

GE Vernova
Grid Solutions

iSTAT I4X Communications Converter

Manual

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GE VERNOVA

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HANDLING OF ELECTRONIC EQUIPMENT

A person's normal movements can easily generate electrostatic potentials of several thousand volts. Discharge of these voltages into semiconductor devices when handling circuits can cause serious damage, which often may not be immediately apparent but the reliability of the circuit will have been reduced.

The electronic circuits of GE Vernova Grid Solutions products are immune to the relevant levels of electrostatic discharge when housed in their cases. Do not expose them to the risk of damage by withdrawing modules unnecessarily.

Each module incorporates the highest practicable protection for its semiconductor devices. However, if it becomes necessary to withdraw a module, the following precautions should be taken to preserve the high reliability and long life for which the equipment has been designed and manufactured.

1. Before removing a module, ensure that you are at the same electrostatic potential as the equipment by touching the case.
2. Handle the module by its front-plate, frame, or edges of the printed circuit board. Avoid touching the electronic components, printed circuit track or connectors.
3. Do not pass the module to any person without first ensuring that you are both at the same electrostatic potential. Shaking hands achieves equipotential.
4. Place the module on an anti-static surface, or on a conducting surface, which is at the same potential as you.
5. Store or transport the module in a conductive bag.

More information on safe working procedures for all electronic equipment can be found in BS5783 and IEC 60147-0F.

If you are making measurements on the internal electronic circuitry of equipment in service, it is preferable that you are earthed to the case with a conductive wrist strap.

Wrist straps should have a resistance to ground between 500k – 10M ohms. If a wrist strap is not available you should maintain regular contact with the case to prevent the build up of static. Instrumentation which may be used for making measurements should be earthed to the case whenever possible.

GE Vernova Grid Solutions strongly recommends that detailed investigations on the electronic circuitry, or modification work, be carried out in a Special Handling Area such as described in BS5783 or IEC 60147-0F.

1. SAFETY SECTION

This Safety Section should be read before commencing any work on the equipment.

1.1 Health and Safety

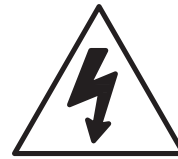
The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section.

1.2 Explanation of symbols and labels

The meaning of symbols and labels may be used on the equipment or in the product documentation, is given below.



Caution: refer to product documentation



Caution: risk of electric shock



Protective/safety *earth terminal



Functional *earth terminal

Note: This symbol may also be used for a protective/safety earth terminal if that terminal is part of a terminal block or sub-assembly e.g. power supply.

***NOTE:** THE TERM EARTH USED THROUGHOUT THE PRODUCT DOCUMENTATION IS THE DIRECT EQUIVALENT OF THE NORTH AMERICAN TERM GROUND.

2. INSTALLING, COMMISSIONING AND SERVICING



Equipment connections

Personnel undertaking installation, commissioning or servicing work on this equipment should be aware of the correct working procedures to ensure safety. The product documentation should be consulted before installing, commissioning or servicing the equipment.

Terminals exposed during installation, commissioning and maintenance may present a hazardous voltage unless the equipment is electrically isolated.

If there is unlocked access to the rear of the equipment, care should be taken by all personnel to avoid electrical shock or energy hazards.

Voltage and current connections should be made using insulated crimp terminations to ensure that terminal block insulation requirements are maintained for safety. To ensure that wires are correctly terminated the correct crimp terminal and tool for the wire size should be used.

Before energising the equipment it must be earthed using the protective earth terminal, or the appropriate termination of the supply plug in the case of plug connected equipment. Omitting or disconnecting the equipment earth may cause a safety hazard.

The recommended minimum earth wire size is 2.5mm², unless otherwise stated in the technical data section of the product documentation.

Before energising the equipment, the following should be checked:

- Voltage rating and polarity;
- CT circuit rating and integrity of connections;
- Protective fuse rating;
- Integrity of earth connection (where applicable)

3. EQUIPMENT OPERATING CONDITIONS

The equipment should be operated within the specified electrical and environmental limits.

3.1 Current transformer circuits



Do not open the secondary circuit of a live CT since the high level voltage produced may be lethal to personnel and could damage insulation.

3.2 External resistors



Where external resistors are fitted to relays, these may present a risk of electric shock or burns, if touched.

3.3 Battery Replacement



Where internal batteries are fitted they should be replaced with the recommended type and be installed with the correct polarity, to avoid possible damage to the equipment.

