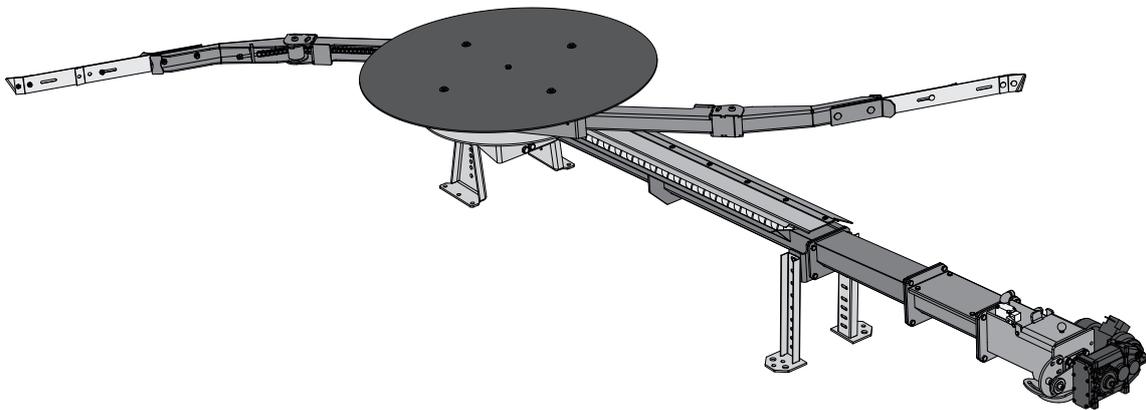


# froling

## Installation and operating instructions GAR articulated arm rotary agitator



Translation of original German version of installation and operating instructions for technicians and operators.

Read and follow all instructions and safety instructions.  
All errors and omissions excepted.

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<b>1 General</b>	<b>4</b>
1.1 Functional description	5
<b>2 Safety</b>	<b>6</b>
2.1 Hazard levels of warnings	6
2.2 Permitted uses	7
2.2.1 Permitted fuels	8
2.3 Qualification of staff	9
2.3.1 Qualification of assembly staff	9
2.3.2 Personal protective equipment for assembly staff	9
2.3.3 Qualification of operating staff	9
2.3.4 Protective equipment for operating staff	10
2.4 Design information	10
2.4.1 Standards	10
2.4.2 Requirements at the installation site	11
2.5 Safety devices	12
2.6 Residual risks	13
<b>3 Technology</b>	<b>15</b>
3.1 Dimensions	15
3.2 Store sizes	16
3.3 Technical data	17
<b>4 Assembly</b>	<b>18</b>
4.1 Transport and handling	18
4.1.1 Temporary storage	18
4.2 Installation site	18
4.2.1 Wall penetration	19
4.3 Assembling the articulated arm rotary agitator	20
4.3.1 Materials supplied	20
4.3.2 Assembling the gears and feeder trough	21
4.3.3 Mounting the fibre shredder (optional)	27
4.3.4 Fitting the upper part of gravity shaft and drive unit	28
4.3.5 Fitting attachments	31
4.3.6 Fitting adjustable feet in boiler room (optional)	32
4.3.7 Closing the wall penetration	32
4.3.8 Temperature monitoring device in the fuel store (TMD):	33
4.4 Connecting the system	34
4.4.1 Electrical connection	34
4.4.2 Connecting the sprinkler system	34
<b>5 Operating the system</b>	<b>35</b>
5.1 General information	35
5.2 Initial startup	35
5.3 Filling/refilling the store with fuel	36
5.3.1 Loading of fuel for a partially emptied store with rotary agitator	36
5.3.2 Loading fuel into an empty fuel store with a rotary agitator	37
5.3.3 Blowing in fuel for a partially emptied store with rotary agitator	37
5.3.4 Blowing in fuel for an empty store with rotary agitator	38
5.3.5 Drainage of fuel store	39
5.4 During operation	39
5.5 Decommissioning	40
5.5.1 Disassembly	40
5.5.2 Disposal	40
<b>6 Servicing the system</b>	<b>41</b>

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6.1	Maintenance work by the operator .....	42
6.2	Maintenance work by technicians.....	44
6.3	Replacement parts.....	44
<b>7</b>	<b>Troubleshooting .....</b>	<b>45</b>

# 1 General

Thank you for choosing a quality product from Froeling. The product features a state-of-the-art design and conforms to all currently applicable standards and testing guidelines.

Please read and observe the documentation provided and always keep it close to the system for reference. Observing the requirements and safety information in the documentation makes a significant contribution to safe, appropriate, environmentally friendly and economical operation of the system.

The constant further development of our products means that there may be minor differences from the pictures and content. If you discover any errors, please let us know: [doku@froeling.com](mailto:doku@froeling.com).

Subject to technical change.

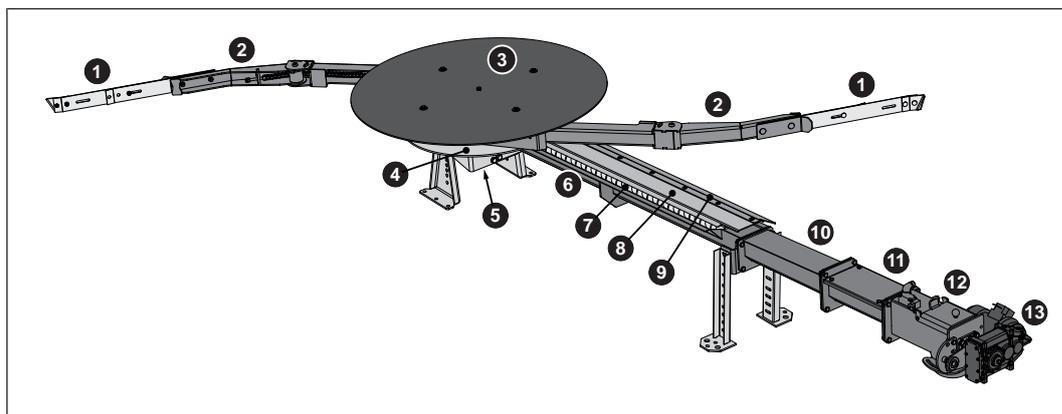
*Issuing a delivery certificate*

This is an incomplete machine as defined by the Machinery Directive. The incomplete machine must only be started up when it has been confirmed that the machine, in which the incomplete machine has been installed, conforms to the provisions of Directive 2006/42/EC.

Compliance with the open provisions and verification of the correct installation must be confirmed in the delivery certificate of the declaration of installation (included in documentation).

## 1.1 Functional description

The Froling discharge system “GAR articulated arm rotary agitator“ consists of:



- |    |   |
|----|---|
| 1  | Spring piles  |
| 2  | Articulated arms  |
| 3  | Rotary agitator   |
| 4  | Intermediate plate for connecting the raised floor to the stirring head       |
| 5  | Mitre gear  |
| 6  | Trough channel, open  |
| 7  | Discharge screw   |
| 8  | Cover plate for wood chips or pellets   |
| 9  | Raising plate for fuel store without raised floor                             |
| 10 | Transfer channel from open to closed trough channel                           |
| 11 | Trough channel, closed  |
| 12 | Top part of gravity shaft with gravity shaft cover and water sprinkler system |
| 13 | Geared motor  |

When the store is full, the rotary agitator arms are positioned at the rotary agitator plate, reducing resistance during system operation due to the smaller diameter.

If fuel is requested using the boiler controller, the system starts and the material is loosened by the pre-tensioned rotary agitator arms, and fed to the trough of the discharge screw. The discharge screw feeds the material to the transfer position, where it falls through the burn back protection system (burn back flap/rotary valve) into the stoker screw of the boiler that is positioned below or into another feed screw.

## 2 Safety

### 2.1 Hazard levels of warnings

This documentation uses warnings with the following hazard levels to indicate direct hazards and important safety instructions:

#### **DANGER**

*The dangerous situation is imminent and if measures are not observed it will lead to serious injury or death. You must follow the instructions!*

#### **WARNING**

*The dangerous situation may occur and if measures are not observed it will lead to serious injury or death. Work with extreme care.*

#### **CAUTION**

*The dangerous situation may occur and if measures are not observed it will lead to minor injuries.*

#### **NOTICE**

*The dangerous situation may occur and if measures are not observed it will lead to damage to property or pollution.*

## 2.2 Permitted uses

Froling's "GAR articulated arm rotary agitator" discharge system is only designed to discharge fuels from suitable stores. Only use fuels specified in the "Permitted fuels" section.

The unit should only be operated when it is in full working order. It must be operated in accordance with the instructions, observing safety precautions, and you should ensure you are aware of the potential hazards. The inspection and cleaning intervals in the operating instructions must be observed. Ensure that any faults which might impair safety are rectified immediately.

The manufacturer or supplier is not liable for any damage resulting from non-permitted uses.

Only original spare parts or specific alternative spare parts authorised by the manufacturer may be used. Any kind of change or modification made to the product will invalidate the manufacturer's conformity with the applicable guideline(s). In such cases, the product will need to undergo new hazard evaluation procedures by the operator. The operator will then be fully responsible for the declaration of conformity according to the valid guideline(s) for the product and will need to issue a corresponding declaration for the device. This person will then assume all of the rights and responsibilities of a manufacturer.

### DANGER



If the device is used incorrectly:

***Incorrect use of the system can cause severe injury and damage.***

When operating the system:

- Observe the instructions and information in the manuals
- Observe the details on procedures for operation, maintenance and cleaning, as well as troubleshooting in the respective manuals.
- Any work above and beyond this (e.g. servicing) must be carried out by a heating engineer approved by Fröling Heizkessel- und Behälterbau GesmbH or by Froling customer services

## 2.2.1 Permitted fuels

### Wood chips

Designation as per EN ISO 17225-4	Description
<b>M20</b>	Water content max. 20%
<b>M30</b>	Water content max. 30%
<b>M35</b>	Water content max. 35%
<b>P16S</b>	Main proportion (at least 60% mass portion): 3.15–16 mm, max. length of 45 mm, used to be fine wood chips G30
<b>P31S</b>	Main proportion (at least 60% mass portion): 3.15–31.5 mm, max. length of 150 mm, used to be medium-sized wood chips G50

Note on standards

EU:	Fuel acc. to EN ISO 17225 - Part 4: Wood chips class A2 / P16S-P31S M35
Additional for Germany:	Fuel class 4 (§3 of the First Federal Emissions Protection Ordinance (BimSchV) in the last amended version)

### Wood pellets

Wood pellets made from natural wood with a diameter of 6 mm

Note on standards

EU:	Fuel acc. to EN ISO 17225 - Part 2: Wood pellets class A1 / D06
and/or:	ENplus / DINplus certification scheme

#### General note:

Before refilling the store, check for pellet dust and clean if necessary.

## 2.3 Qualification of staff

### 2.3.1 Qualification of assembly staff

#### CAUTION



Assembly and installation by unqualified persons:

***Risk of personal injury and damage to property***

During assembly and installation:

- Observe the instructions and information in the manuals
- Only allow appropriately qualified personnel to work on the system

Assembly, installation, initial startup and servicing must only be carried out by qualified personnel:

- Heating technicians/building technicians
- Electrical installation technicians
- Providing customer services

The assembly staff must have read and understood the instructions in the documentation.

### 2.3.2 Personal protective equipment for assembly staff

You must ensure that staff have the protective equipment specified by accident prevention regulations!



- During transport, erection and installation:
  - wear suitable work wear
  - wear protective gloves
  - wear safety shoes (min. protection class S1P)

### 2.3.3 Qualification of operating staff

#### CAUTION



If unauthorised persons enter the Storeroom:

***Risk of personal injury and damage to property***

- The operator is responsible for keeping unauthorised persons, in particular children, away from the system.

Only trained operators are permitted to operate the unit. The operator must also have read and understood the instructions in the documentation.

### 2.3.4 Protective equipment for operating staff

You must ensure that staff have the protective equipment specified by accident prevention regulations!



