

IQ528 Controller



Description

The IQ528 controller provides a secure and versatile control platform for building and energy management systems. With two onboard Ethernet ports and two RS-485 ports the IQ528 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, MS/TP.

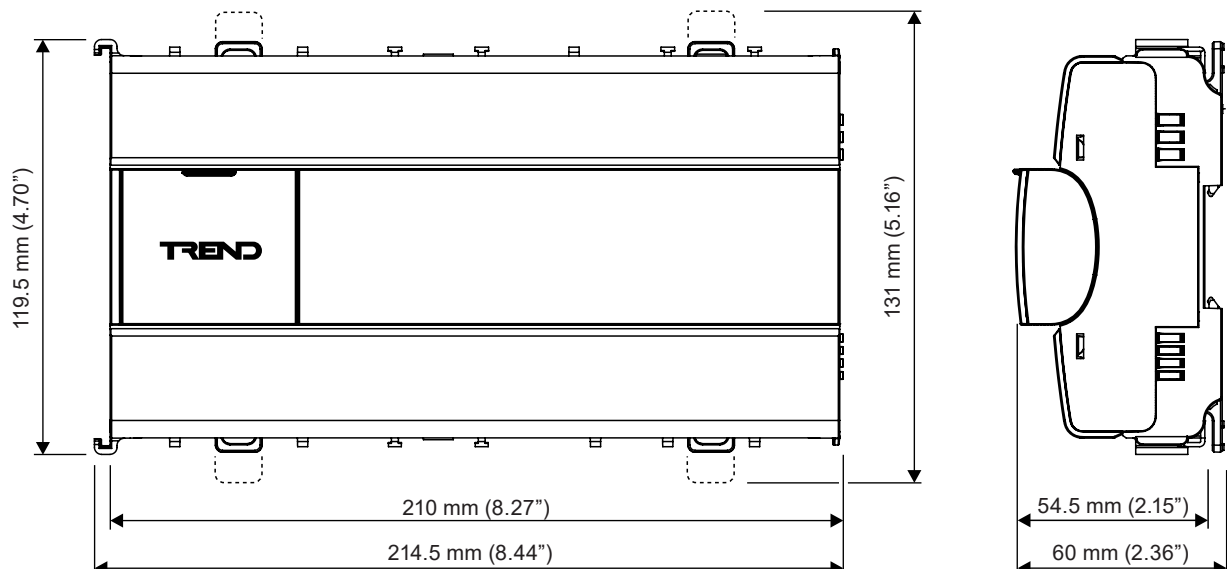
It has 28 onboard input/output channels (16 universal I/O channels, 4 relay outputs, 4 solid state relay outputs, and 4 digital inputs). It can integrate with the latest IQ5-IO input/output modules over a high-speed T1L bus enabling up to 52 IO points by adding IQ5-IO modules.

Flexible licensing options allow the IQ528's functionality and number of IO channels to be easily configured to match your application.

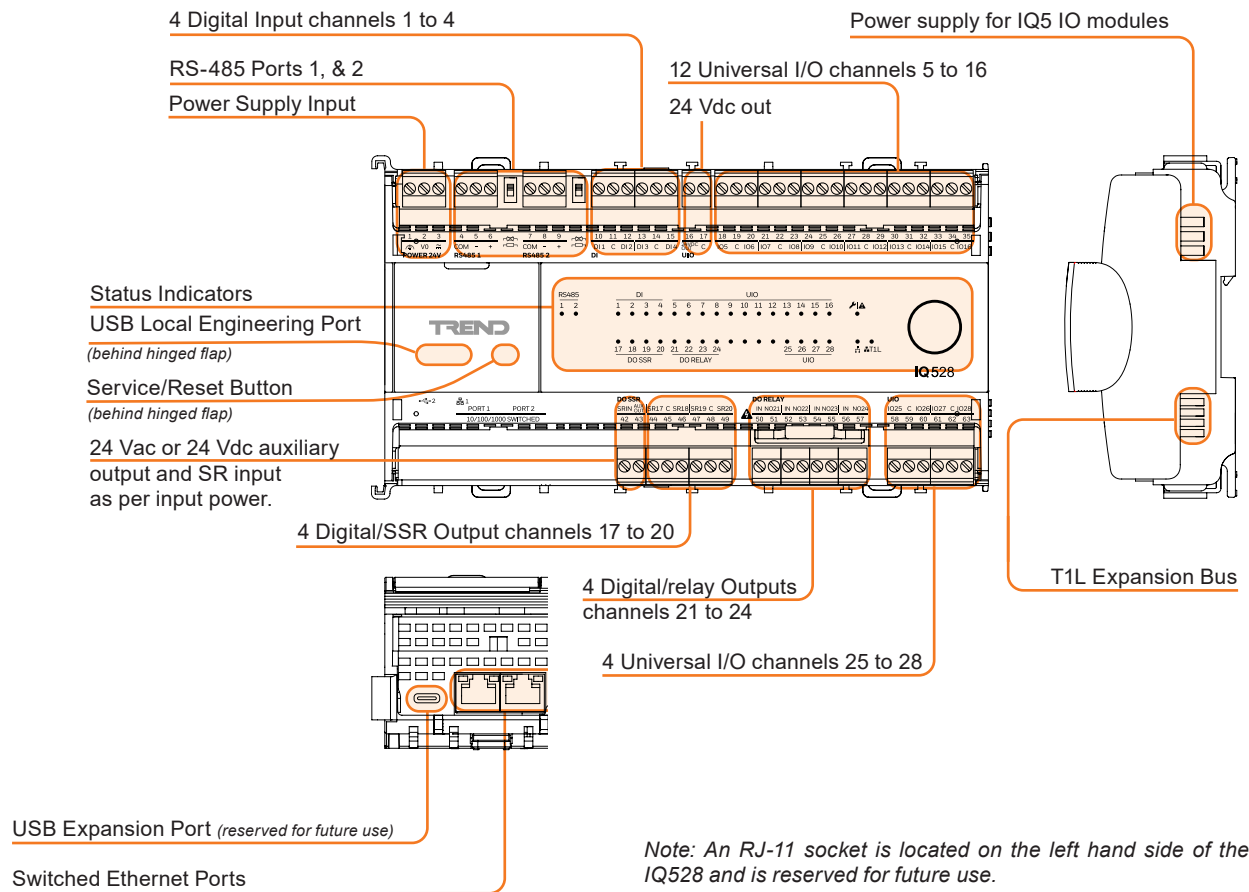
Features

- Designed to meet ISA/IEC 62443-4-2, and been developed using processes that are fully certified to ISA/IEC 62443-4-1.
- Audit logging.
- T1L high-speed secure bus for T1L devices (IQ5-IO modules & IQ5-LAN-ADPT)
- Compatibility mode for incorporating into existing Trend systems
- 2 Switched Gigabit Ethernet Ports
- 2 onboard RS-485 ports for Modbus, M-Bus (via M-Bus converter), MS/TP and XNC
- BACnet over IP
- Automatic time synchronisation and daylight saving via SNTP
- DIN rail mounting, DIN 19 size 2 standard enclosure
- USB local supervisor/engineering port
- 24 Vac/dc input power supply

Physical



Physical (continued)



FUNCTIONALITY

COMPATIBILITY WITH EXISTING SYSTEMS

The IQ528 is able to coexist on the same Trend network as pre IQ5 controllers (IQ1, IQ2, IQ3, IQ4, IQECO). To allow this the IQ528 can be configured to operate in one of two modes:

- IQ5 Mode
- Compatibility Mode

IQ5 Mode: When in IQ5 Mode the IQ528 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 IQ528 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:

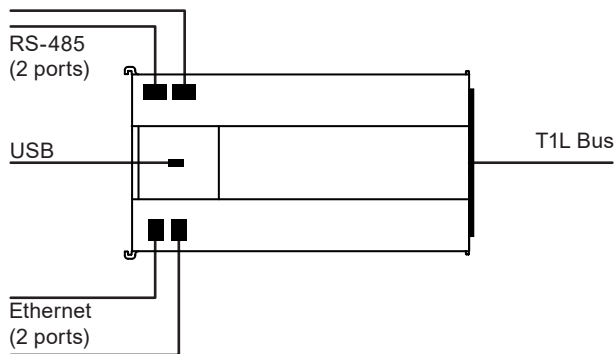
Feature	IQ5 Mode	Compatibility Mode
Compatible IQ1, 2, 3 and 4 systems	×	✓
System Accounts	✓	×
Synchronised Account Management	✓	×
Encrypted Trend communications	✓	×
IQ5-IO Modules	✓	✓
IQ4/IO/.. I/O Expansion Modules	Not supported on IQ528	
XCITE/IO/.. I/O Expansion Modules	Not supported on IQ528	
*Use all RS-485 ports for interfacing	✓	✓
*IQ Interfacing (ModBus, M-Bus, XNC)	✓	✓
*MS/TP router (NC)	✓	✓
BACnet	✓	✓
Password recovery via email	✓	×
IQVIEW SCD for IQ5	✓	✓
802.1x	Not supported on IQ528	
Trend Current Loop	×	✓
Isolated Ethernet port	Not supported on IQ528	

*Requires Licence

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

SYSTEM

The IQ528 has communication ports for Ethernet, RS-485 and USB, and the T1 bus:



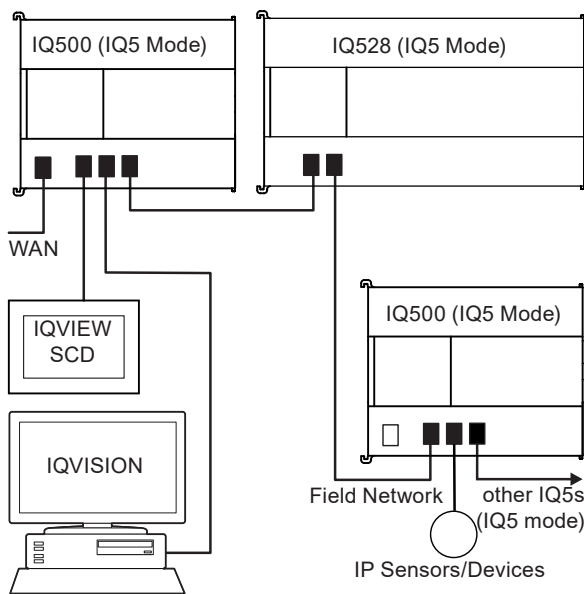
Note: The Current Loop LAN Adapter (IQ5-LAN-ADPT) can be used to enable an IQ5 in compatibility mode to connect to the a Trend current loop network - see the IQ5-LAN-ADPT Current Loop LAN Adapter Data Sheet (TA201510).

Ethernet Ports

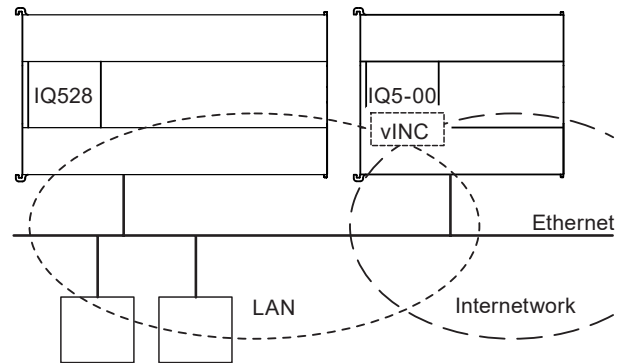
The IQ528 has two gigabit Ethernet ports connected to a single network adapter (A1). The adapter is connected to two switched ports (A1 1, & 2). The adapter has a unique MAC address that can be used to help identify the IQ5 during configuration. All ports support either static or dynamic (DHCP) IP addressing (DHCP by default) and can be individually enabled/disabled and configured. 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 NC.
- IP-based communication with field devices,
- connection to the IQVISION supervisor,
- accessing web pages via the onboard web server,
- integration with third party IP systems using XNC

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



Using one of the ports the IQ528 can form a Trend LAN with other IQ5-compatible devices over an Ethernet network:



The IQ528 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 IQ528 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 IQ528 or another CNC on the network. For further details see 'Networking' on page 7.

An integral web interface is also accessible over an Ethernet/IP connection (see 'Web Server' on page 15).

IQ528 supports communication with IP Modbus devices (see 'Modbus and M-Bus Interfacing' on page 6).

Port Management

The Ethernet ports can be individually enabled/disabled.

RS-485 Ports

The IQ528 has two 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 6 and 'XNC Functionality' on page 7.

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

If IQ528 is configured as a node controller, one port can be used to connect IQECO controllers on an MS/TP trunk. For further details see 'Node Controller Operation' on page 7.

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 7).

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.

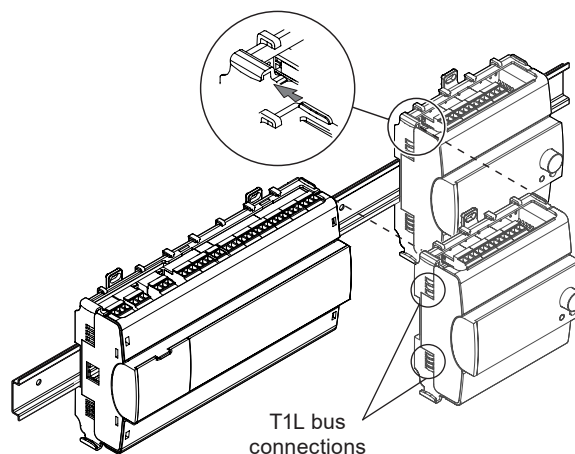
A full specification of the objects, properties, and BIBBS (BACnet Interoperability Building Blocks) supported by the IQ528 are given in the IQ5 Protocol Implementation Conformance Statement (TP201479). The mapping of BACnet properties to Trend parameters is described in the IQ5 Configuration Manual (TE201486).

T1L Bus

The T1L bus enables the connection of T1L devices (IQ5-IO modules and a single IQ5-LAN-ADPT).

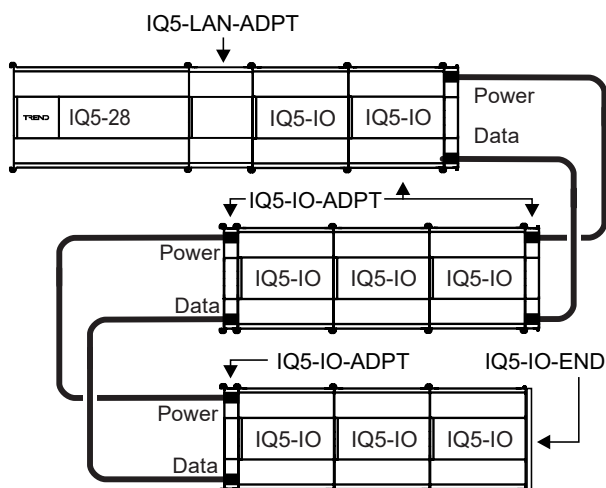
For details of the range of available IQ5-IO modules refer to the IQ5-IO Modules Data Sheet (TA201481). For details of the Current Loop LAN Adapter (IQ5-LAN-ADPT) refer to the Current Loop LAN Adapter Data Sheet (TA201510).

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



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

Alternatively, T1L devices can be mounted remotely and connected to the T1L bus by means of the IQ5-IO-ADPT wiring adapter and suitable cable.



