Series C MDL-frame

400-800A, 240-600V

Contents

Note:
Time/current characteristic curves for series C M-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 curves are UL489 listed for use in North America.
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. For field testing molded case circuit breakers, refer to NEMA AB 4 guidelines.

Powering Business Worldwide

Note: Unless noted below, all curves remain unchanged from their prior revision.

Revision	Curve number	Page	Date
Changed trip labels on page 5			
Updated curves on pages 6 and 7.			2/2020

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. Thermal-magnetic trip unit

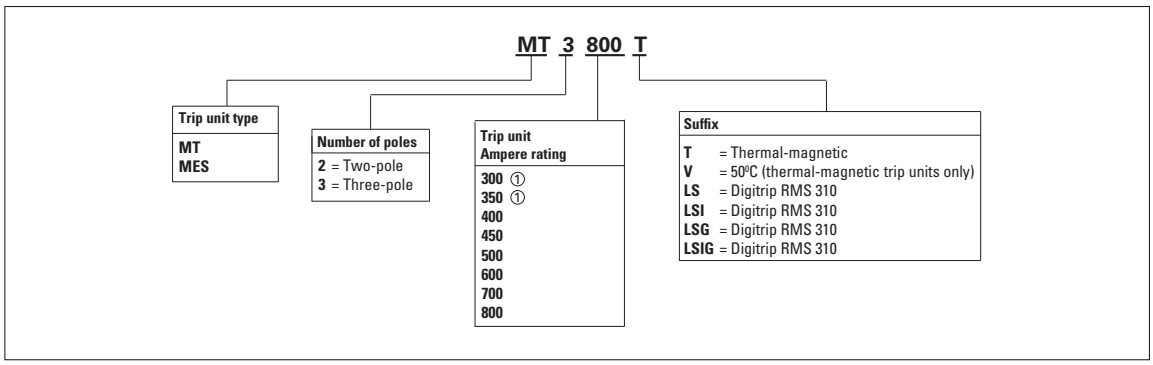
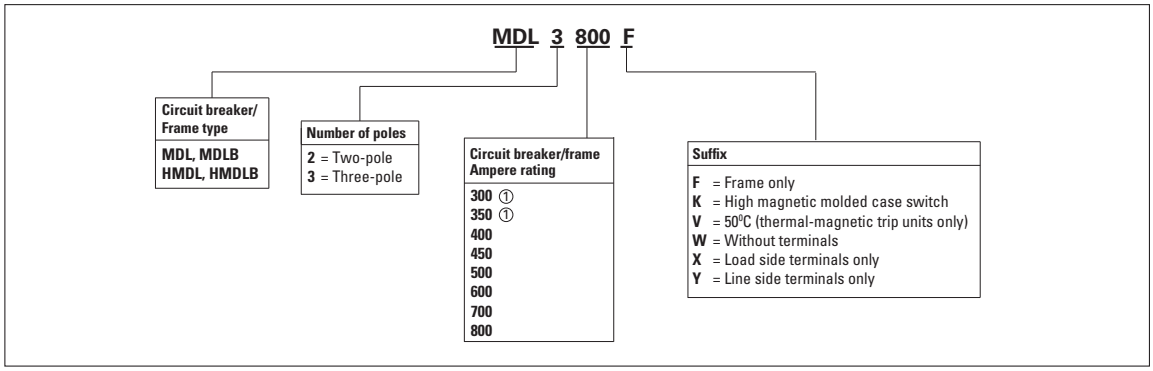


Table 2. Circuit breaker/frame



Note

① Thermal-magnetic only.

Table 3. MDL breaker assembly

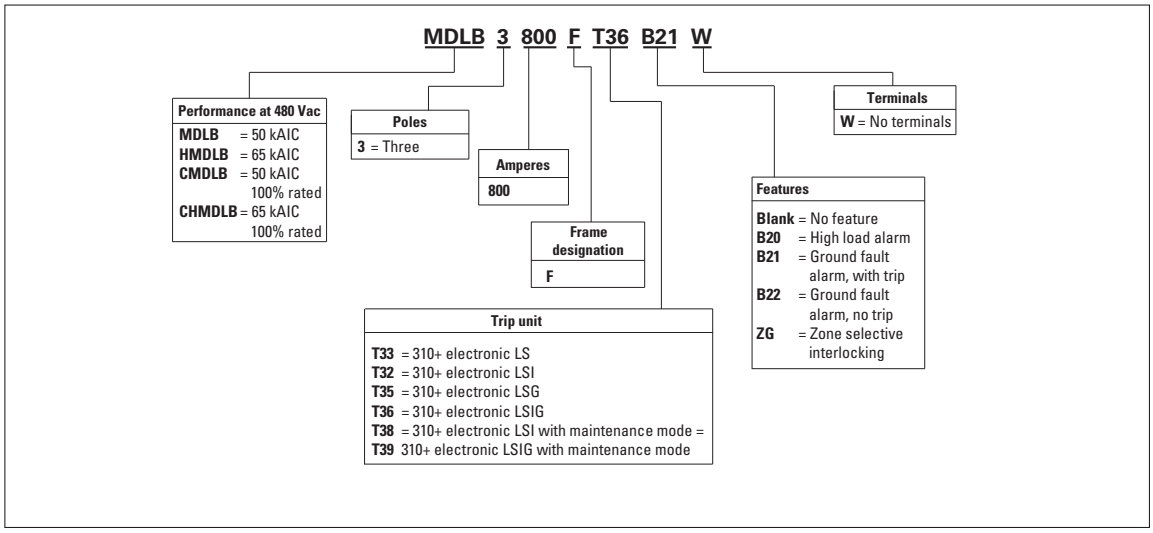


Table 4. MDL electronic trip unit

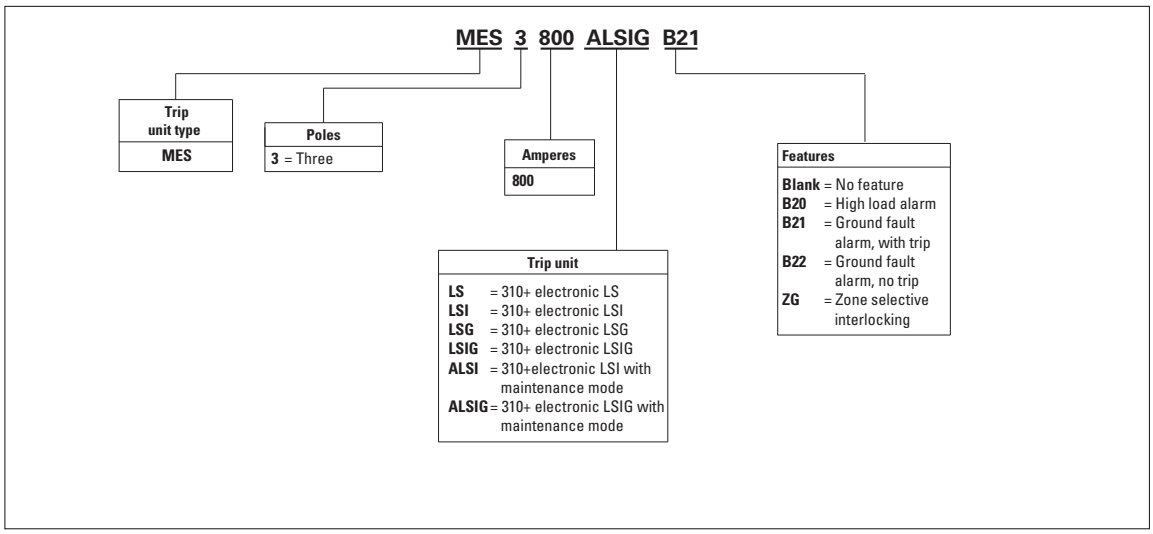
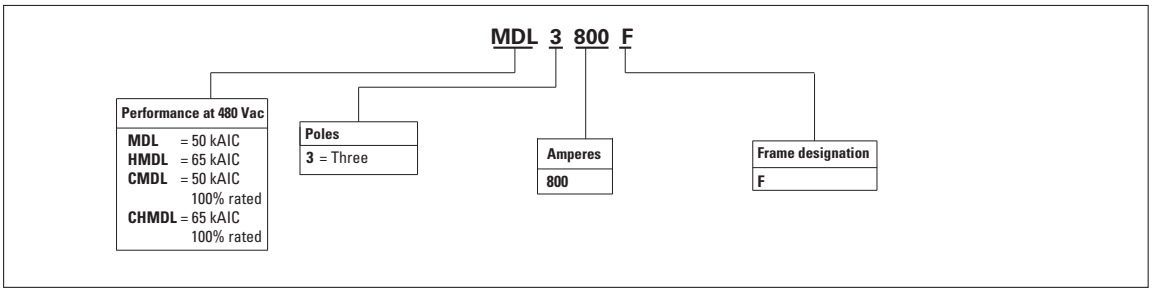


