Circuit Protection

Low voltage circuit breakers (below 1000 volts) are used to protect circuits (lighting installations, industrial electricity, wires and cables, machineries, etc.) against overloads, short circuit faults and leakage currents.

These circuit breakers are used in industry, household, and similar installations. In the following, we will introduce some of them which are among the products of RAAD Company:

- One of the most widely used circuit breakers is the MCB. This type of circuit breaker protects circuits against overloads and short-circuits. MCBs produce in the nominal current range from 1A to 63 A.
- Another type of circuit breaker is called RCCB which protects life from the risk of electric shock and prevents leakage current in the electrical circuits. These circuit breakers are divided into two types in terms of sensitivity: the household type protects operators from direct or indirect electrical contact, and the industrial type protects industrial devices and equipment by preventing leakage current effectively.
- RCBOs are another type of circuit breakers that protect against overload, short circuits, and leakage currents simultaneously.

AC Miniature Circuit Breaker (AC-MCB)

RB/M

AC-miniature circuit breaker (MCB) is used in the electrical circuits to protect equipment and circuits against overload or short-circuit faults.

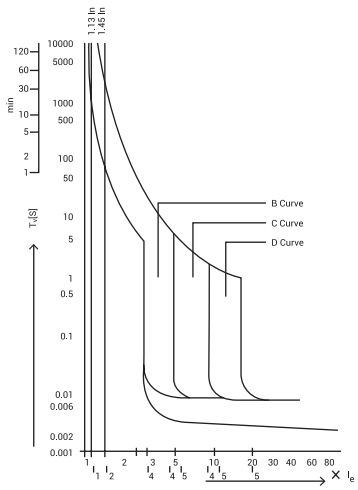
RAAD AC-MCBs are available in rated currents from 1A to 63A as well as curves B, C, and D for different applications.

RAAD AC-MCBs are manufactured in 1P, 1P+N, 2P, 3P, 3P+N, and 4P types.

The design for the interior and the body of RAAD MCBs are aimed to easily withstand short circuit current in both 6KA and 10KA.

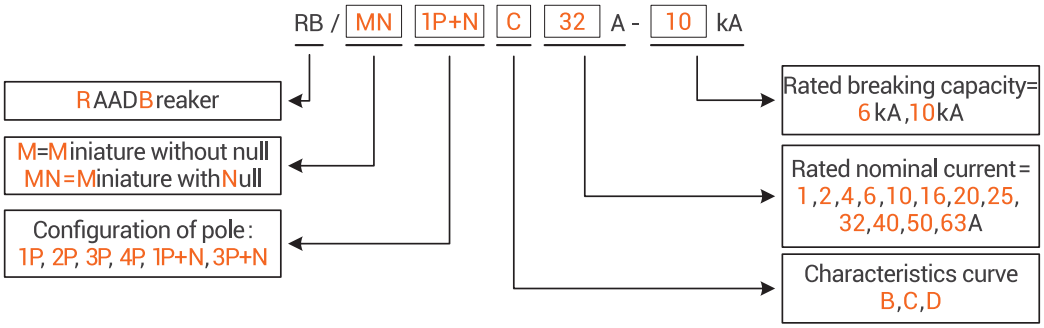
RAADs MCBs can install two types of auxiliary contacts (RB-CB and RB-FB) for better use in circuits.

The design and adjustment of AC-MCBs produced by this company follow all the test clauses of the international standard IEC 60898-1, and all MCBs have product approval and certification. Based on the Tripping Characteristics, RAAD AC-MCB is available in B, C, and D curves to suit different applications. The figure and table below show the thermal and magnetic tripping characteristics of AC-MCB according to IEC 60898-1.



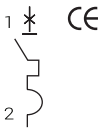
	Thermal Tripping			Magnetic Tripping		
As per IEC 60898	No tripping current I_1	Tripping current I_2	Time Limits t	Hold current I_4	Trip current I_5	Time Limits t
B Curve	$1.13\times I_e$		≥1h	$3\times I_e$		≥0.1s
		$1.45\times I_e$	<1h		$5\times I_e$	<0.1s
C Curve	$1.13\times I_e$		≥1h	$5\times I_e$		≥0.1s
		$1.45\times I_e$	<1h		$10\times I_e$	<0.1s
D Curve	$1.13\times I_e$		≥1h	$10\times I_e$		≥0.1s
		$1.45\times I_e$	<1h		$20\times I_e$	<0.1s

RAAD AC-MCB product selection guide is shown below:



All RAAD MCBs have a unique hologram for the product's authenticity and a text message number informing the customer.

