

Time-Current Characteristic Curves

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Basis

Time-current characteristic (TCC) curves for VacuFuse II Self-Resetting Interrupters are shown in this publication. These curves are plotted for a system frequency of 60 Hertz. All curves in this document were developed using discrete data points. These data points can be found in the “Time-Current Characteristic Curves” section of sandc.com.

VacuFuse II interrupter TCC curves are applicable to both 50- and 60-Hertz systems. They are also applicable over the VacuFuse II interrupter’s entire operating temperature range of -40C to +50C. No adjustments must be made to these curves for ambient temperatures within this temperature range.

Tolerances

TCC curves for VacuFuse II interrupters are plotted to minimum test points and maximum test points (minimum tripping curves and total clearing curves, respectively). Tolerances for minimum trip curves, expressed in terms of current, are +10%. Tolerances for minimum trip curves, expressed in terms of time, is +0.0167 seconds. Interrupting time is 8 ms for 60-Hz systems and 10 ms for 50-Hz systems.

Coordination

When coordinating a VacuFuse II interrupter with upstream protective devices, it will be necessary to develop total-clearing TCC curves in addition to the minimum-tripping TCC curves displayed in this document.

The total-clearing curve is used when coordinating the interrupter with upstream protective devices such as the substation feeder circuit breaker or recloser, lateral recloser, or sub-lateral fuse. The total-clearing curve is constructed by adding interrupting time to the maximum-tripping curve. The maximum-tripping curve is constructed by adding positive tolerances in both time and current to the minimum-tripping curves shown in this publication.

Power-up Time

If the VacuFuse II interrupter is closed into a fault, it will take a small but finite amount of time for the control to power up and issue a trip signal. This time can be determined as follows:

$$T_{power-up} = \frac{2.53}{I}$$

Where:

$T_{power-up}$ is the minimum time the control will take to power up, in seconds (or 0.004 seconds, whichever is larger)

I is the fault-current value, in amperes.

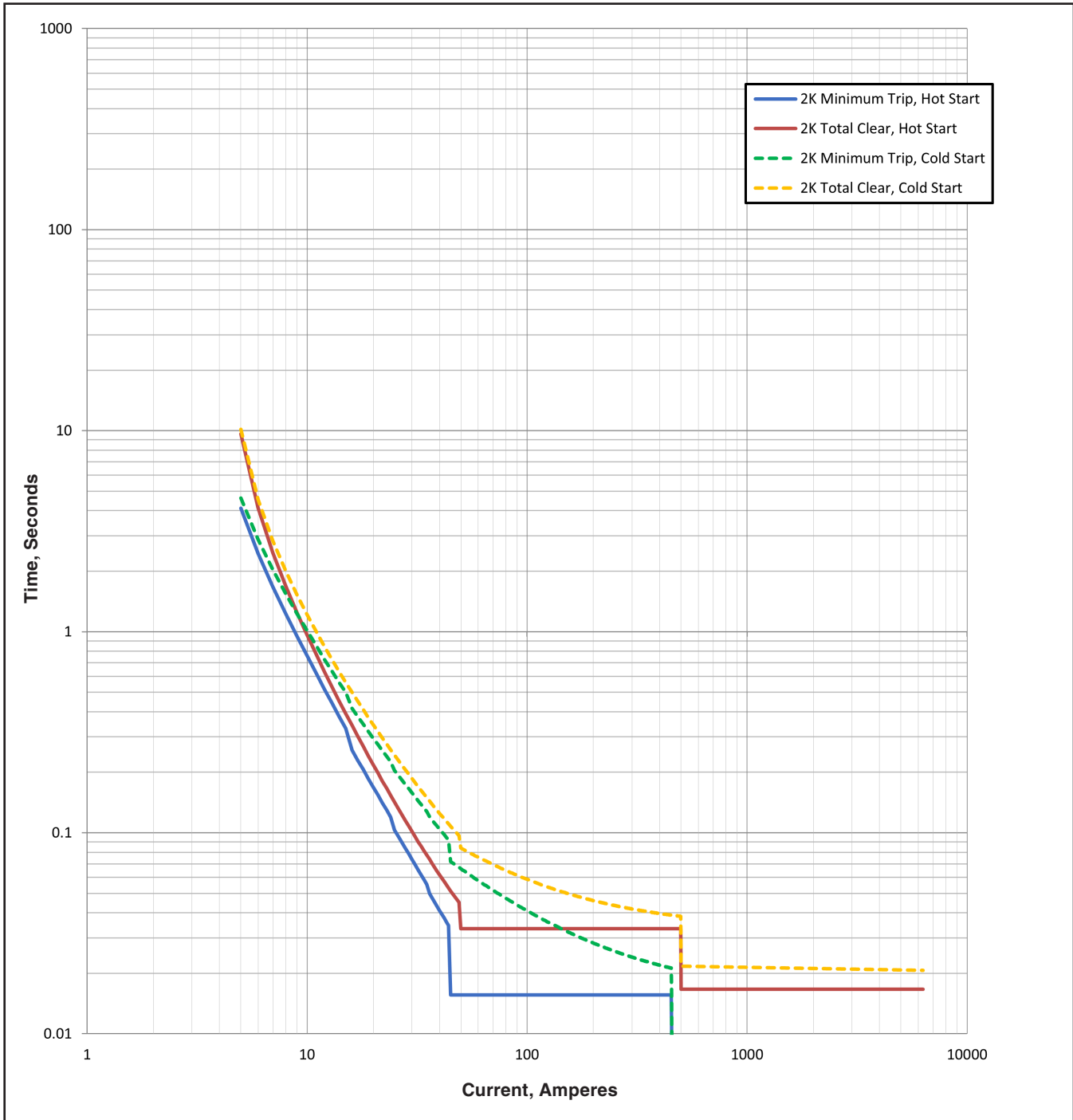
The effect of power-up time on TCC curves is illustrated on page 4 for a 2K speed curve and page 5 for a 20TXP speed curve.

Application

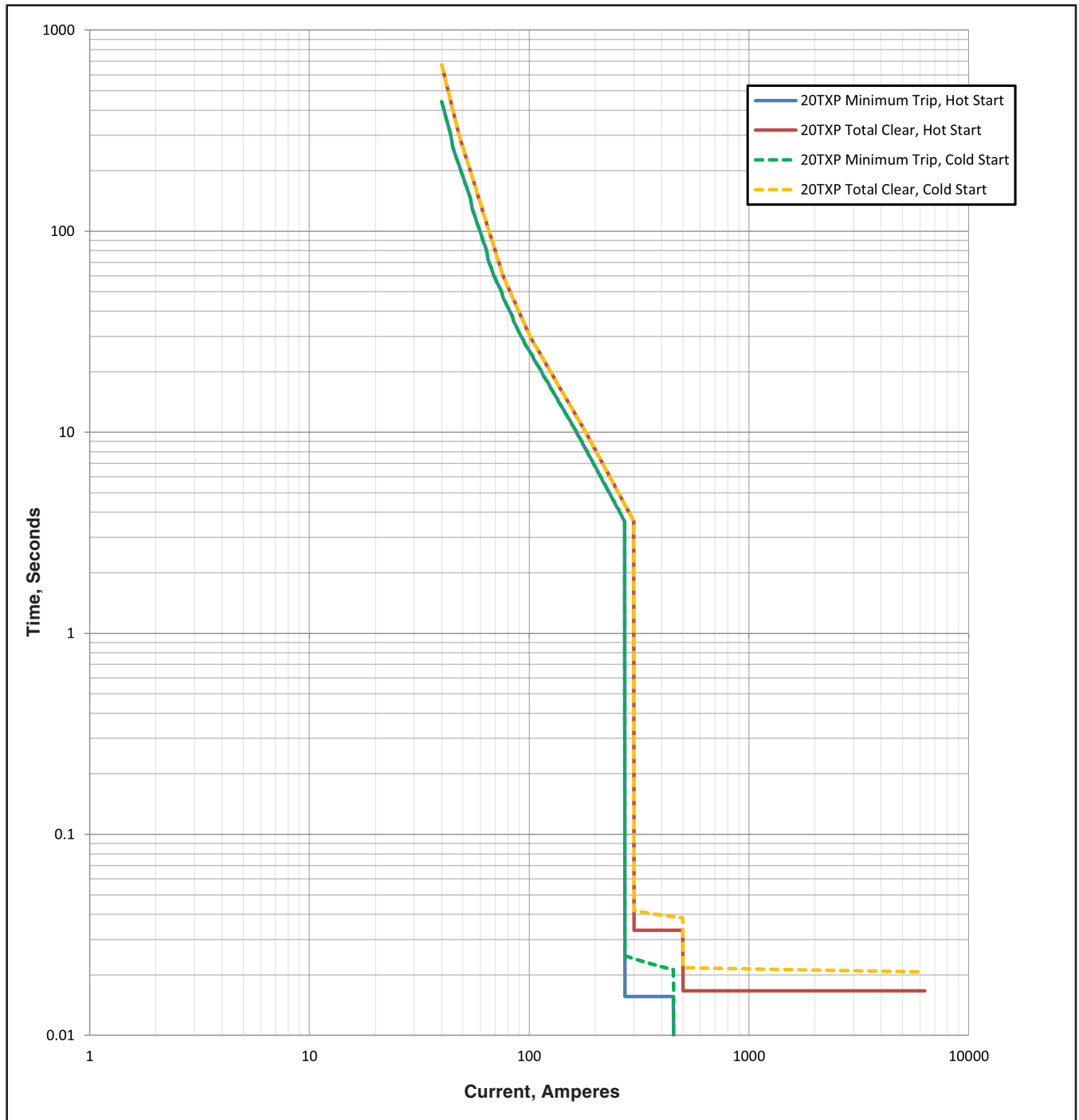
The maximum continuous current-carrying capability of a VacuFuse II interrupter is 20 amperes. The control is capable of sensing current in the range of 4.0 amperes to 6,300 amperes. A minimum of 4.0 amperes of load current must be flowing through the device in order to power the control.

Control Settings—Time-current characteristic curves for VacuFuse II interrupters must be determined at the time of order and are set by the factory.

Example of Power-up Time on a 2-Ampere K-Speed TCC Curve with Definite Times at High Current

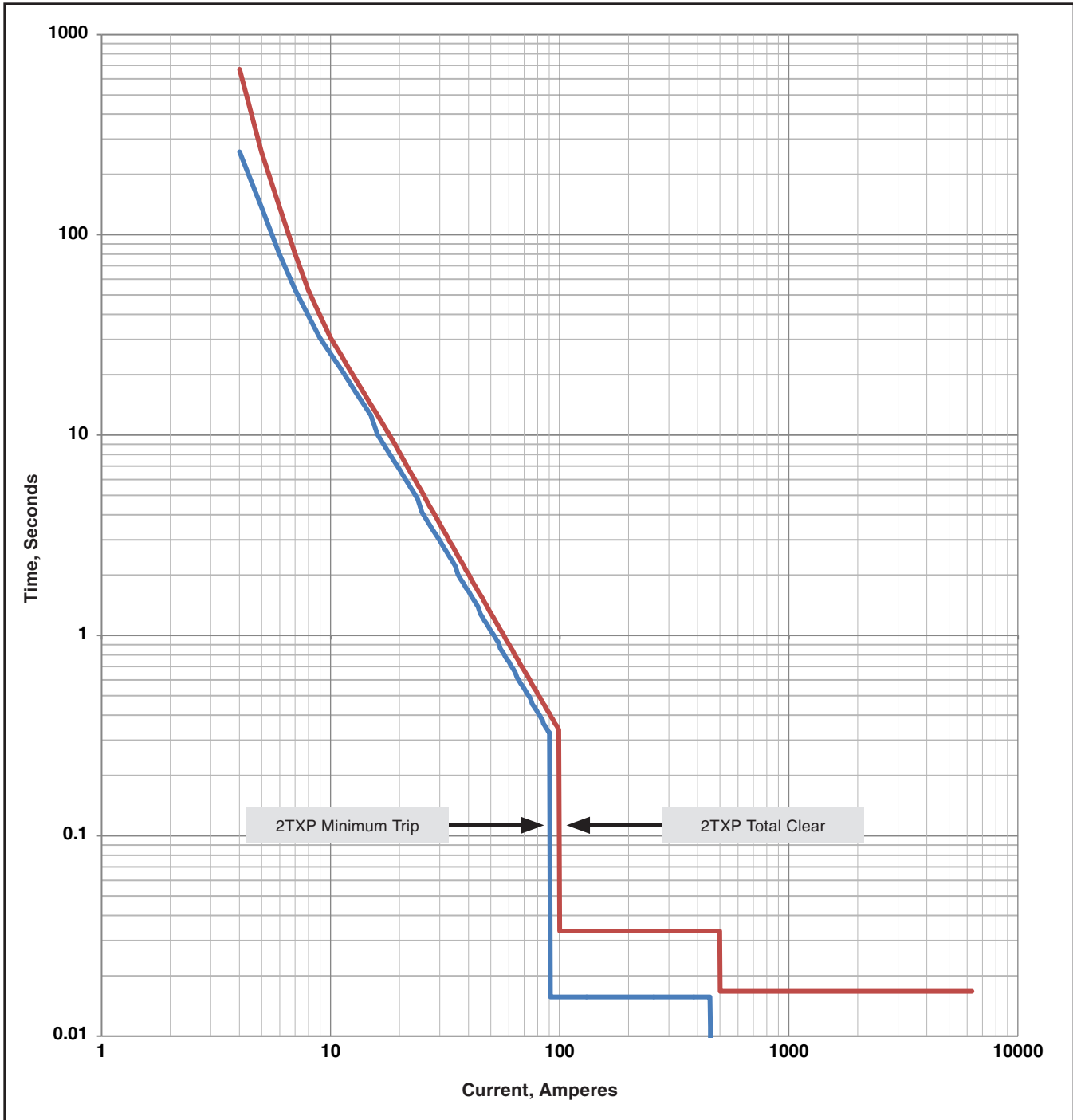


Example of Power-up Time on a 20-Ampere TXP-Speed TCC Curve with Definite Times at High Current

