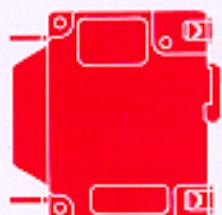


Heinemann®

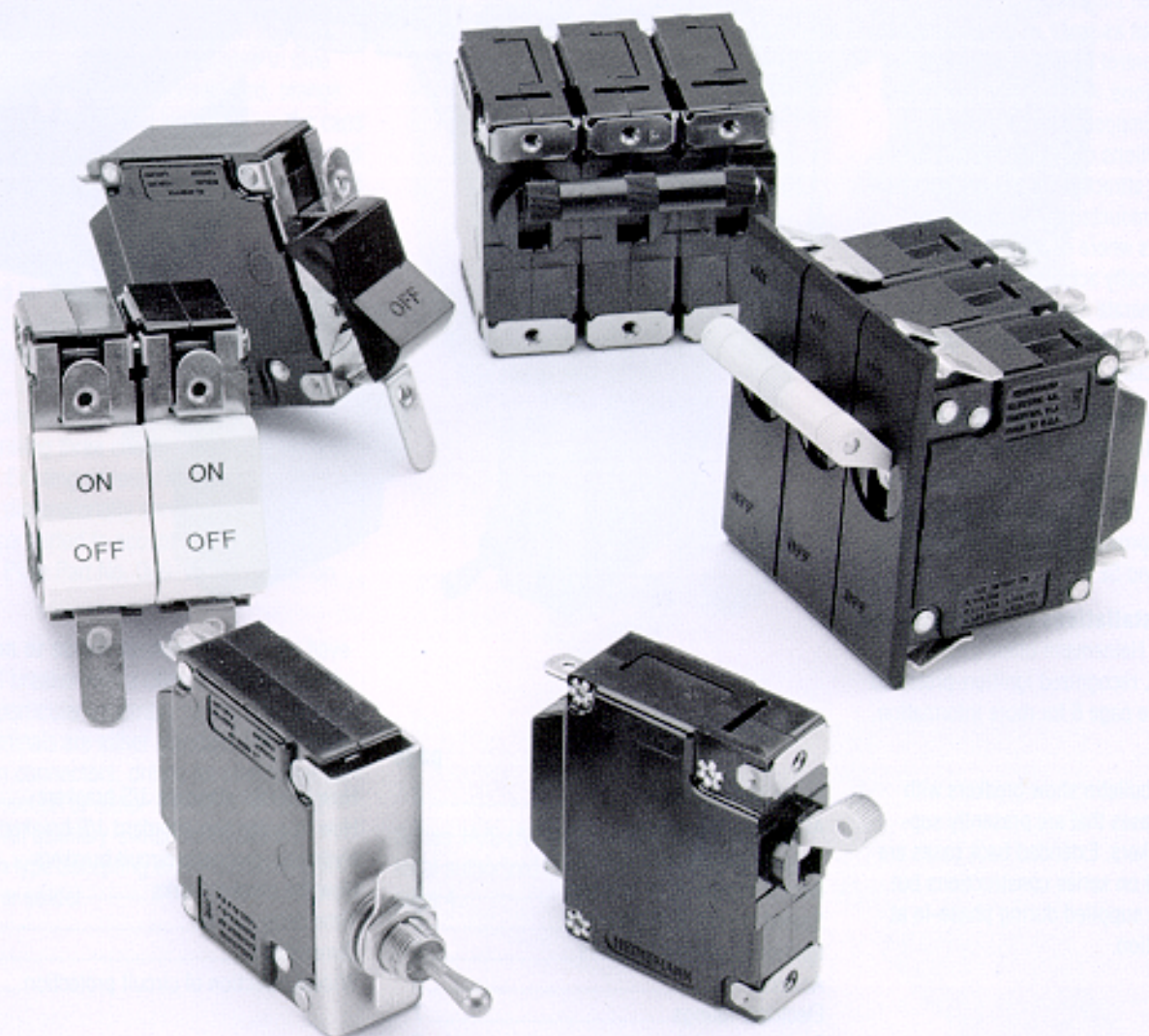
Circuit Breakers

EATON



Series J/S

- Small, lightweight, hydraulic-magnetic
- UL recognized, CSA certified
- VDE approved to 0660 and 0806, IEC 380
- SEV approved
- Available for marine applications
- Ratings: 0.02 to 50 A



Bulletin JS

No wonder they are so popular with O.E.M.'s...

Versatile J/S circuit breakers for domestic, world-class and marine applications

Low-cost Heinemann "J" magnetic circuit breakers have long been the O.E.M. designer's first choice. Whether your product requires a simple single-pole circuit breaker for on/off switching with overcurrent protection, or a multi-pole breaker with built-in auxiliary functions for alarm or control purposes, chances are you'll find what you need in the expanded Heinemann Series J/S.

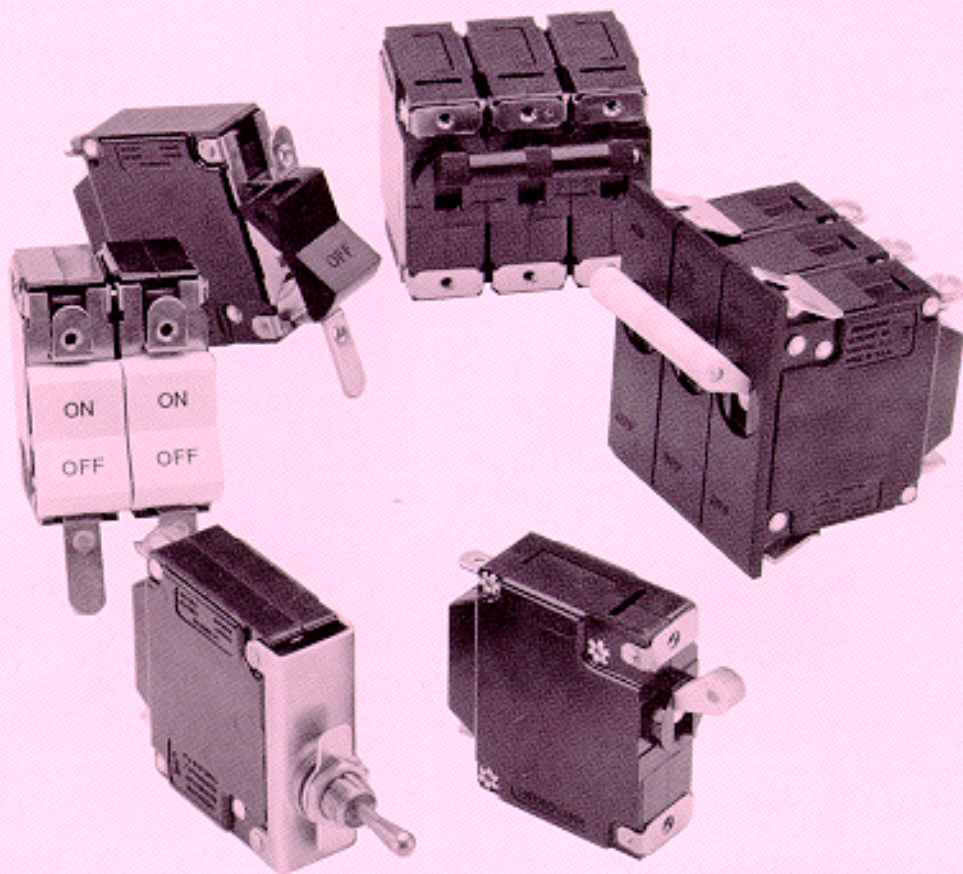
Small, lightweight Series J/S circuit breakers are especially well suited for use where equipment must be kept as small as possible, such as in crowded control panels or in portable or military applications. Additionally, Series J/S circuit breakers impose minimum panel-mounting restrictions on the designer. While they are visually attractive for use on front panels, they can be mounted out of the way in cramped quarters where necessary. Because they are magnetically actuated, Series J/S circuit breakers generate negligible heat under load and may be installed as close together as requirements dictate.

Suitable for domestic or world market applications, the Series J/S (to 30 A ac, to 50 A dc) are UL recognized as supplementary protectors under UL 1077 and CSA certified as components. Approvals include VDE 0660 and 0806, IEC 380 and SEV.

For marine installations in closed areas near a fuel-line joint, Heinemann offers circuit breakers with UL recognized ignition-protected construction. See page 6 for more information.

Note:

Pictures in this bulletin show breakers with extended back cases that are presently supplied on all breakers. Extended back cases are being eliminated on series constructions but may possibly be supplied during phase-in at Heinemann's option.



