

User Guide 2017 - sealed silo

Congratulations with your sealed steel silos for storage of grain. The silo will give you several advantages, for example.

- no drying costs
- flexible and better use of combine harvester capacity
- substantial work savings with transport and handling
- no pests can survive in the silo
- sealed grain has less dust and gives animals greater appetite

- But you must obviously follow certain usage rules that we describe below. We will stress the need to carefully follow the rules, because the silo content represents high value, and because of the consequences for the grain, which will result from lack of observing the rules.



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1. General information and safety instructions

Please read the entire manual before operating the unit.

The warranty is voided if the following conditions are not met:

- installation, operation and servicing is performed according to the instructions in this user guide
- Assentoft Silo original spare parts shall be used exclusively

1.1. Safety Instructions

Electrical connection to the delivered equipment must be carried out by a qualified electrician.

Assentoft Silo is not liable for damages resulting from incorrect use or technical changes to the system in relation to what is specified in this user manual.



Warning: Under no circumstances, may anyone enter the silo before it is well ventilated. Leave the top hatch and man door open to draught for a minimum of 24 hours!



REMEMBER to always disconnect power with all work on mechanical parts!!

2. Prior to filling each year

2.1. Tighten the anchor bolts

When cleaning the silo before harvest, we recommend that anchor bolts be tightened. The bolts on the base clamps must be tightened, since steel and concrete work differently, and it therefore may be necessary to tighten the base bracket bolts.

Silos, erected before 2007:

Silos erected before 2007 have base clamps inside. Older silos with internal oblique concrete edges shall not be tightened.

Silos, erected in 2007 or later:

Bolts can be tightened from the outside.

If the silo is not emptied before harvest, we recommend that it be tightened the next year.

Instructions:

Anchor bolts are located inside the silo –along the silo wall. The anchor bolts press the base clamp down on the angle iron so as to lock the silo in place.

Tighten the bolts with a large face wrench. The bolts are sufficiently tightened when an "ordinary man" has pulled hard - using an extension piper or the like.

2.2. Check prior to filling

Since chaff and impurities from the grain accumulate at the outer edge of the silo, the silo must be emptied and cleaned before each filling commences.

Prior to filling, check the silo and the grain unloading auger and the sweep arm auger shall be checked.

The Silo's moveable, self-emptying auger is placed in position (see page 14)

- Check that all silo and auger gaskets are in order/tight.
- Check and install slats in the man door.
- Make sure all doors are closed. Tighten moderately - and alternately on all nuts
- Make sure that the inlet at the top of the silo is positioned so there is no skew filling
- Check the sealed vents - that they are dust-free, have intact seals, and that the flap closes tight - (should be checked every 3 months). See our Video:
<https://www.youtube.com/watch?v=E667hjD7bxo>
- Check the bearings on the discharge transport up to and including the sealed vent are tight - otherwise there is risk of leaks and seepage of CO₂
- Inspect the inside, bottom seam visually; if moisture has penetrated, contact Assentoft Silo for pressure testing (or pressure test yourself – see below) and repair the bottom joint if necessary
- Verify correct rotation direction of the sweep auger (counter clockwise) – as seen from outside, at the silo wall
- Sweep around the base, so there is no chaff or other spillage against the bottom joint

Checking the pressure valve - type "ASSENTOFT":

The pressure equalisation valve on the silo roof, equalises over and under pressure in the silo due to temperature changes.

The pressure valve can be blocked by grain, insects and dust, so it is necessary to open the valve and clean it once a year.

Check and clean the pressure valve after harvest when the silo is full, to remove impurities blown up when filling.

