PRIMARY INJECTION TEST SYSTEM

Raptor

F1 by SMC
Formula Innovation

SMC
Just what you need

www.smcint.com

The Raptor System

Multifunctional Primary Testing System

The Raptor is a smart test system designed as the ultimate solution for the main primary test applications required in the commissioning and maintenance of substations, marking the difference with respect to existing equipment now being used. This new generation of Primary Injection Test System makes primary testing easier, faster and more convenient.

The system consists of a Master unit which can be upgraded with up to four Slave sets which add further power capacity to the system. The user is not limited to the power initially determined. In case of more power required, Raptor sets can be added, or what is also very important, be left behind when not needed.

In comparison with the big and heavy traditional variac-based equipment, the Raptor is designed incredibly smaller and lighter than its predecessors, combining a revolutionary high current generation technology, DSP based, with an automatic smart control, in a really transportable set, less than 35 Kg and able to inject up to 15,000 A.

An additional advantage to the easy transport is that sets can be much closer to the devices tested, reducing the length of cables, and a significant decrease in power losses by eliminating intermediate connections, thanks to the new loop-through concept. The sets have in the middle a hole to pass through the cables which are connected to the load, forming in this way the injection circuit.

Efficient Power

The modern high-tech design of the Raptor system enables the highest level of injection capability in terms of power and duty cycle, with an ease of use so far unknown in this type of equipment. A touch-sensitive console allows the user to fully monitor and control the test process, including the storage of results and test configuration tools.

The Raptor system provides automatic regulation of the magnitude to be injected, being stable regardless of the load or power supply changes. Current output range is adjusted at all times according to application, taking advantage of the modularity and versatility of the concentration of measurement and control functions in the Raptor Master unit, with a unique capacity to adjust the voltage and current required through the number of spire turns used.

The Raptor also includes a powerful measurement section, extending the number of testing applications.

Raptor system includes factory configured tests, to automatically perform a large amount of the most common testing, just by selecting the appropriate template and start the test. The user has also the possibility to easily make or modify test templates.

UNIQUE FEATURES

SMALLEST SIZE AND WEIGHT FOR OUTSTANDING PORTABILITY

AUTOMATIC OUTPUT REGULATION WITH DIGITAL TECHNOLOGY

MULTIFUNCTIONALITY FOR MOST PRIMARY INJECTION TESTING

COMBINING HIGH CURRENT AND HIGH VOLTAGE INJECTION

INSTANT COMBINATION OF UNITS BY INFRARED

LOOP-THROUGH HIGH CURRENT TECHNIQUE

FLEXIBLE MODULARITY AND ADAPTABILITY

MODERN, ROBUST AND UPGRADEABLE TECHNOLOGY

CONTROLLED BY ANY WINDOWS WIFI DEVICE

RESULTS STORAGE AND REPORTING

PREDEFINED TEST TEMPLATES

The Raptor System: Applications

Raptor - Control

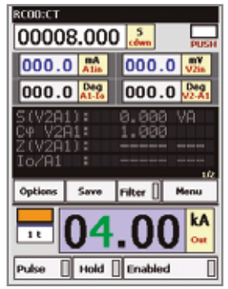
Raptor Control is the user-friendly interface from which the operator remotely controls and monitors all the test process. The Raptor Control detects and configures the master and slave units automatically. It can be installed in any Windows 10 (or higher), Android or IOS device that combined with the existing test templates makes the test configuration and execution task extremely easy and fast.

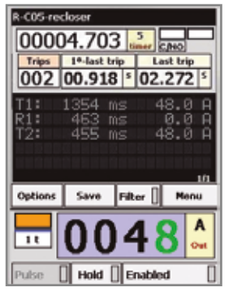
The Raptor Control saves all the test configurations and results on its own memory, and allows to work them, even exporting to several file formats.

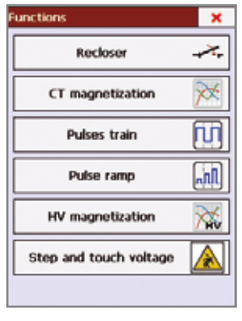
The Raptor Control is connected to the Master through a wifi connection that allows the user to stay at a convenient location while the test set is working much closer to the load.

Other advantages are: data storage and reporting, configuration assistance, software upgrades by internet, simplify and reduce testing time, easy touch operation, maximum test accuracy.

The Raptor Current Calculator is included as standard in the Raptor Control and can also be installed on a Windows device. It is a simple to use yet sophisticated tool that allows the user to quickly define the Raptor configuration and the number and type of cables required as minimum to successfully accomplish a specific high current job, even before leaving the office.







