



**... we come to grip
with moisture**



- Desiccant bags
- Desiccant capsules
- Desiccant cartridges
- Indicators
- Packing aids
- Molecular sieves
- White silica gel and self-indicating gel
- Shockwatch
- Desiccant activated alumina
- Laminated barrier foils
- Packing list shields and envelopes
- Swing lids / Ventilation panels



Reg.-Nr. 100602520

Damage caused by corrosion or humidity are likely to occur during transportation or storage of industrial products such as:

- **Machine tools**
- **Data processing plants**
- **Optical and precision instruments**
- **Electronic equipment**
- **Pharmaceuticals**
- **Chemicals**
- **Military components**
- **Leather goods**
- **Food**

Desiccant bags, filled with highly active drying agents, offer the ideal solution for the protection of moisture-sensitive goods in an effective and environmentally friendly way.

The filling of the desiccant bags is measured in units. One desiccant unit is equal to the amount of a drying agent capable of adsorbing a minimum of 3g at 20% relative humidity and 6g at 40% relative humidity of water vapour at an air temperature of 23°C (±2).

The DIN 55473 only allows for the description in desiccant units. The following table offers an overview of the approximate amount of desiccant in each bag.

Units	1/6	1/3	1/2	1	2
= approximately g Filling weight	6	12	18	35	70
Units	4	8	16	32	80
= approximately g Filling weight	145	285	540	1130	2850

Version A - DIN 55473

low dust leakage = regular bag

Version B - DIN 55473

dust-free = for highly sensitive products

TROPAgel® are manufactured with highly efficient drying agents allowing for a high adsorption and drying rate thanks to their superior porous properties.

The adsorption capacity may be as high as 30% of its weight at 80% RH and 25°C.

TROPAgel® desiccant bags are chemically inert and non-toxic for metal or any other materials.

TROPAgel® corrosion protection is further required during the transportation of industrial steel and iron products, as well as for copper and aluminium goods which are usually transported in a hermetically sealed environment, where the formation of condensation water will have a corrosive effect on the transported goods. The formation of such condensation water may be triggered by a sharp fall in temperature.

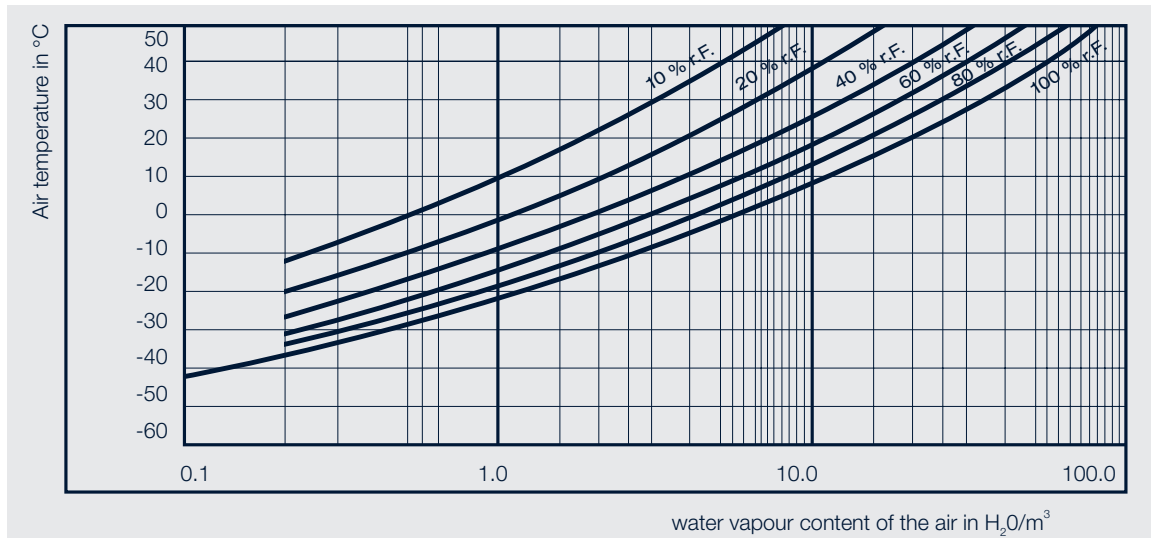
The attached table allows for an easy calculation of the required amount of drying agent and thus the corresponding amount of desiccant units. Further factors need to be observed in order to guarantee true desiccant protection since the drying agent, according to DIN 55473, has only a limited humidity adsorption capacity.

We have therefore developed a simple method to calculate the amount of desiccants required for the respective purpose. The information is available on disc which can be purchased through our company.

- **Type of packaging**
- **Amount of water vapour penetrating through the packaging from the outside**
- **Length of transportation and storage period at the addressee**
- **Climate conditions during the transportation and at the recipient's end**
- **Level of humidity inside the packaging**
- **Amount of padding material used (wood, paper, synthetic fillers, cardboard, wooden parts, etc.)**



WATER CONTENT SUBJECT TO TEMPERATURE AND RELATIVE HUMIDITY



SEAWORTHY PACKING

Wooden boxes, packaged items shrink-wrapped in aluminium or polyethylene barrier foil.

The desiccant bags are used in combination with barrier foils. Each foil type is equipped with a specific rate of water vapour permeability. When calculating the amount of drying agents needed, the degree of humidity continuously penetrating the packaging therefore needs to be taken into account. Please also refer to DIN 55474. Please make sure to adhere to the items listed below:

- More than one temperature zone during transportation
- Total length of transportation
- Storage time
- Degree of water vapour permeability of the foil
- Packaging surface measured in m² (all 6 sides)

There needs to be a constant humidity level of below 50% inside the packaging in order to truly prevent corrosive damage.

There are two types of barrier foils:

Polyethylene Barrier Foil

For transportation and storage periods with a maximum term of 1 year.

Aluminium Barrier Foil TL 8135-0003

For transportation and storage periods between 1 and up to 5 years.

When using standardized packaging with polyethylene barrier foil it is important to use a foil with a total thickness of 200 microns and a maximum water vapour permeability rate of 0.5 g/m² in 24 hours and 23°C/ 85% RH (please also refer to DIN 55122).