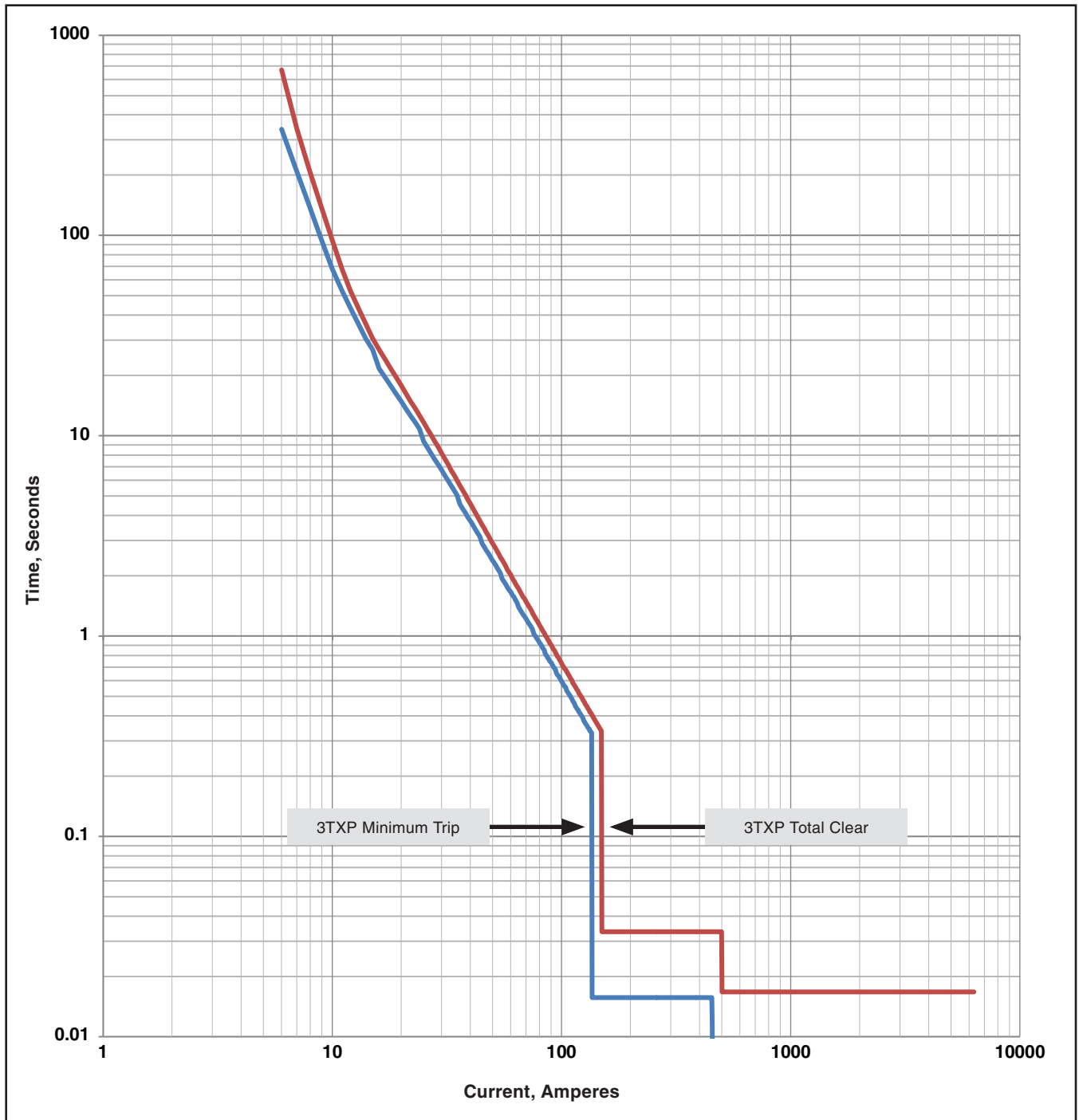


TXP-Speed TCC Curves with Definite Times at High Current

2-Ampere TXP-Speed TCC Curve with Definite Times at High Current

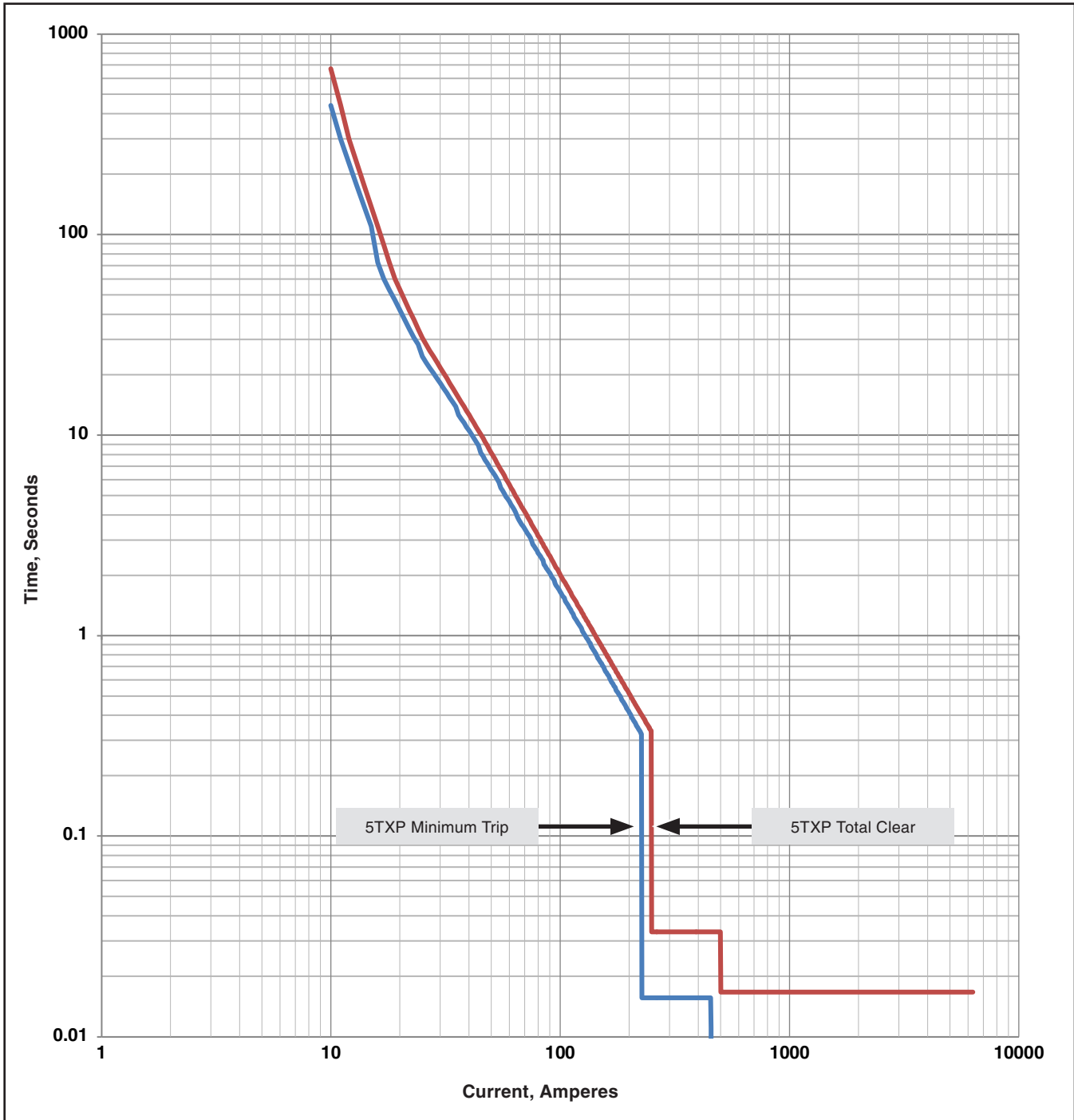


3-Ampere TXP-Speed TCC Curve with Definite Times at High Current

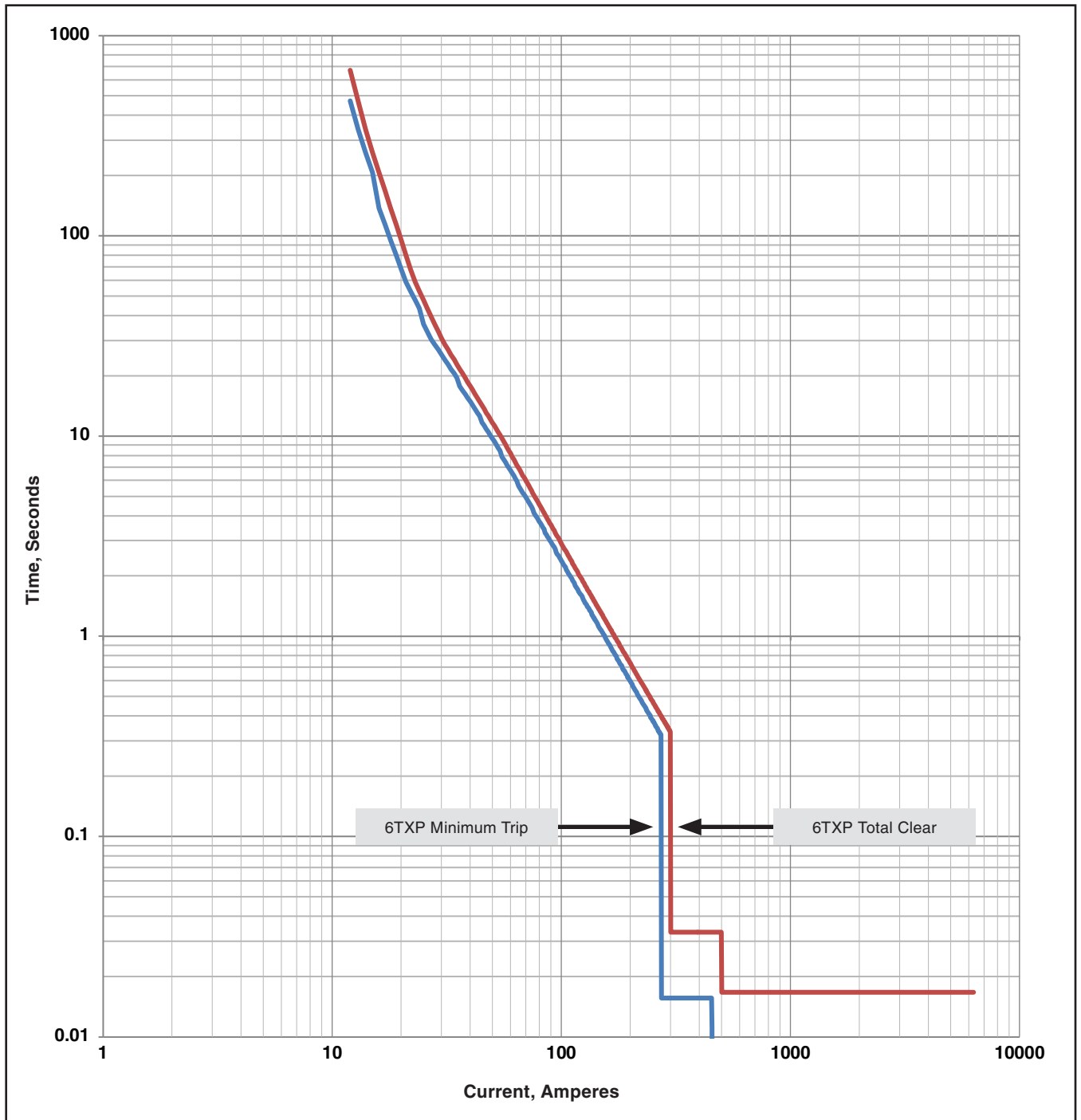


TXP-Speed TCC Curves with Definite Times at High Current

5-Ampere TXP-Speed TCC Curve with Definite Times at High Current

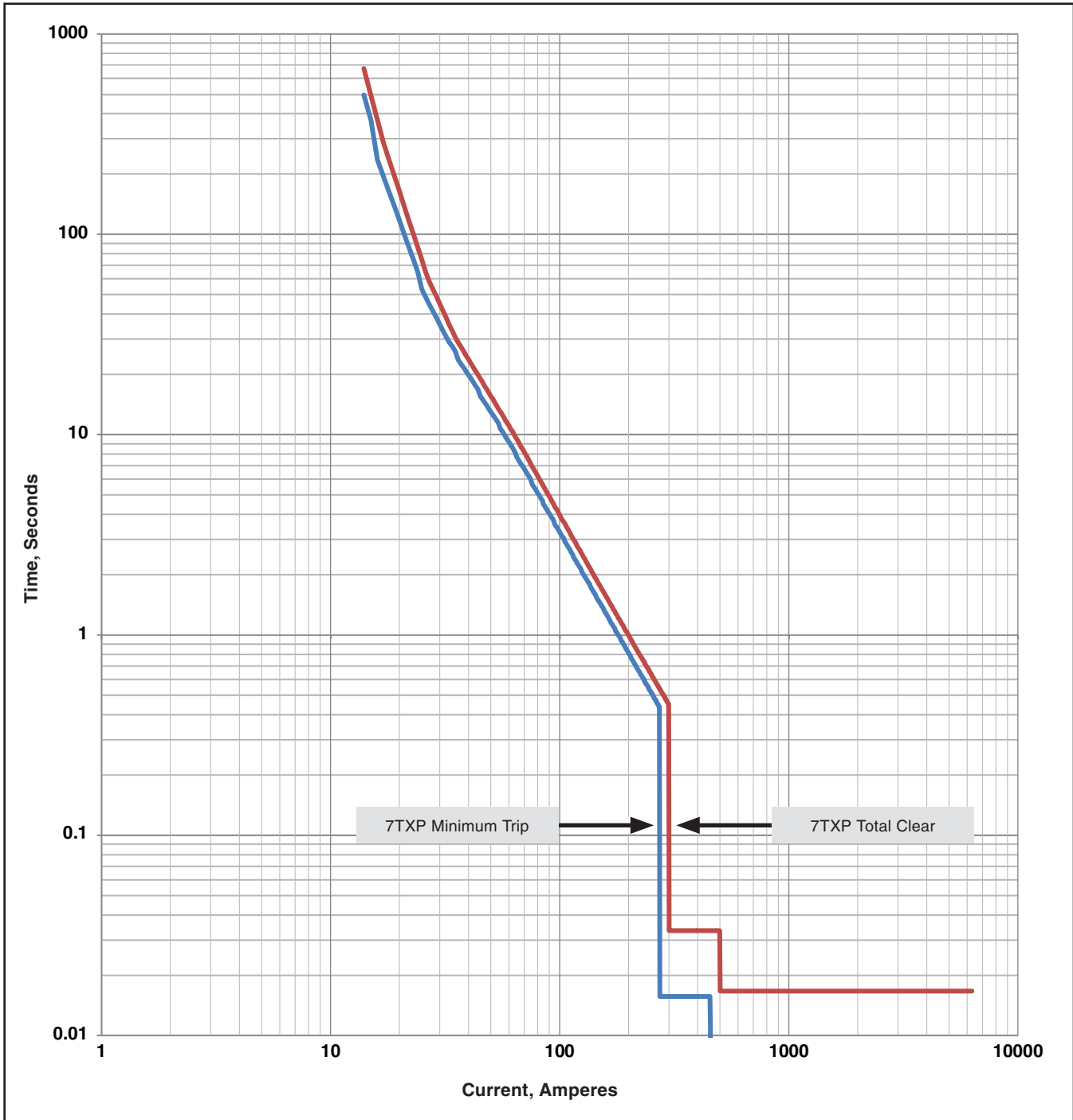


6-Ampere TXP-Speed TCC Curve with Definite Times at High Current

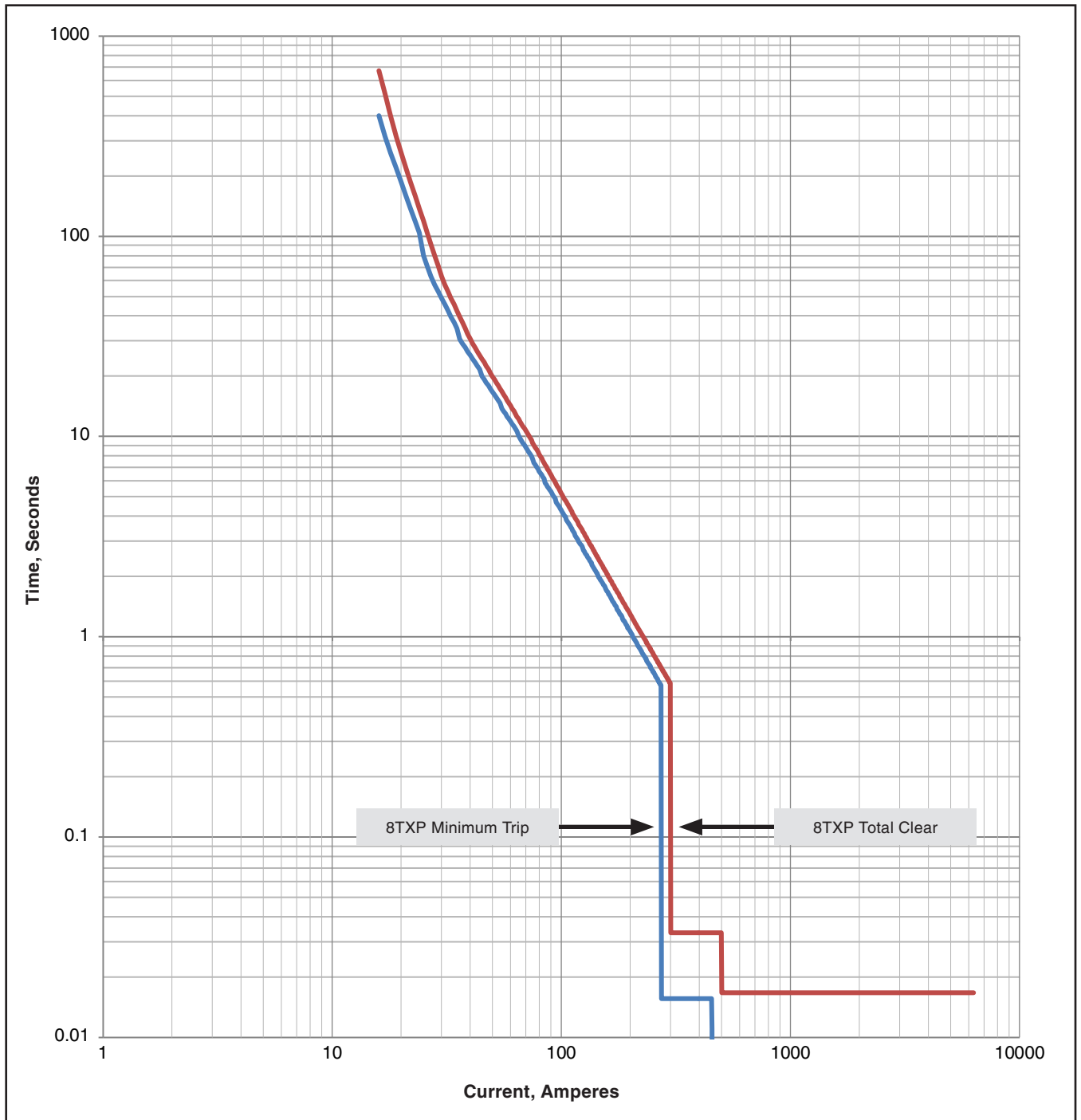


TXP-Speed TCC Curves with Definite Times at High Current

7-Ampere TXP-Speed TCC Curve with Definite Times at High Current

