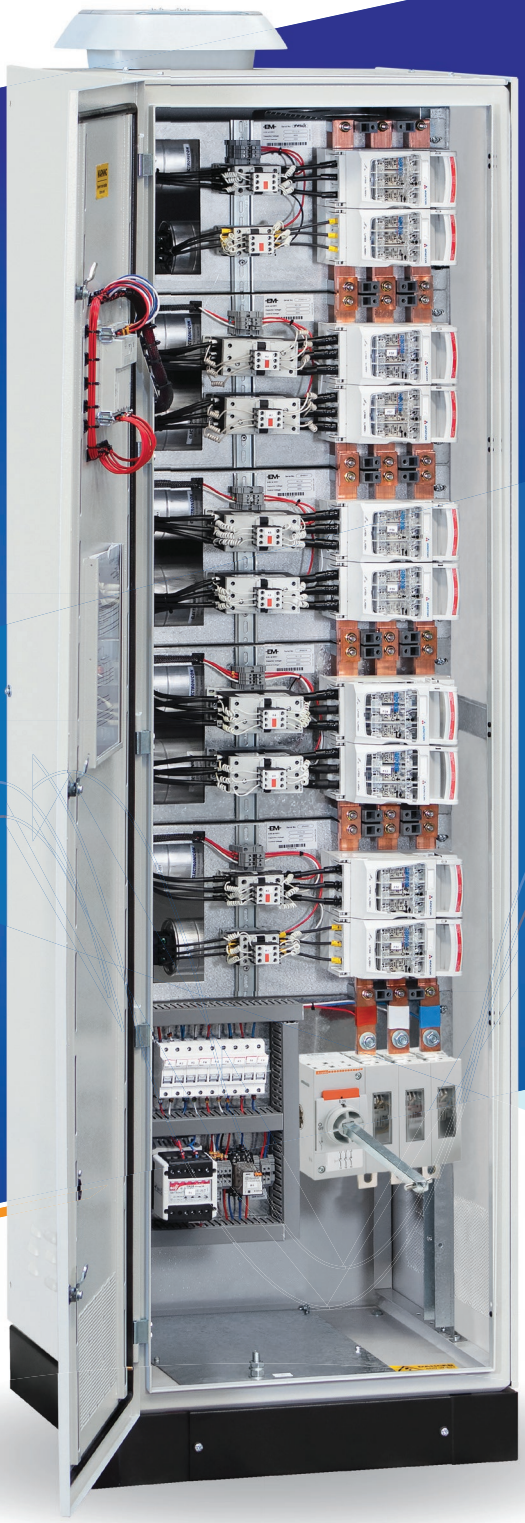
ElectroMechanica

making connections, powering tomorrow

REDUCE ELECTRICITY DEMAND COSTS

Power Factor Correction System



www.em.co.za

INTRODUCTION

What is Power Factor?

Power factor is simply the ratio of “actual” power (active power) being used in a circuit, expressed in kilowatts (kW) to the power which is "apparently" being drawn from the mains, expressed in kilo volt amps (kVA)

To learn more about PF watch our video

Visit www.em.co.za/powerfactor

Electrical supply authorities have changed to kVA demand systems from the inefficient kW demand system. Consumers are now billed and penalised for their inefficient systems according to the apparent power being used. Consumers are now also penalised for plants with power factor below a pre-determined value.

Enhance the quality of your electrical distribution network through the implementation of Power Factor Correction and Power Quality solutions from EM.

For over three decades EM has been providing customers with solutions to increase energy efficiency, reduce maximum demand charges and substantially decease the cost of electricity.

Why you need Power Factor Correction?

Power Factor Correction is a mechanism to reduce operating costs associated with electricity consumption.

Disadvantages of Low Power Factor

- Increases energy cost since more current has to be transmitted, and this cost is directly billed to consumers on maximum demand kVA systems.
- Causes overloaded generators, transformers and distribution lines within a plant, resulting in greater voltage drops and power losses, all representing inefficiency and needless wear and tear on industrial electrical equipment.
- Reduces load handling capability of the plants electrical system.

Power Factor Advantages:

- Reduced kVA charges
- Improved plant efficiency
- Additional loads can be added to the system
- Reduced overloading of cables, transformers, switchgear, etc.
- Improved network voltage
- Improved starting torque of motors
- Reduced fuel requirements to generate power due to lower losses
- Compensates reactive power requirements in cogeneration installations.

Brands that form part of EM Power Factor Solutions:

