Magnum DS Switchgear

Magnum DS Switchgear with Power Circuit Breaker

Contents

Cross-Reference

Aftermarket

Eaton's Low Voltage Assembly supports vintage and current switchgear breakers and parts that date as far back as the 1950s, including the Magnum® DS, DSII and SPB families.

For more information, refer to the following Eaton catalogs: CA08100014E, RP01301001E or call 1-800-BKR-FAST (257-3278).

For technical details of current product configurations, reference Eaton's *Consulting Application Guide* CA08104001E.

Product Description

Eaton's Magnum DS switchgear has a 50-year history of power circuit breaker and switchgear development that has set industry standards for quality, reliability, maintainability and extended operating life. Magnum DS switchgear is an assembled metal enclosure that houses drawout power circuit breakers and typically includes control and metering devices. Low voltage switchgear is applied at 600 V and less.

Application Description

Switchgear is used for protection, control and monitoring of low voltage distribution systems in all types of industrial, commercial and utility environments requiring up to 600 V distribution between 1600 A and 10,000 A continuous loads, and between 42,000 A and 200,000 A interrupting current.

Product Offering

- Indoor NEMA 1
- Rear access
- Front access
- Arc resistant (2B)
- Integrated switchboard, MCC and ATS
- Unit substation transformer integration
- Outdoor NEMA 3R rear access
- Outdoor NEMA 3R front access

Features, Benefits and Functions

Standard Finish—The light gray paint finish (ANSI 61) uses a modern, completely automated and continuously monitored electrostatic powder coating. This continuously monitored system includes spray de-grease and clean, spray rinse, iron phosphate spray coating spray rinse, non-chemical seal, oven drying, electrostatic powder spray paint coating and oven curing.

Integral Base—The rugged formed base greatly increases the rigidity of the structure and reduces the possibility of damage during the installation of the equipment and is suitable for rolling, jacking and handling. A lifting angle is permanently welded into the bus compartment structure for increased strength.

Heavy-Duty Door Hinges—Each breaker door is mounted with hinge pins. Removal of the door is easily accomplished by just lifting the hinge pin. This allows easy access to the breaker internal compartment for inspection and maintenance.

Rear Cover/Doors—In Magnum DS Switchgear, standard rear covers with captive hardware are the bolt-on type. They are split into two sections to facilitate handling during removal and installation. Optional rear doors are also available.

Through-the-Door Design—The following functions may be performed without the need to open the circuit breaker door: levering the breaker between positions, operate manual charging system and view the spring charge status flag, close and open breaker, view and adjust trip unit, and read the breaker rating nameplate.

Through-the-Door Design

Front Accessible—When the door is open or removed, each breaker compartment provides front access to isolated, vertical wireways, primary disconnects, cell current transformers and other breaker compartment accessories for ease of field wiring and troubleshooting field connections.

Four-Position Drawout—Breakers can be in connected, test, disconnected or removed position. The breaker compartment door can be closed in the connected, test and disconnected positions.

Closing Spring Automatic Discharge—Mechanical interlocking automatically discharges the closing springs when the breaker is removed from its compartment.

Breaker Cell

Breaker Inspection—When withdrawn on the rails, breaker is completely accessible for visual inspection; tilting is not necessary. The rails are permanent parts of every breaker compartment.

Interference interlocks are supplied on breakers and in compartments where the compartments are of the same physical size to ensure that an incorrect breaker cannot be inserted.

Features—Bus

Buses and Connections—Vertical and cross bus ratings in Magnum DS Switchgear are based on a UL® and ANSI standard temperature rise of 65°C above a maximum ambient air temperature of 40°C.

Bus Ampacities—Vertical and cross bus ratings in Magnum DS are 2000, 3200, 4000, 5000 and 6000 amperes. In addition, 8000 and 10,000 amperes continuous cross bus ratings are also available.

Bus Bracing—Unique vertical bus configuration provides an optional short-circuit withstand rating of 150,000 amperes without the need for preceding current limiting fuses. Standard bracing is 100,000 amperes. The U-shaped bar is the heart of the Magnum DS vertical bus. This configuration provides a much higher mechanical strength. To further demonstrate the strength and rigidity of this bus system, it has been verified through testing to withstand 85,000 amperes short-circuit for a full 60 cycles.

Silver Plating—Bolted, silver-plated copper main buses are standard. The plating is over the entire length of the bar, not just at the joints. Optional tin-plated copper buses are available.

Bus Joints—All joints are bolted and secured with Belleville-type spring washers for maximum joint integrity. These washers reduce the potential of joint hardware loosening during the change of joint temperature associated with variations of the loads. As an option, maintenance-free hardware can be provided.

