

E² mining service molded-case circuit breakers

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Note:
Time/Current characteristic curves for Series C F-frame circuit breakers—voltages shown in curve headings are maximum at which the breaker may be applied. Interrupting capacity of individual breaker is tabulated on each curve.

Note:
The following circuit breakers are derived from Eaton, Westinghouse, or Cutler-Hammer history.

Time Current Curves are engineering reference documents for application and coordination purposes only.



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Catalog Number Selection

This information is presented only as an aid to understanding catalog numbers. It is not to be used to build catalog numbers for circuit breakers or trip units.

Table 1. Catalog Structure Electronic Trip

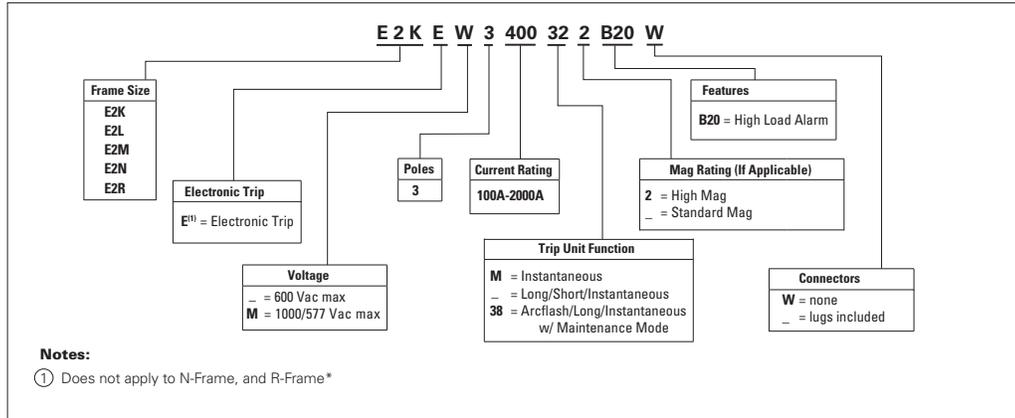
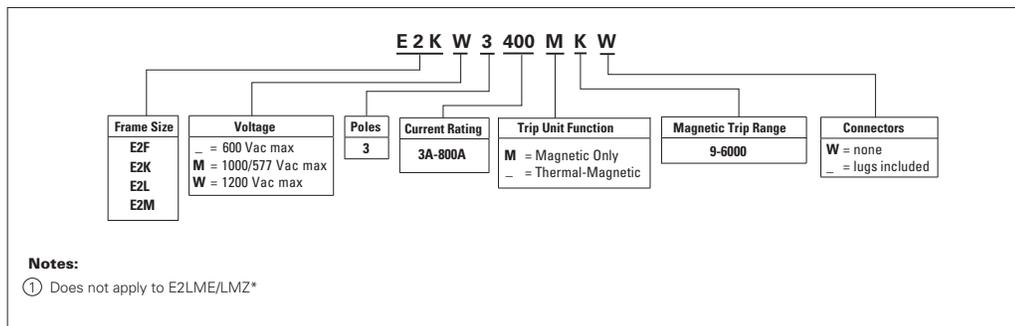


Table 2. Catalog Structure Non-Electronic Trip



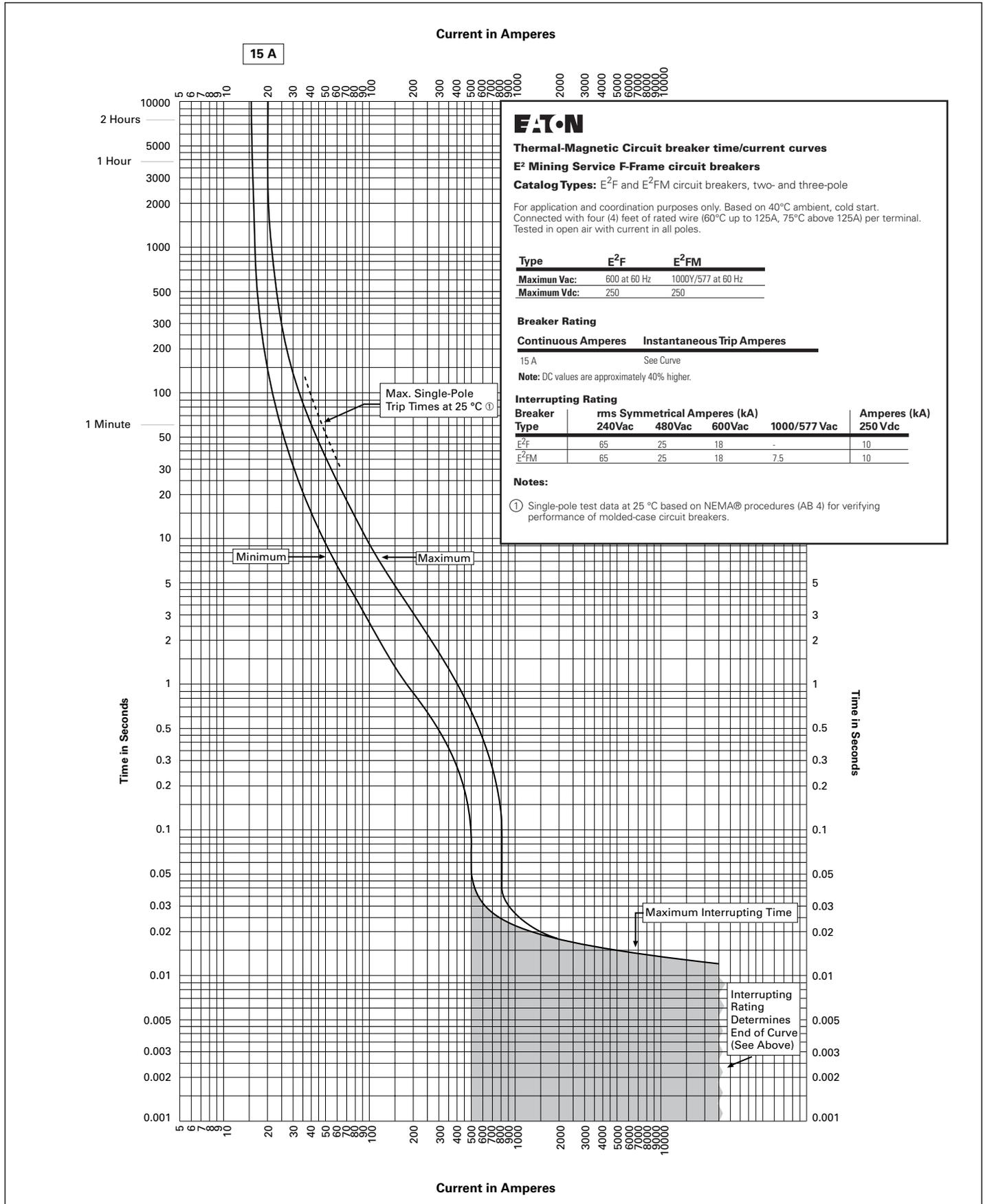


Figure 1. Types E²F and E²FM Circuit Breakers, 15 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7068-98

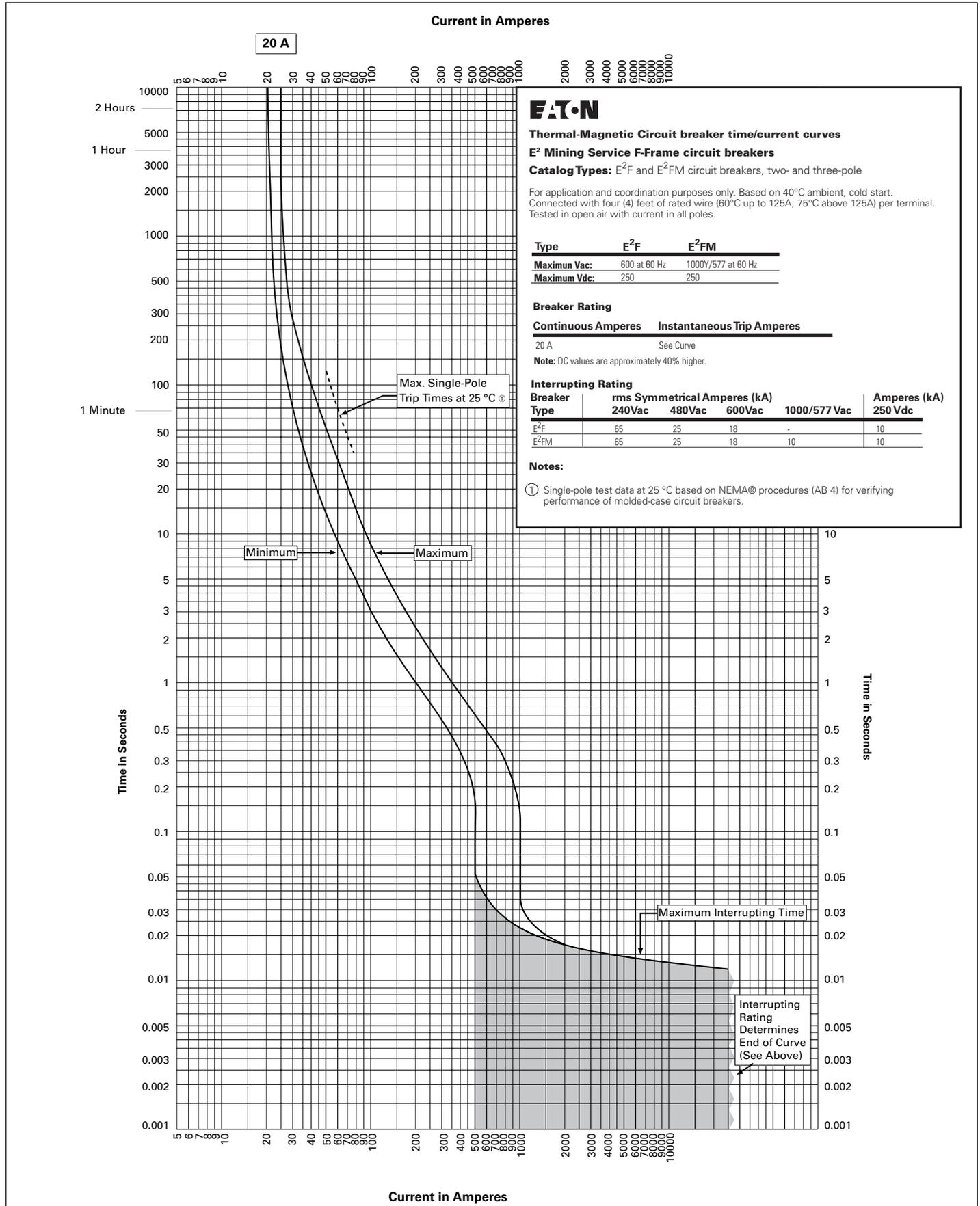


Figure 2. Types E²F and E²FM Circuit Breakers, 20 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7069-98

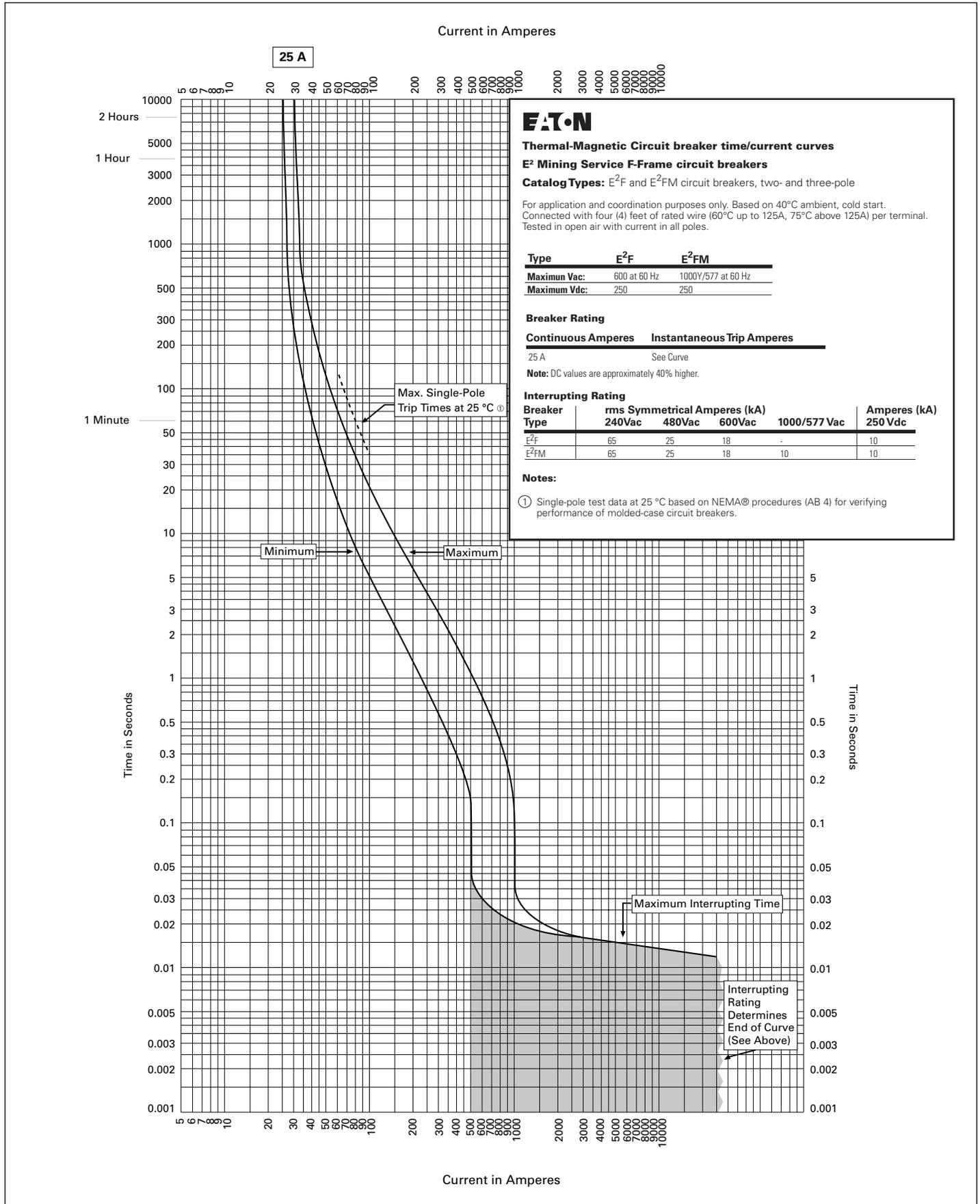


Figure 3. Types E²F and E²FM Circuit Breakers, 25 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7070-98

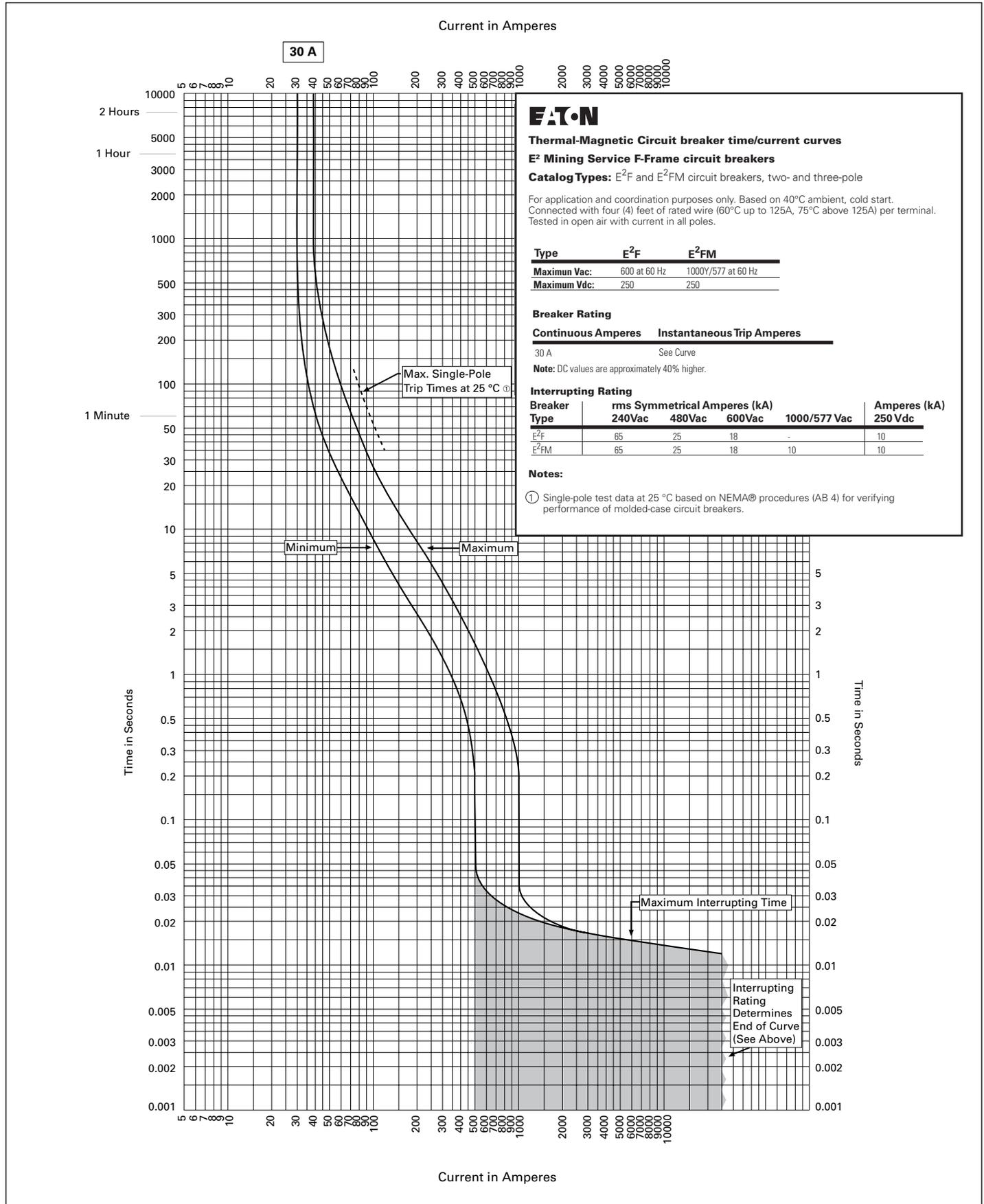


Figure 4. Types E²F and E²FM Circuit Breakers, 30 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7071-98

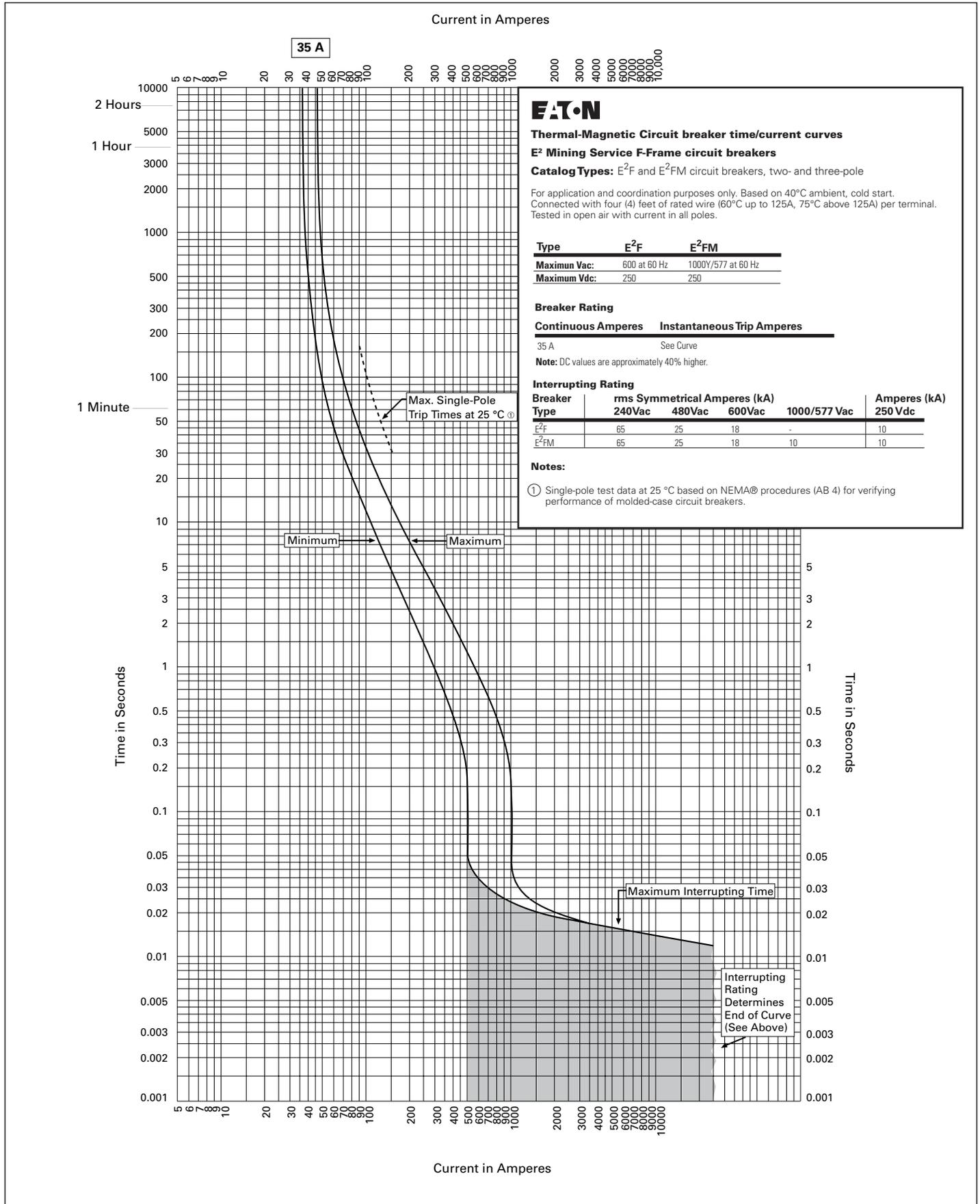


Figure 5. Types E²F and E²FM Circuit Breakers, 35 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7072-98

