4 Mile Creek

Wichita, KS

Andritz Project #
1553

D5LLC30CHP Centrifuge

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SAFETY INSTRUCTIONS

It is the responsibility of the contractor, the installer, and the owner to maintain and operate the equipment supplied by ***ANDRITZ*** in such a manner as to comply with the laws concerning occupational safety and health, as well as with all national, state, and local laws and ordinances. Consult the local safety standard authorities or plant supervisors for a complete listing of these regulations.

Safety must be considered a primary factor in all aspects of equipment installation, operation, and maintenance, at all times. Safety training and equipment maintenance will be covered by authorized ***ANDRITZ*** personnel prior to start-up of the equipment. All operating personnel will be advised of the location and operation of all emergency control devices.

The following safety instructions are basic guidelines, and should be considered minimum provisions:

- Unobstructed access to controls and emergency stop devices should be maintained at all times. Sufficient lighting and good housekeeping practices should be maintained around the equipment at all times.
- All rotating equipment, such as drives, gears, fans, pumps, shafts, couplings, chains, belts, and ropes should be guarded, as required by the applicable laws and standards. The equipment should not be operated until all covers and guards are in place.
- If equipment is to be opened for inspection, maintenance, or servicing, the drive motor should be **locked-out** and secured against being switched-on again (lockable repair switch, shorting bar, etc.). Operation should not resume until all covers and safety guards are in place.
- High-voltage and rotating electrical machinery can cause serious or fatal injury. Installation, operation, and maintenance of rotating electrical machinery should only be performed by qualified personnel.
- Inlet and discharge openings should remain connected to other equipment to ensure that any dangerous parts of the machinery are not exposed.
- Warning signs should not be removed. If warning signs become dirty or damaged, they should be cleaned or replaced immediately.

DECANTER N° 80-4605
TYPE D5 LLC 30 C HP

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PARTICULAR SPECIFICATIONS

DECANTER N° 80-4605
TYPE D5 LLC 30 C HP

SPEED	Nominal absolute speed	: 3000 rpm
	Maximum safety absolute speed	: 3200 rpm
	For maximum density of sludge	: 1.2
	Variable relative speed	: 1 to 12 rpm
MATERIALS	Bowls	: St. Steel 316 L
	Screw conveyor	: St. steel 316 L
	Screw thread coating	: Tiles CS3 + BL7
	Casing in contact with product	: St. steel 316 L
	Protection casing (bowl, transmission)	: Fibber glass + resin
	Joints in contact with product	: Buna N
REDUCER	Make - size / ratio	: ZS 619 / 87
	Lubrication	: BP Energrease PR-EP 00
PULLEY REDEX DISENGAGEABLE	Type	: SR 30-6
	Reduction	: K=2
	Lubrication	: oil
LUBRICATION	Type oil	: KLÜBER NBU15
LEVEL ADJUSTMENT	Level adjustment plates	: 262 to 322 mm
	Conical bowl overflow	: 302 mm

DRIVE			BOWL	SCREW
	MOTOR	Make	: Baldor	: Baldor
		Type	: ECP4400T-4-M13F-M23A	: CECP2334T-4-M23A-M13C
		Power	: 100 HP	: 20 HP
	VARIATOR	Make	: Allen Bradley	: Allen Bradley
		Type	:	:
	Voltage / Frequency		: 460V / 60Hz	
	Belts	Type	: SPB 2310	NB: 5
	Ø Drive pulley		: 315 mm	
	Ø Driven pulley		: 185 mm	
	Pulleys ratio		: 1. 7	

TOTAL WEIGHT OF WHOLE UNIT : 14471 LBS

SERVICE SAFETY REQUIREMENTS

Preliminary remarks:

The decanter or centrifuge is a high-speed precision turning machine.
Andritz Centrifugation makes centrifuges, which have high precision balanced parts. Our long experience in this field has allowed us to establish specific safety measures for the use of the machine as well as the safety of the maintenance personnel.
However, certain operating conditions or environments can run risks not documented here.
The operator must realize this and adapt safety measures accordingly.

1. 1st PHASE

Before installing, repairing or operating, read the following chapters:

- Installation
- Start Up
- Running Mode
- Maintenance

2. RECOMMENDATIONS

2.1 General Recommendations

2.1.1. Vibrations:

Stop the machine if the vibrations become abnormal and look for the cause. See chapter on TROUBLE SHOOTING.

As a rule: the machines are accepted at the bench test stage when block vibrations (block mounted on frame) do not exceed **7 mm/s effective** (10 mm/s peak), measured vertically on each block. This value corresponds to slightly detectable vibrations when using your fingertips as detectors.

Up to **15 mm/s effective** (21.2 mm/s peak) the machine can run momentarily without major risk. If run continuously under these conditions there is major risk to rotor fixations, hood, bearings, etc..

Over 15 mm/s effective (21.2 mm/s peak) the operator must immediately stop the machine.

2.1.2. Things not to do:

- Do not run the machine without protection casings in place.
- Do not run the machine if parts are worn, corroded or missing, which could decrease safety.
- Do not replace parts with anything other than parts approved by the manufacturer.
- Do not block or modify safety measures recommended by the manufacturer, especially those concerning torque set limits and vibration, if present.
- Do not work on machine before insuring that the main power is off and blocked. If not blocked, take out the fuses and belts.

2.1.3. Things to do:

- Before running the machine check the motors rotation direction and the maximum speed programmed in the inverters. When programming the maxi bowl speed inverter keep in mind the pulley diameter ratio.
- Use recommended lubricants only.
- When the machine is installed overhead an appropriate maintenance platform must be provided for containing safety cages and rails. Provide sufficient space in front of the feed flange so as to be able to dismantle the scroll within the axis of the machine.
- Use only recommended tools when performing maintenance procedures on machine.
- Meticulously clean the machine at each stop. Otherwise an imbalance may occur during the next start up. Make sure that the feed flow is shut off. The machine must not be fed during stop mode.
- If welding must be done on the machine make sure that a ground is not on the bearings.

2.2 Specific centrifuge recommendations

2.2.1. Things not to do:

- Do not run the machine without protection casings. If the machine was purchased without protection casings, the user is responsible for furnishing and properly installing these protections according to present day norms.
- Do not run the machine if it is excessively noisy. Look for the cause.
- Do not exceed the maxi values indicated on the machine info plate: rotation speed, product density, temperature, and do not use different products without contacting ***Andritz Centrifugation***.
- Do not attempt to dismantle before the machine is completely stopped and shut down.
- Do not run the machine if parts are worn, corroded or missing, which could decrease safety.
- Do not use the machine for purposes other than designed for and indicated in the original purchase order.
- If something must be verified during rotation without protection devices in place (ex. in place balancing, observation with stroboscope, etc.) **never stand beside of uncovered rotating or moving parts**, do not approach rotating parts with rag or loose clothing, tie, long hair, etc.. Establish a safety zone around the machine to avoid unnecessary access.

2.2.2. Things to do:

- Use recommended lubricants only.
- Regularly check nut and bolt tightness on hood, blocks, transmission, tubes etc…
- Regularly check for cleanliness in order to detect product or lubricant leaks.
- Adhere to dismantling and assembly procedures.

2.3 Specific rotor recommendations

The rotor being off center by only a few hundredths of a millimeter can cause unacceptable imbalance. This can be caused by:

- Hammer marked or poorly cleaned Resting faces
- Centering with too much clearance
- Deformed parts
- A seal pinched between two faces

Thoroughly adhere to:

- Assembly procedures
- Do not heat the parts (especially the bowl) with a torch.
- Do not force the parts during assembly/dismantling.
- Change all parts judged defective.
- Assemble bearings correctly. Never use force on the rollers. Never use hammer on cage.
- Qualified and trained personnel must do maintenance regularly.
- Maintain sufficient spare parts in stock.
- Do not introduce corrosive liquids or other abrasive materials not specified in the machine specifications.

2.4 Specific bearing block recommendations

The blocks are aligned in house and pinned on the frame. They are not interchangeable. In case of deterioration these parts must be realigned (except D1).

For the same reason, you must not exchange blocks between different machines. This could cause major damage.

Note: An “oval sized” block (even only a few microns) can result in seizure.

2.5 Specific bowl recommendations

2.5.1. General:

Never invert bowl parts. They are balanced while mounted and have specific alignment marks.

Check for correct rotation direction using the arrow usually found on the hood or reducer casing.

Do not weld on bowl.

2.5.2. Maximum bowl speed:

The maximum bowl speed indicated on the machine nameplate is valid for extracted solids with a maximum density corresponding to the value indicated on the machine nameplate.
For higher density or speeds, please contact ***Andritz Centrifugation***.

2.6 Prevention against fire

Avoid product accumulations where overheating can occur: discharge casing, base frame and cover partition walls in contact with the product. It is necessary to follow the washing sequences and check periodically the presence of such accumulations.

Check the belt tension. A loose belt slips and heats up.

Check periodically the state of the connections in the motors junction boxes.

In case the treated product is flammable, follow the relevant procedures in connection with this kind of product.

Do not smoke.

2.7 Specific motor recommendations

2.7.1. General:

- Check that the power feed and cabling (star or delta) corresponds to the wiring of the motor.
- Lubricate the motor according to the indications noted on the motor's nameplate.
- Do not try to run an overheated motor. Let it cool down to ambient temperature before starting.
- Do not run a motor if it is not turning freely or if the parts it is driving are not turning freely.

2.7.2. Explosion proof Equipment:

Preliminary Remarks:

The electronics security system is based on the following principals:

EEx "e"	Protect against explosion via arc or spark Increased safety	Security equipment augmented avoiding arc or spark
EEX "d"	Contain explosion Flameproof enclosure	Equipment designed to resist explosion
EEx "i"	Explosion impossible Intrinsically safe	Circuit designed so that the absorbed energy does not generate spark

- Make sure that all electrical equipment conforms to local Standards and is in accordance with contract requisitions.
- De-energize all power before working on any electrical equipment
- Do not scratch the insulating material on the electric box
- Make sure that all gland packings are locked and adapted to motor wiring
- Make sure all cables and wiring cannot touch moving or vibrating parts. Cables should not be bent, pinched or pulled too tight. Adhere to cable specifications when elbowing.
- If electric components such as contacts are being used as “safety” devices, make sure they are isolated from the SI relays or Zener barrier.
- To eliminate/prevent static electricity:
    - Make sure that all ground wires are properly installed. Check that the motor, frame, machine support, etc are all grounded.
    - Use only certified anti-static belts.
- Before treating product, make sure that the machine is running correctly at nominal speed and that there are no abnormal noises, sparks and abnormal behavior.
- Check the bearing block temperatures, which should always be lower than those corresponding to temperature class (T1 to T6) mentioned on the motor.
- To avoid motor overheating:
    - For machines outfitted with inverters; adhere to maximum and minimum speed indications noted on the motor info plate.
    - For machines outfitted with hydraulic coupling start up system; wait for the motor to cool down before re-starting machine.
- DO NOT SMOKE IN EXPLOSION PROOFED AREAS.
- TURN OFF CELL PHONES BEFORE ENTERING THE CENTRIFUGE AREA.

2.8 Specific electrical risk recommendations

2.8.1. General:

- Turn off all power before working on any electrical equipment.
- Install all ground equipment (permanent and portable) in accordance with local requirements.
- Use circuit breakers or fused disconnects between equipment and power source.
- Never touch electrical components with wet hands or when standing on a wet surface.
- When handling electrical equipment, take care to avoid contacting live parts. Assume all parts are live. Check with a voltmeter.
- Keep electrical controls and motors clean and free of dust. Dust prevents thorough air circulation, generating heat; heat in turn can ignite the dust or flammable vapors if present in the atmosphere.
- Never use a liquid stream to clean any electrical equipment unless it is constructed for that purpose.

2.8.2. Maintenance:

- Only qualified personnel, familiar with electrical safety procedures, and the construction and operation of the equipment, should make electrical installations and repairs.
- Do not perform any inspection (mechanical or electrical) until power has been switched off and disconnected. Provide a safety lockout at the main power switch.
- Periodically inspect and test by operating all the automatic shut off devices and monitoring systems provided to make sure they will be functional if needed.

2.9 Specific product recommendations

2.9.1. Chemical products:

If corrosive and/or toxic chemicals or solvents are used as part of the process or as cleaning materials:

- Become thoroughly familiar with the properties of these products and their hazards, the precautions necessary to handle them safely, and follow all manufacturer recommendations for their use.
- If flammable, take care to prevent fire explosion.
- Avoid contact with skin and eyes, wear goggles, gloves, shields and protections recommended by the manufacturer.

If in doubt whether a product is dangerous or not – assume it is. Take all necessary precautions.

2.9.2. Products and temperature:

When working with very hot or very cold processes, extreme caution should be used to avoid personal injury.

Do not open or disconnect circuits under pressure.

2.9.3. Abrasive or corrosive product:

The different parts of the rotor were calculated to:

- Resist the constraints of high centrifugation within the speed limits, load, temperature defined on the machine info plate.
- Guarantee long machine life with a high level of security.

However, in the case an environment containing corrosive or abrasive materials, *(even though* ***Andritz Centrifugation*** *equipment is furnished with the highest quality materials in order to resist abrasion)* ***Andritz Centrifugation*** cannot guarantee these parts without prior knowledge of a durable reaction on these parts.

It is therefore, the responsibility of the client to specify timely checks for deterioration and to alert after sales service at ***Andritz Centrifugation*** if the cracks, abrasion or other abnormalities would seem to cause mechanical problems.

3. REPAIRS

- Do not attempt disassembly or make mechanical or electrical repairs unless the equipment has come to a complete stop, the power is shut off, and the use of circuit breakers and/or padlocks on the disconnected circuit.

- Major repairs to the centrifuge must not be made without first consulting with ***Andritz Centrifugation***. Under no circumstances should weld repair or other alterations be made to bowl shells, bowl tops, bowl hubs, coupling rings, shafts, spindles, conveyors, or other rotating parts, without prior written approval from ***Andritz Centrifugation***.

- The individual components of the assembly are not balanced individually. If replacement of a bowl component on your centrifuge is required, the entire bowl assembly must be returned for balancing to ***Andritz Centrifugation***.

- If time does not permit the customer to return the entire bowl assembly, a component may be purchased only when an ***Andritz Centrifugation*** technician supervises assembly and balance.

- Partial flight repairs can be done on site, by replacing the tiles (used or broken), under the condition that the flight support is not damaged. Balancing under these conditions is not required.

- In the case of major wear concerning the scroll lining and/or the distributor, consult ***Andritz Centrifugation*** for repairs and the possibility of an exchange scroll.

4. MAINTENANCE

Safe practices for lifting and handling equipment should be followed:

4.1 General

Hoists and slings should be of adequate capacity, inspected regularly, and in good repair.

Note: Handling equipment made by specialized firms are usually certified. The user should have them periodically re-tested and certified himself (he is legally responsible) in order to adhere to local safety codes.

Use only tools and methods recommended by the equipment manufacturer.

Personal safety equipment such as eye shields, safety shoes, etc., must be used.

Do not stand under a loaded hoist.

When using lifting beams and hoists with slings, screw the lifting lugs completely. If an orientation is called for, use the adjustment wedges.

In the case of handling heavy parts with 2 or 4 slings:

The angle of the sling strips should not be greater than **90°**, which corresponds to a workload per sling strip of **0.7** times the weight of the part.

In the case of a 4 strip sling, it must be considered that the load will be supported by only 2 strips given that the strips are not exactly the same length and that the attachment points are not exactly the same.

*Ex. a sling with 2 or 4 strips having a capacity of a 2500 lbs load per strip, can only lift a load of (2500 *0.7) * 2 = 3500 lbs.*

Never place fingers, hands, feet, or head where they may become trapped or pinched. Use extra caution when lifting, moving, or holding worn parts, since these may be sharp, slippery or weakened.

Provide a spacious cleared area around the equipment during maintenance.

4.2 Specific Recommendations

Be careful not to pinch fingers between the flight and the bowl flange when introducing the scroll into the bowl. Use handling gloves.

Wear appropriate gloves when assembling heated bearings.

Do not turn the rotor by hand by pulling on the belts.

Do not try to take off or re-install belts without first loosening them.

When handling the conveyor scroll with the lifting beam, make sure that the sliding handling strap is blocked.

TRANSPORT, STORAGE, HANDLING

Page

1. TRANSPORT

The machine, with the drive system, is fixed on a wooden floor. The method consists in taking off the shock-absorbers and replacing them with two beams across the frame.

The dimensions of the floor must exceed the dimensions of the motors and the feed tube in order to protect these two ends, which are sensitive to shocks.

The whole machine must be securely fixed to prevent any possible displacement, and protected against bad weather.

The ROTOR is LOCKED, on feed and reducer side, by 1 radial screw fixed on each pillow block to avoid hammering. A plate with the corresponding instructions is fixed on the casing. The machine is wrapped in packing plastic. (bubbles) All unpainted ferrous surfaces are protected with grease, lid, threaded parts and rotating shaft.

2. STORAGE

2.1 In a seaworthy case

Preferably in dry and ventilated area.

2.2 Outside the case

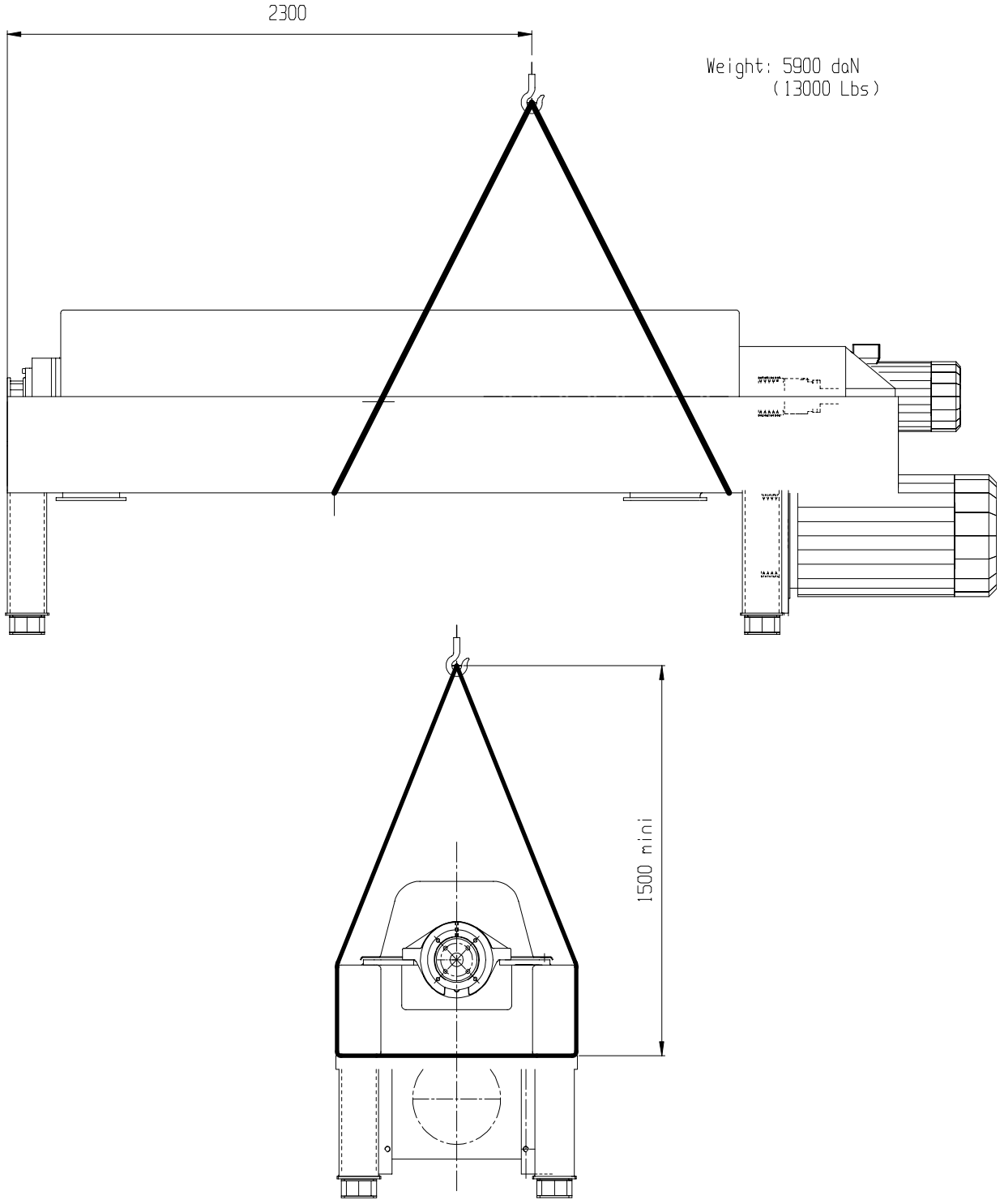
Preferably in dry and ventilated area.
Protect the bearings of the bearing block against moisture by injecting 10 to 15 cm^3 of the grease through the lubricators (recommended in Chapter 5 Manual). Rotate the rotor by hand, so that the rolling elements are properly lubricated
with grease. Repeat every six months.

Caution: A total filling of the bearing housing would result in an abnormal heating during start up, which might then require a partial dismantling to remove the excess of grease.

NOTE: The other bearings and the speed-reducer are enclosed in tight housing filled with grease and no maintenance is required.

Loosen the belts and protect the pulley with a varnish or paint.
Minimum admissible temperature: - 86 °F.

3. HANDLING



START UP AND SHUT DOWN PROCEDURES

1. START UP

1.1 Lubrication unit start up
1.2 Sediment transporter start up
1.3 Centrifuge start up

During this operation, the operator must supervise acceleration and be ready to stop the machine in case of the following irregularities:

- Suspect noise
- Oil leaks
- Abnormal vibrations

Product feed has to take place progressively and only **after** the machine has reached its nominal working speed (which takes 60sec. to 150sec. depending on the starting method).

Start up must always be done at low speed.

1.4 Start the dosing pump
(if flocculation is required for sludge treatment).
30 sec. delay before sludge arrival

1.5 Open the manual valve
supplying sludge to be treated, if supply is not motor-driven.

1.6 Start the volumetric feed pump
(minimum output).

1.7 Progressively increase the feed input
by varying the feed pump adjustment - manually or electrically (servo-control).

2. STOP - RINSE

2.1 Reduce the supply input to minimum
(Reduce to minimum flow in order to avoid product loss during wash and insure a low flow re-start.

2.2 Proceed to rinse at full speed

* Adjust the rinsing liquid valve to the output stated in the following table.

Machine Size	Rinse flow	Time
D5LL	10 to 20 m3/hr.	10’

NOTE: The liquid inlet is located on the intake pipes between the feed pump and the sludge inlet valve, which enables the entire feed pump, pipes and centrifuge to be washed.

2.3 Close the sludge supply valve
(this delay valve insures that the pump never runs empty)

2.4 Stop the dosage pump
(when sludge is being flocculated, stop the dosage pump after 3 to 5 min to flocculate any sludge, which may still be present in the tube work)

ATTENTION: If the sediment is to remain dry, an independent extraction for the rinse liquid has to be planned at the sediment casing output.

2.5 Centrifuge Stop
(When the liquid running out of the centrifuge is sufficiently clear)

IN COUNTER-CURRENT and CO-CURRENT MODES:

- Stop the motor.
- During de-acceleration leave the rinse liquid at the same flow to avoid hydraulic unbalance until about 500 rpm.

NOTE: LOW SPEED WASH: should be used for thorough bowl and scroll cleaning. The speed should be set between 70 and 200 rpm while the wash and/or bowl speed flow should be adjusted so that there are no leaks on the face of the pillow block. Relative speed should be slightly positive and can be increased in the case of a transmission comprised of two inverters per reverse rotation of the reducer input shaft: - 500 maximum rpm.

Remarks

During slow-down, the bowl speed will, at some time, correspond to the frequency resonance of the shock absorber (at about 400-rpm), causing a strong but slow vibration of the machine for some seconds.

Below 100 rpm, the liquid ring "collapses", or at the least what remains of it. It is evacuated partly with the solid in the sediment casing.

2.6 Close the liquid feed valve (wash water valve)
(At the end of the rinse cycle)

2.7 Stop lubrication unit
(After full machine stop)

3. EMERGENCY STOP

Exceptional procedure

Stop the whole installation by pushing the button **EMERGENCY STOP** (this can be found on Dwg. # E-1553-1 and E-1553-1B under Chapter 15).

CAUTION:
Before starting again:

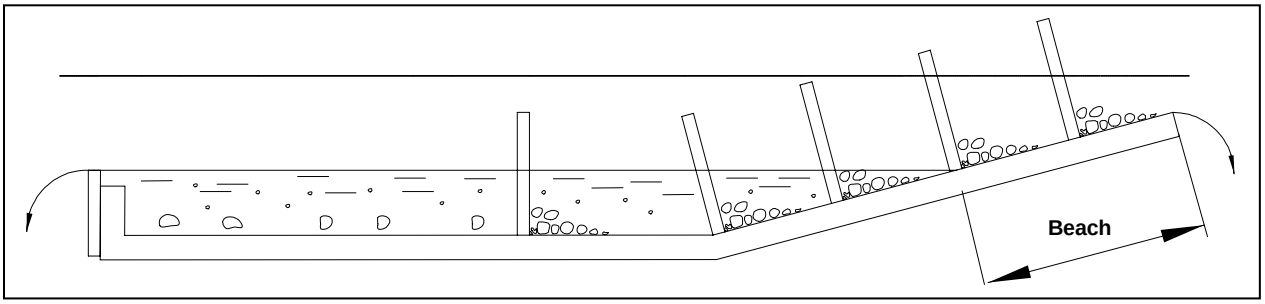
Adjust the feed pump variator to **MINIMUM** position in the case of mechanical variator.
Carry out bowl rinsing at low speed (between 200 to 500 rpm) with the frequency inverter.
Repeat the operation once or twice, at most, so as not to damage the motor, until the clarity of the liquid is satisfactory.
After rinsing, do not forget to close the liquid supply valve (wash water valve).

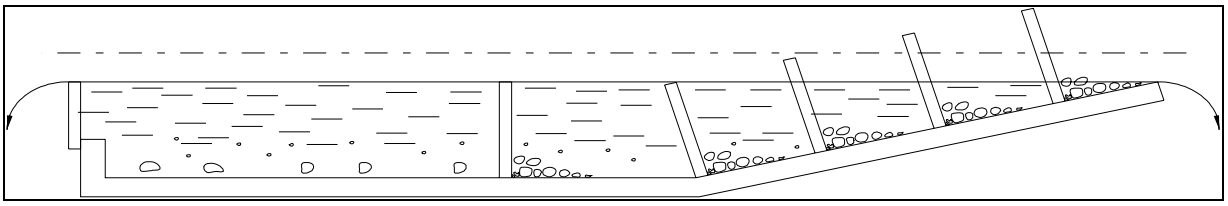
OPERATION

1. PARAMETER ADJUSTMENTS

1.1. Level adjustment

The level adjustment is essential
LOW LEVEL: favors dryness to the detriment of the conveying torque.

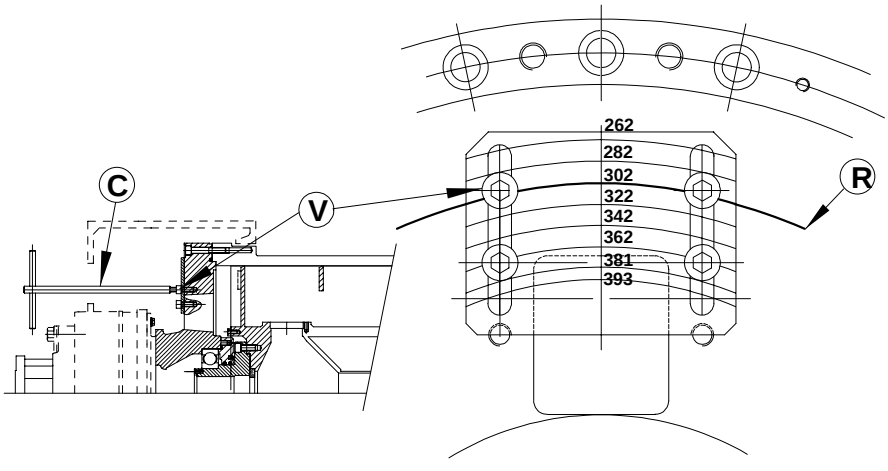




HIGH LEVEL: favors clarification and extraction of solid matter.

N.B.: For products with a high concentration of solid matter, it is possible to get very close to overflow without increasing the water content of the solids, which, at an optimum relative speed, dam up the liquid.

Adjustment by sliding plates -: example: On the following drawing, the level is adjusted to 302 mm



Procedure:

- Remove the trap on the front pillow block
- Loosen the screw (**V**) by means of a hexagonal spanner (**C**),
- Slide the weir plates until the chosen diameter corresponds to the tool-mark (**R**) shown on the front hub.
- Tighten the screws (**V**),
- For balance reasons, make sure that the 4 weir plates are all on the same diameter.

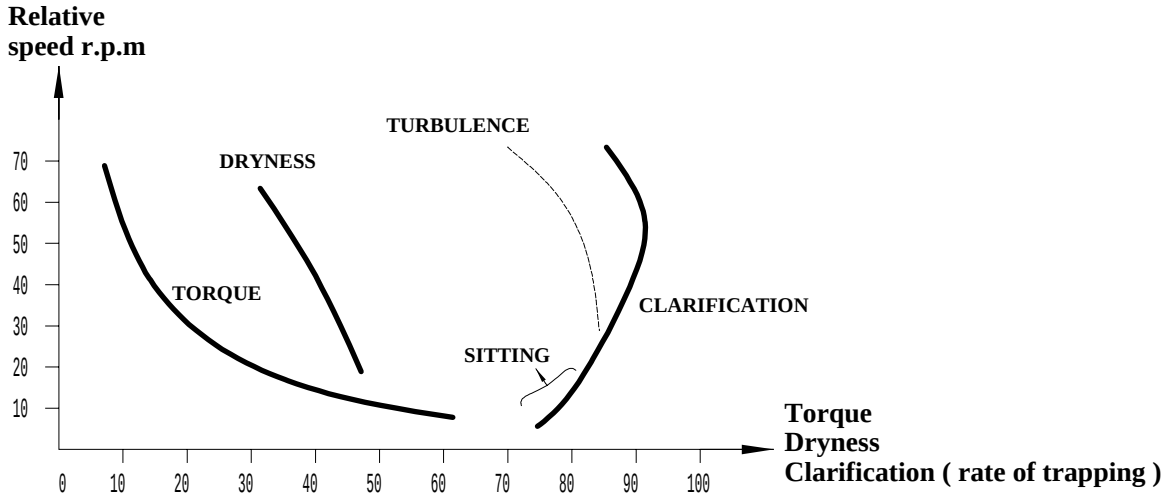
1.2. Relative speed (RS) between screw conveyor and bowl

1.2.1 Relative Speed Influence (RS)

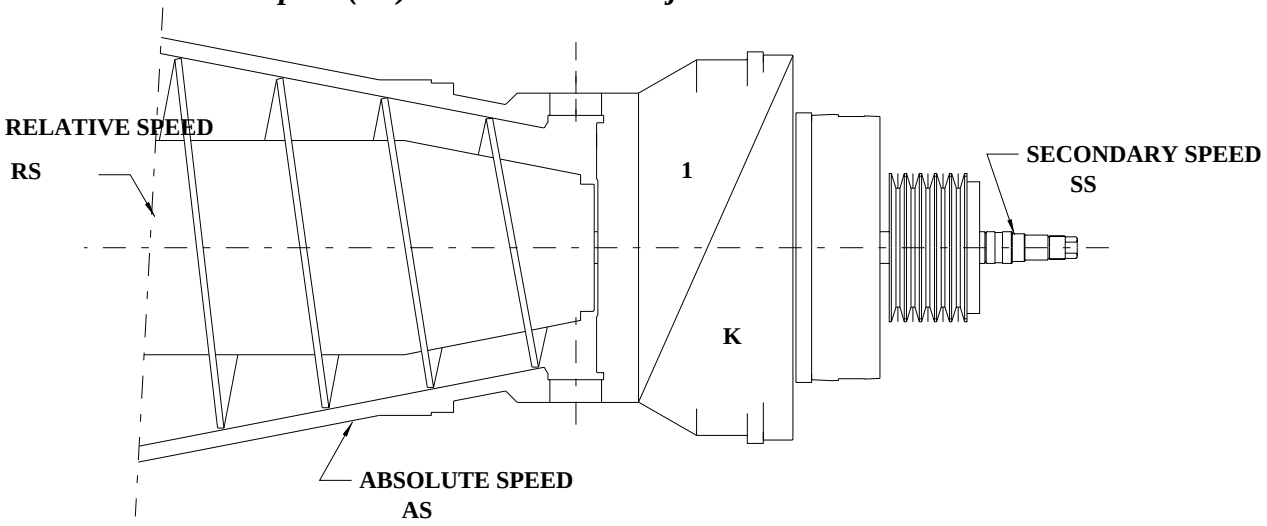
- Must be low for products lightly loaded with solids.
- Must be high for products highly loaded with solids.
- Low speed favors dryness, increases the torque.
- High speed increases humidity, diminishes torque.

The adjustment of the relative speed is very important from a mechanical point of view (reducer fatigue, stuffing) as well as from the performance point of view (dryness and even clarification). A relative speed, which is too high, can cause turbulence affecting the clarification.

TABLE INDICATING TENDENCIES



1.2.2 Relative speed (RS) Calculation and adjustment



RS: Differential speed between screw conveyor and bowl or (relative speed).
AS: Bowl Speed or (Absolute Speed).
SS: Entrance shaft reducer speed or Secondary Speed
K: Reduction of the reducer: 25 - 35 - 45 - 59 - 71 - 87 - - 174 (with REDEX module).

$$RS = \frac{AS - SS}{k}$$

Example:
AS = 3000 rpm
SS = 2450 rpm
K = 55

RS = (3000 - 2450) / 59
RS = 9.3 rpm

The relative speed adjustment is obtained by adjusting the secondary speed with a motor/generator and an inverter. The relative speed is read on the measurement module on the **CONTROL PANEL.**

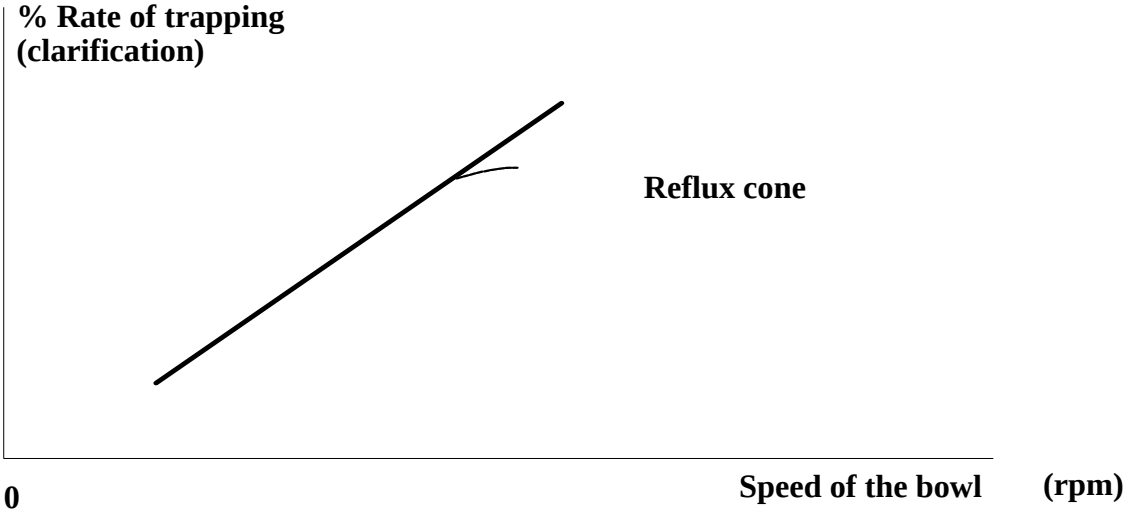
1.3. Bowl Speed or Absolute Speed (AS)

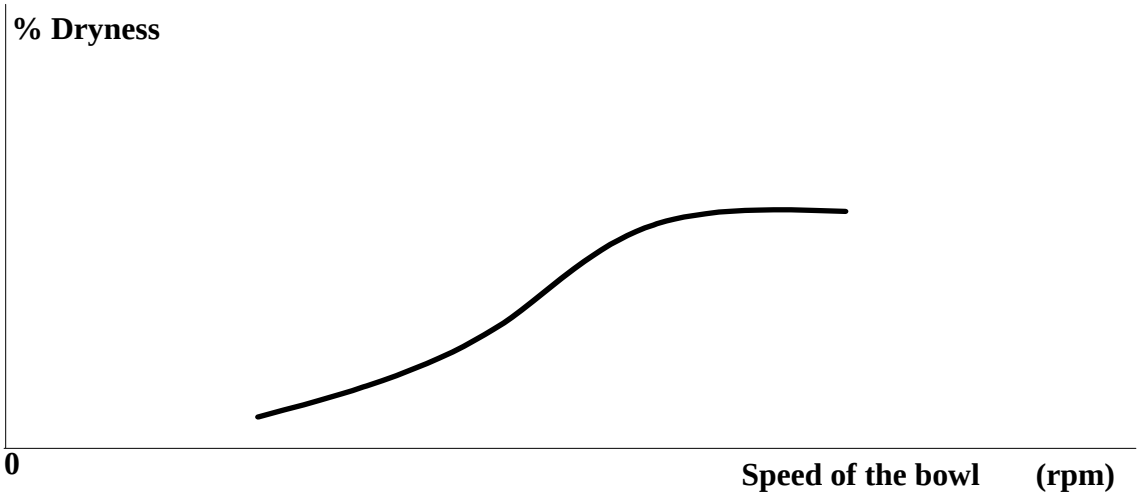
An increase of the absolute speed is favorable to the increase of:

- performance of recovering particles settle much quicker towards the sediment
- suspension output entering into the decanter
- extracted sediment dryness when compressibility is noticeable.

It is advisable, however, to optimize the bowl speed considering the risks:

- of excessive wear of the screw conveyor
- of torque increase
- of vibration (unbalance is proportional to the square of the speed)
- of higher noise level
- of the occurrence of the solids thrown back towards the large diameter of the extraction cone when the particles are very difficult to dewater.





2. MACHINE UNPLUGGING

Machine choking or stuffing can cause partial or complete filling of the conveyor flights, which, due to decanted solids, becomes very compacted.

This choking can be subsequent to:

- too low relative speed
- strong variations in the concentration
- worn screw conveyor
- loss of adhesion in the bowl (the solid turns with the screw conveyor instead of following the generatrix of the bowl)
- packing of the solid on the conveyor flights

Before disassembling the screw conveyor, it is possible to use the generator as motor to drive the screw conveyor.

Procedure:

- Lock the bowl with the screws from each pillow block.
- Remove the upper solids discharge cover.
- Switch off the main motor
- Run the secondary motor in the REVERSE to obtain positive relative speed.
- Adjust the speed to about 500rpm

Check sediment outlet:

- If the solid continues to come out, keep operating until complete discharge and finish the washing procedure.
- If the torque is too high and if the inverter trips, stop the operation after 2 or 3 tests and carry out the dismantling of the screw conveyor.

LUBRICATION D5LL

CYCLO ZS 619

Drawings:

1 GENERAL

This chapter describes procedures for:

- Checking and maintaining unit cyclo grease level,
- Main bearing lubrication and thrust bearing lubrication

    . All bearings are lubricated with grease
    . Main bearings can be lubricated with an automatic device.

Refer to chapter on lubrication schedule, page 4, for frequency, quantity and approved lubricants.

2 PILLOW BLOCK BEARING

See pages 5, 6.

Each pillow block bearing is fitted with a grease escape valve which allows the lubrication when the machine is running and avoids the accumulation of grease which would cause the overheating of the bearing block.
Every 200 hours or so, inject the quantity of grease, stated in the schedule, into each of the lubricators (1) and (2). This operation must be carried out while the machine is rotating.

CAUTION

An excess of grease causes an abnormal heating of the bearings. The device for discharging excessive grease does not work instantly, and between 3 to 24 hours may pass before the bearing block has cooled to its normal temperature.

3 CONVEYOR THRUST BEARING

See page 5

The screw conveyor thrust bearing is totally filled with grease. A long renewal interval, approximately 3000 hours, is sufficient due to this low rotation speed. It is accomplished by means of lubricator n° 3, which is accessible through the trap in the effluent discharge casing. The used grease is discharged through the lip seal (**B**) which must be mounted in the proper direction. Do not forget to replace screw (**V**) and joint (**J1**).

4 REDUCER BLOCK LUBRICATION

See page 6

Both bearings on the eccentric shaft are watertight and lubricated for the life of the machine. The 2 bearings on the grooved hub and the reducer itself are lubricated with grease. The reducer is fully filled with grease during bench tests.

The reducer block is completely filled with BP Energrease PR-EP 00 type grease.

The procedure consists of injecting the grease via the central (**N**) hole extending from the exterior flange of the pulley shaft with the 2 holes situated on the exterior CYCLO cover open. In this manner air is easily evacuated from the center towards the exterior.

Proceed in the following manner: *Page 6 fig. 2*

- Take off the 2 plugs on the cover CYCLO (RV)
- Take out the screw plug (N) and put a grease extension piece N° GRA-5017014-M10.
- Inject the required amount of grease (see lubrication table) into hole (**N**) until it comes out of the 2 (**RV**) holes. (If the grease tends to come out of one hole rather than both, plug this hole until the grease seeps out of the other).

Finally, the reducer should be turned by hand with the (**RV**) holes open until no more grease comes out of these holes.

During this operation the eccentric shaft must be maintained in a fixed position and the grease extension piece removed.

This operation is used to remove excess grease located in the drive holes of the eccentric came disc and avoid "over pressure".

Finally, to insure that there are no air pockets, the grease must be centrifuged:

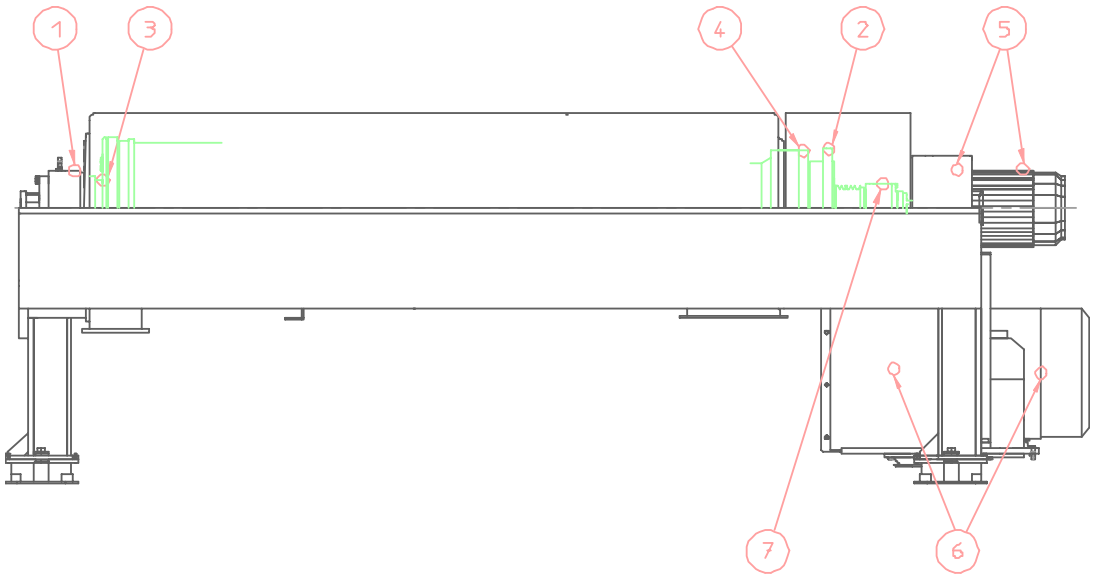
- Replace all the plugs with new joints.
- Run the machine at normal speed for 5 minutes.
- Stop the machine
- Check the fill level by injecting some more grease via the (**N**) hole with one of the (**RV**) holes opened.
- Turn the reducer by hand again.
- Replace all plugs.
- Run the machine and check for grease tightness in the following manner:

- Remove all traces of grease on the reducer block, the hood and the frame with White Spirit.
- Stick a piece of white paper on the inside of the upper hood opposite the reducer.
- Close the hood.
- Run the machine and check (after a few minutes) the paper for grease marks.

To empty the CYCLO block, proceed in the following manner:

- Take off the 2 plugs (**RV**) located on the cyclo crown.
- Stick a piece of paper carton opposite the projections on the frame and casing to facilitate cleaning.
- Refit the casing.
- Run the machine for one minute without product feed and with out relative speed (or with minimum relative speed) to evacuate used grease.

LUBRICATION TABLE



Item	Designation	Type of grease	Frequency (h)	Quantity	Page
①	Feed bearing block	Grease KLÜBER NBU 15 ❶	200 ❷	15 g ❷	5
②	Reducer bearing block	Grease KLÜBER NBU 15 ❶	200 ❷	15 g ❷	6
③	Screw conveyor thrust bearing	R ❸	3000	100 g	5
④	Reducer Cyclo	BP Energrease PR-EP 00	3000	3000 g	6
⑤ et ⑥	Bearing of electric motor	R	3000		See supplier specifications
⑦	Redex Pulley (Option)	Oil	200 (running-in) and after 3000	0.35 liter	

Important remarks:

❶ : Caution! The grease KLÜBER NBU 15 is not miscible with another grease.

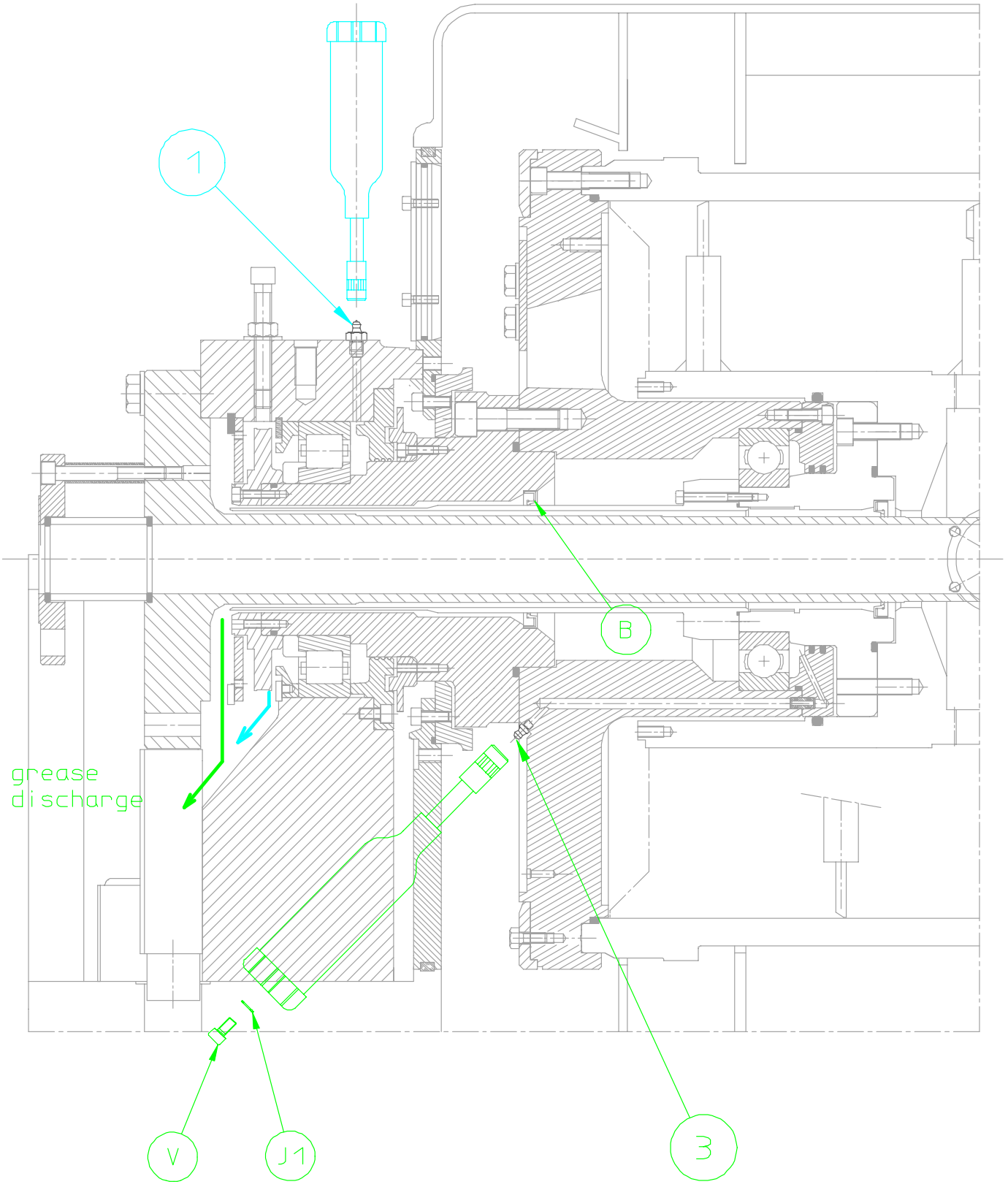
❷ : In the case of an automatic centralized lubrication, the quantity of grease becomes 1 gram for a 10 hours frequency.

❸ : The original grease for item ③ is SKF LGMT3

Type of Grease: R

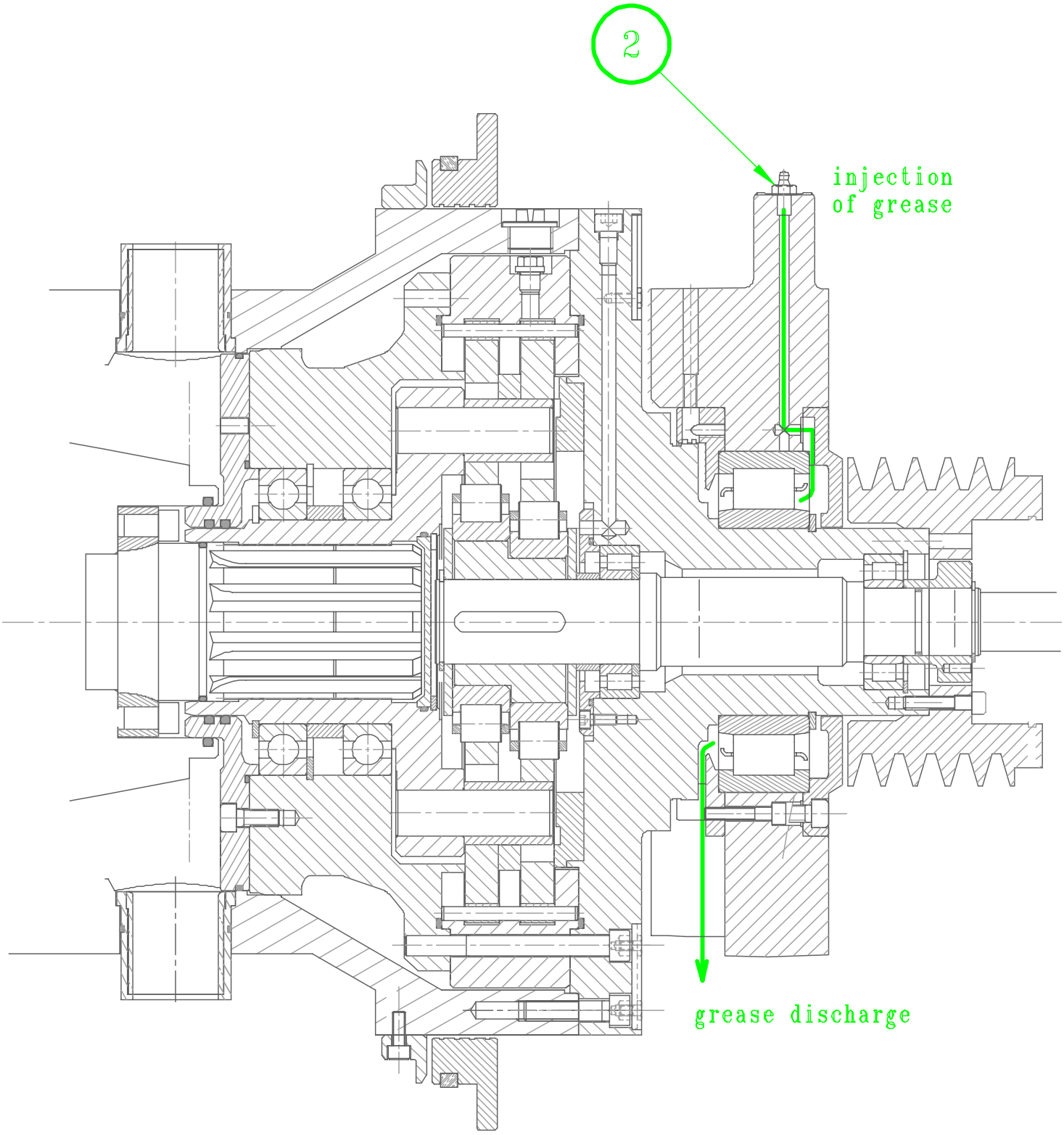
SKF ALFALUB LGMT2
ELF EPEXA 2
BP ENERGREASE LS EP2
TOTAL MULTIS EP2
SHELL ALVANIA EP2
ESSO BEACON EP2
SOPHOS STABILUB EP2
MOBIL MOBILUX EP2

FEED PILLOW BLOCK BEARING (1) AND CONVEYOR THRUST BEARING (3)

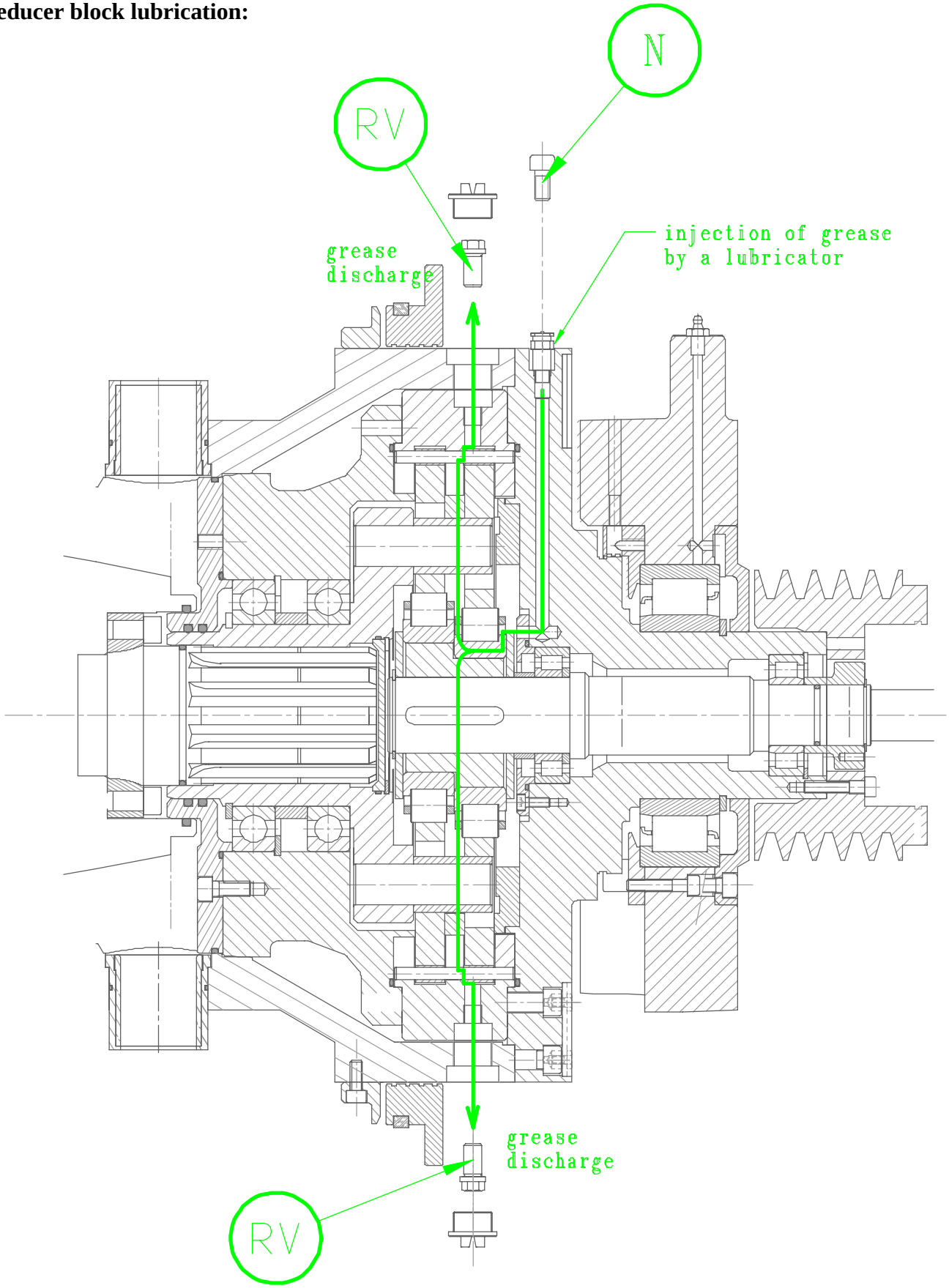


REDUCER PILLOW BLOCK BEARING LUBRICATION

Pillow block bearing lubrication:



Reducer block lubrication:



GENERAL MAINTENANCE

Apart from lubrication, the supervision of the machine consists in periodically controlling the following points:

1 EVERY DAY

1 - Check for cleanliness around the centrifuge
2 - Check for excessive vibration
3 - Check for excessive bearing noise
4 - Check that the temperature of pillow blocks does not exceed 176°F
5 - Check torque readings (CONTROL PANEL)
6 - Check for grease leaks from cyclo unit
7 - Check for product leakage from pillow block
8 - Check flexible connectors for deterioration

2 EVERY 3 MONTHS OR 2000 HOURS

1 - Check for conveyor and bowl wear:

- Check the scraper blades; change the fixation screws if they show traces of wear.
- Check the bowl feed nozzles, turn them 1/4 rotation if wear is superior to 2 mm *(see chapter 5 page 3)*. See also the feed nozzle changing procedure *chap. 6 page 3*.
- Check both parts of the disks for water tightness and change them before the support begins to wear.
- Check the sediment casing wall within the solid projection zone. If wear is > than 5 mm re-work or replace the removable protection walls.

