Low Voltage Products

Automatic power factor improvement solutions - Series, CLMM and CLMR

Shortform catalog and fast runners selection guide

Power and productivity
for a better world™

Automatic power factor improvement solutions
Standard range - key features & benefits

Product fit - suitable applications
ABB capacitor banks (or ***cap banks*** for simplicity) as reflected in their design and build, are suitable for very demanding conditions typically found in industrial environments.

CLMR cap bank (detuned) up to 700 kvar in one cabinet (7 steps)

Easy selection - Standard and custom design options
ABB cap banks listed in this brochure broadly comprise the design series 100, 300, 300R, 500, 500R, 700, CLMM, & CLMR based on size and kvar rating. The tabular listings on pages 4 & 5 are intended to simplify selection and ordering. While the objective of this brochure is to only highlight standard "fast-runner" cap banks, we are able to provide a very wide variety of custom designs on request.

Built strong - safety and reliability
The safety-oriented design and robust construction of all ABB cap units and banks ensures problem-free and long-term reliability at all levels of operation and maintenance. Capacitor units are composed of multiple internally protected elements (**IPE**), each covered with a special paper to contain any energy given off in case of failure. Unique cooling fins are fitted around each IPE providing effective heat dissipation. These IPE's are then arranged in a steel enclosure and further packed down with a dry, inert, non-toxic, non-flammable material called "Vermiculite" which not only displaces oxygen in the box but also absorbs any energy let off in a burnout, thereby almost fully preventing fire hazards. Our dry-type, metallized film technology facilitates environment-friendly, end-of-life disposal.

Smart design
The key benefit of ABB cap bank design is the level of scalability and customization possible. All ABB capacitors and cap banks, whether fixed or automatic, carry the requisite CSA & UL approvals.

Easy to install
- Plug & play, factory tested and ready to install, with auto or manual commissioning option
- Adequate space for power & control wiring
- The series 700, series 500R, CLMM and CLMR cubicles are equipped with lifting eye-bolts for easy handling.
- Auxiliary units are equipped with interconnection wires on terminals for fast connection to the master unit controller.

Easy to use
The automatic and intuitive features of ABB's RVT power factor controller (RVT) offer unprecedented simplicity in setting and operation (more details on page 6) including auto-commissioning option for easy startups.

S100 plain cap bank front view

Heat losses and ventilation
Capacitor losses are below 0.5 W/kvar. Auto cap bank losses (without reactors) can be below 1.5 W/kvar. The main source of heat in a cap bank is the reactors. To ensure longer operating life, all ABB cap banks (except series 100) are force-cooled with door-mounted fans that are switched by the RVT controller, based on inputs from temperature probes. In case of temporary overheating beyond a specific threshold, the cap bank is automatically deactivated. With open, non-cluttered, easily accessible arrangements, ABB cap banks are naturally conducive to convectional cooling.

Life cycle
Heat dissipation and self-healing properties of ABB capacitor elements help to ensure a long operating life. Operating life is adversely affected by a combination of factors including voltage, network frequency, switching frequency, ambient temperature and harmonics. Depending on severity of the conditions, CLMD capacitors realistically can have an operating life of anywhere up to 15 years.

Automatic power factor improvement solutions
Standard range - general specifications

Add-on options for standard capacitor banks:
– Add-on options limited to enclosure type, CB and BFI only
– Base part number format is XXX**G**-XXXXXX**B**XX-XX**0**
– For NEMA 12 enclosure, **G** changes to **D**
– For NEMA 3R enclosure, **G** changes to **R**
– For circuit breaker (**CB**) option, **B** changes to **C**
– For blown fuse indication (**BFI**) option, **0** changes to **1**
– Excel product selector available on request and online
– Ratings above 600 kvar on request
– For options not listed in this brochure, please contact us

Standard inclusions (varies with rating):
– Suitable for top-entry cables
– Incoming via busbars or splitters
– Capacitor protection by stud-mounted fuses or fuse holders
– Stud-mounted fuses used with busbar assembly
– Fuse holders used in case of incoming splitters
– Standard reactors for detuned banks (reinforced on request)
– Standard ingress protection offered NEMA 1
– NEMA12 or 3R optional (see above comment on options)
– ABB RVT controller, 6 or 12 steps as applicable
– Capacitor switching by ABB AF or UA type contactors
– All cap banks undergo insulation and functional tests

