Advancing a sustainable energy future for all

HITACHI
Inspire the Next

Brochure

Contactor-switched capacitor banks APCQ

Hitachi Energy

With energy transition, good power quality is becoming more and more essential for utility, industrial and commercial networks. Power quality issues can result into poor productivity, damage to equipment and penalties for non-compliance to grid code.

Hitachi Energy's capacitor banks series APCQ provides the ideal power factor correction solution for industrial and commercial networks, thereby assuring good power quality.

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Low voltage capacitor banks

Hitachi Energy's experience and expertise

Hitachi Energy is a global technology leader that is advancing a sustainable energy future for all. We serve customers in the utility, industry and infrastructure sectors with innovative solutions and services across the value chain. Together with customers and partners, we pioneer technologies and enable the digital transformation required to accelerate the energy transition towards a carbon-neutral future. We are advancing the world's energy system to become more sustainable, flexible and secure whilst balancing social, environmental and economic value. Hitachi Energy has a proven track record and unparalleled installed base in more than 140 countries. Headquartered in Switzerland, we employ around 38,000 people in 90 countries and generate business volumes of approximately $10 billion USD.

Hitachi Energy is a leader in high-voltage technology, offering a wide range of high-voltage products up to 1,200-kilovolt (kV) helping enhance the safety, reliability and efficiency of power networks while minimizing environmental impact. Our technology leadership continues to facilitate innovations in areas such as ultra-high-voltage power transmission, enabling smart grids and enhancing eco-efficiency.

Industrial and commercial installations consume both reactive and active power, resulting in reduced availability and lower quality of power. This translates into lower capacity utilization and eventually additional capital and running costs.

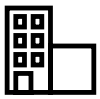
Hitachi Energy, with its cutting-edge technologies and extensive experience, has developed a wide range of advanced low voltage (LV) capacitor banks, which offer simple and cost-effective solution to improve power quality and reduce costs.

The APCQ capacitor bank series from Hitachi Energy is the safest, highly reliable range of automatic capacitor banks that provides the ideal power factor correction solution for low voltage industrial and commercial networks.

APCQ series is easy to install, operate and service as well as ensures exceptional reliability, efficiency and safety.

The key feature of APCQ series is the QCap capacitor, the latest evolution of Hitachi Energy low-voltage capacitors

The APCQ capacitor bank series improves power factor in a wide variety of applications including:


Buildings


Mining


Metals


Chemicals / Plastics


Pulp and paper


Cement


Food and bevarage


Printing and textile

APCQ capacitor banks

Advantages

Main benefits offered by APCQ are:
- Elimination of penalty charges from utility due to low power factor
- Improved energy efficiency
- Additional power capacity availability
- Increased service life of equipment

Comprehensive service

Hitachi Energy offers a total service approach that goes well beyond supplying equipment. Hitachi Energy supports its customers through every step of their project, from identification of the needs till installation and commissioning of the equipment. Hitachi Energy also offers comprehensive equipment maintenance and repair service everywhere in the world.

Design:

With up to 400 kvar in one single cubicle (without reactor), APCQ delivers maximum reactive power with minimum footprint.

APCQ series is available in two models: free floor standing cubicles (APCQ-M and APCQ-R) and wall-mounted (APCQ-L).

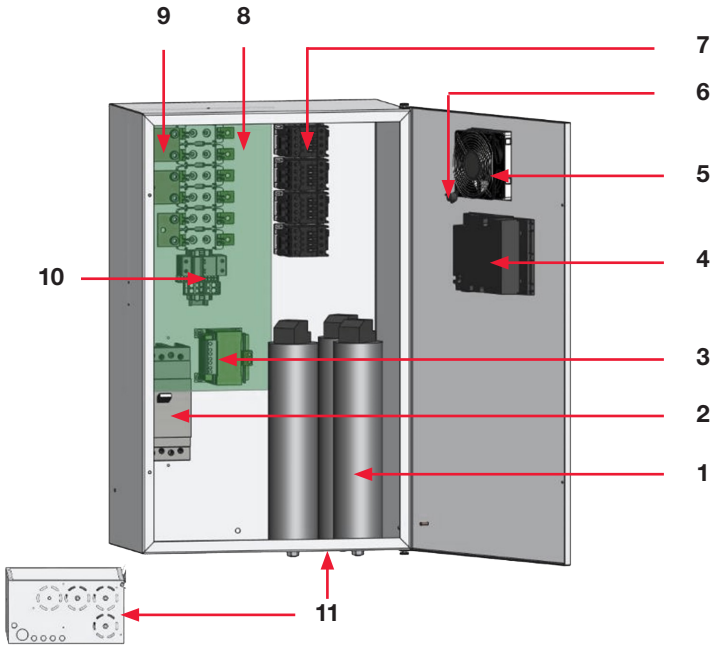
APCQ contactor-switched capacitor banks: types

