

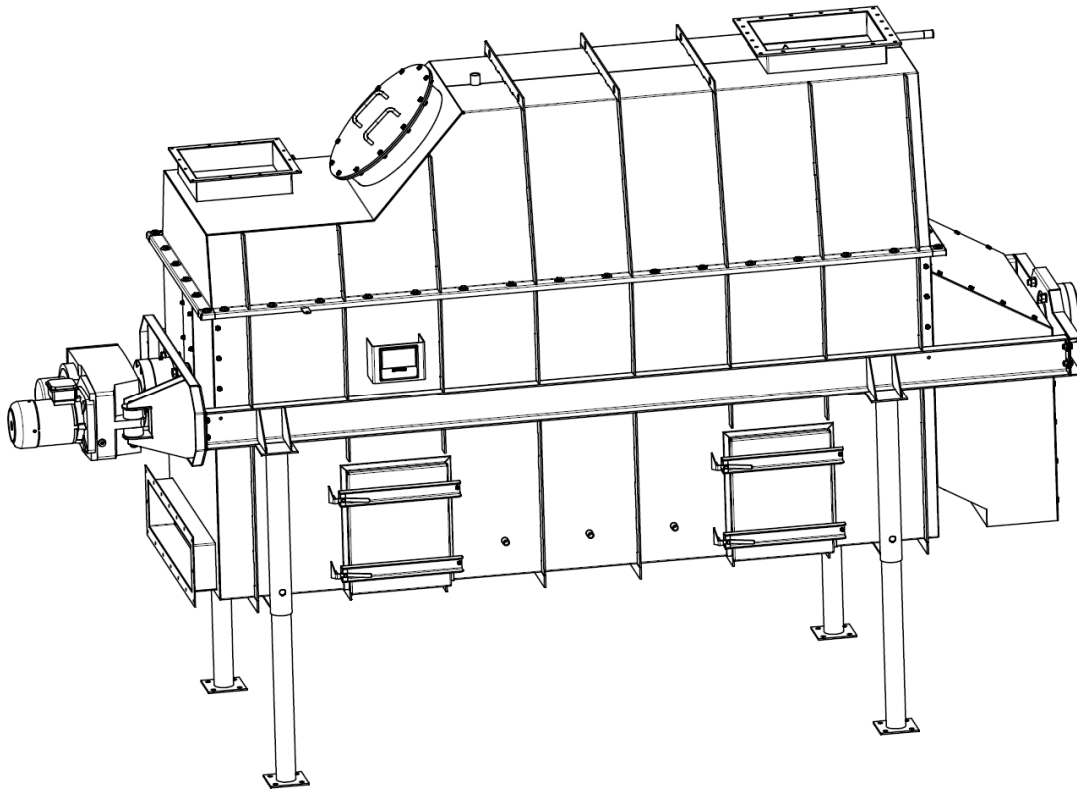
ALLGAIER

PROCESS TECHNOLOGY

Operating and Maintenance Instructions

Rolling Bed Heater

WB-T-1.00 x 3.00



Order number: 15 8620 10

Tag-No. T100

Machine number: 363

Year of construction: 2012

Read before carrying out any work on or with the machine!

Keep to hand for future use!

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These operating instructions are to be treated as confidential. They are intended only for persons working on and with the machine or system. It is not allowed to distribute the operating instructions to third parties without written approval from the manufacturer. If needed, please contact the manufacturer.

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ALLGAIER Process Technology GmbH is not responsible for:

- **fire detection, fire protection system, fire extinguishing system**
- **explosion prevention and protection**
- **occupational safety**
- **insulation of the complete heater system**

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1. Instructions for use

1.1. About these operating instructions

These operating instructions are **part** of the rolling bed heater from the company ALLGAIER Process Technology GmbH, Germany.

They contain important instructions for the **proper operation** of the system. Compliance with all safety instructions and other instructions is required in order to work safely and properly with the system.

In addition, all local accident prevention regulations and general safety laws for the area where the system is used must be followed.

The entire set of documentation, consisting of the operating instructions and all supplier documentation provided must always be available at the site where the system is used. If the system is sold, the operating instructions must also be passed along.

The graphic illustrations in these instructions are not necessarily to scale in order to better illustrate the technical matter being explained, and may deviate slightly from the actual design of the system.

The operating instructions are intended for operating and maintenance personnel and must be read, understood, and used by anyone performing the following work with or on the system:

- Transporting, installing and assembling;
- Operating,
- Retooling, servicing and maintenance.

Please pay particular attention to the following:

- The chapter on "safety"
- The warnings in the text of each chapter.

The operating instructions do not replace your **personal responsibility** as the operator and user of the system.

CAUTION!	
	These operating instructions must be read thoroughly and carefully before starting any work with or on the system, particularly before commissioning. The manufacturer accepts no liability for damage and malfunctions that result from the failure to follow the operating instructions.

We reserve the right to make technical changes to the product in the context of the improvement of the characteristics and the further development.

1.2. Warranty and liability

All information and instructions in this operation manual have been collected in accordance with the applicable regulations, the latest level of technical engineering development, and our years of experience and knowledge.

The translations of the operating instructions have also been prepared to best of our knowledge. However, we cannot accept liability for mistakes in the translations. The German version of these operating instructions as supplied is definitive.

The actual items supplied may vary from the information and drawings given here for special versions, if additional options are ordered, or if they are due to the latest technical changes. If you have any questions, please contact the manufacturer.

ALLGAIER provides a warranty and liability within the framework of product liability and statutory provisions. ALLGAIER excludes warranty and liability claims for personal injuries and material damage attributable to one or more of the following causes:

- Improper use of the system
[\(see also Chapter 2: Proper use\)](#)
- Operating the system when the safety device have not been properly installed or are not functional,
- Failure to follow the instructions, commands, and prohibitions in the operation and maintenance manual and on the system,
- Unauthorized modifications to the construction of the system,
- Inadequate monitoring of parts subject to wear;
- Maintenance and repair work not carried out correctly or on time.

Warranty claims with respect to the ALLGAIER scope of supply can be accepted only if the installation has been accepted as authorized by ALLGAIER Process Technology GmbH in conjunction with system commissioning.

Any defects discovered must be reported to the supplier immediately in writing. The buyer must provide the supplier with the opportunity to inspect and correct them within a reasonable time.

As an individual agreement between ALLGAIER Process Technology GmbH and Lund Hovedgaard AS, liability for consequential damages is expressly excluded. Consequential damages are those damages that do not affect the supplied product itself. Consequential damages include, for example, lack of economic success, damages due to the claims of third parties, forgone profits, loss of production and interest losses. This exclusion of liability remains valid even if the system operator is not the direct customer of ALLGAIER Process Technology GmbH.

1.3. Reference documents

Components from other manufacturers are installed in the system (e.g., drive motors). These bought-in assemblies have been subjected to risk assessments by their manufacturers. The manufacturers of the components have declared compliance of the designs with the applicable European and national regulations.

The declarations of these manufacturers according to the Machinery Directive (2006/11/EC) and the operating, maintenance, and repair instructions for the affected components are an inseparable part of this machine documentation. The instructions on safety, assembly and installation, operation, maintenance, disassembly and disposal found in the manufacturer's documents must be followed by the operating personnel without exception.

The instructions for the installed accessory and system parts are an inseparable part of these operating instructions.

1.4. Conventions for layout

1.4.1. Directions and instructions

Instructions that consist of individual action steps are marked as follows:

➤ Work step 1

The anticipated result or additional useful information is given after the series of operations:

➔ Result of series of operations, additional information where appropriate.

Instructions that consist of several action steps are numbered

1. Work step 1

2. Work step 2

➔ Additional information on the previous work step.

1.4.2. Lists

Lists without a compulsory order are represented as a list with bullet points (level 1) and dashes (level 2):

- Feature A
- Feature B
- Point A
- Point B

1.4.3. References

Titles of other passages in the text or references to these are underlined, e.g.: See [Chapter 3: Safety](#)

1.4.4. Symbols

Important or particularly useful information is highlighted using symbols to help the reader register it more quickly.

WARNING!	
	This symbol indicates a warning that absolutely must be followed. A detailed description of warnings can be found in Chapter 3.2: Meaning of warning notices, Page 6.

NOTICE!	
	This symbol indicates general notes. General notes include tips for use and particularly useful information, but not warnings of hazards.

2. PROPER USE

2.1. Intended use

The system is intended for processing the products listed in the chapter “Technical data”. The type of processing (e.g., drying, cooling, heating) is also described in [Chapter “Technical data”](#).

The operational safety of the system is guaranteed only for proper use in accordance with the information in the operating instructions.

Any other use of the system, or use exceeding this scope, is considered to be improper. Claims of any nature against the manufacturer and/or the manufacturer's representatives due to damage caused by improper use are excluded. The operator bears sole responsibility for damages resulting from improper use.

Proper use also includes exact compliance with maintenance and service instructions; see [Chapter “Servicing and maintenance”](#)

2.2. Possible misuse

The system must not be used to process materials that are ecologically harmful, explosive, poisonous, toxic, hazardous to health, or other than those listed in the specification. The only exceptions are machines that are specially conceived for the areas of applications listed above, where this has been confirmed to the operator in writing.

The design data listed in the [Chapter “Technical data”](#) must not be exceeded by the operator without written permission from the manufacturer.

Persons climbing onto the system, use of the system as a platform, or the use of the system or parts thereof for processing materials other than those listed in the specification are all forbidden.

2.3. Field of application

- Only for industrial use.
- Only in technically sound condition, with active, functional safety devices.
- Only in compliance with all operating conditions.

2.4. Operating conditions

See [Chapter “Technical data”](#)

2.5. Conversions and modifications

The only conversions and modifications to the system permitted are those described in these operating instructions.

Any other conversions and modifications to the system may be performed only with the written permission of ALLGAIER Process Technology GmbH, otherwise any warranty claims are null and void.

The following in particular are impermissible:

- Unauthorized conversion and modification to the system,
- Disassembling or disabling safety devices.
- Welding, including weld repairs, if electronic components are installed.

3. Safety

3.1. Introduction

The Safety chapter contains fundamental safety instructions and worker safety requirements for working with the system.

Compliance with all instructions listed in this chapter is a fundamental prerequisite for the safe use and trouble-free operation of this system.

3.2. Meaning of warning notices

The operating instructions contain warning notices that draw attention to potentially dangerous situations. The warning notices are given ahead of the work steps.

→ Read the warning notices carefully before carrying out the operation.

Failure to comply with these safety instructions can lead to severe personal injury—including death—as well as damage to equipment and the environment.

The warning notices are labeled with a pictogram. Underneath this pictogram there is a signal word indicating the seriousness of the hazard.

DANGER!	
	Immediate risk to life and health A pictogram accompanied by the word “DANGER” warns of an immediate risk to the life and health of a person. Failure to follow these safety instructions will lead to very severe injury, including death. → It is imperative that you follow the measures described to prevent these hazards.

