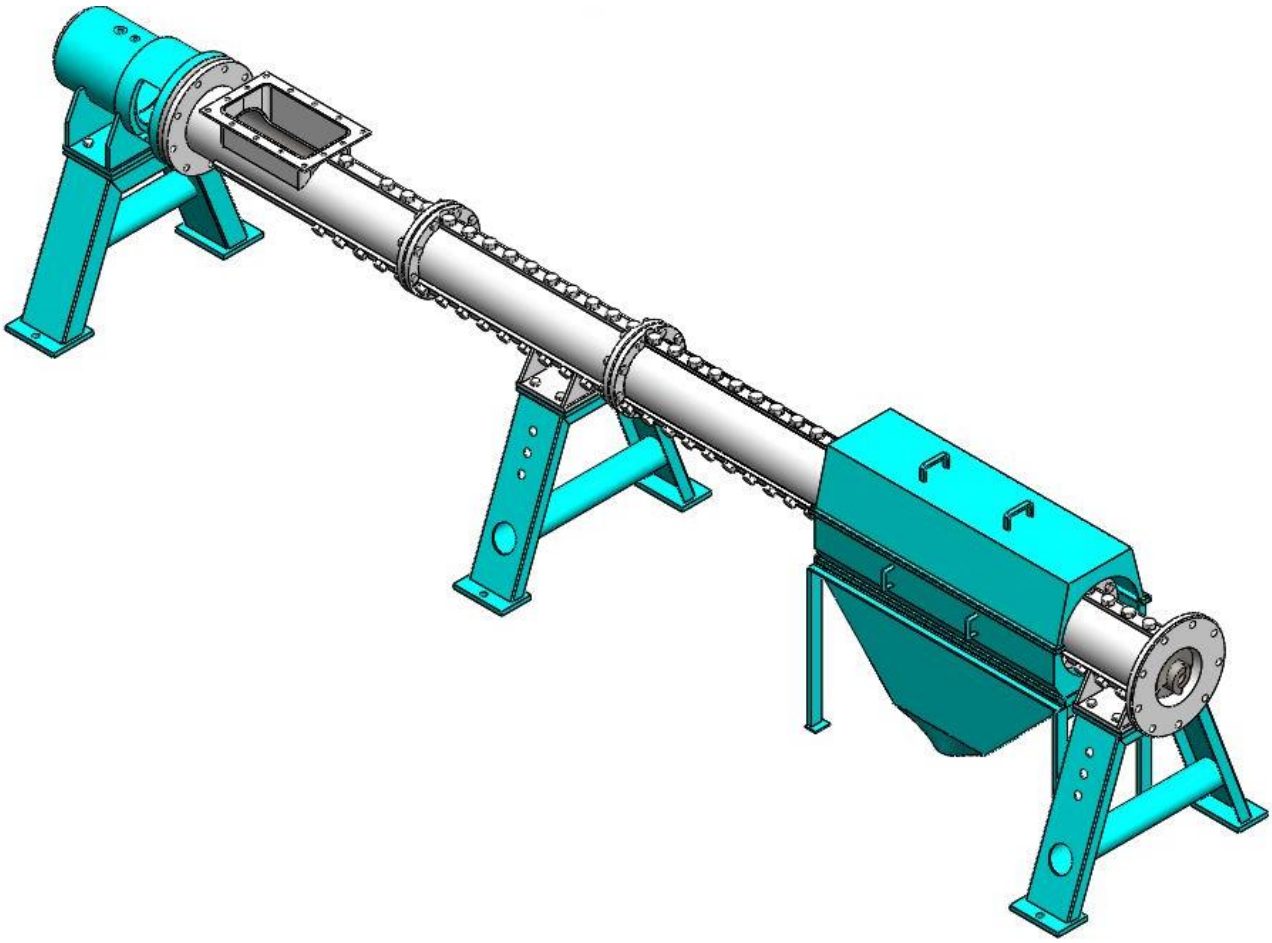
INSTALLATION, OPERATION AND MAINTENANCE MANUAL

EXPANDER

Expander Model: EXP-205 MLE **Nº:** 112/17 and 113/17 **Series:** “B”
Auto-Run Model: AR-205 **Nº:** 112/17 and 113/17 **Series:** “B”
Drive-Head Model: DH-250 MLE **Nº:** 112/17 and 113/17 **Series:** “B”



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1 INTRODUCTION

Over four decades assisting hundreds of companies to feed the world, through the developing and production of equipments for preparation and extraction of vegetal oil, storage, moving and transportation of grains and complete solutions for feed factory.

Recognized national and internationally for the quality and toughness of our equipment. We possess ISO-9001 certification and we attend all the specifications and international rules of quality and safety.

1.1 Dear User

TNL TECNAL thanks for your trust in our equipment. To fulfill our customers in the best possible way, we developed this instruction manual which is your practical guide for the operation and correct maintenance of your equipment.

In case of any doubt that couldn't be solved by this manual, please contact our support department.

This manual must be studied carefully, and the instructions followed by those involved in installation, maintenance and especially in the operation of the machine. The information is displayed, presenting initially the technical data of the machine, its identification and features, as well as nominal capacity. Then are provided information about the equipment installation, the correct way to lift-up and fixate the entire set. On the operation topic, are present the information about situations that can occur during the operation of the machine. Followed by maintenance situations, how to process the activities correctly so the equipment keeps working in perfect conditions, then are indicated the possible spare parts, in this topic also can be seen drawings of assemblies, which can help in the viewing of the equipment and also the commercial references and/or numbers of drawings of the parts that make up the machine, in case they have to be changed. Also presents the safety recommendations, both for installation, operation and maintenance.

Assuming that employees involved with the operation and maintenance of the machine possess the appropriated qualification to realize their tasks satisfactorily, in the operation and maintenance procedures it is fundamental that they have knowledge in:

- Mechanical drawing comprehension;
- General knowledge about mechanical parts like, bearings, seals, joints, etc.
- Use and application of correct tolls for maintenance;
- Knowledge about lubrication systems;
- Use of individual and collective safety equipment (EPI's);
- Basic knowledge of electrics and automation;
- Knowledge of physical quantities as temperature, pressure, force, etc.

For this reason some basic operations that don't demand special knowledge were omitted, as well as repair instructions that exceed a formal maintenance.

The inappropriate use of this machine, in certain circumstances, can cause physical, damage to the persons involved, to third parties or damage to the machine itself, as well to nearby machines. Therefore, due importance was given to safety, including pictograms inserted in the text, just to get the attention to the risks.

	Read the instructions before handling

	Attention
	Danger of crushing hands
	Shock Hazard
	Danger: Lifting parts
	Hot surface
	Danger: hands entanglement
	Turn off the equipment and read the instructions before maintenance or cleaning
	Lubrication



MAKE ELECTRICAL BLOCKAGE OF THE EQUIPMENT BEFORE DOING ANY JOB.



ADVICE: Access to this manual it is important for people to be aware of risks that these activities can cause.

1.2 Individual Safety Equipment (EPI's) Needed for Operation and Maintenance

For operation and/or maintenance must use the EPI's described below:

	**MANDATORY USE OF HELMET, EAR PROTECTOR AND PROTECTIVE GOOGLES.**
	**MANDATORY USE OF SAFETY BELTS.**
	**MANDATORY USE OF SAFETY BOOTS.**
	**MANDATORY USE OF SAFETY GLOVES.**



VERIFY THE SAFETY POLICY RULES APPLIED ON THE EQUIPMENT INSTALLATION COMPANY.

Respect the safety rules, as well the mandatory blockage of the motors, avoiding any accident with mobile parts. Isolate the work area, use the Individual Safety Equipment (EPI's) and use the correct tools for each kind of maintenance. Don't improvise. When lifting parts, use the correct and safer way for each part according to its weight. Remember, your safety only depends on yourself.

2 TECHNICAL INFORMATION

2.1 Technical Data

EXPANDER MODEL: EXP-205 (Barrel 8”)	**Nº:** 112/17 **Nº:** 113/17	**Series:** “B”
AUTO-RUN MODEL: AR-205	**Nº:** 112/17 **Nº:** 113/17	**Series:** “B”
ROTATION: 165 rpm	**PRODUCT:** Sunflower	
DIMENSIONS	**LENGTH:** 6300mm	**WEIGHT:** ~2,7t
	WIDTH: 3100mm	
	HEIGHT: 2000mm	

2.2 Identification Plates

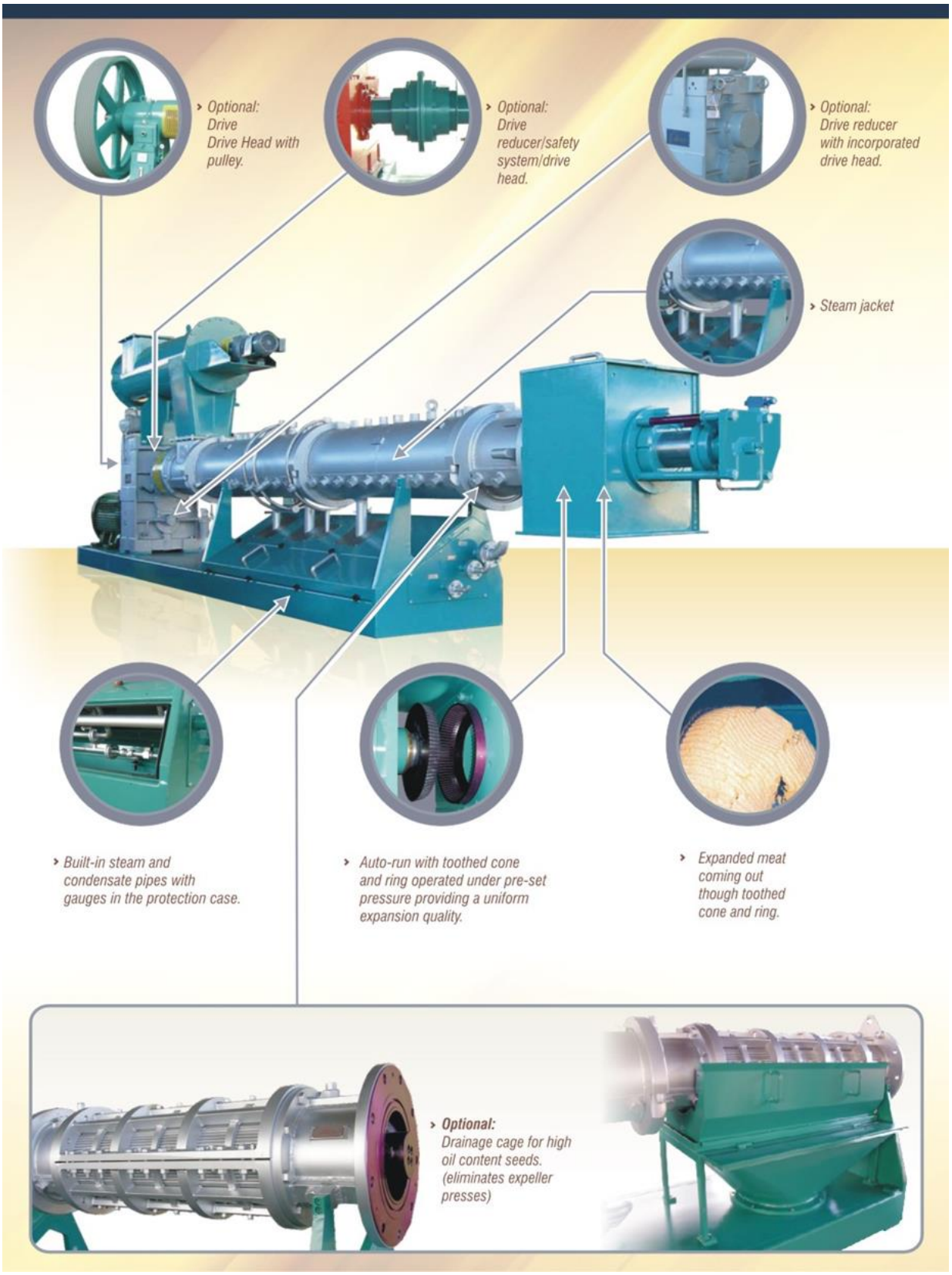








2.3 Description



3 INSTALLATION

3.1 First Procedures

Reception:

A visual inspection must be made immediately after receiving the machines. If it were any damage caused by the transport, please contact us.

Storage:

The machine and the equipment that cannot be installed immediately in its predestined sites must be stored with their original packaging materials and protected against the influence of all external factors.

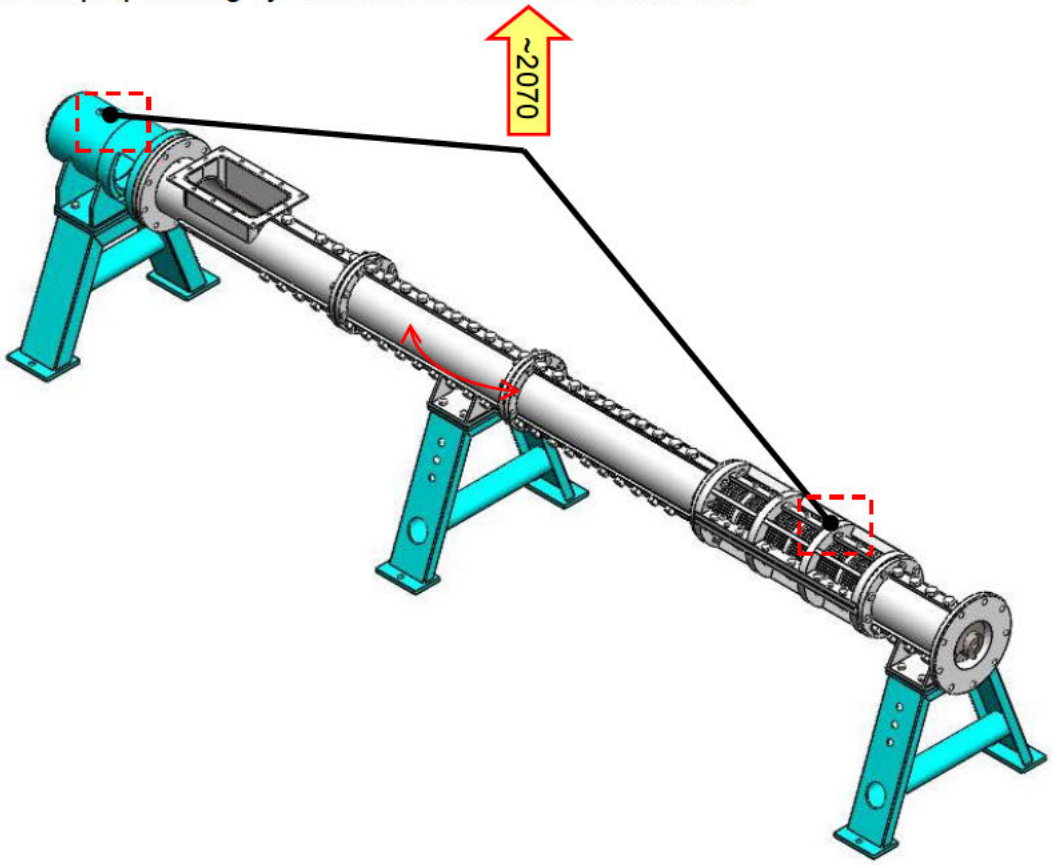
Installation:

Place the expander on beams of prepared steel structure or foundation.

The foundation and the foot plates of the expander unit and of the drive set should be previously aligned, leveled and anchored as the foundation drawing. Check their level and alignment before any mounting.

