

Cutler-Hammer Products

Low Voltage AC Power Circuit Breakers Types DSII and DSLII... The Best Has Become Better

Proven Technology with the
Enhancements and Additional
Ratings Our Customers Asked For

For over 25 years, Types DS and DSL Low Voltage AC Power Circuit Breakers have continually set industry standards for quality, reliability, and extended operating life resulting in the largest installed base of low voltage power circuit breakers.

But electrical distribution system requirements are changing...and our customers asked for enhancements that provide the capabilities of more accessories, more communications, easier wiring, and improved protection. And they emphasized that we add these enhancements without altering the breakers' proven construction and performance characteristics.

That's just what we did...and the enhanced DSII and DSLII Breakers provide exactly what our customers require. We even added new ratings to help meet their expanding distribution system requirements.

Where They're Used

DSII and DSLII Breakers are designed specifically for use in metal-enclosed low voltage switchgear assemblies applied at nominal system voltages of 208-240, 480, or 600V AC. Six continuous current frame sizes, 800 through 5,000 amperes are covered by just three breaker frame sizes.

Above 240V AC, DSII and DSLII Breakers have a short time rating that is equal to the instantaneous rating. This provides for better downstream coordination, allowing the breaker closest to the fault to trip.

DSII and DSLII Breakers are also fully interchangeable, meaning they can be placed into compartments having the same dimensions and ratings.

100 Percent Rated

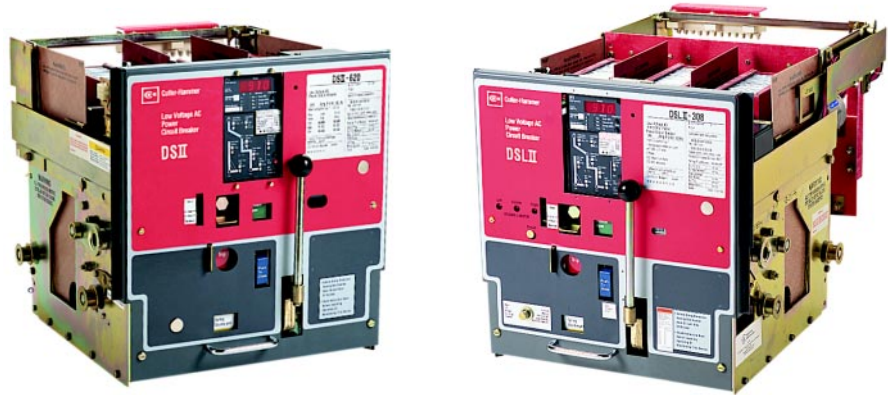
DSII and DSLII Breakers are 100 percent rated, UL listed, and are built and tested to applicable NEMA, ANSI, IEEE, and UL standards in an ISO 9001 certified facility.

Quality and Reliability

Cutler-Hammer performs consistent endurance and reliability tests on DSII and DSLII Breakers.

- **Mini-Life Tests.** Daily, a breaker is randomly selected from the production line and tested for an average 150 mechanical operations to assure performance as required.
- **Maxi-Life Tests.** MTBF testing continuously tests DSII and DSLII Breakers until they fail. This identifies any weak links in the breaker mechanism and also demonstrates how design changes improve the performance and quality of the breakers.

Ratings



Type DSII-620 Low Voltage AC Power Circuit Breaker (left) and Type DSLII-308 (right) both shown with optional Digitrip RMS 910 Trip Units.