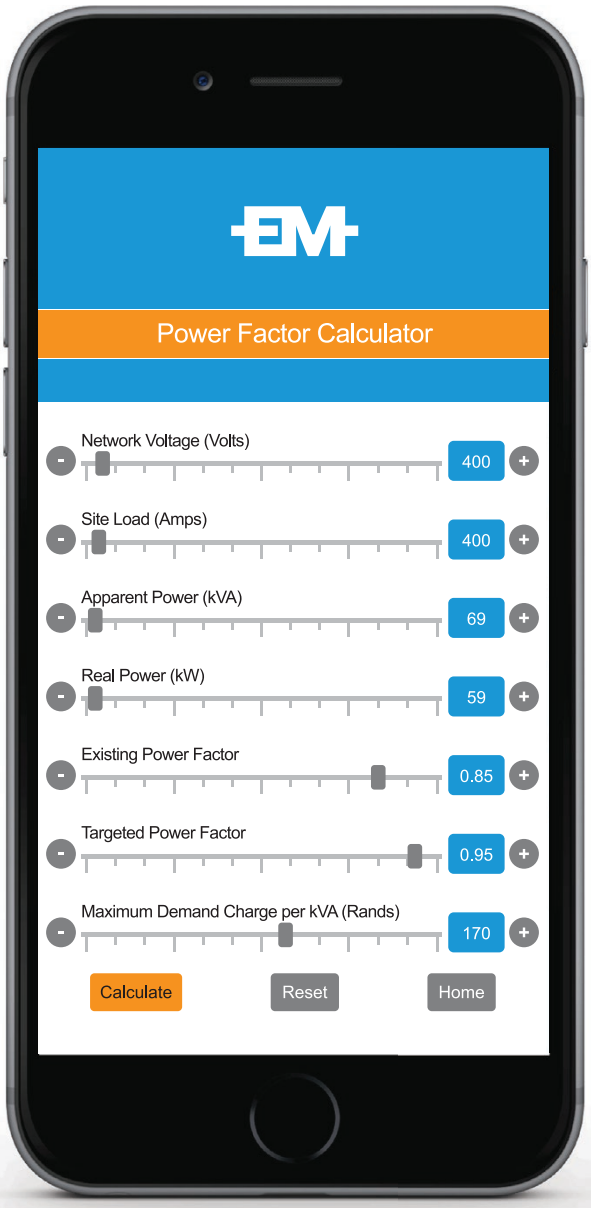
Lovato electric · DELTA · ELECTRONICON · Elecnova · POLAR MONITORING · CHAUVIN ARNOUX GROUP

Power Factor Correction Calculator

The EM Power Factor Correction Calculator estimates your power factor correction requirements and calculates how your business will benefit from using our various solutions.

Try the EM Power Factor Correction Calculator.

Visit our website www.em.co.za/powerfactor



Substantiating Power Factor Correction Costs

This question can best be answered by an example:

Assuming a plant has a total load of 500 kW and a power factor (cosφ) of say 0.73 lagging. A typical supply authorities kVA demand charge is approximately R211.66 per kVA as in the case of Johannesburg (2020).

(kVA tariffs vary between different utility suppliers)

$$\frac{kW}{PF} = kVA : \frac{500\ kW}{0.73} = 685\ kVA$$

685 kVA @ R211.66 per kVA

= R144,987.10

By installing capacitors to improve power factor (cosφ) to 0.98 lagging new costs are;

$$\frac{500\ kW}{0.98} = 510\ kVA$$

510 kVA @ R211.66 per kVA

= R107,946.60

Potential monthly saving with PFC = R37,040.50
KVA Improves by 175 KVA

A complete system required to effect power factor from 0.73 to 0.98 (*as in above example*) would require a system of 375 kVAr which would cost approximately R131,000 (2020)

Power factor correction usually pays for itself well within 12 months of the initial purchase (*less than 5 months in above example*) and continues saving.

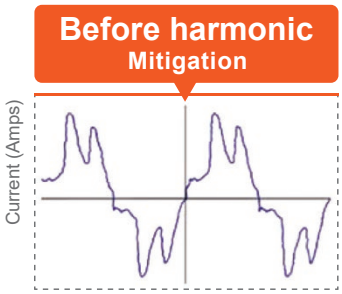
It therefore stands to reason that more significant savings can be anticipated with the ever increasing costs of electricity in the future.

Harmonics

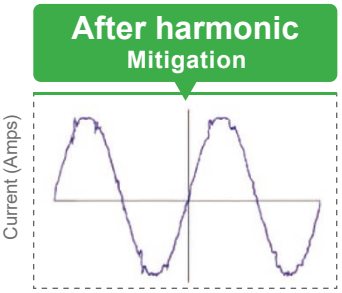
What causes Harmonics?

Normally, power system generators produce a clean sinusoidal voltage waveform at their terminals. A lot of modern electronic equipment generates sinusoidal current into the power system, which causes electrical harmonic pollution.

Modern equipment such as
- Variable Frequency Drives (VSD's)
- Battery Charges
- Switched-mode Power Supplies
- Inverters
- Uninterruptable Power Supplies (UPS's)
- LED lighting



Current oscillogram before filtration



Current oscillogram after filtration

Harmonics Solutions

It is important, therefore, to measure harmonic levels in the network and to install harmonic reactors when harmonics are above acceptable levels.

At EM we offer the following solutions:

- Modular and Floor Standing de-tuned reactor systems.
- Active Power Filter and Static VAR Generator

Power Quality Solutions

Excellent power quality reduces energy loss, extending equipment life and lowers costs. In contrast, poor power quality caused by harmonics distortion, reactive power, or non-linear loads, tends to lower power quality and reliability.

There are **Three Main Contributors** to low voltage and poor power quality problems:

- **Harmonic Pollution**
- **Reactive Power**
- **Load Imbalance**

Our Power Quality solution consists of the Active Power Filter (APF) and Static VAR Generator (SVG). Both provide an active compensation solution based on power electronics technology.

The increase of non-linear and other challenging loads in electrical grids today present unique power quality challenges. **Elecnova's SVG and APF** provides a cost effective, extremely fast solution to power quality problems, enhancing equipment operating life whilst improving overall power system capacity.

Static VAR Generator (SVG)

SVG rapidly and continuously compensate both inductive and capacitive reactive power, and correct load imbalance.

The SVG operates by detecting the load current, analysing the reactive content and then injecting the exact reverse reactive compensating current on an instantaneous real-time basis enabling perfect compensation on each phase for both inductive and capacitive loads.

Active Power Filter (APF)

APF systems for harmonic mitigation, eliminates resonance problems, preventing amplified harmonic current and voltage.