All packaged goods with storage over extended periods of time need to be sealed and shrink-wrapped with an aluminium barrier foil, i.e. **Tropac**[®]. For further information, please refer to the chapter "multilayer barrier foils".

All calculations based on goods in packing boxes can also be applied to small items packed into the respective laminated barrier foil bags.

In the table, both sides of the surface are illustrated in square meters.

All packaging needs to be free from any leaks and damages or split seams.





SEALED BARRIER PACKAGING

Tin Barrel

This type of packaging effectively prevents the penetration of humidity due to its water vapour resistant properties. The air, initially included inside the packaging, therefore needs to be dehumidified.

Please observe the temperatures on the interior of the packing area. The requirement is 1 unit of drying agent per 200 l of head space inside the packaging in reference to the empty packaging drum.



TYPES AVAILABLE

VA Type A

Low-dust bag made of tear-proof fleece material. Minimum order of 8 units. Hanging loops included. Area of application: All overseas packaging.

PA Type B

Dust-free soda-paper bags for regular use.

TA Type B

Dust-free tyvek bag made of a special tear-proof protective fabric with a low particle count. Area of application: Pharmaceutical industry, electronics and any packaging with elevated exposure levels. This item meets the FDA-requirements (DMF 1893).

Types PA 1/6-4 units

Types VA 1/6-32 units

Types VA 1/6-16 units

All products can be equipped with a humidity indicator card as an additional feature. In that case, a "W" will be added to the product labelling (example: VAW).

These types are in line with the DIN 55473 in the 02/2001 version and are provided with the DIN Certco sign 5B004.

Please contact us for custom-made desiccant bags which we will manufacture according to your request and requirements.

We offer special sized bags with an imprint according to your own design.

We would be happy to assist you with your product needs.





PACKAGING OF DESICCANT BAGS ACCORDING TO DIN 55473

The basic packaging consists of a polyethylene bag in line with DIN 55473 and applies for all bag types which are divided as follows:

Inside this basic packaging, the desiccant bags may be stored in dry areas for extended periods of time without losing any of their dehumidifying capacity. Each of the basic packaging is imprinted with an instruction manual and contains a humidity level indicator 8% RH. If the colour of the indicator is blue, the desiccant is still active. Please refer to the text on the tally sheet when the indicator has turned pink.

The items are shipped inside a corrugated cardboard box which holds up to 30 kg with a net weight of up to approx. 20 kg. The box includes the following total quantities:

Units	1/6	1/3	1/2	1	2
1 Basic Pack contains:	100	80	60	40	20

Units	4	8	16	32	80
1 Basic Pack contains:	15	10	5	3	1

Units	1/6	1/3	1/2	1	2
1 Original cardboard box contains:	1500	1000	800	500	240

Units	4	8	16	32	80
1 Original cardboard box contains:	120	60	30	18	7



SAFETY AND COST ADVANTAGE

TROPAgel® desiccant bags with highly effective drying agents guarantee the safe transportation of your products coupled with a cost advantage through:

- Reduction of transportation time and simple packaging
- Increase in customer satisfaction
- Lower insurance premiums / no risk exclusions
- No transportation or storage damage
- Environmentally-friendly disposal of the drying agent (domestic waste).

The information rendered in this brochure is just a short overview and is noncommittal. We kindly ask you to refer to the local conditions and the materials applied when using the desiccant bags.

Please do not hesitate to contact us for any further inquiries you may have and we would be happy to personally assist you with all your packaging requirements.

THE PRODUCT

The especially compact product requires only a minimum of packaging space. Its compact size (please refer to the table below) and the white silica gel filling

offer a multitude of application possibilities. At the same time, our "TROPACK Mini" reliably offers its usual and outstanding humidity adsorption capacity.

DESICCANT BAG MATERIAL

The mini bags are made of heat-sealed Tyvek®. Tyvek® is an extremely resistant and durable material made from polyolefin fibres. The high fibre density

guarantees an absolutely dust-free end product for the protection of sensitive goods. Additional features are the wear-resistant and lint-free surface of the bags.

THE DRYING AGENT

The bags are usually filled with white silica gel, but you can also select a 4 Angstroms or any other pore size molecular sieve filling.

DURABILITY

Due to the chemically inert filling material, the protected goods remain free from mould, corrosion and other detrimental chemical reactions.



LABELLING

All bags can be imprinted with a warning or caution statement and company logo according to your request. The bags come with a standard "do not eat" warning

statement in German, English, French and Spanish. We would be happy to accommodate your requests.

PRODUCT COMPOSITION

Tyvek® is medically tested, chemically inert and therefore serves as the ideal drying agent for all food packaging. The TROPACK minis are in line with the provisions of the U.S. Food and Drug Administration and the German Federal Public Health Department ("Bundesgesundheitsamt"). The desiccant fill white silica gel is in line with the

requirements of the FDA and approved for indirect food contact applications. White silica gel further meets the TOSCA provisions of the positive list of additives of the Commission of the European Communities (CEC) for the manufacturers of food-proved additives, plastics and dyes, which may come into contact with food.

Tyvek® miniature desiccant bags

White silica gel fill 0.2-1 mm or molecular sieve 4Å					
weight	g	0,5	1,0	2,0	3,0
Dimen- sions: +/- 2mm	mm	20 x 30	20 x 40	23 x 50	23 x 58

CONTAINER DESICCANT BAGS

THE PRODUCT

TranSorb™ desiccant bags possess the capacity of reducing the dew point in storage and transportation containers and offer an especially effective protection

against condensation water. The water adsorption rate is about twice as high as its own weight. One bag weighs 196 grams and measures 17.78 cm x 25.4 cm.

DESICCANT BAG MATERIAL

The bags are made of Tyvek® and foil. Tyvek® is a material with outstanding resistant properties. The polyolefin fibre used is extremely durable. The bags are dust-free due to

the high fibre density. The surface is wear-resistant and lint-free with an integrated heat protection.

