PRODUCT BROCHURE

Vmax

Medium voltage vacuum circuit-breakers 12...17.5 kV-630...2000 A-25...31.5 kA

- Vmax
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Description

General
The new Vmax circuit-breakers are the synthesis of ABB's affirmed technology in designing and constructing vacuum interrupters and their excellence in design, engineering and production of circuit-breakers.

The Vmax medium voltage circuit-breakers consist of an insulating monobloc in which three vacuum interrupters are housed.

The monobloc and operating mechanism are fixed to a frame.

The vacuum interrupter houses the contacts and makes up the interrupting chamber.

Current interruption in vacuum
The vacuum circuit-breaker does not require an interrupting and insulating medium. In fact, the interrupter does not contain ionisable material.

In any case, on separation of the contacts an electric arc is generated made up exclusively of melted and vaporised contact material.

The electric arc only remains supported by the external energy until the current is cancelled by passing through natural zero.

At that instant, the rapid reduction in the load density carried and the fast condensation of the metallic vapour, leads to extremely rapid recovery

The vacuum interrupter therefore recovers the insulating capacity and the capacity to withstand the transient recovery voltage, definitively extinguishing the arc.

Since high dielectric strength can be reached in the vacuum, even with minimum distances, interruption of the circuit is also guaranteed when separation of the contacts takes place a few milliseconds before passage of the current through natural zero.

The special geometry of the contacts and the material used, together with the limited duration and low voltage of the arc guarantee minimum contact wear and long life. Furthermore, the vacuum prevents their oxidation and contamination.

EL type operating mechanism
The low speed of the contacts, together with the reduced run, and the mass contained, limit the energy required for the operation and therefore guarantee extremely limited wear of the system.

This means the circuit-breaker requires limited maintenance.

The Vmax circuit-breakers use a mechanical operating mechanism, with stored energy and free release. These characteristics allow opening and closing operations independent of the operator.

- Vacuum interruption technique
- Contacts in vacuum protected against oxidation and contamination
- Operation under different climatic conditions
- Limited switching energy
- Stored energy operating mechanism with anti-pumping device supplied as standard
- Simple customisation with a complete range of accessories
- Fixed and withdrawable version
- Compact dimensions
- Sealed-for-life vacuum interrupters
- Sturdiness and reliability 10,000 operations without maintenance
- Circuit-breaker racking in and racking out with the door closed
- Incorrect and hazardous operations prevented thanks to special locks in the operating
- mechanism and in the truck
- High environmental compatibility
- Life Cycle Assessment (LCA) according to ISO 14040 standards
- Recyclable components
- Plastic components marked according to ISO 11469 standards to make separation easy
- at the end of the product's life cycle

The mechanical operating mechanism is of simple concept and use and can be customized with a wide range of easily and rapidly installed accessories. This simplicity translates into greater reliability of the apparatus.

The structure
The operating mechanism, the monobloc and the interrupters are fixed to a metal frame which is also the support for the fixed version of the circuitbreaker.

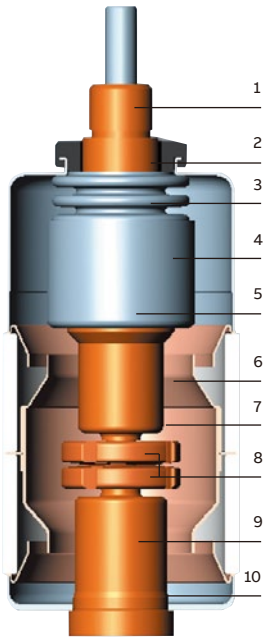
The compact structure ensures sturdiness and mechanical reliability.

Apart from the isolating contacts and the cord with plug for connection of the auxiliary circuits, the withdrawable version is completed with the truck for racking it into and out of the switchgear with the door closed.

Interruption principle of ABB interrupters
In a vacuum interrupter, separation of current-carrying contacts initiates the vacuum arc and this is maintained until the current zero and can be influenced by magnetic fields.

Diffuse or contracted vacuum arcs Following contact separation, single melting points form on the surface of the cathode, producing metal vapours which support the arc.

The diffuse vacuum arc is characterised by expansion over the contact surface and by an even distribution of the thermal stress.



Vacuum interrupter

1 Stem/terminal
2 Twist protection
3 Bellows
4 Interrupter housing
5 Shield
6 Ceramic insulator
7 Shield
8 Contacts
9 Terminal
10 Interrupter housing

At the rated current of the vacuum interrupter, the electric arc is always of the diffuse type. Contact erosion is negligible, and the number of current interruptions very high.

As the interrupted current value increases (above the rated value), the electric arc tends to be transformed from the diffuse into the contracted type, due to the Hall effect.

Starting at the anode, the arc contracts and as the current rises further it tends to become sharply defined.

Near the area involved there is an increase in temperature with consequent thermal stress on the contact. To prevent overheating and erosion of the contacts, the arc is kept rotating. With arc rotation it becomes similar to a moving conductor which the current passes through.

The spiral geometry of ABB vacuum interrupter contacts
The special geometry of the spiral contacts generates a radial magnetic field in all areas of the arc column, concentrated over the contact circumferences.

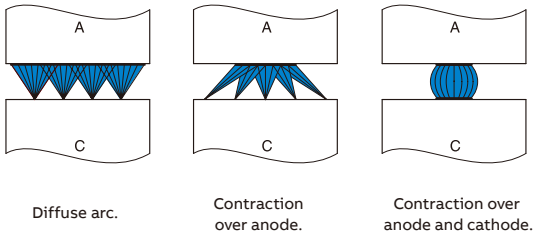
An electromagnetic force is self-generated and this acts tangentially, causing rapid arc rotation around the contact axis.

This means the arc is forced to rotate and to involve a wider surface than that of a fixed contracted arc.

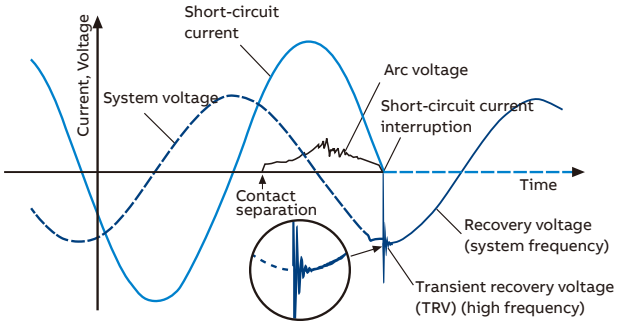
Apart from minimising thermal stress on the contacts, all this makes contact erosion negligible and, above all, allows the interruption process even with very high short-circuits.

ABB vacuum interrupters are zero-current interrupters and are free of any re-striking.

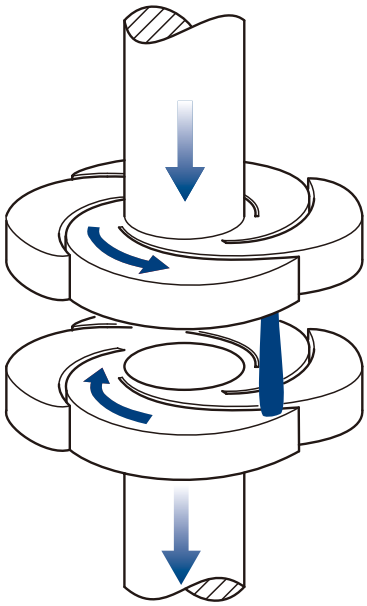
Rapid reduction in the current charge and rapid condensation of the metal vapours simultaneously with the zero current, means maximum dielectric strength can be restored between the interrupter contacts within microseconds.



Schematic diagram of the transition from a diffuse arc to a contracted arc in a vacuum interrupter.



Schematic diagram of the transition from a diffuse arc to a contracted arc in a vacuum interrupter.



Radial magnetic field contact arrangement with a rotating vacuum arc.

Versions available
Vmax circuit-breakers are available in the fixed and withdrawable version with front operating mechanism. The withdrawable version is available for UniGear type switchgear.

Fields of application
Vmax circuit-breakers are used in electrical distribution for control and protection of cables, overhead lines, motors, transformers, generators and capacitor banks.

Standards and approvals
Vmax circuit-breakers comply with the IEC 62271- 100, GB/T 1984-2003 standards and with those of the major industrialised countries. The Vmax circuit-breakers have undergone the tests indicated below and guarantee the safety and reliability of the apparatus in service in any installation.

- **Type tests:** heating, withstand insulation at industrial frequency, withstand insulation at atmospheric impulse, short-time and peak withstand current, mechanical life, short-circuit current making and breaking capacity, and noload cable interruption.
- **Individual tests:** insulation of the main circuits with voltage at power frequency, auxiliary and control circuit insulation, measurement of the main circuit resistance, mechanical and electrical operation.

Service safety
Thanks to the complete range of mechanical and electrical locks (available on request), it is possible to construct safe distribution switchgear with the Vmax circuit-breakers.

The locking devices have been studied to prevent incorrect operations and to inspect the installations guaranteeing maximum operator safety.

Key locks or padlock devices enable opening and closing operations and/or racking in and racking out.

The racking-out device with the door closed allows the circuit-breaker to be racked into or out of the switchgear with the door closed.

Anti-racking-in locks prevent circuit-breakers with different rated currents from being racked in, and the racking-in operation with the circuit-breaker closed.

Accessories
The Vmax circuit-breakers have a complete range of accessories to satisfy all installation requirements.

