

OPERATING INSTRUCTION

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1	General.....	1-1
1.1	Introduction.....	1-1
1.2	Information on patent rights / copyright	1-1
1.3	Information for the user/operator.....	1-1
1.4	Service and warranty	1-2
1.5	Customer support for indoctrination and training	1-3
1.6	Examples for training topics	1-4
2	Safety	2-1
2.1	General	2-1
2.2	Designated use of the plant.....	2-1
2.3	Signs and symbols.....	2-1
2.4	Residual risk	2-2
2.5	Signs / labels at the plant	2-3
2.6	Safety notes for operating personnel	2-4
2.7	Safety instructions for operating the plant	2-5
2.8	Safety instructions for maintenance work	2-6
2.9	Information on specific danger situations	2-9
2.9.1	Electric energy	2-9
2.9.2	Electromagnetic compatibility (EMC).....	2-11
2.9.3	Pneumatics	2-11
2.9.4	Hot surfaces.....	2-12
2.9.5	Raw material, solvents, oils, grease and other chemical media	2-12
2.9.6	Noise.....	2-13
3	Product description	3-1
3.1	General design and arrangement of the H&P swinging bucket- conveyor	3-1
3.2	Technical Data	3-3
3.2.1	General data of the conveyed material:	3-3
3.2.2	Technical Data Bucket Elevator	3-4

3.3	Function of the H&P swinging bucket-conveyor	3-5
3.4	Safety-relevant arrangements	3-5
4	Transport.....	4-2
4.1	Delivery	4-2
4.2	Transport by crane	4-2
4.3	Transport industrial vehicles.....	4-4
4.4	Transport by road, rail or waterways	4-4
5	Mounting / installation	5-1
5.1	Qualification of Mounting personnel	5-1
5.2	Preparatory measures.....	5-2
5.3	Welding work	5-2
5.4	Mounting of the lower horizontal strand	5-3
5.5	Mounting of the vertical strand	5-4
5.6	Mounting of the upper corner section	5-4
5.7	Mounting of the upper horizontal strand.....	5-4
5.8	Mounting of the conveyor chains	5-5
5.9	Mounting and installation of electric components	5-6
5.9.1	Check/confirm the sense of rotation	5-6
5.9.2	Error detection	5-7
5.9.3	Speed monitoring device	5-7
5.9.4	Installation of the repair switches	5-8
5.9.5	Discharge station	5-9
5.9.6	Adjusting of drive settings.....	5-9
5.10	Mounting of the chain buckets.....	5-10
5.10.1	General remarks	5-10
5.10.2	Installation of the chain buckets	5-10
5.11	Tensioning of the conveyor chain	5-12
5.12	Adjustment of the bucket guiding bars:.....	5-15
5.12.1	Guiding bar bottom tensioning station:	5-15
5.12.2	Guiding top corner section:.....	5-17
5.13	Adjustment of constraint.....	5-18
5.13.1	Constraints in the lower horizontal area:	5-19
5.14	Discharge station – Head Discharge	5-21
5.14.1	Discharge station	5-21
5.14.2	Bucket control in the drive station – Head discharge	5-22
5.15	Adjusting the bucket dragging deck	5-24
5.15.1	Stainless steel dragging deck.....	5-24

6	Commissioning	6-1
6.1	Adding on and checking the protective features.....	6-1
6.2	Checking the screws and the screw joints	6-1
6.3	Checking the electrical connections	6-3
6.4	Final check with the plant in a running state	6-4
6.5	Functional test of the swinging bucket-conveyor	6-5
6.5.1	Test phase 1	6-5
6.5.2	Test phase 2	6-5
6.6	Final work.....	6-5
7	Maintenance and upkeep.....	7-1
7.1	General.....	7-1
7.2	Operating conditions	7-2
7.3	Care and visual inspection	7-3
7.4	Maintenance.....	7-4
7.4.1	General instructions.....	7-4
7.4.2	Electrical- and drive motors	7-5
7.4.3	Lubrication	7-5
7.5	Service intervals.....	7-5
7.5.1	General information	7-6
7.5.2	Intervals	7-2
7.5.3	Cleaning.....	7-3
7.6	Lubrication.....	7-4
7.6.1	Lubrication plan	7-4
7.6.2	Replenishment of grease in flange bearings	7-5
7.6.3	Sealed-in grease.....	7-6
7.6.4	Re-greasing	7-6
8	Fault analysis and trouble shooting	8-1
8.1	General comments to the danger of accidents.....	8-1
8.2	Recognizing of operational faults.....	8-1
8.3	Causes for faults/discrepancies.....	8-1
8.3.1	Sliding clutch does not react.....	8-1
8.3.2	False overlapping of buckets.....	8-2
8.3.3	Corrective measures for causes of faults and discrepancies:	8-2

9	Disposal	9-3
	9.1 Environmental protection	9-3
	9.2 Oils and oily waste, lubricants	9-3
	9.3 Eventual de-commissioning of the plant.....	9-3

1 General

1.1 Introduction

These operating instructions are provide users and operators with important information for the efficient and safe operation of the H&P swinging bucket-conveyor – the plant.

The operating instructions contain vital information for the safe, correct and efficient use of the swinging bucket-conveyor. Full compliance with the instructions is instrumental for the prevention of danger situation, minimising of down times, and for optimising the reliability and the plant's overall service life.

The operating instructions must be available at the plant itself, and all personnel engaged at or with the plant shall study and comply with the information contained therein when these persons are allocated to the activities as listed below:

- Operation, fault analysis and correction, routine care, handling and disposing of operating media and process materials,
- Maintenance (service, inspection, repair) and/or
- Transport and installation.

1.2 Information on patent rights / copyright

These operating instructions shall be treated as confidential. They shall not be made available to unauthorised persons. The information may not be released to third parties unless written approval has been obtained from Humbert & Pol GmbH & Co. KG.

All documents are subject to the laws for copyright. Passing the information to third parties as well as the dissemination of copies – also of excerpts – are not allowed unless approved in writing.

Offences are liable for legal action, and offenders are liable for damages incurred. We reserve all rights for the commercial patent and design rights.

1.3 Information for the user/operator

The operating instructions are an integral part of the plant. The user/operator is responsible for making the operating personnel familiar with these instructions.

As the operating instructions at the plant will be subjected to extensive use, the user has the following options:

- Keep the original copy at a safe place (in the office);
- Take care that a copy is provided for use at the plant itself;
- Ensure that every operator carefully studies and complies with the information in operating instructions.

The user shall complement the operating instructions to comply with existing national directives for accident prevention (e.g. BGV) and for environmental protection, including the required information for mandatory supervision and reports to consider specific features for the user's administration, e.g. on the subject of work organisation, work flow and scheduling of personnel.

Further to these operating instructions as well as to the mandatory statutory regulations for accident prevention, the general rules for safe and professional workmanship shall also be observed.

Specifically, this applies to the directives on accident prevention when working with powered equipment.

At least once a year, the plant shall be inspected by an expert. The records of these inspections shall be document in an inspection book.

The user/operator must not effect any changes or modifications at the plant which could possible jeopardise the safety of the plant, unless such changes/modifications area approved in writing by Humbert & Pol GmbH & Co. KG! In particular, this applies to the installation and setting of safety devices and safety valves as well as to welding work at structural components.

Replacement parts must comply with the technical demands set forth by Humbert & Pol GmbH & Co. KG. This is always ensured when using original replacement parts.

Only trained and authorised personnel shall be scheduled to operate the plant. Responsibilities of individual personnel shall be defined as to the operation, service and maintenance of the plant!

Maintenance work at the plant shall be executed only by personnel which was specially trained by Humbert & Pol GmbH & Co. KG or by an authorised service partner.

1.4 Service and warranty

Customer service personnel at Humbert & Pol GmbH & Co. KG will render their assistance to answer any questions and to process specific orders with not undue delay. For expediting such processing, we kindly ask the users/operators to include in their enquiry their own name and call-back phone number plus the plant's identification data. The latter are shown behind the cover sheet of these operating instructions.

The warranty by Humbert & Pol GmbH & Co. KG for the plant covers discrepancies to the equipment within the warranty period when such discrepancies were caused by faulty design, material or workmanship.

The warranty period is valid for 1 year or 1000 operating hours, whichever comes first. It starts with the acceptance date or the commissioning date of the plant by the dealer or customer.

Warranty claims shall be accepted only to the full extent when

- the acceptance inspection, commissioning and training is executed as directed;
- the plant is used and operated only as intended by the manufacturer;
- the directives for regular inspections and service/maintenance are strictly complied with.

In case of a warranty claim, Humbert & Pol GmbH & Co. KG shall accept the cost for material and installation which are the direct result of the corrective actions at the plant. In such cases, the valid values for spare parts prices and labour by Humbert & Pol GmbH & Co. KG shall apply.

Further to this, the general warranty terms and the business terms of Humbert & Pol GmbH & Co. KG will also apply.

1.5 Customer support for indoctrination and training

It is the user's obligation to instruct the operating and maintenance personnel on the subject of relevant statutory rules and directives on accident prevention with special attention devoted to safety devices at and near the plant. The training scheme shall consider the individual qualification and performance of the planned personnel.

Training shall be such to ensure that operating and maintenance personnel have understood the training subjects, and procedures shall be implemented to ensure that pertinent instructions and rules are complied with.

This all is to ascertain that your personnel will perform safety minded, always considering possible danger situations. For that matter, you as the user should document such training and indoctrination and have all participants sign the roster for each training class.

On the following pages you will find examples for instructional topics as well as an original form to be copied for the training course and to be signed by the trainees.

1.6 Examples for training topics

1. Subject: Safety
→ Directives on accident prevention
→ General statutory rules and regulations
→ General safety directives
→ Measures in Emergency situations
→ Personal (protective) equipment
→ Safety directives regarding the operation of the plant
→ Handling/applying the safety directives at the plant
→ Handling/applying the safety directives in the general working environment
→ Meaning of symbols
2. Subject: Operation of the plant
→ Use of control elements for the plant
→ Elaborating on the operating instructions for the operating personnel
→ User's experience with the operation of the plant
→ Use of operating media, process materials and auxiliary equipment
→ General experience from using the plant
→ Fault analysis and corrective actions
3. Subject: Service and maintenance instructions
→ Correct handling of cleaning agents and lubricants
→ User's experience from servicing and maintaining the plant

Confirmation of the instruction and training courses		
Topic:		
Date:	Instructor:	Signature of instructor:
No	Name, first name	Signature
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2 Safety

2.1 General

The swinging bucket-conveyor – the plant – has been designed to the state-of-the-art and in full compliance with approved safety standards.

Nevertheless, the use may constitute a risk for users or of third parties, or cause damage to the plant and to other material property if the following situations should prevail:

- Operation by untrained or unauthorised personnel;
- Utilisation for other tasks or purposes than designated;
- Incorrect servicing and maintenance work.

2.2 Designated use of the plant

The swinging bucket-conveyor from Humbert & Pol GmbH & Co. KG shall be used exclusively for conveying the type of material or bulk goods as they are described in the attached technical data.

The plant shall be operated only with accessories and ancillary equipment which has been designated and cleared by Humbert & Pol GmbH & Co. KG.

Users/operators shall observe and comply with the pertinent information in the chapter on Safety as well in the attached original documents.

Any use or application other than the intended purpose shall be regarded as non-compliance with the above instructions.

The manufacturer/supplier cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user. This also applies for consequences from any self-initiated changes or modifications to the plant.

Operating the plant within the limits of its designated use also involves observing the instructions and notes regarding:

- Safety
- Operation
- Service / maintenance

as they are described and discussed in theses operating instructions and in the suppliers' documents.

2.3 Signs and symbols

The following signs and symbols are used in these operating instructions to draw the reader's attention to safety-relevant information or to particularly important subjects:



Danger !

Refers to information on an imminent dangerous state which – if the instructions are not complied with - may lead to severe or fatal injuries.



Warning !

Refers to information on a possible danger situation which – if the instructions are not complied with - may lead to severe or fatal injuries.



Caution !

Refers to information on a possible danger situation or an unsafe and dangerous way of handling/operating which – if not complied with – may lead to personal injuries or damage to the plant or the local environment.

All WARNINGS must be complied with to the full extent !

Users/operators shall adhere to the relevant safety information and proceed with the required caution! All types of safety information shall be passed on to other users/operators and co-workers!

Further to the information provided in these operating instructions, the general rules and directives on safety and accident prevention shall be complied with!



Note !

This information refers to special subjects and procedures which shall be observed and complied with to ensure the safe, professional and efficient operation of the plant.

All such notes shall be complied with to warrant the designated use of the plant. All these notes shall be passed on to other users/operators and co-workers!

- This eye-catching dot marks specific work or procedural steps. These steps shall be performed in the sequence from top to bottom!
- The dash marks a listing of items.
- * The asterisk marks optional equipment or components parts.

Signs, labels, symbols for direction of motion, type plates, etc. mounted directly at the plant must be observed and complied with.

Such signs, labels, type plates, etc. must not be removed from the plant and they shall be kept clean and legible!

2.4 Residual risk

Even when all safety directives are observed, there will be a remaining residual risk during any operation of the plant.

All persons who are engaged at or with the plant must know about the residual risks and they shall comply with pertinent instructions to preclude that such risks lead to an accident or to any damage.



Danger !

High voltage !

Following an Emergency-STOP action, high tension may still be present at plugs and sockets and at other components!

Check for the presence of voltage at the components before starting with any work at the electric equipment!

All work details at the electric equipment shall be executed only by trained and authorised specialist personnel!



Warning!

Hot surfaces at the cleaning station for the swinging bucket-conveyor!

Danger of severe burns!

Use protective gloves when working at hot surfaces!



Warning!

Chain drive!

Danger of heavy pinching at hands and arms!

Before starting any service or maintenance work, isolate the plant from the mains supply and secure it against inadvertent re-activation!

Place a warning sign!



Warning!

The plant has an automatic starting feature!

Danger of severe pinching!

Before starting the plant, all covers and access doors and flaps shall be closed using the locking key!

2.5 Signs / labels at the plant

The following signs and symbols are attached at the plant:



Caution! Danger from electric current!

This sign is attached to the switch cabinets and terminal boxes. Either one may be opened by specialist electricians only.

This sign is also attached near the sockets which may still have live voltage even after isolating the plant via the main contactor switch.



