

# SHORT CIRCUIT CURRENTS OF INSULATED CABLES

Power systems require consideration of the short circuit capabilities of cables. Calculations can be used to determine an installed cable's ability to withstand various short circuit conditions, or the cable size needed to withstand a given short circuit condition.

## CONDUCTOR FORMULA

The equation used to calculate the conductor's short circuit current ( $I_{sc}$ ) is presented in ICEA P-32-382 for copper and aluminum conductors. The accompanying figures graphically depict the relationship between conductor size and short circuit current duration for copper and aluminum conductors with thermoset (XLPE, EPR) or thermoplastic (PVC, PE, TPE, etc.) insulations. For these equations and curves to be valid, the conductor must be allowed to operate at the maximum temperature ( $T_1$ ) before another short circuit is encountered.

The short circuit current equations may be simplified after designating the conductor metal and the values of  $T_1$  and  $T_2$  as follows:

$$I_{sc} = \frac{AF_c}{\sqrt{t}}$$

where:  $I_{sc}$  = short circuit current in amps  
 $A$  = conductor area in cmil  
 $F_c$  = conductor short circuit factor from below table  
 $t$  = duration of short circuit in seconds

CONDUCTOR SHORT CIRCUIT FACTORS, $F_c$		
Insulation	Copper	Aluminum
Thermoset (XLPE, EPR)	0.0719	0.047
$T_1 = 90^\circ\text{C}, T_2 = 250^\circ\text{C}$		
Thermoset (XLPE, EPR)	0.0678	0.0443
$T_1 = 105^\circ\text{C}, T_2 = 250^\circ\text{C}$		
Thermoplastic (PVC, PE, TPE)	0.0529	0.0346
$T_1 = 75^\circ\text{C}, T_2 = 150^\circ\text{C}$		

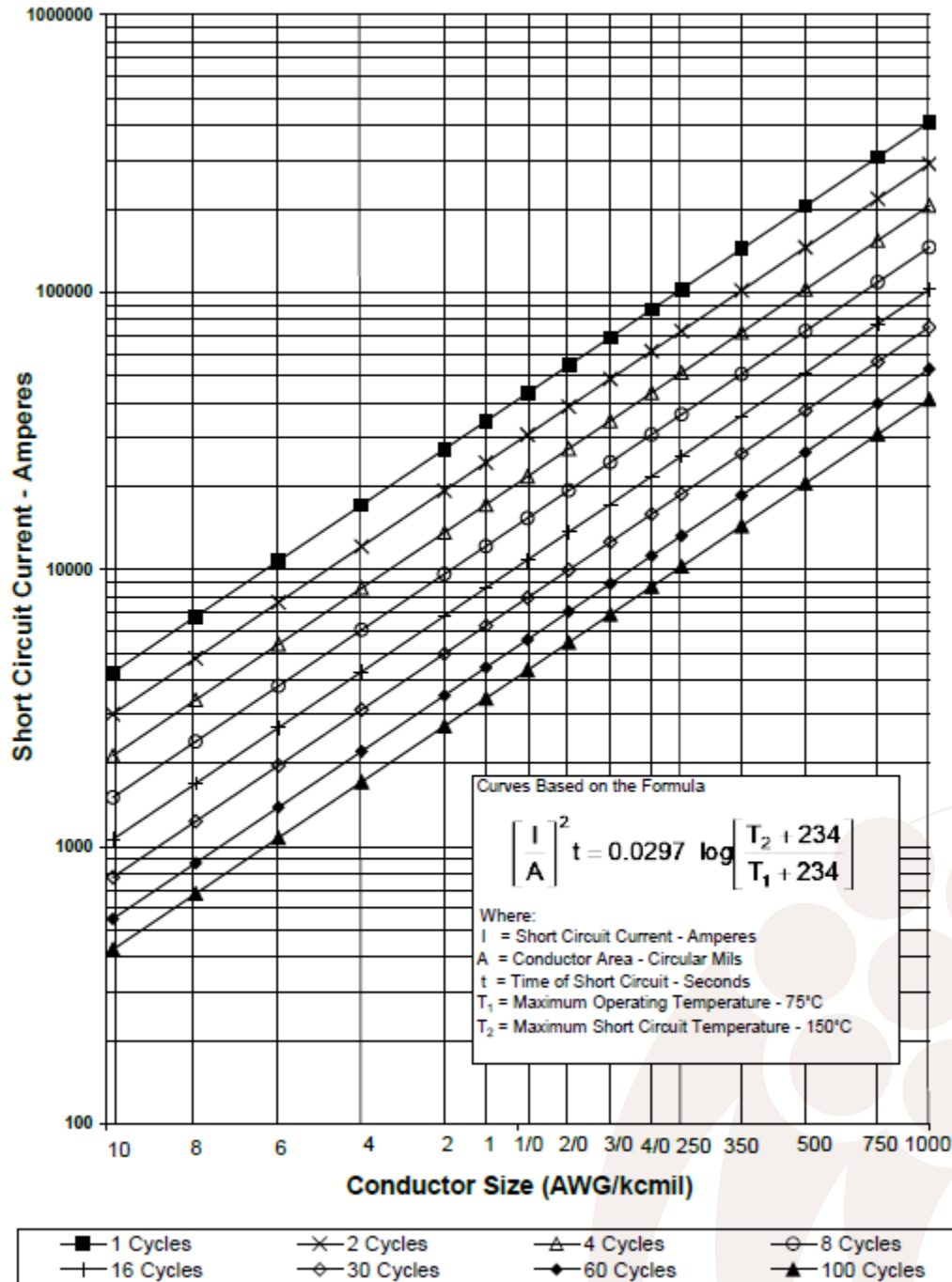
The next equations are used to determine:

- The maximum short circuit permitted for a specific conductor and short circuit duration.
- The conductor size needed to carry a specific short circuit current for a given duration.
- The maximum duration a specific conductor can carry a specific short circuit current.



# Southwire® **SHORT CIRCUIT CURRENTS** OF INSULATED CABLES

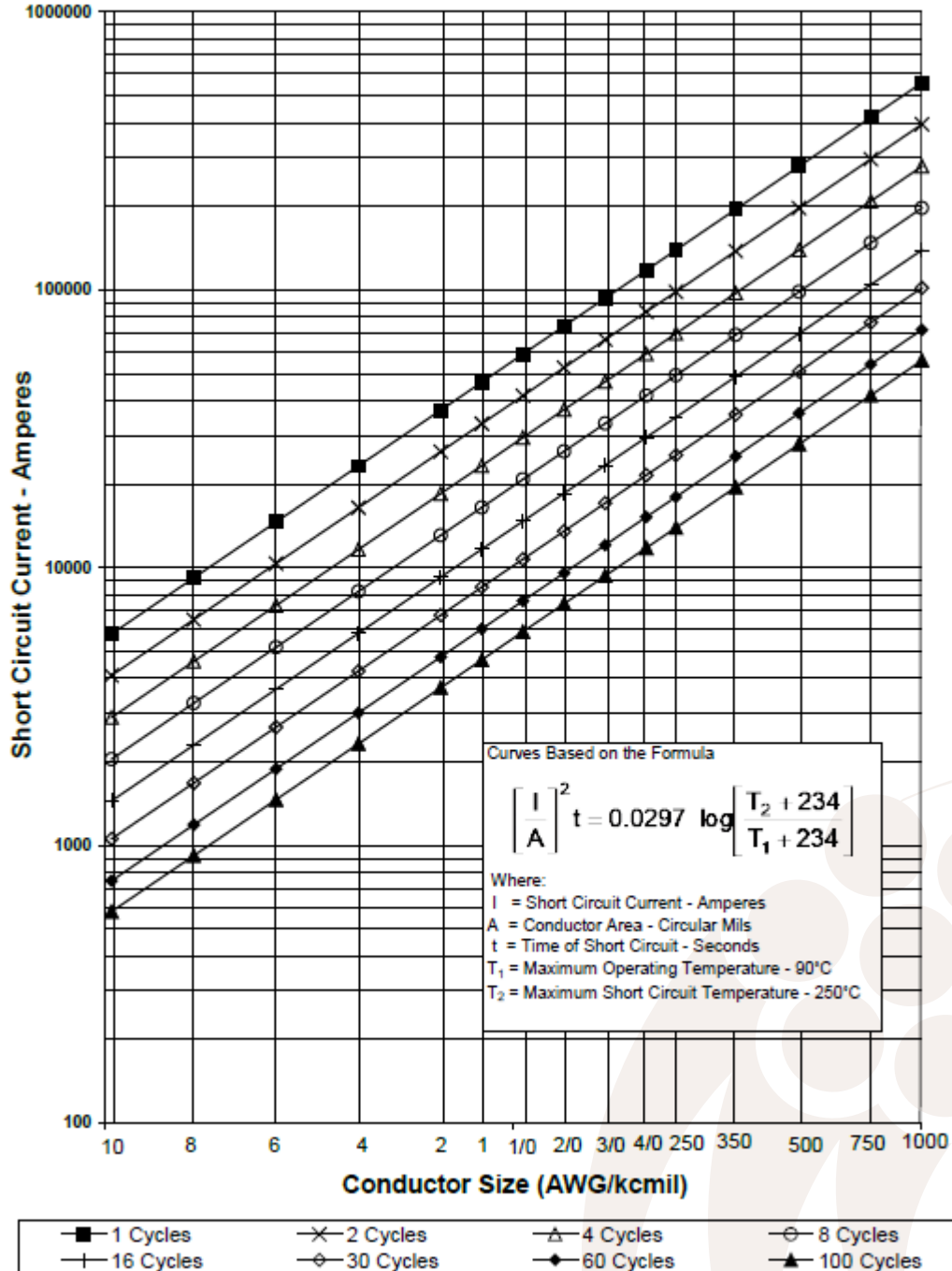
## ALLOWABLE SHORT CIRCUIT CURRENTS FOR THERMOPLASTIC INSULATED COPPER CONDUCTORS RATED FOR 75°C MAXIMUM CONTINUOUS OPERATION