2 - In the case of CO-CURRENT screws, check the clarified liquid evacuation channels:

Sedimentation generally occurs inside the channels down to the overflow, which consists of liquid level adjustment plates on the bowl plate.
This sedimentation does not generally hinder the extraction of clarified liquids.
If the contrary occurs, carry out a periodical cleaning or modify the setting for overflow in order to reduce the level of the sedimentation. *Refer to the directions POLYVALENT ROTOR, for this adjustment.*

Note. In case of nozzle anti-abrasion (on bowl, screw conveyor) plan on regularly turning the solids diffuser and the radial and lateral sediment scraper blades of the housing, a few degrees, if abrasion is noticeable.

3 - Check drive belt tension: *see Chapter 7.*

3 EVERY YEAR OR 8000 HOURS

A general overhaul is called for, during which it is necessary to:

- Examine carefully the parts subject to abrasion: in particular spiral conveyor, diffuser,
- Look for possible fissures and generally change all abraded, corroded or abnormally deformed parts,
- Change main bearings and thrust bearing on conveyor and replace seals.

4 EVERY TWO YEARS OR 16000 HOURS

- Dismantle and clean the reducer completely. Examine most carefully the eccentric shaft
- Replace seals and bearings

COMMENTS

The frequency of the maintenance checks is given for your guidance. It can be adapted to the environment and to the aggressive nature of the substances processed.
The thorough examination should be carried out by competent personnel and carefully recorded.
A sufficient number of spare parts should be provided for in case ANDRITZ SAS cannot deliver one of these spare parts when needed. ANDRITZ SAS cannot be held responsible for down time due to lack of spare parts.

5 FEED NOZZLE ORIENTATION

The bowl feed nozzles can be turned 1/4 revolution if the wear of the coating is greater than 2 mm.
If this operation can not be done by hand, tap on the nozzles in order to unwedge them, and then use a wrench to turn them.

6 FEED NOZZLE REPLACEMENT

6.1 Dismantling:

- Disassemble the scroll (see dismantling procedure)
- Disassemble the upper part of the sediment housing.
- Disconnect the bowl from the gearbox.
- Following installation, come the lower part of the sediment housing down, or remove the rotor.
- Remove the bowl
- Remove the nozzles.

6.2 Nozzles mounting:

- Replace the nozzles. Put a new and greased o-ring..
- A keeper can be put on the nozzle while fitting the gearbox in the bowl.

6.3 Reassembling:

- Operate in the opposite order, following the dismantling procedure handbook.

DRIVE BELT INSTALLATION AND TENSIONING PROCEDURE

Page

The belts are a matched set. Always check for matching before installing belts, when replacing belts, always replace the set.

1. INSPECT PULLEYS

- Worn grooves, rough spots, oil, rust etc.. can damage belts.
- Proper alignment of machine pulley and motor pulley is essential to longer belt life.

2. PULLEY ALIGNMENT

- Line up edges of motor pulley with machine pulley.
- If the pulleys are lined up properly, the straight edge will touch all along the face *(See fig.1)*.
- Rotate each pulley to check there is no distortion of pulley or drive shaft.

3. DRIVE BELT INSTALLATION

V-belts must be mounted by hand; the centre distance is reduced accordingly for this purpose: *(see fig. 1)*

- Remove guard
- Unscrew (04)
- Unscrew (02) and screw (01) about 2 centimeters until the V-belts slide over the pulley on the machine
- Install a new set of belts
- Unscrew nuts (02) gradually to keep the motor support (03) parallel to the base frame, until the belts are tightened.
- Screw (01) and (04).

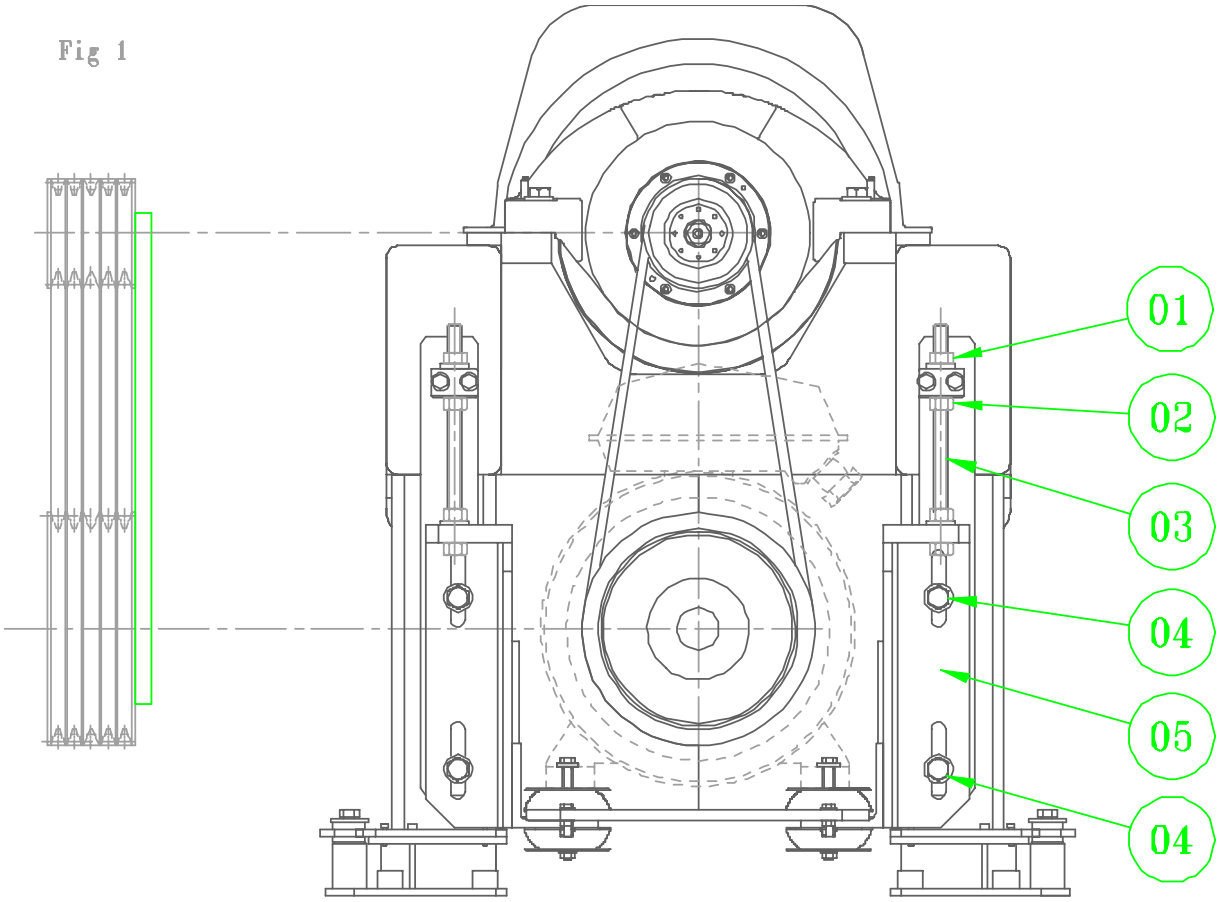
Prying belts over flanges by force or with assembly tools may result in indiscernible damage to the tension member and to the fabric jacket with a consequent reduction in service life.

4. TENSIONING PROCEDURE

- This operation is done by means of two threaded rods (03) and nuts (01).
- Value of stretching: 0.5 to 0.6 %.

V-belts drives must be tensioned with great care. Insufficient belt tension leads in inadequate power transmission and premature wear due to excessive slip. Over-tensioning causes excessive elongation, unnecessary flexing combined with high temperatures and thus a reduction in service life. The shaft bearings are also subjected to excessive strain.

Fig 1



5. IMPORTANT REMARKS

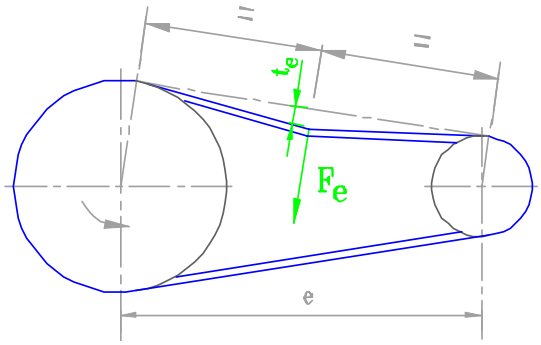
- Tension is almost achieved by the motor weight when the screws of the plates are unscrewed.
- However, the belt tension must be set and controlled by means of an adequate tension gauge *(see fig. 2)*, where F_e is the belt tension test force, t_e is the belt tension test deflection of belt and e is the centre distance.

Test effort per belt :
Fe = 75 N

Correct depression :
Te = 17.5 mm

Eigen frequency of the free bit :
43 Hz

Fig 2



- **After a brief running-in phase, and every month, the tension must be checked and, if necessary, the belt tightened.**
- Insufficient tension : risk of slippage
- Excessive tension: belt lifetime reduced, load on bearing increased.

DISASSEMBLY REASSEMBLY
D 5 LL

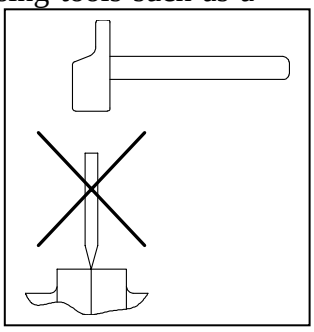
1. GENERAL RECOMMENDATIONS

The decanter is a relatively simple machine; nonetheless, it requires a minimum amount of care and skill.

In order to provide assistance during maintenance, here is a list of recommendations regarding disassembly and reassembly.

1.1 Disassembly

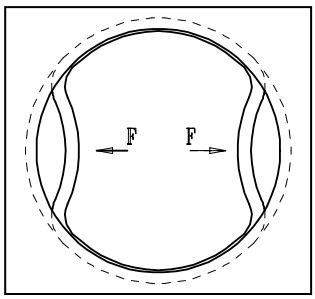
- Never hit the parts with a hammer or remove bearing surfaces using tools such as a screwdriver, chisel, etc.
- Always use the tapped holes provided for the purpose or specific tools.
- Never use a blowtorch to remove the roller bearing inner rings.
- Use a wheel hub puller.



1.2 Reassembly

- It must be carried out in conditions of strict cleanliness.
- The surrounding air must be free from dust, metallic particles (no grinding) and if possible, not too humid.
- Prior to reassembly, clean all parts carefully.
- Check the bearings faces and alignments. Polish the faces to remove any lifting screw marks and traces of shocks.
- Change the parts deemed faulty: corroded, abraded, deformed, unbalanced or with abnormal assembly play.
- Change seals, bearings at each disassembly and the stainless steel screws every three disassemblies.

1.3 Assembly of the ROTO Glyd Ring in relative speed between screw and bowl



- A ROTO Glyd Ring is 5% longer than the groove which houses it.
- The ring must therefore be compressed when fitted in its groove, which necessitates a certain level of experience on the part of the operator.
- Oil the ring and the groove.
- As shown in the drawing opposite, place the joint in the groove and leave two loops facing each other. Push the loops into the groove simultaneously and gradually, as shown by the arrows **(F)**.
- Touch the joint with a finger to ensure that there are no bulges remaining. If necessary, remove bulges by rubbing them gently with an oiled wooden handle.

1.4 Assembly of bearings

- Clean and strip shafts and bores carefully.
- If there is any doubt, check the shape and dimensions of the parts.
- Leave bearings in their original packaging until they are required.
- Do not hit bearings directly.
- The assembly stress must on no account be transmitted through the roller elements.
- Adjustment surfaces must be slightly oiled.
- Bearings of smaller dimensions may be fitted with slight hammer blows applied using a mild steel circle or tube all around the ring to ensure the bearing fits properly.
- Properly aligned stress is guaranteed when using a striking bush *(Fig.1)*.
- For simultaneous assembly of both rings, use an assembly similar to *Fig.2*

FIG. 1

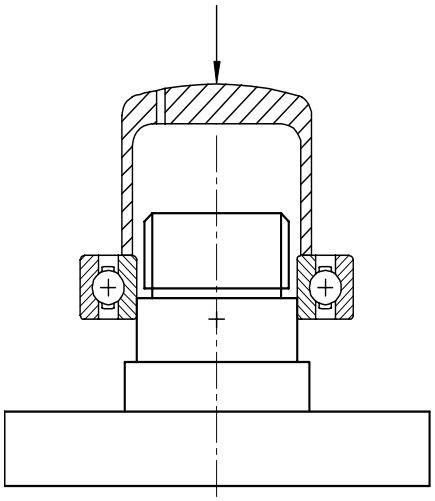
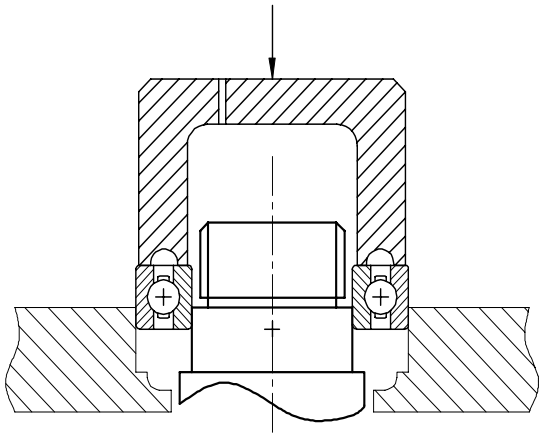


FIG. 2



1.5 Stainless steel fastenings

Maximum tightening torque according to diameter and category

CATEGORY	Ø 6	Ø 8	Ø 10	Ø 12	Ø 16	Ø 20	Ø 24	Ø 30	
80	9,3	22	44	76	187	364	629	1240	Nm
70	7	17	33	57	140	273	472	930	Nm
50	3,3	7,8	15	27	65	127	220	434	Nm

Note: Standard fastenings: category 70

To prevent seizing, coat thread with special green paste such as LOWAC.

1.6 Hardened steel fastenings

Maximum tightening torque according to diameter and category

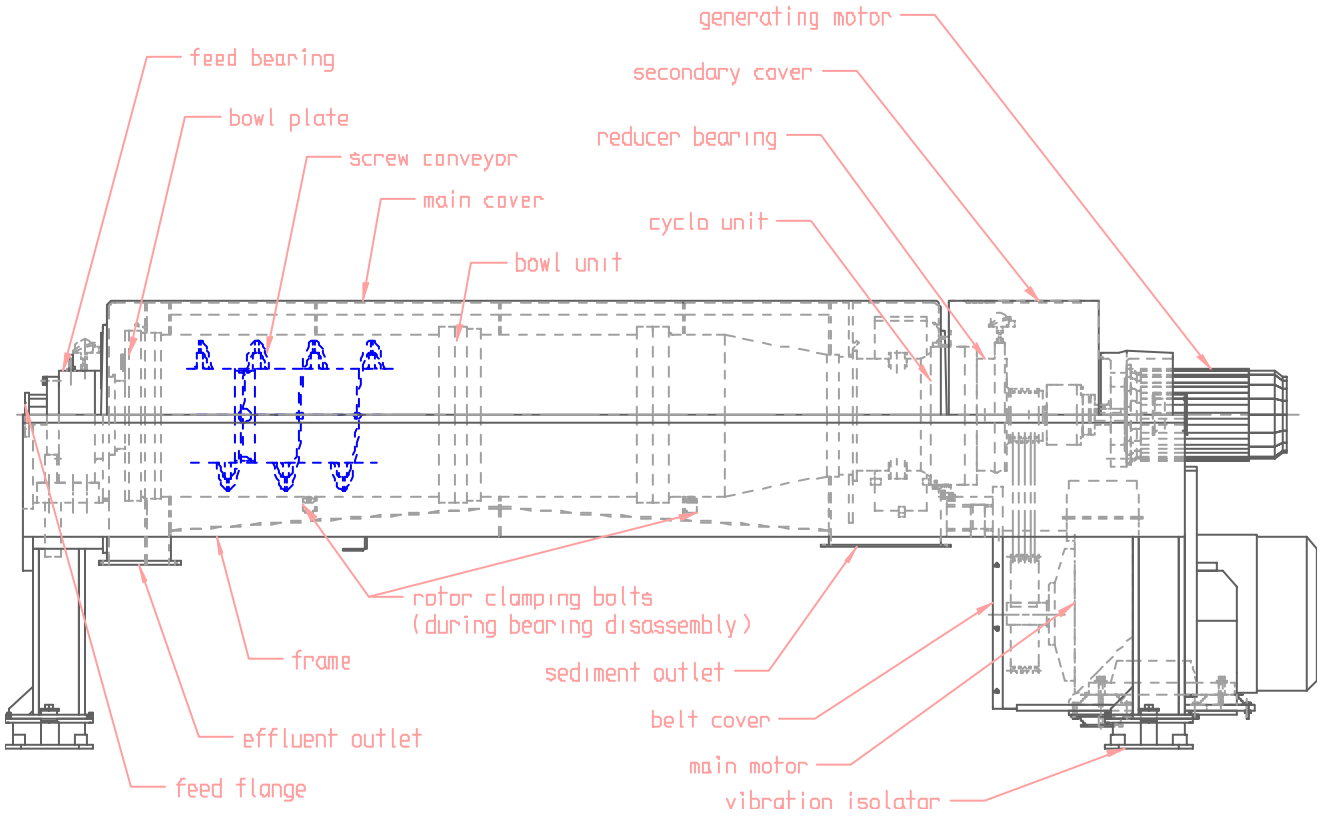
CLASSE	**Ø 6**	**Ø 8**	**Ø 10**	**Ø 12**	**Ø 16**	**Ø 20**	**Ø 24**	
8-8	8.6	21	42	71	170	340	590	Nm
10-9	12	29	58	100	240	480	830	Nm

Oil the screw thread and underneath the screw head.

The information included in this manual is the result of our know-how and experience. It is provided to enable you to better understand the characteristics, properties and the quality of the product sold, but may under no circumstances be considered as an acknowledgement of any obligation of guarantee whatsoever.

Our after-sales service has skilled fitters who are available to assist our clients regarding any type of work to be carried out on various items of equipment (start-up, tuning, test, reconditioning, etc.). Unless our client's maintenance service possesses sufficient experience, we strongly advise that no disassembly work be carried out in the absence of our fitters.

2. GENERAL ASSEMBLY



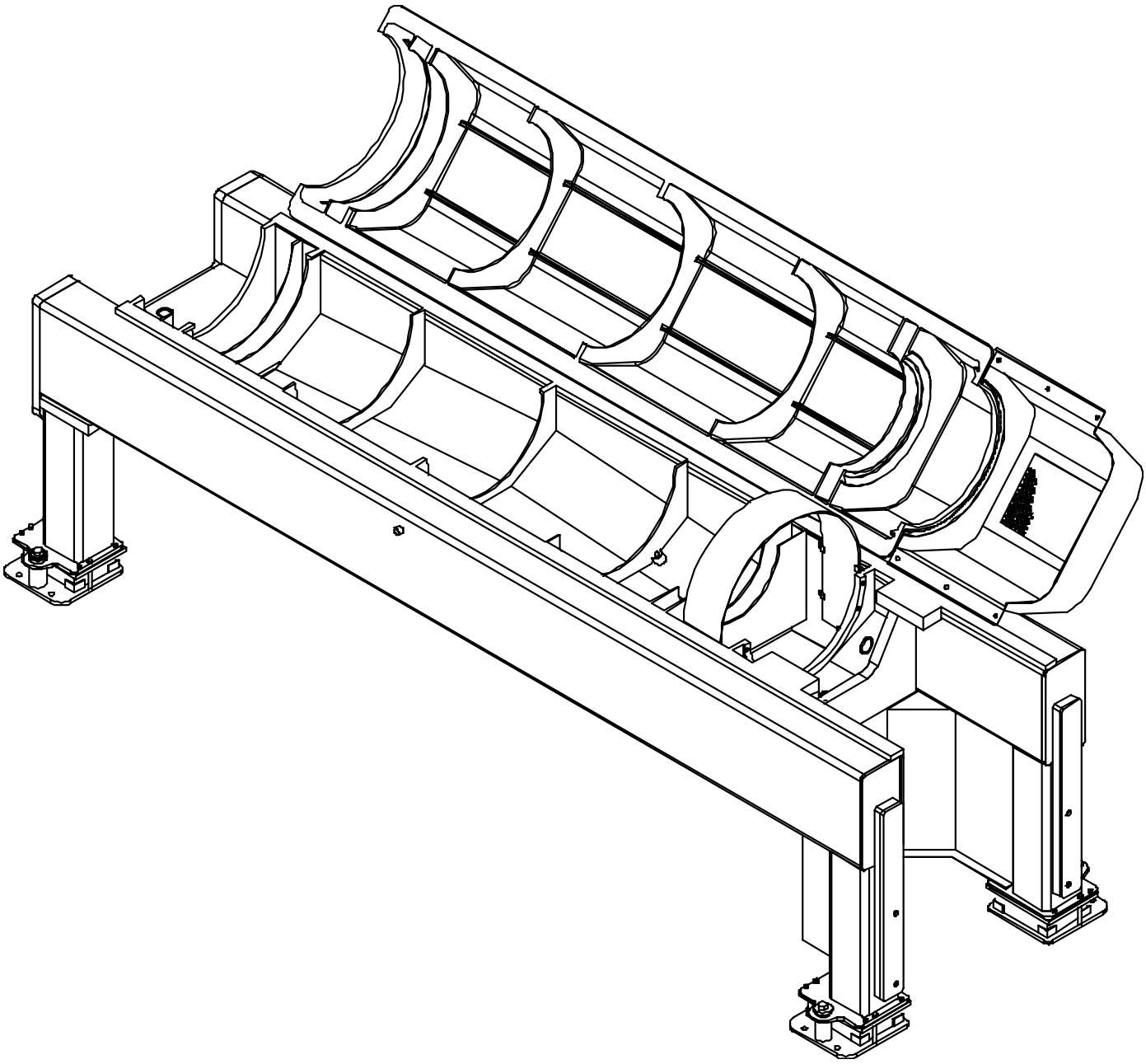
NOTE: The bowl includes 3 parts which are assembled and balanced together.
If a bowl element requires replacement, the entire bowl must be returned for repair and balancing.

The bowl nozzles can be removed and may be replaced in sets.

To do so:

- Remove the frame rotor.
- Remove the CYCLO reducer unit.
- Move the screw conveyer with the bowl plate axially by 100mm.
- Introduce the nozzles from the inside, and reassemble the elements following the disassembly instructions in the reverse order.

3. FRAME AND ENCLOSING COVER



3.1 Description

The solid and liquid reception casings include an upper housing made of glass fibre and a lower housing made of stainless steel and built in to the frame. The frame rests on 4 feet and is made of painted steel profiles filled with concrete.

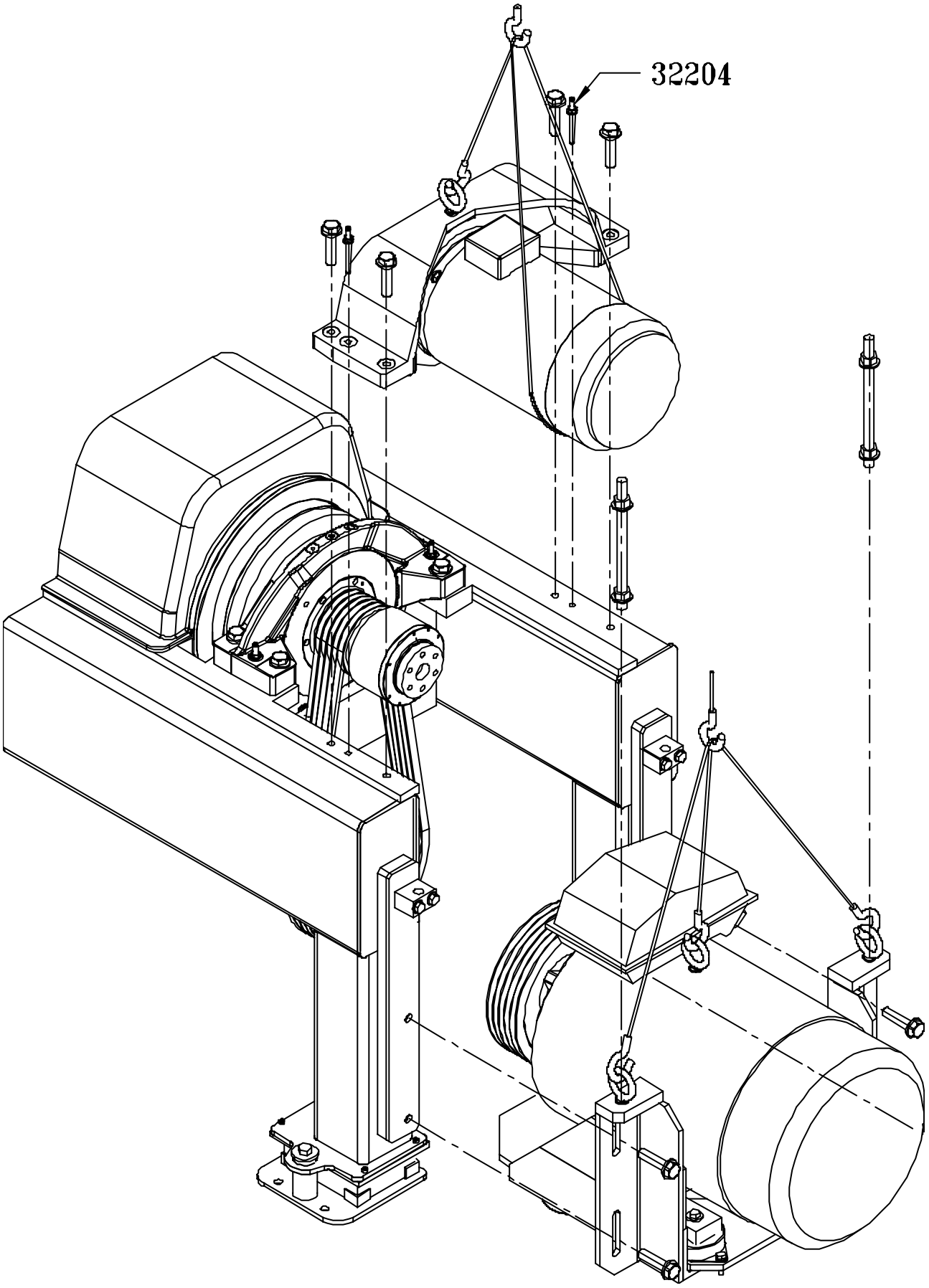
The seal between the upper housing and the frame is provided by a 10 x 10 section silicone joint with a 10 shore hardness rating.

3.1.1. Liquid discharge side

The glass fibre upper housing is protected by a layer of polyurethane approximately 5 millimetres thick.

3.1.2. Solid discharge side

The upper and lower housings are protected by a removable stainless steel plate.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4. PREPARING DISASSEMBLY – FASTENING BEARINGS

See figure page 11.
The machine can be disassembled by removing the entire rotor *(chap.5)* or each of the bearings *(chap.6 and 9).*
Disassembly always begins by fixing one of the two bearings.

4.1 Feed side disassembly

- Remove the main cover (4), remove the gas cylinder.
- Disconnect the oil inlet and outlet pipes on the bearings and the temperature sensors.

Remove:
- The feed tube
- The screws and bushes (1, 2) fastening the feed bearing
- The taper pins (3)
- The leak collector (6)

4.2 Reducer side disassembly

- Remove the main cover (4), and the secondary cover (7).
- Disconnect the oil inlet and outlet pipes on the bearings and the temperature sensors.
- Disconnect the generating motor: remove the screw (11), the spacers (12), and the flexible coupling (13)

Remove:
- The belts
- The screws and washers (1, 2) fastening the feed bearing
- The taper pins (3)

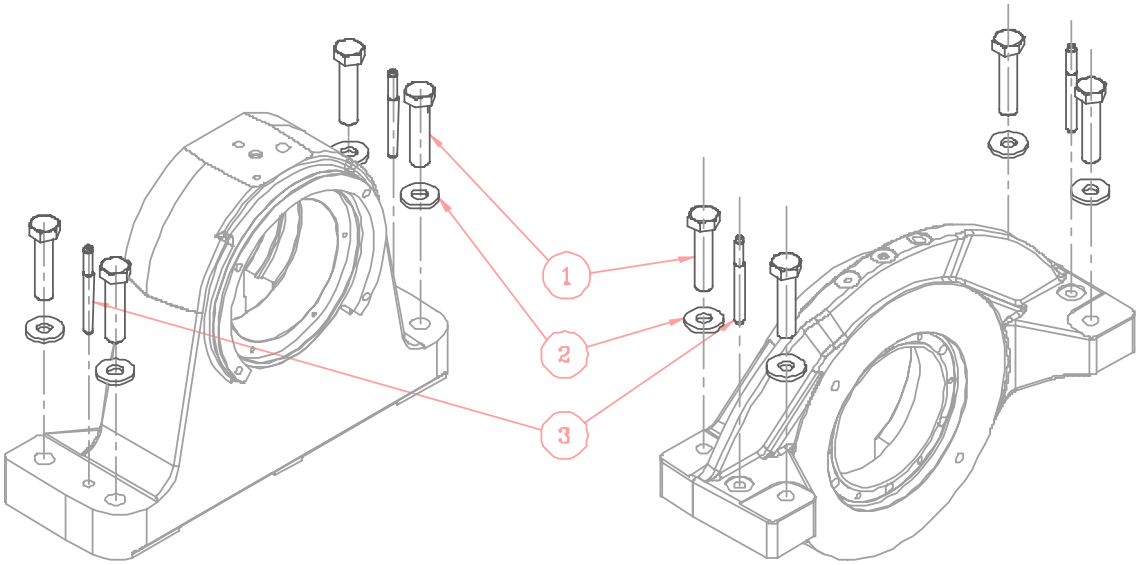
4.3 Reassembly

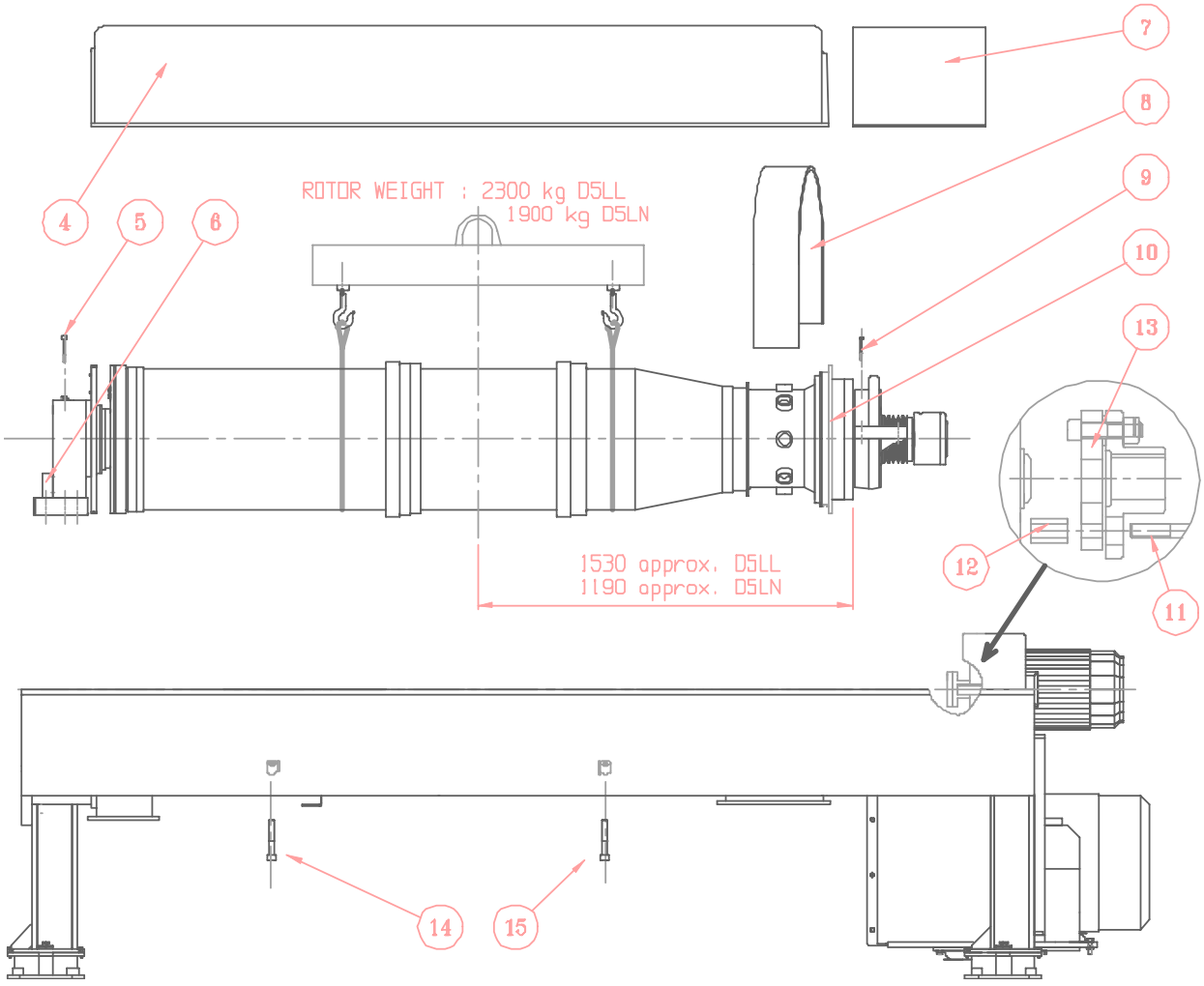
- Use the taper pins as guides for the bearing positions.

Reassemble:
- The taper pins (3): push them into their housing without forcing. Use a plastic or wooden mallet
- The screws and washers (1, 2)
- If necessary: the belts feed tube and leak collector.

Connect:
- If necessary: the generator's flexible coupling (11, 12, 13)
- The oil inlet and outlet tubes on each bearing
- The temperature sensors.
- Put the main housing cover in place and put the gas cylinder stay back in place
- If necessary: put the secondary cover (7) back in place.

Prior to restarting the machine, ensure that the lock screws (5 and 9) are loose and that the rotor clamping bolts (14 and 15) have been replaced with screw plugs.


1
2
3


ROTOR WEIGHT : 2300 kg D5LL
1900 kg D5LN
1530 approx. D5LL
1190 approx. D5LN
4
5
6
7
8
9
10
11
12
13
14
15

5. ENTIRE ROTOR

5.1 Disassembly of the entire rotor

Proceed to prepare disassembly on the feed and reducer side (chap. 4.1 and 4.2)

- Remove the screw plugs and use screws (5) and (9) to lock the bearings. These screws are used to lock the rotor during transport.
- Remove the solid discharge protection (8).
- Unscrew the sediment sealing ring (10) and leave it on the rotor.
- Remove the entire rotor using the bowl handling spreader beam.
- Place the rotor on an appropriate support: *wooden Platform.*
- Remove the handling system.

5.2 Replacing the entire rotor in the frame

- Clean the bearing faces of the bearings on the frame carefully and, if necessary, polish to remove any traces of shock.
- Place the rotor above the frame and lower it slowly until the bearings come into contact with the frame. Place the sealing ring at the same time.
- Use the taper pins as guides for the bearing positions.
- Fasten the sealing ring (10) on the frame. Here, use a set of chocks to ensure that the radial clearance is constant between the bowl and the seal ring.
- Install the solid discharge protection (8).

Complete reassembly of the bearings (chap. 4.3)

6. BEARING ON FEED SIDE

First, carry out disassembly on the feed side (chap. 4) and /or rotor disassembly (chap. 5)

6.1 Removal of the roller bearing

(fig. 1 page 14)

- Remove the fastening screw of the tightening flange (1), the retaining ring (2), the washer (3), the grease valve (4, 14) and the o rings (5).
- Tighten the 4 clamping bolts of the rotor to lift it slightly.
- Remove the bearing; use a lifting ring and a hoist very carefully not to damage the roller bearing *(fig. 2 page 14).*
- Remove the retaining ring (11), the washer (10), the lubricator (7) and the rear pillow cover (8)
- Remove the bearing (9), and the outer cage with the bearing rollers.

6.2 Disassembly of the inner ring of the roller bearing

(fig. 2 page 14)

For this operation, use tool set 34001 in configuration n°1+2+4 with M10 threaded rods. Lock each part in its end position and tighten nuts.

6.3 Reassembly of the inner ring of the bearing

- Heat up the inner ring to 176° F max.
- Place the ring (14) vertically on the hub and put it in place rapidly
- Ensure that the ring rests on the face of the hub. Here, use a hammer and a tool with a mild steel end piece.
- Lubricate the bearing seating, which must be cleaned carefully beforehand.

6.4 Reassembly of the roller bearing

Put in place :

- The retaining ring (11), the washer (10)
- The bearing (9), (outer cage with the bearing rollers)
- Carefully clean the cavities which will receive the grease of the pillow cover (8)
- The rear pillow cover (8) and the lubricator (7)
- Furnish with recommended grease the cover; fill it with the three quarters.
- Use a grease pump mounted on the lubricator (7) to inject the grease in the bearing
- Slightly lubricate the bearing rolling pieces while turning the cage manually.

> **CAUTION** - : Do not completely fill the bearing with grease. That would cause to make it heat unnecessarily.

Put in place :

- The pillow block: use a lifting ring and a hoist.
- The O-ring (5), the grease valve (4), the screws (14), the washer (3), the retaining ring (2), the fixing screws of the tightening flange (1).
- Unscrew the 4 rotor clamping bolt.

Fig 1 : disassembly of the roller bearing

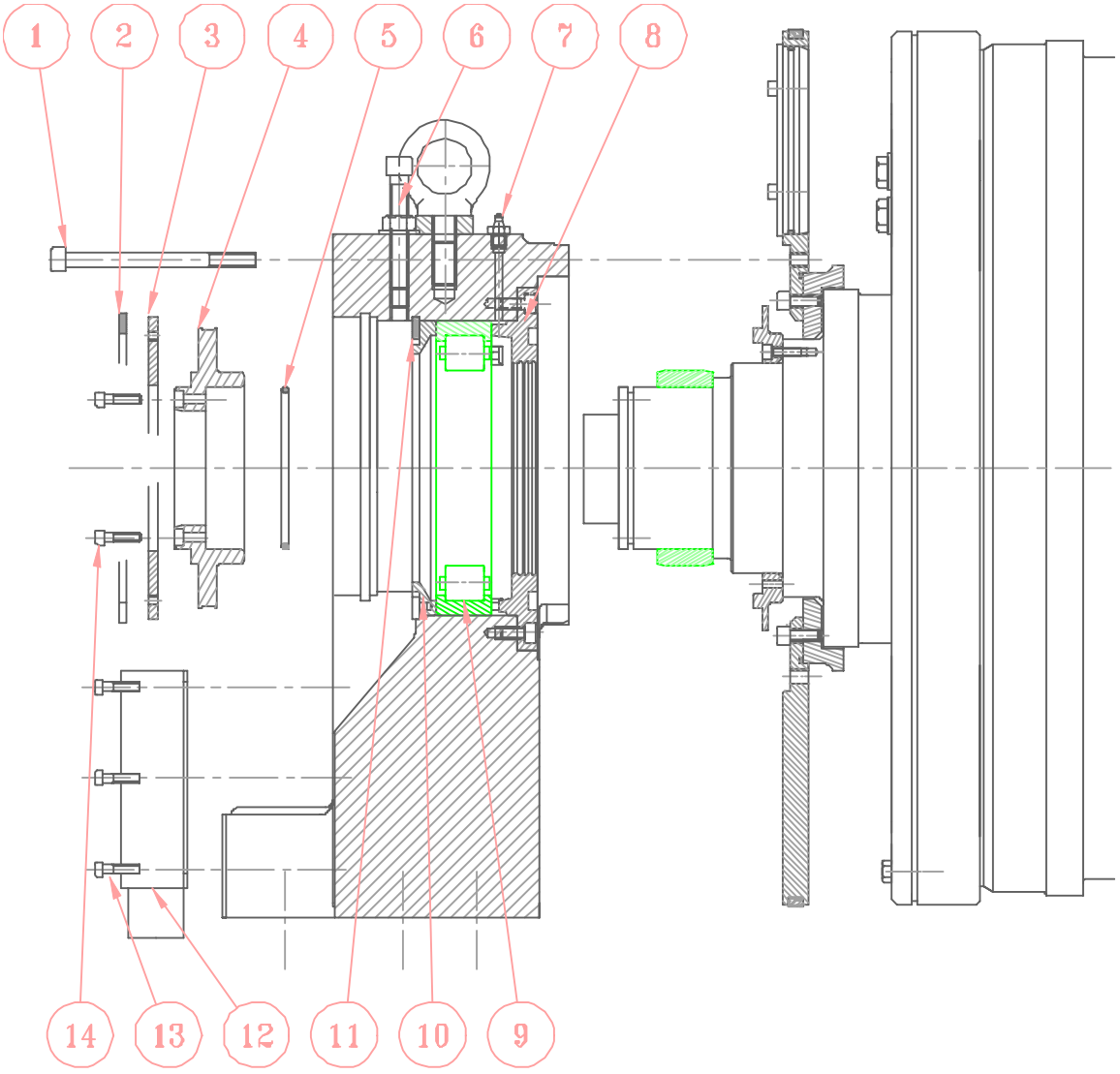
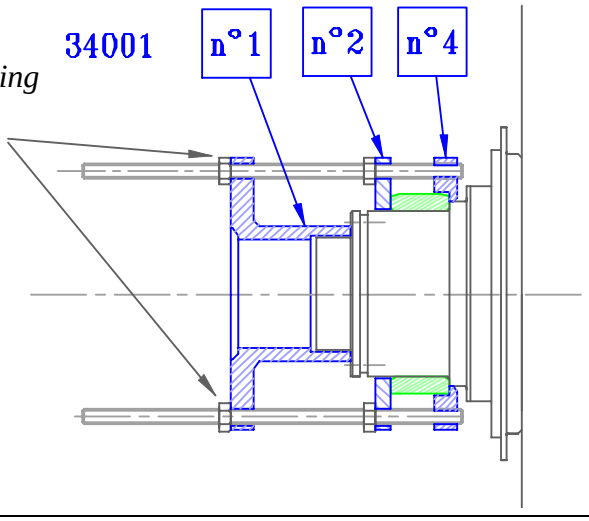


fig 2 : disassembly of the bearing's inner ring



7. DISASSEMBLY OF THE BOWL PLATE AND SCREW THRUST BEARING

7.1 Disassembly of the bowl plate and screw thrust bearing

Disassemble the feed bearing beforehand (chap. 6).

Remove: *(fig. 1 page 16)*
- Screw (1), deflector (2), tightening assembly (3), screw (4), bowl hub (5) with O-ring (6), screw (11) and sleeve (12) with lip ring (7).
- Screw (14) and anti-noise ring (11)
- Screw (8)

- Use a lifting ring and a hoist to support the bowl plate (9). Remove the bowl plate by using the screw (8) in the removal holes.

Assemble tools 33811 in configuration A+B+C+D, See also Chapter 9: *(fig. 2 page 16)*
- Screw elements D in the screw hub (19)
- Tighten the screw C
- Screw elements B on the bowl plate (9)
- Screw threaded rod A in element B until the bowl plate set has been disassembled

Remove:
Tool set 33811, joints (23), screw (17), seal ring (18), o ring (16), grease passage (24), bearing (15), screw hub (19) with o ring and lip ring, joint (22).

7.2 Assembly of the screw thrust bearing and bowl plate

- Assemble: new lip ring, o ring and screw hub (19). *Ensure that the joint bearing surface is in good condition.*
- New joint (22)
- Heat up the bearing (15) (max. 80° C) and install it on the bowl plate (9)
- Lubricate the o ring (16)
- Check the direction of the ring (18) in relation to the position of the grease passage (24)
- Assemble: grease passage (24), seal ring (18) with o ring (16) by screw (17).
- Lubricate joints (23)
- Place the bowl plate set (use a lifting ring and a hoist)

Assemble tools 33811 in configuration E+B+D *(fig. 3 page 16)*, See manual 819
- Screw element D in the screw hub (19)
- Screw element B on the bowl plate (9)
- Screw threaded rod E in elements D through B
- Screw E until the bowl plate set has been assembled
- Tighten screw (8)

Assemble: *(fig. 1 page 16)*

- Sleeve (12) on screw hub (19) with new o ring (10), screw (11)
- Bowl hub (5) with new o ring (6) and new lip ring (7), screw (4)
- Sealing set (3), deflector (2) and screw (1)

- Fill the entire chamber with the recommended grease.
- Here, use a grease gun with a greaser and inject grease until it appears between the bowl hub (5) and the sleeve on screw hub (12). *(See specific instructions)*
- Assemble the plug and its joint instead of the greaser.

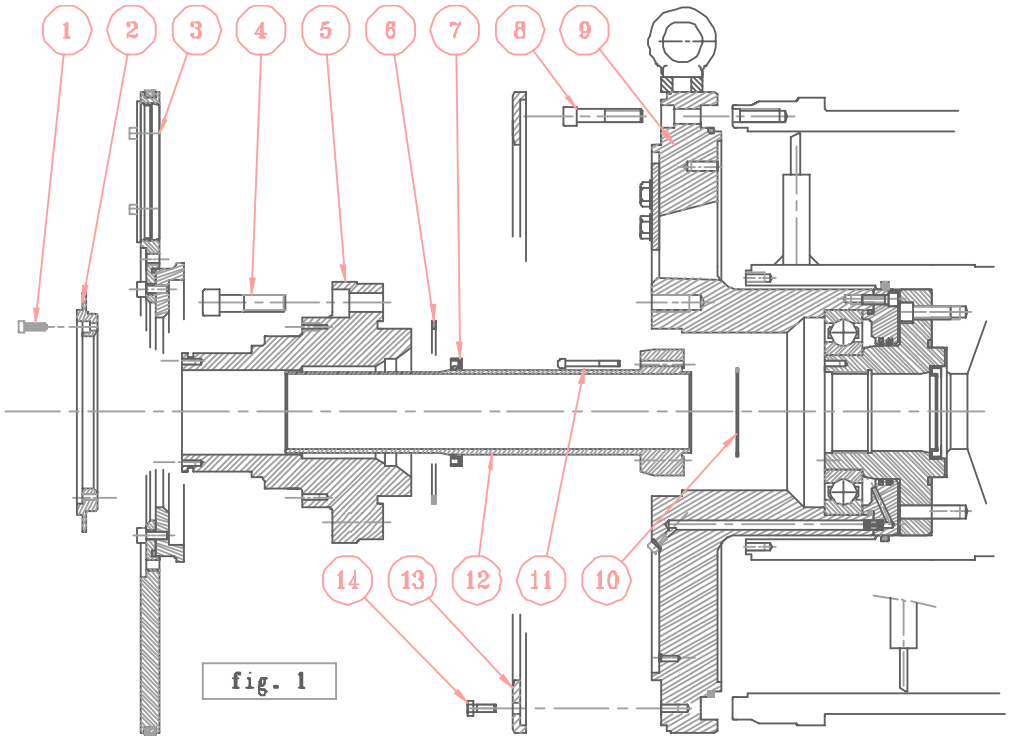


fig. 1

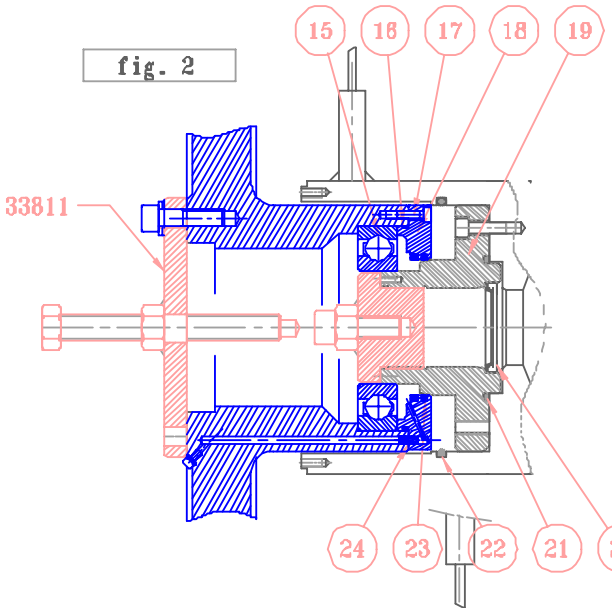


fig. 2

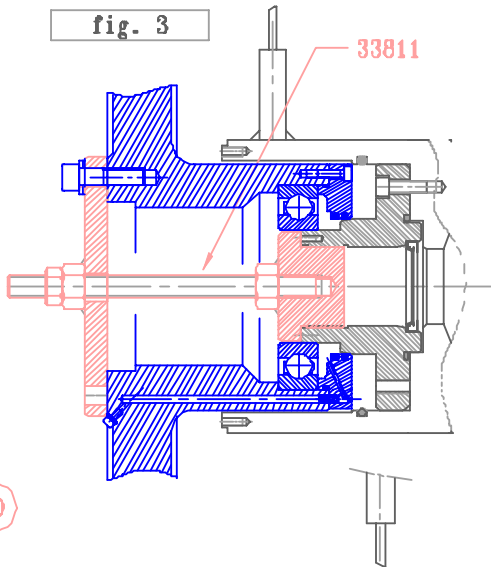


fig. 3

8. DISASSEMBLY AND REASSEMBLY OF THE SCREW CONVEYER

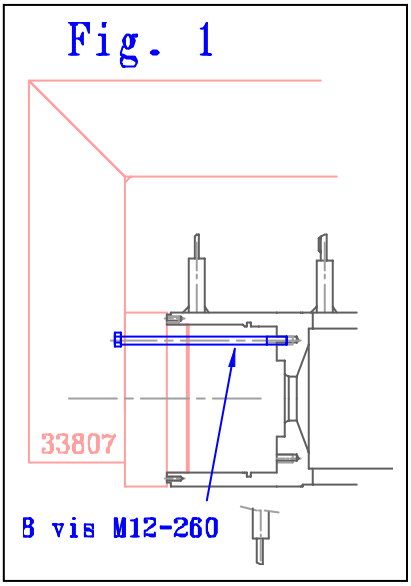
Beforehand
Remove:

- The rotor *(See chapter 5)* or simply the feed bearing *(See chapter 6)*
- The bowl plate with the screw thrust bearing *(See chapter 7).*

Then

8.1 Removing the screw conveyer

- Remove the screw (1), hub (2), joints (3 and 4) and lip ring (5) *(fig. 2 p. 18)*
- Assemble the handling spreader (33807) on the rear face of the screw *(fig. 1 opposite)*
- To pull out the screw axially, adjust the position of the handling sling and lock it.
- Pull out the screw axially whilst avoiding shocks on the tiles.



8.2 Reassembly of the screw conveyer

Preparation:

- Check the condition of the joint bearing surface of the screw hub. Change it if necessary.
- Ensure that the splined shaft is clean. If necessary, remove all traces of rust.
- Change the o ring (7), ROTO Glyd Ring (8)
- Lubricate the splines and o ring (7), (8) *fig.2 p.18*
- Check the alignments and the bowl/bowl plate bearing faces. Polish if necessary.

When these operations have been carried out, place the screw inside the bowl very carefully to avoid damaging the tiles (*fig.3 p.18).*

To assemble the splined shaft in the splined hub, proceed as follows:

- Bring the splined shaft in contact with the splined hub.
- Push the screw conveyer and at the same time rotate the eccentric shaft of the cyclo reducer in either direction until the shaft splines fit into those of the conveyer.
- Remove the spreader.
- Finish the assembly by reassembling the bowl plate following the instructions of chapter 7.

ATTENTION: The thread of the screw conveyer is covered with tiles made of sintered tungsten carbide, which are highly wear resistant but sensitive to shocks, so it is recommended to carry out the axial disassembly of the screw very carefully. Place the screw on an appropriate wooden support. Protect the splined shaft using an oiled cloth.

9.