THE DRYING AGENT

TranSorb™ desiccant bags are equipped with a specially developed drying agent with very high humidity adsorption properties. They have been especially designed to effectively protect the goods against rust, corrosion, mildew, and other moisture and humidity damage during

transport over longer periods of time. The amount required always depends upon the individual container size. For example, 32 desiccant bags would usually suffice for a 20-foot container.

DURABILITY

TranSorb™ desiccant bags are designed to last over longer periods of time. They are capable of adsorbing humidity over the course of 45 days and beyond and thus protect the transported goods against moisture-related damage. The handling is easy. They are simply

placed on the bottom or near the wall of the container. TranSorb™ desiccant bags are wear-resistant, dust and lint-free and equipped with an integrated heat protection and also suitable for storage container use.

LABELLING

The bags come with a standard "do not eat" warning statement in German, English, French and Spanish. All bags can be imprinted with a warning or caution

statement and your company logo according to your request. Please contact us at any time for further inquiries.

PRODUCT COMPOSITION

Both bag and drying agent are explicitly labelled to be approved for food contact. Tyvek® has been medically tested. The material is chemically inert which makes it suitable for the use during food transports. The drying agent inside the bag, for which the application for

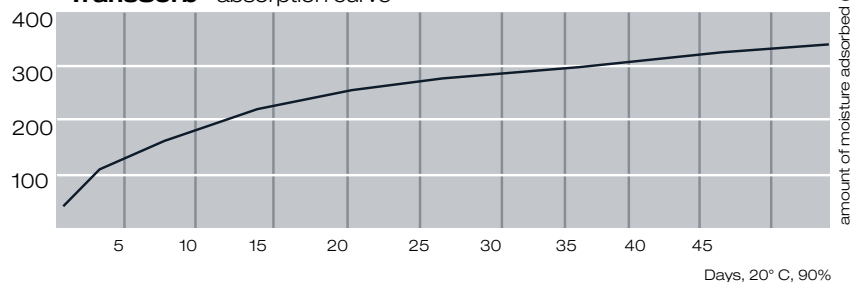
a patent has been filed, does also meet the requirements of the German Federal Public Health Department and the U.S. Food and Drug Administration (FDA).



TranSorb® desiccant bag

Fill:	Calcium, chloride and vermiculite	
Weight:	≈ g	196
Dimensions	mm	200 x 300

TranSorb® absorption curve



Goods vulnerable to corrosion need to be protected by a reliable form of packaging if they are supposed to be transported by sea or into polar or tropical regions. The same caution is to be applied to storage periods extending one year or more. The all-weather packaging consists of a water vapour resistant barrier equipped with a considerable quantity of drying agent.

The material components listed here is the best possible economical solution because they allow optimal coordination. Freight costs are kept at a minimum due to their low weight and minimal amount of effort in preservation and handling.



BARRIER FOIL MATERIALS

There are three different barrier product types depending on the individual requirements:

Tropac® I - for regular use

This material has been especially designed for irregular shaped metal parts and large machinery in a canted design.

Tropac® III - to meet more demanding requirements

Tear-proof product with an enhanced tensile and bursting strength.

Tropac® I and III offer a 100% protection against water vapour, oils and grease. The material is flexible, scrub and rot resistant and heat-sealable on the matt side of the product. Our barrier foils are also available as tubes, flat bags or crate liners.

TROPAgel® - Drying Agents

in combination with barrier foils are the perfect all-weather packaging. The barrier foils hermetically seal the packaged goods from the ambient air. The drying agent adsorbs and scavenges the remaining moisture from the bag's interior.

Our special offer for you:
We can custom-make covers or "crate liners" to suit your own individual requirements.

		Tropac® I	Tropac® III
Material Composition		Polyethylene Aluminium Polyester	Polyethylene (HD/LDPE foil) Aluminium Polyester
Mass per unit area DIN 53104	g/m ²	120	128
Thickness DIN 53105	µm	110	115
Tensile strength DIN 53455 lengthwise crosswise	N N	75 85	70 75
Tensile strength of the sealed seams DIN 53455	N	32	55
Burst resistance DIN 53141	kPa	604	458
Temperature range for the application	°C	-60 to + 100	-40 to + 80
Water vapour permeability DIN 53122 part 2	g/m ² d	<0.01	<0.01
Oil resistance DIN 53521		yes	yes
Compliance with military requirements TL 8135-0003-1 MIL-B-131-G		+ +	+ +
Form of delivery and sizes available: roll length roll width	m cm	100 100/125/150	100 100/125/150

Desiccant cartridges and capsules are required in order to effectively protect high-end equipment used for measuring and controlling optical and electronic devices against corrosion or moisture damage. The equipment needs to be protected against the penetration of dust and moisture and therefore perfectly sealed packaging is vital for the useful life of these products. The remaining

moisture inside the equipment and the humidity penetrating through leaks in the packaging may condense by ambient temperature cooling and result in the formation of rust or mildew (glass). Deteriorated equipment becomes useless and involves serious consequential costs.

APPLICATIONS

It is recommended to use the desiccant cartridges inside the delicate equipment of measurement and control technology and other highly sensitive optical and electronic devices such as military equipment. The desiccant cartridges effectively protect the goods against

moisture, corrosion and fungal contamination. Desiccant capsules are furthermore a very good protection for all pharmaceuticals due to their various sizes and shapes. They can be filled with a variety of drying agents.

COMPONENTS

The desiccant capsules and cartridges are predominantly made from modern synthetic materials such as acrylonitrile copolymers. The cover is made of paper or

other non-woven materials to achieve a diffusion of air humidity. The products are partly equipped with moisture indicators.

DRYING AGENT

Depending upon the application, the customer may request the appropriate drying agent, which

is predominantly silica gel (Silicon dioxide – SiO_2) or molecular sieves.

MOLECULAR SIEVES

The round zeolite crystals have an adsorptive capability of approx. 20% weight percentage subject to the relative humidity. The product regenerates at 400 °C. Molecular

sieves have an especially high adsorption rate and are virtually dust free.

HOW IT WORKS

Please adhere to the following guidelines for optimal application and results: All components need to be hermetically closed, gaps need to be sealed. This is important because the drying process on the equipment interior leads to a slight pressure drop which may easily

result in the intake of new humid air. All parts should be clean and dry and free from any residual moisture. Please note that plastic parts may contain a 3–5% level of residual moisture.

