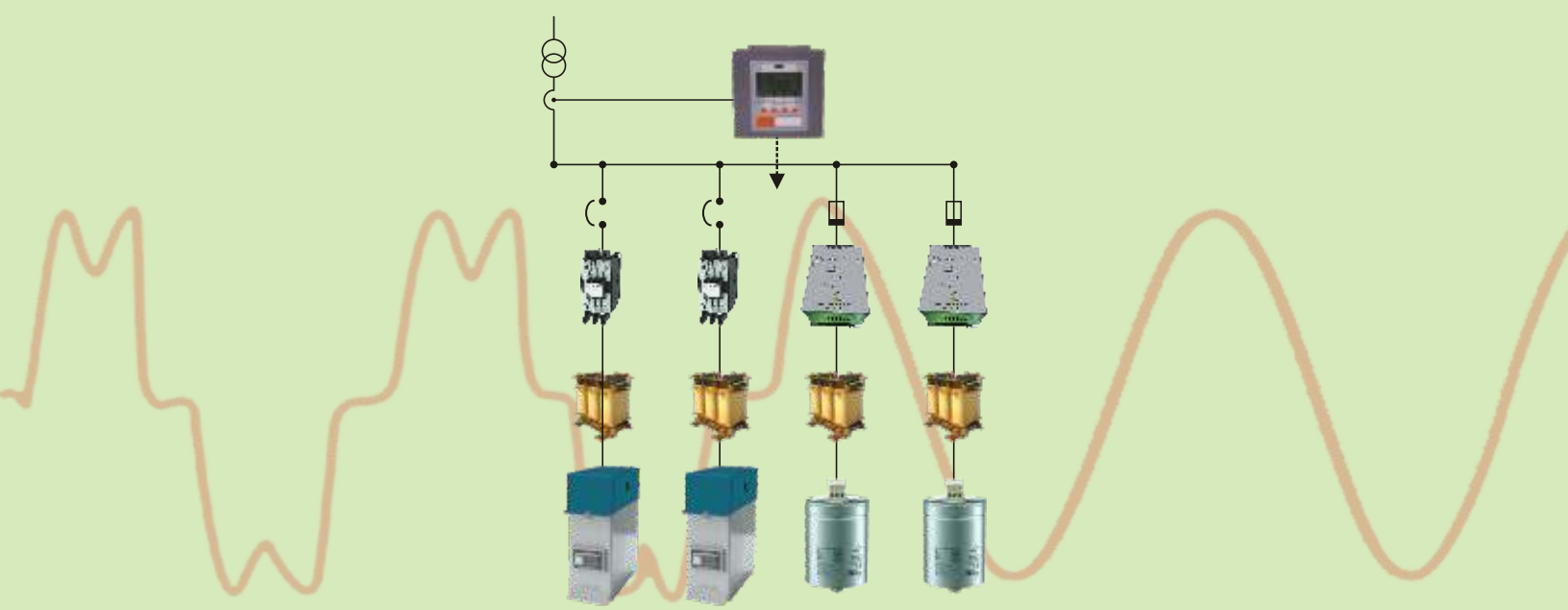




# Cos-One

**Power Factor Correction and Harmonic Filtering products**



*Energy Saving & Clean Power Solutions*

## Detuned Harmonic Filter Reactors (HFR) for APFC



Unique **HLL** technology  
(High Linearity Low Loss)  
5 to 250 KVAR upto 850 Vac

