



# Digital Switchgear Communication at Eye Level



The new xEffect Digital Series



*Powering Business Worldwide*



# Yesterday, the future was yet to come. Today, it's already here.

## The future has already begun.

For us, innovation is tradition: in 1957 Eaton's Moeller segment developed the first fault current protection switch, and with this, a new era of electrical safety engineering began. And now, Eaton is still ahead of its time: the new digital switchgear range in the Eaton xEffect series communicates potential problems in advance and sets new standards in precision, security and convenient service.

### **Maximal safety with optimal ease**

Modern Residual Current Circuit Breakers (RCCB) protect people and technical equipment conveniently and reliably against faulty currents. The digital RCCB from the xEffect series do more than just switch off. They monitor electrical installations and give advance warning of critical current flows. So plant / factory shutdowns – and the resulting costs – can be avoided.

### **Precise Release – Highest Reliability**

Short-time fault currents or other briefly occurring malfunctions do not cause the digital protection switch to shut down, thanks to the short time delay and optimized tripping threshold. So the electrical installation is optimally protected against nuisance tripping.

### **Easy and adaptable installation for fast modernization**

The big Eaton Plus: It is very easy to upgrade a switchboard! Simply replace the RCCB – and you have all advantages of digitalization.



## Digital protection switches – the new era has begun.

### More security through proactive communication!

The new xEffect models exceed the IEC/EN-61008 standard: their trigger reaction is much more precise than that of conventional switches to the 100% fault current threshold. The digital protection switches supports in addition the preventive maintenance which is recommended by IEC 60204. With a fault current, the information is reported to the security center of the industrial plant, and troubleshooting would begin before there would be a shutdown or plant failure. So the cause of the fault current can be determined precisely and the system service can be easily planned ahead. Therefore, system availability is increased and service is improved because of the convenience of the remote control.

### Numerous advantages at a glance

- The difference between harmless and critical fault currents is detected
- Precise switching and reduction of nuisance tripping
- Continuous monitoring of plant/factory status – prompt warning of a change in status quo
- Convenient troubleshooting by precise location of the malfunction
- As easy to install as a conventional RCCB
- Longer intervals between servicing
- Ideal for system monitoring thanks to preventive information
- Warning of tripping at leakage current
- Clear status display of the fault current problem with tri-colored LEDs
- Real contact position indicator
- Indicator for fault current tripping
- Comprehensive range of accessories available
- Can be integrated in several bus systems

# Highly qualified controllers offer their services

## PROMOTION

Allow us to introduce ourselves: **FRCdM** and **FRBdM** would like to work in your switchbox. We're two highly qualified control robots from the famous EATON talent factory – the first of the new digital generation.

It's not only that I work completely reliably as a Residual Current Operated Circuit Breaker with integrated Overcurrent Protection (RCBO), but I also display the cause and extent of the flowing fault current.

This enables fast actions quickly take measures to maintain system availability.

And since I'm the RCCB a fault current protection switch, I don't wait until the tripping threshold is reached; I continuously check the present status and register any possible failures, sending this information by remote warning immediately to the central control system. This increases system safety, application availability and minimizes maintenance costs.

**Hire us – and finally experience communication at eye level!**

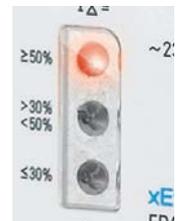
The LEDs set off an alarm when fault currents or a shut down are coming. This makes the troubleshooting faster and much easier. The service mode of the RCBO quickly indicates the extent of the flowing fault current in milliamp increments. By pushing the service button, the blinking LED identifies the area where the fault current is located in. The potential-free contact which is integrated in the RCCB offers a connection to a monitoring system.

- Mains voltage-independent residual current protection and additional protection with other digital functions
- Auto-reclosure is possible



### Red

When the red LED lights up, the leakage current is already higher than 50 percent of the nominal fault current. Therefore the system is in a critical status – the digital RCCB only trips when the fault current continues to increase.



### Yellow

The yellow LED shows a residual current in the ambit of 30 to 50 percent of the nominal fault current. Before the system is shut down, professional countermeasures can be taken.



### Green

If the current flow in the system to ground is in the ambit from 0 to 30 percent of the nominal fault current, the green LED indicates the proper status.



## FRBdM and FRCdM offer several other advantages



The LED allows for a fault current display directly on site. In the service mode, malfunction causes can be determined quickly and without complication.



The digital display facilitates real-time diagnostics directly at the switch. By means of the LEDs, the system status can be seen at anytime, and with one glance.

All models have at least a short time delay to prevent from nuisance tripping due to transient disruptions (lightning, engine start).

### Digital RCCB type A

Protection in case of sinusoidal AC fault currents and pulsating currents with DC components up to 6 mA..