# Southwire® **SHORT CIRCUIT CURRENTS** OF INSULATED CABLES

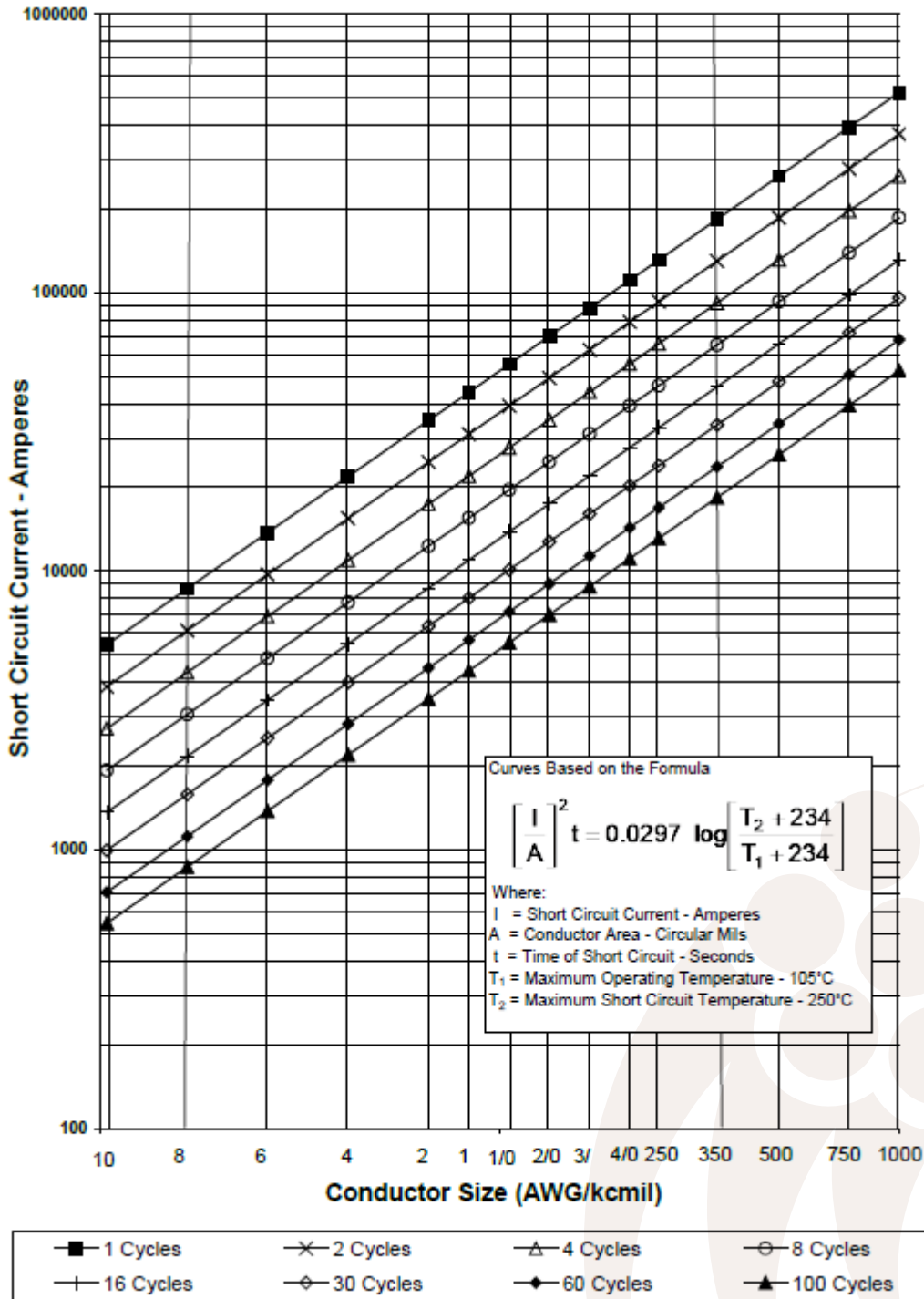
## ALLOWABLE SHORT CIRCUIT CURRENTS FOR THERMOSET INSULATED COPPER CONDUCTORS RATED FOR 90°C MAXIMUM CONTINUOUS OPERATION





