

Tripping tables for CP-C.1 power supplies with miniature circuit breakers (MCBs) and electronic protection devices (EPD24)

Nearly all power supplies for industrial use are electronically protected against overloads and short-circuits. However, these electronic protection serves to protect the power supply and not the devices and lines connected at the outputs.

The goal of “selective” protection is to increase system availability. In case of an error, only the affected system branch may be shut down, but not any parallel branches or even the entire system. In order to guarantee such selective protection and therefore the safe shutdown of affected system branches, fuses, miniature circuit breakers (MCBs) and electronic protection devices (EPD24) are used.

- The protective function of the fuse is based on the thermal destruction of a wire caused by an (imprinted) current over a specific period of time. While fuses can be implemented at low cost, they cannot be reset after being tripped and their tripping time is imprecise (slow, medium time-lag, fast).
- Miniature circuit breakers are based on a combination of thermal and electromechanical tripping mechanisms. For protection in case of a short-circuit (magnetic tripping), a specific amperage is required for fast tripping (a few milliseconds). In the 230V alternating voltage range, this can be achieved with low amperages ($P = U \cdot I$), while in the 24V direct voltage range, the power supply has to provide very high short-circuit currents in order to reach the required tripping current. An alternating voltage network can also provide significantly higher short-circuit currents for magnetic tripping of the miniature circuit breakers. The combination with a bimetallic strip ensures a safe shutdown also in case of smaller overloads over a longer period of time (thermal tripping, line protection).
- The third option for the implementation of selective protection is to use electronic protection devices (EPD24). These devices are based on transistor technology and offer a combination of active current limitation and overload shutdown if the nominal current is exceeded by the factor 1.1. This technology ensures safe selective shutdown without coordination with the lines. In contrast to protection with fuses or miniature circuit breakers, the output voltage will not temporarily drop in case of an error and the other parts of the line not affected by the error will continue to be supplied without any change.

MCB

Tripping table

CP-C.1 24/5.0 or CP-C.1 24/5.0-C

Cross-section [mm ²]	0.75							1							1.5							2.5						
Total length [m]	4	6	8	10	20	40	4	6	8	10	20	40	4	6	8	10	20	40	4	6	8	10	20	40				
Line resistance R _l [mΩ]	0	96	143	191	239	477	953	72	108	143	179	358	715	48	72	96	120	239	477	29	43	58	72	143	286			
Miniature circuit breakers																												
Z0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Z1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Z1.6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Z2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Z3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Z4	X	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	O	X	X	X	X	X	O				
C0.5	X	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X				

CP-C.1 24/10.0 or CP-C.1 24/10.0-C

Cross-section [mm ²]	0.75							1							1.5							2.5						
Total length [m]	4	6	8	10	20	40	4	6	8	10	20	40	4	6	8	10	20	40	4	6	8	10	20	40				
Line resistance R _l [mΩ]	0	96	143	191	239	477	953	72	108	143	179	358	715	48	72	96	120	239	477	29	43	58	72	143	286			
Miniature circuit breakers																												
C1	X	X	X	X	X	O	O	X	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	X				
C2	X	X	X	X	X	O	O	X	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	X				
C3	X	X	X	X	X	O	O	X	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	O				
C4	X	X	X	O	O	O	O	X	X	X	O	O	O	X	X	X	X	O	O	X	X	X	X	O				
B6	X	X	O	O	O	O	O	X	X	O	O	O	O	X	X	X	X	O	O	X	X	X	X	O				

