

# iSC2F

Single Port RS-232/422/485 to Fiber Media Converter  
IEC61850-3 and IEEE1613 Compliant

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# Alerts

- Equipment for use in locations where children are not likely to be present



Do not plan to use the device in a location where children are likely to be present.

- For equipment intended only for use in a restricted access area



This equipment is intended only for use in a restricted access area.

- For installation by skilled person



Electrical hazard – above ES2 limits. To be accessible by Skilled Persons only

- For protective earthing conductor



Protective earthing conductor

- For replaceable component or module



Caution – Access to wiring terminals and replaceable modules is restricted to Skilled Persons only.

- For outdoor installations

- **Humidity and Dust Hazards**

Do not store the switch in locations where it will be subject to excessive dirt and dust and high humidity. Conformal coating is recommended for humid / moist applications.

## Caution: Laser



This product contains a laser system and is classified as a CLASS 1 LASER PRODUCT. Use of controls and adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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# Table of Contents

<b>1. Getting Started</b> .....	<b>1</b>
1.1 Introduction .....	1
1.2 Configuring the Device .....	2
1.2.1 Serial-to-Fiber Conversion—Point-to-Point .....	3
1.2.2 Fiber Repeater Mode .....	4
1.2.3 Serial Standard Conversion .....	5
1.3 Communication Ports .....	6
1.3.2 Serial Terminal.....	8
<b>2. Hardware Overview</b> .....	<b>9</b>
2.1 Front Panel .....	9
2.3 Power Supply Connections .....	10
<b>3. Hardware Installation</b> .....	<b>12</b>
3.1 DIN Rail Installation.....	12
3.2 Dimensions .....	13
<b>4. Specifications</b> .....	<b>14</b>

# 1. GETTING STARTED

## 1.1 Introduction

The iSC2F is a cost-effective single serial media converter solution for the conversion between serial RS232/RS485/RS422 interfaces and optical fiber. The iSC2F has been designed for power substation applications and rolling stock applications and is fully compliant with the IEC 61850-3 and IEEE 1613 standards.

The iSC2F accepts a wide input voltage range from single input of 11-36VDC (Opr), 24VDC (Nom); 36-75VDC (Opr), 48VDC (Nom); or single input 88-300VDC (Opr), 100-240VDC (Nom); or 85-264VAC (Opr) 50/60Hz, 100-240VAC (Nom), which makes it suitable for harsh operating environment. These features combined with a wide operating temperature of -40°C to 85°C help protect mission-critical applications from network interruptions or temporary malfunctions.

The iSC2F supports the following functions:

- Two-wire RS232 compliant (TX, RX)
- Two-wire RS485 half-duplex compliant (D+, D-)
- Four-wire RS485/422 full-duplex compliant (TX+, TX-, RX+, RX-)
- Switch selectable 120  $\Omega$  terminations
- Up to 5 km multimode fiber
- Selectable Fiber Repeater Mode (fiber in -> fiber out)
- TX/RX LED indicators on RS232/485/422 traffic
- Configurable RS485 half-duplex turn-around time
- 1200-115200 baud supported

The iSC2F is equipped to provide conversion from serial (RS232, RS485, or RS422) to fiber optics or between serial standards (RS232 to RS485 / RS422).

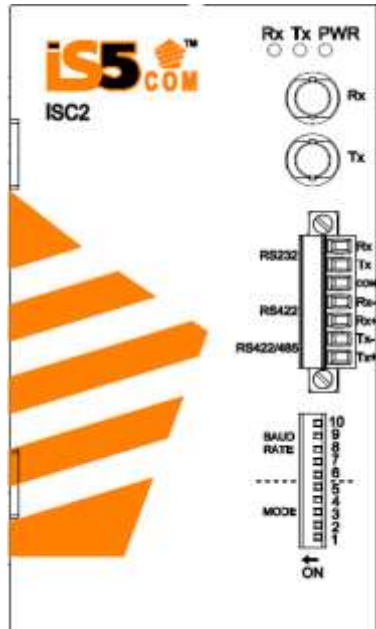
Serial to fiber optical conversion connections can be:

- Point-to-Point
- Fiber Repeater Mode
- Standard Serial Connection

By using the DIP switches, iSC2F can be used in the following operating modes.