- For operation, inspection and cleaning:
  - suitable work wear
  - protective gloves
  - sturdy shoes

## 2.4 Design information

Carrying out modifications to the system and changing or disabling safety equipment is prohibited.

Always comply with all fire, building and electrical regulations when installing and operating the system, in addition to following the assembly and operating instructions and mandatory regulations that apply in the country of use.

### 2.4.1 Standards

The system must be installed and commissioned in accordance with the local fire and building regulations. The following standards and regulations should be observed in any case:

ÖNORM / DIN EN 60204	Safety of machines; Electrical equipment of machines, Part 1: General requirements
TRVB H 118	Technical directives for fire protection/prevention (Austria)
ÖNORM H 5170	Construction and fire protection requirements (Austria)
ÖNORM H 5190	Heating systems - Acoustic insulation
EN ISO 13857	Safety of machines; Safety distances for maintaining a safe distance from hazardous areas

## 2.4.2 Requirements at the installation site

- Protect the store against all weather conditions.
- Protective structures must be designed in accordance with the applicable standards and regulations

### Information about the fuel store



**NOTICE!** The fuel store plate provided must be affixed in a conspicuous place in the access area of the store

**When FILLING the fuel store, observe the system DOCUMENTATION.**

The filling procedures may vary depending on the discharge system, type of fuel and fill level of the fuel store. Only use fuels permitted according to the boiler's operating instructions.

**SWITCH OFF the HEATING AND FEED SYSTEM before ENTERING the fuel store.**

Risk of injury due to moving parts and automatic startup. Shut off the feeder unit before entering the fuel store and secure it so that it cannot be switched on again. There is a further risk of injury from the uncontrolled rotation of spring-loaded components. These must be secured during work.

There is a risk of carbon monoxide poisoning in the pellet stores. Adequately ventilate the store before entering (at least 15 mins.). Only enter the store under the supervision of a second person. While in the store, keep the door open and use a dust mask! There is a risk of collapse and being buried alive as a result of cavity formation in the store. Therefore, do not enter the fuel area!

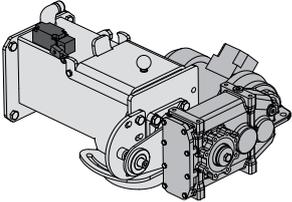
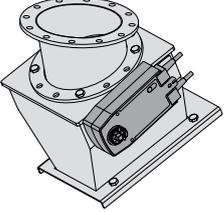
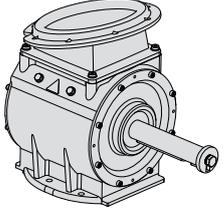
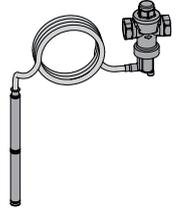
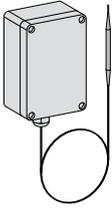
Slick surfaces in the fuel store present a slipping hazard and fuel supply points present a risk of falling.

As a rule, personal protective equipment (work clothing, protective gloves, sturdy shoes) should be worn when working in the store and on the conveyor.

Unauthorized access prohibited! Keep children away! Design the fuel store in such a way that it is safe to access and keep it locked. Keep the key in a safe place. No fire, open flames or smoking! Protect the fuel from moisture.

Affix this notice in a conspicuous place in the access area of the fuel store.

## 2.5 Safety devices

Safety equipment	Safety function
<p>Limit switch for top of gravity shaft:</p> 	<p>Protection against access to the danger area of the feed/discharge screw when the system is switched on</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> If the inspection cover is opened, the system is switched off via the limit switch <ul style="list-style-type: none"> <li>↳ The power supply remains switched on</li> </ul> </li> </ul>
<p>Burn back flap:</p> 	<p>The burn back protection system (BPS) is part of the boiler and is located directly below the top part of the gravity shaft. During the heating up phase, after loading has taken place and in the event of a fault, it reliably disconnects the discharge and infeed devices, preventing fire from spreading to the fuel store.</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Depending on the design of the system, a burn back flap or a rotary valve is fitted.</li> </ul>
<p>Rotary valve:</p> 	
<p>Water sprinkler system:</p> 	<p>Self-activating extinguisher system to limit burn back around the top of the gravity shaft.</p> <p>If the temperature in the top of the gravity shaft rises above 95°C, the valve of the sprinkler system opens, water flows out and prevents the fire from spreading to the fuel store.</p>
<p>TMF:</p> 	<p>Temperature monitoring device in the fuel store (as per TRVB H118, Austria only) which activates the customer's alarm(s) when the temperature in the fuel store exceeds 70°C.</p>

## 2.6 Residual risks

### DANGER

When working on rotary agitator arms:

***Serious injuries possible from pre-tensioned rotary agitator arms!***

When working on the rotary agitator arms, you must therefore:

- Loosen the tension in the rotary agitator arms, or secure them so they cannot spring back in an uncontrolled way before dismantling them

### DANGER

When working on the unit with a live power supply:

***Serious injury possible due to automatic startup!***

When working on the system or in the store, it is essential that the five safety directives are followed:

- Disconnect all poles on all sides
- Secure so that it cannot be switched on again
- Check that there is no power
- Earth and short circuit
- Cover any adjacent live parts and limit area of risk



### NOTICE

Filling the store when the discharge system is switched off

***Equipment damage hazard.***

Due to the high resistance from the weight of the fuel on the rotary agitator arms, the system cannot be started. The drive would be overloaded

- Take the following precautions:
  - ↳ The discharge system must be switched on during filling the store with fuel

### NOTICE

If the rotary agitator arms touch the fuel store wall:

***damage to equipment may occur***

If the structural layout means that the rotary agitator arms come into contact with the fuel store wall:

- rotary agitator arms can dislodge pieces of plaster
- Pieces of wall or plaster that have broken off can block the discharge system or disrupt the material feed into the boiler, causing a system failure.
  - ↳ If this happens:

- Fit an approx. 300 mm high covering made of sheet metal or hardwood to the fuel store wall.
- ↳ Froling offers a ready-made wall protection pack for this purpose.  
The staff at Froling will be happy to advise you.

## NOTICE

If non-permitted fuel types are used:

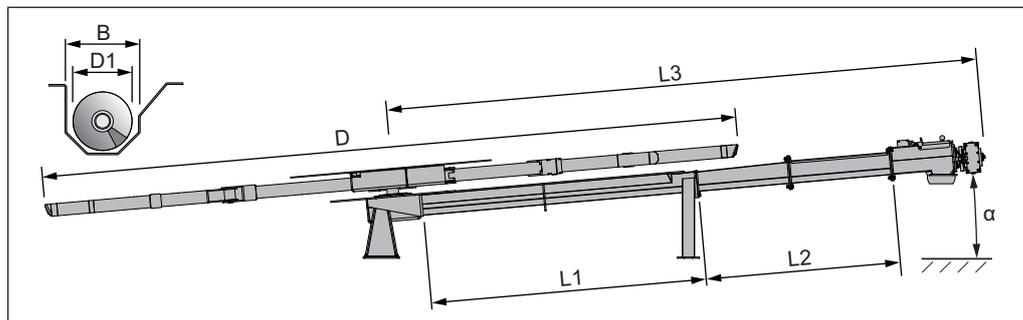
***Non-standard fuels can cause stiffness and block the system, resulting in the failure/breakage of components.***

***Therefore:***

- Only use fuels specified in the “Permitted uses” section of this manual.

## 3 Technology

### 3.1 Dimensions



Item	Description	GAR 110	GAR 150
L1	Length of open trough	↻ "Store sizes" ▶ 16]	
L2	Length of closed trough	Transfer channel + connected trough	
L3	Length of discharge screw	Determined during planning of the fuel store	
D	Diameter, rotary agitator	↻ "Store sizes" ▶ 16]	
D1	Diameter, screw	Ø 110 mm	Ø 150 mm
B	Width of trough channel	140 mm	200 mm
α	Gradient angle	0 – 10° (wood chips) 0 – 3° (pellets)	

#### NOTICE

Operating the discharge system with a gradient angle > 10°

***The mitre gear can break due to insufficient lubrication!***

When installing the discharge system, you should therefore ensure:

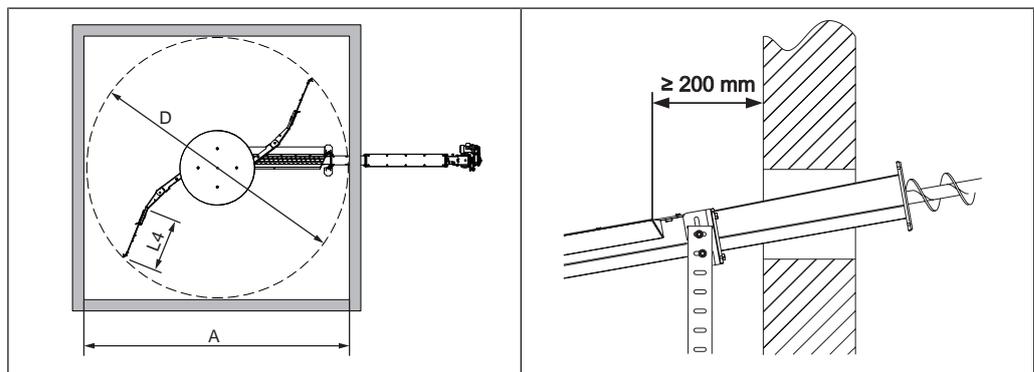
- When operating with wood chips do not exceed a gradient angle  $\alpha$  of 10°
- When operating with pellets do not exceed a gradient angle  $\alpha$  of 3°
  - ↳ The rotary agitator should always be fitted as flat as the place of installation allows

### 3.2 Store sizes

The diameter of the rotary agitator and the length of the open trough vary depending on the size of the fuel store. The articulated arms of the agitator head have a uniform length, the diameter is adjusted accordingly by extending them with the spring blades. The table below shows the respective dimensions:

	Store length in screw direction					
	≤ 3.5 m	≤ 4.0 m	≤ 4.5 m	≤ 5.0 m	≤ 5.5 m	≤ 6.0 m
Nominal diameter D [mm]	3500	4000	4500	5000	5500	6000
Length of spring blades (L4) (mm)	605	875	1145	1415	1685	1955
Open trough (L1) [mm]	1545	1795	2045	2295	2545	2795

1. The rotary agitator arms have a certain excess to ensure optimum use of the fuel store!



- The nominal diameter of the discharge must be selected according to the lateral length (A) of the space that runs parallel to the discharge screw.
- The discharge must be positioned so that the shear edge (transition from open to closed trough) is at least 200 mm away from the wall.

### 3.3 Technical data

Description		T4e 20-60	T4e 80-110	T4e 130-180	T4e 200-350
Screw diameter		110 mm		150 mm	
Drive motor - feed screw	Power supply	400 VAC / 50 Hz			
	Power	0.37 kW	0.55 kW	0.37 kW	0.75 kW
Output speed, gears		4-5 rpm	10-11 rpm	4-5 rpm	10-11 rpm
Safety switch		24 VDC			

Description		TM 150-320 TI 350 (pellets)	TM 150 (wood chips)	TM 220-320 TI 350 (wood chips)
Screw diameter		110 mm	150 mm	
Drive motor - feed screw	Power supply	400 VAC / 50 Hz		
	Power	0.37 kW		0.75 kW
Output speed, gears		4-5 rpm		10-11 rpm
Safety switch		24 VDC		

## 4 Assembly

### 4.1 Transport and handling

The discharge system is part-assembled and comes packed on a pallet.

- Follow the transport instructions on the packaging!

A door should be provided in the store or a ceiling opening in the silo for bringing in the unit

- Observe the stirring head diameter of 1300 mm!

