

## RCCBs - Residual current circuit breakers EFI



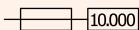




Residual current circuit breakers can be used in TN-S, TN-CS, TT and IT network systems, or with other words, in all systems where neutral and protective conductors are separated. Residual current circuit breakers EFI are used for protection against indirect contact (fault protection) and direct contact (additional protection) of parts under voltage. In the case of protection against indirect contact (fault protection) you can use residual current protective devices with a rated residual current of  $I_{\Delta n} \leq 300\text{mA}$ . Residual current protective devices with a rated residual current of  $I_{\Delta n} \leq 30\text{mA}$  fulfil the conditions for protection against direct contact (additional protection). For protection against fire, according to DIN VDE 0100-482 and IEC 60364-4-482, all cables and conductors in TN and TT systems must be protected by means of residual current protective devices with rated residual current of  $I_{\Delta n} \leq 300\text{mA}$ . In applications where resistive faults can cause a fire (radiant ceiling heating with panel heating elements), the rated residual current must be  $I_{\Delta n} = 30\text{mA}$ .

### Types



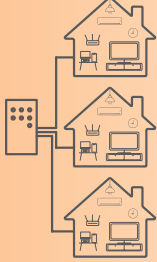



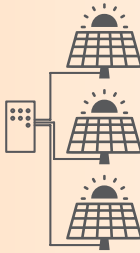
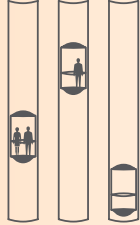



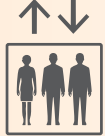
- **AC Type:** they are sensitive to alternating (sinusoidal) AC residual currents.
- **A Type:** they are sensitive to alternating (sinusoidal) AC residual currents and pulsating DC residual currents.
- **B Type:** they are sensitive to alternating (sinusoidal) AC residual currents, pulsating DC residual currents and smooth DC residual currents. Tripping values are defined up to 1 kHz.
- **B+ Type:** they are sensitive to alternating (sinusoidal) AC residual currents, pulsating DC residual currents and smooth DC residual currents. Tripping values are defined up to 20kHz and they are below 420mA.

### Classification regarding break time




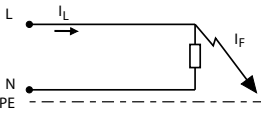
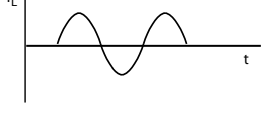
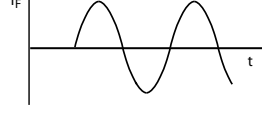
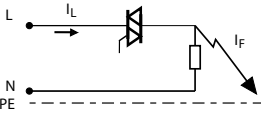
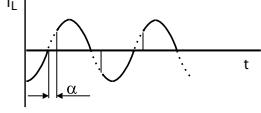
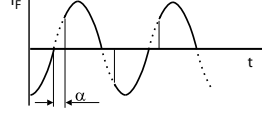
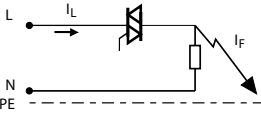
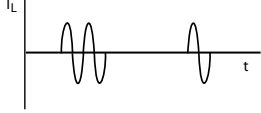
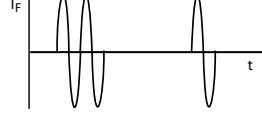
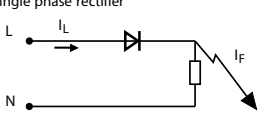
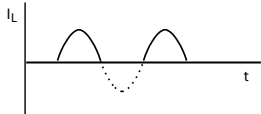
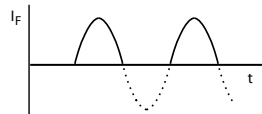
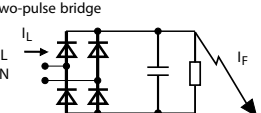
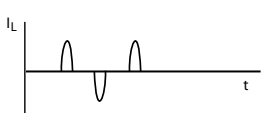
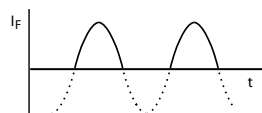
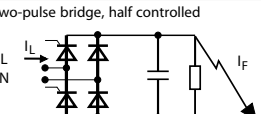
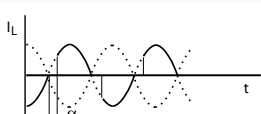
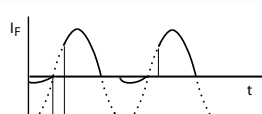
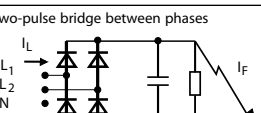
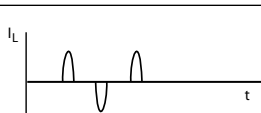
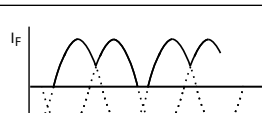
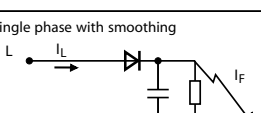

