

MCB Tripping Curves Explained — B, C and D Selection with Brand Cross-Reference

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What B, C and D curves actually trip at ($3-5$, $5-10$ and $10-20 \times I_n$), how to choose for cable runs, motors and transformers, and the cross-reference between the big MCB families — ABB S200, Schneider Acti9 iC60 and Siemens 5SL — with breaking-capacity grades.

What the curve letter sets

Every MCB trips two ways: a thermal element handles sustained overload (the same for all curves), and a magnetic element fires instantly on short circuit. The curve letter fixes where the instant trip begins, as a multiple of rated current I_n :

Curve | Magnetic trip | Built for | Watch out |

B | $3-5 \times I_n$ | Long cable runs, resistive loads, sockets in dwellings — trips on the smallest fault current | Nuisance-trips on inrush (motors, many LED drivers) |

C | $5-10 \times I_n$ | The industrial default: mixed and moderately inductive loads | Needs more fault current at cable end to trip instantly — check loop impedance on long runs |

D | $10-20 \times I_n$ | Transformers, welding sets, motor groups with heavy inrush | Demands the highest fault current for instant disconnection; verify earth-fault clearance times |

Same-rating, different-curve breakers are not interchangeable in either direction without checking: a C16 swapped to B16 may nuisance-trip the machine; B16 to C16 may stop a long lighting radial from meeting disconnection times.

The big three families, side by side

| ABB S200 | Schneider Acti9 iC60 | Siemens 5SL |

Breaking grades | S201/S202/S203/S204 by poles; 6 kA standard, S200M 10 kA | iC60N 6 kA · iC60H 10 kA · iC60L higher at common ratings | 5SL6 = 6 kA · 5SL4/5SL7 shift the class |

Curves stocked | B and C widely (S201-B10, S203-C40) | B/C/D (iC60N 3P C63) | B/C (5SL6363-7 C63 3P) |

Reference anatomy | S + poles + curve+rating: S203-C40 | family + grade, curve+rating in the suffix: iC60N C63 | 5SL + series + digits; decoded in the Siemens decoder |

Catalogue depth | ~350 items | ~1,500 Acti9 items | 5SL range + SENTRON |

Cross-brand replacement at the same rating, curve and breaking capacity is routine in general distribution — DIN-rail pitch and busbar comb systems are where the brands differ, so a mixed board keeps one maker per comb section. Coordination with upstream MCCBs is its own discipline: see the selectivity guide.

Five-second selection recipe

Resistive/lighting, long run !' B at the cable's rating.

General industrial mix !' C (the default for a reason).

Transformer, welding, grouped motors !' D, then verify fault-loop current covers $10-20 \times I_n$.

Breaking capacity "e the board's prospective fault current — grade letter (N/H, 6/10 kA) before anything else.

Poles: switch every live conductor the system earths demand (1P+N and 3P+N variants exist across all three families).

Frequently asked questions

What is the difference between a B16 and C16 breaker? Only the instant-trip threshold: B fires at $3-5 \times 16$ A, C at $5-10 \times 16$ A. Thermal overload behaviour is identical — the choice is inrush tolerance versus minimum fault current. When should a D-curve MCB be used? Where inrush regularly exceeds ten times rated current — transformers, welding equipment, motor groups — and the supply can still deliver the $10-20 \times I_n$ needed for instant tripping. Is an ABB S201-C16 equivalent to a Schneider iC60N C16? Functionally yes at 6 kA: same rating, curve and class trip alike. Physically they differ in comb-busbar and accessory systems, so boards stay single-brand per busbar section. What does the N in iC60N mean? The breaking-capacity grade — 6 kA; H raises it to 10 kA and L beyond at common ratings. The curve letter and ampere rating follow separately. Can I put a C-curve in place of a B-curve to stop nuisance tripping? Only after checking the circuit's earth-fault loop: the C curve needs roughly double the fault current for instant disconnection, which long runs may not deliver.

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