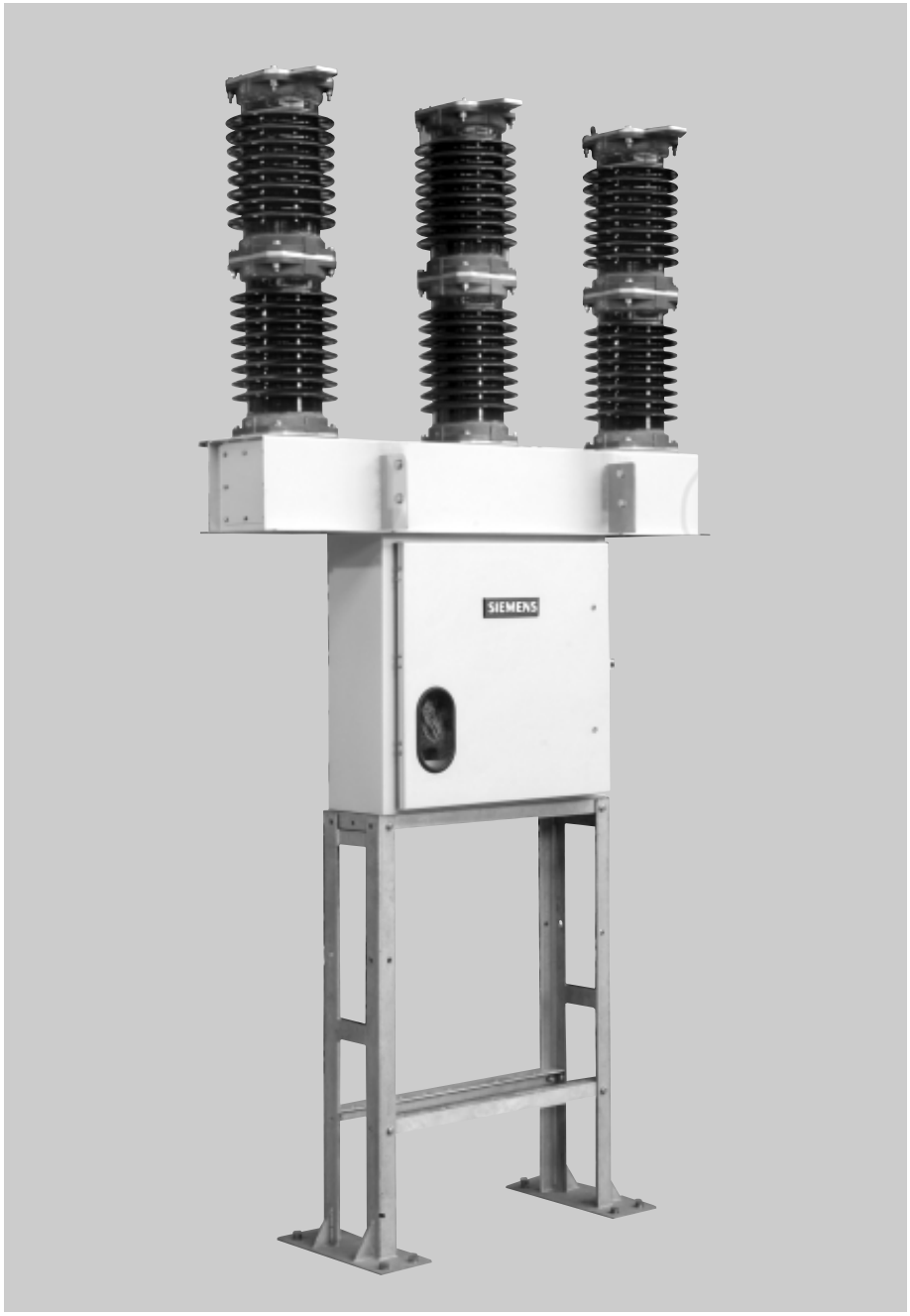
SIEMENS

3AF 01
Outdoor Vacuum Switchgear
36 kV

Operating Instructions Manual **4P-0080-03-95273-001AB**



Contents

Instructions regarding Safety

This manual contains information titled 'NOTE', 'CAUTION', 'WARNING' & 'DANGER'. These titles indicate the following:-

NOTE:
This indicates an interesting or helpful information is provided.

CAUTION:
This indicates a condition which may result in damage to the equipment or its parts or minor personal injury if the caution is not heeded to. Follow the advice provided with the caution.

WARNING:
This indicates a condition which may result in property damage or injury to persons if the warning is not heeded to. Follow the advice provided with the warning.

DANGER:
This indicates a condition of high voltage availability which may lead to substantial property damage or death of a person if the danger is not heeded to. Follow the advice provided with the danger.

Qualified personnel

For the purpose of these operating instructions and warning notices, a "qualified person" is one who is familiar with the installation, construction and operation of the equipment and the hazards involved. In addition, he/she has the following qualifications:

- Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- Is trained in the proper care and use of protective equipment in accordance with established and safety practices.
- Is trained in rendering first aid.

NOTE

Product liability claims are valid only if the spare parts purchased have been replaced by Siemens personnel trained and certified to do so.

Warning

This equipment contains hazardous voltages and mechanical parts which move at high speed and may be controlled remotely.

Non-observance of the safety instructions can result in death, severe personnel injury or damage to property & environment.

Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with all warnings, safety notices and maintenance procedures contained herein.

Successful and safe operation of this equipment is dependent on perfect project planning of the system, proper handling (transport, storage), installation, operation and maintenance.

1. General

Siemens 3AF 01 vacuum circuit-breakers are of the triple-pole outdoor type for rated voltage of 36 kV.

The vacuum circuit-breaker consists of a steel structure, a mechanism housing complete with stored-energy spring mechanism & control elements, and a baseframe with three poles with vacuum interrupters mounted in porcelain insulators and operating rods.

1.1 Standard specifications

The 3AF 01 vacuum circuit-breakers comply with the provisions of IEC 62271-100, IEC 60694 and IS13118. Refer Table1 for Technical Data.

NOTE

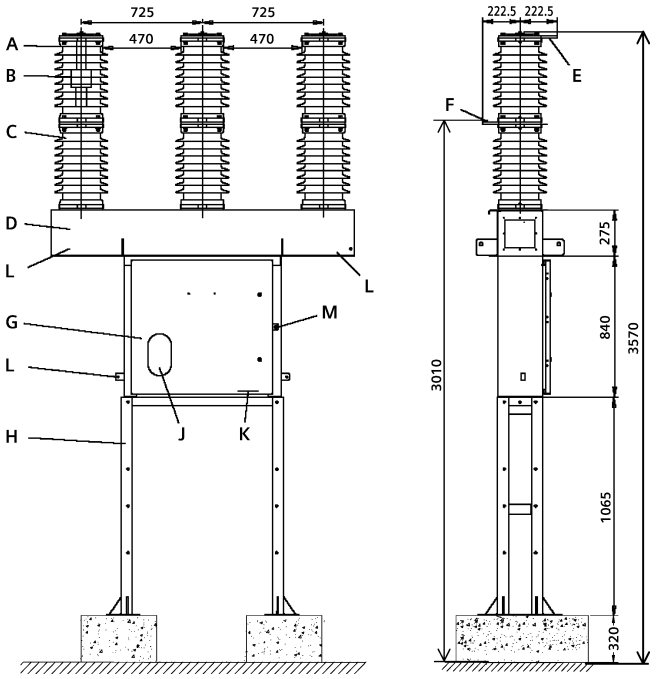
In their basic design and with all standard listed equipment options, 3AF 01 vacuum circuit-breakers are type-tested components in accordance with IEC.

If the customer intends to fit the breakers with additional functions, we recommend that he should first consult us as in most cases proven and tested solutions are already available.

1.2 Fields of application

The combination of the special contact geometry and contact material developed of the vacuum interrupters enables Siemens 3AF 01 vacuum circuit-breakers to be used universally for all fields of application, e.g. this circuit-breaker with stored-energy mechanism is suitable for the operating sequence O - 0.3s - CO - 3 min. - CO.

However, certain applications, such as filter circuits, operating reactors, furnace breakers etc., may necessitate taking of special measures.



A. Interrupter Assembly
B. Vacuum Interrupter
C. Support Insulator
D. Base Frame
E. Top Terminal
F. Bottom Terminal
G. Drive Mechanism Housing
H. Steel Structure
J. Plexiglass for Viewing Mechanical Indications
K. Control Cable Gland Plate
L. Earthing Terminals
M. Facility for Padlock

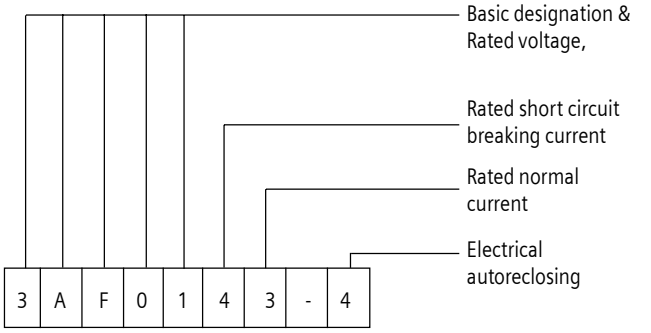
Fig. 1 : Typical General Layout

2. Technical data

2.1 Type spectrum

2.1.1 Type designation

3AF 01 vacuum circuit-breakers are identified by a machine-readable product designation made up of a series of numbers and letters, whose first 8 places can be found on the name plate of the circuit-breakers. The design code stated on the name plate together with the machine-readable product designation provides a full description of the circuit-breaker. The figure below shows what the individual places of the basic machine-readable product designation stand for:



Besides the basic machine-readable product designation of the circuit-breaker stated on the name plate (Fig. 2); it also contains the following information.

