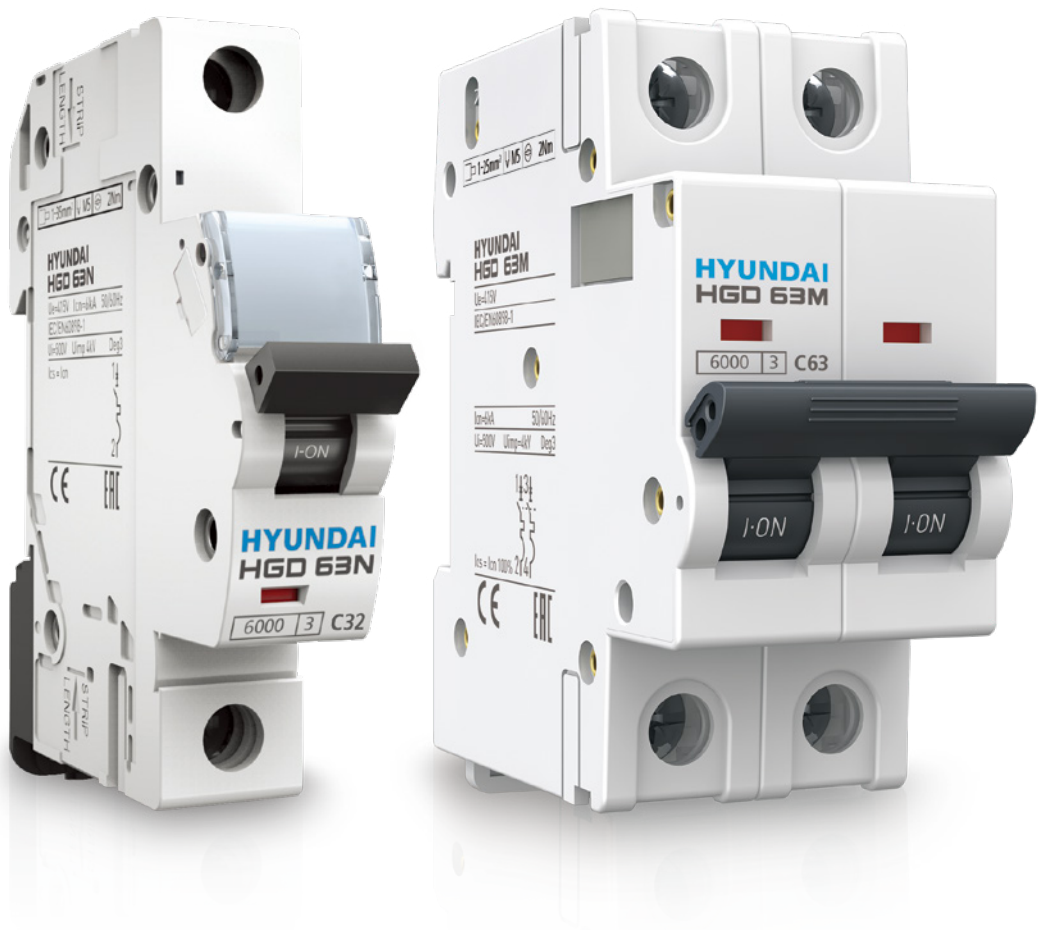


Feature

HGD Miniature Circuit Breaker

Electric distribution needs are continuously evolving in residential, commercial and industrial sectors. Improved operational safety, continuity of service, greater convenience and operating cost have assumed a tremendous significance. Miniature circuit breakers have been designed to continuously adapt to these changing needs.





Product Feature

HGD series MCBs rating covers from 0.5 A to 125 A. The range offers a variety of feature benefits such as uniform breaking capacity of 15 kA across entire range in accordance with IEC/EN 60898-1 and IEC/EN 60947-2. HGD also incorporates features like inscription window, safety terminal, large cable terminals, bi stable clip, positive contact indication and field fittable AUX, ALT, SHT, UVT, OVT.

Deluxe Type

Standard Type



Product Performance

- Low power consumption, thus cost effective & energy saving
- Longer electrical life
- Energy limiting class 3 to ensure low let through energy to limit thermal & mechanical stress on cables.

- Compact structure and external design.
- Customers can choose between deluxe type and standard type depending on the need for inscription window
- Under the standard of IEC 60898-1, all ranges are available with a short circuit capacity of 3 kA~15 kA and it is designed to use both pin type and fork type busbar



Product Structure

- Inscription window
- Precise hammer action
- Easy DIN-Rail extraction
- 13 plates arc chute for effective arc quenching
- Dual termination for bus-bar as well as cable connection
- Trip free mechanism: MCB trips even if held in ON position

- 13 plates arc chute for effective arc quenching
- Dual termination for bus-bar as well as cable connection
- Trip free mechanism: MCB trips even if held in ON position



Accessories

- Selectable AUX/ALT with knob
- Available with enclosure (Option-IP40)

- AUX, ALT, SHT, UVT options are available.
- SHT with AUX function together



Specification

- IEC 60898-2 for DC application
- IEC 60947-2 for industrial application
- IEC 60898-1 for household application

- IEC 60898-1 for household application
- IEC 60947-2 for DC application

Product Overview



Deluxe Type (6 kA, 10 kA)



Standard Type (3 kA, 4.5 kA, 6 kA, 10 kA, 15 kA)

HGD (Standard Type)

HGD63E, 63 AF, 3 kA ¹⁾	HGD63S, 63 AF, 4.5 kA ¹⁾	HGD32NS, 32 AF, 6 kA	HGD63M, 63 AF, 6 kA ²⁾	HGD63P, 63 AF, 10 kA ²⁾	HGD63U, 63 AF, 15 kA	HGD63D (DC), 63 AF, 10 kA	HGD100S, 125 AF, 10 kA
							
IEC/EN 60898-1	IEC/EN 60898-1	IEC/EN 60898-1	IEC/EN 60898-1, IEC/EN 60947-2	IEC/EN 60898-1, IEC/EN 60947-2	IEC/EN 60898-1 IEC/EN 60947-2	IEC/EN 60947-2	IEC/EN 60947-2
1P, 1P + N, 2P, 3P, 3P + N, 4P	1P, 1P + N, 2P, 3P, 3P + N, 4P	N + 1P (N-left)	1P, 1P + N, 2P, 3P, 3P + N, 4P	1P, 1P + N, 2P, 3P, 3P + N, 4P	1P, 1P + N, 2P, 3P, 3P + N, 4P	1P, 2P, 3P, 4P	1P, 1P+N, 2P, 3P, 3P + N, 4P
1, 2, 3, 4, 5, 6, 10, 16, 20, 25, 32, 40, 50, 63 A	1, 2, 3, 4, 5, 6, 10, 16, 20, 25, 32, 40, 50, 63 A	1, 2, 3, 4, 5, 6, 10, 16, 20, 32 A	1, 2, 3, 4, 5, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63 A	1, 2, 3, 4, 5, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63 A	1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63 A	1, 2, 3, 4, 6, 10, 13, 16, 20, 25, 32, 40, 50, 63 A	63, 80, 100, 125 A
AC 240/415 V	AC 240/415 V	AC 240/415 V	AC 240/415 V	AC 240/415 V	AC 240/415 V	1P: 110V/125V/220V/250Vdc 2P: 220V/250V/440V/500Vdc 3P: 660/750Vdc 4P: 880/1000Vdc	AC 240/415 V
50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	-	50/60 Hz
3 kA (Ics=100 % Icn)	4.5 kA (Ics=100 % Icn)	6 kA (Ics=100 % Icn)	6 kA (Ics=100 % Icn)	10 kA (Ics=75 % Icn)	15 kA (Ics=50 % Icn)	10 kA (Ics=75 % Icu)	10 kA (Ics=75 % Icu)
(3-5)In-B Curve (5-10)In-C Curve (10-20)In-D Curve	(3-5)In-B Curve (5-10)In-C Curve (10-20)In-D Curve	(3-5)In-B Curve (5-10)In-C Curve (10-20)In-D Curve	(3-5)In-B Curve (5-10)In-C Curve (10-20)In-D Curve	(3-5)In-B Curve (5-10)In-C Curve (10-20)In-D Curve	(3-5)In-B Curve (5-10)In-C Curve (10-20)In-D Curve	C curve : Ii=6In D curve : Ii=12In	(3-5)In-B Curve (6-9)In-C Curve (8-12)In-D Curve
500 V	500 V	500 V	500 V	500 V	500 V	1,000 V	500 V
4 kV	4 kV	4 kV	4 kV	4 kV	4 kV	6 kV	4 kV
2.5 kV	2.5 kV	2.5 kV	2.5 kV	2.5 kV	2.5 kV	2 kV	2.5 kV
10,000/20,000	10,000/20,000	10,000/20,000	10,000/20,000	10,000/20,000	10,000/20,000	10,000/20,000	10,000/20,000
-40 °C to + 55 °C	-40 °C to + 55 °C	-40 °C to + 55 °C	-40 °C to + 55 °C	-40 °C to + 55 °C	-40 °C to + 55 °C	-40 °C to + 55 °C	-40 °C to + 55 °C
95 % RH	95 % RH	95 % RH	95 % RH	95 % RH	95 % RH	95 % RH	95 % RH
1	1	3	3	3	3	3	1
25 mm ²	25 mm ²	10 mm ²	25 mm ²	25 mm ²	25 mm ²	25 mm ²	50 mm ²
2 N·m	2 N·m	1.2 N·m	2 N·m	2 N·m	2.5 N·m	2.5 N·m	3.5 N·m
3 g	3 g	3 g	3 g	3 g	3 g	3 g	3 g
40 mm free fall	40 mm free fall	40 mm free fall	40 mm free fall	40 mm free fall	40 mm free fall	40 mm free fall	40 mm free fall
IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20
Red-ON, Green-OFF	Red-ON, Green-OFF	Red-ON, Green-OFF	Red-ON, Green-OFF	Red-ON, Green-OFF	Red-ON, Green-OFF	Red-ON, Green-OFF	Red-ON, Green-OFF
0.090 kg	0.090 kg	0.109 kg	0.100 kg	0.115 kg	0.130 kg	0.130 kg	0.155 kg
80.5 x 71.0 x 17.8 mm	80.5 x 71.0 x 17.8 mm	83.0 x 71.0 x 17.8 mm	81 x 71.0 x 17.8 mm	81 x 71.0 x 17.8 mm	83.0 x 71.8 x 17.8 mm	83.0 x 71.8 x 17.8 mm	81.0 x 71.0 x 26.8 mm
Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)	Clip on DIN Rail (35 mm x 7.5 mm)
Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material	Molded, flame-retardant thermoplastic material
Pin type	Pin type	-	Pin/Fork type	Pin/Fork type	Pin type	Pin type	-
No	No	Yes	Yes	Yes	Yes	Yes	Yes (SHT/UVT)

※ 1) HGD63E, 63S The appearance are the same.