3.4 Insulation and dielectric strength testing



Insulation testing may leave capacitors charged up to a hazardous voltage. At the end of each part of the test, the voltage should be gradually reduced to zero, to discharge capacitors, before the test leads are disconnected.

3.5 Insertion of modules and pcb cards



These must not be inserted into or withdrawn from equipment whilst it is energised since this may result in damage.

3.6 Fibre optic communication



Where fibre optic communication devices are fitted, these should not be viewed directly. Optical power meters should be used to determine the operation or signal level of the device.

4. OLDER PRODUCTS

Electrical adjustments



Equipment's that require direct physical adjustments to their operating mechanism to change current or voltage settings should have the electrical power removed before making the change, to avoid any risk of electrical shock.

Mechanical adjustments



The electrical power to the relay contacts should be removed before checking any mechanical settings, to avoid any risk of electric shock.

Draw out case relays



Removal of the cover on equipment incorporating electromechanical operating elements, may expose hazardous live parts such as relay contacts.

Insertion and withdrawal of extender cards



When using an extender card, this should not be inserted or withdrawn from the equipment whilst it is energised. This is to avoid possible shock or damage hazards. Hazardous live voltages may be accessible on the extender card.

Insertion and withdrawal of heavy current test plugs



When using a heavy current test plug, CT shorting links must be in place before insertion or removal, to avoid potentially lethal voltages.

5. DECOMMISSIONING AND DISPOSAL



Decommissioning: The auxiliary supply circuit in the relay may include capacitors across the supply or to earth. To avoid electric shock or energy hazards, after completely isolating the supplies to the relay (both poles of any dc supply), the capacitors should be safely discharged via the external terminals prior to decommissioning.

Disposal: It is recommended that incineration and disposal to water courses is avoided. The product should be disposed of in a safe manner. Any products containing batteries should have them removed before disposal, taking precautions to avoid short circuits. Particular regulations within the country of operation, may apply to the disposal of lithium batteries.

6. TECHNICAL SPECIFICATIONS

6.1 Protective fuse rating

The recommended maximum rating of the external protective fuse for this equipment is 16A, Red Spot type or equivalent, unless otherwise stated in the technical data section of the product documentation.

Insulation class:	IEC 61010-1 : 2002 Class II EN 61010-1 : 2002 Class II	
Insulation Category (Over voltage):	IEC 61010-1 : 2002 Category II (600V), III (300V) EN 61010-1 : 2002 Category II (600V), III (300V)	
Environment:	IEC 61010-1 : 2002 Pollution degree 2 (600V), 3 (300V) EN 61010-1 : 2002 Pollution degree 2 (600V), 3 (300V)	Compliance is demonstrated by reference to generic safety standards.
Product Safety:	73/23/EEC & 2006/95/EC EN 61010-1 : 2002	Compliance with the European Commission Low Voltage Directive. Compliance is demonstrated by reference to generic safety standards.

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7. INTRODUCTION

7.1 General

The iSTAT I4X is a range of communications Interfaces were primarily designed for use with communicating iSTAT Measurement Transducers or Measurement Centres, but can be used with other communicating devices, i.e. Micom Relays.

There are three different versions of the I4X, these convert the following signals:

EIA (RS)232 to EIA (RS)485 (2-wire)

Ethernet to EIA (RS)232

Ethernet to EIA (RS)485 (2-wire)

7.2 iSTAT I4X Family

The iSTAT I4X family consists of 3 products

7.2.1 EIA (RS)232 to EIA (RS)485 (2-wire)

The RS232 to RS485 converter is bi-directional; the 'Master' unit can be connected to either the RS232 or RS485 port.

The unit works with any protocol which can be transmitted over both RS232 and RS485 2-wire systems.

The use of digital technology achieves high reliability over a wide data speed range of 1200 to 115200 bits per second.

7.2.2 Ethernet to EIA (RS)232

The Ethernet to RS232 interface is uni-directional; the 'Master' unit must be connected to the Ethernet port.

The unit works with the Modbus RTU protocol over RS232 and Ethernet.

The use of digital technology achieves high reliability over a wide data speed range of 1200 to 115200 bits per second for the RS232 port.

7.2.3 Ethernet to EIA (RS)485 (2-wire)

The Ethernet to RS485 interface is uni-directional; the 'Master' unit must be connected to the Ethernet port.

The unit works with the Modbus RTU protocol over RS485 and Ethernet.