SIEMENS	
Type designation	Design code
Serial number	Year of manufacture
Rated voltage / Frequency	Rated normal current
Rated s.c. breaking current	Rated s.c. duration
Rated light.imp. with. voltage	Weight
Purchase Order No. & Date	
Rated operating duty	
Made in India	03-95307-001

Fig. 2: Name plate

For abbreviations of rated characteristics, refer Table 1 below.

The name plate, is located on the mechanism housing of the circuit-breaker.

2.1.2 Rated data

NOTE

In the event of any queries, state the type designation, design code, year of manufacture and the serial number.

2.1.3 Dimensions and weights

The dimensions of the vacuum circuit-breaker are shown in the relevant drawings, which can be ordered through your Siemens office.

The weight can be found on the breaker rating plate, in Fig. 2; or in the relevant drawing.

2.2 Characteristic values

Definitions:

Opening time = the interval of time between the initiation of the opening operation and the instant when the contacts separate in all poles.

Arcing time = the interval of time between the instant of the first initiation of an arc and the instant of final arc extinction in all poles.

Break time = the interval of time between the initiation of the opening release and the instant of final arc extinction in all poles. (= opening time + arcing time).

Close-open time = the interval of time (in a make-break operating cycle) between the instant when the contacts touch in the first pole in the closing process and the instant when the arcing contacts separate in all poles in the subsequent opening process.

Dead time = The interval of time between final arc extinction in all poles in the opening operation and the first re-establishment of current in any pole in the subsequent closing operation.

Closing time = the interval of time between the initiation of the closing release and the instant when the contacts touch in all poles.

Type designation	Rated voltage U in kV	Rated short-circuit making current I_{ma} in kA	Rated short-circuit breaking current I_{sc} in kA	Rated short-circuit duration t_{th} in s	Rated current I_n in A	Rated power frequency withstand voltage in kV	Rated lightning impulse withstand voltage U_w in kV	Pole centre distance in mm	Weight (approx.) in kg
3AF 01 42	36	66	26.3	3	1250	70	170	725±5	650
3AF 01 43	36	66	26.3	3	1600	70	170	725±5	650
3AF 01 44	36	66	26.3	3	2000	70	170	725±5	650
3AF 01 45	36	62.5	25	3	1600	70	170	725±5	650
3AF 01 47	36	62.5	25	3	2000	70	170	725±5	650

Table 1: 3AF 01 Technical Data

The operating and pulse duration times stated in Table 2 below apply for 3AF 01 vacuum circuit-breakers:

Operating times:	
Opening time, 1st shunt release (Y1)	≤ 65 ms
Opening time, 2nd shunt release (Y3)	≤ 65 ms
Opening time, suppl.shunt release (Y2)	≤ 50 ms
Arcing time	<15 ms
Break time, 1st shunt release (Y1)	≤ 80 ms
Break time, 2nd shunt release (Y3)	≤ 80 ms
Break time, suppl.shunt release (Y2)	≤ 65 ms
Close-open time, 1st shunt release (Y1)	≤ 90 ms
Close-open time, 2nd shunt release (Y3)	≤ 90 ms
Close-open time, suppl.shunt release (Y2)	≤ 90 ms
Dead time	300 ms
Closing time with stored-energy mech.	≤ 75 ms
Synchronizing error between the poles	≤ 2 ms
Spring charging times:	
Spring charging time (M1)	≤ 15 s
Minimum pulse duration:	
Shunt release (Y1) .. 3AY1510	40 ms
Supplementary release (Y2, Y4,Y6) .. 3AX 110_	20 ms
Closing solenoid (Y9) .. 3AY1510	40 ms

Table 2: Operating and pulse duration times

2.3 Influence of environmental parameters

2.3.1 Permissible ambient conditions

The 3AF 01 vacuum circuit-breakers are designed for the normal operating conditions laid down in the standards.

Permissible ambient temperatures:

Maximum value	+ 55°C
Average over a period of 24 hours	+ 35°C
Minimum value	- 25°C

Permissible relative atmospheric humidity:

Maximum value, 24 hour mean	95 %
Maximum value, 1 month mean	90 %

Under these conditions, condensation may occur occasionally.

1320mm creepage is provided on the porcelain insulators. These are suitable for very high levels of pollution at site.

2.3.2 Installation altitude

The insulating capacity of air decreases with rising altitude due to the lower air density. In conformity with IEC 62271-1, the rated lightning impulse voltage values given in Fig. 5 are valid up to an installation altitude of 1000m above mean sea level. As from an altitude of 1000m, the insulation level must be corrected as shown in Fig. 4:

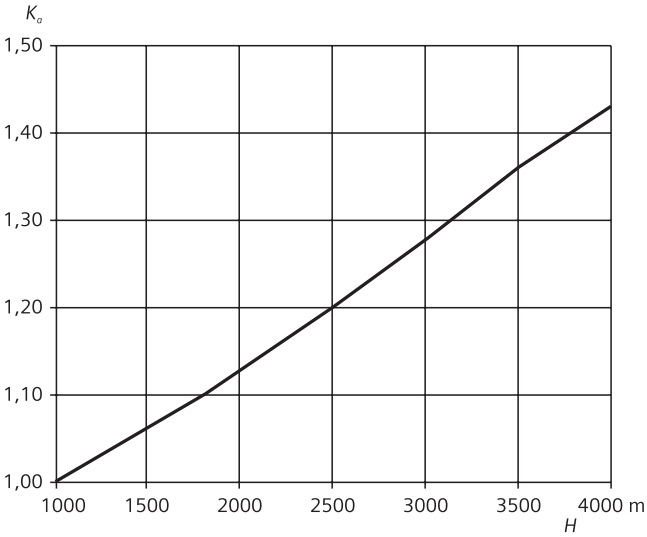


Fig. 3: Altitude compensation factor K_a

$U \geq U_o \bullet K_a$

U Rated withstand voltage V under standard reference atmosphere

U_o Required rated withstand voltage for the installation location

K_a Altitude compensation factors

$K_a = e^{m \bullet (H-1000) / 8150}$

Calculating the altitude compensation factor K_a:

H = Installation altitude in meters

m = 1 for AC voltage, lightning impulse voltage (between the phases, phase-earth, applied longitudinally)

Example:

For a specified rated withstand voltage of 185kV at an altitude of 1400m, an insulation level of at least 195kV under standard reference atmosphere is required:
$195kV \geq 185kV \bullet e^{1*(1400-1000)/8150} = 185 \bullet 1.05$

This means that equipment designed for a rated voltage of 195 kV, is required for this application.

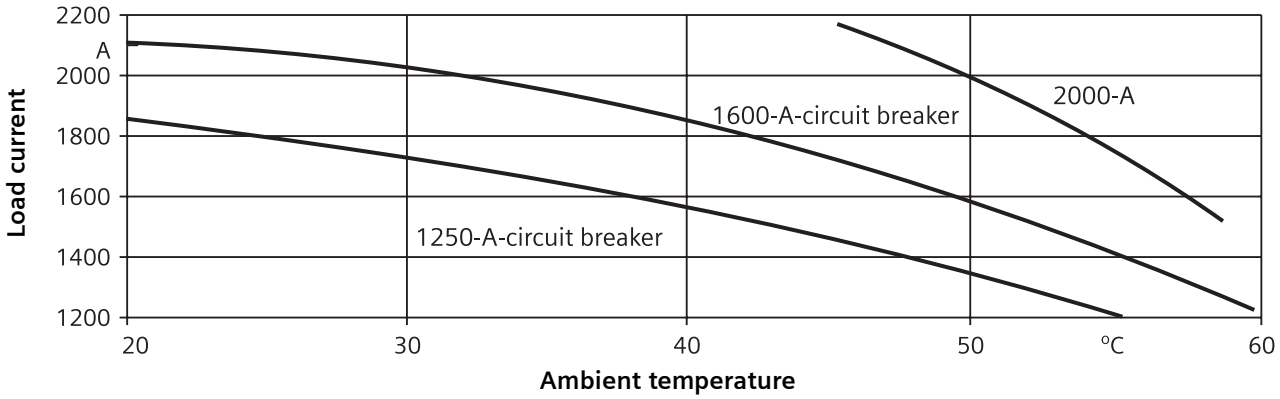


Fig. 4: Maximum permissible load current as a function of the circuit-breaker ambient temperature

2.3.3 Load current

The rated normal currents listed in Table 1 have been laid down for an ambient temperature of 40°C. The maximum permissible load current as a function of the ambient temperature of the 3AF 01 circuit-breaker has been plotted in Fig. 4.

2.4 Service life

Under normal operating conditions, the circuit-breakers are designed for 10,000 mechanical operating cycles. Due to the optimization of the service life of all parts, the level of reliability falls if the breakers are used for a greater number of operating cycles. The manufacturer can therefore not recommend continued use of the circuit-breakers, even if certain subassemblies are renewed.

