



HAVELLS



POWER SOLUTION & COMPONENTS

- Load Flow & Harmonic Analysis
- Harmonic Duty Power Capacitor
- IOT Enabled IPFC Relay
- HD Harmonic Detuned Reactor
- APFC Panel (Thyristorised / Contactor)
- Thyristor Switches
- SVG & Active Harmonic Filter
- Hybrid PQ Manager
- Broad Band Passive Filter
- Crusher Duty Capacitor
- MV Capacitor
- MFD Capacitor



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Havells India Limited is a leading Fast Moving Electrical Goods (FMEG) Company and a major power distribution equipment manufacturer with a strong global presence. Havells enjoys enviable market dominance across a wide spectrum of products, including Industrial & Domestic Circuit Protection Devices, Cables & Wires, Motors, Fans, Modular Switches, Home Appliances, Air Conditioners, Electric Water Heaters, Power Capacitors, CFL Lamps, Luminaires for Domestic, Commercial and Industrial Applications.

Today, Havells India Limited owns some of the most prestigious brands like Havells, Lloyd, Crabtree and Standard. Its network constitutes of 6500 professionals, over 7650 dealers and 40 branches in the country. Our products are available in over 50 countries. The company has twelve state-of-the-art manufacturing plants in India located at Haridwar, Baddi, Sahibabad, Faridabad, Assam, Alwar and Neemrana, manufacturing globally acclaimed products, synonymous with excellence and precision in the electrical industry.



