

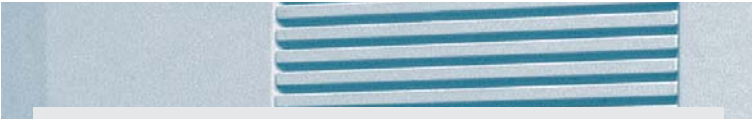




Vmax

Medium voltage vacuum circuit-breakers

12 ... 17.5 kV - 630 ... 1250 A - 16 ... 31.5 kA

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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 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 customised 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 circuit-breaker.

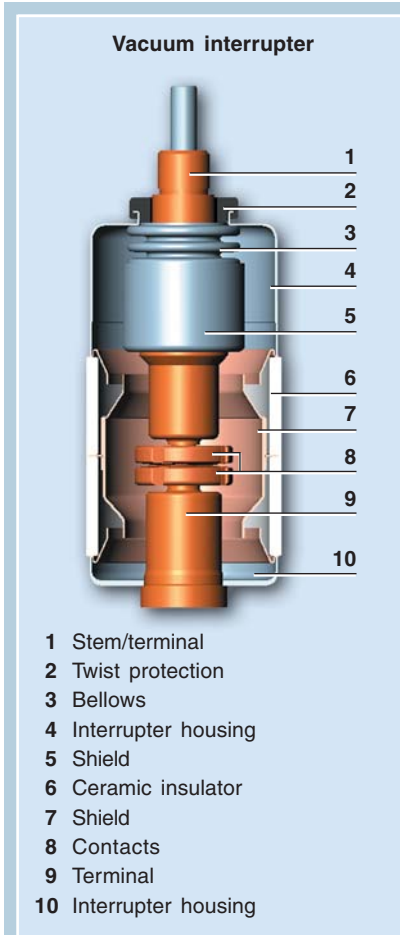
The compact structure ensures sturdiness and mechanical reliability.

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

DESCRIPTION

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.

Versions available

Vmax circuit-breakers are available in the fixed and withdrawable version with front operating mechanism. The withdrawable version is available for UniGear ZS1 type switchgear.

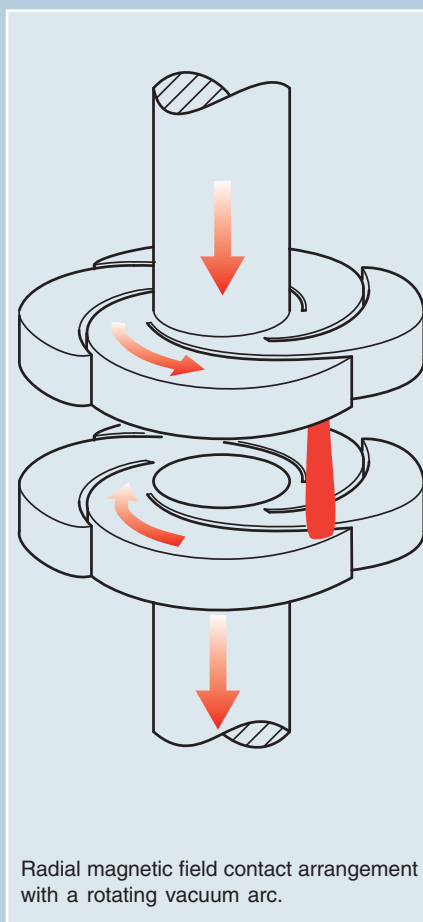
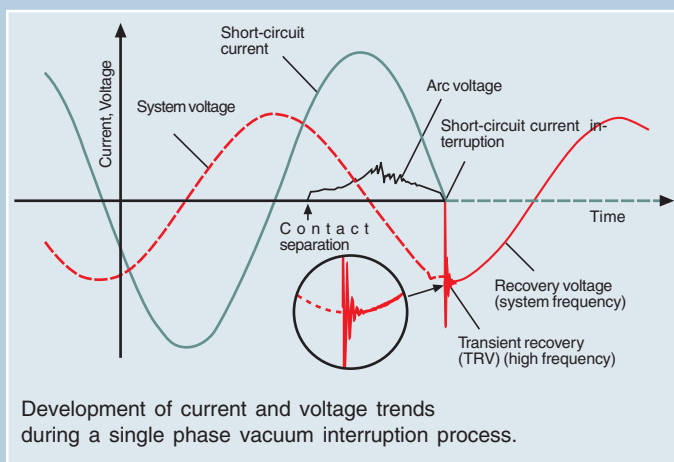
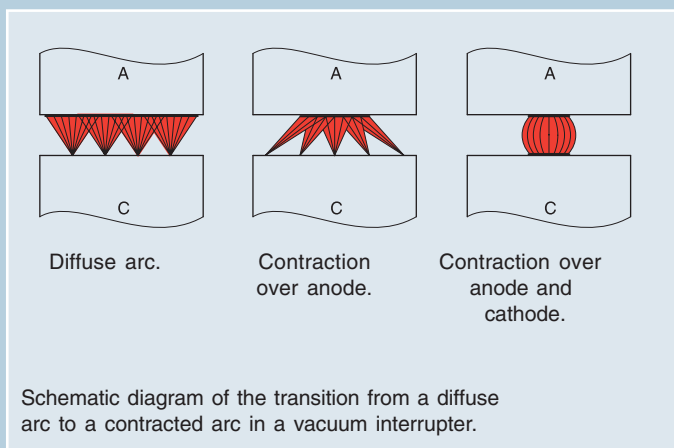
Fields of application

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

Standards and approvals

Vmax circuit-breakers comply with the IEC 62271-100, CEI 17-1 file 1375 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 no-load 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.

DESCRIPTION

Accessories

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

The operating mechanism has a standardised range of accessories and spare parts which are easy to identify and order. The accessories are installed conveniently from the front of the circuit-breaker. Electrical connection is carried out with plug-socket connectors.