Read the operating instructions before using!

This sign is attached at the drive assembly and at the tensioning assembly.



Warning of hot surfaces!

This sign is attached at the cleaning station. The components may still be hot even after the plant is shut down.



Warning of hand injuries!

This sign is attached at the drive assembly.



Warning of rotating machine parts!

This sign is attached at all removable protective covers and at the cleaning drawers.



Warning of ingestion of body parts, clothing, tools, etc. when working at the plant!

This sign is attached at the drive assembly, at the tensioning assembly, at the corner elements and at the fill station.

2.6 Safety notes for operating personnel

The plant shall be used and operated only as directed and with the operating personnel being conscientious of the inherent dangers and of the safety measures, and when the plant is in a technically perfect state! All faults and discrepancies shall be corrected without any undue delay – particularly those which could jeopardise the overall safety!

Every person that shall be engaged in the installation, commissioning, operation, service or maintenance of the plant must have studied and fully understood these operating instructions – with special emphasis on the chapter on *Safety*.

During the actual work at the plant it will be too late.

This is applicable in particular for personnel that is engaged at the plant only from time to time.

These operating instructions shall always be readily available at the plant itself.

The manufacturer/supplier shall not assume any liability for damage and accidents which were on account of non-compliance with these operating instructions.

Further to this, pertinent rules and directives for accident prevention as well as the general statutory rules and regulations for health and safety shall be complied with.

The responsibilities for the various work details for the operation, service and maintenance of the plant shall be clearly defined and complied with. This is prerequisite for the prevention of false actions, control inputs, etc. – particularly during a danger situation.

The user shall oblige his operating and maintenance personnel to wear personal protection equipment. In particular, this includes safety shoes, safety gloves and safety goggles.

On the job, personnel shall not wear long open hair, loosely fitting clothes or jewellery! There is always the danger potential of getting caught, being ingested or pulled away when acting near any moving components!

If there are any signs of safety relevant changes to the plant's operational behaviour or whenever a fault occurs at the plant, the operator shall stop the plant with no delay and report the incident to the relevant person in charge / administrative position!

First-Aid facilities (First-Aid kit, eye washing bottles, etc.) shall be kept in the immediate vicinity of the plant and within easy reach!

The location and the handling procedure for fire bottles shall be posted, and personnel shall be advised regarding the fire reporting procedure and the means for fire fighting.

Refer to and comply with the information in chapter 9 when effecting any inspection, service, maintenance or repair work at the plant!

Any such work at the plant may be executed only by reliable personnel. Managers shall observe the minimum legal age for such personnel!

Only trained and authorised shall be allowed to work at the plant!

Personnel under training or trainees for specific job details shall be permitted at the plant only when they are supervised by experienced persons!

2.7 Safety instructions for operating the plant

Start and stop procedures (switching the plant On and Off) and the instructions regarding service and maintenance work at the plant shall be observed and complied with whenever effecting any jobs such as listed below:

- Normal operation,
- Retrofitting or set-up work as well as checks and set-up work at the plant's safety devices,
- Inspection,
- Service and/or
- Maintenance.

The plant may be put into operation only when it is totally assembled and ready for operation.

The plant may be put into operation only when all protection and safety devices are in place and functional, such as removable protective covers, Emergency-STOP buttons, noise abatement equipment, etc.!

Before putting the plant into operation in a working environment where there is no special power transformer, an EMC check (Electro-Magnetic Compatibility) of the harmonic oscillations shall be performed, and possible reaction into the mains circuit shall be investigated.

Before a work shift with the plant, personnel shall make themselves familiar with the immediate work environment.

Prior to switching the plant On, operators shall make sure that no other persons are anywhere within the danger area and that no one can be endangered by the starting plant!

The plant shall never be left without a personal operator/supervisor to monitor the correct operation!

At least once per work shift, the plant shall be checked for visible exterior damage. Any changes (including a change of the plant's operational behaviour) shall be reported to the responsible supervisor or shop manager.

When a functional fault occurs, the plant shall be shut down with no delay and secured in the Off status. Thereafter inform the specialist personnel to correct the fault situation as soon as possible.

2.8 Safety instructions for maintenance work

Operating personnel shall be informed prior to any special maintenance or repair work. A job supervisor shall be designated.

The prescribed service and maintenance intervals and the deadlines for routine checks/inspections as shown in the operating instructions shall be complied with.

A suitable array of workshop equipment and tools shall be provided for the execution of routine and special maintenance work.

Whenever required, work zones shall be illuminated with additional work lights and hand lamps.

The work area for maintenance and repair work shall be secured with a suitable distance for the safety of other personnel!

The working area shall be marked off with a red-white safety chain plus a warning sign.

The plant shall be shut down and secured against any inadvertent re-activation before starting with any service, maintenance or repair work:

- lock and secure all major control elements, such as switches and valves,
- remove the key from the key switch and
- place warning signs at the main control elements.

The plant shall be shut down and secured against any inadvertent re-activation before starting with any service, maintenance or repair work. For that matter, the main switch must be in position **0** and it shall be secured with a padlock. The warning sign shall indicate: Do not activate the plant. – Work in progress.

During set-up, installation or maintenance work, do not reach into openings, access doors or access flaps and do not touch any moving parts. First, stop the plant and wait for all components to come to a complete halt.

Do not open any electric assemblies, housings or covers – Danger of electric stroke.

Never touch any damaged, broken or other live components of the electric equipment.

Work at the electric equipment – including all control elements – as well as work at the pneumatic installation shall be executed only by trained specialists of the trades or by other trained and authorised personnel under the supervision of a specialist!

Electric wirings as well as hose connections – especially those at moving parts – shall be checked for wear or damage at regular intervals; replace if required.

Regularly check the seals at electric housing and replace if required.

Totally dump the pneumatic pressure before opening any screw connection at the pneumatic equipment.

Filter cartridges and wear parts at the pneumatic system shall be replaced at the prescribed intervals or after reasonably long operating hours, even when they there seem to be no safety-relevant discrepancies!

Once a year , pneumatic hoses shall be checked for wear and damage. After 6 years, the hoses shall be replaced, even if they do not show any signs of wear or damage.

Screw connections which were released for service or maintenance work must be fastened and torqued! If so directed, specific screw connections shall be fastened using a calibrated torque wrench.

If safety devices are removed as part of service or maintenance work, the correct mounting and setting of such devices shall be checked *immediately* after the end of the relevant service or maintenance work!

Maintenance personnel shall use hoisting gear to secure assemblies and individual components when they have to be removed in order to reduce the risk from these parts. Use only suitable and technically perfect hoisting gear and tackle of sufficient load capacity!

Never move about or work under any hoisted load.

Only experienced and specifically authorises shall be permitted to attach the hoisting tackle and to assist the crane operator during the hoisting task! The assistant shall maintain visual contact with the crane operator or he shall be in voice contact!

When working overhead, personnel shall use appropriate safety steps and work platforms! Never use parts of the plant to gain access to a work position!

When working at greater height, fall-down safety equipment (harness, safety line) shall be used! All handles, handrails, platforms, ladders, access steps, etc. shall be kept clean at all times!

Before starting any service/maintenance/repair work, the plant itself - particularly all fittings and screw connections - shall be cleaned from dirt and residue, such as remains of oil, grease, cleaning agents, etc.

Do not use aggressive cleaning agents or such media containing solvents. Use lint-free cloths.

Only use mild, water-based cleaning agents. Observe the manufacturer's instructions. Do not use organic solvents – Danger of fire and explosion!

Close and/or tape up all openings and access doors which for reasons of safety and function must be protected from water/steam/cleaning agent before cleaning the plant with water, steam jet (high-pressure jet) or with other cleaning agents. Special attention before such work shall be devoted to electric motors, switch cabinets and terminal boxes. After the cleaning work, all extra covers and sealing tape must be removed again.

Operating media and process materials as well as replaced parts shall be disposed off in a safe manner in compliance with the rules for environmental protection!

2.9 Information on specific danger situations

2.9.1 Electric energy

Work at the electric equipment shall be executed only by specialist electricians or by trained and authorised service personnel under the supervision of an electrician and in compliance with the rules and directives for electrical engineering!

Before opening a switch cabinet, the plant must be shut down and isolated with the main switch. The switch shall be secured against any inadvertent or unauthorised re-activation.

Wait at least five minutes after shutting the plant off to allow the internal capacitors in the control system to discharge. Do not open any electric housing or the doors of the switch cabinet before this time period has elapsed.

If there is any fault at the electric power supply, shut down the plant via the main switch with no delay!

Only use original fuses with the prescribed current rating!

Never perform any work detail at live electric components.

Assemblies and components which are subjected to inspection, service, maintenance or repair work must be isolated from electric power. The relevant deactivation devices shall be safeguarded or secured against inadvertent activation. (Fuses to be stored in a safe place, contactors to be secured and blocked, etc.) The isolated electric assemblies and components shall be checked for any residual electric load. Thereafter, these items shall be earth bonded shorted out; other assemblies nearby shall be also be isolated.

After isolating the electric power, the supply cable shall be ground wired before starting to work at high-tension assemblies! Components such as capacitors shall be earth bonded by means of an earth bonding rod!

When effecting any repair work, personnel shall take care that structural characteristics of the plant are not changed such that design safety features are jeopardised. In particular, creeping joints and spacings which were designed to create a certain free play for component parts must not be reduced by adding insulation material.

After shutting the plant down by means of the main switch, the following assemblies and components will remain live:

- internal sockets in the switch cabinets (if installed),
- lighting in the switch cabinets (if installed).

If work details must be effected at live components (in exceptional cases only!), an assistant shall be allocated to act in case of emergency to actuate the Emergency-STOP button or to de-activate the main switch. Only isolated tools shall be used.

Protective conductors shall be used to ensure the correct earth bonding of the electric system.

Regularly check all electric leads for damage and replace if required.

Changes to the programme at the control system are permitted only after prior consultation with Humbert & Pol GmbH & Co. KG or with a representative for Humbert & Pol GmbH & Co. KG.

2.9.2 Electromagnetic compatibility (EMC)

Main power switch must be turned Off before replacing any printed circuit board!

Check for antistatics! Certain component parts are charged with static electric load. Apply individual earth bonding to prevent the accumulation of any static load!

Do not execute any welding work at the plant when the plant is On or in use!

2.9.3 Pneumatics

Work at the pneumatic system shall be executed only by trained and authorised personnel with special knowledge of pneumatics in general and with the plant's installation in particular!

Prior to starting such service or maintenance work, the fittings and screw connections at the pneumatic installation shall be cleaned from any type of accumulated dirt. Flushing after work if so required.

Pressure lines shall be laid correctly and secured in place! Use caution not to mix up any connections! Fittings, as well lengths and quality of the pressure hoses must comply with the demands set forth by Humbert & Pol GmbH & Co. KG.

All pressure vessels shall be checked at regular intervals. All safety valves shall be inspected and serviced at regular intervals.

2.9.4 Hot surfaces

The cleaning station*, in particular, will be very hot during normal operation, after an Emergency-STOP event and during any trouble shooting.

Surface temperature may reach 80°C. Coming into contact with the relevant surfaces may lead to heavy burns! For that matter, operators and service personnel should wear thermal protection gloves when working at these parts!

Thermal protection gloves should be worn for any work detail at or near the equipment!

2.9.5 Raw material, solvents, oils, grease and other chemical media

Personnel shall observe and comply with the relevant manufacturers' instructions when handling raw material, solvents, oil, grease and other chemical media as to the storage, use and application as well as disposing of such media!

Use suitable personal protection equipment (protective goggles, rubber gloves, rubber boots, protective clothing) when dealing with caustic media!

When such media comes in contact with skin or eyes, use ample water to flush the affected area. Suitable equipment (eye washing flask, handwash basin, shower stall) shall be provided near the work position!

Skin areas which have come into contact with cleaning or disinfecting media shall be treated after the media have been washed off. The preventive application of skin care ointment or other suitable skin care will preclude latent damage to one's skin. The specific skin care product shall be selected considering the particular operating media and the pollution at the work position and in relation to the personnel's individual skin characteristics. Products with high lipoidal concentration are recommended.

No eating, drinking, smoking or storing of food in rooms with chemicals at any time!

Never store dangerous media in vessels or containers which normally are used for food products. Always use the type of vessel or container which is intended for a specific type of product or medium, and the contents shall be marked clearly.

Caution when handling a hot product or hot cleaning media. Danger of scalding and burns!

Do not shut off or remove any suction or venting devices when the plant is operating.

At any one time, the hygienic status of the plant must comply with statutory rules and regulations.