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

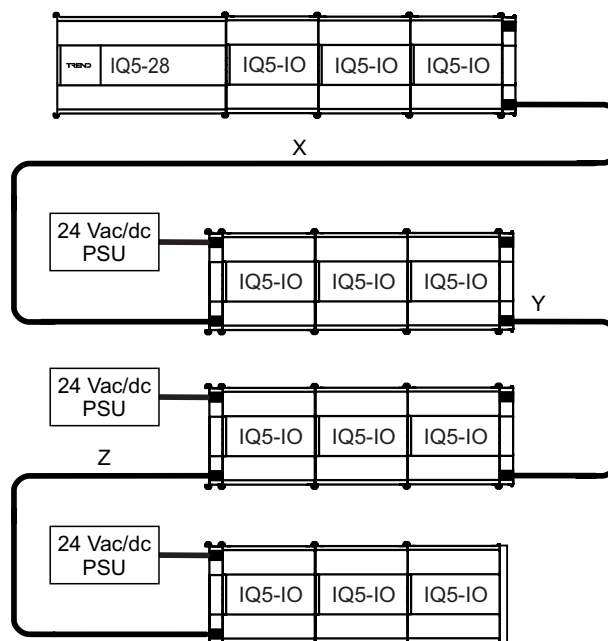
Cabling between devices on the T1L bus may be wired from right to left side, right to right or left to left, as long as correct bus polarity is maintained. Spurs are not permitted.

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

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

Maximum T1L Bus Length

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



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

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

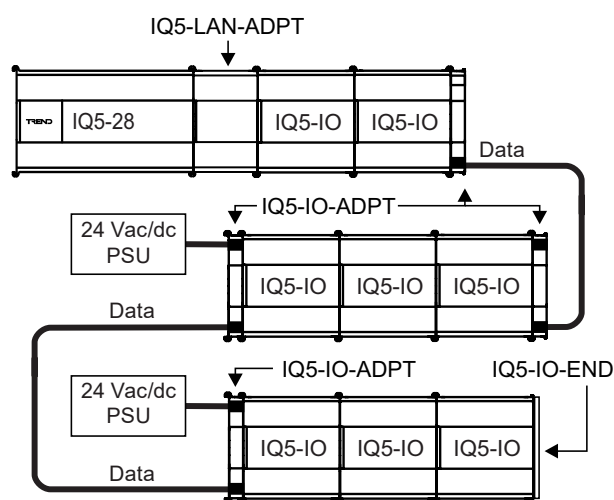
Power Supply

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

The maximum current required by each T1L device is specified in the appropriate data sheet and can be used to estimate the total current required by the T1L bus:

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

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



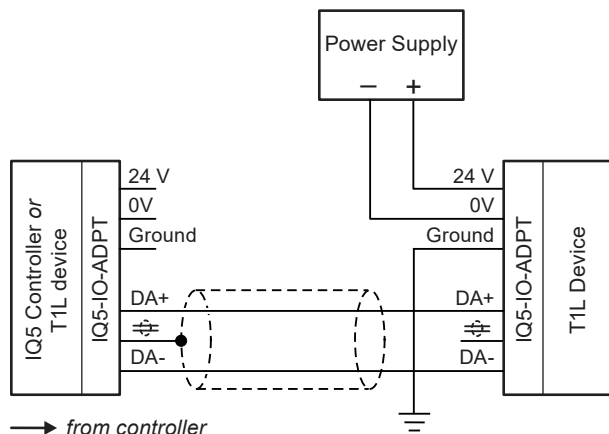
Additional Power Supplies

Important: Not permitted for UL compliant installations.

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

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

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



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

Earthing/Grounding Arrangements

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

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

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

All DIN rails must be earthed/grounded.

Trend Current Loop

When in compatibility mode the IQ528 can be configured to connect to a Trend current loop LAN or internetwork via the Current Loop LAN Adapter (IQ5-LAN-ADPT) - see the IQ5-LAN-ADPT Current Loop LAN Adapter Data Sheet (TA201510).

Note: For connection to a Trend current loop internetwork, Node Controller functionality needs to be enabled using an optional NC licence (see 'Licences' on page 19).

Modbus and M-Bus Interfacing

The IQ528 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 19).

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.

Modbus

IQ528 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 (500 combined total). If more than this is required additional Modbus Interface modules can be connected to the same Modbus address (device).

**Note: The total number of inputs/outputs across all is limited by the number of licensed interface points.*

Maximum number of devices: Although the maximum number of Modbus devices connected to the IQ528 is determined by the number of available interface modules in the IQ528 (max 1000), in reality, the limit is set by the Modbus rules or the integration license.

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 IQ528's hardware.

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

Note: IQ528 cannot operate as a subordinate so does not have registers.

M-Bus

IQ528 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: Total number of outputs is limited by the number of licensed interface points.*

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 1000, the maximum number of M-Bus devices is limited to 250 but is dependent on the M-Bus converter used.

**Note: Total number of outputs is limited by the number of licensed interface points.*

When values are requested from an M-Bus device ALL values are sent to the IQ528. 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 IQ528. 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 IQ528's hardware.

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

XNC Functionality

The IQ528 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 19).

Node Controller Operation

The IQ528 can be licensed for Node Controller operation. It can be configured to operate in one of four modes:

Ethernet Internetwork to MS/TP LAN Mode
Trend Internetwork to MS/TP Mode
Ethernet to Trend LAN Mode
Ethernet to Trend Internetwork Mode

Ethernet Internetwork to MS/TP LAN Mode: Available in both IQ5 Mode and Compatibility Mode this mode enables it to connect a LAN of IQECO controllers on an MS/TP RS-485 trunk to a Trend internetwork on Ethernet.

Trend Internetwork to MS/TP Mode: Only available in Compatibility Mode and requires an IQ5-LAN-ADPT. This mode enables the IQ5 to act as an interface between an internetwork on a Trend current loop network and an IQECO LAN on the MS/TP trunk.

Ethernet to Trend LAN Mode: Only available in Compatibility Mode and requires an IQ5-LAN-ADPT. This mode enables the IQ5 to act as an interface between an internetwork on Ethernet, and a LAN on the Trend current loop network.

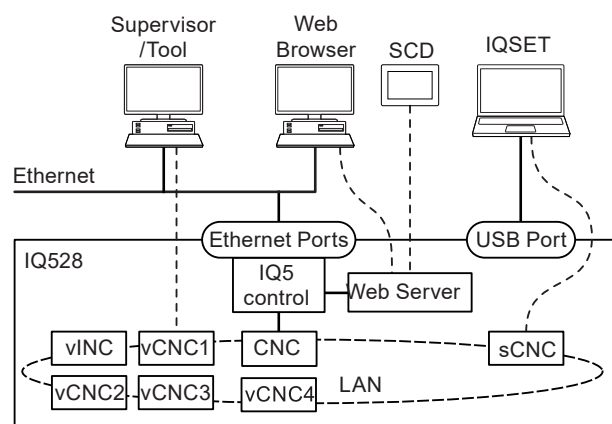
Ethernet to Trend Internetwork Mode: Only available in Compatibility Mode and requires an IQ5-LAN-ADPT. This mode enables the IQ5 to act as an interface between an internetwork on Ethernet, and an internetwork on the Trend current loop network.

Note: Node Controller functionality needs to be enabled using an optional NC licence (see 'Licences' on page 19). Only one RS-485 port can be enabled for MS/TP.

Networking

In order to connect to the Trend network the IQ528 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 IQ528's device (outstation) address is factory-set (in the Address module) as follows:

Local LAN	20
Local Address	20

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 IQ528 has four vCNCs, which increases to eight when operated as a Node Controller (with an NC licence).

vINC Functionality: When the IQ528 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 IQ528 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 17.

When in Compatibility Mode the IQ528 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 17.

Inputs and Outputs

The IQ528 has 28 onboard input/output channels (16 universal I/O channels, 4 relay outputs, 4 solid state relay outputs, and 4 digital inputs). It has a T1L Bus for connection IQ5-IO modules.

