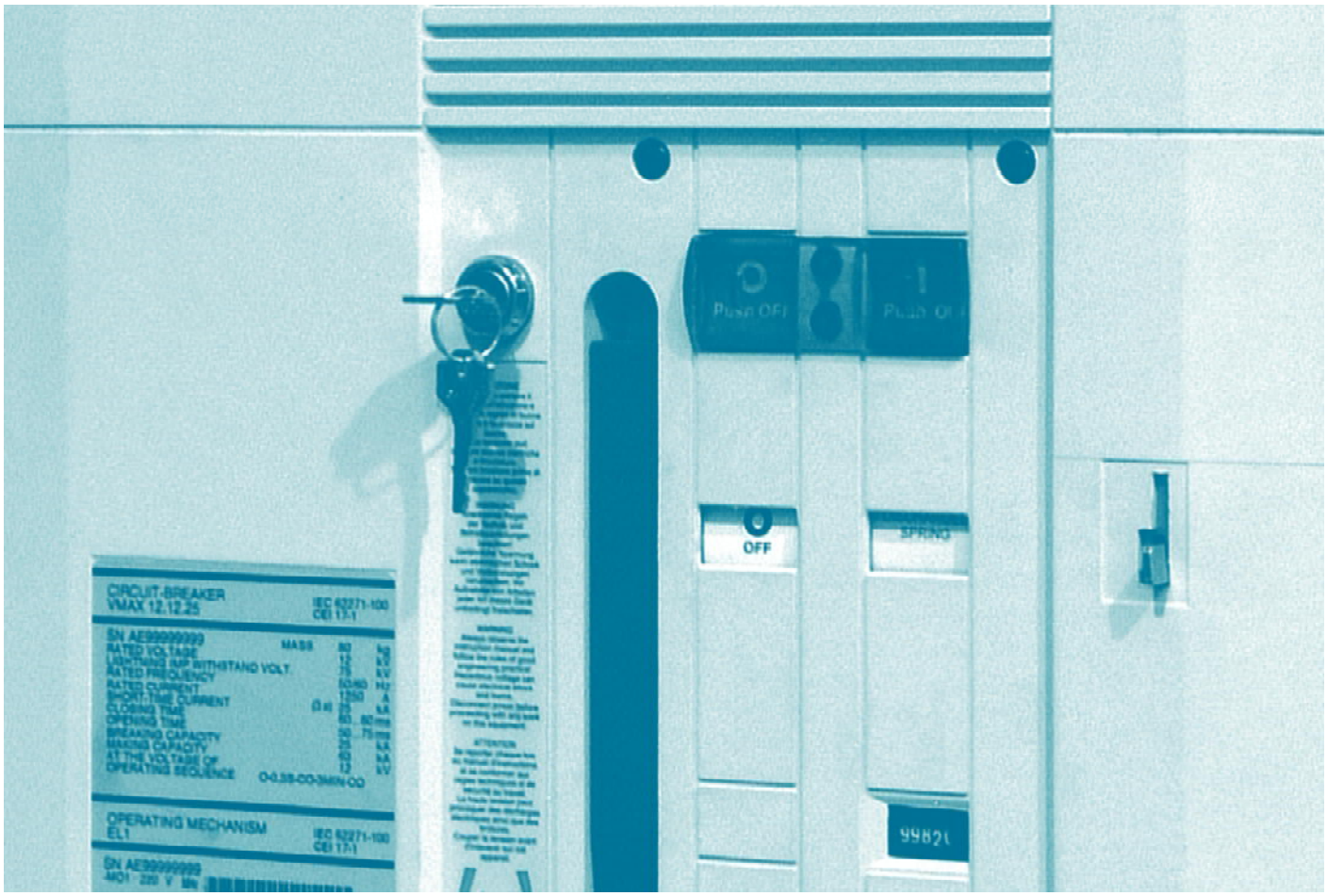
Product Instruction

Vmax
Medium voltage vacuum circuit-breakers
12...17.5kV - 630...2000A - 16...31.5kA

Power and productivity
for a better world™

Contents



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 of the dielectric properties.

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.

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.

- 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

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.

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.

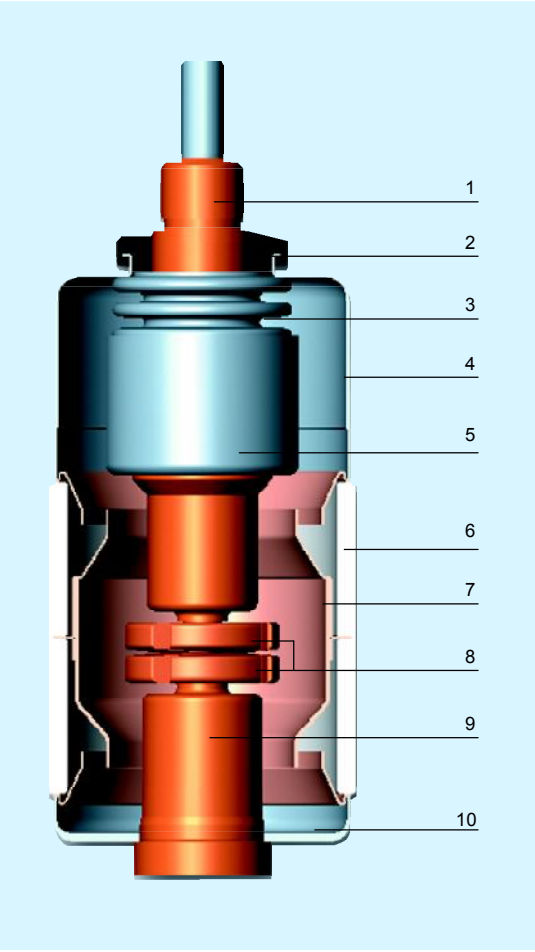
Apart from minimising thermal stress on the contacts, all this makes contact erosion negligible and, above all, allows the interruption process even with very high short-circuits.

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.