RB/M

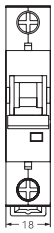


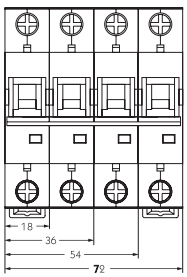
RB/MN

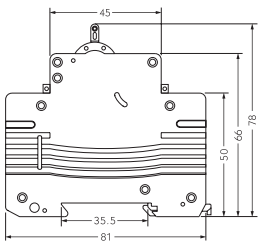
Technical data	RB/M				RB/MN	
Pole	1P	2P	3P	4P	1P+N	3P+N
Qty.	12	6	4	3	6	3
Rated voltage Ue (V)	230/400	400	400	400	230/400	400
Rated current Ie (A)	1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63					
IEC 60898-1 rated data						
Insulation voltage Ui (V)	500					
Rated frequency (Hz)	50					
Rated breaking capacity Icu (kA)	6, 10					
Energy limiting class	3					
Rated impulse withstand Uimp (kV)	4					
AC dielectric test voltage for 1 minute (kV)	2					
Thermo-magnetic release characteristic	B (3×Ie - 5×Ie)					
	C (5×Ie - 10×Ie)					
	D (10×Ie - 20×Ie)					
Reference temperature for setting thermal element (°C)	30					
Ambient temperature (°C) (daily average≤35 °C)	-5 ~ +40					
Storage temperature (°C)	-25 ~ +70					
Mechanical Features						
Electrical life (Cycles)	8000					
Mechanical life (Cycles)	20000					
Protection degree	IP20					
Installation						
Terminal connection type	Cable, Pin- type busbar, U- type busbar					
Connection capacity for cable/busbar (mm^2)	0.75 - 25					
Connection capacity for cable/busbar (AWG)	18 - 3					
Striping length (mm)	12					
Tightening torque (N.m)	2.5					
Mounting	DIN 35 (according IEC 60715)					
Connection	From top and bottom					

Accessories	Type	Ordering No.	Qty.
Auxiliary contact	RB/M-CB	6124001101	12
Alarm contact	RB/M-FB	6124101101	12

Overall and Installation Dimension (mm) :







DC Miniature Circuit Breaker (DC-MCB)

RB/MD

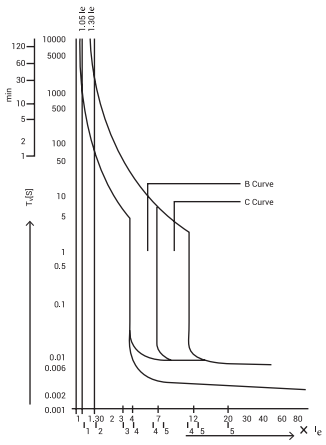
DC-miniature circuit breaker (MCB) is used in direct current electrical circuits to protect equipment and circuits against DC overload or DC short-circuit faults.

RAAD DC-MCBs are available in rated currents from 1A to 63A for different applications like photovoltaic and DC distribution systems. RAAD DC-MCBs are in 1P and 2P types.

The design for the interior and the body of the of RAAD DC-MCBs are aimed to easily withstand short circuit currents in both 6KA and 10KA.

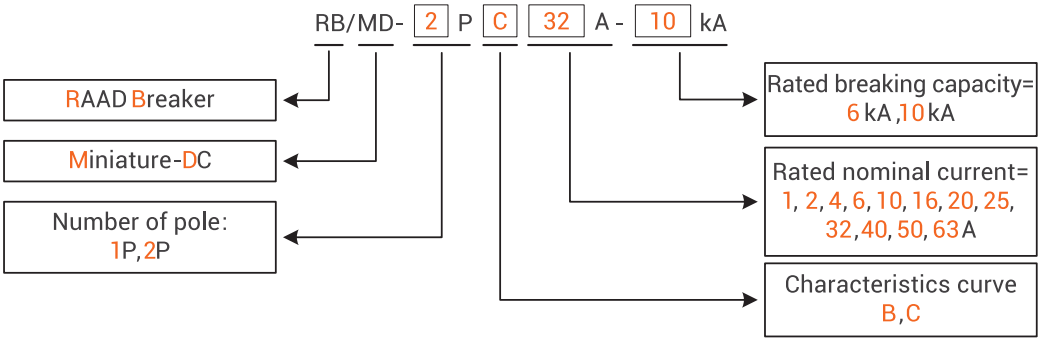
The design and adjustment of DC-MCBs produced by this company follow all the test clauses of the international standard IEC 60947-2, and all DC-MCBs have product approval and certification.