Contents

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Ignition-protected breakers	6	Dimensions	17
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Series JA/S breakers

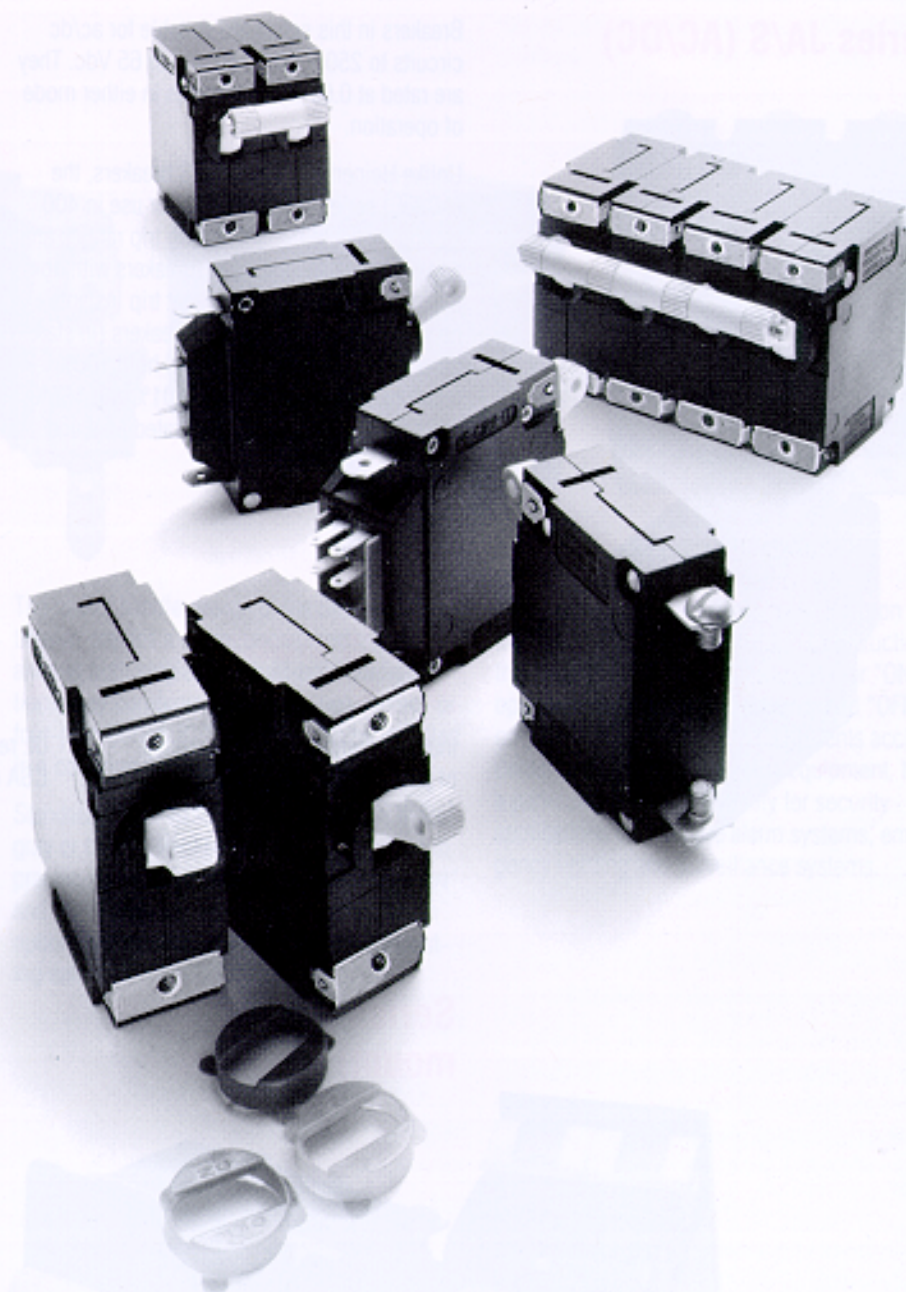
The basic breaker in the Heinemann "J/S" family is the Series JA/S. These breakers have found broad acceptance in applications such as O.E.M. power supplies, control systems and EDP equipment. They are available in one-, two-, three- and four-pole models. The number of poles is indicated by replacing the "/" with the number. For example, a three-pole breaker in this series would be designated as JA3S.

A widely used and immediately available version of the Series JA/S, stocked in quantity by Heinemann authorized distributors, is the JA/S (AC/DC). See page 4 for details and simplified ordering instructions.

"Instant" color-coding. Snap-in color caps add much to the attractiveness and utility of Heinemann JA/S breakers. Available in nine standard colors — black, brown, red, orange, yellow, green, blue, gray and white — the caps can serve both as decorative panel accents and as a means of color-coding breaker-controlled circuits.

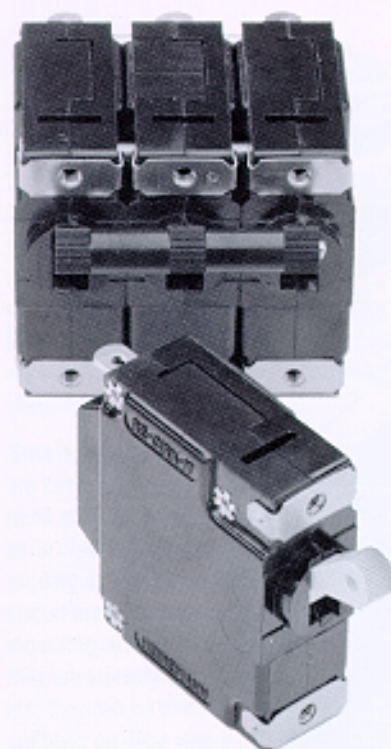
Easy installation. The Series JA/S breaker is designed for fast, easy panel mounting. Its round boss eliminates square cuts during panel fabrication as required by most other breakers, thus reducing production time. Cutout preparation is a simple matter of punching or drilling three common-center holes per breaker. Existing panels that have been cut to fit other dimensionally similar breakers can be readily converted to accept the JA/S with the Adapter Plate Part No. 009-18091 shown on page 6.

Quick-on or screw terminals. You can have the JA/S breaker with a choice of terminals to fit your particular assembly needs. The line and load terminals are either standard 1/4 in. male quick-on connectors, drilled for alternative solder connection or either #8-32 or #10-32 screws. All auxiliary-switch terminals are quick-on type accepting either quick-on connectors or solder.



Need standard circuit breakers in a hurry?

Series JA/S (AC/DC) are available from your local authorized Heinemann Distributor. See page 4.

Series JA/S (AC/DC)

Breakers in this series are suitable for ac/dc circuits to 250 V 50/60 Hz and to 65 Vdc. They are rated at 0.02 to 30 amperes in either mode of operation.

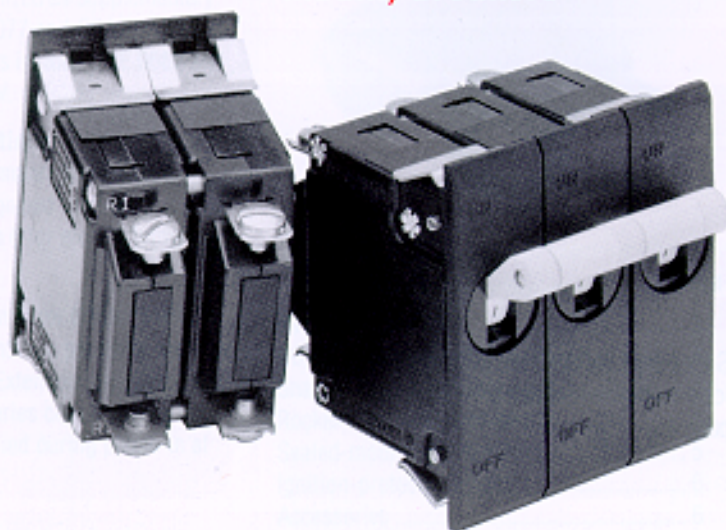
Unlike Heinemann's basic J/S breakers, the (AC/DC) series is not suitable for use in 400 Hz applications. For time-delay trip ranges and non-time-delay trip ranges (breakers with no deliberately imposed delay that trip instantaneously as specified), these breakers (in standard wall-mount position) shall hold 100% rated load; may trip between 101% and 135% rated load; must trip at 135% rated load and above.

Stock breakers immediately available

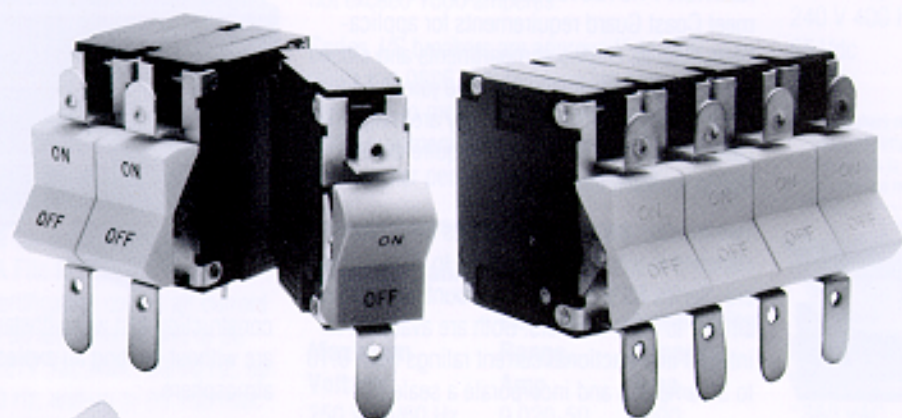
Standard 1-, 2- and 3-pole Series JA/S (AC/DC) circuit breakers are immediately available from stock or at your local authorized Heinemann Distributor. Multi-pole JA/S (AC/DC) breakers contain a white toggle handle on each pole with the handle tie furnished as a kit. They have 6/32 std. UNC mounting clips and a voltage rating of 250 Vac/65 Vdc.