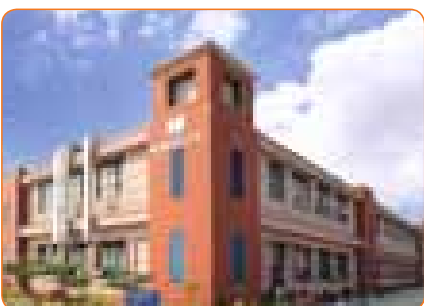
Sahibabad



Faridabad



Baddi



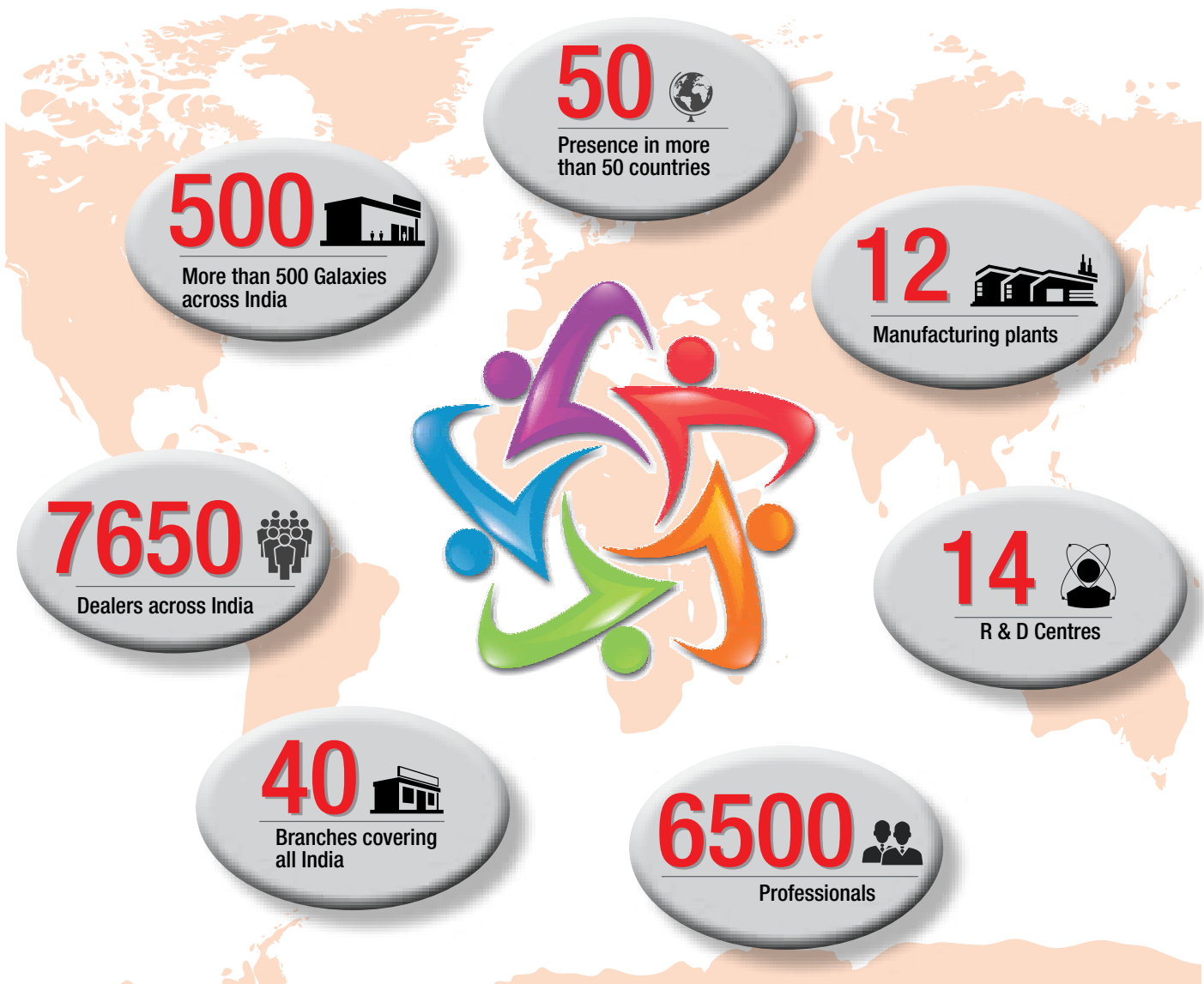
Haridwar

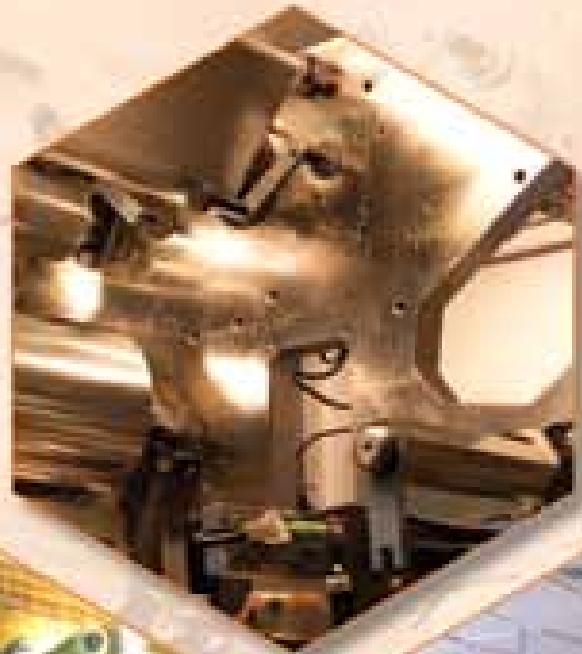


Alwar



Neemrana





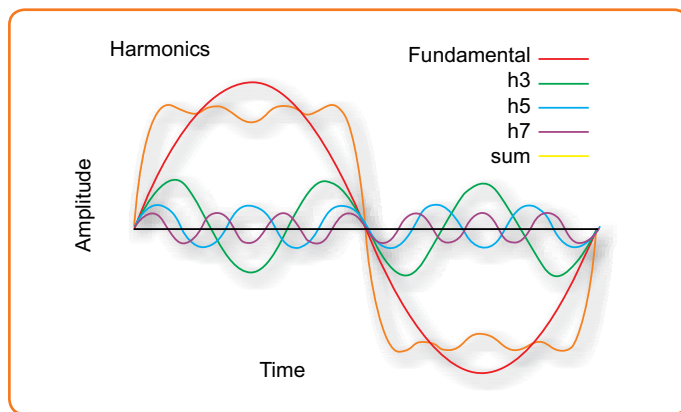
**Swiss
Technology**



Load Flow & Harmonic Analysis

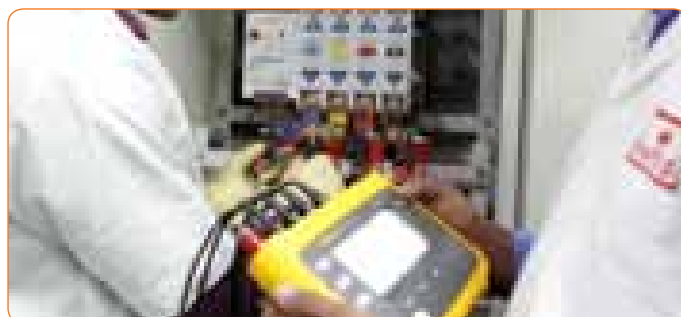
What is Harmonics?