### Digital RCCB type B

In addition to fault currents in the AC and pulse current range, type B also detects smooth DC fault currents, which can occur in frequency inverter controls, photovoltaic systems and increases safety considerably.

### Digital RCCB type B+

Complies with the standard VDE 0664-400 (formerly VVDEV 0664-110) for superior fire protection as required by the Association of German Insurance Companies. The type B+ detects high frequency currents up to 20 kHz and the tripping level is limited to max. 420 mA over the defined frequency range.

### Digital RCCB type Bfq

The type Bfq comply with the requirements of the type B. The tripping curve is extended and allows the defection of high frequency currents up to 50 kHz. The adjusted frequency behaviour (insensitive to higher frequencies) prevents nuisance tripping errors in industrial plants with powerful frequency inverter controllers.

## Residual Current Devices FRCdM Type G/B

Surge current-proof 3 kA, AC-DC sensitive, Type G/B (ÖVE E 8601)



SG49812



$I_n/I_{\Delta n}$   
(A)

Type  
Designation

Article No.

Units  
per  
package

### 4-pole

25/0.03	FRCdM-25/4/003-G/B	167892	1/30
25/0.3	FRCdM-25/4/03-G/B	167896	1/30
40/0.03	FRCdM-40/4/003-G/B	167893	1/30
40/0.3	FRCdM-40/4/03-G/B	167897	1/30
63/0.03	FRCdM-63/4/003-G/B	167894	1/30
63/0.3	FRCdM-63/4/03-G/B	167898	1/30

## Residual Current Devices FRCdM Type S/B

Selective + surge current-proof 5 kA, Type S/B



SG49812



$I_n/I_{\Delta n}$   
(A)

Type  
Designation

Article No.

Units  
per  
package

### 4-pole

25/0.3	FRCdM-25/4/03-S/B	167900	1/30
40/0.3	FRCdM-40/4/03-S/B	167901	1/30
63/0.3	FRCdM-63/4/03-S/B	167902	1/30

## Residual Current Devices FRCdM Type G/Bfq

Surge current-proof 3 kA, AC-DC sensitive, Type G/Bfq (ÖVE E 8601)



SG49812



$I_n/I_{\Delta n}$   
(A)

Type  
Designation

Article No.

Units  
per  
package

### 4-pole

25/0,03	FRCdM-25/4/003-G/Bfq	179530	1/30
25/0,3	FRCdM-25/4/03-G/Bfq	167904	1/30
40/0,03	FRCdM-40/4/003-G/Bfq	179531	1/30
40/0,3	FRCdM-40/4/03-G/Bfq	167905	1/30
63/0,03	FRCdM-63/4/003-G/Bfq	179532	1/30
63/0,3	FRCdM-63/4/03-G/Bfq	167906	1/30

## Residual Current Devices FRCdM Type S/Bfq

Selective + surge current-proof 5 kA, Type S/Bfq



SG49812



$I_n/I_{\Delta n}$   
(A)

Type  
Designation

Article No.

Units  
per  
package

### 4-pole

25/0.3	FRCdM-25/4/03-S/Bfq	167908	1/30
40/0.3	FRCdM-40/4/03-S/Bfq	167909	1/30
63/0.3	FRCdM-63/4/03-S/Bfq	167910	1/30

## Residual Current Devices FRCdM Type G/B+

Surge current-proof 3 kA, Type G/B+ (ÖVE E 8601)



SG49812



$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
<b>4-pole</b>			
25/0.03	FRCdM-25/4/003-G/B+	167880	1/30
25/0.3	FRCdM-25/4/03-G/B+	167884	1/30
40/0.03	FRCdM-40/4/003-G/B+	167881	1/30
40/0.3	FRCdM-40/4/03-G/B+	167885	1/30
63/0.03	FRCdM-63/4/003-G/B+	167882	1/30
63/0.3	FRCdM-63/4/03-G/B+	167886	1/30

## Residual Current Devices FRCdM Type S/B+

Selective + surge current-proof 5 kA, Type S/B+



SG49812



$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
<b>4-pole</b>			
25/0.3	FRCdM-25/4/03-S/B+	167888	1/30
40/0.3	FRCdM-40/4/03-S/B+	167889	1/30
63/0.3	FRCdM-63/4/03-S/B+	167890	1/30

