

xEffect - Industrial Switchgear Range Combined RCD/MCB Devices FRBdM



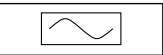
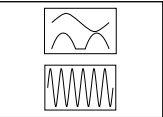
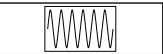
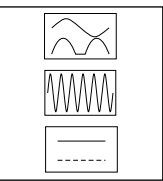
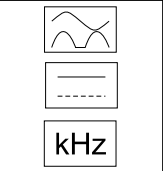
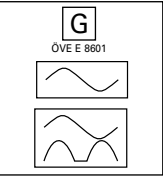
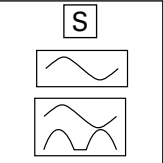
Catalog



Powering Business Worldwide

Residual Current Devices - General Data

Short description of the most important RCD types

Symbol	Description
	Eaton standard. Suitable for outdoor installation (distribution boxes for outdoor installation and building sites) up to -25° C.
	Conditionally surge-current proof (>250 A, 8/20 µs) for general application.
	Type AC: AC current sensitive RCCB
	Type A: AC and pulsating DC current sensitive RCCB, not affected by smooth DC fault currents up to 6 mA
	Type F: AC and pulsating DC current sensitive RCCB, trips also at frequency mixtures (10 Hz, 50 Hz, 1000 Hz), min. 10 ms time-delayed, min. 3 kA surge current proof, higher load capacity with smooth DC fault currents up to 10 mA
	Frequency range up to 20 kHz
	Trips also at frequency mixtures (10 Hz, 50 Hz, 1000 Hz)
	Type B: All-current sensitive RCD switchgear for applications where DC fault currents may occur. Non-selective, non-delayed. Protection against all kinds of fault currents.
	Type B+: All-current sensitive RCD switchgear for applications where DC fault currents may occur. Non-selective, non-delayed. Protection against all kinds of fault currents. Provides enhanced fire safety.
	RCD of type G (min 10 ms time delay) surge current-proof up to 3 kA. For system components where protection against unwanted tripping is needed to avoid personal injury and damage to property. Also for systems involving long lines with high capacitive reactance. Some versions are sensitive to pulsating DC. Some versions are available in all-current sensitive design.
	RCD of type S (selective, min 40 ms time delay) surge current-proof up to 5 kA. Mainly used as main switch, as well as in combination with surge arresters. This is the only RCD suitable for series connection with other types if the rated tripping current of the downstream RCD does not exceed one third of the rated tripping current of the device of type S. Some versions are sensitive to pulsating DC. Some versions are available in all-current sensitive design.

Residual Current Devices

General

Kind of residual current and correct use of RCD Types

Kind of current	Current profile	Correct use / application field of RCCB types						Tripping current
		AC	A	F	B	/ B+		
				 	 		 kHz	
Sinusoidal AC residual current		✓	✓	✓	✓			0.5 to 1.0 $I_{\Delta n}$
Pulsating DC residual current (positive or negative half-wave)		–	✓	✓	✓			0.35 to 1.4 $I_{\Delta n}$
Cut half-wave current		–	✓	✓	✓			Lead angle 90°: 0.25 to 1.4 $I_{\Delta n}$ Lead angle 135°: 0.11 to 1.4 $I_{\Delta n}$
Lead angle 90° el Lead angle 135° el			✓	✓	✓			
Half-wave with smooth DC current of 6 mA		–	✓	✓	✓			max. 1.4 $I_{\Delta n}$ + 6 mA
Half-wave with smooth DC current of 10 mA		–	–	✓	✓			max. 1.4 $I_{\Delta n}$ + 10 mA
Smooth DC current		–	–	–	✓			0.5 to 2.0 $I_{\Delta n}$

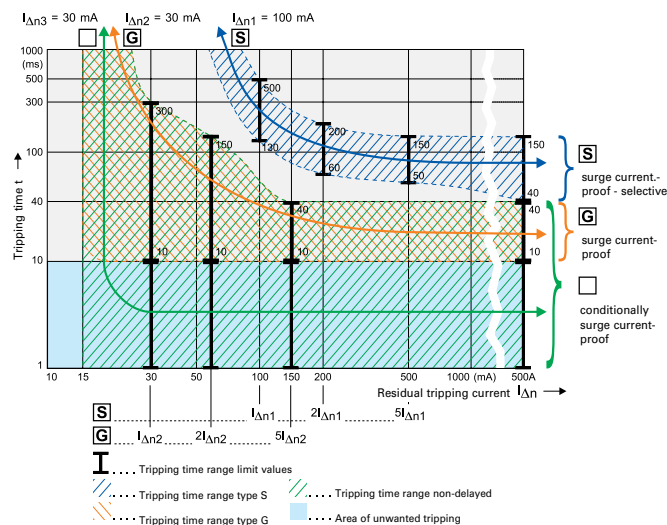
Tripping time

Break time and non-actuating time for alternating residual currents (r.m.s. values) for type AC and A RCCB

Classification	$I_{\Delta n}$ mA		$I_{\Delta n}$	$2 \times I_{\Delta n}$	$5 \times I_{\Delta n}$	$5 \times I_{\Delta n}$ or 0.25A	500A
Standard RCD Conditionally surge current-proof 250 A	≤30	Max. tripping time (s)	0.3	0.15		0.04	0.04
Standard RCD Conditionally surge current-proof 250 A	>30	Max. tripping time (s)	0.3	0.15	0.04		0.04
RCCB Type G (Short-time-delay) Surge current-proof 3 kA	30	Min. non actuating time(s) Max. tripping time (s)	0.01 0.3	0.01 0.15		0.01 0.04	0.01 0.04
RCCB Type G (Short-time-delay) Surge current-proof 3 kA	>30	Min. non actuating time(s) Max. tripping time (s)	0.01 0.3	0.01 0.15	0.01 0.04		0.01 0.04
RCCB Type S (Selective) Surge current-proof 5 kA	>30	Min. non actuating time(s) Max. tripping time (s)	0.13 0.5	0.06 0.2	0.05 0.15		0.04 0.15

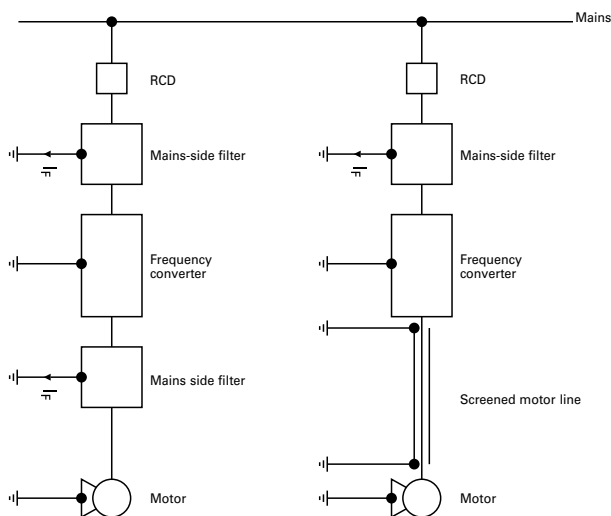
Break time for half-wave pulsating residual currents (r.m.s. values) for type A RCCB

