Low Voltage Systems

MaxSB - Low Voltage Switchboard
# MaxSB Product Overview

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Main bus current</td>
<td>1600A, 2000A, 3000A, 3200A, 4000A, 5000A</td>
</tr>
<tr>
<td>Group Mounted Vertical bus</td>
<td>800A, 1500A, 2250A</td>
</tr>
<tr>
<td>Distribution vertical bus</td>
<td>1000A-5000A</td>
</tr>
<tr>
<td>Rated tested maximum voltage</td>
<td>254Vac, 508Vac, 635Vac</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>240Vac, 480Vac, 600Vac</td>
</tr>
<tr>
<td>Phases</td>
<td>3 phase 3 wire, 3 phase 4 wire</td>
</tr>
<tr>
<td>Neutral</td>
<td>100% rated</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Short circuit current 480V</td>
<td>65kA, 100kA</td>
</tr>
<tr>
<td>Short circuit current 600V</td>
<td>50kA</td>
</tr>
<tr>
<td>Service Entrance</td>
<td>Yes (Optional)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>NEMA 1</td>
</tr>
</tbody>
</table>
MaxSB Standards

- **SWITCHBOARD**
  - UL 891 — Low Voltage Switchboards
  - CSA C22.2 No. 244-05 — Canadian Standards Association
  - ANCE NMX-J-1182/2 ANCE-2006 — Association of Standardization and Certification
  - IEEE-STD-693-2005 — Seismic Qualification

- **CIRCUIT BREAKER**
  - ANSI C37.13 — LV AC Power Circuit Breakers Used in Equipment
  - ANSI C37.16 — Preferred Rating, Related Requirement, Application Recommendations For LV Power Circuit Breakers and AC Power Circuit Protectors
  - ANSI C37.50 — Testing of Low Voltage AC Power Circuit Breakers
  - UL 1066 — Low Voltage Power Circuit Breakers
  - UL489 — Standard for Molded-Case Circuit Breakers and Circuit Breaker Enclosures
  - CSA 22.2 — Canadian standard for enclosures
MaxSB Market Segments

- Oil and Gas
- Mining and Metals
- Utility and co-generation
- Steel Mill
- Pharmaceutical
- Waste Water
- Generator Manufacturing
- Power Generation
- Food and Beverage
- Aerospace
- Critical Power and Data Centers
MaxSB Offerings

- Hinged door, large wire ways save time and money in field wiring.
- Plated copper bus used in all three phases and neutral.
- Copper ground bus extends full width of switchboard.
- Horizontal bus up to 5000A
- Vertical bus up to 2250A
MaxSB Structure

- Standard Textured Paint Finish RAL7035
- Frame is made of Turati ArTu-K made of zinc coated steel of thickness 1.5 mm
- Frame is reinforced with #12 ga galvanized supports
- Frame is secured on corners by a three way aluminum joint
- Shipping base is four inches high #12 ga galvanized steel
- All switchboards are shipped on wooden pallets
- Maximum shipping split is 78”
- Four inch base is standard
- 92” Height
- Lifting eyes on roof
MaxSB Dimensions - Widths
MaxSB Dimensions - Depths

15" (385 mm) Wide Section

33" (840 mm) Wide Section

41" (1037 mm) Wide Section
MaxSB Covers and Doors

- All doors and covers are painted RAL 7035
- Side panels and rear panels are #16 ga galvanized steel
- Top panel is #14 ga steel
- Group mounted door and breaker covers are #16 ga steel and is locked by door handle
- Emax breaker doors are #14 ga thickness and are secured by screws
MaxSB Layouts – Main and Tie Sections

<table>
<thead>
<tr>
<th>Amperage (A)</th>
<th>Frame Size</th>
<th>Dimensions</th>
<th>Line/Load Lug Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Width</td>
<td>Depth</td>
</tr>
<tr>
<td>800</td>
<td>E3</td>
<td>28.3” (720mm)</td>
<td>33” (840 mm)</td>
</tr>
<tr>
<td>1200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>E4</td>
<td>37” (940 mm)</td>
<td>33” (840 mm)</td>
</tr>
<tr>
<td>3200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4000</td>
<td>E6</td>
<td>44” (1120 mm)</td>
<td>41” (1037 mm)</td>
</tr>
<tr>
<td>5000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MaxSB Layouts – Emax Feeder Sections

- The MaxSB can provide stacked feeder sections up to 2000A using fixed or drawout type Emax power circuit breakers (UL1066). Each circuit breaker is located behind a hinged door secured by screws.
- The MaxSB utilizes only the E3 frame size.

