LV Capacitor Bank APC
The ABB comprehensive solution for automatic power factor correction

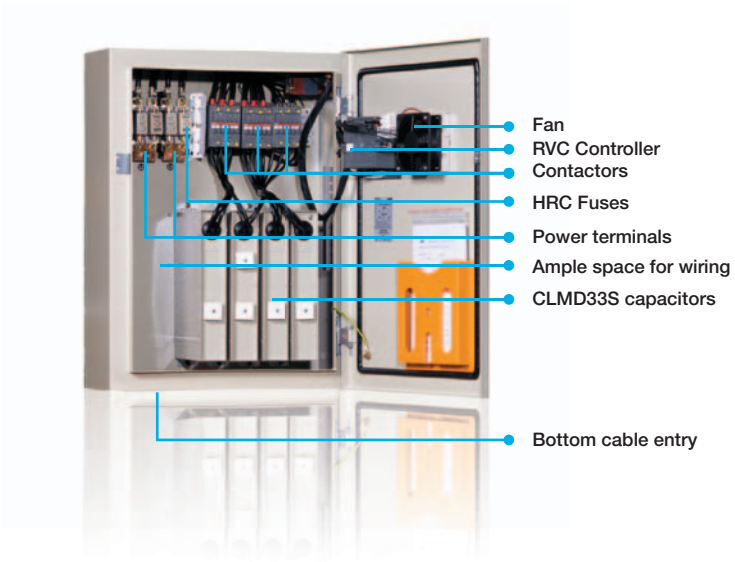
Power and productivity
for a better world™

APC range

The APC is a powerful and compact automatic bank. It is very easy to install and to operate. It provides a high level of reliability and security.

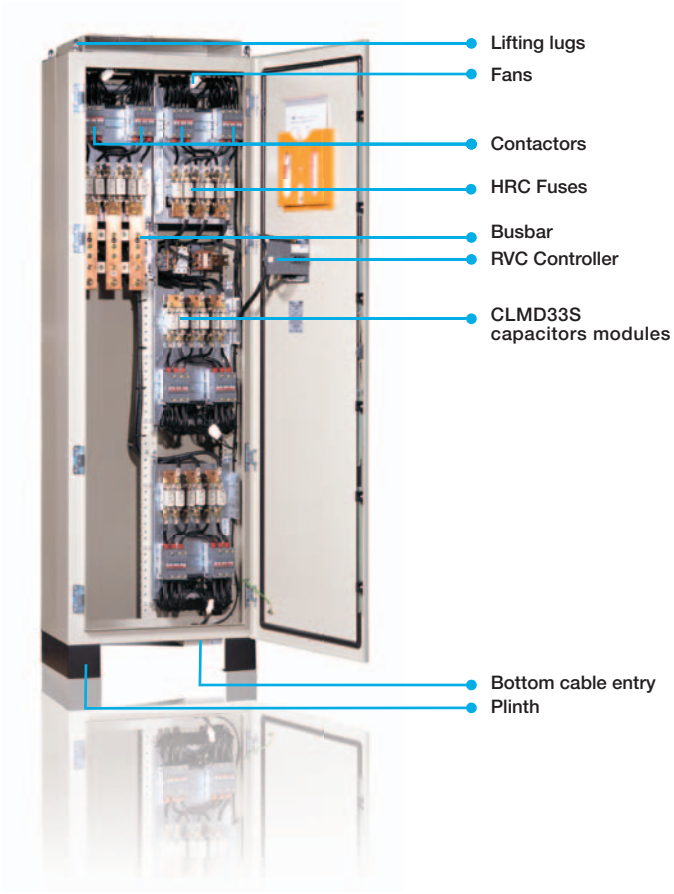
APCL : standard and reinforced ranges

APCL2 box of 125kvar (master unit)



APCM : standard and reinforced ranges

APCM2 cubicle of 400kvar (master unit)

