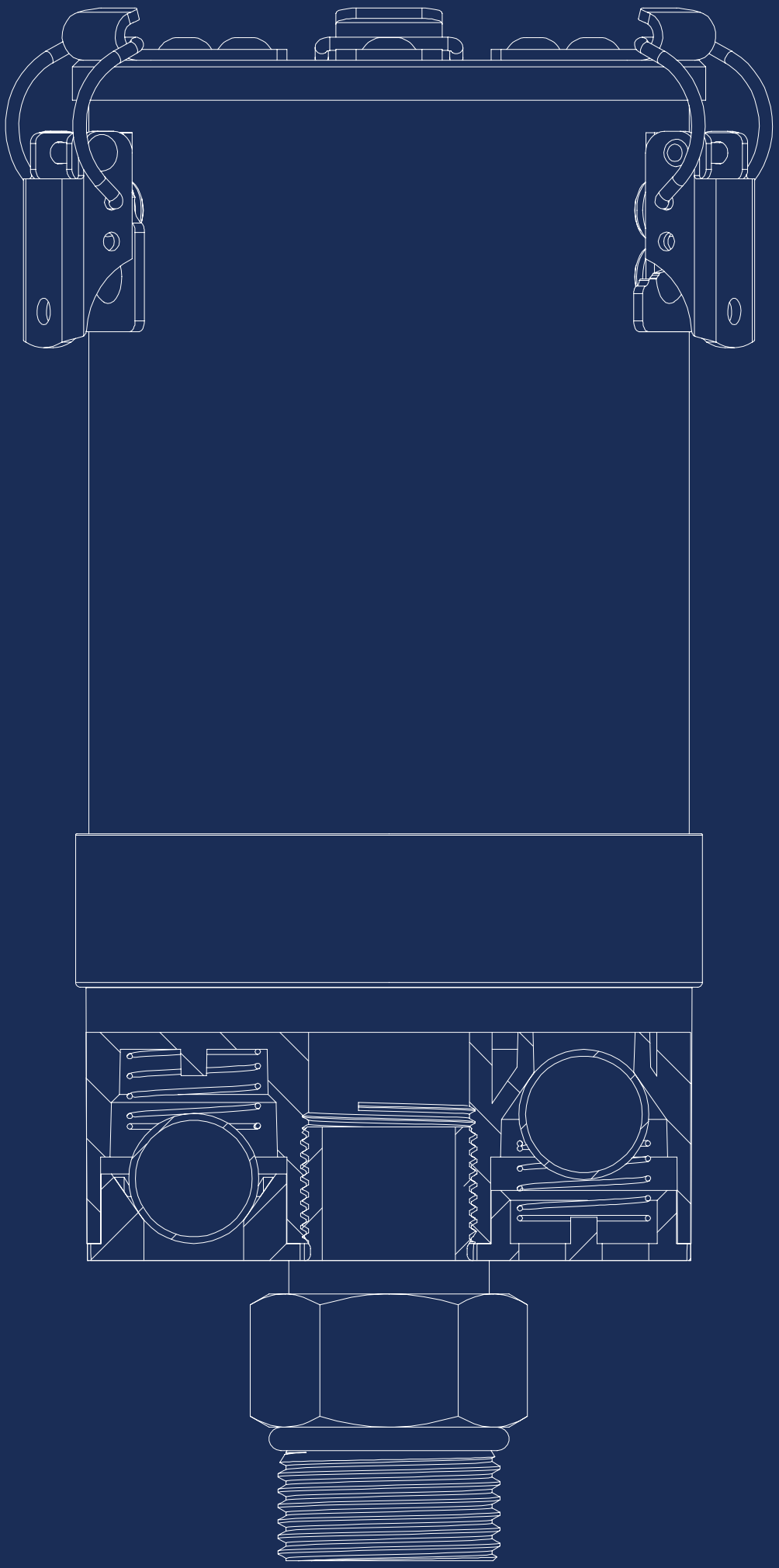


GIEBEL Adsorber®

# GIEBEL Adsorber.

## Save money by preventing condensation in hydraulic power packs, gearboxes, drums, IBCs, storage tanks and transformers.

**Why it is necessary to avoid condensation.**

Oil in the hydraulic unit, gearbox and transformer expands during operation due to heat generation and contracts again as soon as the system comes to a standstill and cools down. To compensate the differential pressure, air is either forced out of the system or sucked in. If this air is not filtered, moisture easily enters the system. It condenses inside and gets into hydraulic or transmission oil in the form of droplets. Condensation damage to the tank and contamination of the oil are the result. The same happens in a storage tank, drum and IBC container when air flows in during emptying to equalize the pressure.

**How to solve the problem.**

With the installation of a GIEBEL adsorber, the air is dried before it enters the system. Valves on the bottom of the adsorber ensure that the application can be properly ventilated.

A variety of connections as well as an extensive range of accessories ensure that GIEBEL adsorbers can also be adapted for systems that are difficult to access and those that are operated in particularly harsh environments (e.g. offshore).

**Overview**



**Adsorbers for special applications**



**Desiccants**

# Adsorbers ensure that moisture does not get into the system and oil mist / pollutants do not get into the ambient air.

### Hydraulic power packs

By drying the incoming air, adsorbers protect hydraulic units from condensation damage.

### Gears

Sucked-in, moist ambient air significantly reduces the service life of a gear oil. Adsorbers can prevent the ingress of moisture.

### Storage tanks

When tanks cool down, humid air leads to condensate and thus reduces the quality of the substance in the tank. GIEBEL has developed special tank aeration dryers to keep the air dry.

### Barrels & IBC

Aeration dryers from GIEBEL can be used to protect hygroscopic substances such as isocyanate, oils and biological fuels.

### Transformers

GIEBEL dehumidifiers protect transformers from hydrolysis of the cellulose paper in the transformer and thus from a reduction in the degree of polymerization by effectively drying and filtering the moist supply air.

### Closed systems

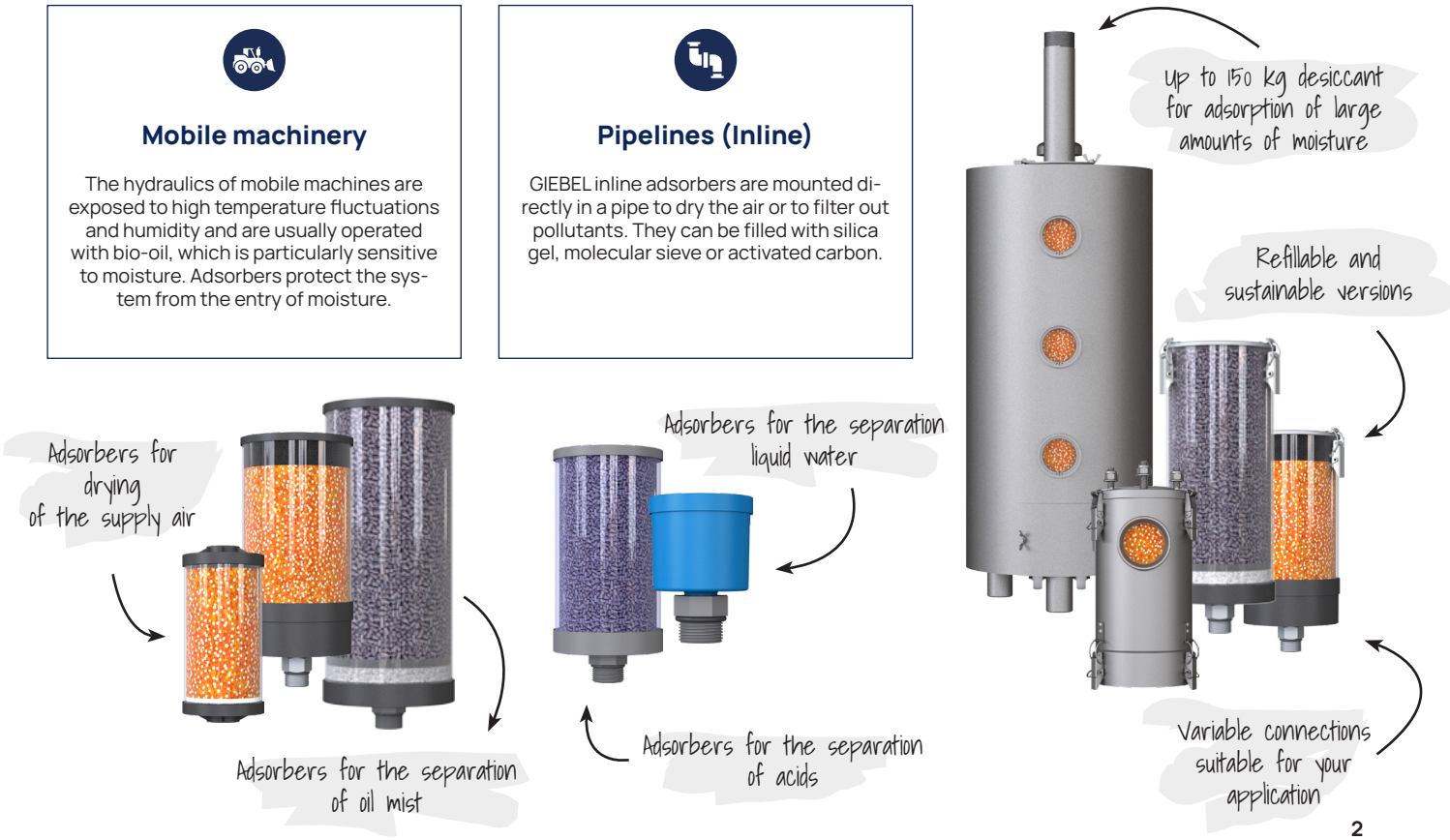
Room air dryers are used in rooms and containers to protect the contents from moisture damage (e.g. in control cabinets, server cabinets, display cases or containers for moisture-sensitive goods).

### Mobile machinery

The hydraulics of mobile machines are exposed to high temperature fluctuations and humidity and are usually operated with bio-oil, which is particularly sensitive to moisture. Adsorbers protect the system from the entry of moisture.

### Pipelines (Inline)

GIEBEL inline adsorbers are mounted directly in a pipe to dry the air or to filter out pollutants. They can be filled with silica gel, molecular sieve or activated carbon.



# Adsorber series.

## An overview.

**Dehumidifier / Ventilation dryer** for the separation of humidity

**Water separator** for the separation of liquid water

**Oil mist separator / Aerosol filter** for the separation of oil mist & pollutants

**Gas separator** for the separation of gases

**Acid separator** for the separation from acids

### VV-D series

GIEBEL Adsorber® of the VV-D series are disposable aeration dryers without valves. They are suitable for indoor, outdoor and offshore use on hydraulic power packs, gearboxes, drums and IBCs as well as on mobile machinery.
The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, it is replaced. We recommend the use of the VV-D series especially for plants with permanent air exchange and short maintenance intervals.

