Technical Standards Selector Guide

Agency	Standard	ESD	EFT	Surge Combination Wave	Surge Telecom Wave[1]	Power Frequency Magnetic Field	Pulse Magnetic Field	Dips & Interrupts	100kHz Ring Wave[1]
IEC	EN 50082-1: Jan 92 Generic Immunity Residential, Commercial, and Light Industrial	8kV air discharge	1kV	—	—	—	—	—	—
	prEN 50082-1: Oct 96[5] Generic Immunity Residential, Commercial, and Light Industrial	4kV contact mode 8kV air discharge	1kV	2kV common mode 1kV differential mode	—	3A/m	—	40%, 70% Dips; Interrupts to 0	—
	EN 50082-2: 1995 Generic Immunity Industrial Environment	4kV contact mode 8kV air discharge	2kV	—	—	30A/m	—	—	—
	prEN 50082-2: Aug 96[5] Generic Immunity Industrial Environment	4kV contact mode 8kV air discharge	2kV	4kV common mode 2kV differential mode	—	30A/m	—	40%, 70% Dips; Interrupts to 0	—
	EN 55104 Immunity for Household Appliances, Tools and Similar Apparatus	4kV contact mode 8kV air discharge	1kV	2kV common mode 1kV differential mode	—	—	—	40%, 70% Dips; Interrupts to 0	—
UL	864[2] Fire Protective Signaling Systems	—	—	—	—	—	—	—	6kV, up to 4/min.
	1449[3] Low Voltage Surge Protective Devices	—	—	6kV	—	—	—	—	—
CCITT	Rec. K.17[4] Tests on Power Fed Repeaters	—	—	—	5kV	—	—	—	—
ANSI/ IEEE	C62.41 Category A IEEE recommended practice on surge voltages in low voltage AC power circuits	—	—	—	—	—	—	—	6kV, 200A Short Circuit Current
	C62.41 Category B	—	—	6kV	—	—	—	—	6kV, 500A Short Circuit Current
ETSI	prETS 300-386-1: 1994[5] Public Telecommunications Equipment Normal Priority Service	4kV contact mode 4kV air discharge	2kV	2kV[4]	4kV[4]	—	—	—	—
	ETS 300-047-1: 1992 Integrated Services Digital Network (ISDN)	—	—	1kV[4]	2.5kV[4]	—	—	—	—
FCC	Part 68 Telecom	—	—	—	1kV	—	—	—	—
Required EMC-PRO Capability		PRO-ESD	PRO-EFT	PRO-SURGE	PRO-TELECOM	PRO-HPOWER HPOWER-EXT CM-HCOIL	PRO-HPULSE PRO-SURGE CM-HCOIL	PRO-PQF	PRO-RING

[1] PRO-TELECOM and PRO-RING may not be installed together
[2] Also requires additional waves
[3] Other lower current combination waves required
[4] Coupling and impedance matching networks not supplied
[5] Draft

