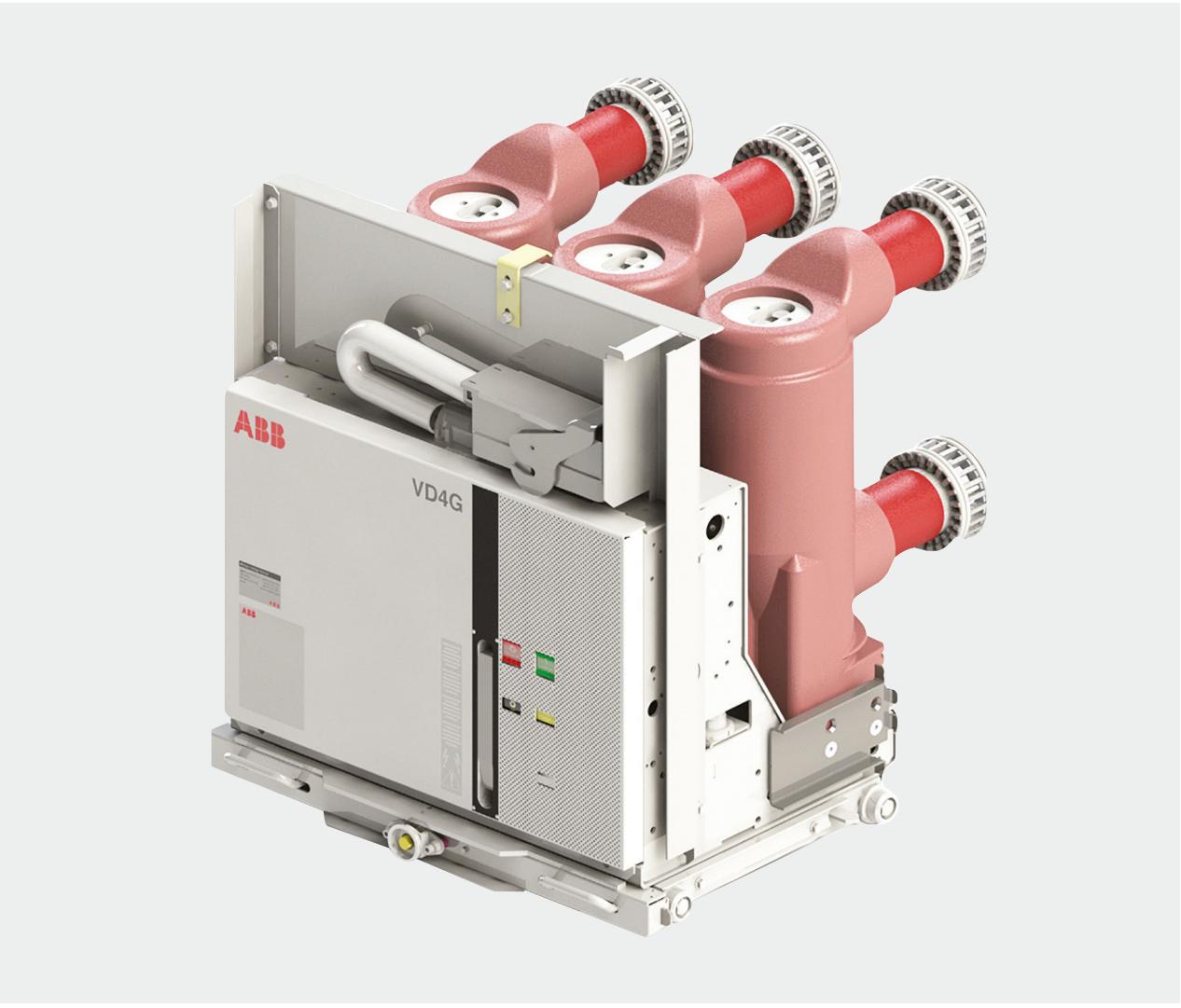
DISTRIBUTION SOLUTIONS

VD4G

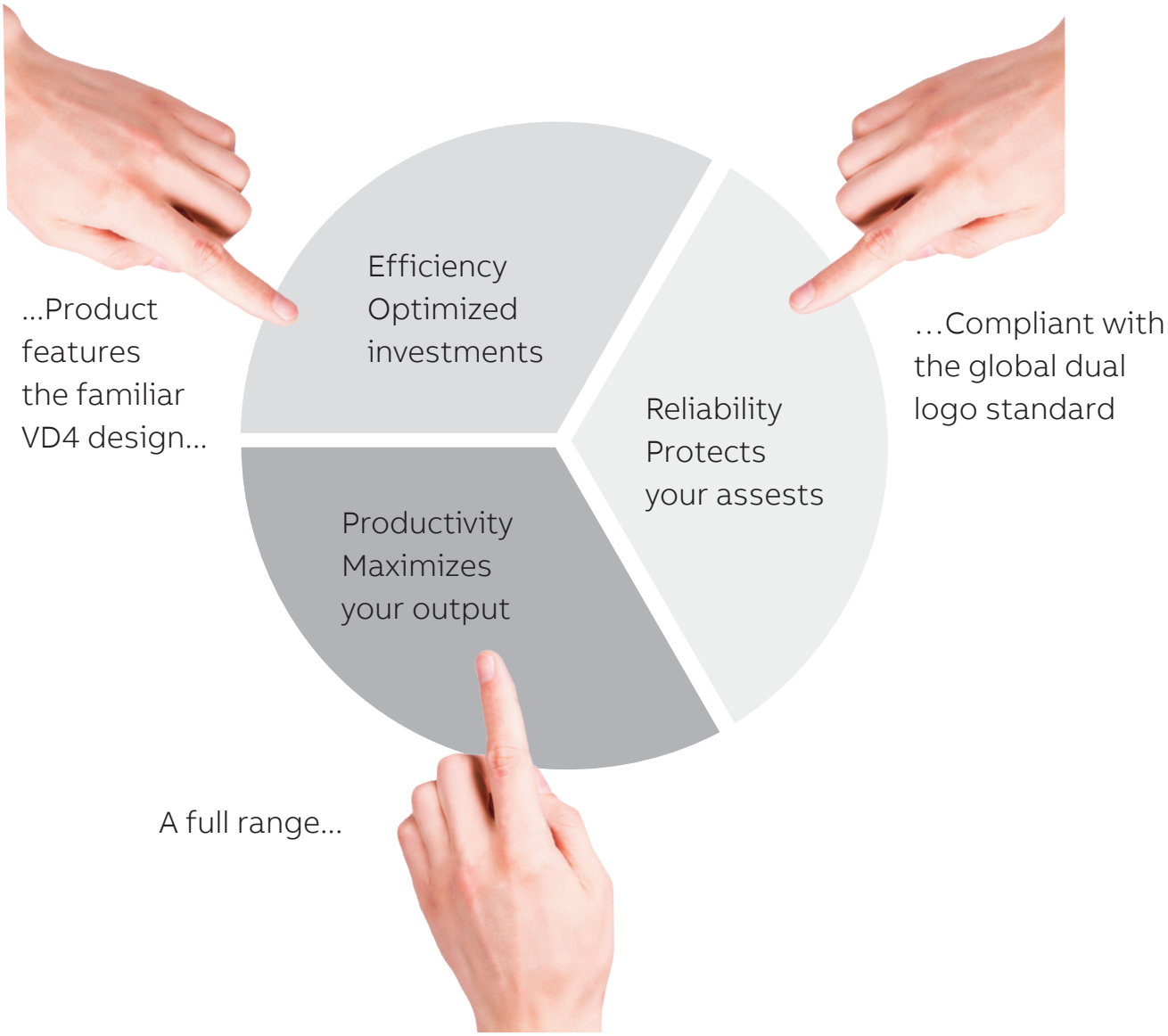
Medium voltage vacuum circuit breakers
15 kV - 1250...3150 A - 25...63 kA

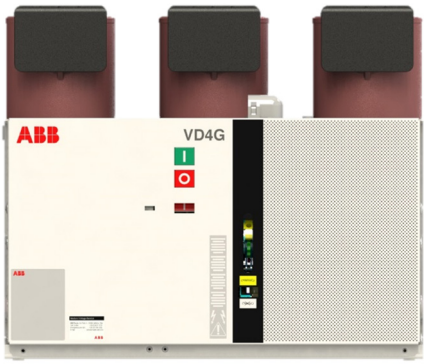


Vacuum circuit breakers for generator switching applications tested to meet the most stringent IEEE and IEC requirements for generator applications as per IEEE C37.013 and the new revision IEC/IEEE 62271-37-013, the only standards for GCB.

Index

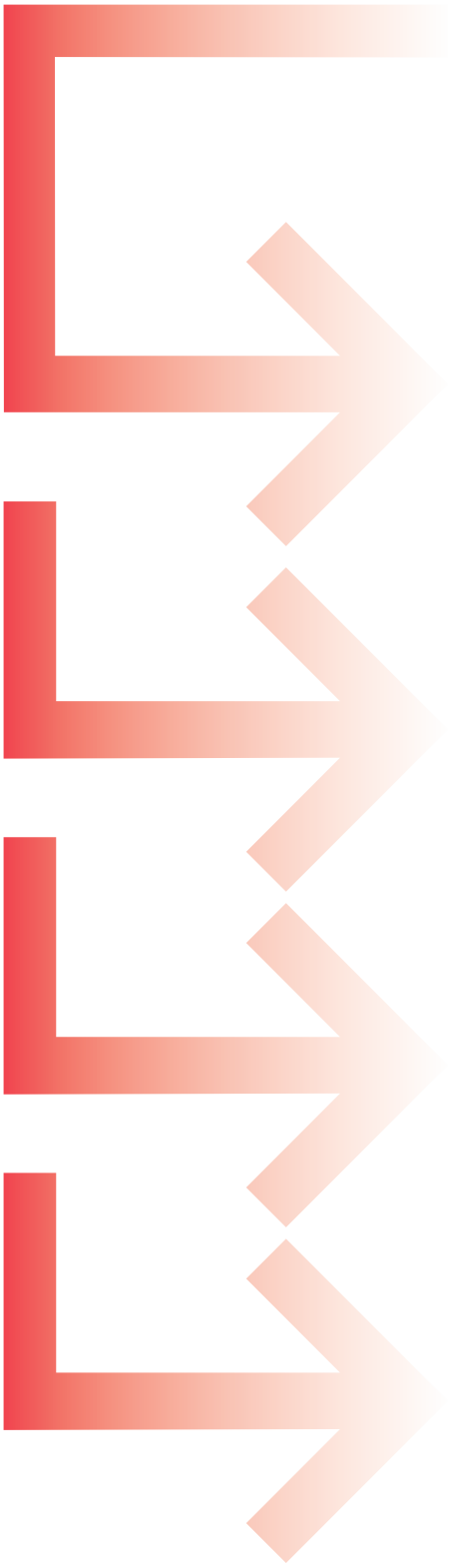
1. ABB strength, Your benefit





VD4G: small footprint, full protection for generator applications

Thanks to the VD4G family you can:

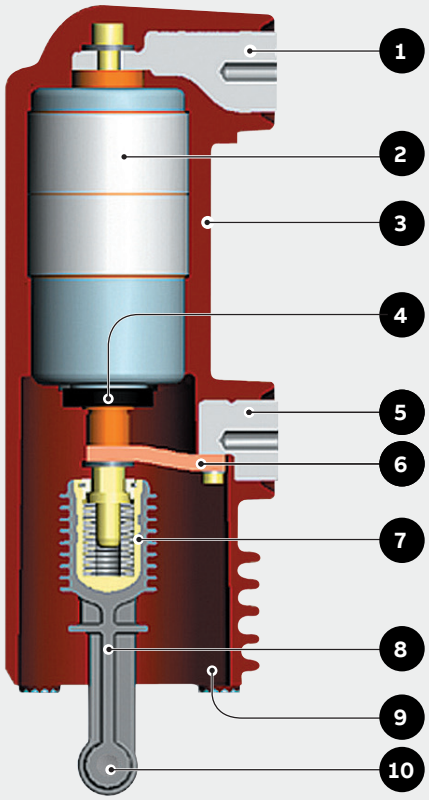


- Suits for installation in standard medium voltage switchgear for the most cost-effective solution due to compact design
- Count on the highest Generator-fed fault breaking capacity at the same System-fed fault breaking capacity level among competitors
- Experience the same familiar ABB medium voltage circuit breakers design
- Take advantage from cassettes and module systems available for OEMs and panel builders to create their own solutions

2. Description

The new VD4G family epitomizes ABB's renowned technology and excellence in designing and constructing vacuum interrupters embedded in poles and circuit breakers.
VD4G medium voltage circuit breakers use vacuum interrupters embedded in the poles. This construction technique makes the circuit breaker poles particularly sturdy and protects the interrupter from impact, dust and humidity. The vacuum interrupter houses the contacts and forms the interrupting chamber.

Vacuum interruption technique
The vacuum circuit breaker does not need a breaking and insulating medium. Thus, the interrupter does not contain ionizable material. The electric arc that generates when the contacts separate is merely formed by the fusion and vaporization of the contact material.
Sustained by the external energy, the electric arc persists until the current is annulled near the natural zero crossing. In that instant, the dielectric properties are very rapidly restored by a sharp reduction in the density of the conveyed charge and rapid condensation of the metallic vapor.



1 Upper terminal
2 Vacuum interrupter
3 Housing/pole
4 Stem of moving contact
5 Lower terminal
6 Flexible connection
7 Tie-rod spring fork
8 Tie-rod
9 Pole fastening
10 Connection to operating mechanism

Vacuum interrupter embedded in the pole

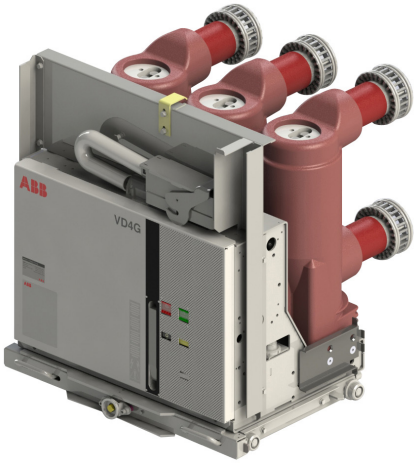
- Vacuum interruption technique
- Vacuum contacts protected against oxidation and contamination
- Vacuum interrupter embedded in the pole
- Interrupter protected against shocks, dust and humidity
- Operation under different climatic conditions
- Limited switching energy
- Stored energy operating mechanism with anti-pumping device supplied as standard equipment
- Simple customization with a complete range of accessories
- Fixed and withdrawable versions
- Compact dimensions
- Sealed-for-life poles
- Sturdy and reliable
- Limited maintenance
- Circuit breaker racked in and out with the door closed
- Incorrect and hazardous operations prevented thanks to special locks in the operating mechanism and truck
- High degree of environmental compatibility

Thus the vacuum interrupter restores the insulating capacity and the ability to sustain the transient recovery voltage, thereby definitively extinguishing the arc.
Since high dielectric strength can be reached in the vacuum even with minimum distances, circuit breaking is also guaranteed when the contacts separate a few milliseconds before natural zero crossing.
The special shape of the contacts and material used, combined with the brief arcing time and low arc voltage guarantee long-lasting contacts with a minimum amount of wear. The vacuum also prevents the contacts from tarnishing and becoming contaminated.

Operating mechanism
Along with short travel and low weight, the low speed of the contacts limits the energy required for operation, thus guaranteeing extremely limited wear in the system.
This ensures that the circuit breaker also requires very little maintenance.

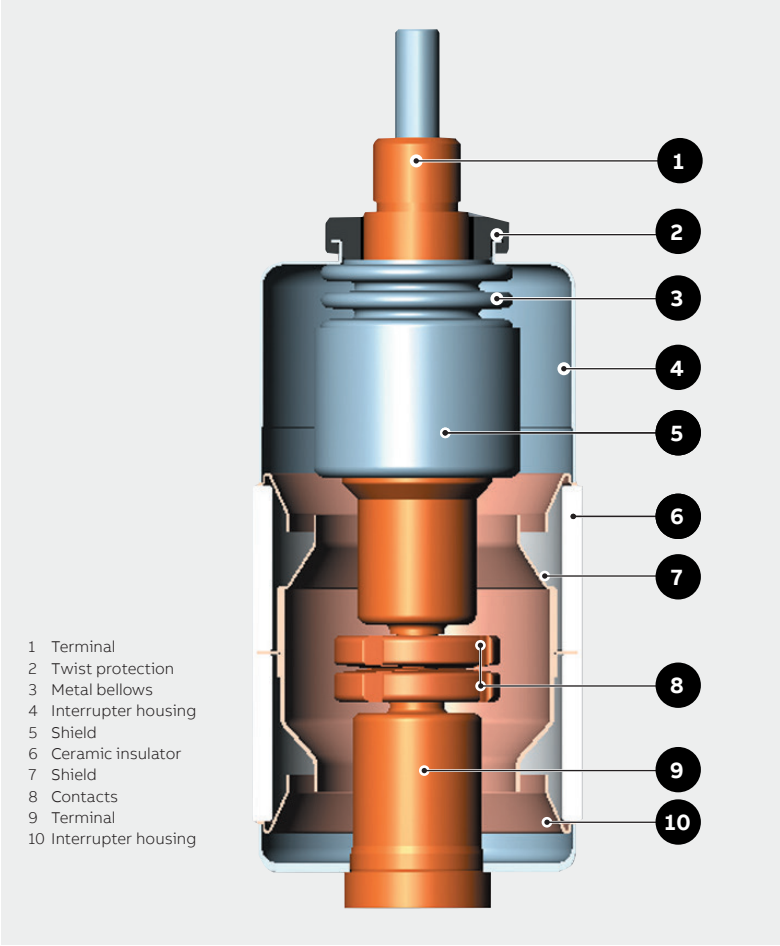
VD4G circuit breakers use a mechanical operating mechanism, with stored energy and free trip. These characteristics allow opening and closing operations to be performed independent of the operator. The simply designed, user-friendly operating mechanism can be customized with a wide range of easily and rapidly installed accessories. Since it is so simple, the apparatus is more reliable.

Structure
The operating mechanism and poles are fixed to a metal frame, which also acts as the support for the fixed version of the circuit breaker. The compact structure is sturdy and ensures mechanical reliability.
Apart from the isolating contacts and cord with plug for connecting the auxiliary circuits, the withdrawable version has a truck for racking it into and out of the switchgear or enclosure with the door closed.



2. Description

Interruption principle of ABB interrupters



Vacuum interrupter

In a vacuum interrupter, an electric arc begins the instant in which the contacts separate. It persists until zero crossing is reached and can be influenced by magnetic fields.

Diffuse or contracted arc in a vacuum
Individual points of fusion form on the surface of the cathode following separation of the contacts. This leads to the formation of metallic vapors that support the arc itself.
The diffuse arcis characterized by expansion over the contact surface itself and by evenly distributed thermal stress.
The electric arc is always the diffuse type at the interrupter's rated current value. The contact is only eroded very slightly and the number of interruptions is very high.
As the value of the interrupted current increases (beyond rated value), the electric arc tends to change from diffuse to contracted owing to the Hall effect.
Starting out from the anode, the arc contracts and tends to concentrate as the current rises. There is a temperature rise on a level with the affected area and the contact is consequently subjected to thermal stress.
To prevent the contacts from overheating and becoming eroded, the arc is made to rotate. By turning, the arc resembles a moving conductor through which current passes.

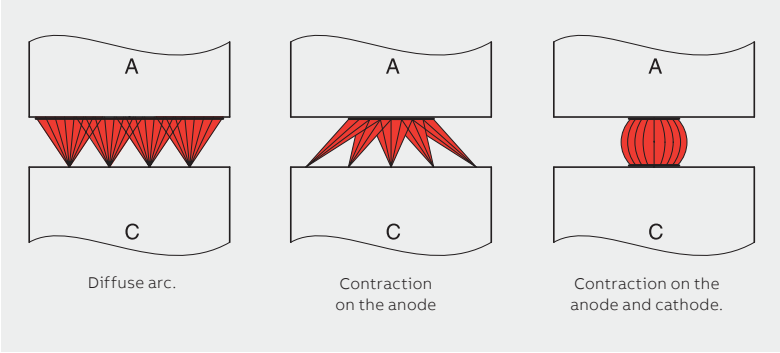
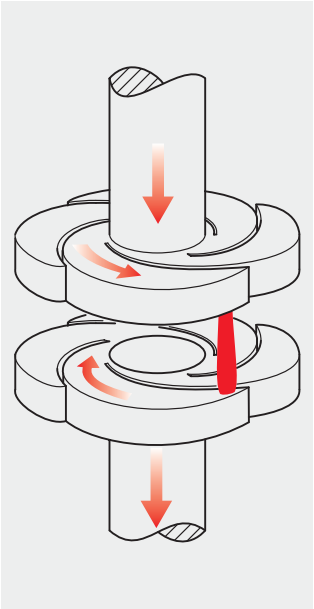
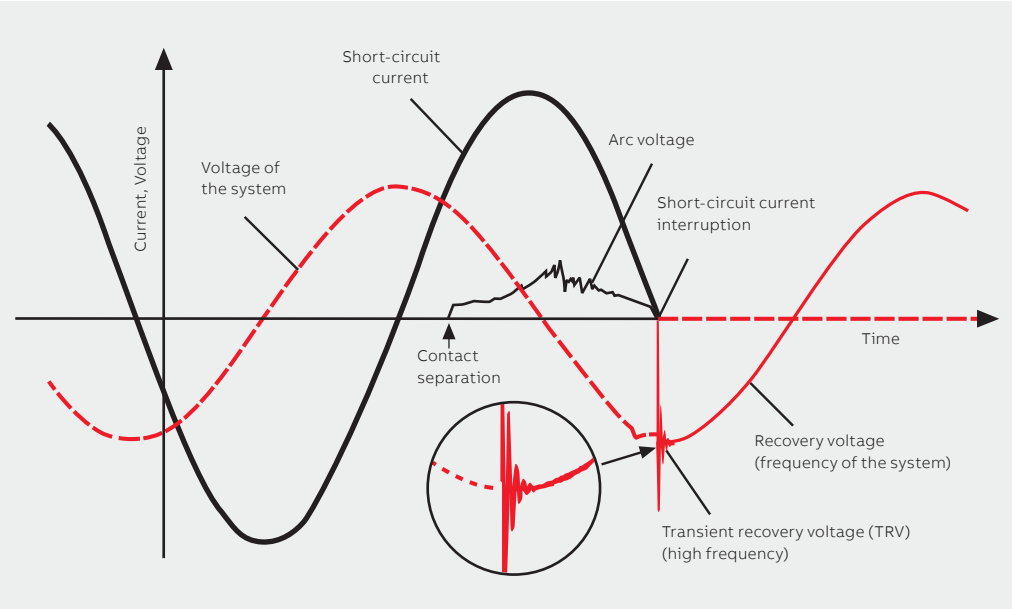


Diagram of transition from diffuse arc to contracted arc in a vacuum interrupter.

