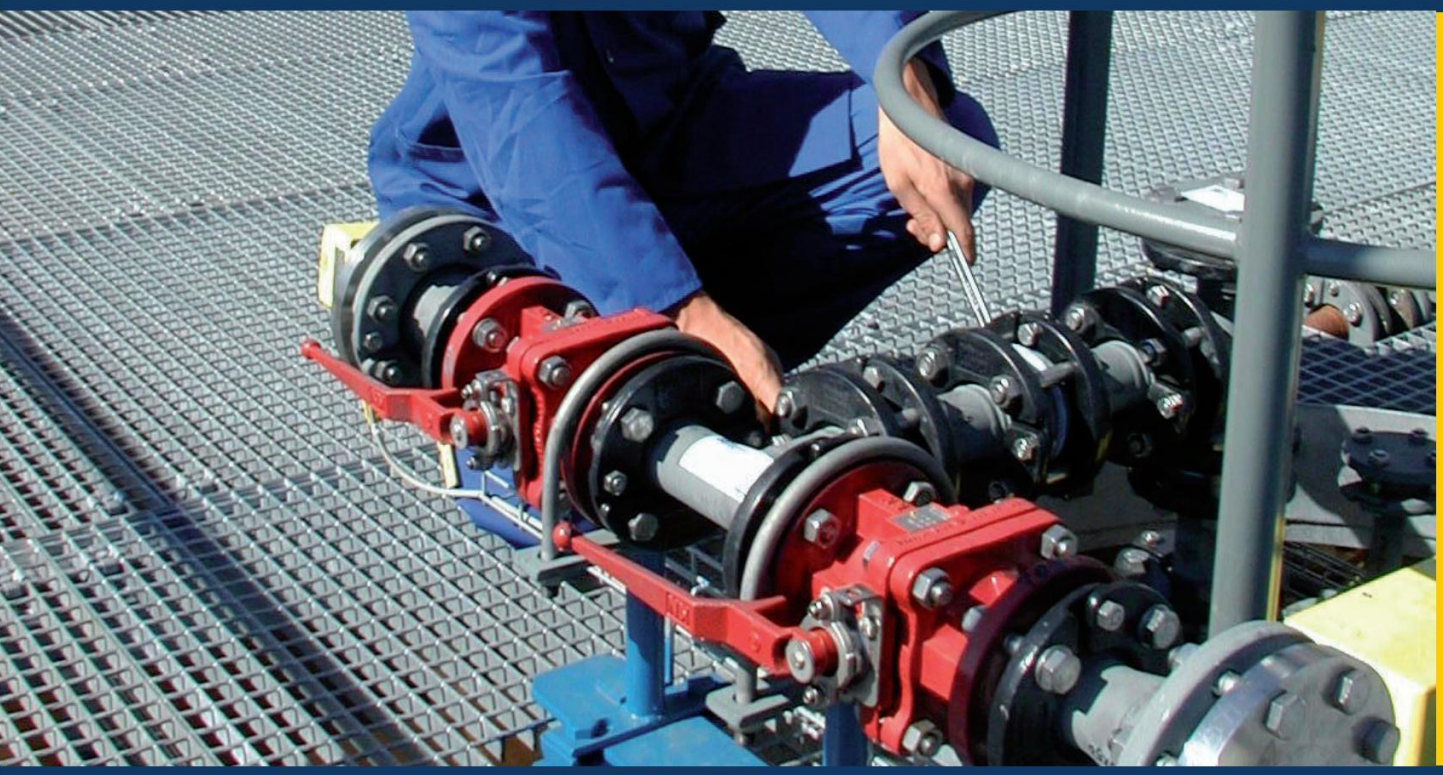
Düker Email Technologie



Manual for Assembly, Commissioning, Maintenance and Disassembly

email800
email850P
email350

Foreword

Manual for assembly, commissioning, maintenance and disassembly

This manual provides the information need for mounting installation, commissioning (IBN), maintenance (IH) and dismantling under optimum safety and quality conditions. For optimum use, production safety and a particularly long service life of your process plant, please follow the procedures specified in this manual and inform all persons entrusted with its operation.

Glass lined components are robust in process use. They are a versatile and valuable goods and require a safe and practised hand during transport, storage and installation. On the following pages you will find suggestions and advice on how to handle glass lined steel components. The instructions in this information brochure apply equally to email800 and to the glass lined qualities email350 and email850P. The statutory or national legal requirements for flange connections relating to plant safety, occupational health and safety and environmental protection must be met.

Specific assembly installation and disassembly of existing plants are partly listed in the manual. These should be carried out by specialised staff.

We therefore recommend that you consult our specialists for these operations. More generally, if you are not familiar with the use of glass lined material, we recommend that you contact our Customer Service/Sales Department, which will provide you with support at all stages.

In general, we recommend that all installation and commissioning work on your equipment be carried out by qualified personnel.

We thank you for your confidence and support you for any further information you may require.

The Customer Service Department

vertrieb@dueker-emailtechnologie.de

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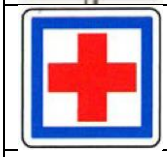
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NOTES ON USER MANUAL

This manual provides you with all the information and tips you need for the installation, commissioning, use and maintenance of glass lined components. It supplements the information in the technical documentation, which is part of the documentation supplied. It is essential that the persons responsible for carrying out the various measures should have this manual at their disposal.

These instructions must be followed to ensure optimum use of the equipment. Their observance at every stage of the work is also decisive for the safety of your equipment, your personnel and the protection of Düker Email Technologie GmbH warranty claims. In this manual, warning signs with four different symbols are repeatedly used to draw your attention to notes or dangers.

The four symbols are:

	Telephone consultation and support by Düker Email Technologie specialists Activities must be carried out with qualified operating personnel
	ALARM Non-compliance with the above recommendations may result in injury to the operating personnel.
	ATTENTION Failure to follow the above recommendations may result in damage to materials or equipment.
	NOTE Recommendations which serve as advice.

This manual is specially designed for your order and the optional equipment of your apparatus and piping. Its contents may therefore vary depending on the delivery. It covers the general treatment of glass lined apparatus and piping and can be supplemented with specific documentation for special components.

The manual covers the following sections:

- General: this part contains information about the glass lined apparatus and piping, the precautions to be taken when using it and our conditions
- Acceptance and installation on site: the measures described here must be carried out in the following order, each step must be completed before the next one begins
- Commissioning: this may only be carried out after the above-mentioned steps have been completed and the operating conditions of the system have been checked
- Production plant: this section informs you about the most common causes of damage to enamelled components
- Maintenance: all maintenance-specific information is listed here
- Annex: supplementary documents, if necessary

GENERAL

INTRODUCTION

	This booklet contains information and instructions that are valid and applicable to glass lined apparatus and piping. Please read through them before you take up device-specific information.

WARNING

The glass lined components you purchase are particularly well suited to take account of the diversity of chemical processes. The operating conditions and limit values are specified in our documentation. Certain optional equipment and/or accessories have been determined in accordance with your technical specifications and your delivery conditions.

If the process is further developed or modified, it is essential that the operating conditions of the glass lined components are checked.

 ACHTUNG	Non-compliance with these instructions may result in damage and/or other harm.

The instructions for use and the supplier certificates for the accessories are part of the technical documentation and the quality documents accompanying the documentation.

	The operations described in this manual must be carried out by qualified operating personnel who are aware of the dangers of serious damage to personnel and material if used improperly.

	Our customer service/sales department can offer you inspection and maintenance contracts tailored to your needs in order to optimise the operational reliability and service life of your equipment. The Düker Email Technologie customer service/sales is generally available for all customer service technical questions.

LIABILITY

The liability claims explained in our General Terms and Conditions of Business stipulate, among other things, that the company Düker Email Technologie GmbH is not liable, especially in case of possible material, immaterial and physical damages,

- as soon as technical changes have been made to the material
- and/or measures have been carried out that do not comply with the regulations and instructions in this manual.

Wear of the components (seals, PTFE compensators, gaskets, etc.) is excluded from liability.

EXCLUSION OF WARRANTY

	Apparatuses are subjected to an internal acceptance test and a FAT. These apparatuses are preferably delivered completely assembled. Pipelines are also tested, but are delivered as modular individual pieces.

	If parts or accessories have to be completely or partially dismantled on site due to lack of space, it is absolutely necessary to obtain Düker Email Technologie written approval in advance or to call in the customer service/sales department for support by a factory fitter.

In case of problems and disassembly of the units not approved by Düker Email Technologie, the warranty becomes void.

INFORMATION ON THE APPARATUS

Every piece of equipment that leaves our production facilities has been factory tested and checked. It has been packed by us so that transport and installation on site do not pose any risks.

	The delivered apparatus can also be set up undismantled. However, should space restrictions make it necessary to remove components during installation, we ask you to inform us of this so that we can give you our prior consent. Otherwise, in the event of damage or loss, we may be unable to accept liability.

	Our customer service/sales department can assist you at all stages of equipment installation.

If you have any doubts or questions, you can always contact us.