PACKAGING

Both desiccant cartridges and capsules are filled with active drying agent during the production process. In order for the drying agents to maintain their performance level during transport and storage, the product is delivered in hermetically sealed protective packaging. The standard form of packaging is a 0.2 mm polyethylene pouch further containing a humidity indicator.

Another option is the use of water vapour resistant laminated aluminium foils in line with TL 8135-0003. The bags are non-transparent and the humidity indicators on the inside may only be inspected with the bag open. There is an option to select from transparent laminated foil bags possessing a very high water vapour resistance in compliance with MIL-B22191, type I.

PROTECTIVE SLEEVES

The desiccant cartridges are additionally equipped with a protective sleeve according to VG-95239. One protective sleeve, made of transparent polystyrol, is screwed onto each desiccant cartridge. They may additionally be placed in an aluminium box (please refer to TL 4440-0007). We can only guarantee the proper

condition and performance of the capsules and cartridges when all packaging remains intact and unopened during transportation. We would like to point out that all information with regard to military standards are based on their effective versions at the time this brochure was printed.

DESICCANT CARTRIDGES AND CAPSULES

Tropack is developing and offering a wide selection of desiccant cartridges and capsules in various designs.



PRODUCT RANGE

Reference-no.	Supply no. NATO stock no.	Description	Dimensions (mm)
Desiccant cartridges for optical and precision mechanical equipment in compliance with VG 95 239 made of black polystyrene with vision panel and humidity indicator for 40% RH at the top of the desiccant cartridge			
			Fitting length
1	4440-12-158-5262	Nominal size 2,5 – 15 (transparent); Weight M16 x 1.5; filling: 0.35 g molecular sieves	15
2	4440-12-158-5263	Nominal size 5 – 25 (transparent); Weight M16 x 1.5; filling: 0.7g molecular sieves	24
3	4440-12-158-5264	Nominal size 10 – 50 (transparent); Weight M16 x 1.5; filling: 1.5 g molecular sieves	50
4	4440-12-175-4087	Nominal size 10 – 17 (transparent); Weight M16 x 1.5; filling: 1.7 g molecular sieves	17
5	4440-12-175-4086	Nominal size 25 – 16 (transparent); Weight M16 x 1.5; filling: 3.5 g molecular sieves	16
6	4440-12-158-5265	Nominal size 25 – 35 (transparent); Weight M16 x 1.5; filling: 3.5 g molecular sieves	35
7	4440-12-158-5429	Nominal size 50 – 70 (transparent); Weight M16 x 1.5; filling: 7g molecular sieves	70
8	4440-12-154-7226	Nominal size 100 – 45 (transparent); Weight M16 x 1.5; filling: 14 g molecular sieves	45
The nominal size of 100, for example is used to describe the empty volume of a device with a maximum capacity of 100 dm ³ . The VG 95 239 desiccant cartridges are securely screwed into the protective sleeves and the top of the cartridge as well as the protective sleeves are secured with a red adhesive tape.			
Plastic desiccant capsules (cylindrical container) with a porous cardboard cover. Non-regenerative.			
9	HKS000009	Desiccant capsules KA 0.5 Filling: 0.5 g White silica gel	Ø 15 height 8.2
10	HKS000001	Desiccant capsules KA 0.5 Filling: 0.5 g White silica gel	Ø 12.7 height 9
11	HKS000009	Desiccant capsules KA 1.25 Filling: 1.25 g White silica gel	Ø 20 height 10
12	HKS000009	Desiccant capsules KA 0.65 Filling: 0.65 g silica gel	Ø 15 height 10
13	HKS000009	Desiccant capsules KA 3 Filling: 3 g silica gel	Ø 29 height 10
Metal or plastic case desiccant cartridges Different shapes and fillings, partly exchangeable.			
14	4440-12-140-2234	Desiccant cartridge P1; Filling: 5 g; 2 units each in one box	Ø 11 height 36

The fill weight of the desiccant cartridges and capsules may vary due to the different bulk density levels of the drying agent.

Please request your own specific requirements with regard to product size and dimensions.

All adsorbent agents have an extremely porous surface area. Like a sponge, they possess the capacity of soaking up moisture and to store it inside their internal cavities. Those are set up as layers, pores and channels.

The adsorption agents themselves are water-insoluble. The stored moisture will be released to the ambient air again, once the adsorption agent is heated. There are different types of adsorption agents:



SILICA GEL



Among them, silica gel is one of the predominantly used adsorption agents against moisture with a wide range of applications. Silica gel consists of irregularly shaped and porous particles and is a form of silicic acid. The raw materials to a large extent consist of sodium silicate and sulphuric acid. Those chemicals are exposed to a chemical reaction which takes place under certain conditions. The result is pure silicon dioxide with a very high SiO_2 -content. Silica gel is inert and compatible with any kind of materials, except for strong alkaline

substances and hydrofluoric acid. Silica gel is odourless, non-toxic, does not release fumes and does not corrode metal. The very extensive surface in the interior of the silica gel particles consists of a vast network of microscopic pores which attract and hold moisture up to 36% of their own weight without losing its structure.

Silica gel is regenerated at 130°C . This process can be repeated numerous times without considerably affecting the adsorptive performance of the gel.



MICROPOROUS WHITE SILICA GEL



The high-density gel is used for the maximum extraction of moisture from the air. The water vapour adsorption capacity is approximately: 15 weight-% at 20% RH, resp. 25 weight-% at 40% RH.

Bead size 0.2–1mm those types are predominantly used in the insulation glass sector for the dehydration of air between the glass panels. They can be further found inside the desiccant cartridges and capsules. Other microscopic gels with a very high degree of purity are used with fragrance carriers and for the maintenance of pour ability of chemicals and pharmaceuticals. They find further applications in the cosmetic industry.

Bead sizes 1–2 or 2–3mm are used inside the filters of gas masks, on the insulation glass sector and for the dehydration of liquids and cooling agents.

The bead sizes 1–3mm represent a universal grain size for drying air and gas in smaller sized equipment and for the drying of cooling agents.