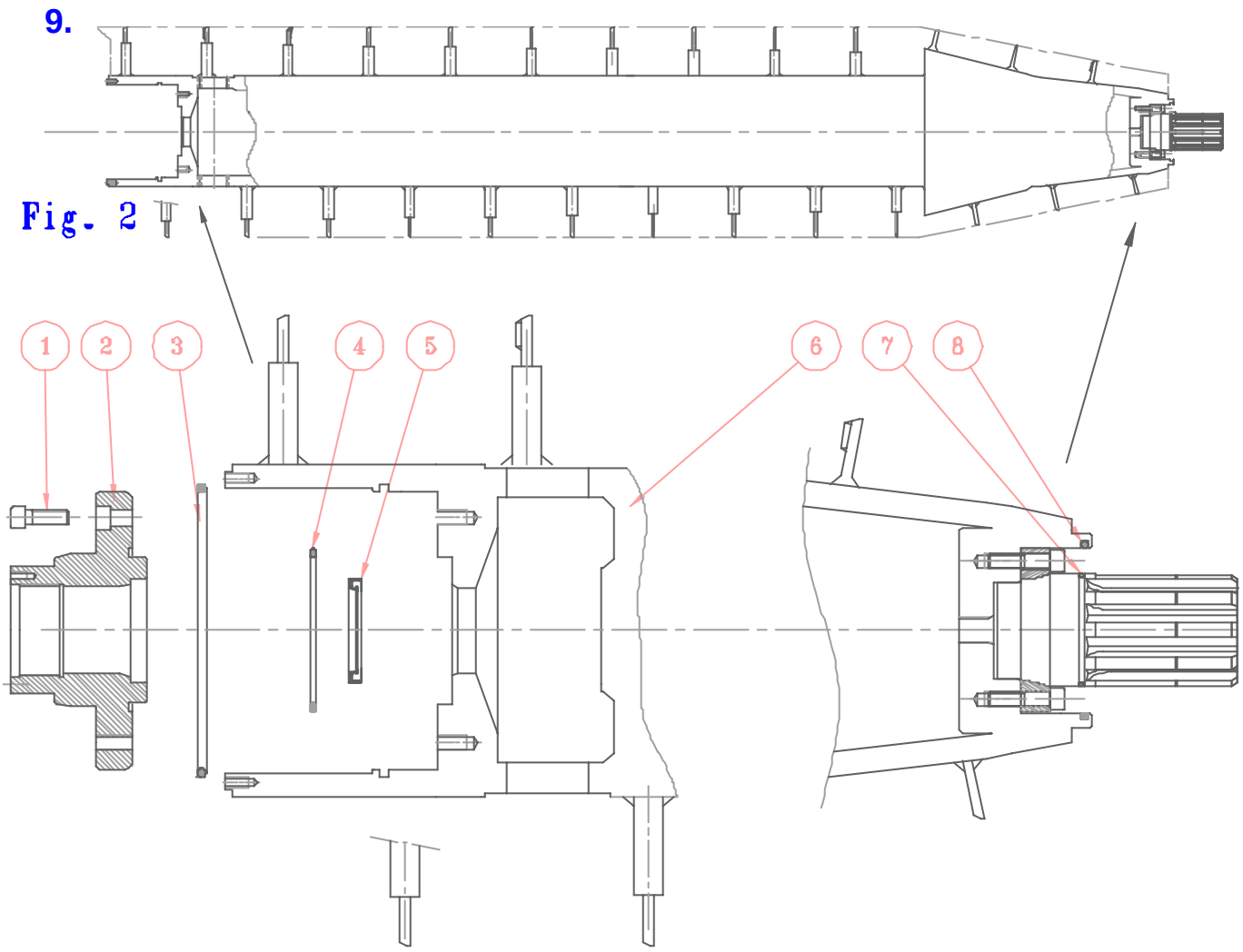


Fig. 2

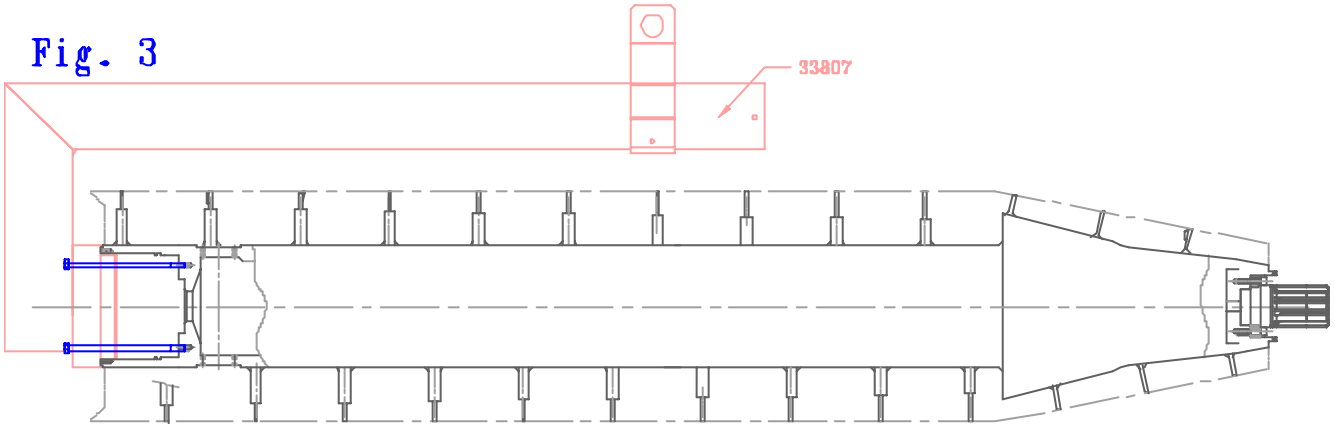


Fig. 3

10. DISASSEMBLY AND REASSEMBLY OF THE BEARING ON THE REDUCER AND MACHINE PULLEY SIDE

Beforehand, prepare the disassembly on the reducer side (chap. 4) and/or rotor disassembly (chap. 5) If the rotor is not disassembled, it is necessary to move or disassemble the secondary motor.

10.1 Disassembly of the machine pulley

Remove: *fig. 1 p. 20*

1. Screw (6), screw (5), ring (4)
2. Redex pulley (3, 2, 1 - HP version) or Redex hub (standard version)
3. Screw and machine pulley (16): here, use both tapped holes M 8

10.2 Disassembly of the pillow block on the reducer side and the bearing

Remove: *(fig. 2 p. 20)*

1. Screw (15)
2. Pillow block cover (14)
3. Retaining ring (13)
4. The shoulder fitted on the bearing (12)
5. Pillow block set including block (11), rear cover (9) and screw (10), outer ring and bearing rollers (8): use a lifting ring and a hoist.
6. Inner ring of the bearing (7) with tool set 34001 in configuration n°1+2+3

10.3 Assembly of the inner ring of the roller bearing

1. Heat up the ring (17): 176° F maxi
2. Install the ring on the shaft rapidly.
3. Ensure that the ring is in contact on the shaft shoulder. *Use a hammer and mild steel drift.*
4. Clean the bearing surface carefully and lubricate it.

10.4 Assembly of the bearing

Assemble bearing set:

1. Pillow block cover (9) on pillow block (11)
2. Screw (10)
3. Outer ring and bearing rollers (8)

➢ Lubricate manually the rollers while turning them.

Assemble :

1. Pillow block assembly on hollow shaft
2. The shoulder fitted on the bearing (12)
3. Retaining ring (13)

➢ Carefully clean the chamber which will receive the grease of the front cover (14)

Put in place the front cover (14). Furnish with recommended grease the chamber; fill it with the three quarters. Use a grease pump.Assemble :

1. Pulley (15), screw (16)
2. Redex pulley (1, 2 et 3) or Redex hub
3. Ring (4) + screw (5)

Fig. 1

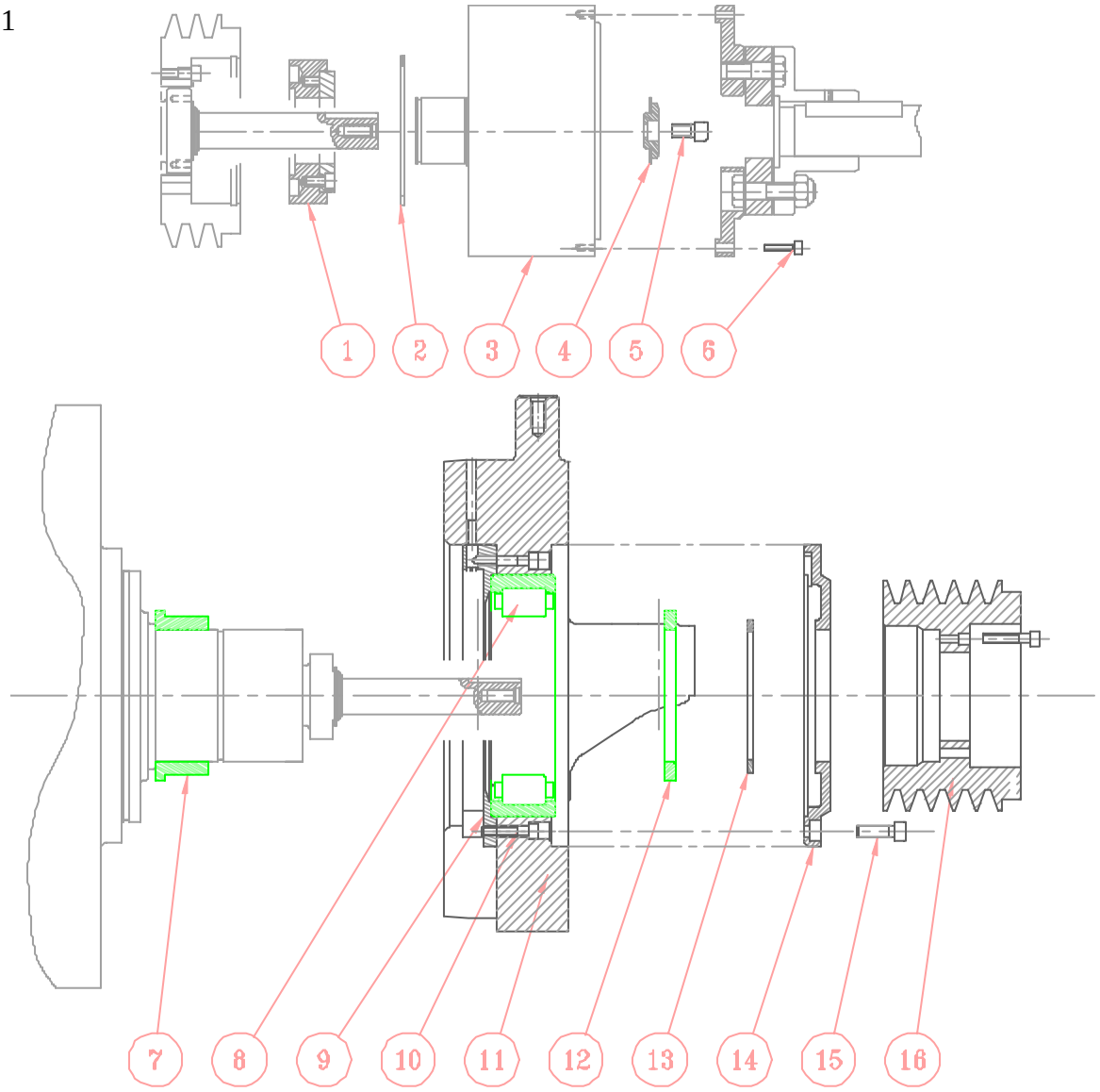
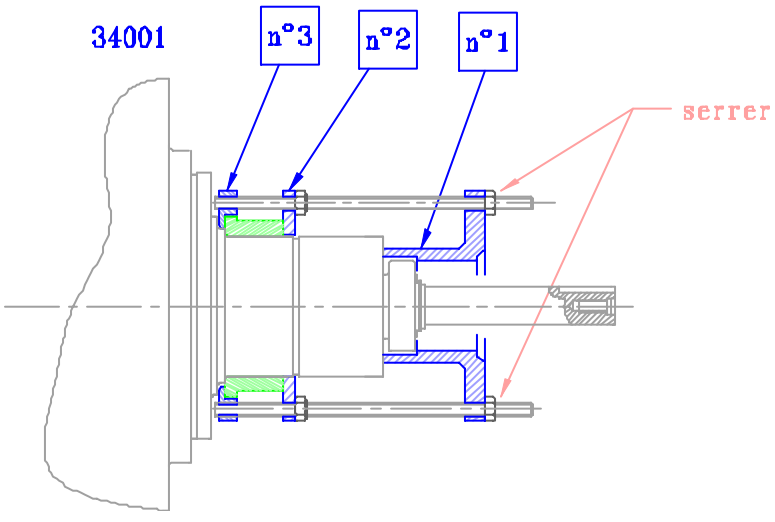


Fig. 2



11. CYCLO REDUCER ASSEMBLY/DISASSEMBLY

11.1 Removal of the reducer unit

- First, carry out the disassembly on the reducer side (chap. 4) and/or rotor disassembly (chap. 5)

Note. To disassemble the reducer alone, it is not necessary to remove the bearing and pulley.

- Remove the screw (2), soundproof washers (3), and screw (1). *(fig.1 page 22*)
- Remove the reducer unit: here, use the handling lug N°34373.

11.2 Disassembly of the Cyclo

- Position the CYCLO unit as shown on *fig. 2*.
- Remove the screw (14)
- Screw on two lifting rings *See fig. 3*
- Remove the splined hub unit (5) + hub (6)
- Then remove in this order: the bushes (7), cam discs (8), spacer (9),
- Circlips (10), stop washer (15), eccentric (12), lower cam disc (11).

11.3 Removing/Fitting eccentric shaft

(See fig.5 page 23)

Removing:

- Screw (23), joint (24), o ring (25), circlips (29), joint (28).
- Thrust bearing (19): to make it easier to remove it, use a plastic or wooden mallet according to arrow F
- Reassembly is carried out in the reverse order. Always replace the lip ring (27), and o rings (25) *fig. 5*

11.4 Removing/Fitting the splined hub

Removing: *(fig. 6)*

- Screw (20)
- Plug (16)
- Ring (21): use the lifting screw (17)
- Circlips (22)
- Hub (5): use the lifting screw (18).

Putting back in place: *(fig. 7)*

- Heat up the bearing (30) max. 176°F and install it in the splined hub (5)
- Splined hub (5) + bearing (30) in hub (4): use a press
- Spacer (31)
- Bearing (32): use a press
- Circlips,(22)
- Joint (21) with a new o ring (33) and ROTO Glyd Ring (34).

11.5 Reassembly of the cyclo reducer

Reassembly is carried out in the opposite order to disassembly, however, the following points must be observed:
The cam discs must be positioned so that the marks are visible for the operator and placed at 180° from each other. *See fig. 4.*
To check the position at this stage of the assembly, assemble all bushes (7) and rotate the eccentric shaft manually. It must rotate freely.

The following points must also be observed:

- Check the surface of the lip ring (28) *(fig. 5),* change this part if necessary.
- Replace the o rings (6, 13, 25, 33), ROTO Glyd Ring (34), lip ring (27).
- Use only original parts and lubricate the reducer only with the grease specified in the lubrication manual.
- Heat up the bearing inner ring (max. 80°F) and assemble the eccentric shaft carefully to avoid scratching the rings and rollers of bearings.
- Prior to re-assembly, clean all parts carefully. Ensure that they are not damaged and if necessary polish mainly the bearing faces, alignments and the surfaces in contact with the joints.
- Examine carefully the grooves of the eccentric. If they have begun to deteriorate or worse are chipped, change the eccentric.

ATTENTION: Check the cam discs, if they are damaged replace them in pairs. Ensure that the filling and drain plugs on the cyclo and bowl ring are in the same plane.

Fig 1

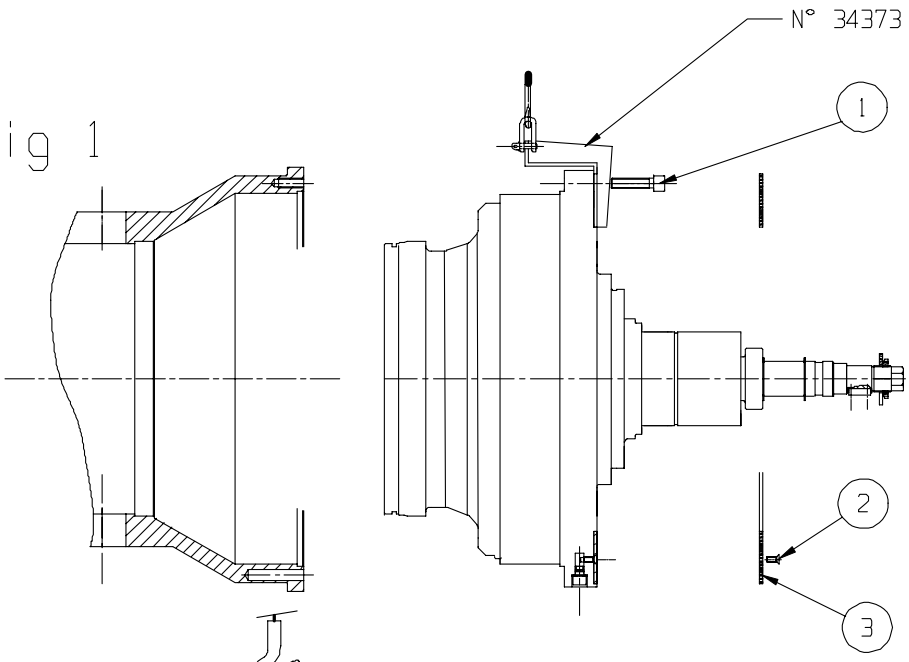


Fig 3

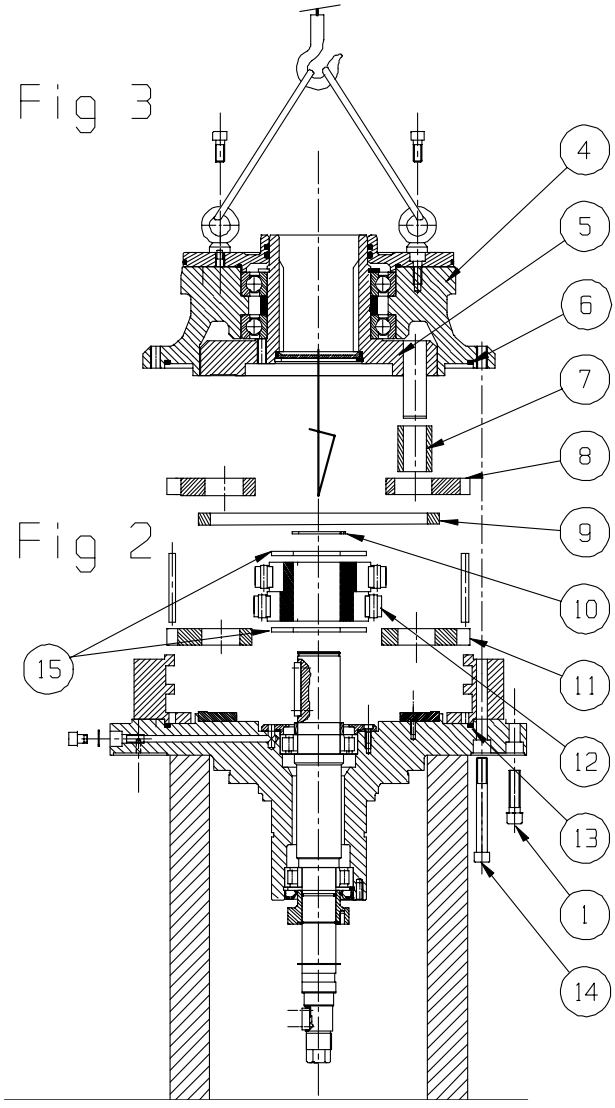


Fig 4

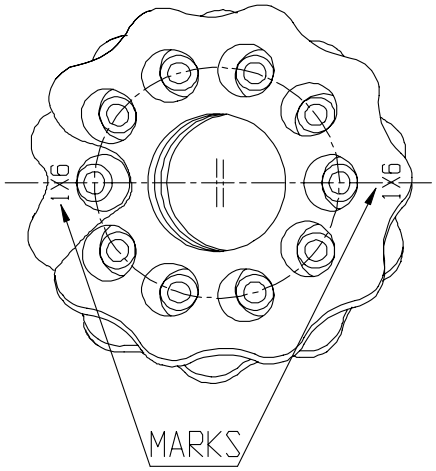


Fig 2

Fig 6

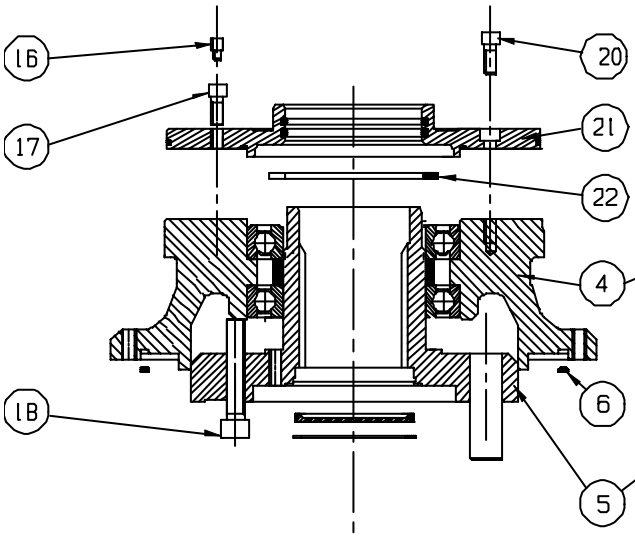


Fig 7

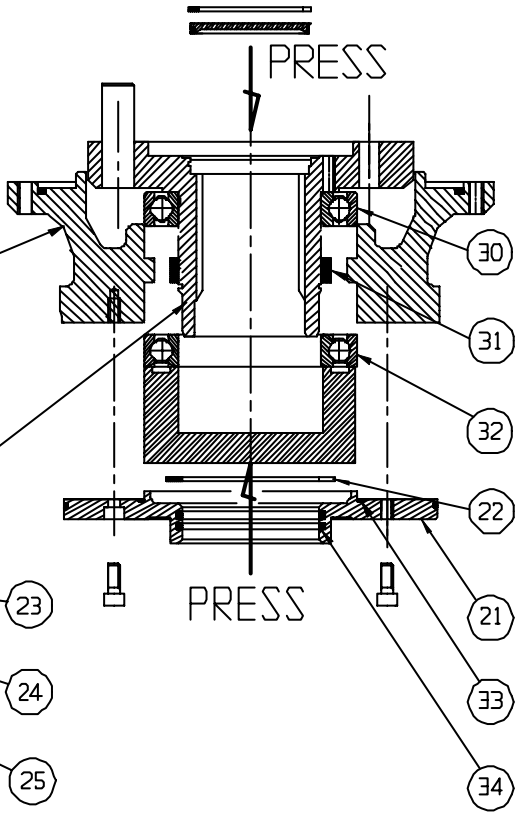
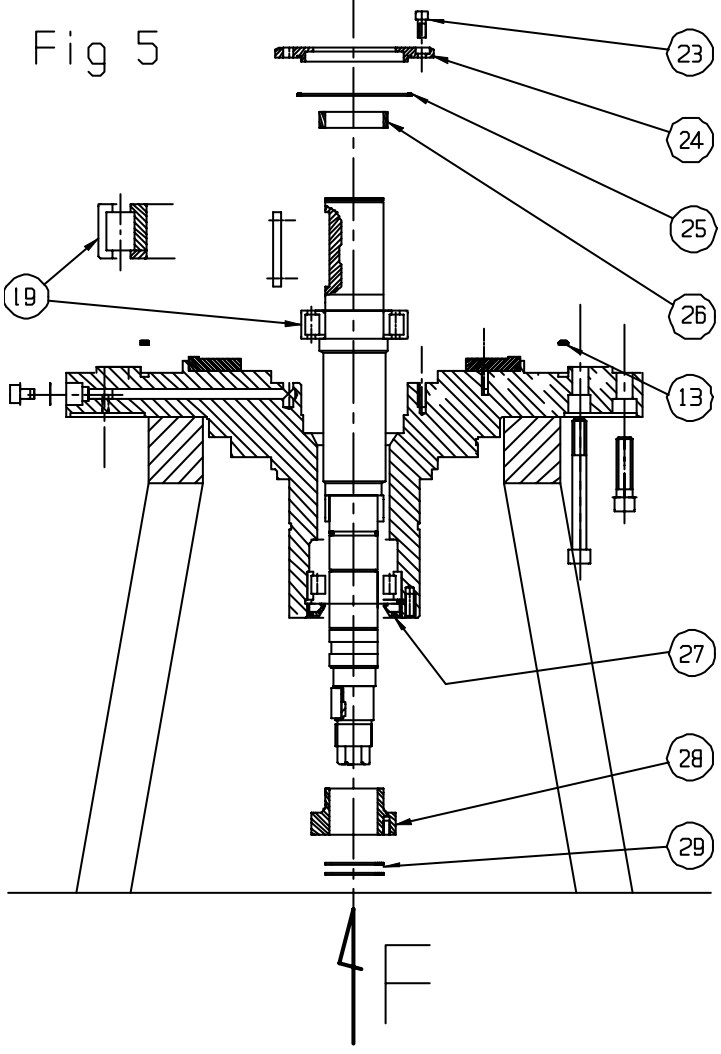
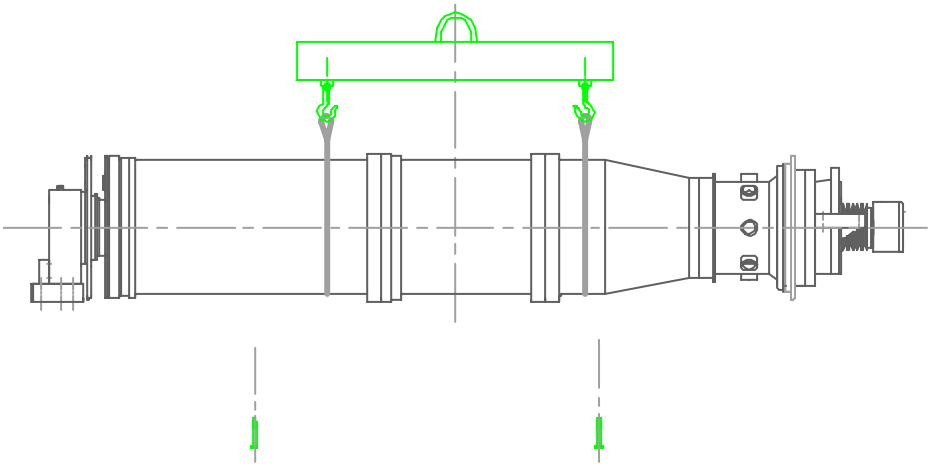


Fig 5



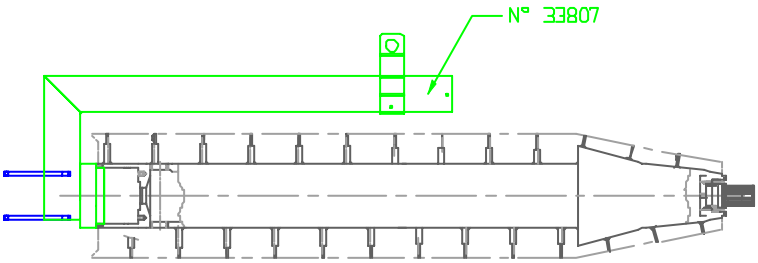
LIST OF TOOLS

BOWL LIFT STRAPS
(Not supplied)

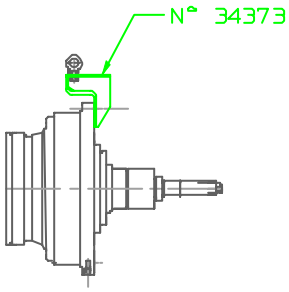


4 SCREWS TO LOCK BOWL
for transport and handling
N° 34754

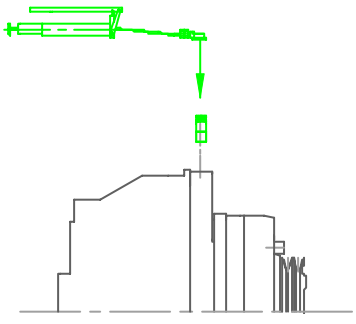
SCREW CONVEYOR LIFTER
N° 33807



REDUCER BLOCK LIFT STARPS
N°34373

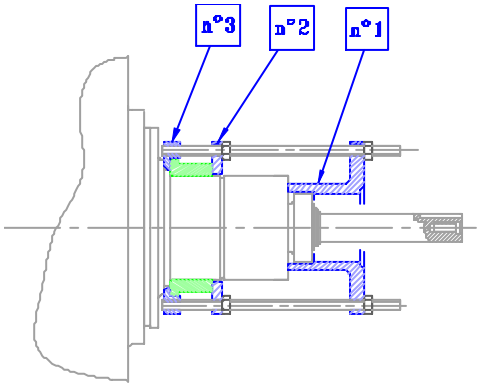


REDUCER BLOCK LUBRICATION
Lubricator extension piece GRA-5017014-
M10*150

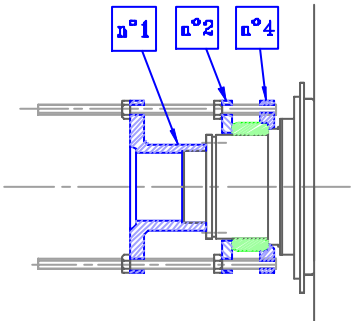


LIST OF TOOLS

REAR PILLOW BLOCK BEARING
Tool n°34001

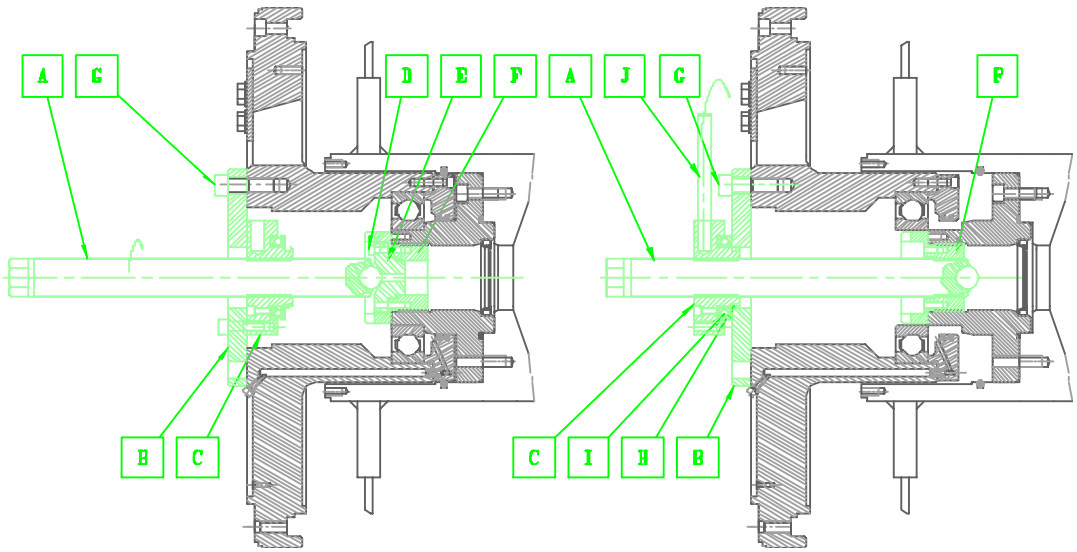


FRONT PILLOW BLOCK BEARING
Tool n°34001



TOOL FOR DISMANTLING AND REASSEMBLING THE BOWL PLATE
N° 34715

item	designation	code	qty
A	Bearing housing dismantle screw	33573	1
B	Extraction flange	34716	1
C	Thrust ball bearing support	34106	1
D	Screw CHc M6	-	4
E	Stop ring	17219	1
F	Extraction ring	34717	1
G	Screw CHc M16	-	4
H	O-ring	-	1
I	Thrust ball bearing	-	1
J	Working rod	34110	1
-	Wrench to squeeze item F	34719	1



TROUBLE SHOOTING

1 MECHANICAL PROBLEMS - IRREGULARITIES

1.1 Vibrations

Preliminary remarks:

The vibrations are all the more destructive as they occur at high speed:

- Rapid deterioration of the bearings on the bearing block,
- Breakage of hooding fixings, transmission, casings, etc,
- Fatigue of the rotating parts.

Thus a machine must not be run when they are abnormal, and their cause has to be traced.

In order to help you in diagnosis, we have listed the following possible causes according to the vibrations having appeared:

Suddenly:

- Product silting up between screw-conveyor and bowl,
- Machine badly washed when stopped,
- Scraper blade of sediment casing torn off,
- Weir plate loosened,
- Tungsten carbide tiles baked on screw-conveyor torn off.

Progressively:

- Screw-conveyor worn,
- Bearing damaged (thrust of screw-conveyor and bearing on bearing block),
- Clearance in the grooved shaft,
- Shock-absorbers damaged,
- Fixing screw loosened in co-current, effluent return tube choked up unevenly.

After a mechanical intervention:

- Resting faces or centerings damaged or badly cleaned,
- Joint nipped between two resting faces,
- Distorted or damaged parts,
- Fixing screws of bearing block or of rotor tightened,
- Level plate badly adjusted,
- Poorly aligned secondary motor,
- Poorly tightened belts.

Note:
Our service department, has a device which makes it possible to make an on site analysis of vibrations and to balance the machine for emergency repairs.
The criterion taken into account for the quality of the balance is the vibration intensity or moving speed of the frame in mm/sec.

1.2 Noise

The centrifuge is too noisy:

- The Absolute Speed was increased.
- One of the bearings on the bearing block is worn.

Screws are loosened on:
- The main hooding
- The sediment exit casing,
- The transmission,
- The inverter,
- The shock absorbers are damaged or worn.

1.3 Overheating

The bearing blocks overheat:

Greased Bearings

If this happens subsequent to excessive grease, several hours will have to pass before the bearing block has cooled to its normal temperature. Otherwise, it may be due to a lack of grease and the beginning of bearing deterioration.

Oil lubricated bearings

- Oil cooling via the lubrication central unit is insufficient (temp max. 140°F)
- Insufficient water supply
- Thermostat poorly adjusted
- Oil flow too strong or weak
- Flow rate poorly adjusted
- Clogged oil filter
- Low oil level
- Oil too used
- Bearing may be beginning to wear

The reducer overheats:

The normal temperature is between 104° and 140°F. Measurements after 5 to 10 minutes slow down time are not always significant. Use a non contact thermometer (laser) for a more precise indication.

An abnormal temperature may be caused by:

- A permanent high torque
- Excessive grease kneading at the eccentric due to a sizeable speed difference between the outer ring and the entrance shaft or eccentric shaft. As a rule, this figure should not exceed 3000 rpm
- An incorrect grease/oil level - too much or not enough
- An inappropriate grease/oil type
- Early reducer deterioration. One way of checking the state of a reducer without dismantling is to check that the eccentric shaft turns freely by hand without catching.

1.4 Abnormal motor load - possible causes:

- The bowl speed accelerates.
- The extraction torque has increased.
- One of the bearings on the bearing block is damaged.
- The effluent outlet is block up and the liquid rises up to the rotor.

The rotor is not turning freely:

- The sediment exit casing is packed and the solid grinds against the diffuser
- Solid has seeped into the frame cradle and grinds against the bowl or against the cyclo ring
- Solid particles carried off by the effluent have dried in the narrow passage between the bowl flange and the effluent casing
- Product has dried between the feed tube and the screw-conveyor sheath
- The two screws supporting the bowl on the feed bearing block side have not been sufficiently loosened
- The prime flow rate is too high for an HP scroll *(the time it takes for product plug forms at the HP disk level, the liquid flow passes through the solid evacuation and uses more power)*

2. PROBLEMS - IRREGULARITIES CONCERNING PRODUCT

2.1 Abnormal extraction torque

The solid extraction torque between screw-conveyor and bowl is abnormal and causes the first and second threshold to trigger.

Preliminary remarks

Before any major intervention on the machine, check that the torque is actually abnormal by making sure that:

1. ***Mechanical torque limiter***
   - The **0** mark is not out of adjustment by some mms.
   - The elastic ring is not sheared: if this is the case, the **0** marks are completely out of adjustment.
   - The aluminum ring (B1) is well fixed.
   - The plate (P) holding the bolt (D) does not touch, in its angular course,
   - The elastic ring (M1).
2. ***Electronic torque limiter***
   - Read the secondary motor torque directly from the frequency inverter and recalculate the % of reducer torque in order to compare it with the display

An abnormal torque capable of reaching the trigger can be due to the following causes:

PROBABLE CAUSES	CHECKS	REMEDIES
The screw-conveyor is worn. Thread worn - Chamfering disappeared	- The effluents are a little more loaded - The machine vibrates a little	- Change the screw-conveyor. If wear is minimal, reset by hand. Balance if necessary.
The solid tends to turn with the screw-conveyor.	The solid is badly evacuated in the casing. It comes out in spurts	- Raise the level - Lower the Absolute Speed (VA). - Flute the bowl
The product has changed	Check the output, the concentration.	If these speeds are adjustable : -Increase the V.R. - Decrease the V.A.
Screw-conveyor thrust bearing damaged	The machine vibrates a little	- Take down the bearing block on feed side - Change the bearing.
The reducer is damaged. The bearings of the eccentric shaft are damaged	Check by hand the rotation of the eccentric shaft. It must turn in either direction without blockage points.	- If it catches, take down the reducer. Change the damaged parts. BEWARE : the pinions or cycloid discs have to be changed by pairs.
The belts of the secondary speed slip.	Check state and tension of the belts.	- Change all the belts (V.A. and V.S.).

An abnormal torque capable of reaching the triggering can be due to the following causes:

PROBABLE CAUSES	CHECKS	REMEDIES
The hydraulic level is too low.	The solid is too dry or the effluent becomes loaded. The level plates are loosened.	Progressively raise the level up to a compromise between. Torque / Dryness.
The centrifuge is partially silted up.	The effluent is loaded.	Clear it.
For co-current, silting up behind the Roto Glyd Ring between screw-conveyor and bowl.	Try using a strong jet through the holes in the bowl plate.	Dismount screw-conveyor and bowl plate.
For adjustable VR, the VR has decreased.	Solid dryer, effluent more loaded.	Check and raise it again.

Note: For machines equipped with elastic ring and without torque measure, it is possible, to follow the variation of the torque by means of a **STROBOSCOPE**, with the machine running.

2.2 The clarification has become too poor

Probable causes

- The screw-conveyor is worn; the extraction of solid is poorly done.
- In co-current, the joint between screw-conveyor and bowl is damaged.
- The screw-conveyor is partially silted up.
- The product turns inside the bowl.

Possible mis-adjustments

- Relative speed:
  Too high..... Turbulence
  Too low..... Solid evacuation too slow
- Bowl speed:
  Too high..... Bad extraction
  Too low..... "G" forces not high enough
- Level:
  Too low..... Time in machine reduced
  Extraction more difficult
- Out put of feed pump:
  Too high..... Machine overloaded
- Concentration:
  Too high
- Out put of flocculent pump:
  Too low..... Poor flocculation
  Too high..... Poor flocculation
  Make sure there is no polymer build-up in the circuit.
- The flocculent is no longer to the product.

With FLOCCULATED product, check:

- The flocculation in a test-tube,
- The proportion of the flocculent,
- The concentration of the sludge,
- The concentration of polymer in the tanks.

ATTENTION survey polymer age

With NON FLOCCULATED product, check:

- Clarity of the mud,
- Out put of the pumps,
- The concentration - the pH - the temperature...

Other possible causes

- Sediment casing silted up: keeps the solid from leaving the bowl,
- The solids turn with the screw-conveyor: slips inside the bowl,
- The belts slip and thus lower the relative speed: cause of an insufficient extraction of the decanted solid.

2.3 The dryness has become too poor

With FLOCCULATED product, check

The efficiency and the quantity of polymer.

With NON FLOCCULATED PRODUCT, check:

- The clarity of the product
- The concentration : too low
- The relative speed : too high
- The level : too high
- The absolute speed : too low
- The feed input : too high
- In co-current, the effluent return tubes are blocked up

2.4 The extraction of solid is done poorly

Probable causes:

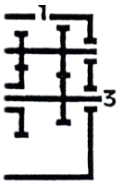
- Feed pump blocked up
- Concentration very much diminished

No more relative speed:

- Check the elastic ring, sheared
- Check the belts, loose
- The solid turns with the screw-conveyor
- The screw-conveyor is silted up
- The sediment outlet casing is blocked up

REDEX DIFFERENTIAL UNIT

1. Description



ANDANTEX

EPICYCLIC UNIT

Type SA

As with our previous ranges the ANDANTEX Type SA Unit is designed on the principle of the epicyclic gearbox with multiple planet assemblies having their gears and shafts fixed together by a patented method for injecting nylon.

The particular advantages of this system are :

- greatly reduced overall dimensions in comparison with conventional gearboxes.
- the capability within the same gearbox housing, to cover a wide range of torque capacities depending on the number of planet assemblies fitted. The gear ratio is not affected.

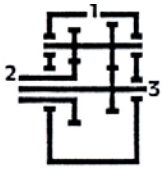
Experience obtained on over 150,000 units sold throughout the world during the past 25 years has resulted in a new improved SA series, having :

- an increase in transmissible torque,
- an increase in thermal horsepower,
- an increase in bore size of the central shaft.

The ANDANTEX SA unit may be used either as a speed reducer or differential gearbox, as required.

A wide range of accessories is available permitting many applications of the ANDANTEX SA.

Manufactured in Britain, France, Germany and the United States, the ANDANTEX SA unit is also distributed in many other countries.



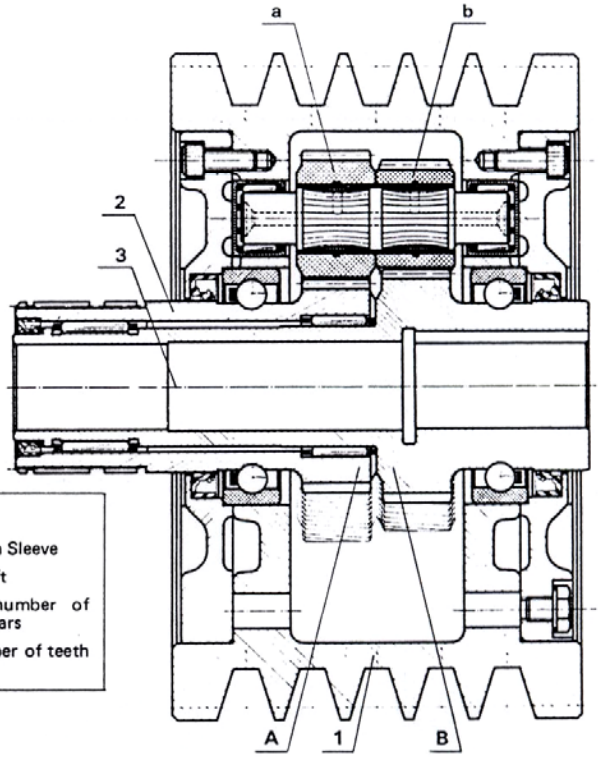
ANDANTEX
EPICYCLIC UNIT

Type SA

Technical data

The ANDANTEX epicyclic unit is comprised of three principal elements, as follows :

- **The casing which carries the planets.**
- **The central shaft/sun gear.**
- **The torque arm sleeve/sun gear.**



1. Casing
2. Torque Arm Sleeve
3. Central shaft

A and B. number of teeth in sun gears

a and b. number of teeth in planet gears

KINEMATIC

The relationship between the angular speeds of these elements is given by the Willis formula :

$$\frac{\omega_3 - \omega_1}{\omega_2 - \omega_1} = \rho$$

ω_3 - angular speed of central shaft/sun gear.

ω_2 - angular speed of torque arm sleeve/sun gear.

ω_1 - angular speed of casing and planet assemblies.

ρ - internal ratio ω_2 to ω_3.

$$\rho = \frac{\text{Product of number of teeth in driving gears}}{\text{Product of number of teeth in driven gears}} = \frac{A \times b}{a \times B}$$

TABLE OF NUMBERS OF TEETH FOR SA 20 UP TO SA 95 *(for other sizes please consult us)*

Gear reference number		1	2	3	4	5	6	7	8
Sungear A	Number of teeth	45	37	40	36	35	38	40	36
Planet Gear a		20	26	28	25	23	26	24	32
Sungear B		45	37	40	36	35	38	40	36
Planet Gear b		20	26	28	25	23	26	24	32

Standard Gears

Special Gears

Each internal ratio ρ (or K) has a corresponding gear combination C (see pages 7 and 8) comprising two sets of numbers. See table above.

The two numbers of the combination give the respective numbers of teeth in the sun and planet gears : A-a and B-b.

Example : $\rho = 0.9351$ (K = 15.42) combination C : 2,5.
(A = 37 teeth, a = 26 teeth, B = 35 teeth, b = 23 teeth).

Reduction ratio $K = \frac{\omega_1}{\omega_3} = \frac{1}{1-\rho}$ when $\omega_2 = 0$.

K is positive when $\rho < 1$ ω_3 rotates in same direction as ω_1.

K is negative when $\rho > 1$ ω_3 rotates in opposite direction to ω_1.

ω_3 angular speed of central shaft.

$$\omega_3 = \omega_2 \rho + \omega_1 (1 - \rho)$$

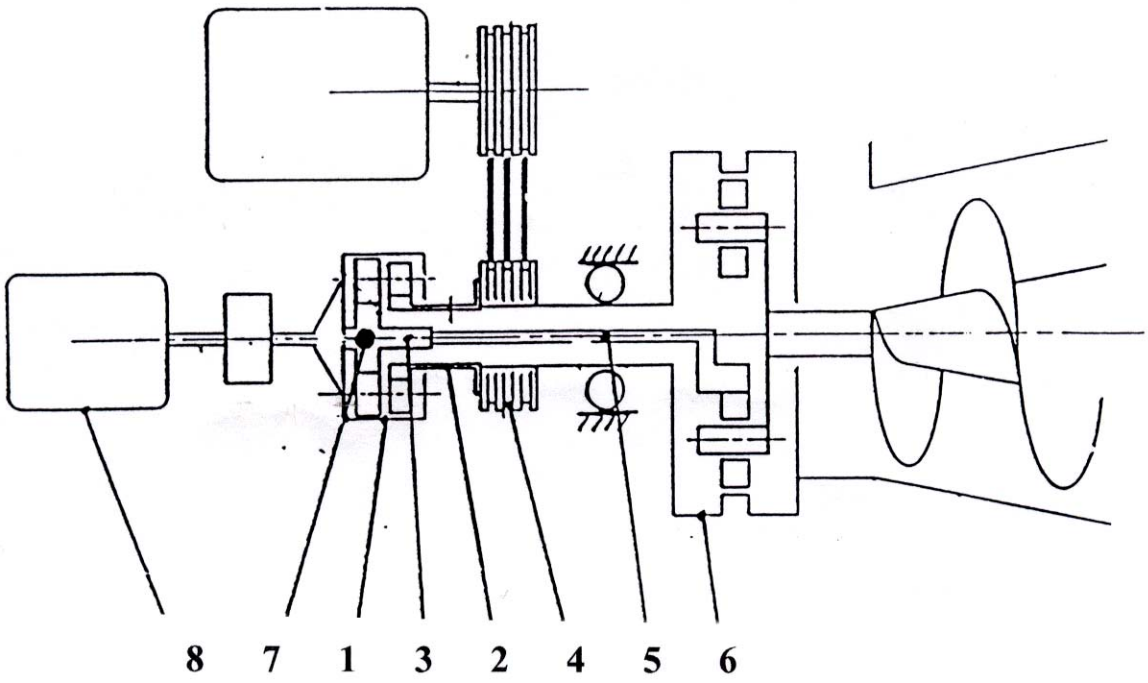
DYNAMIC

C_2 torque on torque arm sleeve $= -\rho\, C_3 \times \frac{1}{0.97}$ where 0.97 is the efficiency between ω_2 and ω_3.

C_1 torque on case $= -C_3 (1 - \rho) \times \frac{1}{\eta}$ where η is the efficiency of the epicyclic train (see table on pages 7 and 8).

C_3 torque on central shaft.

2. Assembly



The REDEX differential unit (7) is assembled in series with the CYCLO reducer (6) between the pulley machine (4) and the generator (8).

The hub (3) of the differential unit is directly assembled on the eccentric shaft (5).

The bush (2) of the differential unit is driven in rotation by the fixing screws of the pulley machine (4).

Under these conditions, half the braking torque of the eccentric shaft (5) is distributed on the housing (1) controlled by the generator, and half on the pulley machine (4).

The total **k** reducer ratio seen by the generator is equal to the **k1** reducer ratio of the CYCLO multiplied by the **k2** reducer ratio of the REDEX differential unit. Therefor: 87 x 2

3. Purpose

1- To increase the relative speed accuracy: 0.1 rpm.

2- To decrease the set power of the generator and therefore that of the principal motor.

Comment:

- The REDEX differential unit, in multiplying by 2 the reducer ratio of the CYCLO or more, enables to obtain a precise relative speed. This particularity is required for the HP screws working with weak relative speeds running from 1 to 5 rpm and allows for an easy adjustment of the constant torque.

- Concerning the power, the REDEX differential unit divides the torque, detected by the generator, by 2 - while decreasing the secondary speed - this amounts to dividing by 2 the set power compared to a system without the REDEX differential unit.

Formula:

RS	= Relative Speed	rpm
AS	= Absolute Speed of the bowl	rpm
SS	= Secondary Speed controlled by the generator	rpm
k1	= CYCLO reduction	
k2	= REDEX reduction	

$$RS = \frac{AS - SS}{k1 \times k2} \qquad SS = AS - RS(k1 \times k2)$$

ST	= Secondary torque seen by the generator	Nm
P	= useful Power generator	kw
NT	= CYCLO Nominal Torque on outlet shaft	Nm

$$P = \frac{ST \times SS}{9550} \qquad ST = \frac{NT}{k1 \times k2}$$

Example:

AS = 3000 rpm k1 = 87
NT = 7000 Nm k2 = 2
RS = 3 rpm

ST = 7000 / (87 x 2) = 40 Nm

SS = 3000 - 3(87 x 2) = 2478 rpm

$$P = \frac{40 \times 2478}{9550} = \boxed{10{,}4 \text{ kw}}$$

4. Assembly, maintenance, lubrication

ANDANTEX DIFFERENTIAL UNIT MOUNTING AND MAINTENANCE	PRODUCT SHEET RX 122/001 March 1994	1/2

INTRODUCTION :

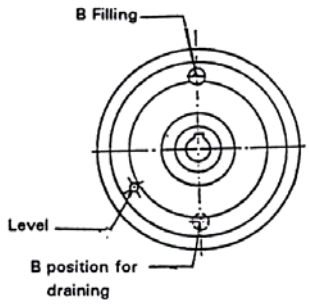
Thé ANDANTEX unit will give excellent service providing that it has been correctly selected and the mounting and maintenance instructions are followed.

LUBRICATION :

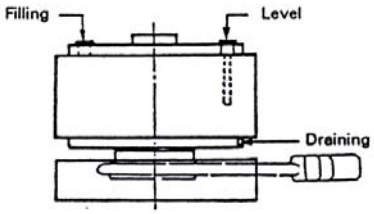
ANDANTEX units are supplied without oil.

Filling and oil level control is carried out as indicated in the figure below :

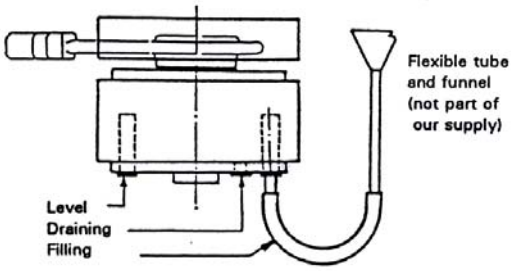
HORIZONTAL SHAFT



VERTICAL SHAFT
Torque arm sleeve below



VERTICAL SHAFT
Torque arm sleeve above



OIL QUALITY

A mineral oil of 100 CTS at 40°C and 12 CTS at 100°C (7 to10 ENGLER at 50°C) has to be used.
The oil must be drained off after 200 hours of running (bedding in period). Thereafter the oil must be changed after each 3000 hours of running and the level checked every month.

ESSO	SHELL	MOBILOIL	ELF	ANTAR	BP	TOTAL
UNIFLO 10W40	X 100 30	629 Synthetic	ELF 15W40	SAE 30	BP SUPER Visco Static 20W50	CARTER EP/ES 150

REDEX 45210 FERRIERES FRANCE

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ANDANTEX DIFFERENTIAL UNIT MOUNTING AND MAINTENANCE	PRODUCT SHEET RX 122/001 March 1994	2/2

APPROXIMATE QUANTITY IN LITRES

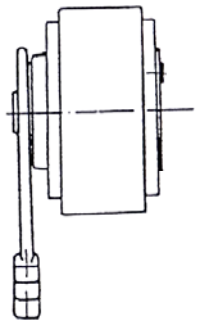
Type H series	H 18	H 25-1 à H 25-6	H 35-1 à H 35-6	H 50-1 à H 50-6	H 65-1 à H 65-6	H 80-1 à H 80-6	H 130-2 à H 130-8	H 165-3 à H 165-12
horizontal shaft	0,15	0,35	0,80	2 * 4,5	4 * 11,5	7	10	12
vertical shaft	0,20	0,45	0,95	2,5	4,5	11	13	17

Type SR series	SR 20.1 à SR 20.6	SR 30.1 à SR 30.6	SR 42.1 à SR 42.6	SR 56.1 à SR 56.6	SR 75.1 à SR 75.6	SR 95.1 à SR 95.6	SR 130.2 à SR 130.8	SR 165.3 à SR 165.12
horizontal shaft	0,2	0,35	1,25	2,7	5	9	10	12
vertical shaft	0,25	0,45	1,4	3,2	5,5	13	13	17

NOTE :

1 - TEMPERATURE
On initial installation a certain amount of heating will take place in the region of the central shaft and torque arm sleeve due to the oil seals. This will disappear after several days running.

2 - PROLONGED STOCKAGE
It is recommended to fill the unit completely to prevent internal oxydation.



GUARANTEE

1 - See general conditions on our guarantee card.

2 - SPECIAL NOTES FOR UNITS USED AS A REDUCER

- The torque arm and its leaf springs are considered as security features.
- The failure of these or of the torque limiter means an overload of 30 to 50 % of the nominal torque.
- Consequently, the garantee is void if : there has been a failure of the toque arm or its leaf spings or the torque limiter.
- The guarantee will be renewed after corrective action has been taken.