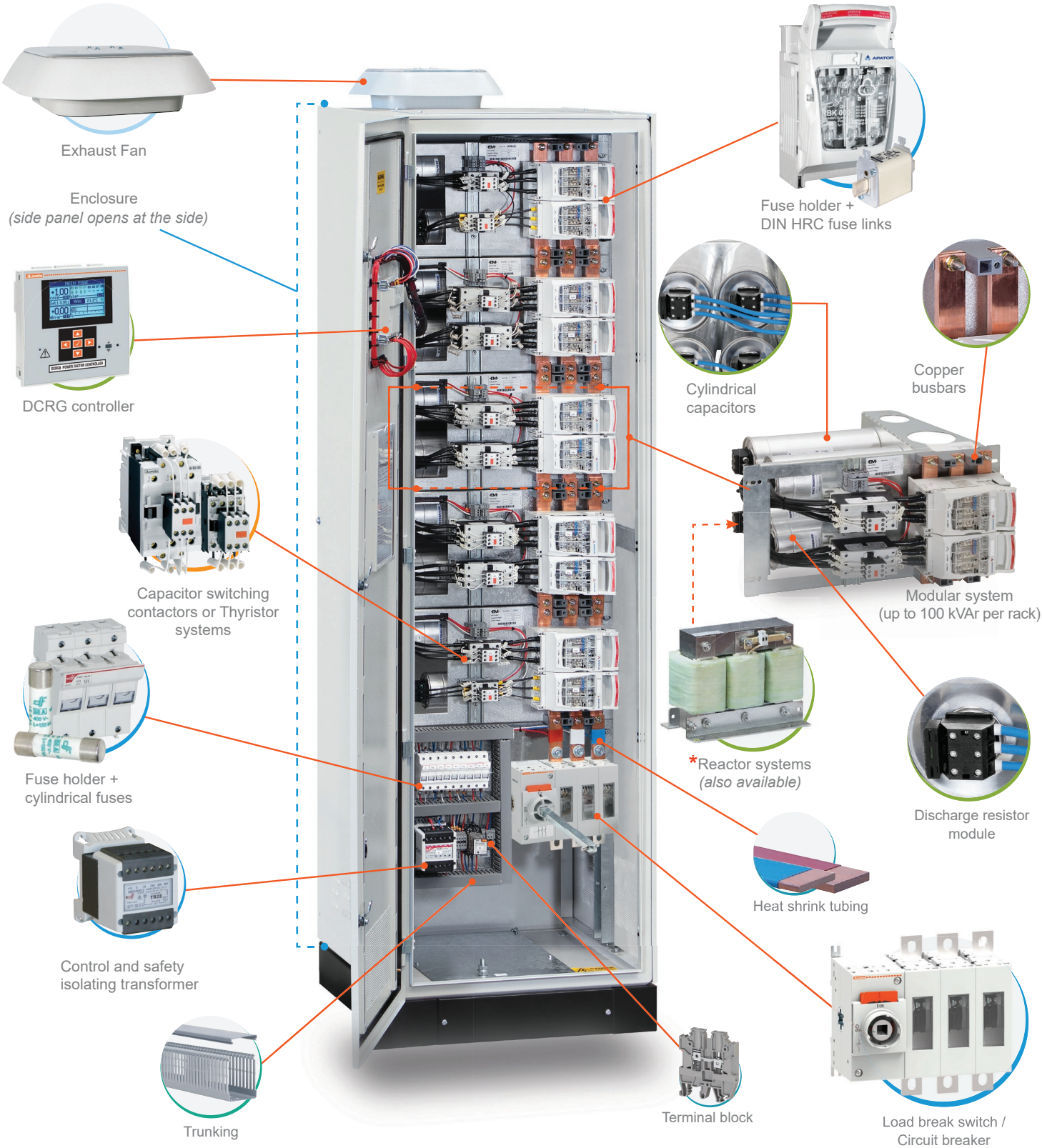
Benefits include:

Reduced maintenance, a considerably longer lifespan, compact size.

Technical Assistance
011 249 5057

Contact us for technical assistance and guidance on system selection.

***Network analyser available for rental or purchase.**



ELECTRONICON®

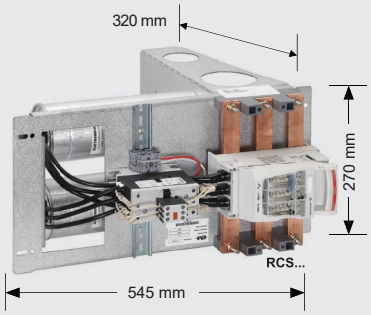
MKPg-275 three-phase power capacitors, dry self-healing dielectric, gas filled (N2) protecting windings from environmental influences extending life expectancy, permitting mounting in any position.

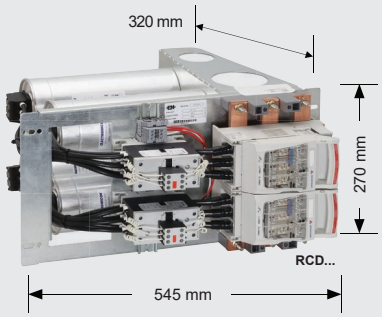
Lovato electric

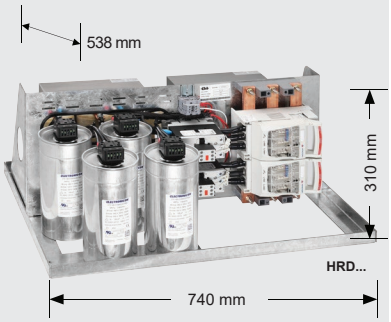
DCRG controllers

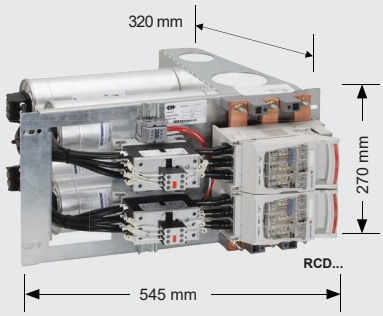
single and three-phase CT connection

- Expansion slots for additional steps and or communication modules
- Advanced programmable I/O functions and user-definable alarms
- Capability to operate with several units interconnected in Master-Slave mode
- Quick CT programming function / Automatic identification of direction of CT current flow