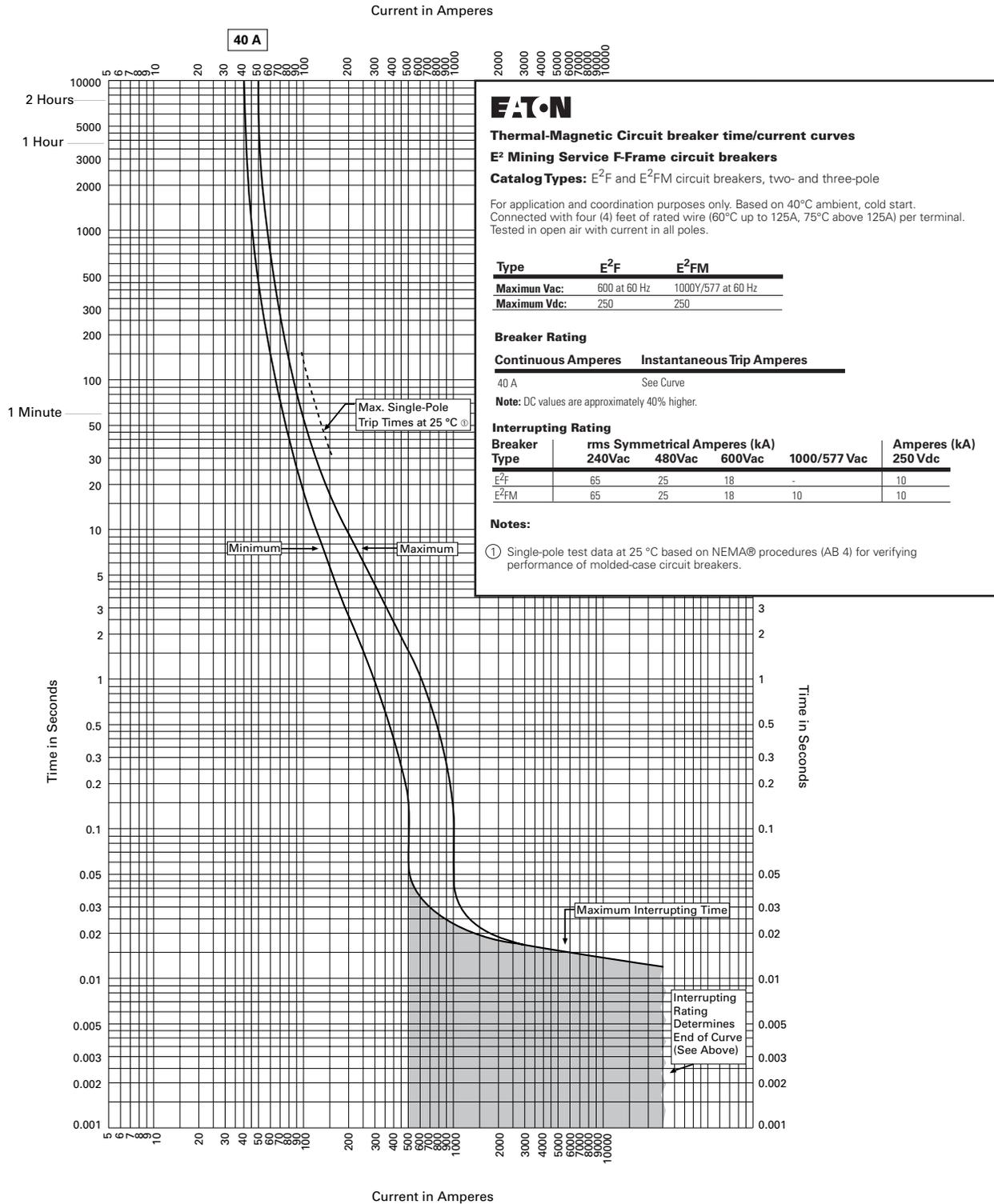


Figure 6. Types E²F and E²FM Circuit Breakers, 40 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7073-98

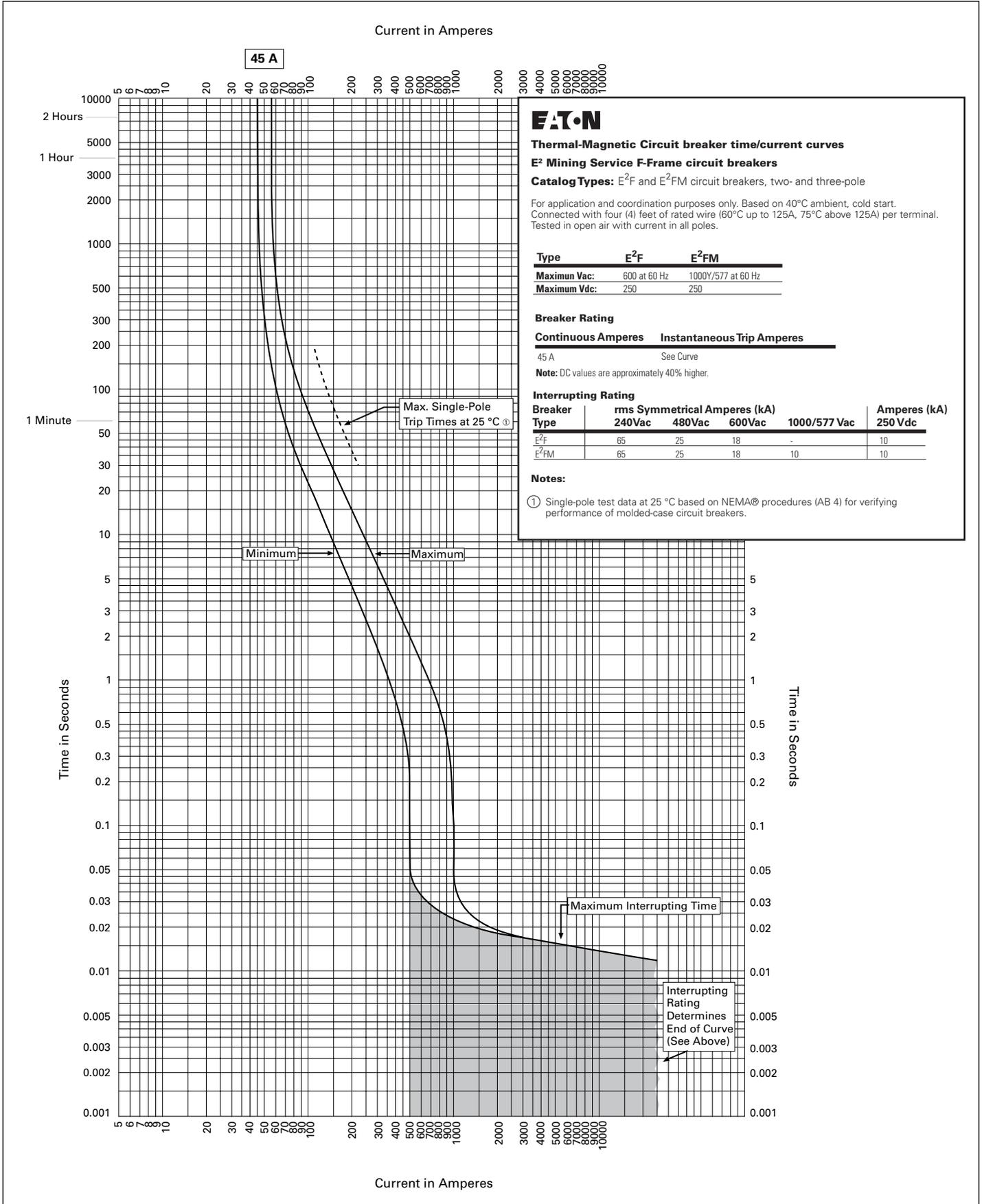


Figure 7. Types E²F and E²FM Circuit Breakers, 45 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7074-98

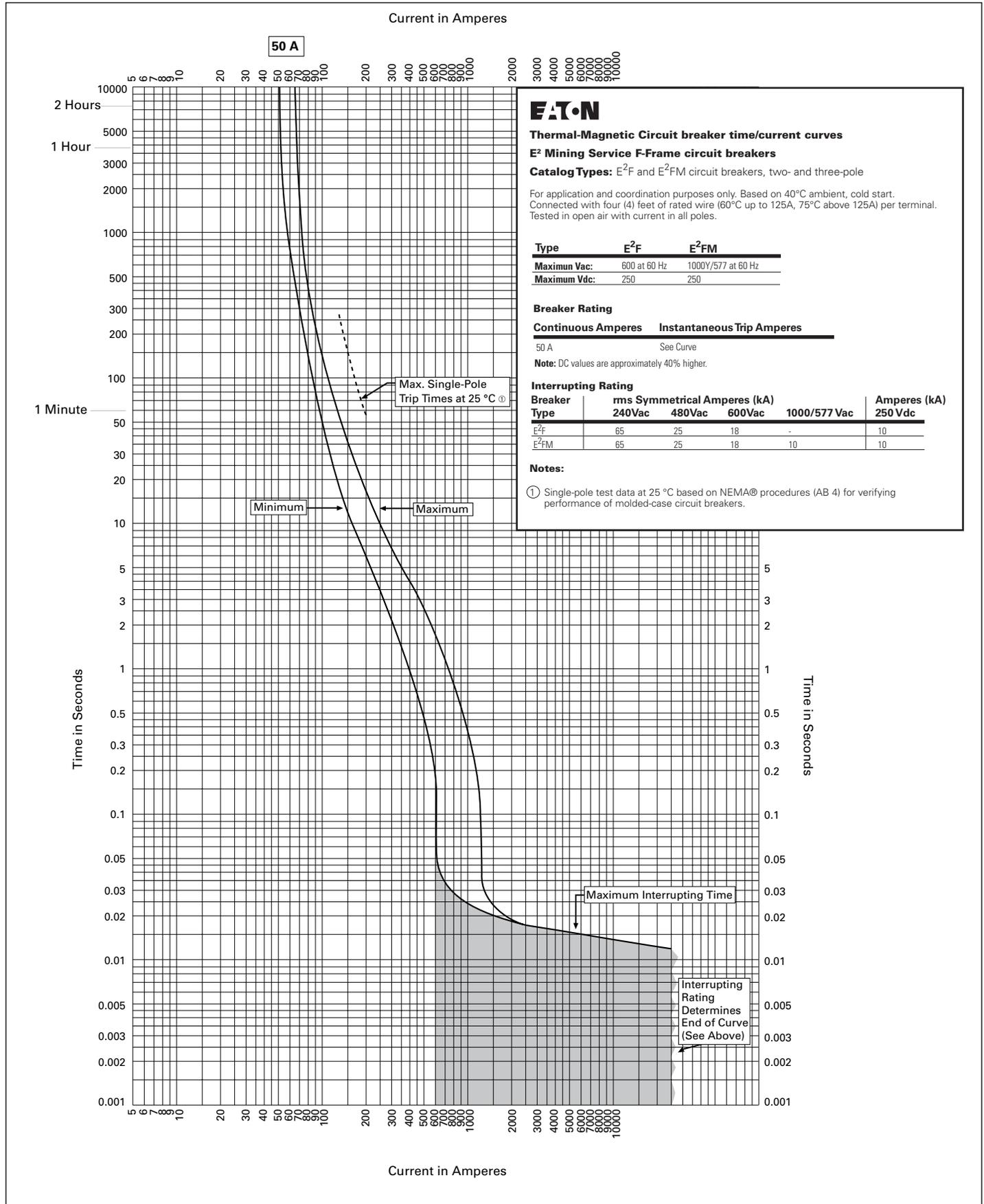


Figure 8. Types E²F and E²FM Circuit Breakers, 50 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7075-98

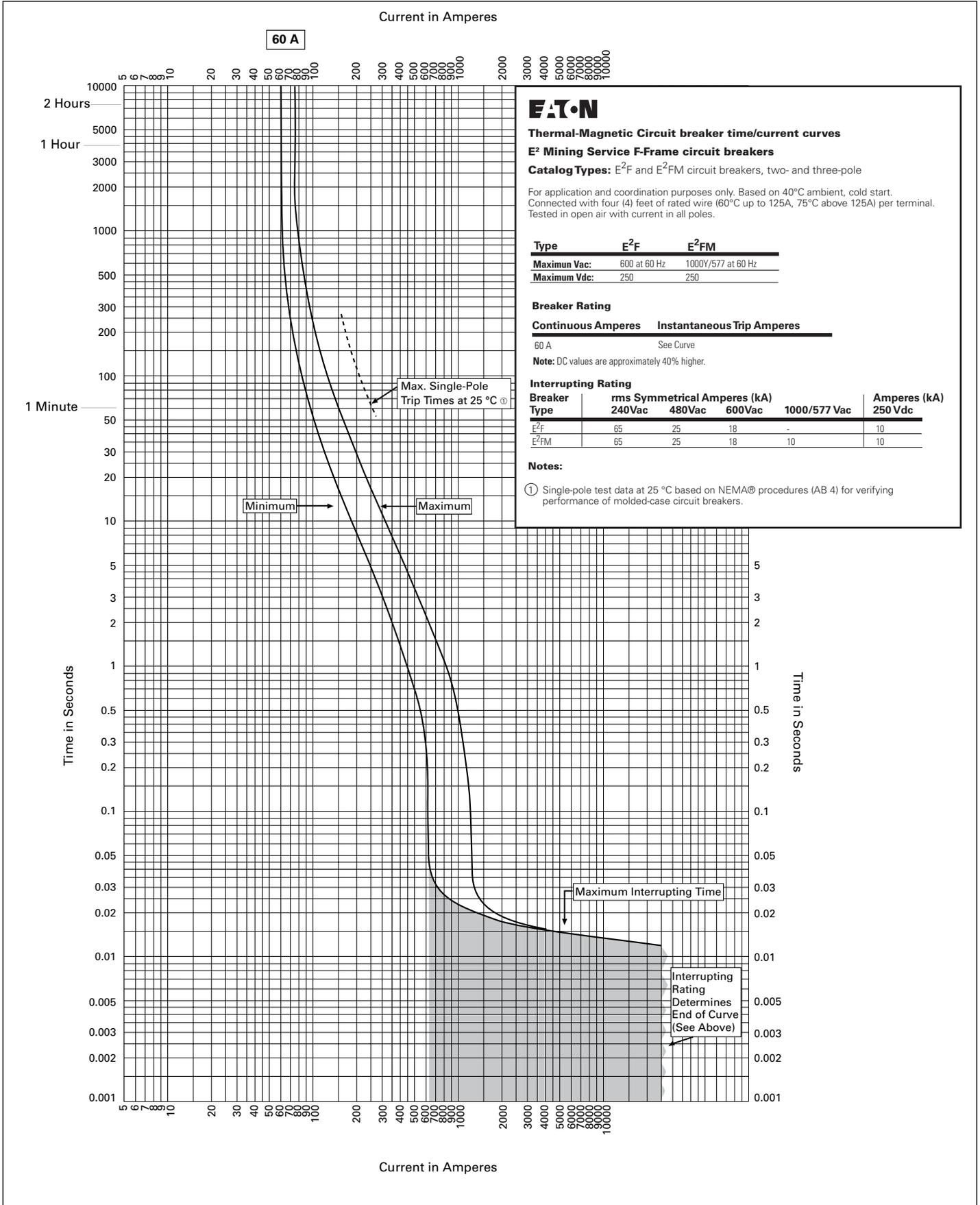


Figure 9. Types E²F and E²FM Circuit Breakers, 60 A, Two- and Three-Pole, Thermal-Magnetic— Curve No. SC-7076-98

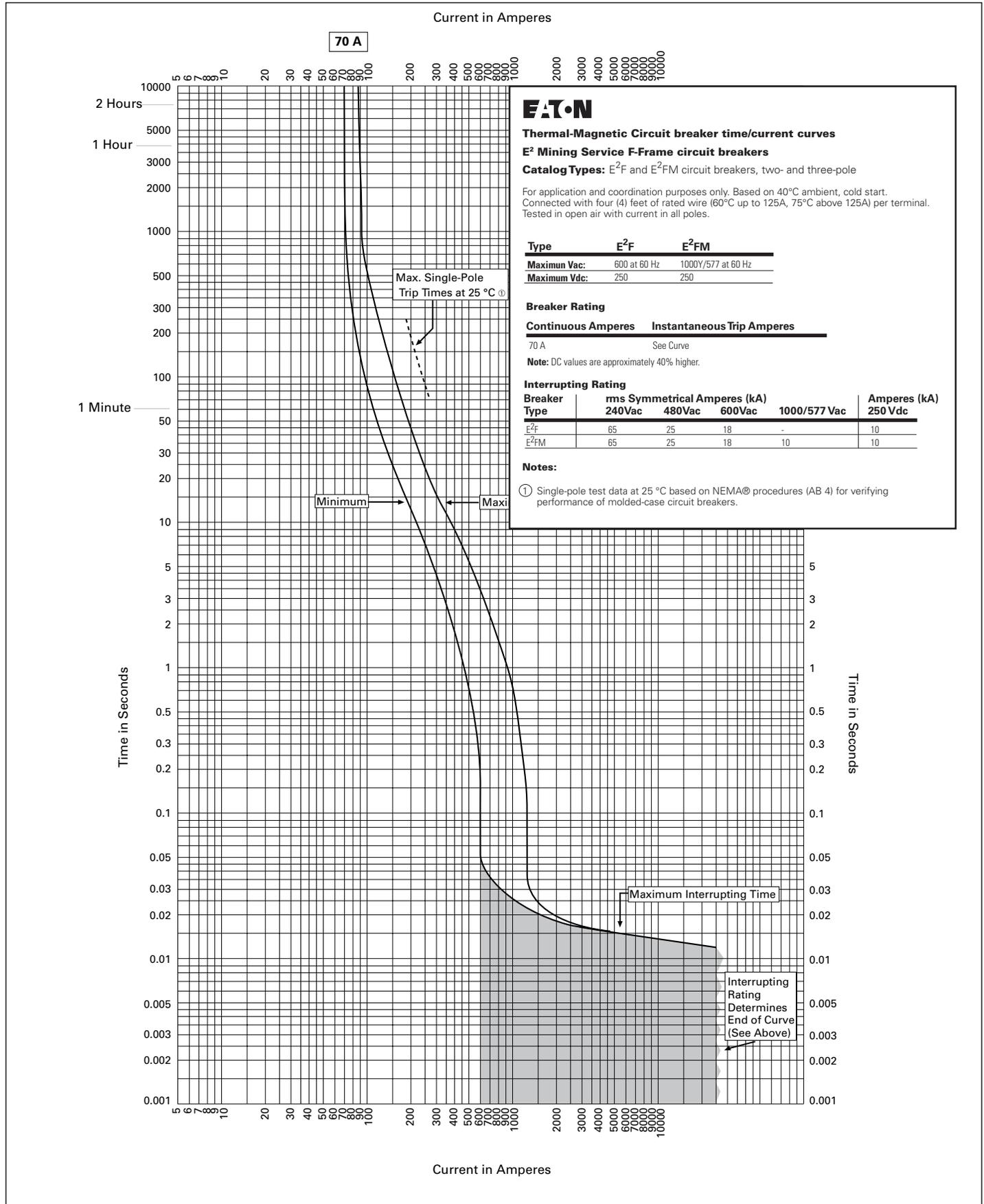


Figure 10. Types E²F and E²FM Circuit Breakers, 70 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7077-98

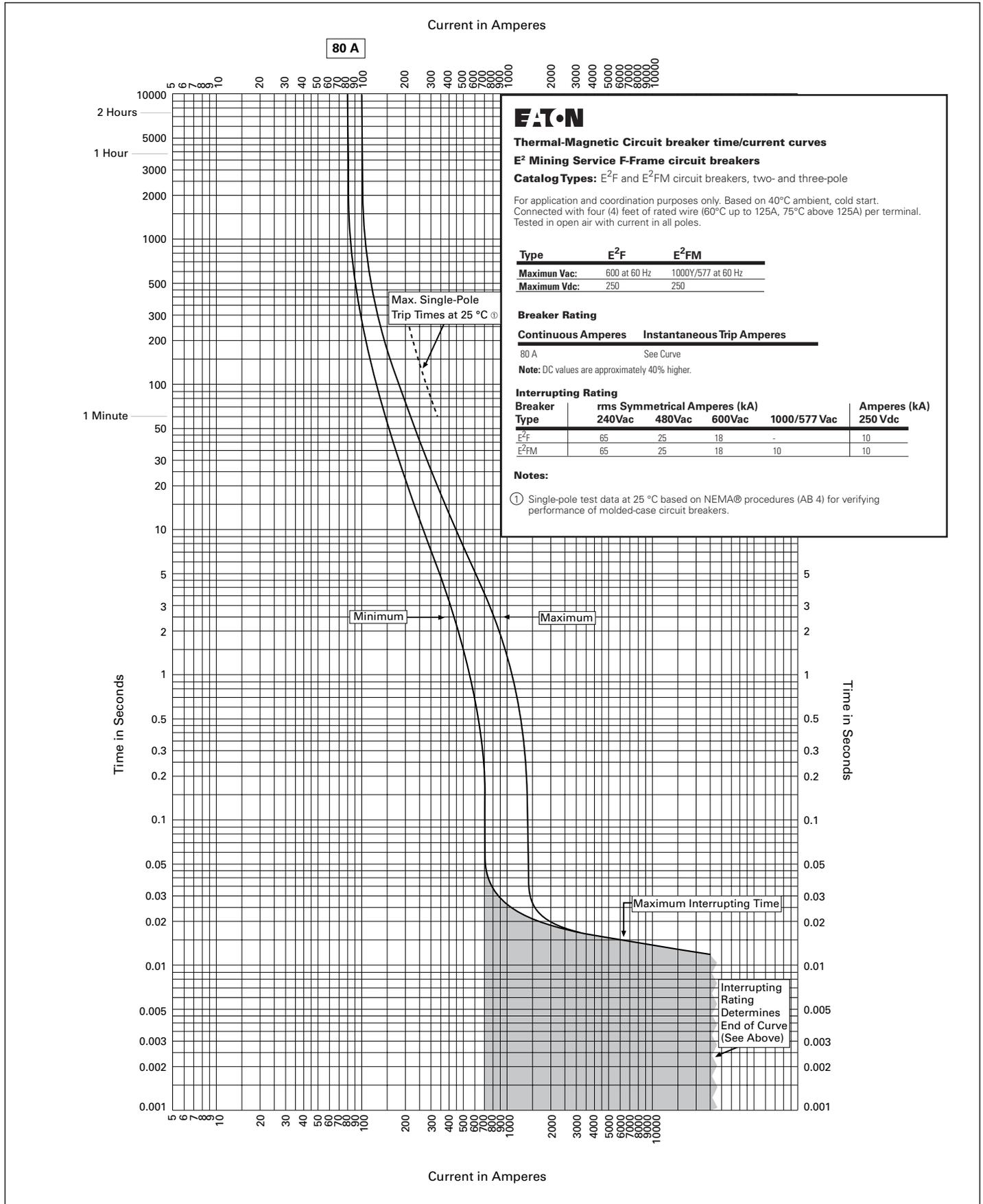


Figure 11. Types E²F and E²FM Circuit Breakers, 80 A, Two- and Three-Pole, Thermal-Magnetic— Curve No. SC-7078-98