The spiral contacts of ABB vacuum interrupters
Thanks to their special shape, spiral contacts generate a radial magnetic field in all areas of the arc column, which concentrates over the contact circumferences.
A self-generated electromagnetic force acts tangentially, causing the arc to rapidly rotate around the contact axis.
The arc is forced to rotate and involve a wider surface than that of a fixed contracted arc.
Besides minimizing thermal stress on the contacts, this makes contact erosion negligible and above all, allows the interruption process to be controlled even with very high short-circuits.
ABB vacuum interrupters interrupt at the natural zero crossing, thereby preventing the arc from restriking after that event.
A rapidly reduced current charge and rapid condensation of the metal vapors at the same time as zero crossing, allows maximum dielectric strength to be restored between the interrupter contacts within microseconds.



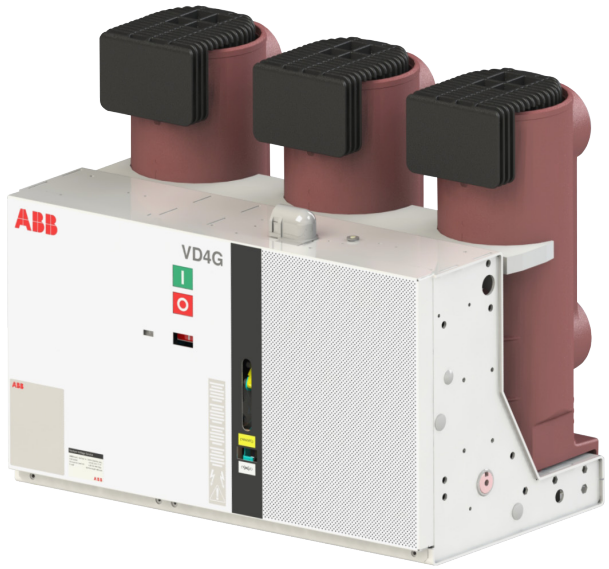
Geometry of radial magnetic field contact with a rotating vacuum arc.



Current and voltage trend evolution in a single phase during vacuum interruption.

2. Description

Vacuum circuit breakers for generator switching applications

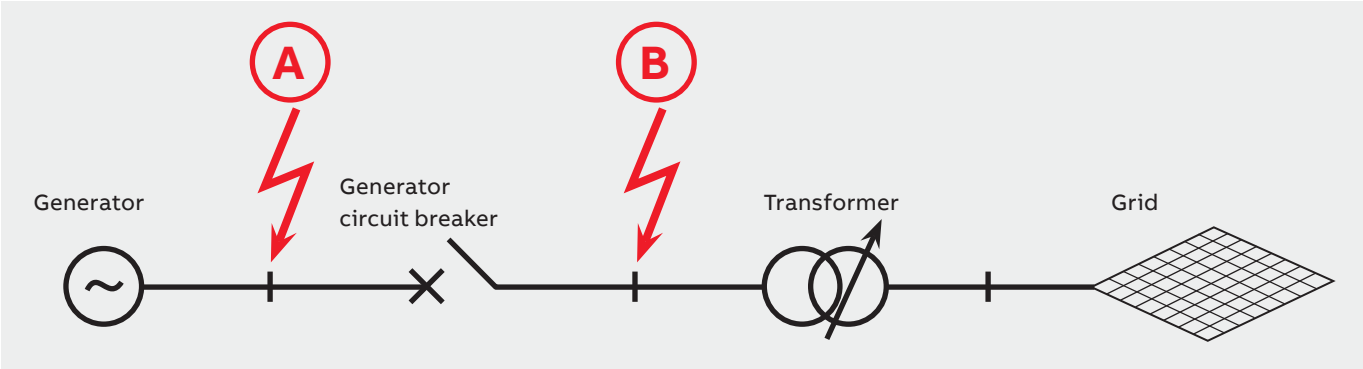


A complete product line compliant with the latest Global Dual Logo IEC/IEEE 62271-37-013 Standard, featuring the familiar VD4 design for easy integration into existing installations.

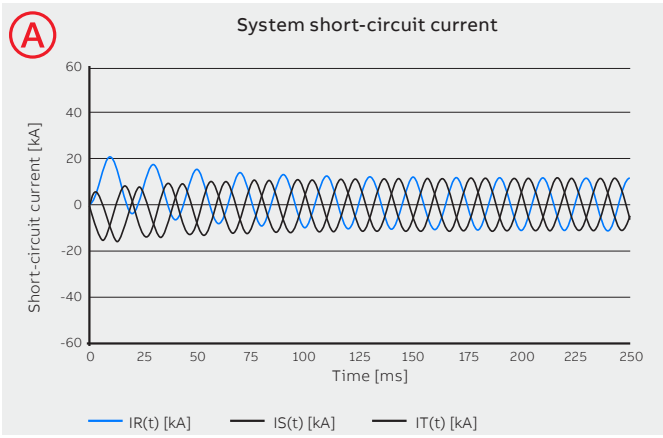
The VD4G breaker family is the first complete product line for generator switching applications developed in accordance with the most recent Dual Logo IEC/IEEE 62271-37-013 Standard.

Generator switching applications

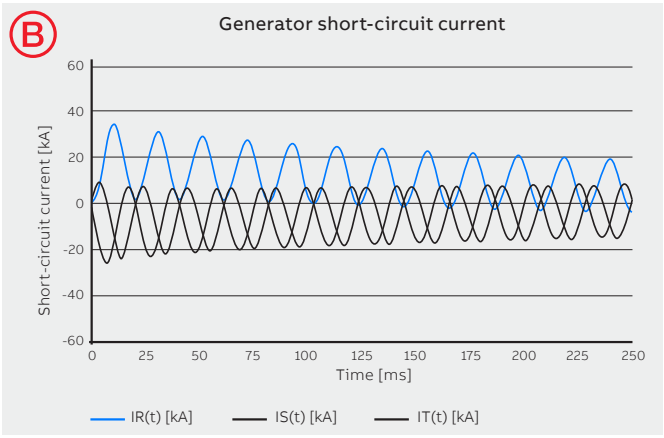
The globally expanding energy demand is increasingly covered by decentralized power plants and small installations using renewable resources. As the generated power is fed into the grid by step-up transformers and MV distribution boards, the VD4G family of vacuum circuit breakers offers a reliable and economical solution for protecting power plant assets.



Typical schematic of generator circuit breaker application



Failure location A: System-fed fault
Fast decaying DC component



Failure location B: Generator-fed fault
Slowly decaying and raised DC component results in delayed current zero.

The need to protect the grid as well as the generator from failures makes generator circuit breakers indispensable. The specific current shapes in this kind of application require dedicated circuit breakers tested for compliance with the specific duty defined by the latest Global Standard for Generator applications.
Each generator plant has specific technical characteristics. It is essential to perform a suitability analysis of the generator circuit breaker application for the purpose of selecting the solution most able to fully meet your needs and ensure plant safety.

Versions available

VD4G circuit breakers are available in fixed and withdrawable versions with front operating mechanism.
The withdrawable version is available for UniGear ZS1, switchgear enclosures.

Fields of application

VD4G circuit breakers are used in power generation systems for generation for the full protection of power generation assets.

Standards

VD4G circuit breakers conform to IEC /IEEE 62271-37-013 Standards.
VD4G circuit breakers undergo the tests indicated below and guarantee the safety and reliability of the apparatus in service in any installation.

- **Type tests:** temperature rise, power frequency insulation withstand voltage, lightning impulse insulation withstand voltage, short-time and peak withstand current, mechanical life, short-circuit current making and breaking capacity.
- **Individual tests:** insulation of the main circuits with voltage at power frequency, auxiliary circuit and operating mechanism insulation, measurement of the main circuit resistance, mechanical and electrical operation.

Service safety

Safe distribution switchgear can be created with VD4G circuit breakers thanks to the complete range of mechanical and electric locks available on request.
The locking devices have been designed to prevent incorrect operations and allow the installations to be inspected whilst guaranteeing maximum operator safety.
The key locks and padlocks enable opening and closing and/or racking in and out operations to be performed.
The closed door racking-out device only 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 racking-in and out operations with the circuit breaker closed.

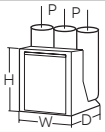
- Complete product line fully compliant with the latest Global Dual Logo IEC/IEEE 62271-37-013 Standards
- Same familiar VD4 design for easy integration into existing installations.
- Highly reliable operating mechanisms thanks to a low number of components manufactured by mass production systems
- Limited and simple maintenance
- Electrical accessories that can be easily and quickly installed or replaced thanks to wiring pre-engineered with plug-socket connectors
- Mechanical anti-pumping device included in standard equipment
- Built-in closing spring loading lever

Accessories

VD4G circuit breakers are available with a full range of accessories to suit 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 circuit breaker. Plug-socket connectors are used for the electrical connections.
Operation and maintenance of the apparatus are simple and require limited use of resources.

3. Selection and ordering
Fixed circuit breakers

Fixed VD4G circuit breakers (15 kV)

Circuit breaker			VD4G-25
Standards		IEC/IEEE 62271-37-013	•
Rated voltage		Ur [kV]	15
Rated insulation voltage		Us [kV]	15
Withstand voltage at 50 Hz	Rated value	Ud (1 min) [kV]	38 (**)
Impulse withstand voltage	Rated value	Up [kV]	95
Rated frequency		fr [Hz]	50-60
Rated current (40 °C)		Ir [A]	1250
Rated breaking capacity (system-source)	Symmetrical short-circuit current	IscSFF [kA]	25
	DC component of breaking capacity	%	75
	Asymmetrical short-circuit current (system-source)	IascSFF [kA]	36.5
Rated breaking capacity (generator-source)	Symmetrical short-circuit current Iscg Class G1	IscGFF [kA]	16
	DC component of breaking capacity Class G1	%	110
	Symmetrical short-circuit current Iscg Class G2	IscGFF [kA]	16
	DC component of breaking capacity Class G2	%	130
Rated breaking current under out-of-phase conditions	Symmetrical short-circuit current	IscOOP [kA]	12.5
	DC component of breaking current	%	75
Making current		Ip [kA]	68.5
Rated operating sequence during short-circuit interruption			CO-10 min-CO
Short-time withstand current (3s)		Ik [kA]	25
Opening time		[ms]	33...60
Closing time		[ms]	30...60
Maximum overall dimensions 		H [mm]	475
		W [mm]	450
		D [mm]	424
		Pole center-distance [mm]	150
Weight		[kg]	73
Standardized dimensions table		TN	1VCD003891
Operating temperature		[°C]	- 5 ... + 40

([1]) 4000 A with forced ventilation
(**) Contact ABB for higher values

Types of fixed circuit breakers available

The circuit breakers can be completed with the optional accessories indicated on the following pages.

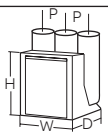
Fixed VD4G circuit breaker (15 kV)						
Ur	**Isc**	**Rated current (40 °C) [A]**				
		H = 475	H = 610	H = 636	H = 636	
		D = 424	D = 456	D = 456	D = 456	
kV	**kA**	P = 150	P = 210	P = 275	P = 275	**Circuit breaker type**
		W = 450	W = 608	W = 758	W = 758	
	25	1250				**VD4G-25 15.12.25 p150**
	40		1250			**VD4G-40 15.12.40 p210**
	40		1600			**VD4G-40 15.16.40 p210**
	40		2000			**VD4G-40 15.20.40 p210**
	40			2000		**VD4G-40 15.20.40 p275**
15	40				3150 (1)	**VD4G-40 15.32.40 p275**
	50		1250			**VD4G-50/25 15.12.50 p210**
	50		1600			**VD4G-50/25 15.16.50 p210**
	50		2000			**VD4G-50/25 15.20.50 p210**
	50				3150 (1)	**VD4G-50 15.32.50 p275**
	63				3150 (1)	**VD4G-63 15.32.63 p275**

H = Height of circuit breaker
D = Depth of circuit breaker
P = Horizontal center distance of pole
W = Width of circuit breaker

VD4G-40				**VD4G-50/25**	**VD4G-50**		**VD4G-63**	
•				•	•		•	
15				15	15		15	
15				15	15		15	
38 (**)				38 (**)	38		38 (**)	
95				95	95		95	
50-60				50-60	50-60		50-60	
≤2000	2000	3150	4000 (1)	≤2000	3150	4000 (1)	3150	4000 (1)
40	40	40	40	50	50	50	63	63
75	75	75	75	75	75	75	75	75
58.5	58.5	58.5	58.5	73	73	73	92	92
25	25	25	25	25	50	50	50	50
110	110	110	110	110	110	110	110	110
25	25	25	25	25	37	37	37	37
130	130	130	130	130	130	130	130	130
20	20	20	20	25	25	25	31.5	31.5
75	75	75	75	75	75	75	75	75
115	115	115	115	144	137	137	173	173
CO-10 min-CO				CO-30 min-CO	CO-30 min-CO		CO-30 min-CO	
40	40	40	40	50	50 (4s)	50 (4s)	63 (2s)	63 (2s)
33...60	33...60	33...60	33...60	33...60	28 ÷ 40	28 ÷ 40	28 ÷ 40	28 ÷ 40
30...60	30...60	30...60	30...60	30...60	≤55	≤55	≤55	≤55
610	610	636	636	610	636	636	636	636
608	758	758	758	608	750	750	750	750
456	456	456	456	456	459	459	459	459
210	275	275	275	210	275	275	275	275
146	158	177	177	147	210	210	210	210
1VCD000240	1VCD000241	1VCD000242	1VCD000242	2RDA038045	1VCD003935	1VCD003935	1VCD003935	1VCD003935
- 5 ... + 40				- 5 ... + 40	- 5 ... + 40		- 5 ... + 40	

3. Selection and ordering
Withdrawable circuit breakers

Withdrawable circuit breakers
for Unigear ZS1 switchgear(*) (15 kV)

Circuit breaker			**VD4G-25**
Standards		IEC/IEEE 62271-37-013	•
Rated voltage		Ur [kV]	15
Rated insulation voltage		Us [kV]	15
Withstand voltage at 50 Hz	Rated value	Ud (1 min) [kV]	38 (**)
Impulse withstand voltage	Rated value	Up [kV]	95
Rated frequency		fr [Hz]	50-60
Rated current (40 °C)		Ir [A]	1250
Rated breaking capacity (system-source)	Symmetrical short-circuit current	IscSFF [kA]	25
	DC component of breaking capacity	%	75
	Asymmetrical short-circuit current (system-source)	IascSFF [kA]	36.5
Rated breaking capacity (generator-source)	Symmetrical short-circuit current Iscg Class G1	IscGFF [kA]	16
	DC component of breaking capacity Class G1	%	110
	Symmetrical short-circuit current Iscg Class G2	IscGFF [kA]	16
	DC component of breaking capacity Class G2	%	130
Rated breaking current under out-of-phase conditions	Symmetrical short-circuit current	IscOOP [kA]	12.5
	DC component of breaking current	%	75
Making current		Ip [kA]	68.5
Rated operating sequence during short-circuit interruption			CO-10 min-CO
Short-time withstand current (3s)		Ik [kA]	25
Opening time		[ms]	33...60
Closing time		[ms]	30...60
Maximum overall dimensions 		H [mm]	627
		W [mm]	503
		D [mm]	662
		Pole center-distance P [mm]	150
Weight		[kg]	116
Standardized dimensions table		TN	1VCD000233
Operating temperature		[°C]	- 5 ... + 40

([1]) 4000 A with forced ventilation
(*) Contact ABB for withdrawable circuit breakers VD4G for PowerCube enclosure
(**) Contact ABB for higher values

Types of withdrawable circuit breakers available for UniGear ZS1 switchgear

The circuit breakers can be completed with the optional accessories indicated on the following pages.

Withdrawable VD4AG circuit breaker (15 kV)						
Ur	**Isc**	**Rated current (40 °C) [A]**				
		H = 627	H = 698	H = 743	H = 735	
kV	**kA**	D = 662	D = 643	D = 643	D = 650	**Circuit breaker type**
		P = 150	P = 210	P = 275	P = 275	
		W = 503	W = 653	W = 853	W = 851	
15	25	1250				**VD4G/P-25 15.12.25 p150**
	40		1250			**VD4G/P-40 15.12.40 p210**
	40		1600			**VD4G/P-40 15.16.40 p210**
	40		2000			**VD4G/P-40 15.20.40 p210**
	40			2000		**VD4G/P-40 15.20.40 p275**
	40				3150(1)	**VD4G/P-40 15.32.40 p275**
	50		1250			**VD4G/P-50/25 15.12.50 p210**
	50		1600			**VD4G/P-50/25 15.16.50 p210**
	50		2000			**VD4G/P-50/25 15.20.50 p210**
	50				3150(1)	**VD4G/P-50 15.32.50 p275**

H = Height of circuit breaker
D = Depth of circuit breaker
P = Horizontal center distance of pole
W = Width of circuit breaker

VD4G-40				**VD4G-50/25**	**VD4G-50**	
•				•	•	
15				15	15	
15				15	15	
38 (**)				38 (**)	38	
95				95	95	
50-60				50-60	50-60	
≤2000	2000	3150	4000 (1)	≤2000	3150	4000 (1)
40	40	40	40	50	50	50
75	75	75	75	75	75	75
58.5	58.5	58.5	58.5	73	73	73
25	25	25	25	25	50	50
110	110	110	110	110	110	110
25	25	25	25	25	37	37
130	130	130	130	130	130	130
20	20	20	20	25	25	25
75	75	75	75	75	75	75
115	115	115	115	144	137	137
CO-10 min-CO				CO-30 min-CO	CO-30 min-CO	
40	40	40	40	50	50	50
33...60	33...60	33...60	33...60	33...60	28 ÷ 40	28 ÷ 40
30...60	30...60	30...60	30...60	30...60	≤55	≤55
698	698	743	743	698	735	735
653	853	853	853	653	851	851
643	643	643	643	643	650	650
210	275	275	275	210	275	275
190	205	221	221	191	270	270
1VCD000234	1VCD000243	1VCD000244	1VCD000244	2RDA03805	1VBM700160	
- 5 ... + 40				- 5 ... + 40	- 5 ... + 40	

3. Selection and ordering
Optional accessories for VD4G up to 50 kA and EL actuator

1 Shunt opening release (-MBO1)
Allows opening command of apparatus to be enabled by remote control.
This release is suitable for both instantaneous and permanent duty. However, an auxiliary contact -BGB1 de-energizes it after circuit breaker has opened. In the case of instantaneous service, the current impulse must last at least 100 ms.
This release can be controlled by the following devices: coil continuity control (CCC), opening circuit supervision (TCS)(*) or the ABB STU functionality control device (see accessory 16, supplied on request).

Characteristics	
Un	24-30-48-60-110...132-220...250 V DC
Un	48-60-110...127-220...250 V AC 50-60 Hz
Operating limits	65 ... 120% Un
Inrush power (Ps)	60...100 W / VA
Continuous power consumption (Pc)	1.5 W
Electronics self-consumption (no coil supplied); value independent of voltage applied	1.5 mA
Opening time	33...60 ms
Insulation voltage	2000 V 50 Hz (for 1 min)

(*) The minimum current that the relay with TCS function (used for monitoring coil continuity) detects as a condition denoting that the trip circuit is operating correctly (specified for each relay in the relative manual), must be sensibly higher than the current consumption of the actual coil (~1.5 mA).
If this fails to occur, always add, in parallel to the TCS, a circuit able to absorb sufficient current to compensate the gap while preventing the total current in the TCS circuit from rising above the maximum threshold (Itcs <10 mA for High Voltage coils - from 110V to 250V, and Itcs <50 mA for Low Voltage coils from 24 V to 60 V).
A simple resistor can be sized for the purpose, depending on the parameters of the TCS and the auxiliary voltage range used.

2 Additional shunt opening release (-MBO2)
Similarly to shunt opening release -MBO1, this allows the opening command of the apparatus to be transmitted by remote control. It can be powered by the same circuit as main shunt opening release -MBO1 or by a circuit that is completely separate from release -MBO1.
This release is suitable for both instantaneous and permanent duty. However, an auxiliary contact -BGB1 de-energizes it after the circuit breaker has opened.
To guarantee the release action, the current impulse must last at least 100 ms.
Continuity functionality can be checked with a continuity control device (CCC), opening circuit supervision (TCS)(*) or the STU functionality control device (see accessory 16, supplied on request).
- -MBO2 has the same electrical and operating characteristics as release -MBO1.

