ARS-ALTMANN

OIL FILTER UNIT S-03 Combi
for
on-load filtration of tap-changers

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Introduction

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

- particles
- moisture

When a 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 moisture then causes another, very substantial, decrease of the dielectric strength of a switching oil . The 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 dielectric behavior of modern tap-changers (without hygroscopic parts) is very sensitive to any water input. It forces the user to continuously remove the water and/or dirt from his tap-changer to prevent the decrease of the dielectric strength of the oil.

The total operating costs of filter units connected to highly loaded tap-changers then can be substantial due to:

- permanent replacement of exhausted filter cartridges
- labor/service costs
- transportation and ecological costs.

Within a couple of years, the corresponding costs then easily exceed the purchase price of the whole filtration unit.

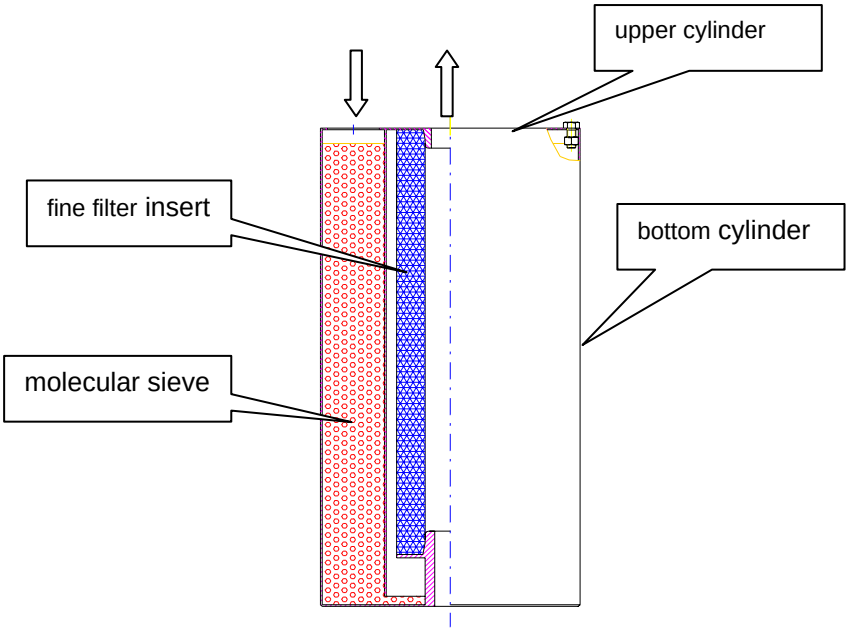
Because the price of active parts of a filter cartridge (molecular sieve and a fine filter insert) is relatively low, the problem has only one, the environment-friendly, solution:

⇒ to use non-active components repeatedly

⇒ to use a cartridge with the bigger water and particles capacity

⇒ overhaul in situ to minimize the transportation costs

The new Combi Filter cartridge, which fulfills all these demands, shows the picture below.



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The cartridge consists of four parts only. By the overhaul, the upper- and bottom cylindrical metal parts remain, only active parts, the molecular sieve filling and filter insert, are replaced.

The oil axially enters the cartridge via the aperture in the upper part, then flows downwards through the molecular sieve filling, radially enters the fine filter insert and releases it via central canal:

⇒ the molecular sieve filling (red) bonds the diluted water from the oil and, simultaneously, works like a coarse filter element: removes the bigger particles (carbon flakes) from the oil

⇒ the fine filtration then enables the standard filter insert (blue)

The replacement of the exhausted molecular sieve filling and clogged filter insert, inclusive deaerating, then takes ca 10 minutes.

Essential advantages of the S-03 Combi filter unit: :

- **substantial reduction of operating costs (more than 50%)**
- the long-term preservation of the required dielectric strength of the oil
- the radical decline of the wear of mechanical parts
- the decrease in costs due to prolonging of maintenance time-intervals
- the substantial reduction of the number of oil replacements = cost reduction
- easy change of the filter inserts under normal operational conditions without an oil discharge or spill.
- online reclaiming of the tap-changer oil filling (the alumina substitutes molecular sieve)
- deaerating of its internal parts via vacuum (geat pump works as a vacuum pump)

Specification

Motor:	Type :3-phase, squirrel-cage (or on demand)
	Power: 0.18 kW
	Voltage: 3x400V, 50Hz (60Hz) (or on demand)
	Speed: 1350 1/min.
	Protection class : IP65 (fully hermetized)
Oil pump:	Gear pump (Monobloc version)
	Hydraulic power : 250 l/hour or on demand
Safety valve	Adjustable: 3b
Filter insert	Combi cartridge (molecular sieve 3A + fine filter)
	Water capacity : 250 gr
	Particle capacity : 150 gr
	Typical pressure drop at 20C:
	New insert : < 2 bar (3 bar)
	Max. storage time : 12 months, with undamaged package
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