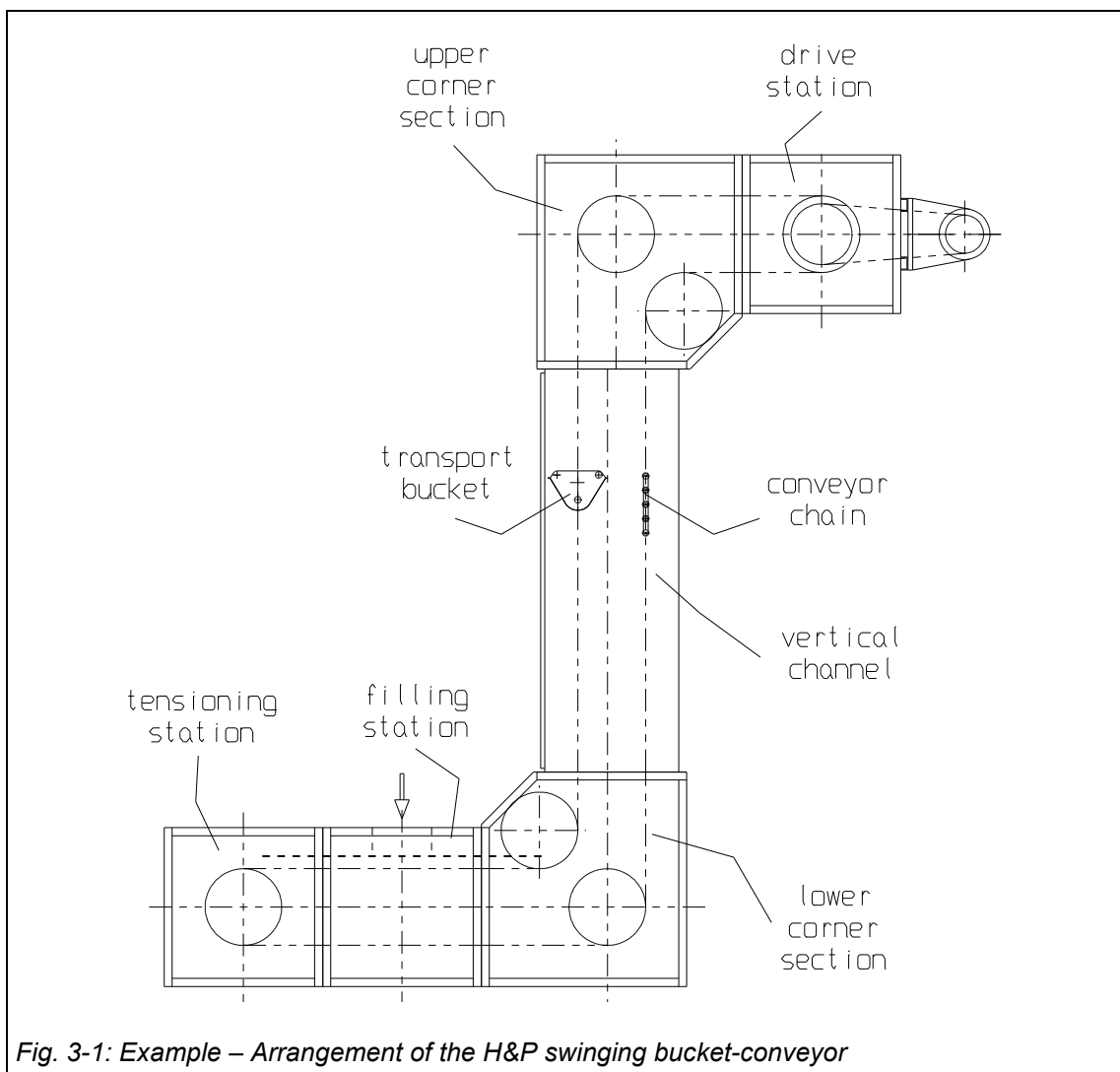
2.9.6 Noise

All noise abatement devices at the plant must be functional when the plant is operating.

The acoustic noise level at the operators' position is <80 dB(A) during normal operation.

3 Product description

3.1 General design and arrangement of the H&P swinging bucket-conveyor



H&P swinging bucket-conveyors are arranged either in Z, C. The conveyor system comprises the following assemblies:

- upper and lower horizontal strand
- vertical strand
- upper and corner section
- drive station / discharge station
- tensioning station
- filling station
- conveyor chain with buckets
- cleaning station (optional)*

A swinging bucket-conveyor is used to transport bulk goods within an enclosed housing which can be assembled from horizontal and vertical strands. These strands allow for the horizontal or vertical motion of the conveying buckets. The buckets as such are mounted in a pendulum arrangement between two chains, and they are supported and guided by the chains' roller elements.

The general modular design permits modifications and changes to the current plant and to adapt the swinging bucket-conveyor to other operating conditions.

The type of bulk goods to be handled determines the selection of material and the specific design of buckets, chains and enclosures.

The conveyor chains are made from stainless steel, galvanised steel or hardened steel. Rollers between the individual chain links are made from the same material, or as an alternative, plastic rollers are used.

Depending on the type of bulk product, the buckets can be made from plastics, steel, stainless steel, aluminium or with PTFE-coating.

At the open end, the buckets feature an overlapping edge which during the filling sequence prevents the bulk goods to drop between the buckets.

The enclosure is made from either lacquered steel or from stainless steel. For use of the plant in the food production industry, all components parts coming into contact with the products are made from food-compatible material.

Inspection doors are provided for the whole of the enclosure. This ensures that every spot inside of the plant can be reached for service and cleaning tasks. The lower horizontal strands features additional drawers (optional) in the tensioning / filling station and at the angle section to collect spilled material and to facilitate cleaning jobs.

3.2 Technical Data

3.2.1 General data of the conveyed material:

Conveyed material	Sulphur pastilles
Granulation	3-5MM
Characteristic of conveyed material	dry, free flowing
Apparent weight	1,04 - 1,25 t/m ³
Moisture content	water content <0,2%
Ambient temperature	-36°C up to +33°
Product temperature	up to 70°C, no condensate

3.2.2 Technical Data Bucket Elevator

Drawing No.:	25358-04-03-010
Computational performance	max. 25m ³ / hr, 25 To/hr
max. conveying speed [m/s]:	0,25m/s
Rated power	11 kW
Number of inlets	1
Number of Outlets	1
Length of bottom horizontal part	7.218 mm
Length of upper horizontal part	5.472 mm
Discharge height	36.830 mm
Number of Buckets	270
Material of buckets	Stainless steel 1.4301
Length of conveyor chain	201 m
Materials	St, St-ROLLER
Material Certificates	Yes
Explosion protection cate- gory after RL 94/9/EG (ATEX 100)	ATEX Zone 22

3.3 Function of the H&P swinging bucket-conveyor

The conveyor chains with the linked buckets are driven by an electric motor acting via a chain drive or via a reduction gear. A return stop mechanism is provided to prevent any reverse motion of conveyor chain due to the weight of the bulk goods when the plant is stopped.

The tensioning station ensures the correct the tension for the conveyor chains.

Filling of the buckets is effected at one or several fill stations, whereby at these locations, the overlapping buckets will provide a continuous strand.

As one of possible options, a cleaning station*. Depending on the specific design, the cleaning station* can be designed as a wet cleaning process with water or as a dry cleaning process using compressed air.

3.4 Safety-relevant arrangements

The chain and bucket conveyor for technical reasons is equipped with two safety devices which interact. They serve for recognizing irregularities at an early stage before damages can occur and for switching off the drive.

The drive is equipped with an mechanical overload protection which has to be adjusted while commissioning the plant with product. The overload protection is realized by a friction coupling.

To observe the friction coupling the bucket elevator is as well furnished with a rotation control located at the top or bottom corner section. The rotation control is visible from the outside.

If the plant is built with a direct driven motor the friction coupling is located between motor and gear and will be scanned by a separate initiator installed at the coupling.

4 Transport

4.1 Delivery



Caution!

Damage to component parts due to improper transport and handling!

Some of the component parts may be damaged through force introductions, such as falling down or through other loads being placed on top.

Hard jolts should be prevented when placing the packaged goods on the ground!

The selected hoisting or transport equipment shall be suitable for the relevant type of packaged goods and weights!

Refer to the weight information in the attached Technical Data!

Refer to the information on the transport packages!

Do not tilt the transport boxes/packages.

Directional arrows on the transport must point upward.

Transporting the assemblies and components of the swinging bucket-conveyor to the place of erection shall be effected with due care.

For the transport phase, the assemblies and components shall be secured against tipping or falling.

Leave the assemblies and components on their transport pallets or in the transport boxes/packages until reaching the final place for the erection/installation.

Observe and comply with pertinent rules and regulations for accident prevention and safe workmanship.

4.2 Transport by crane

Where the assemblies and components are transported by crane, the following safety information shall be considered:



Danger!

Imminent danger of pinching with possible fatal injuries when lifting and transporting the equipment!

Incorrect lifting and transporting of the assemblies or components may induce tipping and falling down!

Individual assemblies or components shall be lifted and transported only when using proper and suitable hoisting tackle! Hoisting tackle shall be connected only to the designated hoisting points!

Never move about under any lifted loads!



Warning!

Warning of fatal injuries from being pinched or crushed when transporting the equipment!

Incorrect lifting and transporting of the assemblies or components may induce tipping and falling down!

During the transport/hoisting sequence, the assemblies shall remain closed as delivered to prevent any shifting of the centre of gravity which may induce a tipping action!

Use only ropes (straps) which are in a fully functional condition and which are suitable for the total weight of the hoisted equipment!

Never move about under any lifted loads!

Observe and comply with pertinent rules and regulations governing accident prevention and work safety!

Personnel shall comply with the instructions and information given by the freight / transporting supervisor.

Check for firm seating of ropes (straps) at the lifting points and at the crane hook.

When applying the lifting force, the ropes (straps) shall be stressed evenly. Lifting of the equipment off the ground (or from the transport vehicle) shall be effected very slowly.

The slanting angle of the suspended load shall not exceed 15°.

Use the necessary care when lowering the equipment to ground and omit any jolt when touching down.

Keep ample distance to any obstacle when moving / transporting the assemblies / component parts.

4.3 Transport industrial vehicles

When transporting the assemblies and components with industrial transport vehicles such as:

- fork lift trucks and
- pallet trucks,

the following information shall be observed:

Fork lift trucks and pallet trucks shall be suitable for the intended gross weight of the assemblies or components.

The individual weights are indicated in the attached packaging lists!

Use hold-down straps to secure transport boxes or crates on the transport vehicles to prevent any tipping.

The load should not directly touch the lifting columns of the transport vehicles:

- Place a some timber as a spacer between the transport box and the lifting column.
- Prevent any hard jolt when placing the load on the ground.

4.4 Transport by road, rail or waterways

Prevent any hard jolt when placing the load on the surface of the transport vehicle or into the loading bay.

Once in place, the load shall be secured against sliding or tipping.

To preclude any effects from inclement weather during transport, the load shall be covered with a tarpaulin or with other suitable protection. This cover shall be taught and secured to prevent the wind from blowing it off.

5 Mounting / installation

5.1 Qualification of Mounting personnel

The Mounting personnel shall have experience in the Mounting and installation of processing plants. Only well trained and authorized personnel shall be ordered for such work details. Individual and overall responsibilities shall be clearly allocated!

Adjustment work at the swinging bucket-conveyor shall be executed only by specifically trained and authorized personnel.

Define the responsibility of the job supervisor / system operator. He shall be entitled to refuse safety-relevant instructions from third persons if they jeopardise the safe working status.

During all work details for Mounting and system operation, the relevant rules and regulations for accident prevention (in Germany: UVV) and operating instructions as well further rules and regulations issued by the employers' liability insurance shall be observed.

Mounting personnel shall be informed about valid statutory regulations and pertinent rules and regulations on accident prevention regarding the safety devices and arrangements at the swinging bucket-conveyor.

Mounting personnel shall be instructed and trained accordingly and users shall ensure that the personnel has understood and complies with all these instructions, rules and regulations.

This all is prerequisite for safety-minded and danger-conscientious working of all personnel.

The owner/user shall responsible for the safe function of the swinging bucket-conveyor if transport or handling are not realised in compliance with the technical data as attached to this document and/or the position of the components is not according to the drawing for Mounting and general arrangement.



Note!

Mounting and installation of the plant shall be effected according to our attached drawing for Mounting and general arrangement. Please not the position numbers in the drawing and in the accompanying documents. For the delivery, each component part is clearly identified by a packaging list which is attached to transport packing.

It must be ensured that the H&P swinging bucket-conveyor is assembled and erected in the final location in full compliance with the positions designated in the documents.

Humbert & Pol GmbH & Co. KG shall not assume any responsible and shall not be liable for damages as a result of such non-compliance. These notes and this information shall not expand our terms for warranty and liability of our current general terms for delivery and payment.

5.2 Preparatory measures

- Remove the transport packaging and compare the parts list with the drawing for Mounting and general arrangement.

For operational reasons and for reasons of safe packaging, some components may arrive in a pre-assembled status, although they do not belong together as to their position numbering. They must be separated before commencing with further mounting.

- Remove all inspection doors, using the enclosed locking/unlocking tool.



Note!

The locking/unlocking tool shall only be handed over to trained and authorised personnel.

- In case of using pneumatic discharge stations only use filtered air

5.3 Welding work



Note!

As a matter of principle avoid welding work on the machine!

If in absolutely exceptional cases welding work must be carried out on the machine

- the following safety instructions must certainly be complied with:



Danger!!

The machine unintentionally running during the welding works!

can cause the most severe injuries!

Only carry out welding work with the machine disconnected and secured!

Disconnect the machine with the main switch at the control and secure the main switch with a padlock against being unintentionally connected!



Caution!

Welding work on the machine!

can cause severe damage to the machine!

Ensure that there is sufficient earth in the welding area!

- The earthing must happen directly on the welding point!



Note!

After the welding works have been carried out the welding seams must be professionally refinished and protected against outside influences.

5.4 Mounting of the lower horizontal strand



Note!

Follow mounting direction signs were give.

Mounting direction are give by an arrow and the remark “conveying direction”

- Mount the components of the lower horizontal strand, tensioning station, fill station, horizontal enclosures, the optional cleaning station* (refer to special operating instructions for the cleaning station) plus the lower angle section at the flange connections.

The components shall be mounted such that they are bolted perfectly level and flush with the foundation.

- The horizontal enclosures shall be supported at the flange connections of every second joint, and these supporting braces shall be secured against tipping or sliding (e.g. by bolting them to the foundation).

5.5 Mounting of the vertical strand



Note!

Install and mount the vertical strand made up of the individual vertical sections such that the inspection doors point to the side of the filled buckets.

- Mount the vertical enclosure or enclosures to the lower angle section.

The vertical enclosures shall be mounted flush and in a true vertical line.

- For elevating heights of more than 2050 mm, the vertical enclosures shall be supported by additional braces, and these braces shall be secured against tipping or sliding.

5.6 Mounting of the upper corner section

- Mount the upper corner section to the vertical enclosure as shown in the drawing.



Note!

Check the drawing for the mounting of C-type or Z-type swinging bucket-conveyor.

5.7 Mounting of the upper horizontal strand



Note!

For the correct sequence of horizontal sections refer to the numbers in the drawing.

Follow mounting direction signs were give.

Mounting direction are give by an arrow and the remark "conveying direction"

- Mount the horizontal enclosures and the discharge station to the flange connection.

The components shall be mounted such that they are bolted perfectly level and flush.

- The horizontal enclosures shall be supported at the flange connections of every second joint, and these supporting braces shall be secured against tipping or sliding.
- Mount the drive station without chain and without the protecting cover to the upper horizontal strand. Align the drive station with the horizontal enclosure and bolt the station in place.
- Support the drive station or suspend it from above as required.

5.8 Mounting of the conveyor chains

- Roll out the individual lengths of the conveyor chains. They shall not be tilted.



Note!

The conveyor chains are supplied as a matching pair. When mounting check that the correct lengths are installed

Where a conveyor chain is assembled from several individual sections, the resulting number of links including the closing link shall be divisible by 3.