LIMITS FOR THE USE OF DÜKER EMAIL

Technical enamel is a very special surface protection used by the chemical, pharmaceutical and food industries for their equipment. Tanks, pipelines, valves and columns made by Düker Email Technologie can be combined to complex, indestructible units. All options are open to the user: the basic programme, the construction of special parts or the tailor-made combination of both.

Due to new products and new processes, both the fields of application and the requirements for enamels are constantly growing. We have been meeting these requirements since 1969 with our "Technical Enamels" such as email800, email250 and email850P, based on results from research and development.

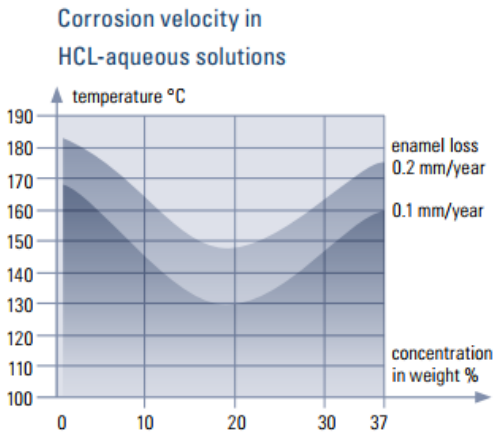
The main material-typical characteristics of technical enamelling are

- High resistance to corrosion attack, especially of acidic media, even at higher process temperatures
- High wear resistance against abrasive media
- surface smoothness
- Good cleanability, no tendency to adhere
- Biologically and catalytically inert behaviour

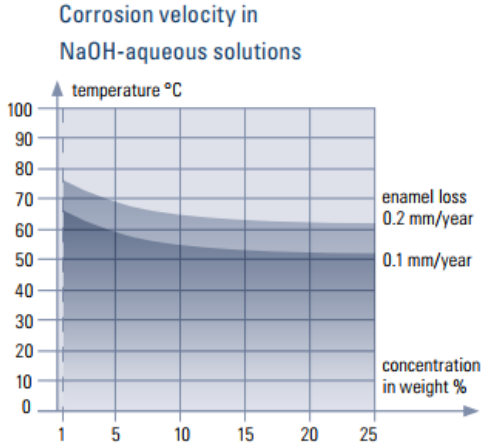
CHEMICAL RESISTANCE

The properties of our highly resistant enamels are confirmed by laboratories of our customers and the TÜV. Here are some facts and figures:

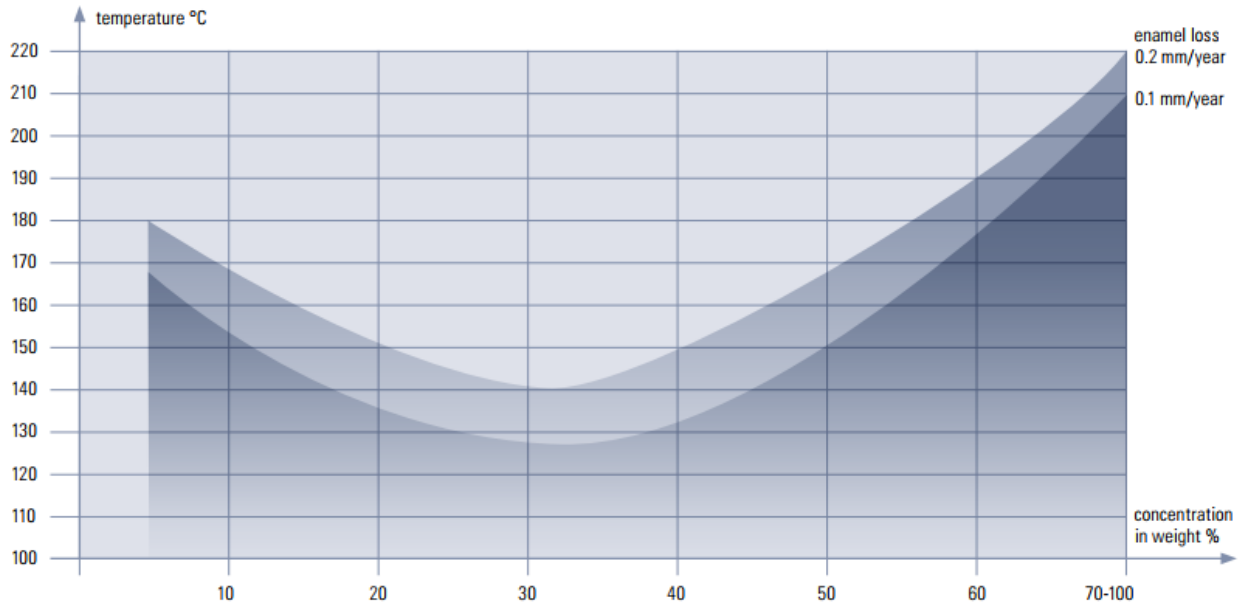
Resistance to acids:
is tested according to section 12
of DIN EN ISO 28706-2 - boiling acids



Resistance to alkalis:
is tested according to section 9
of DIN EN ISO 28706-4 - alkaline liquids



Corrosion rate in H2SO4 aqueous solutions



enamel resistance (extract of resistance overview)

Medium		Enamel Resistance			
		Chemical resistance	Gas-Tightness	Abrasion	Heating
Aethylalkohol	200°C	GR	GR	GR	Good
Jod	200°C	GR	GR	GR	Good
Nitrobenzol	150°C	GR	GR	GR	Good
Tetrachlorkohlenstoff	200°C	GR	GR	GR	Good

*GR: Good Resistant

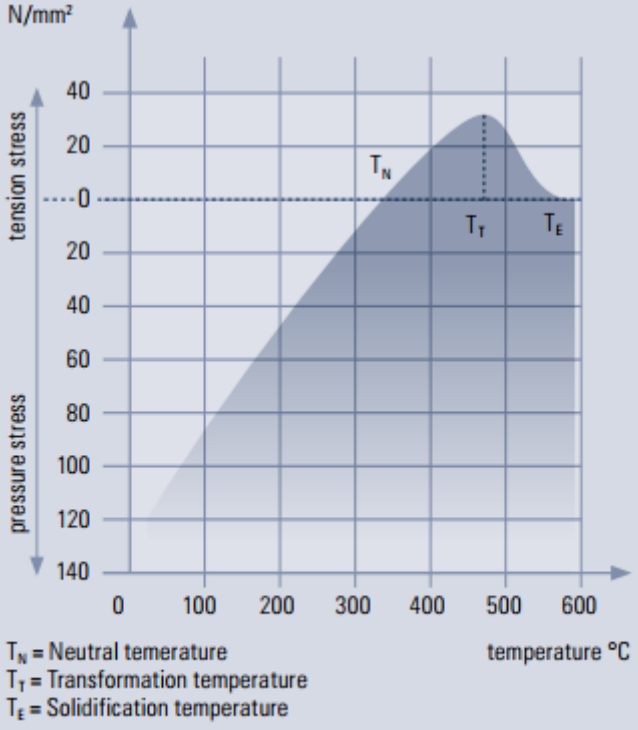
THERMAL SHOCK RESISTANCE

The thermal shock resistance of an enamel is primarily determined by the compressive pre-stressing of the enamel. Düker enamel800 has a prestress on steel of approx. 120N/mm2 at room temperature. This is achieved by adjusting the coefficient of expansion accordingly. With increasing temperatures the pre-stressing decreases until it is released at about 350°C (see figure). The table of thermal shock resistance of enamelled parts contains this reduction. It also takes into account the fact that quenching a hot enamel with a cold product is the most dangerous shock. Exceeding the permissible temperature differences can lead to cracking and then spalling.