WARNING!	
	Situation posing a risk to life and health A pictogram accompanied by the word “WARNING” warns of a situation that is potentially dangerous to the life and health of persons. Failure to follow these safety instructions can lead to very severe injury, including death. → It is imperative that you follow the measures described to prevent these hazards.

CAUTION!	
	Potentially hazardous situation or unsafe procedure A pictogram accompanied by the word “CAUTION” or “ATTENTION” warns of a situation that is potentially dangerous to the health of persons or that could cause property damage or ecological harm. Failure to follow these safety instructions can lead to injuries or property damage or ecological harm. ➔ It is imperative that you follow the measures described to prevent these hazards.

3.3. General notes

NOTICE!	
	Comply with the defined process parameters • The system is designed for the particular product to be heated up, with respect to the material, moisture content, grain size, throughput, fill level, processing times, amount of air, and temperatures. • The process data that have been defined and agreed to (see Technical Data) must be maintained, particularly with respect to the amount of air provided, temperature, etc., in order to maintain optimal economic operation of the system. • In order to prevent dust discharge from the system during operation, the heating unit may be used only while under pressure is present in the system.

3.4. Sources of danger

The system has undergone a hazard analysis. The design and implementation of the system is based on this analysis and incorporates the latest technology.

Nevertheless, there are residual risks.

3.4.1. Electricity

DANGER!	
	Electrical energy can cause severe injuries. Damaged insulation or individual components pose a risk of death due to electrical current. • All parts of the installation must be effectively grounded (resistance < 10⁻⁶ Ohm) by the customer or operator. • Use only original fuses with the prescribed current values. • Disconnect the machine immediately in case of a fault in the electrical power supply.

	• All work on electrical equipment must only be carried out by trained electricians. • Parts of the machine where inspection, maintenance, or repair work is being done must be disconnected from electrical sources. First check the disconnected parts to ensure they have zero voltage, then ground and short them and insulate any adjacent parts that are at non-zero voltage. • Moving system parts must be secured against restarting, particularly when performing inspections, maintenance, or repairs. Follow the motor manufacturer's operating instructions. • Check electrical equipment on a regular basis. Have deficiencies (e.g. loose connections, scorched cables) rectified immediately. • Prior to switching on, the equipment grounding conductor must be securely connected to all electrical equipment according to the connection diagram. • Operation is permitted only if the equipment grounding conductor is securely connected to the specified points on the components, even for brief measurement and testing purposes. • Before switching on, install the covers and guards provided to prevent contact with the devices. Before switching on the power, securely cover and protect parts that carry current in order to prevent contact. • Work required to be performed on parts and element that carry current may be done only in the presence of a second person who can cut off the power supply by actuating the emergency cutoff or the main disconnect switch. Cordon off working area using a red and white safety chain and a warning sign. Use only electrically insulated tools.
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3.4.2. Moving and driven components

WARNING!	
	Rotating and/or moving parts of the machine can capture and draw in parts of the body and cause life-threatening crushing and shearing injuries and broken bones • The operator must ensure that appropriate protective equipment is installed in order to prevent unauthorized access to the system. • Do not enter the system during operation. Maintain a minimum clearance of 1m = approx. 3 feet. • Prior to working on the system, switch it off and secure it against unauthorized starting. • Never touch moving and rotating parts or reach over them. • Do not keep any objects near moving parts of the system and components. • Ensure that all safety devices are functional. They must not be circumvented, removed or deactivated. • During operation there is a crushing hazard from the rotating parts.

3.4.3. Sources of heat-induced hazards

CAUTION!	
	The system heats up intensively when starting burners Accessible surfaces that heat up can cause burns. This hazard can also occur with insulated surfaces. The electric motors can also heat up to a temperature of 90°C. These temperatures can lead to burns to the skin with related injuries (e.g. infections). ➔ In accordance with the threshold values for burns in DIN EN 563 (Temperatures of touchable surfaces) and EN 292 (Safety of machinery), the operator must provide suitable safety measures to prevent or limit these risks. ➔ The operator must install appropriate access guarding or prohibit access to the system or parts of the system. ➔ Always wear suitable protective clothing (gloves and full arm covering) when carrying out work.

3.4.4. Emissions

EMC As stipulated in the EMC Directive and the applicable EMC standards for use in the industrial sector.

Sound pressure level (in accordance with DIN45635)

Emission value at the work area during nominal operation: LAeq < 85 dB

NOTICE!	
	The sound pressure level data refer to the system without heating material The actual noise emissions in the production environment depend greatly on the material being heated up and the size of the load. Noise reduction measures may therefore be required under the regulations in force at the installation site.

WARNING!	
	Risk of harm to the hearing Intensity and duration of the noise produced can cause serious harm to the hearing. It is recommended to use hearing protection!

3.4.5. Fire and explosion prevention

WARNING!	
	Certain heating materials tend to burn or explode under particular conditions. The system may be operated only with the data specific to the system. It must be ensured that no potential sources of ignition are introduced to the system. The system must be cleaned regularly and checked continuously to ensure that there is no buildup or caking of product or dust. All system components that come into contact with the product must be electrostatically grounded (grounding resistance $R < 106 \text{ Ohm}$, surface resistance $R < 109 \text{ Ohm}$). All measurement devices and electrical equipment in the product flow must be adapted to the requirements of the individual zones.

3.4.6. Resources and auxiliary materials

Resources and auxiliary materials such as oils, greases, cleaning agents and chemical substances represent a hazard to the environment.

Always read the manufacturer's instructions when using resources and auxiliary materials. In particular, observe the general safety instructions and the directions for disposing of the products in a safe and environmentally friendly manner.

3.4.7. Gas, heating oil, dust, steam, smoke

WARNING!	
	Danger of suffocation
	Combustion of the heating medium produces waste gases.
	→ Never operate the burner in an unventilated space.
	→ The operator must ensure that the burner is supplied with sufficient fresh, clean (dust-free) air.
	→ Preventive measures must be taken to ensure that the burner is shut off in case of dust evacuation or fan failure. This shutoff must be electronically protected in the burner power control system.

Any work required to be performed on gas and oil lines, gas and oil tanks, gas and oil fittings, and gas and oil burners during maintenance or repair may be performed only by technical personnel.

Welding, burning, and grinding work on the system may be performed only as explicitly instructed, due to the risk of explosion and fire.

Prior to performing welding, burning, and grinding work, the system and the environment must be cleaned of dust and other combustible substances; adequate ventilation of the building and property must also be ensured (risk of explosion).

3.4.8. Mobile machinery and equipment

When loading, all lifting gear and slings must have sufficient load capacity.

A competent supervisor must be named in support of lifting operations. Machinery and equipment may be lifted only by means of suitable lifting gear that meets the specifications, in accordance with the requirements in the operating instructions (attachment points for slings, etc.).

Only suitable means of transport with sufficient load capacity may be used. Loads must be securely attached at the attachment points provided.

Before or immediately after loading, the machine or system must be secured against unintended slippage by means of the recommended or supplied gear. An appropriate warning sign must also be attached to the machine or system.

Before the machine or system is restarted, these shipping restraints must be properly removed again.

All parts removed for transport must be carefully re-installed and attached prior to recommissioning of the machine or system.

Even if only slight changes in position are intended, the power supply to the machine or system must be disconnected. Properly reconnect the machine to the power supply prior to commissioning.

When recommissioning, the directions in the operating instructions must be followed.

3.5. Responsibility of the operator

These operating instructions and the operating instructions for the installed components must be stored in the immediate vicinity of the system, and must be accessible to the installation, operation, maintenance, and cleaning personnel at any times.

The system may be operated only when in technically sound and operationally safe condition. All safety devices must be accessible at all times and checked regularly to ensure they function properly.

The system may be operated only if all protective and safety equipment, such as removable safety devices, emergency stop equipment, noise protection elements, and exhaust systems are installed and fully functional.

Information about worker safety refers to the European Union regulations in force at the time of manufacture of the system. The operator is obligated to ensure that the worker safety measures indicated always comply with the current regulations throughout the entire service life of the system, and to comply with new regulations. Outside of the European Union, the worker safety laws and regional country specifications in force at the site of operation of the system must be followed.

In addition to the worker safety instructions in these operating instructions, the generally applicable safety and accident prevention regulations for the area of application and the applicable environmental regulations must be observed and followed.

The operator and authorized personnel are responsible for the trouble-free operation of the system and for clearly defining responsibilities during installation, operation, maintenance, and cleaning of the system.

The operating instructions must be followed completely and without exception. The operator must also ensure that

- Other hazards that may arise due to special working conditions at the site of operations are identified in a hazard analysis in accordance with worker safety laws.
- All additional directions and safety instructions that arise from the hazard analysis of the workstations on the system are summarized in an operating manual in accordance with the regulations on the use of production equipment.

Specific obligations on the operator

Under the EC “Machinery” directive and its national implementations, the operator / installer is solely responsible for testing (acceptance report).

The operator must ensure that hazards are labeled with safety labels at the workstation. The labeling, however, does not provide relief from the required protective measures as required in individual cases by the rules and regulations.

The operator is obligated to perform the following tasks at regular intervals - that is, at least semi-annually - in accordance with the local safety regulations, and to maintain documented evidence that they have been performed.

1. Check all safety equipment for correct condition, function and effectiveness.
2. Provide training on proper use as well as operation, maintenance, rectification of malfunctions and repair in accordance with the regulations for the related personnel.
3. Instruct operating personnel on the location, function, and use of the safety equipment and the wearing of personal protective equipment.

In addition, the operator must check daily for compliance with the safety instructions and work instructions from the operating procedure and these operating instructions.

When designing and assigning tasks to work areas, human abilities and limitations must be taken into consideration. The results of the work, resources, conduct and incorrect conduct of the personnel are to be monitored and regularly assessed by the operator. Furthermore, additions that contribute to safety such as ergonomic design, rectification of problems, concentration, isolation, time pressure etc. are to be derived and implemented in the work process.

The operator must set forth in an operating procedure that

- All functions in the safety chain for the control of the plant
- The installed safety modules
- The software used for controls

are checked at appropriate, regular intervals to ensure that they are technically sound and function reliably.

3.6. Operating personnel

The system may be operated and maintained only by authorized, trained, and instructed technical personnel.

An instructed person is a person who has been instructed about the tasks to be performed and possible hazards in the event of incorrect conduct, has the necessary knowledge and has been trained about the necessary safety devices and safety measures.

Technical personnel are those who can evaluate the work assigned to them and recognize potential hazards due to their technical education, knowledge, and experience, as well as knowledge of the applicable regulations.

If the personnel do not have the necessary knowledge, they are to be trained.

The system may be operated and maintained only by persons who perform their work reliably. No action may be taken that would compromise the safety of persons, the environment, or the system. Persons under the influence of drugs, alcohol, or medications that affect the ability to respond may not work on or with the system.

When selecting personnel, the regulations on age and occupation in force at the site of operations must be followed.

Responsibilities for operation and maintenance must be clearly defined so that there are no duties that are not clearly allocated.

The user must ensure that unauthorized persons are kept at a safe distance from the system.

The user is required to report to the operator immediately any changes to the system that may compromise safety.

