NORMAG Thin Film Evaporator TFE

- Thin Film Evaporator in stainless steel or borosilicate glass 3.3
- Magnetic coupling for leak-free operation and extremely low operation pressures
- ROTAFLILM-, roller wiper or wing wiper depending on the application
- Optimised residence time and heat stress
- Outlet spiral for viscous systems
- Design for feasibility studies and scale-up
- Single apparatus or complete system
- Modular Design
- Options
  - complete corrosion resistant design
  - Fractionation of distillate
  - Design to assemble the evaporator as a Thin-Film or short-path evaporator
  - Automation with PLC-system

A major focus of R&D and small-scale production in fine chemistry, pharmaceutical, herb and food industry is the concentration and isolation of high molecular weight and temperature sensitive products.

The NORMAG short-path evaporator has been developed in cooperation with leading Chemical and Pharmaceutical companies for the concentration of such substances in laboratory, research centres and small-scale productions with respect to previous problems. The evaporator can be operated in a wide feed range, down to low pressures and temperature differences across the heating wall. Due to its modular design the evaporator can be combined e.g. with a condenser or a distillation column.

The evaporator can be re-assembled into a short-path evaporator as an option. Therefore the specific product outlet and pipes & hoses needs to be exchanged.

For most applications the wiper system is designed in a combination of stainless steel and PTFE. Especially for high corrosive applications a completely corrosion resistant system can be used.

Thin-Film Evaporator Unit with descending condensation
**Characteristics of NORMAG Thin Film Evaporator**

1. Magnetic coupling, Leakage-free
2. Feed distributor
   Linear feed distribution with respect to maximised vapour throughput at extremely low pressures
3. Heating jacket options
   - Equally distributed thermofluid
   - Steam heating
4. Flange zone
   Optimised heating even of the flange zones by use of NORMAG-turn backs as an option
5. Evaporator jacketing
   Especially for crystallising and high melting systems the complete jacketing and temperaturisation of the evaporator should be considered
6. Outlet spiral for viscous media (up to 35.000 cP)
7. Calibrated evaporator tube
   For the minimisation of film thickness and optimisation of the radial film distribution
8. Modular Flange system,
   e.g. for condensers or a distillation section
9. Coupling
   for an easy exchange of different wiper systems
10. Wiper systems
    Depending on the application, e.g. low boilers, viscosity, solids or corrosivity, we propose the use of
    - ROTAFILM-wiper
    - Roller wiper
    - Wing wiper;
    type Nölkensmeier

**Wiper systems**

- Rotafilm 1.4301/PTFE
- Nölkensmeier corrosion resistant
- Roll wiper corrosion resistant
Feed-Degasser:
Inert gas or air is dissolved within the feed of the evaporator. The content can be determined most times by the pressure and temperature while the feed is in contact with the gas. For Evaporation processes with a relatively high soluted gas content of the feed and extremely low pressures at moderate pressures is proposed, since this will reduce the rising volume flow of non-condensable gases from the evaporator to the vacuum pump system.

Modularity:
The evaporator can be easily adapted with various other modules, in most cases with
- A descending condenser
- A distillation unit as illustrated

NORMAG-quality:
The NORMAG sign on each glass component ensures reliable components of highest quality required by our customers. All units conform to specific dimensional and tolerance validation to ensure our quality.

Engineering
A user-specific support can be provided by NORMAG in regard to the evaporator type, the required heating volume and thermal stress. These data are important for a later scale-up.
Exemplarily is the illustrated heat transfer, the k-value, depending on various factors, e.g. the feed rate.
From the vessel B01 the feed will be manually controlled, fed into the short-path evaporator and equally distributed onto the evaporator tube. The liquid film rinses down the inner glass tube downwards and is continuously redistributed by the rotating wiper. This ensures, in addition, an equal thin liquid film and a continuous down-flow.

The evaporator jacket W01 is heated by steam or – as illustrated – with a thermofluid, T01. This enforces the evaporation of the lower boiling substances out of the downwards-rinsing liquid film. The vapour will be directly condensed with W02 and is collected in vessel B03/B05. The concentrated product flows into the collector vessel B02/B04.

The operating pressure is controlled by the vacuum system P01.

**Typical applications:**

- **Sensitive Organica:** Isocyananates, Herbs, etc.
- **Pharmaceutica & food:** Enzymes, Lecithin, Phytoextracts, fruits, sugar
- **Product recovery:** Solvents, Motor oil, Glycerin, etc.
- **Resins & plastics:** Acrylic & Phenolic resins, Silicone, Polyester, etc.

**Technical specification:**

<table>
<thead>
<tr>
<th>Capacity</th>
<th>0.1 l/h up to 50 l/h (Feed)</th>
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<tbody>
<tr>
<td></td>
<td>0.02 m² up to 0.5 m²</td>
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<tr>
<td>Operation temperatures</td>
<td>Up to 250 °C</td>
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<tr>
<td>Operation pressures</td>
<td>&lt; 1 mbar up to 1 bara</td>
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</tbody>
</table>

**Energy:**

- **Power:** 230/400 VAC, 50/60 Hz
- **Water:** min. 1 barg