter with three switched ports (identified as ports 1, 2 & 3). The adapter is pre-configured with a unique MAC (Media Access Control) address that helps identify the IQ500 during configuration. It supports either static or dynamic (DHCP) IP addressing (DHCP by default). Using daisy-chain/star/tree topologies the ports can be used for:

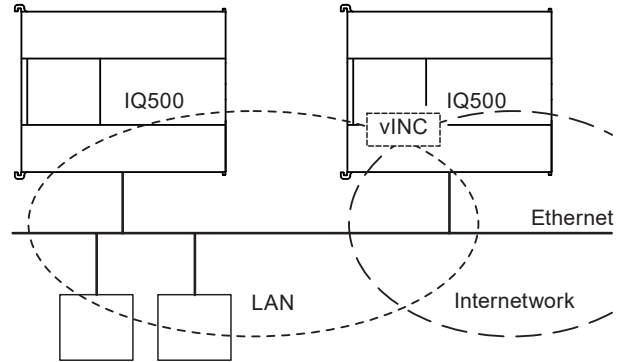
- communication with IQ5 Controllers (IQ5 Mode),
- communication with IQ5 (Compatibility Mode), IQ4, IQ3 controllers, and IQ1 and IQ2 controllers via an IQ4NC.
- IP-based communication with field devices,
- connection to the IQVISION supervisor for configuration and system monitoring,
- accessing web pages via the onboard web server,
- integration with third party IP systems using XNC

*Note: The single primary Ethernet port identified as port 1 is reserved for future use.*

The diagram below shows an example of how a system might be connected using the Ethernet ports:



Using one of the ports the IQ500 can form a Trend LAN with other IQ5-compatible devices over an Ethernet network:



In addition, the IQ500 has the ability to join an internetwork using its virtual internetwork node controller (vINC).

Other devices connected to the Ethernet network can communicate with the IQ500 using IP addressing. Remote PCs can communicate through standard IT networks using IP, enabling communication from anywhere in the world.

*Note: Remote communication with the Trend network by a supervisor, tool or display will require the use of a secure virtual CNC (vCNC) in the IQ500 or another CNC on the network.*

For further details see 'Networking' on page 5.

An integral web interface is also accessible over an Ethernet/IP connection (see 'Web Server' on page 10).

In addition, IQ500 supports communication with IP Modbus devices (see 'Modbus and M-Bus Interfacing' on page 4).

**RS-485 Ports**

The IQ500 has three galvanically isolated RS-485 ports, each provided with switchable 120 Ω termination.

These can be independently configured to operate using Modbus, M-Bus or XNC functionality. For further details see 'Modbus and M-Bus Interfacing' on page 4 and 'XNC Functionality' on page 4.

*Note: M-Bus operation will require an RS-485 to RS-232 converter (e.g. the PW60).*

If IQ500 is configured as a node controller, one port can be used to connect IQECO controllers on an MSTP trunk. For further details see 'Node Controller Operation' on page 4.

**USB (Local Engineering Port)**

The USB port allows direct connection of a PC running IQ™SET (System Engineering Tool). When connected in this way IQSET can communicate across the entire Trend network (see 'Networking' on page 5).

This connector is located behind a drop-down flap on the left of the front panel.

*Note: An additional USB port is located adjacent to Ethernet port 1. This is reserved for future use.*

## BACnet Communications

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. It supports communication using BACnet over IP (Ethernet) including:

- Access to IQ5 parameters over BACnet,
- Alarm delivery,
- IC comms to a BACnet device.

A full specification of the objects, properties, and BIBBS (BACnet Interoperability Building Blocks) supported by the IQ500 are given in the IQ5 Protocol Implementation Conformance Statement (TP201479). The mapping of BACnet properties to Trend parameters is described in the IQ5 Configuration Manual (TE201486).

## Modbus and M-Bus Interfacing

The IQ500 can be configured to communicate with Modbus devices enabling it to be easily integrated with many third party devices including meters, sensors, and variable speed drives.

*Note: Modbus and M-Bus functionality needs to be enabled using an optional INT licence (see 'Licences' on page 14).*

Standard strategy blocks, available in IQSET, allow easy strategy configuration using drag and drop for common Modbus and M-Bus devices.

Engineering with standard Network and Interface modules allows connection to other Modbus or M-Bus devices. Strategy blocks can be created for favourite devices to save engineering time.

### Modbus

IQ500 can be configured to communicate with Modbus devices over IP (using the onboard Ethernet ports) or the RS-485 ports.

**Maximum number of inputs/outputs per device:** Each Modbus Interface module can have up to 500 inputs and 500 outputs, this allows 500 inputs and 500 outputs per device. If more than this is required additional Modbus Interface modules can be connected to the same Modbus address (device).

**Maximum number of devices:** Although the maximum number of Modbus devices connected to the IQ500 is determined by the number of available interface modules in the IQ500 (max 1000), in reality, the limit is set by the Modbus rules.

**Maximum number of connected Modbus networks:** Each connected network requires one Modbus Network module. There is a maximum of 10 Modbus IP network modules. For Serial Modbus network modules, the number is set by the IQ500's hardware.

Devices from different manufacturers can be connected to the same network providing the network parameters configuration are the same.

*Note: IQ500 cannot operate as a slave so does not have registers.*

### M-Bus

IQ500 can be configured to communicate with M-Bus devices using the RS-485 ports in conjunction with a suitable RS-485 to RS-232 converter (e.g. the PW60).