Based on the Tripping Characteristics, RAAD DC-MCB is available in B and C curves to suit different applications. The figure and table below show the thermal and magnetic tripping characteristics of DC-MCB according to IEC 60947-2.



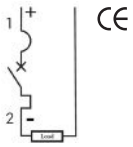
	Therminal Tripping			Magnetic Tripping		
As per IEC 60947- 2	No tripping current	Tripping Current I_2	Time Limits t	Hold current I_4	Trip current I_5	Time Limits t
B Curve	$1.05 \times I_e$		≥1h	$4 \times I_e$		≥0.1s
		$1.30 \times I_e$	<1h		$7 \times I_e$	<0.1s
C Curve	$1.05 \times I_e$		≥1h	$7 \times I_e$		≥0.1s
		$1.30 \times I_e$	<1h		$12 \times I_e$	<0.1s

RAAD DC-MCB product selection guide is shown below:



All RAAD MCBs have a unique hologram for the product's authenticity and a text message number informing the customer.

RB/MD 1P

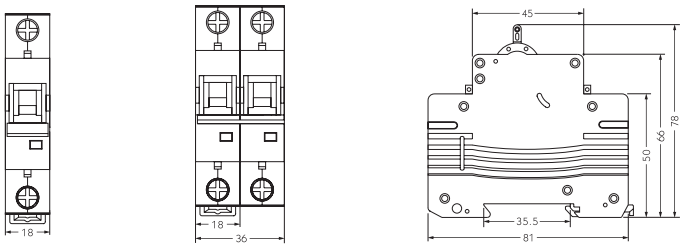


RB/MD 2P

Technical data	RB/MD 1P	RB/MD 2P
Pole	1P	2P
Qty.	12	6
Rated voltage Ue (V DC)	250	500
Rated current Ie (A)	1, 2, 4, 6, 10, 16, 20, 25, 32, 40, 50, 63	
IEC 60947-2 rated data		
Insulation voltage Ui (V)	500	
Rated breaking capacity (kA)	6, 10	
Energy limiting class	3	
Rated impulse withstand Uimp (kV)	4	
AC dielectric test voltage for 1 minute (kV)	3	
Thermo-magnetic release characteristic	B (4×Ie - 7×Ie)	
	C (7×Ie - 12×Ie)	
Reference temperature for setting thermal element (°C)	30	
Ambient temperature (°C) (daily average≤35 °C)	-5 ~ +40	
Storage temperature (°C)	-25 ~ +70	
Mechanical Features		
Electrical life (Cycles)	4000	
Mechanical life (Cycles)	10000	
Protection degree	IP20	
Installation		
Terminal connection type	Cable, Pin- type busbar, U- type busbar	
Connection capacity for cable/busbar (mm^2)	0.75 - 25	
Connection capacity for cable/busbar (AWG)	18 - 3	
Striping length (mm)	12	
Tightening torque (N.m)	2.5	
Mounting	DIN 35 (according IEC 60715)	
Connection	From top and bottom	

Accessories	Type	Ordering No.	Qty.
Auxiliary contact	RB/M-CB	6124001101	12
Alarm contact	RB/M-FB	6124101101	12

Overall and Installation Dimension (mm) :