The operating mechanism has a standardized range of accessories and spare parts which are easy to identify and order. The accessories are installed conveniently from the front of the circuitbreaker.

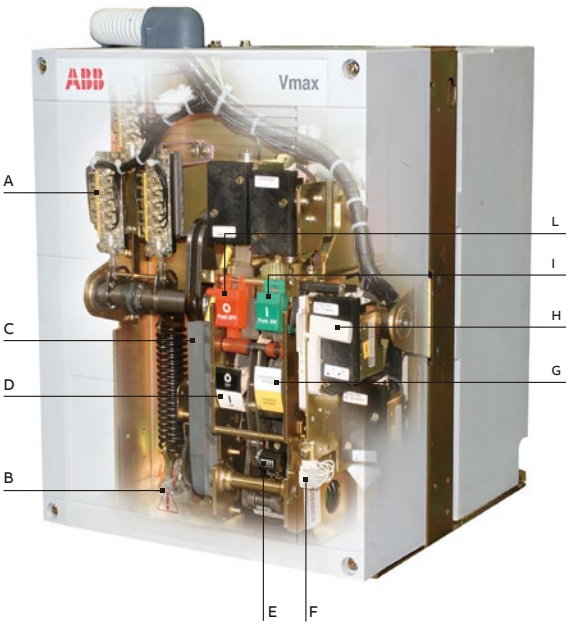
Electrical connection is carried out with plug-socket connectors.

Use, maintenance and service of the apparatus are simple and require limited use of resources.

Operating mechanism
The mechanical operating mechanism of Vmax circuitbreakers is of simple concept and use and can be customised with a wide range of easily and rapidly installed accessories. This simplicity translates into greater reliability of the apparatus. The operating mechanism is of the stored energy type with the anti-pumping device mounted as standard and it is fitted with suitable locks to prevent incorrect operations.

Each operation sequence is only enabled if all the conditions ensuring it being carried out correctly are respected.

- Highly reliable operating mechanisms thanks to featuring a low number of components and manufactured using production systems for large quantities
- Extremely limited and simple maintenance
- The accessories are common to the whole range and are identical for either a.c. or d.c. applications
- The electrical accessories can be easily and rapidly installed or replaced thanks to the wiring already prepared with its own plug-socket connectors
- Mechanical anti-pumping device is supplied as standard
- Built-in closing spring charging lever
- Protective cover of the opening and closing pushbuttons to be operated using a special tool
- Padlock device on the switching pushbuttons



Circuit-breaker operating mechanism

A Open/closed auxiliary contacts
B Geared motor for closing spring charging
C Built-in closing spring charging lever
D Mechanical signalling device for circuitbreaker open/closed
E Mechanical operation counter
F Plug-socket connectors of electrical accessories
G Signalling device for closing springs charged/discharged
H Service releases
I Closing pushbutton
L Opening pushbutton

Technical documentation
To go into technical and application aspects of the Vmax circuit-breakers in depth, please ask for the following publications:

UniGear 550 type switchgear	code 1YHA000080
REF542 plus	code 1YZA000003

Quality system
Complies with ISO 9001:2008 standards, certified by an independent organisation.

Environmental management system
Complies with ISO 14001: 2004 standards, certified by an independent organisation.

Health and safety management system
Complies with OHSAS 18001: 2007 standards, certified by an independent organisation.


DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

ABB Xiamen Switchgear Co., Ltd.

No. 319, Torch Road, Torch Park, Torch Hi-Tech Zone, Xiamen, Fujian, P.R. China
(Unicode: 91350206120179660)
and the sites as mentioned in the appendix 1 accompanying this certificate

has been found to conform to the Quality management system standard:
ISO 9001:2008/GB/T 19001-2008

This certificate is valid for the following Scope:

Design, Manufacture and Service of Medium Voltage (1kV-52kV) Switchgear and Related Apparatus.


DNV·GL

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and the sites as mentioned in the appendix 1 accompanying this certificate

has been found to conform to the Environmental management system standard:
ISO 14001:2004

This certificate is valid for the following Scope:

Design, Manufacture and Service of Medium Voltage (1kV-52kV) Switchgear and Related Apparatus


DNV·GL

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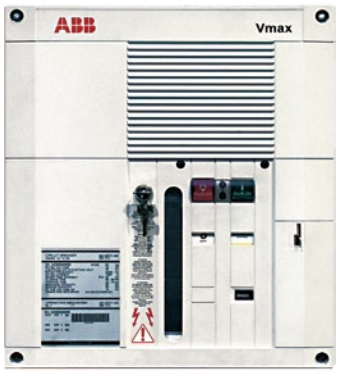
has been found to conform to the Occupational Health and Safety management system standard:
OHSAS 18001:2007

This certificate is valid for the following Scope:

Design, Manufacture and Service of Medium Voltage (1kV-52kV) Switchgear and Related Apparatus

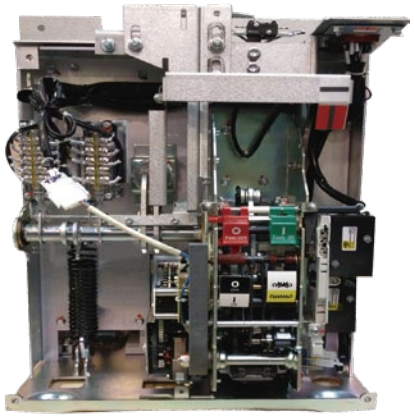
Circuit-breaker selection and ordering

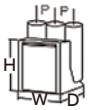
General characteristics of fixed circuit-breakers



Circuit-breaker		Vmax 12	Vmax 12
Standards	IEC 62271-100	•	•
	GB/T 1984-2014	•	•
Rated voltage	Ur [kV]	12	12
Rated insulation voltage	Us [kV]	12	12
Withstand voltage at 50 Hz	Ud (1 min) [kV]	42	42
Impulse withstand voltage	Up [kV]	75	75
Rated frequency	fr [Hz]	50-60	50-60
Rated normal current (40°C)	Ir [A]	630	1250
Rated breaking capacity	Isc [kA]		
(rated symmetrical		25	25
short-circuit current)		31.5	31.5
Rated short-time	Ik [kA]	25	25
withstand current (4s)		31.5	31.5
Making capacity	Ip [kA]	63	63
		80	80
Operation sequence	[O-0.3 s-CO-15 s-CO]	•	•
Opening time	[ms]	33...60	33...60
Arc duration	[ms]	10...15	10...15
Total interruption time	[ms]	45...75	45...75
Closing time	[ms]	45...80	45...80
Maximum overall dimensions	H [mm]	531	531
	W [mm]	416	416
	D [mm]	433	433
Phase space	P [mm]	133	133
Weight	[kg]	77	77
Standardised table of dimensions		1VCD003279	1VCD003279
Operating temperature	[°C]	-15...+40	-15...+40
Tropicalization	IEC 60068-2-30	•	•
	721-2-1	•	•
Electromagnetic compatibility	IEC 62271-1	•	•

Vmax/F - Fixed circuit-breakers for UniGear 500R



Circuit-breaker			**Vmax/F 12 (*)**			**Vmax/F 17 (*)**		
For UniGear switchgear/enclosures			UniGear 500R			UniGear 500R		
Standards	IEC 62271-100		•			•		
	GB/T 1984-2014		•					
Rated voltage	Ur [kV]		12			17.5		
Rated insulation voltage	Us [kV]		12			17.5		
Withstand voltage at 50Hz	Ud (1 min) [kV]		28			38		
Impulse withstand voltage	Up [kV]		75			95		
Rated frequency	fr [Hz]		50-60			50-60		
Rated normal current (40°C)	Ir [A]		630	1250	2000	630	1250	2000
Rated breaking capacity (rated	Isc [kA]		25	25	25	25	25	25
symmetrical short-circuit current)			31.5	31.5	31.5	31.5	31.5	31.5
Rated short-time	Ik [kA]		25	25	25	25	25	25
withstand current (4s)			31.5	31.5	31.5	31.5	31.5	31.5
Making capacity	Ip [kA]		63	63	63	63	63	63
			80	80	80	80	80	80
Operation sequence	[O-0.3 s-CO-15 s-CO]		•	•	•	•	•	•
Opening time	[ms]		33...60	33...60	33...60	33.5...60	33.5...60	33...60
Arc duration	[ms]		10...15	10...15	10...15	10...15	10...15	10...15
Total interruption time	[ms]		45...75	45...75	45...75	45...75	45...75	45...75
Closing time	[ms]		45...80	45...80	45...80	45...80	45...80	45...80
Maximum overall dimensions		H [mm]	543	543	543	543	543	543
		W [mm]	416	416	516	416	416	516
		D [mm]	461	461	562	461	461	562
Phase space		P [mm]	133	133	133	133	133	133
Weight	[kg]		77	77	80	77	77	80
Standardised table of dimensions			003516	003516	003558	003516	003516	003558
Operating temperature	[°C]		-15...+40	-15...+40	-15...+40	-15...+40	-15...+40	-15...+40
Electromagnetic compatibility	IEC 62271-1		•	•	•	•	•	•

General characteristics of withdrawable circuit-breakers for:

- UniGear switchgear (width 550 mm)