Join each one of the chains from the sections provided using the enclosed rivet links. Pay attention that each bolt will be locked with a snap ring.

- Pull the conveyor chains into the swinging bucket-conveyor using a hemp rope and pull until the chain ends are in the tensioning station.
- Place the chains onto the chain wheels.
- Join the chain ends temporarily using the enclosed rivet link (bolt connection with snap ring is located in direction of the buckets) and mark the position of the connection!

5.9 Mounting and installation of electric components



Note!

Normally, the swinging bucket-conveyor is supplied without its own control system. Prior to mounting the conveyor buckets into the chain system, the planned control system must be connected and operationally ready.

Observe the following information.

5.9.1 Check/confirm the sense of rotation

- Remove the protective cover and the drive chain at the drive station.
- When using a slip-on gear motor, remove the return stop mechanism.
- Electrically connect the drive motor.

Observe the connecting diagram from the motor manufacturer.

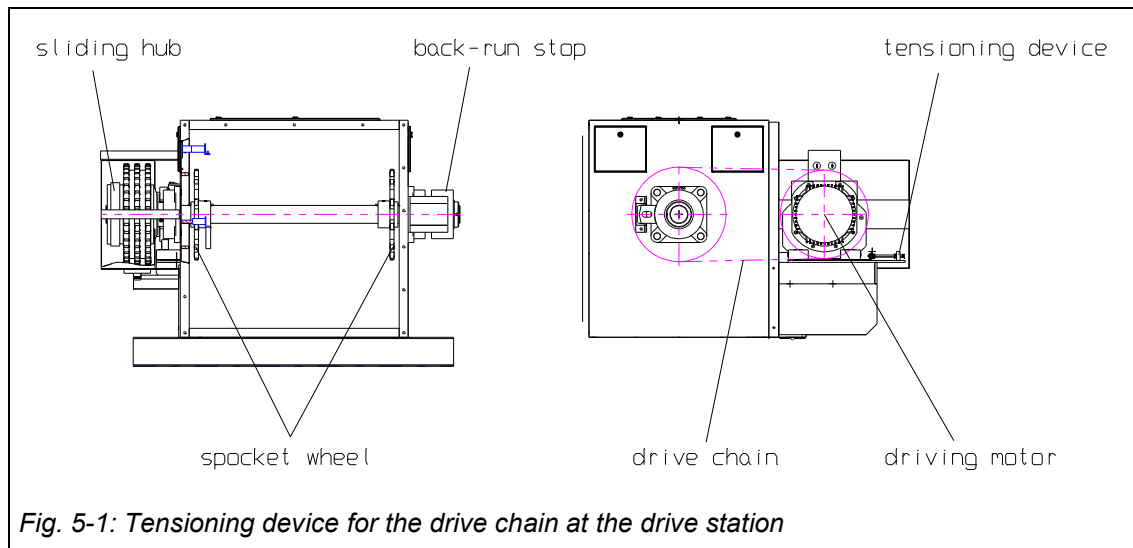


Note!

Check/confirm the drive motor's sense of rotation!

When using a brake motor, also refer to the enclosed connecting diagram from the motor manufacturer.

- Check for the correct alignment of the two transmission chains. When running, the drive chain must not tilt.
- Put the drive chain (in case of using if not using a direct drive) in position and tighten.
- Replace and secure the protective cover.



5.9.2 Error detection

- Where an error detection is supplied connect this to the local control system.



Note!

An error detection is not stringently required.

The error detection must be integrated to the control in that way that a restart of the plant can only be done after clearing / repairing the reason

The repairing of the fault must be signed by using push buttons.

- Install the push buttons near the proximity switches which indicate the error.

The proximity switches are usually located in the tensioning and drive station (see installation plan for electrical components).

5.9.3 Speed monitoring device

- Connect the speed monitoring device to the local control system.



Note!

In case of driving the plant in a Hazardous area refer to HUMBERT & POL 's ATEX supplement

The control must be created as described on the supplied wiring diagram, in case of undertaking the warranty will expire.

5.9.4 Installation of the repair switches



Danger!

High tension!

Warning of severe or even fatal injuries!

Work at the electric installation may be executed only by trained and authorised electric specialists!

De-activated switches shall be secured against inadvertent reactivation!

Attach a warning sign at the main switch!

- To facilitate later maintenance and service work, install a lockable switch at both the lower and upper horizontal strand. The switches are used to start and stop the swinging bucket-conveyor in case that reparation work requires



Note!

Repair switches are not stringently necessary but administrable.

Lock repair switches and secure them against impermissible use

5.9.5 Discharge station

- with an elevator type ZK the discharge is steadily located in the drive station.



Note!

Discharge by rotating the buckets 180° in the drive station:

5.9.6 Adjusting of drive settings



Warning!

Danger of pinching when working at the swinging bucket-conveyor!

The automatic functional sequence at the swinging bucket-conveyor is a continuous hazard for pinching and other injuries!

Operators shall apply extreme care when initiating any motion or action at the swinging bucket-conveyor!

Never reach into the swinging bucket-conveyor when it is in operation!

H&P swinging bucket-conveyors feature a sliding hub which serves as an over-load safety device.

- Before the final installation of the conveyor chains and before mounting the chain buckets, lower the torque setting at the sliding hub to a level that is barely sufficient to move the empty buckets.



Note!

refer to the supplier' operating instructions enclosed to this document. The drive unit shall be capable of starting the swinging bucket-conveyor with the buckets filled



Warning!

Chain drive!

Warning of severe pinching at hands and arms!

Replace the protective cover at the chain drive after adjusting the required setting!

5.10 Mounting of the chain buckets

5.10.1 General remarks



Attention!

Incorrect installed buckets and proximity switches!

This might lead to enormous destructions of the plant!

For adjusting the bucket guiding rails, proximity switches and error detectors first install 3 buckets in a row!



Note!

To check and adjust the various couplings of the buckets, their positions and possible error detection points, the chain and bucket conveyor must at first only be driven with 3 buckets.

Only this way the assembler has a chance to check the correct position of all couplings and proximity switches one after the other. If the couplings and error recognizing points are incorrectly adjusted, the chain and bucket conveyor may be considerably damaged.

5.10.2 Installation of the chain buckets



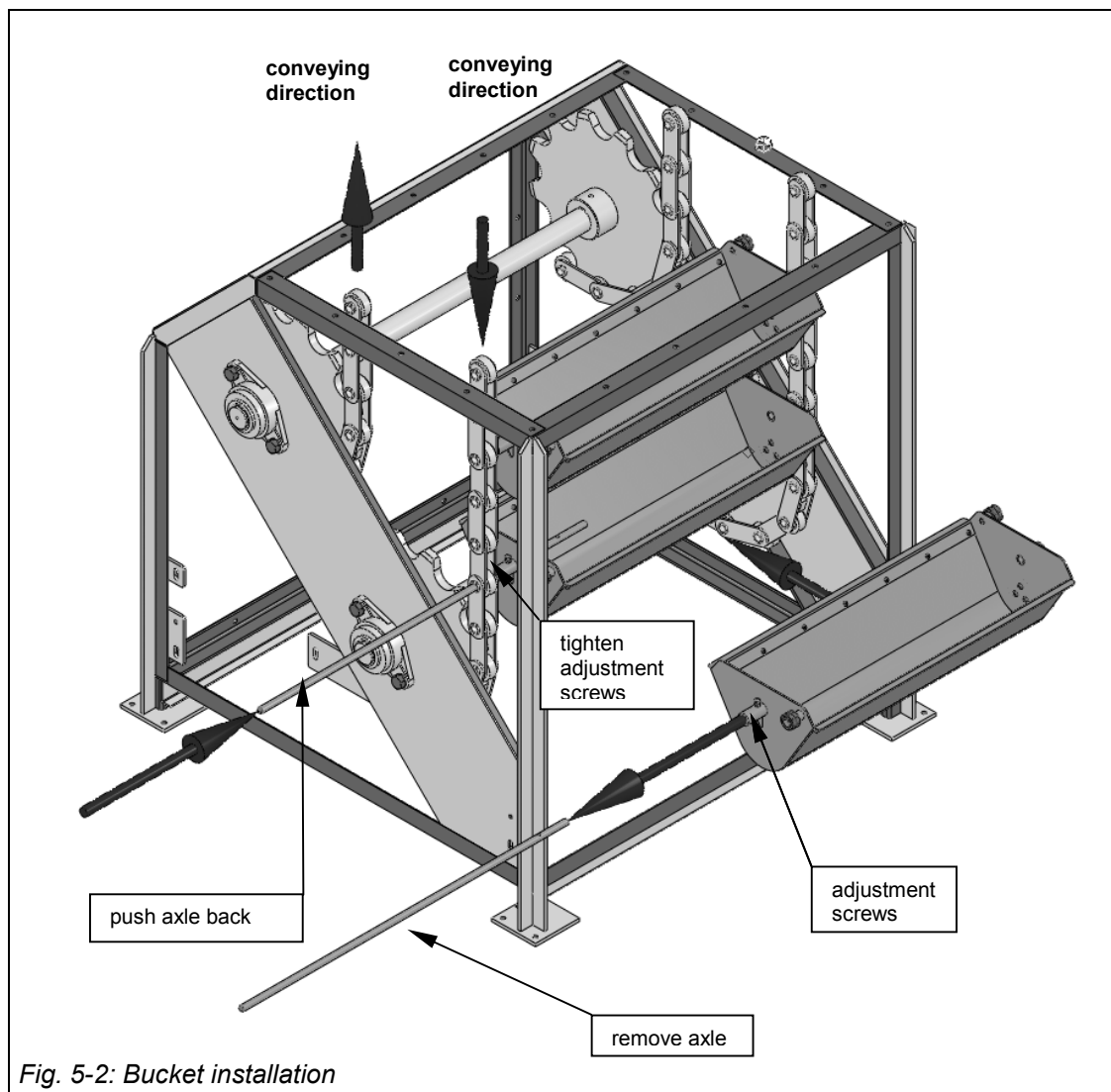
Note!

Install the buckets at the lower corner section or at a specifically designated location at the enclosure.

The buckets will be hung at each third chain link .

Do not hang them side reversed.

- Before installing the buckets, mark the bucket axis with a marker
- loosen the adjustment screws and pull out the bucket axes
- Lift the bucket between both conveyor chain lines, push the bucket axis from outside through the hollow bolt of one chain line
- then push it through both bucket hubs into the hollow bolt of the opposite chain line. Take care of the markings of the bucket axes!
- tighten the adjustment screws firmly and securely





Warning!

Automatically moving chain wheels!

Danger of severe pinching at the hands!

Do not reach into the plant when jogging the conveyor chains!



Note!

If there should be a gap in the line of buckets at the end, the conveyor chains must be shortened accordingly.

If the tensioning device does not allow a shortening of the conveyor chain, the necessary number of chain links and buckets must be added into the chain system.

5.11 Tensioning of the conveyor chain

After installing the buckets the conveyor chains must be tensioned.

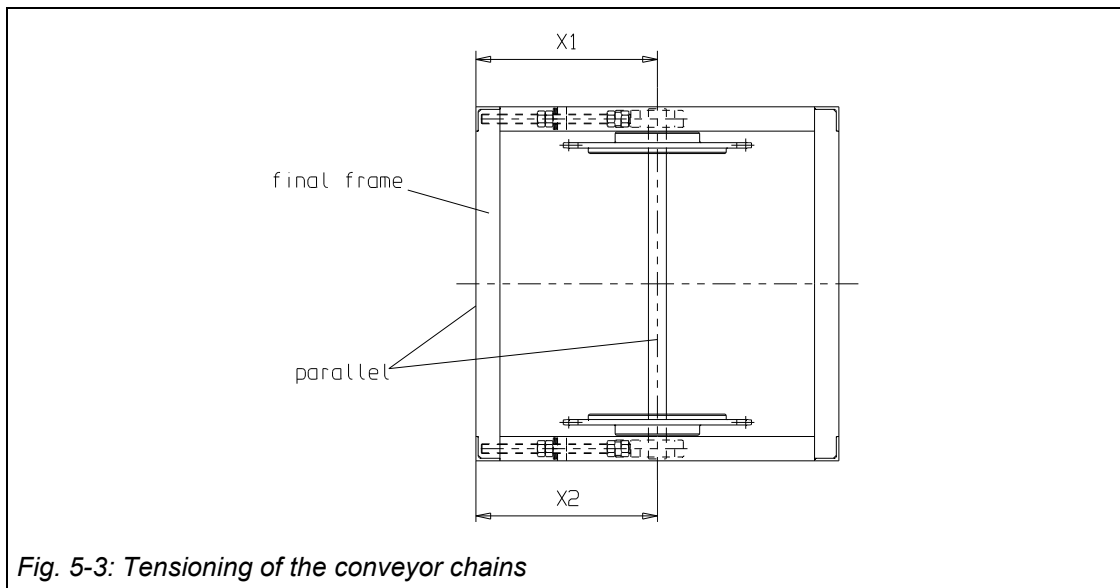


Caution!

Do not apply excessive tension to the conveyor chains!

Excessive chain tension may induce chain breaking and excessive stress on the chain wheels.

- Tensioning of the conveyor chains shall be applied evenly and parallel to the axes. The end frame of the tensioning station shall be used as a reference point.
- Check and confirm the parallelism by measuring. The dimensions X1 and X2 must be equal (refer to Fig. 5-3).
- The conveyor chains shall be tensioned such that they do not sag between the ends of the chain guiding rails and the deflection elements, however, they should yield approx. 20 mm from the centre when applying normal hand pressure.