### VV-DV series

GIEBEL Adsorber® of the VV-DV series are aeration dryers with a one-way cartridge and a valve part. They are suitable for indoor, outdoor and offshore use on hydraulic power packs, gearboxes, storage tanks and mobile machinery.
The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, only the cartridge is replaced. The stable and frost-proof valve part remains on the system. It protects the adsorber from unnecessary loading, enables use under extreme, dusty ambient conditions, and ensures minimal pressure build-up even at high air flows.

### VV-R series

GIEBEL Adsorber® of the VV-R series are multi-way aeration dryers without valves. They are suitable for indoor and outdoor use on hydraulic power packs, gearboxes, drums and IBCs as well as on mobile machinery.
The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, desiccant and, if necessary, all other components of the internal system can be replaced at low cost. We recommend the use of the VV-R series especially for plants with constant air exchange and short downtimes.

### VV-RV series

GIEBEL Adsorber® of the VV-RV series are aeration dryers with a reusable cartridge and a valve section. They are suitable for indoor and outdoor use on hydraulic power packs, gearboxes, storage tanks and mobile machinery.
The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, desiccant and all other components of the internal system can be replaced at low cost if necessary. The stable valve section protects the adsorber from unnecessary loading, enables it to be used in extreme, dusty ambient conditions, and ensures minimal pressure build-up even at high air flows.

### MA-R series

GIEBEL Adsorber® of the MA-R series are multi-way aeration dryers without valves. They are suitable for indoor and outdoor use on barrels and IBCs.
The all-aluminum housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist and other pollutants, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, desiccant and all other components of the internal system can be replaced at low cost if necessary. MA-R adsorbers can also be used when isocyanates, polyols, DOT4, SKYDROL, solvents or oils need to be protected from moisture ingress. They are available with FKM or EPDM seals and can be used in zone II 2 G / D IIC T4 according to the ATEX product directive 2014/34/EU.

### MA-RV series

GIEBEL Adsorber® of the MA-RV series are multi-way aeration dryers with valves. They are suitable for indoor and outdoor use on hydraulic power packs, gearboxes, storage tanks and mobile machinery.
The all-aluminum housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, desiccant and all other components of the internal system can be replaced at low cost if necessary. MA-RV adsorbers are used for aeration of aggressive materials as well as in harsh environments. The aeration dryers are available with FKM or EPDM seals and can be used in zone II 2 G / D IIC T4 according to the ATEX product directive 2014/34/EU.

### ME-RV series

GIEBEL Adsorber® of the ME-RV series are multi-way aeration dryers with valves. They are suitable for indoor, outdoor and offshore use on hydraulic power packs, gearboxes, storage tanks and mobile machinery.
The stainless steel housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. A 3 µm filter additionally cleans the sucked-in air. When air is forced out of the system, a layer of activated carbon adsorbs escaping oil mist, thus protecting the desiccant and the environment from contamination. When the adsorber is saturated, desiccant and, if necessary, all other components of the internal system can be replaced at low cost. ME-RV adsorbers are used for the ventilation of offshore plants as well as in the chemical industry or for the ventilation of large storage tanks. The adsorbers are available with FKM or EPDM seals and can be used in zone II 2 G / D IIC T4 according to the ATEX product directive 2014/34/EU.

### MS-R series

GIEBEL Adsorber® of the MS-R series are multi-way aeration dryers without valves. They are suitable for indoor, outdoor and offshore use on storage tanks.
The stainless steel housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. When the adsorber is saturated, desiccant and, if necessary, all other components of the inner workings can be replaced at low cost. MS-R adsorbers are used to ventilate large storage tanks of more than 60 cbm. The adsorbers can be used in zone II 2 G / D IIC T4 according to the ATEX product directive 2014/34/EU and meet the criteria of corrosivity category CX. In combination with a venting system and a supply air valve, the air flow into and out of a tank can be controlled.

### VG-D series

GIEBEL Adsorber® of the VG-D series are disposable oil mist separators without valves. They are suitable for indoor and outdoor use on hydraulic power packs, gearboxes, barrels & IBC.
The plastic housing is filled with activated carbon. Combined with a slosh protection and oil demister, the activated carbon cleans the air coming out of the unit, protecting the environment from oil aerosol contamination. When the adsorber is saturated (discoloration of the white silica gel layer), it is replaced. VG-D adsorbers are used on turbo gearboxes, test benches and recirculating oil lubrication systems.

### VG-R series

GIEBEL Adsorber® of the VG-R series are multi-way oil mist separators without valves. They are suitable for indoor and outdoor use on hydraulic power packs, gearboxes, barrels & IBC. The plastic housing is filled with activated carbon. Combined with a slosh protection and oil demister, the activated carbon cleans the air coming out of the unit, protecting the environment from oil aerosol contamination. When the adsorber is saturated (discoloration of the white silica gel layer), both the activated carbon bed and, if necessary, all other components of the internal system can be replaced at low cost. VG-R adsorbers are used on turbo gearboxes, test benches and recirculating oil lubrication systems.

### TB-DV series

GIEBEL Adsorber® of the TB-DV series are disposable dehumidifiers especially for transformers. They are suitable for indoor and outdoor use.
The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. In addition, the dehumidifiers have a stable valve part made of fiberglass-reinforced polyamide and an oil reservoir. When the adsorber is saturated, the cartridge can be unscrewed and replaced at low cost as part of our GIEBEL Send & Refresh system. The suspended version is available with all common connections for transformers. The series has an activated carbon layer to separate escaping oil mist. This ensures cyclic self-regeneration and thus very long maintenance intervals.

### TB-RV series

GIEBEL Adsorber® of the TB-RV series are reusable dehumidifiers especially for transformers. They are suitable for indoor and outdoor use.
The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. In addition, the dehumidifiers have a stable valve part made of fiberglass-reinforced polyamide and an oil reservoir. When the adsorber is saturated, both desiccant and, if necessary, all other internal components can be replaced at low cost.
The suspended version is available with all common connections for transformers. The series has an activated carbon layer to separate escaping oil mist. This ensures cyclic self-regeneration and thus very long maintenance intervals.

### TM-RV series

GIEBEL Adsorber® of the TM-RV series are reusable dehumidifiers especially for transformers. They are suitable for indoor, outdoor and offshore use.
The stainless steel housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. In addition, the dehumidifiers have a stable valve part and an oil reservoir. When the adsorber is saturated, both desiccant and, if necessary, all other internal components can be replaced at low cost.
The suspended version is available with all common connections for transformers. The series features an activated carbon layer to separate escaping oil mist. This ensures cyclic self-regeneration and thus very long maintenance intervals. The adsorbers can be used in zone II 2 G / D IIC T4 according to the ATEX product directive 2014/34/EU and meet the criteria of corrosivity category CX.

### VL-D series

GIEBEL Adsorber® of the VL-D series are disposable inline filters with connections on both sides for installation in a line. The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. In addition, a filter is integrated to separate abrasion and ambient dirt.
VL-D adsorbers are used to dry air streams in electronic, optical or other systems.
If required, the inline filters can also be filled with other desiccants - e.g. molecular sieves (3A,4A,5A, 13X), if other substances are to be adsorbed specifically in addition to the separation of moisture.

### VL-R series

GIEBEL Adsorber® of the VL-R series reusable inline filter with threaded connection on both sides. The plastic housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the supply air. In addition to the desiccant, a filter is integrated to separate abrasion and ambient dirt.
VL-R adsorbers are used to dry air streams for small laser systems up to large storage tanks. With a DN50 thread, even large volume flows can be passed through the adsorber.
If required, the inline filters can also be filled with other desiccants - e.g. molecular sieves (3A,4A,5A, 13X), if other substances are to be adsorbed specifically in addition to the separation of moisture. Once the adsorber is saturated, both the desiccant bed and, if required, all other components of the inner workings can be replaced at low cost.

### VM-R series

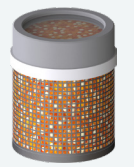
GIEBEL Adsorber® of the VM-R series are reusable inline filters for use under extremely harsh conditions or in explosion protection zones according to ATEX 2014. Consisting of a metal housing with threaded connections on both sides, these adsorbers can be installed in pipelines and ensure that moisture is separated and the system to be ventilated is protected.
If required, the inline filters can also be filled with other desiccants - e.g. molecular sieves (3A,4A,5A, 13X), if other substances are to be specifically adsorbed in addition to the separation of moisture. Once the adsorber is saturated, both the desiccant bed and, if required, all other components of the inner workings can be replaced at low cost.

### PL-R series

GIEBEL Adsorber® of the PL-R series are high-pressure inline filters. They are completely made of aluminum and can be loaded up to 8bar. The aluminum housing is filled with GIEBEL Xdry®. The desiccant mixture ensures effective drying of the air flowing through.
PL adsorbers are suitable for high-pressure applications requiring very dry air - for example PUR dosing systems. If required, the inline filters can also be filled with other desiccants - e.g. molecular sieves (3A,4A,5A, 13X), if other substances are to be specifically adsorbed in addition to moisture separation.
The adsorbers can be used in zone II 2 G / D IIC T4 according to the ATEX product directive 2014/34/EU. Once the adsorber is saturated, both desiccant and, if necessary, all other components of the inner workings can be replaced at low cost.

### ES-R series

GIEBEL Adsorber® of the ES-R series are room air dryers. They are used in closed systems and containers to protect the contents from moisture damage.
The stainless steel housing is filled with silica gel. The desiccant ensures effective drying of the room air. When the adsorber is saturated, the desiccant can be replaced at low cost.
ES-R adsorbers are used, among other things, in switch cabinets, server cabinets, display cases and storage containers with moisture-sensitive goods.



### HS-D series

GIEBEL Adsorber® of the HS-D series protect gearboxes from water droplet ingress while allowing them to breathe. With the help of an ePTFE filter in the core of the robust polyamide housing, the gear oil is protected from contamination with water, even when the gear is used outdoors or cleaned with water.
The 0.3 micrometer pores of the membrane filter retain water or oil, but allow air to flow through. The pressure build-up remains low.

The HS-D membrane filters are an excellent alternative to adsorbers when liquid water is a challenge for a gearbox, but humidity does not cause problems.

**AS-D series**

GIEBEL Adsorber® of the AS-D series are acid separators without valves. They consist of a PVC housing with activated carbon filling and are used to separate aggressive substances before they evaporate into the environment. Even when adsorbing formic acid and hydrochloric acid, the adsorbers remain stable over a long period of time. As a disposable design, the AS-D adsorbers are easy to install and efficient and quick to replace.

They are mainly used in plants of the chemical industry, especially on IBC containers and barrels. However, other plants can also be equipped with this type of adsorber.

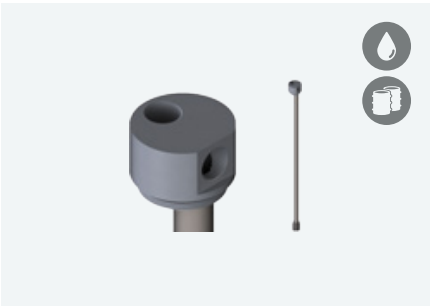
# Accessories.