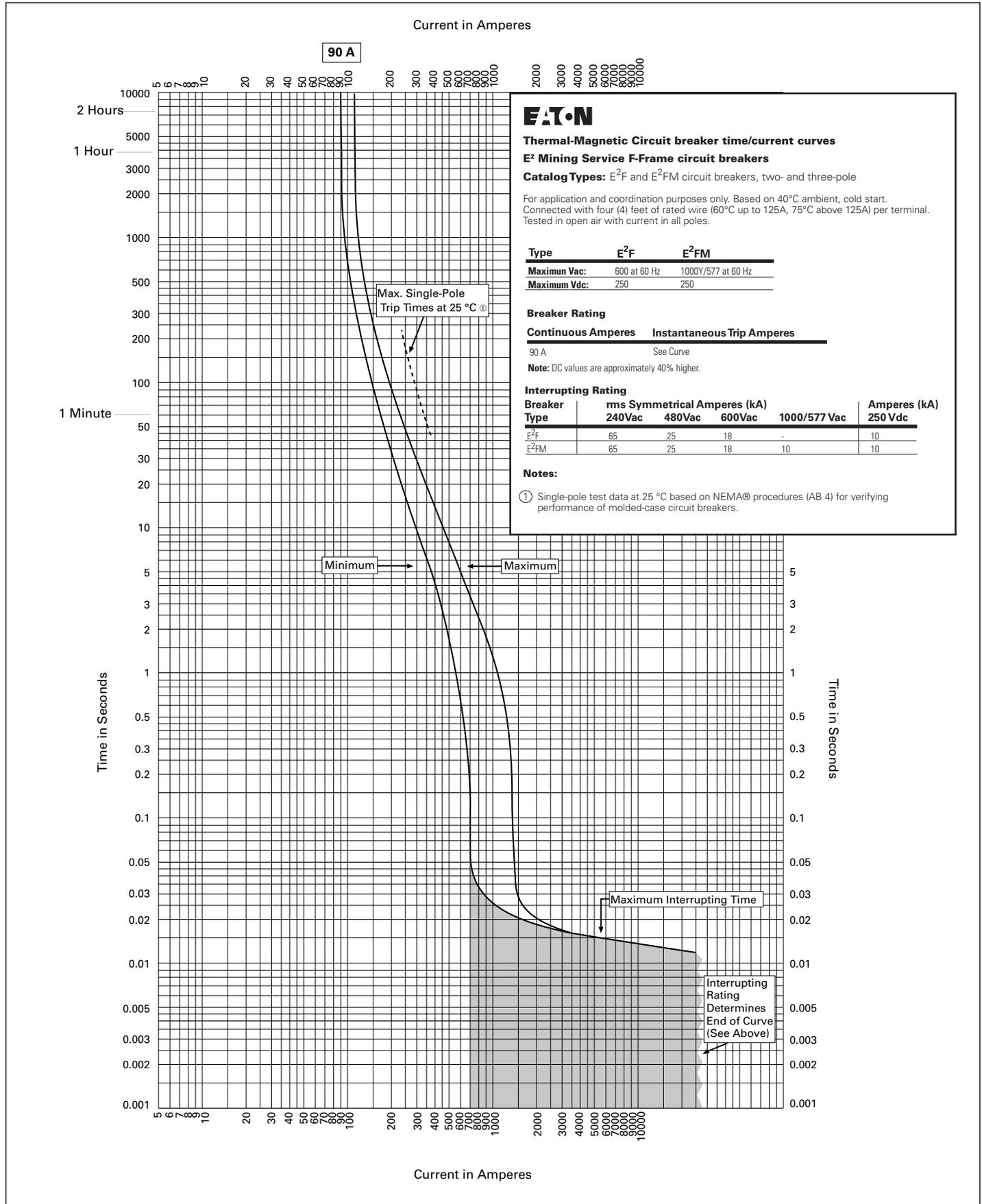


Figure 12. Types E²F and E²FM Circuit Breakers, 90 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7079-98

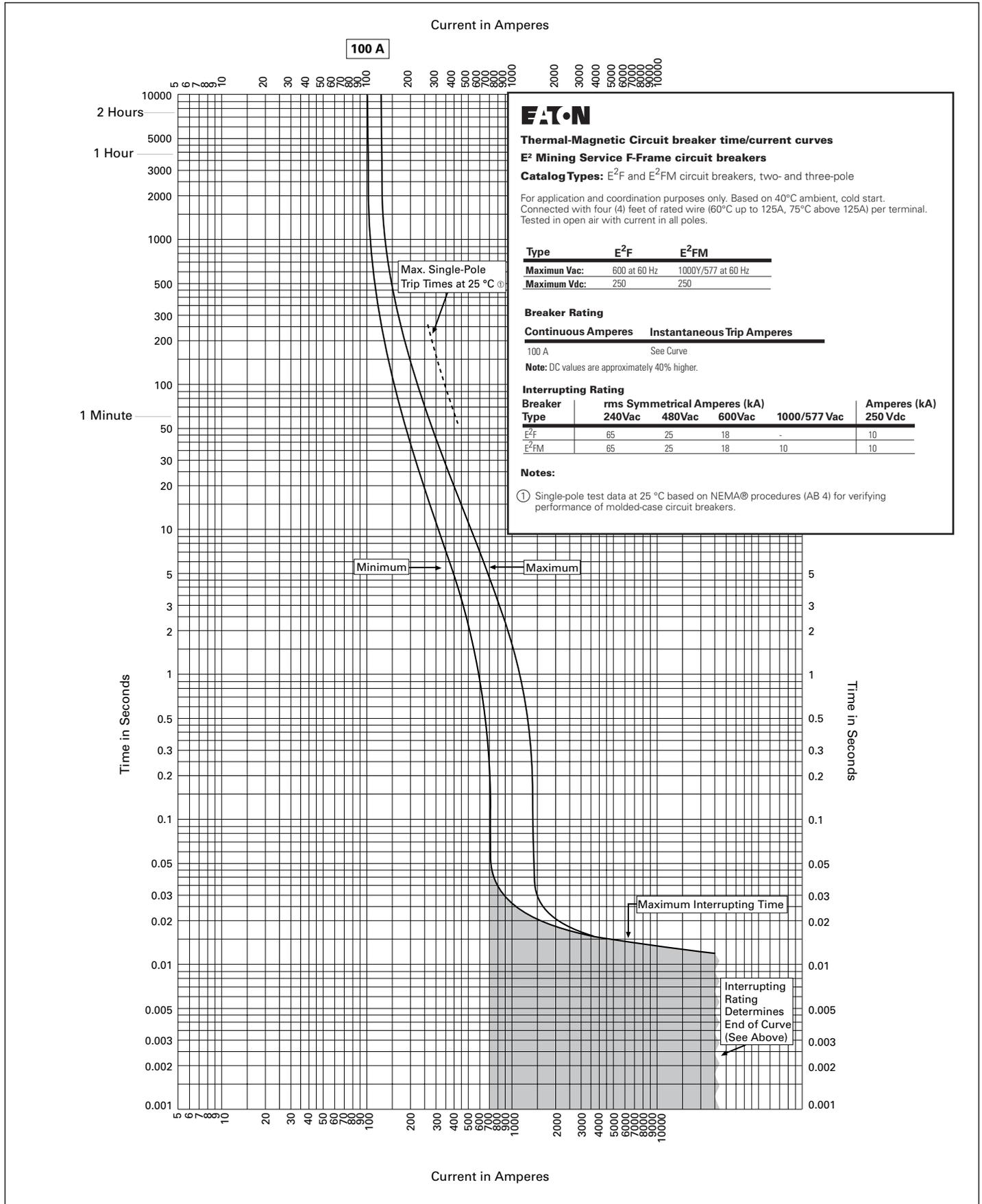


Figure 13. Types E²F and E²FM Circuit Breakers, 100 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7080-98

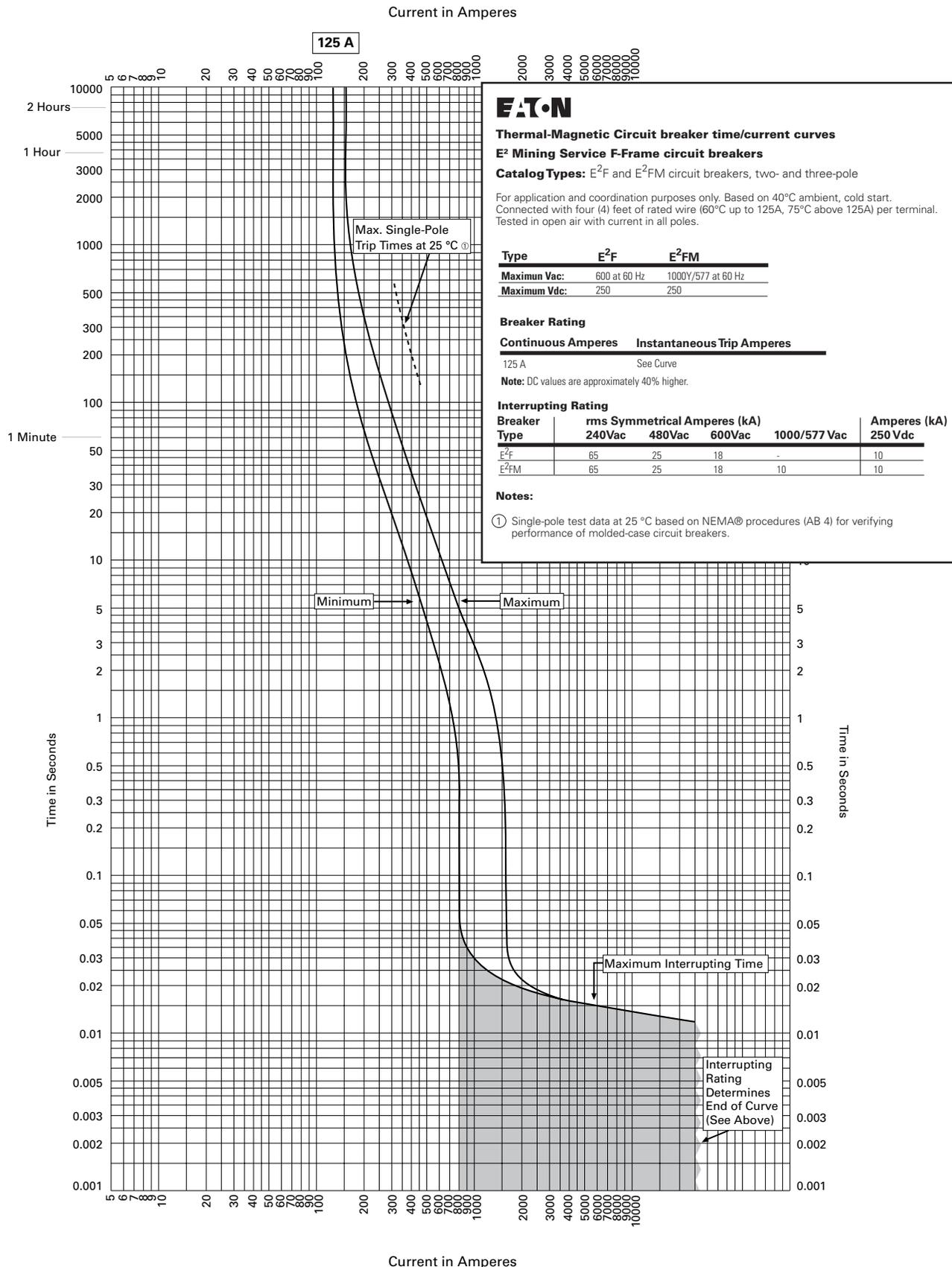


Figure 14. Types E²F and E²FM Circuit Breakers, 125 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7081-98

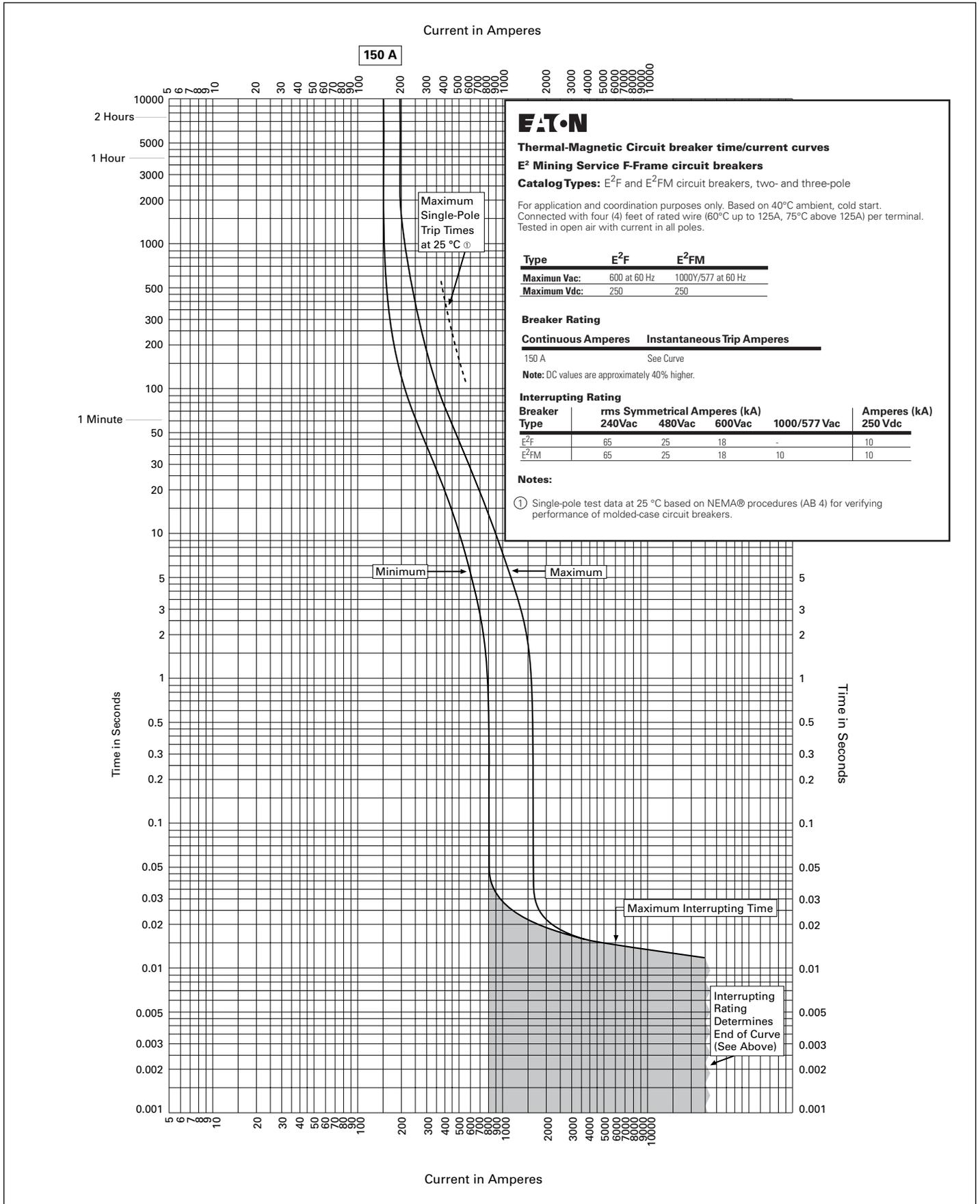


Figure 15. Types E²F and E²FM Circuit Breakers, 150 A, Two- and Three-Pole, Thermal-Magnetic—Curve No. SC-7082-98

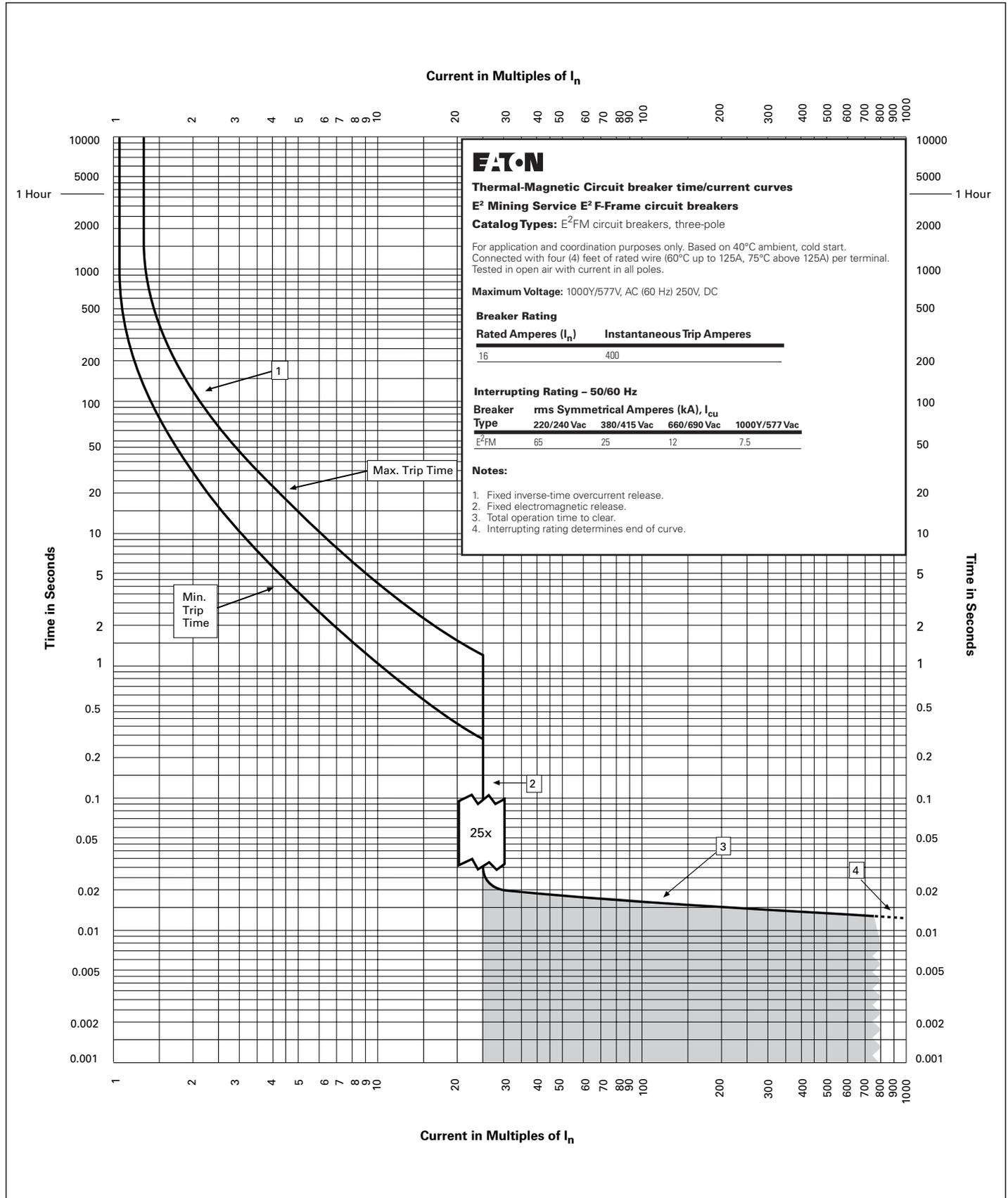


Figure 16. Type E²FM Circuit Breaker, 16A, Three-Pole, Thermal-Magnetic—Curve No. SC-7205-99