Test Templates

The default Test Templates and automatic Functions included in Raptor Control allow the user to just select the appropriate template/function and start the test.

- General Test Template: General purpose screen for all kind of primary testing applications and quick testing.
- Circuit Breaker: overcurrent testing of low voltage breakers and switches, with zero current detection.
- Overcurrent Relay: prepared to measure tripping time of the overcurrent relay by primary injection.
- Current Transformer (CT): test to measure CT ratio, ratio error, polarity, phase shift and burden.
- Rogowski CT/Low Power CT: CT ratio, ratio error, phase shift, of Rogowski transformers and low power CT.
- CT Burden: test to calculate impedance, power and power factor of the load.
- CT, Voltage method: CT turn ratio, ratio error, and polarity, by injecting voltage.
- CT Magnetization: automatic test that displays the CT exciting curve, Voltage Knee point, and excitation current.
- CT magnetization – HV: excitation curve using the Raptor HV, suitable for all kind of protection CTs, and VTs.
- Voltage Withstand - HV: Test the voltage withstand of the insulation of the CT, VT, PT and other elements.
- Voltage Transformer (VT): checks VT turn ratio, ratio error, polarity and phase shift.
- VT burden: test to calculate impedance, power and power factor of the load.
- HV Voltage Transformer: similar to VT template, but using the Raptor HV.
- PT Ratio: Checks Power Transformer's turn ratio and ratio error
- HV no load PT: similar to PT template but with the generation through Raptor HV.
- Short-circuited PT: short-circuit impedance, reactance losses, resistance and phase shift.
- HV PT Short circuit: similar template but using the Raptor HV.
- Polarity Test: polarity checking in transformers of any type, using the RAPTOR Polarity Tester.
- AC Resistance: template ready to measure the resistance of connections, contacts or other elements.
- Ground Grid: template for detecting bad contacts in the ground grid.
- Recloser: automatic test of the opening and reclosing times of the recloser under test.
- Train of Pulses: preset sequence of current or voltage pulses, and also HV pulses.
- Pulses Ramp: programmable ramp of pulses, suitable to test the instantaneous trip of breakers.
- Step and Touch: Automatic function for Step & Touch Voltage measurement in transformation centers.

APPLICATIONS

The combination of mobility, adaptability, automatic output regulation, high-tech, ease of use and versatility makes the Raptor the best system available in the market for all major primary injection testing applications in and around substations and power plants:

Primary Current Injection Testing

Primary Injection Testing is essential in commissioning and verifying a protection scheme. The secondary injection test does not check all the components in the system, as it cannot provide the condition of the overall protection installation, whether CTs have the correct ratio or polarity, or whether the secondary wiring is correct and serviceable, and it does not mimic the operating conditions in service. Therefore, the Primary injection testing is the only way to prove correct installation and operation of the entire protection scheme, and the Raptor has been specially designed to meet all primary testing needs.

The Raptor´s variable output frequency extends the primary testing diagnostic with frequency sweep, offering test frequencies different from the mains frequency, and thus enhancing its electrical testing capacity. Primary Test involves the entire circuit; current transformer primary and secondary windings, relays, trip and alarm circuits, circuit breakers and all wiring are checked. Primary injection tests are carried out after secondary injection tests, to ensure that problems are limited to the VT's and CT's involved, circuit breakers, plus associated wiring, all other equipment in the protection scheme having been proven satisfactory from the secondary injection tests. Hence it is often the last tests performed in the commissioning and maintenance process, or after major modifications have been carried out, and also as an invaluable aid to faultfinding.

Relay Testing

With the Raptor, primary faults can be simulated to check if protective relays operate correctly; trip times are measured and registered by the system, with 1 ms resolution. The automatic current regulation, the pre-set current injection, the injection time control, and the test results storage, provide the user with the most advanced primary testing tool for protection relays.

Circuit Breaker Testing

It is also essential for the verification of the entire protection scheme to verify live CB tripping, and CB operating time analysis in combination with total trip time including the IEDs and CB trip time. Measurements with the Raptor deliver reliable and repeatable results due to high signal and measurement accuracy.

