

# MINIATURE CIRCUIT BREAKERS



IEC / EN 60898-1  
CE

Mounting Position : Free  
 Altitude : 2000m (max)  
 Relative Humidity : %50 (40°C), %90 (20°C)  
 Ambient Temperature : between -25°C and 60°C<sup>⊕</sup>  
 Pollution Degree : II  
 Protection Degree : IP20

IEC / EN 60947-2  
CE

Mounting Position : Free  
 Altitude : 2000m (max)  
 Relative Humidity : %50 (40°C), %90 (20°C)  
 Ambient Temperature : between -25°C and 60°C<sup>⊕</sup>  
 Pollution Degree : II  
 Protection Degree : IP20

IEC / EN 60947-3  
CE

Mounting Position : Free  
 Altitude : 2000m (max)  
 Relative Humidity : %50 (40°C), %90 (20°C)  
 Ambient Temperature : between -10°C and 60°C<sup>⊕</sup>  
 Pollution Degree : III  
 Protection Degree : IP20

IEC / EN 60947-4-1 IEC / EN 61095  
CE

Mounting Position : Face Down  
 Altitude : 2000m (max)  
 Relative Humidity : %50 (40°C), %90 (55°C)  
 Ambient Temperature : between 25°C and 60°C<sup>⊕</sup>  
 Pollution Degree : III  
 Protection Degree : IP20

All these given information are general. We have always right to change them.

## Miniature Circuit Breakers

FM3 - FM6 - FM10  
0,5A ... 63A



FM6L - FM10L  
80A ... 125A



FM10 DC  
0,5A ... 63A



FM10L DC  
80A ... 125A



## Miniature Circuit Breakers Boxes



## ATS with MCB



FIR (Impulse Relay)  
16A



FMS Disconnectors  
40A ... 125A

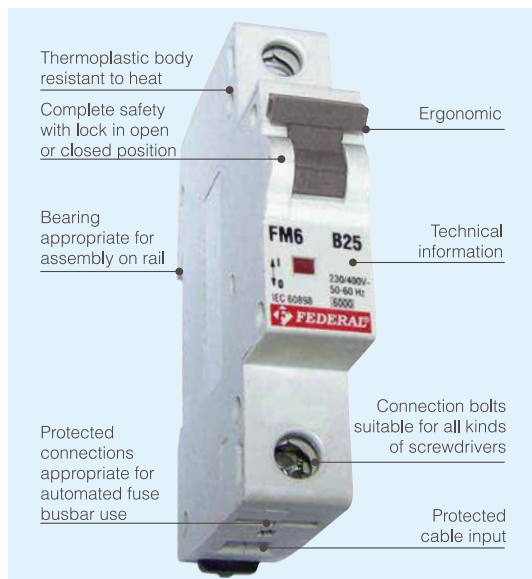


## Installation Contactors

20A ... 63A



**MINIATURE CIRCUIT BREAKERS (IEC / EN 60898-1), (IEC / EN 60947-2)**



Federal miniature circuit breakers protect the electrical circuit they are connected to against over current and short circuits. They allow easy open-close of the circuit. Miniature circuit breakers are manufactured with 1,2,3,4 poles and 1 phase + neutral, 3 phase + neutral from 0,5A to 125A in accordance **CE**. There are three separate types as B, C, and D. In case of a short circuit, B types open the circuit at 3 or 5 times more than nominal current, C types open the circuit at 5 or 10 times more than the nominal current and D types open the circuit at 10 or 20 times more than the nominal current. Miniature circuit breakers with 2, 3, 4 poles disable the device they are connected to, thanks to their mechanisms in case of a failure in any phase.

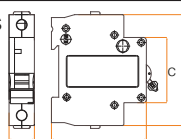
**B Curve:** Used in illumination of houses, plugs and control circuit.

**C / D Curve:** Used in inductive loads like transformers, several fluorescent lamps etc.

The device opening the current is enabled by lifting the lever in case of any failure. Lever-free opening mechanism shall open the current again as the failure continues. Federal miniature circuit breakers open the circuit in a very short time in case of a short circuit current are limited. It provides ease in assembly thanks to the desing of connection terminals, accidentally touches

are eliminated. Federal miniature circuit breakers resist an ambient temperature of 55°C and resist a relative humidity of 95%. 25mm<sup>2</sup> cable can be connected to specially-designed cable inputs.