Breaker Type	Frame Size Amperes	Interrupting Ratings, rms Symmetrical Amperes					
		With Instantaneous Trip			Without Instantaneous Trip ^{①②}		
		208-240V	480V	600V	208V-240V	480V	600V

Type DSII Circuit Breakers

DSII-308	800	42,000	30,000	30,000	30,000	30,000	30,000
DSII-508	800	65,000	50,000	42,000	50,000	50,000	42,000
DSII-608	800	65,000	65,000	50,000	65,000	65,000	50,000
DSII-516	1600	65,000	50,000	42,000	50,000	50,000	42,000
DSII-616	1600	65,000	65,000	50,000	65,000	65,000	50,000
DSII-620	2000	65,000	65,000	50,000	65,000	65,000	50,000
DSII-632	3200	85,000	65,000	65,000	65,000	65,000	65,000
DSII-840	4000	130,000	85,000	85,000	85,000	85,000	85,000
DSII-850	5000	130,000	85,000	85,000	85,000	85,000	85,000

Type DSLII Circuit Breakers

DSLII-308	800	All Types 200,000 on System Voltages 600 or Below					
DSLII-516	1600						
DSLII-620	2000						
DSLII-632	3200						
DSLII-840	4000						

① Also short time ratings.

② Short circuit ratings of nonautomatic breakers except the DSII-840 and DSII-850 which are 65,000.

Note: DSLII-308, DSLII-516, and DSLII-620 include current limiters integral with drawout breaker elements. DSLII-632 includes DSII-632 Breaker and DSLII-840 includes DSII-840 Breaker and DSLII-FT40 drawout fuse truck, in separate interlocked compartments.

Breaker Weights/Dimensions

Breaker Type	Frame Size Amperes	Dimensions – Inches			Weight – Pounds
		Height	Width	Depth	

Type DSII Circuit Breakers

DSII-308	800	18.22	18.38	21.06	150
DSII-508	800	18.22	18.38	21.06	195
DSII-608	800	18.22	18.38	21.06	200
DSII-516	1600	18.22	18.38	21.06	195
DSII-616	1600	18.22	18.38	21.06	200
DSII-620	2000	18.22	18.38	21.06	200
DSII-632	3200	29.56	18.62	21.06	300
DSII-840	4000	29.56	30.12	25.93	400
DSII-850	5000	29.56	30.12	25.93	400

Type DSLII Circuit Breakers

DSLII-308	800	18.22	18.38	29.06	200
DSLII-516	1600	18.22	18.38	29.06	260
DSLII-620	2000	29.53	18.62	29.06	275
DSLII-632 ^①	3200	29.56	18.62	19.68	325
DSLII-840 ^①	4000	29.56	30.12	24.56	430

① Breaker and drawout fuse truck in separate interlocked compartments.

Low Voltage AC Power Circuit Breakers

New Secondary Contacts Provide for More Accessories and Easier Wiring

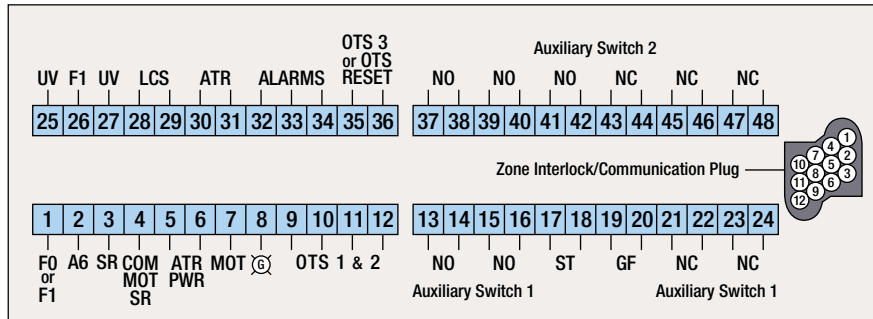
Up to 60 Contact Points and Only
One Standard Connection Drawing

The one standard connection drawing feature provides significant time savings... because a switchgear builder can prewire a harness prior to installation, making connections to the secondary and zone selective interlocking (ZSI) contacts when the breaker is being installed in the cell.