3.7. Notes for the operating and maintenance personnel

All persons involved in the operation and maintenance of the drum heater must have read and understood the operating instructions, particularly the chapter on safety, prior to beginning work.

The following safety notices in particular are important for preventing personal injuries and material damage:

- Only work with a safe, functional system.
- Follow all safety instructions and hazard notices on the system.
- Keep unauthorized persons away from the system.
- Keep the emergency stop button and safety devices clear as well as access to and escape routes from these.
- Ensure that no persons will be endangered prior to starting the system, every time.
- Keep the system and the work area clean.
- In case of faults, stop the system immediately and report the fault to the responsible location. Have faults repaired immediately.
- Wear the requisite personal protective equipment for the respective activity.
- For overhead installation work, use safe and appropriate climbing equipment or scaffolding, as provided or from another source. Do not use machine parts as climbing aids. For maintenance work at greater heights, use fall protection.
- All handles, steps, platforms, landings, scaffolds, and ladders must be kept free of contaminants, snow, and ice.
- Prior to cleaning the system with water or steam jets (pressure washer) or other cleaning agents, cover or seal off all openings where water, steam, or cleaning agents must not be allowed to enter for safety and/or functional reasons. Electric motors and switch cabinets are particularly endangered.
- Remove the covers and seals completely after cleaning.
- Always tighten any bolted connections that have been loosened for maintenance and repair work.
- If safety equipment must be removed for setup, maintenance, and repair, the safety equipment must be re-installed and checked immediately after completing the maintenance and repair work.
- Ensure that operating and auxiliary materials and replacement parts are disposed of in a safe and environmentally friendly manner.
- After assembly, maintenance, or repair work has been completed, ensure that all tools and operating and auxiliary materials have been removed from the system.

3.8. Work safety

Following the safety instructions can prevent personal injury and equipment damage when working on the system. Failure to follow these instructions will lead to significant risk of personal injury and can lead to danger of damage to or destruction of the system.

Failure to comply with safety regulations will result in any and all claims of liability and damages against the manufacturer or its representatives to be null and void.

3.9. Personal protective equipment

Personal protective equipment must be worn during operation, maintenance, troubleshooting, fault correction, repair, and cleaning.

The operator must ensure that the required protective equipment is available to persons working on or with the system and is worn when the work is performed.

Users and technicians who work on or with the system are required to put on personal protective equipment prior to starting work and to wear it when working.

4. TECHNICAL DATA

4.1. Type plate

The type plate is mounted on the torque support of geared motor and contains:

- Information on the manufacturer
- Machine type
- Year of construction
- Manufacturer's order number

Rolling bed dryer	
Type: ALLGAIER WB-T 1.00-3.00	
construction year:	2012
machine no°:	363
order no°:	15862010
TAG-no°:	T100
design temperature:	140°C

ALLGAIER

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4.2. Product data

Description	Value	Unit
Product description	horse manure	
Particle size	approx. 10 mm max. 100 mm	
Feed moisture at design point	50	%
Medium residual moisture after dryer:	15	%
Bulk density wet	approx. 350	kg/m ³
Specific heat capacity of solids	design: 2,5	kJ/kg*K

4.3. Heater performance data

Description	Value	Unit
Heater model:	WB-T-1.00-3.00	
Heater style:	Design point horse manure	
Wet solid material input	nominal: 350	kg/h
Dry solid material output:	nominal: 200	kg/h
Max. air flow rate:	12.000	kg/h
Design air flow rate:	7.500	kg/h
Initial product moisture:	50,0	% H ₂ O
ambient product temperature:	+10	°C
ambient air temperature design:	+10	°C
Ambient air temperature:	0 - 35	°C
Product temperature after dryer:	approx. 60	°C
Exhaust air temperature:	approx. 55	°C

4.4. Consumption values (for normal operation)

Description	Value	Unit
Heater style:	Design point A	
Heating rate at design point:	250	kW
Installed electric heater power output:	250 kW (4 x 62,5)	kW
Heating medium:	Electricity	
Installed electrical power: (incl. further components)	approx. 310	kW

4.5. Technical data for designing the exhaust air cleaning

Description	Value	Unit
Amount of exhaust air (inclusive reserve):	6.000	Bm ³ /h
Nominal flange size on electric heater:	1.000 x 700	mm
Under pressure pressure at exhaust flange on heater:	approx. 2	mbar

4.6. Dimensions

See the applicable dimension sheet for exact dimensions and design of your system.

The dimension sheet is part of the documentation.

4.7. Foundation and steel support structure

The static and dynamic loads indicated in the dimensional drawing must be taken into consideration for a suitable foundation (concrete or steel structure).

The load values and dimensional drawings are part of the documentation.

The drawing numbers are:

- assembly drawing rolling bed dryer: 301 25 00054 Rev. 04

NOTICE!



Use only the latest version of the drawings. The latest applicable version may deviate from the information provided here.

NOTICE!



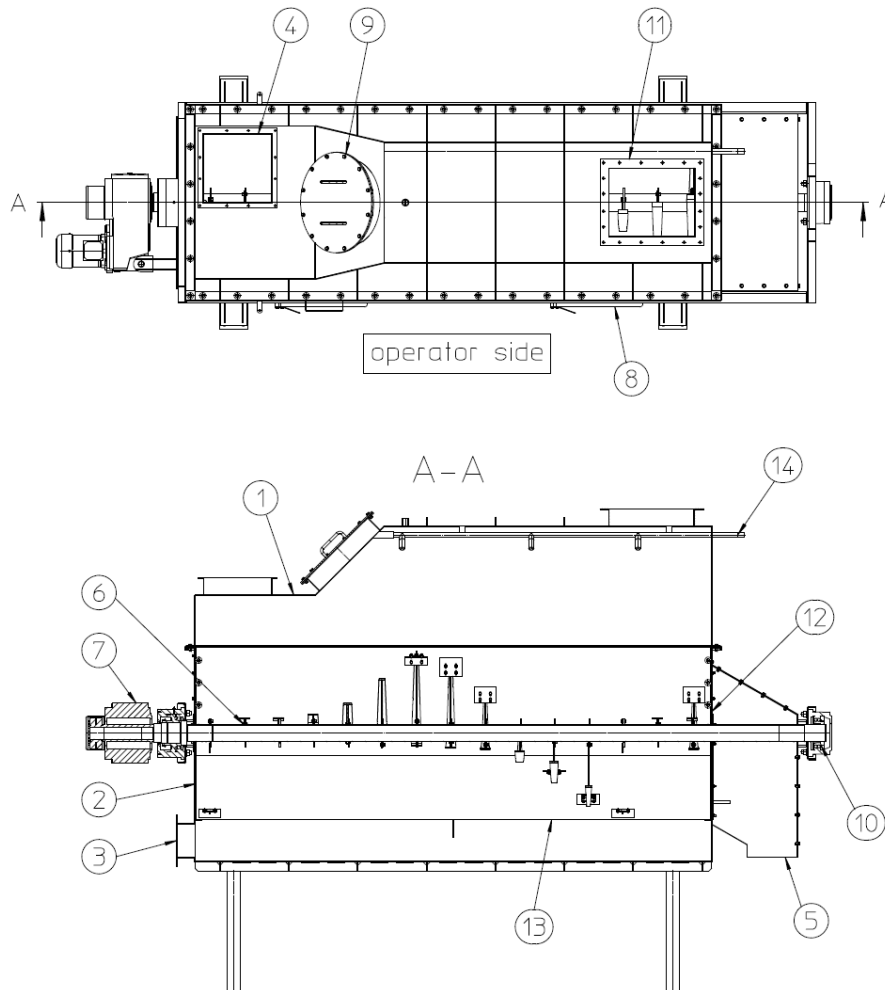
Wind, snow, and seismic loads are not included in the calculation.

- The foundation or steel structure must be secure and free of vibrations.
- Relatively weak residual dynamic forces may induce vibrations in steel structures that are not sufficiently secured, with negative effects on the system.
- The design and implementation of the foundation should be led by a structural or construction engineer.
- The dimension sheet contains only the minimum dimensions for support surfaces, and the connection dimensions for securing the system.
- For a steel support structure, class 8.8 connection bolts are required.
- Tightness of nuts must be checked with a torque wrench. Use self-locking nuts to prevent loosening.

5. DESIGN AND FUNCTION

5.1. Design

The following illustration shows a schematic view of the unit and does correspond to the system as delivered.



Item	Description	Item	Description
1	Housing top part	8	Inspection doors bottom part
2	Housing bottom part	9	Inspection opening top part
3	Connection flanges hot gas	10	Main bearings shaft
4	Material inlet flange	11	Suction flange
5	Material outfeed flange	12	Outfeed weir
6	Shaft with paddles	13	Perforated floor sections
7	Geared motor (main drive)	14	Quench water supply pipe

5.2. Brief description of the machine

The Rolling bed heater consists of the following:

Housing top part with measure connections for pressure and temperature and with 5 pcs. inspection doors with window, with suction flange for customer connection and inlet flange for infeed material.

Housing bottom part with 4 pcs. hot gas flanges, connection flanges to trough screw conveyors for fines, with 8 pcs. inspection doors (4 each side), with outfeed flange for accept material and measure connections for pressure and temperature, with lubrication nipple for middle bearing and with the outfeed weir which can be adjusted for the optimal material flow.

Perforated floor which divides material side from hot gas side, fines material can fall through.

Shaft with paddles for the transport/mixing of the material, with middle bearing to support the long paddle shaft and minimize bending from the shaft. Main bearing as roller bearing both sides.

Geared motor as main drive of the paddle shaft

Insulation complete by others

5.3. Functionality

5.3.1. General

The Rolling bed heater consists of a three-piece shaft which is equipped with 78 pcs. paddles with transportation tools for distributing and transporting the material to be heated up and dissolved. The rolling bed system is operated with a concurrent flow of material and hot gas. The perforated floor, installed in the bottom housing partitions the material flow from the hot gas, which comes into the heater with over pressure. This over pressure fluidizes the material flow, supports transportation and heats up the product flow. On the other hand fines material is able to slip through the openings of the perforated floor and drops into the trough of the screw conveyors. The screw conveyors transports the fine material into the rotary valves which encapsulates the over pressure zone from the subsequent "normal pressure" area.

The weir, at the end of the working zone, dams material and is foreseen to control the material flow height in the heater. This can be adjusted easily with bolted baffle plates which can be moved, added or removed to the needs of the technology.

NOTICE!



A precondition for proper operation of the heater is, that the heater will be fed with material uniformly, in accordance with the design data (quantity, moisture, grain size, etc.)

The material is fed continuously to the rolling bed heater and is deposited into the housing top part (1) at the material inlet flange (4) of the housing top part. Hot gas will be fed to the connection flanges (3) with over pressure which are attached to the housing bottom part (2) via a flanged connection (4x). The hot gas is required for heating and dissolving, therefore natural gas will be used on the customer's side. The under pressure, present in the rolling bed top housing, draws in the hot air flow on the top of the housing (14). The underpressure is generated by the fan (by others) of the dust removal system working in suction mode. The dust removal system separates the dust out of the exhaust air. The fluidized material is transported and mixed up by the paddle shaft to the material outfeed flange at the end of the heater. It exits the heater through the weir (15) either continuously through the material outfeed channel (7) or at minimized intervals according to the position of the baffle plates of the weir. All baffle plates are bolted and can be adjusted according the needs for technology in the start-up periode.