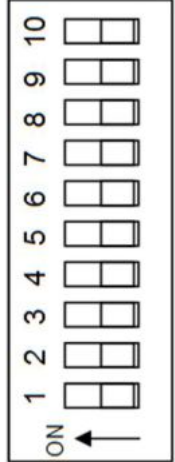
## 1.2 Configuring the Device

The ISC2F can be configured using the Mode DIP switch located on the right side off the enclosure. Use the DIP switch to change the operating mode of the ISC2F.

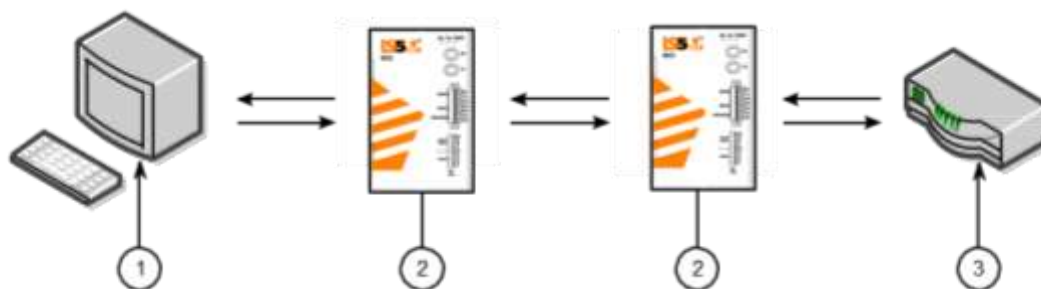


The configuration settings are as follows:

Switch	ON	OFF
1	RS232 to fiber	RS485/422 to fiber
2	RS232-to-RS485/422 conversion enabled	RS232-to-RS485/422 conversion disabled
3	Full-duplex	Half-duplex (RS485 only)
4	120Ω terminations enabled	No 120Ω termination
5	Fiber repeater enabled	Fiber repeater disabled
6	1200 – 2400 baud	n/a
7	4800 – 9600 baud	n/a
8	14400 – 19200 baud	n/a
9	28800 – 38400 baud	n/a
10	57600 – 115200 baud	n/a



## 1.2.1 Serial-to-Fiber Conversion—Point-to-Point



1. RS232 device
2. iSC2F
3. RS485 Device/ Network

Note that the distance between the two iSC2F devices should be less than 5 km (3.1 mi).

### RS232 Device

Position	State	Notes
1	ON	RS232 to fiber
2	OFF	RS232-to-RS485/422 conversion
3	ON/OFF	Full-duplex (485-4W or 485-2W)
4	OFF	No 120 $\Omega$ termination
5	OFF	Fiber repeater

Note: Position 3 applies to RS485 only.

### RS422/RS485 Device

Position	State	Notes
1	OFF	RS232 to fiber
2	OFF	RS232-to-RS485/422 conversion
3	ON	Full-duplex
4	OFF	No 120 $\Omega$ termination
5	OFF	Fiber repeater

In this mode, serial data is converted directly into light signal and transmitted over multi-mode fiber optics. The serial standard is selected by Position 1 of the DIP switches: OFF (default) is for RS485/RS422, and ON is for RS232. Position 2 should be OFF for serial to fiber conversion. Position 6-10 should be configured if RS485 communications are used, to have the appropriate turn-around timer shown below selected. Positions 6-10 do not impact communications in full-duplex mode.

Baud Rate (bps)	DIP6	DIP7	DIP8	DIP9	DIP10
1200 – 2400	ON	OFF	OFF	OFF	OFF
4800 – 9600	OFF	ON	OFF	OFF	OFF
14400 – 19200	OFF	OFF	ON	OFF	OFF
28800 – 38400	OFF	OFF	OFF	ON	OFF
57600 – 115200	OFF	OFF	OFF	OFF	ON

### 1.2.2 Fiber Repeater Mode

When a distance that is more than 5 km (3.1 mi) has to be supported, iSC2F must be used in Fiber Repeater mode. This mode supports extended distance between serial devices.