Circuit-breaker		**Vmax 12**	**Vmax 12**
For UniGear switchgear/enclosures		UniGear 550	UniGear 550
Standards	IEC 62271-100	•	•
	GB/T 1984-2014	•	•
Rated voltage	Ur [kV]	12	12
Rated insulation voltage	Us [kV]	12	12
Withstand voltage at 50Hz	Ud (1 min) [kV]	42	42
Impulse withstand voltage	Up [kV]	75	75
Rated frequency	fr [Hz]	50-60	50-60
Rated normal current (40°C)	Ir [A]	630 1250	1600 2000
Rated breaking capacity	Isc [kA]		
(rated symmetrical		25	25
short-circuit current)		31.5	31.5
Rated short-time	Ik [kA]	25	25
withstand current (4s)		31.5	31.5
		63	63
Making capacity	Ip [kA]	80	80
Operation sequence	[O-0.3 s-CO-15 s-CO]	•	•
Opening time	[ms]	33...60	33...60
Arc duration	[ms]	10...15	10...15
Total interruption time	[ms]	45...75	45...75
Closing time	[ms]	45...80	45...80
Maximum overall dimensions	H [mm]	665	665
	W [mm]	461	461
	D [mm]	665	660
Phase space	P [mm]	150	150
Weight	[kg]	98	121
Standardised table of dimensions		1VCD003334	1YHT350003
Operating temperature	[°C]	-15...+40	-15...+40
Tropicalization	IEC 60068-2-30	•	•
	721-2-1	•	•
Electromagnetic compatibility	IEC 62271-1	•	•

Vmax/W - Withdrawable circuit-breakers for PowerCube modules

Circuit-breaker		**Vmax/W 12**	**Vmax/W 17**
For UniGear switchgear/enclosures		PowerCube	PowerCube
Standards	IEC 62271-100	•	•
	GB/T 1984-2014	•	
Rated voltage	Ur [kV]	12	17.5
Rated insulation voltage	Us [kV]	12	17.5
Withstand voltage at 50Hz	Ud (1 min) [kV]	42	38
Impulse withstand voltage	Up [kV]	75	95
Rated frequency	fr [Hz]	50-60	50-60
Rated normal current (40°C)	Ir [A]	630 1250	630 1250
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	25 31.5	25 31.5
Rated short-time withstand current (4s)	Ik [kA]	25 31.5	25 31.5
Making capacity	Ip [kA]	63 80	63 80
Operation sequence	[O-0.3 s-CO-15 s-CO]	•	•
Opening time	[ms]	33...60	33...60
Arc duration	[ms]	10...15	10...15
Total interruption time	[ms]	45...75	45...75
Closing time	[ms]	45...80	45...80
Maximum overall dimensions	H [mm]	665	665
	W [mm]	503	503
	D [mm]	662	662
Phase space	P [mm]	150	150
Weight	[kg]	98	98
Standardised table of dimensions		1VCD003280	1VCD003280
Operating temperature	[°C]	-15...+40	-15...+40
Electromagnetic compatibility	IEC 62271-1	•	•

Standard fittings for fixed series circuit-breaker
The basic versions of the fixed circuit-breakers are three-pole and fitted with:
- EL type manual operating mechanism
- Mechanical signalling device for closing springs charged/discharged
- Mechanical signalling device for circuit-breaker open/closed
- Closing pushbutton
- Opening pushbutton
- Operation counter
- Set of ten circuit-breaker open/closed auxiliary
- Contacts (1)

Standard fittings of withdrawable series circuit-breaker
The basic versions of the withdrawable circuitbreakers are three-pole and fitted with:
- EL type manual operating mechanism
- Mechanical signalling device for closing springs charged/discharged
- Mechanical signalling device for circuit-breaker open/closed
- Closing pushbutton
- Opening pushbutton
- Operation counter
- Set of ten circuit-breaker open/closed auxiliary contacts(1)
- Isolating contacts
- Cord with connector (plug only) for auxiliarycircuits, with striker pin which does not allowthe plug to be inserted into the socket if therated current of the circuit-breaker is differentfrom the rated current of the panel
- Racking-in/out lever

(1) Application of the shunt opening release and/or the supplementary shunt opening release foresees the use of one and/ or two auxiliary make contacts (normally open), thereby reducing the number of available auxiliary contacts.

Optional accessories

The accessories identified with the same number are alternative to each other.

1 Shunt opening release (-MO1)

This allows remote opening control of the apparatus.

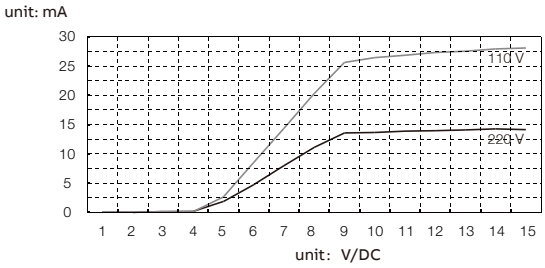
The release can operate both in direct and alternating current. This release is suitable for both instantaneous and permanent service. In the case of instantaneous service, the minimum current impulse time must be 100 ms.

Characteristics	
Un: 24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V–	
Un: 24 - 48 - 60 - 110 - 120...127 - 220...240 - V ~ 50 Hz	
Un: 110 - 120 - 127 - 220 - 240 - V ~ 60 Hz	
Operating limits: Opening release: 65% (DC) or 85% (AC)...110% Un Closing release: 85%...110% Un	
Power on inrush (Ps):	DC = 200 W; AC = 200 VA
Inrush duration:	about 100 ms
Continuous power (Pc):	DC = 5 W; AC = 5 VA
Opening time:	33...60 ms
Closing time:	45...80 ms
Insulation voltage:	2000 V 50 Hz (for 1 min)

Note: If monitoring the functions of the shunt closing release (-MC) and opening releases (-MO1, -MO2) is required:

- Releases with rated voltage of 110V/220V AC/ DC can be monitored without STU device:

Volt-Ampere characteristic curve,-MC/-MO1/-MO2



110 V
220 V

At a power supply of 110 V~130 V, connect the “control coil continuity” device, or a relay or a signalling lamp which consumes a current not exceeding 20 mA.

At a power supply of 220 V~250 V, connect the “control coil continuity” device, or a relay or a signalling lamp which consumes a current not exceeding 10 mA.

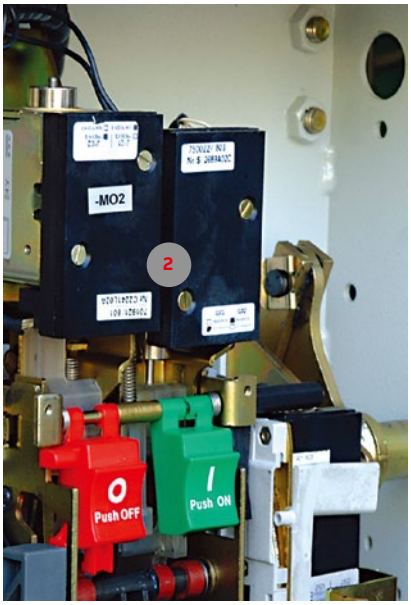
- For releases with rated voltage range fange from 24V to 60V DC, the only device able to carry out monitoring is the STU device. Please contact us for more information.

2 Additional shunt opening release (-MO2)

Like the shunt opening release described above, this allows remote opening control of the apparatus and can be supplied by a circuit completely separate from the -MO1 release.

The electrical and operating characteristics are identical to those of the shunt opening release -MO1.

1



2

3 Shunt closing release (-MC)
This allows remote closing control of the apparatus.

The release can operate both in direct and alternating current.

This release is suitable both for instantaneous and permanent service. In the case of instantaneous service, the minimum current impulse time must be 100 ms.

The permanently supplied release carries out the electrical anti-pumping function.

The electrical and operating characteristics are identical to those of the shunt opening release-MO1.

4 Undervoltage release (-MU)
The undervoltage release opens the circuit-breaker when there is notable lowering or lack of its power supply. It can be used for remote release (by means of normally closed type pushbuttons), to control the voltage in the auxiliary circuits or for mechanical lock on closing allowed only with release energized.

The circuit-breaker can only close with the release supplied (the closure lock is made mechanically).

The release can operate both in direct and alternating current.

The undervoltage release is available in the following versions:
- **4A** Undervoltage release with power supply branched on the supply side.
- **4B** Undervoltage release with electronic time delay device (0.5 - 1 - 1.5 - 2 -3 s) (power supply branched on the supply side). This device is delivered set at 0.5 s (for adjustment, please see the Electric Circuit Diagram chapter).

Characteristics	
Un: 24 - 30 - 48 - 60 - 110 – 125 - 220 - 250 V–	
Un: 24 - 48 - 60 - 110 - 120 - 127 - 220...240 V ~ 50 Hz	
Un: 110 - 120...127 - 220...240 V ~ 60 Hz	
Operating limits:	circuit-breaker couldn't close: <35% Un circuit-breaker could open with one value between: 35-65% circuit-breaker closing: 85-110% Un
Power on inrush (Ps):	DC = 200 W; AC = 200 VA
Inrush duration:	about 100 ms
Continuous power (Pc):	DC = 5 W; AC = 5 VA
Opening time:	30 ms
Insulation voltage:	2000 V 50 Hz (for 1 min)

3

4

Electronic time-delay device (-KT)
The electronic time delay device must be mounted externally to the circuitbreaker. It allows release trip with established and adjustable times.

The use of the delayed undervoltage release is recommended in order to prevent trips when the power supply network of the release may be subject to cuts or voltage drops of short duration.

If it is not energized, circuit-breaker closing is prevented.

The time-delay device must be combined with an undervoltage release with the same voltage as the delay device.

