WesTech
Process Equipment. Process Driven.

WesTech
Experts in Liquid/Solids Separation

Installation, Operation and Maintenance Manual

One (1) 75-foot Diameter Thickener
WesTech Model THS32

For:
Coal Innovations
Stoystown, PA 15563
USA

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WesTech Job Number: 22157A
January 2014

One (1) 75-foot Diameter Thickener Mechanism
WesTech Model THS32

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To ensure compliance with the warranty, we recommend that this operation and maintenance manual be thoroughly read and understood. This manual is separated into six basic sections:

1. Equipment Information
2. Installation Instructions
3. Start-up and Operation
4. Maintenance and Parts
5. Accessory Equipment
6. Enclosures

Refer to the Table of Contents at the front of the manual for specific listings.

All equipment, including standard "Buyout" items, must be maintained according to each respective manufacturer's operation and maintenance procedures enclosed within this manual to ensure coverage of possible failures while the unit is still under warranty, along with ensuring trouble-free operation for the life of the equipment.

Since the enclosed information is based upon the instructions available at the time of printing, WesTech Engineering, Inc. reserves the right to make subsequent changes to the manual without obligation to update existing copies.

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SECTION 1: EQUIPMENT INFORMATION

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Thickener General Description

This WesTech Engineering, Inc. equipment is designed for the purpose of removing settleable solids from a process stream.

In these thickeners, the feed enters into a circular feedwell by means of a horizontal feed pipe or launder. The liquid / solid mixture flows out radially from the feedwell toward the tank wall.

Solids settle to the tank floor where they are collected by the rake arms and removed to an underflow line for transport out of the tank.

The clarified overflow is removed by the tank peripheral launder. Sufficient detention time is allowed to permit the solids to settle, leaving only clarified water to flow over the weir.

The thickener system consists of the following:

Walkway and Platform: Provides structural support for the mechanism and provides access to the drive unit.

Drive Unit: Provides motive power for the thickener rake arms.

Center Shaft: Provides support for and transfers motive force to the rake arms.

Feedwell: Reduces the energy of the feed as it enters the thickener.

Rake Arms: Support rake blades, which move settled solids toward the tank center for removal from the tank.

Weir: Allows for a controlled, uniform overflow withdrawal from the tank. Overflow exits the tank by flowing over the weir into the launder. (Not provided by WesTech)

Overflow Launder: Collects overflow for transportation out of the tank. (Not provided by WesTech)

Electrical Control Panel: Allows for control of the drive, lift and torque cutoff.

General Precautions Installation

The installation instructions are provided to assist in the installation and adjustment of the thickener. They are suggested procedures and are not intended to be substituted for the experience of the persons assigned to install this equipment. It is suggested that these instructions be studied prior to installing and adjusting.

In the installation of this equipment, it may be necessary to install, adjust, and maintain certain items which are not manufactured by WesTech. This equipment must be stored, handled, adjusted, and maintained in accordance with instructions provided by the manufacturer, to insure warranty protection on the equipment. WesTech will not accept responsibility for damage to equipment which has not been handled in accordance with the manufacturer's instructions.

Equipment Tags

Each shipping piece has been tagged or piece marked for convenience. Typically the part number or item number will be marked on all items. Piece marked items received will have a mark such as "Part No. D120A" or “Item 203" which may be cross referenced with the packing list and general erection drawings.

Painting

The material supplied for this job has received surface preparation and paint.

Any indentations, mars, and/or scratches caused by loading and unloading the equipment must be **immediately** touched up.

Fasteners

If supplied, stainless steel fasteners shall incorporate anti-seize during assembly. Failure to utilize this will cause significant extra time by the installation and maintenance crews.

Anchor Bolts

Anchor bolts must be placed accurately. The location and projection of all anchorage is critical. The specified amount of projection and location are shown on the general arrangement drawings. Prior to equipment installation, clean and oil the threads of all anchorage bolts.

Operation and Maintenance Manual

Keep an Operation & Maintenance Manual in the area where the operators can familiarize themselves with it and have it for reference.

Further Assistance

If a problem is encountered in installing or operating the equipment which cannot be solved by referring to this manual, feel free to contact:

WesTech Engineering, Inc.
3625 South West Temple
Salt Lake City, Utah 84115
Phone: (801) 265-1000
Fax: (801) 265-1080

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Receiving Equipment

The equipment pieces and components received may have been shipped from:

1. WesTech Engineering, Inc. in Salt Lake City, Utah.
2. A fabricator acting under WesTech Engineering's instructions.
3. A "buy-out" distributor such as a motor or pump manufacturer.

Since there will often be more than one shipment to the jobsite, it is important to coordinate the receiving and storage of all items accordingly.

Upon receipt of a shipment, check the packing list against the items received and retain this list for future reference. If items are missing, note this on the shipping papers to protect all interests.

All material has been thoroughly checked and inspected before shipment. If the equipment is received in bad condition or if the packages are broken, make a notation on the shipping papers to this effect. This notation will enable filing the proper claims against the freight company.

Notify WesTech immediately if any parts are missing, broken or damaged.

Please handle the equipment properly when unloading and installing. All crates, electrical equipment, and drives should be stored under cover and protected from moisture, grit, and mud.

All rolled steel sections must be stored on edge or blocked up to prevent distortion. If allowed to lie flat, these items may lose their shape which could hinder installation and proper alignment of the equipment.

When receiving a shipment, the following procedures must be followed. These procedures are also listed on the WesTech Bill of Lading. The receiving company must sign the Bill of Lading, to prove that delivery of the goods was made. If the following procedures are not followed, WesTech will not be liable for any shortages or damages.

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Receiving Procedure

a) **Before** signing the Bill of Lading (BOL) in receipt of the goods shown thereon, and **before** the driver leaves, do the following:

1) Inspect the shipment, and **note** any damage or shortages (according to what is listed on the BOL).

2) Have the driver sign the notation in acknowledgment.

3) Retain a copy for use in filing a freight claim.

4) If there is damage, **notify** WesTech Engineering Inc. (801) 265-1000 **immediately** so that arrangements can be made with the carrier, if necessary, to have the damaged goods inspected by their agent.

b) **After** signing the BOL and receiving the shipment, do the following:

1) Use the attached/enclosed packing list to further inspect the entire shipment for shortages and/or damage.

2) **Notify** WesTech within **three (3)** working days from date of receipt, of any shortages or concealed damage.

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Shortages, Defects and Field Charges

Shortages and Defects

The equipment was thoroughly inspected prior to shipment. However, if upon receipt, any apparent manufacturing defects or shortages are encountered with our equipment please notify WesTech Engineering Inc. immediately.

Fabricated steel parts and assemblies furnished by WesTech. are manufactured following best shop practices and standards. However, some misfits and imperfect work may arise. In such cases, the American Institute of Steel Construction "Code of Standard Practice" will apply to installation of this equipment. It reads as follows:

"7.14 Corrections and Errors

The correction of minor misfits by moderate amounts of reaming, grinding, welding or cutting, and the drawing of elements into line with drift pins, shall be considered to be normal erection operations. Errors that cannot be corrected using the foregoing means, or that require major changes in member or Connection configuration, shall be promptly reported to the Owner's designated Representative for Design and construction and the fabricator by the Erector, to enable to responsible entity to either correct the error or approve the most efficient and economical method of correction to be used by others"

Back Charges and Field Charges

Company policy dictates that no back charges or field charges will be allowed without prior written approval from a WesTech representative. Written authority must be given in the form of a WesTech Engineering, Inc. Inspection and Change Work form with a warranty tracking number. The warranty tracking number will be issued when the extent of such modifications and the price for preforming these modifications have been agreed upon.

In general, when parts require replacement, and we agree that replacement is necessary, WesTech will furnish new parts. The customer will remove the defective parts and install the replacement parts at no cost to WesTech.

Warnings

WesTech recommends that this page be thoroughly read and understood before erecting and operating the equipment. The procedures must be followed as WesTech will not accept responsibility for damage to the equipment, which has not been handled in accordance with the manufacturer's instructions. A brief summary of the warnings are listed below

Operating and maintaining this equipment has inherent risks. It is your responsibility to read and understand the Operation and Maintenance Manual prior to working with the equipment. This page is intended to summarize the warnings associated with WesTech's equipment. Where equipment manufactured by others has been provided in conjunction with WesTech equipment, additional warnings specific to that piece of equipment may only be contained in that section of the Manual. Please read and understand all warnings provided in this Manual.

Failure to observe warning listed in this manual for WesTech Equipment or other manufacturer's equipment listed in the Operations and Maintenance Manual may void WesTech's Warranty.

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Warnings in the manual:

Mechanism

Safety Instructions

- Only operators who have been trained in safety procedures should be allowed to work on or around this equipment. Exercise caution around moving parts. In general, limit access to authorized personnel.
- To prevent personal injury, the mechanism and accessories must be stopped before any maintenance or adjustments. Lockout power before performing maintenance.
- Anyone entering the area should be wearing adequate safety equipment, such as safety glasses, safety shoes, hard hats, etc.
- Keep hands, clothing, etc., away from moving parts.
- Place "Warning" signs in the area of moving parts.
- Never permit people who have been drinking alcohol, using drugs, or are otherwise impaired to maintain or repair unit.
- Inspect equipment frequently for loose bolts or malfunctioning equipment. Take care of problems in a timely manner
- It is important that operator safety is stressed. Do not perform maintenance or repairs on moving parts!

Cold Weather Operation

- Do not operate the equipment if ice forms and builds up on the inside of the tank wall.

Emergency Procedures

- Do not attempt to continue running the mechanism when an overload condition is indicated; identify the trouble and resolve it!
- Do not start-up the mechanism with a load of sludge in the tank
- Do not tamper with the overload alarm switch adjustments in an attempt to keep the machine running under overloaded conditions. Such tampering will void the warranty.

Structural Lifting

- Do not pull, drag, push or dump components off the delivery truck.
- Stand clear as the equipment is lifted.

Drive Unit Precautions

Maintenance

- To prevent personal injury, only trained employees should be allowed to work on or around the drive. Lock out all electrical power before performing maintenance on any moving part of the drive. Employees entering the drive areas should wear adequate safety equipment such as safety glasses, safety shoes, hard hats, etc.
- Keep hands, clothing, etc. away from moving parts. Inspect equipment on a weekly basis for any irregularities. Take care of these in a timely manner.
- If the clarifier or thickener has stopped due to high torque, do not open the torque control device. Energy is stored in the drive train and torque control spring. The stored energy should be released prior to undertaking any maintenance or repair. (Refer to 'Drive Unit Troubleshooting' section in this manual.)

Sandblasting

- The WesTech drive unit (including the motor and reducer) must be fully covered or sealed off to protect against sand and dust when sandblasting is being done in the vicinity.

- All external openings and areas between the rotating main gear and the stationary base in the main drive should be taped closed, covered with polyethylene film, or stuffed with oakum or rag waste. After start-up, look into all inspection ports to be sure grit has not penetrated the drive. If grit is detected, contact WesTech immediately!

Welding

- If welding is required, once the drive is installed, do not allow current to pass through the precision bearing roller balls. Attach the welding ground clamp to one of the parts to be welded to prevent pitting the roller balls or ball races. Do not weld on the drive itself.

Lubrication

- The drive unit main gear housing is shipped without oil. Fill the housing to the appropriate oil level before operation. The correct oil level is the middle of the sight glass. The oil level must be checked with the unit off for an impeller driven mechanism.

- The cycloidal speed reducer is shipped packed with grease and is ready for use. The reducer housing is not completely filled with grease as this will cause the unit to overheat. Maintenance lubrication of the speed reducer is accomplished via a single grease fitting below the motor coupling as shown on the 'Drive Lubrication Drawing'.

- Do not mix mineral gear oil with synthetic oil without consulting with the oil supplier. This may adversely affect the performance of the lubricant for some combinations of mineral and synthetic oil. Damage to drive components may result from non-compatible oils.

Drive Rotation

- The drive unit is designed for one direction of rotation only. To ensure proper rotation, electrically jog the motor and watch the mechanism before putting into operation. The correct drive rotation is noted on the drive assembly drawing. To avoid damage to the collector arms during operation, be sure to operate the drive in its proper direction.

Condensate

- Operation: The drive housing is exposed to many changes in temperature and weather conditions and because of this, condensate forms inside the drive housing. The condensate collets in the low points of the drive and should be drained from once a day to once a week depending on the climate to prevent the bearings and gear from running in water. Refill the drive housing with fresh oil to maintain correct operating level.

- Storage: Condensate forms in the same manner as stated above even during storage and should be drained. Either a schedule should be enacted to periodically drain the condensate or leave the drain valve open continuously to allow the condensate to drain as it forms.

Torque Control

- During overloaded conditions when the Torque Control has stopped the mechanism, the drive unit may have stored spring force energy. This poses a potentially dangerous situation if the stored energy is not released properly.

- Do not disassemble the drive unit during a stored energy condition. Serious injury or machine damage may result.

- Make sure the power to the drive has been disconnected and locked out to prevent accidental starting of the drive or accidental injury.

- Do not attempt to continue running when an overload is indicated; find the trouble and correct it!

- Do not start-up the mechanism with an excessive amount of solids in the tank

- Do not alter the factory-set positions of the torque limit switch actuators in the torque box. This can cause serious damage to the drive and rake mechanism. The 4-20 mA transmitter signal (if provided) should not be used for alarm and motor cutout as it does not correspond precisely with the drive torque control device cams and limit switches. Over torque cutout requires manual restart, or reset of a latched cutout circuit that prevents auto restart of the units with the motor. Units with hand/off/auto selector switches must be checked to insure proper torque protection when set in auto and hand modes

- The torque control must be connected before starting the grouting with drive unit power. This is a protective device for the drive unit and mechanism. Bypassing it directly to the motor drive will void warranty.

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One Year Warranty

WesTech equipment is backed by WesTech's reputation as a quality manufacturer, and by many years of experience in the design of reliable equipment.

Equipment manufactured or sold by WesTech Engineering, Inc., once paid for in full, is backed by the following warranty:

For the benefit of the original user, WesTech warrants all new equipment manufactured by WesTech Engineering, Inc. to be free from defects in material and workmanship, and will replace or repair, F.O.B. its factories or other location designated by it, any part or parts returned to it which WesTech's examination shall show to have failed under normal use and service by the original user within one (1) year following initial start-up, or eighteen (18) months from shipment to the purchaser, whichever occurs first.

Such repair or replacement shall be free of charge for all items except for those items such as resin, filter media and the like that are consumable and normally replaced during maintenance, with respect to which, repair or replacement shall be subject to a pro-rata charge based upon WesTech's estimate of the percentage of normal service life realized from the part. WesTech's obligation under this warranty is conditioned upon its receiving prompt notice of claimed defects, which shall in no event be later than thirty (30) days following expiration of the warranty period, and is limited to repair or replacement as aforesaid.

This warranty is expressly made by WesTech and accepted by purchaser in lieu of all other warranties, including warranties of merchantability and fitness for particular purpose, whether written, oral, express, implied, or statutory. WesTech neither assumes nor authorizes any other person to assume for it any other liability with respect to its equipment. WesTech shall not be liable for normal wear and tear, corrosion, or any contingent, incidental, or consequential damage or expense due to partial or complete inoperability of its equipment for any reason whatsoever.

This warranty shall not apply to equipment or parts thereof which have been altered or repaired outside of a WesTech factory, or damaged by improper installation, application, or maintenance, or subjected to misuse, abuse, neglect, accident, or incomplete adherence to all manufacturer's requirements, including, but not limited to, Operations & Maintenance Manual guidelines & procedures.

This warranty applies only to equipment made or sold by WesTech Engineering, Inc.

WesTech Engineering, Inc. makes no warranty with respect to parts, accessories, or components purchased by the customer from others. The warranties which apply to such items are those offered by their respective manufacturers.

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WesTech Mining and Metallurgical Products

Clarifiers
- Buoyant Media Center
- Flocculating Clarifier
- Metallurgical Contact Clarifier
- Solids Contact Clarifier™
- SuperSettler™ Inclines Plate Settler

Clarifier / Thickener Drives
- Adaptable to All Other Manufacturers
- Bridge Supported Shaft Drive
- Column Supported Cage Drive
- Traction Drive

Granular Media Filtration
- Horizontal Pressure Filter
- Open top Gravity Filter
  - Circular
  - Rectangular
- SuperSand™ Continuous Backwash Filter
- Vertical Pressure Filter

Magnetic Separators
- Permanent Magnet Belt Separator

Man Camp Potable Water Treatment
- AltaFilter™ Ultrafiltration Membrane System
- AltaPac™ Ultrafiltration Package System
- ClariCell-B™ Package Treatment Plant

Man Camp Wastewater Treatment
- ClearLogic™ MBR System
- STM-Aerotor™ IFAS Package System

Parts / Field Service / Training
- 24 Hour Hot-Line
- Full Service Parts Department
- Installation and erection Services
- Mechanical Evaluations
- Operator Training
- Process Training
- Regional Service Technicians

Screens
- CIP / CIL Carbon Retention Screen
- Linear Screen

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Services
- Bench Scale Feasibility Testing
- Field Pilot Studies
- Installation and Erection Services
- Mechanical E valuations
- Plant Process Audits
- Pilot Rental Equipment
  - AltaFlo™ High Rate Thickener
  - AltaPac™ Ultrafiltration Package System
  - Buoyant Media Center
  - High Rate Thickener
  - Horizontal Belt Filter
  - Linear Screen
  - Paste Thickener
  - Precoat Filter
  - Rotary Drum Filter
  - Solids Contact Clarifier

Tankage
- Anchor Channel Tank
- Elevated Tank
- Steel Bottom Tank
- Supply and / or Field Erection

Thickeners
- AltaFlo™ High Rate Thickener
- Conventional Thickener
- Deep Bed™ Paste Thickener
- HiDensity™ Paste Thickener
- HiFlo™ High Rate Thickener
- Swing Lift Thickener

Vacuum Filters
- Disc Filter
- Horizontal Belt Filter
- Precoat Drum Filter
- Rotary Drum Filter
  - Belt Discharge
  - Roll Discharge
  - Scraper Discharge

SECTION 2: INSTALLATION INSTRUCTIONS

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Suggested Installation Sequence

The sequence listed below is suggested only and should not take precedence over the experience of the installer. Due to special circumstances or the equipment available, the installer may decide to vary this order. Detailed sheets follow which explain each of the steps outlined below.

To assist in the construction of the Thickener, a list containing drawing numbers and drawing descriptions has been included in the table of contents. References to drawings will be made using the drawing description only but drawing numbers can be accessed quickly through the use of this list.

1. Bench mark tank
2. Set center shaft, rakes, and feedwell into tank
3. Set walkway onto tank
4. Install drive unit
5. Connect shaft to drive
6. Connect feedwell to bridge
7. Connect rake arms to shaft
8. Install feed pipe / launder (may not have been provided by WesTech Engineering, Inc.)
9. Final check for level
10. Electrical Installation

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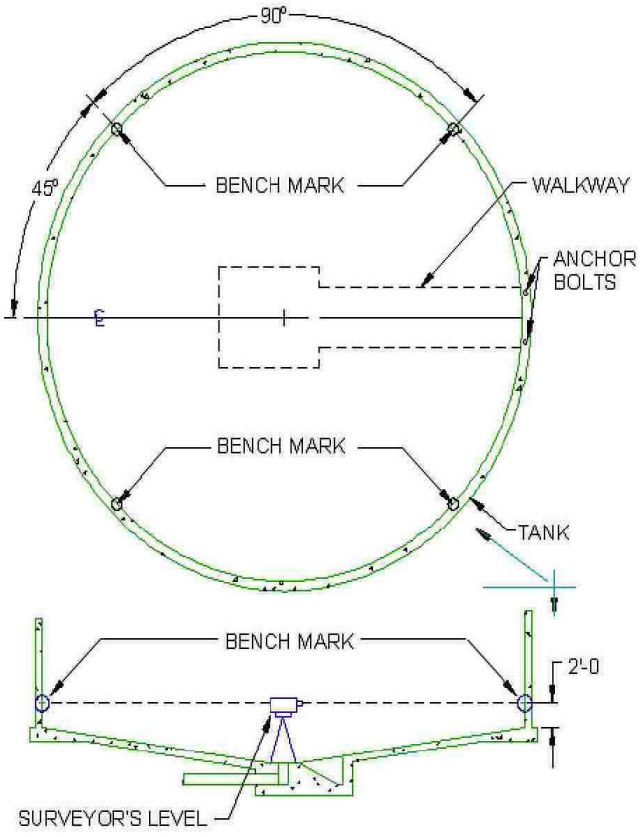
Please note that WesTech does not provide the following items unless otherwise noted:

1. Concrete, concrete reinforcing or grout.
2. Piping, valves, pipe supports, fittings, wall brackets.
3. Electrical wiring, conduit or electrical equipment.
4. Shimming materials.
5. Caulk or mastic.
6. Field painting or paint.
7. Field welding or weld rod.
8. Water for testing.
9. Grease or lubricating oil.

1 BENCH MARKS

Using a surveyor's level, bench mark the tank wall at four equally spaced locations (90° apart) and approximately 2'-0" above tank bottom. These marks will be used later to check final level of the drive. They should be oriented 45° from walkway centerline. See Bench Mark Figure 2.1.



BENCH MARK FIGURE 2.1

2 Set Center Shaft, Rakes, Feedwell into Tank

a) Place rake arms into tank on bracing on tank floor. Align rakes to ensure easy alignment to center shaft.

b) Set center shaft into tank and brace in place so the center shaft is in center of tank to allow for proper alignment of drive unit during the drive installation. Rake arms can be used to help brace center shaft in place if combined weight of rakes and shaft can be lifted.

c) Assemble feedwell using the supplied bolts marked feedwell splice. Be sure to follow assembly drawings and match marks on panels to ensure proper fit-up and orientation. This is easier if done outside the tank if possible.

d) Place feedwell over center shaft and rest feedwell on bracing. Feedwell can be supported on the rake arms if dunnage is used to protect coating surfaces.

3 Set Walkway Bridge onto Tank

a) Inspect the mounting and attachment surfaces of walkway, platform and drive unit. Clean and remove any foreign material.

b) Check to see that design cambers have been maintained during shipping and assembly of bridge. Notify WesTech Engineering, Inc. of deviations.

c) Install handrail

d) Attach walkway grating / floor plate to walkway following manufacturer's erection drawings

e) Lift entire bridge and install on top of tank.

f) Nuts and bolts at wall ends should be tightened to snug condition only to allow for expansion.

Note: Care must be taken during hoisting and placing the bridge to prevent over-stressing or bending of members.

g) The drive platform is offset from the center of the tank to accommodate the torque box. As a result one section of the drive platform is longer than the other. The long end of the platform should face the stairway.

h) Check walkway and supports for level and uniform camber after installation.

i) Attach WesTech Engineering Inc. name plate to handrail.

Note: Ensure center of walkway is directly over the center of the tank. Adjustment may be required after completion of installation.

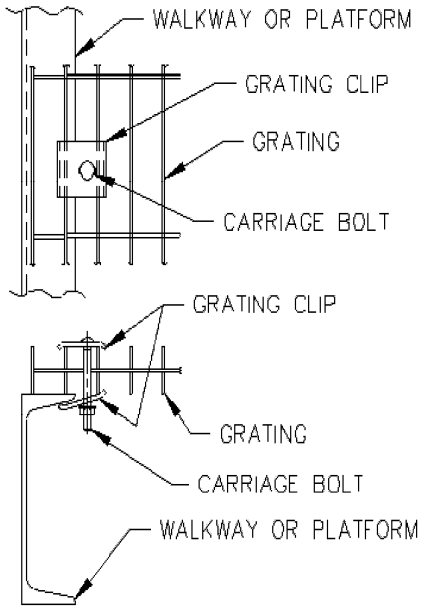


Figure 3.1

4 Install Drive Unit

Lifting the Drive Unit

Lift the drive unit using the lifting lugs provided in the drive base. Keep the drive unit as level as possible during lifting. Spreader bars may be necessary to keep the lifting cables from touching other parts of the drive as this may cause damage. Any lifting lugs on individual components (motor, reducer, etc.) are for lifting those components only during assembly or disassembly and are **not** for lifting the entire drive.

Drive unit Installation

Make sure mounting surfaces are clean and free from foreign debris. Place the drive unit on the bridge and loosely fasten.

The final check for level will be completed after all the items designed to hang from the drive are attached.

Lubricate the drive unit according to the instruction on the drive lube tag and under “Drive Lubrication” in the “Maintenance” section of this manual.

Check the drive motor for proper direction of rotation as shown on the General Arrangement / Drive Assembly drawings. (Refer to drive rotation direction arrow sticker placed on the drive.) WesTech Engineering, Inc. will not accept responsibility for any damage caused by the drive rotating in the wrong direction. On multi pinion drives, be sure all motors are connected to rotate in the same direction. This is done by removing all motors and confirming they all rotate in the same direction. Severe damage to the drive will result if all motors do not run in the same diction.

Connect the motor alarm and cutout limit switches in the torque control device (see the suggested electrical schematic or WesTech Engineering, Inc. panel wiring diagram). The torque transmitter (if provided) is calibrated to correspond with the visual torque indicator scale. Refer to General arrangement drawings for alarm and motor cutout torque values.

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Shimming the Drive

In order to achieve maximum drive bearing life, the drive base must be properly shimmed. After the drive is leveled, shims should be placed in any gap exceeding 0.005" inches between the mounting surface and the drive base (see "Drive Shimming Procedure" drawing). Shims should be placed all along the drive base connection not just at the location of drive mounting bolts. Shims must completely fill any gap between the drive base and the mounting surface.

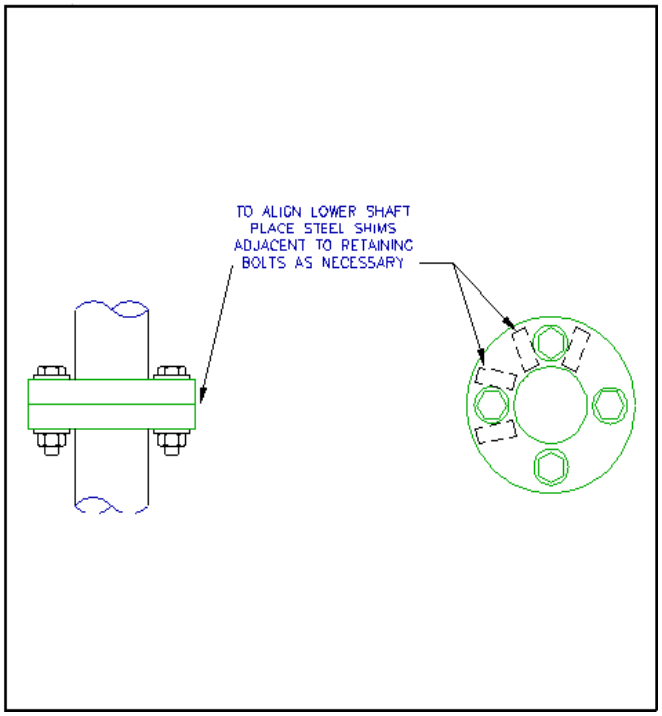
After the drive is leveled and fully shimmed, loosen jack screws (or external hydraulic jacks) and evenly tighten drive mounting bolts. After the bolts are tightened, the final level must be re-verified.

5 Connect Shaft to Drive

a) Check that shaft is plumb and on tank centerline.

b) Check the shaft for alignment (run-out). One way to do this is to drop a plumb line from the walkway. Then, while rotating the shaft, measure the distance from the plumb line to the shaft at four 90° intervals near the rake arm connection. This measurement should not vary more than 1/8 inch. Optional methods to check alignment are the use of dial indicator or machinist's level.

c) Plumb the center shaft by means of shimming between drive shaft flange and center shaft flange as necessary.



Center Shaft
Figure 5.1

6 Connect Feedwell to Bridge

Note: Feedwell must be positioned over center shaft prior to installation of center shaft.

a) Using erection drawings as a reference, install feedwell supports to the walkway at the appropriate locations.

b) Raise the entire assembled feedwell and bolt to supports. Support the feedwell at several locations with the use of spreader bars, so that the feedwell is not distorted and supports are not unevenly loaded during installation.

c) Tighten all connecting bolts. Check elevation of feedwell with respect to water level to ensure proper location

7 Connect Rake Arms to Shaft

a) Place rake arms in tank on blocking. Position to line up with the center shaft attachment.

b) Using blocking or jacks, position rake arm assembly and bolt to lower shaft attachment using extreme care not to bend shaft or disturb drive.

Adjust arms as follows:

1. Bolt the rake arm assembly to upper shaft attachment and adjust using jacks to fit slope of tank bottom. Field welding of these connections is required after final adjustment for level.

2 Adjust arms so that both rake arms have proper and equal clearance with the tank bottom. This is to ensure that each arm shares its load and the equipment does not operate with unevenly distributed loads. (This must follow the final check for level of the drive unit.) The drive unit must be readied and used for this operation.

3) The rake blades must be adjusted to rake at the proper slope and in the same plane. By means of a reference mark on the tank floor, or a pile of sand leveled by the arms, note the exact clearance of the arms from the tank floor.

4) Rotate each arm to the reference mark and adjust according to the reference dimensions (or pile of sand). Use a jack under the arms to assist in this adjustment. The arms should be adjusted for the same elevation.

c) Repeat steps c and d after the final check for level is complete. They will have to be re-set.

d) After all adjustments have been made including the final check for level, securely tighten arm connections and field weld the weld plates in place.

8 Install Feed Pipe / Launder

Install feed pipe / launder using the general arrangement drawings, orient and install the feed pipe / launder.

9 Final Check for Level

The objective in the final check for level is to verify that the drive gear / bearing is level. This will ensure proper operation and will extend drive bearing life. This will be done by checking the level at the end of one arm, at four points around the tank. The entire mechanism should be assembled at this point, especially parts that attach to the shaft or the arms.

a) The tank was bench marked previously during the tank inspection. These four level marks (90° apart) will now be used to check the level of the drive.

b) Only one arm is used to check if drive is level. Rotate the drive and stop the arm at one of the level points marked around the tank. Using a carpenter's level as an extension from that arm to the tank wall, make a second mark on the wall.

c) Repeat procedure rotating **the same arm** to each of the four marks on the tank. These are shown as the "Reference Marks" in the illustration.

d) If power is not available, remove the fan cover and rotate the drive by turning the fan. Do not push rake arms or otherwise move arms during the leveling.

e) Referring to the illustration, compare the difference in dimensions between the level marks and the rake arm reference marks at diametrically opposite sides of the tank.

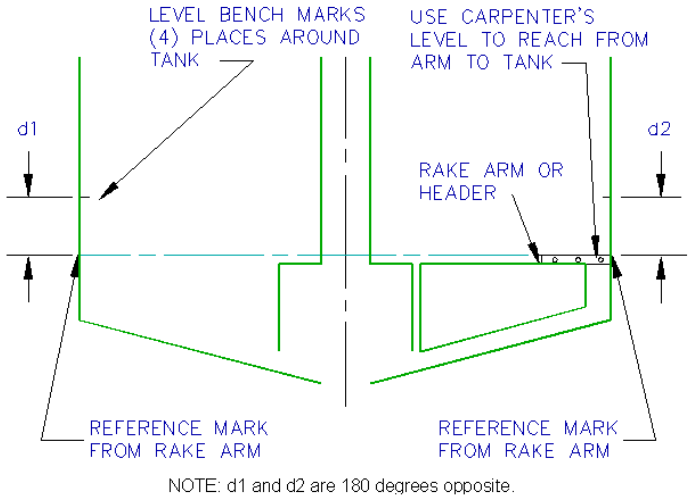


Figure 9.1

TANK DIAMETER	TOLERANCE (d1 minus d2)
0' - 50' DIA.	1/4"
> 50' & ≤ 75' DIA.	3/8"
> 75' & ≤ 100' DIA.	1/2"
> 100' & ≤ 125' DIA.	5/8"
> 125' & ≤ 150' DIA.	3/4"
> 150' & ≤ 175' DIA.	7/8"
> 175' & ≤ 200' DIA.	1"
> 200' & ≤ 225' DIA.	1 1/8"
> 225' & ≤ 250' DIA.	1 1/4"
> 250' & ≤ 275' DIA.	1 3/8"
> 275' & ≤ 300' DIA.	1 1/2"
> 300' & ≤ 350' DIA.	1 5/8"
> 350' & ≤ 400' DIA.	1 3/4"

f) The difference between the two observed dimensions (d1 minus d2) must not exceed the tolerance shown on the chart. If the given tolerance is exceeded, adjustment to the drive level should be made.

g) If shimming is necessary, repeat as instructed in drive unit installation instructions. Use leveling bolts on drive unit. This procedure checks and adjusts internal drive bearing level which is not possible until this stage of assembly work. Shim until level tolerances are achieved.

h) In making the final adjustment, care should be taken to tighten the drive mounting bolts equally. Uneven tightening may cause deformation of the bearing races, causing shortened bearing life.

i) Maximum bearing life of the drive unit main bearing is dependent on proper leveling. Perfect final leveling is not practical; however, it should be as accurate as possible.