3.2 Lifting the machine:

Lift the expander from the case or from the container and place it on the mounting site. Use proper lifting eyes and steel cables as shown below:



Picture for illustrative purpose only

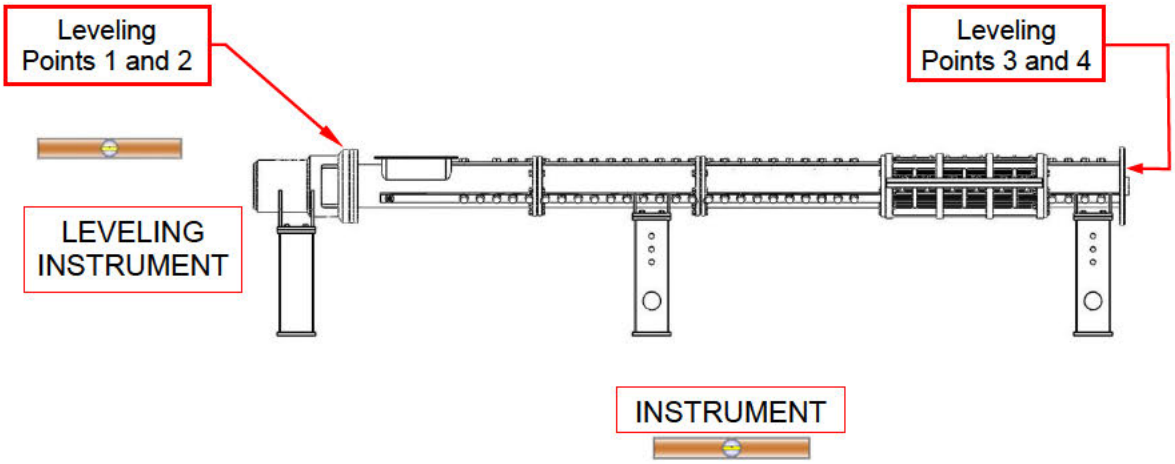
The weight (2.7 ton.) indicated above is relative to the EXPANDER without DRIVEN PULLEY AND AUTO-RUN.

Remark: Rigging plan must be made before lifting the expander.

3.3 Mounting the Expander with Mono-Structure

Insert the anchor bolts in the proper holes located in the expander´s structure. These anchor bolts are shipped separately.

- Prepare the foundation for the expander;
- Check the alignment and leveling of the foot plates on the base. Make adjustments if necessary.



Place the expander unit on the foot plates.

- Check accurately the leveling of the expander unit using the leveling points indicated in the expander;
- Also check the transversal leveling with a ruler and a proper leveler in the points indicated in the drawing;
- After final leveling/alignment, weld the anchor bolts to the foot plates existing in the base.

3.4 Expander with Drive Pulley

Mounting the Pulleys: mount the main pulley (moved pulley), to the Expander and the driven pulley to the motor. Also, mount the expansion rings in the moved pulley following the instructions in Maintenance;

Mounting the Electric Motor: mount the motor on its base;

Leveling the Drive Base: level the base and align the main pulley / motor pulley. Fix it foot plates by welding points only, without final welding;

Checking: Check the leveling/alignment of all parts, adjust them if necessary and make the final welding in all the foot plates to the base.

Mounting the transmission belt and pulley guard: After the final welding of the base, mount the transmission belts and the pulley guard.

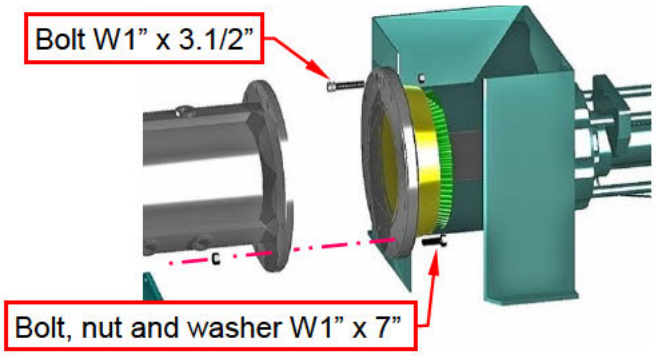
Other mounting steps

- Mount the Auto-run system (see "Assembling the Auto-run", "Drive System" and "Electric Installation").
- Mount steam feeding lines (for direct steam and for jacket) and condensate line (see "Steam Lines")
- Make electric installations (see "Electric Installation").
- Mount inlet chute. Connect it to a slide gate valve at the outlet of the feeding conveyor to protect the Expander against foreign bodies when it is not in operation.
- The discharge bin, as it is part of the Auto-run system, should be interlinked to the conveyor (or spout) that feeds the drier-cooler or cooler.
- Remove seals and mount the thermometers and pressure gauges.

If you mount the whole drive set in a separate place and then mount it to the expander unit, all leveling and alignment of the machine and drive elements must be done again at the site of operation as per the above sequence. Avoid any chance of leveling fail or misalignment.

3.5 Assembling the Auto-Run

Place the Auto-run to the barrel outlet and fix the set with supplied bolts. The Auto-run becomes part of the Expander



3.6 Electric Installation

The helicoid shaft must rotate in anti-clockwise direction viewing from the feeding end. Make sure the motor is turning in the correct direction before the electric tests.

See the proper direction of rotation indicated in the motors of the pumps.

- Interlocking of the Expander:
- Sequence for turning-on the motors:
  - First, the pump that sends lubrication oil to the expander;
  - Second, the expander´s main motor;
  - Third, the feeding conveyor´s motor.
  - The motor of the expander should be installed to start before the feeding conveyor and flaking rolls or conditioner.
  - Interlock the motor of the expander to other downstream equipment.

Please follow the instructions to empty the barrel if the stop is longer than half an hour

- The discharging conveyor of the expander and other downstream equipment should be electrically interlocked to the feeding conveyor. After stopping the feeding conveyor, allow the Expander to run about one minute to empty the barrel and then stop it. Have a proper discharge hopper in this case.
-
- Electrical components are not supplied with the expander. Assemble them in a dry, cool and vibration-free location. Install proper circuit breakers, push buttons and ammeter according to local codes. Place an ammeter at the site of works so that the motor load can be monitored.

Note: Lubrication

The Expander is shipped without oil and/or grease. Fill it with oil or grease the indicated points as per the lubrication instructions.

3.7 Automation Suggestions

This description is a **suggestion** for automation of the Expander that can be installed by the customer. Note: automation not supplied with the machine.

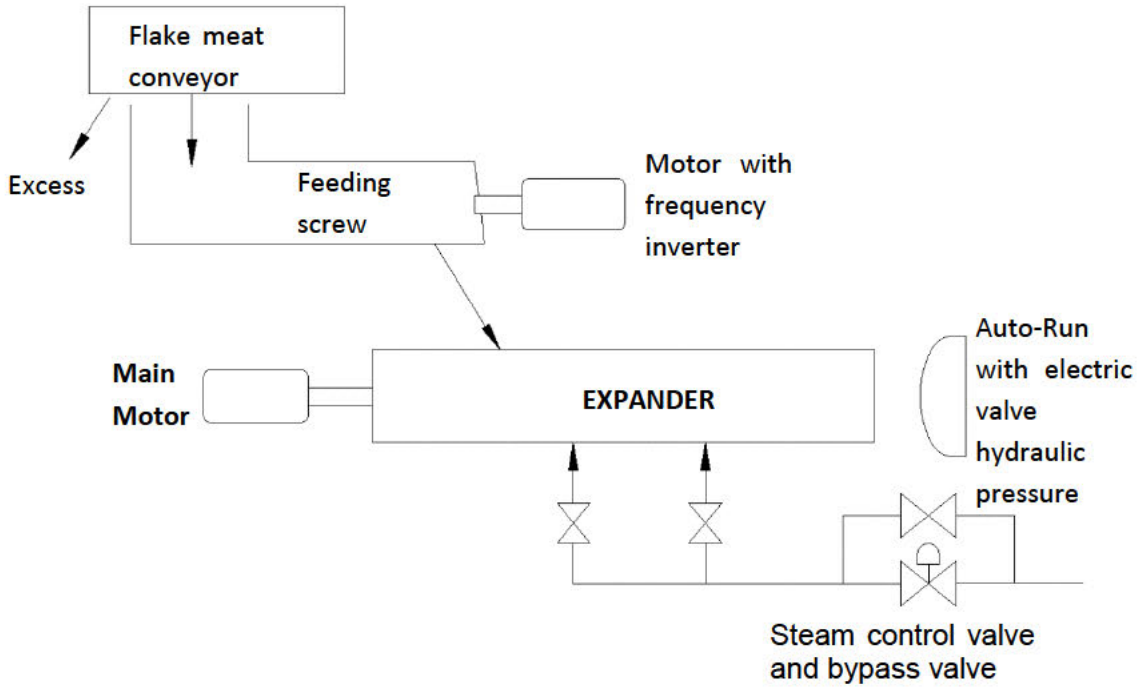


Image for illustration purpose only

Principle of Operation

The first START-UP is executed manually, slowly increasing the feeding rate and the pressure of the auto-cone. The amperage of the main motor should be controlled by the flow rate of direct steam, until it is found the ideal values of the variables for a good quality of the expanded material. Variables:

- production rate → regulated by the frequency of the feeding screw;
- auto-cone's hydraulic pressure;
- power of main motor → motor amperage;
- steam pressure

The suggestion is to run with Expander manually for at least 24 hours to reach the nominal capacity with the best parameters of the variables. Once the expander reaches a stable working condition, put it in automatic mode, gradually closing the steam by-pass valve. In automatic mode the steam flow is controlled automatically by the steam valve control, to increases or decreases the steam flow according to the desired value of the main motor amperage (normally 85% of maximum amperage). The feeding rate is defined by the frequency of the feeding screw at a fix rate.

The feeding screw conveyor must be equipped with a frequency inverter to increase or decrease the production manually and to keep constant its rotation. The operator must be alert in case of increasing or decreasing of production in order to take action to change the frequency of the screw conveyor. Consequently, it must be verified the performance of the Expander again. The conveyor that feeds the feeding screw conveyor must have a bypass to excesses. Thus, the amount of direct steam will be controlled only to meet the variations in the meat quality.

Logical of operation in automatic system:

1- Interlock of extraction section releases the expansion equipment to be turned on.
2- Turn on lubrication unit (if there is in your machine).
3- Turn on main motor of expander.
4- Together the steam control valve opens percentage of (10%) (=minimum opening in empty regime), and the hydraulic unit of auto-cone is turned on → Hydraulic pressure already regulated at work rate and auto-cone kept open.
5- Feeding screw is turned on at ideal working frequency → await material feeding.
6- If main motor amperage (>45%) (there is material feeding) → Close auto-cone.
7- After (3 seconds), increase opening of the steam control valve to (30%) (=minimum opening at material regime).
8- Then PID System of steam control valve enters into operation according to the main motor amperage (85%) of nominal amperage.
9- If main motor amperage (<45%) → close steam control valve to (10%) and open the auto-cone.
10- If main motor amperage (>=100%) of nominal amperage → Open auto-cone.
11- If main motor amperage (<=100%) of nominal amperage → Close auto-cone.
12- If main motor amperage (>120%) of nominal amperage → Stop feeding screw.
13- If main motor amperage (<100%) of nominal amperage → Start feeding screw.

Ps. Values in between parentheses can be changed according to operational convenience.

Operating preventions

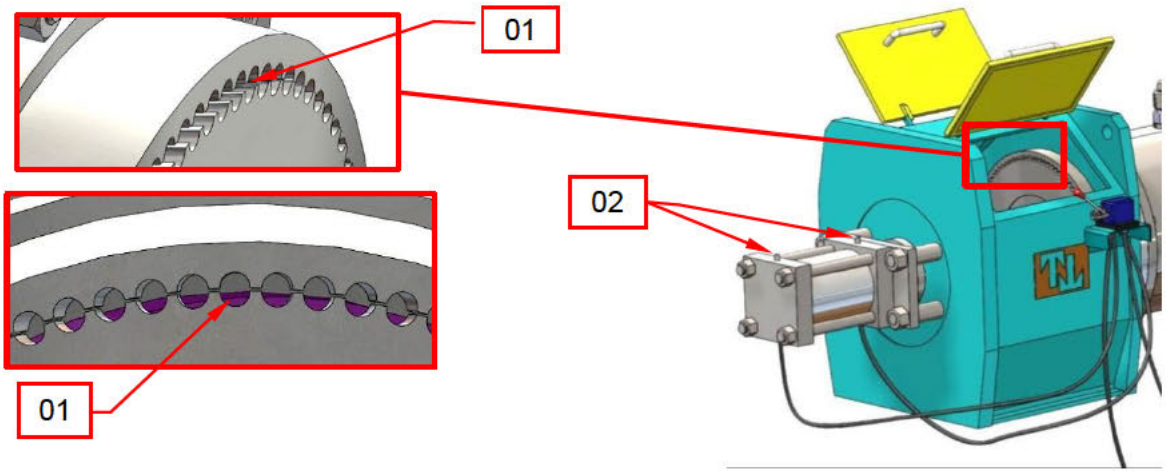
OCCURRENCES	CONSEQUENCES	ATTITUDES
Lack of energy – the machine stops full of material.	No pressure on hydraulic unit.	Open Auto Cone
	Excess of steam.	Close steam control valve.
Energy return.	Release to turn on equipment.	Follow logical of automatic system.
Over amperage of main motor (>120%).	Danger of locking.	Stop feeding screw.
Lack of feeding of material.	Main motor amperage = motor in empty regime (40%).	Close steam control valve at (10%). Open Auto Cone.
Feeding of material returns.	Main motor amperage = motor in work regime (>45%).	Follow logical of automatic system.

3.8 Testing the Auto-Run

The Expander must be stopped for any of the tests below.

Checking the position of the teeth for correct expanded meat

- Check carefully the correct position of each conical head´s tooth to each ring's tooth: their ends must coincide, and so result a perfect circle to give cylindrical expanded meat. This is their correct position of the teeth.
-



- As the conical head gets further from the ring, the expanded meat will present oblong shapes.
- Should you need some adjustment, turn the conical head so that you can get the ends of the teeth to coincide each other for a perfect circle (Pos.01). Lock it in the correct position.

3.8.1 Removing air from oil pipes line

Open a little the bolts (Pos.02) to scape air. When leaving oil through the bolt, close it again. See picture above to identification the position this bolts.

ADVICES:

Re-tighten all barrel and auto-run´s flanges after the initial 2 hours of operation.

Re-tighten definitively the expansion rings of the pulley drive after the initial 2 hours of operation. Stop the machine to do so and follow the instructions at "Maintenance".

Please keep in mind that the pressure inside the barrel will always be the same you have adjusted. Make any decision taking into consideration this concept.

3.9 Stops

3.9.1 Regular stop

- Stop feeding, and close the slide gate valve between the feeding conveyor and feeding bin.
- Close direct steam and jacket steam valves immediately after the barrel is empty.
- Fully open the piston to remove all the remaining material.
- Keep closed the slide gate valve to avoid foreign bodies in the circuit. The barrel must be clean before any re-start.

3.9.2 Stop due to power cut-off

- Close direct steam and jacket steam valves **immediately**.
- Close the slide gate valve to avoid foreign bodies in the circuit.
- As soon as the power is back, place the cone backwards and bump the expander motor to remove the material inside the barrel.
- Then re-start operation normally.
- Meats must not stay inside the barrel for a long time because they will harden - see “Meats inside the barrel”.

3.9.3 Stop due to a foreign body presence

Depending on the pressure it is adjusted, if too big piece of foreign material enters the barrel it may stop the machine. In this case, the belts will slip or break (for pulley drive) and the electric-mechanical safety device breaks its safety pin and stops the main motor (for speed reducer drive). In this event:

- Close steam and feeding immediately.
- Fully open the piston, and bump motor to expel the foreign body through the discharge end. A compact meat should be expelled together with the foreign body.
- If it cannot be expelled, remove the scraper bolts of the last section of the expander barrel (discharge end). Keep the correspondent liner in its place by bolting it to the barrel with proper bolt supplied with the machine. To do so, use the upper thread holes of corresponding scraper bolts.
- Keep the piston fully open and bump the motor to remove the foreign body.
- If the foreign body still cannot be expelled, proceed removing the scraper bolts and bumping the motor until you are able to extract it. Remember to keep liners in their places with proper bolts supplied with the machine.
- If you could not remove it after all these procedures, you have to take out the helicoids until you get succeed.
- Reassemble all components and re-start normal operation.

3.9.4 In case feeding stops

- Close direct steam and jacket steam valves immediately after the barrel is empty.
- Fully open the piston to remove all the remaining material.
- Do not allow the expander to run longer without material; stop it if necessary.
- Keep closed the slide gate valve to avoid foreign bodies in the circuit. The barrel must be clean before any re-start.



Meats must not stay inside the barrel because they will harden. Depending on the raw material, this process may occur in less than 2 hours. If this occurs, follow "Stop due to presence of foreign body". If power is not available, you should turn the main shaft by hand through the shaft of the main motor.