3 Opening solenoid (-MBO3)

The opening solenoid (-MBO3) is a special demagnetization release to be used in conjunction with a self-supplied overcurrent protection relay.
It is situated in the operating mechanism (left-hand side) and is not an alternative to the additional shunt opening release (-MBO2).
It is not available for 40 and 50 kA circuit breakers.
Should this accessory be required, it must be requested at the time of order since subsequent application by the customer is not possible.
Note: the compatible protection relays are listed in document: Data sheet 1VCD600854.
The opening solenoid (-MBO3) is available in two versions:

- For DC (release by discharging energy stored in protection relay against self-supplied overcurrent)
- For AC (release by means of the energy supplied by an adder transformer on the secondaries of the protection current transformers) (CT is at customer's charge)

(*) The minimum current that the relay with TCS function (used for monitoring coil continuity) detects as a condition denoting that the trip circuit is operating correctly (specified for each relay in the relative manual), must be sensibly higher than the current consumption of the actual coil (~1.5 mA).
If this fails to occur, always add, in parallel to the TCS, a circuit able to absorb sufficient current to compensate the gap while preventing the total current in the TCS circuit from rising above the maximum threshold (Itcs < 10 mA for High Voltage coils - from 110V to 250V, and Itcs < 50 mA for Low Voltage coils from 24 V to 60 V).
A simple resistor can be sized for the purpose, depending on the parameters of the TCS and the auxiliary voltage range used.

4 Shunt closing release (-MBC)

Allows closing command of apparatus to be transmitted by remote control.
This release is suitable for both instantaneous and permanent duty. An auxiliary contact that de-energizes it after the circuit breaker has closed is not envisaged.
The permanently supplied release provides the electrical anti-pumping function with both electrical opening and re-closing commands maintained. To guarantee the closing action, the current impulse must last at least 100 ms.
If there is the same supply voltage for shunt closing release -MBC and under-voltage release -MBU and the circuit breaker must close automatically when auxiliary voltage returns, there must be a delay of at least 50 ms between under-voltage release energizing and energizing of the shunt closing release to allow the closing operation to take place. Continuity functionality can be checked with a continuity control device (CCC), opening circuit supervision (TCS)(*) or the STU functionality control device (see accessory 16, supplied on request).

Characteristics	
Un	24-30-48-60-110...132-220...250V DC
Un	48-60-110...127-220...250V AC 50-60Hz
Operating limits	65 ... 120% Un
Inrush power (Ps)	60...100 W/VA
Continuous power consumption (Pc)	1.5 W
Electronics self-consumption (no coil supplied; value independent of voltage applied	1.5 mA
Opening time	33...60 ms
Insulation voltage	2000V 50Hz (for 1 min)

3. Selection and ordering
Optional accessories for VD4G up to 50 kA and EL actuator

5 Auxiliary contacts of the circuit breaker (-BGB1)

Electrical signaling of circuit breaker open/closed can be obtained with a group of 10, 16 or 20 auxiliary contacts for the fixed version and 10 or 16 auxiliary contacts for the withdrawable version. The standard equipment comprises 10 auxiliary contacts.

Note

The following are available using the standard group of ten auxiliary contacts and the maximum number of electrical accessories:

- for fixed circuit breakers: three closing contacts "a" for signaling circuit breaker open and five opening contacts "b" for signaling circuit breaker closed;
- for withdrawable circuit breakers: three closing contacts "a" for signaling circuit breaker open and four opening contacts "b" for signaling circuit breaker closed;
- Fixed circuit breakers are available with two finishing accessories (to be specified when ordering):
  - non-wired auxiliary contacts; wiring to the terminals of the contacts is at the customer's charge (photo below left; the terminal box to which the other electrical accessories are wired is at the top); ask for instructions 1VCD601204 (available in the main languages) which describe how to remove, wire the auxiliary contacts more easily and fit the auxiliary contacts unit back into its housing;
  - auxiliary contacts already wired to the terminal box (see photo at top right)

Consult circuit diagrams 1VCD400151 for fixed circuit breakers and 1VCD400155 for withdrawable circuit breakers.

Note

The main shunt opening release and/or the additional shunt opening release use 1 and/or 2 closing contacts "a", thereby reducing the number of auxiliary contacts available. Always check the maximum number of contacts available if the equipment is non-standard.

The new layouts can be interchanged with the existing ones, with the following exceptions:
- diagram 1VCD400151 (substitutes 1VCD400046 and 1VCD400099)
- fig. 34 on the previous diagrams is represented by fig. 31 + fig. 32 on the new diagram;
- fig. 33 and fig. 35 on the previous diagrams are not available with the new layout
- diagram 1VCD400155 (substitutes 1VCD400047)

Auxiliary contacts –BGB1 conform to the following standards/regulations/directives:
- IEC 62271-100
- IEEE C37.54
- EN 61373 cat.1 class B / impact and vibration test
- Germanish Loyd regulation / vibrations envisaged by the shipping registers
- UL 508
- EN 60947 (DC-21A DC-22A DC-23A AC-21A)
- RoHS Directive

General characteristics	
Insulation voltage to standard VDE 0110, Group C	660 V AC 800 V DC
Rated voltage	24 V ... 660 V
Test voltage	2 kV for 1 min
Maximum rated current	10 A - 50/60 Hz
Breaking capacity	Class 1 (IEC 62271-1)
Number of contacts	5
Groups of contacts	10 / 16 / 20
Contact travel	90°
Actuating force	0.66 Nm
Resistance	<6.5 mΩ
Storage temperature	–30 °C ... +120 °C
Operating temperature	–20 °C ... +70 °C (-30° ref. ANSI 37.09)
Contact overtemperature	10 K
Mechanical life	30.000 mechanical operations
Protection class	IP20
Cable section	1 mm^2

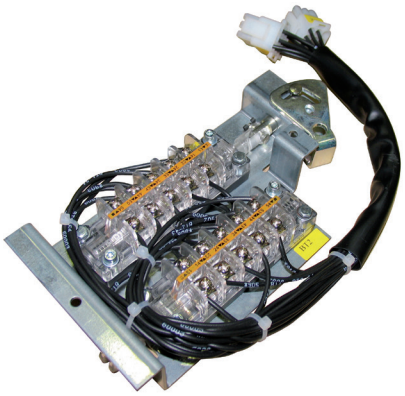
Electrical characteristics (according to IEC 60947)		
Rated current Un		Breaking capacity (10000 interruptions)
220 V AC	Cosφ = 0.70	20 A
220 V DC	Cosφ = 0.45	10 A
24 V DC	1 ms	12 A
	15 ms	9 A
	50 ms	6 A
60 V DC	1 ms	10 A
	15 ms	6 A
	50 ms	4.6 A
110 V DC	1 ms	7 A
	15 ms	4.5 A
	50 ms	3.5 A
220 V DC	1 ms	2 A
	15 ms	1.7 A
	50 ms	1.5 A
250 V DC	1 ms	2 A
	15 ms	1.4 A
	50 ms	1.2 A

Electrical characteristics (according to IEC 62271-100 class 1)	
Rated current Un	Breaking capacity
24 V DC 20 ms	18.8 mA
60 V DC 20 ms	7.4 mA
110 V DC 20 ms	4.2 mA
250 V DC 20 ms	1.8 mA

3. Selection and ordering
Optional accessories for VD4G up to 50 kA and EL actuator

6 Position contact (-BGT3)
This contact is used together with the locking magnet in operating mechanism (-RLE1) to prevent remote closing during racking into the unit.
It is only supplied for withdrawable circuit breakers for UniGear ZS1 switchgear and PowerCube modules.
It cannot be supplied when the transmitted contacts are required in the truck (-BGT1; -BGT2).

7 Transmitted contacts in truck (-BGT1; -BGT2)
Transmitted contacts of withdrawable circuit breaker (installed in circuit breaker truck - only for VD4G/P withdrawable circuit breaker).
These contacts are provided either in addition or as an alternative to the position contacts (for signaling circuit breaker racked out) located in the unit. They also perform the function of position contact (-BGT3).
Contacts -BGT1 and BGT2 have the same general and electrical characteristics as auxiliary contacts.



8 Motor operator (-MAS)

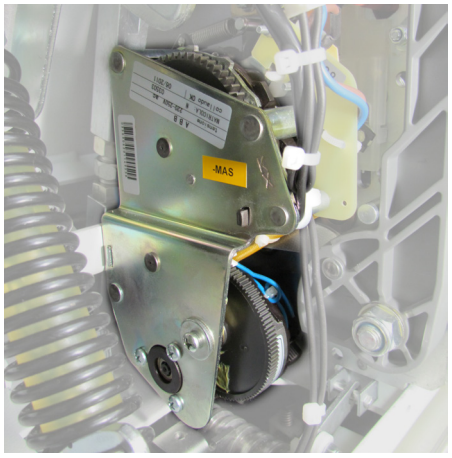
The motor operator automatically loads the closing spring of the circuit breaker operating mechanism. After the circuit breaker has closed, the geared motor immediately reloads the closing springs.
In a power failure or during maintenance work, the closing spring can always be loaded by hand (using the special crank handle built into the operating mechanism).

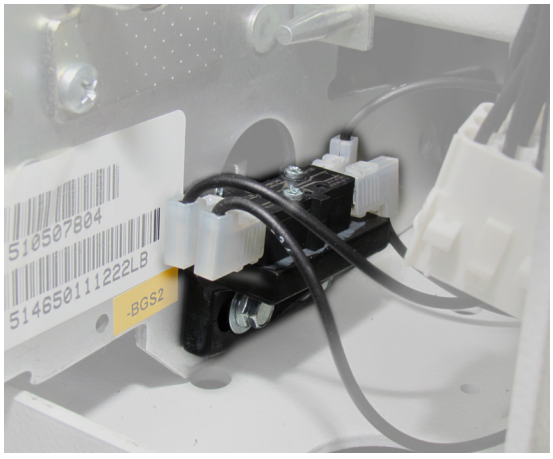
Characteristics		
Un	24...30 - 48...60 - 110...130 - 220...250 V–	
Un	100...130 - 220...250 V~ 50/60 Hz	
Operating limits	85 ... 110% Un	
Power on inrush (Ps)	≤ 40 kA	50 kA
	DC = 600 W; AC = 600 VA	DC = 900 W; AC = 900 VA
Rated power (Pn)	DC = 200 W; AC = 200 VA	DC = 350 W; AC = 350 VA
Loading time	6-7 s	6-7 s
Insulation voltage	2000 V 50 Hz (for 1 min)	2000 V 50 Hz (for 1 min)

9 Contact for signaling closing spring loaded/ discharged (-BGS2)

Consists of a microswitch which remotely signals the state of the closing spring of the circuit breaker operating mechanism.
The following signals can be transmitted:
- contact open: signaling spring loaded
- contact closed: signaling spring discharged

The two signals must be used for circuits with the same power supply voltage.





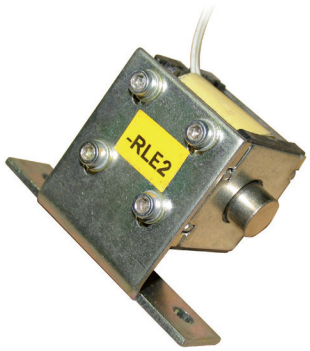
3. Selection and ordering
Optional accessories for VD4G up to 50 kA and EL actuator

10 Locking magnet on operating mechanism (-RLE1)
Only allows activation of the command with the supplied electromagnet.
The locking electromagnet in the operating mechanism has the same electrical characteristics as shunt closing release -MBC.

Protections and locks

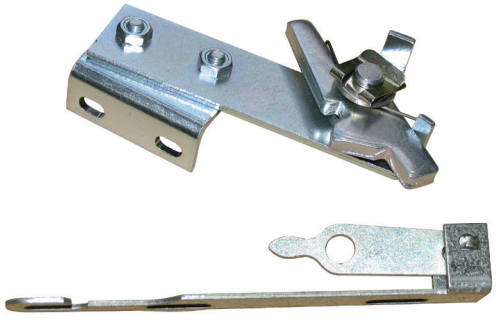
11 Locking magnet on truck (-RLE2)
This accessory is compulsory for withdrawable circuit breakers for UniGear ZS1 switchgear and PowerCube modules. Prevents circuit breaker racking into the switchgear when the auxiliary circuit plug is disconnected.
This plug also acts as an anti-insertion lock when the rated currents differ from each other. Special striker pins prevent the plug from being fitted into the socket if the rated current of the circuit breaker is lower than the rated current of the panel.
This accessory is not available when the motor-operated truck is required.

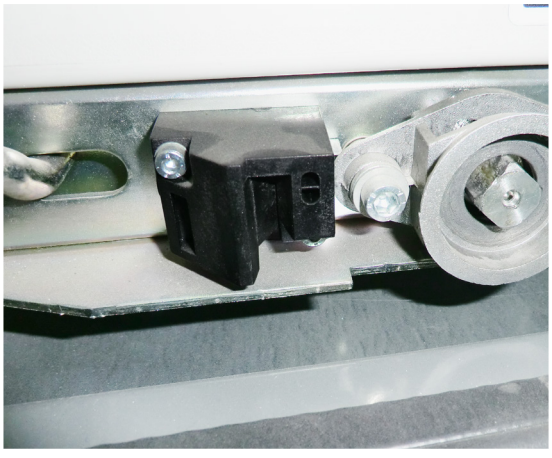
Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 125 - 127 - 132 - 220 - 240 V–
Un	24 - 30 - 48 - 60 - 110 - 125 - 127 - 220 - 230 ... 240 V~ 50/60 Hz
Operating limits	85 ... 110% Un
Nominal power (Pn)	DC 250 W; AC = 250 VA
Continuous power (Pc)	DC = 5 W; AC = 5 VA
Inrush duration	150 ms
Insulation voltage	2000 V 50 Hz (for 1 min)



12 Interlock for fixed circuit breaker
Device for fixed circuit breakers converted into withdrawable ones by the customer. It allows the customer to make a mechanical lock to prevent racking-out/in with the circuit breaker closed, and the circuit breaker from closing as it travels. Note: The device must be requested when ordering since it must be assembled and tested in the factory.

13 Mechanical door interlock
This device prevents circuit breaker racking-in when the switchgear door is open. It is only provided for circuit breakers used in UniGear ZS1 switchgear and PowerCube modules fitted with a special actuator on the door.



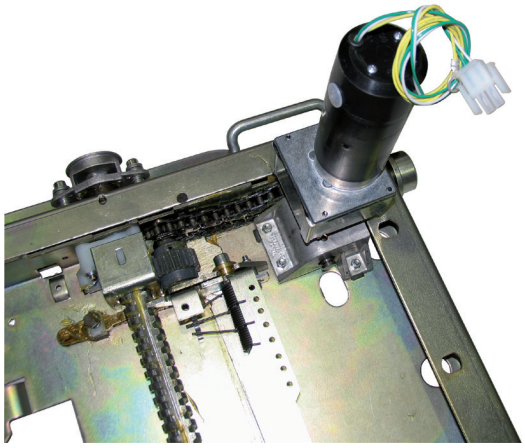


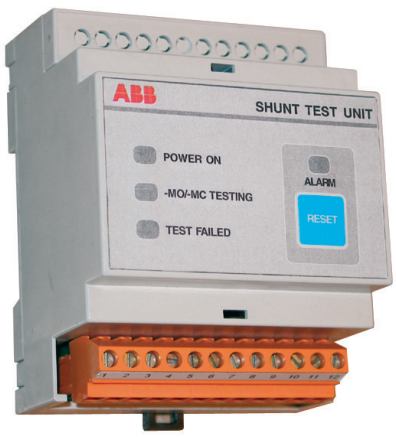
3. Selection and ordering
Optional accessories for VD4G up to 50 kA and EL actuator

14 Motor-operated truck (-MAT)
Allows the circuit breaker to be racked into and out of the switchgear via remote control (only withdrawable circuit breakers for UniGear ZS1 switchgear and PowerCube modules).
The motor version with clutch can be ordered on request and allows racking-in/ out to be performed in an emergency if the truck motor fails to operate.

Characteristics	
Un	24 - 30 - 48 - 60 - 110 - 220 V–
Operating limits	85 ... 110% Un
Rated power (Pn)	40 W

15 STU Shunt Test Unit
Owing to their construction, the functionality of the shunt closing (-MBC) and opening (-MBO1, -MBO2) releases cannot be checked with dedicated relays (e.g. TCS Test Control Supervision, CCC Control Coil Continuity) or with the REF control and protection unit. The only device able to check this functionality is the STU Shunt Test Unit. Please contact us if you want to check this functionality using devices other than STU.
This device can be used in conjunction with shunt opening release (-MBO1; -MBO2) or shunt closing release (-MBC) for the purpose of checking functionality and continuity.
The Shunt Test Unit is used to check the continuity of releases with rated operating voltage between 24 V and 250 V (AC and DC), as well as the functionality of the electronic circuit of the release.
Continuity is checked cyclically with an interval of 20 seconds between one test and the next.
LEDs on the front provide optical signals. The following information is given:
- POWER ON: power supply present
- (-MBO) TESTING: test in progress
- TEST FAILED: signal given if a test fails or in the absence of auxiliary power supply
- ALARM: signal given after three failed tests.





Two relays and a changeover contact are also available on the unit for remote signaling of the following two events:

- test failure (resetting occurs automatically when the alarm stops)
- failure of three tests (resetting can only be performed by means of the manual - RESET – button from the front of the unit).

Characteristics	
Un	24 ... 250 V AC/DC
Maximum interrupted current	6 A
Maximum interrupted voltage	250 V AC

16 Undervoltage release

According to Dual Logo standard, the requirement stated in IEC 62271-1, subclause 5.8.4, is not applicable. In case under-voltage release is needed, please contact ABB confirming the awareness of this prescription.

4. Specific product characteristics

Environmental protection program

VD4 circuit breakers are manufactured in accordance with ISO 14000 Standards (Guidelines for environmental management).
The manufacturing processes take place in compliance with the environmental protection standards as to reduced energy consumption, use of raw materials and the production of waste. Production complies with the environmental management system implemented in the medium voltage apparatus manufacturing facility.
Assessment of the environmental impact of every stage in a product's life cycle is a method used by ABB to develop environmentally compatible components and systems. This goal is pursued by minimizing energy consumption and the overall use of raw materials. A policy that begins when the products are designed by targeted selection of materials, processes and packing.
This means that components can be reused and materials recycled when a product has reached the end of its useful life.

Optional accessories for VD4G-50 and VD4G-63 (Classic actuator)

Designation	Item No.	Rated supply voltage
Auxiliary switch (with clamp-type terminal)	-BGS1 -BGB1 -BGB2 -EGB3	
Auxiliary switch on locking magnet	-BGL1	
Auxiliary switch for fault signaling	-BGB4	
1st shunt release OFF	-MBO1	24 V ··· 240 V DC
2nd shunt release OFF	-MBO2	110 V ··· 240 V AC
Shunt release ON	-MBC	24 V ··· 240 V DC
Locking magnet	-RLE1	110 V ··· 240 V AC
Undervoltage release with spring mechanism	-MBU	24 V ··· 240 V DC
Delayed undervoltage release with spring mechanism	-MBU	see RNSU for supply voltage
Indirect overcurrent release with intermediate current transformer and spring mechanism	-MBO3	
Intermediate current transformer for indirect overcurrent release		
Magnet holder, complete (with integrated rectifiers -TB4, -TB1, -TB3, -TB2)		
Series rectifier	-TB6/-TB7	
Loading motor (with gearing)	-MAS	24 V ··· 240 V DC 110 V ··· 240 V AC
Push-on sleeve 4.8-2.5 for push-on blade 0.8 thick (for additional external connections)		

Spare parts for VD4G up to 50 kA and EL actuator

- Shunt opening release
- Additional shunt opening release
- Shunt closing release
- Geared motor for spring loading with electrical signaling of spring loaded
- Contact for signaling geared motor protection circuit breaker open/closed
- Contact for signaling closing spring loaded/ discharged
- Transient contact with momentary closing during circuit breaker opening
- Circuit breaker auxiliary contacts
- Locking electromagnet on operating mechanism
- Position contact of withdrawable truck
- Contacts for signaling connected/isolated
- Opening solenoid
- Isolating door interlock
- Locking electromagnet on withdrawable truck
- Set of six isolating contacts.

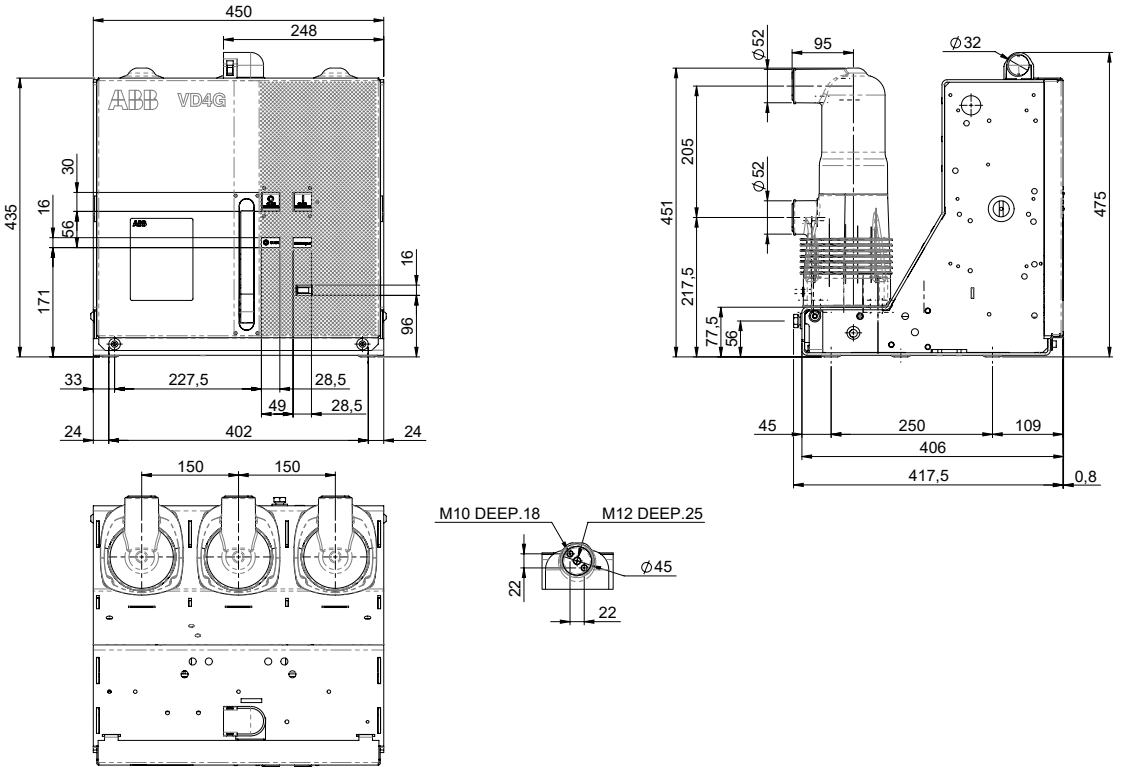
Ordering

Please contact our Service department and specify the circuit breaker serial number to order spare parts and check availability.

