

# Safety, reliability and performance under critical conditions

Eaton Heinemann Hydraulic-Magnetic Circuit Breakers



**Eaton Heinemann Hydraulic-Magnetic Circuit Breakers offer the most reliable, stable and accurate means of protecting your electrical equipment against overload or short-circuit, without creating nuisance tripping.**

Invented by Heinemann, and first patented in 1932, Eaton Heinemann hydraulic-magnetic circuit breakers will reduce your total cost of ownership by eliminating downtime caused by nuisance tripping, and optimizing the cross-section of cables.

The results are optimized performance, an enhanced reputation for your business, and improved profitability.

## Features

- Broad range of electrical protection from 0.02 to 1,200 amperes
- Choice of sizes
- Fixed current tripping value from -40°C to +80°C
- Compliance with major approvals and certifications

## Benefits

Eaton Heinemann circuit breakers avoid nuisance tripping caused by:

- High starting current on motor start or capacitive circuits
- Derating of tripping value due to ambient T° variations
- Interference caused by long wiring acting as an antenna
- Shock and vibration
- Long service life

## Choose your best protection

The wide choice of options offered by Eaton Heinemann hydraulic-magnetic circuit breakers means you can find the ideal protection for your specific equipment.

## Options comprise:

- Instantaneous, short, medium or long tripping curve
- Standard InRush level of 8x, 15x, 22x nominal current at 50Hz and 8x, 18x, 25x at 60Hz
- Series trip, shunt, relay, dual control, dual rating, switch-only circuits
- Auxiliary contact one circuit breaker's pole in many configurations such as single (SPDT), double (DPDT) and can be protected or not
- Mid-Trip option available for all series. This option puts the handle on horizontal position when circuit breaker is triggered electrically

## You can also choose:

- Size
- Internal circuits
- Handle's size, length, color (with possible LED illumination on AR series)
- Markings
- Terminals

## Customization

Eaton Heinemann's in-house development and production capabilities enable customization to meet your specific application, including integrated customized busbars or specific terminals.

Our application engineers can also provide expert advice on even the most challenging circuit protection choices and customized solution developments.

