DQURE

Power Factor Correction

info@dqure.com
www.dqure.com
+966-573746982

ABOUT DQURE

DQURE is a specialized provider of Power Quality Solutions, with over 25 years of expertise in Power Factor Correction (PFC) and advanced power quality technologies. Our deep technical knowledge and hands-on experience enable us to deliver tailored solutions that help industries optimize energy performance, enhance system stability, and reduce operational costs.

We combine technical insight with cutting-edge manufacturing to provide reliable and efficient systems that comply with international standards. All DQURE products are built with precision using the latest technologies and strict quality management processes.

What sets DQURE apart is our 360° service approach, offering:

- Site surveys and power network assessments
- Harmonic and load performance measurements
- Data analysis and custom system design
- On-site implementation and commissioning
- Performance assurance under real operating conditions

At DQURE, clients gain more than products — they gain a trusted partner committed to delivering measurable, lasting results in power quality and energy efficiency.

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WHY POWER FACTOR MATTERS?

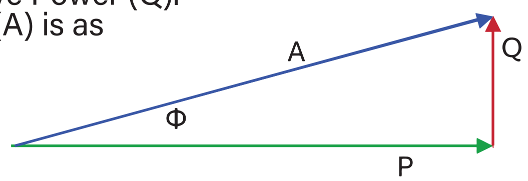
With heavy induction load such as motors which dominates the industrial equipment in terms of size and quantity, lagging power factor is imminent. Lagging Power Factor in which current and voltage are out of phase increases the energy consumption and losses. Below are the key factors to consider related to power factor issue:

Penalty: Government regulation to maintain Power Factor above 0.95 are in-force, failure to maintain 0.95 PF can result in penalty

Losses: Increased Lagging will result in more energy consumption which is going to burden the transformer, cables, MCCBs etc.

Improvement of Power Quality: Increased gap between Voltage and Current is considered poor power quality. This can affect the voltage of network.

The total absorbed Power by a motor is Real Power (P) and Reactive Power (Q). The total Apparent Power (A) is as illustrated in vector below:



As far as there are no harmonics, PF is equal to cos phi of the network. Or else distorted waveform will be produced known as distortion Power Factor.

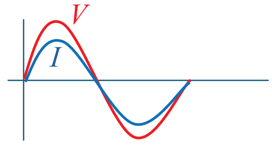
$$PF = \frac{P}{A} \qquad A = \sqrt{P^2 + Q^2}$$

WHAT IS POWER FACTOR?

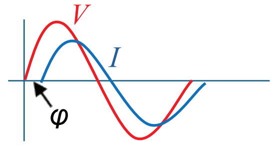
When the load is resistive, the voltage and current are in phase. However, if the load is inductive or capacitive, voltage and current are then no longer in phase.

This difference of voltage and current phase is factored as cos phi. In case of inductive load, the current will be lagging to voltage and vice versa in case of capacitive.

In terms of Power Factor, cosine phi is also referred as displacement Power Factor.



Resistive load
(in phase waveform)



Inductive load
(out of phase waveform)

HOW TO CORRECT POWER FACTOR?

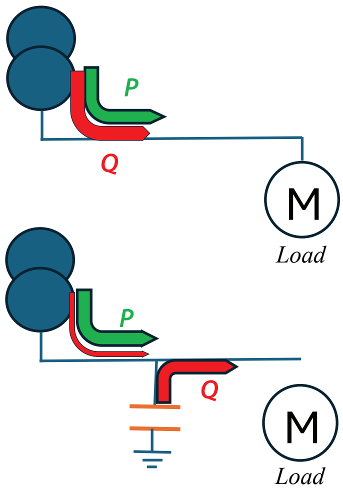
To compensate inductive load, capacitors can help in balancing the equation!
Since leading current will be produced in the network. The Power Factor correction system takes into account the actual readings of the network and applying the steps to reach near target.

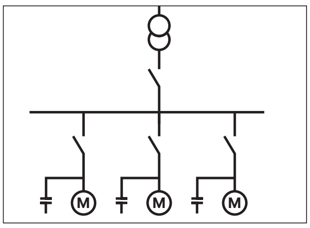
Reaching 0.95 and above will keep the penalty away.

However, more than unity will make the network leading, which is not desirable.

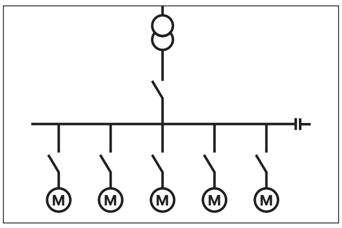
There can be two type of installations:

1. Individual Compensation
2. Central Compensation





Individual Compensation



Central Compensation

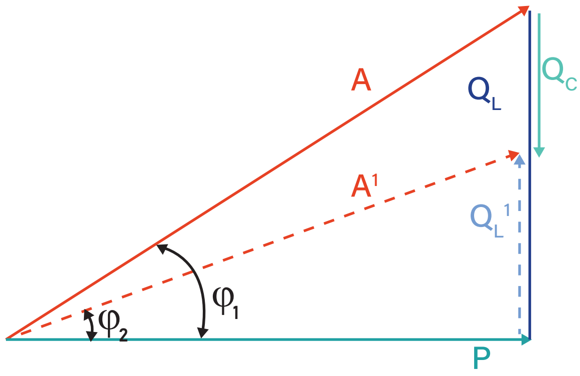
Selecting and opting one of the solutions depends on load distribution and site condition. Each compensation has its own advantages. Individual compensation allows easy installation, since a small load will be turned off while keeping complete plant running. However, large number of capacitors will increase the cost, which makes central compensation attractive. Plus, central compensation system is easy to maintain.

HOW TO SELECT THE CORRECTION SYSTEM?

