



2017

SafeGear[®] Motor Control Center Arc Resistant Metal-Clad Construction Brochure

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Arc resistant Metal-Clad construction

Brochure

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SafeGear® Motor Control Center

Arc resistant Metal-Clad construction

1. Description

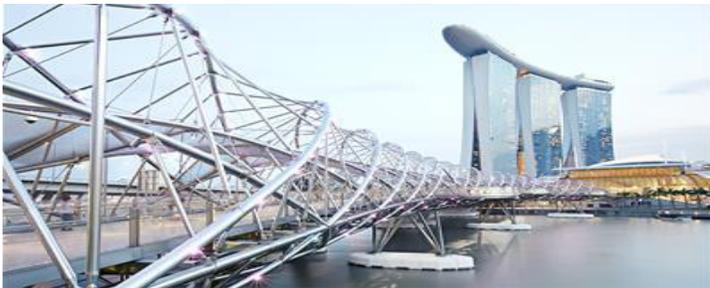
Designed for the highest degree of safety and reliability, ABB's UL- Listed arc-resistant Motor Control Center is suitable to meet most market needs.

The SafeGear MCC is equipped with mechanical interlocks between the removable contactor truck and the front door to increase operation and maintenance safety.

The withdrawable contactor design eliminates the need for an isolation switch. Due to the reduced parts and simple design the handling, maintenance and safety is improved.

A segregated LV instruments compartment with type 2B arc resistant construction provides a high level of operator safety.

For optimal flexibility, the SafeGear MCC is designed to be used in combination with SafeGear® Metal-Clad switchgear so a transition section is not required.



2. SafeGear MCC applications

Suitable for most applications:

Utilities and power plants

- Substations
- Power generation stations
- Transformer stations
- Switching stations
- Main and auxiliary switchgear

Infrastructure

- Shops
- Hospitals
- Educational Institutions
- Waste water treatment

Industry

- Pulp and paper
- Cement
- Textiles
- Chemicals
- Food
- Automotive
- Oil and gas facilities
- Metallurgy
- Rolling mills
- Mines

Transportation

- Airports
- Ports



3. Electrical Features

Electrical features		SafeGear MCC
Enclosure Type		Type 1 Gasketed
Arc resistance accessibility type		Type 2B
Rated voltage	(kV)	Up to 7.2
Insulation level / Power Frequency / Lighting impulse BIL	(kV)	7.2 / 20 / 60
Rated frequency	(Hz)	60
Rated main bus current	(A)	1200 / 2000 / 3000
Rated contactor current	(A)	400 and 720

4. Standards

The SafeGear MCC and main apparatus contained in it comply with the following standards:

UL 347, 5th edition	Medium-Voltage AC contactors, controller and control centers
UL 50/50E	Enclosure for Electrical Equipment
IEEE C37.20. 2	Standard for Metal-clad switchgear
IEEE Guide C37.20.7	Guide for test metal-enclosed switchgear for internal arcing faults
CSA C22.2 No. 253-09	Medium-voltage ac contactors, controllers, and control centers
CSA 22.2 No. 14	Industrial Control Equipment
NMX-J-564/106-ANCE	Asociación de Normalización y Certificación, A.C
Seismically Qualified	According to 2012 IBC & ASCE 7-10

5. Standard service conditions

The listed SafeGear MCC rating are applicable under the following conditions:

- Minimum ambient temperature: -5°C
- Maximum ambient temperature: $+40^{\circ}\text{C}$
- Maximum 24 hour ambient relative humidity: 85% non-condensing
- The normal operational altitude is up to 1000m above sea level. For higher altitude applications, please consult your ABB sales representative
- Non-corrosive and non-contaminated atmosphere
- Transition section is not required for connections with ABB's SafeGear Metal-Clad switchgear of similar rating



6. HCV vacuum contactors

Description

The medium voltage HCV contactors are suitable for alternating current operation and are normally used to meet customer's requirements .

The basic contactors consist of:

- Molded polyester resin monoblock containing the vacuum interrupters
- Bistable electromagnetic drive
- Multi-voltage feeder
- Auxiliary contacts
- Mechanical status indicator (open/closed).

Reduced Maintenance: Vacuum bottle contacts have a long life with virtually no maintenance required.

Environment Resistant: Ideal for use in high dust areas. Switching arc is contained within the vacuum bottle, shielding the main contacts.

Electronic Control Drive Unit: All contactors include electronic control of the operating coil which offers a wide control voltage of 115/120 or 230/240V ac 50/60Hz (120/125 or 240/250V dc), anti-chopping feature and reduced power consumption.