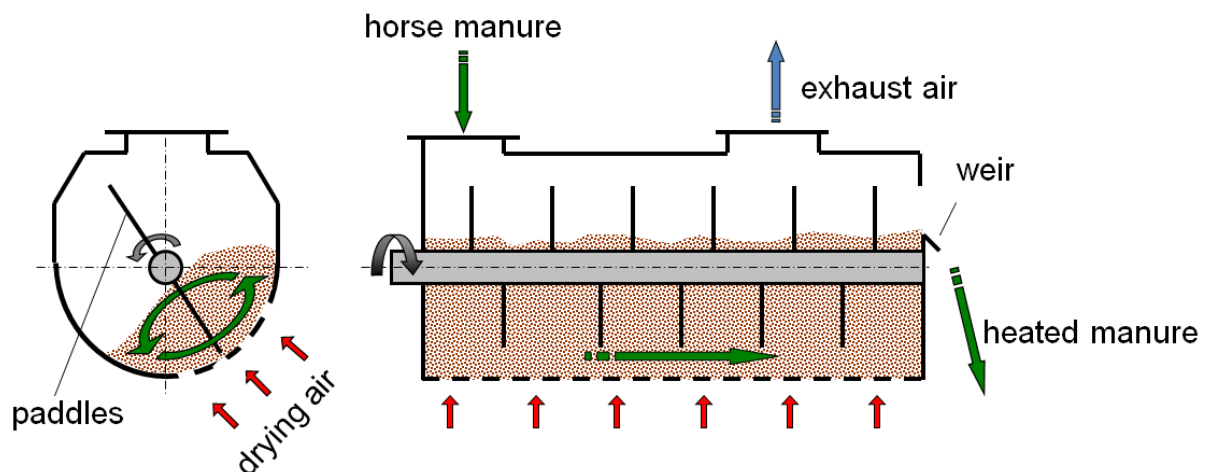
The rolling bed heater is equipped with two pendulum roller bearings (13) in stabile cast iron housings that rests on stabile consoles on the housing bottom part (2). Both main bearing (13) are fixed bearings, the roller bearing will be kept in place by means of fixing rings, both roller bearings are designed as self-aligning roller bearings. The shaft-halves expands during operation as it heats up. Both shaft parts are able to expands by means of 30 mm gap left and right-hand side of the middle bearing (12). The shaft ends are equipped with two fitting keys each side which can slide and transfer the torque of the geared motor to the paddle shaft (8).

The paddle shaft is driven by a geared motor (9) that is mounted directly on the drive shaft (shaft mount geared motor). The shaft rotates at a constant speed if the motor is started by using a frequency converter (by others). The drive is equipped with a variable frequency drive, the speed can be varied during operation. This affects the dwell time of the material in the rolling bed heater. The shaft speed should never be greater than 8 revolutions per minute.

The burner power is controlled by means of the exhaust air temperature (Burner system by others). Depending on the results of the heating and dissolving process, and considering the effects on upstream and downstream parts of the overall system, the exhaust air temperature can be adjusted.

The rolling bed heater is part of an overall system. Coordination of the individual units among each other, logical lockout of units in automatic mode, and regular maintenance and inspection with immediate correction of defects are all critical to the uninterrupted operation of the rolling bed system.

The following picture shows the *principle* of the Rolling Bed Heater:



WARNING!



- The maximum shaft speed of 7,9 (100 Hz) revolutions per minute must not be exceeded.
- A slight under pressure must always be present in the housing top part.
- The exhaust air temperature must not exceed the maximum permissible temperatures for the downstream unit.

5.3.2. Description of the overall process

The purpose of the installation is to heat up horse manure pieces directly by hot air.

The manure heater is called Rolling Bed Heater, hereinafter also called WB-T.

The manure is heated in a cross stream process using the WB-T Rolling Bed Unit. The horse manure is mechanically transported in the WB-T in a horizontal way. The manure pieces rest on a perforated plate. Additionally they are blended by an agitator (shaft with paddles).

The heating air is entering from the bottom, passing the perforated plate and flowing through the bulk of manure pieces upwards.

The heating air is taken in from the ambient, pre-heated in a electric heater. The process temperature is heated up by a electric heater. The heater shall be operated below 120°C inlet air temperature. The temperatures are controlled inclusive automatic shut off in case of high level.

The exhaust air is not returned to the inlet but cleaned and sent to the ambient. The heat recovery between hot exhaust air and cold ambient air is done indirect by the mentioned heat exchanger which allows a process without air recirculation.

5.3.3. Description of the manure heating process

5.3.3.1 Structure of the Manure Heater WB-T

Its structure from the bottom to the top is composed of

- bottom housing part for the heating air inlet, outlet sections for accept material and fines.
- perforated plate where the manure pieces rest on,
- slowly turning paddle shaft with 15 pcs. paddles and tools (approx. 4-6 rpm),
- the heater top housing part inclusive air outlet flange and opening for manure feed

5.3.3.2. Heating process

The shredded manure pieces are mechanically mixed by the paddle shaft and kept in motion. Heating air is crossing the bulk of manure pieces from the bottom to the top. By direct contact between the heating air and the manure the heat exchange takes place and the manure heats up. For that heating process approx. 7.500 kg/h (design air flow rate) of air will be used. In order to heat that air up, The electric heater of min. 250 kW is needed.

5.3.3.3. Safety aspects WB-T

Regarding accumulation of natural gas in the heater unit the following aspects are beneficially in comparison to other ovens:

- high air flow volume
- high dilution of the natural gas by the air flow volume
- heating air used only once - no air recirculation

5.3.4. In application

DANGER!	
	The system is <u>not</u> suitable for treating explosive or flammable materials.

The rolling bed heater is matched to the continuously fed product to be heated up, with respect to moisture, throughput, air volumes, and dwell times.

DANGER!	
	• Entering of the heater during operation is strictly forbidden. • Entering of the heater during downtime is strictly forbidden. • During heater operation, it is strictly forbidden to keep the inspection- and maintenance- door(s) opened ! All inspection doors must be secured with padlocks

NOTICE!	
	The descriptions in Chapters 5.3.3 to 5.38 below, assume a typical standard design and may differ from the situation at hand. The documentation for this particular case, such as the P&ID, functional description, etc. must be consulted.

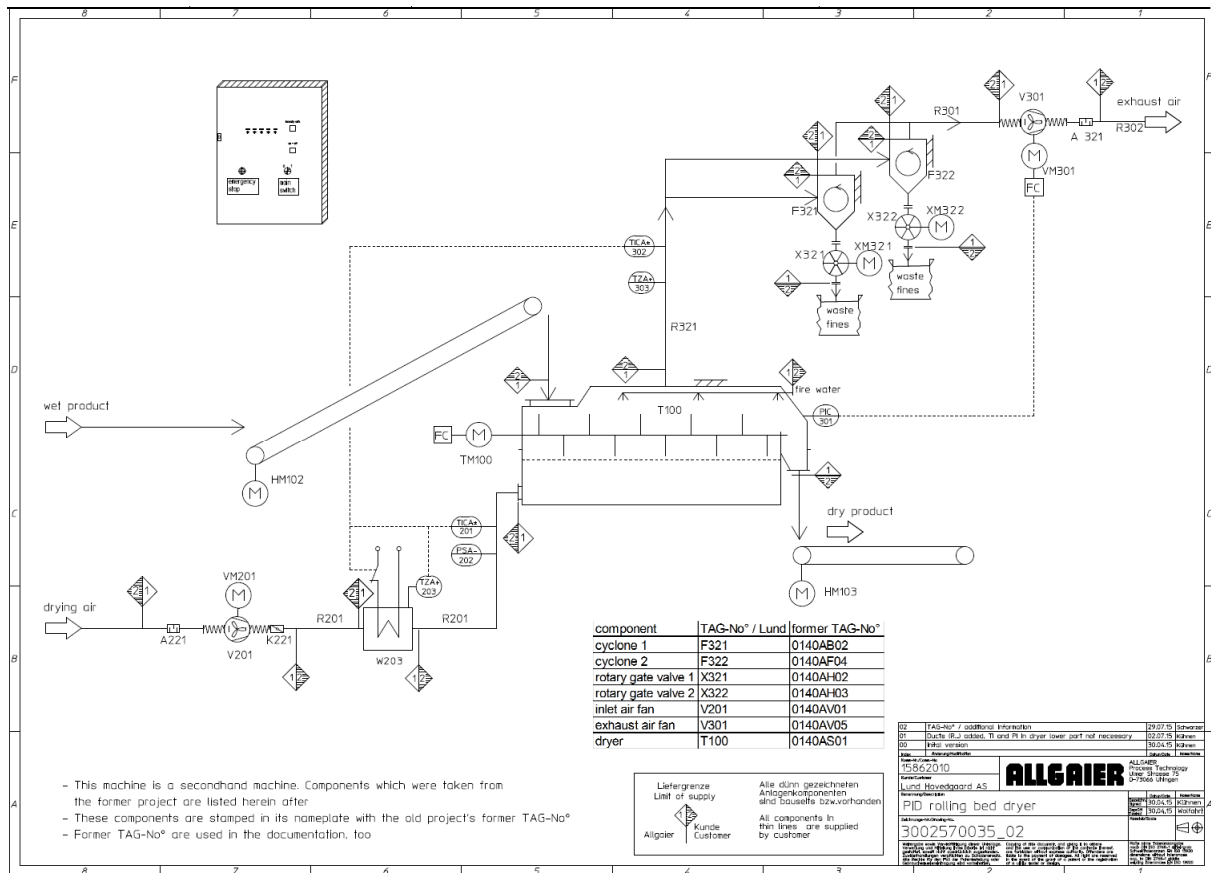


Fig.: Flow diagram of the actual heating system with gas burners and cyclones

5.3.5. Inlet air preparation

The air volume required for the heating process is drawn in from outside.

5.3.6. Damp material infeed

The chopped manure is fed into the heater via conveyor system (by customer).

5.3.7. Product discharge and exhaust ducting

Completely supplied by others.

5.3.8. Air ductwork

Completely supplied by others

5.3.9. I&C Equipment (Indication and Control Equipment)

Completely supplied by others.

5.3.10. Control system

Completely supplied by others

5.3.11. Insulation of the heater

Completely supplied by others

6. TRANSPORT, PACKAGING AND ASSEMBLY

6.1. Transporting the system

6.1.1. Safety instructions

Lifting gear or loading equipment with insufficient load capacity can cause the system to fall.

DANGER!	
	Danger of death from heavy falling loads! • Never walk underneath suspended loads. • Observe a sufficient safety distance (at least twice the machine height) due to risk of tipping. • Only use lifting equipment and load-carrying equipment with a sufficient load capacity. • Transport loads as close to the ground as possible. • When transporting with a crane, or fork-lift truck, make sure, that the load is distributed evenly.