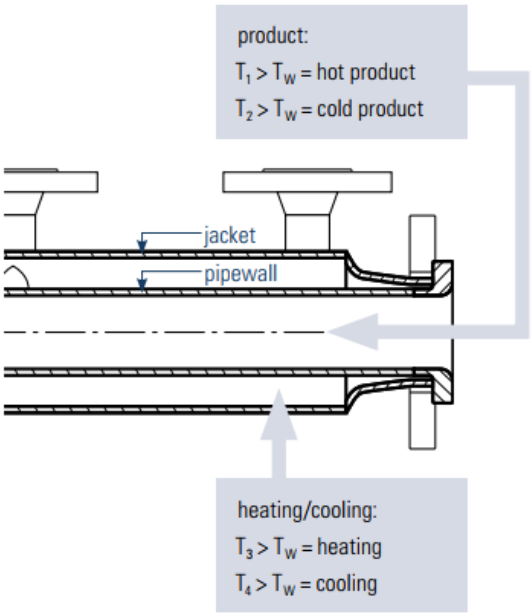
Material data:

• Specific weight	2.5 g/cm³
• Coefficient of thermal conductivity	1.2 W/mK
• Modulus of elasticity	80,000 N/mm²
• Compressive strength	≈ 800 N/mm²
• Tensile strength	80 N/mm²
• Dielectric strength	20-30 kV/mm
• Surface finish of enamel	0.05 µm

Stress curve in the enamel of steel



T_N = Neutral temerature
T_T = Transformation temperature
T_E = Solidification temperature



pipewall T_W °C	hot product T_W °C	cold product T_W °C	heating agent T_W °C	cooling agent T_W °C
230	250	150	250	100
220	250	140	250	90
210	250	125	250	80
200	250	100	250	70
190	250	90	250	60
180	250	75	250	50
170	250	60	250	40
160	250	50	250	30
150	250	35	250	20
140	250	20	250	10
130	250	10	250	0
120	250	0	250	-10
110	240	-10	240	-20
100	230	-20	230	-30
90	220	-30	220	-40
80	210	-40	210	-50
70	200	-50	200	-60
60	190	-60	190	-60
50	180	-60	180	-60
40	170	-60	170	-60
30	160	-60	160	-60
20	150	-60	150	-60
10	140	-60	140	-60
0	130	-60	130	-60
-10	120	-60	120	-60
-20	110	-60	110	-60
-30	100	-60	100	-60
-40	90	-60	90	-60
-50	80	-60	80	-60
-60	70	-60	70	-60

The temperature of the enamelled pipe wall (TW) serves as the basis in each case.
For a given TW (°C), the temperature of the product between T1 and T2 and the temperature of the heating/cooling medium
lie between T3 and T4.

EXAMPLES OF USE

1. hot product
The temperature of the pipe wall is 50°C.
Which product temperature must not be exceeded?
From TW = 50°C horizontally in the table to T1 = 180°C

2. cold product
The temperature of the pipe wall is 200°C.
What is the minimum temperature the product must have?
From TW = 200°C horizontal to T2 = 100 C

3. heating
The temperature of the pipe wall is 20°C.
Which heating medium temperature must not be exceeded?
From TW = 20°C horizontal to T3 = 150°C

4. cooling
The temperature of the pipe wall is 180°C.
Which coolant temperature must not be fallen below?
From TW = 180°C horizontally to T4 = 50°C

BASIC PRECAUTIONS

Transport and storage

You will receive enamelled components, fitted with protective caps as standard, delivered in wooden boxes or wooden constructions. Please check all parts for possible transport damage, e.g. scratches, abrasions, sealing cap seat and report them immediately to Düker Email Technologie and to the forwarding agent. For intermediate storage, it is better to leave the parts in the transport packaging for protection. If this is not possible, ensure gentle storage, e.g. on wooden pallets or similar and pay attention:

	Securing against rolling away and slipping
	Avoidance of external loads
	Scratch protection
	The protective caps of the enamelled components must not be removed during transport and storage.

The six rules to be observed for glass lined pipelines are

1. avoid deformation, shock and impact
2. protect the sealing surfaces of the flange connections
3. store components safely and securely
4. training of the installation personnel in the handling during installation
5. tighten flanged joints incl. hardened washer with torque wrench
6. do not install damaged parts before release by qualified personnel

We would like to draw your attention to some special aspects:

- You mechanical impact of any kind on glass lined apparatuses. Attention: Tools or screws can fall down from the upper steps due to too meshed gratings
- No welding on glass lined components
- Avoid strong heat sources of all kinds in the immediate vicinity
- Do not weld or cut near bare glass lined surfaces: splashes could damage the enamel. Caution with open manhole/handhole sockets and nozzles during work on the process plant
- If there is a risk of frost, drain the liquids from the double jacket, the pipe coils and pipes at risk of frost

 ACHTUNG	In order to comply with the operating limits of the equipment, we would like to point out that safety devices must be provided to protect the apparatus and, if necessary, the double jacket and coils from pressure and temperature damage.

ACCEPTANCE AND INSTALLATION ON SITE

INSTALLATION OF THE APPARATUS

	Irrespective of the type of apparatus, we recommend that all peripheral system components be installed as far away from the apparatus area as possible in order to protect the apparatus and simplify its maintenance and care.

When connecting all process lines, be aware that there is a risk that the apparatus could be damaged by corrosive products in case of leakage.

Observe the required height during operation so that components can be easily removed and installed during maintenance. If necessary, provide a maintenance opening on production buildings with low ceilings.

MATERIAL ACCEPTANCE

Do not start unloading until you have checked that the delivered material is complete and undamaged. Carry out a visual inspection for any external damage, impact or chipped paint.

Check that all nozzles are fitted with their transport protection covers.

Check the condition of the accessories: intactness, fastening.

Check the number (see delivery note) and condition of the material packages supplied with the machine.

 ACHTUNG	If you have any doubts or if the material could have slipped during transport, immediately report any reservations to the carrier. Fill in the relevant documents and have them countersigned by the driver. Take photos if possible.

Send the complaint to the carrier within 48 hours, with all available receipts and documents.

	Notify the Düker Email Technologie sales department immediately and send a copy of the documents for a damage assessment. If necessary, an email check could be necessary.

 ACHTUNG	To confirm the validity of the warranty, Düker Email Technologie recommends to carry out a dielectric check according to EN 14430 - either before unloading or during unpacking or commissioning of the equipment - to ensure that the enamel layer is intact (except for the conductive enamel quality). This check must be carried out by personnel recognised by Düker Email Technologie as qualified and with voltage values not exceeding 7000 V.

UNPACKING PROCEDURE



General notes
The packaging is adapted according to the scope of delivery. Usually, the boxes are opened at the cover and the materials are lifted out with suitable lifting equipment. For larger components, delivery can also be made on transport slides instead of in a box. In this case, the crate can also be opened at the sides.
Remove all internal fixing elements and wedges of the transport crate before removing the equipment from the crates.

UNLOAD

MATERIAL

- Hoist

  Only use lifting equipment suitable for the required load. The material weight is stated on the type plate. In the case of equipment delivered on saddles, the saddle weight must be included in the calculation of the load capacity, which is approx. 15% of the weight of the equipment.

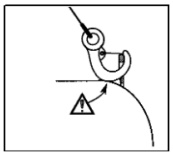
  In order to avoid mechanical loads on apparatus with large dimensions, we recommend either the use of 2 cranes or a lifting beam.

- Other lifting gear

  The choice of the hoist must be matched to the weights. Make sure that the hoist complies with the local regulations.

ACHTUNG	We recommend that you work with textile handling belts. We draw your attention to the dangers of using chains and hooks that could hit the machine and damage the enamel coating.

We recommend the use of shackles. Make sure that they are suitable for the eyelets.

ACHTUNG	However, if you are working with hooks, make sure they are the correct size and make absolutely sure that no leverage is applied to the outer wall of the apparatus. Proceed carefully to avoid shocks to the machine. If the machine is long or has accessories, crane lifting beams must be used.	

Do not forget to attach a rope to the underside of the component to be lifted to allow steering from the ground.

General:

Use proper tools, e.g. hammers, nail pullers, chisels.

UNLOAD

Prepare a level place to park the machine that is free from other objects that could obstruct the handling of the machine.

	NEVER put the belt around the sockets to lift the machine! ALWAYS use the eyelets provided for this purpose. NEVER use eyelets covered by metal plates!

All nozzles and other protective devices must remain in place during unloading. Small apparatuses delivered in vertical position must be unloaded and transported in vertical position due to the transport safety device. NEVER LAY DOWN. All other apparatus must be unloaded with their transport saddles.

STORAGE AND PROTECTION MEASURES - GENERAL

Pictograms

	Caution with frost risks. A seamless transfer of the equipment into heated rooms or freezing of residual water (condensation) can cause damage to the enamel coating. (see also graphics on thermal shock load)
	Too much sunlight can damage the equipment. (painting,...)
	The equipment must be protected from the weather.
	At the storage location, expressly point out that the glass lining is sensitive!
	Handle with care.
	Any damage due to improper storage is excluded from complaints and the Düker Email Technologie warranty scope.

SHORT-TERM STORAGE AND PROTECTION (LESS THAN 3 MONTHS STORAGE TIME)

New products are supplied with the protective devices for short-term storage limited to 3 months at -15° to +40°C and a maximum relative humidity of 65%. Our apparatus and piping should preferably be stored inside the building. In certain countries with extreme climatic conditions, the components must be stored in a dry and temperate place, protected from weather and frost. If the apparatus is stored outdoors, it should be placed under a canopy or covered with a protective sheet.



The apparatus must, in any case, be stored in a safe place free of passage so that it is not damaged by mechanical shocks. Place warning signs "CAUTION ENAMEL".

	For both outdoor and indoor storage, the equipment must be stored in a place where it is protected from all possible mechanical damage. Therefore, attach a label with the warning symbol and the note "BREAKABLE - ENAMEL" to the equipment.