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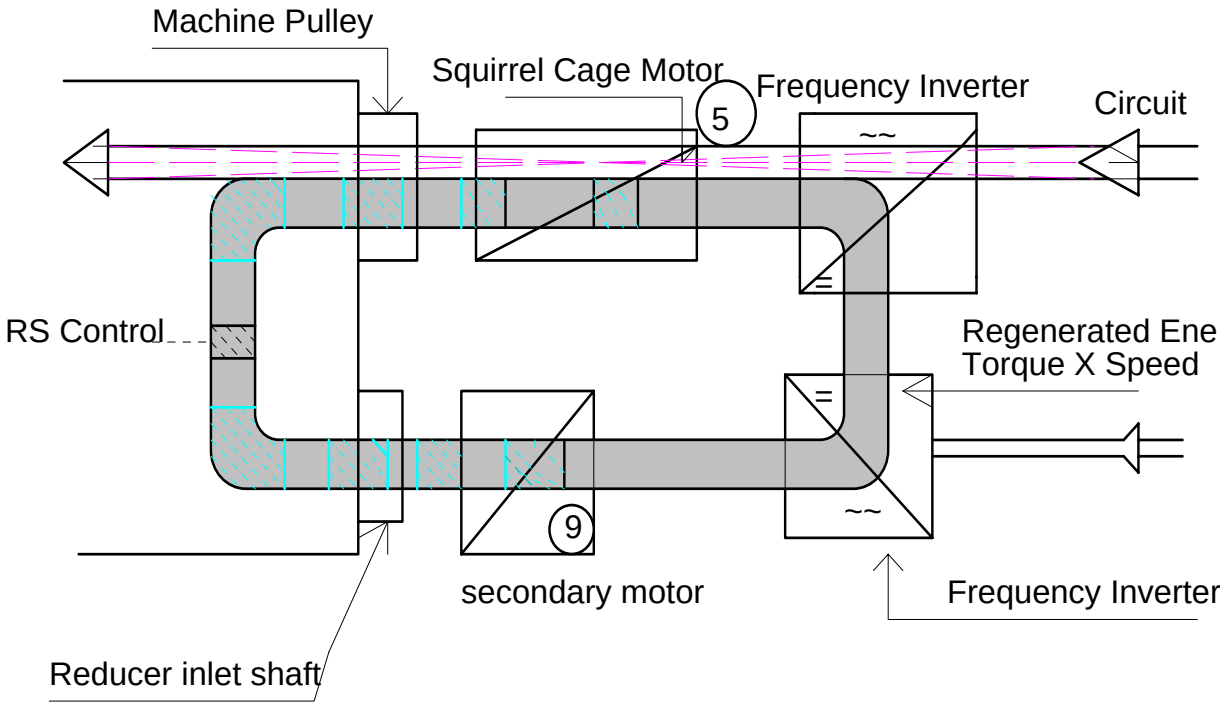
DECANTING MACHINE TRANSMISSION

ELECTRONIC DOUBLE SPEED VARIATION (Patented)
1- BOWL SPEED (AS)
2- RELATIVE SPEED (RS)

1. DESCRIPTION AND DIAGRAM OF POWER CIRCULATION



A centrifuge machine is basically comprised of a cylindrical - cone shaped bowl and a screw conveyor used to extract sediment driven to the side of the bowl by centrifugal force.

On one hand an epicycloid type reducer, mounted between the screw and the bowl, develops a significant torque on the outlet shaft attached to the screw, and on the other hand it guarantees a precise and variable differential speed (screw with regards to the bowl) by simple action on the inlet shaft.

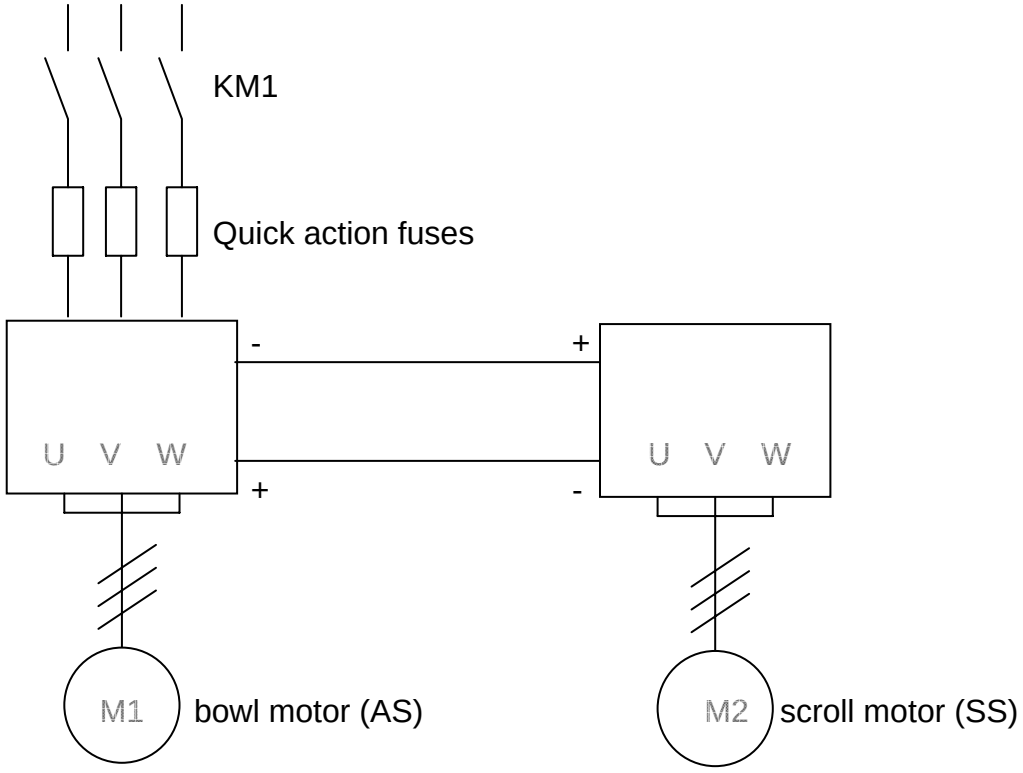
The main motor (5) torque is applied to the exterior collar of the reducer via the machine pulley: this torque directly drives the bowl at high speed (AS) and indirectly drives the screw at a higher speed in relation to the bowl (RS) and drives the reducer inlet shaft at a secondary speed (SS).

The torque of the secondary reaction (CS) exerted on the reducer inlet shaft drives the secondary motor (9), which thus becomes a generator. The corresponding frequency inverter allows for variation of the generator speed and transmission of energy to the main VFD. The energy is recycled (according to VFD efficiency N>0.8) and not perceived by the network.

NOTE:
In this configuration, considering the direction of the flights, the scroll will turn faster than the bowl in order to evacuate the sediments at the end of the cone shaped bowl.

2. ELECTRONIC FREQUENCY INVERTER COUPLING

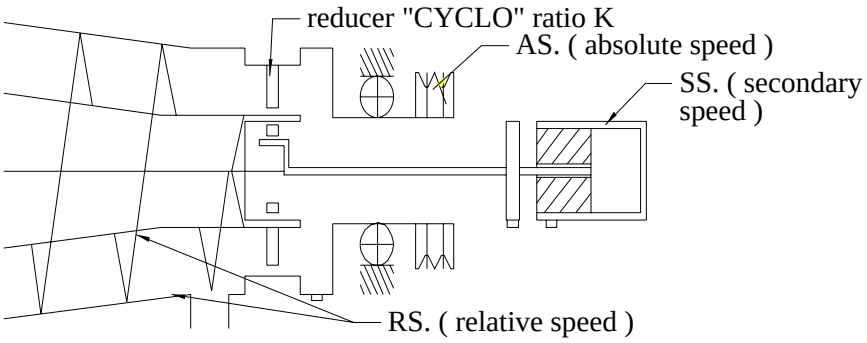
- Cabling principle



Note: Electric diagrams, done by the client, must be submitted for approval by ANDRITZ

3. MECHANICAL PRINCIPLE - SAFETY PRINCIPLE

Preliminary remarks



The relation between the bowl speed (AS), the speed of the screw in relation to the bowl (RS) and the reduction gear inlet shaft speed (SS) is established as follows:
RS = (AS - SS)/K K = the reduction gear reducing ratio
or SS = AS - (RS x K)

Based on this relation, it may be deduced that:

RS = 0 for AS = SS
RS = + for SS < AS
RS = - for SS > AS
RS = maximum for SS mini

Mechanical operation conditions

1 **RS positive ----> SS < AS**
to evacuate solid matter towards the edge of the cone shaped bowl.

2 **RS mini --------> (AS - SS maximum) / K > 3 to 5 rpm**
to avoid plugging

3 **RS maximum --------> (AS - SS mini) / K with AS - SS mini < N_{limit}**
to avoid excessive reduction gear grease mixing and to avoid excessive inlet shaft bearings speed.

See table for value of **N_{limit}**

Machine	D1L	D2L	D3L	D4L	D5L	D6L	D7L
N (rpm)	4000	3500	2700	2500	2200	2000	1800

Example D4L

AS = 3000 rpm
N_{limite} = 2500 rpm,
Therefore SS = 3000 - 2500 = 500 rpm min. under normal operating conditions
For K = 71. The maximum RS shall be: 2500/71 = 35 rpm

NOTE:
In the "mechanical variation" version, the AS/SS torque is carried out by a motor with 2 shaft ends, which control the AS at one end and the SS through the inverter at the other. For a given SS variation range, simply adjust the mechanical and electrical switches: (SS MINIMUM and SS MAXIMUM) to meet the conditions detailed above.
In the "electronic variation" version, the main motor and the secondary motor/generator are independent. In addition, considering the fact that their acceleration and deceleration ramps are different, the relative speed during the start-up or shut down phases may be negative or even nil.

At first, this could be considered inconvenient, but in reality, the electronic elements (automation) eliminate this inconvenience fairly easily and, more importantly, the system allows for other possibilities such as:

1° - After the shutdown phase, re-start 2 or 3 times in a row with low AS and negative SS to clean the bowl thoroughly. *(see diagram, chapter 6.4).*

2° - During the 1st threshold, increase the RS to make de-plugging easier, then re-calibrate to the original speed. *(see diagram, chapter 6.5).*

3° - De-plugging with AS at low speed and negative SS to increase the RS *(see diagram, chapter 6.6).*

4° - Stationary cleaning: low speed cleaning with slow AS speed and SS in one direction and then in the opposite direction. *(see diagram, chapter 6.7).*

5° - During the speed reduction phase, if the liquid is to be prevented from overflowing into the sediment case, the scroll must be made to turn more slowly than the bowl before the liquid ring collapses (under 100 rpm), to direct the liquid back into the head wall.

6° - During extended operation when empty, free the motor/generator to obtain a nil RS (avoid putting stress on the joints at relative speed and avoid operating the reduction gear when empty).

Contact ANDRITZ for any special applications.

4. FREQUENCY INVERTERS

1° - The frequency is varied either by hand using a potentiometer, or by a 0 - 10 V tension source or a 4 - 20 mA current source.

2° - In any case, whatever the planned frequency, start-up must always commence at the beginning of the programmed acceleration ramp.

3° - This acceleration ramp (for the main motor inverter) must be adjusted so that the intensity absorbed is inferior to the nominal intensity.

The rotor of a highly inert decanting machine requires a gradual increase ramp, therefore a relatively long period of time, or a slope equal to :

- Approximately 150s for a range of 0.5 to 50 Hz

- Approximately 260s for a range of 0.5 to 87 Hz (150 x 87/50) =260s

- Approximately 300s for a range of 0.5 to 104 Hz

- Approximately 430s for a range of 0.5 to 144 Hz

NOTE:
0.5-144 Hz is recommended for linear characteristics, in case of 0.10 V or 4.20 mA control.

4° - The main motor deceleration ramp must be adjusted so that the inverter uses practically no energy (approximately 15 to 20 % of the nominal force), exceeding this limit risks tripping the system, except in special cases: injection of direct current or braking resistance.

Practical adjustment:
For the 0 - 50 Hz range, the minimum time must be equal to 80 % of the speed reduction time:

Ex :D4 L at 3000 rpm
Speed reduction time: 8 min x 60 = 480 s
RAMP Time: 480 x 80/100 = 384 s
For the 0 - 144 Hz range, this time should be equal to 384 x 144 / 50 = 1106 s

5° - Concerning the motor/generator, the acceleration and deceleration ramps must be adjusted according to the RS variation speed desired, rather than according to the inertia of the screw conveyor after reduction, which remains low, viewed from the input shaft side.

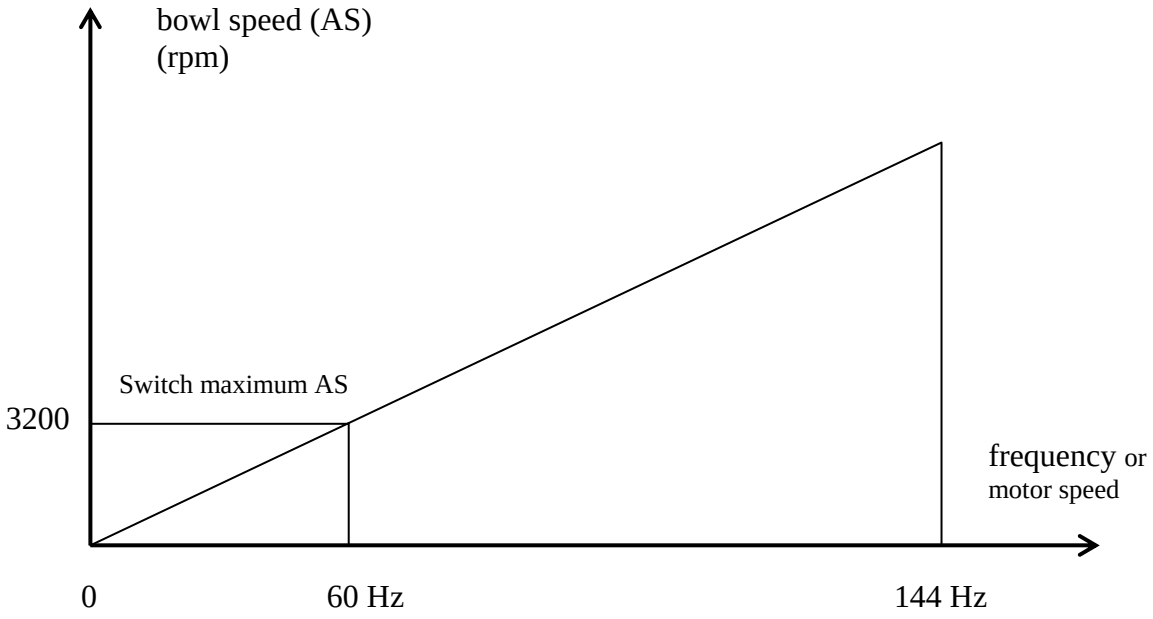
Ex : For the 0 - 144 Hz range

Variable times from 30 s to 120 s and more if necessary, for example, when adjusting with a product which is not very responsive to the torque.

6° - If the machine is in permanent in use, the inverter must not be used under 10 Hz (except in a particular case of low speed rotor drive CIP (stationary cleaning) cycle).

MAIN MOTOR FREQUENCY INVERTER

4.1 - MAXIMUM AS Switch Adjustment

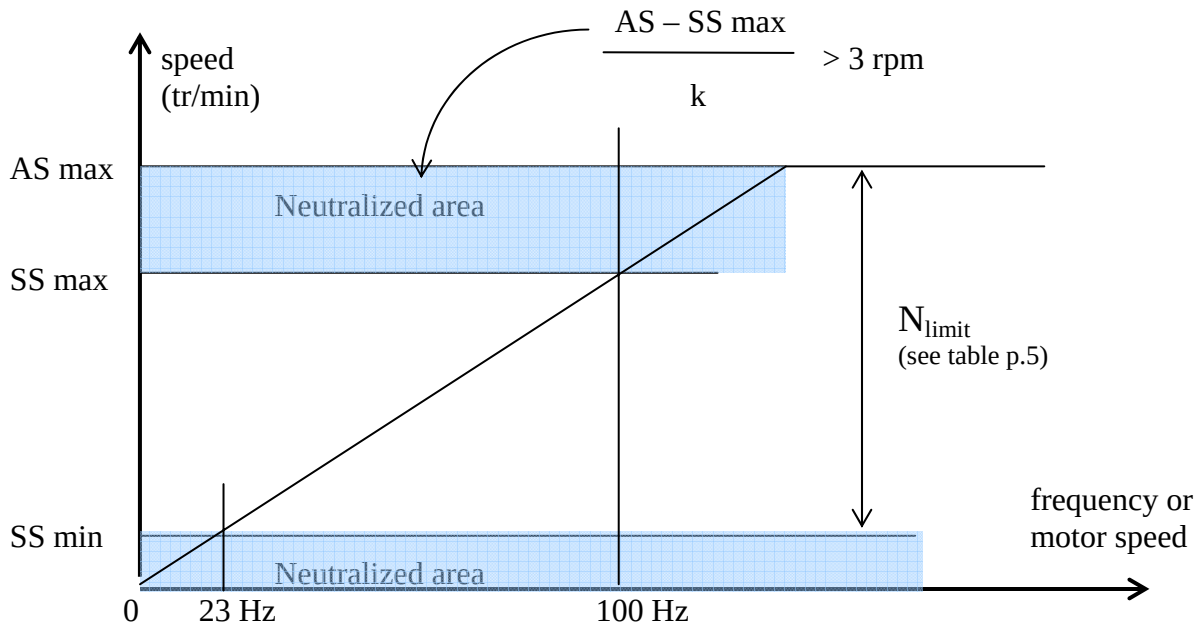


Example: D4L machine

Characteristics: AS maximum speed = 3,200 rpm
Driving pulley / machine pulley ratio R1 = 1.8
Acceleration ramp: 0 to 144 Hz
Motor N speed = 1,480 rpm (for 50 Hz)

Calculations: MAXIMUM frequency = 50 Hz x AS / N motor x 1/R1
= 50 x 3200/1480 x 1/1.8 = 60 Hz

4.2- RS maximum & RS minimum Adjustment



Example: D4L machine

Characteristics:	AS bowl speed	= 3200 rpm
	Value of N	= 2500 rpm (according to the table)
	K reduction ratio	= 71
	Generator speed	= 1500 rpm (for 50 Hz)
	Minimum relative speed	= 3 rpm

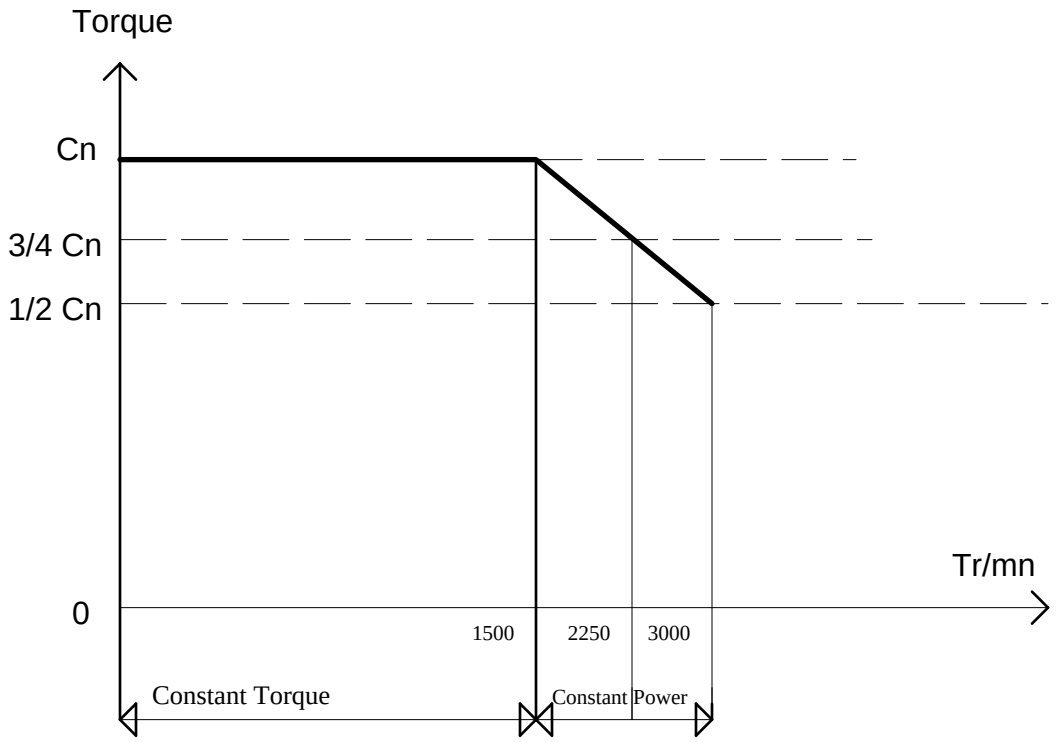
Calculations: SS MAXI = AS - (RS Mini x k) = 3200 - 3x71 = 2987 rpm
(50*2987)/1500 = **100 Hz**
SS MINI = AS - N = 3200 - 2500 = 700 rpm
(50*700)/1500 = **23 Hz**

5. MOTOR / GENERATOR

If an asynchronous motor is driven at a speed, which is higher than its synchronized speed, and if it is connected to an electric system, it will become an asynchronous generator. When operating as a generator, the absolute value of the maximum torque is slightly higher than the absolute value of the operating motor and the slippage will become negative.

In most cases, three-phased asynchronous squirrel cage motors are used; these motors are simple, robust and require no special maintenance. Moreover, they do not require special current excitation. They are considerably less expensive than synchronized generators and simpler to connect, since synchronization during coupling on the system is not necessary.

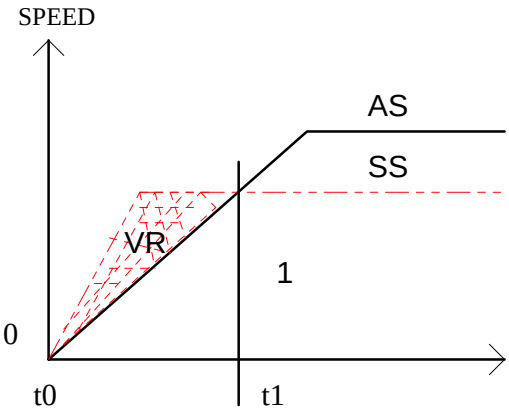
NOTE:
The motor/generator works at a constant torque until it has reached its nominal speed and at constant power when it exceeds its nominal speed (see the diagram below).

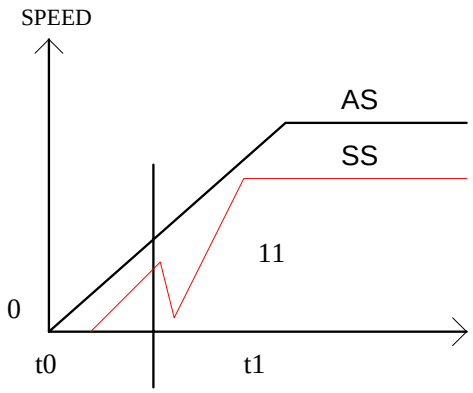


Ex: Motor/generator : 7.5 KW, 1,500 rpm
Nominal torque Cn : 48 Nm
Torque at 2,250 rpm : 36 Nm

6. AS/SS COMBINATIONS

6.1- Start-up





I - <u>Simultaneous start-up (AS and SS) with RS</u>

t0 : start-up AS and SS

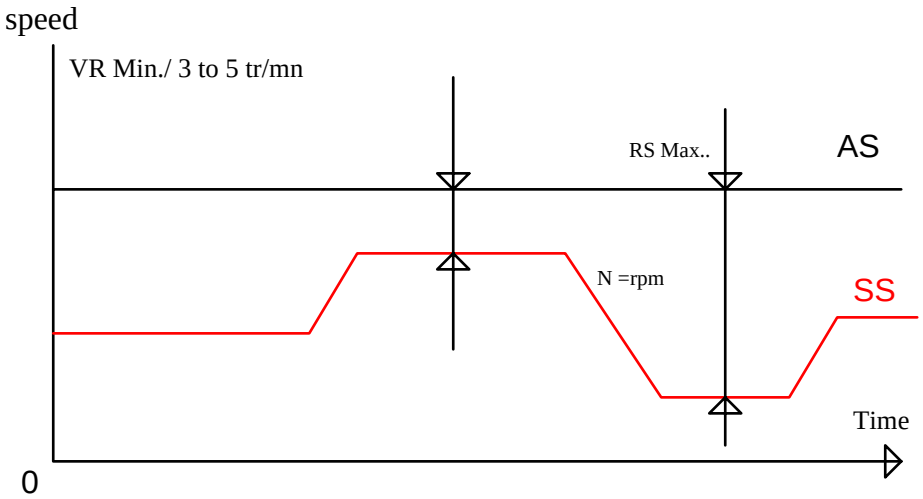
from t0 to t1 : the relative speed is negative

II - <u>Delayed SS start-up with RS +</u>

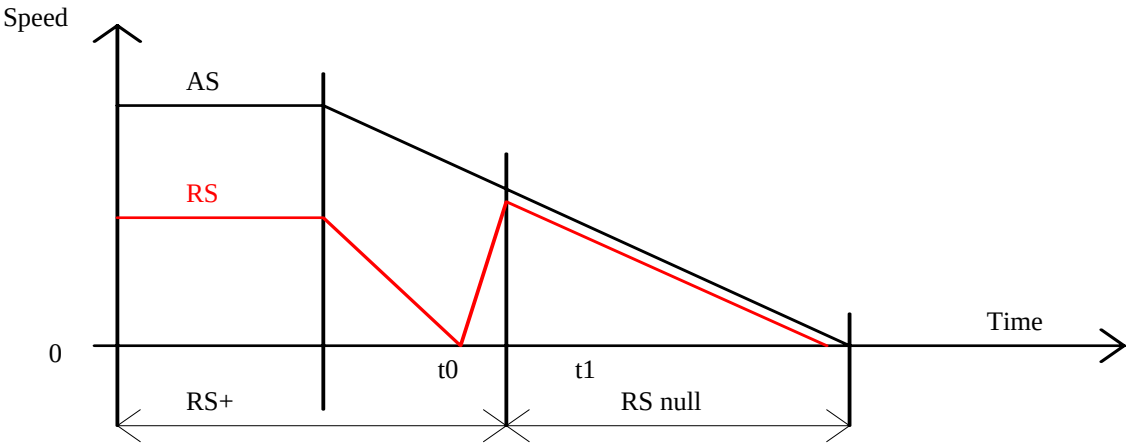
t0 : AS start-up
SS is driven by AS

t1 : SS start-up : the motor/generator takes control of the shaft first by reducing its speed to equal its own speed, then by accelerating the speed of the shaft according to its ramp.

6.2- Normal operation with RS mini/maxi variation

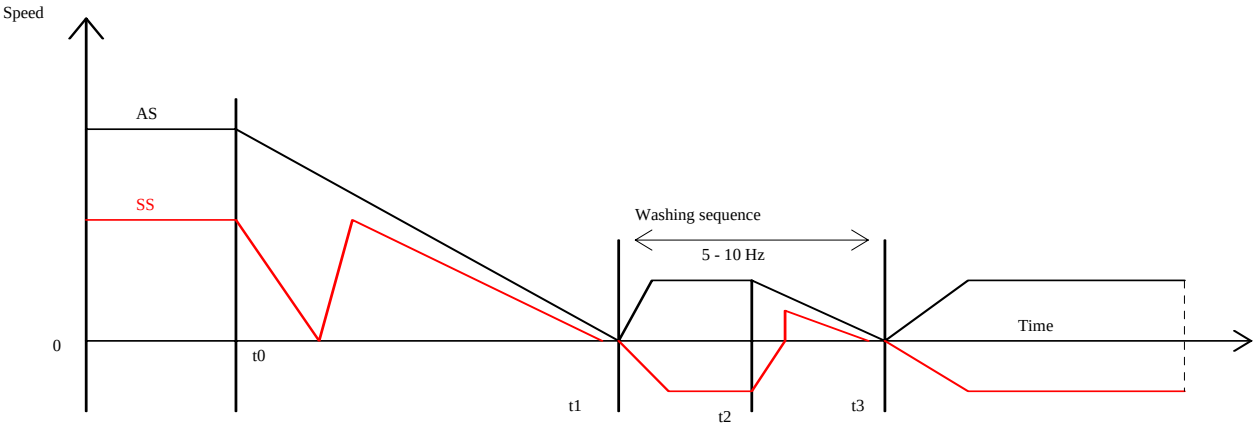


6.3- Simple SHUT DOWN



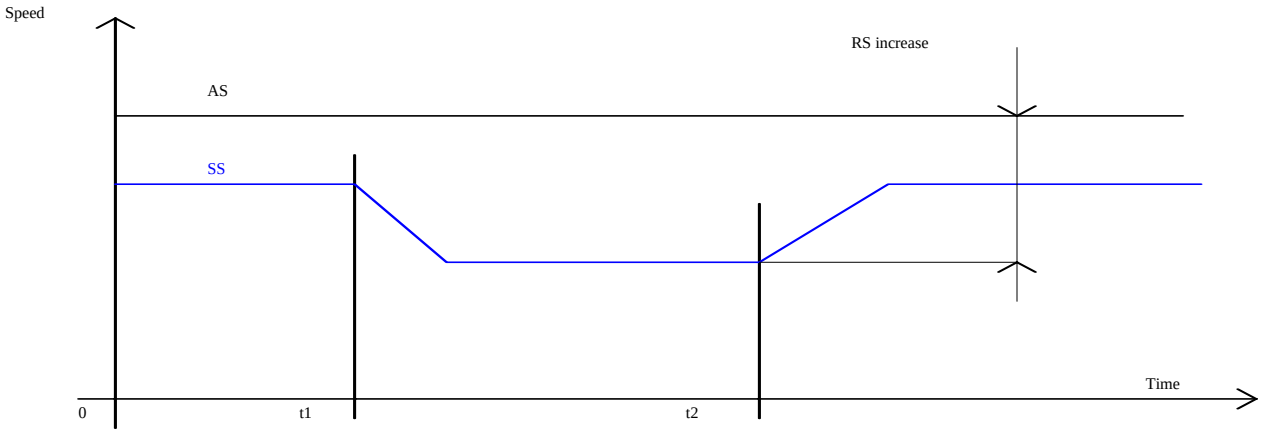
t0 : Shut down by deceleration AS and SS with a different ramp.
t1 : The generator uncouples (under 2 Hz).
The speed of the input shaft meets the speed of the bowl AS; the relative speed is reduced to zero.

6.4 - SHUT DOWN with successive re-starting to perfect cleaning of the bowl



t0 : Simple shut down
t1 : AS and SS re-starting
t2 : Shut down
t3 : Re-starting sequence repeated n times (n = 2 to 3).
Note: AS: low speed 10 Hz
SS : negative (-10Hz) to increase the relative speed

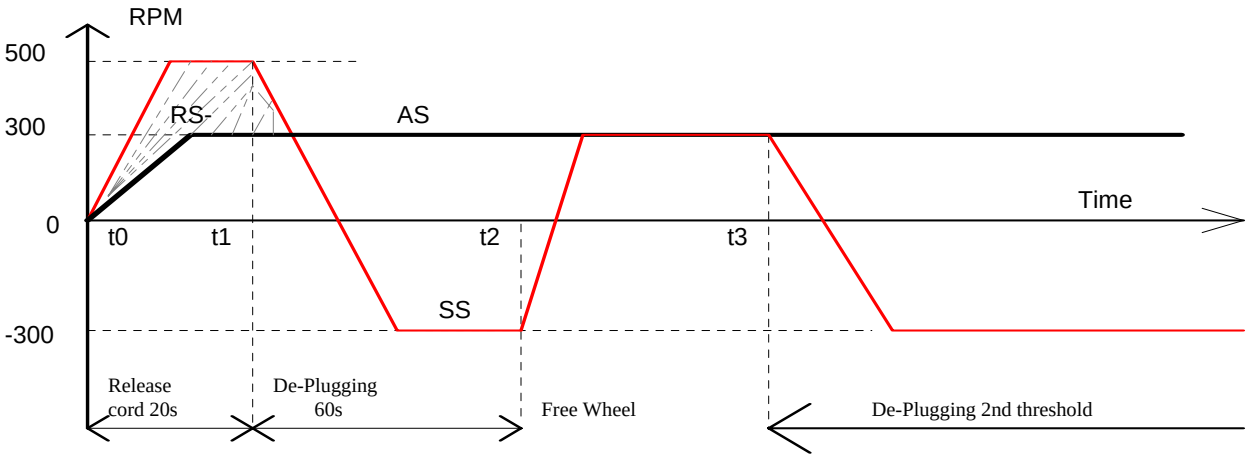
6.5 - De-Plugging 1st threshold



t1 : Begin 1st threshold. Reduce SS to increase RS.
t2 : Return to the original position

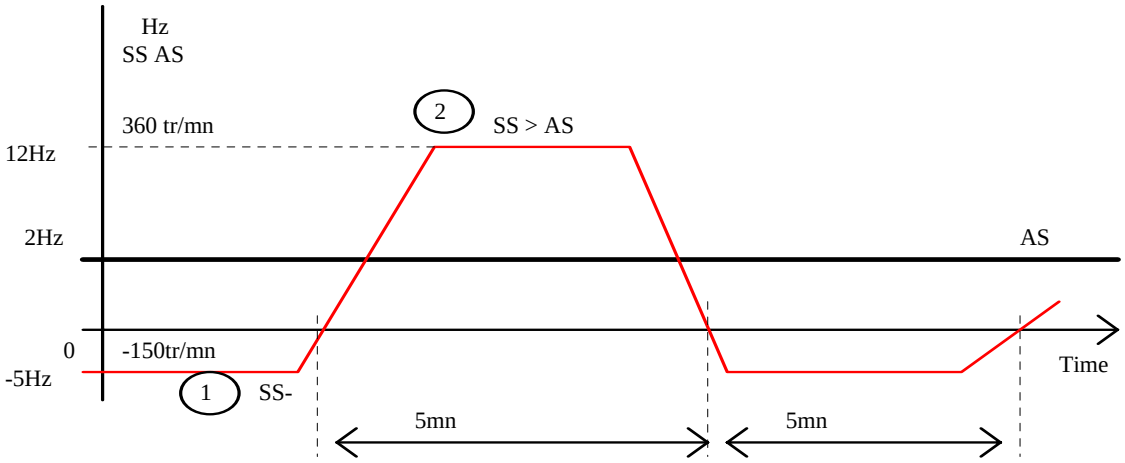
6.6 - Low speed de-plugging

Note: If the bowl torque is too high, the bowl may be blocked while rotating by placing a wooden wedge between the diffusion apparatus tripping blade and the open sediment case. In this way, the bowl inverter will be neutralized.



t0 : simultaneous re-starting of AS and SS
t0 to t1 : RS to compress the cord in the opposite direction
t1 : SS deceleration command until approximately - 300 rpm
t2 : if the product is not extracted, give the order to stop the secondary motor.
t3 : return 2nd operation

6.7 - STATIONARY CLEANING (example of a wash cycle diagram)



1) AS : low speed
SS : negative for higher RS
Ex : RS (1) = (AS - SS) / k = (106 - (- 150)) / 71 = + 3.6 rpm

2) AS : low speed
SS > AS for low negative RS
Ex : RS(2) = (AS - SS)/K = (106-360)/71 = -3.6 rpm

7. CONCLUSION

This double speed variation devise is as reliable and as robust as a short-circuit cage motor.
In addition, the later is well protected by frequency inverters which have also been chosen for their dependability.

This system also offers effective protection of the reducer which will not, under any circumstances, work under an excessive load, since the generator acts as the electromagnetic torque limiter.

A fair amount of energy is regenerated, even slightly more than the energy regenerated with a mechanical inverter.

Maintenance is limited simply to lubrication of the motors, approximately every 3,000 hours.

Finally, the flexibility of this devise allows the user to obtain the best AS/SS combination, depending on the product.

ELECTRICAL DOCUMENTS

SEQUENCE OF OPERATION

The centrifuge control system consists of two panels. The Centrifuge Starter Panel (CSP) which houses the variable frequency drives and any other power devices required for the project. The Centrifuge Operator Panel (COP), which houses the programmable logic controller (PLC) and operator interface terminal (OIT). It is important to insure that all control switches are in proper position and equipment is ready to operate from the COP. The "inhibit centrifuge run" bit form the plant must equal zero (not energized) for the centrifuge to run. The "alarm input for centrifuge pause" bit must equal zero (not energized) before attempting an autostart.

COP and CSP emergency stops will de-energize the master control relay to interrupt all run commands for immediate shutdown. To restart system, the emergency stop(s) must be manually reset.

OIT SCREENS

- Main- this screen provides a system overview with operational status indicators, mode selection touch zones, sequence start and stop touch zones, and access to other system screens.
- Manual Control- this screen provides start and stop touch zones and status indicators for each piece of equipment.
- Polymer & Sludge setup- this screen provides set point entry for polymer and sludge flows along with numeric and bargraph representations of both setpoints and actual flows.
- Torque Control- this screen allows selection of PID auto or manual mode, entry of relative speed or torque setpoint, and numeric and bargraph representation of setpoints and actual values.
- System Monitor- this screen provides numeric and bar graph representation of setpoints and actual values of all system-monitored values along with centrifuge run time indication.
- Alarms- this screen provides indication for all system alarms including counters for high vibration and high torque alarms (see alarm description below for details).
- Torque Control Setup- this screen is password protected and provides entry for PID tuning parameters for the torque control loop.
- Setup1- this screen is password protected and provides entry for centrifuge specific machine and motor data for PLC program use.
- Setup2- this screen is password protected and provides entry for auto start, auto stop, and conveyor torque control parameters.
- Setup3- this screen is password protected and provides CIP settings.
- Setup4- this screen is password protected and provides entry for alarm setpoint parameters.

STARTING/STOPPING MODES

- On the "Main" screen select the system-operating mode by touching one of the mode select touch zones (Auto, CIP or Maintenance). All equipment must be stopped to change modes; this will be indicated by the mode select enabled indicator.

  Manual mode – In this mode, system components can be started with their respective start pushbuttons, which can be accessed by touching the manual control touch zone, which displays the "Manual Control" screen. System components are stopped with their respective stop pushbuttons. Emergency stop will always stop all equipment. **This mode of operation is provided for maintenance purposes only and should not be left unattended.**

Auto mode – In this mode, start-up and shutdown can be controlled from the auto start/auto stop pushbuttons. Operating the auto start pushbutton will initiate the sequence of events described below. At any time while in the Auto mode the operator can begin a start-up or shutdown. After an Auto stop has completed, an Auto CIP will begin.

Clean in place (CIP) mode. In this mode, start-up and shutdown can be controlled from the CIP start/stop pushbuttons. Operating the CIP start pushbutton or any Auto stop sequence will initiate an automatic CIP.

Operating the Auto Start pushbutton will initiate the following sequence of events:

1. Centrifuge bowl drive starts (instantly)
2. Centrifuge back drive starts (3 second delay from bowl starting)
3. Polymer pump starts (when the bowl reaches 95% speed)
4. Sludge pump starts (xx seconds delay from polymer pump starting)
5. Plug valve opens (when centrifuge starts)
6. Reversing conveyor starts in reverse (when plug valve opens)
7. Reversing conveyor washwater valve opens (when conveyor runs reverse)
8. Plug valve closes (based on torque setpoint)**
9. Reversing conveyor starts in forward (based on torque setpoint)**
10. Stacker conveyor starts (when reversing conveyor runs forward)
11. Reversing conveyor washwater valve closes (when conveyor runs forward)

* - Time delay is set on “Setup 2” screen.

While Auto start is in progress the Auto start indicator light will flash “STARTING IN AUTO”. After start-up is complete the indicator light will stay on steady “RUNNING IN AUTO”.

Operating the Auto Stop pushbutton will initiate the following sequence of events:

1. Sludge pump stops (instantly)
2. Polymer pump stops (instantly)
3. Centrifuge goes to relative speed control (instantly)
4. Plug valve opens (when torque setpoint is met)**
5. Reversing conveyor runs in reverse (when plug valve opens)
6. Reversing conveyor washwater valve opens (when reversing conveyor runs reverse)
7. Stacker conveyor stops (xx seconds after reversing conveyor runs reverse)***
8. Centrifuge goes to auto stop preset speed #1 (at normal deceleration ramp)
9. Washwater valve opens (once centrifuge is at preset speed #1)
10. Centrifuge remains at this preset speed #1 (duration as set on “Setup 2” screen)
11. Centrifuge goes to auto stop preset speed #2 (at normal deceleration ramp)
12. Centrifuge remains at this preset speed #2 (duration as set on “Setup 2” screen)
13. Washwater valve closes (at bowl speed set on “Setup 2” screen)
14. Centrifuge stops (at normal deceleration ramp)
15. Reversing conveyor stops (when centrifuge stops)
16. Reversing conveyor washwater valve closes (when conveyor stops)
17. Automatic CIP (after factory set time elapses)

**- Torque setpoint for conveyor operation and washwater timing is set on “Setup 2” screen.
*** - Time delay is set on “Setup 2” screen.

Auto stop indicator light will flash “STOPPING IN AUTO” while in progress and go on steady “STOPPED IN AUTO” when complete.

CIP mode – In this mode, start-up and shutdown can be controlled from the CIP start/auto stop pushbuttons. Operating the CIP start pushbutton or any Auto stop will initiate the following sequence of events. At any time while in the CIP mode the operator can begin a start-up or shutdown.

Operating the CIP Start pushbutton will initiate the following sequence of events:

1. Centrifuge bowl drive starts (instantly)
2. Centrifuge back drive starts (3 second delay from bowl run confirm)
3. Washwater valve opens (once bowl and scroll come to speed)
4. Plug valve opens (when washwater valve opens)
5. Reversing conveyor runs in reverse (when plug valve opens)
6. Reversing conveyor washwater valve opens (when conveyor runs in reverse)

The duration and speeds for the CIP cycle are set on “Setup 3” screen.

Operating the CIP Stop pushbutton will initiate the following sequence of events:

1. Washwater valve closes (instantly)
2. Centrifuge stops (at normal deceleration ramp)
3. Plug valve closes (instantly)
4. Reversing conveyor stops (when plug valve closes)
5. Reversing conveyor washwater valve closes (when conveyor stops)

OPERATING MODE

Torque/Relative speed control:
The centrifuge operates in two different control modes torque control (PID Auto) or relative speed control (PID manual). The active control mode is indicated below the centrifuge graphic on the main screen. To access control mode selection and setpoint entry touch the centrifuge graphic, this will display the Torque control screen. The control mode is selected by touching either the Auto or Manual touch zones. The setpoint is entered by touching the numeric display button, which brings up a numeric entry keypad. The setpoint range is 0-100% * for Torque setpoint and 0-15 ** for Relative speed setpoint.

*- Torque setpoint may be limited on the Torque Control Setup screen.
**- Relative speed maximum is limited on Torque Control Setup screen.

Feed Control:
The speed/flow set points for the polymer and sludge pumps can be accessed by touching either pump graphic, this will display the “Polymer and Sludge Setup” screen. To change pump settings simply touch the pump selection touch cell. This will bring up a numeric entry keypad. The setpoint range is based on actual flow range.

Feed Control Pause:

There is a Pause and Resume push-button located on the Main screen, Polymer and Sludge Setup screen. The Pause pushbutton, when depressed will cause a temporary sludge and polymer shutdown to allow changing of trucks. To reactivate the feed system, depress the appropriate Resume pushbutton. When a centrifuge has been paused for 10 minutes the alarm horn will sound 3 times to draw attention to a none processing machine. This will continue for 1 hour and at that time an auto stop sequence will be initiated. The feed control pause can also be initiated from the plant through the "alarm input for centrifuge pause" bit.

ALARMS

Alarm conditions are indicated with red indicators on the alarm screen and will cause the alarm horn to sound and the beacon to flash. Alarm lights will go on steady as long as the signal is still in the fault condition. Operating the acknowledge pushbutton will silence the horn and cause the indicator light to flash only if the condition has been cleared. Operating the reset button will clear the alarm indicator and allow system start-up.

The following conditions will immediately shutdown the complete system in auto, manual, or CIP:

- CSP or COP Emergency stop
- Bowl drive VFD fault
- Bowl motor high temperature
- Scroll drive VFD fault
- Scroll motor high temperature
- High-High torque
- High-High vibration **
- DC bus blown fuse
- Feed end bearing high-high temperature**
- Drive end bearing high-high temperature**
- Centrifuge high torque third strike alarm
- Centrifuge high vibration third strike alarm
- Inhibit centrifuge run input from plant

The following conditions will enable a feed pause in the auto mode:

- High vibration *, **
- High torque *, **
- Polymer pump VFD fault
- Polymer pump dry run protection fault
- Polymer pump high discharge pressure alarm
- Polymer pump gear motor overload alarm
- Sludge pump VFD fault
- Sludge pump high vacuum alarm
- Sludge pump high discharge pressure alarm
- Low differential speed *, **
- Reversing conveyor fault
- Reversing conveyor zero speed
- Reversing conveyor e-stop pull cord
- Stacker conveyor fault

The following conditions will enable an alarm only:

- Feed end bearing high temperature**
- Drive end bearing high temperature**

*- High vibration or high torque will initiate a flush sequence the duration of which is set on “Setup 3” screen. If three high vibration or high torque alarms occur within a ten-minute time limit an auto stop sequence will be initiated. If the alarm clears the polymer and sludge pumps will be restarted in auto mode.

**- These alarm set points are set on “Setup 4” screen.

Grease timer:
On the System monitor screen, there is a “time till next Lube” display. This display is in hours, and counts down the appropriate amount of time required between lubricating of the centrifuge. When this display reaches “0” it is time to lube the machine. To reset the display after lubrication you must, with the machine running and the display at 0 or below, press the reset button.

CONTROL SYSTEM DESCRIPTION

The Centrifuge will be supplied with a Centrifuge Starter Panel (CSP) and a Centrifuge Operator Panel (COP). All control panels will be U.L. 508a listed.

The CSP will be a Nema 12 painted enclosure 60” x 48” x 18” with 12” legs. The CSP will be ventilated.

The following major components will be mounted within the CSP:

- Main power circuit breaker disconnect switch, accepts 480 VAC, 3 Phase
- Control voltage transformer
- Primary control voltage fuses and secondary circuit breakers
- DC bus fuses
- Variable frequency drives for
  - Centrifuge bowl drive
  - Centrifuge back drive (scroll)
- Motor starter for reversing conveyor
- Terminal strip for all external connections with other equipment

The following controls shall be mounted on the CSP:

- Emergency Stop: Maintained position mushroom head pushbutton.
- Main disconnect: Circuit breaker operator handle with tripped indication, lockable

The following indicators shall be mounted on the centrifuge starter panel:

- System control power-on, illuminated push-to-test pilot light

The COP will be a Nema 4X 304 stainless steel enclosure 60” x 36” x 12” with 12” leg stands.

The following components will be mounted within the COP:

- PLC processor, power supply, all I/O cards, and communication modules
- Control relays
- Industrial Ethernet switch/modem
- Receptacle
- Surge suppressor
- Terminal strip for all external connections with other equipment.
- 24 Volt DC power supply
- Control circuit breakers

The following panel mounted devices shall be provided on the COP.

- System control power: On-Off selector/Emergency Stop pushbutton.
- Silence pushbutton
- Operator interface terminal.
- Alarm Beacon and Horn

The following controls shall be provided for the centrifuge control system via the panel mounted OIT:

- Auto/Maintenance/CIP mode selection
- Auto start/stop
- CIP start/stop
- Back drive PID Manual/Auto selection
- Back drive relative speed set-point (PID manual mode)
- Back drive torque set-point (PID auto mode)
- Centrifuge start/stop
- Centrifuge washwater open/close
- Polymer pump start/stop
- Polymer pump speed set-point
- Sludge pump start/stop
- Sludge pump speed set-point
- Reversing conveyor run fwd/rev/stop
- Reversing conveyor washwater valve open/close
- Stacker conveyor start/stop
- Plug valve open/close
- Alarm silence/reset
- Pause feed enable/resume

The following indicators shall be provided for centrifuge control system via the panel mounted OIT:

- Auto selected – on
- Auto start – in progress
- Auto stop – in progress with countdown timer
- CIP selected – on
- CIP start – in progress with countdown timer
- CIP stop
- Maintenance selected – on
- Feed pause - on
- Washwater valve – open
- Centrifuge – on
- Polymer pump – on
- Sludge pump– on
- Washwater valve – open
- Plug valve open/closed
- Reversing conveyor – running forward/reverse
- Reversing conveyor – zero speed

- Reversing conveyor – e-stop
- Reversing conveyor washwater valve – open
- Stacker conveyor – run
- Stacker conveyor – alarm
- Plug valve fault – alarm
- Bowl drive VFD fault – alarm
- Back drive VFD fault – alarm
- Scroll motor high temp – alarm
- Bowl motor high temp – alarm
- DC bus blown fuse – alarm
- Low relative speed – alarm
- Centrifuge high torque – alarm
- Centrifuge high-high torque – alarm
- Centrifuge High torque third strike – alarm
- Centrifuge high vibration – alarm
- Centrifuge high-high vibration – alarm
- Centrifuge High vibration third strike – alarm
- Drive end bearing high temperature – alarm
- Drive end bearing high-high temperature – alarm
- Feed end bearing high temperature – alarm
- Feed end bearing high-high temperature – alarm
- Polymer pump VFD fault – alarm
- Polymer pump dry run protection – alarm
- Polymer pump high discharge pressure – alarm
- Polymer pump gear motor overload – alarm
- Sludge pump VFD fault – alarm
- Sludge pump high vacuum – alarm
- Sludge pump high discharge pressure – alarm
- Reversing conveyor fault – alarm
- Red strobe alarm signal
- Centrifuge run inhibited by plant

The following digital meters shall be provided on the COP via the panel mounted OIT:

- Centrifuge bowl drive speed – RPM
- Centrifuge bowl drive load – % full load
- Centrifuge back drive speed – RPM
- Centrifuge back drive torque – % full load
- Centrifuge vibration – in/sec
- Drive end bearing temperature – °F
- Feed end bearing temperature – °F
- Polymer flow – GPM
- Sludge flow – GPM

All pushbuttons, selector switches and indicator lights will be NEMA 4X rated. OIT is NEMA 4X rated.

MACHINE WIRING

The centrifuge machine will be supplied with the following Nema 4X rated components: stainless steel terminal box, vibration sensor, bearing temperature sensors (1 ea. drive & feed ends), and centrifuge washwater valve (to be field mounted and wired).

All components will be wired complete to the terminal box with the exception of the washwater solenoid valves and the Centrifuge motors which will be field wired.

Wire runs will be rigidly mounted to centrifuge frame.

CENTRIFUGE STARTER PANEL INTERFACE REQUIREMENTS

- Power input from customer supply:
  - 480 VAC, 3 Phase, 60 HZ, 200 amps

- Power output from CSP to motors:
  - Bowl drive motor (100 HP)
  - Back drive motor (20 HP)
  - Reversing conveyor motor

- Outputs from CSP to COP: (dry contact)
  - DC Bus blown fuse
  - CSP E-stop
  - Bowl motor high temp
  - Back motor high temp
  - Reversing conveyor run forward confirm
  - Reversing conveyor run reverse confirm
  - Reversing conveyor fault

CENTRIFUGE OPERATOR PANEL INTERFACE REQUIREMENTS

- Power input from CSP:
  - 120 VAC, 1 PHASE, 60 HZ 10 amps

- Interconnect communication between COP and CSP: (Belden 9463)
  - Remote I/O for VFD communication with PLC

- Inputs to COP from remote equipment by others: (dry contact)
    - Polymer pump running
    - Polymer pump VFD fault
    - Polymer pump dry run protection switch
    - Polymer pump high discharge pressure switch
    - Polymer pump gear motor overload
    - Sludge pump running
    - Sludge pump VFD fault
    - Sludge pump high vacuum switch
    - Sludge pump high discharge pressure switch
    - Plug valve open confirm
    - Plug valve close confirm
    - Reversing conveyor – zero speed switch
    - Reversing conveyor e-stop pull cord
    - Stacker conveyor running
    - Stacker conveyor fault
    - Alarm input for centrifuge pause
    - Centrifuge run inhibit input

- Inputs to COP control panel from machine junction box: (4-20 MADC Signal)
    - Centrifuge vibration
    - Drive end bearing temperature
    - Feed end bearing temperature

- Inputs to COP from remote equipment by others: (4-20 MADC Signal)
    - Sludge flow indication
    - Polymer flow indication

- Outputs from COP to remote equipment by others: (4-20 MADC Signal)
    - Polymer pump speed setpoint
    - Sludge pump speed setpoint

- Outputs from COP to remote equipment by others: (dry contact)
    - Polymer pump run command
    - Sludge pump run command
    - Stacker conveyor run command
    - Plug valve open command
    - Plug valve close command
    - PLC fault
    - Centrifuge ready for sludge
    - Centrifuge autostop initiated

- Outputs from COP to remote equipment by others: (120 VAC)
    - Reversing conveyor washwater solenoid power

- Outputs from COP to field mounted devices Andritz supplied: (120 VAC)
    - Centrifuge washwater solenoid power

CONTROL PANEL

MAJOR COMPONENT LISTING

COMPONENT	MANUFACTURER
Enclosure	Universal, Inc. (per drawing size and configuration)
Main Circuit Breaker	Square D
Surge Protector	Control Concepts Islatrol/IC+115
Transformer	Square D 9070
VFD	Allen-Bradley PowerFlex 700
DC Bus Fuses (VFD)	Bussman Fuses: 170M1415 Fuse blocks: 170H1013 Microswitch: 170H0238
PLC	A-B SLC 5/05 1746-A13- 13 Slot Chassis 1746-P4 - Chassis Power Supply 1747-L551 Ethernet CPU 1747-SN – Remote I/O module 1746-IA16 - 16 Channel Input 1746-OA16 - 16 Channel Output 1746-NI4 - 4 Channel Analog Input 1746-NO4I – 4 Channel Analog Output 1747-M13
Operator Interface	A-B PanelView Plus 1000
DC power supply	A-B 2711P-RSACDIN
Modem/Ethernet Switch	AB 9300 RADES
Relays	Square D 8501 type K, X
Terminals	Entrelec M 4/6 Series
Fuse Blocks	Gould Ultrasafe
Fuses	Gould ATDR/ATQR
Pushbutton Controls	Square D 9001 SK Series
Control circuit breaker	A-B 1492-GH
Beacon	Federal 225xst Red 120 volt strobe
Horn	Edwards 876-N5
Wire Duct	Panduit
Wire/Cable	UL Listed
	Machine Components
Vibration Sensor	Hardy H1 5701vt 0-1ps/4-20madc
Temperature sensor	WEED: #110-01B-A-3-B-24-FB1 (2-total)
Sensor head	WEED: #2A00D1 (2-total)
Transmitter	WEED: #4HQT3U+000+0400F (2-total)
Terminal Box	Hoffman 8”X6”X4” stainless steel
Centrifuge WW solenoid	2” solenoid
Conveyor WW solenoid	1” solenoid

DRIVE LIST

DRIVE LIST

Bowl Drive Motor

MOTOR: (BY *ANDRITZ)*

MANUFACTURER: BALDOR ECP4400T-4-M13F-M23A

100HP 460V 3 PHASE, 60HZ, 1780 RPM 405T FRAME F3-TOP MOUNT TERMINAL BOX 1.15 SERVICE FACTOR TEFC, 40C AMBIENT, CONTINUOUS DUTY NEMA DESIGN B CLASS F INSULATION INVERTER SPIKE RESISTANT WIRE N.C. THERMOSTATS INSTALLED IN WINDINGS. PAINT MOTOR MG1000B84

1553—100hp	Baldor Super E	460V, 109A	405T	spec 16R068W66961 SN C0606015150	1780	stats,
1553—20hp	Baldor Super E	460V, 24.0A	256TC	cat M00 96518774—001 spec M09P070Y583G2	1765	stats, C-face

Back Drive Motor

MOTOR: (BY *ANDRITZ)*

MANUFACTURER: BALDOR CECP2334T-4-M23A-M13C

20HP 460 VOLT 3 PHASE 60HZ C-FACE 1765 RPM 256TC FRAME 1.15 SERVICE FACTOR TEFC 40 C AMBIENT,CONTINUOUS DUTY,NEMA DESIGN B,CLASS F INSULATION,INVERTER SPIKE RESISTANT WIRE, N.C. THERMOSTATS INSTALLED IN WINDINGS. PAINT MOTOR MG1000B84

BALDOR®

Integral Horsepower
AC Induction Motors
ODP, WPI, WPII Enclosure
TEFC Enclosure
Explosion Proof

Installation & Operating Manual

5/04 MN400

Table of Contents

Section 1
General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.

