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3AH5 Vacuum Circuit-Breakers

Medium-Voltage Equipment

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3AH5 Vacuum Circuit-Breakers

Medium-Voltage Equipment Catalog HG 11.05 · 2017

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The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).



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Industrial application: Refinery

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Description

General

1

3AH5 standard circuit-breaker from 12 to 36 kV – The Economical

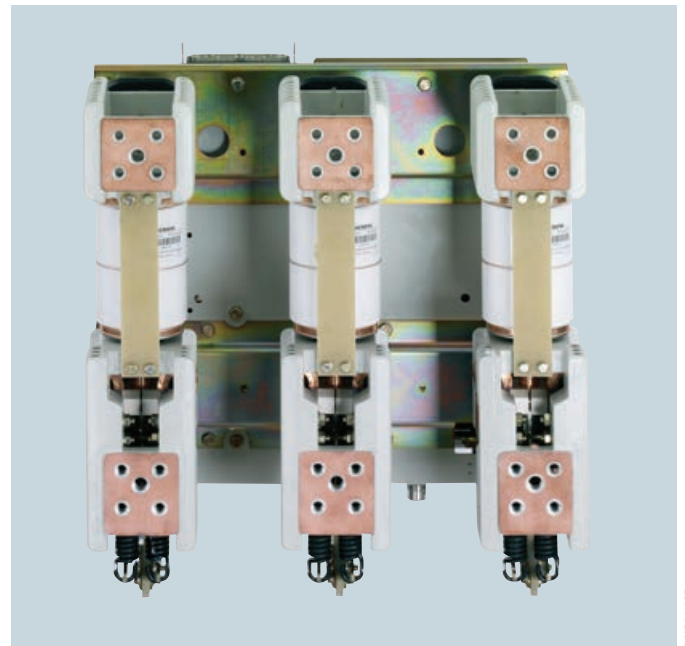
3AH5 vacuum circuit-breakers control all switching duties in medium-voltage systems. They are applicable for operation of e.g. overhead lines, cables, transformers,

generators, capacitors, filter circuits, motors and reactors. Here, small short-circuit ratings in distribution systems face high breaking currents in industrial systems.

3AH5 – the universal circuit-breaker in the product range



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The 3AH5 vacuum circuit-breaker is a real all-round device in its field of application. With its compact dimensions, it fits in all customary switchgear types. The comprehensive variety of types with different normal currents and short-circuit currents

as well as various pole-centre distances for voltage levels from 12 kV to 36 kV enables its universal application for all medium-voltage requirements.

The 3AH5 vacuum circuit-breaker consists of the pole assemblies (1) and the operating mechanism box (2). The pole assemblies are fixed to the operating mechanism box via post insulators (3). The switching movement is transferred by means of operating rods (4) and levers.

Pole assemblies

The pole assemblies consist of the vacuum interrupters (5) and the interrupter supports. The vacuum interrupters are air-insulated and freely accessible. This makes it possible to clean the insulating parts easily in adverse ambient conditions. The vacuum interrupter is rigidly fixed to the upper interrupter support (6). The lower part of the interrupter is guided in the lower interrupter support (7), allowing axial movement. The braces (8) absorb the external forces resulting from switching operations and the contact pressure.

Operating mechanism box

The whole operating mechanism with releases, auxiliary switches, indicators and actuating devices is accommodated in the operating mechanism box. The extent of the secondary equipment depends on the case of application and offers a multiple variety of options in order to meet almost every requirement.

Operating mechanism

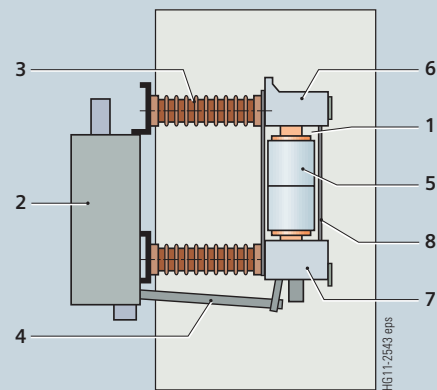
For circuit-breaker operation, both spring-operated and stored-energy mechanisms are available. With manual spring-operated mechanisms, the closing process takes place automatically after manual charging of the closing spring. The opening or contact springs are charged simultaneously during the closing operation, which means that a stored energy mechanism is available for the opening operation.

With motor or manual operating stored-energy mechanisms, the closing spring is either charged electrically or manually. It latches tight at the end of the charging process and serves as an energy store.

To close the breaker, the closing spring can be unlatched either mechanically by means of the local "ON" pushbutton or electrically by remote control. The closing spring charges the opening or contact pressure springs as the breaker closes. The now discharged closing spring will be charged again automatically by the mechanism motor or manually. Then the operating sequence OPEN-CLOSE-OPEN is stored in the springs.

Trip-free mechanism

3AH5 vacuum circuit-breakers have a trip-free mechanism according to IEC 62271-100. In the event of an opening command being given after a closing operation has been initiated, the moving contacts return to the open position and remain there even if the closing command is sustained. This means that the contacts of the vacuum circuit-breakers are momentarily in the closed position, which is permissible according to IEC 62271-100.

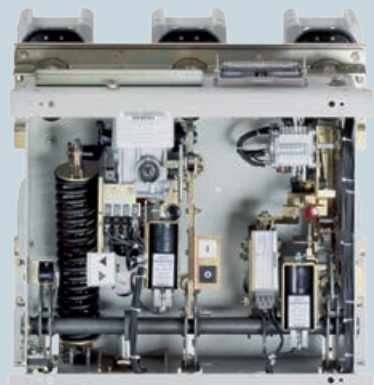


Circuit-breaker structure

- 1 Pole assembly
- 2 Operating mechanism box
- 3 Post insulator
- 4 Operating rod
- 5 Vacuum interrupter
- 6 Upper interrupter support
- 7 Lower interrupter support
- 8 Brace



Front view



Open operating mechanism box

Description

Construction and mode of operation, standards

1

Releases

A release is a device which transfers electrical commands from an external source, such as a control room, to the latching mechanism of the vacuum circuit-breaker so that it can be opened or closed. Apart from the closing solenoid, the maximum possible equipment is one shunt release and another release to be selected at will. For release combinations, refer to page 15.

- The closing solenoid unlatches the charged closing spring of the vacuum circuit-breaker, closing it by electrical means. It is suitable for DC or AC voltage.
- Shunt releases are used for automatic tripping of vacuum circuit-breakers by suitable protection relays and for deliberate tripping by electrical means. They are intended for connection to an external power supply (DC or AC voltage) but, in special cases, may also be connected to a voltage transformer for manual operation.
- Current-transformer operated releases comprise a stored energy mechanism, an unlatching mechanism and an electromagnetic system. They are used when there is no external source of auxiliary power (e.g. a battery). Tripping is effected by means of a protection relay (e.g. overcurrent time protection) acting on the current-transformer operated release. When the tripping current is exceeded (= 90 % of the rated normal current of the c.t.-operated release), the latch of the energy store, and thus opening of the circuit-breaker, is released.
- Undervoltage releases comprise a stored-energy mechanism, an unlatching mechanism and an electromagnetic system which is permanently connected to the secondary or auxiliary voltage while the vacuum circuit-breaker is closed. If the voltage falls below a predetermined value, unlatching of the release is enabled and the circuit-breaker is opened via the stored-energy mechanism.

The deliberate tripping of the undervoltage release generally takes place via an NC contact in the tripping circuit or via an NO contact by short-circuiting the magnet coil. With this type of tripping, the short-circuit current is limited by the built-in resistors. Undervoltage releases can also be connected to voltage transformers. When the operating voltage drops to impermissibly low levels, the circuit-breaker is tripped automatically.

For delayed tripping, the undervoltage release can be combined with energy stores.

Closing

In the standard version of the stored-energy mechanisms, 3AH5 vacuum circuit-breakers can be remote-closed electrically. They can also be closed locally by mechanical unlatching of the closing spring via pushbutton. With spring operated mechanisms, closing obligatory takes place after the charging process.