TYPE		FMN	FM6E	FM3	FM6	FM10	FM6L	FM10L	FM10 DC	FM10L DC	
Standard		IEC 60898-1					IEC 60947-2				
Rated Current- I <sub>n</sub>	A	1-32	1-63	1-63	1-63	1-63	80-125	80-125	0,5-63	80-125	
Number of Poles		IP+N	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	
Rated Insulation Voltage - U <sub>i</sub>	V	500	690	690	690	690	690	690	690	690	
Rated Impulse Withstand Voltage - U <sub>imp</sub>	kV	4	4	6	6	6	4	4	6	6	
Rated Operating Voltage U <sub>e</sub> (V)	50-60 Hz (1P)	230	230	230	230	230	230	230	-	-	
	50-60 Hz (2P, 3P, 4P)	-	400	400	400	400	400	400	-	-	
	DC (1P)	-	60	60	60	60	60	60	250 <sup>①</sup>	250 <sup>①</sup>	
Rated Short Circuit Breaking Capacity	kA	4,5	6	3	10	10	6	10,15 <sup>③</sup>	10	10	
Protection Characteristics	Thermal	In	In	In	In	In	In	In	In	In	
	Magnetic <sup>②</sup>	B,C	B,C,D	B,C,D	B,C,D	B,C,D	8In		10In		
Mechanical Life	Operation	>20000									
Electrical Life	Operation	>4000									
Min-Max Connection Sections	mm <sup>2</sup>	1-10	1-25	1-25	1-25	1-25	1-50	1-50	1-25	1-50	
Min-Max Tightening Torque	Nm	1-2	2-3	2-3	2-3	2-3	3-5	3-5	2-3	3-5	
Shunt Trip Release		□230V	-	□230V			-	□230V			
Auxiliary Contact Block		□1NO+1NC	-	□1NO+1NC			-	□1NO+1NC			
Dimensions 	a <sup>④</sup>	18	18	18	18	18	27	27	18	27	
	b	67	66	66	66	66	66	67	66	66	
	c	45	45	45	45	45	45	45	45	45	
	d	82	82	82	82	82	80	90	82	90	

□ Upon Request  
 ① 2P Series: 500V, 3P Series: 750, 40P Series: 1000V  
 ② B: 3-5In, C:5-10In, D: 10-20In (x 1.4 at DC)  
 ③ 15kA / 230V (2P)  
 ④ Dimension specified in "a" line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)

**MINIATURE CIRCUIT BREAKERS (IEC / EN 60898-1), (IEC / EN 60947-2)**

	Rated current In (A)	Breaking capacity Ics (kA)	Order Codes	Δ : For type B (B), for type C (C), for type D (D)
			Characteristic B / C / D	
 FM3-FM6E-FM6-FM10E-FM10	2-63	3	9EC-Δ033□-0D##	□ : Number of poles (1,2,3,4) ## : Fuse rated current (0,5...125) ☆ : G for FM6E or FM10E, D for FM6 or FM10.
	0,5-63	4,5	9ED-Δ043□-0D##	
	0,5-63	6	9E☆-Δ063□-0D##	
	0,5-63	10	9EE-Δ103□-0D##	

Connection Diagram	1 pole	1 phase + Neutral	2 pole	3 pole	3 phase + Neutral	4 pole

**\*At DC voltage**

- Overload protection (thermal) characteristic is same as AC voltage.
  - Short circuit protection (magnetic) characteristic is %40 higher than AC voltage.
- Circuit Breakers produced for AC system, work at DC 60V voltage per pole.

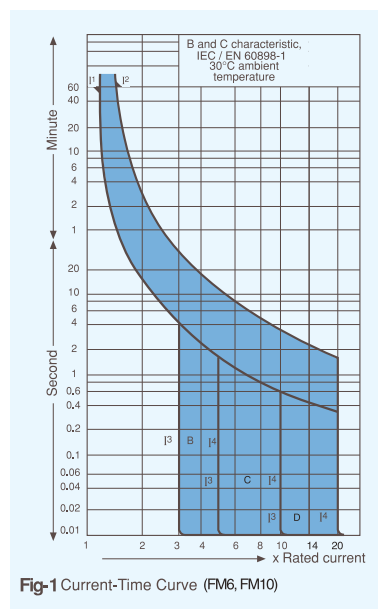
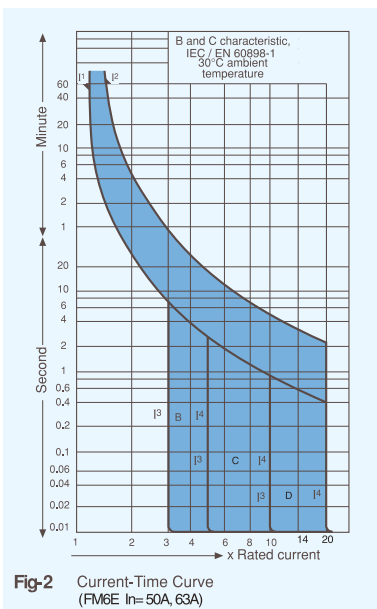
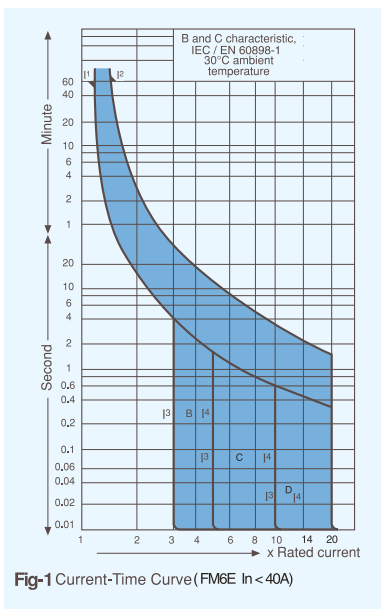
**Temperature Effect in Automatic Fuses:**