Current, Voltage and Power Transformer Testing

The Raptor system has many advanced features – such as powerful measurement input, to allow performing a complete check of a CT. Through a few seconds test the following results are obtained: Turns Ratio, phase (polarity) between primary and secondary of the CT, and burden (Impedance, power and power factor of the load). It can be also used for testing low power and Rogowski CTs, checking ratio, phase and burden in VTs, and checking Ratio, Polarity, short circuit impedance and reactance losses in Power Transformers. Test templates are also available for CT Magnetization curve, with graphical presentation of the curve, the Knee point and the excitation current. After the test finish, the Raptor also performs the CT demagnetization process. When testing a CT, it is usually advisable to test the ratio error and phase angle at different primary currents. In a protection CT it is very important to test the ratio at the highest possible current allowed by your RAPTOR system, apart from at 100% of its nominal current. With the Raptor HV slave further test are available, such as Withstand Voltage test and all related tests that need high voltage up to 2000 V in all type of transformers.

Switchgear Testing

Low voltage switchgear and controlgear assemblies require also high current testing to comply with the relevant product standards, both by assembly manufacturers and users. The Raptor is also suitable for testing the rated short-time current that the assembly must withstand, and MCB/MCCB/ACBs tripping time performance, both thermal and short-circuit trips.

Recloser and Sectionalizers

Through the high current fault simulation, the Raptor performs an automatic test, detecting and measuring the opening and reclosing times, the number of operations, and the total clearing time, of the automatic recloser under test. These devices are increasingly used in Distribution networks and the testing, commissioning and maintenance strategy is becoming a must. The automatic test of the Raptor provides a simple way to perform a functional test of these important devices. This involves, under simulated fault conditions, the operation of the protective relays and circuit breakers, verifying the number and sequence of operations of the recloser until lockout. This primary injection testing of the recloser, makes a reliable diagnostic of the recloser status and is quicker and easier than the test performed through a secondary injection in the electronic control, enabling to check the entire system, including the breaker, CTs, relays, control cables and wiring. The small size and weight of the Raptor facilitates the onsite testing of reclosers, even those mounted on the pole, or before it is put into service, as well as laboratory or factory testing. The Raptor provides the high, accurate, and stable current required. It is also possible to program the total test time to adapt to the different reclosing times of these systems.

The Raptor is also suitable to perform a sectionalizer lockout test, performed by pulsing current through the sectionalizer to simulate the upstream operation of a recloser, so that the sectionalizer goes through its programmed sequence of circuit interruptions to be counted before it operates.

Heat Runs

Thanks to the amplifier-based high current generation of the Raptor, it is ideal for performing heat runs, maintaining the current injection stable throughout long-term testing, and measuring the corresponding time.

Polarity Testing

The Polarity Tester is a lightweight handheld accessory used to verify the correct wiring in a quick and simple way, as the Raptor injects a special polarized signal into the primary side of any transformer (CT, VT, PT, etc). This is especially useful for checking polarities in remote connections and/or those with difficult access.

Ground Grid Testing

By injecting high current and measuring with the low level voltmeter it is possible to detect the existence of any bad or eroded contact in the ground grid.

Step & Touch

For measuring the step & touch voltage characteristics of the protective earthing installations in substations and other electrical facilities, a regulated current must be injected through the earth circuit and the voltage drop must be measured between two test points. An automatic function is included in Raptor for this measurement, with the help of the optional S&T kit. Another important aspect of this feature is the possibility to run it at the line frequency or another selected by the user, filtering into the result the undesirable frequencies.

Functionality Updates

The Raptor System will not become obsolete as all functional elements are programmable. We at SMC keep the end users updated with free new updates and applications required by market demands. Furthermore, the Master unit is designed to enable additional functionality with future add-on equipment.

The Raptor System: Benefits

Automatic Output Regulation

DSP technology maintains an uniform current waveform even with changing load impedances and speeds testing by eliminating the manual variac. Every other high current system requires the user to manually set the output current.

It also overcomes heating of the trip elements which caused the current to drop during the test.

Weight and Size

Amazing portability compared to other existing equipment, due to its light weight and small size, that allows one person to carry it, even in his own car. The modularity allows to carry the minimum units to site.

Easier and cheaper to transport and handle. Each unit has wheels and folding handle.

Reduces the length of cables required as sets can be much closer to the device tested.

Facilitates portability into installations with limited space and/or with difficult access, such as stairs, soft soils, underground substations, etc.

Multi-Functionality

The Raptor system concentrates many applications and testing assets, offering a time-saving and cost effective solution. The Raptor logic system features high-power processors to take care of future requirements, and their functionality can be readily enhanced by means of firmware upgrades through the Internet.

Expandability

The modular design can accommodate several Raptor Slaves to the Master unit, and the user is not limited to initial power requirement, being able to upgrade the system at a modest cost for higher power needs.