An electrical closing lock-out prevents unpermissible closing of the circuit-breaker. The closing lock-out releases the operation of the circuit-breaker when auxiliary voltage is available, and blocks both local manual closing and remote electrical closing mechanically when there is no auxiliary voltage available.

The operating voltage of the electrical closing lock-out is the same as that of the closing solenoid. If constant CLOSE and OPEN commands are present at the vacuum circuit-breaker at the same time, the vacuum circuit-breaker will return to the open position after closing. It remains in this position until a new CLOSE command is given. In this manner, continuous closing and opening (= "pumping") is prevented.

Interlocking

Mechanical interlocking for stored-energy mechanisms

To interlock circuit-breaker trucks, withdrawable parts or disconnectors according to the switch position, the stored energy mechanisms of 3AH5 circuit-breakers can be equipped with a mechanical interlocking. A sensor at the switchgear checks the position of the circuit-breaker and prevents the open circuit-breaker in a reliable way from being closed mechanically and electrically.

Electrical interlocking

The vacuum circuit-breakers can be integrated in electromagnetic feeder or switchgear interlocks. In case of electrical interlocking, the disconnector or its operating mechanism is equipped with a magnetic lock-out mechanism. This mechanism is controlled by an auxiliary contact of the circuit-breaker, so that the disconnector can only be operated when the circuit-breaker is open. On the other hand, the vacuum circuit-breaker is also controlled by the disconnector or its operating mechanism, so that it can only be closed when the disconnector is in an end position. For this purpose, the circuit-breaker operating mechanism must be equipped with a closing lock-out (see "Closing").

Standards

3AH5 vacuum circuit-breakers conform to the following standards:

- IEC 62271-100 (former IEC 60056)
- IEC 62271-1 (former IEC 60694)
- VDE 0671 (former VDE 0670 Part 100 and VDE 0670 Part 1000)

All 3AH5 vacuum circuit-breakers fulfil the endurance classes E2, M2 and C2 according to IEC 62271-100.

Maintenance-free design

The 3AH5 vacuum circuit-breakers are maintenance-free:

- Under normal ambient conditions according to IEC 62271-1 (former IEC 60694).
- Up to 10,000 operating cycles,
 - no relubrication, no readjustment required
 - and within their tolerances, the characteristics are independent of the switching rate or of standing times without switching operations.

Ambient conditions

The vacuum circuit-breakers are designed for the normal operating conditions defined in IEC 62271-100.

Condensation can occasionally occur under the ambient conditions shown opposite. 3AH5 vacuum circuit-breakers are suitable for use in the following climatic classes according to IEC 60721, Part 3-3:

Climatic ambient conditions:	Class 3K4 ¹⁾
Biological ambient conditions:	Class 3B1
Mechanical ambient conditions:	Class 3M2
Chemically-active substances:	Class 3C2 ²⁾
Mechanically-active substances:	Class 3S2 ³⁾

- 1) Low temperature limit: – 5 °C
- 2) Without icing and wind-driven precipitation
- 3) Restriction: Clean insulation parts

Current carrying capacity (see diagram)

The rated normal currents specified in the opposite diagram have been defined according to IEC 62271-100 for an ambient air temperature of + 40 °C and apply to open switchgear. For enclosed switchgear the data of the switchgear manufacturer applies. At ambient air temperatures below + 40 °C, higher normal currents can be carried.

- Characteristics curve 1 = Rated normal current 800 A
- Characteristics curve 2 = Rated normal current 1250 A
- Characteristics curve 3 = Rated normal current 2000 A
- Characteristics curve 4 = Rated normal current 2500 A

Dielectric strength

The dielectric strength of air insulation decreases with increasing altitude due to low air density. According to IEC 62271-1, the values of the rated lightning impulse withstand voltage and the rated short-duration power frequency withstand voltage specified in the chapter "Technical Data" apply to a site altitude of 1000 m above sea level. For an altitude above 1000 m, the insulation level must be corrected according to the opposite diagram. The characteristic shown applies to both rated withstand voltages.

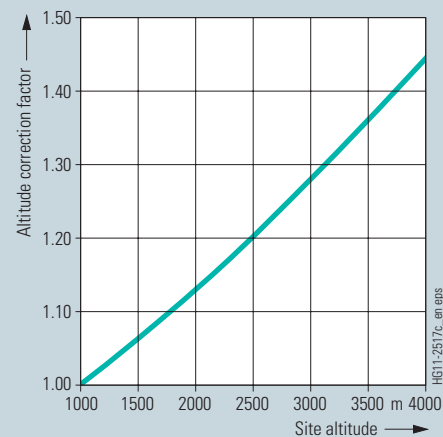
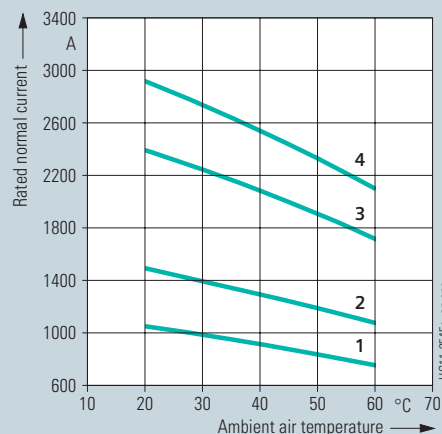
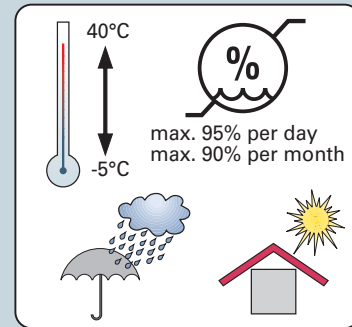
To select the devices, the following applies: $U \geq U_0 \times K_a$

- U Rated withstand voltage under reference atmosphere
- U_0 Rated withstand voltage requested for the place of installation
- K_a Altitude correction factor according to the opposite diagram

Example

For a requested rated lightning impulse withstand voltage of 75 kV at an altitude of 2500 m, an insulation level of 90 kV under reference atmosphere is required as a minimum:

$$90 \text{ kV} \geq 75 \text{ kV} \times 1.2$$



Description

Product range overview and basic equipment

1

Product range overview 3AH5

Rated voltage kV	Rated short-circuit breaking current kA	Rated normal current (A)											
		800			1250			2000			2500		
		Pole-centre distance (mm)											
		160	210	275	160	210	275	350	210	275	350	210	275
12	13.1	■	■										
	16	■	■		■	■							
	20	■	■		■	■			■				
	25	■	■		■	■			■			■	
	31.5				■	■			■			■	
17.5	25	■	■		■	■						■	
	31.5				■	■			■			■	
24	16		■	■		■	■						
	20					■	■		■	■		■	■
	25					■	■					■	■
36	16						■	■					
	25						■	■			■		

■ Available design

For the endurance class C2, all circuit-breakers fulfil the following values according to IEC 62271-100

Rated voltage U_r kV, r.m.s.	Line	Cable	Single capacitor bank	Back-to-back capacitor bank ¹⁾	
	Rated line-charging breaking current I_l A, r.m.s.	Rated cable-charging breaking current I_c A, r.m.s.	Rated single capacitor bank breaking current ²⁾ I_{sb} A, r.m.s.	Rated back-to-back capacitor bank breaking current I_{bb} A, r.m.s.	Frequency of the inrush current f_{bl} Hz
12	10	25	400	400	4250
17.5	10	31.5	400	400	4250
24	10	31.5	400	400	4250
36	10	50	400	400	4250

1) Rated back-to-back capacitor bank making current for a back-to-back capacitor bank – see chapter 3: Technical data

2) The capacitive switching capacity of the circuit-breaker is 0.7xI, above the standard specification.

Basic equipment

In the basic version, the 3AH5 is equipped with a manual spring-operated mechanism. The following overview shows the alternatively selectable or additional equipment, as well as the possibility of designing the switching device with stored-energy mechanisms.