When the permissible maximum has been attained, the complete pole assemblies must be renewed. Detailed instructions are supplied with the replacement pole assemblies.

When ordering replacement pole assemblies, state the circuit-breaker type, design code and serial number (see name plate).

2.5 Fixing/termination dimensions and weights

The dimensions of the vacuum circuit-breaker are shown in the relevant drawings which can be ordered through Siemens office.

The weight can be found on the breaker name plate, in Table 1 or in the relevant General Assembly drawing.

Top / Bottom Terminal (Aluminium) (E,F in Fig. 1)

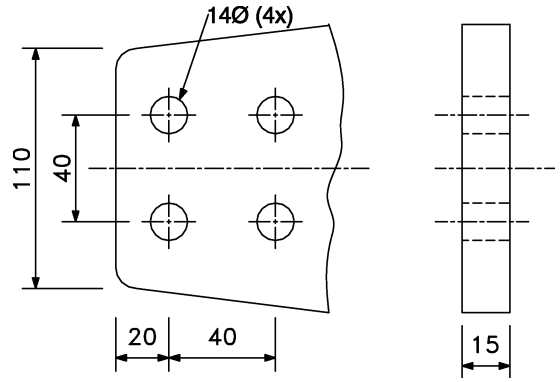


Fig. 6 Typical Terminal pad

Foundation Plan:

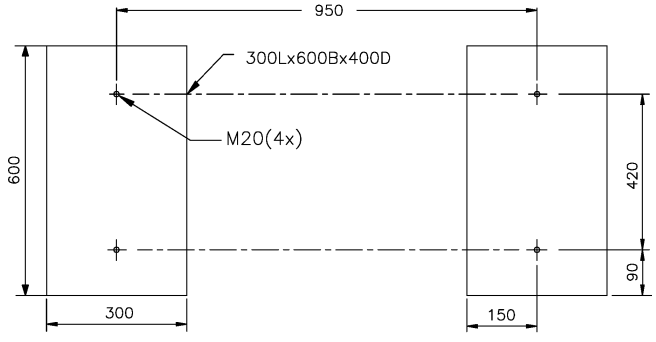
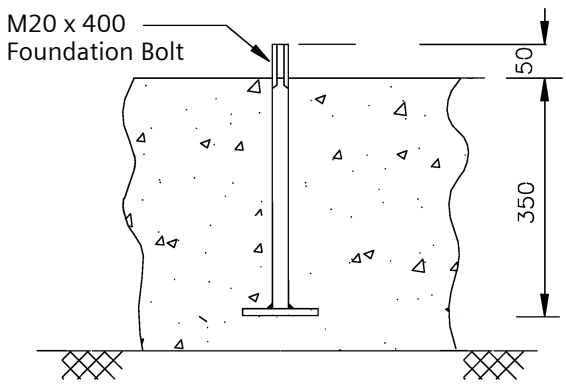


Fig. 5 Typical fixing dimensions

Foundation Details:



3 Description

The 36kV 3AF01 vacuum circuit-breakers are designed to handle all the switching duties that occur in primary distribution systems. The breakers are extremely reliable in service, require minimum maintenance and have a long life expectancy. Moreover, their optimum size and weight, their quiet and low-vibration operation and the fact that they are not affected by temperature nor present a fire risk make the breakers suitable for outdoor locations.

3.1 Construction (Figs.: 7, 10 & 11)

Pole assembly: (Fig. 7)

The vacuum interrupter is mounted in a porcelain insulator to form an interrupter assembly (P-1, Fig. 7). An interrupter assembly & a support insulator assembly form a sealed pole assembly.

Three such assemblies are mounted on a base frame (P-2, Fig. 7) which has a common operating shaft. This assembly is mounted on an operating mechanism housing (P-3, Fig. 7). This is in turn is assembled on steel structure so as to locate the line terminals at a safe distance above the ground. The energy storing mechanism and all the control and actuating devices are installed in operating mechanism housing. The breaker can be electrically operated from control room or by hand locally.

Operating mechanism: (Fig. 11)

The locations of mechanical ON-OFF indicator (P-9, Fig. 11), the spring charged indicator (P-8, Fig. 11) and operation counter are shown. Also shown are the 'ON' push button (P-3, Fig. 11) and 'OFF' push button (P-6, Fig. 11). This figure also shows the opening to insert the crank handle (P-15, Fig. 11) which can be used to charge the spring during maintenance or in case of control supply failure.

Control panel: (Fig. 10)

On the control panel (P-1, Fig. 10) to the right of the mechanism is mounted when necessary, the Local/ Remote switch (P-2, Fig. 10) and the breaker ON/OFF switch (P-3, Fig. 10). Control and signalling cables are connected to terminal blocks (P-4, Fig. 10) on the panel. As per wiring diagram, external connections shall be made on the terminal blocks.

3.2 Vacuum Interrupter (Fig. 9)

The basic construction of the interrupter can be seen in Fig. 9. The moving contact (P-1) moves in guide (P-2). The bellows (P-3) follows the travel of contact (P-1) and seals the interrupter against the surrounding atmosphere.

The vacuum interrupters fitted in the 3AF 01 vacuum circuit-breakers are type-approved in accordance with the X-ray regulations of the Federal Republic of Germany. They conform to the requirements of the X-ray regulations of January 8, 1987 (Federal Law Gazette Page 144) § 8 and Annex III Section 5 up to respective rated short-time AC voltage stipulated in accordance with VDE/IEC (rated power frequency withstand voltage).

3.3 The Arc quenching Principle

When the contacts separate, the current to be interrupted initiates a metal vapour arc discharge and flows through this plasma until the next current zero. The arc is then extinguished and the conductive metal vapour condenses on the metal surfaces within a matter of microseconds. As a result, the dielectric strength in the break builds up very rapidly.

The contacts are designed so that the self generated field causes the arc to travel. This prevents their local overheating when interrupting large current.

The metal vapour arc discharge can only be maintained if a certain minimum current flows. A current that does not attain this level is chopped prior to current zero. The chopping current must be kept to a minimum in order to prevent unduly high over voltages building up when inductive circuits are switched. The use of a special contact material ensures that current chopping is limited to 4-5 A.

The rapid build-up of the dielectric strength in the break enables the arc to be safely extinguished even if contact separation occurs immediately prior to current zero.

The arc drawn in the vacuum interrupter is not cooled. The metal vapour plasma is highly conductive and the resulting arc voltage only attains value between 20 and 200 V. For this reason and because of the short arcing time, the arc energy developed in the break is very small. This also accounts for the long electrical life expectancy of the vacuum interrupter.

3.4 Switching Operation

When a closing command is initiated, the closing spring (P-12, Fig. 11) which was previously charged (by hand or by the motor), actuates the moving contact through the drive shaft (P-20, Fig. 7), pull rod (P-4, Fig. 7), switching shaft (P-5, Fig. 7) and switching rod (P-6, Fig. 7).

During closing, the tripping spring (P-13, Fig. 11) and the contact pressure springs (P-19, Fig. 7) are charged. The closing spring of motor operated breaker is recharged (within 15 seconds) after CB is closed.

In the closed state, the necessary contact pressure is maintained by the contact pressure springs and the atmospheric pressure. The contact pressure spring automatically compensates for contact erosion, which is very small.

When a tripping command is given, the energy stored in the tripping and contact pressure springs is released. If the breaker is to be tripped locally, the tripping spring is released by pressing the OFF button (P-6, Fig. 11). In the case of an electrical command being given, the tripping solenoid Y1 (P-5, Fig. 11) unlatches the tripping spring. The opening sequence is similar to the closing sequence. The residual force of the tripping spring arrests the moving contact in the open position.

In the event of the control supply failing, the breaker can be operated by hand.

The anti-pumping device in the form of an auxiliary contactor in the operating mechanism for the breaker ensures that it is not repeatedly opened and closed in the event of simultaneous ON and OFF commands.

1. Interrupter assembly
2. Base frame
3. Steel structure
5. Switching shaft
6. Insulating stud
7. Handle (for slow closing)
8. Lever
9. Pin
10. Lock washer
11. Drive mechanism housing
12. Pin
13. Pin
14. Lock washer
15. Circlip
16. Pin
17. Vacuum interrupter
18. Insulator
19. Contact pressure spring
20. Drive shaft
23. Bearing
24. Operating mechanism
27. Bottom Switching Rod
30. NRV (optional feature)