Sets are immediately assembled and synchronized thanks to infrared technology connectivity, IRDA type, thus saving time, making the portability even better, and the expandability of the system a simple task.

Loop-through concept

The Loop-through high current secondary concept contributes both with flexible modularity and with lightness and smaller size of the Raptor.

Unique capacity to adjust the voltage and current required through the number of loop turns used.

Reduces cables connection to the minimum possible, thus reducing power losses, and simplifying the test preparation.

Raptor - Control

Powerful and smart interface to control and monitor the test.

Simplify testing through a automating process and test templates, including the storage of test results, and reducing testing time. Simply dial up the desired current and inject.

Generate, store and edit directly your reports in your controlling device.

Pre-defined test templates help the user to perform quickly and in a more efficient way the most frequent tests, with minimal training and preparation. Users can also create their own test templates.

Wifi & Ethernet connector for software updates.

Reliable high speed Raptor Bus connector, with failure detection and alarms.

On screen calculations and magnitudes conversions.

User´s assistance for system configuration, cable selection and testing.

Measurement section

Voltmeter, Ammeter and Low signal Voltmeter inputs, measures AC and DC signals with phase meters incorporated, extending the testing performance.

Binary input, voltage or dry contact, to detect trip commands that define the end of some tests.

Timer of 1 ms resolution, with zero current detection, and also configurable as countdown to limit the injection time.

Based on the internal and hardware measurements, selectable calculated measurements can be shown on screen , such as Total Power, Apparent and Reactive power, Power factor, Impedance, Reactance, Resistance, Transformation Ratio and Ratio Error.

A Vline measurement instrument is implemented in the Raptor which shows during the test the actual supply voltage value. The Raptor Current Calculator also allows introducing the on load supply voltage to find out the maximum current got in different conditions.

The Raptor System: Features

MASTER UNIT'S FEATURES

The Raptor MS is the master unit of any Raptor configuration. It provides the connection for the Raptor - Control and can be used as stand-alone for primary test applications that do not require extremely high current/power. When slave units are added, the MS will detect them automatically over the infrared link and will accommodate the system's parameters with no intervention from the user:

- Regulated high AC current output. Able to inject up to 3.8kA (with 3kVA) indefinitely or 9.5kA (with 2kVA) during 3s. Up to 15kA when combined with one or more slave units.
- Regulated AC auxilliary output. Working in current mode is capable of injecting up to 9 A indefinitely or 35A for 3s. Working in Voltage mode is capable of generating voltage up to 200V AC.
- Voltmeter Input. Ranges: 0.2, 2, 20 or 300Vac/dc (auto or manual). Built-in phase angle meter.
- Ammeter input. Ranges: 0.2, 2 or 20Aac/dc (auto or manual). Built-in phase angle meter.
- Low signal Voltmeter. Ranges: 30, 300 or 3000 mVac/dc (auto or manual). Built-in phase angle meter.
- Binary input: Voltage or dry contact with reversible logic (NO, NC) and auto-detection.
- LEDs: Monitor overload, temperature, status of communications, standby, digital input, power output and power supply.
- IRDA interface: Interconnects Slave units to the Master wirelessly.

CURRENT SLAVE UNIT'S FEATURES

The Raptor SL features toroidal windings that are activated individually by the master unit as the power demand grows, through a sophisticated injection control that ensures seamless current flow and optimal workload distribution.
The slave Raptor is visually identical to the master unit but lacks the measurement section, the Raptor-Control and the auxiliary input/output panels. Its mission is to push an additional 5 kVA power to the high current pass-through secondary. Up to four slaves can be added for up to 15,000 A with a 23-kVA total injection power. The master unit detects the presence of slaves using infrared communications, so no additional control or power interconnections are required. The user only needs to pass the current cables across the entire assembly and use it as if it was a single device, in a fully transparent way to the user. As an added benefit of the pass-through secondary technique, the user can easily multiply the compliance voltage by making more than one turn with the current conductor around the entire system.

The Raptor System: Raptor HV

Description

The Raptor-HV, the High Voltage slave, is an optional product that extends the Raptor's applications to tests that require the use of high AC voltage, up to 2 KV. This product works in combination with a Raptor Master and is visually similar to it.

The Raptor HV connects to the master unit via the Expansion Port, from where it also takes the necessary power. The Raptor HV is a pluggable high voltage peripheral that takes advantage of all the valuable features in the Raptor Master including the electronically controlled switching amplifier, DSP based intelligence and a robust communication and device synchronization system. Naturally the HV's control is fully integrated in the master's Raptor control.