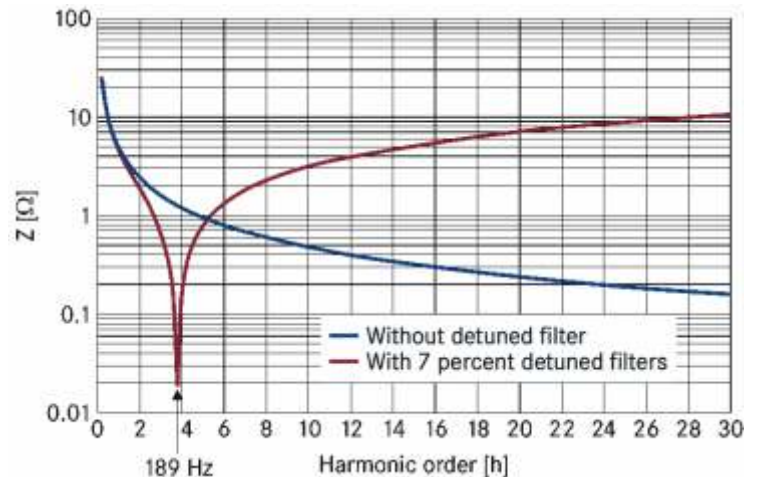
- Available detuning factors  $p$  : 7%, 14%, 5.67%
- Anti-resonance series reactors  $I_1 = 1.06 \cdot I_c$
- High Linearity : 200%
- Low loss design
- Overload capacity : 130% continuous
- Insulation : Class H 185°C
- Noise level : Max 60 dB
- Insulation Level : 2.5 KV
- Ambient Temperature : 50° C
- Enclosure : IP00
- Cooling : Natural
- Over-temperature protection : Microswitch (NC)
- Inrush current limiting reactors 0.2% also available
- Tuned Reactors for 5<sup>th</sup>, 7<sup>th</sup>, 11<sup>th</sup>, 13<sup>th</sup> harmonics available

### Why use a harmonic filter reactor in a power factor correction capacitor bank ?

1. Capacitors are required to improve power factor and possible harmonic interaction may occur with the installation of a plain capacitor bank.
2. Permissible distortion limits of the local utility of IEEE-519 are exceeded and filters are required to reduced them.
3. A combination of PFC capacitors with detuned harmonic filter reactors will result in limiting harmonics.

### Benifits of using detuned reactors

1. Prolongs life of PFC capacitors by reducing harmonic overloading with respect to voltage & current.
2. Reduces amplification of system harmonics thereby restoring sinusoidal waveform.
3. Reduce over heating of busbars, cables & transformer.



### COPPER WOUND

415/ 440V, 3-Ph, Iron core, Class F, Linearity 200%

Rating in KVAR	7%	14%	5.67%
Product code	(fr=189Hz)	(fr=135Hz)	(fr=210Hz)
5	DR7C005	DR14C005	DR6C005
7.5	DR7C007	DR14C007	DR6C007
10	DR7C010	DR14C010	DR6C010
12.5	DR7C012	DR14C012	DR6C012
15	DR7C015	DR14C015	DR6C015
20	DR7C020	DR14C020	DR6C020
25	DR7C025	DR14C025	DR6C025
30	DR7C030	DR14C030	DR6C030
50	DR7C050	DR14C050	DR6C050
75	DR7C075	DR14C075	DR6C075
100	DR7C100	DR14C100	DR6C100
125	DR7C125	DR14C125	DR6C125
150	DR7C150	DR14C150	DR6C150

### ALUMINUM WOUND

415/ 440V,3-Ph, Iron core, Class F, Linearity 200%

Rating in KVAR	7%	14%	5.67%
Product code	(fr=189Hz)	(fr=135Hz)	(fr=210Hz)
5	DR7A005	DR14A005	DR6A005
7.5	DR7A007	DR14A007	DR6A007
10	DR7A010	DR14A010	DR6A010
12.5	DR7A012	DR14A012	DR6A012
15	DR7A015	DR14A015	DR6A015
20	DR7A020	DR14A020	DR6A020
25	DR7A025	DR14A025	DR6A025
30	DR7A030	DR14A030	DR6A030
50	DR7A050	DR14A050	DR6A050
75	DR7A075	DR14A075	DR6A075
100	DR7A100	DR14A100	DR6A100
125	DR7A125	DR14A125	DR6A125
150	DR7A150	DR14A150	DR6A150