How to order:

JA — S	—	D3	—	A	—	20	—	2
Indicate number of poles: 1, 2 or 3		Frequency: ac/dc D3 — push-on terminals, series trip		UL recognized CSA certified		Current ratings available: 1, 2.5, 5, 7.5, 10, 15, 20, 25 30		Time delay curve 2-medium 3-short

Series JB/S (snap-in mount) breakers

Snap-in installation of the Heinemann Series JB/S circuit breaker through a rectangular cutout eliminates the need for special installation hardware or tools. This installation flexibility allows a virtually unlimited number of units to be snapped side-by-side into a single opening while maintaining constant pole spacing. As a result of the snap-in feature, the front escutcheon of the JB/S is free of mounting holes and has a clean, matte finish which harmonizes with contemporary consoles. It is available in one-, two-, three- and four-pole models (JB2S designates two poles).

**Series JC/S
(rocker handle) breakers**

The rocker handle design of the Series JC/S breaker creates a clean, uncluttered appearance in both single and multi-pole configurations. Any combination of one-, two-, three- or four-pole Series JC/S breakers can be installed in a common panel cutout.

Standard rocker handles are available in white, gray or black. Handles can also be supplied in practically any custom color desired. The "ON" and "OFF" legends are recess-molded; as an option, the legends can be filled in a contrasting color.

"ON" only operation. An optional version of the Series JC/S utilizes modified construction that provides manual switching only for "ON" operation; the breaker can be switched "OFF" only by electrical means. This prevents accidental or deliberate shut-off of equipment. It is a particularly useful capability for security applications such as fire alarm systems, emergency lighting and surveillance systems.

**Series JE/S
(sealed-mount) breakers**

The Series JE/S breaker is well suited for use in environments where water spray and splash exist, such as in marine equipment.

A molded-in-place silicon rubber seal surrounding the bat-type handle effectively prevents water entry. The panel cutout itself is sealed, too, by a captive O-ring at the base of the breaker's threaded gland bushing. The Series JE/S has a vented case, however, and is not intended for service where a totally sealed

breaker is required. (For circuit breakers with ignition-protected construction for marine use, see page 6.)

The Series JE/S is easy to install. All that's needed is a single drilled hole. A lock washer and the captive O-ring provide a firm pressure-tight fit when the hex nut is tightened. A bright-metal ON/OFF switchplate is supplied as standard. The Series JE/S is available in one-, two- and three-pole models.

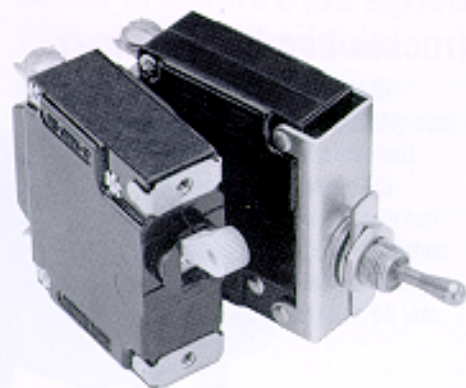


Series MAS and MES ignition-protected breakers



Heinemann ignition-protected circuit breakers are specially designed for use aboard gasoline-powered marine craft. They are designated IGNITION-PROTECTED under UL 1500 and meet Coast Guard requirements for applications such as engine compartments and closed areas containing nearby fuel-line joints. Like all the breakers in this bulletin, they are magnetically actuated so they do not require derating due to ambient temperature.

Two models are available. Series MAS has standard toggle handles similar to JA/S breakers. Series MES has sealed-mount bat handles similar to JE/S breakers. Both are available in integral and fractional current ratings from 0.10 to 30 amperes and incorporate a sealed



construction that will withstand an internal arc without igniting an explosive external atmosphere.

Accessories



Color Caps for Series JA/S Breakers

Color caps for Series JA/S models are packaged separately in the breaker box, one cap per pole. They are available in nine colors as shown in the following table:

Color	Catalog Number
Black	121-76002
Gray	121-76004
Red	121-76005
Green	121-76006
Blue	121-76007
White	121-76008
Yellow	121-76009
Brown	121-76012
Orange	121-76013



Protective Shield

Cat. No. 006-10211 for single pole;
006-10244 for double pole;
006-10245 for three pole.

This tough, transparent flexible boot seals the panel opening around the Series JA/S handle against environmental contamination without hindering operation. Boots and color-coded caps can be used together.



JA/S Adapter Plate Kit No. 009-18091

This kit adapts panels cut for Heinemann Series AM1 or AM12 breakers to accept Series JA/S models. Order one kit per pole. Plate fastens to panel with two customer-supplied #6-32 screws.



Screw-Type Connectors Kit No. 009-18056

Used to convert quick-on line and load terminals to screw-type, this kit contains two quick-on female connectors with screw termination. This method is an alternative to ordering standard screw terminals.

Note:

Customer-supplied crimp-on connectors such as ARK-LES Quick-connect female #3000H9AB; AMP, Inc. Faston Female #41202, or equivalent may be used for currents up to 20 amperes. For 20- to 30-ampere service, Hoffman Industrial Products female #DF-1210T-250 or equivalent is recommended.

Electrical ratings

Standard maximum voltages.
250 V at 50/60 and 400 Hz, 65 Vdc.

Current ratings. Any integral or fractional value from 0.020 to 50 amperes, ac or dc. See table for a complete list of current ratings at various voltages.

Interrupting capacities. See table.

UL and CSA recognition. Single-, two- and three-pole breakers in Series JA/S, JB/S, JC/S and JE/S are recognized by Underwriters Laboratories as supplementary protectors per UL Standard UL-1077 (UL File No. E-67155), and certified by the Canadian Standards Association in CSA File No. LR-9646-46. Recognition and certification covers all current ratings from 0.1 to 30 amperes ac and to 50 amperes dc, up to 277 Vac max., 50/60 Hz; up to 240 V max., 400 Hz; and up to 65 Vdc max. UL recognition and CSA certification at 415 volts, 50/60 Hz, refers to three-pole models used only in a three-phase wye-connected circuit and backed up with a Heinemann Series CD3 or CD4 480 V 100 A breaker as group controller, providing an interrupting capacity of 1500 amperes.

Environmental data

Heinemann Type J/S circuit breakers are designed to meet the requirements of MIL-C-55629.

Fungus and moisture resistance is provided by treating all ferrous parts with a special moisture-resistant finish and by using special springs and fungus-resistant phenolic cases, covers and handles. Tested for moisture resistance per MIL-STD-202, Method 106; tested for salt-spray resistance per MIL-STD-202, Method 101.

NOTE: Where environment contains concentrations of dirt, grit, dust, pumice or corrosive chemicals, Type J/S breakers should be housed in suitable enclosures.

Humidity. Tested in accordance with MIL-STD-202, Method 103, test condition A.

Shock and vibration. Tested for shock in accordance with MIL-STD-202, Method 213, test condition I (100 G's at 6 milliseconds). Tested for vibration in accordance with MIL-STD-202, Method 204: 10 to 500 Hz, 10 G's, 0.06" total excursion on three mutually perpendicular planes. Vibration tests are conducted

When properly installed as original equipment, the combination of Series J/S and CD or CF breakers requires no additional protection. Series J/S breakers rated 65 Vdc max. provide both over-current and short-circuit protection where the current interrupting capacity does not exceed 1000 amperes.

Series J/S breakers are approved* to VDE 0660 and 0806. J/S breakers are also designed to meet the requirements of IEC 380, VDE Equipment Safety Standard 0806 and circuit breaker performance spec. 0660.

*See chart on page 8 for approved constructions.

Available Ratings

Maximum Voltage	Current Range, Amp	Interrupting Capacity, Amp
250 V 50/60 Hz	0.020-50	1000
125 V 50/60 Hz	0.020-50	2000
250 V 400 Hz	0.100-50	1000
125 V 400 Hz	0.200-50	2000
65 Vdc	0.020-50	1000
80 Vdc	0.020-15	1000

with breakers carrying full-rated current. Shock and vibration specifications apply to time-delay breakers only.

Operating temperature. -40°C to +85°C.

Dielectric strength. Tested in accordance with MIL-STD-202, Method 301: 1500 V, 50/60 or 400 Hz, 1100 Vdc (or twice rating plus 1000 V). Meets VDE requirements of 3750 V.

Insulation resistance. 100 megohms minimum at 500 Vdc, per MIL-STD-202, Method 302.

Endurance. 50/60 Hz breakers are subjected to an endurance test consisting of 10,000 on/off operations; 6000 at rated current and voltage, 4000 at no load.

Approximate weights. J/1S: 2.5 oz., J/2S: 5 oz., J/3S: 7.5 oz., J/4S: 10 oz.

Notes:

- Specify voltage-rated coils separately.**
Example: Catalog Number JA1S-A5. Voltage coil, intermittent-duty, trips on voltage specified, Curve P.