2) HGD63M, 63P The appearance are the same.

3) HGD63U, 63D The appearance are the same.

Accessory (Standard Type)

Auxiliary Contact (AUX)

Technical Specification

Standard Conformity	IEC/EN 60947-5-4		
Current Carrying Capacity (max)	6 A		
Rated Voltage (Ue)	AC 240 V		
Contact Configuration	1NO + 1NC		
Rated Insulation Voltage (Ui)	AC 500 V		
Rated Frequency (F)	50/60 Hz		
Utilization Category	AC 12		
Electrical Endurance (no. of operations)	10,000		
Terminal Capacity (max)	2.5 mm ²		
Protection Degree	IP20		
Dimensions (H x D x W)	81.5 x 74.5 x 8.8 mm		
Net Weight	32 g		
Mounting	Left side of MCB (HGD63M/P)/Max. 4 EA		
Operating Current	Operating Power	Voltage	Current
	AC	415 V	3 A
		240 V	6 A
		130 V	1 A
	DC	48 V	2 A
		24 V	6 A

※ Attachment used for signalling, indication and interlocking point 11 and 14 are connected when circuit is closed. Point 11 and 12 are connected when circuit is open.

Ordering Information

AUX HGD63P	AUX
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Alarm Trip (ALT)

Technical Specification

Standard Conformity	IEC/EN 60947-5-4		
Current Carrying Capacity (max)	6 A		
Rated Voltage (Ue)	AC 240 V		
Contact Configuration	1NO + 1NC		
Rated Insulation Voltage (Ui)	AC 500 V		
Rated Frequency (F)	50/60 Hz		
Utilization Category	AC 12		
Electrical Endurance (no. of operations)	10,000		
Terminal Capacity (max)	2.5 mm ²		
Protection Degree	IP20		
Dimensions (H x D x W)	81.5 x 74.5 x 8.8 mm		
Net Weight	32 g		
Mounting	Left side of MCB (HGD63M/P)/Max. 2 EA		
Operating Current	Operating Power	Voltage	Current
	AC	415 V	3 A
		240 V	6 A
		130 V	1 A
	DC	48 V	2 A
		24 V	6 A

※ Attachment used for signalling, indication and interlocking

※ Point 91 and 92 are connected when circuit is closed.

Point 91 and 94 are connected when the breaker trips due to fault.

Point 91 and 92 are connected when the breaker trips by manual operation.

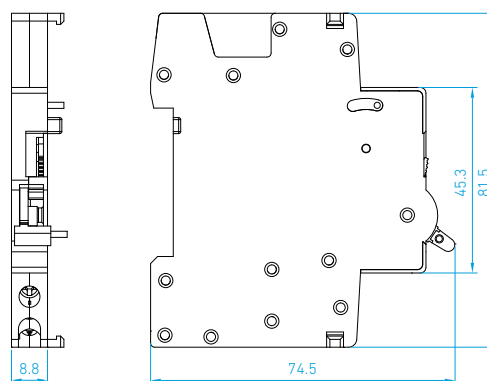
Meanwhile, point 91 and 94 are disconnected.

※ ALT Should be assembled with in 18 mm on the left side of MCB.

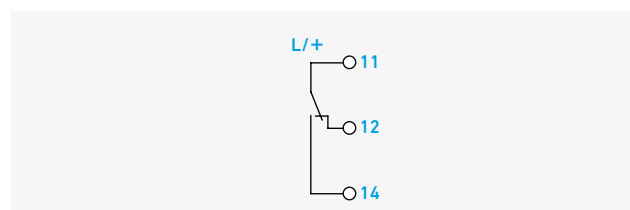
Ordering Information

ALT HGD63P	ALT
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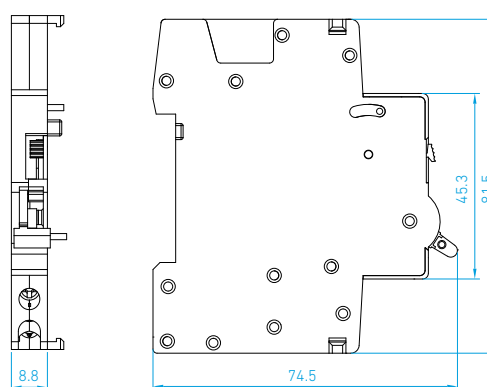
Dimension



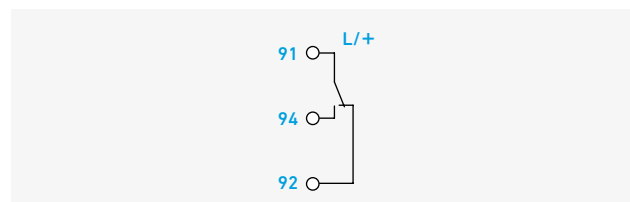
Circuit Diagram



Dimension



Circuit Diagram



Shunt Trip (SHT) + Auxiliary Contact (AUX)

Technical Specification

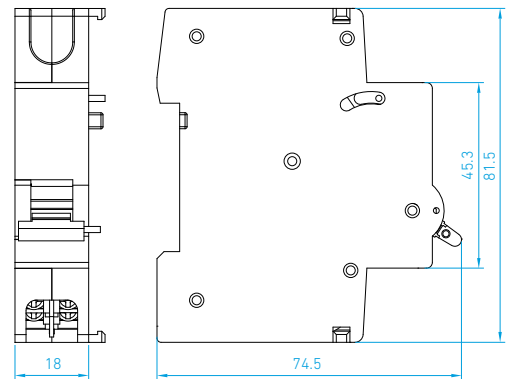
Standard Conformity	IEC/EN 60947-1, 60947-5-4
Coil Consumption	6 VA
Rated Voltage (ac) (Ue)	AC 240 V
Rated Voltage (dc) (Ue)	12, 24, 48 V
Contact Configuration	1NO + 1NC
Rated Insulation Voltage (Ui)	AC 500 V
Rated Frequency (F)	50/60 Hz
Operating Voltage Range	85 % to 110 % of rated voltage
Electrical Endurance (no. of operations)	4,000
Terminal Capacity(max)	6 mm ²
Protection Degree	IP20
Dimensions (H x D x W)	81.5 x 74.5 x 18 mm
Net Weight	64 g
Mounting	Left side of MCB (HGD63M/P)

※ Attachment used for remote tripping, signaling and indication.

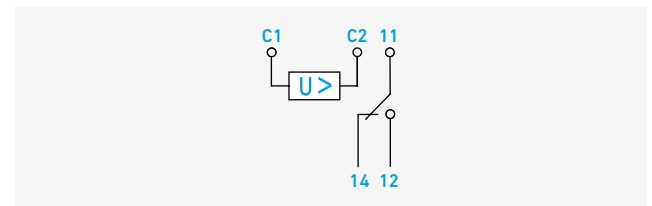
Ordering Information

SHT HGD63P S2	AC 240 V
SHT HGD63P S5	DC 24 V
SHT HGD63P S7	DC 48 V
SHT HGD63P S9	DC 12 V

Dimension



Circuit Diagram



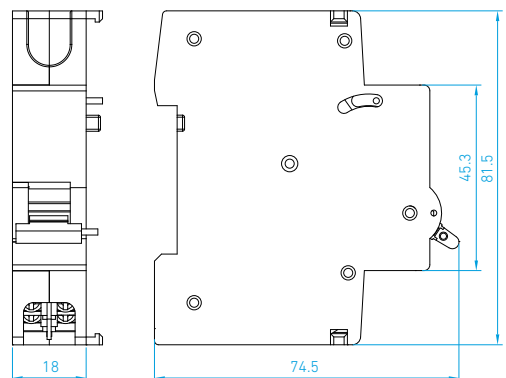
Under Voltage Trip (UVT)

Technical Specification

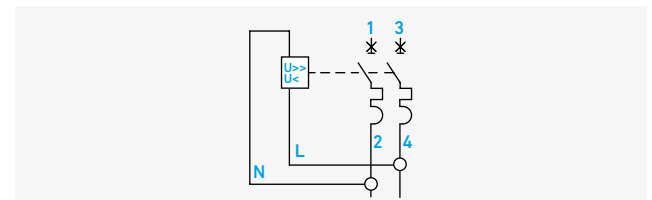
Standard Conformity	IEC 60947-1
Coil Consumption	6 VA
Rated Voltage (ac) (Ue)	AC 240 V
Rated Insulation Voltage (Ui)	AC 500 V
Rated Frequency (F)	50/60 Hz
Operating Voltage Range	$V \leq 0.7 U_e$
Electrical Endurance (no. of operations)	4,000
Terminal Capacity (max)	6 mm ²
Protection Degree	IP20
Dimensions (H x D x W)	81.5 x 74.5 x 18 mm
Net Weight	60 g
Mounting	Left side of MCB (HGD63M/P)

※ Attachment used for tripping when its input voltage decreases $170 V \pm 5 \%$

Dimension



Circuit Diagram



Ordering Information

UVT HGD63P U2	AC 240 V
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Accessory (Standard Type-125 AF)

Shunt Trip (SHT)

Technical Specification

Standard Conformity	IEC/EN 60947-1
Coil Consumption	6 VA
Rated Voltage (Ue)	AC110 - 415 V DC110 - 130 V
Rated Insulation Voltage (Ui)	AC500 V
Rated Frequency (F)	50/60 Hz
Operating Voltage Range	85 % to 110 % of rated voltage
Electrical Endurance (no. of operations)	4,000
Terminal Capacity (max)	6 mm ²
Protection Degree	IP20
Dimensions (H x D x W)	80.2 x 66.0 x 17.8
Net Weight	60 g
Mounting	Right side of MCB (HGD100S)

※ Attachment used for remote tripping.