S500R detuned cap bank up to 300 kvar (6 steps)

S100 plain cap bank up to 45 kvar with space for incoming splitter or breaker

Common specs:
– 208V to 600V, 3-phase, 60Hz (standard range)
– From 0.7 inductive to 0.7 capacitive
– Starting current setting (C/k) 0.01 A to 5 A
– Total heat losses without reactors: below 1.5 Watt/kvar
– Total heat losses with reactors: below 5.5 Watt/kvar
– 227Hz reactors (7%) used as default in detuned banks
– Switching steps: 2 to 6 steps with 25, 50 or 100 kvar/ step
– Controlled by RVT, 6 or 12 steps (details on page 6)
– Grey ASA61 colour
– Ambient temperature -10°C/+40°C

Approvals:
– CSA C22.2 C190
– UL/cUL 508A

Installation:
Cap banks Series 100, 300, 500, 300R ...
– Standard top-entry cables
– Wall mountable (fixing brackets optional)
– Optional bottom or side cable entry

Cap banks Series 700, 500R, CLMM and CLMR ...
– Modular free-standing enclosure, floor mountable
– Lifting eye-bolts provided
– Optional bottom or side cable entry

Capacitors:
– Dry type with metallized film, self-healing (EN 60831-1&2)
– Voltage test: 2.15 times Un (Un = L-L volts) between terminals for 10 sec at rated frequency (EN 60831-1&2)
– Overvoltage tolerance: 10% max, intermittent
– Overcurrent tolerance: 30% permanent
– Temp range: -25°C to +55°C, class D (IEC 60831-1&2)
– **CLMD cap units and all cap banks built in ABB Canada**

Automatic power factor improvement solutions
Standard range listing for 600V, 3ph, 60Hz

KVAR	Volts	Hz	No. of Steps and KVAR per Step						227Hz Reactors (kvar)			Cable Entry & Incoming	Ordering Part Number (Note: CT's not included)	Dimensions		
			Step1	Step2	Step3	Step4	Step5	Step6	100	50	25			H"	W"	D"
50.00	600	60	25	25					0	0	2	Top, Busbars	BR3G-600050B20-120	60	36	16
75.00	600	60	25	50					0	1	1	Top, Busbars	BR3G-600075B20-220	60	36	16
100.00	600	60	50	25	25				0	1	2	Top, Busbars	BR3G-600100B30-520	60	36	16
125.00	600	60	50	50	25							Top, Busbars	B03G-600125B30-200	36	30	16
125.00	600	60	50	50	25				0	2	1	Top, Busbars	BR3G-600125B30-220	60	36	16
150.00	600	60	50	50	50							Top, Busbars	B03G-600150B30-100	36	30	16
150.00	600	60	50	50	50				0	3	0	Top, Busbars	BR3G-600150B30-120	60	36	16
175.00	600	60	50	50	50	25						Top, Busbars	B05G-600175B40-200	60	36	16
175.00	600	60	50	50	50	25			0	3	1	Top, Busbars	BR5G-600175B40-220	72	42	20
200.00	600	60	50	50	50	50						Top, Busbars	B05G-600200B40-100	60	36	16
200.00	600	60	50	50	50	50			0	4	0	Top, Busbars	BR5G-600200B40-120	72	42	20
250.00	600	60	50	50	50	50	50					Top, Busbars	B05G-600250B50-100	60	36	16
250.00	600	60	50	50	50	50	50		0	5	0	Top, Busbars	BR5G-600250B50-120	72	42	20
300.00	600	60	60	60	60	60	60					Top, Busbars	B05G-600300B50-100	60	36	16
300.00	600	60	100	100	50	50			2	2	0	Top, Splitters	BRBG-600300S40-520	90	50	20
350.00	600	60	100	100	100	50						Top, Splitters	BMAG-600350S40-200	90	38	20
350.00	600	60	100	100	100	50			3	1	0	Top, Splitters	BRBG-600350S40-220	90	50	20
400.00	600	60	100	100	100	100						Top, Splitters	BMAG-600400S40-100	90	30	20
400.00	600	60	100	100	100	100			4	0	0	Top, Splitters	BRBG-600400S40-120	90	50	20
450.00	600	60	100	100	100	100	50					Top, Splitters	BMBG-600450S50-200	90	50	20
450.00	600	60	100	100	100	100	50		4	1	0	Top, Splitters	BRCG-600450S50-220	90	62	20
500.00	600	60	100	100	100	100	100					Top, Splitters	BMBG-600500S50-100	90	50	20
500.00	600	60	100	100	100	100	100		5	0	0	Top, Splitters	BRCG-600500S50-120	90	62	20
600.00	600	60	100	100	100	100	100	100				Top, Splitters	BMCG-600600S60-100	90	62	20
600.00	600	60	100	100	100	100	100	100	6	0	0	Top, Splitters	BRDG-600600S60-120	90	74	20