## Thyristor Switch Modules (TSM) for RTPFC



Unique **UFS** Design  
(Ultra Fast Switching)  
5 to 250 KVAR upto 850 Vac

- Suitable for real-time capacitor switching
- Available in 1800, 2200 & 4000 PIV
- Two-leg control, thyristors - SEMIKRON make
- Most advanced thyristor firing card with MOVs
- Compact and heat efficient design
- LED indication : ON/OFF/Supply ON/Signal ON
- Auto Fan operation : 60° C
- Ambient Temperature : 50° C
- Over temperature protection : thermal cut-off switch
- Supply voltage : 230 Vac, Control voltage : 24/12 Vdc
- Enclosure : IP00
- Cooling : Natural/Forced
- Easy to install and maintenance free
- No inrush current limiting reactors required
- No fast discharge resistors required

TSM Rating 440V, 3-Ph, 50 Hz	Product Code		Frame Size	Weight
	1800 PIV	2200 PIV		
5 - 15 KVAR	TS4S015	TS4A015	1	4.7 kg
20 - 25 KVAR	TS4S025	TS4A025	1	5.0 kg
30 - 35 KVAR	TS4S035	TS4A035	1	5.0 kg
40 - 50 KVAR	TS4S050	TS4A050	1	5.0 kg
60 KVAR	TS4S060	TS4A060	1	5.2 kg
75 KVAR	TS4S075	TS4A075	2	5.5 kg
100 KVAR	TS4S100	TS4A100	2	6.5 kg
125 KVAR	TS4S125	TS4A125	2	6.7 kg
150 KVAR	TS4S150	TS4A150	3	7.5 kg

## Comparison between APFC & RTPFC

Sr.	Contactor Switched APFC	Thyristor Switched RTPFC "Cos-One" Brand
1.	High Inrush switching currents - upto 200 times rated	No Inrush currents - switching at zero voltage, no surges
2.	Slow response to changing loads - contactors need upto 3 min to switch on again due to discharge cycle	Fast acting - cycle to cycle correction in 40 to 60 msec Correction will match load changes accurately
3.	Maintenance if high - contactor coil / contact replacement	Negligible maintenance due to static switches - no moving parts
4.	Short term peak loads remain uncompensated	Even momentarily loads of few seconds can be compensated
5.	Limitation of the minimum correction step in panel due to limited operations of contactors	No limitation to minimum correction step due to infinite switching of thyristors
6.	Less accurate p.f. regulation - difficult to maintain over 0.985	Very accurate due to very smaller correction step - unity p.f. possible
7.	Not suitable for DG set application due to load p.f. conditions	Suitable for DG set and harmonic filter applications
8.	Life - of PFC capacitors shortened due to inrush currents	Longer capacitor life due to transient free switching
9.	Cost - Higher cost for larger rating of panels	Economical
10.	Not suitable for welding, crane, lift applications	Suitable for all applications

## Automatic Power Factor Correction panels

LV APFC Contactor Switched upto 3200 KVAR / 850 V

### Outstanding features:

- Intelligent APFC with microprocessor based controller
- Automatic switching of PFC capacitors based on load variations of plant
- Designed to achieve power factor near to unity
- Available for balanced as well as un-balanced loads, 1-ph and 3-phase
- Less maintenance by optimized design, low loss and has long service life
- Display of all electrical parameters like KW, KVAR, KVA, p.f., THD, V, I, etc.
- Alarm output for low p.f., capacitor failure, overcompensation, over temp., undervoltage, excess harmonics, etc.
- Auto/Manual Mode facility, protection for each capacitor feeders
- Light weight, compact design suitable for ambient temp upto 55 deg C
- Enclosures with CRCA sheet steel, seven tank pretreated, powder coated
- Data logging/operational facility through GSM, ethernet, RS485/232
- Manufactured as per relevant national and international standards.
- PFC capacitors MPP SH or Heavy Duty, Gas Filled or APP type capacitors
- Iron core harmonic filter reactors with Copper/Aluminum winding, low