5. Overall dimensions

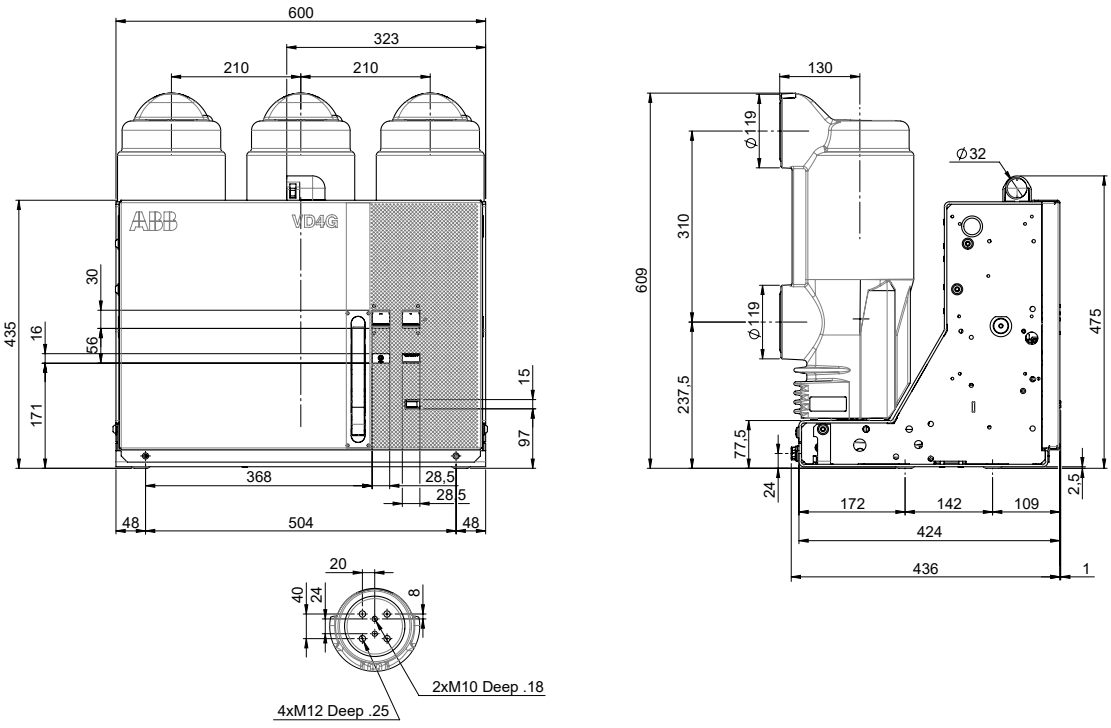
Fixed circuit breakers

VD4G-25		
TN	1VCD003891	
Ur	15	kV
Ir	1250	A
Isc	31.5	kA



Fixed circuit breakers

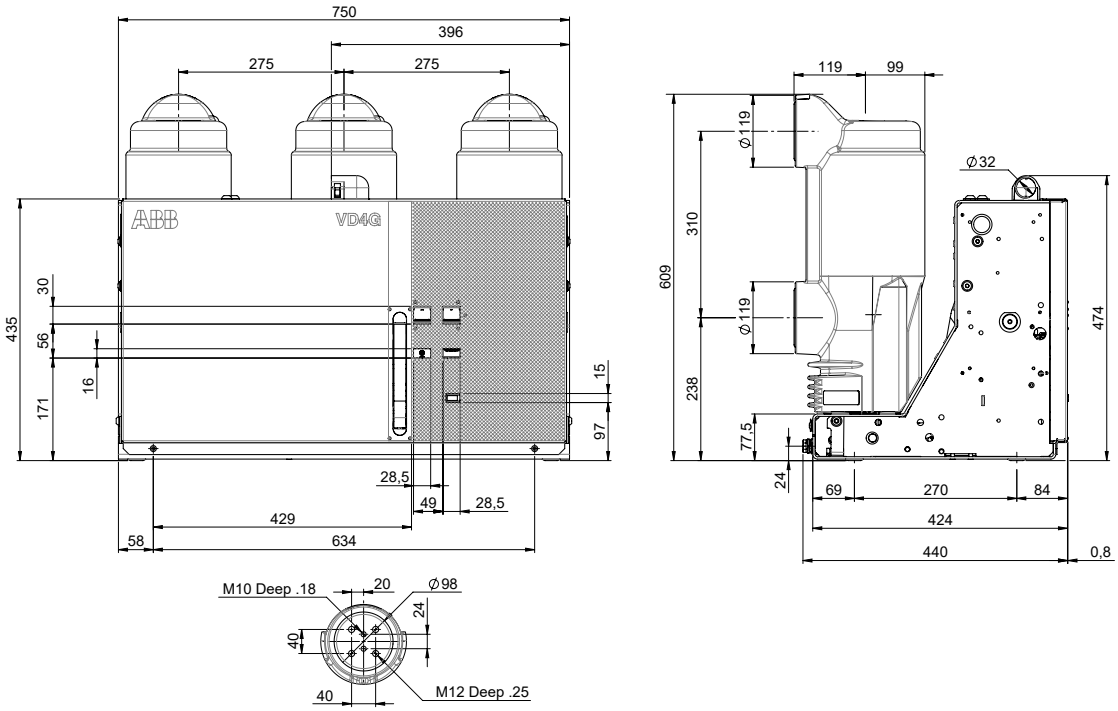
VD4G		
TN	1VCD000240	
Ur	15	kV
Ir	...2000	A
IscSFF	40	kA
IscGFF	25	(G2)
IscOOP	20	kA



5. Overall dimensions

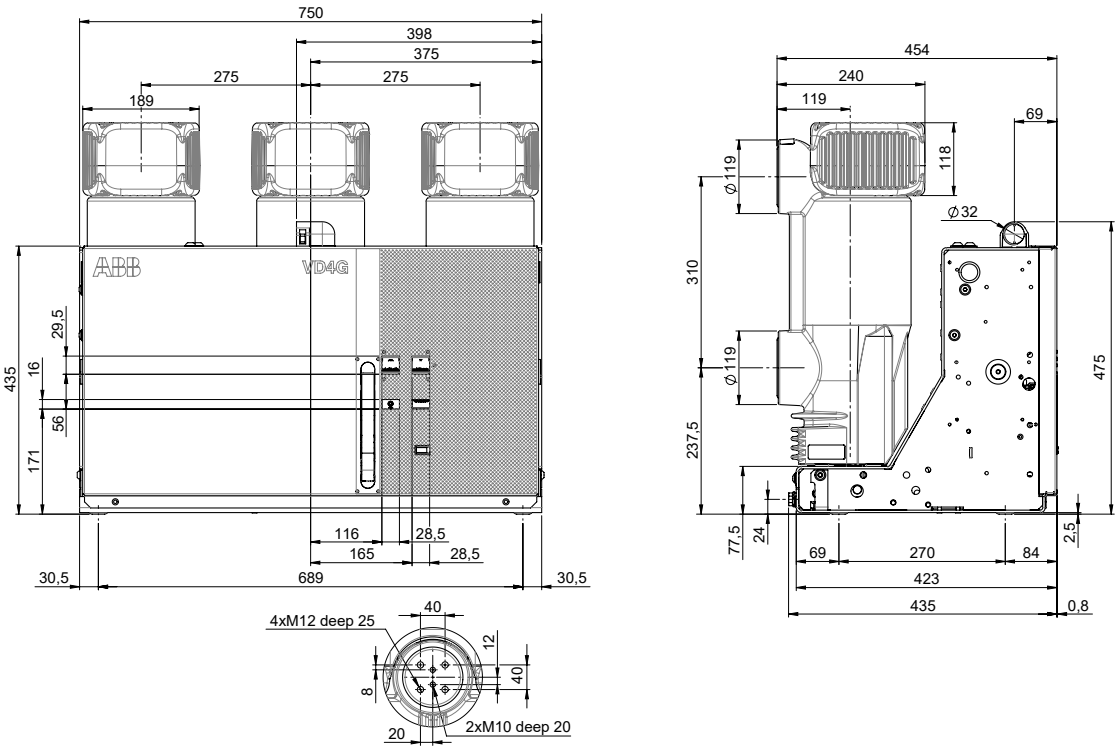
Fixed circuit breakers

VD4G		
TN	1VCD000241	
Ur	15	kV
Ir	2000	A
IscSFF	40	kA
IscGFF	25	(G2)
IscOOP	20	kA



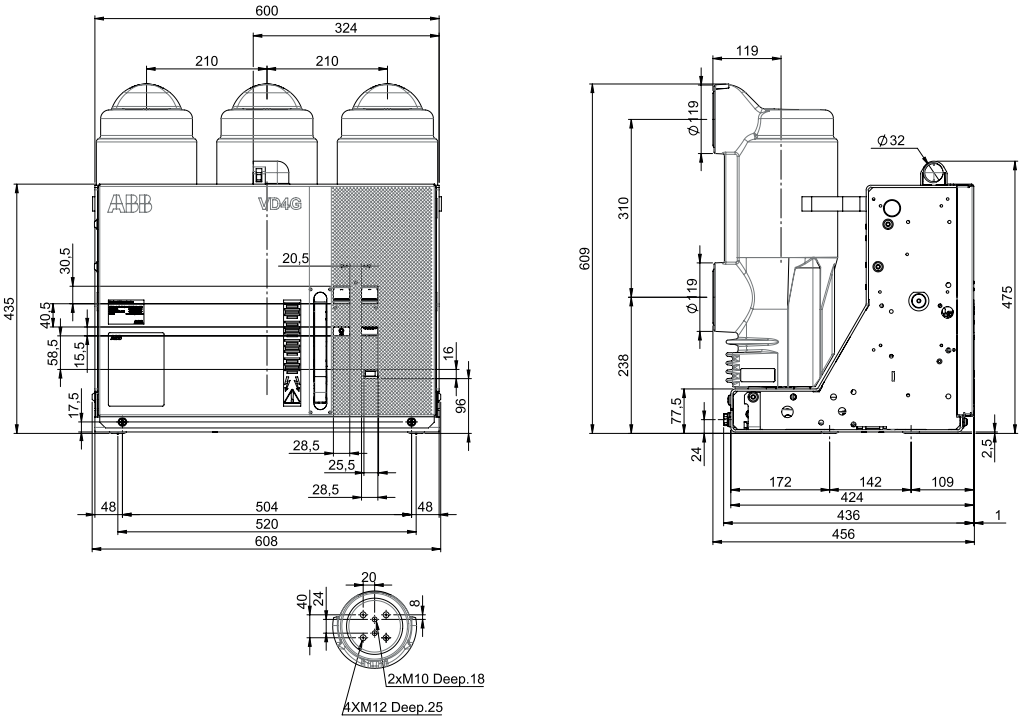
Fixed circuit breakers

VD4G		
TN	1VCD000242	
Ur	15	kV
Ir	3150	A
IscSFF	40	kA
IscGFF	25	(G2)
IscOOP	20	kA



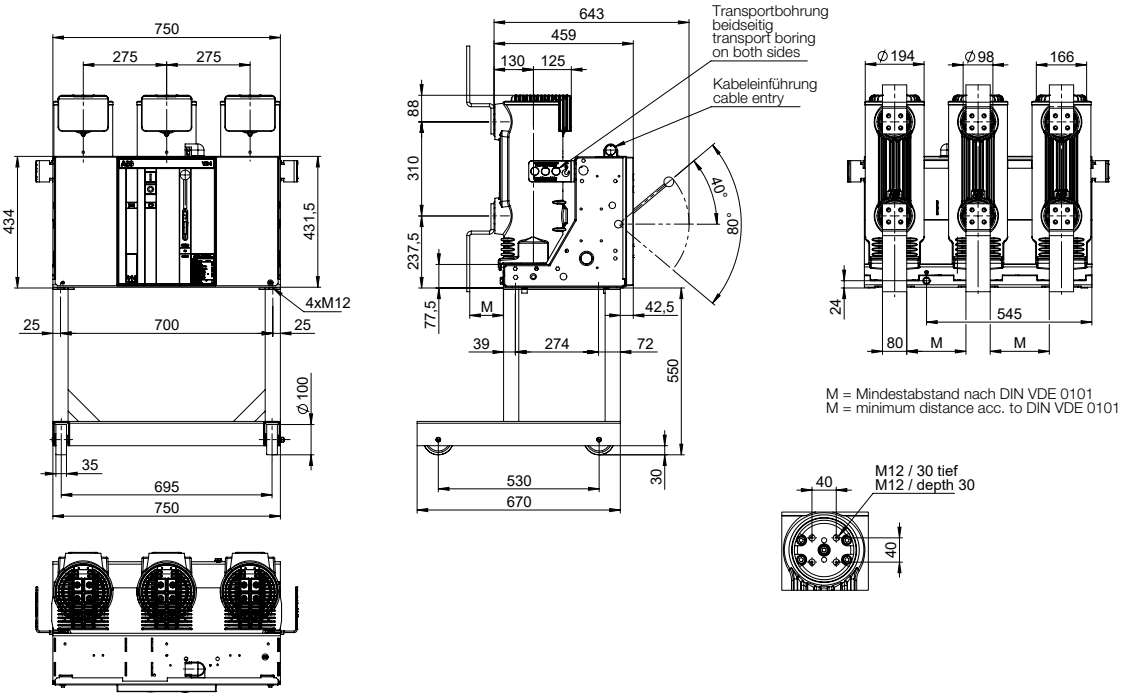
Fixed circuit breakers

VD4G-50/25		
TN	2RDA038045	
Ur	15	kV
Ir	1250	A
	2000	A
Isc	50	kA
	25	kA
	25	kA



Fixed circuit breakers

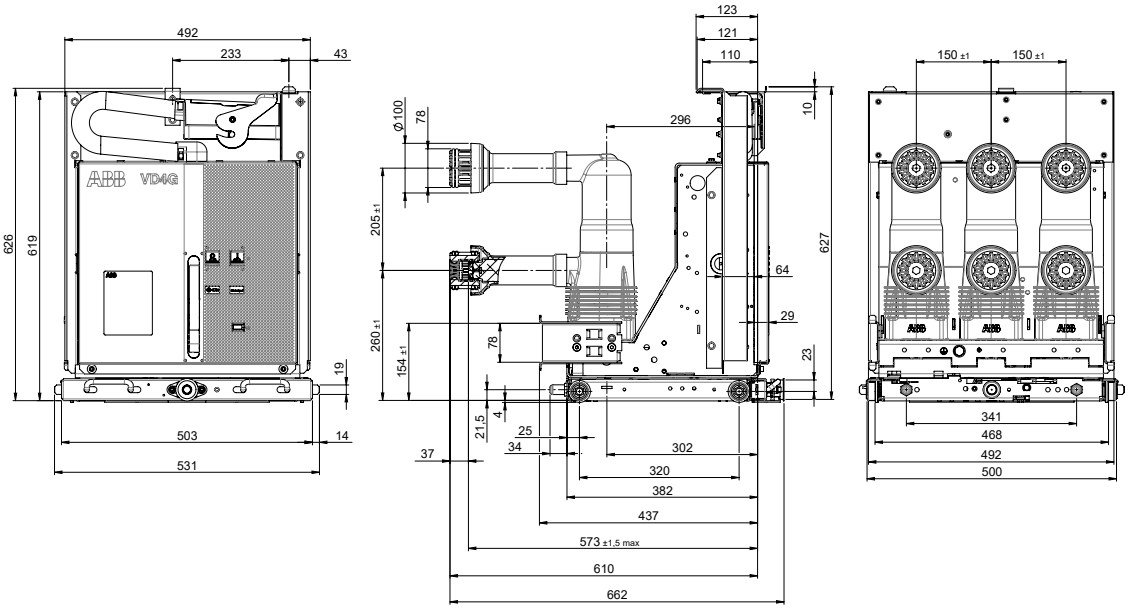
VD4G		
TN	1VCD003935	
Ur	15	kV
Ir	3150	A
IscSFF	50-63	kA
IscGFF	50/37	(G2)
IscOOP	25	kA



5. Overall dimensions

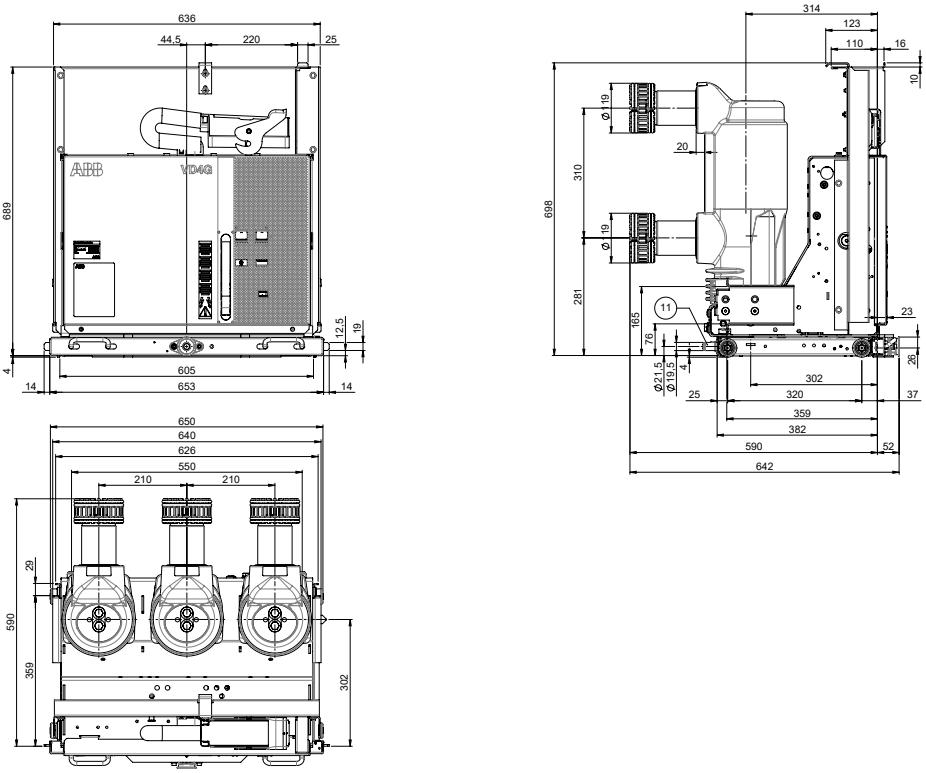
Withdrawable circuit breakers

VD4G		
TN	1VCD000233	
Ur	15	kV
Ir	1250	A
IscSFF	25	kA
IscGFF	16	(G2)
IscOOP	12.5	kA



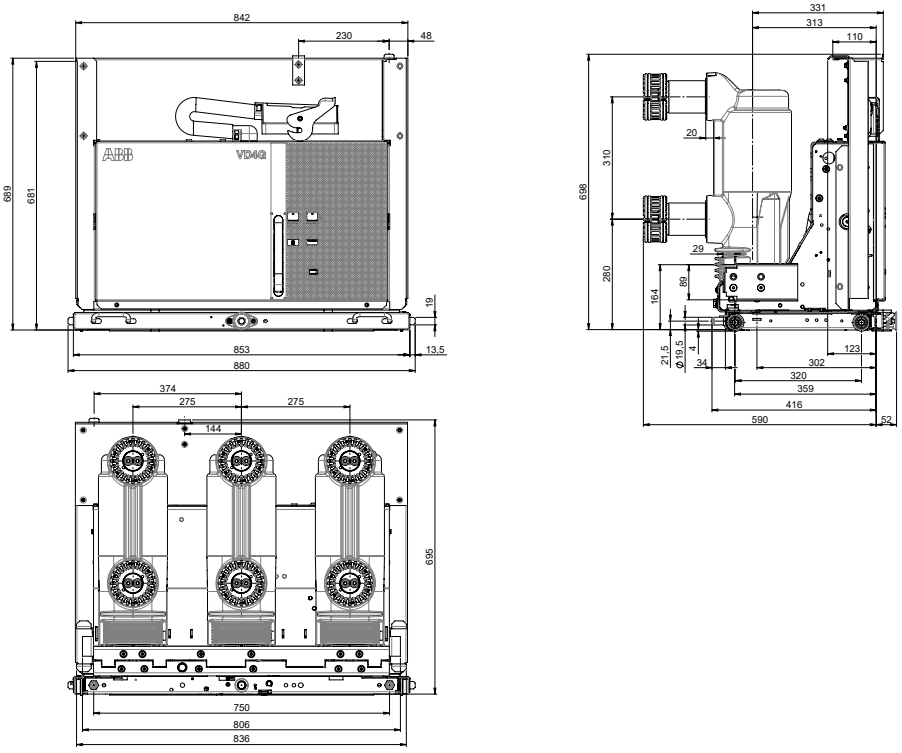
Withdrawable circuit breakers

VD4G		
TN	1VCD000234	
Ur	15	kV
Ir	...2000	A
IscSFF	40	kA
IscGFF	25	(G2)
IscOOP	20	kA