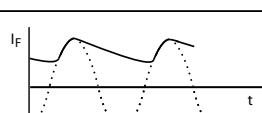
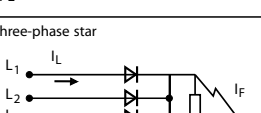
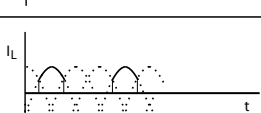
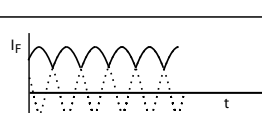
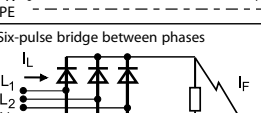
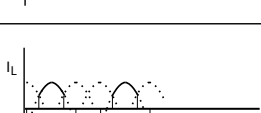
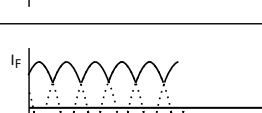
- **Instantaneous:** max. break time 40ms (Inst.)
- **G/KV:** Short time delay: time delayed min. 10ms and max. 40ms (G/KV)
- **S-Selective:** time delayed min. 40ms and max. 150ms (S)

EFI 2 (2M)		Type AC Inst.	Inst.	Type A G/KV	S
	For alternating residual current	✓	✓	✓	✓
	For alternating and pulsating direct residual current		✓	✓	✓
	Short-circuit capacity with back-up fuse	✓	✓	✓	✓
	Lower temperature limit of application -25°C	✓	✓	✓	✓
	VDE 0664, part 1 (up to 80 A)		✓		✓
	Short time delayed (10 - 40 ms)			✓	
	Selective (time delayed 40 - 150 ms)				✓

EFI 4 (4M)		Type AC Inst.	Inst.	Type A G/KV	S	Type B Inst.	G/KV	S	Type B+ Inst.	G/KV	S
	For alternating residual current	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	For alternating and pulsating direct residual current		✓	✓	✓	✓	✓	✓	✓	✓	✓
  	For alternating, pulsating direct and smooth DC residual current (up to 1kHz)					✓	✓	✓	✓	✓	✓
  	For alternating, pulsating direct and smooth DC residual current (up to 20kHz)								✓	✓	✓
	Short-circuit capacity with back-up fuse	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Lower temperature limit of application -25°C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	VDE 0664, part 1 (up to 80 A)		✓		✓	✓		✓	✓		✓
	Short time delayed (10 - 40 ms)			✓			✓			✓	
	Selective (time delayed 40 - 150 ms)				✓			✓			✓