Checking pressure valve - type "WAM":

See our Video: <https://www.youtube.com/watch?v=egSsSqtwfvU>

If the silo is equipped with a WAM pressure/vacuum valve (ø273 mm with "WAM" printed in the rain hood), it must be checked as follows:

- a. Dismantle the rain hood by removing the 3 nuts holding it
- b. Make sure the rubber gasket is intact. Check that all springs (4 pcs.) are intact
- c. Remove dust and dirt from the valve
- d. Check that the vacuum valve (the part in the middle with 1 spring) works by pressing down the plate to compress the spring, and release quickly – the plate shall spring back and seal against the rubber gasket
- e. Check the pressure relief valve (the part which is fitted with 3 springs): Grasp the plate with both hands and pull up to put tension on springs, and release quickly – the plate shall return immediately and seal against the rubber gasket
- f. Then re-install the rain hood and tighten the nuts

2.3. Pressure Testing

Always ensure that the silo is airtight. Assentoft Silo recommends that the silo be pressure tested every one or two years by trained service engineers.

See below, section 3 "Service Agreement".

3. Service Agreement

Assentoft Silo offers a service agreement to pressure test and check silos.

The service agreement includes an annual (or biennial) pressure test and control of the silo system, including filling and emptying conveyance - as well as mill/mix systems.

A 10% discount on spare parts and pressure testing is offered with a service agreement.

Repair services for pressure testing are calculated at our normal hourly rate for technician.

Contact service department for an appointment: Tel. 87 95 15 64.

4. Filling of the silo

The grain is delivered straight from the combine to the silo. It's a good idea to remove the dust, chaff, sand and soil from the grain.

The grain auger and silo must be tightly sealed during the filling period. The top door must be closed during unstable weather and during harvest delays of more than 1 day.

When the silo is full, the pressure equalization valve shall be cleaned and the top door shall be closed.

The sealed silo system is designed for continuous emptying; we therefore recommend taking a smaller portion of grain from the silo during the filling period daily, in order to prevent bridging later. Thus, the cereal grains turn toward the direction of the silo's outlet.

NB: The mounted water column meter will not deflect, when the bin is completely full!

The sealed system functions optimally when the silo is filled during the harvest, and is emptied completely before the next harvest.

4.1 Moisture Percentage

For optimal fermentation, the grain moisture percentage shall be 18-22%.

With fermentation (metabolism), the oxygen in the silo is, and carbon dioxide (CO₂) and alcohol are formed, which preserves the grain and makes for a good feed product.

A high percentage of water does not damage the grain in the sealed silo – fermentation becomes more efficient, animals get a better appetite, and the grain itself will generate CO₂.

The addition of CO₂ to promote conservation is needed most at low moisture percentages.

4.2 Checking CO₂ content in the silo:

The silo's CO₂ content may be checked by immersing candles/hurricane lanterns in the top of the silo. If the light goes out when the hurricane lantern is just above the grain, all oxygen has been displaced by CO₂, and no further CO₂ shall be added.

5. Addition of carbon dioxide (CO₂)

CO₂ is heavier than oxygen and settles, protecting the surrounding grain.

We recommend adding 0,5 kg of carbon dioxide (CO₂) per m³ grain in the silo, for ex.:

M ³ silo	Tonnes of barley/wheat	Kg CO ₂	M ³ silo	Tonnes of barley/wheat	Kg CO ₂
160	104/119	80	1485	1039/1188	743
316	221/252	158	1583	1108/1266	792
434	303/347	217	1682	1177/1345	841
712	498/569	356	2048	1433/1638	1024
937	655/749	469	2565	1795/2052	1283
1115	780/892	558	3062	2142/2449	1531
1274	891/1019	637	3560	2492/2848	1780
1387	970/1109	694	4057	2839/3245	2029

We recommend adding CO₂ while the silo is being filled with grain.

If the harvest is paused for longer than 2 days, add CO₂ corresponding to the amount of grain in the silo.

Add extra CO₂, if

- the bottom door of the silo has been opened
- the unloading auger is left open
- sealed vent has been opened beyond the emptying time

5.1. CO₂ equipment:

Liquid CO₂ is added to the silo through a carbon dioxide valve mounted on one of the silo doors.

The CO₂ valve shall be adjusted so that a 20 kg CO₂ bottle is emptied in about 24 hours.