Compensation and selection depend on three factors:

1. Actual Cos phi (cos φ1)
2. Target Cos phi (cos φ2)
3. Real Power (P)

$Q_C = P \times (\tan \varphi_1 - \tan \varphi_2)$



Or a table can also be used:

Starting Power Factor	Target Power Factor										
	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00
0.50	1.248	1.276	1.306	1.337	1.369	1.403	1.44	1.481	1.529	1.59	1.732
0.51	1.202	1.231	1.261	1.291	1.324	1.358	1.395	1.436	1.484	1.544	1.687
0.52	1.158	1.187	1.217	1.247	1.28	1.314	1.351	1.392	1.44	1.5	1.643
0.53	1.116	1.146	1.175	1.205	1.238	1.271	1.308	1.349	1.396	1.456	1.601
0.54	1.074	1.103	1.133	1.163	1.196	1.23	1.267	1.308	1.356	1.416	1.559
0.55	1.034	1.063	1.093	1.123	1.155	1.19	1.229	1.27	1.318	1.377	1.519
0.56	0.995	1.024	1.053	1.084	1.116	1.151	1.188	1.229	1.276	1.337	1.479
0.57	0.957	0.986	1.015	1.046	1.079	1.113	1.15	1.191	1.238	1.299	1.441
0.58	0.92	0.949	0.979	1.009	1.042	1.076	1.113	1.154	1.201	1.262	1.405
0.59	0.884	0.913	0.942	0.973	1.006	1.04	1.077	1.118	1.165	1.226	1.368
0.60	0.849	0.878	0.907	0.938	0.97	1.005	1.042	1.083	1.13	1.191	1.333
0.61	0.815	0.843	0.873	0.904	0.936	0.97	1.007	1.048	1.096	1.157	1.299
0.62	0.781	0.81	0.839	0.87	0.903	0.937	0.974	1.015	1.062	1.123	1.265
0.63	0.748	0.777	0.807	0.837	0.87	0.904	0.941	0.982	1.03	1.09	1.233
0.64	0.716	0.745	0.774	0.805	0.838	0.872	0.909	0.95	0.997	1.057	1.2
0.65	0.685	0.714	0.743	0.774	0.806	0.84	0.877	0.919	0.966	1.027	1.169
0.66	0.655	0.684	0.713	0.743	0.775	0.809	0.846	0.887	0.934	0.994	1.138
0.67	0.624	0.652	0.682	0.713	0.745	0.779	0.816	0.857	0.905	0.966	1.108
0.68	0.594	0.623	0.652	0.683	0.715	0.75	0.787	0.828	0.875	0.935	1.078
0.69	0.565	0.593	0.623	0.654	0.686	0.72	0.757	0.798	0.846	0.907	1.049
0.70	0.536	0.565	0.595	0.625	0.657	0.692	0.729	0.77	0.817	0.879	1.02
0.71	0.508	0.536	0.566	0.597	0.629	0.663	0.7	0.741	0.789	0.85	0.992
0.72	0.48	0.508	0.538	0.569	0.601	0.635	0.672	0.713	0.761	0.821	0.964
0.73	0.452	0.481	0.51	0.541	0.573	0.608	0.645	0.686	0.733	0.794	0.936
0.74	0.425	0.453	0.483	0.514	0.546	0.58	0.617	0.658	0.706	0.766	0.909
0.75	0.4	0.428	0.457	0.488	0.52	0.553	0.59	0.631	0.679	0.738	0.882
0.76	0.371	0.4	0.429	0.46	0.493	0.526	0.563	0.605	0.652	0.713	0.855
0.77	0.344	0.373	0.402	0.432	0.464	0.5	0.537	0.578	0.626	0.686	0.828
0.78	0.318	0.347	0.376	0.407	0.439	0.474	0.511	0.552	0.599	0.66	0.802
0.79	0.292	0.321	0.35	0.38	0.412	0.447	0.484	0.525	0.573	0.633	0.776
0.80	0.266	0.294	0.324	0.355	0.387	0.421	0.458	0.499	0.547	0.607	0.75
0.81	0.24	0.268	0.298	0.329	0.36	0.394	0.431	0.472	0.52	0.58	0.724
0.82	0.214	0.242	0.272	0.303	0.333	0.366	0.402	0.443	0.491	0.556	0.698
0.83	0.188	0.216	0.247	0.277	0.309	0.339	0.376	0.417	0.469	0.53	0.672
0.84	0.162	0.19	0.22	0.251	0.283	0.317	0.354	0.395	0.443	0.503	0.646
0.85	0.135	0.164	0.194	0.225	0.257	0.291	0.328	0.369	0.417	0.477	0.62
0.86	0.109	0.138	0.167	0.198	0.23	0.265	0.302	0.343	0.39	0.451	0.593
0.87	0.082	0.111	0.141	0.172	0.204	0.238	0.275	0.316	0.364	0.424	0.567
0.88	0.055	0.084	0.114	0.145	0.177	0.211	0.248	0.289	0.337	0.397	0.54
0.89	0.028	0.057	0.086	0.117	0.149	0.184	0.221	0.262	0.309	0.37	0.512
0.90	–	0.029	0.058	0.089	0.121	0.156	0.193	0.234	0.281	0.342	0.484
0.91	–	–	0.03	0.06	0.093	0.127	0.164	0.205	0.253	0.313	0.456
0.92	–	–	–	0.031	0.063	0.097	0.134	0.175	0.223	0.284	0.426
0.93	–	–	–	–	0.032	0.067	0.104	0.145	0.192	0.253	0.395
0.94	–	–	–	–	–	0.034	0.071	0.112	0.16	0.22	0.363
0.95	–	–	–	–	–	–	0.037	0.078	0.126	0.186	0.329

CAPACITOR BANK OPERATION:

Capacitor is a sensitive component to environment and electrical network. The conditions below need a check to keep long life of a capacitor:

- Over voltage conditions
- Ambient Temperature
- Harmonics
- High inrush current
- Discharge Time

Temperature Class	Maximum Ambient Temperature		
	Absolute Maximum temperature	Max. Average Temperature over 1 day	Max. Average Temperature over 1 year
B	45 °C	35 °C	25 °C
C	50 °C	40 °C	30 °C
D	55 °C	45 °C	35 °C

Over voltage condition can result in drawing higher current (higher than the rated). IEC standards allow 10% over voltage up to 8 hours daily. Sudden over voltage can make higher stress on capacitor. This can result in case rupture. Thanks to the internal fuse link of capacitor. Also, external fuses and PF Controller contribute to avoid over voltage conditions.

