

# COMPREHENSIVE SOLUTIONS FROM DESIGN TO DELIVERY



## 36kV OUTDOOR VACUUM CIRCUIT BREAKER



- ✓ Easy installation
  - ✓ Low maintenance
  - ✓ Long service life &
  - ✓ High mechanical endurance
- ## Designed for superior performance

Client \_\_\_\_\_  
Power Grid Company of Bangladesh

📍 400/132kV Substation, Gopalganj

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# GENERAL & TECHNICAL DETAILS

The EOFVp-36 is the successful outcome after years of proficient research and development in the application of current interruption technology for medium voltage switchgear. It is characterized by dimensions, good operator guidance and a modern industrial design.

The EOFVp-36 is a porcelain clad outdoor vacuum circuit breaker, which is supported on steel frames, designed for plinth mounting and is applicable for use on earthed system. It requires minimum maintenance in comparison to other circuit breaker technologies and can also perform well in harsh conditions. The mechanism of this breaker is designed especially for operation of very short stroke which is required in vacuum interrupter.



Fig: EOFVp-36 vacuum circuit breaker (without secondary structure)

## Main characteristics

- Three-pole operation system
- Best quality vacuum interrupters
- Motor-driven operating mechanism
- Spring-loaded mechanism suitable for both mechanical & electrical operation
- Designed and tested for M2 class (10,000 mechanical operating cycles)
- Followed IEC standard in every step

## Key benefits

- Simple to install and to operate
- Long service life than other types of breaker
- Minimum maintenance
- Operates in all kind of extreme climate conditions
- Increased safety with high mechanical endurance
- Environment-friendly than other type of circuit breaker

# GENERAL & TECHNICAL DETAILS

## Selection table

Type		EOFVp-36															
Rated short time current (STC) 3 sec	kA	26.4				31.5					40						
Pole center spacing	mm	725				725					725						
Rated voltage	kV	36				36					36						
Rated power frequency withstand voltage	kV	70				70					70						
Rated lightning impulse withstand voltage	kV	170				170					170						
Rated frequency	Hz	50				50					50						
Rated (normal) current	A	2500	2000	1600	1250	2500	2000	1600	1250	800	2500	2000	1600	1250			
Rated peak withstand current	kA	66				80					100						
Rated short circuit current	kA	26.4				31.5					40						
Drive mechanism	Mechanical	Number of operating cycles without overhaul		10000				10000					10000				
Interrupter chamber				30000				30000					30000				
Rated normal current	Electrical			10000				10000					10000				
With rated short circuit current				100				100					100				
Opening time	Breaker operating times	ms	45 ± 10				45 ± 10					45 ± 10					
Closing time		ms	65 ± 10				65 ± 10					65 ± 10					
Break time		ms	45 - 67				45 - 67					45 - 67					
Arc duration	ms	7 - 12				7 - 12					7 - 12						
Minimum command time for release coils	ms	20				20					20						
Charging time for motor drive mechanism	s	≤ 20				≤ 20					≤ 20						
Weight (approximate)	kg	650	650	650	650	750	700	700	700	700	800	750	750	750			

Table: EOFVp-36 vacuum circuit breaker selection table

# GENERAL & TECHNICAL DETAILS

## Applied standards

The EOFVp-36 vacuum circuit breakers comply with the provisions of IEC 62271 – 100/ IEC 56.

**Note:** In their basic design and with all standard listed equipment options, EOFVp-36 vacuum circuit breakers are type tested components in accordance with IEC. If the customer intends to fit the breaker with additional functions, then we recommend that they consult Energypac, since most of the proven and tested solutions are already available.

## Environment & operating conditions

The EOFVp-36 vacuum circuit breakers are designed for the normal operating conditions laid down in the standards. Any operating conditions that deviate from the conditions mentioned in the standard will be admissible only upon consultation and written approval from the manufacturer.