Classification	$I_{\Delta n}$ mA		$1.4 \times I_{\Delta n}$	$2 \times I_{\Delta n}$	$2.8 \times I_{\Delta n}$	$4 \times I_{\Delta n}$	$7 \times I_{\Delta n}$	0.35 A	0.5 A	350A
Standard RCD Conditionally surge current-proof 250 A	<30	Max. tripping time (s)		0.3		0.15			0.04	0.04
Standard RCD Conditionally surge current-proof 250 A	30	Max. tripping time (s)	0.3		0.15			0.04		0.04
Standard RCD Conditionally surge current-proof 250 A	>30	Max. tripping time (s)	0.3		0.15		0.04			0.04
RCCB Type G (Short-time-delay) Surge current-proof 3 kA	30	Max. tripping time (s)	0.3		0.15			0.04		0.04
RCCB Type G (Short-time-delay) Surge current-proof 3 kA	>30	Max. tripping time (s)	0.3		0.15		0.04			0.04
RCCB Type S (Selective) Surge current-proof 5 kA	>30	Max. tripping time (s)	0.5		0.2		0.15			0.15



Applications with frequency converters:

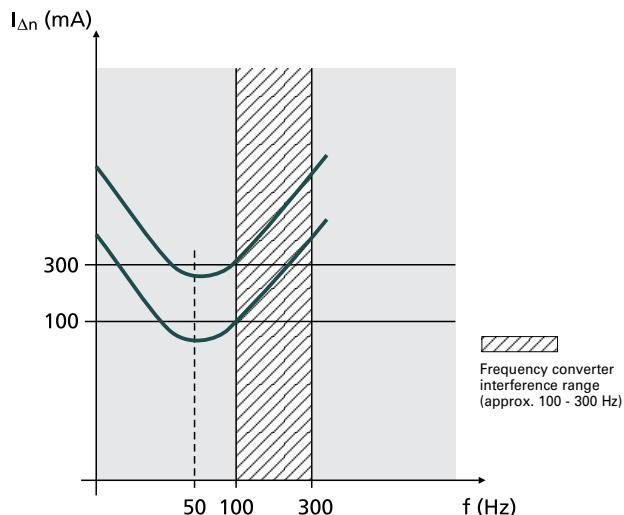
Due to the currents flowing off through the filters (designated IF), the sum of currents through the RCD is not exactly zero, which causes unwanted tripping.



Frequency converters are used in a wide variety of systems and equipment requiring variable speed, such as lifts, escalators, conveyor belts, and large washing machines. Using them for such purposes in circuits with conventional residual current devices causes frequent problems with unwanted tripping.

The technical root cause of this phenomenon is the following: Fast switching operations involving high voltages cause high interference levels which propagate through the lines on the one hand, and in the form of interfering radiation on the other. In order to eliminate this problem, a mains-side filter (also referred to as input filter or EMC-filter) is connected between the RCD and frequency converter. The anti-interference capacitors in the filters produce discharge currents against earth which may cause unwanted tripping of the RCD due to the apparent residual currents. Connecting a filter on the output side between frequency converter and 3-phase AC motor results in the same behaviour.

Tripping characteristic



This sample tripping characteristic of a 100 mA RCD and a 300 mA RCD shows the following: In the frequency range around 50 Hz, the RCDs trip as required (50 - 100 % of the indicated $I_{\Delta n}$).

In the range shown hatched in the diagram, i. e. from approx. 100 to 300 Hz, unwanted tripping occurs frequently due to the use of frequency converters. Type F RCCBs are designed to reliably sense higher frequency residual currents, which leads to an enormous increase in the reliability and availability of electrical systems.

Therefore, we recommend to use RCDs designed for applications with frequency converter!

These special residual current devices can be recognised by an extension of the type designation („F“). They meet the requirements of compatibility between RCDs and frequency converters with respect to unwanted tripping.

Eaton stands for highest availability of your system also in applications where frequency drives are used. Therefore a full suite of Type F RCCBs (mechanical and digital assisted) are available in all feasible ratings to assist you in your application needs.

Our RCDs of type „F“ are characterized by:

- Improved capabilities of reliably sensing residual currents up to 1 kHz
- Improved capabilities of withstanding 10 mA DC offset
- 10 ms short time delay minimum (G/F)
- Surge current proofness of 3 kA (G/F) and 5kA (S/F)

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Description

- High-quality residual current device / miniature circuit breaker combination, line voltage-dependent
- 1+N-poles and 2-poles
- Increased protection in applications with 1-phase frequency converter due to the detection of mixed frequencies (type F)
- Reduction of nuisance tripping (type F or G/A) thanks to
 - time delayed tripping
 - increased current withstand capability
 - 3 kA
- Higher load rating with DC residual currents up to 10 mA (Type F)
- Contact position indicator red - green
- Tripping indicator white - blue
- New level of accuracy due to electronic fault current detection
- Local status indication of residual current through 3 LEDs
- 3-position DIN rail clip, permits removal from existing busbar system
- Comprehensive range of accessories suitable for subsequent installation
- Wide variety of rated tripping currents
- Rated currents up to 25 A
- Tripping characteristics B, C, D
- Rated breaking capacity 10 kA

$I_n/I_{\Delta n}$
(A)Type
DesignationArticle No. Units per
package**Type F****10 kA, 1+N-poles****Sensitive to residual pulsating DC, surge current proof 3000 A, type F**  

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**Characteristic B**

10/0.01	FRBdM-B10/1N/001-F	300539	1/60
13/0.01	FRBdM-B13/1N/001-F	300567	1/60
16/0.01	FRBdM-B16/1N/001-F	300587	1/60
10/0.03	FRBdM-B10/1N/003-F	300540	1/60
13/0.03	FRBdM-B13/1N/003-F	300568	1/60
16/0.03	FRBdM-B16/1N/003-F	300588	1/60
10/0.1	FRBdM-B10/1N/01-F	300538	1/60
13/0.1	FRBdM-B13/1N/01-F	300566	1/60
16/0.1	FRBdM-B16/1N/01-F	300586	1/60