It is also essential to ensure that the instructions and recommended procedures of the original manufacturers of all accessories are followed and adhered to as specified in the relevant technical manuals. Some accessories such as packs must be removed for safety reasons. These operations should be carried out by qualified personnel. Our team of technicians is at your disposal to assist you in all these tasks to be carried out on site. For these services, please contact the following address:

	Düker Email Technologie GmbH	Sales Tel. +49 6093 99 666 11 E-Mail: vertrieb@dueker-emailtechnologie.de

NEW EQUIPMENT - STORAGE: 3 MONTHS OR LONGER

Our new products are supplied with protection devices adapted for them for transport and three months' storage under normal conditions: at -15° to +40°C and a relative humidity of less than 65%.

During the storage phase, it is necessary to ensure that the above conditions are respected and that the good condition of the equipment is maintained; to this end, it may also be necessary to repair the protective covers and guards of the equipment.

 ACHTUNG	If you decide to store your new equipment for longer than the three months specified here, you will need to take some special measures depending on the intended storage period, the climate at the storage location and the type of material installed. Please consult our customer service/sales department to assess the risks involved and to analyse the warranty conditions.

EQUIPMENT ALREADY IN OPERATION - SPECIAL FEATURES

When storing products for use on the farm, the equipment must be correctly prepared beforehand. We recommend that you follow the instructions below.

1. thoroughly clean and rinse the inside and outside areas to eliminate any risk of corrosion by chemical residues.
2. drain and - if necessary - rinse the double jacket or coil(s) Add antifreeze if complete emptying is not possible.
3. apply a new coat of paint to all damaged sections if necessary.
4. completely dry the equipment and the double casing or coil(s).
5. for equipment that must be stored horizontally, wedge the agitator and other components to prevent any damage to these components and to the mechanical seals.
6. place the equipment on a wooden saddle to prevent damage to the piping.
7. remove all the clamp screws on the covers to the minimum necessary to hold the covers in place. Store the clamp screws in an oil bath.
8. apply a protective coating to the clamp bolts remaining in place (see table).
9. seal all openings on the machine to protect it from the atmosphere.
10. paint the edges of the flanges with a suitable epoxy resin paint to protect them from rust. Rust can cause flaking at the border areas of the enamel coating.
11. cover all nozzles except the base nozzle, which should remain open to prevent any accumulation of moisture.
12. use a brush or spray gun to cover all screwed openings, eyes, cams, couplings, etc. and then seal them with rubber or plastic plugs.

Term of protection	Designation	Thickness	Note
Up to 12 months	Tectyl 846 K 19	~ 50 µm	On the basis of long-lasting wax, seawater resistant, suitable for tropical conditions, soluble in petrol.

	Our team of technicians is at your disposal to answer your questions and assist you in these operations.

BEARING ARRANGEMENT OF THE REDUCTION GEARING

If a drive mechanism mounted on the extractor is shipped overseas, it is wrapped in oiled paper with plastic film to protect it from corrosion. Do not remove this protective cover until the equipment is to be put into operation.

The reduction gears which are not used immediately must be protected against the effects of moisture due to condensation. This could lead to corrosion of the internal organs of the reduction unit, which would affect the performance of the gear unit and the service life of the whole unit.

The single reduction units are supplied with an internal protection device, the exposed shaft ends and the surface of the flanges are coated with a protective paint.

If storage is to exceed 3 months, check the condition of this corrosion protection and repair it if necessary:

 ACHTUNG	1. refill the reduction gearing with the specified lubricant 2. 2. at the end of a storage period and before starting up the equipment, remember to adjust the oil level to the level required for operation. 3. 3 Any oil spillage must be removed immediately with an absorbent product and in accordance with current environmental regulations. 4. 4. protection of the outside: - Clean the surfaces. The use of high-pressure cleaners is prohibited. Also do not use sharp-edged tools. - Grease the sealing rings of the input and output shafts of the speed reducer to protect them from rust protection wax. - Check the rust protection coating and replace it if necessary.

Term of protection	Designation	Thickness	Note
Up to 12 months	Tectyl 846 K 19	~ 50 µm	On the basis of long-lasting wax, seawater resistant, suitable for tropical conditions, soluble in petrol.

STORAGE OF THE ENGINES

If the motors are not put into operation immediately, they must be stored in a clean, dry and well-tempered place and protected from vibrations and weather influences.

	If the bearing temperature drops below -15°C, the engine temperature must be brought back to the permissible operating range (i.e. -15°C to +40°C) before starting.

As long as the motors are stored correctly according to these instructions, no maintenance is required for the bearings. However, it is recommended to turn the rotor by hand every three months. After a storage period of more than one year for motors with non-watertight bearings (these motors are usually equipped with grease nipples and a grease plate), it is necessary to check the condition of the lubrication and the motor components. Before installation, check the motor windings with suitable instruments and make sure that the insulation between the phases and earth is correct.

	Do not touch the terminals during and directly after the measurement! They are still live: danger of electric shock.

If the value of the insulation resistance is less than 10 megaohm, or after storage in a humid environment, the motors must be dried in an oven for about 8 hours, gradually increasing the temperature up to 100°C. To ensure that the humidity is completely eliminated, the motors must be disassembled before this oven drying. All the operations described above must be carried out by qualified personnel.

In the case of explosion-proof motors, the following precautions must be taken:

	- Carefully ensure that the specific properties are not changed. - The work must be carried out in authorised workshops. - Be aware that dismantling or opening an engine during the warranty period without the manufacturer's approval will invalidate the warranty or the validity of the warranty.

STORAGE OF THE MECHANICAL SEALING ELEMENTS

Lubricated mechanical double seals

 ACHTUNG	The mechanical sealing elements must be stored in a dry dust-free, moderately ventilated and well-tempered place. We recommend: a relative ambient humidity above 65% and a temperature range of +15°C to +25°C.

In the case of "mothballing" of complete units with the associated sealing elements, it must be ensured that the preservative selected for the mechanical fittings is compatible with the material of the fittings, especially the components of the secondary fitting.

Furthermore, it is important to ensure that any possible cause of blocking of the axis movement is eliminated.

The friction material and the elastomers are subject to specific processes of change (warping) and ageing of the material, which can lead to a reduction in the optimum performance of the sealing fittings. However, this can be avoided by following the storage instructions.

	Direct exposure to heat (solar radiation) and ozone - whether from the environment or from production - must be avoided because of the risk of hardening and embrittlement of the elastomers. Nitrile rubber (NBR, P) in particular must be protected from sunlight or other UV radiation sources (halogen lamps or fluorescent tubes).

If the storage time is longer than approx. 2 months, the mechanical seal fittings must be subjected to a leak test.

The failure of a set due to natural deformation can be compensated by surface treatment of the friction surfaces. This operation must be carried out by the manufacturer of the fitting.

For safety reasons, all elastomer components must be replaced.

 ACHTUNG	Damage due to improper storage is excluded from complaints or warranty within the scope of the Düker Email Technologie warranty.

HANDLING AND INSTALLATION ON SITE

 ACHTUNG	All recommendations, instructions and procedures described for unloading must be fully applied (number and destination of lifting gear). Under no circumstances may the transport gates be removed during handling (bracing of the agitator).

If you install apparatus in buildings, the following must be ensured:

- sufficient dimensioning of the structures to bear the load
- sufficient stiffness of the structures for glass lined apparatuses, e.g. extractors with stirrer and consideration of product loads
- Peripheral devices (pumps, compressor) must not transmit vibrations to the glass lined apparatus
- The structures must not exert any mechanical stress on the apparatus

Positioning of the apparatuses in the production area:

- Extractors with agitator
  - For installation in the production area: see specific booklet.
- Templates and tanks
  - Detach them from their transport saddles.
  - Handling must take place in a cleared area

HORIZONTAL APPARATUSES:

Use the lifting eyes provided for this purpose.

The use of crane lifting beams is mandatory for apparatus with a length of less than 4.0 m.

Special cases

Appliances supplied with feet:

DO NOT use the feet as a pivot point when lifting.

Columns

Handle individual parts of the columns with the aid of the lifting eyes.

NEVER install a column horizontally and then erect it. The elements must be mounted in a vertical position and if possible in the production area.

Levelling and wedging of a device:

Once the device is installed, it must be levelled.
Deviations in the verticality can cause problems when connecting the piping to the different nozzles.

The alignment points depend on the type of apparatus to be installed:

- Vertical tanks: The shell lines of the tank serve as a reference point
- Horizontal tanks: Check whether a slope is indicated in the plan
- Columns: Use the upper main flange
- Horizontal evaporators: Check the specifications on the plan of the apparatus

	Equipment with agitators (reactors or extractors): See specific documentation

Align the apparatus vertically or horizontally using the nuts on the feet or by placing suitable metal wedges under the soles of the feet, support claws, support rings, frames or support saddles.

FIXING OF AN APPARATUS

After levelling the apparatus, it must be fixed to the structure or anchored to the ground.

 ACHTUNG	The attachment of the apparatus depends on its geometry. The method of attachment chosen should enable the apparatus to expand freely according to the temperature variations of the unit. Appropriate precautions must be taken for the pipe connections on the apparatus.

It is strictly forbidden to weld brackets or plates to the unit.

- Units with double jacket:

In double-jacketed units, the brackets are generally welded to the wall.