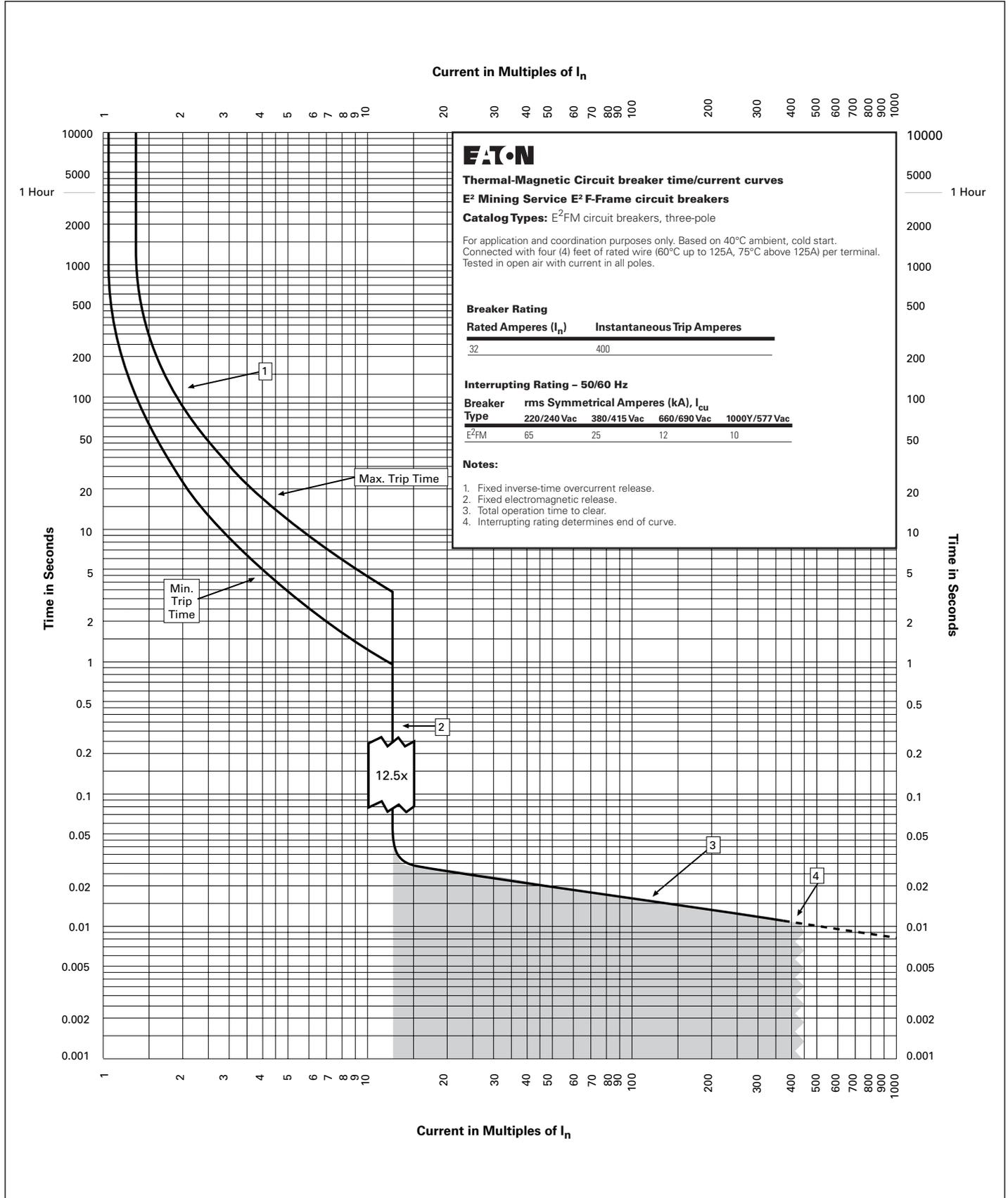


Figure 17. Type E²FM Circuit Breaker, 32A, Three-Pole, Thermal-Magnetic—Curve No. SC-7206-9

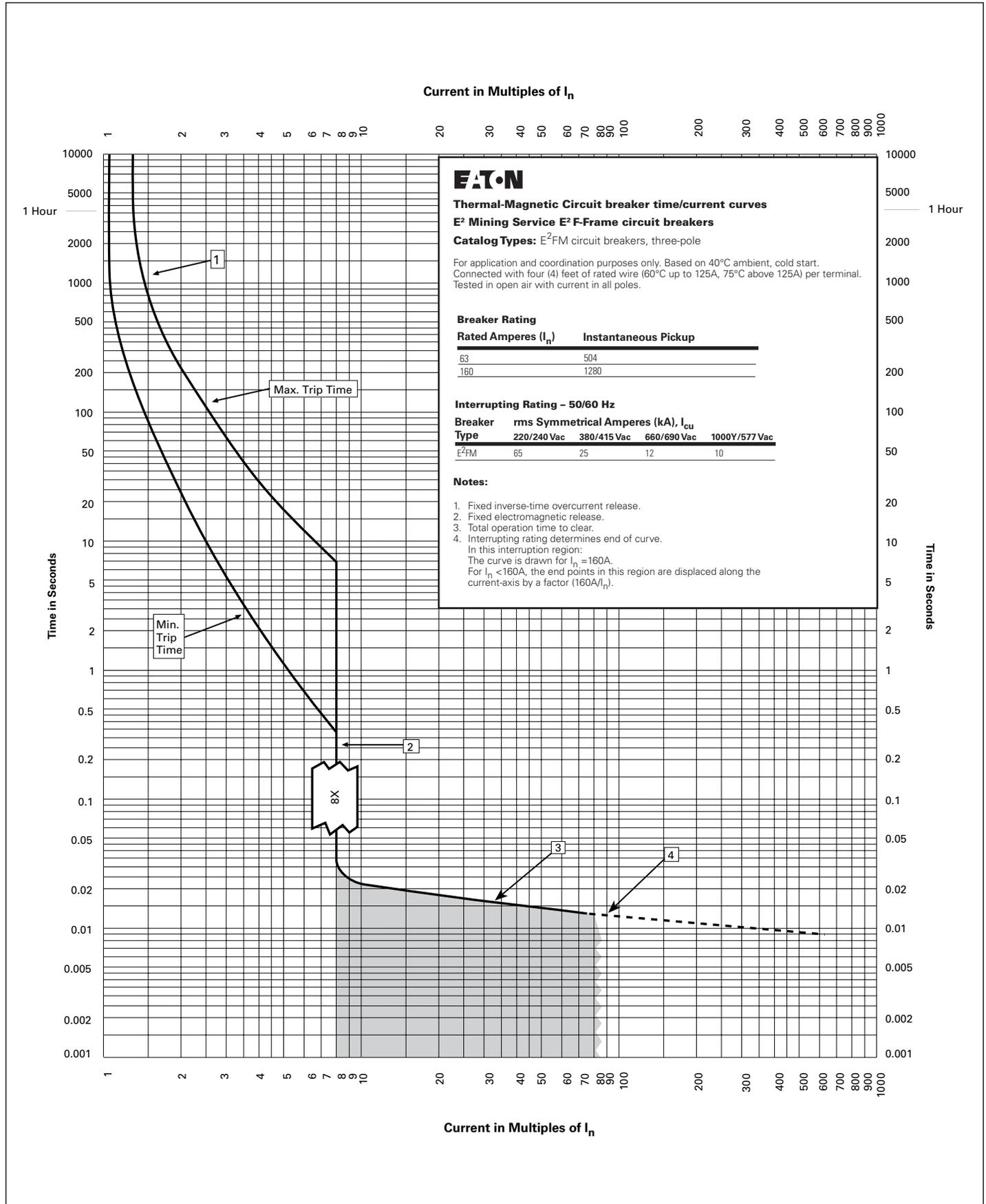


Figure 18. Type E²FM Circuit Breaker, 63A and 160A, Three-Pole, Thermal-Magnetic—Curve No. SC-7207-99

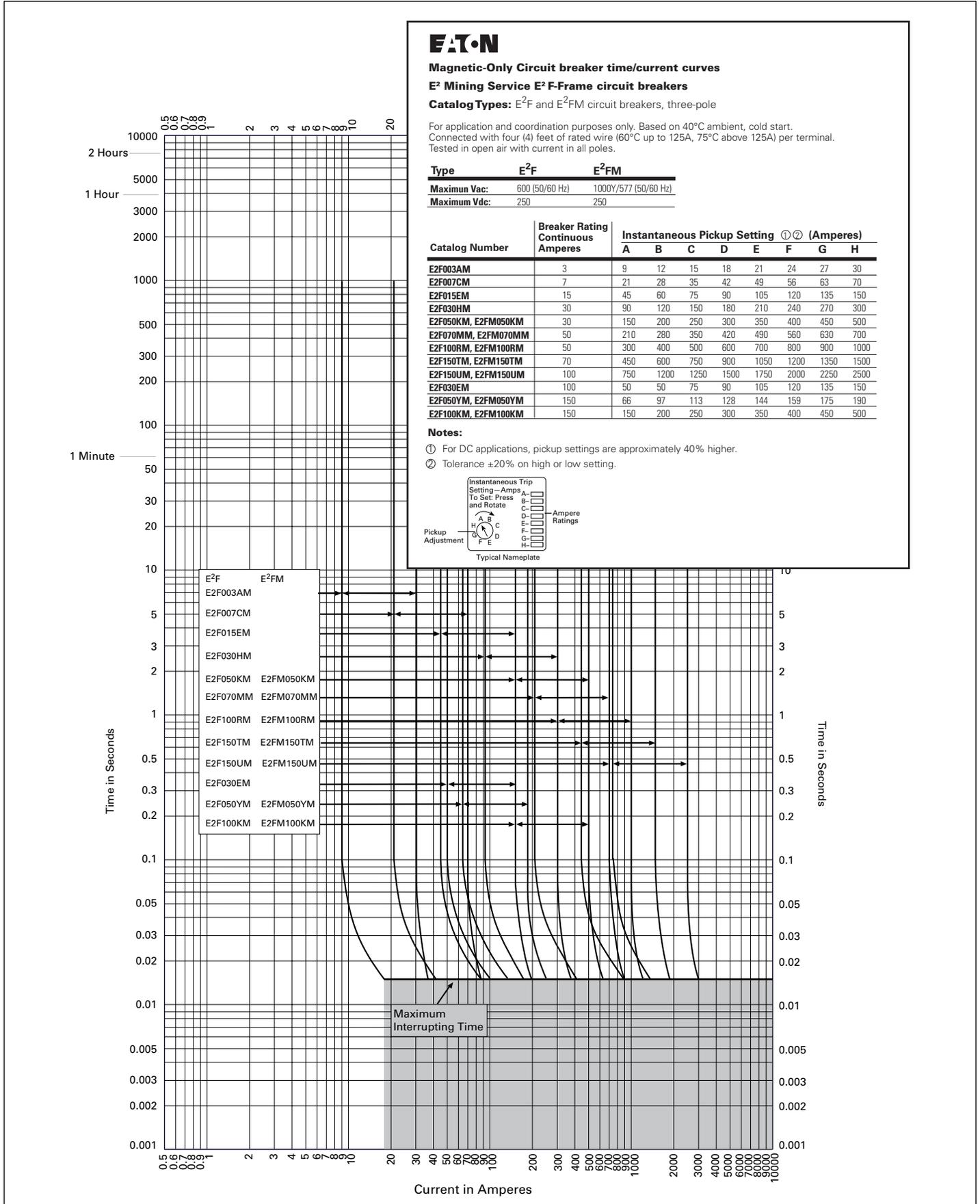


Figure 19. Types E²F and E²FM Circuit Breakers, 3 A to 150 A, Instantaneous Only—Curve No. SC-7083-98

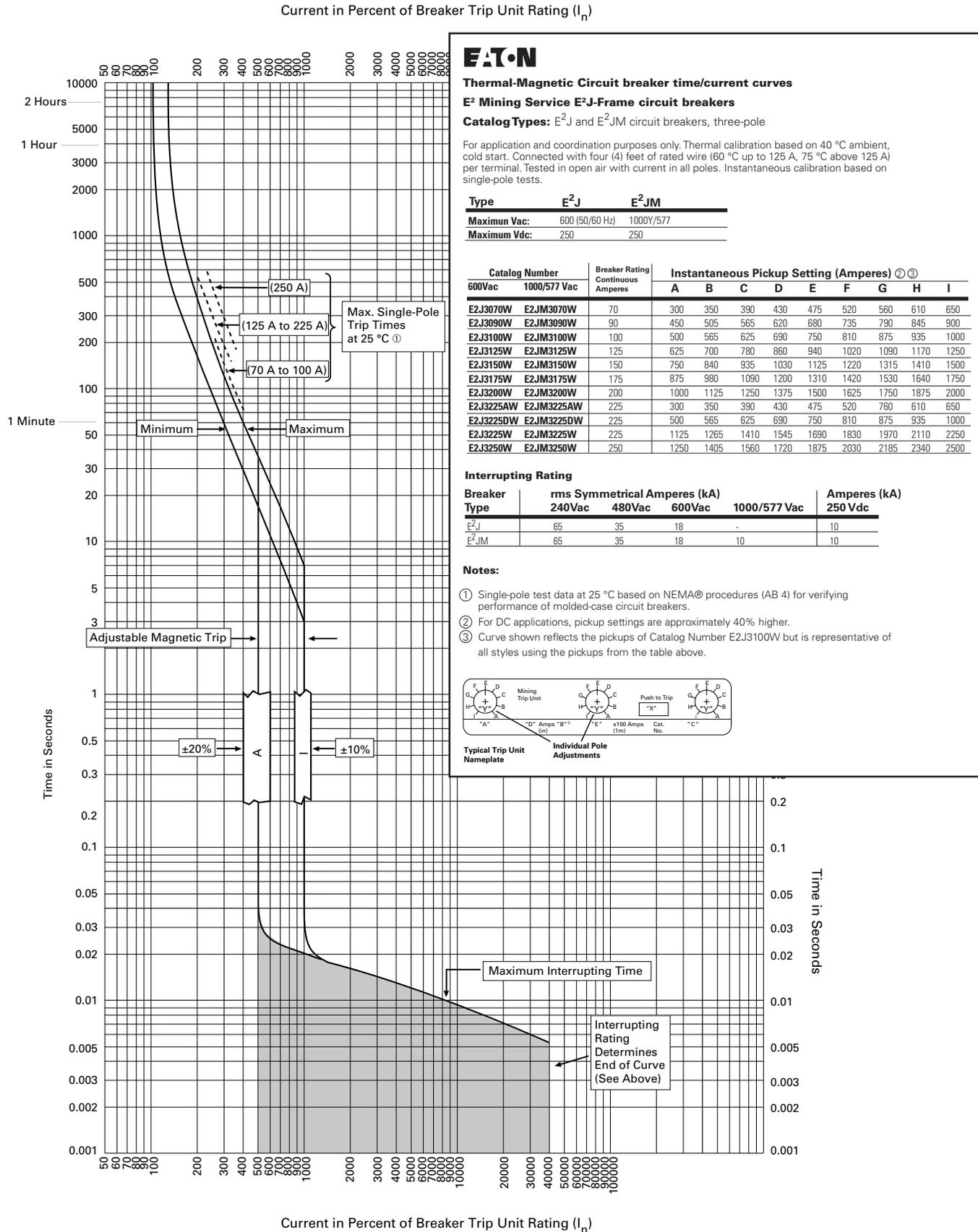


Figure 20. Types E²J and E²JM Circuit Breakers, 70 A to 250 A, Three-Pole, Thermal-Magnetic—Curve No. SC-7084-98

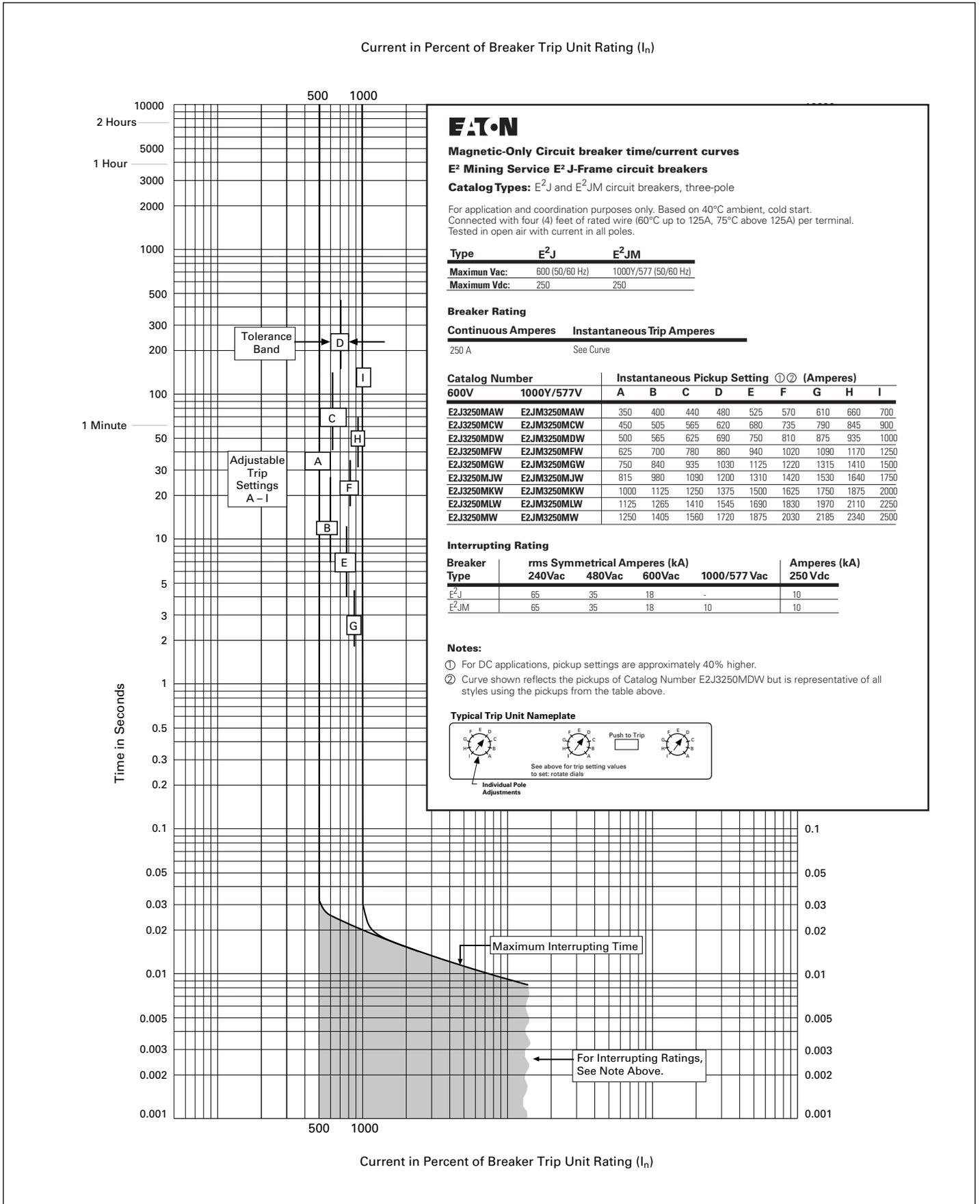


Figure 21. Types E²J and E²JM Circuit Breakers, 250 A, Three-Pole, Instantaneous Only—Curve No. SC-7085-98



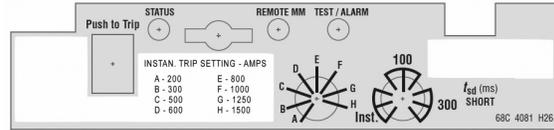
Digitrip 310+ Circuit Breaker Time/Current Curves

Maintenance Mode / Instantaneous Setting

E² Mining Service E² K-Frame circuit breakers

Catalog Types: E²KE and E²KEM circuit breakers, three-pole, ALSI

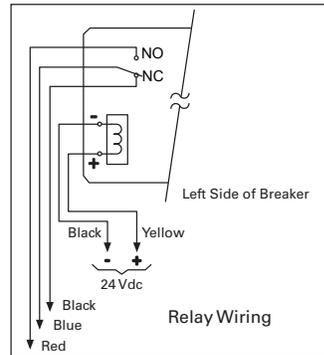
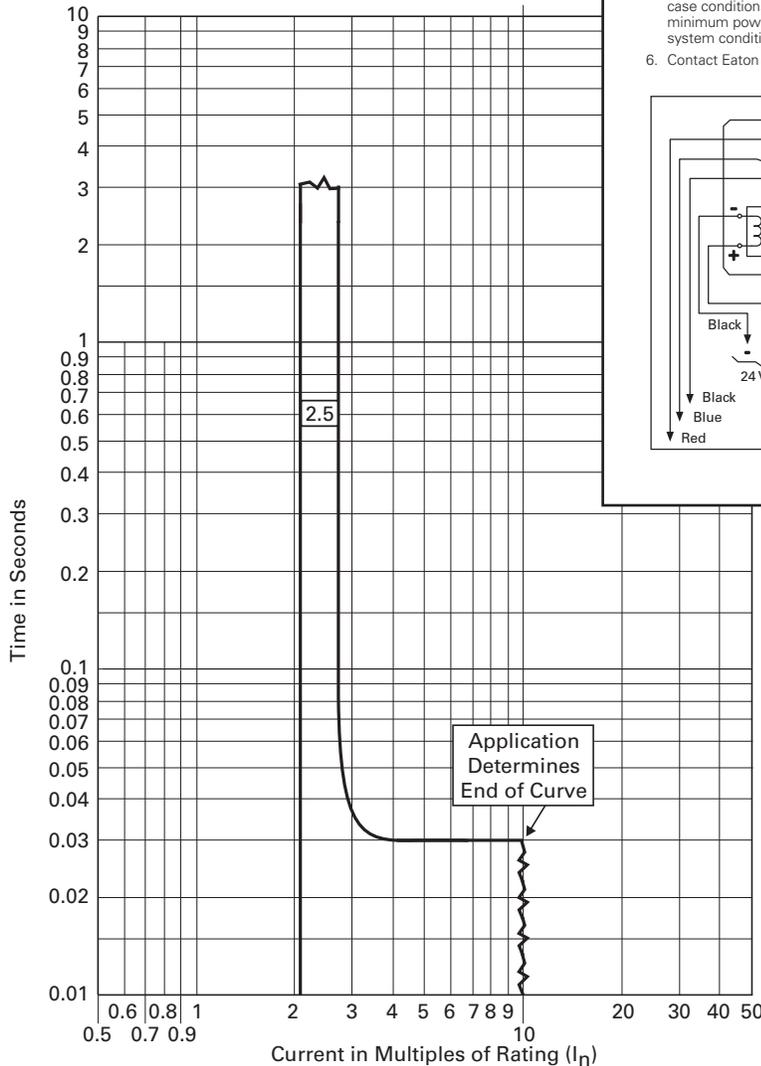
Trip Unit Nameplate



Notes:

1. The Maintenance Mode feature must be ENABLED for these curves to apply, when in Maintenance Mode
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. Nominal Values (Pickup) (Tolerance is ±15%)
5. These curves are comprehensive for the complete family of E² Mining Series K-Frame electronic breakers, including all frame sizes, ratings, and constructions. The total clearing times shown are conservative and consider the maximum response times of the trip unit, the circuit breaker opening, and the interruption of the current in worst case conditions, such as maximum rated voltages, single-phase interruption, and minimum power factor. Faster clearing times are possible depending on the specific system conditions.
6. Contact Eaton for additional information.

