LV SWITCHGEAR

MAGNUM DS
LOW VOLTAGE POWER CIRCUIT BREAKERS AND METAL-ENCLOSED SWITCHGEAR

Achieving the Industry's Highest ANSI Interruption and Short Time Ratings In a New Compact Design

Cutler-Hammer

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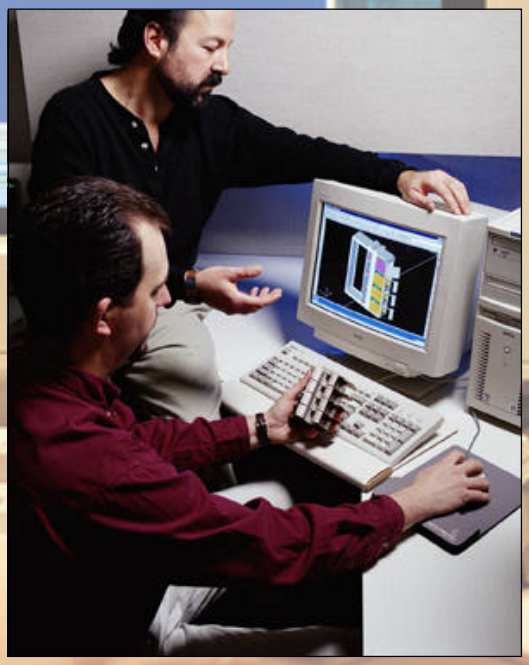


Cutler-Hammer… A Leading Provider of Electrical Power Distribution Solutions

Unique Technology Advancements and Innovative Features Our Customers Asked For

For nearly 70 years Cutler-Hammer has designed, engineered, and manufactured low voltage switchgear, power circuit breakers, and trip units. Our product innovations have continually set the standard for quality and reliability, and represent the largest installed base of ANSI low voltage switchgear.

As a result of our extensive experience, we've learned that low voltage switchgear requirements constantly change. System designers continually demand increased performance, necessitating innovative low voltage switchgear solutions that provide higher ratings in less space, a rugged structure, enhanced safety, and easier maintenance…plus the increasingly important capabilities of communications and power quality monitoring and measuring.

Anticipating future electrical distribution system design requirements and industry trends, a dedicated team of Cutler-Hammer engineers and scientists combined their switchgear and power breaker expertise with input from customer focus groups provided during the equipment design phase. The result is the next generation of low voltage switchgear…the revolutionary Magnum DS!

Higher Ratings, Increased Strength, and Expanded Capabilities…in Less Space

We designed Magnum DS Switchgear to be structurally stronger while providing greater interrupting and withstand ratings in less space than any other ANSI switchgear. Increased ratings in less space provide opportunities to design more rugged electrical distribution systems that can handle larger available fault currents while eliminating the need for limiters in most instances and providing for better coordination with downstream devices.

We also included capabilities for our customers to utilize Cutler-Hammer industry-leading communications and power quality measurement technologies.

- Highest Interruption and Short Time (Withstand) Ratings. Magnum DS Breakers provide the industry's highest ANSI ratings available without current limiters in a physically smaller size.
- A New Through-the-Door Design. All Magnum DS Breaker controls, indicators, and the trip unit are visible and can be safely accessed without opening the compartment door.
- Smaller Size. Magnum DS Breakers include several unique technology breakthroughs making them the industry's physically *smallest* ANSI power breakers.
- A New Family of Trip Units. A full range of Digitrip® RMS Electronic and Programmable Trip Units has been developed to provide customers with a choice of expanded protection, information, power quality measurement, and communication capabilities to meet specific requirements.
- Only Two Structure Widths. 22- and 44-inch widths.
- Unique Wireway. A unique 4-inch wireway is located on the side of the structure for quick and safe wiring.

Magnum DS Switchgear: The Next Generation from the Industry Leader in ANSI Low Voltage Switchgear!

The Switchgear

Meets All Standards… Seismically Qualified

Magnum DS Switchgear is built and tested to the following standards:

- ANSI C37.20.1
- ANSI C37.51
- UL 1558
- NEMA SG3
- NEMA SG5
- CSA

Magnum DS Switchgear and Circuit Breakers are manufactured and assembled in ISO certified facilities.

The switchgear has been seismically qualified and exceeds requirements of the Uniform Building Code (UBC) and California Building Code (CBC).

Two Structure Widths Provide Greater Capacity in Less Space

Cutler-Hammer engineered Magnum DS Switchgear in two space-saving structure widths: 22-inches wide for 800-3200A breaker frames and 44-inches wide for 4000-5000A breaker frames. Magnum DS Switchgear provides opportunities for more circuit breakers in less space than any other ANSI switchgear.

Manufactured in an ISO CERTIFIED Facility

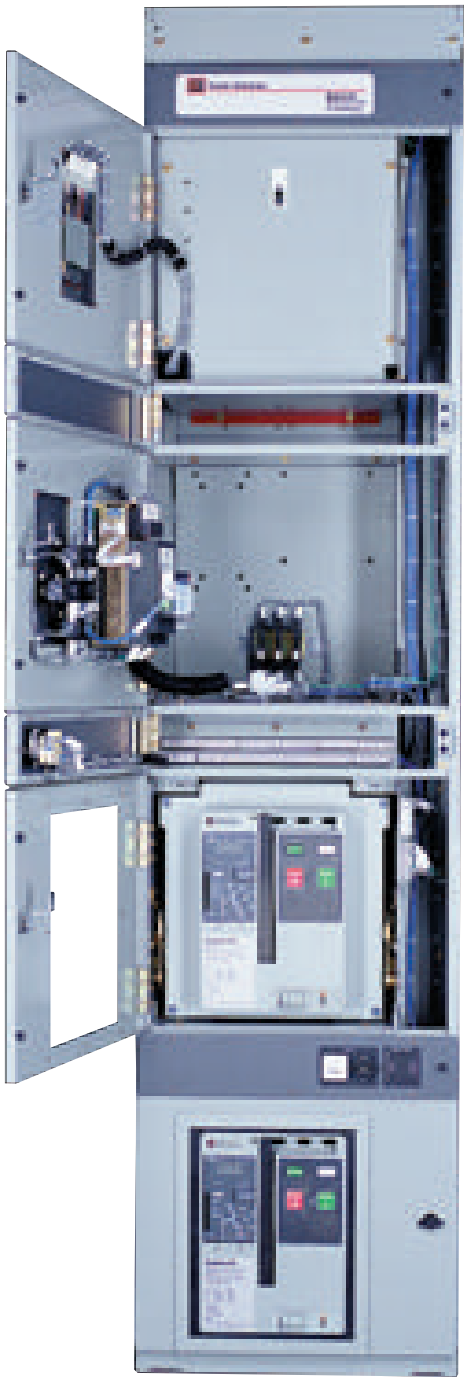
ANSI STANDARDS

Secondary wiring points are located in the top front of the breaker cell, easily accessed via a separate door without exposure to the power cables.

The isolated secondary wireway is uniquely located at the side of the structure, providing for top or bottom customer cell wiring without removing the breaker.

All breakers can be padlocked to secure the breaker in all three positions. An optional key interlock (not shown) can also secure the breaker in each position.

The heavy duty structure includes slots in the frame bottom making it easier to move the assembly using a prybar.



