Product Group Brochure

# PS Range
# Capacitor Vacuum Switches

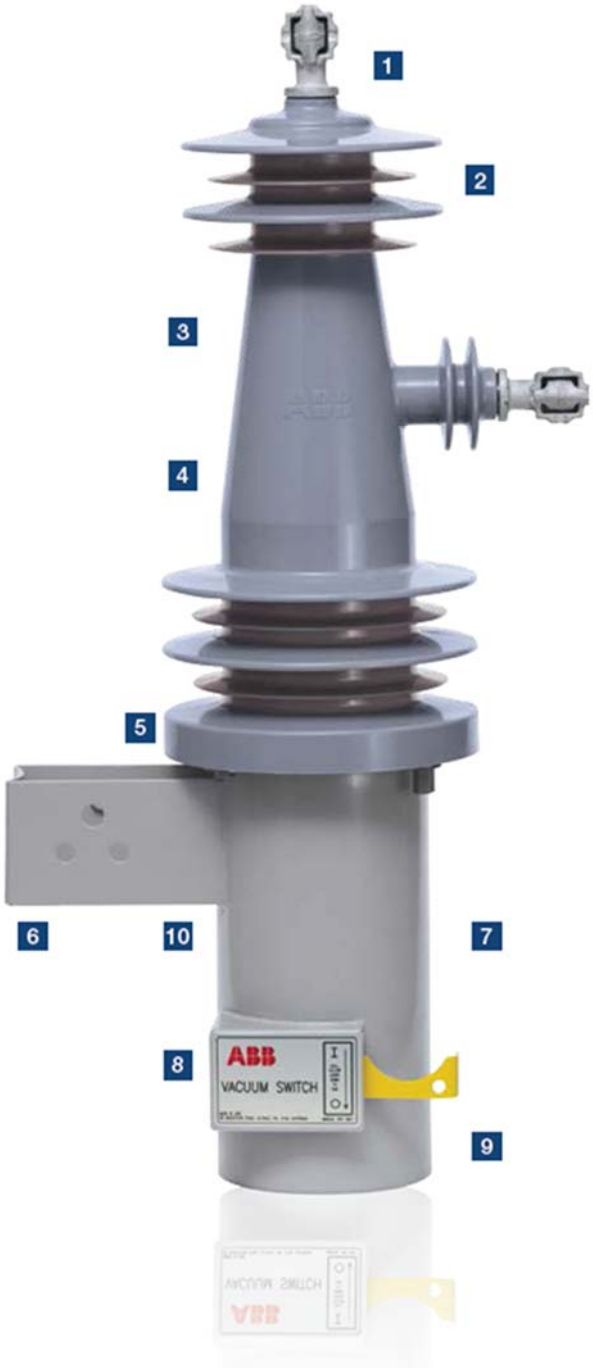


Power and productivity
for a better world™

ABB

# Introduction

ABB introduces the latest range of PS capacitor vacuum switches. Building on the proven PS switch design, new single phase and three phase units are available giving maximum installation flexibility.




The PS vacuum switch is a solid dielectric vacuum switch suitable for use in distribution systems and industrial applications up to 38 kV ungrounded. The switch has been specifically designed for heavy duty capacitor switching applications and tested in accordance with IEEE C37.66 for operation in the harshest climatic conditions.

The PS capacitor vacuum switch is designed to reduce lifecycle costs and offer customers true value.

**1. Range-taking connection clamp**
#8 solid to 2/0 AWG stranded or up to 70mm²

**2. Sleek compact design**
Up to 200 kV BIL insulators offers high creepage distances in relatively small overall dimensions.

**3. Embedded vacuum interrupter**
Unmatched protection from external influences.

**4. Durable insulator**
Advanced hydrophobic cycloaliphatic resin (HCEP) insulator has silicone-like water resistant properties with specially designed sheds engineered for durability.

**5. Mounting flexibility**
Insulator capable of 330° rotation to ease connection and maintain clearances.

**6. Interchangeability**
Mounting brackets suit interchangeability with other brands.

**7. Long-life metal housing**
The main housing and trip lever mechanism is made from stainless steel to provide superior corrosion resistance and durability. The colour is RAL 7035 (ASA 70) light grey.

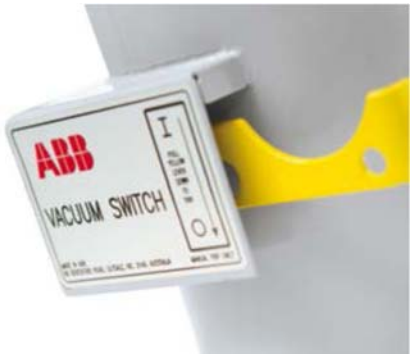
**8. Protection for outdoor components**
The trip lever and control cable connector have protective weather covers.

**9. High visibility**
The stainless steel yellow position indicator provides easy identification of switch status. It doubles as a manual hookstick trip level for isolation.

**10. Control cable connection point**
Control cable connection point to suit 5 or 7-pin mil-spec connection (single phase) and 10-pin mil-spec connection (three phase).