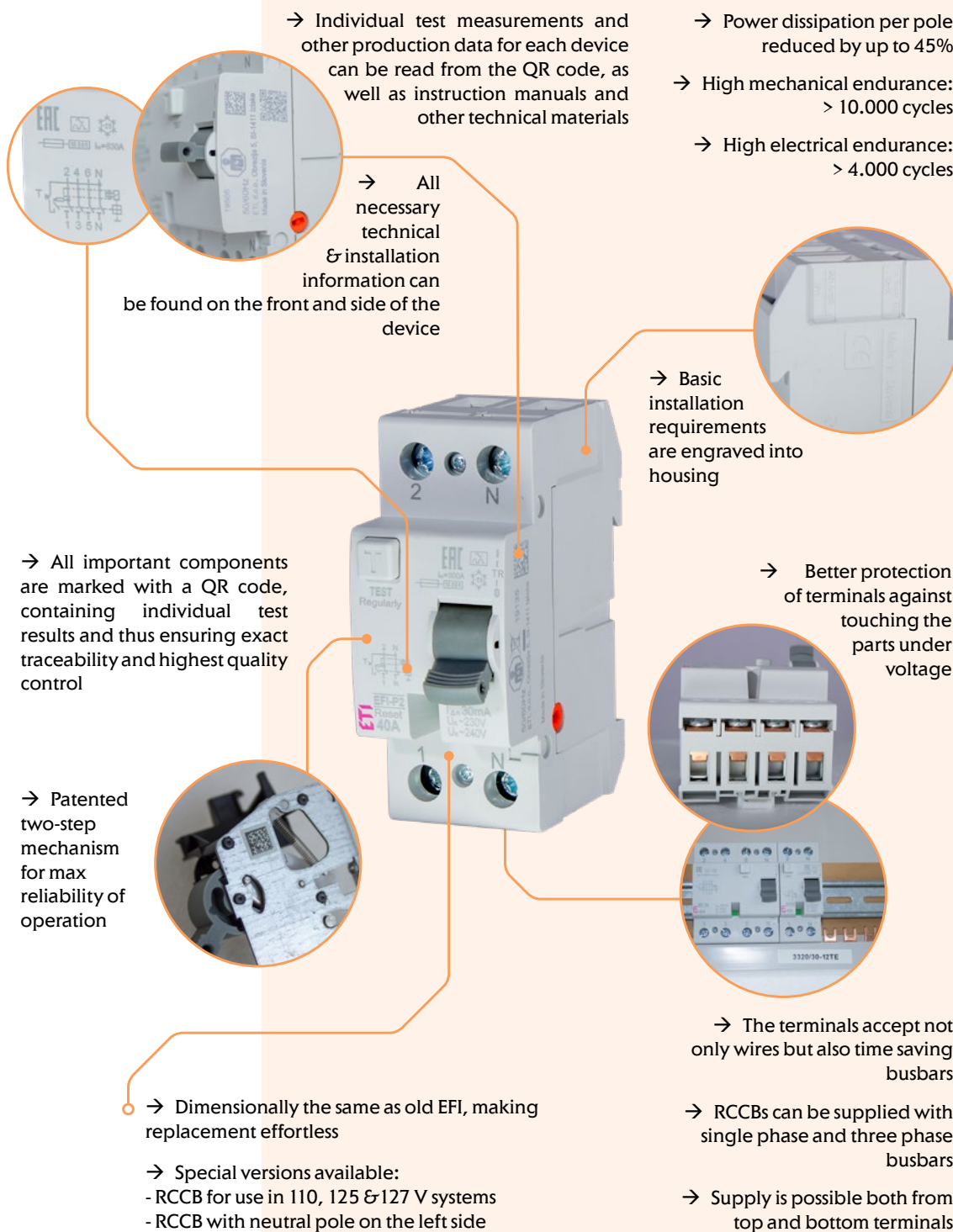
<p>Simple household installations without electronic components</p>  <p><b>AC type - Instantaneous</b> <b>2p / 4p</b> <math>I_n = 25, 32, 40, 63, 80, 100 \text{ A}</math> <math>I_{\Delta n} = 30, 100, 300, 500 \text{ mA}</math></p> <p><b>A type - Instantaneous</b> <b>2p / 4p</b> <math>I_n = 25, 40, 63, 80, 100 \text{ A}</math> <math>I_{\Delta n} = 30, 100, 300, 500 \text{ mA}</math></p> <p><b>A type - G/KV</b> (short-time delay: time delayed min. 10ms and max. 40ms) &amp; <b>S</b> (selective: time delayed min. 40ms and max. 150ms) <b>2p / 4p</b> <math>I_n = 25, 40, 63, 80, 100 \text{ A}</math> <math>I_{\Delta n} = 100, 300 \text{ mA}</math></p> <p><b>B type – Instantaneous</b> (Tripping values are defined up to 1kHz) <b>4p</b> <math>I_n = 25, 40, 63 \text{ A}</math> <math>I_{\Delta n} = 30, 100, 300 \text{ mA}</math></p> <p><b>B type - G/KV</b> (short-time delay: time delayed min. 10ms and max. 40ms) &amp; <b>S</b> (selective: time delayed min. 40ms and max. 150ms) <b>4p</b> <math>I_n = 25, 40, 63 \text{ A}</math> <math>I_{\Delta n} = 100, 300 \text{ mA}</math></p> <p><b>B+ type – Instantaneous</b> (Tripping values are defined up to 20kHz and they are below 420mA) according to VDE 0664-400 <b>4p</b> <math>I_n = 25, 40, 63 \text{ A}</math> <math>I_{\Delta n} = 30, 100, 300 \text{ mA}</math></p>	<p>Household installations with electronic components (LCD TV, computers, printers, wash machines, ...)</p> 	<p>Surge current proof 3kA (8/20μs). High immunity against unwanted tripping. For S: ensuring selectivity in case of serially connected RCD's</p> 	<p>Installations where 3f frequency converters and speed regulated machines are used (elevators, cranes). PV systems on a.c. side, Charging stations for electric vehicles, UPS, computer data centres, X-ray devices</p>   	<p>Surge current proof 3kA (8/20μs) High immunity against unwanted tripping. For S: ensuring selectivity in case of serially connected RCD's</p>  	<p>Requirement for increased fire protection according to VDE 0664-400</p>    
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# Use of AC, A, and B type of RCCB's in case of different fault conditions