Max. flow: 10-12 L/min.

6. Unloading auger



REMEMBER to always disconnect power with all work on mechanical parts!!

The unloading auger, which extends outside the silo, is equipped with air-tight connections to avoid CO₂ leakage.

REMEMBER to always ensure that the auger's sealed vent is closes tightly, and that all the auger connections are airtight. If leakage occurs, the carbon dioxide will leak out of the silo.

WARNING:

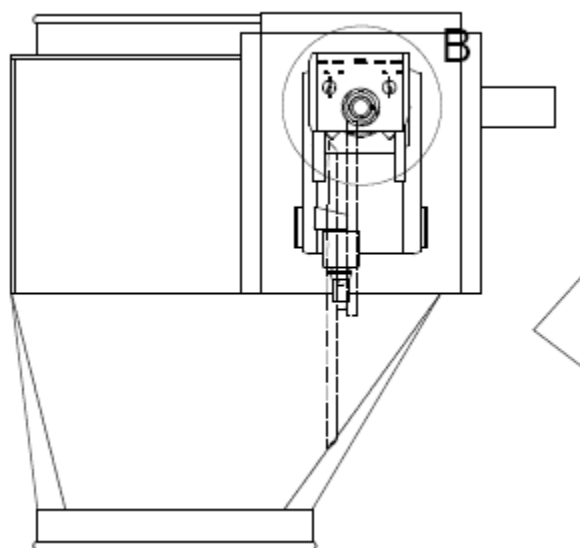
If you leave the unloading auger open, the silo's carbon dioxide content will leak out, oxygen will seep in, and grain will start to breathe during heat development, etc. If the grain begins to heat up, CO₂ should be added into the silo.

6.1. Sealed vent:

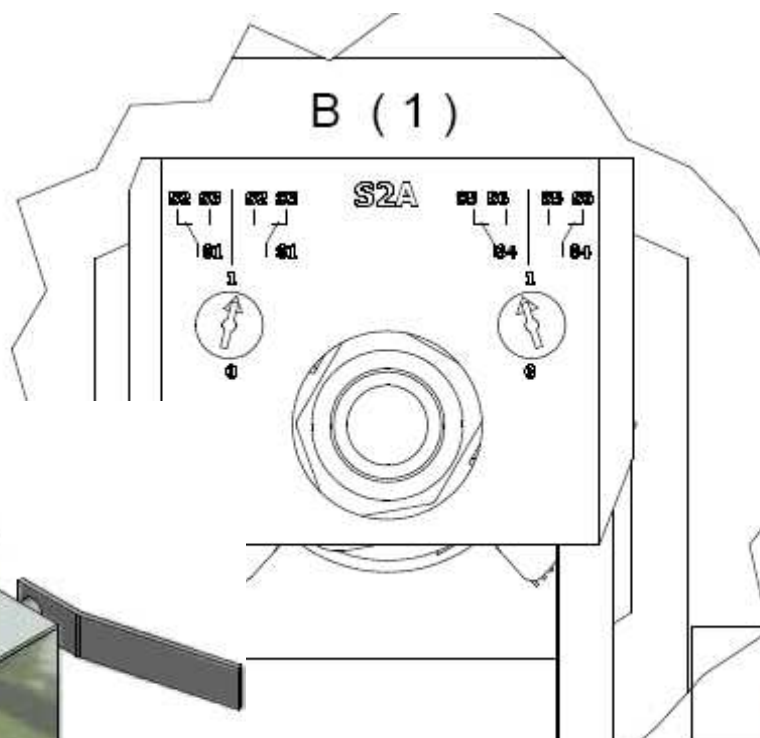
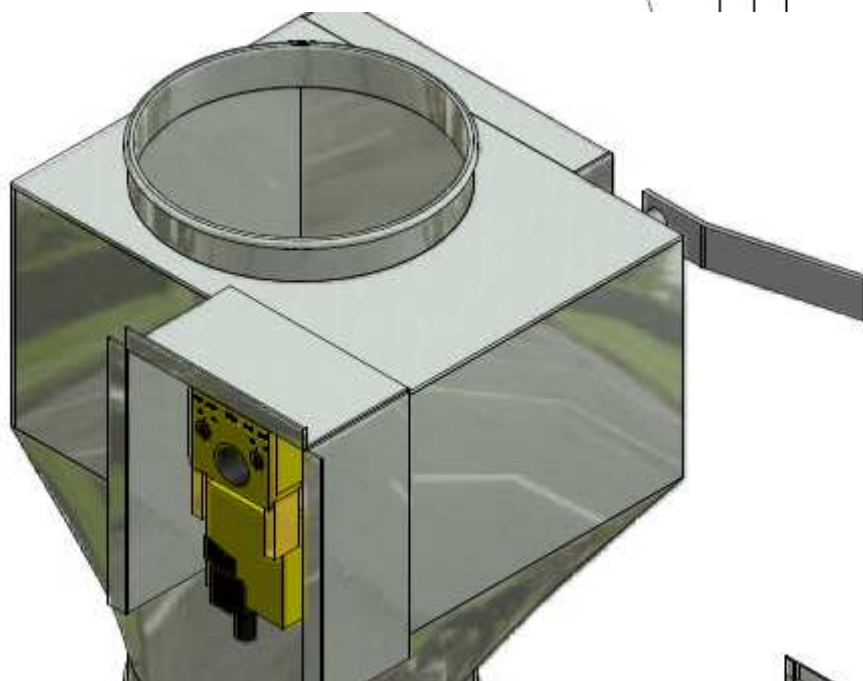
When adjusting of flap boxes: See page 9 and 10 – note the position indicator of respective sealed vent (closed) and sealed vent (open).