3.10 Table of Parameters of a Regular Operation

VARIABLES	CONTROL
Feeding rate	Always at full load
	Minimum 50% of nominal capacity
Main Motor	~85% of nominal current
Direct Steam	Pressure enough to keep ~85% of nominal current of main motor
	Maximum pressure: 8 bar
	Consumption: 25 to 30 kg/t
Jacket steam	Recommended use only to warn machine when star up
	Maximum pressure: 8 bar
Distance of toothed cone to head	Minimum distance – totally close
Hydraulic pressure Auto-run	Minimum to keep close toothed cone
	Normal operation around 100 bar
	Maximum oil pressure (design): 200 bar (2900 psi)
Flakes moisture content	9.5 to 10.5 %
Flakes temperature inlet	60 to 65ºC
Flakes thickness	Maximum 0.35 mm
Cakes moisture content	6 to 8 %
Cakes thickness	Maximum 30 mm
Cakes temperature inlet	60 to 90ºC

3.11 Important Comments About Operation with Expanders

Full-load feeding must be constant.

The initial START-UP may be difficult because of the inexperience as to the amount of meat needed. It is better to start at a rate of 50% of meat, and increase and control the rates to get the desired quality. Check the motor amperage to take decisions.

Increasing or decreasing the hydraulic pressure of the Auto-run will cause the amperage of the main motor to decrease or increase. Check the capacity and the features of the expanded meat until getting the best one.

Do not allow the piston to close with the machine empty.

Take samples on a set schedule, and check the features of the expanded meat.

Do not allow the expander to run empty long time. It´s damage the helicoids. Correct circuit breakers must be used.

In case you have more than one expander in your line, the flow from the preparation section must be reduced if one of the expanders stops. Have an overflow circuit for this event.

3.12 Issues, causes and solutions board

PROBLEM	CAUSE	SOLUTION
Electrical Breakdown	Motor Don't Start	Check the electrical connection, including circuit breakers, switches, etc.
		Check the connection of the equipment to the net.
	High Amperage	Check if the electrical connection is right
		Excess of product inside the equipment
Embedding	- Big load materials, like iron, plastic bags, wood, etc; - Materials that can hide inside the machine	Use the inspection cover to inspect and clean
		Block the feeding and clean the system
	Overloading	Slow the feeding load
		Check if there is not an overflow at previous equipment
		Check the material discharge, if there is not strangulated
Excessive Noise at the Linkage	Misalignment linkage, or the elastic element damaged	Fix the alignment and if necessary, change the elastic element
Excessive noise at the Reducer	Lack of lubricant	Fill
	Expired Lubricant	In both cases, change the lubricant immediately. In case the problem persists, call the manufacturer's technical assistance.
	Use of non-specified lubricant	
Noise on the reducer's bearing	Lack of lubricant	Change the grease
	Damaged Bearing	Change the bearing
Leaking of grease at the reducer	Excess of grease	Remove the grease and re-lubricate
	Damaged retainer	Change the retainer
Oil Leaking	Excess of oil	Check the oil level

Equipment do not start empty	In some cases can have a bad contact on the connectors	Check the electrical connection and the tight on the connectors
	Materials on the inside	Make electrical blockage and try to spin manually, through the motor's cooler to make sure it is locked
		Open the cover for a better verification and possible removal of the material
	Safety sensors and/or emergency keys activated	Check if there is any sensor or key activated
Equipment don't start with load	Bad contact on the electrical connection	Fully check the connection system.
		Check if there is no linked system, which forces the equipment to begin operation after the previous.
	Safety sensor or emergency keys activated	Check if there isn't any sensor or key activated/damaged
	Excessive load at feeding	Check if the previous valve isn't much opened that causes an embedding
	Excess of material inside the equipment (embedded)	Check if the following equipments aren't stopped, causing an embedding inside the Redler

4 SAFETY INFORMATION

4.1 General Measures for the Prevention of Accidents During Operation



- Belt covers, chain covers, coupling protections and all protections provided must always be placed during equipment operation.
- All control devices must always be kept in perfect shape, meaning micro switches, valves to lock doors, blocking pneumatic cylinders, etc. It's forbidden to override them or taking them out of service.
- To perform control, adjusting or maintenance tasks, you should always put the driving motor out of service from the main switch. It is not enough to remove the fuses!!
- When putting back into service a machine that has been taken off service due to an emergency stop, it cannot be done by energizing this emergency switch. It must only be restarted by the main power switch.
- If the machine has elements that operate at high or low temperature, they should be properly protected and signalized. For its control operation or maintenance, it should be treated with special care. It is advisable to wait the necessary time until returning to its regime temperature, in order to avoid burning risks.
- Lubrication of the machine required to be carried out when running should only take place at grease points that are situated in static and accessible elements. For lubrication points located in moving components, at the top or inside the equipment cannot be done, by any means, during operation. It can only be done in a full stop with all sources of energy cut off.
- If process samples need to be extracted, it is desirable that these are taken from before and after the equipment. Opening inspection doors or getting inside the machine must be avoided.
- The machine must be kept clean by removing dust or product depositions. The cleanliness of the machine and installations contributes to a safe functioning and avoids risk of dust explosion.
- Avoid oil or grease spatters, eliminate them and solve the leaks. These are a source for accidents.
- Respect strictly all safety indications specified for each particular machine, mentioned in respective manuals.
- It is important for safety the cleanliness on places where people work with flammable materials.

4.2 Electrical Installation

Electrical installation and daily usage objects must be controlled regularly Check the local rules for prevention of accident when working with electricity. Special attention must be paid to:

- Do not use portable lamps without armor;
- Defective equipment or components must be repaired or changed immediately;
- Do not leave loose cables over the floor;
- At least once a year a professional electrician must check the entire power grid, in order to find isolation problems, according to regulations for high intensity transmission;
- Machine must be grounded, according to its potency.

4.3 Identification Plates

Safety signs must be kept clean and in a visible location, in case of damage, must be changed immediately.

4.4 Employees Safety

When hiring new employee, he should be filly instructed about all danger involved in the operation and maintenance of the machine.

4.5 Risk Board







SITUATION		DANGER	DESCRIPTION	PREVENTION
ASSEMBLY	Installation of the machine	Crushing or death	When the crane is lifting or moving the machine or its components.	Make a rigging plan
				Put “danger tapes” and signs to keep people away, at least in a 15m radius from the machine
				Tie ropes at the machine, so that you can rotate it when necessary
				Do not stand under the machine
OPERATIONAL / MAINTENANCE	Drive Motor	Electrical Shock	This component works energized	Never open the wire connection box
				Make electrical blockage before start the maintenance
				Use all needed Personal Safety Equipment
				Maintenance must be done by a qualified person

	Discharge table rotor	Entanglement	This component works spinning, and can cause entanglement of the worker hands/cloths	Make sure the equipment have electrical blockage
	Bearings and bearing house	Crushing or entanglement	This component is not very heavy, but still, when removed or moved, it can fall and cause, in the most, member loss	Before disassembly, make electrical blockage
				Move the pieces carefully
				Have nearby all the components to be changed, to avoid an long maintenance

5 MAINTENANCE

5.1 Lubrication

ADVICE: In case of contact between the lubricated points with the processed product, use food type lubricant.

5.1.1 Lubrication with Grease

The bearings must be lubricated to operate in a trustable way and avoid the direct contact between the metallic components. The lubricant besides reducing wear, also protect the bearing against corrosion.

Lubricate the related points weekly with high quality grease, NLGI grade nr. 02, with lithium metal soap base. The recommended grease are indicated on the table below, which is not restrict and allows the use of others marcs, since they have the same characteristics.

ADVICE: In long stops must realize a cleaning, removing all the old grease from bearings and bearing house, applying new grease.

RECOMMENDED GREASE	
IPIRANGA	IPIFLEX 2
PETROBRAS	LUBRAX GMA2
TEXACO	MULTIFAK 2
SHELL	ALVANIA R2

EXCESSIVE GREASE CAN CAUSE A FAST ELEVATE ON THE OPERATIONAL TEMPERATURE, ESPECIALLY IN HIGH SPEED.

5.2 Expander Drive Head

Fill with oil the Expander head to the mark in the viewer before any test or START-UP.

Required quantity: 36 liters (10 gallons)	
AMBIENT TEMPERATURE	
0 to 20º C. 32 to 68º F.	10 to 50º C. 50 to 122º F.
Exxon Spartan EP 320	Exxon Spartan EP 460
Texaco Meropa 320	Texaco Meropa 460
Shell Omala 320	Shell Omala 460

- The first oil change should take place after the first 200 hours of operation.
- Other oil changes: every 2.000 hours of operation.
- Check oil level every 500 hours and add oil up to proper level whenever necessary.
- Recommended oils are not exclusive. Other brands with equivalent features may be used.
- Wash oil tank and refill with fresh oil and new oil filter every 3.600 hours of operation.

5.2.1 Speed Reducer

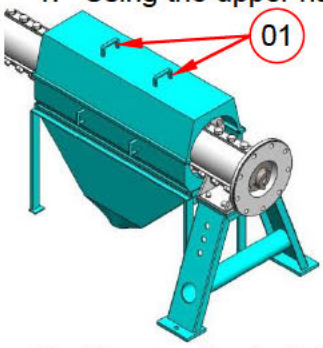
The expander must be equipped with the reducer supplied by manufacturers specialized in this type of device. Please follow their lubrication instructions and oil indications, as well as indication of filters and/or other components, which depend on the model/type/brand of the unit.

The drive head is shipped without lubrication. Please fill it with oil before any test or START-UP.

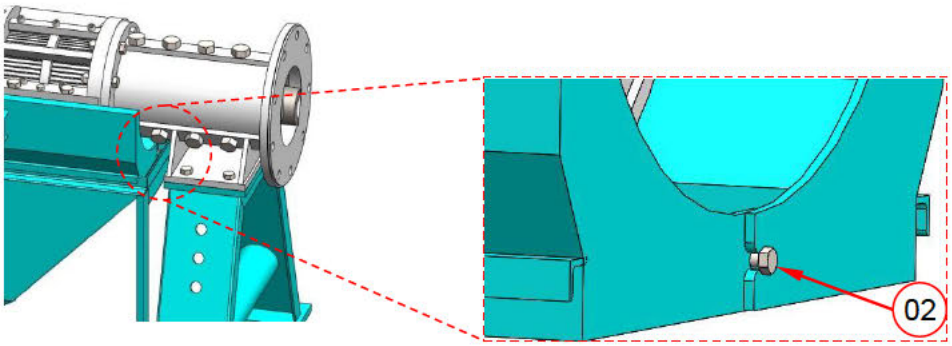
5.3 Removal of the Squeez-o-matic system

5.3.1 How to Disassemble the Drain Basket:

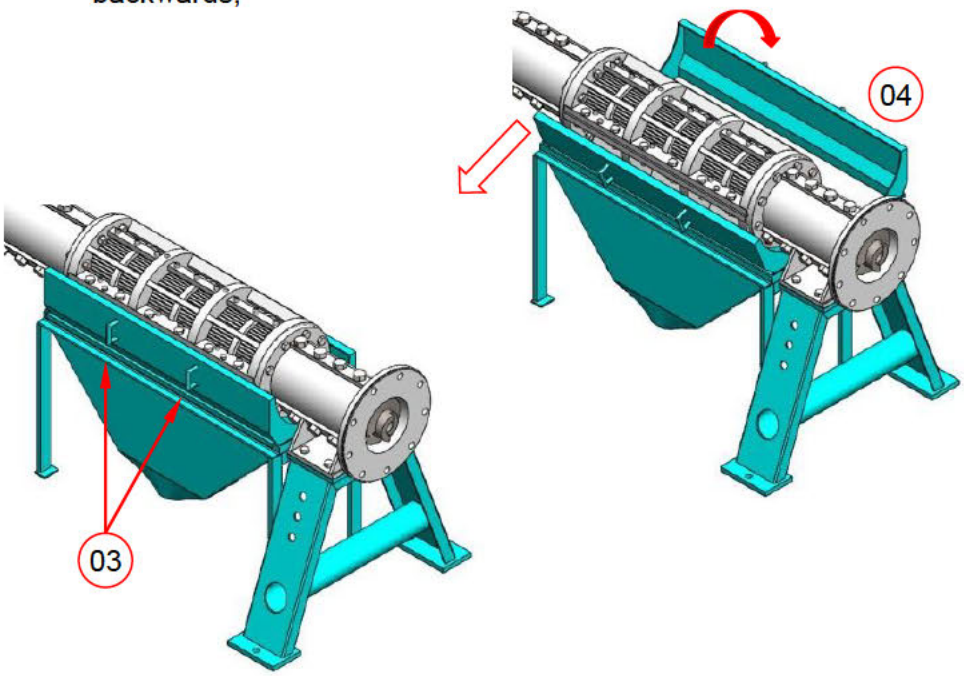
1. Using the upper handle (Pos. 01) remove the superior cover;



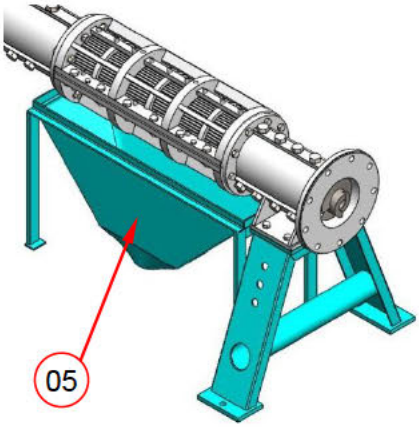
2. Remove the bolts (Pos. 02) that lock the side parts;



3. Using the side handle (Pos. 03), turn each side part (Pos. 04), and then pull backwards;

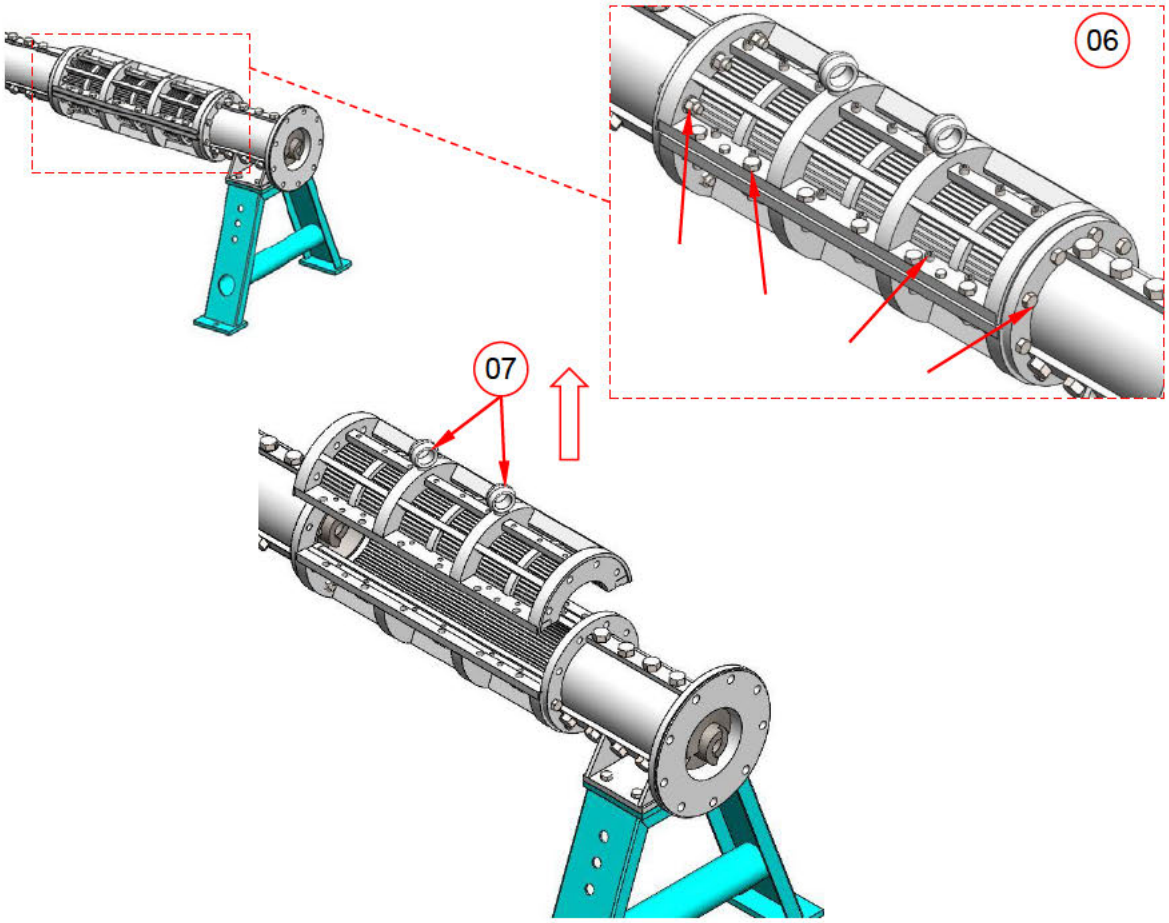


4. Remove the bottom part (Pos. 05);



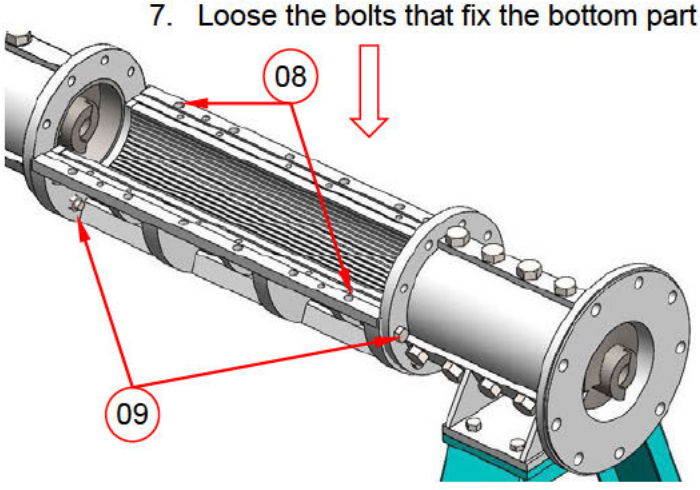
5.3.2 How to Disassemble the Squeez-o-matic:

5. Remove the bolts that fixate the top part of the part (Fig. 06);
6. Locate the existing fixing eyes (Pos. 07) and, with the help of a lifting device, remove the superior part;



After the previous step is done, position the lifting device on the bolt holes (Fig. 08) at the bottom part;

7. Loose the bolts that fix the bottom part (Pos. 09), and remove it;

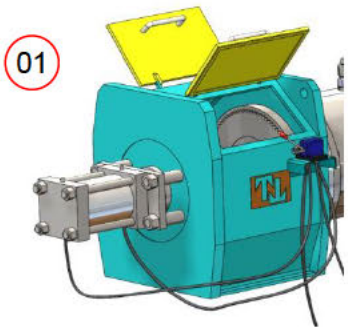


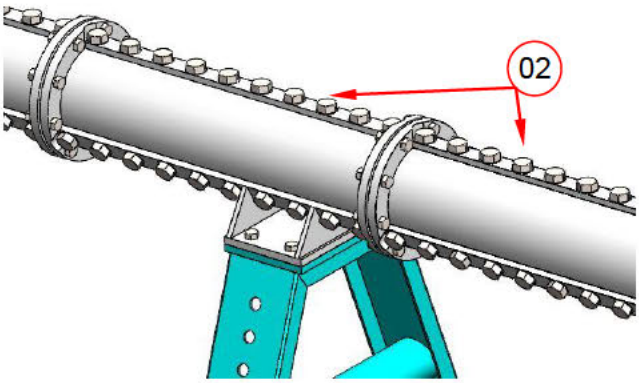
5.4 Removal of the main shaft with helicoids

5.4.1 Initial procedures

To remove the helicoids and the main shaft, have the barrel clean of material and follow the steps 1,2,3,5 and 6 of previous topic (5.3 Removal of the Squeez-o-matic system), then:

- Remove the discharge system (Fig. 01);
- Take out all scraper bolts (Pos. 02);



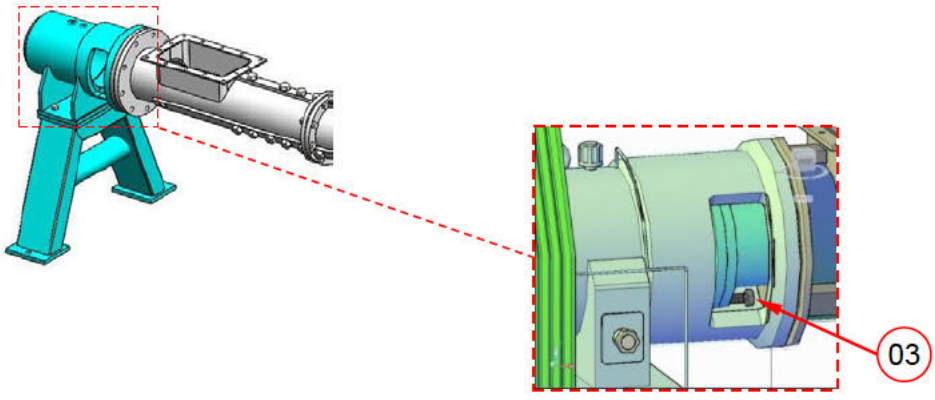


5.4.2 Unlock the helicoids

When the expander is driven by speed reducer: open the Safety Coupling, displace the half coupling toward the Expander and remove the cover from the rod.

When the expander is driven by pulleys: there is no need to take out the pulley for removing the helicoids. Remove the disc that fixes the shaft´s rod:

- Remove the bolts that fix the disc to the shaft;
- Turn the disc in the counter-clock wise direction and it will come off.
- Tighten the bolts (Pos. 03) to push the helicoid set towards the discharge end. Tighten them evenly so that the helicoid set will release off the drive shaft.



Remove the bolts and fixate a lifting eye at the disc on the last helicoid, and using a tackle, remove the entire shaft set from the barrel.

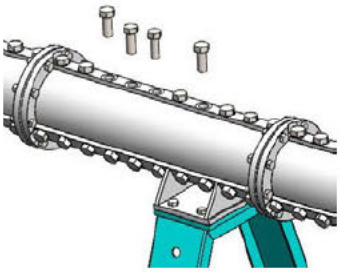
5.5 Repairing the helicoids

- Helicoids may be rebuilt by welding and grinding. See drawing below:



- For welding, use any **electrode standard ASME A-5.1 E 7018.**
- Polish well the surface, until getting it smooth.
- Depressions or corrugations may difficult the material to flow easily through the barrel.

5.6 Replacing scraper bolts

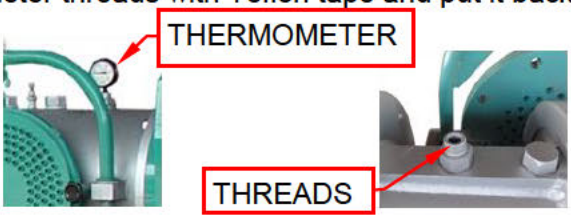


- **Scraper bolts, regular:**

Take out the damaged bolt and replace it by a new one.
It must be firmly tightened.

- **Scraper bolt, thermometer:**

Take out the thermometer and clean its threads.
Replace the damaged scraper bolt by a new one, which m
ust be firmly tightened.
Cover the thermometer threads with Teflon tape and put it back into the scraper-bolt.



5.7 To remove the toothed cone head, follow the procedures below.

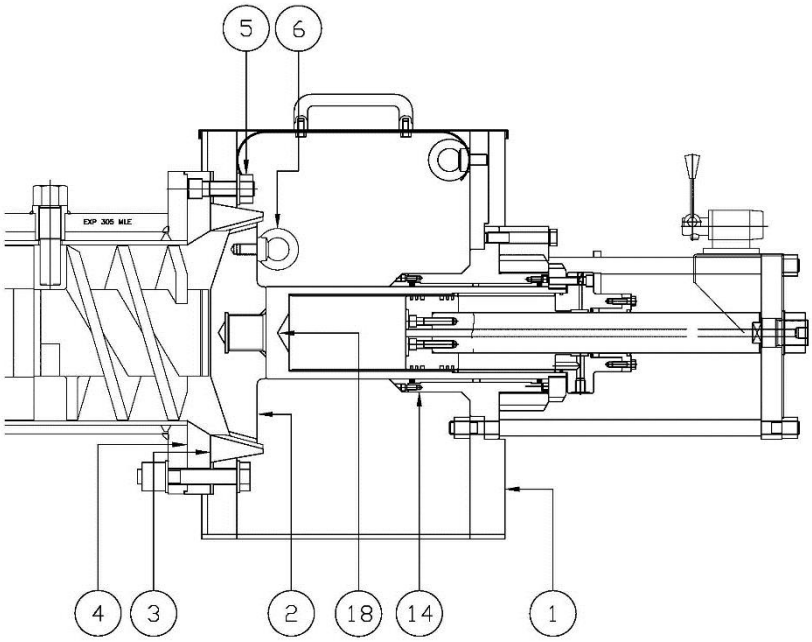
1. Remove the Auto-run set from the expander, releasing the twelve bolts (Pos. 19). Put the Auto-run set on the floor without disconnecting the hoses from the hydraulic system (use a tackle or crane to hold and move the Auto-run set);
2. Remove the toothed cone ring (Pos.03) and the flange (Pos. 04) by removing the bolts (Pos.05);
3. To remove the toothed cone head:

- Insert an 3/4” eye-bolt (pos. 06) in each of the two holes existing in the toothed cone head;
- Using a lever, turn the toothed cone head in the clockwise direction (looking toward the front of the cone head) until it comes free from the rod. Please note that the thread of the cone head is “left thread”;

4. Use the eye-bolts to lift the toothed cone head.

5.8 Replacing and aligning the toothed cone head and toothed cone ring

If you need to take the toothed cone out of the set for some maintenance, please pay attention that it must be mounted back to its *correct mounting position.* The position of each cone’s tooth with each tooth of the toothed ring must result in a perfect circle.

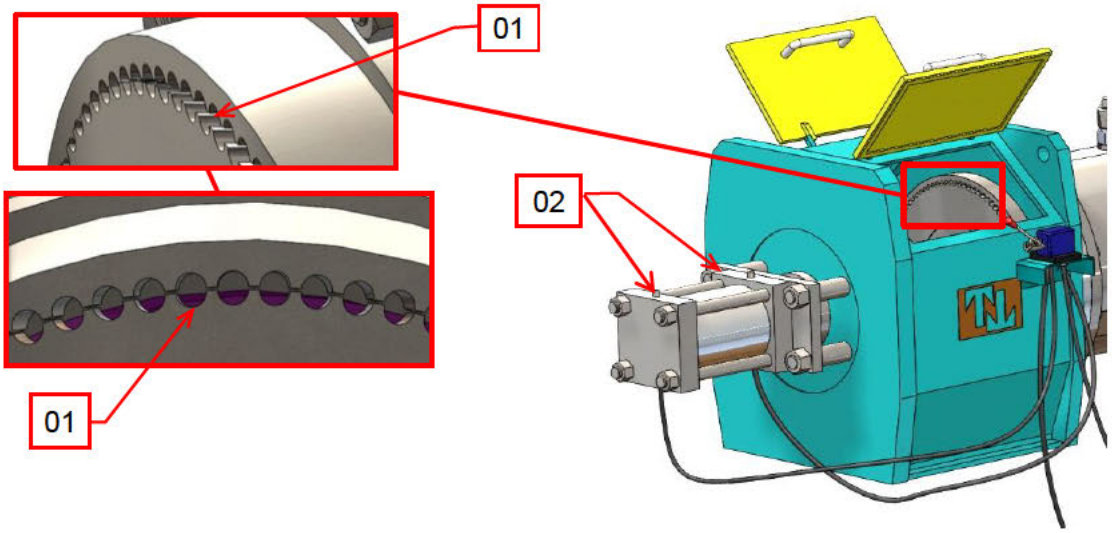


5.9 Mounting the toothed cone head and the toothed cone ring again

1. Fix the toothed cone head (Pos.02) in the rod (Pos.18) by turning it in the counter-clockwise direction;
2. Fix the toothed cone ring in the discharge bin (Pos.01): first put the toothed cone ring, then put the flange (Pos.04) and then the bolts (Pos.05);
3. To align the cone with the ring, use the guide (Pos.14). Using the bolts (Pos. 14A), turn the toothed cone until you get a perfect circle;
4. The whole set must be fixed to the machine using the twelve bolts (Pos.19);

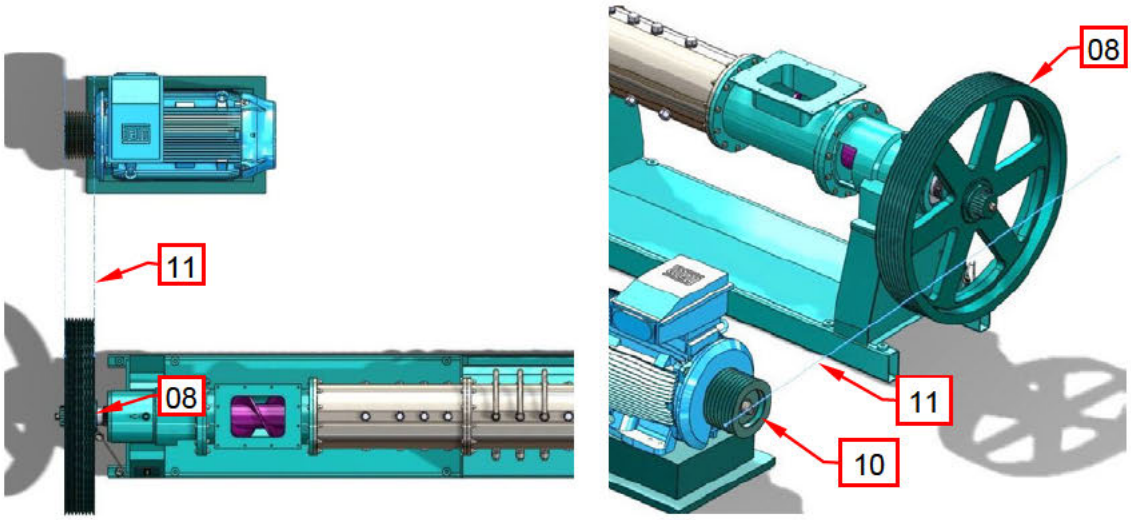
Test the piston course to be sure the cone will keep the minimum clearance of 4 mm from the last helicoid.

Check carefully the position of the cone's tooth and ring's tooth before any test or START-UP. The position of each cone´s tooth with each tooth of the toothed ring must result in a perfect circle as shown in the figure below.



5.10 Checking the parallelism of the drive pulley with the driven pulley

1. Check the alignment of the Drive Pulley (Pos.10) with the Driven Pulley (Pos.08). They must be perfectly aligned.



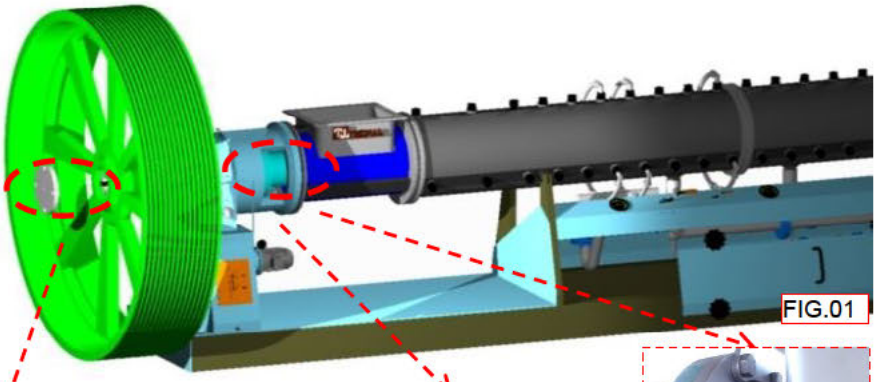
Use a rule, a line or a laser device to help the alignment.
Be careful when tightening the bolts. If any of them receive more torque than others, this can cause misalignment of the Pulley.

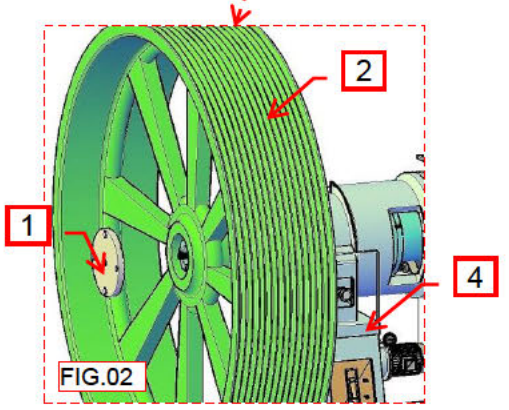
5.11 Replace bearing of the drive head

1) Dismounting the drive head:

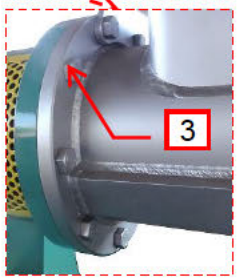
- Drain the oil from head.
- Remove the disc “1” that fixes the shaft´s rod, as shown in figures 1 and 2:
  Remove the bolts that fix the disc to the shaft;
  Turn the disc in the counter-clock wise direction and it will come off.
- Remove the pulley (Pos.02);
- Remove all bolts (Pos.03) with nuts that fix the drive head to the expander´s barrel.
- Remove all bolts (Pos.04) that fix the drive head to the oil tank.
- Untighten the bolts (Pos.05). This will release off the drive head from the expander´s barrel.

