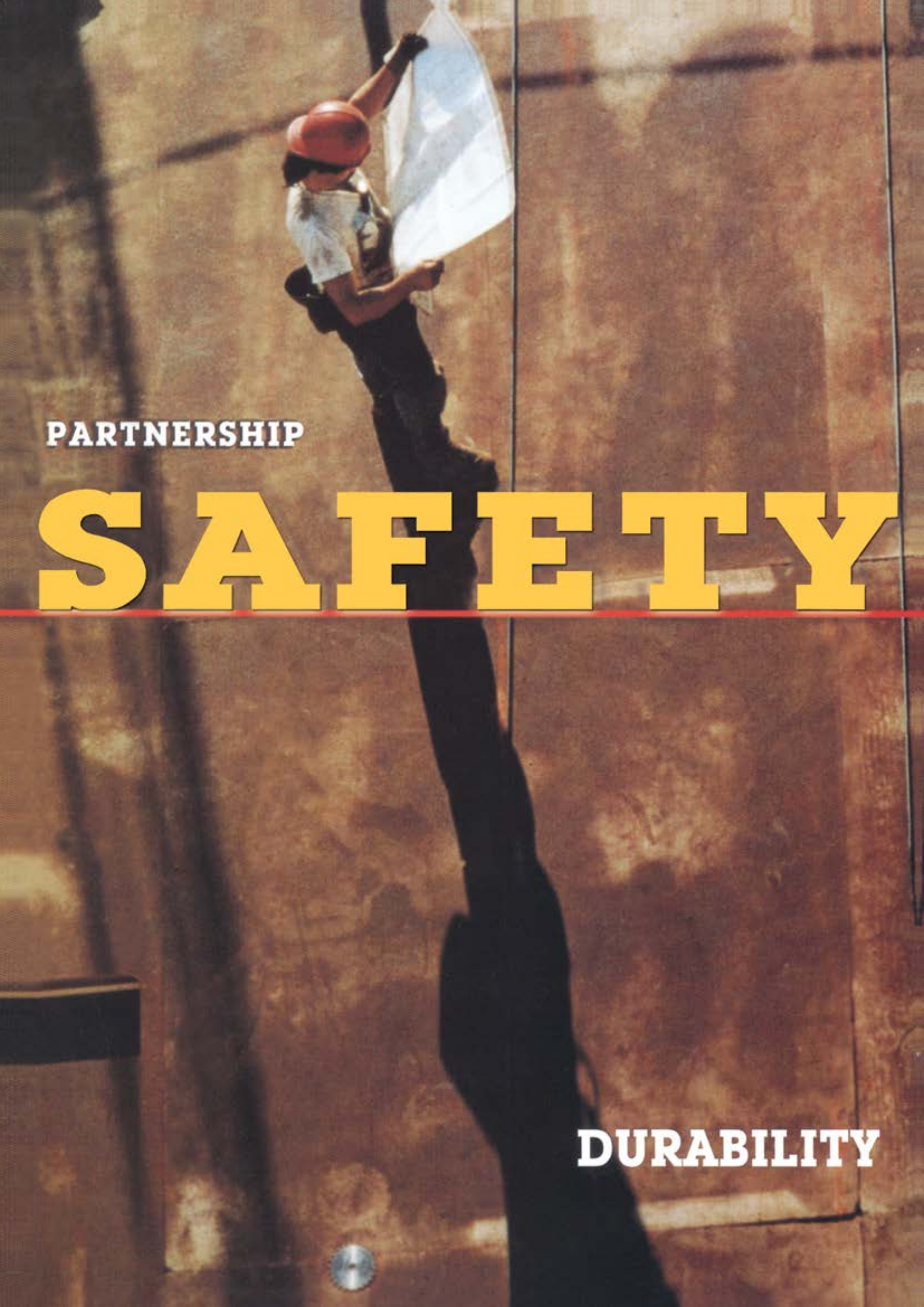
MINIATURE CIRCUIT BREAKER

الفنار
alfanar

www.alfanar.com


PARTNERSHIP
SAFETY
DURABILITY

Contents

alfanar miniature circut breaker product features

alfanar Hassas Miniature Circuit Breaker
Product Features

Design Features

a) Aesthetics: alfanar Identity

A registered signature design style for all **alfanar** modular products that reflect **alfanar**'s originality and commitment to quality.

b) alfanar Patented Design

Our MCB's are patent-protected. The whole MCB is also protected as an industrial design.

Patented tripping device: uncompromising safety (unique arrangement for quick opening under fault condition).