The thermal overload protection characteristics change due to the temperature of the automatic fuses. From the calibrated temperature it will trip earlier than its nominal value if it operates in a warmer environment. If you work in a cooler environment it opens later. Federal automatic fuses are calibrated to 30 ° C as standard. Different on request calibration can also be performed for ambient temperatures. The table below shows the calibrated automatic fuse according to 30 ° C operating currents are given for different ambient temperatures. 40 A calibrated to ambient temperature of 30 ° C the operating current of the fuse at 50 ° C is found on the table 36A.

In (A)	Compensation Factor According to Ambient Temperature (k) (Calibration Temperature 30°C)						
	10°C	20°C	30°C	40°C	50°C	55°C	60°C
0,5	0,6	0,5	0,5	0,5	0,5	0,4	0,4
1	1,1	1,1	1,0	1,0	0,9	0,9	0,9
2	2,2	2,1	2,0	1,9	1,8	1,8	1,7
3	3,3	3,2	3,0	2,9	2,7	2,6	2,6
4	4,4	4,2	4,0	3,8	3,6	3,5	3,4
6	6,6	6,3	6,0	5,7	5,4	5,3	5,1
10	11,0	10,5	10,0	9,5	9,0	8,8	8,5
16	17,6	16,8	16,0	15,2	14,4	14,0	13,6
20	22,0	21,0	20,0	19,0	18,0	17,5	17,0
25	27,5	26,3	25,0	23,8	22,5	21,9	21,3
32	35,2	33,6	32,0	30,4	28,8	28,0	27,2
40	44,0	42,0	40,0	38,0	36,0	35,0	34,0
50	55,0	52,5	50,0	47,5	45,0	43,8	42,5
63	69,3	66,2	63,0	59,9	56,7	55,1	53,6
80	88,0	84,0	80,0	76,0	72,0	70,0	68,0
100	110,0	105,0	100,0	95,0	90,0	87,5	85,0
125	137,5	131,3	125,0	118,8	112,5	109,4	106,3

Since a large number of auto fuses running side by side in a box will affect each other, it will fall even further. In this case, the rated current of the auto-fuse is multiplied by 0.8 to obtain the new rated current. For example, if the 25A automatic fuse runs side-by-side with many fuses in a 40 ° C environment, the current is found to be 23.8 x 0.8 = 19 A.

**MINIATURE CIRCUIT BREAKERS (IEC / EN 60898-1), (IEC / EN 60947-2)**



Characateristic	B	C	D
I1 ( t > 1h )	1,13 x In	1,13 x In	1,13 x In
I2 ( t < 1h )	1,45 x In	1,45 x In	1,45 x In
I3 ( t > 0,1s )	3 x In	5 x In	10 x In
I4 ( t < 0,1s )	5 x In	10 x In	20 x In

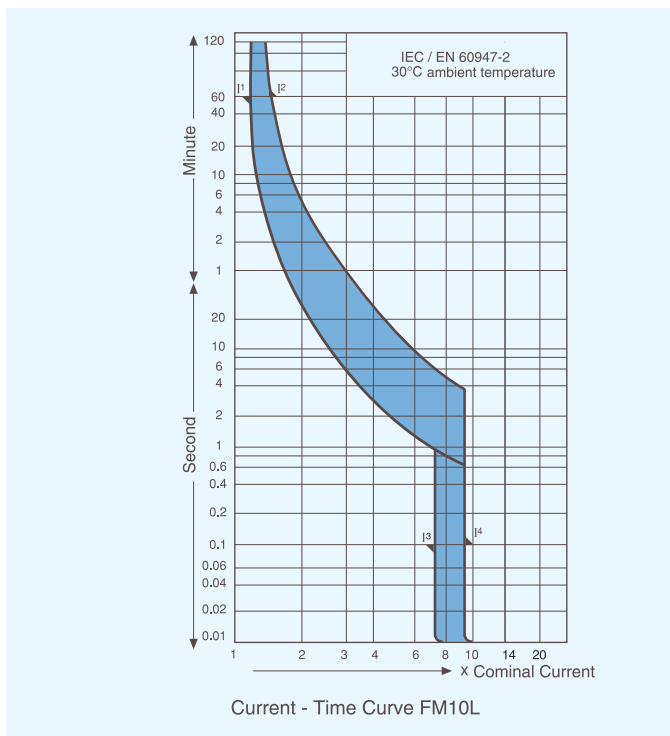
	Current
I1 ( t ≥ 2h )	1,05 In
I2 ( t < 2h )	1,3 In
I3 ( t > 0,2s )	8 x 0,8 x In
I4 ( t < 0,2s )	8 x 1,2 x In