1. RS232 device
2. iSC2F
3. RS485 Device/ Network

Position	State	Notes
1	OFF	RS232 to fiber
2	OFF	RS232-to-RS485/422 conversion
3	OFF	Full-duplex
4	OFF	No 120 Ohm termination
5	ON	Fiber repeater
6	OFF	1200 – 2400 baud
7	OFF	4800 – 9600 baud
8	OFF	14400 – 19200 baud
9	OFF	28800 – 38400 baud
10	OFF	57600 – 115200 baud

The repeat function will optically re-transmit any data received on the optical receiver, in addition to any connected serial devices. As a result, any data transmitted from the master, will be re-transmitted optically to the slave. In this case, the distance between master and slave can be extended over the 5 km (3.1 mi).

This topology can be used for RS232, RS485 or RS422. In all cases, all repeater devices should have the repeat function—DIP position 5 ON.



### 1.2.3 Serial Standard Conversion



1. RS232 device
2. iSC2F
3. RS485 Device/ Network

Position	State	Notes
1	OFF	RS232 to fiber
2	ON	RS232-to-RS485/422 conversion
3	ON/OFF	Full-duplex
4	OFF	No 120 $\Omega$ termination
5	OFF	Fiber repeater
6	ON/OFF	1200 – 2400 baud
7	ON/OFF	4800 – 9600 baud
8	ON/OFF	14400 – 19200 baud
9	ON/OFF	28800 – 38400 baud
10	ON/OFF	57600 – 115200 baud

In this mode of operation, RS232 voltage levels are converted to the appropriate RS485 or RS422 signaling levels depending on the DIP switch configuration. In this mode of operation position 2 of the DIP switches must be in the ON position when operation position of switch 1 is OFF.

Position 6 – 10 of the DIP switches must reflect the proper operating baud rate.

#### NOTE

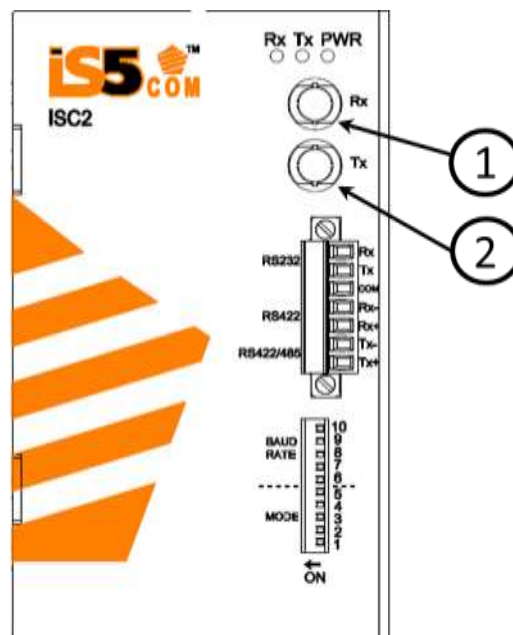
In this mode of operation, no isolation is provided between RS232 device and the RS485/422 network– both devices share the same common terminal. It should be noted that the common terminal on RS232 devices is connected to ground. In some instances (i.e. when connecting to large RS485 networks), it may be preferential for the user to leave the RS485/RS422 shield terminal unconnected to the ISC2F in this mode.

## 1.3 Communication Ports

The iSC2F can be equipped with various types of communication ports to enhance its abilities and performance. To determine which ports are equipped on the device, refer to the factory data file available in specification.

### 1.3.1.1 Fiber Optic Ports

Fiber optic ports are available with ST (Straight Tip) connectors. Make sure the Transmit (Tx) and Receive (Rx) connections of each port are properly connected and matched to establish a proper link.



1. Rx Connector 2. Tx Connector

### 1.3.1.2 Laser Radiation - IEC 60825-1 Clause 7.2-7.7

#### Caution: Laser

This product contains a laser system and is classified as a CLASS 1 LASER PRODUCT. Use of controls and adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

### 1.3.1.3 General Fiber Optics Cables Handling Instruction

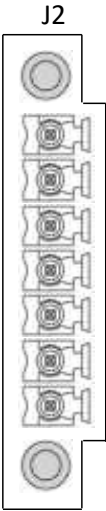
- Wear finger cots or gloves. Your hands may look clean, but dirt and oils on them can damage the fiber and contaminate connectors.
- Never use the fiber pigtail to pick up or support the weight of the device. Keep both the

device and the optical connector together in your hand(s).