For **Ambient Temperature**, Class D is followed for DCure Capacitors. Which means ambient cannot be more than 35 °C as max average for one year and 45 °C max average for 24 hours. Failure to observe temperature level can reduce capacitor life significantly. Controller with built-in temperature sensor can keep the check and stop operation to save the capacitor life.

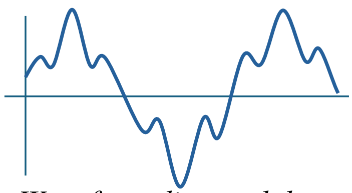
As per the below formula for impedance, we can understand higher frequency levels in network will be attracted to capacitors.

$$X_C = \frac{1}{2\pi fC}$$ (higher the frequency, lower the impedance)

Higher frequencies which in other words, multiple of fundamental frequency known as **Harmonics** can overload the capacitor. Additionally, it can contribute to network pollution by amplifying harmonics. Blocking Harmonics to protect network and capacitor is practiced.

Harmonics are generated by non-linear loads which can be inverters or devices which have rectification. This harmonics in case of matching inductance and capacitance can generate resonant condition.

$$f_{rs} = \frac{1}{(2\pi\sqrt{(L.C)})}$$



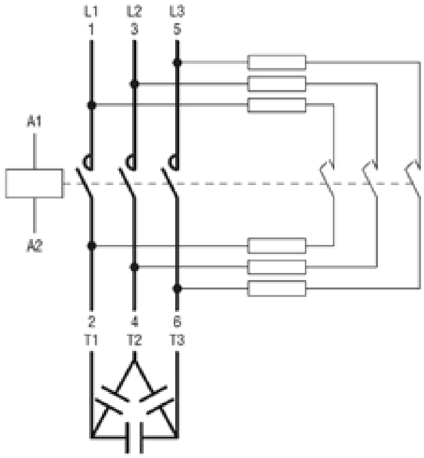
Waveform distorted due to Harmonics

Theoretically, three phase rectification which involves 6 diode rectifiers can product 5th, 7th, 11th, 13th and so on harmonics. Fifth order harmonics is 5 times the fundamental frequency. Which in case of 60Hz as fundamental is 300Hz at 5th order.

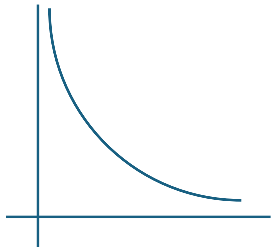
Blocking higher frequencies will avoid overload and resonance conditions, which is achieved by harmonics blocking reactor.

Detuning	Series Resonance Frequency (60Hz fundamental)
P = 14%	160 Hz
P = 8%	212 Hz
P = 7%	227 Hz
P = 5.67%	250 Hz

Capacitors can act as near short circuit conditions due if peak voltage of waveform is applied at terminals. Since, capacitor needs charging, this results in high Inrush Current condition. Additionally, back-to-back switching, which involve additional step engagement in presence of engaged step. Back-to-back switching generates huge inrush which can be a threat to contacts. Harmonics blocking reactor or Capacitor duty contactor can suppress inrush current. Capacitor duty contactor is equipped with Pre-charge resistor, which momentarily make contact before main contacts. Equipped resistors or inductor limits the inrush conditions.



Lastly, the Discharge Time is critical for capacitor life. Capacitors are equipped with in-built resistors, which helps in decaying the residual voltage after step disengage. Once step is disengaged, voltage at capacitor terminal should come to a safe voltage levels defined as per the capacity 50V or 75V before reengagement. Smart PF Controller ensure enough delay time keeping capacitor safe.



Voltage Discharge

LV POWER CAPACITORS

HD - Heavy Duty

Three phase power capacitors, selfhealing

HD - Heavy Duty

Three phase power capacitors, selfhealing

General technical parameters

Standards	IEC EN 60831-1/2, VDE 0560-46/47, GOST 1282-88
Rated Voltage	230-480V / 60Hz (Other rating upon request)
Rated Power	1 - 50 kvar
Capacitance Tolerance	-5 / +10 %
Max. Permissible Current	1,5 x I_N Continuous, 2 x I_N Short period*
Max. Inrush Current	400 x I_N
Capacitor Losses	cca 0,4 W / kvar
Discharge Resistors	Built-in 50 V / 1 min (Above 33,3 kvar 75V / 3min)
Statistical Life Expectancy	> 150 000 hours according to operating conditions
Protection Degree	IP 20 (IP 54 selected types on request)
Temperature Class	40/D (60°C)
Max. Relative Humidity	95 %
Cooling	Natural Air or Forced
Max. Altitude	4 000 m
Mounting Position	Any position
Case	Aluminium can
Dielectric System	Dry metallized polypropylene
Impregnant / Filling	Inert gas N_2 or dry resin (50 kvar)
Safety Device	3 fuses overpressure disconnector
Terminals	One side - 3 clamps

Note: * Maximum current for 48 hours continuous operation with relation to highest mean ambient temperature of 45°C over period of 24 h.