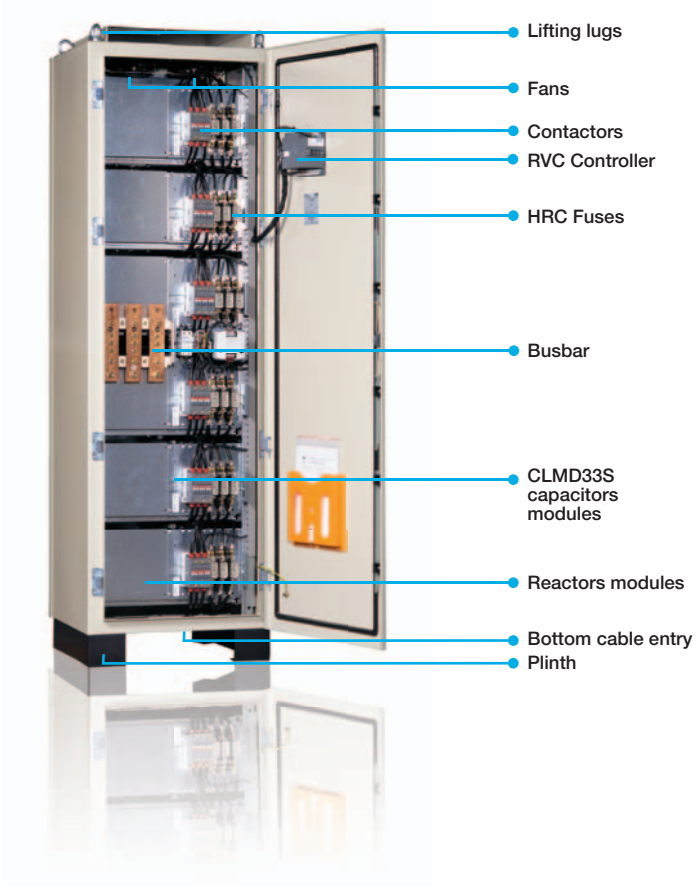


APC range

APCR: de-tuned range

APCR capacitor banks are protected by reactors for network disturbed by harmonics.

APCR cubicle of 300kvar (master unit)



Powerful and compact

ABB capacitors and a specially designed ventilation system allow the APC to reach a maximum reactive power within a minimum volume.

Easy to select

- The APC exists in 4 versions: 1 type of box (APCL2) and 3 types of cubicles (APCM1, APCM2 and APCR).
- The APC offers a power range from 25 to 800kvar (in different configurations).
- Slave units are available for extension up to 250kvar in APCL2, 800kvar in APCM2 and 600kvar in APCR (1 master unit + 1 slave unit).

Easy to install

- The APC is a complete unit, factory tested and ready for connection.
- Its commissioning may be completely automatic.
- There is ample space for wiring.
- The APCL2 box is equipped with wall mounting brackets.
- The APCM and APCR cubicles are equipped with a plinth and lifting lugs for easy handling.
- Slave units (APCL2, APCM2 & APCR) are equipped with an interconnection cable for fast connection to the master unit.

Easy to use

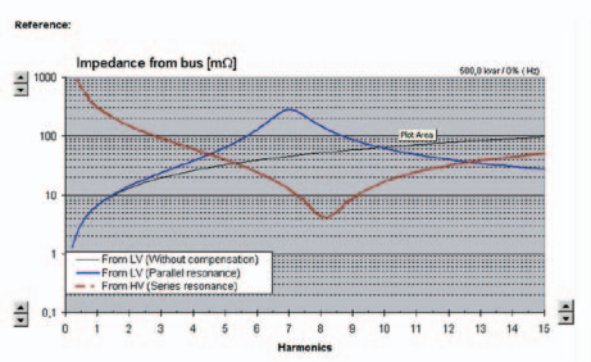
The multiple automatic functions of the RVC and its user-friendly interface make the APC very easy to operate.

Capacitor bank selection

The installation of capacitors on network disturbed by harmonics may require special precautions especially when there is a risk of resonance. Feel free to contact your local ABB agent for a propre selection of your APC LV Capacitor Bank.

Network study

Our Power Quality specialists will, on request, perform a harmonic study of your network in order to propose you a reactive power compensation solutions that prevents any risk of resonance, for maximum reliability.



Reliable and safe

The reliability of the APC is based on a set of ABB components specially designed for the reactive power compensation application.The APC has an IP23D protection level (closed door) and is protected against direct and accidental contact (open door).

ABB capacitors

The dielectric of the capacitors windings is made of in-house metallized polypropylene film giving exceptional properties:

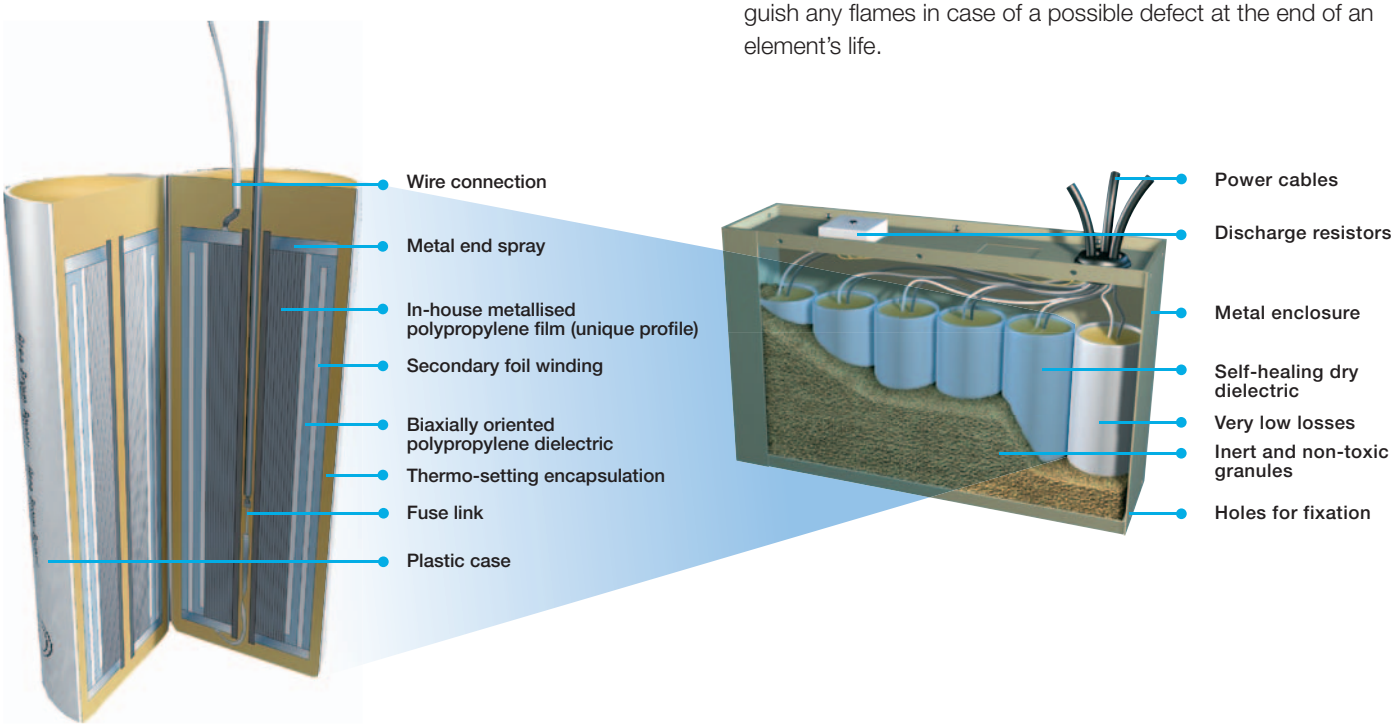
- high voltage withstand capability.
- excellent peak current handling capacity.
- high capacitance stability.
- long life even under high electrical stress.
- very low losses.
- exceptional self-healing properties.

ABB Contactors

Contactors have been specially selected for their excellent endurance tests handling capability.

CLMD33S construction

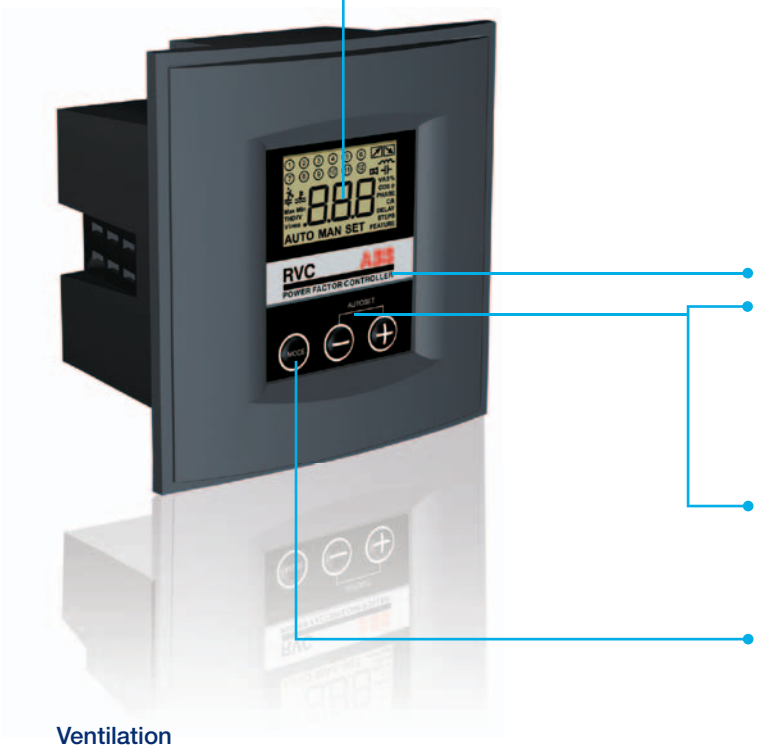
- The CLMD33S capacitor consists of a number of wound elements made with a dielectric of metallized polypropylene film. These dry windings are provided with a sequential disconnector ensuring that each element can be reliably and selectively disconnected from the circuit at the end of its life.
- The capacitor elements receive a treatment under vacuum in order to ensure perfect electrical characteristics. Each winding is placed in a plastic case and encapsulated in thermo-setting resine in order to obtain a perfectly sealed element.
- The elements are placed inside a sheet steel box and connected in such a way as to supply the three-phase power at the required voltage and frequency.
- The sheet steel box is filled with inorganic, inert and fire proof granules in order to absorb the energy produced or to extinguish any flames in case of a possible defect at the end of an element's life.