<table>
<thead>
<tr>
<th>Amperage (A)</th>
<th>Frame Size</th>
<th>Dimensions</th>
<th>Line/Load Lug Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Width</td>
<td>Depth</td>
</tr>
<tr>
<td>800</td>
<td>E3</td>
<td>28.3” (720mm)</td>
<td>33” (840 mm)</td>
</tr>
<tr>
<td>1200</td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size (kcmil) Mechanical</td>
<td>#2-600</td>
</tr>
</tbody>
</table>
MaxSB Layouts – Group Mounted Sections

- Breaker are mounted by bus straps
  - Bus straps are covered with electrical tape
  - holes on vertical bus allow for mounting of breakers at different location
- Incoming can be main lug or single main for single group mounted sections
- 3P4W require depth of 33” (840mm)
- Single group mounted can be 15” (385 mm) deep
- 3000A requires an incoming pull section
MaxSB Layouts – Group Mounted Sections

- For 2500A and 3000A sections an incoming pull section is required
- Only uses Tmax breakers

### Incoming Pull Sections

<table>
<thead>
<tr>
<th>Amperage (A)</th>
<th>Dimensions</th>
<th>Line/Load Lug Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width</td>
<td>Depth</td>
</tr>
<tr>
<td>2500</td>
<td>28.3&quot; (720mm)</td>
<td>33&quot; (840 mm)</td>
</tr>
<tr>
<td>3000</td>
<td>37&quot; (940 mm)</td>
<td></td>
</tr>
</tbody>
</table>
MaxSB Layouts

Pull Sections

- 28.3" Instrument Compartment
- 37" Instrument Compartment
- 40" Instrument Compartment

Dimensions:
- Width: 28.3" 37" 40"
- Height: 92"
MaxSB Horizontal Bus Design

- Horizontal bus ratings: 1600A, 2000A, 3000A, 3200A, 4000A, and 5000A
- Short Circuit Current: 100 kA (3 Cycle Rating)
- Silver-plated standard with option for tin-plated
- Location is top, bottom, or middle depending on incoming and application
MaxSB Group Mounted Vertical Bus Design

- Vertical bus ratings: 800A, 1500A, and 2250A
- Short Circuit Current: 65 kA without main breaker
- Group mounted feeder breakers ranging from 15 amps to 1200 Amps
- Silver-plated standard with option for tin-plated
- Vertical bus is slotted to allow adjustability for mounting location of molded case breakers
- 52” high interior available for mounting of breakers
## MaxSB Group Mounted Vertical Bus Design

<table>
<thead>
<tr>
<th>1P</th>
<th>1P</th>
<th>2.06 in</th>
<th>T1 100 Amp</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/3 Pole</td>
<td>2/3 Pole</td>
<td>4.13 in</td>
<td>T2 100 Amp</td>
</tr>
<tr>
<td>2/3 Pole</td>
<td>2/3 Pole</td>
<td>4.13 in</td>
<td>T3 225 Amp</td>
</tr>
<tr>
<td>2/3 Pole</td>
<td>2/3 Pole</td>
<td>4.13 in</td>
<td>TS3 225 Amp</td>
</tr>
<tr>
<td>2/3 Pole</td>
<td>2/3 Pole</td>
<td>4.13 in</td>
<td>T4 250 Amp</td>
</tr>
<tr>
<td>2/3 Pole</td>
<td>2/3 Pole</td>
<td>4.13 in</td>
<td>T4/T5 400 Dbl</td>
</tr>
<tr>
<td>3 Pole</td>
<td>5.51 in</td>
<td>T5 400 Amp</td>
<td></td>
</tr>
<tr>
<td>3 Pole</td>
<td>5.61 in</td>
<td>T4/T5 400 Dbl</td>
<td></td>
</tr>
<tr>
<td>2/3 Pole</td>
<td>8.27 in</td>
<td>T6 800 Amp</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T7 1200 Amp</td>
<td></td>
</tr>
</tbody>
</table>