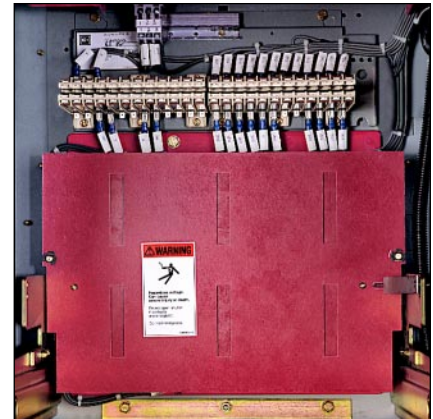
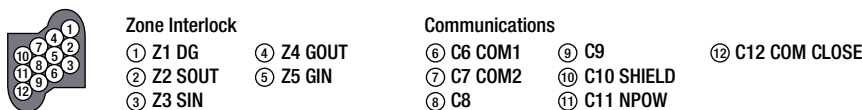
New Secondary Contacts

DSII and DSLII Breakers are now available with up to 48 points of secondary contact in modules of 12 contacts each. More secondary contacts facilitate wiring while providing for nearly twice the number of breaker accessory connections.

Standard Breaker Secondary Wiring Diagram Viewed from Front View of Switchgear Cell



Zone Interlock/Communication 12 Point Plug Detail

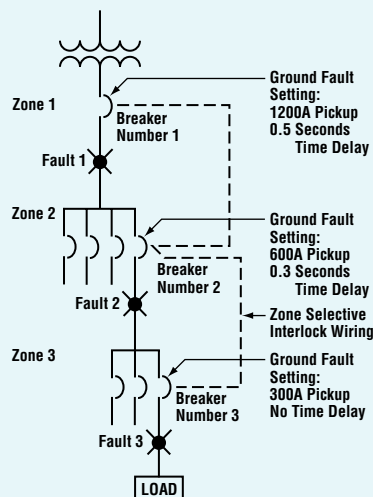


Typical Cell Can Be Prewired
and Ready to Accept DSII Circuit Breaker

A typical OEM cell shown prewired and ready to accept the breaker as delivered from the factory, assuring a positive connection of all contacts. Wiring for zone selective interlocking and/or IMPACC / PowerNet communications is connected in a pin which is easily inserted into the socket plug.

This design also provides for ease of wiring when a customer's requirements increase, requiring the addition of accessories, zone selective interlocking, or IMPACC / PowerNet communications.

Zone Selective Interlocking



Fault 1

There are no interlocking signals. The main breaker trip unit will initiate the trip instantaneously.

Fault 2

The feeder breaker trip unit will initiate the trip instantaneously to clear the fault; and Zone 2 will send an interlocking signal to the Zone 1 trip unit. The Zone 1 trip unit will begin to time out, and in the event that the feeder breaker in Zone 2 would not clear the fault, the main breaker in Zone 1 will clear the fault in 0.5 seconds.

Fault 3

The branch breaker trip unit will initiate the trip instantaneously to clear the fault; and Zone 3 will send an interlocking signal to the Zone 2 trip unit; and Zone 2 will send an interlocking signal to Zone 1.

Zone 1 and Zone 2 trip units will begin to time out, and in the event that the branch breaker in Zone 3 would not clear the fault, the feeder breaker in Zone 2 will clear the fault in 0.3 seconds. Similarly, in the event that the feeder breaker in Zone 2 would not clear the fault, the main breaker in Zone 1 will clear the fault in 0.5 seconds.

New Internal Zone Selective Interlocking Contacts

For customers whose distribution systems require the added protection of zone selective interlocking (ZSI), we placed the floating design socket plug – with 12 points of contact – internal to the breaker, next to the secondary disconnect contacts providing for ease of wiring.

Zone Selective Interlocking Provides Positive System Coordination without Time Delays

Cutler-Hammer pioneered ZSI, which allows the breaker closest to the fault to trip without any preset time delay. Through a hardwired connection between a downstream breaker's Digitrip Trip Unit and a DSII or DSLII main breaker's Digitrip Trip Unit, a restraining signal is sent upstream. This allows the breaker closest to the fault to trip instantaneously while the remainder of the distribution system remains on line, thus avoiding unnecessary and often costly downtime.

