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Product Specifications

The Thermo Scientific ECAT Lightning Test System (LTS) is a modular test platform, which tests to the lightning simulator requirements of RTCA DO-160, Section 22 and Section 17. The system is expandable to meet Boeing, Airbus, EUROCAE and other avionic standards.

Thermo Scientific ECAT Lightning Test System (LTS)

Modular Lightning Test System platform for testing to multiple avionic standards







Features

- Safe
- Quick Test Setup
- Simple User Interface
- Waveforms: 1, 2, 3, 4, 5A, 5B and 6
- Levels 1, 2, 3, 4 and 5+
- Single Stroke, Multiple Stroke, Multiple Burst and Pin Injection from the same front panel
- Voltage Spikes
- Modular architecture

When Failure is Not an Option

With its fully-automated test operation, the Thermo Scientific ECAT Lightning Test System (LTS) yields reliable, repeatable and accurate test results to avionics lightning simulation requirements of RTCA DO 160 Section 22 and 17. It is easily expandable to meet most Boeing, Airbus, EUROCAE and other requirements.

Building on the legacy of the proven ECAT platform, it provides field-upgradeable modular technology, featuring fast test set-up, intuitive programming and front panel control. On-site calibration and field service is available worldwide.

System Description

The ECAT LTS is configured as a basic test system, available as a Level 3, Level 4, or Level 5 tester. All test systems feature single-stroke, multiple-stroke, pin injection and multi-burst test capability, integral to the system controls, without any external connections.

The system is composed of a Frame that houses power and control functions for the system. Waveforms are produced from the modules inserted into the Frame. Both the Frame and modules can be purchased separately. Owning multiple frames allows increased capability by “swapping” modules between frames, and testing with each frame simultaneously.

The Total System

The Thermo Scientific Lightning Test System (LTS) provides a modular test platform based on the requirements of RTCA DO-160G Section 17 (Voltage Spikes) and Section 22 (Lightning Induced Transient Susceptibility), EUROCAE, Boeing, Airbus and others. Built upon the proven modular construction of the Thermo Scientific ECAT System, the LTS can be upgraded in the field by the user or in the factory as requirements change by the addition or replacement of individual modules.

The LTS can perform Pin Injection, Cable Bundle and Ground Injection testing with Single Stroke, Multiple Stroke and Multiple Burst modes from the same module. The system can be expanded as test requirements evolve. Purchase of additional frames allows the operator to double his capacity using existing modules, without purchasing another system.

Turn-key Testing

With the advent of the Thermo Scientific LTS, lightning testing of avionics comes of age and provides an easy to use, turn-key solution for test engineers and technicians.

Until recently, the availability of commercial equipment for testing to lightning standards for avionics, such as RTCA DO-160G, has been limited. Most test equipment used in the industry was home made: difficult and time consuming to set-up and awkward to use, often unsafe and requiring skilled engineers for their operation and maintenance.

Testing with the LTS insures repeatable, reproducible test results while virtually eliminating tester set-up time. Waveforms and functions are selected with the push of a button rather than by reconfiguring test equipment, moving around bulky generator boxes and wiring. The LTS can significantly reduce total test time resulting in significant cost savings.

Versatile, Modular Architecture

LTS waveform simulators are completely modular, using plug-in modules that provide all the waveforms required to meet the lightning test requirements of RTCA DO-160G, EUROCAE, Boeing, Airbus and others.

Any Thermo Scientific LTS simulator can be readily expanded, at any time, for testing to new or modified standards. These modules can be added or replaced by the operator, without requiring a field service engineer, or shipping to the factory. Rather than purchasing or constructing a new tester, replacement or addition of plug-in modules saves time and money. Upgrades are considerably less expensive than individual instruments, and what's more, LTS modular systems are totally open-ended and will be able to handle future requirements, whatever they may be.

Thermo Scientifics' plug-in architecture protects you when standards are changed or superseded as the industry understanding of lightning threats to aircraft avionics evolves, and as industry standards evolve.