**Maximum number of outputs per device:** Each M-Bus Interface module can have up to 1000 outputs, this allows 1000 outputs per device. If more than this is required additional M-Bus Interface modules can be connected to the same M-Bus address (device).

*Note: An individual M-Bus device is limited to 255 values. Therefore, although there can be 1000 outputs on the interface module, each one can only be set to one of 255 values from the M-Bus device.*

**Maximum number of devices:** Although the maximum number of interface modules is 500, the maximum number of M-Bus devices is limited to 250 but is dependent on the converter used.

When values are requested from an M-Bus device ALL values are sent to the IQ500. For example, when requesting a single value from an M-Bus device that has 20 values the M-Bus device will send all 20 values to the IQ500. Therefore it is necessary to consider the data flow rate.

*Note: The more values and devices that are required the larger the strategy requirements. Therefore, the briQ count must be considered.*

**Maximum number of connected M-Bus networks:** Each connected network requires one M-Bus Network module. The number of M-Bus network modules is set by the IQ500's hardware.

Devices from different manufacturers can be connected to the same network providing the network parameters configuration is the same.

## XNC Functionality

The IQ500 supports the use of XNC functionality, enabling the Trend system to interface with third party systems. It utilises standard IQ strategy modules in conjunction with the Trend Custom Language (TCL) to present information from other systems as though it is from an IQ controller. It also allows parameters within the third party system to be adjusted from Trend supervisors and software tools.

XNC communication with third party systems can be over Ethernet or RS-485, and with other Trend devices over Ethernet.

*Note: XNC functionality needs to be enabled using an optional INT licence (see 'Licences' on page 14).*

## Node Controller Operation

The IQ500 can be configured for Node Controller operation, enabling it to connect a LAN of IQECO controllers on an MSTP RS-485 trunk to a Trend internetwork on Ethernet.

*Note: Node Controller functionality needs to be enabled using an optional NC licence (see 'Licences' on page 14). Only one RS-485 port can be enabled for MSTP.*

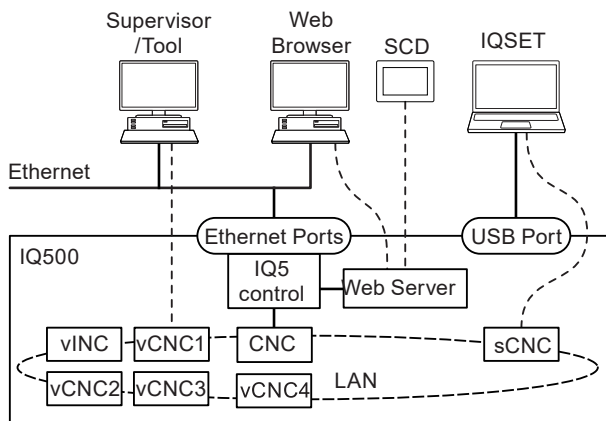
There may be the IQ5 with up to 64 IQECOs or other manufacturer's devices on the MS/TP trunk.

A separate limitation is that the MS/TP segment supports up to 32 'unit' loads. The IQ5 presents a ¼ BACnet 'unit' load (ref. EIA-485), as does the IQECO; other manufacturer's devices may have different unit loads.

### Networking

In order to connect to the Trend network the IQ500 will create its own internal LAN which includes the following nodes:

- a CNC for its own controller,
- a supervisor CNC (sCNC) for its USB port,
- four virtual CNCs (vCNC1, vCNC2, vCNC3 and vCNC4), and
- a virtual INC (vINC).



**Default CNC Addressing:** The IQ500's device (outstation) address is factory-set (in the Address module) as follows:

Local LAN 20  
Local Address 119

**sCNC Functionality:** When a PC running IQSET is connected to the USB port it uses an sCNC. If the USB port address is set to 0 (default), the sCNC is dynamically created at address 125 for the duration of the IQSET session. When the PC is removed the sCNC times out and no longer exists on the network. If the address is configured to be non-zero, the sCNC remains on the network at all times.

**vCNC Functionality:** vCNC Functionality: Allows a supervisor/tool/display to make a permanent secure connection to the Trend network using TCP/IP. By default all vCNCs are disabled. The standard IQ500 has four vCNCs, which increases to eight when operated as a Node Controller (with an NC licence).

**vINC Functionality:** When the IQ500 joins a LAN on Ethernet, the controller with the lowest IP address assumes INC functionality (using its vINC at address 126); any vINCs in other controllers on that LAN will automatically be disabled.

**IC Comms:** When in IQ5 Mode the IQ500 can communicate with other IQ5s in IQ5 mode, IQECOs and BACnet devices using IC Comms. Some IQECOs running earlier versions of firmware may not support all IC Comms types. See 'Compatibility' on page 12.

When in Compatibility Mode the IQ500 can communicate with other IQ5s in Compatibility Mode, IQ4s, IQ3s, IQ2s, IQ1s and IQECOs and BACnet devices using IC Comms in the same way as an IQ4. Some IQECOs running earlier versions of firmware may not support all IC Comms types. See 'Compatibility' on page 12.

### Inputs and Outputs

The IQ500 does not include any onboard analogue or digital I/O but has two I/O buses for the connection of different I/O expansion modules.