UL-Recognized Ratings

Maximum Voltage	Current Range, Amp	Interrupting Capacity, Amp
277 V 50/60 Hz	0.1-30	5000*
415 V 3 ϕ y50/60 Hz	0.1-30	1500**
240 V 400 Hz	0.1-30	1000*
65 Vdc	0.1-50	1000***
80 Vdc	0.1-15	1000***

* AC breakers require four times rated series fusing using K5 fuses (15 Amp minimum)

** See details in text above

***DC units do not require back-up fusing

VDE Approved Ratings

Current Maximum Voltage	Range, Amp	Interrupting Capacity, Amp
*380 VAC	.1-25	1500
65 VDC	.1-25	1000

* 380 VAC is European equivalent to domestic 250 VAC. J/S breakers will be labeled 250 VAC max.

- Relay-trip poles.** Always specify load values for coil and contacts separately. Standard contact rating supplied is 30A. Example: Catalog Number JA1S-B6; coil 5 amp 65 Vdc, Curve 3; contacts 30 amp 250 V 50/60 Hz. Does not apply to VDE construction.
- UL/CSA models** are labeled with the UL/CSA-rated voltage. The catalog number on the breaker label will contain a special suffix A, L or AD indicating a UL/CSA model. See Table F on page 9.
- VDE** - Approved breakers are marked with the VDE registration #223 for Series J/S breakers.
- If voltage is rectifier-produced dc**, furnish separately: (a) Full- or half-wave rectification, (b) number of phases, (c) filtered or unfiltered. If filtered, give ripple factor or percent filter factor.
- Positive polarity** should always be connected to the terminal marked "Line."
- Voltage rated shunt/tap coils** provide tripping on line voltage.

How to order standard Series J/S circuit breakers

NOTE: Standard catalog number must have 18 digits including dashes. See How To Order non-standard when all poles of a multipole unit are not identical.

JA1S

Step 1

-A3-

Step 2a & b

Step 1 Table A

JA1S

Product Type	No. of Poles	Description	Handle Color and Marking	Mounting Threads
JA__S	1 to 4	Toggle handle	White On/Off	6-32
JB__S	1 to 4	Snap-in mount	White On/Off	NA
JC__S	1 to 4	Rocker handle	White On/Off	6-32
JE__S	1 to 3	Sealed bat toggle	NA	See Note 3

1. If part number being specified does not meet the above parameters, see pages 10 and 11 for non-standard numbers.
2. Handles supplied on each pole (consult factory for multipole JE breakers). Handle ties supplied unassembled in kits for multipole JA breakers. JB and JC multipole units have ties installed.
3. $\frac{3}{8}$ -32 thread on JE1S. Consult factory for JE2S and JE3S.

Step 2a Table B

-A3-

Code	Frequency	Terminal Type	Maximum Voltage
A	50/60 Hz	Push-on	250 (to 30A)
T*	50/60 Hz	#8-32 Screw	250 (to 30A)
K*	50/60 Hz	#10-32 Screw	250 (to 30A)
B	DC	Push-on	65 (to 30A)
V*	DC	#8-32 Screw	65 (to 30A)
L*	DC	#10-32 Screw	65 (to 50A)
D	60 Hz/DC	Push-on	250AC/65DC (to 30A)
E*	60 Hz/DC	#8-32 Screw	250AC/65DC (to 30A)
R*	60 Hz/DC	#10-32 Screw	250AC/65DC (to 30A)
C	400 Hz	Push-on	250V (to 30A)
W*	400 Hz	#8-32 Screw	250V (to 30A)
N*	400 Hz	#10-32 Screw	250V (to 30A)

*Screw terminals available on line and load terminals only.

Add a dash before the code letter.

VDE approved units require screw terminals above 20 amps.

Step 2b Table C

-A3-

Inrush Code	Internal Circuit Construction	VDE Approval
N/A Std. 18x 25x		
0	Switch only (no coil)	Yes
2 9 39	**Series trip with SPDT aux. switch	Yes
3 8 38	Series trip	Yes
5	Shunt trip (current rated)	Consult Factory
6	Relay trip (current rated)	No

Single letter code – Add a dash after code (ex. 3 –)

Double letter code – Move frequency code selected in Step 2a (Table B) to the left, add a dash after construction code (ex. JA1SA38)

Consult factory for non-standard constructions available.

**On multipole units one aux. switch is supplied. It is located in the left pole when viewed from the front of the breaker. See page 10 for non-standard part number when additional switches or pole locations are required.

A- Step 3 0015 Step 4 -01 Step 5 E Step 6

Step 3 Table D

A-

Suffix code for UL applications

A- 250 VAC, 50/60 Hz; 65 VDC
240 VAC, 400 Hz

-- Non UL (--)

Single digit codes are followed by a dash as shown.

See page 7 for UL-Recognized ratings.

Consult factory for additional UL codes.

Step 5 Table F

-01

Time Delay Curves

Code	Inrush Codes		
	Std.	18x	25x
-0P	x		
-01	x		
-02	x		
-03	x		
-10		x	
-20		x	
-30		x	
251			x
252			x
253			x

See time delay curves on pages 14-16 for required delay.

Step 4 Table E

0015

Standard Current Ratings

Current		Current	
Code	Ampere	Code	Ampere
OR10	0.10	0010	10.00
OR25	0.25	0015	15.00
OR50	0.50	0020	20.00
OR75	0.75	0025	25.00
0001	1.00	0030	30.00
02R5	2.50	*0035	35.00
0005	5.00	*0040	40.00
07R5	7.50	*0050	50.00

For other current ratings consult factory.

*DC only Code E - See Table B.

Step 6 Table G

E

Code	Voltage Rating
E	0-250 VAC
F	251-277 VAC
G	415 VAC
N	0-65 VDC
H	VDE 380 VAC and 65 VDC

VDE 0660 approval applies to DC and 50/60 Hz constructions listed under VDE column in Step 2b, Table C.

How to order non-standard Series J/S circuit breakers

JA2S—
Step 1

A3A2—
Step 2a & b

Step 1 Table A

JA2S—

Series prefix and number of poles

Product	No. of Poles	Description
JA__S	1 to 4	Toggle handle
JB__S	1 to 4	Snap-in mount
JC__S	1 to 4	Rocker handle
JE__S	1 to 3	Sealed bat toggle

Step 2a Table B

A3A2—

Voltage, frequency and internal circuit for first pole on left as viewed from front of panel, or for all poles if identical, from Tables B and C. Repeat Step 2 for second and third poles and subsequent poles if different from first.

Code	Frequency	Terminal Type	Maximum Voltage
A	50/60 Hz	Push-on	250 (to 30A)
T*	50/60 Hz	#8-32 Screw	250 (to 30A)
K*	50/60 Hz	#10-32 Screw	250 (to 30A)
B	DC	Push-on	65 (to 30A)
V*	DC	#8-32 Screw	65 (to 30A)
L*	DC	#10-32 Screw	65 (to 50A)
D	60 Hz/DC	Push-on	250AC/65DC (to 30A)
E*	60 Hz/DC	#8-32 Screw	250AC/65DC (to 30A)
R*	60 Hz/DC	#10-32 Screw	250AC/65DC (to 30A)
C	400 Hz	Push-on	250V (to 30A)
W*	400 Hz	#8-32 Screw	250V (to 30A)
N*	400 Hz	#10-32 Screw	250V (to 30A)

*Screw terminals available on line and load terminals only.
VDE approved units require screw terminals above 20 amps.

Step 2b Table C

A3A2—

Inrush Code	Std.	18x	25x	Internal Circuit Construction	VDE Approval
0				Switch (no overload coil)	Yes
2	9	39		Series trip with standard enclosed SPDT aux. switch	Yes
3	8	38		Series trip, VDE Approved	Yes
5				Shunt/Tap	*
6				Relay-trip	No
15	25			Du-Con with Shunt/Tap voltage coil	*
16	26			Du-Con with relay-trip voltage coil	No
For World Market use. This pole does not contain breaker contacts					VDE Approval
	86			Relay trip — no contacts — trip coil only	Yes

*Consult factory for VDE availability.
Consult factory for other internal circuits that are available.

B Step 3	J— Step 4	—01 Step 5	W— Step 6	A— Step 7	52— Step 8	PN— Step 9	30— Step 10	02 Step 11
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Step 3 Table D

B

Number of handles and handle position

- A — Single pole unit.*
- B — Two pole unit. Handle on left pole only*
- D — Three pole unit. Handle on center pole only.*
- E — Handle on each pole. Handle tie furnished as kit.**
- J — Four pole unit. Handle on left center and right center poles only. Handle tie furnished as kit.**

Other configurations available; consult factory.

*JE/S available in construction codes A, B and D only.

**Handle tie kit does not apply to JC/S construction.

Step 6

W—

Domestic market (D), World Market (W), VDE approved (H). Available as shown in Table C.

Step 7 Table F

A—

Suffix Code, if for UL Application

- A — 250 VAC, 50/60 Hz; 65 VDC; 240 V, 400 Hz
- L — 277 VAC, 50/60 Hz
- AD — 415 VAC, 50/60 Hz
- NU — Non-UL Recognized

Step 9

PN—

Customer part number to be marked on breaker.