Harmonics are multiple frequency of current apart from fundamental, which are the request of non-linear load.

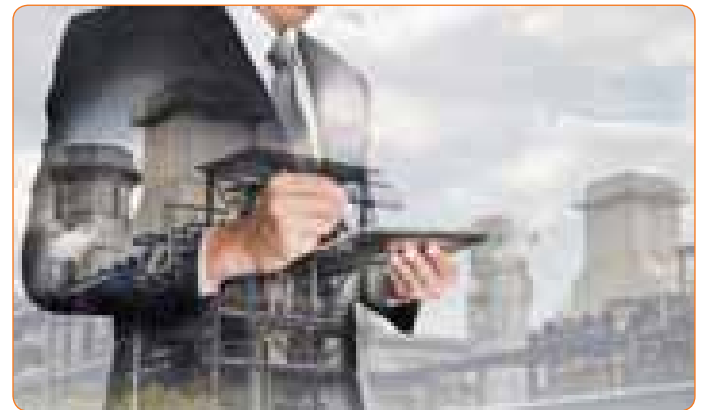


Benefits of Harmonics Analysis & its Solutions:

- Root cause analysis of Power Quality related issues
- Improve True Power Factor
- Reduce kVA Demand
- Reduce kVArh
- Reduce Energy Losses
- Reduce Harmonics
- Eliminate Spurious operation of protection System
- Eliminate Erratic operation of Control Systems
- Stable Operation of Plant in Island as well as Grid connected mode
- Ensure accurate operation of metering systems
- Reduce equipment failures
- Reduce Downtime
- Increase productivity



Harmonics Analysis – Havells Expert Approach



Few critical parameters which should be captured as per their relevant standards for proper solutions:

REFERENCE STANDARD	PARAMETERS
IEEE 519	Current Harmonics
IEEE 519	Voltage Harmonics
EN 50160	Load Unbalance
EN 610002-12	Supply Voltage Unbalance
EN 610006-1 & 6-2	Transient Over Voltage
EN 50160. EN 50160	Long Interruption of Supply Voltage
EN 610006-1 & 6-2	Short Interruption of Supply Voltage
EN 50160 EN 610006-1-2	Voltage Swells/Voltage Dips
EN 50160	Voltage Magnitude Variations
EN 50160	Frequency



Consulting, Optimizing & Delivering Performance



Right solution is the KEY



IEEE 519-2014 Guidelines for Harmonics Limits

Recommended Voltage Harmonics Limits:

Table 1 - Voltage distortion limits

Bus Voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
$V < 1.0 \text{ kV}$	5.0	8.0
$1 \text{ kV} < V \leq 69 \text{ kV}$	3.0	5.0
$69 \text{ kV} < V \leq 161 \text{ kV}$	1.5	2.5
$161 \text{ kV} < V$	1.0	1.5

* High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

Recommended Current Harmonics Limits:

Table 2 - Current distortion limits for systems rated 120 V through 69 kV

I_{sc}/I_L	Maximum harmonic current distortion in percent of I_L					
	Individual harmonic order (odd harmonics) ^{a, b}					
	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
< 20	4.0	2.0	1.5	0.6	0.3	5.0
$20 < 50$	7.0	3.5	2.5	1.0	0.5	8.0
$50 < 100$	10.0	4.5	4.0	1.5	0.7	12.0
$100 < 1000$	12.0	5.5	5.0	2.0	1.0	15.0
> 1000	15.0	7.0	6.0	2.5	1.4	20.0

Havells End to End Solution



LT MPP Harmonic Duty Cylindrical Power Capacitor



Range:

- 0.5 kVAr to 50 kVAr
- 220 Vac to 1000 Vac
- Soft Sticky Resin / Gas Filled
- IS: 13340 / IEC: 60831

Features:

- High inrush current withstand capability.
- Soft sticky resin to withstand high temperature.
- Special imported metallised hazy film profile to withstand high voltage and current stress.
- Penta safety protection (Self healing, internal notch mechanism & over pressure disconnecter, safety cover, high grade resin).
- Explosion proof, low losses & high over current withstand capabilities.

