# Price List - Capacitors

## Capacitor 3 phase, Dry-type, Internally Fused

| Type | kvar at 230V | Price (Baht) |
|---|---|---|
| CLMD 43 | 8 kvar | **8,300** |
| | 16 kvar | **13,900** |
| CLMD 53 | 24 kvar | **20,300** |
| CLMD 63 | 32 kvar | **26,500** |
| | 40 kvar | **32,300** |
| | 48 kvar | **38,000** |
| | 56 kvar | **44,000** |
| | 64 kvar | **49,500** |

| | kvar at 480V | Price (Baht) |
|---|---|---|
| CLMD 43 | 10 kvar | **6,700** |
| CLMD 53 | 20 kvar | **10,700** |
| | 30 kvar | **14,500** |
| | 34 kvar | **14,800** |
| | 40 kvar | **19,000** |
| CLMD 63 | 50 kvar | **22,100** |
| | 60 kvar | **25,700** |
| | 68 kvar | **26,500** |
| | 70 kvar | **29,700** |
| | 80 kvar | **36,500** |

| Type | kvar at 400V | kvar at 415V | Price (Baht) |
|---|---|---|---|
| CLMD 43 | 5 kvar | 5.5 kvar | **5,200** |
| | 10 kvar | 11 kvar | **5,900** |
| | 15 kvar | 16 kvar | **6,500** |
| | 20 kvar | 22 kvar | **9,600** |
| | 25 kvar | 27 kvar | **10,300** |
| CLMD 53 | 30 kvar | 32 kvar | **12,000** |
| | 40 kvar | 43 kvar | **15,600** |
| | 45 kvar | 50 kvar | **17,900** |
| CLMD 63 | 50 kvar | 54 kvar | **18,200** |
| | 60 kvar | 65 kvar | **24,200** |
| | 70 kvar | 75 kvar | **29,200** |
| | 75 kvar | 80 kvar | **29,700** |
| | 80 kvar | 86 kvar | **31,200** |
| CLMD 83 | 100 kvar | 110 kvar | **39,400** |

| | kvar at 500V | kvar at 525V | Price (Baht) |
|---|---|---|---|
| CLMD 43 | 9 kvar | 10 kvar | **6,000** |
| | 18 kvar | 20 kvar | **9,400** |
| CLMD 53 | 27 kvar | 30 kvar | **13,300** |
| | 36 kvar | 40 kvar | **16,700** |
| CLMD 63 | 45 kvar | 50 kvar | **22,000** |
| | 54 kvar | 60 kvar | **24,300** |
| | 63 kvar | 70 kvar | **28,700** |
| | 72 kvar | 80 kvar | **29,700** |
| CLMD 83 | 81 kvar | 90 kvar | **39,600** |
| | 90 kvar | 100 kvar | **42,800** |
| | 110 kvar | 120 kvar | **53,200** |

**Remark:**

1. All prices do not include VAT.
2. Prices are subjected to change without prior notice.
3. **Effective from 1 April 2018.**
4. Please see ABB Capacitors product brochure for technical specification and application.

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Phone. 02 665 1000 Fax. 02 324 0502 **www.abb.co.th**

# Price List - Components

## ABB Power Factor Controller

| Type | Output | Price (Baht) |
|---|---|---|
| RVC-6 | 6 | **28,000** |
| RVC-8 | 8 | **30,000** |
| RVC-10 | 10 | **33,300** |
| RVC-12 | 12 | **35,400** |
| RVT-6 | 6 | **37,500** |
| RVT-12 | 12 | **45,900** |
| MODBUS adaptor kit | accessory | **16,300** |
| Temperature probe for RVT | accessory | **14,800** |
| IP54 gasket | accessory | **2,500** |

## ABB Magnetic Contactor for Capacitor

| Type | Max.kvar (at 400V) | Price (Baht) |
|---|---|---|
| UA 30-30-11 | 27.5 | **4,300** |
| UA 50-30-11 | 33 | **5,900** |
| UA 63-30-11 | 45 | **7,300** |
| UA 75-30-11 | 50 | **8,800** |
| UA 95-30-11 | 60 | **12,000** |
| UA 110-30-11 | 70 | **14,000** |

## ABB 3-pole Fuse Base

| Type | Fuse size | Price (Baht) |
|---|---|---|
| XLP 00 | 00 & 000 | **1,940** |
| XLP 1 | 1 | **4,000** |
| OFAZ 00 P3L | 00 & 000 | **2,900** |
| OFAZ 1 P3 | 1 | **7,100** |