Type	Description	Cable entry	Clearance needed	Typical output range per cubicle (kvar)
APCQ-L	Wall-mounted capacitor bank for 'clean'[1] or 'slightly polluted' [2] network	Bottom	Side: Not needed Top and bottom: 200 mm	37.5 - 100 kvar
APCQ-M	Floor-standing capacitor bank for 'clean'[1] or 'slightly polluted' [2] network	Bottom (optional top)	Side and back: 50 mm (Not needed between 2 cubicles)	125 - 400 kvar
APCQ-R	Floor-standing capacitor bank for 'highly polluted' [3] network	Bottom (optional top)	Side and back: 50 mm (Not needed between 2 cubicles)	100 - 300 kvar

1. 'Clean' network = <15% non-linear loads and no resonance
2. 'Slightly polluted' network = <25% non-linear loads and no resonance
3. 'Highly polluted' network = >25% non-linear loads, possible resonance. APCQ-R is available with 5.67%, 7% or 12.5% detuned reactors as per requirement

APCQ: Design configurations

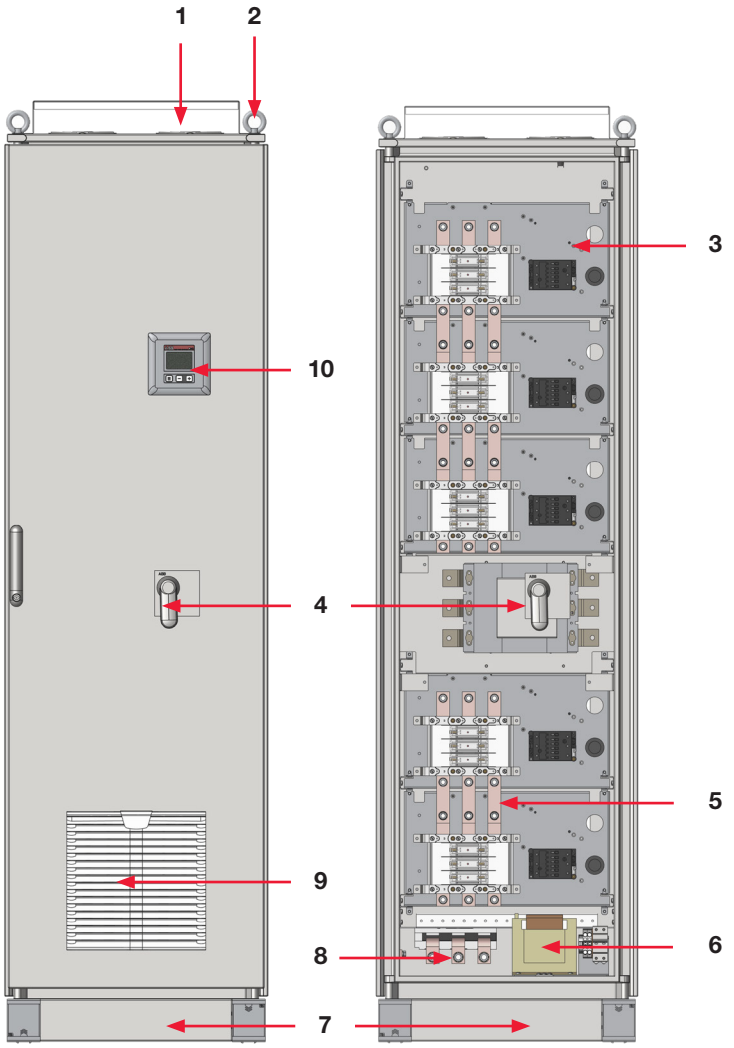
Wall-mounted: APCQ-L

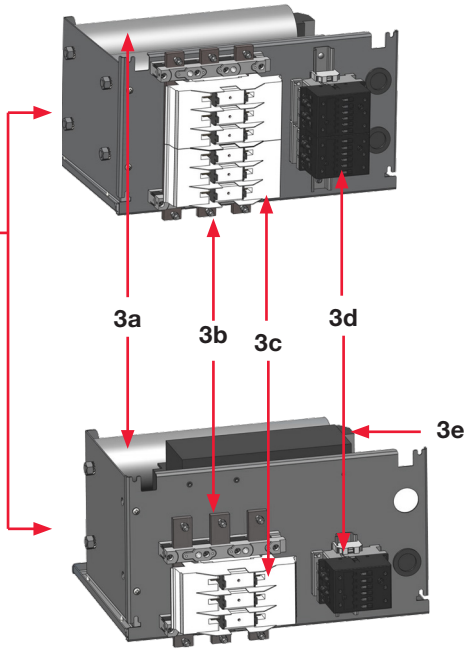


Sr. No.	Description
1	QCap cylindrical capacitors
2	Circuit breaker (optional)
3	Auxiliary transformer
4	Power factor controller (RVC / RVT)
5	Fan + Air outlet
6	Thermal cutoff switch
7	Contactors for capacitor switching
8	Plexiglass (optional protection)
9	Busbar connection
10	Auxiliary connections
11	Air inlet

APCQ: Design configurations

Free floor standing: APCQ-M and APCQ-R





Sr. No.	Description
1	Fan + air outlet
2	Lifting lugs
3	QCap power module
3a	QCap cylindrical capacitors
3b	Busbar connection terminals
3c	Fuse holders + Fuses
3d	Contactors for capacitor switching
3e	Detuned reactor
4	Circuit breaker (optional)
5	Busbars
6	Auxiliary transformer
7	Base plinth
8	Terminals for bottom entry cable
9	Air inlet
10	Power factor controller (RVC / RVT)

APCQ: Components

QCap cylindrical capacitors