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



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 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

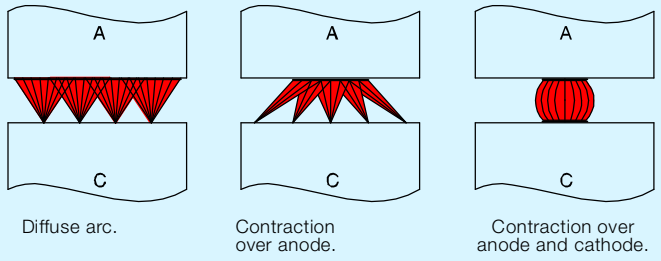
Thanks to the complete range of mechanical and electrical locks (available on request), it is possible to construct safe distribution switchgear with the Vmax circuit-breakers.

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

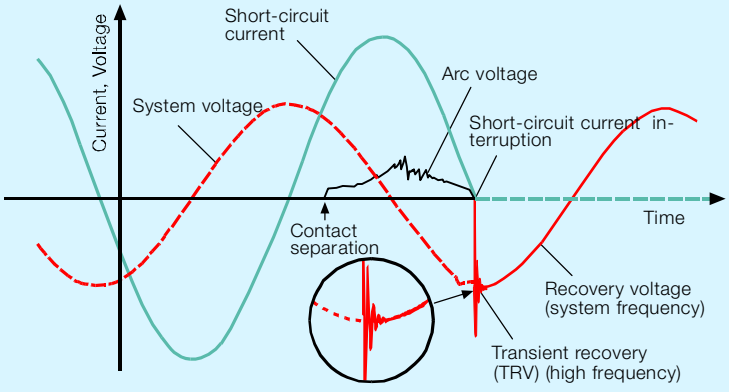
Key locks or padlock devices enable opening and closing operations and/or racking in and racking out.

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.

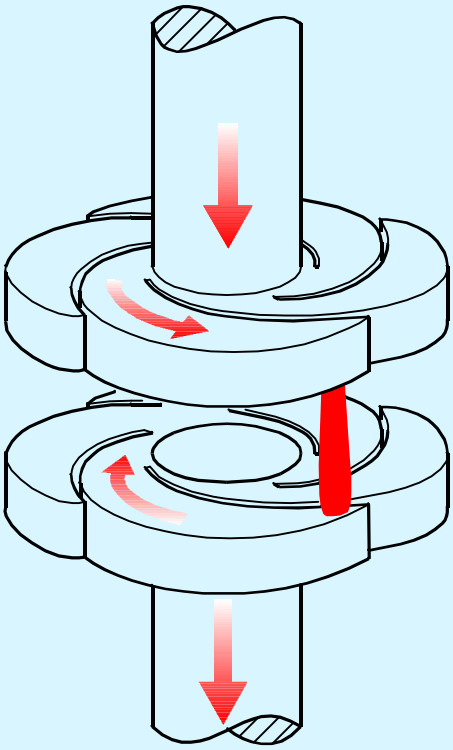
Anti-racking-in locks prevent circuit-breakers with different rated currents from being racked in, and the racking-in operation with the circuit-breaker closed.



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



Development of current and voltage trends during a single phase vacuum interruption process.



Radial magnetic field contact arrangement with a rotating vacuum arc.

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 circuit-breakers 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.

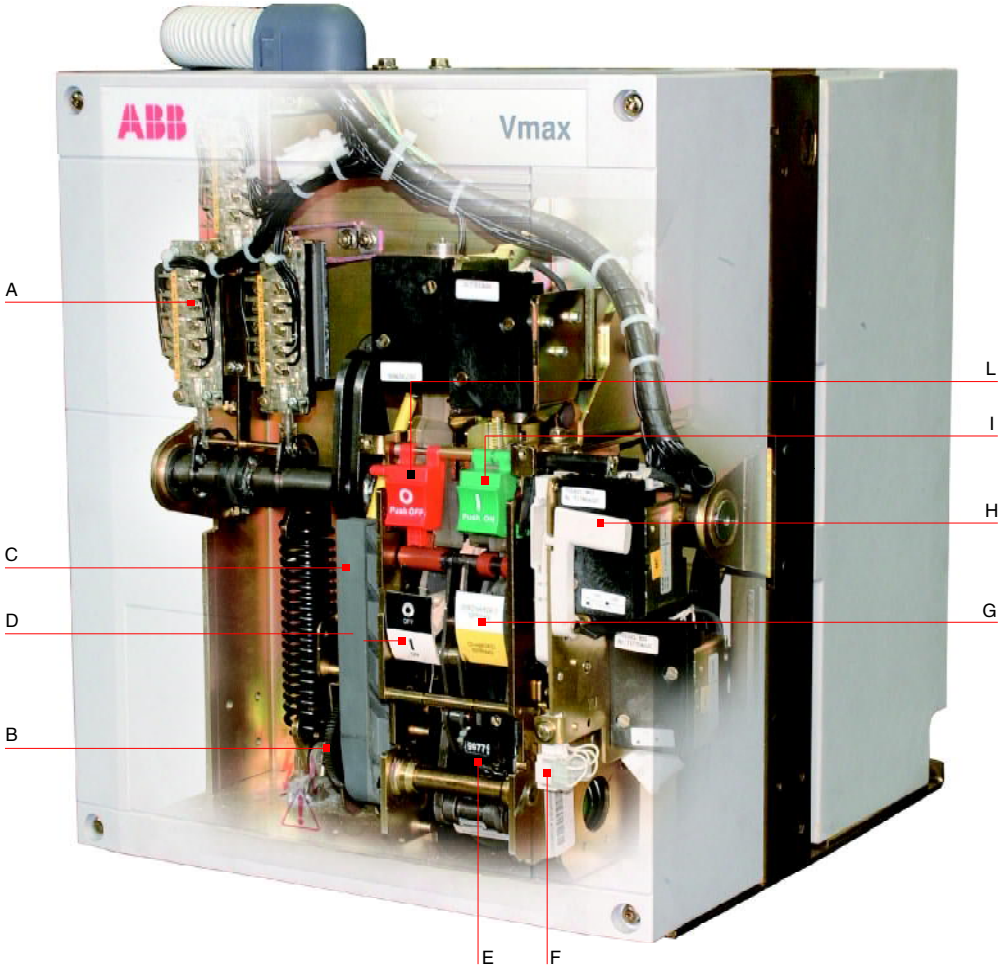
The operating mechanism is of the stored energy type with the anti-pumping device mounted as standard and it is fitted with suitable locks to prevent incorrect operations.