Bead sizes of 2–5mm are equipped with an elevated adsorption capacity with excellent low pressure drop characteristics for the drying of gases (ethane, ethylene, butane, chlorine, natural gas, methane, methylene chloride, sulphur dioxide, nitrogen and hydrogen).



ORANGE SELF-INDICATING GEL



This self-indicating drying agent (white silica gel) is free from any heavy metals and therefore environmentally compatible. The gel is naturally orange when active and at a 6 weight-% saturation level. As the gel adsorbs moisture, the colour changes into white. The total adsorption capacity is approximately 23 in weight-% at 40% RH.

The range of application is identical with that of white silica gel. The colour change, however, represents a great advantage since it allows monitoring of the saturation level. The gel can be regenerated when heated at a temperature of maximum 120°C until it turns to its original orange colour.



MACROPOROUS WHITE SILICA GEL

This gel has been designed for liquid water adsorption. The gel is used for the liquid water adsorption from moist

gas and air streams. It acts as an upstream pre-buffer for the protection of other gels with smaller pores.



MOLECULAR SIEVES



The molecular sieves are synthetic zeolites. They are characterized by a precisely defined and regular pore diameter and possess a crystalline structure. They are predominantly used for the maximum extraction of moisture from the air. Regardless of the relative humidity,

they adsorb about 20–22 weight-% of water vapour. The volume of a molecular sieve is very low at the same time providing excellent adsorption capacities. Molecular sieves regenerate at temperatures of 300 to 400°C .

Humidity indicators in combination with the drying agents serve as a guide to the climate and moisture level inside the packaging. Humidity indicators consist of a special absorbent paper. Several areas of the paper are printed with cobalt (II) chloride solution varying in concentration.

The numbers inside the moisture sensitive spots indicate the relative humidity with a visible colour change from blue to pink. A drop in humidity is shown through the reverse process of the colour change.

APPLICATION

The humidity indicators are placed either inside the barrier foil or form a part of the vision panels or viewing plugs. Properly packaged exported goods with sufficient desiccants experience a 20% RH drop at normal temperature within a very short period of time. The colour of the humidity indicator used should therefore be blue in the 30% spot. If this should not be the case after 2 to 3

days have passed, the packaging ought to be inspected for any leaks or tears, too low amounts of drying agents or moist packaged goods. The colour reaction of the humidity indicator card, however, can be delayed through low temperature levels during winter time, a lack of air circulation between humidity indicator and drying agent or foils not suitable for the purpose.

ACCURACY

The humidity indicator cards are small-sized, easy to handle and inexpensive. When it comes to precision they should not be directly compared with expensive and sophisticated electronic measuring equipment. An inspection temperature of 2°C (+2°C) allows for a tolerance level of +5% RH. The humidity indicators thus comply with the military technical specifications

TL 6685-0003 version 4 (September 1996). Please note that the colour change in regions with extreme climatic conditions maybe delayed or decreased, depending on whether the temperature is above or below 20°C. The deviation levels are approx. 2.5% RH for each 5°C above, resp. below 20°C.





PACKING LIST ENVELOPES

The packing list envelopes protect the shipping documents from environmental impacts such as dirt, dust, rain, etc. Please stick the envelopes with the self-adhesive reverse side to the outside of the packaging.

The packing list envelopes are also available in red. They have a high visibility and the documents can be inserted from the front.

Size I for DIN A 6 documents,
size II for DIN A 5 documents.

The packing list is labelled in eight languages:

- German**
- French**
- Portuguese**
- Arabic**
- English**
- Spanish**
- Russian**
- Chinese**

Additional languages upon request.

PACKING LIST SHIELDS

Versions

- small – for DIN A 6 documents
- small – see above with additional blank space to insert the documents
- large – with blank space for DIN A 5 documents

All packing list shields are printed in 10 languages. The shields are nailed to the shipping box.

CAUTION LABELS AND SIGNS FOR DRYING AGENT METHOD II VG 95604

Made from water-repellent paper and self-adhesive on reverse.
Colour: red RAL 3000

Nominal size 1:

Dimensions: 34 x 74mm, paper
Item no. 7690-12-140-6350

Nominal size 3:

Dimensions: 74 x 148mm, paper
Item no. 7690-12-140-6352

Nominal size 2:

Dimensions: 52 x 100mm, paper
Item no. 7690-12-140-6351

VENTILATION PANELS / SWING LIDS

Between the outer crate wall and the barrier foil in large packaged goods, there is always the possibility of the air to accumulate moisture at a fast rate. There is always the inherent risk of water vapour penetrating through the barrier foil. This can be prevented by installing so-called ventilation panels which facilitate an even circulation of the ambient air. Depending on the size of the packaging, it is recommended to install two or more ventilation panels in the upper part of the box.

Those ventilation panels are also available in a swivelling design, allowing movement of the panel and checking the humidity indicator on the inside of the packaging.

Types - Ventilation panels

small - 130 x 130 mm
large - 180 x 180 mm

Types - Swing lids

small - 130 x 180 mm
large - 180 x 250 mm

TILT INDICATORS

It is vital that your goods be transported in a specific, resp. upright position. The indicator is the perfect tool to monitor a violation of your shipping instructions.

The indicator can be stuck directly to the packaged goods due to its self-adhesive reverse side.

The front side of the red plastic indicator is an arrow-shaped compartment pointing upward. A metal tape separates the compartment which extends into two separate small compartments filled with blue granules at the bottom.

The removal of the metal tape will activate the indicator. Any mishandling of your items will result in a trickling of the granules from their original position into the

arrowhead where they will be kept due to the self-adhesive back side.

This irreversible indicator allows for optimal monitoring of the shipping and handling procedures.

Regardless of whether the indicator is attached to the inside or the outside of the packaged goods, we recommend to use two indicators for safety reasons. This method further helps to avoid any misuse or replacement of the device.

The accompanying caution label serves to indicate the activity of the indicator, for the carrier and the recipient.



Shockwatch® - the reliable bodyguard for sensitive items

Anyone shipping shock-sensitive goods is aware of the problem. The quality control usually ends with the loading and departure of the goods from the company premises. The way the shipping company handles the items is beyond control. The sender, however, warrants for damage-free delivery, except for obvious transportation damage.