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**Characteristic C**

6/0.01	FRBdM-C6/1N/001-F	300518	
10/0.01	FRBdM-C10/1N/001-F	300546	
13/0.01	FRBdM-C13/1N/001-F	300570	
16/0.01	FRBdM-C16/1N/001-F	300590	
20/0.01	FRBdM-C20/1N/001-F	300612	
25/0.01	FRBdM-C25/1N/001-F	300629	
6/0.03	FRBdM-C6/1N/003-F	300519	
10/0.03	FRBdM-C10/1N/003-F	300547	
13/0.03	FRBdM-C13/1N/003-F	300571	
16/0.03	FRBdM-C16/1N/003-F	300591	
20/0.03	FRBdM-C20/1N/003-F	300613	
25/0.03	FRBdM-C25/1N/003-F	300630	
6/0.1	FRBdM-C6/1N/01-F	300517	
10/0.1	FRBdM-C10/1N/01-F	300541	
13/0.1	FRBdM-C13/1N/01-F	300569	
16/0.1	FRBdM-C16/1N/01-F	300589	
20/0.1	FRBdM-C20/1N/01-F	300611	
25/0.1	FRBdM-C25/1N/01-F	300628	

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**Characteristic D**

6/0.01	FRBdM-D6/1N/001-F	300521	
10/0.01	FRBdM-D10/1N/001-F	300549	
13/0.01	FRBdM-D13/1N/001-F	300573	
16/0.01	FRBdM-D16/1N/001-F	300593	
20/0.01	FRBdM-D20/1N/001-F	300615	
25/0.01	FRBdM-D25/1N/001-F	300632	
6/0.03	FRBdM-D6/1N/003-F	300522	
10/0.03	FRBdM-D10/1N/003-F	300550	
13/0.03	FRBdM-D13/1N/003-F	300574	
16/0.03	FRBdM-D16/1N/003-F	300594	
20/0.03	FRBdM-D20/1N/003-F	300616	
25/0.03	FRBdM-D25/1N/003-F	300633	
6/0.1	FRBdM-D6/1N/01-F	300520	
10/0.1	FRBdM-D10/1N/01-F	300548	
13/0.1	FRBdM-D13/1N/01-F	300572	
16/0.1	FRBdM-D16/1N/01-F	300592	
20/0.1	FRBdM-D20/1N/01-F	300614	
25/0.1	FRBdM-D25/1N/01-F	300631	

Type G/A

10 kA, 1+N-poles

Surge current-proof 3 kA, sensitive to residual pulsating DC, Type G/A (ÖVE E 8601) 

Characteristic B

10/0.01	FRBdM-B10/1N/001-G/A	168249	1/60
13/0.01	FRBdM-B13/1N/001-G/A	168250	1/60
16/0.01	FRBdM-B16/1N/001-G/A	168251	1/60
10/0.03	FRBdM-B10/1N/003-G/A	168264	1/60
13/0.03	FRBdM-B13/1N/003-G/A	168265	1/60
16/0.03	FRBdM-B16/1N/003-G/A	168266	1/60
10/0.1	FRBdM-B10/1N/01-G/A	168279	1/60
13/0.1	FRBdM-B13/1N/01-G/A	168280	1/60
16/0.1	FRBdM-B16/1N/01-G/A	168281	1/60

Characteristic C

6/0.01	FRBdM-C6/1N/001-G/A	168252	1/60
10/0.01	FRBdM-C10/1N/001-G/A	168253	1/60
13/0.01	FRBdM-C13/1N/001-G/A	168254	1/60
16/0.01	FRBdM-C16/1N/001-G/A	168255	1/60
20/0.01	FRBdM-C20/1N/001-G/A	168256	1/60
25/0.01	FRBdM-C25/1N/001-G/A	168257	1/60
6/0.03	FRBdM-C6/1N/003-G/A	168267	1/60
10/0.03	FRBdM-C10/1N/003-G/A	168268	1/60
13/0.03	FRBdM-C13/1N/003-G/A	168269	1/60
16/0.03	FRBdM-C16/1N/003-G/A	168270	1/60
20/0.03	FRBdM-C20/1N/003-G/A	168271	1/60
25/0.03	FRBdM-C25/1N/003-G/A	168272	1/60
6/0.1	FRBdM-C6/1N/01-G/A	168282	1/60
10/0.1	FRBdM-C10/1N/01-G/A	168283	1/60
13/0.1	FRBdM-C13/1N/01-G/A	168284	1/60
16/0.1	FRBdM-C16/1N/01-G/A	168285	1/60
20/0.1	FRBdM-C20/1N/01-G/A	168286	1/60
25/0.1	FRBdM-C25/1N/01-G/A	168287	1/60

Characteristic D

6/0.01	FRBdM-D6/1N/001-G/A	168258	1/60
10/0.01	FRBdM-D10/1N/001-G/A	168259	1/60
13/0.01	FRBdM-D13/1N/001-G/A	168260	1/60
16/0.01	FRBdM-D16/1N/001-G/A	168261	1/60
20/0.01	FRBdM-D20/1N/001-G/A	168262	1/60
25/0.01	FRBdM-D25/1N/001-G/A	168263	1/60
6/0.03	FRBdM-D6/1N/003-G/A	168273	1/60
10/0.03	FRBdM-D10/1N/003-G/A	168274	1/60
13/0.03	FRBdM-D13/1N/003-G/A	168275	1/60
16/0.03	FRBdM-D16/1N/003-G/A	168276	1/60
20/0.03	FRBdM-D20/1N/003-G/A	168277	1/60
25/0.03	FRBdM-D25/1N/003-G/A	168278	1/60
6/0.1	FRBdM-D6/1N/01-G/A	168288	1/60
10/0.1	FRBdM-D10/1N/01-G/A	168289	1/60
13/0.1	FRBdM-D13/1N/01-G/A	168290	1/60
16/0.1	FRBdM-D16/1N/01-G/A	168291	1/60
20/0.1	FRBdM-D20/1N/01-G/A	168292	1/60
25/0.1	FRBdM-D25/1N/01-G/A	168293	1/60

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$I_n/I_{\Delta n}$
(A)Type
DesignationArticle No. Units per
package**Type F****10 kA, 2-poles****Sensitive to residual pulsating DC, surge current proof 3000 A, Type F****Characteristic B**

10/0.01	FRBdM-B10/2/001-F	300524	1/60
13/0.01	FRBdM-B13/2/001-F	300553	1/60
16/0.01	FRBdM-B16/2/001-F	300577	1/60
10/0.03	FRBdM-B10/2/003-F	300525	1/60
13/0.03	FRBdM-B13/2/003-F	300554	1/60
16/0.03	FRBdM-B16/2/003-F	300578	1/60
10/0.1	FRBdM-B10/2/01-F	300523	1/60
13/0.1	FRBdM-B13/2/01-F	300551	1/60
16/0.1	FRBdM-B16/2/01-F	300575	1/60