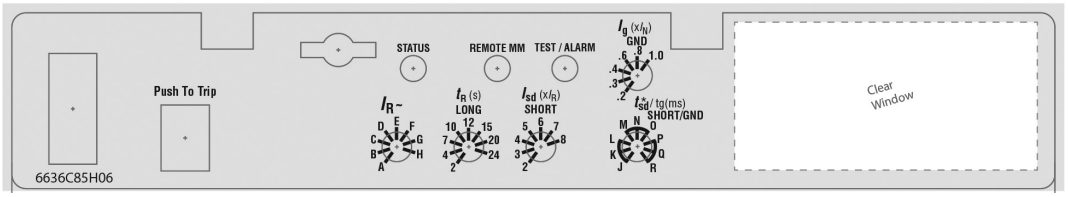
Table 5. MDL frame only



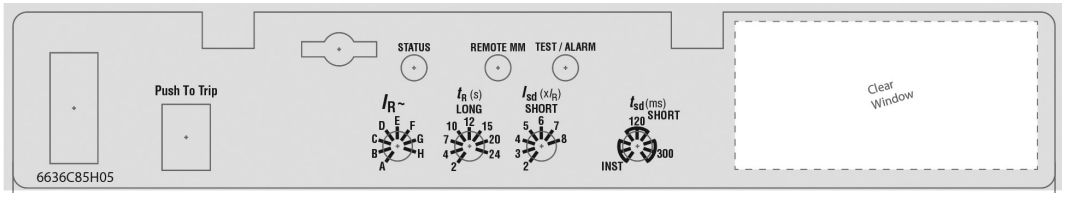
Note

① Maintenance mode and ZSI are only available with LSI and LSIG trip units.
② B21 and B22 features available only with LSG, LSIG and ALSIG trip units.
③ B2x suffixes cannot be combined with other B2x suffixes.

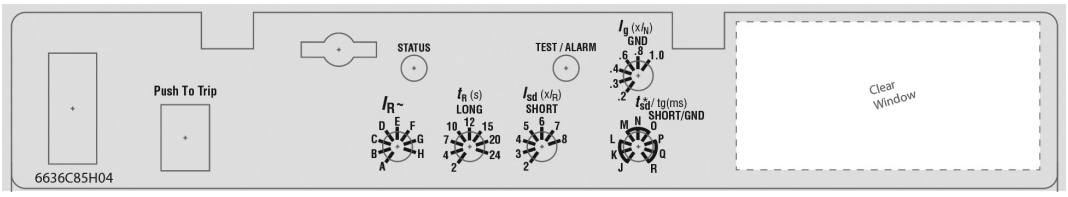
ALSIG (with maintenance mode)



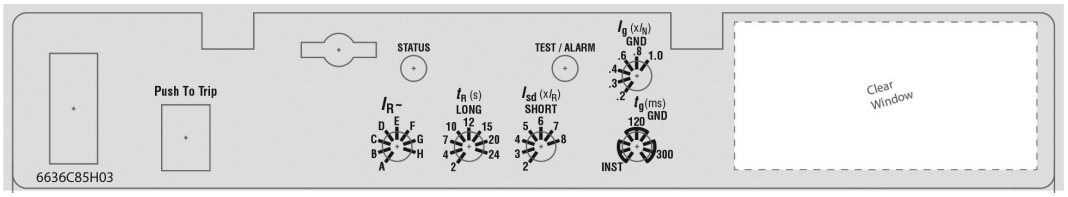
ALSI (with maintenance mode)