Characteristics of the time-delay device

Characteristics
Un: 24...30-48-60-110...127-220...250 V-
Un: 48-60-110...127-220...240-V~50/60 Hz
Adjustable opening time
(release + time-delay device): 0.5-1-1.5-2-3 s

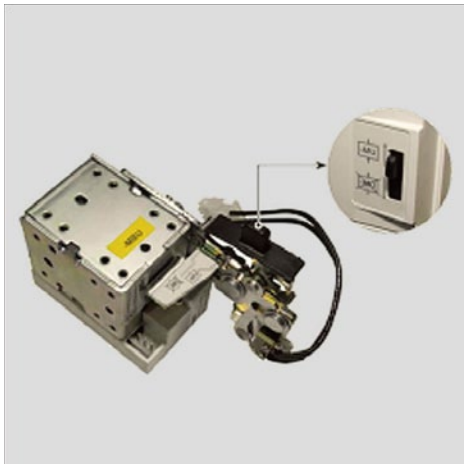
5 Undervoltage release mechanical override
This is a mechanical device which allows the undervoltage release trip to be temporarily excluded.

6 Circuit-breaker auxiliary contacts (-BB1; -BB2; -BB3)
It is possible to have electrical signalling of circuit-breaker open/closed with a group of 15 auxiliary contacts as an alternative to the 10 provided as standard.

Note: Application of the shunt opening release and/or the supplementary shunt opening release foresees the use of one and/or two auxiliary make contacts (normally open), thereby reducing the number of available auxiliary contacts.

Characteristics				
Un: 24...250 V AC-DC				
Rated current: I th2 =10 A				
Insulation voltage: 2000 V 50 Hz (1min)				
Electrical resistance: ≤15 mOhm				
Rated current and breaking capacity in category AC15 and DC13:				
Un	Cosφ	T	In	Icu
220 V-	0.7	--	2.5 A	25 A
24 V-	--	15 ms	10 A	12 A
60 V-	--	15 ms	6 A	8 A
110 V-	--	15 ms	4 A	5 A
220 V-	--	15 ms	1A	2A

5



6

7 Transmitted contacts in the truck (-BT1; -BT2)
Transmitted contacts of the withdrawable circuit-breaker (installed in the circuit-breaker truck).

These contacts are either in addition or as an alternative to the position contacts (for signalling circuit-breaker racked out) located in the unit.

9 Motor operator (-MS)
This carries out automatic charging of the circuit-breaker operating mechanism closing springs. After circuit-breaker closing, the geared motor immediately recharges the closing springs. In the case of a power cut or during maintenance work, the closing springs can be charged manually in any case (by means of the special crank handle incorporated in the operating mechanism).

Characteristics	
Un: 24...30-48-60-110...130-220...250 V-	
Un:100-130-220...250 V~50/60 Hz	
Operating limits:	85...110 %Un
	25 kA
Power on inrush (Ps):	DC=600 W;
	AC=600 VA
Rated power (Pn):	DC=200 W;
	AC =200 VA
Inrush duration:	approx. 0.2 s
Charging time:	6-7 s
Insulation voltage:	2000 V 50 Hz (1 min)

10 Contacts for signalling closing springs charged/discharged (-BS2)
Two microswitches allow remote signalling of the state of the circuit-breaker operating mechanism closing springs.

With the circuit-breaker with springs discharged, a normally open contact and a normally closed contact are available.

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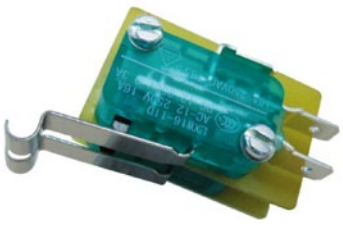

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13 Key lock in open position
The lock is activated by a special circular lock. Different keys (for a single circuit-breaker) are available, or the same keys (for several circuit-breakers).

14 Locking magnet on the truck (-RL2)
Compulsory accessory for the withdrawable version to prevent circuit-breaker racking into the switchgear with the auxiliary circuit plug disconnected.

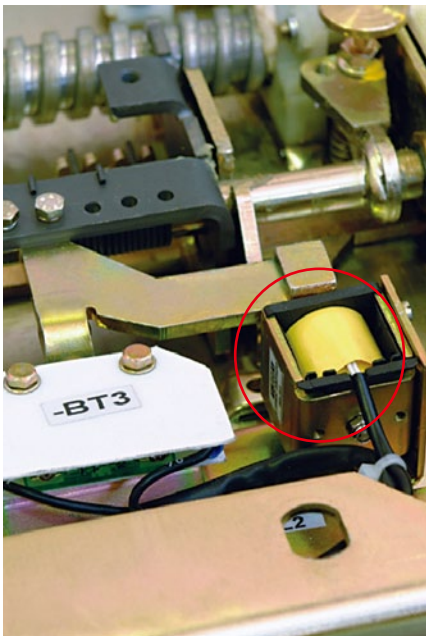
The plug realises the anti racking-in lock for different rated current (by means of special pins).

Characteristics	
Un: 24-30-48-60-110-125-127-132-220-240 V-	
Un: 24-30-48-60-110-125...127-220-230...240 V~50/60 Hz	
Operating limits:	85...110% Un
Power on inrush (Ps):	DC=250 W; AC=250 VA
Continuous power (Pc):	DC=5 W; AC=5 VA
Inrush duration:	approx. 150 ms

15 Locking magnet on the operating mechanism (-RL1)
This allows activation of the operating mechanism when the lock is energized only.

Characteristics	
Un: 24-30-48-60-110-125-127-132-220-240 V-	
Un: 24-30-48-60-110-125...127-220-230...240 V~50/60 Hz	
Operating limits:	85...110% Un
Power on inrush (Ps):	DC=250 W; AC=250 VA
Continuous power (Pc):	DC=5 W; AC=5 VA
Inrush duration:	approx. 150 ms

10



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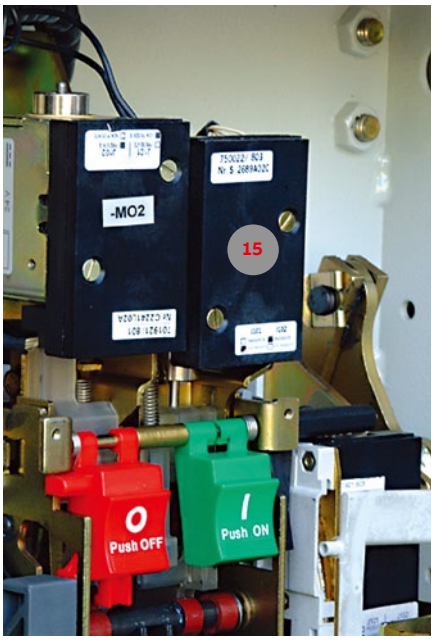
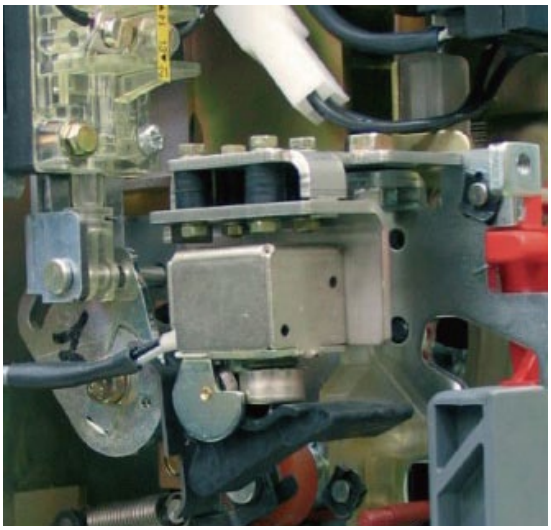


12

17 Opening solenoid (-MO3)
The opening solenoid is a special demagnetising release mainly used with self-supplied overcurrent protection releases, such as the ABB REJ603 release.

Note: The opening solenoid (-MO3) is not alternative to the additional shunt opening release.



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17

Specific product characteristics

Resistance to vibrations
Vmax circuit-breakers are unaffected by mechanically generated vibrations.

For the versions approved by the naval registers, please contact us.

Tropicalization
Vmax circuit-breakers are manufactured in compliance with the strictest regulations regarding use in hot-humid-saline climates.

All the most important metal components are treated against corrosive factors according to UNI 3564-65 standards environmental class C.

Galvanisation is carried out in accordance with UNI ISO 2081 standards, classification code Fe/Zn 12, with a thickness of 12x10-6 m, protected by a conversion layer mainly consisting of chromates in compliance with the UNI ISO 4520 standard.

These construction characteristics mean that the whole Vmax series of circuit-breakers and its accessories comply with standards as follows:

- IEC 60721-2-1 (climate graph 8)
- IEC 60068-2-2 (Test B: Dry Heat) IEC 60068-2-30(Test Bd: Damp Heat, cyclic)

Altitude
The insulating property of air decreases as the altitude increases, therefore this must always be taken into account for external insulation of the apparatus (the internal insulation of the interrupters does not undergo any variations as it is guaranteed by the vacuum).

The phenomenon must always be taken into consideration during the design stage of the insulating components of apparatus to be installed over 1000 m above sea level.

In this case a correction coefficient must be considered, which can be taken from the graph on the next page, built up on the basis of the indications in the IEC 62271-1 and GB/T 11022 standards.

The following example is a clear interpretation of the indications given above.