IMPACC / PowerNet Communications

The floating design socket plug is also used when customers require the highly reliable, comprehensive power monitoring capabilities provided by the IMPACC / PowerNet communications system.

Cutler-Hammer Products

Types DSII and DSLII Breakers Provide Safety, Security, and Easier Operation

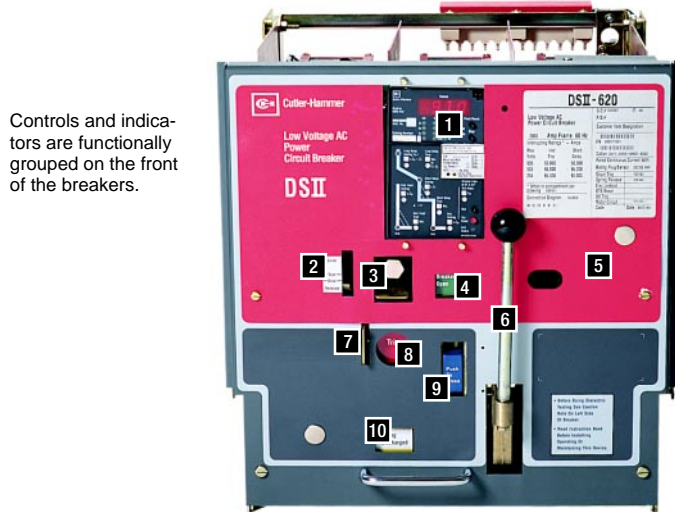
Built-In Safety Features Provide Optimum Operator Safety and System Security

- **Four position automatic mechanical interlocking system** when the breaker is in a breaker compartment.
 1. **Remove.** The breaker is nearest the front of the compartment and open with the closing springs discharged. It cannot be closed electrically or manually. It is padlockable in this position.
 2. **Disconnect.** A storage position with the breaker in the compartment but open and disconnected. It can be padlocked in place.
 3. **Test.** Main disconnects are disengaged, secondary contacts are engaged. All functions of the breaker and trip unit can be tested in this position.
 4. **Connected.** Both main and secondary contacts are connected and the breaker is ready for normal operation.
- **Deadfront faceplate shield** isolates the operator from high voltage when the breaker is energized. When the breaker is in a compartment, the compartment door acts as a double deadfront shield.
- **Padlocking provision** enables the breaker to be padlocked in a trip-free condition. The breaker cannot be closed or moved with the levering device. The padlock itself is placed in the padlock plate that extends through the front of the breaker faceplate. This helps prevent unauthorized racking and operation of the breaker.
- **Glass polyester insulation** provides sufficient mechanical strength to resist short circuit forces and is highly resistant to heat and arcing.
- **Interference interlocks** are provided to prevent insertion of breakers with mismatched disconnects or insufficient interrupting ratings into compartments carrying a higher current.
- **Electrical lockout for manually operated breakers** prevents closing of an unenergized circuit. When the circuit is energized, the breaker can be closed by pushing the push-to-close mechanism release button.
- **Closed breaker interlock** prevents operation of the spring release when the breaker is already closed.

DE-ION® Arc Extinguishers Provide Superior Arc Quenching

Cutler-Hammer developed the DE-ION arc extinguisher that assists in the interruption of high energy faults by dissipating the large amounts of arc energy. Each arc extinguisher includes a series of steel plates that attract the arc and interrupt it by cooling and stretching the arc.