Overpressure disconnector function

Features

$I_{max} = 2 \times I_N$

Lifetime Expectancy: > 150 000 h
Temperature Class: -40/D (60 °C)
Dry type: gas filling

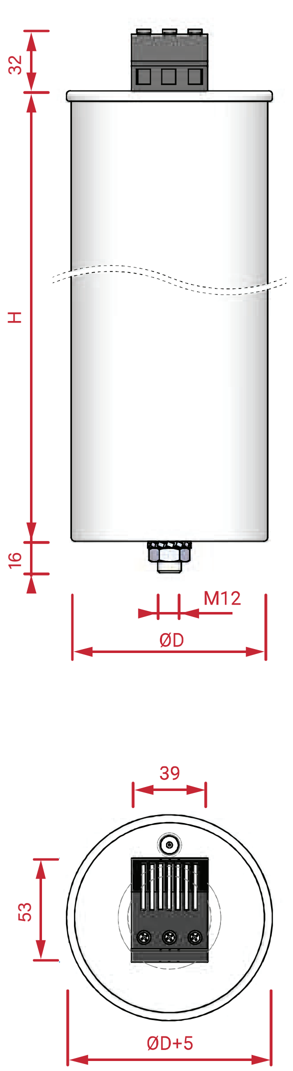
HD - Heavy Duty

440 - 400 - 380 V / 60 Hz

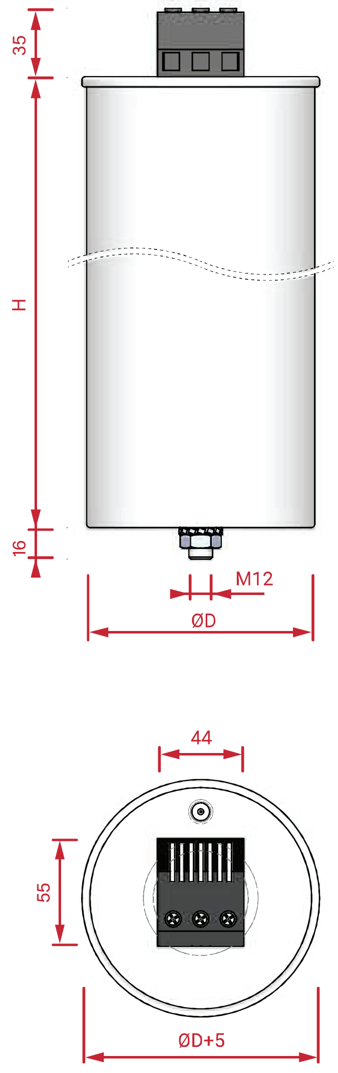
Q_c (kvar)			Type	C_N (Δ)	I_N (A)			Ø D x H	m	Term.
440 V	400 V	380 V		(µF)	440 V	400 V	380 V	(mm)	(kg)	
6,25	5	4,7	CSADG-0,44/6,25-60-HD	3 x 28,5	8,2	7,2	7,1	85 x 175	0,8	A
7,5	6,3	5,6	CSADG-0,44/7,5-60-HD	3 x 34,3	9,8	9,0	8,5	85 x 175	0,9	A
10	8	7,5	CSADG-0,44/10-60-HD	3 x 45,7	13,1	11,5	11,3	85 x 175	1,0	A
12,5	10	9,3	CSADG-0,44/12,5-60-HD	3 x 57,1	16,4	14,4	14,1	85 x 245	1,1	A
14,1	11,5	10,5	CSADG-0,44/14,1-60-HD	3 x 64,4	18,5	16,6	16,0	85 x 245	1,2	A
15	12,5	11,2	CSADG-0,44/15-60-HD	3 x 68,5	19,7	18,0	17,0	85 x 245	1,2	A
20	16,5	15	CSADG-0,44/20-60-HD	3 x 91,3	26,2	23,8	22,8	85 x 245	1,5	A
25	20	18,6	CSADG-0,44/25-60-HD	3 x 114	32,8	28,8	28,3	100 x 245	2,0	A
28,1	23	21	CSADG-0,44/28,1-60-HD	3 x 128	36,9	33,2	31,8	100 x 245	2,2	A
30	25	22,4	CSADG-0,44/30-60-HD	3 x 137	39,4	36,0	34,0	116 x 245	2,6	B
40	33,3	30	CSADG-0,44/40-60-HD	3 x 183	52,5	48,0	45,5	136 x 261	3,8	C
50	40	37,3	CSADG-0,44/50-60-HD	3 x 228	65,6	57,7	56,6	136 x 355	5,2	C

480 - 460 - 440 V / 60 Hz

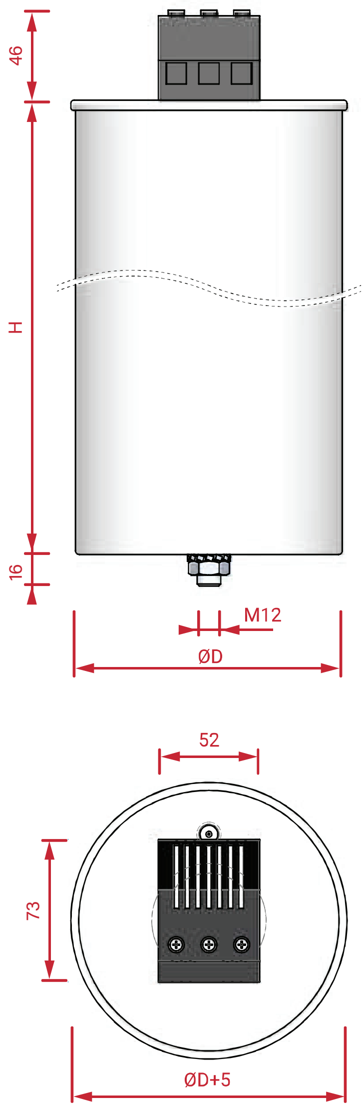
Q_c (kvar)			Type	C_N (Δ)	I_N (A)			Ø D x H	m	Term.
480 V	460 V	440 V		(µF)	480 V	460 V	440 V	(mm)	(kg)	
5	4,6	4,2	CSADG-0,48/5-60-HD	3 x 19,2	6,0	5,8	5,5	85 x 175	0,7	A
10	9,2	8,4	CSADG-0,48/10-60-HD	3 x 38,4	12,0	11,5	11,0	85 x 175	0,9	A
12,5	11,5	10,5	CSADG-0,48/12,5-60-HD	3 x 48,0	15,0	14,4	13,8	85 x 245	1,2	A
15	13,8	12,6	CSADG-0,48/15-60-HD	3 x 57,6	18,0	17,3	16,5	85 x 245	1,3	A
20	18,4	16,8	CSADG-0,48/20-60-HD	3 x 76,8	24,1	23,1	22,1	100 x 245	1,9	A
25	23	21	CSADG-0,48/25-60-HD	3 x 95,9	30,1	28,8	27,6	100 x 245	2,2	A
30	27,6	25,2	CSADG-0,48/30-60-HD	3 x 115	36,1	34,6	33,1	116 x 245	2,9	B
31	28,5	26	CSADG-0,48/31-60-HD	3 x 119	37,3	35,7	34,2	116 x 245	3,0	B
33,3	30,6	28	CSADG-0,48/33,3-60-HD	3 x 128	40,0	38,4	36,7	136 x 261	3,7	B
40	36,7	33,6	CSADG-0,48/40-60-HD	3 x 154	48,1	46,1	44,1	136 x 261	3,8	B
50	45,9	42	CSADG-0,48/50-60-HD	3 x 192	60,1	57,6	55,1	136 x 355	5,2	C