Maintenance Mode Trip



This feature allows enabling of the maintenance mode remotely by applying 24 Vdc to the yellow (+) and black (-) wires that exit the left hand side of the breaker. When energized, the maintenance mode setting that is enabled is the 2.5X setting.

There are two indicators that can verify that the trip unit has been remotely activated/enabled into the maintenance mode feature:

A. The blue LED (MM) located on the top left side of the trip unit will light.

AND/OR

B. The relay output is provided by three wires exiting the left hand side of the breaker: blue = C, red = NO, black = NC. The relay will change state when the maintenance mode is remotely enabled by applying 24 Vdc to the yellow and black wires as described above.

Figure 23. Maintenance Mode / Instantaneous Setting (ALSI) - Curve No. SC-7089-98

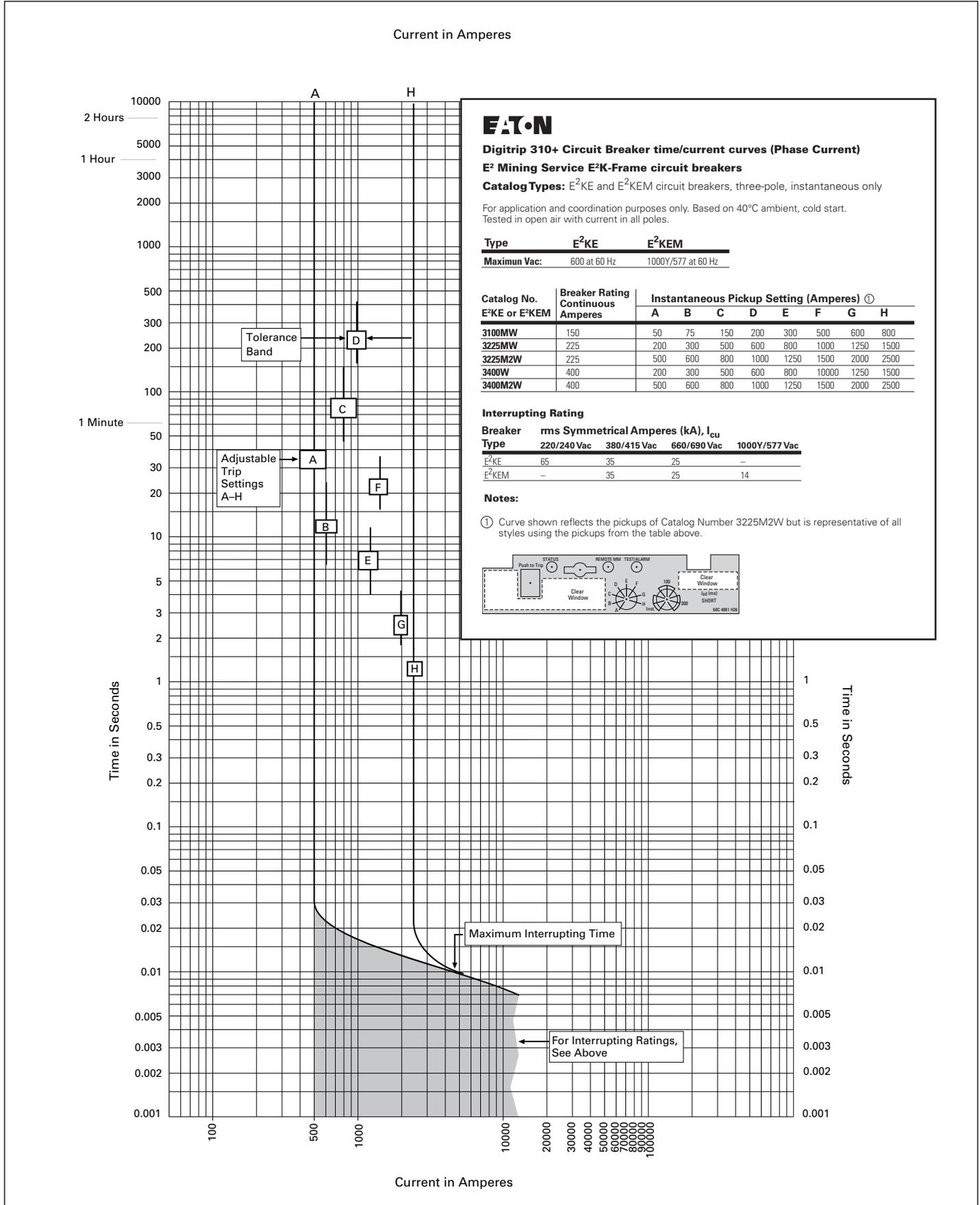


Figure 24. Types E²KE and E²KEM Circuit Breakers, 150 A to 400 A, Three-Pole, Instantaneous Only—Curve No. SC-7089-98

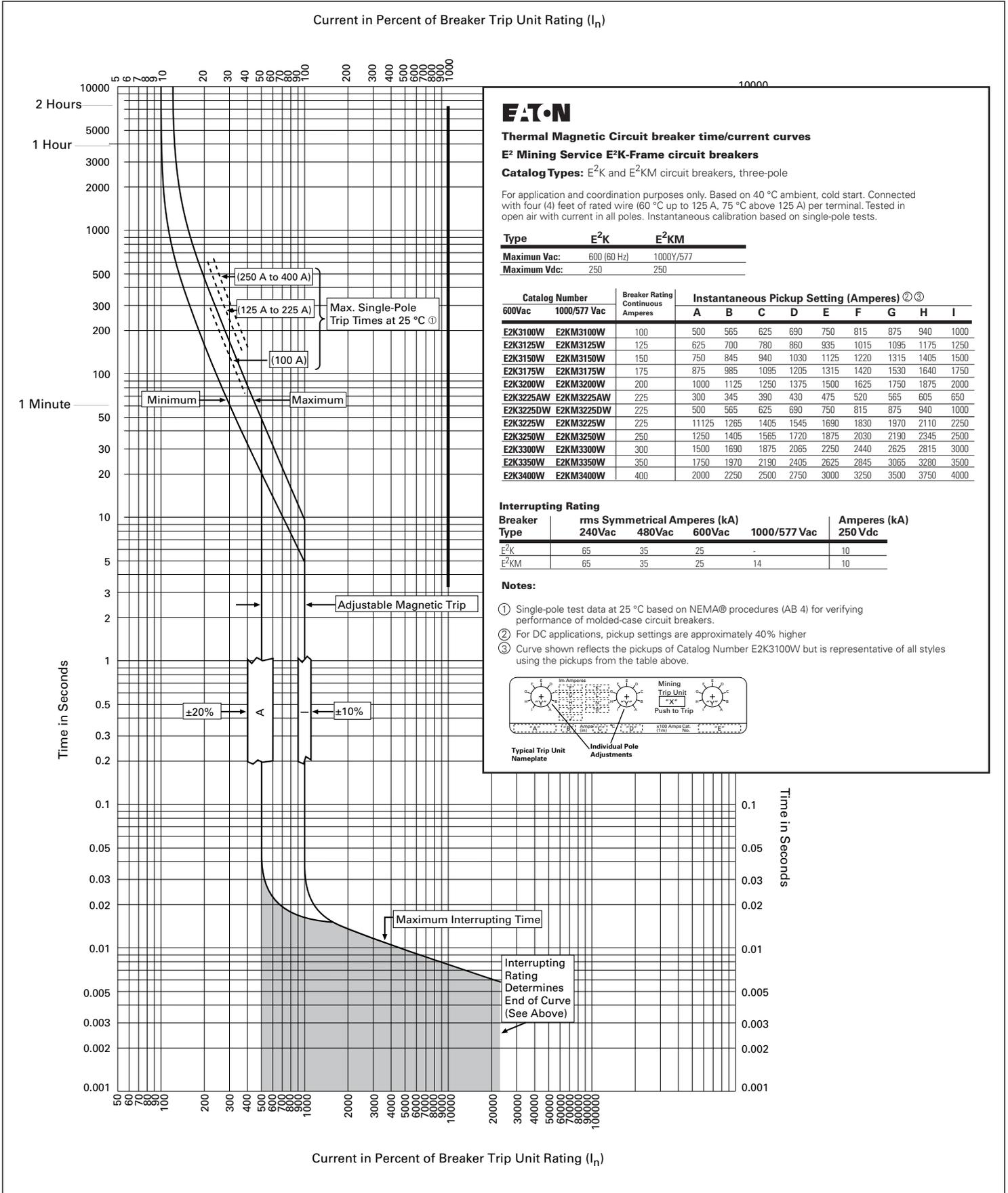


Figure 25. Types E²K and E²KM Circuit Breakers, 100 A to 400 A, Three-Pole, Thermal-Magnetic—Curve No. SC-7086-98

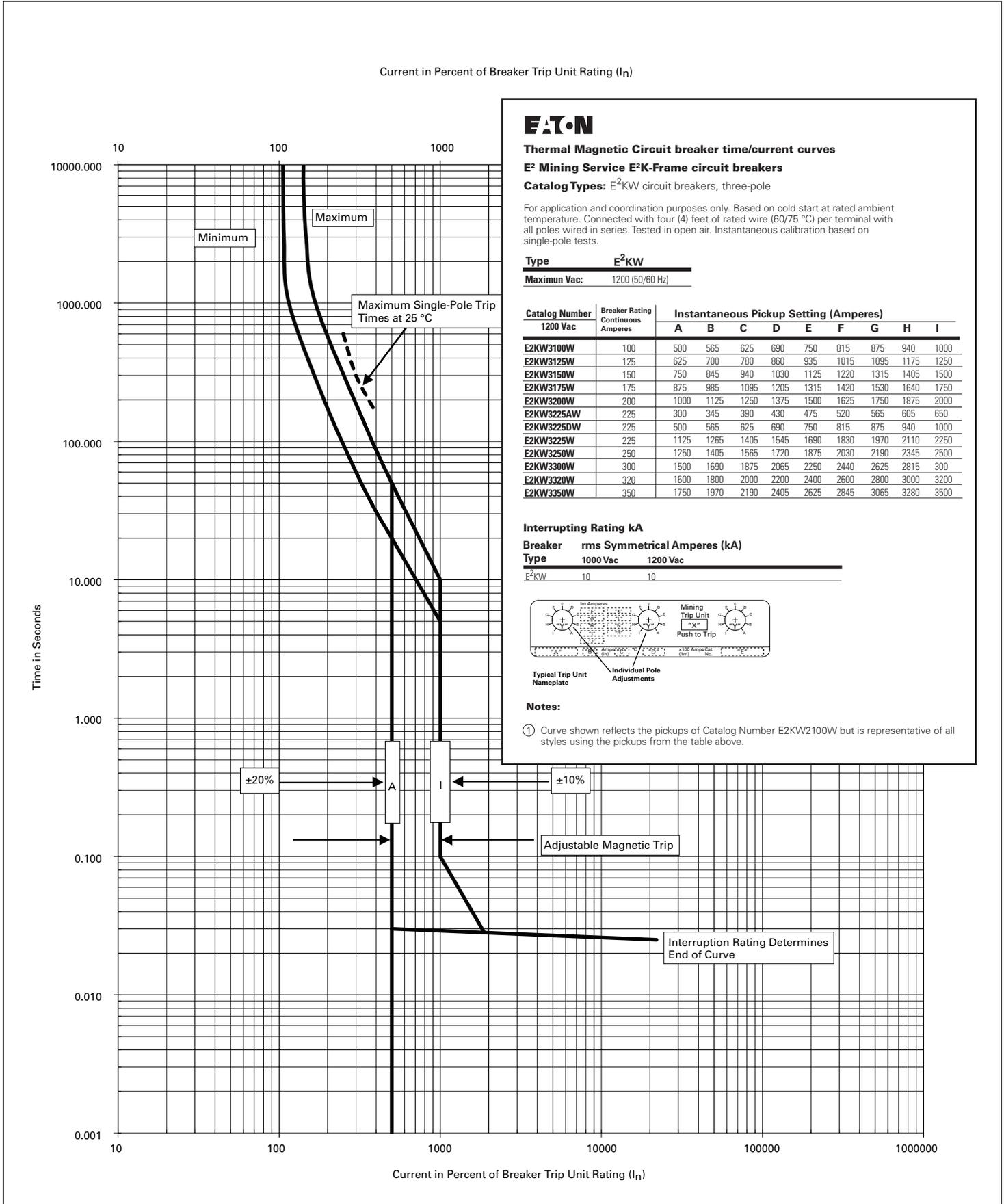


Figure 26. Type E²KW Circuit Breaker, 100 A to 350 A, Three-Pole, Thermal-Magnetic—Curve No. SC-7090-14

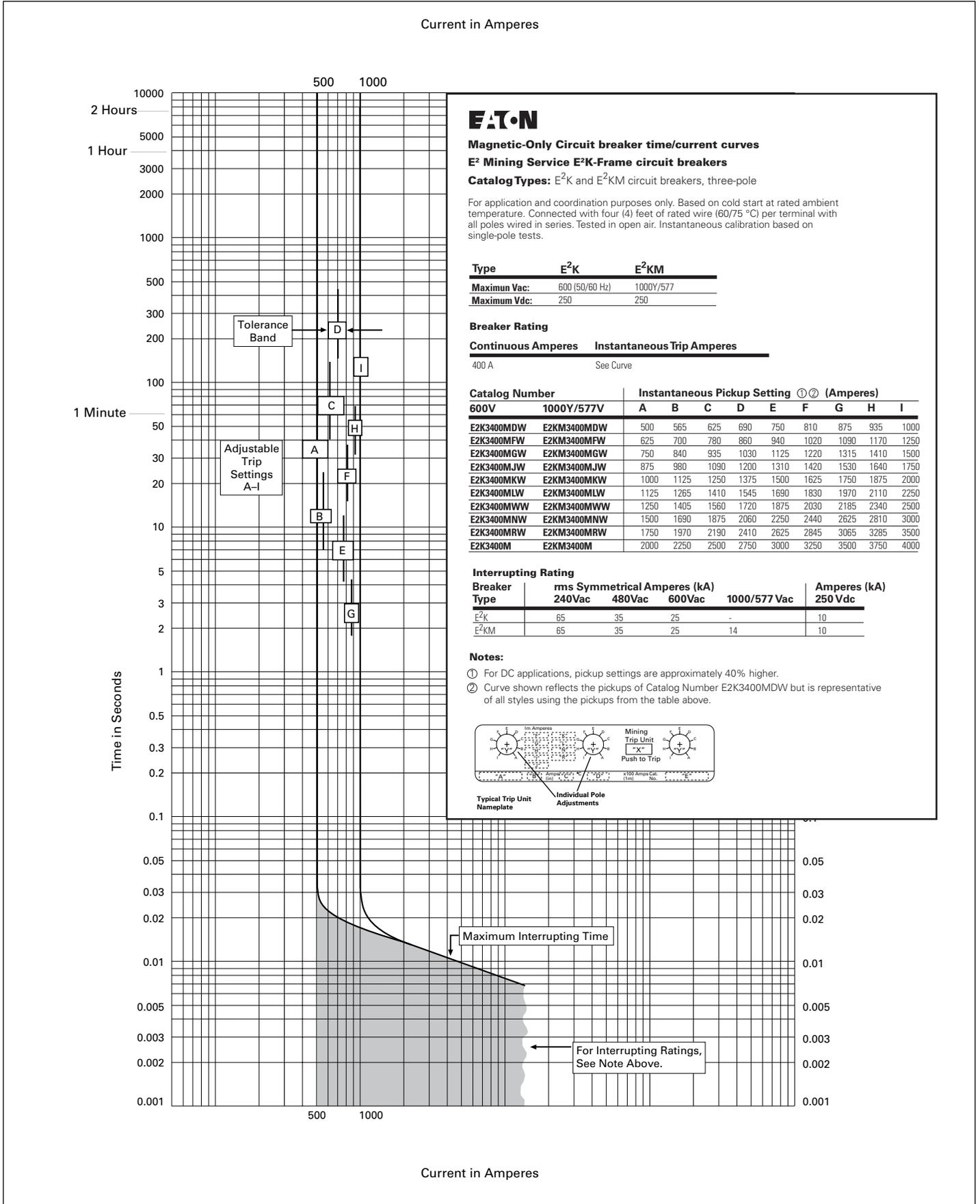


Figure 27. Types E²K and E²KM Circuit Breakers, 400 A, Three-Pole, Instantaneous Only—Curve No. SC-7087-98

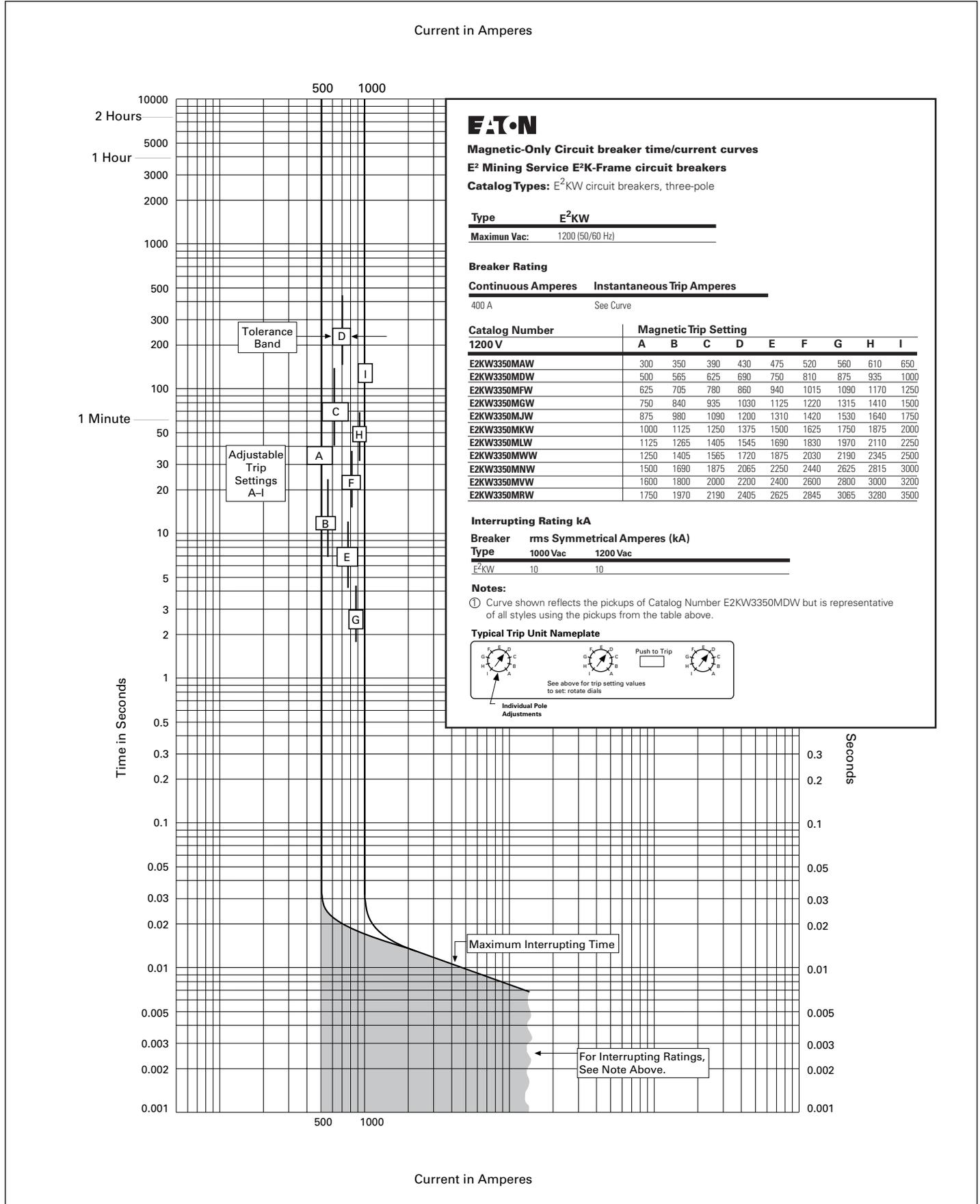


Figure 28. Type E²KW Circuit Breaker, 350 A, Three-Pole, Instantaneous Only – Curve No. SC-7091-14