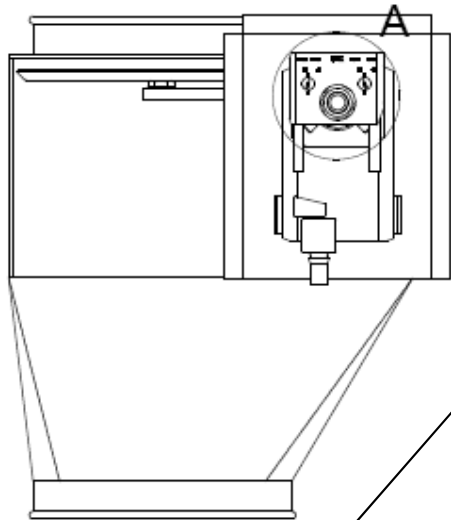
Further, the door can be seen on page 10.

See also video: <https://www.youtube.com/watch?v=E667hjD7bxo>

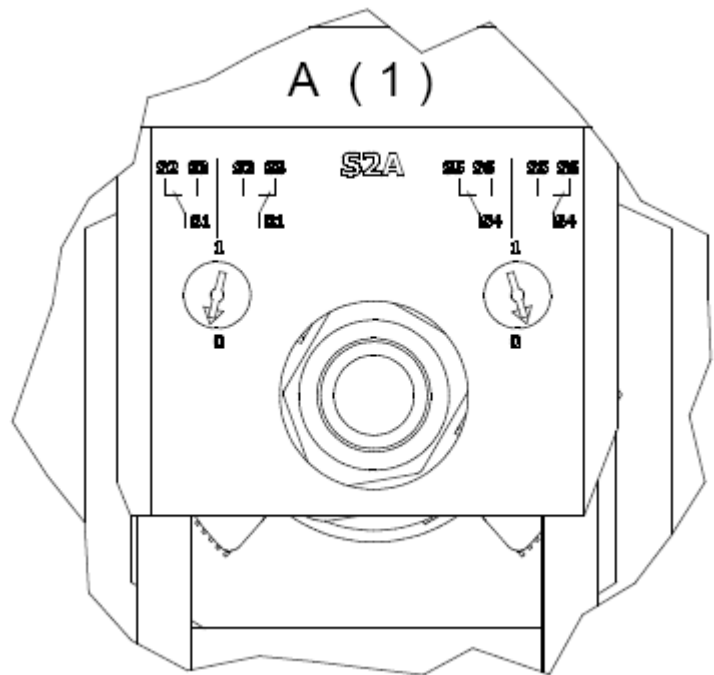


SEALED VENT, OPEN



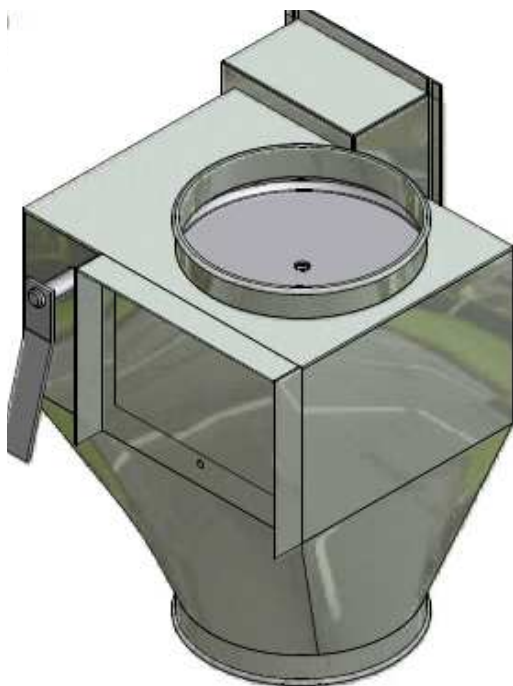


*Release button for sealed door - shall be released when cleaning. **REMEMBER to turn off the power!!!**



NOTE POSITION INDICATION

SEALED VENT, CLOSED



Cleanout

6.2. Mounting of Belimo motor

- Close the sealed valve completely and mount the Belimo-motor as shown in the photo below
- The damper motor is rotated by loosening (disconnecting) the gear
- Press the black button
- The clamp shall be tightened firmly and run a test by loosening the gear and turning the flap manually
- Note that the gear is not fully extended in its outermost position when the valve is closed, since the density function is not sufficient
- Mount setting indication and adjust as per instructions (pages 9 and 10)



Black button

7. Clearing bridging

If bridge formation occurs in the grain inside the silo, try the following:

- If the silo is provided with a movable auger, this is started without removing the protective pipe
- Activate the installed shredder after the unloading auger is started. Activation is performed manually with the supplied handle (see Photo 1)
- Moving the sealed auger 0.3m in or out of the silo