The IQ528 is supplied with a licence for 28 I/O points to support its 28 onboard I/O channels. The license can be expanded to 52 points (see 'Licensing' on page 16) enabling the use of up to 24 external I/O channels via connected I/O modules.

Note: Additional IO points, above the supplied 52 cannot be added to the IQ528.

HARDWARE

Input/Output Channels

The following types of input and output channel are supported:

- Universal Input/Output (UIO)
- Digital/Relay Output (DO)
- Digital/SSR Output (DOSSR)
- Digital inputs (DI)

The IQ528 also has a 24 Vdc auxiliary supply output terminal for powering certain types of I/O devices.

Cable Screening

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

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

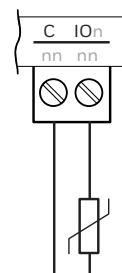
Universal Input/Output (UIO) - (IO5 to IO16; IO25 to IO28)

These channels will function in one of the following modes:

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

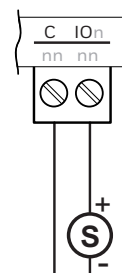
The input/output mode of each channel is set by the strategy configuration in the controller.

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



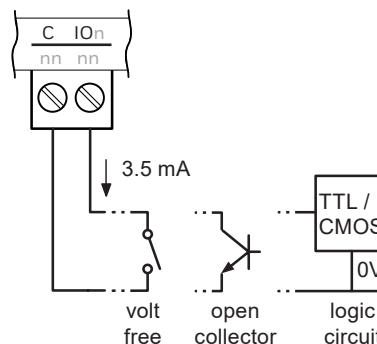
Voltage input: Used with a 0 to 10 Vdc or 2 to 10 Vdc source.

Example wiring



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

Example wiring



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

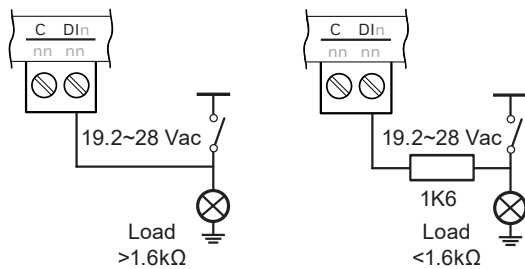
The input has a nominal wetting current of 3.5 mA.

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

The input can be configured for pulse count operation maximum 30 Hz pulse width $\geq 16.6 \text{ ms}$ (both logic high and logic low).

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

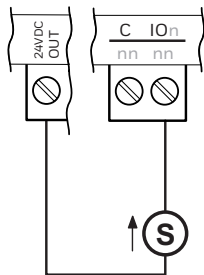
Example wiring



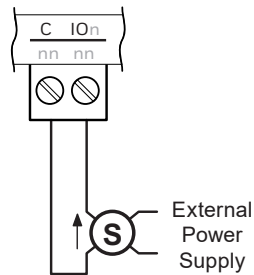
In the above example the input will be ON when the load is powered. If the load impedance is less than 1.6 kΩ (e.g. a filament lamp or relay coil) then a 1.6 kΩ resistor must be fitted in series with the input.

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

Example wiring - loop



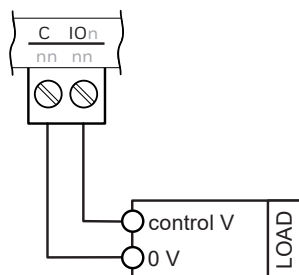
Example wiring - external



Note: The 24 Vdc OUT terminal can source up to 120 mA.

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

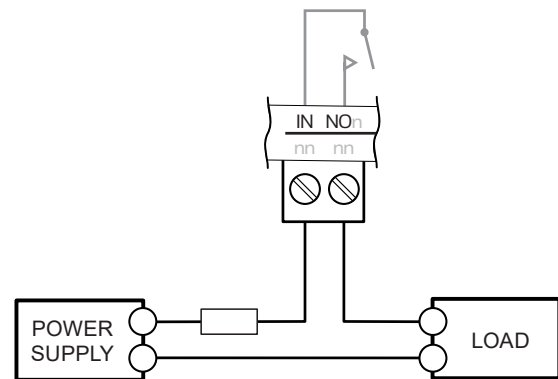
Example wiring



Digital/Relay Output (DO) - (NO21 to NO24)

These channels provide a single pole dry contact relay.

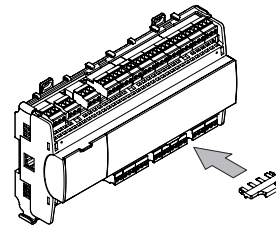
Example wiring



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

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

An optional jumper (IO-JUMPER-4) can be inserted adjacent to the connectors which will link the IN terminals, enabling a common supply to be used on the DO channels.



Jumpers are supplied and are also available as spares.

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

Caution: Mains and low voltage must not be mixed. If switching mains, all relays must switch the same phase and polarity. Arc suppression circuit (RC) recommended for inductive loads (see TG200208).

Digital/ Output (DOSSR) - (SR17 to SR20)

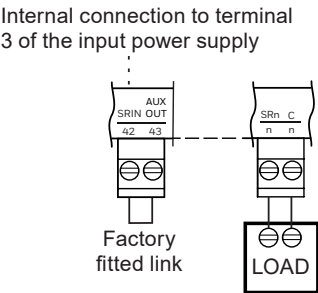
These channels provide switched 24 Vac or 24 Vdc control of thermic (thermoelectric) actuators, relays and synchronous motors.

The controller has an 'AUX OUT' terminal linked to the power supply terminal of the controller. This voltage can be 24 Vac or 24 Vdc. The AUX OUT and SRIN terminals have a factory fitted link allowing it to feed power to the SR17 to SR20 terminals. When the link is removed between the 'AUX OUT' and 'SRIN', a separate power supply can be used to feed power to the SR17 to SR20 terminals.

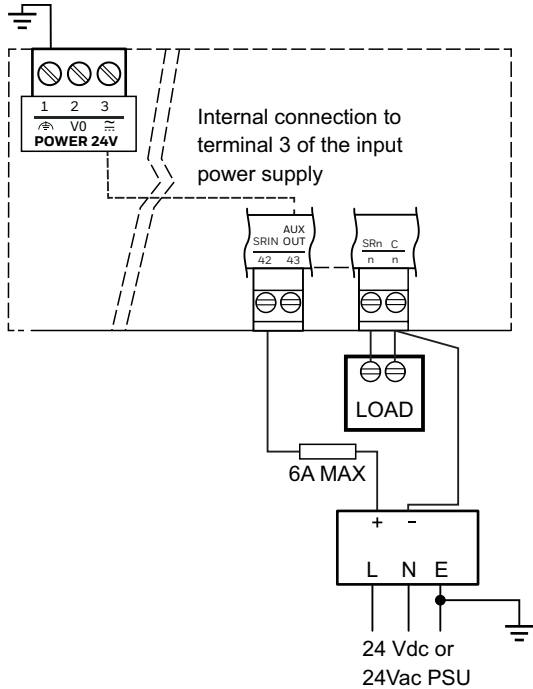
Note: If the combined load of the controller, IQ5 IO module power supply and the DOSSR outputs is greater than the power provided by the controller's supply (Class 2 supply max 100VA) it is necessary to power the outputs from an external supply. The link between auxiliary output and the SR input should be removed to allow an external power supply to be used.

Note: The SRIN input is connected internally to terminal 3 of the input power supply, and has no protection.

Example wiring (internally powered)



Example wiring (externally powered)

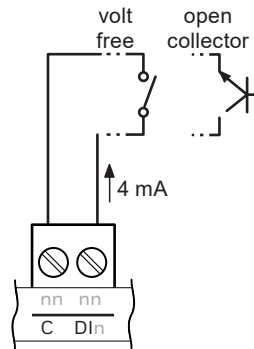


Digital Input (DI) - DI1 to DI4

These channels only support wet connection and are compatible with the following input devices:

- volt free contact (e.g. switch or relay),
- open collector (transistor) or open drain (FET)

Example wiring



	volt-free input
Input Inactive (OFF)	≥3 kΩ
Input Active (ON)	≤500 Ω

The input has a nominal wetting current of 4 mA.