The use of digital technology achieves high reliability over a wide data speed range of 1200 to 115200 bits per second for the RS485 port.

8. CONNECTION MODES

8.1 EIA (RS)232 to EIA (RS)485

There are three groups of terminals on the I4X; the auxiliary voltage, the RS232 port and the RS485 port. These are shown in the table below:

I4X	Auxiliary supply	RS232 port	RS485 port	Output device
Screw Terminals	13 + ~ , 14 – ~	(TX) 26 (RX) 24 (GND) 25	(A) 21 (B) 23	DATA + DATA -

The maximum cable length between the I4X and the RS232 device is 3 meters.

The maximum number of devices that can be supported using RS485 communications is 32. The line should be terminated by a 120 ohm resistor.

8.2 Ethernet to EIA (RS)232

There are three groups of terminals on the I4X; the auxiliary voltage, the Ethernet port and the RS232 port. These are shown in the table below:

I4X	Auxiliary supply	Ethernet port	RS232 port	Output device
Terminals	13 + ~ , 14 – ~	10/100 RJ45 socket	(TX) 26 (RX) 24 (GND) 25	(TX) (RX) (GND)

The maximum cable length between the I4X and the RS232 device is 3 meters.

8.3 Ethernet to EIA (RS)485

There are three groups of terminals on the I4X; the auxiliary voltage, the Ethernet port and the RS485 port. These are shown in the table below:

I4X	Auxiliary supply	Ethernet port	RS485 port	Output device
Terminals	13 + ~ , 14 – ~	10/100 RJ45 socket	(A) 21 (B) 23	DATA + DATA -

The maximum number of devices that can be supported using RS485 communications is 32. The line should be terminated by a 120 ohm resistor.

8.4 Status Indication: Power

On each I4X there is a single Power LED that indicates when there is an auxiliary supply connected. The I4X uses a universal ac/dc power supply that can operate between 24 to 300V DC and 40 to 276V AC. The frequency range of the power supply is 40 to 70Hz.

8.5 Status Indication: Ethernet

When used with an Ethernet connection, LED's on the RJ45 plug will indicate the presence of Ethernet activity. When the network is active the left hand LED will be continuously lit or blinking for a 10Mb/s connection or activity and the right hand LED for 100Mb/s connection or activity.

8.6 EIA (RS)232 to computer socket connection

When using RS232 to connect to a computer, the RS232 connection can be made with either a 9 or 25 pin socket. The connections are shown in the table below:

RS232 Port on I4X	Computer DB9F terminal (9 pin)	Computer DB25F terminal (25 pin)
(TX) 26	2	3
(RX) 24	3	2
(GND) 25	5	7

9. COMMUNICATION SETTINGS

9.1 EIA (RS)232 to EIA (RS)485

The I4X RS232 to RS485 communications interface does not require any settings for its operation.

However for correct operation when using RS485 the devices that are connected to the I4X will have to be correctly addressed. When more than one device is connected on the RS485 port each must have a different address number. The maximum number of devices that can be connected to the RS485 port is 31.

The default serial settings for communicating devices vary and when more than one device is connected to the I4X they should all have the same serial settings.

9.2 Ethernet to EIA (RS)232

The I4X Ethernet to RS232 communications interface requires that the settings for the Ethernet and the RS232 ports are configured prior to use in the application. This can be done using QDSP and a Web browser.

The RS232 settings in the I4X must match those for the RS232 device attached. The RS232 device attached must also be assigned a Modbus device address.

9.3 Ethernet to EIA (RS)485

The I4X Ethernet to RS485 communications interface requires that the settings for the Ethernet and the RS485 ports are configured prior to use in the application. This can be done using QDSP and a Web browser.

All of the RS485 devices connected to the I4X must have the same serial settings as the RS485 port on the I4X. Up to 31 x RS485 devices can be connected to the I4X RS485 port and each must be assigned a unique Modbus address in the range 1 – 247.

9.4 Ethernet IP addresses

When using the Ethernet each device requires a unique IP address. There are two ways of assigning this address to the I4X:

- Fixed IP address
- DHCP address

Fixed IP address: This is the most common method used where the IP address is defined by the System Administrator. The IP address should be valid for the net, it has to be unique and in the same subnet as the computer that it being used with. The following information is required for this addressing:

IP Address	_____.	_____.	_____.	_____.
Subnet mask	_____.	_____.	_____.	_____.
Gateway	_____.	_____.	_____.	_____.

