



## Total Clearing Time-Current Characteristic Curves SM Refill Units-S&C Coordinating Speed

**BASIS**—These refill units are tested in accordance with the procedures described in IEEE Standard C37.41. As required by this standard, the minimum melting curves are based on tests starting with the refill unit at an ambient temperature of 25°C (77°F) and no initial load.

**CONSTRUCTION**—Fusible elements are silver and of solderless construction.

**TOLERANCES**—Curves are plotted to minimum test points. Maximum variations expressed in current values are minus.

**APPLICATION**—These S&C Coordinating Speed refill units should be applied only where the maximum continuous load current does not exceed 200 amperes and where all fault currents below 1000 amperes will be cleared by another fuse. They are for use where load conditions do not require a fuse of a higher ampere rating but where additional time margin in the “protected” fuse is necessary for coordination with a “protecting” fuse or other device or to withstand transient overcurrents associated with the switching and starting of electrical equipment.

Because these refill units have silver element construction not subject to damage by aging or transient overcurrents, it is unnecessary to replace unblown refill units in single-phase or three-phase installations when one or more refill units has blown.

**COORDINATION**—These curves represent the total time required for a refill unit to melt and interrupt a fault current, and they should be followed in coordination problems where fuses are applied as “protecting” devices.

There are cases where the coordination requirements may be very exacting; for example, in coordinating a transformer-primary fuse with a secondary breaker and a source-side breaker. The time interval between the operating characteristics of the two breakers may be very narrow. Under these circumstances, there must be an extremely short time interval between the minimum melting and the total clearing characteristics of the fuse.

The refill units represented by these curves possess this short time interval feature because—having a nondamageable fusible element of precise construction—they require:

- As little as 10% *total* tolerance in melting current compared to the 20% tolerance of many fuses (20% and 40% respectively in terms of time)
- No “safety-zone” or setback allowances

This narrow time band normally will provide the desired coordination. If the selected S&C Coordinating Speed refill unit does not meet the coordination requirements, check whether a refill unit in the S&C Slow Speed or S&C Standard Speed will satisfy.

Sometimes a selected ampere rating will fail to meet the coordination requirements in any available speed. In this case, the selection of another ampere rating for either the protecting or protected fuse usually will satisfy all requirements.

Do not assume other fuses that do not use S&C’s silver, helically coiled fusible element construction can better resolve a coordination impasse than the use of another ampere rating in one of the S&C speed options. Such other fuses, including “time-lag” speeds, “super-slow” speeds, and “high-surge” speeds, require the use of “safety-zone” or setback allowances, and they have larger construction tolerances (plus 20% in current; plus 40% in terms of time). The application of these two factors will give a time interval between the adjusted minimum melting curve and the total clearing curve greater than in the case of S&C speed options.

### REFILL UNITS AVAILABLE

Refill Unit	kV Nom. Ratings	Ampere Ratings
SM-4®	14.4	210