10 Electrical Installation

a) If applicable, install control panel.

b) Complete external wiring in accordance with the wiring diagram.

c) The Torkmatic drive control is factory set, but should be checked in the field at this time for proper operation and wiring. Refer to drive drawings for torque settings.

d) Do not alter the factory set position of limit switches as damage to the mechanism can occur. Any alteration of the limit switch position must be performed by a factory representative or with written permission from WesTech Engineering, Inc. Failure to follow these guidelines will void the warranty.

SECTION 3: STARTUP AND OPERATION

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Safety Instructions

a) Only operators who have been trained in safety procedures should be allowed to work on or around this equipment. Restrict access to authorized personnel.

b) To prevent personal injury, the mechanism must be stopped and locked out before performing any maintenance or adjustments.

c) **Exercise caution around moving parts.** Keep hands, clothing, etc., away from moving parts.

d) Place "Warning" signs in the area of moving parts.

e) **Never** permit people who have been drinking alcohol, using drugs, or are otherwise impaired to maintain or repair unit.

f) Inspect equipment frequently for loose bolts or malfunctioning equipment. Fix problems immediately.

g) It is important that operator safety is stressed.

DO NOT perform maintenance or repairs on moving parts!

Operating Instructions

Before operating this thickener, it is suggested that the following instructions are read and understood. Proper maintenance and operating procedures will maximize efficiency and minimize operational problems.

Principle

Feed Overflow

Various methods of introducing the feed are used. Generally, flows through a pipe or trough side of the tank to a circular feedwell from which it flows out radially towards the peripheral overflow weir.

The overflow is usually removed at the tank periphery. A sufficient detention time is allowed to permit the solids in the feed to settle. The overflow weirs should be adjusted to continuously remove a uniform amount of overflow and to eliminate irregular flow at any one place. Any low spots will cause a convergence of flow and the velocity at these points may be high enough to carry fine solids with the overflow.

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Raking Mechanism

The raking mechanism at the tank bottom collects the solids as they settle. The rake blades push solids to the center cone for removal. The speed of the raking mechanism has been set for the particular application and should not be changed without consulting WesTech Engineering, Inc.

PRE -STARTUP INSTRUCTIONS

a) Determine the following:

    1) Thickener application.

    2) Solids concentration of feed.

    3) Underflow solids concentration.

    4) Chemical properties of the feed, i.e., alkaline, acid, etc.

    5) Expected overflow clarity.

    6) If flocculent will be used, the type and expected dosage.

b) Be familiar with the piping, including:

    1) Method of feeding.

    2) Method of discharging overflow from the tank.

    3) Method of discharging the underflow.

c) Be sure the mechanism is lubricated in accordance with the lubrication instructions.

d) Recheck mechanism assembly and performance during several revolutions of the arms with the tank dry. Minor adjustments or corrections may be required. If major corrections are necessary, contact WesTech Engineering Inc. or our authorized representative.

e) Be sure the overflow, underflow, and feed pips are clear on any foreign matter. Insure operational readiness of pumps, valves, instrumentation, etc.

Start-Up

A complete check of the entire mechanism should first be performed. It is suggested that arrangements be made for a WesTech Engineering Inc. trained service representative to perform final inspection before the tank is filled and the mechanism is put into service.

The mechanism is now ready for start-up. Inspect the tank and the mechanism path for any obstructions. Start the unit while the tank is still empty and watch carefully for correct rotation and possible interferences. **Upon shutdown, the mechanism should not re-start until the operator has physically re-pushed the start button.** If the unit does not operate at the given settings, check the field wiring for correct installation. If it is still incorrect, call WesTech Engineering, Inc.

Allow the mechanism to continue to run for several revolutions. This will allow operators the advantage of observing the mechanism and all of the components in operation. As soon as it is verified that the unit has been installed correctly, the unit is ready for introduction of feed. Remember, proper start-up and operation depends on one major rule: **Withdraw solids at the same rate that they are fed into the tank.** Thickeners are not designed as storage units. Otherwise, accumulated solids will overflow the mechanism, resulting in equipment shutdown.

Log all readings and observations during start-up for possible future reference

Dewatering / Shutdown

Approximately twice a year, the thickener should be taken out of service and dewatered. This gives plant personnel an opportunity to inspect all parts of the mechanism, perform adjustments and maintenance to submerged components, touch-up paint, etc. If you anticipate the thickener will be out of service for an extended period, please refer to long-term storage and shutdown procedures elsewhere in this manual.

Shut off feed to the thickener. Use the sludge withdrawal system and/or floor drain(s) (if present) to completely drain the thickener tank. The mechanism should be allowed to rotate while the tank is being drained. This will ensure that very few solids remain behind on the floor when the liquid is gone.

As the liquid level drops in the tank, carefully watch the mechanism torque indicator. The thickener mechanism is designed to be balanced when submerged. In some thickeners, the mechanism can tip slightly as rake arms, etc. becomes un-submerged. This may cause the rake blades on one arm to start dragging slightly on the floor. If the torque indicator shows a sudden jump in torque as the tank is draining, it is probably being caused by an unbalanced condition. In this case, the mechanism should be shut down.

When the tank is completely drained, a high pressure hose may be used to wash any remaining solids from the floor. The mechanism should also be sprayed clean to aid in inspection.

Caution

If a small amount of liquid is allowed to remain in the tank, it may cover the center cone or other drains in the floor. Personnel working in the tank should be very careful to first locate and mark any obscured areas or drains to avoid injury from accidentally falling or stepping in them.

If the thickener needs to be dewatered more quickly than the solids withdrawal system and/or drain(s) can accommodate, temporary additional pumps may be used to speed up the tank drawing.

The feed to the thickener should first be shut off. If possible, use the solids withdrawal system alone to begin dewatering the tank. This will allow the mechanism to remain in operation and continue to move settled solids to the outlet. Allow the mechanism and solids withdrawal system to remove most of the solids blanket from the tank, if possible, before using additional pumps. When additional pumps and/or hoses are introduced into the tank, the mechanism must be shut off.

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THICKENER OPERATING INSTRUCTIONS

IF PROCESS INDICATORS SHOW…….			*DO THIS*	
SOLIDS BED LEVEL	***TORQUE***	***UNDERFLOW DENSITY***	***UNDERFLOW PUMP RATE***	***FLOCC.***
→	→	→	→	→
↗	→	→	↗	→
↗	↗	→	↗	→
↗	→	↘	↘	↗
↗	↗	↗	↗	↘
↘	→	→	↘	→
		THEN TRY	↘	↘
↘	→	↘	↘	↘
↘	↘	↘	↘	→
		THEN TRY	↘	↗
→	↘	↘	↘	→
		THEN TRY	↘	↗
→	→	↘	↘	→
→	↗	↗	↗	↘
→	→	↗	↗	→
→	↗	↘	↘	↗
↘	↘	↘	↘	↗

→ = STEADY ↗ = INCREASING ↘ = DECREASING

SECTION 4: MAINTENANCE AND PARTS

Equipment Maintenance

a) All bolts and nuts should be kept tight and original alignments and adjustments maintained. Inspection should be made at least annually.

b) Examine all wearing parts monthly to determine whether excessive wear is taking place.

c) Keep the mechanism and surroundings clean and free from any accumulation of trash or debris.

d) Lubrication instructions and recommended lubricants as specified are to be followed. This will provide long life and trouble-free operation of the drive unit.

e) Manufacturer's recommendations for maintenance and lubrication of the speed reducers are included and should be followed in order to maintain warranties.

f) Check the drive unit oil level weekly. The oil level should be at the middle of the sight glass. Replenish oil as required. Refer to the section on **Lubrication** in the **Maintenance and Parts** category of this manual.

g) If oil is noticeably discolored, it should be drained and filtered through a fine-mesh cloth. Any sediment or contaminants should be measured and recorded.

h) Check drive unit for accumulated condensation at least weekly and in high humidity areas as often as daily. Any condensation must be promptly removed to prevent accumulation of moisture in the drive unit housing or main bearing.

i) If the power is shut off or if the mechanism is stopped for any reason longer than an hour (1) for light sediment and 15 minutes for a heavier sediment load, bypass the flow until the machine is started again.

j) Drain the tank at least every six (6) months to remove particulate deposits from the mechanism. Inspect the entire mechanism above and below the water line. This is a good opportunity to touch up all rust spots with paint.

k) As routine checks are made, special attention should be given to the operating sound of the mechanism. Any unusual or irregular noise should be investigated immediately as this could be an indication of a problem.

l) Any irregular or jerking motion in the operation of the mechanism must be immediately investigated and the cause determined and remedied. The mechanism must not be allowed to continue operation if this problem is present.

m) Manually test the raise-lower operation of the lift mechanism at least once every two(2) weeks.

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Storage and Shutdown Precautions

It is preferable to store mechanical and electrical items indoors in a dry, well ventilated enclosure with a relatively constant temperature. The equipment should be adequately supported to prevent distortion and undue stresses. It should be at least six inches off the floor.

Whether stored indoors or outdoors, the steps outlined in the following should be taken:

"Short Term" is from 30 to 120 days
"Long Term" is 120 days or more

Short Term Storage or Shutdown

The following instructions also apply if there is to be a period of time between installation and start-up or between start-up and the equipment going on line. These steps are required to protect against corrosion and assure operating condition.

a) **Cover** with a tarpaulin that allows adequate ventilation, drainage, and inspection access in an area protected against wind, direct sunlight, rain, and snow.

   Note: Plastic covers should not be used if space heaters are energized (refer to #2 below).

b) **Space heaters** should be used in cold or wet weather.

c) **Coat** all unpainted metal surfaces, such as drive shafts, with oil, grease, or a rust inhibitor (i.e. Cosmo line).

d) At least once a month, **re-lubricate** all items that are grease lubricated and grease exterior surfaces of all seals. Inspect all of the equipment for signs of corrosion and take corrective steps as required.

e) If power is connected, **operate** the equipment for five minutes approximately once a week to prevent brineling of bearings, and to maintain lubricant condition and pliability of seals. If power is not connected, the equipment should be manually rotated enough to accomplish the above.

f) **Drain** condensate from the main gear housing at least once a week or leave the drain valve open to continuously to allow the condensate as it forms.

In addition to these steps, the instruction manuals of the manufacturers of the speed reducers, variable speed drives, etc. should be read and their instructions followed.

Long Term Storage or Shutdown

In addition to those steps shown under "Short Term", the following steps should be taken whether storage is indoors or outdoors:

Periodic checks, frequency dependent upon ambient conditions, must be made of painted surfaces for deterioration of paint. Wide variations in ambient temperatures are conducive to condensation with its resultant oxidation. Steps should be taken to protect the affected surfaces.

Bitumastic coatings tend to become brittle and to chip. Increasing ventilation and reducing humidity are frequently required. Where equipment is well covered and protected, inspection doors, covers, etc. should be blocked open slightly to increase ventilation. Relatively small areas and shafts can be coated with a waterproof grease or rust inhibitor.

Speed Reducers, Gear Drive, Etc.

The respective manufacturer's instruction manuals should be followed closely. At the very least, the following steps should be taken in addition to the steps called for under "Short Term".

a) Units that were furnished with a dry sump should be filled completely with oil, if they are the oil lubricated type.

b) Any breathers, vents, etc., should be taped over.

c) Disconnect hanging loads or block support to relieve the load on bearings.

d) Drain oil at six month intervals and refill with oil of proper viscosity. Re-grease those units that are grease lubricated.

e) Tag the unit to indicate what must be done before starting up, such as:

    1) Drain oil to operating level

    2) Remove tape from vents and breathers

    3) Re-grease

    4) Re-connect hanging loads or remove blocking

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Electric Motors

The following are considered by motor manufacturers to be the minimum precautions for outdoor storage of electric motors:

a) Coat all machined parts, such as drive shafts, with Cosmo line or similar material, if not already protected. Motors should be elevated a minimum of six inches above the ground.

b) Remove plastic covering (or carton) and cover motors with a tarpaulin. This will offer protection from the weather while allowing the motor to breathe.

c) Keep the motors warm. If equipped with a space heater, energize at all times. If space heaters were not supplied, auxiliary heat must be used to keep the motor windings warm and free of condensation.

d) Motors with grease lubricated bearings have inherent rust inhibitors in the grease. The shaft should be rotated slowly by hand at least once every 30 days. This will distribute the grease in the bearings.

e) All drains are to be fully operable while in storage, and/or the drain plugs removed. The motors must be stored so that the drain is at the lowest point. All breathers and automatic "T" drains must be operable to allow breathing at points other than through the bearing fits. Vertical motors should be stored in the vertical position.

f) All units equipped with heaters are to have the heaters connected, if storage conditions in any way simulate or approach atmospheric conditions experienced in operation.

g) Windings are to be megged at the time equipment is put in storage. At the termination of storage, the motor should be megged prior to applying power. The minimum readings should be one megaohm for motors rated 600 volts and less. Any drop below this point necessitates electrical or mechanical drying. Where a large quantity of motors is stored, an inspection or sampling should be made by removing the end brackets and visually inspecting for the presence of water in the grease or rust on the bearings. If present, replace the bearings and lubricate.

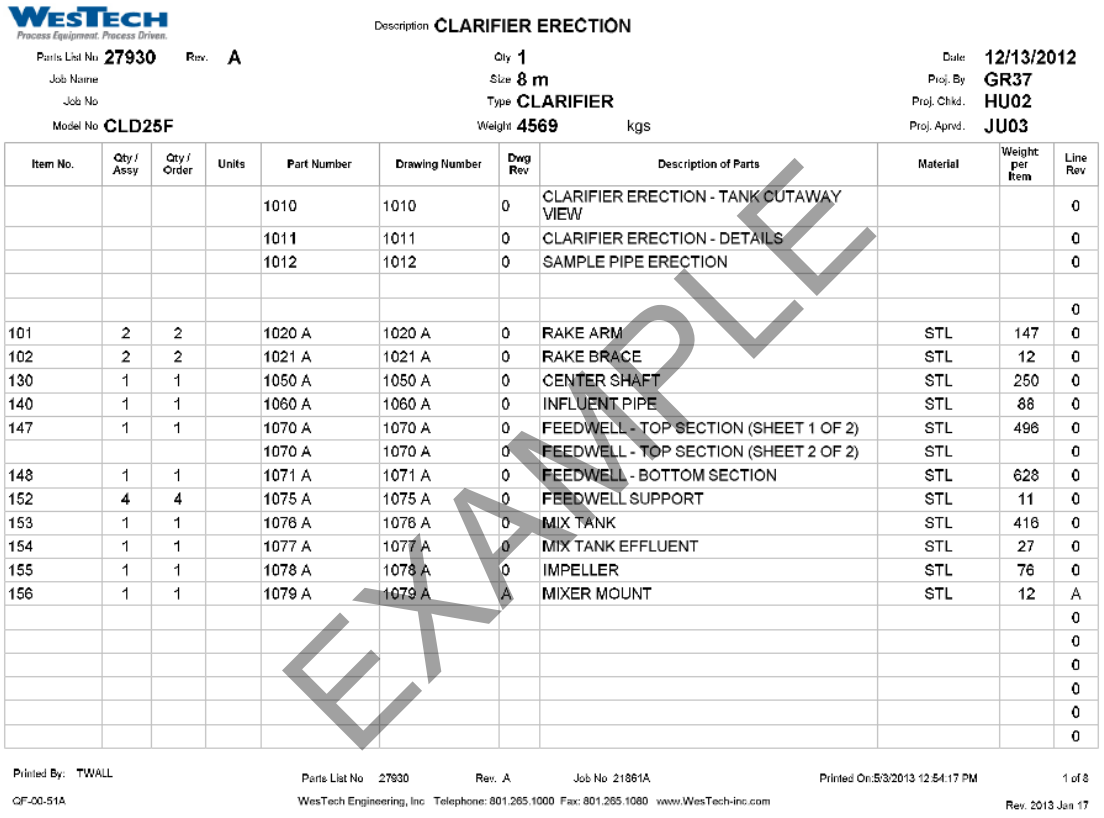
h) Grease in the motors is to be purged at the time of removal from storage, making sure that an ample supply of fresh grease is in each grease cavity.

i) All external parts and motors subjected to corrosion should be protected by some corrosive resistant coating.

j) Where motors are not installed in the original containers, but are removed and mounted on other pieces of machinery, the mounting must be such that the drains and breathers are fully operable. In this respect, the drains must be kept at the lowest point on the motor and/or the drain plugs removed so that all condensation can automatically drain out.

k) Vertical motors should be stored in the vertical position. All other storage conditions apply, including rotation of motor shafts.

Explanation of Parts List and Part Numbers



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Description **CLARIFIER ERECTION**

Parts List No **27930** Rev. **A** | Qty **1** | Date **12/13/2012**
Job Name | Size **8 m** | Proj. By **GR37**
Job No | Type **CLARIFIER** | Proj. Chkd. **HU02**
Model No **CLD25F** | Weight **4569** kgs | Proj. Aprvd. **JU03**

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
				1010	1010	0	CLARIFIER ERECTION - TANK CUTAWAY VIEW			0
				1011	1011	0	CLARIFIER ERECTION - DETAILS			0
				1012	1012	0	SAMPLE PIPE ERECTION			0
										0
101	2	2		1020 A	1020 A	0	RAKE ARM	STL	147	0
102	2	2		1021 A	1021 A	0	RAKE BRACE	STL	12	0
130	1	1		1050 A	1050 A	0	CENTER SHAFT	STL	250	0
140	1	1		1060 A	1060 A	0	INFLUENT PIPE	STL	88	0
147	1	1		1070 A	1070 A	0	FEEDWELL - TOP SECTION (SHEET 1 OF 2)	STL	496	0
				1070 A	1070 A	0	FEEDWELL - TOP SECTION (SHEET 2 OF 2)	STL		0
148	1	1		1071 A	1071 A	0	FEEDWELL - BOTTOM SECTION	STL	628	0
152	4	4		1075 A	1075 A	0	FEEDWELL SUPPORT	STL	11	0
153	1	1		1076 A	1076 A	0	MIX TANK	STL	416	0
154	1	1		1077 A	1077 A	0	MIX TANK EFFLUENT	STL	27	0
155	1	1		1078 A	1078 A	0	IMPELLER	STL	76	0
156	1	1		1079 A	1079 A	A	MIXER MOUNT	STL	12	A
										0
										0
										0
										0
										0
										0

EXAMPLE

Printed By: TWALL | Parts List No 27930 Rev. A Job No 21861A | Printed On:5/3/2013 12:54:17 PM | 1 of 8
QF-00-51A | WesTech Engineering, Inc Telephone: 801.265.1000 Fax: 801.265.1080 www.WesTech-inc.com | Rev. 2013 Jan 17

Item Numbers

Item numbers identify a part shown on an erection or assembly drawing and are encircled on the drawing with an arrow pointing to the part. On the parts list, item numbers are found in the left most column of the list and are three digit numbers. Most item numbers will appear on an assembly drawing.

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Drawing / Part Numbers

These numbers identify shop drawing numbers and / or buy-out drawing numbers. These drawings are not included in instruction manuals. The drawing revision column indicates the revision of the drawing used on this project.

Description of Parts

This column gives a general description of the drawing / part number. This information is necessary when ordering spare parts.

Description of Material

The material of the particular part is indicated in this column. This information is necessary when ordering spare parts.

Weights & Quantities

The weight per order column shows the weight of each item multiplied by the quantity per order. Quantity per assembly indicates the number of parts needed for each assembly. In some cases more than one assembly is required per filter. In this case the quantity per order is the quantity per assembly multiplied by the number of assemblies.

Line Rev

This column shows the latest revision level of each item.

Example Parts List Page

This is an example of WesTech Engineering Inc.'s standard parts list allowing the company to use a common database. Information contained in columns will vary according to equipment provided.

Part / Drawing Numbers

These numbers identify electrical drawing numbers and manufacturer's part numbers. These items may be included in instruction manuals. The drawing revision column indicates the revision of the drawings used on this project.

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MECHANISM PARTS LIST

Parts List No **31761** Rev.

Job Name **COAL INNOVATIONS**

Job No **22157A**

Model No **THS32**

Qty **1**

Size **75'-0 DIA.**

Type **THICKENER**

Weight **18913** lbs

Date **10/17/2013**

Proj. By **KA02**

Proj. Chkd. **GR37**

Proj. Aprvd. **GR00**

Part Number	Drawing Number	Dwg Rev	Description of Parts	Weight	Qty / Order	Line Rev
			EQUIPMENT & SPECIFICATIONS INDEX			
31759			THICKENER ERECTION	18913	1	
31770			DRIVE UNIT		1	0
31754			THICKENER CONTROL PANEL		1	0
			REFERENCE DRAWINGS:			0
1000	1000	0	GENERAL NOTES			0
1001	1001	A	THICKENER GENERAL ARRANGEMENT - TANK CUTAWAY VIEW			0
1002	1002	0	THICKENER GENERAL ARRANGEMENT - ELEVATION VIEW			0
1003	1003	0	THICKENER GENERAL ARRANGEMENT - PLAN VIEW			0
1004	1004	0	THICKENER GENERAL ARRANGEMENT DETAILS			0
1005	1005	0	SURFACE PREP & PAINT - SUBMERGED STL			0
1006	1006	A	SURFACE PREP & PAINT - NON-SUBMERGED STL			0
1007	1007	0	SURFACE PREP & PAINT - DRIVE UNIT			0
			REFERENCE SPECIFICATIONS:			
WAST0001	WAST0001	E	FIELD ERECTION REFERENCE TAG			
P24Z-024A	P24Z-024A	E	WESTECH STANDARD SPECIFICATION			
A60B-001A-D	A60B-001A-D	E	FABRICATION AREA CLEANING REQ GRADE "D"			
WAST0008	WAST0008	C	HOT DIP GALVANIZING SPECS			

WESTECH

Description **THICKENER ERECTION**

Parts List No **31759** Rev.

Job Name **COAL INNOVATIONS**

Job No **22157A**

Model No **THS32**

Qty **1**

Size **75'-0 DIA.**

Type **THICKENER**

Weight **18913** lbs

Date **10/17/2013**

Proj. By **KA02**

Proj. Chkd. **GR37**

Proj. Aprvd. **GR00**

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
				1010	1010	0	THICKENER GENERAL ERECTION - TANK CUTAWAY VIEW			0
101	2	2		1020 A	1020	0	RAKE ARM (2 SHEETS)	STL	2428	0
105	4	4		----------	----------		WELD PLATE (PL 3/8 x 6 x 6)	STL	4	
127	1	1		1039 A	1039	0	CENTER SHAFT	STL	1058	0
129	1	1		1041 A	1041	0	CONE SCRAPER	STL	251	0
130	2	2		1045 A	1045	0	FEEDWELL SUPPORT - CROSS BRACE #1	STL	91	0
131	1	1		1046 A	1046	0	FEEDWELL SUPPORT - CROSS BRACE #2	STL	61	0
139	2	2		1047 A	1047	0	FEEDWELL - SECTION A	STL	576	0
141	2	2		1049 A	1049	0	FEEDWELL - SECTION C	STL	576	0
142	4	4		1050 A	1050	0	FEEDWELL SUPPORT	STL	14	0
201	1	1		1054 A	1054	A	SUPERSTRUCTURE - LONG (2 SHEETS)	STL	5853	0
203	1	1		1056 A	1056	0	DRIVE PLATFORM	STL	932	0
205	1	1		1057 A	1057	0	SUPERSTRUCTURE - SHORT (2 SHEETS)	STL	2591	0
208	1	1		1061 A	1061	0	SPLICE ANGLE - TOP	STL	53	0
209	2	2		1061 B	1061	0	SPLICE ANGLE - SIDE	STL	49	0
210	1	1		1061 C	1061	0	SPLICE ANGLE - BOTTOM	STL	46	0
211	1	1		1062 A	1062	0	HANDRAIL	STL	544	0
301	2	2		SDWWB013 A	SDWWB013 A	0	SLIDE PLATE	UHMW		
303	2	2		1099 A	1099	0	SPACER PLATE	STL	6	0
318	1	1		1089 A	1089	0	GRATING - BRIDGE 1 96-SQ.FT. PER ORDER	HDG STL		0

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
320	1	1		1091 A	1091	0	GRATING - PLATFORM 55-SQ.FT. PER ORDER	HDG STL		0
322	1	1	EACH	SIT-00008A	SIT-00008 A	0	WESTECH NAMEPLATE, LARGE	AL		
323	2	2	EACH	3225T15	----------	0	TENSION BAND, 1-3/4" W/ EPDM CUSHIN	HDG STL		
405	8	8	EACH	BHH307G-075C0250	----------		CAPSCREW HEX HD 3/4" X 2 1/2"	A307G		
	8	8		NF307G-075	----------		HEX NUT 3/4" W/ FW	A307G		
							(WALKWAY TO TANK)			
413	8	8		ACL-00006 B	----------	A	U-BOLT W/	A307G		
	8	8			----------		(4)NUTS,(2)FW	A307G		0
							(HANDRAIL TO SUPERSTRUCTURE)			
416	4	4	EACH	BHH307G-037C0100	----------		CAPSCREW HEX HD 3/8" X 1"	A307G		
	4	4		NF307G-037	----------		HEX NUT 3/8" W/ FW	A307G		
							(CONTROL PANEL TO SUPPORT)			
426	6	6	EACH	BHH307G-100C0200	----------		CAPSCREW HEX HD 1" X 2"	A307G		
	6	6		NL307G-100	----------		HEX NUT W/ LW 1"	A307G		
							(DRIVE TO WALKWAY)			
428	4	4		ATR307G-075C0900			THRD ROD 3/4 x 9	A307G		
	16	16		NF307G-075	----------		HEX NUT 3/4" W/ FW	A307G		
							(RAKE TO SHAFT)			
448	8	8	EACH	BHH307G-100C0200	----------		CAPSCREW HEX HD 1" X 2"	A307G		
	8	8		N307G-100	----------		HEX NUT 1"	A307G		
							(SPLICE ANGLES TO SUPERSTRUCTURE)			
471	10	10	EACH	BHH307G-075C0175	----------		CAPSCREW HEX HD 3/4" X 1 3/4"	A307G		
	10	10		N307G-075	----------		HEX NUT 3/4"	A307G		

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
							(REMOVABLE ANGLES TO SUPERSTRUCTURE)			
472	32	32	EACH	BHH307G-100C0200	----------		CAPSCREW HEX HD 1" X 2"	A307G		
	32	32		N307G-100	----------		HEX NUT 1"	A307G		
							(SUPERSTRUCTURE SPLICE)			
505	12	12	EACH	BHH307G-050C0150	----------		CAPSCREW HEX HD 7/8" X 3 3/4"	A307G		
	12	12		NF307G-050	----------		HEX NUT 7/8" W/ FW	A307G		
							(DRIVE TO CENTER SHAFT)			
520	20	20	EACH	BHH307G-062C0175	----------		CAPSCREW HEX HD 5/8" X 1 3/4"	A307G		
	20	20		NF307G-062	----------		HEX NUT 5/8" W/ FW	A307G		
							(FEEDWELL SPLICE)			
521	20	20	EACH	BHH307G-062C0175	----------		CAPSCREW HEX HD 5/8" X 1 3/4"	A307G		
	20	20		N307G-062	----------		HEX NUT 5/8"	A307G		
							(FEEDWELL SPPT TO FEEDWELL, CROSS BRACES TO			
							FEEDWELL SPPT)			
522	4	4	EACH	BHH307G-062C0200	----------		CAPSCREW HEX HD 5/8" X 2"	A307G		
	4	4		NF307G-062	----------		HEX NUT 5/8" W/ FW	A307G		
							(FEEDWELL SUPPORT TO WALKWAY)			
540	8	8	EACH	BHH325G-075C0200	----------		CAPSCREW HEX HD 3/4" X 2"	A325G		
	8	8	EACH	N325G-075			HEX NUT 3/4	A325G		
			EACH				(CONE SCRAPER TO CENTER SHAFT)			
546	4	4	EACH	BHH325G-150C0350	----------		CAPSCREW HEX HD 1 1/2 X 3 1/2"	A325G		
	4	4	EACH	N325G-150			HEX NUT 1 1/2	A325G		
			EACH				(RAKE ARM TO CENTER SHAFT)			

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Process Equipment. Process Driven.

ELECTRICAL PARTS LIST

WESTECH

Description **THICKENER CONTROL PANEL**

Parts List No **31754** Rev. **A**
Job Name **COAL INNOVATIONS**
Job No **22157A**
Model No

Qty **1**
Size **T-2-1-2-3**
Type **THICKENER**
Weight **47** lbs

Date **10/17/2013**
Proj. By **KE32**
Proj. Chkd. **HE58**
Proj. Aprvd. **RU08**

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
101				E10D	A	PANEL LAYOUT	.	A
102				E11D	A	ELECTRICAL SCHEMATIC	.	A
103				E12D	A	ELECTRICAL SCHEMATIC	.	A
104				E13D	A	FIELD WIRING DIAGRAM	.	A
105							.	
106							.	
107	1	1		----------		WIRE, DUCT, BITS, FASTENERS, ETC	WESTECH	-
108							.	
109							.	
110	1	1	ENCLOSURE	CSD24208		ENCLOSURE, TYPE 4/12	HOFFMAN	-
111	1	1	ENCLOSURE	CP2420		BACK PANEL, 22.2 X 18.2	HOFFMAN	-
112	1	1	ENCLOSURE	CMFK		MOUNTING FOOT KIT	HOFFMAN	-
113							.	
114							.	
115	2	2	4,5	APD1126DNR		PILOT LIGHT, LED RED, 120V TRANSFORMER	IDEC	-
116							.	
117							.	
118	1	1	6	APD1126DNA		PILOT LIGHT, LED AMBER, 120V TRANSFORMER	IDEC	-
119							.	
120							.	
121	2	2	8,13	APD1126DNS		PILOT LIGHT, LED BLUE, 120V TRANSFORMER	IDEC	-
122							.	
123							.	
124	2	2	7,12	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-

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Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
125	2	2	7,12	ABD1BNB		BLACK PUSHBUTTON HEAD ONLY	IDEC	-
126	2	2	7,12	BST010		CONTACT BLOCKS, NO	IDEC	-
127							.	
128							.	
129	1	1	9	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-
130	1	1	9	ABD1BNR		PUSHBUTTON, RED	IDEC	-
131	1	1	9	BST010		CONTACT BLOCKS, NO	IDEC	-
132							.	
133							.	
134	1	1	10	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-
135	1	1	10	ABD2BNR		PUSHBUTTON, RED EXTENDED, HEAD ONLY	IDEC	-
136	1	1	10	BST001		CONTACT BLOCKS, NC	IDEC	-
137							.	
138							.	
139	2	2	11,14	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-
140	2	2	11,14	ABD1BNG		PUSHBUTTON HEAD ONLY GREEN	IDEC	-
141	2	2	11,14	BST010		CONTACT BLOCKS, NO	IDEC	-
142	2	2	11,14	BST001		CONTACT BLOCKS, NC	IDEC	-
143							.	
144							.	
145	1	1	AL	105STA-N5		BEACON ASSY.,AMBER, 120VAC	EDWARDS	-
146	1	1	AL	105PM		MOUNTING BRACKET, 3/4 PIPE MNT (FOR 105 SERIES BEACONS)	EDWARDS	-
147	1	1	AH	876-N5		HORN, 120VAC, W/BACKBOX TYPE 4X, 103 dB, .13A	EDWARDS	-
148							.	
149							.	
150							.	
151							.	
152	2	2	F1,2	FH8-1PC30L		FUSE HOLDER, 1 POLE, 30A CC	SPR	-
153	2	2	F1,2	FNQ-R-3		TIME DELAY FUSE, 3 AMP	BUSSMAN	-
154							.	

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
155							.	
156	1	1	PS1	2866446		POWER SUPPLY, 24VDC, 1.3 AMP MINI-PS-100-240AC/24DC/1.3	PHOENIX	-
157							.	
158							.	
159	1	1	CR1	RH4B-ULAC120V		RELAY, FOUR POLE, 120VAC W/INDICATION LIGHT	IDEC	-
160	1	1	CR1	SH4B-05C		FINGERSAFE RELAY BASE, FOUR POLE	IDEC	-
161							.	
162							.	
163	2	2	CR3,5	RH3B-ULAC120V		RELAY, THREE POLE, 120VAC W/INDICATION LIGHT	IDEC	-
164	2	2	CR3,5	SH3B-05C		FINGERSAFE RELAY BASE, THREE POLE	IDEC	-
165							.	
166							.	
167	2	2	CR2,6	RH2B-ULAC120V		RELAY, TWO POLE, 120VAC W/INDICATION LIGHT	IDEC	-
168	2	2	CR2,6	SH2B-05C		FINGERSAFE RELAY BASE, DOUBLE POLE	IDEC	-
169							.	
170							.	
171	1	1	CR4	RH1B-ULAC120V		RELAY,SINGLE POLE, 120VAC W/INDICATION LIGHT	IDEC	-
172	1	1	CR4	SH1B-05C		FINGERSAFE RELAY BASE, SINGLE POLE	IDEC	-
173							.	
174							.	
175	56	56	TB1-3	3044102		TERMINAL BLOCK, 6mm UT4	PHOENIX	-
176							.	
177	5	5	GND	0442079		TERMINAL BLOCK, GROUND	PHOENIX	-
178							.	
179							.	
180							.	
181							.	