To prevent damage:

- Transport components, particularly drive components, with care

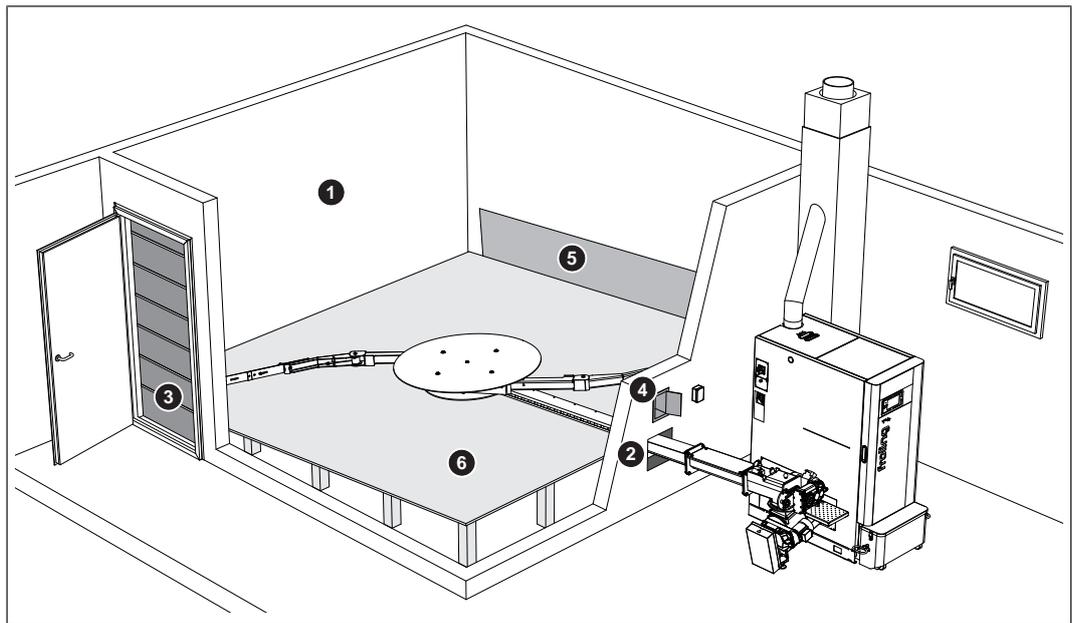
#### 4.1.1 Temporary storage

If the system is not going to be assembled immediately:

- Store components at a protected location, which is dry and free from dust
  - ↳ Damp can lead to damage to individual parts, particularly in the motor!

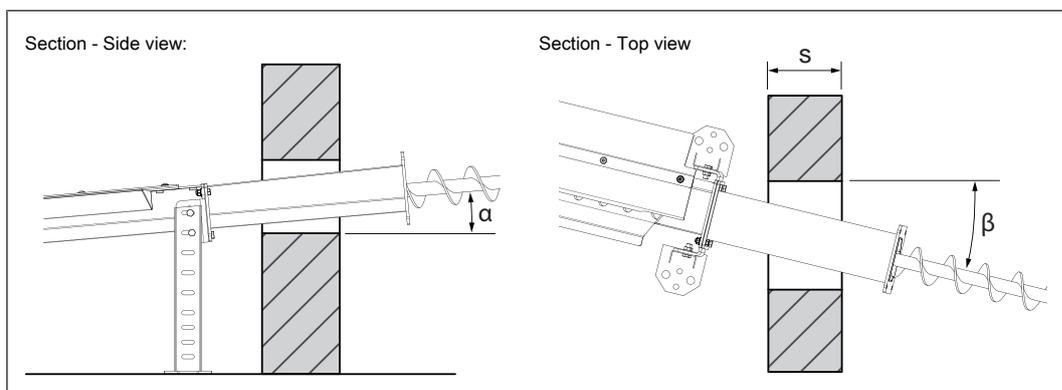
### 4.2 Installation site

When planning the fuel store, you should observe the following design information:



Store detail		Design information
1	Walls and ceilings	The walls and ceilings of the store and the boiler room must be fire-proof (REI 90) in compliance with local regulations
2	Hole in wall	Do not fix or cement the transfer trough and rotary agitator duct to the brickwork as this can create a bridge transferring all mechanical noise and vibrations to the brickwork. For this reason, fill any gaps around holes made in walls with insulating material as per EN 1366-3 and EN 13501-2. For dimensions of the opening see "Hole in wall"
3	Boarding the store door	The store door must be a fire door with an EI <sub>2</sub> 30-C fire resistance rating; it must have a seal. Wooden boards should also be fitted on the interior of the store so that the fuel does not press against the door.
4	Inspection opening	Maintenance opening with class EI <sub>2</sub> 90-C fire resistance rating (e.g. chimney door) immediately over the hole in the wall for easy clearance of any blockages from oversized material around the shear edge of the discharge screw. The inspection opening must be designed in such a way that it can only be opened with a tool. The operator must highlight residual risks at the inspection opening.
5	Side wall protection	If the structure of the store means that the arms come into contact with the wall (rectangular room), we recommend that you fit an approx. 300 mm high covering made of sheet metal or hardwood to the wall of the store. This prevents pieces of the wall and plaster from breaking off and blocking the discharge system.
6	Raised floor	This prevents material from remaining below the rotary agitator arms. This material would decay, and this could affect the heating value. For this reason, we recommend that the customer installs a raised floor. The construction should be dimensioned so that the raised floor is not deformed under the static load of the fuel. The raised floor must also be self-supporting, and it should not be supported by the screw channel.

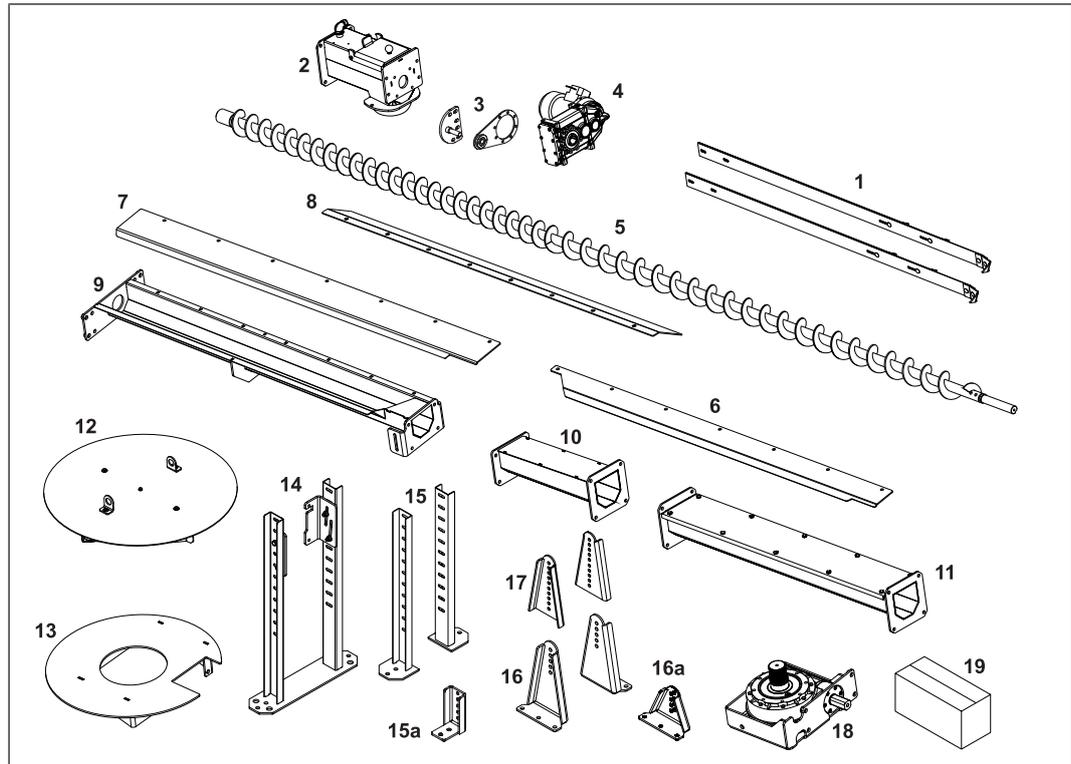
### 4.2.1 Wall penetration



Before installing the rotary agitator, the customer must provide a wall penetration for the trough. The dimensions of the opening are calculated from the wall thickness (s) and the angle of the trough to the wall (β) or the angle of inclination (α) of the entire system. Experience indicates that an opening of 500 mm x 500 mm is sufficient. You should also note that the trough must not be connected to the wall, and that it should be cladded in elastic at the end.

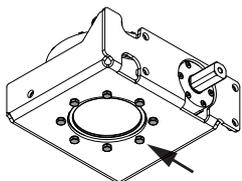
## 4.3 Assembling the articulated arm rotary agitator

### 4.3.1 Materials supplied

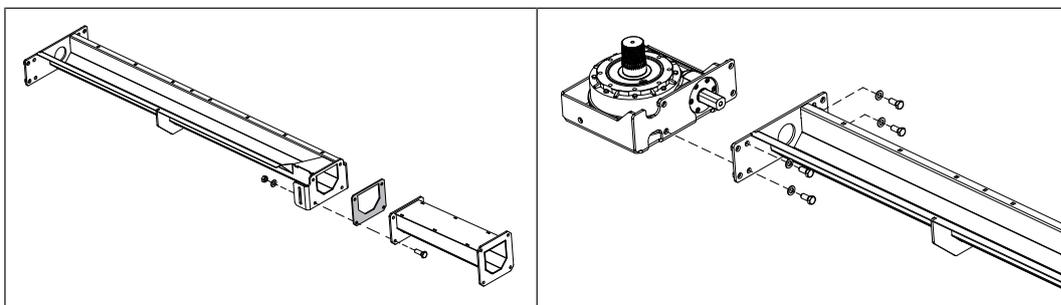


1	2x spring piles	12	Rotary agitator head with articulated arms
2	Top part of gravity shaft	13	Intermediate plate
3	Torque support	14	Support in the boiler room (option)
4	Geared motor	15	Adjustable feet
5	Feed screw	15a	Shorter adjustable feet (optional for horizontal installation)
6	Trough cover - wood chips (standard)	16	Gear supports
7	Trough cover - pellets (optional)	16a	Shorter gear supports (optional for horizontal installation)
8	Raising plate for discharge without raised floor	17	Extensions for gear supports (optional)
9	Trough open (store side)	18	Bracket with mitre gear
10	Transfer channel (hole in wall)	19	Accessories kit
11	Trough closed (boiler room side)		

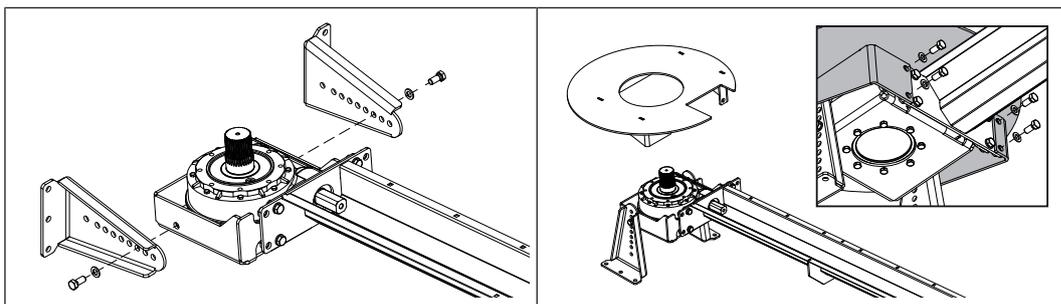
### 4.3.2 Assembling the gears and feeder trough



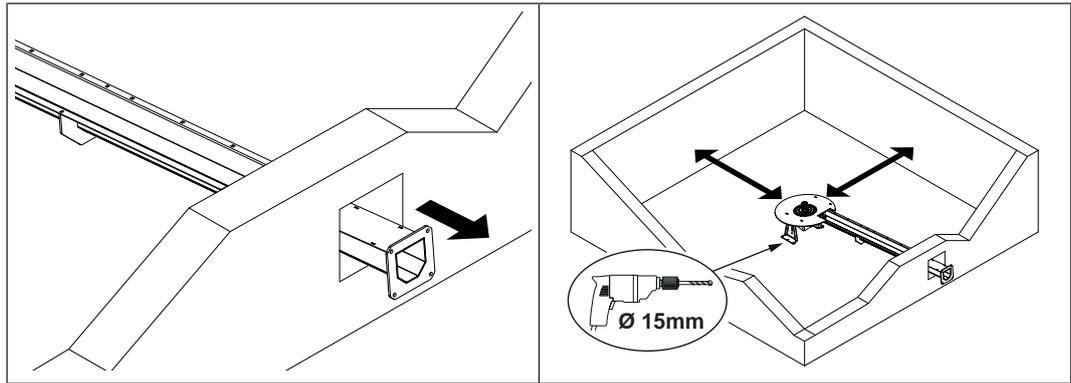
**NOTICE!** The mitre gear is pre-assembled on the bracket. Tighten all screw connections during installation!