Miniature Circuit Breakers protect electrical circuits against overload and short-circuit current. They provide ON-OFF switching easily. 6, 10 kA Federal Miniature Circuit Breaker is manufactured between the ranges 80A - 125A and 1, 2, 3, 4 poles. It is manufactured in accordance with IEC 60947-2 standard and CE norms. In the event of failure on any phase, 1, 2, 3, 4 poles circuit breakers obtain to not being put into use of device.

**Technical Specifications::**

Type	FM6L / FM10L	
Breaking capacity	kA <sub>rms</sub>	FM6L 400V 6kA / FM10L 230V 15kA - 400V 10kA
Rated current	A	80, 100, 125
Rated operating voltage - U <sub>e</sub>	V	230/400
Rated insulation voltage - U <sub>i</sub>	V	630
Rated impulse withstand voltage - U <sub>imp</sub>	kV	6
Number of poles		1, 2, 3, 4
Frequency	Hz	50 - 60
Mechanical life	operation	>20.000
Electrical life	operation	>10.000
Min. - max. connection section	mm <sup>2</sup>	1 ... 50
Min. - max. clamping torque	Nm	3 - 5
Standard		IEC / EN 60947-2



**MINIATURE CIRCUIT BREAKERS (IEC / EN 60898-1), (IEC / EN 60947-2)**

FM10L  1 pole	 2 pole	 3 pole	 4 pole	Rated current In (A)	Breaking capacity Ics (kA)	Order codes
				80	6	9EF-C033 □-D080
100	6	9EF-C033 □-D100				
125	6	9EF-C033 □-D125				
80	10	9EF-C103 □-D080				
100	10	9EF-C103 □-D100				
125	10	9EF-C103 □-D125				

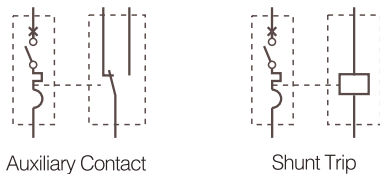
For FM6L-FM10L, desired number of poles is written in □ part (1,2,3,4)

**Accessories**



Type		Order Code
Shunt Trip - FM6 - FM10 - FM10L-AB	AC 230V	9EF-BA□00-D220
Auxiliary Contact - FM6 - FM10 - FM10L-YK	1NO / 1NC	9EF-A□11-D000

□ : 1 for FM6-FM10; 0 for FM10L.



**AUTOMATIC TRANSFER SYSTEMS with MCB (IEC / EN 60947-2)**



**Technical Features:**

Standard	TS EN 60947-6-1
Circuit Breaker Rated Current (In)	0,5A ~ 125A
Pole number	1, 2, 3, 4
Control Voltage	140 - 270V
Auxiliary Control Voltage	10 - 15V DC
Jenerator Start-Stop Time Adjustment	0,5 - 90 seconds (adjustable)
System Voltage	415V
Mechanical Life	10.000
Operating Temperature	-20 ~ +60°C
Protection Class	IP20
Pollution Level	II / 2

**Product Types and Amps**

FM6 / 6kA	0,5A ... 63A
FM10 / 10kA	0,5A ... 63A
FM10L / 10kA	80A ... 125A

**MINIATURE CIRCUIT BREAKERS BOXES**

- General Technical Specifications**
- Material: Thermoplastic
  - Standard color: White
  - Recommended assembly temperature: before -15°C and + 60°C
  - Field of use: Flush mounted and surface mounted installations

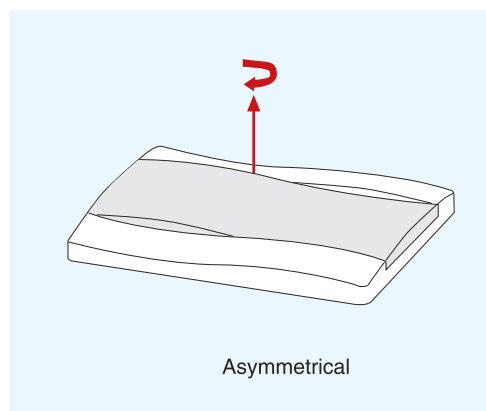
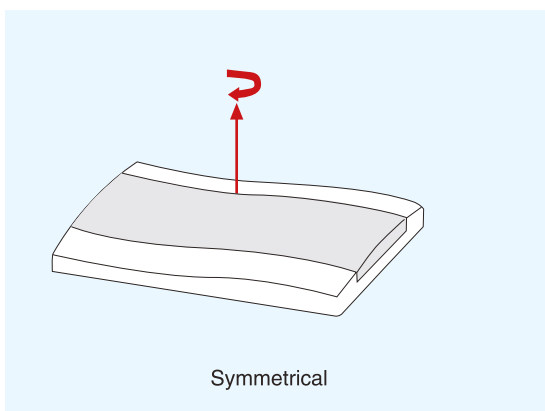
- Circuit labels, ground busbars, automated assembly rail are present.
- Model of 1, 2, 3, 4, 6, 8, 9, 12, 18, 24
- Cover opening towards right or left.
- High-strength cover.
- Opening direction of covers may be reversed to right or left.