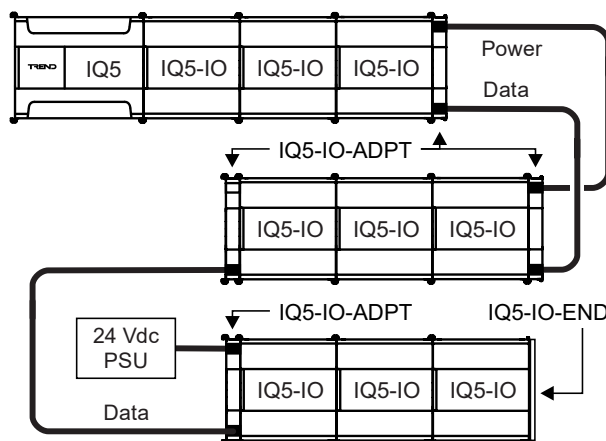
- T1L Bus - for IQ5-IO modules
- IQ3/4 Bus - for IQ4/IO and XCITE/IO (IQ3) modules

The IQ500 ships with a base licence supporting up to 16 channels/points, which is expandable up to 300 points (see 'Licences' on page 14). The total licenced point count is shared between both I/O buses.

#### T1L IO Expansion Bus

The T1L bus enables the connection of a wide range of IQ5 I/O modules. These modules can be slotted together, adjacent to the controller (or other I/O modules) with inter-module connections being made via integral spring connectors. Alternatively, modules can be mounted remotely and connected to the I/O bus by means of the IQ5-IO-ADPT wiring adapter and suitable cable.

Adjacent mounted modules can be powered via the attached controller (or module). Remote modules (or remote banks of modules) can be powered from the controller but may require a separate 24V power supply, depending on supply loading and cable distance.



A protective cover (IQ5-IO-END) is supplied with the IQ500 to protect the T1L contacts when not in use. This can be removed and fitted to cover the contacts of the last module on the T1L bus. Spare covers are also available.

Up to 64 devices can be connected on the T1L bus. For full details of the range of available modules refer to the IQ5-IO Modules Data Sheet (TA201481).

#### IQ3/4 IO Expansion Bus

The IQ3/4 bus allows the IQ500 controller to be used in conjunction with both IQ4 and XCITE I/O modules. This bus must be enabled using an optional CAN licence (see 'Licences' on page 14).

Up to 30 modules can be connected to the IQ3/4 I/O bus, depending on the module range(s).

Module Range	IQ4/IO only	IQ4/IO and/or XCITE/IO
Number of Modules	30	15

*Note: Modules connected to the IQ3/4 bus cannot be powered from the IQ500 controller and must be provided with one or more separate 24Vdc power supplies.*

For further details see the IQ4/IO Modules Data Sheet (TA201341) and the XCITE/IO Modules Data Sheet (TA201352).

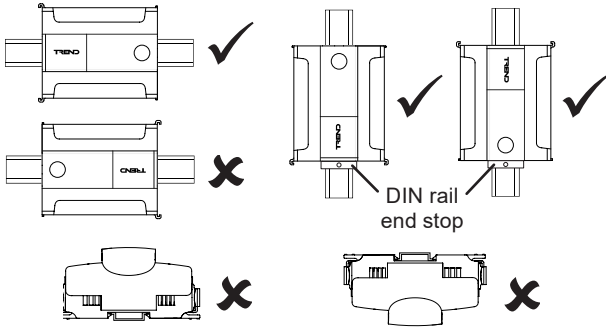
**HARDWARE**

**Enclosure**

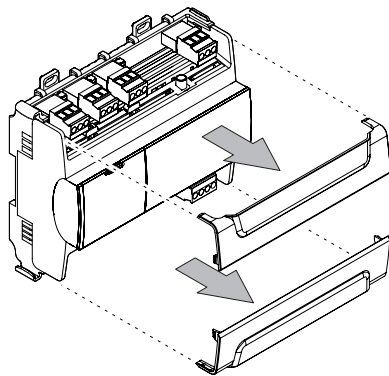
The IQ500 is housed in a polycarbonate enclosure compatible with the DIN43880 and DIN 19 size 2 standard. Integral clips on the back of the enclosure enable the unit to be clipped on to (and quickly released from) a standard TS35 DIN rail.

It must be installed in a secondary enclosure with a minimum protective rating of IP20 (or equivalent).

The unit may be mounted horizontally or vertically but not upside down or on its back:



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



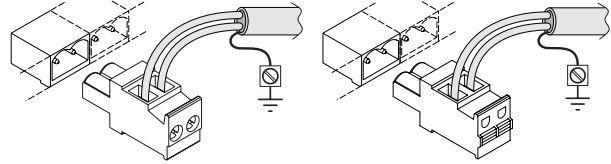
Spare covers are available (see 'Order Codes' on page 14).

**Terminal Connectors**

Connection for power, RS-485 and CAN bus is via two-part pluggable screw terminal connectors which are supplied as standard with the controller and available in packs for spares. Optional connectors with push-fit terminals are also available (see 'Order Codes' on page 14).

Screw terminal plug

Push-fit terminal plug



Function	Connector Type
Power	3-way
RS-485	3-way
CAN Bus	4-way

**Input Power Supply**

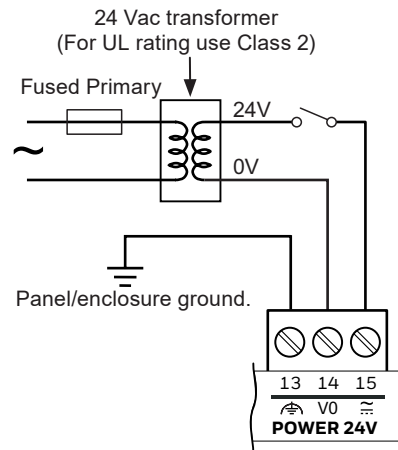
The IQ500 requires a 24 Vac/dc power supply rated as follows:

- 24 Vac  $\pm 20\%$ , 50/60 Hz, 34VA (1.42A);
- 24 Vdc  $\pm 20\%$ , 12.5W (0.52A).