**Environmentally friendly**
Free from any oil, gas or foam insulating mediums.

# Benefits and features


| Benefits | Features |
|---|---|
| **Economy** | Maintenance free<br>Standard features<br>– High visibility position indicator<br>– Manual trip lever<br>– Up to 200kV BIL<br>– Wildlife protectors |
| **Flexibility** | Mounting flexibility, rotatable 330° (single phase switches only)<br>Compact design<br>Operable with most capacitor controllers<br>Interchangeable with other makes of switches<br>Single phase and three phase options available |
| **Reliability** | Vacuum technology guarantees over 50,000 paired fault-free mechanical operations<br>Compliant to the highest restrike category in accordance to IEEE C37.66<br>Simplicity in design<br>Type tested to IEEE C37.66<br>Manufactured in an ISO 9001 and ISO14001 environment |
| **Easy to Use** | Visual indication<br>Lightweight<br>Wide control voltage range<br>Low power solenoid mechanism<br>Over 50,000 paired maintenance-free mechanical operations |
| **Durability** | Few moving parts<br>Stainless steel external components<br>Stainless steel 304 housing<br>Advanced hydrophobic cycloaliphatic resin (HCEP) insulators |
| **Environmentally friendly** | Dry type design<br>Oil, gas and foam free |
| **Safety** | Trip level for emergency operations |

# Vacuum technology

**A vacuum is an ideal switching medium, providing the dielectric strength required for capacitor switching with no harmful environmental side effects.**

ABB's range of PS switches utilises proven vacuum technology, with over 25 years of experience in developing and manufacturing vacuum interrupters. The vacuum interrupters are also used in other ABB products including automatic circuit reclosers, circuit breakers and contactors.

ABB's PS switches are manufactured with vacuum interrupters that have been especially designed for capacitor switching applications. The vacuum interrupter consists of either copper chromium (CuCr) or tungsten copper (WCu) contacts depending on the voltage rating. This provides superior interrupting capabilities and the capacity to withstand high temperatures, guaranteeing a long switching life.

ABB vacuum interrupters are renowned for their operational reliability and robust construction, allowing the PS switch to achieve over 50,000 paired fault-free and maintenance-free mechanical switching operations.

# Magnetic actuator technology

**The magnetic actuator provides force-travel characteristics ideal for vacuum switching. It also reduces the number of moving parts and requires zero maintenance.**

The design of the PS vacuum switch incorporates a fast-acting solenoid mechanism, which eliminates prestrike and restrike of switch contacts. Incorporating a single DC powered actuator coil and a ring of incredibly strong permanent rare earth magnets, the speed of operation and holding force of the PS switch actuator are key to its high performance ratings.

The magnetic actuator is designed in such a way that the driving spool acts directly on the moving contact of the vacuum interrupter via an insulating push rod. This design, having fewer parts, results in highly efficient and reliable operation. Even on power failure, the PS switch can be manually disconnected by a manual trip lever.

The magnetic actuator is designed with power efficiency in mind. The mechanism draws a 10 A 'single shot' current pulse (100 msec) during a close or trip operation (120 V). At all other times, it remains in stand-by, with no current draw.

# Insulator technology

**The PS switch insulator is manufactured with advanced 'hydrophobic cycloaliphatic epoxy' (HCEP) resin. HCEP resin adds hydrophobic properties similar to silicones, to the well-known benefits of traditional cycloaliphatic epoxies.**

Increased hydrophobicity leads to less surface wetting, which in turn provides better reliability, improved life expectancy and very high resistance to electrical tracking.
The self-cleaning properties of HCEP, similar to a freshly polished car, make it ideal for high pollution and dusty environments. HCEP is also much stronger than porcelain providing greater crack and chip resistance.

The PS switch insulator is manufactured by automatic pressure gelation. In this process, the HCEP resin is fed into a preheated mould where gelation occurs under pressurised conditions. To ensure the structural and electrical integrity of its insulators, every insulator is x-ray tested to identify any voids before acceptance.

BIL ranges of 125 kV to 200 kV are available as standard.

# Three phase vacuum switch

**Introducing ABB's latest inclusion to the PS Range.**

The three phase PS15 and three phase PS25 are the latest addition to ABB's portfolio of switches.

The three phase switches offer all the benefits of the single phase design in a three phase gang-operated configuration. This can reduce installation time and save space.

The three phase PS15 is rated up to 15.5 kV ungrounded (27 kV grounded) and the three phase PS25 is rated up to 25 kV ungrounded (43 kV grounded).

# Switch options


## Terminal types

The PS vacuum switch comes with several cable termination options including:

- 200 A standard termination
- 400 A 1-hole termination
- 400 A NEMA type 2-hole termination

The terminals can be located either on the top of the switch (location A), side of the switch (location B), or both locations.

**400A NEMA TYPE TERMINATION**

**400A TERMINATION**

**200A STANDARD TERMINATION**

## Control voltages

The PS switch is available with a choice of control voltages. Standard control voltages are:

- 110V AC or DC
- 240V AC
- 48V DC

The standard control mode is mechanically latched whereby a pulse is required to both open and close the switch.

For 110V and 240V units, electrically held operation is also available, automatically tripping the switch whenever power is lost.

The smart control board inside the switch also provides surge protection, advanced timing control and rapid switching prevention, and is perfectly matched to the magnetic actuator operation.