## ABB HRC Blade Fuse Link

| Fuse size | Rating (A) | Price (Baht) |
|---|---|---|
| 000 | 50, 63, 80, 100 | **430** |
| 00 | 125, 160 | **530** |
| 1 | 200, 250 | **720** |

## ABB Detuning Reactor (7%)

| Type | Price (Baht) |
|---|---|
| Reactor 7% for capacitor net output 25 kvar at 400V | **22,000** |
| Reactor 7% for capacitor net output 50 kvar at 400V | **27,600** |

**Remark:**

1. All prices do not include VAT.
2. Prices are subjected to change without prior notice.
3. **Effective from 1 December 2019.**
4. Please see ABB Capacitors product brochure for technical specification and application.

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PRODUCT BROCHURE

# LV Capacitor Products and Guideline

## Enhancing power quality and energy efficiency

# ABB Capacitor Products Low Voltage: Improve your power quality and reduce your energy costs



## Table of contents

# **Improving power factor and enhancing power quality of your network**
Applications in several areas of the power value chain

ABB is a pioneering technology leader in electrification products, robotics and motion, industrial automation and power grids, serving customers in utilities, industry and transport & infrastructure globally. Continuing a history of innovation spanning more than 130 years, ABB today is writing the future of industrial digitalization and driving the Energy and Forth Industrial Revolutions. As title partner of Formula E, the fully electric international FIA motorsport class, ABB is pushing the bundaries of e-mobility to contribute to a sustainable future. ABB operates in more than 100 countries with about 136,000 employees.

ABB offer a wide range of products from 208 V up to 1200 kV that help enhance the reliability, efficiency and quality of power in transmission and distribution grids, power plants and industrieswhile minimizing environmental impact. The wide product rang is complimented by a comprehensive service offering.

Power quality is a major concern for transmission and distribution utilities, industries, transport and infrastructure sectors. Poor power quality affects grid reliability, productivity, leads to higher operating costs and penalties for non-compliance with grid codes. Abb is a technology leader with awide range of products, systems and services that improve power quality including capacitors and filters, power electronics-based compensators and software solutions. The offering is avilable acreoos the power value chain for low, medium and high voltage applications, heling to shape a stronger, smarter and greener grid.

**The benefits of enhanced power quality can be seen across the power value chain:**

**Utilities**

- Enhanced asset utilization
- Lower network losses and $CO_2$ emissions
- Expansion of network capacity
- Voltage stability

**Industries**

- Reduction of electricity expenses
- Lower network losses and $CO_2$ emissions
- Grid compliance
- Increase in plant capacity
- Higher productivity (i.e. fewer outages, lower operating costs)



# **LV Capacitor CLMD**
from 200 to 1000 V

| | |
|---|---|
| **Standard** | IEC 60831-1&2 |
| **Rated voltage** | 200 to 1000 V |
| **Connection** | 3-phase (single-phase on request) |
| **Rated frequency** | 50 and 60 Hz |
| **Type** | Self-healing, dry |
| **Dielectric** | Polypropylene (metallized) |
| **Execution** | Indoor (outdoor on request) |
| **Overvoltage** | 1.1 $U_N$ at intervals |
| **Overcurrent** | 1.3 $I_N$ |
| **Maximum overload** | 1.35 times of nominal rating (IEEE Std.18-2002) |
| **Maximum inrush current** | 200 $I_N$ |
| **Safety protection** | Internal fuse within each element |
| **Tolerance on capacitance** | -5 /+10% |
| **Temperature category** | -25/D according to IEC 60831 |
| **Losses** | Dielectric losses < 0.2 w/kvar<br>Total <0.5 w/kvar (discharge resistor included) |
| **Degree of protection** | IP42 (IP54 on request) |
| **Voltage test** | Between terminals 2.15 $U_N$ for 10 seconds<br>Between terminals and earth 3 kV for 10 seconds |
| **Insulation level** | 3/15 kV |
| **Discharge device** | Internal discharge resistors |
| **Discharge time** | <50 V in 1 minute |
| **Minimum distance between unit** | 50 mm |
| **Minimum distance between unit and wall** | 50 mm |

# UA Contactor

## Exclusive Designed for Capacitors Switching


| | |
|---|---|
| **Standard** | IEC 60947-1/60947-4-1 and EN 60947-1/60947-4-1 |
| **Number of main pole** | 3 poles |
| **Execution** | Indoor |
| **Control voltage** | 220 to 230 V (other on request) |
| **Rated voltage** | 690 V |
| **Rated frequency** | 50/60 Hz |
| **Mechanical durability** | 10 millions operating cycles |
| **Max.electrical switching frequency** | 240 cycle/h |
| **Electrical durability AC-6b $U_e \leq 690V$** | For max.peak current 100 $I_N$ of the capacitors 100,000 operating cycles |
| **Peak current** | See the selection table |