DHCP address: This is an automatic method of assigning IP addresses. When a device connects to the Ethernet, it will search for the DHCP server which will assign the next available IP address using the DeviceInstaller program.

9.5 Programming I4X settings using QDSP and Web browser

9.5.1 QDSP setting software

The QDSP setting software is used to program all iSTAT communicating Measurement Devices and it can also be used to programme the IP address for the Ethernet interface of an I4X.

The software is available free-of-charge from the GE Vernova Grid Solutions website.

The separate QDSP manual includes the details of how to install the QDSP software on a PC and how to program the PC's Ethernet port to allow QDSP to interface to an external Ethernet device and how to set an IP address in the I4X.

The IP address used for the PC in local mode and in the I4X will depend on the requirements of the application and may be different from those used in the examples in the QDSP manual.

9.5.2 Internet Browser

When the IP address has been confirmed in the I4X using QDSP it is now possible to address the setting pages in the I4X over Ethernet using a web browser.

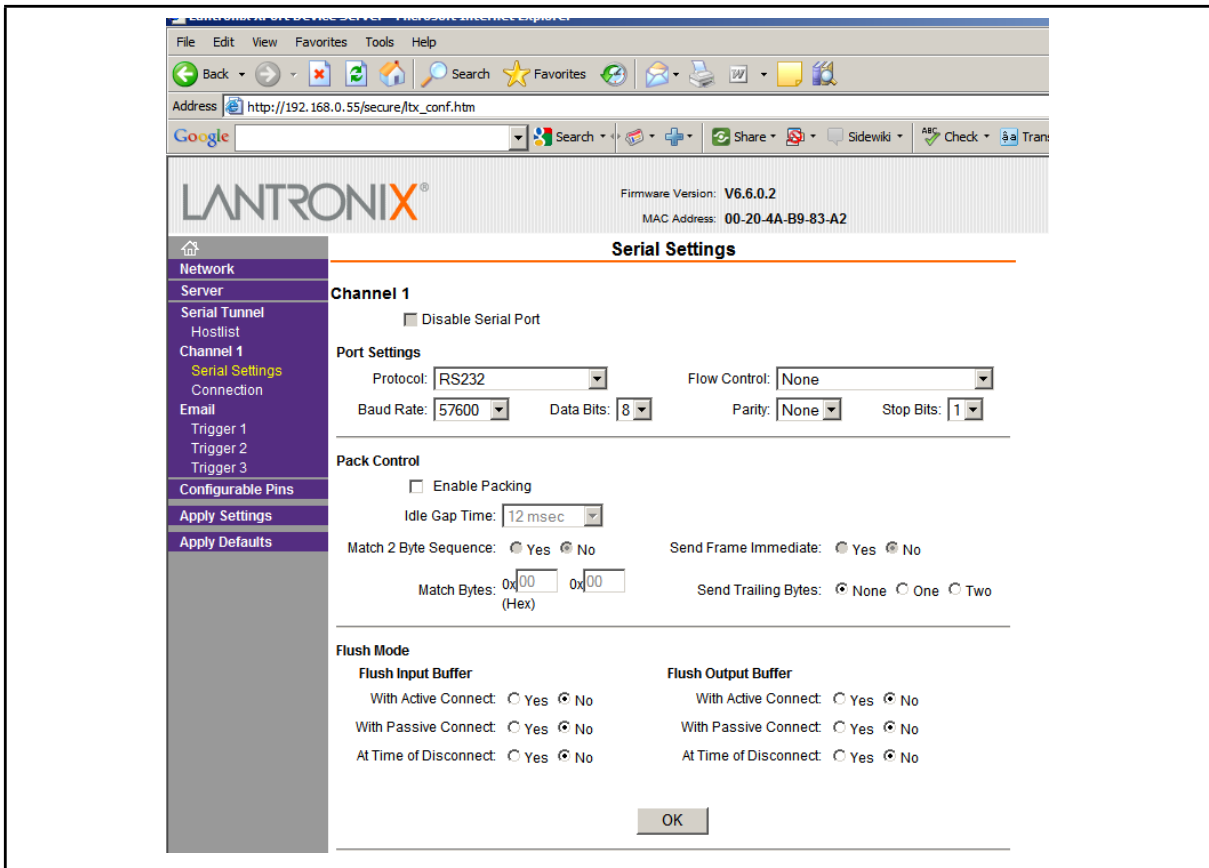
Open up the preferred web browser and enter the IP address of the I4X into the address line (i.e. 192.168.0.55) and press <RETURN>. The web interface in the I4X will then be displayed.