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
182							.	
183							.	
184							.	
185	1	1		NP-2X9W		NAMEPLATE	WESTECH	-
186			1			RAKE DRIVE	.	-
187			2			LIFT DRIVE	.	-
188			3			EQUIPMENT ALARMS	.	-
189							.	
190	2	2		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
191			4-5			RUN	.	-
192							.	
193	1	1		LP-I30R		LEGEND PLATE - IDEC, 30mm, RED	WESTECH	-
194			6			CUTOUT	.	-
195							.	
196	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
197			7			START	.	-
198							.	
199	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
200			8			HIGH POSITION	.	-
201							.	
202	1	1		LP-I30R		LEGEND PLATE - IDEC, 30mm, RED	WESTECH	-
203			9			ALARM SILENCE	.	-
204							.	
205	1	1		LP-I30R		LEGEND PLATE - IDEC, 30mm, RED	WESTECH	-
206			10			STOP	.	-
207							.	
208	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
209			11			RAISE	.	-
210							.	
211	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
212			12			RESET	.	-

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
213							.	
214	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
215			13			LOW POSITION	.	-
216							.	
217	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
218			14			LOWER	.	-

SECTION 5: ACCESSORY EQUIPMENT

DRIVE INFORMATION

General

Warning Page

Installation

Maintenance

Operation

Enclosures

Accessory Equipment

Rake Drive Reducer
Rake Drive Motor
Lift Jack Information
Lift Drive Motor
Lift Drive Reducer

Drive Parts List

32105

Drawings

22157A-D02 – Shaft Drive Assembly – Elevation
22157A-D03 – Shaft Drive Assembly – Plan
SL43-OGA1-LC – Assembly Diagram
SL43-OGA2-LASER – Assembly Diagram-Lift
DRV103 – Drive Assembly Procedures
22157A-D05 – Equipment Lubrication & Name Tag
900-611D – Drive Shimming Procedure

Torque Box Information

E10D – Panel Layout
E11D – Electrical Schematic
E12D – Electrical Schematic

GENERAL

Introduction

Thoroughly read and familiarize yourself with the instructions in this manual before the drive unit is installed, adjusted, or operated. The drive unit, including the accessory equipment furnished but not built by WesTech, must be stored, installed, operated, and maintained according to these instructions to ensure long stable equipment life and complete warranty coverage.

The instructions in this manual are based on information available at the time of issuance of this manual. WesTech reserves the right to make subsequent changes to the manual without obligation to update existing copies.

Receiving and Inspection

The drive unit has been thoroughly checked and inspected before shipment. Nevertheless, before accepting shipment, check all the items against the packing list for shortages and inspect for evidence of physical damage. In either case, notify the carrier by making notes on the shipping papers and also immediately notify the WesTech project manager.

Inspect painted surfaces for damage. WesTech assumes no responsibility for field touch-up or damage, which occurs to painted surfaces in shipping. Purchasers are invited to inspect the paint on the drive unit in WesTech's shops for proper preparation and application prior to shipment. Field painting of fasteners and other touch-up to painted surfaces will be by the purchaser.

Keep a record of all claims and correspondence (photographs are recommended).

If the drive unit is not to be installed immediately, refer to the storage instructions under 'Storage and Paint Durability' below.

Field Charges and Modifications

WesTech does not anticipate problems with the installation of the drive unit. However, due to the nature of fabricated steel, a certain amount of minor fit-up and adapting work may be required of the installer. Such work is a normal part of installation work, especially with replacement retrofit drives.

The American Institute of Steel Construction Manual, Thirteenth Edition,
"Code of Standard Practice" will apply to the erection of this equipment. It reads as follows:

"7.14. Corrections and Errors

> The correction of minor misfits by moderate amounts of reaming, grinding, welding or cutting, and the drawing of elements into line with drift pins, shall be considered to be normal erection operations. Errors that cannot be corrected using the foregoing means, or that require major changes in member or Connection configuration, shall be promptly reported to the Owner's Designated Representatives for Design and Construction and the Fabricator by the Erector, to enable the responsible entity to either correct the error or approve the most efficient and economical method of correction to be used by others."
>
> Commentary:
>
> "As used in this Section, the term "moderate" refers to the amount of reaming, grinding, welding or cutting that must be done on the project as a whole, not the amount that is required at an individual location. It is not intended to address limitations on the amount of material that is removed by reaming at an individual bolt hole, for example, which is limited by the bolt-hole size and tolerance requirements in the AISC and RCSC Specifications.

The installer should inform WesTech immediately of any problems due to fabrication or engineering error, which can't be corrected by minor fit-up and adaptive work.

Before any re-work is started, the installer must obtain a WesTech warranty tracking number, which must include a cost limitation. WesTech policy dictates that no field charges will be paid without prior approval by WesTech and a warranty tracking number.

The warranty tracking number will be issued when the extent of such modifications and the price for performing these modifications have been agreed upon. In general, when parts require replacement, and WesTech agrees that replacement is necessary, WesTech will furnish the parts. The contractor will remove the defective parts and install the replacement parts at a cost agreed upon by both parties.

WESTECH

Storage and Paint Durability

Pre-Installation Storage:

If the drive unit will be stored or out of use for more than 30 days, the following procedures must be followed in order to protect against corrosion and maintain the warranty.

A. If possible, store the drive unit indoors on a level surface in a dry, well-ventilated place with a relatively constant temperature. The drive should be adequately supported to prevent distortion of the main gear housing. The drive should be at least six inches off the floor.

B. If the drive unit must be stored outdoors:

1. Store the drive unit in an area that is out of the way of moving equipment. Cover the drive unit with a tarpaulin that allows adequate ventilation, drainage and inspection access. Place the unit in an area protected from wind, direct sunlight, rain, and snow.
   (Note: Plastic covers should not be used since they tend to trap condensation.)
2. Make sure the threaded holes in the terminal boxes of the motor are taped closed. If the motor is equipped with a heater, temporary power should be connected to the heater so the motor temperature remains fairly constant.

C. Lubricate the drive with proper lubricants as shown on the Lubrication Tags drawing.

D. On a weekly basis, run the drive for a minimum of one (1) hour by connecting temporary power in order to coat all the gear and bearing surfaces with oil (for oil lubricated drives) or grease (for grease lubricated drives). The condensate must be drained at least weekly from the oil drain valve (for oil lubricated drives). Make sure the weep holes are clear for condensate to drain freely (for grease lubricated drives). Perform a megger test of the motor windings when the drive unit is received and prior to startup. Prior to the megger testing, disconnect any sensitive electronic equipment such as VFDs or motor controllers.

E. Inspect painted surfaces for damage. Apply a suitable protective coating to damaged paint areas.

F. For storage instructions for the motor, reducer or other accessory equipment, refer to the respective manufacturer's instructions in the 'Accessory Equipment' section of this manual.

Storage after Drive Has Been Installed or in Operation:

If the drive unit is to be shut down and remain out of operation for a period longer than 30 days, the following instructions must be followed.

A. Shut off electricity to the drive motor except for heaters (if provided).

B. Follow steps C-F under "Pre-Installation Storage" section in this manual.

C. Perform a megger test of the motor windings when the drive unit is taken out of operation and prior to putting back in operation. Prior to megger testing, disconnect any sensitive electronic equipment such as VFDs or motor controllers. The minimum reading should be 1 (one) mega ohm for motors rated for 600 volts and less. Any drop below this point necessitates electrical or mechanical drying of motor windings.

WARNINGS PAGE

Warnings Page

General Warning

Warning: Operating and maintaining this equipment has inherent risks. It is your responsibility to read and understand the Operation and Maintenance Manual prior to working with the equipment. This page and the following pages are intended to summarize the warnings associated with WesTech's drive equipment. Where equipment manufactured by others has been provided in conjunction with WesTech's equipment, additional warnings specific to that piece of equipment may only be contained in that section of the Manual. Please read and understand all warnings provided in this Manual.

Sandblasting Warning

The WesTech drive unit (including the motor and reducer) **must** be fully covered or sealed off to protect against sand and dust when sandblasting is being done in the vicinity.

All external openings and areas between the housing, gear hub, and drive cover must be covered or taped closed. After sandblasting and before start-up, check a sample of the oil to make sure that sand has not penetrated the drive and contaminated the oil. Samples can be taken through the drain valves. If sand is present in the oil, drain completely and re-fill with quantity listed on the lube tag.
Failure to observe this warning will void the drive warranty.

Lubrication Warning

Do not operate the drive unit, including the motor and reducer, without proper lubrication. For lubrication instructions, refer to "Drive Lubrication" in the 'Maintenance' section of this manual.
Failure to observe this warning will void the drive warranty.

Welding Warning

If field welding is required after the drive is installed, **do not** allow current to pass through the precision bearing balls. This will result in sparking between bearing balls and bearing races and will destroy the precision bearing assembly. **Do not weld on the drive unit itself**. Attach the welding ground directly to the part to be welded.
Failure to observe this warning will void the drive warranty.

Torque Control Settings Warning

Do not alter the factory-set positions of the torque limit switch actuators in the torque box. This can cause serious damage to the drive and rake mechanism. The 4-20 mA transmitter is set and calibrated in WesTech's manufacturing shops. Over torque cutout requires manual restart, or reset of a latched cutout circuit that prevents auto restart of units with the motor. Units with hand/off/auto selector switches must be checked to insure proper torque protection when set in auto **and** hand modes. Contact the WesTech project manager if the torque control setting needs to be changed.

Rotating drive parts and cage may destroy electrical conduit if installed too close to the drive unit. Over torque cutout requires manual restart, or reset of a latched cutout circuit that prevents auto restart of the motor.

Failure to observe this warning will void the drive warranty.

Maintenance and Operation Warning

To prevent personal injury, only trained employees should be allowed to work on or around the drive. Lock out all electrical power before performing maintenance on any moving part of the drive. Employees entering the drive areas should wear adequate safety equipment such as safety glasses, safety shoes, hard hats, etc.

Keep hands, clothing, etc. away from moving parts. Inspect equipment on a weekly basis for any irregularities. Take care of these in a timely manner.

If the clarifier or thickener has stopped due to high torque, do not open the torque control device. Energy is stored in the drive train and torque control spring. The stored energy should be released prior to undertaking any maintenance or repair. (Refer to 'Drive Unit Troubleshooting' section in this manual.)

Failure to observe this warning will void the drive warranty.

INSTALLATION

Lifting the Drive Unit

Lift the drive unit using the lifting lugs provided in the drive base. Keep the drive unit as level as possible during lifting. Spreader bars may be necessary to keep the lifting cables from touching other parts of the unit as this may cause damage. Any lifting lugs on individual components (motor, reducer, etc.) are for lifting those components only during assembly or disassembly and are **not** for lifting the entire drive.

Drive Unit Installation

Make sure both mounting surfaces are clean and free from foreign debris. Place the drive unit on the walkway frame (shaft drive) or the center column (cage drive). The drive should be loosely fastened to the walkway or center column.

The final check for level will be completed after all the items designed to hang from the drive are attached. (Refer to the 'Final Check for Level' section of the Clarifier/Thickener Equipment Installation Manual and the Shimming Procedure drawing).

Lubricate the drive unit according to the instructions under 'Drive Lubrication' in the 'Maintenance' section of this manual. The accessory equipment (motor, reducer, etc.) should be lubricated according to the respective manufacturer's instructions (See the 'Accessory Equipment' section of this manual).

Connect the drive motor for proper direction of rotation as shown on the General Arrangement / Drive Assembly drawings. (Refer to drive rotation direction arrow sticker placed on the drive.) WesTech will not accept responsibility for any damage caused by the drive rotating in the wrong direction. On multi-pinion drives, be sure all motors are connected to rotate in the same direction. This is done by removing all motors and confirming they all rotate in the same direction. Severe damage to the drive will result if all motors do not run in the same direction.

Connect the motor alarm and cutout limit switches in the torque control device (see the suggested electrical schematic or WesTech panel wiring diagram.) Refer to General Arrangement drawings for alarm and motor cutout torque values.

Welding Warning

If field welding is required after the drive is installed, **do not** allow current to pass through the precision bearing balls. This will result in sparking between bearing balls and bearing races and will destroy the precision bearing assembly. **Do not weld on the drive unit itself**. Attach the welding ground directly to the part to be welded. **Failure to observe this warning will void the drive warranty.**

Shimming the Drive

In order to achieve maximum drive bearing life, the drive base must be properly shimmed. After the drive is leveled, shims should be placed in any gap exceeding 0.005" between the mounting surface and the drive base (see "Drive Shimming Procedure" drawing). Shims should be placed all along the drive base connection not just at the location of drive mounting bolts. Shims must completely fill any gap between the drive base and the mounting surface. This may require placing shims on both the inside and the outside of the drive base.

After the drive is leveled and fully shimmed, loosen jack screws (or external hydraulic jacks) and evenly tighten drive mounting bolts. After the bolts are tightened, the final level must be re-verified.

Startup

Before starting the drive, make sure the tank and mechanism path are free from any debris and obstructions. Check drive and accessory equipment for proper lubrication. Perform a test on the motor windings to make sure there is no electrical current leakage between the windings. Disconnect any sensitive electronic equipment before performing megger test. Watch for correct rotation of the mechanism and any interference.

For drives with a lift, the lifting mechanism should raise the rake arms at the preset torque. When the lifting device is used, check clearances in the up and down positions of the rake arms.

Observe the drive and other mechanisms for proper and unobstructed operation. The tank is now ready for the influent. A gradual increase in the indicated torque is normal as influent is being introduced. Any irregular or jerking motion in the operation

of the rake arms must be immediately investigated and remedied. A minor amount of 'swing' is normal for operation in an empty tank.

Check the alarm switch and motor cutout switch wiring. An alarm should sound and the motor should shut off when these switches are activated. A latching relay that is manually reset must be used in the control wiring to prevent the mechanism (clarifier, thickener, etc.) from relaxing and overloading itself several times without resolving the cause for overload.

MAINTENANCE

Drive Disassembly/Assembly

Refer to the enclosed Assembly Diagram and 'Drive Assembly Procedures' in the event disassembly of the drive is required for maintenance purposes.

Drive Lubrication

The upper, main and upper thrust bearings were packed with grease at the WesTech manufacturing shop before shipment. For proper lubrication, fresh grease, which is compatible with the grease already used by the WesTech manufacturing shop, must be added in quantities shown on the Lubrication Tags drawing and lubrication plate. Grease shall be applied at twice the frequency as shown on the Lubrication Tags drawing for the first 500 operating hours so that grease used during wear-in is replaced. The lubrication tag etched on the torque box lid indicates the type of grease used so that the plant can procure compatible grease.

The application of grease is to be done as follows: Lube point #1 is rotating fast so normal pumping is recommended. All other points are rotating so slow that grease should be applied slowly. One ounce is approximately 5 shots from a grease gun. Since gun sizes vary, the operator should determine the number of shots of grease per ounce for his grease gun. Therefore, when 2 oz. are called for weekly or monthly, one slow pump should be applied per one tenth of a revolution. This is roughly 1 slow shot every 2 minutes which would result in the uniform distribution of grease around the main gear bearing rather than cause the grease to puddle up at one point on the pinion face.

The main gear and lower bearing are oil lubricated. The oil was drained before shipment. Oil should be added before the drive unit is set for start up. Please refer to the "Recommended Gear Oils" table in the Maintenance Section of this manual. After adding oil, check the oil level site glass. The oil level should be at the middle of the site glass.

Note: Some motors require grease (See **lubetag** drawing for quantity and frequency). Motors which require grease are normally done yearly. Most small HP motors have bearings that are sealed for life and do not require lubrication. **DO NOT use the same grease for the motor as used on the drive gears and bearings.**

Recommended Grease / Gears and Drive Bearings

Ambient Temperature	5° F to 140° F (-15°C to 60°C)
NLGI Grade Number	2
Manufacturer	**Lubricant**
Shell Oil Co. Mobil Oil Co. Exxon Co. Gulf Oil Corp. American Oil Co. Chevron	Alvania #2 Mobilux EP #2 Beacon #2 Gulfcrown #2 Amolith #2 Multifak EP2

Recommended Grease / Motors (If Applicable)

Manufacturer	**Lubricant**
Mobil Oil Co. Exxon Co. Texaco Chevron Rykon Pennzoil	Polyrex EM Polyrex EM Polystar SRI Premium #2 Pen 2 Lube

Recommended Food Grade Grease /Gears & Drive Bearings

Ambient Temperature	5° F to 140° F (-15°C to 60°C)
NLGI Grade Number	2
Shell Oil Co. Mobil Oil Co. Chevron	Shell Grease FM 2 Mobil FM 222 EP FM Grease EP

WESTECH

Recommended Gear Oils

Ambient Temperature	14° F to 104° F (-10° C to 40° C)	32° F to 120° F (0° C to 50° C)	50° F to 140° F (10° C to 60° C)
Viscosity Grade	AGMA 4 EP or ISO 150	AGMA 5 EP or ISO 220	AGMA 6 EP or ISO 320
Manufacturer	**Lubricant**	**Lubricant**	**Lubricant**
Exxon Co. B.P. Oil Co. Gulf Oil Corp. Lubrication Eng. Mobil Oil Co. Shell Oil Co. Chevron Corp.	Spartan EP 150 Energol GR-XP 150 EP LubricantHD150 Duolec 1604 Mobilgear 600XP150 Omala Oil Co. 150 Meropa ISO 150	Spartan EP 220 Energol GR-XP220 EP LubricantHD220 Duolec 1605 Mobilgear 600XP220 Omala Oil Co. 220 Meropa ISO 220	Spartan EP 320 Energol GRXP320 EP LubricantHD320 Duolec 1606 Mobilgear 600XP320 Omala Oil Co. 320 Meropa 320

Equivalent Synthetic Gear Oils

Ambient Temperature	14° F to 140° F (-10°C to 60°C)
ISO Viscosity Grade	320
Manufacturer	**Lubricant**
Lubrication Engr. Inc. Mobil Oil Co. Amsoil Chevron Corp.	Synolec 9832 Mobilgear SHC320 SGM Tegra ISO 320

Synthetic Food Grade Gear Oils

Ambient Temperature	Pours at -21C and -6F
ISO Viscosity Grade	150
Manufacturer	**Lubricant**
Mobil	SHC Cibus 150

It is WesTech's experience that synthetic oil performs better and lasts longer than regular oil. Synthetic oil has the following advantages: it separates more easily from water, has a stronger boundary layer resulting in better lubrication, and generally has a longer service life. It is recommended that the customer change the mineral gear oil yearly (after the initial 500 hour run-in period) or get it analyzed by an independent laboratory for extended service intervals.

Synthetic oil may be used for three to five years based on yearly lab analysis and recommendations from local providers.

WARNING:
DO NOT MIX MINERAL GEAR OIL WITH SYNTHETIC OIL WITHOUT CONSULTING WITH THE OIL SUPPLIER. THIS MAY ADVERSELY AFFECT THE PERFORMANCE OF THE LUBRICANT FOR SOME COMBINATIONS OF MINERAL AND SYNTHETIC OIL. DAMAGE TO DRIVE COMPONENTS MAY RESULT FROM NON-COMPATIBLE OILS.

Yearly Drive Maintenance

Shutdown and lockout power to the drive unit. Check and re-tighten all exposed fasteners of the drive. (For torque values of the fasteners, refer to the 'Drive Assembly Procedures' drawing).

Weekly Drive Maintenance

Lubrication instructions and recommended lubricants (oil and grease) as specified are to be followed. This will provide long life and trouble-free operation of the drive unit.

Refer to the section on Lubrication in the Maintenance and Parts category of this manual.

Lubrication of Accessory Equipment

Reducer (Grease Lubricated):

All grease lubricated reducers are pre-lubricated at the reducer manufacturer's factory. Refer to the reducer manufacturer's catalog data for the type and brand of grease used or the lubricant sticker attached to the reducer. Apply grease to the reducer as shown on the 'Lubrication Tags' drawing and lubrication plate. Some smaller reducers are maintenance free and do not require re-lubrication. Refer to the Lubrication Tags and drawings to see if this applies.

WESTECH

MAINTENANCE LOG

BREAK-IN MAINTENANCE REQUIREMENTS	INTERVAL	INITIALS	DATE
Drain and Fill Oil Cavity/Cavities (Before Operating)	0 hours		
Drain and Replace Oil	500 hours		
PREVENTIVE MAINTENANCE REQUIREMENTS			
Grease Cyclo Reducer	M		
Grease Upper Bearing	M		
Grease Main Bearing	W		
Oil Main Gear/Lower Bearing	W		
Grease Gear Hub	M		
Grease Lift Jack	M		
Grease Upper Thrust Bearing	W		
INSPECTION REQUIREMENTS			
Inspect Fasteners For Tightness	M/A		
Visually Inspect Drive Mech. for Wear	W/A		
Check/Drain Condensate	W		
Check/Drain Particulates	S		
Inspect/Repair Drive Unit Paint	A		
Inspect Torque Control Device	A		

A - ANNUALLY, S - SEMIANNUALLY, M - MONTHLY, W - WEEKLY, D - DAILY

Refer to Equipment Maintenance and Lubrication Summary for specific maintenance and inspection instructions.

WESTECH

Procedure for Ordering Spare or Replacement Parts

Spare or replacement parts may be ordered from the Aftermarket Sales Department at:

WesTech Engineering, Inc.
3665 South West Temple
Salt Lake City, UT 84115
Phone: (801) 265-1000
Fax: (801) 265-1080
24-hour service/emergency:
(801) 265-1000
E-Mail address
parts@westech-inc.com
Web address
www.westech-inc.com

If you would like to talk directly to an Aftermarket Sales Representative during normal business hours (7:30 am to 5:00 pm MST), dial (801) 265-1000 and ask for the Aftermarket Sales Department. You may fax your order to (801) 265-1080.

To use the 24-hour service/emergency line after hours (5:00 pm to 7:30 am), dial (801) 265-1000. **Please indicate to the Answering Service Operator whether your facility is Water, Waste Water or Industrial.** They will inform you that a WesTech Representative will call and assist you with your problem.

If you would like to e-mail a spare parts order, simply e-mail your request to us at parts@westech-inc.com and a WesTech representative will process your order and follow up with an Order Acknowledgment.

Spare parts may also be requested directly from our web page www.westech-inc.com. Simply go to the web page, click on Parts and Service. If you know the part number and job information you need, you can input it directly. A WesTech Representative will process your request and follow up with a purchase quotation, or a return phone call to confirm that your request has been received.

For convenience, a 'Recommended Spare Parts List' is provided in this manual. This is a guide for the appropriate level of spares to keep on hand minimizing lost time due to unscheduled breakdowns. Each item listed in the Recommended Spare Parts List is identified within one of the following categories:

Normal maintenance and wear items.
Long lead items (minimum downtime).

Should you require further assistance in determining which spare parts are appropriate for your particular situation please contact WesTech's Aftermarket Sales Department.

To avoid unnecessary delays in obtaining the correct spare or replacement parts for your equipment, be sure to give the following information with each order.

1. Identify equipment using the WesTech Job number. Your equipment is identified as follows:

   WesTech Job Number: 22157A
   Equipment Type: Drive Unit

2. Identify the part by name and give the number of the drawing on which this part or assembly appears.

3. Identify the part number.

4. Identify the size and include all pertinent dimensions (such as diameter, length, thickness, bore, pitch, etc.) whenever possible.

5. If parts being ordered are electrical in nature, give all pertinent data such as voltage, amperage, wattage, cycles, speed, power factor, or other information given on the parts nameplate or included in the parts brochure.

6. Submit your written purchase order or request for a quotation, both signing and printing your full name so that WesTech will know whom to contact should further clarification of the inquiry be necessary. **All verbal orders must be verified in writing.**

7. Give a return address and a shipping address.

8. Give a preferred method of shipping: e.g., UPS, truck freight, rail freight, air express, etc.

9. Indicate the quantity desired.

10. Provide instructions for proper invoicing.

All spare or repair parts orders are subject to a **$100.00** minimum order charge.

Item Numbers:

An item number identifies a part shown on an assembly drawing. (See sample segment of the General Arrangement drawing and sample Parts List on the following page.) Item numbers enclosed in circles are shown on the drawing with arrows pointing to each part. On the parts list, item numbers are found in the leftmost column of the Parts List. Item numbers are three-digit numbers. The first digit is the parts list page number where the part is listed. The second and third digits are the line number on the page where the part is listed.

Part Numbers:

Part numbers identify drawing numbers of the fabrication drawings. Fabrication drawings are not included in this operation and maintenance manual.

OPERATION

Operation Instruction – Drive Unit

Inspect the drive for proper lubrication as per the Lubrication Tags drawing and lubrication instructions.

Drive with Lifting Device:

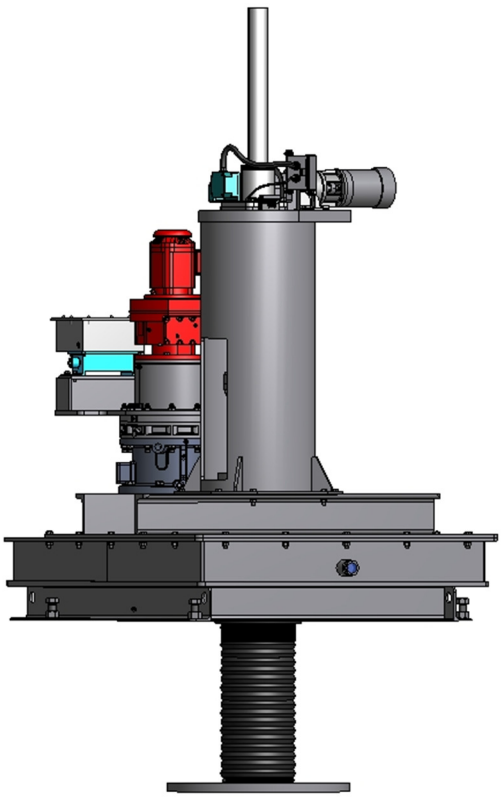
The mechanism (clarifier, thickener, etc.) operation must be checked both at the lowest as well as at the highest lift positions. Check proper operation of the lower and upper limit switch settings of the lifting device.

Refer to the Clarifier/Thickener Operation & Maintenance manual for further instructions.

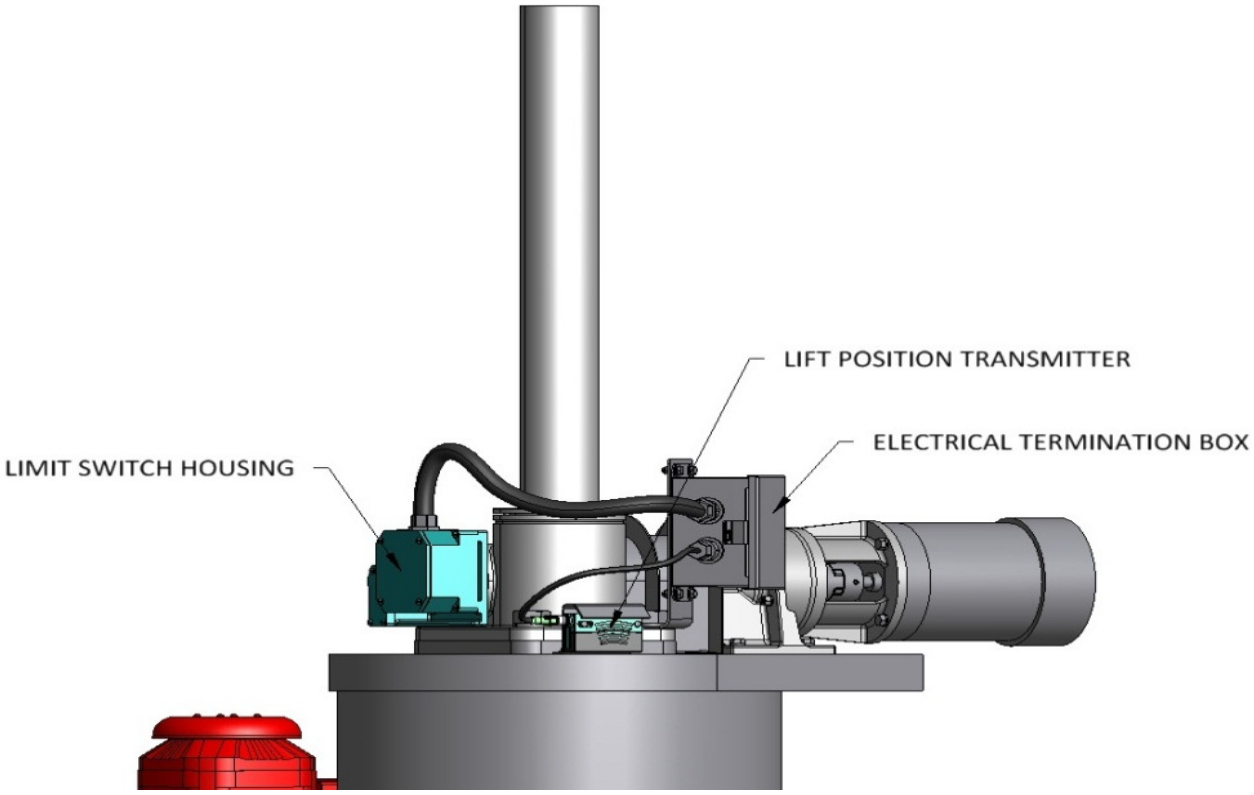
Procedure for Setting the Lift Jack Limit Switches:

The WesTech lift has high and low limit switches that are factory set to for the maximum lift height. The following portion of this manual is to help adjust these limits when field conditions dictate.

See lube tag drawing included in this O&M for lubrication instructions relating to lifting parts.



The limit switches are located in the limit switch housing as shown on next page.



Limit switch housing
(Figure: 1)

To adjust the low Switch: Watching for interference run the lift to the lowest desired location. (Figure: 2&3) Next loosen the red set screw. Turn the low switch adjustment screw (typically counter clockwise) so that the low cam is actuating the low limit switch (low cam is typically moving clockwise) Re-tighten the red set screw. Low switch is now set.

To adjust the high switch: Watching for interference run the lift to the highest desired location. (Figure: 2&3) Next loosen the blue set screw. Turn the high switch adjustment screw (typically clockwise) so that the high cam is actuating the high limit switch (high cam is typically moving counter clockwise) Re-tighten the red set screw. High switch is now set.

Use supplied Allan wrench to adjust low and high switches.