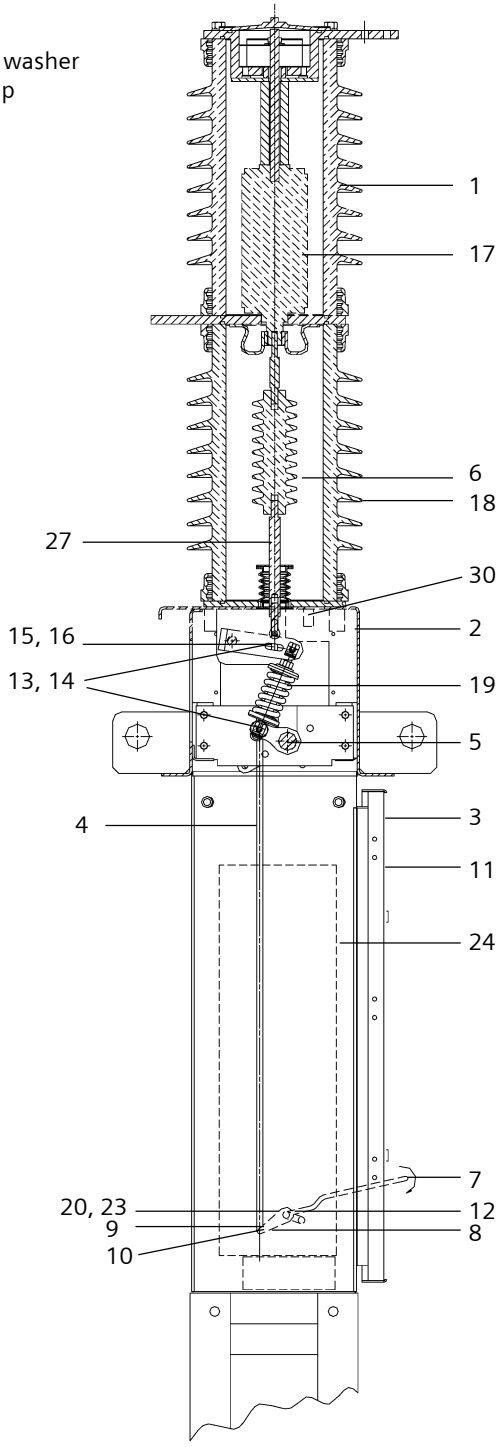


Fig. 7. Cross section of interrupter assembly, base frame and operating mechanism

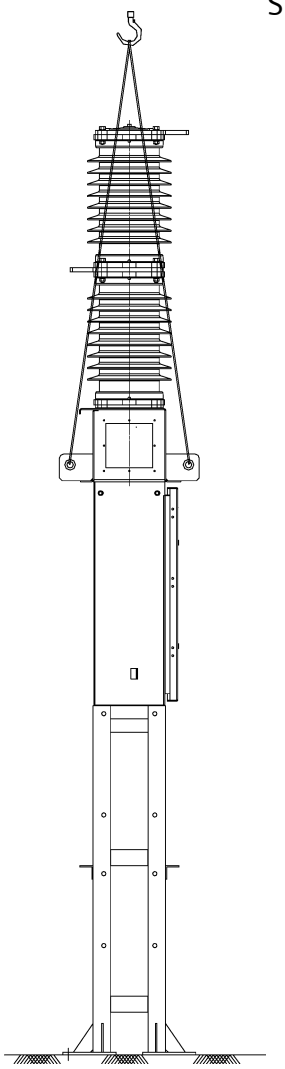


Fig. 8. Mounting of operating mechanism on steel structure

1. Moving contact
2. Guide
3. Metal bellows
4. Fixed contact
5. Insulator
6. Arc chamber

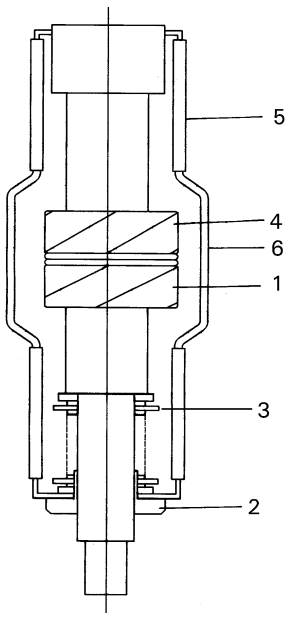


Fig. 9. Section through a vacuum interrupter

4. Equipment

The basic version of the 3AF 01 vacuum circuit-breaker comprises:

- Manually operated stored-energy mechanism for closing
- Electrical operating mechanism ..... (M1) with anti-pumping feature
- Shunt closing release ..... (Y9)
- 1st shunt release ..... (Y1)
- Auxiliary switch 5NO+5NC or 11NO+11NC ..... (S1)
- Operating cycle counter
- Mechanical ON-OFF & spring charge indicators

Each 3AF 01 vacuum circuit-breaker can be equipped with the following supplementary devices:

- Position switch for signalling "Closing spring charged" ..... (S4)
- 2nd shunt release 3AY 1510 ..... (Y3)
- Suppl. shunt release 3AX 1101 ..... (Y2)
- Current transformer-operated release 3AX 1102 ..... (Y4)
- Undervoltage release 3AX 1103 ..... (Y7)
- Non return valve

The permissible combinations of supplementary equipment and special versions are stated in Table 4.

4.1 Operating Mechanism (Fig. 11)

The operating mechanism is of the stored energy type, i.e. the charging of the closing spring is not automatically followed by the contacts changing position.

When the stored-energy mechanism has been charged, the instant of operation can be chosen as desired.

A distinction is made between hand operating and motor operating mechanisms, the actual stored-energy mechanism being the same in both cases.

The mechanical energy for carrying out an 'OFF-ON-OFF" sequence is stored in the closing and tripping springs.

4.2 Closing

Motor-operated mechanism (M1) with stored-energy mechanism (P-2, Fig. 11):-

The stored-energy mechanism of the circuit-breaker is available with a motor-operated mechanism, including shunt closing release. The motor-operated mechanism starts operating immediately once the power supply has been connected with the closing spring initially in discharged state. The motor is automatically de-energized internally after charging the closing spring.

Manual operation can also be performed at any time. The closing spring is charged by inserting the hand crank in the opening (P. 15, Fig. 11) until the "spring charged" indication appears and an audible clicking noise indicates that the closing pawl has latched. It is then possible to close the breaker either manually or electrically. After closing, the spring can be recharged manually.

The maximum DC power input is 770 W (approx.) The maximum AC power input is 900 VA (approx.). During part of the short spring charging time, the motors operate in the overload range.

The supply voltage of the motor-operated mechanism may deviate from the rated value by -15% to +10%.

4.3 Shunt releases

4.3.1 Shunt closing release (Y9) 3AY1510 (P-4, Fig. 11).

The closing solenoid unlatches the charged closing spring and thus closes the circuit-breaker electrically. It is available for both AC and DC operations. The closing solenoid is not designed for continuous operation and it is de-energized internally. The supply voltage of the closing solenoid may deviate from the rated value by -15% to +10%.

Power consumption: approx. 200 W/VA

4.3.2 1st shunt release (Y1) 3AY1510 (P-5, Fig. 11)

The 3AY1510 shunt release is used as standard in the basic circuit-breaker version. With the Y1 release, the electrically supplied tripping pulse is passed to the "Open" latching mechanism by means of a direct-action solenoid armature and the circuit-breaker is thus opened. This opening solenoid is not designed for continuous operation and it is de-energized internally. The supply voltage of the shunt release may deviate from the rated value by -30% to + 10% with DC voltage; by -15% to + 10% with AC voltage.

Power consumption: approx. 200 W/VA

4.3.3 2nd shunt release (Y3) 3AY15 10 (optional feature)

This release is used if more than one shunt release is required to ensure opening of the breaker in case of failure of first shunt release. The voltage of this release hence can be same or different than first shun release. This release is dimensionally & functionally same as first shunt release (Y1)

Power consumption: approx. 200 W/ VA

4.3.4 Suppl.shunt release (Y2) 3AX1101 (optional feature)

The 3AX1101 shunt release is fitted if more than one shunt release is required. With this design, the electrical opening command is transferred in boosted form to the "Open" latching mechanism via a solenoid armature through unlatching of an energy store and the circuit-breaker is thus opened. This opening solenoid is not designed for continuous operation and it is de-energized internally.

Power consumption: approx. 60 W/ 100 VA

4.3.5 Under voltage release (Y7) 3AX1103 (optional feature)

Undervoltage release consist of a stored-energy mechanism, an unlatching mechanism and an electromagnet system which is connected continuously to the supply when the circuit-breaker is in the close state. if this voltage drops to below certain value, the

unlatching mechanism is released and opening of the circuit-breaker is thus initiated via the stored-energy mechanism. The stored energy mechanism is automatically recharged by the circuit-breaker.

The deliberate tripping of the undervoltage release generally takes place via an NC contact in the tripping circuit. But it can also be carried out via an NO contact by short-circuiting of the magnet coil. With this type of tripping, the short-circuit current is limited by the built-in resistors.

Undervoltage release can also be connected to voltage transformers. When the operating voltage drops to impermissible low levels, the circuit-breaker is tripped automatically. Power consumption 6.5W or ≤ 7.5VA

4.3.6 Current transformer-operated release (Y4) 3AX1102 (optional feature)

Current transformer-operated (CT-operated) releases consist of a stored-energy mechanism, an unlatching mechanism and an electromagnet system. When the tripping current is exceeded (90% of the CT-operated release rated current), the unlatching device of the stored-energy mechanism is released and opening of the circuit-breaker is thus initiated. In addition to the primary current transformers, matching transformers are also required to enable use of the CT-operated releases.

Power consumption for releases with 0.5 A rated tripping current ≤ 6 VA at 90% of the release rated current and with open armature.

Basic Equipment		Supplementary release (at additional cost)			
Closing release 3AY15 10	1st opening release 3AY15 10	2nd Opening 3AY15 10	2nd Opening 3AX1101	under-voltage 3AX1103	C.T. operated 3AX1102
Y9	**Y1**	**Y3**	**Y2**	**Y7**	**Y4**
1	1				
1	1	1			
1	1		1		
1	1		1	1	
1	1		1		1
1	1			1	
1	1			1	1
1	1				1

Table 4: Release Combinations

4.4 Auxiliary switch (S1) 3SV92 (P-14, Fig.11)

The breaker is fitted with 5 NO and 5 NC contacts. It is actuated by the breaker shaft, and switches the auxiliary circuits. Optionally, aux. switch with 11NO and 11NC contacts is also available.