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

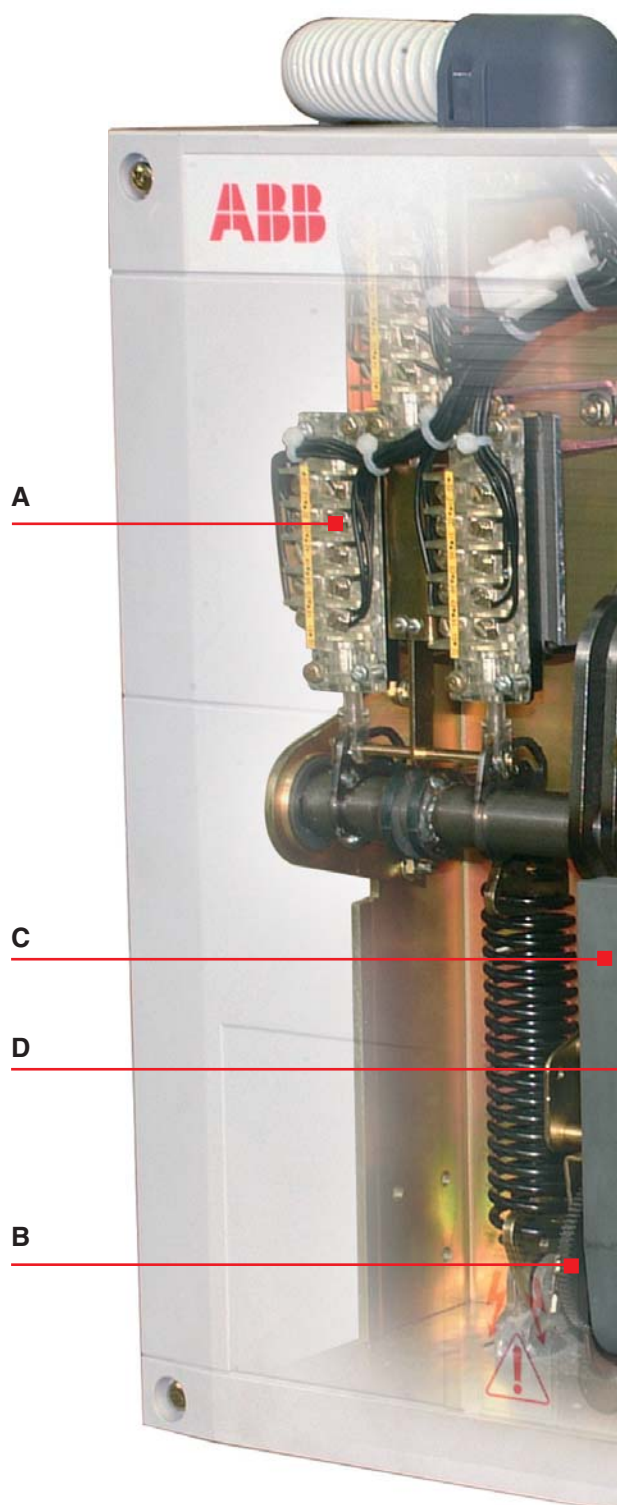
Operating mechanism

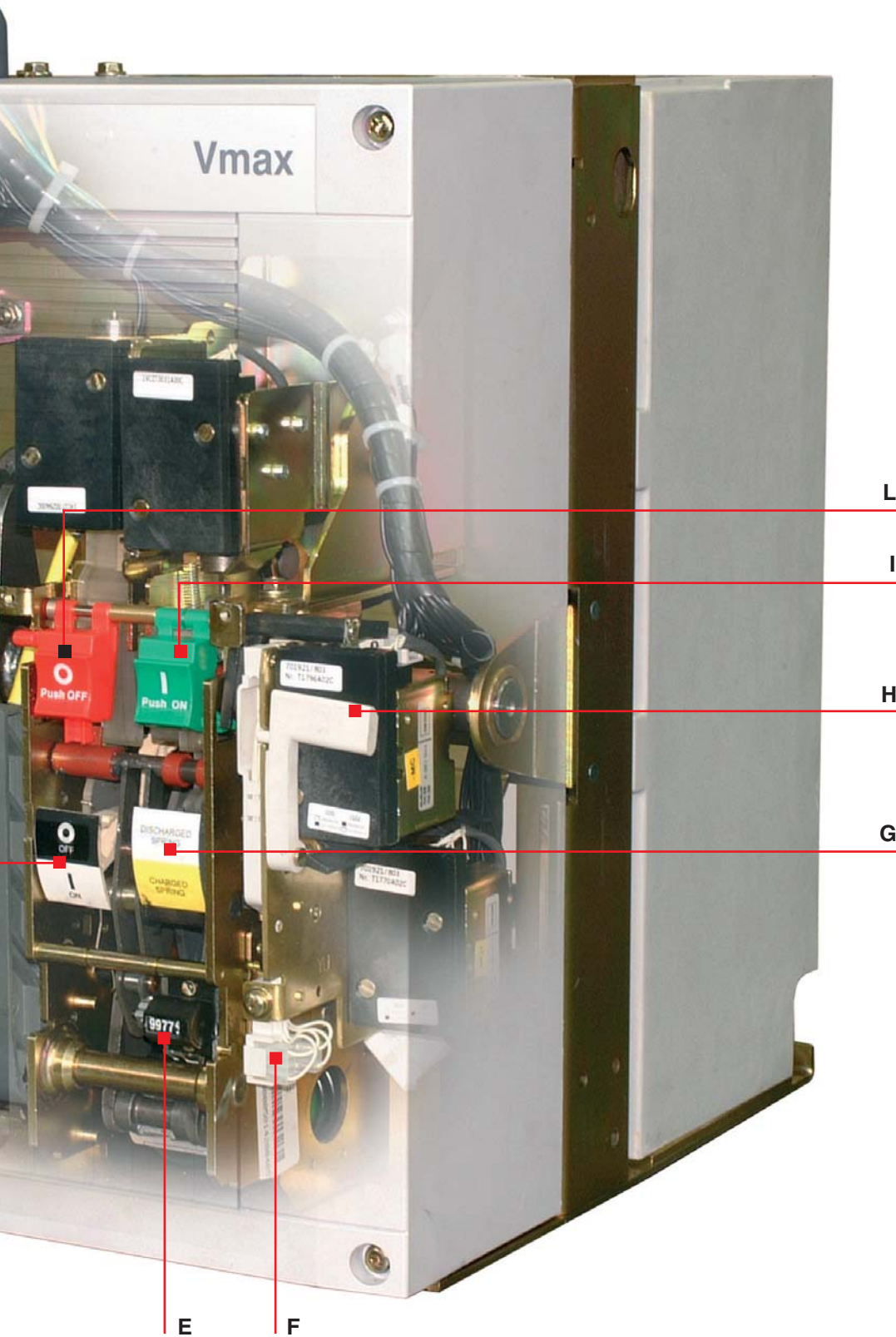
The mechanical operating mechanism of Vmax circuit-breakers is of simple concept and use and can be customised with a wide range of easily and rapidly installed accessories. This simplicity translates into greater reliability of the apparatus. The operating mechanism is of the stored energy type with 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.

The accessories are the same for all the types of Vmax circuit-breakers. To facilitate assembly and replacement of accessories, assembly seats with special fixed references are provided.

- 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.
- Key lock with circuit-breaker open.
- 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 circuit-breaker 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

L

I

H

G

E

F

DESCRIPTION

Technical documentation

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

– UniGear ZS1 type switchgear	code 1VCP000138
– REF542 <i>plus</i> Unit	code 1VTA100001

Quality Assurance System:

This complies with the ISO 9001 Standards, certified by an independent external organization.