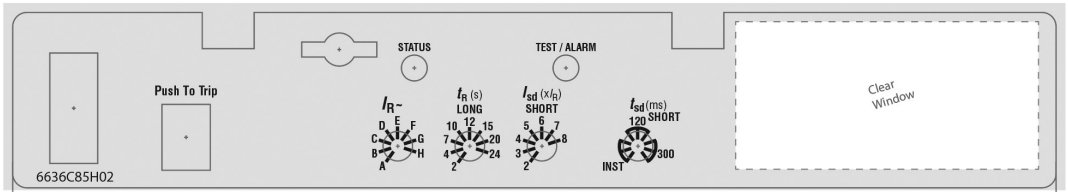
LSIG



LSG



LSI



LS

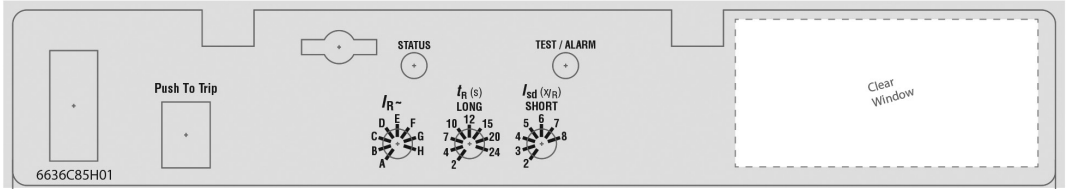
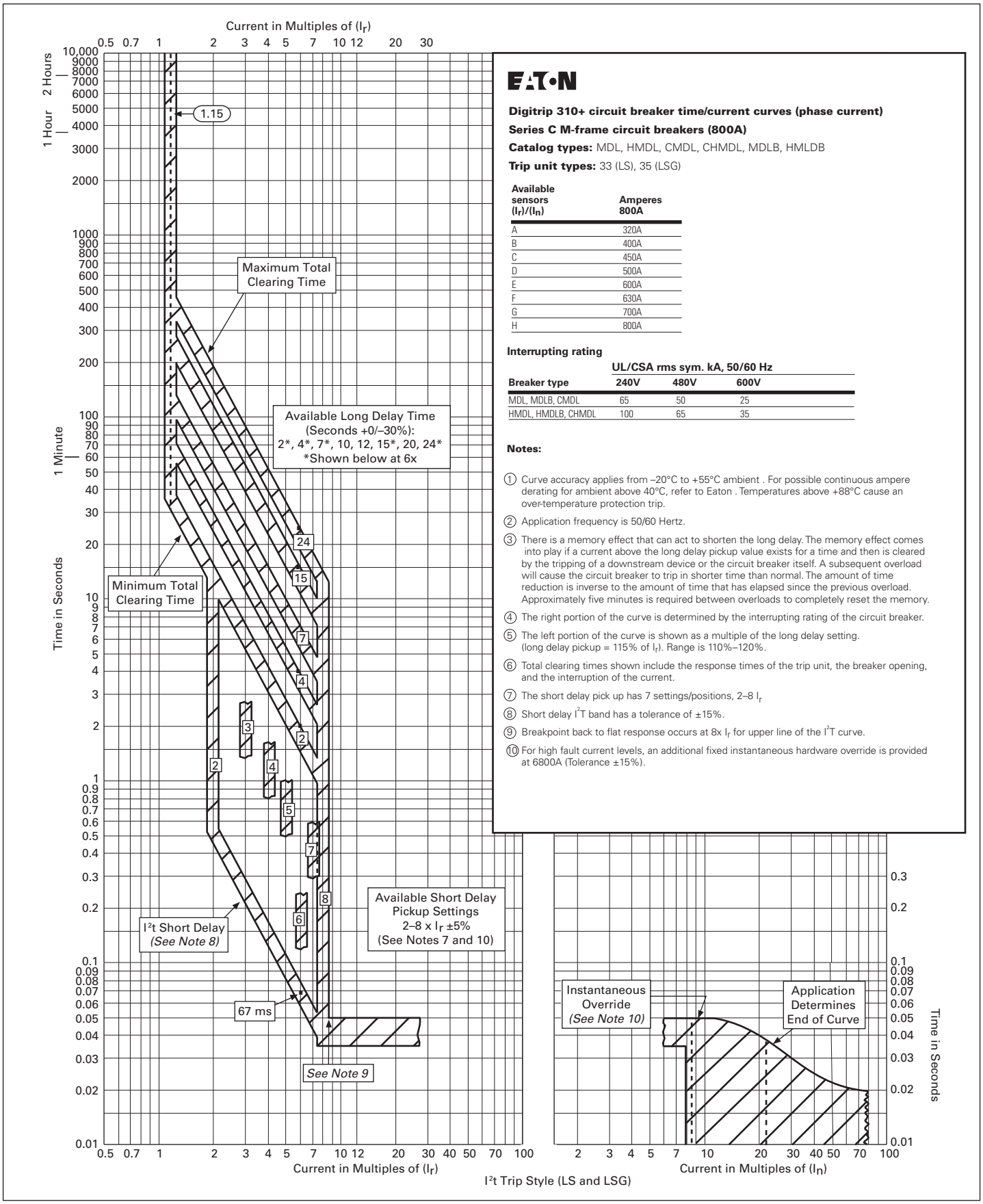


Figure 1. Digitrip 310+ faceplates



Digitrip 310+ circuit breaker time/current curves (phase current)

Series C M-frame circuit breakers (800A)

Catalog types: MDL, HMDL, CMDL, CHMDL, MDLB, HMLDB

Trip unit types: 33 (LS), 35 (LSG)

Available sensors (I_r)/(I_n)	Amperes 800A
A	320A
B	400A
C	450A
D	500A
E	600A
F	630A
G	700A
H	800A

Interrupting rating

	UL/CSA rms sym. kA, 50/60 Hz		
Breaker type	**240V**	**480V**	**600V**
MDL, MDLB, CMDL	65	50	25
HMDL, HMDLB, CHMDL	100	65	35

Notes:

① Curve accuracy applies from –20°C to +55°C ambient . For possible continuous ampere derating for ambient above 40°C, refer to Eaton . Temperatures above +88°C cause an over-temperature protection trip.

② Application frequency is 50/60 Hertz.

③ There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a 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 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.

④ The right portion of the curve is determined by the interrupting rating of the circuit breaker.

⑤ The left portion of the curve is shown as a multiple of the long delay setting. (long delay pickup = 115% of I_r). Range is 110%–120%.

⑥ Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.

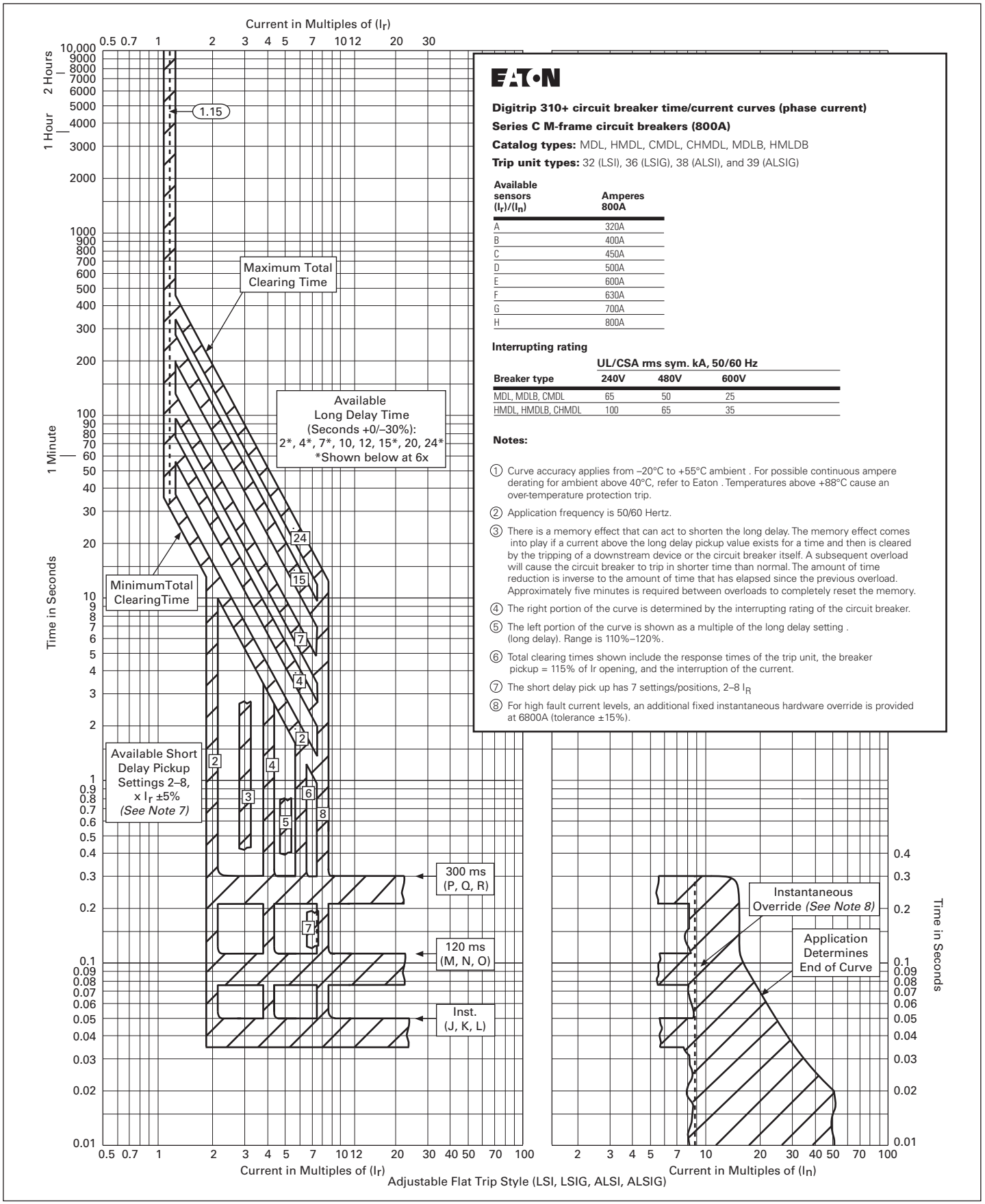
⑦ The short delay pick up has 7 settings/positions, 2–8 I_r

⑧ Short delay I^2T band has a tolerance of ±15%.