Fitted inside the I4X is a Lantronix device which implements the Ethernet to serial conversion.

In the index on the left we are only interested in 2 options, 'Serial Settings' and 'Connection' and in these windows only a few adjustments are required.

9.5.2.1 Serial settings

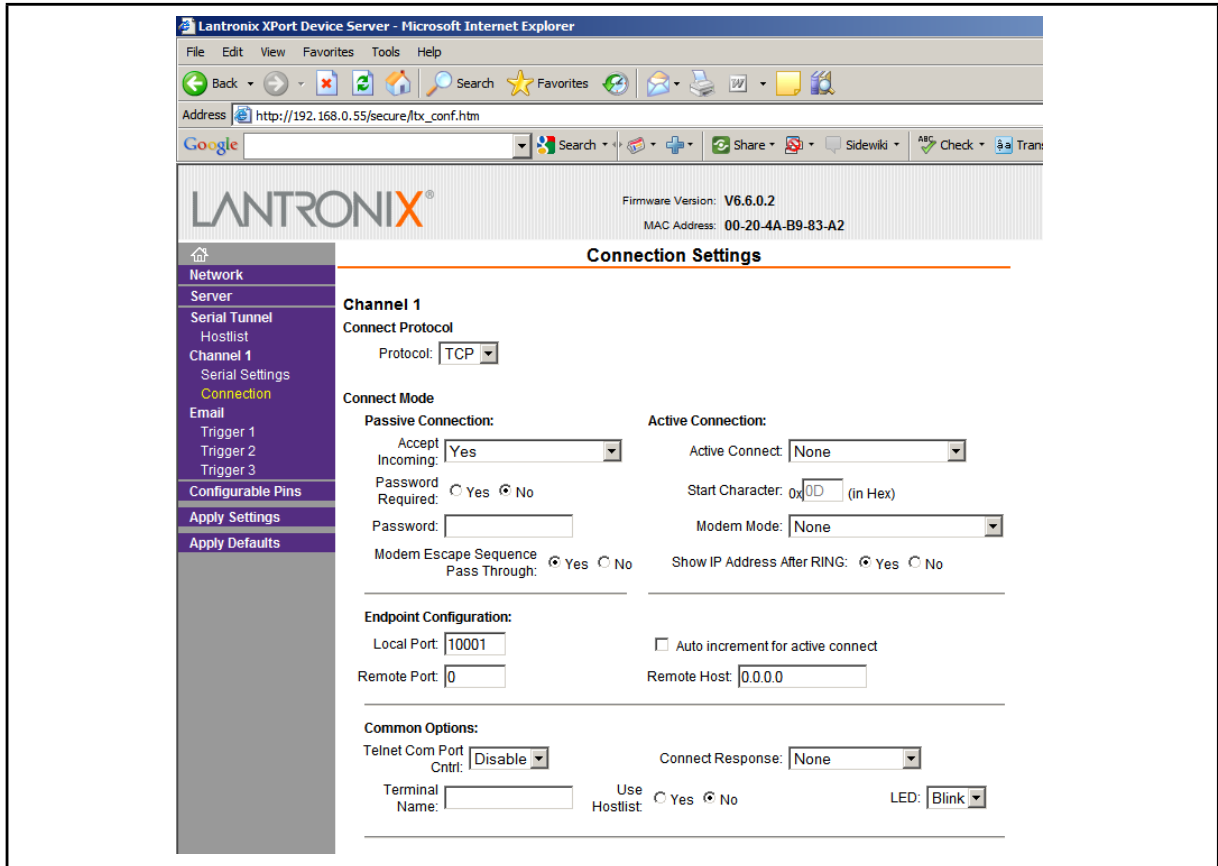


In the 'Serial Settings' window, only adjust the Baud Rate, Data Bits, Parity and Stop Bits, these should be set to the same as the serial devices which are connected to the RS232 or RS485 port. All other settings should not be changed from the defaults.

NOTE: Even when an Ethernet to RS485 converter is being programmed, the 'Protocol' setting must remain as 'RS232', this is due to the internal construction of the I4X.

When settings are complete click <OK>.

9.5.2.2 Connection



On the 'Connections Settings' window only the 'Local Port' setting may need to be changed, this will depend on the system the I4X is being used in.