Test laboratory

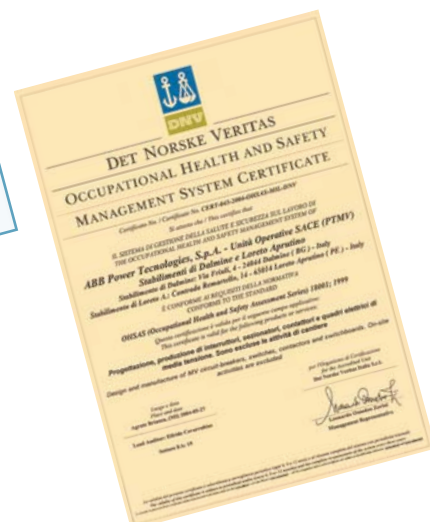
This complies with the UNI CEI EN ISO/IEC 17025 Standards, accredited by an independent external organization.

Environmental Management System

This complies with the ISO 14001 Standards, certified by an independent external organization.

Health and Safety Management System

This complies with the OHSAS 18001 Standards, certified by an independent external organisation.



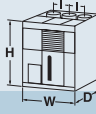
CIRCUIT-BREAKER SELECTION AND ORDERING

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CIRCUIT-BREAKER SELECTION AND ORDERING

General characteristics of fixed circuit-breakers

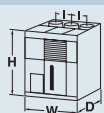


		Vmax 12		Vmax 17		
Circuit-breaker						
Standards	IEC 62271-100	■		■		
	CEI 17-1 (File 1375)	■		■		
Rated voltage	Ur [kV]	12		17.5		
Rated insulation voltage	Us [kV]	12		17.5		
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28		38		
Impulse withstand voltage	Up [kV]	75		95		
Rated frequency	fr [Hz]	50-60		50-60		
Rated normal current (40 °C)	(2) Ir [A]	630	1250	630	1250	
Rated breaking capacity (rated symmetrical short-circuit current)	Isc [kA]	16	16	16	16	
		20	20	20	20	
		25	25	25	25	
		31.5	31.5	31.5	31.5	
Rated short-time withstand current (3 s)	Ik [kA]	16	16	16	16	
		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]	40...60	40...60	40...60	40...60	
Arc duration	[ms]	10...15	10...15	10...15	10...15	
Total interruption time	[ms]	50...75	50...75	50...75	50...75	
Closing time	[ms]	60...80	60...80	60...80	60...80	
Maximum overall dimensions		H [mm]	496	496	531	531
		W [mm]	416	416	416	416
		D [mm]	433	433	433	433
Pole centre distance	I [mm]	133	133	133	133	
Weight	[Kg]	77	77	77	77	
Standardised table of dimensions	1VCD	003279	003279	003279	003279	
Operating temperature	[°C]	-5 ... +40	-5 ... +40	-5 ... +40	-5 ... +40	
Tropicalization	IEC: 60068-2-30	■	■	■	■	
	721-2-1	■	■	■	■	
Electromagnetic compatibility	IEC 60694	■	■	■	■	

General characteristics of withdrawable circuit-breakers for:

- UniGear switchgear (width 550 mm)
- PowerBox PB1 modules (width 600 mm)



Circuit-breaker		Vmax/L 12		Vmax/L 17		Vmax/W 12		Vmax/W 17	
Use in switchgear/enclosures		UniGear 550		UniGear 550		PowerBox		PowerBox	
Standards	IEC 62271-100	■	■	■	■	■	■	■	■
	CEI 17-1 (File 1375)	■	■	■	■	■	■	■	■
Rated voltage	Ur [kV]	12		17.5		12		17.5	
Rated insulation voltage	Us [kV]	12		17.5		12		17.5	
Withstand voltage at 50 Hz	Ud (1 min) [kV]	28		38		28		38	
Impulse withstand voltage	Up [kV]	75		95		75		95	
Rated frequency	fr [Hz]	50-60		50-60		50-60		50-60	
Rated normal current (40 °C)	(2) Ir [A]	630	1250	630	1250	630	1250	630	1250
Rated breaking capacity	Isc [kA]	16	16	16	16	16	16	16	16
(rated symmetrical short-circuit current)		20	20	20	20	20	20	20	20
		25	25	25	25	25	25	25	25
		31,5	31,5	31,5	31,5	31,5	31,5	31,5	31,5
Rated short-time withstand current (3 s)	Ik [kA]	16	16	16	16	16	16	16	16
		20	20	20	20	20	20	20	20
		25	25	25	25	25	25	25	25
		31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
Making capacity	Ip [kA]	40	40	40	40	40	40	40	40
		50	50	50	50	50	50	50	50
		63	63	63	63	63	63	63	63
		80	80	80	80	80	80	80	80
Operation sequence	[O-0.3s-CO-15s-CO]	■	■	■	■	■	■	■	■
Opening time	[ms]	35...60	35...60	35...60	35...60	35...60	35...60	35...60	35...60
Arc duration	[ms]	10...15	10...15	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	45...75	45...75
Closing time	[ms]	45...80	45...80	45...80	45...80	45...80	45...80	45...80	45...80
Maximum overall dimensions	 H [mm]	665	665	665	665	665	665	665	665
	W [mm]	461	461	461	461	503	503	503	503
	D [mm]	665	665	665	665	662	662	662	662
Pole centre distance	I [mm]	150	150	150	150	150	150	150	150
Weight	[Kg]	98	98	98	98	100	100	100	100
Standardised table of dimensions	1VCD	003334	003334	003334	003334	003280	003280	003280	003280
Operating temperature	[°C]	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40	-5...+40
Tropicalization	IEC: 60068-2-30	■	■	■	■	■	■	■	■
	721-2-1	■	■	■	■	■	■	■	■
Electromagnetic compatibility	IEC 60694	■	■	■	■	■	■	■	■

CIRCUIT-BREAKER SELECTION AND ORDERING

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)
- lever for manually charging the closing springs
- auxiliary circuit support terminal board.

Standard fittings of withdrawable circuit-breakers

The basic versions of the withdrawable 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)
- lever for manually charging the closing springs
- 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 (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck (-RL2). This prevents the circuit-breaker being racked into the panel with the auxiliary circuits disconnected (plug not inserted in the socket).

(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:	70 ... 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:	40...60 ms
Closing time:	40...80 ms
Insulation voltage:	2500 V 50 Hz (for 1 min)

Note

Control of release function is only possible by means of the STU device (optional accessory – see kit 16).



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.

CIRCUIT-BREAKER SELECTION AND ORDERING



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 energized 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 opening: 35-70% 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: 2500 V 50 Hz (for 1 min)



Electronic time-delay device (-KT)

The electronic time delay device must be mounted externally to the circuit-breaker. 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

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. It is always fitted with electrical signalling.



6 Circuit-breaker auxiliary contacts (-BB1; -BB2; -BB3)

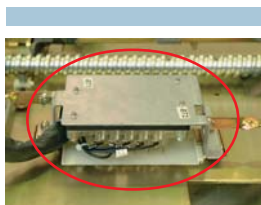
It is possible to have electrical signalling of circuit-breaker open/closed with a group of 15 auxiliary contacts as an alternative to the 10 provided as standard.