## For mounting, monitoring, protecting and venting.

**Flange adapters**
for mounting on hydraulic tanks

**Sensors**
for monitoring the adsorber loading

**IBC-Covers**
for mounting on IBC containers

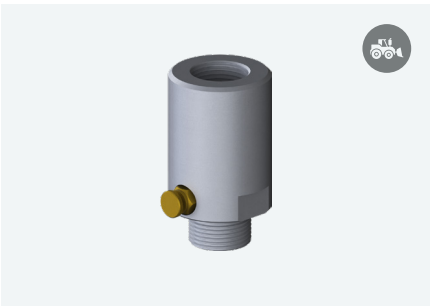


**Suction lances**
for connecting barrel pumps and bypass filter systems to a hydraulic tank and for easy removal of substances from the bottom

**Filling adapters**
for easy refilling of oil into a hydraulic power unit or gearbox

**Oil separators**
for plants with high oil mist emission, to protect adsorbers from contamination by larger oil particles

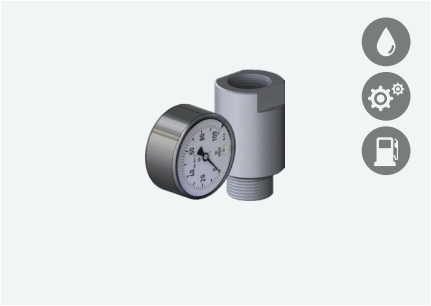
**Wall mounts**
for the flexible installation of adsorbers



**Valve adapters**
for mounting adsorbers on mobile machines with tank preload of 0.3 and 0.5 bar

**Ventilation systems**
for filling a tank without vapor recovery

**Mounting adapters**
for mounting an adsorber on horizontal barrels and in confined spaces



**Protection adapter**
to output an optical or electronic signal when the vacuum is too high

**Protection hoods**
for the protection of adsorbers in harsh environments, e.g. in mines or offshore operations

**Sleeves & Reductions**
for flexible mounting

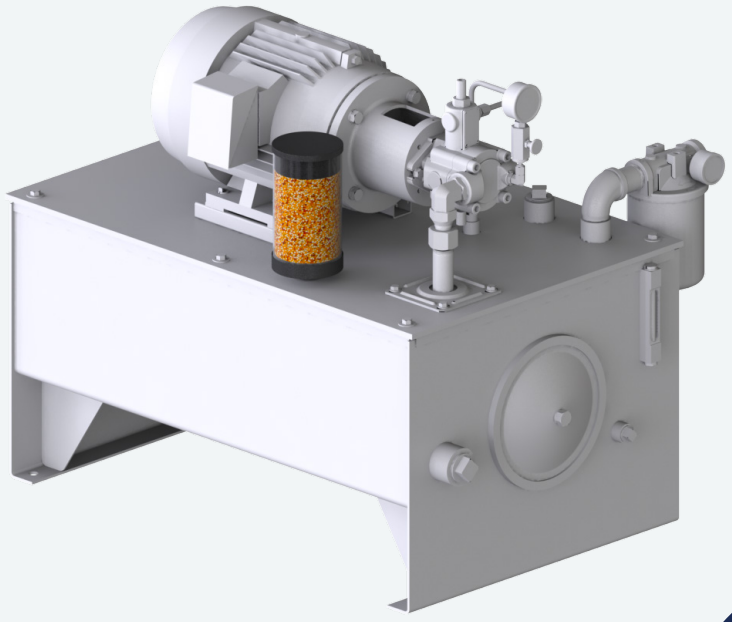
# Services.

**Branding**
Adsorbers adapted to your corporate design with your own label sticker and in matching color.

**Send & Refresh**
Sustainability is important to us. That is why we take back used adsorbers and recondition them at the price of a spare parts kit.

**Inspection**
Not sure if your adsorber is working properly? We check it.

# Adsorbers for hydraulic power units.

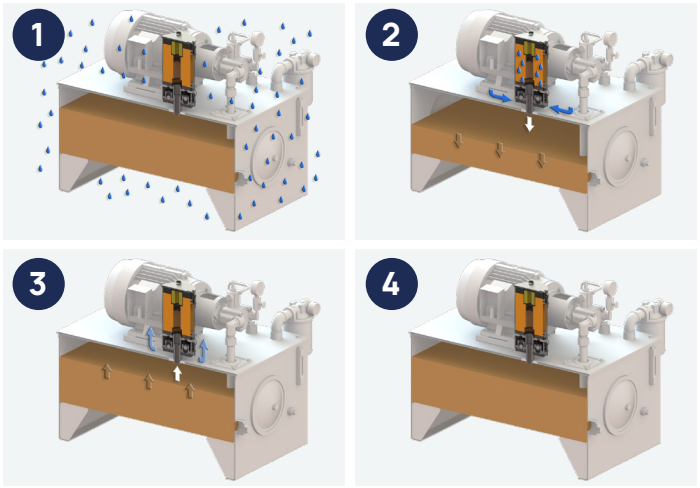



GIEBEL offers a wide range of adsorbers specially designed for hydraulic power packs. They are available with and without valves, with FKM or EPDM seals, according to ATEX 2014, for indoor, outdoor and offshore use, and as disposable or refillable versions. They are divided into adsorbers for air drying and adsorbers for separation of pollutants.

The adsorber size is determined on the basis of the tank or shuttle volume.

| Tank- / shuttle volume | Adsorber size aeration dryer | Adsorber size oil mist separator |
|---|---|---|
| 0 - 50 ltr. | 1L | 1L |
| 50 - 100 ltr. | 2L | 2L |
| 100 - 400 ltr. | 3M | 3L |
| 400 - 800 ltr. | 3L | 5L |
| 800 - 1800 ltr. | 5M | 5XL |
| 1800 - 3600 ltr. | 5L | |

## How adsorbers work on hydraulic power packs




**1.** The adsorber is mounted on the hydraulic power unit. The ambient air is enriched with moisture.

**2.** Hydraulic oil is removed from the tank, the oil level drops and pressure is equalized by incoming air. The adsorber separates moisture up to 2% rH (10% rH on average).

**3.** When the hydraulic oil is pumped back into the tank, the oil level rises and the pressure is equalized by escaping dry air.

**4.** Because the air inside the system always remains dry, no condensation takes place in the hydraulic unit even if the ambient air drops below the dew point.

## Adsorbers for use on hydraulic units

### VV-D

Disposable version without valves, with FKM seal, for indoor, outdoor & offshore use

### VV-DV

Disposable version with valves, with FKM seal, for indoor, outdoor & offshore use

### VV-R

Reusable version without valves, with FKM seal, for indoor & outdoor use

### VV-RV

Reusable version with valves and FKM seal, for indoor & outdoor use

### MA-RV

Reusable version with valves and FKM / EPDM seal, for indoor & outdoor use according to ATEX

### ME-RV

Reusable version with valves and FKM / EPDM seal, for indoor, outdoor & offshore use according to ATEX

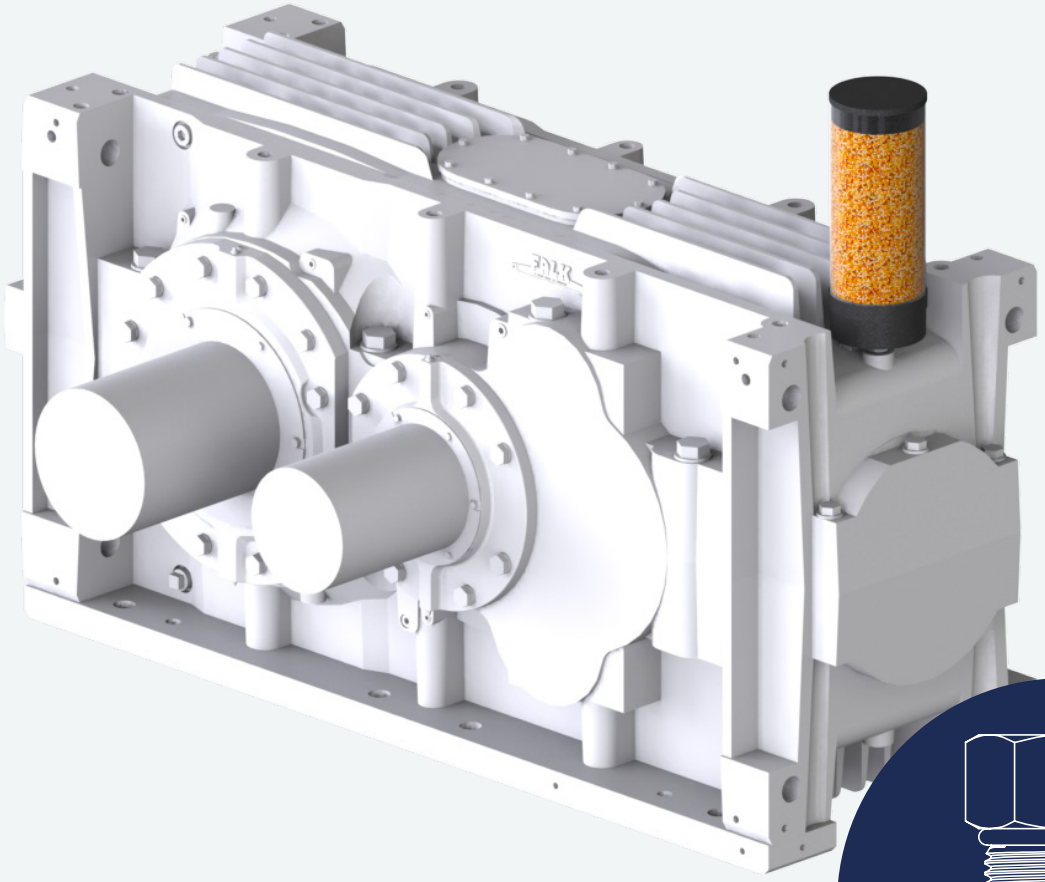
### VG-D

Disposable version without valves, with FKM seal, for indoor & outdoor use

### VG-R

Reusable version without valves, with FKM seal, for indoor & outdoor use

# Adsorber for gears..

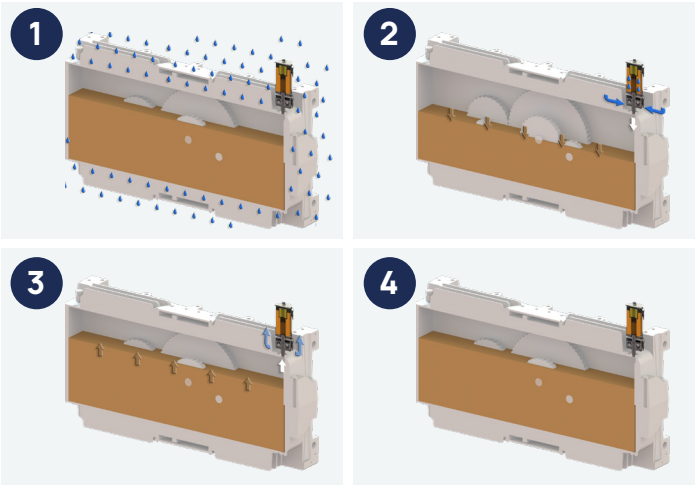



GIEBEL offers a wide range of adsorbers specially designed for gears. They are available with and without valves, according to ATEX 2014, for indoor, outdoor and offshore use, and as disposable or refillable versions. They are divided into adsorbers for air drying and adsorbers for separation of pollutants.