Full Neutral—For four-wire applications, the neutral bus is rated 100% of main bus rating as standard.

Ground—A ground bus is furnished for the full length of the switchgear assembly and is fitted with terminals for purchaser's connections.

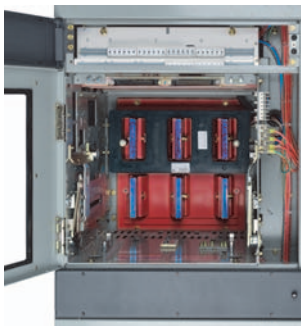
Glass-Reinforced Polyester Stand-Off Insulation System—Glass-reinforced polyester has been used on both low and medium voltage switchgear for decades. By combining this industry-proven material with our other insulation materials, a total system providing exceptional mechanical and dielectric withstand strength, as well as high resistance to heat, flame and moisture, is produced. Substantial testing to demonstrate accelerated effects of heating and cooling on the mechanical and dielectric properties of this system prove it to provide superior performance for decades of trouble-free operation.

Features—Wiring

Cable Compartment—The cable compartment gives ample room for terminating the power cables. Removable top roof sheets allow for easy conduit hub installation. The floor of the cable compartment is open to allow cable entry from underground duct banks. Optional floor plates are available.

Lug Pad—The lugs are located on the breaker run-backs to accommodate lug orientations at a 45° angle to reduce the bending radius of the cable needed for making the connections, thus reducing installation and maintenance time. Mechanical setscrew type lugs are standard. Optional NEMA two-hole compression lugs are available as an option.

Control Wireway—An isolated vertical wireway is provided for routing of factory and field wiring in each switchgear section. Breaker secondary terminal blocks are mounted as standard above each circuit breaker. The terminal blocks are rated 30 amperes and will accept bare wire, ring or spade terminals for wire size ranges of #22 to #10. Extruded loops are punched in side sheets of the vertical wireway to allow securing of customer control wiring without the use of adhesive wire anchors.



Control Wireway

Control Wire—Standard wire is Type SIS insulated stranded copper, extra flexible No. 14 AWG minimum.

Control Wire Marking—Each wire is imprinted with ink cured under ultraviolet light for durability and for easy identification by the user. The enhanced solvent resistance and durability of the aerospace-grade UV cure ink has been tested for severe environments. The imprinting is made periodically along the length of the wire, with the ends being imprinted more frequently. The point of origin, wire designation and point of destination are imprinted in the following format: <origin zone/wire name/destination zone>. Each device has a uniquely designated zone. "<" indicates the direction of the wire origination and ">" indicates the direction of the wire destination. As an option, wire marking can be made using sleeve type or heat shrink sleeve type.

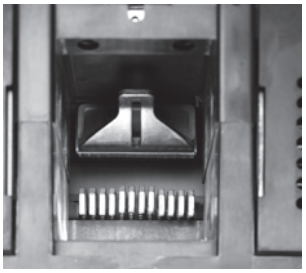
Control Wire Marking

Secondary Terminal Compartment Door—The customer's secondary terminal connections are located behind a separate door providing access to these connections without the need to open the breaker compartment door.

Shipping Split Connection—At each shipping split, the control connections are made with plug-in terminal blocks rated 600 volts, 40 amperes. The terminal blocks interlock mechanically without removing the line or load connections. This method of making the shipping split control connections increases the speed of installation and reduces the potential of incorrect connections.

Features—Breaker Contacts—The Magnum DS has silver tungsten moving contacts and silver graphite stationary contacts. The contacts provide a long-wearing, low-resistance joint. The contacts are protected from arcing damage even after repeated interruptions by the "heel-toe" action that causes the integral arcing contacts to mate before the main contacts part. The arcing contacts then part last, striking the arc away from the main contacts.

The main contacts are of the butt type and are composed of a multiplicity of fingers to give many points of contact without alignment being critical.



Magnum DS Breaker Contacts (Arc Chutes Removed)

Stored-Energy Mechanism—A cam-type closing mechanism closes the breaker. It receives its energy from a spring that can be charged by a manual handle on the front of the breaker or by a universal electric motor.

Release of the stored energy is accomplished by manually depressing a button on the front of the breaker or electrically energizing a releasing solenoid.

Arc Chute—There are three basic means of extinguishing an arc: lengthening the arc path; cooling by gas blast or contraction; and deionizing or physically removing the conduction particles from the arc path.

The DE-ION® principle is incorporated in all Magnum DS circuit breakers. This makes possible faster arc extinction for a given contact travel, and ensures positive interruption and minimum contact burning.