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 ... 250 V AC-DC			
Rated current:	$I_{th}^2 = 10 \text{ A}$			
Insulation voltage:	2500 V 50 Hz (for 1 min)			
Electrical resistance:	3 mOhm			
Rated current and breaking capacity in category AC11 and DC11:				
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	1 A	2 A



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

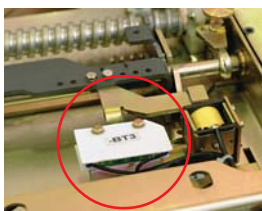
Transmitted contacts of the withdrawable circuit-breaker (installed in the circuit-breaker truck).

These contacts are either in addition or as an alternative to the position contacts (for signalling circuit-breaker racked out) located in the unit. They also carry out the function of the position contact (-BT3).

Note

Available on request for the withdrawable version for PowerBox PB1 module.

CIRCUIT-BREAKER SELECTION AND ORDERING



8 Position contact (-BT3)

This is used, together with the locking magnet of the operating mechanism (-RL1) to prevent remote closing during racking in the unit. It is supplied for Vmax/P withdrawable circuit-breakers. It is not supplied when the transmitted contacts in the truck are required (-BT1; -BT2).



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
Power on inrush (Ps):	DC 500 W; AC = 500 VA
Rated power (Pn):	DC = 200 W; AC = 200 VA
Inrush duration:	0,2 s
Charging time:	4-5 s
Insulation voltage:	2500 V 50 Hz (for 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.

Protections and locks (kit 11 16)

Various mechanical and electromechanical locking and protection devices are available.



11 Opening and closing pushbutton protection

The protection allows the opening and closing pushbuttons to be operated using a special tool only.



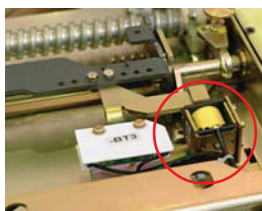
12 Opening and closing pushbutton padlock

The device allows the opening and closing pushbuttons to be locked using a maximum of three padlocks (not supplied): \varnothing 4 mm.



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:	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:	150 ms

CIRCUIT-BREAKER SELECTION AND ORDERING



16 Monitoring device of the functionality and continuity of the shunt opening/closing releases (Shunt Test Unit)

This device can be used combined with the shunt opening release (-MO1; -MO2) or with the shunt closing release (-MC) to check their functionality and continuity.

The control/monitoring Shunt Test Unit allows the continuity of releases with a rated operating voltage between 24 V and 250 V (AC and DC) to be checked, as well as the functionality of the electronic circuit of the release.

The continuity check is carried out with a cycle of 20 seconds between one test and the next.

The unit has optical signals by means of LEDs on the front. In particular, the following information is given:

- POWER ON: power supply present
- YO TESTING: test being carried out
- TEST FAILED: indication after a failed test or lack of auxiliary power supply
- ALARM: indication after three failed tests.

Two relays and a changeover device are also available on board the unit, which allow remote indication of the following two events:

- failure of a test (resetting takes place automatically when the alarm is over)
- failure of three tests (resetting only takes place by means of manual - RESET - from the front of the unit).

On the front of the unit there is also a key for manual - RESET -.

Characteristics

Un:	24 ... 250 V AC/DC
-----	--------------------

Maximum interrupted current:	6 A
------------------------------	-----

Maximum interrupted voltage:	250 V AC
------------------------------	----------



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.

SPECIFIC PRODUCT CHARACTERISTICS

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SPECIFIC PRODUCT CHARACTERISTICS



Resistance to vibrations

The Vmax circuit-breakers are unaffected by mechanically generated vibrations. Please contact us for the versions approved by the shipping registers

Tropicalization

The Vmax circuit-breakers are manufactured in compliance with the strictest regulations for 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 12×10^{-6} m, protected by a conversion layer mainly consisting of chromates in compliance with the UNI ISO 5420 Standards. These construction characteristics mean that all the Vmax series of apparatus and their accessories comply with climate graph 8 of the IEC 60721-2-1 and IEC 60068-2-2 (Test B: Dry Heat) / IEC 60068-2-30 (Test Bd: Damp Heat, cyclic) Standards.



Altitude

The insulating property of air decreases as the altitude increases, therefore this phenomenon must 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 account 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 following page, built up on the basis of the indications in the IEC 60694 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 to the lightning impulse withstand and between phase voltages.

Example

- Installation altitude: 2000 m
- Rated service voltage of 12 kV
- Industrial frequency withstand voltage: 28 kV rms
- Impulse withstand voltage: 75 kVp
- Ka factor, which can be taken from the graph = 1.13.

Considering the above parameters, the apparatus must withstand (on test at zero altitude, i.e. at sea level):

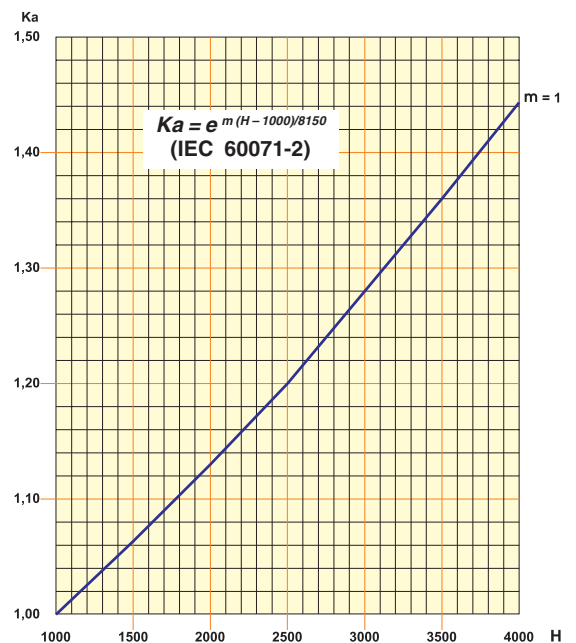
– power frequency withstand voltage:

$$28 \times 1.13 = 31.6 \text{ kVrms}$$

– impulse withstand voltage:

$$75 \times 1.13 = 84.7 \text{ kVp.}$$

From the above, it can be deduced that for installations at an altitude of 2000 m above sea level, with 12 kV service voltage, the apparatus must be provided with 17.5 kV rated voltage, characterised by insulation levels at industrial frequency of 38 kVrms with 95 kVp impulse withstand voltage.