Safety Features

a) Sealable Handle

Safe and effective method for locking out circuit breakers in ON and OFF positions. This enables user to securely lock the breaker, control the supply, prevent tampering and perform safe maintenance of end equipment.

b) True Contact Indication

Red and green color flags provide a clear visual indication of the contact status inside, irrespective of handle position.

c) IP20 Protection

A rating of “IP20” denotes protection from solid objects approximately 12mm in size, such as adult fingers.

d) Phase Barrier

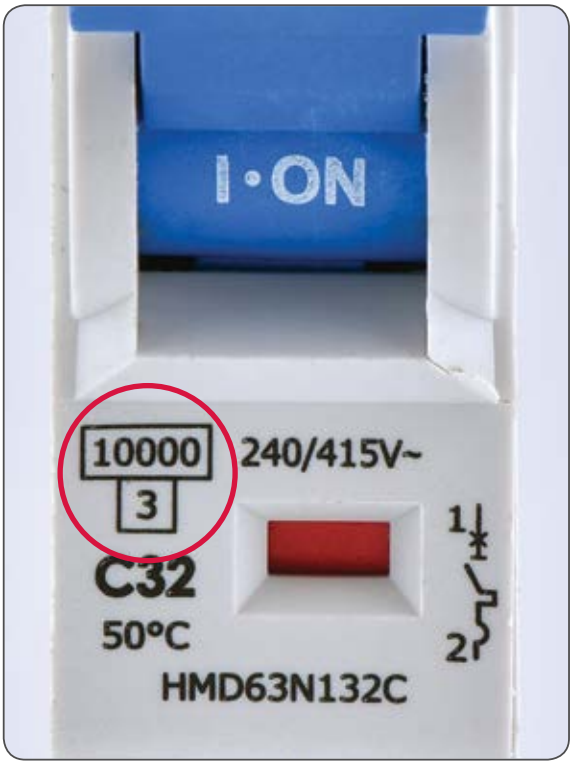
There is a provision to add the phase barrier accessory on the top and bottom sides for a more secure connection.

e) Anti Single Phasing

For multi-pole breakers, removing the handle connector is impossible.

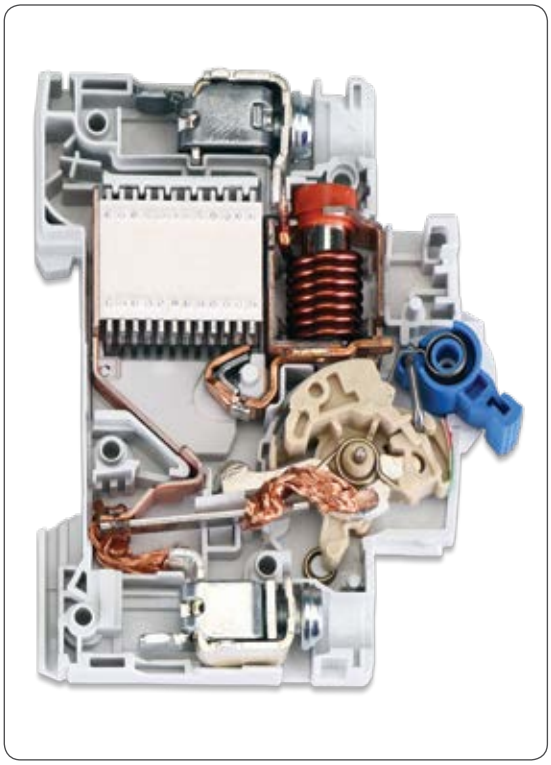
Even in the absence of the handle connector, it is not possible to turn the multi-pole MCB “ON”.

This prevents the closing of even one pole of the multi-pole breaker in response to the overcurrent fault in any of poles.



f) Energy Class 3

Energy Class 3 ensures the lowest possible flow of energy through the circuit in case of fault preventing damage to surrounding and downstream equipment and networks.



g) Contact Separation

1. In normal ON/OFF operation current separation is 8 mm, in case of abnormal /fault conditions the contacts get separated by 10 mm, which prevents the arc from restriking and ensures effective arc quenching.

2. Use as isolator benefits
   - Prevents arc re-striking
   - Foolproof breaking of circuit
   - Higher voltage withstand capability

Reliability Features

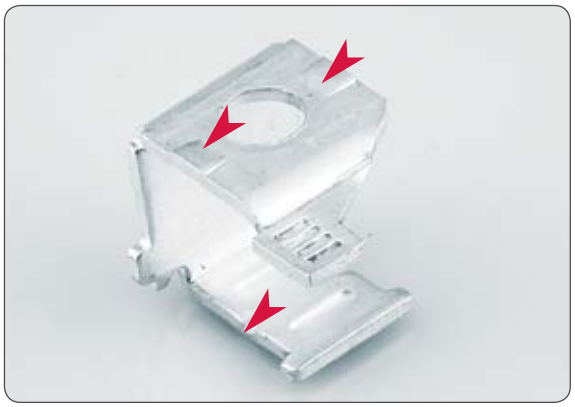
a) Rigid Multi-Pole Coupling

Two poles are coupled with spacers in between to ensure proper alignment of poles for reliable operation.

b) Conforms to Major International Standard

Tested as per IEC 60898-1, IEC60947-2,

SASO CE conformity and DEKRA CB certified.



c) Reliable Termination

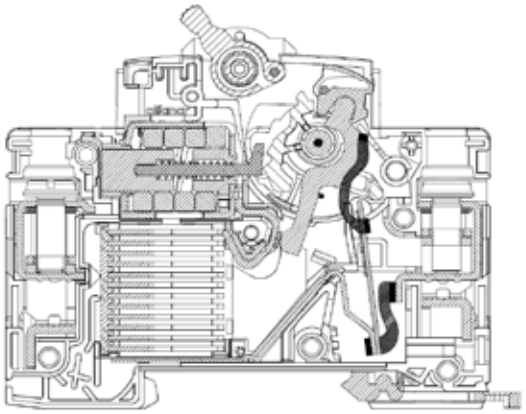
Biting teeth on both ON and OFF terminals for both cable and busbar termination.