Graph for determining the Ka correction factor according to the altitude
H = altitude in metres
m = value referred to power frequency and the lightning impulse withstand voltages and those between phase and phase

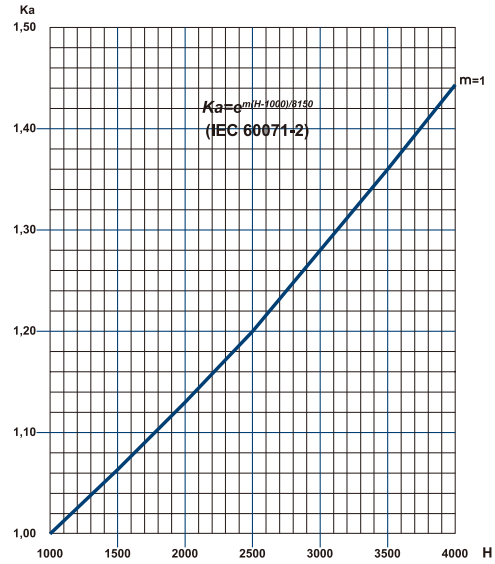
Example

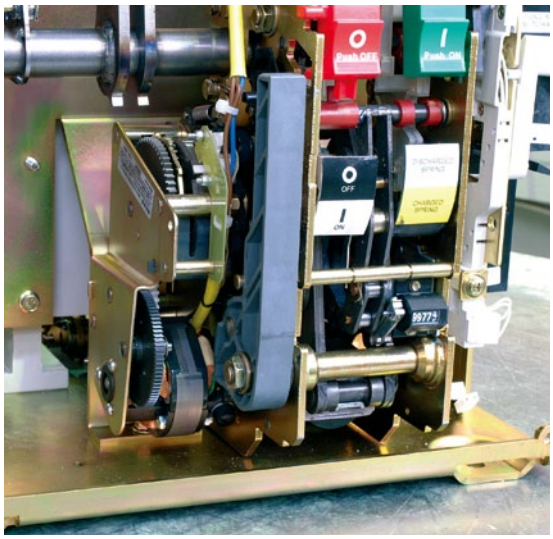
- Installation altitude 2000 m
- Operation at the rated voltage of 12 kV
- Withstand voltage at power frequency 42 kV rms
- Impulse withstand voltage 75 kVp
- Ka factor obtained from graph = 1.13

Considering the above parameters, the apparatus will have to withstand the following values (under test and at zero altitude, i.e. at sea level):

- Withstand voltage at power frequency equal to: 42 x 1.13 = 47.5 kVrms

- Impulse withstand voltage equal to: 75 x 1.13 = 84.7 kVp





From the above, it can be deduced that for installations at high altitude, the circuit breaker has to overpass an insulation test at a higher voltage level at zero altitude.

Please contact ABB for choosing correct type of circuit breakers.

Anti-pumping device
The EL operating mechanism of Vmax circuit breakers (in all versions) is fitted with a mechanical anti-pumping device which prevents re-closing due to either electrical or mechanical commands.

Should both the closing command and any one of the opening commands (local or remote) be active at the same time, there would be a continuous succession of opening and closing operations.

The anti-pumping device avoids this situation, ensuring that each closing operation is only followed by a single opening operation and that there is no closing operation after this. To obtain a further closing operation, the closing command must be released and then relaunched.

Furthermore, the anti-pumping device only allows circuitbreaker closure if the following conditions are present at the same time:
- Operating mechanism springs fully charged
- Opening pushbutton and/or opening release (-MO1/-MO2) not enabled
- Circuit-breaker open

Environmental protection programme
The Vmax circuit-breakers are manufactured in accordance with the ISO 14000 standards (Guidelines for environmental management). The production processes are carried out in compliance with the standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system. Assessment of the environmental impact of the life cycle of the product, obtained by minimizing energy consumption and overall raw materials of the product, became a concrete matter during the design stage by means of targeted selection of the materials, processes and packing. This is to allow maximum recycling at the end of the useful life cycle of the apparatus.

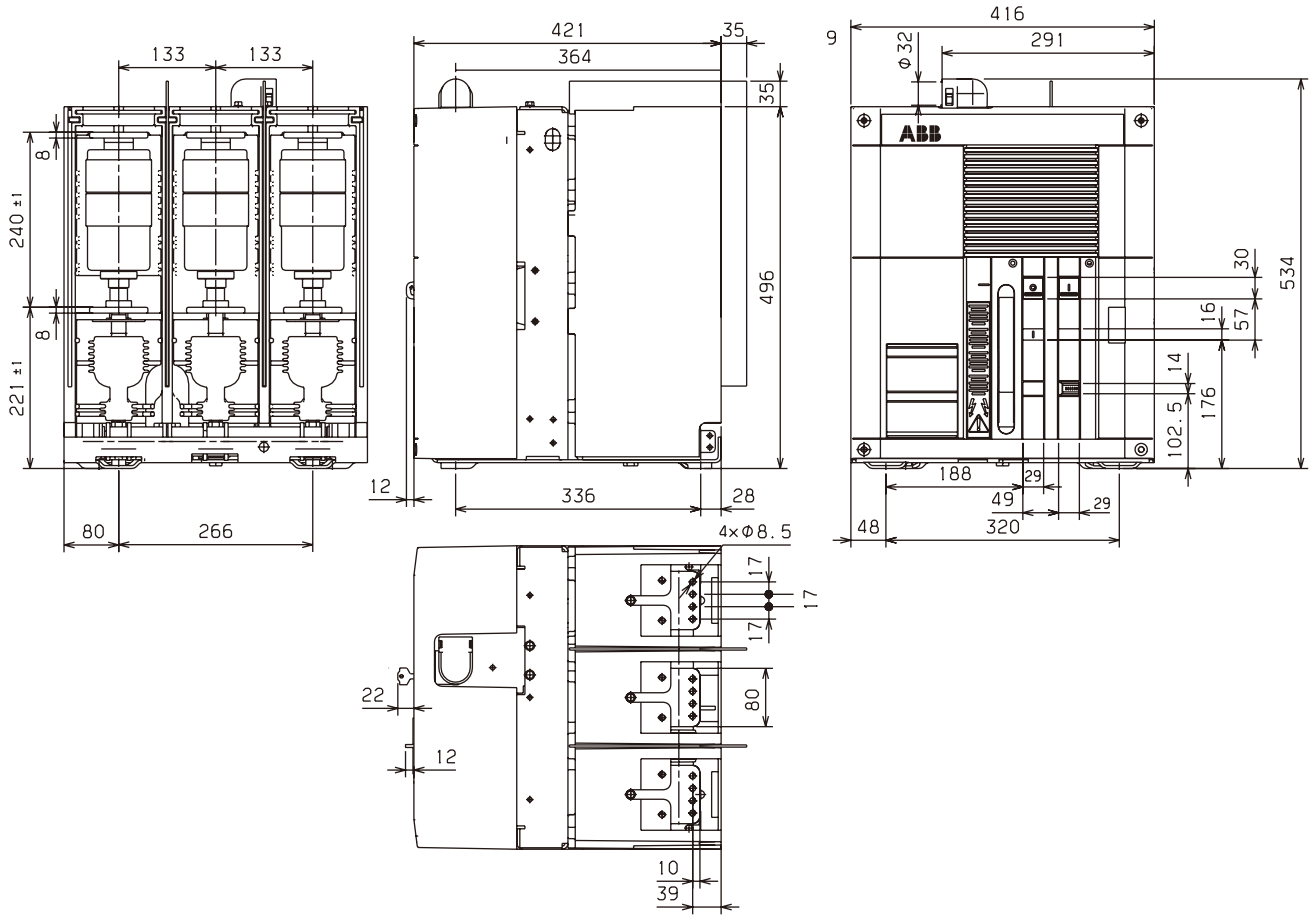
Spare parts
- Shunt opening release
- Supplementary shunt opening release
- Undervoltage release
- Time delay device for undervoltage release
- Undervoltage release override
- Shunt closing release
- Spring charging geared motor with electrical signalling of springs charged
- Contact signalling closing springs charged/ discharged
- Circuit-breaker auxiliary contacts
- Locking electromagnet on the operating mechanism
- Position contact of the withdrawable truck
- Contacts signalling connected/isolated
- Key lock in open position
- Isolation interlock with the door
- Locking electromagnet on the withdrawable truck
- Set of six isolating contacts

Ordering
For availability and to order spare parts, please contact our Service department, specifying the circuit-breaker serial number.