The adsorber size is determined based on the air & oil volume.

| Air & Oilvolume | Adsorber size aeration dryer | Adsorber size oil mist separator | Adsorber size water separator |
|---|---|---|---|
| 0 - 10 ltr. | 1L | 1L | S |
| 10 - 100 ltr. | 2M | 2L | M |
| 100 - 400 ltr. | 2L | 3L | |
| 400 - 1200 ltr. | 3M | 5L | |
| 1200 - 2400 ltr. | 3L | 5XL | |
| 2400 - ... ltr. | 5M | | |

## How adsorbers work on gears




**1.** The adsorber is mounted on the gear. The ambient air is enriched with moisture.

**2.** If the gear cools down, the oil level drops and the pressure is equalized by incoming air. The adsorber separates moisture up to 2% rH (10% rH on average).

**3.** When the gearbox warms up, the oil level rises and the pressure is equalized by escaping dry air.

**4.** Because the air inside the system always remains dry, no condensation takes place in the gear even if the ambient air drops below the dew point.

## Adsorbers for use on gears

### VV-D

Disposable version without valves, with FKM seal, for indoor, outdoor & offshore use

### VV-DV

Disposable version with valves, with FKM seal, for indoor, outdoor & offshore use

### VV-R

Reusable version without valves, with FKM seal, for indoor & outdoor use

### VV-RV

Reusable version with valves and FKM seal, for indoor & outdoor use

### MA-RV

Reusable version with valves and FKM / EPDM seal, for indoor & outdoor use according to ATEX

### ME-RV

Reusable version with valves and FKM / EPDM seal, for indoor, outdoor & offshore use according to ATEX

### VG-D

Disposable version without valves, with FKM seal, for indoor & outdoor use

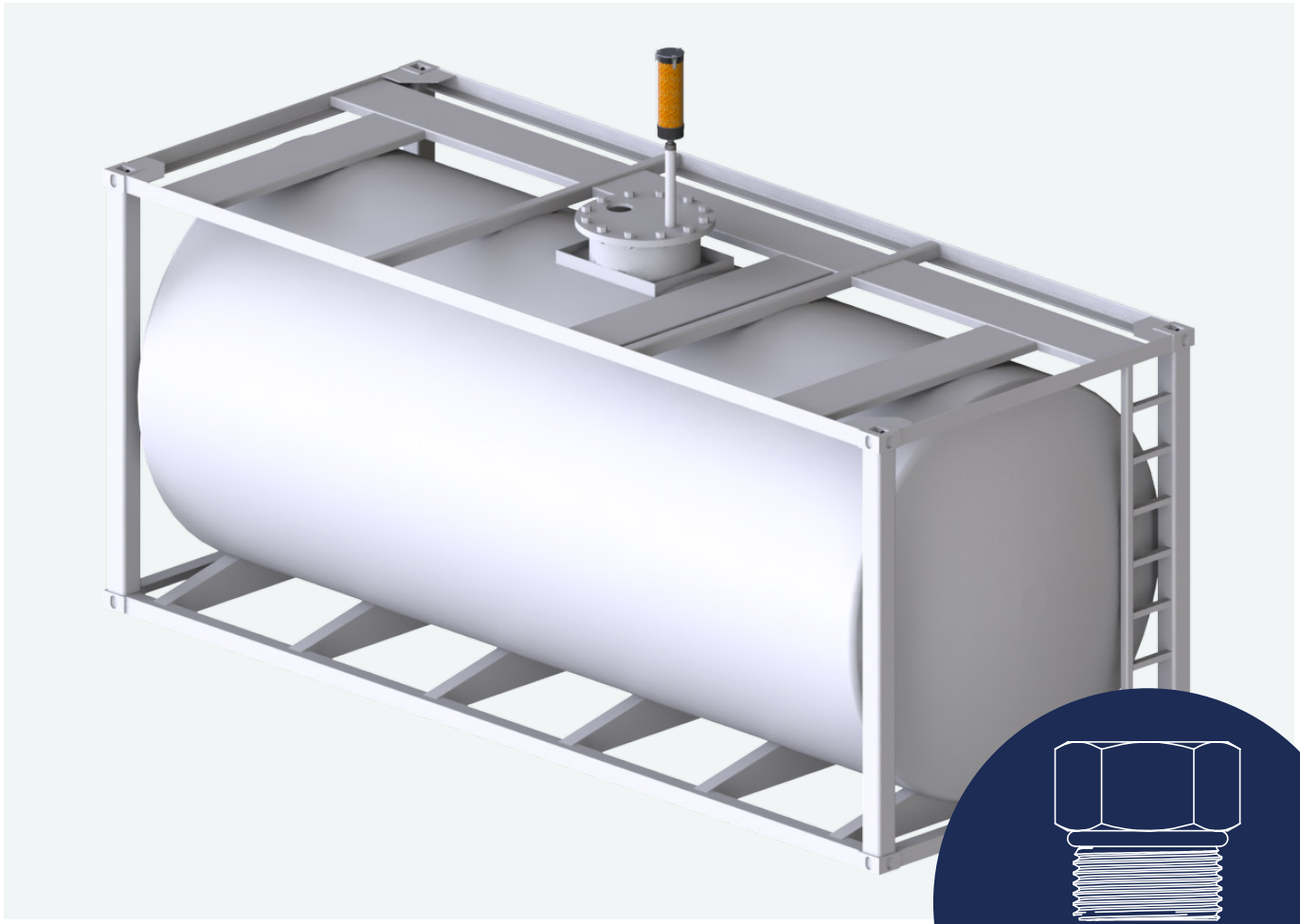
### VG-R

Reusable version without valves, with FKM seal, for indoor & outdoor use

### HS-D

Disposable version with ePTFE filter (water-repellent)

# Adsorbers for storage tanks.

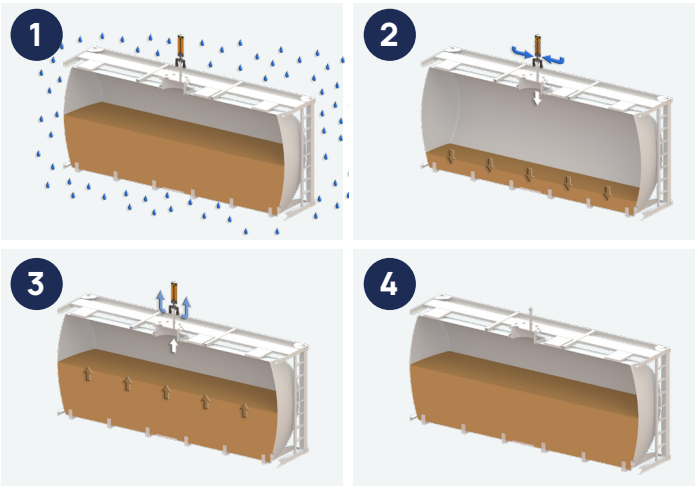



GIEBEL offers a wide range of adsorbers specially designed for storage tanks. They are available with and without valves, with FKM or EPDM seals, according to ATEX 2014, for indoor, outdoor and offshore use, and as disposable or refillable versions.

The adsorber size is determined on the basis of the tank volume.

| Tank volume | Adsorber size aeration dryer |
|---|---|
| 1 - 5 cbm | 3L |
| 5 - 30 cbm | 5L |
| 30 - 60 cbm | 5XL |
| 60 - 120 cbm | 35L |
| 120 - ... cbm | 50L |

## How adsorbers work on storage tanks




**1.** The adsorber is mounted on the storage tank. The ambient air is enriched with moisture.

**2.** When medium is taken from the tank, the level decreases and pressure is compensated by incoming air. The adsorber seperates moisture up to 2% rH (10% rH on average).

**3.** When the tank is refilled, the level is rising and pressure is compensated by outgoing dry air.

**4.** Because the air inside the system always remains dry, no condensation takes place in the storage tank even if the ambient air drops below the dew point.

## Adsorbers for use on storage tanks

### VV-DV

Disposable version with valves, with FKM seal, for indoor, outdoor & offshore use

### VV-RV

Reusable version with valves and FKM seal, for indoor & outdoor use

### MA-RV

Reusable version with valves and FKM / EPDM seal, for indoor & outdoor use according to ATEX

### ME-RV

Reusable version with valves and FKM / EPDM seal, for indoor, outdoor & offshore use according to ATEX

### MS-R

Reusable version without valves, with FKM seal, for indoor, outdoor & offshore use according to ATEX

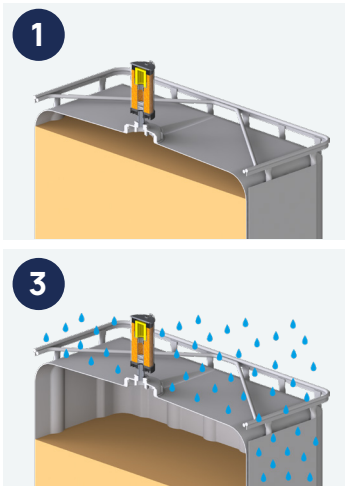
# Adsorbers for barrels & IBC.


GIEBEL offers a wide range of adsorbers specially designed for barrels & IBCs. They are available with and without valves, with FKM or EPDM seals, according to ATEX 2014, for indoor and outdoor use, and as disposable or refillable versions. They are divided into adsorbers for air drying and adsorbers for separation of pollutants.

The adsorber size is determined on the basis of the container volume.

| Container volume | Adsorber size aeration dryer | A dsorber size oil mist separator | Adsorber size acid separator |
|---|---|---|---|
| 60 ltr. barrel | 1L | 1L | |
| 200 ltr. barrel | 2L | 2L | 2L |
| 1000 ltr. IBC | 2L | 2L | 2L |

## How adsorbers work on barrels and IBCs




**1.** The adsorber is mounted on the IBC.

**2.** The ambient air is enriched with moisture. When medium is taken from the IBC, the level decreases and pressure is compensated by incoming air. The adsorber seperates moisture up to 2% rH (10% rH on average).

**3.** The moisture remains in the desiccant of the adsorber. No water gets into the container. No loss of quality of the substance.