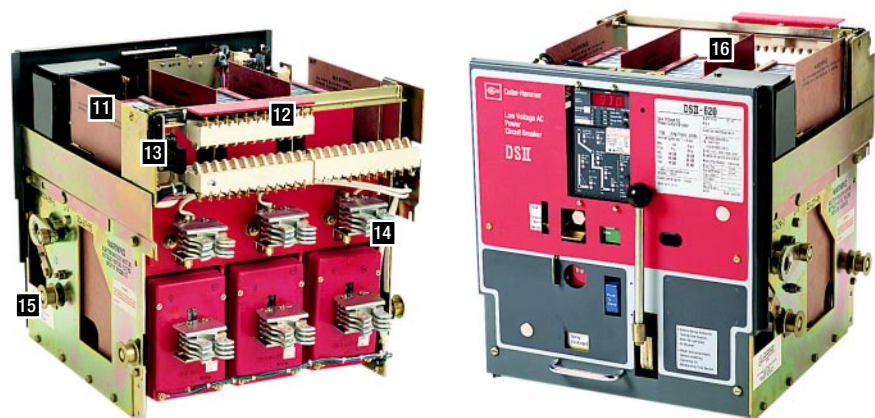
User Friendly Operation — Types DSII and DSLII Breakers



- 1 Standard Digitrip RMS Trip Unit
- 2 Drawout Position Indicator
- 3 Shutter Covering Access to Levering Shaft (Shown in Closed Position)
- 4 Open-Close Indicator
- 5 Metal Faceplate Shield
- 6 Manual Charge Handle
- 7 Padlock Plate
- 8 Push-to-Trip Button

- 9 Push-to-Close Mechanism Release Button
- 10 Spring Charge Indicator
- 11 Interphase Barriers
- 12 Secondary Disconnects
- 13 Zone Selective Interlock/IMPACC / PowerNet Communications Plug
- 14 Main Disconnects
- 15 Levering Device Arm
- 16 DE-ION Arc Chute

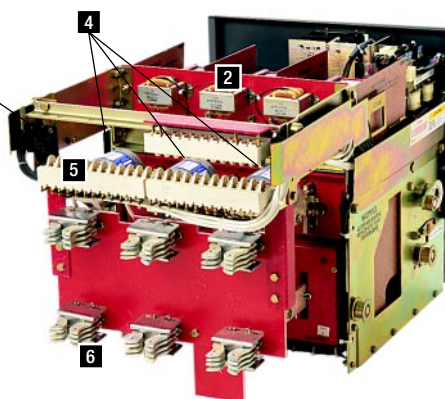
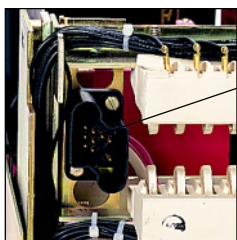
Rear and front views of Type DSII-620 Low Voltage AC Power Circuit Breaker.



Low Voltage AC Power Circuit Breakers

Types DSII and DSLII Breakers Are Simple to Inspect and Easy to Maintain

Type DSLII Circuit Breakers



- 1 Blown Limiter Indicators
- 2 Isolating Transformers for Blown Fuse Indicators
- 3 Zone Selective Interlock/IMPACC/PowerNet Communications Plug
- 4 Current Limiters
- 5 Secondary Disconnects
- 6 Main Disconnects

Extend Interrupting Ratings up to 200 kA rms Symmetrical

DSLII Breakers are a combination of series connected current limiters and standard DSII Breakers...extending the interrupting rating of DSII Breakers up to 200 kA.

Consequently, they're used on systems where the overload protection and switching functions of air power breakers are required...and available fault currents exceed the interrupting ratings of the circuit breakers alone and/or exceed the withstand and interrupting ratings of downstream circuit components.

Current Limiters Mounting

800, 1600, and 2000 Ampere Breakers: Integrally mounted in the drawout breaker.
3200 and 4000 Ampere Breakers: Mounted on separate drawout trucks that fit into compartments of equal size to their compatible breakers and are positioned adjacent to one another.

Exclusive Features

- **Fault Interruption.** On overloads and faults within the breaker interrupting rating, the breaker protects the limiters. On higher fault currents exceeding the breaker rating, the limiters protect the breaker.

