

# ATMoS

AUTOMATIC TRANSFORMER MOISTURE SUPERVISION

## Moisture supervision for power transformers



*Drying, moisture regulation and monitoring  
of oil-/ paper insulated transformers*

# Total loss due to accelerated aging- save your valuable power transformers!

## Aging factors

Crucial point in the aging process of transformers is the operation temperature and the moisture content of the insulation material, especially the solid insulation. Transformers with wet insulation and high operation temperatures can age up to 20 times faster!

Caused by continuous accumulation of moisture (entry of environmental moisture, chemical processes in the insulating oil), the moisture content of the oil-paper insulation system increases and the aging process of the whole system accelerates immensely. Moisture generates even in the expansion vessel, despite the upstream dehumidifier.

The result of progressed aging is the generation of oil sludge through accumulation of suspended particles and dirt. The sludge massively influences the cooling of the windings and impedes the heat dissipation. In turn, this heat build-up expedites the aging of the cellulose insulation.

Hence, drying the insulating media and filtering particles are important points in the maintenance of transformers. Furthermore, they have substantial impact on the operational safety.

## Conventional drying methods

The drying of transformers in operation is mainly carried out with two methods:

First, continuous drying by vacuum oil treatment plants. The treatment is possible during the transformer's normal operation, but removes the gas needed for DGA (Dissolved Gas Analysis).

Second, by oil spray or low frequency drying (LF). These methods remove the moisture accumulated in the liquid insulation (oil) in a short time. The transformer needs to be disconnected and though being effective for the liquid insulation, the main moisture, up to 98%, remains stored in the cellulose insulation. Furthermore, all components are exposed to high material stresses.

With these methods, the maintenance is expensive and time consuming: Transformer downtime, rent of the purification equipment, personnel costs, disposal expenses for the used oil, costs for oil replacement.



Short circuit due to high moisture content of the insulating oil



Burn due to reduced dielectrical strength



Explosion caused by sludge accumulation in the BH relay

# Smooth, efficient On-Line Drying with full control

## The ATMoS system

ATMoS is a material saving on-line method for drying the complete insulation system and for maintaining this dry state:

## Permanent absorption

The ATMoS absorbs moisture from the oil insulation. This process happens on molecular basis and disturbs the moisture equilibrium: Moisture diffuses from the wet cellulose insulation into the dried transformer oil, slowly but steadily removing the moisture from the solid insulation.

## On-line operation

This process exerts considerably less stress on the transformer material than the common high temperature method and is carried out during the normal service of the transformer.

## Remove of particles

The oil sludge consisting of suspended solids from cellulose and oil separates has an impact on the dielectric strength and operational safety of transformers. The ATMoS system uses two industrial filters with special temperature-resistant filter cartridges to remove those particles from the insulating system.

ATMoS reduces not only the aging process of the solid insulation, but can also improve the dielectric insulation features disturbed by moisture or oil sludge in a cost and maintenance efficient way.



*Installation of an ATMoS system in the field*



*E. Westendarp/ pixelio*

## In all weathers

All materials of ATMoS are designed for operation regardless of weather conditions. Stainless steel components, couplings and hoses are mounted inside a weatherproof housing and resist even rough coastal climate. The electric cabinet complies to protection class IP 65. Mounted directly to the transformer or in the close vicinity, ATMoS works independently from temperature or precipitation.

# Applications

*Continuous moisture extraction from liquid and solid insulation decelerates the aging process of transformers considerably. The permanently installed ATMoS system achieves this cost efficient.*



P.G. Meister/pixelio

## ***New transformers***

The moisture content of the solid insulation in new transformers amounts to <math><0,5\%</math>. The ATMoS system prevents further moisture formation and maintains the low moisture level.



## ***Transformers in service***

ATMoS minimises the moisture content in any transformer, regardless of its age. After some years of service, the moisture content in most transformers amounts to over 2%. By taking advantage of the moisture equilibrium in solid and liquid insulation, ATMoS reduces the moisture content in the cellulose insulation and maintains the low level in the long run.



H.D. Volz/ pixelio

## ***Recently maintained transformers***

After maintenance at the factory, the moisture content of the insulation amounts to approx. 0,5%. Being installed at this point of time, ATMoS keeps the moisture level costanly low.