QCap is a cylindrical type capacitor. It is based on Hitachi Energy‘s latest technologies and developments in the field of power quality and is a result of over 70 years of expertise in capacitor technologies. These decades of dedication and continuous improvement in each manufacturing process guarantee the customer the best quality capacitor in the market

QCap answers following customer needs:

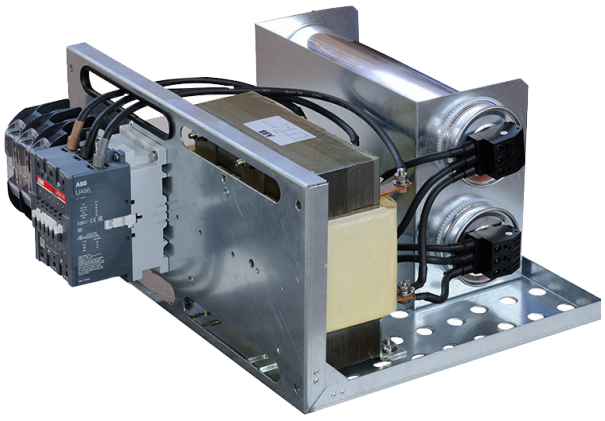
Reliability
Capacitors can be of poor quality if made with non-capacitor grade film. Hitachi Energy‘s strict selection criteria of raw materials and it‘s first class capacitor film ensure QCap‘s high reliability.

Quality
The unique low losses design of the QCap decreases the temperature of the capacitor and increases it‘s lifetime. The optimized thermal dissipation prevents premature failure which is not uncommon with many low quality capacitors.

Safety
At the end of its lifetime the capacitor must disconnect itself safely. The specially designed overpressure disconnection device by Hitachi Energy guarantees a safe disconnection.

Consistency
A consistent quality over time is most often a challenge for manufacturers. Hitachi Energy tests 100% of its products with criteria surpassing even international standards.

QCap capacitors



QCap power module

QCap power module

QCap power module is all-in-one pre-wired power module, which includes capacitor – QCap type, contactor, fuses and reactors (if existing). QCap power module provides all advantages of QCap dry capacitor technology in a compact case, delivering high performance within a small footprint.

QCap power module offers a number of exceptional features like: high voltage withstand capability, excellent peak current handling capacity, high capacitance stability, long life even under high electrical stress, low losses, exceptional reliability and safety.

