



MNS-MCC Motor Control Center Application Guide



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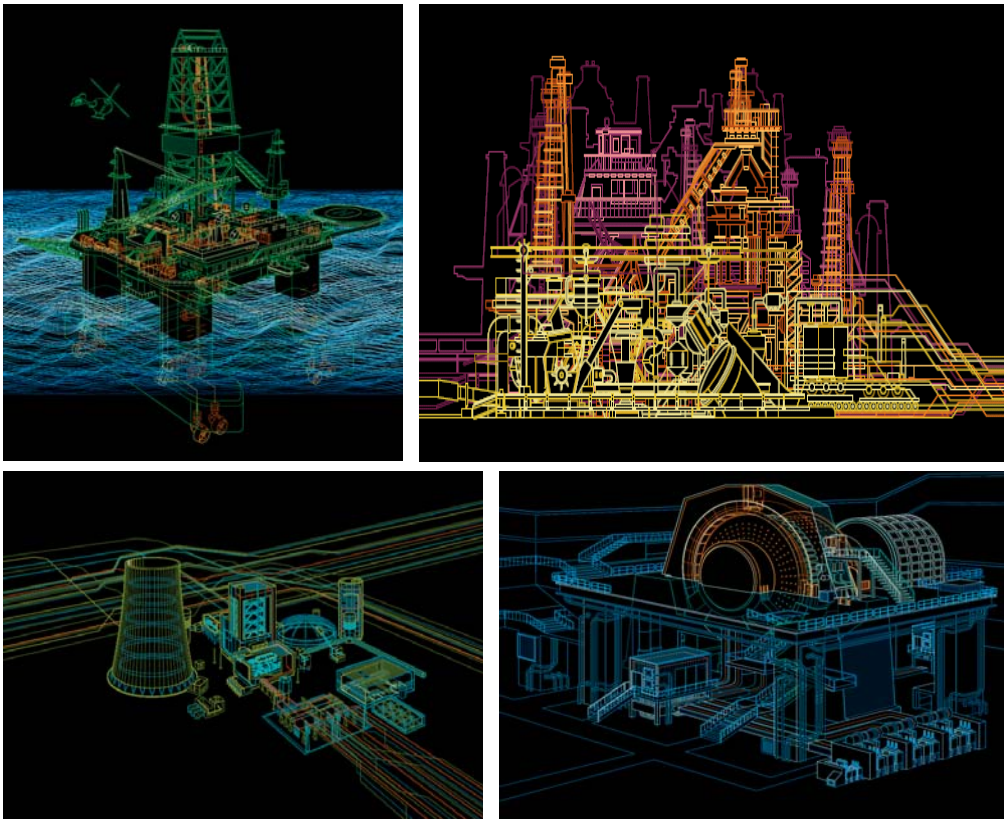
General

The MNS-MCC is designed to meet the industry requirements for such markets as:

- Oil and Gas/Petrochemical
- Chemical
- Mining and Minerals
- Power Generation
- Water/Wastewater
- Pulp and Paper

For over 30 years ABB has been the global leader for low voltage switchgear and motor control centers (MNS). In drawing upon the heritage and excellence of the innovative technology of the MNS and its withdrawable unit technology ABB has enhanced its market growth in North America with the new MNS-MCC. The MNS-MCC has been designed, built, and tested to meet all requirements for standards UL 845, CSA, and NOM.

The high flexibility of the MNS-MCC platform results from a framework construction with maintenance-free bolted connections which can be equipped as required with standardized components and can be perfectly adapted to each application. The consistent application of the modular principle both in electrical and mechanical design permits optional selection of the structural design, interior arrangement and degree of protection according to the operating and environmental conditions.



The MNS-MCC offers many advantages and alternative solutions with conventional-type installations that include:

- Higher levels of safety
- Arc-flash features incorporated
- Reduced maintenance
- Highly advanced withdrawable unit technology allowing ease of assembly, removal, and replacement with little or no tools
- High operational reliability and availability
- Main bus up to 4000A and vertical bus up to 1600A
- Compact, space-saving design
- Bus splice windows
- Economical energy distribution in the sections
- Easy project and detail engineering through standardized components
- Comprehensive range of standardized types
- Various design levels depending on operating and environmental conditions
- Seismic compliance to IBC-2006



Product Description

System Overview

The basic design:

- Standard UL845, CSA, and NOM.
- Enclosure Types: NEMA 1A and NEMA 12
- Withdrawable unit technology

MNS-MCC is available with the following nominal ratings:

- 600Vac max
- 4000A max main bus
- 50/60 Hz
- 100kA Max Symmetrical Short Circuit withstand rating at 600V

Standards

The MNS-MCC is designed, tested, and constructed in accordance with the following industry standards and guidelines:

- UL845 — Low Voltage Motor Control Centers
- UL50 — Enclosures for Electrical Equipment
- NOM NMXJ853 — Normas Oficiales Mexicanas
- NFPA 70E — National Electric Code Safety Requirements
- NFPA 70 — National Electric Code
- NEMA ICS 1B — Motor Control Centers
- NEMA 250 — Enclosures for Electrical Equipment
- IEEE 1584 — Arc Flash Calculations Standard
- CSA C22.2 — Canadian Low Voltage Electrical Equipment
- ANSI C84.1 — Voltage Tolerances for North America
- Seismic Qualification to IBC-2006 and CBC-2007, AC156, “Shake-Table Testing for Nonstructural Components and Systems,” and ASCE/SEI 7-05, “Minimum Design Loads for Buildings and Other Structures”



Ratings

Description	Value
Rated operating voltage	208Vac, 240Vac, 480Vac, 600Vac
System	3 phase-3 wire, 3 phase-4 wire
Frequency	60 Hz
Voltage Tolerances	+/- 10%
Frequency Tolerances	+/- 2%
Short circuit current withstand at 480Vac	42kA, 65 kA, 100kA
Short circuit current withstand at 600Vac	25kA, 42kA, 65 kA, 100 kA ¹
Rated continuous current Main Busbar (Horizontal)	800A, 1200A, 2000A, 2500A ² , 3000A ² 800A, 1200A, 2000A, 2500A ² , 3200A ² , 4000A ²
Distribution Bus (Vertical) at 65kA	800A, 1600A
Distribution Bus (Vertical) at 100kA	1600A
Ground Bus	400A

Notes:

1. Consult with sales office for additional information
2. NEMA 1A only

Environmental Ratings

Requirements	Value
Ambient air temperature for indoor type enclosures	-10°C to +40°C (14°F to 104°F)
Ambient air temperature for equipment storage	-25°C to +65°C (-40°F to 149°F)
Altitude	1000 m/ 3300 ft *Reference to altitude de-rating chart in table
Humidity Rating	85%, non-condensing for indoor enclosures

Product Description

Overall System Derating

ANSI Altitude Correction Factors		
Altitude (m)	Voltage	Current
2000m and below	1.00	1.00
2600m	0.95	0.99
3900m	0.80	0.96

Notes:

- Intermediate values may be obtained by interpolation.
- For devices used in switchgear assemblies, standards covering the specific devices should be used to determine the specific altitude correction factors.
- 1000m is approximately 3300 ft.
- All values are under review by an IEEE Switchgear Committee Working Group, PC37.100.1 on Common Requirements for Power Switchgear and are provided here for reference until revised values are available.

Breaker Derating

The Emax power breakers do not undergo any changes in their rated performance up to an altitude of 6600 ft (2000m).

As the altitude increases the atmospheric properties alter in terms of composition, dielectric capacity, cooling power and pressure. Therefore the breaker undergoes the following derating:

Altitude	(ft)	<6600	9900	13200	16500
	(m)	2000	3000	4000	5000
Rated service voltage	[V]	600	600	500	440
Continuous current rating	[A]	In	0.98xIn	0.93xIn	0.90xIn

Notes:

- In = breaker current

Emax Breaker Loss

Circuit Breaker	I _u [A]	Fixed 3 Pole [btu/hr]
E2B-A/N-A/S-A	1280	222
E3N- A/S-A/H-A/V-A	1280	188
	1600	290
	2000	444
E4S-A/V-A	2400	699
	2560	699
E6H-A/V-A	3000	706

Emax Breaker Temperature Derating

The continuous current rating of Emax circuit breakers is based on their use in an enclosure at 40°C ambient temperature and 105°C maximum breaker temperature for Class A insulation. Continuous current ratings of Emax circuit breakers must be derated for ambient temperatures above 40°C (Trip unit ambient is limited to 70°C.)

Ambient temperature (°C)	Derating Factor
40	1.00
45	0.95
50	0.89
55	0.84
60	0.77
65	0.71
70	0.63

Technical Data

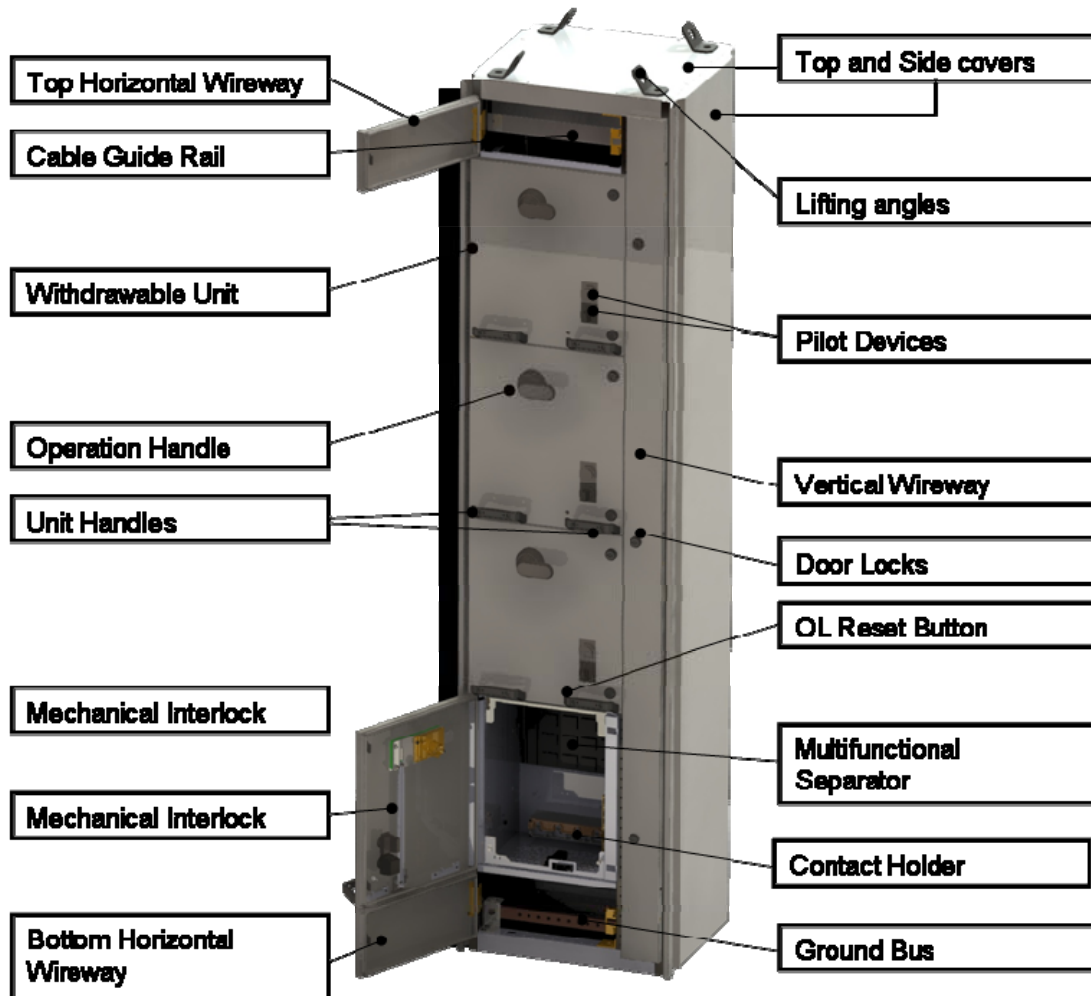
Structure

The MNS-MCC assembly consists of one or more enclosed vertical sections with an area for mounting units, a vertical wireway for motor lead and control wire connections, and bus compartment. The end panels are designed to allow the addition of future. Each section also includes a top and bottom horizontal wireway for ground bus and cable guide rail.

The bottom of each section is completely open to provide unrestricted bottom entry of cable. A top plate is provided on the roof of section for top entry.

The horizontal bus compartment is separated from the area for mounting units and the vertical wireway by use of the multifunction separator and barriers.

Lifting eyes are provided as a standard on the roof of the enclosure to allow lifting by the use of a crane.

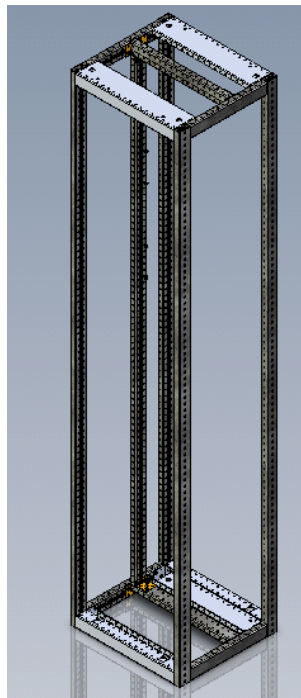


Standard Finish

The standard finish color is light gray textured paint (ANSI 61). The paint comes standard with a gloss: G40 +/- 10. The finish is Hammer Tone. The standard painting process is a UL approved electrostatic powder coat paint system utilizing polyester powder coat paint. The completed finish has minimum 2 mils dry film thickness. The process includes cleaning any grease or deficient phosphate, rinsing, spray coating, oven drying, electrostatic powder spray paint coating, and oven baking.

Frame

The basic elements of the frames are: rigid C-channel rails of 12 and 14 gauge thickness galvanized steel with holes at 1" (25 mm) intervals. The parts of the frame are secured with thread-forming screws and require no maintenance. The corner joints are carried out by means of pressure plates and secured with thread-forming screws.



Covers and Barriers

Side panels on the MNS-MCC are made 16-gauge sheet metal secured by threaded screws. The rear panels are full size 16-gauge sheet metal fastened by self-tapping screws. The roof plate is one piece made of 14-gauge galvanized material.

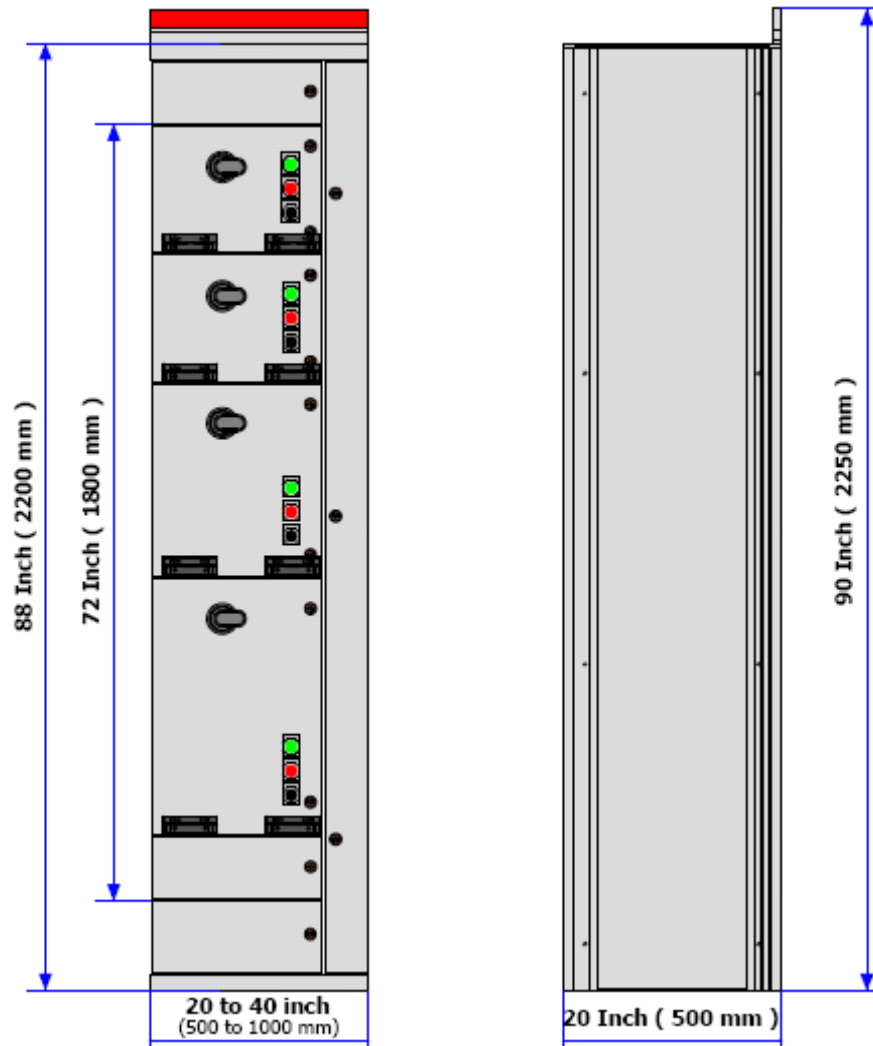
The MNS-MCC is provided with 14-gauge galvanized cable entry plates on the roof of each section. Each section is separated from the next by vertical 14-gauge galvanized barriers located on the ends of the bus compartment.

Technical Data

Available Dimensions

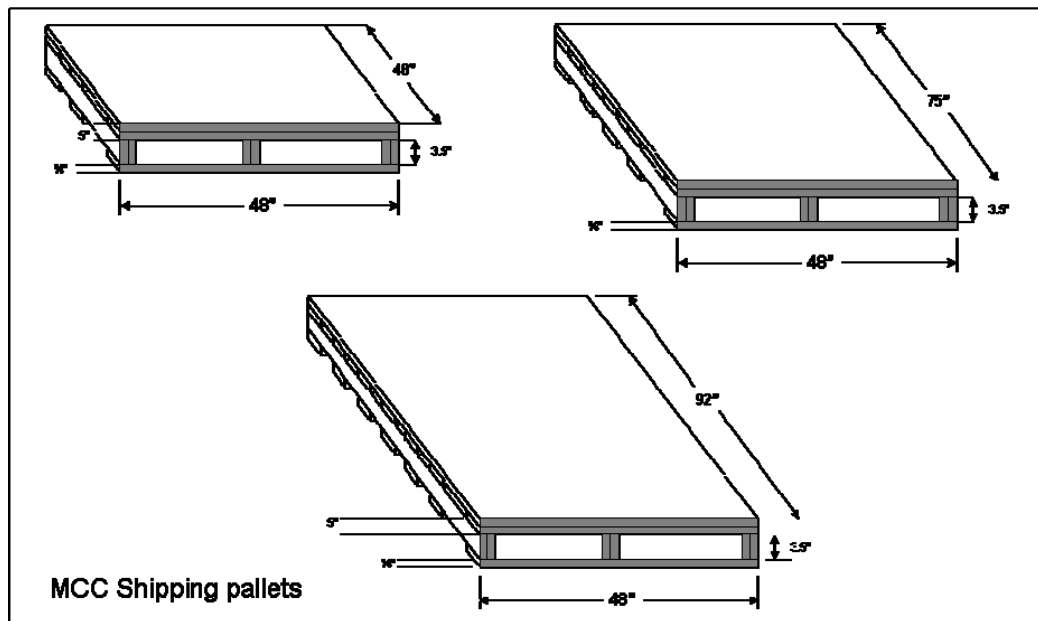
The standard structural height of the MNS-MCC is 88 inches (2200 mm) with a top 6 inch (150 mm) wireway, a bottom 7 inch (175 mm) horizontal wireway for ground bus access and additional wiring space. The balance of the vertical compartment, 72 inches (1800 mm) is available for mounting withdrawable or plug-in units. There are 2 additional inches added to the total height with the lifting eyes and the banner with the ABB logo and product name.

The standard motor control center section has a width of 20 inches (500 mm) wide. Incoming sections and other types of sections range from 20 inches (500 mm) to 40 inches (1000 mm) depending on size, application, and amperage of the section. The MNS-MCC depth is 20 inches (500 mm).



Shipping Design

Removable wood shipping base is heat-treated and fumigated; a wood base is provided per shipping split and anchored at four points in each section. The maximum shipping split for a motor control center is 60 inches (1500 mm).



Vertical Wireway

A vertical wireway is provided in each structure. The vertical wireway is located on the right side of each structure and it extends the full height of the structure. The standard width of the wireway is 4 inches (100 mm). An optional 8 inch (200 mm) wireway is available for additional wire bending space. The overall depth of the wireway is 11.5" (300 mm) providing a cross-sectional area of 40.25 square inches (201.25 mm) for easily accommodating control and load wiring. The wireway has holes for wire ties in order to support and secure all wiring and cables.