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

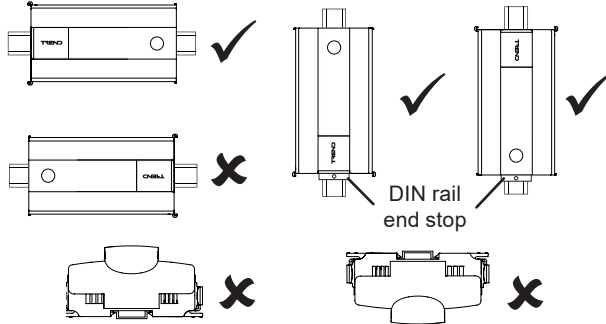
The input can be configured for pulse count operation (maximum 100Hz maximum. Pulse width ≥5 ms both logic high and logic low).

Enclosure

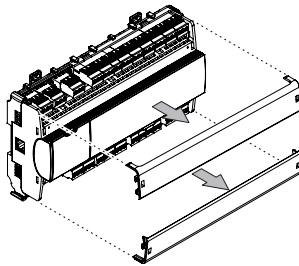
The IQ528 is housed in a polycarbonate enclosure compatible with the DIN43880 and DIN 19 size 2 standard. Integral clips on the back of the enclosure enable the unit to be clipped on to (and quickly released from) a standard TS35 DIN rail.

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.



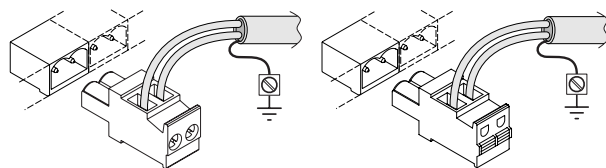
Spare covers are available (see 'Order Codes' on page 18).

Terminal Connectors

Connection for power, and RS-485 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 18).

Screw terminal plug

Push-fit terminal plug



Function	Connector Type
Power	3-way
RS-485	3-way
Digital Input (DI)	3-way
Universal Input/Output (UIO)	3-way
Digital/Relay Output (DO)	2-way
Digital/SSR Output (DOSSR)	3-way
24VDC OUT	2-way
AUX OUT/SRIN	2-way

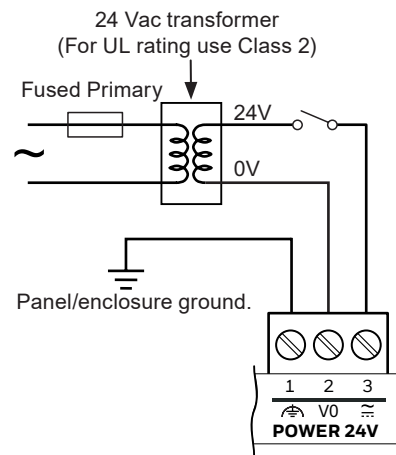
Input Power Supply

The IQ528 requires a 24 Vac/dc power supply rated as follows:

- 24 Vac $\pm 20\%$, 50/60 Hz, 80 VA (3.33 A);
- 24 Vdc $\pm 20\%$, 35 W (1.46 A).

If T1L devices (IQ5-IO modules and IQ5-LAN-ADPT) are to be powered from the controller's T1L bus, or the SSR outputs are to provide power the above rating must be increased to take account of the additional load. Refer to the IQ5-IO Modules Data Sheet (TA201481) or IQ5-LAN-ADPT Current Loop LAN Adapter Data Sheet (TA201510) for details of T1L device 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

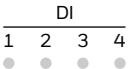
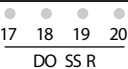
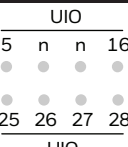
The service button is located behind the drop-down flap located on the front of the IQ528. It has the following functions:

- To identify the IQ528 to IQSET during commissioning,
- To return the IQ528 to its factory default settings.

Indicators

Various indicators are provided on the IQ528 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 bus status.
	Green Red	State of associated digital input: unlit = OFF, lit green = ON, lit red = alarm.
	Green	State of associated digital output: unlit = OFF, lit = ON.
	Green	State of associated digital output: unlit = OFF, lit = ON.
	Green Red	State of associated universal input/output: unlit = OFF, fully lit green = ON, fully lit red = alarm (DI and AI only).

Ethernet: (located adjacent to each Ethernet connector):

Indicator	Colour	Function
	Green	1000 Mbps link/data. Solid = connected Blinking = activity on network
	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 IQ528 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.

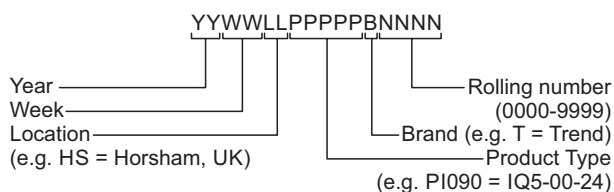
Note: Operation at elevated temperature or high humidity levels may reduce the lifetime of the supercap. Extended operation in these conditions may permanently reduce the capacity of this component and result in a reduction in the number of days that the controller can successfully backup the time and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

Labelling

Two removable self-adhesive labels detailing the serial number (SN) and Ethernet MAC address (EN1 MAC) of the IQ528 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

A third self-adhesive label detailing licences included with the controller when shipped from the factory and the serial number (SN) is fixed behind the drop-down flap.



The QR code provides a comma separated scannable format of the Part number, description & serial number.

FIRMWARE

The firmware in the IQ528 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 MS/TP/current loop)	① ④
Interface	130	1000	① ③
I/O Module	14	284	
Knob	13	4000	
Logic	19	4000	①
Loop	55	1000	
Network Service/ 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 MS/TP and Trend current loop 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 shared between the two networks.
 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 IQ528'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 IQ528 has a total available memory capacity of 40,000 briQs. IQ5-INT-50-BASE and IQ5-INT-50-UP will increase the BriQs by 15000.

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

Plot Modules

The IQ528'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	Synchronised plots	
	single precision	600,000
	(5 log points per record)	
	double precision	300,000
	(10 log points per record)	
	Triggered, COV or periodic plots	
	single precision	300,000
	(10 log points per record)	
	double precision	200,000
	(15 log points per record)	

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 IQ528 has a maximum of 750 steps in the sequence table.

BACnet COV Reporting and Receiving

The IQ528s 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. IQ528 provides both COV reporting (limited to 1000 COV subscriptions - see page 13 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 IQ528 connected over Ethernet or the USB Engineering Port.

Timemaster

The IQ528 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 IQ528 will generate Network, General, and Item alarms. Network alarms are generated by the Trend Network nodes, General alarms are generated when the IQ528 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.

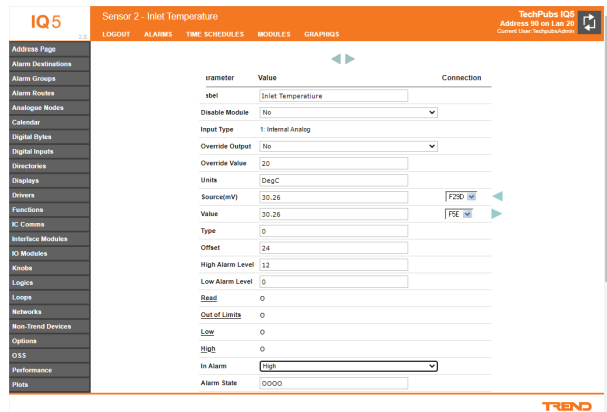
For coded alarms, the protocol limits the item number to 255 maximum. For text alarms the maximum item label length is 20 characters.

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.