Rated insulation voltage: AC/DC 250 V
Insulation class: C
Current: 10 A
Making capacity: 50 A
Breaking capacity: in accordance with table 3

Voltage [V]	Breaking Capacity [A]	
	resistive load	inductive load
upto 230 AC	10	10
24 DC	10	10
48 DC	10	9
60 DC	9	7
110 DC	5	4
220 DC	2.5	2

Table 3: Breaking capacity of the 3SV92 auxiliary switch

4.5 Mechanical interlocking (optional feature)

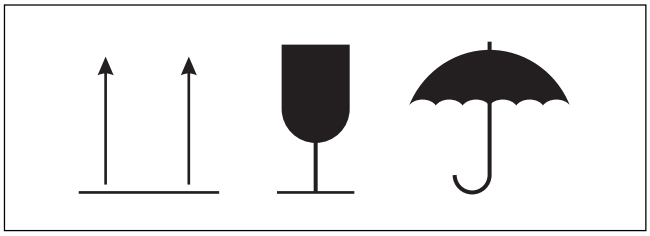
The stored-energy mechanisms of the 3AF01 circuit-breakers can be equipped with a mechanical (Castell) interlocking facility to interlock with an isolator.

This arrangement has two locks (one each for breaker and isolator) and one key. Hence when the key is trapped in the lock of the breaker, the isolator cannot be operated. However, when the key is removed from the lock of the breaker, it is in the off position and thus this lock ensures that breaker cannot be made on. The key then canbe used to operate the isolator.

5. Transport

Do not open the packing cases during transport.

Whenever possible, transport the breaker to the installation site in its (unopened) original packing. Pay attention to handling markings.



Immediately after receipt of a consignment, check the entire packing for signs of damage (see under "Arrival at site").

CAUTION

The vacuum circuit-breaker may be lifted only by means of suitable gear attached to the correct points.

Non-compliance can lead to damage.

5.1 Packing Cases

The 3AF 01 outdoor vacuum circuit-breakers are despatched in one wooden case or in corrugated board. The equipment is protected by polyethylene sheet while packing. **Support structure is strapped together and supplied separately.**

The case contains the base frame (P-2, Fig. 7) with interrupter assemblies (P-1, Fig. 7) which are housed in porcelain insulators and mechanism housing (P-G, Fig. 1). This case also contains the foundation bolts (Fig. 5) with nuts, plain washers and spring washers and any other loose items ordered. The CB is packed and transported with vacuum interrupters in the open condition. Lifting instructions and consignee address are marked on the cases.

5.2 Desiccant

Bags of desiccant for moisture absorption are fixed inside the sealed packing. The effectiveness of the desiccant is indicated by a moisture indicator which discolours under conditions of excessive atmospheric humidity.

Indicator blue	=	desiccant fully active
Indicator turned pink	=	desiccant has become ineffective, contents moist

5.3 Loading & Unloading during Transport

It is recommended that the breakers be transported to the site in their original packing.

Care must be taken to see that the packing unit is not damaged. The packing units must be stored so as to prevent shifting, tipping or falling down under normal transport conditions and to provide protection against abrupt braking, centrifugal forces, jolts from shunting as well as rolling and pitching at sea. Do not use hooks for loading and unloading. The packing is marked by arrow, glass and umbrella symbols to ensure safe transportation and paper storage.

The design and loading capacity of the means of transport used at site must be suitable for the intended purpose.

5.4 Arrival at site

Check immediately the packing cases all over for damage, if any, when they arrive.

Should a packing case be found to have been damaged, open the covers so that the contents become visible and can be checked.

CAUTION

When damaged (or presumably damaged) equipment is unpacked, take care that it is stored in a dry room and repack it if necessary. It is important that the equipment be inspected right away to determine the degree of damage, its cause and, if possible, the person or persons responsible. The transport agent must be informed immediately about the damage and invited to take part in a joint damage assessment. Make sure that any external damage noticed during inspection is certified immediately by the transport agent, since this is indispensable for claiming damages from the insurance company.

In the case of overseas shipments, the authorized claims agent must be invited immediately for inspection and damage certification (at the port of discharge if possible).

CAUTION

Serious damage must be documented photographically.

6. Installation

6.1 Unpacking

CAUTION

The vacuum circuit-breaker may be lifted only by means of suitable gear attached to the correct points.

Non-compliance can lead to damage.

The 3AF 01 outdoor vacuum circuit-breaker is despatched in one crate. The equipment is protected by polyethylene sheet while packing. The packing case is marked with the breaker serial number. A list of items kept in the case is enclosed with it.

The case contains the base frame (P-2, Fig. 7) with three pole assemblies (P-1, Fig. 7). These are mounted on mechanism housing (P-G, Fig. 1). This case also contains support structure, the foundation bolts (P-4, Fig. 5) nuts (P-1, Fig. 5), plain washers (P-3, Fig. 5) and spring washers (P-2, Fig. 5) and any other loose items ordered separately. The CB is packed and transported with vacuum interrupters in the open condition. Lifting instructions and consignee address are marked on the case.

6.2 Receiving the Equipment

The case nos. should be checked with the despatch challans before acceptance. The packing case should be carefully inspected for damage. This should be immediately brought to the notice of the forwarding agent and an inventory of damages should also be made in his presence.

CAUTION

1. Use crane to lift the packing case.
2. Put slings on the marked portion on the packing case
3. Do NOT topple or tumble the packing case.

6.3 Storage and Handling

It is recommended that the equipment, after removal from the packing case, be stored in a clean, sheltered area. Care should be taken against the ingress of water in the packages. For long time storage, ensure that the space heater is switched ON.

Refer Fig. 8 for the handling and shifting in a safe manner.

1. Control panel
2. Local/Remove selector switch
3. C.B. ON/OFF switch
4. Terminal blocks
5. Steel structure
6. Operating mechanism
7. Pull rod
8. Transport cover
9. Eye bolt
10. Lever
11. Pin
12. Lock washer
13. Glass window for viewing mechanical indications
14. Operating mechanism housing

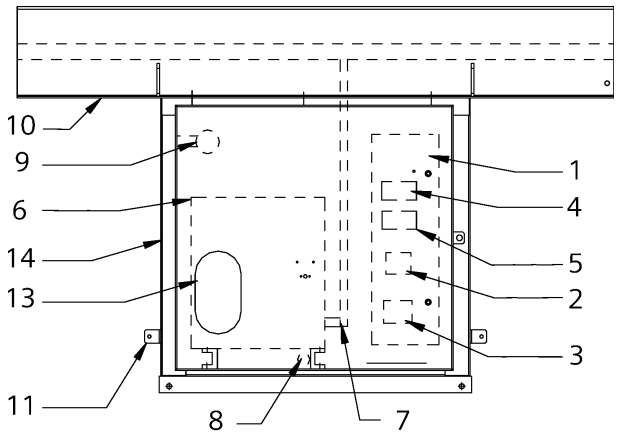


Fig. 10 Baseframe, operating mechanism and control panel

6.4 Erection

The following care will be taken for proper & safe operation of the breaker.

(1) Use only the bolts supplied.

(2) Use torque wrench for assembly since unchecked tightening can result in damage to or loosening of joints.

The necessary torque for screwed joints are as follows:

S. No.	Type of Joint	Torque (Nm) ± 10%			
	Size of Bolt →	M8	M10	M12	M20
	Property Class →	6.6	8.8	8.8	8.8
1	Steel to Steel	32	65	115	–
2	Steel with insulator	16	32	77	170
3	Busbar Joint	20	40	70	–
4	Busbar with Steel	20	40	70	–

Note: The values given in the table above are for **Tightening Torques**. For testing the joint, 70% of above values are to be considered as **Checking Torque**.

(3) Any locking washer or gasket loosened or exposed during assembly must be replaced.

The following sequence should be followed :

(i) In line with the foundation plan shown in the G.A. drg., the foundation pockets are made. Grout the foundation bolts and cure. Ensure the foundation area is leveled for proper seating of the circuit-breaker.

(ii) Mount the support structure on to the grouted bolts, fully tighten the foundation bolt hardware.

(iii) **The pull rod length is factory preset. Do not change it.**

(iv) The contacts of the vacuum interrupter are in the open position during transport.

(v) Place the breaker assembly (P-2, Fig. 7) over the support structure and fix the assembly with the hardware supplied
(M12 x 50 Bolt). Take care to strictly follow the lifting instructions, with special care of porcelain insulators.

6.5 Electrical connections

(i) Earthing

Connect the vacuum circuit-breaker to the appropriate high-voltage protective earth by means of the suitably marked earth terminals on the base frame using flat copper, copper cable or hot galvanized steel strip.

(ii) Drill suitable holes on the gland plate. Run the control cables into the mechanism housing through the cable glands which will be mounted on the gland plate (K; Fig. 1). Connect the protective conductors to the earthing terminals provided. Connect the auxiliary supply as per the approved schematic/wiring diagram.

CAUTION

When the supply voltage is applied, the motor immediately charges the closing spring.

(iii) Cleaning

WARNING

For safety reasons, cleaning may be taken up only when the vacuum circuit-breaker is in the open state, closing spring discharged.