In this case, no special precautions are required to secure the unit to the floor or the structure of the building.

Use screws or pins of suitable size in view of the holes provided in the brackets of the unit.

- Apparatuses with coils:

In the case of coils, the brackets are welded to the enamelled wall between the coils.

 ACHTUNG	The attachment of these apparatuses must ensure the expansion of the apparatus.

- Appliances on feet:
  ONLY ONE SINGLE FOOT SHOULD BE SOLID, the rest should allow for thermal expansion through sliding.
- Apparatuses on support brackets:
  ONLY ONE PRODUCT SHALL BE SOLID, the rest should slide to allow for thermal expansion.
- Apparatuses on support ring:
  The brim of the apparatus rests on a support ring; the latter must be centred underneath the brim. After installation of the apparatus, the support ring MUST NOT touch the enamelled wall. The brim may be welded to the support ring.

After completing this step, you can start mounting the accessories or connecting the piping to the machine.

	In order to carry out this work, we recommend that you take advantage of the support of a Düker Email Technologie specialist

CONNECTIONS

There are three different connection types on your telephone:

- Glass lined connections for process piping,
- Connections of heat transfer media,
- electric terminals

The first two connection types require the use of special seals and compliance with the tightening torques. Otherwise there is a risk of leakage and/or damage to the enamel coating.

	Make sure that the paint is not damaged when removing the nozzle covers. Check that the paint touches the outer edge of the enamelled sealing surface everywhere. If there are areas with chipped paint, repair them with the same type of paint as the one originally used before installing the connections (see technical documentation).

ASSEMBLY OF PIPELINES

Provision for assembly

- Ensure that the unit is transported to the installation site without knocks with the protective caps fitted.
- Take precautions to prevent damage to the cables at the assembly site by other trades (e.g. scaffolding, construction work or similar).
- Do not place enamelled parts with their enamel surface unprotected on the ground or grating.

Ensure tension-free assembly:

- The use of spacers, angle washers and height-adjustable brackets allows stress-free assembly; under no circumstances may length compensation be carried out by pulling.
- By turning the individual components during installation, geometric deviations (deviations in horizontal and vertical alignment, offset) can be compensated and slopes can be adjusted.

	Glass lined pipelines must always be isolated from external loads and laid free of stress!

Installation procedure

- A connection point (tank, pump, nozzle, etc.) must be assumed
- The pipe parts are positioned at height and first provisionally fixed (suspended, supported, etc.)
- Free hanging of pipe parts should be avoided
- Fit and close the flanges (see section 3.3). Ensure that the sealing surfaces are plane-parallel and centred
- If necessary, mount the provided holders (see section 3.5)
- Take into account gradients and heat-related length changes (see sections 6.4 and 6.5)
- Adjust pipe inclinations by means of angle washers or by turning the bends
- Align the pipeline finally and tighten the holder
- Connect further piping elements analogously
- Spacers must be used to compensate for the required overall length of the cables

 ACHTUNG	Under no circumstances may voltage be generated by forcing or pulling the cables together!

Assembly of flange connections

- Mount the loose flange halves loosely on one side with a connecting screw
- Unfold connected halves and place them around the pipe near the collar, stepped side of the flange (centering) points to the collar
- Close connected halves and screw together with second connecting screw
- Screw head also points to the collar
- Mount counter flange analog
- Arrange the parting lines of flange and counter flange offset by 90°
- The correct assembly of flanged joints requires parallel aligned flange blades without offset in the centre, which allow the gasket to be inserted in the correct position without damage
- Lubrication of the bolted connection must be carried out in accordance with the VCI guidelines for the assembly of flanged joints
- Tighten the screws evenly crosswise and then in several steps in turn up to the specified tightening torque (see section 6.1)
- For connections with shim rings, angle washers and instrument connectors, we recommend the use of threaded rods (see section 6.2.3)
- After warming up, the screw connection should be retightened after cooling down due to the settling behaviour of the seal

SEALING TYPES

For the connection of enamelled pipelines, Düker Email Technologie recommends gaskets made of graphite/PTFE with diffusion barrier as well as gaskets made of modified PTFE. Selection and application depend on the stress and the associated properties of the gaskets and must be agreed upon between the gasket manufacturer and the operator. The following table lists a selection of gasket types that have been tested in practice.

Typ/ Type	Aufbau/ Structure/ Composition	Dicke/Thickness/Épaisseur mm ungepresst/gepresst not-compressed/compressed non compacté / compacté	Temperatur/Einsatzbereich Temperature/application area Température/champ d'application °C
1	PTFE ummantelte Graphitdichtung PTFE envelope graphite gasket Joint en graphite à enveloppe PTFE	4,0/3,0	-50/+230
1	ummantelte Wellringdichtung mit beidseitiger Graphitauflage with corrugated steel ring and graphite layers on both sides joint Wellring à enveloppe PTFE avec revêtement en graphite des deux côtés	6,5/5,0	-50/+230
2	PTFE ummantelte Wellringdichtung mit beidseitiger Aramidauflage PTFE envelope gasket with corrugated steel ring and aramid layers on both sides Joint Wellring à enveloppe PTFE avec revêtement en aramide des deux côtés	6,5/5,0	-50/+150
3	Gylon blau/blue/bleu	3,2/2,0	-210/+260
4	IDT – Uniflor WS 7550	3,2/2,0	-210/+260
5	Gore Style 800	6,0/2,0	-240/+270

SELECTION AND MOUNTING OF BRACKETS

Pay attention when designing and positioning the holders:

- Basically the following applies: Welding is NOT allowed on enamelled pipes!
- Vertically installed pipelines should be supported by welded support cams. However, these may only be installed by Düker Email Technologie before the enamelling
- Supports, in particular special supports, must be designed and installed in such a way that they do not introduce additional stresses into the pipelines
- All brackets, mounting parts and special supports should be screwed, if possible. Height-adjustable brackets facilitate installation. The use of welded bracket constructions is also possible.
- Align the pipe system exactly and screw it together without tension, do not "force" pipes into the holder.

Special care must be taken when fitting and tightening the gaskets to achieve an efficient seal without damaging the enamelled surface.

We recommend that any defects in flatness and geometry that may occur during the production cycle of the equipment should be systematically underlaid with gaskets from nominal diameter 300 upwards.

	This work must be carried out by a trained and authorised person will be. We recommend that you contact the Düker customer service/sales department.

TIGHTENING TORQUE OF THE SEALS ON THE ENAMELLED NOZZLE

The tightening torque depends on the type and condition of the seal, its diameter and the size of the screws or clamp bolts. The tightening torques of the seals for standard devices with a pressure of 6 bar and for pipelines with a pressure of 10 bar are given in the table below.

	To tighten gaskets type Gore-Tex and Gylon Blue use the tightening values for insert gaskets with aramid fibres.

TIGHTEN

The seals must be tightened at ambient temperature and pressure.

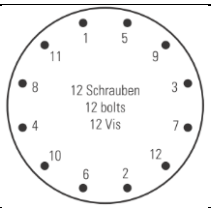
ACHTUNG	Tighten crosswise and progressively around the entire flange circumference. Use a torque wrench and observe the torques specified in the table.

When all accessories are installed on the machine, the torque of the connections must be checked.

Nominal tightening torques in Nm for DIN versions

DN mm	Schrauben Anzahl x Abmessung Bolts Number x size Vis Quantité x dimensions	Gylon blau Gylon bue Gylon bleu	PTFE ummantelte Wellenringdichtung mit beidseitiger Aramidauflage PTFE envelope gasket with corrugated steel ring and aramid layers on both sides Joint Wellring à enveloppe PTFE avec revêtement en aramide des deux côtés	PTFE ummantelte Graphitdichtung* PTFE envelope graphite gasket* Joint en graphite à enveloppe PTFE*	Gore S 800
25	4 x M12	20	20	15	30
32	4 x M 16	35	35	25	50
40	4 x M 16	40	40	30	60
50	4 x M 16	60	60	45	80
65	4 x M 16	80	80	65	90
80	8 x M 16	55	55	45	65
100	8 x M 16	65	65	50	70
125	8 x M 16	80	80	65	90
150	8 x M 20	120	120	90	120
200	8 x M 20	160	160	120	170
250	12 x M 20	135	135	110	130
300	12 x M 20	160	160	135	150
350	16 x M 20	155	155	120	200
400	16 x M 24	195	195	150	280

DIN

Tightening procedure according to VCI Guideline		The basis for the application of the tightening torques are lubricated bolts in the thread and contact area of the nut or head and the use of a hardened washer under the nut.
	After the first temperature cycle, we recommend retightening the screws at room temperature with the specified nominal tightening torque. Any possible leakage in the area of the flange connection must be eliminated by retightening the screws. The specified tightening torques may be exceeded by up to 30 %.	

After initial heating of the apparatus, the seals must be tightened at ambient temperature.

	If the machine is not subject to temperature fluctuations, retightening is not necessary. In this case, tightening must be carried out a few days after commissioning to compensate for the yielding of the seals. When retightening, the values shown in the table above must be observed.