## Ambient temperature & relative humidity

Admissible ambient temperature & relative humidity	
Maximum ambient temperature	+55°C
Average ambient temperature over 24 hours	+35°C
Minimum ambient temperature	-10°C
Maximum average relative air humidity over 24 hours	95%
Maximum average relative air humidity over 1 month	90%

Table: Ambient conditions for EOFVp-36 vacuum circuit breaker

## DESIGN & DIMENSIONS

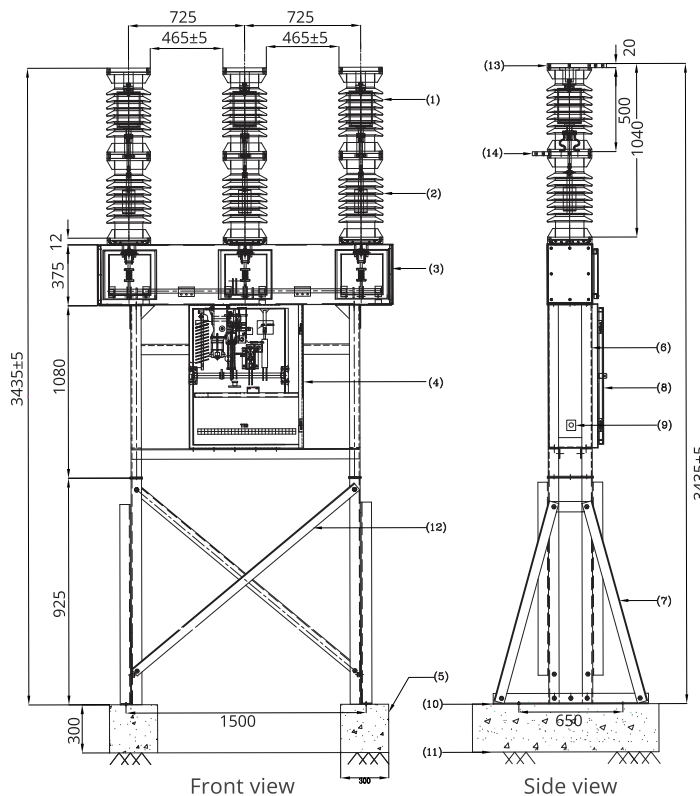


Fig: EOFVp-36 outdoor vacuum circuit breaker basic dimensions

### List of basic parts

01. Top insulator
02. Bottom insulator
03. Drive chamber
04. Mechanism chamber
05. Foundation
06. Primary structure
07. Secondary structure
08. Mechanism chamber door
09. Earth pad
10. Plinth level
11. Ground level
12. Cross angle
13. Terminal

# MAIN COMPONENTS

## Main components

EOFVp-36 outdoor vacuum circuit breakers consist of four main components:

- Pole assembly
- Drive chamber
- Mechanism chamber
- Support structure

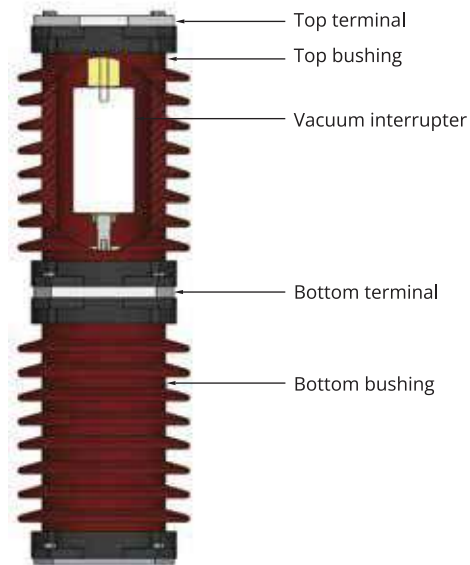


Fig: Broken out view of pole assembly of EOFVp-36 vacuum circuit breaker

## Pole assembly

- Each vacuum circuit breaker consists of three pole assemblies. Three such assemblies are mounted on drive chamber intended to locate the line terminals at a safe distance above the ground.
- Insulator bushing at top and bottom part is made of porcelain.
- Top insulator bushing contains the vacuum interrupter, also known as the heart of the circuit breaker.

## Drive chamber

- The drive chamber contains a common drive shaft and also a contact pressure spring for each phase.
- The common linkage assembly is attached to the three vacuum interrupters by respective insulator link called epoxy link.