APCQ: Components

Power factor controllers

RVC controller

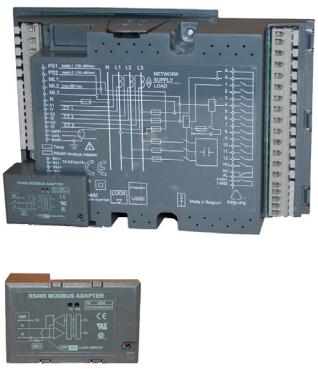
APCQ capacitor bank series is simple and easy to operate thanks to the automatic functions provided by the RVC controller:

- User-friendly interface
- Easy commissioning
- Completely automatic set-up
- Display of: cos ø, V, I, THDI, THDV
- Multiple built-in protections
- Not affected by harmonics
- Designed for hot environment (60 °C)
- Hardware and software switches

RVT controller

For enhanced functionnality, ABB recommends its advanced RVT controller with the following features:

- Three-phase measurement and control
- Communication interfaces: Ethernet, USB 2 and RS-485 Modbus adapter
- complete graphical display, touchscreen with back-lighting
- Multi-language
- Programmable protection threshold



RVT with Modbus adapter

APCQ: Components

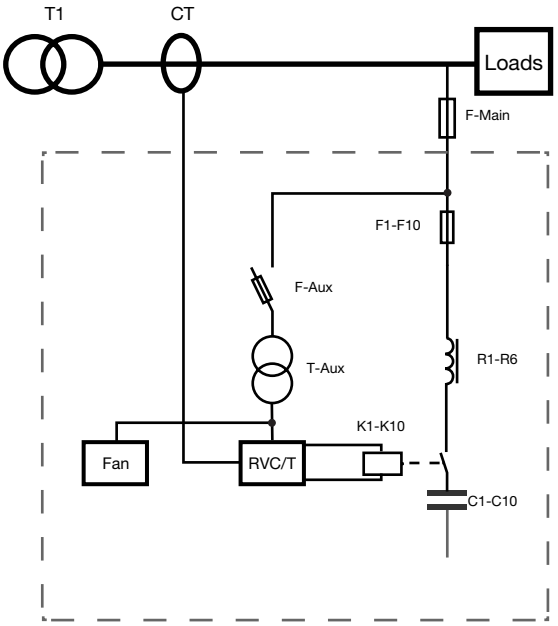
Other design features

Detuned installation

The presence of harmonics may overstress the capacitors, resulting in technical issues or premature ageing.
In such cases the capacitors can be protected with reactors

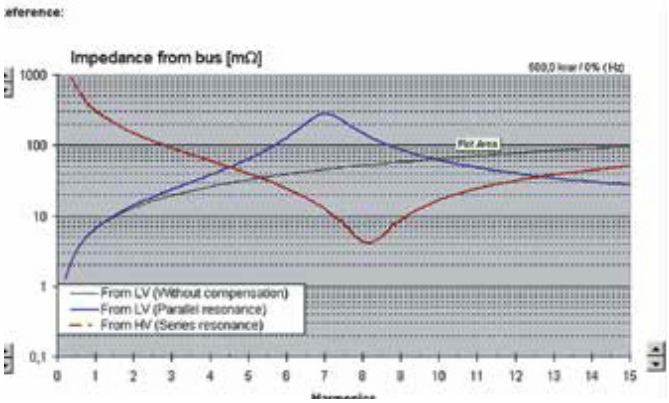
Hitachi Energy reactor, specific design

APCQ: Wiring diagram



Network Analysis

Hitachi Energy Power Quality specialists can conduct a detailed study of harmonics for your network and propose a solution that is safe and customized to your installation.



Code	Description
C1 - C10	Capacitor steps
F-Main	Feeder main fuses or protective devices (not provided)
F-Aux	Auxiliary fuses
F1 - F10	Capacitor step fuses
K1 - K10	Contactors
RVC/T	Power factor controller
T1	Power transformer
T-Aux	Auxiliary transformer
CT	Current transformer (not provided)
Fan	Cooling fan(s)
R1 - R6	Reactors (APCQ-R only)

APCQ: Offering range

Standard Range [1]

400 V, 50 Hz (Clean network)

Model	Rating (kvar)	Regulation (x*kvar)
APCQ-L	37.5	12.5 + 25
	50	2*12.5 + 25
	62.5	12.5 + 2*25
	75	3*25
	87.5	12.5 + 3*25
	100	4*25
APCQ-M	125	25 + 2*50
	150	2*25 + 2*50
	175	25 + 3*50
	200	4*50
	200	2*25 + 3*50
	225	25 + 4*50
	250	5*50
	300	6*50
	350	7*50
	400	8*50