Reliable and safe

RVC PF Controller

- The RVC is not affected by the harmonics.
- The RVC complies with EU directives for EMC for operation at 50Hz and bears the CE marking to this effect.
- The RVC is suitable for hot environments thanks to its maximum ambient temperature of 60°C.
- The RVC is fitted with an overvoltage / undervoltage protection and protections against harmonic distortion (THDV).



LCD display with indication of:
- **inductive/capacitive PF**
- **active outputs**
- **demand for switching on/off a capacitor step**
- **alarm conditions**
- **overtemperature condition**
- **capacitor disconnection**
- **key parameters : voltage, current, power factor, THDV and THDI**

Keypad

Automatic setting of:
- **phase shift**
- **C/k**
- **switching delay**
- **number of outputs**
- **type of switching sequence**

Easy commissioning with automatic recognition of:
- **special connections (single-phase, CT leads)**
- **number of outputs**
- **type of switching sequence**

Automatic/manual mode

Ventilation

All APCs are equipped with a ventilation system specially selected for its long life duration. In case of temporary overheating, the APC is automatically disconnected.

Environment friendly

The ISO 14001 certification guarantees our commitment to the environment.

ABB Reactors (for APCR execution)

The dry type resin embedded reactors are specially designed to suit the reactive power compensation application. Their exceptional linearity and thermal stress resistance characteristics ensure a high reliability degree even in case of temporary overvoltage.

Options and wiring diagram

Options

- Main circuit-breaker.
- Top cable entry (for APCM1, APCM2 and APCR only).
- RVT controller (for APCM1, APCM2 and APCR only).

RVT Modbus

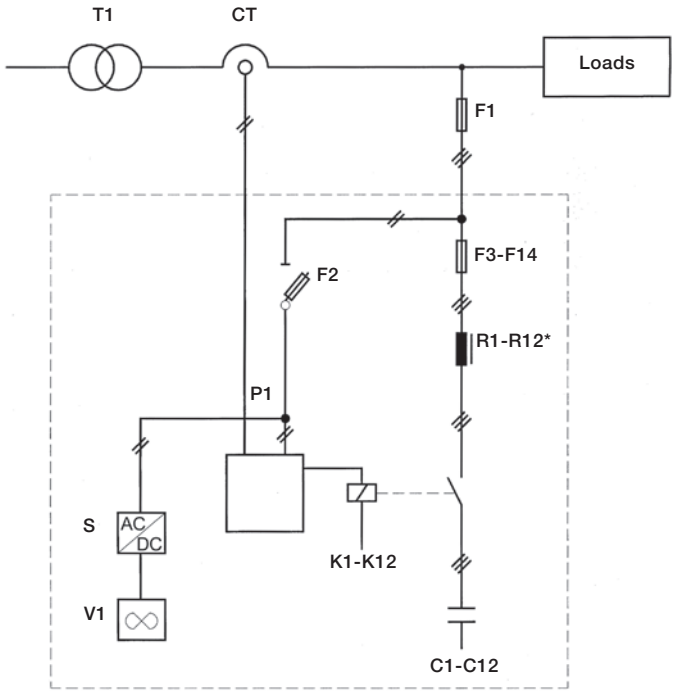
For a maximum protection of your capacitor bank against temporary deterioration of your network quality.

- While having all the functions of the RVC, the RVT also has features including:
- programmable protection thresholds (undervoltage, overtemperature, excessive harmonic distortion, etc…).
- The RVT protects your capacitor bank. It is recommended for installation where overvoltage, resonance or overtemperature is likely to happen.
- full graphics display with backlighting.
- guided navigation and programming.
- network information and bank monitoring (voltage, current, harmonics spectrum, etc...)
- RS-485 Modbus adapter allowing communication with a monitoring system. All RVT parameters are remotely accessible (including harmonic spectra and tables.)
- multi-language support.
- help button giving instant access to a description of all RVT features and functionality.
- printer connection.
- input contacts for day/night cos j and external alarm.
- output contacts for alarm and fan relays.

(for further information on the RVT controller, please refer to our specific documentation)

Wiring diagram

- C1...C12 capacitor steps
- F1 main fuses or protective devices
- F2 control fuses
- F3...F14 capacitor step fuses
- K1...K12 contactors
- P1 PF controller
- T1 power transformer
- S Fan DC supply
- CT current transformer
- V1 fan
- * R1...R12 reactors (APCR only)



Technical specifications

Nominal voltage and frequency:
- 230, 400V - 50Hz (standard range).
- 240, 480V - 60Hz (standard range).
- 400V - 50Hz (reinforced range rated at 457V).
- 400, 415, 525, 690V - 50Hz (de-tuned capacitor bank)
- 240, 380, 480, 600V - 60Hz (de-tuned capacitor bank)

Configuration:
- APCM1: master unit only.
- APCL2, APCM2 & APCR: master and slave units.
- Slave units are not equipped with PF controller but are fitted with an interconnection cable.