Shockwatch® detects concealed damage which is not recognized at first glance. Any violation of the shipping instructions will be unerringly indicated right away. This tamper-proof device allows for exactly attributing any transport damage with regard to time and place.

The principle is simple. The indicator is a label with a strong adhesive and a sensing indicator made of glass. The invisible part of the small glass tube contains a red liquid. Should the goods transported be mishandled in any way not according to the previously set instructions, the liquid turns into a permanent bright red colour.

The shock watch indicators are attached to each packaging together with a caution label prior to shipment. The person in charge of the goods consigned confirms the intact condition of the indicator by signature. All indicators will be inspected upon arrival of the goods. Any changes in colour or missing indicators will be noted on the receipt. Every **Shockwatch®** can be identified with a serial number in order to avoid any tampering. This number is also recorded in the shipping documents.

Freight forwarders around the globe are very well aware of **Shockwatch®** transport indicators and have adapted to treat the corresponding shipments with special care.

Any orders above 1,600 items can be carried out with an individual imprint at the cost of production.



The Shock Watch Indicator:
The reliable protection of your sensitive transportation goods.





TABLE OF QUANTITIES FOR 200 my POLYETHYLENE FOIL PACKAGING

All specifications in units per surface m² of the packaging.
For packing and padding materials please note the additional units listed in the quantity table for additional packing material.

Number of bags (in units) without other packing material

Number of bags (in units) without other packing material

	M	M	Y		M	M	Y
Storage and/or transportation length	3	6	1	Storage and/or transportation length	3	6	1
Europe – climatic zone A Albania, Federal Republic of Germany (Helgoland), Andorra, Belgium, Cyprus, Spain, Great Britain and Northern Ireland, Greece, Republic of Ireland, Italy, Poland (Bratislava), Portugal, Finland	12	20	36	Middle East – climatic zone A Saudi Arabia (Djidda), Oman	16	32	64
Europe – climatic zone A Federal Republic of Germany, Austria (Vienna, Linz), Bulgaria, Denmark, Hungary (Budapest), The Grand Duchy of Luxembourg, France, Norway, The Netherlands (Groningen), Poland (Posen), Romania, Switzerland, Czech Republic, Slovakia (Eger), Bosnia and Herzegovina, Serbia, Montenegro	8	16	24	Middle East – climatic zone B Afghanistan (Kandahar), Saudi Arabia (Riyadh (Ar-Riyad) Mecca), Bahrain, UAE, India, Iraq, Iran, Israel, Kuwait, Lebanon, Pakistan, Qatar, Syria, Turkey	16	24	48
Europe – climatic zone C Austria (Klagenfurt, Salzburg), Hungary (Debrecen), The Netherlands (Amsterdam), Den Haag), Poland (Warsaw, Katowic, Stettin), Sweden	4	8	20	Middle East – climatic zone C Afghanistan (Kabul), Jordan	4	24	8
former UdSSR – climatic zone A Anadyr, Armenia (Eriwan), Belarus (Minsk, Brest), Estonia (Tallinn), Kazakhstan (Alma-Ata), Tselinograd, Kirgistan (Frunse), St. Petersburg, Latvia (Riga), Lithuania (Wilna), Rostow, Seratow, Stawropol, Ukraine (Kiev, Kharkow, Kirowograd), Werchojansk	4	8	16	Far East – climatic zone A Bangladesh, Kashmir, People's Republic of China (except for Beijing and Tsinan), Hong Kong, Japan (Hiroshima, Nagasaki, Tokyo), Laso, Nepal, Taiwan	8	20	48
former UdSSR – climatic zone A Moscow, Murmansk, Smolensk, Wolgograd	4	8	16	Far East – climatic zone B Burma, Borneo, Cambodia, Sulawesi Indonesia, Malaysia, Manchuria (Jiamusi, TaLien, Tchang Tchoung), Sumatra, Thailand, Vietnam, The Philippines	16	32	72
former UdSSR – climatic zone C Georgia (Tiflis), Moldavia (Kishinev), Tajikistan (Dusanbe), Turkmenistan (Ashgabat)	6	8	20	Far East – climatic zone C People's Republic of China (Beijing), Republic of North Korea (DPRK), Japan (Hakodate, Niigata, Sapporo, Miyako, Nemuro), South Korea (ROK)	6	8	24
former UdSSR – climatic zone D Azerbaijan (Baky)	8	16	32	Far East – climatic zone D Manchuria (Harbin), Mongolia (Ulan, Bator)	8	16	32
				Africa – climatic zone A Benin (Pobe, Cotonou), Camerun (Douala, Baturi), Congo, Ivory Coast, Republic of Djibouti, Gaboon, Ghana, Guinea, Burkina Faso (Ouagadougou), Kenya (Mombasa), Liberia, Madagascar (Tamatave), Nigeria (Lagos, Port Harcourt), Senegal, Somalia, Tanzania (Dar-Es-Salaam)	16	32	64

DESICCANT BAGS

Number of bags (in units)
without additional packing material

	M	M	Y
Storage time and/or transportation time	3	6	1
Africa – climatic zone B Algeria (except for Be char), Angola, Benin (Natitingou), Cameroun (Yaounde), Egypt (except for Assuan), Burkina Faso (Fada N'gouma, Dori), Kenya (Kisanu, Kutui, Nairobi), Libya, Madagascar (Nosy-Varika, Tananarive), Mali, Marocco, Mauretania, Mozambique, Niger, Nigeria (Kano), Uganda, Republic of South Africa (Durban, Cape Town), Zimbabwe (Umtali, Sinoia), Tanzania (Dodona), Tschad, Tunisia, Zaire, Zambia	12	24	48
Africa – climatic zone C Algeria (Béchar), Egypt (Aswan), Ethiopia, Republic of South Africa (Johannesburg), Pretoria), Zimbabwe (Salisbury), Sudan	8	12	20
North America – climatic zone A USA (South Carolina, South Dakota, Florida, Georgia, California, Louisiana, Virginia)	8	20	36
North America – climatic zone B Canada (Montreal, Ottawa, Quebec, Toronto), USA (Alaska, North Carolina, Columbia, North Dakota, Idaho, Illinois, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Missouri, New York, Pennsylvania), Island, Newfoundland, Labrador	8	12	20