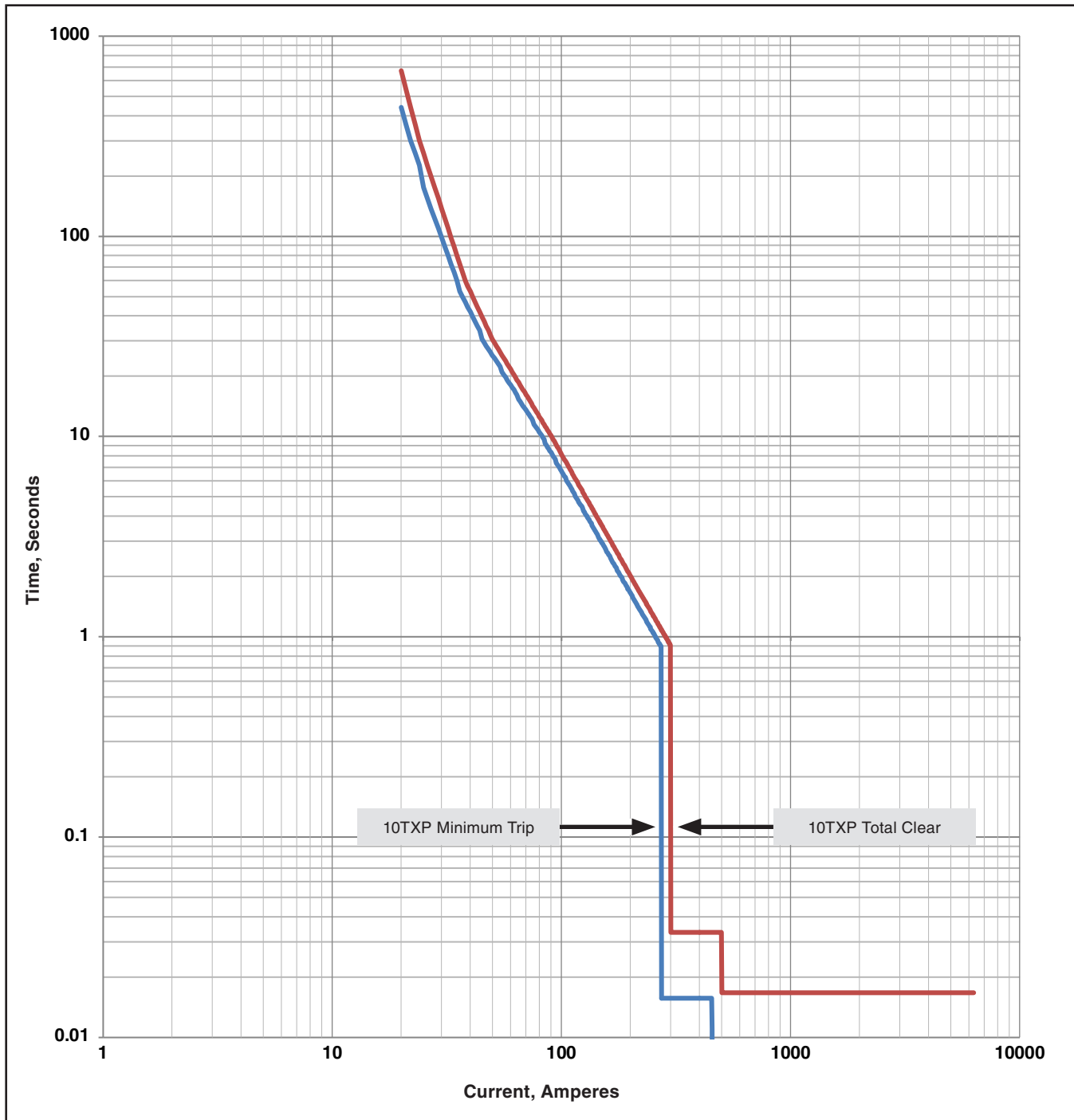


8-Ampere TXP-Speed TCC Curve with Definite Times at High Current

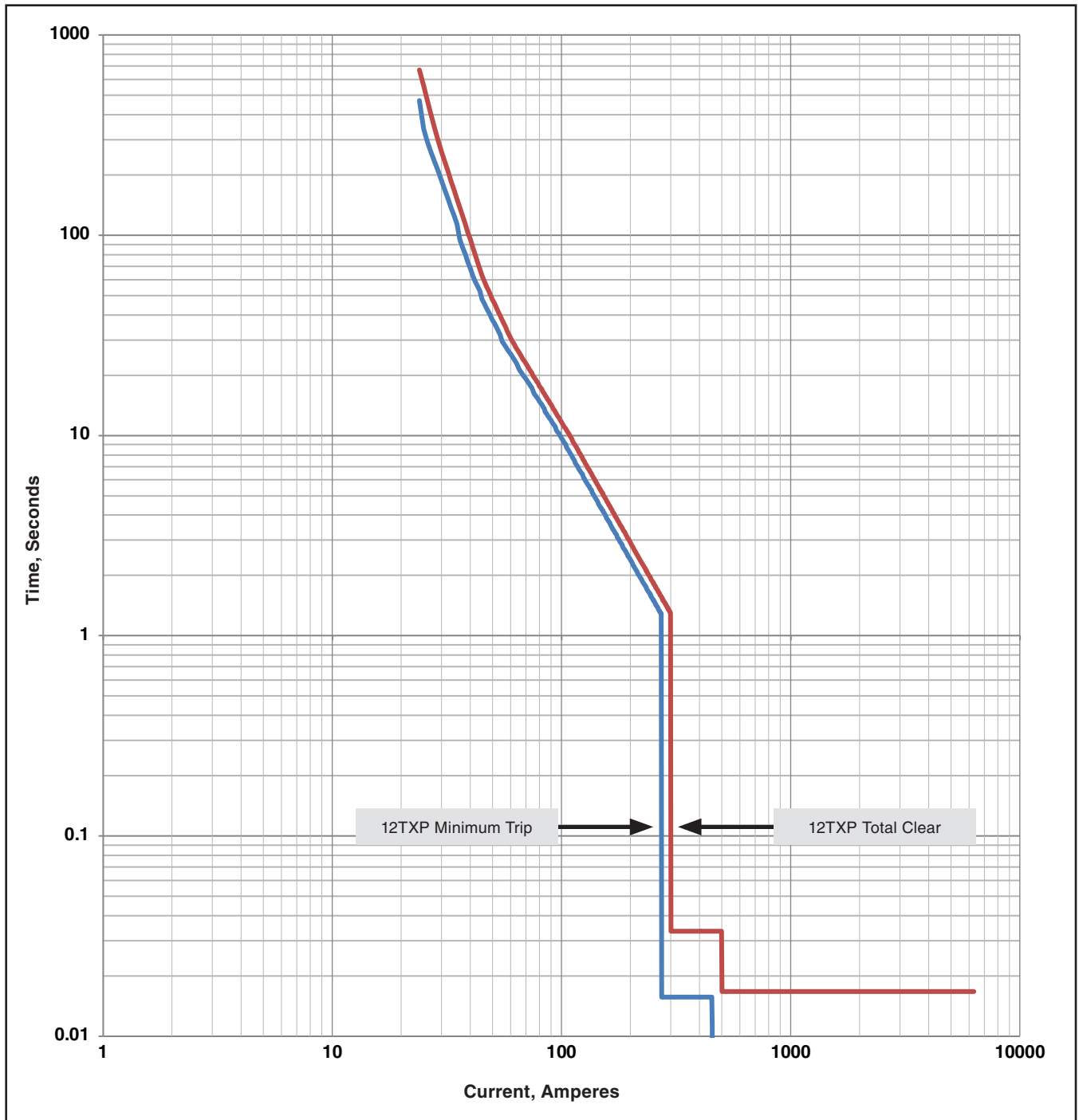


TXP-Speed TCC Curves with Definite Times at High Current

10-Ampere TXP-Speed TCC Curve with Definite Times at High Current

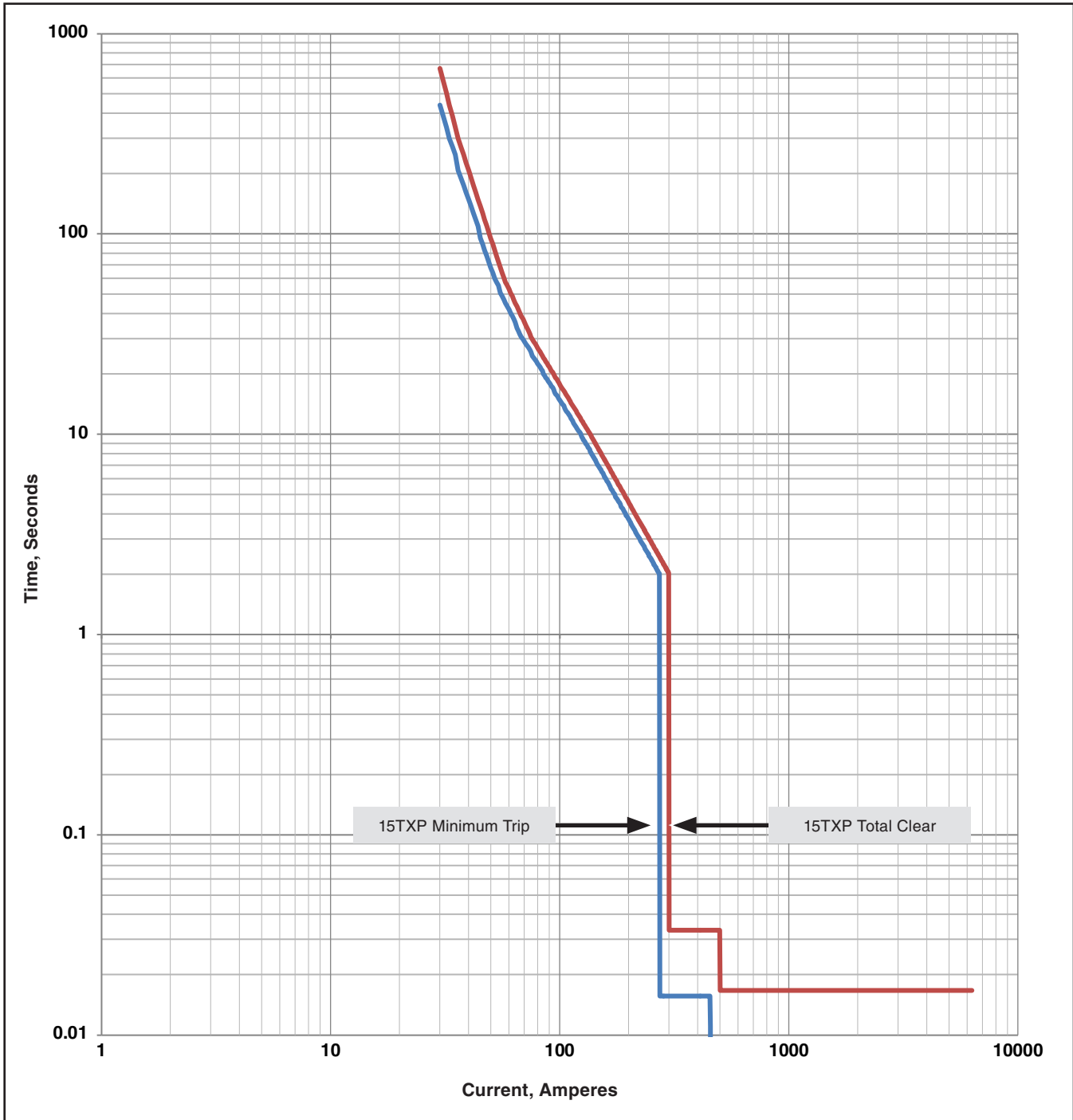


12-Ampere TXP-Speed TCC Curve with Definite Times at High Current

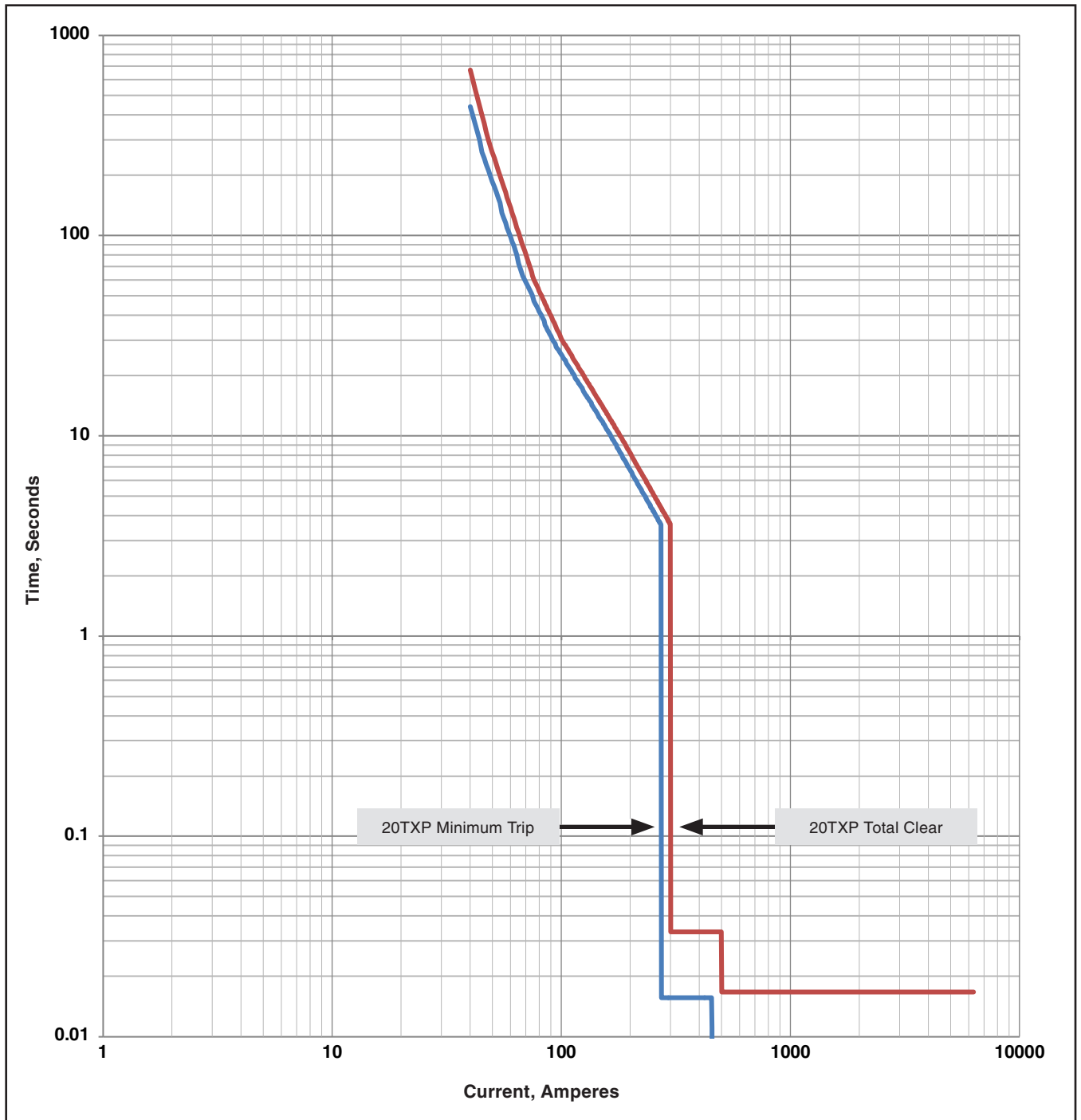


TXP-Speed TCC Curves with Definite Times at High Current

15-Ampere TXP-Speed TCC Curve with Definite Times at High Current

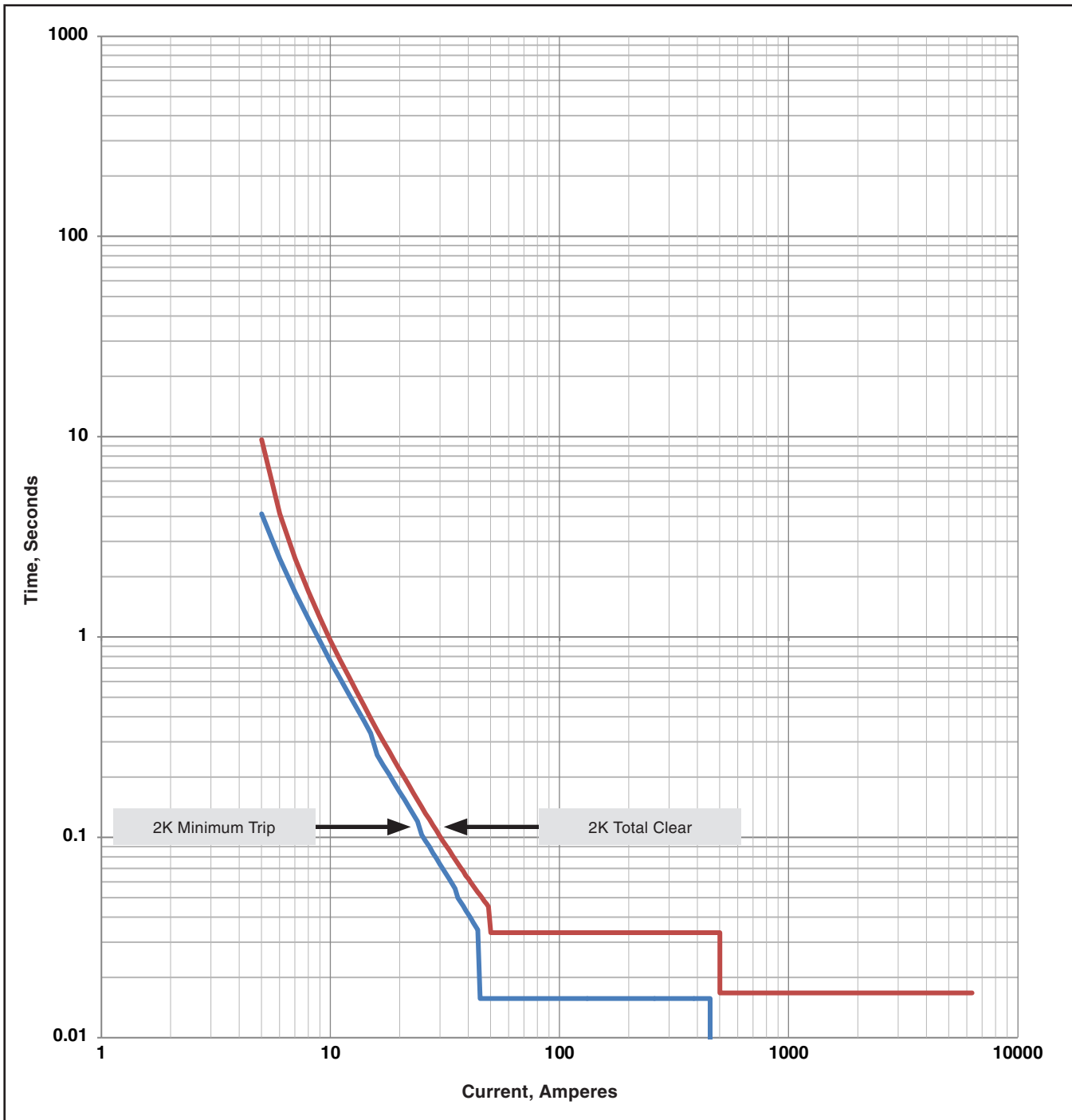


20-Ampere TXP-Speed TCC Curve with Definite Times at High Current