Levering Mechanism—The worm gear levering mechanism is self-contained on the breaker drawout element and engages slots in the breaker compartment. A removable crank is used to lever the breaker between the connected, test and disconnected positions.

Mechanical interlocking is arranged so that levering cannot be accomplished unless the breaker is in the opened position.

Protection During Levering Operation—When levering the breaker between the connected, test and disconnected positions, the operator is protected from contact with live parts by the breaker door.

Levering Magnum DS Breaker

True Two-Step Stored Energy Closing—This sequence is required to charge and close the breaker.

The breaker closing springs are charged either through the manual-charging handle or by the optional charging motor. The breaker is mechanically interlocked to prevent closing of the breaker until the closing springs are fully charged.

With the closing springs fully charged, the breaker can then be closed by pressing the manual close pushbutton on the breaker, or by the optional spring release coil through a remote electrical signal.

This means that the energy required to open the breaker is always prestored following a closing operation.

"Stored energy" is energy held in waiting, ready to open or close the breaker within five cycles or less. The unique cam and spring design provides necessary energy for a single close-open sequence, as well as the energy for multiple charge-close operations such as this possible sequence: charge-close-recharge-open-close-open.

The closing springs are interlocked with the breaker racking mechanism to ensure that the closing springs are discharged before the breaker can be removed from the compartment.

Manually Operated Breakers—Manually operated breakers are equipped with a manual charging handle to charge the closing springs. Manual closing and tripping pushbuttons are utilized to operate the breaker. Remote closing and tripping can be accomplished by installing optional electric spring release and shunt trip coils. The breaker closing springs must be charged manually, then remote closing and tripping signals can be sent to the breaker.

Electrically Operated Breakers—Electrically operated breakers are equipped with a spring charging motor and electrically operated spring release and shunt trip coils. The breaker manual charging handle can be used to charge the closing springs when power is not available to the charging motor.

Provisions for Padlocking—All breakers include provision for padlocking open to prevent electrical or manual closing. This padlocking can secure the breaker in the connected, test or disconnected position by preventing levering of the breaker.

Ease of Inspection and Maintenance—Magnum DS breakers are designed for maximum accessibility and the utmost ease of inspection and maintenance.

Magnum DS Switchgear—Trip Units

Digitrip® RMS Trip Unit—The Digitrip RMS trip units feature a dependent curve that is depicted in the nameplate by a blue shaded area of the trip curve. The dependent curve affords better protection flexibility. Additionally, all of the trip units have, as standard, thermal memory, 50/60 Hz operation and thermal self-protection at 90°C.

Digitrip RMS Integral Microprocessor-Based Breaker Overcurrent Trip Systems—These systems provide maximum reliability with true rms sensing as standard, gives excellent repeatability, and requires minimum maintenance. No external control source is required for its protective functions.

Trip Functions—Magnum DS trip units provide the maximum in flexibility and are available in the following configurations: LSI, LSIG and LSIA (ground fault alarm only). In each case, either the short delay or the instantaneous function (not both) may be defeated. This reduces the need for spare breaker inventories and provides maximum utilization of interchangeable breakers.

Accessories

Magnum Remote Racking Device (MRR1000)

The MRR1000 permits the operator to remotely open and close a breaker from up to 25 feet away during the rack-in or rack-out process, a distance well beyond the arc flash boundary for traditional LV switchgear.

For more information, refer to product documentation PA01900008E.

Digitrip Test Kit (MTK2000)

The MTK2000 Trip Unit Test Kit is used to test and verify the pickup levels and time delay settings of a breaker's trip unit.

For more information, refer to technical documentation IL01906008E.

Standards and Certifications

Magnum DS Switchgear assemblies have undergone an extensive seismic qualification program. The test program utilized ANSI standard C37.81, the Uniform Building Code® (UBC) and the California Building Code (CBC) as a basis for the test program. The assemblies have been tested and qualified to exceed these requirements.

Magnum DS Switchgear conforms to the following standards: CSA®, ANSI C37.20.1, C37.51, and UL Standard 1558, and is built in an ISO® certified facility.

American Bureau of Shipping (ABS) certification is also available.

Contact Eaton for details and part numbers for CSA-approved units.

Product Selection

Refer to TB1901001E for application data.

Contact Eaton for configurations, pricing and availability.

Technical Data and Specifications

Product Specifications

Refer to Section 16426A of the *Product Specification Guide*.