Each wireway is provided with a full height hinged 14-gauge steel door that is securely fastened by three steel quarter turn latches. The hinges are secured with self-tapping screws and are easily removable. The doors swings open 105° opposite of the unit doors for maximum accessibility.

Technical Data

Horizontal Wireways

The top horizontal wireway is 6 inches (150 mm) high. The wireway provides access the guide rail and cable connections. The horizontal wireway is covered by a 6" inch (150 mm) high 14-gauge steel hinged door secured by a steel quarter-turn latch.

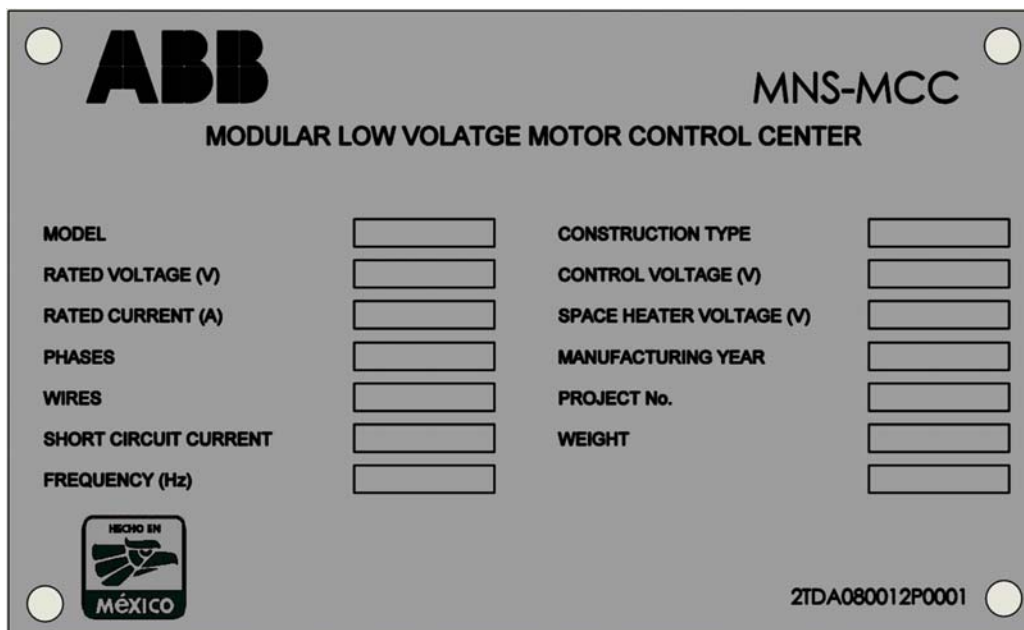
The bottom horizontal wireway is 7 inches (175 mm) high. The wireway contains the ground bus. The horizontal wireway is covered by a 7" inch (175 mm) high 14-gauge steel hinged door secured by a steel quarter-turn latch.

Nameplates


Line Up Nameplate

Each MCC line up is provided with an engraved stainless steel nameplate located in the middle of the vertical wireway door of each line up. The nameplate includes the following information:

- Model Type
- Rated Voltage, Current, Phases, and Wires
- Short Circuit and Frequency
- Construction Type
- Control Voltage
- Space Heater Voltage
- Manufacturing Year
- Project No
- Weight
- Nameplate Part Number



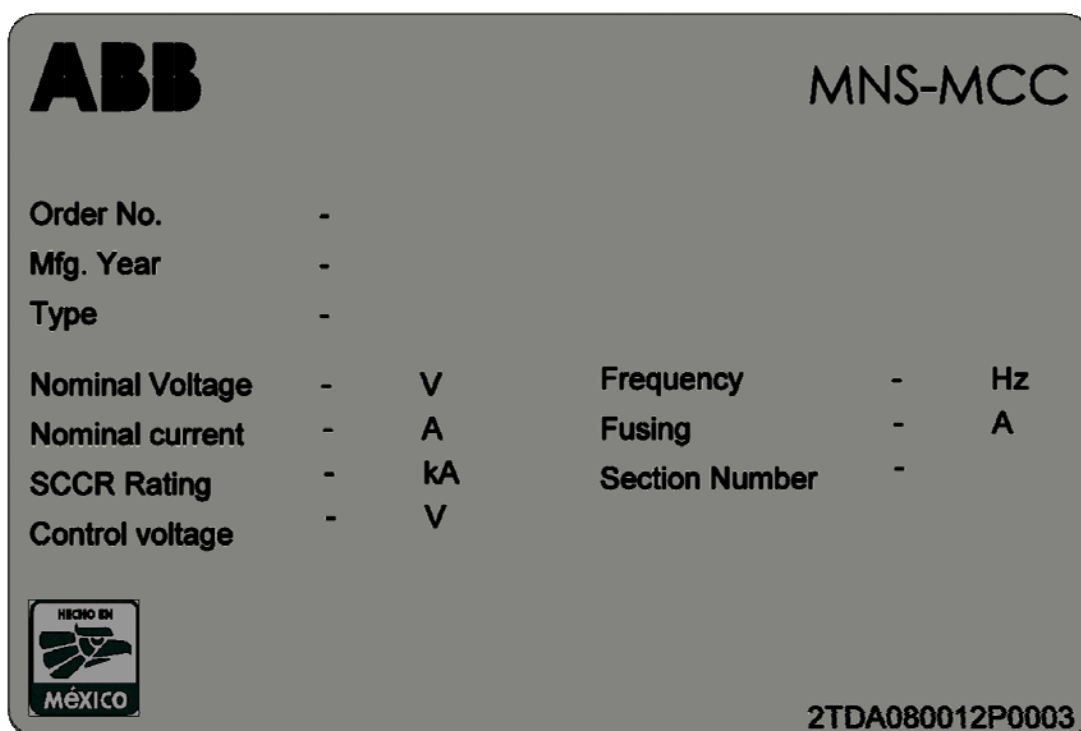
The image shows a rectangular stainless steel nameplate for an ABB MNS-MCC. The top left corner features the ABB logo, and the top right corner displays 'MNS-MCC'. Below this, the text 'MODULAR LOW VOLTAGE MOTOR CONTROL CENTER' is centered. The nameplate is divided into two columns of information, each with a corresponding empty rectangular box for engraving. The left column includes: MODEL, RATED VOLTAGE (V), RATED CURRENT (A), PHASES, WIRES, SHORT CIRCUIT CURRENT, and FREQUENCY (Hz). The right column includes: CONSTRUCTION TYPE, CONTROL VOLTAGE (V), SPACE HEATER VOLTAGE (V), MANUFACTURING YEAR, PROJECT No., and WEIGHT. In the bottom left corner, there is a logo for 'HECHO EN MÉXICO' (Made in Mexico) featuring a stylized eagle. In the bottom right corner, the part number '2TDA080012P0001' is printed.

ABB	MNS-MCC		
MODULAR LOW VOLTAGE MOTOR CONTROL CENTER			
MODEL	<input type="text"/>	CONSTRUCTION TYPE	<input type="text"/>
RATED VOLTAGE (V)	<input type="text"/>	CONTROL VOLTAGE (V)	<input type="text"/>
RATED CURRENT (A)	<input type="text"/>	SPACE HEATER VOLTAGE (V)	<input type="text"/>
PHASES	<input type="text"/>	MANUFACTURING YEAR	<input type="text"/>
WIRES	<input type="text"/>	PROJECT No.	<input type="text"/>
SHORT CIRCUIT CURRENT	<input type="text"/>	WEIGHT	<input type="text"/>
FREQUENCY (Hz)	<input type="text"/>		
		2TDA080012P0001	

Section Nameplate

Each MCC section is provided with an engraved white background with black lettering phenolic section nameplate located in the top portion of the vertical wireway door or cover for other types of sections. The nameplate includes the following information:

- Order number
- Manufacturing Date
- Enclosure Type
- Bus Bar Voltage, Short circuit, Current and Frequency Ratings
- Control Voltage
- Serial Number
- Nameplate Part Number

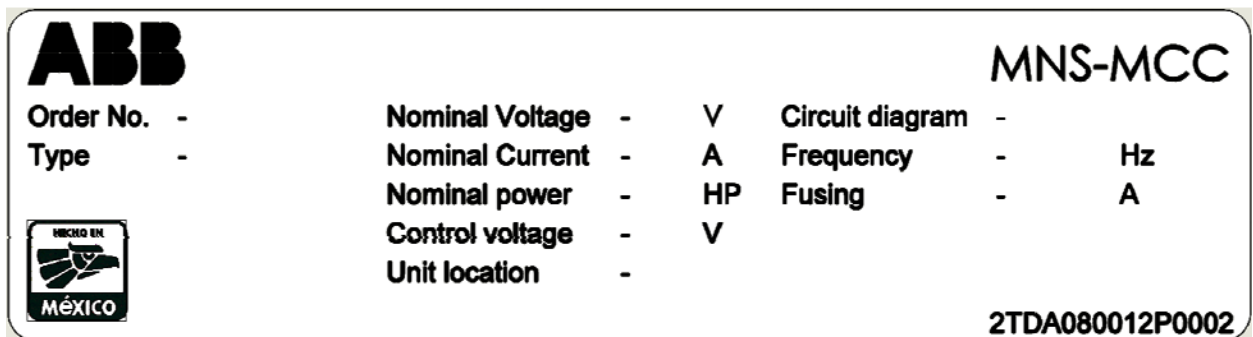


Technical Description

Unit Label

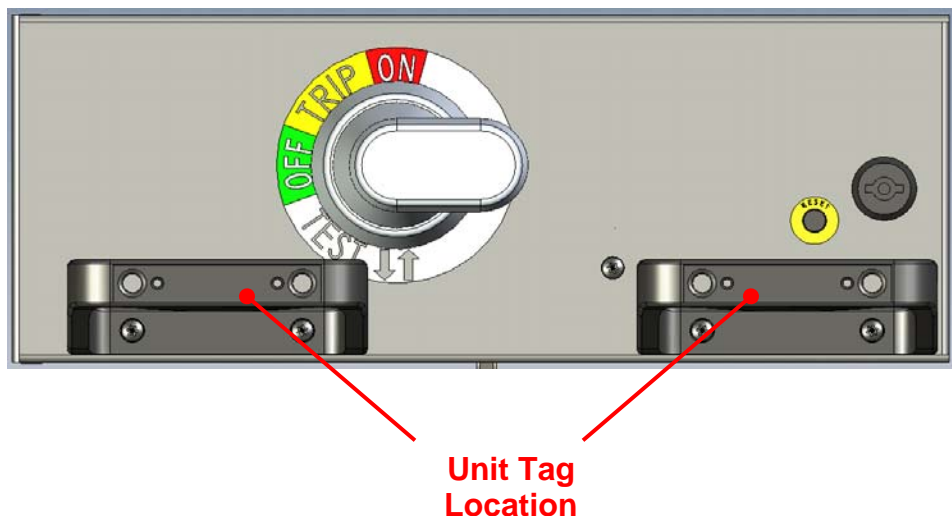
MCC units have labels located on the inside of the unit door. The labels have a white background with black lettering as a standard. The nameplate includes the following information:

- Bus Bar Voltage, Current and Frequency Ratings
- Power Output Rating
- Control Voltage and Wire Gauge Cable
- Circuit diagram Drawing Number
- Section and Unit Location
- Serial Number
- UL Certification Marking
- Nameplate Part Number.



Unit Tags

MCC units also contain lamicoid nameplates on the two handles of each unit containing unit tag information.



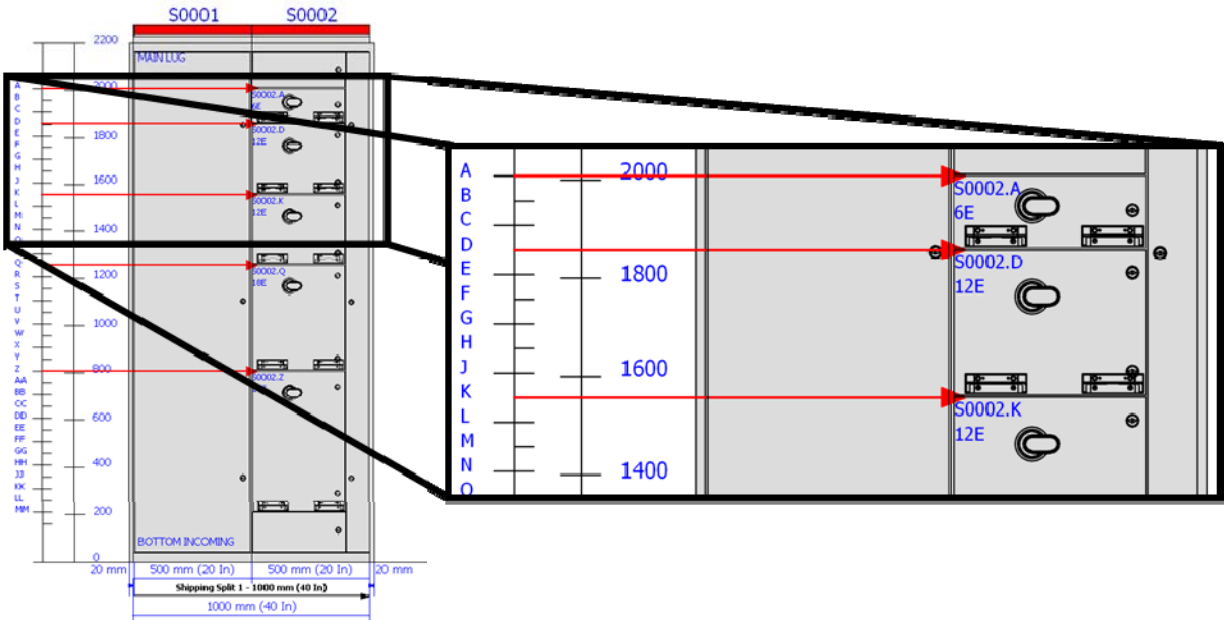
Technical Description

Unit Numbering Scheme

Each MCC section has a location number. This number is assigned during the creation of the general arrangement drawings. This numbering scheme is used to insure correct sequencing of vertical sections during installation.

In addition to the numbering of vertical sections, each removable unit is also assigned a code indicating correct placement within the vertical section. This coding system assigns letters to each inch of the 72 inches of the available unit space in the section. The top most position is coded as "A" the bottom most position is coded as "MM"

By combing the numeric section code with the alpha height code, each unit is assigned a code that describes its position within an MCC line-up.



Technical Data

Enclosures

NEMA-1A (gasketed)

The MNS-MCC standard enclosure is NEMA-1A gasketed. The enclosures are deadfront, metal-enclosed structures. All front doors, side panels, and rear panels or doors are painted using textured electrostatic powder type paint. The enclosure is appropriate for installations with normal atmospheric conditions. It is intended for use primarily to provide a degree of protection against limited amounts of falling dirt.



Standard Features:

- ANSI 61 textured paint color
- 4" vertical wireway
- Barriers between each section
- Removable, steel top plates over conduit entrance
- Cable wire tray in top of unit wireway
- Gasketing on all doors
- Lifting eyes

Available Options:

- 8" vertical wireway
- Bottom plates

NEMA-12 (Dust-tight and Driptight)

As an option the MNS-MCC may offer a NEMA-12 enclosure. The enclosures are deadfront, metal-enclosed structures. All front doors, side panels, and rear panels or doors are painted using textured electrostatic powder type paint. The enclosure is intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping non-corrosive liquids. A gasketed bottom plate is provided with this enclosure. Filters or louvers are provided on all vent openings. All standard gaskets as those in the NEMA-12 enclosure are also part of the design.



Standard Features:

- ANSI 61 textured paint color
- 4" vertical wireway
- Barriers between each section
- Removable, steel top plates over conduit entrance
- Cable wire tray in top of unit wireway
- Gasketing on all doors
- Lifting eyes
- All units are gasketed
- Gasketing is provided between sections
- Louvers and filters are provided on all vents

Available Options:

- 8" vertical wireway
- Bottom plates

Technical Data

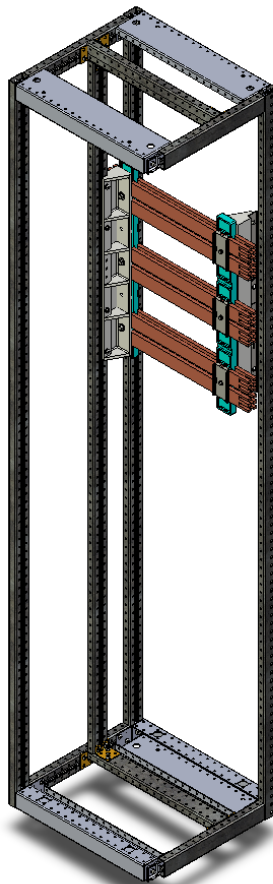
Bus Bar System

The bus bar system is installed in the rear of the MCC vertical section and it includes the main horizontal bus bar system. The vertical distribution bus bar system is located in the unit wireway embedded in the multi-function wall.

The **horizontal busbar** run phases Neutral, A, B, and C phase from top to bottom in each vertical section. The bus bars are either single stack on the top portion of the main bus compartment or are double stacked (top and bottom) for higher amperage ratings. The cross-section on both bus bar stacks levels is equal. The horizontal busbars are divided into lengths in accordance with the size of the MCC shipping split. Units having busbars of different cross-sections can be coupled together (short-circuit withstand to be considered). The horizontal bus is secured by maintenance free screw connectors.

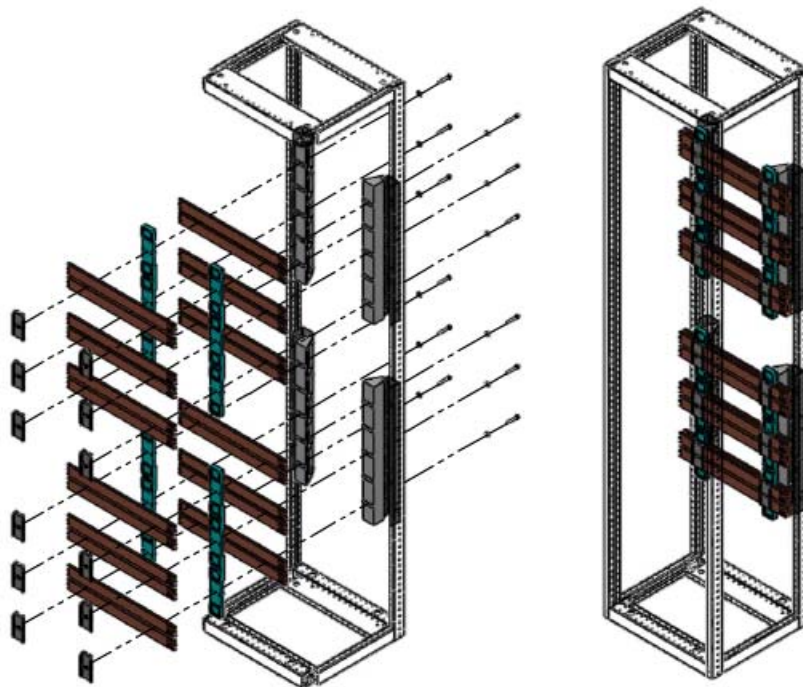
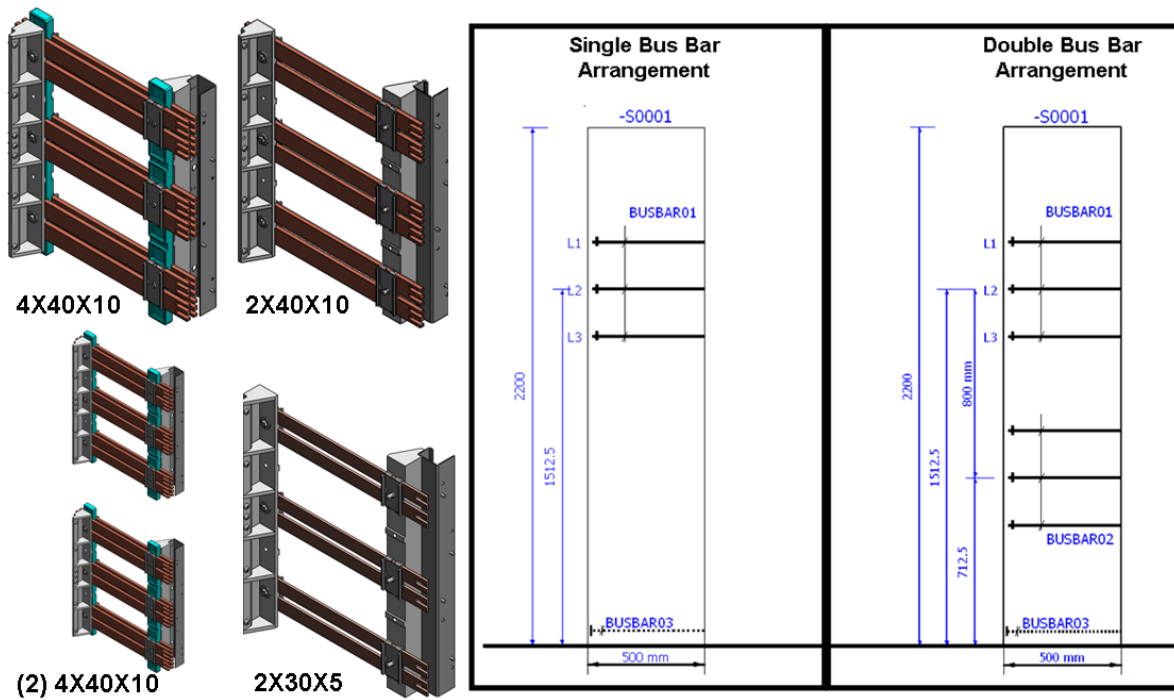
The bus bars are connected to the adjacent section at each end by means of shipping bus splice bar kits which are provided on the left side of each shipping split. The bus splice kits are accessible through the front side in the vertical wireway. The bus splice kits are secured by grade 5 hardware.