## Adsorbers for use on barrels and IBCs

### VV-D

sposable version without valves, with FKM seal, for indoor, outdoor & offshore use

### VV-R

Reusable version without valves, with FKM seal, for indoor & outdoor use

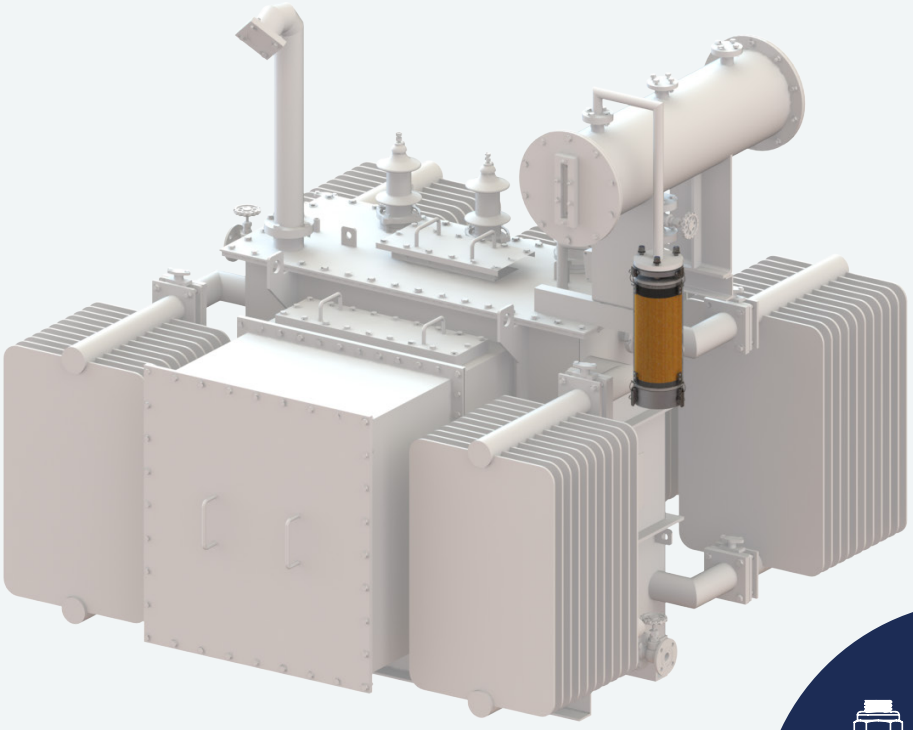
### MA-R

Reusable version without valves, with FKM / EPDM seal, for indoor & outdoor use according to ATEX

### AS-D

Disposable version without valves, with EPDM seal, for indoor, outdoor & offshore use

# Adsorbers for transformers.



Various Connections

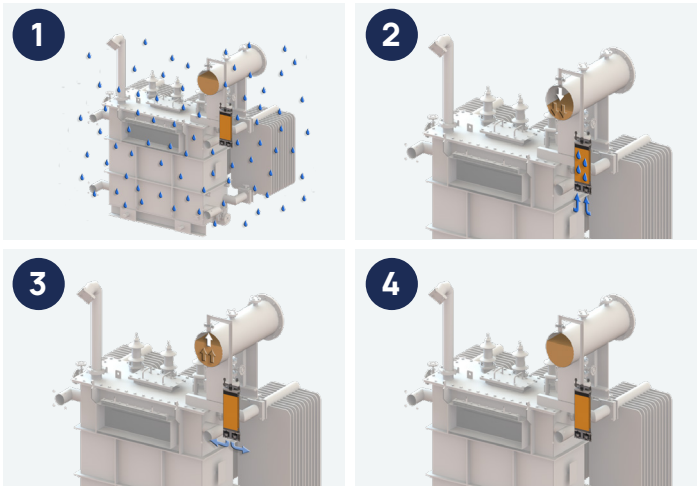
DIN42562, DIN42567A
DIN42567B, DIN42567C

GIEBEL offers a wide range of adsorbers specially designed for transformers. They are available for hanging and standing installations, according to ATEX 2014, for indoor, outdoor and offshore use, and as disposable or refillable versions.

The adsorber size is determined on the basis of the transformer power or the oil volume.

| Power / tank volume | Adsorber size aeration dryer |
|---|---|
| 0 - 5 MVA (up to approx. 2.500 ltr. oil) | 3M |
| 5 - 10 MVA (up to approx. 5.000 ltr. oil) | 3L |
| 10 - 30 MVA (up to approx. 15.000 ltr. oil) | 5M |
| 30 - 60 MVA (up to approx. 30.000 ltr. oil) | 5L |
| 60 - 100 MVA (up to approx. 50.000 ltr. oil) | 5XL |

## How adsorbers work on transformers




**1.** The adsorber is mounted on the transformer. The ambientair is enriched with moisture.

**2.** If the transformer cools down, the oil level drops and the pressure is equalized by incoming air. The adsorber separates moisture up to 2% rH (10% rH on average).

**3.** When the transformer warms up, the oil level rises and the pressure is equalized by escaping dry air.

**4.** Because the air inside the system always remains dry, no condensation takes place in the transformer even if the ambient air drops below the dew point. Water ingress into the insulating oil is prevented.

## Adsorbers for use on transformers

### TB-DV

Disposable version (Recyclable in Send & Refresh system) with valves and FKM seal, for indoor & outdoor use

### TB-RV

Reusable version with valves and FKM seal, for indoor & outdoor use

### TM-RV

Reusable version with valves and FKM seal, for indoor, outdoor & offshore use according to ATEX

# Adsorbers for closed systems.

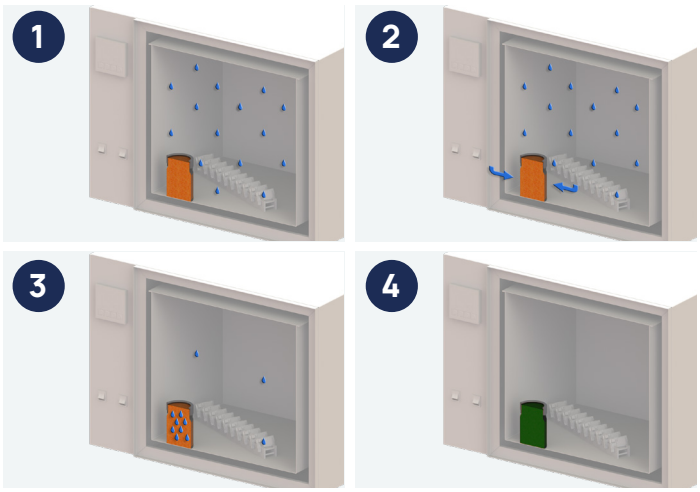

GIEBEL offers adsorbers specially designed for closed systems. They consist of a metal housing and a desiccant filling.

ES-R adsorbers are available in different sizes to adapt to the space conditions, for example in switch & server cabinets, display cases and storage containers . They can be filled with silica gel (standard) as well as with molecular sieves and activated carbon.

The adsorber size is determined on the basis of the volume.

| Container volume / room volume / cabinet volume | Adsorber size aeration dryer |
|---|---|
| 0 - 100 ltr. | S |
| 100 - 500 ltr. | M |
| 500 - 1000 ltr. | L |
| 1000 - ... ltr. | XL |

## How adsorbers work in closed systems




**1.** The adsorber is placed in a closed container / room - for example in a control cabinet. The air inside is humid.

**2.** Air flows through the fine openings of the enclosed metal grid into the adsorber.

**3.** The silica gel absorbs the moisture from the incoming air.

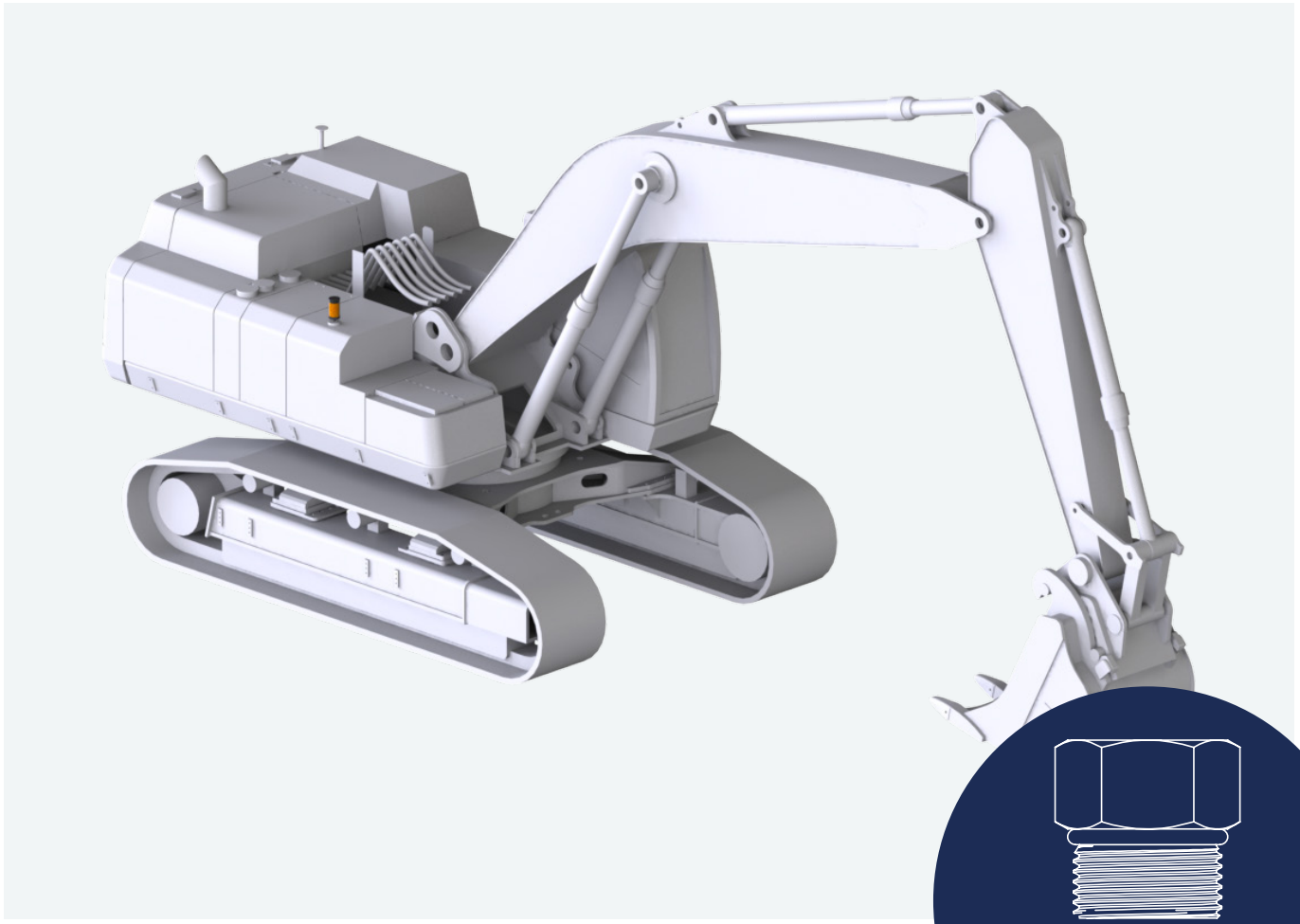
**4.** As saturation increases, the silica gel grains turn green, indicating when it should be replaced.