A New Through-the-Door Design Provides User-Friendly Operation and Optimum Safety

Through-the-door design provides clear visual and physical access to the trip unit and *all* breaker controls and indicators…including open and close buttons, the open/close indicating flag, the charging handle, breaker interlock, and the spring charge/discharge flag. Even breaker levering is accomplished with the breaker compartment door closed.

For safety and security, the breaker compartment provides three breaker positions with the door closed: connect, test, and disconnect.

Extension rails can be padlocked to prevent a breaker from being inserted into a cell, a requirement when maintenance is being performed. This helps assure that no one can install a breaker and energize a circuit on which a person may be working.

Unique Secondary Contact Placement Facilitates Wiring and Maintenance

Secondary wiring points are located in the top front portion of each cell. A separate door covers the contacts so an operator can safely access them without opening the breaker compartment door. Customer contact points are dedicated to the customer's interface meaning they are free from factory connections.

The secondary terminals have standard finger-proof hinged covers, providing safety by protecting against accidental contact with live secondary contacts. Covers are hinged for making connections and include a small hole for circuit testing using a probe.

Each secondary contact point is dedicated to a specific function, allowing standardized wiring diagrams and true electrical interchangeability of common size breakers. Standard wiring points help improve quality while reducing maintenance and inspection time for customers.

Unique Vertical Bus Configuration Provides Highest Short Circuit and Withstand Ratings

The exclusive "U" shaped bar provides higher mechanical strength that yields standard bus bracing ratings of 100 kA…and optional 150 kA and 200 kA, the highest short circuit rating in the industry. In addition, the bus has been tested for short circuit values of 85 kA for a full 60 cycles.

CONNECT

TEST

DISCONNECT

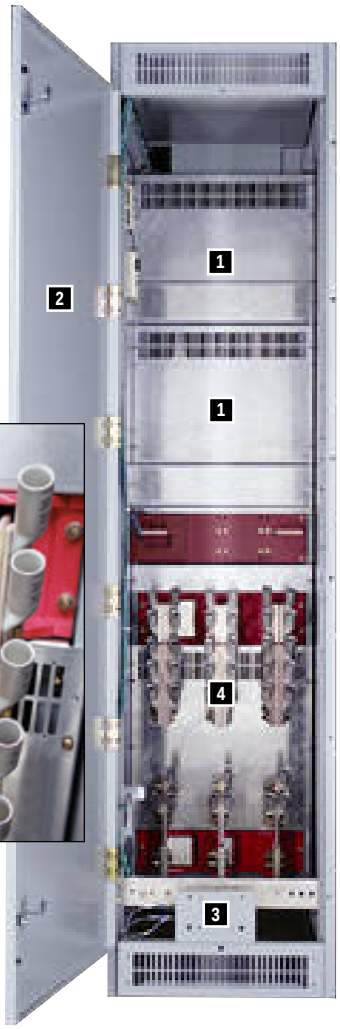
Safety is enhanced by the through-the-door design that provides for three breaker positions with the door closed: connect, test, and disconnect. In the withdrawn position above, the breaker can be removed from the cell on integral extension rails.

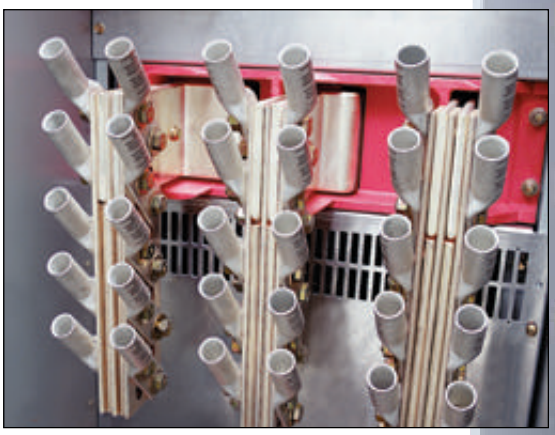
The Assembly

Rear Compartment Options

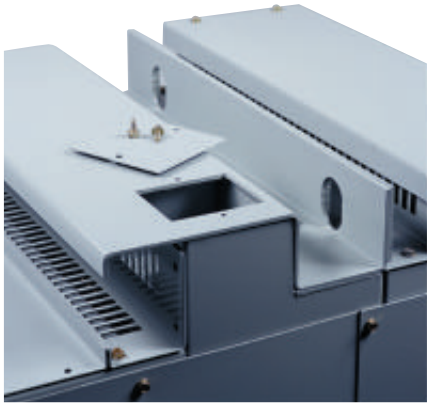
Generous rear compartment space is provided for easy cable connection, maintenance, and inspection. The rear compartment is shown with options:

1. **Metal Barriers**
2. **Hinged Door**
3. **Space Heater**
4. **Compression Lugs**





Cable lugs are mounted at a 45° angle to facilitate cable terminations with minimum bending. Both compression and mechanical lugs are available.



Top control conduit access is through an easily removable cover.

Bus Compartment Can Be Isolated by Optional Grounded Metal Barriers

Customer input recommended this feature as an option since grounded metal barriers can interfere with thermal scans. When specified, these barriers serve to isolate the bus compartment from the cable compartment, protecting against accidental contact with the live vertical and cross bus, and reducing the potential of objects falling into the bus compartment.

Shipping Split Terminal Blocks

Magnum DS Switchgear is delivered with plug-in terminal blocks at the shipping splits. They're rated at 600 volts, 40 amperes and accept a wire range of #22 to #8.

Our terminal blocks interlock mechanically without removing the line or load connection, virtually eliminating the labor normally required to connect control wire across shipping splits. Installation speed is increased and the potential of incorrect connections is substantially reduced.

Unique Control Wireway

The control wireway is located at the front of the switchgear structure, on the side. Control circuits in all cells can be wired without removing any of the breakers...and the wireway itself is safely barriered from the power circuits.

An installer can wire the rear power circuits at the same time another is wiring the control circuits, providing a reduction in overall installation time.

Convenient Control Conduit Entry Points

We simplified access for both top and bottom control conduit entry to help facilitate wiring and reduce installation time. Top access is through a cover that is easily removed and punched by the customer to receive the conduit. This design feature eliminates metal cutting on the assembly itself and the potential of damaging metal shavings falling into the assembly. Bottom entry is made directly into the control wireway.

Additional Innovative Features Provide Ease-of-Installation and Maintenance

New Breaker Lifter Design

Responding to customer recommendations, we re-engineered the breaker lifter with increased mobility enabling it to move smoothly on a continuous track from structure-to-structure. This new design reduces the amount of time necessary to remove a breaker for maintenance.

Breakers Shipped Installed

In an additional response to customer recommendations, the standard for shipping Magnum DS Switchgear is with the breakers installed, reducing the potential of breakers being installed in the wrong cell, lost, or damaged in shipment. This feature provides customers with several time-saving and cost-reducing benefits such as eliminating the requirement of receiving, handling, storing, and installing the breakers.

Split Rear Access Covers

Bolted rear access covers are fabricated in two pieces, providing for ease-of-handling by a single person and easy access to the cable compartment. Optional rear hinged padlockable doors are available.

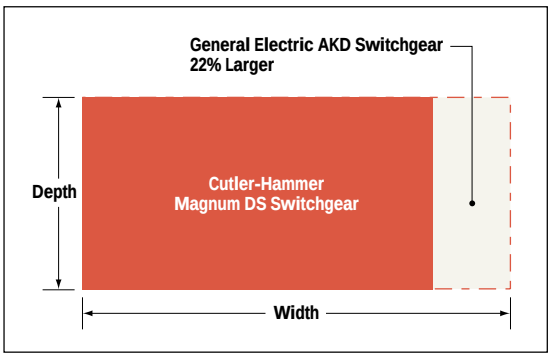
Captive Hardware

Captive hardware is used on the rear covers to facilitate ease-of-installation and maintenance. Additionally, structures at the shipping splits include captive hardware in the breaker compartment area providing for easy section-to-section connections by just one person.