Step 10 Table H

30—

Current rating in amperes.

Standard Ampere Ratings

0.10	1	10	30
0.25	2.5	15	35*
0.50	5	20	40*
0.75	7.5	25	50*

*Available on DC only — 10-32 screw terminals required. Other non-listed ratings are available. Consult factory for availability

Step 4 Table E

J—

Handle color and marking

	*On/Off	*I-O
Black**	A	I
White	B	J
Red	D	L

Other colors available; consult factory.

*Standard color for marking is white except black is used on white.

**JE/S available in A and I handle marking only.

Step 8 Table G

52—

Auxiliary switch information

- 10 — SPDT 0.1 Amp .110 Quick connect terminals
- *52 — SPDT 10 Amp .110 Quick connect terminals
- *54 — SPDT 0.1 Amp .110 Quick connect terminals

Other auxiliary switches available; consult factory.

*Only #52 and 54 are VDE rated, must be used with World Market/VDE.

Step 11 Table F

02

Time Delay Curves

Code	Inrush Codes		
	Std.	18x	25x
—0P	x		
—01	x		
—02	x		
—03	x		
—10		x	
—20		x	
—30		x	
251			x
252			x
253			x

See time delay curves on pages 14-16 for required delay.

Step 5

—01

Mounting information:

- 00 — JB/S snap-in mounting
- 01 — #6-32 UNC thread mounting
- 04 — M3-0.5 metric thread mounting
- 11 — 3/8-32 thread on JE1S. Consult factory for JE2S and JE3S.

Precise overload protection – with Heinemann hydraulic-magnetic circuit breakers

Heat-induced nuisance tripping eliminated

Heinemann hydraulic-magnetic circuit breakers offer three major advantages over thermal devices:

1. Elimination of nuisance tripping caused by high ambient temperatures in or near the installation. The breaker responds only to current variations, not to temperature change.
2. Assurance that 100% of the rated current will be carried. There is no such assurance with thermal devices, which may fail to carry rated current when subjected to above-normal ambient temperatures. A Heinemann breaker rated at 20 A, for example, will sustain 20 A, even at elevated temperatures. Derating and other forms of temperature compensation are unnecessary.
3. Immediate reset. Since there are no thermal elements, heat build-up is not a factor. Therefore, no "cooling off" period is required after fault interruption.

Time delay eliminates breaker tripping due to transient current surges

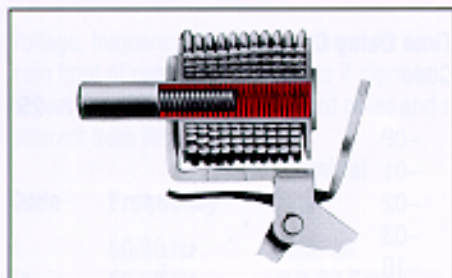
Elimination of transient current surges as a cause of nuisance tripping is accomplished through the creation of a controlled time delay. In any

installation where a power supply or compressor motor is on the line, an inrush of current occurs when the equipment is first turned on. The bigger the equipment, the larger the surge. Although inrush surges are, in fact, transient overloads, they usually pose no threat of damage to the line or the equipment. So, it is not necessary or even desirable to interrupt the power when they occur.

The hydraulically-controlled time-delay mechanism of a Heinemann breaker eliminates nuisance tripping without lessening overload protection. The delay is inversely proportional to the overload; response is quicker on large overloads, where greater potential danger exists, and slower on small overloads. Except in special high-inrush models, heavy overload and short-circuit currents of greater than 10 times the breaker's rating provide instantaneous response. (An instantaneous-trip breaker is available for use on, for example, modern medical and communication equipment, which can not tolerate even brief overloads.)

For added protection, the time-delay is self-adjusting to ambient temperature conditions. At high ambients, where the overload tolerance of most circuits is lowered, the viscosity of the special fluid in the breaker's dashpot is lessened, and the time-delay response is thereby shortened. At low temperatures, the response is correspondingly longer to allow for cold-equipment startups.

The hydraulic-magnetic principle (how the breaker works)



1. The Heinemann hydraulic-magnetic circuit breaker operates on load-current-produced magnetic-flux variations in a solenoid. The coil is wound around a hermetically-sealed, non-magnetic tube containing a spring-loaded, movable iron core in a special-liquid fill. With the load current either at or below the breaker's nominal rating, the magnetic flux is of insufficient strength to move the core, so it remains at the end of the tube opposite the armature.



2. With excessive current, the magnetic-flux force increases, pulling the iron core toward the armature end of the tube. This core insertion reduces the reluctance of the magnetic circuit and further increases the strength of the magnetic field. The special liquid regulates the core's speed of travel, creating a controlled trip delay that is inversely proportional to the magnitude of the overload. If the overload subsides before the core reaches the pole piece, the core returns to its original position, and the breaker does not trip. (For non-delay applications, the breaker is modified to omit the intentional delay.)



3. When 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 achieved first.) On very heavy overloads or short circuits, the flux produced by the coil alone, regardless of core position, is sufficient to pull in the armature. This circuit interruption occurs with no intentional delay – a highly desirable response characteristic.

Time-delay curves and characteristics

Tripping specifications

Time-delay trip ranges

Breakers (in standard wall-mount position) shall hold 100% rated load.

60 Hz and DC

Breakers may trip between 101% and 125% rated load; must trip at 125% rated load and above, as shown on time-delay curve selected. Breakers rated 50/60/DC have a must trip of 135%.

400 Hz

Breakers may trip between 101% and 150%, must trip at 150% and above.

Non-time delay trip ranges

Breakers have no deliberately imposed delay and will trip instantaneously as specified.

Breakers shall hold 100% load.

Breakers for 50/60 Hz or dc service may trip between 101% and 125% rated load, must trip at 125% rated load and above.

Breakers for 400 Hz service may trip between 101% and 150% rated load, must trip at 150% rated load and above.

NOTE: All the curves shown describe breaker response with no pre-loading. (Breakers do not carry current prior to application of overload for calibration testing.)

Curves are plotted at an ambient temperature of 77°F (25°C), with breakers in the standard wall-mount position. For nonstandard mounting, consult factory.

Time-delay curve selection

1. Determine required frequency.
2. Determine required high inrush tolerance (tolerance to starting surges caused by high-reactance loads such as ferro-resonant power supplies which may last up to 8 milliseconds). Select lowest high inrush tolerance compatible with application.
3. Determine required curve characteristics based on application:

Long time-delay curve – motor starting, locked rotor tolerance, general purpose applications.

Medium time-delay curve – transformer protection, capacitor loads, special incandescent lamp loads, general purpose applications (most widely used curve).

Short time-delay curve – electronic equipment.

Instantaneous curve (no deliberate time delay provided) – unusual circumstances in electronic equipment and other special applications.

Note: Inrush tolerance is defined as a single pulse of half sine wave peak current 8 milliseconds duration that will not trip breaker.

Nominal DCR and impedance

DC Delays (Resistance in Ohms)

Current Rating Amps.	Curves		
	P-2-3 10-20-30	251-252-253	DuCon 2-3-20-30
0.05	447	730	730
0.10	127	182	174
0.5	4.12	7.0	6.4
1	.86	1.65	1.67
5	.050	.069	.069
10	.014	.0181	.0177
15	.0059	.0164	.0146
20	.0045	.0068	.0067
30	.0031	.0028	.0028
50	.0017	.0020	.0019

60 Hz Delays (Impedance in Ohms)

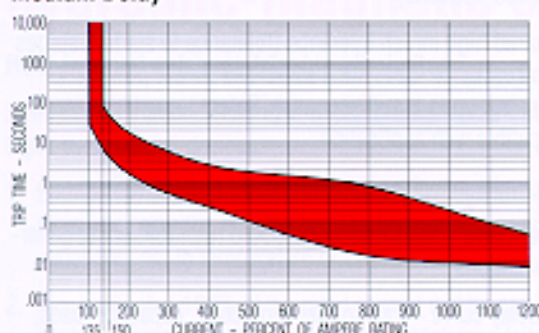
Curves	Curves		
	P-2-3 10-20-30	251-252-253	DuCon 2-3-20-30
	418	836	809
	139	176	186
	3.99	7.3	6.4
	.917	1.580	1.780
	.051	.073	.068
	.016	.0172	.0158
	.0060	.0162	.0155
	.0046	.0067	.0068
	.0031	.0031	.0029
	.0017	.0020	.0019

400 Hz Delays (Impedance in Ohms)

Curves
P-1-2-3
744
200
9.36
1.74
.074
.021
.0101
.0060
.0037
.0024

DCR and impedance based on 100% rated current applied and stabilized a minimum of one hour.
Tolerance: 0.02 amps to 2.5 amps, $\pm 20\%$; 2.6 amps to 20 amps, $\pm 25\%$; 21 amps to 50 amps, $\pm 50\%$.

