

ELECTRIC MOTOR EMULATOR

FOR MOTOR DRIVE INVERTER TESTING

DESIGN, PERFORMANCE, PRODUCTION

STANDALONE INVERTER TEST SOLUTION - LAB SAFE - IDEAL FOR VALIDATION / ENDURANCE / PRODUCTION TESTING

- Integral HV & LV battery emulators
- Configurable internal motor models with drive cycle simulation
- P-HIL compatible with OpalRT real time simulation
- Over 70 user selectable DAC outputs provide system information including motor characteristics not available from real motor

CIRCULATES AC/DC POWER BETWEEN THE EME AND INVERTER

- Minimal facility requirements - power sized for make-up power only (about 25% of system rating)
- Enables small footprint / casters
- Low operating cost
- Ability to test overspeed, burst and locked rotor conditions
- Supports DPWM, SVM, Sine-Triangle, etc.

ULTIMATE FLEXIBILITY

- Relocate – small footprint with casters supports positioning multiple units around environmental chamber
- Scalable from one up to four emulators connected in parallel (up to 1.1MW)
- Reconfigure for 3 up to 6 phase emulation
- Dual independent channels available to drive more than one machine
- Test with or without real battery pack
- Reconfigure to optimize for multiple voltage levels (48/350/800)
- Control from PC or test automation system



TESTING THE FUTURE®

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E-MOTOR EMULATOR

The e-Motor Emulator mimics the 4-quadrant electrical output of a synchronous or induction machine under user-controlled speed, torque and temperature conditions thereby simulating an electric drive train.

This Electronic Dynamometer Test Stand:

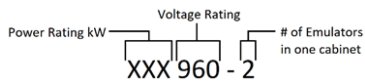
- Enables inverters to be tested before real motor is available
- Emulates the BEMF and impedances of a synchronous or induction three phase motor
- Is compatible with most known PWM switching methods (space-vector, sine-triangle, DPWM & others)
- Includes position sensor emulation
- Enables test under extreme operating conditions in a safe mode without harm to the inverter or test equipment (high rate of change, overspeed, continuous overload conditions)
- Can emulate different motors with a simple change of parameters via software load
- Contains no moving parts with associated maintenance and no special safety room for mechanical containment

Options

- Fault Injection Unit (for one emulator): Phase-Phase Shorts; 3-Phase Short; Single Phase to Open Circuit; Single Phase to Ground Short; Open and Shorts to VBAT and Short to Ground on EXC/SIN/COS Resolver Signals, Encoder Signals, CAN Signals and Temperature Signals.
- Casters: can be mounted directly on Model 150500-A1 and adds 3.5 inches to total height. Higher rated power models require a caster carrier that decreases overall height by 0.5 inches and adds 7 inches on each side of the cabinet width at the base (2nd cabinet, if required, has casters).
- Real time simulation: Opal-RT real time computer with advanced motor models.
- Test Stand: UUT test stand with HVIL doors and connections for coolant, power, signal and test measurement.
- Growth: The EME can be delivered with one emulator installed in large cabinet and configured to allow second emulator to be added in future for higher current and/or 6-phase operation. Up to four emulators (2 cabinets) can be parallel connected (see Note 3).
- Parallel: Software and Fixture provided to parallel connect two 3-phase emulators into one 3-phase emulator. Mounts directly to power panel on cabinet.

Notes

- ① Other models with Continuous Power ratings from 60kW and up are available upon request. Models defined with the following convention:



- ② Rated Power is based on local power circulation with a unidirectional make-up supply and nominal system losses, your actual power may vary. Bidirectional supplies can be used unidirectionally for makeup or bidirectionally to support test configurations that include an external DUT DC Source in the loop to circulate power to the facility grid - rated Power equals about 90% of DC Supply rating for grid circulation.
- ③ All models are rated 350Arms continuous, 550Arms peak AC and 300A continuous, 430A peak DC per emulator but may be limited to lesser values due to available makeup current. Dual emulator units can be paralleled into a single unit to double the AC and DC current, and in total 4 emulators can be paralleled to quadruple the current to 1400Arms, 1200ADC continuous.
- ④ The battery voltage for certain models can be configured via user interface for 500 and 960 VDC to optimize testing of inverters from different voltage platforms.
- ⑤ Dimensions and weights are for reference and are subject to change. Tower Light adds 6 inches and is shipped uninstalled.