Less Floor Space

Magnum DS Switchgear provides for more circuit breakers per square foot than any other ANSI switchgear manufacturer.

Floor Space Comparison – Top View



Magnum DS Switchgear occupies the least amount of floor space while providing for the most breaker protection per square foot.

Floor Space Comparison

Manufacturer	Width Inches	Depth Inches	Floor Space Square Feet	Size Ratio to Magnum DS	Number of Feeder Breakers
Magnum DS	110	60	45.8	1.00	4-7
GE AKD	134	60	55.8	1.22	3-6
Siemens Type R	134	60	55.8	1.22	3-6
Square D	110	61	46.6	1.02	2-5
ABB K-Line	138	58	55.6	1.21	2-5

Floor space comparison shown using 3200 ampere main-tie-main double ended switchgear with indicated feeder breakers on each side; 480/277 volts cable in and out.

Introducing Another Industry Power Breaker First!

The Highest ANSI Interrupting and Short Time (Withstand) Ratings…in the Smallest Physical Unit Size

Our Cutler-Hammer design team innovations, coupled with customer focus group input, provided the re-definition of what is needed in an ANSI power breaker:

- The capability to design more flexible systems that can withstand larger available fault currents.
- Better coordination with downstream devices.
- Elimination of limiters in most instances.
- Reduced size of the switchgear assembly.

Cutler-Hammer Met the Challenge

Magnum DS Breakers are designed and engineered specifically for use in Magnum DS Low Voltage Switchgear assemblies applied at nominal voltages of 240, 480, and 600 V AC. Six continuous ratings – 800 amperes through 5000 amperes – are covered by only two breaker sizes.

Controls and indicators are functionally grouped on the front of the breakers...and the through-the-door design means they are easily viewed and accessible.

1. **Trip Flag**
2. **Three Accessory Windows**
3. **Digitrip RMS Trip Unit**
4. **Contact Status Indicator (Open or Closed)**
5. **Spring Status Indicator (Charged or Discharged)**
6. **"Push Off" to Open Breaker Button**
7. **"Push On" to Close Breaker Button**
8. **Manual Charging Handle**
9. **Optional Operations Counter**
10. **Optional "Off" Key Lock**
11. **Padlockable Levering Device**
12. **Color-Coded Breaker Position Indicators**

Integrally designed breaker cassette for drawout breakers provides clear indication of connect, test, and disconnect positions.

The breaker can be conveniently racked in or out, stopping at the various positions with the door closed.

Faceplate controls facilitate operation of the breaker, and the three accessory mounting windows provide for easy identification.

The breaker spring charging handle is designed with sufficient space for operation even with a gloved hand.

100 Percent Rated…
Meet or Exceed Rigid ANSI and UL Standards

Magnum DS Breakers are 100 percent rated, UL listed, and are built and tested in an ISO 9000 certified facility to applicable standards including:

- ANSI C37.13
- ANSI C37.16
- ANSI C37.17
- ANSI C37.50
- NEMA SG3
- UL 1066
- CSA 22.2

Magnum DS is also suitable for use in:

- UL 1558 Low Voltage Switchgear
- UL 891 Low Voltage Switchboards
- CSA 22.2.31 Low Voltage Assemblies

Magnum DS Ratings – *Without Current Limiters*
Breaker Ratings at 240, 480, and 600 Volts

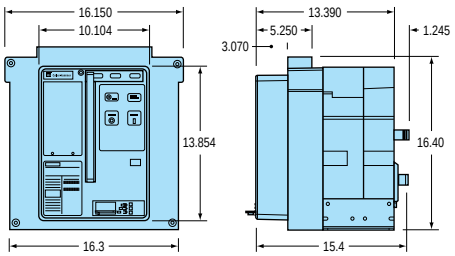
Maximum Amperes	Breaker Designation	Interrupting Rating	Short Time Rating
800	MDS-408	42 kA	42 kA
	MDS-608	65 kA	65 kA
	MDS-808	85 kA	85 kA
	MDS-C08	100 kA	85 kA
1600	MDS-616	65 kA	65 kA
	MDS-816	85 kA	85 kA
	MDS-C16	100 kA	85 kA
2000	MDS-620	65 kA	65 kA
	MDS-820	85 kA	85 kA
	MDS-C20	100 kA	85 kA
3200	MDS-632	65 kA	65 kA
	MDS-832	85 kA	85 kA
	MDS-C32	100 kA	85 kA
4000	MDS-840	85 kA①	85 kA
	MDS-C40	100 kA①	100 kA
5000	MDS-850	85 kA①	85 kA
	MDS-C50	100 kA①	100 kA

① *Interrupting rating is 130 kA at 240 volts.*

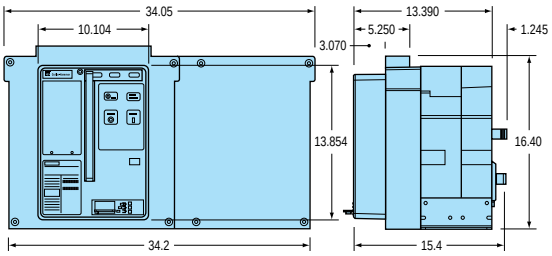
Frame Sizes

Amperes	Dimensions – Inches		
	Height	Depth*	Width
800-3200	16.40	15.40	16.30
4000-5000	16.40	15.40	34.20

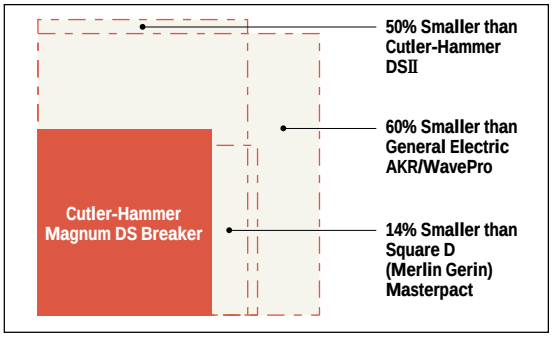
* *Drawout breaker with finger clusters.*