# Components: All safe

## The ATMoS system

The ATMoS system consists of three absorption filter cartridges and two particle filters. Bigger systems (more absorption filter cartridges in parallel) are available on request.

## Molecular sieve, pump

The adsorption filter cartridges contain a special granulated material that absorbs moisture on molecular basis. This process is carried out during the normal operation of the transformer without any impact on temperature or pressure conditions. Solely a small, maintenance-free electrical pump is used to support the oil flow through the cartridges.

## Steel components

Cartridges, valves, frame, catch basin and housing are made of stainless steel. The electrical cabinet is executed waterproof, according to protection class IP65.

## Sealings

All screwed connections are sealed with loctite, the weldings are pressure tested during production.

## Hoses and couplings

The ATMoS system is connected to the inlet / outlet hoses with self-sealing hydraulic couplings. The connections inside the system are carried out with flexible, pressure resistant stainless steel coated PTFE hoses.



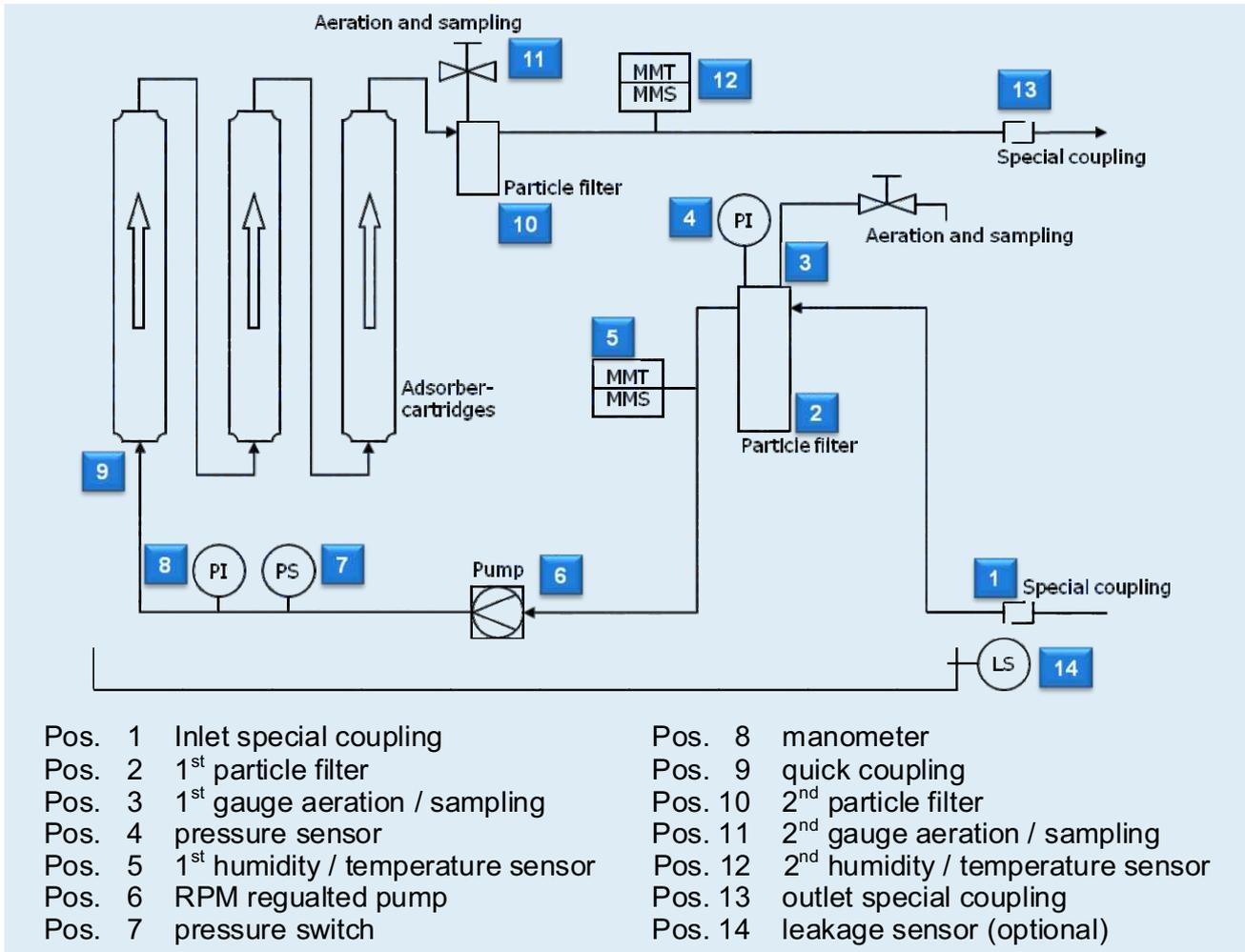
*ATMoS with options humidity-/temperature-sensor, bigger particle filter, industrial SPS with touchpanel and leakage monitoring (weatherproof housing, drip tray and leakage sensor)*