The current draw required by the 48V DC switch can be higher than regular power supplies can deliver. For lower power 48V DC operation, single or three phase capacitor discharge power supplies are recommended. Please see accessories.

# PS switch selection table

| Switch selection table | PS | 15 | – | 1A | M | BC | – | 212 | 1 | S |
|---|---|---|---|---|---|---|---|---|---|---|

**Switch rating:**
**15**. 15.5 kV (1-phase and 3-phase)
**17**. 17.5 kV (1-phase and 3-phase)
**25**. 25.0 kV (1-phase and 3-phase)
**36**. 38.0 kV (3-phase only)

**Control voltage:**
**1A**. 120V AC
**1D**. 120V DC
**2A**. 240V AC
**4D**. 48V DC
**1H**. 120V AC with DC heater (Three-phase only) or 120V DC with AC heater (Three-phase only)
**2H**. 240V AC with DC heater (Three-phase only)

**Latching options:**
**M**. Mechanically latched

**Limit switch (auxiliary contacts):**
**AO**. N/O “A” contact (5-pin plug)
**BC**. N/C “B” contact (5-pin plug)
**AB**. N/O and N/C “A” and “B” contacts (7-pin plug)
**DP**. N/O and N/C “A” and “B” contacts (10-pin plug for all 3-phase switches only)

**Current rating / BIL:**
**212**. 200 A, 125 kV BIL (PS15 and PS25)
**412**. 400 A, 125 kV BIL (PS15 only)
**215**. 200 A, 150 kV BIL (PS25 only)
**415**. 400 A, 150 kV BIL (PS17 only)
**320**. 300 A, 200 kV BIL (PS36 only)

**Switch type:**
**1**. Single phase switch
**3**. Three phase switch

**Terminal palm:**
**S**. Standard terminal (200A)
**1**. One hole terminal (400A)
**2**. Two hole terminal (400A)

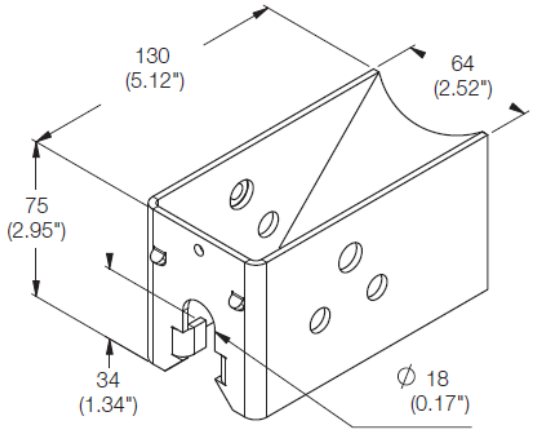
## Capacitor switch standards

- 304 stainless steel tank
- Protective bird guards for each terminal provided
- Manual trip handle
- Installation, operation and maintenance manual

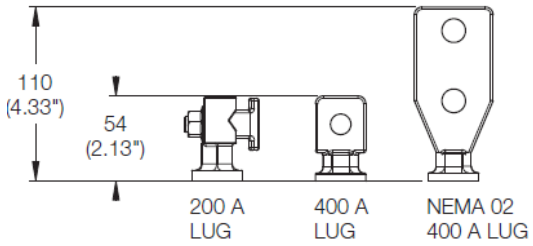
## Accessories

- PS-4D-CDPS-1P Single phase power supply
- PS-4D-CDPS-3P Three phase power supply

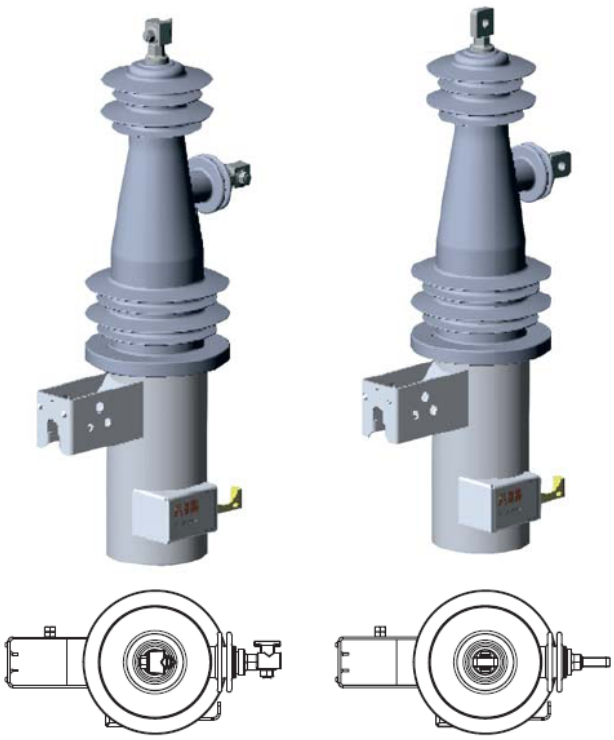
# Single phase range
## PS15, PS17 and PS25