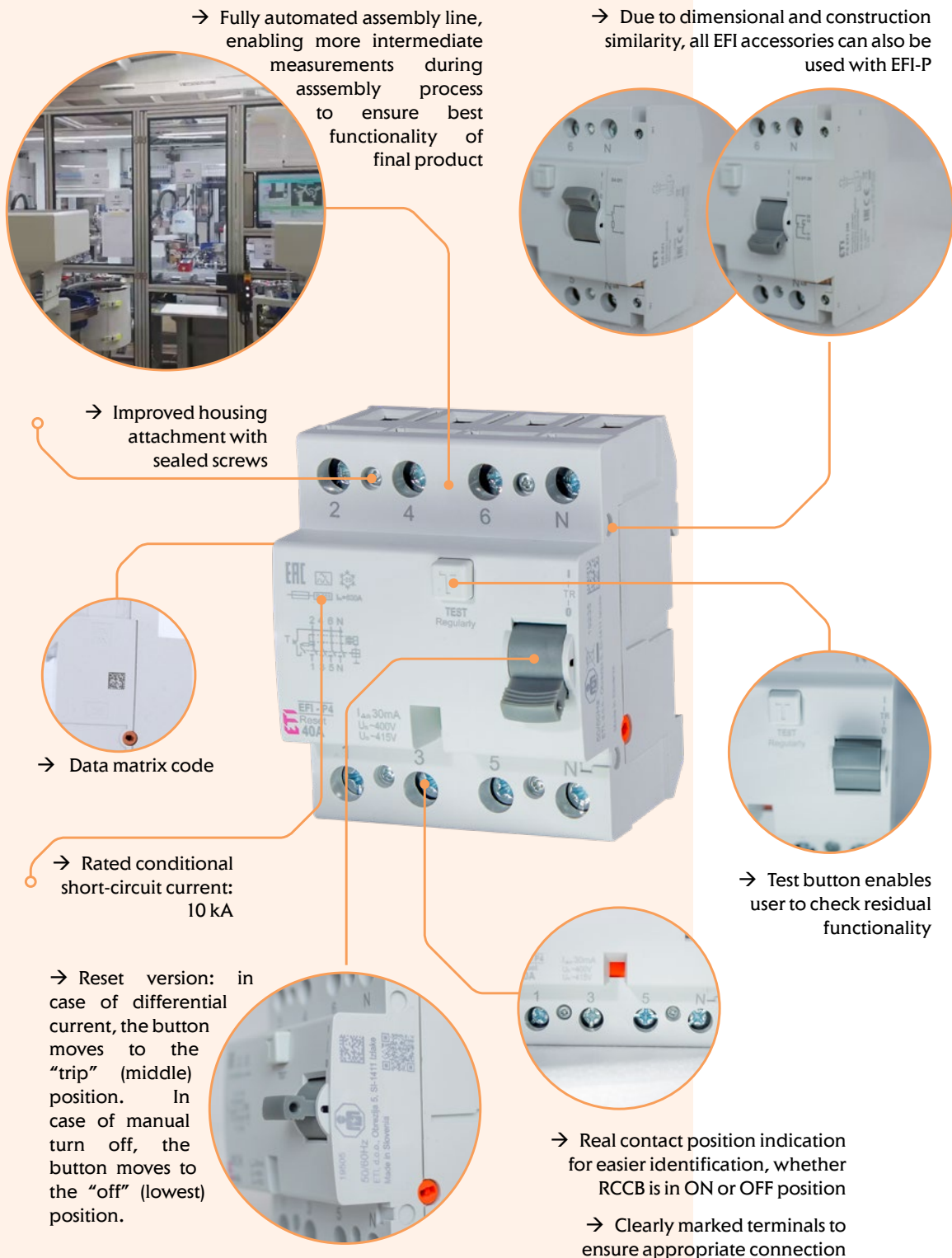
				AC	A	B, B+
	Connection	Normal mains current	Fault earth current			
1	Single phase 			✓	✓	✓
2	Phase control 			✓	✓	✓
3	Burst control 			✓	✓	✓
4	Single phase rectifier 				✓	✓
5	Two-pulse bridge 				✓	✓
6	Two-pulse bridge, half controlled 				✓	✓
7	Two-pulse bridge between phases 				✓	✓
8	Single phase with smoothing 					✓
9	Three-phase star 					✓
10	Six-pulse bridge between phases 					✓