If the I4X communications interface is to be used in conjunction with a Com Port redirector program, the local port should be selected within the range 14000 to 14010,

When setting changes are complete click <OK>.

9.5.2.3 Apply Settings

To download the settings to the I4X, click 'Apply Settings', the download will be completed and the Lantronix interface will be rebooted automatically.

10. TROUBLE SHOOTING

10.1 EIA (RS)232 to EIA (RS)485

If communication with the serial communicating device cannot be established, check for the following:

- Is the I4X connected to a power supply, check that the POWER LED is lit?
- Is the I4X connected to the computer, has the right COM port been selected?
- Has the correct addressing, data speed and formatting been used, when using RS485 are the individual devices correctly addressed? For iSTAT devices QDSP can be used to check.
- If using a data speed of 115,200 b/s, try reducing this to a lower data speed, e.g. 57,600 b/s

10.2 Ethernet to EIA (RS)232 or EIA (RS)485

If communication with the communicating device cannot be established, check for the following:

- Is the I4X connected to a power supply, check that the POWER LED is lit?
- Is the I4X connected to the Ethernet?
- Has the correct IP address been defined for the I4X?
- Has the correct RS232 and RS485 data settings been defined in the individual units and the I4X? For units connected to the RS485 check that each unit has a different Modbus slave address.
- If using a data speed of 115,200 b/s, try reducing this to a lower data speed, e.g. 57,600 b/s

11. TECHNICAL DATA

11.1 EIA (RS)232 communications

Connection type	Point to point
Signal level	EIA (RS)232
Maximum cable length	3m
Connector	Screw terminals
Isolation	3.7kVrms for 1 minute between all terminals and all other circuits.
Transmission mode	Asynchronous
Data rate	1200 to 115200 bps

11.2 EIA (RS)485 communications

Connection type	Multi drop (max 32 connections)
Signal level	EIA (RS)485
Cable type	Screened twisted pair
Maximum cable length	1000m
Connector	Screw terminals
Isolation	3.7kVrms for 1 minute between all terminals and all other circuits.
Transmission mode	Asynchronous
Data rate	1200 to 115200 bps

11.3 Ethernet communications

Connection type	Single RJ45 socket
Signal level	10/100 Base-T
Data rate	1200 to 115200 bps
Protocol	IEEE 802.3
Transmission rate	10M/100M bits per se cond
Maximum cable length	100m
Transmission mode	Asynchronous

11.4 Universal Auxiliary Supply

Rated Voltage	24...300Vdc
	40...276V ac
Frequency range	40...70Hz
Power Consumption	< 3VA

11.5 Electrical Environment

High frequency disturbance

IEC 60255-22-1: 1988 Class II and Class III 2.5kV peak applied between all circuits and earth

1kV peak applied between the communication port and earth.

1kV peak applied across the terminals of all circuits

Fast transient disturbance

IEC 61000-4-4: 1995 Level IV

4kV, 2.5kHz applied directly between all terminals and earth.

Electrostatic discharge

IEC 60255-22-2: 1996 Class III

8kV air discharge
6kV contact discharge

AC ripple on DC supply

IEC 60255-11: 1979

The unit will withstand 12% ripple on the DC auxiliary supply

AC supply voltage dips and short interruptions EN 61000-4-11: 1994.

The unit will withstand voltage dips of 100%, 60% and 30% in the auxiliary power supply for a duration of 10ms, under normal operating conditions, without de-energising

The unit will withstand a 10ms interruption in the auxiliary power supply, under normal operating conditions, without de-energising

EMC compliance

89/336/EEC & 2004/108/EC

Compliance with European Commission Directive on EMC, is claimed via the technical construction file route.

Product Safety

73/23/EEC & 2006/95/EC

Compliance with European Commission Low Voltage Directive

EN 61010-1: 2002

Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.

Compliance is demonstrated by reference to generic safety standards.

600V Installation category II, pollution degree II

300V Installation category III, pollution degree III

Protection Class II

11.6 Environmental withstand

Atmospheric environment

Temperature and humidity

JVF (DIN 40 040)

Reference range of operation

0°C to 50°C

Nominal range of operation

-10°C to 60°C

Storage and transit

-40°C to 70°C

Humidity

to 95% non-condensing

Enclosure protection

EC 50529: 1989 : IP 52 front panel

Construction

Polycarbonate. Compliance with UL 94 V0

Dimensions

45x75x108 mm

Weight

0.3kg



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