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Thermo KeyTek

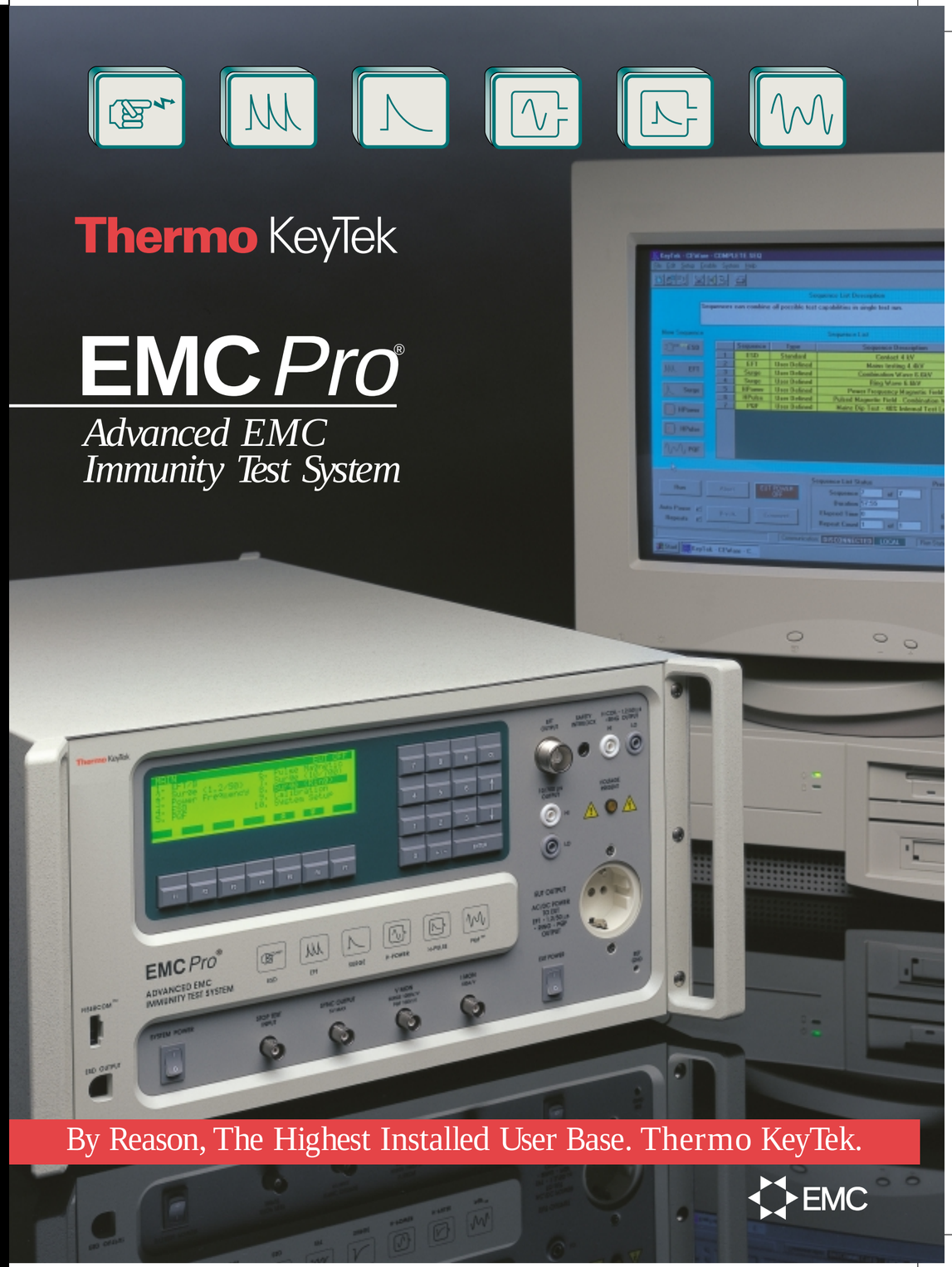
A Thermo Electron business

With the CEMASTER®, EMCPro® and ECAT®, Thermo KeyTek provides a family of EMC immunity test systems to meet the broad range of test requirements and budgets for organizations worldwide.

Thermo KeyTek

EMC *Pro*®

Advanced EMC Immunity Test System



By Reason, The Highest Installed User Base. Thermo KeyTek.

EMC

EMC *Pro*®

Advanced EMC Immunity Test System

The next level of advanced EMC immunity test systems is here: presenting the **EMC***Pro*® system from Thermo KeyTek, the worldwide leader in EMC test technology.

The answer to manufacturers' demand for a mid-range, multi-capability EMC immunity tester, **EMC***Pro*® is easily configured to meet today's immunity standards required for CE Marking and compliance requirements. Operating via Thermo KeyTek's easy to use Windows®-based PC software or from the front panel, it enables test engineers and technicians to run compliance-level EMC immunity tests in accordance with European Norm requirements (see sidebar).

UL

Portable and low cost, the **EMC***Pro*® is ideal for companies who require flexibility, versatility, and the highest test level-to-cost ratio instrument on the market.