Careful
Heavy pieces Danger of injury



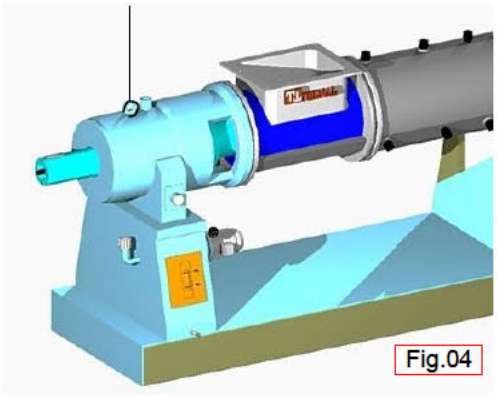


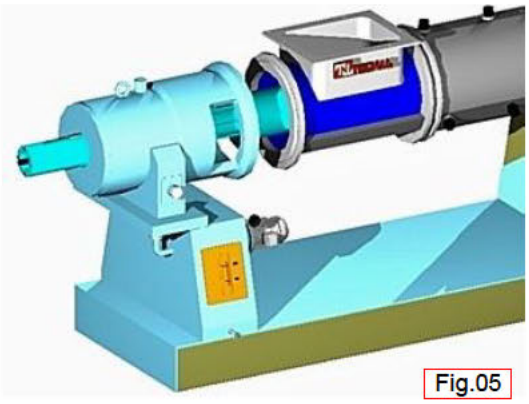




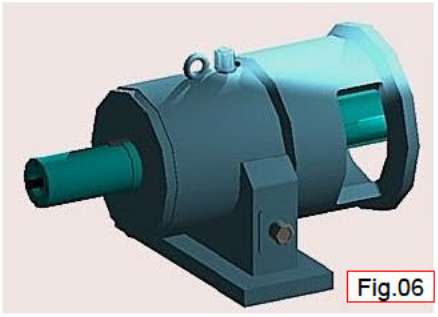
Never tighten only one bolt because this may lock the set.

2) Keep the drive head hanged by a tackle, as shown in Fig.04;
3) Remove the drive head, as shown in Fig.05;


Fig.04


Fig.05

4) Place the drive head on a working table or on the floor;


Fig.06

5) For lifting purposes, insert a rod passing through the shaft´s bore, as shown in Fig.07 and Fig.08. Such rod should be made as per Fig.09;

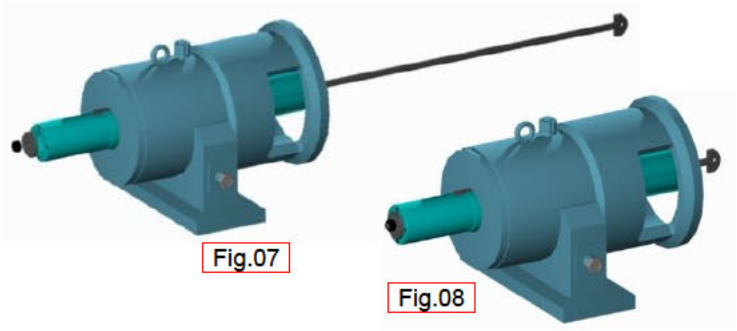
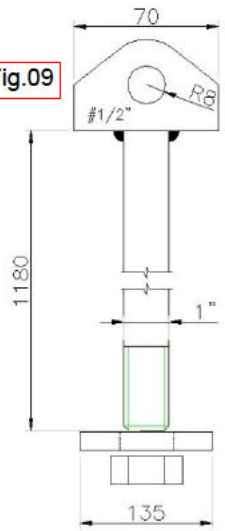

Fig.07

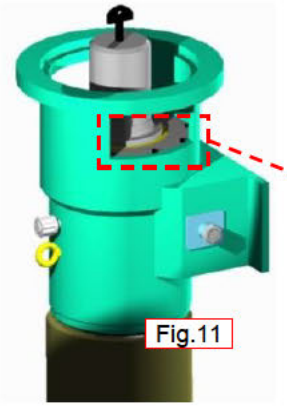
Fig.08

Fig.09



6) Carefully place the drive head in the vertical position on an appropriate base, as shown in Fig.10 and Fig.11. The shaft must not touch the bottom, to avoid damages in it;
7) Loosen bolts (Pos.01) indicated in Fig.12;


Fig.10


Fig.11

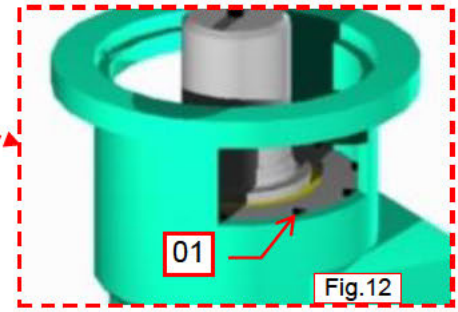
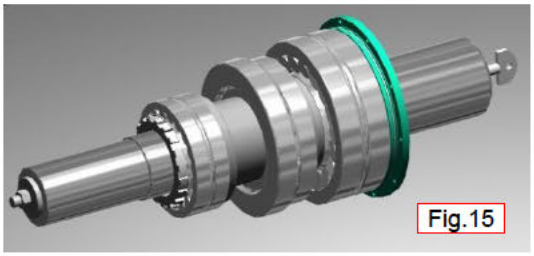


Fig.12

8) Using the tackle, lift the shaft out of the drive head, as shown in Fig.13;
9) The shaft should come out complete, with all bearings, as shown in Fig.14;
10) Carefully place the shaft with bearings on a bench or on the floor, as shown in Fig.15. If you will work on the floor, put a wooden board under the shaft;


Fig.13


Fig.14


Fig.15

Careful Heavy pieces Danger of injury

11) Remove the lifting rod;
12) Remove the ring (Pos.01) shown in Fig.16;

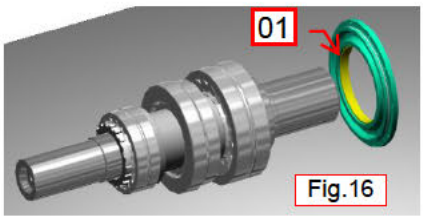


Fig.16

13) Insert the lifting rod through the other end of the shaft, as shown in Fig.17.

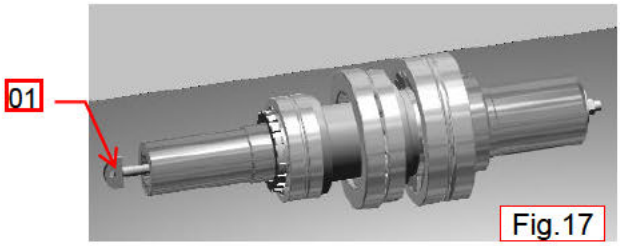


Fig.17

14) Lift the shaft in the vertical position as shown in Fig.18;
15) Place the shaft on an appropriate base (Pos.03) shown in Fig.19. Such base must have a window as shown in (pos.04), through which a pressure oil injector will be inserted to facilitate the removal of the bearing (pos.05);
16) Remove the lifting rod – Fig.20;



FIG.18

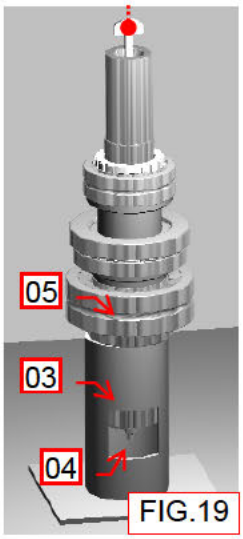


FIG.19


FIG.20

The vertical position of the shaft is the ideal position for removal of the bearings.

NOTE: *The procedures for removal of the bearings should be made with the shaft in the vertical position, as shown in the previous figures. The next figures show the shaft in the horizontal position, but these figures are for illustration purposes only and they have the intention to show step by step how to remove the bearings from the shaft.*

17) Remove the nut KM (Pos.01) shown in Fig.21 Remove also the washer MB, (Pos.02);

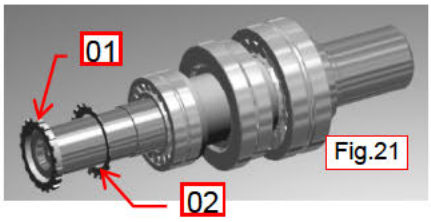


Fig.21

18) There are threaded holes (1/4" BSP) in both ends of the shaft, as shown in Fig.22, through which oil should be injected under pressure;
A) (Pos.03) indicates where is the hole through which oil under pressure should be injected to facilitate the removal of bearing (Pos.05);
B) (Pos.04) indicates where is the hole through which oil under pressure should be injected to facilitate the removal of bearing (Pos.06);
C) Bearing (Pos.07) does not need oil injection and it should come out the shaft easily.

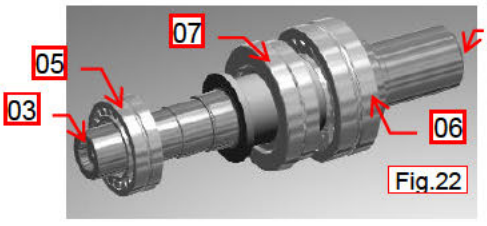
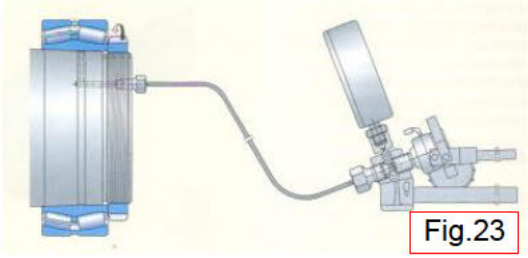


Fig.22

19) To facilitate the removal of the bearings, use a pressure oil injector, as shown in Fig.23. The oil injected under pressure will creates a thin oil layer between the bearing and the shaft and this will make easier its removal.


Fig.23

20) Then, using a bearing puller, remove the bearings.
21) Fig.24: inject oil under pressure in the hole (Pos.03) and remove bearing (Pos.05);

a) Remove the bushing (Pos.3a) indicated in Fig.25. This bushing will come off easily by hand;

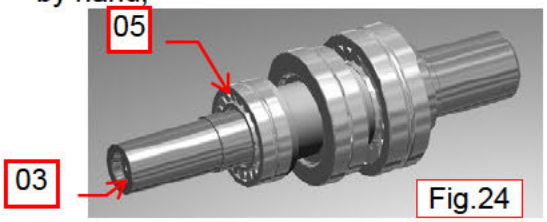


Fig.24



Fig.25

22) Remove the bearing (Pos.07), as shown in Fig.26. It should come out easily;
23) Remove the ring (Pos.07)a indicated in Fig.27;
24) Fig.28: inject oil under pressure in the hole (Pos.04) and remove bearing (Pos.06);

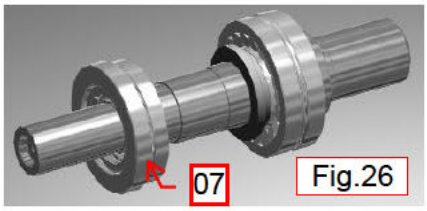


Fig.26

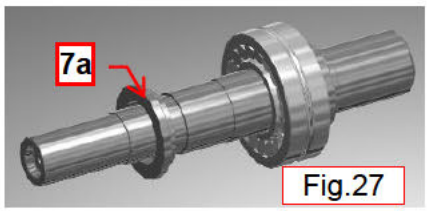


Fig.27

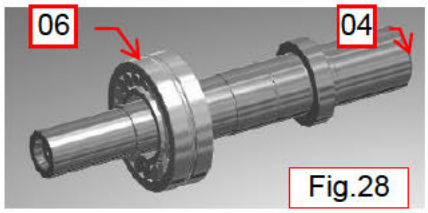
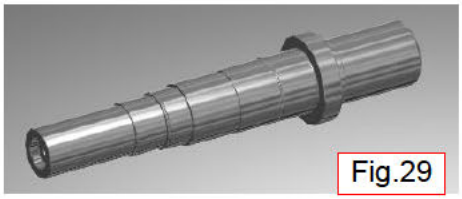


Fig.28

25) Clean the shaft before reassembling the bearings


Fig.29

26) In case you need to replace the bearings due to bearing locking:
Check if the shaft is not damaged;
Check if the drive head housing is not damaged;

27) Check if the gap:
Between the bearings and the shaft;
Between the bearing and the housing, as per this table:

BEARING	DIMMENSIONS
29328 E	Ø140 x Ø240 x 60mm
29328 E	Ø140 x Ø240 x 60mm
22228 CC/W33	Ø140 x Ø250 x 68mm

28) To assemble the bearings onto the shaft, precede inverse way as described in steps 1 to 24.
a) It is not necessary to use pressure oil injector for assembling the bearings;
b) Check the conditions of the oil seals and change them if necessary.

After reassembling the drive head do not forget to fill it with oil as per section "Lubrication"

5.12 How to replace oil seals of the drive head

1) Remove the pulleys, as per previous instructions in this manual – See "**Dismounting the drive head**";
2) Dismount the drive head following the steps 1 to 3 in the section "**Dismounting the drive head**";
3) Now with the drive head apart, follow these steps:

- Remove all bolts (Pos. 6.1) shown in Fig.26;
- Remove the cover (Pos.06) shown in Fig.26;
- Replace O'ring (Pos.05) shown in Fig.26;
- Replace the retainers (Pos.04) shown in Fig.26;
- Put back the cover and bolts (Pos. 6 a 6.1)

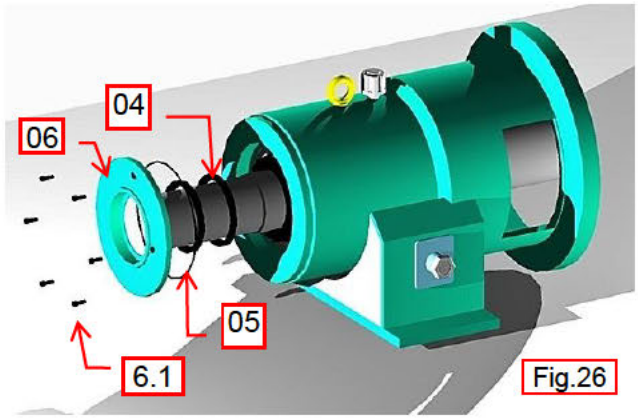


Fig.26

4) To replace the seals located in the rear part of the drive head it is not necessary to dismount the drive head. Just follow the steps below:

4.1) Replacing the retainers (Pos.16):

Using a pointy tool, just pull out the retainers and replace them by new ones. It is not necessary to dismount the drive head to replace such retainers.

4.2) Replacing the o´ring (Pos.14):

- Remove all bolts (Pos.6.1) shown in Fig.27;
- Remove the rear cover (Pos.15) shown in Fig.27;
- Replace the o´ring (Pos.14);
- Put back the retainers (Pos.16);
- Put back the cover (Pos.15) and tighten the bolts (Pos.6.1).

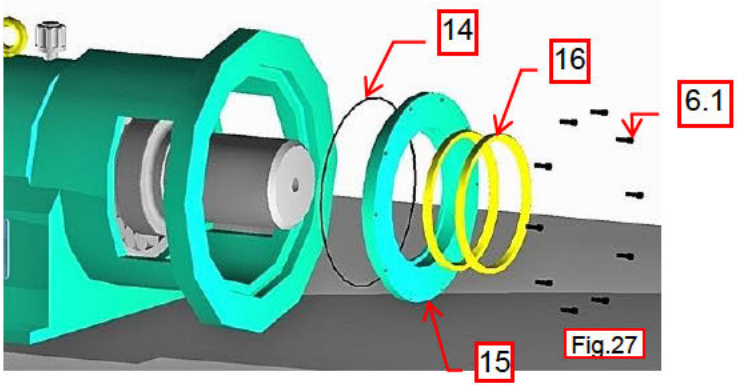


Fig.27

5.13 Predictive and preventive maintenance

Predictive and preventive maintenance is very important to obtain a good and correct operation of the expander and to get the longest useful life for it. Please check periodically the machine while running so that you can observe what part or component needs to be repaired or replace. We recommend to take note and to register the working parameters of the machine, so that each machine will have its recorded history. This will facilitate the decision for stopping the machine at the right moment for preventive maintenance.