Power voltage generated by the master at the expansion port is raised by the HV up to two user selectable ranges, 1kV and 2kV, and the output is measured in current, voltage and phase angle to provide adequate injection control and application's feedback. Voltages and currents can be measured with very high precision to allow for a wide variety of applications.

In order to comply with international safety requirements, the Raptor HV's package includes an internal buzzer that signalizes the high voltage output activation and two connectors for an optional rotting warning lamp and an optional mushroom type emergency breaker. The internal buzzer can be disabled from the Raptor's console.

Other outstanding feature is the capacity to inject in frequencies different from the mains frequency, enhancing its electrical testing capacity.

The use of any of the Raptor C-XX systems with the Raptor HV provides a world-wide unique system, which combines both high current and high voltage injection, with the suitable power, for the main maintenance and commissioning test applications in substations and switchgear. It is an innovative and advanced substation test system that replaces the need for multiple test sets.

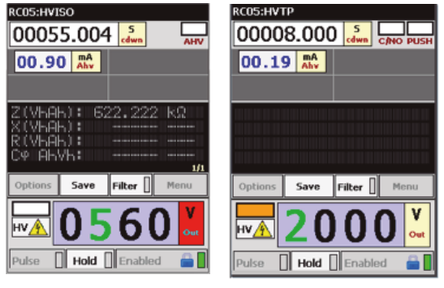
The Raptor HV weighs only 28 kg, and it has the same small and compact size than the rest of Raptor units, with wheels and folding handle, that provides a lower transportation cost and a reduction of manpower needs.

Features

- Two user selectable output ranges: 0-1000 VAC and 0-2000 VAC.
- Powered from the Raptor Master via expansion port.
- Controlled from the common Raptor Master's Raptor control.
- Integrated test voltage and current measurement.
- Supported by additional Test Templates.
- Audible safety buzzer.
- Detachable rotary warning lamp and Emergency stop button.
- Outstanding Raptor style portability.

Applications

- CT, VT and PT withstand voltage tests.
- CT and VT excitation current measurement, Knee Point.
- VT and PT ratio measurement.
- Polarity test in VT's secondary winding.
- Testing voltage sensors and converters.
- Step & Touch Voltage measurement.



Raptor PT

Raptor Polarity Tester

The Polarity Tester is a lightweight handheld accessory used to check a three-phase installation for correct wiring in a quick and simple way, while the Raptor injects a special polarized signal into the primary side of any transformer (CT, VT, PT, etc). This is especially useful for checking polarity in remote spots and/or those which are difficult to reach.

A single CT supplies secondary current to more than one device (protective relays, meters, etc.) which are installed in switchgear panels, relatively far from the CT itself. The polarity concordance of the secondary current for the various devices is essential to assure proper operation of the secondary scheme; hence, this polarity must be always checked in the commissioning and/or maintenance process. This task is traditionally made using a phase angle meter in combination with an injected current, which could be either primary or secondary, and takes a long time as the meter needs to be connected very carefully to avoid interpretation errors.

Application

The Polarity Tester makes this task very easy, straightforward and efficient because it saves a lot of time and connection errors. The SMC Raptor primary injector injects a special test current waveform from which the Polarity Tester is able to immediately determine if polarity on each device is correct or not. The operator just needs to inject the test current in the circuit and move around all the connected devices while checking the polarity one by one.

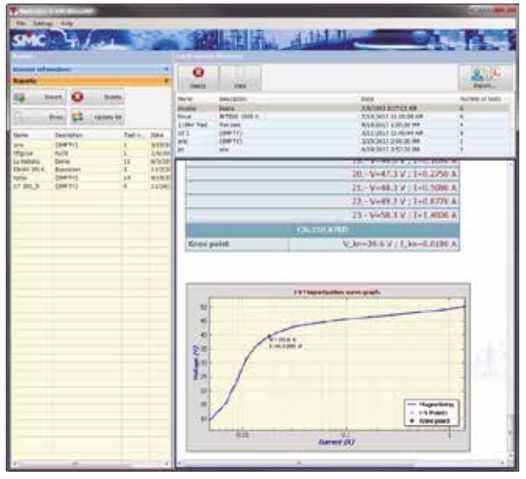
Description

The Raptor-PT has two probes that you connect to points whose polarity is to be tested. By pressing the test button, the result is shown in less than 2 seconds by means of the following LEDs:

- Correct polarity (green): the Raptor-PT detects signal in phase with the injected by the Raptor.
- Wrong polarity (red): the detected signal is in counter-phase to the Raptor's signal.
- Polarity not detected (yellow): PT cannot determine polarity, not suitable connection, not using polarized mode in Raptor, or Raptor is not inyecting.
- Low battery (orange): the batteries must be replaced.