Characteristic C

6/0.01	FRBdM-C6/2/001-F	300512	1/60
10/0.01	FRBdM-C10/2/001-F	300529	1/60
13/0.01	FRBdM-C13/2/001-F	300556	1/60
16/0.01	FRBdM-C16/2/001-F	300580	1/60
20/0.01	FRBdM-C20/2/001-F	300599	1/60
25/0.01	FRBdM-C25/2/001-F	300623	1/60
6/0.03	FRBdM-C6/2/003-F	300513	1/60
10/0.03	FRBdM-C10/2/003-F	300531	1/60
13/0.03	FRBdM-C13/2/003-F	300557	1/60
16/0.03	FRBdM-C16/2/003-F	300581	1/60
20/0.03	FRBdM-C20/2/003-F	300607	1/60
25/0.03	FRBdM-C25/2/003-F	300624	1/60
6/0.1	FRBdM-C6/2/01-F	300511	1/60
10/0.1	FRBdM-C10/2/01-F	300527	1/60
13/0.1	FRBdM-C13/2/01-F	300555	1/60
16/0.1	FRBdM-C16/2/01-F	300579	1/60
20/0.1	FRBdM-C20/2/01-F	300597	1/60
25/0.1	FRBdM-C25/2/01-F	300622	1/60

Characteristic D

6/0.01	FRBdM-D6/2/001-F	300515	1/60
10/0.01	FRBdM-D10/2/001-F	300535	1/60
13/0.01	FRBdM-D13/2/001-F	300563	1/60
16/0.01	FRBdM-D16/2/001-F	300583	1/60
20/0.01	FRBdM-D20/2/001-F	300609	1/60
25/0.01	FRBdM-D25/2/001-F	300626	1/60
6/0.03	FRBdM-D6/2/003-F	300516	1/60
10/0.03	FRBdM-D10/2/003-F	300537	1/60
13/0.03	FRBdM-D13/2/003-F	300565	1/60
16/0.03	FRBdM-D16/2/003-F	300584	1/60
20/0.03	FRBdM-D20/2/003-F	300610	1/60
25/0.03	FRBdM-D25/2/003-F	300627	1/60
6/0.1	FRBdM-D6/2/01-F	300514	1/60
10/0.1	FRBdM-D10/2/01-F	300534	1/60
13/0.1	FRBdM-D13/2/01-F	300562	1/60
16/0.1	FRBdM-D16/2/01-F	300582	1/60
20/0.1	FRBdM-D20/2/01-F	300608	1/60
25/0.1	FRBdM-D25/2/01-F	300625	1/60

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$I_n/I_{\Delta n}$
(A)Type
DesignationArticle No. Units per
package**Type G/A****10 kA, 2-poles****Surge current-proof 3 kA, sensitive to residual pulsating DC, Type G/A (ÖVE E 8601)** **Characteristic B**

10/0.01	FRBdM-B10/2/001-G/A	168294	1/60
13/0.01	FRBdM-B13/2/001-G/A	168295	1/60
16/0.01	FRBdM-B16/2/001-G/A	168296	1/60
10/0.03	FRBdM-B10/2/003-G/A	168198	1/60
13/0.03	FRBdM-B13/2/003-G/A	168199	1/60
16/0.03	FRBdM-B16/2/003-G/A	168200	1/60
10/0.1	FRBdM-B10/2/01-G/A	168213	1/60
13/0.1	FRBdM-B13/2/01-G/A	168214	1/60
16/0.1	FRBdM-B16/2/01-G/A	168215	1/60

Characteristic C

6/0.01	FRBdM-C6/2/001-G/A	168297	1/60
10/0.01	FRBdM-C10/2/001-G/A	168298	1/60
13/0.01	FRBdM-C13/2/001-G/A	168299	1/60
16/0.01	FRBdM-C16/2/001-G/A	168300	1/60
20/0.01	FRBdM-C20/2/001-G/A	168301	1/60
25/0.01	FRBdM-C25/2/001-G/A	168302	1/60
6/0.03	FRBdM-C6/2/003-G/A	168201	1/60
10/0.03	FRBdM-C10/2/003-G/A	168202	1/60
13/0.03	FRBdM-C13/2/003-G/A	168203	1/60
16/0.03	FRBdM-C16/2/003-G/A	168204	1/60
20/0.03	FRBdM-C20/2/003-G/A	168205	1/60
25/0.03	FRBdM-C25/2/003-G/A	168206	1/60
6/0.1	FRBdM-C6/2/01-G/A	168216	1/60
10/0.1	FRBdM-C10/2/01-G/A	168217	1/60
13/0.1	FRBdM-C13/2/01-G/A	168218	1/60
16/0.1	FRBdM-C16/2/01-G/A	168219	1/60
20/0.1	FRBdM-C20/2/01-G/A	168220	1/60
25/0.1	FRBdM-C25/2/01-G/A	168221	1/60

Characteristic D

6/0.01	FRBdM-D6/2/001-G/A	168303	1/60
10/0.01	FRBdM-D10/2/001-G/A	168304	1/60
13/0.01	FRBdM-D13/2/001-G/A	168305	1/60
16/0.01	FRBdM-D16/2/001-G/A	168195	1/60
20/0.01	FRBdM-D20/2/001-G/A	168196	1/60
25/0.01	FRBdM-D25/2/001-G/A	168197	1/60
6/0.03	FRBdM-D6/2/003-G/A	168207	1/60
10/0.03	FRBdM-D10/2/003-G/A	168208	1/60
13/0.03	FRBdM-D13/2/003-G/A	168209	1/60
16/0.03	FRBdM-D16/2/003-G/A	168210	1/60
20/0.03	FRBdM-D20/2/003-G/A	168211	1/60
25/0.03	FRBdM-D25/2/003-G/A	168212	1/60
6/0.1	FRBdM-D6/2/01-G/A	168222	1/60
10/0.1	FRBdM-D10/2/01-G/A	168223	1/60
13/0.1	FRBdM-D13/2/01-G/A	168224	1/60
16/0.1	FRBdM-D16/2/01-G/A	168225	1/60
20/0.1	FRBdM-D20/2/01-G/A	168226	1/60
25/0.1	FRBdM-D25/2/01-G/A	168227	1/60