## Adsorbers for use in closed systems

### ES-R

Reusable version, made of stainless steel with PVDF sight glass

# Adsorbers for mobile machinery.



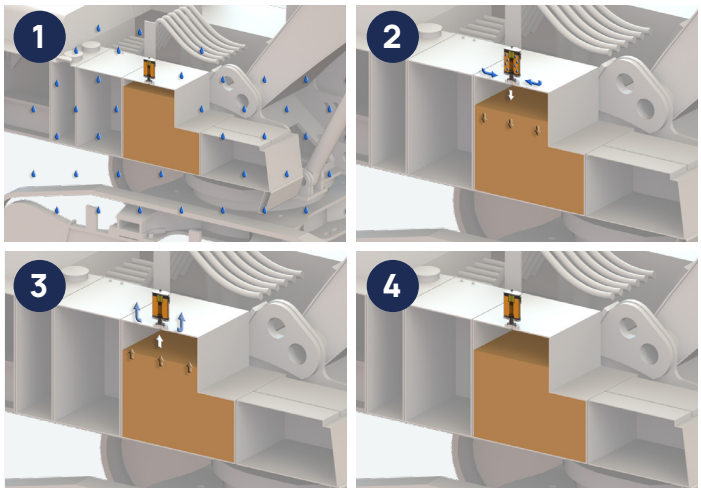

GIEBEL offers adsorbers suitable for Mobile Machinery. They are available with and without valve, with FKM or EPDM seals, according to ATEX 2014, for indoor, outdoor and offshore use and as disposable or refill version.

When mounting adsorbers on mobile machines with tank pressures of 0.3 and 0.5 bar, a valve adapter is also installed.

The adsorber size is determined on the basis of the tank volume.

| Tank volumen | Adsorber size aeration dryer |
|---|---|
| 0 - 50 ltr. | 2L |
| 50 - 100 ltr. | 3M |
| 100 - 400 ltr. | 5M |
| 400 - 800 ltr. | 5XL |

## How adsorbers work on mobile machinery




**1.** DThe adsorber is mounted on the hydraulic tank of a mobile machine. The ambient air is enriched with moisture.

**2.** Hydraulic oil is withdrawn from the tank, the oil level drops and the pressure is equalized by incoming air. The adsorber separates moisture up to 2% RH (on average 10% RH).

**3.** When the hydraulic oil is pumped back into the tank, the oil level rises and the pressure is equalized by the escaping dry air.

**4.** Since the air inside the system always remains dry, no condensation takes place in the hydraulic tank, even if the ambient air falls below the dew point.

## Adsorbers for use on mobile machines

### VV-D

Disposable version without valves, with FKM seal, for indoor, outdoor & offshore use

### VV-DV

Disposable version with valves and FKM seal, for indoor, outdoor & offshore use

### VV-R

Reusable version without valves, with FKM seal, for indoor & outdoor use

### VV-RV

Reusable version with valves and FKM seal, for indoor & outdoor use

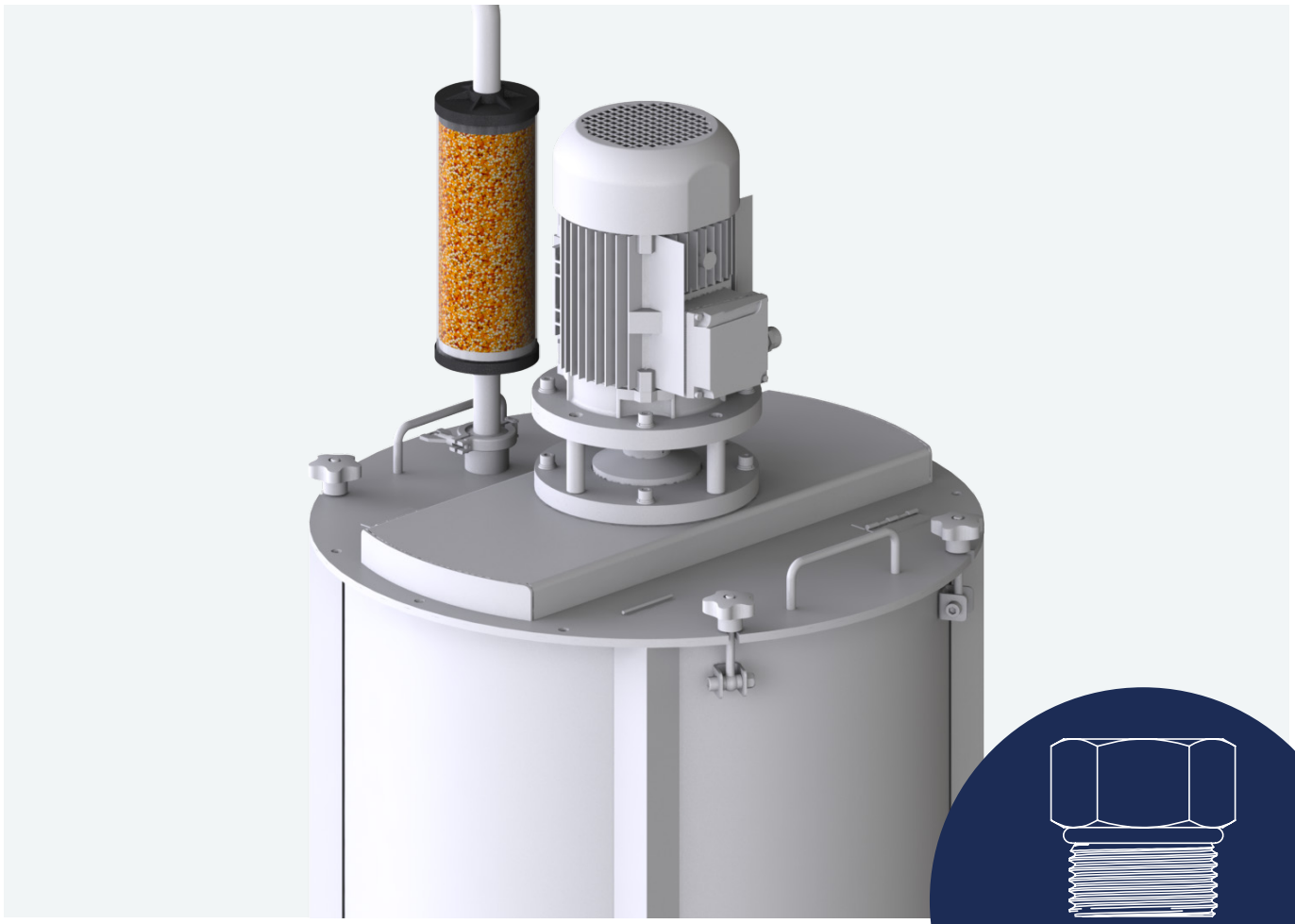
### MA-RV

Reusable version with valves and FKM / EPDM seal, for indoor & outdoor use according to ATEX

### ME-RV

Reusable version with valves and FKM / EPDM seal, for indoor, outdoor & offshore use according to ATEX

# Adsorber for inline assembly.




GIEBEL offers adsorbers that are specially designed for installation in pipelines to separate moisture or even pollutants from a system. For this purpose, the inline adsorbers can be filled with silica gel (standard), molecular sieves or activated carbon.

The inline adsorbers are designed for different volume flows and are also available in variants that can be operated in explosion protection zones according to ATEX or in high-pressure lines.

The adsorber size is determined on the basis of the volume flow.

| Volume flow | Adsorber size aeration dryer |
|---|---|
| Up to 10 l / min & max. 30 l / min | 1L |
| Up to 20 l / min & max. 100 l / min | 2L |
| Up to 40 l / min & max. 260 l / min | 3M |
| Up to 80 l / min & max. 490 l / min | 3L |
| Up to 160 l / min & max. 930 l / min | 5L |

## How adsorbers work in pipelines


**1.** The adsorber is installed vertically or horizontally in a pipeline.

**2.** Process air flows through the adsorber. Silica gels and molecular sieves absorb moisture contained in the process air. Molecular sieves are also capable of adsorbing other gases. Activated carbon is used when oil mist or other pollutants are to be filtered out.

## Adsorbers for use in pipelines

### VL-D

Disposable Inline-Adsorber with integrated filter

### VL-R

Reusable Inline-Adsorber with integrated filter & FKM seals

### VM-R

Reusable Inline-Adsorber with integrated filter & FKM seals for use in harsh environments, according to ATEX

### PL-R

Reusable high pressure inline adsorber with integrated filter & FKM seals for use up to 8bar, according to ATEX

# Silica gel, activated carbon & molecular sieve.

**Silica gels** are silicon dioxides (SiO2) with amorphous, disordered microstructure and broad pore radius distribution. They belong to the hydrophilic adsorbents - which is expressed by their affinity for dipole molecules such as H2O. Silica gels are chemically neutral and resistant to almost all acids.

A distinction is made between narrow-pored and wide-pored grades. Both silica gels absorb water molecules at high vapor pressures in multiple layers by capillary condensation. However, narrow-pored silica gels are used more frequently in dehumidification. Thanks to their larger specific surface area and higher number of silanol groups, they are more hydrophilic. Wide-pore silica gels, on the other hand, serve as „buffer gels“ to trap water droplets. Silica gels can be provided with color indicators so that the state of loading with water can be seen via a color change. They can also be regenerated in a commercial oven at 120°C (with color indicator) or 150°C (without color indicator).

**Molecular sieves** are synthetically produced aluminosilicates which are distinguished by their crystal lattice structure and the resulting different pore diameters. They are used when gases are to be „screened out“ in addition to atmospheric moisture or when very strong drying is required. This is because molecular sieves achieve high electrostatic adsorption forces even at low temperatures.

The maximum water absorption in a fully saturated environment is approx. 23 % (molecular sieve 4A) to 27 % (molecular sieve 13X). There is no color indicator to show the loading status. The regeneration temperature of the molecular sieve is 300 °C.

**Activated carbon** is a porous carbon with a large inner surface. The pore diameters are between 0.3 nm and several thousand nanometers, so that molecules can optimally attach themselves.

The surface is essentially non-polar and thus hydrophobic as well as organophilic. This means that the less water-soluble a substance is, the better it is adsorbed from the aqueous phase. Activated carbon is therefore ideally suited as an oil mist separator.

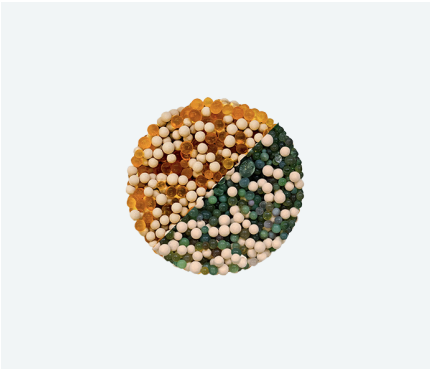
Thanks to the hydrophobic nature of the surface, adsorption of water vapor is very low at low concentrations. Only at higher concentrations (higher humidity) does the water loading increase steeply.