**PLASTIC BOXES (IEC / EN 60670-1)**



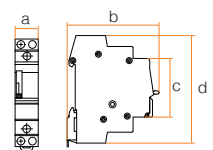
Technical Specification	
Material	Thermoplastic
Number of Ways	1, 2, 3, 4, 6, 8, 9, 12, 18, 24
Ambient Temperature	-15°C ... +60°C
Type	Flush Mounted / Surface Mounted
Color	White

Symmetrical and asymmetrical used cover. 180° opening cover.



Symmetrical and asymmetrical used cover

**IMPULSE RELAY (IEC 669-1, EN 669-2-2)**

TYPE	Coil V AC 50 / 60Hz	Coil V DC	Power Circuit AC 1
1NA	230	110	16A-250V
2NA	230	110	16A-250V
1NA+1NK	230	110	16A-250V
Dimensions 	a mm		18
	b mm		71
	c mm		45,6
	d mm		83,75



Impulse Current Breakers are used to control lightning from two or more points. Traditionally, the need for controlling lightning circuits in larger areas from various points was met by using wavy-key system. Limited number of keys, high material and installation costs creates a need for more economical and comfortable solutions. The product were developed to overcome this deficiency and presented to the end-users. According to the changing position principle of contacts when switched as the number of connection terminals will be the same regardless of the number of keys, 80% of the time during cable pulling and 50% savings in cable length is achieved.

**Specifications of Impulse Current Breaker:**

- 24V-48V-230V coil voltage
- The modularity
- Rail mounting feature
- Auxiliary contacts can be added

**Connection Capacity:**

- Rigid Conductor 10mm<sup>2</sup>
- Flexible Conductor 6mm<sup>2</sup>

**Description:**

For control of lighting circuits in private buildings, small industry buildings. Latching relays operate when pulsed by a signal voltage. The pulse can be provided via a push button or switch. The first impulse sets the relay into its set (opposite) state, the next impulse returns it to its reset (original) state.

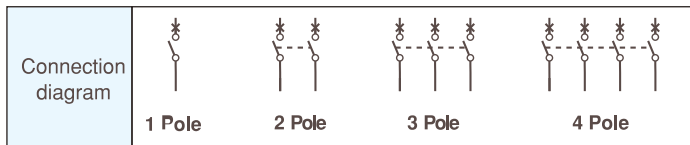
**ISOLATORS (IEC / EN 60947-3)**



TYPE		FMS	FMS-DC	
Number of Poles		1, 2, 3, 4	1, 2, 3, 4	
Utilization Category		AC-22A	DC-21	
Rated Current I <sub>n</sub>		A 40, 63, 80, 100, 125	40, 63, 80, 100, 125	
Rated Insulation Voltage U <sub>i</sub>		V 800	800	
Rated Operation Voltage U <sub>e</sub>	50/60 Hz (1P)	230V	-	
	50/60 Hz (2P,3P,4P)	400V	-	
	DC (1P) (1P)	-	250V <sup>①</sup>	
Rated Impulse Withstand Voltage U <sub>imp</sub> kV		6	6	
Short-Time Withstand Current		12xI <sub>n</sub>	12xI <sub>n</sub>	
<b>Size Type</b>		<b>Type-1 (AC)</b>	<b>Type-1 (DC)</b>	<b>Type-2 (DC)</b>
<b>Rated Current</b>		<b>40, 63, 80, 100, 125</b>	<b>40, 63</b>	<b>80, 100, 125</b>
Dimensions	<sup>②</sup> a mm	17,6	18	26,3
	b mm	79,1	66	67,5
	c mm	45	45	45
	d mm	81	81,5	90

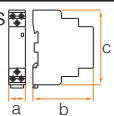
① 2P Series: 500V, 3P Series: 750, 40P Series: 1000V  
 ② Dimension specified in "a" line, is increasing according to number of poles. (2P=a x 2, 3P=a x 3, 4P=a x 4)

On-off switches without thermal and magnetic protection feature are called isolators. Federal switches are manufactured in accordance with TS EN 60947-3 standard and **CE** norms from 40A to 125A with 1, 2, 3 and 4 poles. Thanks to their 2, 3 and 4 poles switch lever mechanisms, they break the system simultaneously. They can be used safely with distribution and control elements.