SG05613

SG05613

SG05613

Specifications | Combined RCD/MCB Devices FRBdM, digital

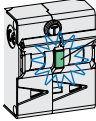
Description

- Combined RCD/MCB device
- Line voltage-dependent tripping
- Compatible with standard busbar
- Twin-purpose terminal (lift/open-mouthed) above and below
- Busbar positioning optionally above or below
- Free terminal space despite installed busbar
- Guide for secure terminal connection
- Contact position indicator red - green
- Fault current tripping indicator white - blue
- Comprehensive range of accessories suitable for subsequent installation
- The test key "T" must be pressed every year. The system operator must be informed of this obligation and his responsibility in a way that can be proven. Under special conditions (e.g. damply and/or dusty environments, environments with polluting and/or corroding conditions, environments with large temperature fluctuations, installations with a risk of overvoltages due to switching of equipment and/or atmospheric discharges, portable equipment ...), it's recommended to test in monthly intervals.
- Pressing the test key "T" serves the only purpose of function testing the residual current device (RCD). This test does not make earthing resistance measurement (R_E), or proper checking of the earth conductor condition redundant, which must be performed separately.
- **Type -A:** Protects against special forms of residual pulsating DC which have not been smoothed.
- **Type -G/A:** High reliability against unwanted tripping. Suitable for any circuit where personal injury or damage to property may occur in case of unwanted tripping. Additionally protects against special forms of residual pulsating DC which have not been smoothed.
- **Type -F:** Sensitive to pulsating DC residual current and detection of multifrequency residual currents up to 1 kHz
 - Increased protection due to the detection of mixed frequencies
 - Higher load rating with DC residual currents up to 10mA
 - Reduction of nuisance tripping thanks to time delayed tripping and increased current withstand capability of 3 kA
 Recommended for washing machines, dish washers, or motor applications with single-phase drives.

Accessories:

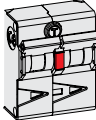
Auxiliary switch for subsequent installation	ZP-IHK	286052
	ZP-WHK	286053
Tripping signal switch for subsequent installation	ZP-NHK	248437
Shunt trip release	ZP-ASA/..	248438, 248439
Terminal cover 2-poles	Z-TC/SD-2P	178099

Local Indication RCD



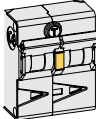
green

Self check (power ON) 2 s



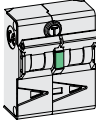
red

$I_{\Delta} \geq 50\% I_{\Delta n}$



amber

$I_{\Delta} = 30\text{-}50\% I_{\Delta n}$

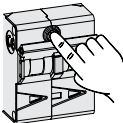


green

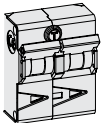
$I_{\Delta} \leq 30\% I_{\Delta n}$

Service Mode (measuring of residual current I_{Δ})

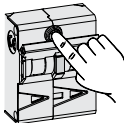
Pressing test button twice to activate Service-Mode



press
(0,1 - 0,4 s)



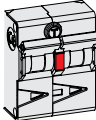
release
(0,1 - 0,4 s)



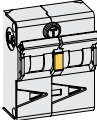
press
(0,1 - 0,4 s)

Measurement delimiter	red
Measurement delimiter ON time	400 ms
10 mA measurement color	amber
1 mA measurement color	green
Double-pressing test button to activate Service Mode	press (0.1-0.4 s) -> release (0.1-0.4 s) -> press (0.1-0.4 s)
Time duration of Service Mode	4 min (during activated Service Mode all protection functions are still working)

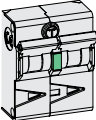
Lamp test



red

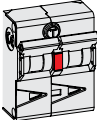


amber

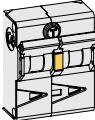


green

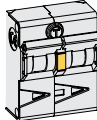
2 s →



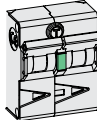
red



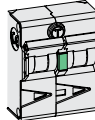
amber



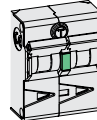
amber



green



green



green

2 s →

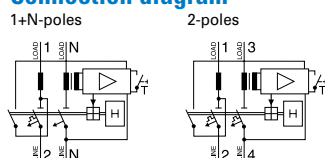
100 mA + 10 mA + 10 mA + 1 mA + 1 mA + 1 mA

123 mA

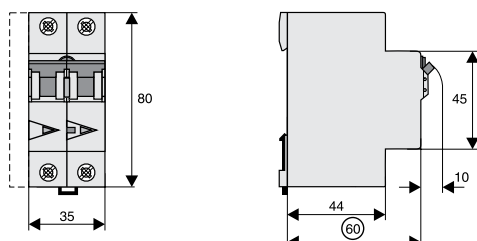
Technical Data

FRBdM	
Electrical	
Design according to	IEC/EN 61009 Type G according to ÖVE E 8601
Current test marks as printed onto the device	
Number of protected poles	
1+N-poles	1
2-poles	2
Tripping	
Type G / Type F	line voltage-dependent, 10 ms delay 3 kA (8/20µs), surge current-proof
Rated voltage	U_n 240 V AC, 50 Hz
Rated operational voltage	U_e 204-260 V AC
Voltage range test circuit	195-264 V AC
Rated tripping current	$I_{\Delta n}$ 10, 30, 100 mA
Rated non-tripping current	$I_{\Delta no}$ 0.55 $I_{\Delta n}$
Sensitivity	AC and pulsating DC, Type F according to IEC 62423
Press of test button duration	> 0.5 s
Selectivity class	3
Service short circuit capacity	I_{cs} 7.5 kA
Rated short circuit capacity	I_{cn} 10 kA
Rated current	6 - 25 A
Rated impulse withstand voltage	U_{imp} 4 kV (1.2/50µs)
Characteristic	B, C, D
Maximum back-up fuse (short circuit protection)	100 A gL (>10 kA)
Endurance	
electrical components	≥ 4,000 operating cycles (I_n , U_n , $\cos\varphi = 0.87$)
mechanical components	≥ 10,000 operating cycles
Mechanical	
Frame size	45 mm
Device height	80 mm
Device width	35 mm (2MU)
Mounting	3-position DIN rail clip, permits removal from existing busbar system
Degree of protection switch	IP20
Degree of protection, built-in	IP40
Upper and lower terminals	open mouthed/lift terminals
Terminal protection	finger and hand touch safe, DGUV VS3, EN 50274
Terminal capacity	1 - 25 mm ²
Terminal screw	M5 (with slotted screw acc. to EN ISO 4757-Z2, Pozidriv PZ2)
Terminal torque	2 - 2.4 Nm
Busbar thickness	0.8 - 2 mm
Operation temperature	-25°C to +40°C
Storage- and transport temperature	-35°C to +60°C
Resistance to climatic conditions	acc. to IEC 68-2 (25..55°C / 90..95% RH)
Line side (supply)	lower terminals
Load side	upper terminals