Power factor setting: From 0.7 inductive to 0.7 capacitive.

Starting current setting (C/k):
- From 0.01A to 3A for the RVC controller.
- From 0.01A to 5A for the RVT controller (optional for the APCM1, APCM2 and APCR).

Operation: Automatic or manual setting of the controller with indication of :
- the number of active outputs.
- the inductive or capacitive power factor.
- alarm conditions.
- overtemperature.
- demand for switching on/off a capacitor step.
- voltage, current, THDV and THDI

Threshold setting for protection against overvoltage, undervoltage and high THDV.

Installation:
- Dielectric losses: less than 0.2 Watt/kvar.
- Capacitor total losses: less than 0.5 Watt/kvar
- (discharge resistors included).
- Automatic bank total losses at 400V 50Hz:
  - without reactors: less than 1.5 Watt/kvar
  - (including accessories losses),
  - with reactors: less than 5.5 Watt/kvar
  - (including accessories losses).

Capacitors:
- Dry type self healing according to IEC 60831-1&2.
- Voltage test: 2.15 Un between terminals during 10 sec at rated frequency (above IEC 60831-1&2).
- Acceptable overloads:
  - overvoltage tolerance:
  - 10% max. intermittently.
  - overcurrent tolerance: 30% permanently.
- Temperature range: -25°C / class D according to IEC 60831-1&2.

Connection: Three phase.

Reactors (APCR only):
- Type : dry type resin embedded according to IEC 289, IEC 76
- Maximal harmonic voltage distortion:
  - U3/U1 = 0.5 % U5/U1 = 6.0 %
  - U7/U1 = 5.0 % U11/U1 = 3.5 %
  - U13/U1 = 3.0 % (not exceeding a THDU of 8 %).

The automatic capacitor bank complies with EN 61921.

Automatic capacitor bank tests:
- Insulation test.
- Functional test.

CE Marked.

Protection:
- IP23D (closed door).
- Protected against direct and accidental contact (open door).

Execution: Indoor.

Color: Beige RAL 7032.

Ambient temperature: -5°C/+40°C according to EN 61921.

Ventilation: Forced.

Installation:
- Box:
  - Wall mounting (fixation brackets included).
  - Bottom cable entry.
- Cubicle:
  - Floor fixation.
  - Equipped with a plinth.
  - Lifting lugs provided.
  - Top or bottom cable entry.

Slave units have to be connected to the master unit.

Important notice: the installation of capacitors on networks disturbed by harmonics may require special precautions especially when there is a risk of resonance.

APCL2, APCM1 and APCM2 Range

Standard range :
230V 50Hz - Clean network

Type	Power (kvar) at 230V	Regulation x*kvar	Optional main circuit breaker
APCL2	25	4*6.25	T1N160FFC
	37.5	3*12.5	T1N160FFC
	50	4*12.5	T3N250FF
	62.5	5*12.5	T4N320FF
(1)	100	8*12.5	2x T3N250FF (2)
(1)	125	10*12.5	2x T4N320FF (2)
APCM1	75	9*8.3	T4N320FF
	87.5	7*12.5	T5N630FF
	100	12*8.3	T5N630FF
APCM2	112.5	9*12.5	T5N630FF
	125	5*25	T5N630FF
	150	6*25	T5N630FF
	175	7*25	S6N800F 3P F
	200	8*25	S6N800F 3P F
(1)	250	10*25	2x T5N630FF (2)
(1)	300	12*25	2x T5N630FF (2)
(1)	400	16*25	2x S6N800F 3P F (2)

Standard range:
400V 50Hz - Clean network

Type	Power (kvar) at 400V	Regulation x*kvar	Optional main circuit breaker
APCL2	25	2*12.5	T1N160FFC
	37.5	3*12.5	T1N160FFC
	50	4*12.5	T1N160FFC
	62.5	5*12.5	T1N160FFC
	75	3*25	T3N250FF
	87.5	3*25	T3N250FF
	100	4*25	T3N250FF
	125	5*25	T4N320FF
(1)	200	8*25	2x T3N250FF (2)
(1)	250	10*25	2x T4N320FF (2)
APCM1	150	9*16.7	T5N630FF
	175	7*25	T5N630FF
	200	4*25	T5N630FF
	200	12*16.7	T5N630FF
APCM2	225	9*25	T5N630FF
	250	5*50	T5N630FF
	275	11*25	S6N630FF
	300	6*25	S6N800F 3P F
	325	13*25	S6N800F 3P F
	350	7*50	S6N800F 3P F
	400	8*50	S7S1250F 3P F
(1)	450	18*25	2x T5N630FF (2)
(1)	500	10*50	2x T5N630FF (2)
(1)	600	12*50	2x S6N800F 3P F (2)
(1)	700	14*50	2x S6N800F 3P F (2)
(1)	800	16*50	2x S7S1250F 3P F (2)

(1): 1 master unit + 1 slave unit.
(2): Circuit breaker for master unit and circuit breaker for slave unit.
(3): Circuit breaker for master unit.
(4): Circuit breaker for slave unit.

