Trench is a recognized world leader in the design and manufacture of high voltage equipment for application in electric utilities and high energy industrial systems. Since several decades Trench offers an advanced line of products for electrical systems utilizing Arc Suppression Coils (ASCs) for earthing of the neutral.

Besides the traditional algorithms for the tuning of Arc Suppression Coils to the network conditions the new EFC60m offers a superior multi-frequency current injection mode which makes the tuning process extremely resistant to network interferences.
## MAIN FEATURES

### General
- Advanced controller for adjusting Arc Suppression Coils (ASCs) to the network conditions even under extreme network conditions
- Current injection is mechanically and electrically integrated in the 19” rack design
- Multi-frequency current injection control mode
- Single frequency 50 (60) Hz current injection control mode
- Resonance peak by minor coil adjustment control mode

### Applications
- In resonant earthed power distribution networks the neutral point of the network is connected to earth by means of a stepless adjustable inductor (ASC)
- If the resonance circuit formed by the adjustable inductive coil and the earth capacitance of the network is tuned to or close to resonance, the fault current is greatly reduced in case of a line-to-earth fault (earth fault)
- In most cases the arc caused by the fault current is extinguished without the need to switch off the faulty part of the network
- As the Arc Suppression Coil (ASC) and the earth capacitance form a resonance circuit, the neutral-to-ground voltage of the network depends on the value of the inductance of the ASC and reaches a maximum when the ASC is tuned to resonance
- The ASC can be tuned automatically by evaluation of the voltage maximum of the resonance curve (by coil adjustment) or by impedance-measurement of the resonance circuit (by current injection)
- The multi-frequency current injection of the EFC60m enables network analysis with frequencies different from the operating frequency, which is extremely resistant to possible network interferences

### Operation
- Easy operation
- Integrated 7” colour touch screen
- Possible to remote install display (Communication via Ethernet)
- Terminal program E-Soft for Windows for parameter setting and on-site operation via PC or remote control via Ethernet
- E-Soft C-Interpreter for internal PLC-commands
- Flexible parameterisation
- Pre set factory configuration (changeable/overwriteable)
- Short delivery time
- Maintenance free during a long lifetime
- Trench Management System has been certified to ISO 9001, ISO 14001 and ISO 45001 standards
### Hardware
- Microprocessor based controller 19” rack mounted (3 HU), width 84 TE with integrated current injection
- Optimized operation by means of a graphic 7” LCD touchscreen
- Extended operation via PC by means of a terminal program E-Soft
- Indication of the digital outputs via customer labelled and parameterized LEDs at the front
- Central acquisition and display of arc suppression coil alarms via LEDs at the front
- USB-A and-B at the front
- Analogue output modules 0...20 mA for external indication of coil position and neutral to ground voltage

### Hardware Options
- Alternative power supply
- Additional external digital inputs
- Additional external digital outputs
- IEC 61850 Ed2 module (externally mounted)
- Assembly variant on mounting plate
- Assembly variant in electrical cabinet (outdoor design for mounting at the coil-controller and coil already wired and prepared)
- Option without current injection (tuning with coil adjustment)
- Additional parallel inductance L2 in order to increase the injected current (L2 externally mounted)

### Software
- Easy parameter setting, since pre-set factory values can be adjusted by the user as required
- High flexibility through software controlled inputs and outputs, free assignment of digital outputs to different state functions as well as free assignment of digital inputs to different control functions
- Powerful PLC: In case that special functions are required a powerful PLC is available, which can be programmed with help of a C-interpreter
- Indication of operating status via a short text message
- Counting of various events (e.g. transient earth fault) and controller conditions for statistical evaluations. Data-Download via USB or Ethernet interface (RI45) onto PC or directly to an USB-stick
- Remote parameter changes by means of a PC connected via USB or Ethernet
- Several parameter levels for adaptive user settings
- Software-update by USB or Ethernet interface (RI45) from PC or directly from an USB-stick