6.1.2. Moving and lifting the system

The system is delivered in individual, unassembled sections and is not ready for operation until the various units have been assembled.

Moving the system to the installation site

- The heater can be moved on site by truck. The placement should be done by two cranes onto the heater steelwork.
- Sufficient lifting eyes on the housing bottom part are available, two each side.
- The top part can be lifted by means of installed transverse pipes. The lifting devices (chain or belts) must be placed at the outside of the pipes next to the flanges and sheet metal walls!
- When using lifting equipment, all typical safety measures for preventing accidents must be taken.
- Local regulations must be observed and followed.

Rolling Bed Heater

NOTICE!



Following the transport drawing sketch:

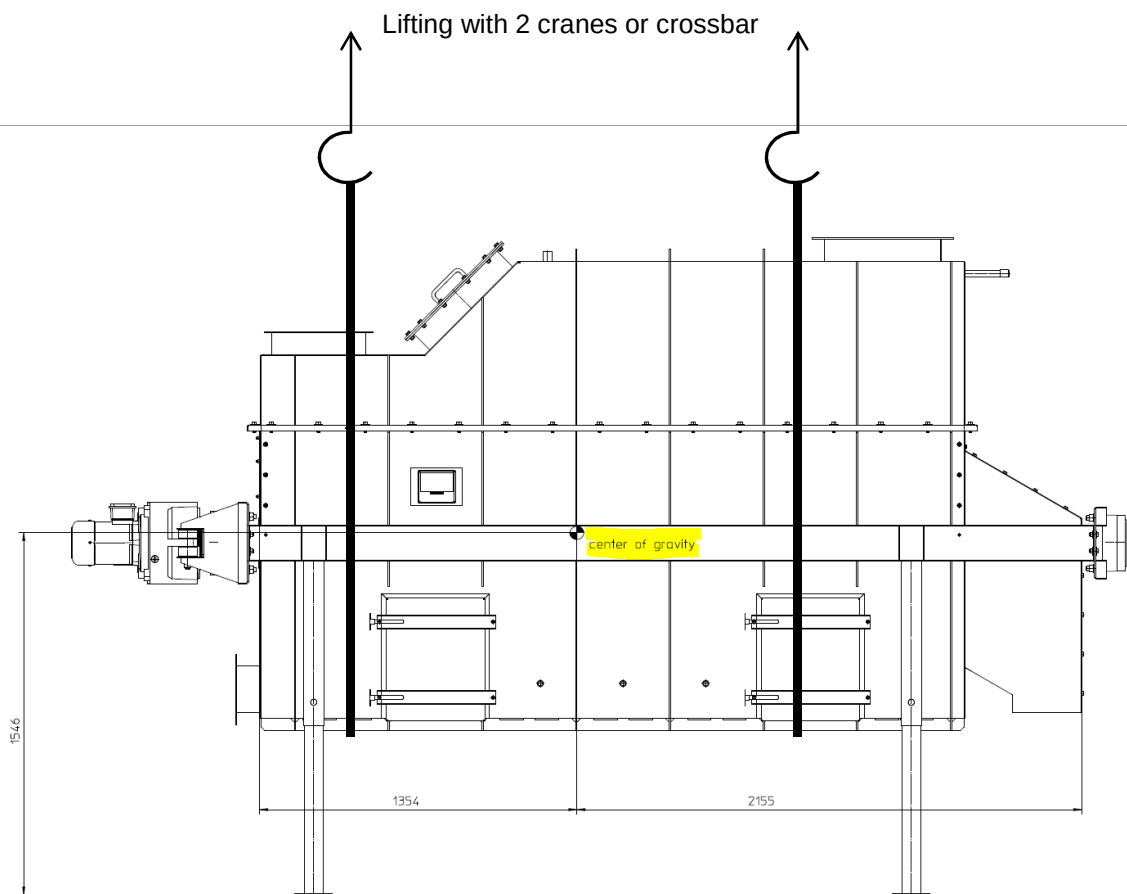


Fig.: Transportation sketch for Rolling bed dryer

Accessories

Lifting of geared motor, trough screw conveyors and rotary valves please see separate Technical documentation of the manufacturer.

NOTICE!



Dimensions and weights of the individual sub-assemblies can be taken from the packing list.

6.1.3. Packaging

The packaging material consists of wood, cardboard, and possibly plastic foil.

NOTICE!



Always dispose of the packaging materials with due care for the protection of the environment and in accordance with the applicable local regulations on disposal. Engage a recycling service provider if necessary. Packaging materials are valuable raw materials and can often be reused or sensibly processed and recycled.

6.2. Installing and assembling the system

6.2.1. Foreword to assembly

These installation instructions apply to rolling bed heaters.

The description shows one possibility for assembling the system. The sequence can and must be adapted to the building and other conditions at the time of assembly.

NOTICE!	
	The system construction, as described below, shows a typical application with respect to the system component descriptions. This application does not, however, have to match the current system in addition, all of the system components described are not necessarily within the ALLGAIER scope of supply. If anything about the assembly is incomprehensible, consult the manufacturer.

6.2.2. Requirements for assembly

In order to complete the installation of the system quickly and successfully, it is important that:

- The installation site is free accessible,
- The foundation and steelwork are prepared and the dimensions and connections have been checked,
- Lifting gear of sufficient rating is available, along with suitable slings,
- Tools, auxiliary materials for installation and material required for assembly are on hand and any required scaffolding has been set up,
- Reliable structural installers are available or have been requested,
- Machinery and equipment have been completely delivered and are available at the installation site,
- Installation instructions are followed.

6.2.3. General information about assembly

1. Prior to beginning the installation work, check the packing list to ensure that all parts have been delivered. If there are parts missing, report them to the supplier immediately.
2. A prerequisite for assembly is that the steelwork is available for installation, that the dimensions of the foundation or steel structure meet the requirements in the foundation and installation drawing, and that there are no impermissible differences present.

3. All described components must be transported to the location and site, installed and assembled and ready to operate, including attachment or anchoring to the floor or steel construction. The installation must be **“stress-free”**, using shims if required. All contact points must be bolted to the foundation or the steel construction without stresses.
4. The installation and assembly specifications from the component suppliers must be followed.
5. Any additional attachments of measurement devices or distributors on the various components that may be required are performed at site.
6. All bolted stainless steel connections must be greased with a suitable lubricating grease (white ceramic paste, such as CHETRA AS.FM) in order to prevent seizing of the parts.
7. Flange connections must be sealed off all around their circumference.).

6.2.4. Suggested sequence of assembly

NOTICE!	
	For the assembly of the heater, we recommend to engage the ALLGAIER supervisor, because of the complexity of the plant system.

1. Delivery and erection of the heater bottom part in steelwork
2. Erection of the geared motor
3. Erection of the housing top part
4. Erection of the trough screw conveyors
5. Erection of the rotary valves
6. Connection to the site medias: gas, oil, compressed air
7. Placing the measurement equipment
8. Connection hot gas supply, outfeed conveyor, infeed conveyor, suction head and outfeed conveyor fines material.
9. Electrical assembly and wiring of the system components and measurement devices
10. Erection of the insulation (by customer)

NOTICE!



This is only a suggestion for assembling the system and must be completed by the customer and the construction supervisor. System components that are not part of the scope of supply of ALLGAIER Process Technology GmbH, Germany are not addressed. They must be incorporated into the assembly sequence in a sensible manner. This must be determined, however, by the operator or the overall construction site manager.

NOTICE!



The assembly and installation instructions for all system components must be followed at all times. Particularly when components from sub-suppliers are involved.

6.3. Additional information for assembling the rolling bed heater

The assembly sequence for a rolling bed heater is described step by step below. If there are deviations between the current product and the description, or if there are any questions, please consult the contact person named in the "Service" chapter.

For better understanding of the assembly described below, various assembly drawings from the documentation are included, which should be consulted for the individual assembly steps.

6.3.1. Rolling bed heater assembly

1. Prior to starting installation, the completeness of the parts supplied should be checked against the packing and shipping list. If parts are missing, provide a claim to the delivery service immediately.
2. Measure the foundation or steel substructure according to the dimensions in the enclosed assembly drawing.
3. Mark the location of the heater axis and the position of the consoles in the steel substructure.
4. Set the bottom part of housing on the steelwork and put the screws in the bores of the consoles. If necessary adjust consoles, then mount nuts and washers and tighten it.
5. Mount the geared motor acc. separate Technical documentation of the manufacturer
6. Mount sealing strips to connection flange of bottom housing part to top part. Put two sealing strips both sides of bores all around without any interruption.
7. Set top part of housing in place with correct direction. Put all screws, nuts and washers in place and tighten it.
8. All further erection work is out of the scope of supply by ALLGAIER.

WARNING!



Oil- and gas-trains should only be connected to the oil- or gas- network by educated and authorized personnel !

6.3.2. Installing the drive for the paddle shaft with shaft-mounted gearbox:

NOTICE!	
	See chapter 5 "Installation / Erection" page 32 In the Erection and maintenance description from NORD.

6.3.3. Installing the temperature measurement devices:

NOTICE!	
	Temperature measurement devices are supplied by others

DANGER!	
	Danger of electrocution! Work performed incorrectly on the electrical equipment could cause life-threatening injuries, possibly even death. Only trained electricians who have been authorized by the operator may perform work on the electrical systems.

6.4. Tightening torques for bolts

The entries in Table 1 and 2 are based on an assumed coefficient of friction $m=0.12$, typical for commercial bolts with no special surface treatment.

The initial tightening force is based on maximum utilization of the elastic or 0.2% strain limit of 90%, wherein the permissible display error for the torque wrench must also be taken into consideration.

The table values are not applicable for bolted connections to a strain shaft.