A True, Total Immunity Test System

While CE Mark qualification is, and will remain a mandate for manufacturers, many test beyond levels dictated by the EMC Directive, and have implemented aggressive company- and market-driven test programs to insure quality and reliability in the field. In addition, demanding national and international standards such as ANSI/IEEE, CCITT, ETSI and UL must also be addressed by many companies.

4kV EFT

In response to these needs, Thermo KeyTek has designed **EMC***Pro*'s testing capabilities to go well beyond those required for the CE Mark. Users can configure **EMC***Pro*® to meet specific test requirements using the full line of options and accessories offered by Thermo KeyTek, including mains and I/O line coupler/decouplers, magnetic field monitors, coils and more. All accessories and options have been specifically designed to maximize the capabilities of **EMC***Pro*®, and are available directly from Thermo KeyTek. This ensures test compatibility and instrument reliability, and eliminates the problems that can arise from third party sourcing.

Breaking The 4.4kV Voltage Barrier For Combination Wave, Telecom And Ring Wave Surge Testing

EMC*Pro*® features surge testing to 6kV with the combination, telecom and ring waves. It is the only combination tester on the market to offer the combination wave with one of two additional built-in surge waveforms. As a result, manufacturers can eliminate dependence on test houses, as well as the need to purchase various pieces of expensive test equipment.

In addition, **EMC***Pro*® offers a number of unique features not available in other combination test systems. For example, **EMC***Pro*® is the only system to monitor surge voltage and current at the *output* terminals. It monitors at the output of the coupling unit, and will automatically switch connections according to the coupling mode instead of measuring at the generator, which can lead to large errors. For example, if the coupling is L2 to PE, the voltage monitor is switched to L2 to PE. This results in the most accurate monitoring possible with an internal attenuator.

One System, One Vendor, One Solution

With the highest test levels, the widest selection of test capabilities and the lowest cost, **EMC***Pro*® meets and exceeds the requirements for a wide range of engineering and manufacturing test challenges. When test requirements change, or as standards evolve, upgrading is a simple matter of adding appropriate options or accessories. This makes **EMC***Pro*® an excellent short-and long-term testing solution.

Thermo KeyTek offers a 5 year warranty program for the **EMC***Pro*® subject to the purchase of an annual calibration by Thermo KeyTek or an authorized Thermo KeyTek service center. **EMC***Pro*® customers are supported by Thermo KeyTek's in-depth service and calibration capabilities throughout North America, Europe and the Pacific Rim. Customers have the option of factory or on-site calibration programs to accommodate their testing schedules and budgets.

Please contact Thermo KeyTek for further information about **EMC***Pro*®, or for additional information on Thermo KeyTek's comprehensive line of EMC test systems, options and services.

ETSI

6kV SURGE

EMC *Pro*® Standards

The **EMC***Pro*® tests products for full compliance to 6 IEC standards:

IEC 1000-4-2	**ESD**
IEC 1000-4-4	**EFT**
IEC 1000-4-5	**Combination and Telecom Wave Surge**
IEC 1000-4-8	**Power Frequency Magnetic Field**
IEC 1000-4-9	**Pulse Magnetic Field**
IEC 1000-4-11	**Dips and Interrupts**

In addition, **EMC***Pro*® tests beyond the test levels dictated by the EMC Directive for the following IEC standards:

IEC 1000-4-4 to 4.4kV, 100kHz
IEC 1000-4-5 to 6kV for both combination wave and telecom wave

EMC*Pro*® can also be used for testing to the following national and international standards:

ANSI/IEEE C62.41 (Category A & B)
CCITT Rec. K.17, K.20, K.21
ETSI
UL 864 (Ring Wave)
UL 1449 (3kA Combination Wave)
FCC Part 68

ANSI/IEEE

CCITT

Model PRO-BASE EMC*Pro*® Base Unit

The Pro-Base can be configured with up to 7 test capabilities* in a single unit.

The **EMC***Pro*® base unit can be configured with one of three output receptacles which include BS 1361 (British), CEE7 (Schuko) Australia/China 16A or NEMA 5-15 (US).

Each base unit contains the front panel for local control and operation of the **EMC***Pro*®. The front panel also features pre-programmed test routines and sequences, as well as the ability to customize testing via optional software to meet the specific parameters of a product or organization.