Important: **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Most Baldor products are warranted for 18 months from the date of shipment to Baldor's customer from Baldor's district warehouse or, if applicable, from Baldor's factory. Baldor Standard–E® standard efficient motors are warranted for 24 months. Standard–E is limited to three phase, general purpose, 1–200 HP ratings that fall under the Energy Policy Act (EPAct). Baldor Super–E® premium efficient motors are warranted for 36 months. Baldor IEEE841 motors are warranted for 60 months. All warranty claims must be submitted to a Baldor Service Center prior to the expiration of the warranty period.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
   a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
   b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Safety Notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.

WARNING: Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.

WARNING: This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.

WARNING: Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.

WARNING: Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.

WARNING: Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.

WARNING: Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.

WARNING: Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.

WARNING: Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.

WARNING: Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

Safety Notice Continued

WARNING: **Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo.**

Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.

WARNING: **UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**

Caution: **To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.**

Caution: **If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG-1 and MG-2 standards to avoid equipment damage.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Unpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WPII motor.
2. When lifting a WPII (weatherproof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.
3. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

   If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Section 2
Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

Location

It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor.

Proper ventilation for the motor must be provided. Obstructed airflow can lead to reduction of motor life.

1. **Open Drip–proof/WPI** motors are intended for use indoors where atmosphere is relatively clean, dry, well ventilated and non–corrosive.
2. **Totally Enclosed and WPII** motors may be installed where dirt, moisture or dust are present and in outdoor locations.

Chemical Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Alignment

Accurate alignment of the motor with the driven equipment is extremely important.

1. **Direct Coupling**
   For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
   The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
   The pulley ratio should not exceed 8:1.
4. **Belt Drive**
   Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

5. Sleeve bearing motors are only suitable for coupled loads.

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

Conduit Box

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

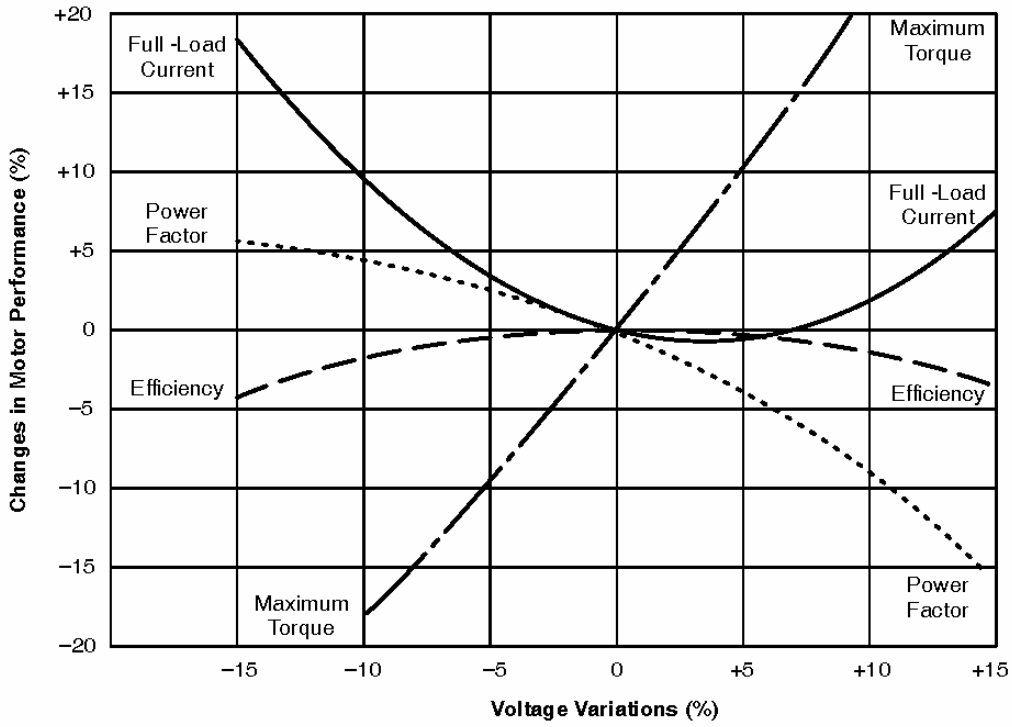
AC Power

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within ±10% of rated voltage with rated frequency. (See motor name plate for ratings).
   OR
2. AC power is within ±5% of rated frequency with rated voltage.
   OR
3. A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-1.

Figure 2-1 Typical Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

Coupled Start Up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor though the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3
Maintenance & Troubleshooting

WARNING: **UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.**

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Lubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:
Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

– Maximum operating temperature for standard motors = 110° C.
– Shut–down temperature in case of a malfunction = 115° C.

Lubrication Intervals

Recommended lubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2 and 3-3.

Table 3-1 Lubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)			3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)			* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)			*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Lubrication intervals are for ball bearings. For vertically mounted motors and roller bearings, divide the lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN401).
Relubrication interval for 6205 bearing bearing is 1550Hrs. (using grease lubrication).
Relubrication interval for 6806 bearing bearing is 720Hrs. (using grease lubrication).

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<–30° C **	

* Special high temperature grease is recommended (Dow Corning DC44). Note that Dow Corning DC44 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

** Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)					
	Bearing	OD D mm	Width B mm	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
					in^3	tea-spoon
56 to 180 incl. (63 to 112)	6206	62	16	0.19 (5.0)	0.3	1.0
210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (17)	1.2	3.9
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23)	1.5	5.2
Over 360 to 449 incl. (280)	6319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	6328	300	62	4.70 (130)	9.2	30.0
Over 360 to 449 incl. (280)	NU319	200	45	2.12 (60)	4.1	13.4
Over 5000 to 5800 incl. (355)	NU328	300	62	4.70 (130)	9.2	30.0
Spindle Motors						
76 Frame	6207	72	17	0.22 (6.1)	0.44	1.4
77 Frame	6210	90	20	0.32 (9.0)	0.64	2.1
80 Frame	6213	120	23	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB

Note: Not all bearing sizes are listed. For intermediate bearing sizes, use the grease volume for the next larger size bearing.

Lubrication Procedure

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings.
2. Remove grease outlet plug.
3. Add the recommended amount of grease.
4. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA listed explosion proof motor to maintain it's UL/CSA listing.

1. Disassemble the motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Lubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as “Severe”.
3. Table 3-3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 3-4 shows that 1.2 in^3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Accessories

The following is a partial list of accessories available from Baldor.
Contact your Baldor distributor for availability and pricing information.

Note: Space heaters and RTD's are standard on some motors.

Bearing RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor bearing during operation.

Bearing Thermocouples
Used to measure or monitor bearing temperatures.

Bearing Thermostat
Temperature device that activates when bearing temperatures are excessive. Used with an external circuit to warn of excessive bearing temperature or to shut down a motor.

Conduit Boxes
Optional conduit boxes are available in various sizes to accommodate accessory devices.

Cord & Plug Assembly
Adds a line cord and plug for portable applications.

Drains and Breathers
Stainless steel drains with separate breathers are available.

Drip Covers
Designed for use when motor is mounted in a vertical position. Contact your Baldor distributor to confirm that the motor is designed for vertical mounting.

Fan Cover & Lint Screen
To prevent build-up of debris on the cooling fan.

Nameplate
Additional stainless steel nameplates are available.

Roller Bearings
Recommended for belt drive applications with a speed of 1800 RPM or less.

Rotation Arrow Labels
Rotation arrows are supplied on motors designed to operate in one direction only. Additional rotation arrows are available.

Space Heater
Added to prevent condensation of moisture within the motor enclosure during periods of shut down or storage.

Stainless Hardware
Stainless steel hardware is available. Standard hardware is corrosion resistant zinc plated steel.

Winding RTD
RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor winding during operation.

Winding Thermocouples
Used to measure or monitor winding temperatures.

Winding Thermostat
Temperature device that activates when winding temperatures are excessive. Used with an external circuit to warn of excessive winding temperature or to shut down a motor.

Note: On some motors, leads for accessory devices are brought out to a separate conduit box located on the side of the motor housing (unless otherwise specified).

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten “Thru Bolts”.
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $^3/_4$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $^3/_4$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $^3/_4$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $^3/_4$ filled.

Suggested bearing and winding RTD setting guidelines

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTD (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

Winding RTDs – Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Class B Temp Rise ≤ 80°C (Typical Design)		Class F Temp Rise ≤ 105°C		Class H Temp Rise ≤ 125°C	
	Alarm	Trip	Alarm	Trip	Alarm	Trip
≤ Rated Load	130	140	155	165	175	185
Rated Load to 1.15 S.F.	140	150	160	165	180	185

Note: • Winding RTDs are factory production installed, not from Mod–Express.
• When Class H temperatures are used, consider bearing temperatures and lubrication requirements.

Bearing RTDs – Temperature Limit In OC with 40°C Max Ambient

Bearing Type Oil or Grease	Anti–Friction		Sleeve	
	Alarm	Trip	Alarm	Trip
Standard*	95	100	85	95
High Temperature**	110	115	105	110

Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.
** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as "standard" lubricants) include the following:
– Texaco Polystar
– Rykon Premium #2
– Chevron SRI #2

See the motor nameplate for replacement grease or oil recommendation. Contact Baldor application engineering for special lubricants or further clarifications.

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MN400

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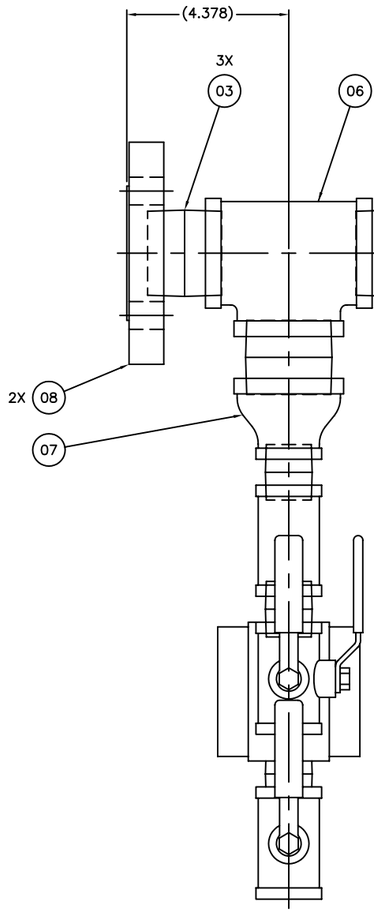
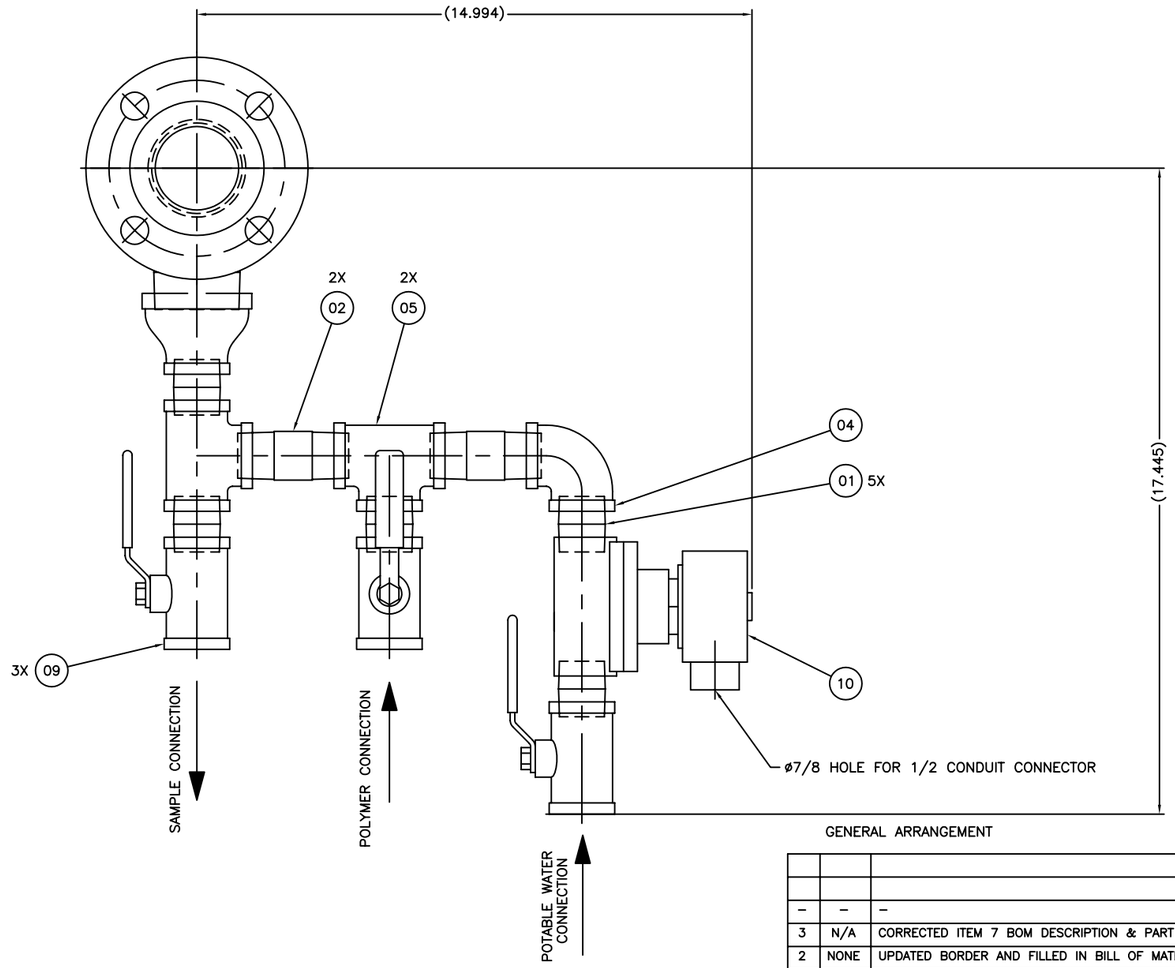
5/04 C&J10000

PROJECT DRAWINGS

No	PART No	QTY	DESCRIPTION	MATERIAL
01	PINIX1.0CMN	5	CLOSE NIPPLE, 1"	*
02	PINIX1.0CMN3	2	NIPPLE, 1 x 3 LG	*
03	PINIX2.0CMN	3	CLOSE NIPPLE, 2"	*
04	PI90X1.0CFN	1	90° ELBOW, 1"	*
05	PITEX1.0CFN	2	TEE, 1" FNPT	*
06	PITEX2.0CFN	1	TEE, 2" FNPT	*
07	PIREX2X1CFN	1	REDUCER, CONC., 2 X 1 SCH 40 FNPT	*
08	PIFLX2.0FFN	2	FLANGE, 2 (150 LB) THREADED	*
09	VBLX1.0FFN	3	BALL VALVE, 1" FNPT	*
10	SEE ELEC BOM	1	ASCO 82110D89, 1 SOL VALVE	*

* SEE JOB BOM FOR MATERIAL





GENERAL ARRANGEMENT

REV	EIR	REVISION	BY	APVD	DATE
–	–	–	–	–	–
3	N/A	CORRECTED ITEM 7 BOM DESCRIPTION & PART NUMBER	JAB	JB	01/09/01
2	NONE	UPDATED BORDER AND FILLED IN BILL OF MATERIALS	MPU	JB	01/05/00
1	NONE	REVISED GRAPHICS	MPU	JB	09/17/97

ESTIMATED WEIGHT IN LBS:	DRAWN BY: MPU	DATE 01/17/97
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER	CHECKED BY:	DATE
	APPROVED BY: JB	DATE 01/17/97
	THIRD ANGLE PROJECTION	

ANDRITZ

ANDRITZ–RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE
CENTRIFUGE
2" MANIFOLD PIPING

SIZE	DRAWING NUMBER	REV
D	DMM14325	3

SCALE	FILE	SHEET
1/2	14325B01	1 OF 1

FOR APPROVAL ONLY

No	PART No	QTY	DESCRIPTION	MATERIAL
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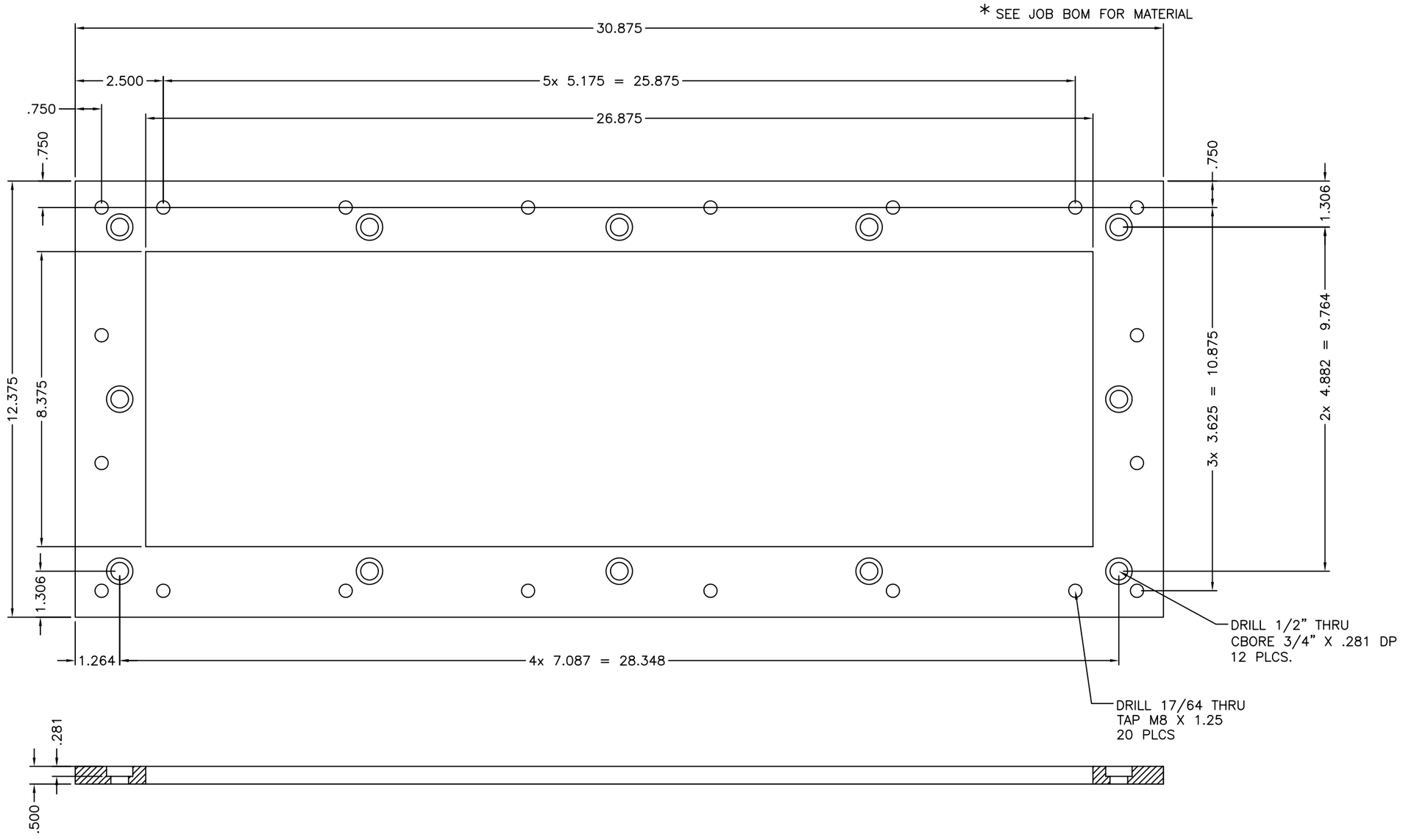

ESTIMATED WEIGHT IN LBS:	DRAWN BY: TB	DATE 11/19/02
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: JB	DATE 11/19/02
MACHINING TOLERANCES .XXX±.005 ANG±.5' HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ
ANDRITZ-RUTHNER, INC.
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ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

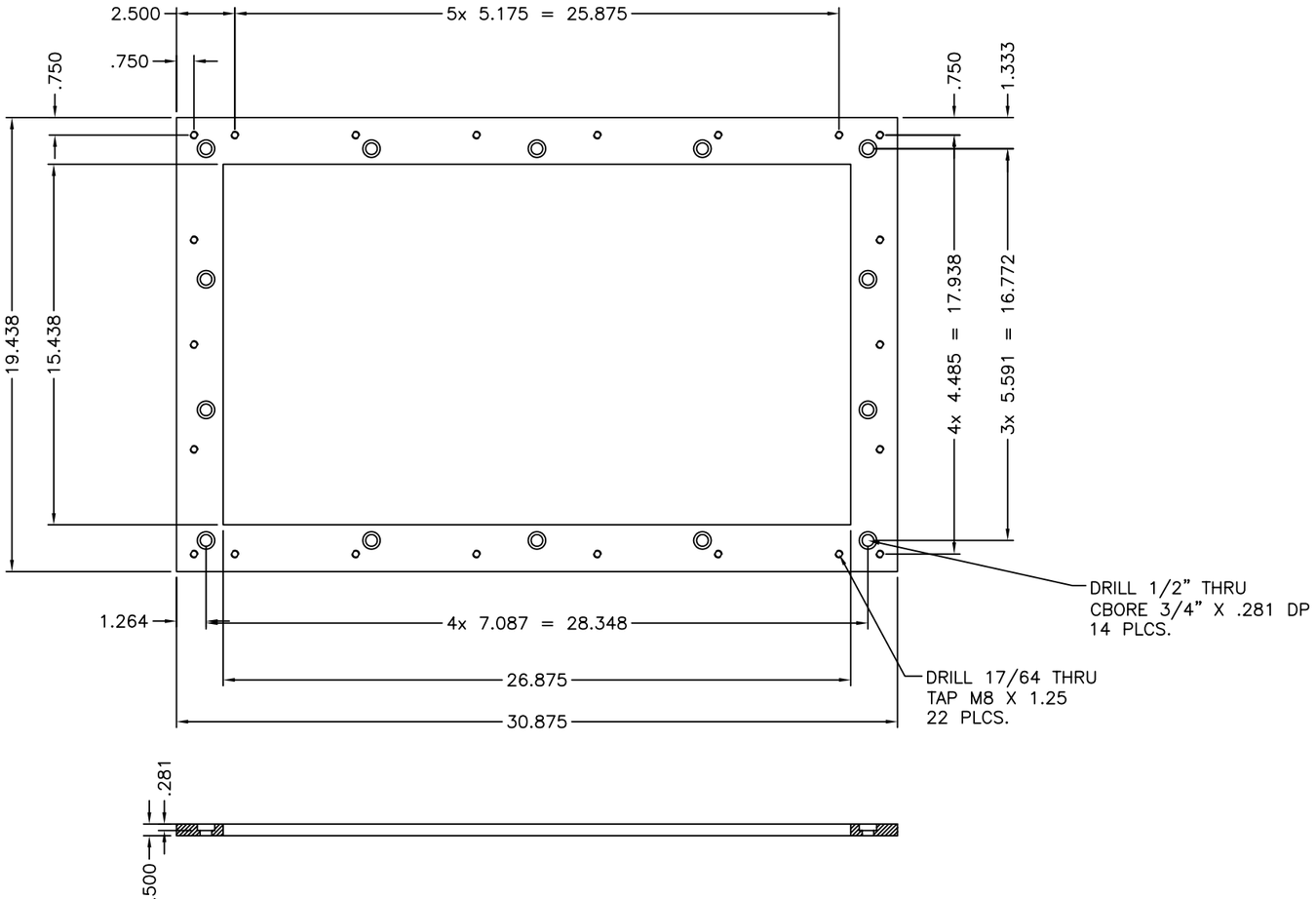
TITLE
D5LL CENTRIFUGE
CENTRATE DISCHARGE ADAPTOR

SIZE	DRAWING NUMBER	REV
C	DMM22386	0

SCALE	FILE	SHEET
1/2	22386	1 OF 1

No	PART No	QTY	DESCRIPTION	MATERIAL
01	DMM22387	1	PLATE, 1/2" X 19-7/16 X 30-7/8	*

* SEE JOB BOM FOR MATERIAL



ESTIMATED WEIGHT IN LBS:	DRAWN BY: TB	DATE 11/20/02
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: JB	DATE 11/20/02
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ
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1010 COMMERCIAL BLVD. SOUTH
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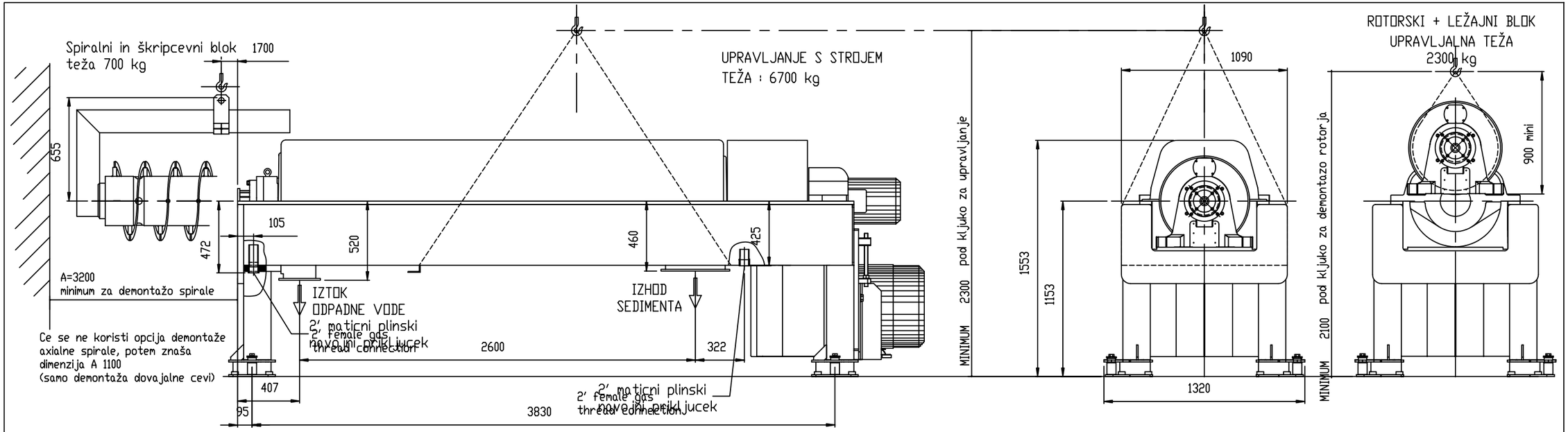
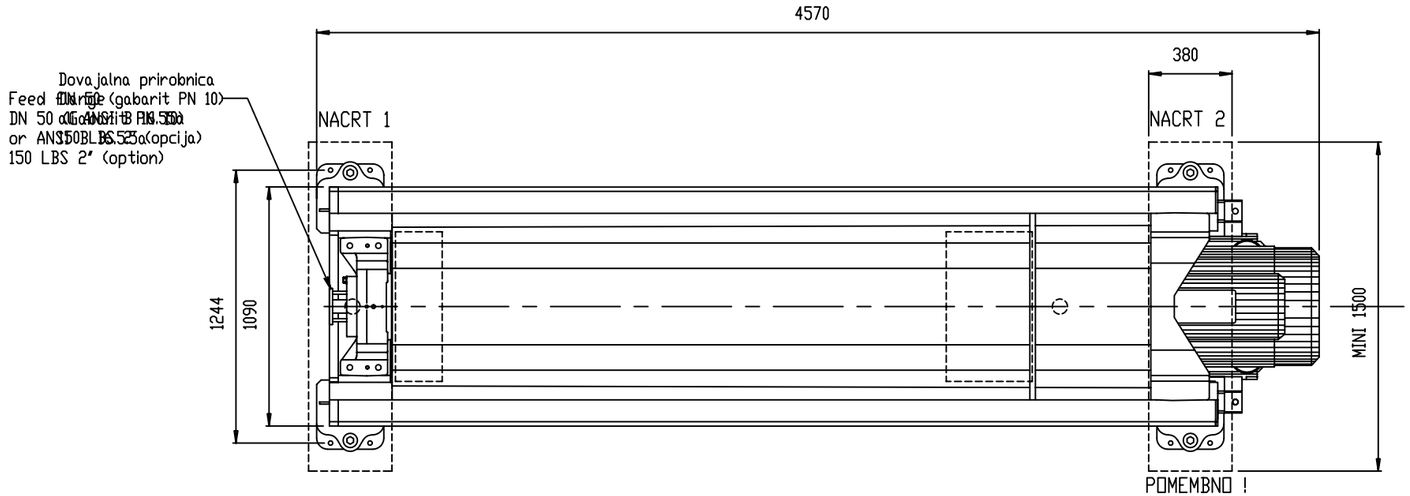
PHONE: (817) 465-5611

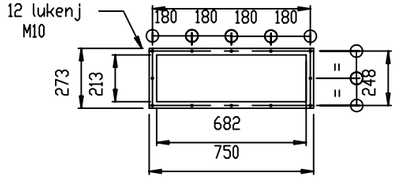
TITLE
D5LL CENTRIFUGE
SOLIDS DISCHARGE
ADAPTOR FLANGE

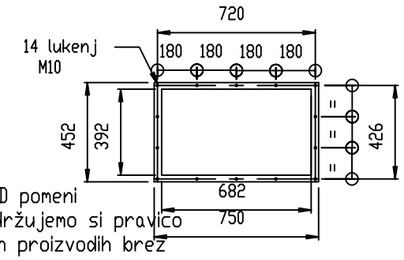
SIZE	DRAWING NUMBER	REV
C	DMM22387	0

SCALE	FILE	SHEET
1/4	22387	1 OF 1







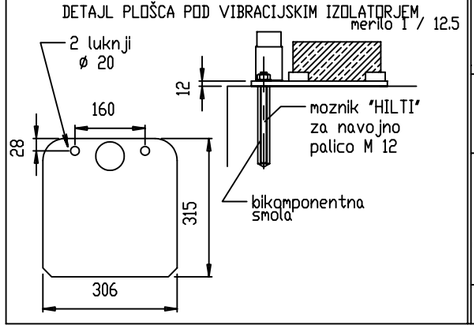


POMEMBNO !
Politika firme ANDRITZ-GUINARD pomeni konstantne izboljšave in pridržujemo si pravico do sprememb dejalov na naših proizvodih brez predhodnega obveščanja.

Predvideni odvod zraka na izpustu odpadne vode indikativni Ø : 100 mm

vse dimenzije v mm

POMBA !
Vsi prikljucki (dovajalni vhod & izhod) morajo biti iz fleksibilne cevi



Upoštevaj obremenitev za izracun temeljev
STATICNA OBREMENITEV:
NACRT 1: 30000 N 1.2 = 36000 N
NACRT 2: 37000 N 1.2 = 44400 N
DINAMICNA OBREMENITEV:
67000 N x 10 % = 6700 N porazdeljena na 4 vibracijske izolatorje

Skupna dinamicna obremenitev teoreticno v N.
Ekvivalent rotacijske sile na neravnotežje pravokotno na rotorsko os in na gravitacijsko središčе

Pri normalni obratovalni hitrosti	Hitrost stroja	pred izolatorji	po izolatorji
	2800 rpm	7390 N	150 N
	3000 rpm	7920 N	160 N
	3200 rpm	8440 N	170 N

INDICE	DESIGNATION	DATE	DESSINE	DATE	VERIFIE
6	Enlevement du piquage pour lavage et du voyant d'alimentation	14/05/03	AC Baumel		
5	Reduction hauteur sylomer 5 mm	16/10/02	P.Gréau		
4	Ajout de 2 manchon 2' gaz femelle	27/09/02	P.Gréau		
3	180 devient 160 ; ?ch 1/10 devient 1/12.5	24/06/02	Matuszewski		
2	nouveau capot	20/02/02	Matuszewski		
0	CREATION	30/10/01	Matuszewski		

MACHINE : D 5 LL | SCALE : 1/25 | N°fichier : 33321.PRT

ANDRITZ GUINARD

NACRT CELOTNIH DIMENZIJ

N° FOLIO:

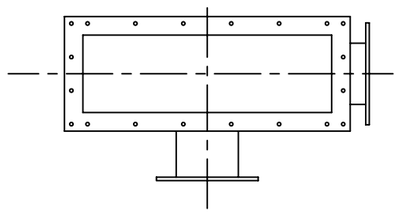
N° 33321

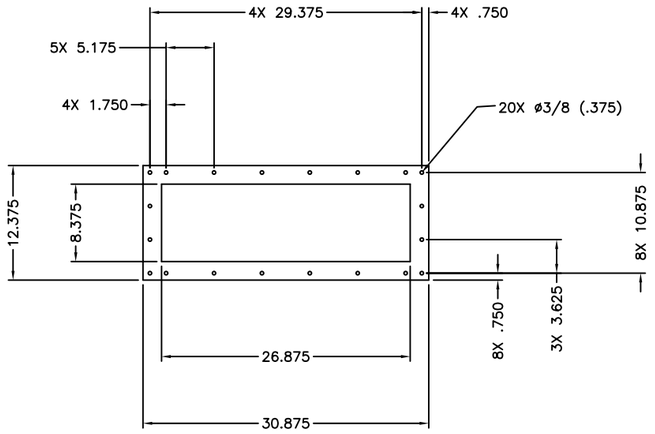
SL

No	PART No	QTY	DESCRIPTION	MATERIAL
01	DMM25210-01	1	PLATE, 1/4 X 12-3/8 X 30-7/8	*
02	DMM25210-02	1	SHEET, 12GA X 9-1/2 X 32-7/8	*
03	DMM25210-03	1	SHEET, 12GA X 9-1/2 X 32-7/8	*
04	DMM25210-04	1	SHEET, 12GA X 26-5/8 X 30	*
05	DMM25210-05	1	SHEET, 12GA X 26-5/8 X 30	*
06	DMM25210-06	1	PLATE, 1/4 X 8-7/8 X 21-13/32	*
07	DMM25210-07	1	PIPE, 6" SCH10 X 4-1/6	*
08	DMM25210-08	1	PIPE, 6" SCH10 X 6" LONG	*
09	DMM12960	2	PIPE FLANGE, 6" LOW PRESSURE FLANGE	*
10	PICOX1.0FFN	1	COUPLING HALF, 1" FNPT	*
11	PIPGX1.0FMN	1	PIPE PLUG 1" MNPT, SQ HEAD	*
12	PINIX1.5CMN3.0	1	NIPPLE, 1-1/2" SCH40 3" LONG (HALF)	*

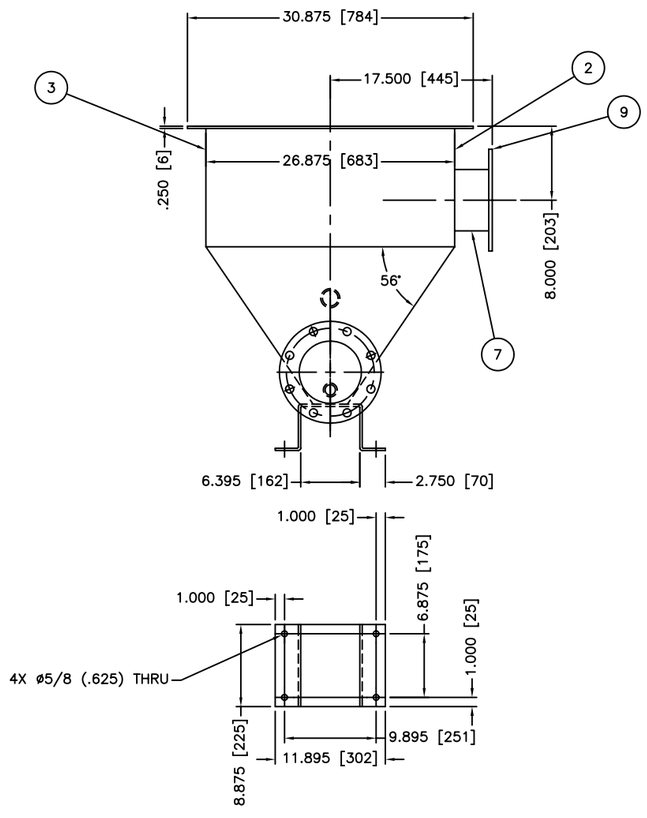
1 CUT IN HALF

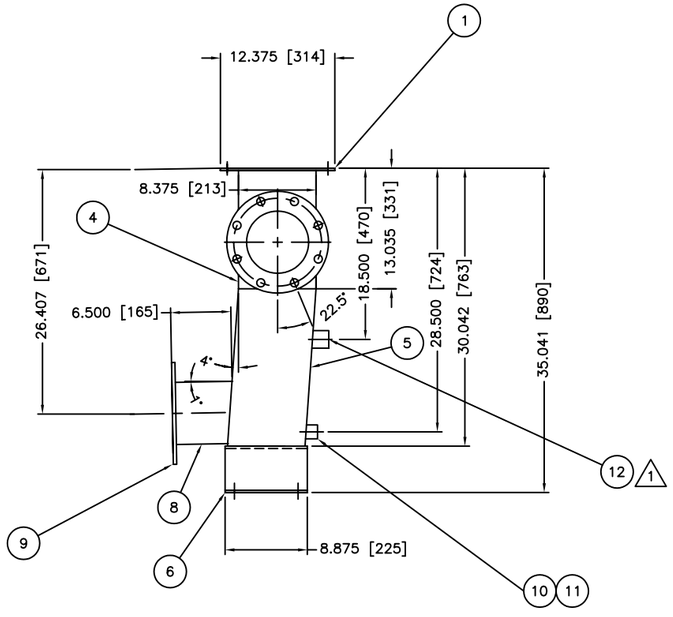
* SEE JOB BOM FOR MATERIAL





DETAIL-01





NOTES:
1. ALL METAL SURFACES ARE TO BE FREE OF ALL BURRS, WELD SLAG, SHARP EDGES, SCALE AND ANY OTHER SURFACE CONTAMINANTS.
2. ALL WELDS TO BE SEAL WELDED.

REV	EIR	REVISION	BY	APVD	DATE
1	NONE	ADDED ITEM-12	MW	MW	10/01/04

ESTIMATED WEIGHT IN LBS:	DRAWN BY: MW	DATE 09/22/04	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE	
FABRICATION TOLERANCES .XX±.040 ANG±1° HOLE±.020	APPROVED BY: JB	DATE 09/28/04	
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION		
MILL FINISH ALL OVER			

ANDRITZ

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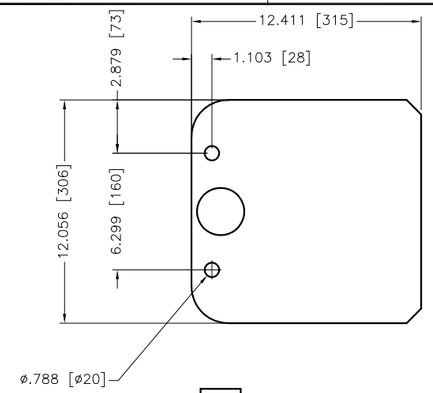
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: D5LL CENTRIFUGE
CENTRATE DISCHARGE CHUTE

SIZE	DRAWING NUMBER	REV
D	DMM25210	1

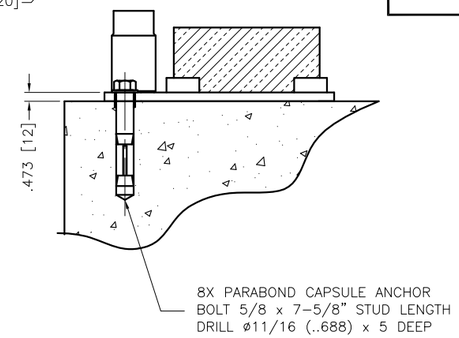
SCALE	FILE	SHEET
1/8	25210	1 OF 1

TOTAL LOAD DISTRIBUTION AMONG THE FOUR (4) VIBRATION ISOLATORS (IN NORMAL OPERATION)					
STATIC LOAD	DYNAMIC LOAD	DYNAMIC LOADING IN LB WITH Kg IN [ ]. ROTATING FORCE EQUIVALENT TO THE UNBALANCED LOAD PERPENDICULAR TO THE AXIS OF ROTATION AND EXERTED ON THE CENTER OF GRAVITY.			
FEED END PEDESTAL 8093 lb [36000 N]	1506 lb [6700 N] DISTRIBUTED AMONG THE 4 VIBRATION ISOLATORS	AT NORMAL WORKING SPEED.	MACHINE SPEED	BEFORE VIBRATION ISOLATORS	AFTER VIBRATION ISOLATORS
			2800 rpm	1661 lb [7390 N]	34 lb [150 N]
			3000 rpm	1780 lb [7920 N]	36 lb [160 N]
DRIVE END PEDESTAL 9981 lb [44400 N]			3200 rpm	1897 lb [8440 N]	38 lb [170 N]



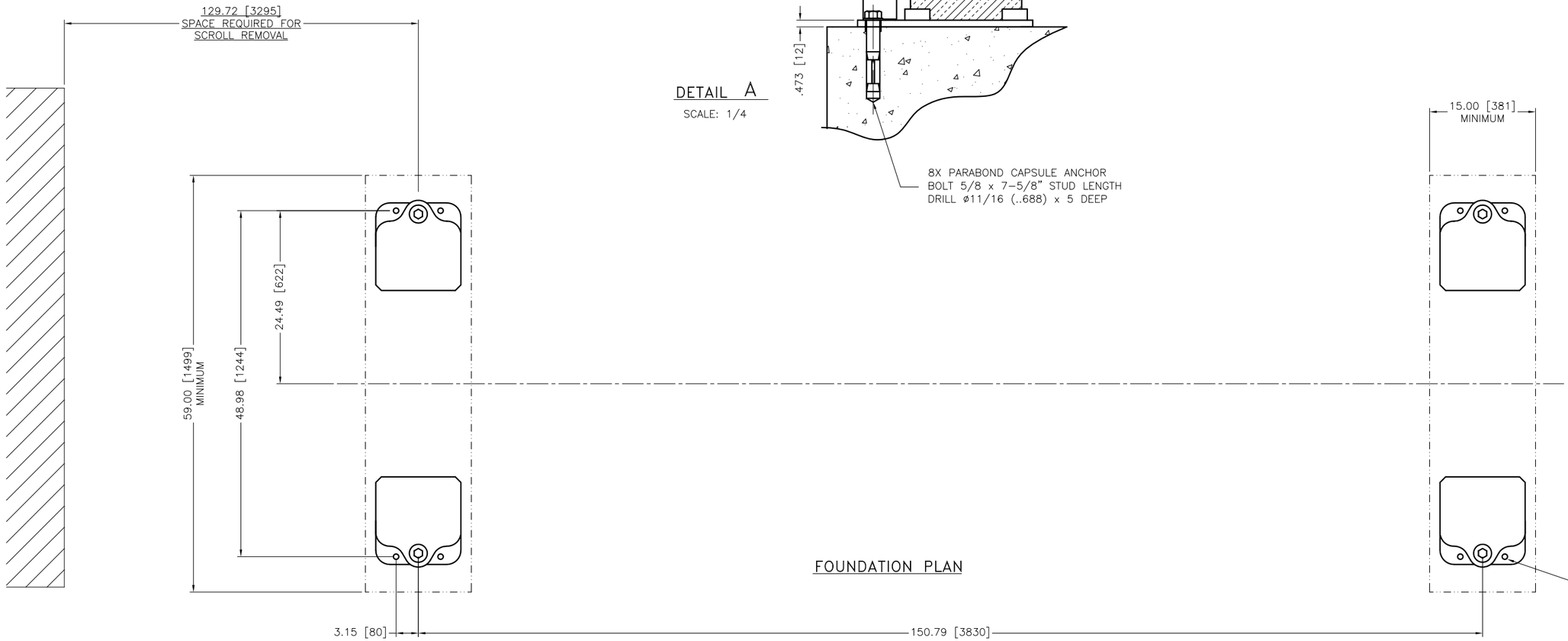
ISOLATOR NOTE!

APPLY LOCTITE TO ALL VIBRATION ISOLATOR HARDWARE DURING INSTALLATION.



DETAIL A

SCALE: 1/4



FOUNDATION PLAN

REFERENCE DRAWING: 33321 REV. 6

NOTES

1. THE FOUNDATION DESIGN SHOWN INDICATES MINIMUM REQUIREMENTS FOR CLEARANCE AND DRAINAGE. ACTUAL FOUNDATION DESIGN AND CONSTRUCTION TO BE FURNISHED BY OTHERS.
2. WEIGHT OF SCROLL FOR REMOVAL : 1543 lb [700 Kg]
3. DRY WEIGHT OF MACHINE : 14771 lb [6700 Kg]
4. ALL VIBRATION ISOLATION PADS TO BE LEVEL TO WITHIN 1/32".

FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
A	NA	UPDATE TITLE BLOCK	JL	jl	5/10/18

AST No.–

ESTIMATED WEIGHT IN LBS: –	JWR	03/14/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	jwr	03/14/06
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	jwr	03/14/06
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

FOUR MILE CREEK
D5LL CENTRIFUGE
FOUNDATION DETAILS

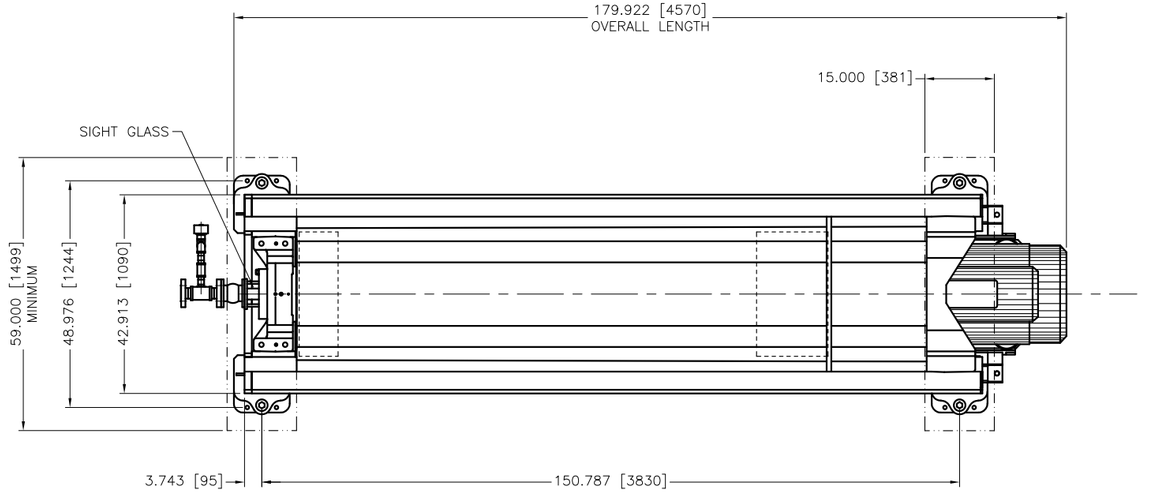
D F1553 A

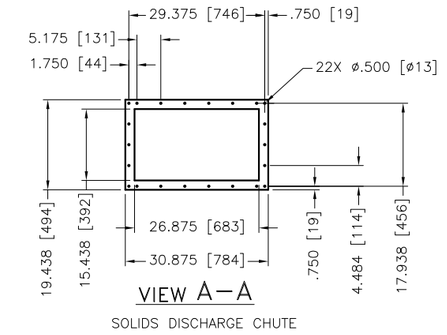
1/8 F1553 1 1

PIPING CONNECTIONS		
PORT	SIZE	DESCRIPTION
A	2"–150 LB ANSI FLANGE	FEED INLET
B	RECTANGULAR 12–3/8 X 30–7/8	CENTRATE DISCHARGE
C	RECTANGULAR 19–7/16 X 30–7/8	SOLID DISCHARGE
D	1" NPT	SLUDGE SAMPLE
E	1" NPT	POLYMER CONNECTION
F	1" NPT	WASHWATER CONNECTION
G	2" BSPT	FRAME DRAIN CONNECTION
H	2" BSPT	FRAME DRAIN CONNECTION

NOTES:

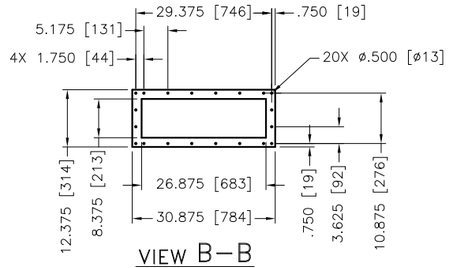
1. ALL DIMENSIONS ARE IN INCHES WITH mm IN [ ].
2. SEE FOUNDATION DRAWING FOR LOADS.
3. DRY WEIGHT OF MACHINE: 14471 LB [6700 KG]
4. SCROLL WEIGHT: 1543 LB [700 kg]
5. PROCESS CONDITIONS:
   WASHWATER: 110gpm @ 35psi
   SHUTDOWN: 15min
   CIP: 10min
   AIR FLOW: 206–295 CFM





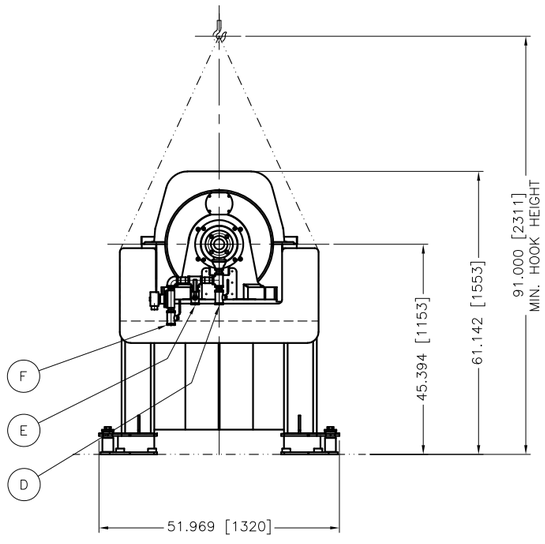
VIEW A–A

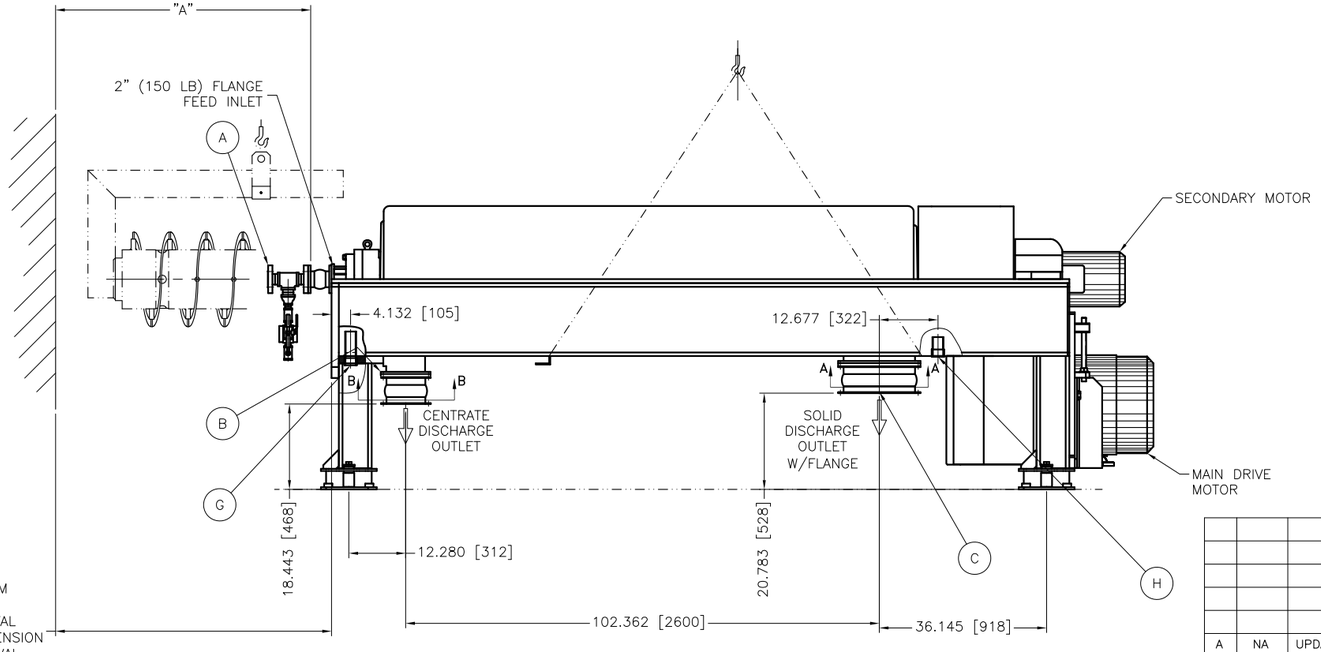
SOLIDS DISCHARGE CHUTE



VIEW B–B

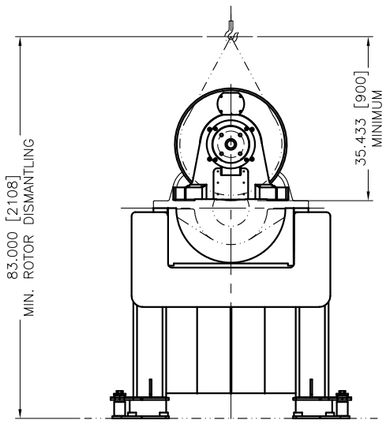
CENTRATE DISCHARGE OUTLET





A = 123.00 [3200] MINIMUM
FOR SCROLL REMOVAL
(IF THE AXIAL SCROLL REMOVAL
OPTION IS NOT USED, THEN DIMENSION
A IS 43.307 [1100] – REMOVAL
OF FEED PIPE ONLY)

ROTATING ASSEMBLY
WEIGHT: 5071 LB [2300 kg]



REV	EIR	REVISION	BY	APVD	DATE
A	NA	UPDATE TITLE BLOCK	JL	jl	5/10/18

AST No.–

ESTIMATED WEIGHT IN LBS: –	JWR	03/14/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	jwr	03/14/06
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	jwr	03/14/06
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