800-3200 Ampere Frame



4000-5000 Ampere Frame



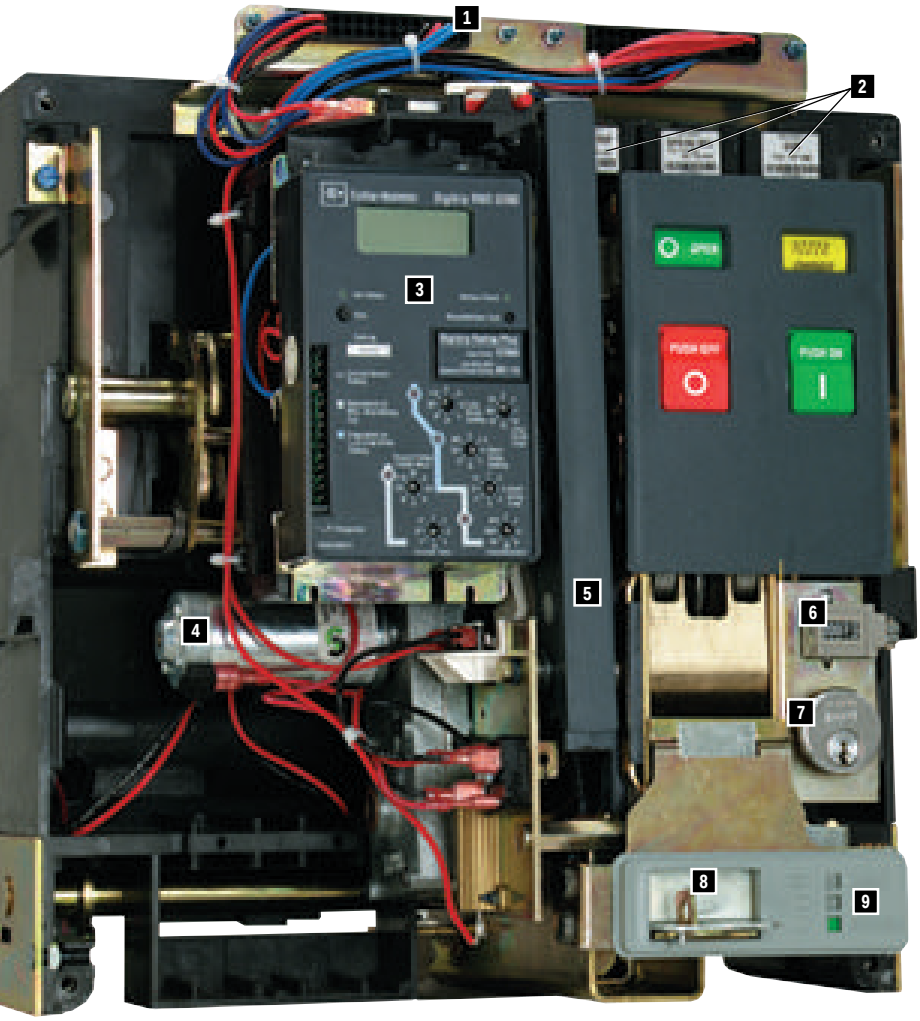
Significant overall size reductions are easily seen in this comparison of 3200 ampere power breaker mounting dimensions.

4000A and 5000A Fixed Breaker

800A - 3200A Drawout Breaker

The innovative design and engineering advancements of Magnum DS Breakers have resulted in dramatic size reductions and increased interrupting ratings…in just two physical frame sizes.

A Look Inside



Designed for Easy Access, Inspection, and Minimal Maintenance

The stored energy mechanism, control devices, accessories, and secondary contacts are easily accessible by removing the front cover…held in place by four captive screws. This can only be done when the breaker is in the disconnect position or removed from the cell.

The current sensor viewing window on the rear of the breaker allows for easy identification of the current sensor mounted inside.

The contact wear indicator eliminates the need for elaborate testing to determine if the contact assembly needs replaced.

Many minor replacement functions involving the mechanism, control, and/or accessories can be easily accomplished.

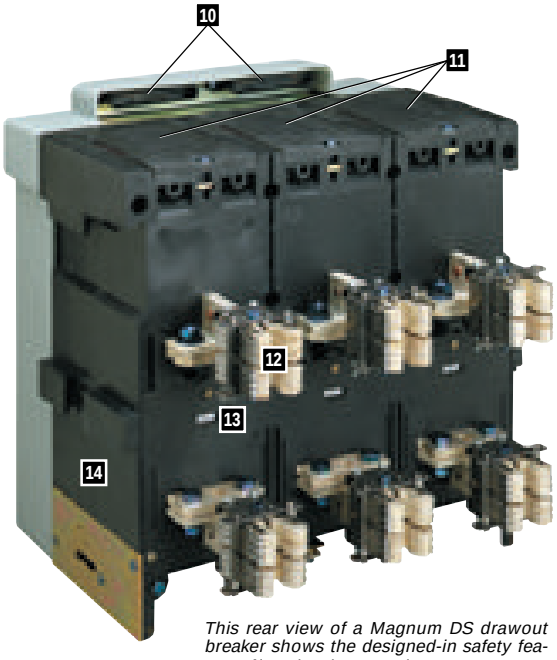
Two-Step Stored Energy Mechanism for Manually and Electrically Operated Breakers

The potential energy is stored in the mechanism to close the breaker in 5 cycles or less. Sufficient energy to open the breaker remains available following the closing operation.

After closing, the charging spring can be recharged to provide potential energy for reclosing following a fault, providing high continuity of service. This feature allows for the following sequence: charge – close – recharge – open – close – open.

On manually operated breakers, closing springs are charged by hand. For electrically operated breakers, springs are charged by an electric motor but can be manually charged if no power is available.

1. Secondary Wiring Points
2. Field Installable Accessories (Three Maximum)
3. Digitrip RMS Trip Unit
4. Optional Electric Charging Motor
5. Manual Charging Handle
6. Optional Operations Counter
7. Optional "Off" Key Lock
8. Padlockable Levering Device
9. Breaker Position Indicator
10. Secondary Contacts
11. Arc Chute Covers
12. Primary Finger Cluster Disconnects
13. Current Sensor Window
14. Rigid Frame Housing

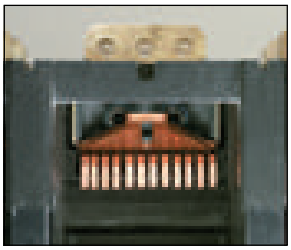


This rear view of a Magnum DS drawout breaker shows the designed-in safety feature of locating the secondary contacts away from the primary disconnects.

Positioning of the secondary contact subassembly is dedicated for installation, maintenance, and testing. Top view shown with breaker cover removed, bottom of photo is front of breaker.

New Flexible Current Path Increases Current Carrying Capability in Less Space

- Multi-finger contact structure *divides* the current flow, increasing the thermal carrying capability of the entire current path.

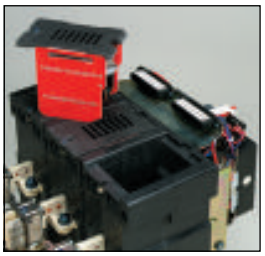


Visual contact wear indicator shows when contact replacement is necessary.

- Flexible braided current path to the contact fingers reduces necessary current carrying space and provides a smooth connection, eliminating bolted joints and contact springs. This design helps increase breaker service life by reducing localized heat buildup and mechanical stress inherent in conventional bolted joints.

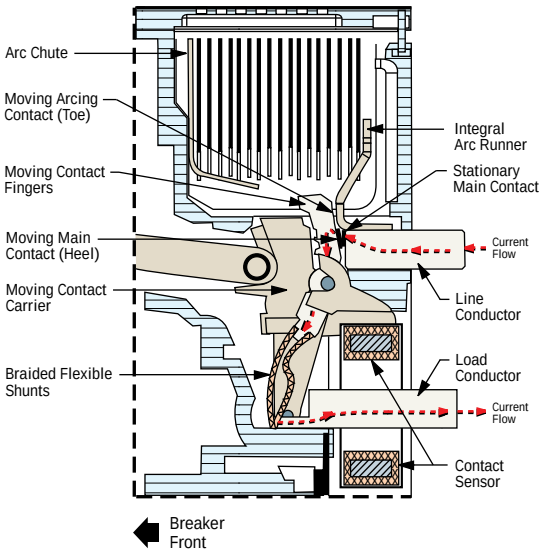
Innovative Arc Running System Provides Higher Interrupting Capacity in Less Space

- Heel-toe contact structure is a single contact finger design that performs both main and arcing contact functions by controlling the arc direction. This design provides for longer contact life.
- Integral arc runner enhances the magnetic action of the arc chute by drawing the arc into the chute with increased efficiency, reducing arcing at the toe of the contacts. This exclusive design allows for higher arcing in a smaller space, resulting in increased interrupting ratings.
- Patented alternating V Arc Chute™ quickly divides and extinguishes the arc. The V Arc Chute reaction speed protects contact material, extending contact life.