Ordering Information

SHT HGD100S S2	AC 240 V
----------------	----------

Under Voltage Trip (UVT)

Technical Specification

Standard Conformity	IEC/EN 60947-1
Coil Consumption	6 VA
Rated Voltage (Ue)	AC240 V
Rated Insulation Voltage (Ui)	AC500 V
Rated Frequency (F)	50/60 Hz
Operating Voltage Range	$V \leq 0.7 U_e$
Electrical Endurance (no. of operations)	4,000
Terminal Capacity (max)	6 mm ²
Protection Degree	IP20
Dimensions (H x D x W)	81 x 77.7 x 17.8
Net Weight	73 g
Mounting	Right side of MCB (HGD100S)

※ Attachment used for tripping when its input voltage decreases 170 V $\pm$ 5 %

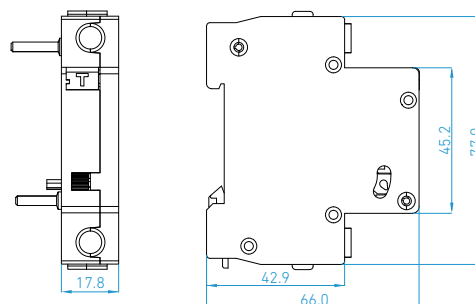
Ordering Information

UVT HGD100S U2	AC 240 V
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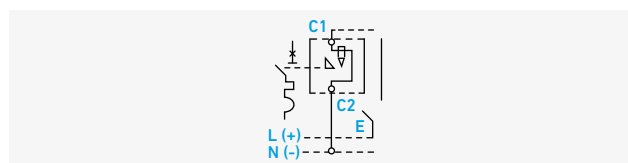
Handle Padlock Device (For 63 AF MCB)

Function	MCB handle can be locked either at "ON" position or at "OFF" position to prevent unwanted operation of the product
General	Diameter of the padlock : 8mm max. Locking in the ON position does not prevent the circuit breaker from tripping in the event of a fault
Standard Conformity	IEC/EN 60947-2
Application Type	HGD63
Ordering Information	PLD M63 A
Appearance	

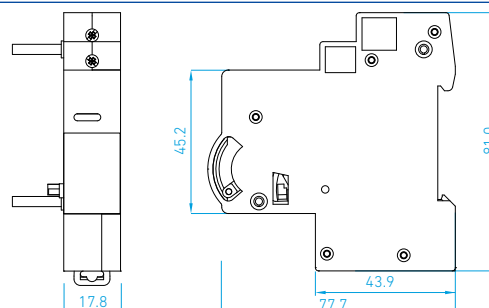
Dimension



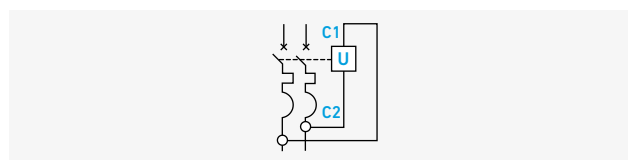
Circuit Diagram



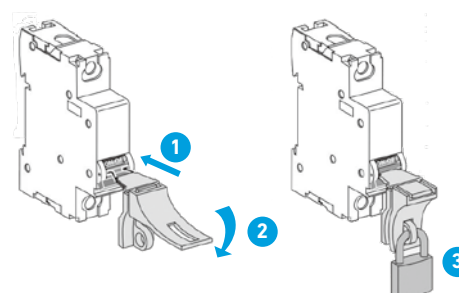
Dimension



Circuit Diagram



Installation



※ Supplied without lock

Accessory (Standard Type-HGD63U/D)

Auxiliary Contact (AUX)

Technical Specification			
Standard Conformity	IEC/EN 60947-5-4		
Current Carrying Capacity (max)	6 A		
Rated Voltage (Ue)	AC 240 V		
Contact Configuration	1NO + 1NC		
Rated Insulation Voltage (Ui)	AC 500 V		
Rated Frequency (F)	50/60 Hz		
Utilization Category	AC 12		
Electrical Endurance (no. of operations)	10,000		
Terminal Capacity (max)	2.5 mm ²		
Protection Degree	IP20		
Dimensions (H x D x W)	83.6 x 77.3 x 9.0 mm		
Net Weight	32 g		
Mounting	Left side of MCB (HGD63U/D)/Max. 4 EA		
Operating Current	Operating Power	Voltage	Current
		415 V	3 A
		240 V	6 A
	AC	130 V	1 A
		48 V	2 A
		24 V	6 A
	DC	415 V	3 A
		240 V	6 A
		130 V	1 A

※ Attachment used for signalling, indication and interlocking point 11 and 14 are connected when circuit is closed. Point 11 and 12 are connected when circuit is open.

Ordering Information

AUX HGD63U	AUX
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Alarm Trip (ALT)

Technical Specification			
Standard Conformity	IEC/EN 60947-5-4		
Current Carrying Capacity (max)	6 A		
Rated Voltage (Ue)	AC 240 V		
Contact Configuration	1NO + 1NC		
Rated Insulation Voltage (Ui)	AC 500 V		
Rated Frequency (F)	50/60 Hz		
Utilization Category	AC 12		
Electrical Endurance (no. of operations)	10,000		
Terminal Capacity (max)	2.5 mm ²		
Protection Degree	IP20		
Dimensions (H x D x W)	83.6 x 77.3 x 9.0 mm		
Net Weight	32 g		
Mounting	Left side of MCB (HGD63U/D)/Max. 2 EA		
Operating Current	Operating Power	Voltage	Current
		415 V	3 A
		240 V	6 A
	AC	130 V	1 A
		48 V	2 A
		24 V	6 A
	DC	415 V	3 A
		240 V	6 A
		130 V	1 A

※ Attachment used for signalling, indication and interlocking

※ Point 91 and 92 are connected when circuit is closed.

Point 91 and 94 are connected when the breaker trips due to fault.

Point 91 and 92 are connected when the breaker trips by manual operation.

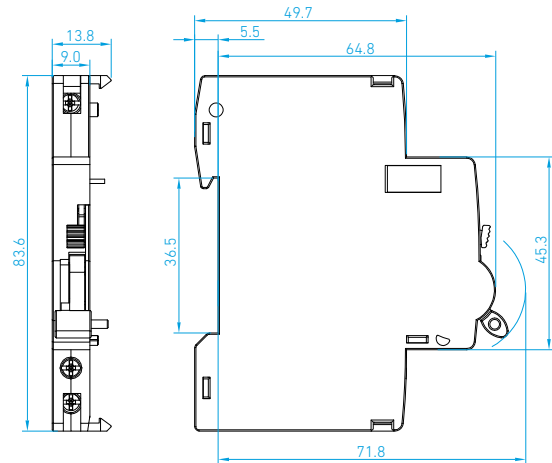
Meanwhile, point 91 and 94 are disconnected.

※ ALT Should be assembled with in 18 mm on the left side of MCB.