Benefits
a) World class terminal reliability
b) Excellent electrical joint
c) Excellent mechanical joint
d) 2.8 N-m torque
e) Firm cable grip
f) Excellent cable pull withstand
g) Excellent temperature performance

d) Ready for Connection

A box clamp is provided in an open condition so that the breaker is ready for cable and busbar connection to reduces installation time.

Performance Features



a) Unique Patented Quick Tripping Arrangement

The mechanism is arranged to transform linear force into rotary force for quick opening of the contacts which reduces the energy inside the breaker to a minimal level during the clearance of fault. The effectiveness of this action remains the same up to the last shot of short circuit sequence.

b) Line/Load Reversibility

An incoming supply can be connected to both the upper and lower side, and load to the opposite side, without compromising the breaking capacity and isolation.

c) Ventilation Channel

The uniquely designed air channels located between adjacent poles facilitate better heat dissipation.

d) Contact Tip

Silver graphite contact tips ensures longer life and maximum safety against contact welding due to superior anti-welding properties enhancing safety and life of system.

Installation Features

a) Ergonomics: Better Grip

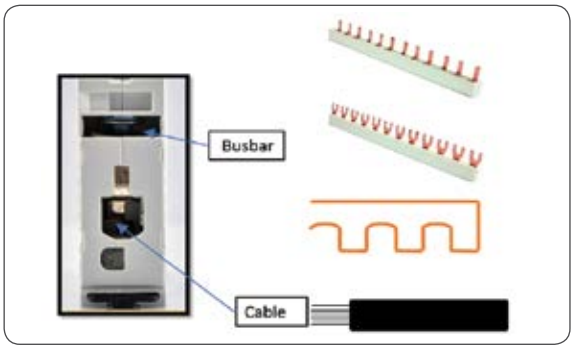
With its wide surface area and prominent strips around the periphery, the ergonomically designed handle assists with the manual operation of the circuit breaker from single pole to four poles with optimum force, and ensures a secure grip while operating the handle.

b) Multiple Cable Connection

Cable terminals allow connection of cables from 18AWG (0.75mm^2) up to 4 AWG (25mm^2). Conductors of different sizes can be used in the same terminal, with up to five conductors of size 16AWG (1.5 mm^2).

c) Suitable for Multiple Tools

Space for insulated screwdrivers - the larger hole allows the use of an insulated screwdriver to tighten the screws of both wire terminals, ensuring maximum operational safety.



d) Multiple Termination

Both incoming and outgoing terminals are suitable for: normal cable, fork type busbar, comb type busbar, fork busbar + cable simultaneous connection.

e) Terminal Shutter

Insertion of cable in the wrong place below the wrong termination is not possible.

Flat locking shutters cover the gap behind the box to eliminate the possibility of the wrong entry of wire during installation.

f) Ease of Mounting

Two-position DIN clip, facilitates easy mounting and removal of MCB from DIN rail channel for convenient installation.

Environment Features

RoHS compliant – **alfanar** uses environmentally friendly state-of-the-art housing material. With the latest generation of halogen free thermoplastics for MCBs, it is now possible to recycle the MCBs completely which reduces environmental pollution. **alfanar**'s entire range of circuit protection devices conform to RoHS Standards.

RoHS Compliant

Performance and Technical Specifications

AMCB Technical Data		
Product standard		IEC 60898-1
Tripping characteristics		B,C Curve
Electrical		
Rated current range (A)		6, 10, 16, 20, 25, 32, 40, 50, 63
Number of poles		1P,2P,3P,4P
Rated operational voltage (Ue) V AC	Single pole Multi pole	240 415
Rated insulation voltage (Ui) V AC		500
Rated impulse voltage (Uimp) kV		4
Rated ultimate short circuit		10kA,6kA
Rated service short circuit breaking capacity Ics (A) at 415V AC		7.5kA, 6kA
Rated frequency (Hz)		50/60
Suitability for isolation		Yes
Thermal tripping characteristics		> 1 hour @ 1.13 In @ 50°C
		< 1 hour @ 1.45 In @ 50°C
Electrical endurance (Number of operation cycles)		≥10000
Mechanical		
Protection degree		IP 20
Maximum terminal capacity (mm²)		35
Tightening torque (Nm)		2.8
Mounting type		DIN rail 35 mm acc. to EN 60715
Method of connection		Cables / Busbar / Cables+Busbar
Frame width (mm) (max.)		17.7 mm per pole
Dimensions 1 Pole (W × H × D) (mm) (max.)		17.7 x 83.2 x 68.3
Dimensions 2 Pole (W × H × D) (mm) (max.)		35.4 x 83.2 x 70.1
Dimensions 3 Pole (W × H × D) (mm) (max.)		53.1 x 83.2 x 70.1
Dimensions 4 Pole (W × H × D) (mm) (max.)		70 x 83.2 x 70.1
Environmental/General		
Energy limiting class		3
Reference ambient air temperature		50°C
Operating temperature range		- 5°C to + 70°C
Storage temperature range		- 5°C to + 70°C