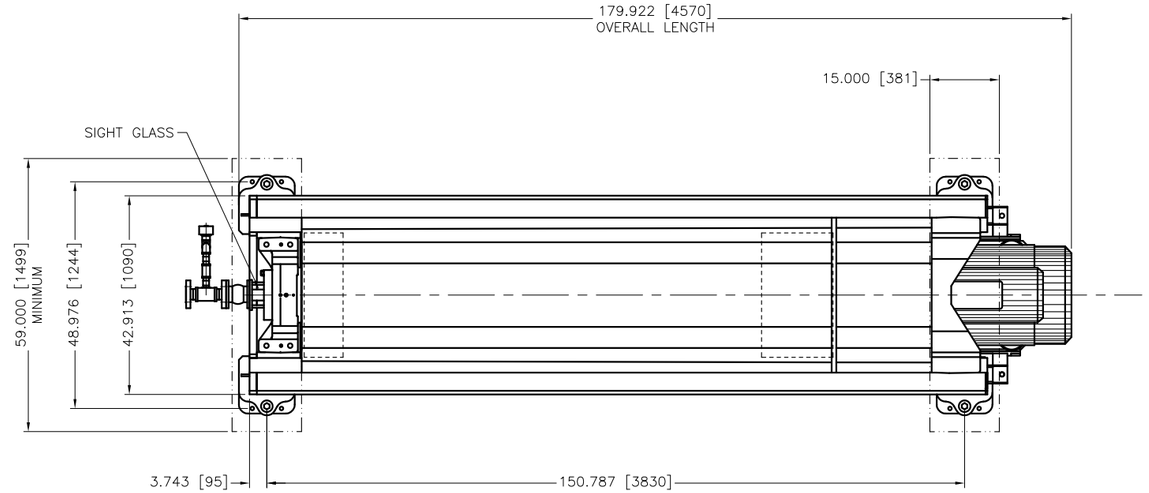
D5LL

FOUR MILE CREEK GENERAL ARRANGEMENT

D	M1553–1	A
1/16	M1553–1	1 1

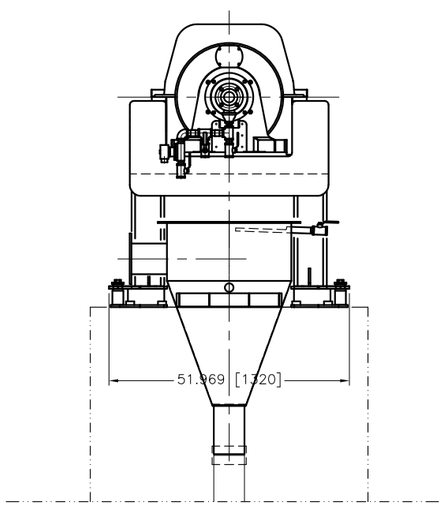
REFERENCE DRAWING: 33321 REV. 6

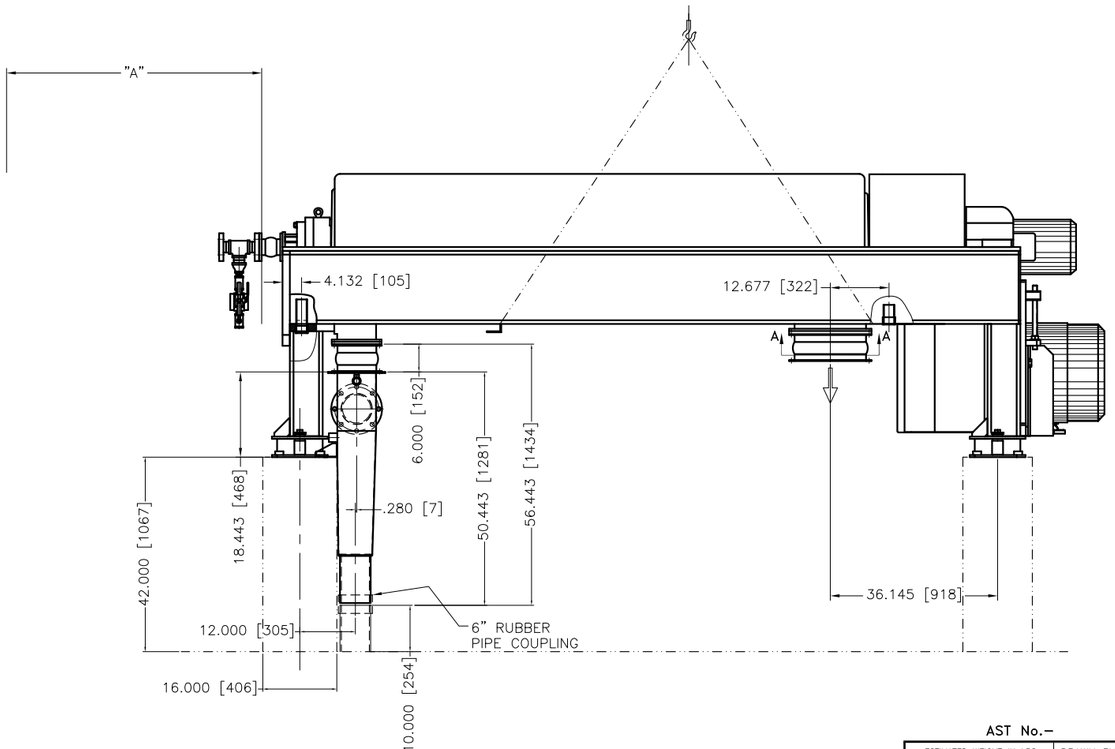
FOR APPROVAL ONLY



NOTES:

1. ALL DIMENSIONS ARE IN INCHES WITH mm IN [ ].
2. SEE FOUNDATION DRAWING FOR LOADS.
3. DRY WEIGHT OF MACHINE: 14471 LB [6700 KG]
4. SCROLL WEIGHT: 1543 LB [700 kg]
5. PROCESS CONDITIONS:
   WASHWATER: 110gpm @ 35psi
   SHUTDOWN: 15min
   CIP: 10min
   AIR FLOW: 206–295 CFM





REV	EIR	REVISION	BY	APVD	DATE
A	NA	UPDATE TITLE BLOCK	JL	JL	5/10/18

AST No.–

ESTIMATED WEIGHT IN LBS: –	DRAWN BY: JWR	DATE 03/14/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY: JWR	DATE 03/14/06
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: JWR	DATE 03/14/06
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE
D5LL
FOUR MILE CREEK

SIZE	DRAWING NUMBER	REV
D	M1553–2	A

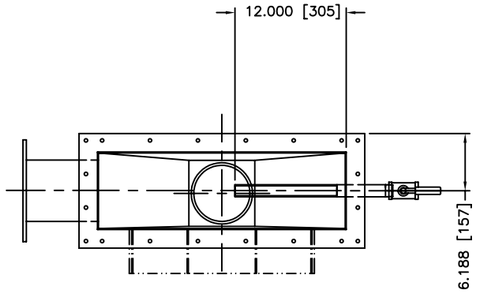
SCALE	FILE	SHEET
1/16	M1553–2	1 OF 1

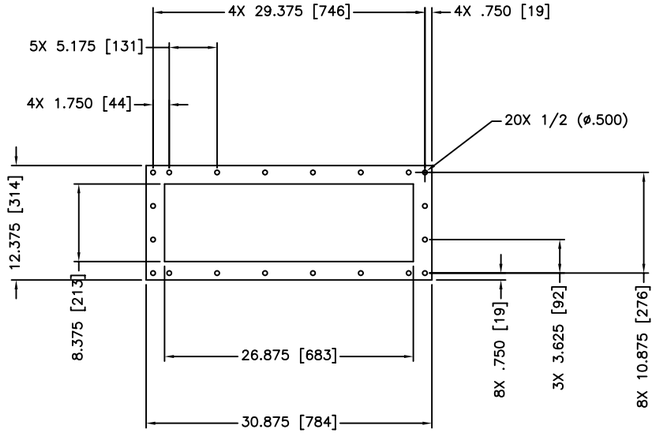
REFERENCE DRAWING: 33321 REV. 6

FOR APPROVAL ONLY

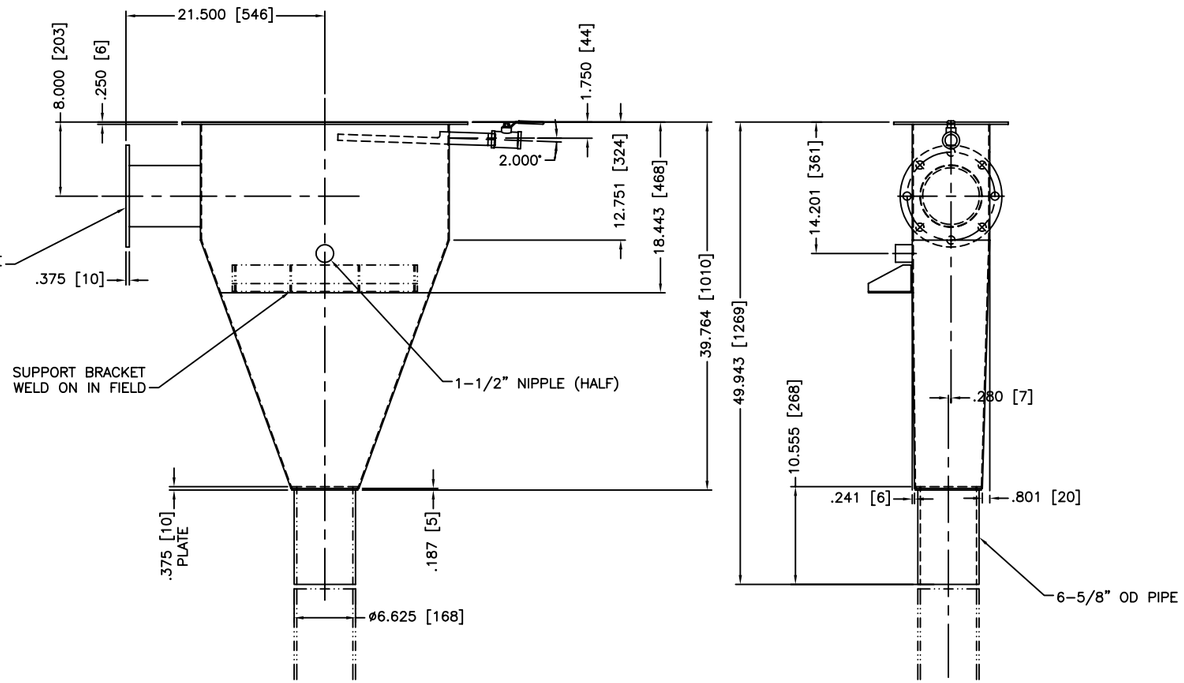
No	PART No	QTY	DESCRIPTION	MATERIAL
01	–	–	–	*
02	–	–	–	*
03	–	–	–	*
04	–	–	–	*
05	–	–	–	*

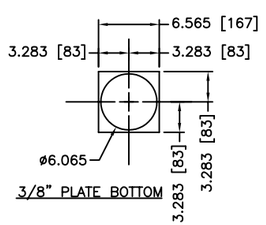
* SEE JOB BOM FOR MATERIAL



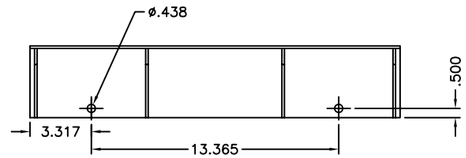


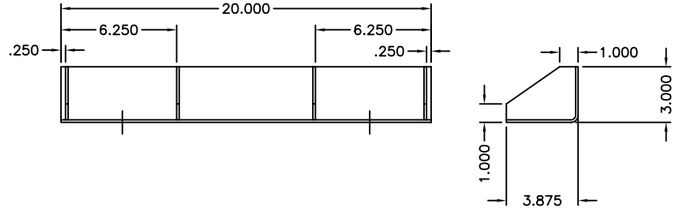
DETAIL–01





3/8" PLATE BOTTOM





2X SUPPORT BRACKET
MATERIAL: 10 GA. SHEET

NOTES:
1. ALL METAL SURFACES ARE TO BE FREE OF ALL BURRS, WELD SLAG, SHARP EDGES, SCALE AND ANY OTHER SURFACE CONTAMINANTS.
2. ALL WELDS TO BE SEAL WELDED.
3. MATERIAL IS 12 GA SHEET UNLESS OTHERWISE STATED.

REV	EIR	REVISION	BY	APVD	DATE

ESTIMATED WEIGHT IN LBS:	DRAWN BY: JWR	DATE 07/27/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: [signature]	DATE 07/27/06
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ–RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

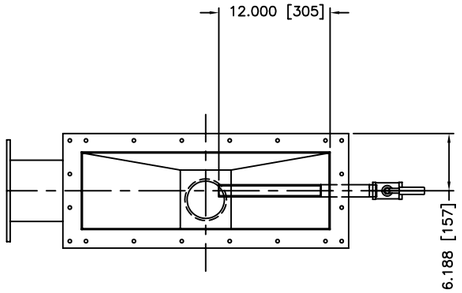
TITLE
D5LL CENTRIFUGE
CENTRATE DISCHARGE CHUTE

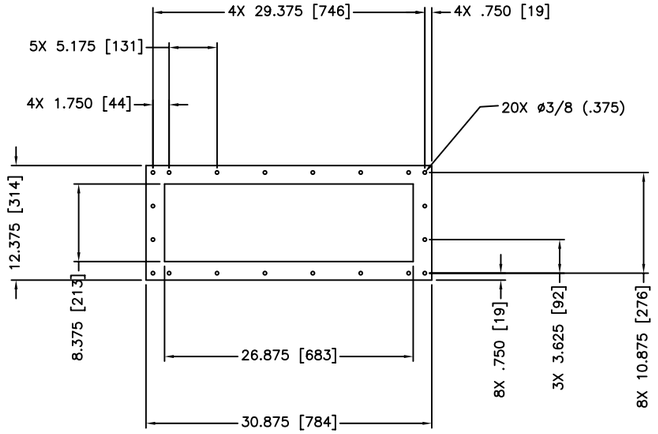
SIZE	DRAWING NUMBER	REV
D	M1553–3	0

SCALE	FILE	SHEET
1/8	M1553–3	1 OF 1

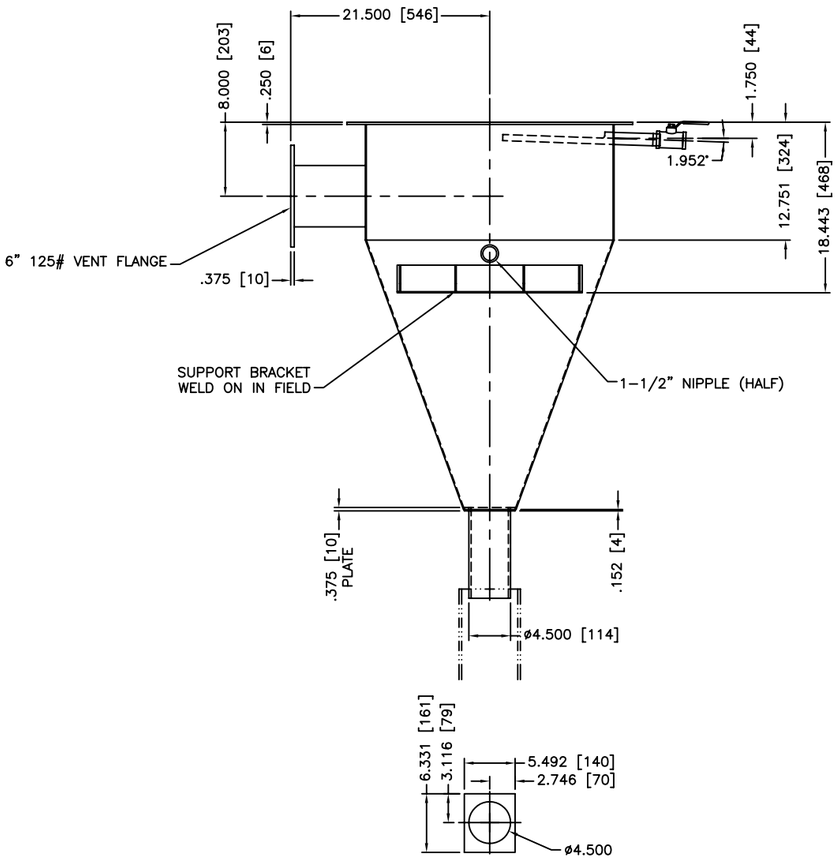
No	PART No	QTY	DESCRIPTION	MATERIAL
01	–	–	–	*
02	–	–	–	*
03	–	–	–	*
04	–	–	–	*
05	–	–	–	*

* SEE JOB BOM FOR MATERIAL

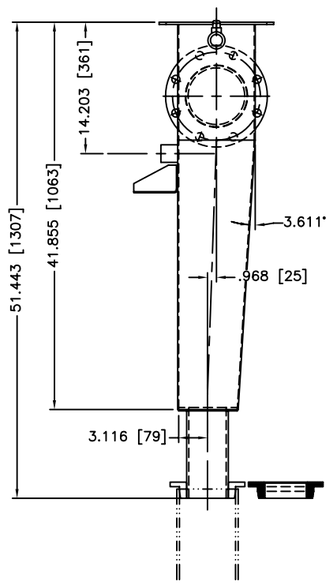


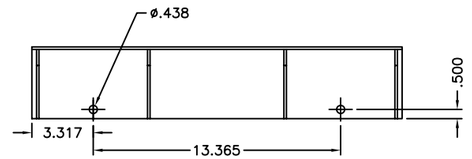


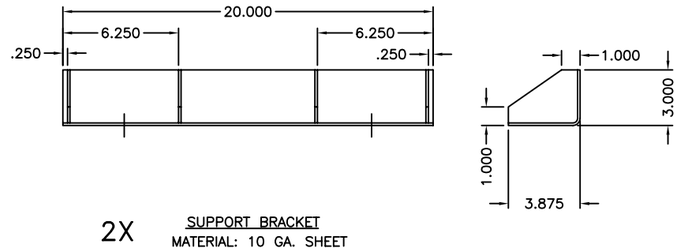
DETAIL–01



3/8" PLATE BOTTOM







2X SUPPORT BRACKET
MATERIAL: 10 GA. SHEET

NOTES:
1. ALL METAL SURFACES ARE TO BE FREE OF ALL BURRS, WELD SLAG, SHARP EDGES, SCALE AND ANY OTHER SURFACE CONTAMINANTS.
2. ALL WELDS TO BE SEAL WELDED.
3. MATERIAL IS 12 GA SHEET UNLESS OTHERWISE STATED.

REV	EIR	REVISION	BY	APVD	DATE

ESTIMATED WEIGHT IN LBS:	DRAWN BY: JWR	DATE 07/27/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: [signature]	DATE 07/27/06
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ–RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE: D5LL CENTRIFUGE
CENTRATE DISCHARGE CHUTE

SIZE	DRAWING NUMBER	REV
D	M1553–3	0

SCALE	FILE	SHEET
1/8	M1553–3	1 OF 1

FOUR MILE CREEK D5LL CENTRIFUGE

BILL OF MATERIAL

Item	Qty	Part #	Manufacturer	Component	Device ID
				- CENTRIFUGE STARTER PANEL (CSP)	
1	1	Encl 304SS 60x36x12, 4H, 1C/O	Saginaw	Encl 304SS 60x36x12, 4H, 1C/O	
2	1	SCE-60P36	Saginaw	Encl backpanel 60x36	
4	1	PK15-GTAL	Square D	Ground Buss	GB
5	1	1492-SPU1C100	Allen Bradley	Circuit Breaker 10a	CB225
6	1	1492-SP1C050	Allen Bradley	Circuit Breaker 1p 5a supplementary	CB229
7	3	1492-SP1C030	Allen Bradley	Circuit Breaker 3a supplementary	CB227,
9	12	700-HF32A1-4	Allen Bradley	plug-in relays 120vac - 2no-2nc	CR246
10	1	DRUB-15	Hubbell	duplex convenience outlet - 120v	
11	1	20G1AND125AN0NNNNN	Allen Bradley	Allen Bradley PowerFlex 755 VFD; 100HP	VFD204
12	1	20-750-DCBB1-F6	Allen Bradley	Front End Kit DC Buss Bar	VFD210, VFD204
13	1	20G11ND027AA0NNNNN	Allen Bradley	Allen Bradley PowerFlex 755 VFD; 20HP	VFD210
14	2	20-HIM-A6	Allen Bradley	FREQUENCY CONVERTER KEYPAD AB 755 HIM MODULE	VFD210, VFD204
15	1	HGP0100AW800000	TCI	TCI Passive Filter - CP Kit	
16	1	HGP0100AW900000	TCI	TCI Passive Filter - KP Kit	
28	1	140G-J3F3-D20	Allen Bradley	200A Main Circuit Breaker	CB201
29	1	305-BOD-EEE	Allen Bradley	Size 1 FVR motor starter with overloads	MS608F, MS610R
30	1	1492-PD3161	Allen Bradley	POWER DIST BLOCK 1 TO 6 300A	PTB202
32	1	SCE-N12FA1010	SAGINAW	FAN 10X12 N12 120V	
33	1	SCE-N12GA1010	SAGINAW	FAN EXHAUST 10X10 N12	
34	1	SCE-TEMNO	SAGINAW	FAN THERMOSTAT 120V COOLING	TS227
35	1	KAL36200	Square D	MCB OPERATING MECH AND HANDLE	CB201
43	2	ATQRS5	Bussmann	Line Fuses 5Amp	F223, F224
46	1	1497B-A11-M14-0-N	Allen Bradley	Transformer,480V, Pri, 120 VAC 1KVA	T225
47	2	170H0238	Bussmann	DC link microswitch - blown fuse indicator	DCF208, DCF209
48	2	170M1415	Bussmann	DC link fuses - 63amp	DCF208, DCF209
49	2	170H1007	Bussmann	DC link fuse holders	DCF208, DCF209
50					

Item	Qty	Part #	Manufacturer	Component	Device ID
				- CENTRIFUGE CONTROL PANEL COP	
4	1	PK15-GTAL	Square D	Ground Buss	GB
5	1	1492-SPU1C100	Allen Bradley	Circuit Breaker 10a	CB301
6	1	1492-SP1C050	Allen Bradley	Circuit Breaker 1p 5a supplementary	CB314
7	3	1492-SP1C030	Allen Bradley	Circuit Breaker 3a supplementary	CB320, CB801, CB805
8	3	1492-SP1C020	Allen Bradley	Circuit Breaker 2a supplementary	CB327, CB343, CB339
16	1	700-P800A1	Allen Bradley	master relay 120vac 8 contacts	CR306
17	12	700-HF32A1-4	Allen Bradley	plug-in relays 120vac - 2no-2nc	CR604, CR606, CR612, CR614, CR616, CR 623, CR625, CR627, CR629, CR631, CR633, CR635
18	12	700-HN116	Allen Bradley	plug-in relay bases	
19	200	1492-W4	Allen Bradley	terminal blocks	
20	16	1492-WG4	Allen Bradley	grounding terminal blocks	
21	3	199-DR1	Allen Bradley	din rail	
22	18	F2X4WH6	Panduit	wireway 2x4 white	
23	18	C2WH6	Panduit	wireway cover 2 white	
24	1	225-120R	Edwards	beacon red 120v	
25	1	876-N5	Edwards	Horn - 120v	
26	1	800H-FRXT6A5	Allen Bradley	e-stop pb 30mm - 2NC	ES231
27	1	800H-16HRG2KB6AX	Allen Bradley	2-pos sel switch 30mm - 1NO - illum green 120v	SS303, SSL303
36	1	2711P-T12W21DS8	Allen Bradley	Allen Bradley OIT Adapter Kit	OIT327
37	1	1606-XLE120E	Allen Bradley	DC Power Supply, 120 VAC/24 VDC,	PS323
38	1	SPIDER II 8TX(943376001)	Hirschmann	Spider II 8TX, 8 Port Ethernet Switch	ENET329
39	1	00394		Ethernet Patch Cable - 6ft	ENET329
40	1	2711P-RAAT12	Allen Bradley	Allen Bradley OIT Adapter Kit	OIT327
41	2	1769-IA16	Allen Bradley	Allen Bradley CompctLogix, 16 Point, 120VAC, Input Module	PLC401, PLC501
42	2	1769-OA16	Allen Bradley	Allen Bradley CompctLogix, 16 Point, 120VAC, Output Module	PLC601, PLC701
43	2	1769-IF4	Allen Bradley	Allen Bradley CompctLogix, 4 Channel, 4-20mA, Analog Input Card	PLC901, PLC1001
44	2	1769-OF4	Allen Bradley	Allen Bradley CompctLogix, 4 Channel, 4-20mA, Analog Output Card	PLC1101
45	1	1769-PA4	Allen Bradley	Allen Bradley CompctLogix PLC Power Supply, 120VAC Input	PS320
46	1	1769-ECR	Allen Bradley	Allen Bradley CompctLogix PLC End Cap	PLC1111
51	1	1769-L30ER	Allen Bradley	Allen Bradley CompctLogix PLC End Cap	PLC1111
52	1	1769-AENT	Allen Bradley	Allen Bradley CompctLogix PLC End Cap	PLC1111
62					

PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
0		APPROVAL	RLS	JC	7/5/18

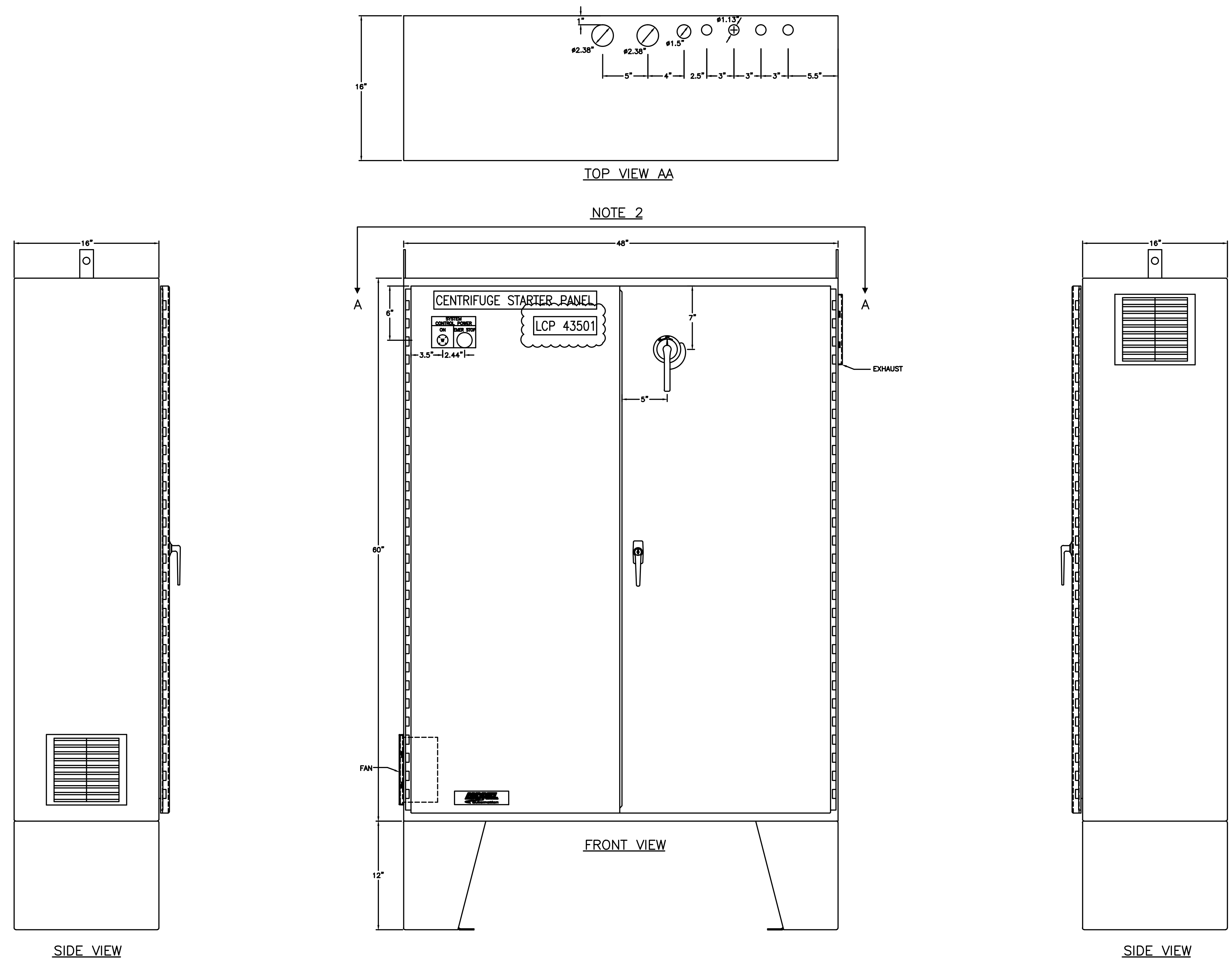
ESTIMATED WEIGHT IN LBS:	DRAWN BY: RLS	DATE 7/5/18	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY: –	DATE –	
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY: –	DATE –	
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION		
MILL FINISH ALL OVER			

ANDRITZ

ANDRITZ SEPARATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001

PHONE: (817) 465-5611

TITLE	FOUR MILE CREEK WQRF D5LL CENTRIFUGE BILL OF MATERIAL		
SIZE B	DRAWING NUMBER E-1553-0		REV 0
PREV. SHEET: NONE	NEXT SHEET: E-1553-1	SHEET 1	OF 1



NOTES:

1) ENCLOSURE IS NEMA 12 PAINTED GRAY STEEL WITH THROUGH DOOR DISCONNECT. PANEL DEPTH IS 16".
2) ALL PUSHBUTTON OPERATORS ARE HEAVYDUTY NEMA 4X RATED. CONTACTS ARE RATED 10 AMPS AT 600 VAC.
3) ALL WIRING TO CONFORM TO NATIONAL ELECTRIC CODE AND INCLUDES PERMANENT WIRE MARKERS.
4) ALL CONTROL PANEL COMPONENTS WITH GROUND SYMBOLS OR GROUND SCREWS SHALL BE CHASSIS GROUND.
5) PROVIDE 10% SPARE TERMINALS.
6) PANEL IS UL 508A LISTED.
7) PANEL TO HAVE PIANO HINGES.

NOTES 12/4/17:

1) EXISTING CONTROL PANEL UPGRADED AND MOVED TO DIFFERENT LOCATION.
2) CONDUIT ENTRY HOLES EXIST FROM ORIGINAL INSTALLATION. CONTRACTOR TO USE AS REQUIRED AND PLUG REMAINING HOLES.
3) (cloud) - UPGRADED COMPONENTS FOR THIS PROJECT

APPROXIMATE WEIGHT = 350LBS

PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
3		MOVE SITE / UPGRADE B46043	RLS	JC	12/4/17
2		REVISED PER AS BUILT	DT	BAM	7/18/06
1		CERTIFIED	DT	BAM	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 / MILL FINISH ALL OVER	THIRD ANGLE PROJECTION	

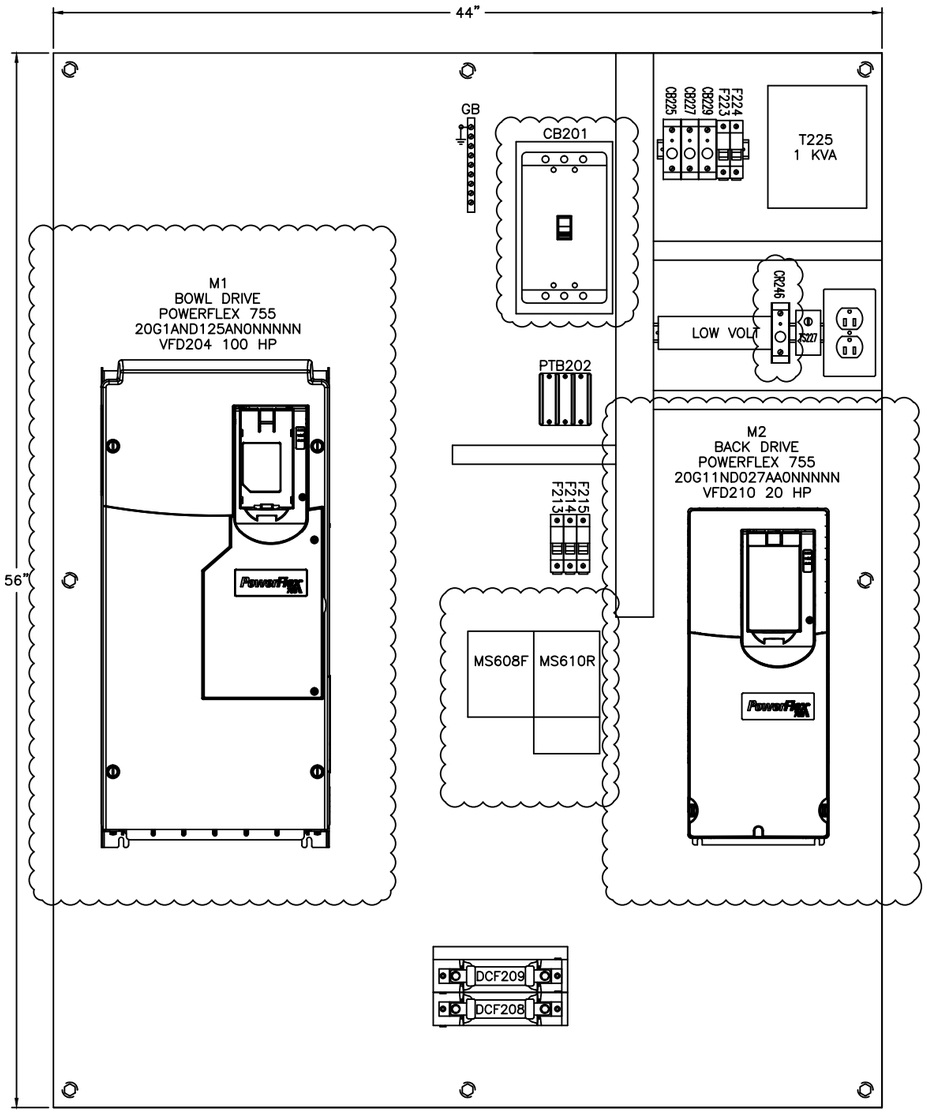
ANDRITZ

ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE STARTER PANEL LAYOUT

SIZE	DRAWING NUMBER	REV
E	E-1553-1	3

SCALE NONE | FILE E-1553-1 | SHEET 1 OF 1



LEGEND

CB–CIRCUIT BREAKER
CR–CONTROL RELAY
DCF–DC FUSE
F–FUSE
FB–FUSE BLOCK
GB–GROUND BAR
LR–LINE REACTOR
MS–MOTOR STARTER
PTB–POWER TERMINAL BLOCK
RECPT–RECEPTACLE
SP–SURGE PROTECTOR
T–TRANSFORMER
TS–TERMINAL STRIP
VFD–VARIABLE FREQUENCY DRIVE

– UPGRADED COMPONENTS FOR THIS PROJECT

PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
3		MOVE SITE / UPGRADE B46043	RLS	jc	12/4/17
2		REVISED PER AS BUILT	DT	aem	7/18/06
1		CERTIFIED	DT	aem	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

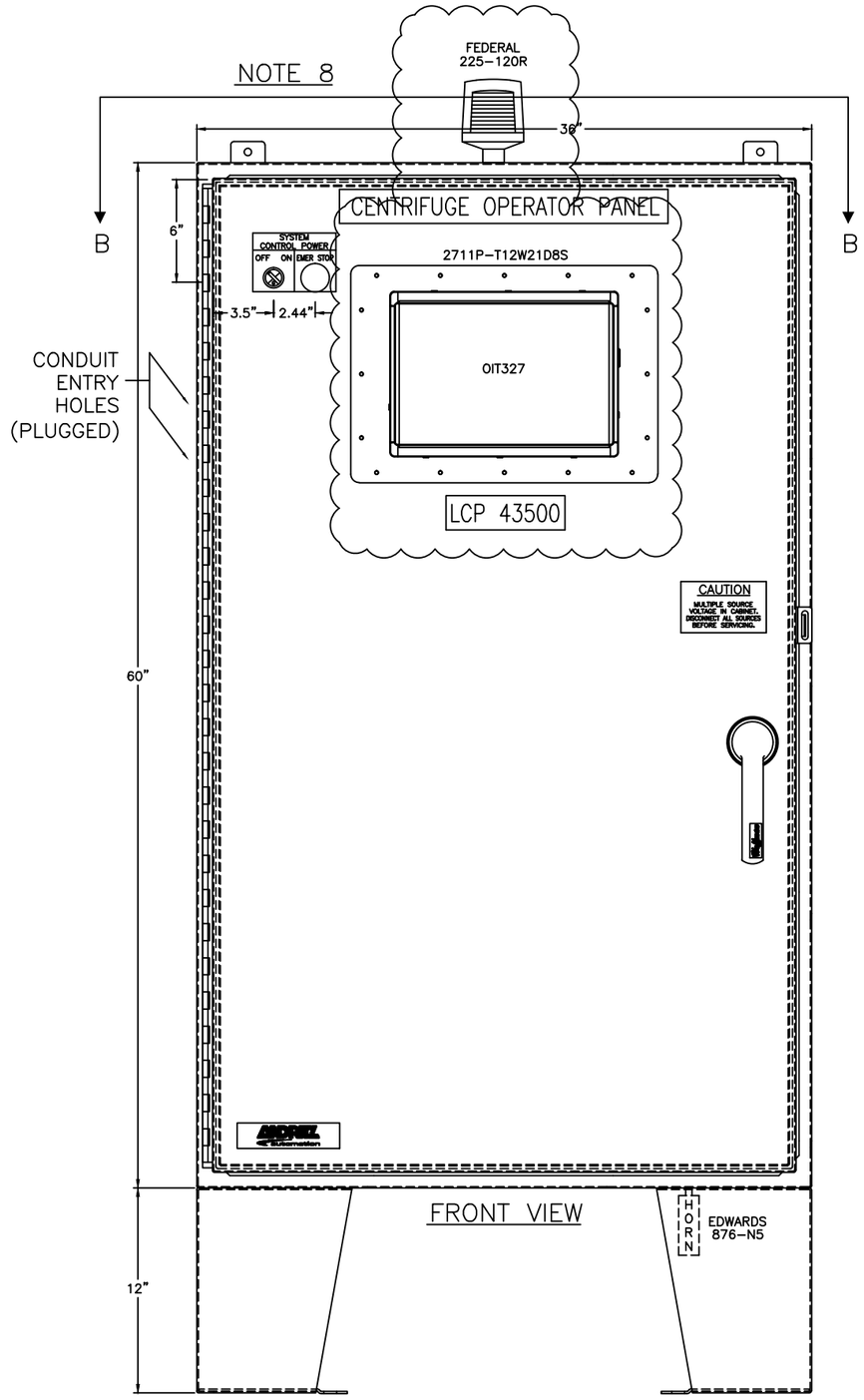
ANDRITZ

ANDRITZ–RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

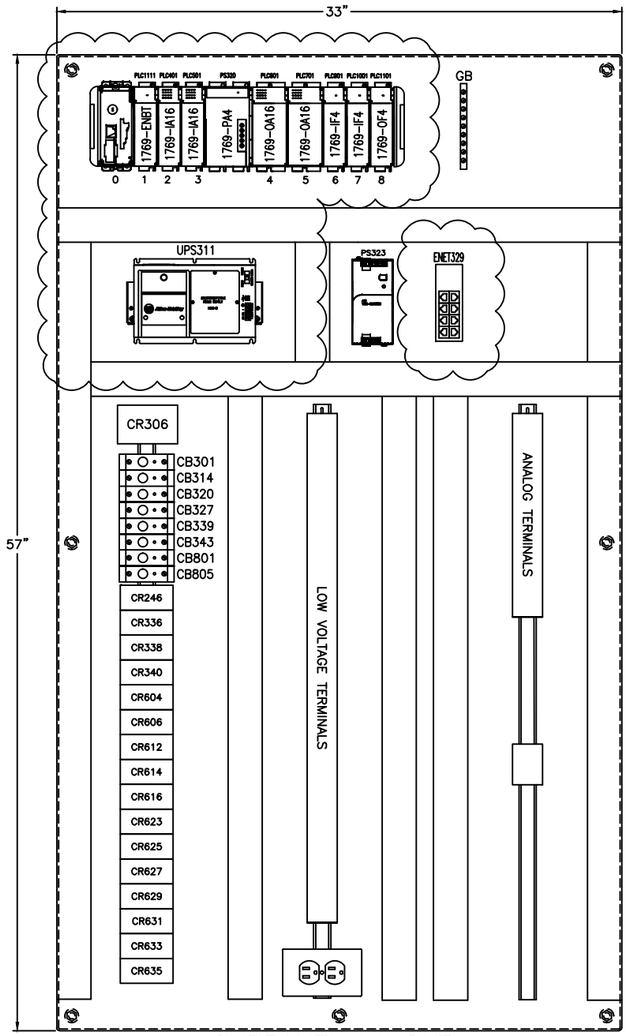
TITLE
FOUR MILE CREEK WQRF
D5LL CENTRIFUGE STARTER
SUBPANEL LAYOUT

SIZE	DRAWING NUMBER	REV
D	E–1553–1A	3

SCALE	FILE	SHEET
NONE	E–1553–1A	1 OF 1



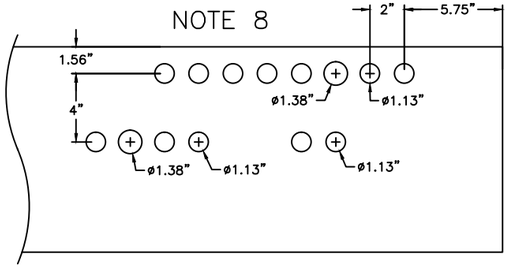
FRONT VIEW



SUBPANEL LAYOUT

NOTES:

1) ENCLOSURE IS NEMA 4X 304 STAINLESS STEEL. PANEL DEPTH IS 12".
2) ALL PUSHBUTTON OPERATORS ARE HEAVYDUTY RATED. CONTACTS ARE RATED 10 AMPS AT 600 VAC.
3) ALL WIRING TO CONFORM TO NATIONAL ELECTRIC CODE AND INCLUDES PERMANENT WIRE MARKERS.
4) ALL CONTROL PANEL COMPONENTS WITH GROUND SYMBOLS OR GROUND SCREWS SHALL BE CHASSIS GROUND.
5) PROVIDE 20% SPARE TERMINALS.
6) PANEL IS UL 508A LISTED.
7) PANEL TO HAVE PIANO HINGES.
8) EXISTING CONDUIT ENTRY PENETRATIONS



TOP VIEW BB

(CONDUIT ENTRY HOLES PLUGGED)

APPROXIMATE WEIGHT = 300LBS

PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
3		MOVE SITE / UPGRADE B46043	RLS	jc	12/4/17
2		REVISED PER AS BUILT	DT	aem	7/18/06
1		CERTIFIED	DT	aem	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE	
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE	
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION		
MILL FINISH ALL OVER			

ANDRITZ

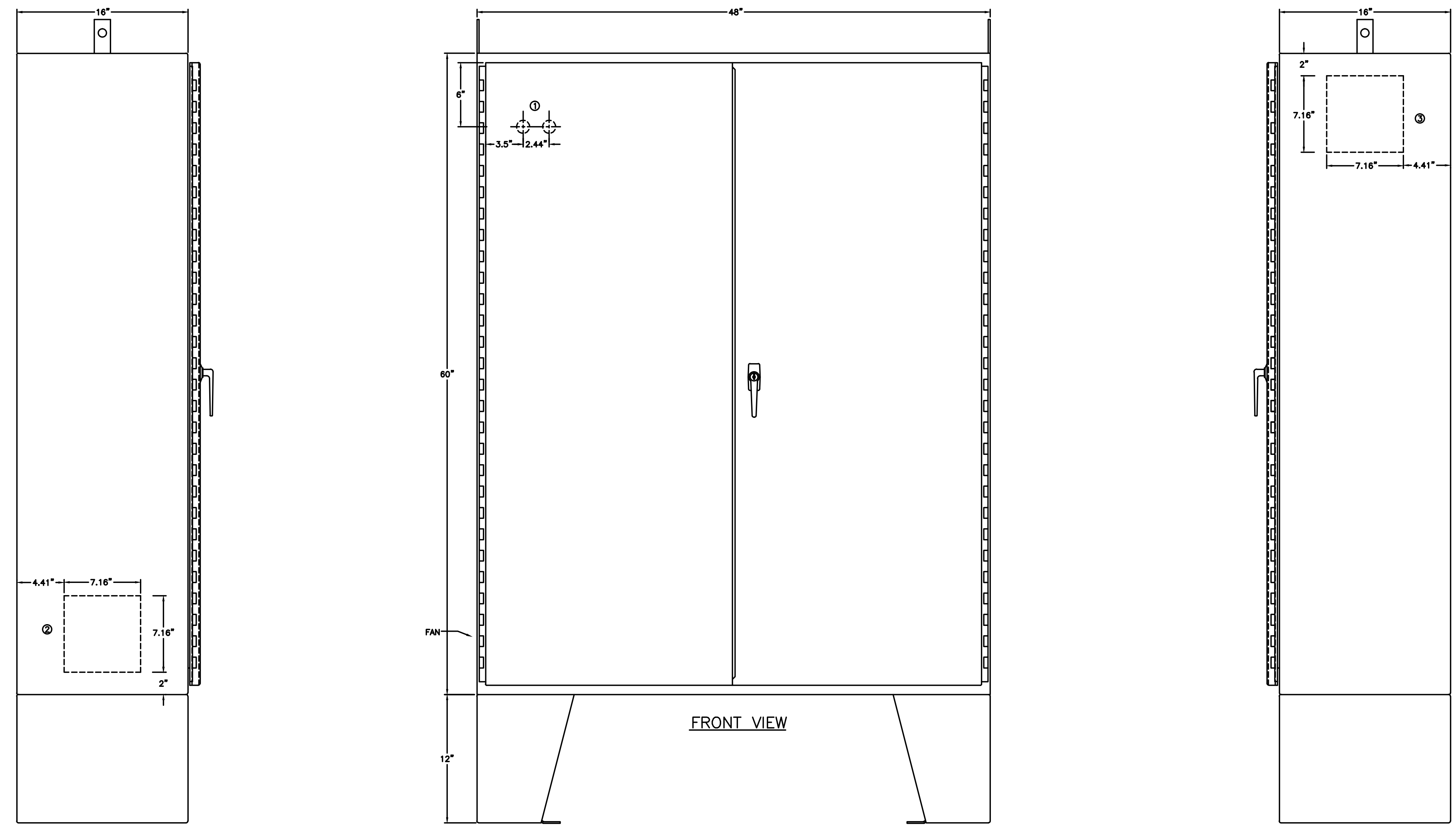
ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL LAYOUT

SIZE	DRAWING NUMBER	REV
D	E-1553-1B	2

SCALE NONE | FILE E-1553-1B | SHEET 1 OF 1

ITEM NO.	QTY.	DEVICE	HOLE CUTOUT
1	2	PUSHBUTTONS	1-7/32" ø
2	1	FAN	7.16" x 7.16"
3	1	EXHAUST VENT	7.16" x 7.16"



SIDE VIEW

FRONT VIEW

SIDE VIEW

NOTES:

1) ENCLOSURE IS NEMA 12 PAINTED GRAY STEEL WITH THROUGH DOOR DISCONNECT. PANEL DEPTH IS 18".

ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BRM DATE: 5/8/06
PROJECT No. 1553

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	DT	BRM	5/8/06

CERTIFIED CORRECT FOR INSTALLATION
BY: BRM DATE: 5/8/06
PROJECT No. 1553
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

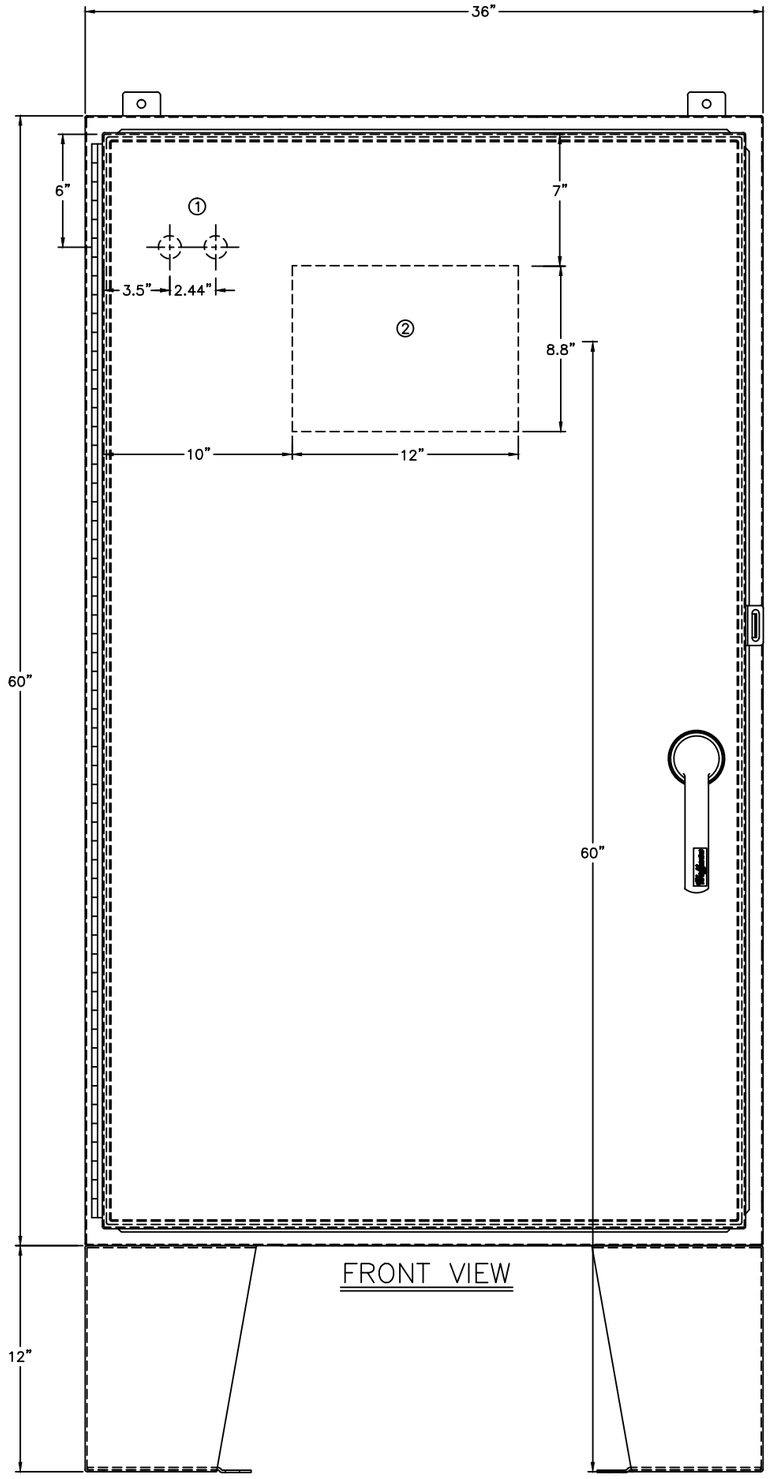
ESTIMATED WEIGHT IN LBS:
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020
MILL FINISH ALL OVER

DRAWN BY: DT — DATE 3/20/06
CHECKED BY: — DATE
APPROVED BY: — DATE
THIRD ANGLE PROJECTION

ANDRITZ
ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: WICHITA ASR
D5LL CENTRIFUGE STARTER
PUSHBUTTON CUTOUT DETAILS

SIZE: E — DRAWING NUMBER: E-1553-1C — REV: 1
SCALE: NONE — FILE: E-1553-1C — SHEET 1 OF 1



FRONT VIEW

NOTES:

1) ENCLOSURE IS NEMA 4X 304 STAINLESS STEEL. PANEL DEPTH IS 12".