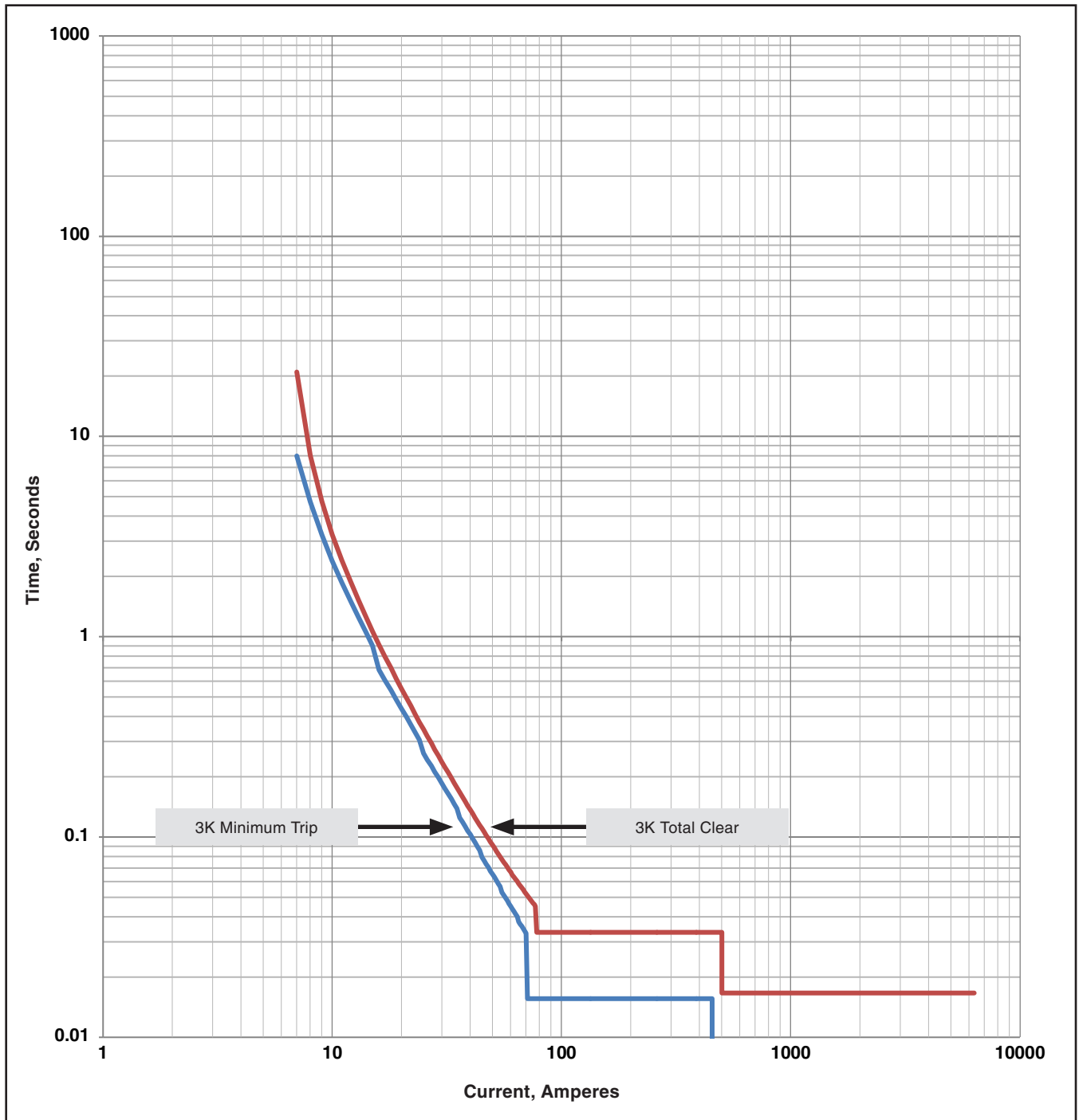


K-Speed Time-Current Characteristic Curves with Definite Times at High Current

2-Ampere K-Speed TCC Curve with Definite Times at High Current

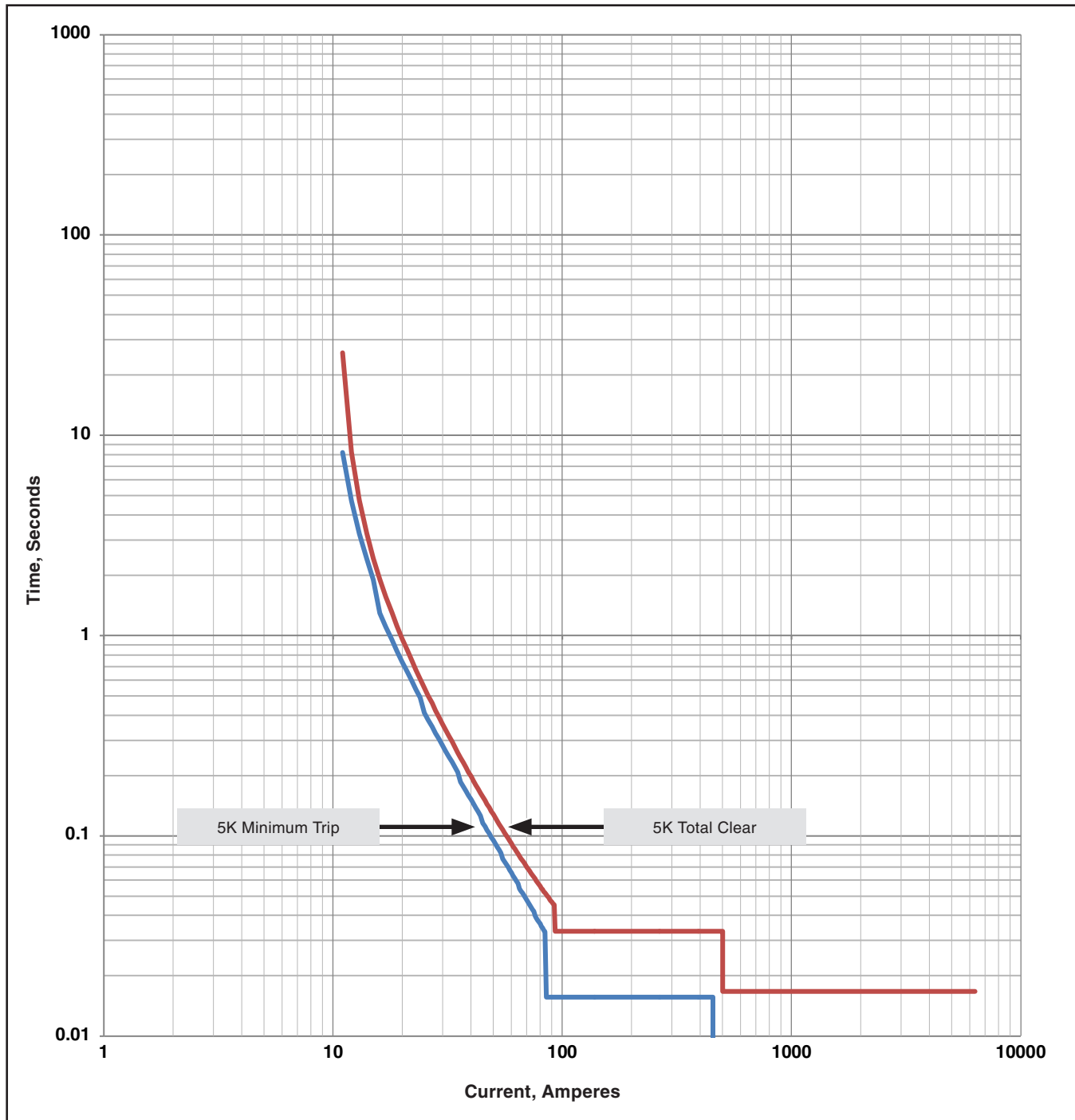


3-Ampere K-Speed TCC Curve with Definite Times at High Current

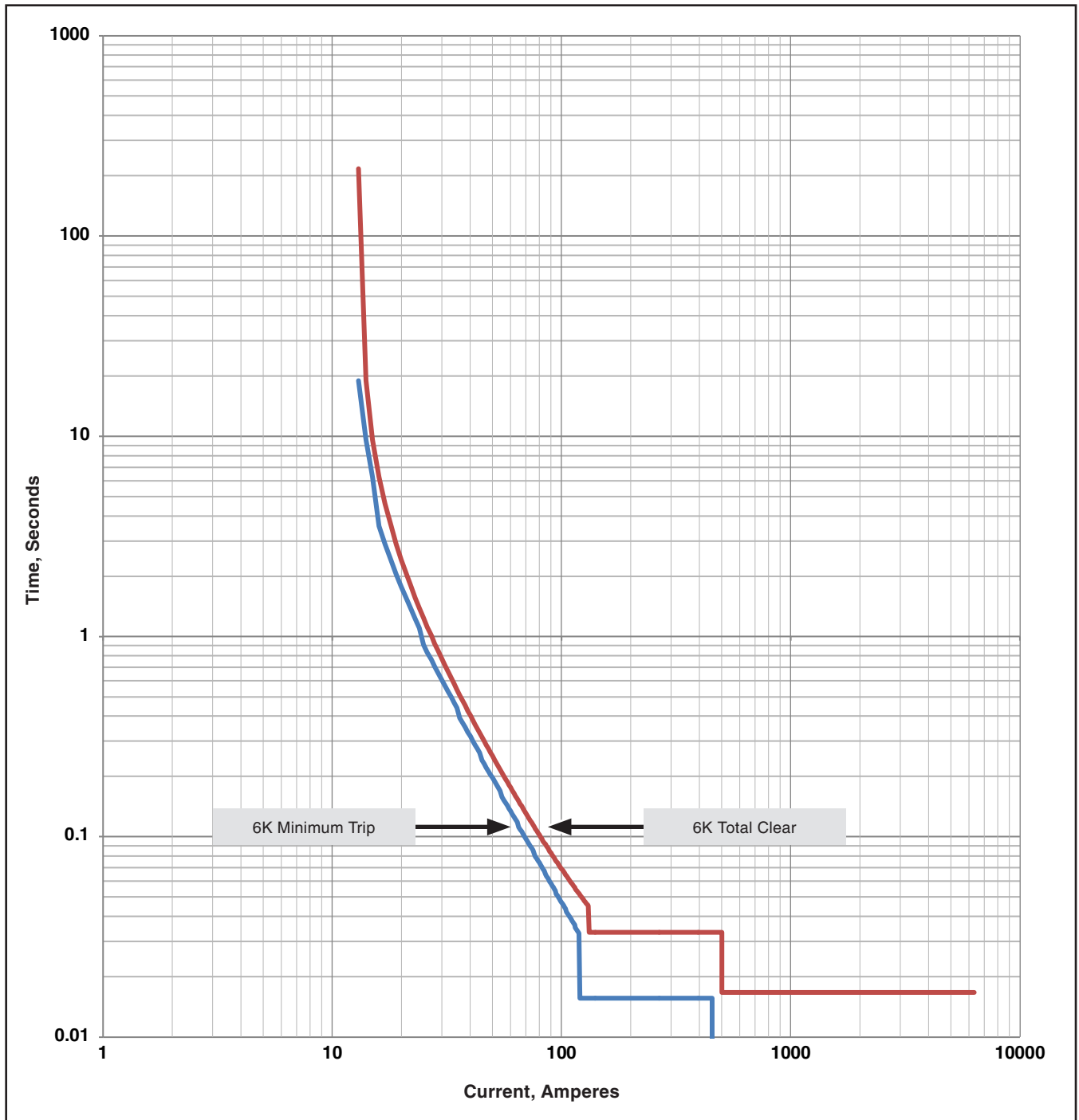


K-Speed Time-Current Characteristic Curves with Definite Times at High Current

5-Ampere K-Speed TCC Curve with Definite Times at High Current

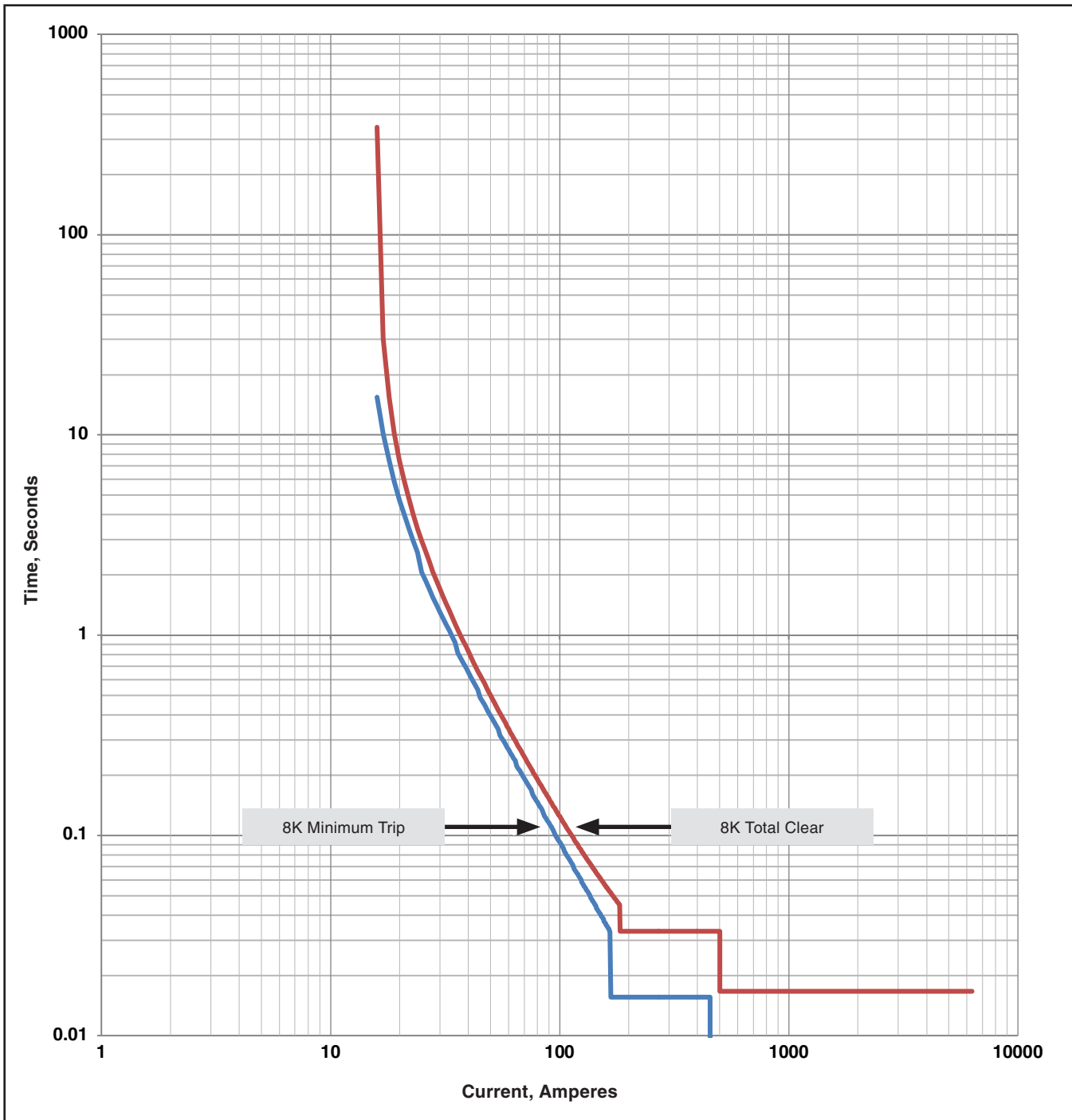


6-Ampere K-Speed TCC Curve with Definite Times at High Current

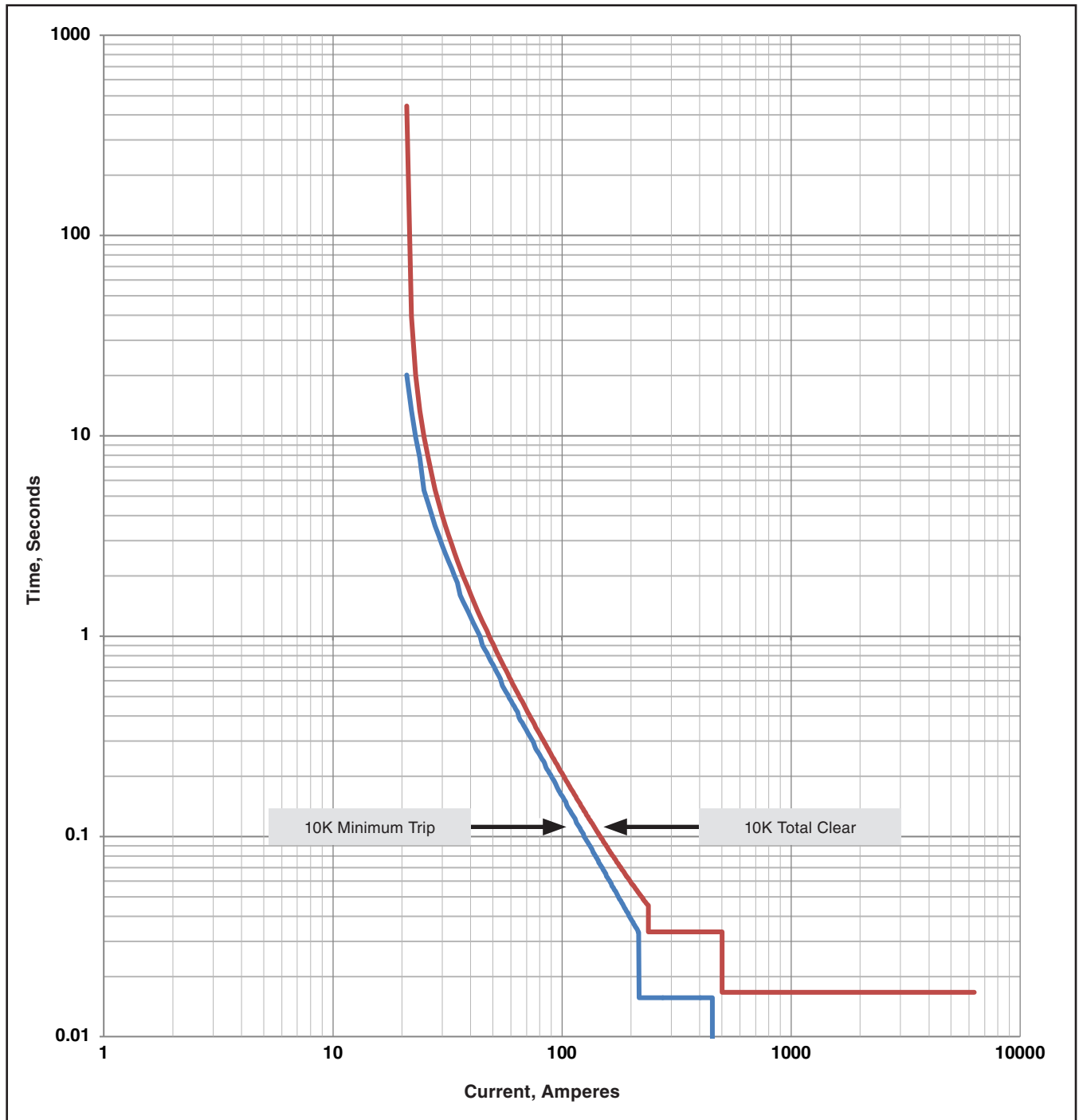


K-Speed Time-Current Characteristic Curves with Definite Times at High Current