Slave units are available for extension. Only master and slave units of the same type can work together (APCL2 master with APCL2 slave, APCM2 master with APCM2 slave and APCR master with APCR slave). For compatibility between master unit and slave unit, please check with your local ABB agent that the total (master + slave) switching sequence (1:1:2:2:..., 1:2:4:4:..., etc) is recognized by the PF controller.

Reinforced range (capacitor rated at 457V): 400V 50 Hz - Slightly polluted network

Type	Power (kvar) at 400V	Regulation x*kvar	Optional main circuit breaker
APCL2	25	2*12.5	T1N160FFC
	37.5	3*12.5	T1N160FFC
	50	4*12.5	T1N160FFC
	62.5	5*12.5	T1N160FFC
	75	3*25	T3N250FF
	87.5	7*12.5	T3N250FF
	100	4*25	T3N250FF
APCM1	112.5	9*12.5	T4N320FF
	131	7*18.7	T4N320FF
	150	12*12.5	T5N630FF
APCM2	168	9*18.7	T5N630FF
	187.5	5*37.5	T5N630FF
	225	6*37.5	T5N630FF
	262.5	7*37.5	T5N630FF
	300	8*37.5	S6N800F 3P F
(1)	300	12*25	2x T5N630FF (2)
(1)	400	16*25	2x S6N800F 3P F (2)

Standard range: 240V 60Hz - Clean network

Type	Power (kvar) at 240V	Regulation x*kvar	Optional main circuit breaker
APCM1	75	9*8.3	T4N320FF
	87.5	7*12.5	T5N400FF
	100	12*8.3	T5N400FF
APCM2	112.5	9*12.5	T5N500FF
	125	15*8.3	T5N630FF
	150	6*25	T5N630FF
	175	7*25	S6N800F 3P F
	200	8*25	S6N800F 3P F
(1)	250	30*8.3	2x T5N630FF (2)
(1)	300	12*25	2x T5N630FF (2)
(1)	400	16*25	2x S6N800F 3P F (2)

Standard range: 480V 60Hz - Clean network

Type	Power (kvar) at 480V	Regulation x*kvar	Optional main circuit breaker
APCM1	90	6*15	T3N200FF
	112.5	5*22.5	T3N250FF
	135	9*15	T4N320FF
	157.5	7*22.5	T4N320FF
	180	12*15	T5N400FF
APCM2	202.5	9*22.5	T5N400FF
	225	11*22.5	T5N630FF
	247.5	5*50	T5N630FF
	270	6*45	T5N630FF
	292.5	13*22.5	T5N630FF
	315	7*45	S6N800F 3P F
	360	8*45	S6N800F 3P F
(1)	450	10*45	2x T5N500FF (2)
(1)	540	12*45	2x T5N630FF (2)
(1)	630	14*45	2x S6N800F 3P F (2)
(1)	720	16*45	2x S6N800F 3P F (2)

(1): 1 master unit + 1 slave unit.
(2): Circuit breaker for master unit and circuit breaker for slave unit.
(3): Circuit breaker for master unit.
(4): Circuit breaker for slave unit.

Slave units are available for extension. Only master and slave units of the same type can work together (APCL2 master with APCL2 slave, APCM2 master with APCM2 slave and APCR master with APCR slave). For compatibility between master unit and slave unit, please check with your local ABB agent that the total (master + slave) switching sequence (1:1:2:2:..., 1:2:4:4:..., etc) is recognized by the PF controller.

APCR Range - 50 Hz

De-tuned range :
400V 50Hz - Polluted network

% Reactors	Power (kvar) at 400V	Regulation x*kvar	Optional main circuit breaker
5.67-7-12.5	100	4*25	T3N250FF
	125	5*25	T4N320FF
	150	3*50	T5N630FF
	150	6*25	T5N630FF
	175	7*25	T5N630FF
	200	4*50	T5N630FF
	200	8*25	T5N630FF
	250	5*50	T5N630FF
	300	6*50	S6N800F 3P F
(1)	350	7*50	2x T5N630FF (2)
(1)	400	8*50	2x T5N630FF (2)
(1)	450	9*50	2x T5N630FF (2)
(1)	500	10*50	2x T5N630FF (2)
(1)	600	12*50	2x S6N800F 3P F (2)