Main bus amperages include: 800A, 1200A, 1600A, 2000A, 2500A, 3200A, and 4000A with bus bracing available up to 100kA max at 600V. Tin-plating bussing is standard; optional silver-plating is available.



Technical Data

Depending on the amperage size a combination of either 2, 4, or 8 (two of the four) are provided per section.

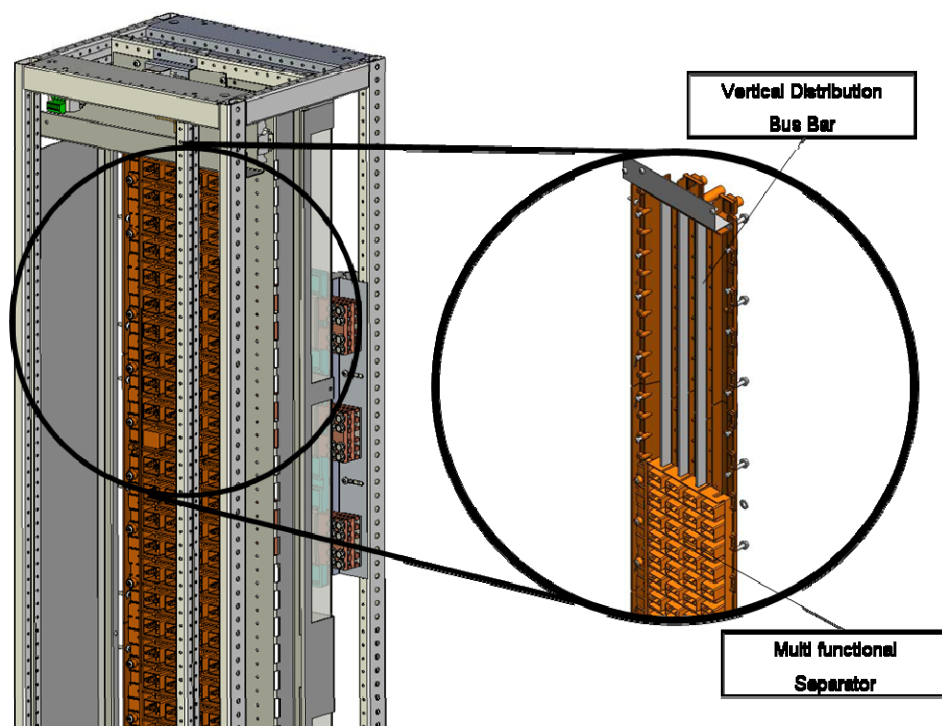


Technical Data

The **vertical distribution busbars** run A, B, and C phase from left to right. The bars are used for connecting plug-in and withdrawable units. The distribution bars are L-shaped and are embedded into the multi-function separator made of insulating material, non-flammable, and non-hygroscopic material. The separator provides a degree of protection IP20 (protection against ingress of solid foreign objects equal or greater than 12.5 mm) and separates main horizontal bus and the unit wireway.

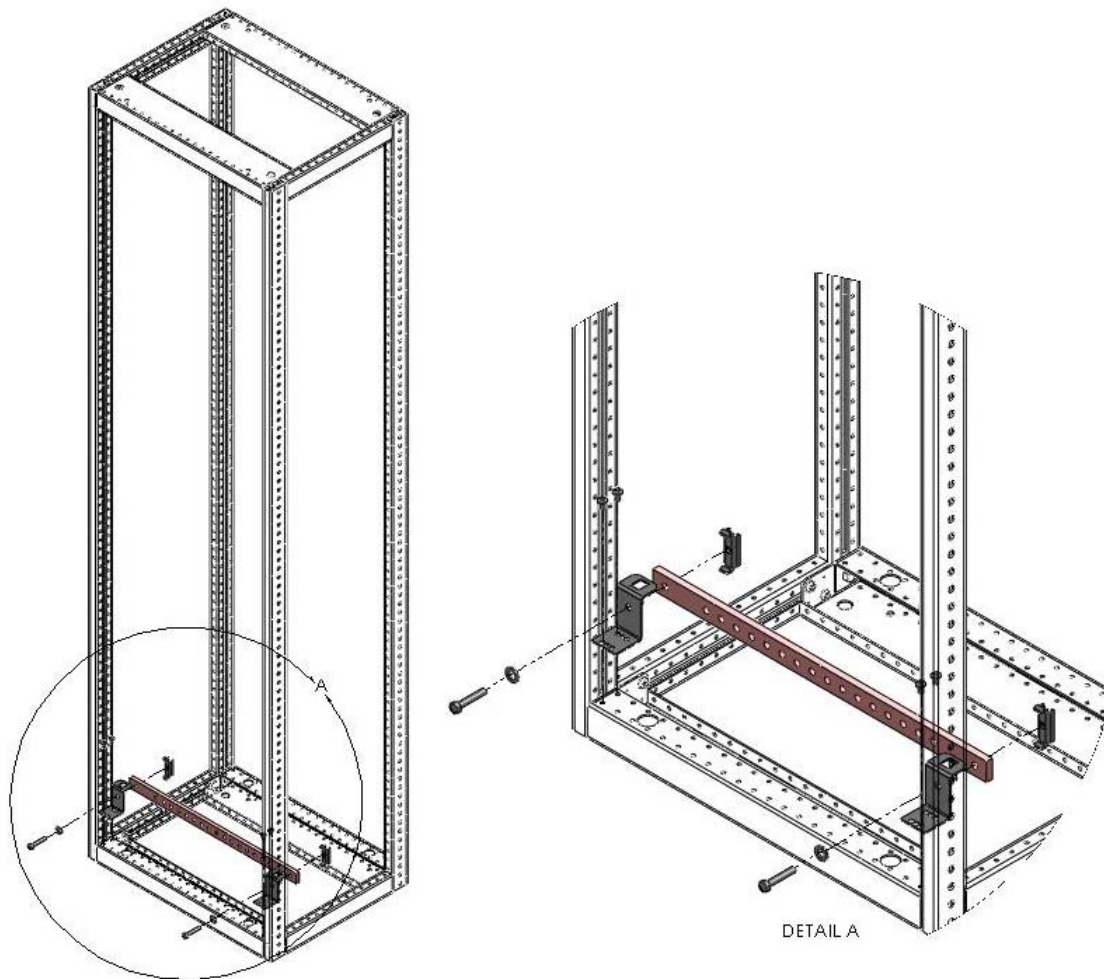
The vertical distribution busbars are available in ratings of 800A at 65kA and 1600A at 100kA. The embedded busbars are silver-plated copper standard with an option for tin-plated.

For 1600A vertical distribution busbar applications a double busbar system is used.



The **ground bus** is rated as follows: 1 bar of 1 3/16" x 3/8", rated 400A. The length of the bar is dependent on the MCC shipping unit lengths. As a standard ground bus, ABB offers a bare copper bus. The protective connection bar is arranged vertically in the cable compartment.

As a standard the ground bus is provided with several 0.4 inch (10 mm) holes for each section in order for them to accept ground lugs for any load that may require a ground conductor. The ground bars and connection bars are punched accordingly which allow the bars to be mounted in the section.



Technical Data

NEMA Types of Wiring

The ABB MNS-MCC offers and complies with a wide range of NEMA classifications. The available offerings are:

Class I – Independent Units

Class 1 motor control centers MCC's consist of mechanical groupings of combination motor control (MCCs) consist of mechanical groupings of combination motor control units, feeder taps, other units, and electrical Devices arranged in a convenient assembly. The manufacturer completes wiring between components within each unit. Connections between units are not provided.

Class 2 - Interconnected Units

Class 2 MCCs are the same as Class 1 MCCs with the addition of manufacturer-furnished electrical interlocking and wiring between units as specifically Described in the overall control system diagrams supplied by the purchaser.

Type B:

User field control wiring connects directly to the control unit terminal block(s) in or adjacent to each unit, and user field load wiring connects directly to the Device adjacent to the vertical wireway. User field load wiring for Size 3 or smaller combination starter units connects as follows:

General

The MNS-MCC offers three types of units:

- Plug-in type
- Withdrawable type
- Full height

The units are either a disconnect feeder or a combination type of a motor starter, softstarter, or variable frequency drive (VFD) with a circuit protector (circuit breaker or fusible switch).

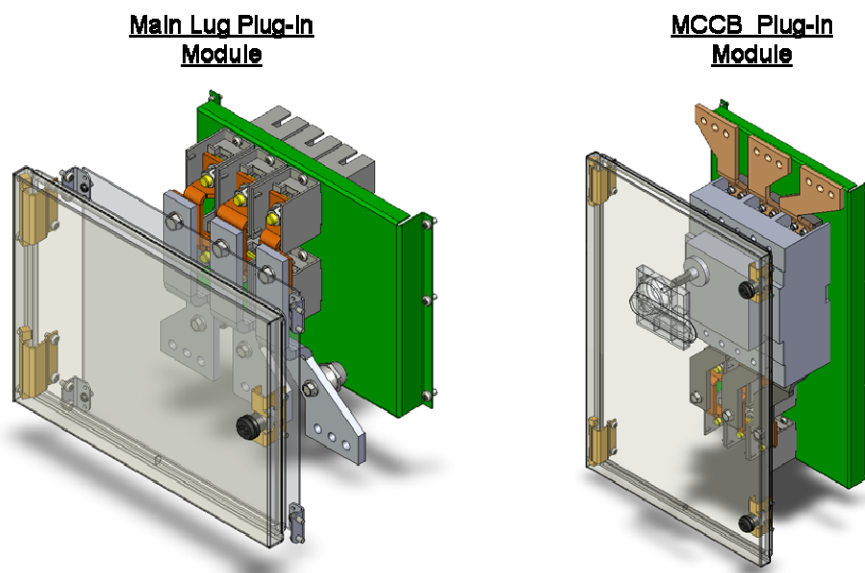
Plug-in Type

Plug-in type units are connected to the distribution bars by means of plug-in contacts. The unit is fastened directly on the frame through self-tapping screws. Its own contacts elements are used to connect to the multi-function separator. Each unit is covered by a hinged door secured by either one or two quarter-turn latches. Depending on the design and application a rotary handle may be fitted on the door of the unit with an interlocking system for operation from the outside. On main lug plug-in units a plate is placed behind the door for additional protection and isolation.

The plug-in units consist of a supporting plate made of sheet metal. The plug-in units are either provided with plates with cut-outs for contact units for connection to the multi-function separator or they are provided with covers over cut-outs on the plate. On outgoing units where there is no need to connect to the multi-function separator connection are made directly to the MCC unit via terminals. The units range from any sizes of 1 inch increments up to a height of 72 inches. Each plug-in unit is grounded by means of the frame.

There are two options available for plug-in type units:

- Main Lug
- Main Incoming Breaker



Units

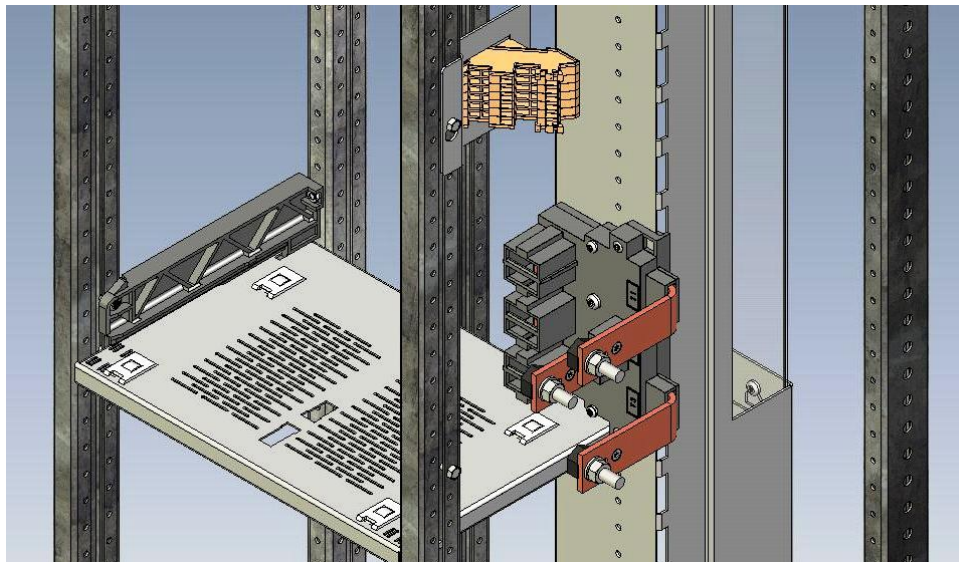
Withdrawable Units

The other type of unit available on the MCC is the withdrawable unit. The standard unit sizes are: 6", 12", 18", 24", 30", 36", 42", 46", and 48". Withdrawable units are used to house NEMA Size 00 to Size 5 starters.

The withdrawable compartment consists of the following:

- Compartment bottom steel plate with roller.
- Guide rails for the units.
- Sheet metal side wall with the outgoing control plug.
- Outgoing cable connection unit

The uppermost withdrawable unit compartment is covered by a compartment bottom plate. The top cover for the lower compartments is the bottom plate of the compartment above.

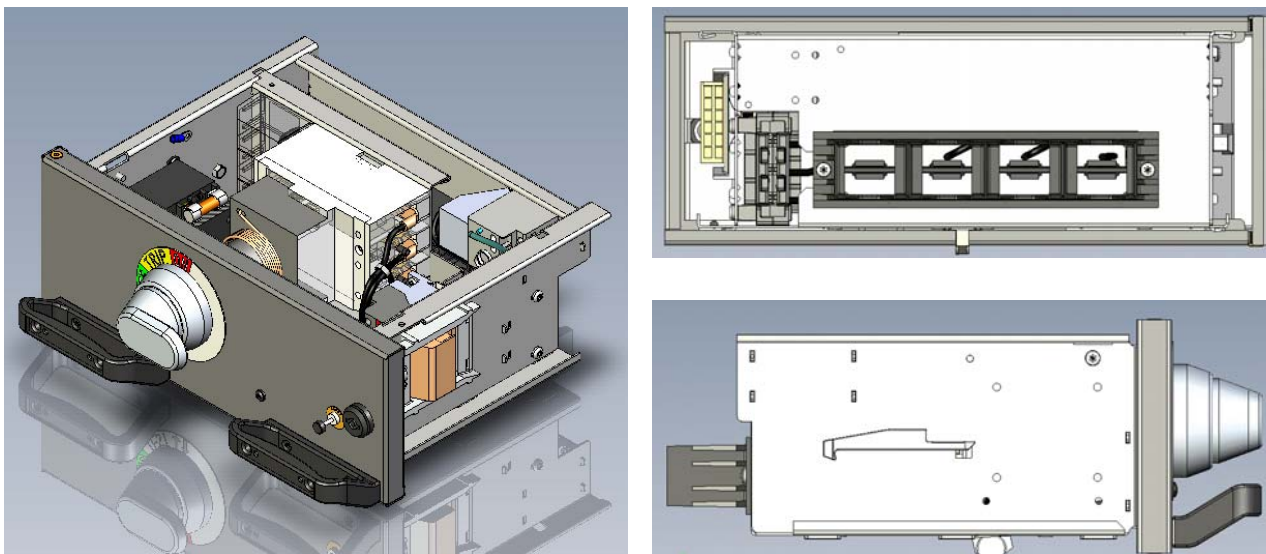


The withdrawable unit consists of the following:

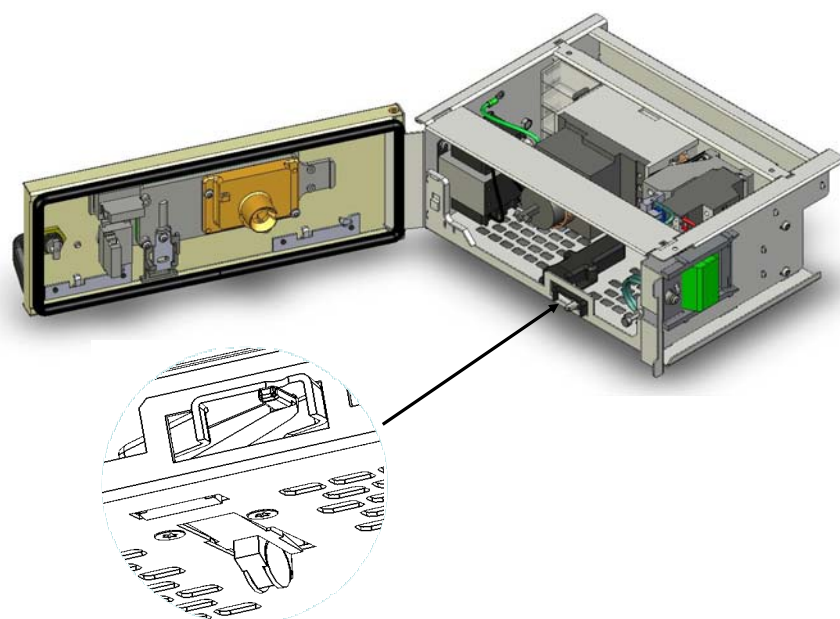
- Hinged front cover that is secured by a quarter-turn latch which allows ease of accessibility to the components inside the unit from the front side.
- Two handles attached to the front cover for ease of removing the unit from the MCC structure.
- A rotary handle for operation.
- Sheet metal side wall with one end of the pull-apart terminal blocks.
- Roller wheel for mechanically interlocking the device.
- Plug-in contacts to connect to the multi-function wall and distribution bus.
- Plug-in contacts for motor lead connections.
- Electrical components such as starters, contactors, control power transformers, indicating lights, and metering and control products.

Withdrawable unit feeder connections to the distribution bar system are done directly via the contact holder of the withdrawable units. Outgoing cables are connected via plug-in-contacts to the outgoing cable connection unit (main circuit) and via terminal blocks (auxiliary circuit). The outgoing cable connection units are fastened directly to the frame.

Instrument panels for measuring, operating and indicating units are also provided for the withdrawable units and are mounted on the unit itself. The accessories protrude through a cut-out in the hinged front cover of the unit.









The main switch is operated via a rotary operating handle which is used for mechanically and electrically interlocking the unit. The rotary handle mechanically interlocks by means of an isolating position mechanism located on the front bottom portion of each unit and a locking rod.



Units

Each withdrawable unit rotary handle is provided with six unique indications. The indications are listed below.

Figure	Position of Rotary Handle	Position of Module	Main and Control Circuits
	ON	In Section	All main and control circuits are closed and operational.
	OFF	In Section	All main and control circuits are open and disconnected.
	TEST	In Section	All main circuits are open and control circuits are closed, ready for testing.
	TRIP	In Section	All main and control circuits are open or disconnected, main disconnect switch has tripped.
	ISOLATED	The module is 30 mm drawn out of the section.	All main and control circuits are open and disconnected and the unit can be withdrawn.
	MOVE	In Section Isolated Position Withdrawn	All main and control circuits are open or disconnected and the unit has fulfilled isolated distance.

Full Height Units Section

The MNS-MCC utilizes full size sections for NEMA Size 6 and Size 7 starters, VFD's, and softstarters. All components within a full height unit are mounted on steel plates securely fastened by self-tapping screws to the frame. Each full height is provided with a full height hinged door securely fastened by three quarter-turn latches. The doors are either solid or are provided with louvered vents depending on its application. A rotary handle is fitted on the doors for control of the disconnecting device.

Additional accessories such as pilot devices, push buttons, selector switches, and softstarter or VFD display units may be mounted on the door when necessary.