General Characteristics

MCB (Miniature Circuit Breaker) is an electromechanical device which protects an electrical circuit from overcurrent and overload conditions. Unlike a fuse, an MCB can be reused after clearing the fault; offering improved operational safety and greater convenience without incurring large operating costs.
After an overload trip occurs, MCBs are easier to reset than to replace blown fuses. The tripping of an MCB, which stops the current from flowing, is much faster than a fuse can operate.

Working of MCB
The MCB has two different operations; the thermal effect of overcurrent and secondly the electromagnetic effect of overcurrent.

- Thermal trip (overload)
- Magnetic trip (short circuit)

A miniature circuit breaker functions by interrupting the electrical flow through the circuit once a fault occurs, and an overcurrent is detected. The MCB acts like a switch that automatically disconnects when the current flowing through it exceeds the maximum allowed limit.
There are two contacts in an MCB.

- fixed contact
- moving contact

When the current exceeds its pre-determined value, solenoid forces the moveable contact to open. The MCB switches OFF and discontinues the current flow in the circuit. To resume the flow of current; the MCB needs to be switched ON. This protects the circuit from faulty current flowing due to overload and overcurrent.

To protect against a fault arising from overheating or an increase in temperature a bi-metallic strip is used. Whenever continuous overcurrent flows through the MCB, the bimetallic strip heats up, deflects and releases the trip mechanism.

This deflection of the bimetallic strip releases the latch. As this mechanical latch is attached to the operating mechanism it opens the miniature circuit breaker contacts.

During a short circuit condition, there is sudden rising of current which causes the electromechanical movement of the plunger connected to the tripping coil or solenoid of the MCB. The plunger strikes the trip lever causing the instant release of the latch mechanism which subsequently opens the circuit breaker contacts.

An energy limiting class number denotes the maximum I2t let-through by a circuit breaker under short circuit or earth fault conditions. This information may be used by the electrical installation designer for the same purposes as the information obtained from the I2t characteristic.

Class 3 is the highest current limiting classification and may be used to offer protection to cables having a smaller cross sectional area, thereby reducing installation costs.

General Characteristics

Rated Operating Voltage Ue (in V)

This is the voltage(s) at which the circuit breaker can be used. The value indicated is usually the maximum value. At lower voltages, certain characteristics may differ, or even be improved, such as the breaking capacity.

Insulation Voltage Ui (in V)

This value acts as a reference for the insulation performance of the device. The insulation test voltages (impulse, industrial frequency, etc.) are determined based on this value.

Impulse Voltage Uimp (in kV)

This value characterizes the ability of the device to withstand transient overvoltage such as lightning (standard impulse 1.2/50 µs).

Rated Current In (in A)

This is the maximum current value the circuit breaker can withstand on a permanent basis. This value is always given for an ambient temperature around the device of 30°C in accordance with standard IEC 60898-1. **alfanar** products go beyond this standard by offering no derating up to 50°C. If this temperature is higher, it may be necessary to reduce the operating current.

Nominal Breaking Capacity Icn

In IEC 60898-1 standard, the breaking capacity of the device is tested in a similar way but is called Icn. After the test, the circuit breaker must retain its dielectric properties and be able to trip in accordance with the specifications in the standard.

Standard Breaking Capacity Ics

This is the value expressed as a percentage of Icu. It will be one of the following values: 25% (category A only), 50%, 75% or 100%. The circuit breaker must be capable of operating normally after breaking the Ics current several times using the sequence O-CO-CO. Standard IEC 60898 gives the minimum values to be reached according to the Icn of the device.

Power Loss

The power (watt) loss is calculated on the basis of the voltage drop across the main terminals measured at the device rated current.

MCB rated Current (A)	10	16	20	25	32	40	50	63
Watts loss per pole (W)	1.7	1.8	2.4	2.6	3.8	3.8	4	6

Energy Limiting

Energy is measured in Joules. *James Prescott Joule proved that thermal energy was produced when an electric current flowed through a resistance for a certain time, giving us the formula:
Joules = I2 x R x t or because we know that watts = I2R
Joules = watts x seconds
Therefore, we can say that:
One Joule = one watt second
Or energy = watts x seconds = I2R t

If the resistance (R) remains constant or is very small compared with the current (I) as in the case of short circuit current, then energy becomes proportional to I2t. Which is why the energy let-through of a protective device is expressed in ampere squared seconds and referred to as I2t.

I2t (Joule Integral) is the integral of the square of the current over a given time interval (t0, t1) The I2t characteristic of a circuit breaker is shown as a curve giving the maximum values of the prospective current as a function of time. Manufacturers are required by the Standard to produce the I2t characteristic of their circuit breakers.