## Technical Data

		<b>FRCdM Type B, Bfq and B+</b>
<b>Electrical</b>		
Design according to		Types B and Bfq acc. to IEC/EN 61008, IEC/EN 62423 Types B+ acc. to VDE 0664-400, formerly known as VDE V 0664-110 Type G/B, G/Bfq and G/B+ additional acc. to ÖVE E 8601
Current test marks as printed onto the device		
Tripping		
Type G		10 ms delay
Type S		40 ms delay - with selective disconnecting function
Rated voltage	$U_n$	240/415 V AC, 50 Hz (Special types for 60 Hz Networks available)
Limits operation voltage electronic		50 – 456V AC
Limits operation voltage test circuit		
30 mA		196 - 264V AC
300 mA		196 - 456V AC
Rated tripping current	$I_{\Delta n}$	30, 300 mA
Sensitivity		All types of current
Rated insulation voltage	$U_i$	440 V
Rated impulse withstand voltage	$U_{imp}$	4 kV (1.2/50µs)
Rated short circuit capacity	$I_{cn}$	10 kA with back-up fuse
Peak withstand current		
Type G/B, G/B+ and G/Bfq		3 kA (8/20 µs) surge current proof
Type S/B, S/B+ and S/Bfq		typ. 5 kA (8/20 µs) selective + surge current proof
Rated breaking capacity or rated fault breaking capacity		
$I_n = 25-40A$		500 A
$I_n = 63A$		630 A
Endurance		
electrical components		≥ 4,000 operating cycles
mechanical components		≥ 20,000 operating cycles
<b>Mechanical</b>		
Frame size		45 mm
Device height		80 mm
Device width		70 mm (4MU)
Mounting		quick fastening with 2 lock-in positions on DIN rail IEC/EN 60715
Degree of protection, built-in		IP40
Degree of protection in moisture-proof enclosure		IP54
Upper and lower terminals		open mouthed/lift terminals
Terminal protection		finger and hand touch safe, BGV A3, ÖVE-EN 6
Terminal capacity		1.5 - 35 mm <sup>2</sup> single wire 2 x 16 mm <sup>2</sup> multi wire
Terminal screw		M5 (with slotted screw acc. to EN ISO 4757-Z2, Pozidriv PZ2)
Terminal capacity warning contact		0.25-1.5 mm <sup>2</sup> (plug in terminals)
Terminal torque		2 - 2.4 Nm
Busbar thickness		0.8 - 2 mm
Operation temperature		
25-40 A		-25°C to +55°C
63 A		-25°C to +45°C
Storage- and transport temperature		-35°C to +60°C
Resistance to climatic conditions		25-55°C/90-95% relative humidity acc. to IEC 60068-2
Contact position indicator		red / green
Tripping indicator		white / blue
<b>Alarm contact</b>		
Nominal switching capacity @ 30 V DC (resistive load)		2 A
Nominal switching capacity @ 240 V AC (resistive load)		0.25 A
Maximum switching power (resistive load)		60 W
Maximum switching voltage DC		220 V
Maximum switching voltage AC		240 V
Maximum switching current		2 A
Minimum switching capacity (Reference value)		10 µA, 10 mV DC
Number of electrical operations		
Electrical (at 20 cpm) 2 A 30 V DC resistive		>10 <sup>5</sup>
Electrical (at 20 cpm) 1 A 30 V DC resistive		>5 x 10 <sup>5</sup>
Terminals		0.25 – 1.5 mm <sup>2</sup>

## Combined RCD/MCB Devices FRBdM Type G/A

10 kA, 1+N-pole

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



SG05713



### Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
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

SG05713



### Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
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

SG05713



### Characteristic D

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
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

## Combined RCD/MCB Devices FRBdM Type G/A

10 kA, 2-pole

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



	$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package	
<b>Characteristic B</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	
<b>Characteristic C</b>					
	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	
	<b>Characteristic D</b>				
		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	

## Technical Data

		FRBdM
<b>Electrical</b>		
Design according to		IEC/EN 61009
Current test marks as printed onto the device		
Number of protected poles		
1+N-pole		1
2-pole		2
Tripping		
Type G		line voltage-dependent, 10 ms delay 3 kA (8/20 $\mu$ s), 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		G/A
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 (1.2/50 $\mu$ s)
Characteristic		B, C, D
Maximum back-up fuse (short circuit)		100 A gL (>10 kA)
Endurance		
electrical components		$\geq 4,000$ operating cycles ( $I_n, U_n, \cos\varphi = 0.87$ )
mechanical components		$\geq 10,000$ operating cycles
<b>Mechanical</b>		
Frame size		45 mm
Device height		80 mm
Device width		35 mm (2MU)
Mounting		2-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, VBG4, ÖVE-EN 6
Terminal capacity rigid solid/stranded wire		1 - 25 mm <sup>2</sup>
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
Climatic conditions		acc. to IEC 68-2 (25..55°C / 90..95% RH)
Line side (supply)		lower terminals
Load side		upper terminals

Eaton is a power management company with 2015 sales of \$20.9 billion. Eaton provides energyefficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton has approximately 97,000 employees and sells products to customers in more than 175 countries.

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Powering Business Worldwide

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