Weekly inspection

Please check weekly:

- Oil level and temperature at the drive head
- Oil level and temperature at the speed reducer (for expanders driven by speed reducer)
- Oil level and temperature at the hydraulic unit.
- Pressure of the hydraulic unit.
- Lubrication pressure of the drive head.
- Pressure of the steam line.
- Vibration level of the drive head.
- Water pressure in the heat exchanger of the speed reducer and hydraulic unit.
- Re-tightening of the bolts of the Auto-run´s piston.
- Alignment of the toothed cone of the Auto-run.
- Steam traps and steam filters. Clean them if necessary.
- Re-tightening of the scraper bolts.

Monthly inspection

Some simple maintenance attitudes should be taken monthly, but with the machine stopped. So, maintenance stops should be programmed.

Please do monthly:

- Re-tighten of the bolts that joint the helicoid shaft to the drive shaft.
- Re-tighten the bolts of the disc at the end of the helicoid shaft.
- Re-tighten the bolts of the couplings (for expanders driven by speed reducer).
- Re-tighten the fixation bolts of the mechanical safety device (for expanders driven by speed reducer).
- Clean or change the oil filters.
- Check the gap between the helicoids and the liners. This will tell you if they need to be replaced or not.
- Check the conditions of the scraper bolts.
- Check the conditions of the toothed cone head and ring.
- Check the conditions of the drive head.
- Check the hydraulic components.

Working parameters

According to the history of the working parameters and maintenance of each machine, you can program preventive maintenance. The parameters below are for reference only, as they may vary from one expander to another and depend on the working conditions and on the raw material being processed.

- Temperature of the drive head: maximum 70ºC;
- Temperature of the speed reducer: maximum 70ºC;
- Temperature of the hydraulic unit: maximum 70ºC;
- Pressure at the hydraulic unit: 200 bar;
- Lubrication pressure of the drive head: minimum 2 kgf/cm²;
- Pressure of the steam line: minimum 6 kgf/cm²;
- Vibration level of the drive head: maximum 5 mm/s;
- Water pressure in the heat exchanger of the speed reducer and hydraulic unit: minimum 3 kgf/cm²;
- Gap between the helicoids and the liners:

First of all, the operator must evaluate if the quality of the expanded meat is good or not and if there is excessive vibration in the expander. Bad quality of expanded meat and excessive vibration indicates that the helicoids and the liners are not good and must be replaced.

After that, the operator should also check the inside gap between the helicoids and the liners. The gap limit between the helicoids and the liners must be a radius of 5 mm. That means 2.5 mm of wearing for the helicoids and 2.5 mm of wearing for the liners.

We recommend replacing the helicoids and the liners if this gap is over 5 mm.

- Scraper bolts: Replace the scraper bolts when the wearing is more than 2.5 mm in radius.

- Toothed cone head and ring:

When the toothed conical head and ring are together, they form holes of 10 mm in its diameter. Replace them when this diameter is less than 5 mm.

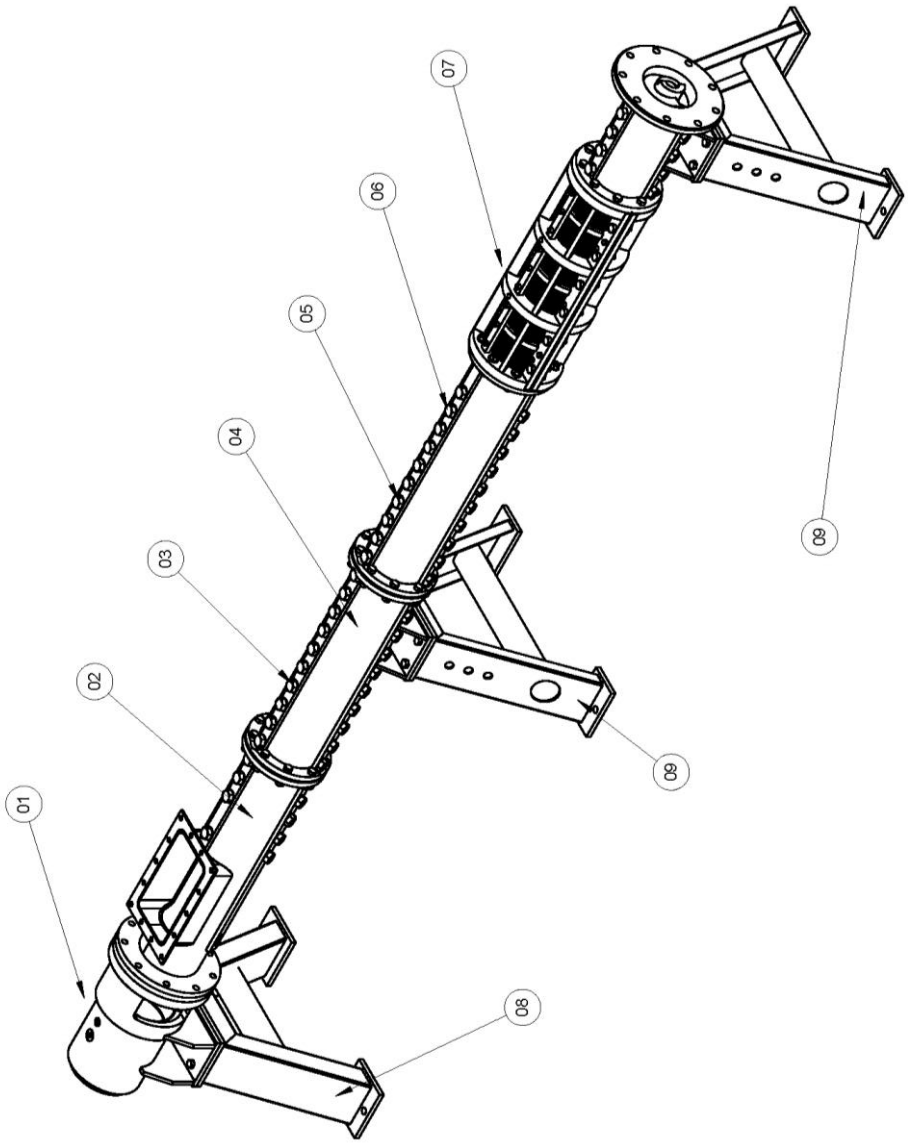
- Drive head:

The operator should check if there is vibration in the bearings, which should last around 5 years in normal conditions of operation and maintenance.

The oil seals must be replaced when leaks are observed.

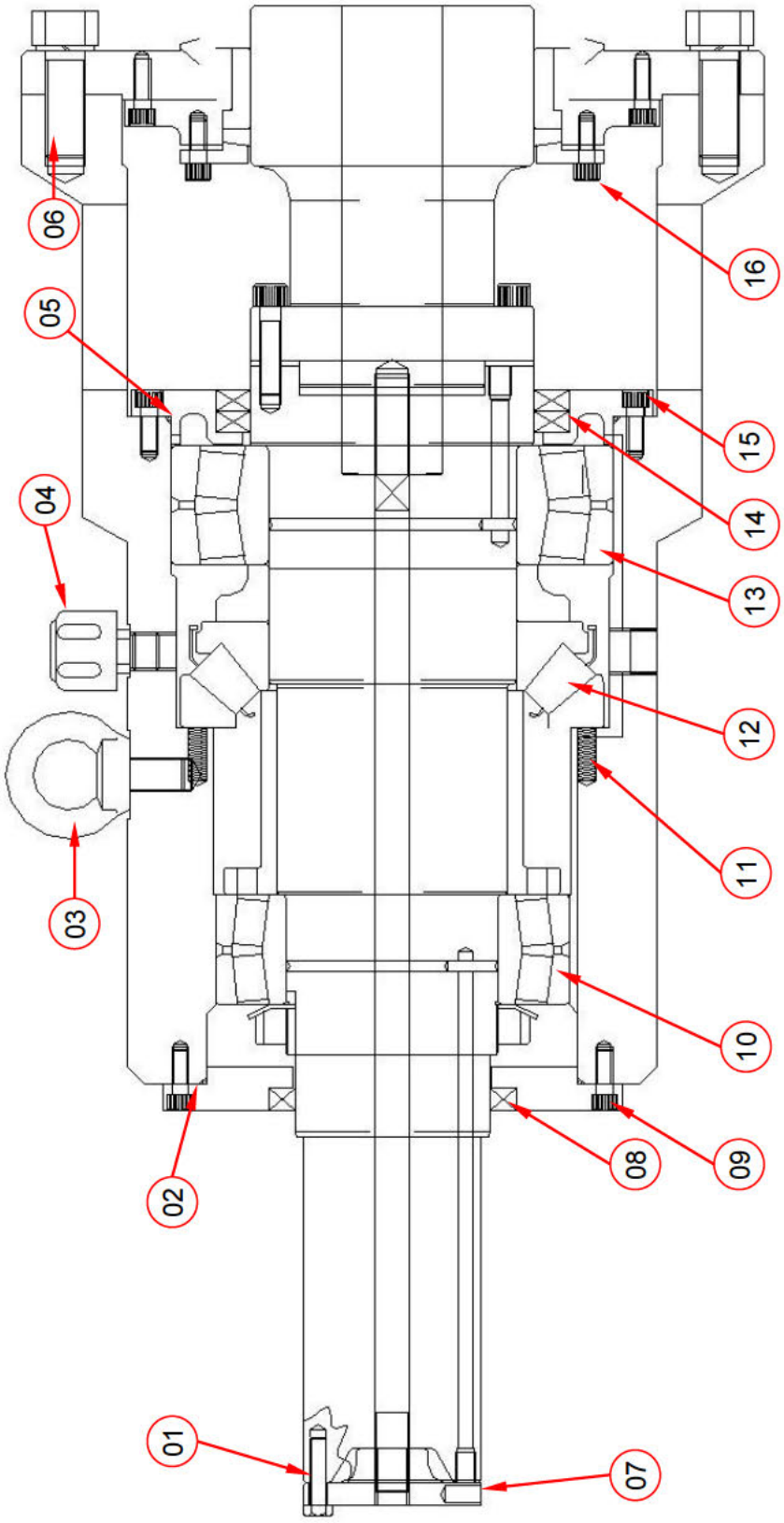
6 SPARE PARTS

6.1 Over View



ITEM	DESCRIPTION	QTY.	SUPPLIER
01	Drive Head	01	M11-514-140
02	Expander Body	01	M11-514.154
03	Shirt Bolt	01	C-514.008
04	Shaft with Helicoid	01	M11-514.139.
05	Body bolts	77	C-217.031
06	Thermometer Bolt	01	C-217.033
07	Squeeze-o-matic System	01	M11-514.122
08	Drive Head Support	01	M11-514.148
09	Body Support	02	M11-514.149

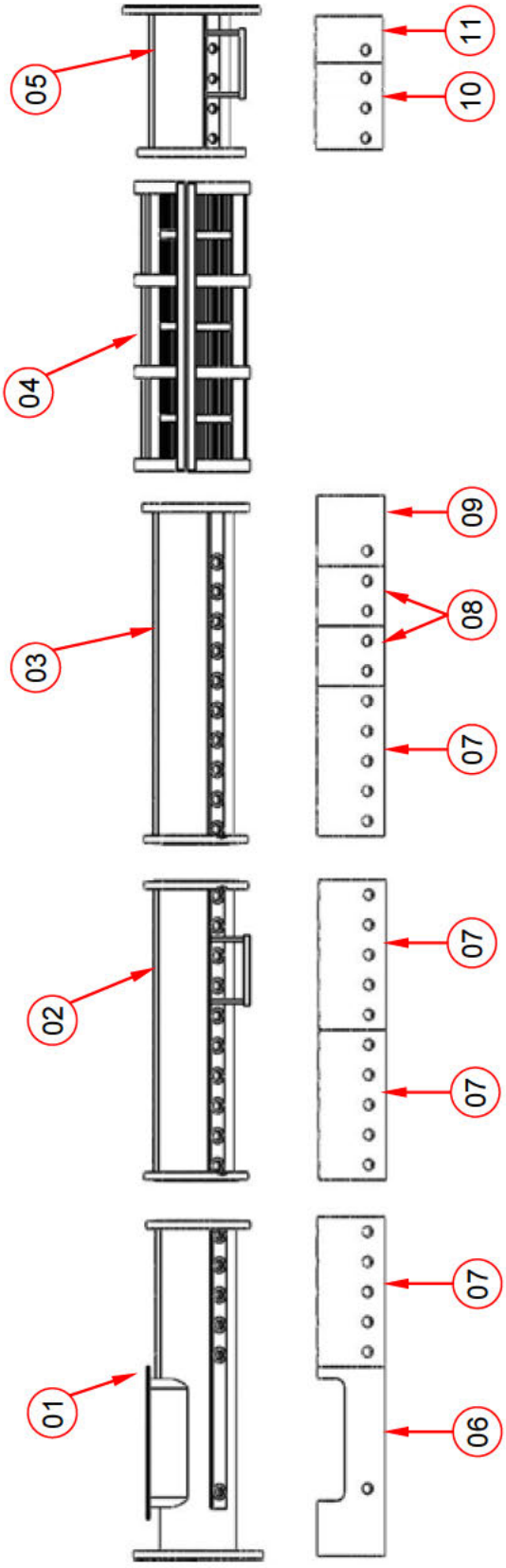
6.2 Drive Head (M11-514.140)



Spare Parts List:

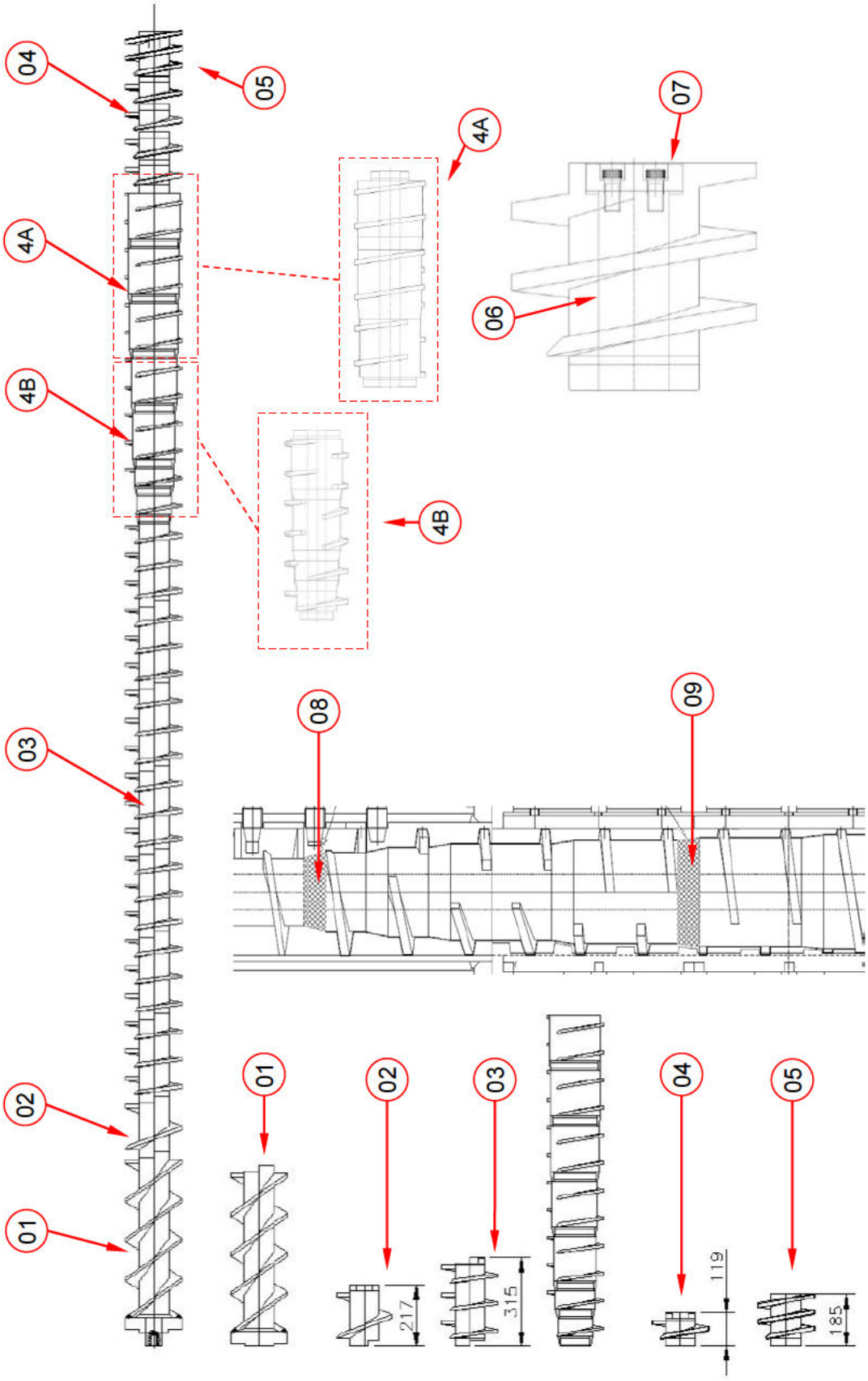
PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Hex. Bolt W3/8” x 1.1/2”	02	Market
02	O’RING nº10869 (Ø210X3)	01	Market
03	Lifting Eye Ø3/4”	01	M11-514.140
04	Air Filter 1/2” HDA – FAR 4440	01	Market
05	O’ring Nº12106 (Ø250x3)	01	Market
06	Hex. Bolt with washer W7/8” x 2.1/2”	09	Market
07	Drive Head Support	01	M11-514.151
08	Reteiner Nº 00516-B (Ø110 x 139.5 x 13)	01	Market
09	Allen Bolt 3/8” x 1”	06	Market
10	Bearing 29328 E	01	SKF
11	Helicoidal Spring (Ø10 x 45mm)	06	Market
12	Bearing 29328 E	01	SKF
13	Bearing 22228 CC/W33	01	SKF
14	Reteiner Nº01951 BR (Ø160 x 200 x 12)	02	Market
15	Allen Bolt 3/8” x 1”	06	Market
16	Allen Bolt W1/2” x 2”	03	Market