## Mechanism chamber

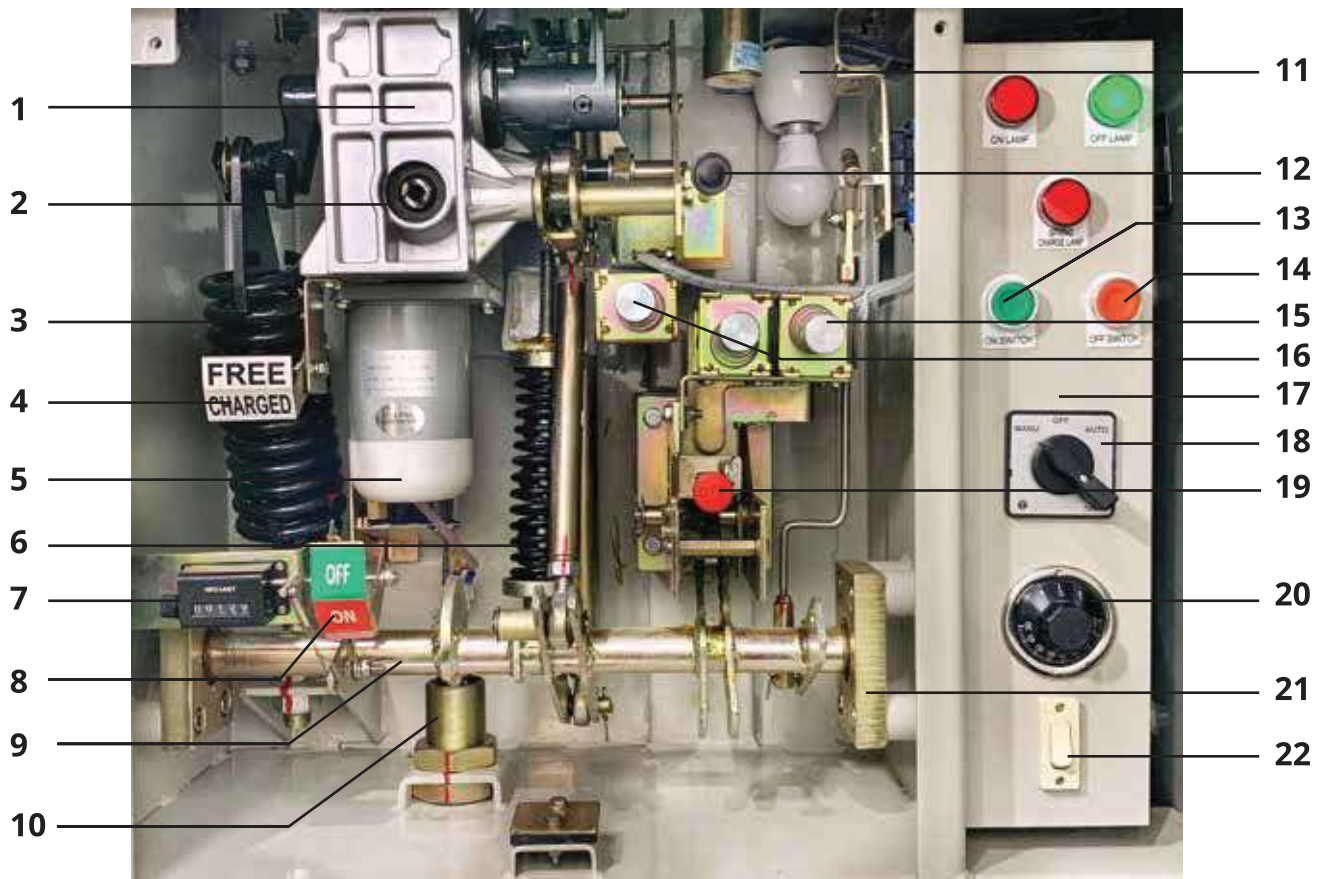
The operating mechanism, together with the trip spring, stores the necessary energy for the closing and opening operation of the circuit breaker. Located at ground potential, the operating mechanism also includes necessary wiring. The breakers can be electrically operated from the control room or by hand locally. Control and signaling cables are connected to terminal blocks on the panel. As per the wiring diagram, external connections shall be made on the terminal blocks.

## Support structure

There are two types of support structures – primary and secondary. The main function of the primary structure is to support the breaker along with linkage assembly and mechanism. The secondary structure provides necessary line to ground clearance. The supports are usually made of hot-dip galvanized steel.



# MAIN COMPONENTS



## Operating box contains the following basic parts:

- |  |                                |
|--|--------------------------------|
| 1. Mechanism (gear box)                | 12. Mechanical ON push button  |
| 2. Opening for manual charging lever   | 13. Electrical ON push button  |
| 3. Closing spring                      | 14. Electrical OFF push button |
| 4. Mechanical spring charged indicator | 15. Tripping coil              |
| 5. Charging motor                      | 16. Closing coil               |
| 6. Tripping spring                     | 17. Control panel              |
| 7. Operation counter                   | 18. Local/remote switch        |
| 8. Mechanical ON/OFF indicator         | 19. Mechanical OFF push button |
| 9. Operating shaft                     | 20. Thermostat                 |
| 10. Shock absorber                     | 21. Bearing block              |
| 11. Bulb                               | 22. Door lamp switch           |