Non-observance can result in personal injury.

Use only warm water with a mild liquid household detergent added as cleaning agent.

(iv) Using 5kV kit, megger the system to confirm insulation resistance of min. 100 M ohms.

(v) Terminal connectors and/or Flat bar connections:

Prior to fitting the conductors, position them to ensure that they have smooth contact with their connecting parts and are fully aligned with the holes of terminal pads.

Rub the contact faces to be bolted together with crisscrossing strokes using a wire brush or emery cloth (for metal grain size 150) until bright metal shows, and then wipe with a clean rag. Thinly grease the bright contact faces with acid-free Vaseline (e.g. Shell Vaseline 8420) and bolt them together immediately.

Differing contact materials (Al/Cu) must not be worked with the same cleaning tool.

Use the M12 nuts and bolts of strength class 8 and corresponding spring elements and plain washers.

Use cupal sheets while mounting copper terminal overhead connectors to avoid galvanic corrosion with a aluminium alloy top and bottom flanges.

7. Commissioning

Danger

High voltage!

Touching live parts will result in death or severe personal injury.

This equipment may be operated only by qualified personnel who have become thoroughly familiar with the operating instruction manual and in particular all safety instructions.

CAUTION

This equipment contains hazardous voltages and mechanical parts which move at high speed and may be controlled remotely.

Non-observance of the safety instructions can result in severe personal injury or damage to the property.

In particular:

Do not open the door of the mechanism housing. Do not reach inside the operating mechanism. Do not touch pole assemblies and operating rods mounted in the base frame.

Prior to commissioning, check the vacuum circuit-breaker in accordance with the following points.

1. Clean the circuit-breaker as applicable (for details refer to “Cleaning”).
2. Check that all fixing and terminal screws are tightened securely.
3. Examine the circuit-breaker for any external damage, especially to the terminal pads, porcelain insulators and vent tube.
4. Check functioning of space heater.

7.1 Slow Closing Operation (Optional)

When CB is in open position, with the closing and tripping springs discharged and auxiliary supply switch in OFF position, start the following sequence.

(a) Insert the manual handle (P-7, Fig. 7) between the drive mechanism shaft (P-17, Fig. 11) and pin (P-18, Fig. 11).

(b) Slowly move the handle down till the trip pawl latches with the trip lever roller. The CB contacts have closed. This will be shown by the movement of ON/OFF indicator to “I” symbol.

7.2 Slow Opening Operation (Optional)

Starting with the condition at the end of the slow closing operation

(a) Insert the manual handle in the same position.

(b) Move the handle down still further.

(c) Keeping the handle pressed down, press the OFF P.B. (P-6, Fig. 11) and gradually release the pressure on the handle, allowing the shaft to rotate. The movement ends with the indicator showing “O” symbol for CB Off.

Safety Precautions : Always keep downward pressure on the handle. Release pressure gradually. Withdraw the handle for further steps.

7.3 Charging the Closing Spring manually (Fig. 11)

CAUTION

The vacuum circuit-breaker may be operated manually with the hand crank in order to avoid injuries that may occur if the motor starts up suddenly.

Insert the hand-crank in hole (P-15) and turn it clockwise until the indicator (P-8) shows “closing spring charged”.

The hand-crank is coupled with the charging mechanism via a decoupling facility. The operator is thus not exposed to any risk should the control supply recover during charging.

7.4 Manual Closing (Fig. 11)

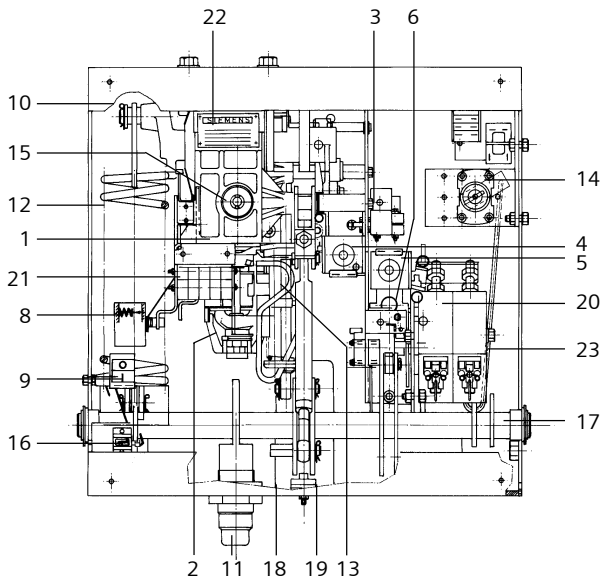
Press the “ON” button (P-3) or initiate a switching command from the control room until the vacuum breaker has closed. The ON-OFF indicator (P-9) will then display the symbol “I” and the closing spring indicator will display “spring discharged” symbol.

The closing spring is automatically recharged by the motor mechanism immediately after the breaker has closed. In hand operated breakers, the closing spring can be recharged by hand.

7.5 Manual Opening (Fig. 11)

The tripping spring is charged during closing. To open the breaker, press the “OFF” button (P-6) or initiate a tripping command from the control room unit. The vacuum breaker will open and the “O” symbol is displayed by indicator (P-9).

Note: Closing and opening operations of CB can be checked locally also by CB ON/OFF switch (P-3 Fig. 10) mounted on the control panel inside the mechanism housing.



1. Gear box
2. Motor
3. Mechanical ON push button
4. Closing solenoid (release)
5. Tripping solenoid (release)
6. Mechanical OFF push button
7. Operating rod for snap switches
8. Mechanical spring charged indicator
9. Mechanical ON/OFF indicator
10. Sheet steel frame
11. Shock absorber
12. Closing spring
13. Tripping spring
14. Auxiliary switch
15. Opening for hand crank
16. Operation counter
17. Drive shaft
18. Pin
19. Damping plates
20. Additional releases (optional)
21. Snap switch
22. Rating plate
23. Tie rod for aux. switch

Fig. 11 Details of operating mechanism

7.6 Space Heater in the operating mechanism housing

CAUTION

Note : The heater must be always "ON" whether the breaker is in service or not, to prevent condensation of moisture particularly on the insulating components.

One heater is provided in the mechanism housing. Keep the heater switch in the ON position, so that when the control supply is applied all the heaters are ON.

NOTE

Keep door and all covers closed firmly to prevent entry of dust, moisture, insects etc.

7.7 Inert Gas in the Sealed Pole (optional feature)

Inert gas N_2 is filled up in each pole at about 1.5 bar during manufacturing, in order to prevent the entry and subsequent condensation of moisture during the service life of the breaker. The gas is not for the purpose of insulation.

3. Pin
4. Shaft
28. Indicator
28.1 Erosin Scale

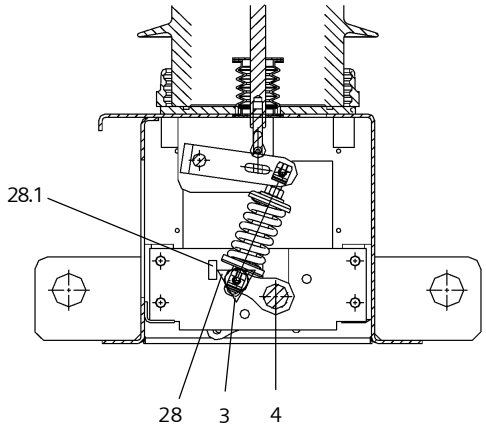


Fig. 12A Cross section of base frame

8. Maintenance

8.1 Safety Measures

Danger

Maintenance, repair and subsequent conversion work may be carried out only by specially trained personnel in accordance with the operating instructions and/or special conversion instructions. Training and information sessions for personnel can be provided by the competent Siemens department.

Before starting any work on vacuum circuit-breakers, reference must be made to the local safety regulations for high-voltage switchgear. Switch off the power supply and then close and open the vacuum circuit-breaker manually (breaker in open state, "closing spring discharged" indication is visible) to ensure that the closing spring is discharged.

Control terminals must not be touched if the power supply is connected.

Non-observance can result in death, severe personal injury or substantial damage to property.

The 3AF 01 vacuum circuit-breakers in general require little maintenance. The interval at which the maintenance is to be carried out depends on the application by the client. The parameters to be considered are :

— The number of short circuit operations the CB is subjected to,

— the switching frequency,

— the service duty, and

— Ambient conditions temperature, humidity, pollution level at the site.

8.2 Maintenance schedule

The maintenance schedule is given as a guideline. However depending upon particular operating & site conditions, the schedule should be fixed up.

— As per the site conditions once a year

(a) Visual inspection*

(b) Cleaning of insulators** and operating mechanism parts (plungers, moving joints, etc...) as per clause 7.7

(c) Check functioning of space heater.

(d) Check vacuum as per clause 7.6.

(e) Dielectric tests as per clause 7.7.

— Every 10 years or after 10,000 operations check for contact erosion as per clause 7.5.

— Check supply (A.C.) and battery (D.C.) voltages regularly to ensure proper ratings to operate breaker electrically.

* It is recommended nonetheless a regular visual inspection for soiling (e.g. dust, saline fog, fungus etc.) of the circuit-breaker.

** The periodicity of insulator washing is to be determined by the site personnel based on the amount of pollutions deposited.