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Installation and Commissioning

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

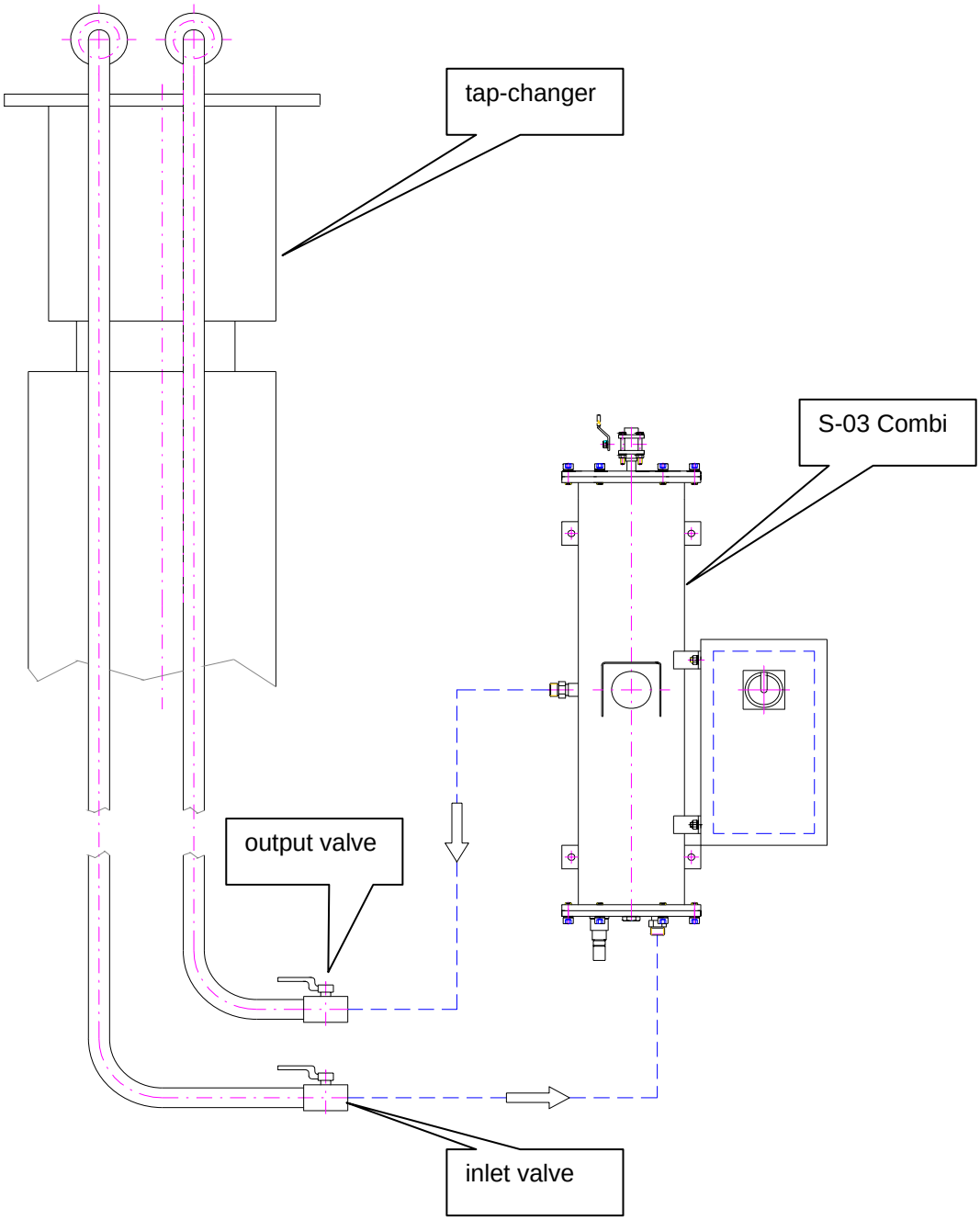

Fig. 1 Hydraulic interconnection of a tap-changer and S-03 Combi filter

The S-03 Combi 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 with a minimal intervention into the existing tap-changers oil system.

For a detailed description of the filter insert, its overhaul in situ or a shop, See www.ars-altmann.com/ News/ S-03 Combi Manual.

The gear pump running in the reverse enables via vacuum an effective deaerating of internal parts of the S-03 Combi and its easy and smooth commissioning.