	Model ①			
	150500-1	250500-2	275960-1	550960-2

MOTOR EMULATOR				
Quantity of Motors Emulated	1	2	1	2
Quantity of Cabinets	1	1	1	2 or 3
Max Continuous Power (kW)②	150kW/emulator; 250kW combined		275kW/emulator; 550kW combined	
AC Continuous Current③	350Arms per emulator; 700Arms in parallel connection			
AC Peak Current③	550Arms for 30 sec.; 450Arms for 60 sec. (double current in parallel connection)			
Fundamental Frequency	DC to 1500Hz			
Motor Voltage	0 to 365 VAC RMS L-L		0 to 700 VAC RMS L-L④	
Motor Type	Synchronous PM or Induction, 3-phase per emulator, up to 6-phase for dual emulator connection			
Motor Rotation	Clockwise or Counter			
Torque Direction	Positive or negative			
Motor Poles	2 to 40			
Position Sensing Emulation	Resolver or Encoder			
Resolver Lobes	2 to 24			
Resolver Offset	-2pi to 2pi radians			
Resolver Excitation	3kHz to 20kHz			
Encoder Pulses	up to 80 pulses/revolution			
Emulated Phase Inductance	30uH to 2000uH			
Emulated Phase Resistance	0 to 1000 mOhm			
PWM Integrating Inductance	Used to limit UUT ripple current. 30uH to 1000uH. 960V units ship with externally configurable inductors for 105uH and 210uH, unless otherwise specified, to optimize testing of inverters from different voltage platforms.			
Temp Sensor Emulation	Three per Emulator, stator and rotor, 0 to 5V per lookup table			

INTERNAL HV BATTERY EMULATOR		
Battery Voltage	up to 500 VDC	up to 960 VDC④
DC Continuous Current③	-300 to 300 ADC per emulator; -600 to 600 ADC in parallel connection	
DC Peak Current③	-430 to 430 ADC per emulator for 20 sec.; -860 to 860 ADC in parallel connection	
Battery Voltage Bandwidth	3Hz up to 20kHz (with choice of DC power supply)	
Isolated	Yes	

INTERNAL LV BATTERY EMULATOR	
UUT Control Power	8 to 30 VDC, 25A max standard. Others available.

USER INTERFACE
The EME is provided with PC based Graphical User Interface Software that can be used to control both the EME and Unit Under Test. PC to EME interface is via CAN. P-HIL compatible with OpalRT real time computer/simulation via high-speed fiber. Custom control software interfaces to the EME via standard 11-bit identifier messages at 500kbps (Communication Interface Document provided).

FACILITY REQUIREMENTS	
PC with CAN Interface	D&V Interface Software requires User PC with VectorCAN Compliant Hardware (VN1600 series, CANCaseXL, CANCardXL, etc.)
3Φ Service (480/380/208)	Phase current per 10kW of DC Makeup Power: Unidirectional is 18A/21A/36A; Bidirectional is 15A/18A/26A
1Φ Service (120/240)	15A
Isolation Transformer	Not required, DC make-up power supply to grid is isolated
Ambient air temperature	0 to 30C
Max UUT & EME Losses	Equal to DC make-up power supply rating
Coolant:	Water (with aluminum corrosion inhibitor) or 50% WEG, 30C max, non-condensing. Multiple cabinets to be plumbed in parallel. Single cabinet from 4.5 to 6.0 GPM dependent upon power rating. Second cabinet dependent upon choice of DC power, contact D&V Electronics.
Dimensions WxDxH inches (mm)⑤	All cabinets have the same footprint of 23" x 39" (585 x 991 mm). Cabinet height varies from 75" (1900 mm) to 86" (2185 mm) depending on configuration and power rating.
Weight (lbs / kg)⑤	Approximation and will vary with choice of DC power. Emulator cabinet up to 1800 / 820, Power supply cabinet up to 1000 / 450.



ISO 9001:2015
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