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

Circuit-breaker operating mechanism

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

- 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.



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

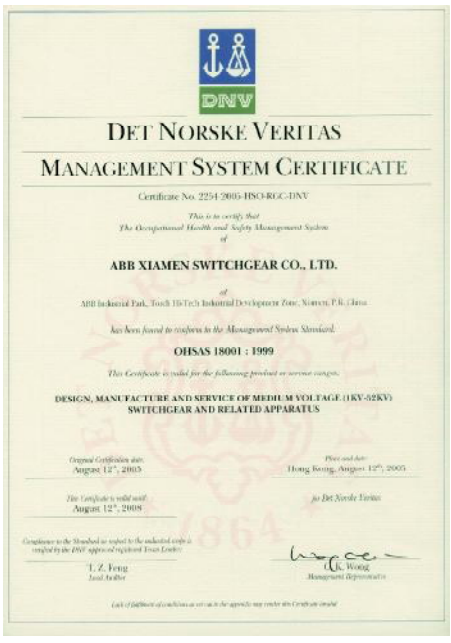
Complies with ISO 9001:2000 Standards, certified by an independent organisation.

Environmental Management System

Complies with ISO 14001:2004 Standards, certified by an independent organisation.

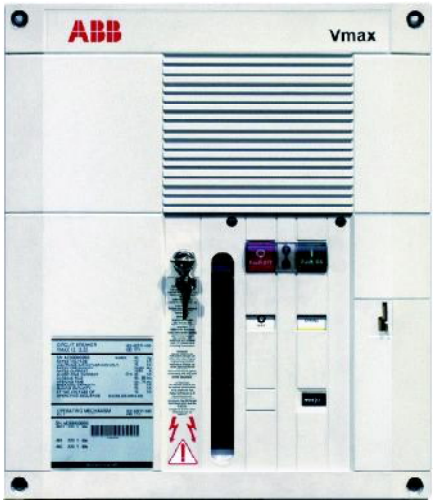
Health and Safety Management System

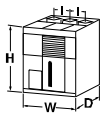
Complies with OHSAS 18001:1999 Standards, certified by an independent organisation.



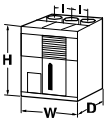
CIRCUIT-BREAKER SELECTION AND ORDERING

General characteristics of fixed circuit-breakers



Circuit–breaker		Vmax 12	
Standards	IEC 62271–100	■	
	GB 1984–2003	■	
Rated voltage	Ur [kV]	12	
Rated insulation voltage	Us [kV]	12	
Withstand voltage at 50 Hz	Ud(1min) [kV]	42	
Impulse withstand voltage	Up [kV]	75	
Rated frequency	fr [Hz]	50–60	
Rated normal current (40°C)	Ir [A]	630	1250
Rated breaking capacity	Isc [kA]	16	16
(rated symmetrical		20	20
short–circuit current)		25	25
		31.5	31.5
Rated short–time	Ik [kA]	16	16
withstand current (4 s)		20	20
		25	25
		31.5	31.5
Making capacity	Ip [kA]	40	40
		50	50
		63	63
		80	80
Operation sequence	[O–0.3s–CO–15s–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
Pole centre distance	I [mm]	133	133
Weight	[kg]	77	77
Standardised table of dimensions	1VCD	003279	003279
Operating temperature	[°C]	–15...+40	–15...+40
Tropicalization	IEC: 60068–2–30	■	■
	721–2–1	■	■
Electromagnetic compatibility	IEC 62271–1	■	■

General characteristics of withdrawable circuit-breakers for:
– UniGear switchgear (width 550 mm)

Circuit–breaker		Vmax/L 12		Vmax/L 12	
For UniGear switchgear/enclosures		UniGear 550		UniGear 550	
Standards	IEC 62271–100	■		■	
	GB 1984–2003	■		■	
Rated voltage	Ur [kV]	12		12	
Rated insulation voltage	Us [kV]	12		12	
Withstand voltage at 50 Hz	Ud(1min) [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]	16	16	16	16
(rated symmetrical		20	20	20	20
short–circuit current)		25	25	25	25
		31.5	31.5	31.5	31.5
Rated short–time	Ik [kA]	16	16	16	16
withstand current (4 s)		20	20	20	20
		25	25	25	25
		31.5	31.5	31.5	31.5
Making capacity	Ip [kA]	40	40	40	40
		50	50	50	50
		63	63	63	63
		80	80	80	80
Operation sequence	[O–0.3s–CO–15s–CO]	■	■	■	■
Opening time	[ms]	33...60	33...60	33...60	33...60
Arc duration	[ms]	10...15	10...15	10...15	10...15
Total interruption time	[ms]	45...75	45...75	45...75	45...75
Closing time	[ms]	45...80	45...80	45...80	45...80
Maximum overall dimensions	 H [mm]	665	665	665	665
	W [mm]	461	461	461	461
	D [mm]	665	665	660	660
Pole centre distance	I [mm]	150	150	150	150
Weight	[kg]	98	98	121	121
Standardised table of dimensions		1VCD003334	1VCD003334	1YHT350003	1YHT350003
Operating temperature	[°C]	–15...+40	–15...+40	–15...+40	–15...+40
Tropicalization	IEC: 60068–2–30	■	■	■	■
	721–2–1	■	■	■	■
Electromagnetic compatibility	IEC 62271–1	■	■	■	■

Standard fittings for fixed circuit-breaker series

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 circuitbreakers

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 auxiliary circuits, with striker pin which does not allow the plug to be inserted into the socket if the rated current of the circuit-breaker is different from 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.

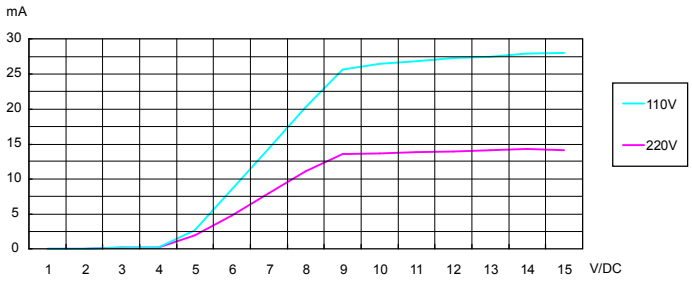
The release can operate both in direct and alternating current. This release is suitable for both instantaneous and permanent service. In the case of instantaneous service, the minimum current impulse time must be 100 ms.