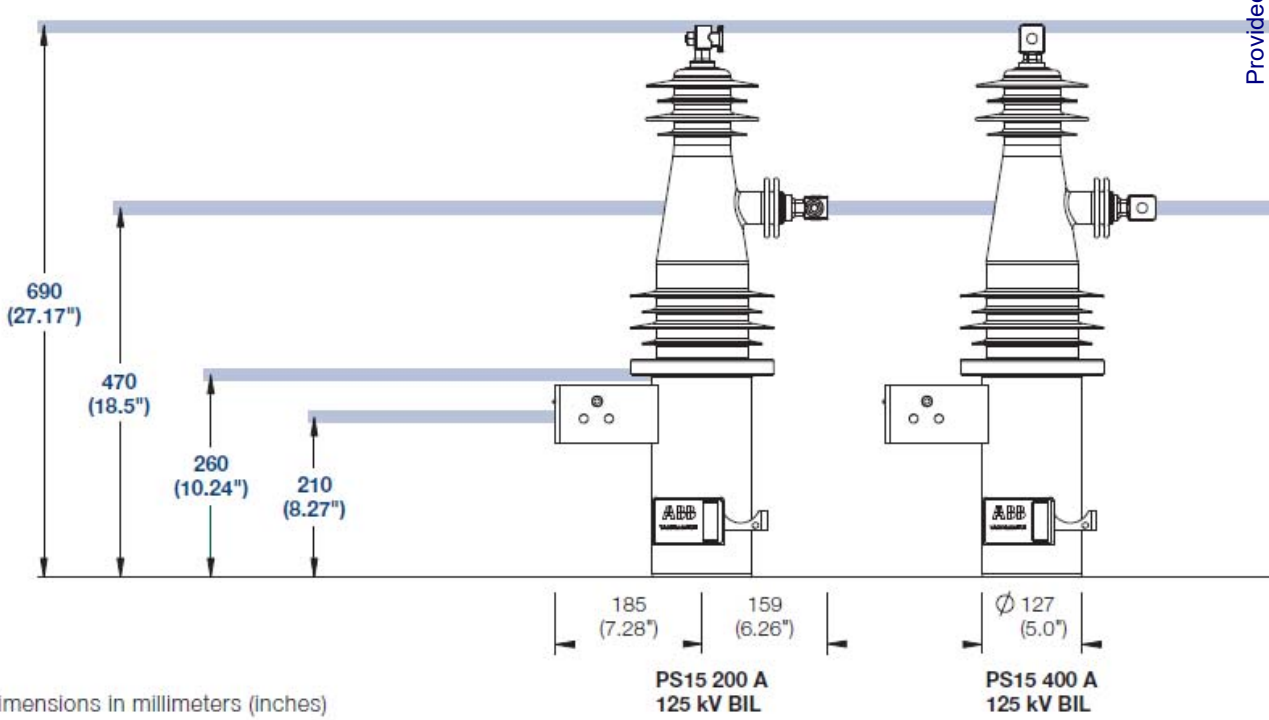



**MOUNTING BRACKET**

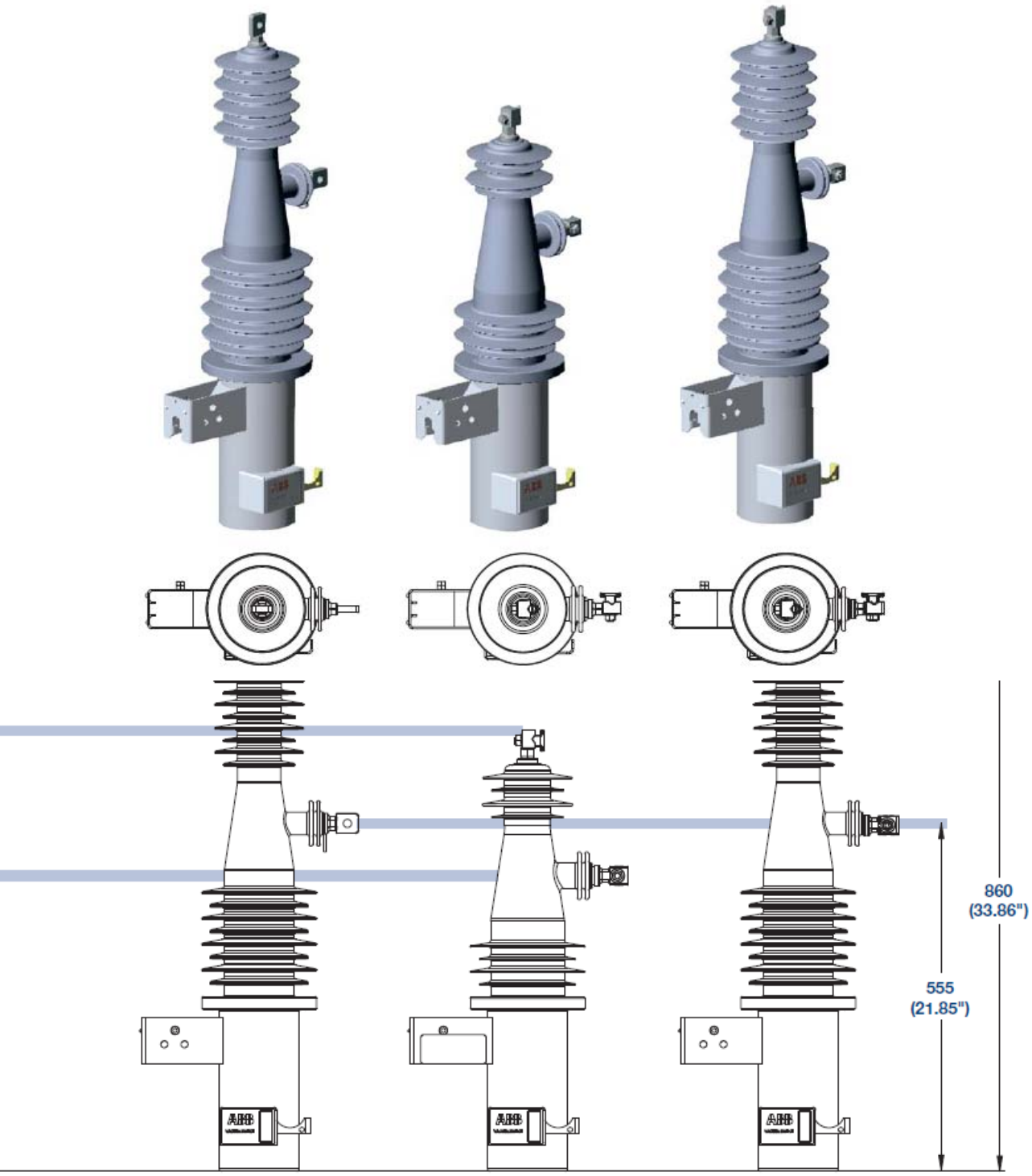



**LUG OPTIONS**






**Note:** All dimensions in