⑨ Breakpoint back to flat response occurs at 8x I_r for upper line of the I^2T curve.

⑩ For high fault current levels, an additional fixed instantaneous hardware override is provided at 6800A (Tolerance ±15%).

Figure 2. Digitrip 310+ trip units (800A), long delay response and short delay with I^2T response curve and override (LS, LSG) - TD012051EN, February 2020



Digitrip 310+ circuit breaker time/current curves (phase current)

Series C M-frame circuit breakers (800A)

Catalog types: MDL, HMDL, CMDL, CHMDL, MDLB, HMLDB

Trip unit types: 32 (LSI), 36 (LSIG), 38 (ALSI), and 39 (ALSIG)

Available sensors (I_r)/(I_n)	Amperes 800A
A	320A
B	400A
C	450A
D	500A
E	600A
F	630A
G	700A
H	800A

Interrupting rating

	UL/CSA rms sym. kA, 50/60 Hz		
Breaker type	**240V**	**480V**	**600V**
MDL, MDLB, CMDL	65	50	25
HMDL, HMDLB, CHMDL	100	65	35

Notes:

① Curve accuracy applies from –20°C to +55°C ambient . For possible continuous ampere derating for ambient above 40°C, refer to Eaton . Temperatures above +88°C cause an over-temperature protection trip.

② Application frequency is 50/60 Hertz.

③ There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a 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 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.

④ The right portion of the curve is determined by the interrupting rating of the circuit breaker.

⑤ The left portion of the curve is shown as a multiple of the long delay setting . (long delay). Range is 110%–120%.

⑥ Total clearing times shown include the response times of the trip unit, the breaker pickup = 115% of Ir opening, and the interruption of the current.

⑦ The short delay pick up has 7 settings/positions, 2–8 I_R

⑧ For high fault current levels, an additional fixed instantaneous hardware override is provided at 6800A (tolerance ±15%).

Figure 3. Digitrip 310+ trip units (800A), long delay response and short delay with flat response curve and override (LSI, LSIG, ALSI, ALSIG) - TD012052EN, February 2020

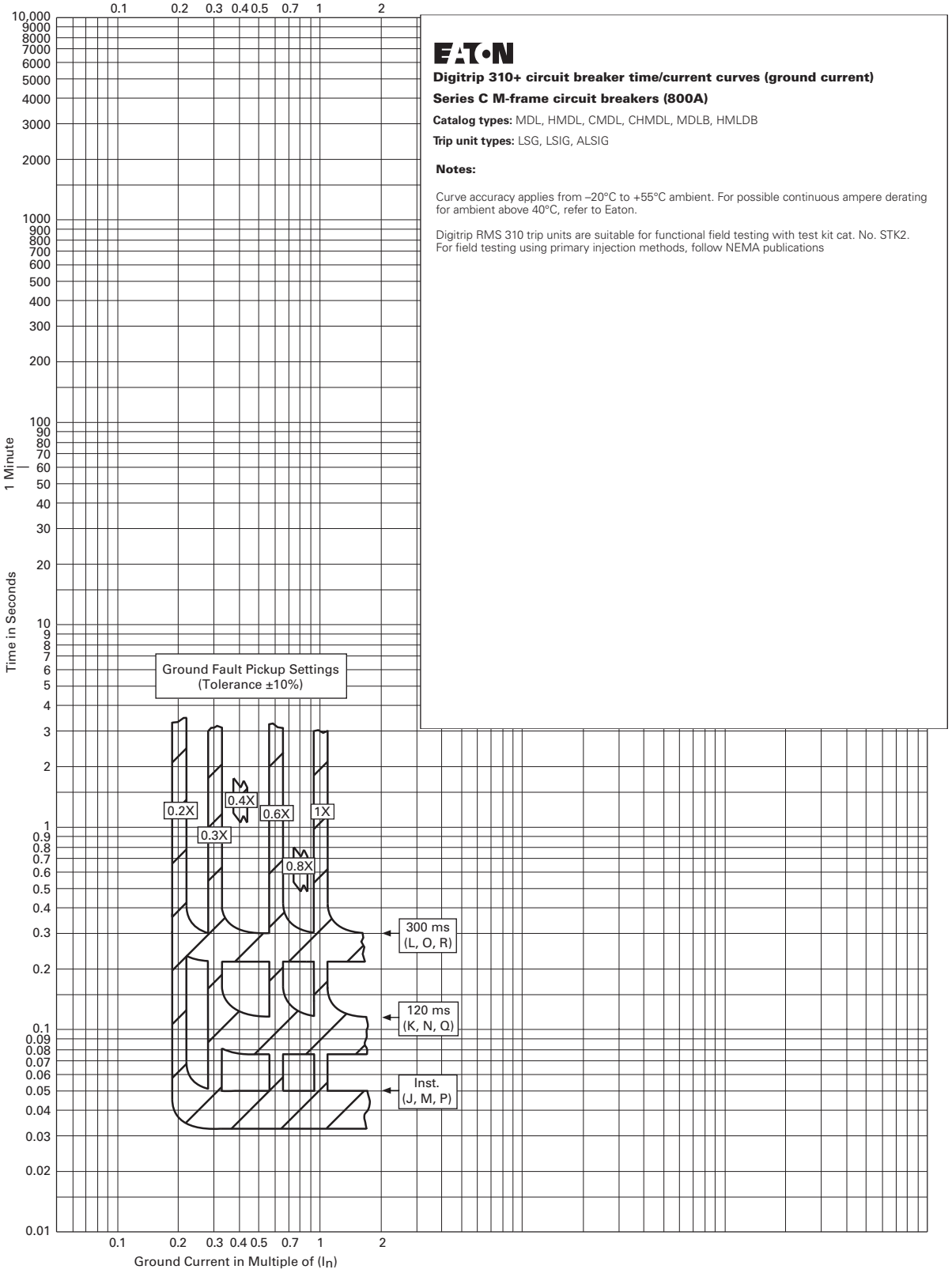


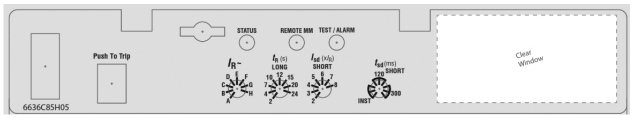
Figure 4. Ground fault delay response curve (LSG, LSIG, ALSIG) - curve number TD012053EN

Digitrip 310+ circuit breaker time/current curves

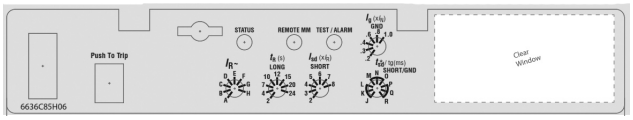
Maintenance mode setting

Trip unit types: 38 (ALSI) and 39 (ALSIG)

Series C M-frame trip unit nameplates



ALSI



ALSIG

I_r = Continuous current setting or rating plug value, I_s = Current sensor frame rating, I_n = Rating plug value, I_g = Ground current pickup multiplier, I_i = Instantaneous override pickup.

Notes:

1 The maintenance mode feature must be ENABLED via application of 24 Vdc for these curves to apply. The blue LED is lit when in maintenance mode.

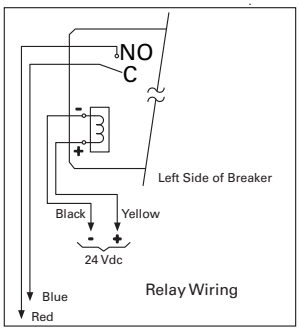
2 The end of the curve is determined by the interrupting rating of the circuit breaker.