Characteristics	
Un: 24-30-48-60-110-125-220-250V-	
Un: 24-48-60-110-120...127-220...240-V~50Hz	
Un: 110-120-127-220-240-V~60Hz	
Operating limits:	65 ... 120% 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



At a power supply of 110V~130V, connect the "Control Coil Continuity" device, or a relay or a signalling lamp which consumes a current not exceeding 20mA. The total resistance of other components in the monitoring circuit, excluding the release, should be less than 5.5kΩ.

At a power supply of 220V~250V, connect the "Control Coil Continuity" device, or a relay or a signalling lamp which consumes a current not exceeding 10mA. The total resistance of other components in the monitoring circuit, excluding the release, should be less than 20kΩ.

- 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.

1

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.

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: 24-30-48-60-110-125-220-250V-	
Un: 24-48-60-110-120...127-220...240V~50Hz	
Un: 110-120...127-220...240V~60Hz	
Operating limits:	circuit-breaker opening: 35-65% Un
	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)

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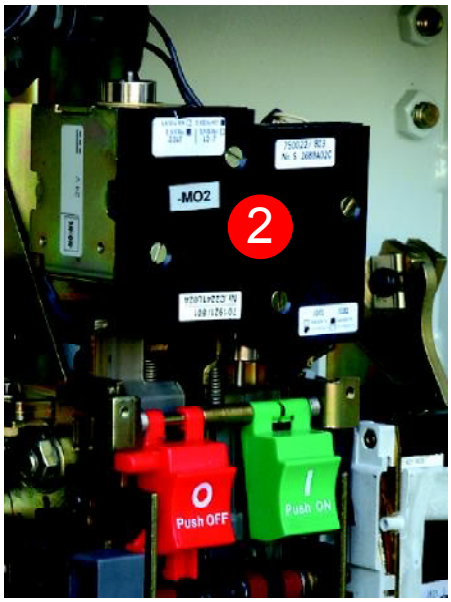

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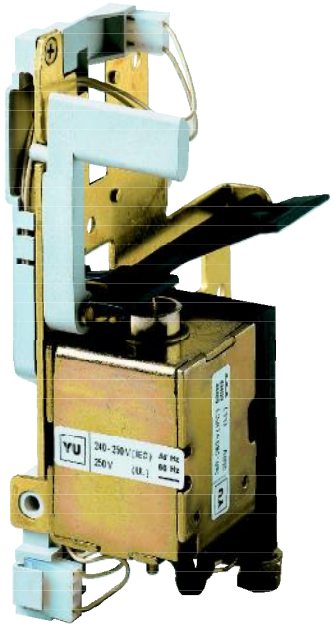

Electronic time-delay device (-KT)

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

5 Undervoltage release mechanical override

This is a mechanical device which allows the undervoltage release trip to be temporarily excluded. It is always fitted with electrical signalling.

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...250V AC-DC			
Rated current:	Ith^2 =10A			
Insulation voltage:	2000V 50Hz (1min)			
Electrical resistance:	3mOhm			
Rated current and breaking capacity in category AC11 and DC11:				
Un	Cosφ	T	In	Icu
220V~	0.7	--	2.5A	25A
24V-	--	15ms	10A	12A
60V-	--	15ms	6A	8A
110V-	--	15ms	4A	5A
220V-	--	15ms	1A	2A

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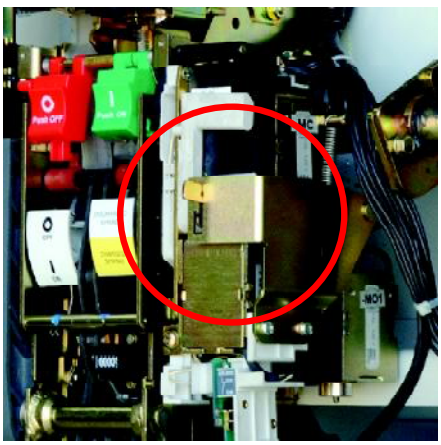

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7 Transmitted contacts in the truck (-BT1; -BT2)

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...250V-		
Un: 100-130-220...250V~50/60Hz		
Operating limits:	85...110%Un	
	25kA	31.5kA
Power on inrush (Ps):	DC=500W; AC=500VA	DC=900W; AC=900VA
Rated power (Pn):	DC=200W; AC =200VA	DC=350W; AC=350VA
Inrush duration:	approx. 0.2s	approx. 0.2s
Charging time:	4-5s	5-6s
Insulation voltage:	2000V 50Hz (1min)	2000V 50Hz (1min)

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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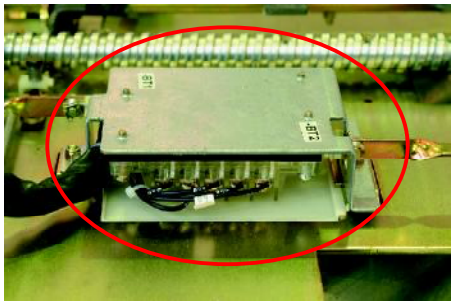

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Protections and locks (kit 13 ...15)

Various mechanical and electromechanical locking and protection devices are available.