Equipment features for the different types of operating mechanisms

Type of operating mechanism	Closing solenoid	Electrical closing lock-out ³⁾	1 st shunt release	2 nd release	Counter	Circuit-breaker tripping signal	Auxiliary switch 2NO+2NC	Auxiliary switch 6NO+6NC	Auxiliary switch 12NO+ 12NC	Without terminal strip	24-pole terminal strip	24-pole plug connection	64-pole plug connection	Mechanical interlocking
Manual spring operated mechanism ¹⁾	-	-	■	○	■	○	X	X	-	X	X	X	-	○
Manual operating stored-energy mechanism ¹⁾	○	○	■	○	■	○	X	X	-	X	X	X	-	○
Motor operating stored-energy mechanism ²⁾	■	○	■	○	■	○	-	X	X ⁴⁾	-	X	X	X	○

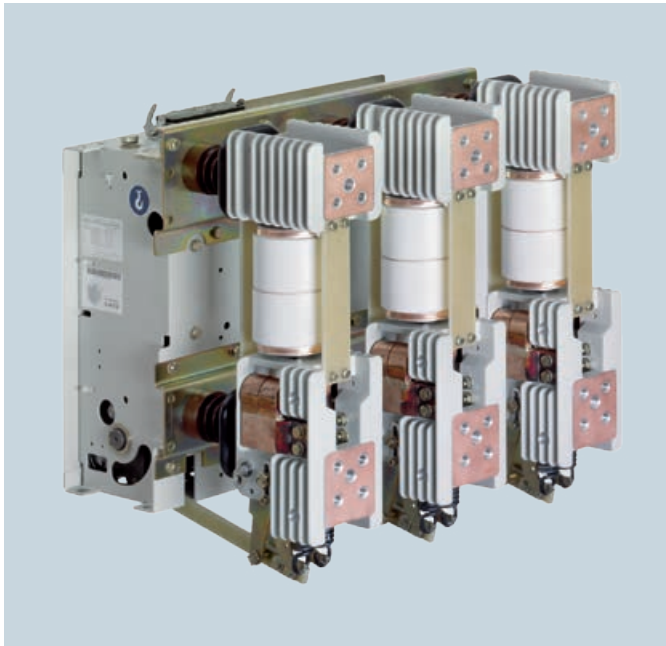
■ Basic equipment X Optionally selectable basic equipment ○ Selectable additional equipment - Not available

1) With manual operating mechanism, always with hand crank

2) With anti-pumping device

3) From pole-centre distance ≥ 210 mm

4) Only with 64-pole plug



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3AH5 135-6 vacuum circuit-breaker



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3AH5 204-1 vacuum circuit-breaker

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Voltage level 24 kV

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Voltage level 36 kV

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Operating voltage, 1st shunt release

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Operating voltage, 2nd release

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Counter and circuit-breaker tripping signal

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type of operating mechanism

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Equipment Selection

Order number structure and configuration example

Order number structure

The 3AH5 vacuum circuit-breakers consist of a primary and a secondary part. The relevant data make up the 16-digit order number. The primary part covers the main electrical data of the circuit-breaker poles. The secondary part covers the auxiliary devices which are necessary for operating and controlling the vacuum circuit-breaker.

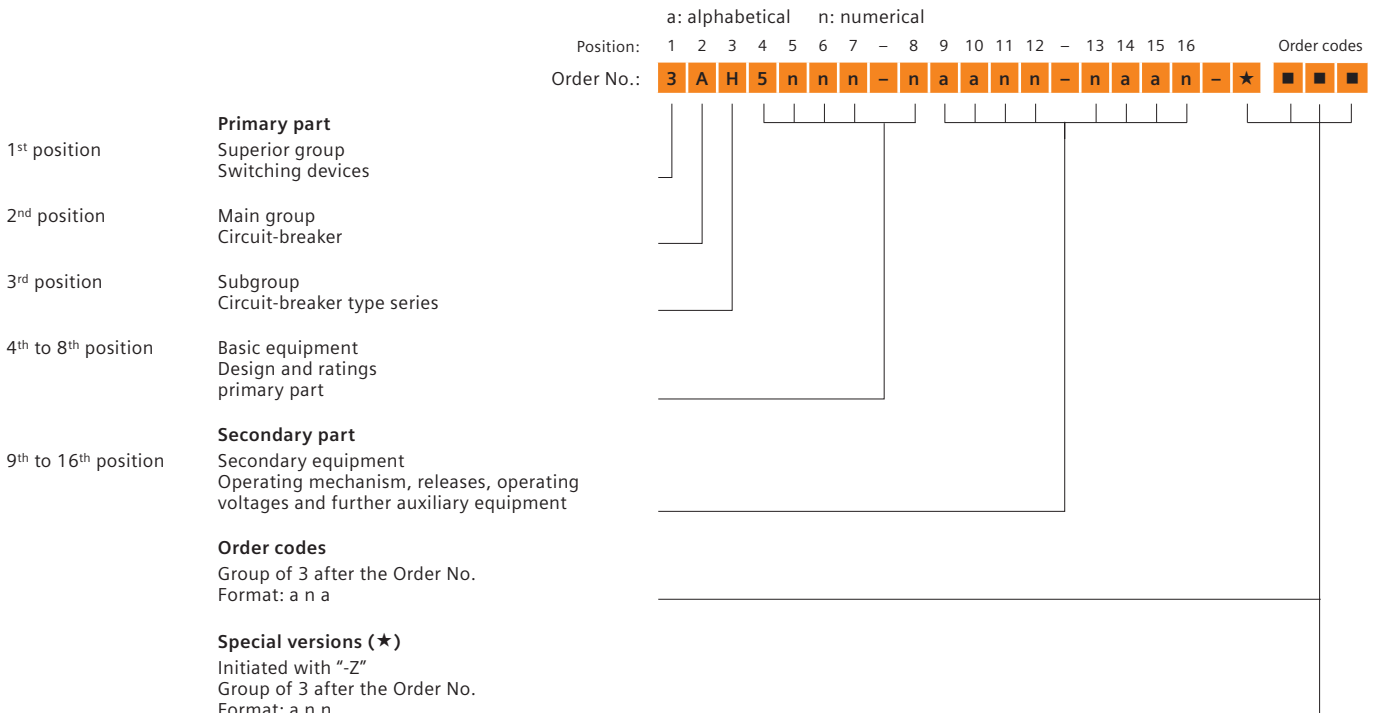
Order codes

Individual equipment versions, marked with "9" or "Z" in the 9th to 16th position, are explained more in detail by a 3-digit order code. Several order codes can be added to the order number in succession and in any sequence.

Special versions (★)

In case of special versions, "-Z" is added to the order number and a descriptive order code follows. If several special versions are required, the suffix "-Z" is listed only once. If a requested special version is not in the catalog and can therefore not be ordered via order code, it has to be identified with Y 9 9 after consultation. The agreement here to is made directly between your responsible sales partner and the order processing department in the Switchgear Factory Berlin.

2



Configuration example

In order to simplify the selection of the correct order number for the requested circuit-breaker type, you will find a configuration example on each page of the chapter "Equipment Selection". For the selection of the secondary part, always the last example of the primary part was taken over and continued, so that at the end of the equipment selection (page 20) a completely configured circuit-breaker results as an example.

On the foldout page we offer a configuring aid. Here you can fill in the order number you have determined for your circuit-breaker.