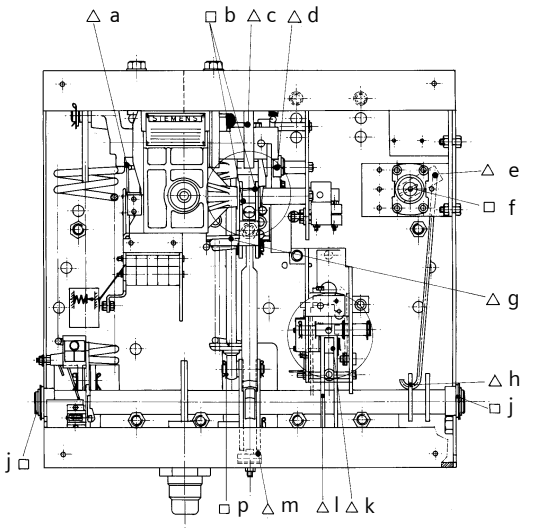
8.3 Typical Maintenances Sequences

1. Put the circuit-breaker off.
2. Isolate the circuit-breaker.
3. Earth the circuit-breaker.
4. Disconnect the auxiliary supply.
5. Discharge the springs manually.
6. Visually inspect the circuit-breaker and carry out further maintenance.

8.4 Lubrication of the parts

To achieve higher level of reliability, we recommend lubrication after 4,000 operations. However lubrication will be required more frequently depending upon dusty atmospheric conditions at site.

The points to be lubricated are marked in Figs. 7 and 13. These figures also show the type of lubrication of various points. In short the same are as follows :-



Key to parts

a Lever for snap switch operation
b Bearing for lever
c Cam disc
d Lever for switch-on block
e Lever for operating the auxiliary switch
f Auxiliary switch
g Guide for opening spring
h Operating rod of auxiliary switch
j Bearing for switching shaft
k Lever for switch-off block
l Lever on the switching shaft
m Damping plate
p Pin for opening spring

Fig. 13 Points on the vacuum breaker to be lubricated

△ Bearings, sliding surfaces: Isoflex Topas L 32

□ Bearings inaccessible to grease and bearings of the auxiliary switch S1: Shell Tellus 32 (Oil)

To lubricate the mechanism remove the cover. Lubricate the appropriate points beginning at the top left and working downwards. Parts that are not rigidly fixed (e.g. joints) should be moved slightly to and fro to let the lubricant penetrate. Following this, operate the breaker a few times to test it.

Joints and bearings that cannot be dismantled should be cleaned with a cleaning agent prior to begin oiled.

8.5 Checking of Contact Erosion

The contact erosion is to be checked with the circuit-breaker in the ON condition. Carry out steps 1 to 5 as in clause 7.3 and close the breaker slowly as per clause 6.1.

Open the rear cover. The maximum permissible contact erosion in vacuum interrupter is 3mm. It can be checked by means of an indicator fitted on one side of each pole support. In the 'as-supplied state' and with the breaker closed, the contact erosion indicator (28) points to the lower level of 3mm thick erosion scale (28.1). When the breaker is in service, the degree of contact erosion can be seen by the position of indicator relative the scale.

The breaker may only be operated as long as the erosion indication remains with in the scale range.

8.6 Checking the Vacuum

Before putting the breaker in service, or if an interrupter is suspected of leakage as a result of mechanical damage check the vacuum as follows:

Steps 1 to 6 as in clause 7.3

Remove the bottom covers of the base frame.

Remove the circlip (P-15, Fig. 7) from the pin (P-16, Fig. 7) use the handle in the closing direction to facilitate removal of the pin.

When the pin is removed, the switching rod (P-6, Fig. 7) will be suddenly pulled up due to the vacuum in the healthy interrupter.

In the case of a loss of vacuum in the interrupter, if the switching rod is pulled down it will not move back on its own. This indicates that the vacuum interrupter has to be replaced.

8.7 Cleaning

DANGER

Non-observance can result in death or serious personal injury.

Terminals must not be touched if the power supply is connected.

DANGER

Non-observance can result in personal injury.

All springs of the operating mechanism must be discharged and the vacuum circuit-breaker be brought into the open state, "Closing spring discharged" indication visible.

To assure the insulating capacity, it is necessary that the insulating components are clean. Insulating components and external breaker part must be wiped with a damp cloth. Use only warm water with the addition of a mild liquid household detergent as cleaning agent.

8.8 Dielectric Test

Prior to commissioning the breaker or putting it back into service after a maintenance outage, the circuit-breaker should be checked for insulation resistance using a 5 kV meggar kit.

1. CB open between phase terminals (2 readings)
2. CB open between top terminals and earth (3 readings) and
3. CB closed between terminals and earth (3 readings)

In each case the reading should be greater than 100 MOhm.

8.9 Accessories and standard spare parts

Owing to the fact that all parts of this breaker type have been optimized to last the normal service life, there is no need to recommend any particular spare parts for keeping in stock.

Nevertheless, if you require spare parts, state the following data when ordering them:

8.9 Standard Spares for 36/40.5 kV V.C.B. (3AF01)

			M L F B No.	Item No.
1. (Y1/Y3/Y9) : Closing or Tripping Release (consumption 200W / VA)				
a) 24V DC	...		3AY1510 - 3BY	4398095020
b) 30V DC	...		3AY1510 - 3MY	4398095021
c) 110V DC	...		3AY1510 - 3EY	4398095024
d) 220V DC	...		3AY1510 - 3FY	4398095026
2. (V1/V2/V3) Rectifier for Motor and Releases	...		3AX15 25 - 1F	4109764015
3. (S1) Auxiliary Switch				
a) 5NO + 5NC	...		3SV92 21	4109764021
b) 11NO + 11NC	...		3SV92 22	4109764022
4. MCB 6A, 2 pole, 240V AC	...		5SQ22107YA06	–
MCB 4A, 2 pole, 240V AC	...		5SQ22107YA04	–
MCB 2A, 2 pole, 240V AC	...		5SQ22107YA02	–
5. (E11) Heater, 240V AC, 100W	...		–	4396201101
6. (M1) Motor (770W)				
a) 110V DC	...		3AY15 11 - 1EY	4109764016
b) 220V DC	...		3AY15 11 - 1FY	4109764017
7. Manual / Emergency Handle (P-7, Fig. 7) (optional)	...		–	4110490001
8. (K1) Contactor 2NO + 2NC (Voltage same as closing release)				
24V DC	...		3TH30220BB4	–
30V DC	...		3TH30220BC4	–
110V DC	...		3TH30220BF4	–
220V DC	...		3TH30220BM4	–
9. (S21,S22,S3,S4) Position switch	...		3SE 4206	4107766996
10. Vacuum Interrupter (D21) Type VS36025	...		3AY1716 - 1A	4398107002
11. (Y2) 2nd Shunt Release				
(a) 24V - 32V DC	...		3AX1101 - 2B	4110660052
(b) 48V - 60V DC	...		3AX1101 - 2C	4110660063
(c) 110V - 127V DC	...		3AX1101 - 2E	4110660054
(d) 220V DC	...		3AX1101 - 2F	4110660055
(e) 110V AC, 50Hz	...		3AX1101 - 2G	4110660058
(f) 230V AC, 50Hz	...		3AX1101 - 2J	4110660059
12. (Y4) C.T. Operated Release 0 - 0.5 A	...		3AX1102 - 2A	4110660062
13. (S13) Local/Remote Selector Switch (P-2, Fig. 10)	...		–	4113488907
14. Lubricants & Grease	...		3AX1133 - 3A	4110522005
15. Spring charging handle (Hand crank)	...		3AX1530 - 3B	4112871002
16. Kit of lock washers	...		3AY1550 - 0A	4109764024
17. (S14) Circuit-breaker Control Switch (P-3, Fig. 10)	...		–	4394570001
18. Sealed Pole Assembly	...	1600A	900mm creepage	4395205001
	...	1600A	1300mm creepage	4395205002
	...	2000A	900mm creepage	4395205003
	...	2000A	1300mm creepage	4395205004

8.10 Service life

Refer Section 2.4 on page 4.

8.11 Disposal of the Product

The product is environmentally compatible.

The following materials have used to make up the device: steel, copper, aluminium, cast-resin, glass-fibre-reinforced thermoplastics, rubber, porcelain, greases etc. PVC is used as an insulation material for control wire.

In as-supplied condition, the product does not incorporate any hazardous substances.

In operation, the product does not emit by hazardous materials or gases.

During disposal of the product, care must be taken to dismantle as far as possible in more environmentally accepted way as recyclable & non-cyclable scraps i.e. steel, copper, aluminium, rubber, PVC, cast-resin & glass-fibre-reinforced materials segregated properly.

The cyclable materials like steel, copper, aluminium can be reused. Non cyclable materials like cast-resins, glass-fibre-reinforced etc. can be broken in to pieces & then used as land filling materials. Also refer local legislation for disposal of waste products.

Local customer support-Siemens office will be able to answer any questions concerning disposal.

8.12 Summary of Important Instructions-

DOs

During Installation & Commissioning Stages :-

(1) To connect the pull rod in bottom unit to the lever of the switching shaft in the top unit, follow instructions 5.4(vi) on page10.

(2) Brush the contact surfaces properly before bolting overhead terminals on flanges of breaker. Also grease the joints & apply proper torque on the bolts.

(3) Check rated voltages of equipments such as motor, closing & tripping releases mounted in the operating mechanism with the available auxiliary supply to be connected to these equipments in the substation.