	If an installed original seal appears defective, it should be replaced. In this case, it is essential that you contact Customer Service/Sales so that they can clarify the measures to be taken with you.

LINING OF AN INSERT SEAL

Insert gaskets allow to compensate for the unevenness of the sealing surface in the case of glass-lined flanges. When compensating for unevenness of more than 0.5 mm, it is absolutely necessary to refill the gasket.

	This work must be carried out by trained and certified personnel, otherwise there is a risk of email damage. We recommend Düker Email Technologie customer service/sales.

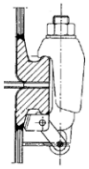
MOUNTING WITH CLAMP SCREWS

	For connections with clamp screws, the number of screws specified in the technical manual of the apparatus must be observed.

Check the bracket system at the connection.

Never drop the clamp screws onto the outside wall of the appliance, as this may cause enamel to chip off inside.

Check the condition of the threads. Grease the screw threads. Position the screws evenly over the entire flange circumference.

 ACHTUNG	Check that the clamp bolts are correctly positioned on the bead and that the bolt body does not cause any stress around the flanges.	

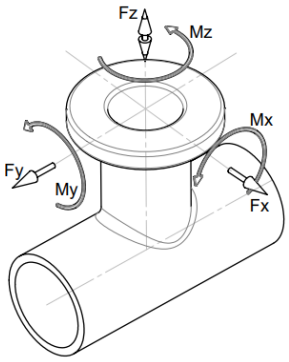
CONNECTION OF THE PROCESS NOZZLE

Do not remove the caps of the enamelled nozzles until the pipes or equipment to be connected are fitted.

Protect the upper part against the danger of falling objects (rubber mat).

 ACHTUNG	Ensure that no tension is created at the enamelled sockets by aligning the connecting lines exactly.

DN	Kräfte in [N]		Momente in [Nm]	
	Fx = Fy	Fz	Mx = My	Mz
25	200	900	30	20
32	250	1100	50	30
40	300	1400	75	45
50	400	1800	120	75
65	500	2300	200	120
80	600	2800	300	180
100	750	3500	400	250
125	950	4400	700	450
150	1100	5300	900	550
200	1500	7000	1500	900
250	1900	9000	2100	1300
300	2300	11000	3100	1900
400	3000	14000	6200	3700
500	3500	16200	8600	5200



- The use of compensators is recommended for the connections in order to avoid the transmission of vibrations and to allow temperature expansion without loading the line and the apparatus. Use suitable makes for processes operated in vacuum.
- Provide brackets on all accessories such as valves, flow meters, instrument connectors, etc. to limit the load on the nozzles.

- Do not bump against the enamelled nozzles.
- The sealing surfaces must be clean and degreased.
- Use the gaskets recommended in the technical documentation.
- Lubricate the screws and observe the tightening torques given in the manual.
- For openings with clamp screws: keep to the specified number of screws and position them at even intervals.
- When pressure testing the pipelines, we recommend closing the open apparatus connections with blind flanges.

CONNECTION OF THE SERVICE MEDIA

Connection data of the operating media are listed in the documentation depending on the application.

	Please refer to the documentation for the following data: ➢ Heat transfer medium ➢ Thermal shocks ➢ Mechanical loads ➢ Flow nozzles ➢ Cleaning of boilers with double jacket or half pipe coils ➢ Thermal insulation

ELECTRICAL CONNECTIONS

All connections must be made by a qualified electrician.

 ACHTUNG	➢ Follow the manufacturer's instructions for all electrical and electronic accessories. ➢ Refer to the overall drawing in the technical documentation of the appliance for the location of the earthing connections.

If a frequency converter is connected, it must be ensured that this controller is parameterized correctly in order to avoid possible damage to the engine and/or the transmission

 ACHTUNG	Please refer to the documentation for the components. They contain specific information on a number of different equipment parts that are part of your order documentation.

Specific recommendations for accessories and/or options can be found in the technical documentation.

Grounding of enamel lines

To dissipate electrostatic charges from glass lined piping systems, these must be earthed. The contact can be made by earthing bolts or by external galvanisation of the pipeline parts.

Grounding via bolt

- Depending on the length of the pipeline, one or two earthing bolts are provided.
- The bolts are connected to the connecting bolts of the loose flange halves by means of an earthing cable.
- Compensators made of non-conductive material are bridged with an earthing cable.
- Düker also offers in its product range conductive seals with earthing lugs. During installation, the lugs are connected to one side of the flange screws.

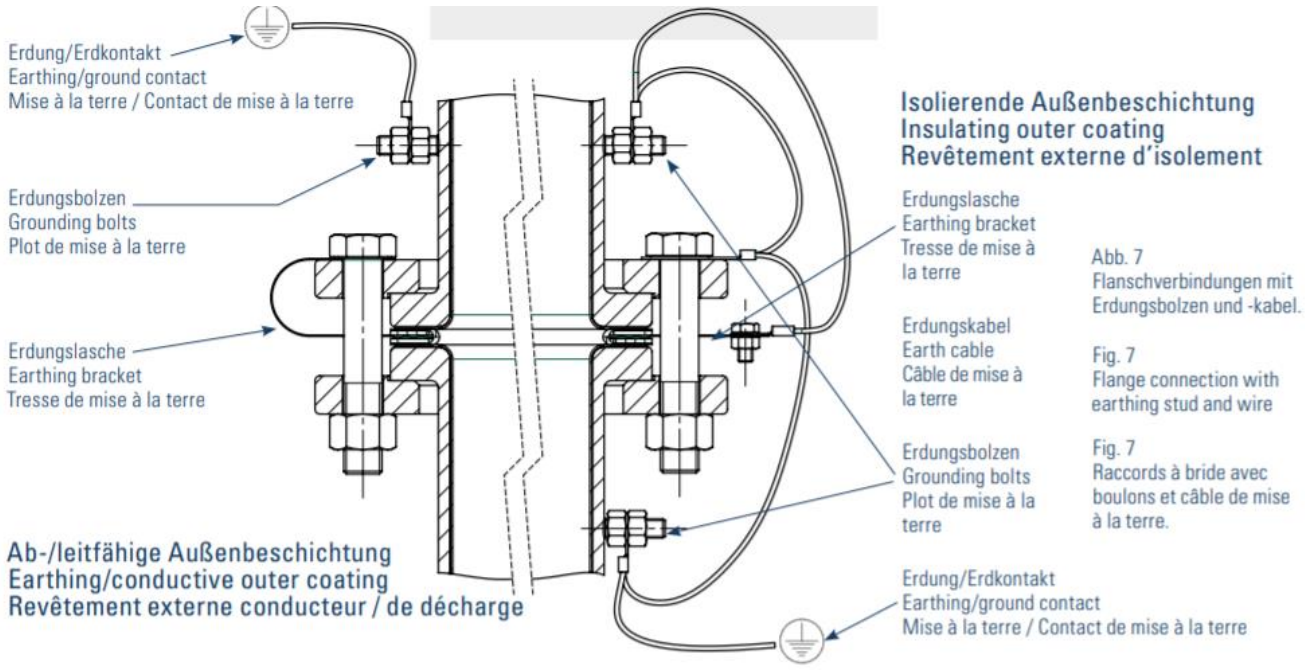


Abb. 7
Flanschverbindungen mit Erdungsbolzen und -kabel.

Fig. 7
Flange connection with earthing stud and wire

Fig. 7
Raccords à bride avec boulons et câble de mise à la terre.

FIRST ATTEMPTS AT COMMISSIONING

PRELIMINARY TESTS

	The commissioning phase may only be carried out by authorised operating personnel. Instructions for the prevention of hygiene, safety and environmental risks must be posted and followed by all employees.

The following points must be checked:

- Cleanliness inside the apparatus
- Level of the lubricants
- Lubrication of the rotating elements
- Connection of the security organs
- Tightening all connections
- Condition of the outer coating.

For reasons of safety for operating personnel and equipment, the machine must be located in a clean and tidy place.

	The first start-up should be carried out with clean tap water. Units with agitators: Observe the operating instructions Heating the apparatus: Observe the operating instructions

HEAT UP AND COOL DOWN

The efficiency of the heating and cooling of your apparatus depends on the type of medium used and the commissioning procedure.

	Excellent mastery of the heating/cooling system of your appliance will certainly help you to avoid serious damage. Observance of the operating instructions

	We would like to remind you that our customer service/sales department will be pleased to help you and provide information on the operating conditions of your apparatus.

LEAKAGE CHECKS

BASIC

During this check, all connections must be checked for leaks. The seals must be tightened at ambient temperature and atmospheric pressure.

Use a torque wrench.

Observe the tightening torque values.

 ACHTUNG	For all components with retainer, it must be removed before retightening the seals to avoid tension forces on the parts.

 ACHTUNG	If there is still leakage after tightening to the required torque, DO NOT INCREASE THE TIGHTENING TORQUE FURTHER, but replace the seal.