With properly selected and coordinated limiters, the breaker itself will clear overloads and faults within its interrupting rating, leaving the limiters intact and undamaged. The limiters will provide fast interruption of fault currents beyond the breaker rating up to a maximum 200 kA rms symmetrical.

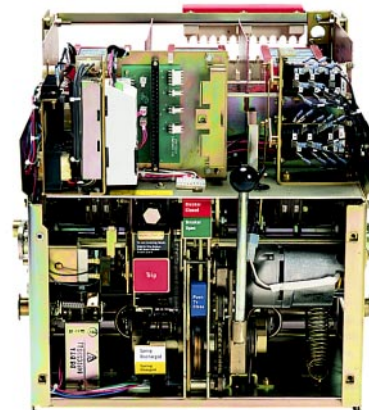
- **Single-Phasing Protection.** Interlock arrangements trip the breaker whenever any limiter blows, preventing single-phasing. The breaker cannot be re-closed on a live source unless there are three unblown limiters on the breaker.

There are three blown limiter indicators on the breaker faceplate, providing a visual indication when a limiter in any phase has interrupted a fault.

- **Safety Features.** Current limiters on Types DSLII-308, DSLII-516, and DSLII-620 Breakers are accessible only when a breaker has been completely withdrawn from its compartment. For Types DSLII-632 and DSLII-840 Breakers, current limiters are mounted on a separate fuse truck. It is key interlocked with the breaker to prevent withdrawal or insertion unless the breaker is disconnected.

Designed for Easy Access, Inspection, and Minimal Maintenance

The stored energy mechanism and control devices are easily accessible (in the remove and disconnect positions) and can be inspected by removing the front panel. Inspection, minor maintenance when required (such as lubricating the mechanism), and accessing the control components is simplified.



Additionally, many minor replacement functions involving the mechanism, control, and/or accessory devices can be easily accomplished.

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

"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.

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

On manually operated breakers, closing springs are charged by hand. For electrically operated breakers, springs are normally charged by an electric motor but can be manually charged in the absence of control power.

More Information

Further information and pricing can be found in PL.22B.01.P.E.

Cutler-Hammer Products

A Wider Selection of Trip Units Provide Expanded Protection Capabilities

Cutler-Hammer introduced the first micro-processor-based trip unit and has advanced this technology into a new family of Digitrip® RMS Electronic and Digitrip OPTIM™ Programmable Trip Units.

Digitrip RMS 510 is the standard trip unit of DSI and DSLI Breakers. It enables the user to select as many as nine phase and

ground current protection settings for maximum flexibility in trip-curve shaping and multi-unit coordination.

For more sophisticated distribution systems, other Digitrip Electronic or Programmable Trip Units may be specified to provide IMPACC/PowerNet communications, systems diagnostics information, and systems

monitoring information including power factor, voltage values, harmonic distortion values, and waveform capture.

For additional Digitrip information, contact your Cutler-Hammer distributor or sales engineer.

Digitrip RMS Electronic and OPTIM Programmable Trip Units Selection Guide

Digitrip RMS 510 is standard.

For Voltage/Rating information, refer to Page 2.