De-tuned range :
415V 50Hz - Polluted network

% Reactors	Power (kvar) at 415V	Regulation x*kvar	Optional main circuit breaker
5.67-7-12.5	100	4*25	T3N250FF
	125	5*25	T4N320FF
	150	3*50	T5N630FF
	150	6*25	T5N630FF
	175	7*25	T5N630FF
	200	4*50	T5N630FF
	200	8*25	T5N630FF
	250	5*50	T5N630FF
	300	6*50	S6N800F 3P F
(1)	350	7*50	2x T5N630FF (2)
(1)	400	8*50	2x T5N630FF (2)
(1)	450	9*50	2x T5N630FF (2)
(1)	500	10*50	2x T5N630FF (2)
(1)	600	12*50	2x S6N800F 3P F (2)

(1): 1 master unit + 1 slave unit.
(2): Circuit breaker for master unit and circuit breaker for slave unit.
(3): Circuit breaker for master unit.
(4): Circuit breaker for slave unit.

Slave units are available for extension. Only master and slave units of the same type can work together (APCL2 master with APCL2 slave, APCM2 master with APCM2 slave and APCR master with APCR slave). For compatibility between master unit and slave unit, please check with your local ABB agent that the total (master + slave) switching sequence (1:1:2:2:..., 1:2:4:4:..., etc) is recognized by the PF controller.

De-tuned range :
525V 50Hz - Polluted network

% Reactors	Power (kvar) at 525V	Regulation x*kvar	Optional main circuit breaker
5.67-7-12.5	100	4*25	T3N250FF
5.67-7-12.5	125	5*25	T3N250FF
5.67-7	150	3*50	T4N320FF
5.67-7-12.5	150	6*25	T4N320FF
5.67-7	175	7*25	T4N320FF
5.67-7	200	4*50	T5N630FF
5.67-7	200	8*25	T5N630FF
12.5 (1)	200	8*25	2x T3N250FF (2)
5.67-7	250	5*50	T5N630FF
12.5 (1)	250	10*25	2x T3N250FF (2)
5.67-7	300	6*50	T5N630FF
12.5 (1)	300	12*25	2x T4N320FF (2)
5.67-7 (1)	350	12*25	T5N630FF (3)
			T4N320FF (4)
5.67-7 (1)	400	8*50	2x T5N630FF (2)
5.67-7 (1)	450	9*50	2x T5N630FF (2)
5.67-7 (1)	500	10*50	2x T5N630FF (2)
5.67-7 (1)	600	12*50	2x T5N630FF (2)

De-tuned range :
690V 50Hz - Polluted network

% Reactors	Power (kvar) at 690V	Regulation x*kvar	Optional main circuit breaker
5.67-7-12.5	100	4*25	T1N160FFC
	125	5*25	T3N250FF
	150	3*50	T3N250FF
	150	6*25	T3N250FF
	175	7*25	T3N250FF
	200	4*50	T4N320FF
	200	8*25	T4N320FF
	250	5*50	T5N630FF
	300	6*50	T5N630FF
(1)	350	7*50	T4N320FF (3)
			T3N250FF (4)
(1)	400	8*50	2x T4N320FF (2)
(1)	450	9*50	T5N630FF (3)
			T4N320FF (4)
(1)	500	10*50	2x T5N630FF (2)
(1)	600	12*50	2x T5N630FF (2)

(1): 1 master unit + 1 slave unit.
(2): Circuit breaker for master unit and circuit breaker for slave unit.
(3): Circuit breaker for master unit.
(4): Circuit breaker for slave unit.

Slave units are available for extension. Only master and slave units of the same type can work together (APCL2 master with APCL2 slave, APCM2 master with APCM2 slave and APCR master with APCR slave). For compatibility between master unit and slave unit, please check with your local ABB agent that the total (master + slave) switching sequence (1:1:2:2:..., 1:2:4:4:..., etc) is recognized by the PF controller.

APCR Range - 60 Hz

De-tuned range : 240V 60Hz - Polluted network

% Reactors	Power (kvar) at 240V	Regulation x*kvar	Optional main circuit breaker
6-7-12.5	100	4*25	T5N630FF
	125	5*25	T5N630FF
	150	6*25	T5N630FF
(1)	200	8*25	2x T5N630FF (2)
(1)	250	10*25	2x T5N630FF (2)
(1)	300	12*25	2x T5N630FF (2)

De-tuned range : 380V 60Hz - Polluted network

% Reactors	Power (kvar) at 380V	Regulation x*kvar	Optional main circuit breaker
6-7-12.5	100	4*25	T4N320FF
	125	5*25	T4N320FF
	150	3*50	T5N630FF
	150	6*25	T5N630FF
	175	7*25	T5N630FF
	200	4*50	T5N630FF
	200	8*25	T5N630FF
	250	5*50	S6N800F 3P F
	300	6*50	S6N800F 3P F
(1)	350	7*50	2x T5N630FF (2)
(1)	400	8*50	2x T5N630FF (2)
(1)	450	9*50	S6N800F 3P F (3)
			T5N630FF (4)
(1)	500	10*50	2x S6N800F 3P F (2)
(1)	600	12*50	2x S6N800F 3P F (2)

(1): 1 master unit + 1 slave unit.
(2): Circuit breaker for master unit and circuit breaker for slave unit.
(3): Circuit breaker for master unit.
(4): Circuit breaker for slave unit.