For more information about our desiccants and the possibility to purchase them online, please visit

**www.giebel-desiccants.com**

# GIEBEL Xdry ®.

## The strengths of silica gel & molecular sieve combined



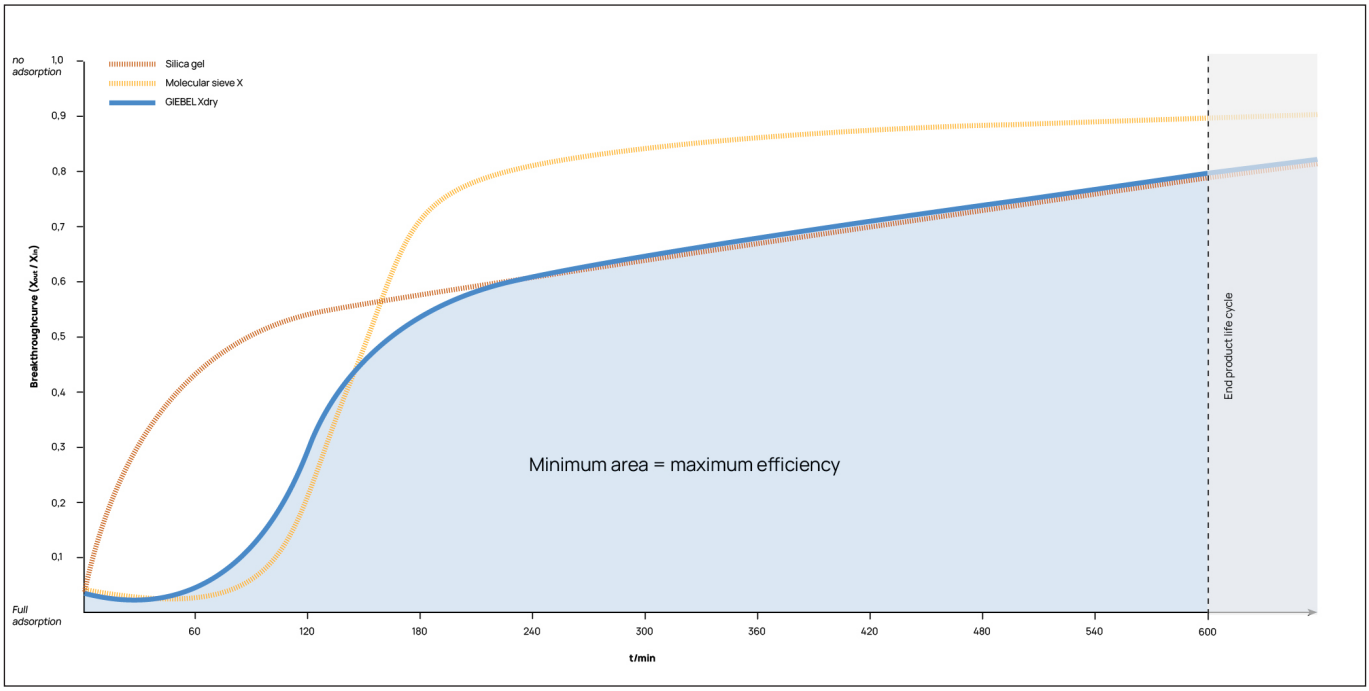
GIEBEL Xdry® - the new fill makes our adsorbers even more effective, because it combines the strengths of molecular sieve and silica gel orange-green.

While molecular sieve has the significantly stronger binding energy to polar substances, especially to water, silica gel orange-green scores with its very high water absorption capacity and a high-contrast color indicator.

**The advantages of GIEBEL Xdry® at a glance:**
- Use at higher temperatures possible
- Use at lower humidities possible
- Stronger drying of the sucked in air and less humidity in the plant
- Safe use & easy disposal

## GIEBEL Xdry® compared to silica gel.

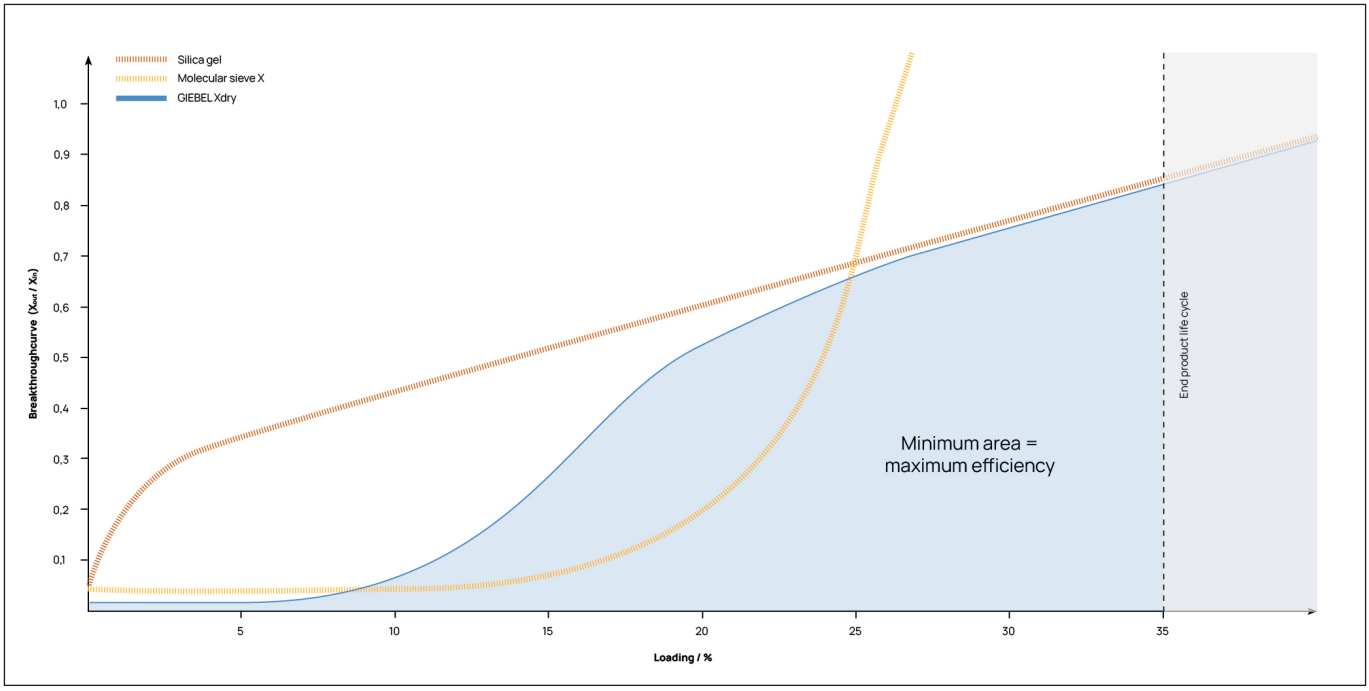
GIEBEL Xdry® has a maximum water absorption of 35% at 100% RH and 20°C in the climatic chamber – silica gel therefore appears at first glance to be the more suitable desiccant with a maximum water absorption of 40%. In practice, however, an adsorber is already fully loaded and colored green at a water absorption of 33% of the dry mass. The initial humidity of the air flowing through is then approx. 35% RH. The fact that GIEBEL Xdry® has the lower maximum water absorption therefore does not come into play when used in an aeration dryer.




*Graphic 1: Breakthroughcurve*

A similar picture emerges when considering the drying performance. Up to a load of 25%, less moisture flows out of an adsorber when it is filled with GIEBEL Xdry® instead of silica gel. This shows: more water remains in the adsorber. At a loading of 25% to 35%, both materials behave approximately the same.

At a loading of 35%, the end of the product life cycle of an adsorber is reached. If the adsorber were to be operated further, GIEBEL Xdry® would be at a disadvantage compared to silica gel. In both cases, however, a plant would then no longer be sufficiently protected. The replacement of the adsorber at a loading of 35% is therefore urgently recommended.



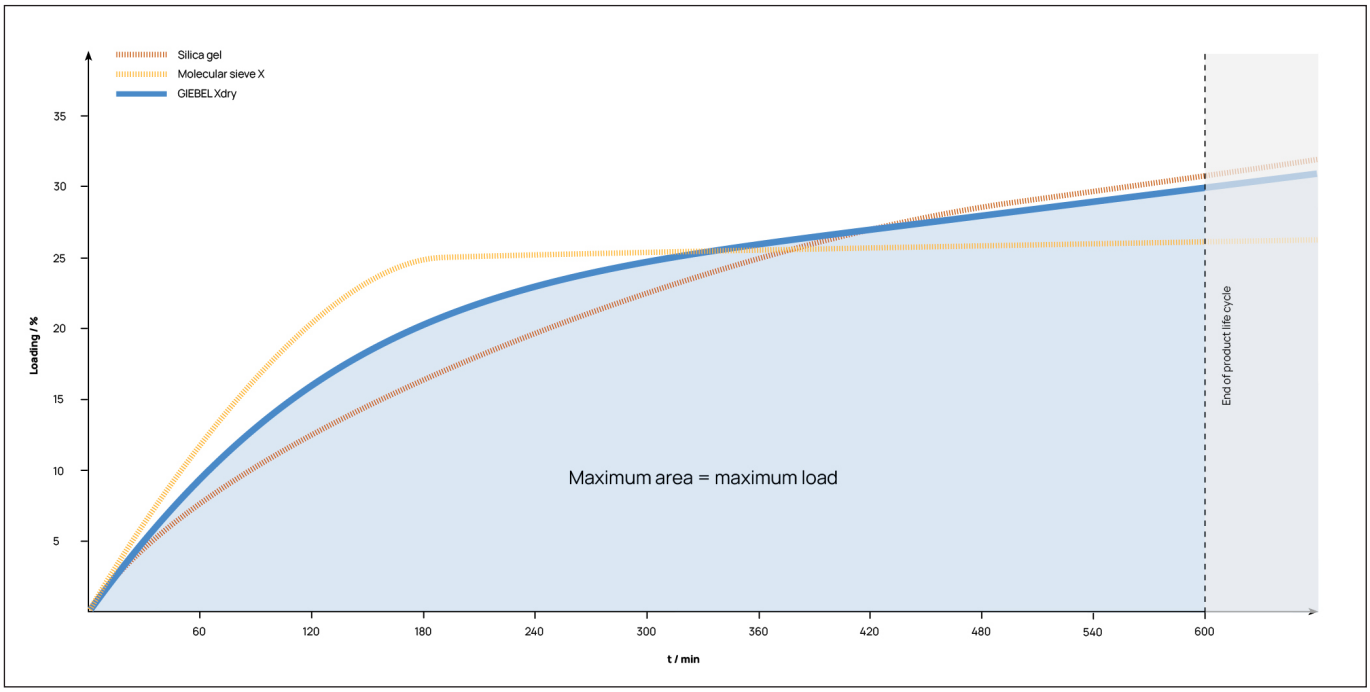

*Graphic 2: Residual humidity after loading*

## How do I recognize that I have to exchange an adsorber filled with GIEBEL Xdry®?

Replace your adsorber as before when a complete color change of the silica gel grains from orange to green has taken place. GIEBEL Xdry® and silica gel have the same color change point and therefore the same maintenance interval.