Terminal A



Terminal B

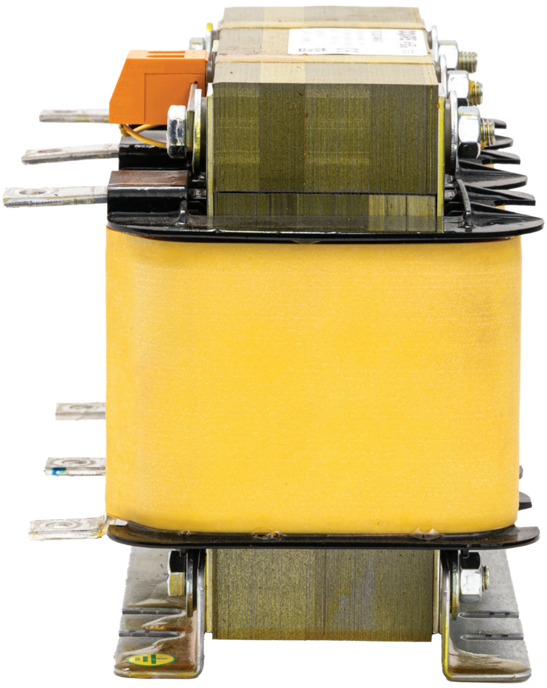


Terminal C

Terminal	A	B	C
Max. cross section (mm²)	16	25	35

LV DETUNING REACTORS

LV Detuning Reactors



General technical parameters

Standards	IEC EN 60076-6, IEC EN 61558-2-20
Rated Voltage	400 / 60 Hz
Rated Power	25-50kVAr (other ratings upon request)
Inductance Tolerance	-5 / +5 %
Detuning Factor	7 %
Resonance Frequency	227 Hz (Other ratings upon request)
Temperature Class	F (155 °C)
Ambient Temperature	40 °C
Statistical Life Expectancy	> 200 000 hours
Protection Degree	IP 00
Insulation (winding - core)	3 kV
Max. Relative Humidity	95 %
Max. Altitude	4 000 m
Cooling	Natural Air or Forced
Design	Three phase, iron core with multi air gap
Winding Material	Copper (TKC), Aluminium (TKA)
Impregnant	Polyester (epoxy) resin
Safety Device	Thermal switch (TKA-130 °C, TKC-90 °C)
Terminals	Terminal block, Al bar

Application

Frequent use of power electronic devices with nonlinear loads leads to harmonic distortion in electrical system. This nonsinusoidal load causes increase of effective current of power capacitor and other components of the system as well as the posibility of capacitor resonance with other inductive loads. Finally it may lead to problems or even failures in the installation. The solution is to use detuning (filtering) reactors, which creates a series resonant circuit with power capacitors. This detuned system prevents the installation from resonance effect and also acts as a filter for higher harmonic content. Usually there is recommended to use detuning reactors for the total voltage distortion THD-U higher than 3 %.

Construction

Detuning reactors are produced from high grade, low loss transformer sheets, with winding either from copper wire or aluminium band. Iron core is designed with multi air gap to meet high current linearity and low thermal losses. They are impregnated with high quality epoxy resin to ensure good insulation, low noise and long lifetime. Reactors are equipped with thermal protection to prevent overheating. Reactors with lower rated power are designed with copper wire and outlets via terminal block or cable lug. Higher power rated reactors are produced from aluminium band with outlets as aluminium bars (copper outlets are possible on request).

Reactor power designation

Reactor type designation is always according to power of matching capacitor Q_C.

Q_C - Rated power of the capacitor

Basic terms and definitions

EFFECTIVE CURRENT

An effective current load of a reactor operating continuously is calculated with a fundamental wave and superposed harmonics:

$$I_{rms} = \sqrt{I_1^2 + I_3^2 + ... + I_{13}^2}$$

The fundamental wave is presumed with a 10 % increase of a nominal current, resulting from voltage tolerances in a distribution network:

$$I_1 = 1{,}1 \cdot I_N$$

Permitted harmonics in the distribution network for continuous operation:

$$U_3 = 0{,}5\,\%\,U_N$$
$$U_5 = 6\,\%\,U_N$$
$$U_7 = 5\,\%\,U_N$$
$$U_{11} = 3{,}5\,\%\,U_N$$
$$U_{13} = 3\,\%\,U_N$$

DETUNING FACTOR

The ratio between reactances of reactor X_L and capacitor X_C is called the detuning coefficient:

$$p = \frac{X_L}{X_C}$$

SERIES RESONANCE FREQUENCY

Series resonance frequency is an important parameter for filtering and blocking effect of the reactor and capacitor. It is determined with a fundamental frequency of the distribution network and the detuning factor:

$$f_r = f_N \cdot \sqrt{\frac{100}{p}}$$

CURRENT LINEARITY

Current linearity I_{lin} is a parameter of the reactor which specifies the maximum current, up to which inductance does not decrease by more than 5 %.