Arc chutes can be easily removed and inspected. The contact wear indicator on the main contact assembly can also be inspected.

Cross-Section of Magnum DS Heel-Toe Contact



Unlike conventional power breaker designs utilizing separate arcing and main current carrying contacts, Magnum DS Circuit Breakers perform both functions on different parts of the same contact finger. Each finger has a moving main contact (heel) and a moving arcing contact (toe). A complete movable contact is merely the combination of a number of individual fingers.

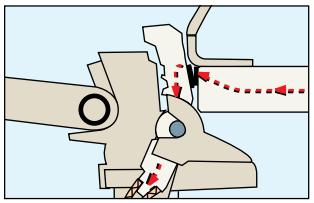
As the circuit breaker is called upon to open, the toe and heel simultaneously touch. At that point, the current changes its path from the main contact to the arcing contact. As the heel lifts off, any remaining current is driven to the toe. The result is minimal arcing damage to the main contact (heel) providing for longer main contact life.

Upon closing, the toe absorbs most of the impact and deals with any arcing by touching down before the heel. Once again, the main contact (heel) is protected resulting in longer life.

Isolated View of Contact Opening Sequence

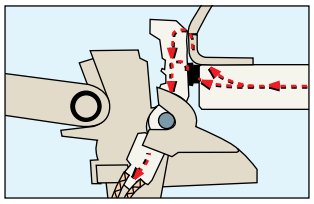
1. Fully Closed Position

Only the main contact (heel) touches and all current flow is through the main contact.



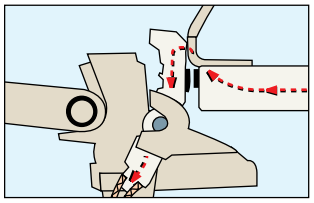
2. Simultaneous Touching of All Contacts

The arcing contact (toe) touches down before the main contact (heel) lifts off with current flow dividing between main (heel) and arcing (toe) contacts.



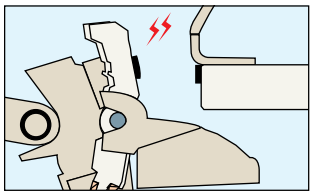
3. Toe (Arcing) Contacts Touching

The main contact (heel) lifts off with the arcing contact (toe) still touching to deal with any arcing. Current flow is only through the arcing contact (toe).



4. Fully Open Position

Both the main (heel) and arcing (toe) contacts are open and there is no current flow. The arc dissipates up into the arc chute.



Safety and Reliability

Rigid Frame Housing

Another Cutler-Hammer innovation is the Magnum DS Breaker's rigid frame housing – an ANSI power breaker exclusive. This housing provides the strength and stability required in the mounting of the current path and operating mechanism.

- Increased Uptime. Because the current path is isolated and insulated inside a two-piece interconnected housing, any potential damage that may occur during arc interruption between the poles or outside of the breaker is minimized.
- Increased Breaker Life. By providing rigid support for the operating mechanism and the contact structure, mechanical stress is reduced, increasing reliability.
- Design Reliability. The housing reduces the number of frame parts in comparison with conventional ANSI power breakers, providing increased reliability.
- Rigid Frame. The engineered thermoset composite resin provides excellent structural properties, dielectric strength, and arc track resistance …helping to provide the higher interrupting and short time (withstand) ratings in a smaller size.

Built-In Safety Features Provide Optimum Operator Safety and System Security

- Improved C-loop current path design provides dramatic improvements in both safety and efficiency. Higher current ratings increase the blow-on forces on the contact surfaces, allowing the proper downstream protective device to open, isolating the fault and increasing uptime.
- Positive on is indicated on the breaker faceplate. This unique interlocking feature prevents the levering door from being opened if the contacts are welded, protecting personnel from exposure to live primary contacts.
- Making current release prevents the breaker from closing in on a fault exceeding 25 times the nominal current.
- Keyed sensor plug insures error-free installation of the sensor in the field.
- Deadfront faceplate isolates the operator from the primary voltage when the breaker is energized.
- Anti-pump prevents any attempts to reclose the breaker on a short circuit fault if the close signal (mechanical or electrical) is maintained.
- Interlocked levering door cannot be opened until the contacts are in the open condition.
- Three position indicators on the faceplate for drawout mounting. Specific colors identify the breaker position.

- Connect. Both main and secondary contacts are connected and the breaker is ready for normal operation.
- Test. Main disconnects are disengaged, secondary contacts are engaged. All functions of the breaker and trip unit can be tested in this position.
- Disconnect. A storage position in the compartment but the breaker is open and disconnected.

Quality and Reliability

Cutler-Hammer performs consistent endurance and reliability tests on Magnum DS Breakers.

- Mini-Life Tests. A breaker is randomly selected from the production line daily, and tested for an average of 50 mechanical operations to assure performance as required.
- Maxi-Life Tests. MTBF testing continuously tests Magnum DS Breakers until they fail. This identifies potential performance issues with the breaker and provides statistical analysis for further improvement.

Application Flexibility

Magnum DS Breakers are suitable for broad applications in other Cutler-Hammer power equipment.

Low Voltage Switchboard

Motor Control Center

Transfer Switch Equipment

Field Installable Accessories

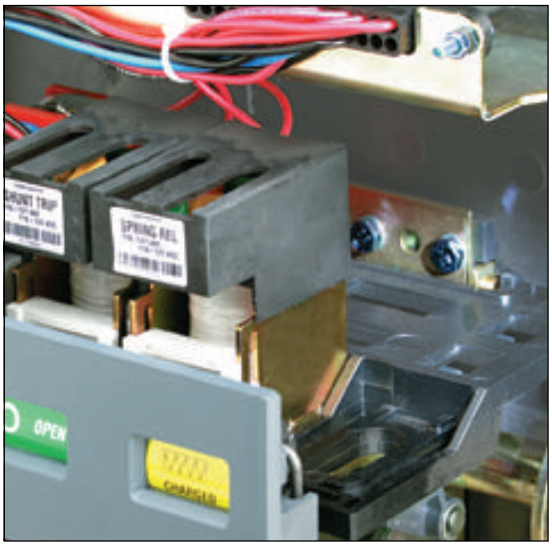
A Common Family of Accessories for Both Frame Sizes

We designed Magnum DS accessories to fit both frame sizes, thus reducing inventory parts and the possible confusion that can exist when different accessory sizes are required for each individual breaker frame.

Magnum DS through-the-window accessories are installed near the right front of the breaker. The unique windows in the breaker cover enable accessories to be quickly identified by name and rating.

Accessories are plug-in, providing for easy mounting and wiring to save both installation time and cost. This feature facilitates accessory changes and replacements by user personnel, eliminating the need to use factory trained personnel or outside service companies.

Modular accessories are keyed for fast error-free mounting in the field. For example, the spring release can only be mounted in the center cavity.