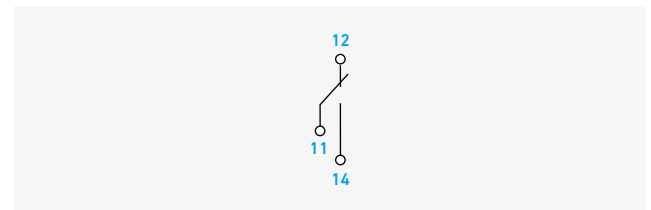
Ordering Information

ALT HGD63U	ALT
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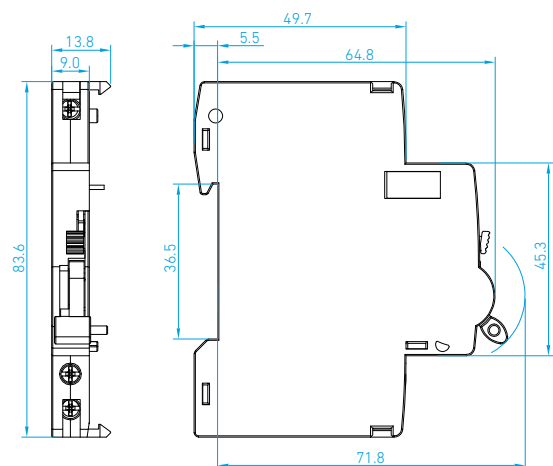
Dimension



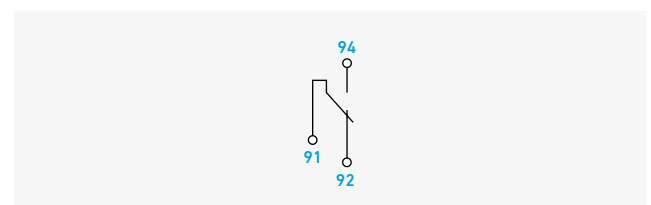
Circuit Diagram



Dimension



Circuit Diagram



Accessory (Standard Type-HGD63U/D)

Shunt Trip (SHT)

Technical Specification

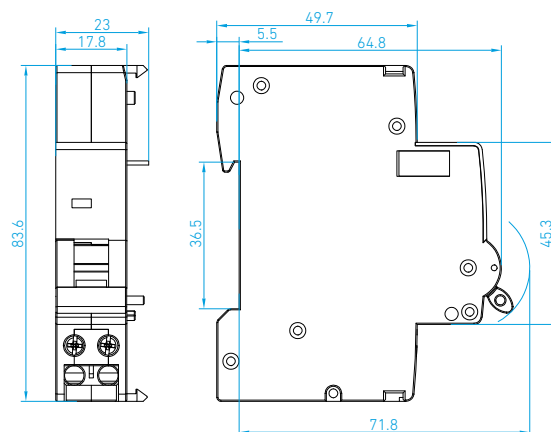
Standard Conformity	IEC/EN 60947-1, 60947-5-4
Coil Consumption	6 VA
Rated Voltage (ac) (Ue)	AC 240 V
Rated Insulation Voltage (Ui)	AC 500 V
Rated Frequency (F)	50/60 Hz
Operating Voltage Range	85 % to 110 % of rated voltage
Electrical Endurance (no. of operations)	4,000
Terminal Capacity(max)	6 mm ²
Protection Degree	IP20
Dimensions (H x D x W)	83.6 x 77.3 x 17.8 mm
Net Weight	64 g
Mounting	Left side of MCB (HGD63U/D)

※ Attachment used for remote tripping, signaling and indication.

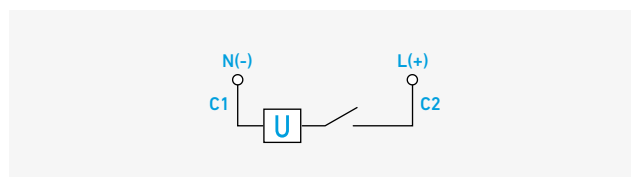
Ordering Information

SHT HGD63U S2	AC 240 V
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Dimension



Circuit Diagram



Under + Over Voltage Trip (UOVT)

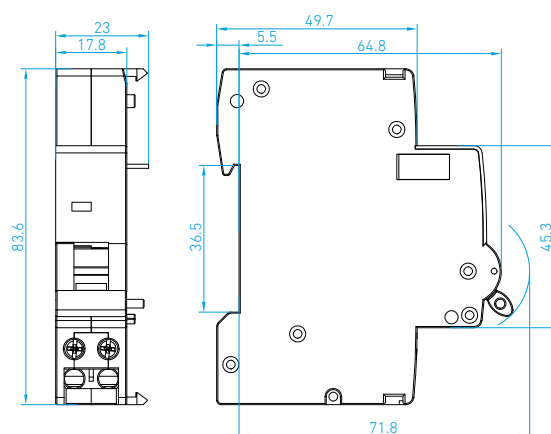
Technical Specification

Standard Conformity	IEC 60947-1
Rated Voltage (Ue)	AC 240 V
Rated Insulation Voltage (Ui)	AC 500 V
Max Non-Tripping Voltage	AC 255 V
Max Tripping Voltage	AC 280 V
Under Voltage Trip Voltage	$V \leq 0.7 U_e$
Max Duration of Impulse Command	10 ms
Terminal Capacity (max)	6 mm ²
Protection Degree	IP20
Mechanical Status Indicator	Front
Tightening Torque	0.8 N·m
Dimensions (H x D x W)	83.6 x 77.3 x 17.8 mm
Net Weight	78 g
Electrical Endurance (no. of operations)	4,000
Mounting	Left side of MCB (HGD63U/D)

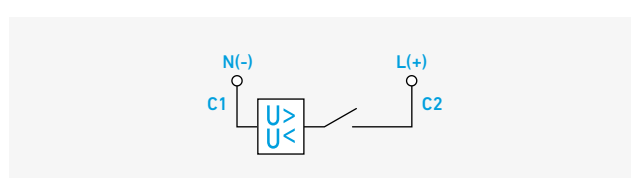
Ordering Information

UOVT HGD63U U0S2	Single phase
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Dimension



Circuit Diagram



Technical Data

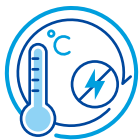
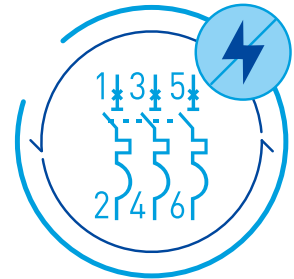
Description

Construction

Miniature circuit breakers have precisely formed molded case & cover of flame retardant high strength thermoplastic material having high melting point, low water absorption, high dielectric strength and temperature withstand.

The switching mechanism is independent, manual and trip free, i.e., the breaker trips internally even if the operating knob is held in ON position.

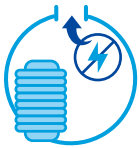
The contact mechanism comprises of fixed & moving contacts specially designed for reliability, long life and anti-weld properties. The arc extinguishing device comprises of 13 plates arc chute. The arc under the influence of the magnetic field and arc guide is moved into the arc chute where it is rapidly split and quenched. The tripping mechanism is thermal magnetic type.



Thermal Operation

The thermal operation provides protection from moderate overloads.

Under overload condition, a thermo-metallic element (bimetallic strip) deflects until it operates a latching mechanism allowing the main contacts to open.

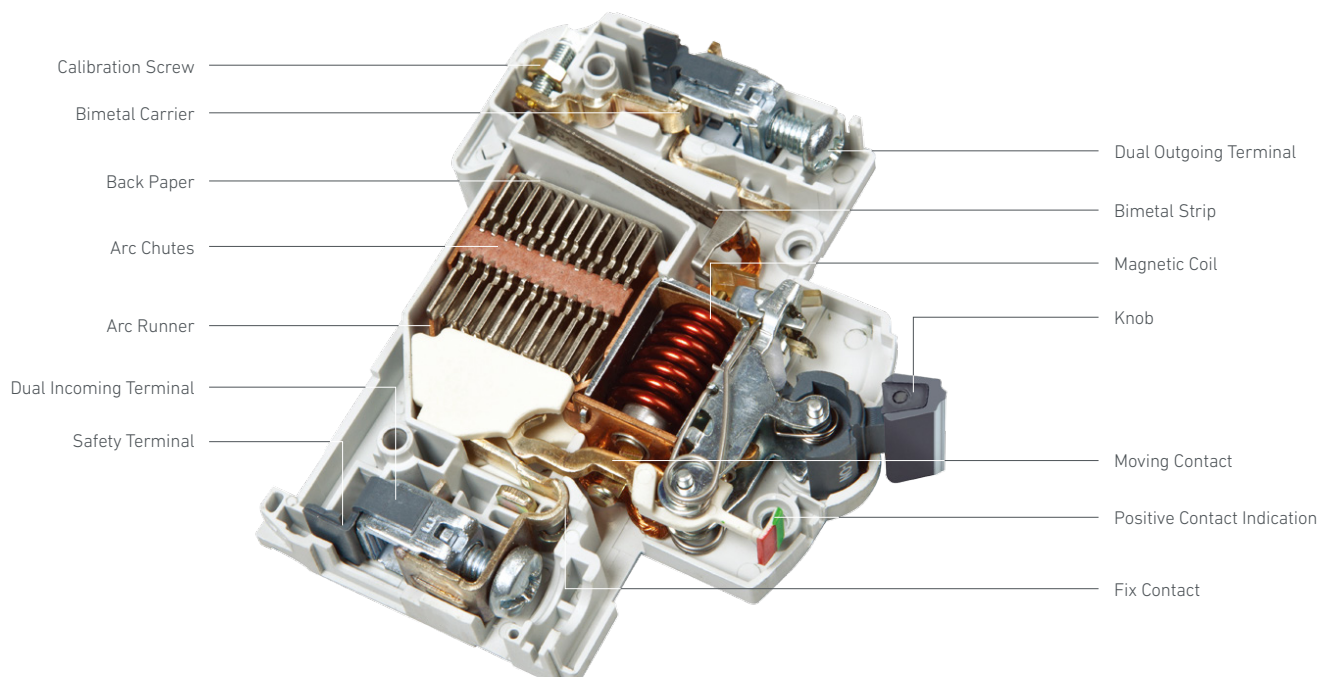


Magnetic Operation

In magnetic operation, large overloads or short circuit current actuates

a solenoid causing a plunger to strike the latching mechanism rapidly opening the main contacts.