- Fit the open trough with ceramic fibre seal to the transfer channel
  - 4x hexagonal screw M12 x 35
  - ↪ Check the alignment of the flange plates!
- Fit bracket with mitre gear to open trough
  - 4x hexagonal screw M16 x 35



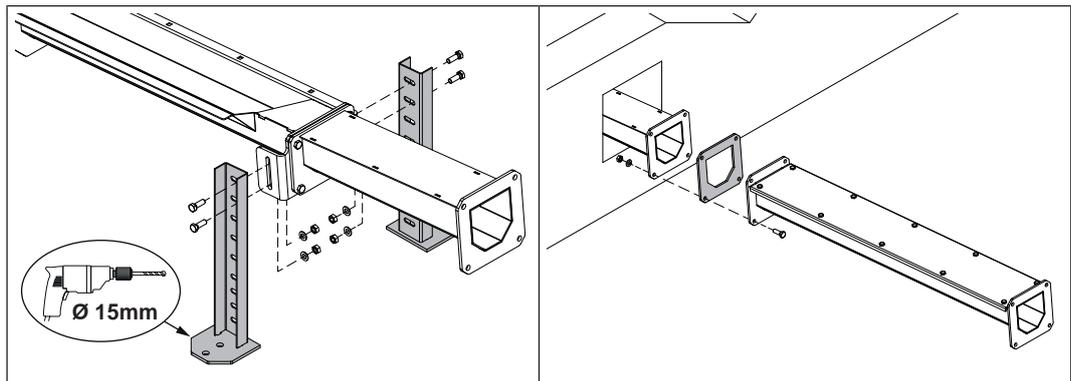
- Fit the gear supports to the mitre gear as shown
  - 2x hexagonal screw M16 x 35
  - ↪ Observe the assembly height in the installation diagram!
  - ↪ Do not fully tighten the screws yet!
- Place intermediate plate over bracket with mitre gear and secure it to the flange of the open trough
  - 4x hexagonal screw M16 x 35



- When the unit has been screwed together, insert it through the hole in the wall on the store side
- Align the stirring head with the troughs in the store in accordance with the installation diagram

#### Secure the agitator head to the floor:

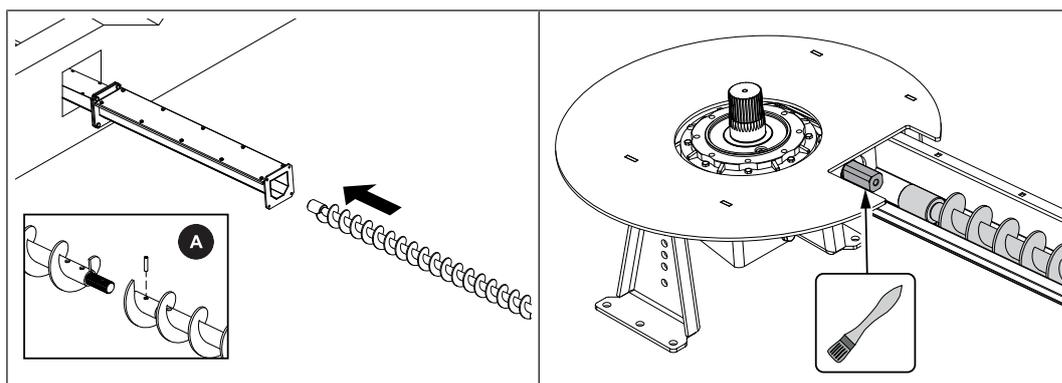
- Make two holes each in the floor for the gear supports
- Drill the holes marked
  - Drill diameter: 15 mm
  - Drill depth at least 105 mm
- Hammer the heavy duty anchors into the bore holes and tighten with a spanner (AF 17 mm)



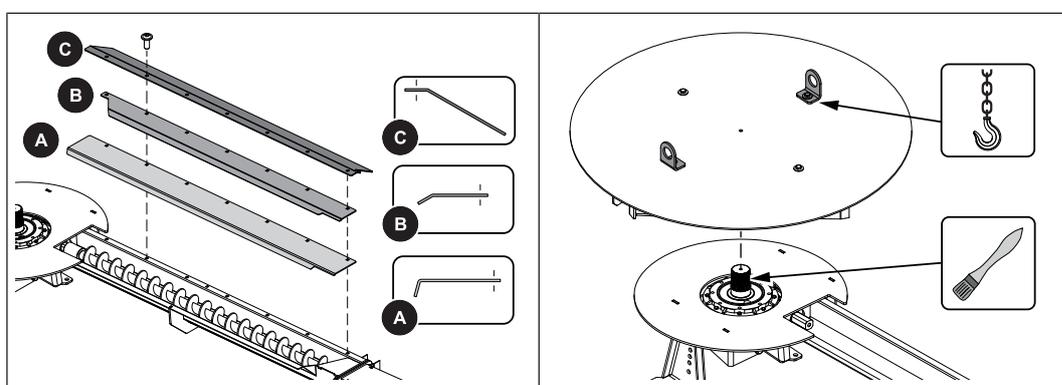
- Fit adjustable feet on both sides of the open trough
  - 2x hexagonal screws M12 x 35 on each side
- Fit the closed trough with ceramic fibre seal to the transfer channel
  - 4x hexagonal screw M12 x 35
  - ↳ Check the alignment of the flange plates!

#### Secure the adjustable feet to the floor:

- Make a hole in the floor for the adjustable feet
- Drill the holes marked
  - Drill diameter: 15 mm
  - Drill depth at least 105 mm
- Hammer the heavy duty anchors into the bore holes and tighten with a spanner (AF 17 mm)
- Shorten the adjustable feet using an angle grinder so that the rotary agitator arms are not obstructed

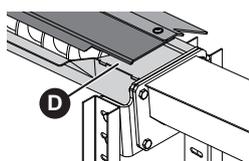


- Only for screw Ø 110 mm:** Push both feed screws together (A) and fix with spring pin Ø 8 x 40
- Insert the feed screw into the trough on the boiler room side
- Grease the square shaft of the mitre gear with copper paste and attach the feed screw
- Align the troughs in a row, and adjust with the adjustable feet if necessary

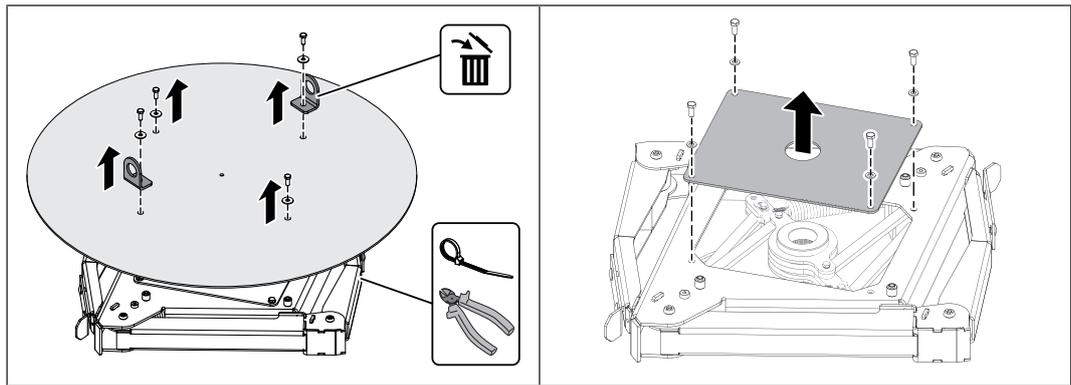


Fit the following cover plates to the open trough using round-head screws M10 x 25:

- Pellet cover plate (A)
  - For pellet version
- Wood chips cover plate (B)
  - For wood chips version
- Raising plate (C)
  - When no raised floor is used
- Grease the multi-tooth shaft of the mitre gear with copper paste
- Place the rotary agitator head on the multi-tooth
  - ↪ Use mounted eye bolts for this purpose

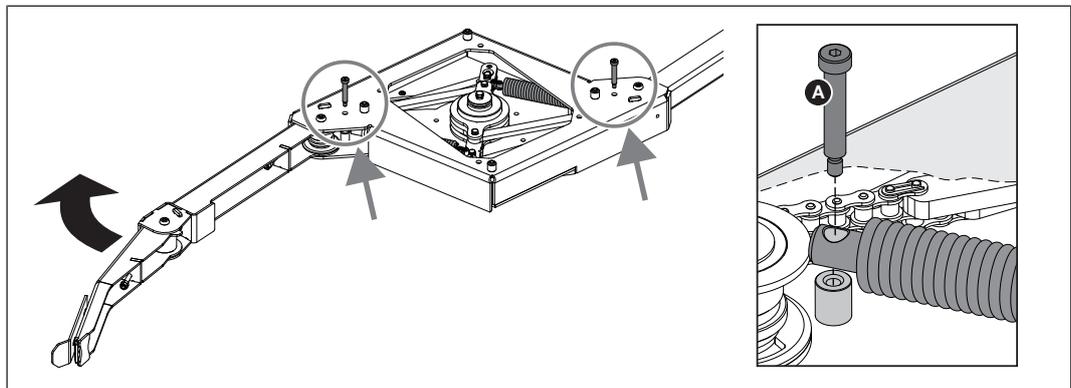


**NOTICE!** The rear end of the cover plate rests on the cutting edge (D) of the open trough.

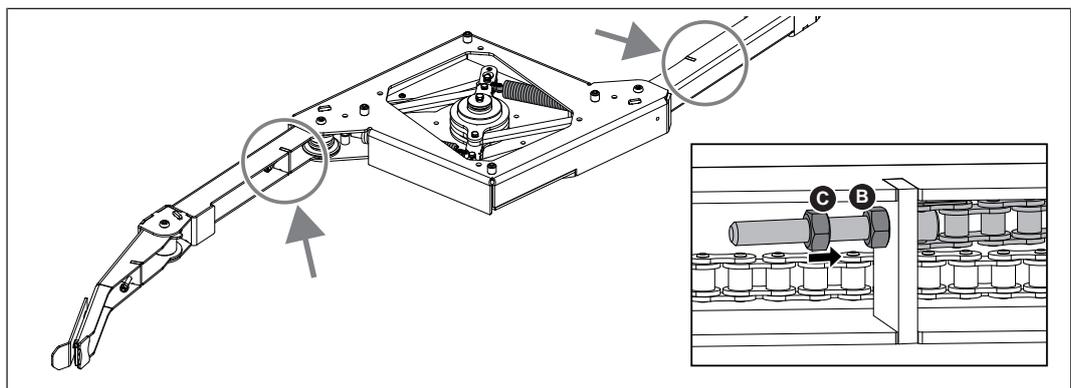


- Loosen the four hexagonal screws M12 x 30 and remove the rotary disc
  - ↳ Eye bolts are no longer required
- Remove the cable ties (transport lock) on both articulated arms
- Remove the cover of the basic module
  - 4x hexagonal screw M12 x 30