Auxiliary contact

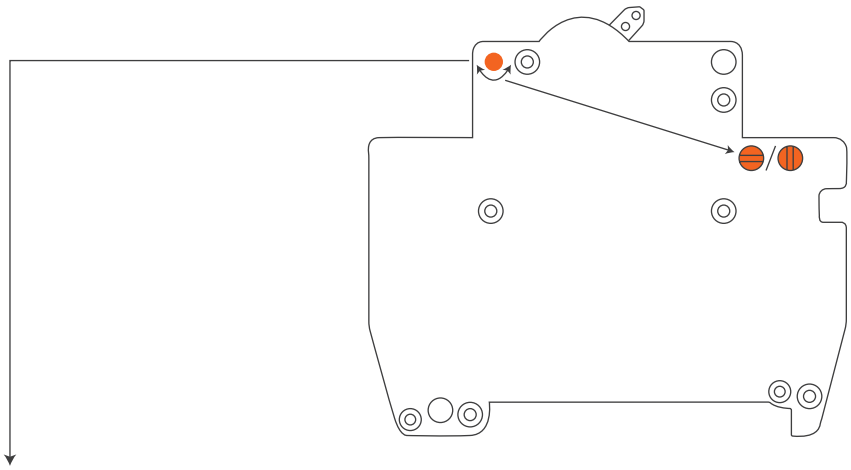
RB/M-CB, RB/M-FB

Auxiliary Contacts are used in command circuits, and their task is to add some normally open (NO) and normally close (NC) contacts on circuits. Auxiliary contacts are installed besides MCB or RCBO. these contacts do not protect solitarily; when the MCB or RCBO trips due to a fault, the auxiliary contacts will trips as well.

RAAD Auxiliary contacts are manufactured in two types (FB & CB). The CB type has 1NO+1NC, and the FB type has 2CO (2NO+2NC). In addition, the FB type has an indicator that turns blue when a fault occurs. It is possible to fully identify whether the auxiliary contact was cut off manually or disconnected due to a fault on the MCB or RCBO .

The electrical and mechanical life of RAAD Auxiliary contacts are 6050 and 10,000 cycles, respectively. Production of the contacts are in full compliance with the international standard IEC 60947-5-1.

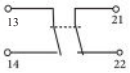
In the following, it shows the function of the FB auxiliary contact when it is installed next to a MCB in different situations



The state of the FB's rotary switch	Situations	MCB lever status	MCB indicator	FB aux indicator	Electrically connected FB's terminals	
	Connection current path of MCB	On	Red	White	11-14	21-24
	Manual MCB disconnection of current path	Off	Green	White	11-12	21-24
	Disconnection of the MCB current path due to the current fault event	Off	Green	Blue	11-12	21-22
	Connection current path of MCB	On	Red	White	11-14	21-24
	Disconnection current path of MCB	Off	Green	Blue	11-12	21-22

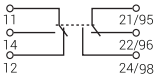
RB/M-CB

CE



RB/M-FB

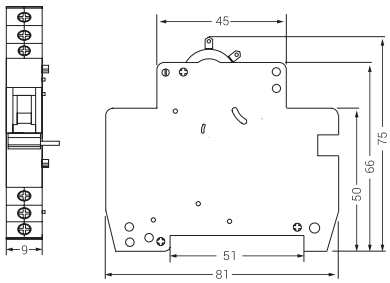
CE



Description	Type	Ordering No.	Qty.
Auxiliary contact	RB/M-CB	6124001101	12
Alarm contact	RB/M-FB	6124101101	12

Utilization category	AC13		AC15		DC12
Rated voltage Ue (V)	AC-230	AC-400	AC-230	AC-400	DC 110
Rated current Ie (A)	3	2	2	1	0.5
IEC 60947-5-1 rated data					
Insulation voltage Ui (V)	400				
Rated frequency for Vac (Hz)	50/60				
Rated short circuit making capacity	20Ie, t=0.1s				
Rated impulse withstand Uimp (kV)	2.5				
AC dielectric test voltage for 1 minute (kV)	2				
Ambient temperature (°C) (daily average≤35 °C)	-5 ~ +40				
Storage temperature (°C)	-25 ~ +70				
Mechanical Features					
Electrical life (Cycles)	6050				
Mechanical life (Cycles)	10000				
Protection degree	IP20				
Installation					
Terminal connection type	Cable				
Connection capacity for cable/busbar (mm^2)	0.75 - 2.5				
Connection capacity for cable/busbar (AWG)	18 - 13				
Striping length (mm)	6.5				
Tightening torque (N.m)	0.8				

Overall and Installation Dimension (mm) :



Residual Current Circuit Breaker (RCCB)

RB/RC

RCCBs are designed to protect against leakage current, and always note that these products cannot protect against short circuit faults and overload faults.

RAAD Company RCCBs are produced in two rated residual currents (30, 300 mA). The RCCB with 30 mA residual current (household type) is suitable for protection against electric shock. The 300 mA residual current RCCB (industrial type) is for fire protection and protection against leakage current as well. Note that the 300 mA type is not ideal for protection against human shock.