## Thyristor switched Real time PFC - High speed electronically switched

LV RTPFC Thyristor Switched upto 2400 KVAR / 690 V



### Outstanding features:

- Latest thyristor zero-voltage switching system – cycle-to-cycle correction
- High speed – transient free switching of PFC capacitors within 40 to 60 ms.
- Designed to achieve precisely unity p.f. near to unity to get max pf rebate and avoid leading p.f.
- Suitable for rolling mills, welding loads, DG set loads, ports, steel mills, cement and paper, etc
- Available for balanced as well as un-balanced loads, 1-ph an 3-phase
- Enhanced capacitor life due to transient-free, zero inrush current switching
- Maintenance-free because of static switching, no wear and tear of contactors
- Alarm output for low p.f., capacitor failure, overcompensation, over temp., undervoltage, etc.
- Auto/Manual Mode facility, fuse/MCCB protection for each capacitor feeders
- Hybrid version also available – contactor + thyristor switching for cost effectiveness
- Enclosures with CRCA sheet steel, seven tank pretreated for anti-rust and powder coated, modular CNC construction also available
- Data logging /operational facility through GSM mobile, ethernet, RS485/232





## Active Harmonic Filters

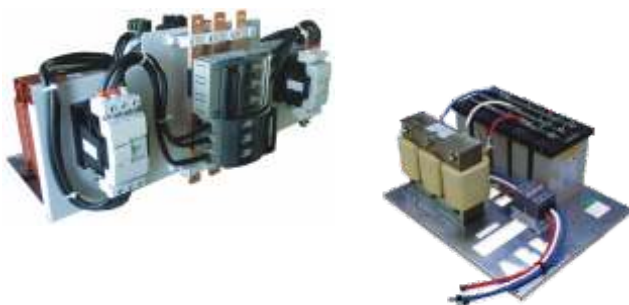
- Essential to reduce harmonic levels under IEEE 519 limits
- Available from 30 to 600 A, 415 & 690 V, 50/60 Hz
- Available in both versions : 3P3W & 3P4W
- Operation modes : Harmonic filtering, power factor correction, and phase balancing
- Programmable selective harmonic elimination
- Interface : RS485 (Modbus RTU), TCP/IP (Ethernet)
- IGBT base power electronic technology
- Neutralizes harmonic currents by phase opposition signals
- Capable to filter 2<sup>nd</sup> to 50<sup>th</sup> harmonic orders
- Ultra fast reaction time : < 200 milisec
- Noise level : < 60 dB
- Switching frequency : 24 kHz
- Control frequency : 48 kHz
- Flicker compensation feature
- Standards : IEEE 519, IEC 61000-3-6, ER G5/4
- Enclosure : IP00
- Ambient temperature : -10 to 50° C
- Power loss : < 3% of rated power
- Humidity : 95% non-condensing
- Cooling : Forced air
- Easy to install and maintenance free

## MV APFC Panels and Capacitor Banks

Product range : Upto 10,000 KVAR / 132 KV AC, 1-ph and 3-ph.

### Outstanding features:

- Intelligent APFC with microprocessor based controller
- HT capacitor banks upto 10,000 KVAR, 132 KV voltage class, indoor as well as outdoor type
- HT APFC panels with 3 to 8 step switching as per the load variations
- APP (All Polypropylene) type low loss capacitors with detuned / tuned harmonic filter reactors
- All accessories like NCT, RVT, isolator, VCB, HRC fuses, LA, protection relays, etc. available optionally
- Long service life of more than 10 years
- 15 KVAR to 400 KVAR in single unit and voltage upto 3.3 KV to 132 KV
- Outdoor type mounting GI structures, HT CT and PT set, VCB panels available as accessories



## PFC modules for APFC & RTPFC - modular

- Ready-to-install modules for assembly of APFC & RTPFC
- Available for 5 to 150 KVAR
- Rack type assembly for modular panels
- Complete range available in just 4 frame sizes
- Compact and heat efficient design
- Economical with minimum assembly time
- Ambient Temperature : 50° C
- Over temperature protection : thermal cut-off switch
- Enclosure : IP00, Cooling : Natural/Forced
- Easy to install and maintenance free

## Power Factor Correction Capacitors & Accessories - LV & MV



APP Capacitors



MPP Capacitors



APFC Controllers



Contactors

### MV Power Factor Correction capacitors, series reactors Outdoor & Indoor type

A Polypropylene Film Dielectric, with extended / folded. Al. Foil and impregnment with Non-PCB Oil conforming to IS-13925 Part I-1998, suitable for all types of electric loads and applications.