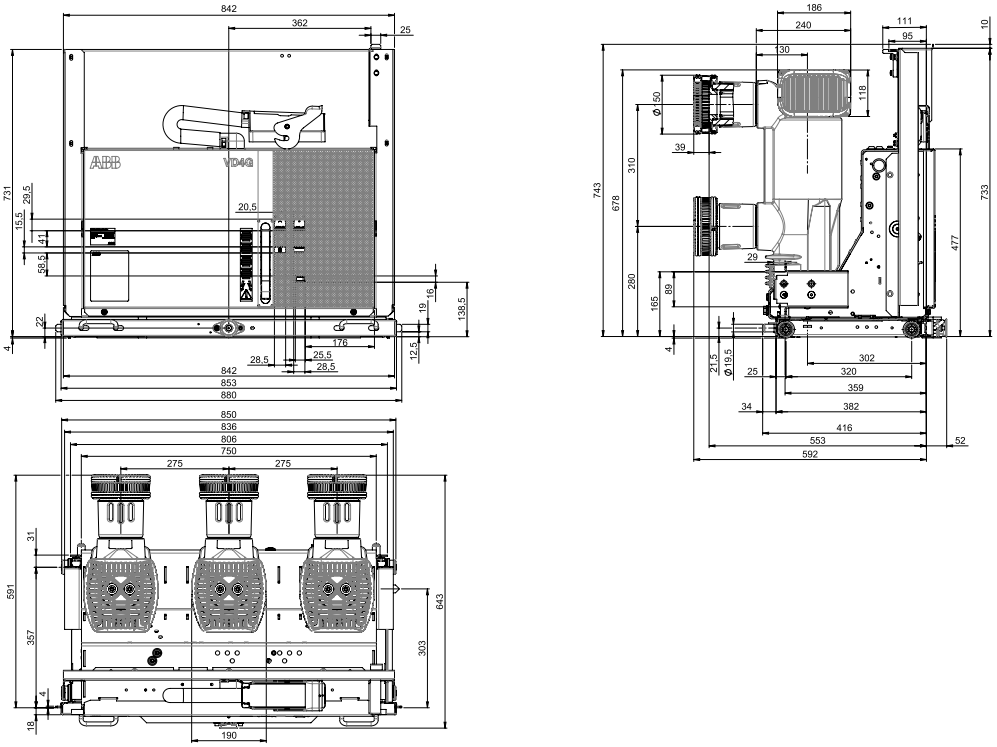
Withdrawable circuit breakers

VD4G		
TN	1VCD000243	
Ur	15	kV
Ir	2000	A
IscSFF	40	kA
IscGFF	25	(G2)
IscOOP	20	kA



Withdrawable circuit breakers

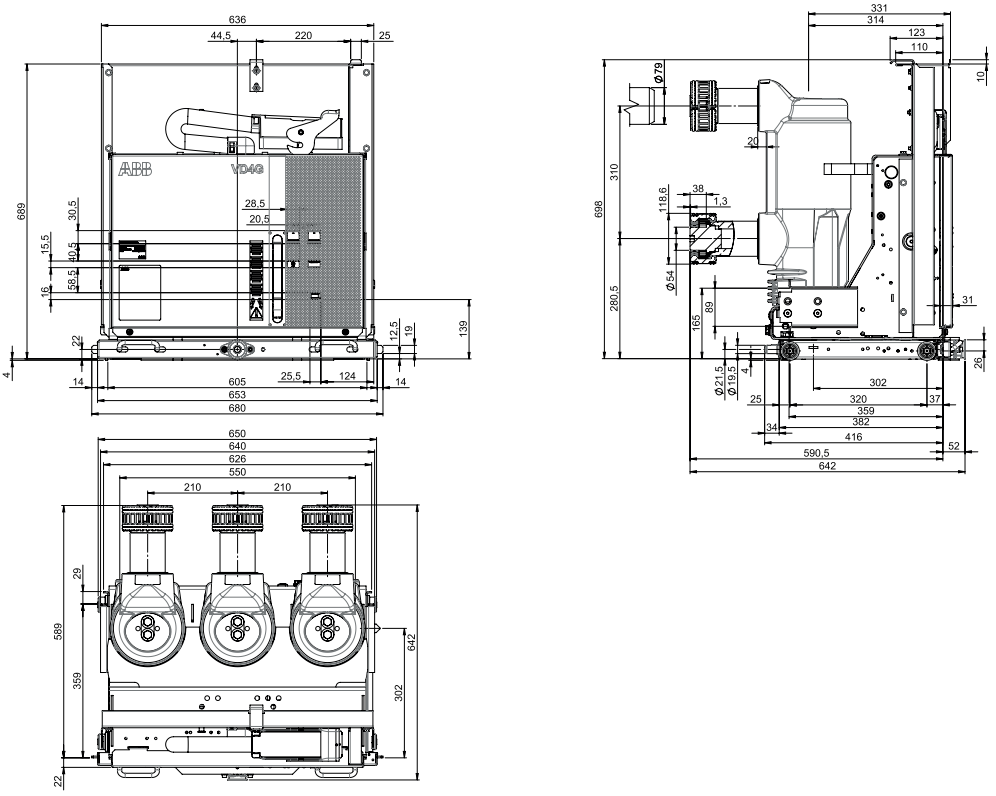
VD4G		
TN	1VCD000244	
Ur	15	kV
Ir	3150	A
IscSFF	40	kA
IscGFF	25	(G2)
IscOOP	20	kA



5. Overall dimensions

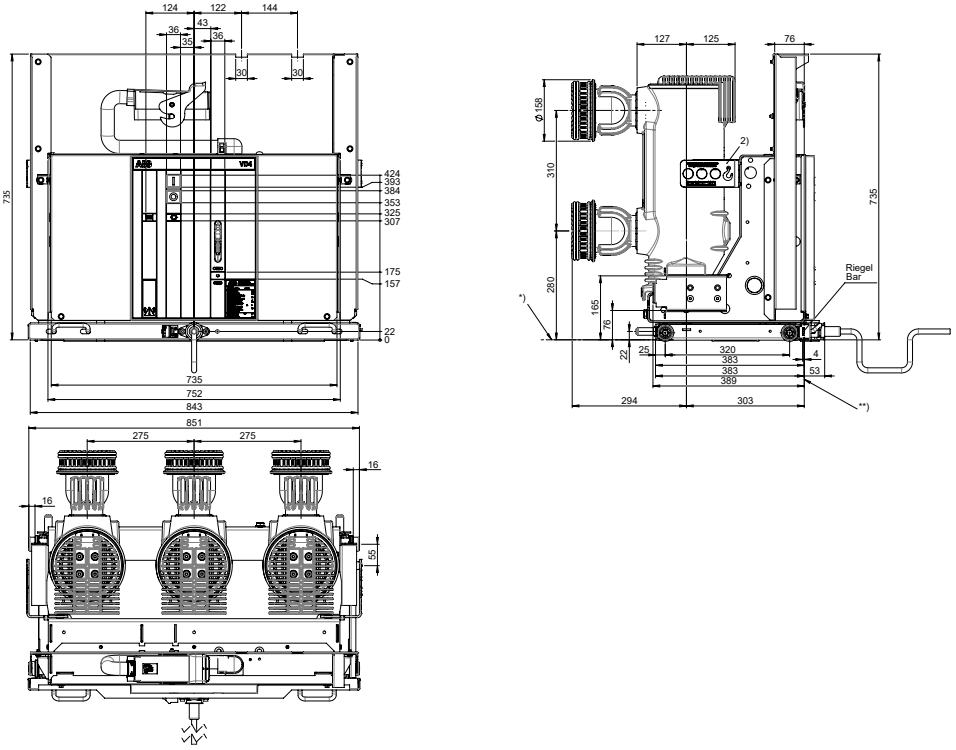
Withdrawable circuit breakers

VD4G/P-50/25		
TN	2RDA038051	
Ur	15	kV
Ir	1250	A
	1600	A
	2000	A
Isc	50	kA
	25	kA
	25	kA



Withdrawable circuit breakers

VD4G		
TN	1VBM700160	
Ur	15	kV
Ir	3150	A
IscSFF	50	kA
IscGFF	50/37	(G2)
IscOOP	25	kA



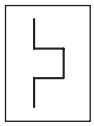
*) Rail
**) Front edge of bar
2) Remove the locking lugs on both sides before commissioning

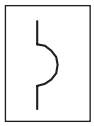
6. Electric circuit diagram

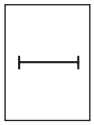
State of operation represented

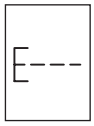
The diagrams illustrate the following conditions:
- Circuit breaker open and connected (only withdrawable circuit breaker)
- Circuits de-energized
- Closing springs discharged

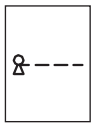
Graphical symbols for circuit diagrams


Thermal effect

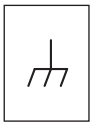

Electromagnetic effect

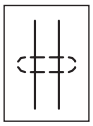

Timing

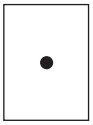

Push-button control

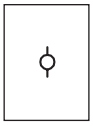

Key control


Earth (general symbol)

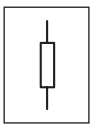

Mass, frame

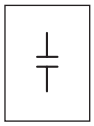

Conductors in shielded cable (two conductors shown)

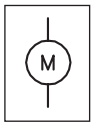

Connection of conductors


Terminal or clamp


Socket and plug (female and male)

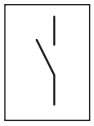

Resistor (general symbol)

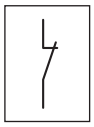

Capacitor (general symbol)

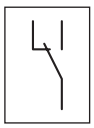


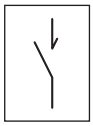
Motor (general symbol)

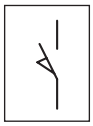

Rectifier with two half-waves (bridge)


Make contact


Break contact

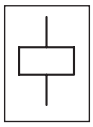

Change-over break before make contact

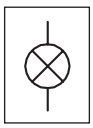

Passing make contact closing momentarily during release


Closing position contact (limit switch)


Opening position contact (limit switch)


Power circuit breaker with automatic opening

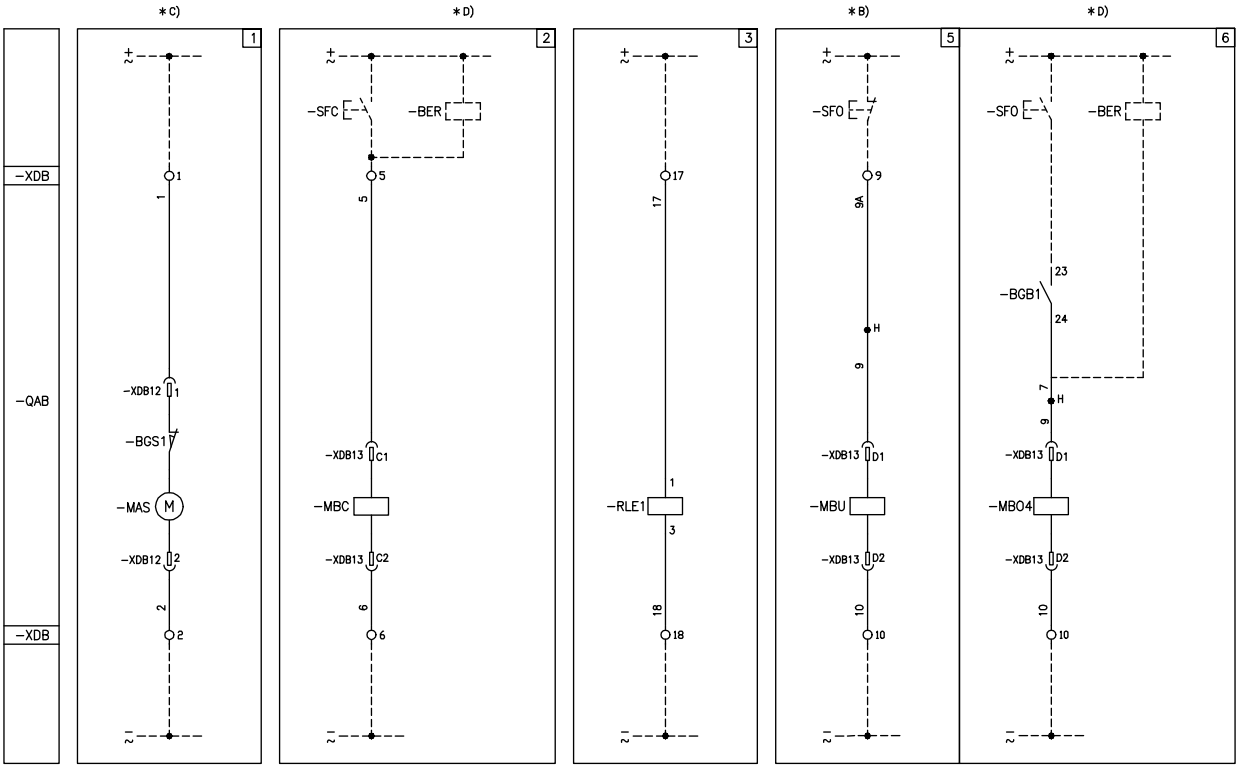

Control coil (general symbol)

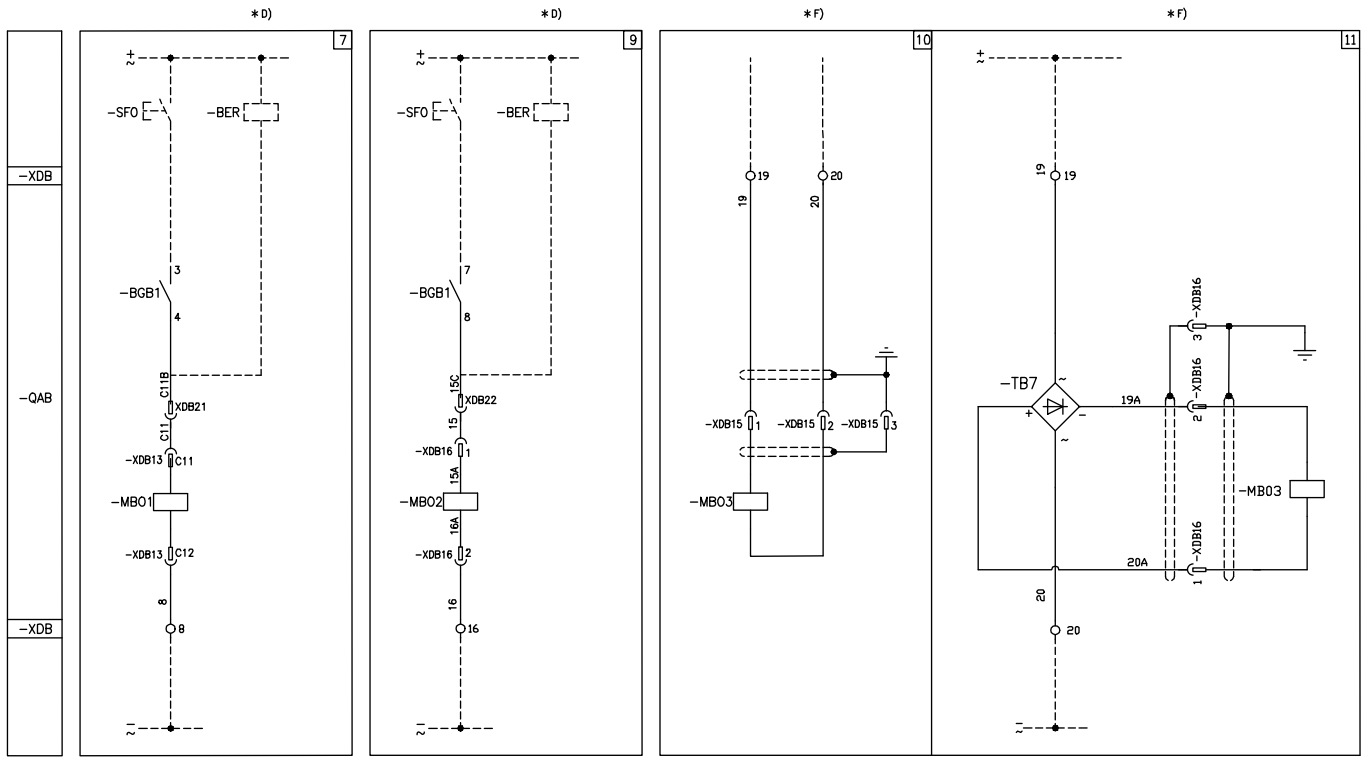

Lamp (general symbol)

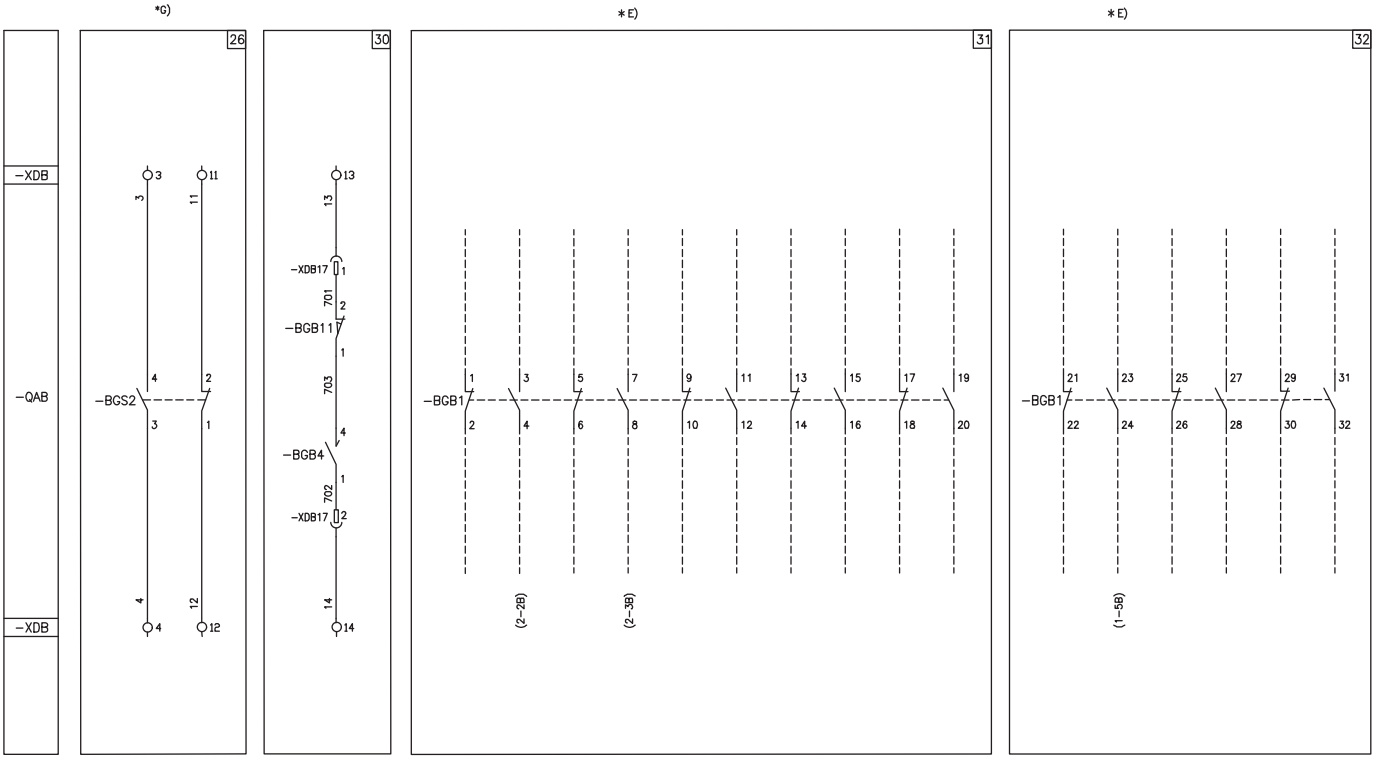
6. Electric circuit diagram

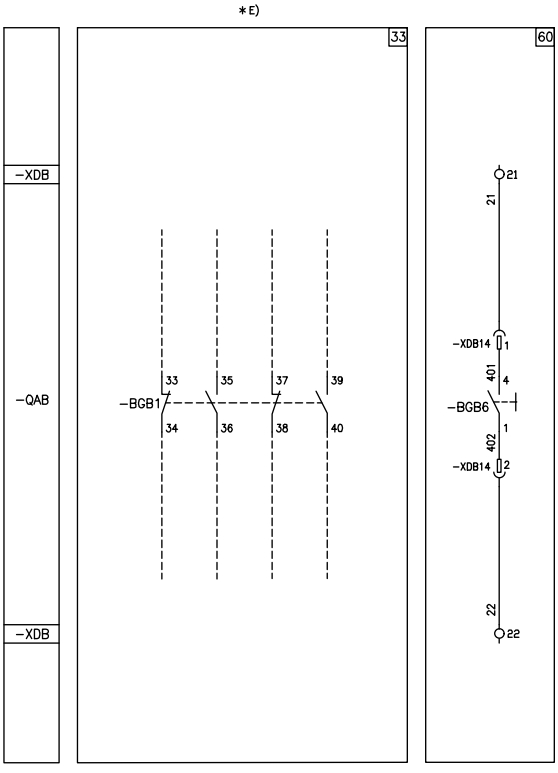
Circuit diagram 1VCD 400151 for 15 kV fixed circuit breakers up to 50 kA with EL actuator.