ITEM NO.	QTY.	DEVICE	HOLE CUTOUT
1	2	PUSHBUTTONS	1-7/32" ø
2	1	PANELVIEW PLUS 1000	8.8" x 12"

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION
BY: BRM DATE: 5/8/06
PROJECT No. 1553

REV	EIR	REVISION	BY	APVD	DATE
1		CERTIFIED	DT	BRM	5/8/06

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)465-5611
Telefax: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION
BY: BRM DATE: 5/8/06
PROJECT No. 1553
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

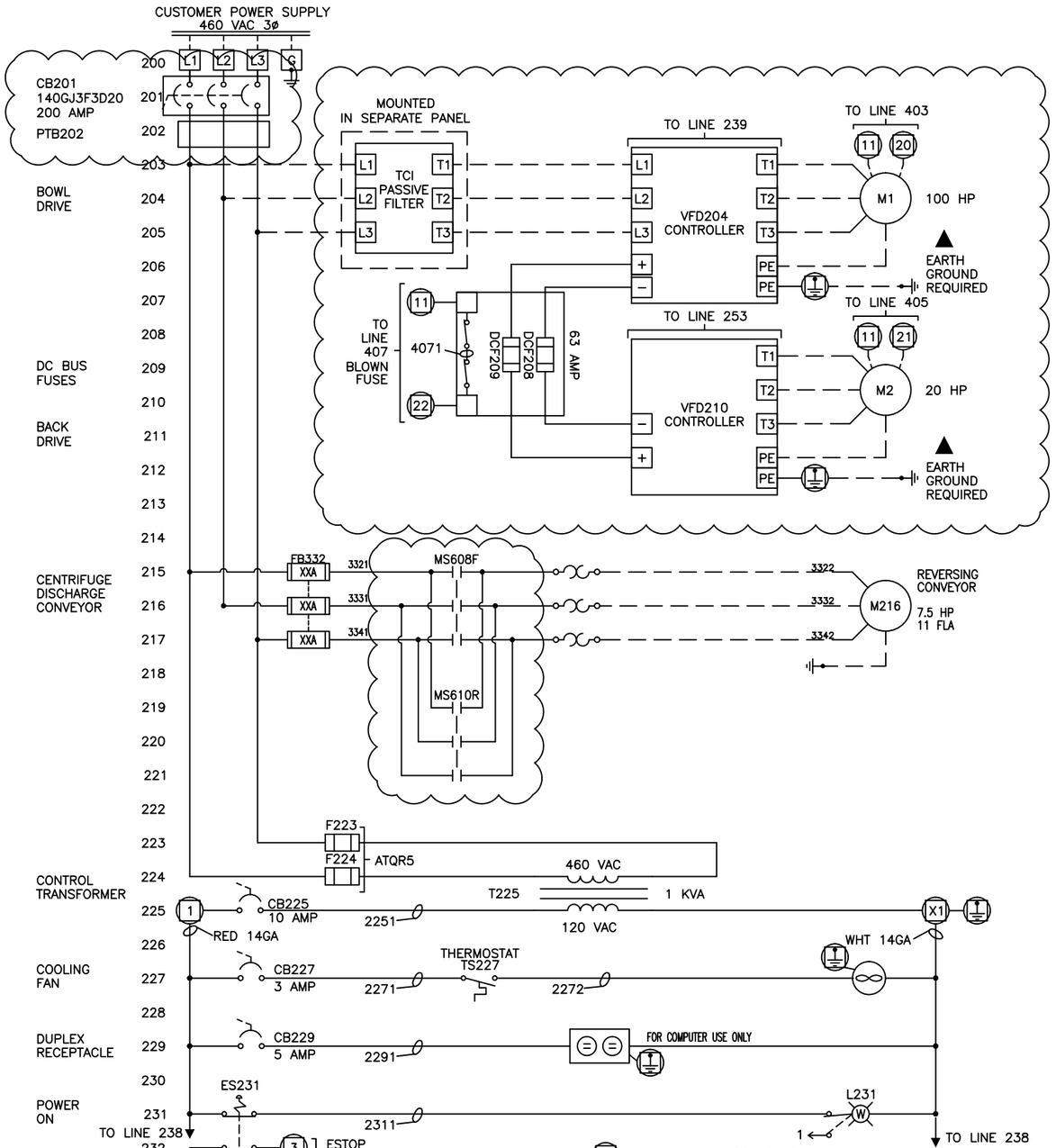
ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 12/27/05
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

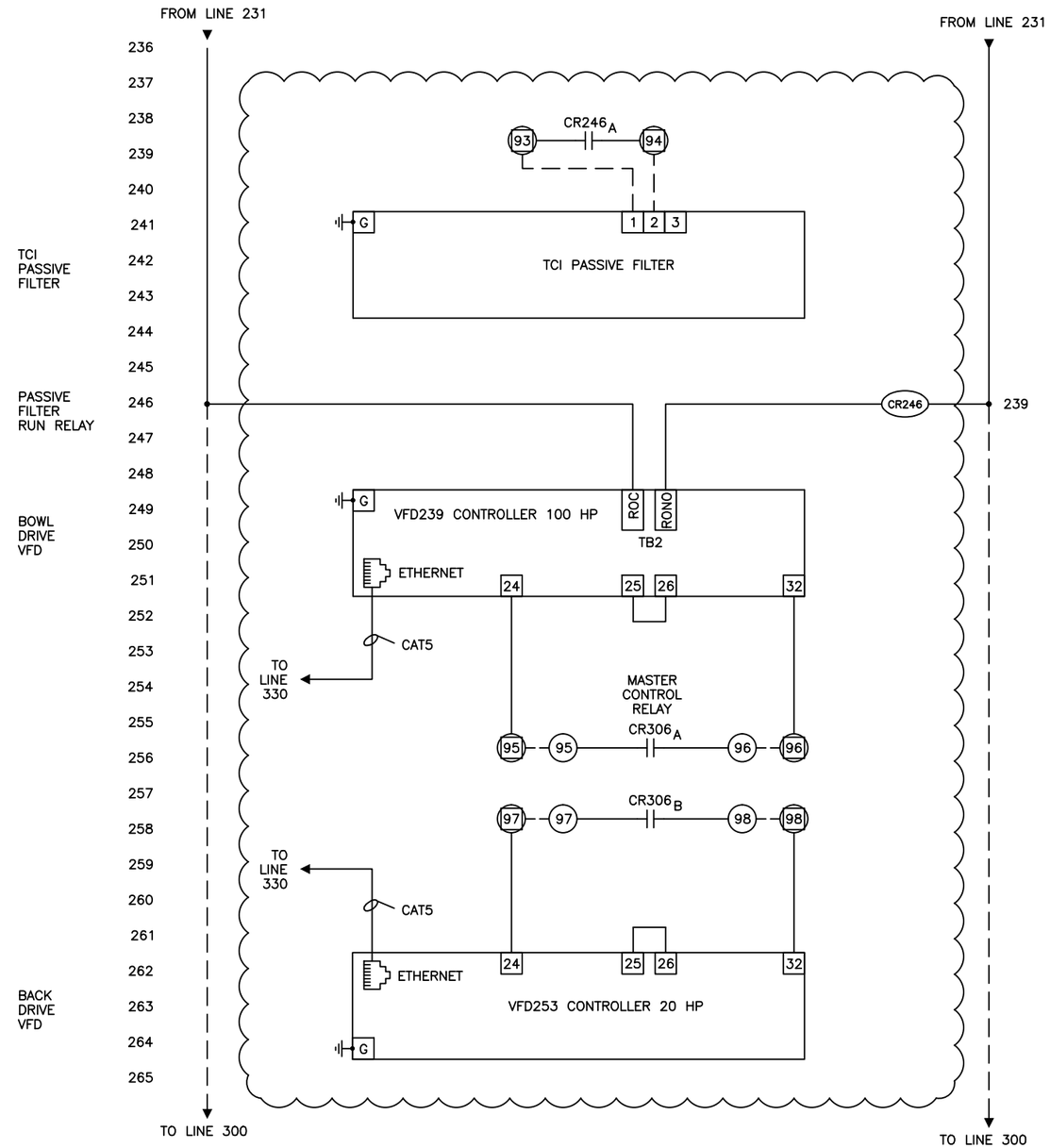
ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

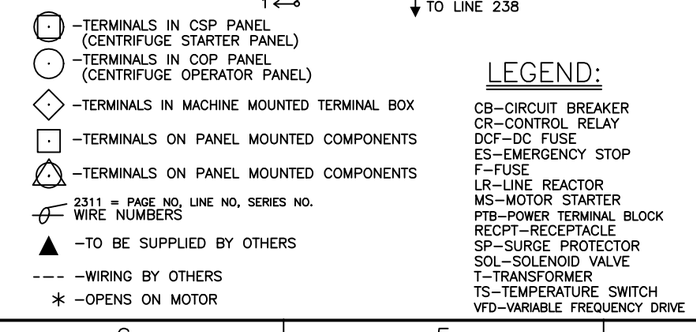
TITLE: WICHITA ASR
D5LL CENTRIFUGE COP PANEL
PUSHBUTTON CUTOUT DETAILS

SIZE	DRAWING NUMBER	REV
D	E-1553-1D	1

SCALE NONE | FILE E-1553-1D | SHEET 1 OF 1







LEGEND:

CB–CIRCUIT BREAKER
CR–CONTROL RELAY
DCF–DC FUSE
ES–EMERGENCY STOP
F–FUSE
LR–LINE REACTOR
MS–MOTOR STARTER
PTB–POWER TERMINAL BLOCK
RECPT–RECEPTACLE
SP–SURGE PROTECTOR
SOL–SOLENOID VALVE
T–TRANSFORMER
TS–TEMPERATURE SWITCH
VFD–VARIABLE FREQUENCY DRIVE

PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
4		MOVE SITE / UPGRADE B46043	RLS	jc	12/04/17
3		CORRECTED CONVEYOR WIRING	BRM	jec	9/5/06
2		REVISED PER AS BUILT	DT	acm	7/18/06
1		CERTIFIED	DT	acm	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

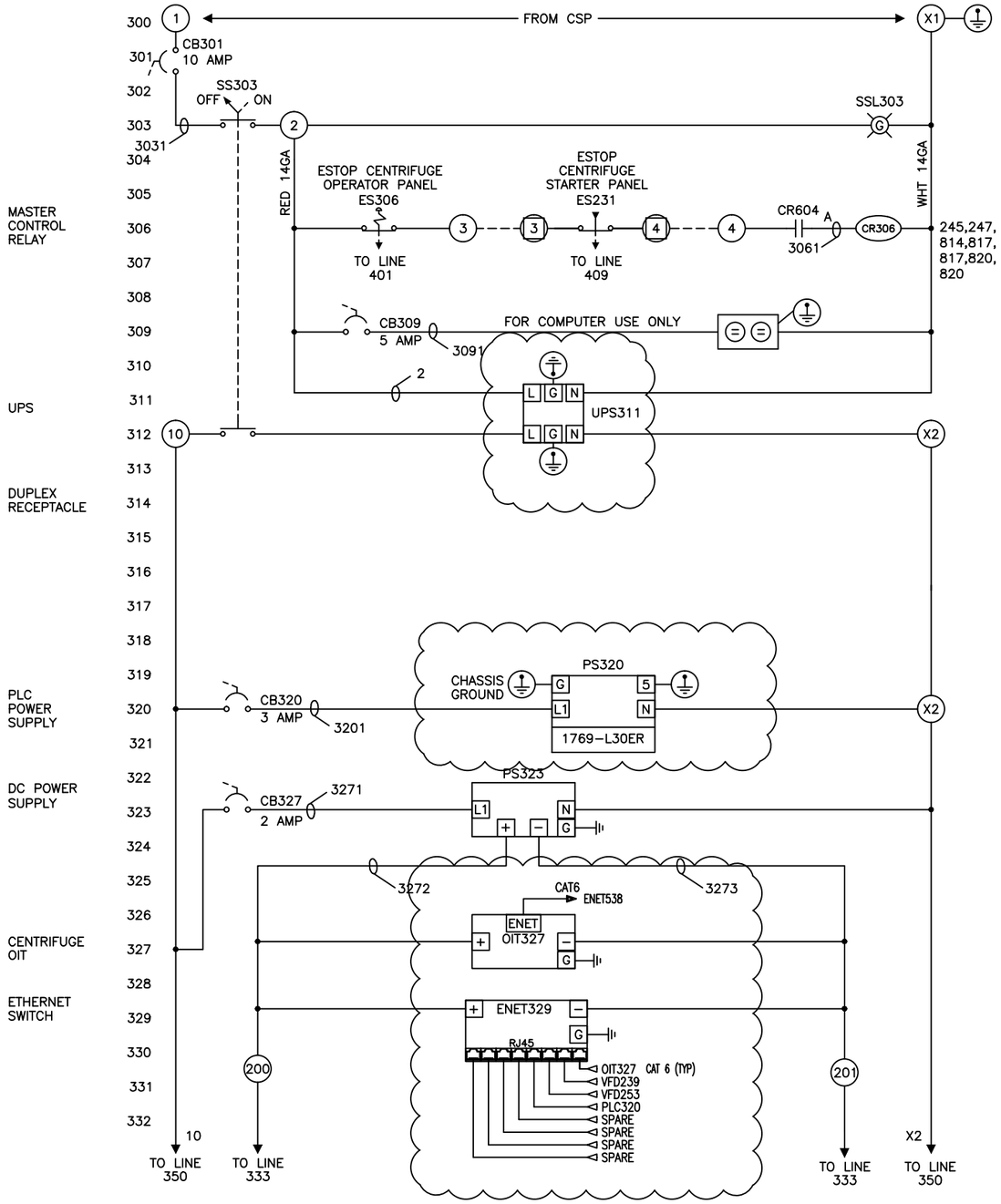
ANDRITZ

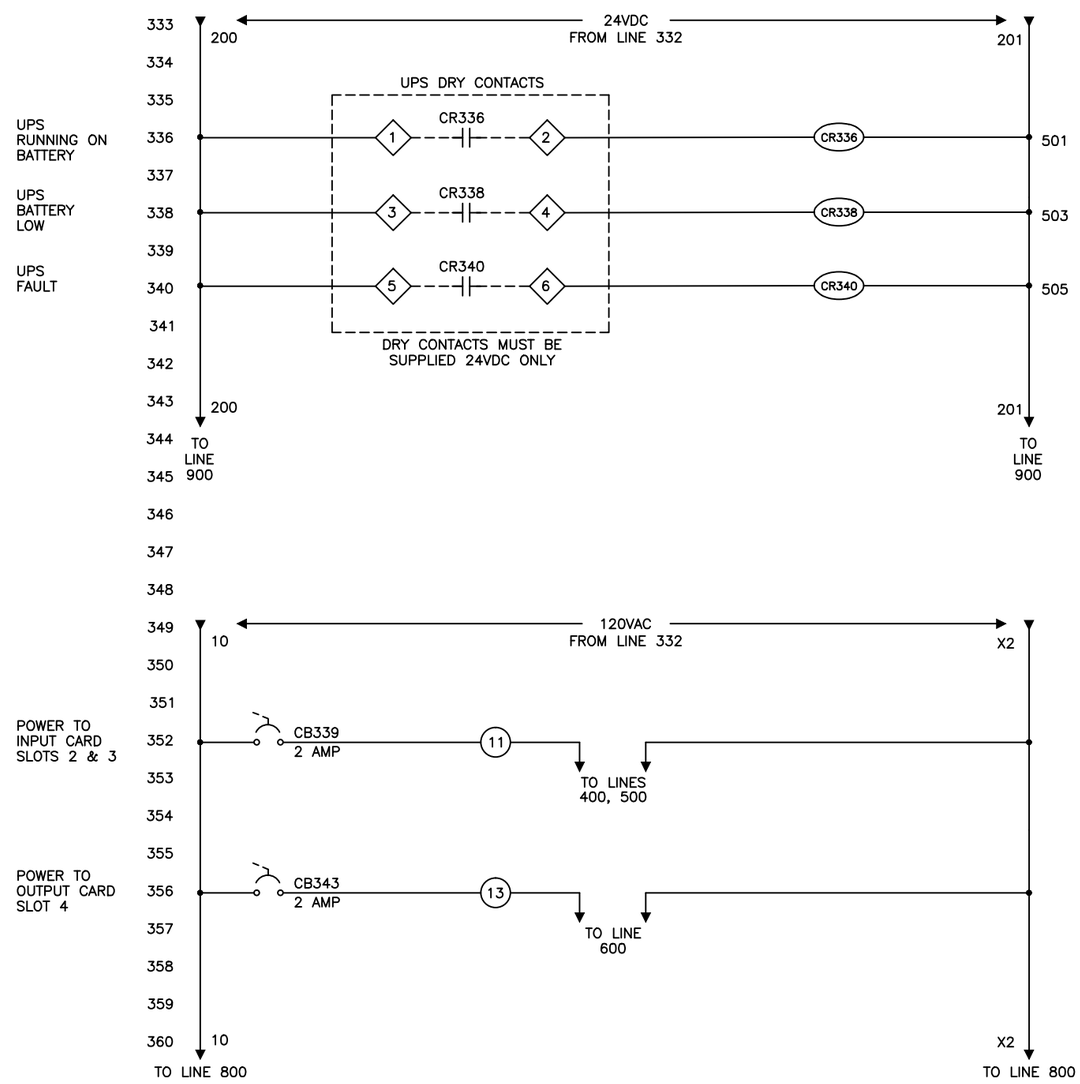
ANDRITZ–RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE STARTER ELECTRICAL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E–1553–2	4

SCALE NONE | FILE E–1553–2 | SHEET 1 OF 1





PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
3		MOVE SITE / UPGRADE B46043	RLS	JC	12/04/17
2		AS BUILT	BRM	BB	7/14/06
1		CERTIFIED	DT	BEM	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

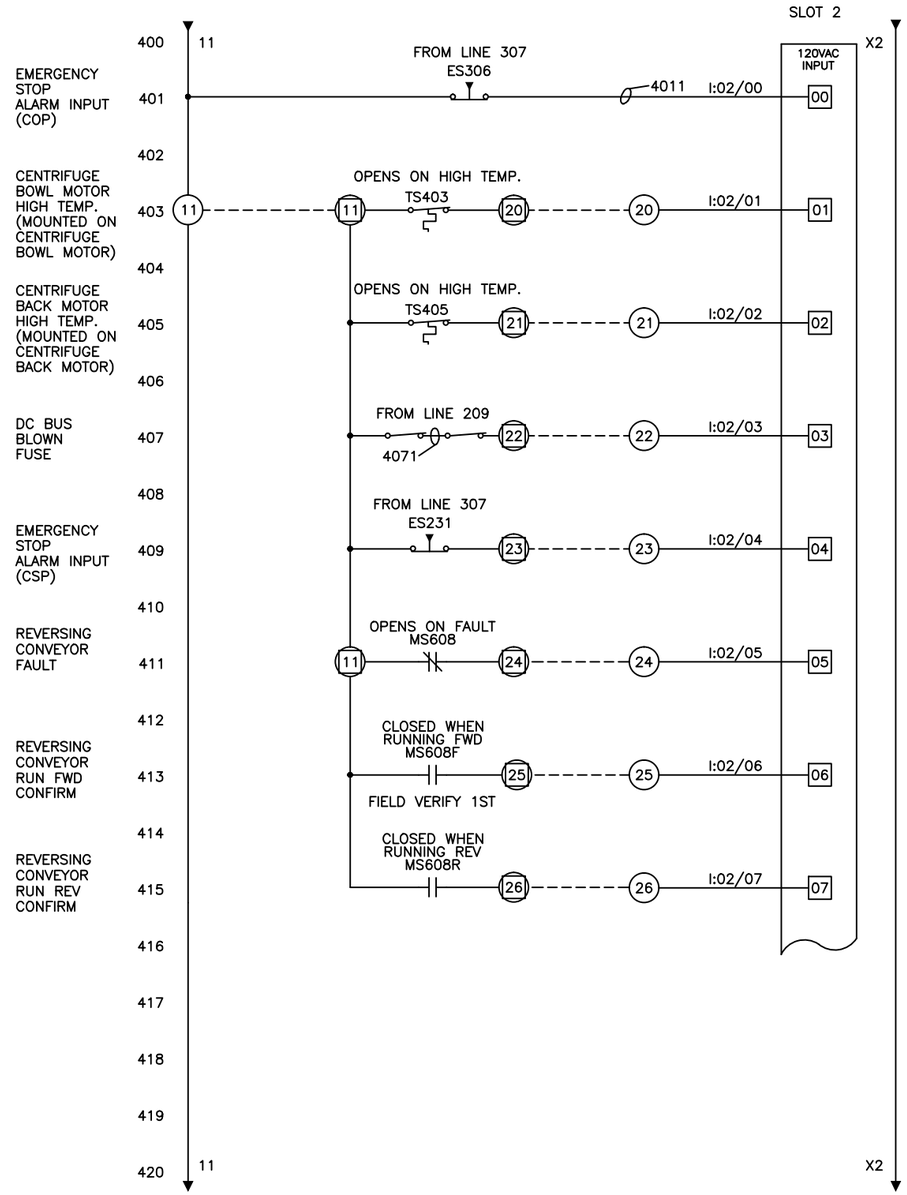
ANDRITZ

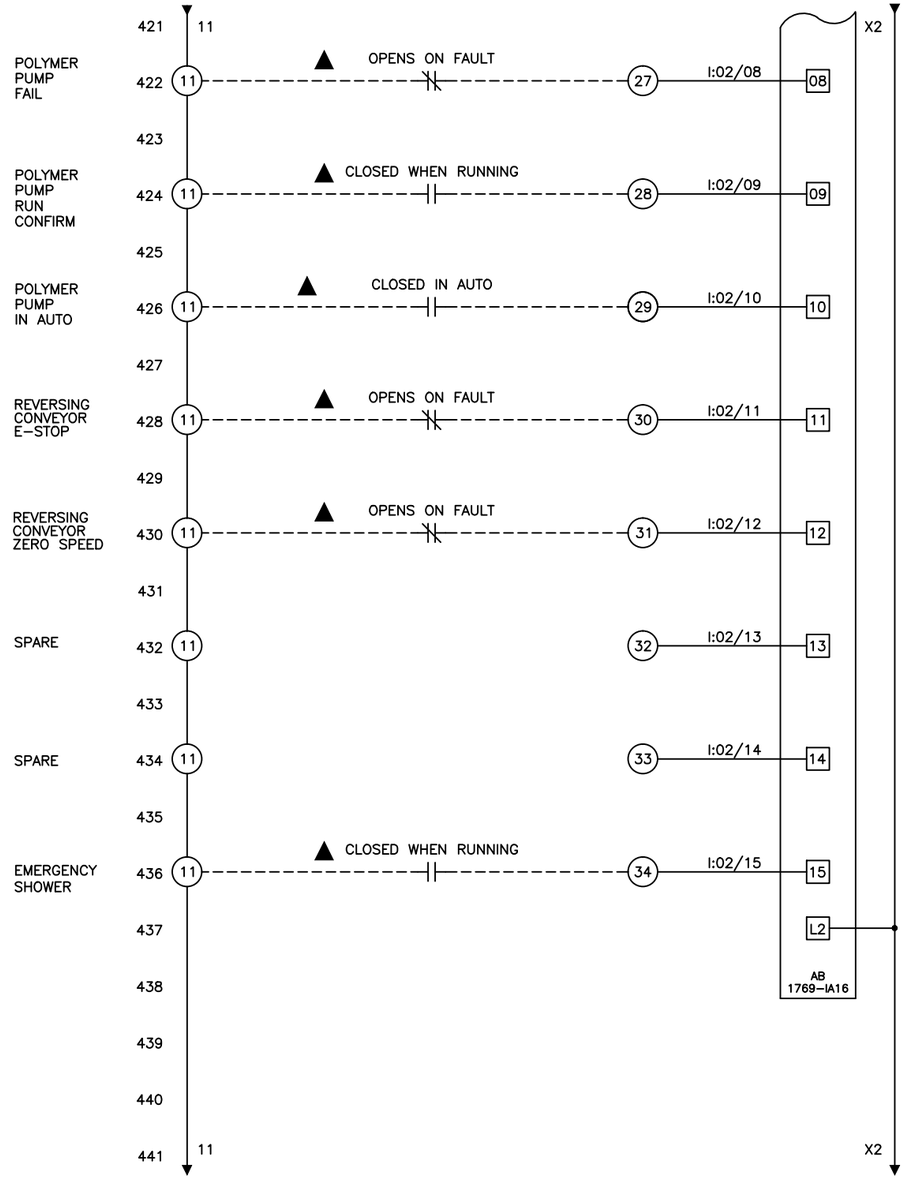
ANDRITZ-RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E-1553-3	3

SCALE NONE | FILE E-1553-3 | SHEET 1 OF 1





REV	EIR	REVISION	BY	APVD	DATE
4		MOVE SITE / UPGRADE B46043	RLS	jc	12/4/17
3		CORRECTED CONVEYOR TERMINAL NUMBERS	BRM	jec	9/5/06
2		REVISED PER AS BUILT	DT	bem	7/18/06
1		CERTIFIED	DT	bem	5/8/06

PRELIMINARY DWGS.
FOR APPROVAL ONLY

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

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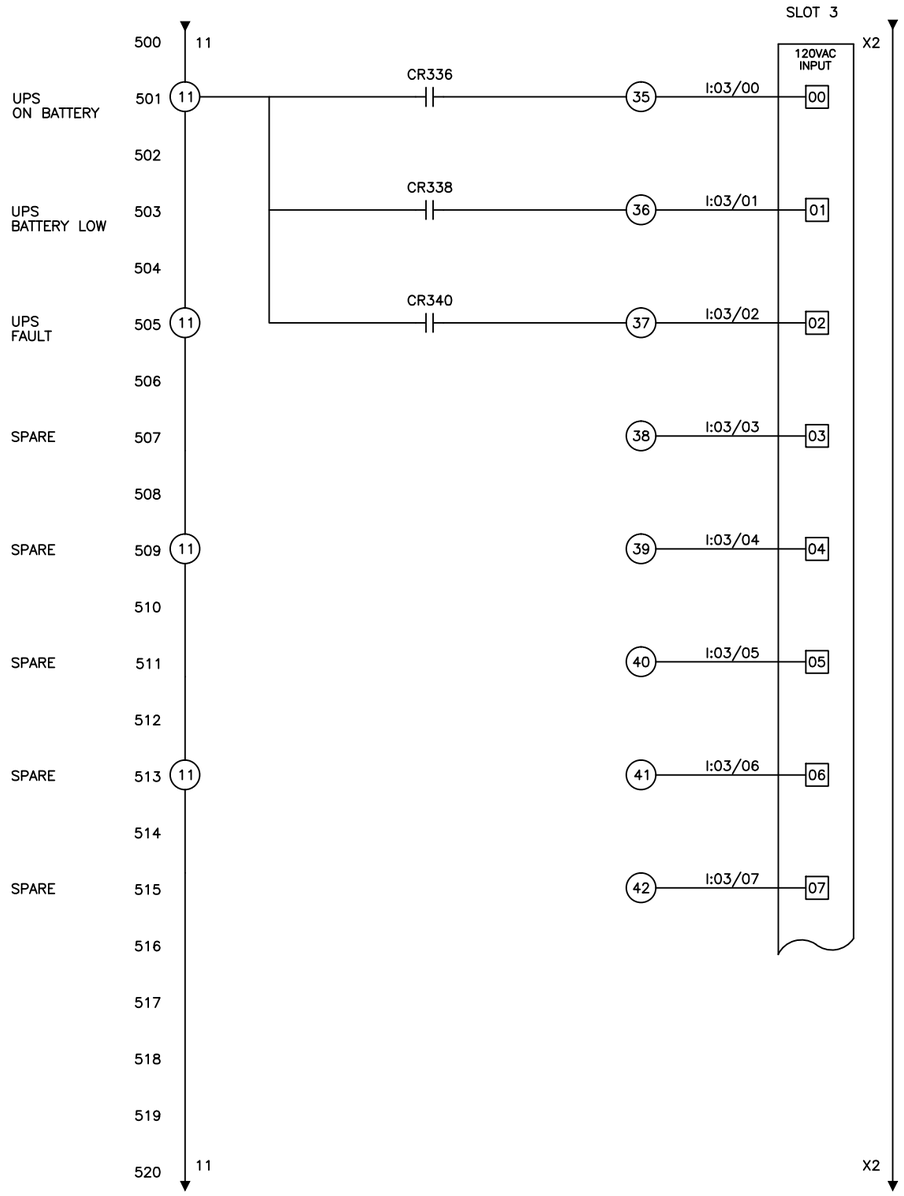
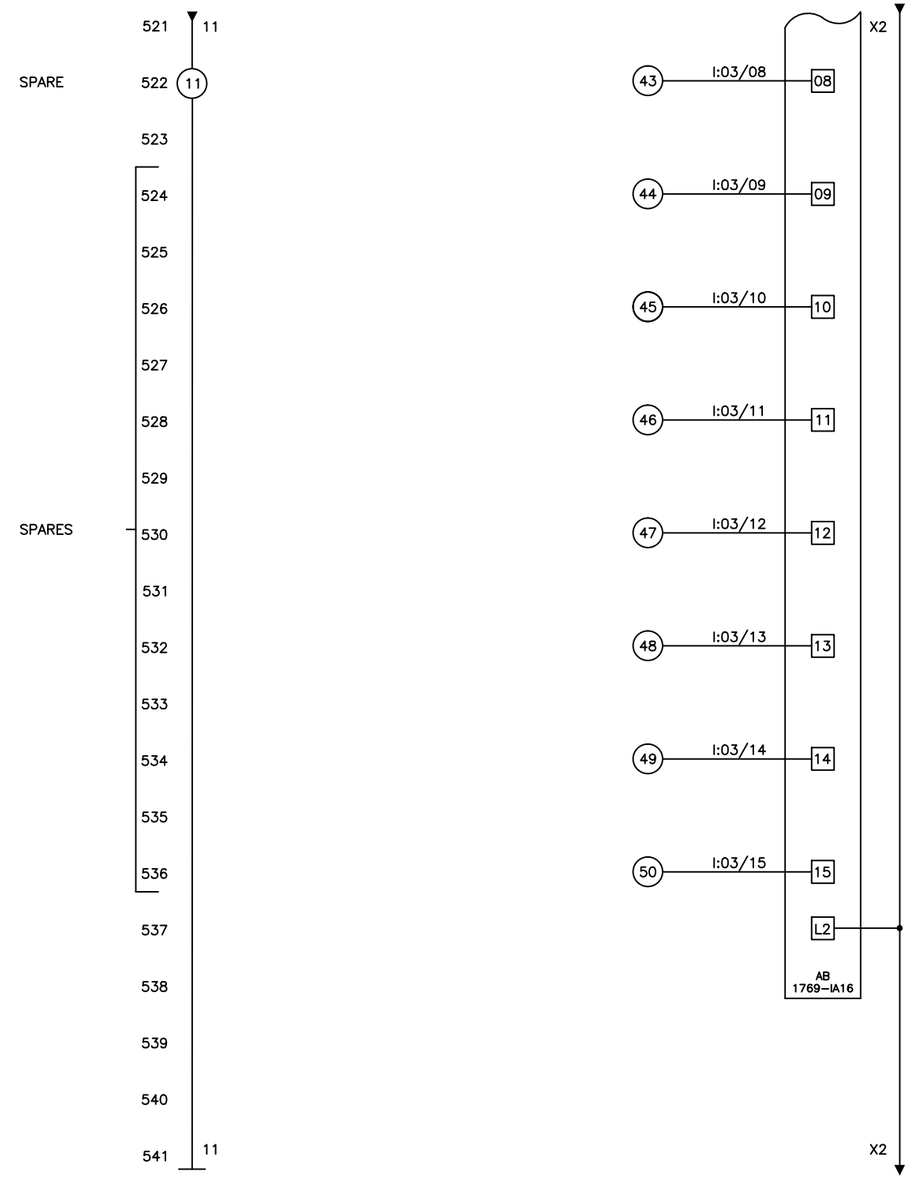
TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E-1553-4	4

SCALE NONE | FILE E-1553-4 | SHEET 1 OF 1





PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
4		MOVE SITE / UPGRADE B46043	RLS	JC	12/4/17
3		CORRECTED CONVEYOR TERMINAL NUMBERS	BRM	JLC	9/5/06
2		REVISED PER AS BUILT	DT	BEM	7/18/06
1		CERTIFIED	DT	BEM	5/8/06

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	APPROVED BY:	DATE
	THIRD ANGLE PROJECTION	

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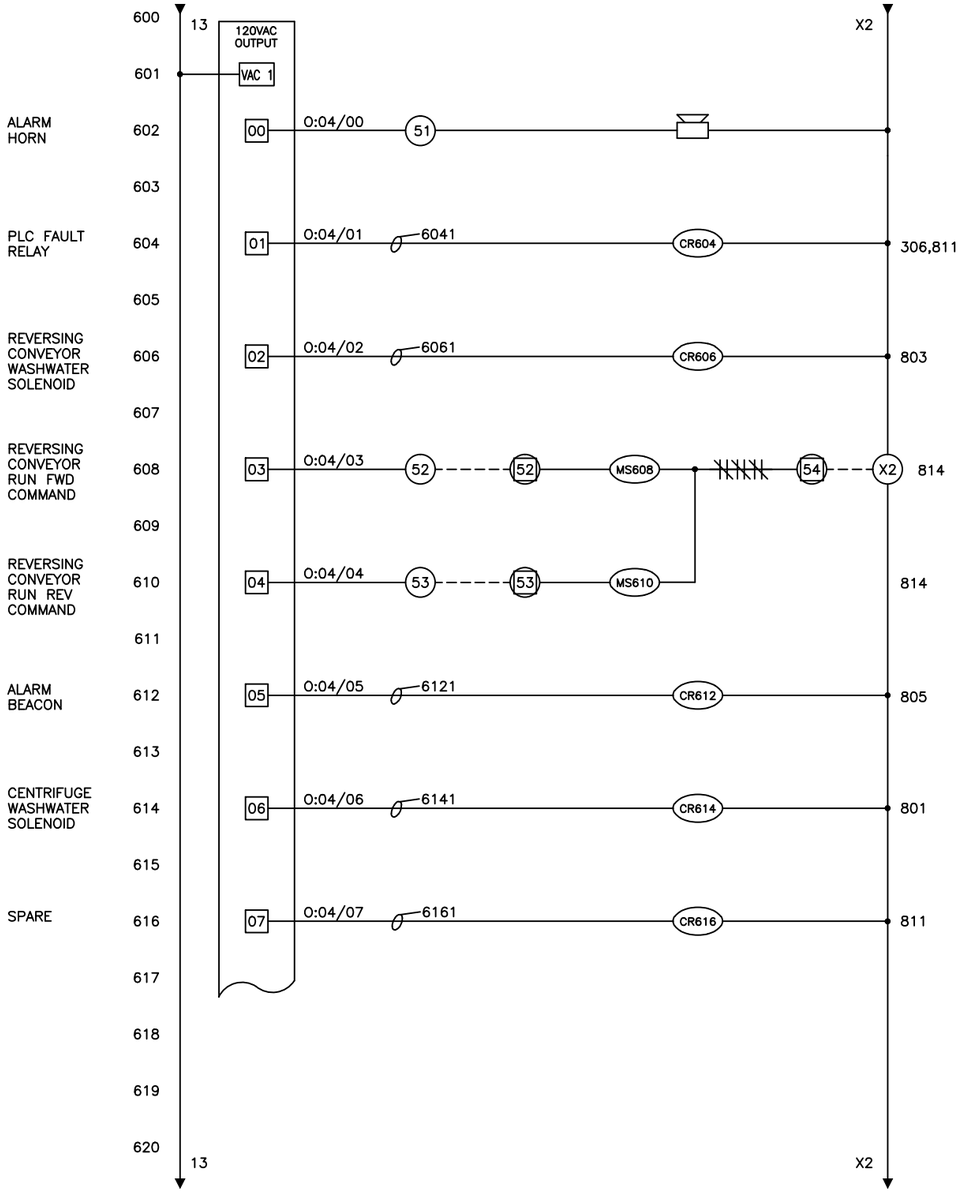
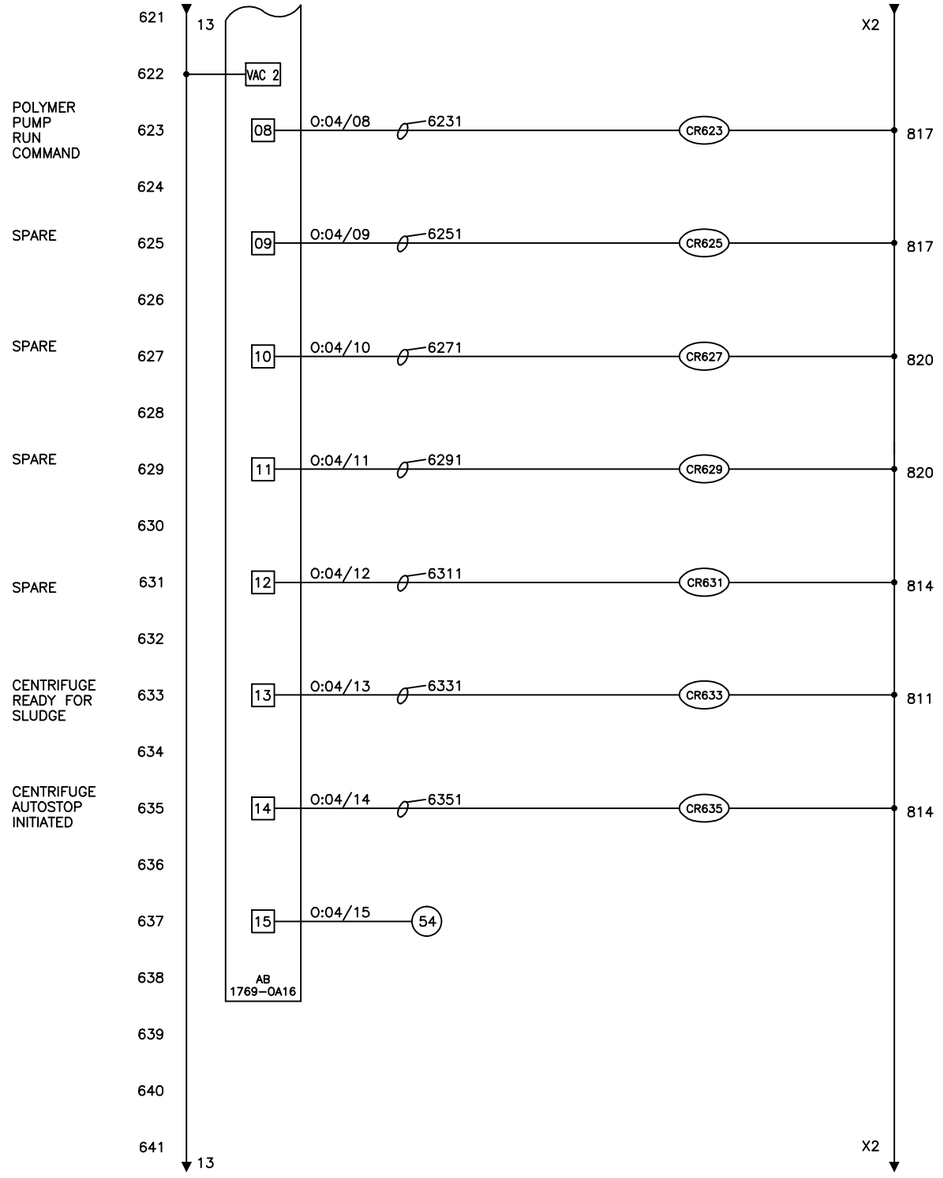
TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E-1553-5	4

SCALE: NONE | FILE: E-1553-5 | SHEET 1 OF 1

SLOT 4





REV	EIR	REVISION	BY	APVD	DATE
3		MOVE SITE / UPGRADE B46043	RLS	jc	12/4/17
2		CORRECTED CONVEYOR TERMINAL NUMBERS	BRM	jec	9/5/06
1		CERTIFIED	DT	cam	5/8/06

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MILL FINISH ALL OVER		

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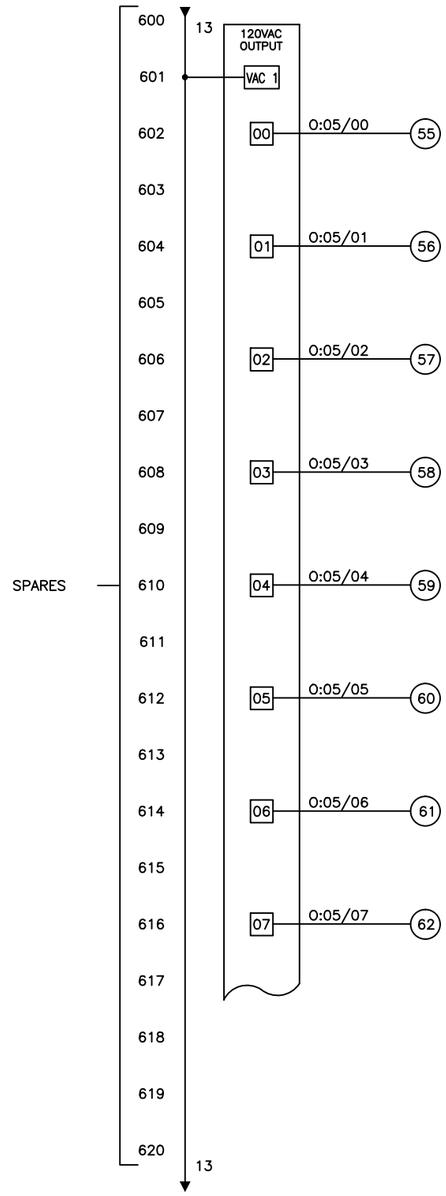
ARLINGTON, TEXAS 76001
PHONE: (817) 465-5611

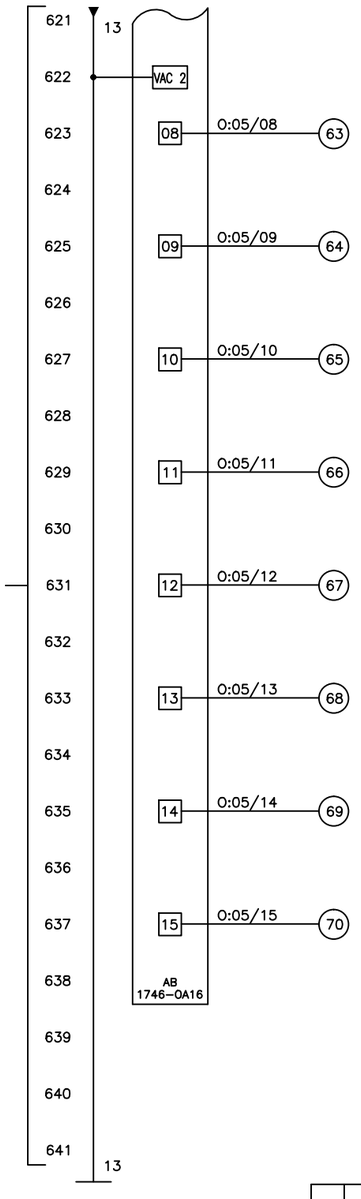
TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E-1553-6	3

SCALE NONE | FILE E-1553-6 | SHEET 1 OF 1

SLOT 5





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3		MOVE SITE / UPGRADE B46043	RLS	JC	12/4/17
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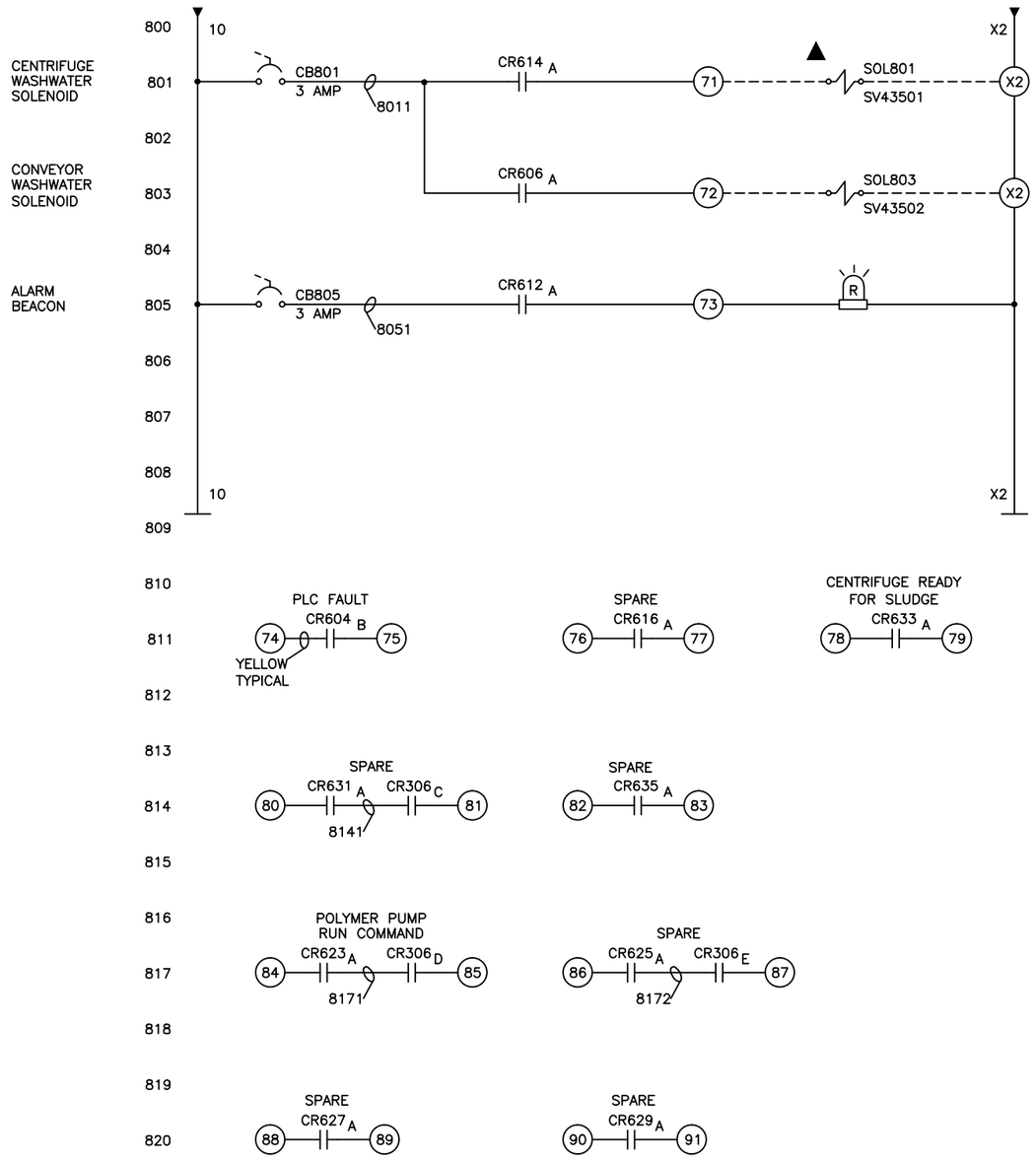
1		CERTIFIED	DT	BEM	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06	ANDRITZ ANDRITZ-RUTHNER, INC. 1010 COMMERCIAL BLVD. SOUTH ARLINGTON, TEXAS 76001 PHONE: (817) 465-5611
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FABRICATION TOLERANCES .XXX±.040 ANG±1° HOLE±.020 MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020 MILL FINISH ALL OVER	CHECKED BY:	DATE	
	APPROVED BY:	DATE	
	THIRD ANGLE PROJECTION		

TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E-1553-7	3

SCALE NONE | FILE E-1553-7 | SHEET 1 OF 1



PRELIMINARY DWGS.
FOR APPROVAL ONLY

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4		MOVE SITE / UPGRADE B46043	RLS	JC	12/4/17
3		CORECTED CONVEYOR TERMINAL NUMBERS	BRM	JLC	9/5/06
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MILL FINISH ALL OVER		

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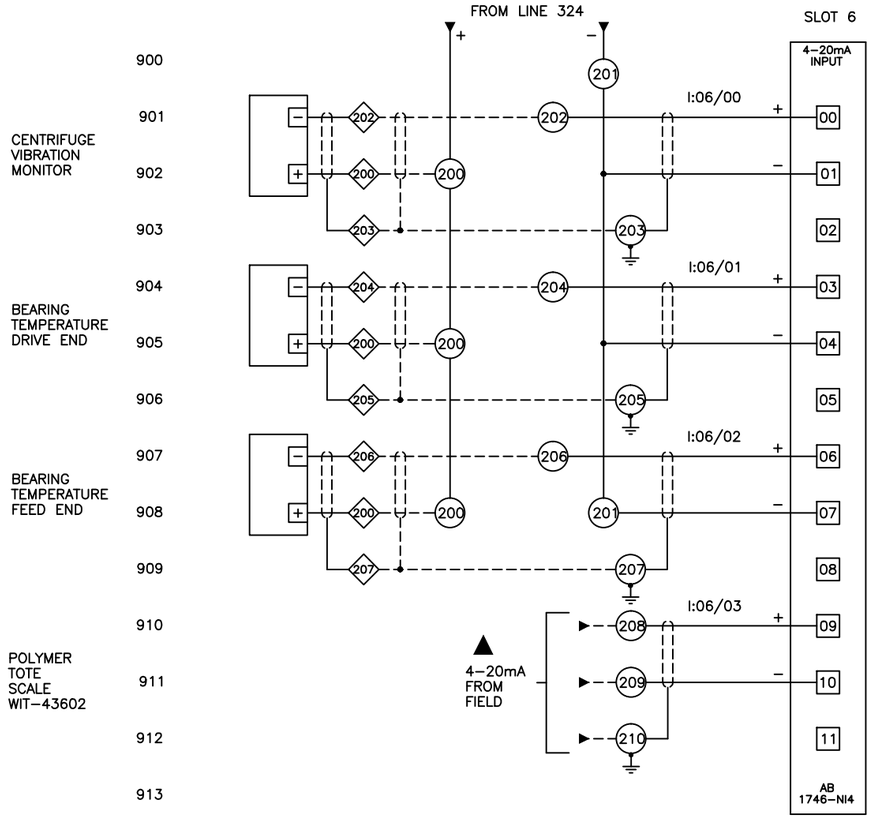
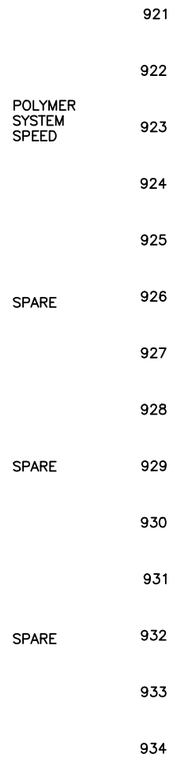
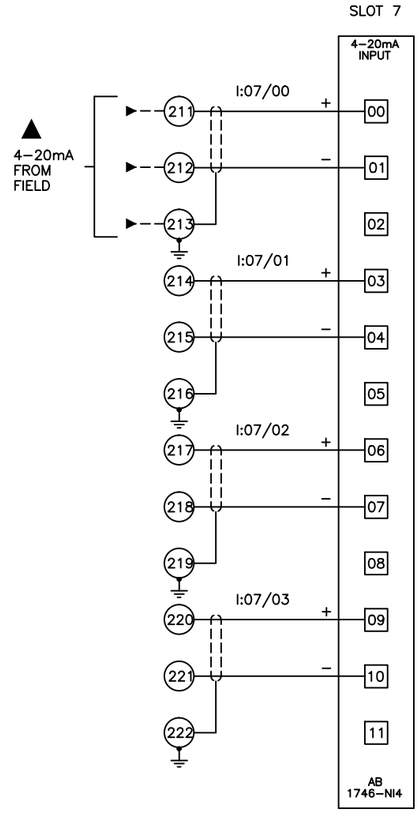
TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E–1553–8	4

SCALE NONE | FILE E–1553–8 | SHEET 1 OF 1







NOTES:
ALL DIP SWITCHES ON ANALOG INPUT CARDS MUST BE TURNED ON.

PRELIMINARY DWGS.
FOR APPROVAL ONLY

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3		MOVE SITE / UPGRADE B46043	RLS	jc	12/4/17
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	THIRD ANGLE PROJECTION	

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TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E–1553–9	3

SCALE NONE | FILE E–1553–9 | SHEET 1 OF 1

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PRELIMINARY DWGS.
FOR APPROVAL ONLY

REV	EIR	REVISION	BY	APVD	DATE
2		MOVE SITE / UPGRADE B46043	RLS	JC	12/4/17
1		CERTIFIED	DT	BAM	5/8/06

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DT	DATE 3/20/06
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MILL FINISH ALL OVER		

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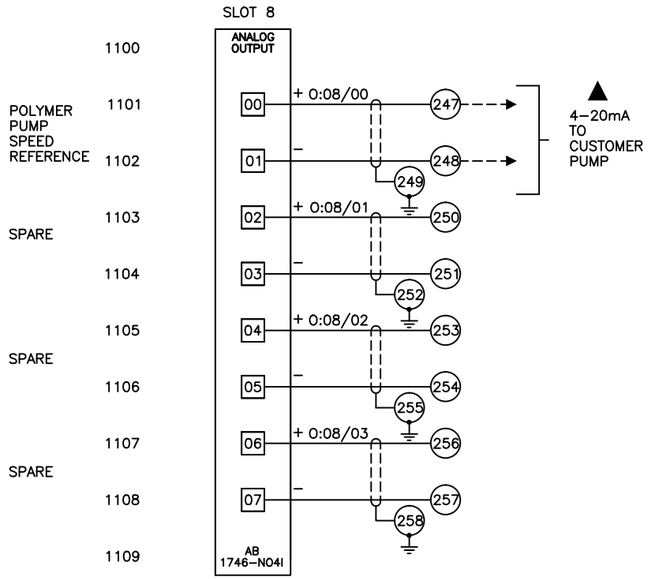
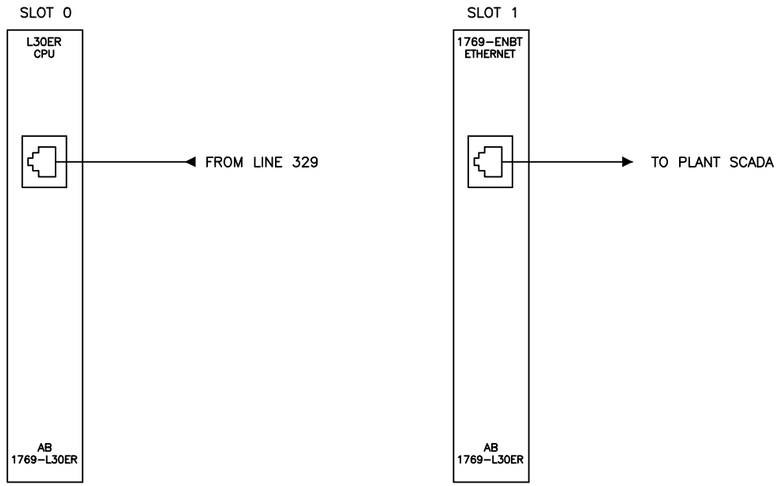
ARLINGTON, TEXAS 76001
PHONE: (817) 465–5611

TITLE: FOUR MILE CREEK WQRF
BLANK PAGE

SIZE	DRAWING NUMBER	REV
D	E–1553–10	2

SCALE: NONE | FILE: E–1553–10 | SHEET 1 OF 1





1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141

PRELIMINARY DWGS.
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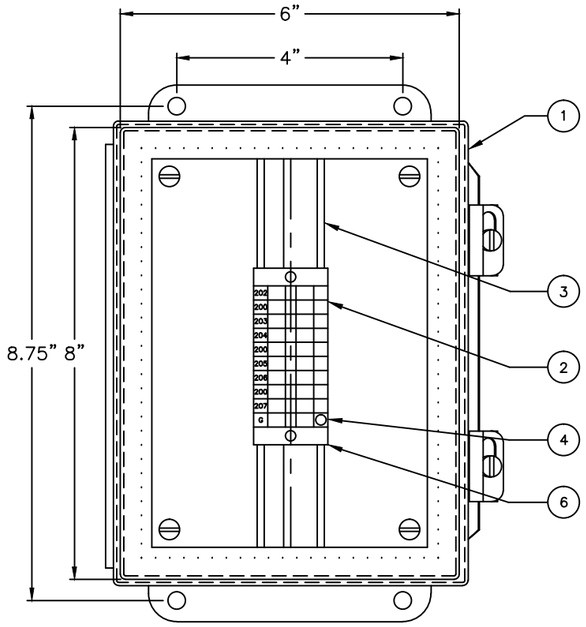
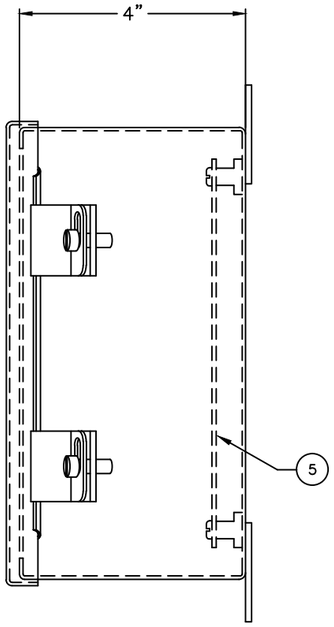
TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
COP PANEL SCHEMATIC

SIZE	DRAWING NUMBER	REV
D	E–1553–11	3

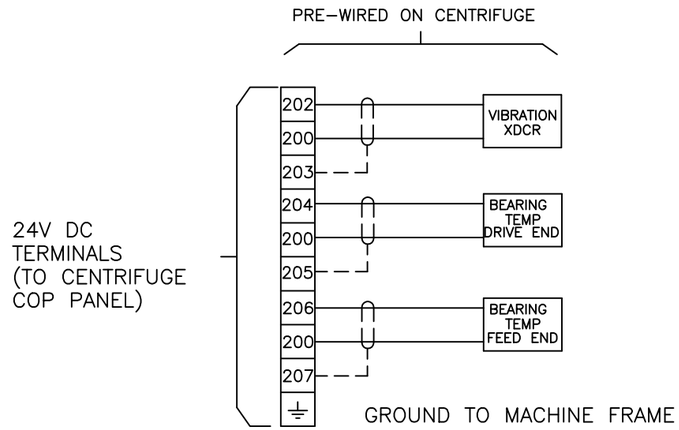
SCALE NONE | FILE E–1553–11 | SHEET 1 OF 1



FRONT VIEW
(COVER REMOVED)



SIDE VIEW



TERMINAL CONNECTION DETAIL

ITEM DESCRIPTION

1. –TERMINAL BOX–HOFFMAN A–8064CHNFSS6 NEMA 4X 316 STAINLESS STEEL.
2. –WIRING TERMINALS–ENTRELEC TYPE 115118.11, 50A @600 VAC, #8 AWG. MAX.
3. –TERMINAL MOUNTING TRACK–ENTRELEC PR5 101598.26.
4. –GROUND TERMINAL–ENTRELEC 165114.17.
5. –TERMINAL BOX SUBPANEL A8P6.
6. –END BRACKET–ENTRELEC 103002.26.