Number of bags (in units)
without additional packing material

	M	M	Y
Storage time and/or transportation time	3	6	1
North America – climatic zone C Canada, Greenland (Thule, Peary Land)	4	4	12
North America – climatic zone A Costa Rica, Guadeloupe, Guatemala, Cuba, Martinique, Mexico, Nicaragua, Puerto Rico	16	24	48
Central America – climatic zone B Haiti, Honduras, Jamaica, Panama, Dominican Republic, Trinidad	16	32	68
South America – climatic zone A Argentina, Bolivia (La Paz), Brazil (Recife, Rio de Janeiro, Caceres), Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay	12	20	48
South America – climatic zone B Brazil (Brasilia, Natal, Salvador), Guyana, French Guyana, Surinam, Venezuela	16	32	72
South America – climatic zone C	6	8	20



TABLE OF QUANTITIES FOR HEAT-SEALABLE BARRIER FOILS

All specifications in units per surface m² of the packaging. Please not the additional units required for packaging and padding material. Please refer to the table of quantities for additional packaging.

The list applies to all barrier foils in compliance with the following standards:

Federal Republic of Germany = TL 8135-0003
USA = MIL B 131
France = AIR 8140

Number of bags (in units)
without additional packing material

Storage time and/or transports	Y	Y	Y	Y	Y
Europa	1	2	3	4	5
Albania	8	16	32	40	64
Federal Republic of Germany	8	16	24	32	48
Andorra	8	16	24	32	40
Austria	8	16	24	32	48
Belgium	16	32	40	48	64
Bulgaria	8	16	24	32	40
Cypress	16	32	40	48	56
Creta	8	16	24	32	40
Denmark	8	16	24	32	40
Spain	16	24	40	48	64

Number of bags (in units)
without additional packing material

Storage time and/or transports	Y	Y	Y	Y	Y
Finland	8	16	24	32	48
Greece	8	16	24	32	40
Hungary	8	16	24	32	48
Republic of Ireland	8	16	24	32	48
Italy	8	24	32	48	56
Luxembourg	8	16	24	32	40
Norway	8	16	24	32	48
The Netherlands	8	16	24	32	48
Poland	8	16	24	32	48
Portugal	8	24	32	48	64

Number of bags (in units)
without additional packing material

Storage time and/or transports	Y	Y	Y	Y	Y
	1	2	3	4	5
Romania	8	16	24	32	48
Great Britain	8	16	32	40	48
Isle of Man	8	16	32	40	48
Northern Ireland	16	32	40	48	64
Sweden	8	16	24	32	48
Switzerland	8	16	24	32	40
The Czech Republic, Slovakia	8	16	24	32	40
Bosnia and Herzegovina, Serbia and Montenegro	8	16	24	32	40
Former UdSSR -					
St. Petersburg, Rostow, Stawropol	8	16	24	32	48
Anadyr, Werchojansk	4	8	16	20	24
Moscow	8	16	24	32	48
Murmansk	8	16	24	32	56
Smolensk	8	16	24	32	40
Volgograd	8	12	16	24	32
Armenia	8	16	24	32	48
Azerbaijan (Baky)	8	24	32	48	56
Belarus	8	16	24	32	48
Estonia	8	24	32	40	48
Georgia	8	16	24	32	40
Kazakhstan	8	16	24	32	48
Kirgisistan	8	16	32	48	56
Latvia	8	16	24	32	48
Lithuania	8	16	24	32	48
Moldavia	8	16	32	40	48
Uzbekistan	8	16	24	32	40
Tajikistan	8	16	24	32	40
Turkmenistan	8	16	32	40	48
Ukraine	8	16	24	32	48
North America					
Canada	8	16	24	32	48
Newfoundland	8	16	24	32	48
Labrador	8	16	24	32	40
Greenland	8	16	24	32	40
Iceland	8	16	24	32	48
USA					
Alaska	8	16	24	32	48
California	8	24	32	48	56
North Carolina	8	16	24	32	40
South Carolina	8	16	24	32	40
Columbia	8	16	24	32	40
South Dakota	16	24	40	56	64
Florida	16	32	48	56	64
Georgia	8	24	32	48	56
Illinois	8	16	24	32	48
Idaho	8	16	24	32	48
Kentucky	8	16	24	32	40
Louisiana	8	24	32	48	56
Maine	8	16	24	32	48
Maryland	8	15	24	32	40
Massachusetts	8	15	24	32	40
Michigan	8	15	24	32	48

Number of bags (in units)
without additional packing material

Storage time and/or transports	Y	Y	Y	Y	Y
	1	2	3	4	5
Missouri	8	15	24	32	48
New York	8	15	24	32	40
Albany	8	15	24	32	48
Pennsylvania	8	15	24	32	40
Virginia	8	15	24	32	40
Indiana	8	15	24	32	48
Central America					
Costa Rica	16	32	48	64	80
Cuba	16	32	48	64	80
Dominican Republic	16	32	48	64	80
Guadeloupe	16	32	48	64	80
Guatemala	16	24	32	48	64
Haiti	16	32	48	64	80
Honduras	24	40	64	80	104
Jamaica	24	40	56	72	88
Martinique	16	32	48	64	80
Mexico	8	16	24	32	40
Nicaragua	16	32	48	64	80
Panama	24	40	64	96	112
Puerto-Rico	8	24	32	48	64
Trinidad	16	32	48	64	80
South America					
Argentina	16	32	48	64	80
Bolivia	16	32	48	64	80
Brazil	24	40	56	72	88
Chile	16	32	48	64	80
Columbia	8	16	32	40	48
Ecuador	8	16	32	40	48
Guyana	24	40	64	80	96
French Guyana	24	40	64	80	96
Paraguay	8	24	32	48	64
Peru	16	24	40	56	64
Surinam	24	40	64	80	96
Uruguay	8	16	32	40	48
Venezuela	24	40	64	80	96
Africa					
Algeria	16	32	48	64	80
Angola	16	32	48	64	80
Camerun	24	40	64	80	104
Ivory Coast	24	40	64	80	96
Benin	24	40	64	80	96
Egypt	16	32	48	64	80
Ethiopia	8	16	24	32	48
Gabon	32	48	64	80	96
Ghana	24	40	56	72	88
Guinea	32	48	64	80	96
Burkina Faso	32	48	64	80	96
Kenya	16	32	48	64	80
Liberia	24	40	56	72	80
Libya	16	32	40	56	64
Madagascar	16	32	48	64	80
Mali	16	24	40	48	64
Mauretania	16	32	48	56	64
Mozambique	16	32	48	64	80

