

## De-Energised Rotary Switches:

**Tap Changers 1 & 3 Phase 11kV to 36kV 30A, 60A & 100A 200kV BIL**



## Introduction:

ZEP WW de-energised rotary tap changers are designed for use in liquid filled distribution transformers, pad mount, pole mount and industrial types.

The switches mount directly through the tank wall or cover and are operated from outside the transformer tank.

They are available in single and three phase configurations.

Tested to IEC 60214 the switches have been given a nominal rating of 36kV, 200kV BIL 60A and 36kV, 200kV BIL 100A cover the full range of standard voltages of 12, 24 and 36kV in the same design, allowing customers to reduce inventory and costs.

36kV, 200kV BIL 30A are also offered, these allow for easier crimp of smaller diameter cable (5mm<sup>2</sup>) into the fixed contacts without the use of fillers.

All switches are available in 5, 7 and 9 positions.

## Contact System:

### 60A Switches:

The moving contact is Silver plated copper and is spring loaded. The fixed contacts are silver plated copper tube.

The fixed contacts in the 60A switches have dimensions of 6mm (OD) x 4.4mm (ID) accepting 10mm<sup>2</sup> flexible conductors.

### 30A Switches:

The 30A unit has fixed contact dimensions of 6mm (OD) x 3.5mm (ID) accepting maximum 5mm<sup>2</sup> flexible conductors. Whilst the current carrying characteristics of the contact system is unchanged the 5mm<sup>2</sup> conductor limits the maximum rating of these units to 30A.

### 100A Switches:

The moving contact is Silver plated copper and is spring loaded. The fixed contacts are manufactured from solid copper rod and are Silver Plated and threaded M6 for connection to the switch.

## Operating Handles and Indicators:

There are 2 handles styles available as follows:

1. Handle available is hook stick style with a pointer and is capable of being locked in position. The handle, position indicator and the assembly nut are moulded from glass reinforced high strength Ultra Violet inhibited PA66 material. The external "Black" position indicator plate has raised white letter position indication and operating information. The colour contrast allows the indicator plate to be easily read under adverse conditions.
2. Aluminium Handles – With both "Clockwise" and "Anti-clockwise" numbering dependent on customer requirements, these are also capable of being locked into position with either a padlock (not ZEP supply) or by use of an M8 screw. Handles numbered 1-5, 5-1, 1-7, 7-1, 1-9, 9-1.

## **Corrosion and Weather Resistance (External Parts):**

### **1. UV Stabilised Glass Reinforced Resins.**

All external parts of the switches are designed and manufactured from materials capable of withstanding the ageing effects of sunlight and corrosive environments.

The external parts are manufactured from high strength, weather-resistant, UV stabilized glass reinforced resins that have been used in similar applications in tap switches and LV bushing assemblies for in excess of 30 years.

The material was recommended for the intended use by Bayer Germany.

Long term aging information is available on request.

All external metallic parts are 300 series stainless steel.

### **2. Aluminium Handles and locking Parts**

All external parts utilizing the Aluminium handle option incorporates a Mild Steel Hot Dip Galvanised locking nut and locking bracket, all other external metal parts are 300 series stainless steel.

## **Chemical Resistance (Internal Parts):**

The main switch insulating material is high strength glass reinforced PBT resins.

The material is not affected by motor and transformer oil, petrol and brake fluids at high temperatures. ZEPWW has been supplying tap switches utilizing this material in tap switch contact panels for in excess of 15 years.

The material PBT has been in use in the electrical, automotive and transformer industry for over 35 years.

Products manufactured from this material in the electrical engineering field include, tap switches, bushing wells, terminal blocks and LV bushing assemblies.

## **Sealing System:**

The sealing system features double "O" ring rotary shaft seal and positively retained "O" ring static tank seal.

All seals are fabricated from high temperature Viton elastomer, giving compatibility with oil and silicon fluids.

The double "O" ring shaft seal provides a balanced shaft seal assembly which prevents over stressing of the "O" ring due to longitudinal and flexural movement.

The use of two "O" rings also provides a redundant seal for the critical shaft seal application.

The moulded seal geometry of the static tank seal features a fully captive and retained "O" ring with controlled compression, providing security against over tightening.

## **Tightening Torque:**

ZEP WW recommends a tightening torque of 20Nm on the M30 switch locating nut during assembly of the tap changer onto the transformer tank.