**INSTALLATION CONTACTORS (IEC / EN 60947-4-1), (IEC / EN 61095)**



TYPE		FCR2020	FCR4020	FCR6320	FCR4040	FCR6340	
Number of Pole		2	2	2	4	4	
Ie AC1 / AC7a	A	20	40	63	40	63	
Operation Voltage	AC V	230	230	230	400	400	
Insulation Voltage U <sub>i</sub>	V	500	500	500	500	500	
Number of Contact		2NO	2NO	2NO	4NO	4NO	
Dimensions		a mm	18	36	36	53,5	53,5
		b mm	65,5	66,8	66,8	65,5	65,5
		c mm	81	81	81	84,5	84,5

**Installation Contactors**

**Area of Usage**

- Small engines
- At residential and office, at the power control of the last distribution circuit.
- Lighting
- Heating, pumps and furnaces
- Water heating for home using

Impact voltages and currents, which occur in illumination applications from time to time, may force the contactor.

It has been classified in terms of type behavior and closing-breaking operation for selection. While contactor is selected for illumination circuits, important factors are bulb type, connection, whether there is compensation or not, start-up and operating current and power factor. While the contactor is loaded up to 15 times of the lamp rated current during closing in filament lamps, breaking current is equal to rated current.

Compensation is very important in discharge and florescent lamps. In high pressure mercury vapor lamps, a current occurs at two times of the operating current during pre-heating period (approximately 5 minutes). This regime period is about 10 minutes in halogen lamps and sodium vapor lamps.

**Technical Features:**

Type	Using Category	Insulation Voltage U <sub>i</sub> (V)	Operating Voltage U <sub>e</sub> (V~)	Rated of Heat Current (A)	Ie (A)	Control Power (kW)
FCR2020	AC-1,AC-7a	500	230	20	20	3,6
FCR4040	AC-1,AC-7a	500	400	40	40	22
FCR6340	AC-1,AC-7a	500	400	63	63	34

**Effect of ambient temperature to rated operating current of installation contactors:**

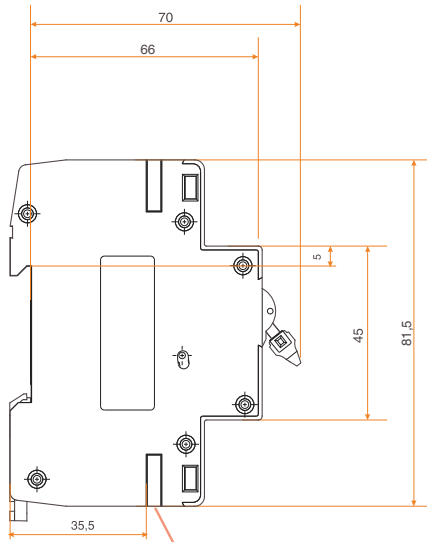
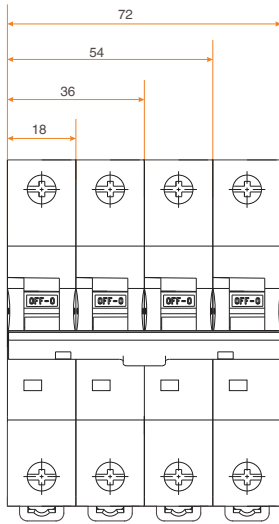
Rated Current (A)	40°	50°	60°	70°
Ie=20	20A	18A	16A	14A
Ie=40	40A	38A	36A	32A
Ie=63	63A	57A	50A	46A

**Number of Lamp which can be controlled by installation contactors:**

Tungsten Filamanlı ve Halojen Ampuller 230V									
Güç	40W	60W	75W	100W	150W	200W	300W	500W	1000W
20A	45	35	29	29	14	12	8	5	2
40A	118	87	72	72	36	26	18	11	7
63A	150	112	95	95	47	34	25	15	8

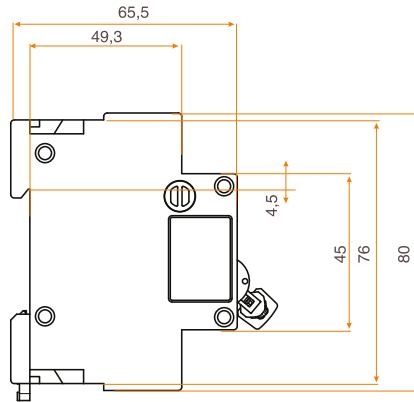
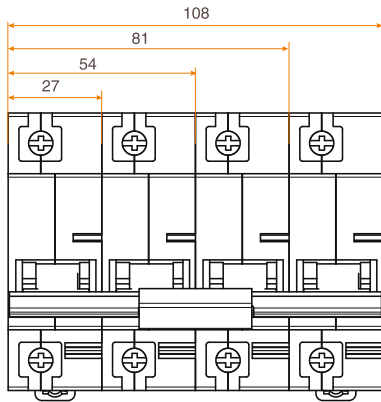