RAAD RCCBs are made of electromagnetic type in AC class. This class breaks the main current flow by less than 100 milliseconds when the detected residual current is between half to one times of the rated residual current.

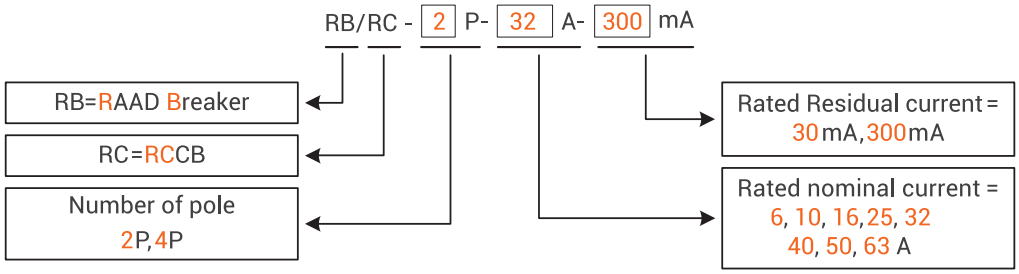
RCCBs in RAAD are produced in two models, 2P (1P+N) and 4P (3P+N), with the rated current range between 6A and 63A. These specific types endure short-circuit currents up to 6 KA.

The electrical and mechanical life of RAAD RCCBs are 2,000 and 4,000 cycles, respectively.

Two busbars are allocated on the top and bottom sides of the product.

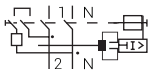
Our RCCBs fully comply with the international standard IEC 61008-1, and have a unique hologram for the product's authenticity and a text message number informing the customer.

RAAD RCCB product selection guide is shown below:



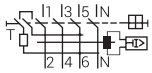
RB/RC-2P

CE



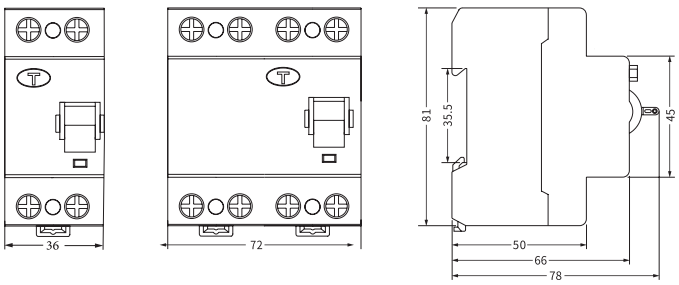
RB/RC-4P

CE



Technical data	RB/RC-2P	RB/RC-4P
Pole	2P (1P+N)	4P (3P+N)
Rated voltage Ue (V)	230	400
Rated current Ie (A)	16, 20, 25, 32, 40, 50, 63	
IEC 61008-1 rated data		
Type	AC	
Insulation voltage Ui (V)	500	
Rated frequency (Hz)	50/60	
Rated residual operation current I_nc (mA)	30, 300	
Rated residual making and breaking capacity IΔm (A)	500 (Ie=16, 20, 25, 32, 40, 50A) 630 (Ie=63A)	
Short circuit current IΔc (kA)	6	
Short circuit protection device	Fuse 63A 6000	
Break time under rated residual operation current (s)	≤ 0.1	
Rated impulse withstand Uimp (kV)	4	
AC dielectric test voltage for 1 minute (kV)	2.5	
Ambient temperature (°C) (daily average≤35 °C)	-25 ~ +40	
Storage temperature (°C)	-25 ~ +70	
Contact position indicator	Yes	
Mechanical Features		
Electrical life (Cycles)	2000	
Mechanical life (Cycles)	4000	
Protection degree	IP20	
Installation		
Terminal connection type	Cable, Pin- type busbar, U- type busbar	
Connection capacity for cable/busbar (mm^2)	0.75 - 25	
Connection capacity for cable/busbar (AWG)	18 - 3	
Striping length (mm)	12	
Tightening torque (N.m)	2.5	
Mounting	DIN 35 (according IEC 60715)	
connection	Power supply in both direction	

Overall and Installation Dimension (mm) :



Residual Current circuit Breaker with Overcurrent

RB/RO

Residual Current Circuit Breaker with Overcurrent (RCBO) protects circuits against short circuit faults, overload faults, and leakage currents. This product is a combination of a MCB and a RCCB.