RC series - Power Factor rack system

RC series power factor racks are designed for direct panel mounting onto vertical supports within floor standing electrical panels. RC series rack design incorporates the following:

- Sheet metal mounting frame for easy panel mounting
- Electronicon heavy duty "gas filled" cylindrical capacitors *(with integrated discharge resistors)*
- Special capacitor switching contactors 400 VAC coil *(230V on request)*
- Three-phase busbar mounted fuse holder with hinged fuse protection cover
- Suitably rated HRC fuses per phase of each capacitor bank
- Incorporated busbar, supports and inter-connecting busbar links

type	kvar at:			description	dimensions (mm)		
	400V	440V	480V		(H)	(W)	(D)
RC series - Rack system *(without harmonic reactors)*							
RCS01204	**12.5**	14	17	single step capacitor rack	270	545	320
RCS02504	**25**	28	34	single step capacitor rack	270	545	320
RCS05004	**50**	56	67	single step capacitor rack	270	545	320
RCD02524	**2 x 12.5**	2 x 14	2 x 17	double step capacitor rack	270	545	320
RCD05024	**2 x 25**	2 x 28	2 x 34	double step capacitor rack	270	545	320
RCD10024	**2 x 50**	2 x 56	2 x 68	double step capacitor rack	270	545	320
RCD03734	**12.5+25**	14 + 28	17 + 34	double step capacitor rack	270	545	320
RCD07534	**25 + 50**	28 + 56	34 + 68	double step capacitor rack	270	545	320
HR7 series - Racks (480V capacitors) with 7% de-tuned harmonic capacitor banks							
7% - 189 Hz De-tuned reactors *for networks with 5th and 7th Harmonics*							
HRS013074	**12.5**	14	17	capacitor + 7% reactor rack	310	740	538
HRS025074	**25**	28	34	capacitor + 7% reactor rack	310	740	538
HRS050074	**50**	56	67	capacitor + 7% reactor rack	310	740	538
HRD025274	**2 x 12.5**	2 x 14	2 x 17	capacitor + 7% reactor rack	310	740	538
HRD050274	**2 x 25**	2 x 28	2 x 34	capacitor + 7% reactor rack	310	740	538
HRD100274	**2 x 50**	2 x 56	2 x 68	capacitor + 7% reactor rack	310	740	538
HRD038374	**12.5+25**	14 + 28	17 + 34	capacitor + 7% reactor rack	310	740	538
HRD075374	**25 + 50**	28 + 56	34 + 68	capacitor + 7% reactor rack	310	740	538
HR14 Series - Racks (525V capacitors) with 14% de-tuned harmonic capacitor banks							
14% - 134 Hz De-tuned reactors *for networks with high levels of 3rd Harmonics*							
HRS054144	**50**	56	68	capacitor + 7% reactor rack	310	740	538
HRD025144	**2 x 12.5**	2 x 14	2 x 17	capacitor + 14% reactor rack	310	740	538
HRD050144	**2 x 25**	2 x 28	2 x 34	capacitor + 14% reactor rack	310	740	538
HRD038144	**12.5+25**	14 + 28	17 + 34	capacitor + 14% reactor rack	310	740	538

Double-step racks - 690V capacitors *for use in 400/525/550V networks (230V coil)*							
	400V	525V	**550V**				
RCD64026	2 x 17	2 x 30	**2 x 32**	double step capacitor rack	270	545	320

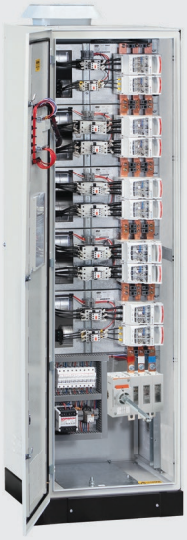
Additional Accessories

Remote Monitoring Devices

For remote monitoring and control of all electrical network parameters *(including harmonics)*, panel internal temperature, alarms, events and all setup parameters.

Software Solutions

Polar Monitoring is a remote control and supervision cloud portal for devices equipped with communication capabilities via serial ports, Ethernet or modem in a simple and reliable way. The supported protocols are Modbus-RTU, Modbus-ASCII and Modbus-TCP.



FMS...

FMS...

FMS series - Power factor Correction (PFC) *(automatic)*
For applications with varying capacitor requirements. An automatic reactive controller monitors the network and only switches capacitor banks when required, avoiding potential over or under compensation in a network.