PRELIMINARY DWGS.
FOR APPROVAL ONLY

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MACHINING TOLERANCES .XXX±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

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PHONE: (817) 465–5611

TITLE: FOUR MILE CREEK WQRF
D5LL CENTRIFUGE
TERMINAL BOX DETAILS

SIZE	DRAWING NUMBER	REV
D	E–1553–12	3

SCALE NONE | FILE E–1553–12 | SHEET 1 OF 1

460 VAC, 3PH
60HZ POWER
200 A

L1
L2
L3

EARTH GROUND REQUIRED

G

CENTRIFUGE STARTER PANEL

LCP–43501

120 VAC

1
X1

SEE NOTE 1

EARTH GROUND REQUIRED

G

CENTRIFUGE OPERATOR PANEL

LCP–43500

TCI PASSIVE FILTER

L1
L2
L3

T1
T2
T3

MAIN DRIVE VFD

MAIN DRIVE VFD
95
96

BACK DRIVE VFD
97
98

VFD ENABLE CR306
A
B

E–Stop
3
4

11
120VAC

BOWL HI TEMP 20
SCROLL HI TEMP 21
DC BUSS BLOWN FUSE 22
E–Stop 23
REV CONV FAULT 24

VFD239 ETH
VFD253 ETH

CAT5 CABLE

ETHERNET SWITCH

CR246
1
2

FROM CONVEYOR MOTOR STARTER

RUN FWD CONFIRM 11
RUN REV CONFIRM 25
FAULT 11
26
11
24

52 RUN FORWARD COMMAND
54 X2
53 RUN REVERSE COMMAND

CENTRIFUGE WASHWATER SOLENOID
71 OPEN COMMAND
X2

REVERSING CONVEYOR WASHWATER SOLENOID
72 OPEN COMMAND
X2

BOWL DRIVE VFD
BACK DRIVE VFD
20
11
21

SEE NOTE 2

M1
M2

TS403
TS405

BOWL DRIVE MOTOR & TEMP. SWITCH

BACK DRIVE MOTOR & TEMP. SWITCH

CENTRIFUGE MACHINE MOUNTED TERMINAL BOX

VIBRATION SENSOR 202 200 203
BEARING TEMPERATURE DRIVE END 204 200 205
BEARING TEMPERATURE FEED END 206 200 207

EARTH GROUND REQUIRED

G

RUN COMMAND 11 85
SPEED REF 4–20mA 247 248 249

POLYMER PUMP FAIL 11
RUN CONFIRM 27
11
28
84
IN AUTO 29
SPEED INDICATION 4–20mA 211 212 213

▲ POLYMER PUMP

▲ REVERSING CONVEYOR

11
E–STOP 30
11
ZERO SPEED 31

▲ WASHWATER BOOSTER PUMP

COMMON FAIL ALARM 11 29
RUN INDICATION 11 30
RUN COMMAND 86 87

▲ POLYMER TOTE SCALE (WIT–43602)

LEVEL INDICATION 4–20mA 208 209 210

(SCADA) ▲ SLUDGE PUMP

ETH CAT5 CABLE ETH

RUN REQUEST
SPEED SETPOINT
RUN CONFIRM
VFD FAULT
SPEED INDICATION

EYEWASH STATION 11 34

▲ SHOWER/EYE WASH STATION (FSH–43600)

PLC FAULT 74 75
SPARE 76 77
CENTRIFUGE READY FOR SLUDGE 78 79
SPARE 80 81
SPARE 82 83
SPARE 86 87
SPARE 82 83
SPARE 86 87

SPARE CUSTOMER CONNECTION IF REQUIRED

NOTES:

1) CONTROL PANEL MUST BE SUPPLIED WITH POWER SOURCE GROUND FOR PROPER OPERATION OF INSTRUMENTS.
2) MOTOR GROUND WIRE MUST GO DIRECTLY TO VFD GROUND TERMINAL "PE".
3) THIS POINT TO POINT DRAWING IS DERIVED FROM PROJECT SCHEMATICS. **REFER TO PROJECT SCHEMATICS FOR FURTHER CLARIFICATION.**

⇄ – ARROW DIRECTION INDICATES INPUT OR OUTPUT

RECOMMENDED MINIMUM WIRE SIZE REQUIRED TO HANDLE LOAD

– POWER WIRE 12GA

– CONTROL WIRE 14GA

– SHIELDED CABLE 18GA (SIGNAL)
RUN ALL SHIELDED CABLE IN SEPARATE CONDUIT FROM POWER OR CONTROL CONDUCTORS. ALL SHIELDED CABLE GROUND CONDUCTORS SHOULD BE GROUNDED AT 1 END ONLY, PREFERABLY IN THE COP PANEL.

✳ – IF TERMINAL NO'S ARE KNOWN FOR EQUIPMENT SUPPLIED BY OTHERS. PLEASE PROVIDE FOR COMPLETION OF DRAWING.

▲ – TO BE SUPPLIED BY OTHERS.

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MILL FINISH ALL OVER		

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PHONE: (817) 465–5611

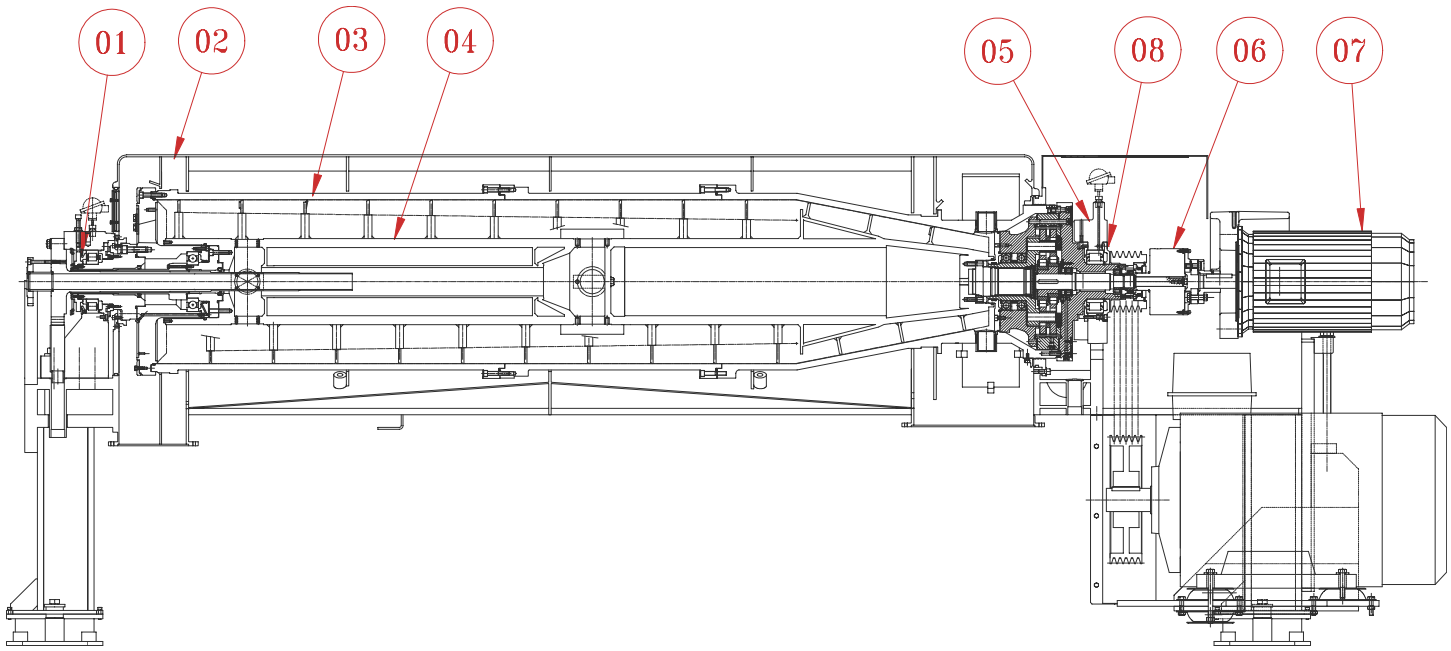
TITLE: FOUR MILE CREEK WQRF
POINT TO POINT

SIZE	DRAWING NUMBER	REV
D	E–1553–13	4

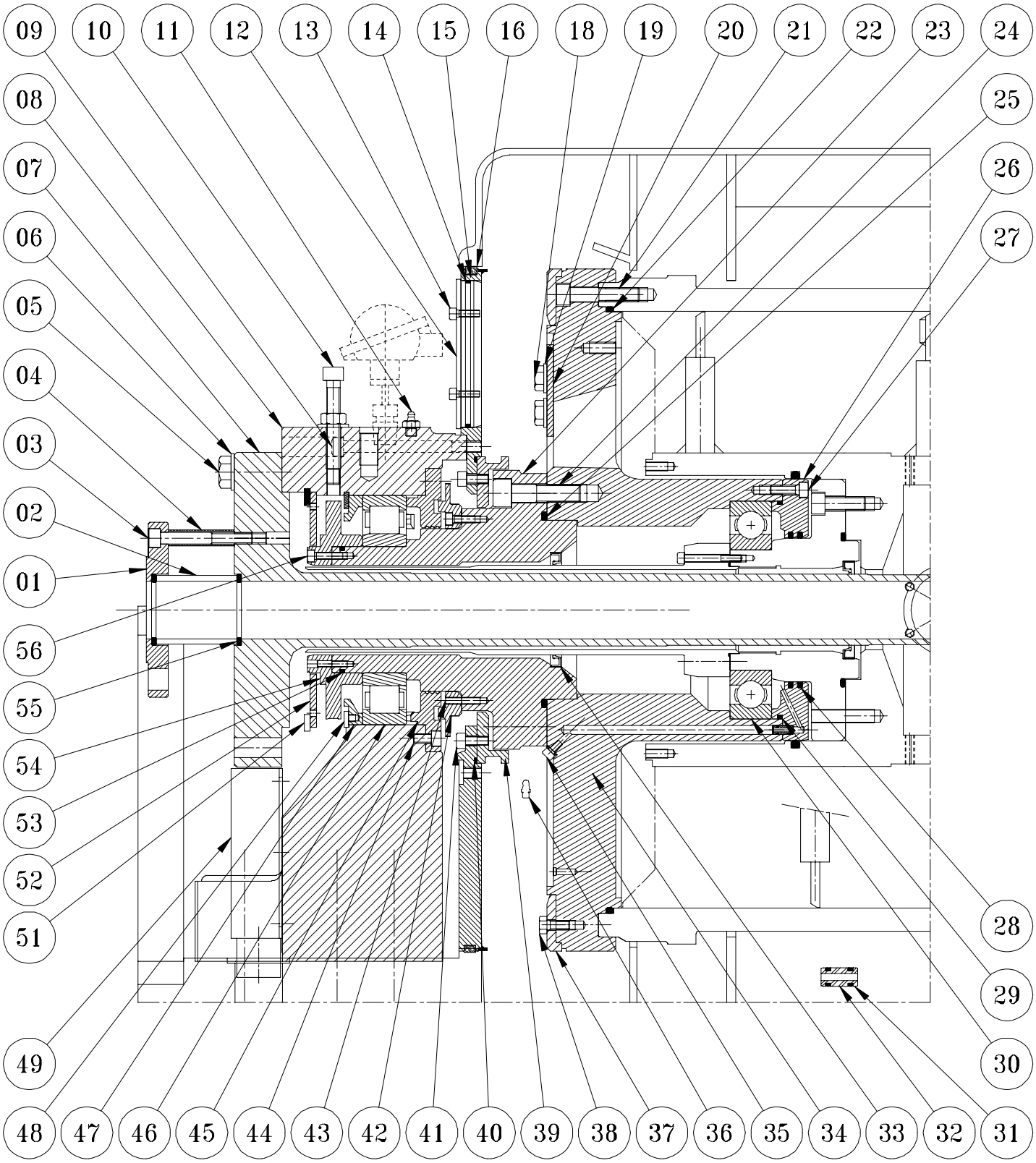
SCALE	FILE	SHEET
NONE	E–1553–13	1 OF 1

SPARE PARTS MANUAL

D 5 LLC 30 HP
SUMMARY DRAWINGS
ASSEMBLY: 39024



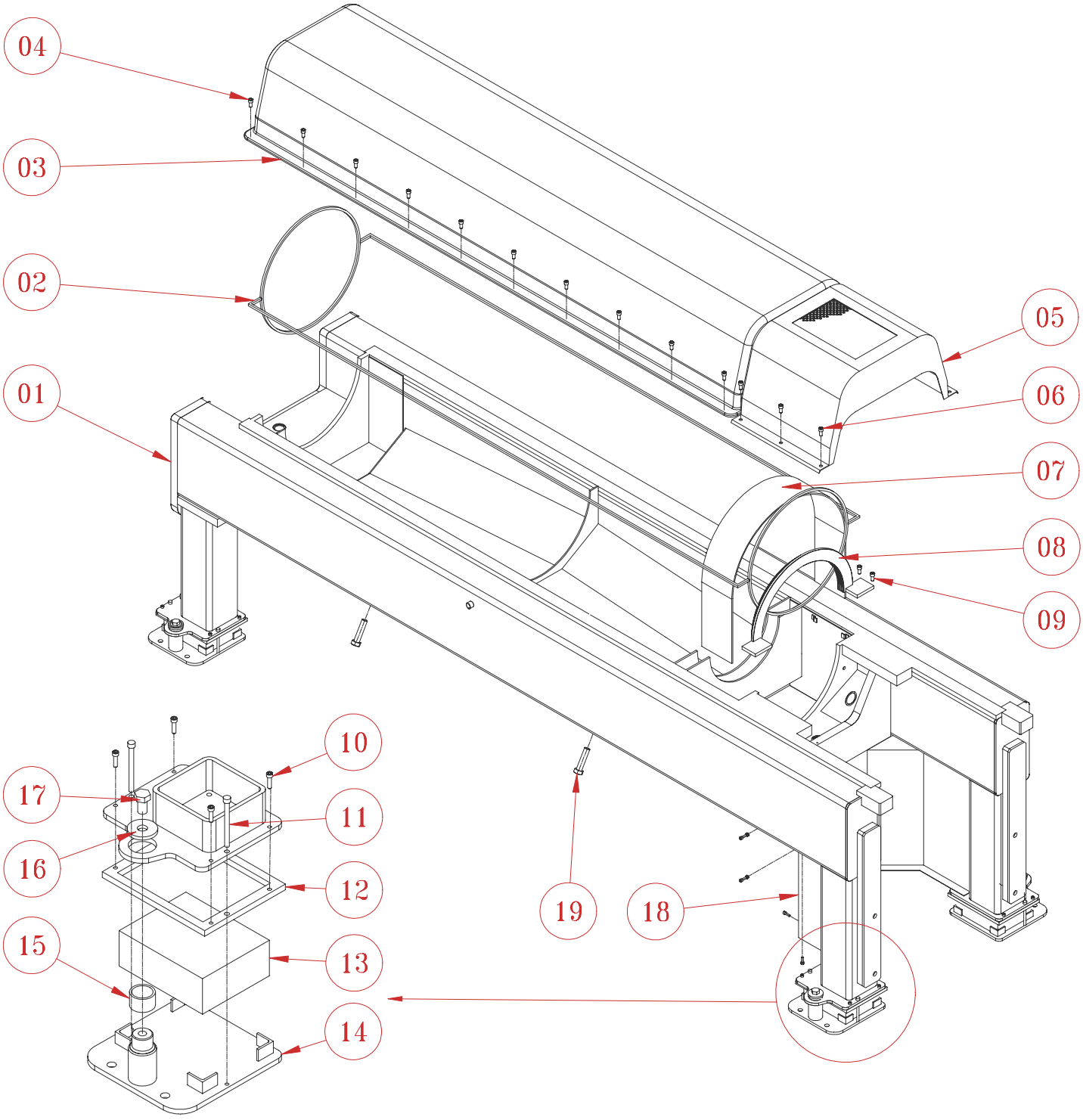
FRONT PILLOW BLOCK ASSEMBLY
N° 37445



FRONT PILLOW BLOCK ASSEMBLY
N° 37445

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
01	25946	FEED FLANGE	ST.STEEL	1
02	VOY/PY-09243/05	FEED SIGHT GLASS	PYREX	1
03	VIS/I-CHC-M10*100*032	CZ 263-SCREW	TREATED STEEL	4
04	09246.12*14*57,5	SPACER	ST.STEEL	4
05	VIS/A-H-M16*070*038	ZV 22-46-SCREW TH	STEEL	4
06	RDL/AT-P-E16	WASHER	ST.STEEL	1
07	34935 C	FEED PIPE	ST.STEEL	1
08	33384 F	PILLOW BLOCK	FGS 500.7	1
	VIS/A-H-M24*120*055	SCREW	TREATED STEEL	4
	RDL/AT-P-E24	WASHER	TREATED STEEL	4
	32204 C	CONICAL PIN	ST.STEEL	2
	ECR/I-H-M12	CZ 102-NUT	ST.STEEL	2
	RDL/I-P-M12	WASHER	ST.STEEL	2
09	VIS/I-CHC-M10*130*32	CZ 347-SCREW	ST.STEEL	4
10	VIS/AT-CHC-M12*090*090	SCREW	TREATED STEEL	1
	RDL/I-P-M12	WASHER	ST.STEEL	1
	ECR/I-M12	NUT	ST.STEEL	1
11	GRA/A-9.20.00.31-M10*100	CY 618-LUBRICATOR	STEEL	1
12	33754 C	TRAP DOOR	ST.STEEL	1
13	VIS/I-CHC-M06*20*20	CZ 055-SCREW	ST.STEEL	4
14	JNT/T/N-BU/PRP246-D113,9*3.53	TRAP DOOR SEAL	BUNA N	1
15	33755	TIGHTENING FLANGE	ST.STEEL	1
16	JNT/P-SI-10*10	CELLULAR BAND 10*10 L: 1900mm	SILICONE	1
18	VIS/I-CHC-M12*25*25	CZ 353-SCREW	ST.STEEL	12
19	RDL/I-P-M12	WASHER	ST.STEEL	12
20	33514 C	LIQUID LEVEL ADJUSTMENT	ST.STEEL	4
21	VIS/I.A4/C80-CHC-M12*070*036	SCREW	ST.STEEL	30
22	JNT/T/N-BU/PRP389-D506.78*5.33	CS 572-O-RING	BUNA N	1
23	33746 U	BOWL HUB	DUPLEX	1
24	VIS/I-CHC-M16*060*035	SCREW (33752/33746)	ST.STEEL	8
25	JNT/T/N-BU/PRP360 D148.59x5.33	O-RING (33752/33746)	BUNA N	1
26	33766 C	TIGHTENING RING ON BOWL PLATE	ST.STEEL	1
27	VIS/I-CHC-M08*030*030	SCREW	ST.STEEL	6
28	JNT/B-TG3201250-T10N	ROTO GLYD RING	BUNA N	2
29	JNT/T/N-BU/PRP262-D177.4*3.53	CS 536-O RING	BUNA N	1
30	RLT-6221	BALL BEARING		1
31	23923 C	GREASE PASSED	ST.STEEL	1
32	JNT/T/N-BU/PRP008-D004.47*1.78	CS 652-O RING	BUNA N	2
33	JNT/B/LE-N-IE.D078*100*10	LIP SEAL	NITRILE	1
34	33752 U	BOWL PLATE	DUPLEX	1
35	VIS/I-CHC-M06*012*012	CZ 093-SCREW	ST.STEEL	1
	JNT/R/RR-CU-D06*10*1	COPPER SEAL	COPPER	1
36	GRA/A-9.20.00.01-M06*100	LUBRICATOR		1
37	33516 C	ANTI-NOISE SECTOR	ST.STEEL	1
38	VIS/I-H-M08*20*20	CZ 060-SCREW	ST.STEEL	10
39	33515 PLA	TIGHTENING RING	POLYAMIDE 6	1
40	JNT/T/N-BU/PRP274-D253.59*3.53	O-RING	BUNA N	1
41	VIS/I-CHC-M08*20*20	CZ 075B-SCREW	ST.STEEL	6
	RDL/I-P-M08	WASHER	ST.STEEL	6
42	33530 C	DEFLECTOR	ST.STEEL	1
43	VIS/I-CHC-M06*20*20	CZ 072B-SCREW	ST.STEEL	4
44	VIS/I-CHC-M08*16*16	CZ 073B-SCREW	ST.STEEL	6
45	33464 M	REAR COVER ON FRONT PILLOW BLOCK	BRONZE	1
46	RLT-NU222/M/C3	ROLLER BEARING		1
47	26273 A	TIGHTENING RING OF BEARING	STEEL	1
48	CIR-I-D200	CQB 200-RETAINING RING	ST.STEEL	1
49	33458 C	COLLECTOR	ST.STEEL	1
	34638	SEAL		1
	VIS/I-CHC-M06*025*025	CZ 200-SCREW	ST.STEEL	6
50				
51	CIR-I-D205	CQB 205-RETAINING RING	ST.STEEL	1
52	26279 B	GREASE VALVE DEFLECTOR	STEEL	1
53	JNT/T/N-BU/PRP242-D101.2*3.53	CS 533-O RING	BUNA N	1
54	34482 A	GREASE VALVE	STEEL	1
55	JNT/T/N-BU/PRP329-D050.2*5.33	CS 191-O RING	BUNA N	2
56	VIS/I-CHC-M06*025*025	CZ 200-SCREW	ST.STEEL	6

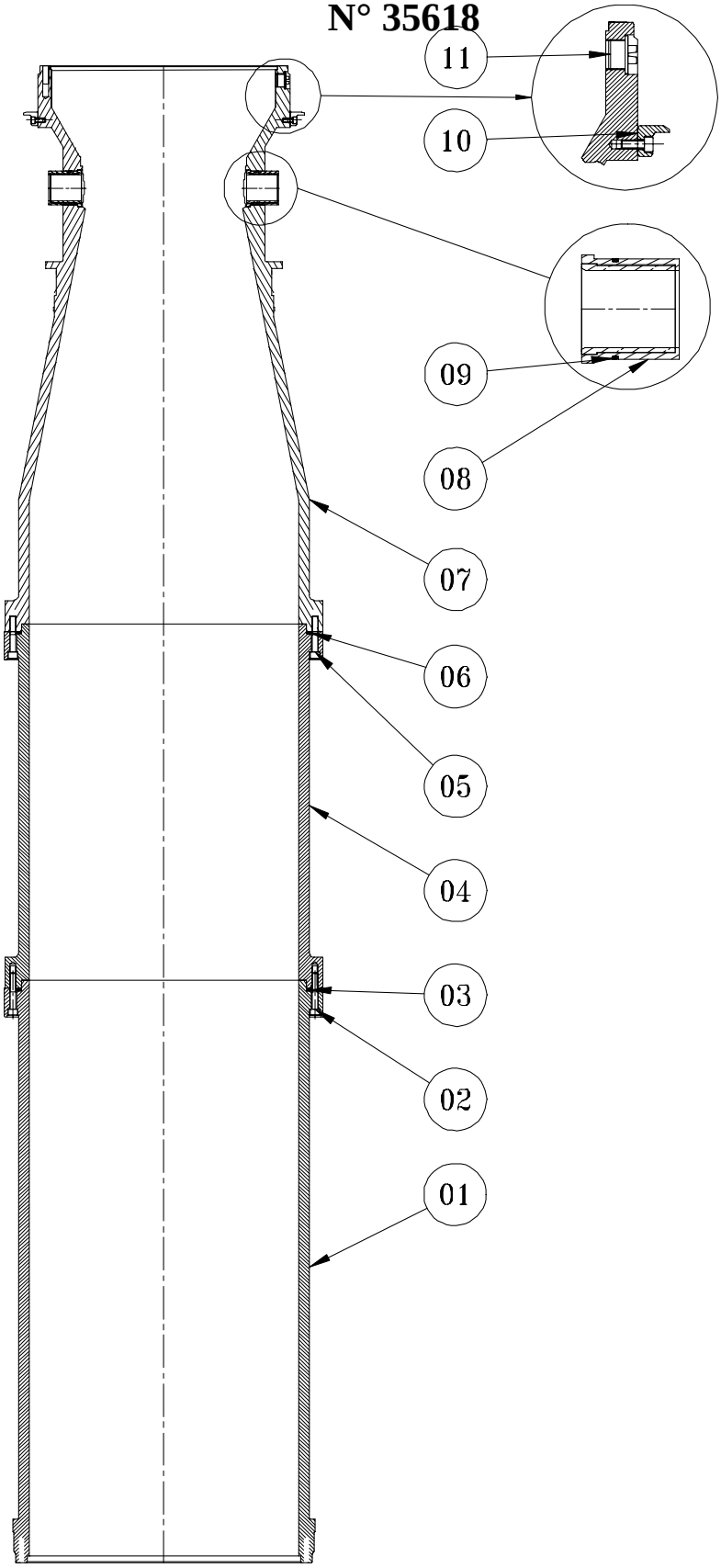
COVER AND FRAME ASSEMBLY
N° 36688



COVER AND FRAME ASSEMBLY
N° 36688

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
1	BAT/D5LL/A42-35401	FRAME	A42	1
	BOU/B/316-1"1/4G-CO	PLUG	ST.STEEL	2
	34569 ou 34938 ou 35151	REAR PROTECTION		1
2	JNT/P-SI-10*10	SQUARE SEAL	SILICONE	9m
3	CAP/P/D5LL-33776	MAIN COVER	GLASS FIBER	1
4	VIS/I-H-M12*30*30	SCREW TH	ST.STEEL	20
	RDL/I-P-M12	WASHER		20
5	33774 C	SECONDARY COVER	GLASS FIBER	1
6	VIS/I-H-M12*30*30	SCREW TH	ST.STEEL	6
	RDL/I-P-M12	WASHER		6
7	33784 C ou 35239 C	SEDIMENT CASING PROTECTION	ST.STEEL	1
8	35635 C	SEDIMENT TIGHTENING RING	ST.STEEL	1
9	VIS/I-H-M16*45*45	SCREW TH	ST.STEEL	4
	RDL/I-P-M16	WASHER	ST.STEEL	4
	GOP/A/MEC-D06*35	CY 431-PIN MECANINDUS	STEEL	2
10	VIS/I-CHC-M08*30*30	SCREW CHC	ST.STEEL	16
	RDL/I-P-M08	WASHER	ST.STEEL	16
12	33421 C	UPPER FRAME	ST.STEEL	4
11	VIS/I-CHC-M10*130*32	SCREW CHC TO REMOVE AFTER INSTALLATION	ST.STEEL	8
13	AMO-SYLOMER S800-250*200*10	SYLOMER BLOCK	SYLOMER	4
14	33423 C	SYLOMER UNDERPLATE	ST.STEEL	4
15	33481	RING	COURBHANE 40 shores	4
16	33482 C	WASHER	ST.STEEL	4
17	VIS/I-H-M20*40*40	SCREW TH	ST.STEEL	4
18	33775 C	BELT PROTECTION	ST.STEEL	1
	VIS/I-H-M08*020*013	SCREW TH	ST.STEEL	11
	RDL/I-P-M08	WASHER	ST.STEEL	11
19	34754	ROTOR BLOCK SCREW (use screw VIS/I-H-M20*055*055 during working)	ST.STEEL	4
	VIS/I-H-M20*055*055	SCREW TH	ST.STEEL	4
	ECR/I-H-M20	NUT	ST.STEEL	1

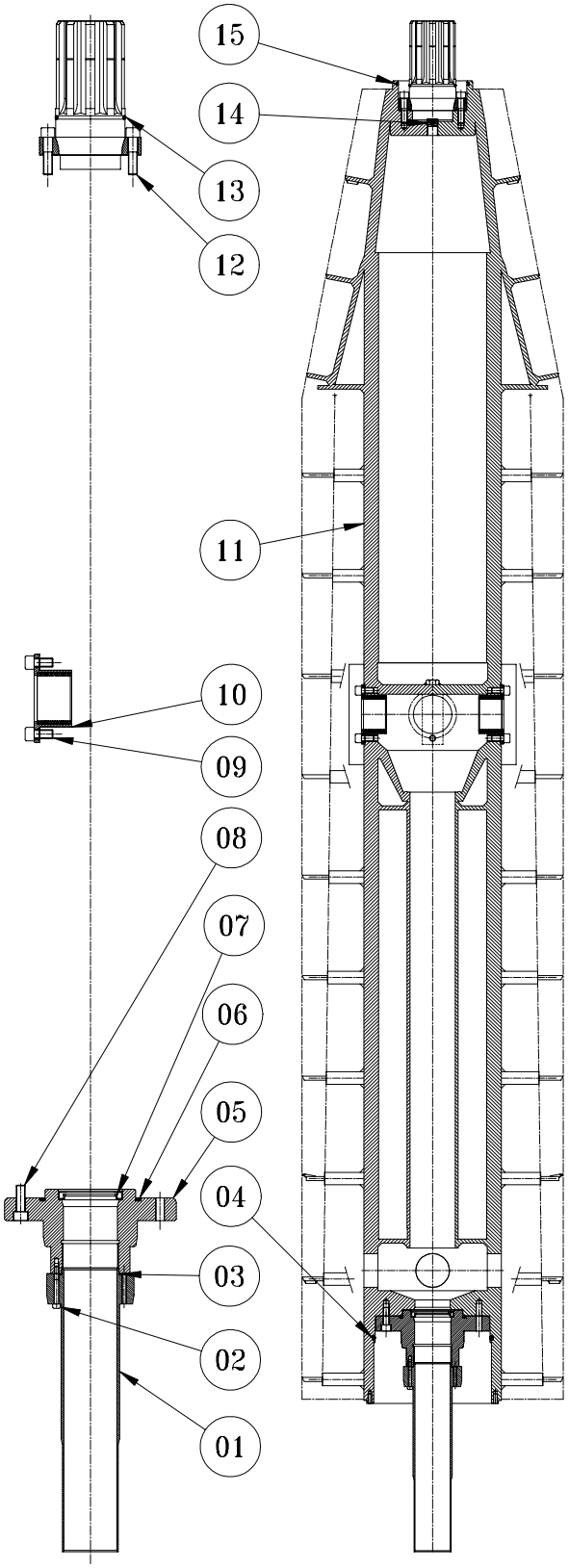
BOWLS ASSEMBLY TYPE C 30 HP
N° 35618



BOWLS ASSEMBLY TYPE C 30 HP
N° 35618

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
01	33599 C	LONG CYLINDRICAL BOWL	ST.STEEL	1
02	VIS/I,A4/C80-CHC-M12*070*036	SCREW CLASS 80	ST.STEEL	36
03	JNT/T/N-BU/PRP390-D532,18*5,33	O-RING	BUNA N	1
04	33598 C	SHORT CYLINDRICAL BOWL	ST.STEEL	1
05	VIS/I,A4/C80-CHC-M12*070*036	SCREW CLASS 80	ST.STEEL	36
06	JNT/T/N-BU/PRP390-D532,18*5,33	O-RING	BUNA N	1
07	35340 C	CONICAL BOWL	ST.STEEL	1
08	BUS/CE-28736 ou BUS/CA-25997+25998	NOZZLE		8
09	JNT/T/N-BU/PRP139-D55,25*2,62	O-RING	BUNA N	8
10	33601	DEFLECTOR	ST.STEEL	1
	VIS/I-CHC-M08*020*020	SCREW CHC	ST.STEEL	4
11	BOU/K-GPN735-M26*1,5	PLUG KAPSTO	POLYAMID 6	2

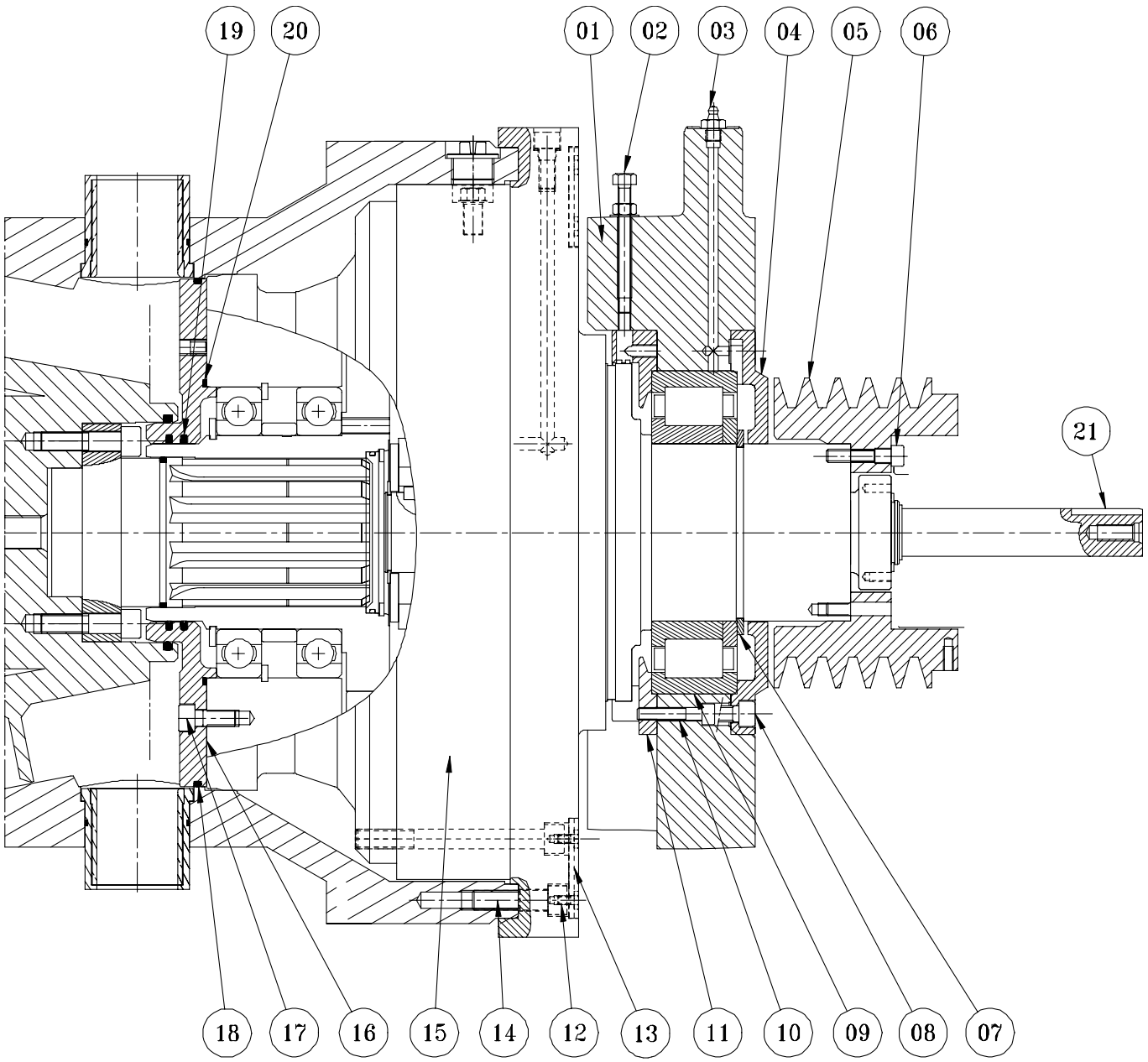
SCREW CONVEYOR ASSEMBLY TYPE C 30 HP
N° 33822-1



SCREW CONVEYOR ASSEMBLY TYPE C 30 HP
N° 33822-1

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
01	33783 C	SLEEVE ON SCREW CONVEYOR HUB	ST.STEEL	1
02	VIS/I-CHC-M06*70*018	SCREW CHC	ST.STEEL	6
03	JNT/T/N-BU/PRP233-D72,62x3,53	O-RING	BUNA N	1
04	JNT/T/N-BU/PRP447-D228.0*7.0	O-RING	BUNA N	1
05	33763 J	SCREW CONVEYOR HUB	APX	1
06	JNT/T/N-BU/PRP351-D120.02*5.33	O-RING	BUNA N	1
07	JNT/B/LE-N-BA.D065*85*10	LIP RING	BUNA N	1
08	VIS/I-CHC-M12*050*050	SCREW CHC	ST.STEEL	12
09	VIS/I-CHC-M12*025*025	SCREW CHC	ST.STEEL	8
10	BUS/CE-35685 ou BUS/CA-30129+32589	NOZZLE	CERAMIC	4
11	35262 C	SCREW CONVEYOR TYPE 30 HP	ST.STEEL	1
12	VIS/AT-CHC-M12*050*050	SCREW CHC	STEEL	10
13	JNT/T/N-BU/PRP237-D85,32*3,53	O-RING	BUNA N	1
14	BOU/R-BHC.15.GC-1/2 GAZ	PLUG		1
15	JNT/T/RO-PRP358-D142,24*5,33	O-RING	BUNA N	1

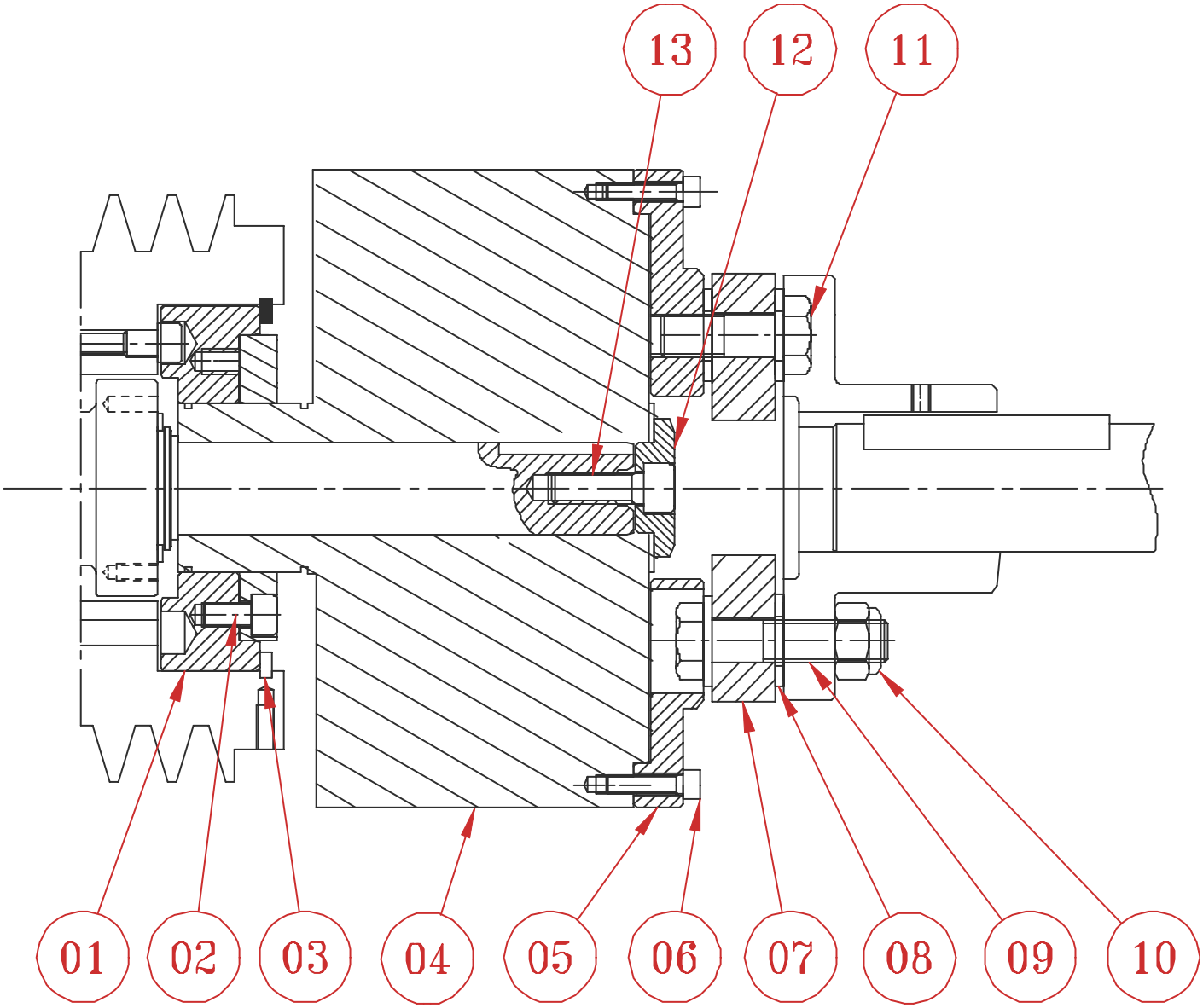
REAR PILLOW BLOCK ASSEMBLY (NUP 2222) ZS 619 REDEX N° 37843



REAR PILLOW BLOCK ASSEMBLY (NUP 2222) ZS 619 REDEX N° 37843

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
01	33317 F	REAR PILLOW BLOCK	FGS 500.7	1
	VIS/A-H-M20*100*046	SCREW TH	STEEL	4
	RDL/AT-P-E20	WASHER	TREATED STEEL	4
	32204 C	CONICAL PIN	ST.STEEL	2
02	VIS/AT-CHC-M08*080*080	SCREW CHC	TREATED STEEL	1
	RDL/I-P-M08	WASHER	ST.STEEL	1
	ECR/I-H-M08	NUT	ST.STEEL	1
03	GRA/A-9.20.00.31-M10*100	LUBRICATOR	ST.STEEL	1
04	33579 F	REAR PILLOW BLOCK COVER	FGL 250	1
05	33806 A	PULLEY AS	XC38 H1	1
06	VIS/AT-CHC-M10*040*030	SCREW CHC	TREATED STEEL	12
07	CIR-E-D110	RETAINING RING	TREATED STEEL	1
08	VIS/AT-CHC-M10*020*020	SCREW CHC	TREATED STEEL	6
09	RLT-NUP2222EC/ML/C3	ROLLER BEARING	100 C 6	1
10	VIS/AT-CHC-M08*040*030	SCREW CHC	TREATED STEEL	6
11	30089 C	REAR PILLOW BLOCK FLANGE	ST.STEEL	1
12	33129 C	ANTI-NOISE SECTOR	ST.STEEL	1
13	VIS/I-H-M06*010*010	SCREW TH	ST.STEEL	12
14	VIS/I-CHC-M12*050*050	SCREW CHC	ST.STEEL	12
15	CYC-ZS/619/87-PB 003818	CYCLO UNIT FEMALE		1
16	33800 C	HOLLOW SHAFT COVER	ST.STEEL	1
17	VIS/I-CHC-M10*25*25	SCREW CHC	ST.STEEL	6
18	JNT/T/N-BU/PRP277-D291,69*3.53	O-RING	BUNA N	1
19	JNT/T/N-BU/PRP349-D113,67*5.33	O-RING	BUNA N	1
	JNT/B-TG3201100-T10N	ROTO GLYD RING	BUNA N	1
20	JNT/T/N-BU/PRP262-D177.4*3.53	O-RING	BUNA N	1
21	8754,08044	PARALLEL KEY		1

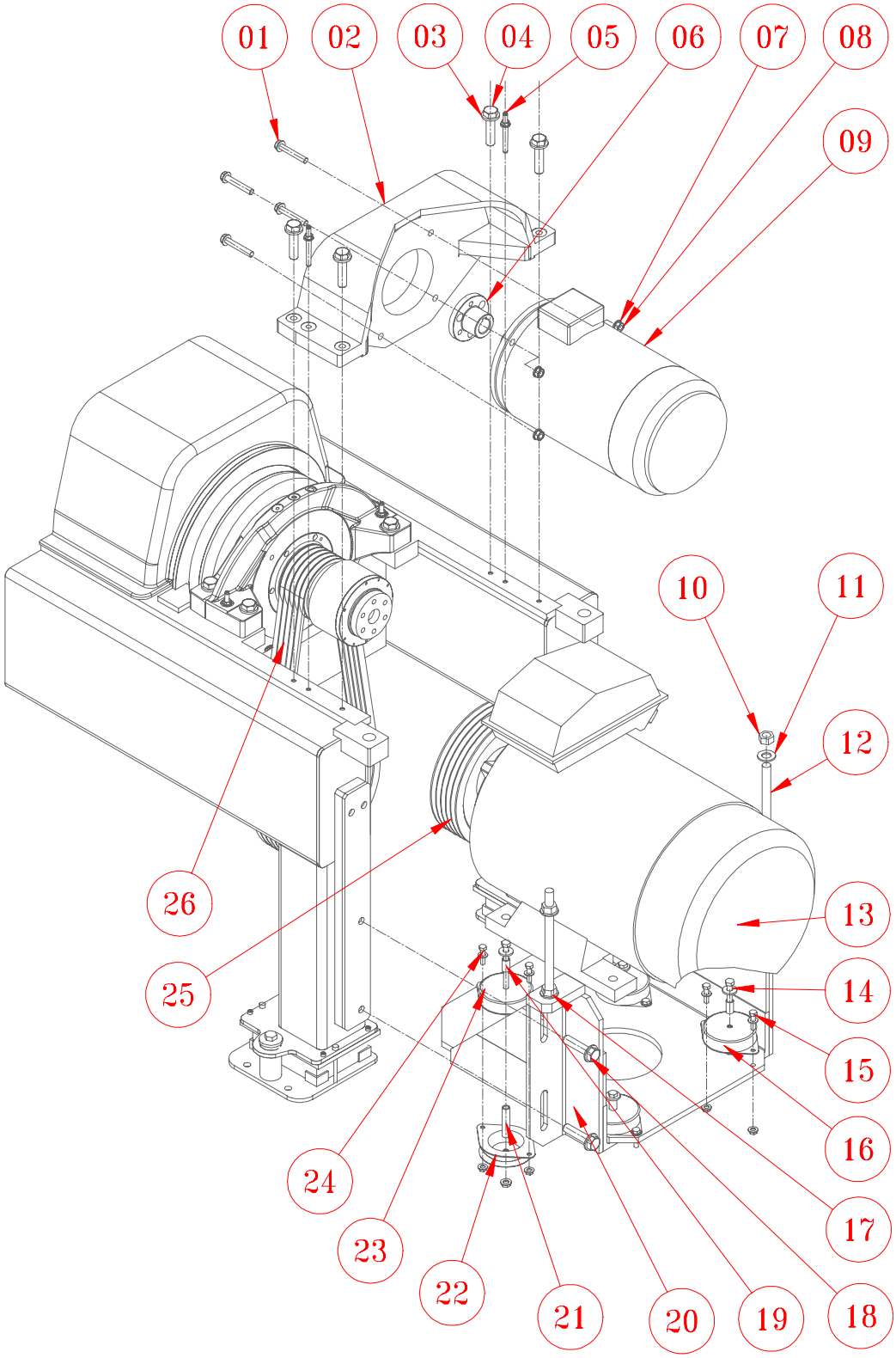
REDEX ASSEMBLY
N° 33825



REDEX ASSEMBLY
N° 33825

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
01	33779 A	REDEX SPACER	STEEL	1
02	VIS/I-CHC-M08*020*020	CZ 75B-SCREW CHC	ST. STEEL	8
03	CIR-I-D120	INTERNAL RETAINING RING	STEEL	1
04	POU-RDX/SR30.3-K2	REDEX DIFFERENTIAL UNIT		1
05	26255 B	COUPLING REDEX SHAFT	ST. STEEL	1
06	VIS/I-CHC-M06*025*025	CZ 200-SCREW CHC	ST. STEEL	6
07	ACC-635634	CY 0638-COUPLING STRAFLEX	RUBBER	1
08	RDL/I-P-M14	WASHER Ø 14	ST. STEEL	6
09	VIS/I-CHC-M14*060*060	CZ 206-SCREW CHC	ST. STEEL	3
10	ECR/I-NY-M14	CZ 324-NUT " NYLSTOP "	ST. STEEL	1
11	VIS/I-CHC-M14*040*040	CZ 203-SCREW CHC	ST. STEEL	1
12	26254 B	REDEX WASHER	A 60.2	1
13	VIS/I-CHC-M10*020*020	CZ098-SCREW CHC	ST. STEEL	1

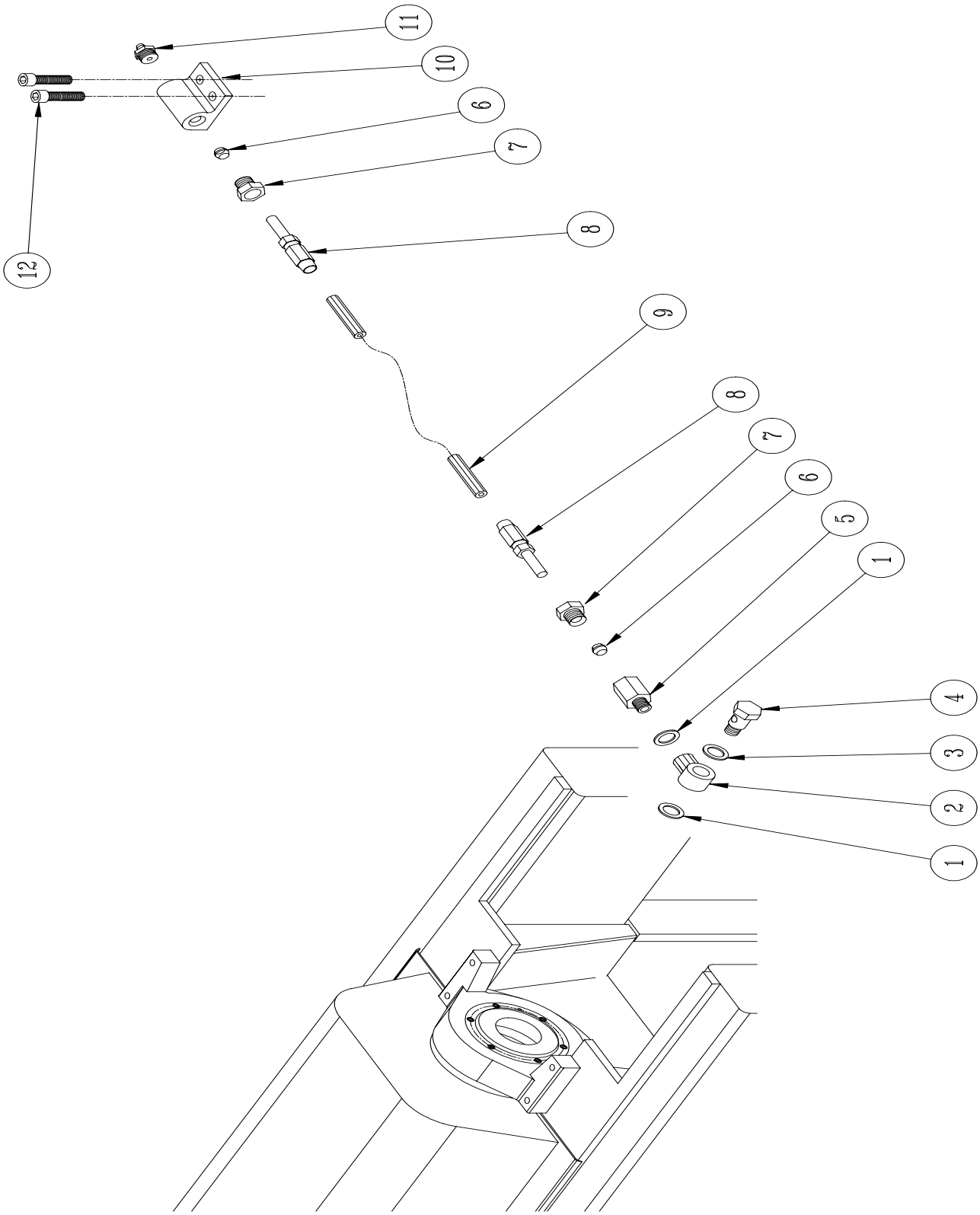
DRIVE AND BACK DRIVE ASSEMBLY
(MOTOR 100 HP – GENERATOR 20-30 HP)
N° 37449



DRIVE AND BACK DRIVE ASSEMBLY
(MOTOR 100 HP – GENERATOR 20-30 HP)
N° 37449

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
01	VIS/A/CA-H-M16*100*100	SCREW H	CADMIUM STEEL	4
02	34888 F+32125 C ou 33994 F	GENERATOR SUPPORT (20 OU 30 HP)	FGL 250	1
03	RDL/AT-P-E16	WASHER	ST.STEEL	4
04	VIS/AT-H-M16*080*038	SCREW H	ST.STEEL	4
05	32204 C	CONICAL PIN	ST.STEEL	2
	RDL/I-P-M08	WASHER	ST.STEEL	2
	ECR/I-H-M08	NUT	ST.STEEL	2
06	31445 A ou	COUPLING HUB 20 HP	STEEL	1
	26617 A	COUPLING HUB 30 HP	STEEL	1
07	RDL/I-P-M16	WASHER	ST.STEEL	8
08	ECR/I-H-M16	NUT	ST.STEEL	4
09	CUSTOMER SUPPLY	GENERATOR (20 OR 30 HP)		1
10	ECR/A-H-M24 HAUT	THREATED ROD SUPPORT	ST.STEEL	2
11	RDL/A-P-M24 ARTICULEE	THREATED ROD	B7	2
12	35614 A	SCREW H	TREATED STEEL	2
13	CUSTOMER SUPPLY	MOTOR (100 HP)		1
14	34776 C ou 33333 C	SPACER	ST.STEEL	2
	VIS/AT-H-M14*080*035	SCREW H	TREATED STEEL	2
	RDL/AT-P-E14	WASHER	TREATED STEEL	2
15	VIS/A-H-M12*050*030	SCREW H	STEEL	4
	RDL/I-P-M12	WASHER	ST.STEEL	8
	ECR/A-H-M12	NUT	STEEL	4
16	AMO-BECA-533152/75SH	VIBRATION ABSORBER		2
17	ECR/A-H-M24	NUT	STEEL	4
	RDL/AT-P-E24	WASHER	TREATED STEEL	4
18	VIS/A-H-M24*060*060	SCREW H	STEEL	4
	RDL/AC-P-M24	WASHER	CADMIUM STEEL	4
19	34776 C ou 33333 C	SPACER (BALDOR OR RELIANCE)	ST.STEEL	2
	34640	SCREW H	TREATED STEEL	2
	RDL/AT-P-E14	WASHER	TREATED STEEL	2
20	34753 A ST	MOTOR SUPPORT		1
21	33342 C	SPACER	ST.STEEL	2
22	AMO-BECA-533652/75SH	VIBRATION ABSORBER		2
23	AMO-BECA-533152/75SH	VIBRATION ABSORBER		2
24	VIS/A-H-M12*050*030	SCREW H	STEEL	4
	RDL/I-P-M12	WASHER	ST.STEEL	8
	ECR/A-H-M12	NUT	STEEL	4
25	CUSTOMER SUPPLY	PULLEY		1
	CUSTOMER SUPPLY	PULLEY HUB		1
26	CUSTOMER SUPPLY	BELT		5

LUBRICATION LOOP
N° 26677



LUBRICATION LOOP
N° 26677

POS	PART NUMBER	DESCRIPTION	MATERIAL	QTY
1	RAC/JNT-JO.400	JOINT	ALUMINIUM	2
2	RAC/MF-OS400-M8*100	CONNECTION	ALUMINIUM	1
3	RAC/JNT-JO.401	JOINT	ALUMINIUM	1
4	RAC/MF-VO400-M8*100	SCREW	STEEL	1
5	RAC/MF-RI.607	INTER CONNECTION	BRONZE	1
6	RAC/MF-BI.600-D04.1	DOUBLE CONE	BRONZE	2
7	RAC/MF-RB.600-8*100	DOUBLE-CONE CONNECTION	BRONZE	2
8	RAC/EB-404106	SHAFT	STEEL	2
9	TUB-TU.3.2x7.NYF	FLEXIBLE TUBE		1
10	RAC/MF-JP600-10*100	CRAMP CONNECTION	ALUMINIUM	1
11	GRA/A-9.20.00.31-M10*100	LUBRICATOR	STEEL	1
12	VIS/I-CHC-M06*020*020	SCREW CHc CZ 072 B	INOX	2