DESICCANT BAGS

Number of bags (in units)
without additional packing material

Storage time and/or transports	Y	Y	Y	Y	Y
	1	2	3	4	5
Marocco	16	32	40	56	64
Niger	16	24	40	48	64
Nigeria	24	40	64	80	106
Tanzania	16	32	48	64	80
Tschad	16	24	40	48	64
Djibouti	24	40	64	96	112
Togo	24	40	56	72	88
Tunisia	16	24	40	56	64
Zaire	16	32	48	64	80
Zambia	16	24	40	48	64
Congo	16	32	48	64	80
Uganda	16	32	48	64	80
Zimbabwe	16	24	32	48	56
Senegal	16	32	48	64	80
Somalia	24	40	56	72	88
Republic of South Africa	24	40	48	64	72
Sudan	8	16	24	32	40
Middle East					
Afghanistan	8	16	32	40	48
Saudi Arabia	32	48	64	80	96
Bahrain	16	32	48	64	80
UAE	16	32	48	64	80
India	24	40	56	72	88
Iran	16	32	48	64	80
Iraq	8	24	32	48	64
Israel	16	32	48	64	80
Jordan	8	16	32	40	48
Kuwait	16	24	40	56	64
Lebanon	8	24	32	48	56
Oman	32	48	64	80	96
Pakistan	16	32	48	64	80
Qatar	16	32	48	64	80
Syria	8	16	32	48	56
Turkey	8	16	32	48	56
Yemen	16	32	48	64	80

Number of bags (in units)
without additional packing material

Storage time and/or transports	Y	Y	Y	Y	Y
	1	2	3	4	5
Far East					
Bangladesh	16	32	48	64	80
Birma	24	40	64	80	96
Borneo	24	48	64	80	104
Cashmere	8	24	32	48	56
Sulawesi	16	32	48	64	80
Sri Lanka	24	40	56	72	88
People's Republic of China					
Nanking	8	24	32	48	56
Beijing	16	32	48	56	64
Republic of North Korea (DPRK)	8	16	32	48	56
Manchuria	24	40	64	80	104
Mongolia	8	16	24	32	48
The Philippines	24	40	64	80	96
Sumatra	24	40	64	80	96
Taiwan	8	24	32	48	56
South Korea (ROK)	8	16	24	32	40
Hong Kong	16	24	40	56	64
Indonesia	24	40	64	80	96
Japan	8	24	32	48	56
Cambodia	24	40	64	80	96
Laos	16	32	48	64	80
Malaysia	24	40	64	80	96
Thailand	24	40	56	72	88
Vietnam	24	40	64	80	96
Oceania					
Australia	24	40	56	80	96
Hawaii	16	32	48	64	80
New Caledonia	16	32	48	64	80
New Guinea	32	48	64	80	96
New Zealand	84	24	32	48	56
Tahiti	8	40	64	80	96
Tasmania	24	24	32	48	56

Table of quantities for additional packing material

All information given is based on units per kg of packaging or padding material.

It is to be absolutely avoided to include hygroscopic material inside the packaging. If this cannot be avoided, the following unit amounts as listed in the table needs to be added per kg of packaging or padding material:

Wood, cardboard and other synthetic materials

Europe	17
Former UdSSR	20
North America	20
Central America	20
South America	20
Africa	20
Middle East	20
Far East	20
Oceania	20

Calculation based on DIN 55474

How to calculate the required number of drying agent units:

$$n = \frac{1}{a} \cdot (V \cdot b + m \cdot c + A \cdot e \cdot D \cdot t)$$

n = number of the drying agent units

a = amount of water vapour to be adsorbed by drying agent unit according to the permitted final moisture content

Final Moisture:
 20% RH a = 3 g
 40% RH a = 6 g
 60% RH a = 8 g

e = correction factor with regard to the final moisture:
 for 20% RH e = 0.9
 for 40% RH e = 0.7
 for 60% RH e = 0.6

v = volume inside the packaging in m³

b = humidity content per m³ air subject to the temperature and relative humidity during the packing, i.e. at 20°C and 85%RH b = 15g/m³.

m = weight of the hygroscopic packing in kg

c = factor for moisture content per gram of the hygroscopic packing aid subject to the dry condition for wood, paper and cardboard with an undefined moisture content c = 140 with defined pre-desiccation c = 0

A = surface of the barrier foil in m²

D = water vapour permeability for the expected climate in g/m² D. Regulation in compliance with DIN 53122 or the information supplied by the barrier foil manufacturer.

t = transport and storage time in t (days)

Please request our drying agent calculation program to determine the amount of desiccant required in compliance with DIN 55473.

The desiccant bags are to be placed inside the packaging and be evenly spread if so required. It is imperative that desiccant bags will be stored inside their airtight packaging until the time of use. Please close the bag right away after taking out the desiccant bags.

TROPAgel®- desiccant bags are manufactured in units and in line with the DIN 55473 and the German military specification TL 6850-0008 and the US specification MIL-D-3464 E .

All information provided in these technical specifications serves as advise for our customers. They are based on our latest research and development findings. They are, however, not to be regarded as any form of warranty and no further obligations on our part shall be concluded. All product types and delivery terms are in line with the provisions currently in force. There shall

be no specific notes to changes thereof. We shall not resume any liability for the fact that the products and their recommended use offered shall be free from domestic or international property rights from any third parties. Please refer to our terms of sale which include our entire range of products.





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