Overall dimensions

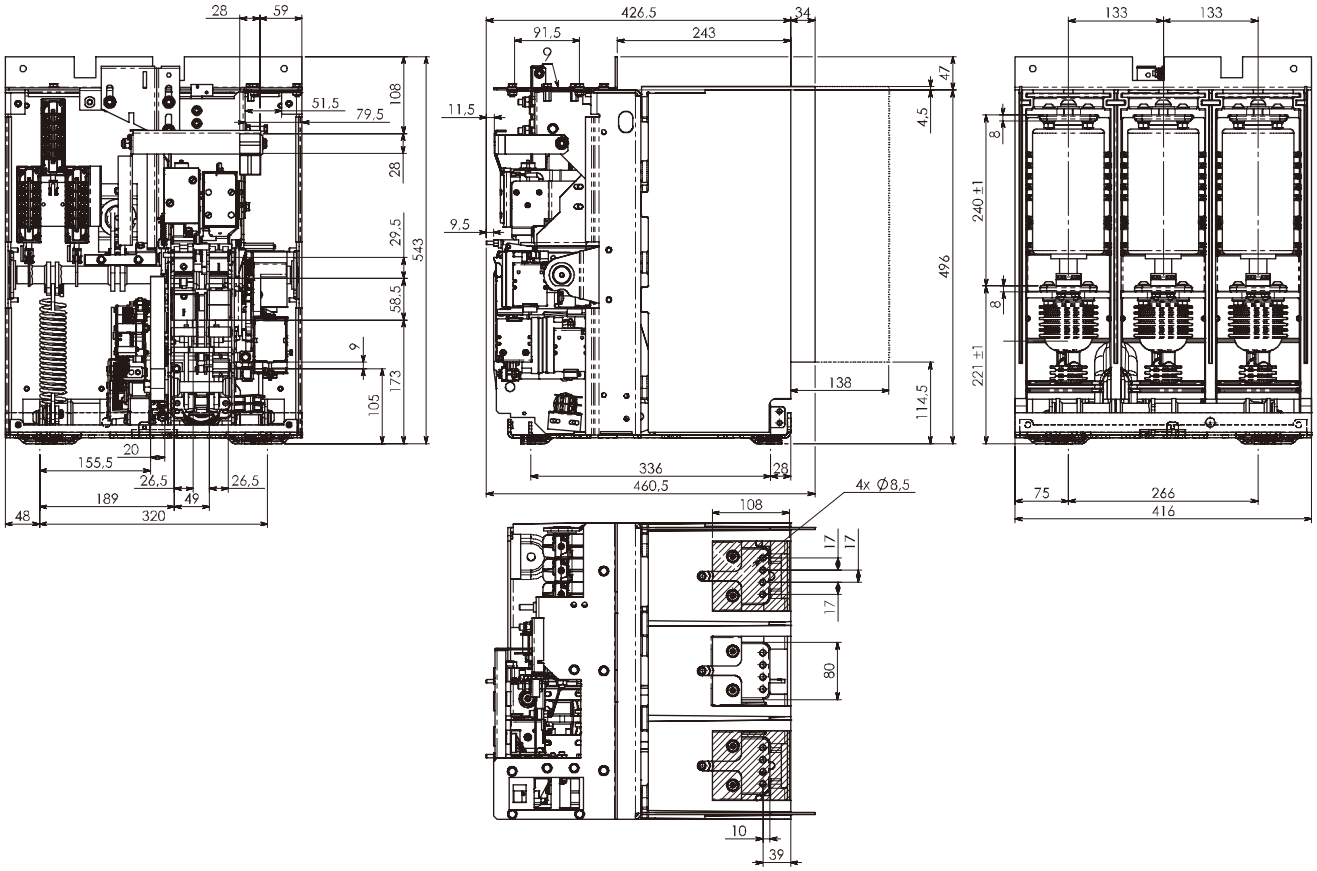
Fixed Vmax circuit-breakers

TN	Ur	Ir	Isc
1VCD003279 (E0441)	12 kV...17.5 kV	630 A...1250 A	25 kA...31.5 kA



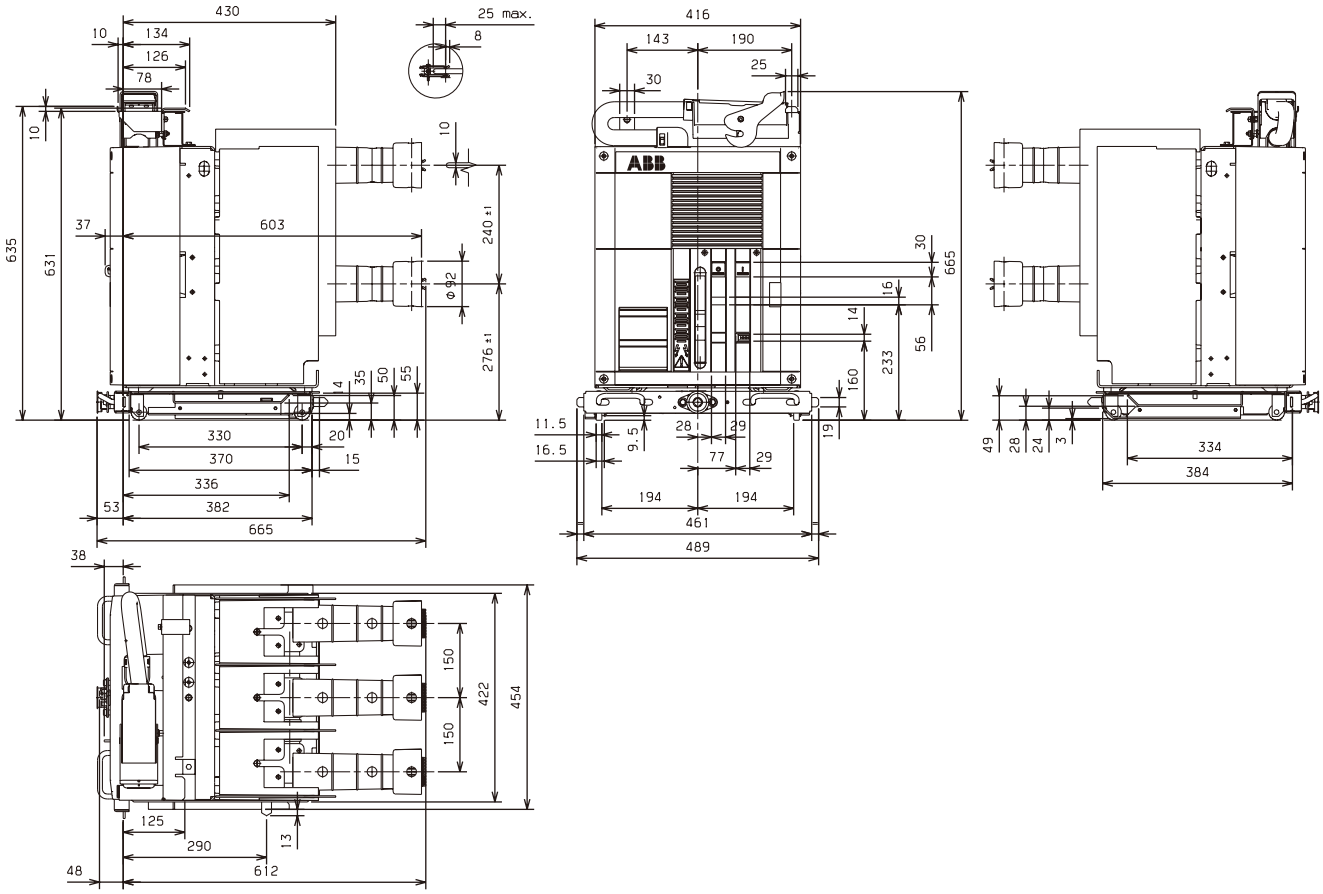
Vmax/F - Fixed circuit-breakers for UniGear 500R

TN	Ur	Ir	Isc
1VCD003516	12...17.5 kV	630...1,250 A	25...31.5 kA



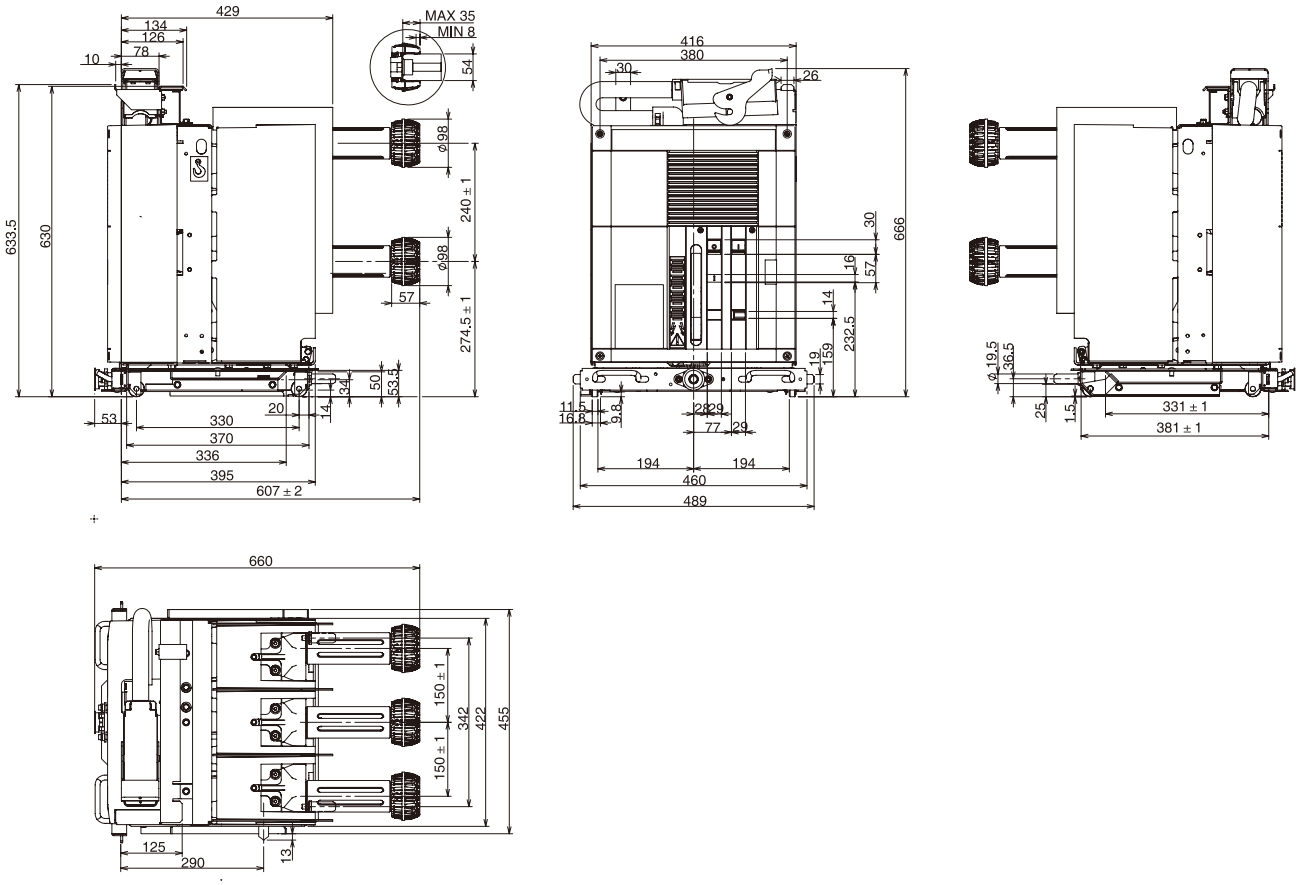
Withdrawable circuit-breakers for UniGear switchgear (width 550 mm)