Currently available LTS Modules[1]:

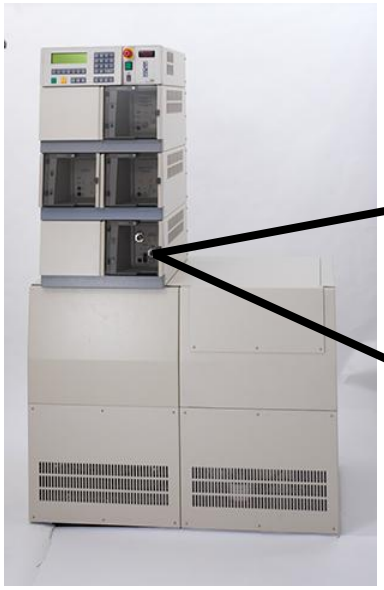
Waveform	Pin Injection	Single Stroke	Multiple Stroke	Multiple Burst	Description	Plug-in Module
WF1		♦	♦		6.4µs X 69µs Current Wave	D561, D566
WF2	♦	♦	♦		≤100ns x 6.4µs Voltage Wave	D562
WF3 - 1 MHz	♦	♦	♦	♦	1 MHz Oscillatory Voltage Wave	D563
WF3 - 10 MHz		♦	♦	♦	10 MHz Oscillatory Voltage Wave	D563
WF4	♦	♦	♦		6.4µs X 69µs Voltage Wave	D561, D566
WF5A	♦	♦	♦		40µs X 120µs Current Wave	D561, D567
WF5A Airbus / Boeing		♦	♦		40µs X 120µs Voltage & Current Wave	D568
WF5B	♦	♦	♦		50µs X 500µs Current Impulse	D564
WF6				♦	0.25µs X 4.0µs Current Impulse	D569
Voltage Spikes				[2]	≤2µs X ≥10µs, ≤2µs X ≥50µs, ≤2µs X ≥100µs, X ≥200µs, ≤2µs X ≥400µs	D570

[1] See Spec sections for complete specs [2] Up to 50 pulses in 60 seconds

One example of the multiple standards supported for WF3 Multiple Burst Test Mode:

LTS Display	Standards Compliance	Min Applic Time	Max # Trans	Max # Bursts	Time Between Bursts	Time Between Transients
DO160	DO160 Boeing D6-16050-5 Airbus ABD0100.1.2-F Airbus ABD0100.1.2-G	3 sec	20	3	30-300ms	50-10,000µs
Airbus/E	Airbus ABD0100.1.2-E	15 sec	500	1	----------	10-10,000µs
Boeing-4	Boeing D6-16050-4 NH-90	3 sec	20	24	10-200ms	10-50µs

Example Test Setup for WF3 Single-Stroke, Multiple-Stroke, Multiple-Burst <u>and</u> Pin Injection from the <u>same module front panel</u>





DCHV-1 Coupler

<u>Cable Induction</u>

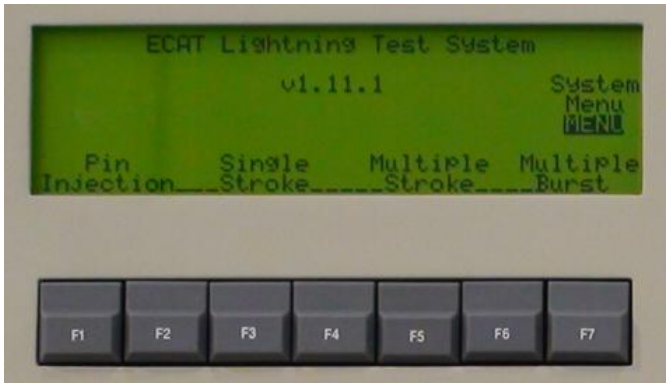
- **Single Stroke**
- **Multiple Stroke**
- **Multiple Burst**

<u>Pin Injection</u>

Controller Front Panel Programming for above example



1. Select Test Type: Pin Injection, Single Stroke, Multiple Stroke or Multiple Burst



2. Select Waveform type, voltage levels and timing



It doesn't get any easier than this!

Specifications

Model: F-LTS

LTS Frame/Controller for the operation of individual modules

General Specifications:

System Voltage: 190-230 VAC, 50/60 Hz, 3Ø Wye, 30 A_{max}
(Optional 190-230 VAC, 50/60 Hz, 1Ø 50 A_{max})

Test Types: Single Stroke
Multiple Stroke: 1-24 pulses; 10 – 200 ms fixed, random or irregular 1st pulse and subsequent pulse spacing
Multiple Burst: 1-500 pulses; 50 – 1000 us fixed, random or irregular pulse spacing; 1-24 bursts; 30 – 300 ms fixed, random or irregular burst spacing
Pin Injection
Voltage Spikes

Number of Tests: 1 to 999

Test Repetition Rate: 3 s to 255 s (at maximum level, min rep rate may be >3 s)

Control Interface:
- Display: 8x40 character LCD
- Remote: USB, RS232, Fiber-optic (Future Feature)