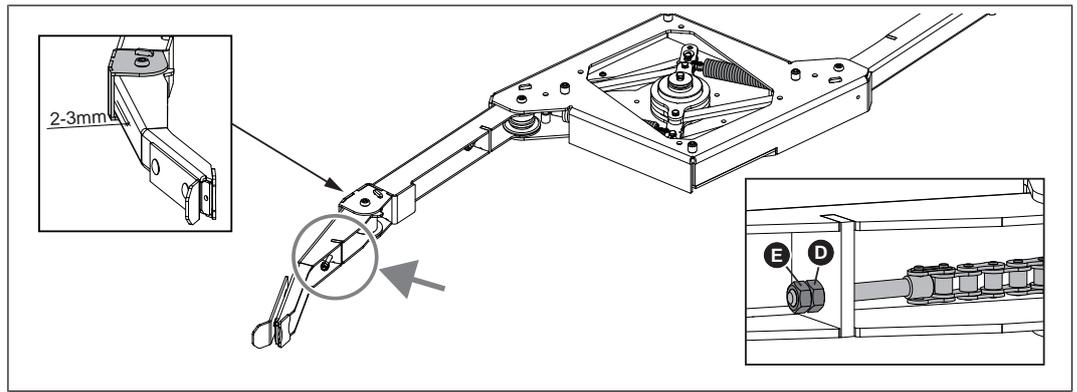
Carry out the following steps for both articulated arms in the same way:



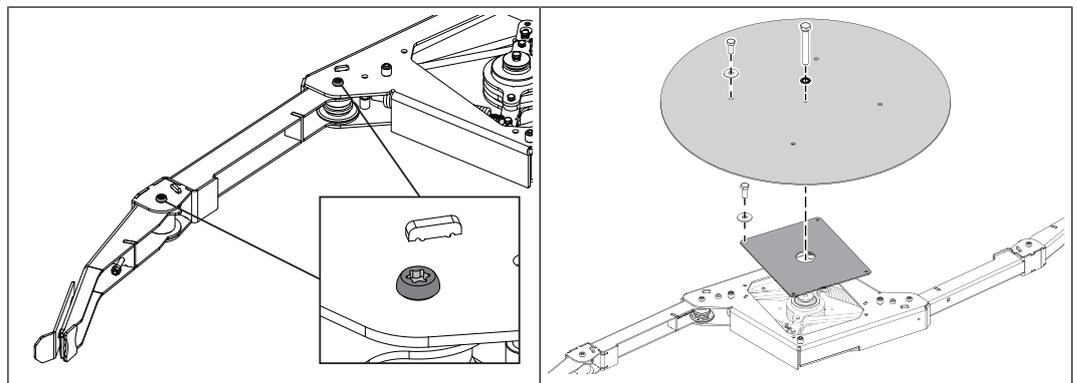
- Remove the fitting screws M12 x 65 (A) on the top of the housing and fully extend the articulated arms
- Fix the tension springs with previously removed fitting screws (A)



- Fully tighten nut (B) on the inner joint and lock with second nut (C)

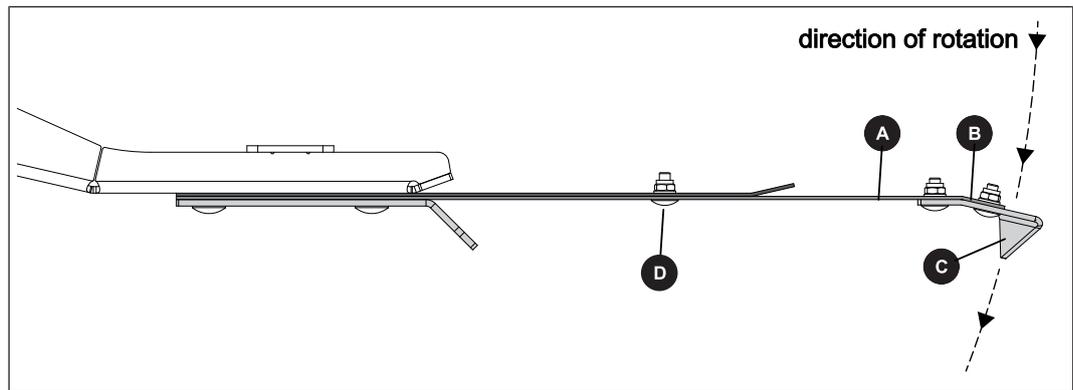


- Tighten the nut (D) on the outer joint until the chain is slightly tensioned and a play of approx. 2-3 mm remains to the stop
- Lock screw connection with second nut (E)



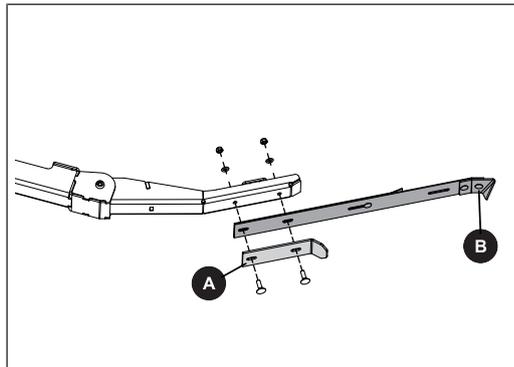
- Check the screws on the joints for tightness
  - ↳ Max. tightening torque: 300 Nm
- Re-install cover of basic module and rotary disc on basic module
  - 8x hexagonal screw M12 x 30
  - 1x hexagonal screw M12 x 90

The spring piles may already be assembled, depending on the delivery configuration. In this case, the following step is omitted:



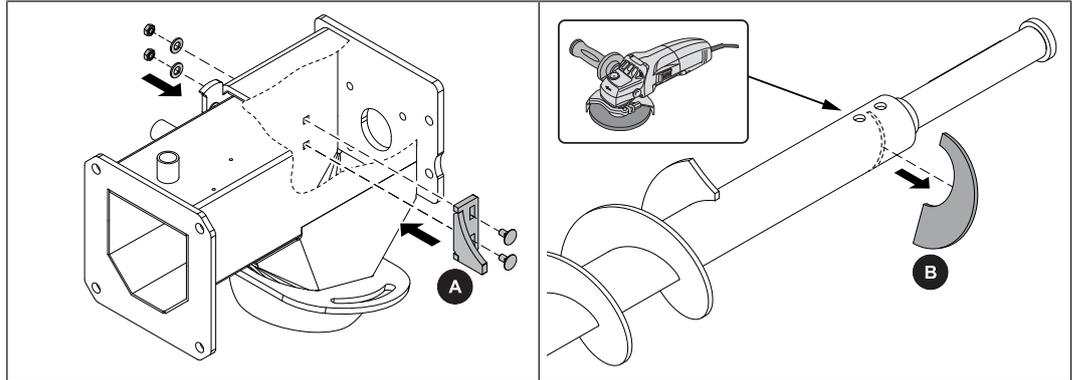
- ☐ Screw the spring blades to a pile according to their size. The longest spring blade (A) should be used in such a way that the bend (B) points in the other direction (=direction of rotation)
- ☐ Fit the tearing hook (C) to the bend (B) of the longest spring blade
  - ↳ The tip of the tearing hook (C) points in the direction of rotation of the rotary agitator

**CAUTION: Screw connections of the spring blades (D) should have about 1 mm of play, so they should not be fully tightened. Depending on the size of the fuel store, the number of parts required as well as the length of the spring piles varies!**

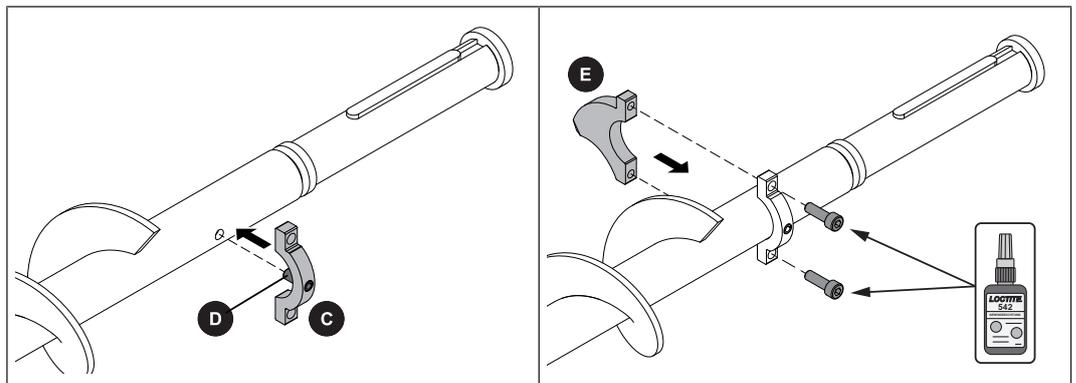


- ☐ Fit spring blades with clamping plates (A) to the rotary agitator arms
  - 2x hexagonal screws M12 x 40 on each side
  - ↳ Hook (B) must point in the direction of the clamping plate (A – in the direction of rotation)

### 4.3.3 Mounting the fibre shredder (optional)



- Remove the screws on the side of the top part of gravity shaft
- Instead, mount the shearing jaw (A) on the inside of the top part of gravity shaft as shown
  - 2x round-head screw M8 x 20
- Remove the counter plate (B) from the screw shaft



- Position the clamping jaw (C) on the screw shaft, pushing the spring pin (D) into the hole
- Fix the clamping jaw (C) and cutting jaw (E) to the screw shaft
  - 2x cylinder head screw M8 x 25
- Secure screws against loosening with Loctite (Froling item no.: 50378)

#### 4.3.4 Fitting the upper part of gravity shaft and drive unit



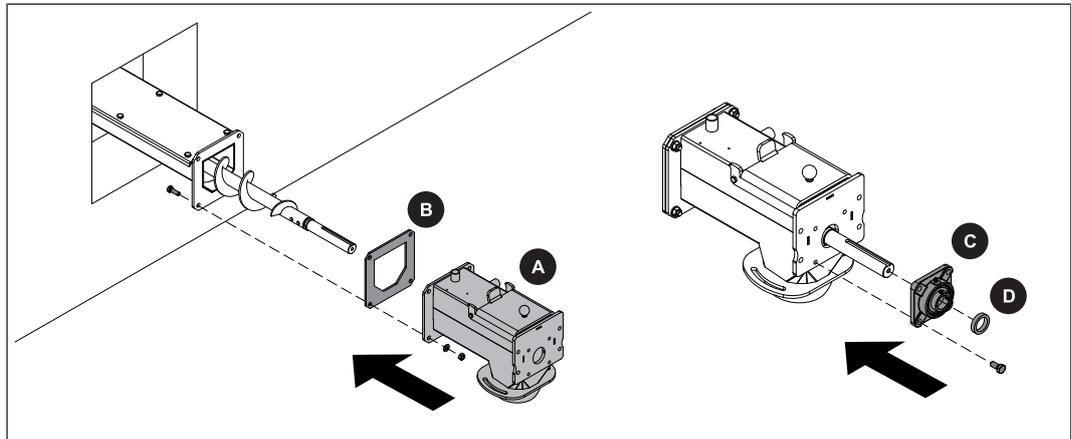
Ball



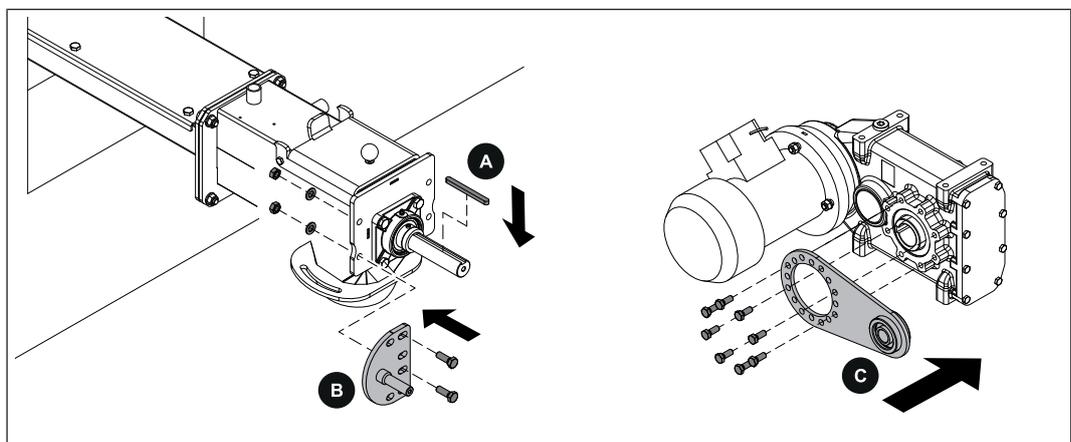
Flange

**NOTICE!** Depending on the type of installation, the top part of gravity shaft is designed with a ball or flange connection.