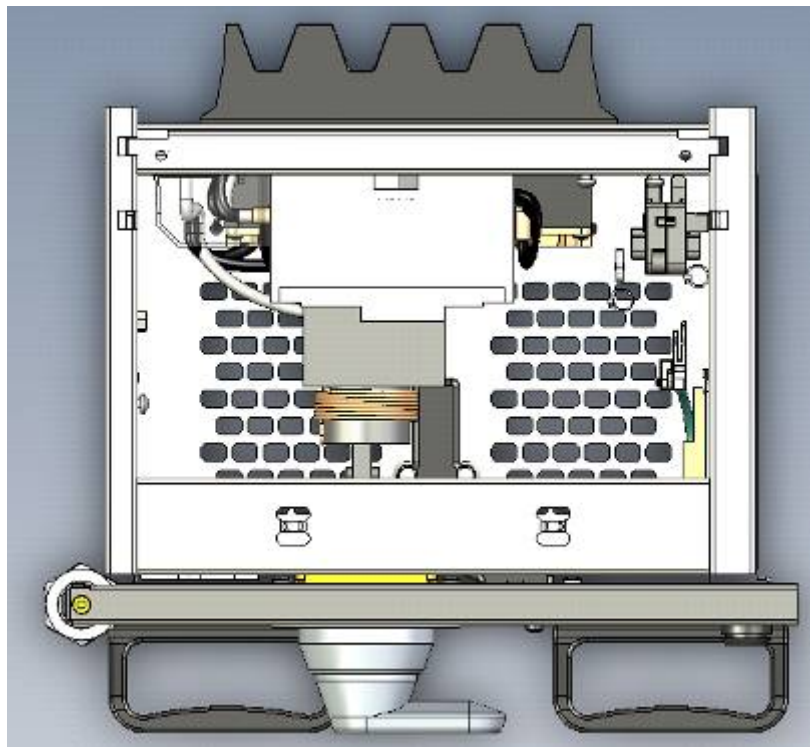
Units

Feeder Disconnects Units

When there is a need to only provide a feeder disconnect (circuit breaker or fused disconnect) the disconnect device is mounted in a withdrawable type unit. Within the unit door the following accessories for control may be provided:

- Rotary handle (standard)
- LED pilot devices for monitoring

Each unit is sized in accordance to the size of the feeder disconnect device (circuit breaker or fused disconnect). The available units sizes are: 12", 24", and 30" depending on size of the breaker and amperage.



Combination Motor Starter Units

The MNS-MCC offers four types of combination starters: full voltage non-reversing (FVNR), full voltage reversing (FVR), two-speed one winding (2S1W), and two-speed two winding (2S2W). Combination starters mount in a withdrawable unit for NEMA Sizes 00 to 5. The unit sizes range from 6" to 48" depending on the NEMA Size and its content. For the larger NEMA Size 6 and 7 the units are mounted fixed in a full height unit. The combination starters have the following ratings:

- Up to 600 HP (800 A) max for 2SW1 and 2S2W
- 640 HP (720 A) max for FVR and FVNR

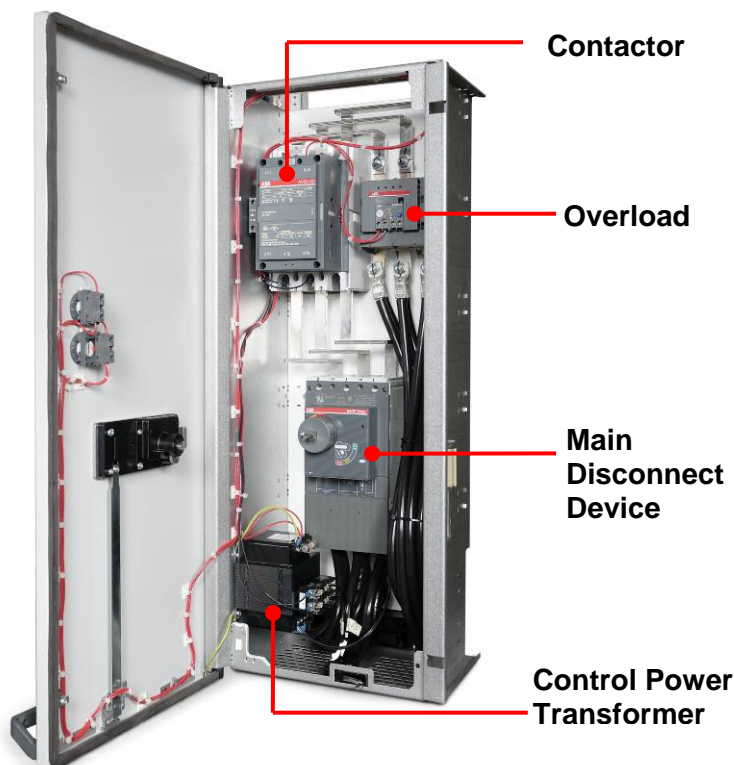
Please refer to the coordination tables section in this guide for further information.

Each combination starter is provided with a combination of the following:

- An ABB disconnecting means (MCP or fused disconnect switch)
- An ABB A-line or AF contactor
- An ABB thermal overload or electronic overload protection
- An ABB control power transformer for 120VAC power

Additional accessories may be provided for monitoring and control such as:

- LED Pilot lights (30 mm) or optional (22mm)
 - Red (RUN)
 - Green (OFF)
- Pushbuttons (30 mm) or optional (22mm)
 - Red (OFF)
 - Green (START)
 - White (Other)
 - Blue (Other)
 - Amber (Other)
- HOA switch
- Cam switch
- Optional push to test
- Voltage Indicators



Units

Softstarters Units

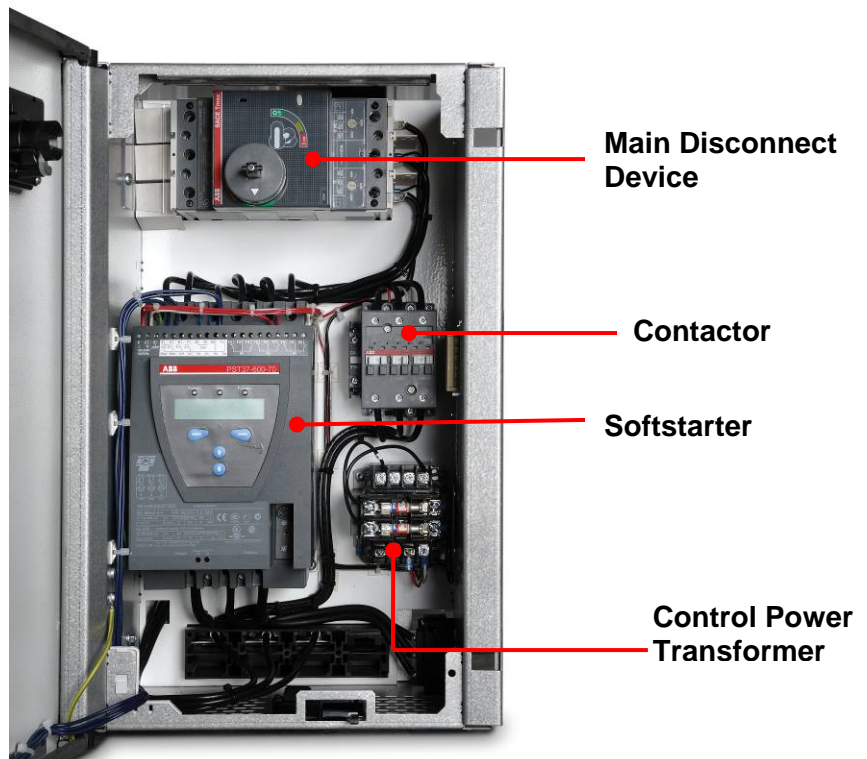
The softstarter units from the MNS-MCC are mounted in a withdrawable unit or in a full height. Softstarter units are available for NEMA Size 2 to Size 6. There two types of softstarter units offered are: softstart reversing and softstart non-reversing. The ratings for the softstarter units are: up to 400 HP (500 A). Please refer to the coordination tables section in this guide for further information.

The MNS-MCC softstarter units are provided with a combination of the following:

- An ABB control power transformer for 120VAC power
- An ABB PST series softstarter ranging from 20 HP to 250 HP (27 A to 300 A) or an ABB PSTB series softstarter with integrated bypass ranging from 300 HP to 400 HP (370 A to 470 A)
- An ABB disconnecting means (MCP or fused disconnect switch)
- Reversing units shall include a bypass contactor and a set of reversing contactors (A-line or AF type)
- Non-reversing units shall include a bypass contactor (A-line or AF type)

Additional accessories may be provided for monitoring and control such as:

- LED Pilot lights (30 mm) or optional (22 mm)
 - Red (RUN)
 - Green (OFF)
- PST or PSTB digital controller
- HOA switch
- Forward/Reverse switch



Variable Frequency Drive Units

The MNS-MCC takes advantage of the well renowned ABB variable frequency drives (VFD) and has incorporated them in its design. The variable frequency units are available in a withdrawable unit as well as in a full height unit depending on the VFD's size. The following VFD's are available in the MNS-MCC:

- ABB ACS 350 up to 25 HP (67 A)
- ABB ACS550 up to 150 HP (192 A)
- ABB ACS800 up to 150 HP (215 A)

Each VFD unit is provided with one or a combination of the following accessories:

- An ABB VFD
- An ABB disconnecting means (Thermal Magnetic breaker or fused disconnect switch)
- An ABB control power transformer for 120VAC power
- An ABB interface control relay (CR series)
- An ABB power supply (CP series)

Please refer to the coordination tables section in this guide for further information.

Additional accessories may be provided for monitoring and control such as:

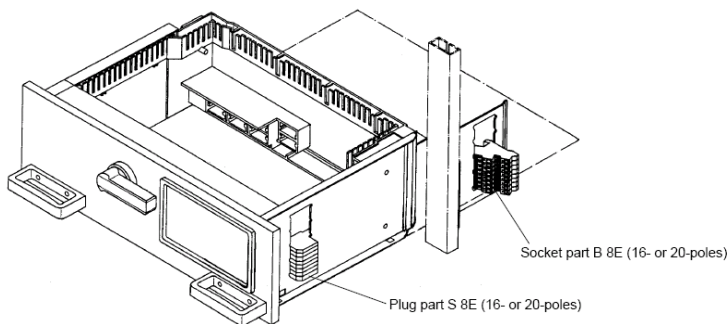
- LED Pilot lights (30 mm) or optional (22 mm)
 - Red (RUN)
 - Green (OFF)
- Remote door mount keypad



Components of Units

Terminal Blocks

ABB uses a unique terminal block system for each of the withdrawable units which allow the connection between the unit and the external terminal without any additional wiring. The terminal plugs consist of two-pole individual elements which are supplied as completely labeled 12-pole or a 24-pole terminal block assembly. The top screw connection on the terminal blocks allows the possibility of connecting all conductor types without any previous treatment.



Technical Data

Rated voltage	8" ... 24"	500 VAC/600 VDC
Insulation group		Group C to VDE 0110
Rated current/pole		10 A (55°C)
Protection class		IP 20
Contacting cycles		≤ 100
Contact material		CuZn 40
Surface finish		gal SnPb 8
Volume resistance		8 E: ≤ 7.5 mΩ
Insertion/withdrawal force/pole		3 to 4 N
Tightening torque of screwed connection		0.8 Nm
Insulation material		PA 66, break-resistant, halogen-, cadmiumfree
Fire rating		UL 94: V2 VDE 0304 P. 3 Lev. IIb VDE 0304 P. 3/82:FV2

Pilot Devices/Selector Switches

The MNS-MCC utilizes ABB 30 mm metal bezel LED pilot devices mounted as part of unit on a control station plate with an option for 22mm optional for indication of status. For pushbuttons an ABB 30 mm metal bezel shall be available. The pushbutton functions available shall be: Fwd/Rev, High/Low, Start/Stop, Fast/Slow, On/Off, Illuminated. Nameplates are provided standard on all pilot devices.



Selector switches used in the withdrawable units shall be ABB type. The following functions shall be available: H/O/A, Start/Stop, On/Auto, On/Off, High/Off/Low, Hand/Auto, Test/Auto, Fwd/Off/rev, High/low, Slow/Off, Slow/Fast, Fwd/rev, and 4-position. Nameplates are provided standard on all selector switches.



Control Power Transformer

Description

- Epoxy encapsulated coils up through 750VA
- Epoxy resin impregnated coils 1 kVA to 5 kVA
- Provides stepped down voltages for machine tool control devices and industrial control panels
- Laminations of high quality silicon steel
- Minimum core loss
- Optimized performance
- Copper magnet wire providing the highest quality and efficient operation
- Molded-in terminals
- 80°C rise, 130°C insulation system
- 50/60 Hz
- UL File # E175311
- CSA File #LR27533
- IP 20 Touch safe covers available as an option

For further information please see product catalog: Product Selector 1SXU0000023C0202 or visit website at <http://www.abb.us>.



Components of Units

Contactors

Application

A-Line and AF contactors are mainly used for controlling 3-phase motors and for controlling power circuits corresponding to their operating characteristics up to 690 and even 1000 VAC. and 440 VDC.

Description of 3 pole contactors A

All A-line and AF contactors can be assembled side by side. The add-on or built-in auxiliary contacts are suitable for low level currents.

Control circuit types

- A-line types: AC operated with laminated magnetic circuit.
- AF types: AC/DC operated with laminated magnetic circuit

Contactor types

- 3 pole contactors with NO or NC built in auxiliary contact for A9-A40 contactors; factory assembled auxiliary contacts for A50-A300
- 4 pole contactors: 4 NO or 2 NO & 2 NC without any auxiliary contacts. (A9-A75)
- 3 pole contactors with 1 NO 1 NC factory assembled auxiliary contacts for AF50-AF1650

Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 7.5mm for A9 - A40

35 x 15mm for A9 - A75

75mm for A45 - A110

Location of side mounted accessories: on right or left hand side. Factory mounted on left hand side for CAL5 on A50 - A300

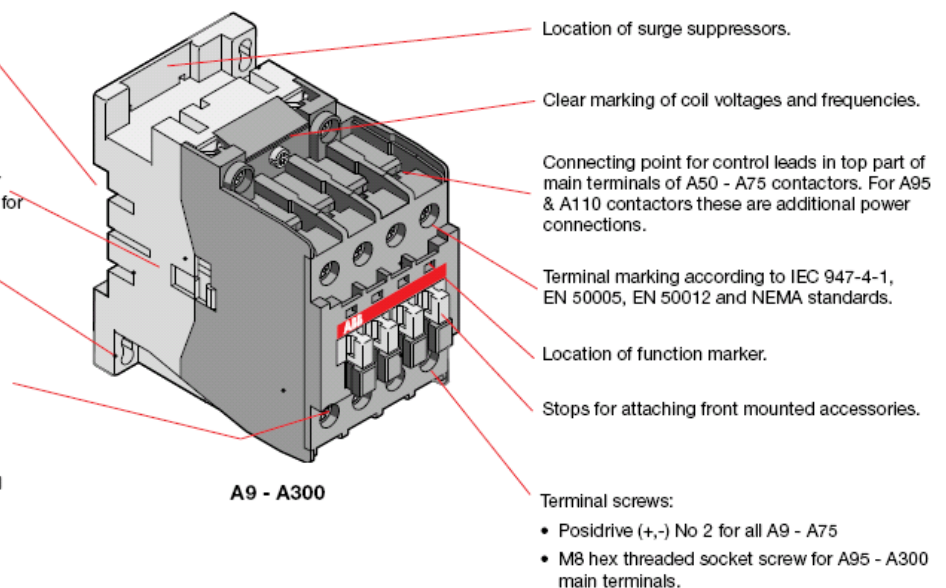
Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals in A9 - A110 contactors are delivered in open position with captive screws (screws of unused terminals must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

All A9 - A40 contactor terminals as well as A45 - A300 contactor auxiliary contact and coil terminals ensure IP20 degree of protection according to IEC 947-1.



Components of Units

Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 15mm for AF50 - AF75

75mm for AF50 - AF110

Location of side mounted accessories: on right or left hand side. Factory mounted on left hand side for CAL5 on AF50 - AF1650

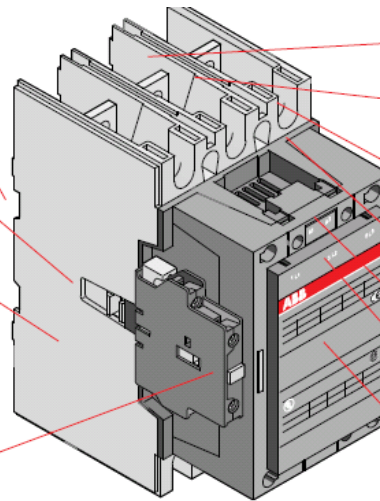
Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals delivered in open position with captive screws (screws of unused terminals must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

All AF50- AF110 contactor terminals as well as AF50 - AF1650 contactor auxiliary contact and coil terminals ensure IP20 degree of protection according to IEC 947-1.



AF50 - AF1650

Surge suppressors built in as standard on the printed circuit board.

Clear marking of coil voltages and frequencies.

Connecting point for control leads in top part of main terminals of AF50 - AF75 contactors. For AF95 & AF110 contactors these are additional power connections.

Terminal marking according to IEC 947-4-1, EN 50005, EN 50012 and NEMA standards.

Location of function marker.

Stops for attaching front mounted accessories.

Terminal screws:

- Posidrive (+,-) No 2 for all AF50 - AF75
- M8 hex threaded socket screw for AF95 - AF1650 main terminals.

For further information please see product catalog: Product Selector 1SXU0000023C0202 or visit website at <http://www.abb.us>.

Components of Units

Thermal Overloads

TA thermal overload relays are used with A Line contactors for the protection of motors having a nominal voltage of up to 600VAC max per UL/CSA (690VAC).

Product range

- Standard relays:
Types: TA25DU, TA42DU, TA75DU, TA80DU, TA110DU, TA200DU and TA450DU
 - TA25 to TA110 and TA200 are directly connected in the motor circuit.
 - TA450DU relays are fed through a linear type transformer
- Special construction
Thermal overload relays with different certifications and approvals.
Relays for protection EEx e motors.

Construction and function

- General
Thermal O/L relays and their accessories meet UL, CSA and most other important international standards (IEC), European standards (EN) and the most important national standards (DIN-VDE, NFC-UTE, BS, etc.). They meet the certification and

approval directives required throughout the world.

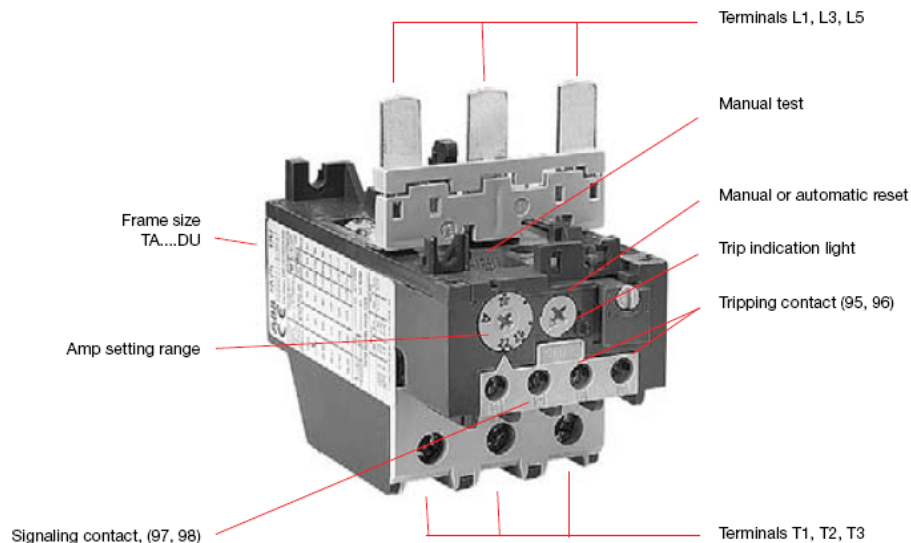
Thermal overload relays are 3 pole. The motor current flows through their bimetals (1 per phase) which are indirectly heated. Under the effect of the heating, the bimetals bend; cause the relay to trip and the position of the auxiliary contacts to change.

The relay setting range is graduated in amps. In compliance with international and national standards, the setting current is the motor nominal current and not the tripping current (no tripping at 1.05 x setting current, tripping at 1.2 times setting current).

The tripping curves (cold or warm starting, 3 phases and 2 phases) are shown on page 2.14.

The relays are built to be self protecting in the event of an overload until the short circuit protection device is activated.