- Pull the protective pipe ca. 80 cm out of the silo. Attach the enclosed tube of 1 m. See Photo (2). View video: https://www.youtube.com/watch?v=T5CXS_Of4Qs

The sealed silo system is based on continuous emptying, so to prevent subsequent bridge formation, we recommend taking a smaller batch of grain from the silo during the filling period daily. Thus, the cereal grains will turn toward the direction of the silo's outlet.

If none of the above helps, contact Assentoft Silo.



Photo 1



Photo 2

8. Emptying with suction unit

WARNING:

If the bin is emptied with a suction unit, the top door and the man door must be opened!

- Otherwise you risk sucking the silo roof down or the silo wall in!

WARNING:

The large man door or the extra emptying branches must **not** be used for the extraction of larger quantities of cereals unless the unloading auger or suction head is placed close to the silo centre - min. 1/3 in relation to the silo diameter.

If large quantities of cereals are allowed to run down the silo wall, there will be a risk that the silo wall can be sucked in when the grain pressure suddenly drops!

9. Personal access

WARNING:



Remember that under no circumstances should you enter the silo without prior, thorough airing and checking that there is oxygen in the silo (controlled by candlelight)!!

The silo contains carbon dioxide (CO₂), Which is heavier than oxygen and will thus settle downward.