**FM3 - FM6 - FM10 - FM10 DC**

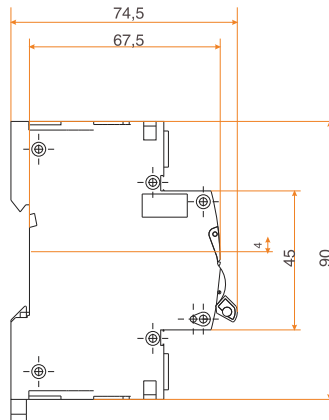
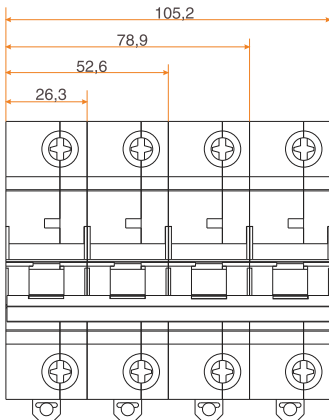


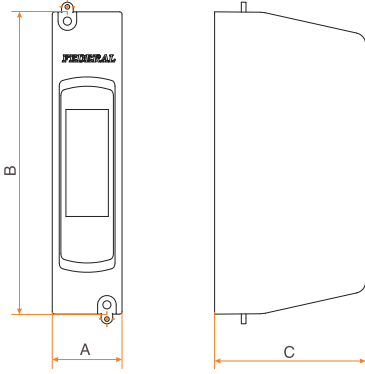
Federal Electric FM6, FM10 miniature circuit breakers may be used with FK2, FK4 residual current circuit breakers, thanks to automat busbar.

**FM6L**

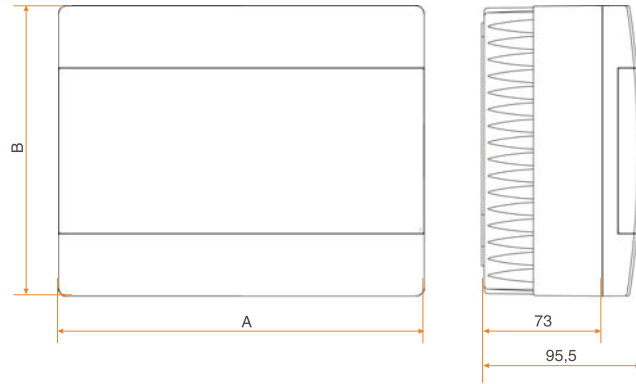


**FM10L - FM10L DC**

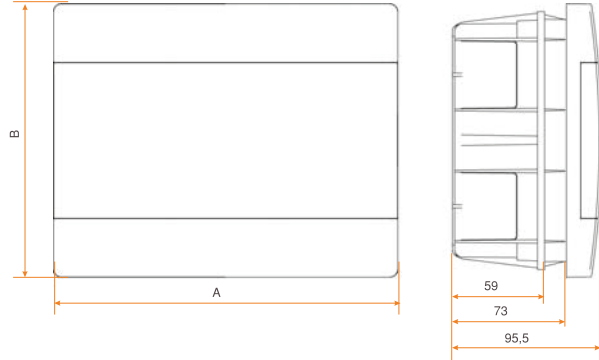


**SIVA ÜSTÜ SERİSİ**


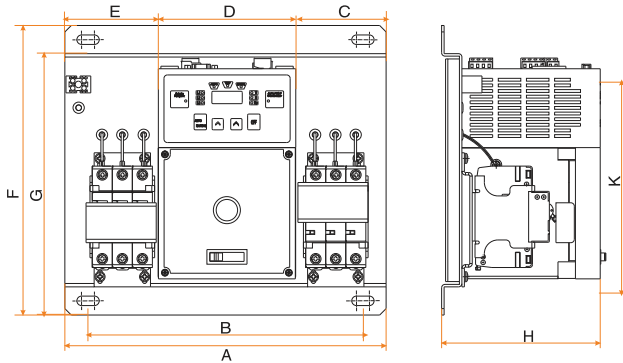
MODEL	A	B	C
FEB1	30	130	65
FEB2	51	126	60
FEB4	85	126	60