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%) 2.5 x In.

5 The total clearing times shown are conservative and consider the maximum response time of the trip unit, the circuit breaker opening, and the interruption of the current in the 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.

Contact Eaton for additional information.



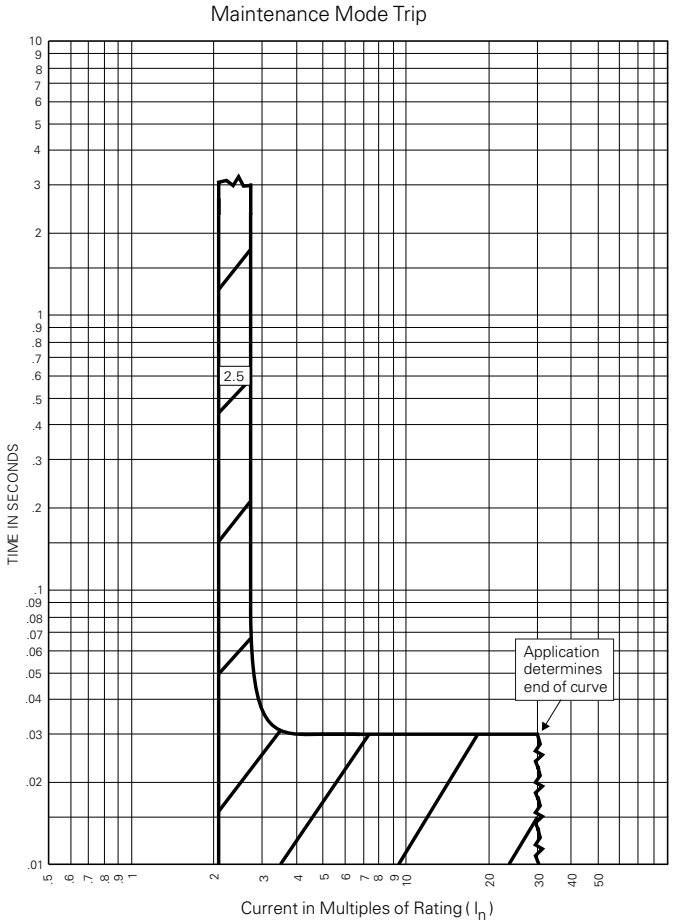
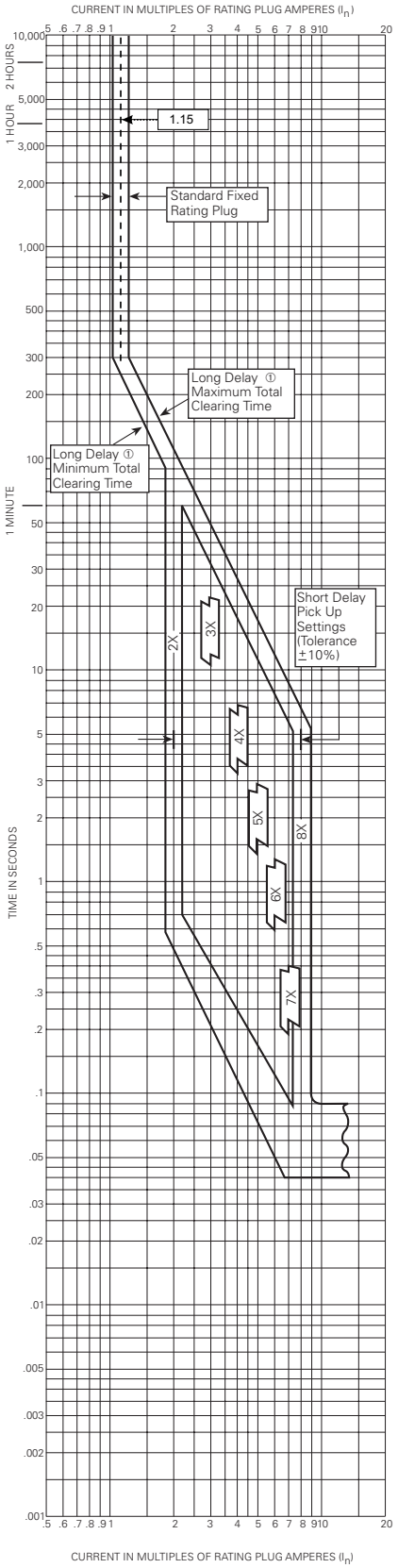


Figure 5. Maintenance mode setting (ALSI, ALSIG) - curver number - TD012054EN, October 2014

Types MDL, HMDL, CMDL, and CHMDL equipped with type MES digitrip RMS 310 trip units, types MES3800LS and MES3800LSG



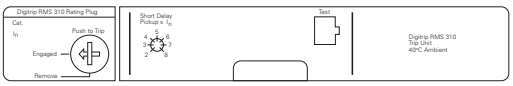
Circuit breaker time/current curves (phase current)

Series C M-frame circuit breakers

Equipped with type MES digitrip RMS 310 trip units

Catalog types: MES3800LS and MES3800LSG digitrip RMS 310 trip units for use with circuit breaker types MDL, HMDL, CMDL and CHMDL 3 poles.

Fixed Short Delay Time **Typical Trip Unit Nameplate**



Available rating plugs

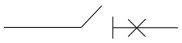
Ampere rating (I_n)	Type	Rating plug catalog number	Short delay pickup range amperes
800	Fixed	8MES800T	1600-6400
700	Fixed	8MES700T	1400-5600
600	Fixed	8MES600T	1200-4800
500	Fixed	8MES500T	1000-4000
400	Fixed	8MES400T	800-3200
400, 500, 600, 800	Adjustable	A8MES800T1	800-6400

Interrupting rating

	UL/CSA rms sym. kA, 50/60 Hz		
Breaker type	**240V**	**480V**	**600V**
MDL, MDLB, CMDL, CMDLB	65	50	25
HMDL, HMDLB, CHMDL, CHMDL	100	65	35

	IEC 60947-2 rms sym. kA, 50/60 Hz					
Breaker Type	**240V**		**380/415V**		**690V**	
	Icu	Ics	Icu	Ics	Icu	Ics
MDL, MDLB, CMDL, CMDLB	65	65	50	50	20	10
HMDL, HMDLB, CHMDL, CHMDL	100	100	70	50	25	13

Utilization category A
U_{IMP} = 8 kV



Notes:

Digitrip RMS 310 trip units are suitable for functional field testing with test kit cat. no. STK2. For field testing using primary injection methods, follow NEMA AB4 publications.

Calibration response in short delay pick-up range is same for 1, 2 or 3 poles in series.

There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pick-up 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.

① Curve accuracy applies from –20°C to +55°C ambient. For possible continuous ampere derating for ambient above 40°C, refer to Eaton.

② For high fault current levels a fixed instantaneous override is provided at 6800A. (Tolerance ±15%).

③ The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.

④ Long delay pickup is 115% of I_n, +/- 15%.