Example for Order No.:

3	A	H	5	1	2	2	-	1	■	■	■	■	-	■	■	■	■	■	■	■	■	■	■
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Order codes:

■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Equipment Selection

Selection of secondary equipment



10th position

Operating voltage of the closing solenoid

		Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Order codes					
		Order No.:	3	A	H	5	■	■	■	-	■	■	■	■	-	■	■	■	■	■				
Standard voltages	Special voltages													See page 17		See page 18	See page 18	See page 19	See page 19	See page 20				
To be observed for selection!																								
• Manual spring-operat.mechan. generally without closing solenoid (A)																								
• Man. operat. stored-energy mechan. option. with closing solenoid (A – Z)																								
• Motor op. stored-energy mech. generally with closing solenoid (B – Z)																								
Without closing solenoid												A												
24 V DC												B												
48 V DC												C												
60 V DC												D												
110 V DC												E												
220 V DC												F												
100 V AC 50/60 Hz ¹⁾												H												
110 V AC 50/60 Hz ¹⁾												J												
230 V AC 50/60 Hz ¹⁾												K												
												Z		With order code							K 1	A		
												Z		With order code								K 1	B	
												Z		With order code								K 1	C	
												Z		With order code								K 1	D	
												Z		With order code								K 1	E	
												Z		With order code								K 1	F	
												Z		With order code								K 1	K	
												Z		With order code								K 1	L	
												Z		With order code								K 1	M	

11th position

Operating voltage of the 1st shunt release

		Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Order codes					
		Order No.:	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Standard voltages	Special voltages																							
To be observed for selection!																								
24 V DC														1										
48 V DC														2										
60 V DC														3										
110 V DC														4										
220 V DC														5										
100 V AC 50/60 Hz ¹⁾														6										
110 V AC 50/60 Hz ¹⁾														7										
230 V AC 50/60 Hz ¹⁾														8										
														9		With order code						L 1	F	
														9		With order code						L 1	B	
														9		With order code						L 1	C	
														9		With order code						L 1	D	
														9		With order code						L 1	E	
														9		With order code						L 1	F	
														9		With order code						L 1	K	
														9		With order code						L 1	L	
														9		With order code						L 1	M	

1) The AC frequency 50 or 60 Hz is selected at the 16th position of the order number together with the language (see page 19)

Configuration example

3AH5 vacuum circuit-breaker

($U_l = 36 \text{ kV}$, $I_{SC} = 25 \text{ kA}$, $I_r = 2000 \text{ A}$, pole-centre distance = 350 mm)

Operating voltage of the closing solenoid 48 V DC (manual operating stored-energy mechanism)

Operating voltage of the 1st shunt release 48 V DC

Example for Order No.: **3 A H 5 3 1 4 - 4 U C 2 - - - - - Z**
 Order codes: **A 4 6**

Equipment Selection

Selection of secondary equipment



13th position

Counter and circuit-breaker tripping signal

Position: 1 2 3 4 5 6 7 - 8 9 10 11 12 - 13 14 15 16 Order codes

Order No.: 3 A H 5 ■ ■ ■ - ■ ■ ■ ■ ■ ■ ■ ■ - ■ ■ ■ ■ ■ - ■ ■ ■ ■ - ★ ■ ■ ■ ■

Attention! Selection of the counter and the circuit-breaker tripping signal depends on the selection of the secondary connection.

Counter	Circuit-breaker tripping signal	Without terminal strip/plug	24-pole terminal strip/plug	64-pole plug	Definition 15 th position (See page 19)
■		○			A, B
■			○		E, F, G, and H
■	■		○		E, F, G and H
■	■			○	J, K, L, ¹⁾ and M

■ Equipment to be selected ○ Dependent equipment

1) Equipment only possible in combination with motor operating stored-energy mechanism

14th position

Operating voltage of the operating mechanism/ type of operating mechanism

Type of operating mechanism/ standard voltages	Special voltages
Manual operat. stored-energy mechan. (hand crank incl. in the scope of supply)	
Manual spring-operated mechan. (hand crank incl. in the scope of supply)	
Motor operating stored-energy mechan. (selection of an operating voltage)	
24 V DC	
48 V DC	
60 V DC	
110 V DC	
220 V DC	
100 V AC 50/60 Hz ²⁾	
110 V AC 50/60 Hz ²⁾	
230 V AC 50/60 Hz ²⁾	
	30 V DC
	32 V DC
	120 V DC
	125 V DC
	127 V DC
	240 V DC
	120 V AC 50/60 Hz ²⁾
	125 V AC 50/60 Hz ²⁾
	240 V AC 50/60 Hz ²⁾

2) The AC frequency 50 or 60 Hz is selected at the 16th position of the order number together with the language (see page 19)

Configuration example

3AH5 vacuum circuit-breaker

($U_f = 36 \text{ kV}$, $I_{SC} = 25 \text{ kA}$, $I_r = 2000 \text{ A}$, pole-centre distance = 350 mm)

With counter and circuit-breaker tripping signal

Manual operating stored-energy mechanism

3 A H 5

3 1 4 - 4 U C 2 0 -

2

A

Example for Order No.:

Order codes:

3 A H 5 3 1 4 - 4 U C 2 0 - 2 A ■ ■ - Z
A 4 6

2

On request, we will be pleased to send you an overview of accessories and spare parts, as well as the spare circuit-breaker poles available. Please consider the following information for your purchase order.

Remark for orders

The order numbers are applicable to vacuum circuit-breakers of current manufacture. When mounting parts or spare parts are being ordered for an existing vacuum circuit-breaker, always quote the type designation, serial number and the year of manufacture of the circuit-breaker to be sure to get the correct delivery.

Retrofitting

When releases/solenoids are retrofitted, the order numbers of the mounting parts must also be specified. For other additional equipment, the required mounting parts are included in the delivery.

Spare parts

As spare parts, the vacuum interrupters are always supplied as a complete pole including post insulator.

To select the correct spare interrupter, please specify the type designation, serial number and year of manufacture of the circuit-breaker. All data is given on the rating plate.

Vacuum interrupters and other spare parts must only be replaced by instructed personnel.

Accessories for the plug connector

Included in the scope of supply of the basic equipment for 3AH5 vacuum circuit-breakers:

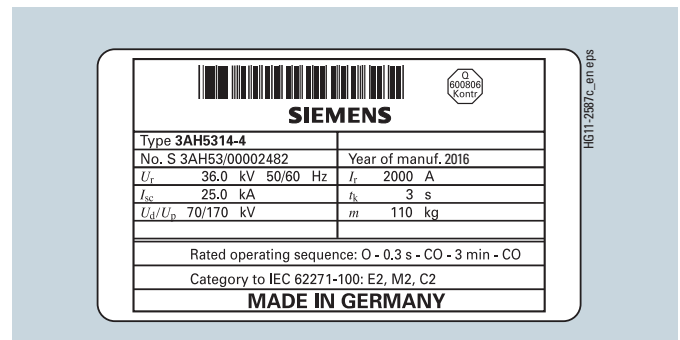
For 24-pole plug connector

- Lower part of plug
- Crimp sockets according to number of contacts
- Upper part of plug with screwed contacts (no crimp sockets required)

For 64-pole plug connector

- Lower part of plug
- Upper part of plug
- Crimp sockets according to number of contacts

Data on the rating plate



Note:

For any query regarding spare parts, subsequent deliveries, etc. the following three details are necessary:

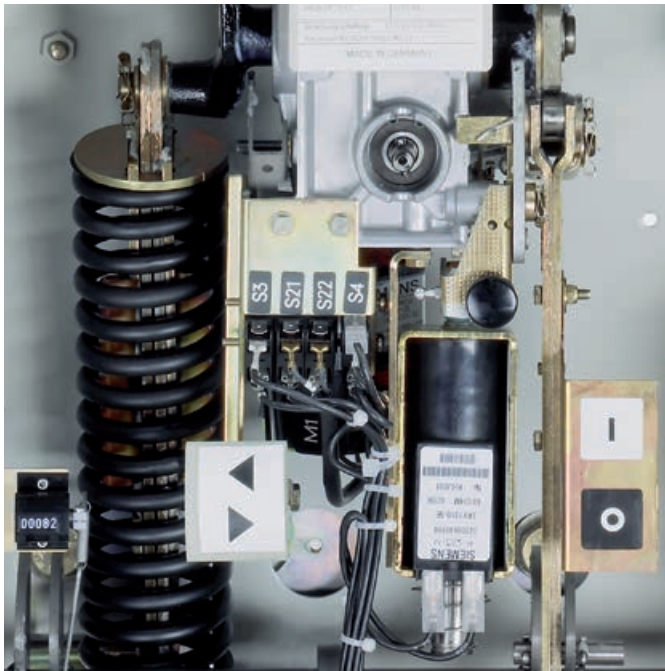
- Type designation
- Serial No.
- Year of manufacture