## Design Tests:

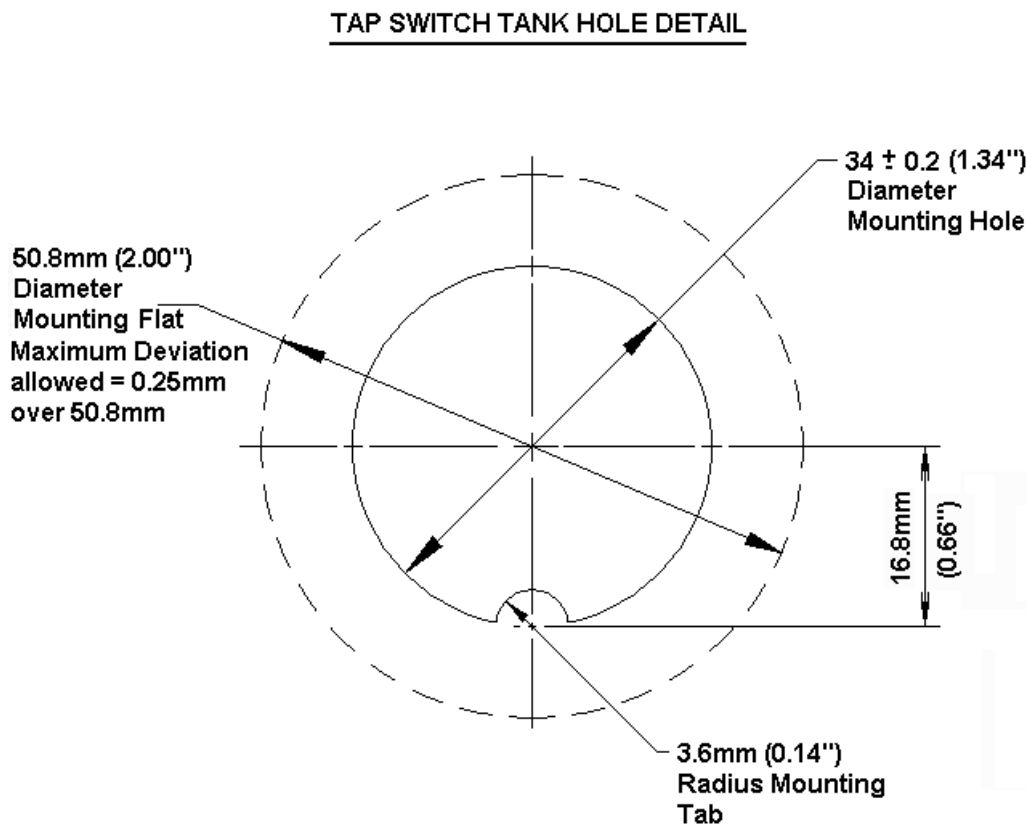
The ZEPWW range of tap changers passed a series of tests which were designed to verify their ratings and suitability for use in fluid filled distribution transformers and their long term reliability. The tests are listed below:

Full Wave Impulse Test  
Partial discharge and RIV Test  
Short Time Current Withstand Test  
Contact Temperature Rise Test  
Leak Test

Low Frequency Voltage Withstand Test  
Mechanical Life Test – 10,000 operations  
Cantilever Load Test  
Coil Oven Bake Test at 135° C  
Safe Transit Test

## Tank Mounting Detail:

The drawing below shows the tank hole detail required for mounting the switch.



### NOTE:

For mounting on small round tank pole mounted transformers it is important that the flat switch body does not foul on the inside radius of the tank ensuring the tank seal is not compromised.

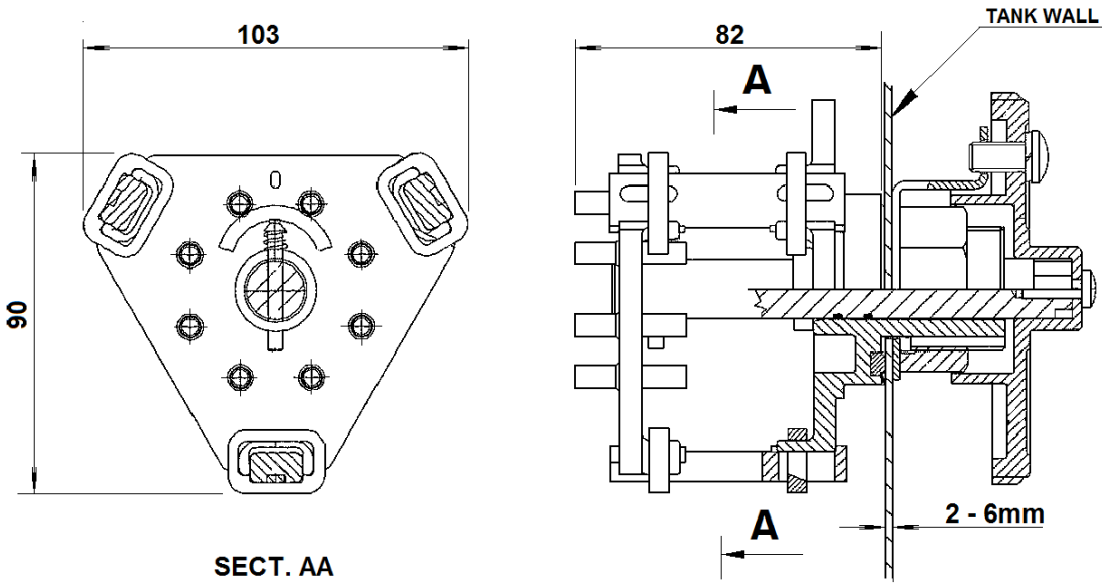
## ORDERING INFORMATION BY ZEP MODEL NUMBER