The energy limiting characteristics of modern MCBs greatly reduce the damage that might otherwise be caused by short-circuits. They protect the cable insulation and reduce the risk of fire and other damage. Knowledge of the energy limiting characteristic of a circuit breaker also helps the circuit designer calculate discrimination with other protective devices in the same circuit. Because of the importance energy limiting characteristic the Standards for circuit breakers for household and similar installations suggests three energy limiting classes based on the permissible I2t (let-through) values for circuit breakers; class 3 having the highest energy limiting performance.

All **alfanar** MCBs are well within the limits of energy let-through set by IEC 60898 for energy limiting class 3. The circuit breaker can have the line\load connected to either top or bottom terminals.

General Characteristics

Temperature Derating

MCBs are designed and calibrated to carry their rated current and to operate within their designated thermal time/current zone at 50°C.

Testing is carried out with the breaker mounted singly in a vertical plane in a controlled environment. Therefore, if the circuit breaker is required to operate in conditions which differ from the reference conditions, certain factors must be applied to the standard data. For instance, if the circuit breaker is required to operate in a higher ambient temperature other than 50°C it will require progressively less current to trip within the designated time/current zone.

In(A)	-5 ˚C	0 ˚C	10 ˚C	20 ˚C	30 ˚C	40 ˚C	50 ˚C	60 ˚C	70 ˚C
10.0	12.9	12.7	12.2	11.7	11.2	10.6	10.0	9.4	8.7
16.0	20.2	19.9	19.2	18.4	17.7	16.8	16.0	15.1	14.2
20.0	24.3	24.0	23.2	22.5	21.7	20.9	20.0	19.1	18.2
25.0	29.1	28.8	28.0	27.3	26.6	25.8	25.0	24.2	23.3
32.0	39.1	38.5	37.3	36.0	34.7	33.4	32.0	30.5	29.0
40.0	50.3	49.4	47.7	45.9	44.0	42.1	40.0	37.8	35.5
50.0	61.2	60.3	58.4	56.4	54.3	52.2	50.0	47.7	45.3
63.0	77.1	75.9	73.5	71.0	68.5	65.8	63.0	60.1	57.0

Grouping Factors

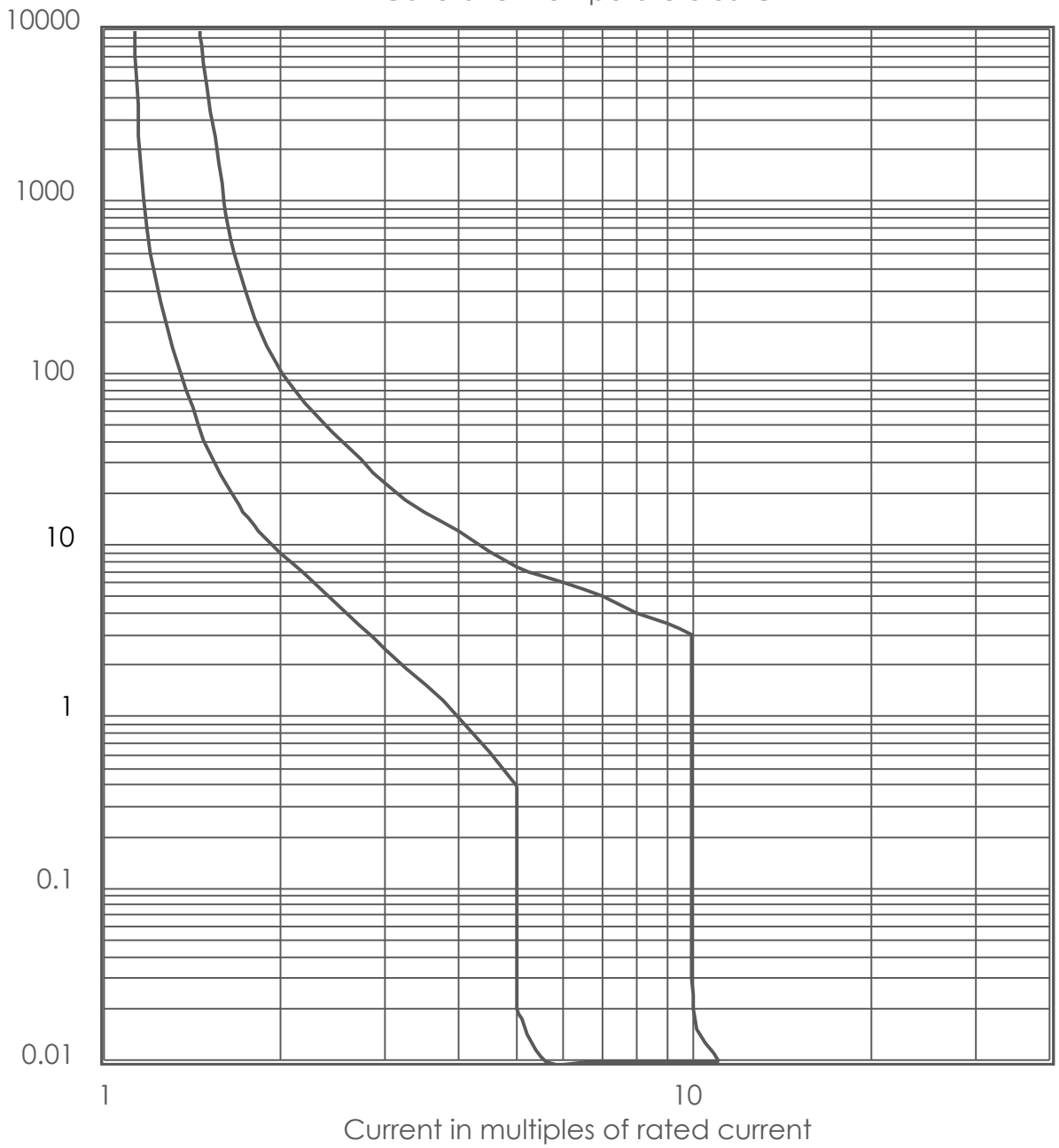
Consideration should also be given to the proximity heating effect of the breakers themselves when fully loaded and mounted together in groups. There is a certain amount of Watt-loss from each breaker depending on the trip rating which may well elevate the ambient air temperature of the breaker above the ambient air temperature of the enclosure. Grouping factor (rated current reduce by factor K).