Automatic power factor improvement solutions
Standard range listing for 480V, 3ph, 60Hz

KVAR	Volts	Hz	No. of Steps and kVAR per Step						227Hz Reactors (kvar)			Cable Entry & Incoming	Ordering Part Number (Note: CT's not included)	Dimensions		
			Step1	Step2	Step3	Step4	Step5	Step6	100	50	25			H"	W"	D"
100.00	480	60	50	25	25							Top, Busbars	**B03G-480100B30-500**	36	30	16
100.00	480	60	50	25	25				0	1	2	Top, Busbars	**BR3G-480100B30-520**	60	36	16
150.00	480	60	50	50	50							Top, Busbars	**B03G-480150B30-100**	36	30	16
150.00	480	60	50	50	50				0	3	0	Top, Busbars	**BR3G-480150B30-120**	60	36	16
200.00	480	60	50	50	50	50						Top, Busbars	**B05G-480200B40-100**	60	36	16
200.00	480	60	50	50	50	50			0	4	0	Top, Busbars	**BR5G-480200B40-120**	72	42	20
250.00	480	60	50	50	50	50	50					Top, Busbars	**B05G-480250B50-100**	60	36	16
250.00	480	60	50	50	50	50	50		0	5	0	Top, Busbars	**BR5G-480250B50-120**	72	42	20
300.00	480	60	100	100	50	50						Top, Busbars	**B07G-480300B40-500**	72	42	20
300.00	480	60	100	100	50	50			2	2	0	Top, Splitters	**BRBG-480300S40-520**	90	50	20
350.00	480	60	100	100	100	50						Top, Busbars	**B07G-480350B40-200**	72	42	20
350.00	480	60	100	100	100	50			3	1	0	Top, Splitters	**BRBG-480350S40-220**	90	50	20
400.00	480	60	100	100	100	100						Top, Busbars	**B07G-480400B40-100**	72	42	20
400.00	480	60	100	100	100	100			4	0	0	Top, Splitters	**BRBG-480400S40-120**	90	50	20
450.00	480	60	100	100	100	100	50					Top, Busbars	**B07G-480450B50-200**	72	42	20
450.00	480	60	100	100	100	100	50		4	1	0	Top, Splitters	**BRCG-480450S50-220**	90	62	20
500.00	480	60	100	100	100	100	100					Top, Busbars	**B07G-480500B50-100**	72	42	20
500.00	480	60	100	100	100	100	100		5	0	0	Top, Splitters	**BRCG-480500S50-120**	90	62	20
600.00	480	60	100	100	100	100	100	100				Top, Splitters	**BMCG-480600S60-100**	90	62	20
600.00	480	60	100	100	100	100	100	100	6	0	0	Top, Splitters	**BRDG-480600S60-120**	90	74	20

General Notes:

– Remember that power factor improvement not only helps reduce penalties from the utility but also helps maximize system capacity on the existing network
– Consider selecting a size higher than the kvars currently required, in order to factor in future expansions
– Non-linear loads are increasingly common in modern networks
– As a rule of thumb, if 25% or more of the installed load is non-linear, please select detuned cap banks (with reactors)
– **For ratings below 120 kvar, plain banks only, please consider our new compact and economical Q100 range of cap banks**
– Contact us on pqs_rfq@ca.abb.com for any product or application support
– Ratings, dimensions and product specifications listed above or elsewhere in this brochure are subject to change without prior notice