- The fiber is made of a very pure expensive glass. Treat it with the same care that would be used when handling expensive crystal glass.
- Do not allow kinks or knots to develop in the fiber. Do not pull on the fiber when kinks or knots are present. Pulling will only cause knots, kinks, and curls to tighten and exceed the minimum bend radius.
- Always use the correct tools for stripping and cleaving the fiber. It will save time and reduce breakage caused by scratches.
- Follow all ESD precautions.

### 1.3.2 Serial Terminal

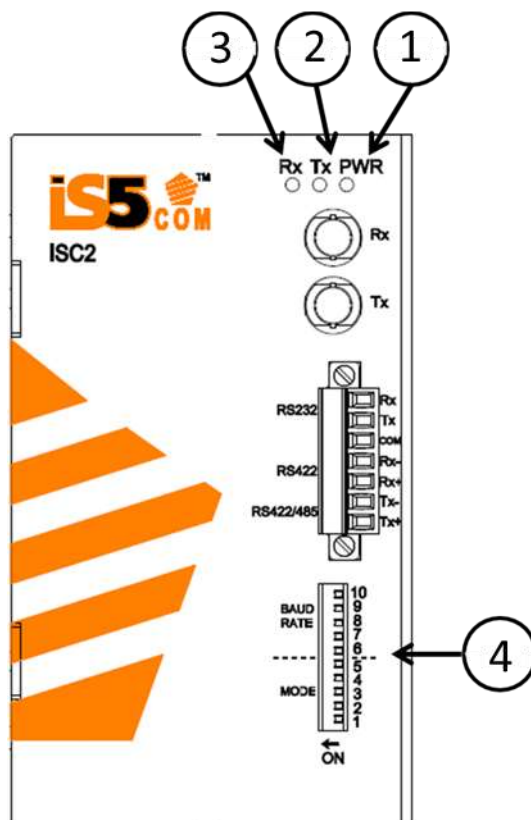
The ISC2F is equipped with a seven-terminal Phoenix-style connector. This connector can accommodate one RS232 connection, and one RS485/422 connection. The following is the pin-out for the serial terminal:

Pin #	Signal	
1 (top)	RS232 RX	
2	RS232 TX	
3	Common	
4	RS422 RX-	
5	RS422 RX+	
6	RS422 TX- / RS485 D-	
7 (bottom)	RS422 TX+ / RS485 D+	

## 2. HARDWARE OVERVIEW

### 2.1 Front Panel

The ISC2F features various ports, controls and indicator LEDs on the front panel for configuring and troubleshooting the device.



Number	Description	Function
1	<b>Power Indicator LED</b>	The power indicator LED illuminates when power is being supplied to the device.
2	<b>Tx LED</b>	Tx LED illuminates when traffic is transmitted to Serial Interface.
3	<b>RX LED</b>	Rx LED illuminates when traffic is received from Serial Interface.
4	<b>Mode Selector Switch</b>	This switch sets the device in transparent, half-duplex (HDX), full-duplex (FDX) or reserved mode.

## 2.3 Power Supply Connections

The Phillips Screw Terminal Block, located on the bottom of the unit, has Phillips screws with compression plates, allowing either bare wire connections or crimped terminal lugs. The use of #6 size ring lugs is recommended to ensure secure and reliable connections under severe shock or vibration. The terminal block comes with a safety cover which must be removed before connecting any wires. This cover must be re-attached after wiring to ensure personnel safety.

The iSC2F supports a single power supply (PWR1) with 4 options:

1. LV: Single Input 11-36VDC (Opr), 24VDC (Nom);
2. MV: Single input 36-75VDC (Opr), 48VDC (Nom);
3. HV: Single input 88-300VDC (Opr), 100-240VDC (Nom);
4. HV: Single input 85-264VAC (Opr) 50/60Hz, 100-240VAC (Nom);

### Terminal Block (for option 4)

Terminal Number	Description	Connection
1	<b>PWR1 (L) – Live</b>	Connect to the (Live) of DC power supply 1 or (Live) terminal of an AC power source.
2	<b>PWR1 (G) – Ground</b>	DC Power supply 1 ground connection or AC power round connection.
3	<b>PWR1 (N) – Neutral</b>	Connect to the Neutral of the DC power supply 1 or (Neutral) terminal of an AC power source.
4	<b>G – Chassis Ground</b>	Connected to the ground bus for DC inputs or Safety Ground terminal for AC Units. Chassis Ground connects to both power supply surge grounds via a removable jumper.