FMS series - Floor standing systems

Complete ready-to-install system comprising following:

- Suitably ventilated floor standing enclosure *(thermostatically controlled roof mounted exhaust fan)*
- Mains isolator, door interlocking *(with early make/late break auxiliary contact)*
- DCRG 8 high end reactive control relay *(incorporating digital display of all important network parameters)*
- Bottom cable entry *(top entry available on request)*
- RC series racks with heavy duty capacitors, fusegear, capacitor switching contactors and busbar system

Able to monitor all three phase voltage and current to providing accurate indication of:

- Active, Apparent Power as well as Active, Reactive, Apparent Energy monitoring
- Current and Voltage Harmonics analysis *(up to 31st harmonic)*
- Event logging: alarms, setup changes, events etc. *(internal memory stores last 250 events)*
- Internal panel temperature monitoring
- Expandable with up to 4 expansion modules for:

Analog Inputs/Outputs, RS-323, RS-485, Ethernet, *(for optional remote monitoring refer to **Polar Monitoring**)*

type	kvar at:		steps (kvar) at 400V				expands to (kvar)	dimensions (mm)		
	400V	440V	12.5	25	50	100		(H)	(W)	(D)
FMS series - Floor standing complete power factor systems *(480V capacitors)*										
• *Using 480V heavy duty capacitors with RC racks for use in 400V networks*										
400V floor standing complete power factor systems										
FMS13804	**138**	165	1	1	2	–	475	2180	600	630
FMS17504	**175**	210	–	1	3	–	475	2180	600	630
FMS21304	**213**	255	1	2	3	–	475	2180	600	630
FMS23804	**238**	285	1	1	2	1	475	2180	600	630
FMS27504	**275**	330	–	1	3	1	475	2180	600	630
FMS31304	**313**	375	1	2	1	2	475	2180	600	630
FMS33804	**338**	390	1	1	2	2	475	2180	600	630
FMS37504	**375**	450	–	1	3	2	475	2180	600	630
FMS43804	**438**	525	1	1	2	3	475	2180	600	630
FMS47504	**475**	570	–	1	1	4	–	2180	600	630
Double floor standing panels*										
FMS57524*	**575**	690	–	1	1	5	950	2180	1200	630
FMS67524*	**675**	810	–	1	1	6	950	2180	1200	630
FMS77524*	**775**	930	–	1	1	7	950	2180	1200	630
FMS87524*	**875**	1050	–	1	1	8	950	2180	1200	630

FMS series - Floor standing complete PFC systems

- *Using 690V heavy duty capacitors with RC racks for use in 400/525/550V networks*

type	kvar at:			step kvar at 550V		Expands to (kvar)	dimensions (mm)		
	400V	525V	**550V**	32	64		(H)	(W)	(D)
FMS12806	68	120	**128**	2	1	320	2180	600	630
FMS19206	102	180	**192**	2	2	320	2180	600	630
FMS25606	136	240	**256**	2	3	320	2180	600	630
FMS32006	170	300	**320**	2	4	–	2180	600	630
FMS38426*	204	360	**384**	2	5	640	2180	1200	630
FMS44826*	238	420	**448**	2	6	640	2180	1200	630
FMS51226*	272	480	**512**	2	7	640	2180	1200	630
FMS57626*	306	540	**576**	2	8	640	2180	1200	630
FMS64026*	340	600	**640**	2	9	–	2180	1200	630
FMS70426**	374	660	**704**	2	10	960	2180	1800	630
FMS76826**	408	720	**768**	2	11	960	2180	1800	630
FMS83226**	442	780	**832**	2	12	960	2180	1800	630
FMS89626**	476	840	**896**	2	13	960	2180	1800	630
FMS96026**	510	900	**960**	2	14	–	2180	1800	630

Note: *Larger systems are made up with two (*) or three (**) panels each incorporating an individual isolator requiring supply cable to be split between the isolators.*

EM Solutions

We offer a complete range of components and equipment for Power Factor Correction and Power Quality Solutions:

- Single/double step modular racks designed for direct mounting
- Floor standing power factor systems
- PFC systems for 400 - 525V voltage networks
- Wall mount power factor systems
- Rack for floor standing systems with or without anti-harmonic de-tuned reactors
- Active Power Filters (APF)
- Static Var Generator (SVG)
- Fast switching thyristor based systems

DCRG 8 (Door Mount)

FHS...

FHS series - Floor standing power factor systems *(with anti-harmonic de-tuned capacitor banks)*

- For networks with THDU ≤6% and/or THDI ≤40%

Growing use of power electronic devices such as: variable speed drives, inverters, UPS systems, battery chargers, LED lighting etc. is causing increasing levels of harmonic distortion in electrical networks, often leading to problems with capacitor installations.

Installation of detuned *(reactor-connected)* capacitors designed to force the resonant frequency of the network below the frequency of the lowest harmonic present *(usually the 5th)* thereby ensuring no resonant circuit or amplification of harmonic currents. Such an installation also has a partial filtering effect, reducing the level of voltage distortion on the supply.

Detuned capacitors are safer than non-detuned capacitors and future-proof for conditions of more and more deteriorating power quality in modern mains.

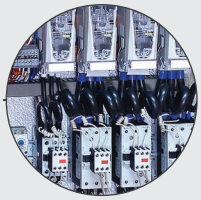
Complete ready-to-connect floor standing power factor system comprising:

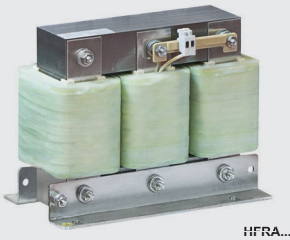
- Suitably ventilated floor standing enclosure with roof mounted exhaust fan
- Mains isolator, door interlocking *(with early make/late break auxiliary contact)*
- HR heavy duty racks comprising: capacitors, reactors, switchgear, fusegear and busbars
- High end reactive control relay DCRG 8 *(incorporating digital display of all important network parameters)*
  Configurable to monitor three voltage and current phases and provide accurate indication of:
  - Active, Apparent power as well as Active, Reactive, Apparent Energy monitoring
  - Current and Voltage Harmonics analysis *(up to 31st harmonic)*
  - Calendar-clock with backup reserve power
  - Event logging: alarms, setup, changes, ect. *(internal memory stores last 250 events)*
  - Internal panel temperature monitoring
- Expandable with up to 4 expansion modules for:
  Additional steps, Analog I/O's, RS-323, RS-485, Ethernet, *(for optional remote monitoring refer to **Polar Monitoring**)*

type	kvar at:		steps (kvar) at 400V				expands to (kvar)	dimensions (mm)		
	400V	440V	13.5	27	54	108		(H)	(W)	(D)
Anti-harmonic systems *incorporating 7% de-tuned capacitor banks (480V capacitors)*										
• 7% - 189 Hz De-tuned reactorsfor 400V networks with a high level of 5th and 7th Harmonic										
FHS138074	**138**	165	1	1	2	–	375	2280	900	600
FHS175074	**175**	210	–	1	3	–	375	2280	900	600
FHS213074	**213**	255	1	2	3	–	375	2280	900	600
FHS238074	**238**	285	1	1	2	1	375	2280	900	600
FHS275074	**275**	330	–	1	1	2	375	2280	900	600
FHS313074	**313**	375	1	2	1	2	375	2280	900	600
FHS338074	**338**	405	1	1	2	2	375	2280	900	600
FHS375074	**375**	450	–	1	1	3	–	2280	900	600
FHS438074*	**438**	525	1	1	2	3	775	2280	1800	600
FHS475074*	**475**	570	–	1	1	4	775	2280	1800	600
FHS538074*	**538**	645	1	1	2	4	775	2280	1800	600
FHS575074*	**575**	690	–	1	1	5	775	2280	1800	600
FHS638074*	**638**	765	1	1	2	5	775	2280	1800	600
FHS675074*	**675**	810	–	1	1	6	775	2280	1800	600
FHS738074*	**738**	885	1	1	2	6	775	2280	1800	600
FHS775074*	**775**	930	–	1	1	7	–	2280	1800	600
FHS838074**	**838**	1005	1	1	2	7	975	2280	2700	600
FHS875074**	**875**	1050	–	1	1	8	975	2280	2700	600
FHS975074**	**975**	1170	–	1	1	9	–	2280	2700	600
Anti-harmonic systems *incorporating 14% de-tuned capacitor banks (525V capacitors)*										
• 14% - 134 Hz De-tuned reactorsfor 400V networks with a high level of 3rd Harmonic										
FHS138144	**138**	165	1	1	2	–	203	2280	900	600
FHS150144	**150**	180	–	2	2	–	203	2280	900	600
FHS200144	**200**	240	–	2	3	–	–	2280	900	600
FHS238144*	**238**	285	1	1	4	–	432	2280	1800	600
FHS288144*	**288**	345	1	1	5	–	432	2280	1800	600
FHS300144*	**300**	360	–	2	5	–	432	2280	1800	600
FHS350144*	**350**	420	–	2	6	–	432	2280	1800	600
FHS400144*	**400**	480	–	2	7	–	–	2280	1800	600
FHS450144**	**450**	540	–	2	8	–	648	2280	2700	600
FHS500144**	**500**	600	–	2	9	–	648	2280	2700	600
FHS550144**	**550**	660	–	2	10	–	648	2280	2700	600
FHS600144**	**600**	720	–	2	11	–	648	2280	2700	600

Note: *Larger systems are made up with two (*) or three (**) panels each incorporating an individual isolator requiring supply cable to be split between the isolators.*


WMS...




HFRA...

EXP1011

PM-GW-LTE

WMS series - Wall mount power factor systems *(automatic)* 400/440V

For applications with varying capacitor requirements. An automatic reactive controller monitors the network and only switches capacitor banks when required, avoiding potential over or under compensation in a network.

WMS series - Wall mount power factor systems (37 - 150 kvar - 400V)

Complete ready-to-install system comprising the following:

- Reverse-flow fan ventilated wall mount enclosure, bottom cable entry (top entry on request)
- Mains isolator, door interlocking (with early make / late break auxiliary)
- Heavy duty three phase capacitors (with internal discharge resistors)
- Reactive control relay **DCRL 5** (digital display of all important electrical network parameters)
- "Special" capacitor switching contactors incorporating limiting resistors
- HRC fuse protection (per capacitor bank)

WMS series - Wall mount complete power factor systems *(440V capacitors)*

type	kvar at:		steps (kvar) at 400V			expands to (kvar)	dimensions (mm)		
	400V	440V	12.5	25	50		(H)	(W)	(D)
WMS03704	**37.5**	45	1	1	–	87.5	950	700	270
WMS05004	**50.0**	60	2	1	–	87.5	950	700	270
WMS06204	**62.5**	75	1	2	–	87.5	950	700	270
WMS07504	**75.0**	90	2	2	–	87.5	950	700	270
WMS08704	**87.5**	105	1	3	–	–	950	700	270
WMS10004	**100.0**	120	2	1	1	150	950	700	270
WMS11204	**112.5**	135	1	2	1	150	950	700	270
WMS12504	**125.0**	150	2	2	1	150	950	700	270
WMS13704	**137.5**	165	1	1	2	150	950	700	270
WMS15004	**150.0**	180	–	2	2	–	950	700	270

De-tuned anti-harmonic reactors 400V, 50Hz

De-tuned reactors protect capacitors against harmonics, avoiding parallel resonance and amplification of harmonics flowing within the network.