## How much water does GIEBEL Xdry® absorb?

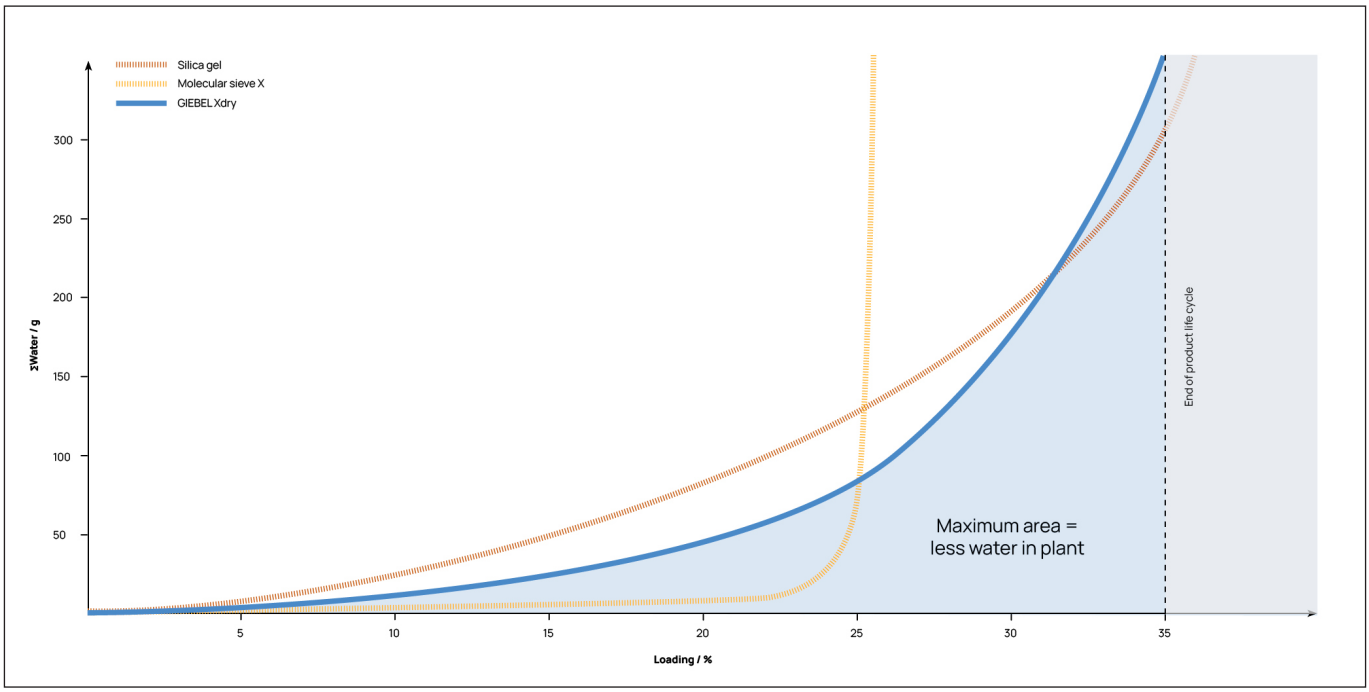
The maximum water absorption capacity of GIEBEL Xdry® is 35% of the dry weight. At a loading capacity of approx. 33%, the adsorber is completely discolored green and must be changed. For practical purposes, the loading capacity of 33% is therefore relevant.
The following shows the loading curve. Here, too, it can be seen that GIEBEL Xdry® combines the advantages of silica gel & molecular sieve.




*Graphic 3: Loading process*

The proportion of water that flows through the adsorber into the system is significantly lower than with pure silica gel. GIEBEL Xdry® thus adsorbs a higher proportion of water from the air drawn in and thus protects the plant to be ventilated more effectively.

The proportion of water entering the plant is between the drying performances of silica gel and molecular sieve.



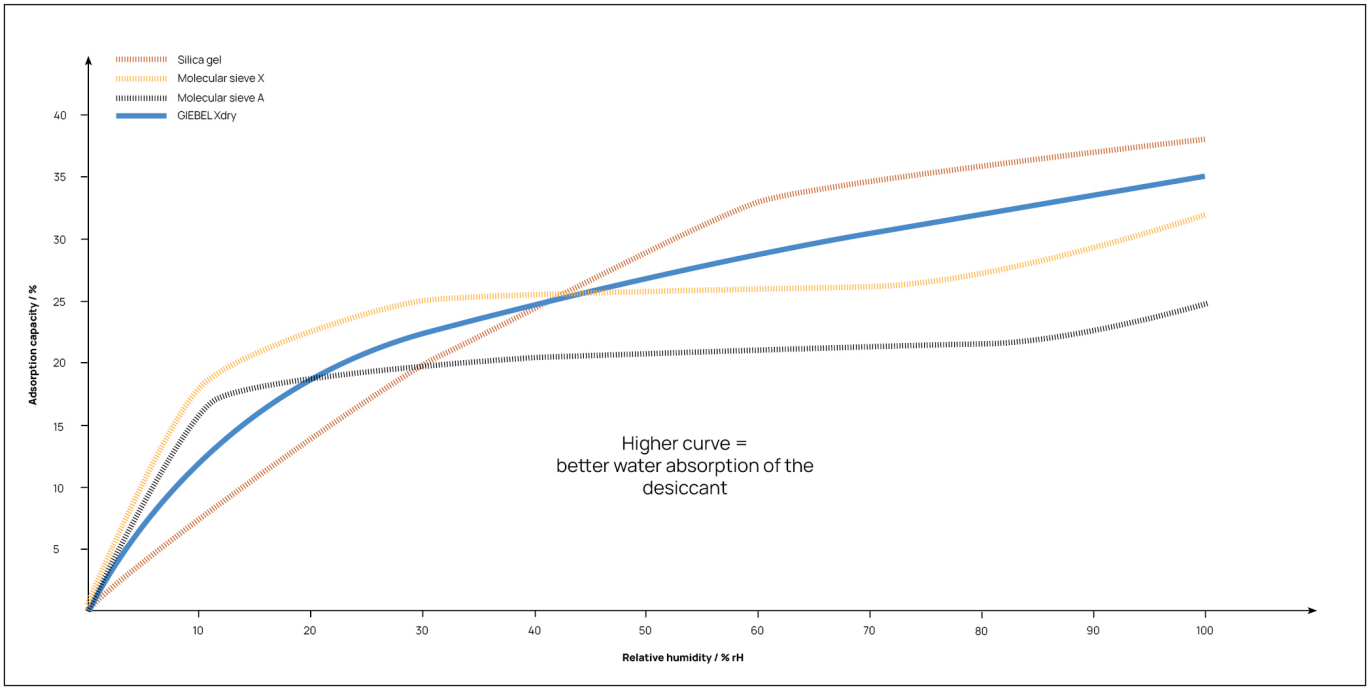

*Graphic 4: Water entry after loading*

## The perfect mixture for GIEBEL Xdry®?

In tests with various mixing ratios and molecular sieves of different grain sizes, it has been shown that an increase in the silica gel content always leads to a reduction in drying performance. An increase in the molecular sieve content, on the other hand, has a negative effect on the water absorption capacity and shortens the maintenance interval of an adsorber. For our aeration dryers, a different mixing ratio would therefore prove disadvantageous. To ensure that our adsorbers provide the best possible drying performance for you, GIEBEL Xdry® consists of silica gel orange-green as well as a molecular sieve with X structure and Na+ cations with an effective pore size of 10A.

## At which humidities is GIEBEL Xdry® used?

Ventilation dryers are usually used at humidities of 60-100% RH. At this humidity the risk for condensation in your installations is highest. The higher isotherm of GIEBEL Xdry® at lower humidities (see figure) allows the use also in dry environments. Thus, use is already possible at 30% rH to further dry air flowing through.




*Graphic 5: Isotherme*

## At which temperatures can GIEBEL Xdry® be used?

The temperature application range GIEBEL Adsorber® is extended by the change to the new desiccant. Since the regeneration temperature of silica gel is 120°C, the water absorption of silica gel is already limited at 80°C. Molecular sieve, on the other hand, has a constant water absorption up to about 250°C and is not regenerated until 300°C.

At temperatures above 80°C, adsorption with GIEBEL Xdry® is taken over by the molecular sieve contained. Until the molecular sieve is completely loaded, adsorbers with GIEBEL Xdry® can therefore also be used at temperatures above 80°C.

## How can GIEBEL Xdry® be regenerated?

Due to the different regeneration temperatures of the silica gel and molecular sieve contained in the GIEBEL Xdry® , we do not recommend regeneration of the desiccant. If silica gel is heated to over 120°C, the color indicator it contains burns out and turns brown. Temperatures below 250°C, on the other hand, have no significant effect with regard to the regeneration of molecular sieve.

The bed of our adsorbers filled with GIEBEL Xdry® is therefore replaced after complete loading. For this purpose, you can obtain practical refill packs of GIEBEL Xdry® in various sizes from us.

## Is GIEBEL Xdry® harmful to health?

The components silica gel orange and molecular sieve are classified as non-hazardous substances according to the law of the European Union (Regulation EC No. 1272/2008). They are not subject to mandatory labeling according to the EC Directive (67/548/EEC or 1999/45/EC).

GIEBEL Xdry® is thus also classified as a substance that is not hazardous to health or the environment.

# Desiccant bags..

## Small bags with large absorption capacity..

### Clay bags

Clay bags are the „classics“ among desiccant bags. They are primarily used as packaging materials for moisture-sensitive goods with long transport routes or storage times - but can also be used for air drying in control and server cabinets, display cases, storage boxes and containers. They are also available in a dust-tight version in accordance with MIL-D-3464E.

### Silica gel bags

Silica gel bags reliably protect against moisture and corrosion thanks to their high absorption capacity. They are used in shipping packaging, in switch and server cabinets, in the pharmaceutical industry, for the protection of electrical and optical components and in many other areas.

Our silica gel bags are filled with silica gel orange-green. This makes it possible to quickly identify when the bags need to be replaced via a color change to green.


### Molecular sieve bags

In bag form, molecular sieve is used primarily in the pharmaceutical, diagnostic and electronics industries where low relative humidities of less than 10%RH or low temperatures prevail. Desiccants such as clay and silica gel would not achieve the desired effects.

Our molecular sieve bags are filled with molecular sieve 4A.

### Superadsorber bags

Per gram of desiccant (sodium polyacrylate) Superadsorber bags can absorb 80ml of liquid water. This makes them extremely efficient.

Your contact person:

**GIEBEL FilTec GmbH**
Carl-Zeiss-Str. 5, 74626 Bretzfeld

**www.giebel-adsorber.com**
**www.giebel-desiccants.com**

GIEBEL Adsorber®