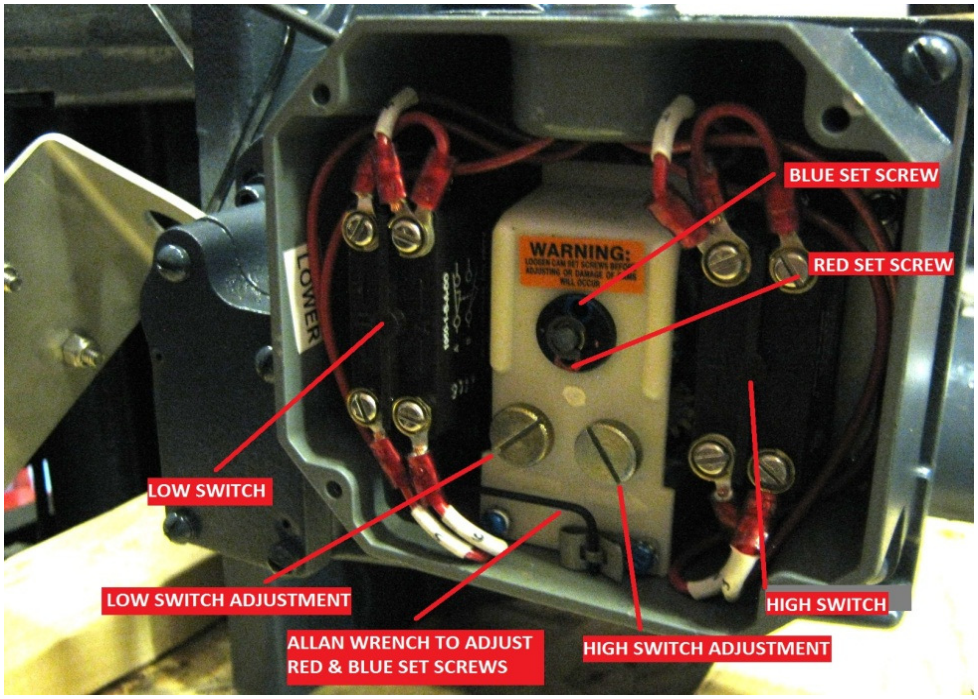


Figure: 2

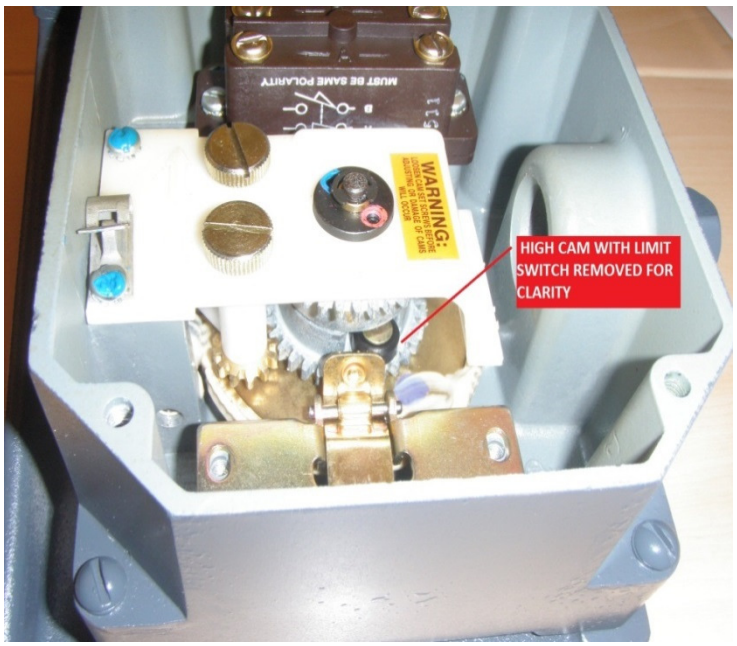


Figure: 3

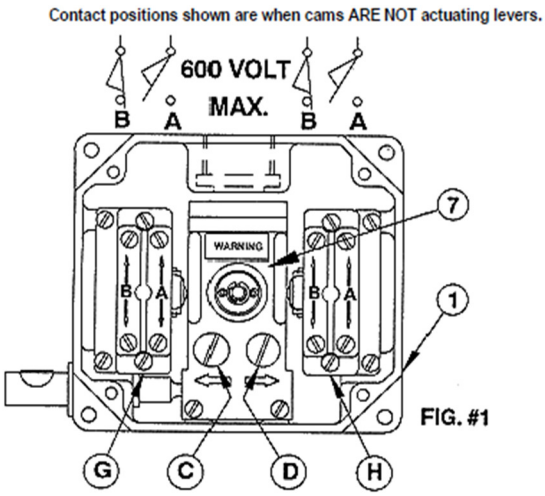


Figure: 4

Lift Position Transmitter Adjustment & Calibration:

1: Place selector switch in the run mode and press and hold the set button down for 10 full seconds until the flashing LED's go out. This has reset any set points to factory default. (Figure: 5)
2: Run lift to the low position limit (fully extended (rake fully lowered).
3: Place the selector switch in the Q2A position (for 4mA).

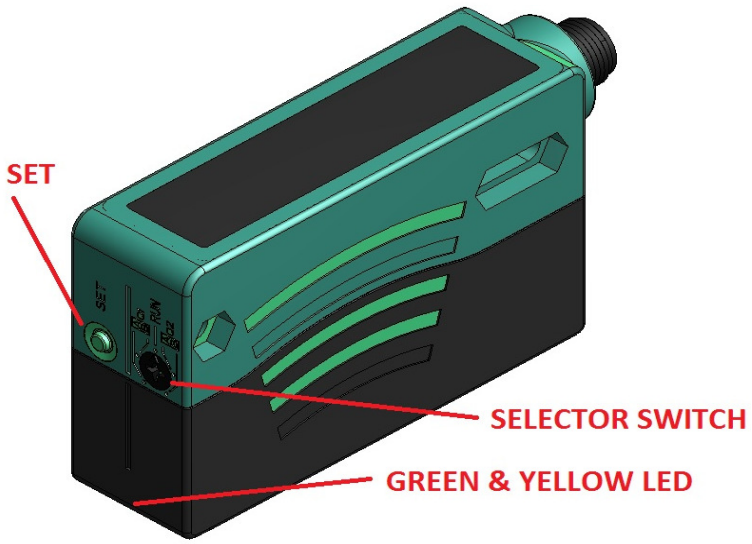


Figure: 5

4: Press and hold the set button for two seconds and release. (The Green and Yellow LED should flash alternately about ½ seconds apart after releasing the button; if they flash rapidly the limit has been unsuccessfully taught.) Meter measurement between the laser output and 24vdc negative should be 4mA.

5: Run lift to the high position limit (fully retracted (rake fully raised)). An 8" minimum clearance is required.

6: Place the selector switch in the Q2B position (for 20mA).

7: Press and hold the set button for two seconds and release. (The Green and Yellow LED should flash alternately about ½ second apart after releasing the button; if they flash rapidly the limit has been unsuccessfully taught.) Meter measurement between the laser output and 24vdc negative should be 20mA.

8: Move the selector switch to the run mode. The lift laser should now be set to linearly output 4-20mA indicating the exact position of the lift.

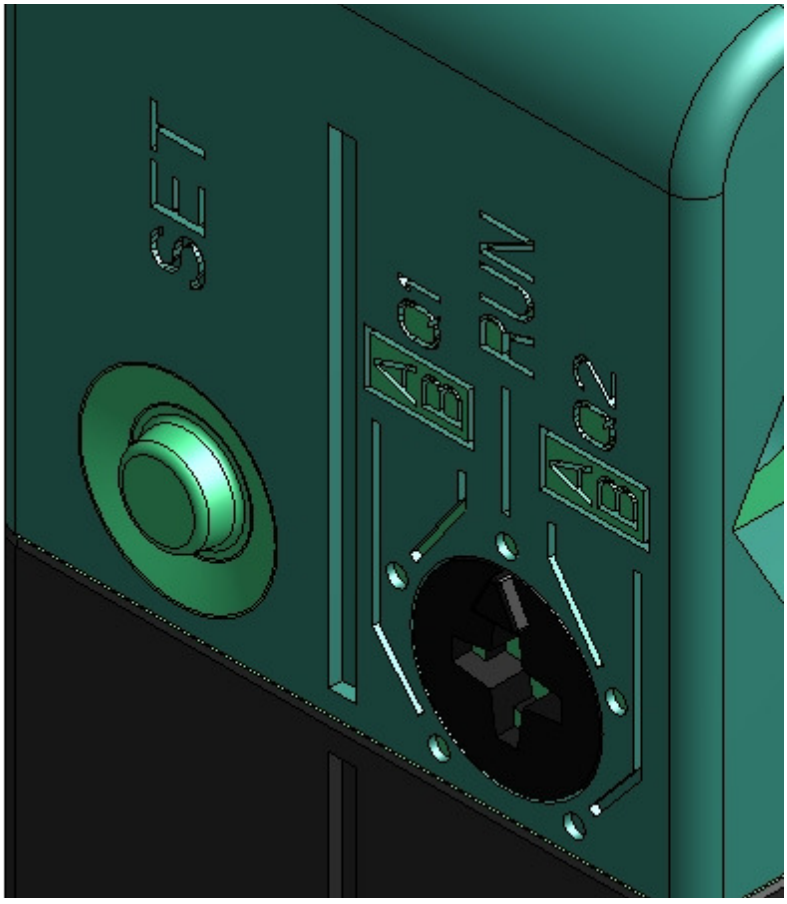
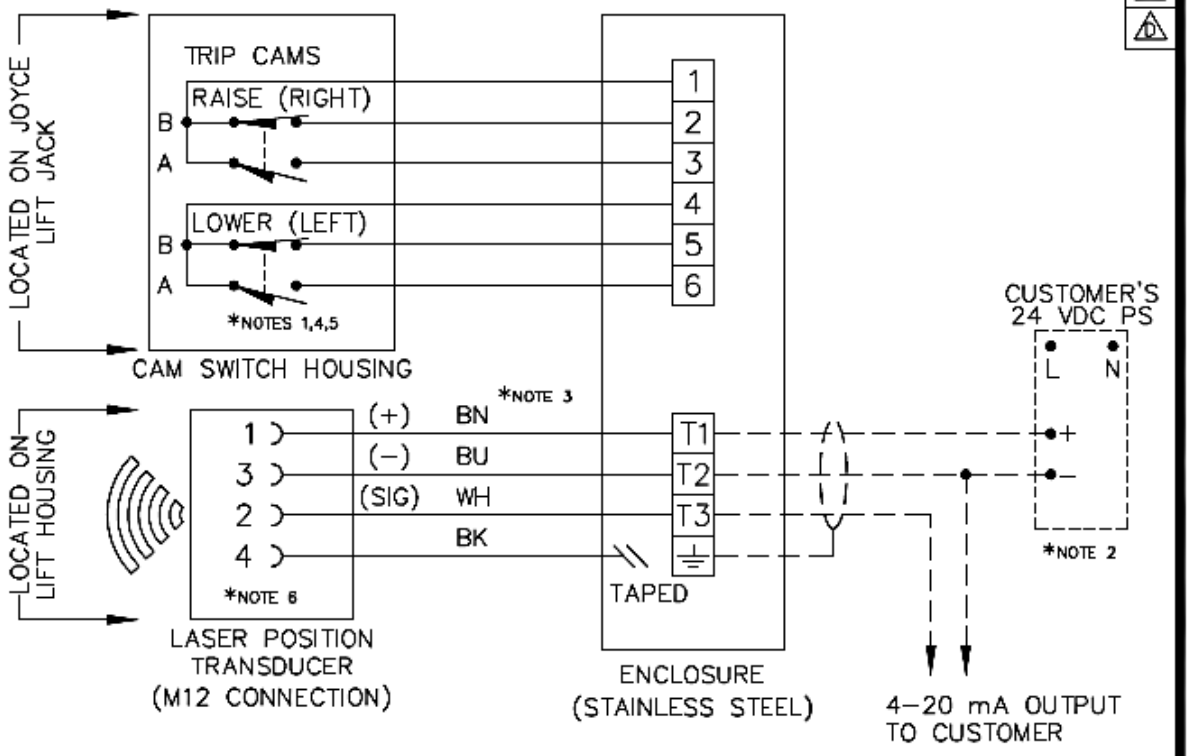


Figure: 6

WESTECH

REVISION	BY	CHKD	DATE	LTR
REVISED TO ADD NOTES	BRJ	NRT	2/3/12	A



NOTES:

1. SWITCH CONTACTS RATED AT 4A 250V.
2. CUSTOMER MUST SUPPLY A 24 VDC POWER SUPPLY.
3. M12 CABLE COLORS PER PHOENIX CONTACT PART #: 1536298
4. LIMIT SWITCHES ARE SHOWN IN MECHANICALLY HELD POSITION.
5. LIMIT SWITCH LOCATIONS ARE VIEWED WITH CONDUIT ENTRY ON TOP OF LIMIT SWITCH HOUSING.
6. LASER SETTINGS: Q2A=4mA, Q2B=20mA, Q1 IS NOT USED.

JOYCE LIFT WIRING SCHEMATIC WITH LASER LIFT TRANSDUCER AND J BOX

DESCRIPTION

JOYCE LIFT WITH LASER TRANSDUCER	ALL
TYPE	SIZE 1 x 1

12/11	BRJ	PES	JRL	NONE				
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

ALL COMPONENTS MUST BE FABRICATED AND MACHINED ACCORDING TO WESTECH STANDARD SPECIFICATION (DRAWING P24Z–024A), UNLESS SPECIFICALLY NOTED ON THIS DRAWING.

WESTECH	DRAWING NUMBER	PROJECT NUMBER	REV.
	TB–068A		A

Load Cell Torque Box

Do not alter the factory-set positions of the torque limits in the torque box. This can cause serious damage to the drive and rake mechanism. The 4-20 mA transmitter signal (if provided) is set and calibrated in WesTech's manufacturing shops. Over torque cutout requires manual restart, or reset of a latched cutout circuit that prevents auto restart of units with the motor. Units with hand/off/auto selector switches must be checked to insure proper torque protection when set in auto and hand modes. Contact the WesTech drive group if the torque control setting needs to be changed.

Failure to observe this warning will void the drive warranty.

It is recommended to manually test the limit switches on the electronic torque control device twice a year to make sure that the controls and torque control limits are working properly. This can be done by compressing the load cell and torque arm tab with a c-clamp. The will make sure that the alarm activates and the cutout stops the drive mechanism until the mechanism is manually reset.

Drive Unit Troubleshooting

Read and understand the 'Maintenance and Operation Warning' in the 'GENERAL' section of this manual, before doing any troubleshooting or inspections. There are many hazardous conditions around a drive such as electric shock, risks related to rotating equipment, etc.

Problem	Possible Causes	Corrective Actions
Motor not Rotating	(1) Terminal wires are loose or not wired correctly. (2) Fuses have been blown. (3) Circuit breakers have tripped. (4) Burnt out windings due to overload, impaired ventilation, and incorrect power supply. (5) Excessive cold temperatures causing lubricants to flow less easily.	(1) Check connections and wire these correctly. (2) Correct cause of overload, replace fuses. (3) Reset and check running amps. (4) Check all that apply, remove cause then replace motor. (5) Provide temporary heat. Change to lower viscosity lubricants, or make sure to run continuously.
Motor Overheating	(1) Motor is overloaded. (2) Motor operating on wrong voltage.	(1) Remove overload condition. (2) Check supply voltage and connect correct motor wiring.
Motor Operating with Excessive Noise	(1) Coupling misaligned. (2) Coupling halves too close. (3) Worn out bearings. (4) Broken fan. (5) Bent fan cover. (6) Loose fasteners.	(1) Align coupling. (2) Correct gap per specifications. (3) Replace worn out bearings. (4) Replace fan. (5) Repair or replace fan cover. (6) Tighten fasteners.

Drive Unit Troubleshooting (continued)

Problem	Possible Causes	Corrective Actions
Mechanism not Turning	(1) Shear pin broken (if provided). (2) Coupling between motor and reducer broken. (3) Sheared or slipped key between drive train components.	(1) Replace broken shear pin. (2) Replace broken couplings. (3) Replace sheared key between drive train components.
Torque Control Device not Operating Correctly Before attempting any work on torque box, contact WesTech for assistance. *Unauthorized adjustment of the torque control device will void the warranty.	(1) Incorrect wiring. (2) Check for unauthorized adjustment of the cams. (3) Check for bent, broken, or bound-up parts.	(1) Correct the wiring. (2) Contact WesTech for assistance. (3) Replace the bent and broken parts.
Torque Control Device Shows High Torque	(1) Rakes stuck in excessive sludge. (2) Rake interference due to a foreign object. (3) Plugged underflow. (4) Thickener/Clarifier operational problems. (5) Bound up pinion shaft bearings due to presence of frozen condensate or corrosion.	(1) Remove accumulated solids. (2) Correct the cause of rake interference. (3) Unplug underflow. (4) Correct the operational problems. (5) Provide temporary heat to drive unit or replace corroded parts.

Drive Unit Troubleshooting (continued)

Problem	Possible Causes	Corrective Actions
Reducer or Drive Running with Excessive Noise and Vibrations	(1) Lack of lubrication. (2) Loose fasteners. (3) Loose coupling.	(1) Check and add grease/oil as required. (See Lubrication Tags) (2) Tighten fasteners. (3) Tighten coupling.
Reducer Overheating**	(1) Reducer is overloaded. (2) Incorrect lubricant or quantity of lubricant.	(1) Increase pump rate to minimize solids in tank. (2) Contact WesTech for assistance. Overhaul of the reducer may be required.
Lubricant Leakage from Reducer	(1) Seal or shaft worn out. (2) Excessive lubricant. (3) Water contamination. (4) Reducer fasteners are loose.	(1) Repair or replace seal and shaft. (2) Reduce frequency of re-lubrication. (3) Find water contamination source and correct it. (4) Tighten fasteners.
Main Gear/Main Bearing Making Noise	(1) Lack of lubricant. (2) Condensate water in gear/bearing cavity.	(1) Check gear teeth and add grease/oil as required. (See Lubrication Tags) (2) Drain condensate water.
Discolored Oil in Sight Glass (Milky, Dark Brown or Black)	(1) Condensate mixing with oil. (2) Oil dissolving grease. (3) Wash down water entering the main bearing. (4) Oxidation of the oil.	(1) Drain condensate Weekly or as site conditions require. (2) Add 14 oz grease to main bearing during one rotation. (3) Do not wash the top of the main gear/bearing. (4) Change the oil. Note: If discolored, drain and replace all oil plus add fresh grease (see Lubrication Tags).

ENCLOSURES

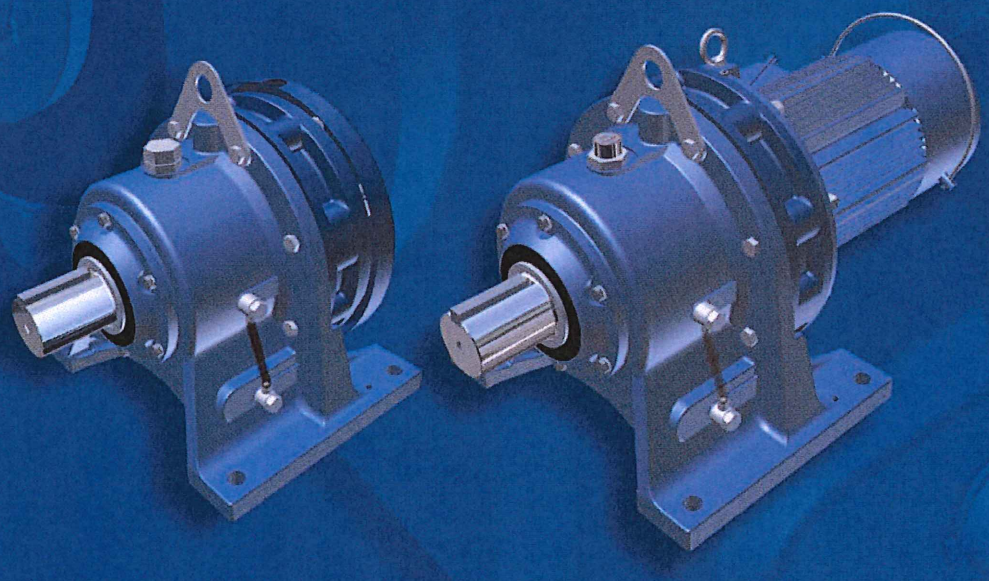
WESTECH

RAKE DRIVE REDUCER

SUMITOMO
MACHINERY CORPORATION OF AMERICA

POWER TRANSMISSION PRODUCTS

Cyclo® 6000



▸ High Torque Density, High Reliability Cycloidal Speed Reducers and Gearmotors

A Unique Concept . . .

The word CYCLO . . .
. . . derives from *Kyklos* the Greek word for *circle* and refers to the CYCLO disc, whose outer profile describes a cycloidal curve.

Features & Benefits of the CYCLO concept

• Outstanding Reliability – 2 Year Warranty

CYCLO speed reducers are noted for outstanding reliability and extended operating lifetime – 20 years of problem-free performance is not unusual. This reliability is due in part to the high material specifications, component quality controls and careful assembly procedures. It also results from the *total absence of sliding friction*. Correctly sized and selected CYCLO speed reducers and gearmotors are covered by a two year warranty.

• High Overload Capacity – 500% plus

CYCLO speed reducers have the strength to withstand over-loads that can break the teeth of other reducers.

Here's why:

At least 30% of the CYCLO's unique disc profiles share shock of overload and the components are in *compression* – so they cannot be sheared off.

Compare that to conventional helical gear reducers, where one or two teeth must absorb the entire shock and are more prone to catastrophic failure.

• Overall Economy

Competitive initial cost, high reliability, long life and minimal maintenance give CYCLO speed reducers superior overall economy when compared to conventional gear boxes.

• Ideal for Highly Dynamic Applications

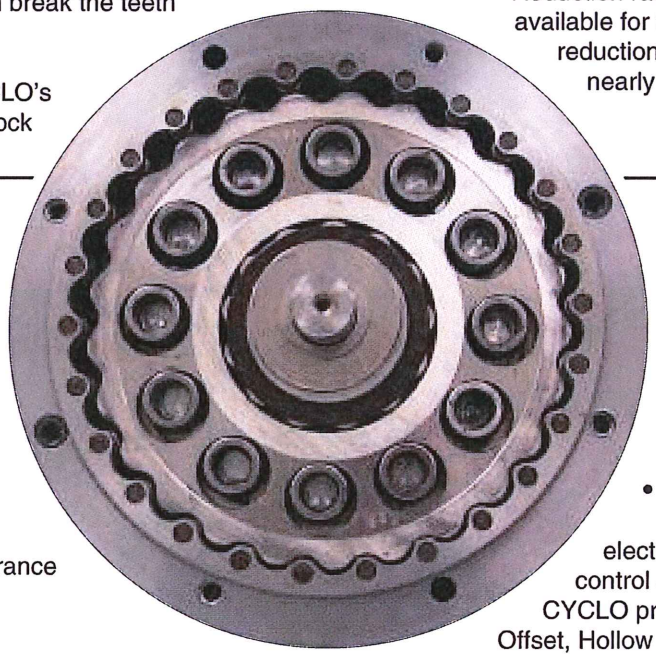
Since inertia is very low, the CYCLO speed reducer is ideally suitable for frequent start-stop-reversing duties and the combination with a frequency inverter.

• High Efficiency – Even at High Ratios

Torque transmitting parts have rolling action with minimal friction, so the overall efficiency is as high as 95% in single reduction units.

• Compact Size

Reduction ratios from 6:1 to 119:1 are available for the single stage. Triple reduction stages offer ratios up to nearly 1,000,000:1.



Additional Value

Sumitomo, THE ORIGINAL CYCLO, offers these additional benefits:

• Total Quality

Precision manufacturing and unmatched Quality Assurance insure consistent product performance.

• 70 Years of Product Development

The unique CYCLO operating principle was invented by the German engineer Lorenz Braren in 1931 and his ingenious design has continued its progressive development until the present day.

• Over 7,000,000 Units Sold

CYCLO speed reducers are in daily use in industries throughout the world replacing the more conventional helical, worm and spur gear units.

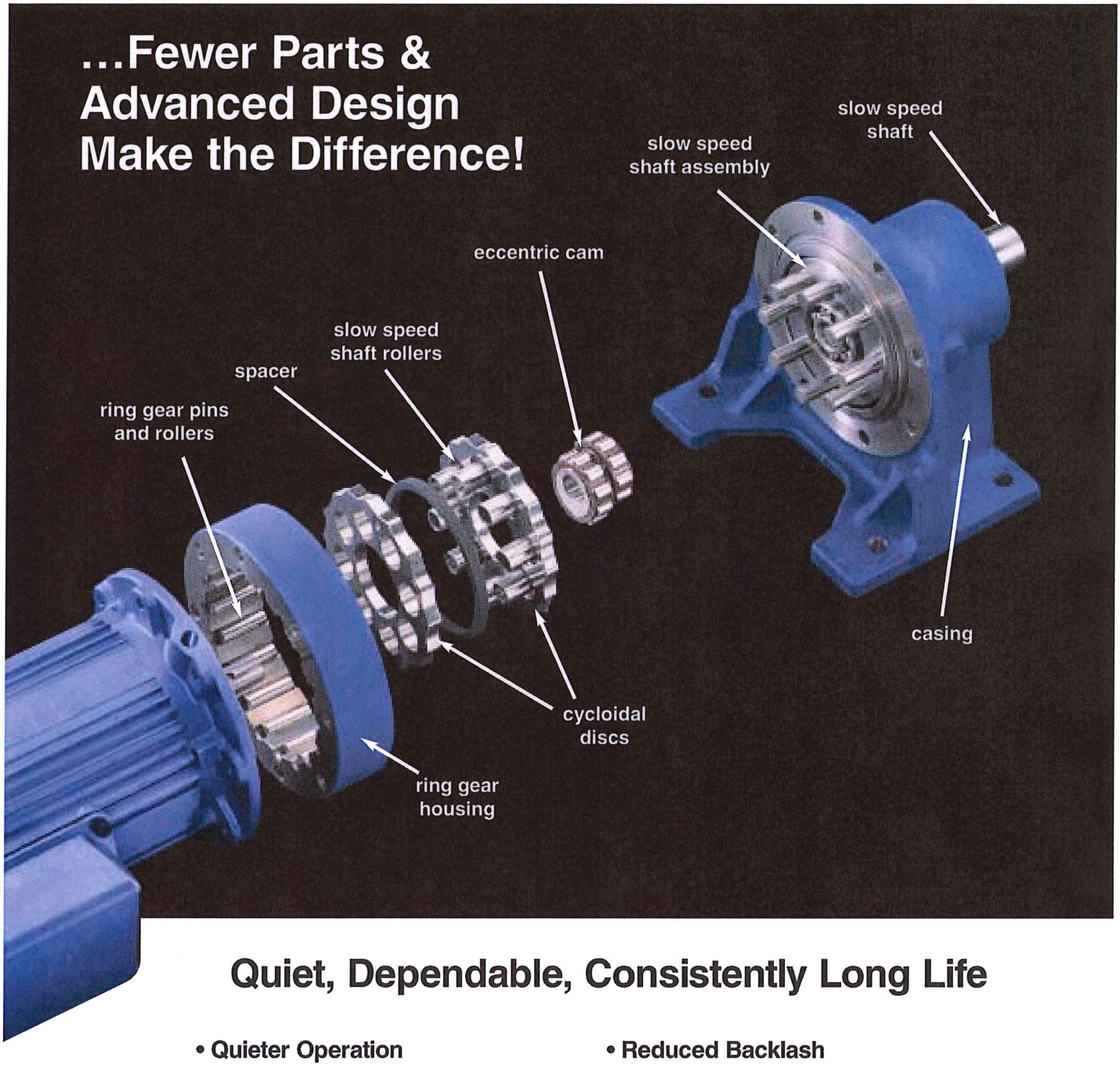
• Many Options . . .

. . . in mechanical and electrical power transmission and control are offered in the complete CYCLO product range. Right Angle, Offset, Hollow Shaft, and Bushing Mounted variations are readily available.

• Worldwide Product Support

Fast, competent technical assistance with selection, installation and after-sales service is available from production and distribution centers throughout the world.

...Fewer Parts & Advanced Design Make the Difference!



Quiet, Dependable, Consistently Long Life

• Quieter Operation
Super finishing of rotating components provides smoother rolling action

• Higher Ratings
Optimized design imparts more uniform internal load distribution

• Longer Life
Improved internal gearometry extends already long life

• Reduced Backlash
Decreased internal clearances for high performance requirements

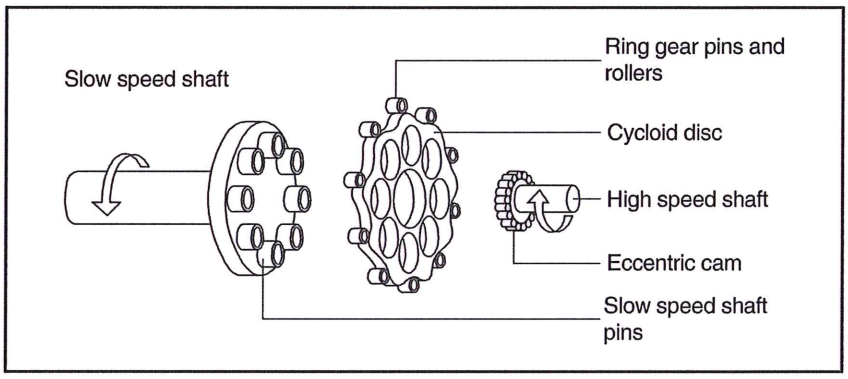
• Total Dependability
Torque transmitting parts are made from fully hardened, vacuum degassed bearing grade steel

• Absolute Consistency
Stringent manufacturing process and assembly controls assure reliability

HOW IT WORKS

The unique SM-CYCLO® speed reducing system is based on an ingeniously simple principle that offers many benefits to the designer and user of power transmission drives. Basically, the speed reducer has only three major moving parts:

1. **High speed input shaft with integrally mounted eccentric cam and roller bearing assembly**
2. **Cycloid discs**
3. **Slow speed shaft assembly**

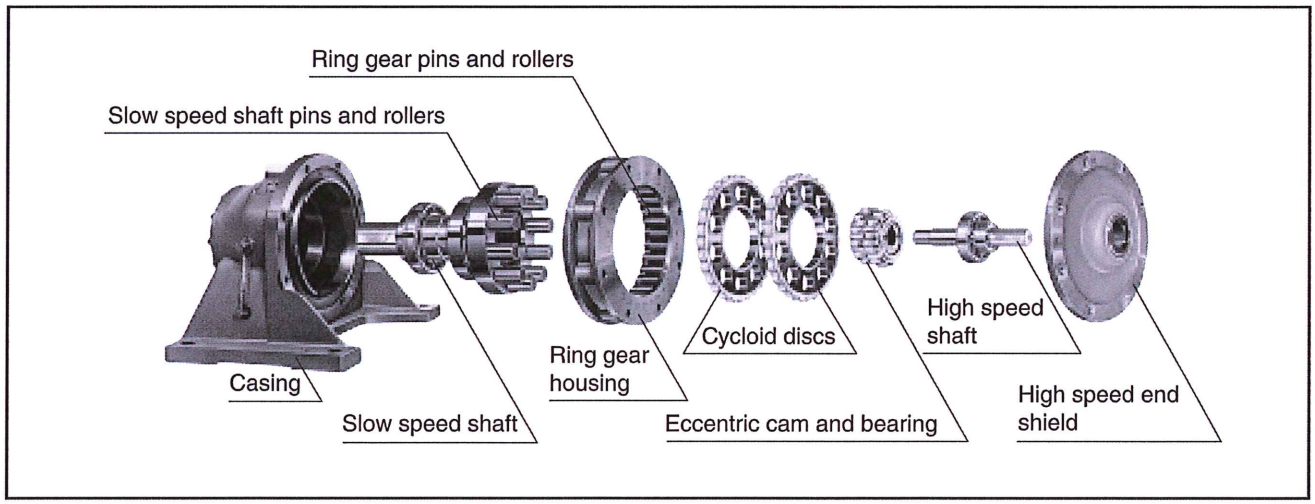


As the eccentric cam rotates, it rolls the cycloid discs around the internal circumference of the stationary ring gear.

The resulting action is similar to that of a wheel rolling around the inside of a ring. As the wheel (cycloid disc) travels in a clockwise path around the ring (ring gear housing), the wheel itself turns slowly on its own axis in a counter-clockwise direction. In the SM-CYCLO® system the cycloidal profile around the outer edge of the disc engages progressively with the rollers of the fixed ring gear housing to produce a reverse rotation at reduced speed. For each complete revolution of the high speed shaft, the cycloid disc turns one cycloidal tooth in the opposite direction. In general, there is one less cycloidal tooth around the disc than there are pins in the fixed ring gear housing, which results in reduction ratios equal to the number of cycloidal teeth on the disc. (Note: For some ratios, there are two less teeth per cycloid disc than there are pins in the ring gear housing.)

The reduced rotation of the cycloid discs is transmitted to the slow speed shaft by means of drive pins and rollers that engage with holes located around the middle of each disc.

Typically, a two disc system is used with a double eccentric cam which increases the torque capacity and offers an exceptionally smooth, vibration-free drive.