Each base unit includes an integrated EFT and Surge coupler/decoupler for single phase EUT mains connections. The coupler/decoupler features surge voltage and current monitors that automatically switch connections according to the coupling mode. Mains voltage and current monitoring for PQF tests is also included.

Coupler/decoupler Specifications

AC voltage:	0 - 277 VAC, 50/60Hz**
AC current:	16A max.**
DC voltage:	100VDC max.
DC current:	10A max.
EFT modes:	L1, L2 or PE
Surge modes:	L1 to L2, L1 to PE, L2 to PE or L1 + L2 to PE
EUT connectors:	Nema, British or Schuko

Base Options

PRO-RMK:	Rack mount kit for 19" rack
PRO-CASE:	Transportation case

IEC

Model PRO-ESD
ESD (Electrostatic Discharge)
For compliant testing per IEC 1000-4-2 and EN 61000-4-2

Electrostatic Discharge (ESD) is the abrupt release of charge from one object (often a person) to another. Such a discharge can permanently damage or otherwise upset the function of sensitive electronic circuits.

In addition to pre-defined ESD tests accessible from front panel controls, this ESD test capability also allows tests to be created and driven by easy-to-use Windows®-based software. An integrated software controlled ESD test capability reduces test errors and results in repeatable, reproducible tests with accurate control of discharge events and polarity. ESD test results will automatically be incorporated into the test report with the results of other immunity tests. A complete range of accessories is also available.

Specifications

Discharge network:	150pF/330Ω per IEC 1000-4-2
Rise time:	0.7 - 1ns
Peak current:	3.75A / kV
Air discharge voltage:	500V to 8.8kV
Contact mode voltage:	500V to 4.4kV
Polarity switching:	Under complete software control
Repetition rate:	Single-shot, 1pps or 20pps

ESD Options and Accessories - please refer to CM-ESD Accessory data sheet

PRO-ESD shown with **EMC***Pro*®

Model PRO-RING
Ring Wave Surge
For testing per ANSI C62.41 Category A, B and UL 864

The 100kHz ring wave replicates the surge waveform expected at the AC wall socket inside a building or residence. Although the lightning or switching surge is initially an impulse, building wiring causes the voltage to "ring." This waveform is commonly used for testing electronic products connected to the AC mains in the U.S. and other countries.

The ability to add this ring wave broadens the capabilities of the **EMC***Pro*® and enables users to test to a range of ANSI and UL standards, as well as the mains testing requirement for the 100kHz ring wave.

Specifications

Open-circuit voltage:	250V - 6.6kV
Rise time:	0.5µs
Frequency:	100kHz
Short-circuit current:	200A or 500A @ 6kV
Repetition rate:	up to 4/min. depending on surge voltage

Ring Options

Models CM-3CD-16/32: 16 or 32 Amp. 3-phase EFT and Surge coupler/decoupler

Optional CM-3CD

Model PRO-EFT
EFT (Electrical Fast Transients)
For compliant testing per IEC 1000-4-4, EN 61000-4-4 and ANSI C62.41

Electrical Fast Transients (EFT) are caused anytime a gaseous discharge occurs (a spark in air or other gas), the most common being the opening of a switch through which current is flowing. Coupling of the EFT into electronic products occurs when power cables handling high currents are run in close proximity to power, data, and/or I/O cables.

Designed to meet both current and future testing needs, the EFT capability of the **EMC***Pro*® meets today's testing requirements, and is in compliance with proposed amendments for enhanced control of waveform parameters and higher frequency burst testing.

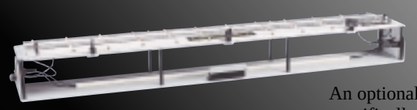
An optional interlocked safety cover designed specifically for the capacitive coupling clamp adds a level of safety beyond IEC requirements.