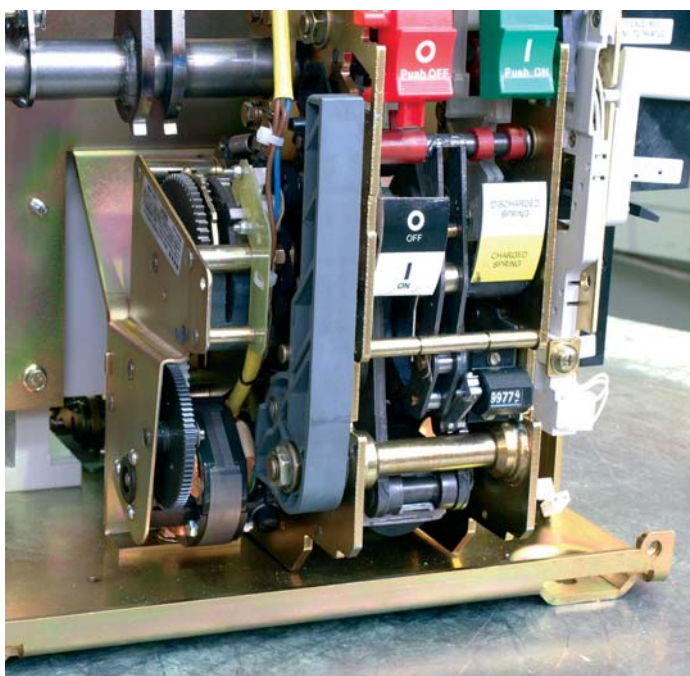


Anti-pumping device

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 minimising 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.

SPECIFIC PRODUCT CHARACTERISTICS

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
- Protection for opening pushbutton
- Protection for closing pushbutton
- Locking electromagnet on the withdrawable truck
- Set of six isolating contacts
- Insulating partitions.

Ordering

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

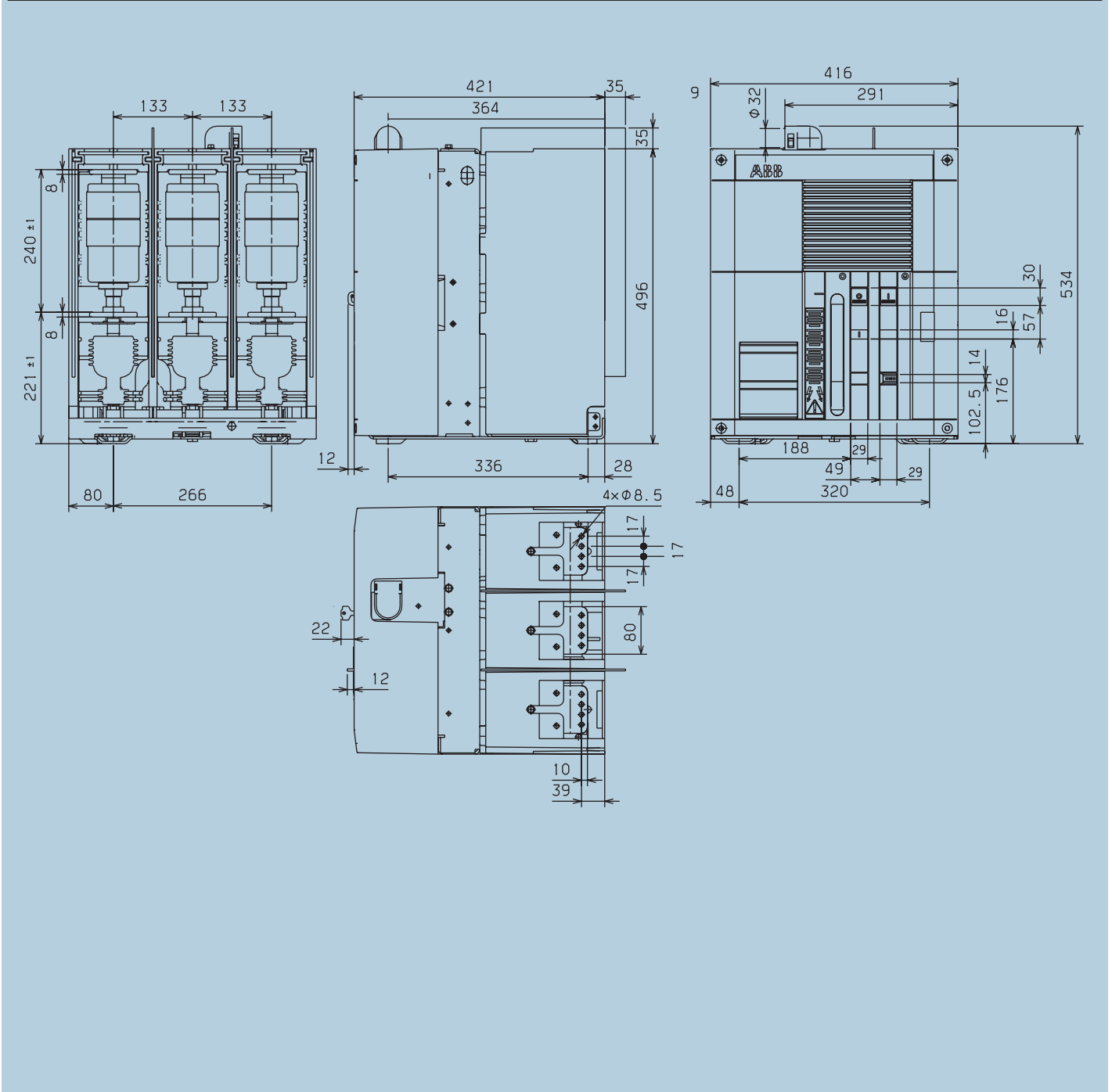
OVERALL DIMENSIONS

Fixed circuit-breakers	26
Withdrawable circuit-breakers for UniGear ZS1 type switchgear	27
Vmax/W withdrawable circuit-breakers for PowerBox modules	28