Note:

Options 1,2, and 3 don't include terminal blocks. The DV power connection should be done based on the diagram of the supplied chassis.

- Always use Lexan cover over terminals protects from unintentional contact
- The input terminals are to be in a restricted access location and accessed only by skilled persons.

### Terminal Block Safeguard



This equipment is intended only for use in a restricted access area.



Electrical hazard – above ES2 limits. To be accessible by Skilled Persons only

## Power Supply Connection

- ⚡ 100-240VAC rated equipment: A 250VAC appropriately rated circuit breaker must be installed.
  - ⚡ Equipment must be installed according to the applicable country wiring codes.
- 
- ⚡ 110-370VDC rated equipment: A 370VDC appropriately rated circuit breaker must be installed.
  - ⚡ A circuit breaker is not required for DC power supply voltages of 9-48VDC.
  - ⚡ Equipment must be installed according to the applicable country wiring codes.



## Chassis Ground Connection

The iSC2F chassis ground connection, located next to the terminal block, uses a #6-32 Screw. We recommend terminating the ground connection using a #6 ring lug, and a torque setting of 15 in.lbs (1.7Nm).

## Reliable Earthing



The Earth ground connection must be verified by an electrical engineer or a service person skilled in electrical installation and grounding.

## 3. Hardware Installation

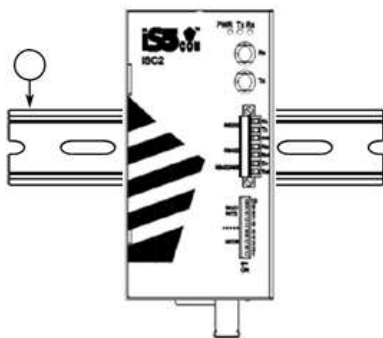
The ISC2F is designed for maximum mounting and display flexibility. It can be equipped with connectors that allow it to be installed in a DIN rail.

### 3.1 DIN Rail Installation

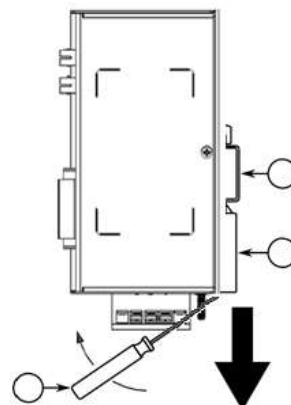
For DIN rail installations, the ISC2F can be equipped with a DIN rail bracket pre-installed on the back of the chassis. The bracket allows the device to be slid onto a standard 35 mm (1.4 in) DIN rail.

To mount the device to a DIN rail, perform the following:

1. Align the slot in the bracket with the DIN rail.
2. Pull the release on the bracket down and slide the device onto the DIN rail. If necessary, use a screwdriver to unlock the release. Let go of the release to lock the device in position.