Therefore, a constant supply of fresh air shall be provided when remaining in the silo, for example with a grain blowing.

Do not enter the silo without having an assistant standing by the silo hatch, so you can get immediate assistance if necessary. Always use the safety line.

Please note risk of collapsing grain.

REMEMBER to always disconnect power with all work on mechanical parts!!

9.1. Respirators and filter masks (dust masks)

If it is not possible to ventilate the silo, special respirators can be used when working inside the silo, which consists of full or half masks supplied with fresh air from an air compressor fitted with a pressurized tank, oil and water separator, pressure controller and air filter.

When working in silos with grain, filter masks are to be used to filter out grain dust. **REMEMBER**, these masks do not protect against lack of oxygen! The silo must still be thoroughly vented and oxygen must be present before working inside the silo.

Respirators and filter masks with instructions are available from DIY stores, technical stores, as well as company ICM Safety, tel. 70 60 66 06, www.icmsafety.com

10. Feeding and Storage

Grain, taken out from the silo has a limited storage durability due to moisture. The shelf-life will, of course, be dependent on the grain moisture and temperature effect.

The sealed system assumes that the silo is filled up, and, that there is continuous removal daily or at least 1 to 2 times per week.

During cold winter periods, whole grains will keep for several weeks. In the hottest summer periods, the product shelf-life will be reduced to a few days.

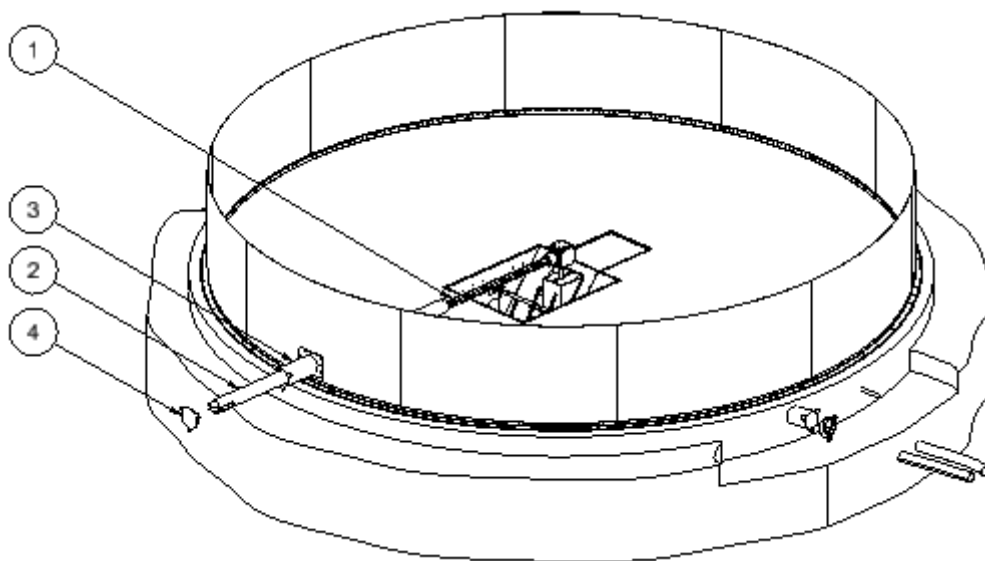
Milling further reduces the shelf-life.

11. Flat bottom with sweep arm auger

11.1. Prior to filling:

The sweep arm auger (1) shall be checked and run into place.
The protection tube (2) shall be pushed in
The extremity shall be placed in the emptying pipe (3)
The door (4) shall be tightened

Check clutch and gearbox for oil leaks.