The criteria adopted for polarity are:

- When using the pass-through secondary, the positive corresponds to the grey side of the Raptor's casing.
- When using the Raptor's auxiliary output (V or I), the positive corresponds to the output's red connector.
- When using the HV slave, the positive corresponds to the output marked with the black point.



As part of Raptor – Control, it can merge test done using the old Raptor HH with new ones, as well as updating firmware if needed.

RaptorSync

After every test the user can automatically save the results of the test and the test parameters in the Raptor control application, grouped under a common report name. The tests stored include the injected level, the measured time, the measurements that are configured to be displayed on the screen and all adjustments in general; the reports can be easily accessed and managed through the Report tab of the menu. The user can also save the test with comments, if required, and can create as many reports as needed.

Subsequent review, printing and edition of the test reports are performed through Raptor control app itself, which is included as standard with any system. The Raptor control program allows the import, viewing and saving of all the reports, and the exporting of any of the listed test reports to standard pdf, Excel or HTML format, which allows for further processing and edition (e.g. Word).

RAPTOR MS

(values @240 Vac, 50 Hz, 1 turn sec. 960 mm², measured 25 cm on each side)

HIGH CURRENT OUTPUT	
Output Current	Output Voltage
No Load V (0%Imax)	0 - 1.20 Vac - Continuous
3.8 KAac (25%Imax)	0 - 0.81 Vac - Continuous
7.5 KAac (50%Imax)	0 - 0.42 Vac - 3 min
9.5 KAac (Imax)	0 - 0.22 Vac - 3 s
No Load Resolution	25 uVac
Output Frequency	20 - 400 Hz (Power reduction applied at 50 > f > 60 Hz)
LOW CURRENT OUTPUT (not simultaneous with high current output)	
Output Current	0 - 35 Aac (0 – 9 Aac continuous)
Voltage Output	0 - 200 Vac
Output Frequency	20 - 400 Hz (Power reduction applied at 50 > f > 60 Hz)
Isolated output	Yes
Protection	fuse
MEASUREMENTS	
Secondary Current	(for high current output)
Ranges	0-1 KAac/N; 0-15 KAac/N (n: number of secondary turns)
Resolution	1 Aac, 10 Aac
Accuracy	±0.2% of the value ±0.2% of the range
Phase angle	±0.25°
AMMETER/LOW LEVEL VOLTMETER	
Ammeter Ranges	0 - 0.2 / 0 - 2 / 0 - 20 Aac
Ammeter Resolution	0.1 mAac, 1 mAac, 10 mAac
Ammeter Impedance	<10 mΩ
Voltmeter Ranges	0 - 30 mVac, 0 - 0, 3 Vac, 0 - 3 Vac
Voltmeter Resolution	0.015 mVac, 0.15 mVac, 1.5 mVac
Voltmeter Impedance	>3000 KΩ
Frequency range	20 - 400 Hz
Accuracy	±0.1% of the value ±0.1% of the range
Phase angle	±0.25°
Isolated input	Yes
VOLTMETER	
Ranges	0 - 0.2 / 0 - 2 / 0 - 20 / 0 - 300 Vac
Resolution	0.1 mVac, 1 mVac, 10 mVac, 0.15 Vac
Impedance	>120 KΩ
Frequency range	20 - 400 Hz
Accuracy	±0.1% of the value ±0.1% of the range
Phase angle	±0.25°
Isolated input	Yes
BINARY INPUT	
Type	Dry contact / Voltage
Voltage mode Levels	1.5 V, 15 V ; Max. Voltage 250 Vac.
Time resolution	1 ms
Isolated input	Yes
COMMUNICATIONS	
2 RS-485	Raptor Bus connectors to control unit Raptor-WA and/or other units
2 IrDA interfaces	Two channels for master/slaves linking
GENERAL	
Supply	230 V ±10%, 50/60 Hz (single phase)
Weight	35 Kg / 77 lb
Dimensions	550 x 440 x 230 mm / 21 ½" x 17 ½" x 9"
Working temperature	0-50° C
Storage temperatura	-25 to + 70 °C
Protections	MCB, overload, temperature, supply, communications, polarity
Sec. hole diameter	85 mm
Transport	Wheels, folding handle, fixed handle

RAPTOR SL

(values @240 Vac, 50 Hz, 1 sec.turn 960 mm², measured 25 cm on each side)