# NEW EFI - P

## Features of residual current circuit breakers EFI-P



## Residual current circuit breakers



## A and AC type residual current circuit breaker EFI-P2 &amp; EFI-2

Rated residual current  
**0,03 - 0,5 A**Rated current  
**16 - 100 A**Type  
**A, AC**

16 - 80 A



100 A



G/KV



S

## EFI-P2 Instantaneous, EFI-P2R Instantaneous

I <sub>n</sub> [A]	I <sub>Δn</sub> [A]	Number of poles	Type A				Type AC	Weight [g]	Packaging [pcs]
				Reset**	127V***	NL****			
16	0,03	2	002061110	002061460	002061350	002061410	002061210	175	1/54
25	0,03	2	002061111	002061461	002061351	002061411	002061211	175	1/54
40	0,03	2	002061112	002061462	002061352	002061412	002061212	175	1/54
63	0,03	2	002061113	002061463	002061353	002061413	002061213	190	1/54
80	0,03	2	002061114	002061464	002061354	002061414	002061214	190	1/54
100	0,03	2	002062530*	-	-	-	002062531*	244	1/54
16	0,1	2	002061120	002061470	002061360	002061420	002061220	175	1/54
25	0,1	2	002061121	002061471	002061361	002061421	002061221	175	1/54
40	0,1	2	002061122	002061472	002061362	002061422	002061222	175	1/54
63	0,1	2	002061123	002061473	002061363	002061423	002061223	190	1/54
80	0,1	2	002061124	002061474	002061364	002061424	002061224	190	1/54
100	0,1	2	002062532*	-	-	-	002062533*	230	1/54
16	0,3	2	002061130	002061480	002061370	002061430	002061230	175	1/54
25	0,3	2	002061131	002061481	002061371	002061431	002061231	175	1/54
40	0,3	2	002061132	002061482	002061372	002061432	002061232	175	1/54
63	0,3	2	002061133	002061483	002061373	002061433	002061233	190	1/54
80	0,3	2	002061134	002061484	002061374	002061434	002061234	190	1/54
100	0,3	2	002062534*	-	-	-	002062535*	230	1/54
16	0,5	2	002061140	002061490	-	-	002061240	175	1/54
25	0,5	2	002061141	002061491	-	-	002061241	175	1/54
40	0,5	2	002061142	002061492	-	-	002061242	175	1/54
63	0,5	2	002061143	002061493	-	-	002061243	190	1/54
80	0,5	2	002061144	002061494	-	-	002061244	190	1/54

\* Old version (EFI-2)

\*\* Reset version: in case of differential current, the button moves to the "trip" (middle) position. In case of manual turn off, the button moves to the "off" (lowest) position.