Detuned Range [3]

400 V, 50 Hz (Polluted network)

Model	Rating (kvar)	Regulation (x*kvar)
APCQ-R	100	4*25
	125	25 + 2*50
	150	2*25 + 2*50
	175	25 + 3*50
	200	4*50
	200	2*25 + 3*50
	225	25 + 4*50
	250	5*50
	300	6*50

Reinforced Range (capacitors rated at 457 V) [2]

400 V, 50 Hz (Slightly polluted network)

Model	Rating (kvar)	Regulation (x*kvar)
APCQ-L	37.5	12.5 + 25
	50	2*12.5 + 25
	62.5	12.5 + 2*25
	75	3*25
	87.5	12.5 + 3*25
	100	4*25
APCQ-M	125	25 + 2*50
	150	2*25 + 2*50
	175	25 + 3*50
	200	4*50
	200	2*25 + 3*50
	225	25 + 4*50
	250	5*50
	300	6*50
	350	7*50
	400	8*50

Notes:

1. Suitable for installations with <15% of non-linear loads and no resonance
2. Suitable for installations with <25% of non-linear loads and no resonance
3. Includes 5.67%, 7% or 12.5% detuned reactors as per installation requirement

Please consult us for other ratings

APCQ: Technical specifications

Parameter	Title
Voltage	400 V at 50 Hz [1]
Working ambient temperature	5 °C (23 °F) to 40°C (104 °F) according to EN 61921
Connection	Three-phase, balanced network
Protection	IP23 (closed door) Optional IP54 Protected against direct and accidental contact (open door) - optional
Execution	Indoor
Color	Beige RAL 7035
Dimensions (W x D x H) and weight	APCQ-L: 500 x 290 x 820 mm / max 30 kg APCQ-M: 610 x 650 x 2185 mm / max 260 kg APCQ-R: 610 x 650 x 2185 mm / max 550 kg
Ventilation	Forced air cooling
Noise levels	APCQ-L: about 55 dBA (1 m) APCQ M /R: about 70 dBA (1 m)
Power factor setting	From 0.7 inductive to 0.7 capacitive
Starting current (C/k)	From 0.01 A to 3 A for RVC controller From 0.01 A to 5 A for RVT controller (Optional)
Operation	During operation, the controller displays : Number of active output Power factor (inductive or capacitive) Alarm conditions: target cos ø, over / undervoltage, THDV, overtemperature Demand for switching on / off a capacitor step
Losses (at 400 V, 50 Hz)	Without reactors: <1.5 watt / kvar With reactors: <5.5 watt / kvar
Capacitors (QCap type)	Dry type, self-healing design according to IEC 60831-1&2 Dielectric: 2.15 Un between terminals during 10 sconds at rated frequency Acceptable overvoltage: +10% max (maximum 8 hours/day) as per IEC 60831-1 Acceptable overcurrent: +30% permanently Temperature range: -25 °C (-13 °F) to 55 °C (131 °F) / Class D according to IEC 60831-1&2
Reactors (APCQ-R only)	Dry type resin embedded according to IEC 289, IEC 76 Maximum harmonic pollution: 8% THDV with specific spectrum
Standards	EN 61921 IEC 60831 - 1&2 CE marked
Options	RVT controller (if <440 V, otherwise provided by default) Circuit breaker Temperature probe (with RVT only) Internal plexiglass protection for APCQ-L Internal grid (IP20 open door) for APCQ-M/R IP54 enclosure Base frame: 200 mm Top cable entry for APCQ-M/R Cable entry cubicle and cubicle for interconnection bars for APCQ-M/R

1. For other voltages (and frequency), please consult us.

Our commitment

Quality assurance

At Hitachi Energy, we are committed to providing the best products and services. Our products comply with or exceed the latest international standards. In addition to type tests in independent laboratories, our certified design and manufacturing processes guarantee the highest quality. We are certified according to the latest relevant ISO quality standards.

Sustainability

For Hitachi Energy, sustainability is about balancing economic success, environmental stewardship and social progress to benefit all our stakeholders.

Sustainability considerations cover how we design and manufacture products, what we offer customers, how we engage suppliers, how we assess risks and opportunities, and how we behave in communities where we operate and towards one another, while striving to ensure the health, security and safety of our employees, contractors and others affected by our activities. We are certified according to the latest relevant ISO quality standards.

Additional information
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