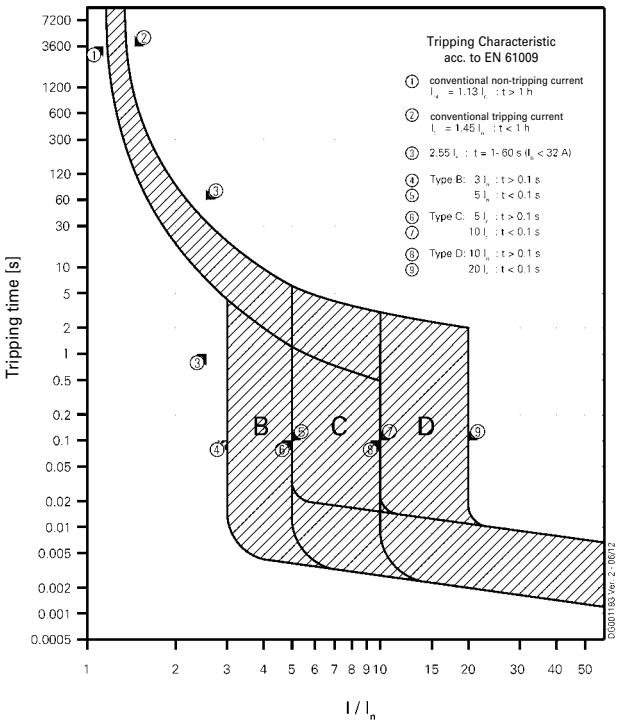
Connection diagram



Dimensions (mm)



Tripping Characteristic FRBdM, Characteristics B, C and D



Internal Resistance FRBdM**Type B**

At room temperature (single pole)

I_n [A]	R^* [mΩ]
10	17.9
13	12.3
16	7.6

* 50Hz

Type C

At room temperature (single pole)

I_n [A]	R^* [mΩ]
6	28.5
10	17.7
13	9.0
16	6.7
20	5.5
25	3.0

* 50Hz

Type D

At room temperature (single pole)

I_n [A]	R^* [mΩ]
6	28.5
10	14.9
13	9.0
16	6.7
20	5.5
25	3.0

* 50Hz

Power Loss at I_n FRBdM**Type B**

(entire unit)

I_n [A]	P^* [W]
10	4.0
13	4.9
16	4.5

* 50Hz and ambient temperature

Type C

(entire unit)

I_n [A]	P^* [W]
6	2.1
10	4.0
13	3.4
16	3.9
20	5.0
25	4.2

* 50Hz and ambient temperature

Type D

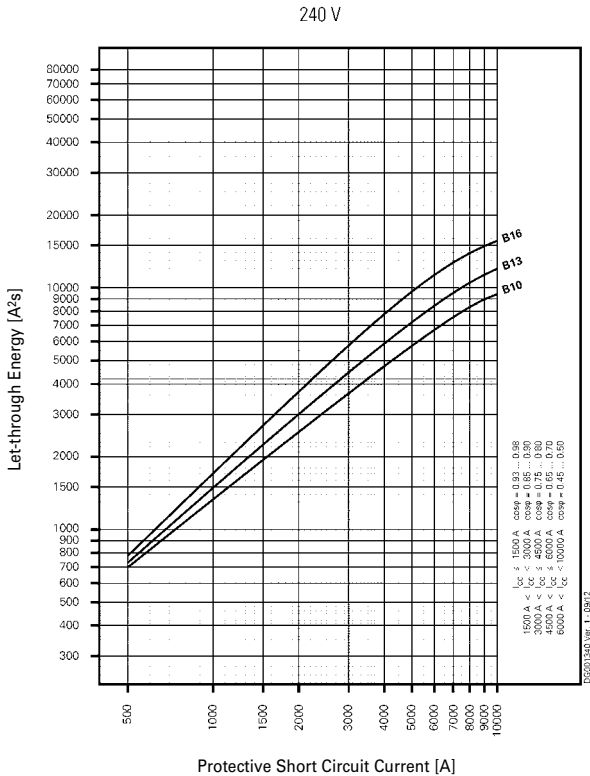
(entire unit)

I_n [A]	P^* [W]
6	2.1
10	3.2
13	3.4
16	3.9
20	5.0
25	4.2

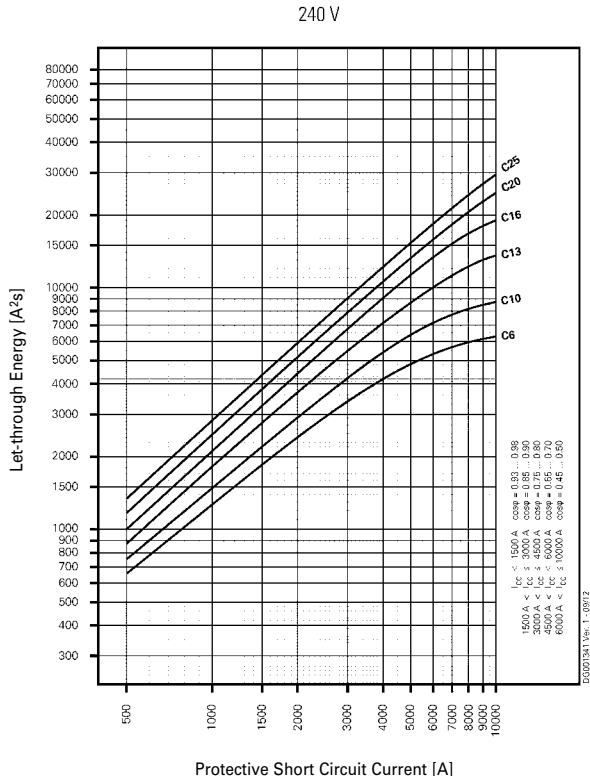
* 50Hz and ambient temperature

Let-through Energy FRBdM

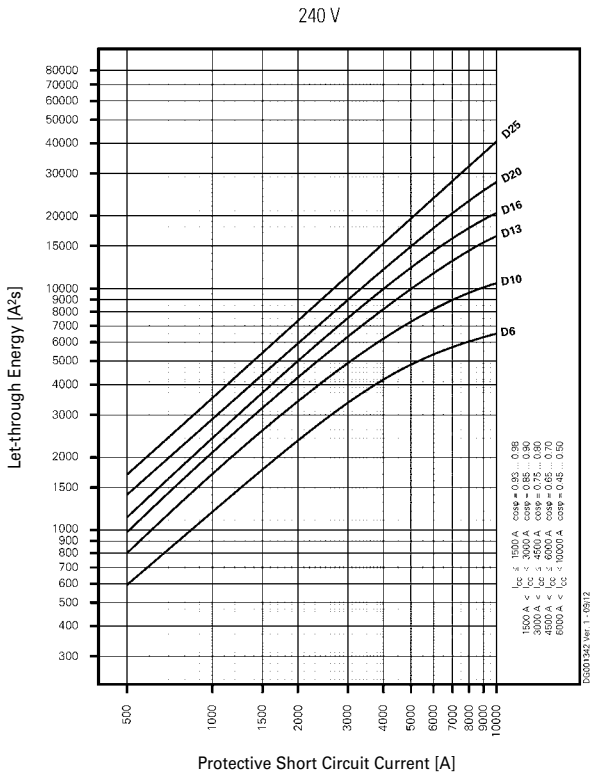
Let-through Energy FRBdM, Characteristic B



