

# Espec Low Voltage Equalizer

**Espec LV Equalizer is a real-time power factor correction and dynamic load compensation system. It continuously provides real-time response for reactive power, Harmonics, voltage drops, flickering and fluctuation. The Equalizer system uses ultra-high**

**power thyristor switching technology, providing transient free smooth switching by connecting capacitors at zero-crossing. The use of this technology enables the Equalizer system to support the grid's stability and can lead to substantial energy efficiency.**



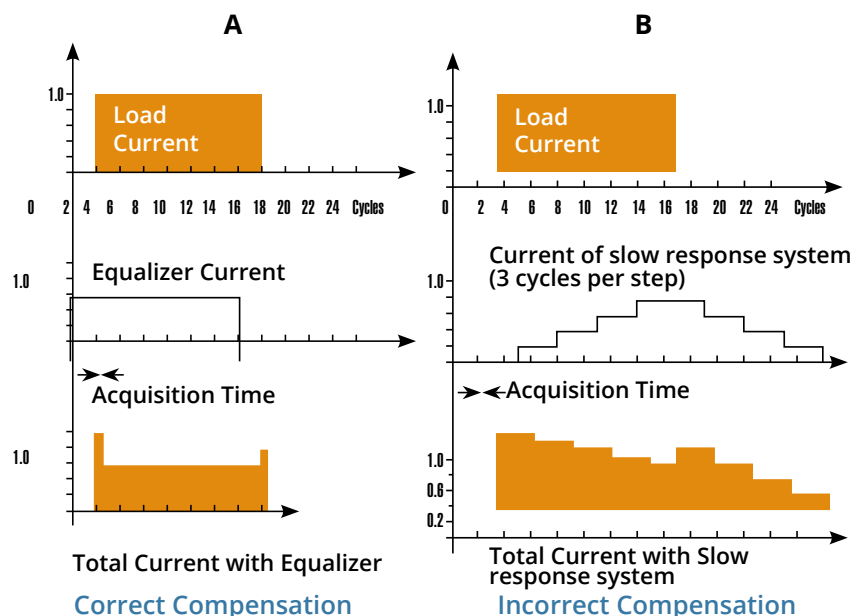
## Power Factor Compensation

The Equalizer is an ideal solution for power quality applications. Regardless of the application, the equalizer solution achieves near- perfect power factor control, network stabilization and efficiency improvements. In many cases, the equalizer is the only proper solution: Implementing quasi-real-time systems in these applications would actually reduce power quality and possibly produce wasted energy. The following example compares the results of the Equalizer (2/3 cycle typical) with a quasi-real time solution (1 step per 3 cycles).

**Correct Compensation Using the Equalizer** Graph A demonstrates the Equalizer's compensation of the reactive

current in a 14- cycle energy load. Typical acquisition time (full compensation of reactive current) is less than once cycle and total current is substantially reduced.

**Incorrect Compensation Using Slow Response Systems** Graph B demonstrates incorrect compensation where response time is 1 step per 3 cycles to connect a single group and acquisition time required to connect a total of 4 groups is 12 cycles. Due to the delay in connections, the current is only partially reduced. Further, the corresponding delay in disconnection causes residual current. The overall effect of this compensation system on total current is negative, as the average current of the load is increased, rather than decreased. This phenomenon can also increase voltage flickering due to overcompensations.