During service life of the breaker-

(4) Keep door & covers firmly closed to prevent entry of dust, moisture, insects etc.

(5) Ensure spring charging handle & manual handle are kept in the mechanism housing.

(6) Decide maintenance schedule based upon
(a) no. of short circuit operations,
(b) frequency of breaker ON/OFF operations,
(c) pollution level etc.

(7) Isolate & earth the breaker before carrying out maintenance & ensure it is in OFF position & springs are discharged completely before cleaning.

(8) Depending on site conditions, inspect
- the interior of the mechanism housing for dust, cobwebs etc. & clean them.
- porcelain insulators & clean them,
- operating mechanism parts such as plungers of releases, moving joints etc. & clean them, and
- functioning of space heaters.

(9) Lubricate moving parts with lubricants provided for the breaker.

(10) Check insulation resistance with a megger before putting the breaker back into service.

(11) Keep a log-book for each breaker.

(12) Follow instructions given in the operating manual.

(13) Ensure breaker operations, maintenance etc. is done by trained persons.

(14) Check supply & battery voltages of control circuits regularly.

DON'Ts

(1) Do not leave any equipments or tools in the mechanism housing.

(2) Do not leave incandescent lamp in ON position when closing the mechanism housing door.

(3) Do not put hands or tools in operating mechanism when breaker is electrically operated.

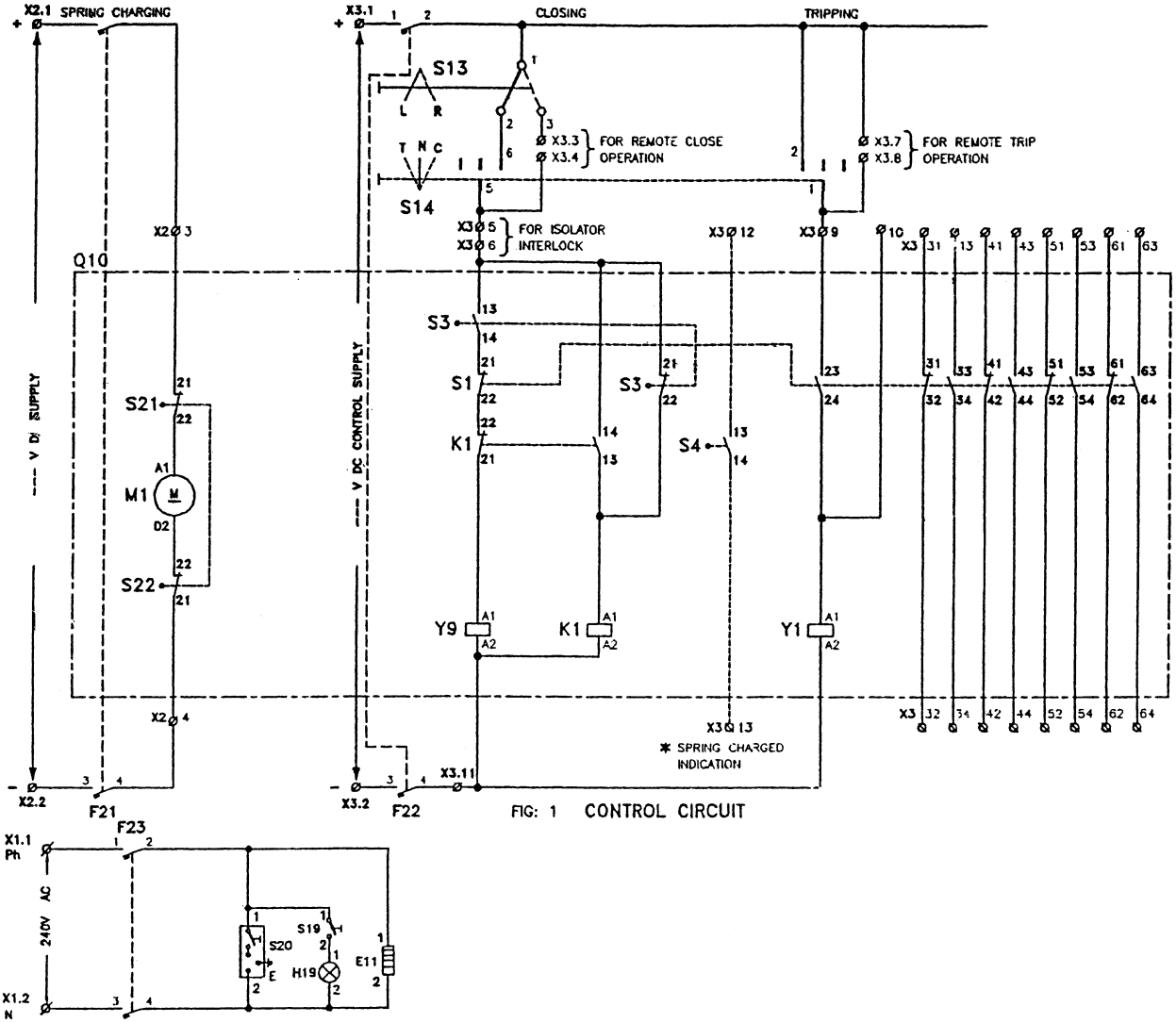
(4) Do not operate the breaker during cleaning process.

8.13 Troubleshooting

Problem	Symptoms / Effect	Possible Causes / Reasons	Remedial Measures
Breaker fails to close.	1. Closing spring charges, but breaker does not close.	1. Electrical power to auxiliary circuit is off, or MCB has tripped.	1. Check electrical power to auxiliary circuit and/or replace blown fuses.
		2. Loose connection, damage to wiring.	2. Check & repair as necessary.
		3. No closing command to terminal X3.5/X3.6	3. Check for continuity & correct logic circuit.
		4. Terminals X3.3 & X3.4 not shorted, if remote close is not required.	4. Check & repair.
		5. Unoperational closing release.	5. Test closing release separately & then replace, if not operating.
		6. Aux. switch (S1) contacts 21-22 are open when the breaker is closed.	6. Check & adjust mechanical linkage with aux. switch.
		7. Unoperational anti-pumping contactor (K1) & its contacts	7. Check & replace, if necessary.
	2. Closing spring does not charge automatically.	1. Electrical power to auxiliary circuit is off, or MCB has tripped.	1. Check electrical power to auxiliary circuit and/or replace blown fuses.
		2. Loose connection, damage to wiring.	2. Check & repair as necessary.
		3. Terminals X3.3 & X3.4 are not shorted, if remote close is not required.	3. Check & repair.
		4. Unoperational charging motor.	4. Check & replace.
		5. Limit switches S21 & S22 fail to operate	5. Check & mechanical linkage with limit switch & correct.
		6. Mechanical failure of operating mechanism.	6. Check & contact authorised service centres.
	3. Closing release operates, sound of breaker closing is heard, but breaker contacts do not close.	Mechanical failure of operating mechanism.	Check & contact authorised service centres.
Nuisance or false closing of breaker	1. Electrical problem	1. Closing command continues on terminal X3.3/X3.4.	1. Check & correct logic circuits.
		2. Terminal A2 of closing release is shorted to earth.	2. Check to find out if problem in wiring or release. Correct as per requirement.
	2. Mechanical problem	Mechanical failure of operating mechanism	Check & contact authorised service centres.
Breaker does not trip.	1. Tripping Release (Y1) does not trip.	1. Electrical power to auxiliary circuit if off, or MCB has tripped.	1. Check electrical power to auxiliary circuit and/or replace blown fuses.
	2. There is no tripping sound.	2. Loose connection, damage to wiring.	2. Check & repair as necessary.
		3. No tripping command to terminal X3.9.	3. Check for continuity & correct logic circuit.
		4. Terminals X3.7 & X3.8 are not shorted, if remote trip is not required.	4. Check & repair.
		5. Unoperational tripping release.	5. Test tripping release separately & replace, if not operating.
		6. Aux. switch (S1) contacts 23-24 are open when breaker is closed.	6. Check & adjust mechanical linkage with aux. switch.
Nuisance or false tripping of breaker	1. Electrical problem	1. Tripping command continues on terminal X3.9.	1. Check & correct logic circuits.
	2. Mechanical problem	2. Mechanical failure of operating mechanism.	2. Check & contact authorised service centres.

8.14 Typical Wiring Diagram

Wiring diagrams includes all possible circuit arrangements:- selection dependent on order of circuit-breaker. Fig 16, illustrates a non-committal example.



Note: MCBs are replaced by fuses and neutral links, if ordered.

8 Service

Thank you for placing your trust in us as a manufacturer of medium-voltage switchgear and components - and thus in our technology as a whole. We attach great importance to personal safety, system reliability, availability and service. Your suggestions enable us to keep on improving our products. Please do not hesitate to contact us.

You can find your contact at the Siemens Regional Offices in your area and other Siemens addreses via the internet under http://www.siemens.com

Call our Customer Support Center
Toll Free Ph. No.: ***1-800-419-7477***
Mail: ***service.energy.in@siemens.com***

Our aim is to provide you with prompt and expert support.

Notes:

Notes:

Siemens Ltd.
Power Transmission & Distribution Division
Medium Voltage Switchgear
Thane Belapur Road,
Thane 400 601, India.
Tel. : +91-22-2762 3544
Fax : +91-22-2762 3715

Order No. 4P-0080-03-95273-001AB

Siemens Ltd.
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