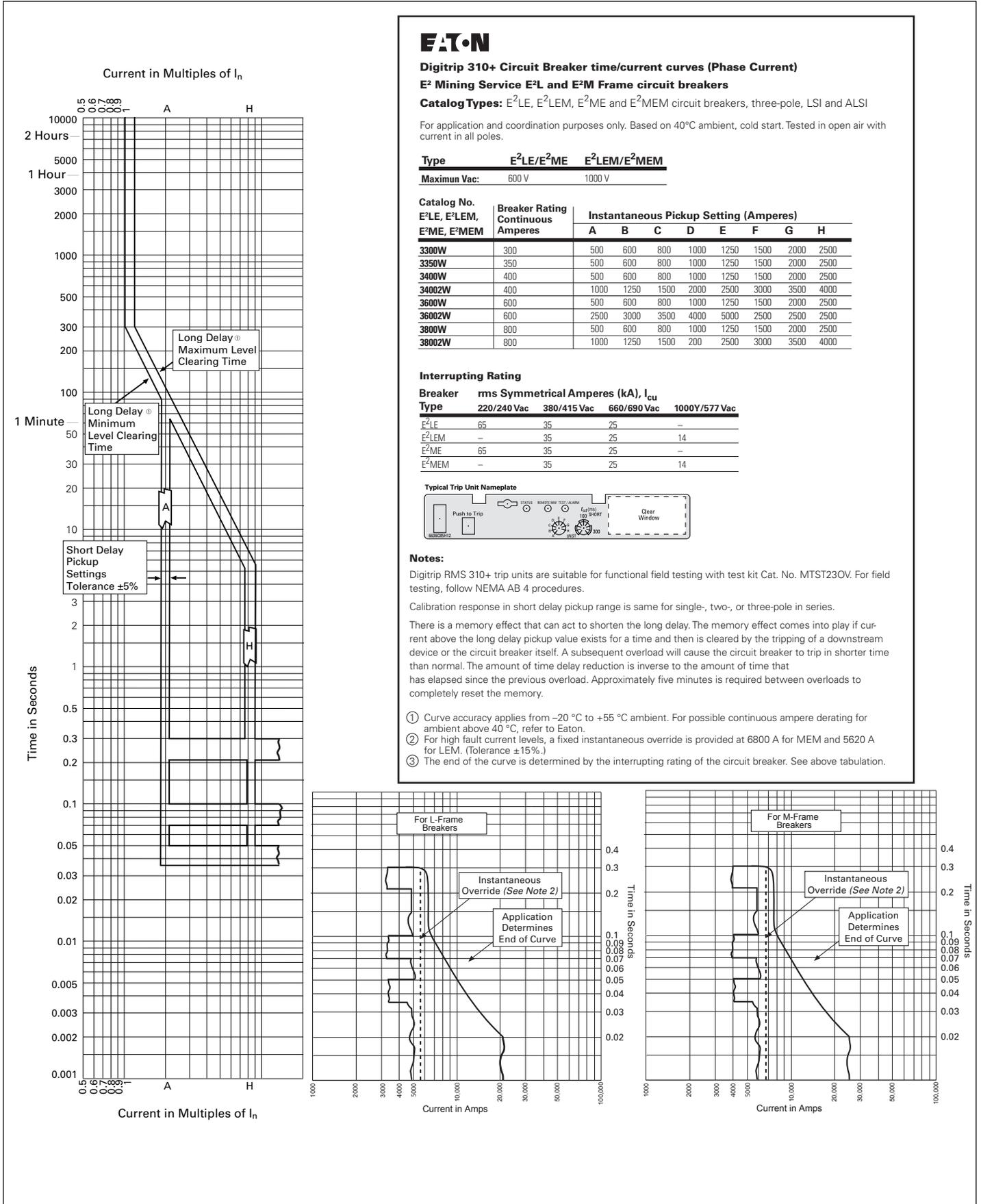


Figure 29. Types E²LE and E²LEM, E²ME and E²MEM Circuit Breakers, 300 A to 800 A, Three-Pole, Long-Instantaneous—Curve No. SC-6748-97



Digitrip 310+ Circuit Breaker Time/Current Curves

Maintenance Mode / Instantaneous Setting

E² Mining Service E² L-Frame circuit breakers

Catalog Types: E²LE E²LEM, E²ME, and E²MEM circuit breakers, three-pole, ALSI

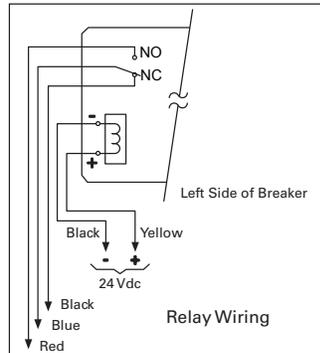
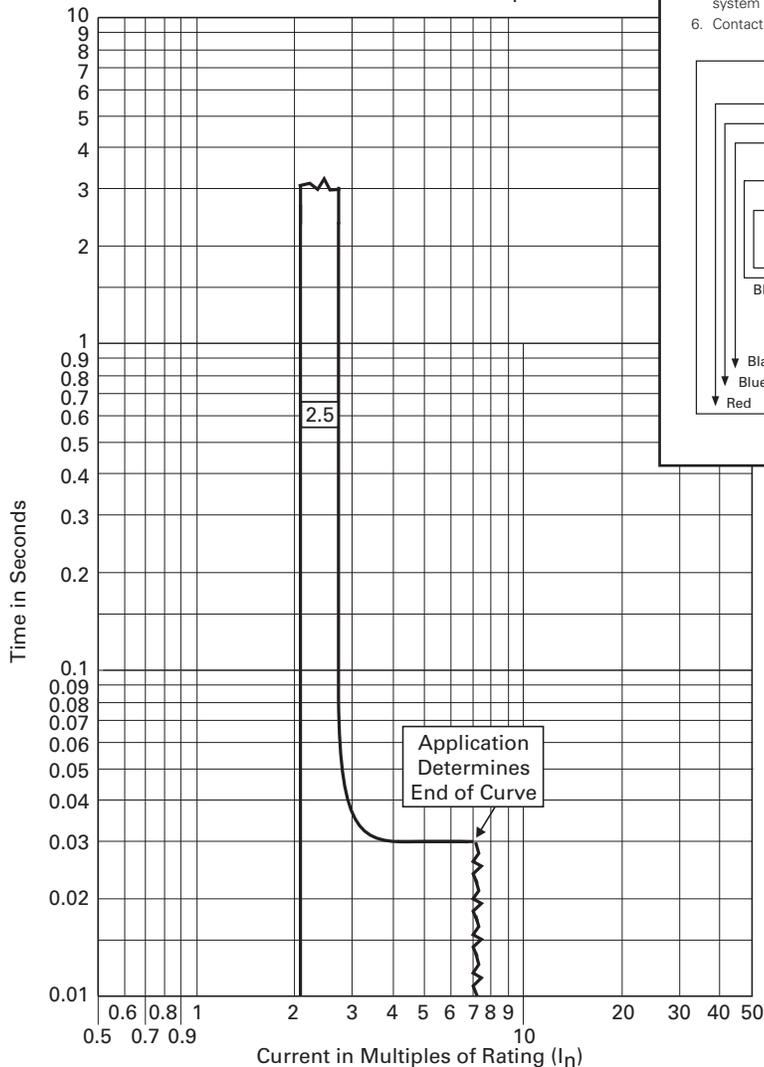
Trip Unit Nameplate



Notes:

1. The Maintenance Mode feature must be ENABLED for these curves to apply, when in Maintenance Mode
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. Nominal Values (Pickup) (Tolerance is ±15%)
5. These curves are comprehensive for the complete family of E² Mining Series L- and M-Frames electronic breakers, including all frame sizes, ratings, and constructions. The total clearing times shown are conservative and consider the maximum response times of the trip unit, the circuit breaker opening, and the interruption of the current in worst case conditions, such as maximum rated voltages, single-phase interruption, and minimum power factor. Faster clearing times are possible depending on the specific system conditions.
6. Contact Eaton for additional information.

Maintenance Mode Trip



This feature allows enabling of the maintenance mode remotely by applying 24 Vdc to the yellow (+) and black (-) wires that exit the left hand side of the breaker. When energized, the maintenance mode setting that is enabled is the 2.5X setting.

There are two indicators that can verify that the trip unit has been remotely activated/enabled into the maintenance mode feature:

- A.** The blue LED (MM) located on the top left side of the trip unit will light.
- AND/OR
- B.** The relay output is provided by three wires exiting the left hand side of the breaker: blue = C, red = NO, black = NC. The relay will change state when the maintenance mode is remotely enabled by applying 24 Vdc to the yellow and black wires as described above.

Figure 30. Maintenance Mode / Instantaneous Setting (ALSI) - Curve No. SC-6747-97

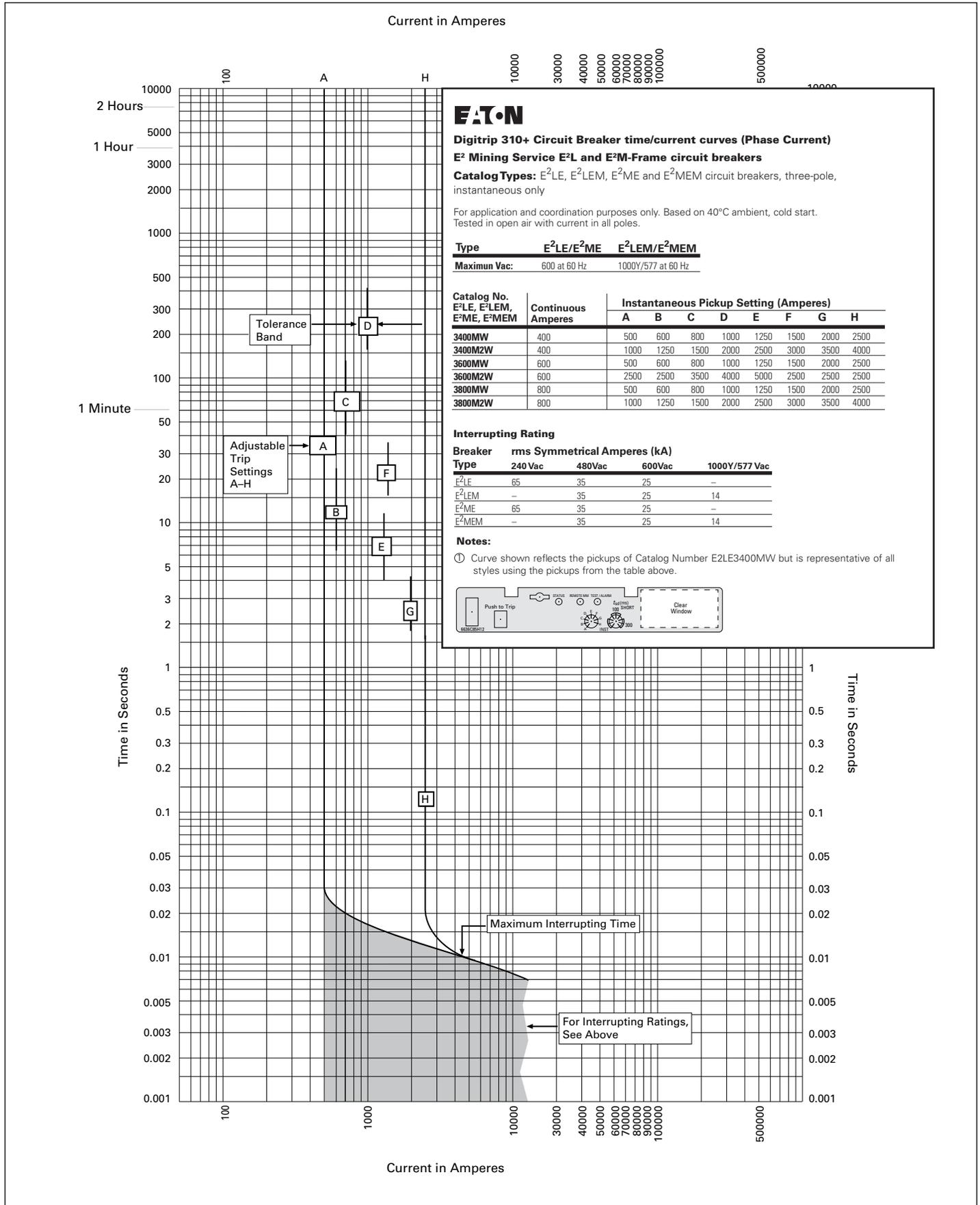


Figure 31. Types E²LE and E²LEM, E²ME and E²MEM Circuit Breakers, 400 A to 800 A, Three-Pole, Instantaneous Only—
Curve No. SC-6747-97

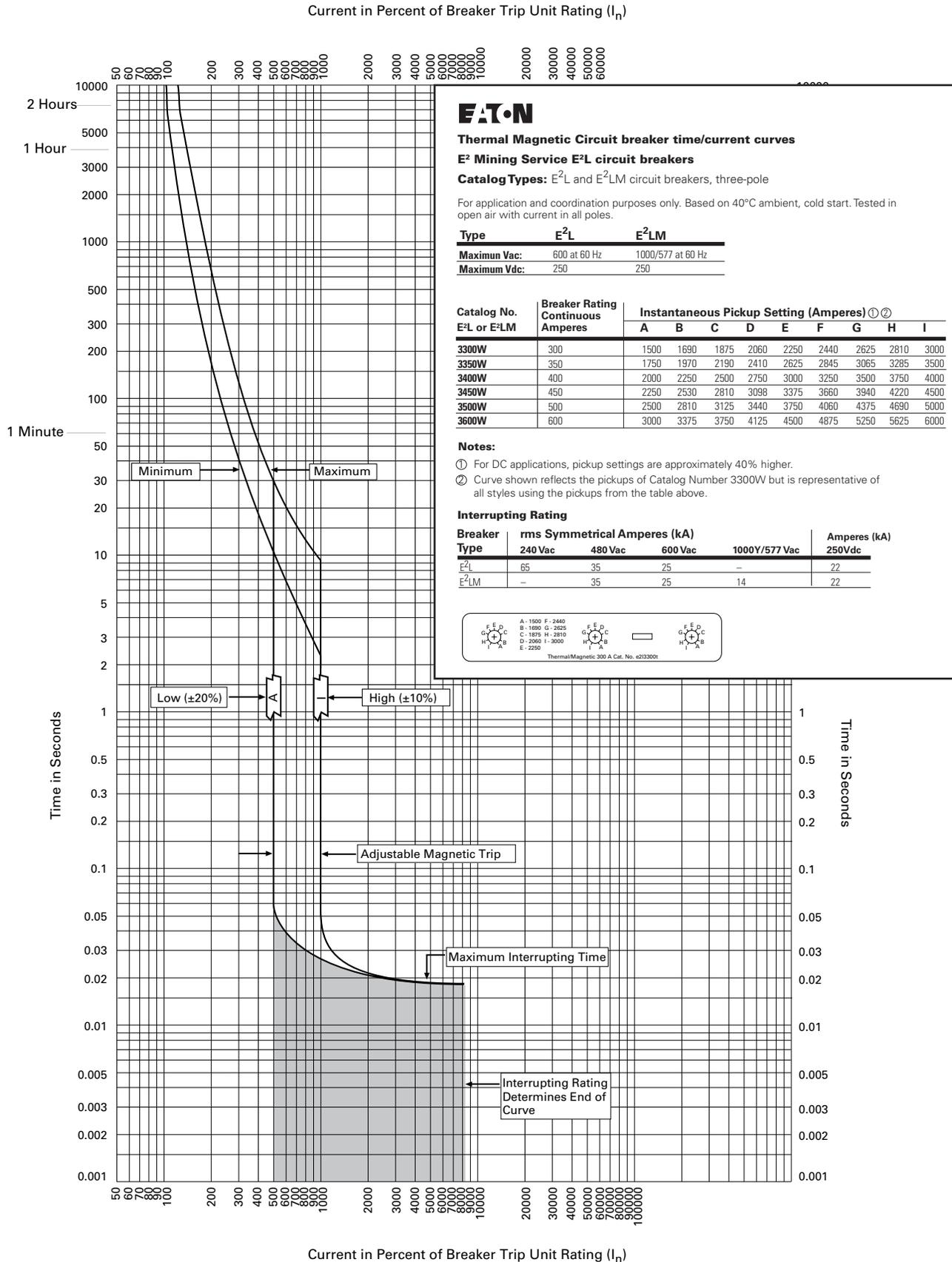


Figure 32. Types E²L and E²LM Circuit Breakers, 300 A to 600 A, Three-Pole, Thermal-Magnetic—Curve No. SC-6745-97

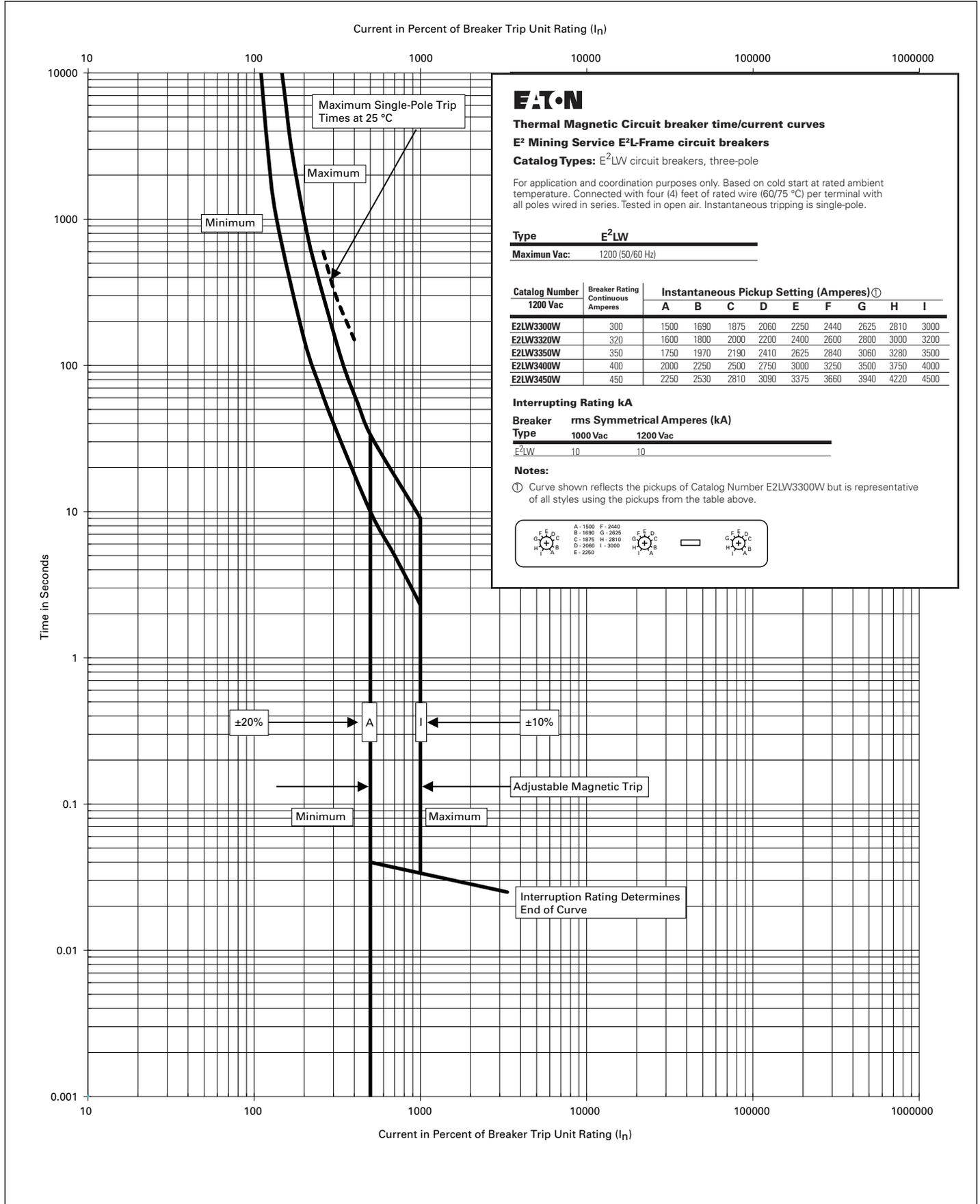


Figure 33. Type E²LW Circuit Breaker, 300 A to 450 A, Three-Pole, Thermal-Magnetic—Curve No. SC-6760-14