### Software Options
- **SEVERAL CONTROLLERS WITHIN THE SAME NETWORK**
  - Reliable control without mutual influences, no remote connection necessary
- **EXTERNAL CIRCUIT BREAKER**
  - Adjusting the ASC to a predefined value when the ASC is switched off
- **RESISTOR CONTROL**
  - Automatic resistor control at earthfault
- **FIX COIL CONTROL**
  - Automatic switching on/off of a fixed coil
- **CONTROL AT EARTH FAULT**
  - Control back to ideal compensation (v=0) if an earth fault occurs
- **SCADA**
  - SPABus
  - IEC 60870-5-101/103/104
  - IEC 61850 Ed2 (with optional hardware module)
- **AUTOMATIC SWITCH VOD/VMAX**
  - Automatic switching of a damping resistor during search operation if Vo exceeds Vmax
- **VECTITAL TRIGGER**
  - Consideration of amount and phase angle of Vo as trigger criteria
ELECTRICAL and MECHANICAL DATA

**Electrical Data**

<table>
<thead>
<tr>
<th>STANDARD OPERATING</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7” LCD, 800 x 480 pixels (WVGA), Touchscreen,16 LEDs</td>
<td>1</td>
</tr>
</tbody>
</table>

**SERIAL INTERFACES, FRONT**

<table>
<thead>
<tr>
<th>USB-A for USB-stick</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB-B for PC (E-Soft)</td>
<td>1</td>
</tr>
</tbody>
</table>

**SERIAL INTERFACES, BACK**

<table>
<thead>
<tr>
<th>USB-A for USB-stick</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS485, 3 pole connector, for SCADA</td>
<td>2</td>
</tr>
<tr>
<td>RJ12 (via converter connector) RS232 for SCADA modem</td>
<td>1</td>
</tr>
</tbody>
</table>

**ETHERNET INTERFACE, BACK**

| RJ45 for SCADA or PC                                     | 1      |

**ANALOG VOLTAGE INPUT**

10 mV ... 230 V AC 50 Hz, rated burden < 0.5 VA

**ANALOG CURRENT INPUT**

0 A ... 5 A / AC

**ANALOG CURRENT OUTPUT**

for e.g. V0 coil position, 0 ... 20 mA/DC, maximum burden at 20 mA/DC: 800 Ohm

**COIL POSITION**

Linear potentiometer, 0 ... 200 Ohm or 0 ... 2 kOhm or 0 ... 20 mA/DC – input signal

**DIGITAL INPUTS**

<table>
<thead>
<tr>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

**DIGITAL OUTPUTS**

Potential free contact (normal open, normal closed) 230 V AC/DC

<table>
<thead>
<tr>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

Potential free contact insulated in groups of terminals (normal open) 230 V AC/DC

<table>
<thead>
<tr>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
</tr>
</tbody>
</table>

**POWER SUPPLY**

Standard: 120 ... 240 V AC (+10%), 140 ... 300 V DC (+10%)

<table>
<thead>
<tr>
<th>Optional: 80 ... 130 V DC (+10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption max: 20 W</td>
</tr>
</tbody>
</table>

Maximum permissible overvoltage at the voltage inputs 230 V AC continuous (2 x Un for 1 s) - Maximum permissible overcurrent at the current inputs (12 x In continuous, 10 x In for 1 s)

**Mechanical Data**

**Dimensions**

<table>
<thead>
<tr>
<th>EFC60m Rack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 483 mm</td>
</tr>
<tr>
<td>Height: 133 mm</td>
</tr>
<tr>
<td>Depth: 388 mm (incl handles)</td>
</tr>
<tr>
<td>cut-out for front mounting: Width 450 mm, Height 134 mm</td>
</tr>
<tr>
<td>necessary gap below and above: min. 1 HU (44 mm)</td>
</tr>
</tbody>
</table>

**Weight**

| 18 Kg |

**Temperatures**

<table>
<thead>
<tr>
<th>Operation</th>
<th>0°C... +40°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage</td>
<td>-25°C... +55°C</td>
</tr>
<tr>
<td>Transport</td>
<td>-25°C... +70°C</td>
</tr>
</tbody>
</table>

**Max installation altitude**

| < 2000m a.m.s.l. |

**Humidity (24 h average)**

| from 5% to 95% acc. IEC 60255-1 |

**Protection class**

| IP20 |