Table 1: Pretensioning forces and tightening torques for regular metric threads

Strength class according to DIN EN 20898 Part 1

Thread	Pretensioning force F_V in N					Tightening torque M_A in Nm				
	5.6	8.8	10.9	A2 ¹⁾	A4 ²⁾	5.6	8.8	10.9	A2 ¹⁾	A4 ²⁾
M 6	6030	12864	18894	4020	4221	6	13	18	4	4
M 8	10980	23424	34404	7320	7686	14	30	44	9	9
M 10	12200	26000	38200	8120	8526	21	44	64	14	14
M 12	17600	37600	55300	11760	12348	35	75	110	24	25
M 16	33000	70300	103500	21980	23079	85	180	265	57	59
M 20	51500	113000	161000	34300	36015	165	360	520	110	115
M 22	63600	140000	199500	42420	44541	220	485	690	147	154
M 24	74100	163000	232500	49420	51891	285	630	690	189	199
M 27	96400	212000	302000	64260	67473	415	910	1300	277	291
M 30	118000	259000	369000	78540	82467	570	1250	1800	378	397
M 33	146000	321000	457000	97200	102060	760	1700	2400	506	533
M 36	172000	377000	538000	114380	120099	980	2150	3100	655	687
M 39	205000	451000	642000	136640	143472	1250	2800	3950	844	886
M 42	235000	517000	737000	156800	164640	1550	3150	4900	1046	1098
M 45	273000	601000	855000	182000	191100	1950	4300	6100	1296	1361
M 48	309000	679000	967000	205800	216090	2400	5200	7400	1576	1655
M 52	370000	813000	1160000	246400	258720	3000	6700	9500	2020	2121

1) per DIN ISO 3506 similar to 1.4541

2) per DIN ISO 3506 similar to 1.4571

Table 2: Pretensioning forces and tightening torques for UNC and 8UN threads

Strength class according to DIN EN 20898 Part 1

Thread	Pretensioning force F_V in N					Tightening torque M_A in Nm				
	5.6	8.8	10.9	321 ¹⁾	316 L ²⁾	5.6	8.8	10.9	321 ¹⁾	316 L ²⁾
½-13 UNC	19110	42042	59878	13200	10829	42	93	133	29	24
5/8-11UNC	30660	67452	96068	21150	17374	83	183	260	57	47
¾-10 UNC	45150	99330	141470	31150	25585	144	317	452	100	82
7/8-9 UNC	62580	137676	196084	43200	35462	230	506	721	160	130
1 – 8 UNC	82110	180642	257278	56650	46529	342	752	1072	235	194
1 1/8-8 UN	107100	235620	335580	73900	60690	495	1088	1550	340	280
1 1/4-8 UN	135450	297990	424410	93500	76755	687	1512	2154	470	389
1 3/8-8 UN	166950	367290	523110	115200	94605	921	2026	2886	640	522
1 ½-8 UN	202230	444906	633654	139500	114597	1206	2653	3778	830	683
1 5/8-8 UN	241080	530376	755384	166350	136612	1551	3412	4860	1070	879
1 ¾-8 UN	281820	620004	883036	194450	159698	1938	4264	6072	1340	1098
1 7/8-8UN	326550	718410	1023190	225300	185045	2397	5273	7510	1650	1358
2 – 8 UN	375270	825594	1175846	258900	212653	2919	6422	9146	2010	1654

1) per ASTM A 182 similar to 1.4541

2) per ASTM A 182 similar to 1.4571

6.5. Final work

- After assembly, minor mechanical damage to the system components and pipework must be repaired. Surfaces of normal steel components that require repair must be primed (coating thickness 40 µm) and finish painted with alkyd resin paint.
- Use a torque wrench to check that all mounting bolts and nuts have been tightened (see attached list of required tightening torques).

6.6. Complete electrical connections

Electrical connections and installation must be performed in accordance with local regulations.

DANGER!	
	Danger of electrocution! Work performed incorrectly on the electrical equipment could cause life-threatening injuries, possibly even death. Only trained electricians who have been authorized by the operator may perform work on the electrical systems.

NOTICE!	
	The data on the (motor) rating plate apply for electrical connections.

7. COMMISSIONING AND OPERATION

7.1. General

Before commissioning the system, ensure the following:

- The temperature sensors in the housing bottom part and top part must be arranged so that the measured values are not distorted by air turbulence or other influences. The sensors must be mounted with thread sealing and have to be tight.
- all inspection doors are closed and secured with padlocks. All star knob nuts on the doors are pulled tight
- inspection door in outlet channel is closed and all screws are pulled tight.

Prior to initial commissioning, check the following:

- Oil levels in the gearmotors have been checked according to the corresponding operation manuals of the manufacturer
- No foreign objects are present inside the heater housing (garbage, waste material, tools, etc.)
- All shipping safety locks have been removed.
- All screwed connections have been tightened.
- The cleaning openings, inspection windows and access openings are closed.
- The devices for infeed and discharge are functional.
- All measurement and control devices are connected and functional.
- Check the direction of rotation of the motors and correct if necessary.
- Tighten bolts on the consoles to steelwork.

7.2. Requirements for commissioning

- Assembly of the entire system is complete.
- Electrical installation of the entire system is complete.
- Functional tests and manual operation of all motors were successful.
- Signal exchange and circuit breakers between local electrical enclosures (such as the electrical enclosure) and the main control system must be installed and checked (functional test).
- Fuel, electrical power, compressed air, and the material to be heated up are available for the entire commissioning period.
- Sufficient storage capacity is available for the heated material. Continuous operation of the heater system during commissioning is thus ensured.
- Operating personnel are available.

7.3. Starting the heater system

NOTICE!	
	- Initial commissioning should be performed without loading product in order to check the heater for proper functionality. - Operating data for inlet and exhaust air and temperature must be adhered to. - No changes may be made to the min / max settings for the speed of the drive unit without prior consultation with ALLGAIER.

7.3.1. Steps to be performed before the heater system is started:

- Direction of rotation test: All motors must be checked for correct direction of rotation.
- Signal tests: All measurement equipment must be checked for correct signal processing.
- Electrical connections: Check all electrical connections (see electrical connection list).
- Start and stop list: Check sequence using the start and stop list.
- The spark detector and extinguishing system (if present) have been commissioned by a technician.
- The explosion suppression system (if present) has been commissioned by a technician.
- Test all control loops and safety devices associated with temperature, volume flow rate, flow speed, and pressure.
- 1. First product run

7.3.2. Automatic system start:

Because each system is individually matched to the product and to the periphery, there is no single sequence for the starting procedure that applies to all cases.

This can be found in the Start and Stop List that has been individually created for this system, which is part of the documentation.

WARNING!	
	Risk of burns! - The system has finished heating up when the exhaust gas temperature in the exhaust gas line has reached the temperature that was preselected on the burner regulator (target value at the burner output controller). - The specific value is 160°C, depending on the properties of the material to be heated up.

	• Do not exceed the temperature limits of downstream systems (such as the dust filter system).
--	--

NOTICE!	
	• The heater must be fed uniformly and continuously. If the heater system is being fed excessively, the product infeed must be throttled back or shut off completely, the drive speed must be reduced and thus the dwell time increased and the heater must be run to empty. • Follow the start / stop list. • Follow the permissible quantities and moisture content for the heater.

7.4. Starting the heater system

As with the automatic system start, the stop procedure is set up individually for each system.
The exact sequence can be found in the Start and Stop List, which is part of this documentation.

NOTICE!	
	Check all bolted connections again after commissioning. Check all flange connections for leak tightness.

8. TAKING OUT OF OPERATION

8.1. Storage

When storing components, care must be taken to ensure that they are not directly exposed to weather effects. This is especially important for machinery components.

For storage or transport lasting longer than 6 months, additional measures for protection and preservation are normally required.

Machine components with rolling bearings (such as drives) must be stored in a dry, frost-free space. Bearings must be rotated by hand every 3 to 6 months in order to ensure uniform grease distribution.

8.2. Long-term storage

Longer-term protection and preservation measures will help maintain the quality and functionality of systems, subassemblies, and components.

The period for which protection must be guaranteed, the type of parts to be protected, the storage location (physical and climatic effects), duration and location of execution, and actions and procedures

- During delivery,
- In the storage environment,
- In the fully assembled state,
- After commissioning,
- And during longer interruptions in operation

determine the type of measures and how they are to be implemented.

The manufacturer's information, even for similar components (such as gearboxes), can be very different from manufacturer to manufacturer, such as for the time periods indicated:

- Up to 3 months,
- 6 - 12 months.
- 12 - 24 months.
- 24 - 36 months.

Because the effective influences very much depend on the local conditions, the measures listed below must be considered as guidelines only. The specifications of each manufacturer of specific components will always override any others. In any case, the paint and coatings used as corrosion protection should be checked and repaired if needed.

Electric motors

Sealing plugs and junction boxes must be checked for damage and secure fit. The entire motor must be stored in a housing to protect it against moisture and aggressive dust.

In order to prevent changes to the lubricant properties, the motor must be rotated by hand every 3 to 6 months, so that the bearing grease does not stick in one place and can be uniformly distributed.

Gearmotors

The values listed under [“Electric motors”](#) must be maintained for all gearmotors. Depending on the design and the lubricant requirements, the gearboxes must be partially or completely filled with internal preservative agents.

Gearbox shafts must be rotated manually every 3 to 6 months. Where needed, any vent plugs that are already installed must be replaced with solid threaded plugs.

Couplings

For flexible couplings of normal design, the flexible elements must be protected.

For hydraulic couplings, which are normally not filled with oil when delivered, the test oil may be used as a basic preservative for up to 6 months, for example. Beyond that, additional special measures may be required.

Rolling bearings

The specifications in the [“Electric motors”](#) section apply for bearings with rolling elements. They should also be rotated manually every 3 to 6 months.

Electrical components

Electrical components must be stored in a housing to protect them against moisture, frost, and aggressive dust.

Heater parts

All parts must fundamentally be checked for shipping and surface damage and the paint or coating for corrosion protection must be repaired if needed.

All heater components must be stored on a stable foundation. A storage location with a roof is recommended, but at least a waterproof cover is required.

Small parts such as assembly materials, accessories, burners, burner accessories, and valves must be stored in a dry space, protected against frost.

9. Malfunctions

The heater is designed and tuned as a complete unit. Changes in construction without the knowledge of ALLGAIER Process Technology GmbH are not permitted, because such measures can degrade the function and safety of the system.

Warranty claims for damage due to improper use cannot be accepted.

NOTICE!



Complete compliance with the maintenance instructions is fundamental to good system availability.

DANGER!



Risk of injury from rotating and hot machinery components

Moving and hot machinery components can cause severe injuries.

→ Clear faults only when the system is switched off and secured against restarting.

Fault	Possible cause	Remedy
Paddle shaft does not rotate	• No voltage present • Fuse defective • Motor defective • Shrink disc loose • Controller defective • Control power circuit interrupted	• Close power circuit • Replace • Replace • Tighten screws • Replace • Find contact interruption, switch on and enable controller
Material is too hot or too cold (risk of fire in the heater)	• Burner controls incorrect or defective • Motor speed too high or too low • Inlet quantity too high or too low • Control system not working • Material backup due to baked-on residue • Worn or defective tools • Exhaust gas temperature too high or too low	• See burner manufacturer, replace if needed • Check and adjust motor controller • Check and correct • Check temperature probes and burner controller • Check inlet moisture • Replace tools • Readjust
No material transport	• paddle shaft stopped • shaft rotation direction incorrect • Inlet conveyor out of service • Tools worn out • backup at the weir	• See paddle shaft does not rotate • Change polarity on drive motor • See manufacturer's doc. • Replace • Unjam or replace, Adjust amount and position of baffle plates
Dust escaping from the system	• door seal broken or worn out • under pressure too low • No under pressure present	• Adjust or replace • check exhaust air fan acc. manufacturer's doc. • check exhaust air fan acc. manufacturer's doc.