### Selection table

| **Type** | **Power in kvar (based on 55°C)** | | | | | **Max.permissible peak current (kA)** | |
|---|---|---|---|---|---|---|---|
| | **230-240 V** | **400-415 V** | **440 V** | **500-550 V** | **690 V** | **$U_e \leq 500$ V** | **$U_e > 500$ V** |
| UA 30-30-11 | 16 | 27.5 | 30 | 34 | 45 | 3.5 | 3.1 |
| UA 50-30-11 | 20 | 33 | 36 | 40 | 55 | 5.0 | 4.5 |
| UA 63-30-11 | 25 | 43 | 48 | 50 | 70 | 6.5 | 5.8 |
| UA 75-30-11 | 30 | 50 | 53 | 62 | 75 | 7.5 | 6.75 |
| UA 95-30-11 | 35 | 65 | 65 | 70 | 80 | 9.3 | 8.0 |
| UA 110-30-11 | 40 | 70 | 75 | 80 | 90 | 10.5 | 9.0 |



# Detuning Reactor

## For Capacitors up to 690 V, Indoor use

### Reactor data

| **P (%)** | **$Q_{net}$ (kvar)** | **$L_N$ (mH)** | **$I_N$ (A)** | **$I_{th}$ (A)** | **$I_{lin}$ (A)** | **$P_{max}$ (W)** | **Weight (kg)** |
|---|---|---|---|---|---|---|---|
| 7 | 25 | 1.533 | 36.1 | 42.3 | 68.6 | 175 | 18 |
| 7 | 50 | 0.767 | 72.2 | 84.5 | 137.1 | 275 | 28 |

| | |
|---|---|
| **Rated voltage** | 3-phase, up to 690 V |
| **Protection degree** | IP00 |
| **Core** | Laminated sheet iron |
| **Wiring** | Aluminum or copper |
| **Terminal** | Copper-Bar |
| **Ground terminal** | Fixation holes |
| **Impregnation** | Completed unit impregnated under vacuum and overpressure in impregnation thermosetting resin temperature class H |
| **Tolerance of inductance** | ± 3% when measured at 20°C (± 5°C) at $f_1$ and $I_N$ |
| **Operation** | The reactor is designed to operate continually at a network voltage equals to $U_N$ with a current load of $I_{th}$ at $T_{max}$ and maintain sufficient safety margin to hot spot temperatures of its insulation while dissipating losses not exceeding $P_{max}$ |
| **Insulation test** | Between winding and core of 3 kV at 1 minute according to IEC 76 |
| **Applicable standard** | IEC 60076-6, VDE 0532, IEC 76 |
| **Operating temperature** | Minimum -25°C, maximum 50°C |
| **Storage temperature** | Minimum -40°C, maximum 75°C |
| **Thermal current** | $I_{th}$ is defined as the root mean square of ($I_1$, $I_3$, $I_5$, $I_7$, $I_{11}$, $I_{13}$)<br>where $I_1$ is calculated from network voltage of 1.1 x $U_N$<br>$I_1$, $I_3$, $I_5$, $I_7$, $I_{11}$, $I_{13}$ are calculated from network<br>Voltage spectrum of maximum<br>$U_3/U_1$ = 0.5% $U_{11}/U_1$ = 3.5%<br>$U_5/U_1$ = 6.0% $U_{13}/U_1$ = 3.0%<br>$U_7/U_1$ = 5.0%<br>but not exceeding a total THDU of 8% |
| **Linearity current** | $I_{lin} = 1.9\ I_N$ |
| **Rated current** | $I_N$ = normal fundamental current of one phase of the capacitor-reactor combination in detuned filter |
| **Maximum losses** | $P_{max}$ |
| **Inductance** | $L_N$ = nominal inductance of one phase of reactor |
| **Net reactive power** | $Q_{net}$ = net output reactive power of 3-phase capacitor-reactor combination in detuned filter at $U_N$ |

# HRC Fuse Links
## Low Voltage


Low loss low voltage high rupturing capacity fuse links type NH are supplied for 500 V.

ABB HRC fuse of standard design are manufactured with flag indicators on the upper end cap. After operation, the red colored leaf spring tucks up and indicates the status of the operation.