The accessory cavity design, unique to ANSI power breakers, is accessible in the front of the breaker. Up to three accessories can be easily installed and wired in the field.

Factory Installed or Available as UL Listed Field Installable Kits

Through-the-Window Electrical Accessories

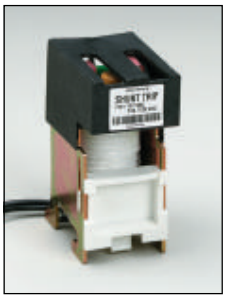
Shunt Trip	Spring Release	Undervoltage Release (UVR)
Provides remote controlled circuit breaker opening when energized by a voltage input.	Remotely closes the breaker when its coil is energized by a voltage input.	Trips the breaker remotely when an existing voltage signal is lost or drops below an established threshold.

Internal Accessories

Auxiliary Switch – Provides the capability to remotely indicate if the breaker is open or closed. Up to six normally open and six normally closed auxiliary contacts are available for customer use.

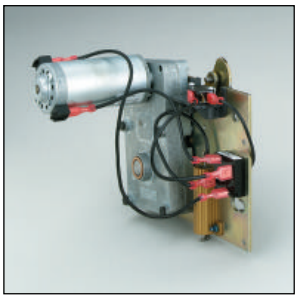
Overcurrent Trip Switch (Bell Alarm) – A set of normally open and normally closed contacts that indicate when a breaker trips.

Electrical Operator – A universal type electric motor, internally mounted in the circuit breaker, that charges the closing springs automatically, facilitating remote or local closing.



Through-the-window electrical accessories are identically sized, yet keyed for error-free mounting.

The auxiliary switch is an internal accessory that provides remote electrical indication if the breaker is open or closed.



An electric motor automatically charges the closing springs. In absence of control power, the springs can be manually charged.

Magnum DS modular design allows customers to mount accessories in the field.

The Trip Unit

A Selection of Trip Units Provides Expanded Protection and Information Capabilities

Cutler-Hammer introduced the first microprocessor-based trip unit and has advanced the technology into a new family of UL and CSA listed Digitrip RMS Electronic and Programmable Trip Units designed and engineered exclusively for Magnum DS Breakers.

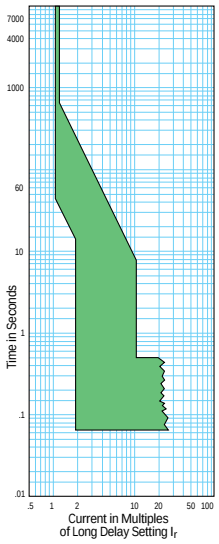
Digitrip RMS 1150 Programmable Trip Unit

The state-of-the-art trip unit with true rms sensing can be programmed at the faceplate or remotely with a PC using the IMPACC communications system. All system parameters as well as programming information can be viewed on the easy-to-read three line digital display window.

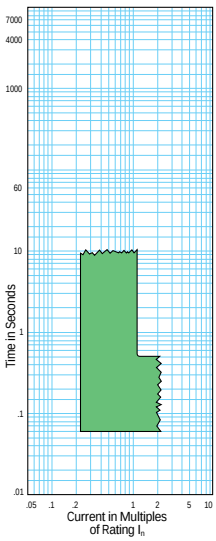
Electronic Trip Units

- Digitrip RMS 220 provides long time and instantaneous protection only.
- Digitrip RMS 520 enables the user as many as nine phase and ground current protection settings for maximum flexibility in trip-curve shaping and multi-unit coordination, and adds ground current protection settings.
- Digitrip RMS 520M adds phase, neutral, and ground current metering…with a four-character LCD display window.

Digitrip 520/520M Long and Short Delay Curves



Digitrip 520/520M Ground Curve



Programmable Trip Units

- Digitrip RMS 1150 provides programmability for more sophisticated distribution systems
  - Increased protection and coordination capabilities.
  - Systems monitoring information including power factor, voltage current, harmonic distortion values, and waveform capture with a three-line, (eight characters per line) LED display.
  - Two programmable contacts for customer use.
  - Time stamping of trip events for improved troubleshooting and diagnostics.
  - Accuracy of 1% on metered values and 2% on energy and power.
  - Systems diagnostic information.
  - IMPACC communications.

Zone Selective Interlocking Capability Provides Positive System Coordination without Time Delays

Zone Selective Interlocking (ZSI) allows the breaker closest to the fault to trip without any preset time delay. The breaker closest to the fault trips first, while the remainder of the distribution system remains on-line, thus avoiding unnecessary and costly downtime.

Magnum Digitrip Trip Units

The next generation of proven Digitrip RMS Trip Units is available exclusively on Magnum DS Breakers. These true rms sensing trip units provide accurate coordination with the conductors and equipment the breaker is designed to protect.

TRIP UNIT TYPE		DIGITRIP 220	DIGITRIP 520	DIGITRIP 520M	DIGITRIP 1150
Ampere Range (16)		200A-5000A	200A-5000A	200A-5000A	200A-5000A
Interrupting Rating at 480V		42 through 100kA	42 through 100kA	42 through 100kA	42 through 100kA
rms Sensing		Yes	Yes	Yes	Yes
PROTECTION AND COORDINATION					
Protection	Ordering Options	LI	LSI, LSIG	LSI, LSIG, LSIA①	LSI, LSIG, LSIA①
	Fixed Rating Plug (I_n)	Yes	Yes	Yes	Yes
	Overtemperature Trip	Yes	Yes	Yes	Yes
Long Delay Protection	Adjustable Rating Plug (I_n)	No	No	No	No
	Long Delay Setting	Fixed	0.4-1.0 x (I_n)	0.4-1.0 x (I_n)	0.4-1.0 x (I_n)
	Long Delay Time I^2t at 6 x I_r	Fixed	2-24 Seconds	2-24 Seconds	2-24 Seconds
	Long Delay Time I^4t	No	No	No	1-5 Seconds
	Long Delay Thermal Memory	Yes	Yes	Yes	Yes
	High Load Alarm	No	No	No	0.5-1.0 x I_r
Short Delay Protection	Short Delay Pick-Up	No	200-1000% M1 x (I_r)	200-1000% M1 x (I_r)	150% M1 x (I_r)
	Short Delay Time I^2t at 8 x I_r	No	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time Flat	No	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time ZSI	No	Yes	Yes	Yes
Instantaneous Protection	Instantaneous Pick-Up	200-1000% M1 x (I_n)	200-1000% M1 x (I_n)	200-1000% M1 x (I_n)	200-M1 x (I_n)
	Making Current Release	Yes	Yes	Yes	Yes
	Instantaneous Override	No	No	No	No
	Off Position	Yes	Yes	Yes	Yes
Ground Fault Protection	Ground Fault Alarm	No	No	Yes	25% -1200A UL
	Ground Fault Pick-Up	No	25-100% x (I_n)①	25-100% x (I_n)①	25% -1200A UL
	Ground Fault Delay I^2t at .625 x I_n	No	100-500 ms	100-500 ms	100-500 ms
	Ground Fault Delay Flat	No	100-500 ms	100-500 ms	100-500 ms
	Ground Fault ZSI	No	Yes	Yes	Yes
	Ground Fault Thermal Memory	No	Yes	Yes	Yes
SYSTEM DIAGNOSTICS					
Cause of Trip LEDs		No	Yes②	Yes②	Yes②
Magnitude of Trip Information		No	No	No	Yes
Remote Signal Contacts		No	No	Yes	Yes
Programmable Contacts		No	No	No	2
SYSTEM MONITORING					
Digital Display		No	No	4 Char. LCD	24 Char. LED
Current (% FS Sensor)		No	No	Yes (2%)	Yes (1%)
Voltage (%) L to L		No	No	No	Yes (1%)
Power and Energy (%)		No	No	No	Yes (2%)
Apparent Power kVA and Demand		No	No	No	Yes
Reactive Power kVAR		No	No	No	Yes
Power Factor		No	No	No	Yes
Crest Factor		No	No	No	Yes
Power Quality – Harmonics		No	No	No	Yes
% THD		No	No	No	Yes
SYSTEM COMMUNICATIONS					
IMPACC		No	No	No	Yes③
Testing Method		Test Set	Test Set	Test Set	Integral and Test Set④
FIELD OPTIONS					
Trip Log (3 Events)		No	No	No	Yes
Electronic Operations Counter		No	No	No	Yes
Triplink		No	No	No	Yes
Waveform Capture		No	No	No	Yes

① Less than 1200 amperes.