PROCEDURE TO BE FOLLOWED

- Pour clean water into the machine.
- Make an initial visual inspection at ambient temperature and atmospheric pressure of the connections in the liquid phase. Repair any leaks detected.
- Heat up the machine.

 ACHTUNG	Observe the limits already specified for the rate of change of temperature and temperature resistance. During this initial heating of the apparatus, the seals will set under the influence of the tightening torques and the material flow. For this reason, it is imperative that all connections are retightened when the ambient temperature is reached again.

- Now carry out a second visual inspection of the connections for leaks in order to detect any leaks.
- Cool down to room temperature. Retighten all connections. Treat all leaks and make sure that the tightening torques are not exceeded.
- Apply pressure
    - In the case of pressure-operated apparatuses, the tests are carried out at maximum operating pressure. Remember that the permissible operating pressures of the auxiliary equipment must be taken into account.
    - Note the operating pressures of the peripheral equipment
    - Ensure that the safety devices are sufficiently dimensioned and function properly.
    - For vacuum-operated units, the tests are carried out at overpressure between 200 and 300 mbar.

- Make a third visual inspection of the connections for leakage in the liquid phase. Use soapy water to check the tightness of the connections which are in the gas phase of the apparatus.
- Return to ambient temperature and atmospheric pressure before correcting any leaks that are detected.

 ACHTUNG	The return to atmospheric pressure must take place slowly so that no pressure surges occur in the apparatus. Use control valves on the ventilation lines.

COMMISSIONING OF THE DEVICE

When all the measures described so far have been taken, your machine is ready for use and can be put into operation.

The following section explains the precautions to be taken to avoid errors that could otherwise have fatal consequences for your glass lined apparatus.

	This information should be communicated to operating and maintenance personnel.

DAMAGE TO THE EMAIL COATING CAN OCCUR AS A RESULT OF:

- Mechanical stresses:
  - Mechanical impacts on the outer wall of a glass lined apparatus
  - Excessive stress or transmission of vibrations to the connecting pieces (check condition and correct installation of the compensators).
  - Slamming of the manhole cover (always close the manhole after use and check that the opening/closing mechanism works properly).In den Apparat gefallene Gegenstände.
- Excessive HEAT VOLTAGE:
  - Too sudden a rise or fall in temperature (installation of systems with progressive rise or fall in temperature)
  - Filling to cold liquids that cause thermal shocks (install temperature safety devices)
- Leakage of corrosive media at the connection points
  - A leakage at a nozzle that is not noticed in time can lead to external corrosion of the steel and to destruction of the enamel by hydrogen diffusion (carry out visual inspections at regular intervals and repair leaks immediately).
- Splashes on the top of the apparatus:
  - Acid splashes on the top of the container cover cause hydrogen diffusion due to corrosion of the steel, which can lead to the enamel on the inside flaking off.
- Return of products on the inner wall (attach inlet or immersion pipes to all liquid supply lines).
- Mechanical shocks:
  - Introduction of solid particles
  - Use of metallic objects
  - Use metal tools to scrape off caking on the walls (use only plastic or Teflon-coated tools, attach CIP nozzles).
- Static discharges
  - Discharges cause pressure shocks that penetrate the enamel coating (change the process to reduce the risk of static discharges or use conductive enamel).

DAMAGE TO THE AGITATORS CAN BE THE RESULT:

- From solidification of products in the apparatus, which leads to shaft damage (installation of a torque limiting system)
- From cavitation on the agitator blades, which can lead to their destruction or damage to the bottom of the vessel (check the steam pressure of the products or, in the case of processes with a violent introduction of steam, check the steam quantity).
- From damage to the mechanical seal housing (check the temperature and sealing media, oil or gas). Refer to the technical instructions for mechanical seal housings.

DAMAGE TO THE DOUBLE JACKET OR COILS OF THE APPARATUS MAY BE THE RESULT OF:

- Pressure surges during start-up (installation of pressure surge protection systems).
- Excessive mechanical stresses on these elements (installation of throughput and pressure control systems)
- Corrosion caused by service media, such as steam or salty water (emptying before using other media, acid control of products) See the documentation for the specific delivery.
- Contamination and loss of performance (installation of filters, regular cleaning)

REGULAR CHECKS AND MAINTENANCE

This table is for information on maintenance activities. For all accessories, refer to the specific instructions of the manufacturer in the technical documentation of your appliance.

	Description of the measure	Daily	Weekly	Monthly	Annually	Monitoring
Engine	Electric motor with grease nipple electric motor without grease nipple / lubricant renewal every 15.000h				**X** **X**	Observe motor manual
Transmission	Sound level Regularly check the oil level Oil change after 10.000h (or 2 years of operation) for mineral oils Oil change after 20.000h (or 4 years of operation) for synthetic oils	**X** **X**			**X** **X**	Switch off the stirrer if abnormal noises are audible or in case of abnormal heating
Coupling	Check that the coupling pins are correctly tightened.			**X**		
Mechanical seal with locking system	Check barrier fluid level Check temperature Check pressure (internal pressure: +2 bar) Regular emptying	**X** **X** **X**	**X**			Do not mix different media
Enamel coatings	Visual inspection of the email Inspection of repairs (if any) Inspection with email test Dielectric stress test and coating thickness test		**X** **X**	**X**	**X**	See chapter Inspection and repair of enamel
Hand or manhole cover	Functionality of the opening aid Condition of the sight glass			**X** **X**		Or in case of malfunction
Double jacket or pipe coils	Scale removal				**X**	If the heat exchange drops
Heat insulation stainless steel welded	Draining the condensates		**X**			
Valve	Check tightening torque of the seal Visual inspection of the valve seat and the valve plug			**X** **X**		
Gasket	Visual inspection for leaks	**X**				
Probe and transmitter	Calibration: Temperature probes: electric motor / agitator / bottom outlet valve				**X**	

GENERAL PRECAUTIONS

The service life of your apparatus/pipeline depends on how carefully you maintain and service it.
To optimise maintenance, we recommend that you keep a maintenance sheet with all maintenance activities carried out:

- Data from all monitoring activities
- Indication of all problems encountered and the attempts made to solve them.
- Tracking of all changes made to the machine and/or auxiliary equipment.

Refer to the manufacturer's information sheets for accessories to determine the intervals at which maintenance work must be carried out: checking, lubrication, etc.
The attached table serves as a basis for the maintenance to be carried out and indicates the recommended frequency. It must be adjusted according to the following aspects:

- Frequency of use
- Type and nature of the operating conditions
- Corrosion-promoting effect of the chemicals

The above recommendations apply to apparatus, but are not suitable for pipelines. The following is recommended:

- Depending on the corrosion load, a period for shutdown should be determined.
- After shutdown, the pipes must be flushed.
- A qualified employee will carry out an assessment after visual inspection, measurement of the layer thickness and, if necessary, a high-voltage test.

	Preventive maintenance measures make a decisive contribution to avoiding serious material damage. Our customer service/sales department can offer you preventive maintenance contracts tailored to your machine and its accessories. For certain products, such as the mechanical seal housing, we offer replacement units to shorten production downtimes.

MAINTENANCE

ENAMEL INSPECTION

We would like to draw your attention to the fact that a regular check of the enamel coating only provides information on the state of the enamel at that time.

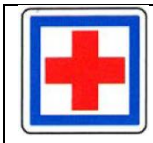
	Certain processes use such highly corrosive products that the steel of the apparatus can be corroded within a few minutes after enamel damage has occurred. Under these conditions, only continuous monitoring of the enamel coating can provide you with an immediate warning in the event of enamel damage so that you can take comprehensive precautions to protect your operators and equipment.

For less corrosive processes we recommend regular inspection of the enamel coating.

The inspections are carried out after emptying and cleaning.

For apparatuses installed in multi-purpose production lines, we recommend to perform a visual inspection together with the cleanliness inspection when changing the product.

We recommend that the apparatus is inspected at least once a year.

	If an inspection requires a technician to enter the machine, the hygiene and safety instructions must be followed.

	If processes require the use of a conductive enamel coating, contact our Customer Service/Sales Department to determine the appropriate test method. Our customer service/sales department offers dielectric monitoring and thickness measurements of the enamel coating. Do not hesitate to consult us!

CHECKING OF THE ENAMEL:

VOLTAGE TESTING

This high-voltage test is characterised by the formation of an arc between the carbon steel on the damaged enamelled surface, e.g. pore, and the electrode to which voltage is applied.	

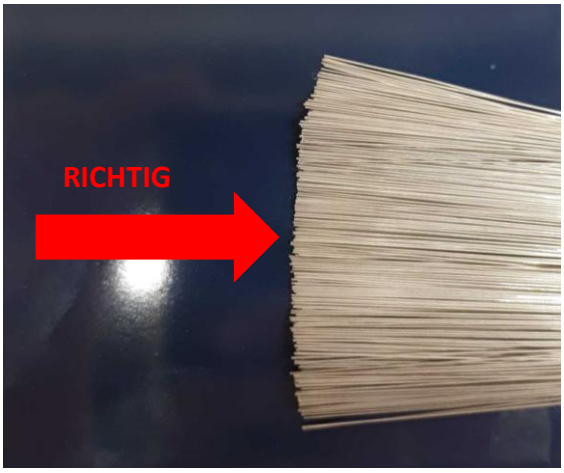
If the cover is not continuous, slightly bluish discharges can be detected around the sensor; at the slightest fault a characteristic white arc will build up.