ABB Low Voltage HRC fuses are available for rated voltages 500 V service category gG, and are according to DIN VDE 0636 part 21; IEC 269-1/EN 60269-1; DIN VDE 0636 part 22. All fuse links according to VDE 0636 for rated voltages 500 V have a minimum breaking capacity of 120 kA.

The geometrical dimensions of the high rupturing capacity fuse links are according to DIN 43620.



# Fuse Bases type EasyLine XLP
## Fuse Switch Disconnector


**Properties of the EasyLine-XLP :**
- XLP 00 and XLP 1
- Type tested according to EN IEC 60947-3
- Fullfills BGV A2
- Easy to recycle/EN ISO 14001 standards
- Quick-make operation device
- Integrated IP20 cable termination
- IP30 degree of protection from the front
- Replacement compatible to similar types in the market
- Voltage measuring from the front
- V-0 plastic materails

**3-pole:**
- XLP 00 160 A
- XLP 1 250 A

**Technical data**

| | | XLP 00 | | | XLP 1 | | |
|---|---|---|---|---|---|---|---|
| For NH fuse links acc. to IEC60269-2-1 | | | 00 | | | 1 | |
| Rated operational voltage $U_e$ AC | (V) | 400 | 500 | 690 | 500 | | 690 |
| Rated operational current $I_e$ AC | (A) | 125 | 160 | 125 | 250 | | 200 |
| Thermal current with fuse link $I_{th}$ | (A) | | 160 | | | 250 | |
| Utilization category | | AC23B | AC22B | AC21B | AC22B | | AC21B |
| Rated insulation voltage $U_i$ | (V) | | 1000 | | | 1000 | |
| Rated impulse withstand voltage $U_{imp}$ | (kV) | | 8 | | | 8 | |
| Rated conditional short circuit current | (kArms) | | 50 | | | 50 | |
| Rated frequency | (Hz) | | 50-60 | | | 50-60 | |
| Power loss at $I_{th}$ without fuse link/per phase | (W) | | 3.5 W | | | 7.5 W | |
| Max allowed power loss in the fuse per phase | (W) | | 12 W | | | 23 W | |
| Electrical durability | | | 200 | | | 200 | |
| Mechanical durability | | | 1400 | | | 1400 | |
| Degree of protection from the front acc. | Open | | IP20 | | | IP20 | |
| to IEC 60529 | Closed | | IP30 | | | IP30 | |

# Power Factor Controller RVC

## Accurate Control and Monitoring of Capacitor Bank


| | |
|---|---|
| **Measuring system** | Micro-processor system for balanced 3-phase networks or single-phase networks |
| **Operating voltage** | 100 to 440 Vac |
| **Voltage tolerance** | ± 10% on indicated operating voltages |
| **Frequency range** | 50 or 60 Hz ± 5% (automatic adjustments to network frequency) |
| **Measuring circuit terminals (L2, L3 and k, l)** | CAT III rated |
| **Current input** | 1 or 5 A (RMS) |
| **Current input impedance** | <0.1 Ohm |
| **Consumption** | 8 VA max. |
| **Output contact rating** | Max.continuous current: 1.5 A<br>Max.peak current: 5 A<br>Max.voltage: 40 Vac<br>Terminal A is rated for a continuous current of 16 A |
| **Alarm contact** | Normally opened contact<br>Max.continuous current: 5 A<br>Rated/max.breaking voltage: 250/440 Vac |
| **Power factor setting** | From 0.7 inductive to 0.7 capacitive |
| **Starting current setting (C/k)** | 0.01 to 3 A |