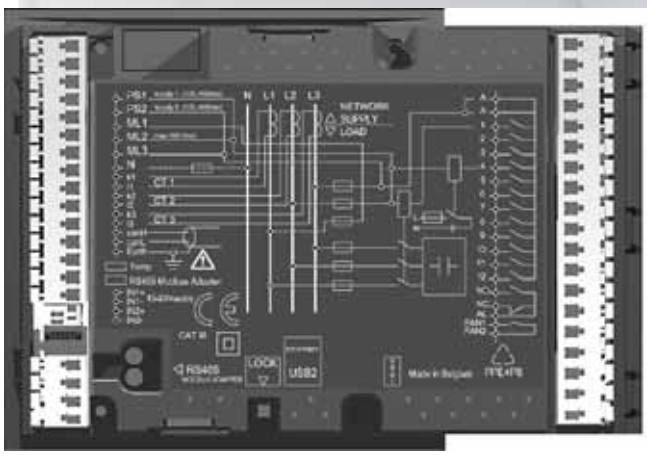
Automatic power factor improvement solutions
Key components - RVT controller

Unique advantages
With its uniquely advanced monitoring and intuitive control functions and features, the RVT is an advantage by itself. There is a noticably strong emphasis on simplicity - in setup, operation as well as diagnostics. With most features included standard there are only 3 model options, which makes selection very simple. A dashboard on the main screen highlights key status data and warnings where applicable. Parameters and system/network values are accessible in real time and can be represented in interchangeable tabular or graphic formats. RVT features full power measurement including real-time harmonic values. All parameters are arranged in 4 main programmable areas.

Power factor correction for both balanced and unbalanced loads
With unbalanced loads increasingly common on modern networks - residential & commercial especially - RVT can control power factor compensation based on 1-ph (L-L or L-N) and 3-ph balanced or unbalanced loads, with the possibility of compensating individual phases or all 3 phases together. Also, individual phase measurements and energy calculations are available on the RVT.

Complete 3-phase measurements and display
– Active power (kW), 3ph/1ph
– Apparent power (kVA), 3ph/1ph
– Reactive power (kvar), 3ph/1ph
– Reactive power (kvar) to reach target cosφ, 3ph/1ph
– Voltage (V), 3ph/1ph
– Current (amps), 3ph/1ph
– Power factor cos φ, 3ph/1ph
– Total Harmonic Distortion on Voltage/Current : THD V/I (%)
– Voltage/Current Harmonics : H2 up to H49 (% spectrum)
– Graphic or tabular display of information (interchangeable)

RVT has easy navigation between menus with both numeric and graphic displays



RVT has color touchscreen in front and spring terminals for wiring in the back

Key features of RVT controller
– Colour touchscreeen 3.5 inch QVGA, 320x240 pixels
– Supply 100 to 460Vac, 45 to 65 Hz
– Measuring voltage upto 690V direct
– CT 5A or 1A, Class 1 (not included)
– Operating temperature range -20°C to +70°C
– Parameters saved on non-volatile memory
– PF setting 0.7 inductive to 0.7 capacitive
– Alarm contact 1NO+1NC, Fan contact 1NO
– Possibility to daisy-chain upto 8 temperature probes
– Real-time clock (RTC) for time-stamped event logging
– H/w and s/w locks for user-settable control access

Communication
– Standard RS485 for Modbus with full read/write access
– Ethernet port with RVT-12TS-3P (full version)
– USB2.0 connection available for linkup to laptop
– PQ Link software for setting and supervision (not included)

Automatic power factor improvement solutions
Key components - contactors, capacitors, reactors

ABB contactors (type AF, UA and UA_RA)