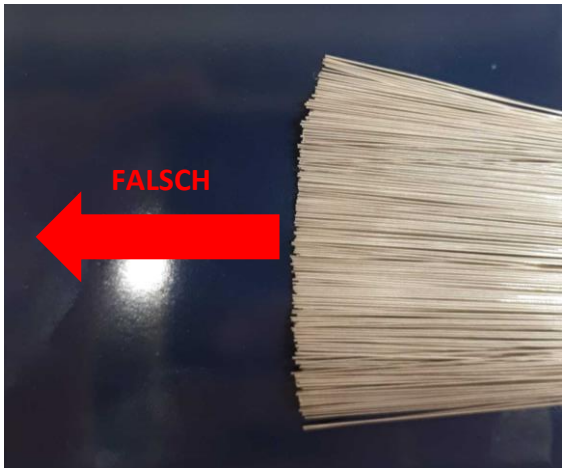
ACHTUNG	Voltage tests must be carried out very carefully. Apparatus or pipelines must be perfectly clean and dry. To avoid damage to the enamelled surface, a voltage of 7000 volts must not be exceeded.

This test voltage complies with the EN 14430 standard.

Remarks:

- The apparatus must be perfectly clean and dry.
- The test is performed at ambient temperature.
- It is not advisable to carry out the test at one and the same place for too long. If this instruction is not observed, the test runs the risk of becoming a material-destroying test.





The coating speed on the enamelled surface must be regular and less than 40 cm/s.

For pipelines, the high-voltage test shall be carried out with a broom specially manufactured for the nominal diameter.





COATING THICKNESS TESTING WITH A SUITABLE COATING THICKNESS GAUGE

The two types of testing described above provided evidence of the integrity of the enamel layer, i.e. that the coating is neither defective nor porous. In the case of corrosive or abrasive wear processes that lead to corrosion of the enamel layer, an additional layer thickness test is necessary. Enamel corrosion can generally be detected when the enamel surface is no longer shiny or becomes slightly granular.	

Principle of coating thickness measurement:

The apparatus or pipeline must be perfectly clean and dry.

Define in advance an area or grid of the apparatus where the measurement is to be taken.

Measure the coating thickness by placing the sensor completely flat on the enamelled surface and write down the measurement results.

Minimum test temperature: +10°C.

REPAIR OF THE ENAMEL COATING

GENERAL

Enamel damage can be repaired if it is quickly discovered and repaired before the corrosion has penetrated deep into the steel.

There are several solutions to repair damaged enamel coatings. The choice of solution depends on the cause of the damage and the extent of the damage.

	In any case you should contact our customer service/sales department, ▪ so that he can offer you an assessment if the cause is not clearly identifiable and there is a risk that the damage will reoccur elsewhere, ▪ so that he can advise you on the type of repair to be made, ▪ if you wish to have the repair carried out by our customer service/sales department.
	Repairs must be carried out by qualified personnel so that the problem is not made worse.
	The problem of a repair on a glass lined apparatus is to restart production with reduced downtime of the apparatus. In processes that are highly corrosive and/or operate at high temperatures, repairs have a limited service life. Replacement of the apparatus within the shortest possible time must be provided for. If the damage is too great for repair, please contact us. We will make you an offer for reglassing the apparatus (for conditions see chapter "Return of material").

DIFFERENT REPAIR METHODS

The different repair methods depend on the type and location of the damage.

- Installation of screws, washers and plates made of tantalum,
- Installation of a tantalum repair sleeve,
- Installation of a PTFE sleeve,
- Under certain conditions: Reenamelling in our workshops.

	When installing a tantalum plate or sleeve, you should preferably contact our customer service/sales department. Repairs should be carried out by qualified personnel to prevent the problem from getting worse.

REPLACING A GASKET

	Consult the technical documentation to identify the types of seals used on your machine. Only use gaskets specified by Düker.

	Gaskets with inserts make it possible to compensate for unevenness in sealing surfaces of enamelled surfaces. It is mandatory to underlay the gaskets in case of flatness deviations of more than 0.5 mm. For apparatuses and columns exposed to operating pressures above 6 bar, wedging is required for unevenness as low as 0.4 mm.

Personal (individual) protective equipment is strongly recommended:

protective goggles (tight)

Dust protection masks

The entire working area must be well ventilated or equipped with a ventilation system.

PROCEDURE FOR REPLACING A GASKET WITH GRAPHITE INSERT:

The procedure for bottom wedging a gasket with graphite insert is almost the same as for aramid fibre insert, with the following exceptions:

It is advisable to insert an aramid fibre insert for the markings. The graphite inlay is too sensitive for this step.

The principle of the subsequent work steps is the same, but the chamfering of the graphite segments should be done by means of a scraper/cutter. Once the wedges are made and checked, the aramid fibre insert should be used to mark the positions on the graphite insert to which the graphite chocks are to be glued.

DISMANTLING

Before starting the disassembly of a flange connection, the release from the company must be obtained. It must be ensured that the plant is depressurized and flushed. The safety guidelines of the respective site must be observed.

- Mounting or attachment parts which are not held separately must be secured before loosening the flange connection.
- Loosening of the screws or nuts begins on the side facing away from the body.
- Bolts or nuts must be loosened crosswise in at least two passes. If a line is under mechanical tension, the line must be expected to deflect.

When replacing gaskets, care must be taken to ensure that the old gasket is completely removed from the flange sealing surface without damaging the flange sealing surface.

MATERIAL RETURNS

Before returning any material, please contact our customer service/sales department.

The following rules apply when returning material for inspection or repair:

- The material must be free of dirt and chemicals.
- A cleaning certificate (see template on the next page) must be enclosed with the machine.
- The parts must be protected by the packaging so that additional damage during transport is avoided.
- Label or mark the parts with the company name.
- Enclose the cleaning certificate with the shipping documents.
-

	In the case of returns without prior agreement or without a cleaning certificate, the material will not be unloaded from the truck and returned at the expense of the sender.

At the entrance the part is examined by our experts:

- If the material is repairable, you will be given a repair quotation. You have one month to order the repair. After that the material will be sent back to you. The corresponding costs are at your expense.
- If the material cannot be repaired, we will make you a replacement offer for the same or a similar device. If you do not order or take back the material on your part, the part that cannot be repaired will be scrapped after consultation. The corresponding costs are at your expense.

CLEANING CERTIFICATE

CLEANING CERTIFICATE	
SAFETY RECOMMENDATIONS FOR THE REPAIR OF COLUMNS / APPARATUS AND VALVES	
CLIENT:	MATERIAL:
LOCATION:	TYPE:
CONTACT PERSON:	CONTENTS:
TEL.:	
E-MAIL:	
INFORMATION	
MANUFACTURER:	
FACTORY NO.: / YEAR OF CONSTRUCTION:	
NUMBER OF PREVIOUS REEMAILINGS:	
OTHERS:	
In case of re-enamelling, the double jacket must be separated. ***We know neither your products nor the suitable cleaning solvents. For this reason we cannot clean the apparatuses / fittings / column components.***	
THE FOLLOWING CONDITIONS MUST BE OBSERVED FOR RE-ENAMELINGS ➢ The machine must be completely clean and rinsed. It must also be free from any trace of corrosive, toxic or flammable products or those which may emit corrosive, toxic or flammable gases during fires in the enamelling furnace. ➢ The double jacket must be drained and cleaned, especially if the apparatus has a breakthrough which has allowed chemical products to penetrate or if a thermal heat fluid is used. ➢ Accessories and mounting parts in good condition as well as manhole covers, mounting covers and valves must be removed. In the case of apparatus with stirrer and drive, the condition of the drive and the availability of spare parts must be checked before sending the apparatus. ➢ The complete insulation must be removed.	
After cutting off the double jacket and inspecting the base material, we will provide you with a cost estimate.	
SHOULD WE HAVE ANY CONCERNS REGARDING THE CLEANLINESS OF THE APPARATUS/COLUMN COMPONENT/FITTING, WE RESERVE THE RIGHT TO RETURN THE APPARATUS TO YOU WITHOUT INSPECTION	
CLIENT:	
SECURITY OFFICER:	
Certify herewith: That the component has been cleaned and rinsed and is free from corrosive, toxic or flammable product ➢ That the Düker Email Technology operating personnel can access the equipment and carry out the necessary work without special care and risk.	

Düker Email Technologie

Düker Email Technologie offers

- Functionality, safety and customer benefits for the chemical and pharmaceutical industries
- Integrated solutions from a single source

- Highly acid-resistant enameled pipeline parts, fittings and columns
- Comprehensive services
- Qualification of your employees
- Engineering, procurement, construction, assembly and maintenance for process plants

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