The most common type of failure in an electrical power distribution network is a single phase-to-earth fault. Many utilities are successfully mitigating the effects of this type of fault by the use of earth-fault compensation systems.

In this scheme the system neutral is earthed through a high impedance reactor, a so-called arc suppression coil (Petersen coil), which is adjusted to the earth capacitance of the network. By utilizing continuously variable arc suppression coils, ideal compensation of the earth-fault current, and therefore optimal efficiency of the resonant earthing technique can be achieved.
MAIN FEATURES

General

As the topology of an electrical power distribution network is subject to dynamic changes, the inductance of an arc suppression coil (ASC) used for neutral earthing must be variable.

Two basic principles to do so exist:

- by performing switching operations on the reactor whereby coil sections are connected or disconnected (step coil), or
- by continuous variation of the reluctance of the magnetic circuit by means of a mechanical drive (plunger core coil).

The earth-fault protection system developed by Trench Austria favours the plunger core coil compared to a reactor which is adjustable in finite steps, as:

- no switching operations for inductance variation are required (preferable since switching can lead to network perturbations during earth fault) and
- plunger core coils can be tuned precisely to minimum current at the fault location due to their continuous variability.

Main features

- Continuously variable (in on-load condition) by means of variation of the air gap
- Adjustment accomplished by means of a motor drive unit which may be either locally or remotely controlled
- Automatic tuning to the actual network condition via an Trench Austria earth-fault compensation controller
- Current regulation range standard 1:10 (other ranges on request)
- Core induction practically constant within the whole regulation range and slightly below saturation point as current regulation is not achieved by connecting or disconnecting winding segments
- Limitation of system related overvoltages
- Compact construction

Standard design

- Iron cored, oil insulated coil with continuously variable air gap adjustment in on-load condition by means of a plunger core
- Suitable for automatic earth-fault compensation via a Trench Austria earth-fault compensation controller (see separate leaflet)
- Winding material: aluminium
- Motor drive unit: Trench Austria model DMA, 230/400 V, 50 Hz, (control voltage 230 V, 50 Hz), mounted on top of the tank, with hand-crank for emergency service and potentiometer for remote position indication, with separate control cabinet mounted on the side wall of the tank at operational height, oil-filled steel tank
  - with air cushion, corrugated steel tank up to 4000 kVar, welded steel tank from 5000 kVar
- Oil-filling: mineral oil on napthenic basis, PCB-free acc. IEC 60296: 2003
- Mobile base with bidirectional rollers
- Porcelain bushings as per EN 50180;
  - for Um > 36 kV condenser bushings
- Protective cap over low voltage bushings
- Voltage measuring winding 100 or 110 V / 3 A
- Power auxiliary winding (500 V, 5 % of coil power, 30 s short time duty) for current injection used for the Trench Austria earth-fault protection system EPSY (see separate leaflet)
- One additional pocket for oil temperature indicator as per DIN 42354
- Oil gauge without indicating contacts
- Desiccant silica gel breather
- Surface treatment according to DIN EN ISO 12944-5, system no. AI11, top coat colour grey as per RAL 7033

Based on years of experience in the construction of arc suppression coils, the coil design concept was thoroughly reviewed, resulting in a new and improved series of ASCs which meet today’s requirements for earth-fault compensation. By means of modern planning and production processes the economic efficiency of plunger core coils has been increased significantly.
MAIN COMPONENTS

- Bushing
- Position indicator
- Motor drive
- Tank
- Spindle
- Control box
- Yoke
- Breather
- Plunger core
- Winding
- Oil drain valve
- Air gap
# TECHNICAL DATA and DESIGN OPTIONS

## Technical Data

<table>
<thead>
<tr>
<th>Power Range</th>
<th>Up to 1250 kVAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Range</td>
<td>10 up to 145/135 kV</td>
</tr>
<tr>
<td>Insulation Level</td>
<td>Uniform or graded</td>
</tr>
<tr>
<td>DUTY</td>
<td>Short-time duty 2 h</td>
</tr>
<tr>
<td></td>
<td>Continuous duty</td>
</tr>
<tr>
<td>Current Regulating Range</td>
<td>10% - 100%</td>
</tr>
<tr>
<td>Rated Frequency</td>
<td>50 Hz (6/7/3 Hz or 60 Hz on request)</td>
</tr>
<tr>
<td>Cooling Method</td>
<td>ONAN (self-cooling)</td>
</tr>
<tr>
<td>Installation</td>
<td>Indoor or outdoor</td>
</tr>
<tr>
<td>Tests</td>
<td>Routine tests acc. IEC 60076-6</td>
</tr>
</tbody>
</table>

## Special Design Options

### OPTIONS
- Winding material: copper
- Steel tank with flange mounted radiators with detachable oil conservator (OC)
- Double float Buchholz relay as per DIN 42556 (only with OC)
- Alternative insulating fluids
- Current transformer
- Power auxiliary winding (with extended power rating, continuous or short time duty)
- Devices for temperature supervision
- Minimum oil level indicator with indicating contacts (without OC)
- Magnetic type oil level indicator with/without indicating contacts (only with OC)
- Plug-in cable termination system
- Surge arrester
- Alternative motor drive types
- Alternative motor voltages
- Devices for remote position indication
- Supplementary resistor mounting brackets/hardware (only in connection with a corresponding power auxiliary winding)
- Air insulated resistor for resistive residual current increase
- Skid base
- Hot galvanized tank surface
- Paint/colour as per customer’s specification

### SPECIAL DESIGNS

**SLIDING CORE ASC**
Simplified design for a power range up to 1250 kVAR, current regulation range 15 with hand or motor drive. Optional equipment as per plunger core ASCs.

**NEUTRAL EARTHING AGGREGATE**
Compact construction of an arc suppression coil and a corresponding neutral point earther/earth transformer, housed in a common oil-filled steel tank. (see separate leaflet)

**FIXED CORE ASC**
Iron core coil with multiple sub-divided air gap for compensation of invariable network sections, without adjustment device.

**DRY TYPE ASC/ NEUTRAL EARTHING AGGREGATE**
Design with epoxy resin impregnated winding

## Technical limits for dry type designs

<table>
<thead>
<tr>
<th>Power Range</th>
<th>up to 1250 kVAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Range</td>
<td>up to 10 kV</td>
</tr>
<tr>
<td>Insulation Level</td>
<td>Graded insulation to 1 kV max. BIL 60 kV</td>
</tr>
<tr>
<td>DUTY</td>
<td>Short-time duty 2 h, Continuous duty</td>
</tr>
<tr>
<td>Regulation Range</td>
<td>10% - 100%</td>
</tr>
<tr>
<td>Rated Frequency</td>
<td>50 Hz</td>
</tr>
<tr>
<td>Cooling Method</td>
<td>AN</td>
</tr>
<tr>
<td>Installation</td>
<td>Indoor</td>
</tr>
</tbody>
</table>