millimeters (inches)




PS17 400 A
150 kV BIL

PS25 200 A
125 kV BIL

PS25 200 A
150 kV BIL

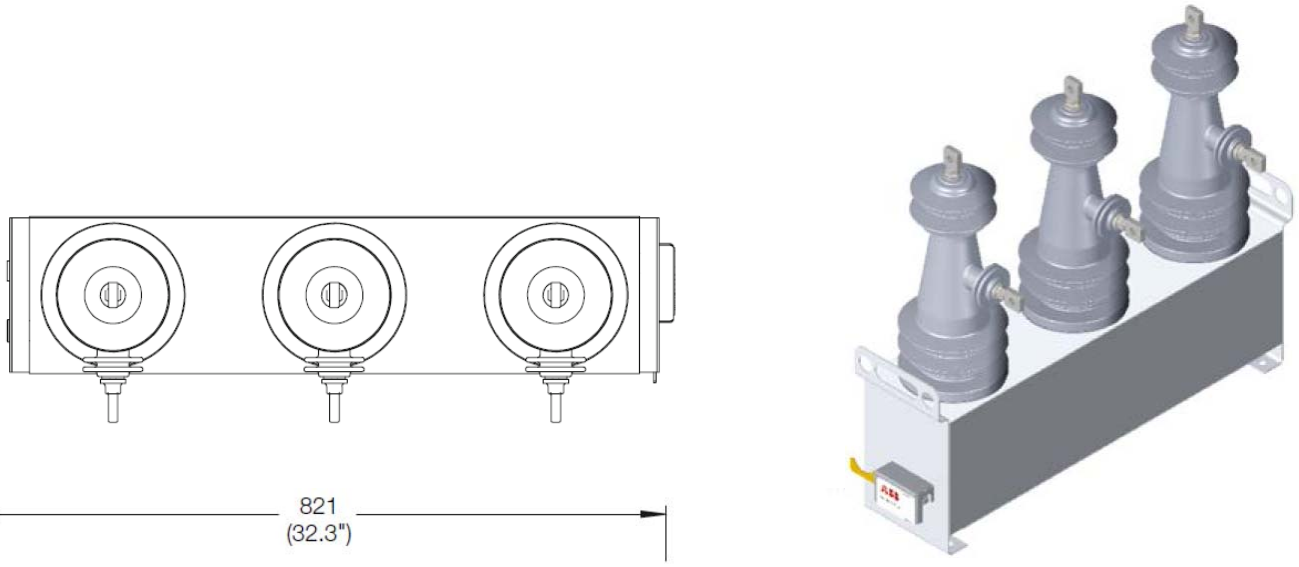
# Three phase range

## PS15