# Power Factor Controller RVT

## The Smart PFC for Automatic Capacitor Bank


| | |
|---|---|
| **Measuring system** | Micro-processor system for balanced 3-phase/single-phase networks and unbalanced network |
| **Supply voltage** | From 100 up to 460 Vac |
| **Consumption** | 15 VA max. |
| **Voltage tolerance** | ± 10% on indicated supply voltages |
| **Measurement category (according to IEC 61010-1)** | CAT III |
| **Voltage measurement** | Up to 690 Vac or higher with voltage transformer |
| **Frequency range** | 45 or 65 Hz (automatic adjustments to network frequency) |
| **Current input** | 5 A or 1 A (RMS) (class 1 C.T.) |
| **Current input impedance** | <0.1 Ohm |
| **Power outage release** | Automatic disconnection of all capacitors in case of a power outage longer than 20 ms |
| **Number of outputs** | RVT6/RVT12 Base Model: programmable up to 6 or 12 outputs<br>RVT12-3P 3-phase Model: programmable up to 12 outputs |
| **Output contact rating** | Max.continuous current: 1.5 A (ac) - 0.3 A (110 Vdc)<br>Max.peak current: 5 A<br>Max.voltage: 440 Vac<br>Terminal A-A are rated for a continuous current of 18 A (9 A/terminal) |
| **Alarm contact rating (voltage free contact)** | One normally closed contact and one normally open contact<br>Max.continuous current: 1.5 A (ac)<br>Rated voltage: 250 Vac (max.breaking voltage: 440 Vac) |
| **Power factor setting** | From 0.7 inductive to 0.7 capacitive |
| **Starting current setting (C/k)** | 0.01 to 5 A |
| **CAN connection** | Support CAN 2.0B interface (for future use) |
| **USB host connection** | For future use |
| **USB device connection** | Available |
| **Step configuration** | Automatic, fixed, disabled |
| **Display** | QVGA 320 x 240 pixels colorful touch-screen |

# Example for Capacitor Rating Calculation

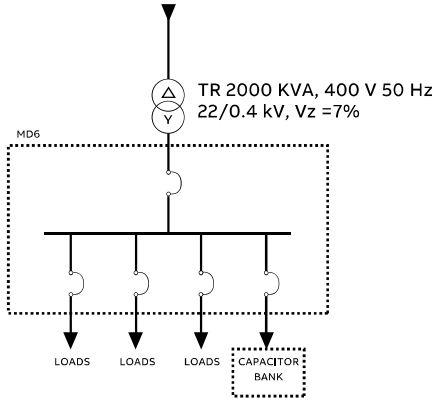
Factory Transformer 2000 kVA 22 kV/400-230 V 50 Hz 3 Ph
Average PF = 0.75, Average Load = 1480 kW
Required PF= 0.90, $Q_c$ = ? (kvar)

**1. Using formula**

P : Active Power (kw)
$PF_1$ : Power Factor (System)
$PF_2$ : Power Factor (Target)
Capacitor required = P [ tan ($\cos^{-1} PF_1$) – tan ($\cos^{-1} PF_2$) ]
= P [ tan ($\cos^{-1}$ 0.75) – tan ($\cos^{-1}$ 0.9) ]
= 1480 (0.397)
= 588 kvar

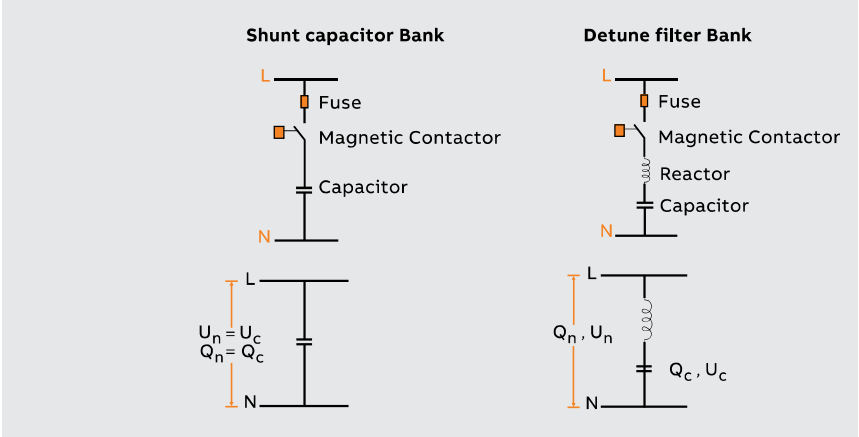
**2. Quickly approximate**

Capacitor required = 30% of Transformer capacity
Capacitor required = 0.3 x 2000 = 600 kvar
Capacitor bank size = 12 x 50 kvar = 600 kvar






# Example for Capacitor Rating Calculation




$U_n$ (Volt) : System voltage (Line-Line)
$Q_n$ (kvar) : Reactive power for compensation
$U_c$ (Volt) : Voltage rating for capacitor (Line-Line)
$Q_c$ (kvar) : Reactive power for capacitor
p (%) : Detuning factor (ratio between reactor reactance and capacitor reactance)
$X_C$ : Reactance of a capacitor
$X_L$ : Reactance of a reactor