<b>ZEP ROTARY OFF CIRCUIT SINGLE PHASE TAP CHANGER PRODUCT LIST</b>						
<b>ZEP MODEL NUMBER</b>	<b>VOLTAGE RATING</b>	<b>CURRENT RATING</b>	<b>IMPULSE LEVEL MAXIMUM</b>	<b>DESCRIPTION</b>	<b>MAXIMUM CABLE CAPACITY IN FIXED CONTACT</b>	<b>HANDLE TYPE</b>
993310	11-33kV	30A	200kV BIL	1 PHASE 5 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 1-5
993310R	11-33kV	30A	200kV BIL	1 PHASE 5 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 5-1
991310	11-33kV	60A	200kV BIL	1 PHASE 5 POSITIONS 60A	10mm <sup>2</sup>	PLASTIC HOOK STICK
992310	11-33kV	60A	200kV BIL	1 PHASE 5 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 1-5
992310R	11-33kV	60A	200kV BIL	1 PHASE 5 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 5-1
993312	11-33kV	30A	200kV BIL	1 PHASE 7 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 1-7
993312R	11-33kV	30A	200kV BIL	1 PHASE 7 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 7-1
991312	11-33kV	60A	200kV BIL	1 PHASE 7 POSITIONS 60A	10mm <sup>2</sup>	PLASTIC HOOK STICK
992312	11-33kV	60A	200kV BIL	1 PHASE 7 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 1-7
992312R	11-33kV	60A	200kV BIL	1 PHASE 7 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 7-1
992314	11-33kV	60A	200kV BIL	1 PHASE 9 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 1-9
992314R	11-33kV	60A	200kV BIL	1 PHASE 9 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 9-1