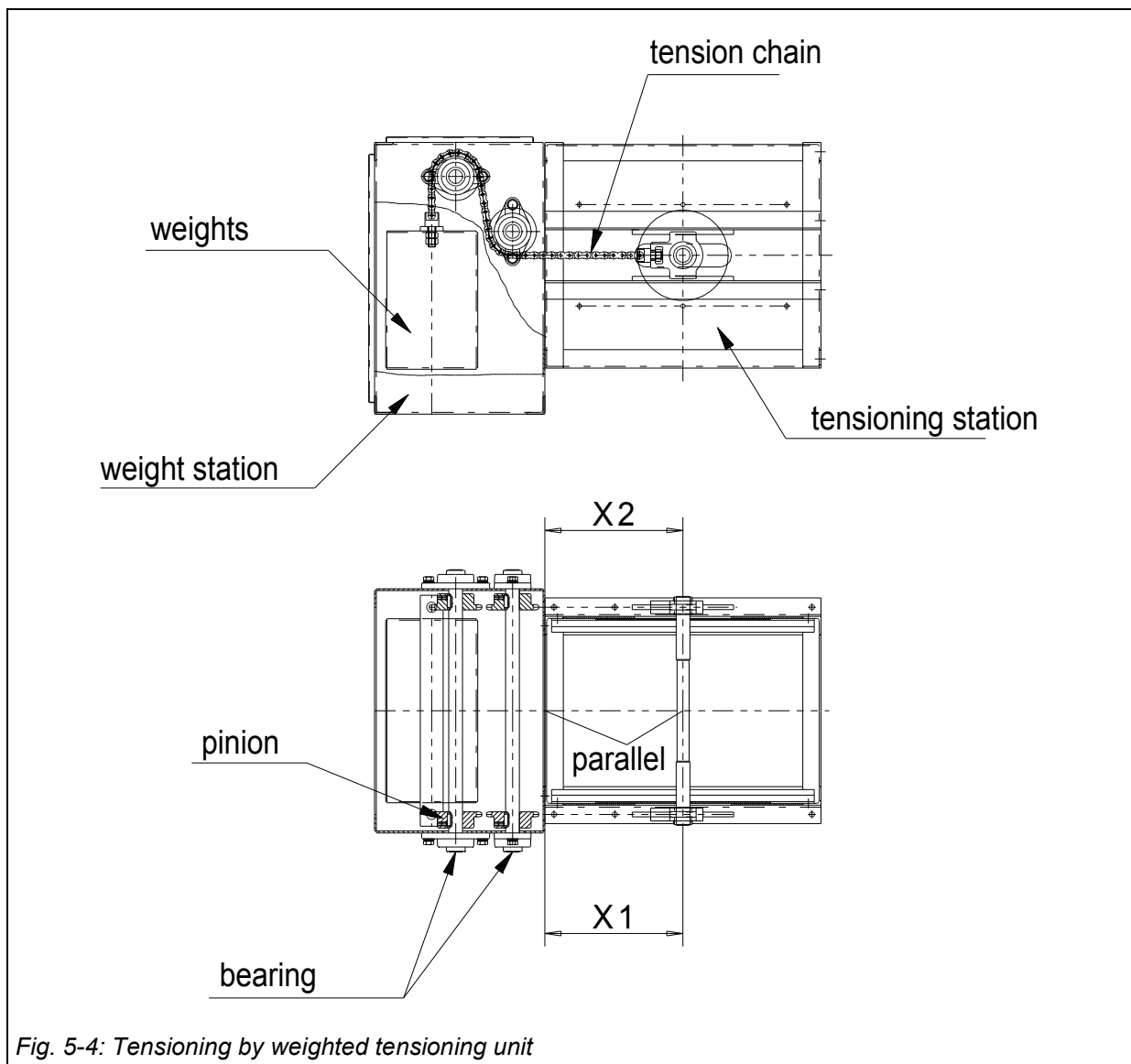


Note!

Weighted tensioning units at a bucket conveyor guarantee a permanent tension of the conveyor chain and allow an unimpeded expanding.

In case of a weighted tensioning unit (see Fig. 5-4) the following points must be observed:

- The provided weighing plates must be used. The increase of chain tension must be done step by step.
- The conveyor chains shall be tensioned such that they do not sag between the ends of the chain guiding rails and the deflection elements, however, they should yield approx. 20 mm from the centre when applying normal hand pressure.
- The maximum tension weight should not be exceeded. For ideal weight refer to technical data chapter 3-4
- Check and confirm the parallelism by measuring. The dimensions X1 and X2 must be equal (refer to Fig. 5-4).



5.12 Adjustment of the bucket guiding bars:

After uniform tensioning of the chain the bucket couplings have to be adjusted.

Correct adjustment of the bucket couplings is vital for a good performance of your chain and bucket conveyor. The bucket couplings serve for changing overlapping of the buckets or to prevent unintentional change of overlapping. This is required, because otherwise material would be spilt. The bucket coupling bars must therefore be adjusted very accurately. The fastening screws for the coupling bars must be protected with a spring washer. After adjustment the fastening screws must be tightened to prevent their loosening under all circumstances.



Note!

The guiding bars for the buckets shall be adjusted with special care.

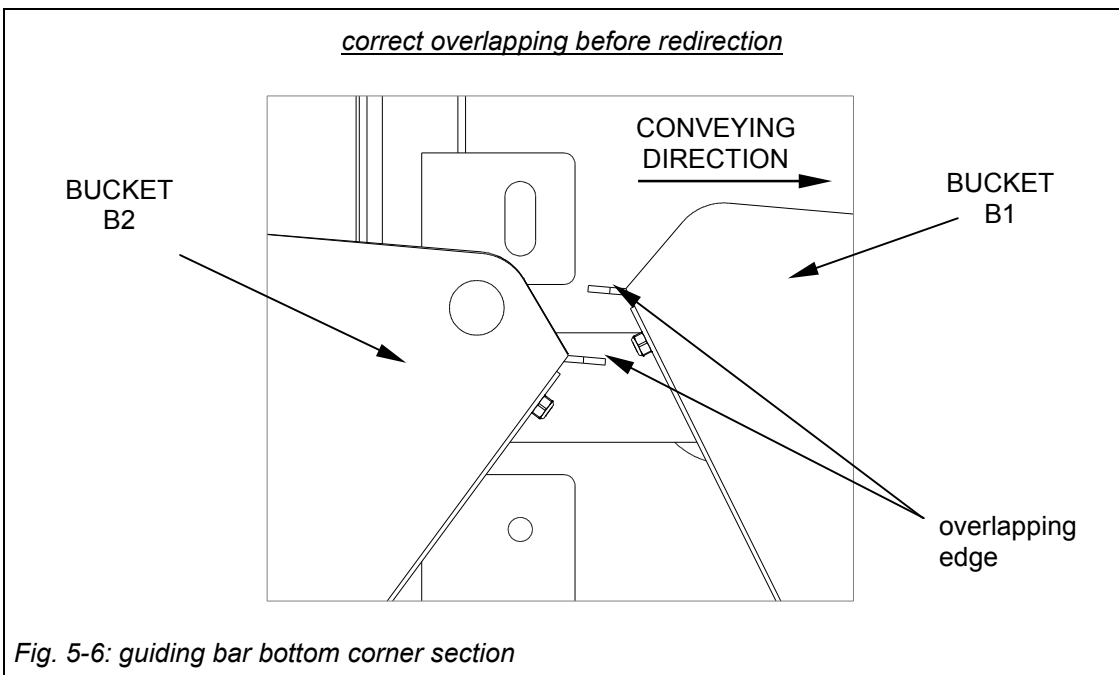
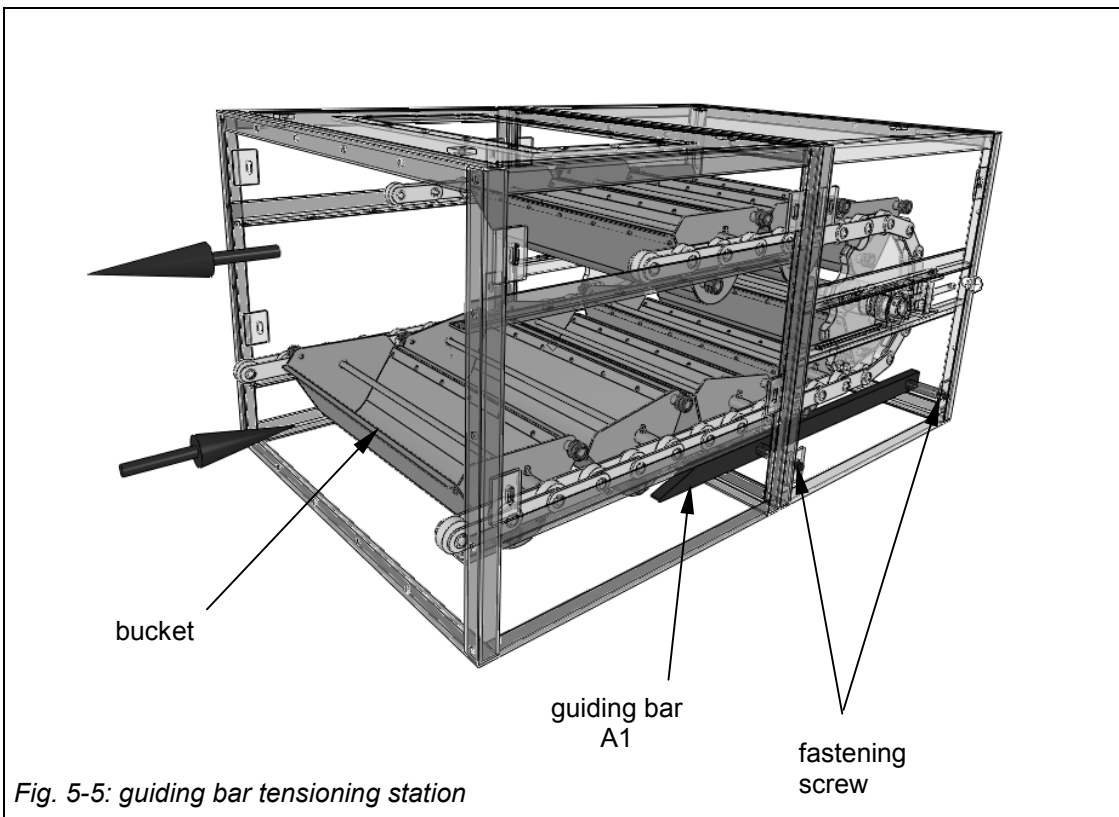
The fastening screws for the guiding bars shall be secured with split washers.

After adjustment work for the correct setting, tighten the screw connections such that they will not come loose.

Refer to installation drawing for position

5.12.1 Guiding bar bottom tensioning station:

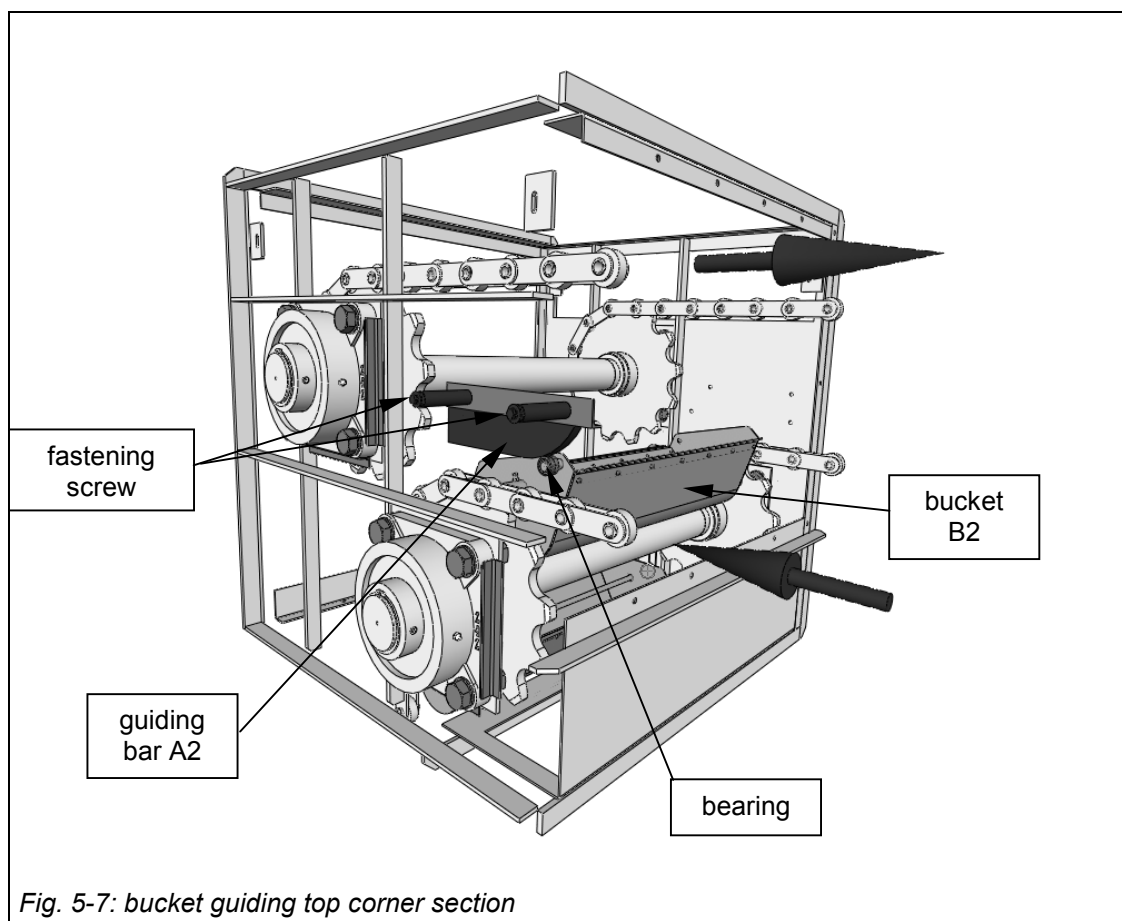
- Use bucket guiding bar A1 to tilt bucket B1 in that way that bucket B2 will change overlapping and that the overlapping edge of bucket B1 will be on top (see Fig. 5-6).