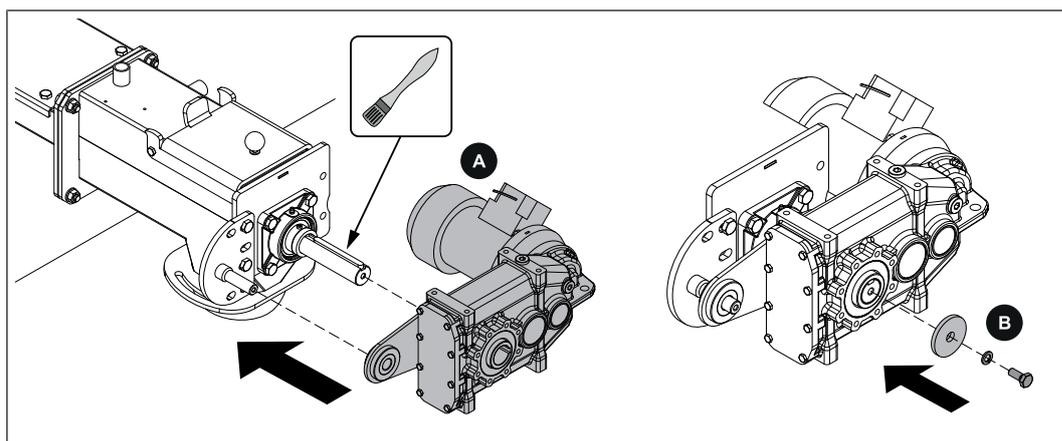
#### Assembly with screw Ø110



- Secure top part of gravity shaft (A) with seal (B) to the closed trough on the boiler room side
  - 4x hexagonal screw M12 x 35
- Push the flange bearing unit (C) onto the screw end and secure to top part of gravity shaft
  - 4x hexagonal screw M12 x 25
- Push the spacer ring (D) onto the screw end



- Insert key (A) into groove on screw end
- Secure torque support with pin (B) to upper part of gravity shaft
  - 2x hexagonal screw M12 x 35
  - The pin and screw end must be at the same height
  - ↪ Centre distance of pin and screw end: 150 mm
- Secure torque support with bearing (C) to the geared motor as illustrated
  - 8x hexagonal screw M8 x 20

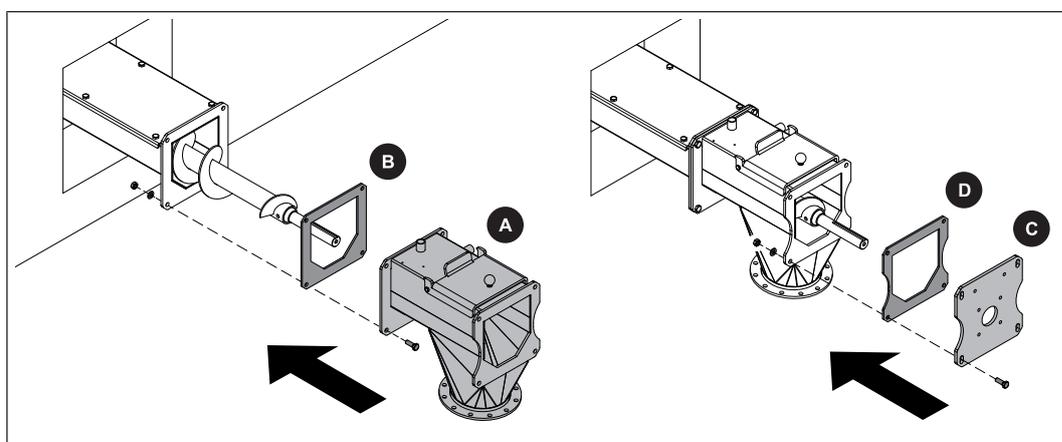


- Lubricate shaft stub incl. key with copper paste
- Push the geared motor (A) onto the screw end
- Secure locking washer  $\varnothing 45 \times 8$  (B) to shaft stub  
- 1x hexagonal screw M10 x 25

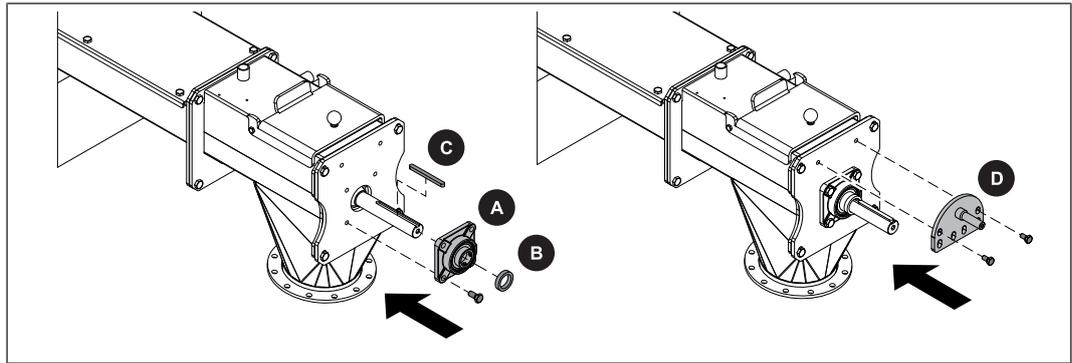
If the geared motor cannot be installed as shown above for reasons of space, it is possible to turn the drive unit:

- Fit the torque support with pin on the opposite side
- Turn the geared motor and torque support  $180^\circ$  and fit to the screw end and torque support as explained above

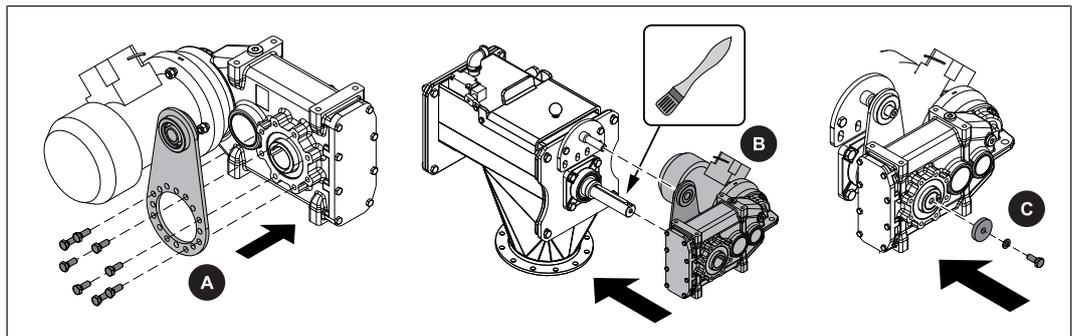
### Assembly with screw $\varnothing 150$



- Secure top part of gravity shaft (A) with seal (B) to the closed trough on the boiler room side  
- 4x hexagonal screw M12 x 35
- Secure flange plate (C) with seal (D) to top part of gravity shaft  
- 4x hexagonal screw M12 x 35



- Push the flange bearing unit (A) onto the screw end and secure to top part of gravity shaft
  - 4x hexagonal screw M12 x 25
- Push the spacer ring (B) onto the screw end
- Insert key (C) into groove on screw end
- Secure torque support with pin (D) to top part of gravity shaft
  - 2x hexagonal screw M12 x 20
  - ↳ Centre distance of pin and screw end: 150 mm

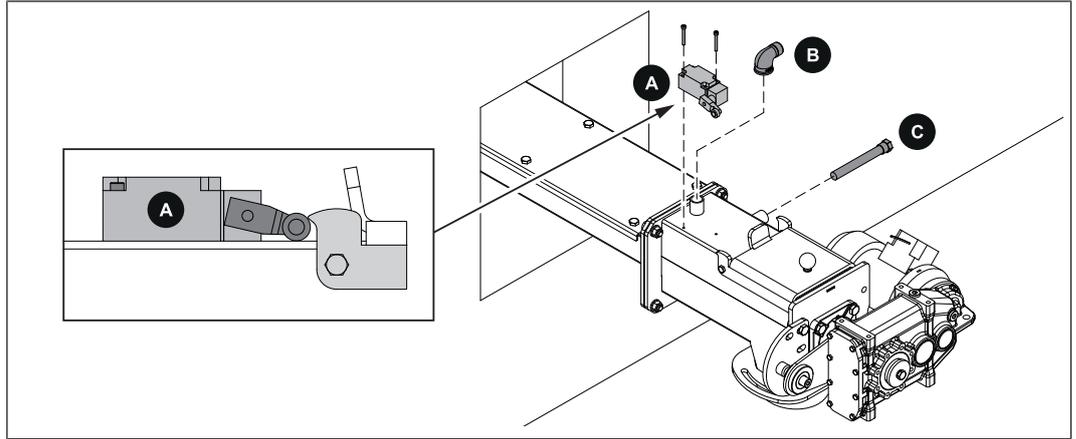


- Secure torque support with bearing (A) to the geared motor as illustrated
  - 8x hexagonal screw M8 x 20
- Lubricate shaft stub incl. key with copper paste
- Push the geared motor (B) onto the screw end
- Secure locking washer  $\varnothing$  45 x 8 (C) to shaft stub
  - 1x hexagonal screw M10 x 25

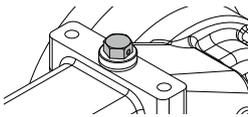
If the geared motor cannot be installed as shown above for reasons of space, it is possible to turn the drive unit:

- Turn the torque support with bearing 180° and secure to geared motor
- Turn the geared motor and torque support 180° and fit to the screw end and torque support as explained above

### 4.3.5 Fitting attachments



- Secure limit switch (A) to upper part of gravity shaft
  - 2x cylinder head screws M5 x 40
  - ↳ The reel of the safety limit switch (A) must be positioned as illustrated
- Fit the elbow (B) of the water sprinkler system to the upper sleeve on the upper part of gravity shaft
- Fit the immersion sleeve (C) of the water sprinkler system to the side sleeve

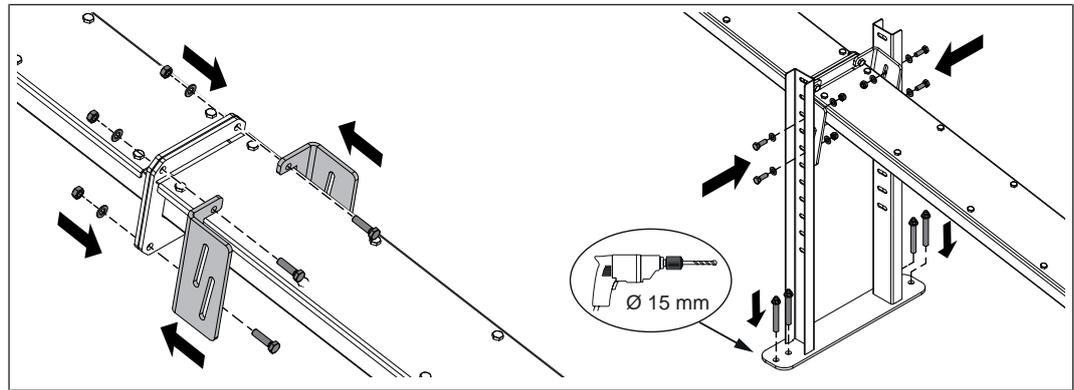


Prepare the geared motor:

- Remove the transport lock
- Fit the vent screw (supplied) to the highest point

### 4.3.6 Fitting adjustable feet in boiler room (optional)

If the closed duct in the boiler room exceeds 2m, an additional support is recommended:



- Remove the brackets from the supporting post
- Remove the screws of the trough flange at the relevant position
  - 4x hexagonal screw M12 x 35
- Secure the brackets to the trough flange with the previously removed screws
- Position the supporting post at the bracket and screw together
  - 4x hexagonal screw M12 x 35