Swiss
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(Splendid Duty)
0.5 kVAr - 50 kVAr
220 Vac - 1000 Vac



(Heavy Duty Plus)
0.5 kVAr - 50 kVAr
220 Vac - 1000 Vac



(Super Heavy Duty Plus)
0.5 kVAr - 50 kVAr
220 Vac - 1000 Vac



SHD - Gas Filled
0.5 kVAr - 50 kVAr
220 Vac - 1000 Vac



Agri Boost
(Normal Duty)
1 kVAr - 15 kVAr
220 Vac - 525 Vac

Parameters	Splendid Duty	HD Plus	SHD Plus	SHD	Agri Boost
Type	MPP	MPP	MPP	MPP-Gas	MPP
Over Current withstand capacity upto	1.6 X Ir	2.2 Ir	3.0 X Ir	2.6 X Ir	1.3 X Ir
Peak Inrush Current Withstand Capacity	250 times	350 times	500 times	325 times	200 times
Losses	0.2 W / kVAr	0.2 W / kVAr	0.2 W / kVAr	0.2 W / kVAr	0.2 W / kVAr
No of switching per year	35000	52500	80000	60000	25000
Max Ambient Temp (°C)	55	60	65	60	55
Operating life in hours	120000	215000	300000	180000	80000

LT MPP / APP / Mixed Dielectric Harmonic Duty Square Power Capacitor



Range:

- 0.5 kVAr to 100 kVAr
- 220 Vac to 1000 Vac
- MPP / APP / Mixed Dielectric
- IS: 13340 / IEC: 60831 & IS: 13585 / IEC: 60931

Features:

- High inrush current withstand capability.
- Inbuilt high grade copper air core inductor for high inrush current suppression.
- Soft sticky resin to withstand high temperature.
- Special imported metallised hezy film profile to withstand high voltage and current stress.
- Wall mounting facility (for square cap capacitor)
- High grade oil impregnation
- Tripple safety protection (Self healing, internal notch mechanism & over pressure disconnecter)
- Explosion proof, low losses & high over current withstand capabilities.



(Splendid Duty)
Range
0.5 kVAr - 100 kVAr
220 Vac - 1000 Vac

Splendid Duty

MPP

1.6 X Ir

250 times

0.2 W / kVAr

35000

55

120000



(Heavy Duty)
Range
0.5 kVAr - 100 kVAr
220 Vac - 1000 Vac

Heavy Duty

MPP

2.4 Ir

350 times

0.2 W / kVAr

50000

60

200000



(Super Heavy Duty)
Range
0.5 kVAr - 100 kVAr
220 Vac - 1000 Vac

Super Heavy Duty

MPP

3.2 X Ir

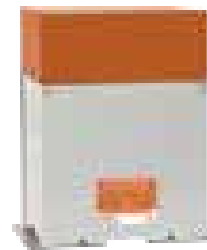
500 times

0.2 W / kVAr

65000

65

250000



UHDXL
(Ultra Heavy Duty) APP
1 kVAr - 100 kVAr
220 Vac - 1000 Vac

Ultra Heavy Duty

APP

4.0 X Ir

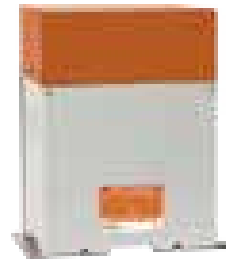
525 times

0.2 W / kVAr

125000

70

325000



UXDXL
Mixed Dielectric
1 kVAr - 100 kVAr
220 Vac - 1000 Vac

Ultra Heavy Duty

Mixed Dielectric

5.0 X Ir

550 times

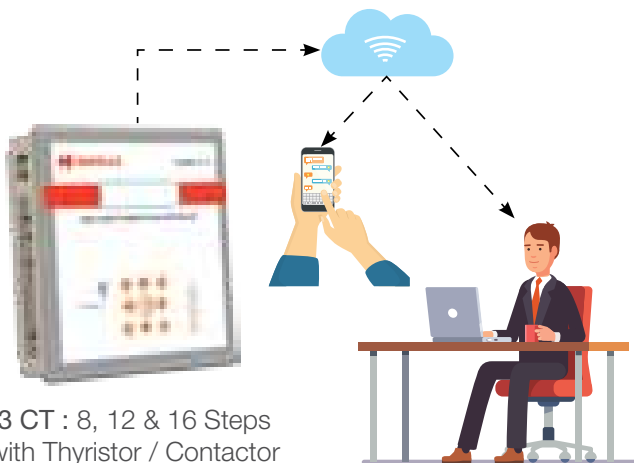
0.2 W / kVAr

135000

75

400000

Intelligent Power Factor Controller



3 CT : 8, 12 & 16 Steps
with Thyristor / Contactor
Switching with GSM

Advance kVAr Sensing Technology

Range:

- 4, 6, 8, 12, 14 & 16 steps
- Size 96 mm X 96 mm and 144 mm X 144 mm
- Single CT & Three CT sensing APFC Relay
- Contactor Switching
- Thyristor switching
- LED & LCD Display.
- IEC: 61010-1

Features:

- Wide band of Auxiliary supply 90 Vac - 550 Vac
- Temper proof
- Plug & Play with Auto programming
- Dual Password protection
- Dual Source PF Relay (E.B./DG)
- IOT enabled with Data logging facility
- 4 digit display (0.xxx) PF
- Automatic CT Polarity Detection
- Advanced 32-bit Micro-controller based logic
- NTC Temperature sensor
- Communication interface through Wi-fi, RS 485, GSM & Modbus RTU

**Zero
Programming
Temper Proof &
IOT Enabled**



HD Harmonic Detuned Reactor



Range:

- Copper / Aluminum
- 1 kVAr to 100 kVAr
- 5.67%, 7% & 14% filtering factor
- 185% to 225% Linearity
- IS: 5553 / IEC: 61558

Features:

- High linearity 185% to 225%
- Insulation Class H
- High harmonic loading capability
- Temperature protection-NC contact (UL approved)
- Long expected life time
- Low noise
- Very low losses
- Convenient mounting
- IEC-61558

Applications:

- Reduction of harmonic distortion (network clearing)
- Avoidance of resonance conditions
- Tuned and De-tuned harmonic filters
- Reduction of power losses



APFCS - Automatic Power Factor Correction System

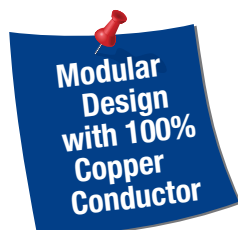


Range:

- 10 kVAr - 1000 kVAr
- Switching: Contactor / Thyristorised (Ultra Fast)

Features:

- Ref. Standard: IEC 61921/IS 8623/IS 16636 / IEC 61439
- Manufactured with highly precise modern Amada CNC machine.
- 11 tank process for corrosion proof powder coating.
- Ergonomic, compact and robust design.
- Designed with fully copper conductor.
- Heavy duty power capacitor for long life.
- Advance C-MOS technology based micro processor relay for intelligent power factor control.
- Air core reactor for extra safety from inrush current (High currents).
- Provision of top and bottom cable entry.
- Automatic temp. control through fans and louvers in panel.
- Double side earthing connection.



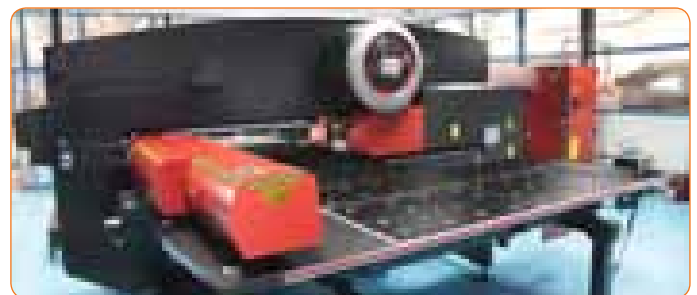
How Havells use the Best Practices and Latest Standards in manufacturing of APFC Panel

“INTERGRATED PROCESS”

○ Fabrication

The sheet metal processing like cutting, sizing, punching & bending are done on state-of-the-art, high accuracy CNC Turret Punch machines of Amada (Japan) & Trumpf (Germany). The fabrication is totally modular design.

The busbar contains High conductivity electrical grade Copper conductors, sourced directly from the manufacturers like Hindalco and other reputed make. The copper bus bar are fully rated considering all design related parameters and completely shielded by sandwich casecading design insulated by nylon robust shrouds with proper air vents.



○ Smart Surface Pre-Treatment

Prior to the painting process, all sheet metal enclosure and fabricated metallic parts of the Panel undergo a robust Eleven Tank process of surface pre-treatment.