6.3 Expander Body (M11-514.154)



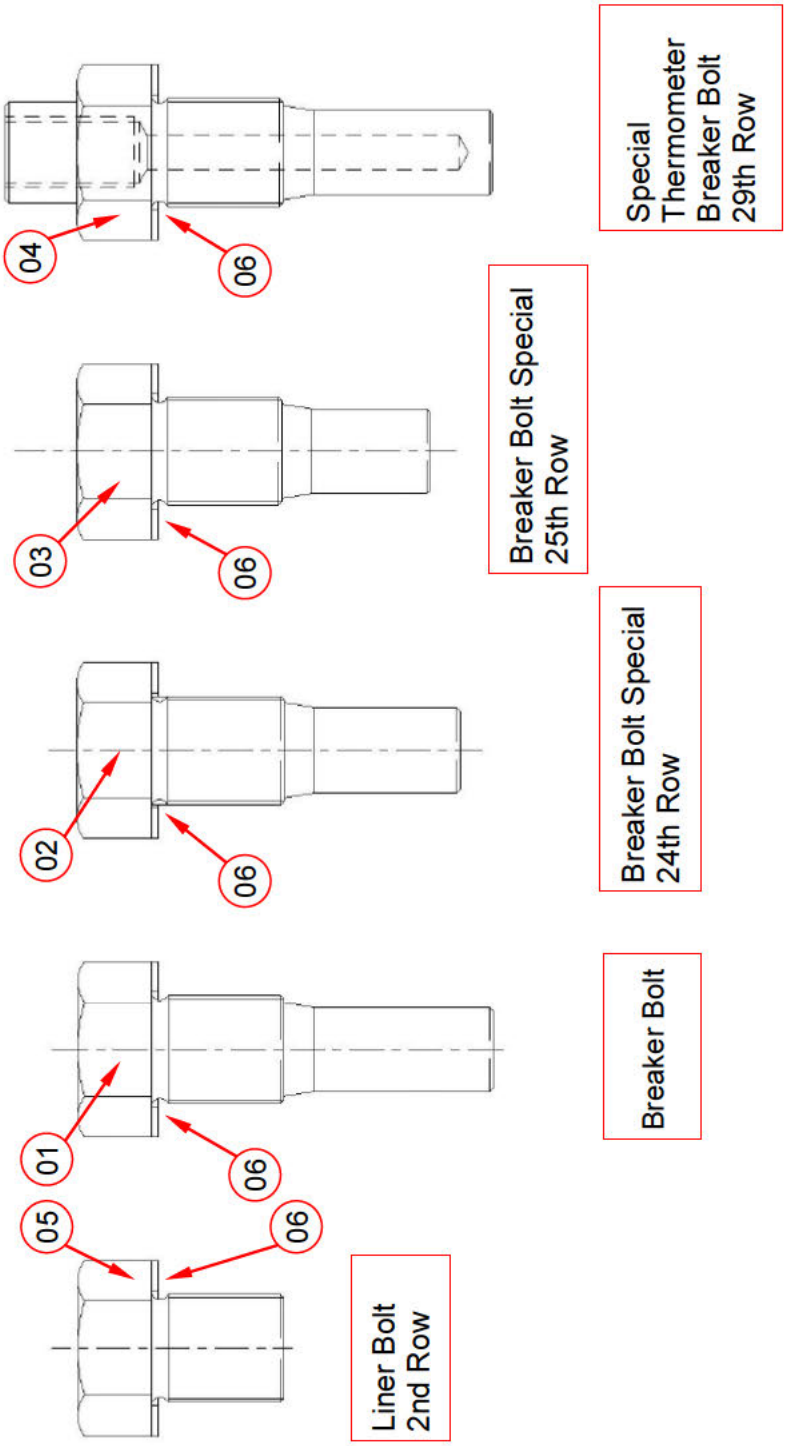
PART	DESCRIPTION	QTY	REFERENCE
01	1ST Feeding Barrel	01	M11-514.018
02	2nd Barrel	01	M11-514.019
03	3rd Barrel	01	M11-514.097
04	Squeez-o-matic	01	M
05	4th Barrel	01	M11-476.122
06	Liner Nr 1	01	M11-476-124-06
07	Liner Nr 2	04	M11-476-124-07
08	Liner Nr 3	02	M11-476-124-08
09	Liner Nr 4	01	M11-476-124-09
10	Liner Nr 5	01	M11-476-124-10
11	Liner Nr 6	01	M11-476-124-11

6.4 Helicoids (M11-476.111)



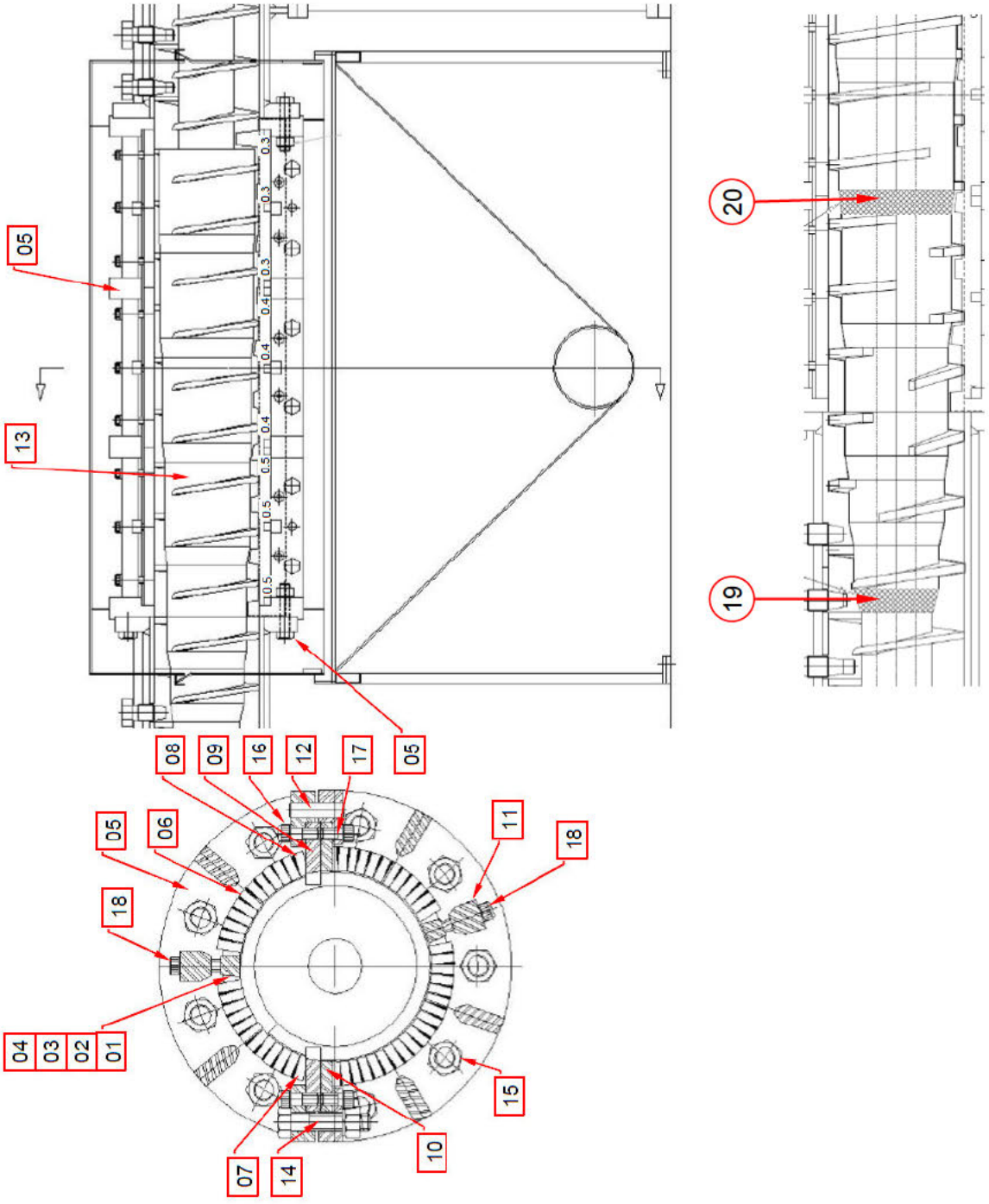
PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Helicoid Nr 1 (Double)	01	M11-514.138
02	Helicoid Nr 2 (Special)	01	M11-154.107
03	Helicoid Nr 3 (Triple)	07	M11-154.108
04	Helicoid Nr 4	04	M11-154.109-R1
4A	Helicoid Nr 1 Squeez-o-matic	01	M11-476.119-R1
4B	Helicoid Nr 2 Squeez-o-matic	01	M11-476.120-R1
05	Helicoid Nr 5	01	C-217.026.1
06	Helicoid Support Shaft	01	M11-514.139
07	Helicoid Disc	01	M11-514.115
08	Adjusting Ring	01	M11-476.121-08
09	Adjusting Ring	01	M11-476.121-09

6.5 Breaker Bolts (M1-217.213)



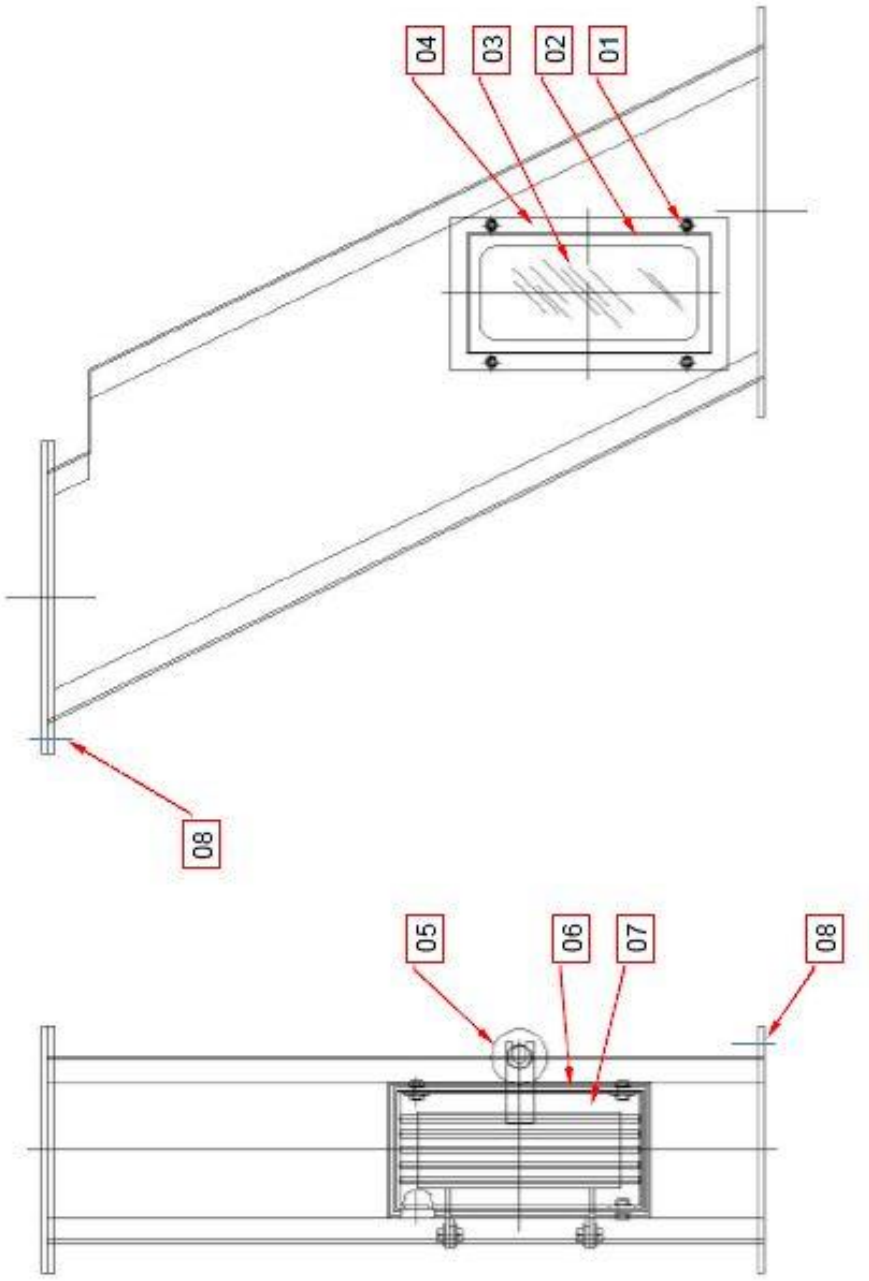
PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Breaker Bolt	77	C-217.33
02	Breaker Bolt Special	03	M11-476.045
03	Breaker Bolt Special	03	M11-476.046
04	Special Thermometer Breaker Bolt	01	C-217.31
05	Liner Bolt	09	C-514.008
06	Washer	84	M11-514.013

6.6 Squeez-O-Matic (M11-476.111)



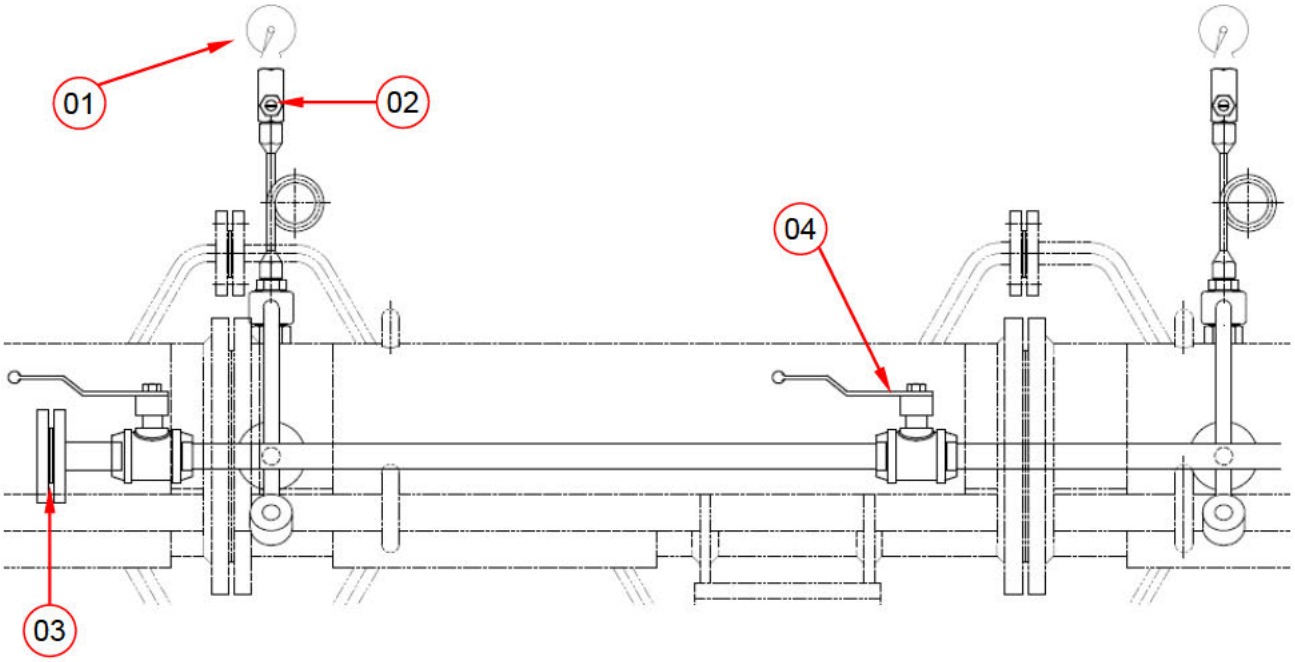
PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Lock Edge	12	M11-476.038-2
02	Edge 0,3	153	M11-476.048
03	Edge 0,4	153	M11-476.049
04	Edge 0,5	153	M11-476.050
05	Frame	01	M11-514.117
06	Knife	153	M11-476.035
07	Left Adjusting Knife	03	M11-476.036
08	Right Adjusting Knife	03	M11-476.037
09	Left and Right Beaters	01	M11-476.034
10	Left and Right Supports	01	M11-476.044
11	Locking Edge	06	M11-476.008
12	Guide Pin	04	M11-476.043
13	Helicoids	01	Page 45
14	Hex Head Bolt W3/4” x 3.1/4” with Nut/Washer	12	M11-476.111-14
15	Hex Head Bolt W3/4” x 3.1/2” with Washer	18	M11-476.111-15
16	Fillister Head Bolt W 1/2” x 1.1/8”	12	M11-476.111-16
17	Fillister Head Bolt W 1/2” x 7/8”	12	M11-476.111-17
18	Fillister Head Bolt W 1/2” x 2.1/4”	18	M11-476.111-18
19	Adjusting Ring	01	M11-476.121-09
20	Adjusting Ring	01	M11-476.121-10