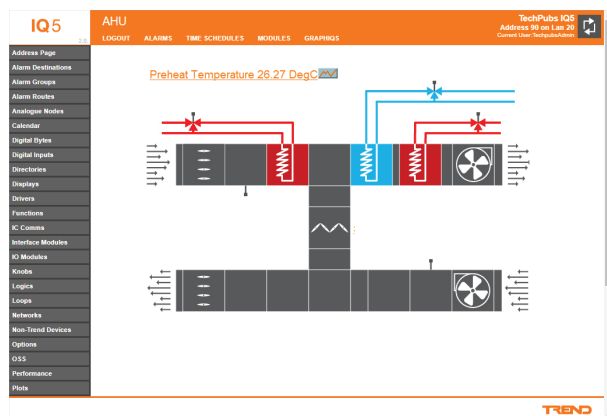
Web Server

Information from the IQ528 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 IQ528'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 IQ528'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 IQ528 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 IQ528 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 IQ528 will identify itself as an IQ5 to w comms. When in IQ5 Compatibility Mode the IQ528 will identify itself as IQ4 v5 to w comms.

SECURITY

IQ528 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 IQ528 provides:

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

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.

It is not recommended that IQ528 is directly connected to the Internet.

Synchronised Account Management: IQ528 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.

Audit logging: The IQ528 provides audit logging which can be viewed from the IQ528's web pages for:

- Access control
- Request errors
- Operating system events
- Control system events
- Backup and restore events
- Configuration changes
- Reconnaissance activities
- Audit logging events

Important: Operating the IQ528 in Compatibility Mode will cause the IQ528 to operate using the same security mechanisms adopted for IQ4-based systems.

LICENSING

All IQ528s have the same base level capacity/functionality i.e. IQ5 Mode or Compatibility Mode, 28 I/O points, T1L bus, Trend communication over Ethernet and BACnet IP communication.

Additional capacity/functionality can be added to an IQ528 by applying a licence to the controller. There are two types of licence Base and Upgrade:

Base Licences

Base licences are used for the initial licensing of the controller i.e. during installation/commissioning. Base licenses can be applied to the controller during the grace period after this an upgrade licence must be used to add to the controller's capacity/functionality.

Grace period: The grace period is 60 days of power-on time following the application of the initial base license. Within this timeframe, additional base licenses may be added. The initial base license is applied either prior to shipment for pre-licensed controllers or by IQSET for unlicensed controllers. The grace period is visible in IQSET's IQ5 feature licenser and the IQ5's web pages in the address module. Prior to IQ5 firmware

Upgrade Licences

Upgrade licenses are used allow for system expansion after the grace period.

Licences can either be applied in the factory (pre-licensed controllers) or by the engineer using IQSET once the controller hardware has been delivered.

Pre-Licensed Controllers

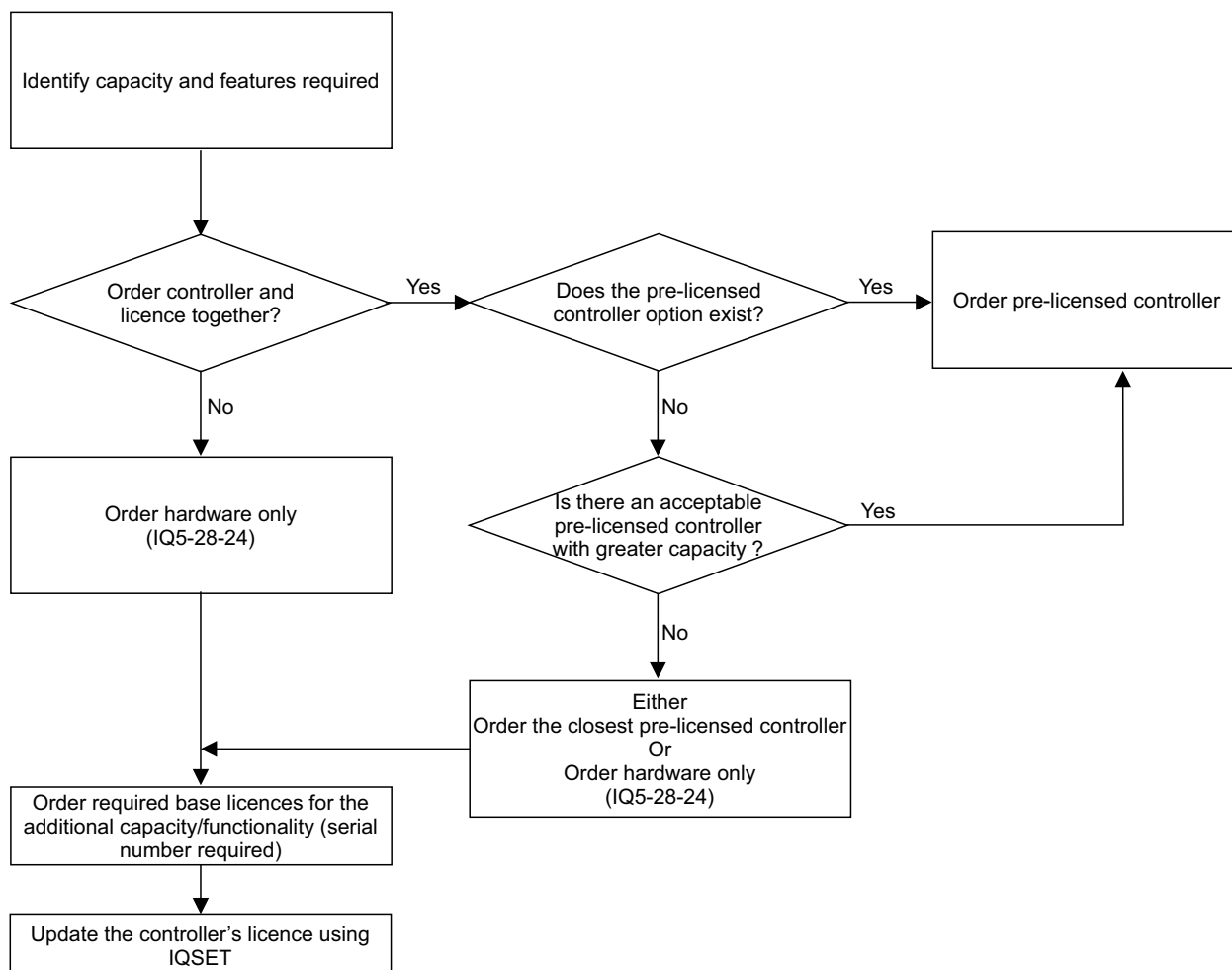
Pre-licensed controllers are IQ528 controllers that are supplied from the factory licensed with additional functionality. The pre-licensed controllers available have been selected to ensure that the most common capacity/functionality combinations are available directly from the factory. If these don't meet the requirements base or upgrade licences can be used to add to the pre-licensed controller's capacity/functionality.

Hardware Only Controllers

Hardware only controllers are IQ528 controllers that are supplied from the factory with only the base level functionality and require either a base or upgrade licence to be applied using IQSET if additional capacity/functionality is required.

See 'Order Codes' on page 18 for the available order codes.

Licensing Process



FIELD MAINTENANCE

The IQ528 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 IQ528.

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 V4.14 SP1 (or later), IQVIEW Single Controller Display for IQ5.
- **Compatibility mode** - IQVISION V4.14 SP1 (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 v8.50 (or later).

T1L Devices:

- **IQ5 Mode** - IQ5-IO Modules
- **Compatibility mode** - IQ5-IO Modules, IQ5-LAN-ADPT

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

Controllers:

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

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 or the Current Loop LAN Adapter (IQ5-LAN-ADPT) is used.

Strategies: IQ1, IQ2, IQ3, IQ4 can be imported into IQSET, converted into IQ5 strategies, and then downloaded into an IQ528.

IC Comms:

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

Note: IC Comms originating from an IQECO cannot be sent to an IQ528 in IQ5 Mode. To obtain a value from an IQECO, the IQ528 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 IQ528 controller is a BACnet Building Controller (B-BC). Compatibility is defined in the IQ5 Product Implementation Conformance Statement (TP201479).