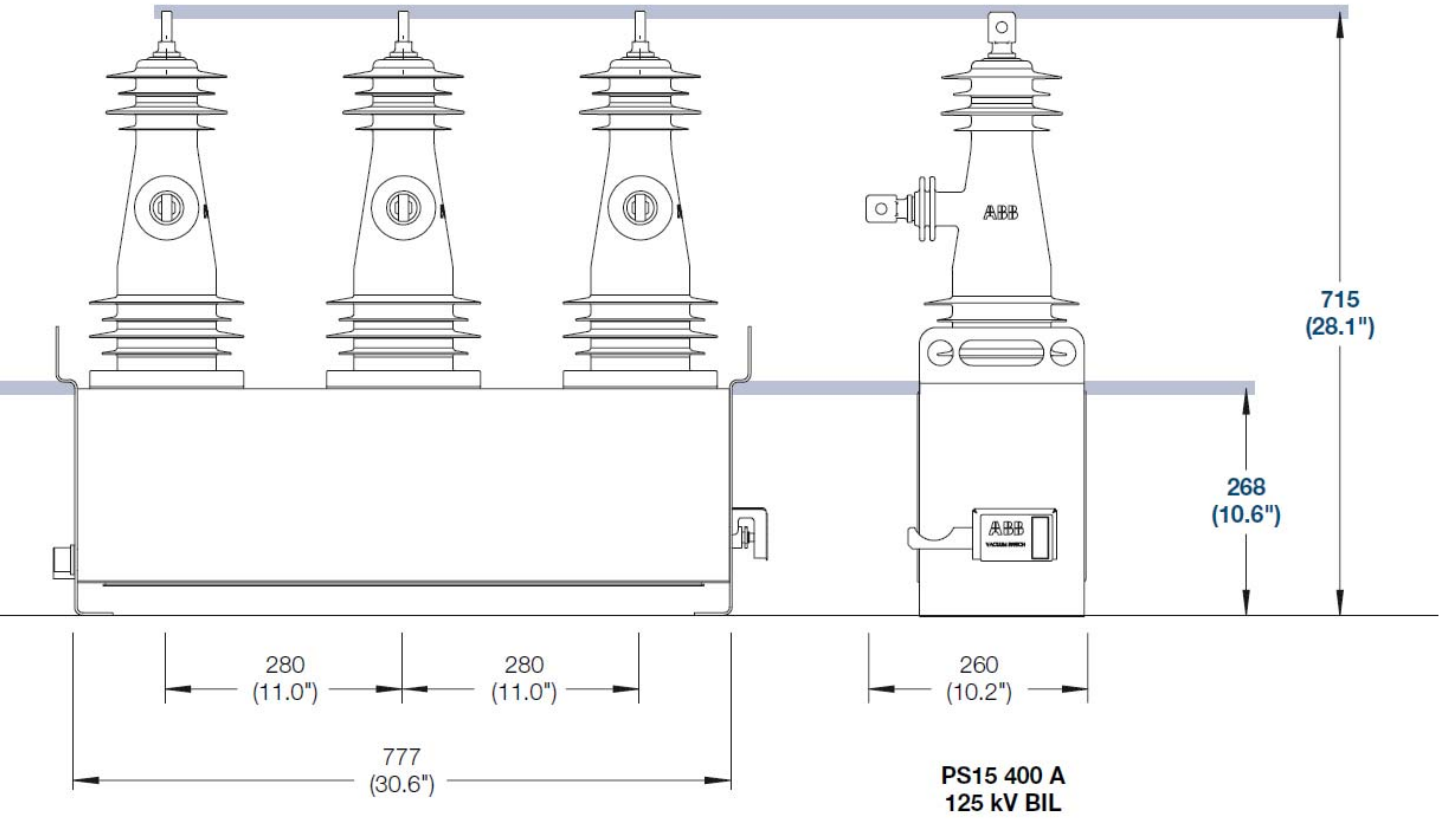



**PS15 200 A**
**125 kV BIL**

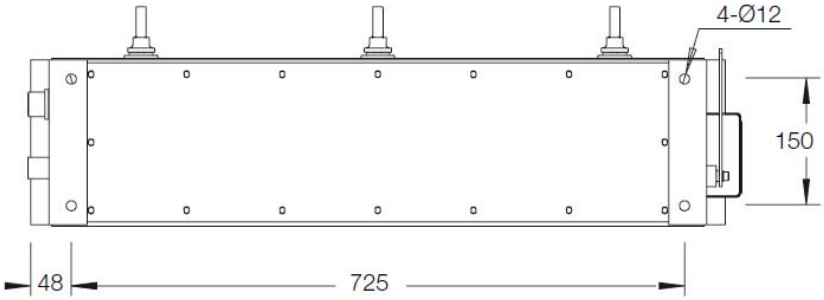
**Note:** All dimensions in millimeters (inches)