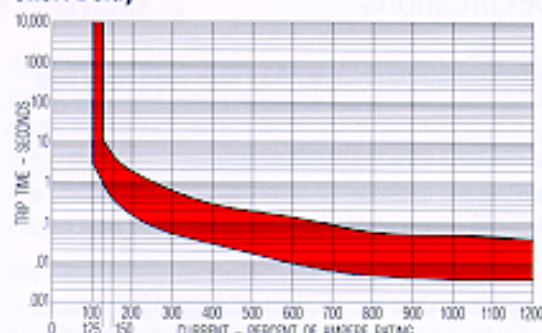
**Curve 2, dc 50/60 Hz
Medium Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	135%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	80	18	2.8	1.5	.8	.2
Delay Minimum (seconds)	no trip	7	1.7	.25	.05	.015	.01

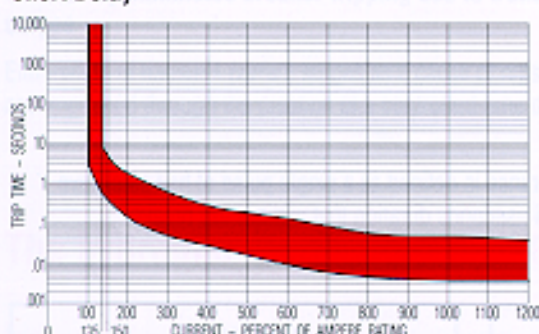
**Curve 3, 50/60 Hz
Short Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	12	1.9	.3	.14	.06	.05
Delay Minimum (seconds)	no trip	1	.15	.03	.01	.005	.004

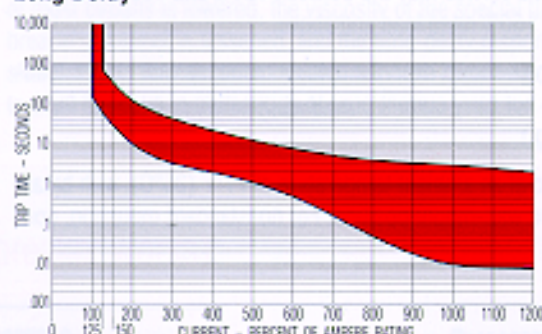
**Curve 3, dc 50/60 Hz
Short Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	135%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	9	1.9	.3	.14	.06	.05
Delay Minimum (seconds)	no trip	.6	.15	.03	.01	.005	.004

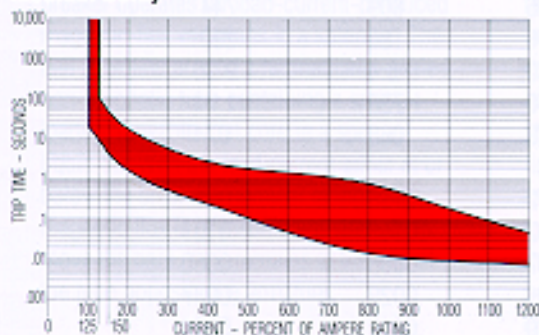
**Curve 10, 50/60 Hz
Long Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	700	120	22	8	4	3
Delay Minimum (seconds)	no trip	60	10	2	.5	.05	.01

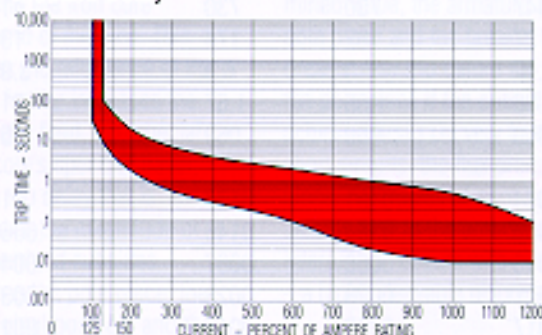
**Curve 2, 50/60 Hz
Medium Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	110	18	2.8	1.5	.8	.2
Delay Minimum (seconds)	no trip	10	1.7	.25	.05	.015	.01

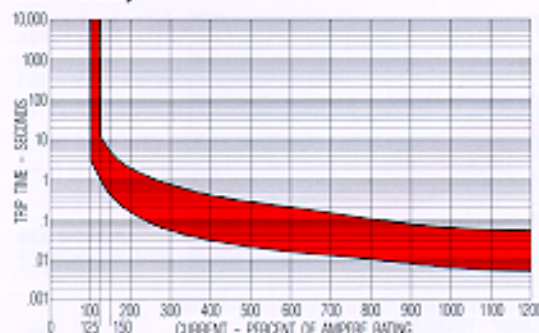
**Curve 20, 50/60 Hz
Medium Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	110	18	4	2	1	.5
Delay Minimum (seconds)	no trip	10	1.7	.3	.1	.02	.01

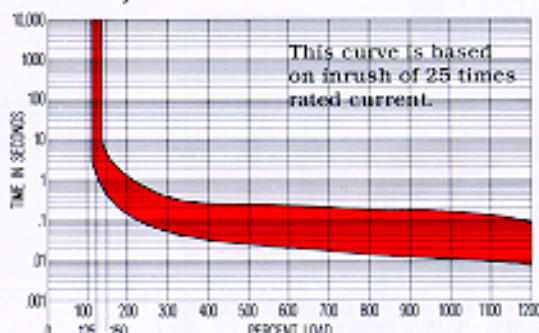
**Curve 30, 50/60 Hz
Short Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	12	1.9	.4	.2	.1	.06
Delay Minimum (seconds)	no trip	1	.15	.03	.015	.01	.006

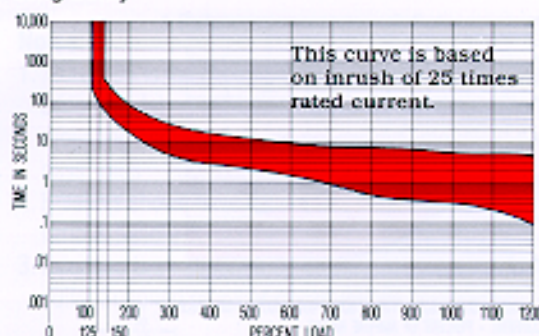
**Curve 253, high-inrush 50/60 Hz
Short Delay**



Percent of rated current vs. trip delay at 25° C

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	17	1.6	0.40	0.30	0.22	0.15
Delay Minimum (seconds)	no trip	1	0.16	0.05	0.03	0.020	0.012

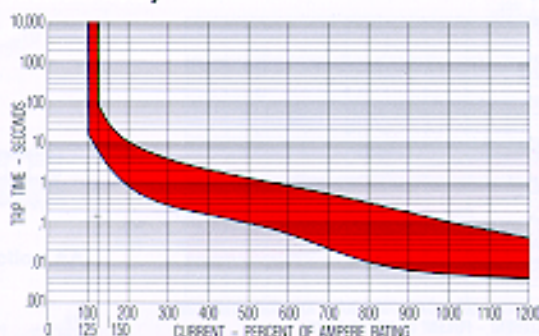
**Curve 251, high-inrush 50/60 Hz
Long Delay**



Percent of rated current vs. trip delay at 25° C

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	400	70	15	8	6	5
Delay Minimum (seconds)	no trip	75	15	3	1.5	0.5	0.3

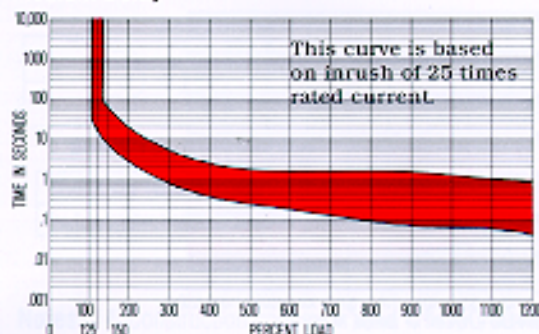
**Curve 2, dc
Medium Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	80	10	2	.8	.3	.1
Delay Minimum (seconds)	no trip	6	.8	.15	.05	.01	.005

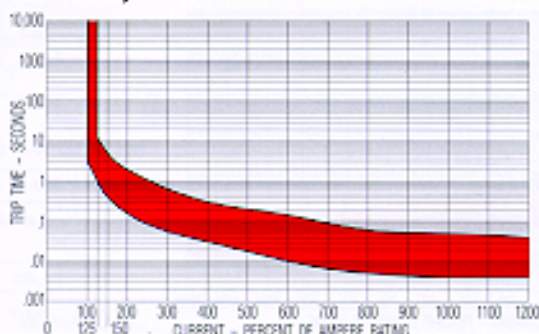
**Curve 252, high-inrush 50/60 Hz
Medium Delay**



Percent of rated current vs. trip delay at 25° C

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	100	20	2.5	1.6	1.4	1.0
Delay Minimum (seconds)	no trip	10	2.5	0.45	0.22	0.10	0.07

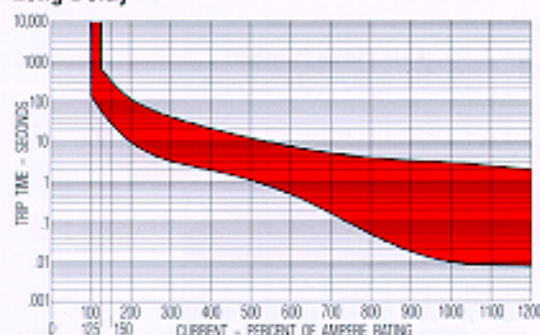
**Curve 3, dc
Short Delay**



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	12	1.9	.3	.14	.06	.05
Delay Minimum (seconds)	no trip	1	.15	.03	.01	.005	.004