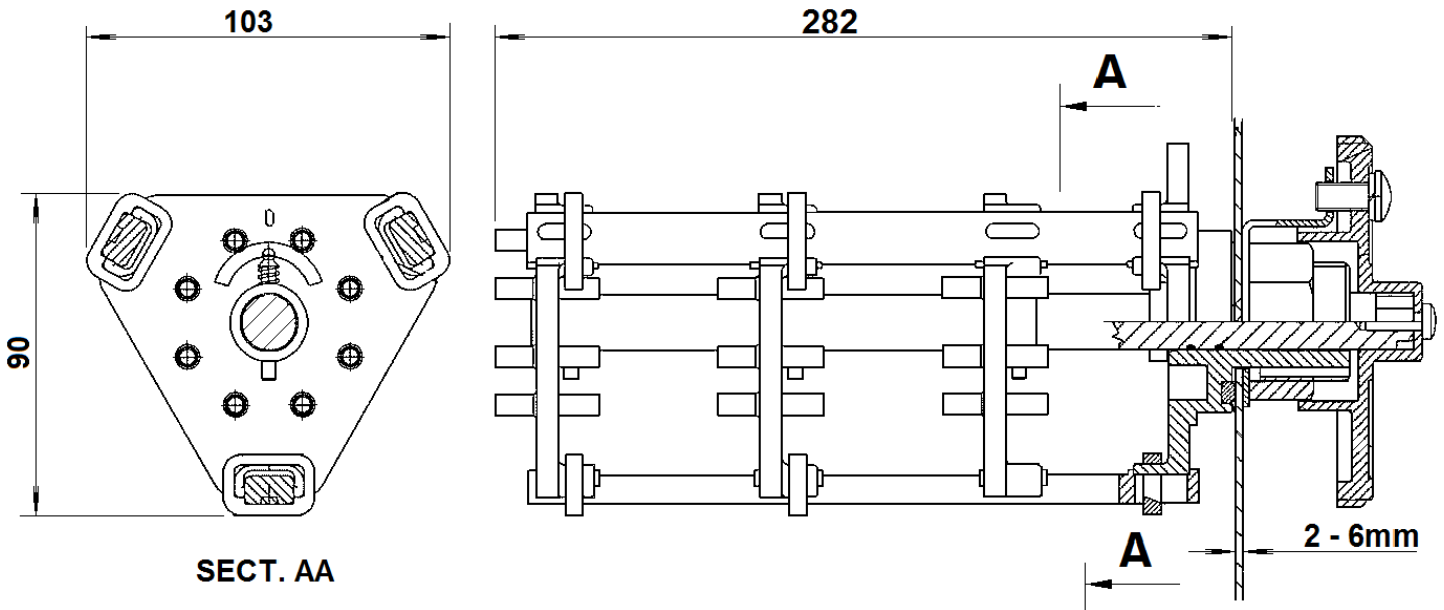
<b>ZEP ROTARY OFF CIRCUIT THREE PHASE TAP CHANGER PRODUCT LIST</b>						
<b>ZEP MODEL NUMBER</b>	<b>VOLTAGE RATING</b>	<b>CURRENT RATING</b>	<b>IMPULSE LEVEL MAXIMUM</b>	<b>DESCRIPTION</b>	<b>MAXIMUM CABLE CAPACITY IN FIXED CONTACT</b>	<b>HANDLE TYPE</b>
994315	11-33kV	30A	200kV BIL	3 PHASE 5 POSITIONS 30A	5mm <sup>2</sup>	PLASTIC HOOK STICK
993315	11-33kV	30A	200kV BIL	3 PHASE 5 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 1-5
993315R	11-33kV	30A	200kV BIL	3 PHASE 5 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 5-1
991315	11-33kV	60A	200kV BIL	3 PHASE 5 POSITIONS 60A	10mm <sup>2</sup>	PLASTIC HOOK STICK
992315	11-33kV	60A	200kV BIL	3 PHASE 5 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 1-5
992315R	11-33kV	60A	200kV BIL	3 PHASE 5 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 5-1
991325	11-33kV	100A	200kV BIL	3 PHASE 5 POSITIONS 100A	M6 STUD	PLASTIC HOOK STICK
992325	11-33kV	100A	200kV BIL	3 PHASE 5 POSITIONS 100A	M6 STUD	ALUMINIUM NUMBERED 1-5
992325R	11-33kV	100A	200kV BIL	3 PHASE 5 POSITIONS 100A	M6 STUD	ALUMINIUM NUMBERED 5-1
993317	11-33kV	30A	200kV BIL	3 PHASE 7 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 1-7
993317R	11-33kV	30A	200kV BIL	3 PHASE 7 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 7-1
991317	11-33kV	60A	200kV BIL	3 PHASE 7 POSITIONS 60A	10mm <sup>2</sup>	PLASTIC HOOK STICK
992317	11-33kV	60A	200kV BIL	3 PHASE 7 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 1-7
992317R	11-33kV	60A	200kV BIL	3 PHASE 7 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 7-1
991327	11-33kV	100A	200kV BIL	3 PHASE 7 POSITIONS 100A	M6 STUD	PLASTIC HOOK STICK
992327	11-33kV	100A	200kV BIL	3 PHASE 7 POSITIONS 100A	M6 STUD	ALUMINIUM NUMBERED 1-7
992327R	11-33kV	100A	200kV BIL	3 PHASE 7 POSITIONS 100A	M6 STUD	ALUMINIUM NUMBERED 7-1
993319	11-33kV	30A	200kV BIL	3 PHASE 9 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 1-9
993319R	11-33kV	30A	200kV BIL	3 PHASE 9 POSITIONS 30A	5mm <sup>2</sup>	ALUMINIUM NUMBERED 9-1
991319	11-33kV	60A	200kV BIL	3 PHASE 9 POSITIONS 60A	10mm <sup>2</sup>	PLASTIC HOOK STICK
992319	11-33kV	60A	200kV BIL	3 PHASE 9 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 1-9
992319R	11-33kV	60A	200kV BIL	3 PHASE 9 POSITIONS 60A	10mm <sup>2</sup>	ALUMINIUM NUMBERED 9-1
991329	11-33kV	100A	200kV BIL	3 PHASE 9 POSITIONS 100A	M6 STUD	PLASTIC HOOK STICK
992329	11-33kV	100A	200kV BIL	3 PHASE 9 POSITIONS 100A	M6 STUD	ALUMINIUM NUMBERED 1-9
992329R	11-33kV	100A	200kV BIL	3 PHASE 9 POSITIONS 100A	M6 STUD	ALUMINIUM NUMBERED 9-1