# Specifications

LV Equalizer System	System power	35kVAR to 16,000kVAR
	Network voltage	208V to 690V
	Operational Frequency	45-55Hz for 50Hz Network 55-65Hz for 60Hz Network
	Losses	208V – 690V: < 0.8%
	Communication	Isolated RS485 Up to 115k Baud Rate Protocol options: ELCOM (Elspec High-Speed communication protocol) ModBus/RTU (IEEE 754 Floating Point) Full remote control
Switching	Transient free operation	Power electronic switching designed to switch capacitor groups into the network without switching transients. Connection to the network during voltage zero-crossings, providing smooth connection of the groups.
Group Configurations	Number of groups	Up to 12 groups per controller
	Binary switching sequence	1:1:1 1:2:2 1:2:4 1:2:2:4 1:2:4:8
Acquisition Time	Full compensation within one network cycle	Up to 20ms for 50Hz network Up to 16ms for 60Hz network
Control Mode	Main ct installation location	Load only (open loop) Load + Capacitors (close loop)
	Network configuration	Single phase Three phases WYE/DELTA balanced Three phases WYE/DELTA unbalanced
Capacitors	Heavy duty capacitors	450V: 7.5um film thickness 550V: 10um film thickness 690V: 12um film thickness 800V: 14um film thickness
	Maximum ratings	Overcurrent: 4" Inrush current: 200"
Inductors	High power cooper inductors	Rated inductance and tolerance: -1.5% / +2.5% Insulation voltage: 8,000V
Operational Modes	Options	Manual Automatic Test Scan option: Can be used in Manual or Automatic modes. This option provides uniform utilization of the capacitor groups, which is carried out by transient free switching between engaged and non-engaged capacitor groups every few seconds in FIFO rotating sequence (First In First Out). Prevents overloading and overheating of the capacitors and inductors.
Display	Structure	Graphic, high contrast FSTN LCD 4.7", Black/White Long life LED backlight Antiglare coated polycarbonate window
	Functions	Menu driven operation Self-explained windows User friendly Easy installation via wizard
	Display Modes	Large Digit Screen – displays 9 numerical values Waveform Screen – displays wave shape together with wave form detailed information Harmonics Screen – displays complete harmonic spectrum, including each harmonic details (amplitude, percentage and phase shift).
Software	Upgrading methods	No Jumpers or switches Firmware can be upgraded by communication All parameters are software selectable, and stored in onboard Flash memory Easy, user-friendly firmware upgrade process Optional features can be enabled just by communication
PC Software	PQScada Sapphire Software	Complete System Remote Control Real Time measurements Time-Of-Use and Cost Allocation Harmonic & Waveform graphic and tabular display Comprehensive Data Logging, including triggers and set points Automatic analysis to international Power Quality standards, such as IEEE 519 (Harmonics standard) Easy Report Generation Exporting to word processor (such as Microsoft Word) and spreadsheets (such as Microsoft Excel) User Friendly on-line help, toolbars and hints Internet and Intranet operation Stand-alone or network versions, allowing intra-net and internet connectivity

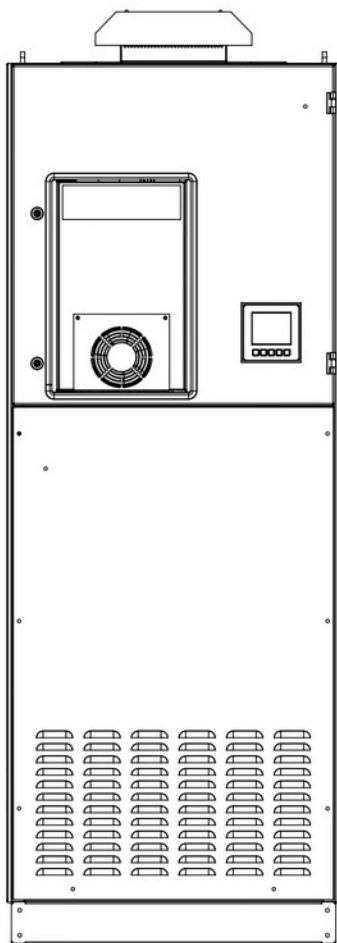
Built in Power Quality Measurement System	Simultaneous measurement of the following sections	<b>Mains</b> (total of load and capacitor system) <b>Load</b> <b>Capacitors</b> (system) <b>Combination of Mains, Load and Capacitors.</b> For example, if reactive energy parameter is selected, the user can see the kVAr consumption by the <b>Load</b> , the connected kVAr by the <b>Capacitor</b> System and the result on the <b>Mains</b> .	
	Calculation method	True RMS measurements (up to 63rd harmonics) Based on FFT algorithm which is carried out cycle by cycle (128 samples per cycle)	
	Measured parameters	Frequency Phase Current Phase to phase Current* Phase Voltage Phase to Phase Voltage Active Power (kW) Reactive Power (kVAr) Apparent Power (kVA) Power Factor *Note: Unique feature: internal current of feeder transformer (delta secondary)	Common N, L1, L2, L3 L1-2, L2-3, L3-1 N, L1, L2, L3 L1-2, L2-3, L3-1 L1, L2, L3, Total L1, L2, L3, Total L1, L2, L3, Total L1, L2, L3, Total
	Thd, harmonic spectrum, and waveform analysis for	3 line current of Mains 3 line-line current of Mains 3 line current of Load 3 line-line current of Load 3 line current of Capacitors 3 Phase to Neutral voltage 3 line Phase to Phase voltages Neutral current Neutral voltage	DELTA, WYE DELTA DELTA, WYE DELTA DELTA, WYE DELTA, WYE WYE WYE WYE
	Energy	Active Energy (kWh) Reactive Energy (kVARh) Stores energy data every 15 minutes for previous	
	Controller Specifications	Power supply	230V, 50/60Hz
Lcd display		Size: 94x76mm Resolution: Graphic 160x128 pixels Type: FSTN, LED backlight	
Frequency		30 to 70 Hz	
Power consumption		10VA	
Operating temperature		-20 to +55°C	
Communications		RS-485 communication port	
Protocol		ELCOM (Elspec's protocol), Modbus/RTU	
Alarm		Voltage free N.O. / N.C., relay, max 250 VAC / 2A	
Protection class		IP 40	
Dimensions		144x144x138mm	
Weight		1.4 kg	
Storage temperature		-25 to +70°C	
Sensors		Three 5A current sensors for Mains/Load currents Two 5A current sensors for capacitors system current Four voltage sensors (up to 500V phase to ground)	
User keys		Five soft touch buttons	
Controller box standard		Electromagnetic compatibility: EN50081-2, EN50082-2, EN55011, EN61000-4-2/3/4/5, ENV50204, ENV50141 Safety standards: EN61010-1, EN50439-1	
Switching Module	Electronic switches	Rated voltage: 2400V/Peak Rated Current: 350Amp	
	Cooling	Temperature controlled, forced air cooling system. Panel mounted Easy for Maintenance External air circulation (air does not pass through the cabinet) Long life, Ball bearings fan	
	Low losses	400V: 0.35% (3.5W/kVAr) 690V: 0.25% (2.0W/kVAr)	