- **Dimensions:**
  - 52" of available space
  - 36" Wide Structure

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ABB
MaxSB Group Mounted – Sizing Section

Example:
- 2 - T2 40A
- 1 – T6 600A
- 2 – T4 200A
- 2 – T5 400A

Total amperage sum = 1888A

Total number of breakers = 7, reduction percentage = 60%

Therefore total available current = 1888 X .6 = 1128A, therefore 1250A vertical bus is required
MaxSB Ground Bus Design

- Single group mounted sections: ¼ x 2” bare copper
- All other types of sections: ¼ X 4” bare copper
- One TA600-NS lug per section is provided as standard, others may be added upon request
MaxSB Barriers

- Instrument mounting panels are used for mounting electrical equipment and as barriers to isolate electrical components from the main bus when accessing through the front.

- Optional glastic or steel barriers are available between each section to segregate each section completely.

- When service entrance is required, the MaxSB will incorporate all appropriate service entrance barriers.
MaxSB Emax Power Circuit Breakers

- 800 - 5000 Amps
- Frame Sizes: E3, E4, and E6
- Fixed/Drawout
- Electronic Trip
- Compact Size
- High Interrupting Rating
- Extremely High Mechanical & Electrical life
MaxSB Emax Power Circuit Breaker

There are three types of trip units available

- PR121
  - Protection Features Only
- PR122
  - Protection Features
  - LCD Display
  - Current Measurement
  - Contact Wear
  - Communications option
- PR123
  - PR122 Features
  - Harmonic Measurements
  - Communications option
MaxSB Emax Power Circuit Breaker

PR121P Trip Unit
- LED Display
- LSIG Protection
- Wireless communication by means of the BT030 adapter unit plugged in the front
MaxSB Emax Power Circuit Breaker

PR122P Trip Unit
- LCD Display
- LSIG Protection
- Phase unbalance protection U
- Zone discrimination for S and G protection
- Self-diagnosis
- Data Logging
- Modbus Communication
MaxSB Emax Power Circuit Breaker

PR123P Trip Unit
- LCD Display
- LSIG Protection
- Double selective S and G function
- Phase unbalance protection U
- Zone discrimination for S and G protection
- Self-diagnosis
- Data Logging
- Modbus Communication
- Measurement function
- Harmonic calculation up to the 40th harmonic
MaxSB Emax Power Circuit Breaker

There are multiple modules that can be incorporated in the PR122 and PR123 trip units

- **PR120/V – Measurement Module**
  - Provides voltage, data logging, power, power factor, frequency, energy, UV, OV, RV, Reverse power protection, and frequency protection
- **PR120/K – Electrical Signaling Module**
  - Provides remote signaling of alarms and trips of breaker and can be provided with a digital input enabling external trip, activation of alternate set of parameter, trip reset, and reset of PR120/K power relays
- **PR120/D-M – Modbus Communication Module**
  - Provides Modbus Communication to PR122 and PR123 trip unit
- **PR021/K – Signaling Unit**
  - Converts digital signals by PR121, PR122, and PR123 into electrical signals. (overload pre-alarm, timing and tripping of protections, overtemperature, trip unit tripped, dialogue fault on serial line, and phase unbalance)
MaxSB Emax Power Circuit Breaker

Breaker Electrical Contacts

- Aux Contacts: 4, 10, and 15
- TOC Contacts: 5 and 10
- Sliding Contacts
- Contacts for signaling closing springs charged
- Contacts for signaling undervoltage release
MaxSB Emax Power Circuit Breaker

Breaker Electrical Accessories

- Shunt Trip
- Second Shunt Trip
- Charging Motor
- Bell Alarm
- Undervoltage Release
MaxSB Emax Power Circuit Breaker