Accessories

Designation	Remarks	Operating voltage	Order No.
Hand crank	Short design		3AX15 30-4A
for charging	Standard design		3AX15 30-4B
the closing spring	Long design		3AX15 30-4C
	Bit for battery screwdriver		3AX15 30-3D
Wire bundle	With 10 wires for connection of auxiliary switch to		
	– 64-pole plug connector		3AX11 34-2D
	– 24-pole plug connector		3AX11 34-2B
	– 24-pole terminal strip		3AX11 34-2C
64-pole plug connector	Upper part of plug incl. sockets		3AX11 34-5A
	Lower part of plug incl. pins		3AX11 34-5B
	Complete plug connector		3AX11 34-6A
24-pole plug connector	Upper part of plug incl. socket insert		3AX11 34-5C
	Lower part of plug incl. pins		3AX11 34-5D
	Complete plug connector		3AX11 34-7A
Accessories for plug connector	(for wire cross-section 1.5 mm ²)		
	Crimp pins for lower part of plug	24-pole	3AX11 34-3A
		64-pole	3AX11 34-4B
	Crimp sockets for upper part of plug	64-pole	3AX11 34-4C
	Crimping pliers		3AX11 34-4D
	Disassembly tool		3AX11 34-4G



R-HG11-201-eps



R-HG11-202.eps

Motor operating mechanism with energy store and closing solenoid



R-HG11-203.tif

Upper pole support with conductor bar connection

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Electrical data, dimensions, weights and dimension drawings

Voltage level 12 kV	24
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Voltage level 36 kV	30

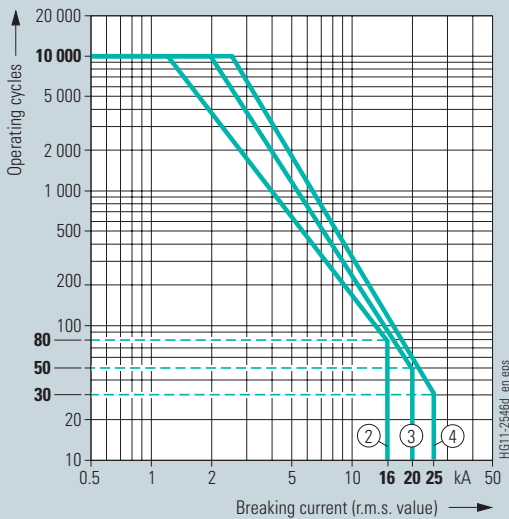
Operating times, short-circuit protection of motors, consumption data of releases

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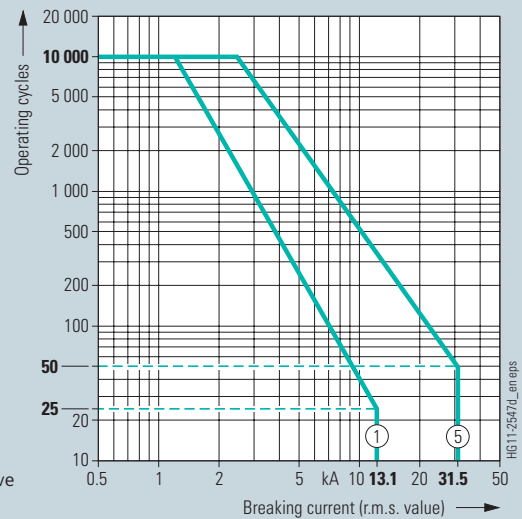
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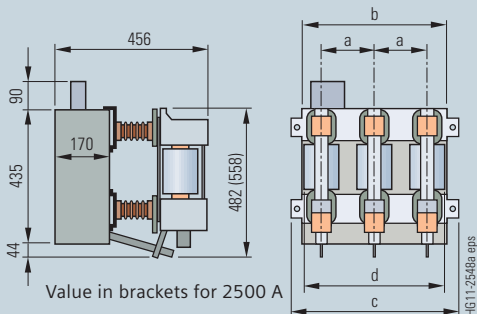
Operating cycle diagrams for 12 kV



The permissible number of electrical operating cycles is shown as a function of the breaking current (r.m.s. value). All vacuum circuit-breakers fulfil the endurance classes E2, M2 and C2 according to IEC 62271-100. The curve shape beyond the parameters defined in IEC 62271-100 is based on average experience data. The number of operating cycles that can actually be reached can be different depending on the respective application.



Dimension drawing for 12 kV

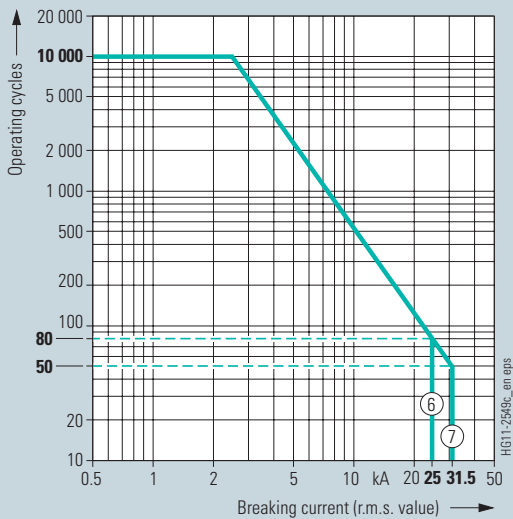


Dimension drawing	a mm	b mm	c mm	d mm
1.1	160	432	490	392
1.2	210	534	592	492
1.3	160	432	490	409
1.4	210	534	592	509
1.5	160	432	490	422
1.6	210	534	592	539
1.7	210	534	592	522
1.8	160	432	490	405
1.9	210	534	592	505

- a = Pole-centre distance
- b = Width of cross member
- c = Width of cross member incl. lugs
- d = Largest energized width

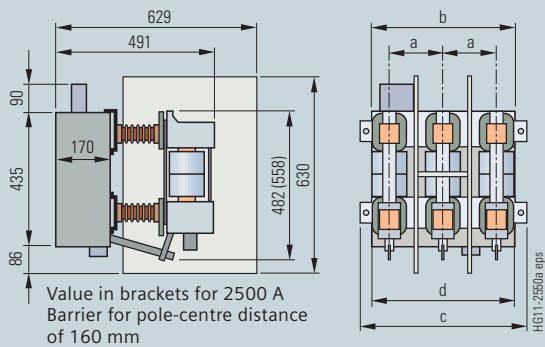


Operating cycle diagram for 17.5 kV



The permissible number of electrical operating cycles is shown as a function of the breaking current (r.m.s. value). All vacuum circuit-breakers fulfil the endurance classes E2, M2 and C2 according to IEC 62271-100. The curve shape beyond the parameters defined in IEC 62271-100 is based on average experience data. The number of operating cycles that can actually be reached can be different depending on the respective application.

Dimension drawing for 17.5 kV



Dimension drawing	a mm	b mm	c mm	d mm
2.1	160	432	490	422
2.2	210	534	592	522
2.3	210	534	592	534

- a = Pole-centre distance
- b = Width of cross member
- c = Width of cross member incl. lugs
- d = Largest energized width