STANDARD REACTORS PROPERTIES

f_N (Hz)	p (%)	f_r (Hz)	I_{lin} (x I_N)
60	6	245	1,8
60	7	227	1,6
60	14	160	1,38

CAPACITOR VOLTAGE

A series connection of reactor and capacitor causes an increase of voltage at the capacitor terminals. In this case, it is necessary to use capacitors dimensioned at a voltage level above result determined by formula:

$$U_C = \frac{U_N}{\left(1 - \frac{p}{100}\right)}$$

The tolerance for a distribution network with a voltage level of 400 V may be ±10 %. The voltage of 415 - 430 V is commonly measured. Our recommendation is therefore to use capacitors with higher nominal voltage.

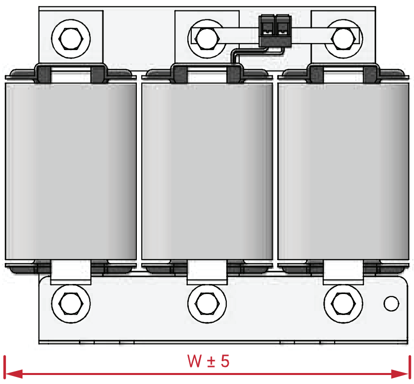
RECOMMENDED CAPACITORS

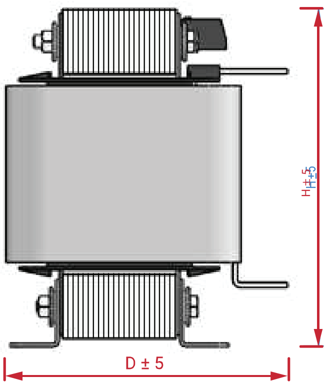
U_N (V)	p (%)	U_C (V)
400	6	480
400	7	480
400	14	525

p = 7 % U_N = 400 V

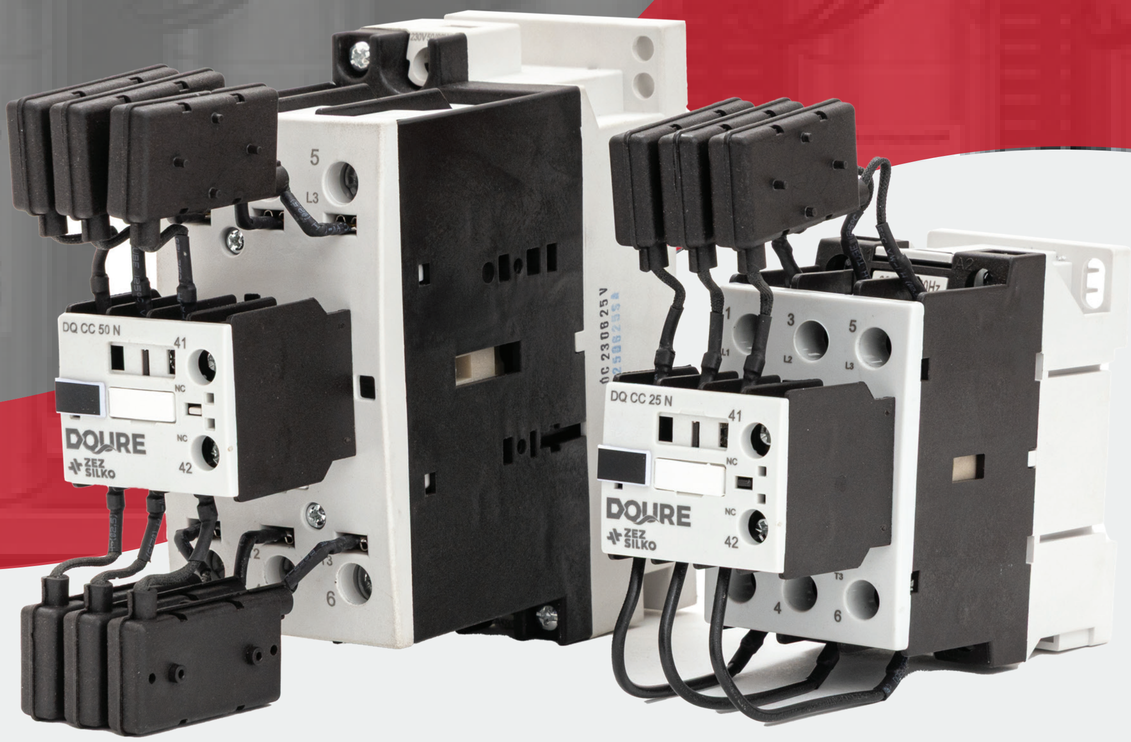
Q_{LC} (kvar)	C_N (Δ) (μF)	Type	Capacitor Model	Quantity	L_N (mH)	I_N (A)	m (kg)	Losses (W)	WxDxH (mm)	Design
25	3 x 128	TK-25-227-400-60	CSADG-0,48/33,3-60-HD	1	1,28	36,0	13	120	240 x 160 x 160	2
50	3 x 257	TK-50-227-400-60	CSADG-0,48/33,3-60-HD	2	0,64	72,2	23	144	255 x 185 x 215	2

Terminal Type	Al bar

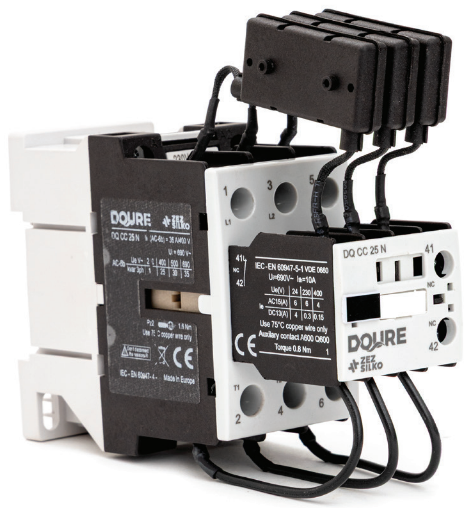




CAPACITOR SWITCHING CONTACTORS



Capacitor Switching Contactors



Capacitor switching contactors CC

CC Capacitor Contactors are suitable for switching low-inductive and low-loss capacitors in capacitor banks, without and with reactors.