TN	Ur	Ir	Isc
1VCD003334 (E0441)	12 kV...17.5 kV	630 A...1250 A	25 kA...31.5 kA



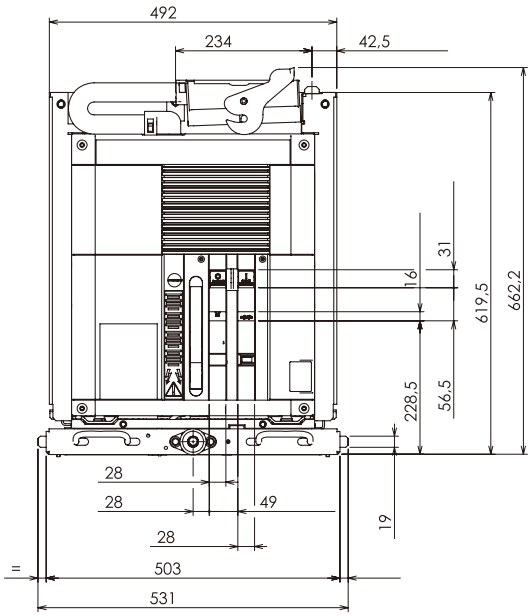
Withdrawable circuit-breakers for UniGear switchgear (width 550 mm)

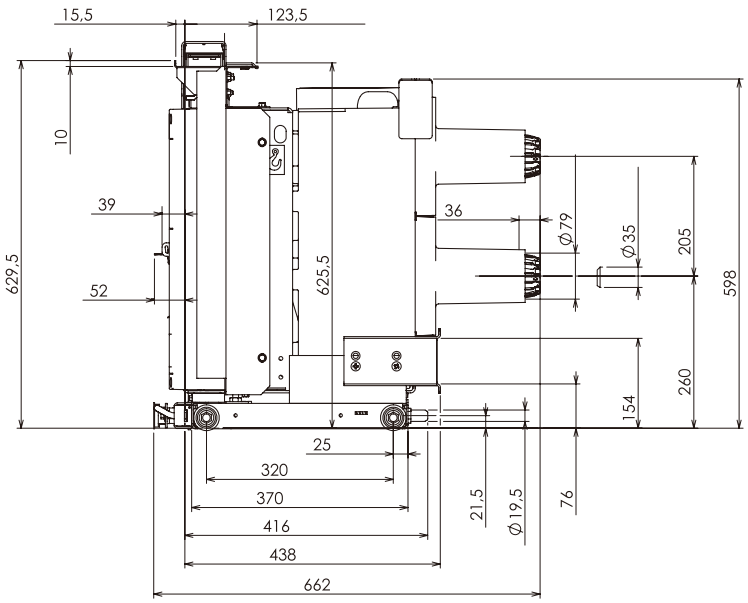
TN	Ur	Ir	Isc
1YHT350003D0101 (Rev.B)	12 kV...17.5 kV	1600 A...2000 A	25 kA...31.5 kA

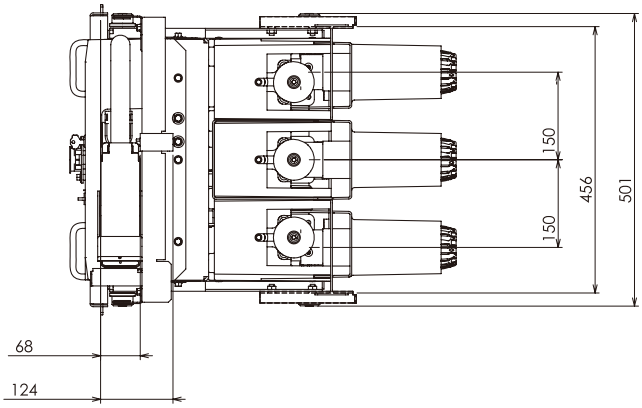


Vmax/W - Withdrawable circuit-breakers for PowerCube modules

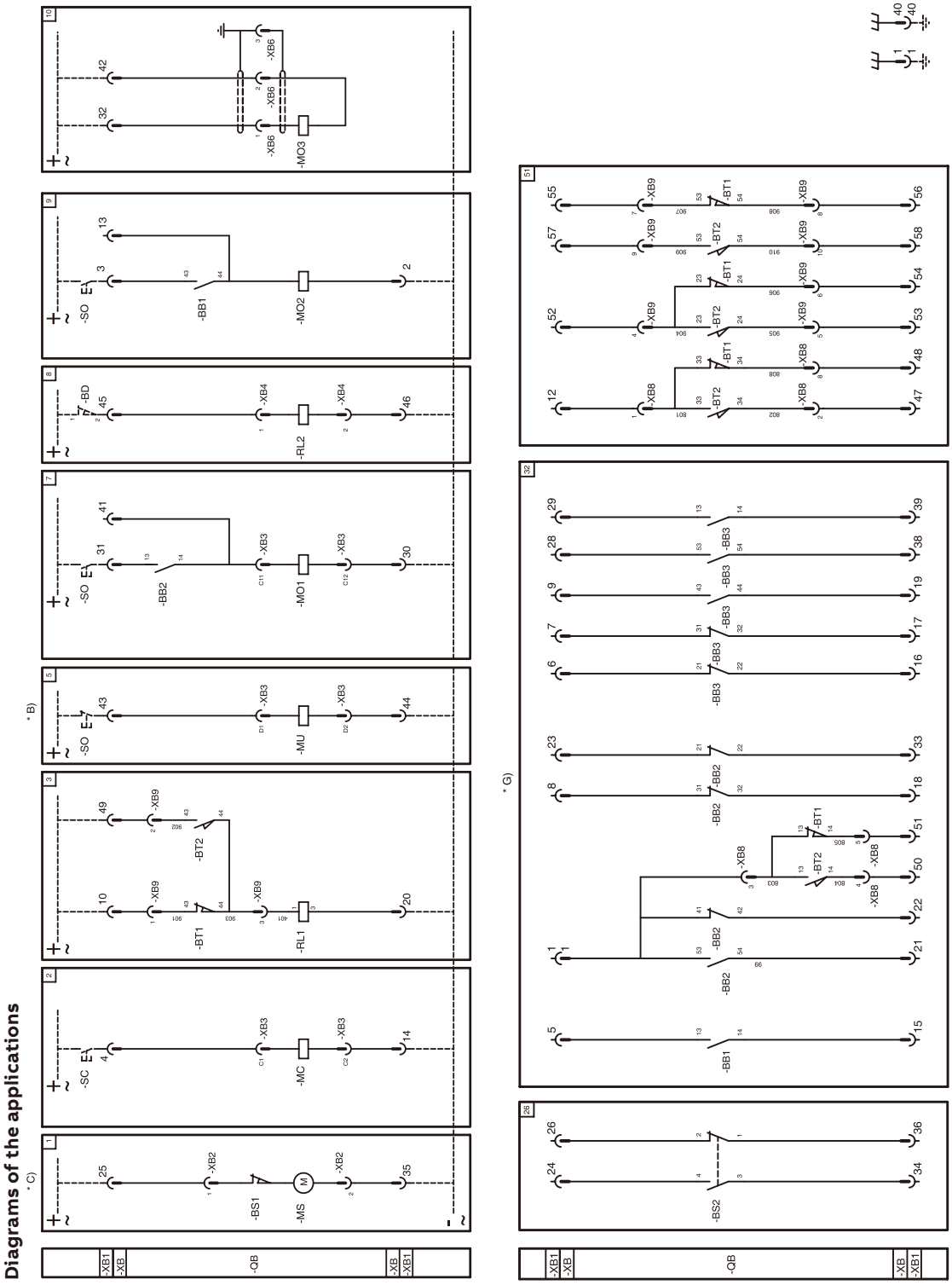
TN	Ur	Ir	Isc
1VCD003280	12 kV...17.5 kV	630 A...1,250 A	25...31.5 kA







Electrical circuit diagram



State of operation shown

The diagram indicates the following conditions:

- circuit-breaker open and racked-in
- circuits de-energized
- closing springs discharged

Caption

☐ =Number of diagram figure
* =See note indicated by the letter
-QB =Circuit-breaker applications
-MS =Closing spring charging motor (see note C)
-BB0..2-3 =Circuit-breaker auxiliary contacts
-BS1 =Spring charging motor limit contact
-BS2 =Contact for signalling closing springs charged/discharged
-BD =Position contact of the enclosure door
-BT2 =Contacts for electrical signalling of circuit-breaker in isolated position (see note E)
-BT1 =Contacts for electrical signalling of circuit-breaker in racked-in position (see note E)
-SC =Pushbutton or contact for circuit-breaker closing
-SO =Pushbutton or contact for circuit-breaker opening
-XB =Connector of the circuit-breaker circuits
-XB2...10 =Application connectors
-XB1 =Terminal box in the switchgear (outside the circuit breaker)
-RL1 =Locking magnet. When de-energised it mechanically prevents circuit-breaker closing.
-RL2 =Locking magnet. When de-energised it mechanically prevents circuit-breaker connection and isolation.
-MC =Shunt closing release
-MO1 =First shunt opening release
-MO2 =Second shunt opening release
-MO3 =Opening solenoid for release outside the circuit-breaker
-MU =Under-voltage release (see note B).