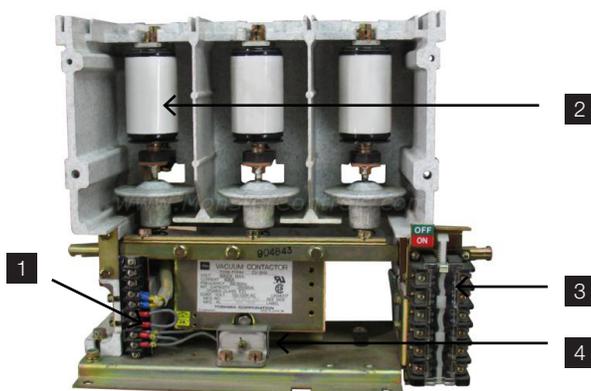
Designed for Safety: High voltage and low voltage parts are separated by an insulated barrier (non-flammable molded frame).



Vacuum contactors are rated to perform a high number of switching operations before the unit requires maintenance, typically 2.5 million for the 400A version and up to a million for the 720 A version.

Since vacuum contactors are not designed for interrupting currents higher than a few kiloamperes, a fuse in series is required to protect the distribution system against faults. The contactor requires a holding current in the solenoid coil to keep it in the closed position. Although the holding current is often quite small, customers are sometimes concerned that the contactor will open during a brief control power outage. Some designs incorporate mechanical latches to keep the contactors in a closed position. However, these latches do not perform all the functions of conventional circuit breakers.

A latched vacuum contactor is not a circuit breaker in terms of functionality or in terms of its rating. However, properly utilized it can provide long service and trouble-free operation.



1. Coil Drive Unit
2. Vacuum Interrupter
3. Auxiliary Contacts
4. Armature

Electrical Characteristics of contactor assemblies

Contactor model	HCV-5HA	HCV-5HAL (Latched Type)	HCV-6KAU	HCV-6KALU (Latched Type)
Rated Voltage	2400/4200/6900 V (7.2 kV Max)		2400V/4200/6900 V (7.2 kV Max)	
Rated Current	400 A		720 A	
Interrupting Capacity	7000A RMS Symmetrical @5000V Max.		7200 A	
	4500A RMS Symmetrical @7200V Max.			
Peak withstand current	15.8 kA		20 kA	
Impulse Withstand	60 kV			
Permissible Switching	1200/Hour	300/Hour	600/Hour	300/Hour
Mechanical Life Operations	2,500,000	250,000	1,000,000	200,000
Electrical Life Operations	250,000	250,000	200,000	
Closing Time	50-110 ms		80-120 ms	
Standard Opening Time	10-60 ms		35-85 ms	
Arcing Time	10 ms or less			
Rated Control Voltage AC	115/120 or 230/240 V 50/60 Hz		100-240V AC	
Rated Control Voltage DC	120/125 or 240/250 V		100-240V DC	
Trip Voltage	-	24, 32, 48 ,125, 250 VDC	-	24, 32, 48 ,125, 250 VDC
Control Circuit Burden (Closing)	5.4 A peak @ 120 VAC, 670 VA (AC), 700 W (DC)		6 to 7.0 A @ 120 VAC, 840 VA (AC), 875 W (DC)	
Control Circuit Burden (Holding)	0.12 A Avg. @ 120 VAC,85 VA (AC), 85 W (DC)		0.8 to 1 A @ 120 VAC 48 VA	
Auxiliary Contact Arrange	3 N.O. - 3 N.C.	2 N.O.-2 N.C.	3 N.O.-3 N.C.	2 N.O.-2 N.C.
Auxiliary Contact Rating	10 A, 600 V (NEMA Class A600)			

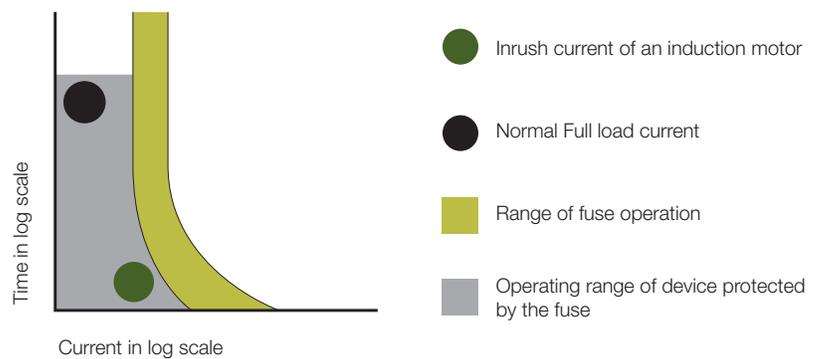
Fuse technology

There are two kinds of power fuses: standard (general purpose) and current limiting fuses.