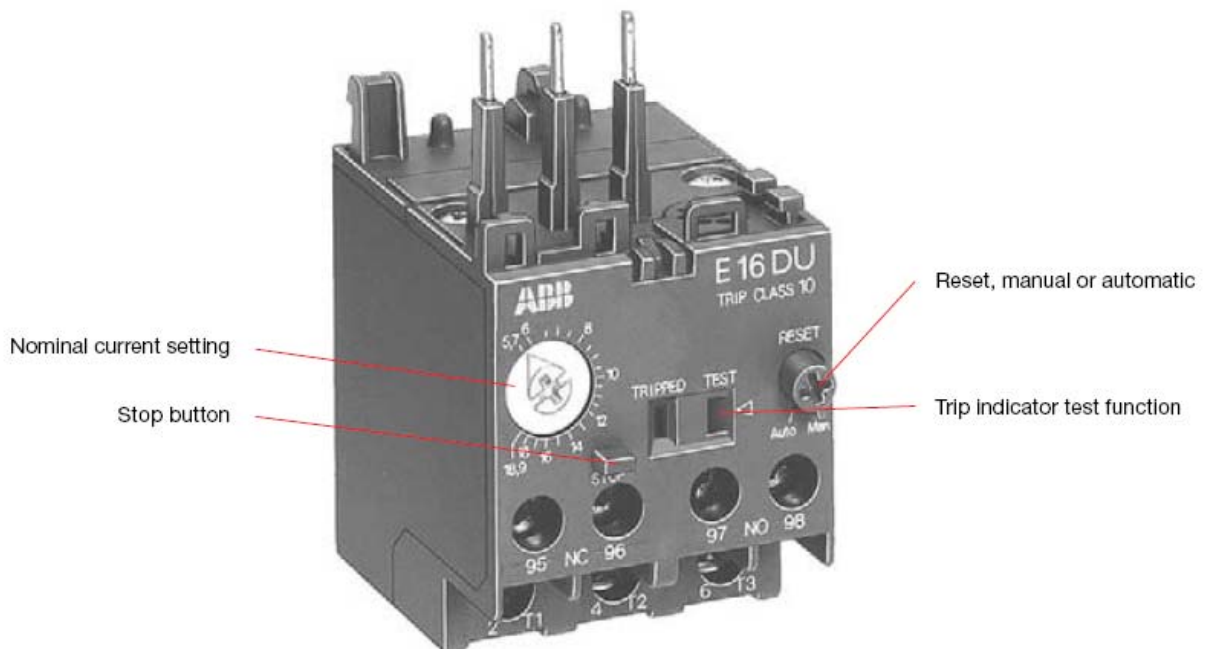
For further information please see product catalog: Product Selector 1SXU0000023C0202 or visit website at <http://www.abb.us>.



Electronic Overloads

Description

- Available for starter construction with A Line contactors and separate panel mounting
- Designed for close couple mounting
- Separate base mounting available for all overload relays
- E16DU Class 10, 20, & 30, field selectable
- E200DU – E800DU Class 10, 20 & 30, field selectable
- Stop button
- Screwdriver guide holes
- All terminal screws are available from the front
- Single phase and phase unbalance protection
- Isolated alarm circuit (N.O.) contact
- Ambient compensation: -25°C to $+70^{\circ}\text{C}$ (-130°F to $+158^{\circ}\text{F}$)
- Manual test
- Manual or automatic reset
- Factory calibrated and tested
- Wide adjustment range
- UL File No: E48139
- CSA File No: LR98336



For further information please see product catalog: Product Selector 1SXU0000023C0202 or visit website at <http://www.abb.us>.

Components of Units

Softstarters

Application

The PST range is a microprocessor based softstarter designed with the latest technology for soft start and soft stop of motors. The PST Softstarter has several advanced motor protection features as standard. The four button key pad and the logic structure of the menu make the installation, commissioning and operation easy. It is possible to choose between 14 different languages.

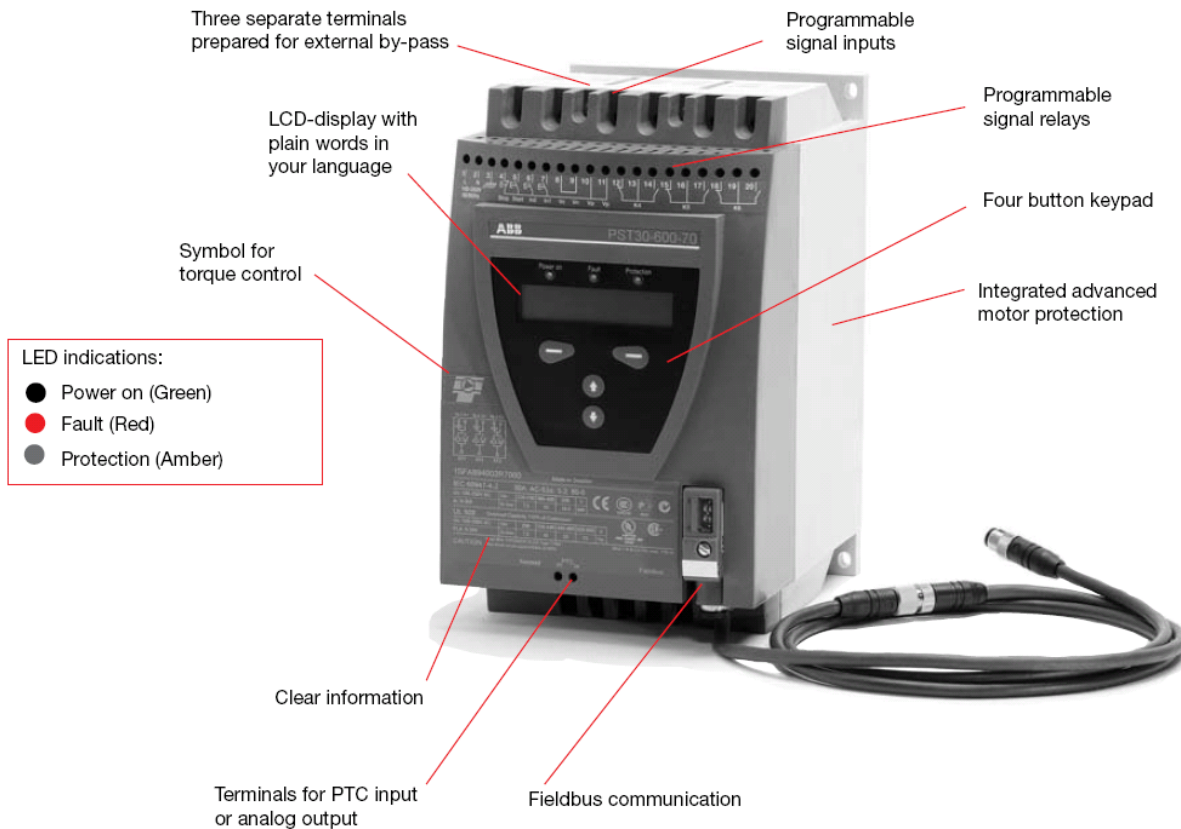
The PST Softstarter can be used with or without a by-pass contactor. The larger sizes, PSTB370 – PSTB1050, include a built-in by-pass contactor.

The PST Softstarter can be selected according to the rated motor power in normal duty applications like pumps, compressors, elevators, escalators, short conveyor belts and bow thrusters.

Product Range and Offering

- Wide main voltage range, 200 - 690 VAC
- Wide control voltage range, 100 - 250 V, 50/60 Hz
- Current ratings 30 to 1050 A (In Line) and 52
 - 1800 A (Inside Delta)
- Same unit can be used for both In Line and Inside Delta connection
- Premium adjustable Softstarter functions like start/stop ramp, kick start, jog, step down voltage and sequential starts
- Current limit adjustable between 200% to 700% of motor FLA
- Thermistor (PTC) supervision of motor winding
- Real time clock
- Logging of last 20 events with time stamp
- Prepared for Field-bus communication
- Programmable electronic overloads: Classes 10A, 10, 20 & 30
- Locked rotor protection
- Motor underload protection
- Phase imbalance protection
- Phase reversal protection
- Torque control
- Analog outputs
- UL File #E161428

Components of Units



Digital Display

The PST display gives you information presented in plain words — in your language. You can choose between 14 languages including English, German, Italian, Chinese, Finnish, Swedish, French, Spanish, Dutch, Russian, Turkish, Polish, Czech and Portuguese. On the PST display, you get all the information you need to setup, adjust and trouble-shoot. This makes the PST extremely easy to handle and reduces the risk of misinterpretations.

At any time, you can read output current, output voltage, number of starts, total run time and motor temperature on the display. If a fault should occur, this is also indicated on the display. The fault messages are presented in clear text in the selected language.



For further information please see product catalog: Product Selector 1SXU0000023C0202 or visit website at <http://www.abb.us>.

Components of Units

Variable Frequency Drives (ACS350)

The ACS350 is designed to be the fastest drive in terms of installation, setting parameters and commissioning.

The ACS350 has been designed to be as user-friendly as possible, yet provide high application flexibility. The ACS350 offers diverse functionality to cater to the most demanding needs.

Application macros:

- 2-wire, 3-wire, Alternate, Motor Potentiometer, Hand/Auto, PID & Torque Control

Power Range:

- 1-phase supply 240V, 0.5 to 3 Hp
- 3-phase supply 240V, 0.5 to 15 Hp
- 3-phase supply 480V, 0.5 to 30 Hp

Features:

- Sensorless Vector Motor Control
- (8) Sequence programming
- Optimized interfaces for users and machines
- Built-in brake chopper as standard
- Built-in 2nd environment EMC filter
- IP 20 (Finger Safe)

Highlights/Options:

- NEMA 1 Enclosure Kit
- UL, cUL approved
- FlashDrop with DrivePM (Parameter Manager)
- MPOT (Speed Pot, Start/Stop & Fwd/Rev Switch)
- Modbus, Modbus TCP, EtherNet IP, Profibus, DeviceNet, CAN
- Unified height and depth
- Coated boards as standard
- Pulse train frequency input
- I/O (2 AI, 2AO, 5 DI, 1 RO, 1DO)

Please refer to the Drive Selection Guide LVD-PHPG01U-EN for further information or visit the website at www.abb.us



Variable Frequency Drives (ACS550)

The ABB ACS550 has common user and process interface with fieldbus, common software tools for sizing, commissioning, maintenance and common spare parts.

The ABB ACS550 is ideal for those situations where there is a need for simplicity to install, commission and use and where customizing or special product engineering is not required.

Application macros:

- ABB standard, 3-wire, Alternate, Motor Potentiometer, Hand/Auto, PID, PFC & Torque Control

Power Range:

- 3-phase supply 240V, 1 to 100 Hp
- 3-phase supply 480V, 1.5 to 550 Hp
- 3-phase supply 600V, 2 to 150 HP

Features:

- IP21 (NEMA 1) & IP54 (NEMA 12)
- Scalar, Open Loop, and Closed Loop Vector
- Built-in brake chopper up to 15Hp
- Built-in 1st environment EMC filter

Highlights/Options:

- UL, cUL approved (600V product is CSA only)
- FlashDrop with DrivePM (Parameter Manager)
- Start-up Assistants (Diagnostic, Maintenance, Start-up, PID Controller, Real-time Clock, Serial Comm, Drive Optimizer)
- DeviceNet, ControlNet, Profibus, Modbus TCP, EtherNet IP, CAN Open, ProfiNet IO
- Patented swinging choke for superior harmonic reduction
- Coated boards as standard
- Flange Mounting
- I/O (2 AI, 2 AO, 6 DI, 3 RO)

Please refer to the Drive Selection Guide LVD-PHPG01U-EN for further information or visit the website at www.abb.us



Components of Units

Variable Frequency Drives (ACS800)

The ACS800 family of AC drives offers a wide range of products with common technologies. This includes Start-up Assistant, Adaptive Programming and DTC- Direct Torque Control, common user and process interfaces, software tools for sizing, commissioning and maintenance with common spare parts.

The heart of the ACS800 is DTC, ABB's premier motor control technology. The consistently excellent performance of the ACS800 assures that this drive will not be limiting factor in your process.

Application macros:

- ABB standard, 3-wire, Alternate, Motor Potentiometer, Hand/Auto, PID, PFC & Torque Control

Power Range:

- 3-phase supply 240V, 1 to 100 Hp
- 3-phase supply 480V, 1.5 to 550 Hp
- 3-phase supply 600V, 2 to 150 HP

Features:

- IP21 (NEMA 1) & IP54 (NEMA 12)
- Scalar, Open Loop, and Closed Loop Vector
- Built-in brake chopper up to 15Hp
- Built-in 1st environment EMC filter

Highlights/Options:

- UL, cUL approved (600V product is CSA only)
- FlashDrop with DrivePM (Parameter Manager)
- DeviceNet, ControlNet, Profibus, Modbus TCP, EtherNet IP, CAN Open, ProfiNet IO
- Patented swinging choke for superior harmonic reduction
- Coated boards as standard
- Flange Mounting
- I/O (2 AI, 2 AO, 6 DI, 3 RO)

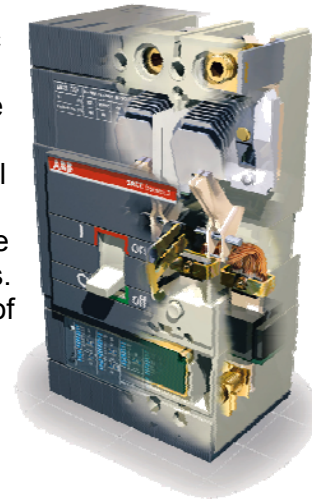
Please refer to the Drive Selection Guide LVD-PHPG01U-EN for further information or visit the website at www.abb.us



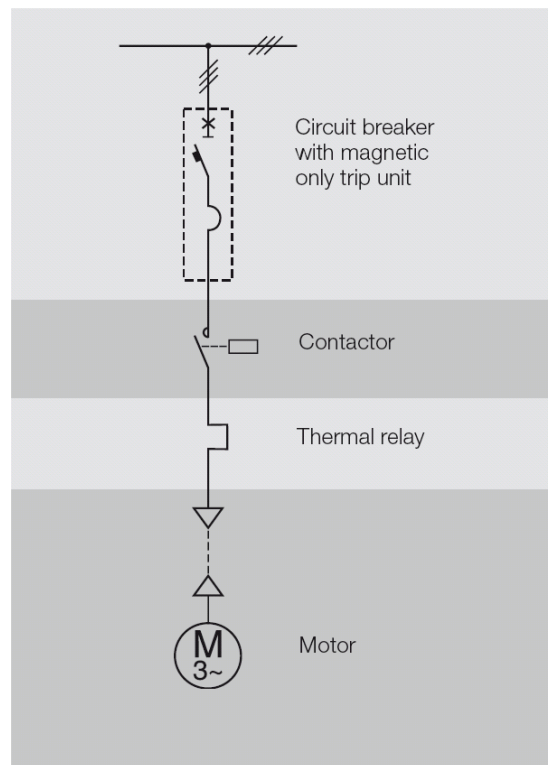
Circuit Breakers

The circuit breakers utilized as disconnecting means in the MNS-MCC are ABB Tmax molded case breakers. The Tmax are UL489 certified and offer the following features:

- Double insulation – this construction characteristic allows for the UL listed field installation for the UL Listed field installation of internal accessories without exposure to energized parts.
- Complete range of electrical and mechanical accessories.
- Positive operation – breakers from ABB ensure that the toggle indicates precise position of the moving contacts. This provides a level of safety and reliability signaling of the device.
- Interrupting ratings at 480VAC up to 150kAIC.
- Compact Size.




There are two types of molded case breakers used in the units of an MNS-MCC: MCP and Thermal Magnetic type. The MCP circuit breakers are used to protect three phase asynchronous motors in combination with a contactor and a thermal overload relay.



Components of Units

ABB offers two different protection types for MCP breakers:

- A magnetic only trip unit (MA) for Tmax T2 with adjustable threshold between 6...12 X In
- An electronic trip unit with only an instantaneous short circuit protection I, PR2221DS-I for Tmax T4, T5, and T6, and PR231/P for Tmax T7



MCP

Type	Tmax T2	Tmax T4	Tmax T5	Tmax T6	Tmax T7
Frame Size	100	250	400	600-800	1000-1200
Poles	3	3	3	3	3
Ratings	S H	N S H L	N S H L	N S H L	S H L
Icu					
240 V AC	65 150	65 100 150 200	65 100 150 200	65 100 200 200	65 100 150
480 V AC	35 65	25 35 65 100	25 35 65 100	35 50 65 100	50 65 100
600 V AC		18 25 35 65	18 25 35 65	20 25 35 42	25 50 65

The thermal magnetic breakers are used in protection of alternating and direct current networks with a range of us from 15A to 800A. They allow the protection against overload with a thermal device (with fixed threshold for T2 and T4 and adjustable threshold for T4, T5, and T6) realized using the bimetal technique and protection against short-circuit with a magnetic device.

For further information please see product catalog: Tmax Technical Catalog 1SDC2100250201 or visit website at <http://www.abb.us>.

Fused Disconnect Switches

All ABB UL98 listed fusible switches are designed to meet customer requirements in terms of high interrupting capacity and long electrical life while occupying little more panel space than the appropriate fuses.

The basic construction provides flexibility and high performance in an extremely compact size. The fusible switch line's unique compact dimensions allow panel size reduction in new applications and easily retrofit into existing applications where space is limited.

ABB's fusible disconnect line includes seven amperage sizes from 30A to 800A and are complimented by a wide range of fuse clip options. ABB fusible switches offer an economical and reliable solution for fused short circuit protection.



Catalog number	OS30A_12	OS60J12	OS100J03	OS200J03	OS400J03	OS600J03
General purpose rating	30	60	100	200	400	600
Technical ratings						
Max operating voltage V	600	600	600	600	600	600
Max horsepower rating Three phases						
240V HP	7.5	15	30	60	125	200
480V HP	15	30	60	125	125	400
600V HP	20	50	75	150	350	500
UL fuse class	J	J	J	J	J	J

For further information please see product catalog: Product Selector 1SXU0000023C0202 or visit website at <http://www.abb.us>.

Incoming Sections

Incoming line cable connections entering the MNS-MCC either the top or bottom can be easily terminated onto either: Main Lugs Only (MLO) or to a Main Disconnect. All incoming line types comply with NEC wiring bending requirements as adopted by UL.

MLO Sections

Up to 800A rated horizontal bus, cables may be terminated on crimp or mechanical lugs mounted on the plug-in main lug unit which is plugged in the multi-function wall. The plug-in main lug unit allows for top or bottom entry of the cables. It is located on the multi-function wall according to what the incoming is.

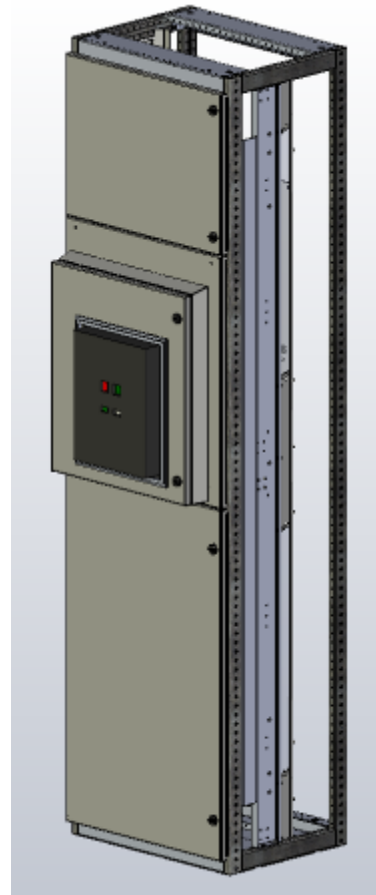
MLO terminations for 1200A, 1600A, 2000A, 2500A, 3200A, and 4000A the MNS-MCC requires the use of a full vertical section.



Main Disconnects

Incoming cables may also be easily terminated on a main circuit breaker. For amperages up to 1200A an ABB Tmax molded case breaker is used in a plug-in unit. It is mounted on a plate and connected to the multi-function wall with the plug-in contacts in the vertical wireway. The entire unit is securely fastened to the frame with self-tapping screws. For 1600, 2000, 2500, and 3000A mains an ABB Emax power breaker is used in its own section. The breaker is connected to the horizontal bus via bus bar. The Emax breaker is fixed mounted.

Please see Layout section in this document for Emax main breaker layouts.