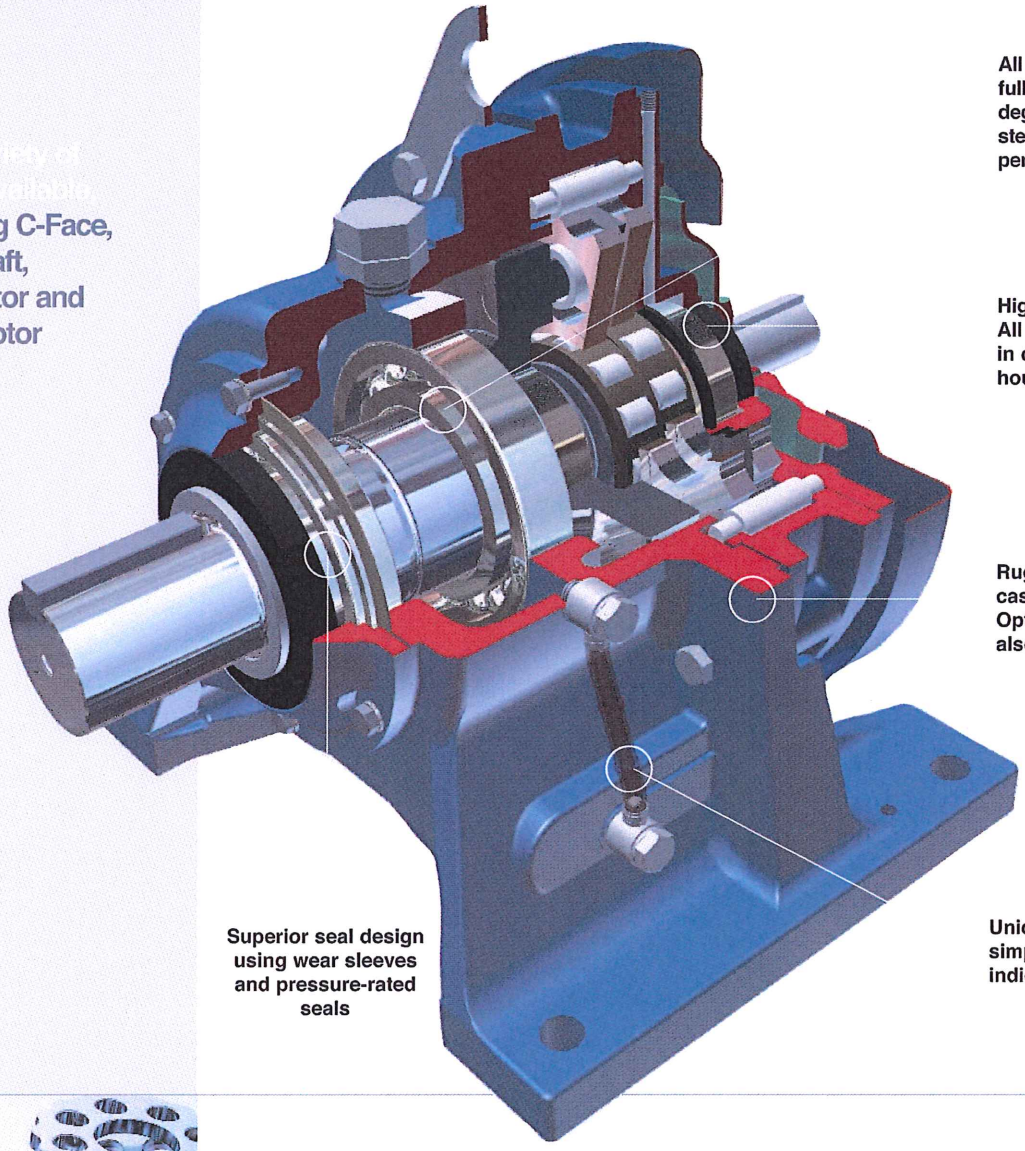


SUMITOMO
MACHINERY CORPORATION OF AMERICA

Cyclo® 6000

High Torque Density, High Reliability Cycloidal Speed Reducers

- Wide variety of inputs available, including C-Face, Free-Shaft, Gearmotor and Brakemotor



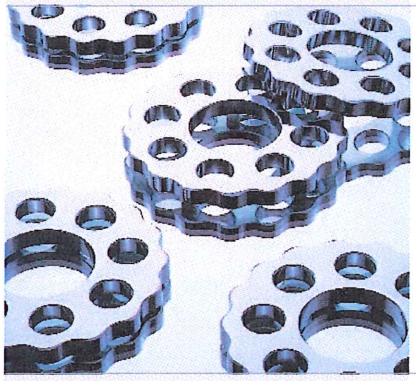
All rotating components are fully hardened, vacuum degassed bearing grade steel, for consistent, reliable performance

High power density. All reduction contained in compact ring gear housing

Rugged, shock-resistant cast iron housing. Optional ductile iron also available

Superior seal design using wear sleeves and pressure-rated seals

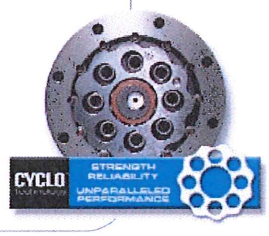
Unique oil sight gauge for simple, visible lubrication indication

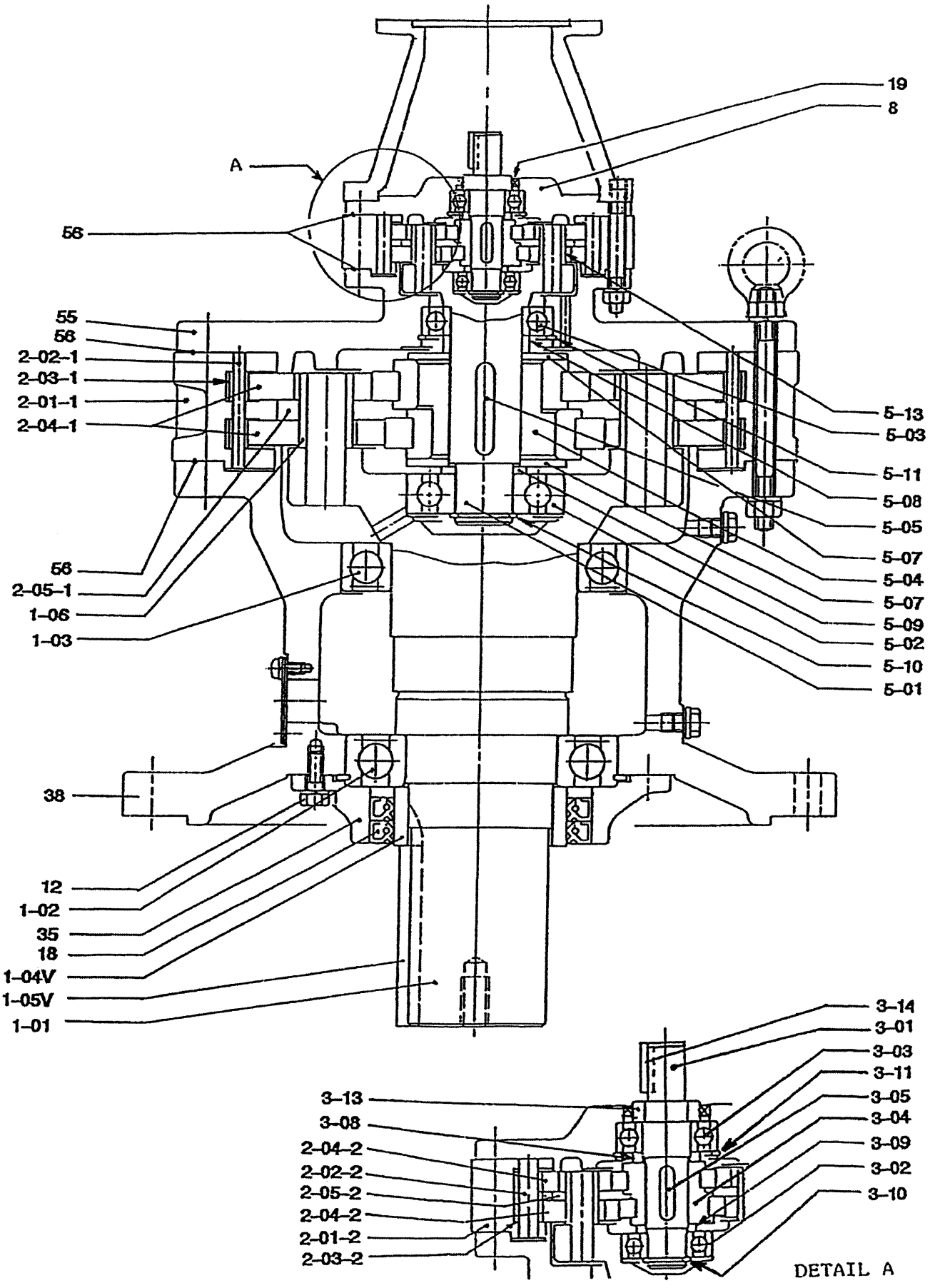


Unmatched Reliability, Exceptional Performance

Cyclo® speed reducers and gearmotors are

of their ratings

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2-01-1
2-04-1
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5-09
5-02
5-10
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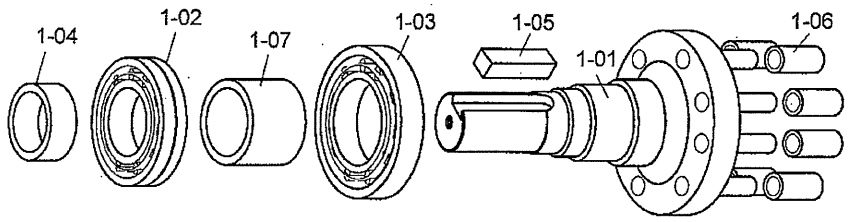
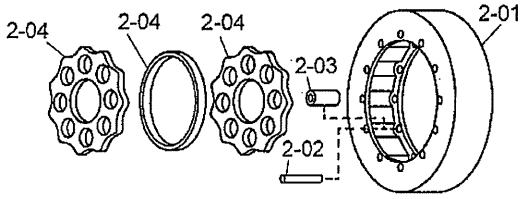
1-06
1-03
38
12
1-02
35
18
1-04V
1-05V
1-01
3-14
3-01
3-03
3-11
3-05
3-04
3-09
3-02
3-10
3-13
3-08
2-04-2
2-02-2
2-05-2
2-04-2
2-01-2
2-03-2
DETAIL A

PART#	PART DESCRIPTION
1-01	SLOW SPEED SHAFT WITH PIN
1-02	BEARING A
1-03	BEARING B
1-04V	OIL SEAL COLLAR - VERTICAL
1-05V	KEY - VERTICAL
1-06	SLOW SPEED SHAFT ROLLERS
2-01-1	RING GEAR HOUSING
2-01-2	RING GEAR HOUSING
2-02-1	RING GEAR PINS
2-02-2	RING GEAR PINS
2-03-1	RING GEAR ROLLERS
2-03-2	RING GEAR ROLLERS
2-04-1	CYCLO DISC
2-04-2	CYCLO DISC
2-05-1	SPACER RING
2-05-2	SPACER RING
3-01	HIGH SPEED SHAFT
3-02	BEARING C
3-03	BEARING D
3-04	ECCENTRIC BEARING ASSEMBLY
3-05	ECCENTRIC KEY
3-06	BALANCE WEIGHT
3-07	SPACER
3-08	SPACER
3-09	SPACER
3-10	RETAINING RING
3-11	RETAINING RING
3-13	COLLAR
3-14	KEY
5-01	INTERMEDIATE SHAFT WITH PINS
5-02	BEARING F
5-03	BEARING G
5-04	ECCENTRIC BEARING ASSEMBLY (1)
5-05	ECCENTRIC KEY
5-07	SPACER
5-08	SPACER
5-09	SPACER
5-10	RETAINING RING
5-11	RETAINING RING (2)
5-13	INTERMEDIATE SHAFT ROLLERS
8	HIGH SPEED END SHIELD
12	BOLTS FOR SS OIL SEAL HOUSING
18	SLOW SPEED OUTPUT OIL SEAL
19	HIGH SPEED INPUT OIL SEAL
35	VERTICAL OIL SEAL HOUSING
38	VERTICAL CASE (INTEGRAL V TYPE)
55	INTERMEDIATE COVER
56	GASKET SET

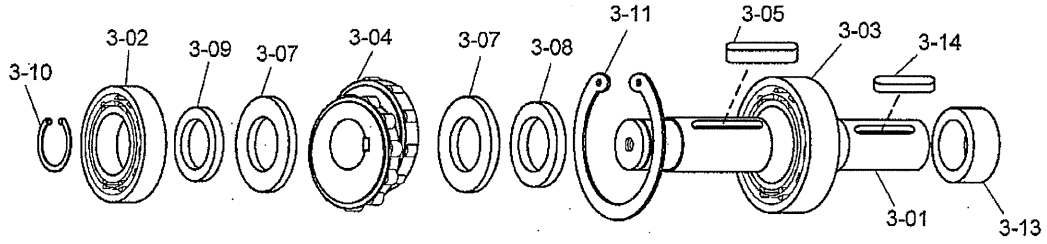
Slow Speed Shaft Assembly



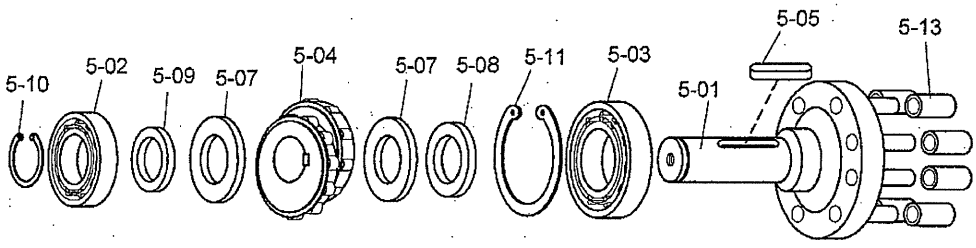
Reduction Parts Sub-Assembly



High Speed Shaft Assembly



Intermediate Shaft Assembly



Lubricants

Grease Lubricated Models

Those models listed in Tables A-3 ~ A-6 as grease lubricated are filled with grease before shipment to the customer and are ready for use.

Table A-7. Standard Greases[1]

Ambient Temperature[2]		SM-Cyclo® Speed Reducer
°F	°C	Shell Oil
14 to 122	-10 to 50	Shell Alvania® Grease 2 (NLGI Grade #2)

Table A-8. Grease Replenishment and Change Interval

Model	Condition		Interval[3]
Single and Double Reduction Maintenance Free Type	Replenishment		NOT REQUIRED
	Overhaul[4]		Every 20,000 Hours or Every 4 ~ 5 Years
Double Reduction	Replenishment	Less Than 10 Hours Per Day Operation	Every 3 ~ 6 Months
		10 ~ 24 Hours Per Day Operation	Every 500 ~ 1000
	Change	Speed Reducer Mechanism, High Speed Shaft Bearings (Speed Reducer Type)	Every 2 ~ 3 Years
		Slow Speed Shaft Bearings	Every 3 ~ 5 Years

Replenishment and Change Guidelines

Replenish grease to the reduction mechanism 1/3 to 1/2 of the quantity listed in Table A-9 or A-10 for the first reduction stage at the interval recommended in Table A-8.

When the unit is disassembled for overhauling, refill with the grease quantities indicated in Table A-9 or A-10. Or alternatively, 80% of the space around the reduction mechanism and slow speed shaft bearings of single reduction units, and 50% around the reduction mechanism of both the first and second stage of double reduction units.

Slightly larger quantities may be supplied to lower reduction ratio units, and somewhat smaller quantities for high reduction ratio units.

Apply grease liberally to the central part (i.e., around the eccentric bearings) of the mechanism. Apply grease to both the slow speed and high speed shaft bearings as you would to ordinary bearings at the time of re-assembly.

If excessive grease is added, agitation heating of the grease will raise the operating temperature of the unit. Avoid excessive greasing, but do not supply an insufficient amount of grease. When the grease is insufficient, it will raise the unit's operating temperature due to breakdown of the lubrication films on the eccentric bearing. In this case, if the operating temperature rises, supply grease immediately.

Notes: [1] Avoid the use of grease other than shown in Table A-7.
[2] Consult the factory when the drives are used under widely fluctuating temperatures, ambient temperatures other than those listed in Table A-7, or any other special conditions.
[3] Single reduction frame sizes 6060 ~ 612H and double reduction frame sizes 6060DA ~ 6125DB are maintenance free units. Grease replenishment is not necessary. Where longer life of the drive is expected or if re-lubricating is preferred before the recommended interval, refer to Tables A-7, A-8, A-9 and A-10.
[4] Overhauling consists of disassembling the unit, replacing the seals and gaskets, cleaning the internal parts and then repacking the unit with designated grease.

DISASSEMBLY/ASSEMBLY

Disassembly

SM-CYCLO® Reducers are designed to provide maximum ease when disassembing and reassembling; they require no special maintenance skills.

1. Remove the complete SM-CYCLO® Reducer with adaptor (motorized type) from the driven machine.

2. Remove the plug at the bottom of the oil gauge to drain all oil from the unit.

3. Remove the cooling fan cover and fan from those Speed Reducers (not motorized) equipped with a cooling fan, and stand the unit on a solid base with its high speed shaft side down. Remove the through bolts for the high speed end shield, ring gear housing, and lift the slow speed side, thus separating the unit into two parts so that the inner mechanism can be removed (Figs. A-12 ~ A17).

Note: If the reducer is motorized (C-adaptor and coupling) remove the motor and coupling before following the procedure outlined above. As a final step, remove the adaptor and cooling fan.

4. If the unit will not separate easily, gently drive a wedge at the line X shown in Fig. A-1 on page A-3 (if this produces a burr, be sure to remove it before reassembly).

5. To lift the slow speed side, attach an eyebolt to the tapped hole on the end of the slow speed shaft and use a hoist or chain block (Fig. A-12).

6. Take out the slow speed shaft rollers, item 1-06, page A-3 (Fig. A-13). Check the slow speed shaft pins (1-01) to see whether any rollers have adhered to them.

7. Using both hands, lift out the top cycloid disc (2-04) on the slow speed side (Fig. A-14).

8. Remove the spacer ring (2-05).

9. The eccentric (3-04) can be removed from the input shaft (3-01) after taking out the retaining ring (3-10) and the inner bearing raceway (Figs. A-15, A-16).

Note: In certain sizes, the eccentric bearings are roller bearings without a retainer. Remove bearings of the top disc before proceeding with the next step.

10. Take out the second disc located on the motor side. (Also remove second disc bearings and eccentric with inner bearing raceway if required.)

11. Remove the ring gear housing (2-01).

12. Follow these steps to remove the slow speed shaft (1-01) with its bearings from the casing (26): (a) Remove the horizontal oil seal housing (25). (b) With a wooden or hard rubber mallet, rap the inner end of the slow speed shaft to expose the retaining ring* from the outer raceway of the bearing. (c) Remove the retaining ring. (d) Rap the outer end of the slow speed shaft with a wooden or hard rubber mallet, and remove it from the casing.

13. The high speed shaft (3-01) with bearings is removed from the high speed shaft end shield (8) by tapping the shaft end after first taking off the retaining ring (3-11).

14. The cycloid disc is made from heat-treated bearing steel and the spacer ring is cast iron. Take care not to strike them together while handling.

The above instructions cover complete disassembly. In ordinary cases, however, only the removal of the cycloid discs and the eccentric, and removal of the slow speed shaft from the slow speed end cap is necessary.

***Note:** Retaining ring is part of bearing A (Part No. 1-02).

Assembly

SM-CYCLO® Reducers are reassembled by reversing the disassembly procedure. Care must be taken to exclude dust or foreign matter from the moving parts, and to see that gaskets are properly placed to make the assembly oil-tight.

Following are some helpful points to remember when assembling SM-CYCLO® Reducers.

1. Set the ring gear housing and insert the ring gear pins and rollers; then test-rotate the pins and rollers by hand. (Apply grease liberally to the ring gear pins and rollers before they are inserted in grease lubricated SM-CYCLO® Reducers.)

2. Cycloid discs are a matched pair. Each carries the same number stamped on one side of the disc.

3. Set the cycloid disc with the stamped number face up as shown in Fig. A-17.

4. Insert the spacer (3-07) and then insert the eccentric with bearings by rapping with a wooden or hard rubber mallet (Fig. A-16).

5. Insert the other spacer and the inner bearing raceway. Secure them with the retaining ring (Fig. A-15).

6. Set the spacer ring in place.

7. Insert top disc in such a way that the mark is 180° opposed to the mark on the bottom disc (Fig. A-13).

8. Insert slow speed shaft rollers (Fig. A-13).

9. Put the slow speed shaft pins into the rollers (Fig. A-12). The above instructions are for **eccentric bearings with retainer.** Following are the instructions suggested for **roller bearings without retainer.**

a. First insert the eccentric with inner raceways of bearings by rapping with a wooden or hard rubber mallet.

Fig. A-12

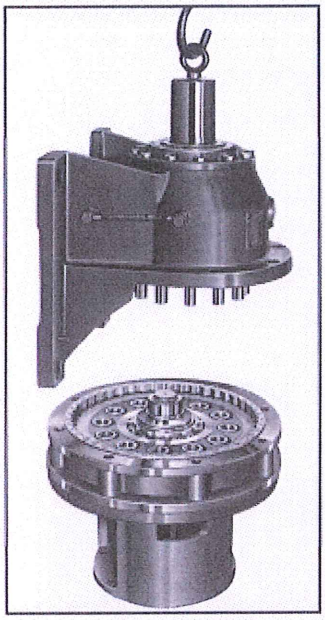


Fig. A-13

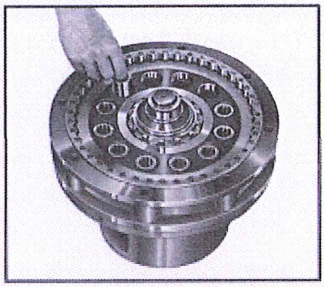


Fig. A-14

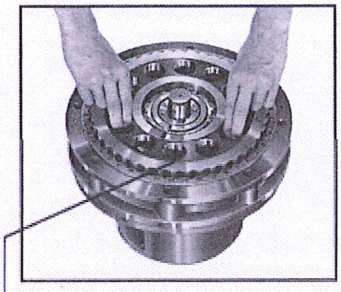


Fig. A-15

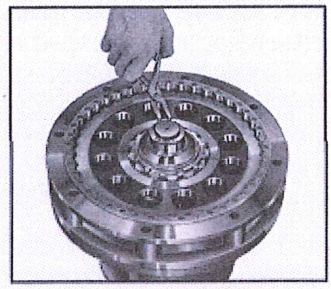


Fig. A-16

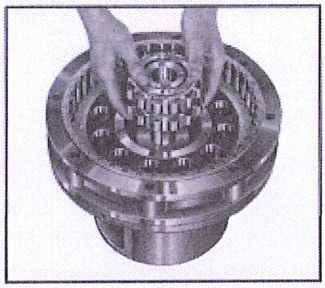
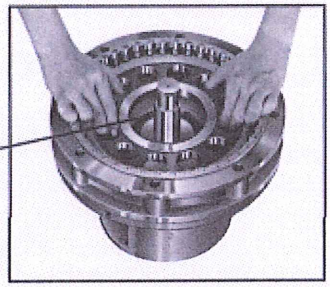


Fig. A-17



Note: Insert second disc with number facing slow speed side, exactly 180° opposed to number on first disc.

Note: Set disc with number facing slow speed side.

b. Apply grease to the raceway of the eccentric on the disc. Fix the rollers and set disc in place.

c. Insert the spacer ring and set second disc in such a way that mark is 180° opposed to mark on the bottom disc.

Eccentric Bearing Replacement Precautions

The eccentric bearings are specially designed for installation on SM-CYCLO® Reducers. They are special roller bearings without outer raceways (refer to the list of bearings on pages A-12 ~ A-13).

It is necessary to insert replacement bearings with numbered surfaces of the inner raceways facing outward. Note that incorrect insertion of the bearings (i.e., insertion of bearings with numbered surfaces inside) causes trouble.

Disassembly and Assembly of Sizes 6060-6095 SM-CYCLO® Reducers

Small sizes 6060-6095 have a single disc system, so they differ in construction from larger sizes in the following ways:

1. A balance weight is provided in lieu of the two-disc system. Refer to figure A-18.

2. The balance weight must be positioned exactly 180° as opposed to that of the eccentric.

3. There are no end plates on either side of the eccentric. In all other respects, 6060-6095 have exactly the same construction as the larger sizes. Follow the instructions given under "Disassembly and Assembly".

Disassembly Of Output Side (6060-612H)

1. With casing supported, tap output shaft until it is disengaged from casing.

2. Remove bearing "A" by using pulling tool.

3. Replace all bearings, gaskets and seals when reassembling. (Pages A-11 ~ A-13).

Assembly Of Output Side (6060-612H)

1. Assemble the "B" bearing (Part No. 1-03) on the slow speed shaft (Part No. 1-01). Heating of "B" bearing is recommended for easier assembly.

Note: Do not exceed temperature of 200°F.

2. Assemble the casing (Part No. 26) over the slow speed shaft (Part No. 1-01), being sure to maintain "X" (Fig. A-18).

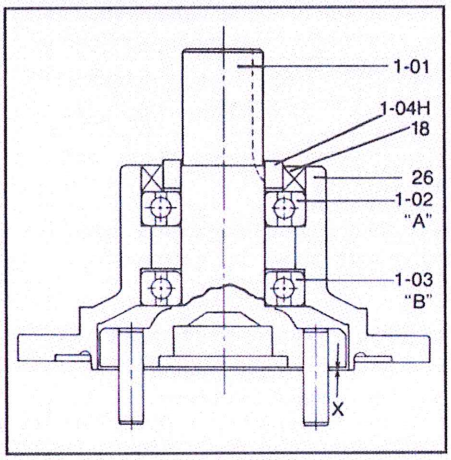
3. Carefully tap bearing "A" (Part No. 1-02) onto the slow speed shaft (Part No. 1-01) until the bearing is flush with the shoulder of the casing.

4. Place the collar (Part No. 1-04H) onto the slow speed shaft (Part No. 1-01). Heating the collar is recommended for easier assembly.

5. Insert the oil seal (Part No. 18), lip in, into the casing (Part No. 26).

Note: Measure for dimension "X" preferably in 3 places to insure proper spacing.

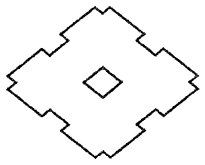
Fig. A-18



X" Dimension (inches)

Frame Size	Dimension
6060/65	0.046 ± 0.007
6070/75 6080/85	0.042 ± 0.007
6090/95	0.046 ± 0.007
6100/05 610H	0.046 ± 0.007
6110/15/20/ 25, 612H	0.042 ± 0.007

TROUBLESHOOTING AND REPAIR



This troubleshooting guide is to help you identify and overcome common problems of reducers. If you have a problem not listed below, please consult factory.

PROBLEM WITH THE REDUCER		POSSIBLE CAUSES	SUGGESTED REMEDY
Runs Hot	Overloading	Load exceeds the capacity of the reducer.	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce load.
	Improper Lubrication	Insufficient lubrication.	Check lubricant level and adjust up to recommended levels.
		Excessive lubrication.	Check lubricant level and adjust down to recommended level.
		Wrong lubricant.	Flush out and refill with correct lubricant as recommended.
Runs Noisy	Loose Foundation Bolts	Weak mounting structure.	Inspect mounting of reducer. Tighten loose bolts and/or reinforce mounting and structure.
		Loose hold down bolts.	Tighten bolts.
	Worn Disc	Overloading unit may result in damage to disc.	Disassemble and replace disc. Recheck rated capacity of reducer.
	Failure of Bearings	May be due to lack of lubricant.	Replace bearing. Clean and flush reducer and fill with recommended lubricant.
		Overload.	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce load.
	Insufficient Lubricant	Level of lubricant in the reducer not properly maintained.	Check lubricant level and adjust to factory-recommended level.
	Damaged Pins & Rollers	Overloading of reducer.	Disassemble and replace ring gear pins and rollers. Check load on reducer.
Output Shaft Does Not Turn	Input Shaft Broken	Overloading of reducer can cause damage.	Replace broken shaft. Check rated capacity of reducer.
		Key missing or sheared off on input shaft.	Replace key.
	Eccentric Bearing Broken	Lack of lubricant.	Replace eccentric bearing. Flush and refill with recommended lubricant.
		Coupling loose or disconnected.	Properly align reducer and coupling. Tighten coupling.
Oil Leakage	Worn Seals	Caused by dirt or grit entering seal.	Replace seals. Breather filter may be clogged. Replace or clean filter.
		Overfilled reducer.	Check lubricant level and adjust to recommended level.
		Vent clogged.	Clean or replace element, being sure to prevent any dirt from falling into the reducer.
		Improper mounting position, such as wall or ceiling mount of horizontal reducer.	Mount horizontally or rework reducer to wall or ceiling mount.

RAKE DRIVE MOTOR

Manual Geral de Instalação, Operação e Manutenção de Motores Elétricos

Installation, Operation and Maintenance Manual of Electric Motors

Manual General de Instalación, Operación y Mantenimiento de Motores Eléctricos

No.:

Date: 08-JAN-2014

DATA SHEET

Three-phase induction motor - Squirrel cage rotor

Customer	:	
Product line	:	W22 High Efficiency

Frame	:	182T
Output	:	3 HP
Frequency	:	60 Hz
Poles	:	4
Full load speed	:	1760
Slip	:	2.22 %
Voltage	:	230/460 V
Rated current	:	7.98/3.99 A
Locked rotor current	:	57.5/28.7 A
Locked rotor current (Il/In)	:	7.2
No-load current	:	3.40/1.70 A
Full load torque	:	8.83 lb.ft
Locked rotor torque	:	220 %
Breakdown torque	:	280 %
Design	:	B
Insulation class	:	F
Temperature rise	:	80 K
Locked rotor time	:	18 s (hot)
Service factor	:	1.25
Duty cycle	:	S1
Ambient temperature	:	-20°C - +40°C
Altitude	:	1000
Degree of Protection	:	IP55
Approximate weight	:	84 lb
Moment of inertia	:	0.26364 sq.ft.lb
Noise level	:	56 dB(A)

	D.E.	N.D.E.
Bearings	6207 ZZ	6206 ZZ
Regreasing interval	---	---
Grease amount	---	---

Load	Power factor	Efficiency (%)
100%	0.79	87.5
75%	0.73	87.5
50%	0.62	86.5

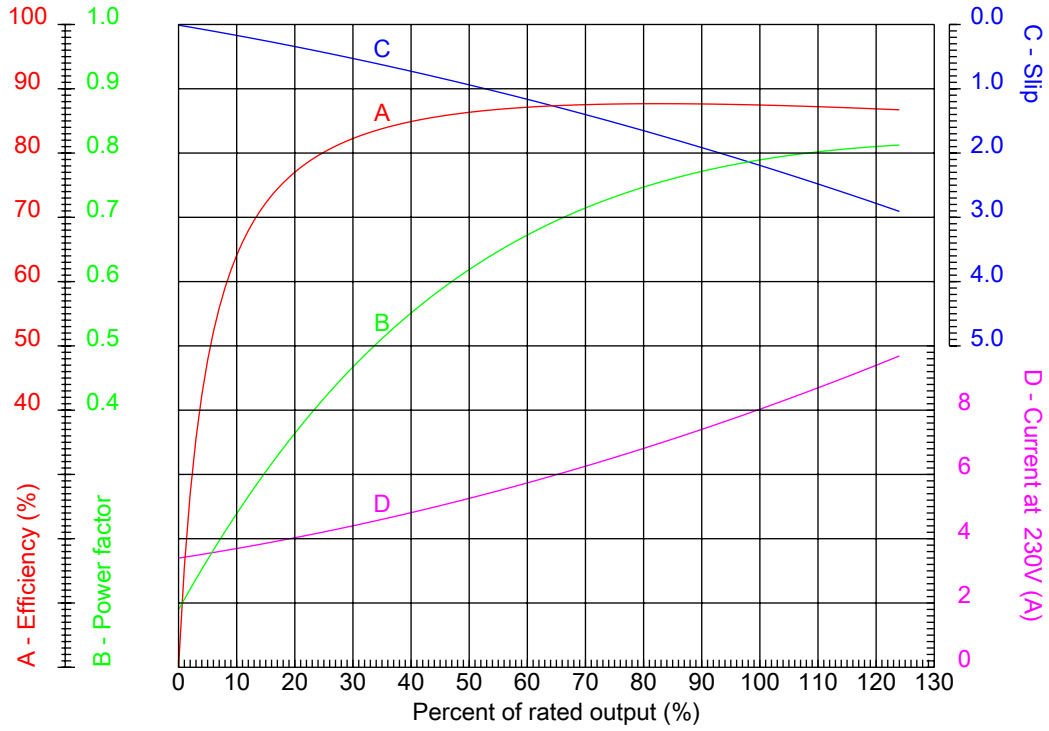
Notes:

Performed by	Checked

	No.:
	Date: 08-JAN-2014

PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer	:
Product line	: W22 High Efficiency

Frame	: 182T	Locked rotor current (Il/In)	: 7.2
Output	: 3 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.25
Full load speed	: 1760	Design	: B
Voltage	: 230/460 V	Locked rotor torque	: 220 %
Rated current	: 7.98/3.99 A	Breakdown torque	: 280 %
Insulation class	: F		

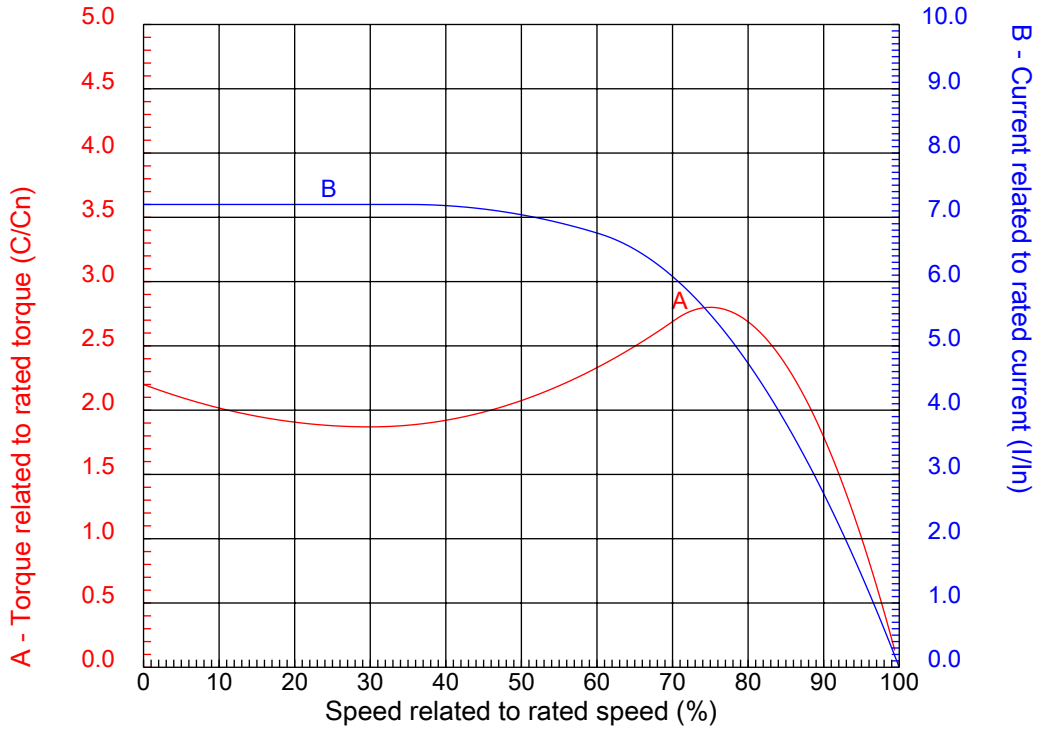
Notes:

Performed by	Checked

	No.:
	Date: 08-JAN-2014

CHARACTERISTIC CURVES RELATED TO SPEED

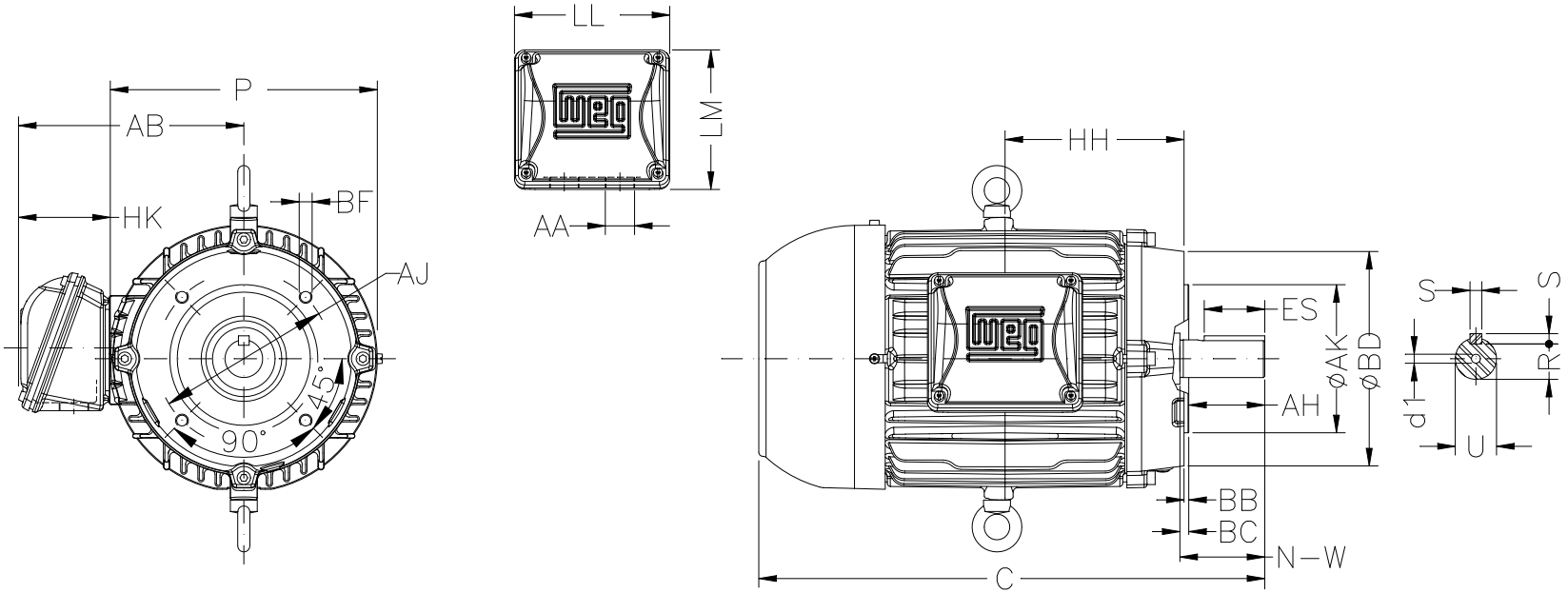
Three-phase induction motor - Squirrel cage rotor



Customer	:		
Product line	:	W22 High Efficiency	
Frame	: 182T	Locked rotor current (Il/In)	: 7.2
Output	: 3 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.25
Full load speed	: 1760	Design	: B
Voltage	: 230/460 V	Locked rotor torque	: 220 %
Rated current	: 7.98/3.99 A	Breakdown torque	: 280 %
Insulation class	: F		

Notes:

Performed by	Checked



P 8.740	AB 7.559	U 1.125	N-W 2.750	ES 1.969
S 0.250	R 0.984	depth 0.250	HH 5.000	HK 3.110
C 14.860	FC 17.860	LL 5.512	LM 5.236	AA NPT 1"
d1 A 4	Flange FC-184	AJ 7.250	AK 8.500	BD 8.875
BF UNC 1/2"x13	BB 0.250	BC 0.125	AH 2.625	

Notes:

Performed by:

Checked:

Customer:

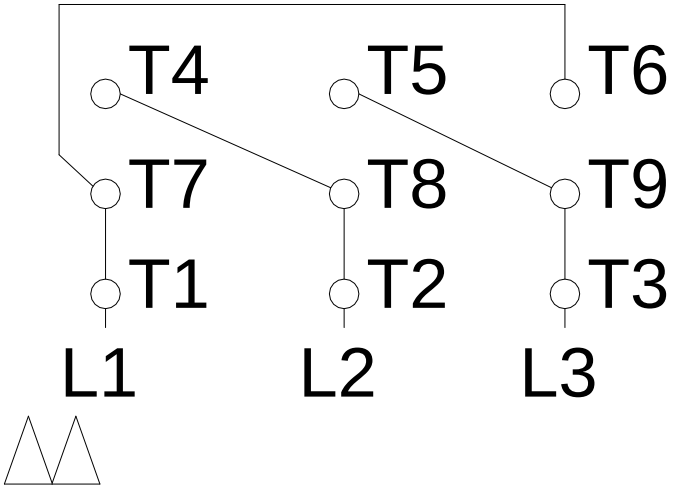
W22 High Efficiency

Three-phase induction motor

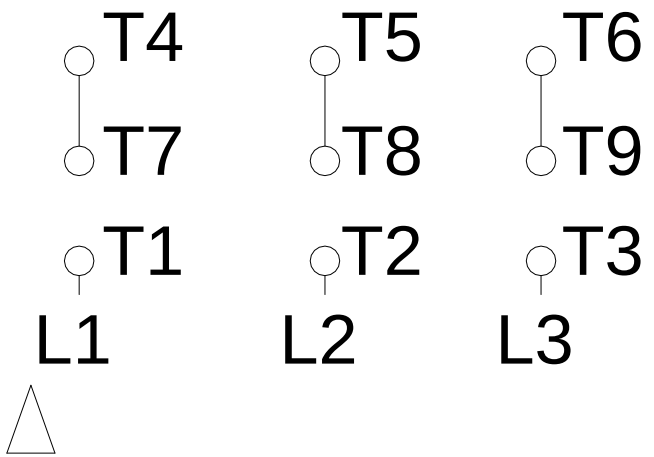
Frame 182T - IP55

08-JAN-2014

LOW VOLTAGE



HIGH VOLTAGE



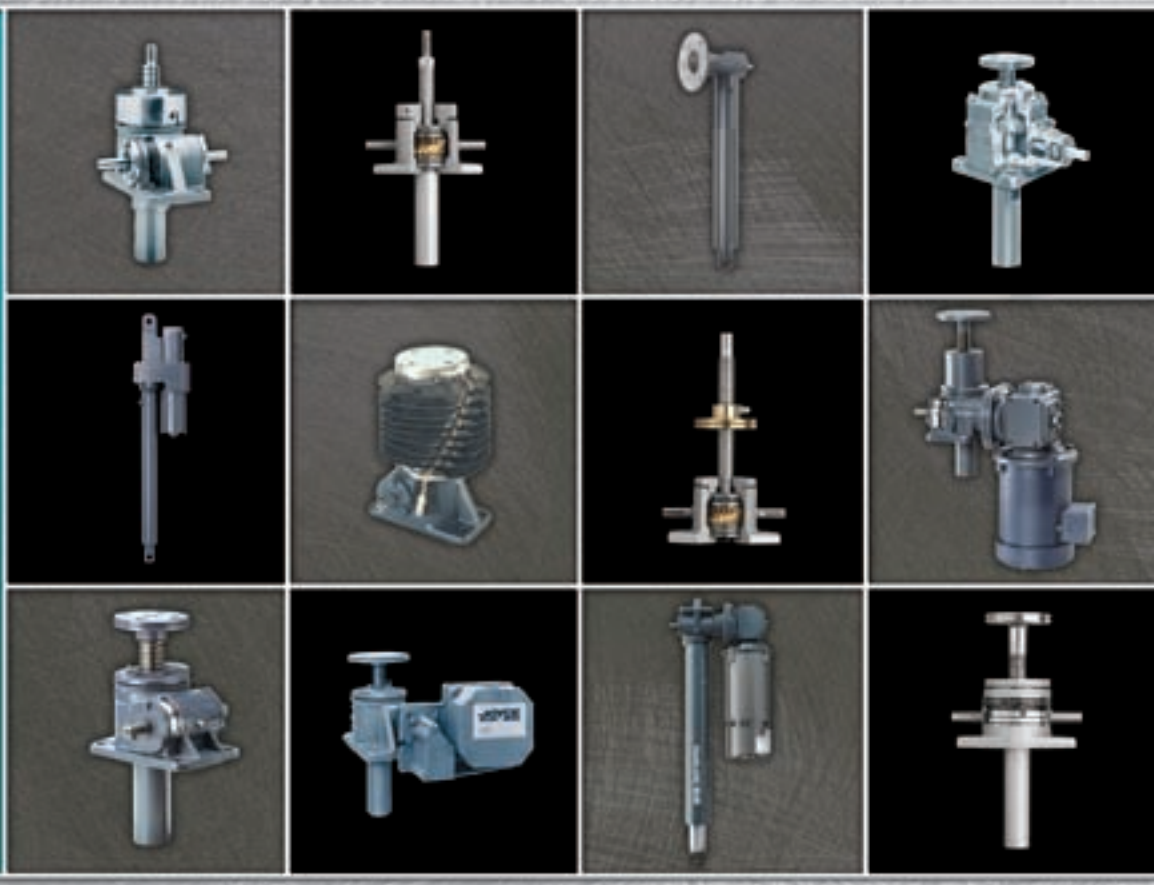
Notes:		
Performed by:		
Checked:		
Customer:		
W22 High Efficiency		
Three-phase induction motor Frame 182T - IP55	08-JAN-2014	

LIFT INFORMATION

JOYCE

Jacks, Actuators & Systems

- Machine Screw Jacks
- Linear Actuators
- Electric Cylinders
- Ball Screw Jacks
- Metric Jacks
- Bevel Gear® Jacks
- Stainless Steel Jacks
- Bevel Ball Actuators
- ComDrive® Actuators
- Miter Gear Boxes
- Protective Bellows
- Limit Switches
- Couplings and Shafting



2008

800-523-5204

www.joycedayton.com

JOYCE MACHINE SCREW JACKS

Versatile Joyce Machine Screw Jacks lift and precisely position all kinds of loads from 250 lbs. to 250 tons.

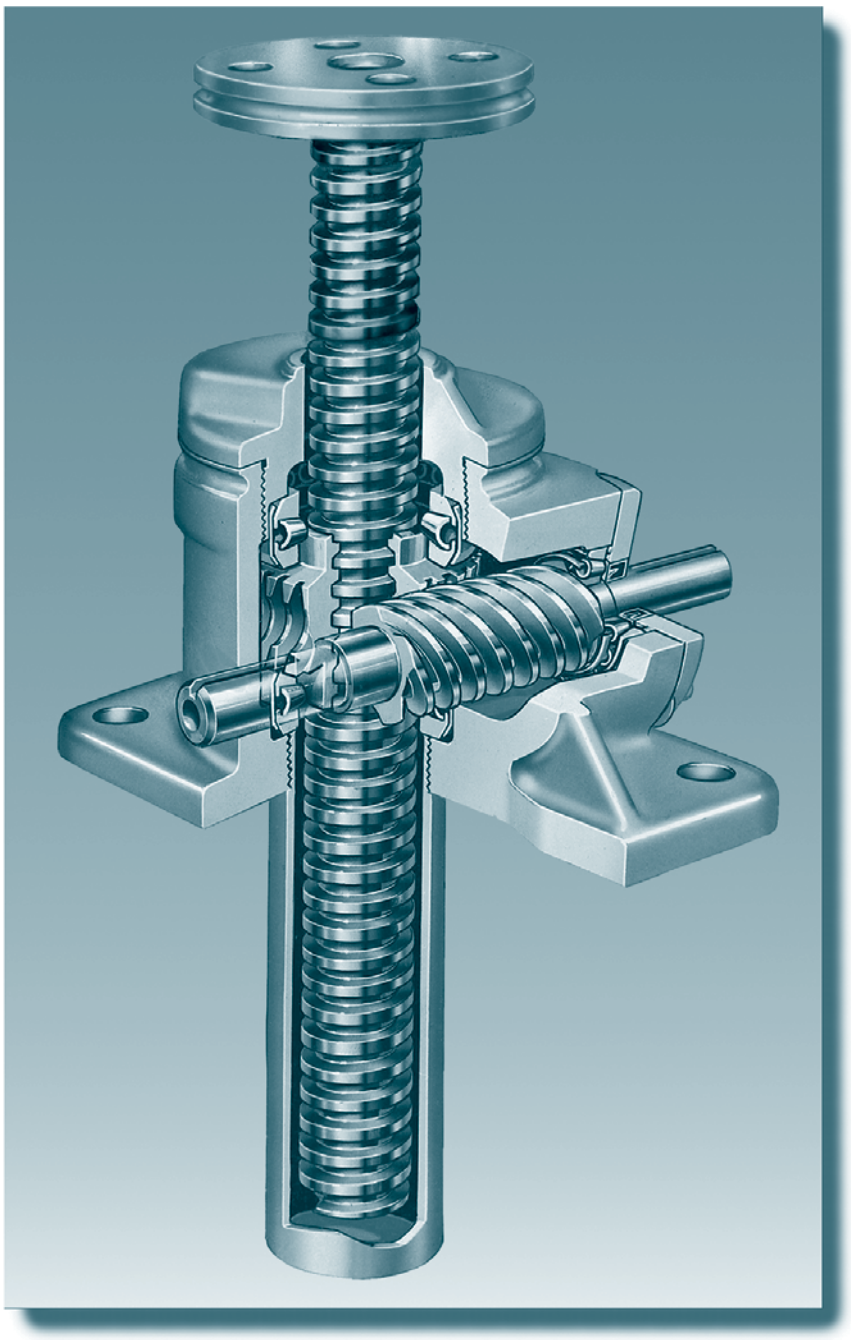
Upright or inverted, these precision jacks operate at full capacity whether the load is in tension or compression. WJ series single lead jacks are self locking under full lifting capacity. DWJ double lead series jacks offer increased travel speed.

Heat treated alloy steel worm shafts, aluminum/bronze worm gears and tapered roller or ball bearings provide rugged reliability.

Double extended worm shafts are standard. Single extended worm shafts are available with right or left hand extension or additional length. Joyce jacks come in translating screw (shown), rotating screw (keyed for traveling nut) and keyed designs. All jack designs can be fitted with a protective boot. Jacks are available with one of four standard screw ends or special ends to meet your requirements.

An optional anti-backlash feature (see page 127) compensates for thread wear, assuring minimum play between lifting screw and worm gear for smooth, precise operation. Jacks equipped with the antibacklash feature are rated at full capacity under static conditions. For jack capacity under dynamic conditions please contact Joyce/Dayton.

Joyce/Dayton will custom design jacks to meet special requirements.



Ordering Information — Order must indicate model number, rise, upright or inverted configuration, translating, keyed to prevent rotation (KEYED) or keyed for traveling nut (KFTN), type of screw end, with or without protective boot, etc.

For complete ordering information see page 164 and 165

JOYCE MACHINE SCREW JACK SPECIFICATIONS

Model	Capacity	Screw Diameter	Thread Pitch/Lead	Worm Gear Ratio	Worm Shaft Turns For 1" Travel	Tare Torque (Inch Lbs)	Starting Torque (Inch Lbs)	Operating Torque (Inch Lbs)	Efficiency Rating % Approx	Screw Torque (Inch Lbs)	Basic Jack Weight (Lbs)	Jack Weight per Inch Travel
WJ250	250 lbs.	1/2	.125 Pitch STUB ACME	5:1	40	1	.025W*	.018W* @ 500 RPM	23.0%	.050W*	1.2	0.1
WJ500	500 lbs.	1/2	.250 Pitch STUB ACME	5:1	20	1	.033W*	.024W* @ 500 RPM	33.3%	.069W*	1.3	0.1
WJ1000	1,000 lbs.	5/8	.125 Pitch STUB ACME	5:1	40	1	.030W*	.021W* @ 500 RPM	19.9%	.059W*	1.3	0.1
WJ51	1 TON	3/4	.200 Pitch ACME	5:1	25	3	.038W*	.026W* @ 500 RPM	25.0%	.075W*	6	0.3
WJ201				20:1	100		.017W*	.009W* @ 500 RPM	15.9%			
(R)WJT62	2 TON	1	.250 PITCH ACME	6:1	24	4	.041W*	.028W* @ 500 RPM	24.2%	.098W*	15	0.3
(R)WJT122				12:1	48		.025W*	.015W* @ 500 RPM	22.0%			
(R)WJT242				24:1	96		.018W*	.009W* @ 500 RPM	18.3%			
(R)WJT252				25:1	100		.015W*	.0085W* @ 500 RPM	17.0%			
D(R)WJ62			.250 PITCH .500 LEAD ACME	6:1	12		.057W*	.039W* @ 500 RPM	33.7%	.139W*		
D(R)WJ122				12:1	24		.035W*	.022W* @ 500 RPM	30.5%			
D(R)WJ242				24:1	48		.025W*	.013W* @ 500 RPM	25.4%			
WJ63	3 TON	1	.250 PITCH ACME	6:1	24	6	.040W*	.029W* @ 500 RPM	24.3%	.098W*	17	0.4
WJ123				12:1	48		.025W*	.016W* @ 500 RPM	22.2%			
WJ243				24:1	96		.017W*	.009W* @ 500 RPM	18.5%			
WJ253				25:1	100		.0155W*	.009W* @ 500 RPM	17.8%			
DWJ63			.250 PITCH .500 LEAD ACME	6:1	12		.055W*	.041W* @ 500 RPM	33.8%	.139W*		
DWJ123				12:1	24		.034W*	.022W* @ 500 RPM	30.7%			
DWJ243				24:1	48		.024W*	.013W* @ 500 RPM	25.6%			
WJT65	5 TON	1 1/2	.375 PITCH STUB ACME	6:1	16	10	.065W*	.044W* @ 300 RPM	23.0%	.151W*	32	0.7
WJT125				12:1	32		.041W*	.025W* @ 300 RPM	20.6%			
WJT245				24:1	64		.029W*	.015W* @ 300 RPM	16.7%			
WJT255			.250 PITCH ACME	25:1	100		.022W*	.011W* @ 300 RPM	13.4%	.131W*		
DWJ65			.250 PITCH .500 LEAD ACME	6:1	12		.072W*	.050W* @ 300 RPM	26.8%	.171W*		
DWJ125				12:1	24		.045W	.028W* @ 300 RPM	23.9%			
DWJ245				24:1	48		.033W*	.017W* @ 300 RPM	19.6%			
WJ810	10 TON	2	.500 PITCH ACME	8:1	16	20	.061W*	.043W* @ 200 RPM	23.1%	.195W*	43	1.3
WJ2410				24:1	48		.030W*	.018W* @ 200 RPM	18.8%			
WJ2510			.250 PITCH ACME	25:1	100		.024W*	.014W* @200 RPM	11.3%	.161W*		
DWJ810			.333 PITCH .666 LEAD ACME	8:1	12		.070W*	.062W* @ 200 RPM	31.9%	.228W*		
DWJ2410				24:1	36		.035W*	.026W* @ 200 RPM	25.9%			

Important: Series DWJ double lead screw jacks may lower under load. External locking systems are required.

(R) = Reverse Base Jack Housing

***W** = Load in pounds

Tare Torque: Initial torque to overcome seal and normal assembly drag. This value must be added to starting torque or operating torque values.

Starting Torque: Torque value required to start moving a given load (dissipates to operating torque values once the load begins moving).

Operating Torque: Torque required to continuously raise a given load at the input RPM listed.

Note: If your actual input RPM is 20% higher or lower than the listed RPM, please refer to our JAX® program to determine actual torque values at your RPM.

Screw Torque: Torque required to resist screw rotation (Translating Design Jacks) and traveling nut rotation (Keyed for Traveling Nut Design Jacks).

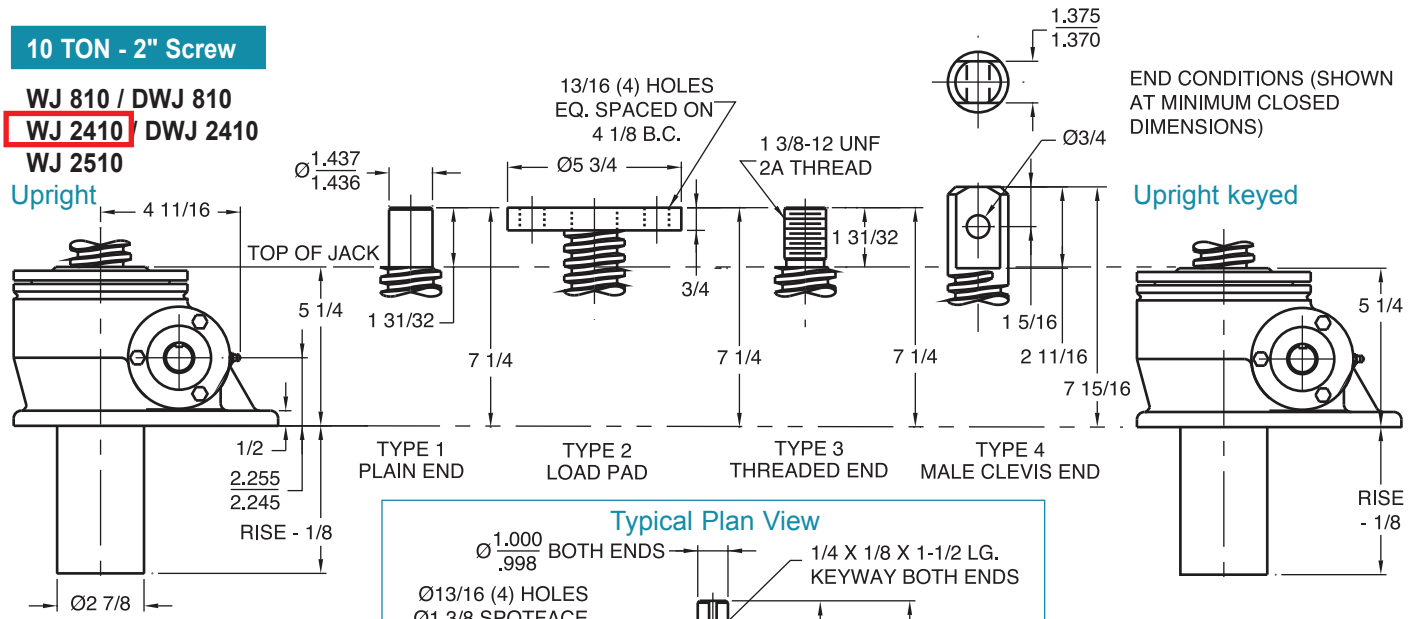
Lead: The distance a screw advances axially in a single turn.

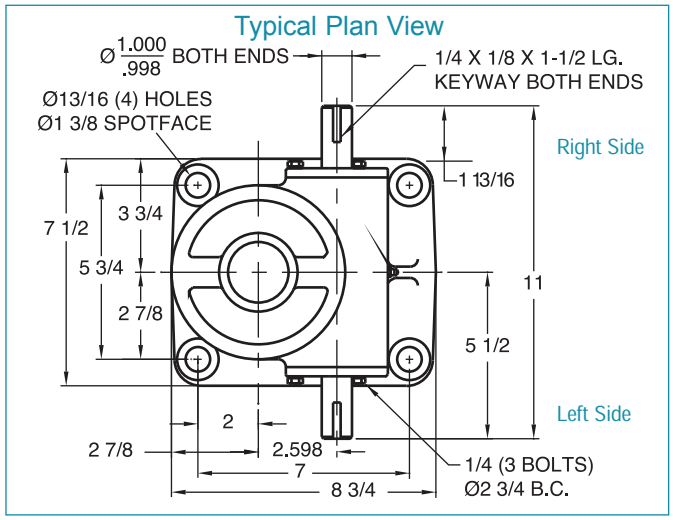
Pitch: The distance from a point on a screw thread to a corresponding point on the next thread, measured axially.
It can also be expressed as the number of threads per inch.

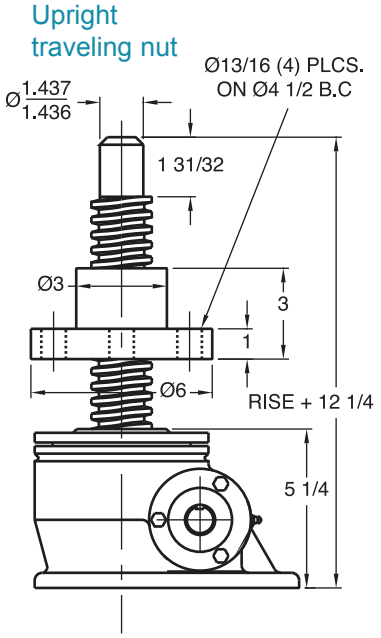
JOYCE MACHINE SCREW JACKS

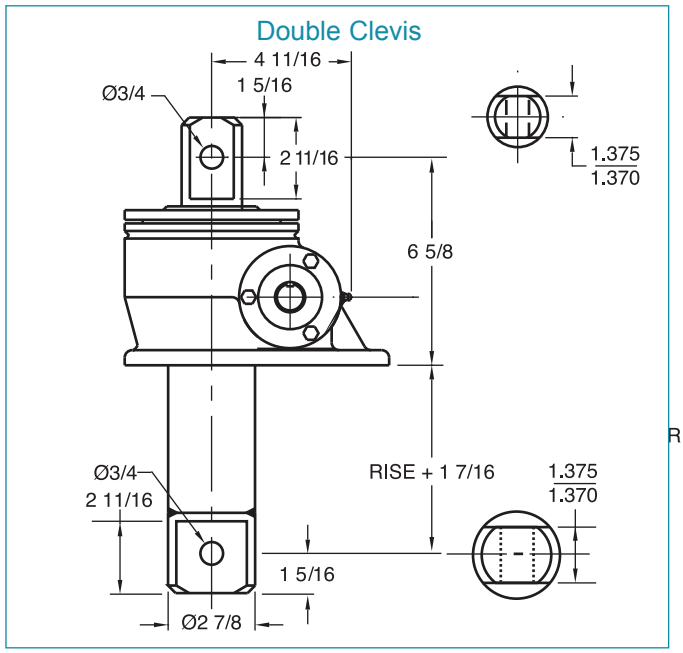
10 TON - 2" Screw

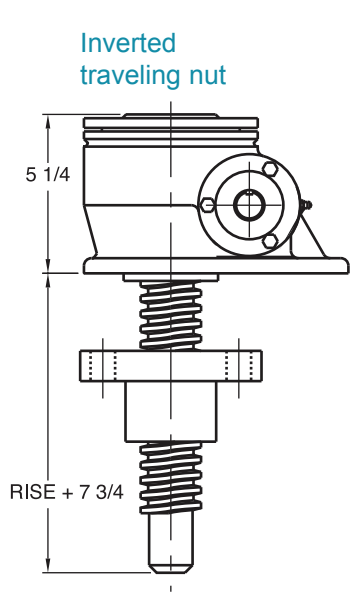
WJ 810 / DWJ 810
WJ 2410 / DWJ 2410
WJ 2510

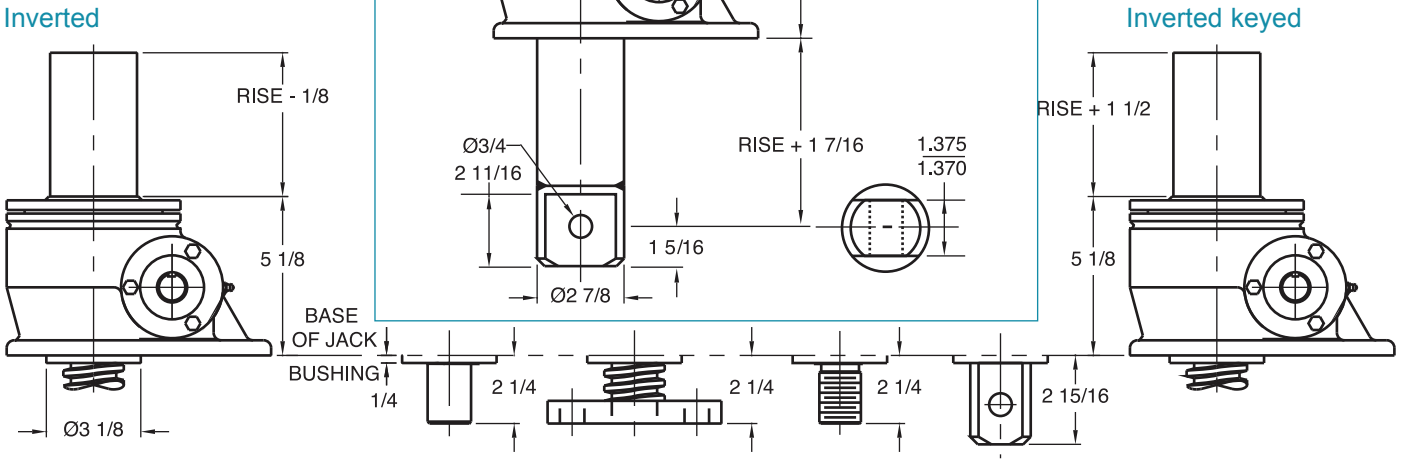












Note: Drawings are artist's conception — not for certification; dimensions are subject to change without notice.

ACCESSORIES — JOYCE GEARED POTENTIOMETERS

Joyce geared potentiometers are ideal for applications where precise position must be known. Using a 10-turn potentiometer, a signal is provided as either a change in resistance or current (when supplied with a 4-20ma instrument transformer) which is proportional to the actual position of the screw. This signal is commonly used for applications where PLCs or computers control jacks.

Geared potentiometers are available on worm gear design jacks of 2-150 ton capacity.

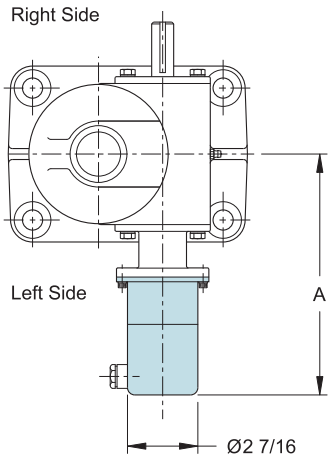
Geared potentiometers include a slip clutch to prevent damage due to over-rotation but should always be inspected during installation to ensure that a full range of motion is available throughout the jack travel.

As an additional option, geared potentiometers are available with upper and lower mechanical limit switches. These switches are common SPDT cam operated switches and can be used for end of travel limits or set points.

The standard operating voltage is less than or equal to 48V. An operating voltage greater than 48V is available upon request.