Step 1

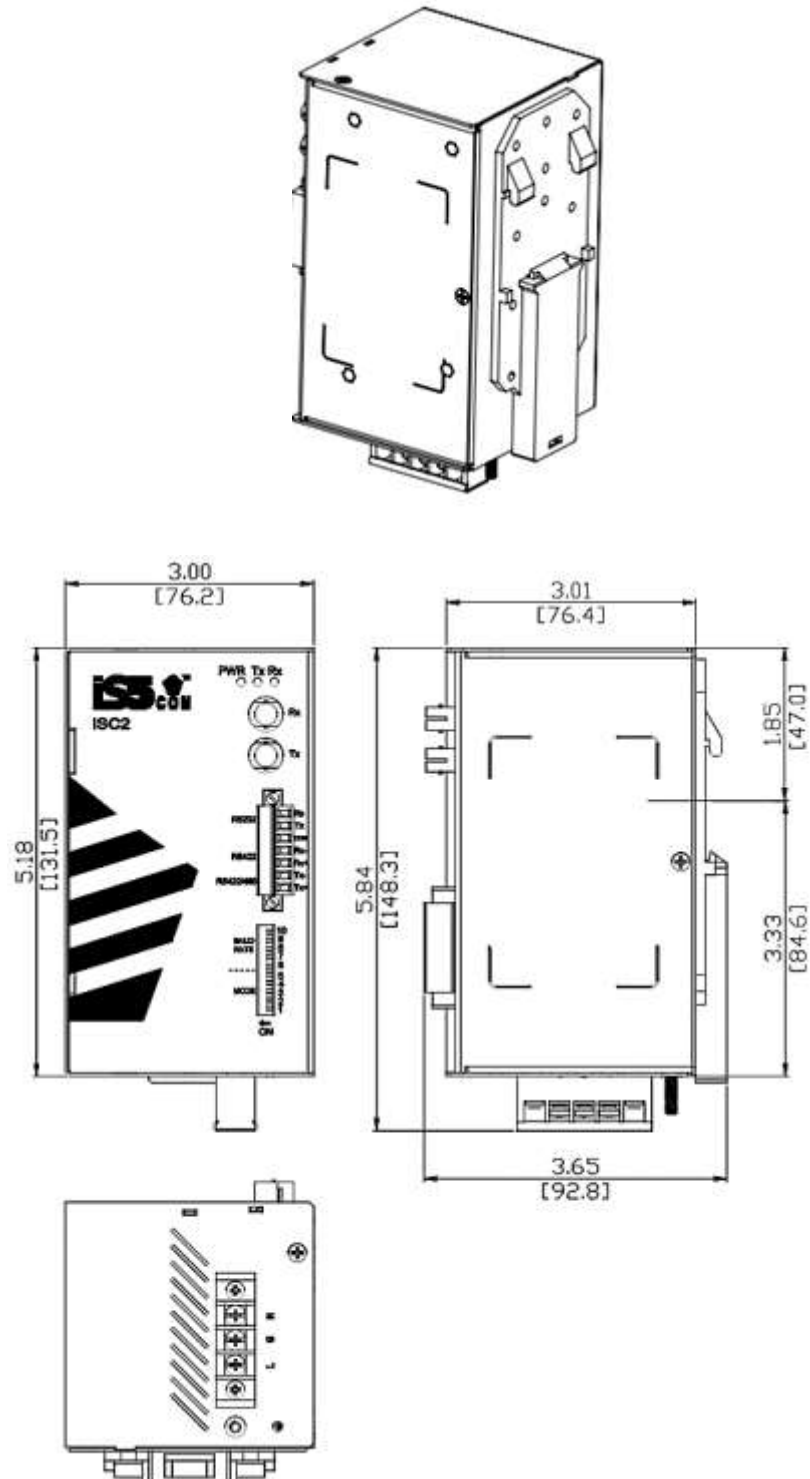


Step 2



## 3.2 Dimensions

All dimensions are shown in inches.



## 4. SPECIFICATIONS

<b>Model Number</b>	<b>iSC2F</b>
<b>Physical Ports</b>	
10M Fiber port	1
RS232/RS422/RS485	1 (2 for RS232 to RS485 conversion)
<b>Power</b>	
Input power	Single input of 11-36VDC (Opr), 24VDC (Nom); 36-75VDC (Opr), 48VDC (Nom); or single input 88-300VDC (Opr), 100-240VDC (Nom); or 85-264VAC (Opr) 50/60Hz, 100-240VAC (Nom)
Power consumption (Typ.)	5 Watts
Overload current protection	Present
Reverse polarity protection	Present on terminal block
<b>Physical Characteristics</b>	
Enclosure	IP-40 Galvanized Steel
Dimension (W x D x H)	76.2(W) x 92.8(D) x 148.3(H)mm (3.0 x 3.65 x 5.84 inches)
Weight (g)	~1000 g
<b>Environmental</b>	
Storage Temperature	-40°C to +85°C (-40° to 185°F)
Operating Temperature	-40°C to +85°C (-40° to 185°F)
Operating Humidity	5% to 95% Non-condensing
<b>Regulatory Approvals</b>	
EMI	FCC Part 15, CISPR (EN55022) class A, EN50155 (EN50121-3-2, EN55011, EN50121-4)
EMS	EN61000-4-2 (ESD), EN61000-4-3 (RS), EN61000-4-4 (EFT), EN61000-4-5 (Surge), EN61000-4-6 (CS), EN61000-4-8, EN61000-4-11
Shock	IEC60068-2-27
Free Fall	IEC60068-2-32
Vibration	IEC60068-2-6
Safety	EN60950-1
<b>Warranty</b>	
Warranty	5 Years