Available Bus Ratings

Cross Bus Ampacity	Bus Bracing kA	Vertical Bus Ampacity
2000	100, 150, 200	2000
3200	100, 150, 200	3200
4000	100, 150, 200	4000
5000	100, 150, 200	5000
6000	100, 150, 200	①
8000	100, 150, 200	—
10,000	100, 150, 200	—

Vertical section bus is sized per main cross bus maximum rating or by ANSI C37.20.1 Section 7.4.13 Table 11 to a maximum of 5000 amperes.

Note: In addition to the available bus bracings shown above, the bus has been tested for short-circuit values of 85,000 amperes for a full 60 cycles.

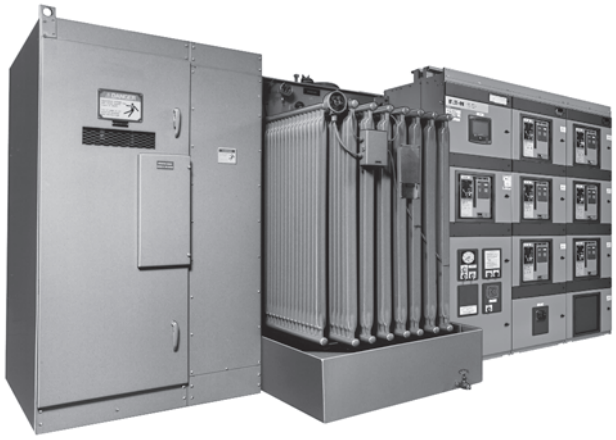
Magnum DS Breaker Ratings

For Magnum breaker ratings, refer to the power circuit breaker section of Eaton's *Consulting Application Guide* CA08104001E.

Note

① 6000 amp riser available in true 44-inch sections.

MVS Primary Switch and Low Voltage Metal-Enclosed Switchgear



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Product Description

Unit Substations

Most switchgear assemblies are configured as unit substations.

A unit substation, as referred to in this publication, is defined as a coordinated assembly consisting of three-phase transformers with high-voltage incoming line sections and an assembly of low voltage distribution sections.

Unit substations may be indoor or outdoor, with a selection of high voltage incoming sections, a choice of transformer types and an arrangement of switchgear to suit the application.

Eaton's unit substations follow the system concept of locating transformers as close as practicable to areas of load concentration at usage voltages, thus minimizing the lengths of secondary distribution cables and buses. This concept provides several basic advantages, such as:

- Reduced power losses
- Improved voltage regulation
- Improved service continuity
- Reduced likelihood of faults
- Increased flexibility
- Minimized installation expense
- Elimination of the need for vaults due to availability of non-flammable types of transformers
- Efficient space utilization

Application Description

Advantages of Unit Substations

- Complete coordination, both mechanical and electrical
- Extreme flexibility with wide choice of components and ratings to meet exact application requirements
- Optimum safety to operators
- Modern design
- Meets all applicable ANSI, IEEE®, NEMA and UL standards

Product Selection

Unit substations are engineered to order and have multiple configurations. Contact Eaton for configurations, pricing and availability.

Unit Substations

	Description	Industry Applications	Standards
Dry-Type Transformers 	**Dry-Type Transformers** ■ VPI, VPE, RESIBLOC®, Cast ■ 113 kVA–25 MVA ■ Up to 46 kV, 150 kV BIL primary ■ Up to 15 kV secondary	■ Commercial and institutional ■ Industrial users (petrochemical, oil & gas, pulp & paper/forest) ■ Utilities	■ ANSI C57.12.01/C57.12.91 ■ UL available ■ Seismic Zone 4 certification
Liquid-Filled Transformers 	**Liquid-Filled Transformers** ■ Primary and secondary unit substations, power substations ■ 112.5 kVA–20 MVA ■ Up to 69 kV primary ■ Up to 34.5 kV secondary ■ Mineral oil, R-Temp®, silicone or BIOTEMP™	■ Commercial and institutional ■ Industrial users (petrochemical, oil & gas, pulp & paper/forest) ■ Utilities	■ Complies with ANSI C57.12.00 and C57.12.90, CSA–C88 ■ UL, FM available ■ Seismic Zone 4 certification
Pad-Mounted Transformers 	**Pad-Mounted Transformers** ■ Small 75–3000 kVA ■ Large 3000–7500 kVA ■ Up to 34.5 kV high voltage ■ Up to 5 kV low voltage ■ Underground cable fed ■ Mineral oil, R-Temp, silicone or BIOTEMP	■ Commercial and institutional ■ Industrial users (petrochemical, oil & gas, pulp & paper/forest) ■ Utilities	■ Complies with ANSI C57.12.00 and C57.12.90, CSA–C88 ■ UL, FM available ■ Seismic Zone 4 certification