## Typical Applications

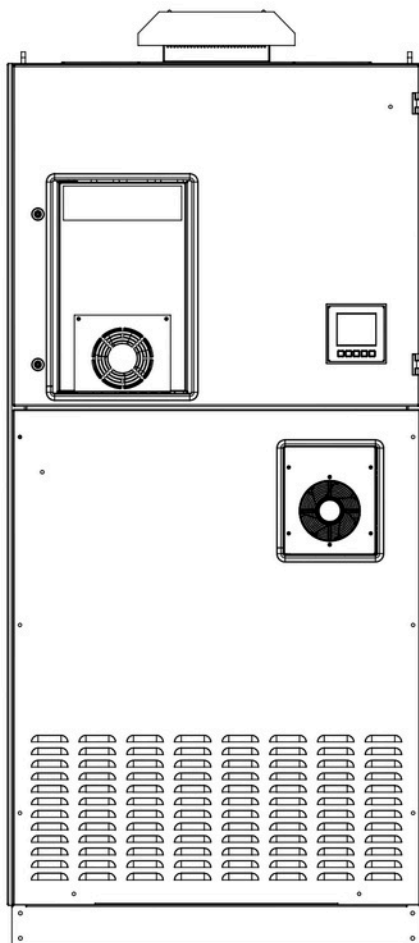
- Solar farms
- Plastic injections
- Welding operations
- Car crushers & shredders
- Healthcare
- Food & beverage
- Port cranes
- Data centers
- Electric trains



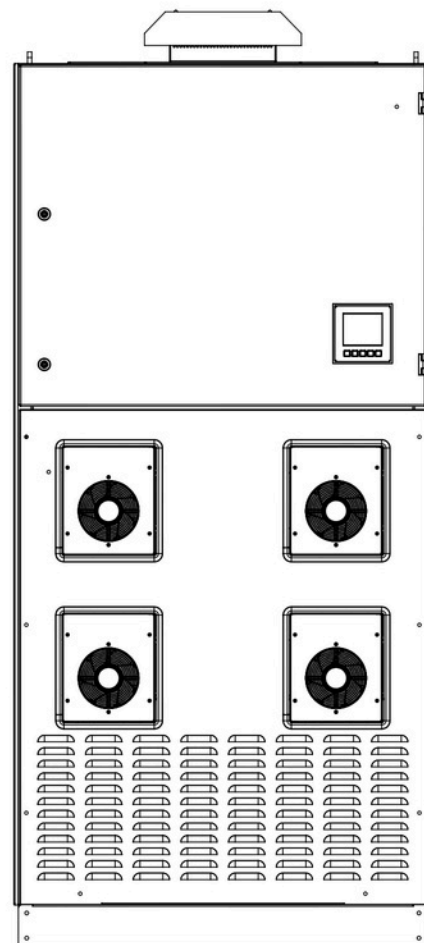
# Mechanical drawings



80X60



100X60



100X80



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Elspec's Official Agent in Denmark  
+45 42 43 21 42 | [info@eluminate.dk](mailto:info@eluminate.dk) | [www.eluminate.dk](http://www.eluminate.dk)  
Eluminate Aps: Smedeholm 13C, 2730 Herlev | VAT: DK 42604895