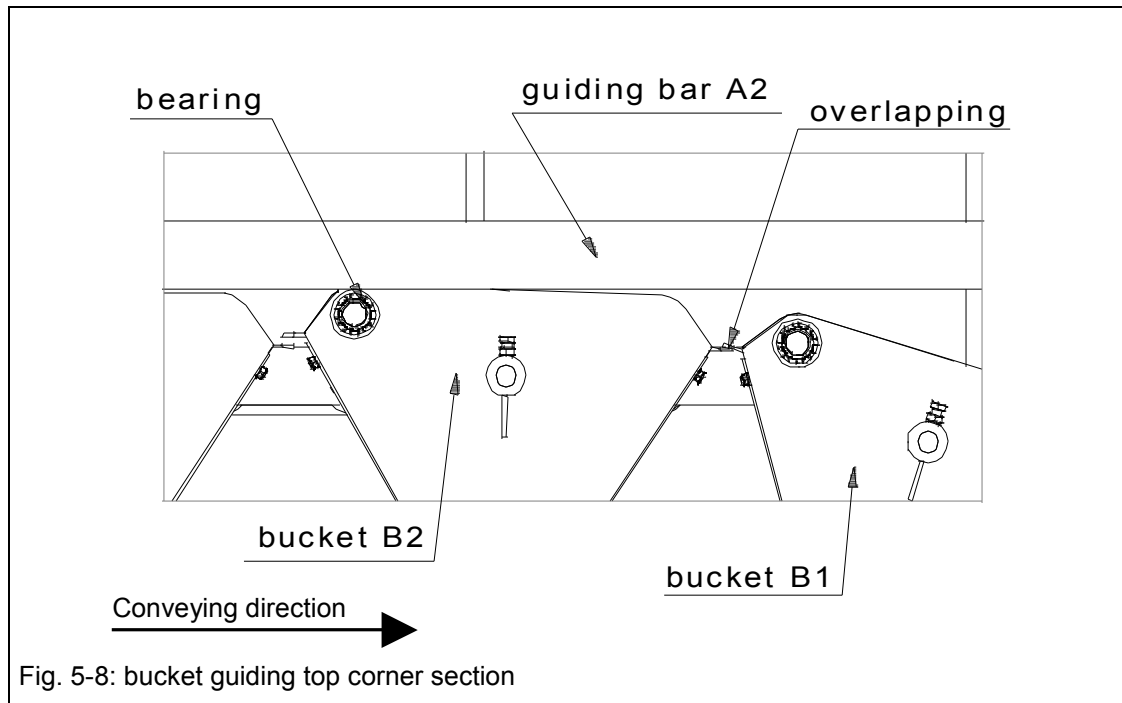


- The tilting angle of bucket B1 should be between 5° and 12° depending on filling volume.
- This adjustment has to be proved regularly during the first weeks of operation.
- To prevent damage the overlapping of the buckets before redirections must be in that way that the overlapping of the first bucket B1 will be on top of the overlapping of the following bucket B2 (Fig. 5-6).

5.12.2 Guiding top corner section:

- Use guiding bar A2 to hold bucket B2 while bucket B1 is starting to move vertically downwards (Fig. 5-7)
- Adjust A2 in that way that the bearing of bucket B2, will hold the bucket horizontally while the overlapping of bucket B1 slips from the one of bucket B2 (Fig. 5-8).





- This adjustment has to be proved regularly during the first weeks of operation.

5.13 Adjustment of constraint



Note!

The constraints in the horizontal areas of the chain and bucket conveyor must be adjusted in such a way that no unintentional overlapping changes can happen.



Warning!

Incorrect installed and/or adjusted constraints will lead to massive destructions within the bucket elevator

5.13.1 Constraints in the lower horizontal area:

- The constraint (A3) is holding the bucket over the whole length. In conveying direction it must be adjusted in that way that the buckets will be caught in an angle between 3° and 5° .
- The constraints in the horizontal channels must be adjusted in that way that an unintentional change of overlapping will be avoided (see Fig. 5-9).
- When correctly adjusted the buckets B1 and B2 will have a small gap between their overlapping edges (see Fig. 5-10).

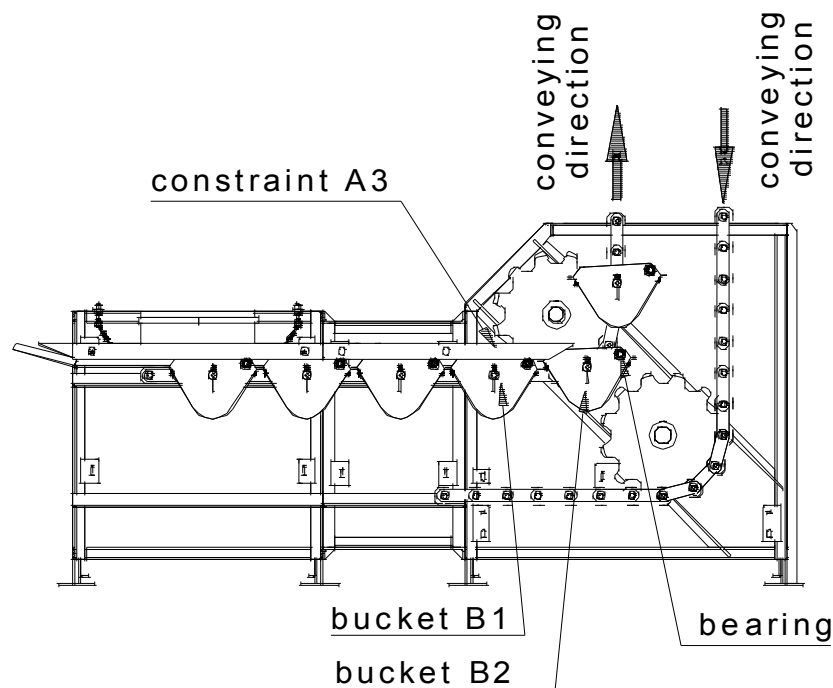
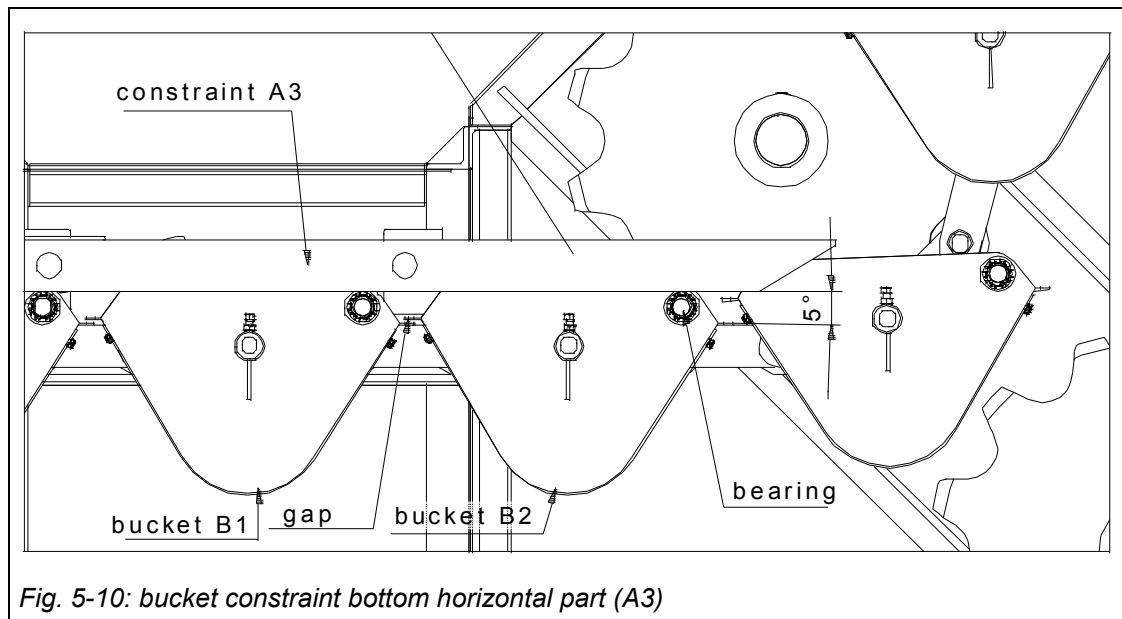
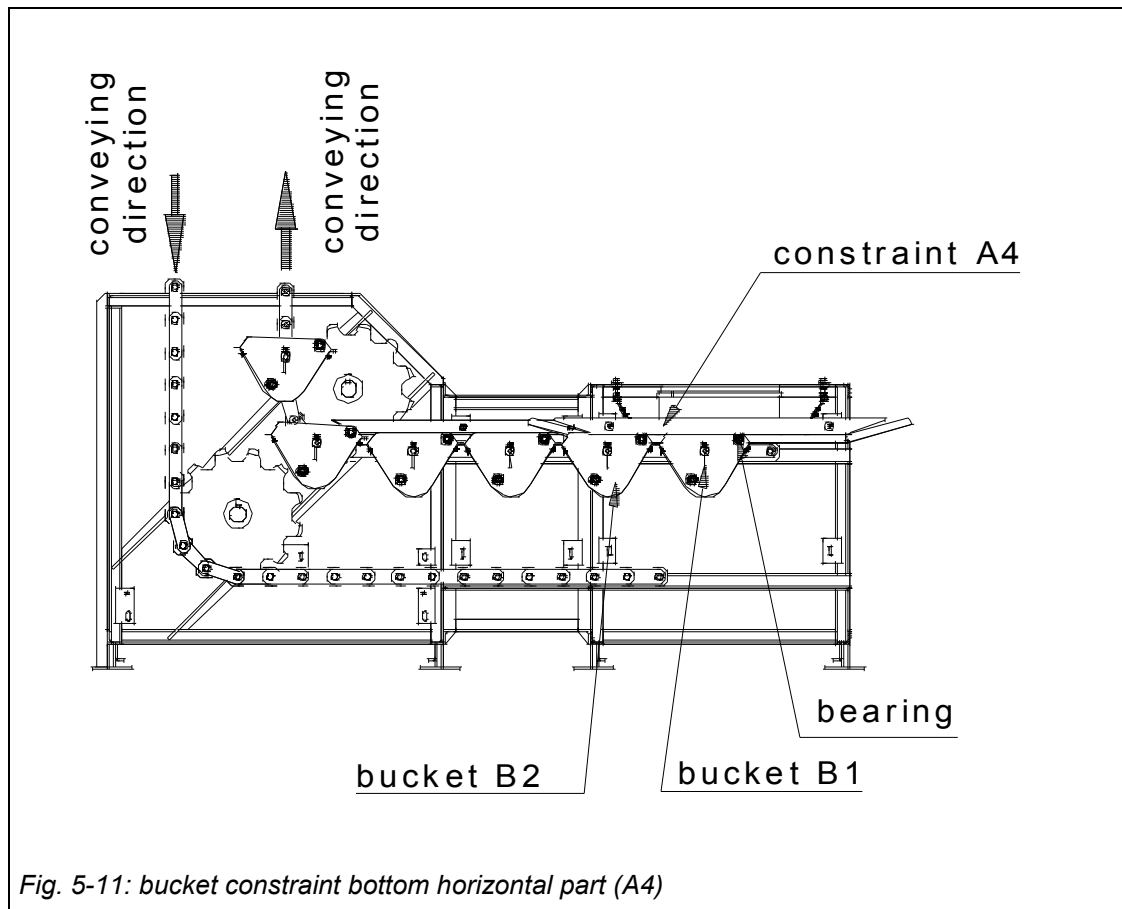


Fig. 5-9: bucket constraint bottom horizontal part (A3)



- The filling station will be equipped with two constraints, one as an extension of constraint A3, the other one on the opposite site A4
- Constraint A4 will be used to close the gap between bucket B1 and B2 when being filled.
- Pay attention that the constraint A4 is adjusted in such a way that the overlapping edges of the buckets are lying loosely one on the other (not compressed) see Fig. 5-11.



5.14 Discharge station – Head Discharge

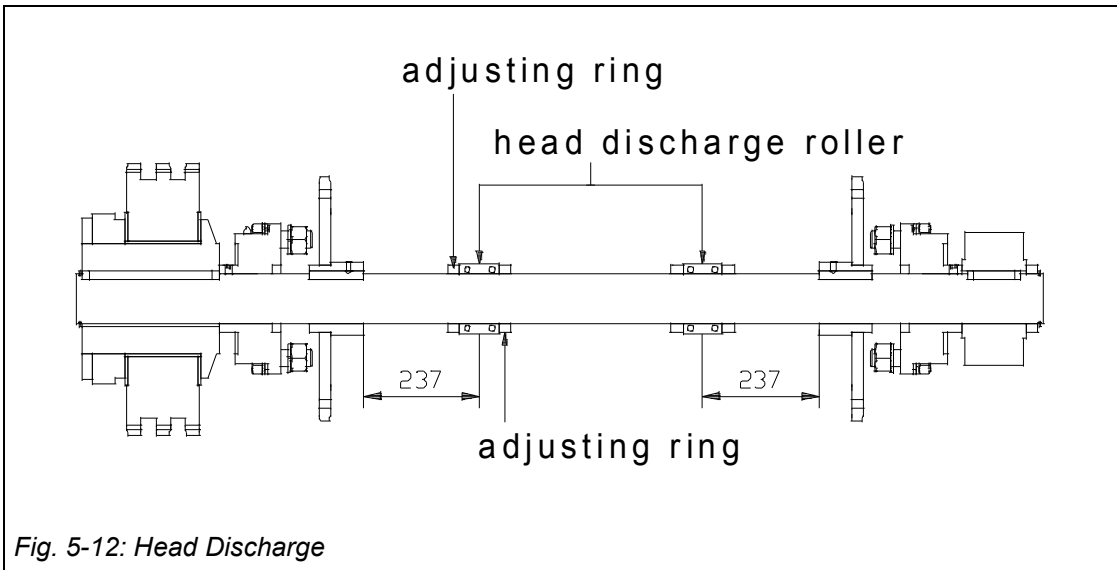
5.14.1 Discharge station

- If the chain and cup elevator is equipped with an end 180° discharge in the drive station be aware that the roller is always free turning on the drive axle.
- Take care that the control roller is mounted on the drive shaft according to Fig. 5-12.



Warning!