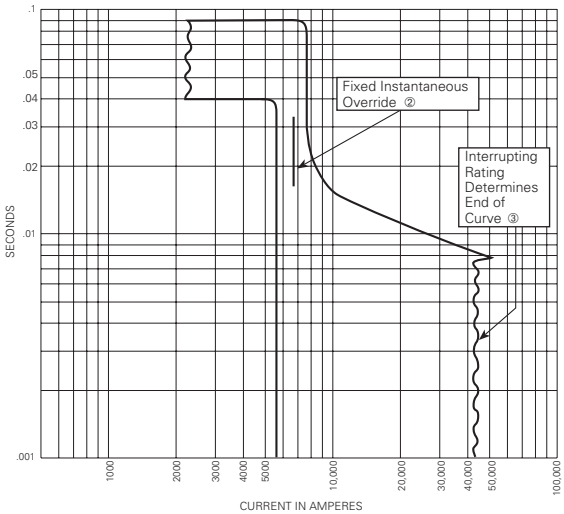


Figure 6. MDL, HMDL, CMDL, and CHMDL, types MES3800LS and MES3800LSG - curve number SC-7204-99, June 2020

Types MDL, HMDL, CMDL, and CHMDL equipped with type MES digitrip RMS 310 trip units, types MES3800LSI and MES3800LSIG

EATON

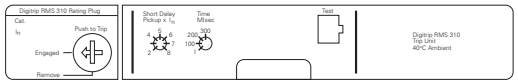
Circuit breaker time/current curves (phase current)

Series C M-frame circuit breakers

Equipped with type MES digitrip RMS 310 trip units

Catalog types: MES3800LSI and MES3800LSIGDigitrip RMS 310 trip units for use with circuit breaker types MDL, HMDL, CMDL, CHMDL 3 poles.

Adjustable Short Delay Time **Typical Trip Unit Nameplate**



Available rating plugs

Ampere rating (I_n)	Type	Rating plug catalog number	Short delay pickup range amperes
800	Fixed	8MES800T	1600-6400
700	Fixed	8MES700T	1400-5600
600	Fixed	8MES600T	1200-4800
500	Fixed	8MES500T	1000-4000
400	Fixed	8MES400T	800-3200
400, 500, 600, 800	Adjustable	A8MES800T1	800-6400

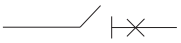
Interrupting rating

	UL/CSA rms sym. kA, 50/60 Hz		
Breaker type	**240V**	**480V**	**600V**
MDL, MDLB, CMDL, CMDLB	65	50	25
HMDL, HMDLB, CHMDL, CHMDL	100	65	35

	IEC 60947-2 rms sym. kA, 50/60 Hz					
Breaker type	**240V**		**380/415V**		**690V**	
	Icu	Ics	Icu	Ics	Icu	Ics
MDL, MDLB, CMDL, CMDLB	65	65	50	50	20	10
HMDL, HMDLB, CHMDL, CHMDL	100	100	70	50	25	13

Notes:

Utilization category A
U_{IMP} = 8 kV



Digitrip RMS 310 trip units are suitable for functional field testing with test kit cat. no. STK2. For field testing using primary injection methods, follow NEMA AB4 publications.

Calibration response in short delay pick-up range is same for 1, 2 or 3 poles in series.

There is a memory effect that can act to shorten the long delay. The memory effect comes into play if a current above the long delay pick-up 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.

(1) Curve accuracy applies from –20°C to +55°C ambient. For possible continuous ampere derating for ambient above 40°C, refer to Eaton.

(2) For high fault current levels a fixed instantaneous override is provided at 6800A. (Tolerance ±15%).

(3) The end of the curve is determined by the interrupting rating of the circuit breaker. See above tabulation.

(4) Long delay pickup is 115% of I_n, +/- 5%.

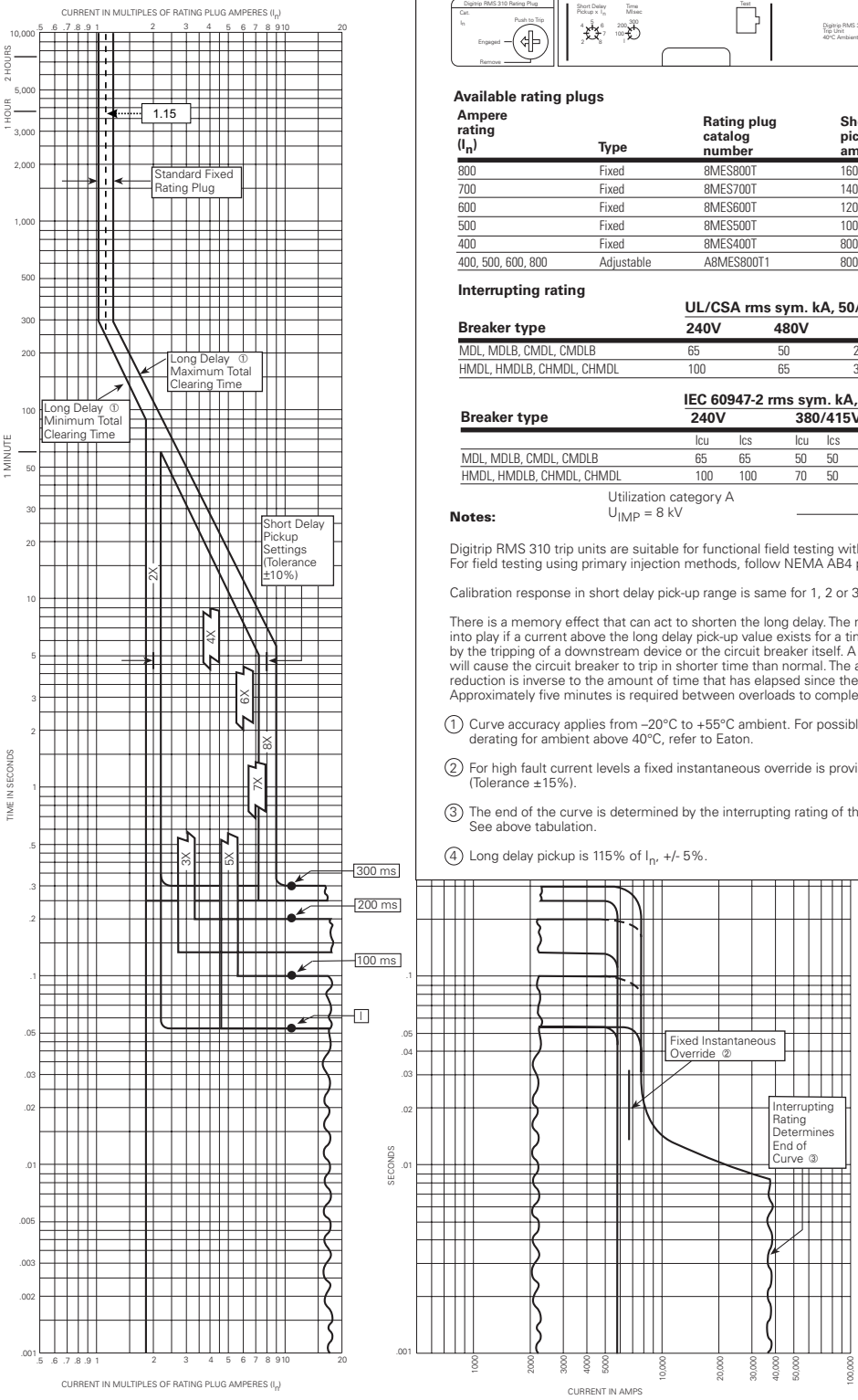
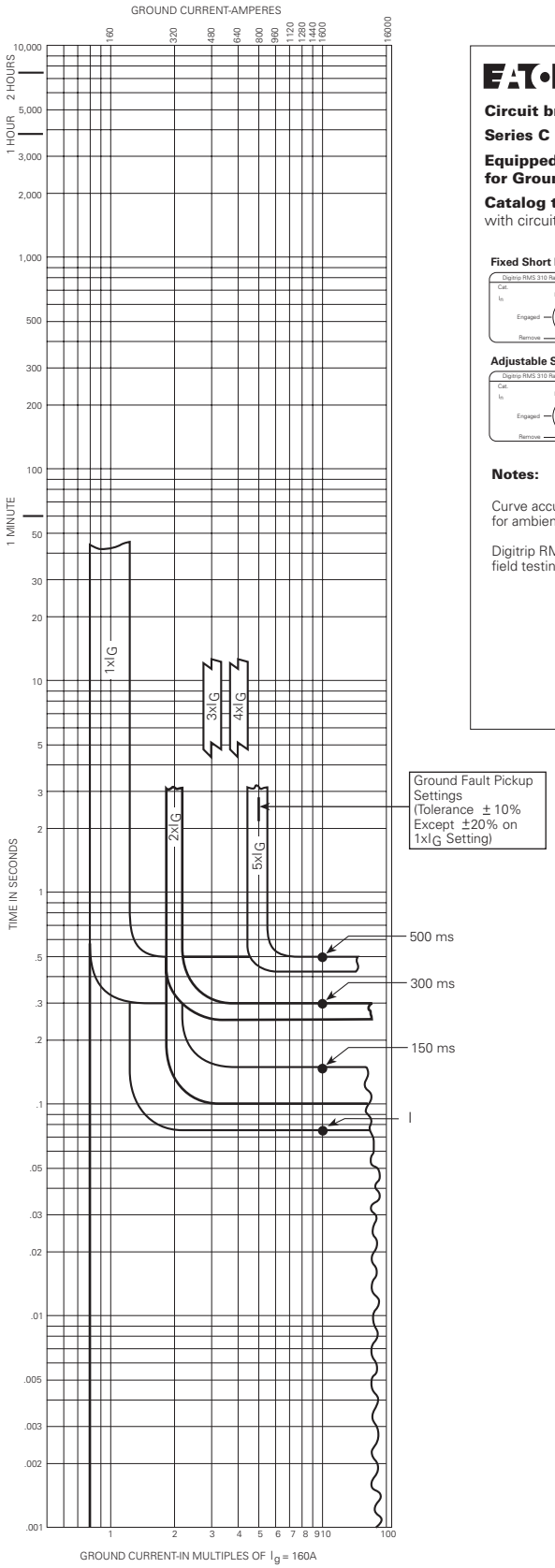