### Screwing the adjustable feet to the floor:

- Mark two holes each for the adjustable feet on the left and right on the floor
- Drill the holes marked
  - Drill diameter 15 mm
  - Min. drill depth 105 mm
- Insert the heavy load anchors into the bore holes and tighten with a spanner (AF 17 mm)

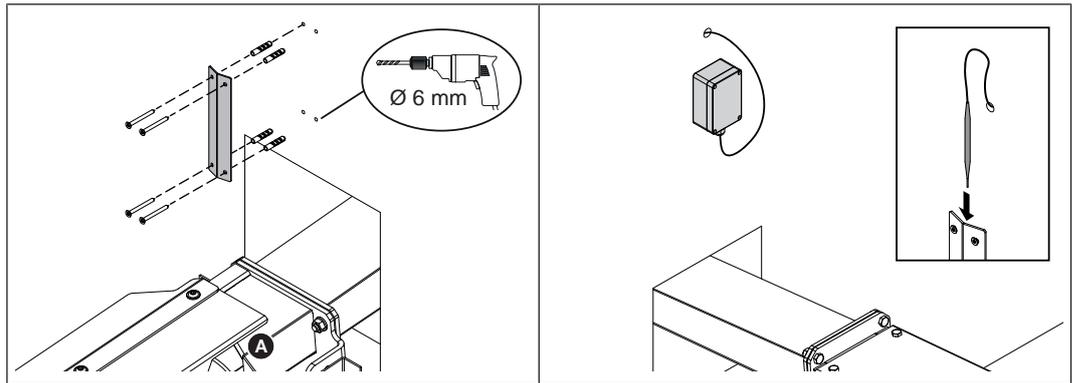
### 4.3.7 Closing the wall penetration

- Pack the space in the wall penetration with a non-flammable insulating material
  - ↳ Insulate the partition as per EN 1366-3 / EN 13501-2
- Close the wall penetration on the store side and the boiler room side with a non-flammable covering

## NOTICE

Do not connect the transfer channel to the brickwork (with concrete), as this will transfer sound through all the brickwork.

### 4.3.8 Temperature monitoring device in the fuel store (TMD):



- Position the sensor plate above the transfer channel from open to closed trough (A) and transfer the holes to the wall
- Drill the marked holes
  - Drill diameter 6 mm
  - Min. drill depth 50 mm
- Hammer dowel  $\varnothing 6 \times 30$  into wall and mount sensor plate
  - 4x screw  $\varnothing 4 \times 40$
- Mount the housing outside the fuel store
- Guide the sensor through the wall at a suitable point and push it into the sensor plate
  - ↳ **CAUTION:** Do not kink the capillary tube!
- Further cabling of the on-site warning device(s) according to the enclosed installation instructions

## 4.4 Connecting the system

### 4.4.1 Electrical connection

 **DANGER**



When working on electrical components:

***Risk of electrocution!***

When work is carried out on electrical components:

- Always have work carried out by a qualified electrician
- Observe the applicable standards and regulations
  - ↳ Work must not be carried out on electrical components by unauthorised persons
  
- Lay cables of components to control cabinet
  - ↳ Lay the cables so that nobody will trip over them!
  - ↳ Do not lay the cable over or around sharp edges!
- Wire the connections according to the wiring diagram

### 4.4.2 Connecting the sprinkler system

Connection should only be carried out by authorised technicians.

When connecting the sprinkler system, please also note:

- Put a stopcock and bolted joint in front of the thermal discharge safety device
  - ↳ Important for easy dismantling in the event of maintenance work!

## 5 Operating the system

### 5.1 General information

The steeper the angle (maximum 10°) at which a rotary agitator is fitted, the more likely that fuel will remain behind when the bunker empties.

When operating with pellets it is particularly important to note:

- Fit as flat as possible (maximum 3°), ideally horizontal
- Fuel may remain in the store due to its high propensity to trickle
- The boiler must be turned off at least two hours before pellets are blown in

### 5.2 Initial startup

#### NOTICE

Efficient operation can only be guaranteed if the system is set by specialist staff and the default factory settings are observed.

Therefore:

- Initial startup should be carried out with an installer approved by Fröling Heizkessel- und Behälterbau GesmbH or with Fröling customer services

Before commissioning or before the first filling, carry out the following checks:

- Check the direction of rotation of the screw
- Check the direction of rotation of the rotary agitator arms
- Check that the safety limit switch on the gravity shaft is working
- Check that the motor overload for the drive motor is working
- Check the connection of the sprinkler device

When the check is finished:

- Fill the store with fuel

## 5.3 Filling/refilling the store with fuel

When filling the store you should always ensure that you are using the right fuel:

➔ "Permitted fuels" [▶ 8]

- Remove foreign bodies from the store before filling

### ⚠ CAUTION

Entering the store space when the system is switched on

***Risk of injury due to automatic startup of system, particularly the discharge system!***

Therefore, before entering the fuel store:

- Switch off the power supply to the entire system
  - ↳ Depending on the model via boiler, expansion switch cabinet, etc.

### ⚠ CAUTION

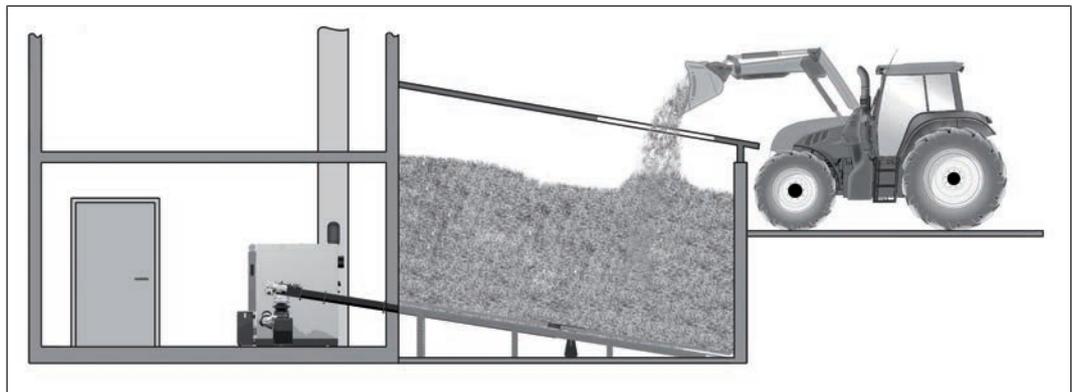
Blowing in fuel when the boiler is switched on:

***The underpressure generated from blowing in fuel can lead to smoke being sucked back into the store if the boiler is switched on. Possible excess pressure could cause smoke to escape into the installation room, possibly resulting in injury and damage!***

Therefore, before blowing in the fuel:

- Switch off the power supply to the entire system
  - ↳ Depending on the model via boiler, expansion switch cabinet, etc.
- Allow the system to cool for **at least two hours**

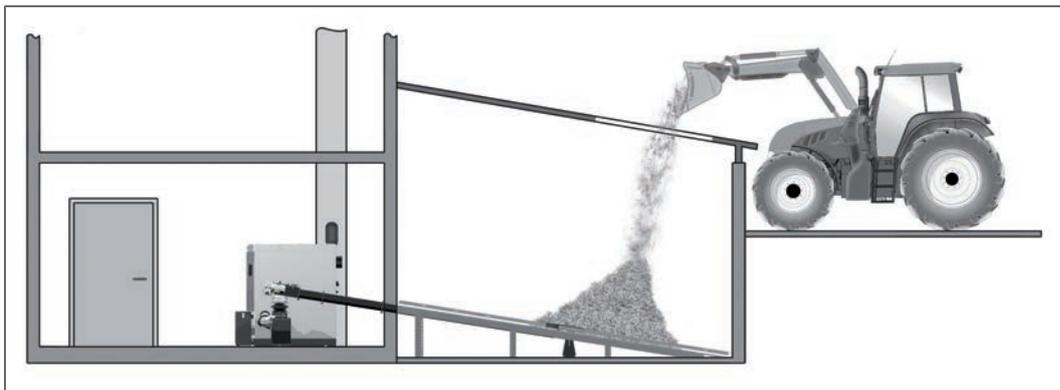
### 5.3.1 Loading of fuel for a partially emptied store with rotary agitator



If there is still sufficient fuel in the fuel store (the rotary agitator head is completely covered with fuel and the rotary agitator arms / spring blades are not extended), the store can be filled.

- Load the fuel at the filling opening

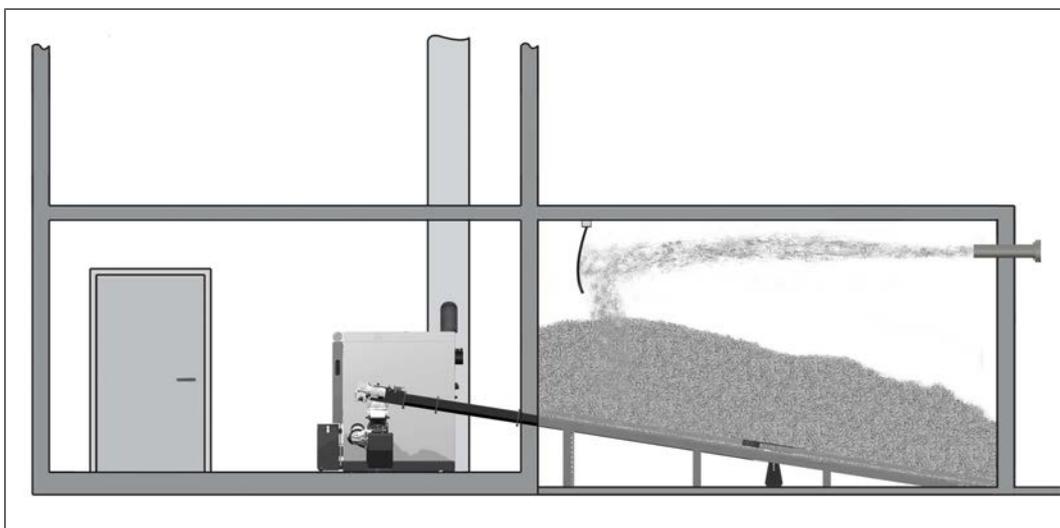
### 5.3.2 Loading fuel into an empty fuel store with a rotary agitator



If the rotary agitator head is already free from material and the rotary agitator arms / spring blades are extended, the feeder unit must be active until the rotary agitator arms / spring blades have fully retracted.

- Activate “Extra heating” mode in the quick selection menu
- Load a small quantity of wood chips and wait until the arms / spring blades are touching the head of the rotary agitator (approx. 2 revolutions)
- Only then should you load the remaining material

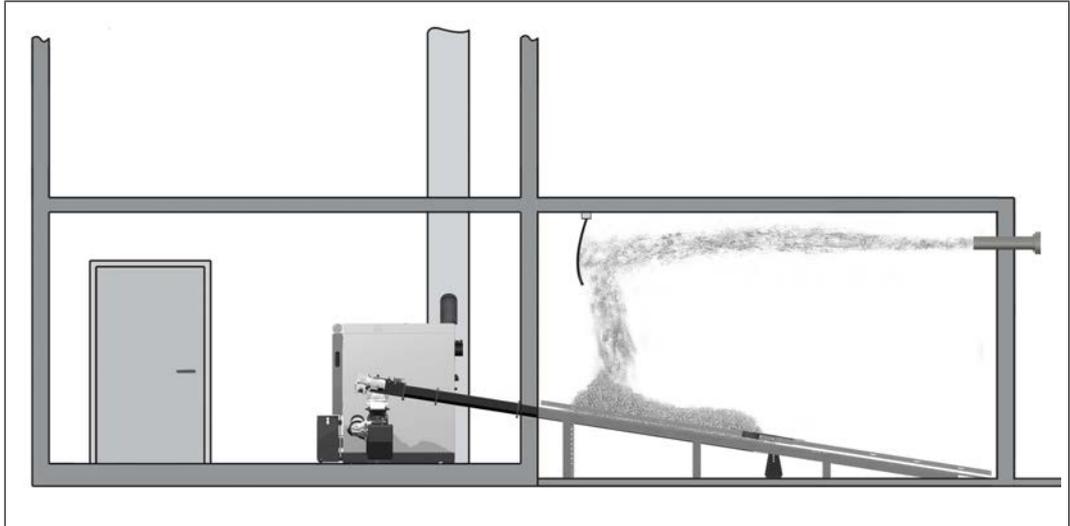
### 5.3.3 Blowing in fuel for a partially emptied store with rotary agitator



If there is still sufficient fuel in the fuel store (the rotary agitator head is completely covered with fuel and the rotary agitator arms / spring blades are not extended), the fuel store can be filled as follows:

- Switch off the boiler by tapping “Boiler off” at the mode icon and allow to cool for at least two hours
- Close all openings to the store to seal out dust
- Blow the fuel into the fuel store

### 5.3.4 Blowing in fuel for an empty store with rotary agitator



If the rotary agitator head is already free from material and the rotary agitator arms / spring blades are extended, they should be covered with the remaining fuel in the fuel store and retracted. This should be done well before the agreed loading time.