# Southwire® **SHORT CIRCUIT CURRENTS** OF INSULATED CABLES

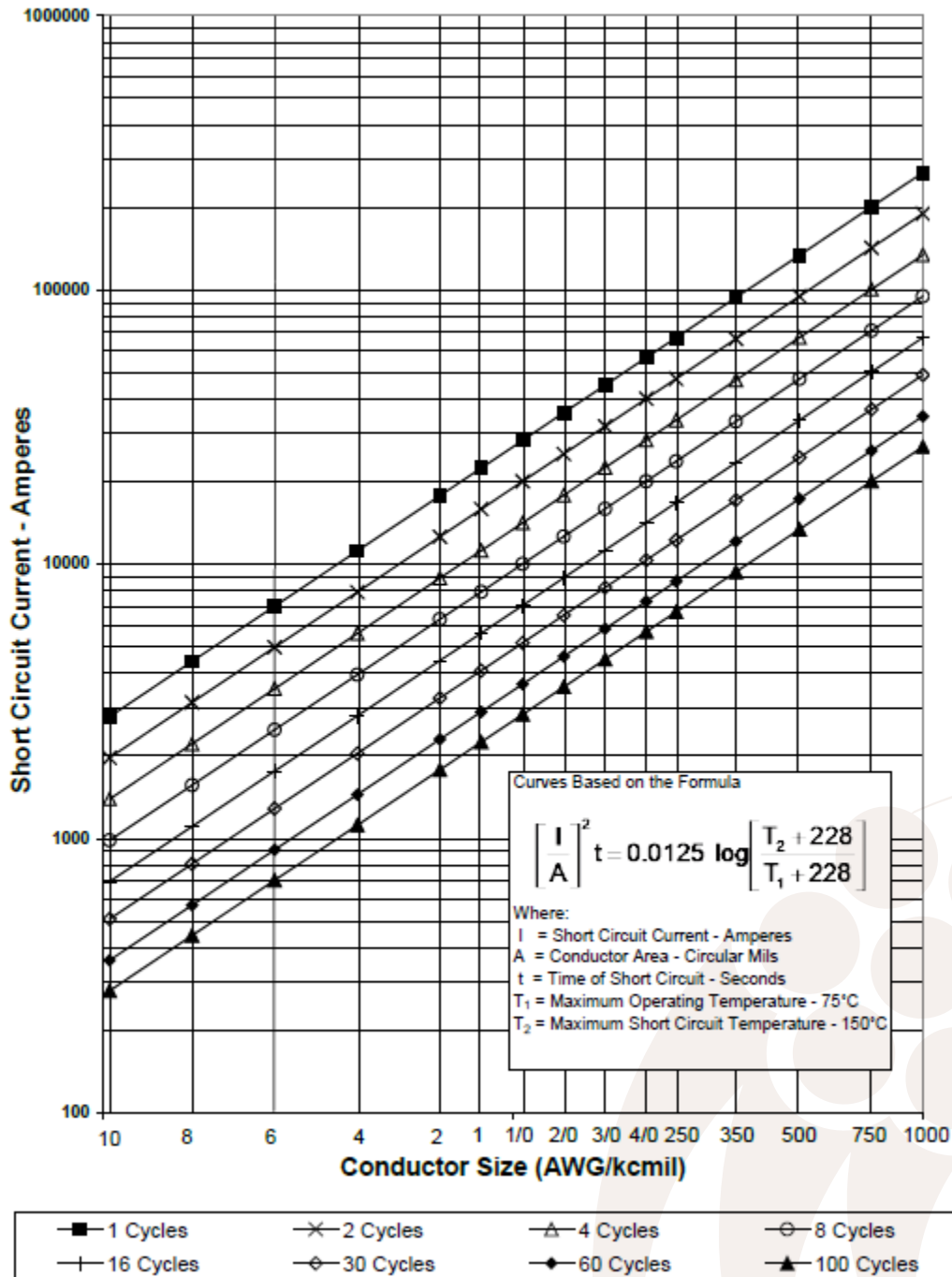
## ALLOWABLE SHORT CIRCUIT CURRENTS FOR THERMOSET INSULATED COPPER CONDUCTORS RATED FOR 105°C MAXIMUM CONTINUOUS OPERATION