Let-through Energy FRBdM, Characteristic C

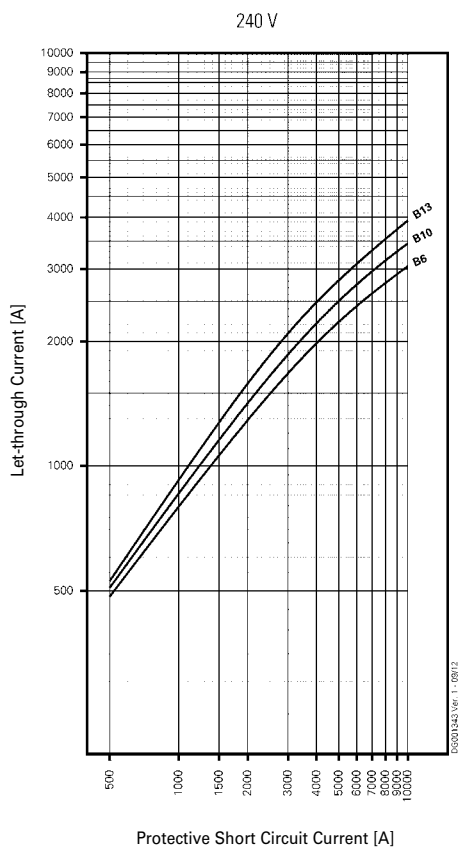


Let-through Energy FRBdM, Characteristic D

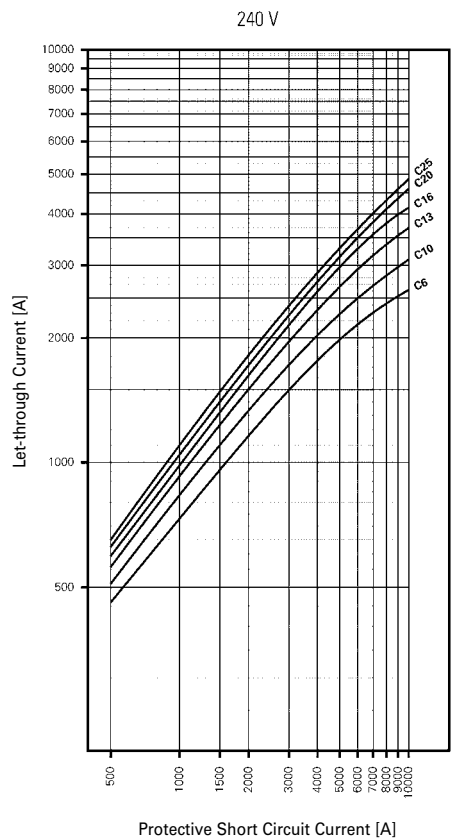


Let-through Current FRBdM

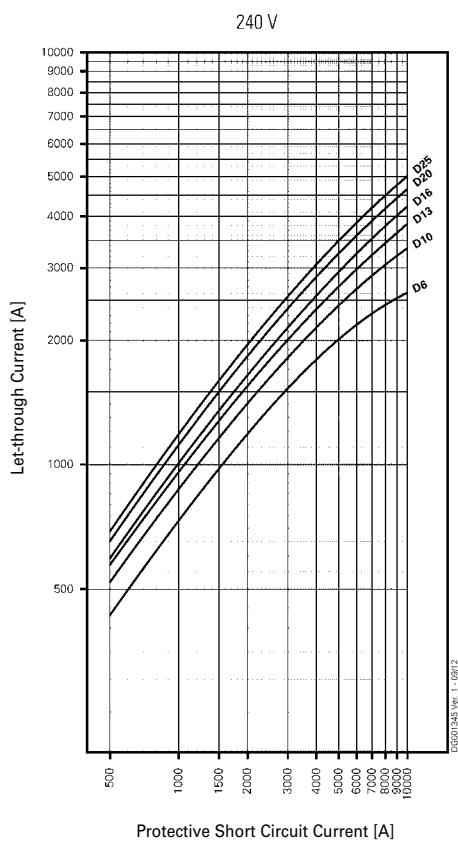
Let-through Current FRBdM, Characteristic B



Let-through Current FRBdM, Characteristic C



Let-through Current FRBdM, Characteristic D



Short-circuit Selectivity FRBdM

In case of a short-circuit, selectivity is provided up to the specified selective current values I_s (kA) applicable between the FRBdM RCD/MCB circuit breakers and the up-stream protective devices.

When a short-circuit occurs, this means that with I_{KS} current values below I_s only the MCB will trip. However, in case of short-circuit currents beyond these values both protective devices will trip.

FRBdM and NZMB(C)(N)(H)1-A..., NZMB(C)(N)(H)2-A...

Short circuit currents in kA, rated currents of fuses in A.

Overload and short-circuit release unit NZM at max. value

FRBdM	NZM.1-A...						FRBdM	NZM.2-A...								
	$I_{cu} = 25 (36) (50) (100) \text{ kA}$							$I_{cu} = 25 (36) (50) (150) \text{ kA}$								
	40	50	63	80	100	125		40	50	63	80	100	125	160	200	250
B10	1.2	1.5	2	2	4	10	B10	1	1.5	2.5	3	10	10	10	10	10
B13	1	1.5	2	2	4	10	B13	1	1.2	2	3	10	10	10	10	10
B16	1	1.2	1.5	2	3	8	B16	1	1.2	1.5	2.5	10	10	10	10	10
C+D6	1.2	1.5	2	2	4	10	C+D6	1	1.5	2.5	3	10	10	10	10	10
C+D10	1.2	1.5	2	2	4	10	C+D10	1	1.5	2.5	3	10	10	10	10	10
C+D13	1	1.5	2	2	4	10	C+D13	1	1.2	2	3	10	10	10	10	10
C+D16	1	1.2	1.5	2	3	8	C+D16	1	1.2	1.5	2.5	10	10	10	10	10
C+D20	0.8	1.2	1.5	1.5	3	8	C+D20	1	1.2	1.5	1.5	10	10	10	10	10
C+D25	0.7	1.1	1.3	1.3	2.5	6	C+D25	0.9	1.1	1.3	1.3	10	10	10	10	10

NZMB1(C1)(N1)(H1): $I_{cu} (400/415V) = 25(36)(50)(100) \text{ kA}$ (acc. to IEC/EN 60947-2)

NZMB2(C2)(N2)(H2): $I_{cu} (400/415V) = 25(36)(50)(150) \text{ kA}$ (acc. to IEC/EN 60947-2)

FRBdM and NH000/NH00/NH1 gG

Short circuit currents in kA, rated currents of fuses in A.