Safety Features:
- Emergency Off switch
- External Interlock for users (mats, Lexan barrier, etc)
- Lockout/Tag out capability

Module Bays:
- 3 Full-width / 4 Half-width plug-in module capability

Environmental Operating Conditions:
- Temperature: +15°C to +35°C
- Humidity: 10-75%, non-condensing

Physical Specifications:
- Height: 160 cm (66.6 in)
- Width: 107 cm (42 in)
- Depth: 69 cm (27 in)
- Weight: 360 kg (800 lb) fully configured

Options Available:

LTS-1PHASE: Adds a power converter to accept 190-230 VAC, 50/60 Hz, 1Ø 50 A_{max} to power the LTS

CE Marking: Safety and EMC Directives

Model: D567-Lx (x indicates level 3, 4 or 5)

LTS Module for WF5A

General Specifications:

WF5A (CI[1], GI[2]): Single Stroke, 40/120 µs, 50-10000 A, 1300 V_{oc}
Multiple Strokes, 40/120 µs, 30-1500 A

WF5A Pin Injection: 40/120 µs, 50-1800 V_{oc} /50-1800 A_{sc} = 1 Ohm

Safety Features:
- Door Interlocks
- Safety Sockets
- Outputs only connected during Transient
- Active Module indicator LED
- Voltage Present indicator LED

Environmental Operating Conditions:
- Operating temperature: +15°C to +35°C
- Humidity: 10-75%, non-condensing

Physical Specifications:
- Full-width ECAT plug-in module

CE Marking:
- Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCI-1 Cable Induction Coupler)
[2] (For **G**round **I**njection take from cal loop on DCI-1)

Model: D561-Lx (x indicates level 3, 4 or 5)

LTS Module for WF1, WF4, WF5A

General Specifications:

WF1 (CI[1], GI): Single Stroke, 6.4/69 µs, 50-3800 A, 2000 V_{oc}
Multiple Strokes, 6.4/69 µs, 25-1200 A

WF4 (GI): Single Stroke, 6.4/69 µs, 25-2000V, 2100 A_{sc}
Multiple Strokes, 6.4/69 µs, 10-600 V

WF4 Pin Injection: 6.4/69 µs, 50-2000 V_{oc} /10-400 A_{sc} = 5 Ohm

WF5A (CI[1], GI): Single Stroke, 40/120 µs, 50-10000 A, 1300 V_{oc}
Multiple Strokes, 40/120 µs, 30-1500 A

WF5A Pin Injection: 40/120 µs, 50-1800 V_{oc} /50-1800 A_{sc} = 1 Ohm

Safety Features:
- Door Interlocks
- Safety Sockets
- Outputs only connected during Transient
- Active Module indicator LED
- Voltage Present indicator LED

Environmental Operating Conditions:
- Temperature: +15°C to +35°C
- Humidity: 10-75%, non-condensing

Physical Specifications:
- Full-width ECAT plug-in module

CE Marking:
- Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCI-1 Cable Induction Coupler)

Model: D566-Lx (x indicates level 3, 4 or 5)

LTS Module for WF1, 4

General Specifications:

WF1 (CI[1], GI): Single Stroke, 6.4/69 µs, 50-3800 A, 2000 V_{oc}
Multiple Strokes, 6.4/69 µs, 25-1200 A

WF4 (GI): Single Stroke, 6.4/69 µs, 25-2000V, 2100 A_{sc}
Multiple Strokes, 6.4/69 µs, 10-600 V

WF4 Pin Injection: 6.4/69 µs, 50-2000 V_{oc} /10-400 A_{sc} = 5 Ohm

Safety Features:
- Door Interlocks
- Safety Sockets
- Outputs only connected during Transient
- Active Module indicator LED
- Voltage Present indicator LED

Environmental Operating Conditions:
- Temperature: +15°C to +35°C
- Humidity: 10-75%, non-condensing

Physical Specifications:
- Full-width ECAT plug-in module

CE Marking:
- Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCI-1 Cable Induction Coupler)

Model: D562-Lx (x indicates level 3, 4 or 5)

LTS Module for WF2

General Specifications:

WF2 (CI[1], GI[2]) Single Stroke, 0.1/6.4 µs, 25-1920 V, 1700 A_{sc}
Multiple Strokes, 0.1/6.4 µs, 25-1200 V

Safety Features:

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

Environmental Operating Conditions:

Operating temperature +15°C to +35°C
Humidity 10-75%, non-condensing

Physical Specifications:

Half-width ECAT plug-in module

CE Marking:

Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCV-1 Cable Induction Coupler and use 2 for Level 5)
[2] (Add wire to clamp between ground planes)

Model: D563-Lx (x indicates level 3, 4 or 5)

LTS Module for WF3, 1 MHz and 10 MHz

General Specifications:

WF3 (CI[1], GI) Single Stroke, 1 MHz, 25-4000 V, 160 A_{sc}
Multiple Strokes, 1 MHz, 25-2400 V
Multiple Burst, 1 MHz, 25-2300V
Single Stroke, 10 MHz, 25-4000 V, 60 A_{sc}
Multiple Strokes, 10 MHz, 25-2400 V
Multiple Burst, 10 MHz, 25-2300V
WF3 Pin Injection 1 MHz, 30-4000 V_{oc} /1.2-160 A_{sc} = 25 Ohm

Safety Features:

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

Environmental Operating Conditions:

Operating temperature +15°C to +35°C
Humidity 10-75%, non-condensing

Physical Specifications:

Full-width ECAT plug-in module

CE Marking:

Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCHV-1 Cable Induction Coupler)

Model: D564-Lx (x indicates level 3, 4 or 5)

LTS Module for WF5B

General Specifications:

WF5B (CI[1], GI[2]) Single Stroke, 50/500 µs, 150-6000 A, 900 V_{oc}
Multiple Strokes, 50/500 µs, 30-1500 V
WF5B Pin Injection 50/500 µs, 50-1800 V_{oc} /50-1800 A_{sc} = 1 Ohm

Safety Features:

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

Environmental Operating Conditions:

Operating temperature +15°C to +35°C
Humidity 10-75%, non-condensing

Physical Specifications:

Full-width ECAT plug-in module

CE Marking:

Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCI-1 Cable Induction Coupler)
[2] (DCI-1 clamp cal loop)

Model: D569-Lx (x indicates level 3, 4 or 5)

LTS Module for WF6

General Specifications:

WF6 (CI[1], GI) Multiple Burst, 0.25/4.0 µs, 5-160 A, 4500 V_{oc}

Safety Features:

Door Interlocks
Safety Sockets
Outputs only connected during Transient
Active Module indicator LED
Voltage Present indicator LED

Environmental Operating Conditions:

Operating temperature +15°C to +35°C
Humidity 10-75%, non-condensing

Physical Specifications:

Full-width ECAT plug-in module

CE Marking:

Safety and EMC Directives

[1] (For **C**able **I**nduction use Model DCHV-1 Cable Induction Coupler)

Model: D568-L5

LTS Module for WF5A for Airbus/Boeing specifications

General Specifications:

WF5A (SS, MS)	40/120 µs, 50-2000 voltage & current.
	Output impedance =1 Ohm

Safety Features:

- Door Interlocks
- Safety Sockets
- Outputs only connected during Transient
- Active Module indicator LED
- Voltage Present indicator LED

Environmental Operating Conditions:

Temperature	+15°C to +35°C
Humidity	10-75%, non-condensing

Physical Specifications:

Full-width ECAT plug-in module

CE Marking:

Safety and EMC Directives

[1] (For **C**able **I**nduction up to 1500V/1500A use Model DCVI-1 Cable Induction Coupler and use 2 for Level 5, use 3 for 2000V/2000A)

Model: D570

LTS Module for RTCA DO-160G, Section 17, Voltage Spikes

General Specifications, Line 1, 2, 3:

≤2µs X ≥10µs	50Ω or 100Ω
≤2µs X ≥50µs	5Ω or 10Ω
≤2µs X ≥100µs	5Ω or 10Ω
≤2µs X ≥200µs	5Ω
≤2µs X ≥400µs	5Ω or 10Ω

Safety Features:

- Door Interlocks
- Safety Sockets
- Outputs only connected during Transient
- Active Module indicator LED
- Voltage Present indicator LED

Environmental Operating Conditions:

Temperature	+15°C to +35°C
Humidity	10-75%, non-condensing

Physical Specifications:

Full-width ECAT plug-in module

CE Marking:

Safety and EMC Directives

Accessories



Model: DCI-1

Cable Induction Coupler for WF1, 4, 5A, 5B

General Specifications

WF1	6.4/69 µs, >2000 V_{Limit}, >5000 A $_{Test}$
WF4	See Technical Note #201
WF5A	40/120 µs, >1200 V_{Limit}, >10,000 A $_{Test}$
WF5B	50/500 µs, >900 V_{Limit}, >6000 A $_{Test}$