Internal View



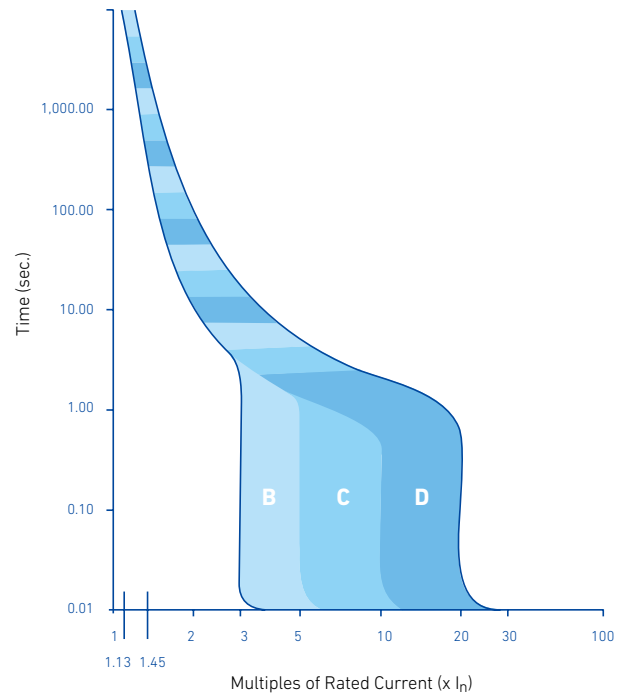
Characteristics Curves

As per	Thermal Tripping			Magnetic Tripping		
	No Tripping	Tripping	Time	Hold	Trip	Time
IEC/EN 60898-1	Current	Current	Limits	Current	Current	Limits
	I_1	I_2	t	I_4	I_5	t
B Curve	$1.13 \times I_n$		≥ 1 h	$3 \times I_n$		≥ 0.1 s
		$1.45 \times I_n$	< 1 h		$5 \times I_n$	< 0.1 s
C Curve	$1.13 \times I_n$		≥ 1 h	$5 \times I_n$		≥ 0.1 s
		$1.45 \times I_n$	< 1 h		$10 \times I_n$	< 0.1 s
D Curve	$1.13 \times I_n$		≥ 1 h	$10 \times I_n$		≥ 0.1 s
		$1.45 \times I_n$	< 1 h		$20 \times I_n$	< 0.1 s
$I_3 = 2.55 \times I_n$	$1 \text{ s} < t < 60 \text{ s for } I_n \leq 32 \text{ A}$ $1 \text{ s} < t < 120 \text{ s for } I_n > 32 \text{ A}$					

Tripping Characteristics

Based on the tripping characteristics, MCBs are available in 'B', 'C' and 'D' curve to suit different types of applications.

- **'B' Curve:** for protection of electrical circuits with equipment that does not cause surge current (lighting and distribution circuits). Short circuit release is set to (3-5) I_n
- **'C' Curve:** for protection of electrical circuits with equipment that causes surge current (inductive loads and motor circuits). Short circuit release is set to (5-10) I_n
- **'D' Curve:** for protection of electrical circuits which causes high inrush current, typically 12-15 times the thermal rated current (transformers, X-ray machines etc.) Short circuit release is set to (10-20) I_n



Technical Data

Temperature Derating Table

Rated Current (A)	Ambient Temperature (°C)													
	-5 °C	0 °C	5 °C	10 °C	15 °C	20 °C	25 °C	30 °C	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
0.5	0.64	0.62	0.60	0.58	0.56	0.54	0.52	0.5	0.48	0.46	0.44	0.42	0.40	0.38
1.0	1.28	1.24	1.20	1.16	1.12	1.08	1.04	1.0	0.96	0.92	0.88	0.84	0.80	0.76
2.0	2.56	2.48	2.40	2.32	2.24	2.16	2.08	2.0	1.92	1.84	1.76	1.68	1.60	1.52
3.0	3.84	3.72	3.60	3.48	3.36	3.24	3.12	3.0	2.88	2.76	2.64	2.52	2.40	2.28
4.0	5.12	4.96	4.80	4.64	4.48	4.32	4.16	4.0	3.84	3.68	3.52	3.36	3.20	3.04
5.0	6.40	6.20	6.00	5.80	5.60	5.40	5.20	5.0	4.80	4.60	4.40	4.20	4.00	3.80
6.0	7.68	7.44	7.20	6.96	6.72	6.48	6.24	6.0	5.76	5.52	5.28	5.04	4.80	4.56
10.0	12.80	12.40	12.00	11.60	11.20	10.80	10.40	10.0	9.60	9.20	8.80	8.40	8.00	7.60
16.0	20.50	19.80	19.60	18.60	17.90	17.70	16.60	16.0	15.40	14.70	14.10	13.40	12.80	12.20
20.0	25.60	24.80	24.00	23.20	22.40	21.60	20.80	20.0	19.20	18.40	17.60	16.80	16.00	15.20
25.0	32.00	31.00	30.00	29.00	28.00	27.00	26.00	25.0	24.00	23.00	22.00	21.00	20.00	19.00
32.0	41.00	39.70	38.40	37.10	35.00	34.60	33.30	32.0	30.70	29.40	28.20	26.90	25.60	24.30
40.0	51.20	49.60	48.00	46.40	44.80	43.20	41.60	40.0	38.40	36.80	35.20	33.60	32.00	30.40
50.0	64.00	62.00	60.00	58.00	56.00	54.00	52.00	50.0	48.00	46.00	44.00	42.00	40.00	38.00
63.0	80.60	78.10	75.60	73.10	70.60	68.00	65.50	63.0	60.50	58.00	55.40	52.90	50.90	47.90
80.0	95.10	93.10	91.00	88.90	86.80	84.60	82.30	80.0	77.60	75.10	72.60	70.00	67.20	64.40
100.0	121.10	118.30	115.50	112.50	109.50	106.50	103.30	100.0	96.60	93.10	89.60	85.60	81.60	77.50
125.0	144.30	141.70	139.00	136.60	133.60	130.80	127.90	125.0	121.90	118.90	115.70	112.40	109.10	105.60

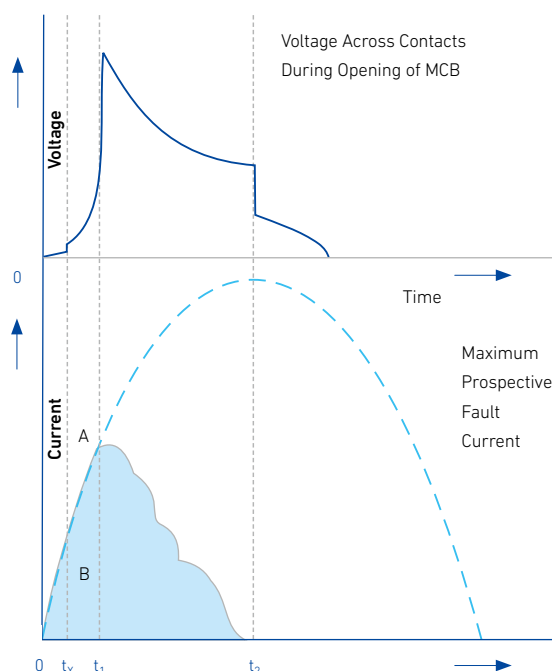
Current Limiting Design

In a current limiting breaker, the tripping & arc control mechanism are designed that under short circuit conditions, the contacts are physically separated and the electrodynamics forces set up by fault current, assist the extinction in less than half cycle.

The figure shows the current limiting effect of circuit breakers.

Fault traces for voltage & current

- 0 = Point of fault initiation
- t_x = Contact opening time (i.e., creation of arc)
- t_1 = Current/Voltage peak (i.e., current limitation)
- t_2 = Time to total extinction of arc (i.e., complete shutdown of fault current)

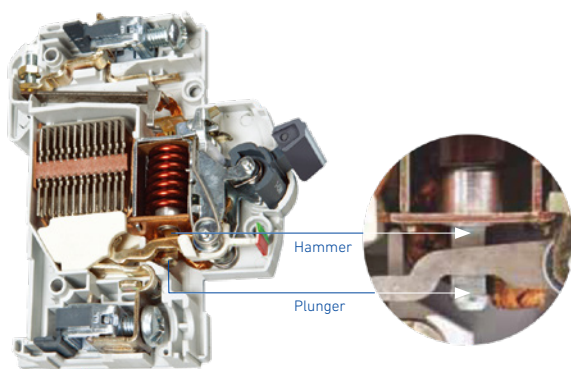


Standard Use Environment

Hammer Trip Mechanism

Current limiting design in itself may not fulfill the requirement of quick breaking (instantaneous action) mainly due to inertia of the latch mechanism and interconnected sequence of operations.

A hammer directly connected to the plunger strikes the moving contact arm with a force proportional to the peak current there by forcibly separating the moving contact from the fixed contact much before the latch mechanism operates. This further reduces the opening time of the circuit breaker.



Effect of Frequency Variation

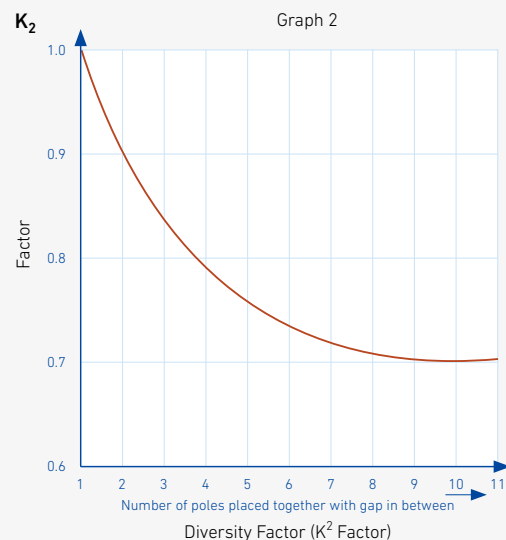
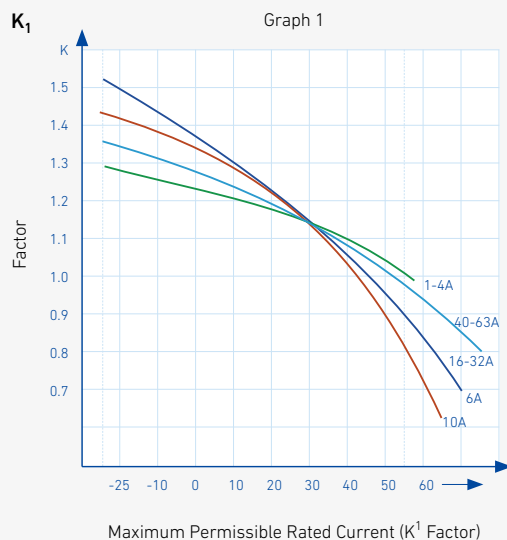
MCBs are designed to operate at AC frequency 50/60 Hz. However, MCBs specially suitable for DC applications and for frequencies upto 400 Hz can be supplied on request.