Technical Data

Electrical data, dimensions, weights and dimension drawings

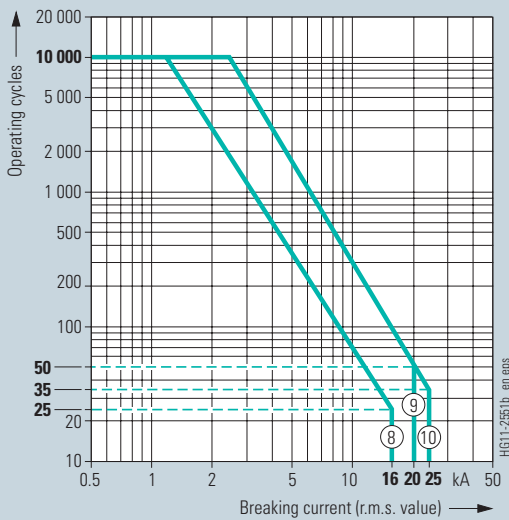
Order No.	24 kV 50/60 Hz		Rated normal current			Pole-centre distance			Rated operating sequence: O – 3 min – CO – 3 min – CO O – 0.3 s – CO – 3 min – CO O – 0.3 s – CO – 15 s – CO			Rated duration of short-circuit		Rated short-circuit breaking current		DC component in % of the rated short-circuit breaking current		Asymmetrical breaking current		Rated short-circuit making current (at 50/60 Hz)		Rated back-to-back capacitor bank making current		Rated lightning impulse withstand voltage		Rated short-duration power-frequency withstand voltage		Voltage drop ΔU between connections (according to IEC 62271-1 at DC 100 A)		Minimum creepage distance, interrupter		Minimum creepage distance, phase-to-earth		Minimum clearance, phase-to-phase		Minimum clearance, phase-to-earth		Weights		Detailed dimension drawing (can be ordered)		Operating cycle diagram no. (see page 29)		Catalog dimension drawing no. (see page 29)	
	I_r	A	mm	t_k	s	I_{sc}	kA	%	kA	I_{ma}	kA	I_{bi}	kA Peak	U_p	kV	U_d	kV	mV	mm	mm	mm	mm	mm	kg	S_																				
3AH5 272-1...	800	210	□ ■ ○	3	16	36	17.9	40/42	10	125	50	3.8	200	190	215	175	55	S_ 441 00660	8	3.1																									
3AH5 272-2...	1250	210	□ ■ ○	3	16	36	17.9	40/42	10	125	50	3.8	200	190	215	175	55	S_ 441 00660	8	3.1																									
3AH5 273-2...	1250	210	□ ■ ○	3	20	36	22.4	50/52	20	125	50	3.8	200	190	215	175	55	S_ 441 00662	9	3.2																									
3AH5 273-4...	2000	210	□ ■ ○	3	20	36	22.4	50/52	20	125	50	2.2	200	190	227	175	80	S_ 441 00663	9	3.3																									
3AH5 273-6...	2500	210	□ ■ ○	3	20	36	22.4	50/52	20	125	50	2.2	200	190	227	175	80	S_ 441 00663	9	3.3																									
3AH5 274-2...	1250	210	□ ■ ○	3	25	36	28	63/65	20	125	50	3.8	200	190	260	175	55	S_ 441 00662	10	3.2																									
3AH5 274-6...	2500	210	□ ■ ○	3	25	36	28	63/65	20	125	50	2.2	200	190	227	175	80	S_ 441 00663	10	3.3																									
3AH5 282-1...	800	275	□ ■ ○	3	16	36	17.9	40/42	10	125	50	3.8	200	190	180	175	55	S_ 441 00661	8	3.4																									
3AH5 282-2...	1250	275	□ ■ ○	3	16	36	17.9	40/42	10	125	50	3.8	200	190	180	175	55	S_ 441 00661	8	3.4																									
3AH5 283-2...	1250	275	□ ■ ○	3	20	36	22.4	50/52	20	125	50	3.8	200	190	165	175	55	S_ 441 00664	9	3.5																									
3AH5 283-4...	2000	275	□ ■ ○	3	20	36	22.4	50/52	20	125	50	2.2	200	190	135	175	80	S_ 441 00668	9	3.6																									
3AH5 283-6...	2500	275	□ ■ ○	3	20	36	22.4	50/52	20	125	50	2.2	200	190	135	175	80	S_ 441 00668	9	3.6																									
3AH5 284-2...	1250	275	□ ■ ○	3	25	36	28	63/65	20	125	50	3.8	200	190	165	175	55	S_ 441 00664	10	3.5																									
3AH5 284-6...	2500	275	□ ■ ○	3	25	36	28	63/65	20	125	50	2.2	200	190	135	175	80	S_ 441 00668	10	3.6																									

■ Standard information on the rating plate

□ Possible with order number suffix Z and order code F27, or standard for manual operating mechanism (14th position A or X)

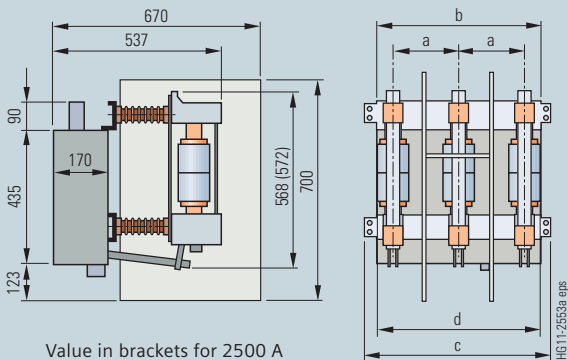
○ Possible with order number suffix Z and order code F28

Operating cycle diagram for 24 kV



The permissible number of electrical operating cycles is shown as a function of the breaking current (r.m.s. value). All vacuum circuit-breakers fulfil the endurance classes E2, M2 and C2 according to IEC 62271-100. The curve shape beyond the parameters defined in IEC 62271-100 is based on average experience data. The number of operating cycles that can actually be reached can be different depending on the respective application.

Dimension drawing for 24 kV



Value in brackets for 2500 A
Barrier for pole-centre distance
of 160 mm

Dimension drawing	a mm	b mm	c mm	d mm
3.1	210	534	592	516
3.2	210	534	592	530
3.3	210	534	592	541
3.4	275	650	708	645
3.5	275	650	708	660
3.6	275	650	708	690

- a = Pole-centre distance
- b = Width of cross member
- c = Width of cross member incl. lugs
- d = Largest energized width

Technical Data

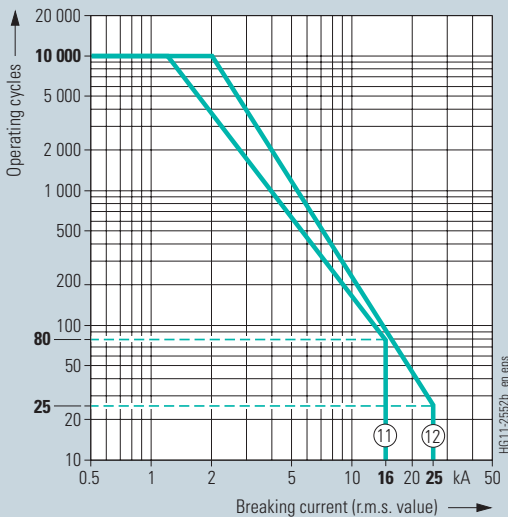
Electrical data, dimensions, weights and dimension drawings

Order No.	36 kV 50/60 Hz		Rated normal current		Pole-centre distance		Rated operating sequence: O – 3 min – CO – 3 min – CO O – 0.3 s – CO – 3 min – CO O – 0.3 s – CO – 15 s – CO			Rated duration of short-circuit		Rated short-circuit breaking current		DC component in % of the rated short-circuit breaking current		Asymmetrical breaking current		Rated short-circuit making current (at 50/60 Hz)		Rated back-to-back capacitor bank making current		Rated lightning impulse withstand voltage		Rated short-duration power-frequency withstand voltage		Voltage drop ΔU between connections (according to IEC 62271-1 at DC 100 A)		Minimum creepage distance, interrupter		Minimum creepage distance, phase-to-earth		Minimum clearance, phase-to-phase		Minimum clearance, phase-to-earth		Weights		Detailed dimension drawing (can be ordered)		Operating cycle diagram no. (see below)		Catalog dimension drawing no. (see below)	
	I_r	A	mm	t_k	s	I_{sc}	kA	%	kA	I_{ma}	kA	I_{bi}	kA Peak	U_p	kV	U_d	kV	mV	mm	mm	mm	mm	mm	mm	kg																		
3AH5 312-2...	1250	350	□	■	○	3	16	36	28	40/ 42	20	170	70	3.0	240	310	256	300	85	S_ 441 00910	11	4.2																					
3AH5 314-2...	1250	350	□	■	○	3	25	36	28	63/ 65	20	170	70	3.0	240	310	256	300	85	S_ 441 00910	12	4.2																					
3AH5 314-4...	2000	350	□	■	○	3	25	36	28	63/ 65	20	170	70	2.5	240	310	256	300	110	S_ 441 00676	12	4.2																					
3AH5 322-2...	1250	275	□	■	○	3	16	36	28	40/ 42	20	170	70	3.0	240	310	256	300	75	S_ 441 00990	11	4.1																					
3AH5 324-2...	1250	275	□	■	○	3	25	36	28	63/ 65	20	170	70	3.2	240	310	256	300	75	S_ 441 00990	12	4.1																					