If IO modules are to be powered from the controller's T1L bus, the above rating must be increased to take account of the additional load. Refer to the IQ5-IO Modules Data Sheet (TA201481) for details of module power consumption.

The local earth terminal must be earthed (grounded) at the controller. 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.

Wiring example:



**Service Button** 






The service button is located behind the drop-down flap located on the front of the IQ500. It has the following functions:

- To identify the IQ500 to IQSET during commissioning,
- To enable the IQ500 to be returned to its factory default settings.



**Indicators**

Various indicators are provided on the IQ500 giving feedback on its operational status.

**General** (located on the front panel):

Indicator	Colour	Function
	Green Yellow Red	Device operational status.
	Green	Service button status.
	Green Yellow Red	RS-485 port status.
	Green	Trend LAN status.
	Green Red	T1L I/O bus status.

**Ethernet:** (located adjacent to each Ethernet connector):

Indicator	Colour	Function
Left 	Green	1000 Mbps link/data. Solid = connected Blinking = activity on network
Right 	Green Yellow	100 Mbps link/data. 10 Mbps link/data. Solid = connected Blinking = activity on network

**Backup**

In the event of interruption to the power supply, the IQ500 uses the following mechanisms to retain data until power is restored.

Controller data (including firmware, strategy and parameter values) is stored in non-volatile eMMC memory. Live data, which includes last known values, is stored in non-volatile FRAM.

A supercap is used to maintain the real time clock (RTC). In the event of power failure this will typically maintain time and date function for up to 3 days.

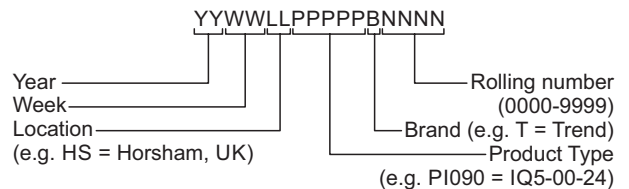
*Note: Operation at elevated temperature or high humidity levels may reduce the lifetime of the supercap. Extended operation in these conditions may permanently reduce the capacity of this component and result in a reduction in the number of days that the controller can successfully backup the time and date.*

**Labelling**

Two removable self-adhesive labels detailing the serial number (SN) and Ethernet MAC address (EN1 MAC) of the IQ500 controller are supplied which can be adhered to plant room panels, cabinets or schematic plans as required:



The serial number comprises the following manufacturing and product information:



The serial number is also provided as a QR code, and the MAC address is provided as a barcode (in Code 128 format) such that both can be read using a suitable hand-held scanner.

A non-removable label containing the same information is fixed to the inside of the drop-down flap on the controller's front panel.

## FIRMWARE

The firmware in the IQ500 controls its basic functionality and provides a range of modules that can be configured to produce a control strategy.

### Strategy

In order to run sequences of operation for equipment and building control, the modules provided by the firmware must be configured to define the way the controller is to control the connected equipment. This configuration is known as the strategy. Strategies are configured using the System Engineering Tool (IQSET).

This produces a strategy file (filename.IQ5) that can be downloaded to the controller to define its operation. This file consists of all the strategy module instances, their parameters, and links. When this is downloaded it is stored in the controller and then run using the controller firmware.

For details of using IQSET see the System Engineering Tool Manual (TE200147).

## Strategy Modules

The range of strategy modules provided in the IQ5 firmware are listed in the table below. Full details of each module can be found in the IQ5 Configuration Manual (TE201486).

Module	brIQs	Max. number of Modules	Note
Address	24	1 (fixed)	
Alarm Destination	14	8	
Alarm Group	9	500	
Alarm Route	9	500	
Alarm Log	0	1 (fixed) 2000 records	
Analog Node	16	4000	
Calendar	566	100	
Digital Byte	16	4000	
Digital Input	28	4000	①
Directory	13	1000	
Display	19	4000	
Driver	57	1000	①
Function	19	4000	①
IC Comms	19	2000 (on IP network) 500 (on MSTP)	①④
Interface	130	1000	①③
I/O Module	14	284	
Knob	13	4000	
Logic	19	4000	①
Loop	55	1000	
Network	0	Max 10 Modbus IP	
NTD	30	4000	
Option	0		
OSS	34	500	
Page	4	500	
Plot	12	4000	
Program	0	1 (fixed)	
Schedule Offset	21	4000	
Sensor	76	4000	①
Sensor type	12	99	
Sequence	106	1 (fixed) - see separate table for maximum steps	
Security	0	1 (fixed)	
States Category	0	100	
Switch	10	4000	
Time	38	1 (fixed)	
Time Schedule	566	100	②
Local User	12	500	
Virtual CNC	9	4 (fixed); 8 (with NC licence)	

① The number of brIQs used on these modules varies with the module type. The largest size is shown here.

② Includes a maximum of 50 exceptions per module.

③ Additional brIQs are required per input and output: XNC 5; Modbus Input 16, Output 15; M-Bus Output 12.