INSTALLATION

The IQ528 is designed to be surface mounted or clipped on to a TH35x7.5 or TH35x15 DIN rail. The IQ528 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	Creating a strategy
Connecting power	Connecting to the controller
Connecting Ethernet network(s)	Setting up feature licensing
Connecting RS485 networks (if required)	Configuring web server (if required)
Mounting and connecting I/O modules (if required)	Setting up NC functionality (if required)
Mounting and connecting Current Loop LAN Adapter (if required)	Downloading strategy and other configuration files
Powering up	Checking BACnet communications
Setting up Ethernet connectivity	Connecting inputs and checking operation
	Connecting outputs and checking operation

A full description of installing the unit is given in the IQ528 Installation Instructions - Mounting (TG201482) and IQ5, IQ5-IO Installation Instructions - Configuring (TG201483).

ORDER CODES

HARDWARE ONLY CONTROLLERS

Hardware only controllers are supplied with base level functionality and require either a base or upgrade licence to be applied using IQSET if additional capacity/functionality is required.

Short Description	Part Number / Product Code	Description
IQ5-28-24	IQ5-28-24	IQ528 controller with 28 onboard I/O, licensed for 28 I/O channels, BACnet communications, 24 Vac/dc supply.

PRE-LICENSED CONTROLLERS

Pre-licensed controllers are IQ528 controllers (IQ5-28-24) that have been licensed in the factory with additional functionality.

Note: Base licences can be added to a pre-licensed controller to add additional capacity/functionality during the grace period. After the grace period upgrade licences must be used to add capacity/functionality.

The pre-licensed controller order codes (Short Description) are in the format below:

IQ5-28-<IO Capacity>-<Integration Capacity>-<Network Routing>-<SCD Support>-24

Code	Options	Description
<IO Capacity>	28, 52	The number of IO channels.
<Integration Capacity>	50	The number of integration points (Modbus, M-Bus and XNC).
<Network Routing>	NC	NC functionality.
<SCD Support>	SCD	IQVIEW SCD functionality.

IMPORTANT: When ordering the pre-licensed controllers the Part number **MUST** be used.

Controller Additional I/O Capacity

Short Description	Part Number / Product Code	Description
IQ5-28-52-24	IQ528-52X000000000	IQ528 licensed for 52 I/O channels.

Controller with Additional I/O Capacity & IQVIEW SCD

Short Description	Part Number / Product Code	Description
IQ5-28-52-SCD-24	IQ528-52X000S00000	IQ528 licensed for 52 I/O channels and IQVIEW SCD.

Controller with Integration Functionality

Short Description	Part Number / Product Code	Description
IQ5-28-28-INT50-24	IQ528-28X1000000000	IQ528 licensed for 28 I/O channels and 50 integration points.
IQ5-28-52-INT50-24	IQ528-52X1000000000	IQ528 licensed for 52 I/O channels and 50 integration points.

Controller with Network Routing Functionality

Short Description	Part Number / Product Code	Description
IQ5-28-28-NC-24	IQ528-28X0N00000000	IQ528 licensed for 28 I/O channels and NC functionality.
IQ5-28-52-NC-24	IQ528-52X0N00000000	IQ528 licensed for 52 I/O channels and NC functionality.

Controller with Integration and Network Routing Functionality

Short Description	Part Number / Product Code	Description
IQ5-28-28-INT50-NC-24	IQ528-28X1N0000000	IQ528 licensed for 28 I/O channels, 50 integration points and NC functionality.
IQ5-28-52-INT50-NC-24	IQ528-52X1N0000000	IQ528 licensed for 52 I/O channels, 50 integration points and NC functionality.

ACCESSORIES

IQ5-IO-ADPT-2	I/O Wiring Adapters for IQ5-00 controller, IQ5-28 controller and IQ5 I/O modules (pack of 2)
IQ5-IO-END-10	Spare End Covers for IQ5-00 controller, IQ5-28 controller and IQ5 I/O modules (pack of 10)
DIN-CLIP-10	Spare DIN Clip (pack of 10)
IQ5-TCVR-210-10	Spare 210mm Terminal Covers for IQ528 (pack of 10)
IO-JUMPER-4-10	Spare 4 pin relay Output Jumper Bars to connect 4 relay commons (pack of 10)
AUX-TRM-16-10	16-way Auxiliary Terminal Blocks. Two groups of eight internally connected push in terminals for distributing signals and power (pack of 10)
AUX-TRM-10-10	10-way Auxiliary Terminal Blocks. Two groups of five internally connected push in terminals for distributing signals and power (pack of 10)
SCRW-TB-2-BLK-50	Spare 2-way Screw Terminal Plug Black (pack of 50)
SCRW-TB-3-BLK-50	Spare 3-way Screw Terminal Plug Black (pack of 50)
SCRW-TB-3-GRY-50	Spare 3-way Screw Terminal Plug Grey (pack of 50)
SCRW-TB-3-PUR-50	Spare 3-way Screw Terminal Plug Purple (pack of 50)
SCRW-TB-3-YEL-50	Spare 3-way Screw Terminal Plug Yellow (pack of 50)
SCRW-TB-2-ORN-50	Spare 2-way Screw Terminal Plug Orange (pack of 50)
SCRW-TB-3-ORN-50	Spare 3-way Screw Terminal Plug Orange (pack of 50)
SCRW-TB-R-2-ORN-50	Spare 2-way Screw Line Voltage Terminal Plug Orange (pack of 50)
PUSH-TB-2-BLK-50	Spare 2-way Push-fit Terminal Plug Black (pack of 50)
PUSH-TB-3-BLK-50	Spare 3-way Push-fit Terminal Plug Black (pack of 50)
PUSH-TB-3-GRY-50	Spare 3-way Push-fit Terminal Plug Grey (pack of 50)
PUSH-TB-3-PUR-50	Spare 3-way Push-fit Terminal Plug Purple (pack of 50)
PUSH-TB-3-YEL-50	Spare 3-way Push-fit Terminal Plug Yellow (pack of 50)
PUSH-TB-2-ORN-50	Spare 2-way Push-fit Terminal Plug Orange (pack of 50)
PUSH-TB-3-ORN-50	Spare 3-way Push-fit Terminal Plug Orange (pack of 50)
PUSH-TB-R-2-ORN-50	Spare 2-way Push-fit Line Voltage Terminal Plug Orange (pack of 50)

LICENCES

Base Licences

Base licences are used for the initial licensing of the controller i.e. during installation/commissioning.

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):

IQ528-52-BASE	IQ528 base license with 52 points
IQ5-NC-BASE	IQ5 base license for NC functionality
IQ5-INT-50-BASE	IQ5 base license for Modbus, M-Bus and XNC integration 50 points
IQVIEW-SC-V-IQ5	License for IQVIEW Single Controller Display.

Upgrade Licences

Upgrade licenses are used allow for system expansion after the grace period. The following upgrade licences are available:

IQ528-28-52-UP	IQ528 upgrade license from 28 to 52 points
IQ5-NC-UP	IQ5 upgrade license for NC functionality
IQ5-INT-50-UP	IQ5 upgrade license for Modbus, M-Bus and XNC integration 50 points
IQVIEW-SC-V-IQ5	License for IQVIEW Single Controller Display.

SPECIFICATIONS

ELECTRICAL

Supply Voltage	24 Vac $\pm 20\%$, 50/60 Hz, 24 Vdc $\pm 20\%$
Supply Current	3.33A (80VA) @ 24 Vac 1.46A (35W) (@ 24 Vdc)
Overvoltage protection	29 Vac or 40 Vdc.
Processor	i.MX 8M mini dual Arm® Cortex®-A53 processor with speed up to 1.2 GHz FRAM: 512 KB, LPDDR4: 2 GB, EMMC: 8 GB.
Memory	
Operating System	LINUX/RTOS.
Real Time Clock	
Accuracy (typical)	± 0.3 s per day (± 2 minutes per year).
Retention	Supercap for up to 3 days (typical).
Cycle Time	Sequence table 1s.