OVERALL DIMENSIONS

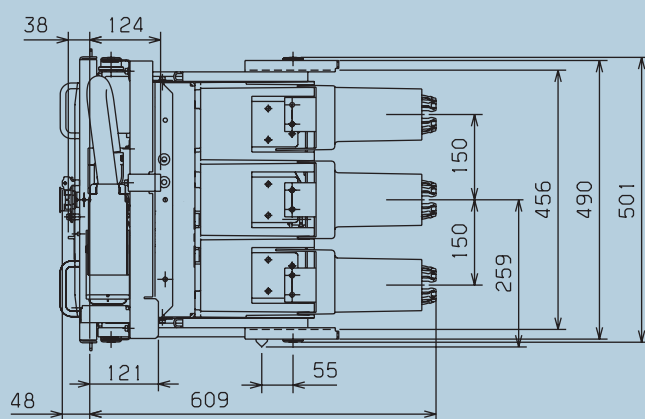
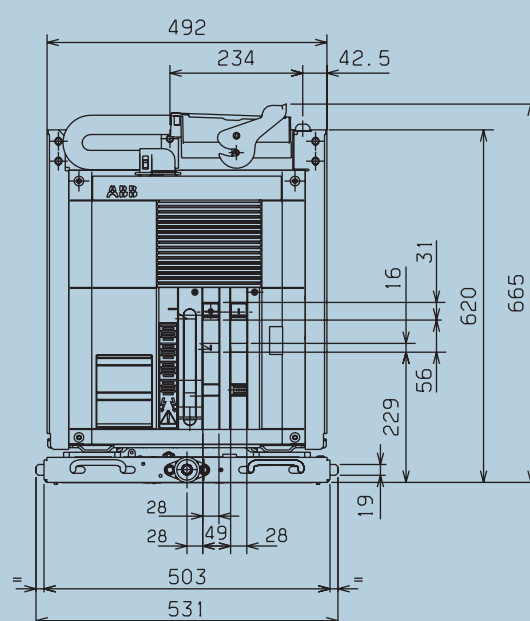
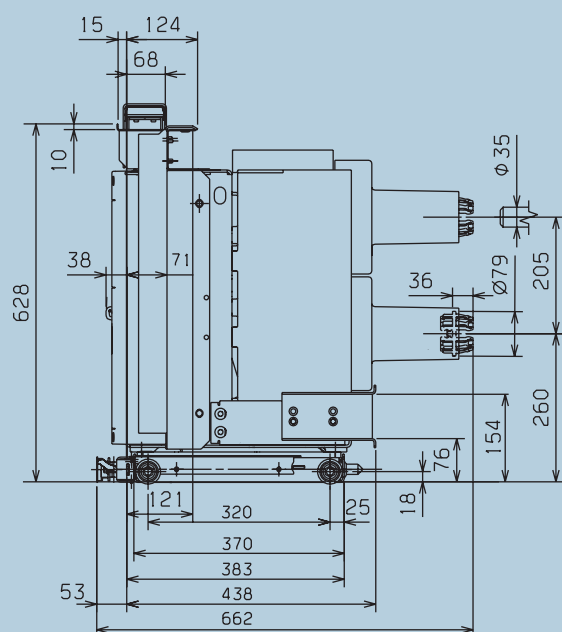
Fixed Vmax circuit-breakers

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 Vmax/L circuit-breakers for UniGear ZS1 type switchgear (width 550 mm)

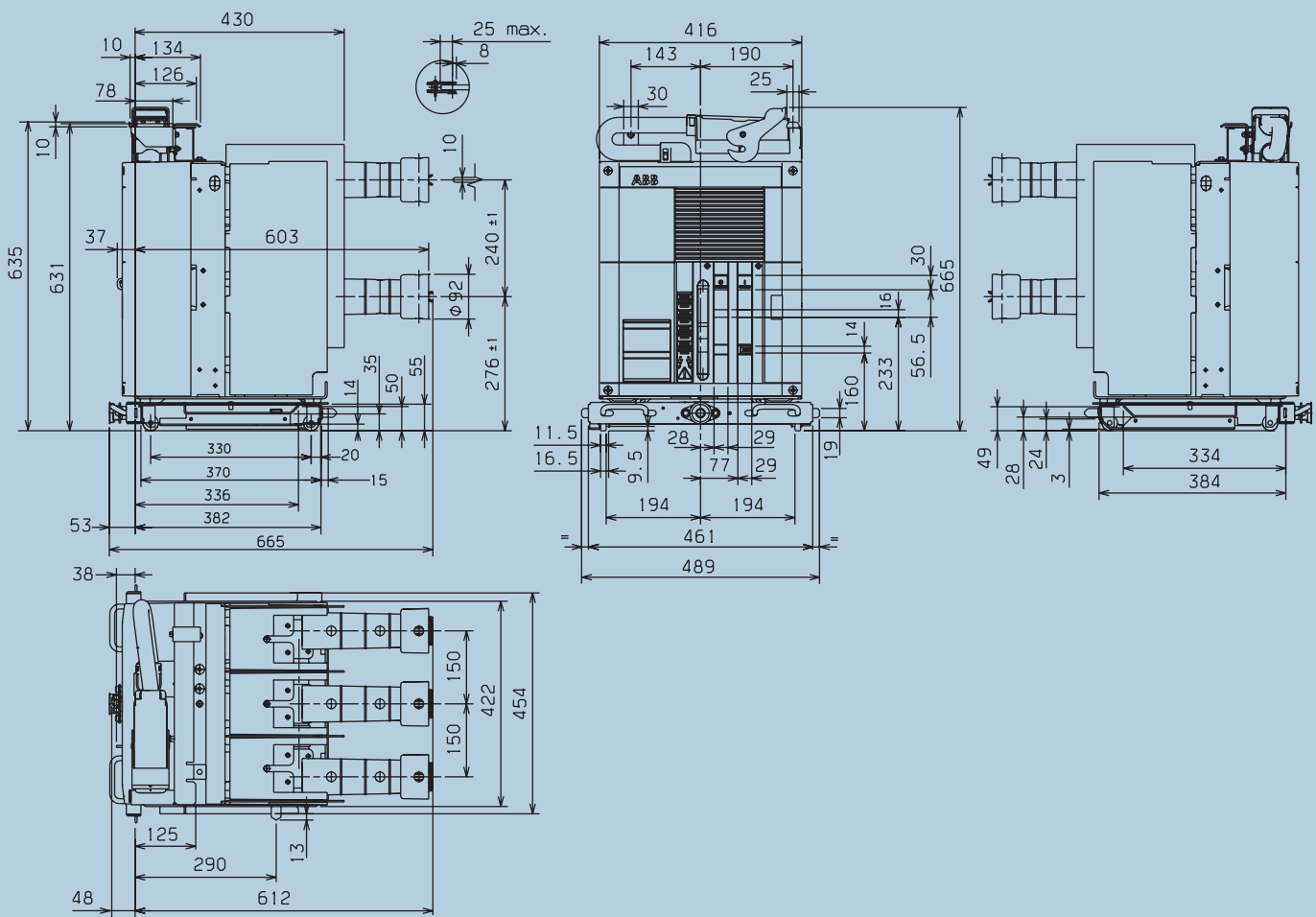
TN	Ur	Ir	Isc
1VCD003334 (E0441)	12 kV	630 A	16 kA
	17.5 kV	1250 A	20 kA
			25 kA
			31.5 kA



OVERALL DIMENSIONS

Vmax/W withdrawable circuit-breakers for PowerBox modules (width 600 mm)

TN	Ur	Ir	Isc
1VCD003280 (E0441)	12 kV	630 A	16 kA
	17.5 kV	1250 A	20 kA
			25 kA
			31.5 kA



ELECTRIC CIRCUIT DIAGRAM

Diagrams of the applications	30
State of operation shown	34
Caption	34
Description of figures	34
Incompatibility	35
Notes	35
Graphic symbols for electrical diagrams	36