④ For IP networks a maximum of 2000 IC comms/COV subscriptions can be configured but there is a maximum transmission rate of 300 IC comms/COV subscriptions per minute. For MSTP networks a maximum of 500 IC comms/COV subscriptions can be configured but there is a maximum transmission rate of 100 IC comms/COV subscriptions per minute.

For more details see the IQ5 Configuration Manual (TE201485).

The quantity of each type of module may be adjusted to match the requirements of the application subject to the following:

- a maximum of 4000 modules in total,
- the maximum for each type of module, and
- the IQ500's memory capacity (measured in 'brIQs').

The maximum number of modules for each type, and number of brIQs required per module are shown in the table above.



The total available memory capacity varies according to the number of licenced I/O channels:

Number of I/O channels	Max. brIQs available
16	30,000
50	40,000
100	60,000
150	90,000
200	120,000
250	150,000
300	180,000

*Note: If the IQ5-INT-50 or IQ5-INT-50-UP licence is applied these values are increased by 15,000. If the IQ5-INT-2500 or IQ5-INT-2500-UP licence is applied these values are increased by 50,000.*

#### Plot Modules

The IQ500's Plot modules can plot the value of any connectable module output (analogue or digital) at a specific interval of between 1 second and 24 hours. There are four types of Plot module: Synchronised, Triggered, Periodic and COV (change of value). Although all four types are BACnet interoperable, only periodic plots can be compliant with the BACnet standard. All Plot modules can generate a buffer ready alarm when the number of records equals a notification threshold.

The maximum number of records per plot is 1000. The maximum total number of records (for all plots) depends on the available plot memory (measured in log points) and the type of plots used:

Maximum plot memory (log points)		3,000,000
Maximum number of records	<b>Synchronised plots</b> single precision (5 log points per record)	600,000
		300,000
	<b>Triggered, COV or periodic plots</b> single precision (10 log points per record)	300,000
		200,000

*Note: A maximum of 100 plots can be serviced in a 1 s period (e.g. 100 x 1 s plots only). This is calculated on the average plots serviced in 1 s, so a 1 minute plot would contribute a 1/60. For example, 90 x 1 s plots plus 360 x 1 min plots would give 96 (90+6) plots per second on average. The periodic and triggered plots must also be counted, and it is up to the engineer to make their best estimate.*

#### Sequence Table Module

The maximum number of steps in the sequence table varies with the number of licenced I/O channels:

Number of I/O channels	Max. sequence steps
16	600
50	750
100	1500
150	2250
200	3000
250	3750
300	4500

*Note: If the IQ5-INT-2500-BASE or IQ5-INT-2500-UP licence is applied these values are increased by 1,000.*

#### BACnet COV Reporting and Receiving

The IQ500s BACnet Change Of Value (COV) services allow a COV client to receive reports from a COV server when the value of a referenced property changes. IQ500 provides both COV reporting (limited to 1000 COV subscriptions - see page 8 for limitations) and COV receiving facilities.

## Firmware Upgrades

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

Firmware can be upgraded using a PC running the IQTool Firmware Upgrade Applet, and to the IQ500 connected over Ethernet or the USB Engineering Port.

## Timemaster

The IQ500 can act as a system Timemaster to synchronise the time and date across the Trend system. It can use SNTP (simple network time protocol) to obtain precision current time from an unauthenticated NTP server on the Internet. Daylight saving can be implemented automatically (via timezone setting) or manually by specified dates and time adjustment.

## Alarms

The IQ500 will generate Network, General, and Item alarms. Network alarms are generated by the Trend Network nodes, General alarms are generated when the IQ500 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 USB local engineering port, or to one of the controller's vCNCs.

General and Item alarms can be sent either to a designated Trend LAN address, to an IP address, or as an email. Alternatively, certain Item alarms (e.g. sensor, digital input, digital driver readback, and plot), can be sent to a BACnet device.

Alarms sent to a Trend LAN address, or to an IP address can either be sent in text, coded, or attribute format. Network alarms are sent in text format only.

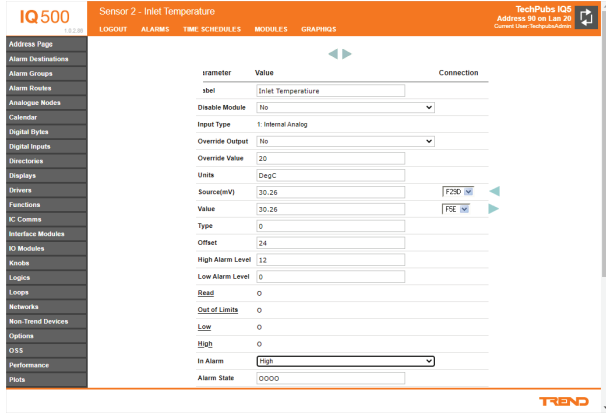
For coded alarms, the protocol limits the item number to 255 maximum. For text alarms the maximum item label length is 20 characters.

Sending an alarm by email requires the Email Server Address to be set up in the Address module. The Email Server Address can be 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.

All alarms (except Network alarms) are also stored locally in the Alarm Log. The alarm log can record up to 2000 alarms. Once this limit is reached each new alarm will overwrite the oldest record.