**SIVA ÜSTÜ SERİSİ**


MODEL	A	B
FVK SA 9	220	175
FVK SA 12	274	210
FVK SA 18	220	290
FVK SA 24	274	335

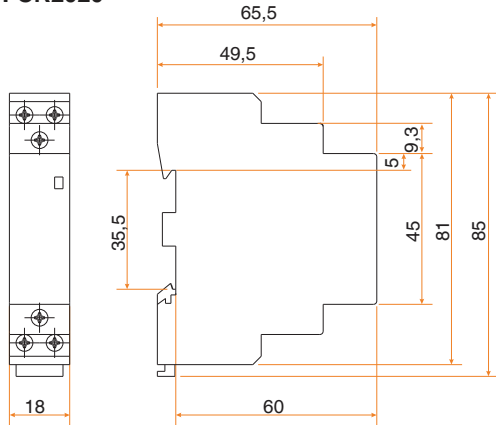
**SIVA ALTI SERİSİ**


MODEL	A	B
FVK SU 9	220	175
FVK SU 12	274	210
FVK SU 18	220	290
FVK SU 24	274	335

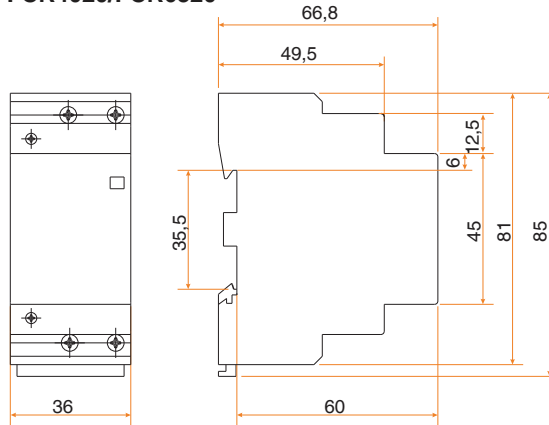
**Minyatür Devre Kesiciler**


Tip	Ölçüler									Amper Aralığı
	A	B	C	D	E	F	G	H	K	
FM6	286	244	80	122	83	257	232	141	187	1A ... 63A
FM10	286	244	80	122	83	257	232	141	187	1A ... 63A
FM10L	390	324	119	122	149	265	242	142	187	80A ... 125A

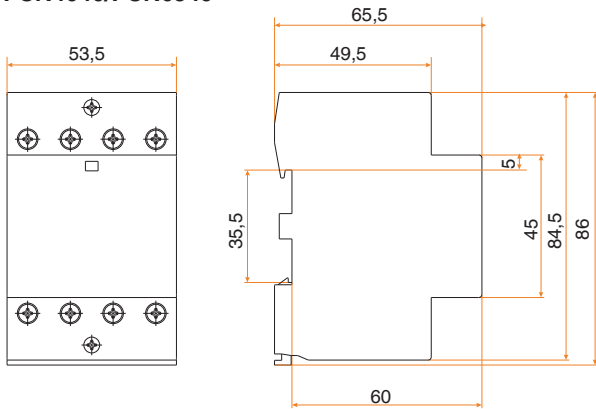
**FCR2020**



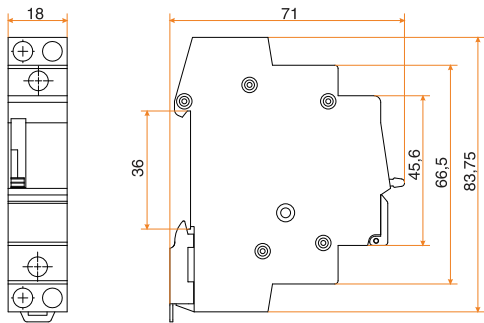
**FCR4020/FCR6320**



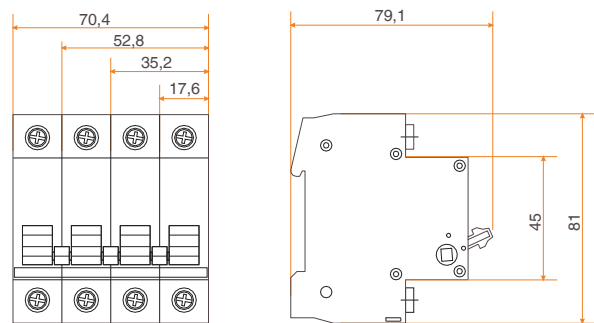
**FCR4040/FCR6340**



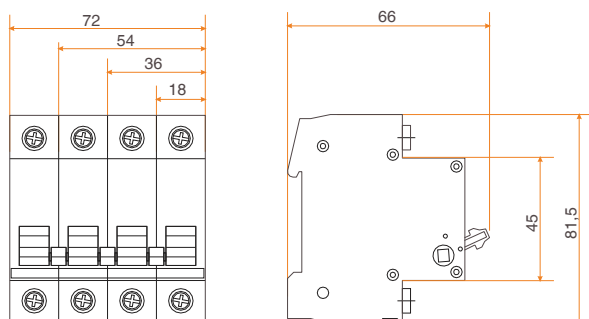
**FIR**



**FMS**



**FMS-DC (TYPE-1)**



**FMS-DC (TYPE-2)**