Ratings of standard fuses depend on (1) the normal continuous current and (2) the time it takes for the fuses to respond to the different magnitudes of overcurrent. Fusible links, the principle elements of every fuse, can have different lengths and thickness and can be made of different metals or alloys.

The interrupting medium of a fuse also influences its operating characteristics. This characteristic of the standard fuse is an inversely proportional time-overcurrent curve, as shown schematically in the figure.

Time-current characteristic curve of a power fuse



Proper selection of a fuse for an induction motor is very important. An improperly selected fuse can permanently damage the motor and other equipment in the system. Both starting inrush and normal load currents have to be considered.

Power Fuses Technical Features

Power Fuses Technical Features Type Bolt-in

Contactor	Application	Voltage	Rated Current (A)
400 A	Motor Protection	5.08 kV	70, 100, 130, 170, 200, 230, 390, 450
		7.2 kV	70, 100, 130, 150, 170, 200, 230, 300, 390, 450
	Transformer Protection	5.5 kV	10, 15, 20, 25, 30, 40, 50, 65, 80, 100, 125, 150, 175, 200, 250, 300, 350, 400
		8.25 kV	125, 150, 175, 200
720 A	Motor Protection	5.08 kV	600, 700, 750
		7.2 kV	540, 600, 750

Maximum load controller ratings

The maximum load ratings for motor and transformer purpose are shown below. This is only a guide. Larger motors & transformers can be supported depending on their performance ratings.

Maximum load Ratings for motors

Voltage Rating (kV)	2.4		4.16		4.8		6.6		6.9	
Contactor Rating (A)	400	720	400	720	400	720	400	720	400	720
Induction motors (HP)	1500	2700	2600	4700	3000	5400	4200	7500	4400	7800
Induction motors (kW)	1100	2000	1900	3500	2200	4000	3100	5800	3200	5800
Fuse type	24R	48X								

Considerations: Efficiency 95%, PF=0.9, Start time: 10 sec, Service Factor=1.25 (According to NEC), Fusing Factor Protection=1.33.

The fuses shown in chart above were selected with the values above mentioned and they should only be taken as reference. The final selection of power fuses is the responsibility of the customer based on system and load parameters and shall be confirmed during engineering stage of the project.

Maximum load rating in KV for transformers

Voltage Rating (kV)	2.4	4.16	4.8	6.9
Contactor Rating (A)	400	400	400	400
Transformers (KVA)	1000	2000	2500	1500
Fuse type	400E	400E	400E	200E

Fuses will conduct transformer magnetizing inrush current of 25 times transformer primary rated current for 0.1 seconds and 12 times for 0.01 second.

7. Cubicle features



Contactor truck assembly



Single phase protection



Shutters



Exhaust Plenum



Main Bus and supports

Contactor truck assembly

The vacuum contactor and power fuses are mounted on a fully withdrawable rackable truck. This truck assembly eliminates the need of an isolation switch, therefore reducing the number of moving parts and simplifying the handling, maintenance and safety.

Single Phase Protection

A blown fuse trip system can actuate a limit switch that will trip the contactor and energize an indicating lamp located on the instrument compartment cell door.

Shutters

A metallic shutter blocks access to primary contacts when the contactor is in the Disconnected/Test position or removed from the SafeGear MCC. The motion of the removable contactor opens and closes the shutter automatically.

Exhaust Plenum

In the event of an internal arc, the exhaust plenum will safely vent the gases outside the building.

Main Bus and supports

The available main bus ratings are 1200, 2000 and 3000A.

Bus supports and insulation materials are flame-retardant, track-resistant and non-hygroscopic.

Bus bars are made of copper and have fully rounded edges. The standard bus insulation is made of a solid epoxy coating standard (heat-shrinkable tubing available is an option).