$$p[\%] = \frac{X_L}{X_C} \times 100$$

$$Q_c\,(\text{kvar}) = Q_n \times \frac{1}{1-(\frac{p}{100})}$$

$$U_c\,(\text{Volt}) = U_n \times \frac{1}{1-(\frac{p}{100})}$$

# Example for Capacitor Rating Calculation

**Example : Determine the main equipment for $Q_C$ = 50 kvar at 400 V**

**1. Calculation or the current** $I_c = \frac{Q_c}{\sqrt{3} \times U_n}$

$$I_c = \frac{50 \text{ kvar}}{\sqrt{3} \times 400} = 72 \text{ A}$$

**2. Selection of fuse**
$I_c$ Multiplier by 1.65 = 72 x 1.65 = 125 A
HRC Fuse link 00/125 A

**3. Selection of magnetic contactor**
by ABB recommended contactor table
Selected contactor is UA 75

**Power in kvar and maximum permissible peak current**

| Type | Power in kvar (based on 55°C) | | | | | Max.permissible peak current (kA) | |
|---|---|---|---|---|---|---|---|
| | 230-240 V | 400-415 V | 440V | 500-550V | 690V | $U_e \leq 500$ V | $U_e > 500$ V |
| UA 30-30-11 | 16 | 27.5 | 30 | 34 | 45 | 3.5 | 3.1 |
| UA 50-30-11 | 20 | 33 | 36 | 40 | 55 | 5.0 | 4.5 |
| UA 63-30-11 | 25 | 43 | 48 | 50 | 70 | 6.5 | 5.8 |
| UA 75-30-11 | 30 | 50 | 53 | 62 | 75 | 7.5 | 6.75 |
| UA 95-30-11 | 35 | 65 | 65 | 70 | 80 | 9.3 | 8.0 |
| UA 110-30-11 | 40 | 70 | 75 | 80 | 90 | 10.5 | 9.0 |

**4. Selection of capacitor unit for capacitor bank**

4.1 Selection of capacitor unit for shunt bank
Selected capacitor is 50 kvar 400 V 50 Hz 3 Ph



# Example for Capacitor Rating Calculation

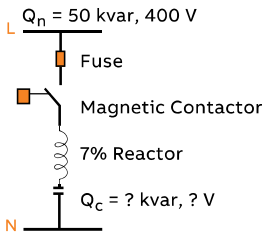
4.2 Selection of capacitor unit for detune filter bank

**Formula**

$$Q_c \text{ (kvar)} = Q_n \times \frac{1}{1-(\frac{p}{100})}$$

$$U_c \text{ (Volt)} = U_n \times \frac{1}{1-(\frac{p}{100})}$$

**50 kvar with 7% reactor 400 V 50 Hz 3 Ph**




$$Q_c \text{ (kvar)} = Q_n \times \frac{1}{1-(\frac{p}{100})} = \frac{50 \text{ kvar}}{1-0.07}$$

$$Q_c \text{ (kvar)} = \frac{50 \text{ kvar}}{0.93} = 53.8 \text{ kvar}$$

$$U_c = U_n \times \frac{1}{1-(\frac{p}{100})} = \frac{400}{1-0.07}$$

$$U_c = \frac{400}{0.93} = 430.1 \text{ V}$$

Hence, capacitor = 53.8 kvar at 430.1 V

**For harmonics and over voltage 20%**
Dimension voltage of capacitor is 430.1 x 1.20 = 516 V
Selected capacitor voltage is 525 V
Capacitor power is a function of (voltage)$^2$

$$= Q_{C_2} = Q_{C_1} \times \frac{U^2_{C_2}}{U^2_{C_1}}$$

$$= 53.8 \times \frac{525^2}{430.1^2}$$

$$= 80.2 \text{ kvar}$$

Selected capacitor unit is 80 kvar 525 V 50 Hz 3 Ph

**5. Conclusion table**

| Item | Components | Shunt Bank | Detune Filter Bank |
|---|---|---|---|
| 1 | Fuse | HRC Fuse Link 00/125 A | HRC Fuse Link 00/125 A |
| 2 | Magnetic Contactor | UA 75-30-11 | UA 75-30-11 |
| 3 | Capacitor | CLMD 63/50 kvar 400 V 50 Hz 3 Ph | CLMD 63/80 kvar 525 V 50 Hz 3 Ph |
| 4 | Reactor | - | 7% Reactor for 50 kvar 400 V 50 Hz 3 Ph |
| 5 | Power Factor Controller | RVC-12 or RVT-12 | RVC-12 or RVT-12 |