- Insulation: F class insulation, 155°C
- Internal protection: Thermal cutout (125°C) incorporated (on centre phase)
- Reference standards: IEC/EN 60076-6, 61558-2-20

type	kvar at:		%	description	dimensions (mm)		
	400V	440V			(H)	(W)	(D)
7% - 189 Hz De-tuned reactors *for networks with 5th and 7th Harmonics*							
HFRA1207	**12.5**	15	7%	anti-harmonic reactors	215	210	120
HFRA2507	**25.0**	30	7%	anti-harmonic reactors	190	240	170
HFRA5007	**50.0**	60	7%	anti-harmonic reactors	240	300	180
14% - 134 Hz De-tuned reactors *for networks with high levels of 3rd Harmonics*							
HFRA1314	**13.5**	16	14%	anti-harmonic reactors	280	240	150
HFRA2714	**27.0**	32	14%	anti-harmonic reactors	250	330	220
HFRA5414	**54.0**	64	14%	anti-harmonic reactors	270	340	220

Communication modules for PFC systems

For remote monitoring and control of all electrical network parameters including harmonics, panel internal temperature, alarms, events and all setup parameters.

Communication modules simply plug-in to the controller and are automatically configured to offer various communication protocols.

EXP1011	opto-isolated	RS-232 plug-in communication	expansion module
EXP1012	opto-isolated	RS-485 plug-in communication	expansion module
EXP1013	opto-isolated	Ethernet with web server function	expansion module
EXP1014	opto-isolated	Profibus-DP plug-in communication	expansion module

Remote monitoring solutions for PFC systems

Polar Monitoring offers remote monitoring systems that enable (RS-485) devices to be securely viewed from anywhere via its comprehensive cloud platform. This provide an ideal solution to monitor generator controllers and Power Factor Correction systems.

General features:

- Remote programming, monitoring, trending
- Alerts and notifications *(SMS and email)*
- Error codes and reporting
- Multiple user access rights
- Device agnostic *(Supports multiple types of devices and applications in one platform)*

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type	supply voltage	network connection	connector type	description
PM-GW-LTE	9...36 VDC	2G/LTE	terminal	LTE - Gateway *(within South Africa)*

1000V CAT IV | IP 54 | 3 YEAR WARRANTY

P01157151

P01157150

P01157151 + P01102134

P01120580

Chauvin Arnoux - PEL103 Power & Energy Loggers *IP54 casing*

Portable, advanced yet simple to use Power and Energy logger, designed for energy audits (ISO 50001 standard) or one-off measurements of the Power and Energy values in low-voltage electrical networks (1000 V CAT III)

PEL100 series Power and Energy loggers provide a complete solution to measuring and identifying energy consumption in any industry, they can be used handsfree, remotely without interruption to the mains power. The logger tracks even the slightest consumption in an electrical network, providing all Power and Energy measurement recording on the internal 2GB SD card, while simultaneously permitting real-time monitoring on its backlit 4 line LCD display. Recordings are time/date stamped for ease of comparing measured gains achieved before and after installation modification. Easily transfer recorded data to a PC via the free PEL data transfer software and SD card with USB adaptor *(included)*.
Designed to fit inside most electrical cabinets thanks to its magnetic base or hook for easy mounting.

Key Features of the PEL103 include:

Measurements and display of:

- RMS frequency, voltage and current measurements
- Voltage measurement ranges 10 to 1000V AC/DC +/- 0.2 % + 0.5 V
- Current measurement ranges 5 mA to 10 kA AC / 50 mA to 1,4 kA DC ±0.5 %
- VA, W and var power values
- Power Factor (PF), cos φ, tan ϕ and crest factor
- Total Harmonic Distortion (THD) for currents and voltages
- DC, 50 Hz, 60 Hz and 400 Hz measurements
- Phase rotation indication and MIN/MAX indication of all parameters
- VAh, Wh (source, load) and varh (4 quadrant) energy values, total energy
- Harmonics: up to the 50th order for currents and voltages *(an essential feature to help identify problems)*

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- **Network types include:** Three phase *(with or without neutral)*, split phase, single phase
- **Automatic recognition:** Of the type of sensor connected
- **Communication / Data transfer:** USB, Ethernet and Bluetooth / PEL transfer PC software *(included)*
- **Records:** Measurements and calculation results on SD card *(included)*
- **Acquisition rate:** 128s/period

PEL 103 Power and Energy logger (KIT) *(created as a complete kit with following accessories)*

1 x PEL103 Power and Energy Logger:	Analyser with backlit LCD screen
3 x MA193 (200 mm) flexible current clamps:	MINIFLEX MA193 flexible current sensors - 200mA to 10 kA
4 x Measurement leads and crocodile clips:	Robust high quality test leads for frequent use/built to last
1 x Set of coloured rings and Inserts:	For easy identification of connections and leads
1 x 2GB SD card (internal):	SD card to USB adaptor

SD card to USB adapter, USB cable, mains cable, MultiFIX mounting system, operating manual (on CD)
PEL transfer PC software enabling data to be transferred to PC, all in a convenient canvas carrying bag.

type	model	description	dimensions (mm) (H)	(W)	(D)
PEL 103 Power and Energy logger (KIT)					
P01157151	PEL103 **(KIT)**	portable power and energy logger/analyser	256	125	37
P01157150	PEL102 **(KIT)**	as above, but without LCD display screen	256	125	37
Accessories for PEL103 Power and Energy logger					
P01120434B	MN 93A	compact tong clamps for PEL102/3	Ø20 mm 0.005 - 100A		
P01120323B	C193	compact tong clamps for PEL102/3	Ø52 mm 1 - 1000A		
P01120580*	MA193-250	Ampflex 250 mm flexible current sensor	Ø70 mm 200mA - 10kA		
P01120526B	A193-450	Ampflex 450 mm flexible current sensor	Ø140 mm 100mA - 10kA		
P01101959	CA833X-F	for reading from 5A secondary CT's	5A adaptor		
P01102134	self-powered	mains adaptor for self powering PEL from supply	mains adaptor		
P01295174*	mains lead	mains power cable - (2P EUR)			
P01295476*	test leads	spare measurement leads (3m) with crocodile clips	KIT *(black)*		
P01102080*	set	ID rings and inserts *(for ends of leads and sensors)*	diff. colours		
P01298078*	bag no.23	canvas carrying bag for PEL analyser and access			