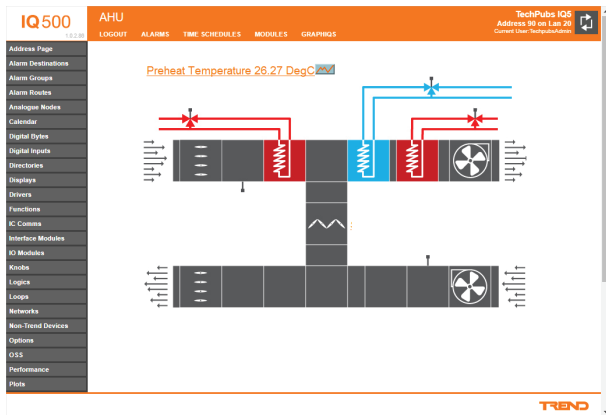
**Web Server**

Information from the IQ500 can be viewed or adjusted from a web client (PC, tablet, or smartphone) over any TCP/IP network (e.g. company intranet) using secure HTTPS protocol. All that is required is the IQ500's IP address or host name, and a user name and password. Once connection to the controller has been made, it is possible to view/adjust occupation times, view the alarm log, and view/adjust/graph individual module parameters.



The web interface does not allow the strategy structure to be modified (e.g. adding or deleting modules, or changing module interconnections).

Graphical display pages (GraphIQs), which are configured using IQ500's display and directory modules, can also be accessed.



For further details of web pages see the IQ5 Configuration Manual (TE201485), the IQ5 User Manual (TE201490), and the Graphical Display Pages Editor Manual (TE200629).

**Language**

The user can specify which language the IQ500 uses for the display of web pages and for transmitted alarms. The standard languages are in the controller as supplied. In the controller the Address module has a language parameter which will be set to the default language, but can be changed to any one of the other available languages. The IQ500 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).

**Identification**

When in IQ5 Mode the IQ500 will identify itself as an IQ5 to w comms. When in IQ5 Compatibility Mode the IQ500 will identify itself as IQ4 v5 to w comms.

**SECURITY**

IQ500 is designed to meet ISA ISA/IEC 62443-4-2, and has been developed using processes that are fully certified to ISA/IEC 62443-4-1. To meet these requirements IQ500 provides:

- Secure Boot
- Authenticated and Encrypted Network
- Encrypted at Rest
- Synchronised Account Management

It is not recommended that IQ500 is directly connected to the Internet.

IQ500 features an account management system which provides the engineer with a single logon for the site, and synchronizes any password changes across the whole site.

In the event of a forgotten password, an engineer can initiate an unlock code to be sent to a pre-defined email address.

All of this is managed by an admin account which should be provided to the site owner.

*Important: Operating the IQ500 in Compatibility Mode will cause the IQ500 to operate using the same security mechanisms adopted for IQ4-based systems.*

## FIELD MAINTENANCE

The IQ500 requires no routine maintenance.



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

## DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulations 2002) ASSESSMENT FOR DISPOSAL OF IQ500.

### 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:** This device has been successfully tested with the latest versions of browsers typically found on most PCs, smart phones, and tablets.

### Supervisors and Displays:

- **IQ5 Mode** - IQVISION V4.13u2 (or later), IQView Single Controller Display for IQ5.
- **Compatibility mode** - IQVISION V4.13u2 (or later), IQView Single Controller Display for IQ5, 963 and IQVIEW8.

*Note: A supervisor connected to the USB Local Engineering Port of an IQECO cannot see IQ5 devices.*

**Utility Software:** IQSET v8.10 (or later).

**I/O Modules:** IQ5-IO range, IQ4/IO range, XCITE/IO (IQ3) range.

### Controllers:

- **IQ5 Mode** - IQ5s in IQ5 Mode (via Ethernet), IQECO (via RS-485 configured as MSTP).
- **Compatibility mode** - IQ5s in Compatibility Mode (via Ethernet), IQ4 (via Ethernet), IQ3 (via Ethernet) IQECO (via RS-485 configured as MSTP).

IQ5s in compatibility mode will also be able to communicate with IQ4, IQ3, IQ2 and IQ1 controllers via Trend current loop providing the link to the current loop is made by a non IQ5 device e.g. IQ4NC.

**Strategies:** IQ1, IQ2, IQ3, IQ4 can be imported into IQSET, converted into IQ5 strategies, and then downloaded into an IQ500.

### IC Comms:

- **IQ5 Mode** - IQ5s in IQ5 Mode, IQECO

*Note: IC Comms originating from an IQECO cannot be sent to an IQ500 in IQ5 Mode. To obtain a value from an IQECO, the IQ500 must request it. See the IQ5 Configuration Manual for further details.*

- **Compatibility mode** - IQ5s in Compatibility Mode, IQ4, IQ3, IQ2, IQECO, and IQ1 (v3 onwards).

*Note: Some controllers running earlier versions of firmware may not support all IC Comms types. Refer to the IQ4 Configuration Manual (TE201263) for full compatibility details.*

**BACnet Devices:** The IQ500 controller is a BACnet Building Controller (B-BC). Compatibility is defined in the IQ5 Product Implementation Conformance Statement (TP201479).

## INSTALLATION

The IQ500 is designed to be surface mounted or clipped on to a TH35x7.5 or TH35x15 DIN rail. The IQ500 must be installed in a secondary enclosure with a minimum protective rating of IP20 (or equivalent).

The installation procedure involves:

Mounting the controller in position	Connecting to the controller
Connecting power	Setting up feature licensing
Connecting Ethernet network(s)	Configuring web server (if required)
Connecting RS485 networks (if required)	Setting up NC functionality (if required)
Mounting and connecting I/O modules (if required)	Downloading strategy and other configuration files
Powering up	Checking BACnet communications
Setting up Ethernet connectivity	Connecting inputs and checking operation
Creating a strategy	Connecting outputs and checking operation

A full description of installing the unit is given in the IQ500 Installation Instructions - Mounting (TG201482) and IQ5, IQ5-IO Installation Instructions - Configuring (TG201483).