# Selection Table

**For ABB Shunt Bank in 3-phase 400/415 V 50 Hz**

| Type | Capacitors Rating (kvar) | | $I_N$ (A) | | Components Fuse Bases | Fuse Links | Contactor | Contactor | Minimum Cu Cable ($mm^2$) |
|---|---|---|---|---|---|---|---|---|---|
| | 400 V | 415 V | 400 V | 415 V | | | 400 V | 415 V | |
| CLMD 43 | 5 | 5.5 | 7.2 | 7.7 | XLP 00/OFAX 00 P3L | 000/16 A | UA 30-30-11 | UA 30-30-11 | 2.5 |
| | 10 | 11 | 14.4 | 15.3 | XLP 00/OFAX 00 P3L | 000/25 A | UA 30-30-11 | UA 30-30-11 | 4 |
| | 15 | 16 | 21.7 | 22.3 | XLP 00/OFAX 00 P3L | 000/50 A | UA 30-30-11 | UA 30-30-11 | 6 |
| | 20 | 22 | 28.9 | 30.6 | XLP 00/OFAX 00 P3L | 000/50 A | UA 30-30-11 | UA 30-30-11 | 10 |
| | 25 | 27 | 36.1 | 37.6 | XLP 00/OFAX 00 P3L | 000/63 A | UA 30-30-11 | UA 30-30-11 | 10 |
| CLMD 53 | 30 | 32 | 43.3 | 44.5 | XLP 00/OFAX 00 P3L | 000/80 A | UA 50-30-11 | UA 50-30-11 | 16 |
| | 40 | 43 | 57.7 | 59.81 | XLP 00/OFAX 00 P3L | 00/100 A | UA 63-30-11 | UA 63-30-11 | 25 |
| | 45 | 50 | 65.0 | 69.6 | XLP 00/OFAX 00 P3L | 00/125 A | UA 63-30-11 | UA 75-30-11 | 25 |
| CLMD 63 | 50 | 54 | 72.2 | 75.1 | XLP 00/OFAX 00 P3L | 00/125 A | UA 75-30-11 | UA 95-30-11 | 35 |
| | 60 | 65 | 86.61 | 90.4 | XLP 00/OFAX 00 P3L | 00/160 A | UA 95-30-11 | UA 95-30-11 | 35 |
| | 70 | 75 | 101.0 | 104.3 | XLP 1/OFAX 1 P3 | 1/200 A | UA 110-30-11 | UA 110-30-11 | 50 |
| | 75 | 80 | 108.3 | 111.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 140-30-11* | AF 140-30-11* | 50 |
| | 80 | 86 | 115.5 | 119.6 | XLP 1/OFAX 1 P3 | 1/200 A | AF 140-30-11* | AF 146-30-11* | 70 |
| CLMD 83 | 100 | 110 | 144.3 | 153.0 | XLP 1/OFAX 1 P3 | 1/250 A | AF 190-30-11* | AF 190-30-11* | 95 |

(* Single step)

**For power rating 75, 80 and 100 kvar 400 V without reactor**

| Step x Power rating (kvar) | Capacitors Type | Rating (kvar) | $I_N$ (A) | Components Fuse Bases | Fuse Links | Contactor | Minimum Cu Cable ($mm^2$) |
|---|---|---|---|---|---|---|---|
| 3 x 75 | CLMD 63 | 75 | 108.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 265 | 50 |
| 6 x 75 | CLMD 63 | 75 | 108.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 400 | 50 |
| 12 x 75 | CLMD 63 | 75 | 108.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 400 | 50 |
| 3 x 80 | CLMD 63 | 80 | 115.5 | XLP 1/OFAX 1 P3 | 1/200 A | AF 265 | 70 |
| 6 x 80 | CLMD 63 | 80 | 115.5 | XLP 1/OFAX 1 P3 | 1/200 A | AF 400 | 70 |
| 12 x 80 | CLMD 63 | 80 | 115.5 | XLP 1/OFAX 1 P3 | 1/200 A | AF 580 | 70 |
| 3 x 100 | CLMD 83 | 100 | 144.3 | XLP 1/OFAX 1 P3 | 1/250 A | AF 400 | 95 |
| 6 x 100 | CLMD 83 | 100 | 144.3 | XLP 1/OFAX 1 P3 | 1/250 A | AF 580 | 95 |
| 12 x 100 | CLMD 83 | 100 | 144.3 | XLP 1/OFAX 1 P3 | 1/250 A | AF 580 | 95 |