Breaker Mechanical Accessories

- Operation Counter

- Circuit breaker lock in racked-in/test isolated/racked-out position

- Key locking provisions

- Padlock provisions

- Button Guard
MaxSB Tmax Molded Case Breakers

- Frame sizes from T1 - 100A to T7 - 1200A
- Thermal Magnetic or Electronic Trip Units
- Fixed Mounted
- Double insulation provided between live power parts and the front of the apparatus preventing any risk of contact
- Interrupting rating up 100kA
MaxSB Tmax Molded Case Breakers

Four types of Trip Units for T1- T6
- Thermal Magnetic
- PR221DS LI
- PR222DS/P LSI
- PR222DS/PD-A LSIG

Four types of Trip Units for T7
- PR231/P LI
- PR232/P LSI
- PR331/P LSIG
- PR332/P LI, LSI, LSIG
## MaxSB Tmax Interrupting Ratings

<table>
<thead>
<tr>
<th>Type</th>
<th>Frame Size</th>
<th>Interrupting ratings [kA rms]</th>
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<tr>
<td></td>
<td></td>
<td>240 VAC</td>
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<tr>
<td>Tmax T1</td>
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<td>N</td>
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<tr>
<td></td>
<td></td>
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<td></td>
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<tr>
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<td>L</td>
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<tr>
<td>Tmax Ts3</td>
<td>225</td>
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<tr>
<td>Tmax T4</td>
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<tr>
<td>Tmax T7</td>
<td>1000-1200</td>
<td>S</td>
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<td>H</td>
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<tr>
<td></td>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

(1) In 15 A => 35kA @ 240 V AC - 14 kA @ 480Y/277 V AC

(2) In from 15 A up to 30 A => 65 kA @ 480 V AC
MaxSB Tmax Molded Case Breakers

- Multiple Common Accessories between each frame
  - Undervoltage Release
  - Shunt Trip
  - Closing Coil
  - Aux Contacts
  - Charging Motor
MaxSB Instrumentation and Metering

**Door mounted lights, meters and control**

- ABB Indicating Lights
- Volt, amp, and watt meters
- Electroswitch Series 20 and 24 control switch
- Multifunction Metering
  - Electro Industries
  - Others (optional)
- Relays
  - ABB (provided standard when required)
  - Others (Optional)
- Surge Protectors
  - APT or ABB TVSS (Standard)
  - Others (Optional)
MaxSB Accessories

- Lift Truck for removing of Emax power breakers
- Breaker test cabinets for testing Emax breakers
- PR010/T portable test unit for all breakers
MaxSB Applications

Main-Tie-Main transfer schemes (open and close)

- ABB standard only
- Kirk Key Interlock
MaxSB Arc Flash Safety Options - Maintenance Switch

- Used to manually change the circuit breaker’s Instantaneous protection settings to a preprogrammed set of values by means of a door mounted switch.

- 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.

Note:
- Only offered in Emax sections
MaxSB Arc Flash Safety Options - REA Relay

- Minimizes material damage to switchgear, enables quick restoration of the power distribution and guarantees improved personnel safety.
- Detects an arc anywhere in the bus compartment and cable compartment utilizing long-fiber sensor system.
- Total reaction time is less than 2.5ms plus Emax breaker opening time.
- Uses a fiber optic cable wired through the bus compartment and cable compartment in order to detect an arc flash. It then feeds signal to an REA relay which verifies current change on the incoming main bus by the use of CT’s. If a change is detected by the relay along with a signal from the fiber optic cable the relay will then send a signal to the main breaker in the corresponding bus to trip, therefore opening the corresponding bus.

Note:
- Only offered in group mounted sections
MaxSB Features and Benefits

- Strong frame construction isolates bus and breaker assemblies from enclosure “skin”.
- Unique bus layout delivers the freedom to locate feeder breakers independent of any hole pattern.
- Optional barriers for increased personnel protection
- Hinged door, large wire ways save time and money in field wiring.
- Standard connections to a full range of ABB products
- Modbus Communication
- Transfer Schemes
MaxSB Competitive Aspects

- Competitive Footprint
- Stability and strong structure
- Emax breaker
  - Trip Units PR121P, PR122P, and PR123P
  - Safety Features
- Tmax breakers
  - Multiple frame sizes with common accessories
- Communication Capabilities (SCADA, Modbus, Ethernet, etc.)
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