*Before working in the fuel store*

- Switch off the boiler by tapping “Boiler off” at the mode icon and switch off main switch
- Turn off the main switch on the expansion switch cabinet (if installed)
- Distribute any fuel remaining in the store (in corners, against walls) over the head of the rotary agitator with your hands
  - ↳ Follow the instructions on working in the fuel store!

**NOTICE! Refer to the notice at the entrance to the fuel store**

*After working in the fuel store*

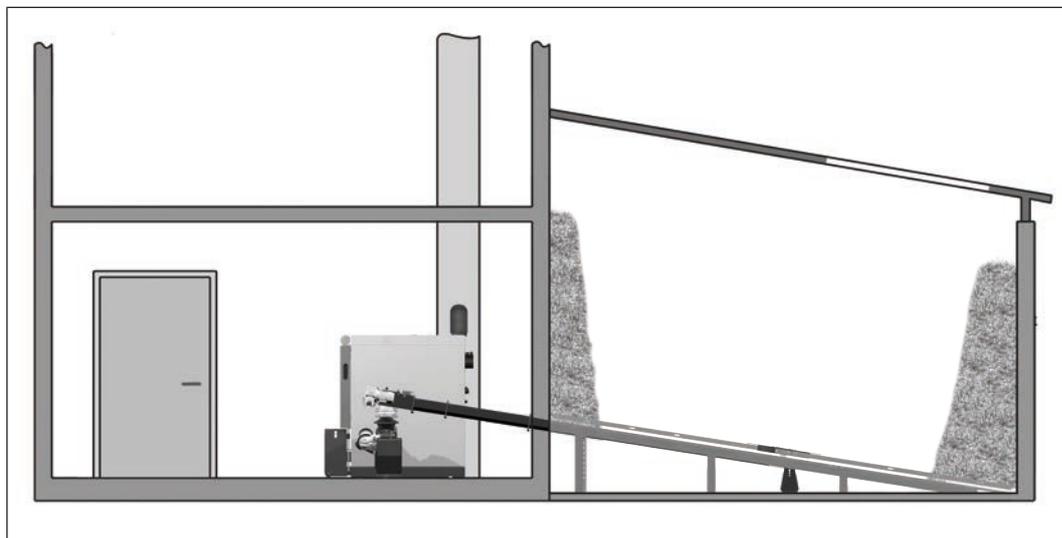
- Turn on the main switch on the boiler and on the expansion switch cabinet (if installed)
- Activate “Extra heating” mode in the quick selection menu
- Wait until the rotary agitator arms / spring blades are touching the head of the rotary agitator (approx. 2 revolutions)
- Switch off the boiler by tapping “Boiler off” at the mode icon and allow to cool for at least two hours
- Close all openings to the fuel store to seal out dust
- Blow the fuel into the fuel store

If the fuel store is completely empty and there is no residual fuel to redistribute:

- Contact Froling and seek advice before filling the fuel store

### 5.3.5 Drainage of fuel store

When the fuel store is emptied, a certain amount of fuel remains and is not removed by the rotary agitator. This is not a malfunction but occurs due to the nature of the system. This effect is amplified when the wood chips are compressed.



Tips for better emptying:

- Use suitable wood chips in terms of moisture content, size etc.
- Reduce the dumping height onto the rotary agitator
- Avoid compressing the wood chips, e.g. by carefully adding to the fuel store
- Design the walls in the bunker so they are as smooth as possible

## 5.4 During operation

The boiler is controlled by the boiler controller. The discharge system switches on and off automatically when material is requested.

When filling, or in the event of a fault, the system is operated in manual mode.

For the necessary steps, and how to display and alter parameters:

**NOTICE! See operating instructions for boiler controller**

### NOTICE



When transporting wood chips or pellets using the feed screw, there may be noise, depending on the function.

## 5.5 Decommissioning

### 5.5.1 Disassembly

To disassemble the system, follow the steps for assembly in reverse order.

### 5.5.2 Disposal

- Disposal should be carried out according to the valid national regulations and guidelines.
- You can separate and clean recyclable materials and send them to a recycling centre.

## 6 Servicing the system

### **WARNING**



Incorrect inspection and cleaning:

***Incorrect or insufficient inspection and cleaning of the discharge can cause serious faults and subsequently result in accidents and damage to property.***

Therefore:

- Carry out maintenance of the discharge according to the instructions!

### **DANGER**



When working on the unit with a live power supply:

***Serious injury possible due to automatic startup!***

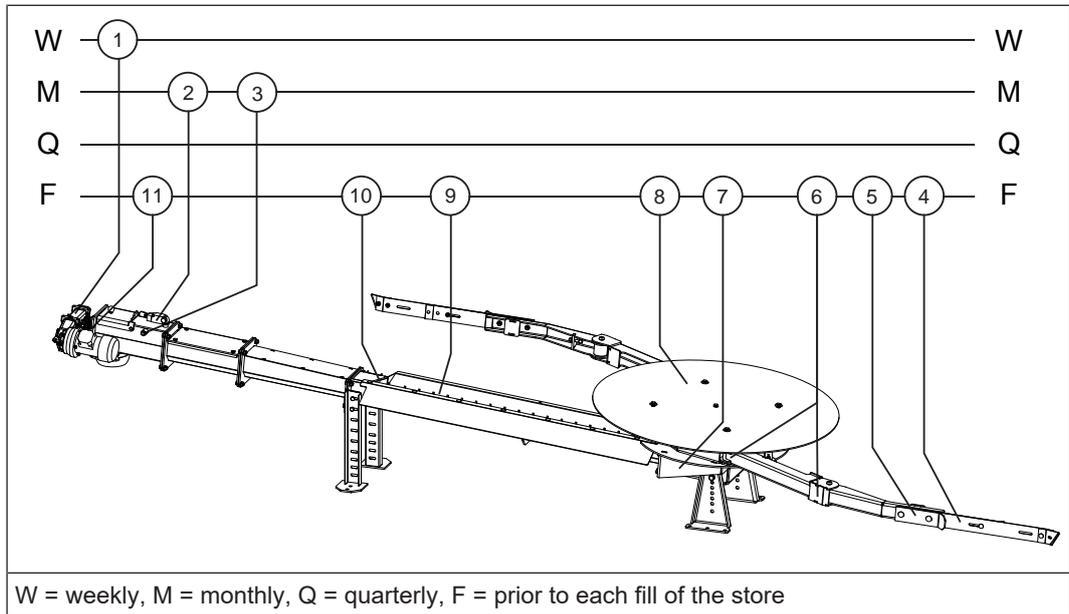
When working on the system or in the store, it is essential that the five safety directives are followed:



- Disconnect all poles on all sides
- Secure so that it cannot be switched on again
- Check that there is no power
- Earth and short circuit
- Cover any adjacent live parts and limit area of risk

## 6.1 Maintenance work by the operator

- Regular maintenance of the discharge extends the service life of the entire plant and is a basic requirement for trouble-free operation!



No.	Component	Int.	Operation
1	Motor / gears	W	<ul style="list-style-type: none"> <li>Carry out a general visual inspection of the drive motor                             <ul style="list-style-type: none"> <li>No major oil leaks should be visible.</li> </ul> </li> </ul>
2	Gravity shaft / safety switch	M	Function test of the safety switch: <ul style="list-style-type: none"> <li>Open the inspection cover of the gravity shaft                             <ul style="list-style-type: none"> <li>The system should switch off immediately.</li> </ul> </li> <li>Check the inlet area for material build-up and clean where necessary.</li> <li>Close gravity shaft cover</li> <li>Check fault message on the controller</li> </ul>
3	Sprinkler system		Sprinkler system ready for operation <ul style="list-style-type: none"> <li>Check the position of the sensor</li> <li>Visual inspection of the sensor and the capillary tube</li> <li>Check water supply for sufficient pressure</li> </ul>
4	Spring piles	F	<ul style="list-style-type: none"> <li>Check that the connecting screws of the clamping plate are firmly in position and tighten if necessary                             <ul style="list-style-type: none"> <li>Replace broken screws immediately</li> </ul> </li> <li>Check that the connections of the spring piles have a little play (approx. 1mm)                             <ul style="list-style-type: none"> <li>Tighten or loosen the screws if necessary</li> </ul> </li> </ul>
5	Clamping plate of the spring piles		<ul style="list-style-type: none"> <li>Check that the screws of the clamping plate are firmly in position and tighten if necessary</li> </ul>
6	Joints		<ul style="list-style-type: none"> <li>Check that the screws of the clamping plate are firmly in position and tighten if necessary</li> <li>Check the joints for wear                             <ul style="list-style-type: none"> <li>Distance between the rotary agitator arms and cover plate on the open trough must be at least 10 mm</li> </ul> </li> </ul>

No.	Component	Int.	Operation
7	Mitre gear		<input type="checkbox"/> Carry out a general visual inspection ↳ No major oil leaks should be visible.
8	Rotary plate		<input type="checkbox"/> Check the rotary plate for material build-up and clean if necessary
9	Trough / dosing screw		<input type="checkbox"/> Check the trough and dosing screw for dirt and damage <input type="checkbox"/> Check the screw blades for wear
10	Inlet area / transfer channel		<input type="checkbox"/> Check the inlet area for material build-up or jammed fuel and clean if necessary <input type="checkbox"/> Check the shear plate in the entry area of the transfer trough for wear
11	Flange bearing		<input type="checkbox"/> Lubricate bearing at lubricating nipple with grease gun

## 6.2 Maintenance work by technicians

**NOTICE! An annual inspection by an authorized partner (external maintenance) or the Fröling factory customer service is recommended!**

Regular maintenance and servicing by a heating specialist will ensure a long, trouble-free service life for your discharge. It ensures that the plant operates trouble-free and economically, and

in the course of maintenance the entire discharge is checked and optimized.

For this reason, FROLING offers a maintenance contract, which optimises operating safety. Please see the details in the accompanying guarantee certificate.

Your Froling customer service office will also be happy to advise you.

**IMPORTANT: An annual inspection by a specialist does not replace the maintenance work to be carried out by the operator in accordance with the maintenance plan!**

### NOTICE

The prerequisite for the feasibility of the inspection and maintenance work is unrestricted access to the components of the discharge system!

**Therefore:**

- Empty fuel store on the agreed date
- Provide for any service openings
- Sufficient ventilation of the fuel store (CO concentration)

Check the following components as part of the maintenance work:

- Motor / gears
- Gravity shaft / safety switch
- Sprinkler system
- Spring piles
- Clamping plate of the spring piles
- Joints
- Mitre gear
- Rotary plate
- Trough / dosing screw
- Inlet area / transfer channel
- Flange bearing

## 6.3 Replacement parts

With Froling original replacement parts in your system, you are using parts that match perfectly. As the parts fit together so well, installation times are shortened and a long service life is maintained.

### NOTICE

Installing non-original parts will invalidate the guarantee.

- Only replace components or parts with original replacement parts.

## 7 Troubleshooting

There are two main types of fault: internal and external.

External faults:

- Heating EMERGENCY STOP activated
- Household fuse (FI circuit breaker) or component fuse blown

Internal faults:

- displayed as error messages on the boiler controller  
**see boiler operating instructions**





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