## ORDER CODES

### CONTROLLER

<b>IQ5-00-24</b>	IQ500 with 0 onboard I/O, licensed to 16 I/O channels, expandable to 300 I/O channels, BACnet communications, 24 Vac/dc supply.
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### ACCESSORIES

<b>IQ5-IO-ADPT-2</b>	Pack of 2 I/O bus wiring adapters (for IQ500 controller and IQ5/IO modules)
<b>IQ5-IO-END-10</b>	Pack of 10 spare end covers (for IQ500 controller and IQ5/IO modules)
<b>IQ5-TCVR-140-10</b>	Pack of 10 spare 140mm terminal covers (for IQ500)
<b>DIN-CLIP-10</b>	Spare DIN Clip (pack of 10)
<b>SCRW-TB-3-BLK-50</b>	Spare 3-way Screw Terminal Plug Black (pack of 50)
<b>SCRW-TB-4-BLK-50</b>	Spare 4-way Screw Terminal Plug Black (pack of 50)
<b>SCRW-TB-3-GRY-50</b>	Spare 3-way Screw Terminal Plug Grey (pack of 50)
<b>PUSH-TB-3-BLK-50</b>	Spare 3-way Push-fit Terminal Plug Black (pack of 50)
<b>PUSH-TB-4-BLK-50</b>	Spare 4-way Push-fit Terminal Plug Black (pack of 50)
<b>PUSH-TB-3-GRY-50</b>	Spare 3-way Push-fit Terminal Plug Grey (pack of 50)

### LICENCES

#### Base Licences

The following base licences are available where additional I/O channels (points) are needed. Additional licenses are available to provide support for node controller operation (NC), Modbus, M-Bus and XNC integration (INT), and IQ3/4 IO bus operation (CAN):

<b>IQ5-50-BASE</b>	IQ5 base license 50 points
<b>IQ5-100-BASE</b>	IQ5 base license 100 points
<b>IQ5-150-BASE</b>	IQ5 base license 150 points
<b>IQ5-200-BASE</b>	IQ5 base license 200 points
<b>IQ5-250-BASE</b>	IQ5 base license 250 points
<b>IQ5-300-BASE</b>	IQ5 base license 300 points
<b>IQ5-NC-BASE</b>	IQ5 base license for NC functionality
<b>IQ5-INT-50-BASE</b>	IQ5 base license for Modbus, M-Bus and XNC integration 50 points
<b>IQ5-INT-2500-BASE</b>	IQ5 base license for Modbus, M-Bus and XNC integration 2500 points
<b>IQ5-CAN-BASE</b>	IQ5 base license for CAN (IQ3/4 IO) modules

#### Upgrade Licences

To allow for later system expansion the following upgrade licences are available:

<b>IQ5-16-50-UP</b>	IQ5 Upgrade license from 16 to 50 points
<b>IQ5-50-100-UP</b>	IQ5 Upgrade license from 50 to 100 points
<b>IQ5-100-150-UP</b>	IQ5 Upgrade license from 100 to 150 points
<b>IQ5-150-200-UP</b>	IQ5 Upgrade license from 150 to 200 points
<b>IQ5-200-250-UP</b>	IQ5 Upgrade license from 200 to 250 points
<b>IQ5-250-300-UP</b>	IQ5 Upgrade license from 250 to 300 points
<b>IQ5-NC-UP</b>	IQ5 upgrade license for NC functionality
<b>IQ5-INT-50-UP</b>	IQ5 upgrade license for Modbus, M-Bus and XNC integration 50 points
<b>IQ5-INT-2500-UP</b>	IQ5 upgrade license for Modbus, M-Bus and XNC integration 2500 points
<b>IQ5-CAN-UP</b>	IQ5 upgrade license for CAN (IQ3/4 IO)

## SPECIFICATIONS

### ELECTRICAL

Power Input	24 Vac $\pm$ 20%, 50/60 Hz, 34VA (1.42A); 24 Vdc $\pm$ 20%, 12.5W (0.52A).
Overvoltage protection	29 Vac or 40 Vdc.
Processor	i.MX 8M Plus, quad Arm <sup>®</sup> Cortex <sup>®</sup> -A53 processor with speed up to 1.2 GHz integrated 800 MHz Arm <sup>®</sup> Cortex <sup>®</sup> -M7. FRAM: 512 KB, LPDDR4: 2 GB, EMMC: 8 GB.
Memory	
Operating System	LINUX/RTOS.
Real Time Clock	
Accuracy (typical)	$\pm$ 0.3 s per day ( $\pm$ 2 minutes per year).
Retention	Supercap for up to 3 days (typical).
Cycle Time	Sequence table 1s.

### Ethernet Network

Number of Ports	3.
Transmission	10/100/1000 BASE-T (IEEE 802.3).
Connection	RJ45, auto MDI-X.
Cable Type	Cat 5e, UTP (unshielded twisted pair).
Distance (to hub)	100 m (328 ft) maximum.
Virtual CNCs	4 (8 in NC mode).
Addresses	Not set by default – set to desired value in range 1 to 119 (excluding 2, 3, & 10)

### USB Local Engineering Port

Connector	USB type C.
Transmission	USB 2.0.
Data Rate	480 Mbits/s. (limited to 19k2 by IQSET)
Distance	5 m (16 ft) maximum.
Address (sCNC)	1 to 119, (2, 3 and 10 not permitted) settable in software.