These can be used on different frequencies in supply from 50-60 Hz without any deration.

For higher frequencies, normal MCBs can be used with a multiplication factor which shall only affect its magnetic trip current.

Supply	AC			DC
Frequency	100 Hz	200 Hz	400 Hz	
Multiplication Factor	1.1	1.2	1.5	1.5

Ambient Temperature Compensation/Diversity Factor Chart



Calculation

$$I_N/\text{MCB} = K_1 \times K_2 \times I_N$$

Example

4 MCBs with $I_N = 10$ A, and the amb. temp. is 50°C kept with no gap in between

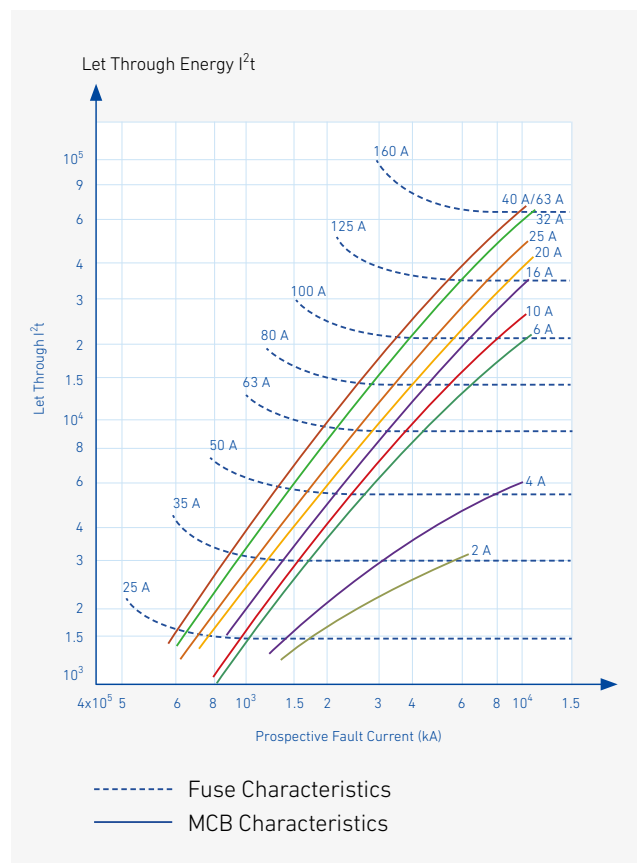
Solution

$K_1 = 0.89$ (from graph 1)

$K_2 = 0.78$ (from graph 2)

$$I_N/\text{pole} = 0.89 \times 0.78 \times 10 = 6.94 \text{ A}$$

Technical Data



Energy Limiting Class 3

MCBs are designed to have low let through energy during faults, thus ensuring better protection of cables and equipment.

Maximum Backup Protection

At site, no. of MCBs are used for outgoing connection. To protect the MCBs under short circuit (higher breaking capacity), we need to put fuses in the incoming side. The current rating of fuses should not be more than the values given in the table.

MCB Current Rating	Backup Fuse Rating
1 A	25 A
2 A	35 A
4 A	50 A
6 A	80 A
10-63 A	100 A

Cold Resistance & Power Loss Details

The power loss value declared at rated current.

Rated Current I_n (A)	Cold Resistance R_l (mΩ)	Power Loss per Pole P_v (W)
0.5	3,100.00	0.8
1	860.80	1.0
2	280.00	1.2
4	70.00	1.2
6	25.00	1.3
10	11.68	1.4
13	10.10	1.6
16	8.00	2.2
20	4.50	2.3
25	3.78	3.1
32	2.57	3.3
40	1.94	3.6
63	1.30	6.2
80	1.00	10.0
100	0.85	11.0
125	0.80	12.5

※ Remarks: Tolerance $\pm 5\%$

DC Application

MCBs for DC application are specially designed to meet tough arc quenching conditions. While selecting circuit breaker for DC applications following parameters have to be taken into consideration.

Normal Circuit Currents

The rating and normal running temperature of the MCB are unaffected by DC. The MCB can be selected using the thermal section of the standard time/current curves. Magnetic tripping on DC is different from the equivalent AC by a peak factor of 1.4
 ie., for 'B' curve AC MCB, magnetic range = $(3-5)I_n$
 for DC MCB, magnetic range = $1.4(3-5)I_n = (4-7)I_n$
 for 'C' curve AC MCB, magnetic range = $(5-10)I_n$
 for DC MCB, magnetic range = $1.4(5-10)I_n = (7-14)I_n$

Short Circuit Currents

The maximum short circuit current possible on a DC system is determined by the voltage of the battery and the total internal resistance of the cells.

It is given by Ohm's law: $I_{SC} = V_b/R_b$

Where, I_{SC} is the short circuit current

V_b is the voltage of the battery (with 100 % charged battery)

R_b is the internal resistance of the battery cells

(this is usually stated by the manufacturer)

Circuit Time Constant

The time constant is given by: $L/R = 15 \text{ ms max}$ where L is the inductance of the circuit

R is The Resistance Of The Circuit

The time constant is usually given in milliseconds (ms.). Ideally, DC circuits would be mainly resistive (i.e. a low number), as inductive circuits produce a back emf when the current suddenly falls. This in turn tends to prolong arcing during switching operations, and so reduce contact life.

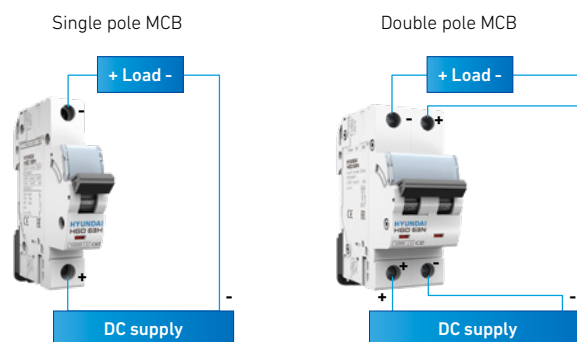
Circuit Voltage

The voltage of the circuit is dependent on the power supply. The lower the voltage the easier switching operations will be, but the voltage makes no difference to the running of the MCBs. Contact life can be significantly increased by reducing the voltage, drop across each pole. This can be achieved by wiring poles in series.

Technical Data

Correct polarity connections for DC MCBs

- Connection diagram

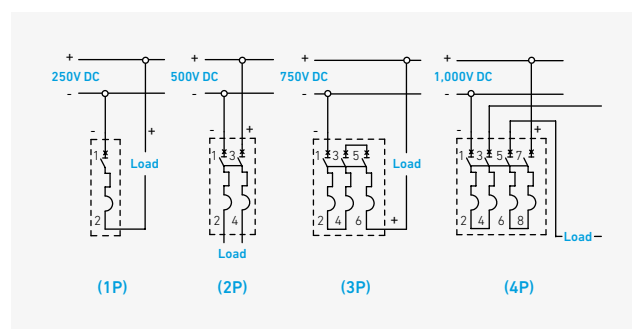


- All HGD type MCB can be applied in DC.

Rated Current (I_n)	A	0.5-63
Rated Voltage (U_e)	V	250/500/750/1,000
No. of Poles		1P, 2P, 3P, 4P
Rated Short Circuit Breaking Capacity	kA	10

※ Also available in DC 24-130 V

Connection Diagram



Technical Data

Discrimination Table

MCB Downstream	MCB Upstream C Curves								
C Curve	10 A	13 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A
0.5 to 5 A	50	65	80	100	125	160	200	250	315
6 A		65	80	100	125	160	200	250	315
10 A				100	125	160	200	250	315
13 A					125	160	200	250	315
16 A						160	200	250	315
20 A							200	250	315
25 A								250	315
32 A									315
40 A									
50 A									

MCB Downstream	MCB Upstream B Curves									
B Curve	6 A	10 A	13 A	16 A	20 A	25 A	32 A	40 A	50 A	63 A
0.5 to 5 A		30	39	48	60	75	96	120	150	189
6 A		30	39	48	60	75	96	120	150	189
10 A				48	60	75	96	120	150	189
13 A					60	75	96	120	150	189
16 A						75	96	120	150	189
20 A							96	120	150	189
25 A								120	150	189
32 A										189

MCB Downstream	MCCB Upstream																				
C Curve	16 A	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A	160 A	200 A	250 A	320 A	400 A	500 A	630 A	800 A	1,000 A	1,250 A	1,600 A
0.5 to 6 A	1,100	1,200	1,400	1,700	2,000	2,500	3,400	4,800	5,800	6,700	T	T	T	T	T	T	T	T	T	T	T
10 A		1,100	1,200	1,400	1,700	2,100	2,500	3,000	3,500	4,300	T	T	T	T	T	T	T	T	T	T	T
16 A				1,300	1,600	1,900	2,100	2,400	2,700	3,200	8,300	T	T	T	T	T	T	T	T	T	T
20 A					1,600	1,900	2,100	2,400	2,700	2,500	8,300	T	T	T	T	T	T	T	T	T	T
25 A						1,700	1,800	2,000	2,200	2,500	5,400	8,700	T	T	T	T	T	T	T	T	T
32 A							1,800	2,000	2,200	2,500	5,400	8,700	T	T	T	T	T	T	T	T	T
40 A								1,500	1,700	2,000	4,300	7,000	T	T	T	T	T	T	T	T	T
50 A									1,300	1,500	3,600	5,900	9,000	T	T	T	T	T	T	T	T
63 A										1,100	2,800	5,200	8,200	T	T	T	T	T	T	T	T