8-Ampere K-Speed TCC Curve with Definite Times at High Current

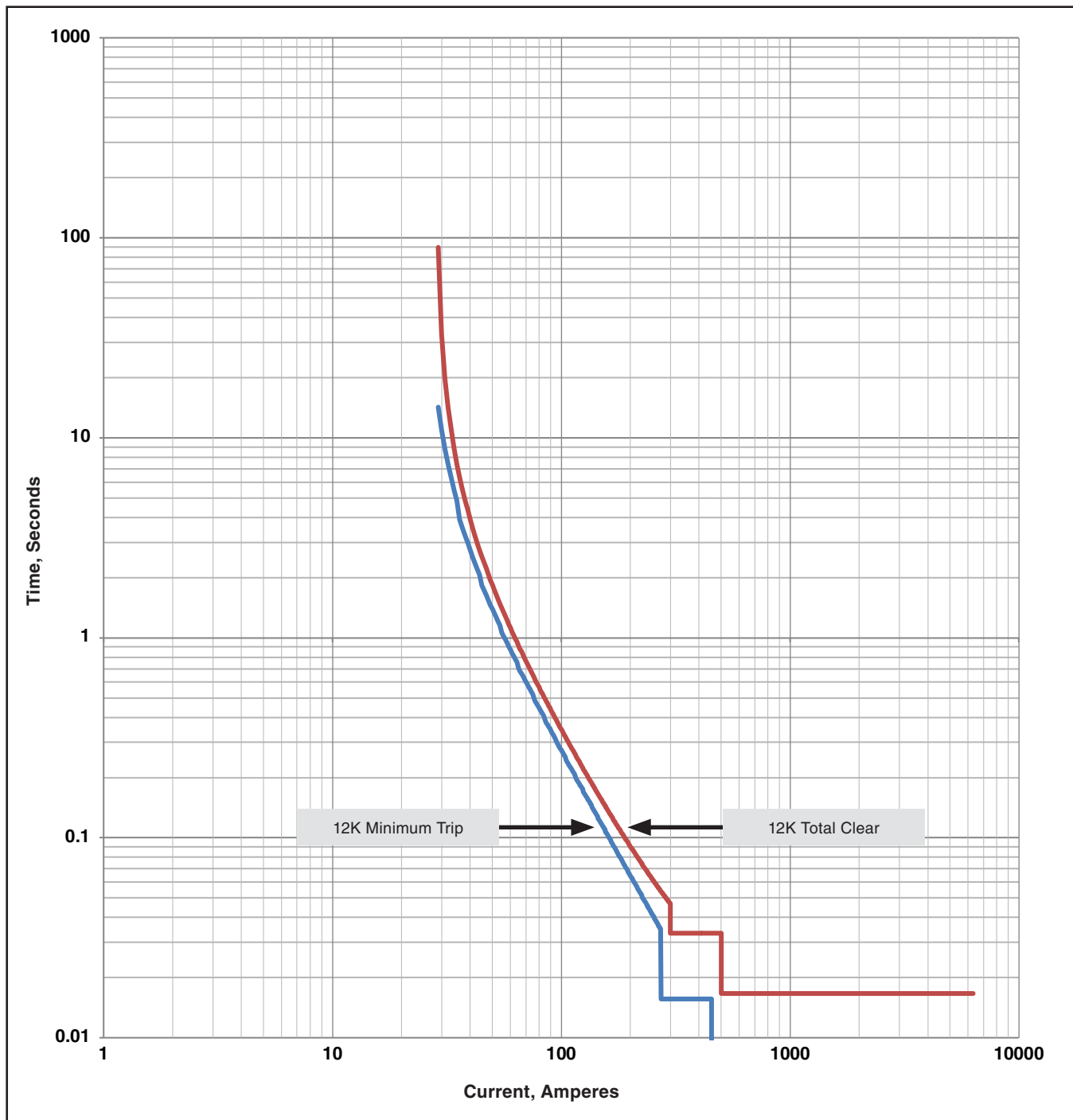


10-Ampere K-Speed TCC Curve with Definite Times at High Current

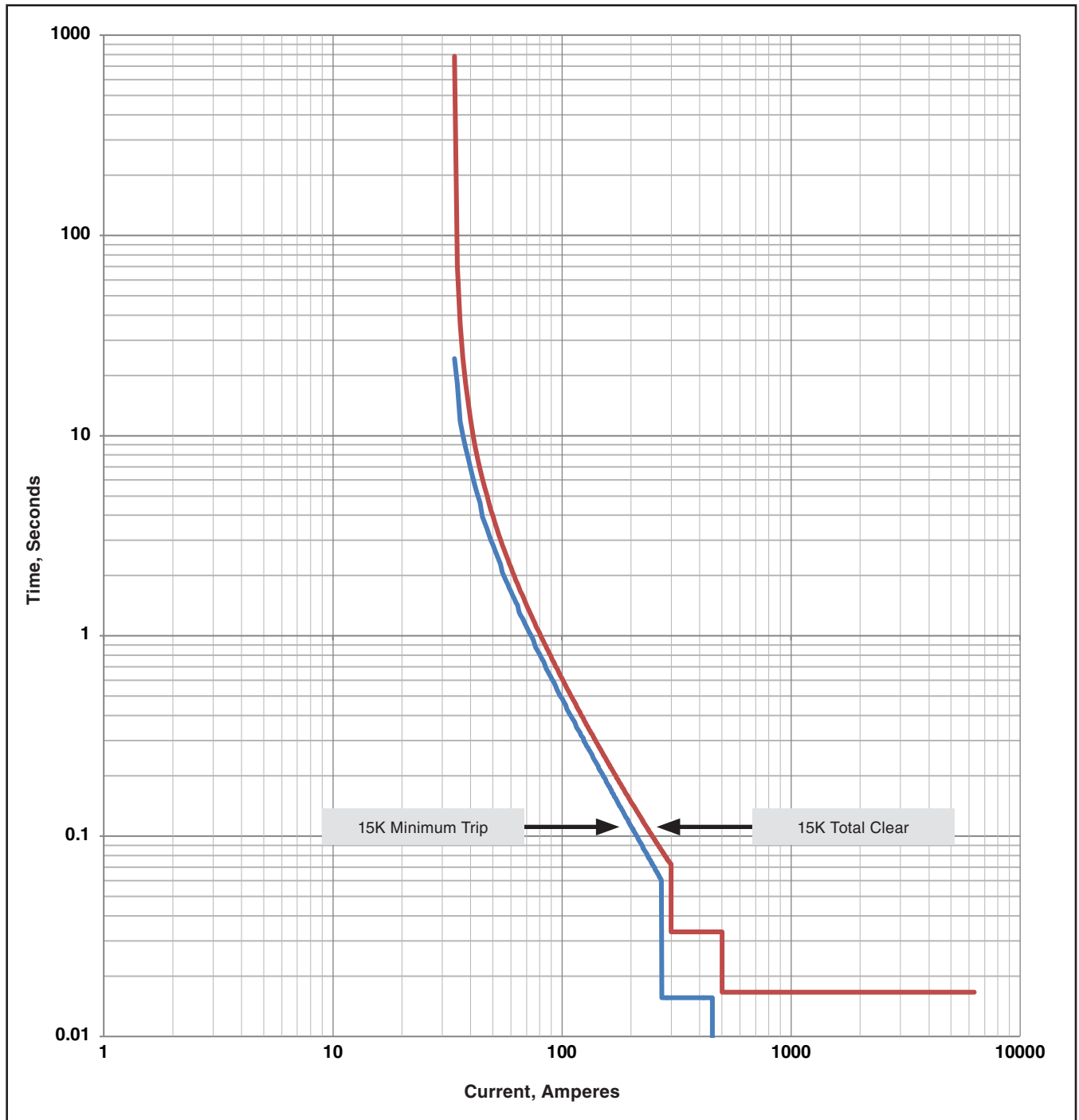


K-Speed Time-Current Characteristic Curves with Definite Times at High Current

12-Ampere K-Speed TCC Curve with Definite Times at High Current

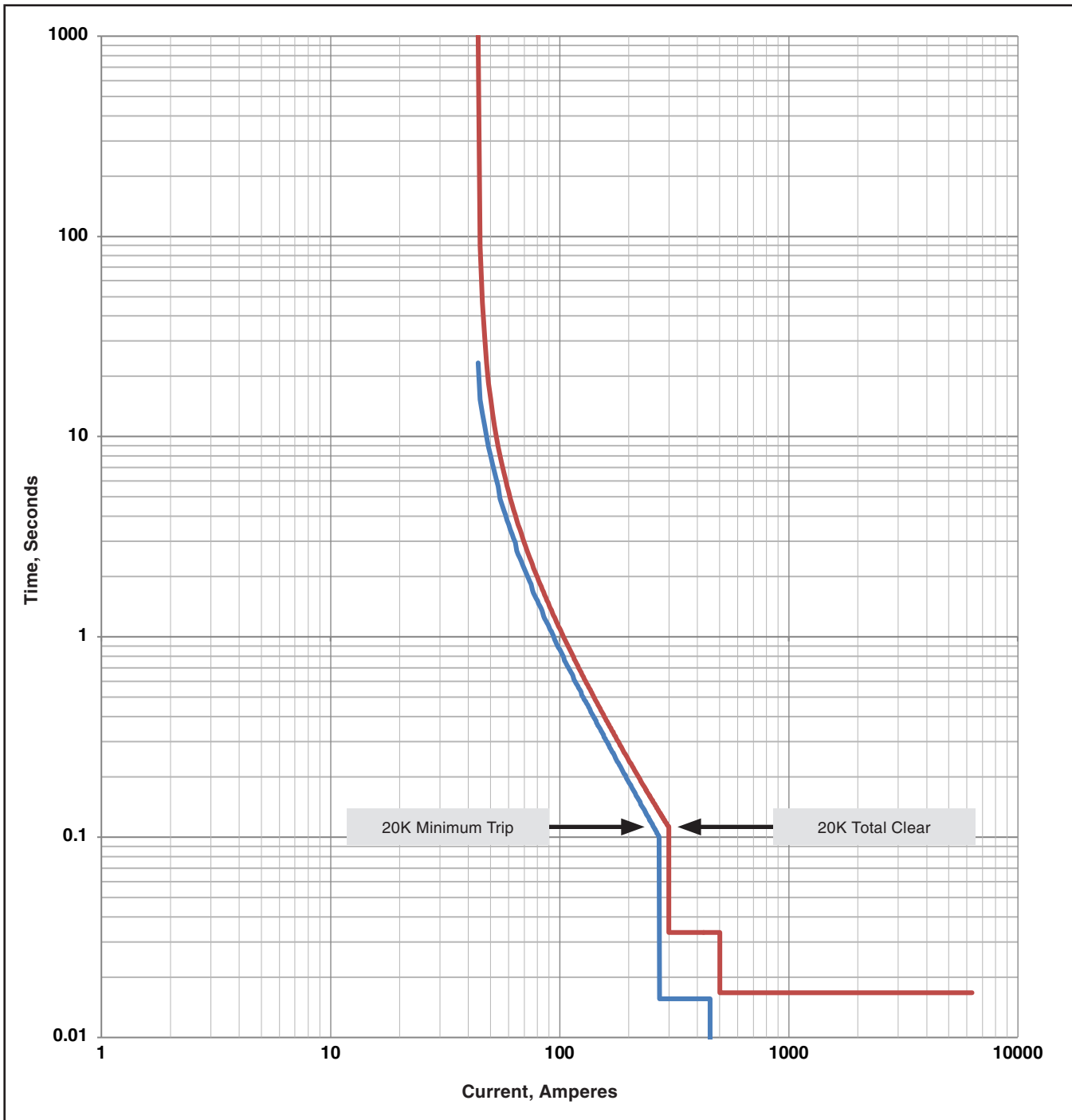


15-Ampere K-Speed TCC Curve with Definite Times at High Current

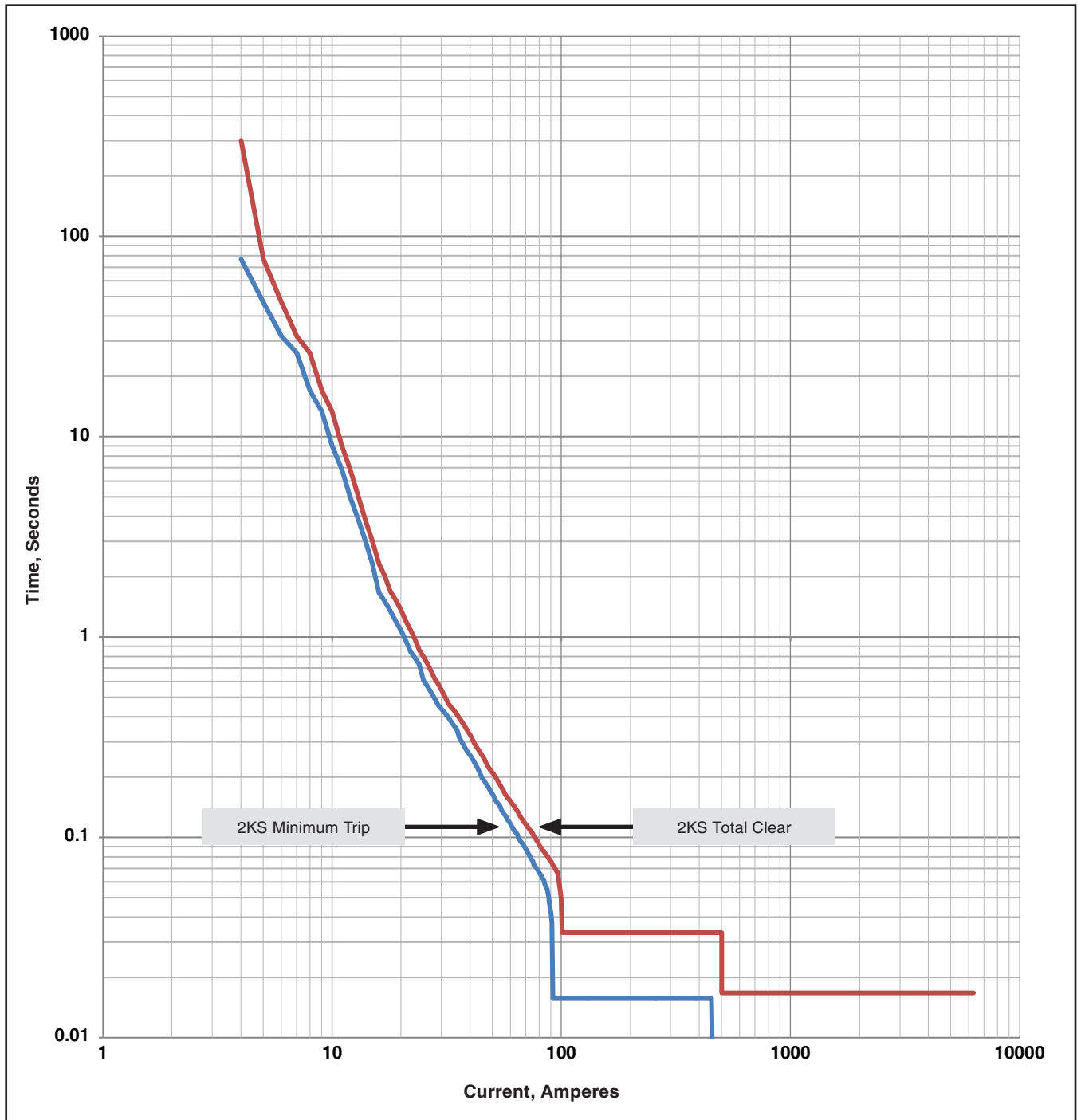


K-Speed Time-Current Characteristic Curves with Definite Times at High Current

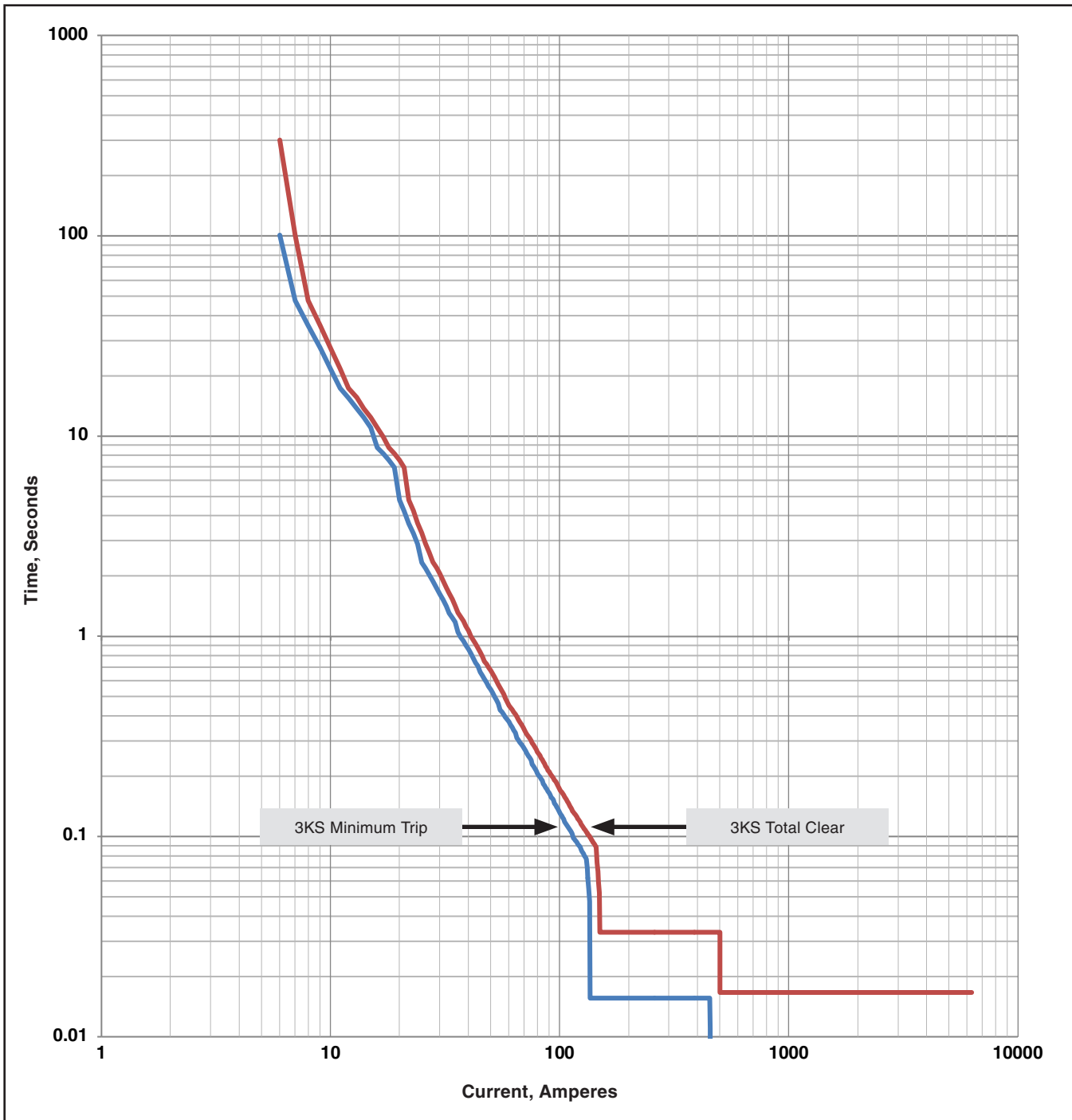
20-Ampere K-Speed TCC Curve with Definite Times at High Current