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Powering Business Worldwide

# Eaton Heinemann Hydraulic-Magnetic Circuit Breakers



SERIES		JS	AR / AMP	ADS (DIN)	C	GH	GJ	GJ1P
<b>Maximum number of poles</b>		4 poles	4 poles, 3 poles in //	4 poles	6 poles	3 poles	3 poles	6 poles in //
<b>Electrical characteristics</b>								
Rating		DC: 0.1 - 50A AC: 0.1 - 30A	DC (AR series): 0.1 - 100A DC (AP series): 101 - 300A AC (AR series): 0.1 - 100A	DC: 0.1 - 63A AC: 0.1 - 63A	DC: 0.1 - 120A AC: 0.1 - 100A	AC: 15-100A DC: 15-100A	AC: 100 - 250A DC: 60-250A	DC: GJ1P: 100 - 700A (160Vdc) DC: GJ1P: 701 - 1200A (65Vdc)
Voltage range		DC: up to 80 Vdc AC: up to 415 Vac	DC: 125 Vdc AC: 480 Vac	DC: 80 Vdc AC: 480 Vac	DC: 125 Vdc AC: 600 Vac	DC: 160/250 Vdc AC: 480/600Vac	DC: 125/250 Vdc AC: 240 Vac	DC: 65/160Vdc
Breaker ratings	UL rating	32/65 Vdc: 50A	80 Vdc: 100A (300A)	80 Vdc: 63A	65 Vdc: 120A	250 Vdc: 100A	250 Vdc: 250A	65 Vdc: 1200A
		72/80 Vdc: 30A	125 Vdc: 50A	400V 50/60 Hz: 63A	125 Vdc: 100A	480 Vac 100A	240V 60Hz: 250A	160 Vdc: 700A
		250/277V 50/60Hz 30A	250V 50/60/400 Hz: 100A	480V 50/60 Hz: 30A	240V 50/60/400 Hz: 100A		240V 400Hz : 250A	
		415V 50/60 Hz: 30A	277V 50/60 Hz: 50A		277V 50/60 Hz: 100A			
		240/400V 400Hz 30A	415V 50/60 Hz: 50A		480V 50/60 Hz: 100A			
			480V 50/60 Hz: 30A		600V 50/60 Hz: 77A			
	DIN EN rating	230/400V 50/60Hz : 25A 65Vdc 50A 80Vdc 30A	AR DC: 100A AR 50/60Hz: 100A AP : 65Vdc 200A	80Vdc 0,1-63A	230/400V 50/60Hz : 0,1 -100A 125Vdc 0,1-100A			
Interrupting capacity	UL rating	32 Vdc: 5 kA	80 Vdc: 7.5 kA	80 Vdc: 5 kA	65 Vdc: 5 kA	250Vdc 14kA (UL489)	65 Vdc: 100 kA	65 Vdc: 100 kA
		72 Vdc: 2.2 kA	125 Vdc: 5 kA	250V 50/60 Hz: 5 kA	125 Vdc: 5 kA	480Vac 14kA (UL489)	125/250Vdc: 10 kA	160Vdc: 10 kA
		80 Vdc: 1.5 kA	250V 50/60 Hz: 5 kA	480V 50/60 Hz: 3 kA	240V 50/60 Hz: 7.5 kA		240 Vac: 10 kA (1 pole)	
		250V 50/60 Hz: 5 kA	277V 50/60 Hz: 5 kA		277/480V 50/60 Hz: 5 kA	480V ac/dc 10 kA (UL 508)	240 Vac: 18 kA (2-3 poles)	
		415V 50/60 Hz: 1.5 kA	415V 50/60 Hz: 5 kA		600V 50/60 Hz: 5 kA	600V ac/dc 10 kA (UL 508)	240V 400Hz : 1kA	
		240V 400 Hz: 1kA	480V 50/60 Hz: 3 kA		240V 400 Hz: 5 kA			
	DIN EN rating	230/400V 50/60Hz : 1kA 65Vdc 1.5kA 80Vdc 1.5kA	AR DC: 10kA AR 50/60Hz: 5kA AP series (DC) : 10kA	80Vdc 3kA	230/400V 50/60Hz : 4kA 125Vdc 5kA			
Dielectric strength					3'750 Vac 50/60 Hz			
Insulation resistance		100 MOhm @ 500 Vdc			100 MOhm @ 470 Vdc		100 MOhm @ 470 Vdc	
<b>Trip specification</b>								
Trip options		Series, shunt, relay, remote trip off (Ducon), switch, dual-rating		Series, remote trip off (Ducon), relay, switch	Series, shunt, relay, remote trip off (Ducon), switch, dual-rating			Series, remote trip off (Ducon)
Trip delay		Instantaneous, short, medium, long delay, motor start						
High inrush		50Hz : 8x, 15x, 22x In    60Hz : 10x, 18x, 25x In						60Hz : 10x, 25x In
<b>Operating conditions, standards and approvals</b>								
Operating temperature		-40°C to +85°C (-40°F to +185°F)						
Shock		IEC 60068-2-27, MIL-STD-202 method 213						
Vibration		IEC 60068-2-6 MIL-STD-202 method 204						
Humidity		IEC 60068-2-78, MIL-STD-202 method 103						
UL/CSA Approvals		UL1077, UL489A, CSA C 22.2	UL1077, UL489, UL489A, CSA C 22.2	UL1077, CSA C 22.2	UL1077, UL489, UL489A, UL508, CSA C 22.2	UL489, UL508	UL1077, UL489, UL489A	UL1077, UL489, UL489A
Other approvals		DIN EN 60934/60947-2, CCC	DIN EN 60934/60947-2, CCC	DIN EN 60947-2, CCC	DIN EN 60947-2			
Approvals - Rail		NFF, IEC, ASTM, Bombardier SMP, Boeing BSS, SNCF			NFF, ASTM, Bombardier SMP, Boeing BSS			
Auxiliary contacts		SPDT, DPDT, protected or not-protected		SPST	SPDT			
Mid trip		Optional						
<b>Physical characteristics</b>								
Poles		1 to 4 poles			1 to 6 poles	1 to 3 poles	1 to 3 poles	1 to 6 poles
Dimensions WxHxD (per pole)		19 x 51 x 49.5 mm	19 x 63.5 x 67 mm	19 x 105 x 73 mm	26 x 147.5 x 85.73 mm	35x152.4x104.4 mm	38.1 x 181 x 109.6 mm	38.1x264x107.5 mm
Weight / pole		65 grams	95 grams	145 grams	262 grams	500 grams	850 grams	1130 grams (2 poles)
<b>Mounting, Handle, Terminals</b>								
Mounting styles		Front, Snap-in, DIN adapt	Front, Snap-in	35mm DIN rail	Front, Rear	Front, Rear	Front, Rear	Front, Rear
Handle		Toggle, rocker, metal sealed	Toggle, illuminated toggle, rocker, flat rocker	Toggle	Toggle	Toggle	Toggle	Toggle
Power terminals		Fast-on, screw terminals, PCB	Bullet, stud, fuse or screw terminals	Pressure wire terminal	Screw terminals (CD), pressure wire terminal (CF)	Pressure-wire terminals	Pressure wire, stud, threaded inserts	Solderless connector, bus bar
Power connection		Rear	Rear	Top and bottom	Front or rear	Front or rear	Front or rear	Front or rear