Specifications

Peak voltage:	250V to 4.4kV
Waveform:	5/50ns
Burst period:	300ms
Burst duration:	15ms @ 1-5kHz 0.75ms @ >5kHz
Pulse frequency:	1kHz - 100kHz
Test duration:	1 - 99999s
Dynamic source impedance:	50Ω
Outputs:	direct- and mains-coupled, software selectable

EFT Options

Models CM-3CD-16/32:	16 or 32 Amp, 3-phase EFT and Surge coupler/decoupler
Model CM-CCL:	Capacitive coupling clamp
Model CM-CCLC:	Coupling clamp cover
Model EFT-ATTN:	EFT attenuator for oscilloscope monitoring of EFT pulses



Optional CM-CCL

Model PRO-TELECOM
Telecom Surge
For compliant testing per IEC 1000-4-5, EN 61000-4-5 and CCITT Rec. K.17; K.20; K.21, FCC Part 68

The telecom surge wave simulates the type of surge expected in bundled telecommunications cables as the result of lightning. Surges are typically limited by primary arresters throughout the telecom system; however, voltages to several kV can be expected in unprotected environments.

Adding the telecom wave to the **EMC***Pro*® provides the user with the ability to test to forthcoming telecom requirements specified in European Norms, ETSI and other standards.

Specifications

Open-circuit voltage:	250V - 6.6kV
Waveform:	10/700µs†
Short-circuit current:	25A at 1kV with external 25Ω resistor included in CM-TELCD
Waveform:	4/300µs†
Repetition rate:	up to 4/min. depending on voltage

Telecom Options

Model CM-TELCD:	External coupler for telecom lines

† Also meets FCC 9/720µs and 5/320µs waveform requirements.

Optional CM-TELCD

Model PRO-SURGE
Combination Wave Surge
For compliant testing per IEC 1000-4-5, EN 61000-4-5, ANSI C62.41 Category B and UL 1449

Surges occur on the AC power mains as a result of switching operations in the power grid and from nearby lightning strikes, either directly to the power distribution system or to nearby objects or ground. Radiated coupling of surges into I/O lines generally occurs only when the lines are very long. Surges may cause disruption or permanent damage to products.

EMC*Pro*® is the first system to offer you an affordable way to test to 6kV. The option to add a second surge wave is a definite advantage for those needing to meet multiple surge wave test requirements.

EMC*Pro*® features an accurate method of monitoring surges at the output of the coupling network, and monitoring is automatically switched according to the coupling mode.

Specifications

Open-circuit voltage:	250V - 6kV
Waveform:	1.2/50µs
Short-circuit current:	125A - 3.3kA
Waveform:	8/20µs
Additional 10Ω Resistor:	Software selectable
Line sync:	0 to 360˚
Repetition rate:	up to 4/min depending on voltage

Surge Options

Models CM-3CD-16/32:	16 or 32 Amp, 3-phase EFT and Surge coupler/decoupler
Model CM-I/OCD:	External, 8 line coupler/decoupler for I/O signal lines
Model CM-I/OCD-HS:	High speed I/OCD option for testing data rates to >100kHz

EMC*Pro*® *shown with optional CM-3CD and CM-I/OCD*

Model PRO-HPOWER
Power Frequency Magnetic Field
For compliant testing per IEC 1000-4-8 and EN 61000-4-8

Electronic products are often subjected to magnetic fields at AC mains frequencies. These fields are frequently produced in the vicinity of power transformers and can cause problems with CRTs, Hall effect sensors, and other electronic products having a sensitivity to magnetic fields.

The ability to internally generate either 50Hz or 60Hz allows a user to test for magnetic field problems at either frequency in any laboratory.

Specifications

Field level:	0.5 to 4A/m with CM-HCOIL; to 30A/m with optional HPOWER-EXT
Output frequency:	50/60Hz
Test duration:	Unlimited

Power Frequency Magnetic Field Options

Model CM-HMON:	Measurement probe for power frequency magnetic fields
Model CM-HCOIL:	1m x 1m magnetic field coil
Model HPOWER-EXT:	External generator for power frequency magnetic field to 30A/m

Optional CM-HMON

Model PRO-HPULSE

Pulse Magnetic Field

For compliant testing per IEC 1000-4-9 and EN 61000-4-9

Pulse magnetic fields are produced as a result of a large current impulse through a conductor. An example is lightning current flowing through a grounding conductor at a power sub-station. Pulse magnetic fields can also occur in heavy industrial areas where very large current impulses are used in a manufacturing process.