No of Device (n)	1	2≤n≥4	4≤n≥6	6≤n
K	1	0.95	0.9	0.85

Minimum Peak Tripping Current

Circuit Breaker type	Circuit Breaker rated current							
	10A	16A	20A	25A	32A	40A	50A	63A
C	73	119	142	170	223	280	380	443

MCB C-curve Time Current Characteristics
Calibration temperature 50°C



General Characteristics

Maximum protected length for the protection of human beings

The Standards give indications about the maximum disconnecting time for the protective devices, in order to avoid pathophysiological effects for people touching live parts.

For the protection against indirect contact, it shall be verified that the circuit breaker trips within a time lower than the maximum time stated by the Standard.

This verification is carried out by comparing the minimum short circuit current of the exposed conductive part to be protected with the operating current.

Corresponding to the time stated by the Standard, the minimum short circuit current occurs when there is a short circuit between the phase and the protective conductors at the farthest point on the protected conductor.

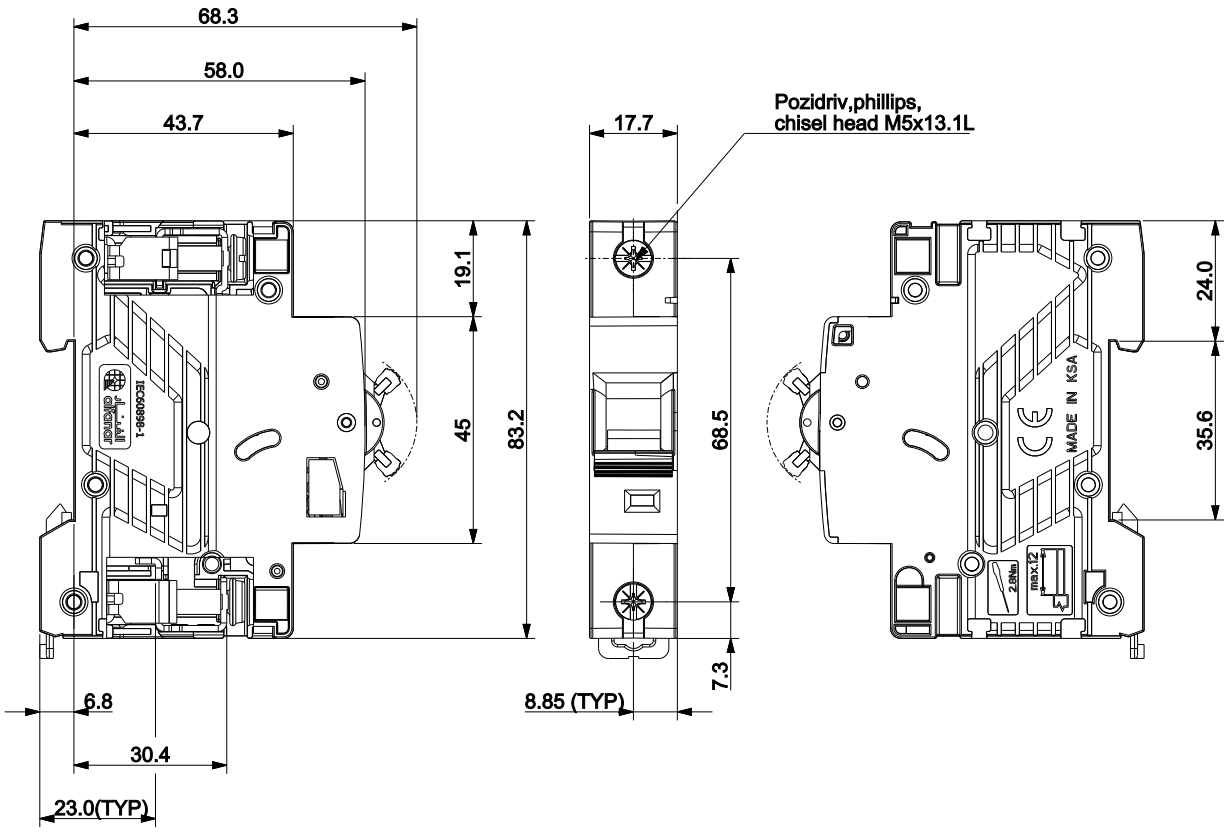
Maximum circuit length (in meters) for different sizes of copper conductor and rated current.