Ethernet Network

Number of Ports	2.
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	2.
Protocols	Modbus, M-Bus, MS/TP, XNC.
Termination	120 Ω switchable.

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

* Dependent on cable specification and baud rate.

**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 $\frac{1}{4}$ BACnet 'unit' load (ref. EIA-485), as does the IQECO; other manufacturer's devices may have different unit loads.

T1L Bus

Compatibility	IQ5-IO modules, IQ5-LAN-ADPT
Transmission Protocol	10BASE-T1L (IEEE802.3cg). MQTT compatible.
Maximum T1L devices	64 - only 1 can be IQ5-LAN-ADPT
Maximum IO Channels	50.
Bus Supply	As per main power input.
Data Cable Type	Screened twisted pair (requires IQ5-10-ADPT wiring adapters)
Cable Length	See - 'Maximum T1L Bus Length' on page 5.

For further details see:

IQ5-IO Modules Data Sheet (TA201481).

IQ5-LAN-ADPT LAN Adapter Data Sheet (TA201510)

Inputs/Outputs

Universal Input/Output (UIO)

Function	Measuring voltage, current, thermistor or digital input, or provide analogue control output (function set by strategy).
Input Noise Rejection	Minimum 60 dB series mode rejection at input power supply frequency.
Analogue Resolution	
Input modes	16 bit (65,536 steps)
Output modes	13 bit (5019 steps)
Voltage Input	
Input range	0 to 10 Vdc, 2 to 10 Vdc.
Input resistance	9.4 k Ω .
Accuracy	$\pm 0.5\%$ of full scale range (50 mV).
Current Input	
Input range	0 to 10 mA, 4 to 10 mA, 0 to 20 mA, 4 to 20 mA.
Current source	onboard 24 Vdc or external PSU.
Input resistance	120 Ω .
Accuracy	$\pm 0.5\%$ of full scale range (100 μ A).
Thermistor Input	
Input range	0 to 1 M Ω .
Accuracy	0 to 80 Ω = 0.5% ± 0.5 Ω ; 80 to 200 Ω = 0.3%; 200 to 10 k Ω = 0.2%; 10 k Ω to 20 k Ω = 0.3%; 20 k Ω to 100 k Ω = 0.8%; 100 k Ω to 200 k Ω = 1%; 200 k Ω to 1 M Ω = 8%.
Bridge resistor	12.2 k Ω .
Bridge supply	3.3 V.
Digital Input	
Volt-free input	
Wetting current	3.5 mA (typical)
ON state	≤ 500 Ω .
OFF state	≥ 3 k Ω (or open circuit)
AC voltage	0 to 28 Vac
ON state	19.2 ~ 28 Vac with frequency 50~60Hz.
OFF state	0 ~ 1.4 Vac.
DC voltage	0 to 40 Vdc,
ON state	0 to 2 Vdc.
OFF state	4 to 40 Vdc.
Pulse rate	30 Hz max. Pulse width ≥ 16.6 ms (both logic high and logic low).
Analogue Output	
Range	0 to 10 Vdc, 1 to 10 Vdc, 2 to 10 Vdc, 0 to 20mA, 4 to 20mA.
Accuracy	$\pm 0.5\%$ of span (50 mV).

Digital Inputs (DI)

Function	On/off state (or pulse count) to strategy from volt free contact, or open collector (transistor)
Volt-free input	
Wetting current	4 mA (typical)
ON state	≤500 Ω.
OFF state	≥3 kΩ (or open circuit)
Pulse rate	100 Hz max. Pulse width ≥5 ms (both logic high and logic low).

Digital/Relay Outputs (DO)

Function	Single pole normally open control from strategy for general purpose use.
Contact Rating (current)	3 A resistive max
Maximum Total Load	12 A (across all channels).
AC voltage	19 Vac to 250 Vac
DC voltage	5 Vdc to 30 Vdc
AC Minimum Load	100 mA
DC Minimum Load	10 mA
Minimum Cable Size	1.5mm ² (16 AWG)

Caution: Mains and low voltage must not be mixed. If switching mains, all relays must switch the same phase and polarity. Arc suppression circuit (RC) recommended for inductive loads (see TG200208).

Digital/SSR Outputs (DOS)

Function	Switched 24 Vac or 24 Vdc control of thermic (thermoelectric) actuators, relays and synchronous motors.
AC voltage	10 Vac to 30 Vac
DC voltage	5 Vdc to 30 Vdc
Current	30mA to 1.5A (continuous); 3.5A inrush for 0.1s
Total current	
Controller powered	Power provided by controller's power supply (Class 2 supply max 100VA) is shared between controller IQ5 IO module power supply and the DOSSR outputs.
Externally powered	6 A shared across all 4 channels, 1.5A maximum per channel.

Note: If the combined load of the controller, IQ5 IO module power supply and the DOSSR outputs is greater than the power provided by the controller's supply (Class 2 supply max 100VA) it is necessary to power the outputs from an external supply. The link between auxiliary output and the SR input should be removed to allow an external power supply to be used.

24 Vdc Output

Voltage	:24 Vdc ±5%
Current (maximum)	:120mA

Auxiliary Supply Output

Voltage	:As per input power.
Current (maximum)	:6 A also limited by per input power

SRIN Input

The SRIN Input is connected internally to terminal 3 of the input power supply, and has no protection.

Voltage	:24 Vac/24 Vdc ±20%.
Current (maximum*)	:6 A

INDICATORS**General Status**

Device 'ring'	Multicolor LED
Service	Multicolor LED
RS-485	Multicolor LED
DI	Multicolor LED
UIO	Multicolor LED
DOSSR	Multicolor LED
DOREL	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)	214.5 x 131 x 60 mm (8.44 x 5.16 x 2.36").
Material (enclosure)	Flame Retardant Polycarbonate.
Weight	0.7 kg (1.5 lb).
Mounting (DIN Rail)	EN 50022 TH35x7.5 or TH35x15 (1.5 mm maximum thickness).

Connectors

Power, RS-485, DI, 24DC OUT, UIO, AUX OUT, SRIN, DOSSR, DOREL

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 ² (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 Bus

Integral spring contacts for inter-device connection. IQ5-IO-ADPT wiring adapter required for cable connection.

Ethernet Ports

USB Engineering Port	USB Type C.
USB Expansion Port	USB Type C (reserved for future use).

ENVIRONMENTAL**Approvals and Certifications**

- EN60730-1/UL60730-1/CSA E60730-1, Standard for Automatic Electrical Controls - 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 device for panel mounting (Open-type) – Equipment that is intended for Field Installed in a panel or enclosure such as the field wiring compartment of lamps or lanterns. (Base on UL 60730-1, UL 916). Incorporated control unit with fixed wiring; panel-mounted on DIN rail. (Base on EN 60730-1).

Action

Rated impulse voltage	24 V circuits: 500 V. Relay outputs: 2500 Vac.
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Pollution degree

2.

Protection against shock

Class 0;

Class II (installed in an enclosure).

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: Restrictions apply at higher operational temperatures and altitudes:

Operational Temp	*Max UIO channels @ 20mA output	**Max altitude above sea level
-25 to +50°C	8	2000m, (6562 ft)
-25 to +60°C	4	
*UIOs channels configured for current output generate the most heat within the controller. Voltage output is recommended for high temperature operation, especially for 60° operation.		
** For equipment operating in altitudes greater then 2000m see the derated operational temperatures below.		
Altitude	Derating ratio for operating temperature	Derated Operational Temperature
0 to 2000m	1.0	-
3000m	0.9	54°C (129°F)
4000m	0.8	48°C (118°F)

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

Use Indoor use only
 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



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