② Cause of trip – L, S, I, G, and making current release.

③ Must utilize NT-based IMPACC software to enable communications.

④ Tester for secondary injection.

I_n = Rating plug rating.
I_r = LDPU setting.
I_s = Sensor rating.

Factory Installed in Magnum DS Switchgear

Cutler-Hammer was the first manufacturer to cost-effectively bring microprocessor-based metering and protection devices to the basic levels of plant operation. These devices provide more usable information with greater accuracy.

IQ Analyzer

A Highly Accurate Meter that Provides Energy Management and Power Quality Information on an Easy-to-Read Display

- Meets rigid ANSI C12.16 Class 10 accuracy specification for revenue meters.
- Waveform display includes the ability to detect subcycle voltage disturbances, including voltage transients and subcycle voltage interruptions.
- Analysis screens provide detailed information on trends, recorded events/alarms, harmonic distortion, and peak demands of current and power.
- Viewed parameters include current, voltage, power (watts, vars, and VA), energy, frequency, demand, power factor, percentage THD current, percentage THD voltage, K Factor, CBEMA derating factor, crest factor, discrete I/O status, and analog input reading.
- Easy-to-use. All programming is completed by the operator on the faceplate. A PC is not required.
- Provides true rms sensing through the 50th harmonic and displays even and odd multiples of the fundamental current and voltage through the 50th harmonic.
- Nonvolatile memory.
- Optional IMPACC communications capability.

IQ DP-4000™

A Full Function Meter Ideal for Complete System Monitoring

- Direct reading metered values including watts, watt demand, watthours, power factor, VA, VA hours, varhours, percentage THD, and load shedding.
- Other direct reading metered values include AC amperes, AC voltage, and frequency.
- Protection functions include phase loss, phase unbalance, phase reversal, overvoltage, undervoltage, and delay.
- Replaces individually mounted and wired ammeters, voltmeters, ammeter and voltmeter switches, wattmeters, varmeters, power factor meters, frequency meters, watthour and demand meters.
- Nonvolatile memory.
- Optional IMPACC communications capability.
- True rms sensing.

Breaker Interface Module

Centralized Local or Remote Monitoring and Information Display

- A communications center that monitors up to 50 Magnum DS Breakers equipped with Digitrip RMS Electronic or Programmable Trip Units.
- Can be used to program/test programmable trip units.
- Displays status, cause of trip, metered values (including current at time of trip), and energy information from each monitored device.
- Monitored locally at the switchgear or, for example, remotely at the maintenance engineer's office.
- Centralized alternative to individually mounted and wired ammeters and ammeter switches, watthour meters, circuit breaker position indicating lights, alarm contacts, and test/programmers.
- Monitors harmonic information.
- User friendly functions displayed by an LED to indicate the selected function.
- Nonvolatile memory.
- Optional IMPACC communications capability.

Clipper Power System

Transient Voltage Surge Suppression (TVSS)

- Protects sensitive equipment from the damaging effects of high and low energy transients as well as high frequency noise.
- "Zero lead length" direct bus bar connection provides superior performance when compared to conventional cable connected or nonintegrated solutions, resulting in the lowest let-through voltage in the industry.
- Highest level of filtering in the industry (55 dB at 100 Hz) removes common electrical disturbances including high and low energy ringing transients.
- Withstands over 3000 sequential Category C3 shots (IEEE C62.41 1991) with less than a five percent change in clamping voltage.
- Three levels of status monitoring.
- Standard disconnect.
- Meets UL 1449 requirements for surge suppression devices and UL 1283 for noise filtration devices.

IMPACC Communications

Highly Reliable, Comprehensive Communications that will Improve Your Operating Efficiency

Your main objective is to produce a cost-effective, high quality product or service. Several things stand in your way – unexpected equipment downtime, energy costs, reduced maintenance personnel, tighter budgets, and limited capital or cash flow. Downtime or power outage costs range from a few thousand to hundreds of thousands of dollars per hour in lost production and related costs.

How Can You Excel in this Environment?

By obtaining information and making it available in real time to the people who need to have it…provided cost-effectively in a simple format that each person can understand and utilize. You can obtain this information from your electrical distribution system with a Cutler-Hammer IMPACC System.

With Magnum DS Switchgear, for example, a master control unit is used to communicate with the breaker's Digitrip RMS 1150 Trip Unit, and other IQ devices such as an IQ Analyzer and IQ DP-4000. The master control unit may be a personal computer, an existing building management system, a programmable logic controller, or a distributed control system.

Through IMPACC, information communicated from a Magnum DS Breaker includes breaker status (open/close/trip), cause and magnitude of trip, metering values, trip rating, and time stamping of events. The breaker itself can be remotely opened or closed.

Software Solutions to Match Your Needs

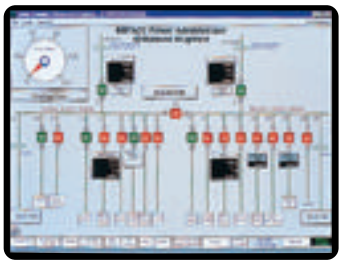
IMPACC software is available to meet specific requirements, providing for easy expansion as system requirements increase. This software ranges from simple monitoring to complex power management applications. IMPACC brings intelligence to any distribution system for energy monitoring, preventive maintenance, expert system diagnostics, and custom control applications.

IMPACC Software

IMPACC features a suite of client-server software products. Cutler-Hammer designed IMPACC specifically as a complete electrical distribution system monitoring program that includes graphical one-line and elevation displays, waveform analysis, trip curve coordination, historical trending, event and alarm management.

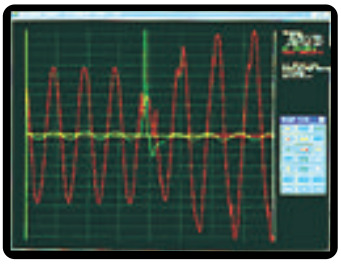
IMPACC was designed to communicate using an existing or dedicated plant TCP/IP Ethernet network. Client software will operate on Microsoft Windows NT and 95 operating systems. Server software operates on Windows NT exclusively for maximum system reliability.