RMS 510



RMS 610



OPTIM 750



RMS 810



RMS 910



OPTIM 1050



TRIP UNIT SENSING							
rms Sensing		Yes	Yes	Yes	Yes	Yes	Yes
PROTECTION AND COORDINATION							
Protection	Ordering Options	LI, LS, LSI, LIG LSG, LSIG	LI, LSI, LIG LSG, LSIG	LSI(A), LSIG	LI, LS, LSI, LIG LSG, LSIG	LI, LS, LSI, LIG LSG, LSIG	LSI(A), LIG
	Fixed Rating Plug (I_n)	Yes	Yes	Yes	Yes	Yes	Yes
	Overtemperature Trip	Yes	Yes	Yes	Yes	Yes	Yes
Long Delay	Adjustable Rating Plug (I_n)	No	No	No	No	No	No
	Long Delay Setting	0.5-1.0 (I_n)	0.5-1.0 x (I_n)	0.4-1.0 x (I_n)	0.5-1.0 x (I_n)	0.5-1.0 x (I_n)	0.4-1.0 x (I_n)
	Long Delay Time I^2t	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds
	Long Delay Thermal Memory	Yes	Yes	Yes	Yes	Yes	Yes
	High Load Alarm	No	0.85 x I_r	0.5-1.0 x I_r	0.85 x I_r	0.85 x I_r	0.5-1.0 x I_r
Short Delay	Short Delay Setting	200-600% S1 & S2 x (I_r)	200-600% S1 & S2 x (I_r)	150-800% x (I_r)	200-600% S1 & S2 x (I_r)	200-600% S1 & S2 x (I_r)	150-800% x (I_r)
	Short Delay Time I^2t	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time Flat	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time ZSI	Yes	Yes	Yes	Yes	Yes	Yes
Instantaneous	Instantaneous Setting	200-600% M1 & M2 x (I_n)	200-600% M1 & M2 x (I_n)	200-800% x (I_n)	200-600% M1 & M2 x (I_n)	200-600% M1 & M2 x (I_n)	200-800% x (I_n)
	Discriminator	Yes ^①	Yes ^①	Yes	Yes ^①	Yes ^①	Yes
	Instantaneous Override	Yes	Yes	Yes	Yes	Yes	Yes
Ground Fault	Ground Fault Setting	25-100% x (I_n) ^②	25-100% x (I_n) ^②	20/25-100% ^②	25-100% x (I_n) ^②	25-100% x (I_n) ^②	20/25-100% ^②
	Ground Fault Delay I^2t	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Ground Fault Delay Flat	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Ground Fault ZSI	Yes	Yes	Yes	Yes	Yes	Yes
	Ground Fault Thermal Memory	Yes	Yes	Yes	Yes	Yes	Yes
SYSTEM DIAGNOSTICS							
Cause of Trip LEDs		Yes	Yes	Yes	Yes	Yes	Yes
Magnitude of Trip Information		No	Yes	Yes	Yes	Yes	Yes
Remote Signal Contacts		No	Yes	Yes	Yes	Yes	Yes
SYSTEM MONITORING							
Digital Display		No	Yes	Yes ^③	Yes	Yes	Yes ^③
Current		No	Yes	Yes	Yes	Yes	Yes
Voltage		No	No	No	No	Yes	Yes
Power and Energy		No	No	No	Yes	Yes	Yes
Power Quality – Harmonics		No	No	No	No	Yes	Yes
Power Factor		No	No	No	Yes ^④	Yes	Yes
SYSTEM COMMUNICATIONS							
IMPACC / PowerNet		No	No	Yes	Yes	Yes	Yes
FIELD TESTING							
Testing Method ^⑤		Integral	Integral	OPTIMizer, BIM, IMPACC / PowerNet	Integral	Integral	OPTIMizer, BIM, IMPACC / PowerNet

① LS, LSG only.

② Not to exceed 1200A.

③ By OPTIMizer/BIM.

④ Over IMPACC / PowerNet only.

⑤ Set by adjustable rating plug.

I_n = Rating plug rating.

I_r = LDPU setting.

I_s = Sensor rating.

BIM = Breaker Interface Module.

Low Voltage AC Power Circuit Breakers

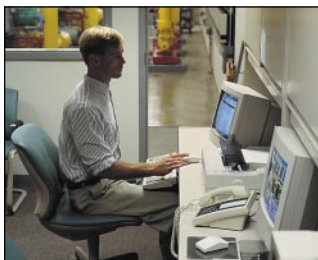
IMPACC / Power Net Communications, Breaker Accessories, and Structural Components

IMPACC / PowerNet Communications: A Highly Reliable System that Will Improve the Operating Efficiency of Your Plant or Building

As a high frequency-based system, IMPACC / PowerNet is unaffected by the electromagnetic fields that result when current flows through conductors. This helps provide for increased reliability while significantly reducing equipment and installation costs.