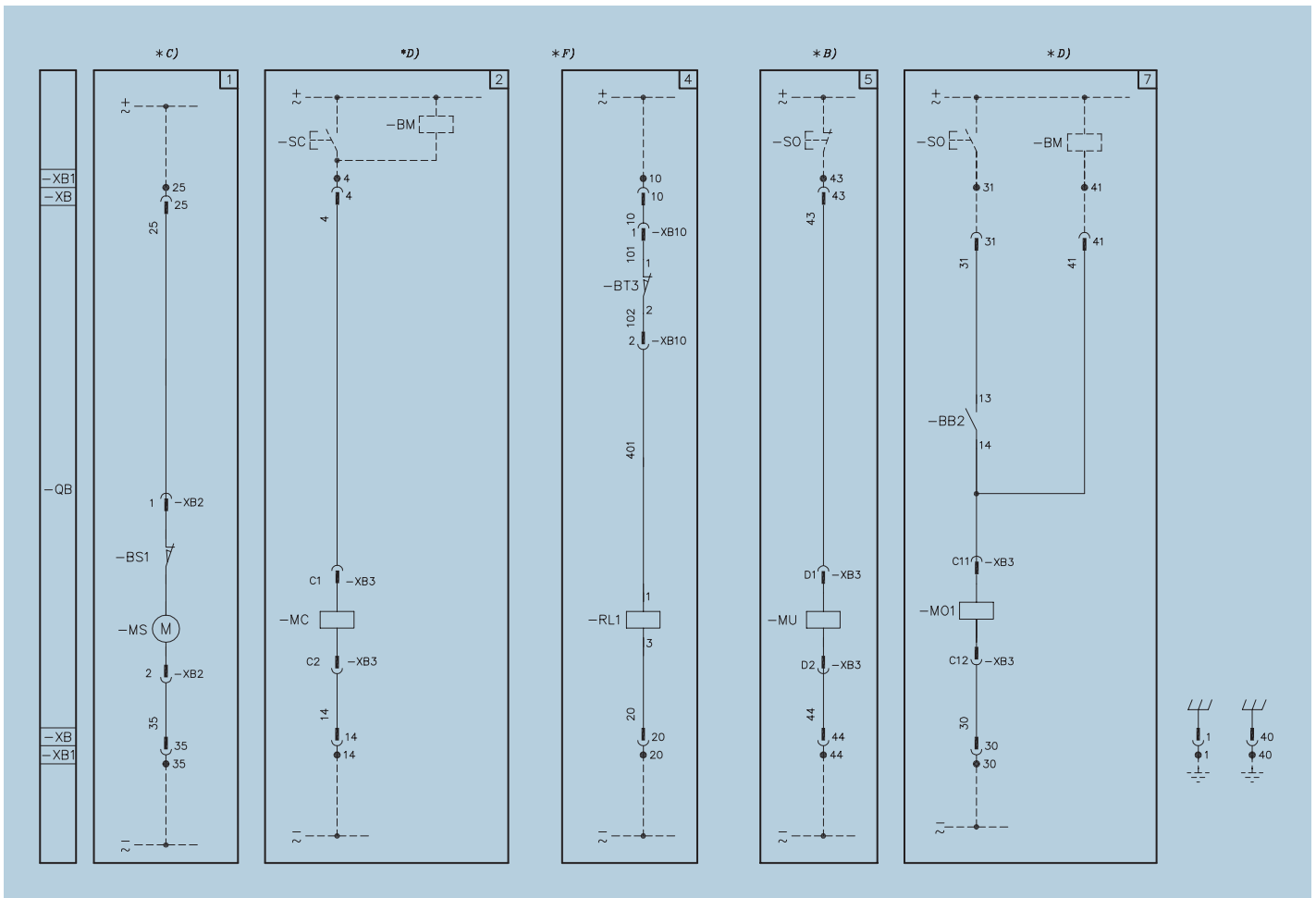
ELECTRIC CIRCUIT DIAGRAM

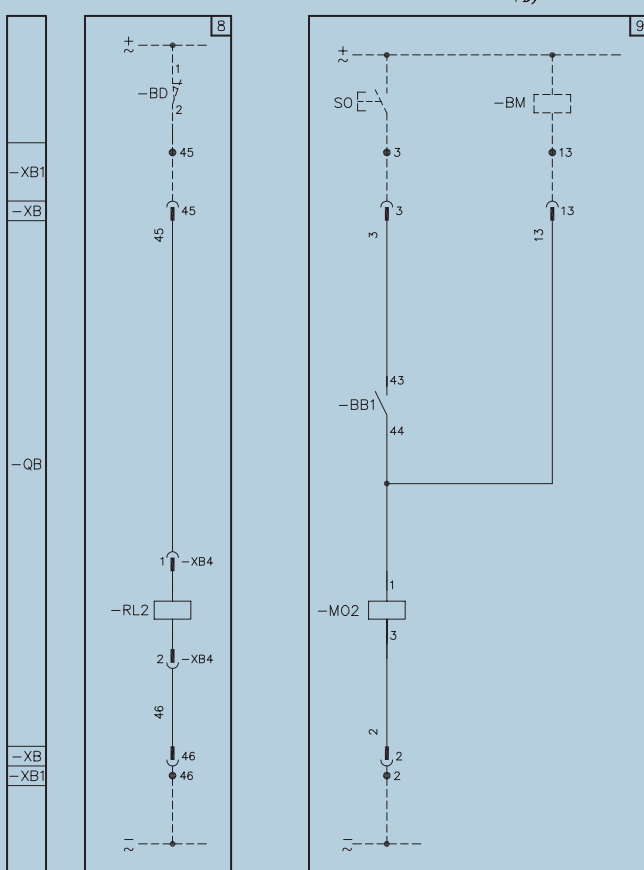
Diagrams of the applications

The following diagram (No. 1VCD400069) represents the withdrawable Vmax circuit-breaker circuits for UniGear switchgear with 550 mm wide compartments, with manual isolation, delivered to the customer by means of the “-XB1” connector.

Diagram No. 1VCD400065 is available for fixed circuit-breakers, whereas diagram No. 1VCD400054 is available for the Vmax/W circuit-breakers for PowerBox modules.