# UNISTAR<sup>®</sup>

## POWER CAPACITORS



## Selection of capacitor - reactors for Detuned circuits

$p = 7\%$  - Resonant frequency 189 Hz

$p = 14\%$  - Resonant frequency 135 Hz

Net output required @ 415 V, 50 Hz in KVA <sub>r</sub>	Detuning factor $p$ in %	Rated current in A	Reactor Inductance L in mH	Rated voltage of capacitor in V	Rated value of capacitor in KVA <sub>r</sub>
5	7	6.96	8.257	480	6.30
10	7	13.91	4.128	480	12.5
12.5	7	17.39	3.303	480	15.7
15	7	20.87	2.752	480	18.7
20	7	27.82	2.064	480	25.0
25	7	34.78	1.651	480	31.0
30	7	41.74	1.376	480	37.5
40	7	55.65	1.032	480	50.0
50	7	69.56	0.823	480	62.5
60	7	83.47	0.688	480	75.0
75	7	104.34	0.550	480	94.0
100	7	139.12	0.412	480	125.0

Net output required @ 415 V, 50 Hz in KVA <sub>r</sub>	Detuning factor $p$ in %	Rated current in A	Reactor Inductance L in mH	Rated voltage of capacitor in V	Rated value of capacitor in KVA <sub>r</sub>
5	14	6.96	16.51	525	7.5
10	14	13.91	8.256	525	15.0
12.5	14	17.39	6.606	525	18.8
15	14	20.87	5.504	525	22.5
20	14	27.82	4.128	525	30.0
25	14	34.78	3.302	525	37.5
30	14	41.74	2.752	525	45.0
40	14	55.65	2.064	525	60.0
50	14	69.56	1.646	525	75.0
60	14	83.47	1.376	525	90.0
75	14	104.34	1.100	525	112.5
100	14	139.12	0.824	525	150.0

### Harmonic Limits as per IEEE-519 Voltage Distortion Limits

Bus Voltage at PCC	Individual Voltage Distortion (%)	Total Voltage Distortion THD (%)
69 kV and below	3.0	5.0
69.001 kV through 161 kV	1.5	2.5
161.001 kV and above	1.0	1.5

NOTE : High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal that will attenuate by the time it is tapped for a user.

### Current Distortion Limits for General Distribution Systems (120 V Through 69000 V)

Maximum Harmonic Current Distortion in Percent of $I_L$						
Individual Harmonic Order (Odd Harmonics)						
$I_{sc}/I_L$	< 11	11£h<17	17£h<23	23£h<35	35£h	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

Even harmonics are limited to 25% of the odd harmonic limits above.

Current distortions that result in a dc offset, e.g. half-wave converters, are not allowed.

\* All power generation equipment is limited to these values of current distortion, regardless of actual  $I_{sc}/I_L$

Where  $I_{sc}$  = maximum short-circuit current at PCC.  
 $I_L$  = maximum demand load current (fundamental frequency component) at PCC.  
 TDD = Total demand distortion (RSS), harmonic current distortion in % of maximum demand load current (15 or 30 min demand).  
 PCC = Point of common coupling.





**Present in 11 Countries**



Power Quality Channel Partner :



**About PQS**

PQS Electrolink (India) Private Limited is ISO 9001:2008, fast growing professionally managed company engaged in manufacturing power factor correction and harmonic filtering products. The company has a latest state-of-art manufacturing plant located near Ahmedabad having total of 10,000 sq. ft. shop floor and office area. Backed by sound technocrats and experienced professionals over more than 20 years, the company is focused in designing, manufacturing power quality systems. Products are manufactured in stages having quality control checks at all points thus ensuring safe and correct products.

**Our motto**

Meeting customer demands for energy saving & clean power through latest world-class technologies and cost effectiveness.

**Certifications**



**PQS Electrolink (I) P. Ltd.**

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