Safety Features

Double Insulated
Safety Sockets

Physical Specifications

Height	21.6 cm (8.5 in)
Width	28.3 cm (11.1 in)
Depth	34.3 cm (13.5 in)
Aperture	3.8 cm x 7.6 cm (1.5 in x 3 in)
Weight	48 kg (106 lb)

CE Marking

Safety and EMC Directives



Model: DCV-1

Cable Induction Coupler for WF2 (use 2 for Level 5)

General Specifications

WF2	0.1/6.4 µs, >2000 V_{Test}, >1700 A $_{Limit}$

Safety Features

Double Insulated
Safety Sockets

Physical Specifications

Height	14.2 cm (5.6 in)
Width	12.7 cm (5.0in)
Depth	31.8 cm (12.5 in)
Aperture	3.8 cm x 5.1 cm (1.5 in x 2 in)
Weight	13 kg (29 lb)

CE Marking

Safety and EMC Directives



Model: DCHV-1

Cable Induction Coupler for WF3, 6

General Specifications

WF3/1 MHz	1 MHz, >4000 V_{Test}, >300 A $_{Limit}$
WF3/10 MHz	10 MHz, >4000 V_{Test}, >20 A $_{Limit}$
WF6	0.2/4µs, >4000 V_{Limit}, >160 A $_{Test}$

Safety Features

Double Insulated
Safety Sockets

Physical Specifications

Height	14.2 cm (5.6 in)
Width	12.7 cm (5.0in)
Depth	31.8 cm (12.5 in)
Aperture	3.8 cm x 5.1 cm (1.5 in x 2 in)
Weight	13 kg (29 lb)

CE Marking

Safety and EMC Directives



Model: D591

Powered Pin Decoupler Module for Powered Pin Injection

General Specifications

Operating AC Voltage	0-244 VAC, 20 A
Operating DC Voltage	0-285DC, 10 A
Operating Frequency	0-400 Hz

Safety Features

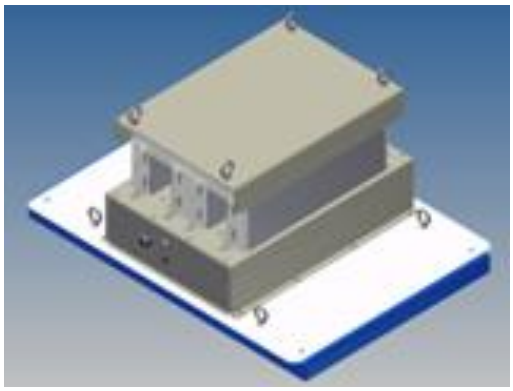
Safety Sockets

Physical Specifications

Half-width ECAT plug-in module

CE Marking

Safety and EMC Directives



Model: DCVI-1

D568-L5 Cable Induction Coupler for Airbus/ Boeing WF5A specifications. Includes lift and ground plane.

Top is removable to allow cable bundle insertion within the coupler. Top section weight is 180 lb.

Ground Plane is 0.06 AL sheet, 1" perforated overhangs for attachment to adjacent ground planes if needed.

Calibration loop contains 1 turn.

2 DCVI-1 clamps required for obtaining waveforms up to
1500V/ 1500A

3 DCVI-1 clamps required for obtaining waveforms at 2000V/ 2000A

General Specifications:

WF5A (SS, MS)	40/120 µs, 50-2000 voltage & current.

Safety Features:

Double Insulated
Safety Sockets



Transformer Physical Specifications:

Height	34.3 cm (13.5 in)
Width	41.9 cm (16.5 in)
Depth	45.7 cm (18 in) cable length
Aperture	6.4 cm x 10.9 cm (2.5 in x 4.3 in)
Weight	362 kg (800 lbs)

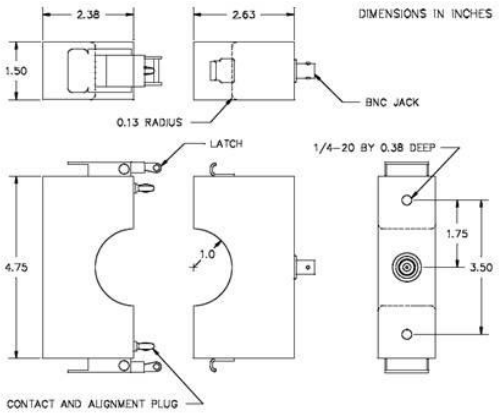
Cart Physical Specifications:

Lowered Height	29.8 cm (11.75 in)
Raised Height	92.7 cm (36.5 in)
Length	90.1 cm (35.5 in)
Width	59.69 (23.5 in)
Lift Time	25 strokes
Capacity	498.9 kg (1100 lbs)
Weight	130.2 kg (287 lb)

DCVI-1 total weight = 493kg 1087 lb)

CE Marking:

Safety and EMC Directives



Model: D111-1

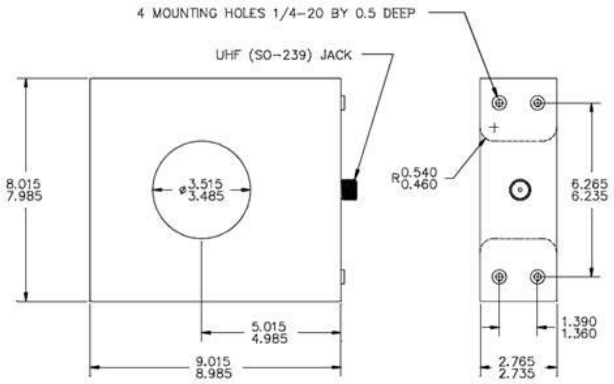
5 KA Current Probe suitable for all waveforms except WF5B

General Specifications

Sensitivity	0.1 Volt/Ampere +1/-0%
Output resistance	50 Ohms
Scope Coupling	1 MΩ DC/AC
Maximum peak current	5,000 Amperes
Useable rise time	25 nanoseconds
Low frequency 3dB point	5 Hz
High frequency 3dB point	15 MHz
Operating temperature	0°C to +65°C

Physical Specifications

Output connector	BNC
Weight	1.7 kg (3.7 lb)



Model: D301X

50KA Current Probe suitable for WF5A, 5B

General Specifications

Sensitivity	0.01 Volt/Ampere +1/-0%
Output resistance	50 Ohms Scope Coupling 1 MΩ DC/AC
Maximum peak current	50,000 Amperes
Useable rise time	200 nanoseconds
Low frequency 3dB cut-off	5 Hz
High frequency 3dB cut-off	2 MHz
Operating temperature	0°C to +65°C

Physical Specifications

Output connector	UHF (SO-239)
Weight	7.9 kg (17.5 lb)



Model: D5KV

Voltage Probe suitable for all Waveforms to 5KV

General Specifications

Max. input voltage	5 kV
Scope Coupling	1 MΩ DC/AC
System attenuation	100:1, +/-2%
System input resistance	50 MΩ Input
capacitance	< 6 pF
System BW (-3 dB)	400 MHz
Operating temperature	0 °C to +50 °C

Physical Specifications

Cable length	2 m
Output connector	BNC

Model: DPI-1

Probe accessory kit suitable for all Waveforms to 5KV

General Specifications

Safety Socket Dolphin Clips
Safety Socket Crocodile Clips
Safety Socket Pointed Probes
Safety Socket Grabber Probes
Safety Socket Lug Terminals
Safety Socket Clip-On
Safety Socket Cables
Safety Socket Leads
Safety Socket Plugs



Model: E000

ECAT Half-width module bay blank for unused module bay locations (required if no module is present in the bay). Cannot be used in lowest module bays.

Physical Specifications

Half-width ECAT plug-in module

CE Marking

Safety and EMC Directives



Model: E002

ECAT Full-width module bay blank for unused module bay locations (required if no module is present in the bay).

Physical Specifications

Full-width ECAT plug-in module

CE Marking

Safety and EMC Directives



Model: LTS-1PHASE

AC converter that allows LTS to operate from a single phase instead of a 3 phase AC source.

General Specifications

Input	1Ø 208VAC +/-10%, 50/60 Hz, 50 Amax
Output	3Ø 208VAC +/-10% 50/60 Hz, 30 Amax

Physical Specifications

Height	50.8 cm (20 in)
Width	38.1 cm (15 in)
Depth	33 cm (13 in)
Weight	34 kg (75 lb)

CE Marking

Safety, EMC Directives and UL listed



Model: LTS-CASTERS

Add-on base for LTS with larger 5” casters to facilitate high threshold and/or aggressive ramp installations. Increases LTS caster ground clearance from 1.5” to 5”

Physical Specifications

Height	25 cm (9.8 in)
Width	107 cm (42 in)
Depth	69 cm (27 in)
Weight	34 kg (75 lb)

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