\*\*\* For use in lower than standard system voltage (for instance 110V, 125V or 127V) system

\*\*\*\* Version with N-pole on the left side

## EFI-2 Short time delay &amp; Selective

I <sub>n</sub> [A]	I <sub>Δn</sub> [A]	Number of poles	Type A		Weight [g]	Packaging [pcs]
			G/KV-Short time delay	S-Selective		
25	0,03	2	002062727	-	197	1/54
40	0,03	2	002062728	-	197	1/54
63	0,03	2	002062729	-	206	1/54
25	0,1	2	002063727	002063732	193	1/54
40	0,1	2	002063728	002063733	193	1/54
63	0,1	2	002063729	002063734	196	1/54
100	0,1	2	-	002062501	230	1/54
25	0,3	2	002064727	002064732	198	1/54
40	0,3	2	002064728	002064733	198	1/54
63	0,3	2	002064729	002064734	204	1/54
100	0,3	2	-	002062502	230	1/54



## Residual current circuit breakers

## A and AC type residual current circuit breaker EFI-P4 &amp; EFI-4

Rated residual current  
**0,03 - 0,5 A**

Rated current  
**16 - 100 A**

Type  
**A, AC**

## EFI-P4 Instantaneous, EFI-P4R Instantaneous

I <sub>n</sub> [A]	I <sub>Δn</sub> [A]	Number of poles	Type A				Type AC	Weight [g]	Packaging [pcs]
				Reset**	127V***	NI****			
16	0,03	2	002061510	002061860	002061750	002061810	002061610	300	1/27
25	0,03	2	002061511	002061861	002061751	002061811	002061611	300	1/27
40	0,03	2	002061512	002061862	002061752	002061812	002061612	300	1/27
63	0,03	2	002061513	002061863	002061753	002061813	002061613	330	1/27
80	0,03	2	002062545*	-	-	-	002062145*	380	1/27
100	0,03	2	002062150*	-	-	-	002062151*	244	1/54
16	0,1	2	002061520	002061870	002061760	002061820	002061620	300	1/27
25	0,1	2	002061521	002061871	002061761	002061821	002061621	300	1/27
40	0,1	2	002061522	002061872	002061762	002061822	002061622	300	1/27
63	0,1	2	002061523	002061873	002061763	002061823	002061623	330	1/27
80	0,1	2	002063545*	-	-	-	002063145*	380	1/27
100	0,1	2	002062152*	-	-	-	002062153*	230	1/54
16	0,3	2	002061530	002061880	002061770	002061830	002061630	300	1/27
25	0,3	2	002061531	002061881	002061771	002061831	002061631	300	1/27
40	0,3	2	002061532	002061882	002061772	002061832	002061632	300	1/27
63	0,3	2	002061533	002061883	002061773	002061833	002061633	330	1/27
80	0,3	2	002064545*	-	-	-	002064145*	380	1/27
100	0,3	2	002062154*	-	-	-	002062155*	230	1/54
16	0,5	2	002061540	002061890	-	-	002061640	300	1/27
25	0,5	2	002061541	002061891	-	-	002061641	300	1/27
40	0,5	2	002061542	002061892	-	-	002061642	300	1/27
63	0,5	2	002061543	002061893	-	-	002061643	330	1/27
80	0,5	2	002065545*	-	-	-	002065145*	380	1/27

\* Old version (EFI-4)

\*\* Reset version: in case of differential current, the button moves to the "trip" (middle) position. In case of manual turn off, the button moves to the "off" (lowest) position.