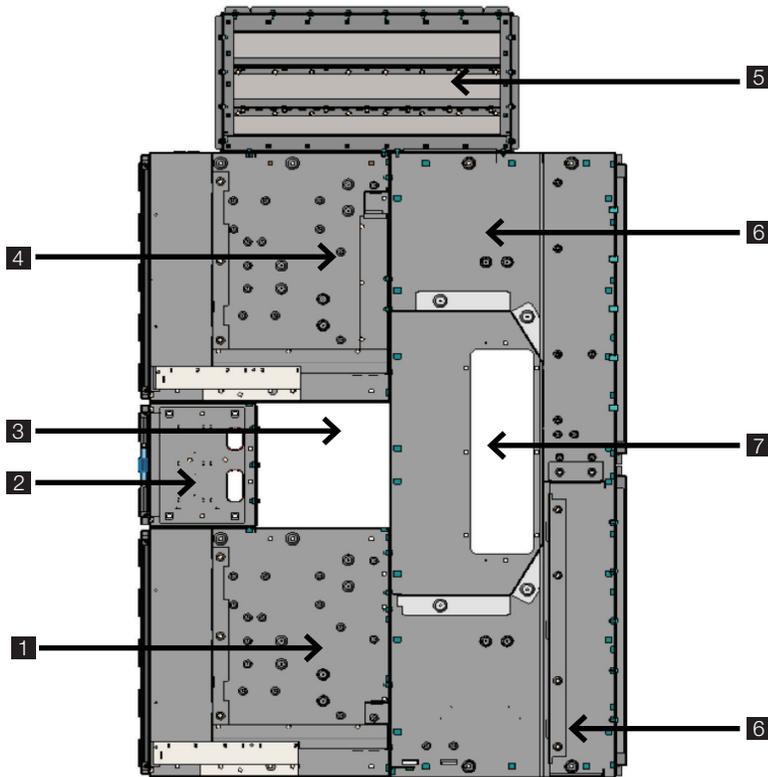
Connection joints, as well as bus bars, are silver-plated (tin plated is an option).

Power Fuses

Current limiting power fuses are installed with the withdrawable contactor and are suitable for use with motor, capacitor or transformer applications.

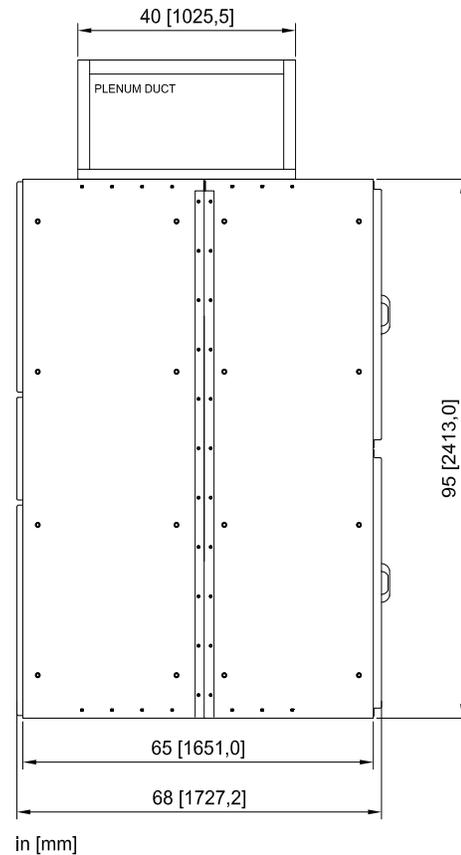
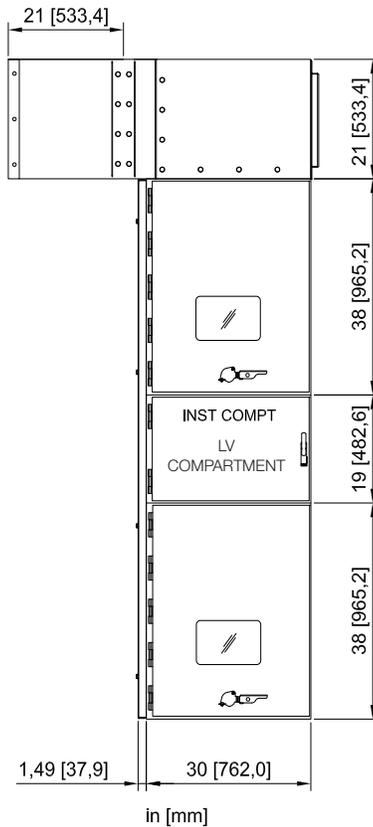
Power fuses for motor protection (type R) will be equipped with bolted type connection. Optional power fuses for transformer protection (type E) equipped with bolted type connection are also available.

8. SafeGear MCC side view



1. Lower contactor compartment
2. Low Voltage compartment
3. Vent chamber
4. Upper contactor compartment or PT compartment
5. Plenum
6. Power cables compartment
7. Bus compartment

9. General dimensions



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