※ Prospective fault levels to which selectivity is achieved (T=Total selectivity)

Discrimination With Fuses (HRC FUSE Upstream Type gG)

MCBs Downstream	HRC FUSE Link Upstream									
	20 A	25 A	32 A	40 A	50 A	63 A	80 A	100 A	125 A	160 A
0.5 to 6 A	700	850	960	1,200	1,350	1,750	2,800	4,500	5,200	6,000
10 A		700	960	1,200	1,350	1,750	2,800	4,500	5,200	6,000
13 A			850	1,200	1,200	1,750	2,800	4,500	5,200	6,000
16 A				960	1,100	1,500	2,500	3,200	5,200	6,000
20 A					1,100	1,500	2,500	3,200	4,500	5,200
25 A					960	1,350	2,000	3,200	4,500	5,200
32 A						1,200	1,750	2,800	4,500	5,200
40 A							1,750	2,800	4,500	5,200
50 A								2,500	3,200	4,500
63 A									3,200	4,500

Technical Data

MCB Selection Chart For Household Applications

Appliances	Capacity/Watt (Load) (240 V~1 ph)	Current Rating of MCB	Type of MCB
Air Conditioner	1.0 ton	10 A ¹⁾	"C" series
	1.5 ton	16 A ¹⁾	"C" series
	2.0 ton	20 A ¹⁾	"C" series
Refrigerator	165 litres	3 A ¹⁾	"C" series
	350 litres	4 A ¹⁾	"C" series
Oven Cum Griller	4,500 W	32 A	"B" series
	1,750 W	10 A	"B" series
Oven only Hot Plate only Room Heater	750 W	6 A	"B" series
	2,000 W	10 A	"B" series
	1,000 W	6 A	"B" series
	2,000 W	10 A	"B" series
Washing Machine	300 W	2 A	"C" series
Washing Machine (with heater)	1,300 W	8 A	"C" series
(Storage/Instant)	1,000 W	6 A	"B" series
	2,000 W	10 A	"B" series
	3,000 W	16 A	"B" series
	6,000 W	32 A	"B" series
Electric Iron	750 W	6 A	"B" series
	1,250 W	8 A	"B" series
(2 Slices)	1,200 W	8 A	"B" series
Electric Kettle	1,500 W	10 A	"B" series

※ 1) The values vary depending on manufacturers.

Rating of MCBs for Specified No. of Fittings ("B" Series MCBs)

Lamp (Watt)	Number of Lamps	Rating (A)
20 W	8	1
	12	1.5
40 W	2	0.5
	10	2
	12	2.5
60 W	1	0.5
	4	1.5
	8	3
	12	4
80 W	1	0.5
	2	1
	5	2
	8	4
	12	5
100 W	1	1
	2	1.5
	4	2.5

※ "B" series MCB is used for all lighting applications

MCB Selection Chart for Motor Protection

S. No.	kW	HP	1 Phase 230 V DOL Starting		3 Phase 400 V DOL Starting		3 Phase 400 V Assisted Starting Star Delta		
			Full Load Current	MCB Selection	Full Load Current	MCB Selection	Full Load Current	MCB Selection	
1	0.18	0.24	2.8	10	0.9	2			
2	0.25	0.34	3.2	10	1.2	2			
3	0.37	0.50	3.5	10	1.2	2			
4	0.55	0.74	4.8	16	1.8	3			
5	0.75	1.01	6.2	20	2.0	3			
6	1.1	1.47	8.7	25	2.6	6			
7	1.5	2.01	11.8	32	3.5	10			
8	2.2	2.95	17.5	50	4.4	10			
9	3	4.02	20.0	63	6.3	16	6.3	16	10
10	3.75	5.03	24.0	80	8.2	20	8.2	20	10
11	5.5	7.37	26.0	80	11.2	25	11.2	32	16
12	7.5	10.05	47.0	125	14.4	40	14.4	40	25
13	10	13.40			21.0	50	21.0	50	32
14	15	20.11			27.0	100	27.0	63	40
15	18.5	24.80			32.0	125	32.0		50
16	22	29.49			38.0	125	38.0		63
17	30	40.21			51.0	125	51.0		63

※ Calculation formulae:

- Incomer current rating, for single phase: $\frac{\text{Total Load in Watts}}{240 \text{ V}}$

- Incomer current rating, for single phase: $\frac{\text{Total Load in Watts}}{\sqrt{3} \times 240 \text{ V}}$

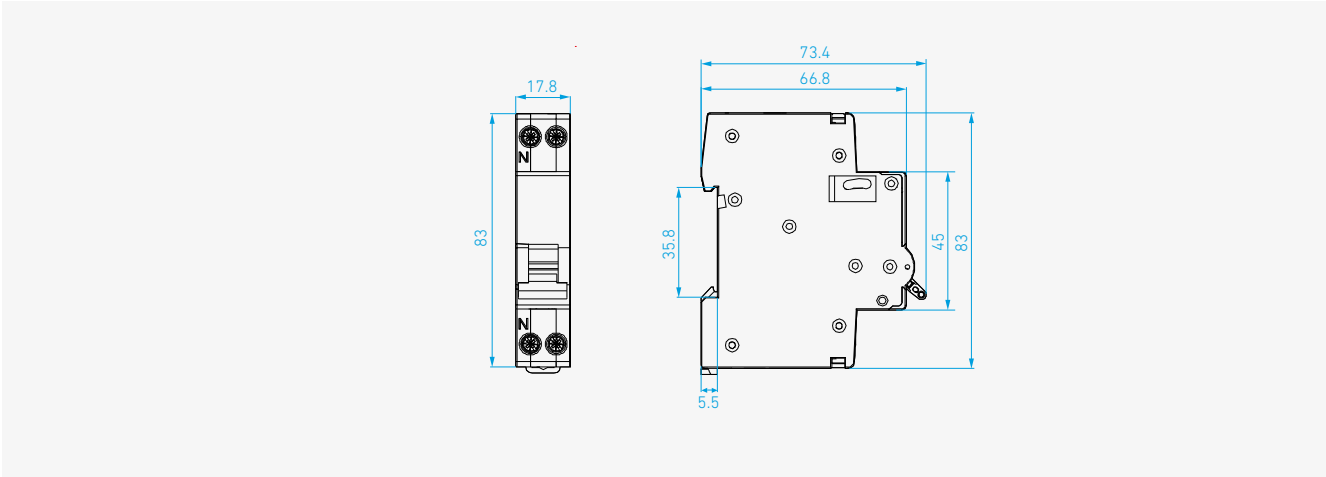
"C" series MCB is used for all motor applications

※ Note: One lighting circuit can have up to 800 W or up to 10 lighting points.

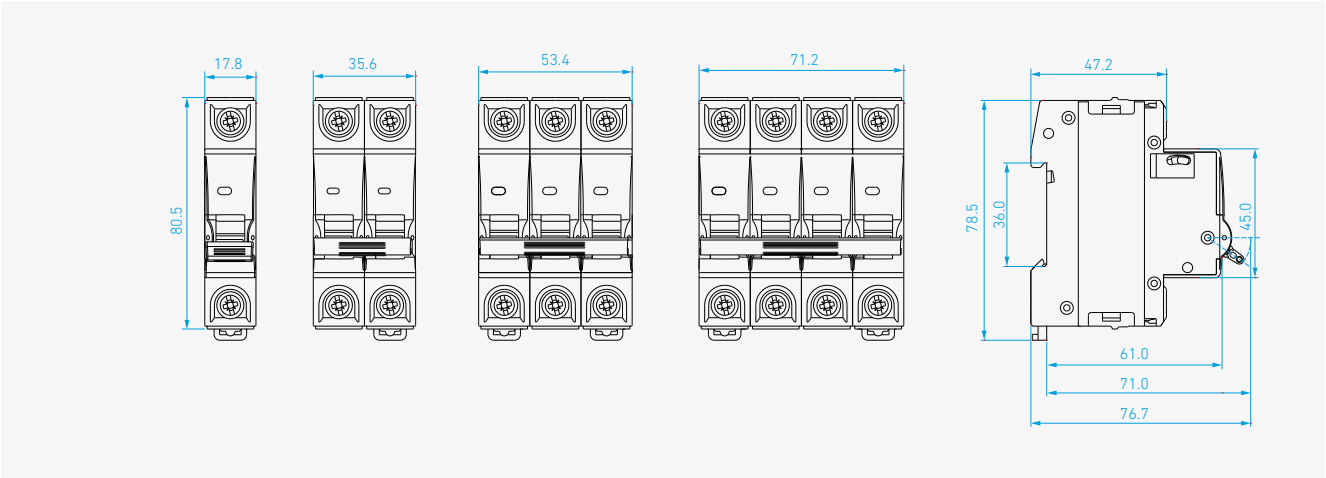
One power circuit can have up to 2,000 W or 1 power points.