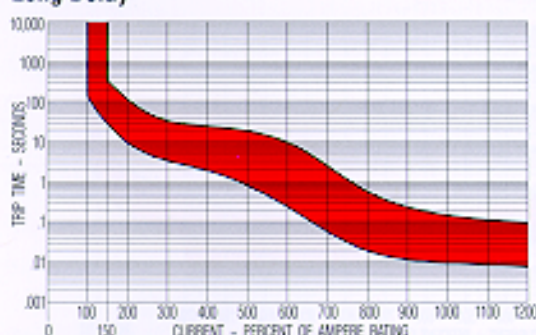
Curve 10, dc
Long Delay



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	700	120	22	8	4	3
Delay Minimum (seconds)	no trip	60	10	2	.5	.05	.01

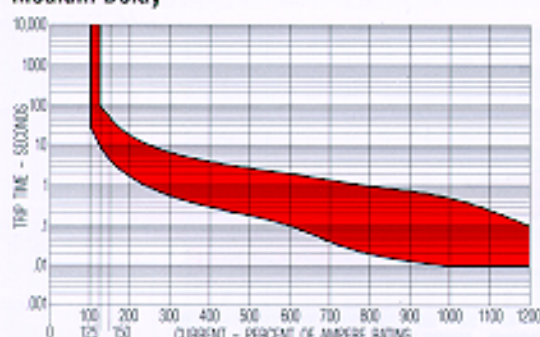
Curve 1, 400 Hz
Long Delay



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	150%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	350	120	25	10	.6	.15
Delay Minimum (seconds)	no trip	30	10	2	.25	.02	.01

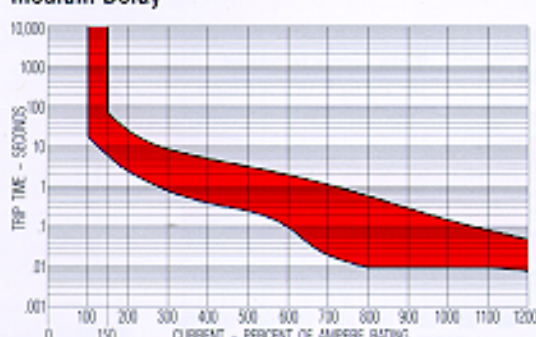
Curve 20, dc
Medium Delay



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	110	18	4	2	1	.5
Delay Minimum (seconds)	no trip	10	1.7	.3	.1	.02	.01

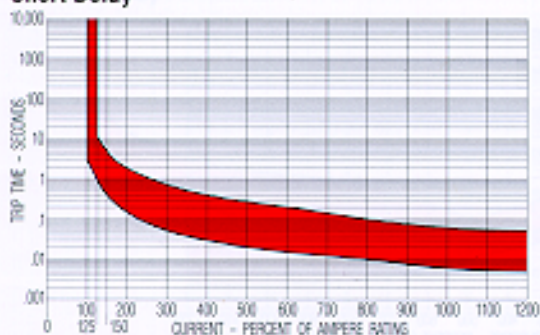
Curve 2, 400 Hz
Medium Delay



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	150%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	70	26	5	2	.6	.15
Delay Minimum (seconds)	no trip	6	2.5	.4	.1	.01	.01

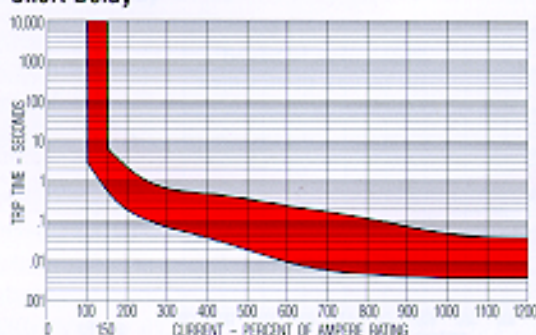
Curve 30, dc
Short Delay



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

% Overload	100%	125%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	12	1.9	.4	.2	.1	.06
Delay Minimum (seconds)	no trip	1	.15	.03	.015	.01	.006

Curve 3, 400 Hz
Short Delay



Percent of rated current vs. trip delay at 25° C; breakers not preloaded

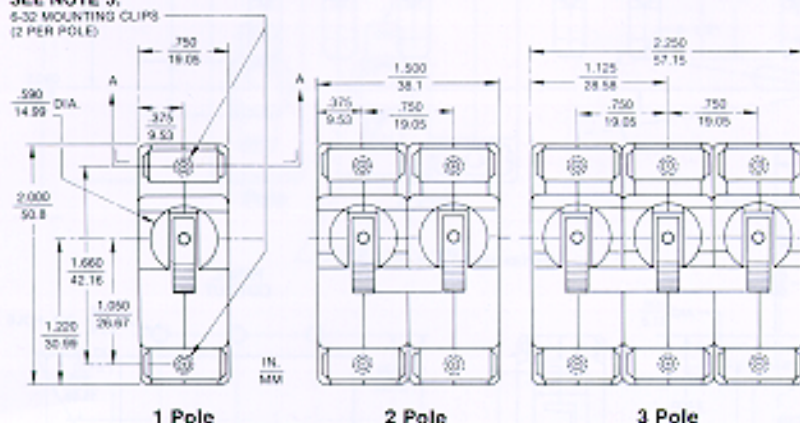
% Overload	100%	150%	200%	400%	600%	800%	1000%
Delay Maximum (seconds)	no trip	7	2.3	.5	.25	.12	.05
Delay Minimum (seconds)	no trip	.6	.2	.04	.01	.005	.004

Dimensions Series JA/S

For metric threads, consult factory.

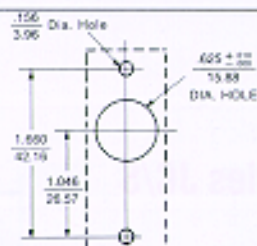
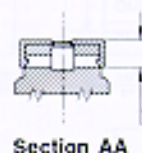
All dimensions are in inches/mm, tolerance $\pm .032/.81$ except where noted. Dimensions are given here only as a preliminary guide to specifying. Final engineering drawings should be made from the latest Heinemann factory drawings, available on request.

SEE NOTE 5.
5-32 MOUNTING CLIPS
(2 PER POLE)



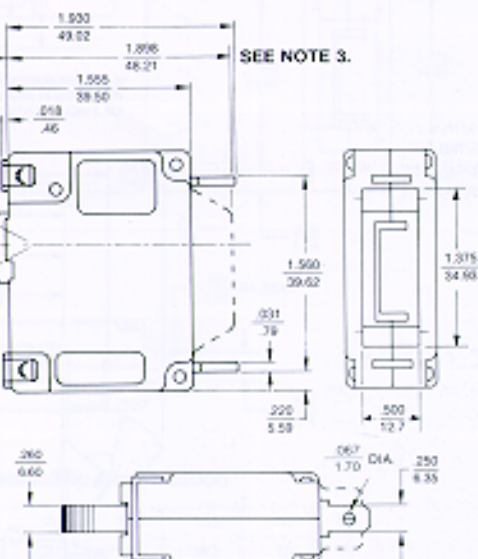
Notes:

1. 200/5.08 is the maximum depth of recess in the breaker for accommodating mounting screws. When determining the mounting screw length, do not exceed "mounting panel thickness" plus ".200/5.08 dimension."
2. Breakers shown have handle ties installed. Refer to Table D for various handle configurations.
3. Extended back supplied on breakers with special function circuits. Supplied on other constructions at manufacturers option.



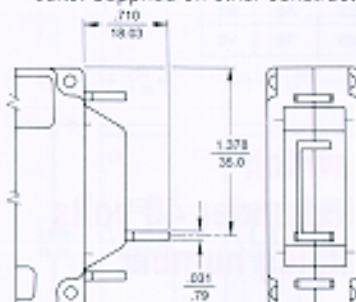
For Multi-pole cutouts,
use .750 between center lines

SEE NOTE 3.



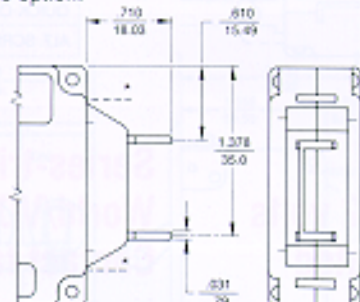
Series Trip Construction

QUICK-ON TERM.	A3	B3	C3	A8	B8
ALT. SCREW TERM.	T3	V3	W3	T8	V8



Shunt Tap Construction

QUICK-ON TERM.	A5	B5	C5
ALT. SCREW TERM.	T5	V5	W5

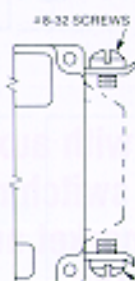


Relay Trip Construction

QUICK-ON TERM.	A6	B6	C6
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*Quick-On Terminals for Domestic Markets.
See Note 4.