Table: Basic parts of mechanism chamber



# OPERATION

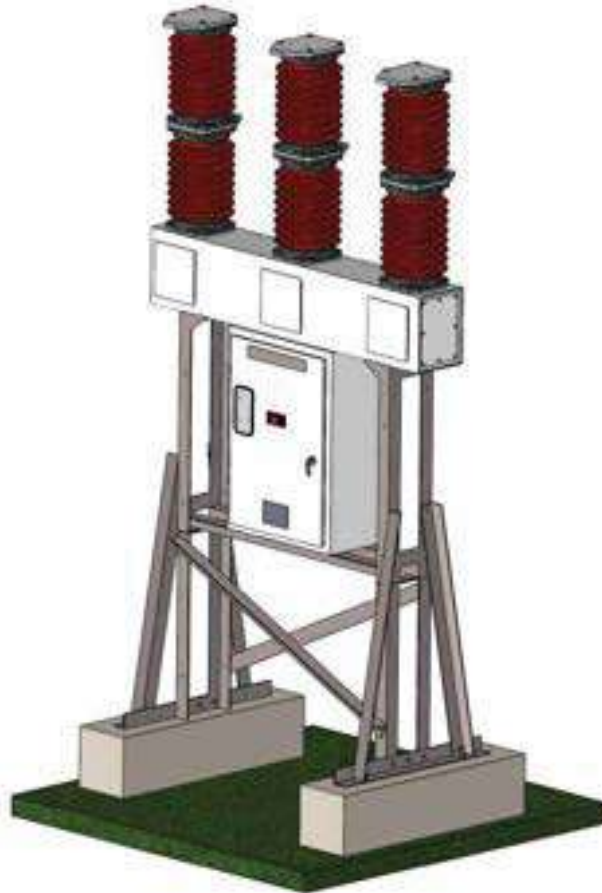


Fig: A complete assembly of EOFVp-36 vacuum circuit breaker

## The basic version of the EOFVp-36 vacuum circuit breaker mechanism comprises:

- Manual/motor operated stored energy mechanism for closing
- Electrical operation with anti-pumping feature
- Closing and tripping done by shunt coil release or manual lever
- 1st shunt release
- Auxiliary switch 8 NO / 8 NC or 12 NO / 12 NC
- Operating cycle counter
- ON-OFF & spring charge indicators (electrical & mechanical)

## Each EOFVp-36 vacuum circuit breaker can be equipped with the following supplementary devices:

- Position switch for signaling "closing spring charged"
- 2nd shunt release
- Current transformer-operated release
- Under-voltage release

# SUMMARY OF IMPORTANT INSTRUCTIONS

## DO'S

### During installation & commissioning stages

- Brush the contact surfaces properly before bolting overhead terminals on flanges of breaker. Also grease the joints & apply proper torque on the bolts.
- Check rated voltages of equipment such as motor, closing & tripping releases mounted in the operating mechanism with the available auxiliary supply to be connected to these equipment in the substation.

### During service life of the breaker


- Keep door & covers firmly closed to prevent entry of dust, moisture, insects etc.
- Ensure spring charging handle & manual handle are kept in the mechanism housing.
- Decide maintenance schedule based upon:
  - a. No. of short circuit operations
  - b. Frequency of breaker ON/OFF operations
  - c. Pollution level etc
- Isolate & earth the breaker before carrying out maintenance & ensure it is in OFF position & springs are discharged completely before cleaning.
- 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
  - Proper functioning of space heaters
  - Please keep all the MCB in off condition & all the springs in charge-free condition during cleaning
- Lubricate moving parts with lubricants provided for the breaker.
- Check insulation resistance with a Megger before putting the breaker back into service.
- Keep a log-book for each breaker.
- Follow instructions given in the operating manual.
- Ensure breaker operations, maintenance etc. is done by trained people.

## DON'TS


- Do not leave any equipment or tools in the mechanism housing.
- Do not leave incandescent lamp in ON position when closing the mechanism housing door.
- Never put hands or tools in operating mechanism during breaker operation.
- Do not operate the breaker during cleaning process.

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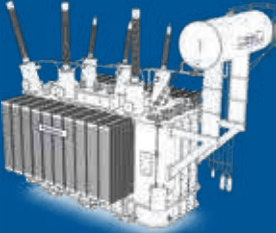

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