Basic switch body dimensions for both Single and Three (3) Phase as detailed below:

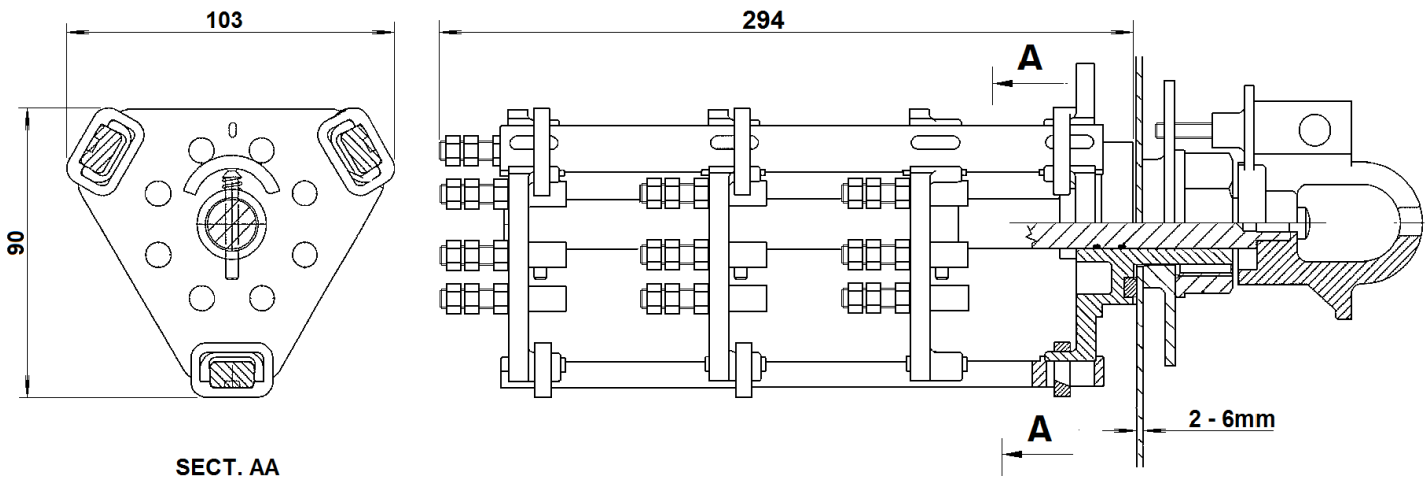
**FIGURE 1 – 11-33kV Single Phase 60A/30A**



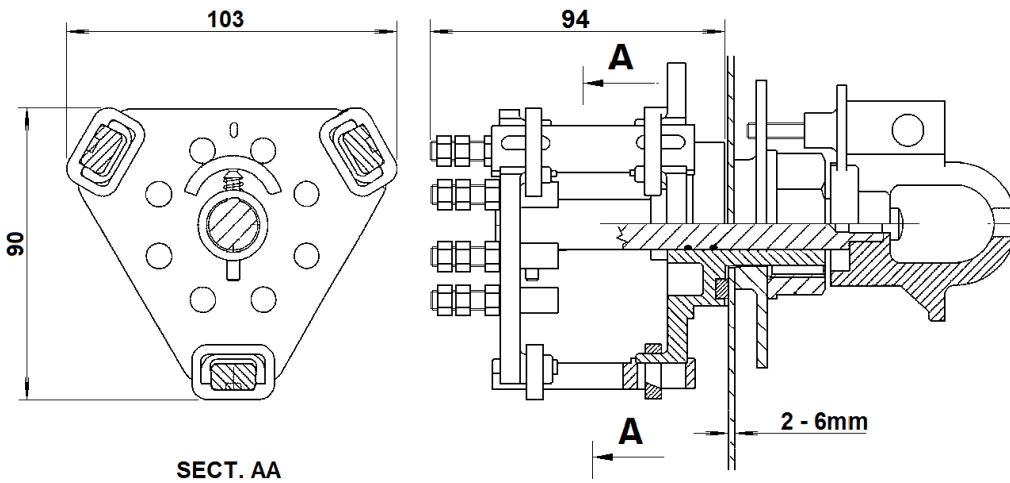
**FIGURE 2 – 11-33kV Three (3) Phase 60A/30A**



**FIGURE 3 – 11-33kV Three (3) Phase (100A)**



**FIGURE 4 – 11-33kV Single Phase (100A)**



**FIGURE 5 – EXAMPLE OF ALUMINIUM HANDLES NUMBERING BOTH CLOCKWISE AND ANTI-CLOCKWISE - 5 POSITIONS ONLY SHOWN**