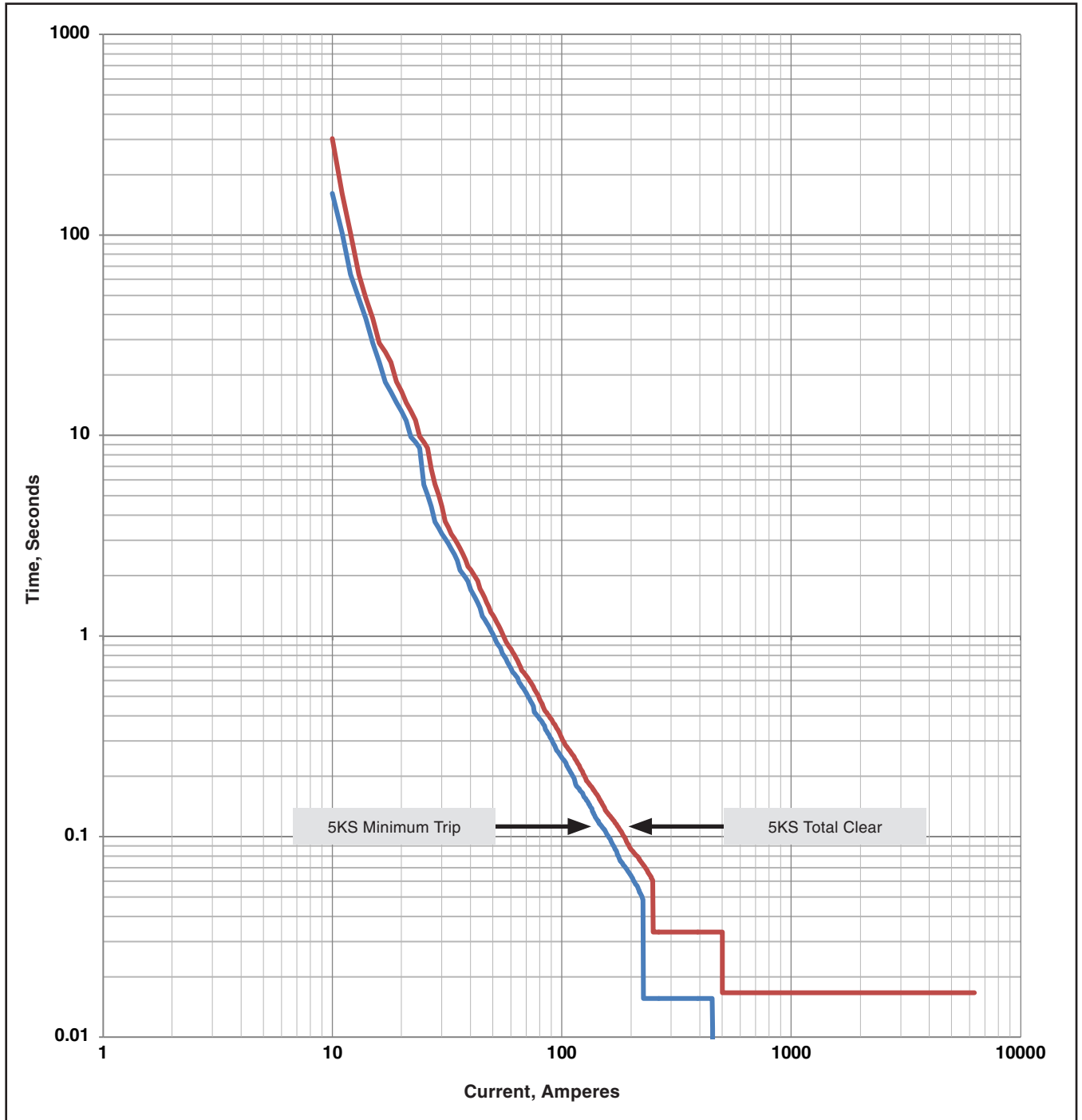
2-Ampere KS-Speed TCC Curve with Definite Times at High Current



3-Ampere KS-Speed TCC Curve with Definite Times at High Current

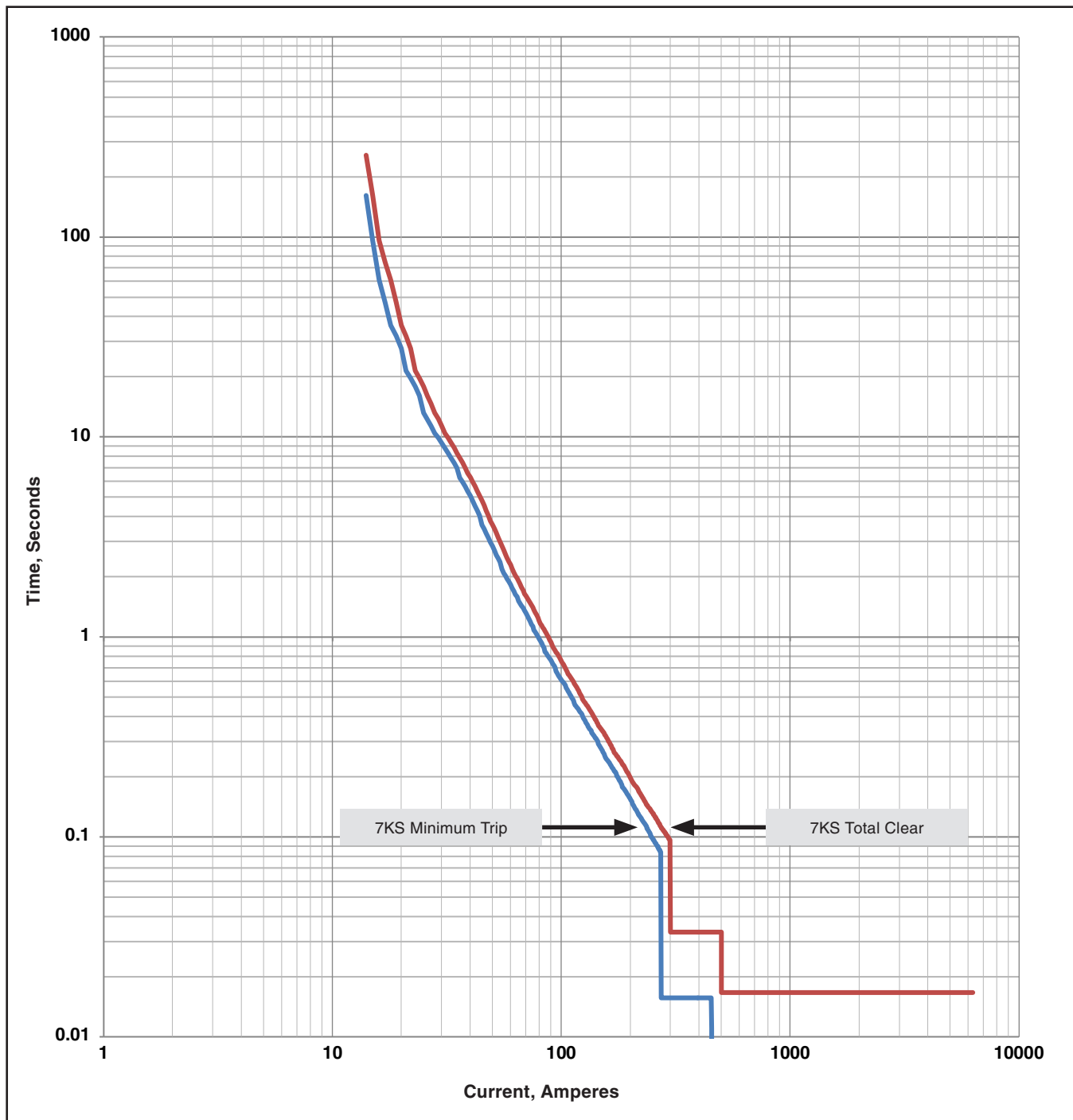


5-Ampere KS-Speed TCC Curve with Definite Times at High Current

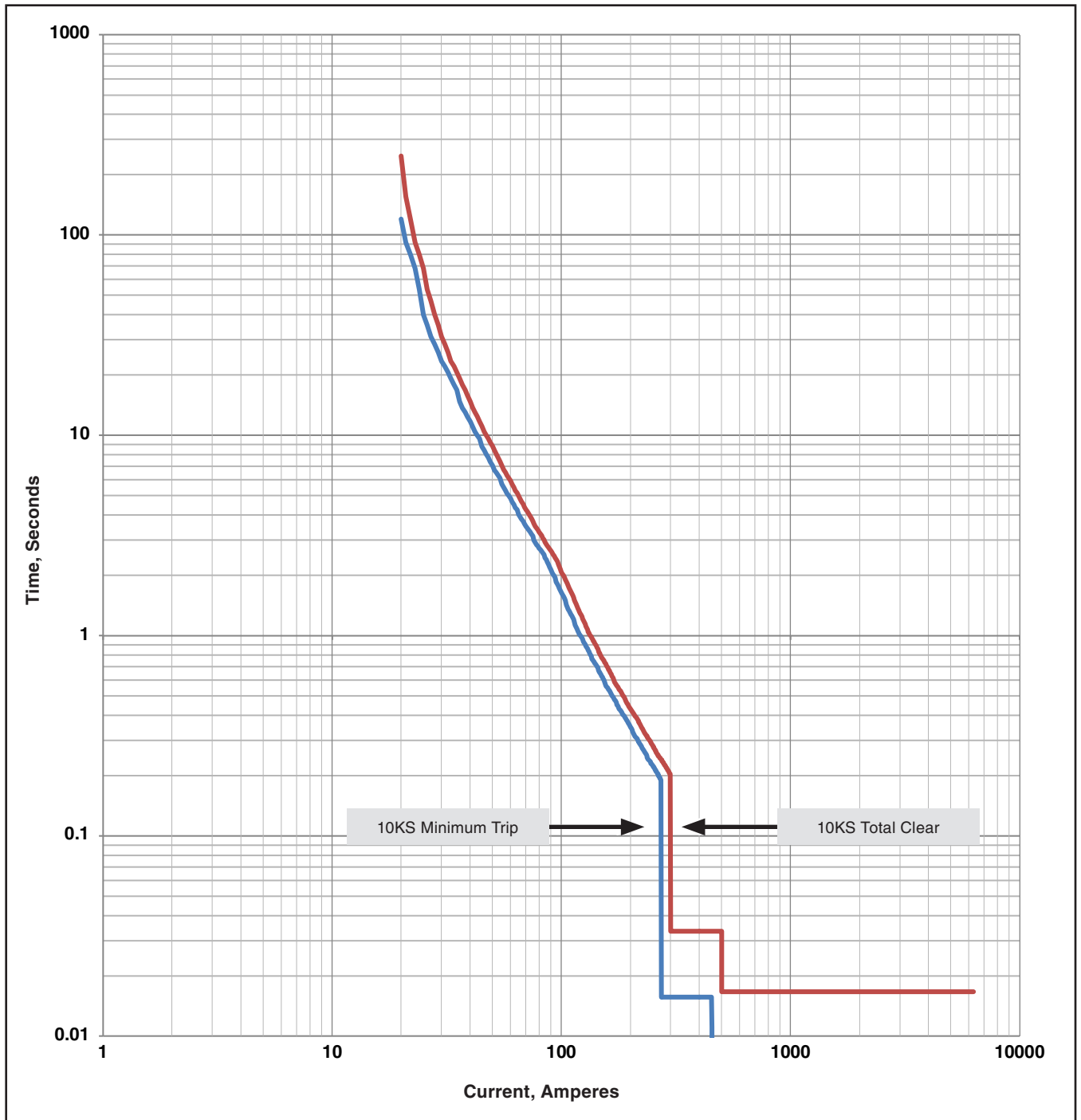


KS-Speed Time-Current Characteristic Curves with Definite Times at High Current

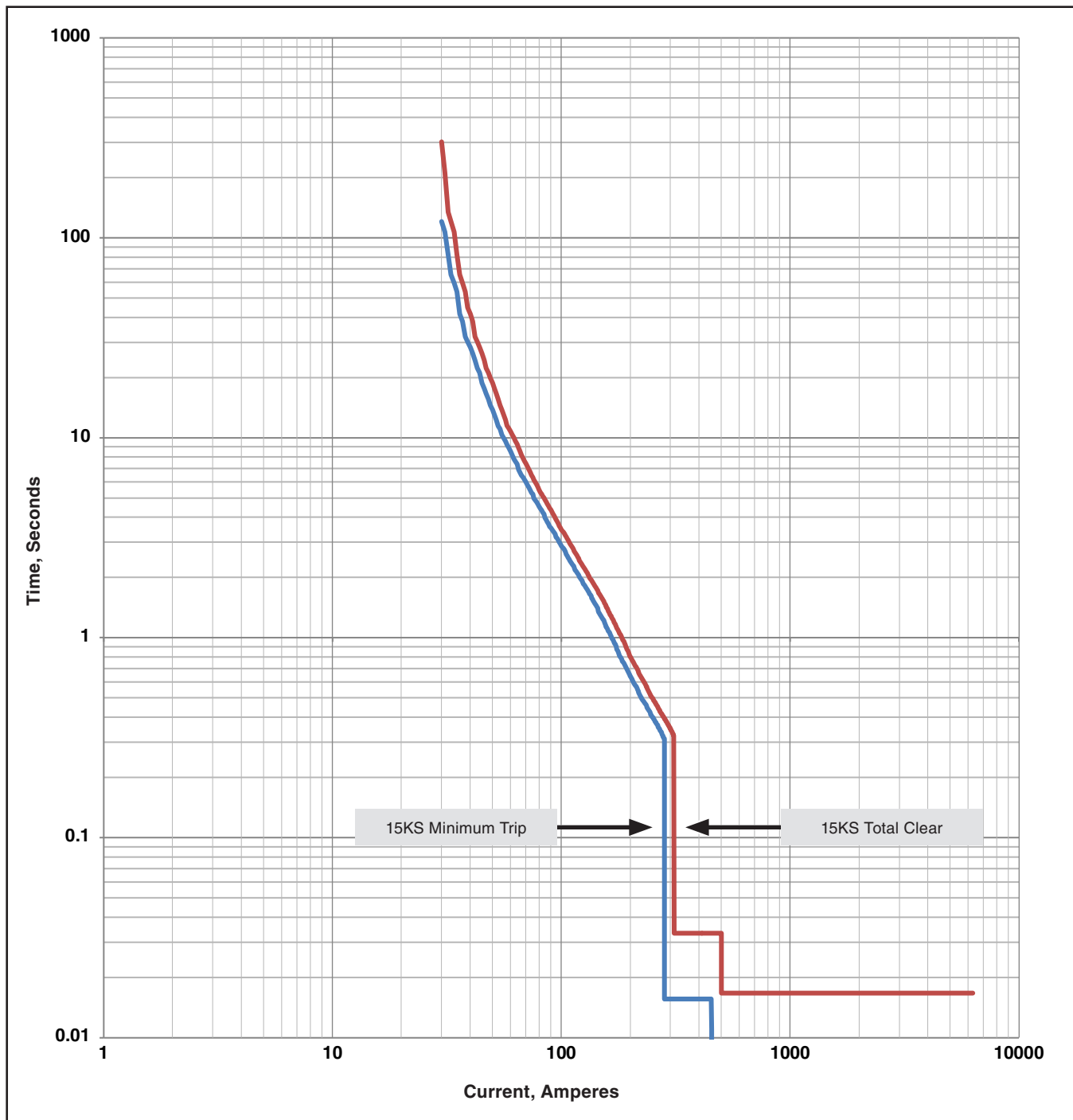
7-Ampere KS-Speed TCC Curve with Definite Times at High Current