\*\*\* For use in lower than standard system voltage (for instance 110V, 125V or 127V) system

\*\*\*\* Version with N-pole on the left side

## EFI-4 Short time delay &amp; Selective

I <sub>n</sub> [A]	I <sub>Δn</sub> [A]	Number of poles	Type A		Weight [g]	Packaging [pcs]
			G/KV-Shorttimedelay	S-Selective		
25	0,03	4	002062747	-	328	1/27
40	0,03	4	002062748	-	328	1/27
63	0,03	4	002062749	-	350	1/27
25	0,1	4	002063747	002063752	320	1/27
40	0,1	4	002063748	002063753	320	1/27
63	0,1	4	002063749	002063754	338	1/27
100	0,1	4	-	002062503	407	1/27
25	0,3	4	002064747	002064752	320	1/27
40	0,3	4	002064748	002064753	320	1/27
63	0,3	4	002064749	002064754	338	1/27
100	0,3	4	-	002062504	372	1/27



16 - 63 A



100 A



G/KV



S

# NEW EFI B and B+ type

## Features and advantages of UNIVERSAL CURRENT SENSITIVE RCCBs B type and B+ type

### APPLICATION

- Fault protection (protection against indirect contact of live parts)
- Additional protection (protection in case of direct contact of live parts,  $I_{\Delta n} \leq 30\text{mA}$ )
- Fire Protection (for locations exposed to fire hazard)

### Residual current sensitivity – UNIVERSAL

AC pure sinus residual current, 50/60Hz

A sinus and pulsating direct current, 50/60Hz

**B AC + A + smooth direct current + high frequency (1 kHz)**

**B+ AC + A + smooth direct current + high frequency (20kHz)**

### Basic types

#### according to rated values:

4p B  $I_n = 25\text{A}, 40\text{A}, 63\text{A}, I_{\Delta n} = 30\text{mA}, 100\text{mA}, 300\text{mA}$

4p B+  $I_n = 25\text{A}, 40\text{A}, 63\text{A}, I_{\Delta n} = 30\text{mA}, 100\text{mA}, 300\text{mA}$

#### according to breaking times:

4p B, B+ instantaneous, short time delayed (G/KV), selective (S)

#### according to the number of poles:

4p, 2p

### Standards

IEC/EN 61008-1 basic standard for RCCB's AC and A type

IEC/EN 62423 additional requirements for type B

VDE 0664-400 B+ VDE standard for B+ requirements (20kHz)

### Mode of operation

Pure a.c. and pulsating d.c. type residual current sensitivity, A voltage independent

Smooth d.c. current sensitivity: B, B+ voltage dependent

Minimum operating voltage: 50V

### Typical applications

Which are vulnerable to smooth d.c. residual currents:

- Frequency converters,
- Photovoltaic systems, a.c side,
- Charging stations for electric vehicles,
- Variable speed machine tools,
- UPS, computer data centres
- Elevator controls,
- Cranes of all kinds
- Electronic equipment on construction sites,
- Test set-ups in laboratories,
- Installation in general where we can expect d.c. smooth direct residual currents, etc.



## Residual current circuit breakers

## B type residual current circuit breaker EFI-4 B Instantaneous

Rated residual current  
**0,03 - 0,3 A**Rated current  
**25 - 63 A**Type  
**B (Instantaneous)**

## EFI-4 B Instantaneous

$I_n$ [A]	$I_{\Delta n}$ [A]	Number of poles	Code No	Weight [g]	Packaging [pcs]
25	0,03	4	002062642	335	1/27
40	0,03	4	002062643	335	1/27
63	0,03	4	002062644	340	1/27
25	0,1	4	002063642	335	1/27
40	0,1	4	002063643	335	1/27
63	0,1	4	002063644	340	1/27
25	0,3	4	002064642	335	1/27
40	0,3	4	002064643	335	1/27
63	0,3	4	002064644	340	1/27



## B+ type residual current circuit breaker EFI-4 B+ Instantaneous

Rated residual current  
**0,03 - 0,3 A**Rated current  
**25 - 63 A**Type  
**B+ (Instantaneous)**

## EFI-4 B+ Instantaneous

$I_n$ [A]	$I_{\Delta n}$ [A]	Number of poles	Code No	Weight [g]	Packaging [pcs]
25	0,03	4	002062647	335	1/27
40	0,03	4	002062648	335	1/27
63	0,03	4	002062649	340	1/27
25	0,1	4	002063647	335	1/27
40	0,1	4	002063648	335	1/27
63	0,1	4	002063649	340	1/27
25	0,3	4	002064647	335	1/27
40	0,3	4	002064648	335	1/27
63	0,3	4	002064649	340	1/27