The pre-treatment consists of:

- | | | |
|-----------------|-----------------|-----------------|
| 1. Degreasing | 2. Rinsing-I | 3. Rinsing – II |
| 4. De-rusting | 5. Rinsing- III | 6. Rinsing –IV |
| 7. Activation | 8. Phosphating | 9. Rinsing |
| 10. Passivation | 11. Dry Off | |



○ Fully Automatic Advance Painting Process

After the Eleven Tank process of surface pre-treatment, the enclosures & fabricated metal sections are ready for painting. The painting process is carried out by powder coating done on fully automated conveyerised painting line & baking in advance automatic and computerised temperature control oven thereafter.

○ In-process & Final Inspection

All products and systems during In-process & as finished products undergoes inspection and testing in accordance with stringent Quality Assurance Plan (QAP) and results are recorded.



**IOT Enabled
&
On Site
Service**

Thyristor Switch



Applications:

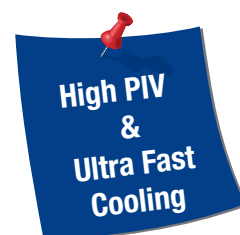
- Production Lines involving automation and CNC machines.
- Lifts / Elevators.
- Sheet Metal Press Shops.
- Wind Turbines involving induction generators.
- Central Air Conditioning Load.
- Metal Rolling Mills, Electrical furnaces and Coiling / De-coiling plants.
- Printing Presses.
- Welding Machines.

Range:

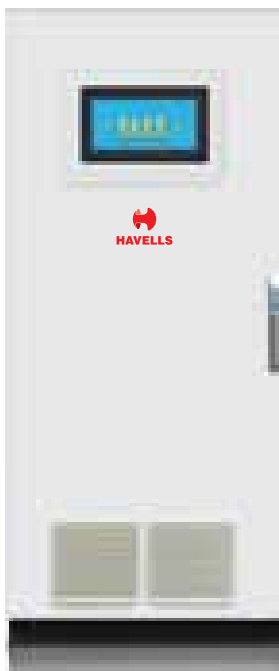
- Rating: 5 kVAr - 100 kVAr
- Voltage: 200 Vac – 1000 Vac

Features:

- Ultra High Speed capacitor switching with response time as Half supply cycle
- Integral Protection to Thyristors facilitates non usage of costly Semiconductor Fuses
- High end Smart Microcontroller Technology
- Multifold Protection system in built
- Remote and Local override control
- Continuous display of Capacitor Current and any annunciation on 4-digit 7-seg LED display & LCD display
- Thyristor rating 2300 V for up to 500 Vac supply and 3600 V for up to 800 Vac supply
- THD monitoring and protection
- Capacitor kVAr value deterioration monitoring and protection
- Thyristor health check and supply health check monitoring
- Standard Protection like Over/Under Voltage, Over temperature, spike current and supply voltage transient protection
- Extra Heavy duty fan for super fast cooling



SVG (Static Var Generator) & Active Harmonic Filter



Applications:

- Compliance of IEEE-519
- Printing Press
- Pharmaceutical
- Data Centre
- IT Park
- Automobile
- Textile
- Hospitals
- Airports
- Harmonic rich environment

Range:

- Rating: 10 A - 5000 A

AHF Technology & Innovation

- Heavy Duty IGBT used for Switching Technology
- Latest technology & Ultra-Fast algorithm used for sensing and control which provides smooth & precise compensation.
- Advanced LCD display with intelligent 32 bit microprocessor.
- User friendly programs and customization as per customer requirement for data display.
- Modular design enclosure fabricated by latest Amada CNC Machines & painted through fully automatic powder coating plant after 11 tank process.

AHF Features:

- The Havells make AHF is a unique innovation solution for Power Quality that address all power quality issues effectively. Major features are:
 - Ultra- fast response
 - No deration up-to 50 °C ambient temperature
 - Havells unique Quad Pro feature- These features enables user to program AHF as per its priority for following compensation :
 - Current harmonics
 - Reactive compensation
 - Load balancing
 - Neutral compensation
 - Priority selection feature for maximum capacity utilization as per the system requirement.