Figure 7. MDL, HMDL, CMDL, and CHMDL, types MES3800LSI and MES3800LSIG – curve number - SC-6913-98, June 2020

Types MDL, HMDL, CMDL, and CHMDL equipped with type MES digitrip RMS 310 trip units, ground fault protection



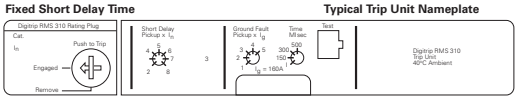
Circuit breaker time/current curves (ground current)

Series C M-frame circuit breakers

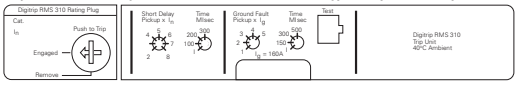
Equipped with type MES digitrip RMS 310 trip units for Ground Fault Protection

Catalog types: MES3800LSG and MES3800LSIG digitrip RMS 310 trip units for use with circuit breaker types MDL, KMDL, CMDL, CHMDL.

Fixed Short Delay Time — **Typical Trip Unit Nameplate**



Adjustable Short Delay Time — **Typical Trip Unit Nameplate**



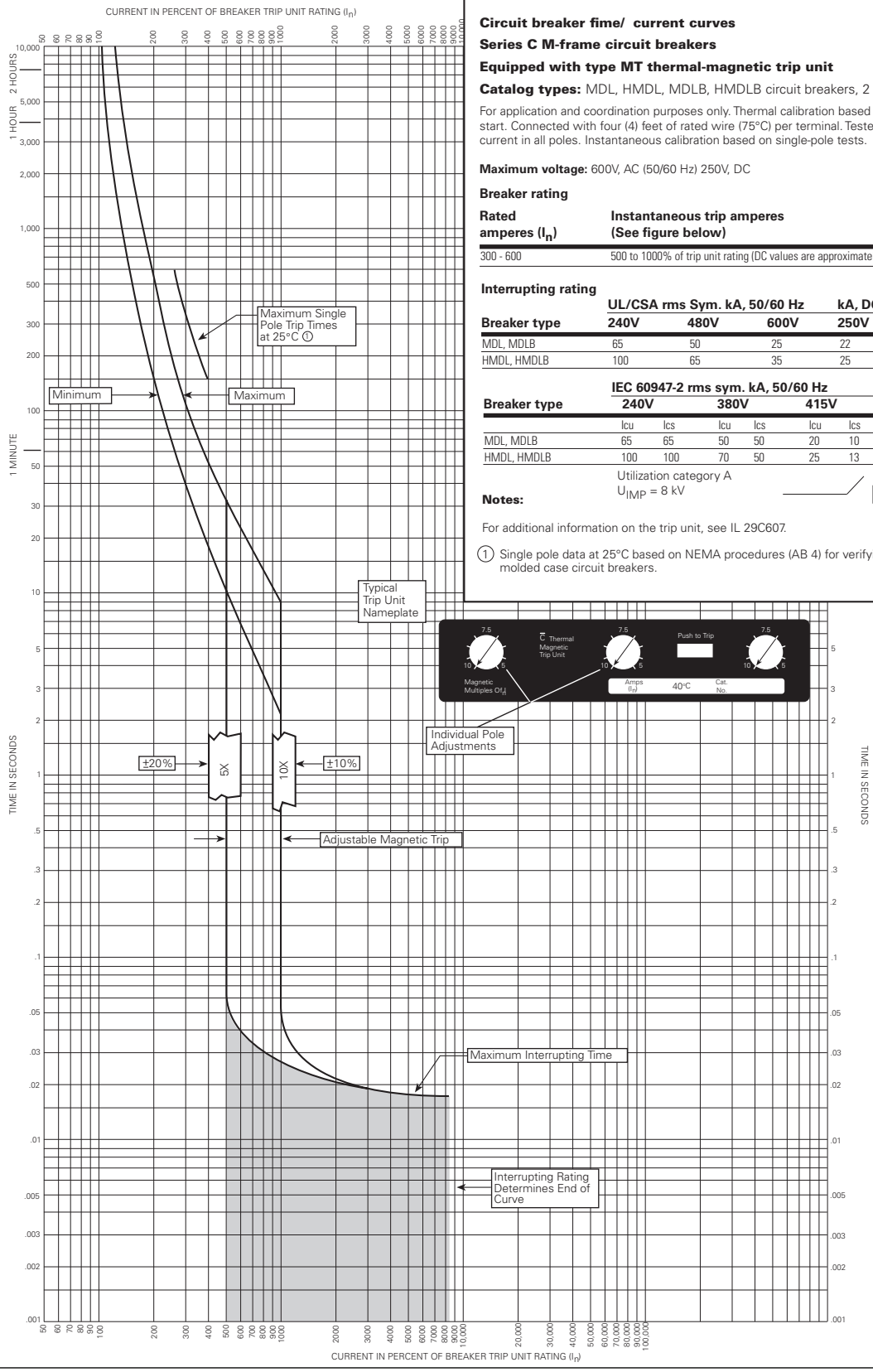
Notes:

Curve accuracy applies from –20°C to +55°C ambient. For possible continuous ampere derating for ambient above 40°C, refer to Eaton.

Digitrip RMS 310 trip units are suitable for functional field testing with test kit cat. no. STK2. For field testing using primary injection methods, follow NEMA publication (AB4).