## B type residual current circuit breaker EFI-4 B G/KV-Short time delay

Rated residual current  
**0,03 - 0,3 A**Rated current  
**25 - 63 A**Type  
**B (G/KV-Short time delay)**

## EFI-4 B G/KV-Short time delay

$I_n$ [A]	$I_{\Delta n}$ [A]	Number of poles	Code No	Weight [g]	Packaging [pcs]
25	0,03	4	002062652	340	1/27
40	0,03	4	002062653	340	1/27
63	0,03	4	002062654	345	1/27
25	0,1	4	002063652	340	1/27
40	0,1	4	002063653	340	1/27
63	0,1	4	002063654	345	1/27
25	0,3	4	002064652	340	1/27
40	0,3	4	002064653	340	1/27
63	0,3	4	002064654	345	1/27



## B type residual current circuit breaker EFI-4 B S-Selective

Rated residual current  
**0,1 - 0,3 A**

Rated current  
**25 - 63 A**

Type  
**B (S-Selective)**



### EFI-4 B S-Selective

$I_n$ [A]	$I_{\Delta n}$ [A]	Number of poles	Code No	Weight [g]	Packaging [pcs]
25	0,1	4	002063662	340	1/27
40	0,1	4	002063663	340	1/27
63	0,1	4	002063664	345	1/27
25	0,3	4	002064662	335	1/27
40	0,3	4	002064663	335	1/27
63	0,3	4	002064664	340	1/27

## Accessories for residual current circuit breakers EFI (16 - 80 A)

The PS EFI is fixed to EFI series switches. The width of the device is 9 mm, other dimensions are in compliance with EFI switches. The auxiliary switch PS EFI is used for the remote signalling of the state of contact's condition (closed/open) of EFI switches. During fitting, the EFI must be switched off. PS EFI and DA EFI can not be mounted both together, because both can only be mounted on the right side of EFI.



### Auxiliary Switch PS EFI

Type	Contact	Code No.	Weight [g]	Packaging [pcs]
PS EFI - MD	b-contact/a-contact	002069001	50	1/12
PS EFI - 2M	2 x b-contact	002069002	50	1/12
PS EFI - 2D	2 x a-contact	002069003	50	1/12

a - contact = make contact (NO)

b - contact = break contact (NC)

### Sealing piece EFI-2

Code No.	Weight [g]	Packaging [pcs]
002069011	2	2

### Sealing piece EFI-4

Code No.	Weight [g]	Packaging [pcs]
002069012	3	2

### Shunt trip release DA EFI

Type	Code No.	Weight [g]	Packaging [pcs]
DA EFI	002069004	45	1/12

## Residual current circuit breakers

**NEW EFI eV**

### Features and advantages of Residual Current Circuit Breakers for Protection of EV Charging Stations EFI eV

- Meets requirements from standard IEC 60364-7-722 --> Low-Voltage electrical Installations - Requirements for special installations or locations - Supplies for electric vehicles
- All necessary technical & installation information can be found on the front and side of the device
- Individual test measurements and other production data for each device can be read from the QR code, as well as instruction manuals and other technical materials
- detects smooth DC residual currents above 6 mA
- Better protection of terminals against touching the parts under voltage
- Basic installation requirements are engraved into housing
- Rated conditional short-circuit current: 10 kA
- RCCBs can be supplied with single phase and three phase busbars
- Supply is possible both from top and bottom terminals
- Clearly marked terminals to ensure appropriate connection
- Real contact position indication for easier identification, whether RCCB is in ON or OFF position

### Residual Current Circuit Breakers for Protection of EV Charging Stations EFI eV

Rated residual current <b>0,03 A</b>	Rated current <b>25 - 63 A</b>	Type <b>A</b>
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#### EFI eV

$I_n$ [A]	$I_{\Delta n}$ [A]	Number of poles	Type A	Weight [g]	Packaging [pcs]
25	0,03	4	002062632	328	1/27
40	0,03	4	002062633	328	1/27
63	0,03	4	002062634	328	1/27