HIGH CURRENT OUTPUT	
Output Current	Output Voltage
No Load V (0%Imax)	0, 0.79 or 1.59 Vac - Continuous
3.8 KAac (25%Imax)	0, 0.67 or 1.34 Vac - Continuous
7.5 KAac (50%Imax)	0, 0.55 or 1.11 Vac - 3 min
15 KAac (100%Imax)	0, 0.30 or 0.61 Vac – 3 s
COMMUNICATIONS	
2 IrDA interfaces	Two channels for master/slaves linking
GENERAL	
Supply	230V ±10%, 50/60 Hz (single phase)
Weight	35 kg / 77 lb
Protections	MCB, overload, temperature, supply, communications, polarity
Sec. hole diameter	85 mm / 3 ½"
Transport	Wheels, folding handle, fixed handle

RAPTOR CONTROL

CONTROL	
OS:	Windows 10 (or higher), Android, IOS
COMMUNICATIONS	
Wifi RJ-45	Raptor BUS Communication with Raptor-MS
RJ-45	Ethernet for software updates

RAPTOR HV

Raptor HV connected to a Raptor Master unit powered by 240 Vac, 50 Hz.

HIGH VOLTAGE POWER OUTPUT (@240Vac, 50Hz)		
Output AC voltage	Max output AC current	Duty cycle
0..2 KV	1 A	Continuous
0..2 KV	2 A	3 min
0..2 KV	2.5 A	2 min
0..1KV	2 A	Continuous
0..1KV	4 A	3 min
0..1KV	5 A	2 min
Open circuit resolution	1 Vac	
Output frequency	20-400 Hz (Power reduction applied when outside the 50-60 Hz range)	
MEASUREMENT (INTERNAL) @(10..100)% of the range / 50-60Hz		
Secondary current (internal)		
Ranges	0.08 / 0.8 / 8 Aac	
Resolution	0.04 / 0.4 / 4 mAac	
Frequency range	20 – 400 Hz	
Level accuracy	0.1% of the value + 0.1% of the range	
Phase angle accuracy	+/-0.25°	
Secondary voltage (internal)		
Ranges	1000 / 2000 Vac	
Resolution	1 Vac	
Frequency range	20 – 400 Hz	
Level accuracy	0.1% of the value + 0.1% of the range	
Phase angle accuracy	+/-0.25°	
EXPANSION PORT	(cable length: 1 m)	
Power input from the amplifier	160 Vac @ 16 A continuous – 32 A 3'	
RS-485 communications link	Integrated in the expansion port	
Bus supply	+5 V	
Phase Synchronism	Yes	
Main supply	230 Vac@1A	
GENERAL		
Power supply	from the Raptor MS's Expansion Port	
Weight	28 Kg / 61.6 lbs	
Protections	Overheating, Power supply failure, Communications failure	
Safety	Integrated high intensity buzzer, External Warning Lamp connector, Mushroom type emergency stop connector	
Transportation	Integrated wheels, fixed and adjustable handle	
Ventilation	Forced	

POLARITY TESTER

Detection range:	5 mVac – 300 Vac
Indicators:	Polarity OK (green), wrong polarity (red), not detected (yellow), low battery (orange)
Test pushbutton:	Switch on and test < 2 s.
Supply:	2 batteries 1.5 Vdc (AAA type), 1 year duration
Consumption:	5 mA (pressing Test)
Weight:	250 g
Dimensions:	140 x 62.7 x 30.5 mm
Case rating:	IP-64
Probe lengths:	40 mm (positive); 102 mm (negative)

OPTIONAL ACCESSORIES

Ultra-flexible high current cables	These copper braid, silicon coated 120 mm2 cables, thanks to its ultra flexibility allows to squeeze the highest performance of the Raptor System, especially when using the multi-turn Technique. This cable will withstand a permanent 500 A injection or shorter 1,000 A (3 min) or 2,000 A (3 sec) tests. Available lengths: 3, 6 and 9 meter. The calculator included in Raptor´s Console allows to determine in seconds the cables and the number of Raptors that you will need for a particular job, and maximum distance to the load with every configuration.
CBL3M-RAP	120 mm² cross section and 3 meters (9 ft) long
CBL6M-RAP	120 mm² cross section and 6 meters (18 ft) long
CBL9M-RAP	120 mm² cross section and 9 meters (27 ft) long
RAP- ACC1	Multi cable terminals up to 4 cables. Cooper terminals for connection of up to 4 cables in parallel for a wider effective cross section
RAP- ACC2	Multi cable terminals for connection of up to 6 cables.
RAP-HCC	Pair of High Current Clamps
RAP-PT	Polarity Tester
RAP-LAMP	External warning lamp for Raptor HV, rotary type.
RAP-STOP	Emergency Stop for Raptor HV, mushroom type, lockable, with magnetic hold.
RAP-SET-S&T	Raptor HV Step & Touch accessory kit, composed by the 25-kg iron electrodes, input switch, and 50m/20 m injection/measurement leads.
TC-03	Sturdy ABS transport case with wheels and extensible handle