*ATMoS with options leakage monitoring (weatherproof housing, drip tray and leakage sensor) and signal lamps*

# Schematic diagram and characteristics

## ATMoS diagram



Schematic diagram & components

## Characteristics

- Capacity of adsorption filter cartridges: > 3 l/ cartridge, higher capacity on request
- Particle filters made of stainless steel, cartridges with 5µm and 1 µm, others on request
- Sensors for moisture and temperature supervision of the oil
- Automatic saturation supervision of the adsorption filter cartridges
- Automatic supervision of the particle filters
- Upon reaching the targeted moisture degree, the value is held constantly
- Online trend control via GSM module
- Status information via SMS (optionally)
- Safe operation of the electric components by 24 V DC
- Option: Leakage supervision
- Option: totally extracted water
- Option: control lamp
- Option: Industrial SPS with touch panel

# ATMoS' advantages

The life span of transformers depends on the state of their insulation system. ATMoS combines cost-effectiveness and productivity in the field of transformer drying - feel free to contact us!

## Continuous moisture extraction

The ATMoS on line system dries both, liquid and solid insulating media, in a gentle way, whereas the interval drying by mobile devices exerts high stresses on all transformer components.

## Dirt removal

The two additional industrial particle filters safely remove suspended dirt particles and prevent the generation of oil sludge. Hence, ATMoS prevents sludge accumulation and decrease of the dielectric strength.

## Simple handling

The ATMoS system is simply structured and easy to operate. It is delivered completely assembled and filled with filter granulate and transformer oil. Delivery without oil on request.

## Remote Control

The status information is available at any time via the integrated measurement electronics and the remote control. The changing intervals of the adsorption and particle filter cartridges can be indicated via GSM module, optionally via SMS.

## Maintenance

After the commissioning, only visible checks should be carried out regularly to control the normal operation of the system. In case of a leakage, a sensor in the cath basin transmits an alarm signal and the system is shut down.

## Economic efficiency

The procurement and operation costs of the ATMoS system are low. Considering the enhanced safety due to the minimised dielectric risk and the significant deceleration of the aging process, a rewarding investment!

## Sustainability

The extracted moisture is not able to return to the transformer: The filter material is not sensitive to fluctuating ambient temperatures and will release the moisture only at a temperature beyond +180°C.

## Constancy

The ATMoS system dries the insulating media when required and furthermore, keeps the moisture level constantly on the desired value (to be defined individually).



Total control: Home screen, display of current process values, configuration of SMS- / E-Mail- notifications (also available in English)

# ATMoS

**AUTOMATIC TRANSFORMER MOISTURE SUPERVISION**

- continuous, gentle moisture extraction
  - target values freely definable
  - maintenance of the defined moisture degree
  - filtering of suspended particles and dirt
  - remote control via GSM module
  - data logging of relative moisture value, ppm<sub>w</sub> water, temperature
  - automatic indication of filter replacement
  - leakage supervision
  - remote control extendable for external sensors systems
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- high quality materials
  - simple handling
  - low maintenance efforts
  - low operational costs
  - high economic efficiency

## Moisture management and -monitoring for your power transformers



Installation with weatherproof housing



High quality materials



Additional particle filters



Full remote process control (available in English).  
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