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: 24-30-48-60-110-125-127-132-220-240V-	
Un: 24-30-48-60-110-125...127-220-230...240V~50/60Hz	
Operating limits:	80...110%Un
Power on inrush (Ps):	DC=250W; AC=250VA
Continuous power (Pc):	DC=5W; AC=5VA
Inrush duration:	approx. 150ms

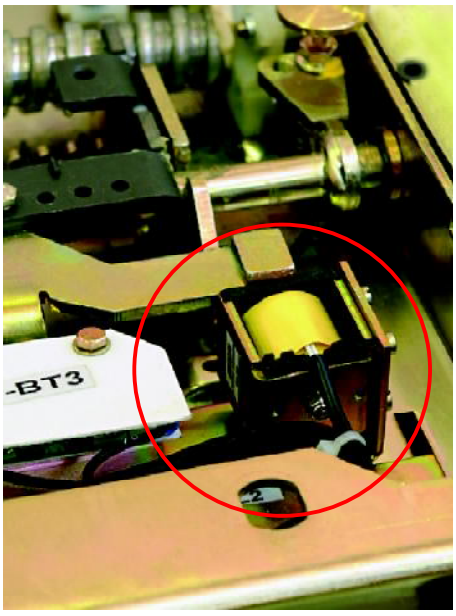
15 Locking magnet on the operating mechanism (-RL1)

This allows activation of the operating mechanism when the lock is energized only.

Characteristics	
Un: 24-30-48-60-110-125-127-132-220-240V-	
Un: 24-30-48-60-110-125...127-220-230...240V~50/60Hz	
Operating limits:	80...110%Un
Power on inrush (Ps):	DC=250W; AC=250VA
Continuous power (Pc):	DC=5W; AC=5VA
Inrush duration:	approx. 150ms

13

14



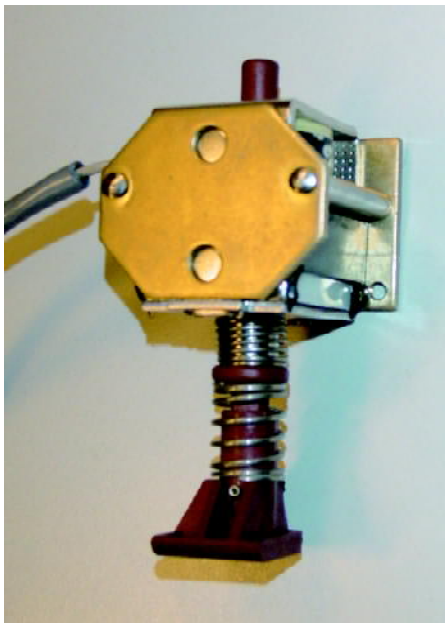
15

17 Opening solenoid (-MO3)

The opening solenoid is a special demagnetising release mainly used with self-supplied overcurrent protection releases, such as the ABB PR512 release.

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

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

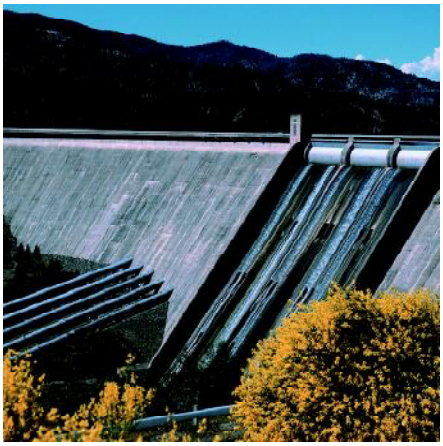
The insulating property of air decreases as the altitude increases, therefore this must always be taken into account for external insulation of the apparatus (the internal insulation of the interrupters does not undergo any variations as it is guaranteed by the vacuum).

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.

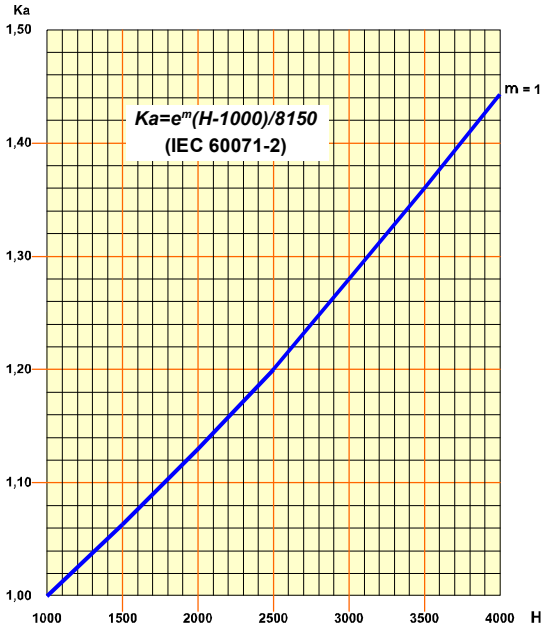
The anti-pumping device avoids this situation, ensuring that each closing operation is only followed by a single opening operation and that there is no closing operation after this. To obtain a further closing operation, the closing command must be released and then re-launched.

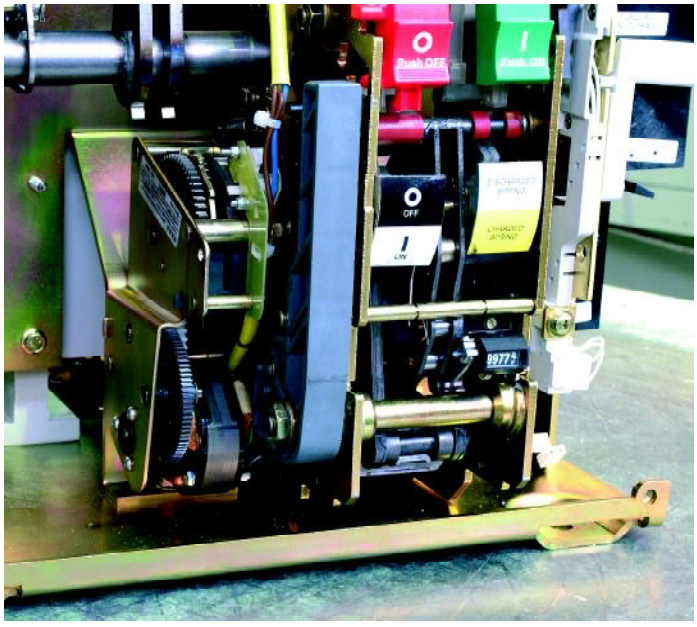
Furthermore, the anti-pumping device only allows circuit-breaker closure if the following conditions are present at the same time:

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

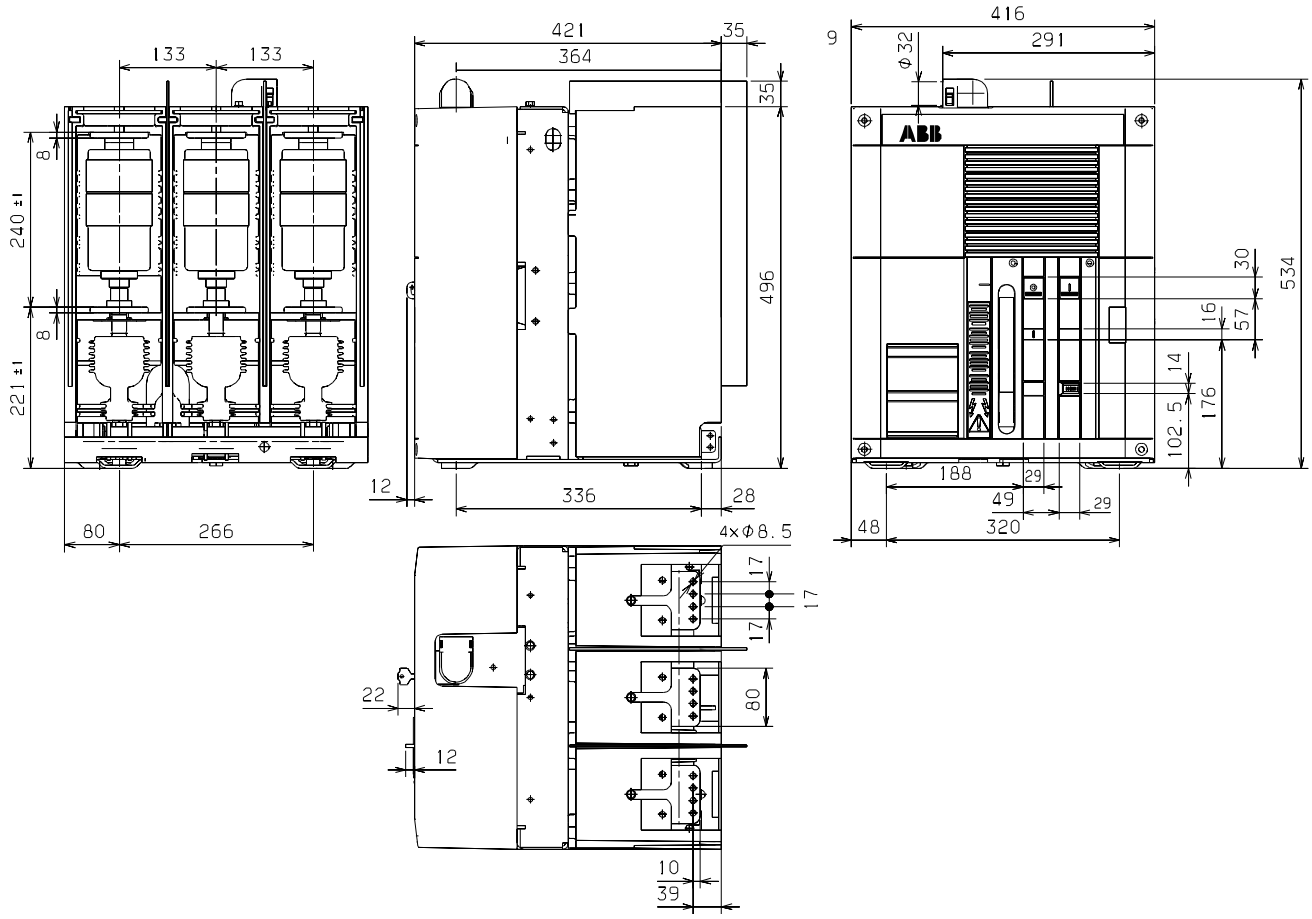
Ordering

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

OVERALL DIMENSIONS

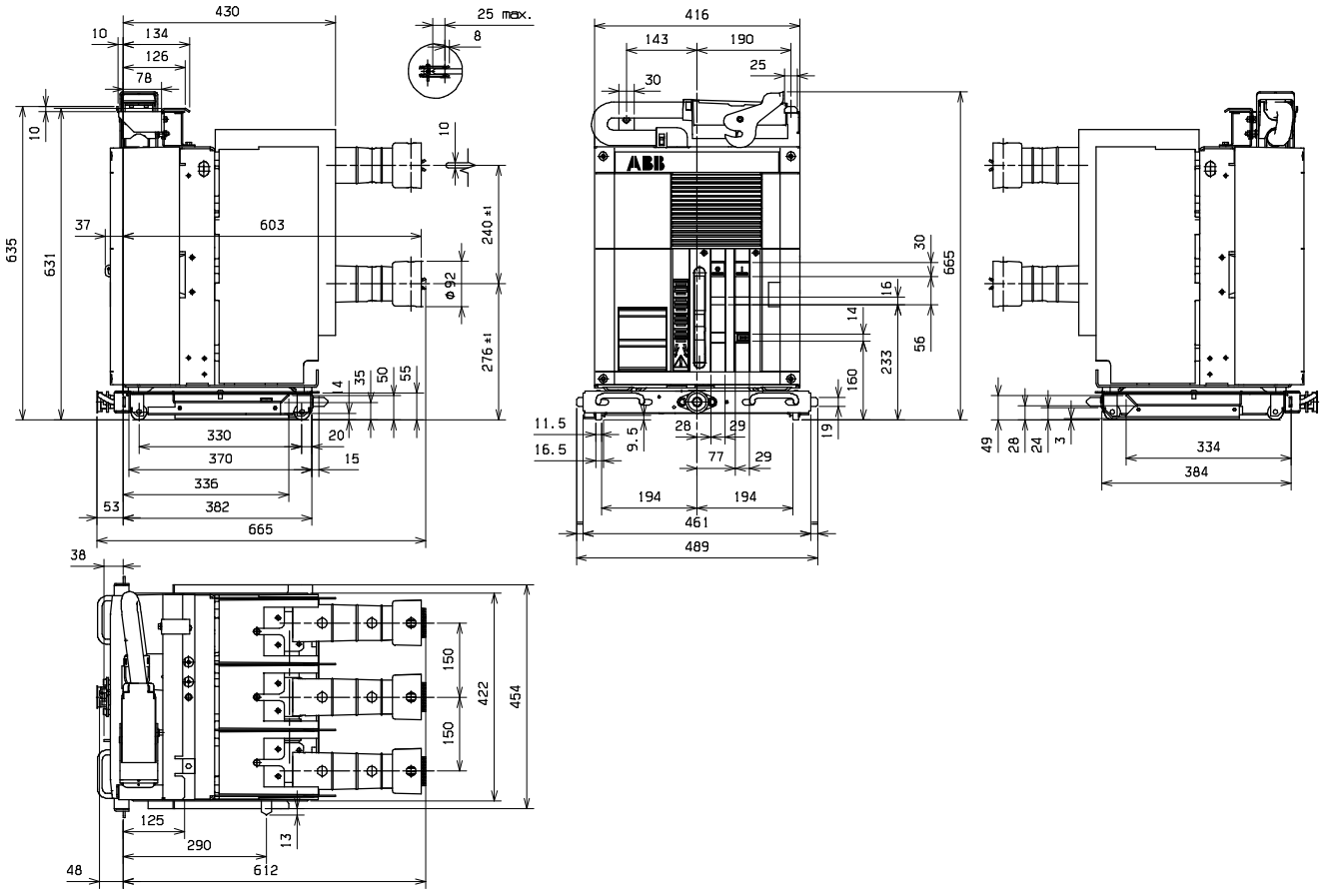
Fixed Vmax circuit-breakers

TN	Ur	Ir	Isc