CP-C.1 24/20.0 or CP-C.1 24/20.0-C

Cross-section [mm ²]	0.75							1							1.5							2.5						
Total length [m]	4	6	8	10	20	40	4	6	8	10	20	40	4	6	8	10	20	40	4	6	8	10	20	40				
Line resistance R _l [mΩ]	0	96	143	191	239	477	953	72	108	143	179	358	715	48	72	96	120	239	477	29	43	58	72	143	286			
Miniature circuit breakers																												
C1	X	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	X				
C2	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
C3	X	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	X	X	X	X	X	X	X				
C4	X	X	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	X				
C6	X	X	X	X	X	O	O	X	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	O				
C10	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O				
B6	X	X	X	X	X	O	O	X	X	X	X	X	O	X	X	X	X	X	O	X	X	X	X	X				
B10	X	-	-	-	-	-	-	O	O	O	O	O	O	X	O	O	O	O	O	X	X	X	O	O				

X: Electro-magnetic trip of the miniature circuit breaker
 O: Thermal tripping of the miniature circuit breaker

MCB

Tripping table

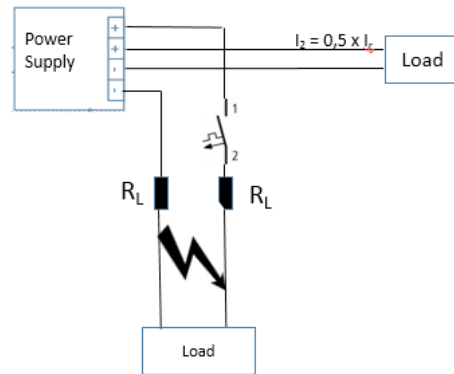
The indicated values specify the distance (l) from the power supply to the load. The following margin parameters form the basis of the calculation:

Miniature circuit-breaker of ABB S200, Characteristic B, C and Z.

– Electro-magnetic tripping of the standard ABB miniature circuit-breaker at:

- Characteristic B:
(3 - 5 x rated current) x (correction factor 1.5 at DC)
= 4.5 - 7.5 x rated current
- Characteristic C:
(5 - 10 x rated current) x (correction factor 1.5 at DC)
= 7.5 - 15 x rated current
- Characteristic Z:
(2 - 4 x rated current) x (correction factor 1.5 at DC)
= 3 - 6 x rated current

In addition to the short-circuit current, the respective power supply unit supplies 50% of the rated output current for parallel connected loads



- Ambient air temperature: + 25 °C
- Input voltage 230 V DC
- Output voltage 24 V DC
- The internal resistances of the miniature circuit-breakers have been considered

Electronic protection device EPD24

Tripping table

Electronic protection device EPD24

Each protected circuit was under rated load, before switching into short-circuit

Type	CP-C.1 24/5.0		CP-C.1 24/10.0		CP-C.1 24/20.0	
	Tripping status	Tripping duration	Tripping status	Tripping duration	Tripping status	Tripping duration
EPD24-TB-101-05A	Yes	2.55 s	Yes	2.44 s	Yes	2.527 s
EPD24-TB-101-1A	Yes	1.82 s	Yes	2.07 s	Yes	2.58 s
EPD24-TB-101-2A	Yes	544.6 ms	Yes	603 ms	Yes	713.95 ms
EPD24-TB-101-4A	Yes	230.8 ms	Yes	271 ms	Yes	276.51 ms
EPD24-TB-101-6A	–	–	Yes	104 ms	Yes	127.46 ms
EPD24-TB-101-8A	–	–	Yes	203 ms	Yes	234.48 ms
EPD24-TB-101-10A	–	–	–	–	Yes	184.21 ms
EPD24-TB-101-12A	–	–	–	–	Yes	182.08 ms

Electronic protection device EPD24, have a typical tripping time of up to 3s in the

- Current limitation typically $1.8 \times I_N$ at $I_N = 0.5 \text{ A} \dots 6 \text{ A}$
- Current limitation typically $1.5 \times I_N$ at $I_N = 8 \text{ A}$ or 10 A
- Current limitation typically $1.3 \times I_N$ at $I_N = 12 \text{ A}$

- Ambient air temperature: +25 °C
- Input voltage 230 V AC
- Output voltage 24 V DC

Contact

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