240/415 V single phase or three phase TN System with m=1(number of parallel conductor).

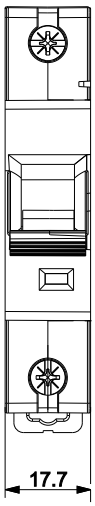
AMCB C Chara									
Sph	In (A)								
S(mm2)	6	10	16	20	25	32	40	50	63
1.5	99	60	37	30	24	19	15	12	9
2.5	165	99	62	50	40	31	25	20	16
4	265	159	99	79	63	50	40	32	25
6	397	238	149	119	95	74	60	48	38
10	661	397	248	198	159	124	99	79	63
16	1058	635	397	317	254	198	159	127	101
25	1653	992	620	496	397	310	248	198	157
35	2315	1389	868	694	556	434	347	278	220
50	3307	1984	1240	992	794	620	496	397	315

AMCB B Chara									
Sph	In (A)								
S(mm2)	6	10	16	20	25	32	40	50	63
1.5	176	106	66	53	42	33	26	21	17
2.5	294	176	110	88	71	55	44	35	28
4	470	282	176	141	113	88	71	56	45
6	705	423	265	212	169	132	106	85	67
10	1176	705	441	353	282	220	176	141	112
16	1881	1129	705	564	451	353	282	226	179
25	2939	1764	1102	882	705	551	441	353	280
35	4115	2469	1543	1235	988	772	617	494	392
50	5879	3527	2205	1764	1411	1102	882	705	560

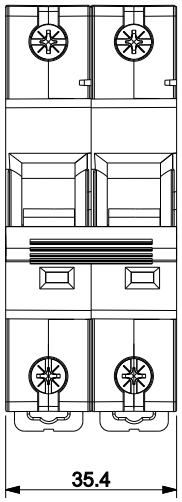
Dimensions



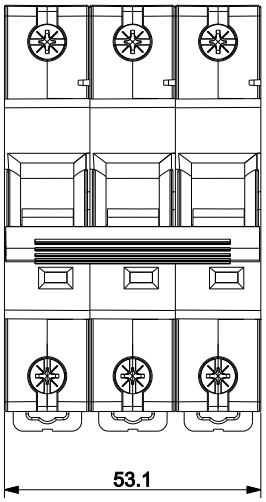
1 POLE



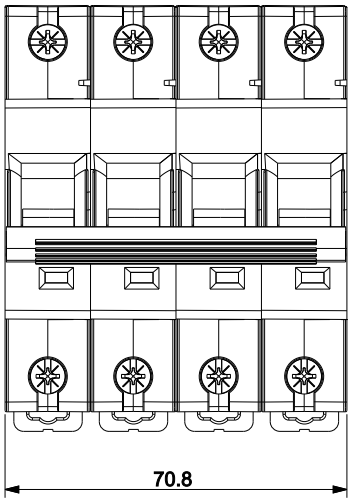
2 POLE



3 POLE



4 POLE



Installation and Ease of Use

1. Installation
Minature circuit breakers can be installed in the shown mounting position with Snap-On fixing in DIN rails as per EN 60 715, 35 mm width.

2. Connection
Ensure that conductors are connected correctly and firmly. Max. tightening torque 2.8 Nm.

3. Operation
Miniature circuit breakers are switched on by switching the handle in the direction of the nameplate. The operating lever now indicates the “I“ operating position. If an MCB trips, probably due to overload, it can be switched on again. If the MCB trips again immediately when trying to reclose after a short period of time, then do not continuously re-close an existing short circuit or earth fault. The MCB trips under overload, or short circuit or earth fault conditions, even if the operating lever is maintained in the ON position.

4. Cleaning the device
MCBs soiled by installation work should be cleaned with a dry, or, if necessary, a damp and soapy cloth. Never use caustic agents or dissolvent.

5. Maintenance
alfanar MCBs are maintenance-free.

6. Fitting of auxiliary switches
MCBs have a knockout on the lower left hand side to add the auxiliary switch. Use a screwdriver to remove the knockout. Switch operating lever into the OFF position ”O“. Attach the auxiliary switch to the MCB and make sure that the outlines match the edges. Insert the driver extension of the auxiliary switch into the associated MCB handle. Then press the snap lock extension from the auxiliary, switch cover against the MCB to ensure it is firmly locked.