The head discharge roller must be free on the drive axle. Check movability regularly



5.14.2 Bucket control in the drive station – Head discharge

To control the bucket in the drive station after discharging a guiding bar is used

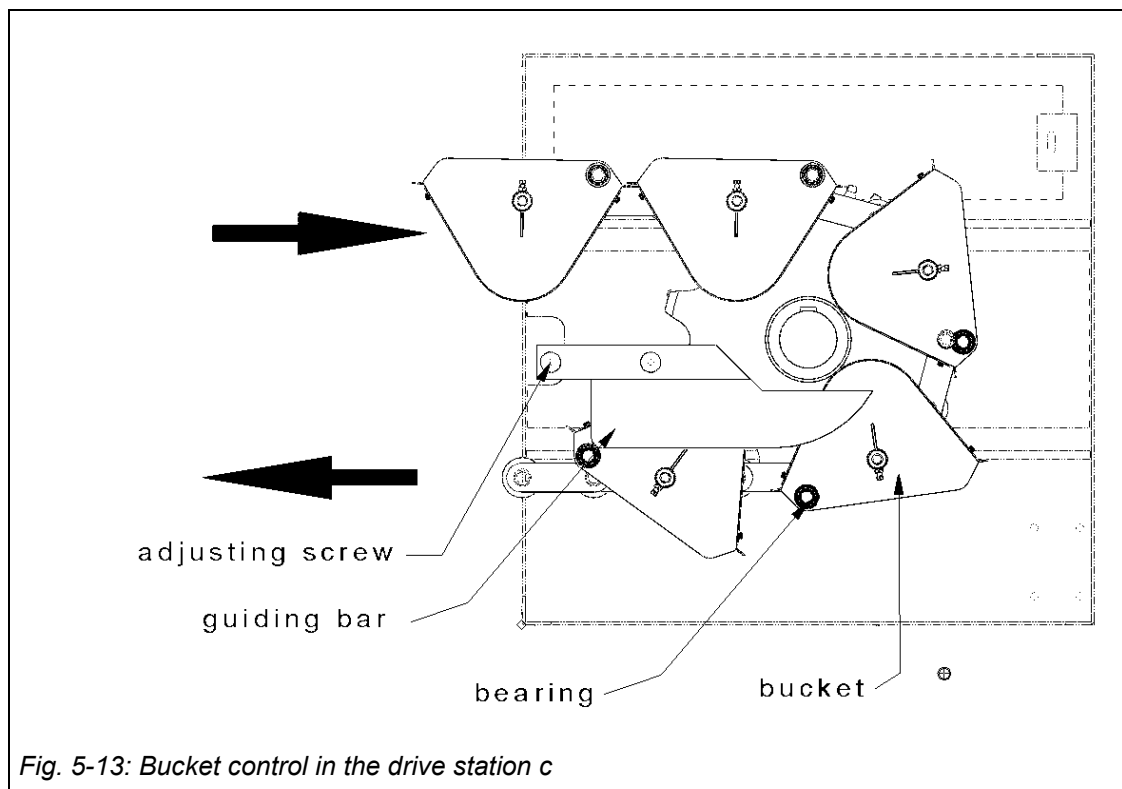
- The guiding is fixed installed and its fitting must be controlled regularly (refer to Fig. 5-13).



Caution !

Control adjustment screws on firm fitting.

Bolted connection should be pasted with a respective adhesion!



- When the bucket gets free after discharging it will be caught with the bearing and will then be guided smoothly back to its original position (Fig. 5-13).



Warning!

Incorrect installed and/or loose guiding bars will lead to massive destructions within the bucket elevator

5.15 Adjusting the bucket dragging deck

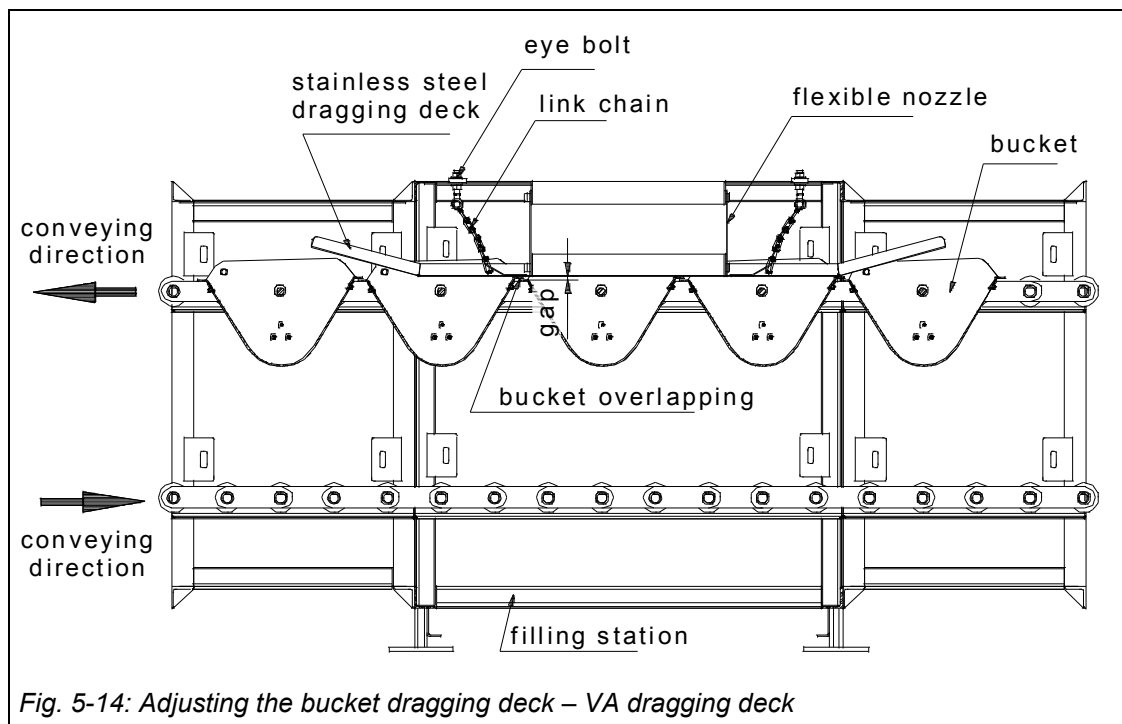
5.15.1 Stainless steel dragging deck



Note!

First check the length of the filling chute and cut it to the correct length if required.
The bucket dragging deck may loosely contact the line of buckets.

- First check the length of the filling chute and if necessary shorten it
- Pull the connecting sleeve of the dragging deck onto the filling chute under the cover plate.
- Align the bucket dragging deck parallel to the bucket line and tie it up with the eye bolts located at the cover sheet of the filling station by using four the four pieces of chain (part of delivery volume). By using the eye bolts adjust the dragging deck in that way that it may rest only loosely on the line of buckets (see Fig. 5-14). There should be a small gap between the dragging deck and buckets overlapping edges.



Warning!

Incorrect installed and/or adjusted dragging decks will lead to massive destructions within the bucket elevator



Note!

During the commissioning cross check position and condition regularly

6 Commissioning

6.1 Adding on and checking the protective features



Note!

The operator is obliged to integrate the machine into a control system present at the operator's plant, which is in accordance with the relevant safety regulations. It is absolutely necessary that an EMERGENCY-OFF switch be realised for the machine.

- First of all check the machine visually for recognisable damage.
- If need be have the damage found repaired immediately!
- Check that all protective features are sitting firmly and functioning flawlessly.
- Set up all protective features required at the location and check that they are functioning flawlessly.
- Check the correct embedment of the machine in the control system at the location and in the EMERGENCY-OFF circuit.
- Check the grounding of the machine.

6.2 Checking the screws and the screw joints



Note!

Tightening torques are dependent on the screw quality, thread friction and the bearing surface of the screw head.

The values given in the following tables are standard values. They are only valid in those cases where no other values are given in the individual chapters of the operating instructions or in the spare part sheets.



Caution

Improper replacement of screws!

can lead to component failure and severe damage to the machine!

If screws are being replaced, on principle always use screws of the same quality and size!

After a disassembly always replace screws with micro-encapsulated plastic and self-locking nuts!

- The following tables contain the maximum tightening torques M_d in Nm for a coefficient of friction $\mu_{ges} = 0,14$; Thread lightly oiled or lightly greased.



Note!

For screws with micro-encapsulated adhesive multiply all tightening torques listed with the factor 1.1!

	Dimensions	Tightening torque M_d [Nm]			
	M	SW	8.8	10.9	12.9
	M 4	7	3,0	4,4	5,1
	M 5	8	5,9	8,7	10
	M 6	10	10	15	18
	M 8	13	25	36	43
	M 10	17	49	72	84
	M 12	19	85	125	145
	M 14	22	435	200	235
	M 16	24	210	310	365
	M 18	27	300	430	500
	M 20	30	425	610	710
	M 22	32	580	820	960
	M 24	36	730	1050	1220
SW = Wrench size	M 27	41	1110	1550	1800
XX = Quality class 8.8, 10.9, 12.9	M 30	46	1450	2100	2450

illustration: Tightening torques for headless screws with metric standard thread

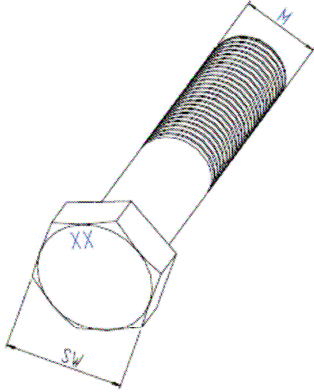
	Dimensions	Tightening torque Md [Nm]			
	M	SW	8.8	10.9	12.9
	M 8 x 1	13	27	39	46
	M 10 x 1,25	17	52	76	90
	M 12 x 1,25	19	93	135	160
	M 12 x 1,5	19	89	130	155
	M 14 x 1,5	22	145	215	255
	M 16 x 1,5	24	225	330	390
	M 18 x 1,5	27	340	485	570
	M 20 x 1,5	30	475	680	790
	M 22 x 1,5	32	630	900	1050
	M 24 x 2	36	800	1150	1350
SW = Wrench size	M 27 x 2	41	1150	1650	1950
XX = Quality class 8.8, 10.9, 12.9	M 30 x 2	46	1650	2350	2750

illustration: Tightening torques for headless screws with metric fine thread

6.3 Checking the electrical connections

Work on the electrical equipment of the machinery, may only be carried out by an electrician or a person acting under instruction and supervision from an electrician in accordance with the electrical regulations!

- Check the system voltage and compare this with that given on the rating plates, specified voltage.
- Both the values must correspond with one another.
- Switch the mains cable to zero potential using the mains switch and secure the mains switch during the work on the system against any unwanted interference.
- Check after attaching the machine to the power supply system, the control voltage.
- Attention is to be paid during the initial operation of the chain hoist, to the details in the attached original manufacturer's operating instructions manual.

**Warning!****Moving drive and conveyor chains!**

Danger of severe pinching!

Before starting any trouble shooting or corrective measure, stop the plant and wait for the chains to come to a complete halt! Do not open any protective cover or access door until the plant has stopped!

After the fault correction and following a final check of the plant, all protective covers and access doors shall be closed and secured again!

6.4 Final check with the plant in a running state

**Note!**

Prior to the final checks, make sure that the swinging bucket-conveyor has been linked to the control system or that the supplied control system is functional.

All discharge devices shall be turned off. Thus the respective control curve is at its bottom dead centre.

If the chain-and-bucket is fitted with a cleaning station, it must be ensured that the tipping system is switched On only when conveying speed is reduced inside of the cleaning station.

- Turn the drive motor On and allow the plant to run for a short time.
- Perform a visual check and look for the following items:
 - All buckets must move easily in a pendulum motion when passing the chain wheels.
 - Check all bucket control and guiding devices for optimum function. Note that movements and behaviour are different when the buckets are full or empty.
 - Check all bucket control and guiding devices for firm mounting.
 - Check the bucket dragging deck at the fill station for its optimum position and for firm mounting. The dragging deck edges must not come in contact with any cams at the buckets.

- In the cleaning station, all buckets shall smoothly turn into the cleaning position and swing back into the normal position after the drying phase.

6.5 Functional test of the swinging bucket-conveyor

Following the final inspection, a functional test shall be performed in two phases. Test phase 1 is started with the buckets filled to 35%, test phase 2 with the buckets filled to 70%.

6.5.1 Test phase 1

- Evenly fill the buckets with bulk goods to 35% of their capacity.
- Perform a visual inspection and correct for irregularities at the bucket control devices.

6.5.2 Test phase 2

- Evenly fill the buckets with bulk goods to 70% of their capacity.
- Perform a visual inspection and correct for irregularities at the bucket control devices (refer to chapter 5. Mounting).
- During the visual check look for the following items:
 - Are the buckets in a vertical position over the whole length of the vertical and horizontal travel?
 - Do the buckets overlap correctly during overlap change phase?
 - Is the loading process for the swinging bucket-conveyor smooth and continuous? (Overfilling of the buckets?)
 - Are the buckets filled evenly? (One-sided filling?)
 - Are all assemblies and supports firmly bolted?

6.6 Final work

After the two test phases, the following final work shall be completed:

- Replace and secure all protective covers and access doors which were removed or opened for the test phase.

7 Maintenance and upkeep

7.1 General

The chapter on upkeep covers the areas of care and visual inspection by the operating personnel as well as of cleaning, maintenance and overhaul of the machine by specifically trained upkeep personnel.

The instructions described in this chapter are to be understood as minimum recommendations. Depending on the conditions of operation extensions of these can become necessary in order to maintain the manufacturing quality of the machine. The time intervals mentioned refer to a three-shift operation. You will find specific further information in the appendix of these operating instructions.



Warning!

Endangerment of persons and material assets possible!

Improper inspection, maintenance or overhaul can immediately or at a later time result in harm to persons or damage to material assets!

All upkeep- and overhaul work on the machine may only be carried out by qualified specialist personnel closely following the chapter on safety!



Warning!

Having the drive of the machine running!

during maintenance- and overhaul work can cause the most severe injuries!

Before beginning the work disconnect the machine with the main switch!

Secure the main switch with a padlock against being unintentionally reconnected and pull out the key!

Place a warning sign!

As the case may be pull out the key of the key-operated switch control on the console!



Note!

In order to maintain the warranty a documentary record of the regular work of maintenance and upkeep must be kept by the maintenance- and operating personnel deflating

Only use spare parts passed by the manufacturer and its supplier firms!

When spare parts or replacement parts or work equipment that have not been passed are used then the manufacturer will not accept any liability!

It is to be ensured that the operational substances and replacement parts are disposed of in a safe and environmentally friendly way.

**Note!**

In order to avoid material- and consequential damage to the machine take care that there is a proper disassembly and assembly of components.

For all disassembly- and dismantling work the fundamental rules therefore are:

- Mark the parts on how they belong together.
- note assembling position and location.
- Disassemble assembly units separately, clean and store.

After overhaul work the fundamental rules are:

- Check that all screw joints are sitting firmly.
- Check that all pipe joints and connections are leak-free.

**Note!**

If the dismounting of safety features is necessary for the overhaul measures then immediately after completion of the work the remounting and testing of the safety features is to be carried out.

