

Application note for residual current device in use with frequency converters



Powering Business Worldwide

Frequency converters are used in many systems that require a variable speed. e.g. Elevators, escalators, conveyor belts, large washing machines. For applications with frequency converters it is important to use the correct residual current device to ensure a proper and safe operation.

In applications with frequency converters, fault currents with different frequencies as well as smooth DC fault currents can occur. In order to detect them and to be able to protect against them in the event of a fault, residual current circuit breakers of type F or B are required.

Overview residual current protective devices

When using frequency converters, the following types of residual current circuit breakers are recommended:

Type F	Fault currents with mixed frequencies up to 1 kHz
Type B	All current sensitive up to 1 kHz
Type Bfq	Insensitive to leakage currents caused by the system at high frequencies up to 50 kHz
Type B+	For extended fire protection (maximum residual current of 420 mA for frequencies up to 20 kHz)

Overview Eaton Frequency Converters & Variable Speed Starters

The demands on mechanical engineering are constantly increasing, from the engine start of the simple machines to the speed control of complex applications. The most popular Eaton frequency converters are:

Frequency converter			General purpose
DE1	1 phase	3 phase	PowerXL Variable speed starter
DE11	1 phase	3 phase	PowerXL Variable speed starter (parameterizable relay output)
DC1	1 phase	3 phase	PowerXL frequency converter Compact Machinery Drive
DA1	1 phase	3 phase	PowerXL frequency converter Advanced Machinery Drive
DG1		3 phase	PowerXL frequency converter General Purpose Drive

Application note residual current device & frequency converter

To guarantee a safe and trouble-free operation in systems with Eaton frequency inverters, we recommend the following combination of component.

1-phase frequency converter:

FC	Recommended RCD Type	30mA RCD's	300mA RCD's
DE1-1...	F	max. 1 frequency converter per RCD. Operation with internal filter possible.	max. 3 frequency converter per RCD. Operation with internal filter possible.
DE11-1...			
DA1-1...			
DC1-1...			

Application note residual current device & frequency converter

3-phase frequency converter:

FC	recommended RCD Type	30mA RCD's	300mA RCD's
DE1-3...	Bfq	max. 1 frequency converter per RCD	max. 3 frequency converter per RCD Operation with internal filter possible.
DE11-3...		The use of an external low-leakage filter is recommended.	
DA1-3...		Operation with the internal filter can lead to tripping of the RCD.	
DC1-3...		Overview of low leakage filters see the following table!	
DG1-3...		max. 1 frequency converter per RCD Operation with internal filter possible.	

Overview of low leakage filters

Eaton offers a wide range of low-leakage line filters.

Three-phase filters (low leakage)	Art.No.	Description	Fits to FC					
			DE1	DE11	DC1	DA1	DG1	
DX-EMC34-008-FS1-L	174604	3-phase 520 V, 8 A	X	X	X			
DX-EMC34-011-FS2-L	174605	3-phase 520 V, 11 A			X	X		
DX-EMC34-015-FS3-L	174606	3-phase 520 V, 15 A			X	X		
DX-EMC34-025-FS3-L	174607	3-phase 520 V, 25 A			X	X		
DX-EMC34-031-FS4-L	174608	3-phase 520 V, 31 A				X		
DX-EMC34-048-FS4-L	174609	3-phase 520 V, 48 A				X		
DX-EMC34-075-FS5-L	174610	3-phase 520 V, 75 A				X		
DX-EMC34-100-L	174611	3-phase 520 V, 100 A				X		
DX-EMC34-130-L	174612	3-phase 520 V, 130 A				X		
DX-EMC34-180-L	174613	3-phase 520 V, 180 A				X		
DX-EMC34-250-L	174614	3-phase 520 V, 250 A				X		
DX-EMC34-400-L	174615	3-phase 520 V, 400 A				X		
DX-EMC34-750-L	177637	3-phase 520 V, 750 A				X		
DX-EMC34-019-FS3-L	179612	3-phase 520 V, 19 A	X	X	X	X		
DX-EMC34-008-L	184506	3-phase 520 V, 8 A	X	X	X	X	X	X
DX-EMC34-016-L	184507	3-phase 520 V, 16 A	X	X	X	X	X	X
DX-EMC34-030-L	184508	3-phase 520 V, 30 A			X	X	X	X
DX-EMC34-042-L	184509	3-phase 520 V, 42 A			X	X	X	X
DX-EMC34-055-L	184510	3-phase 520 V, 55 A			X	X	X	X
DX-EMC34-075-L	184511	3-phase 520 V, 75 A				X	X	X

ATTENTION

Use the factory settings of the filters unchanged to ensure reliable operation of the system.

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