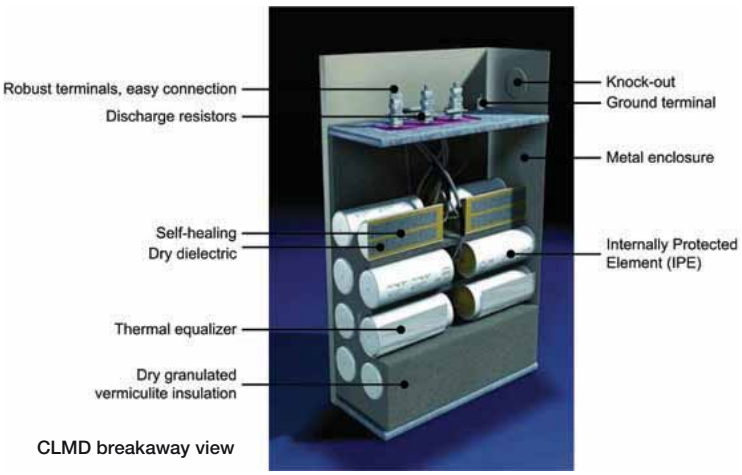
All ABB auto cap banks come fitted only with ABB contactors. For larger kvar steps, suitably rated AF contactors are used. The compact AF contactors are standard fitted with electronic coils for energy saving and chatter-free operation. Our purpose-built UA type capacitor contactors are specially designed to cope with the high inrush currents during capacitor charging. On the other hand, UA_RA contactors come fitted with a front-mounted block with "early-make, early-break" timing to ensure insertion of damping resistors in the circuit before the main contacts close, so as to limit peak current and also to pre-charge the capacitor, thereby limiting the second current peak that occurs when the main poles close a few milliseconds later.

UA_RA contactor

Reactor

ABB reactors (detuned banks only)

Tuned/detuned cap banks are fitted with dry-type, resin-embedded reactors that are specially designed for reactive power compensation applications with a high probability of harmonic currents circulating in the network. Their exceptional linearity and thermal stress resistance characteristics ensure high reliability even in case of temporary overvoltage. Reinforced reactors are also available where required, the only difference being their higher capacity to trap and contain harmonics.

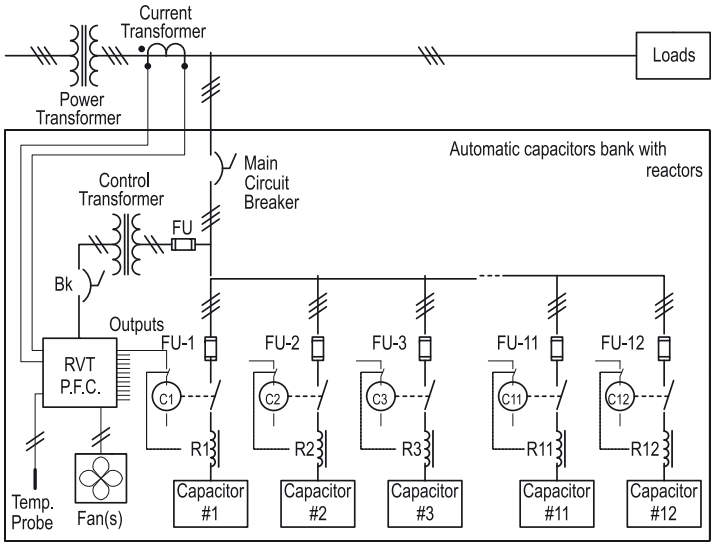


CLMD breakaway view

Additional options on request:

- Mains incoming protection with circuit breaker
- Mains incoming with disconnect (fusible or non-fusible)
- Indication - blown fuse indicators, state indicators, etc.
- Metering - ammeter, voltmeter, etc.
- Ingress protection Nema type 12, 3R, dripshield, etc.
- Enclosure mounting brackets and legs.

Generic wiring schematic (detuned cap bank):



Plain autobanks are wired exactly the same as above, only without the reactors R1, R2 and so on.

ABB capacitor units

We assemble CLMD capacitor units locally in ABB Lachine with the very best quality control. Dry type capacitors with high-grade metallized polypropylene film ensure the best dielectric properties and least possibility of burnouts, hence maximum safety. Internally protected elements contain a fuse protection each. Inherent "self-healing" feature means that micron-sized failures occuring between layers of dielectric during the lifetime of the IPE are contained and localized instantly. Modular design ensures longer operating life of every capacitor unit. Rugged design and build ensures safe and reliable operation at all times.

ABB services

The objective of this brochure is to highlight standard ABB cap bank ranges in order to simplify product selection for most requirements. Certain applications however do require some level of customization, in which case, we are fully equipped to conduct network studies and engineer a solution within the framework of prevailing design parameters and approval guidelines. Please call us on 1800-567-0283 or email us at pqs_rfq@ca.abb.com for more information.

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