# Selection Table

**For power rating 75, 80 and 100 kvar 400 V with 7% reactor**

| Step x Power rating (kvar) | Capacitors Type | Rating (kvar) | $I_N$ (A) | Components Fuse Bases | Fuse Links | Contactor | Minimum Cu Cable ($mm^2$) |
|---|---|---|---|---|---|---|---|
| 3 x 75 | CLMD 63 | 75 | 108.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 140 | 50 |
| 6 x 75 | CLMD 63 | 75 | 108.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 140 | 50 |
| 12 x 75 | CLMD 63 | 75 | 108.3 | XLP 1/OFAX 1 P3 | 1/200 A | AF 140 | 50 |
| 3 x 80 | CLMD 63 | 80 | 115.5 | XLP 1/OFAX 1 P3 | 1/200 A | AF 146 | 70 |
| 6 x 80 | CLMD 63 | 80 | 115.5 | XLP 1/OFAX 1 P3 | 1/200 A | AF 146 | 70 |
| 12 x 80 | CLMD 63 | 80 | 115.5 | XLP 1/OFAX 1 P3 | 1/200 A | AF 146 | 70 |
| 3 x 100 | CLMD 83 | 100 | 144.3 | XLP 1/OFAX 1 P3 | 1/250 A | AF 190 | 95 |
| 6 x 100 | CLMD 83 | 100 | 144.3 | XLP 1/OFAX 1 P3 | 1/250 A | AF 190 | 95 |
| 12 x 100 | CLMD 83 | 100 | 144.3 | XLP 1/OFAX 1 P3 | 1/250 A | AF 190 | 95 |

**For ABB 7% Detune Bank in 3-phase 400 V 50 Hz**

| Target kvar/step | Reactor Type | Capacitor Type | Components Fuse Bases | Fuse Links | Contactor | Minimum Cu Cable ($mm^2$) |
|---|---|---|---|---|---|---|
| 25 | 7% for 25 kvar 400 V | 40 kvar 525 V | XLP 00/OFAX 00 P3L | 000/63 A | UA 30-30-11 | 10 |
| 50 | 7% for 50 kvar 400 V | 80 kvar 525 V | XLP 00/OFAX 00 P3L | 00/125 A | UA 75-30-11 | 35 |
| 100 | 7% for 100 kvar 400 V | 2x(80 kvar 525 V) | XLP 1/OFAX 1 P3 | 1/250 A | AF 190-30-11 | 95 |
| 100 | 2x(7% for 50 kvar 400 V) | 2x(80 kvar 525 V) | 2x(XLP 00/OFAX 00 P3L) | 2x(00/125 A) | 2x(UA 75-30-11) | 2x35 |

# How to check capacitance of CLMD

**1. Current Test :**
Measure the current flowing through a capacitor by applying the rated voltage across the capacitor and check the values by the following formula

$I = Q / \sqrt{3} \times V$

I : Rated current per phase (A)
Q : Reactive power (var)
V : Rated voltage (V)

for example : 50 kvar 400 V 50 Hz 3 Ph
$I = 50 \times 1000 / \sqrt{3} \times 400$
$= 72.17$ A

**2. Capacitance Test :**
Use capacitance meter to measure the capacitance between terminal and check with the table below

| Type | kvar at 400 V | Rated current (A) | Capacitance C1,C2,C3 (uF) | Total Capacitance (uF) | Capacitance per phase (uF) |
|---|---|---|---|---|---|
| CLMD 43 | 5 | 7.22 | 49.76 | 99.52 | 33.17 |
| | 10 | 14.43 | 99.52 | 199.04 | 66.35 |
| | 15 | 21.65 | 149.28 | 298.57 | 99.52 |
| | 20 | 28.87 | 199.04 | 398.09 | 132.70 |
| CLMD 53 | 25 | 36.08 | 248.81 | 497.61 | 165.87 |
| | 30 | 43.30 | 298.57 | 597.13 | 199.04 |
| | 40 | 57.74 | 398.09 | 796.18 | 265.39 |
| CLMD 63 | 45 | 64.95 | 447.85 | 895.70 | 298.57 |
| | 50 | 72.17 | 497.61 | 995.22 | 331.74 |
| | 60 | 86.60 | 597.13 | 1194.27 | 398.09 |
| | 70 | 101.04 | 696.66 | 1393.31 | 464.44 |
| | 75 | 108.25 | 746.42 | 1492.83 | 497.61 |
| CLMD 83 | 80 | 115.47 | 796.18 | 1592.36 | 530.79 |
| | 100 | 144.34 | 995.22 | 1990.45 | 663.48 |

Terminal 1 and 2 = C1
2 and 3 = C2
3 and 1 = C3
Total Capacitance = 2/3 x (C1+C2+C3)
C1, C2, C3 = Capacitance between terminals