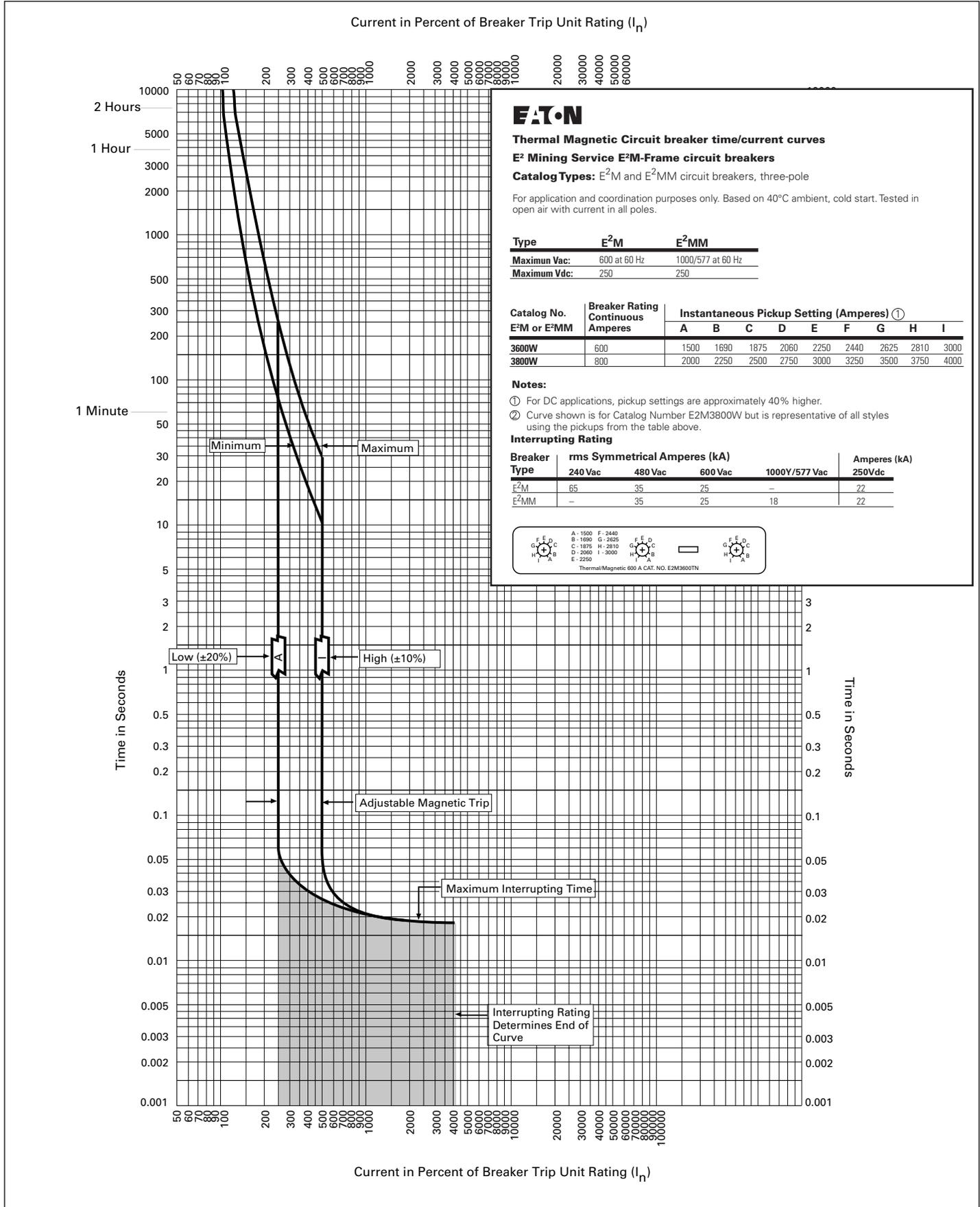


Figure 34. Types E²M and E²MM Circuit Breakers, 600 A to 800 A, Three-Pole, Thermal-Magnetic—Curve No. TC01217003E

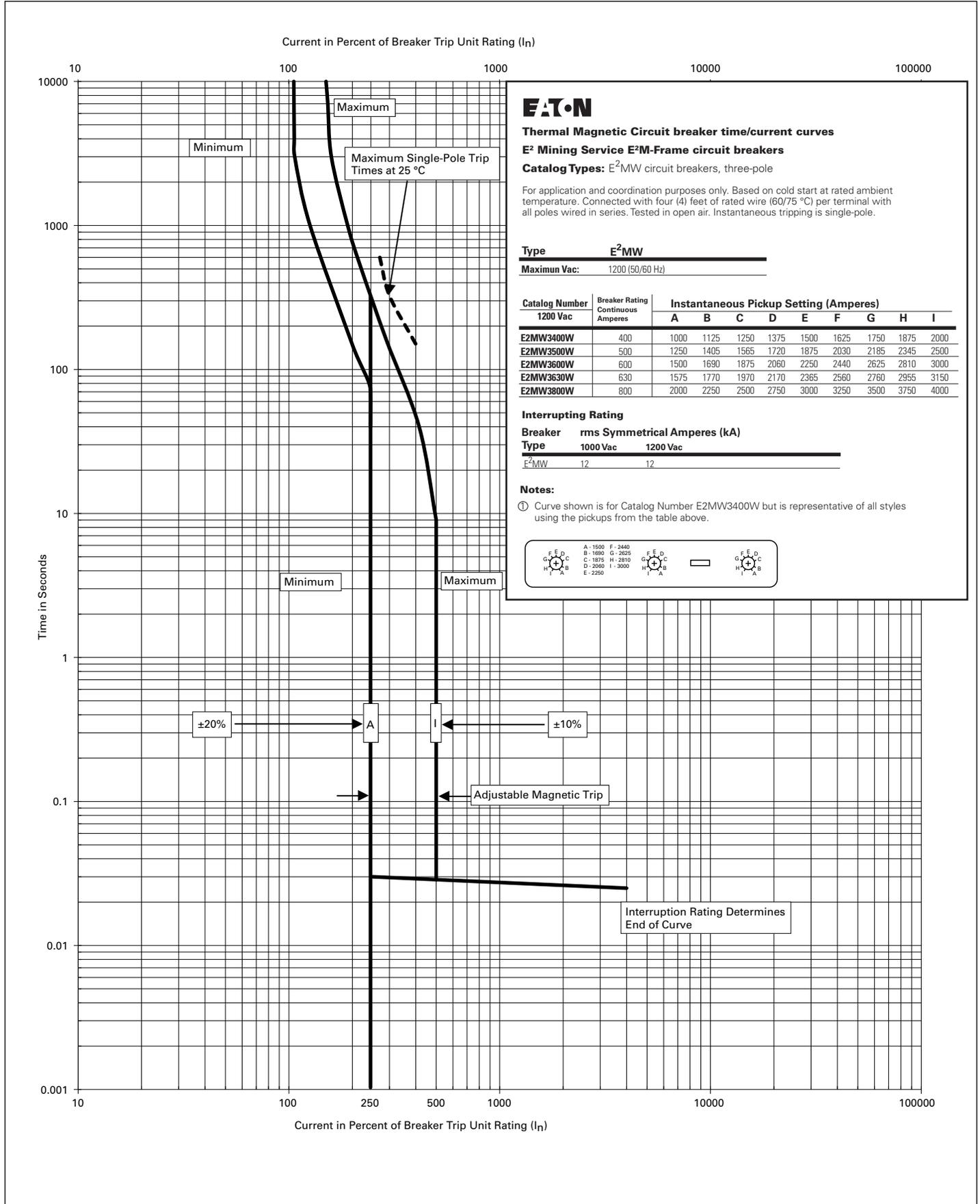


Figure 35. Type E²MW Circuit Breaker, 300 A to 800 A, Three-Pole, Thermal-Magnetic—Curve No. SC-6770-14

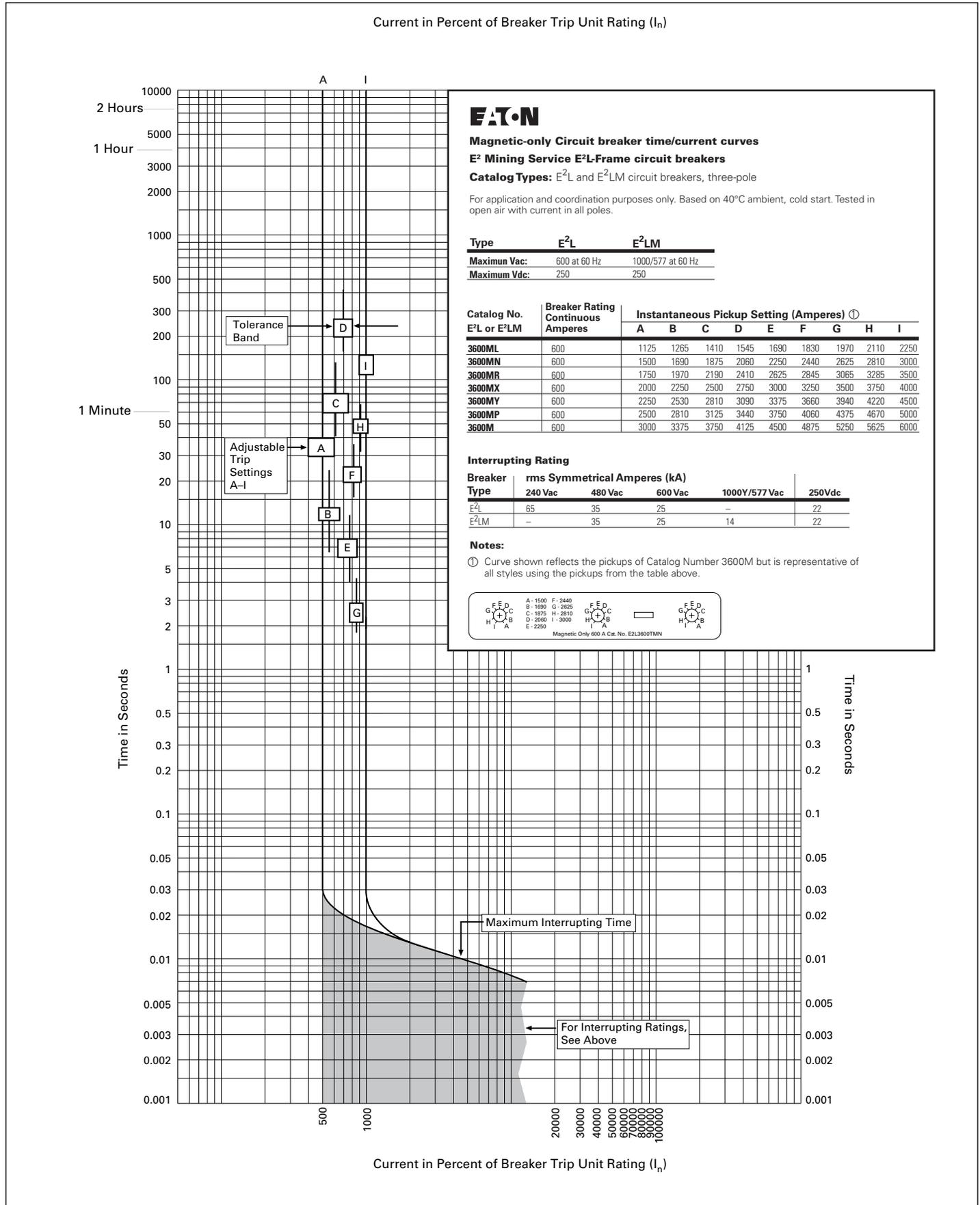


Figure 36. Types E²L and E²LM Circuit Breakers, 600 A, Three-Pole, Instantaneous Only—Curve No. SC-6746-97

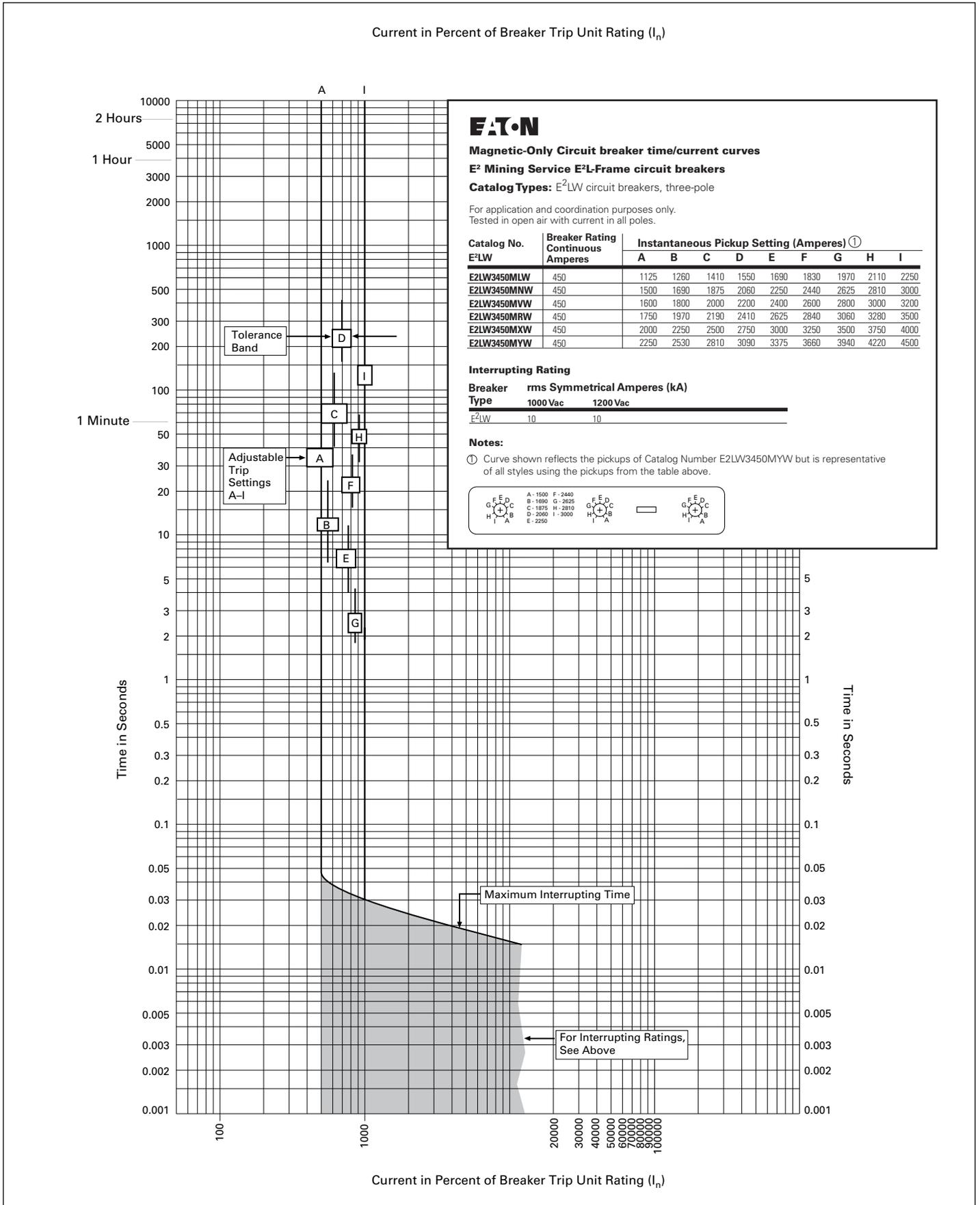


Figure 37. Type E²LW Circuit Breaker, 450 A, Three-Pole, Instantaneous Only—Curve No. SC-6761-14

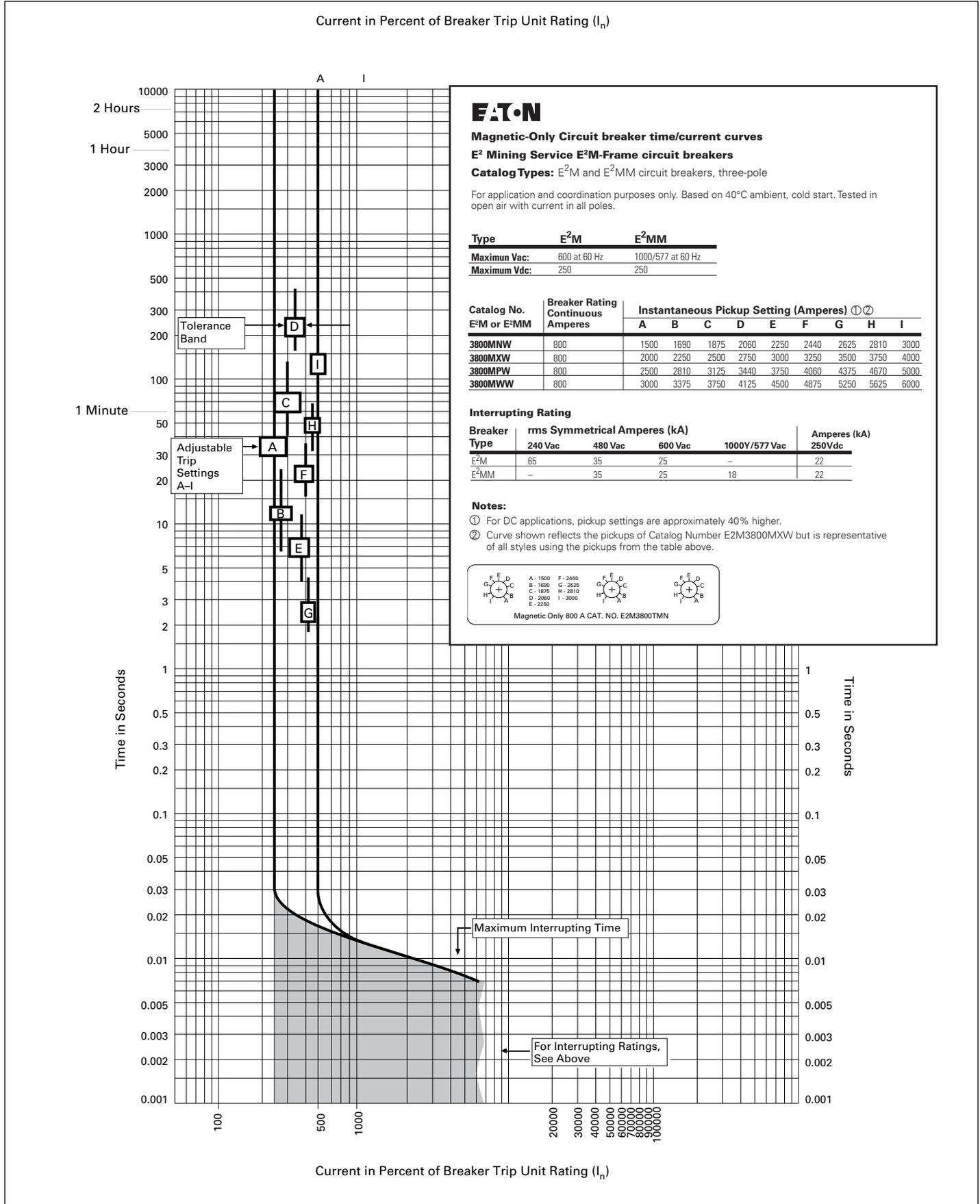


Figure 38. Types E²M and E²MM Circuit Breakers, 800 A, Three-Pole, Instantaneous Only — Curve No. TC01217002E

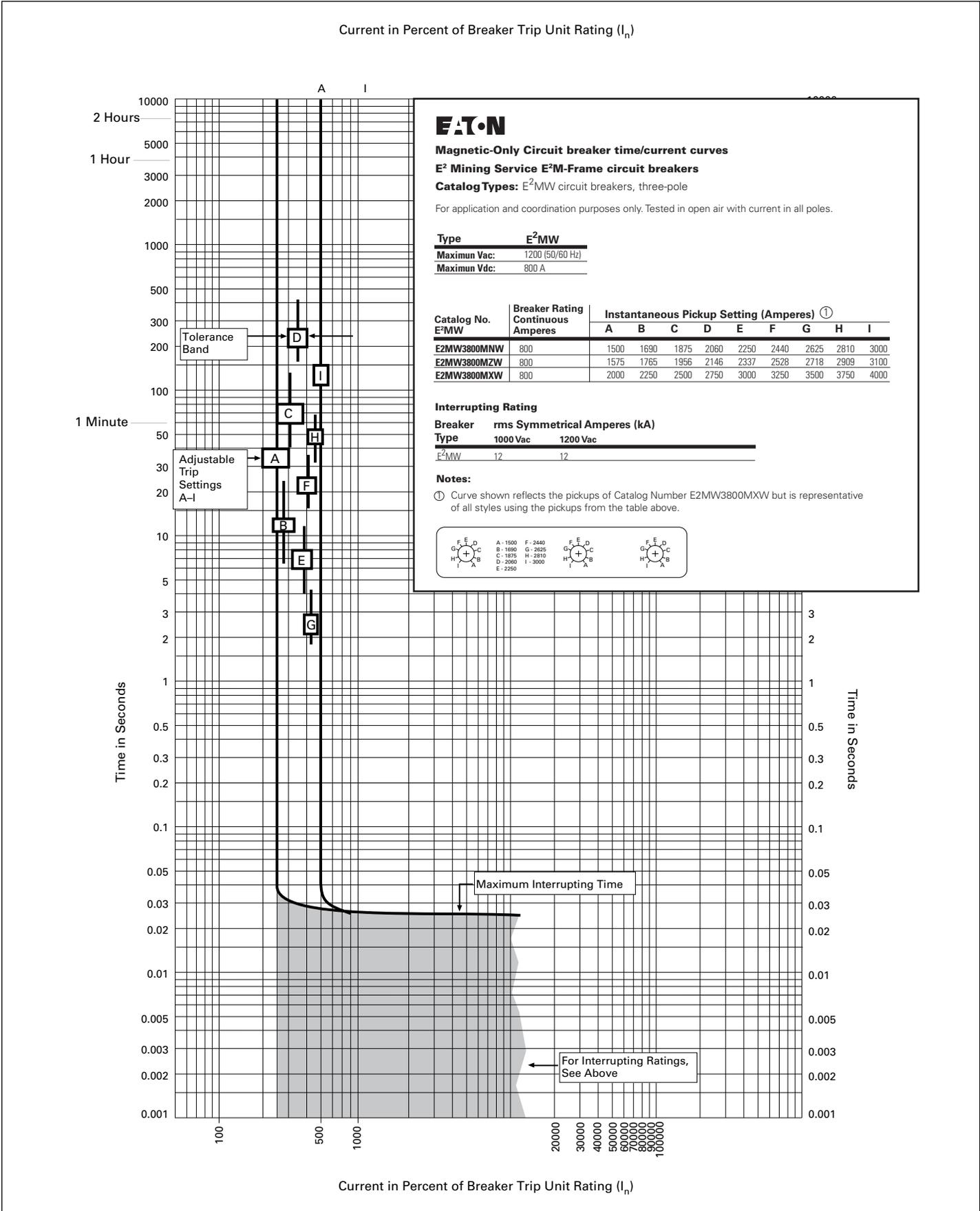
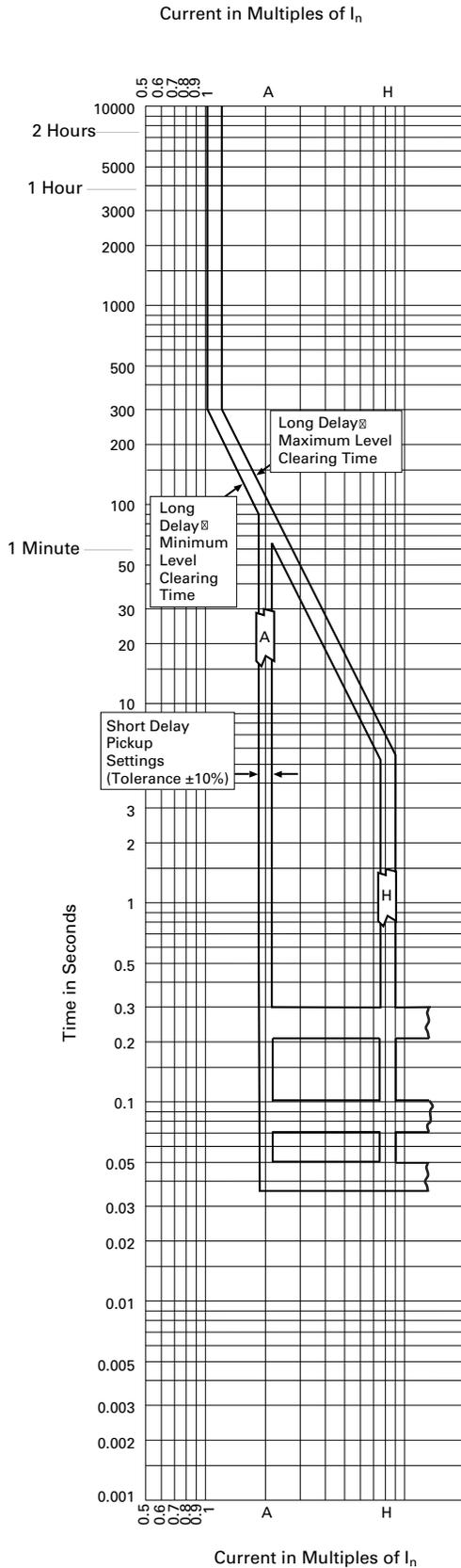


Figure 39. Type E²MW Circuit Breaker, 800 A, Three-Pole, Instantaneous Only—Curve No. SC-6771-14



Digitrip 310+ Circuit Breaker time/current curves (Phase Current)

E² Mining Service E²N-Frame circuit breakers

Catalog Types: E²N and E²NM circuit breakers, three-pole, LSI and ALSI

For application and coordination purposes only. Based on 40°C ambient, cold start. Tested in open air with current in all poles.