The Raptor System: Configurations

Nº sec. turns	Compliance Voltage (V)				Max. Current (A) Continuous	Max. Current (A) 3 minutes	Max.Current (A) 3 seconds
	RAPTOR C-05	RAPTOR C-15	RAPTOR C-25	RAPTOR C-35			
1	1.20 - (0.22)	2.79 - 0.26	4.39 - 0.87	5.98 - 1.48	3,800 @ 0.81 / 2.15 / 3.50 / 4.84 V	7,500 @ 0.42 / 1.53 / 2.63 / 3.73 V	(9,500) 15,000 @ (0.22) / 0.26 / 0.87 / 1.48 V
2	2.40 - (0.33)	5.59 - 0.52	8.78 - 1.73	11.96 - 2.95	1,900 @ 1.61 / 4.30 / 6.99 / 9.68 V	3,800 @ 0.83 / 3.02 / 5.21 / 7.40 V	(5,000) 7,500 @ (0.33) / 0.52 / 1.73 / 2.95 V
3	3.60 - (0.45)	8.38 - 0.77	13.16 - 2.60	17.94 - 4.43	1,267 @ 2.42 / 6.45 / 10.49 / 14.52 V	2,500 @ 1.27 / 4.58 / 7.88 / 11.19 V	(3,800) 5,000 @ (0.45) / 0.77 / 2.60 / 4.43 V
4	4.80 - (0.66)	11.18 - 0.90	17.55 - 3.28	23.93 - 5.66	950 @ 3.23/8.61/13.98/19.36 V	1,900 @ 1.66/6.04/10.42/14.79 V	(2,500) 3,800 @ (0.66)/0.90/3.28/5.66 V
5	6.00 - (1.09)	13.97 - 1.29	21.94 - 4.34	29.91 - 7.38	760 @ 4.04/10.76/17.48/24.20 V	1,500 @2.12/7.63/13.14/18.64 V	(1,900) 3,000 @ (1.09)/1.29/4.34/7.38 V

ACCESSORIES INCLUDED WITH EACH UNIT

RAPTOR WA	
	Ethernet cable
	User's Manual
RAPTOR MS	
	Raptor Master Unit
	Power Supply Cable, 3 m
	Low-level voltmeter cable, 2 m
	Connection cables set
	Spare fuses
	Set of alligator type clips
	Nylon protective bag
	Calibration Certificate
RAPTOR SL	
	Raptor Slave unit
	Power Supply cable, 3 m
	Spare fuses
	Nylon protective bag
RAPTOR HV	
	Raptor HV unit
	Connection cable with Master unit
	HV Test Leads, 2 x 6 m
	Set of 2 injection clamps
	Nylon protective bag

ORDERING INFORMATION

SYSTEM CONFIGURATION	
RAPTOR C-05	1 x Raptor-WA + 1 x Raptor-MS
RAPTOR C-15	1 x Raptor-WA + 1 x Raptor-MS + 1 x Raptor-SL
RAPTOR C-25	1 x Raptor-WA + 1 x Raptor-MS + 2 x Raptor-SL
RAPTOR C-35	1 x Raptor-WA + 1 x Raptor-MS + 3 x Raptor-SL
RAPTOR CV-XX	Any of the above configurations + 1 x RAPTOR HV

Made in the EU

EUROPEAN OFFICE
EUROSMC S.A.
Buril, 69
28400 Collado Villalba
Madrid, Spain
+34 91 849 89 80
sales@eurosmc.com

USA OFFICE
NORAMSMC INC.
5840 South Memorial
Drive Suite 208
Tulsa - OK 74145 - USA
+1 918 622 5725
sales@noramsmc.com

ASIAN OFFICE
EUROSMC S.A.
2, Cangkat Minden Lorong
2, Gelugor, 11700, Penang,
Malaysia
e-mail: asia@eurosmc.com
tel: +60 12-902 5766

MIDDLE EAST OFFICE
MidEastSMC FZE
Businesses Center RAKEZ
Ras Al Khaimah
United Arab Emirates
+971543205225
vipin@eurosmc.com