The circuit diagram shown in this section refers to fixed VD4G-25, VD4G-40 and VD4G-50/25 circuit breakers.

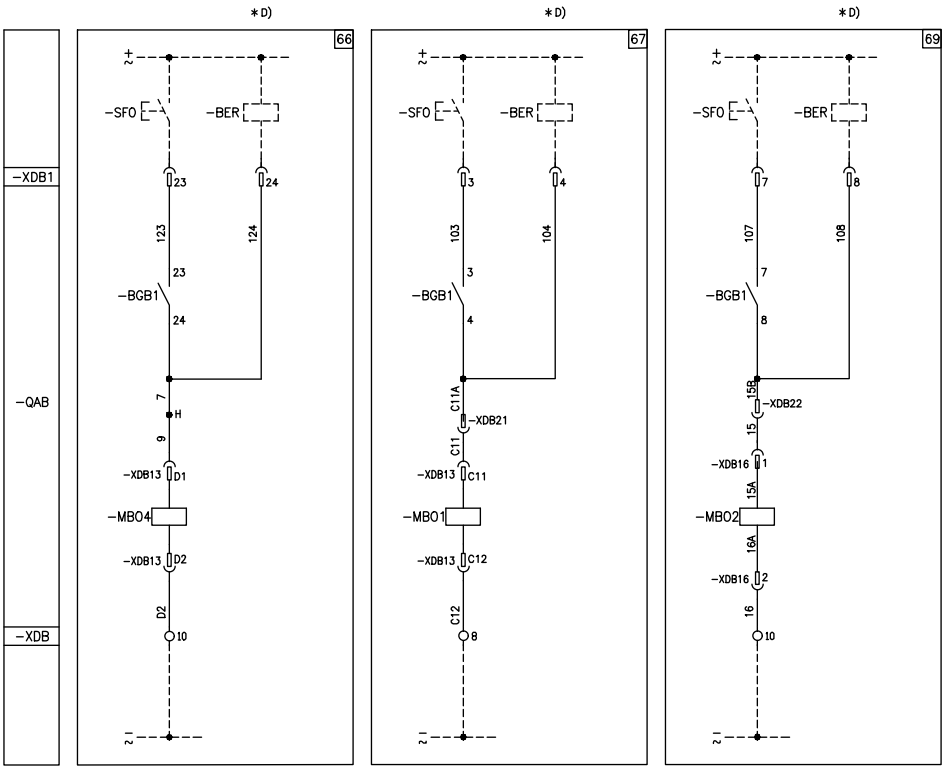


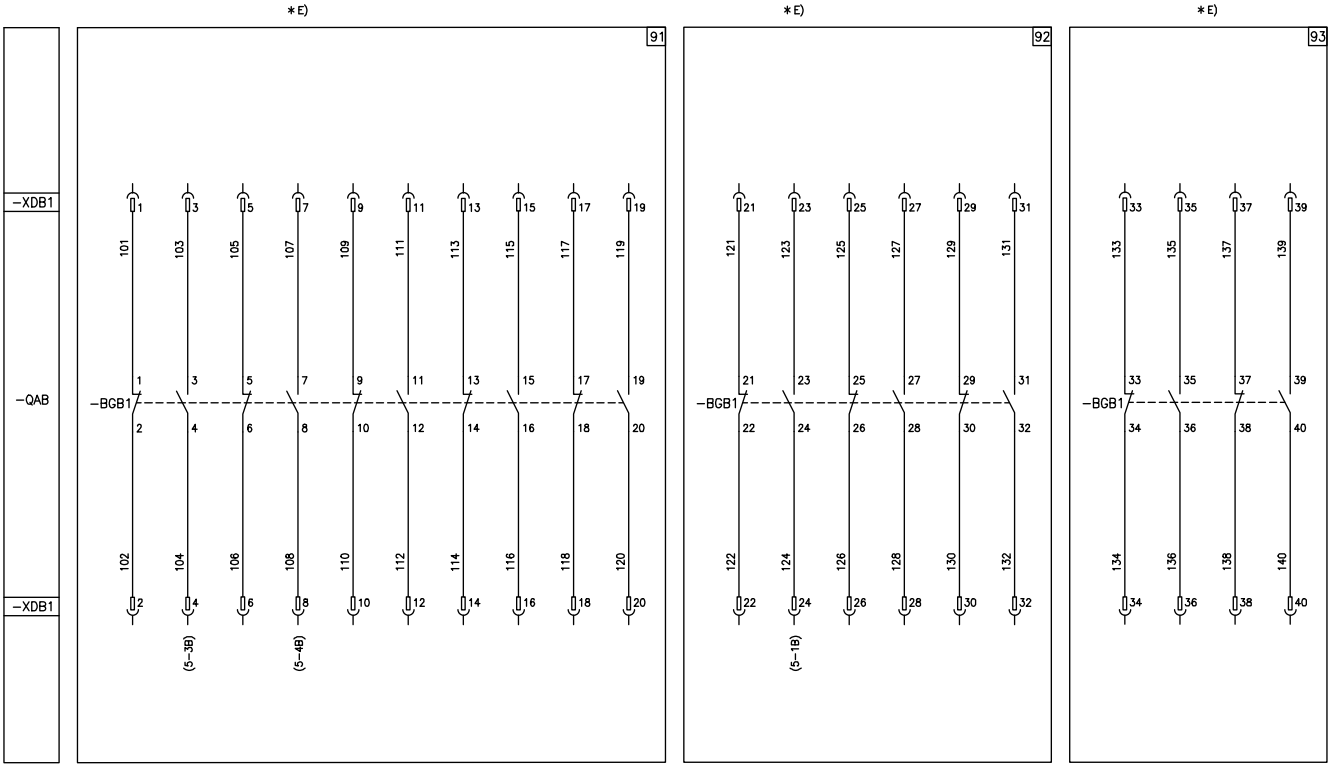



*G)
*E)
*E)
26
30
31
32
-XDB
-QAB
-XDB
-BGS2
-XDB17
-BGB11
-BGB4
-XDB17
-BGB1
-BGB1
(2-2B)
(2-3B)
(1-5B)


*E)
33
60
-XDB
-QAB
-XDB
-BGB1
-XDB14
-BGB6
-XDB14

6. Electric circuit diagram





Caption		
□	=	Figure number of the diagram.
*	=	See note indicated by the letter.
-BER	=	SOR Test Unit for monitoring continuity of shunt opening and closing release winding (see note D)
-BGB1	=	Auxiliary contacts of circuit breaker.
-BGB4	=	Auxiliary let-through contact of circuit breaker with momentary closing during circuit breaker opening.
-BGB6	=	Contact for electrical signaling of undervoltage release de-energized.
-BGB11	=	Contact for cutting off electrical signal -BGB4 if opening operation is performed in the manual mode.
-BGS1	=	Limit contact of spring loading motor.
-BGS2	=	Contact for signaling closing spring loaded-discharged.
-MAS	=	Motor for loading closing springs (see note C).
-MBC	=	Shunt closing release (see note D).
-MBO1	=	First shunt opening release (see note D).
-MBO2	=	Second shunt opening release (see note D).
-MBO3	=	Opening solenoid for release outside circuit breaker (see note F).
-MBO4	=	Third shunt opening release (see note D).
-MBU	=	Under-voltage release (see note B).
-QAB	=	Circuit breaker applications.
-RLE1	=	Locking magnet. Mechanically inhibits circuit breaker closing if de-energized.
		(Consumption can be limited by connecting a delayed operation enabling push-button in series).
-SFC	=	Push-button or contact for closing circuit breaker.
-SFO	=	Push-button or contact for opening circuit breaker.
-TB7	=	Rectifier for release -MBO3.
-XDB	=	Terminal box of circuit breaker circuits.
-XDB1	=	Connector of circuit breaker circuits.
-XDB10, ...,17	=	Connectors of applications.

Description of the figures		
Fig. 1	=	Circuit of motor for loading closing springs (see note C).
Fig. 2	=	Shunt closing release (anti-pumping is achieved mechanically), (see note D).
Fig. 3	=	Locking magnet. Mechanically inhibits circuit breaker closing if de-energized.
		Consumption can be limited by connecting a delayed operation enabling push-button in series.
Fig. 5	=	Instantaneous undervoltage release (see note B).
Fig. 6, 66	=	Circuit of third shunt opening release with possibility of continuous control of winding (see note D).
Fig. 7, 67	=	Circuit of first shunt opening release with possibility of continuous control of winding (see note D).
Fig. 9, 69	=	Circuit of second shunt opening release with possibility of continuous control of winding (see note D).
Fig. 10	=	Opening solenoid for release outside circuit breaker.
Fig. 11	=	Opening solenoid for release outside circuit breaker with AC supply.
Fig. 26	=	Electrical signaling of closing springs loaded and discharged.
Fig. 30	=	Auxiliary let-through contact of circuit breaker with momentary closing during circuit breaker opening.
Fig. 31, 91	=	Available auxiliary contacts of circuit breaker (see note E).
Fig. 32, 92	=	Available auxiliary contacts of circuit breaker (see note E).
Fig. 33, 93	=	Available auxiliary contacts of circuit breaker (see note E).
Fig. 60	=	Contact for electrical signaling of undervoltage release de-energized.

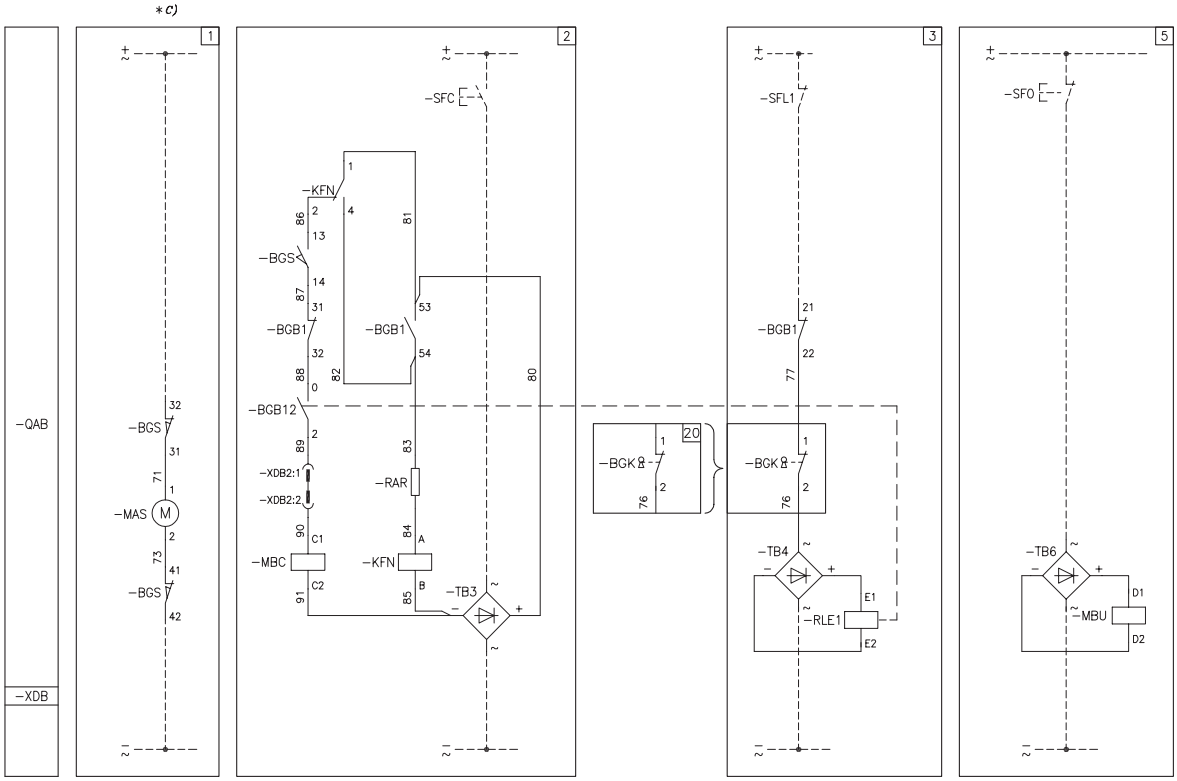
6. Electric circuit diagram

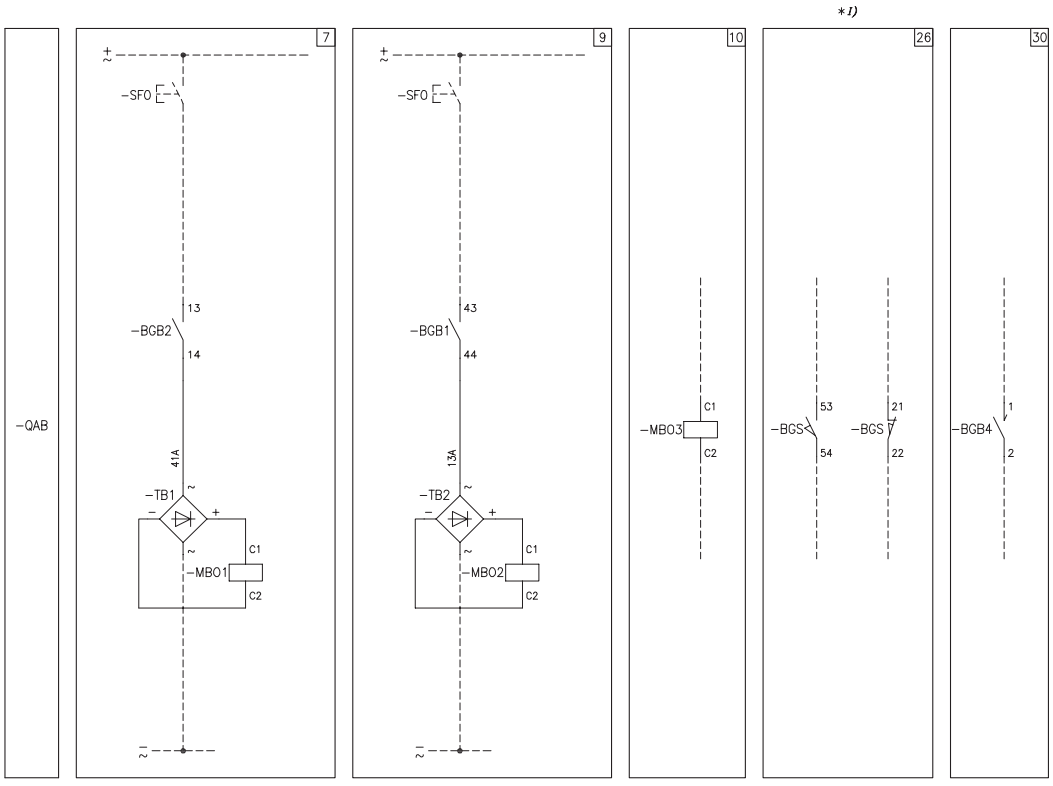
Incompatibility
The circuits indicated in the following figures cannot be supplied at the same time in the same circuit breaker:
5-6-66 | 7-67 | 9-69 | 31-91 | 32-92 | 33-93 | 10-11

Notes	
A)	The circuit breaker is equipped solely with the applications specified in the order confirmation. Consult this catalog for information about how to make out an order.
B)	The undervoltage release can be supplied for energizing with voltage derived from the supply side of the circuit breaker or from an independent source. Circuit breaker closing is only enabled when the release is energized (closing lock is obtained mechanically). If there is the same power supply for the shunt closing and under-voltage releases and the circuit breaker must close automatically when auxiliary voltage returns, there must be a 50 ms delay between the under-voltage release's enabling instant and energizing of the shunt closing release. Incompatible with -MBO4.
C)	Check power of auxiliary circuit to find out whether several motors for loading the closing springs can be operated at the same time. To prevent excessive power draw, the springs must be loaded by hand before the auxiliary circuit is powered.
D)	The circuit for monitoring the continuity of the release windings must only be used for that purpose. The SOR Test Unit can be used for checking the continuity of the various different releases. -MBO4 incompatible with -MBU. -MBO4 not available for VD4 50 kA.
E)	When fig. 6 is required, contact -BGB1 (23-24) of fig.32 is not available. When fig. 7 is required, contact -BGB1 (3-4) of fig. 31 is not available. When fig. 9 is required, contact -BGB1 (7-8) of fig. 31 is not available. When fig. 32 is required, it is obligatory to supply the auxiliary contacts of fig. 31. When fig. 33 is required, it is obligatory to supply the auxiliary contacts of fig. 32. When fig. 66 is required, contact -BGB1 (23-24) of fig. 92 is not available. When fig. 67 is required, contact -BGB1 (3-4) of fig. 91 is not available. When fig. 69 is required, contact -BGB1 (7-8) of fig. 91 is not available. When fig. 92 is required, it is obligatory to supply the auxiliary contacts of fig. 91. When fig. 93 is required, it is obligatory to supply the auxiliary contacts of fig. 92. Figs. 33 and 93 are not available for VD4 50 kA.
F)	Figs. 10 and 11 are only available for VD4 up to 31.5 kA.
G)	The energizing voltage must be the same for both signals.

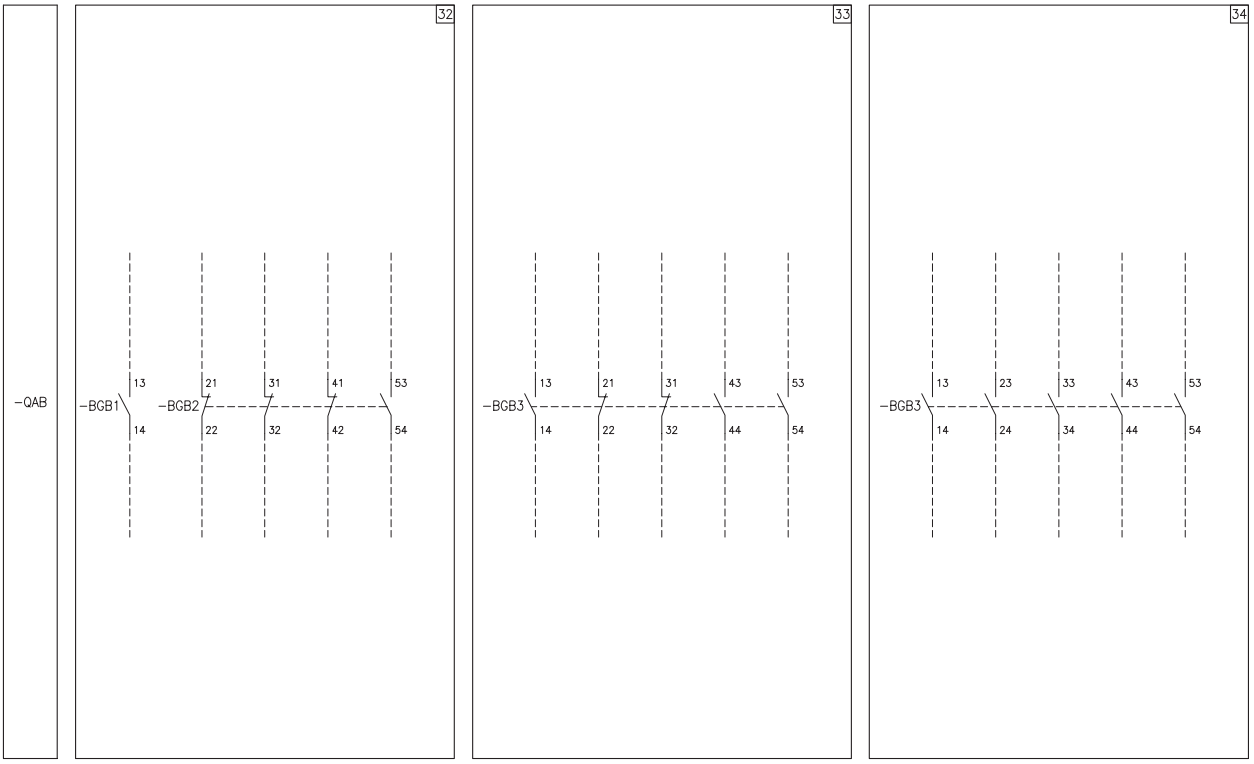
Circuit diagram 1VCD 400 230 for 15 kV fixed circuit breakers at 50 kA and 63 kA with Classic actuator.