### RS-485 Ports

Number of ports	3 (each galvanically isolated).
Protocols	Modbus, M-Bus, MSTP, XNC.
Termination	120 $\Omega$ switchable.

Protocol	Device Count	Cable Type	Max Length* metres (feet)
Modbus	32 unit loads	120 $\Omega$ twisted pair	900 (2953)
M-Bus	60	120 $\Omega$ twisted pair	1000 (3280)
MSTP	32 unit loads 64 IQECOs**	120 $\Omega$ twisted pair	1200 (4000)
XNC	32	Depends on chosen application	

\* Dependent on cable specification and baud rate.

\*\*See 'Node Controller Operation' on page 4.

### T1L IO Expansion Bus

Transmission	10BASE-T1L (IEE802.3cg).
Compatibility	IQ5 IO modules.
Protocol	MQTT compatible.
Maximum Modules	64.
Maximum IO Channels	300 total (depending on licence).
Bus Supply	As per main power input.
Data Cable Type	Screened twisted pair (e.g. TP/1/1/24/HF/305 or Belden equivalent 9841NH). (requires IQ5-10-ADPT wiring adapters)

#### Cable Length

Lon cable TP/1/0/16/HF/200 (Belden 8471) - up to 300 m (1000 ft) between modules.  
MSTP cable TP/1/1/24/HF/305 or Belden equivalent 9841NH - up to 100 m (320 ft) between modules

For further details see:

IQ5-IO Modules Data Sheet (TA201481).

### IQ3/4 IO Expansion Bus

Compatibility	IQ4/IO modules, XCITE/IO Modules.
Maximum Modules	30 (IQ4/IO only), 15 (XCITE/IO).
Maximum IO Channels	300 total (depending on licence).
Bus Supply	24 Vdc $\pm$ 5% (separate PSU required).
Cable Type	Belden 3084A (up to 100 m / 328 ft); Belden 7895A (up to 300 m / 1000 ft).

For further details see:

IQ4/IO Modules Data Sheet (TA201341);  
XCITE/IO Modules Data Sheet (TA201352).

### INDICATORS

General Status	
Device 'ring'	Multicolor LED
Service	Multicolor LED
RS-485	Multicolor LED
LAN	Multicolor LED
T1L IO	Multicolor LED
Ethernet Ports	
Left LED	Green = 1000 mbps
Right LED	Green = 100 mbps, Yellow = 10 mbps

### MECHANICAL

Dimensions (WxHxD)	144.5 x 131 x 60 mm (5.69 x 5.16 x 2.36").
Material (enclosure)	Flame Retardant Polycarbonate.
Weight	0.440 kg (0.97 lb).
Mounting (DIN Rail)	IEC/EN 60715 TH35x7.5 or TH35x15 (1.5 mm maximum thickness).

#### Connectors

Power, RS-485, IQ3/4 IO bus	
Connector type	2 part connector (5 mm pitch) with rising cage clamp screw terminals. Option for push-fit terminals.
Cable size	0.14 to 2.5 mm <sup>2</sup> (22 to 12 AWG). For UL compliance the input power connections must be made using 18 AWG or larger wire rated at least 90°C (194 °F). For UL compliance use copper cable only.
T1L IO Bus	Integral spring contacts for inter-module connection. IQ5-IO-ADPT wiring adapter required for cable connection.
Ethernet Ports	RJ45 connector.
USB Engineering Port	USB Type C.
USB Expansion Port	USB Type C ( <i>reserved for future use</i> ).

## ENVIRONMENTAL

### Approvals and Certifications

- UL 60730-1, Standard for Automatic Electric Controls for Household and Similar Use, Part 1: General Requirements;
- CAN/CSA-E60730-1:13, Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements;
- Complementary listing for UL916, CSA C22.2 No. 205;
- SASO-approved;
- CE-approved;
- FCC part 15B-compliant.

### Classification According to EN61326-1

Environmental conditions Equipment intended for use in industrial environments.

Construction Independently mounted electronic control unit with fixed wiring; panel-mounted on DIN rail.

Action type 1.C.

Rated impulse voltage 24 V circuits: 500 V.

Pollution degree 2.

Protection against shock Class 0 (without terminal covers);  
Class II (with terminal covers).

Software class A.

### Energy Performance of Buildings

EN ISO 52120-1 This controller, when used as part of a complete Trend Controls system AND when programmed with an appropriate application/strategy can support compliance with EN ISO 52120-1. This enables buildings to achieve up to 30% energy cost savings (Energy classification "A") alongside maximizing comfort and wellbeing.

EN12098-1 This control equipment complies with the performance specification defined in EN12098-1. With an appropriate application/strategy it can make use of operation modes, scheduling, optimum start/stop, outside air temperature and frost protection to enhance the energy performance of buildings.

### Ambient Environmental Limits

Humidity 5 to 90%RH non-condensing.

Temperature

Storage -40 to +70°C (-40 to +158°F).

Operating -25 to +60°C (-13 to +140°F).

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

Altitude ≤4000 m (13124 ft).

Pollution Degree 2 (only non-conducting pollution occurs).

Protection IP20 if mounted in an enclosure rated at IP20 or equivalent.

Please send any comments about this or any other Trend technical publication to [techpubs@trendcontrols.com](mailto:techpubs@trendcontrols.com)



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