**Note:** Technical information may differ by product variation, please contact your Eaton representative for more detailed information. In the interests of continual product improvement all specifications are subject to change without notice.

## How does the technology works?

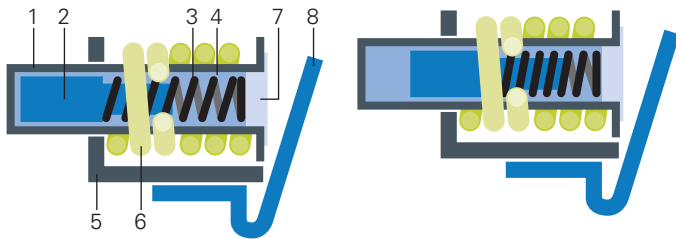
In the event of overload, the magnetic flux force increases. This pulls the iron core (2) into the coil (6) and towards the pole piece (7), and attracts the armature (8).

The silicone oil (4) and spring (3) regulate the core's speed of travel, creating a controlled trip delay that is inversely proportional to the magnitude of the overload.

If the overload current subsides before the core reaches the pole piece, the spring (3) returns the core to its original position and the breaker does not trip. However, if the magnetic flux reaches a predetermined value, the armature is attracted to the pole piece and the breaker trips.

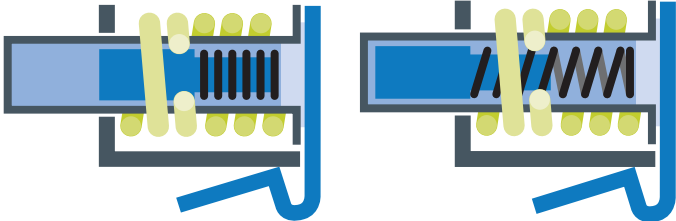
The breaker may trip before the core reaches the pole piece if the critical flux value is reached first.

On very heavy overloads, or short circuits, the flux produced is sufficient to pull in the armature regardless of the core position. This provides the valuable benefit of immediate circuit interruption with no intentional delay.



Circuit breaker with no load

Circuit breaker slightly overloaded



Circuit breaker overloaded

Circuit breaker severely overloaded

Hydraulic-magnetic circuit breaker parts:

1. Tube 2. Core 3. Spring 4. Fluid 5. Frame 6. Coil (sensor)
7. Pole piece 8. Armature

## Contacts:

For North America: [www.eaton.com/HMCB](http://www.eaton.com/HMCB)

For rest of the world: [www.eaton.eu/HMCB](http://www.eaton.eu/HMCB)

For more information please contact [AlexandreZint@eaton.com](mailto:AlexandreZint@eaton.com)

## Complementary technology

### Remote Breaker Reset:

The remote reset of Eaton Heinemann Hydraulic-Magnetic Circuit Breakers enables you to:

- Reduce operating costs by remote control of the breaker
- Optimize space for more passenger comfort, by delocalization of the function outside the coach
- Optimize weight, size and cost of the function by replacing solutions comprising contactors, motorized switches and protection devices
- Reduce downtime thanks to reset capability on powered circuit, and no-risk reset on short circuit

### Remote Breaker Reset (RBR) operation



Circuit Breaker closed (protected circuit is powered)



it Breaker opens (current is cut in the protected circuit)



RBR rests Signal pulse sent to RBR for reset instruction: RBR actuates the Circuit Breakers handle



RBR Back to initial configuration (by gravity)

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