* *Items supplied with standard **PEL KIT**.*

Data processing software *power quality & installation supervision*

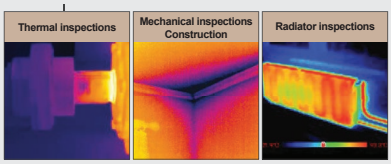
Automatically recognizes the instrument connected to the PC and opens the corresponding menu, providing direct access to the configuration and saved data. Includes many predefined report templates for quick generation in compliance with applicable standards.
Users can create personalised models to fit their requirements and add comments directly.

- Configuration of all the functions of instruments connected to a PC or via Bluetooth
- Recovery of the recorded measurement data and backup of measurement files
- Opening of saved files / processing and creation of reports (EN50160)
- Export into an Excel spreadsheet or PDF format / Database management

P01102095 DataView powerful configuration/transfer/measurement data processing software

1000V CAT IV | IP 54 | 3 YEAR WARRANTY

P01651904



DIACAM 2 series - Thermal Camera

DIACAM 2 is a high performance thermal camera making it simple to perform thermal inspections for energy audits, ensuring trouble-free industrial, electrical or mechanical maintenance.

The wide 2.8-inch screen with auto brightness adjustment provides comfortable reading with a field of view of 38° x 28° and the camera is focus-free. A built-in sliding cover protects the highly sensitive lens.
Contextual help guides users step-by-step, limiting the risk of errors. Particularly rugged, with IP54 ingress protection, the camera can withstand falls from 2 metres.

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Features:

- Exceptional 9-hour continuous use
- Recovery of data from other measuring instruments (current, humidity, dew point, etc.)
- Recording and storage in memory of the configurations for each application
- Allows you to record voice comments directly on the image
- Comfortable grip, perfect balance with direct access to all functions with just one hand

Temperature Measurement

Temperature range:	-20 °C to +250 °C
Accuracy:	±2 °C or ± 2 % of reading

Image Performance

Field of view:	38° x 38°
IFOV (spatial resolution):	4.1 mrad
Focus:	Fixed
Minimum focal distance:	30 cm
Display mode:	Thermal image, real image with automatic parallax compensation *(merging of both images possible with PC software)*

Delivered with:
Delivered with: C.A 1954 thermal camera in a site-proof case with 4 NiMH batteries and charger, micro SD HC card, USB cable, Bluetooth earpiece, specimen measurement report, CAm Report® software on CD-Rom and user's manual.

Analytical functions

Measuring tools:	Manual cursor + automatic detection + Min Max Avg on adjustable area + temperature profile + isotherm
Parameter settings:	Emissivity, environmental temperature, distance, relative humidity
Vocal comments:	Yes via Bluetooth *(earphones provided)*
Data storage:	On 2 GB micro SD card *(approx. 4000 images)* replaceable up to 32 GB
Image format:	PNG *(320 x 240 pixels)* - thermal and real images recorded simultaneously
Laser pointer:	Yes

Thermal Camera - DIACAM 2 *(IP54)*

type	model	description	dimensions (mm) (H)	(W)	(D)
P01651904	**C.A 1954**	high performance thermal camera	225	125	83

P01120947

Digital Power and harmonics clamp multimeter

General-purpose professional clamp-on measuring instrument with True RMS measurement accuracy, reliable an particularly resistant to falls.

Current 1000 A, Voltage 1000 V, power, harmonics and recorder

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Clamping diameter:		**Ø48 mm**
Display:		Large triple 10 000 count, backlit screen
Amp (RMS)	AC	150mA to 1000 A - 1%
	DC, AC+DC	150mA to 1500 A - 1%
Volt AC (RMS)	AC	100 mV to 1000 V - 1%
Volt DC	DC, AC+DC	100 mV to 1000 V - 1%
Automatic AC/DC detection:		Yes (V and A)
Resistance measurement:		100kΩ (continuity buzzer)
Audible continuity:		Yes (<40 Ω)
Frequency:		15Hz to 20kHz
PF and cos φ (DPF):		Yes
Power:		W, VA, var Yes - single-phase and total three-phase
Total Harmonic Distortion:		THDf % / THDr %
Harmonic decomposition:		Yes - up to 25th order
Crest factor (CF) / Motor InRush:		Yes
Current surge (True InRush):		Yes
"Min Max" / Peak function:		Yes / Yes
Auto power off / "Hold" function:		Yes
PC / Bluetooth interface:		Yes
Data logging:		Yes
REC storage function:		Yes - (up to 3000 measurements)
Electrical safety as per:		IEC 61010 CAT IV 1000V, CAT III 1000 V

Delivered with:
Multifix shoulder bag, Power Analyser Transfer (PAT) software, 2 voltage leads (red/black), 2 test probes (red/black), 2 crocodile clips (red/black), 4x 1.5 V AA alkaline batteries, operating manual.

Power and harmonics clamp multimeter *(IP54)*

type	model	description
P01120947	**F407**	digital clamp multimeter/tong tester for all applications

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