Figure 8. MDL, HMDL, CMDL, and CHMD ground fault protection - curve number SC-6914-98, June 2007

Types MDL, HMDL, MDLB, and HMDLB equipped with type MT thermal-magnetic trip unit, 300 to 600 amperes



Circuit breaker fime/ current curves

Series C M-frame circuit breakers

Equipped with type MT thermal-magnetic trip unit

Catalog types: MDL, HMDL, MDLB, HMDLB circuit breakers, 2 and 3 poles.

For application and coordination purposes only. Thermal calibration based on 40°C ambient, cold start. Connected with four (4) feet of rated wire (75°C) per terminal. Tested in open air with current in all poles. Instantaneous calibration based on single-pole tests.

Maximum voltage: 600V, AC (50/60 Hz) 250V, DC

Breaker rating

Rated amperes (I_n)	Instantaneous trip amperes (See figure below)
300 - 600	500 to 1000% of trip unit rating (DC values are approximately 40% higher)

Interrupting rating

	UL/CSA rms Sym. kA, 50/60 Hz			kA, DC
Breaker type	**240V**	**480V**	**600V**	**250V**
MDL, MDLB	65	50	25	22
HMDL, HMDLB	100	65	35	25

	IEC 60947-2 rms sym. kA, 50/60 Hz						kA, DC	
Breaker type	**240V**		**380V**		**415V**		**250V**	
	Icu	Ics	Icu	Ics	Icu	Ics		
MDL, MDLB	65	65	50	50	20	10	20	10
HMDL, HMDLB	100	100	70	50	25	13	20	10

Utilization category A
U_{IMP} = 8 kV

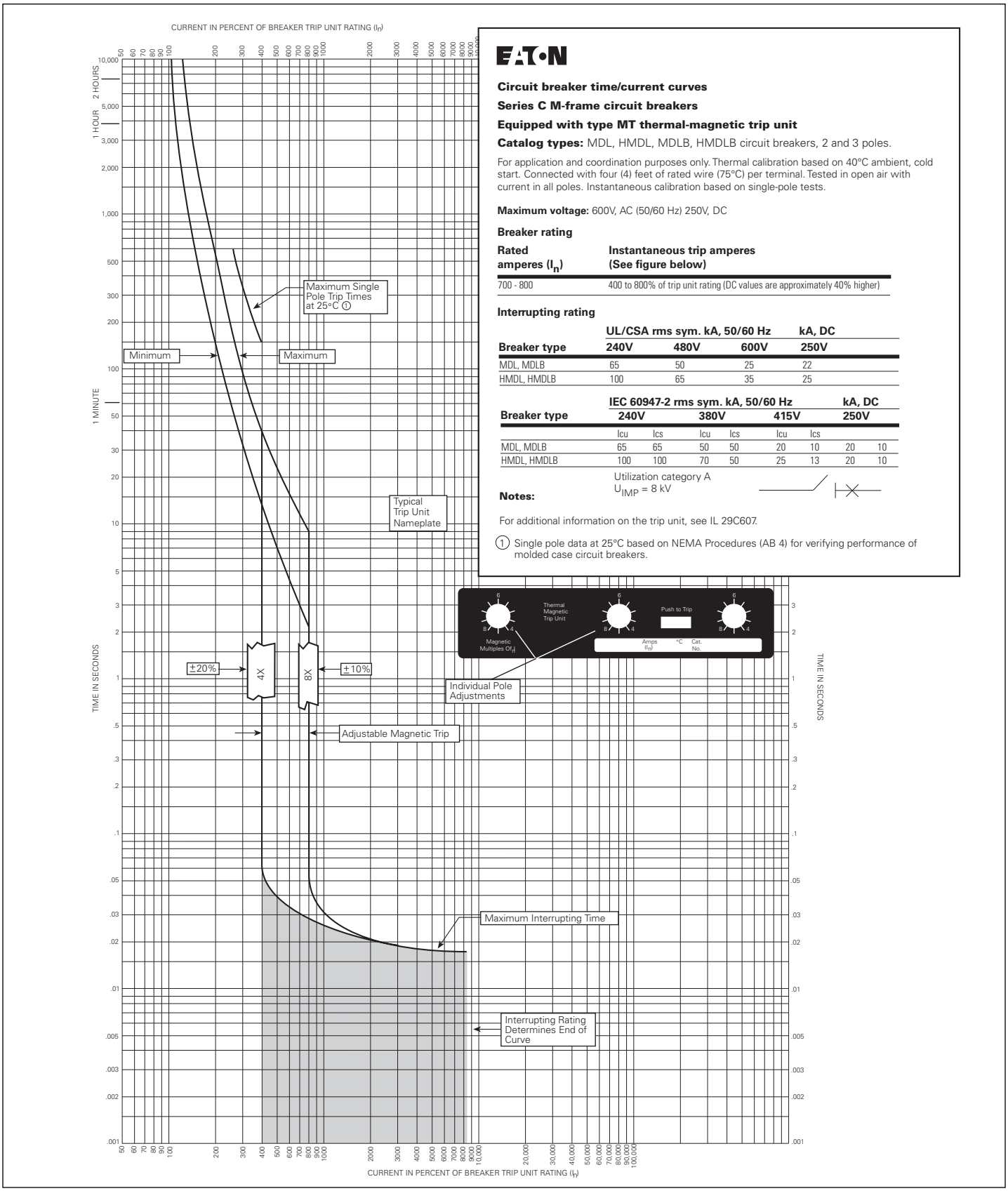
Notes:

For additional information on the trip unit, see IL 29C607.

① Single pole data at 25°C based on NEMA procedures (AB 4) for verifying performance of molded case circuit breakers.

Figure 9. MDL, HMDL, MDLB, and HMDLB, 300-600A - curve number SC-6911-98, June 2007

Types MDL, HMDL, MDLB, and HMDLB equipped with type MT thermal-magnetic trip unit, 700 and 800 amperes



Circuit breaker time/current curves

Series C M-frame circuit breakers

Equipped with type MT thermal-magnetic trip unit

Catalog types: MDL, HMDL, MDLB, HMDLB circuit breakers, 2 and 3 poles.

For application and coordination purposes only. Thermal calibration based on 40°C ambient, cold start. Connected with four (4) feet of rated wire (75°C) per terminal. Tested in open air with current in all poles. Instantaneous calibration based on single-pole tests.

Maximum voltage: 600V, AC (50/60 Hz) 250V, DC

Breaker rating

Rated amperes (I_n)	Instantaneous trip amperes (See figure below)
700 - 800	400 to 800% of trip unit rating (DC values are approximately 40% higher)

Interrupting rating

	UL/CSA rms sym. kA, 50/60 Hz			kA, DC
Breaker type	**240V**	**480V**	**600V**	**250V**
MDL, MDLB	65	50	25	22
HMDL, HMDLB	100	65	35	25

	IEC 60947-2 rms sym. kA, 50/60 Hz						kA, DC	
Breaker type	**240V**		**380V**		**415V**		**250V**	
	Icu	Ics	Icu	Ics	Icu	Ics		
MDL, MDLB	65	65	50	50	20	10	20	10
HMDL, HMDLB	100	100	70	50	25	13	20	10

Utilization category A
U_{IMP} = 8 kV

Notes:

For additional information on the trip unit, see IL 29C607.

① Single pole data at 25°C based on NEMA Procedures (AB 4) for verifying performance of molded case circuit breakers.

Figure 10. MDL, HMDL, MDLB, and HMDLB, 700-800A - curve number SC-6912-98, June 2007

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