1VCD003279 (E0441)	12 kV	630 A	16 kA
	17.5 kV	1250 A	20 kA
			25 kA
			31.5 kA



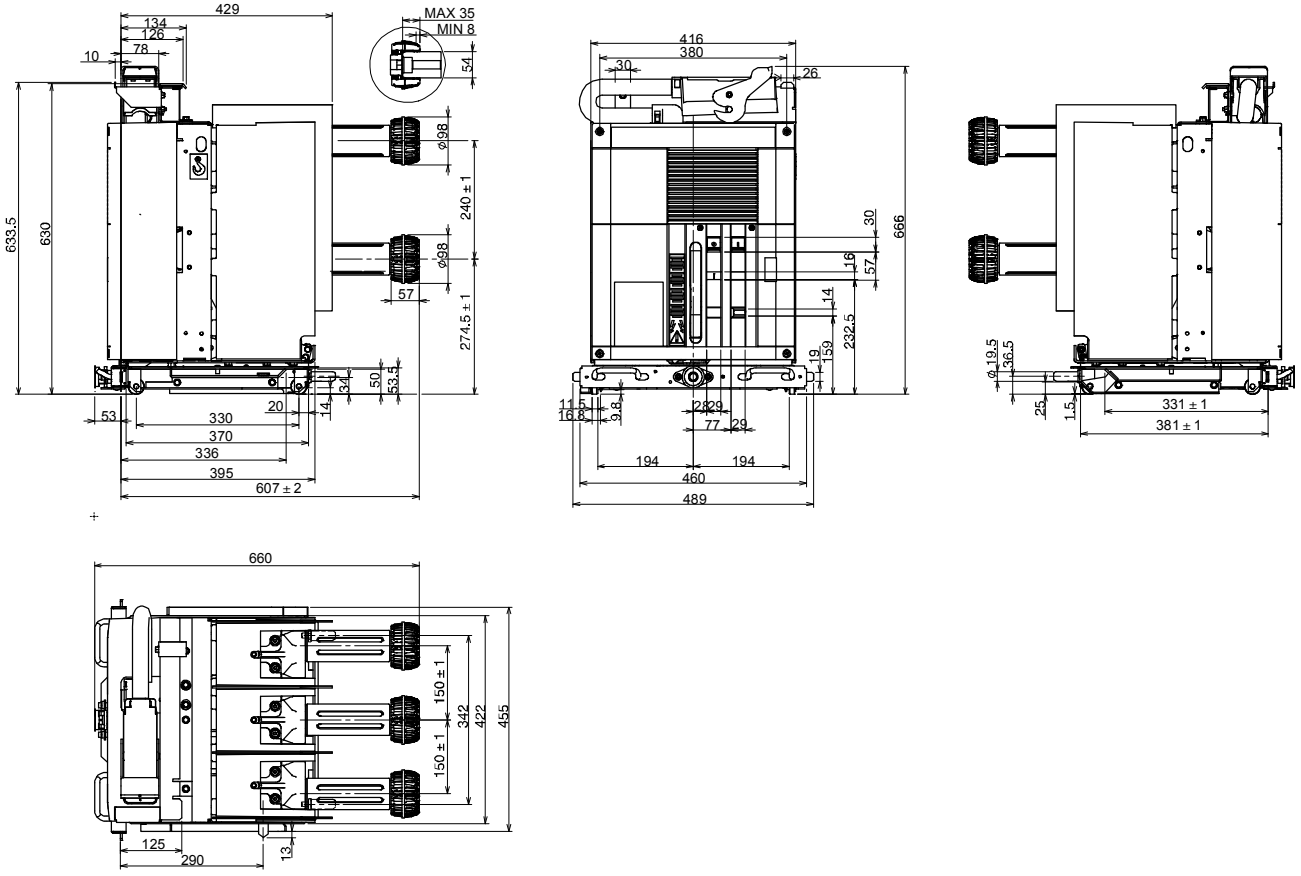
Withdrawable circuit-breakers for UniGear switchgear (width 550 mm)

TN	Ur	Ir	Isc
1VCD003334 (E0441)	12 kV	630 A	16 kA
	17.5 kV	1250 A	20 kA
			25 kA
			31.5 kA