Incoming Main Breaker

All Emax power circuit breakers have as a minimum the following features:

- Manual charging lever and “Charged” indication
- Manual Open/Close push buttons
- Mechanical “Open”/“Closed” indication
- Mechanical signaling of “Overcurrent” release
- 4 Auxiliary contacts

Additional options are available for project specific requirements:

- Shunt opening/closing release
- Spring Charging Motor
- Closing Coil
- Bell Alarm and contact
- Undervoltage release
- Additional auxiliary contacts (10 or 15)
- Key locking
- Shutter padlocking
- Button Guard and Padlocking provisions
- Mechanical Operation Counter
- Configuration and test unit

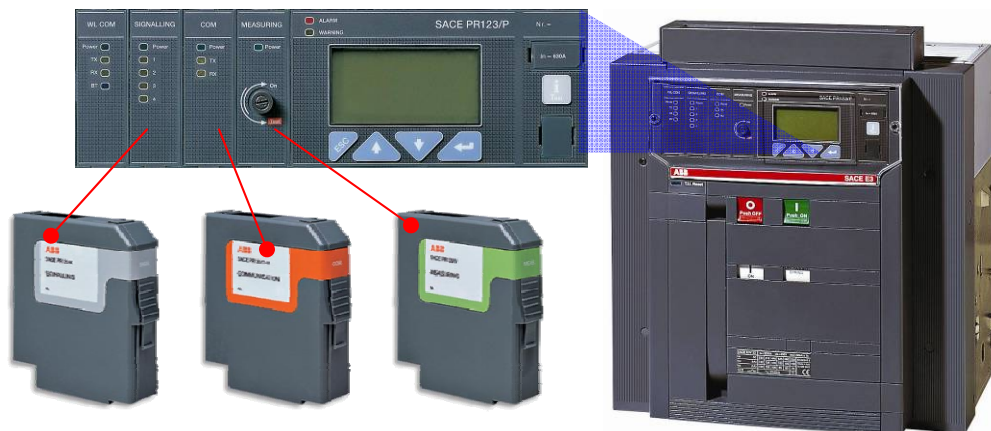
In addition, the Emax circuit breaker offers three different types of trip units: PR121, PR122, and PR123. Each of the trip units offers a combination of protection functions that may be selected such as:

- Overload protection – L
- Selective short circuit protection – S
- Instantaneous short circuit protection – I
- Ground Fault - G

The trip units also allow for modular accessories to be installed on the PR122 and PR123 in order to provide additional functions. Those modules are:

- PR120/V – Measurement module (Provides metering capabilities)
- PR120/D-M – Modbus Communication module (Provides communication capabilities to the trip unit)
- PR120/K – Signaling module (Provides four independent power relays to enable electrical signaling of the following: timing for protections L, S, G, and protections for L, S, I, G, etc. and other events)

For further information please refer to Emax Technical Catalog – 1SDC200005D0201 or visit our website at www.abb.us



Arc Flash Features

Maintenance Switch

Brief Description

The maintenance switch is used to manually change the circuit breaker's Instantaneous protection settings to a preprogrammed set of values by means of a door mounted switch.



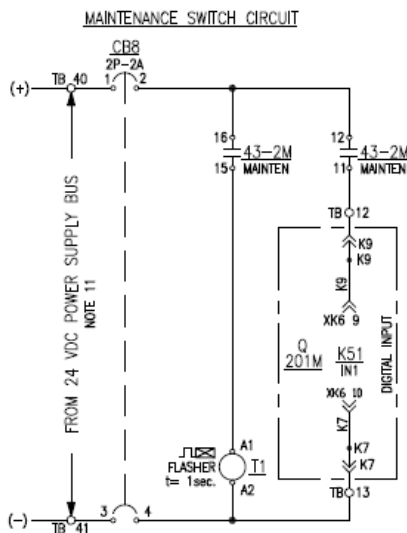
Application

The maintenance switch concept is used when the customer requires a faster tripping time when personnel are working in and around the switchgear. The circuit breaker stores preset values (Value A = "Normal" and Value B = "Maintenance") with regards to the instantaneous settings. These values are determined by the customer and programmed into the circuit breaker trip unit. "Normal" values are specified for regular operation of the switchgear, "Maintenance" values are specified for when work is being performed on the switchgear. The values can be easily changed by means of the maintenance switch located on the circuit breaker compartment door.

Required Parts

- PR123 Trip Unit for the Emax circuit breaker.
- Blue indicating light (to be blinking when in maintenance mode)
- ABB 2 position changeover switch, 4 pole, with padlockable handle in both positions.

Example Schematics



MAINTENANCE-NORMAL SELECTOR (4.3-2M)
CAT. No. 24202XV

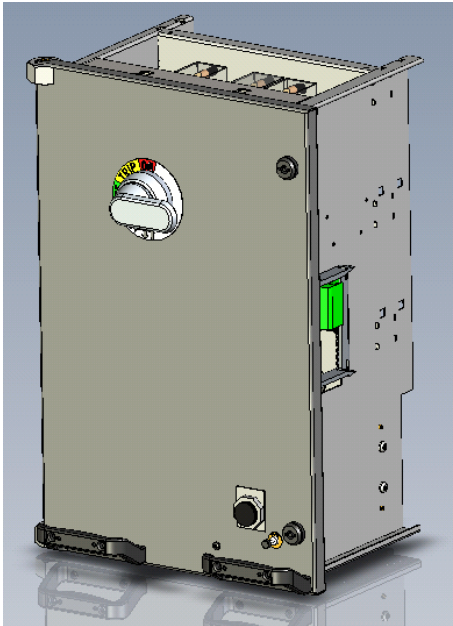
CONTACTS	POSITIONS		
	MAINTEN	NORMAL	
	1	2	
12	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MAINTENANCE SWITCH CIRCUIT
16	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MAINTENANCE SWITCH CIRCUIT
22	<input checked="" type="checkbox"/>	<input type="checkbox"/>	TB-84, 85. TO DCS
26	<input checked="" type="checkbox"/>	<input type="checkbox"/>	TB-86. TO DCS
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	TB-87, 88. SPARE
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	TB-89. SPARE

Arc Flash Features

Closed door unit removal

The MNS-MCC allows the unit to be removed without the need to open the door. The hinged door is attached to unit and securely fastened by steel quarter turn latches. In order to remove the unit, the rotary handle must be placed in the move position and pull to the isolated position.

Control wire connections and power connections are done via plug in terminal blocks therefore allowing the connections to remain in tact. No rewiring would be required for removing the unit.



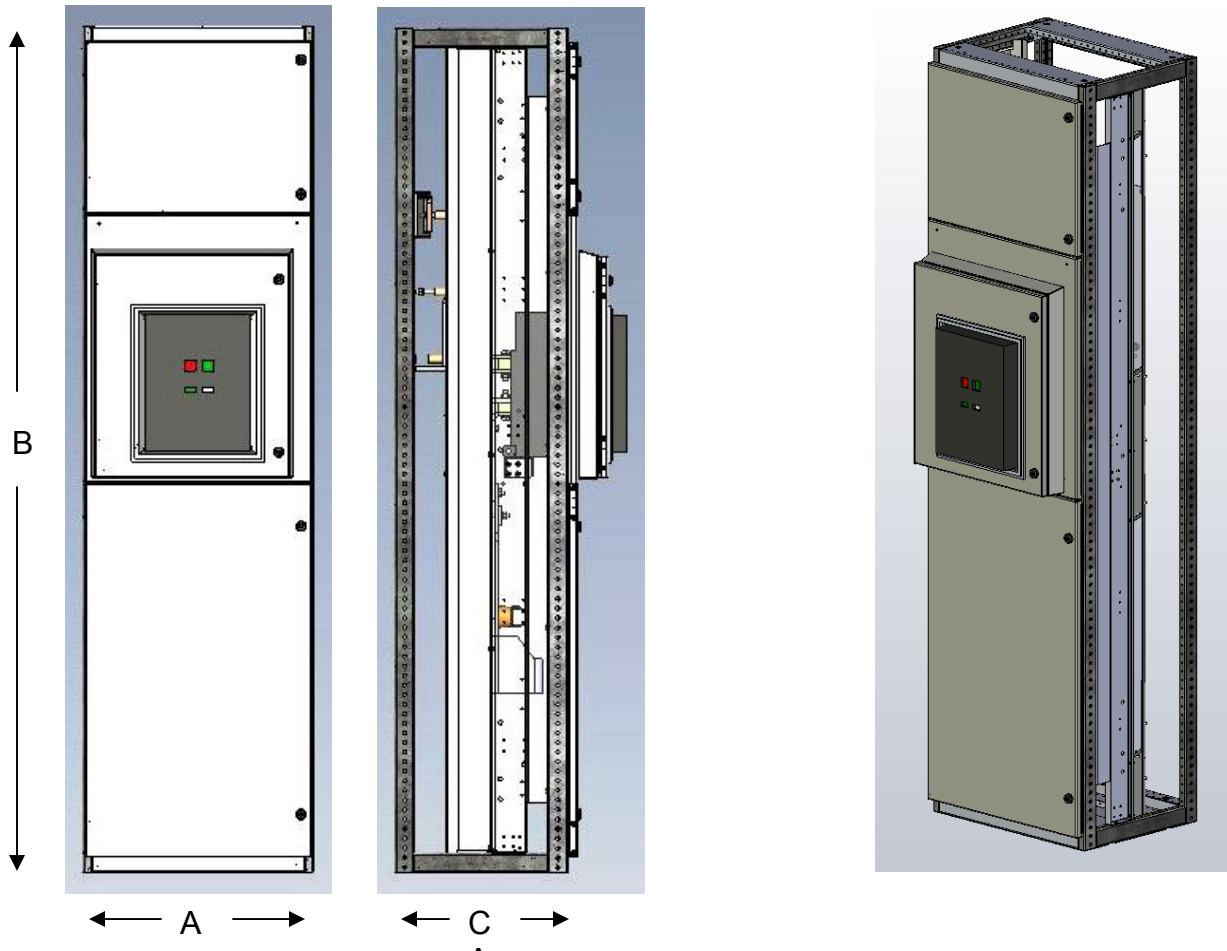
IP20 Touch Safe

Throughout the design of the MNS-MCC the concept of IP20 touch safe is utilized. When units are removed all areas exposed are protected against ingress of solid foreign objects equal or greater than 12.5 mm.



Layouts

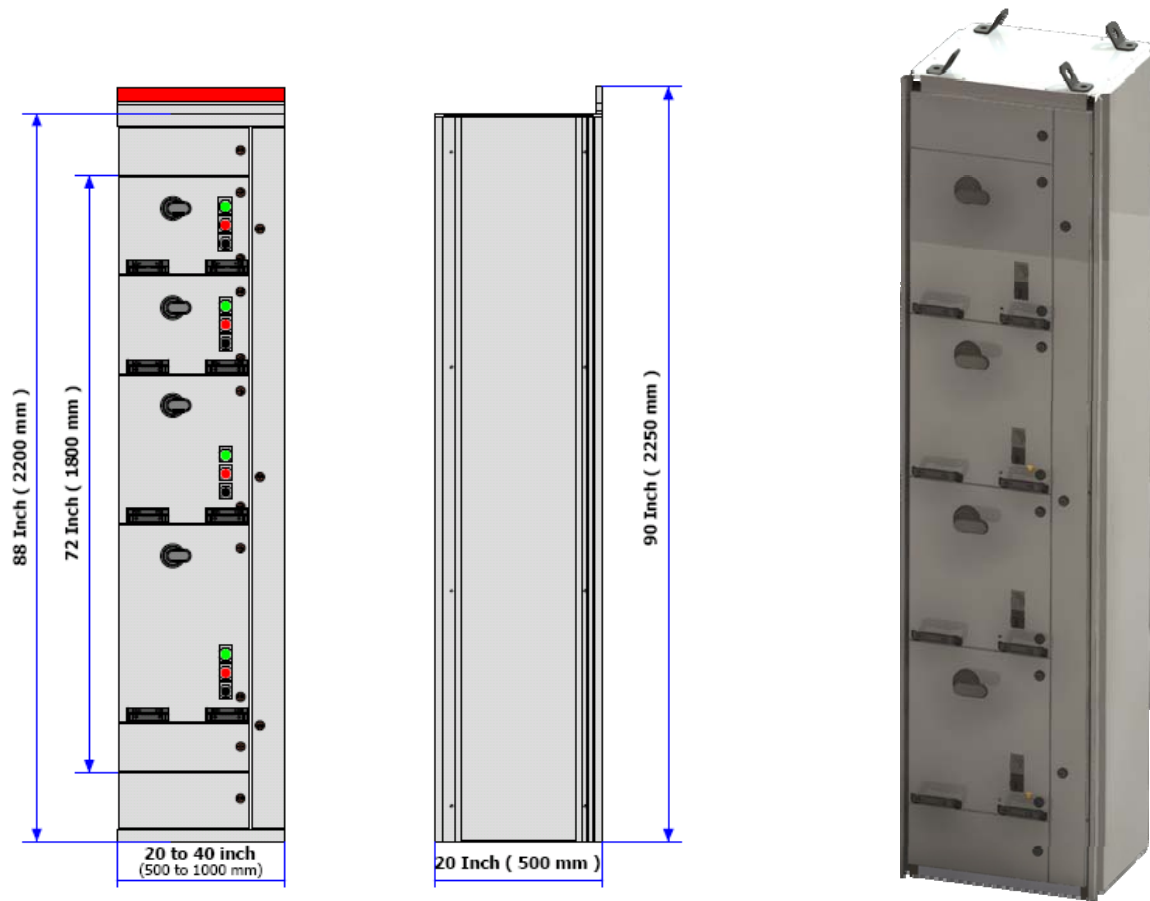
Emax circuit breaker cubicle



Dimensions	1600A	1600A	2000A	2500A	3000A
Breaker Size	E2, E3	E3	E3	E4	E6
Section Width (A)	24" (600 mm)	24" (600 mm)	24" (600 mm)	32" (800 mm)	40" (1000 mm)
Height (B)	90" (2263 mm)	90" (2263 mm)	90" (2263 mm)	90" (2263 mm)	90" (2263 mm)
Depth (C)	20" (500 mm)	20" (500 mm)	20" (500 mm)	20" (500 mm)	20" (500 mm)
Breaker front extension	5" (120.5 mm)	5" (120.5 mm)	5" (120.5 mm)	5" (120.5 mm)	5" (120.5 mm)
Approximate Weight	1102 lbs (500 kg)	1102 lbs (500 kg)	1543 lbs (700 kg)	1543 lbs (700 kg)	2204 lbs (1000 kg)

Layouts

Withdrawable or Plug-in Unit Section



Dimensions	20"	24"
Section Width	16" (400 mm)	16" (400 mm)
Wireway Width	4" (200 mm)	8" (400 mm)
Height	90" (2263 mm)	90" (2263 mm)
Depth	20" (500 mm)	20" (500 mm)
Approximate Weight	600 lbs	750lbs

Layouts

Full Height Unit Sections



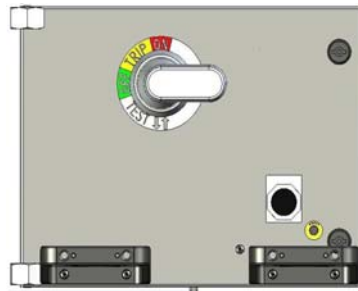
Dimensions	NEMA Size 6	NEMA Size 7
Section Width	24" (600 mm)	24" (600 mm)
Height	90" (2263 mm)	90" (2263 mm)
Depth	20" (500 mm)	20" (500 mm)
Approximate Weight	881 lbs (400 kg)	881 lbs (400 kg)

Layouts

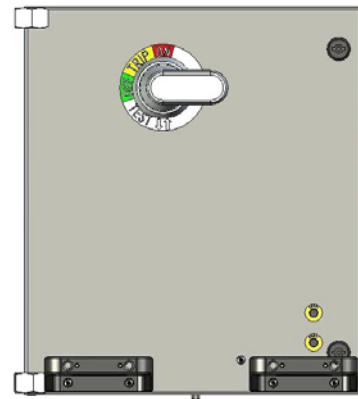
Withdrawable Units



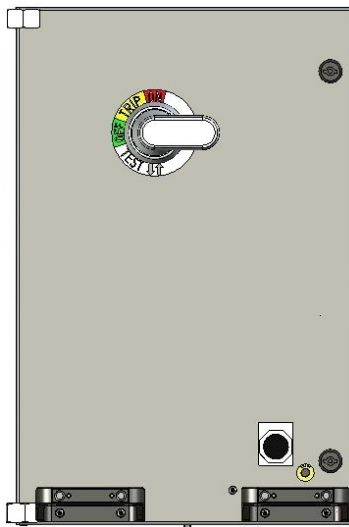
6"



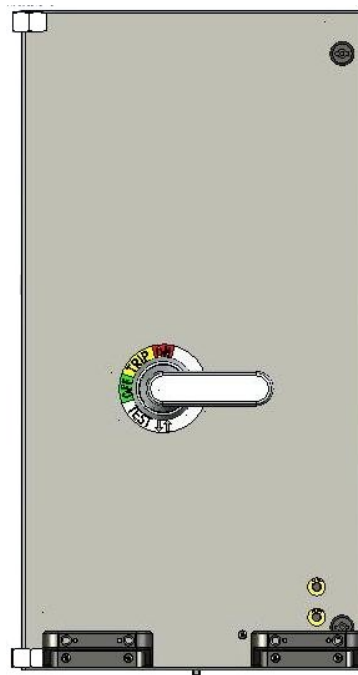
12"



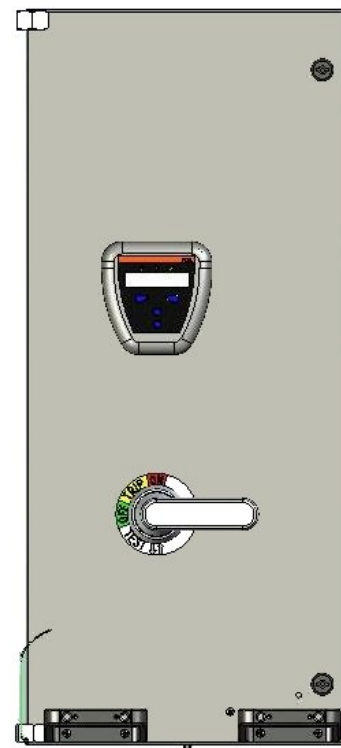
18"



24"

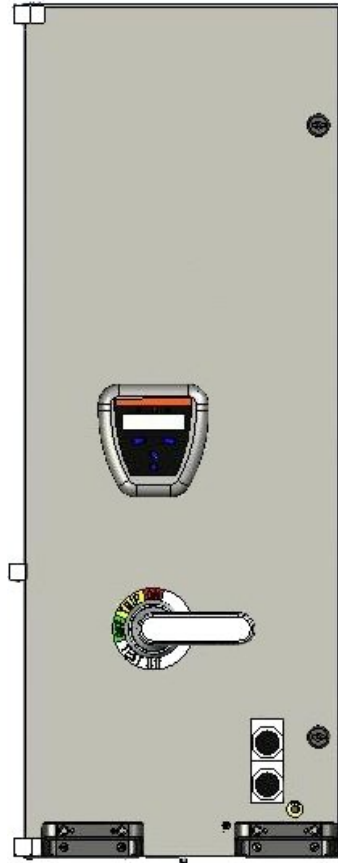


30"

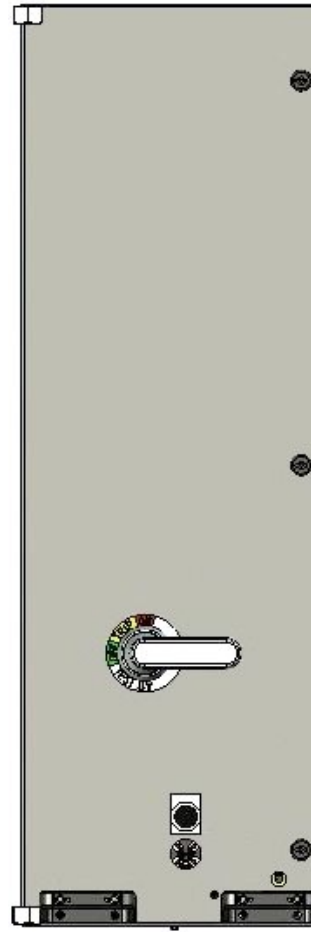


36"

Layouts



42"



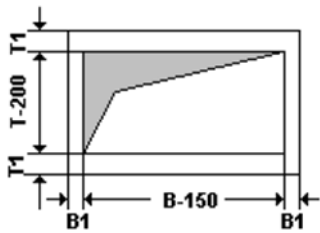
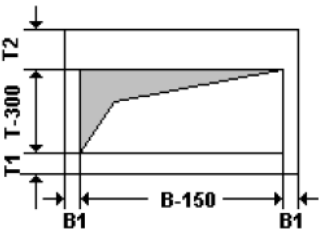
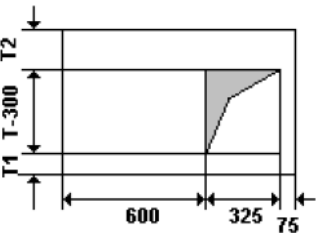
48"

Dimensions	6" Unit	12" Unit	18" Unit	24" Unit	30" Unit	36" Unit	48" Unit
Width	16" (400 mm)	16" (400 mm)	16" (400 mm)	16" (400 mm)	16" (400 mm)	16" (400 mm)	16" (400 mm)
Height	6" (6E)	12E	18E	24E	30E	36E	48E
Depth	16"	16"	16"	16"	16"	16"	16"

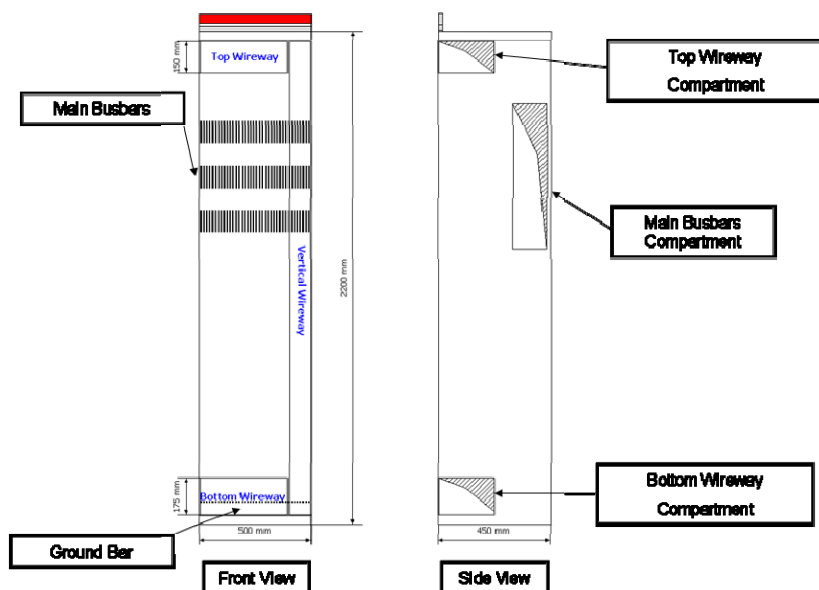
Notes:

- 1E = 25 mm

MCC Floor Cutouts

Sections without busbar compartment	Sections with busbar compartment	Sections with cable and busbar compartment; cable entry only to the cable compartment
		
<p>B: Total width T: Total depth</p>	<p>B: Total width T: Total depth</p>	<p>T: Total depth</p>
<p>T1 = 100 B1 = 75</p>	<p>T1 = 100 T2 = 200 B1 = 75</p>	<p>T1 = 100 T2 = 200</p>

MCC Mounting

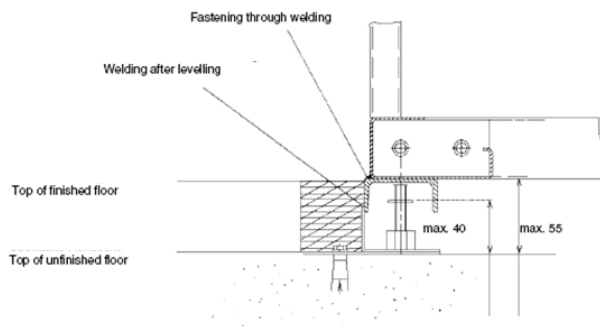


Notes:

Four bolts per vertical section will fasten the MCC through its internal mounting angle to the foundation; the hardware required for a successful installation is HSL-3 M8/20 or Hex Bolt M8X20 Grade 8.8 depending on the surface its being installed, See the following illustrations and tables for general dimensions. Exact dimensions matching your equipment can be found on the elevation drawings shipped with your MCC.