FRBdM	NH000/NH00/NH1 gG										
	16	20	25	32	35	40	50	63	80	100	125
B10	<0.5	<0.5	0.9	1.7	2.3	3.4	5.2	6.9	>10	>10	>10
B13	<0.5	<0.5	0.8	1.4	1.9	2.7	4.1	5.2	8.5	>10	>10
B16	<0.5	<0.5	0.7	1.2	1.6	2.2	3.1	3.8	5.7	>10	>10
C6	<0.5	0.5	0.9	1.8	2.5	3.8	8.2	>10	>10	>10	>10
C10	<0.5	<0.5	0.8	1.5	2.0	2.9	4.5	6.6	>10	>10	>10
C13	<0.5	<0.5	0.6	1.2	1.5	2.2	3.3	4.2	6.7	>10	>10
C16	<0.5	<0.5	0.6	1.0	1.3	1.8	2.6	3.3	4.8	>10	>10
C20	<0.5	<0.5	0.5	0.9	1.1	1.6	2.3	2.8	4.1	8.6	>10
C25	<0.5	<0.5	<0.5	0.8	1.0	1.4	2.0	2.5	3.6	7.1	>10
D6	<0.5	0.5	1.0	1.8	2.5	3.8	7.8	>10	>10	>10	>10
D10	<0.5	<0.5	0.7	1.2	1.6	2.4	3.8	5.2	>10	>10	>10
D13	<0.5	<0.5	0.6	1.0	1.3	1.9	2.8	3.6	5.6	>10	>10
D16	<0.5	<0.5	0.5	0.9	1.1	1.6	2.3	2.9	4.3	>10	>10
D20	<0.5	<0.5	<0.5	0.8	1.0	1.4	2.0	2.5	3.6	7.5	>10
D25	<0.5	<0.5	<0.5	0.7	0.8	1.1	1.6	2.1	3.1	5.5	7.7

Rated breaking capacity (NH) AC 500 V = 120 kA (acc. to IEC/EN 60269)

FRBdM and PLSM-OV/PLHT-OV...

Short circuit currents in kA, rated currents of fuses in A.

FRBdM	PLSM-OV/PLHT-OV						
	$I_{cu} = 10 \text{ kA}$						
	25	32	40	50	56	63	80
B10	1.5	1.5	1.5	1.5	1.5	1.5	1.5
B13	1.5	1.5	1.5	1.5	1.5	1.5	1.5
B16	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C+D6	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C+D10	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C+D13	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C+D16	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C+D20	-	1.5	1.5	1.5	1.5	1.5	1.5
C+D25	-	-	1.5	1.5	1.5	1.5	1.5

Back-up Protection FRBdM

The up-stream protective devices will protect the down-stream FRBdM up to the short-circuit current specified.

FRBdM and NZM1-A..., 240 V

Short circuit currents in kA.

FRBdM	NZMB1-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	25	25
10	25	25	25
13	25	25	25
16	25	25	25
20	-	20	20
25	-	20	20

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMB1) = 25 kA (acc. to IEC/EN 60947-2)

Short circuit currents in kA.

FRBdM	NZMN1-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	40	40
10	40	40	40
13	40	40	40
16	40	40	40
20	-	20	20
25	-	20	20

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMN1) = 50 kA (acc. to IEC/EN 60947-2)

Short circuit currents in kA.

FRBdM	NZMC1-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	36	36
10	36	36	36
13	36	36	36
16	36	36	36
20	-	20	20
25	-	20	20

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMC1) = 36 kA (acc. to IEC/EN 60947-2)

Short circuit currents in kA.

FRBdM	NZMH1-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	40	40
10	40	40	40
13	40	40	40
16	40	40	40
20	-	20	20
25	-	20	20

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMH1) = 100 kA (acc. to IEC/EN 60947-2)

FRBdM and NZM2-A..., 240 V

Short circuit currents in kA.

FRBdM	NZMB2-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	25	25
10	25	25	25
13	25	25	25
16	25	25	25
20	-	20	20
25	-	10	10

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMB2) = 25 kA (acc. to IEC/EN 60947-2)

Short circuit currents in kA.

FRBdM	NZMN2-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	40	40
10	40	40	40
13	40	40	40
16	25	25	25
20	-	15	15
25	-	10	10

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMN2) = 50 kA (acc. to IEC/EN 60947-2)

Short circuit currents in kA.

FRBdM	NZMC2-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	36	36
10	36	36	36
13	36	36	36
16	25	25	25
20	-	20	20
25	-	10	10

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMC2) = 36 kA (acc. to IEC/EN 60947-2)

Short circuit currents in kA.

FRBdM	NZMH2-A...		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	40	40
10	40	40	40
13	40	40	40
16	25	25	25
20	-	15	15
25	-	10	10

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 400/415\text{V}$: I_{cu} (NZMH2) = 150 kA (acc. to IEC/EN 60947-2)

FRBdM and NH00-125 A, 240 V

Short circuit currents in kA.

FRBdM	NH00-125A gG		
	$U_e = 240\text{ V}$		
	B	C	D
6	-	40	40
10	40	40	40
13	40	40	40
16	40	40	40
20	-	20	20
25	-	10	10

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

AC 500 V (NH00-125A gG) = 120 kA (acc. to IEC/EN 60269)

FRBdM and PLSM-OV63, 230 V

Short circuit currents in kA.

FRBdM	PLSM-OV63/2, 3, 4, 3N		
	IT-system $U = 230\text{ V}$		
	B	C	D
6	-	10	10
10	10	10	10
13	10	10	10
16	10	10	10
20	-	10	10
25	-	10	10

$U_e = 240\text{V}$: I_{cn} (FRBdM) = 10 kA (acc. to IEC/EN 61009)

$U_e = 230/400\text{V}$: I_{cu} (PLSM-OV63) = 10 kA (acc. to IEC/EN 60947-2)

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