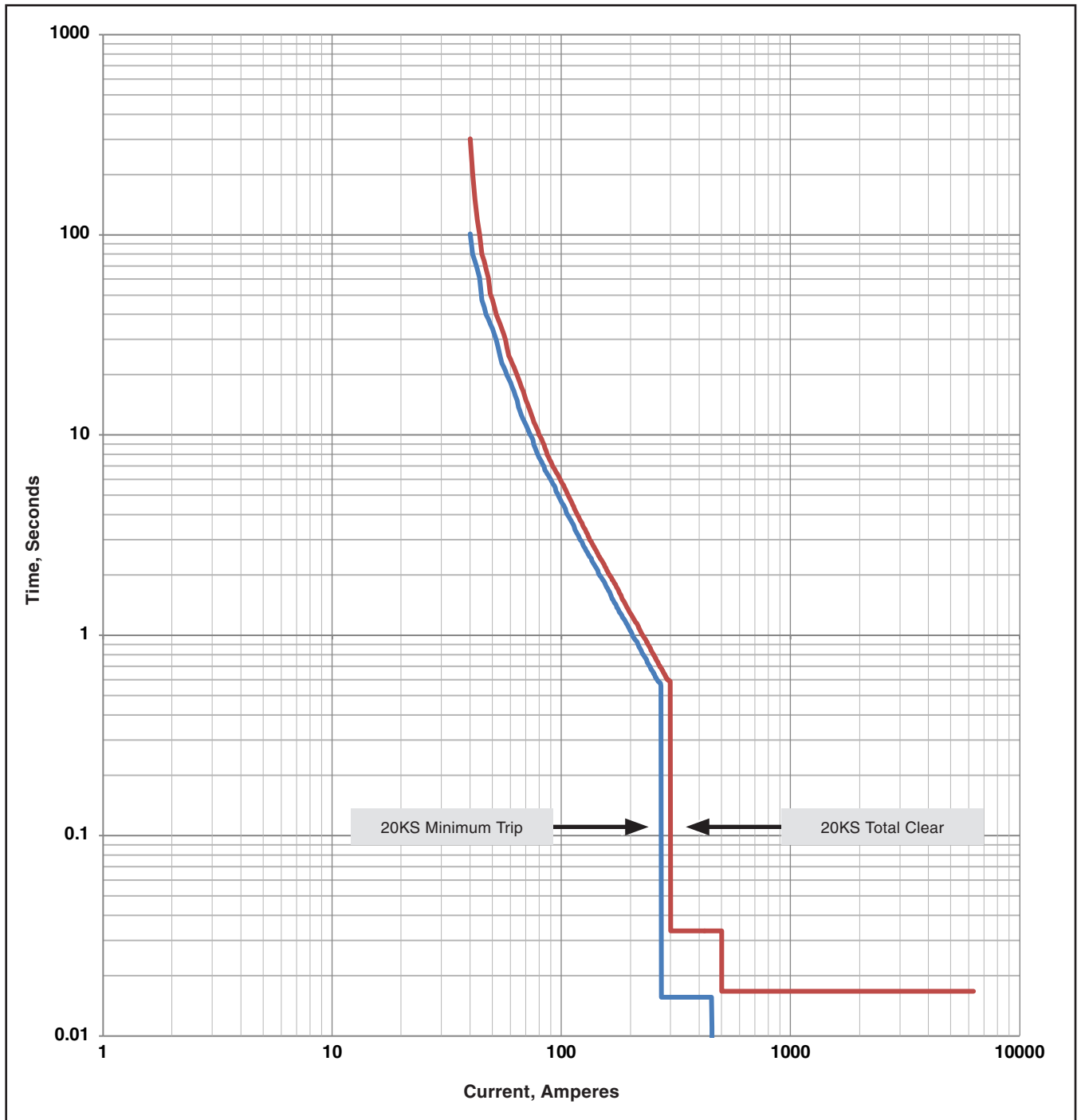
10-Ampere KS-Speed TCC Curve with Definite Times at High Current