RAAD Company RCBOs is in one type, 2P (1P+N). Their nominal current ranges varies from 6A to 63A, and their characteristic curve is C. the rated breaking capacity of RAAD RCBO is 6KA.

RAAD RCBOs are made of electronic type in AC class with rated residual current of 30 mA.

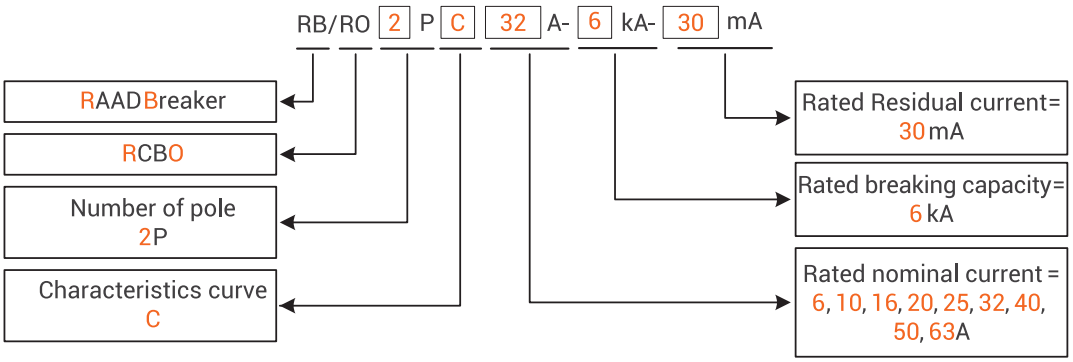
These RCBOs cut off the main current flow by less than 100 milliseconds when the detected residual current is between half to one times of the rated residual current.

The electrical and mechanical life of RAAD RCBOs are 4,000 and 10,000 cycles, respectively.

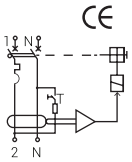
RAADs RCBOs also have two busbars at the top and bottom of the product. These products can install auxiliary contacts for better use in circuits.

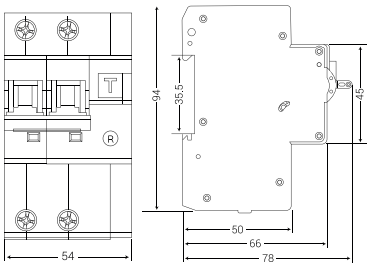
RAAD RCBOs are made in full compliance with the international standard IEC 61009-1. All RCBOs have a unique hologram for the product's authenticity and a text message number informing the customer

RAAD RCBO product selection guide is shown below:



RB/RO-1P+N



Technical data	RB/RO-1P+N		
Pole	1P+N		
Rated voltage Ue (V)	230V		
Rated current Ie (A)	6, 10, 16, 20, 25, 32, 40, 50, 63		
IEC 61009-1 rated data			
Insulation voltage Ui (V)	500		
Rated frequency (Hz)	50/60		
Rated breaking capacity (kA)	6		
Energy limiting class	3		
Rated impulse withstand Uimp (kV)	4		
Rated residual current IΔn (mA)	30		
Break time under rated residual operation current (s)	≤ 0.1		
AC dielectric test voltage for 1 minute (kV)	2		
Thermo-magnetic characteristic	C (5×In - 10×In)		
Reference temperature for setting thermal element (°C)	30		
Ambient temperature (°C) (daily average≤35 °C)	-25 ~ +55		
Storage temperature (°C)	-25 ~ +70		
Mechanical Features			
Electrical life (Cycles)	4000		
Mechanical life (Cycles)	10000		
Protection degree	IP20		
Installation			
Terminal connection type	Cable, Pin- type busbar, U- type busbar		
Connection capacity for cable/busbar (mm^2)	0.75 - 25		
Connection capacity for cable/busbar (AWG)	18 - 3		
Striping length (mm)	12		
Tightening torque (N.m)	2.5		
Mounting	DIN 35 (according IEC 60715)		
connection	Power supply from top		
Accessories	**Type**	**Ordering No.**	**Qty.**
Auxiliary contact	RB/M-CB	6124001101	12
Alarm contact	RB/M-FB	6124101101	12

Overall and Installation Dimension (mm) :