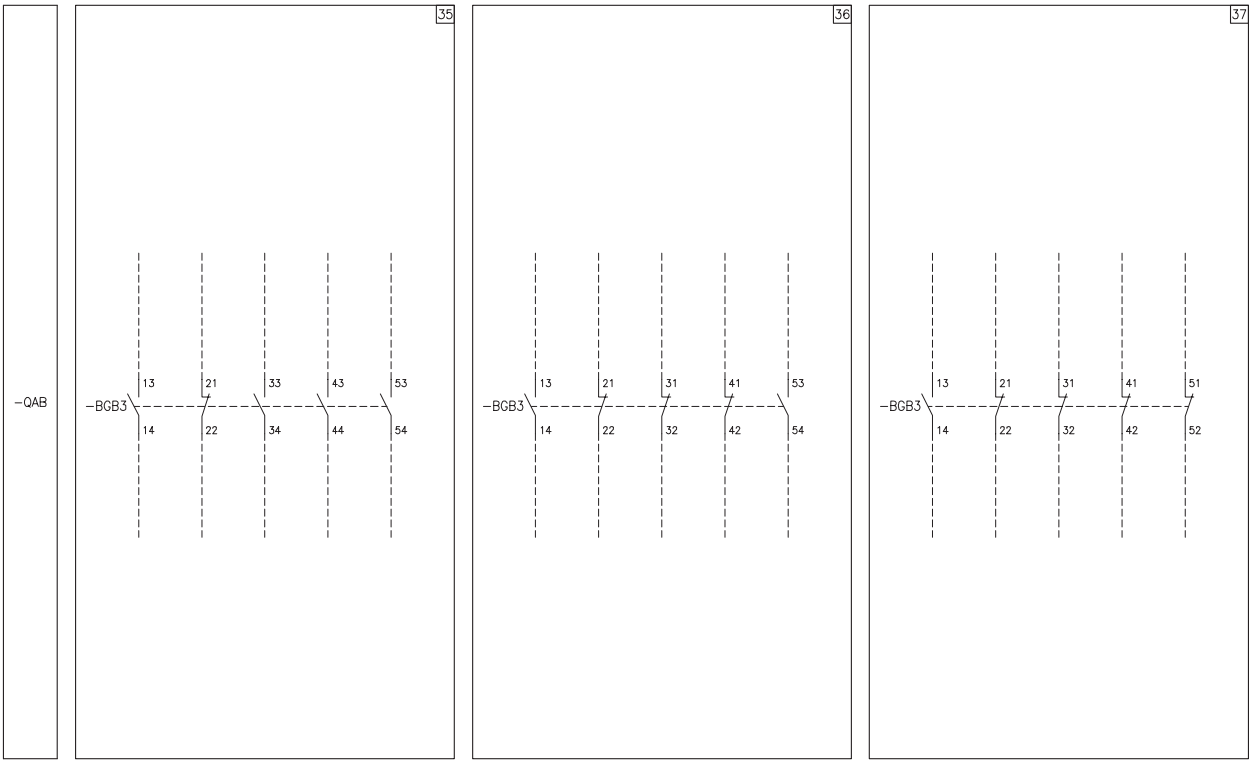
The circuit diagram shown in this section refers to fixed VD4G-50 and VD4G-63 circuit breakers.

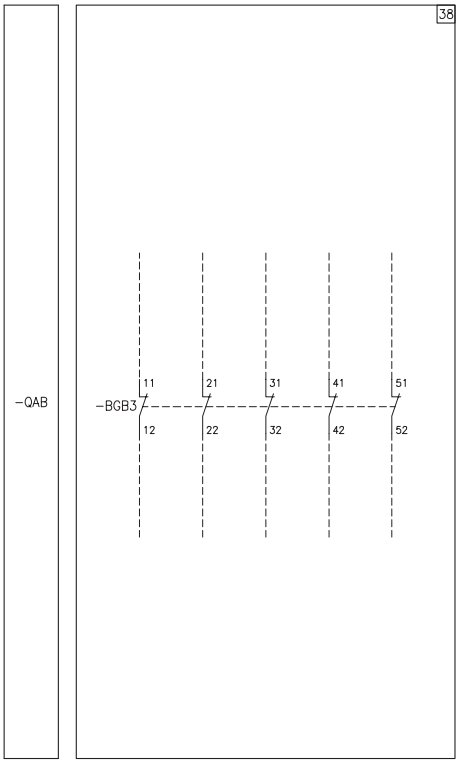




6. Electric circuit diagram







Reference designation of objects in electrical documents
(In compliance with standard IEC 81346-2 and ABB technical standard 2NBA000001)

Caption		
☐	=	Reference number of diagram figure
*	=	See note indicated by the letter
-BGB1 ,..., -BGB3	=	Circuit breaker auxiliary contacts
-BGB4	=	Auxiliary passing contact (closing momentarily when circuit breaker opens)
-BGB12	=	Auxiliary contact for block closing of the circuit breaker
-BGK	=	Contact operated by the key lock preventing the circuit breaker closing
-BGS	=	Limit switch signalling closing springs charged or discharged
-MAS	=	Motor for the closing charging springs (see note C)
-MBC	=	Shunt closing release
-MBO1	=	First shunt opening release (see note E)
-MBO2	=	Second shunt opening release (see note E)
-MBO3	=	Indirect overcurrent relay
-MBU	=	Instantaneous undervoltage release
-KFN	=	Antipumping relay
-QAB	=	Main circuit breaker
-RAR	=	Resistor
-RLE1	=	Locking magnet. If de-energized it prevents the circuit breaker closing
-SFC	=	Pushbutton or contact for the circuit breaker closing
-SFO	=	Pushbutton or contact for the circuit breaker opening
-SFL1	=	Contact locking the circuit breaker closing
-TB1	=	Rectifier for -MO1
-TB2	=	Rectifier for -MO2
-TBJ	=	Rectifier for -MBC and -KFN
-TB4	=	Rectifier for -RLE1
-TB6	=	Rectifier for -MBU
-XDB2	=	Connectors of the accessories

Diagram figures description		
Fig. 1	=	Springs charging-motor circuit (see note C)
Fig. 2	=	Shunt closing release
Fig. 3	=	Locking magnet on the operating mechanism. If de-energized it prevents the circuit breaker closing
Fig. 5	=	Instantaneous undervoltoge release
Fig. 7	=	First shunt opening release circuit
Fig. 9	=	Second shunt opening release circuit
Fig. 10	=	Indirect overcurrent relay
Fig. 20	=	Contact operated by the key lock preventing the circuit breaker closing
Fig. 26	=	Contact signalling charged or discharged closing springs (see note I)
Fig. 30	=	Wiping contact 35 ms for circuit breaker tripped indication
Fig. 32	=	Circuit breaker available auxiliary contacts
Fig. 33,..., 38	=	Circuit breaker available auxiliary contacts

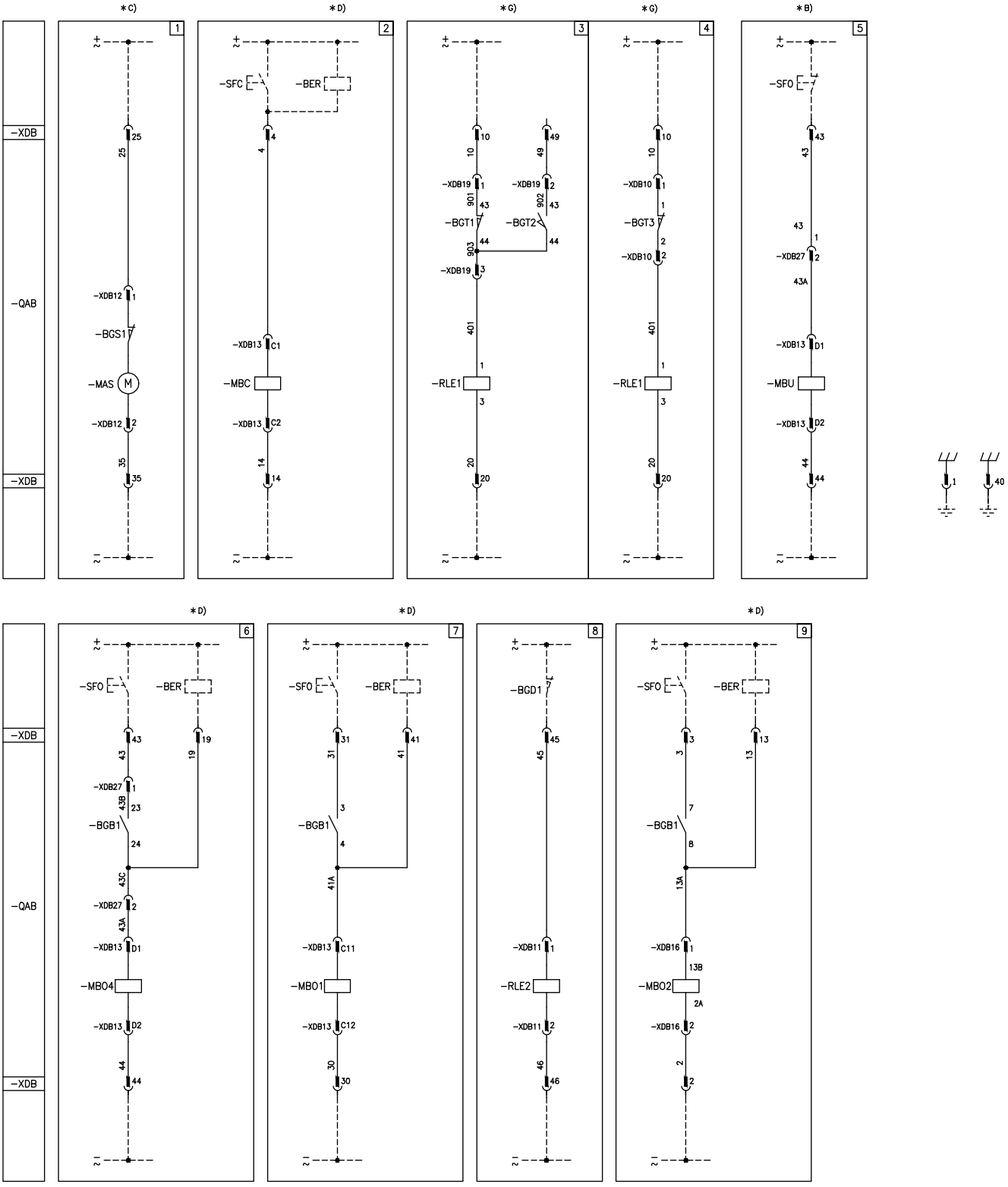
Incompatibility
The combination of circuits given in the figures below are not possible supplied on the same circuit breaker:
33 - 34 - 35 - 36 - 37 - 38

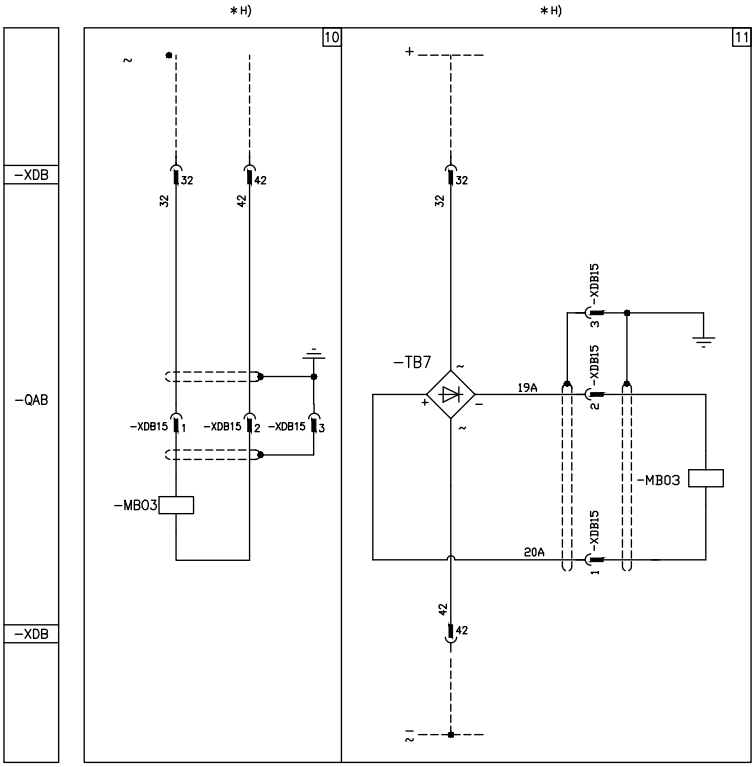
Notes	
A)	The circuit-breaker is delivered complete with the accessories listed in the order aknowledgement only. To draw up the order examine the apparatus catalogue.
C)	Check the power supply available on the auxiliary circuit to verify if it is adeguate to start several closing spring-charging motors simultaneously. To prevent excessive consumption the closing springs must be charged manually before energizing the auxiliary circuit.
I)	Both limit switches signalling must be working ot the same supply voltage.

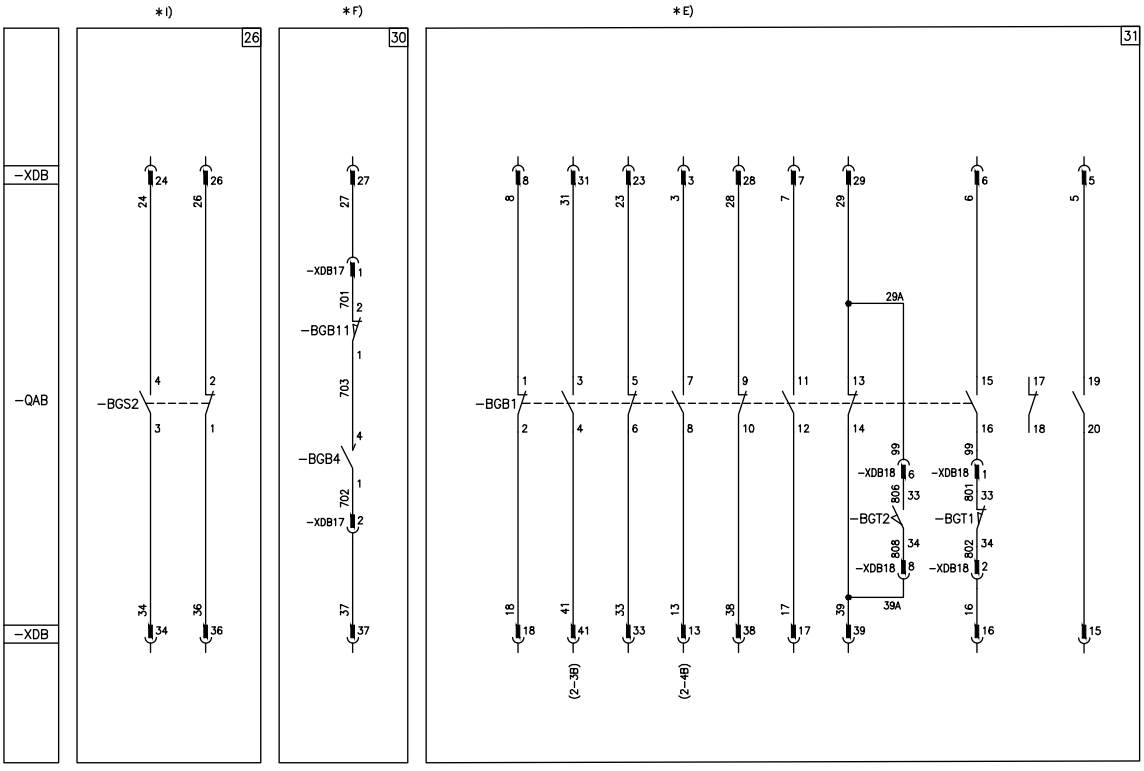
6. Electric circuit diagram

Circuit diagram 1VCD 400 155 for 15 kV withdrawable circuit breakers for UniGear switchgear up to 50 kA with EL actuator.

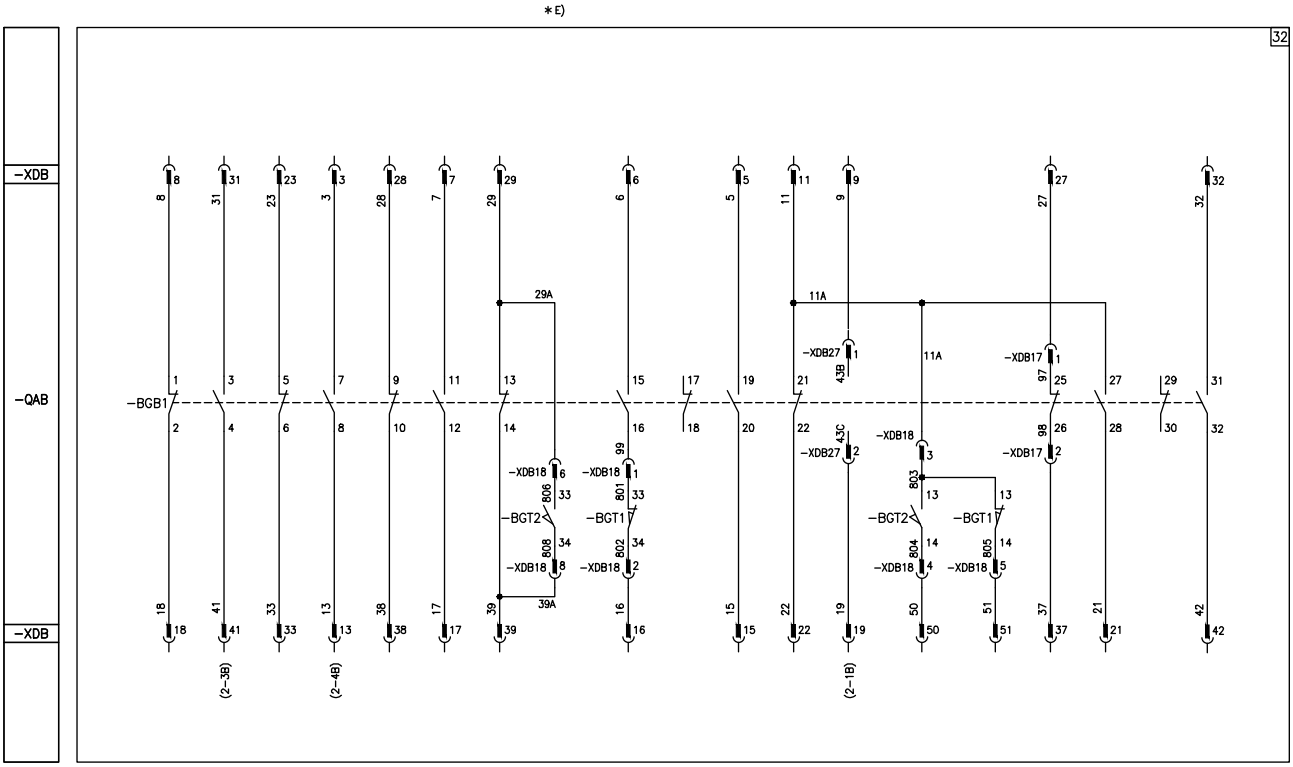
The circuit diagram shown in this section refers to withdrawable circuit breakers VD4G/P-25, VD4G/P-40 and VD4G/P-50/25 for UniGear switchgear. See diagram 1VCD 400156 for withdrawable circuit breakers with motor-operated truck.