A6	B6	C6
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Alternate Terminals

NOTE:
For screw-type terminals see Table B, How to Order. World Market requires screw-type terminals to be used on ratings above 20 amps.

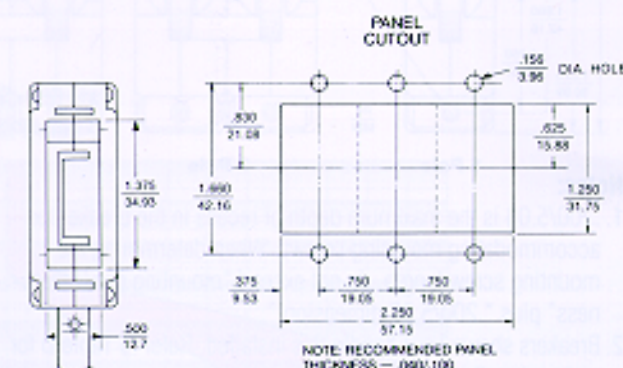
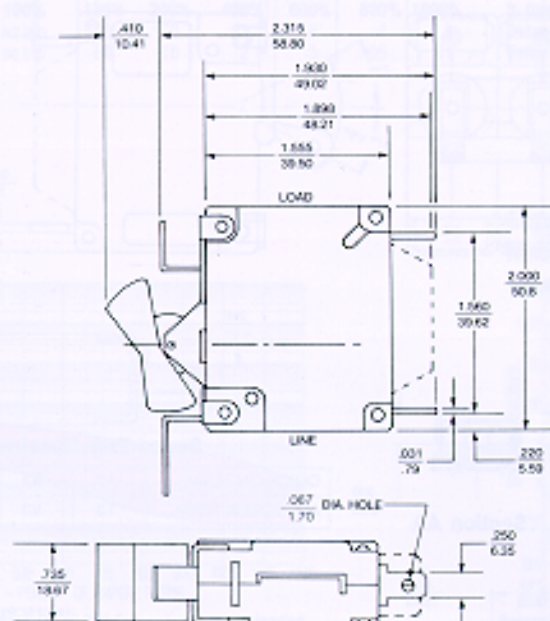
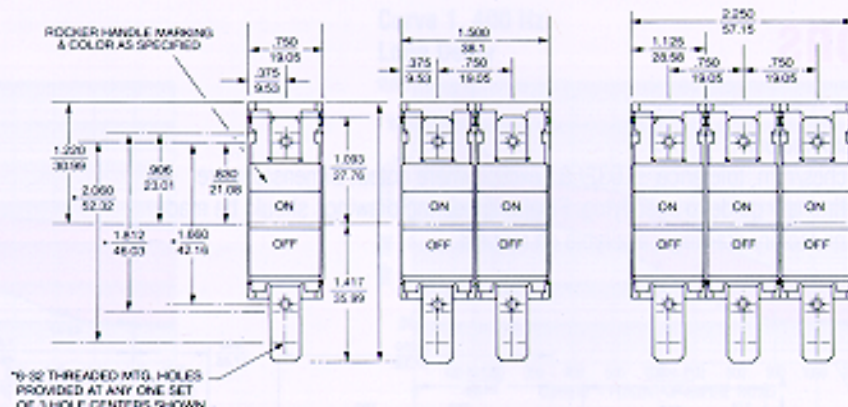
Notes: 4. Construction codes: "A" and "T" = 50/60 Hz. "B" and "V" = DC. "W" = 400 Hz.

5. M3-0.5 pitch, metric mounting clips available.

6. Handles marked "ON-OFF" are available.

7. Overload protection and/or switch construction can not be supplied in the same pole as relay trip.

Series JC/S

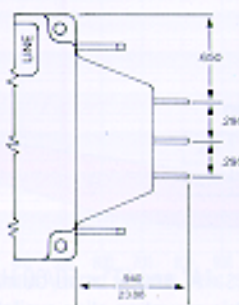
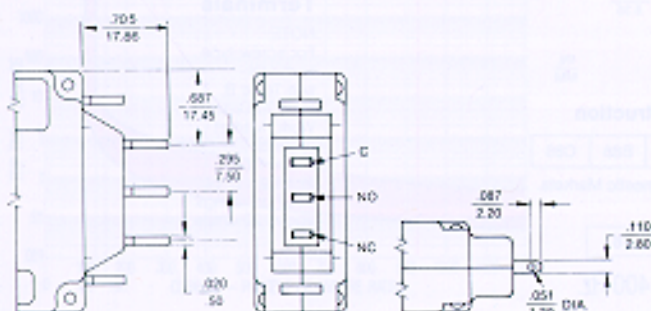


Series Trip Construction

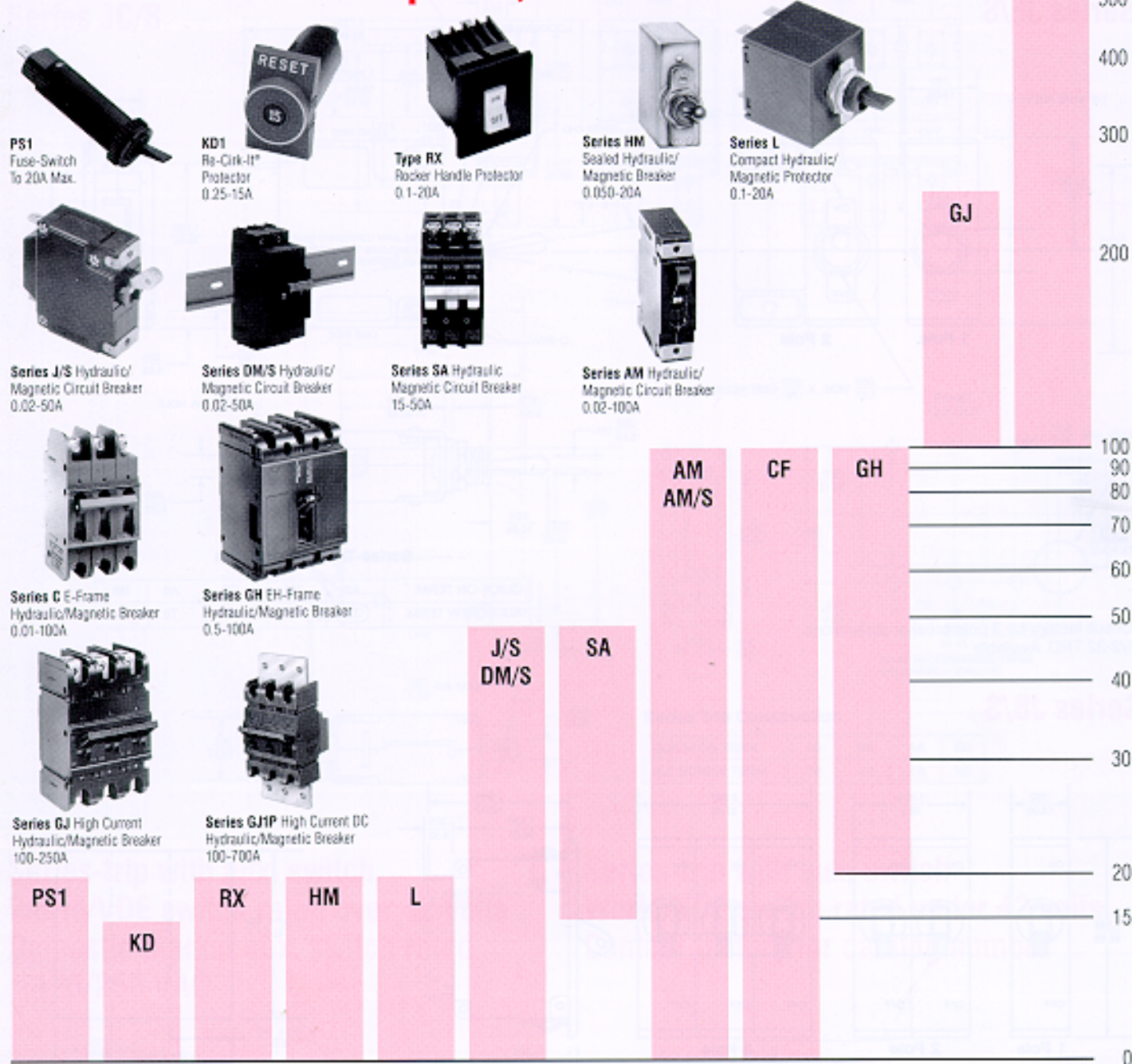
QUICK-ON TERM.	A3	B3	A8	B8
ALT. SCREW TERM.	T3	V3	T8	V8

Series-trip with aux. switch
World/VDE switch rated over 42 volts
Domestic market aux. switch rated
125/250 VAC

Series-trip with aux. switch
World/VDE switch rated under 42 volts
Contact factory for catalog number



**For the widest selection of circuit protection,
from 0.01 to 700 amperes, look to Heinemann.**



Eaton Corporation
Commercial Controls Division
4201 N. 27th Street
Milwaukee, WI 53216
Phone: (800) 526-5476, Fax: (414) 449-6760

For warranty information, see CMCO Bulletin C-7.0.

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