The installation of switchgears having the cable entries at the bottom requires a foundation with an opening or a cable duct.

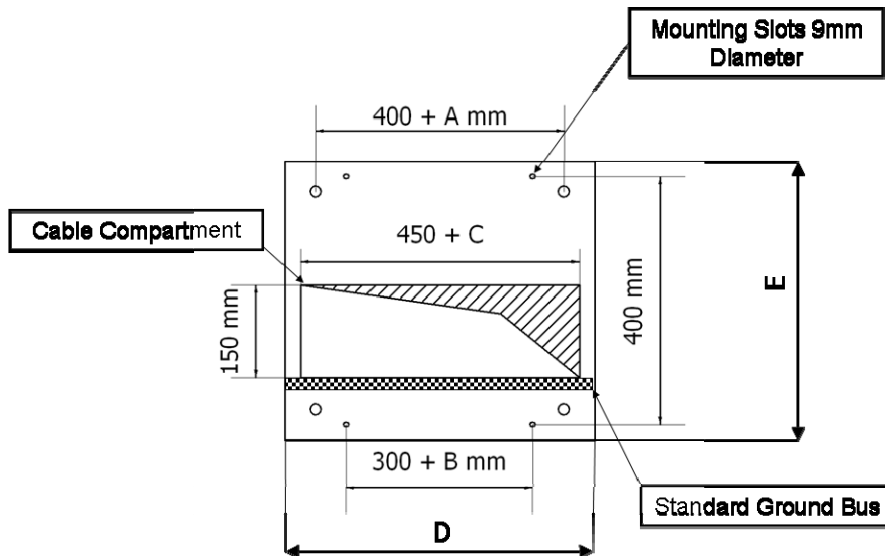
The sections should preferably be installed on a base frame which is either embedded in the concrete floor or rests as false floor on supports.



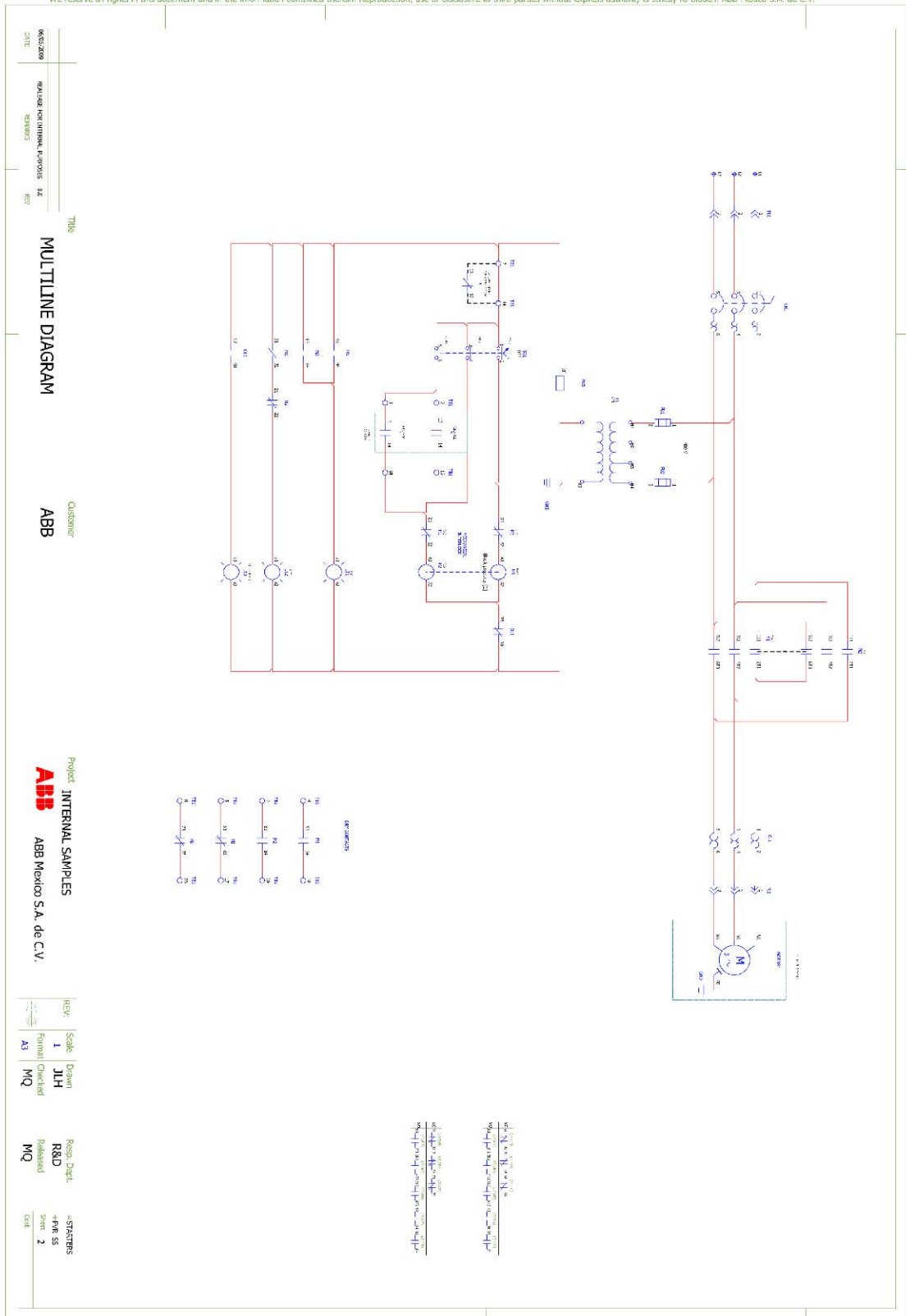
Layouts

MCC Mounting Dimensions

Approx. Dimensions	20" (500 mm) Deep					
	20" (500 mm)	24" (600 mm)	28" (700 mm)	32" (800 mm)	36" (900 mm)	40" (1000 mm)
A	0	4" (100 mm)	8" (200 mm)	12" (300 mm)	16" (400 mm)	20" (500 mm)
B	0	4" (100 mm)	8" (200 mm)	12" (300 mm)	16" (400 mm)	20" (500 mm)
C	0	4" (100 mm)	8" (200mm)	12" (300 mm)	16" (400 mm))	20" (500 mm)
D	20" (500 mm)	24" (600 mm)	28" (700 mm))	32" (800 mm))	36" (900 mm)	40" (1000 mm)
E	20" (500 mm)	20" (500 mm)	20" (500 mm)	20" (500 mm)	20" (500 mm)	20" (500 mm)



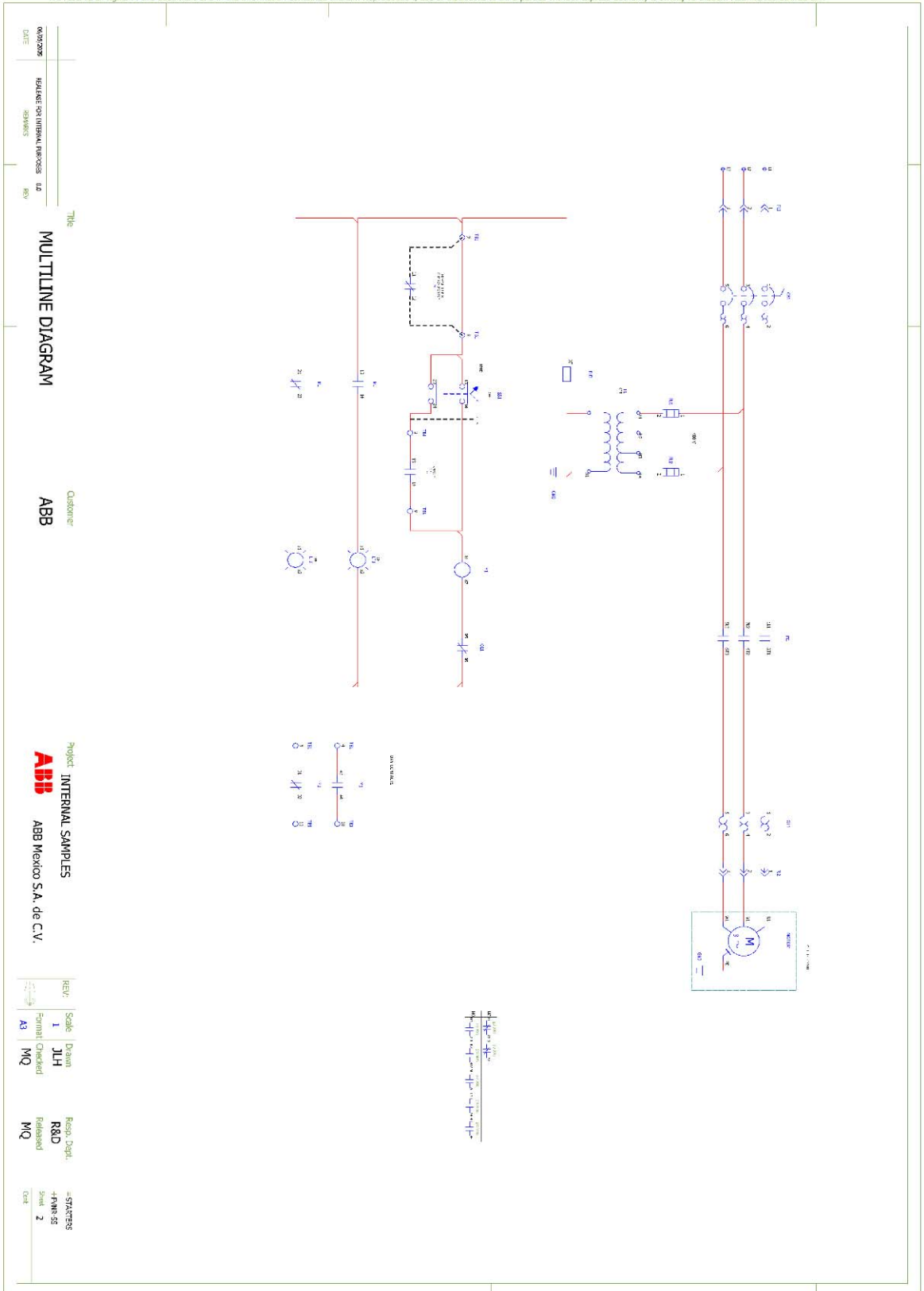
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Combination Starter FVR w/Molded Case Breaker Typical Schematic

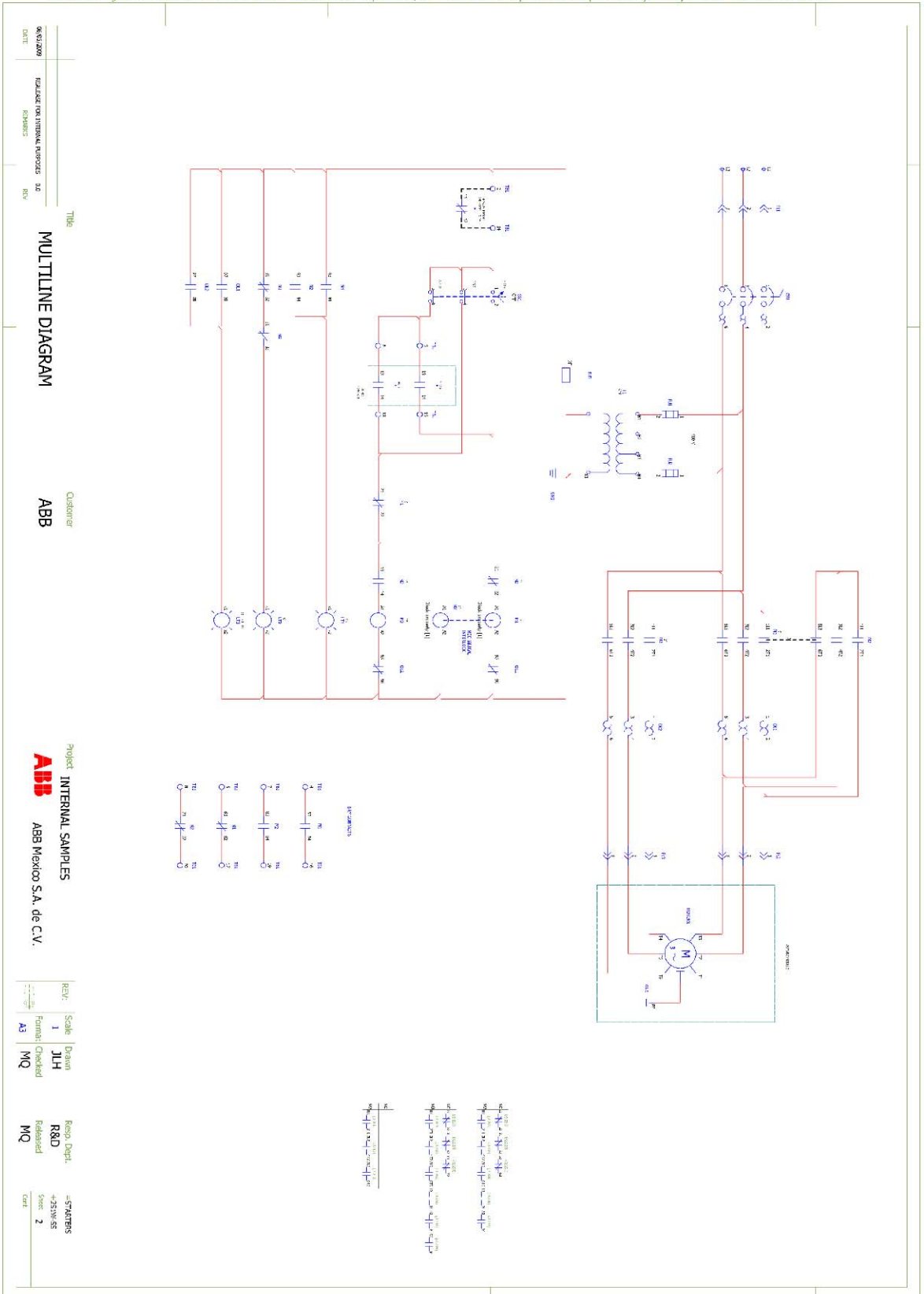
Attachment 1

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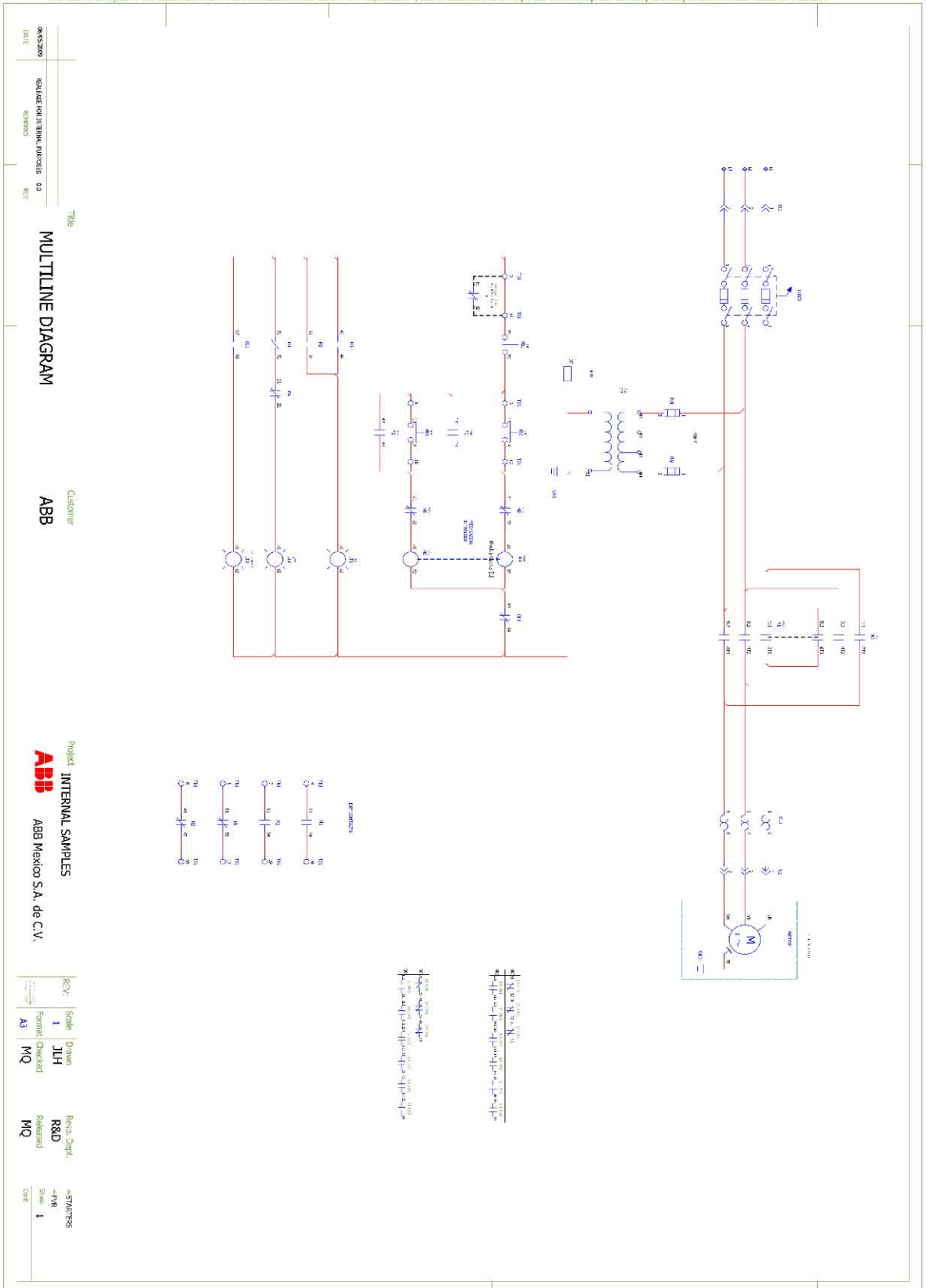