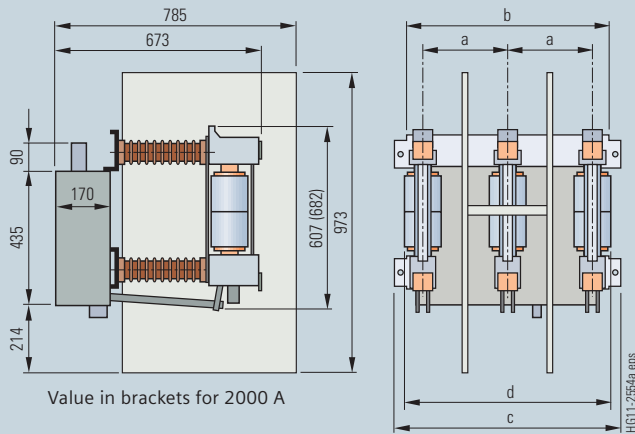
- Standard information on the rating plate
- Possible with order number suffix Z and order code F27, or standard for manual operating mechanism (14th position A or X)
- Possible with order number suffix Z and order code F28

3

Operating cycle diagram and dimension drawing for 36 kV



The permissible number of electrical operating cycles is shown as a function of the breaking current (r.m.s. value). All vacuum circuit-breakers fulfil the endurance classes E2, M2 and C2 according to IEC 62271-100. The curve shape beyond the parameters defined in IEC 62271-100 is based on average experience data. The number of operating cycles that can actually be reached can be different depending on the respective application.



Dimension drawing	a mm	b mm	c mm	d mm
4.1	275	650	708	668
4.2	350	810	868	818

- a = Pole-centre distance
- b = Width of cross member
- c = Width of cross member incl. lugs
- d = Largest energized width

Operating times

Operating times at rated voltage of the secondary circuit	Equipment of circuit-breaker	Operating time of circuit-breaker
Closing time	–	< 65 ms ¹⁾
Opening time	1 st shunt release	< 55 ms ¹⁾
	2 nd release	< 45 ms
Arcing time	–	< 15 ms
Break time	1 st shunt release	< 70 ms
	2 nd release	< 60 ms
Dead time	–	300 ms
CLOSE/OPEN contact time	1 st shunt release	< 75 ms
	2 nd release	< 60 ms
Minimum command duration	Closing solenoid	45 ms
	1 st shunt release	40 ms
	2 nd release	20 ms
Pulse time for circuit-breaker tripping signal	1 st shunt release	> 15 ms
	2 nd release	> 10 ms
Charging time for electrical operation	–	< 15 s
Synchronism error between the poles	–	≤ 2 ms

1) Shorter operating times on request.

Short-circuit protection of motors (fuse protection of drive motors)

Rated voltage of the motor V	Operating voltage		Power consumption of the motor		Smallest possible rated current ²⁾ of the m.c.b. (miniature circuit-breaker) with C-characteristic A
	max. V	min. V	W (at DC)	VA (at AC)	
DC 24	26	20	650	–	10
DC 48	53	41	650	–	8
DC 60	66	51	650	–	6
DC 110	121	93	650	–	4
DC 220	242	187	650	–	3
AC 110	121	93	–	650	3
AC 230	244	187	–	650	2

2) The current inrush in the drive motor can be neglected due to its very short presence.

Consumption data of releases

Release	Power consumption		Tripping ranges	
	Operation at		Tripping voltage at DC	Tripping voltage or tripping current at AC 50/60 Hz
	DC approx. W	AC 50/60 Hz approx. VA		
Closing solenoid 3AY15 10	140 – 210	140 – 210	85 to 110 % U	85 to 110 % U
1 st shunt release (without energy store) 3AY15 10	140	140	70 to 110 % U	85 to 110 % U
2 nd shunt release (with energy store) 3AX11 01	70	50	70 to 110 % U	85 to 110 % U
Undervoltage release 3AY11 03	20	20	35 to 0 % U	35 to 0 % U
Current-transformer operated release 3AX11 02 (rated normal current 0.5 A or 1 A)	–	10 ³⁾	–	90 to 110 % I _a
Current-transformer operated release 3AX11 04 (tripping pulse ≥ 0.1 Ws)	–	–	–	–

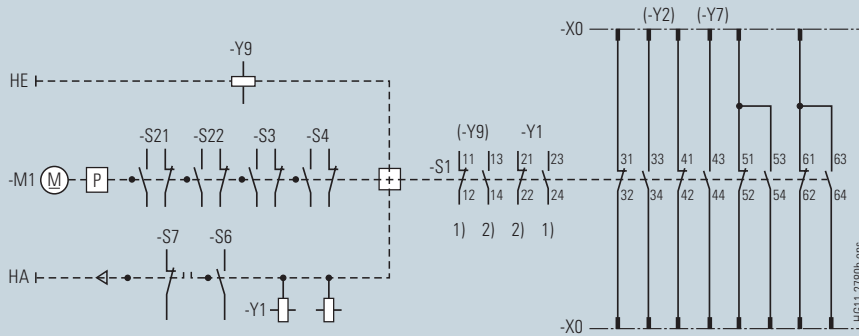
3) Consumption at pickup current (90 % of the rated normal current) and open armature.