7. Wiring diagrams
Supply optional, top or bottom, terminal designation in accordance with EN 50 005/ IEC 60947-1.

Ordering Data

Hassas Branch Breaker Type DIN-rail		
No. of Poles	Ampere	Item Code
1 Pole	06A	HMD63N106C
1 Pole	10A	HMD63N110C
1 Pole	16A	HMD63N116C
1 Pole	20A	HMD63N120C
1 Pole	25A	HMD63N125C
1 Pole	32A	HMD63N132C
1 Pole	40A	HMD63N140C
1 Pole	50A	HMD63N150C
1 Pole	63A	HMD63N163C
2 Pole	06A	HMD63N206C
2 Pole	10A	HMD63N210C
2 Pole	16A	HMD63N216C
2 Pole	20A	HMD63N220C
2 Pole	25A	HMD63N225C
2 Pole	32A	HMD63N232C
2 Pole	40A	HMD63N240C
2 Pole	50A	HMD63N250C
2 Pole	63A	HMD63N263C
3 Pole	06A	HMD63N306C
3 Pole	10A	HMD63N310C
3 Pole	16A	HMD63N316C
3 Pole	20A	HMD63N320C
3 Pole	25A	HMD63N325C
3 Pole	32A	HMD63N332C
3 Pole	40A	HMD63N340C
3 Pole	50A	HMD63N350C
3 Pole	63A	HMD63N363C
4 Pole	06A	HMD63N406C
4 Pole	10A	HMD63N410C
4 Pole	16A	HMD63N416C
4 Pole	20A	HMD63N420C
4 Pole	25A	HMD63N425C
4 Pole	32A	HMD63N432C
4 Pole	40A	HMD63N440C
4 Pole	50A	HMD63N450C
4 Pole	63A	HMD63N463C

Ordering Data

Hassas Branch Breaker Type DIN-rail		
No. of Poles	Ampere	Item Code
1 Pole	06A	HMD63N106B
1 Pole	10A	HMD63N110B
1 Pole	16A	HMD63N116B
1 Pole	20A	HMD63N120B
1 Pole	25A	HMD63N125B
1 Pole	32A	HMD63N132B
1 Pole	40A	HMD63N140B
1 Pole	50A	HMD63N150B
1 Pole	63A	HMD63N163B
2 Pole	06A	HMD63N206B
2 Pole	10A	HMD63N210B
2 Pole	16A	HMD63N216B
2 Pole	20A	HMD63N220B
2 Pole	25A	HMD63N225B
2 Pole	32A	HMD63N232B
2 Pole	40A	HMD63N240B
2 Pole	50A	HMD63N250B
2 Pole	63A	HMD63N263B
3 Pole	06A	HMD63N306B
3 Pole	10A	HMD63N310B
3 Pole	16A	HMD63N316B
3 Pole	20A	HMD63N320B
3 Pole	25A	HMD63N325B
3 Pole	32A	HMD63N332B
3 Pole	40A	HMD63N340B
3 Pole	50A	HMD63N350B
3 Pole	63A	HMD63N363B
4 Pole	06A	HMD63N406B
4 Pole	10A	HMD63N410B
4 Pole	16A	HMD63N416B
4 Pole	20A	HMD63N420B
4 Pole	25A	HMD63N425B
4 Pole	32A	HMD63N432B
4 Pole	40A	HMD63N440B
4 Pole	50A	HMD63N450B
4 Pole	63A	HMD63N463B

Hassas Branch Breaker Type DIN-rail

No. of Poles	Ampere	Item Code
1 Pole	06A	HMD63N6k106C
1 Pole	10A	HMD63N6k110C
1 Pole	16A	HMD63N6k116C
1 Pole	20A	HMD63N6k120C
1 Pole	25A	HMD63N6k125C
1 Pole	32A	HMD63N6k132C
1 Pole	40A	HMD63N6k140C
1 Pole	50A	HMD63N6k150C
1 Pole	63A	HMD63N6k163C
2 Pole	06A	HMD63N6K206C
2 Pole	10A	HMD63N6K210C
2 Pole	16A	HMD63N6K216C
2 Pole	20A	HMD63N6K220C
2 Pole	25A	HMD63N6K225C
2 Pole	32A	HMD63N6K232C
2 Pole	40A	HMD63N6K240C
2 Pole	50A	HMD63N6K250C
2 Pole	63A	HMD63N6K263C
3 Pole	06A	HMD63N6K306C
3 Pole	10A	HMD63N6K310C
3 Pole	16A	HMD63N6K316C
3 Pole	20A	HMD63N6K320C
3 Pole	25A	HMD63N6K325C
3 Pole	32A	HMD63N6K332C
3 Pole	40A	HMD63N6K340C
3 Pole	50A	HMD63N6K350C
3 Pole	63A	HMD63N6K363C
4 Pole	06A	HMD63N6K406C
4 Pole	10A	HMD63N6K410C
4 Pole	16A	HMD63N6K416C
4 Pole	20A	HMD63N6K420C
4 Pole	25A	HMD63N6K425C
4 Pole	32A	HMD63N6K432C
4 Pole	40A	HMD63N6K440C
4 Pole	50A	HMD63N6K450C
4 Pole	63A	HMD63N6K463C

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