**PS15 400 A**
**125 kV BIL**



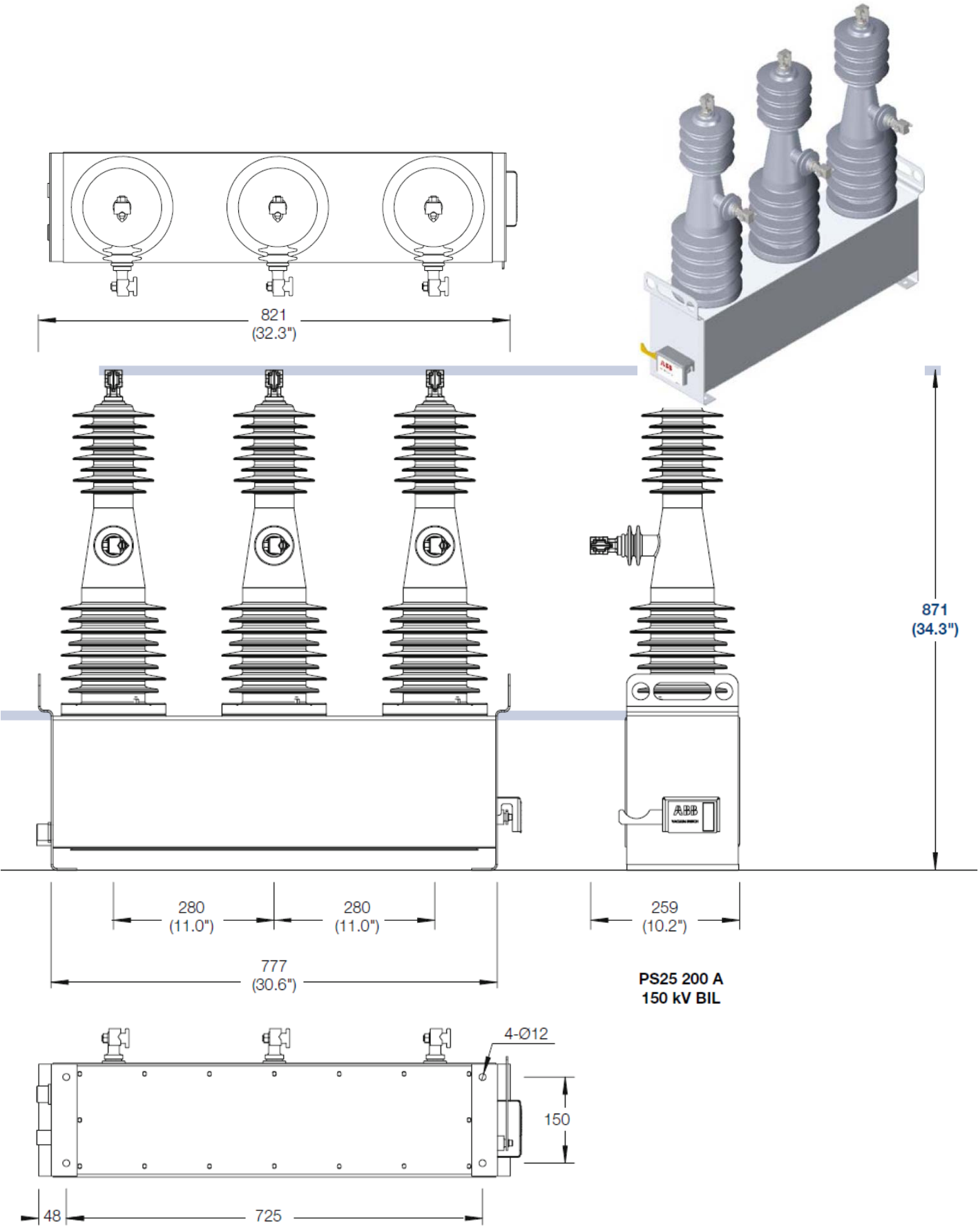
# Three phase range

## PS25



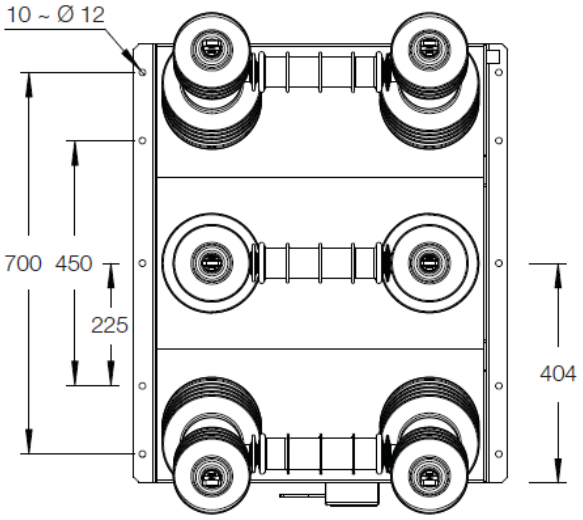

**PS25 200 A**
**125 kV BIL**

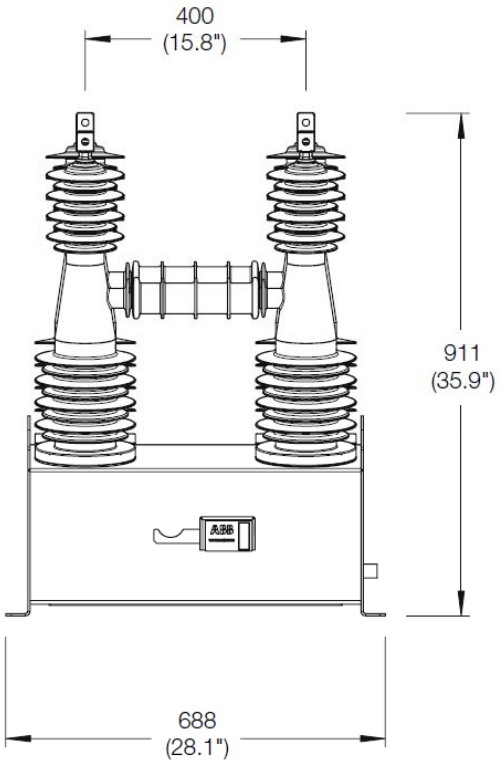
**Note:** All dimensions in millimeters (inches)