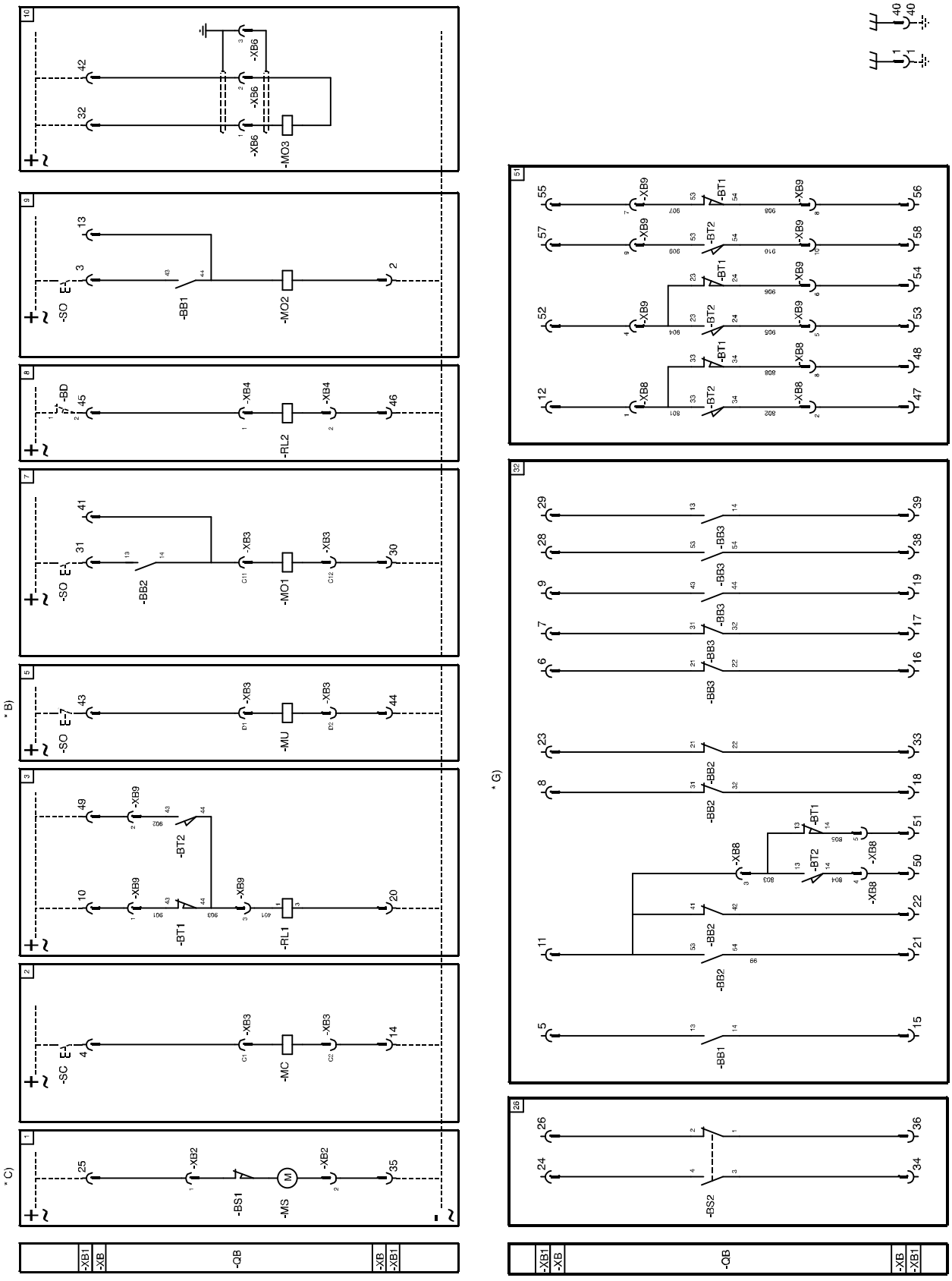
Withdrawable circuit-breakers for UniGear switchgear (width 550 mm)

TN	Ur	Ir	Isc
1YHT350003D0101(Rev.B)	12 kV	1600 A	16 kA
	17.5 kV	2000 A	20 kA
			25 kA
			31.5 kA



ELECTRIC CIRCUIT DIAGRAM

Diagrams of the applications



State of operation shown

The diagram shows the following conditions:
– circuit-breaker open and connected
– 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)
-BB1..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 control 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, triggered 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.

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 circuit-breaker 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.

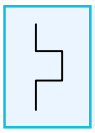
Standard Configuration

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

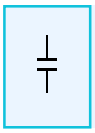
Optional Configuration

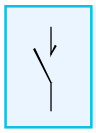
Fig.5 -MU Under-voltage release
Fig.8 -RL2 Locking magnet for rack-in/out operation.
Fig.9 -MO2 Second shunt opening release
Fig.10 -MO3 Opening solenoid

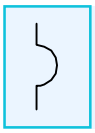
Graphical symbols for electrical Diagrams(IEC 60617 standard)

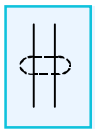

Thermal effect

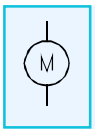

Mass, frame


Capacitor (general symbol)

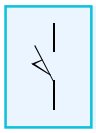

Passing make contact closing momentarily during release

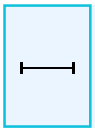

Electromagnetic effect

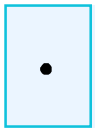

Conductors in shielded cable (two conductors shown)

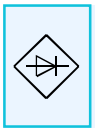


Motor (general symbol)

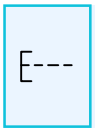

Closing position contact (limit switch)

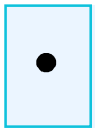

Timing

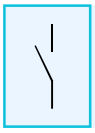

Connection of Conductors

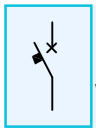

Rectifier with two half-waves (bridge)

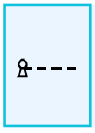

Opening position contact (limit switch)

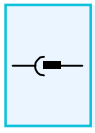

Pushbutton control

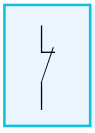

Terminal or clamp

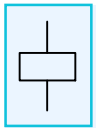

Make contact


Power circuit-breaker with automatic opening

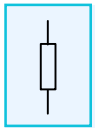

Key control

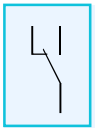

Socket and plug (female and male)

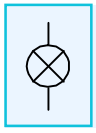

Break contact


Control coil (general symbol)


Earth (general symbol)


Resistor (general symbol)


Change-over break before make contact


Lamp (general symbol)

Contact us

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