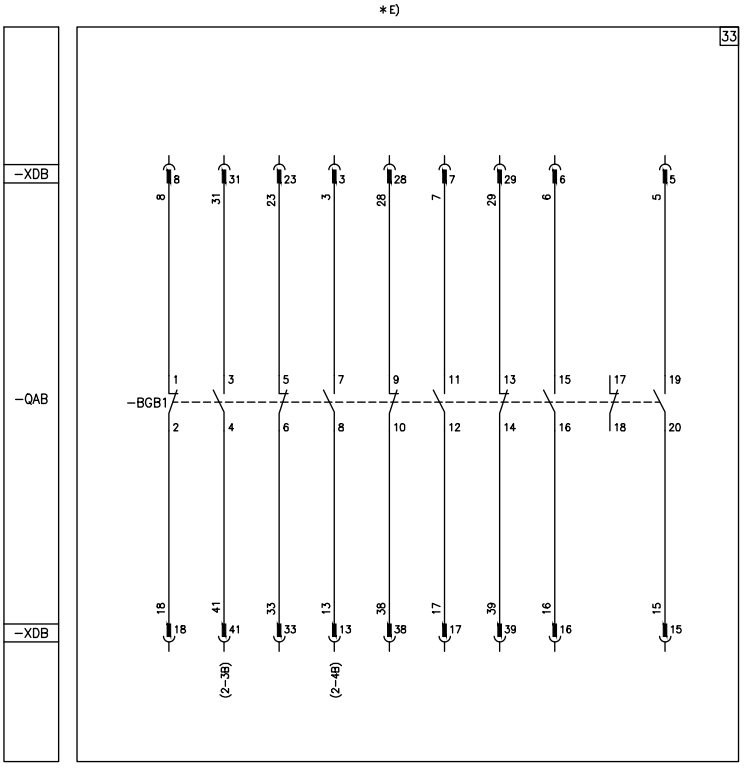


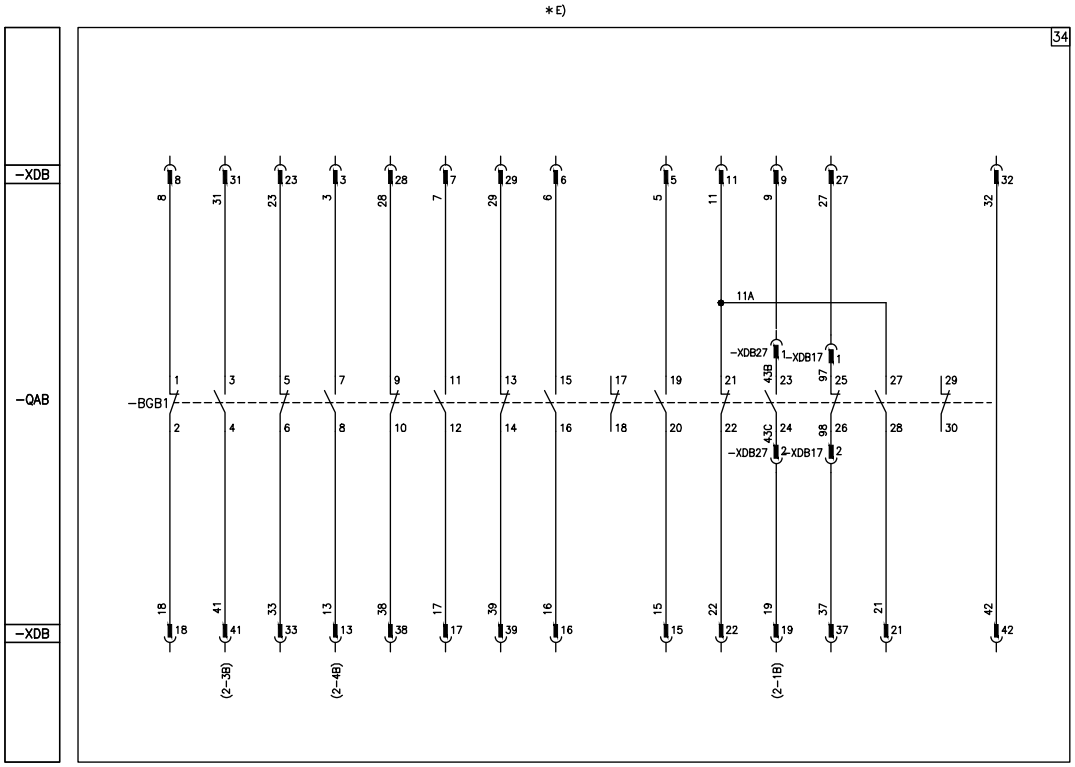

*H)
*H)
10
11
-XDB
-QAB
-XDB
-MB03
-XDB15
-TB7
19A
20A
-MB03

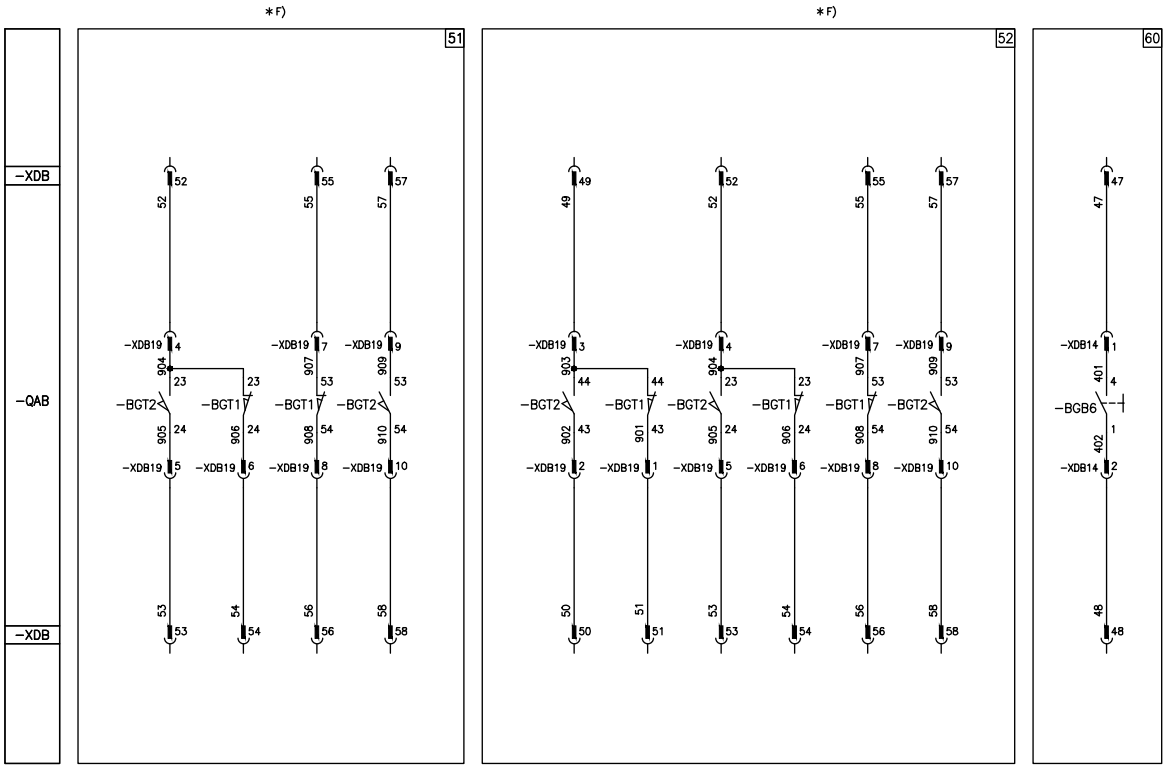

*I)
*F)
*E)
26
30
31
-XDB
-QAB
-XDB
-BGS2
-XDB17
-BGB11
-BGB4
-BGB1
-XDB18
-BGT2
-BGT1
29A
39A
(2-38)
(2-48)

6. Electric circuit diagram






*E)
34
-XDB
-QAB
-XDB
-BGB1
11A
-XDB27
-XDB17
-XDB27
-XDB17
(2-3B)
(2-4B)
(2-1B)


*F)
51
*F)
52
60
-XDB
-QAB
-XDB
-XDB19
-BGT2
-BGT1
-XDB14
-BGB6

6. Electric circuit diagram

Caption		
□	=	Figure number of the diagram.
*	=	See note indicated by the letter.
-BER	=	SOR Test Unit for monitoring continuity of shunt opening and closing release winding (see note D)
-BGB1	=	Auxiliary contacts of circuit breaker.
-BGB4	=	Auxiliary let-through contact of circuit breaker with momentary closing during circuit breaker opening.
-BGB6	=	Contact for electrical signaling of undervoltage release de-energized.
-BGB11	=	Contact for cutting off electrical signal -BGB4 if opening operation is performed in the manual mode.
-BGD1	=	Enclosure door position contact.
-BGS1	=	Limit contact of spring loading motor.
-BGS2	=	Contact for signaling closing springs loaded-discharged.
-BGT1	=	Electrical signaling contacts for circuit breaker in racked-in position (see note F)
-BGT2	=	Electrical signaling contacts for circuit breaker in isolated position (see note F)
-BGT3	=	Circuit breaker position contact, open during isolating travel.
-MAS	=	Motor for loading closing springs (see note C).
-MBC	=	Shunt closing release (see note D).
-MBO1	=	First shunt opening release (see note D).
-MBO2	=	Second shunt opening release (see note D).
-MBO3	=	Opening solenoid for release outside circuit breaker.
-MBO4	=	Third shunt opening release (see note D).
-MBU	=	Under-voltage release (see note B).
-QAB	=	Circuit breaker applications.
-RLE1	=	Locking magnet. Mechanically inhibits circuit breaker closing if de-energized. (Consumption can be limited by connecting a delayed push-button in series so as to enable the operation).
-RLE2	=	Locking magnet (on truck). Mechanically inhibits circuit breaker racking-in and isolating if de-energized. (Consumption can be limited by connecting a delayed push-button in series so as to enable the operation).
-SFC	=	Push-button or contact for closin circuit breaker
-SFO	=	Push-button or contact for closing circuit breaker.
-TB7	=	Rectifier for release -MBO3.
-XDB	=	Terminal box of circuit breaker circuits.
-XDB10, ... , 27	=	Connectors of applications
-XDB28	=	Connector of applications.

Description of the figures		
Fig. 1	=	Circuit of motor for loading closing springs (see note C).
Fig. 2	=	Shunt closing release (anti-pumping is achieved mechanically). (see note D).
Fig. 3	=	Locking magnet. Mechanically inhibits circuit breaker closing if de-energized. (If -RL1 is required, provide this figure when fig.31 or 32 are selected). Consumption can be limited by connecting a delayed push-button in series so as to enable the operation.
Fig. 4	=	Locking magnet. Mechanically inhibits circuit breaker closing if de-energized. (If -RL1 is required, provide this figure when fig.33 or 34 are selected). Consumption can be limited by connecting a delayed push-button in series so as to enable the operation.
Fig. 5	=	Instantaneous undervoltage release (see note B).
Fig. 6	=	Circuit of third opening release with continuous control of winding (see note D).
Fig. 7	=	Circuit of first opening release with continuous control of winding (see note D).
Fig. 8	=	Locking magnet (on truck). Mechanically inhibits circuit breaker racking-in and isolating if de-energized. (Consumption can be limited by connecting a delayed push-button in series so as to enable the operation).
Fig. 9	=	Circuit of second opening release with continuous control of winding (see note D).
Fig. 10	=	Opening solenoid for release outside circuit breaker.
Fig. 11	=	Opening solenoid for release outside circuit breaker with AC supply.
Fig. 26	=	Electrical signaling of closing springs loaded and discharged.
Fig. 30	=	Auxiliary let-through contact of circuit breaker with momentary closing during circuit breaker opening.
Fig. 31, ... , 34	=	Available auxiliary contacts of circuit breaker (see note E).
Fig. 51	=	Contacts for electrical signaling of circuit breaker in racked-in and isolated positions located on circuit breaker truck (obligatory when fig. 31 or 32 are required).
Fig. 52	=	Contacts for electrical signaling of circuit breaker in racked-in and isolated positions located on circuit breaker truck (supplied on request when fig. 33 or 34 are required).
Fig. 60	=	Contact for electrical signaling of undervoltage release de-energized.

Incompatibility

The circuits indicated in the following figures cannot be supplied at the same time in the same circuit breaker:

3-4 | 3-33-34 | 4-31-32 | 5-6 | 10-11 | 31-32-33-34 | 31-32-52 | 33-34-51 | 51-52

Notes

A) Circuit breaker is equipped solely with the applications specified in the order confirmation. Consult this catalog for information about how to make out an order.

B) The undervoltage release can be supplied for energizing with voltage derived from the supply side of the circuit breaker or from an independent source. Circuit breaker closing is only enabled when the release is energized (closing lock is obtained mechanically). If there is the same power supply for the shunt closing and under-voltage releases and the circuit breaker must close automatically when auxiliary voltage returns, there must be a 50 ms delay between the under-voltage release's enabling instant and energizing of the shunt closing release.
Incompatible with -MBO4.

C) Check power of auxiliary circuit to find out whether several motors for loading the closing springs can be operated at the same time. To prevent excessive power draw, the springs must be loaded by hand before auxiliary circuit is powered.

D) The circuit for monitoring the continuity of the release windings must only be used for that purpose. The SOR Test Unit can be used for checking the continuity of the various different releases:
-MBO4 incompatible with -MBU.
-MBO4 not available on Vmax and VD4 50kA.

E) When fig. 6 is required, contact -BGB1 (23-24) of fig. 32-34 is not available.
When fig. 7 is required, contact -BGB1 (3-4) of fig. 31-32-33-34 is not available.
When fig. 9 is required, contact -BGB1 (7-8) of fig. 31-32-33-34 is not available.
When fig. 10 or 11 are required, contact -BGB1 (31-32) of fig. 32 and 34 is not available.
When fig. 30 is required, contact -BGB1 (25-26) of fig. 32 and 34 is not available.

F) The contacts for electrical signaling of circuit breaker in isolated and racked-in position (-BGT1 and BGT2) shown in fig. 51-52 are installed on circuit breaker truck (movable part).

G) Fig. 3 is supplied when fig. 31 or 32 are required.
Fig. 4 is supplied when fig. 33 or 34 are required (in this case, it is obligatory to supply –BGT3).

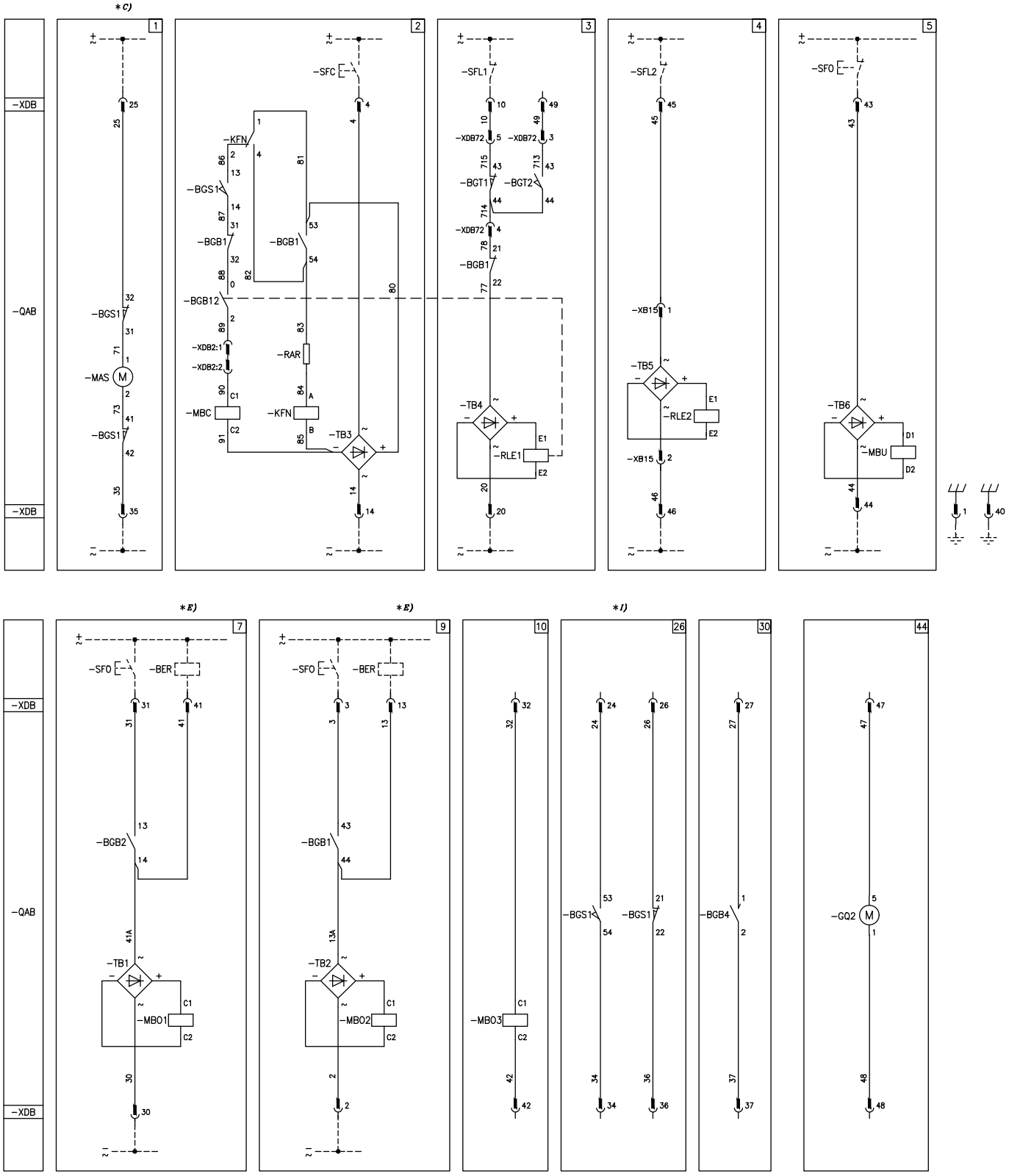
H) Fig. 10 is only available for VD4 up to 31.5 kA and Vmax.
Fig. 11 is only available for VD4 up to 31.5 kA.

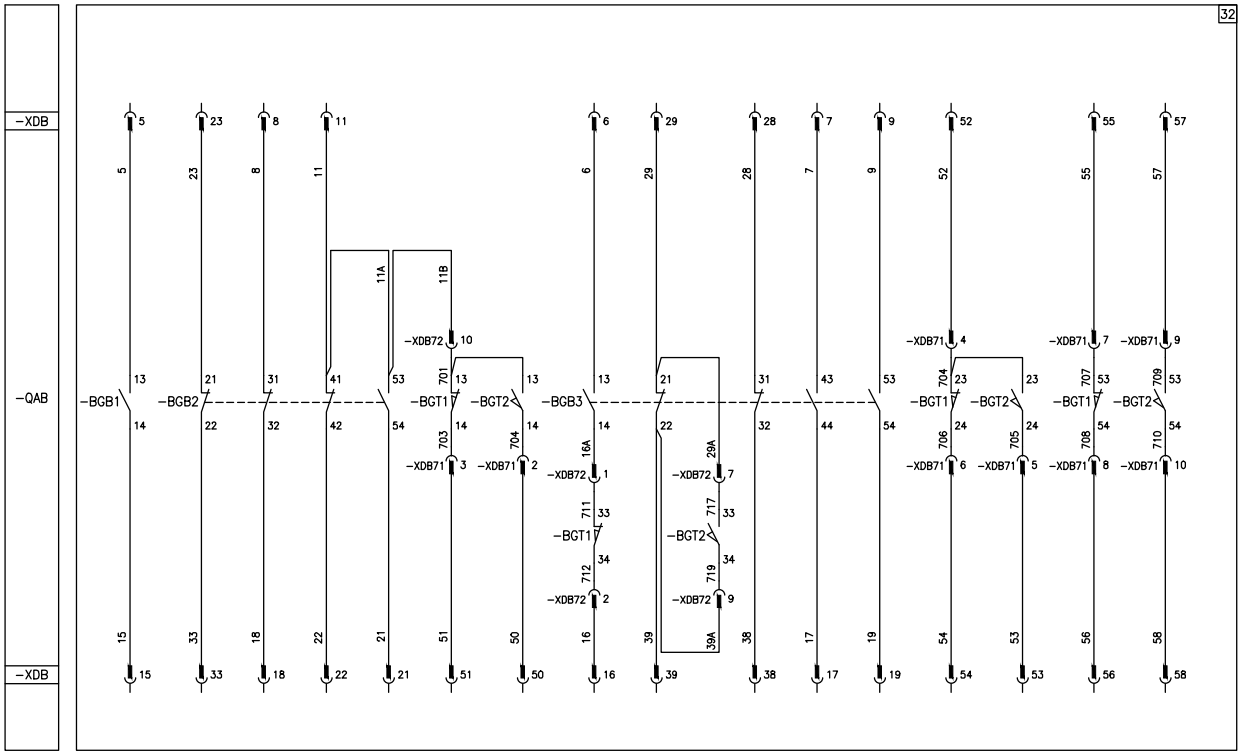
I) The energizing voltage must be the same for both signals.

6. Electric circuit diagram

Circuit diagram 1VCD 400 231 for 15 kV withdrawable circuit breakers for UniGear switchgear at 50 kA with Classic actuator.

The circuit diagram shown in this section refers to withdrawable circuit breakers VD4G/P-50 for UniGear switchgear.




-XDB
-QAB
-XDB
32
-BGB1
-BGB2
-BGT1
-BGT2
-BGB3
-BGT1
-BGT2
-BGT1
-BGT2
-BGT1
-BGT2
-XDB72
-XDB71
-BGT1
-BGT2

6. Electric circuit diagram

Reference designation of objects in electrical documents
(In compliance with standard IEC 81346-2 and ABB technical standard 2NBA000001)

☐	=	Reference number of diagram figure
*	=	See note indicated by the letter
-BER	=	Device for the supervision of shunt opening release coil continuity (see note E)
-BGB1,... -BGB3	=	Circuit breaker auxiliary contacts
-BGB4		Auxiliary passing contact (closing momentarily when circuit breaker opens)
-BGB12	=	Auxiliary contact for block closing of the circuit breaker
-BGS	=	Limit switch signalling closing springs charged or discharged
-BGT1	=	Contacts signalling circuit breaker in the connected position
-BGT2	=	Contacts signalling circuit breaker in the isolated position
-MAS	=	Motor for the closing charging springs (see note C)
-MBC	=	Shunt closing release
-MBO1	=	First shunt opening release (see note E)
-MBO2	=	Second shunt opening release (see note E)
-MBO3	=	Indirect overcurrent relay
-MBU	=	Instantaneous undervoltage release
-KFN	=	Antipumping relay
-QAB	=	Main circuit breaker
- RAR	=	Resistor
-RLE1	=	Locking magnet. If de-energized it prevents the c. breaker closing
-RLE2	=	Locking magnet on the truck. If de-energized it prevents the circuit breaker racking-in and racking-out mechanically
-SFC	=	Pushbutton or contact for the circuit breaker closing
-SFO	=	Pushbutton or contact for the circuit breaker opening
-SFL1		Contact locking the circuit breaker closing
-SFL2		Contact locking the circuit breaker racking-in and racking-out
-TB1		Rectifier for -MO1
-TB2		Rectifier for -MO2
-TB3		Rectifier for -MBC and -KFN
-TB4		Rectifier for -RLE1
-TB6	=	Rectifier for -MBU
-GQ2		Ventilator
-XDB	=	Connector for the circuit breaker circuits
-XDB2	=	Connector of the accessories
-XDB71, -XDB72	=	Connectors of the accessories

Diagram figures description		
Fig. 1	=	Springs charging-motor circuit (see note C)
Fig. 2	=	Shunt closing release
Fig. 3	=	Locking magnet on the operating mechanism. If de-energized it prevents the circuit breaker closing
Fig. 4	=	Locking magnet on the truck. If de-energized it prevents the circuit breaker racking-in and racking-out mechanically
Fig. 5	=	Instantaneous undervoltage release
Fig. 7	=	First shunt opening release circuit with possibility of permanent supervision of coil continuity (see note E)
Fig. 9	=	Second shunt opening release circuit with possibility of permanent supervision of coil continuity (see note E)
Fig. 10	=	Indirect overcurrent relay
Fig. 26	=	Contact signalling charged or discharged closing springs (see note I)
Fig. 30	=	Wiping contact 35 ms for circuit breaker tripped indication
Fig. 32	=	Circuit breaker available auxiliary contacts
Fig. 44	=	Ventilation circuit

Notes	
A)	The circuit breaker is delivered complete with the accessories listed in the order aknowledgement only. To draw up the order examine the apparatus catalogue.
C)	Check the power supply available on the auxiliary circuit to verify if it is adeguate to start several closing spring-charging motors simultaneously. To prevent excessive consumption the closing springs must be charged manually before energizing the auxiliary circuit.
E)	The circuit for the supervision of shunt opening release coil continuity shall be used for this function only.
I)	Both limit switches signalling must be working at the same supply voltage

Notes

For more information please contact:

More product information:
abb.com/mediumvoltage
Your contact center:
abb.com/contactcenters
More service information:
abb.com/service

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