Description of figures

Fig. 1 =Closing spring charging motor circuit (see note C).
Fig. 2 =Shunt closing release (anti-pumping is carried out mechanically).
Fig. 3 =Locking magnet. When de-energised it mechanically prevents circuit-breaker closing
Fig. 5 =Instantaneous undervoltage release (see note B).
Fig. 7 =First shunt opening release circuit with possibility of continuous contro of the winding
Fig. 8 =Locking magnet. The mechanism locked when de-energized to prevent the rack-in/out operation of circuit breaker.
Fig. 9 =Second shunt opening release circuit
Fig. 10 =Opening solenoid, trigged by specific release outside the circuit-breaker
Fig. 26 =Electrical signalling for closing spring charged and discharged
Fig. 32 =Circuit-breaker auxiliary contacts
Fig. 51 =Contacts for electrical signalling of circuit breaker in the racked-in and isolated positions, located on the circuit-breaker.

Standard configuration

Fig. 1	-MS	Closing spring charging motor
Fig. 2	-MC	Shunt closing release
Fig. 3	-RL1	Locking magnet
Fig. 7	-MO1	First shunt opening release
Fig. 26	-BS2	Contact for signalling closing springs charged/discharged
Fig. 32	-BB1,-BB2,-BB3,	Circuit-breaker auxiliary contacts
Fig. 51	-BT1, -BT2	Contacts for signaling circuit breaker's position, racked-in or racked-out

Optional configuration

Fig. 5	-MU	Under-voltage release
Fig. 8	-RL2	Locking magnet for rack-in/out operation
Fig. 9	-MO2	Second shunt opening release
Fig. 10	-MO3	Opening solenoid

Notes

A) The circuit-breaker is only fitted with the accessories specified in the order confirmation. To make out the order, please consult the catalogue of the apparatus.

In any case, considering the possibility of different cnfiguration of the circuit breaker, or the circuit breaker itself might be updated, the actual control circuit might be upated.

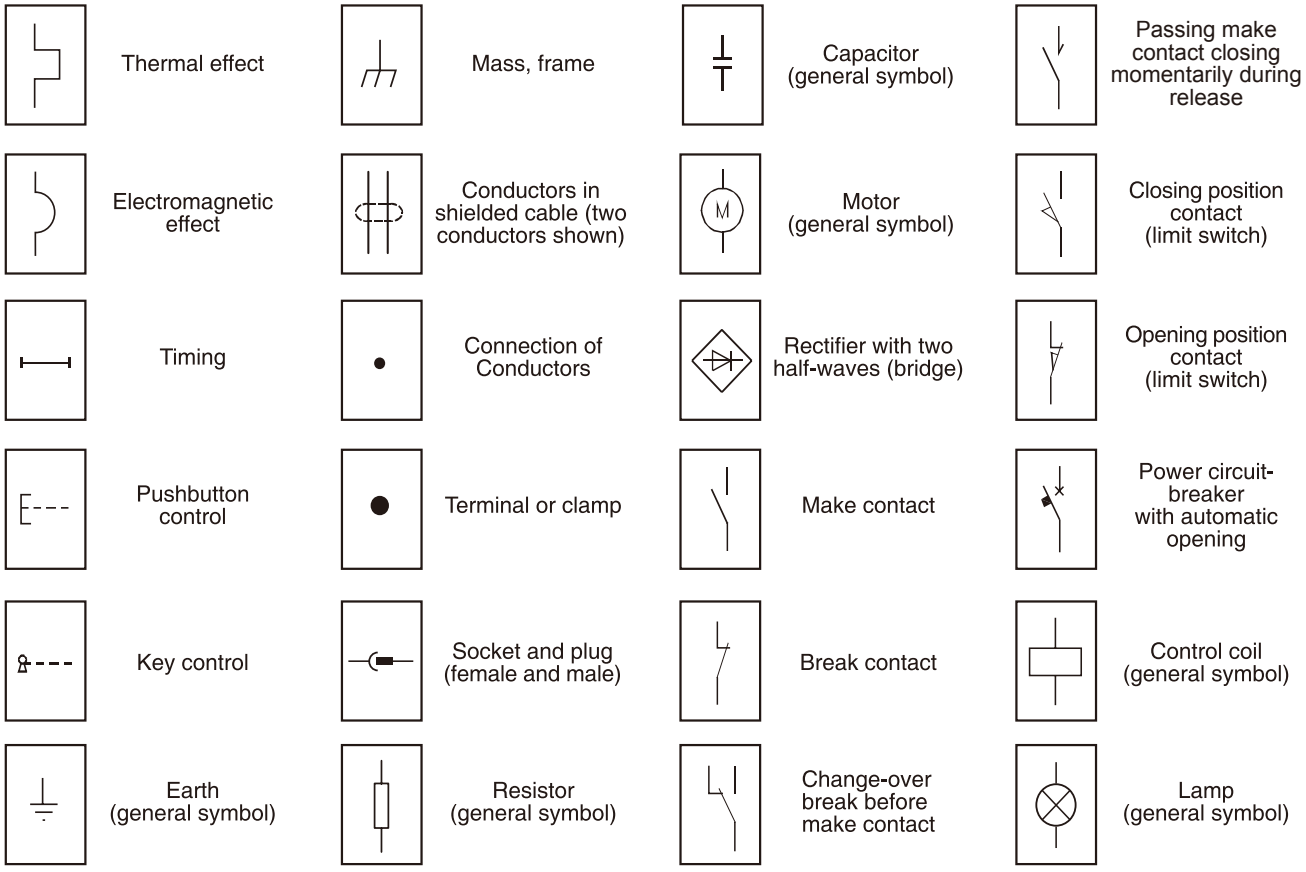
B) The undervoltage release can be supplied for power supply with voltage branched on the supply side of the circuit-breaker or from an independent source. Circuit-breaker closing is only allowed with the release energised (the lock on closing is made mechanically). Should there be the same power supply for the shunt closing and undervoltage releases and automatic circuitbreaker closing on return of the auxiliary voltage is required, it is necessary to introduce a delay of 50 ms between the moment of undervoltage release consent and energisation of the shunt closing release.

C) Check the power available in the auxiliary circuit to verify the possibility of starting several motors at the same time to recharge the closing springs. To prevent excessive absorption, the springs must be charged manually before energising the auxiliary circuit.

E) The contacts for electrical signalling of circuitbreaker in the racked-in and isolated position shown in figs. 51 are located on the circuit-breaker.

G) 10 auxiliary switches in total (5NO 5 NC) is supplied as standard. To extend auxiliary contacts to 7NO 7NC, please contact with ABB.

Graphical symbols for electrical diagrams (IEC 60617 standard)



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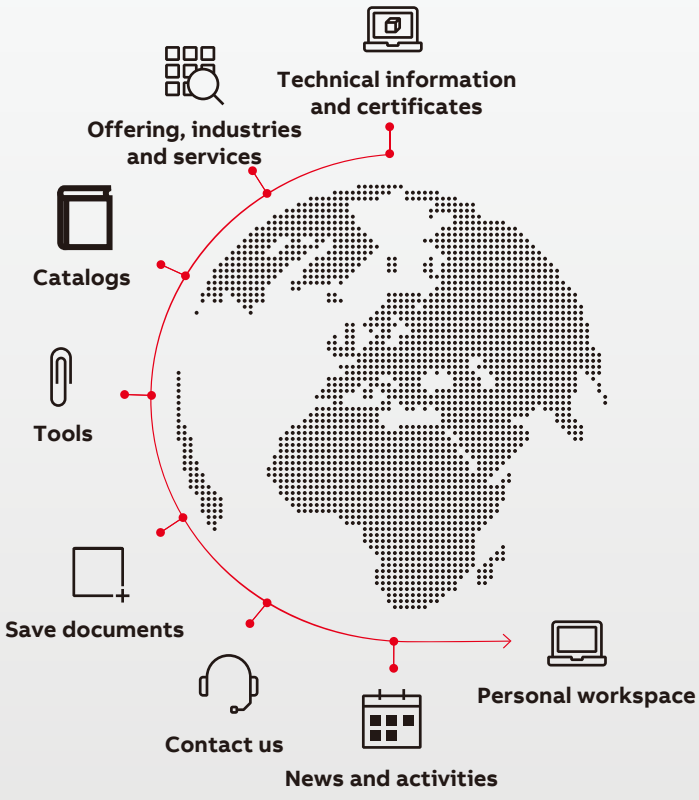

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