HGD (Standard Type)

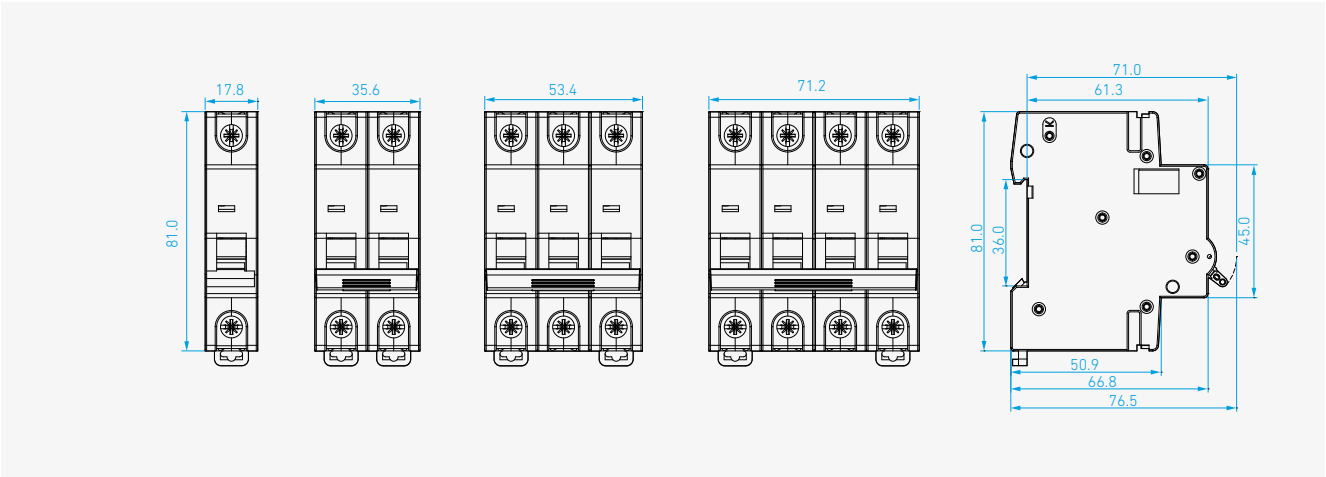
HGD32NS, 32 AF



HGD63E/S, 63 AF



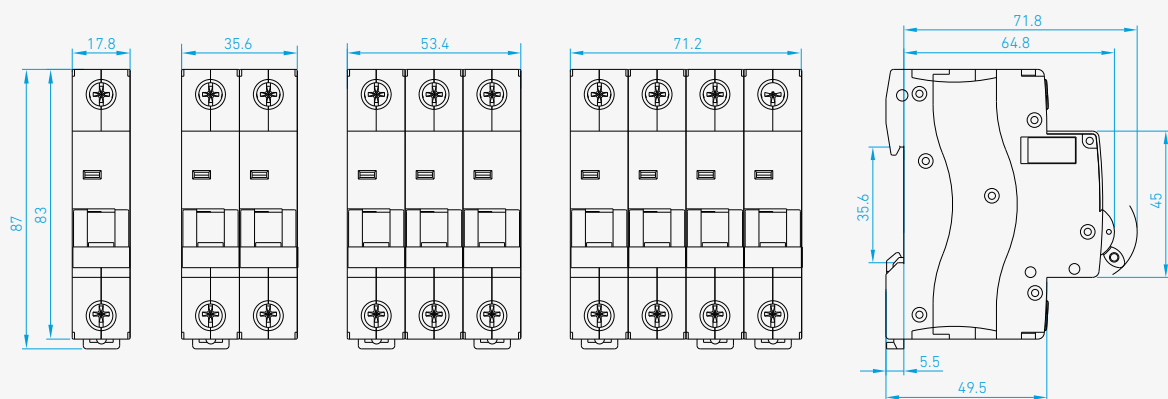
HGD63M/P, 63 AF



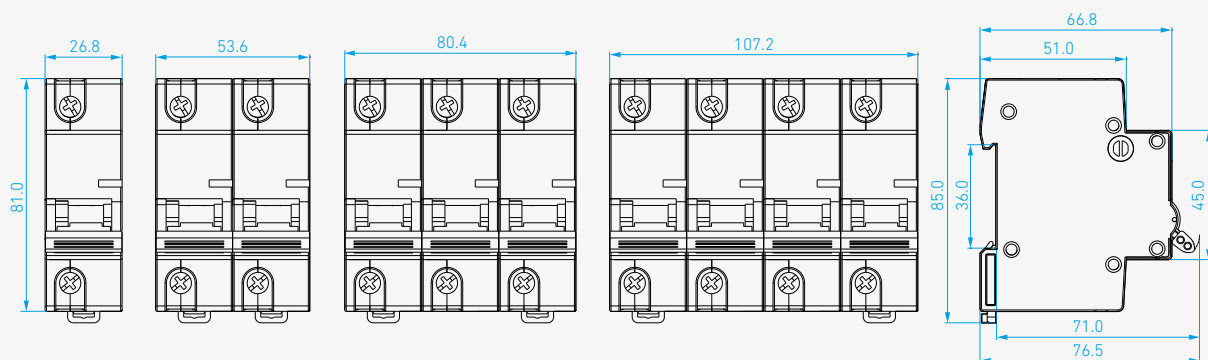
Dimension

HGD (Standard Type)

HGD63U/D, 63 AF

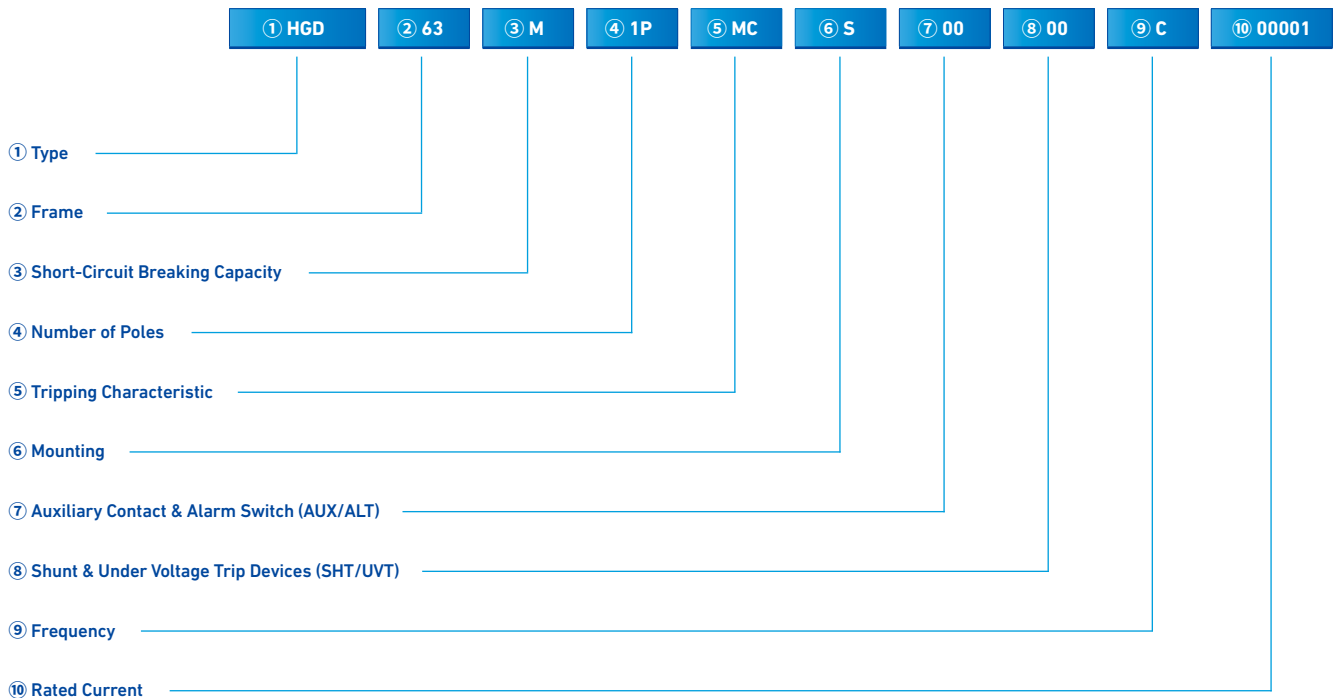


HGD100S, 125 AF



MCB Ordering Information

Ordering Guidelines (Standard Type)



① Type	
HGD	Miniature circuit breaker

② Frame	
32NS	32 AF(Neutral + 1 Pole)
63	63 AF (Standard type)
100S	125 AF (Standard type)

③ Short-Circuit Breaking Capacity	
E	3 kA (Standard type), 63 AF
S	4.5 kA (Standard type), 63 AF
M	6 kA (Standard type), 63 AF
P	10 kA (Standard type), 63 AF
U	15 kA (Standard type), 63 AF
D	10 kA (Standard type), 63 AF – DC

④ Number of Poles	
1P	1 Pole
1N	1 Pole + Neutral
N1	Neutral + 1 Pole
2P	2 Pole
3P	3 Pole
3N	3 Pole + Neutral
N3	Neutral + 3 Pole
4P	4 Pole

⑤ Tripping Characteristic	
MB	B Curve
MC	C Curve
MD	D Curve

⑥ Mounting	
S	Front connection

⑦ Auxiliary Contact & Alarm Switch	
00	Non-attachment

⑧ Shunt & Under Voltage Trip Devices	
00	Non-attachment

⑨ Frequency	
C	50/60 Hz

⑩ Rated Current	
00001	1 A
00002	2 A
00003	3 A
00004	4 A
00005	5 A
00006	6 A
00010	10 A
00016	16 A
00020	20 A
00025	25 A
00032	32 A
00040	40 A
00050	50 A
00063	63 A
00080	80 A
00100	100 A
00125	125 A