	• inlet pressure too high • main shaft sealing worn out • shaft sealing screw conveyor untight • shaft sealing rotary valve untight	• check fans on pressure side • replace or adjust if possible • replace or adjust • replace or adjust
Running noise too loud	• Main bearing defective • paddle bended, scrapped on the inside walls • Middle bearing worn out • Vibrations in the steel substructure	• Replace and adjust • Replace or repair • Replace slide bearing shell • Tighten bolts
Process temperature not reached	• Malfunction of one or more system components	• Check the burner(s) • Check the inlet air volume, heating, inlet fan(s)
No or less fines discharge	• perforated plates clogged • rotary valve defective • Discharge screw defective	• system shut-down, clean with high-pressure cleaner or scraper from inside the heater underneath the perforated floor (first cool down heater) • check function of the valve acc. manufacturer's spec • check function of the screw conveyor(s) acc. manufacturer's spec

Table: Malfunctions

10. SERVICING AND MAINTENANCE

10.1. Safety

Servicing and maintenance work requires greater skill and care on the part of the personnel carrying out the work compared to normal operation.

WARNING!	
	Danger of injury if work is not carried out correctly! Servicing and maintenance of the system by personnel who are not sufficiently qualified leads to incalculable risks, with negative consequences for persons, the system, and the environment. ➔ Servicing and maintenance work must be performed only by trained, instructed technical personnel who are authorized by the operator. ➔ Work on the electrical system must be performed only by experienced technicians who are authorized by the operator.

WARNING!	
	Risk of injury from moving parts and hot surfaces! Servicing and maintenance work on the system must be performed only after it has been switched off and cooled down. ➔ Switch off the system. ➔ Lock out the main controller and remove the starting key, and/or ➔ Attach a warning sign to the main disconnect switch. ➔ Allow the system to cool down.

WARNING!	
	Risk of injury! ➔ The system must be secured against restarting the drive, the heating system, and the fan(s) whenever maintenance work and inspection is being performed. ➔ If the drive unit is switched off and electrically secured, the heater must also be mechanically secured to prevent rotation. ➔ Entry into the heater is permitted only after its safe condition, particularly with respect to the internal atmosphere, has been clarified and documented—authorization to enter. ➔ The directive BGR 117 April 2004 Working in Tanks must be applied without restriction.

NOTICE!



The user is completely responsible for ensuring that all local directives and regulations with respect to working in closed housings are carefully complied with.

Please note and ensure:

It's strictly forbidden to climb inside the housing via inspection doors in the top part (doors with windows), these inspection doors can be opened if the system is shut-down for visual inspection or from there it is possible to dissolve backups by means of hand tools with long arms or handles!

Change of paddles and/or middle bearing is possible when lifting up the top part. Do not climb into the machine over the shaft and paddles! Use adequate scaffolding next to the heater housing to have access to the shaft paddles. It is too dangerous work within this machine onto the shaft!

It is possible to enter the heater underneath des perforated floor by means of 4 inspection doors each side. Please ensure, that the system is shut down and the heater is cooled down. Do not stand into the screw conveyor (use wooden board), the screw conveyors must be secured from restart.

DANGER!



Risk of injury due to falling suspended loads

- ➔ If individual parts or larger subassemblies must be replaced, they must be carefully attached and secured with slings in order to avoid the risk of an accident. Only suitable and technically sound vertical conveyor and load handling devices with sufficient load ratings may be used.
- ➔ Do not step under lifted load.
- ➔ Attachment of loads and instruction of crane operators must be performed only by experienced and skilled personal. The supervisor providing the instructions must be within visual and hearing range of the user.
- ➔ For overhead work, specially made ladders and scaffolds, or those that otherwise meet the safety requirements, must be used. Machine components must never be used as climbing aids.

	➔ A safety harness must be worn for maintenance work at great heights.
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- All handles, steps, platforms, landings, scaffolds, and ladders must be kept free of contaminants, snow, and ice.
- Before cleaning the system with water, high-pressure cleaners, or cleaning agents, all openings that must be protected against the entry of water, steam, or cleaning agents must be sealed off with adhesive tape or covered. Special care is needed for electric motors and electrical enclosures.
- It must be ensured that sensors in the fire detection and fire suppression systems do not come into contact with hot cleaning agents, as this could cause the fire suppression system to be tripped.
- All adhesive strips and covers installed for this purpose must be removed after cleaning.
- Bolted connections that are removed for maintenance and repair work must always be retightened.
- All safety devices that were removed for the purpose of installation, maintenance, or repair work must be replaced and checked immediately upon completion of the work.
- It must be ensured that all consumable materials and replaced parts are disposed of safely and with the least possible effect on the environment.
- Oils, greases, and other chemical substances: Follow all product-specific safety requirements when using oils, greases, and other chemical substances.

WARNING!	
	• Only use original spare parts from ALLGAIER or from suppliers recommended by ALLGAIER. • Use only auxiliary, operating, and cleaning materials that have been approved for this purpose by ALLGAIER. Follow the manufacturer's directions for disposal. • Only use tools and tool accessories designated for the servicing and maintenance work by ALLGAIER. • Perform welding, burning, and grinding work on the system only if this is expressly approved. There is a risk of fire and explosion.

NOTICE!



[See Chapter 6.2.8 for bolt tightening torques](#)

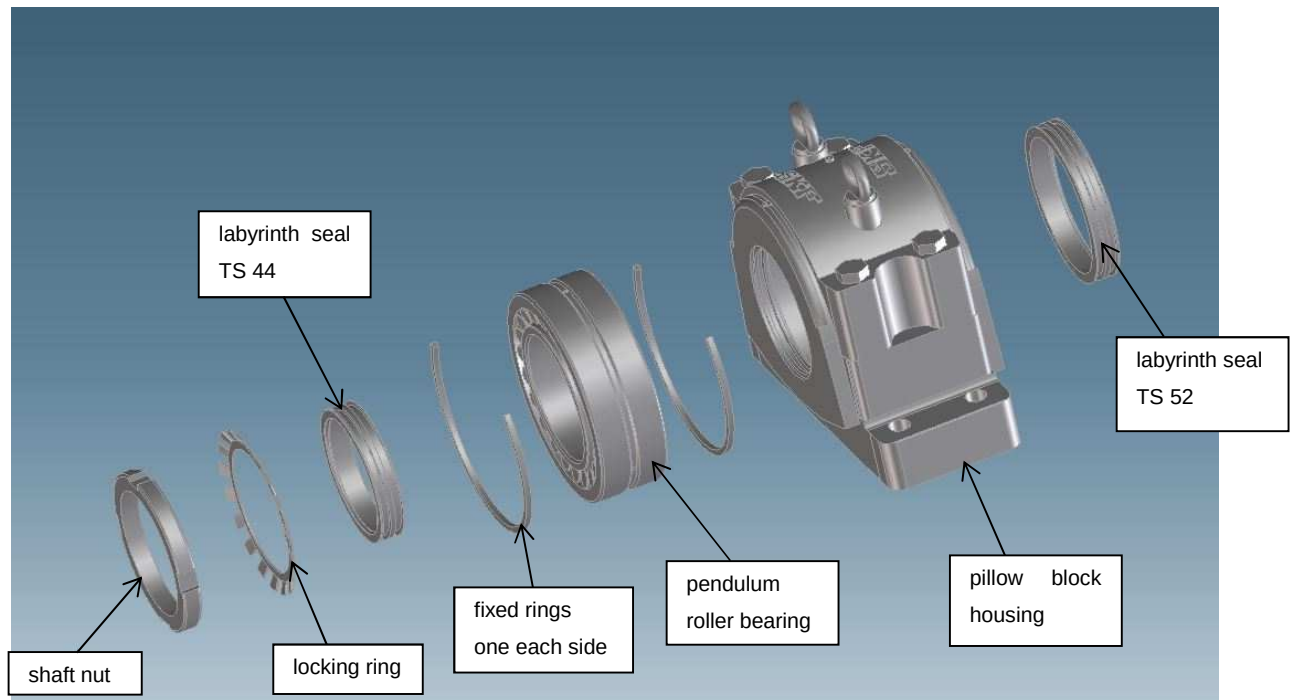
WARNING!



- Do not climb into the heater without lifting up the housing top part and position of adequate scaffolding next to the heater.
- The paddle shaft must be secured to keep in place when unmount the middle bearing. Lock the paddle shaft to prevent rotating.
- The geared motor must be protected from restart. The electrical power must be switched off.
- Use safety harness, never work alone!

In Case of changing the nilos rings it is absolutely necessary to lift the complete paddle shaft out of the heater and to pull both shaft halves out of the intermediate shaft from the middle bearing.

10.3. Construction of the pendulum roller bearings



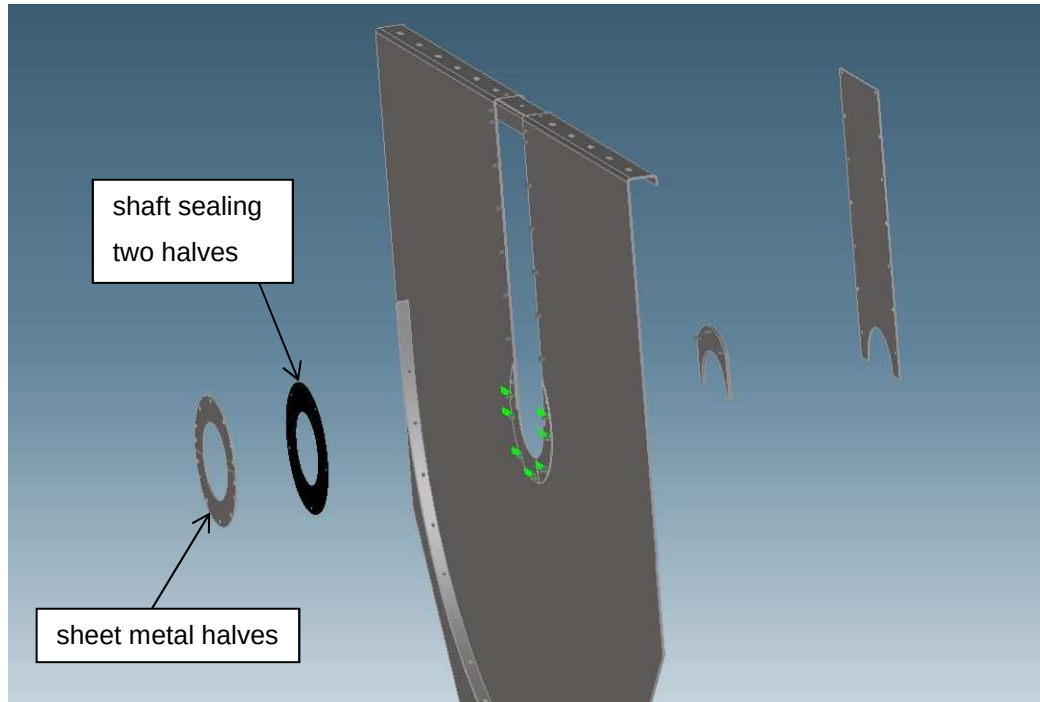
Explosion drawing shows nearly same condition from pillow block drive side and opposite side.
On the opposite side is one end plate installed instead of labyrinth seal TS 44.

NOTICE!



Replacement of roller bearing, labyrinth seals must be done from skilled person from the supplier.