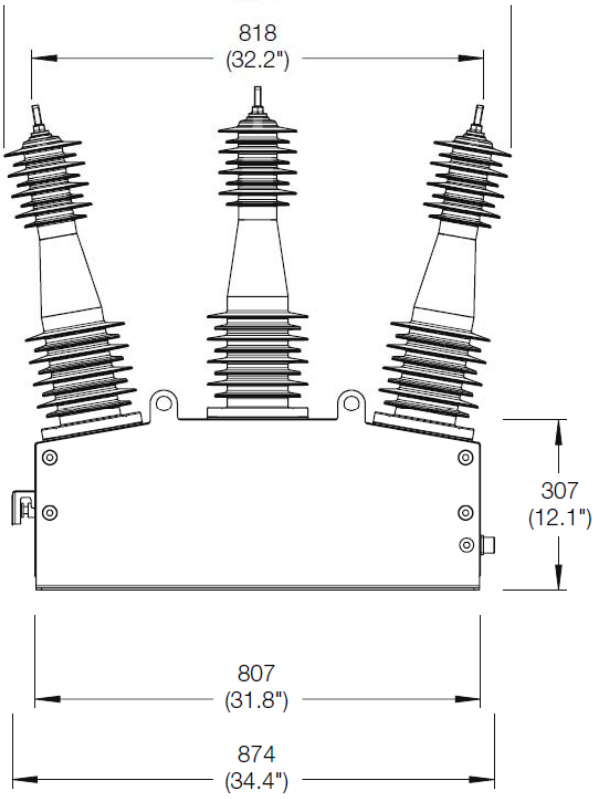


# Three phase range

## PS36




**PS36 300A**
**200 kV BIL**

**Note:** All dimensions in millimeters (inches)

# Technical data

| Electrical | | PS15 | PS17 | PS25 | PS36 |
|---|---|---|---|---|---|
| **Switch Type** | Phase | 1 and 3 | 1 and 3 | 1 and 3 | 3 |
| **Rated maximum voltage, 50 / 60 Hz** | | | | | |
| Ungrounded capacitor banks, line-to-line | kV rms | 15.5 | 17.5 | 25 | 38 |
| Grounded capacitor banks line-to-line | kV rms | 27 | 30 | 43 | 38 |
| **Lightning impulse withstand voltage** | | | | | |
| Line to ground | kV BIL | 125 125 | 150 | 125 150 | 200 |
| Open contact | kV BIL | 95 125 | 125 | 125 125 | 200 |
| **Power frequency withstand voltage, 60 Hz** | | | | | |
| Dry, 1.0 minutes | kV | 60 | 60 | 60 | 70 |
| Wet, 10 seconds | kV | 50 | 50 | 50 | 60 |
| **Continuous current 50/60 Hz** | A | 200 400 | 400 | 200 | 300 |
| **Capacitive switching current (50/60 Hz)** | A | 200 400 | 400 | 200 | 300 |
| **Symmetrical fault making current** | A | 6,000 | 6,000 | 6,000 | 6,500 |
| **Peak (asymmetrical) fault making current** | A | 15,000 | 15,000 | 15,000 | 15,000 |
| **Short time (symmetrical) withstand current** | | | | | |
| 1.0 second | A | 12,500 | 12,500 | 12,500 | 12,500 |
| **High frequency making current** | | | | | |
| Transient peak | A | 12,000 | 12,000 | 12,000 | 15,000 |
| Transient in rush frequency | Hz | 6,000 | 6,000 | 6,000 | 6,000 |
| **Control voltage range** | | | | | |
| 48V DC | V | 36…60 | 36…60 | 36…60 | N/A * |
| 110/120V AC (50 / 60 Hz) or V DC | V | 90…130 | 90…130 | 90…130 | 90…130 |
| 240V AC (50 / 60 Hz) | V | 205…265 | 205…265 | 205…265 | 205…265 |
| **Nominal control current (100msec)** | | | | | |
| 120 / 240V AC/DC (close/open) | A | 10/5 | 10/5 | 10/5 | 30/30 |
| 48V DC (close/open) | A | 25/10 | 25/10 | 25/10 | N/A * |
| **Nominal open/close time** | msec | 100 | 100 | 100 | 220 |
| **Holding current (electrically held only)** | mA | 100 | 100 | 100 | N/A |
| **Creepage distance** | | | | | |
| Terminal to terminal | mm | 518 | 805 | 518 805 | 1600 |
| | inches | 20.4 | 31.7 | 20.4 31.7 | 63.0 |
| Terminal to ground | mm | 510 | 770 | 510 770 | 1350 |
| | inches | 20.1 | 30.3 | 20.1 30.3 | 53.1 |
| **General** | | | | | |
| **Weight** | kg | 13 | 16 | 16 | 110 |
| | lbs | 28 | 35 | 35 | 243 |
| **Operating temperature range** | °C | -40 to +65 | -40 to +65 | -40 to +65 | -40 to +65 |
| | °F | -40 to +149 | -40 to +149 | -40 to +149 | -40 to +149 |
| **Mechanical endurance (paired operations)** | | 50,000 | 50,000 | 50,000 | 30,000 |
| **Restike category in accordance to IEEE C37.66** | | C2 | C2 | C2 | C2 |

Type test certificates from independent testing faculties are available on request
*Contact ABB

## Accessories available

- Connection cables (including connectors)
- Cable terminal earthing point
- Power Factor Controller (ABB CQ900R/CQ900L and CQ930)
- Remote low power supplies
- Junction Box

# Contact us

**Please contact your local sales representative for further information**

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