Observe also the safety instructions in the section safety instructions for upkeep in chapter 2 as well as the information on particular types of danger.

7.2 Operating conditions

Depending on the type and scope of the upkeep measures the machine or the area concerned must be either shutdown or shut completely dead.

For carrying out wide-ranging cleaning- and overhaul measures the machine or the area concerned has to be completely separated from the network supply.

**Danger!****High voltage!**

Causes death or life-threatening injuries!

Set the machine current-free for wide-ranging cleaning- and maintenance work.

Secure it against being unintentionally re-connected.

Put up a warning sign at the main switch.

7.3 Care and visual inspection

The machine is exposed to large strains and to soiling. Therefore it requires attentive and regular care.

It is the task of the operating personnel to check the accessible work areas of the machine for soiling and for damage. Soiling should be - in so far as it is accessible - removed and damage should be reported to the upkeep personnel responsible.

**Note!**

On account of dirt deposits the inscriptions of control elements can become illegible. This can lead to faulty control operations, which can cause material- and consequential damage.

Clean all the inscriptions and the signs from dust and other soiling once per shift.

**Caution!****Material damage on the machine through soiling of components!**

Residue can become deposited on switches and sensors or get into moving components. This can lead to damage of the machine!

Therefore always check the machine at the beginning of the shift.

Clean strongly soiled areas daily.

First switch these areas to current-free.

When cleaning never put your hand into moveable machine parts!

On selecting the cleaning agent it must be ensured that it is not one that will attack the surfaces, plastics or seals.

All liquid industrial cleaners may be used without reservation. Bare metal parts may be cleaned with petroleum, not however the rolling bearings.

Before cleaning the machine with water, steam jet (high pressure water blaster) or other means of cleaning cover up/glue all openings into which for safety- and functional reasons water/steam/cleaning agent may not enter. Electro-motors, circuit cabinets and terminal housings are particularly endangered. After the cleaning completely remove the coverings/bonds.

**Alarm Explosion hazard!**

Due to dust deposits it is possible that increased temperatures or glow clusters occur which produce an effect of burning or explosion.

Dust deposits with a thickness coat of 1 mm must be removed immediately. For this purpose use an exhauster in order to avoid that dust whirled up.

7.4 Maintenance

7.4.1 General instructions

All maintenance work must be carried out within the time frame given and with the appropriate care.

**Note!**

The details on maintenance in the operating instructions of the machine parts supplied in the appendix are to be complied with.

Particularly in the case of the machine a preventative maintenance can lengthen the lifetime of the components. Along with the regular cleaning precautionary replacement of wearing parts is to be advised.

It is useful to make up maintenance handbooks for individual assembly units. You will not find specific overhaul measures described here. However follow the exact instructions, plans and parts lists of the original documentation in the appendix.

Following on here are firstly all-embracing instructions on inspection and maintenance of individual assembly units. Afterwards you will find listed out for the particular maintenance intervals the general measures, which are to be carried out regularly.

7.4.2 Electrical- and drive motors

When servicing the electrical motor the following require special attention, the cooling airways are to be kept clean.

In the appendix of the original documentation you will find further maintainance specifications if they are required.

7.4.3 Lubrication

To obtain a breakdown-free operation of the machine it is important that all lubrication points such as bearings, chains or synchronism drives are carefully lubricated in accordance with the lubrication intervals.

The grease nipples are fitted with protection covers. These should be put back on after lubrication. (see in the following chapter Lubricants)



Note!

For foodstuff machines you must absolutely comply with the grease types permitted!

7.5 Service intervals



Note!

Eight hours after initial operation of machine it is imperative that the following actions be taken:

- All screws are to be checked that they are sitting tight and if necessary they should be tightened,

7.5.1 General information

The service/maintenance intervals for the swinging bucket-conveyor shall be scheduled in relation to the following factors:

- Performance (bulk weight or volume)
- Conveyor/conveyor lengths
- General operating conditions

Therefore, the eventual schedule for service/maintenance shall be determined by users/ operators on location.

Where the swinging bucket-conveyor is used to transport dusty and/or abrasive media, users shall provide for a sufficiently dimensioned suction system and for regular cleaning of both suction system and swinging bucket-conveyor.



Note!

More service is required during the run-in phase. Particular attention shall be devoted to the conveyor chains as they stretch to greater length, and they must be tensioned more frequently.



Caution!

Do not apply excessive tension to the conveyor chains!

Excessive chain tension may induce chain breaking and excessive stress on the chain wheels.

The conveyor chains shall be tensioned such that they do not sag between the ends of the chain guiding rails and the deflection elements, however, they should yield ca. 20 mm from the centre when applying normal hand pressure.



Note

Any service and maintenance/repair work shall be recorded in a service record!

7.5.2 Intervals

Interval	Action	Measure
Daily	Check the machine for outer leakages.	If necessary stop the machine and eliminate the leakage.
Daily	Check the machine for damages.	If necessary stop the machine and eliminate the damage or allow repairs to be carried out by customer services from the manufacturer.
Daily	Check the machine for contamination.	Eradicate contamination.
Daily	Check the machine for unusual noises.	Should unusual operational noises occur, inform the manufacturer's customer service.
2000 h / quarterly	Control the stability and movement of the fastening screws.	Tighten loose or loosened fastening screws attention to max. torque!
2000 h / quarterly	Clean the machine.	External cleaning of the machine.
		<p>i Note!</p> <p>It is not permissible that detergents permeate to the interior of the system! All openings to be covered/sealed before the machine is cleaned with a steam cleaner (High pressure cleaner) or other detergents. For safety and functional reasons permeation of water/ steam/ detergents is not permitted. Especially endangered are electric motors, switch cabinets and terminal boxes. After cleaning the coverings and sealants should be entirely removed.</p>
2000 h / quarterly	Check the motor's electrical connections (Strain relief, seating and damage).	Renew damaged lines Renew strain relief Tighten loose fastenings.
2000 h / quarterly	Check buckets for signs of wear	Replace if required.
2000 h / quarterly	Check bucket dragging deck for signs of wear and correct position	Orientate if required Replace if required.

2000 h / quarterly	Check chain tension	Increase tension if required (refer to section 5-12).
4000 h / half-yearly;	Check sliding rail (if installed) in the chain guides for signs of wear	Replace if required.
4000 h / half-yearly;	Check all bucket guiding devices for signs of wear	Adjust or replace if required (refer to section 5-15; 5-18; Fehler! Textmarke nicht definiert.).
4000 h / half-yearly;	Check sliding clutch for signs of wear	Adjust the setting or replace friction linings if required. Comply with the manufacturer's service instructions!
8000 h / yearly	Check function of return stop	Replace if required.



Warning!

Moving drive and conveyor chains!

Danger of severe pinching!

Before starting any service and cleaning work, stop the plant and wait for the chains to come to a complete halt! Do not open any protective cover or access door until the plant has stopped!

When the work details are finalised, all protective covers and access doors shall be closed and secured again!

7.5.3 Cleaning

The swinging bucket-conveyor shall be totally cleaned at least once every four months. Comply with the instructions for cleaning:

- Clean the swinging bucket-conveyor with water plus a suitable household cleaner both inside and outside.
- Clean the seals at the inspection doors using a wet cloth.
- Clean all bucket sliding decks, particularly those at the fill station.
- Remove spilled goods from the drawers in the lower horizontal strand.

7.6 Lubrication

7.6.1 Lubrication plan

The lubricating points are indicated in the plan below:

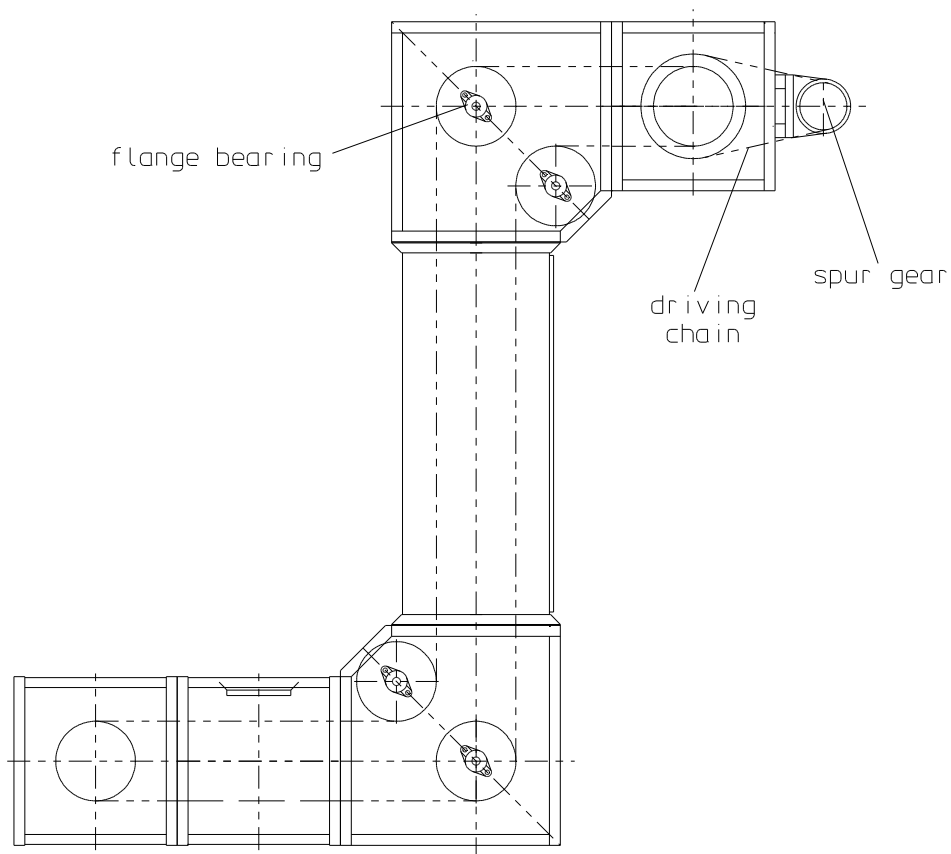


Fig.7-1: Lubricating plan

Spur wheel gearbox:

As a standard lubrication, the spur wheel gearbox is initially charged with a lubricant, viscosity Vg 220, for an ambient temperature from 0° to 40°C. Change intervals for the lubricant are shown in the enclosed manufacturer's operating instructions.

Drive chain:

Use a lubricant, viscosity Vg 100, suitable for serving at an ambient temperature from -5° to +25°C. Type of application: Manual.

Flange bearing:

The flange bearings are charged with a lithium-based grease plus corrosion protection and penetration class 3. For all practical purposes, the flange bearings require no service. In case of heavy dust accumulation, re-greasing shall be considered.

**Warning!****Moving parts**

Danger of severe pinching!

**Note**

Do not over grease the flange bearings.

7.6.2 Replenishment of grease in flange bearings

As bearing units have sufficient high-grade grease sealed in at the time of manufacture, there is no need for replenishment while in use. The amount of grease necessary for lubrication is, in general, very small. With the NTN bearing units, the amount of grease occupies about a half to a third of the space inside the bearing.

7.6.3 Sealed-in grease

With bearing units, no relubrication is the general rule. The standard self-lubricating type of bearing units contain highgrade lithium-based grease which, being suitable for long-term use, is ideal for sealed-type bearings. They also feature a unique sealing device.

Relubrication, therefore, is unnecessary under most operating conditions. At high temperatures, or where there is exposure to water or excessive dust, the highest quality grease is essential. Therefore specially selected brands which are shown in Table 1 are used.

Bearing units	Grease			Symbols
	Name of grease	Thickening agent	Base oil	
Standard	Alvania grease 3	Li soap	Mineral oil	D1
Heat-resistant	Darina grease 2	Non-soap	Mineral oil	HT1D1
Heat-resistant	SH44M	Li soap	Silicone oil	HT2D1
Cold-resistant	SH33L	Li soap	Silicone oil	CT1D1

Table 1: Brand of grease

7.6.4 Re-greasing

The performance of a bearing is greatly influenced by the quantity of grease. In order to avoid over-filling, it is advisable to replenish the grease while the machine is in operation.

Continue to insert grease until a little oozes out from between the outer ring raceway and the periphery of the slinger, for optimum performance.

8 Fault analysis and trouble shooting

8.1 General comments to the danger of accidents



Warning!

Moving drive and conveyor chains!

Danger of severe pinching!

Before starting with fault analysis and trouble shooting, stop the plant and wait for the chains to come to a complete halt! Do not open any protective cover or access door until the plant has stopped!

When the work details are finalized, all protective covers and access doors shall be closed and secured again!

8.2 Recognizing of operational faults

When an operational fault is indicated, one of the following faults may have occurred:

- Motor protection switch was triggered.
- Speed monitoring device (if available) has reacted.
- Sliding clutch is slipping.

8.3 Causes for faults/discrepancies

8.3.1 Sliding clutch does not react

- Friction linings worn?
- Buckets overfilled?
- Foreign objects blocking the conveyor chains?
- Loose bucket sliding deck?
- Excessive tension of conveyor chain?

8.3.2 False overlapping of buckets

- Transport goods spilling from buckets?
- Incorrect setting of bucket guiding rail?

8.3.3 Corrective measures for causes of faults and discrepancies:

For corrective measures of the causes refer to the relevant items in the chapter on mounting instructions.

9 Disposal

9.1 Environmental protection



Caution!

During all work details at the plant the statutory rules and regulations regarding the correct disposal of operating media and material, the general rules for environmental protection and for recycling/disposal shall be complied with!

When effecting any installation, service, maintenance or repair work, the following water-polluting media, such as

- **Oils and greases,**
- **Hydraulic fluids,**
- **Coolant media,**
- **Cleaning agents containing solvents**

must not drain into the soil or into the sewer system!

Such media must be stored in suitable holding vessels and they shall be disposed off as directed!

9.2 Oils and oily waste, lubricants



Caution!

There is a great potential of environmental pollution when dealing with oils and oily waste, grease or other lubricants. Disposal shall be handled by specialist companies!

Collect such waste as directed locally for further handling and processing by these companies!

9.3 Eventual de-commissioning of the plant

When the plant will be de-commissioned after its long service life, the statutory rules and regulations for the disposal of material and media valid at that time shall be complied with.

It should be checked at that time, which material can be returned into the industrial cycle to best utilise such resources and to protect our natural environment.