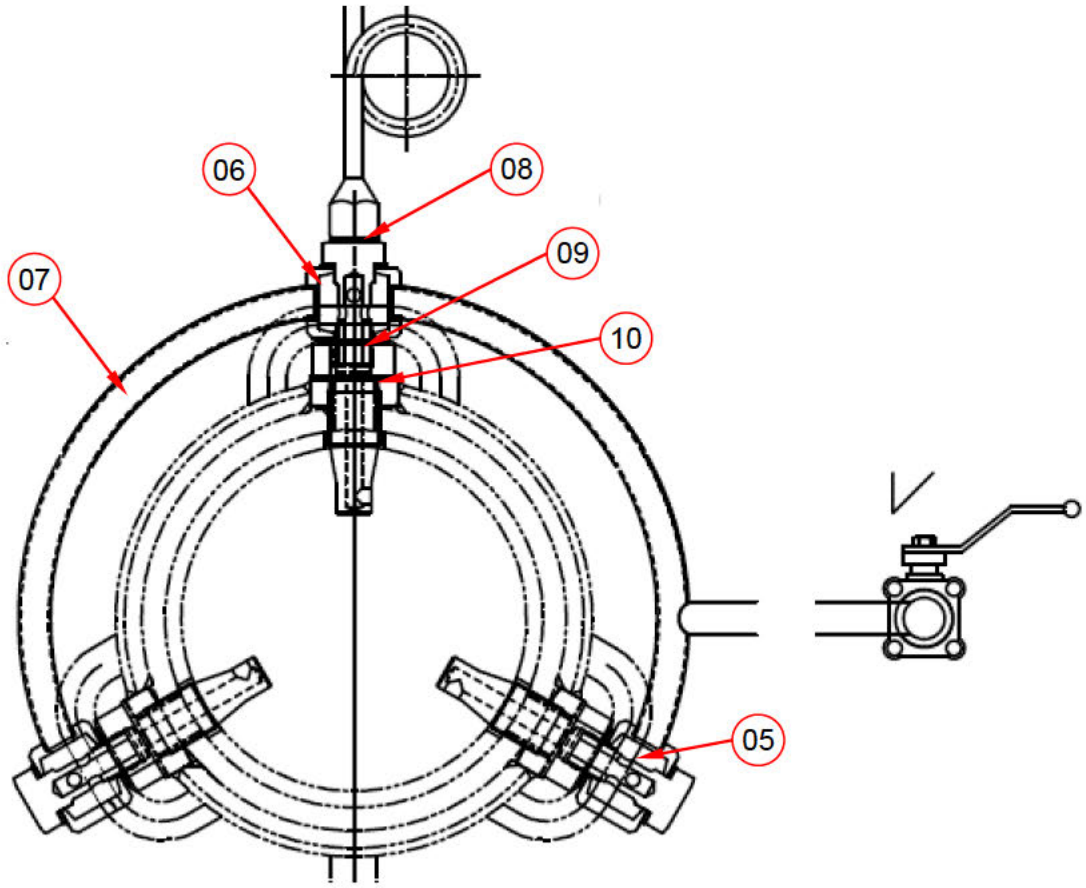
6.7 Feeding Bin (M11-514.008)



PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Bolt Silo W 3/8” x 1/2”	04	Market
02	Neoprene Join 297 x 147 x 1/8”	02	Market
03	Temper Glass Viewer 377 x 187 x 2,66	01	Market
04	Flange	01	C-217.31
05	Handle MBM 4631 W 1/4” x 22	01	Merk Back
06	Neoprene Joint 295 x 160 x 1/8”	01	Market
07	Cover	01	M11-514.099
08	Hex Head Bolt W 1/2” x 1.1/2” with Nut/Washer	20	Market

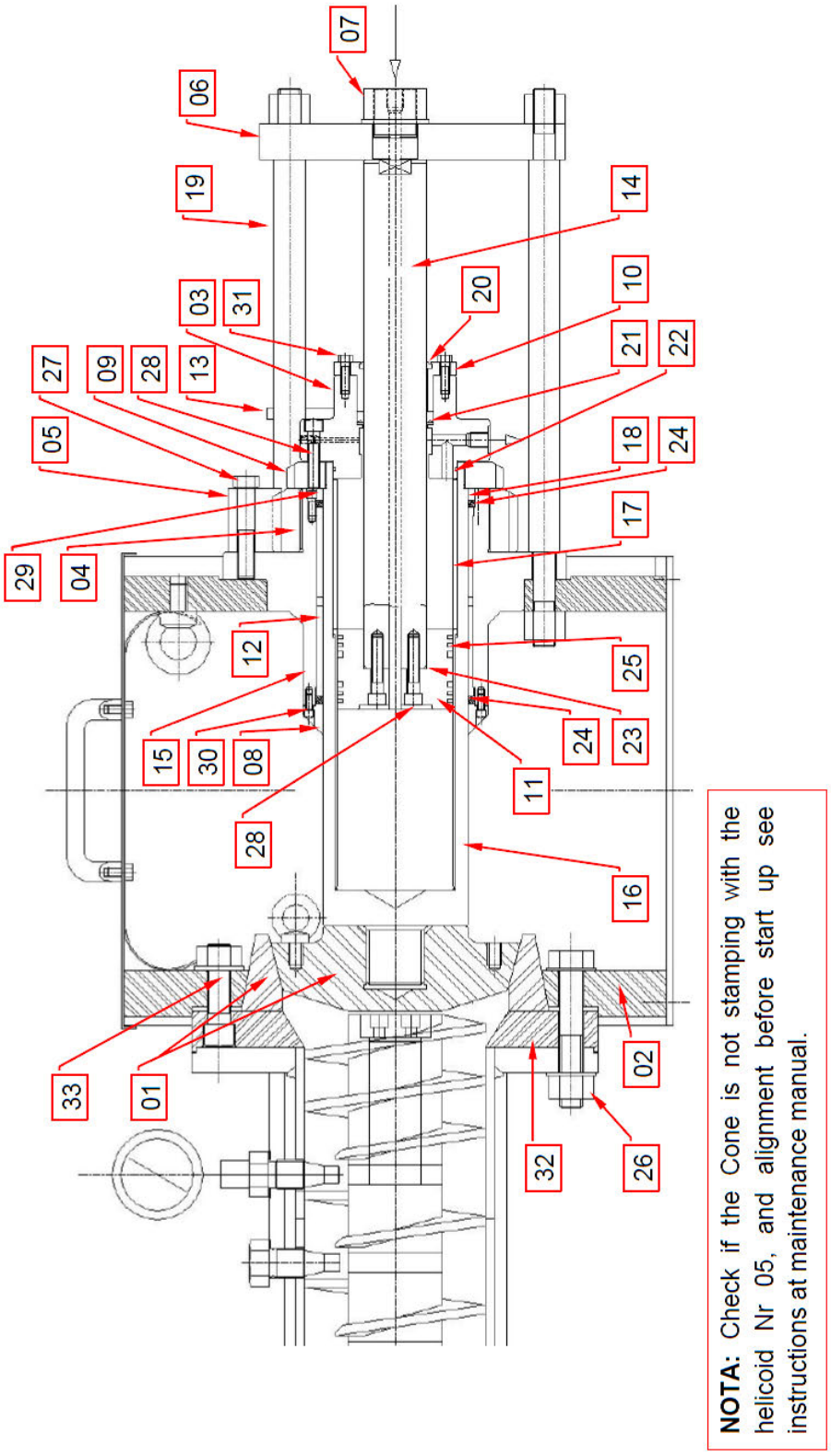
6.1 Steam Injection System (M11-514.127-R1)





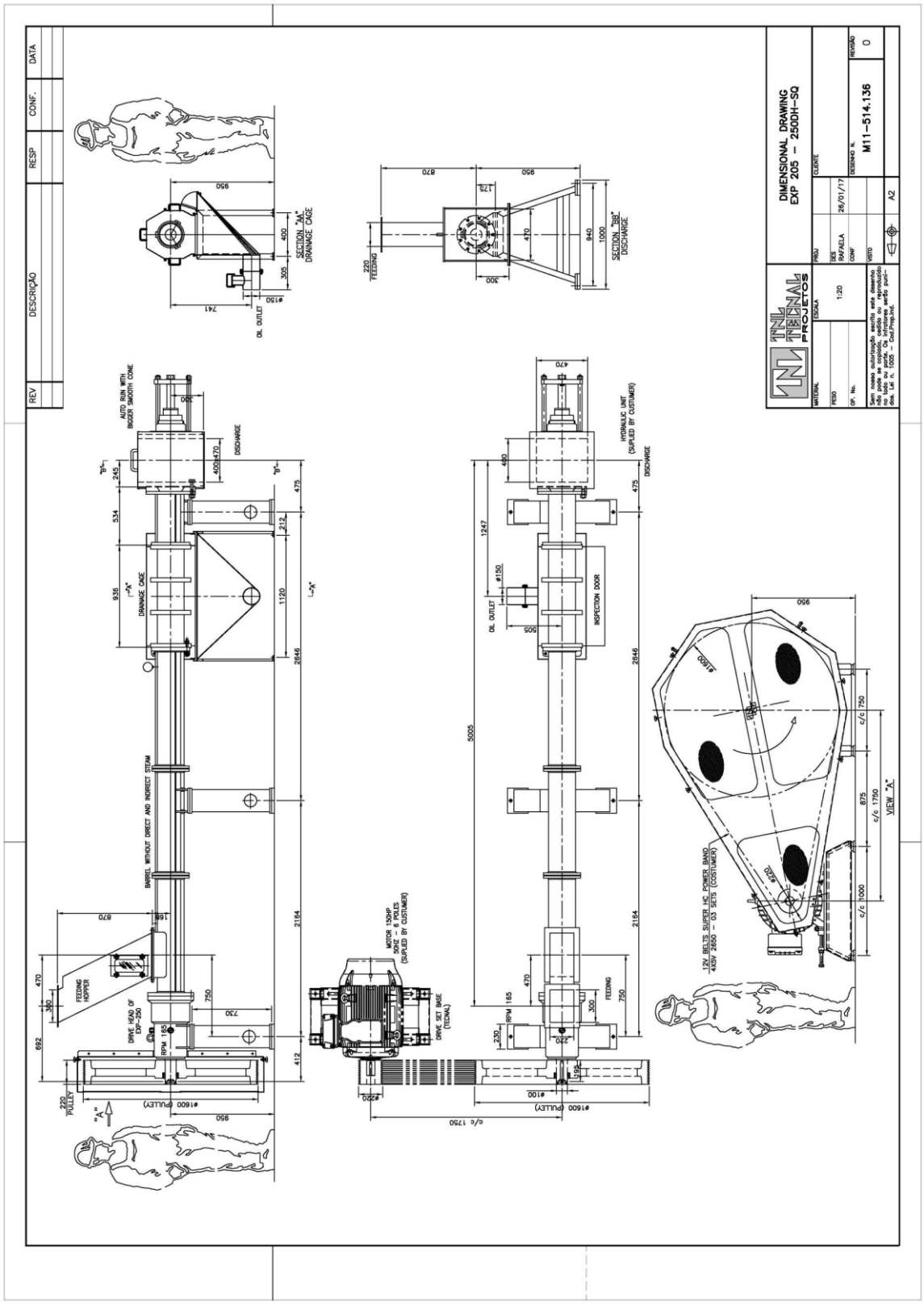
PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Manometer Ø4” – Scale 0-10 BAR Vertical Connection – ½” BSP	02	Market
02	Pulsation Dampener AM4 Stainless Steel AISI 316 ½” BSP	02	Market
03	Flange 150 LBS	08	Market
04	Ball Valve Sarco VMR Ø1” NPT	02	Market
05	Simple Niple	04	S217-034.001
06	Double Niple	02	S217-034.002
07	Simple Steam Input Pipe	02	M11-514.127-R1
08	Sealing Washer	02	M11-514.162-08
09	Sealing Washer	12	M11-514.162-09
10	Adjustment Washer	06	M11-514.163

6.2 Auto Run (M11-473.071)



PART	DESCRIPTION	QTY	COMPONENT REFERENCE
01	Cone Head and Ring	01	M11-473.052
02	Discharging Bin	01	M11-473.061
03	Head of the Piston	01	M11-600.005
04	Locking Nut	01	M11-600.006
05	Locking	01	M11-600.007
06	Flange	01	M11-600.008
07	Locking Nut	01	M11-600.009
08	Metallic Scraper	01	M11-600.010
09	Tightening Washer	01	M11-600.011
10	Cover for Scraper	01	M11-600.012
11	Piston	01	M11-600.013
12	Celeron Bushing	02	M11-600.014
13	Celeron Guide of the Piston	01	M11-600.032-1
14	Rod	01	M11-600.017
15	Housing Guide	01	M11-600.018-1
16	Liner of the Piston	02	M11-600.019
17	Adjusting Bushing	01	M11-600.020
18	Bronze Scraper	01	M11-600.021-1
19	Thread Rod	04	M11-600.022-1
20	*Scraper Ring N° AS-9-53.381 Ø 70 x Ø 80 x 5.7 (Polyurethane) “Vedabrás”	01	M11-473.071-20
21	*Gasket N° UA-2-19.431 Ø69.85xØ85.73x12.7 (Polyurethane) “Vedabrás”	01	M11-473.071-21
22	*O’Ring N° 13.226 Ø 132 x 3 Buna-N “Vedabrás”	01	M11-473.071-22
23	*O’Ring N° 12.090 Ø 63,5 x 3 Viton “Vedabrás”	01	M11-473.071-23
24	*Teflon Gasket (Square)	02	M11-473.071-24
25	Metallic Rings “Cofap” Nr LC2396 OM346 OM355-6 Ø 128 02 Lubrication Rings for the Piston 04 Parallel Rings for the Piston	01	M11-473.071-25
26	Hex Head Bolt W 1” x 6” with Nut / Washer	09	M11-473.071-26
27	Hex Head Bolt W 3/4” x 4” with Washer	01	M11-473.071-27
28	Fillister Head Bolt W 1/2” x 2.1/2”	08	M11-473.071-28
29	Fillister Head Bolt W 5/16” x 1”	03	M11-473.071-29
30	Fillister Head Bolt W 5/16” x 3/4” (Stainless Steel)	03	M11-473.071-30
31	Hex Head Bolt W 3/8” x 1.1/4”	04	M11-473.071-31
32	Locking Flange	01	M11-473.060-A
33	Fillister Head Bolt W 1” x 3.1/2”	02	M11-473.071-33

6.3 Dimensional (M11-514.136



Rights:

Elaboration: Miguel Garcia

Reviewer: Luiz Rafael Fambrini,

Mod.: EXP-205 **Nº** 112/17 **SERIES:** “B”

Review: 23/02/2022

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Some of the machine’s specifications may not be included in this manual.
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