Catalog No. E ² N or E ² NM	Breaker Rating Continuous Amperes	Instantaneous Pickup Setting (Amperes)							
		A	B	C	D	E	F	G	H
3500W	500	500	600	800	1000	1250	1500	2000	2500
3600W	600	500	600	800	1000	1250	1500	2000	2500
3700W	700	500	600	800	1000	1250	1500	2000	2500
3800W	800	500	600	800	1000	1250	1500	2000	2500
3900W	900	1250	1500	2000	2500	3000	3500	4000	5000
310W	1000	1250	1500	2000	2500	3000	3500	4000	5000
312W	1200	1250	1500	2000	2500	3000	3500	4000	5000

Interrupting Rating

Breaker Type	rms Symmetrical Amperes (kA) 240 Vac	480 Vac	600 Vac	1000V/577 Vac
E ² N	65	35	25	—
E ² NM	—	50	25	25

Typical Trip Unit Nameplate



Notes:

Digitrip RMS 310+ trip units are suitable for functional field testing with test kit Cat. No. MTST230V. For field testing, follow NEMA AB 4 procedures.

Calibration response in short delay pickup range is same for single-, two-, or three-pole in series.

There is a memory effect that can act to shorten the long delay. The memory effect comes into play if current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset the memory.

- Curve accuracy applies from -20 °C to +55 °C ambient. For possible continuous ampere derating for ambient above 40 °C, refer to Eaton.
- For high fault current levels, a fixed instantaneous override is provided at 14,400 A. (Tolerance ±15%.)
- The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.

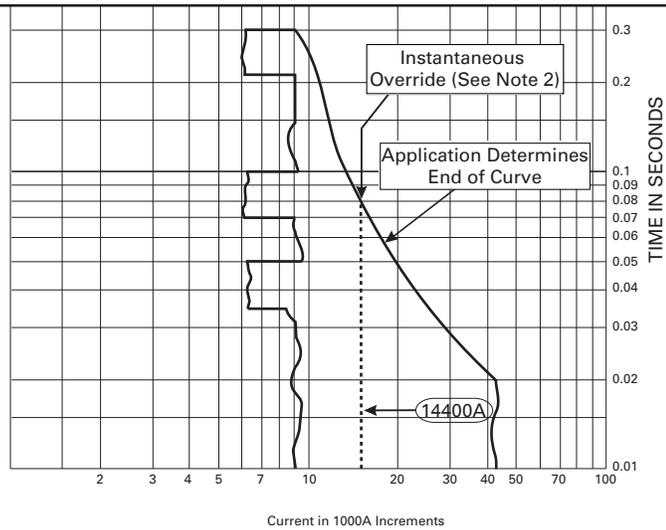


Figure 40. Types E²N and E²NM Circuit Breakers, 500 A to 800 A, Three-Pole, Long-Instantaneous—Curve No. SC-6750-97



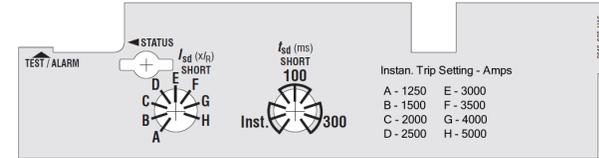
Digitrip 310+ Circuit Breaker Time/Current Curves

Maintenance Mode / Instantaneous Setting

E² Mining Service E² N-Frame circuit breakers

Catalog Types: E²N and E2NM circuit breakers, three-pole, ALSI Trip Unit Nameplate

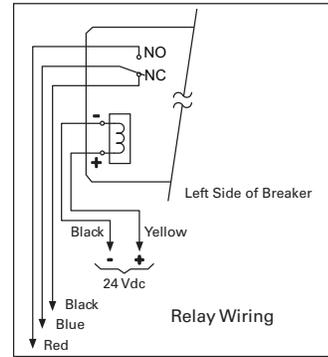
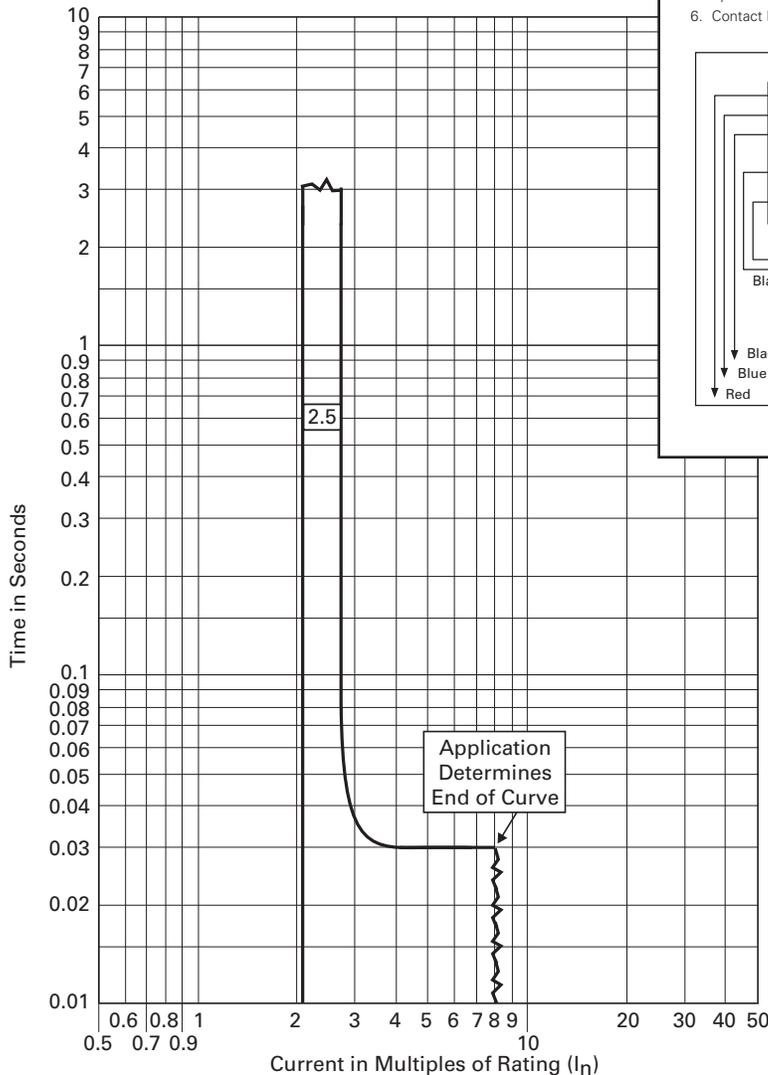
Trip Unit Nameplate



Notes:

1. The Maintenance Mode feature must be ENABLED for these curves to apply, when in Maintenance Mode
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. Nominal Values (Pickup) (Tolerance is ±15%)
5. These curves are comprehensive for the complete family of E² Mining Series N-Frame electronic breakers, including all frame sizes, ratings, and constructions. The total clearing times shown are conservative and consider the maximum response times of the trip unit, the circuit breaker opening, and the interruption of the current in worst case conditions, such as maximum rated voltages, single-phase interruption, and minimum power factor. Faster clearing times are possible depending on the specific system conditions.
6. Contact Eaton for additional information.

Maintenance Mode Trip



This feature allows enabling of the maintenance mode remotely by applying 24 Vdc to the yellow (+) and black (-) wires that exit the left hand side of the breaker. When energized, the maintenance mode setting that is enabled is the 2.5X setting.

There are two indicators that can verify that the trip unit has been remotely activated/enabled into the maintenance mode feature:

A. The blue LED (MM) located on the top left side of the trip unit will light.

AND/OR

B. The relay output is provided by three wires exiting the left hand side of the breaker: blue = C, red = NO, black = NC. The relay will change state when the maintenance mode is remotely enabled by applying 24 Vdc to the yellow and black wires as described above.

Figure 42. Maintenance Mode / Instantaneous Setting (ALSI) - Curve No. SC-6750-97

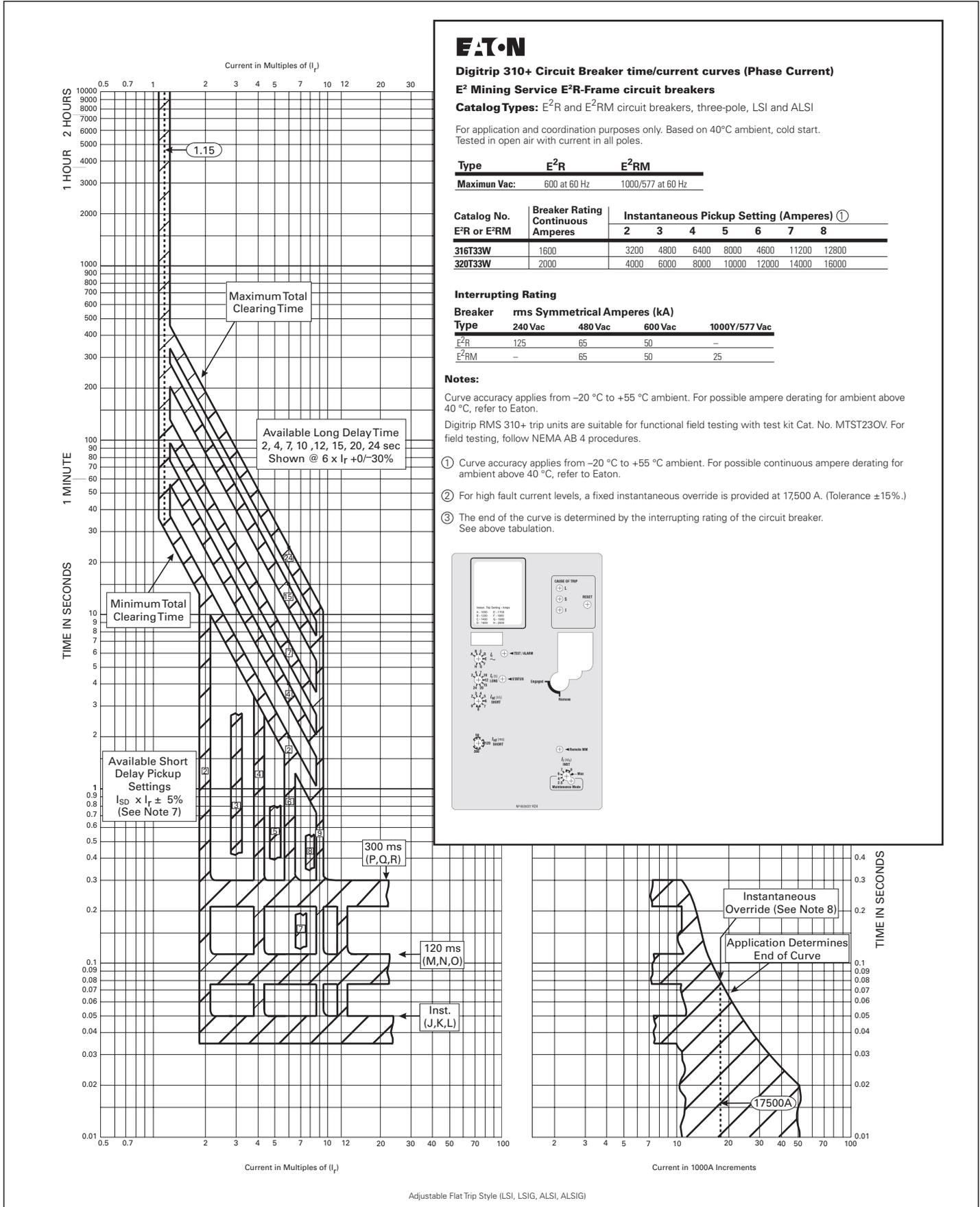


Figure 43. Types E²R and E²RM Circuit Breakers, 1600 A to 2000 A, Three-Pole, Long-Instantaneous—Curve No. SC-6751-97

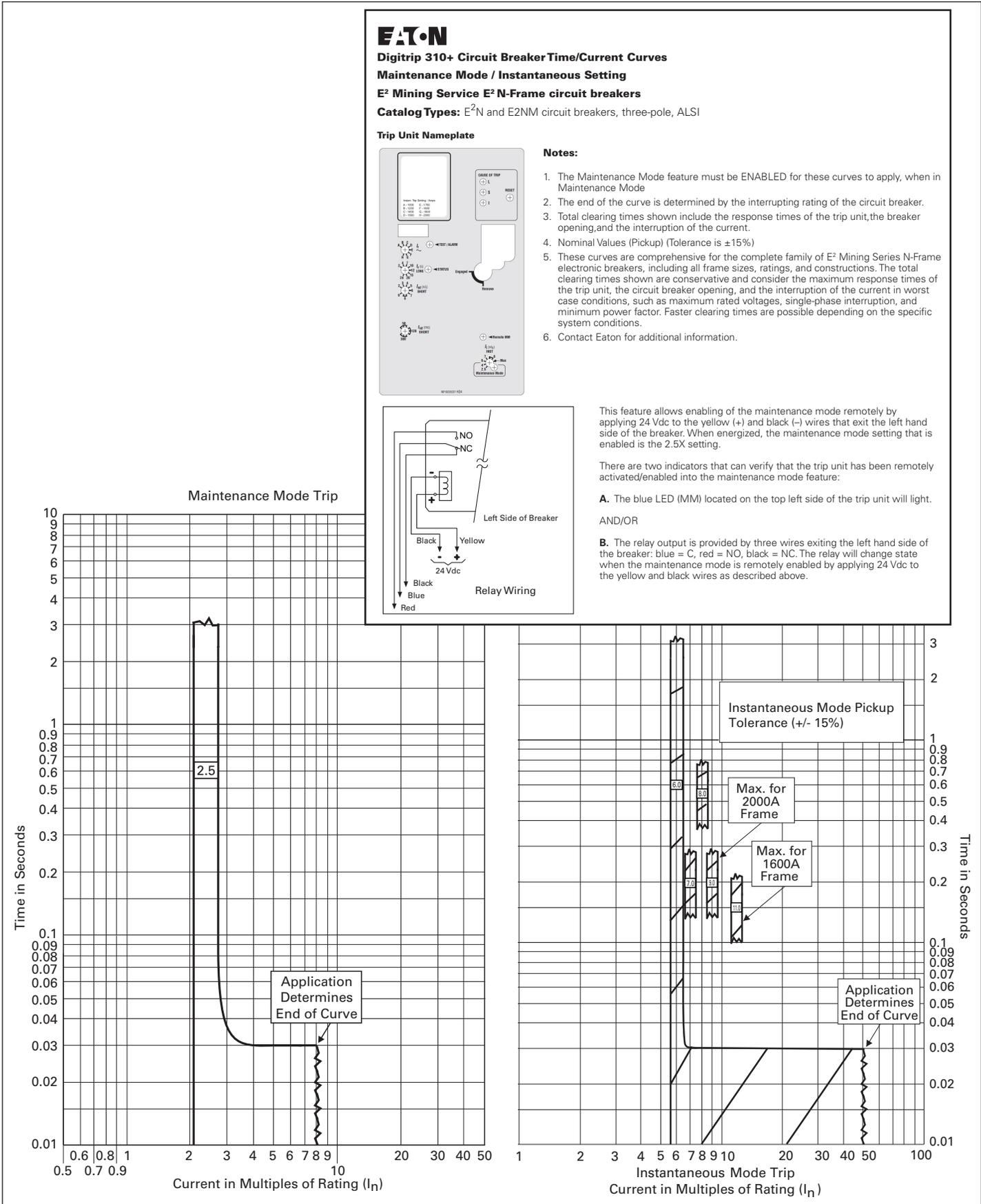


Figure 34. Maintenance Mode / Instantaneous Setting (ALSI) - Curve No. SC-6751-97

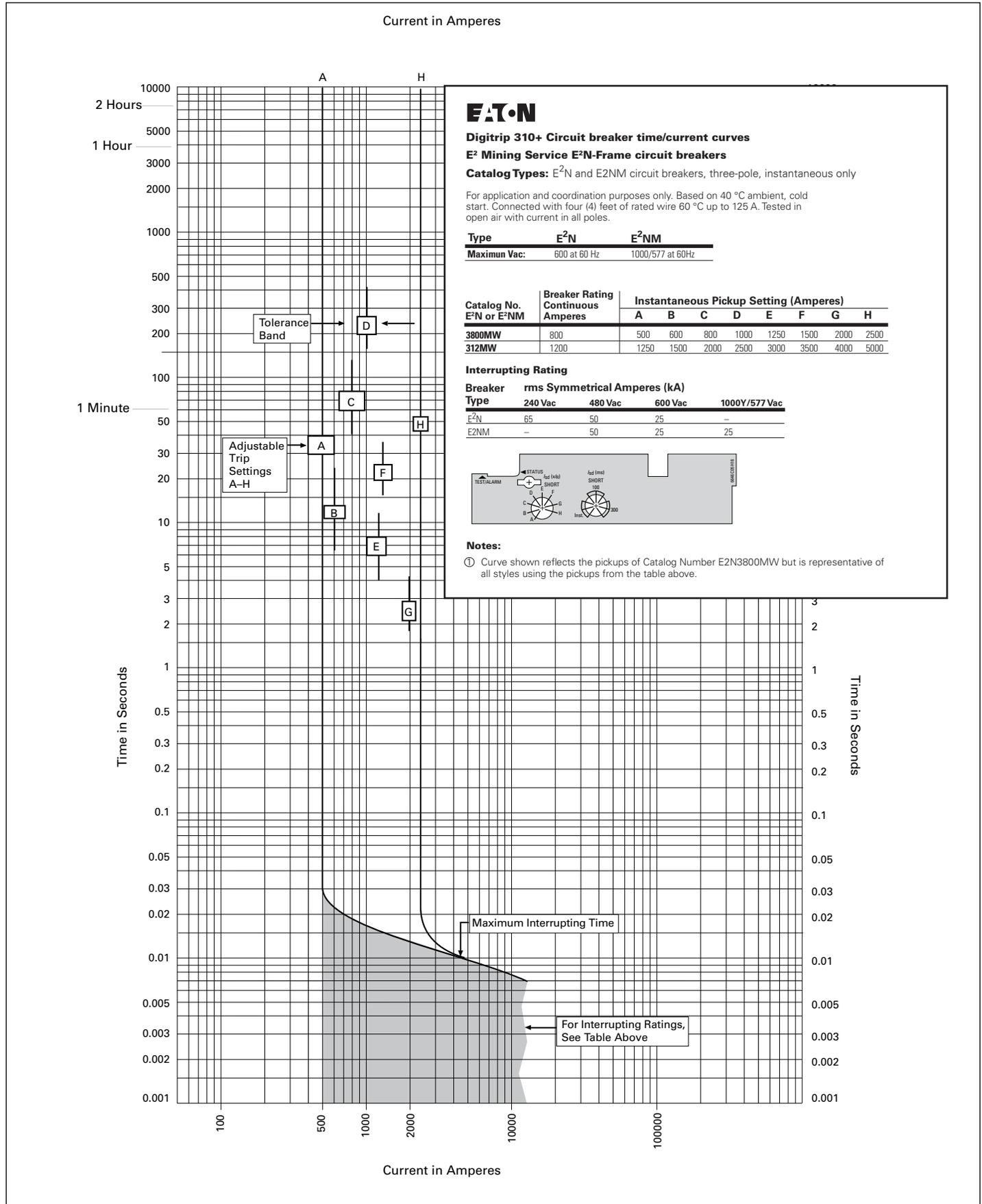


Figure 35. Types E²N and E²NM Circuit Breakers, 800 A to 1200 A, Three-Pole, Instantaneous Only—Curve No. SC-6749-97

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