15-Ampere KS-Speed TCC Curve with Definite Times at High Current

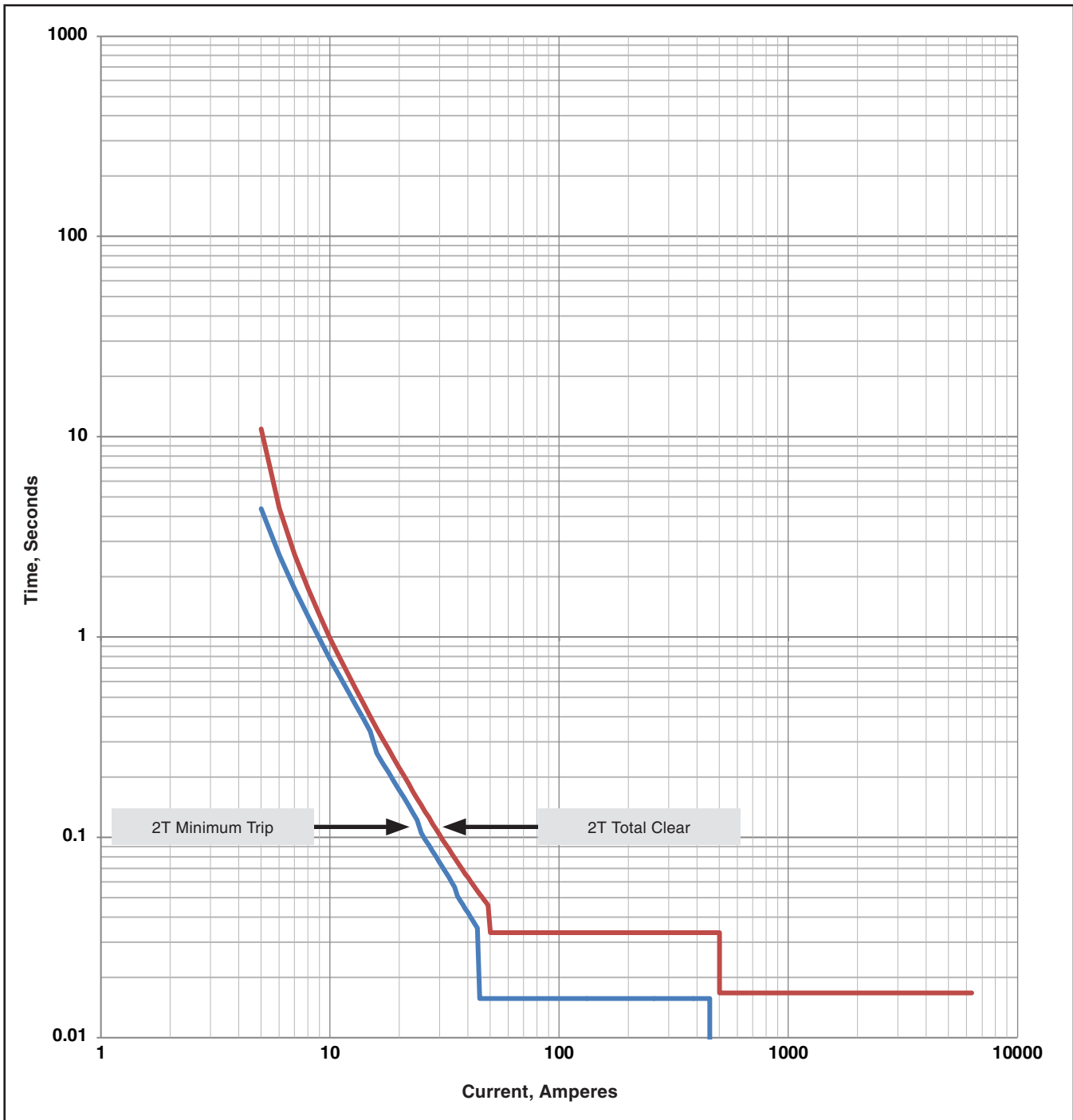


20-Ampere KS-Speed TCC Curve with Definite Times at High Current

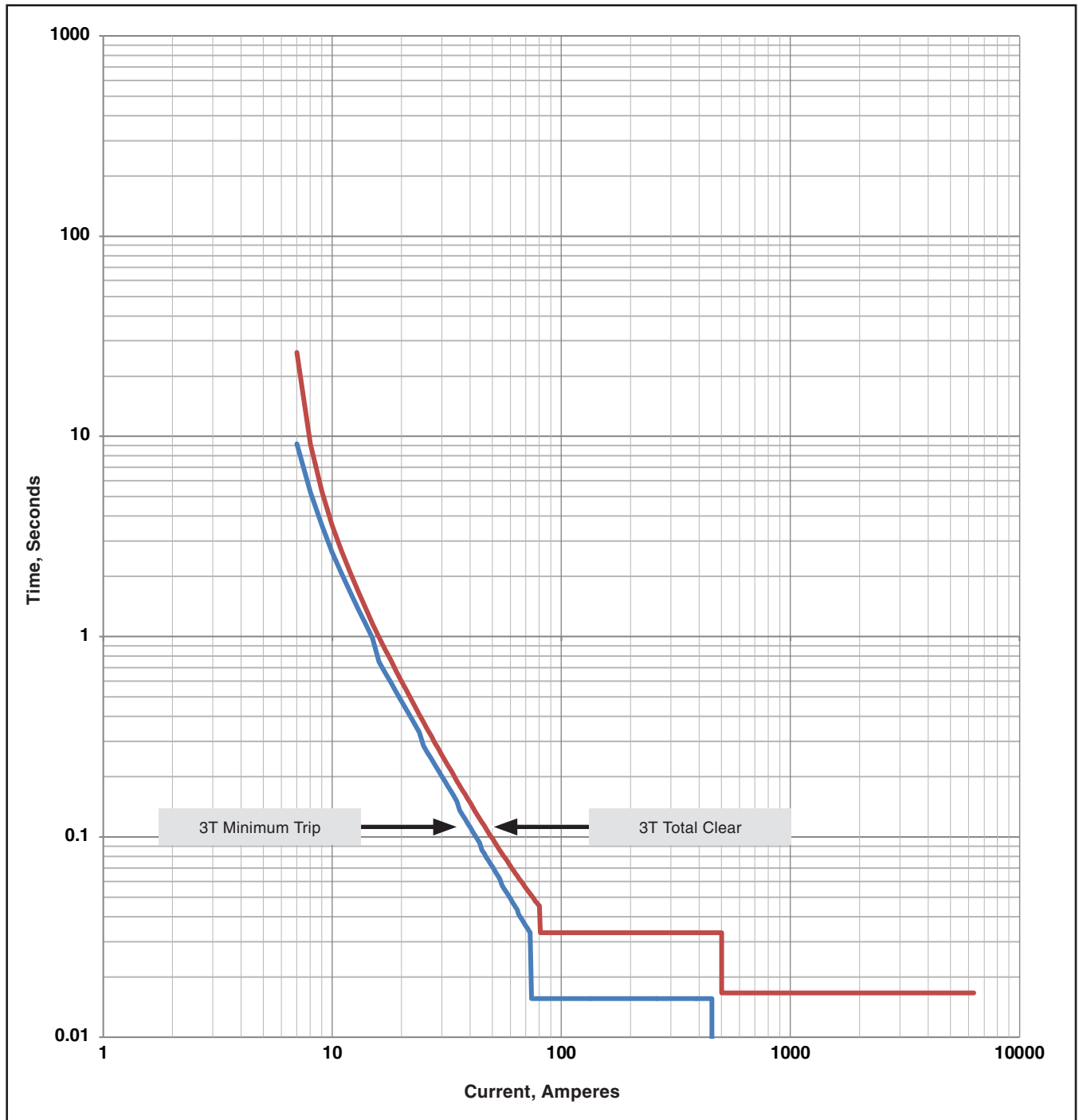


T-Speed Time-Current Characteristic Curves with Definite Times at High Current

2-Ampere T-Speed TCC Curve with Definite Times at High Current

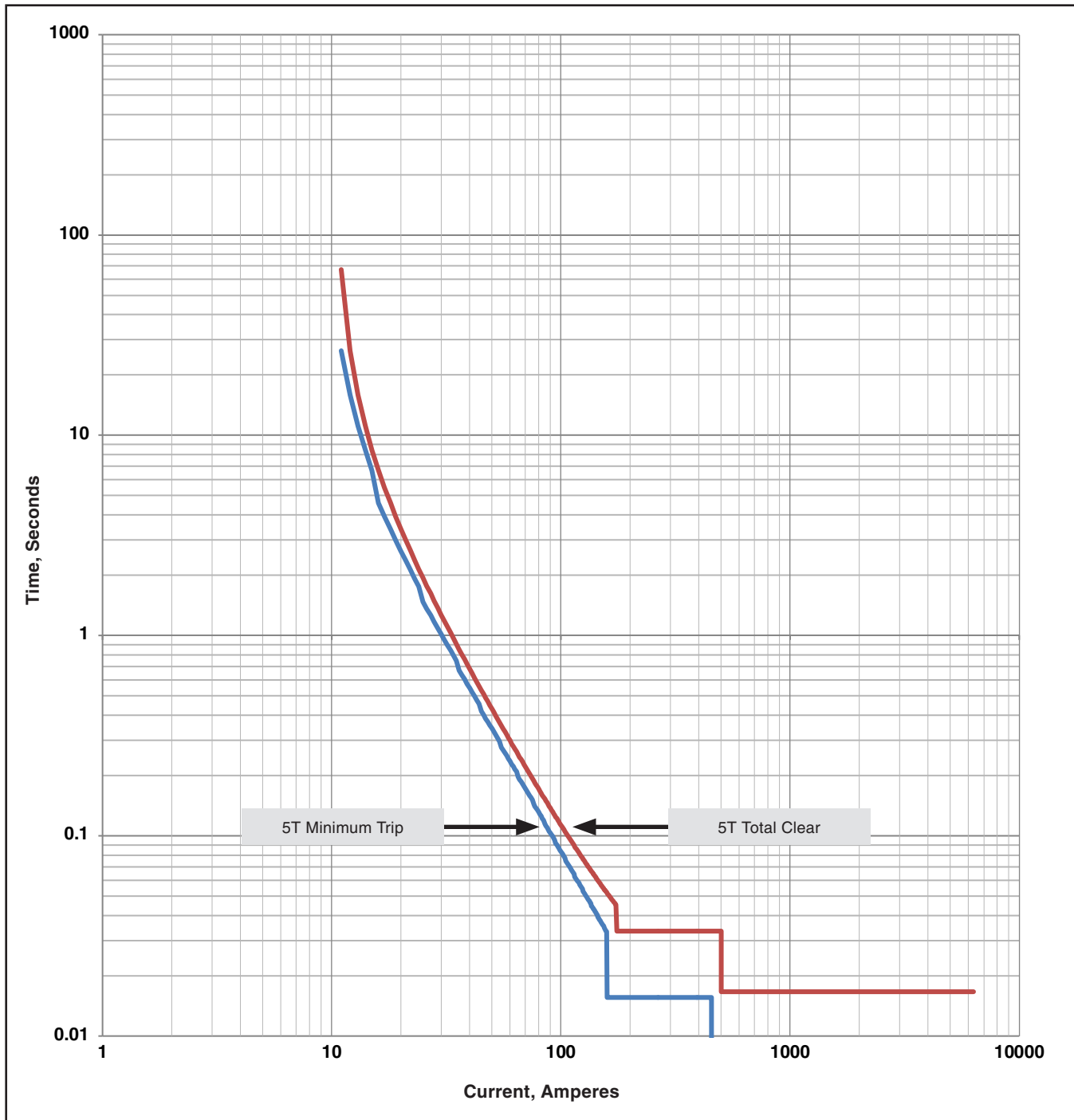


3-Ampere T-Speed TCC Curve with Definite Times at High Current

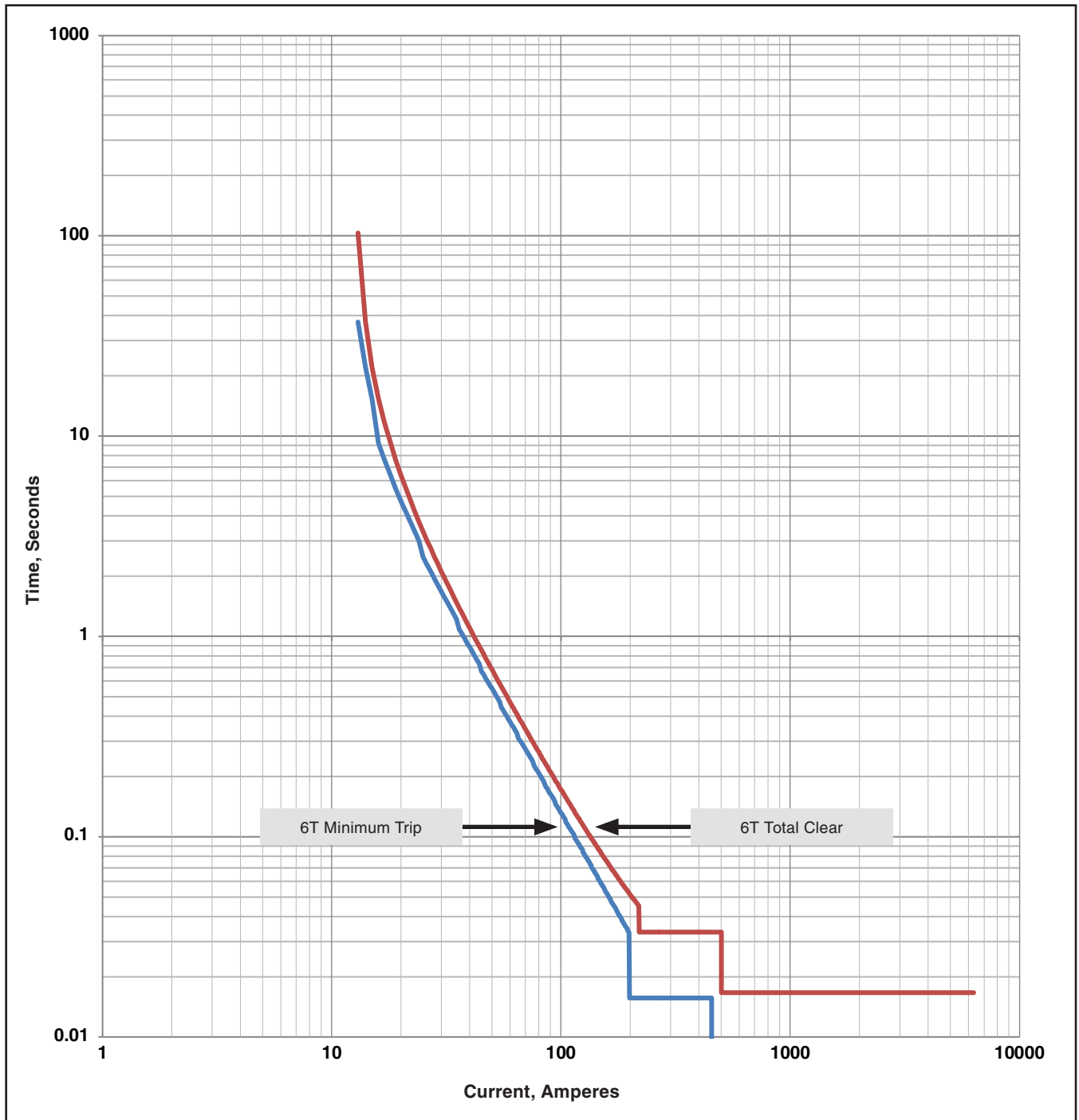


T-Speed Time-Current Characteristic Curves with Definite Times at High Current

5-Ampere T-Speed TCC Curve with Definite Times at High Current

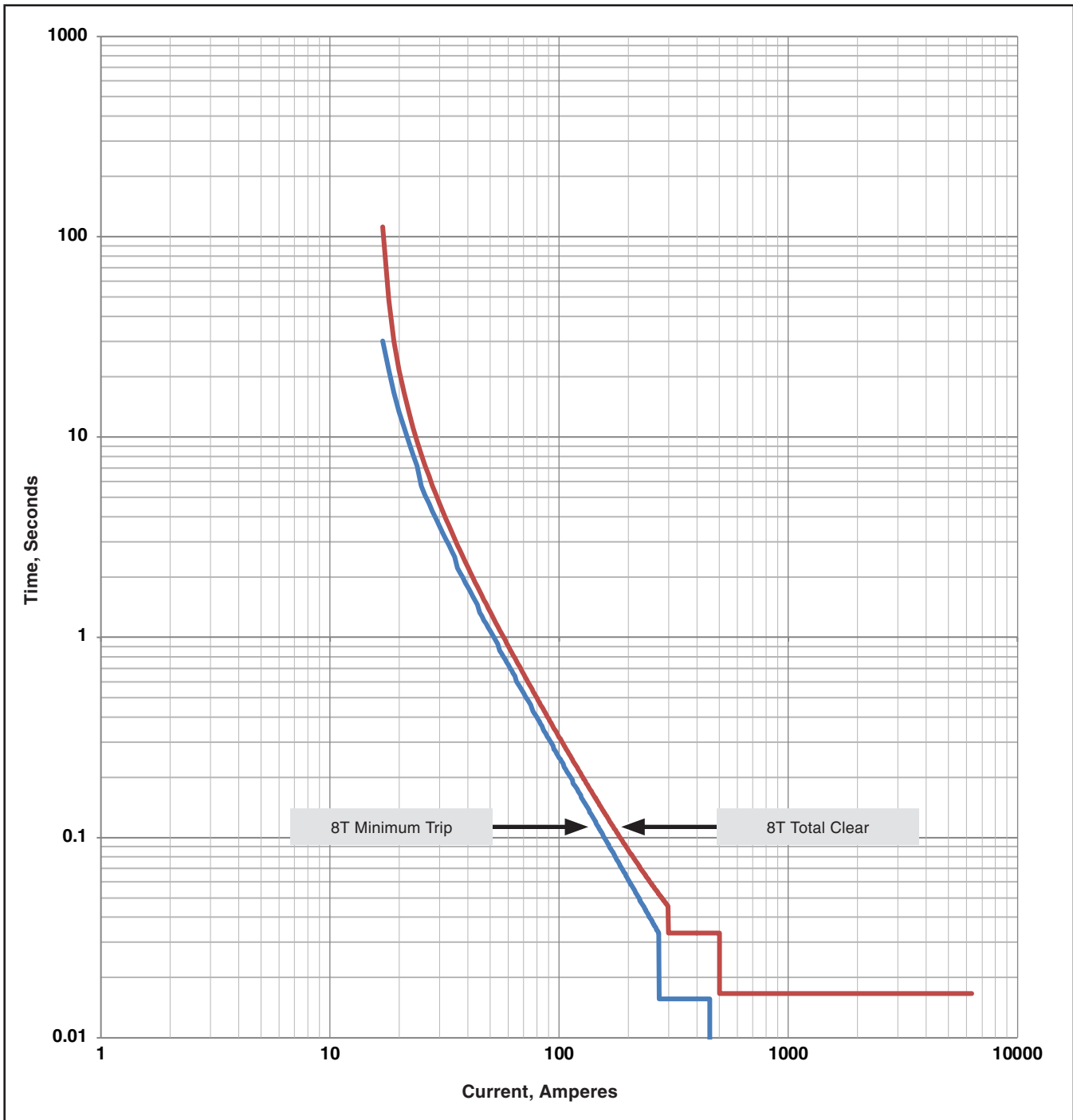


6-Ampere T-Speed TCC Curve with Definite Times at High Current

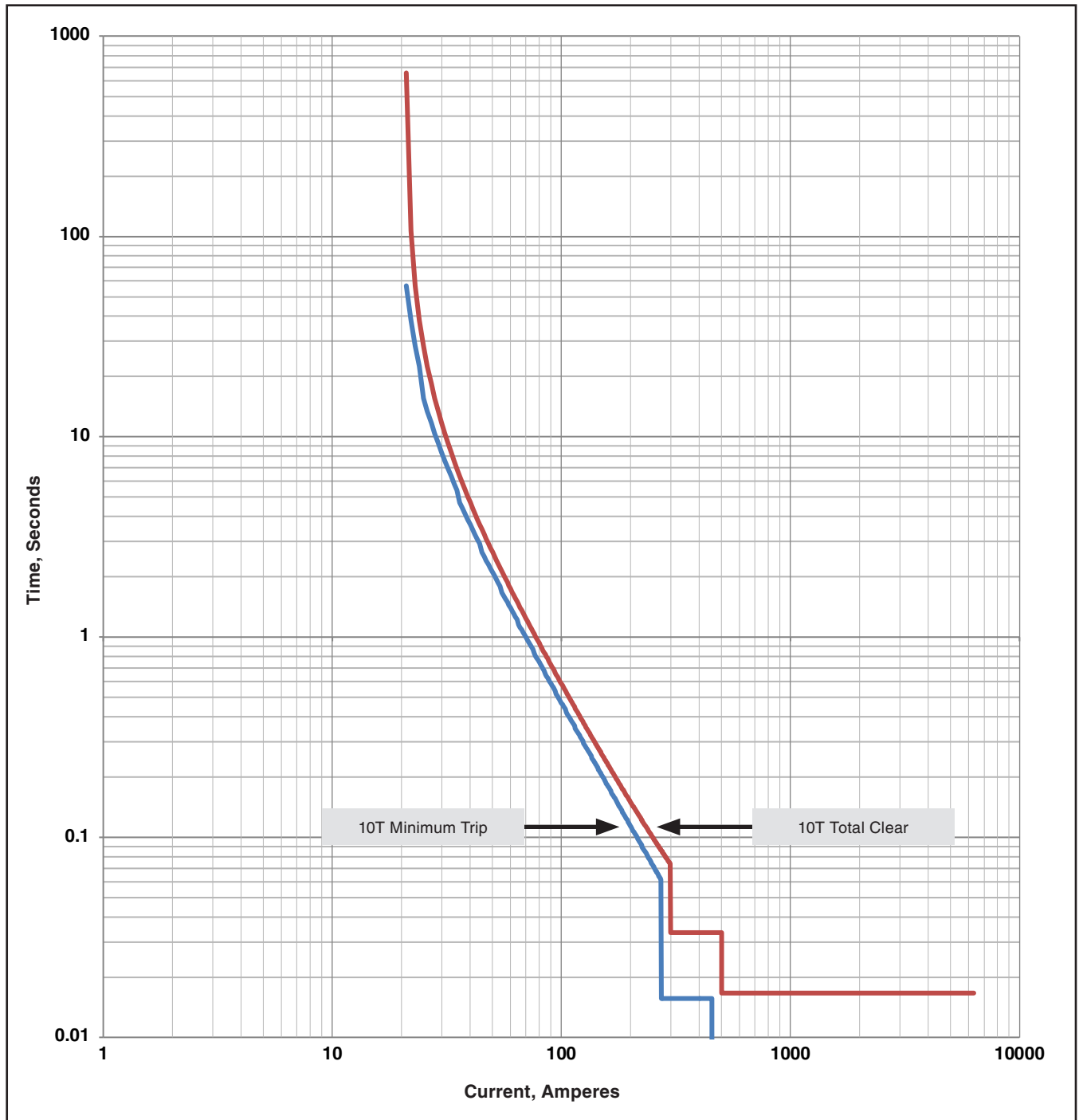


T-Speed Time-Current Characteristic Curves with Definite Times at High Current

8-Ampere T-Speed TCC Curve with Definite Times at High Current

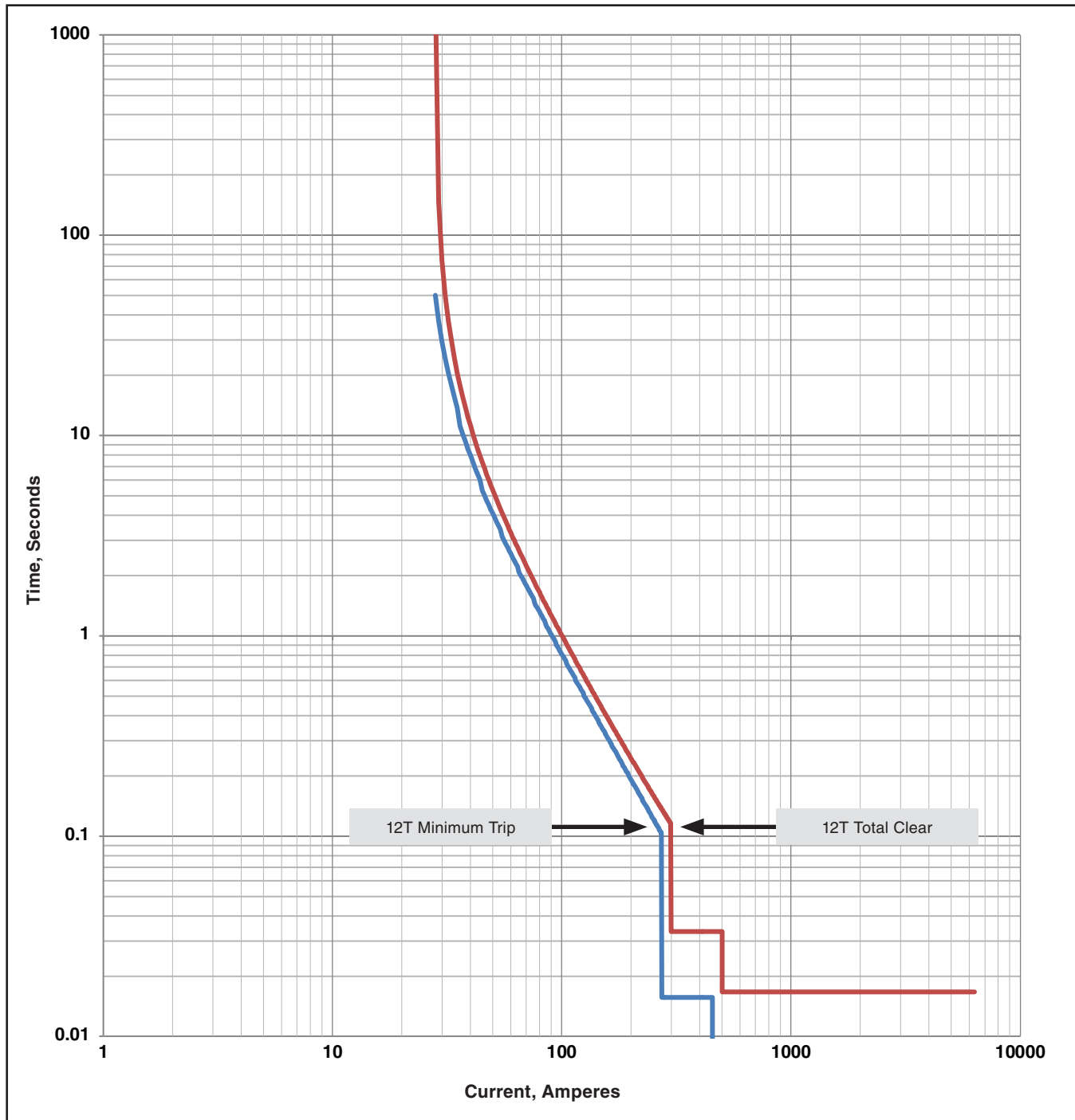


10-Ampere T-Speed TCC Curve with Definite Times at High Current

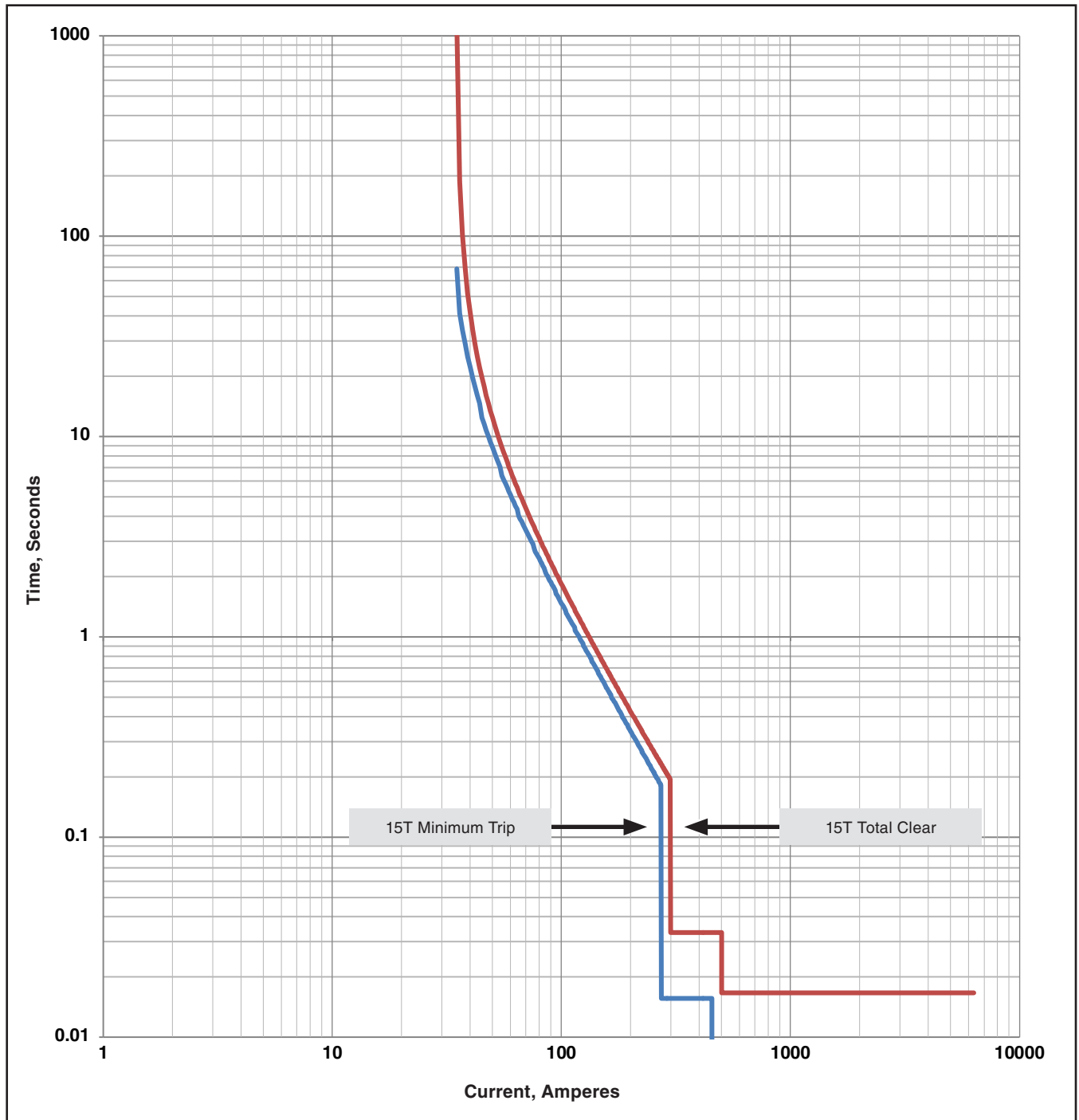


T-Speed Time-Current Characteristic Curves with Definite Times at High Current

12-Ampere T-Speed TCC Curve with Definite Times at High Current



15-Ampere T-Speed TCC Curve with Definite Times at High Current



T-Speed Time-Current Characteristic Curves with Definite Times at High Current

20-Ampere T-Speed TCC Curve with Definite Times at High Current