11.2. Emptying:

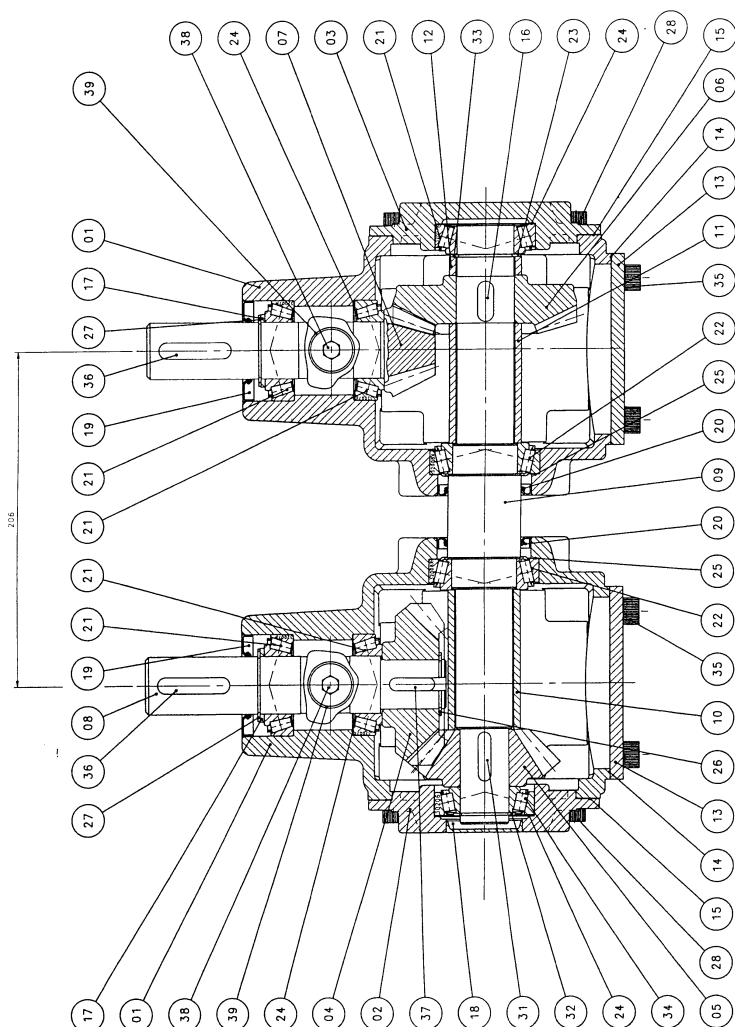
The part of the grain, that slides down is removed by the ordinary sealed auger.
When the silo is almost empty and the grain cannot slide down by itself to the unloading auger, pull out the protective pipe (2), and the sweep arm auger is then started.
This will ease start-up of the auger, that both the movable auger and the unloading auger are started for 5-10 min. when the protective tube has been pulled out a good halfway.

11.3. Automatic start-up of the sweep arm auger

Setting the load relay type DIA 53S:

- performed with silo auger in operation
- function: When the lamp lights, the auger is loaded, and when the lamp is off, the auger is unloaded
- Start call, and when the silo auger is in operation, set the start point by turning the adjustment knob according to the following
- with loaded auger (grain comes out of the silo), turn the knob until the lamp turns on
- with unloaded auger (sweep-auger shall start) turn the knob until the light goes out

11.4. Refilling of grease on sweep arm auger gearbox (see diagram here):



The 2 gearboxes are greased. For optimal greasing of bearings and gearwheels, fill/refill the gear boxes with grease at least once per year.

The gear is opened as follows:

- Remove the 4 allen screws on the end cap (Pos. 35) on both gear boxes and remove the end cap (pos. 13). Replacing should be in reverse order when the gear has been refilled.
- If the end cap is provided with a threaded plug (silos from 2007), fill grease to the edge of the hole.

Pay particular attention that the grease is not contaminated by water (it is a dull grey colour) as well as that the grease is not dried up (in this case, change all the grease!).

There shall be approximately 1.5 kg grease for optimal lubrication in all gearboxes.

Recommended grease type: Q8 Rubens 00 (DIN 51825, del 2-3).

12. Service Instructions for conveyor systems:

12.1. Safety Instructions

The electrical-connection to the delivered equipment must be performed by a qualified electrician.