Combination Starter FVNR w/Molded Case Breaker Typical Schematic

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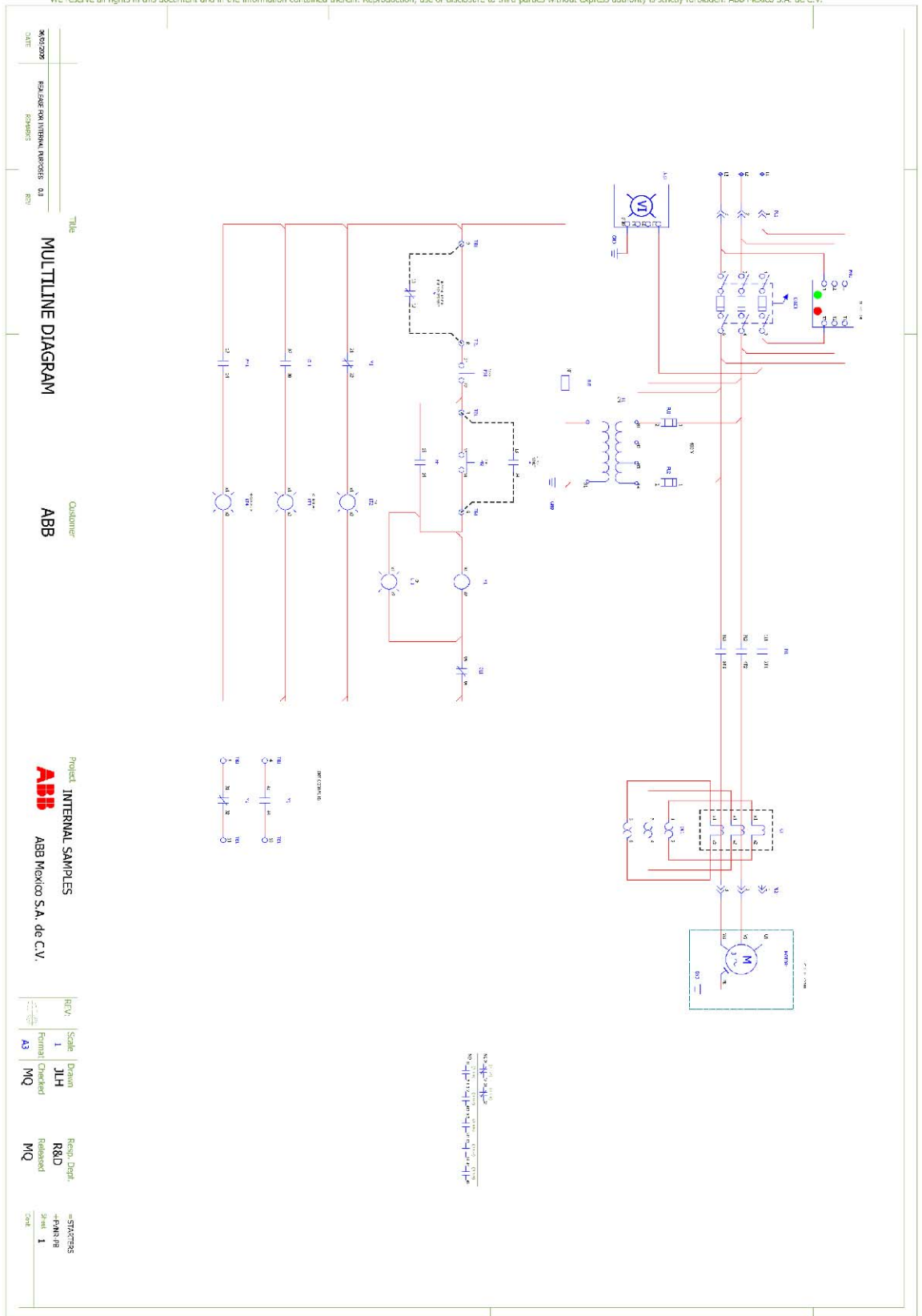
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Combination Starter FVR w/Disconnect Switch Typical Schematic

Attachment 1

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DATE: 26/03/2009
 RELEASE FOR INTERNAL PURPOSES: 03
 REVISIONS: 03
 REV: 03

Title: MULTILINE DIAGRAM

Customer: ABB

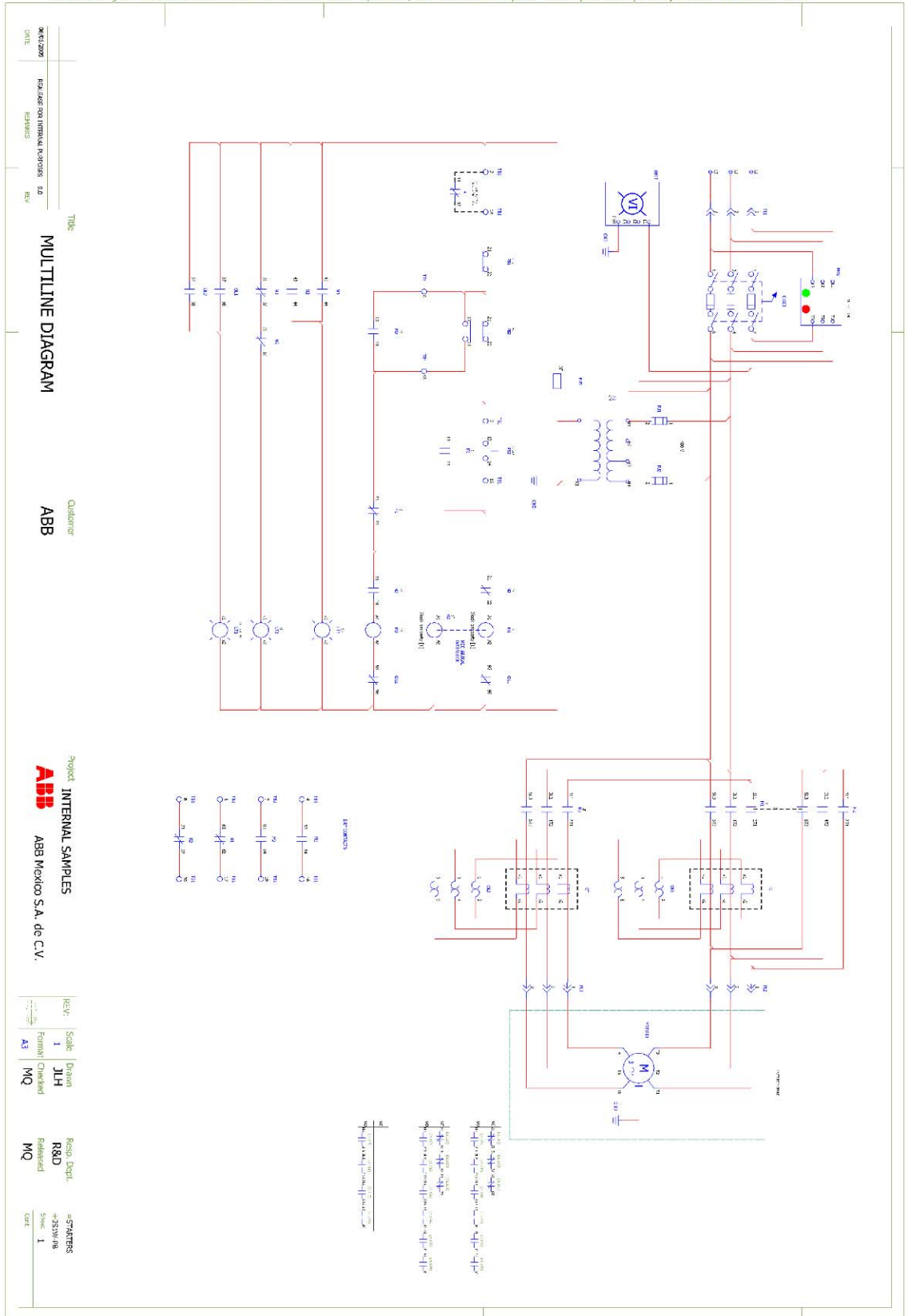
Project: INTERNAL SAMPLES
 ABB Mexico S.A. de C.V.

REV: 03
 Scale: 1
 Format: A3
 Drawn: JH
 Checked: MQ

Rev. Date: R&D
 Released: MQ
 STAFFERS: 1
 PAPER: 1

Combination Starter FVNR w/Disconnect Switch Typical Schematic

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DATE: 06/23/2007
 REVISIONS: 5.0
 REV: 1

MULTILINE DIAGRAM

Customer: **ABB**

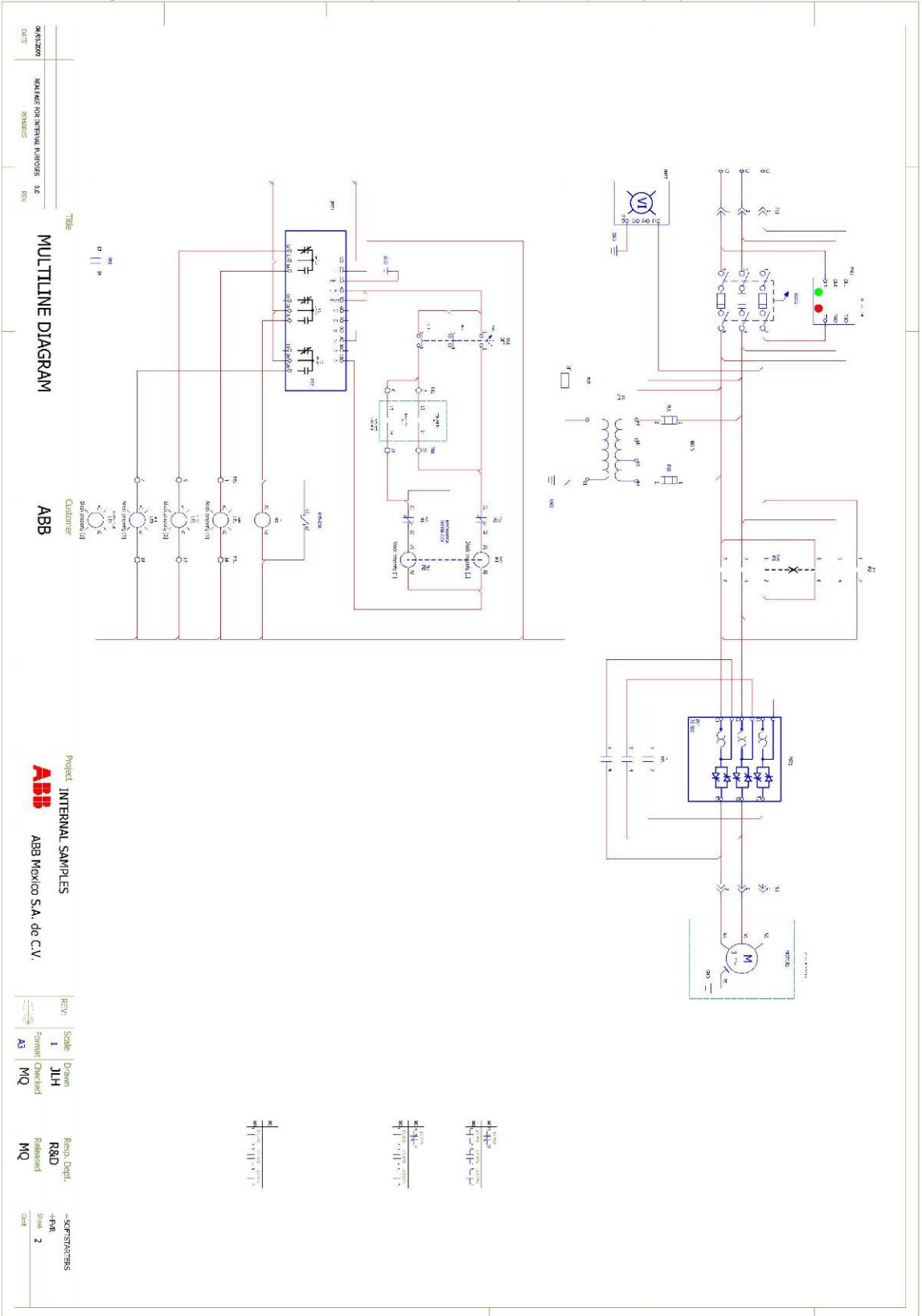
Project: **ABB**
 INTERNAL SAMPLES
 ABB Mexico S.A. de C.V.

REV: 1
 Scale: 1
 Format: A3
 Drawn: JIH
 Checked: MQ

Revis. Dept.: R&D
 Released: MQ
 -SPAREPARTS
 2S1W/1B
 Sheet: 1
 Total: 1

Combination Starter 2S1W w/Disconnect Switch Typical Schematic

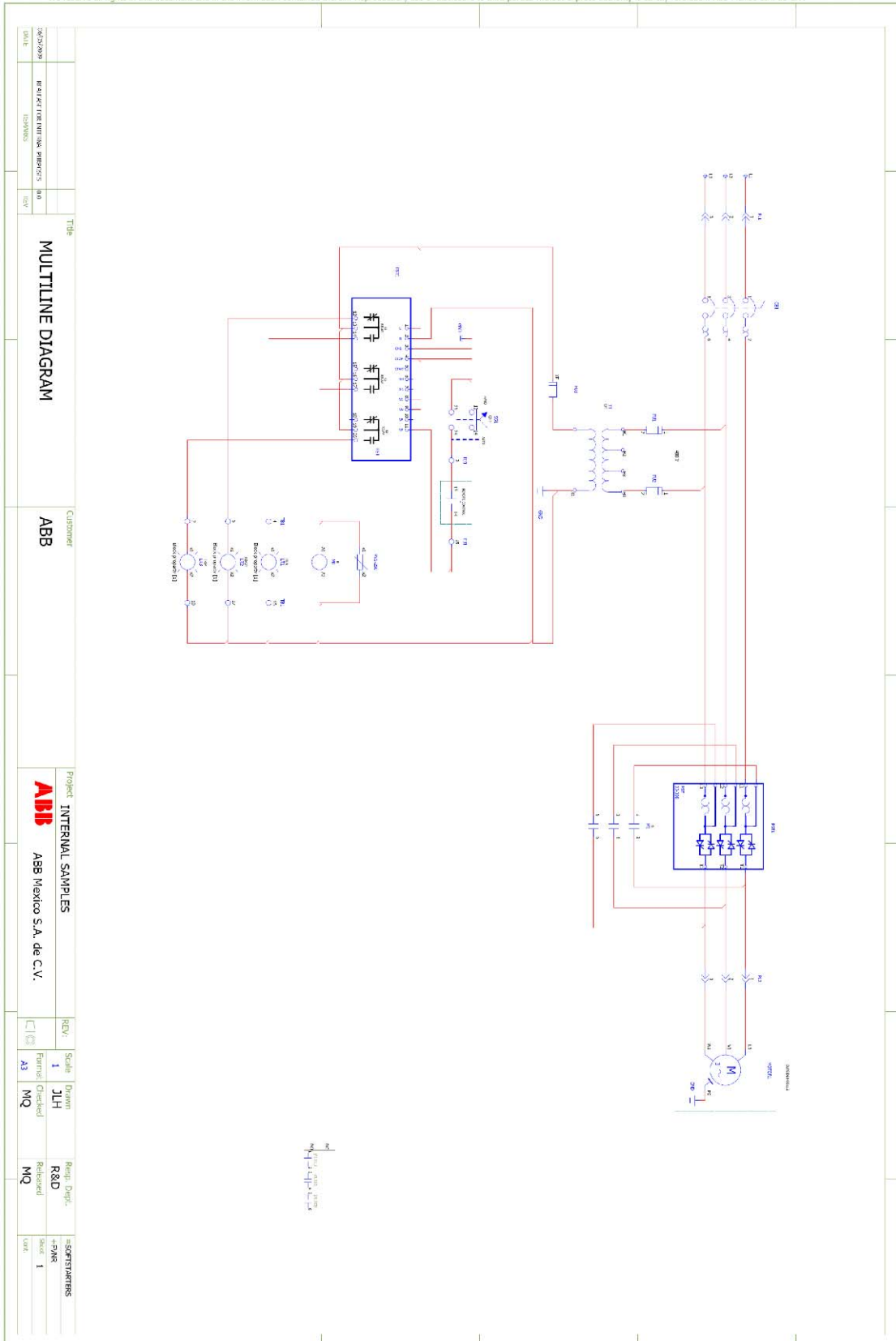
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Sofstarter FVR Typical Schematic

Attachment 1

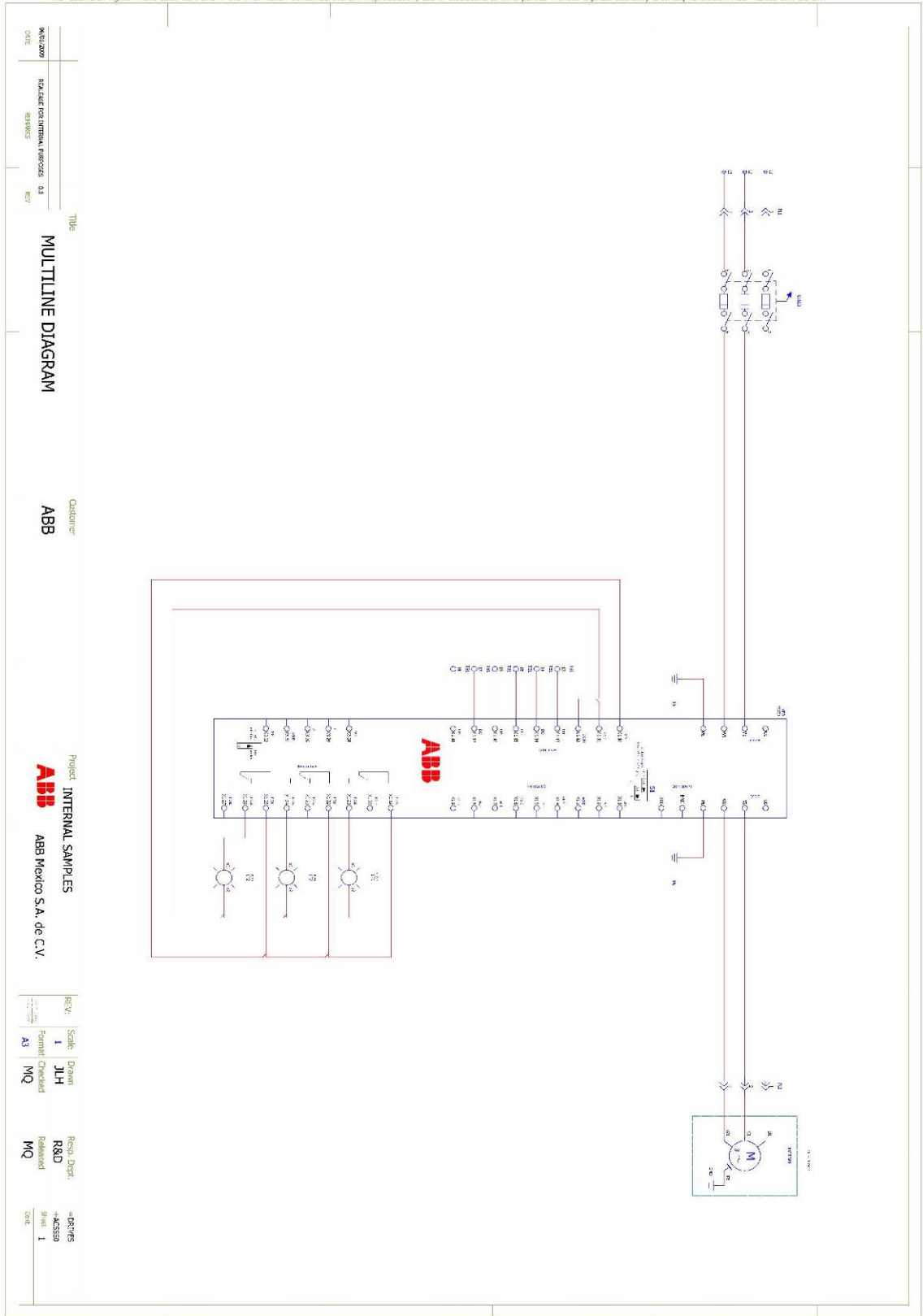
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Sofstarter FVNR Typical Schematic

DESIGN/REV	REVISIONS	TITLE	CUSTOMER	Project	REV	Scale	Drawn	Rev. Dept.	SOFTSTARTERS
DATE	DESCRIPTION	MULTILINE DIAGRAM	ABB	INTERNAL SAMPLES	1	JLT	R&D	Released	FVNR
				ABB Mexico S.A. de C.V.	A3	MQ	MQ	MQ	Sheet 1

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DATE	06/10/2009
REVISIONS	REVISAR POR INTERNAL REVISOR 03
REV	03

MULTILINE DIAGRAM

ABB

INTERNAL SAMPLES
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REV	1	Scale	A3
Drawn	JLH	Format	Checked
MQ			

Responsible	MQ
Drawn	JLH
Released	R&D
Checked	MQ
Sheet	1
Drawn	MQ

Variable Frequency Drive Typical Schematic

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