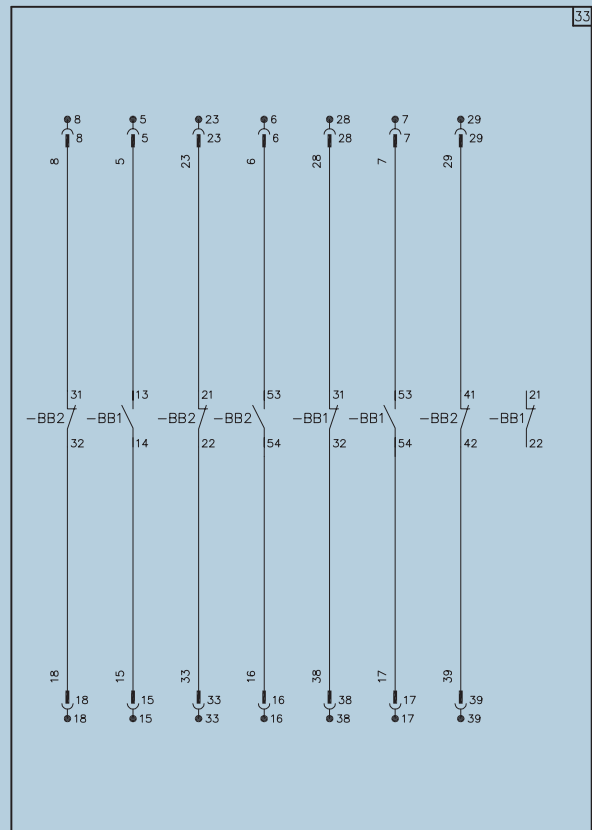
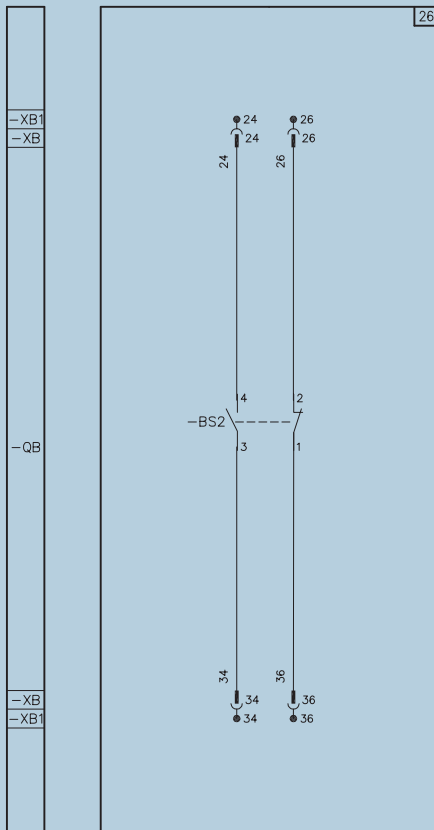
In any case, to take product development into account, it is always useful to refer to the circuit diagram provided with each circuit-breaker.



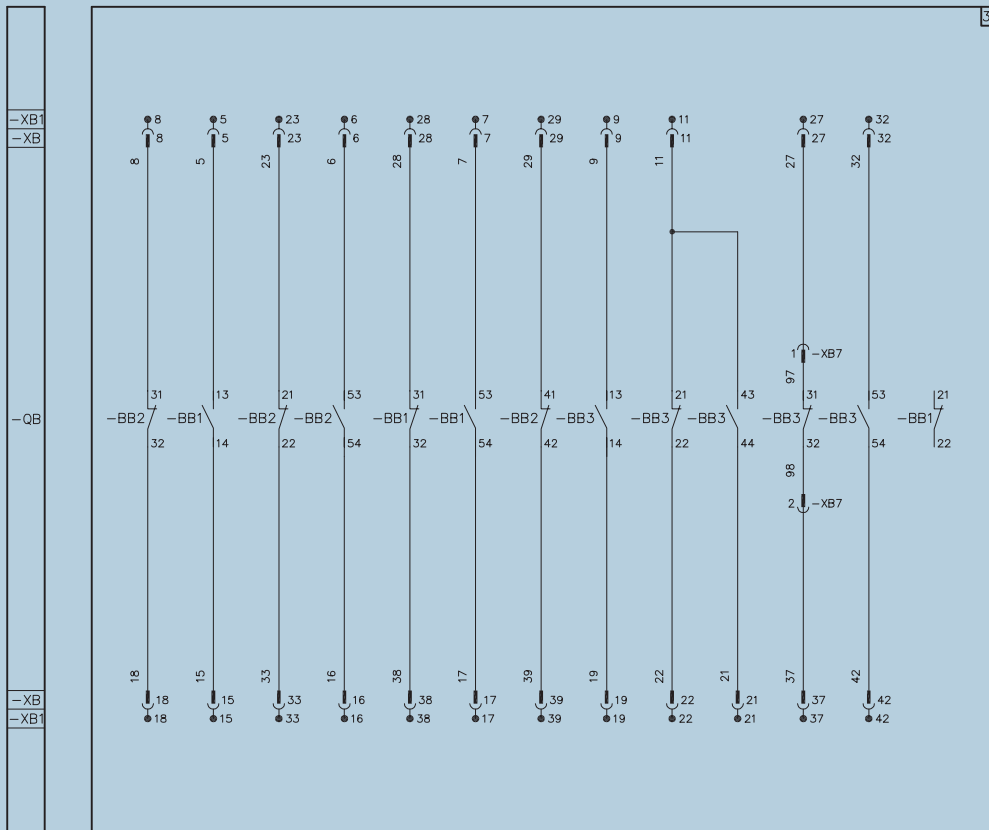


ELECTRIC CIRCUIT DIAGRAM

* E)



* c)



ELECTRIC CIRCUIT DIAGRAM

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
- BM = SOR Test Unit device for controlling continuity of the shunt opening and closing release winding (see note D)
- MS = Closing spring charging motor (see note C)
- BB1..2-3 = Circuit-breaker auxiliary contacts
- BS1 = Spring charging motor limit switch contact
- BS2 = Contact for signalling closing springs charged/discharged (see note E)
- BD = Position contact of the enclosure door
- BT3 = Circuit-breaker position contact, open during the isolation run
- 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. (It is possible to limit its consumption by connecting a delayed pushbutton to enable the operation in series.)
- RL2 = Locking magnet. When de-energised it mechanically prevents circuit-breaker racking-in and isolation. (It is possible to limit its consumption by connecting a delayed pushbutton to enable the operation in series.)
- MC = Shunt closing release (see note C)
- MO1 = Shunt opening release (see note D)
- MO2 = Second shunt opening release (see note D)
- MU = Undervoltage 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. 4 = Locking magnet. When de-energised it mechanically prevents circuit-breaker closing. (If -RL1 is required, provide this figure when fig. 33 or 34 is selected). It is possible to limit its consumption by connecting a delayed pushbutton in series to enable the operation.

- Fig. 5 = Instantaneous undervoltage release (see note B).
- Fig. 7 = First shunt opening release circuit with possibility of continuous control of the winding (see note D).
- Fig. 8 = Locking magnet. When de-energised it mechanically prevents circuit-breaker closing (it is possible to limit its consumption by connecting a delayed pushbutton in series to enable the operation).
- Fig. 9 = Second shunt opening release circuit with possibility of continuous control of the winding (see note D).
- Fig. 26 = Electrical signalling of closing springs charged and discharged.
- Fig. 33-34 = Available circuit-breaker auxiliary contacts.

Incompatibility

The circuits indicated by figures 33-34 cannot be supplied at the same time on the same 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.
- 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 achieved 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 consumption, the springs must be charged manually before energising the auxiliary circuit.
- D) The circuit for controlling continuity of the shunt opening release winding must only be used for this function. It is possible to use the SOR Test Unit to verify continuity of the various releases.
- E) The two signals must have the same power supply voltage.

ELECTRIC CIRCUIT DIAGRAM

Graphical symbols for electrical diagrams (IEC 60617 and CEI 3-14 ... 3-26 Standards)

























	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)



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The data and illustrations are not binding. We reserve the right to make changes in the course of technical development of the product.
1VCP000169 – Rev. C, en – Technical catalogue – 2005.10 (Vmax)