Hybrid PQ Manager



Applications:

- Printing Press
- Textile
- Transmitter
- Automobile
- Hospitals
- Airports
- VFD Application
- Solar
- Harmonic rich environment
- Compliance of IEEE-519

Range:

- 10 kVAR to 3000 kVAR
- Switching IGBT / Contactor / Thyristor

Hybrid Technology & Innovation

- Heavy Duty IGBT used for Switching Technology
- Ultra-Fast algorithm used for sensing and control which provides smooth & precise compensation
- Modular expandable design
- Common algorithm and controller to achieve highest accuracy for detuned PF and active harmonics system

Features:

- Havells Hybrid PQ manager is a unique solutions for harmonics and detuned power factor solution
- Ultra-fast response
- Centralised advanced intelligent controller for De-tuned PF and Harmonic control
- Modularity and Expandability-existing PF system can be converted in to hybrid with retro fit hybrid PQ Manager kit
- No deration upto 50 °C ambient temperature
- Havells unique Quad Pro feature- These features enables user to program as per its priority for following compensation :
 - Current harmonics
 - Reactive compensation
 - Load balancing
 - Neutral compensation
- Priority selection feature for maximum capacity utilization as per the system requirement.





Broad Band Passive Filter



0.5 kW-1000 kW

Range:

- Copper / Aluminum
- .5 kW to 1000 kW

Features:

- High linearity 185% to 225%
- Insulation Class H
- High harmonic loading capability
- Temperature protection-NC contact (UL approved)
- Long expected life time
- Low noise
- Very low losses
- Convenient mounting
- IEC-61558

Applications:

- Complex harmonic rich environment
- VFD application
- Textile
- Automobiles



Crusher Duty Capacitor



(Crusher Duty)
0.5 kVAr - 50 kVAr
220 Vac - 1000 Vac

Crusher Duty Capacitor

Range:

- 0.5 kVAr to 50 kVAr
- 220 Vac to 1000 Vac
- Concentrated oil based

Features:

- Very High inrush current withstand capability.
- concentrated oil to withstand high temperature.
- Special imported metallised hazy film profile to withstand high voltage and fluctuation.
- Penta safety protection (Self healing, internal notch mechanism & over pressure disconnect, safety cover, high grade Concentrated oil).
- Explosion proof, low losses & high over current withstand capabilities.





MV Capacitors

Range:

- 1.1 kV, 2.2 kV, 3.3 kV, 6.6 kV, 11 kV, 33 kV
- Fixed and Automatic
- Heavy edge APP based technology



Features:

- High inrush current withstand capability.
- High grade oil to withstand high temperature.
- Special imported hazy film profile to withstand high voltage and current stress.
- Ultra safety protection
- Explosion proof, low losses & high over current withstand capabilities.
- Brass terminals



Applications:

- Transformer testing
- Reactive power Injection in EB substation
- Steel plants (Hot rolling, Cold rolling) induction furnace, sponge iron etc.
- Sugar mills
- Paper mills
- Cement Plants
- Automobiles

MFD Capacitor



Range:

Rating : 2.25 μ F - 120 μ F

Available in : P0, P2 type

Casing : Plastic & Aluminium

Terminal : Wire, SFO, DFO, QFO

Features:

- Low dissipation factor
- Extended life capacity
- Self healing properties
- Self extinguishing plastic material



Fan



Air Conditioner



Washing Machine



Motor Start



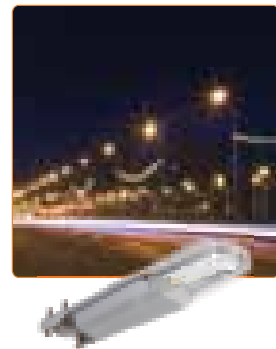
Motor Run



Submersible



Lighting



Certifications



ब्यूरो वर्तास सर्टिफिकेशन इंडिया प्राइवेट लिमिटेड
BUREAU VERITAS CERTIFICATION INDIA PRIVATE LIMITED

Registered Branch Office

ATTACHMENT INCLUDING SCOPE AND DATE: 03/04/2015

SCOPE	REGISTERED SCOPE AND DATE	ISSUE DATE	VALID
ISO 9001:2015	Management System (Quality Management System) for Havells India Limited, covering the entire organization.	03/04/2015	03/04/2018

EMPLOYMENT NO. 04 Date of issue of this certificate: 03/04/2015

Where the Certificate includes ISO 14001:

How employment scope affects the validity of the scope of the Certificate: No. 04 has been extended from the 03/04/2015 to 03/04/2018.

Other scope and conditions of license apply to scope.



Major Manufacturing & Quality Certificates

The most trusted service network



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300+

**Havells Service Centres
Pan India**

670+



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