Although not generally a requirement for most electronic products, the ability to inexpensively test for pulsed magnetic fields allows users to investigate possible immunity problems before shipping product into harsh environments.

EMC*Pro*® is the only system that allows users to program exact surge current test levels.

Specifications

Waveform:	8/20µs current wave
Field level:	100 to 1000A/m with CM-HCOIL

Pulse Magnetic Field Options

Model CM-HMON:	Measurement probe for power frequency magnetic fields
Model CM-HCOIL:	1m x 1m magnetic field coil

Optional CM-HCOIL

Model PRO-PQF

Dips And Interrupts

For compliant testing per IEC 1000-4-11 and EN 61000-4-11

Dips and interrupts can occur on the AC power mains as a result of a fault in the distribution system, such as an open circuit-breaker or a large load being suddenly turned on in the immediate vicinity. A power distribution system fault can cause a switch in the distribution grid to open and close a number of times, resulting in multiple interrupts to electrical and electronic equipment.

EMC*Pro*® includes a built-in transformer for supplying the required 40% and 70% dip levels as well as the ability to switch to external voltage sources. In this way, the PRO-PQF capability provides users with a truly complete solution while retaining flexibility for performing custom test requirements.

Optional CM-3PQF

Specifications

Voltage rating:	50-277VAC**
Rise time/fall time:	1µs to 5µs
Inrush capability:	up to 500A @ 220-240V up to 250A @ 100-120V
RMS current limit:	16A @ 100% level** 40A @ 40% level**
Minimum Event Duration:	0.1 cycle, or 0.01 second minimum
Line sync:	0 to 360°

Dips and Interrupts Options

Model CM-3PQF:	16 Amp, 3-phase Dip/Interrupt selector
Model PQF-QUAL:	Circuit per IEC 1000-4-11 for testing PQF generator inrush capability

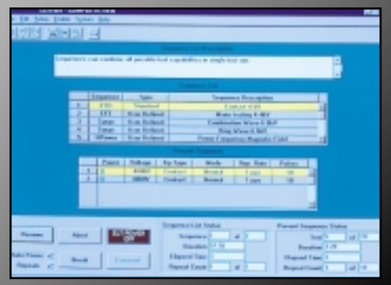
Model PRO-SW

CE*Ware*™ **Software**

EMC*Pro*'s control software, **CE***Ware*™, provides simple, straight forward pre-programmed test sequences ideal for the novice user; yet is sophisticated enough to allow an advanced user to develop and save custom test sequences for future testing. **CE***Ware*™, a Windows 95 - and 3.1-compatible application software, features pull down windows and automatic generation of standard and custom compliance test reports.

Users may program custom "pause and prompt" messages, which are then incorporated into the test sequence and appear in the final test report. Without interrupting the test, the operator may also enter comments which will then appear time stamped in the final report. **CE***Ware*™ will automatically generate a test report upon completion of each test.

A unique fiber optic interface isolates the **EMC***Pro*® from the computer to safeguard it against interference from the simulator thereby avoiding a system crash or loss of data.



CE*Ware*™ *Run Screen*

System Specifications

General

System power:	90 - 240VAC, 50/60Hz
EUT connector:	Nema, British or Schuko
Interlocks:	External, CCL connector, ESD head
External stop input:	Requires contact closure
Interface:	RS232 Fiber-optic, included with PRO-SW
CE Marking:	Safety and EMC Directives

Environmental Operating Conditions

Temperature:	15 - 40ºC
Humidity:	10 - 75%, non-condensing
Altitude:	8000 ft. max.

Physical

Height:	22.9cm (8.75 in.)
Width:	43.4cm (17.1 in.)
Depth:	64.8cm (25.5 in.)
Weight:	39kg (85 lbs.)

*Pro-Telecom and Pro-Ring can not be installed together in the same unit.

**The actual AC mains current and voltage rating is based on the mains connector selected.