10.4. Replacement of the paddle shaft-sealing



Following steps must be done to replace shaft sealing:

- first step lift up top parts of manure heater housing to have access to paddle shaft
- position adequate scaffolding next to the heater
- unmount paddles next to the shaft sealing (only drive side) in order to have mounting free space, at least 2 paddles
- unbolt sheet metal halves around the shaft
- replace shaft sealing halves, ensure that sealing halves are assembled concentrically.
- ensure, that both halves are moved together in the centre line, no gap permitted. Sealing allowed to touch the shaft
- assembly in opposite direction
- all nuts and screws have to be pulled tight

NOTICE!



Replacement of shaft sealing on the non-driving side can be done without lifting top part of heater housing, access trough man hole in side wall of outlet channel, use wooden plate when entering this part between weir and outside wall and support it on the welded steel pipes. Wooden plate must be long acc. inside dimension of outlet channel minus approx. 50 mm. If it is too short, the plate is not secured from tipping down. Thickness of wooden plate must be at least 30-40 mm, enough strength to prevent bending under the weight of the worker.

10.5. Removing the shaft-mounted gearmotor with shrink disc

1. **Disconnect the power supply** to the gearmotor. Secure the system against unintended power up.
2. **Remove all cable connections** to the gearmotor.
3. **Remove the nuts** and washers on the torque supports; remove the bolt and rubber bumper.
4. **Unscrew the shrink disc cover.**
5. Loosen all screws on the **shrink disc**. Attention: The motor must be securely suspended on the crane beforehand.
6. For further removal of the **shrink disc**, see the separate instructions from the manufacturer SEW in chapter 5.8.
7. **Rotate** the gearmotor by 180° upward and suspend it securely using load lifters, using either the torque support hole or a sling around the motor.

NOTICE!



See separate description of the manufacturer SEW in the Technical Documentation chapter 5.8!

8. After the shrink disc has been removed, the motor can normally be pulled off the shaft without a puller tool. Otherwise it can be loosened with light taps from a rubber mallet. If this do not work, please have a look to the Technical Documentation from the manufacturer SEW chapter 5.8!

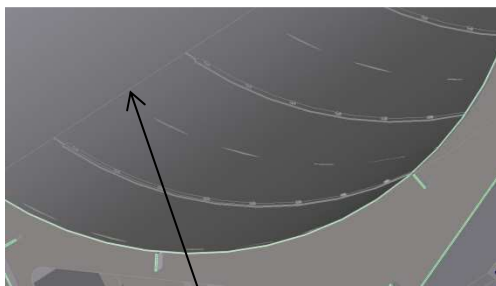
10.6. Replacement of the door sealings

The door sealing is made of special silicone foam with closed surface for high temperatures in square size 20x15 mm. This sealing is only fixed into the door by pushing together and press into the door gap.

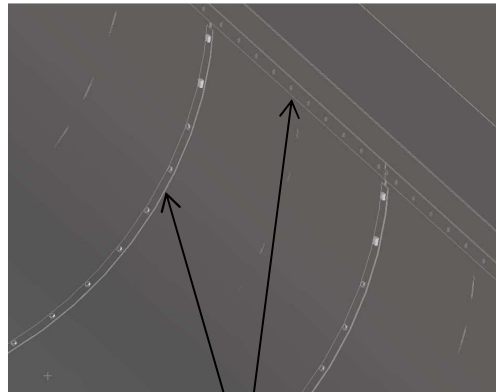
20 mm ist the height, 15 mm is the width and must be pressed together. Press until it stopps. No gap at the ends permitted.

The ends are fixed with heat resistant silicone to be completely closed and tight.

10.7. Replacement of distributor plates (fluidized bed)



spot welded if necessary



screw mounted with sheet metal strips

- first step lift up top part of manure heater housing to have access to housing inside
- position adequate scaffolding next to the heater
- unmount all flat bar strips of the damaged or worn out perforated plate.
on the lowest side the plates are fixed partially with weld points in order to be even to the sheet metal body.
- remove these weld points by means of angle grinder with cutting disc
- the perforated plates can then be turned and raised up.
- the new plates must have same dimensions than the old plates, if necessary adjust size, especially radian measure.
- if necessary spot weld the new perforated plate again in order that this edge fitts even to the joining plate
- pull all of the hexagon screws tight

10.8. Cleaning of distributor plates (fluidized bed)

- In case of clogging of the holes in the perforated plates by means of sticking grain the plates have to be cleaned from the underside
- Therefore shut down and cool down the plant and lock the fans and burners from re-starting of the system.
- open inspection doors in the bottom part housing
- the blocked material (sticking grain) can be removed with scrapers or by means of high-pressure cleaner with long lance with water
- After re-starting of the system the wet areas must be dried by means of the incoming hot air from the fans and burners prior to start with the material infeed.

WARNING!



Risk of injury from high-pressure jet cleaning and slippery surfaces!

Servicing and maintenance work on the system must be performed only after it has been switched off and cooled down.

- Switch off the system.
- Lock out the main controller and remove the starting key, and/or
- Attach a warning sign to the main disconnect switch.
- Allow the system to cool down.
- Be careful with slippery floors or slippery metal surfaces
- always wear sufficient safety clothes, shoes, safety gloves and eye protection.

10.9. Pillow block bearing/middle slide bearing maintenance and lubrication instructions

The SKF bearing housings that we use are generally designed to be lubricated with grease. All bearings on the system are filled with greased when initially shipped. In the majority of applications, the grease applied at the factory is sufficient at first.

The used grease must be replaced at appropriate time intervals (see Chapter 10.8 Maintenance intervals).

The pillow block bearings are filled with FUCHS Lubritech URETHYN MP2 grease prior to shipment. When relubricating, use only FUCHS Lubritech URETHYN MP2. If a different grease is to be used, the bearings must first be completely cleaned before new grease is added.

Do not mix different types of greases!

USE ONLY high-temperature grease for pillow blocks + middle bearing!

The middle slide bearing must be greased with KLÜBER Barrierta L 55/2, which can be used for temperatures up to +260°C or use adequate grease from other suppliers.

The middle slide bearing must be relubricated once a day to be sure that no foreign particles can enter into the bearing. Amount of grease approx. 50 grams per relubrication with grease press.

The grease nipple outside is installed in the middle of the housing top part on the service side.

DANGER!	
	• Replace the grease only while the system is stopped. • USE ONLY high-temperature grease for pillow blocks + middle bearing!

The pillow block can be lubricated with the grease press, nipple installed in the top cover of the bearing housing. It is also allowed, to unmount the top cover for regreasing.

NOTICE!



- Old bearing grease must be completely removed before refilling
- Follow the table for the amount of grease; too much grease can be escape through the labyrinth seal rings

grease amount for initial filling and refilling:

Bearing housing abbreviation: **Grease quantity in kg**

SNL 3144 2,70

DANGER!



- Reinstall the guards (if available) after lubricating again.

10.10. Lubricants

For pillow blocks

use FUCHS Lubritech URETHYN MP 2 or comparable

For middle slide bearing

use KLÜBER Barrierta L 55/2 or comparable

USE only high temperature greases!

Standard greases cannot be used due to very high operation temperatures.

10.11. Maintenance intervals

After the initial operating hours, check the bolted connections and tighten if needed.

Time interval	Possible cause
Prior to starting the system	- Exterior condition of the heater, the doors, screw conveyors and rotary valves. - Check for leakages and untightness in the surroundings.
During operation	- check outgoing material, quality, heater is warmed up? - Under pressure present? (no under pressure = dust escapes from the system) - Drive (noise, movement at the torque support)
Monthly	- Check the shrink disc connection, all screws are tight? - Visual inspection of the pillow block bearings + middle slide bearing. - Check the condition of the paddles and tools (for wear, deformation, contamination, residue) - Check for wear on the inlet flange - Check for wear on the weir / outlet channel - Check all attachment bolt on the entire system - Check for wear of the flights and trough in the screw conveyor - Check for wear of the sealing strips of rotary valves - Check for wear on the perforated plates - Check for plugged material in the perforated plates - Check for material depositions
Quarterly	Replace the grease in the main bearings (see Chapter 10.6 "Maintenance and Lubrication Instructions for Pillow Block Bearing")
Semi-annually	- Check the level of gearbox oil in the geared motor and add or change oil if needed - Check conditions of all inspection doors, sealing, locks..

Table 4: Maintenance intervals

NOTICE!



Perform servicing and maintenance work on third-party components in accordance with the technical documentation of the manufacturer (e.g., gearbox oil change).

10.12. Note on wear parts

Certain components are subject to natural wear, even under normal use, and must therefore be removed and reworked or replaced at regular intervals.

NOTICE!



Wear parts are not covered by warranty.

paddles and paddle tools:

The paddles and paddle tools wear out during normal operation (depending on the operating period and loads) due to abrasive particles in the manure pieces. Rounded edges and laque free surfaces are normal after a certain amount of operation hours. The life time of the paddles and tools are right now unknown. ALLGAIER do not have experience with this special kind of material.

perforated floor plates:

The perforated floor plates are wear parts which are in contact with the product. Due to the over-pressure on the underside and the floating material, the wear of the plates is minimized.

weir:

The plates of the weir are wear parts which are in contact with the product outfeed. These parts can be replaced very easily, it is made in carbon steel and bolted to the weir wall.

Drive motor:

For drive motor wear parts, refer to the documentation of the drive motor manufacturer SEW.

For geared motors the wear parts are listed in the spare parts list.

Spare parts for 2-years-operation are already supplied with the manure heater to site.

11. Overview drawings for the documentation

The following drawings are available for clarification of documentation:

Drawing no.:	Titel:	Title:
3012580011 06	Maßblatt	Dimension sheet
3012500054 04	Zusammenbau / Fundamentbelastung	Assembly / Loads
3002570035 02	Fließschema	PID-schematic

12. SERVICE

12.1. Spare parts

A complete spare parts list and drawing of the heater is part of the overall documentation.

The spare parts lists of the system components from sub-suppliers, such as screw conveyors, are found in the corresponding manufacturer's documentation.

When ordering the following must be provided:

- Machine type, year of construction and serial number. This information can be found on the rating plate.
- Designation of part from spare parts list
- Important! Please do not forget to indicate the quantity or amount of the spare part to be ordered.

WARNING!	
	Incorrect or faulty spare parts Use only the manufacturer's original spare parts. Incorrect or defective spare parts can lead to damage, malfunction, or total loss of the system.

If spare parts are used that have not been released, all claims under warranty, service, damage replacement, and liability against the manufacturer, his agents, dealers, and representatives are null and void.

12.2. On-site service

The operating instructions provide all the instructions required for properly treating your rolling bed heater. Our after-sales service with its many years of experience will assist you in the following areas, for example:

- Assistance with commissioning
- Increasing the machine availability
- Machine conversions/modernisation
- Increasing profitability
- Process support, such as in case of heating problems
- Preventive maintenance
- Maintenance agreements
- Repairs
- Training/instruction
- Spare parts service
- Consultancy

Our on-site service is generally available at short notice.

12.3. Contact

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