Safety equipment which is removed during repair, cleaning or maintenance work shall be replaced before the conveyor is used again.

The electric motors are dimensioned such that they cannot be overloaded during normal operation if they are properly mounted and installed. The motor safety shutdown will switch off the power if the motor is overloaded or if there is a fault in the power supply. The fuse and the motor safety switch must be checked and replaced by an electrician if necessary.

During every repair, electric power must be removed, since there may be others who may accidentally start the conveyor.

12.2. Maintenance - chain elevators

Chain elevators require maintenance lubrication of bearings and inspection of belts.

When the lift is running, it is prohibited to remove control opening, blind plate or auger flighting, or to put your hand in the inlet and outlet.

The V-belt tension generally should be checked every 3 months. With frequent use of the elevator, check it every month. If it is no longer possible to tighten the V-belt, it must be replaced.

It is also important that the chain be inspected and tightened, if necessary.

The chain elevator side auger wears more or less, depending on the dirt part of the conveyor material, and should be checked annually for wear or damage.

Damage to the side auger can be caused by foreign bodies, such as wood, stone or iron pieces. If foreign bodies have caught in the auger, they can be removed with a suitable tool - but never manually.

If the inner auger is worn, replace it. To do this, the roof cover must be removed. Bolts in the feed propeller shall be loosened. The worn inner auger shall be removed and a new one installed. It may be necessary to replace the plastic part at the bottom of the trough.

REMEMBER to turn off the power!

12.3. Maintenance - chain conveyors

Chain conveyors require maintenance lubrication of bearings, chain and inspection of V-belts.

When the chain conveyor is running, do not put your hand into the inlet and outlet or control damper.

V-belt tension should generally be checked every 3 months. Remove the belt screen, check the tightening, and if required tighten the V-belt using the motor bracket set screw. For frequent use of the chain conveyor, check the V-belt tension every month. If it is no longer possible to tighten the V-belt, it must be replaced.

The chain tension shall be checked regularly; this is done by removing the cover plate on one of the middle sections, which allows lifting up the chain and checking the tension.

Check that the carriers are in good condition and that the cleaning belts (belt) on every third carrier is not defective, otherwise they must be replaced. Check that the chain is not stuck.

REMEMBER to turn off the power!

12.4. Cleaning the chain elevators or chain conveyors

The conveyor should be cleaned regularly to avoid product mixtures, bacteria contamination and damage to the product

To avoid overheating, dust deposits on motors and gears shall be removed regularly. At least once a year, the entire conveyor shall be cleaned and inspected for faults and wear and tear. Cleaning is required when changing the crop so as not to mix these together.

For conveying of highly adhesive products such as rape, corn, soybean meal and the like, all inlets and outlets shall be checked.

REMEMBER to turn off the power!

12.5. Maintenance - bucket elevator

Bucket Belts:

Check that bucket belts are properly tightened and run straight.

If the elevator is new - or if fitted with a new bucket belt - the belt must be checked after approx. 50 operating hours. After this, a check and eventual adjustment shall be made approx. every 500 operating hours. At least once per year (approximately every 2000 operating hours) the bucket belt and buckets shall be checked for cracking, damage and loose/missing bolts)

Gear/gear motor:

The oil volume in the gear must be checked prior to start-up. It is recommended to change the oil the first time after about 10,000 hours of operation, then (with synthetic oil) at an interval of 20,000 hours of operation. The gear motor must be cleaned of dust and dirt. Use compressed air if necessary.

Lubrication:

The bearings are provided with grease nipples and must be lubricated approximately every six months.

The bearings must also be kept free of dust and dirt.

REMEMBER to turn off the power!

12.6. Service agreement of conveyor and mill/mix equipment:

Our service department (see section 3) can also offer a service agreement of inspection and control of various conveyor and mill/mixing equipment.

13. Instructional videos

13.1. See Assentoft Silo's instructional videos:

<http://www.assentoftsilo.dk/produkter/service/instruktionsvideo/>



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