CC Capacitor Contactors are designed to meet Capacitor Duty application. Contactors are fitted with block of three early make auxiliary contacts in series with six quick discharge damping resistors - 2 per phase. These auxiliary contacts limit peak current in first stage of switching. Subsequently the nominal current is transferred through main contacts which are switched in next stage and the auxiliary contacts are switched-off at the same time.

Contactor conform to recommendations IEC-EN 60947-4-1

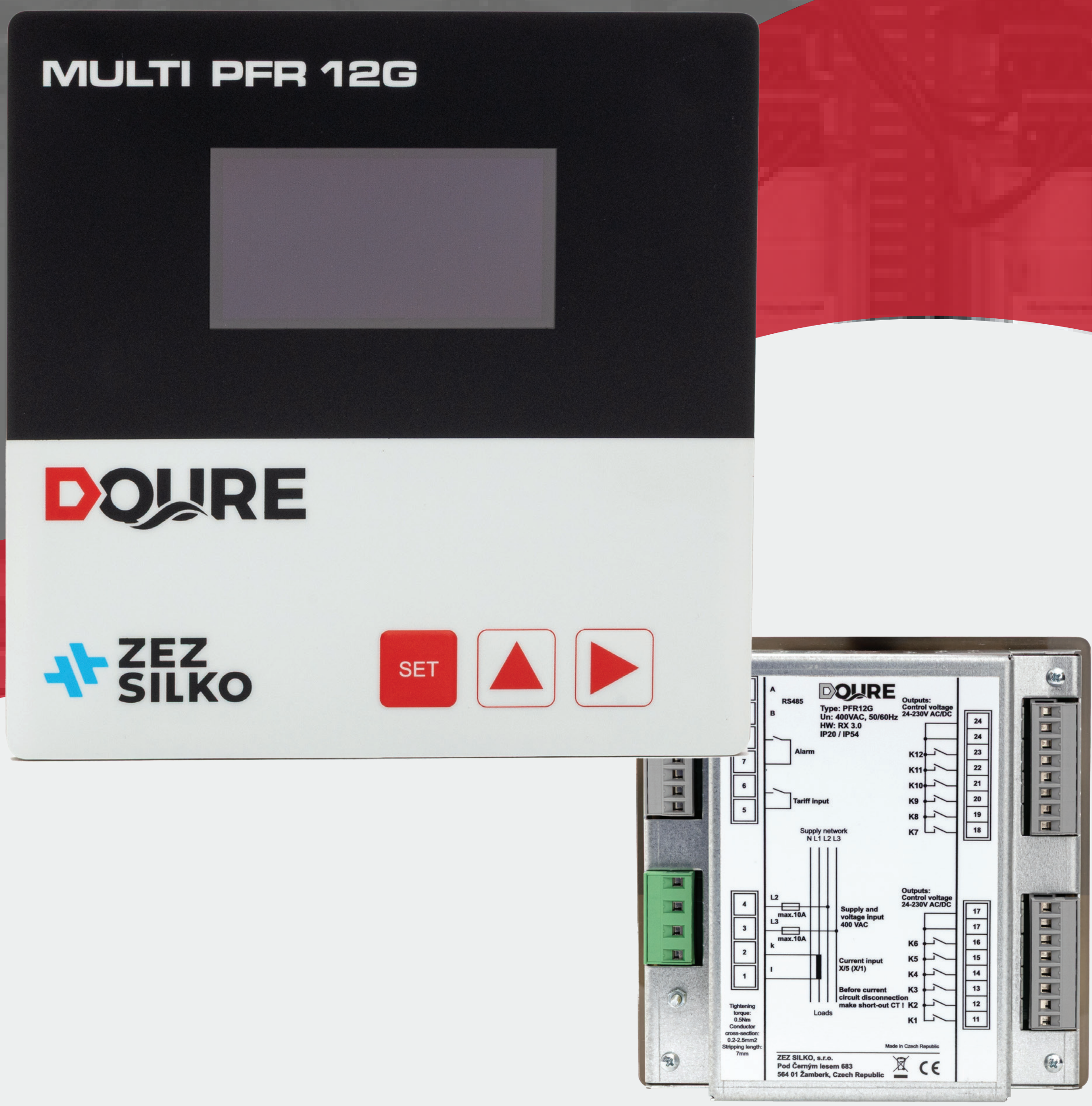
The main features

- Electrical life
- Reduced watt loss during 'ON' condition, saves energy
- Switching of Capacitor bank in parallel without de-rating

Technical features

Complete contactor block (contactor + resistors)	Power (kvar)			Frequency of switching (per hour)	Electrical endurance (operations)	Auxiliary contacts	Dimensions W x D x H (mm) Including damping resistors
	230 V	400 - 440 V	660 - 690 V				
CC 10 N 02	5	10	15	240	250 000	2 NC	45 x 100 x 120
CC 12 N 02	6,7	12,5	18	240	250 000	2 NC	45 x 100 x 120
CC 15 N 02	8,5	15	22	240	250 000	2 NC	45 x 100 x 120
CC 20 N 01	11	20	30	120	175 000	1 NC	45 x 100 x 120
CC 25 N 01	14	25	35	120	125 000	1 NC	45 x 100 x 133
CC 30 N 01	20	30	40	120	125 000	1 NC	45 x 100 x 133
CC 40 N 01	25	40	58	100	125 000	1 NC	55 x 120 x 162
CC 50 N 01	29	50	70	100	125 000	1 NC	55 x 120 x 162
CC 60 N 01	32	60	80	100	125 000	1 NC	55 x 120 x 162
CC 70 N 01	35	70	90	100	100 000	1 NC	70 x 142,5 x 180
CC 80 N 01	45	80	115	100	100 000	1 NC	70 x 142,5 x 180

POWER FACTOR REGULATOR



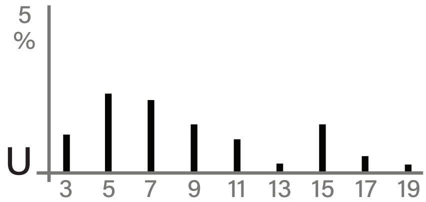
POWER FACTOR REGULATOR

GCT12RS Regulator is the key component of Automatic step engagement and disengagement. "Intelligent" controller is responsible not only for "smart switching" but also monitoring of network and Protection of capacitor bank. Suitable for Automatic and Manual switching operations.