# Southwire® **SHORT CIRCUIT CURRENTS** OF INSULATED CABLES

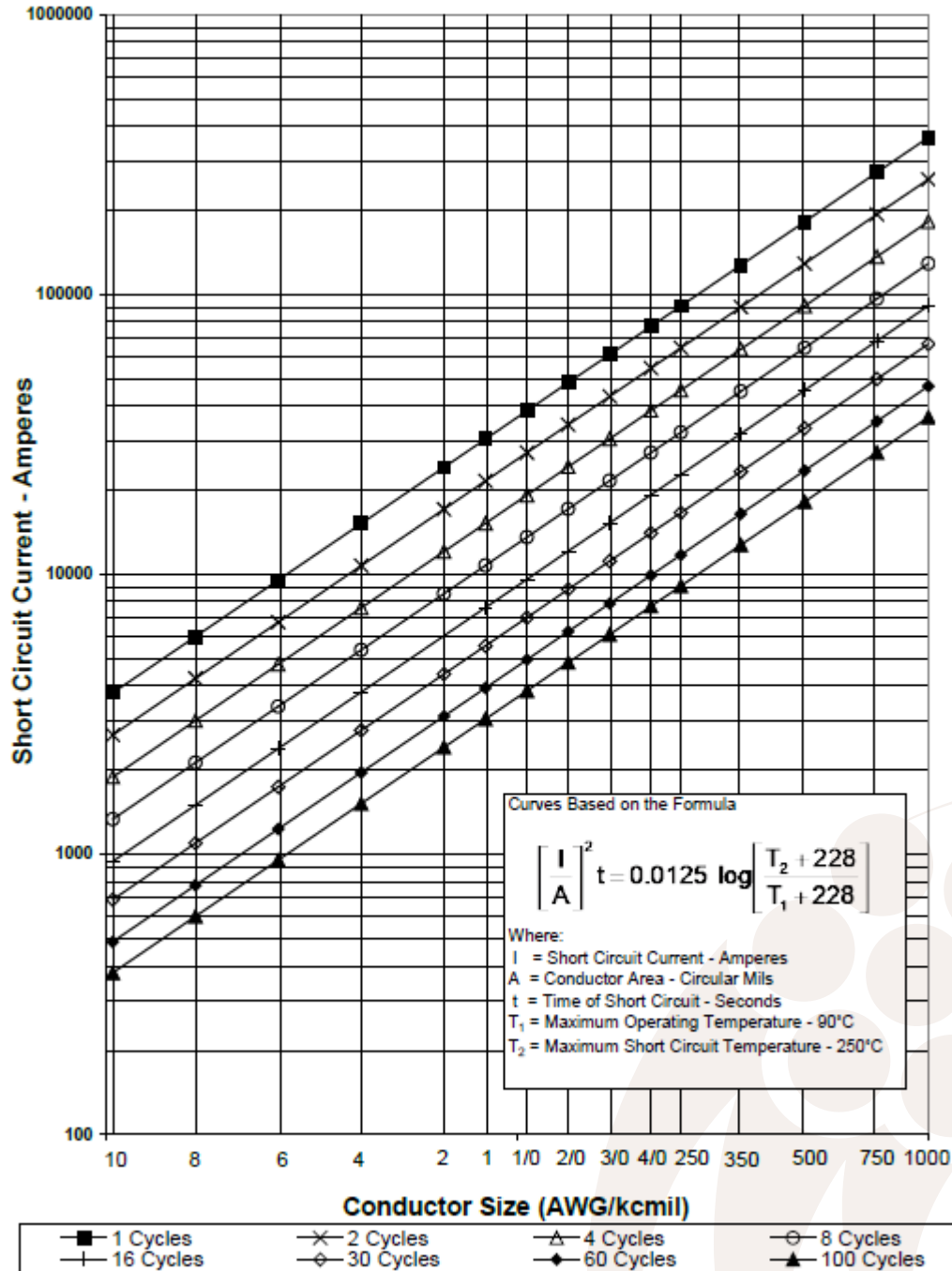
## ALLOWABLE SHORT CIRCUIT CURRENTS FOR THERMOPLASTIC INSULATED ALUMINUM CONDUCTORS RATED FOR 75°C MAXIMUM CONTINUOUS OPERATION





# Southwire® **SHORT CIRCUIT CURRENTS** OF INSULATED CABLES

## ALLOWABLE SHORT CIRCUIT CURRENTS FOR THERMOSET INSULATED ALUMINUM CONDUCTORS RATED FOR 90°C MAXIMUM CONTINUOUS OPERATION





# Southwire® **SHORT CIRCUIT CURRENTS** OF INSULATED CABLES

## ALLOWABLE SHORT CIRCUIT CURRENTS FOR THERMOSET INSULATED ALUMINUM CONDUCTORS RATED FOR 105°C MAXIMUM CONTINUOUS OPERATION