Technical Data

Circuit diagrams

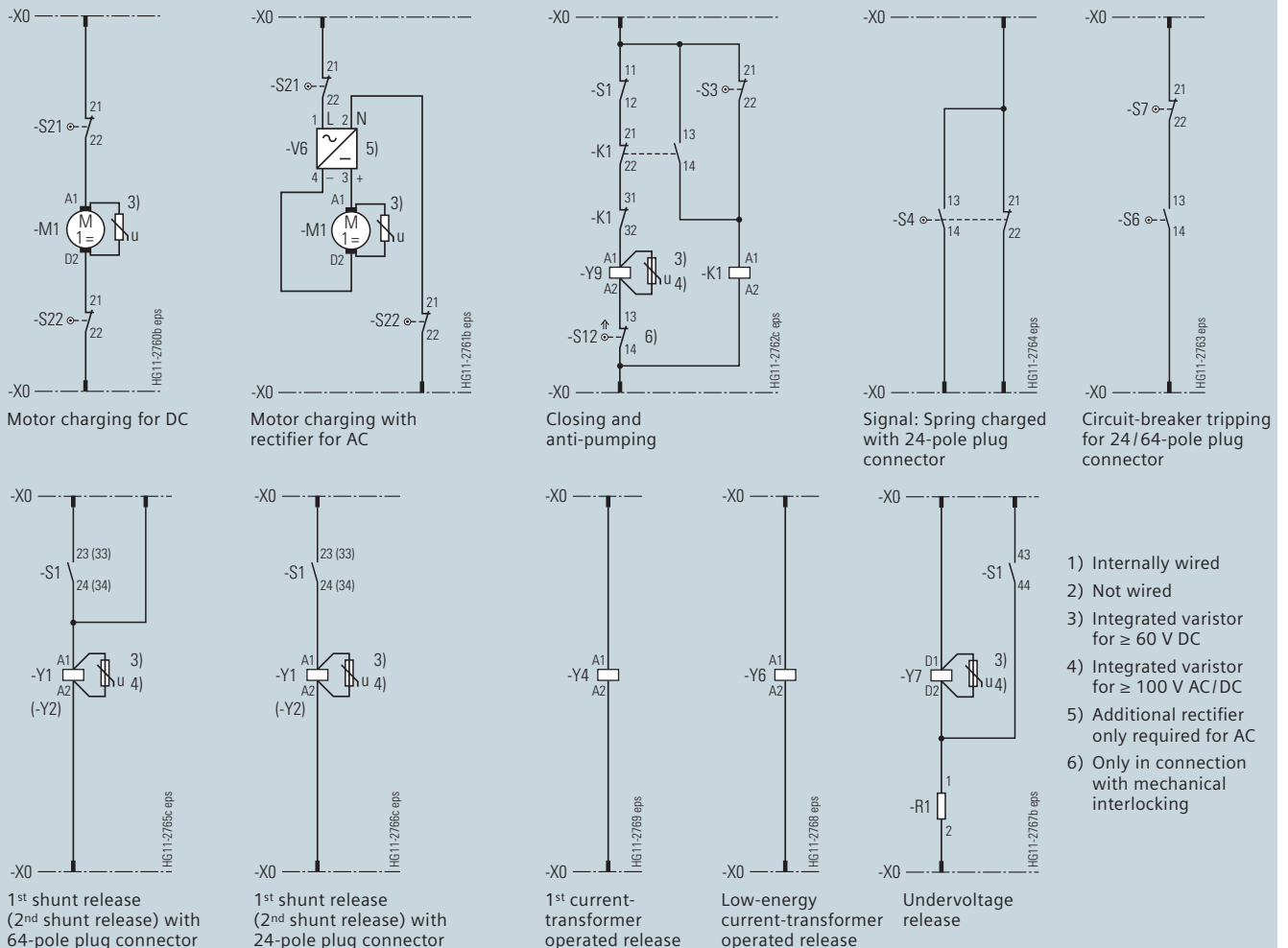
Circuit diagrams

The circuit diagrams shown here are examples from the manifold possibilities of circuit-breaker wiring.



Motor operating stored-energy mechanism

The available possible combinations are described in the chapter "Selection of secondary equipment".



- 1) Internally wired
- 2) Not wired
- 3) Integrated varistor for ≥ 60 V DC
- 4) Integrated varistor for ≥ 100 V AC/DC
- 5) Additional rectifier only required for AC
- 6) Only in connection with mechanical interlocking

Legend

HA Manual opening	S1 Auxiliary switch	S12 Mechanical interlocking	Y2 2nd shunt release
HE Manual closing	S3 Position switch (opens when closing spring is charged)	S21 Position switches	Y4 Current-transformer operated release
K1 Contactor (anti-pumping)	S4 Position switch (indicates the charging state)	S22 (to de-energize the motor operating mechanism after charging)	Y6 Low-energy current-transformer operated release
M1 Motor operating mechanism	S6 Circuit-breaker tripping signal	V6 Rectifier	Y7 Undervoltage release
P Energy store	S7 Cutout switch for circuit-breaker tripping signal	X0 Lower part of plug	Y9 Closing solenoid
R1 Resistance		Y1 1st shunt release	



R-HG11-181.eps

Brandenburg Gate, Berlin, Germany



R-HG11-180.eps

Switchgear Factory, Berlin, Germany

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Configuration aid

Foldout page

Annex

Inquiry form

Please copy, fill in and return to your Siemens partner.

Inquiry concerning

3AH5 circuit-breaker

Please

- Submit an offer
- Call us
- Visit us

Your address

Company

Dept.

Name

Street

Postal code/city

Country

Phone

Fax

E-mail

Siemens AG

Dept.

Name

Street

Postal code/city

Country

Fax

Technical data

				Other values
Rated voltage	<input type="checkbox"/> 12 kV <input type="checkbox"/> 24 kV	<input type="checkbox"/> 17.5 kV <input type="checkbox"/> 36 kV		<input type="checkbox"/> ___ kV
Rated lightning impulse withstand voltage	<input type="checkbox"/> 75 kV <input type="checkbox"/> 125 kV	<input type="checkbox"/> 95 kV <input type="checkbox"/> 170 kV		<input type="checkbox"/> ___ kV
Rated short-duration power-frequency withstand voltage	<input type="checkbox"/> 28 kV <input type="checkbox"/> 50 kV	<input type="checkbox"/> 38 kV <input type="checkbox"/> 70 kV	<input type="checkbox"/> 42 kV	<input type="checkbox"/> ___ kV
Rated short-circuit breaking current	<input type="checkbox"/> 13.1 kA <input type="checkbox"/> 25 kA	<input type="checkbox"/> 16 kA <input type="checkbox"/> 31.5 kA	<input type="checkbox"/> 20 kA	<input type="checkbox"/> ___ kA
Rated normal current	<input type="checkbox"/> 800 A <input type="checkbox"/> 2000 A	<input type="checkbox"/> 1250 A <input type="checkbox"/> 2500 A		<input type="checkbox"/> ___ A
Pole-centre distance	<input type="checkbox"/> 160 mm	<input type="checkbox"/> 210 mm	<input type="checkbox"/> 275 mm	<input type="checkbox"/> 350 mm

Secondary equipment

For possible combinations see pages 15 to 19

Circuit-breaker equipment Manual spring-operated mechanism
 Manual operating stored-energy mechanism
 Motor operating stored-energy mechanism

Motor operating mechanism ___ V DC ___ V AC, ___ Hz

Closing solenoid ___ V DC ___ V AC, ___ Hz

1st shunt release ___ V DC ___ V AC, ___ Hz

2nd shunt release ___ V DC ___ V AC, ___ Hz

Current-transformer operated release 0.5 A 1 A ≥ 0.1 Ws 10 Ω ≥ 0.1 Ws 20 Ω

Undervoltage release ___ V DC ___ V AC, ___ Hz

Auxiliary switch 2 NO + 2 NC 6 NO + 6 NC 12 NO + 12 NC

Low-voltage connection without 24-pole terminal strip 24-pole plug 64-pole plug

Mechanical interlocking

Counter

Circuit-breaker tripping signal

Electrical closing lock-out

Operating instructions English German French Spanish

Application and other requirements

Please check off ___ Please fill in

You prefer to configure your 3AH5 vacuum circuit-breaker on your own?

Follow the steps to the configuration and enter the order number in the configuration aid.

Instruction for configuration of the 3AH5 vacuum circuit-breaker

1st step: Definition of the primary part (see page 13 to 14)

Please specify the following ratings:	Possible options:
Rated voltage (U_r)	U_r : 12 kV, 17.5 kV, 24 kV, 36 kV
Rated lightning impulse withstand voltage (U_p)	U_p : 75 kV, 95 kV, 125 kV, 170 kV
Rated short-duration power-frequency withstand voltage (U_d)	U_d : 28 kV, 38 kV, 42 kV, 50 kV, 70 kV
Rated short-circuit breaking current (I_{sc})	I_{sc} : 13.1 kA, 16 kA, 20 kA, 25 kA, 31.5 kA
Rated normal current (I_n)	160 mm, 210 mm, 275 mm, 350 mm
Pole-centre distance	I_r : 800 A, 1250 A, 2000 A, 2500 A

These ratings define the positions 5 to 8 of the order number.

2nd step: Definition of the secondary equipment (see pages 15 to 19)

Please specify the following equipment features:	Possible options:
Release combination (position 9)	Shunt release, current-transformer operated release and undervoltage release
Closing solenoid (position 10)	Operating voltages from 24 V DC to 240 V AC
Operating voltage of the releases (positions 11/12)	Operating voltages from 24 V DC to 240 V AC
Equipment with circuit-breaker tripping signal (position 13)	Equipment depends on the selection of the secondary connection
Type of operating mechanism and operating voltage of a motor, if available (position 14)	Manual spring-operated mechanism, manual operating stored-energy mechanism, motor operating stored-energy mechanism with operating voltages from 24 V DC to 240 V AC
Number of auxiliary contacts (position 15)	2 NO + 2 NC, 6 NO + 6 NC, 12 NO + 12 NC
Design of the secondary connection (position 15)	24-pole terminal strip, 24-pole plug connector, 64-pole plug connector, without plug connector
Language of the documentation (position 16)	English, German, French, Spanish, other languages on request
Frequency of the operating voltage of the secondary equipment at AC (position 16)	50 Hz/60 Hz

These equipment features define the positions 9 to 16 of the order number.

3rd step: Do you have any further requirements concerning the equipment? (see page 20)

Your Siemens sales partner will be pleased to support you.



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2017