ONE LINE DIAGRAM



ELEVATION DISPLAY

WAVEFORM ANALYSIS



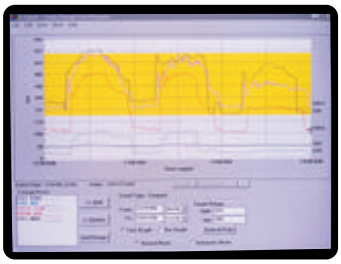
TRIP CURVE COORDINATION

E-Bill Software

E-Bill is an exclusive metering and analysis package designed to gather data for improved allocation and management of energy costs. As an enhancement to E-Bill, Cutler-Hammer offers E-Track, which provides the capability to track industrial production energy costs on a per unit basis. For those users interested in graphics, E-Trend software provides historical energy usage information in a Windows-based graphical display.

E-BILL

E-TREND

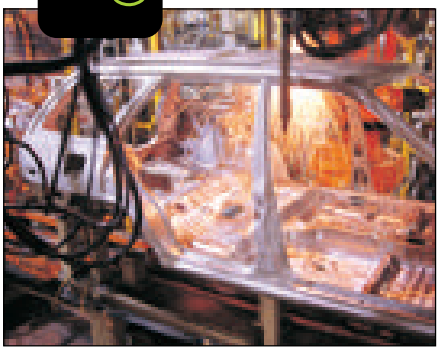


Cutler-Hammer Power for Productivity

For Greater Reliability, Increased Productivity, and Significant Cost Savings... Cutler-Hammer has the Solutions

In today's sophisticated distribution systems, providing power requires more than just meeting minimum standards. It necessitates implementation of solutions that range from efficient distribution to coordination to power quality to energy management to communications! The end result is the production of cost-effective, high quality products.

Power Quality

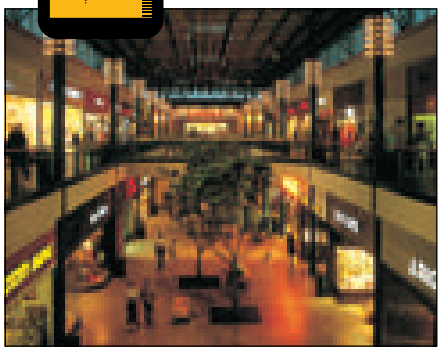


A Key to Distribution System Reliability

Nonlinear loads, momentary voltage transients, and surges can cause significant power quality problems in both industrial and commercial facilities. Many industrial processes and solid-state devices are extremely sensitive to power quality problems...and manufacturing operations can be disrupted by voltage or frequency variances. Poor power quality can result in expensive downtime and costly equipment failures. Computer data centers are very sensitive and minor power disturbances can result in downtime and significant operational problems.

The negative effect of harmonics can result in overheated neutrals in panelboards, switchboards, overheated transformers, and nuisance tripping of breakers and adjustable frequency drives.

Energy Management



Energy: If You Can't Measure It, You Can't Manage It

Energy consumption is a major operations cost for any building and a significant part of every tenant's rent. Electric utilities, reacting to increased demands, have developed programs that provide cost reductions for energy conservation...but penalize for usage during peak demand hours. Additionally, re-regulation of the utility industry is creating new opportunities to save energy and significantly reduce energy expenses.

Tenants have the option to decrease consumption if they can monitor energy usage. By reducing their consumption, peak demand charges (often a substantial portion of a building's electric bill) will be lowered, thus making the building more attractive to prospective tenants.

Decreases in energy consumption are also important in manufacturing facility departments or "lines." Many manufacturing companies are now placing the responsibility for energy budgeting at the line foreman level...and this includes calculating energy costs just the same as for labor, materials, and other direct expenses.

Cutler-Hammer Engineering Services

Enhancing Existing Equipment Reliability

Increased system loads and normal equipment wear can alter performance characteristics and introduce unexpected line variables. Cutler-Hammer Engineering Services provides a solution with skilled engineers and technicians that conduct power quality site surveys, and monitoring and evaluation studies in addition to providing maintenance

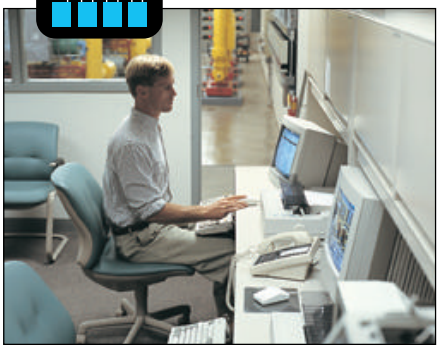
System Uptime and Reliability

If Your System's Not Up…It's Down

In today's electrical distribution systems, the demand for higher standards of protection and coordination are driven by demands for a more reliable, more accurate distribution system. A distribution system that eliminates unnecessary trips, isolates a fault to ensure minimum downtime, and provides system information to assist the user to better manage the system.

Cutler-Hammer has developed a complete family of microprocessor-based devices to meet the demands of users and designers of electrical distribution systems. Our Digitrip OPTIM Programmable and Digitrip RMS Electronic Trip Units offer circuit protection, information, integral testing, remote communications, and energy monitoring functions for low voltage breakers…while a Digitrip 1150 Programmable Trip Unit has been engineered exclusively for Magnum DS Breakers.

Information and Systems Integration



Power for Productivity

Energy costs are rising an average eight to 10 percent per year…maintenance and engineering staffs are trying to do more with less…and electrical power quality is decreasing. These situations are providing increased pressure on electrical staff personnel to improve quality.

A solution is power distribution monitoring because it provides information from the utility substation all the way down to a fractional HP motor…quickly and reliably, empowering maintenance and engineering to take control of the distribution system. Data on energy consumption, maintenance requirements, and troubleshooting are at their fingertips, providing savings in both time and money. The Cutler-Hammer IMPACC System uniquely interrogates the electrical system for necessary firsthand information and displays it with easy-to-understand software.

and retrofit services for existing equipment. A result is information that is used to assess the on-line performance of an installed power system, followed by intelligent action to keep the system on-line and productive. Cutler-Hammer Engineering Services' engineers and technicians are supported by 14 regional operation centers and over 50 satellite locations in the United States and Canada.

More Information

Visit our Website

Magnum DS is accessible on-line through the Cutler-Hammer internet site. Visit the Cutler-Hammer homepage at www.cutlerhammer.eaton.com and click on Magnum DS.

Magnum DS Literature

Additional product literature is available from your local Cutler-Hammer sales office.

- ***Magnum DS Switchgear Product Aid*** **(PA.44A.01.S.E)** – A two-page presentation of innovative switchgear design features, benefits, and ratings.
- ***Magnum DS Breaker Product Aid*** **(PA.22F.01.S.E)** –Bulletized two-page format, including unique breaker features, ratings, and dimensional data.
- ***Magnum DS Metal-Enclosed Low Voltage Switchgear Technical Data*** **(TD.44A.01.T.E)** – An in-depth presentation of switchgear ratings, application, and layout information.
- ***Magnum DS Product Guide*** **(PG.22F.01.S.E)** – Detailed material on Magnum DS functions, technology, ratings, dimensions, and ordering information.

Cutler-Hammer Sales Offices

For a detailed presentation on the additional benefits and cost savings that Magnum DS can create for you, call toll free 1 800-525-2000 or 732-417-5660 for the location and phone number of your nearest Cutler-Hammer sales office or distributor.

Cutler-Hammer, a part of Eaton Corporation, is a leader in the development and manufacturing of power distribution equipment, electrical control products, and advanced industrial automation solutions.

For more information on Cutler-Hammer products and services, call 1-800-525-2000 or 1-732-417-5660, or visit our website at www.cutlerhammer.eaton.com

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