Slave units are available for extension. Only master and slave units of the same type can work together (APCL2 master with APCL2 slave, APCM2 master with APCM2 slave and APCR master with APCR slave). For compatibility between master unit and slave unit, please check with your local ABB agent that the total (master + slave) switching sequence (1:1:2:2:..., 1:2:4:4:..., etc) is recognized by the PF controller.

De-tuned range :
480V 60Hz - Polluted network

% Reactors	Power (kvar) at 480V	Regulation x*kvar	Optional main circuit breaker
6-7-12.5	100	4*25	T3N250FF
	125	5*25	T3N250FF
	150	3*50	T4N320FF
	150	6*25	T4N320FF
	175	7*25	T5N630FF
	200	4*50	T5N630FF
	200	8*25	T5N630FF
	250	5*50	T5N630FF
	300	6*50	T5N630FF
(1)	350	7*50	T5N630FF (3)
			T4N320FF (4)
(1)	400	8*50	2x T5N630FF (2)
(1)	450	9*50	2x T5N630FF (2)
(1)	500	10*50	2x T5N630FF (2)
(1)	600	12*50	2x T5N630FF (2)

De-tuned range :
600V 60Hz - Polluted network

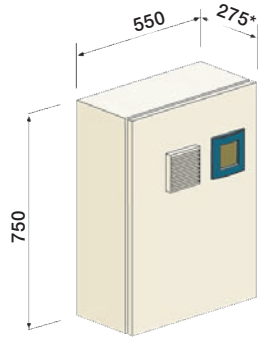
% Reactors	Power (kvar) at 600V	Regulation x*kvar	Optional main circuit breaker
6-7-12.5	100	4*25	T1N160FFC
	125	5*25	T3N250FF
	150	3*50	T3N250FF
	150	6*25	T3N250FF
	175	7*25	T4N320FF
	200	4*50	T4N320FF
	200	8*25	T4N320FF
	250	5*50	T5N630FF
	300	6*50	T5N630FF
(1)	350	7*50	T4N320FF (3)
			T3N250FF (4)
(1)	400	8*50	2x T5N630FF (2)
(1)	450	9*50	T5N630FF (3)
			T4N320FF (4)
(1)	500	10*50	2x T5N630FF (2)
(1)	600	12*50	2x T5N630FF (2)

(1): 1 master unit + 1 slave unit.
(2): Circuit breaker for master unit and circuit breaker for slave unit.
(3): Circuit breaker for master unit.
(4): Circuit breaker for slave unit.

Slave units are available for extension. Only master and slave units of the same type can work together (APCL2 master with APCL2 slave, APCM2 master with APCM2 slave and APCR master with APCR slave). For compatibility between master unit and slave unit, please check with your local ABB agent that the total (master + slave) switching sequence (1:1:2:2:..., 1:2:4:4:..., etc) is recognized by the PF controller.

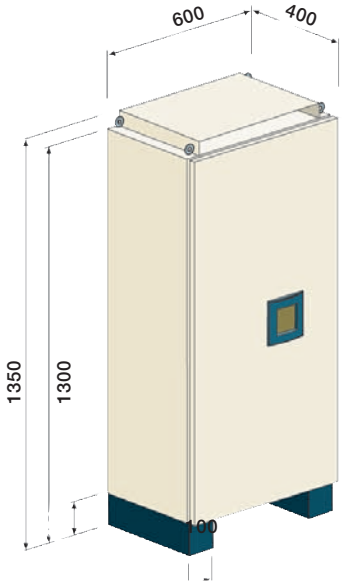
Dimensions

	H (mm)	W (mm)	D (mm)	Maximum weight
APCL2	750	550	275	42 kg



* thickness of the air grid (25 mm) not included.

	H (mm)	W (mm)	D (mm)	Maximum weight
APCM1	1350	600	400	100 kg



	H (mm)	W (mm)	D (mm)	Maximum weight
APCR	2000	600	550	500 kg

	H (mm)	W (mm)	D (mm)	Maximum weight
APCM2	1950	600	400	175 kg

Contact us

ABB n.v.
Power Quality Products
Avenue Centrale 10
Zoning Industriel de Jumet
B-6040 Charleroi (Jumet), Belgium
Phone: +32 (0) 71 250 803
Fax: +32 (0) 71 344 007
E-Mail: Marketing_Power Quality Products@be.abb.com

www.abb.com/lowvoltage

Power and productivity
for a better world™