For more details See please S-03 Combi Manual.

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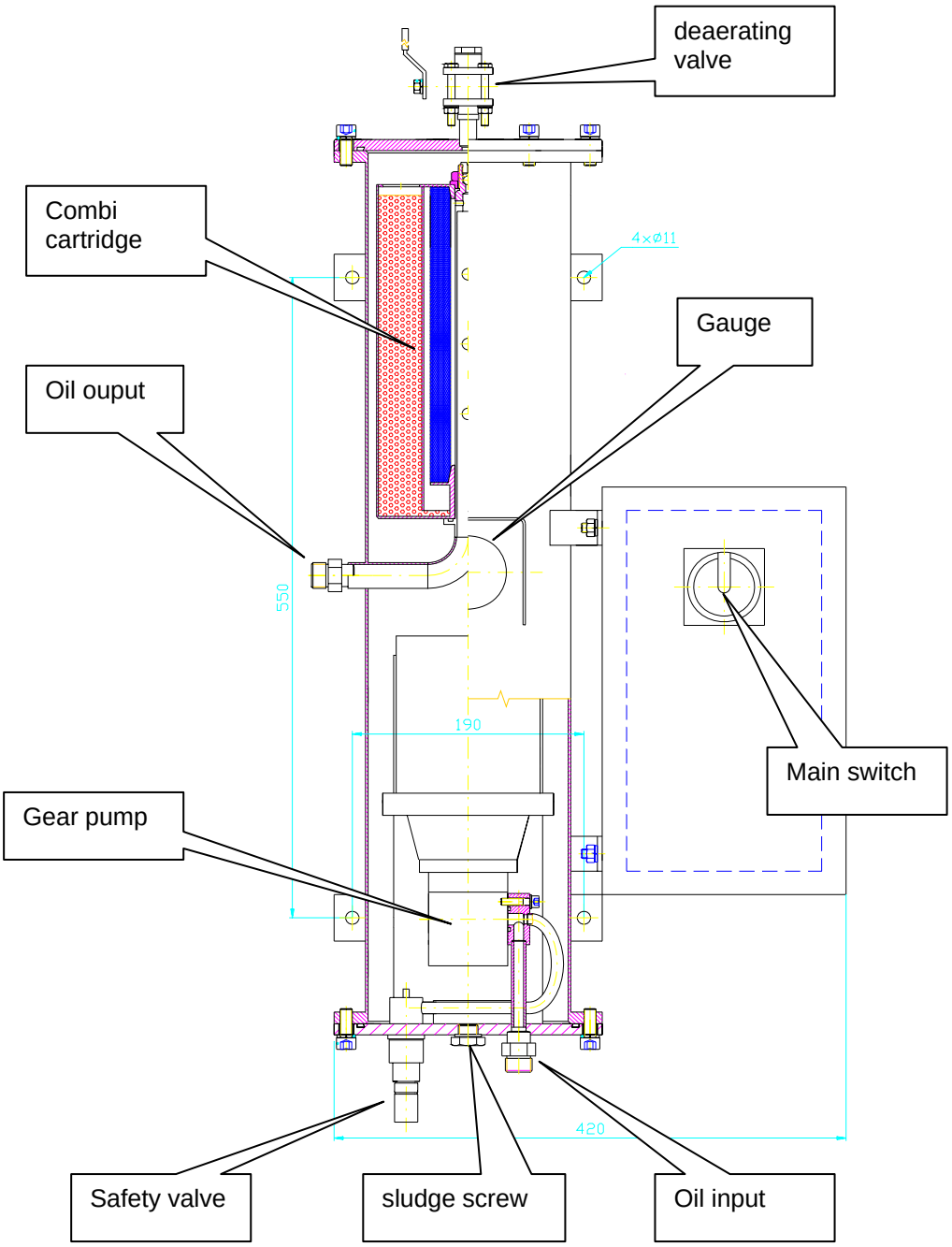

Fig. 2 Internal structure of the S-03 Combi unit

The contaminated oil from the bottom of the tap-changer is fed into the S-03 unit by the inlet screw coupling.

The direct run of the monobloc gear pump then forces the oil into the vessel where the Combi filter insert is situated. And clean oil is forced back into tap-changer.

The reverse run of the gear pump working as a vacuum pump then enables:

- ⇒ deaerating of all internal spaces of the filter unit and both hydraulic interconnections by a commissiong
- ⇒ replacement of the filter cartridge without a discharge of oil or its spill, including it´s deaerating to avoid any air ingress into a tap-changer.

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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.

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