OIL FILTER UNIT S-03
for
continuous on-load filtration of tap-changers
of main transformers

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1. Introduction

The continuous filtration of tap-changers of power (main) transformers is generally focussed on the reduction of the internal contamination of its oil inventory caused by:

- particles
- moisture

When an on-load tap-changer works under load the dirt is always internally generated causing an increase in mechanical wear and a reduction of the dielectric strength of the oil as a consequence.

The another very unpleasant decrease of the dielectric strength of a switching oil is simultaneously caused by the moisture, because two potential sources of the water in the tap-changer always exist:

- internal - as a by-product of the arc-induced decomposition of the oil.
- external – due leaking of the air filter or conservator

The S-03 filtration unit was developed to handle a very new problem of recent versions of tap-changers built from non-hydroscopic (hydrofobic) insulants.

Hydrofobic insulants, on the contrary to the previously used hydroscopic materials (as e.g. boards) of „old“ tap-changers, do not have any „buffer capacity“ to the water - they are not able to bind the water from the oil.

Therefore any little amount of the water which enters into the oil inventory of a modern „hydrofobic“ tap-changer immediately increases the relative humidity and decreases the dielectric strength of the oil.

Users of „hydrofobic“ tap-changers are therefore exposed to a new and very uncomfortable operational reality.

While old „hydroscopic“ tap-changers were able to withstands the slight water contamination for relatively long time without the critical loss of the dielectric strength, the dielectric behaviour of modern tap-changers is very sensitive to any water input and the user is therefore forced to continuously remove the water and/or a dirt from his tap-changer to prevent the decrease of the dielectric strength of the oil.

The S-03 filtration unit, working continuously, satisfies both requirements by means of the external collection of the undesired substances.

The large-volume of the pre-dried cellulose insert simultaneously binds the water and dirt particles for relatively long time without negative impacts on the reliability of a tap-changer.

Basic advantages of the S-03 filter unit:

- the long-term preservation of the required dielectric strength of the oil
- the reduction of the wear of mechanical parts
- the reduction of costs due to prolonging of maintenance time-intervals
- the strong reduction of the number of oil replacements = cost reduction
- easy change of the filter insert under normal operational conditions.
2. Technical specification

<table>
<thead>
<tr>
<th>Motor: Type:</th>
<th>3-phase, squirrel-cage (or on demand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power:</td>
<td>0.18 kW</td>
</tr>
<tr>
<td>Voltage:</td>
<td>3x400V, 50Hz (60Hz) (or on demand)</td>
</tr>
<tr>
<td>Speed:</td>
<td>1350 1/min.</td>
</tr>
<tr>
<td>Protection class:</td>
<td>IP65 (fully hermetized)</td>
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<thead>
<tr>
<th>Oil pump:</th>
<th>Gear pump (Monobloc version)</th>
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<tr>
<td>Hydraulic power:</td>
<td>250 l/hour</td>
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| Safety valve | Adjustable: 3b                        |

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<thead>
<tr>
<th>Filter insert:</th>
<th>Type: B-005-OK-250BP (dia 150)</th>
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</thead>
<tbody>
<tr>
<td>Material:</td>
<td>Cellulose (pre-dried at 0.2 % mass weight)</td>
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<tr>
<td>Filtering grade:</td>
<td>3 µm</td>
</tr>
<tr>
<td>Typical pressure drop at 20°C:</td>
<td></td>
</tr>
<tr>
<td>New insert:</td>
<td>&lt; 2 bar (3 bar)</td>
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<tr>
<td>Max. storage time:</td>
<td>12 months, with undamaged package</td>
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| Pressure / flow reading | Gauge (-100, 300 kPa) |

| Noise | < 65 dB(A) |

| Weight (without oil) | 34 kg |

| Connection | Hose 3/8”, hard tubing 3/8” |
| Surface protection | all-stainless |

3. Installation
The schematical lay-out of the installation of the S-03 filter unit on a tap-changer is shown at Fig.1.

Fig. 1. The schematical lay-out of the installation

The S-03 filter unit is usually fixed directly onto the main tank of a transformer.

The hydraulic interconnection between the tap-changer and the S-03 unit is performed by 3/8" hoses or 3/8" seamless tubes.

For the detailed description of the installation, power supply and the replacement of the filtration insert See: www.ars-altmann.com /News-Manuals.

4. Structure and function of the S-03 filter unit
Fig. 2  Internal structure of the S-03 unit

The contaminated oil from the bottom of the tap-changer is fed into the S-03 unit by the inlet screw coupling and forced by the monobloc gear pump into the vessel where the special large-volume cellulose filter insert is situated.

The water and particles are removed from the oil due the radial flow of the oil through the filter insert, and captured in/on cellulose fibres. The clean oil leaves the S-03 via outlet screw connection and flows back into the upper part of the tap-changer.

The replacement of the saturated filter insert is very simple and can be performed under normal operational condition of a transformer.

For a detailed description of the filter insert See S-03 Manual.
An example of the standard application – the triple S-03 system - the three S-03 filter units on the common frame for the simultaneous filtration of three tap-changers of the 60 MVA main transformer.

The hydraulical circuits are performed by pressure hoses with a minimal intervention into the existing oil system of tap-changers. Every tap-changer has here its own S-03 filtration unit.
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