Self-powered controller is equipped with 12 relay output which means 12 steps can be connected with one controller alone. Controller with OLED display provides detailed and comfortable view of electrical parameters such as voltage, current, power, cos phi, total harmonics and temperature; thanks for to built-in temperature sensor

Measured values

- Power factor ▸
- Current ▸
- Voltage ▸
- Power ▸
- Stage operation No ▸
- Other values ▸



Individual harmonics up to 19th order is also displayed which plays a key role in system diagnosis and safety of capacitor bank.

"Intelligent" controller ensures some critical requirements:

1. **Protection** against over voltage, THD and temperature.
2. **Smart Switching** to ensure the steps life can be equal if it carries the same capacity and to ensure picking the right steps to target the demand reactive power.

Operation is simple, only Current Transformer (CT) connection is required of electrical network and simple configuration to start the capacitor bank. Correct CT location is crucial to ensure right values are fed.

TECHNICAL PARAMETERS

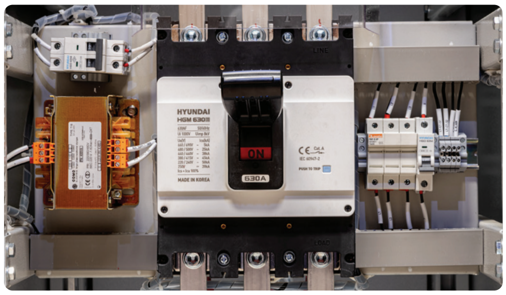
-	Supply voltage	400 V AC (+10%,-15%)
-	Frequency	50/60 Hz
-	Current Range	0.003 ... 6 A
-	Measurement accuracy of Current input	± 0.2%
-	Measurement accuracy of Voltage input	± 0.5%
-	Power Consumption	< 6 VA
-	Output channels	12 Channels for steps 1 Channel for Alarm
-	Range of Power Factor	0.8 ind. ... 0.8 cap.
-	Communication Port	RS485
-	Communication Protocol	MODBUS RTU
-	Over-voltage Class	300V CAT III
-	Temperature limit	-25°C ... +70°C
-	Front panel	144 mm x 144 mm
-	Protection degree	IP20 rear cover / IP54 front panel
-	Standards	EN 61010-1, EN50081-1, EN50082-1

CAPACITOR BANK

READY SOLUTION

As a solution provider, we can tailor ready solution to your need considering site situation.
Voltage range: 230V – 690V

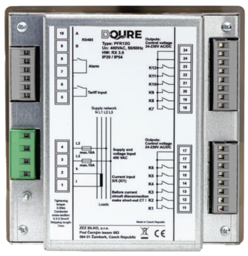
We make sure of suitable main incomer to match the short circuit current requirements with optional padded lock panel door. This can be produced to prevent opening of panel while energised



Contact welding and arcs are our concern. Our solution is equipped with fuses to ensure fast action. This ensures contactor life over a long period.

Steps are carefully designed and racked to have adequate voltage and overload margins. Also ensuring the detuning factor to avoid capacitor overloading due to harmonics.

Capacitor duty contactors ensure to avoid inrush conditions complying with AC-6b standards.

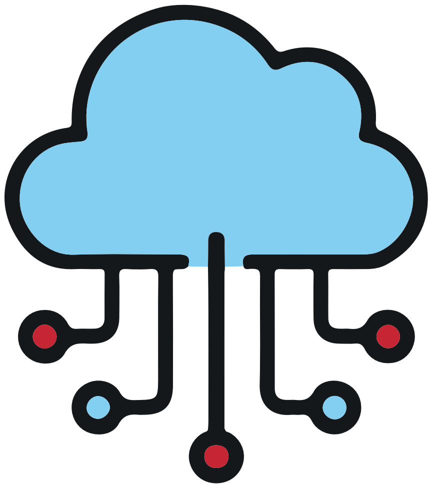


On top of everything, smart controller ensures no limits are violated and system is switch on/off automatically ensuring all time delays along with temperature regulations using force ventilation.

DCONNECT

DCONNECT CLOUD

Cloud-connected capacitor banks are revolutionizing power-factor correction (PFC) by enabling remote monitoring, real-time analytics, and proactive maintenance. These systems pair intelligent controllers with IoT or SCADA connectivity to streamline operations and reduce costs.



This provides comfort to view remotely and make predictive intervention if necessary to keep the operations functional. Below are some of the features:
- Download online reports
- Get email notifications of alarms
- 3rd party platform expandable

Proactive maintenance in cloud-connected capacitor banks uses real-time data to detect early signs of issues like imbalance or wear. By monitoring voltage, harmonics, and switching patterns, systems can trigger alerts for timely repairs. This reduces downtime, extends equipment life, and ensures stable power factor correction.

Avoid the hassle of manual meter readings with DConnect—a smart platform that combines energy meters and Power Factor Controllers on one dashboard. It enables real-time monitoring, energy consumption tracking, and visualization of performance trends. By analyzing historical data, users can identify peak usage hours, optimize capacitor bank operation, and improve overall efficiency.

Connect with DConnect on our website
dconnect.digital

+966-573746982 info@dqure.com www.dqure.com