A master control unit (connected to the DSII or DSLII Breaker with a shielded twisted pair communications wire) is used to monitor, control, and communicate with the breaker's Digitrip RMS Trip Unit. The master control unit may be a personal

On-Site Location



Off-Site Location



computer, an existing building management system, a programmable logic controller, or a distributed control system.

Through IMPACC / PowerNet, information communicated from a DSII or DSLII 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.

For additional IMPACC / PowerNet information, contact your Cutler-Hammer distributor or sales engineer.

A Full Range of Factory Installed Breaker Accessories

- **Electrical Operator.** A universal type electric motor, internal to the breaker, that charges the springs automatically.
- **Shunt Trip for Manually Operated Breakers.** Provides remote controlled tripping.
- **Undervoltage Release – Instantaneous.** Trips the breaker instantaneously when voltage on its coil falls between 30 to 60 percent of normal.

- **Undervoltage Release – Time Delay.** Provided with a nonadjustable time delay that prevents the breaker from tripping during momentary fluctuations of system voltage.
- **Auxiliary Switches.** Provide the capability to remotely indicate if the breaker is open or closed and may be used on breakers with either manually or electrically operated stored energy mechanisms.
Two types of auxiliary switches are available: 2A/2B switches have two

normally open and two normally closed contacts. 5A/5B switches have five normally open and five normally closed contacts.

- **Operation Counter.** A mechanical counter that provides a record of the number of breaker operations.
Contact your Cutler-Hammer distributor or sales engineer for a complete list of accessories.

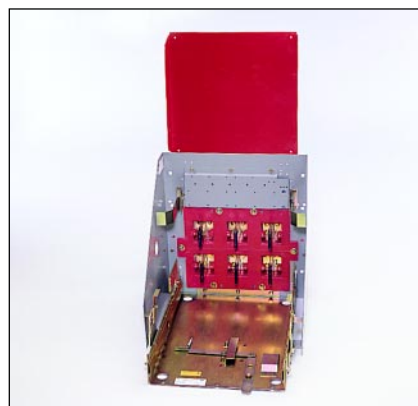
Low Voltage Switchgear Structural Components



DSII Power Modules

Complete structures including fully equipped breaker compartments. The switchgear manufacturer provides value-added items such as doors, bus, cable area compartment, instruments, relays, and associated wiring.

The Cutler-Hammer value-added modular approach for assembling low voltage switchgear featuring DSII Breakers and structures provides switchgear manufacturers



DSII Substructure

The basic assembled breaker supporting structure including breaker mounting pan, contact mounting plate, stationary main contacts, drawout extension rails, and side and back sheets. The switchgear manufacturer provides value-added items such as doors, bus, cable area compartment, instruments, relays, and associated wiring.

with opportunities to add the most value to their low voltage switchgear. For more information refer to PL.44B.04.P.E.



DSII Breaker Cell Parts

Breaker mounting pan, contact mounting plate, and stationary main contacts. In addition to assembling these parts, the switchgear manufacturer provides value-added items such as doors, bus, cable area compartment, side sheets, instruments, relays, and associated wiring. Breaker cell parts are available individually or as an entire kit.

Cutler-Hammer, a part of Eaton Corporation, is a worldwide leader providing customer-driven solutions. From power distribution and electrical control products to industrial automation, Cutler-Hammer utilizes advanced product development, world-class manufacturing, and offers global engineering services and support.

For more information on Cutler-Hammer products, call 1-800-525-2000 or 1-630-377-9738, for engineering services call 1-800-498-2678, or visit our website at www.cutlerhammer.eaton.com



Cutler-Hammer

Pittsburgh, Pennsylvania U.S.A.

Publication No. B.22B.01.S.E
February 2001
Printed in U.S.A. / CMS 2159

EAT•N