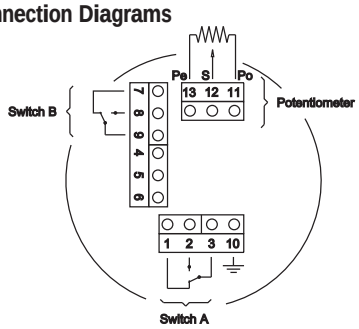
Dimension

Jack Capacity	A
2 Ton	7 5/8
3 Ton	8 3/4
5 Ton	8 3/4
10 Ton	9 3/4
15 Ton	9 3/4
20 Ton	10 1/8
25 Ton	10 3/4
30 Ton	10 3/4
35 Ton	10 3/4
50 Ton	12 3/4
75 Ton	14
100 Ton	14
150 Ton	14



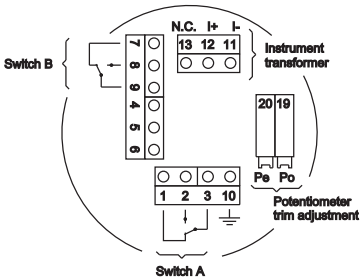
Geared Potentiometer Electrical Characteristics	
Resistance	10 kΩ
Resistance Tolerance	±10%
Linearity Tolerance	±0.25%
Load Capacity	2W at 70°C
Standard Residual End Point Resistance	Greater of 0.2% or 1Ω
Operating Temperature	-55°C to 125°C
Expected Service Life	2x10^6 Revolutions

Geared Potentiometer Connection Diagrams

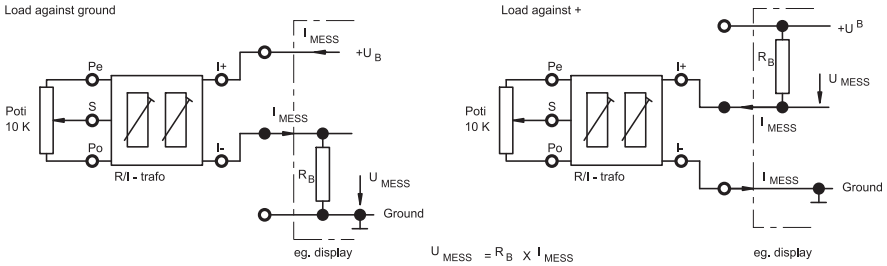


Geared potentiometers with instrument transformers provide a 4-20ma signal (**increasing as the screw extends**) and are ideal when an accurate, stable signal is required or the cable length is long. The instrument transformer operates with the following characteristics:

Supply Voltage (+U_B)	15-28 VDC
Max Load Impedance (R_B)	<500 Ω
Output Current (I_{MESS})	4-20 mA
Operating Temperature	0-50°C



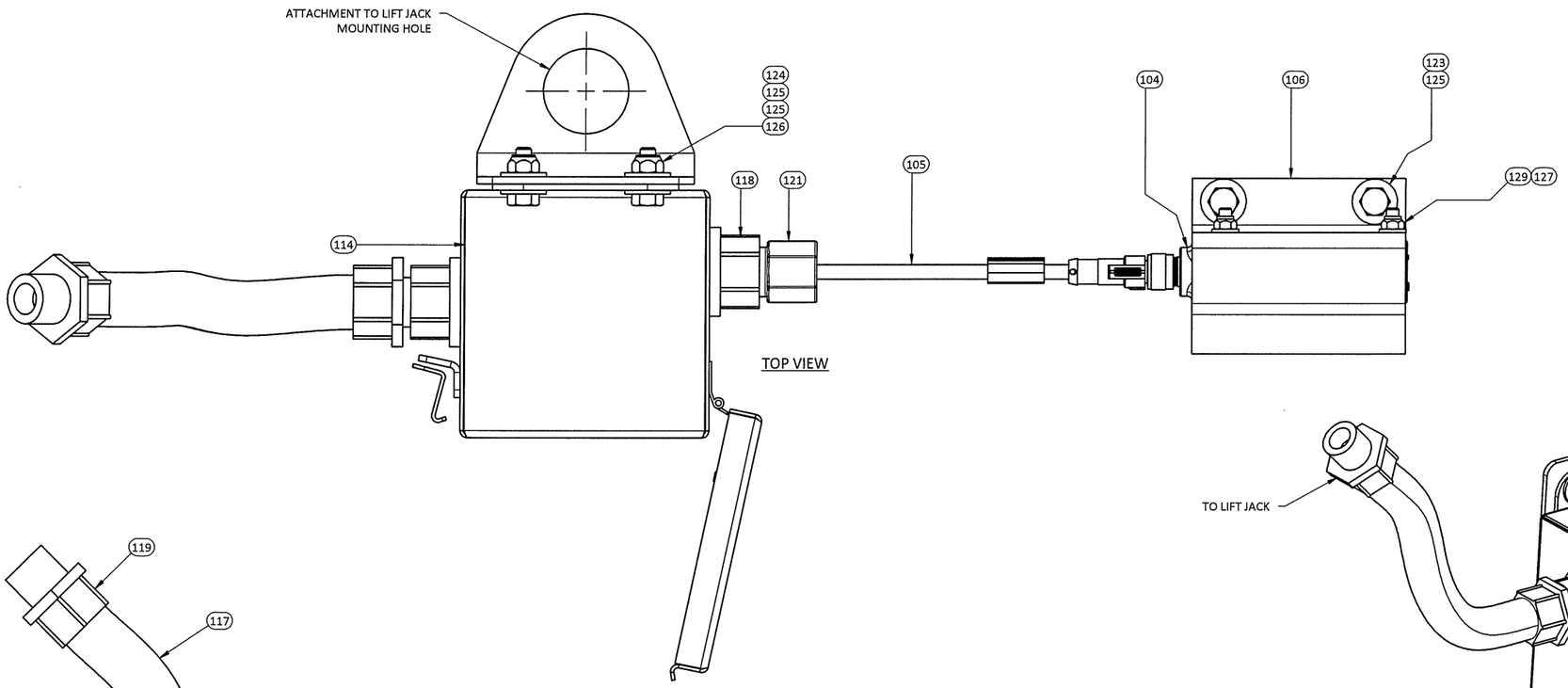
Instrument Transformer: Connection Examples



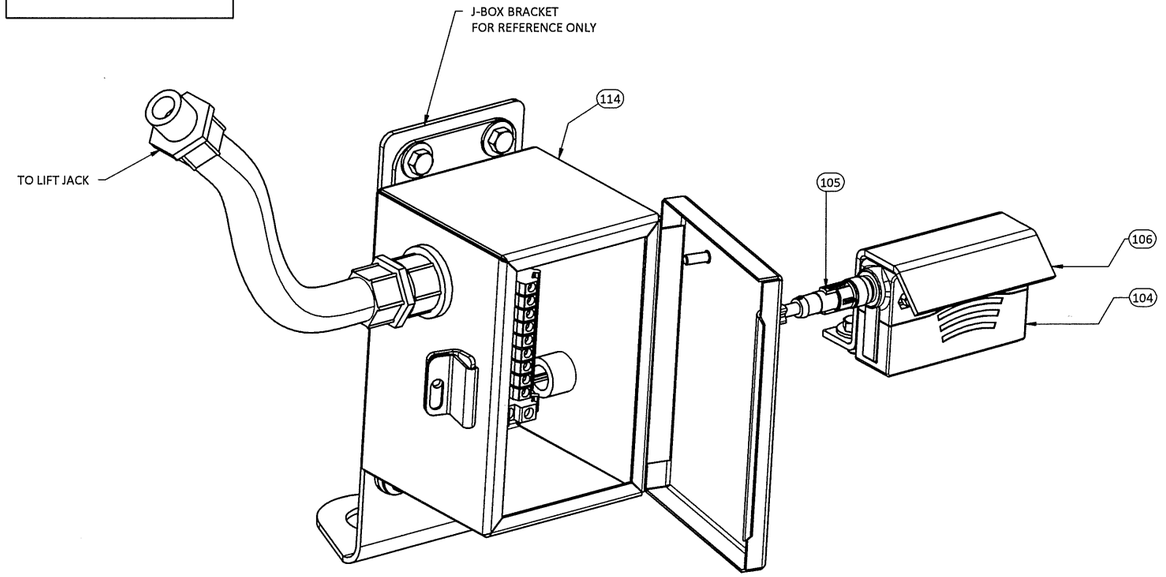
For complete ordering information see pages 164 & 165

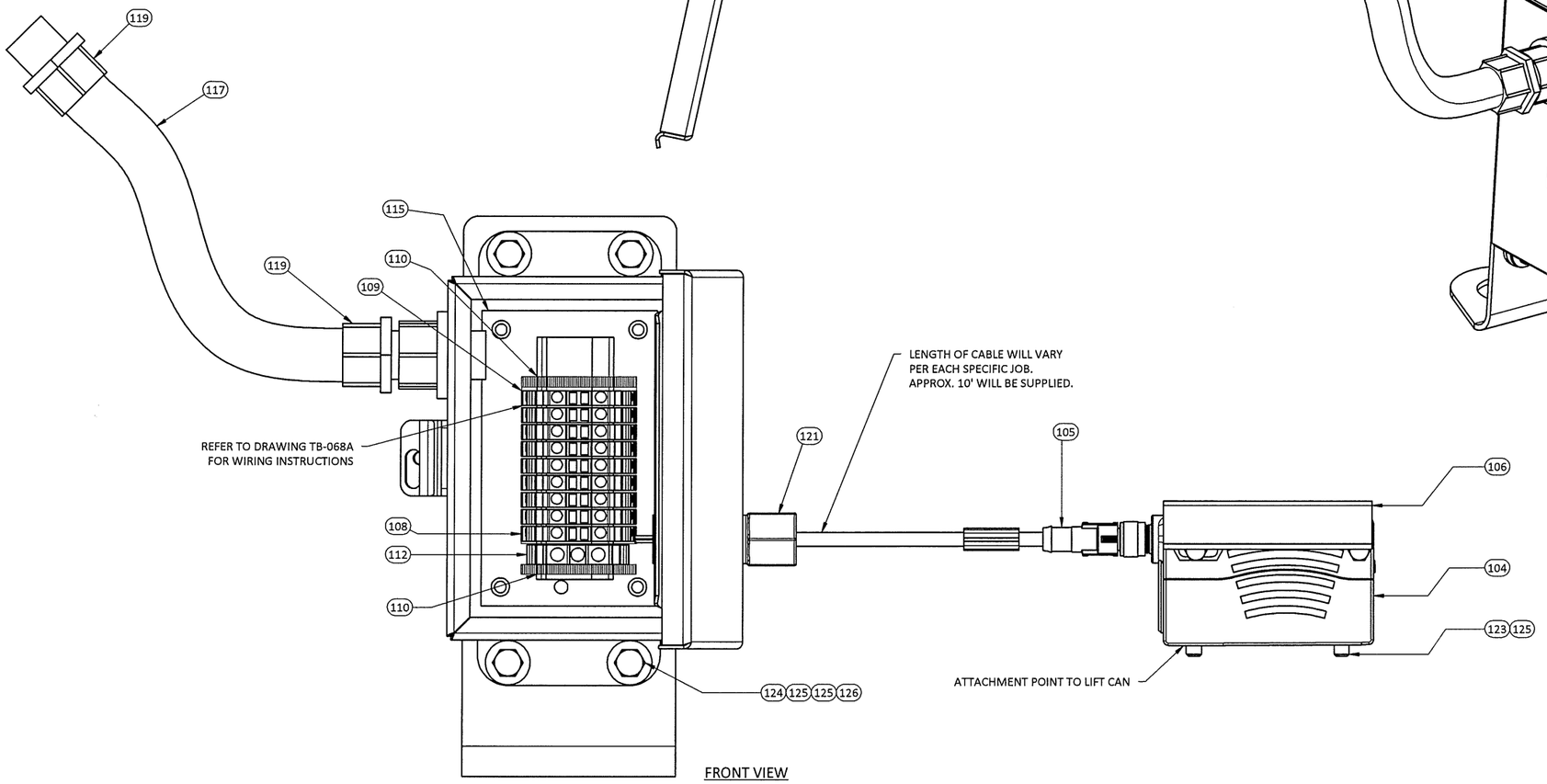
PC	QTY	DESCRIPTION	MATERIAL	WEIGHT (LBS)
104	1	RANGE SENSOR	VARIES	2
105	1	RANGE SENSOR CONNECTION CABLE	VARIES	0
106	1	RANGE SENSOR BRACKET	304 SS	1
108	9	TERMINAL BLOCK	VARIES	1
109	2	TERMINAL BLOCK END COVER	VARIES	0
110	2	TERMINAL BLOCK END BLOCK	VARIES	0
112	1	TERMINAL BLOCK GROUND	VARIES	0
114	1	J-BOX	STAINLESS STEEL	3
115	1	BACK PANEL	STAINLESS STEEL	0
117	1	2' LENGTH 1/2" FLEX CONDUIT	VARIES	0
118	2	MEYERS HUB 1/2" INSUL	ZP STEEL	0
119	2	SEAL TIGHT, STRAIGHT , 1/2"	ZP STEEL	0
121	1	CORD GRIP (RANGE 0.125-0.250)	ZP STEEL	0
123	2	HEX BOLT 1/4-20 UNC X 1/2	STAINLESS STEEL	0
124	4	HEX BOLT 1/4-20 UNC X 3/4	STAINLESS STEEL	0
125	10	PLAIN WASHER 1/4	STAINLESS STEEL	0
126	4	NYLOCK NUT 1/4-20 UNC	STAINLESS STEEL	0
127	2	PLAIN WASHER M5	STAINLESS STEEL	0
128	2	HEX BOLT M5 X 35 mm	STAINLESS STEEL	0
129	2	NYLOCK NUT M5	STAINLESS STEEL	0

EST. WEIGHT (LBS)
10



TOP VIEW





FRONT VIEW

NOTES:

1. THIS DRAWING IS FOR REFERENCE ONLY. IT DOES NOT CONVEY EXACT PLACEMENT OF PARTS, NOR EXACT PART NUMBERS.
2. WORK THIS DRAWING WITH PARTS LIST 24275, LIFT TRANSMITTER ASSEMBLY (LASER).
3. WORK THIS DRAWING WITH TB-068A FOR WIRING SCHEMATIC.
4. DO NOT OVER TORQUE M5 BOLTS ATTACHING RANGE SENSOR.
5. ENSURE RANGE SENSOR LENS IS CLEAR FROM DIRT AND DEBRIS AFTER INSTALLATION.
6. APPLY ANTI-SEIZE TO ALL THREADS.

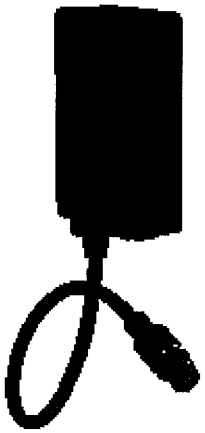
INITIAL RELEASE	-	-	-	0
REVISION DESCRIPTION	BY	CHECK'D	DATE	REV

LIFT TRANSMITTER ASSEMBLY (LASER)								1 OF 1
DESCRIPTION								SHEET
				ALL				
TYPE				SIZE				
02/14/2012	JRH	GA		NONE				
DATE	STD. BY	STD. CHKD.	STD. APPVD	SCALE	DATE	PROJ. BY	PROJ. CHKD.	PROJ. APPVD

ALL COMPONENTS MUST BE FABRICATED AND MACHINED ACCORDING TO WESTECH STANDARD SPECIFICATION (DRAWING P24Z-024A), UNLESS SPECIFICALLY NOTED ON THIS DRAWING.

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
900-1203	STANDARD	0



IO-Link

Model Number

VDM28-8-L-IO/110/115b/122

Distance sensor

with 300 mm fixed cable and 4-pin, M12 x 1 connector

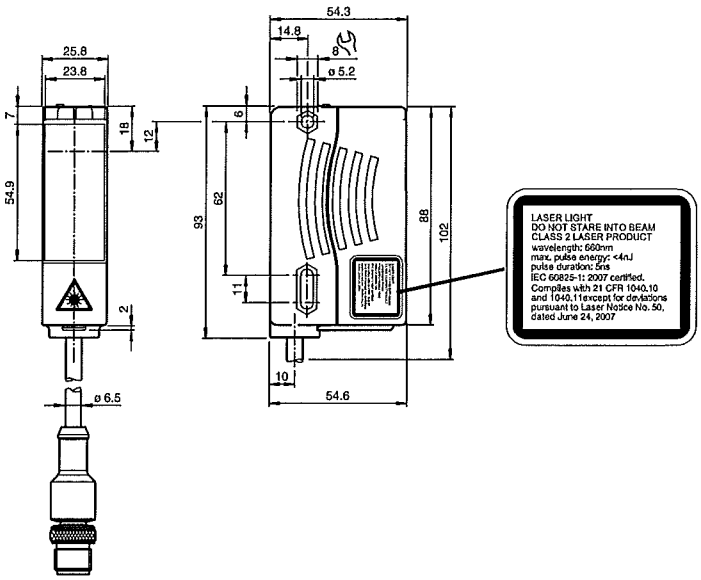
Features

- Distance measurement using object
- Measuring method PRT (Pulse Ranging Technology)
- Accurate, clear, and reproducible measuring results, regardless of ambient conditions and object
- Minimal black/white difference
- Red laser as the light emitter
- Analog output 0/4 mA ... 20 mA

Product information

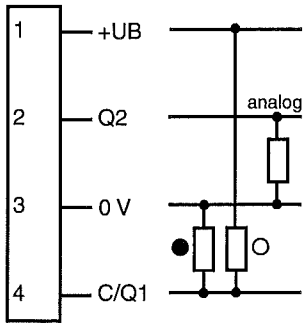
The VDM28 distance measurement device employs Pulse Ranging Technology (PRT). It has a repeat accuracy of 5 mm with an operating range of 0.2 ... 8 m and an absolute accuracy of 25 mm.
The sensor is highly resistant to ambient conditions. The compact housing of the Series 28 photoelectric sensors, with dimensions of 88 mm (height), 26 mm (width) and 54 mm (depth), make it the smallest device available in its class.

Dimensions



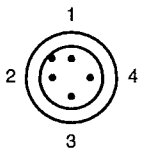
Electrical connection

Option:

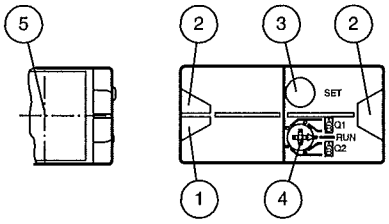


○ = Light on
● = Dark on

Pinout



Indicators/operating means



1	Operating display	green
2	Signal display	yellow
3	TEACH-IN button	
4	Mode rotary switch	
5	Laser output	

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Technical data

General specifications		
Measurement range		0.2 ... 8 m
Reference target		Kodak white (90%)
Light source		laser diode typ. service life 85,000 h at Ta = +25 °C
Light type		modulated visible red light
Laser nominal ratings		
Note		LASER LIGHT , DO NOT STARE INTO BEAM
Laser class		2
Wave length		660 nm
Beam divergence		1 mrad
Pulse length		5 ns
Repetition rate		250 kHz
max. pulse energy		< 4 nJ
Angle deviation		max. ± 2°
Measuring method		Pulse Ranging Technology (PRT)
Diameter of the light spot		< 10 mm at a distance of 8 m at 20 °C
Ambient light limit		50000 Lux
Temperature influence		typ. ≤ 0.25 mm/K
Functional safety related parameters		
$MTTF_d$		200 a
Mission Time (T_M)		10 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operating display		LED green
Function display		2 LEDs yellow for switching state
TEACH-IN indication		TEACH-IN: LED green/yellow equiphase flashing; 2.5 Hz Teach Error:LED green/yellow non equiphase flashing; 8.0 Hz
Controls		5-step rotary switch for operating modes selection (threshold setting and operating modes)
Controls		Switch for setting the threshold values
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC / when operating in IO-Link mode: 18 ... 30 V
Ripple		10 % within the supply tolerance
No-load supply current	I_0	≤ 70 mA / 24 V DC
Time delay before availability	t_v	1.5 s
Interface		
Interface type		IO-Link
Protocol		IO link V1.0
Cycle time		min. 2.3 ms
Mode		COM 2 (38.4 kBaud)
Process data witdh		16 bit
SIO mode support		yes
Output		
Signal output		Push-pull output, short-circuit protected, reverse polarity protected
Switching voltage		max. 30 V DC
Switching current		max. 100 mA
Measurement output		1 analog output 4 ... 20 mA, short-circuit/overload protected
Switching frequency	f	50 Hz
Response time		10 ms
Measurement accuracy		
Absolute accuracy		± 25 mm
Repeat accuracy		< 5 mm
Ambient conditions		
Ambient temperature		-30 ... 50 °C (-22 ... 122 °F)
Storage temperature		-30 ... 70 °C (-22 ... 158 °F)
Mechanical specifications		
Protection degree		IP65
Connection		300 mm fixed cable with M12 x 1, 4-pin connector
Material		
Housing		Plastic ABS
Optical face		Plastic pane
Mass		90 g
Compliance with standards and directives		
Directive conformity		EMC Directive 2004/108/EC
Standard conformity		
Product standard		EN 60947-5-2:2007 IEC 60947-5-2:2007
Laser class		IEC 60825-1:2007 Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated

Accessories

IO-Link-Master01-USB
IO-Link Master

IO-Link-Master-USB DTM
Communication DTM for use of IO-Link-Master

PACTware 4.X

OMH-05
Mounting aid for round steel ø 12 mm or sheet 1.5 mm ... 3 mm

VDM28-IO-Link DTM
Device DTM for communication with VDM28-IO-Link sensors

OMH-07
Mounting aid for round steel ø 12 mm or sheet 1.5 mm ... 3 mm

IODD Interpreter
Software for the integration of IODDs in a frame application (e. g. PACTware)

OMH-21
Mounting bracket

OMH-22
Mounting bracket

OMH-MLV11-K
dove tail mounting clamp

OMH-RLK29
Mounting bracket

OMH-RLK29-HW
Mounting bracket for rear wall mounting

OMH-RL28-C
Protective cover

OMH-K01
dove tail mounting clamp

OMH-K03
dove tail mounting clamp

OMH-VDM28-01

Other suitable accessories can be found at www.pepperl-fuchs.com

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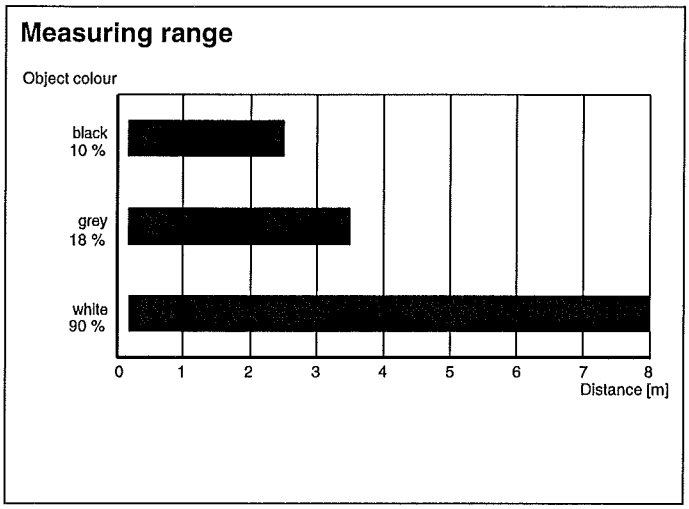
Protection class	II, rated voltage ≤ 250 V AC with pollution degree 1-2 according to IEC 60664-1
UL approval	cULus Listed, Class 2 Power Source, Type 1 enclosure

Curves/Diagrams



Adjustment

Teach-in

With the rotary switch, you can select output Q1 and the relevant switching threshold A and/or B.
The yellow LEDs indicate the current state of the selected output.

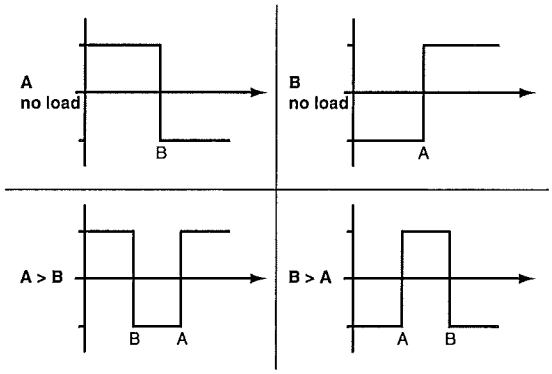
To store the switching threshold (distance value) press the "SET" button until the LEDs flash in phase (approx. 2 s). Teach-in starts when the "SET" button is released.
Successful teach-in is indicated by alternating flashing (2.5 Hz) of the yellow and green LEDs.

Unsuccessful teach-in is indicated by alternating flashing (8 Hz).

After successful teach-in, the output and LED change their status.
After unsuccessful teach-in, the sensor continues to operate with the previous valid setting after the relevant error message is issued.

This procedure can be repeated for all switching points.

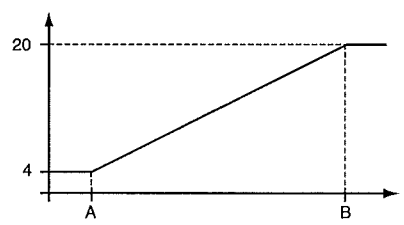
Different switching modes can be selected by choosing different switching points.



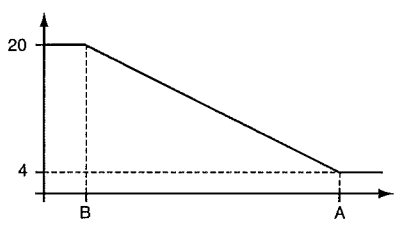
Every taught-in value can be re-taught (overwritten) by pressing the SET button again.

By pressing the "SET" button for > 5 s, the taught-in value is deleted. This procedure is indicated when the LEDs go out simultaneously.
The teach-in of the minimum and maximum value for the analog output **Q2** is set in the same way as the switching output:
For: A = 4 mA
B = 20 mA
With this three different modes are achieved:

A < B -> rising slope



A > B -> falling slope



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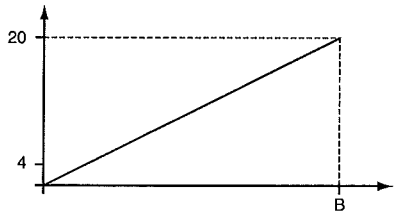
A empty -> zero point straight



Default setting analog output Q2

A = 200 mm
B = 5000 mm

It is not possible to delete value B.
By deleting value A you reach mode „zero point straight"

Reset to default settings

- Set the rotary switch to the "RUN" position.
- Press the "SET" button until the in-phase flashing of the LEDs stops (approx. 10 s)
- If the green LED lights up, the procedure is complete.

Error messages

- Short circuit — In the event of a short circuit, the green LED flashes with a frequency of approx. 4 Hz.
- Teach error: — In the event of a teach error, both LEDs flash alternately with a frequency of approx. 8 Hz.

Laser notice laser class 2

- The irradiation can lead to irritation especially in a dark environment. Do not point at people!
- Caution: Do not look into the beam!
- Maintenance and repairs should only be carried out by authorized service personnel!
- Attach the device so that the warning is clearly visible and readable.
- Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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LIFT DRIVE MOTOR

Manual Geral de Instalação, Operação e Manutenção de Motores Elétricos

Installation, Operation and Maintenance Manual of Electric Motors

Manual General de Instalación, Operación y Mantenimiento de Motores Eléctricos

		No.:
		Date: 08-JAN-2014

DATA SHEET
Three-phase induction motor - Squirrel cage rotor

Customer	:	
Product line	:	W22 High Efficiency

Frame	:	143T
Output	:	1 HP
Frequency	:	60 Hz
Poles	:	4
Full load speed	:	1770
Slip	:	1.67 %
Voltage	:	230/460 V
Rated current	:	3.12/1.56 A
Locked rotor current	:	23.1/11.5 A
Locked rotor current (Il/In)	:	7.4
No-load current	:	2.64/1.32 A
Full load torque	:	2.93 lb.ft
Locked rotor torque	:	280 %
Breakdown torque	:	350 %
Design	:	B
Insulation class	:	F
Temperature rise	:	80 K
Locked rotor time	:	13 s (hot)
Service factor	:	1.25
Duty cycle	:	S1
Ambient temperature	:	-20°C - +40°C
Altitude	:	1000
Degree of Protection	:	IP55
Approximate weight	:	37 lb
Moment of inertia	:	0.09112 sq.ft.lb
Noise level	:	51 dB(A)

	D.E.	N.D.E.
Bearings	6205 ZZ	6204 ZZ
Regreasing interval	---	---
Grease amount	---	---

Load	Power factor	Efficiency (%)
100%	0.73	82.5
75%	0.64	82.5
50%	0.52	78.5

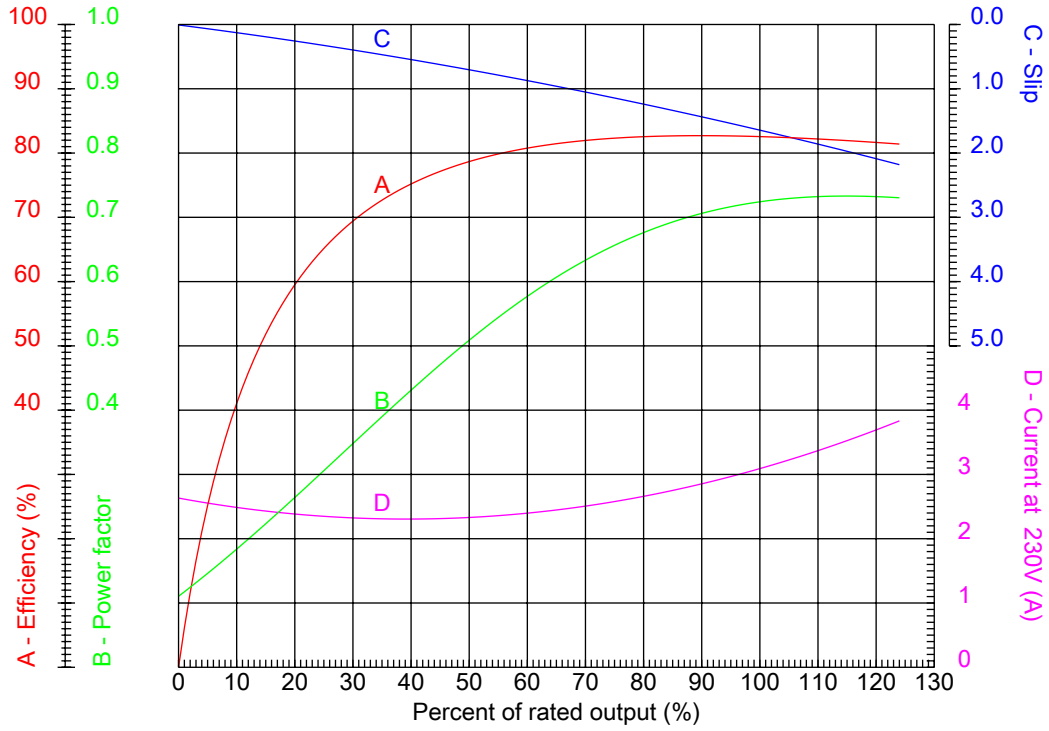
Notes:

Performed by	Checked

	No.:
	Date: 08-JAN-2014

PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer	:
Product line	: W22 High Efficiency

Frame	: 143T	Locked rotor current (Il/In)	: 7.4
Output	: 1 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.25
Full load speed	: 1770	Design	: B
Voltage	: 230/460 V	Locked rotor torque	: 280 %
Rated current	: 3.12/1.56 A	Breakdown torque	: 350 %
Insulation class	: F		

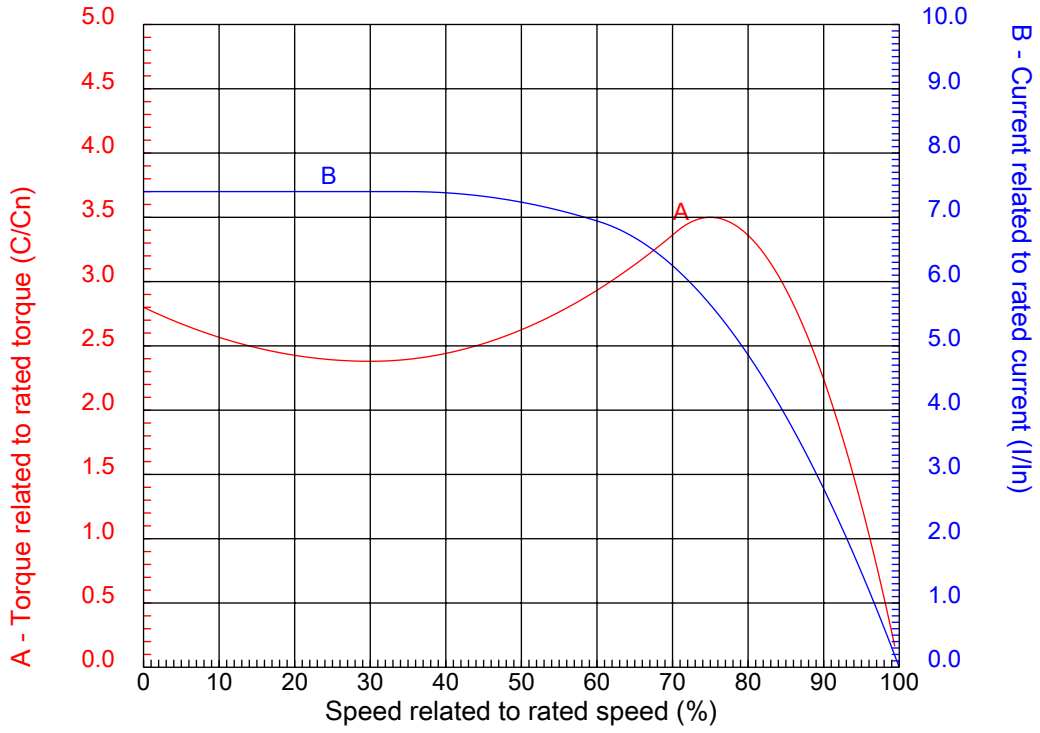
Notes:

Performed by	Checked

	No.:
	Date: 08-JAN-2014

CHARACTERISTIC CURVES RELATED TO SPEED

Three-phase induction motor - Squirrel cage rotor

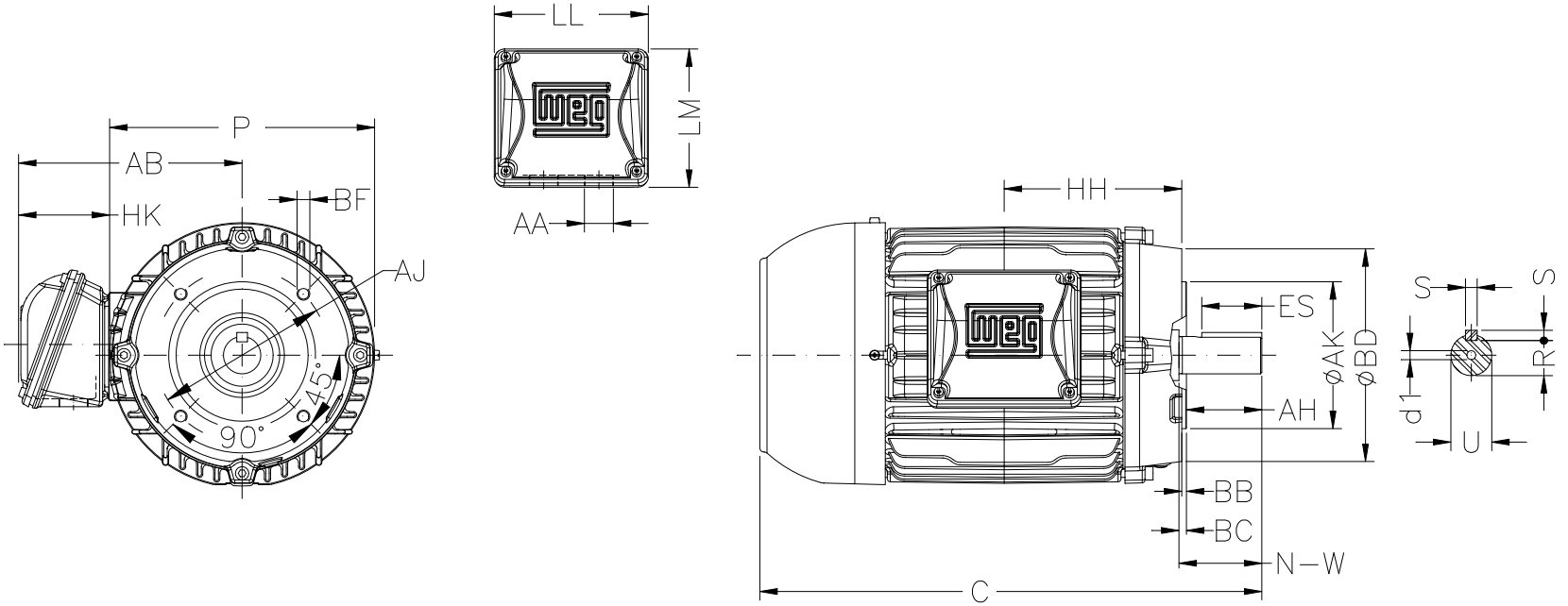


Customer	:
Product line	: W22 High Efficiency

Frame	: 143T	Locked rotor current (Il/In)	: 7.4
Output	: 1 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.25
Full load speed	: 1770	Design	: B
Voltage	: 230/460 V	Locked rotor torque	: 280 %
Rated current	: 3.12/1.56 A	Breakdown torque	: 350 %
Insulation class	: F		

Notes:

Performed by	Checked



P 7.047	AB 6.181	U 0.875	N-W 2.250	ES 1.575
S 0.187	R 0.765	depth 0.187	HH 4.250	HK 2.638
C 12.346	LL 4.527	LM 4.094	AA NPT 3/4"	d1 A 4
Flange FC-149	AJ 5.875	AK 4.500	BD 6.500	BF UNC 3/8"x16
BB 0.156	BC 0.125	AH 2.125		

Notes:

Performed by:

Checked:

Customer:

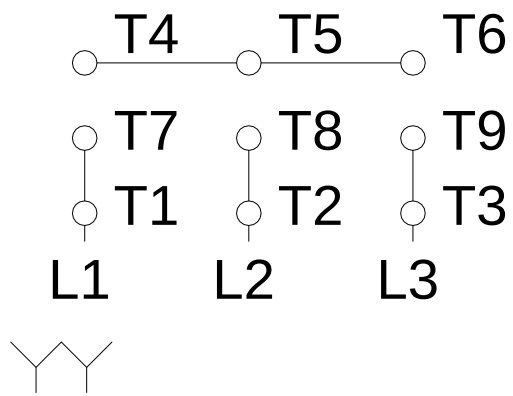
W22 High Efficiency

Three-phase induction motor

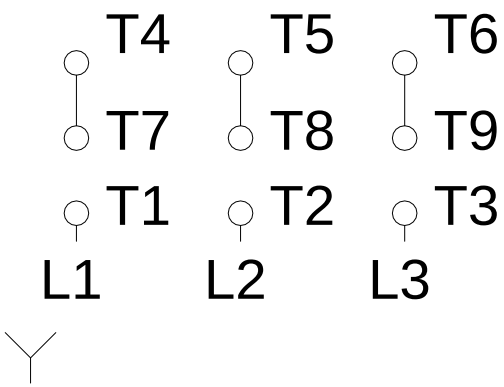
Frame 143T - IP55

08-JAN-2014

LOW VOLTAGE



HIGH VOLTAGE



Notes:		
Performed by:		
Checked:		
Customer:		
W22 High Efficiency		
Three-phase induction motor Frame 143T - IP55	08-JAN-2014	

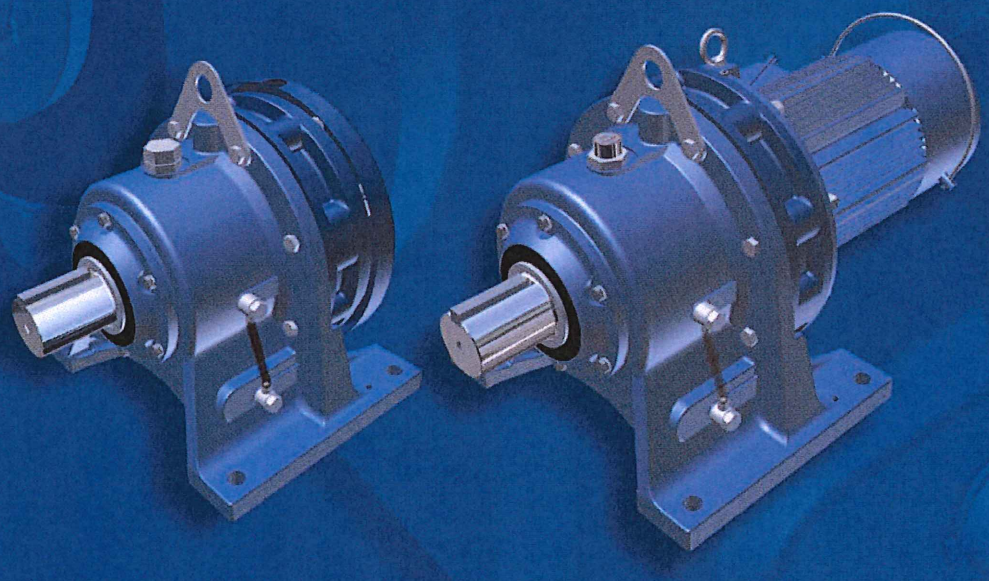
WesTech

LIFT DRIVE REDUCER

SUMITOMO
MACHINERY CORPORATION OF AMERICA

POWER TRANSMISSION PRODUCTS

Cyclo® 6000



▸ High Torque Density, High Reliability Cycloidal Speed Reducers and Gearmotors

A Unique Concept . . .

The word CYCLO . . .
. . . derives from *Kyklos* the Greek word for *circle* and refers to the CYCLO disc, whose outer profile describes a cycloidal curve.

Features & Benefits of the CYCLO concept

• Outstanding Reliability – 2 Year Warranty

CYCLO speed reducers are noted for outstanding reliability and extended operating lifetime – 20 years of problem-free performance is not unusual. This reliability is due in part to the high material specifications, component quality controls and careful assembly procedures. It also results from the *total absence of sliding friction*. Correctly sized and selected CYCLO speed reducers and gearmotors are covered by a two year warranty.

• High Overload Capacity – 500% plus

CYCLO speed reducers have the strength to withstand over-loads that can break the teeth of other reducers.

Here's why:

At least 30% of the CYCLO's unique disc profiles share shock of overload and the components are in *compression* – so they cannot be sheared off.

Compare that to conventional helical gear reducers, where one or two teeth must absorb the entire shock and are more prone to catastrophic failure.

• Overall Economy

Competitive initial cost, high reliability, long life and minimal maintenance give CYCLO speed reducers superior overall economy when compared to conventional gear boxes.

• Ideal for Highly Dynamic Applications

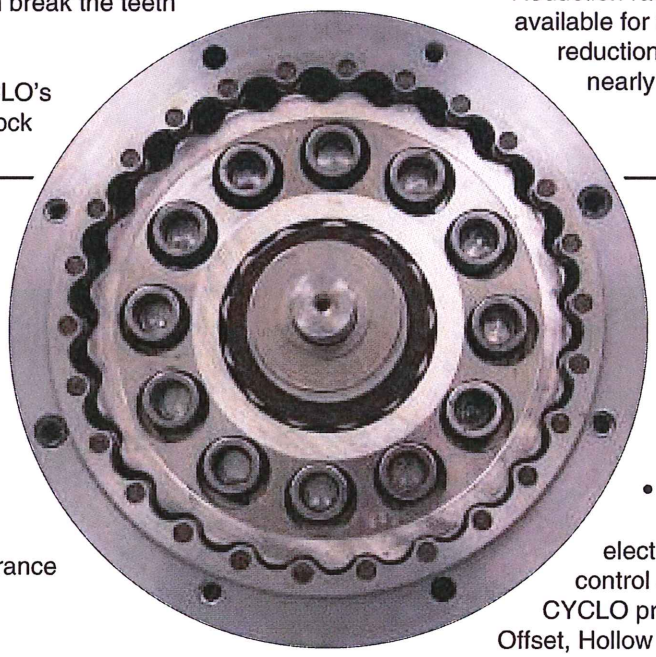
Since inertia is very low, the CYCLO speed reducer is ideally suitable for frequent start-stop-reversing duties and the combination with a frequency inverter.

• High Efficiency – Even at High Ratios

Torque transmitting parts have rolling action with minimal friction, so the overall efficiency is as high as 95% in single reduction units.

• Compact Size

Reduction ratios from 6:1 to 119:1 are available for the single stage. Triple reduction stages offer ratios up to nearly 1,000,000:1.



Additional Value

Sumitomo, THE ORIGINAL CYCLO, offers these additional benefits:

• Total Quality

Precision manufacturing and unmatched Quality Assurance insure consistent product performance.

• 70 Years of Product Development

The unique CYCLO operating principle was invented by the German engineer Lorenz Braren in 1931 and his ingenious design has continued its progressive development until the present day.

• Over 7,000,000 Units Sold

CYCLO speed reducers are in daily use in industries throughout the world replacing the more conventional helical, worm and spur gear units.

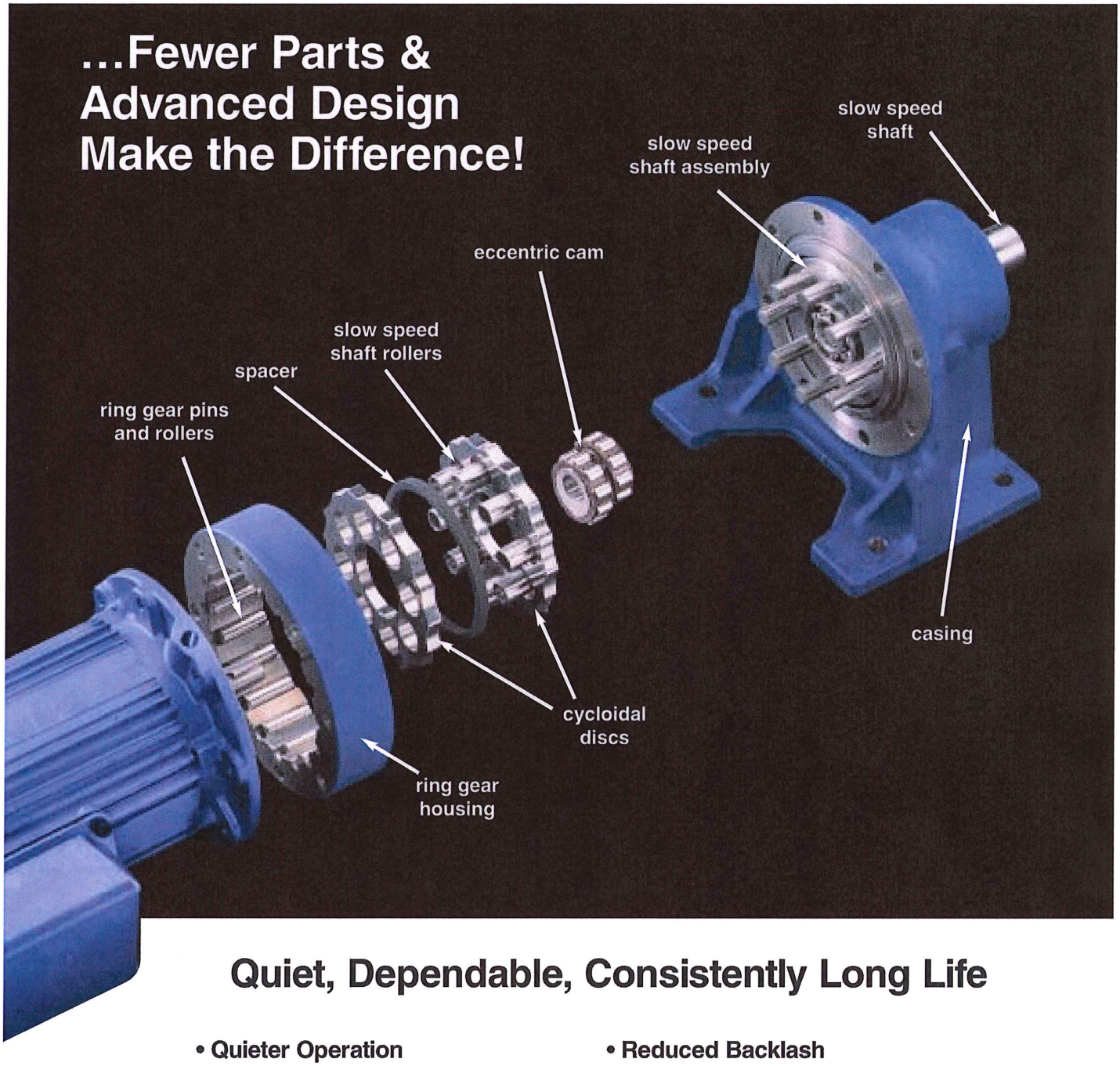
• Many Options . . .

. . . in mechanical and electrical power transmission and control are offered in the complete CYCLO product range. Right Angle, Offset, Hollow Shaft, and Bushing Mounted variations are readily available.

• Worldwide Product Support

Fast, competent technical assistance with selection, installation and after-sales service is available from production and distribution centers throughout the world.

...Fewer Parts & Advanced Design Make the Difference!



Quiet, Dependable, Consistently Long Life

• Quieter Operation
Super finishing of rotating components provides smoother rolling action

• Higher Ratings
Optimized design imparts more uniform internal load distribution

• Longer Life
Improved internal gearometry extends already long life

• Reduced Backlash
Decreased internal clearances for high performance requirements

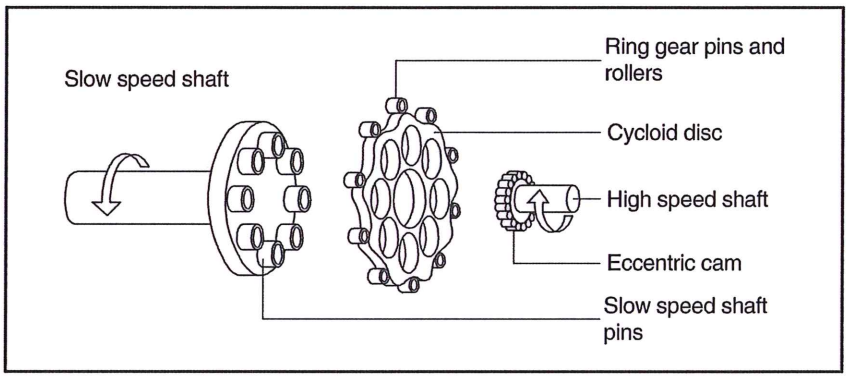
• Total Dependability
Torque transmitting parts are made from fully hardened, vacuum degassed bearing grade steel

• Absolute Consistency
Stringent manufacturing process and assembly controls assure reliability

HOW IT WORKS

The unique SM-CYCLO® speed reducing system is based on an ingeniously simple principle that offers many benefits to the designer and user of power transmission drives. Basically, the speed reducer has only three major moving parts:

1. **High speed input shaft with integrally mounted eccentric cam and roller bearing assembly**
2. **Cycloid discs**
3. **Slow speed shaft assembly**

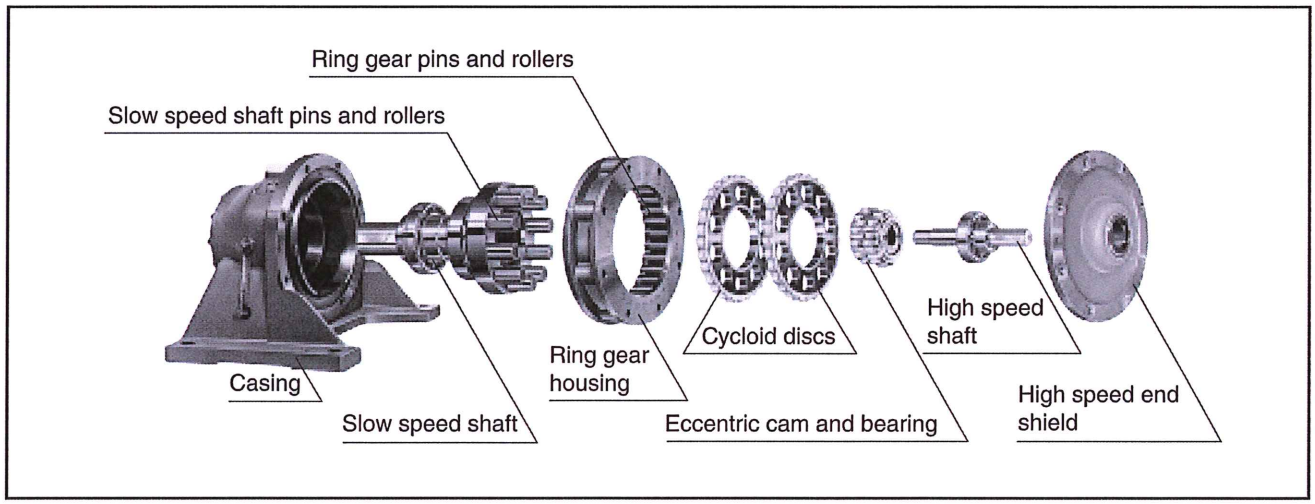


As the eccentric cam rotates, it rolls the cycloid discs around the internal circumference of the stationary ring gear.

The resulting action is similar to that of a wheel rolling around the inside of a ring. As the wheel (cycloid disc) travels in a clockwise path around the ring (ring gear housing), the wheel itself turns slowly on its own axis in a counter-clockwise direction. In the SM-CYCLO® system the cycloidal profile around the outer edge of the disc engages progressively with the rollers of the fixed ring gear housing to produce a reverse rotation at reduced speed. For each complete revolution of the high speed shaft, the cycloid disc turns one cycloidal tooth in the opposite direction. In general, there is one less cycloidal tooth around the disc than there are pins in the fixed ring gear housing, which results in reduction ratios equal to the number of cycloidal teeth on the disc. (Note: For some ratios, there are two less teeth per cycloid disc than there are pins in the ring gear housing.)

The reduced rotation of the cycloid discs is transmitted to the slow speed shaft by means of drive pins and rollers that engage with holes located around the middle of each disc.

Typically, a two disc system is used with a double eccentric cam which increases the torque capacity and offers an exceptionally smooth, vibration-free drive.

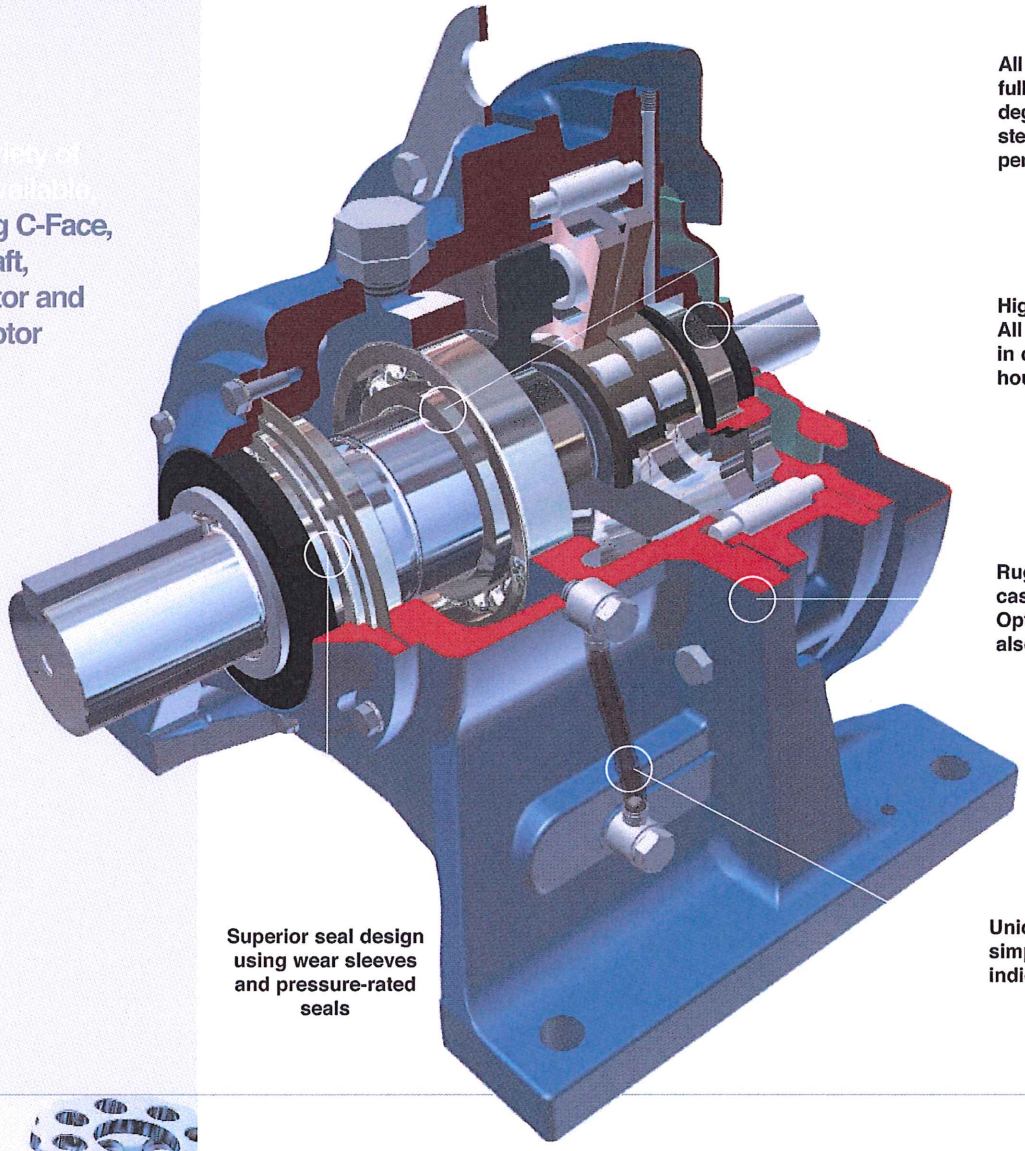


SUMITOMO
MACHINERY CORPORATION OF AMERICA

Cyclo® 6000

High Torque Density, High Reliability Cycloidal Speed Reducers

- Wide variety of inputs available, including C-Face, Free-Shaft, Gearmotor and Brakemotor



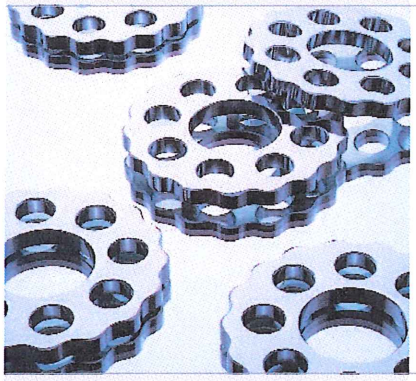
All rotating components are fully hardened, vacuum degassed bearing grade steel, for consistent, reliable performance

High power density. All reduction contained in compact ring gear housing

Rugged, shock-resistant cast iron housing. Optional ductile iron also available

Superior seal design using wear sleeves and pressure-rated seals

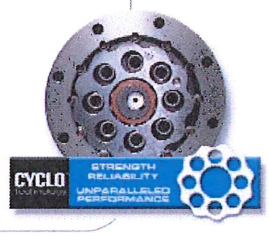
Unique oil sight gauge for simple, visible lubrication indication

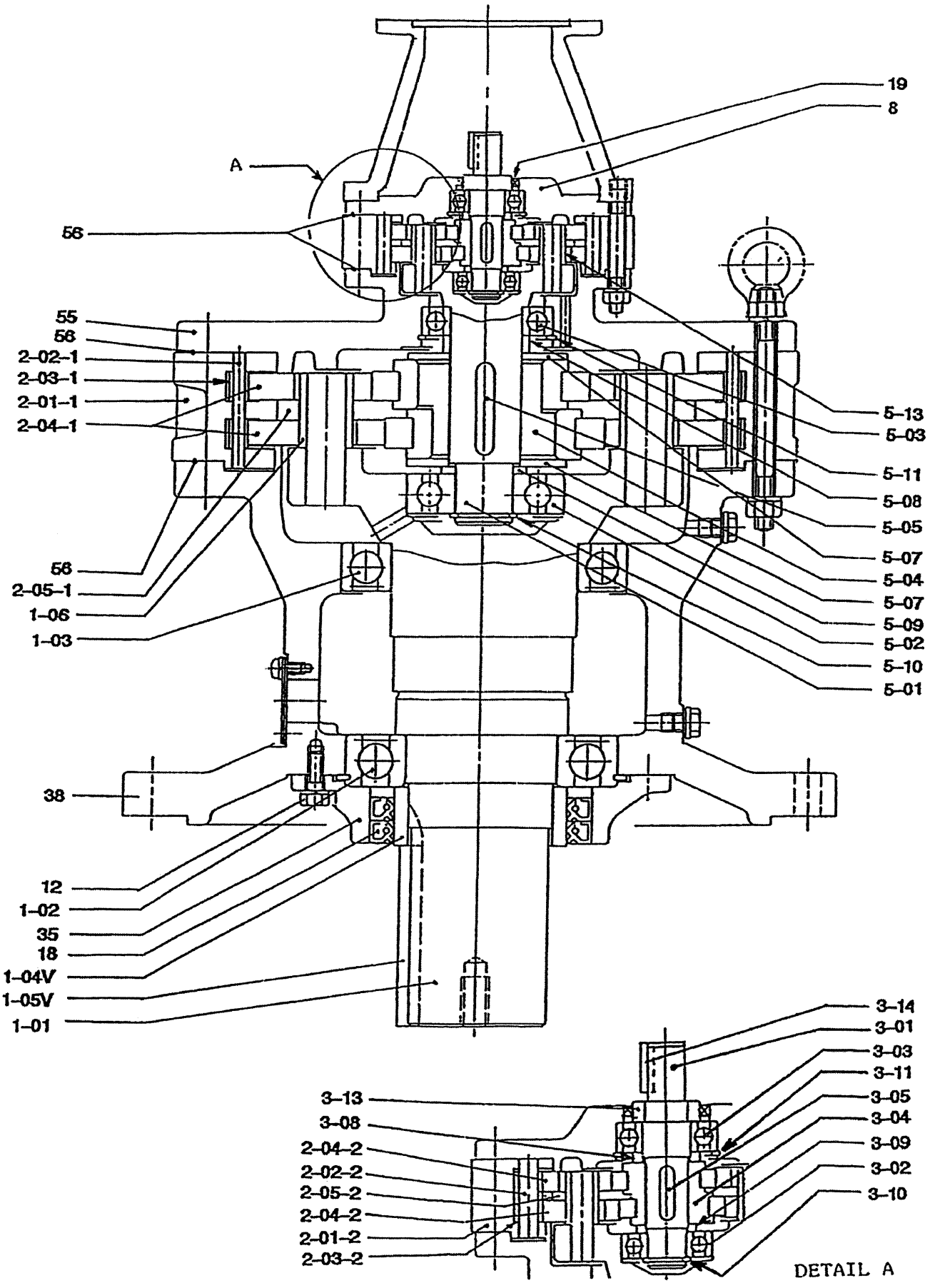


Unmatched Reliability, Exceptional Performance

Cyclo® speed reducers and gearmotors are

of their ratings




19
8
A
56
55
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2-02-1
2-03-1
2-01-1
2-04-1
5-13
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5-09
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2-05-1
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1-02
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1-04V
1-05V
1-01
3-14
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3-05
3-04
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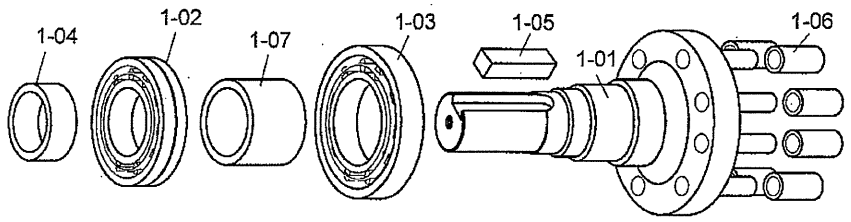
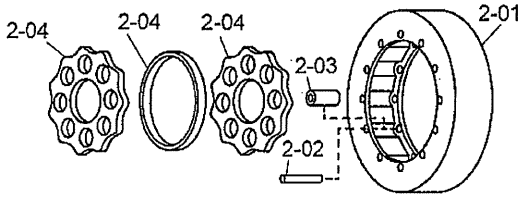
3-02
3-10
3-13
3-08
2-04-2
2-02-2
2-05-2
2-04-2
2-01-2
2-03-2
DETAIL A

PART#	PART DESCRIPTION
1-01	SLOW SPEED SHAFT WITH PIN
1-02	BEARING A
1-03	BEARING B
1-04V	OIL SEAL COLLAR - VERTICAL
1-05V	KEY - VERTICAL
1-06	SLOW SPEED SHAFT ROLLERS
2-01-1	RING GEAR HOUSING
2-01-2	RING GEAR HOUSING
2-02-1	RING GEAR PINS
2-02-2	RING GEAR PINS
2-03-1	RING GEAR ROLLERS
2-03-2	RING GEAR ROLLERS
2-04-1	CYCLO DISC
2-04-2	CYCLO DISC
2-05-1	SPACER RING
2-05-2	SPACER RING
3-01	HIGH SPEED SHAFT
3-02	BEARING C
3-03	BEARING D
3-04	ECCENTRIC BEARING ASSEMBLY
3-05	ECCENTRIC KEY
3-06	BALANCE WEIGHT
3-07	SPACER
3-08	SPACER
3-09	SPACER
3-10	RETAINING RING
3-11	RETAINING RING
3-13	COLLAR
3-14	KEY
5-01	INTERMEDIATE SHAFT WITH PINS
5-02	BEARING F
5-03	BEARING G
5-04	ECCENTRIC BEARING ASSEMBLY (1)
5-05	ECCENTRIC KEY
5-07	SPACER
5-08	SPACER
5-09	SPACER
5-10	RETAINING RING
5-11	RETAINING RING (2)
5-13	INTERMEDIATE SHAFT ROLLERS
8	HIGH SPEED END SHIELD
12	BOLTS FOR SS OIL SEAL HOUSING
18	SLOW SPEED OUTPUT OIL SEAL
19	HIGH SPEED INPUT OIL SEAL
35	VERTICAL OIL SEAL HOUSING
38	VERTICAL CASE (INTEGRAL V TYPE)
55	INTERMEDIATE COVER
56	GASKET SET

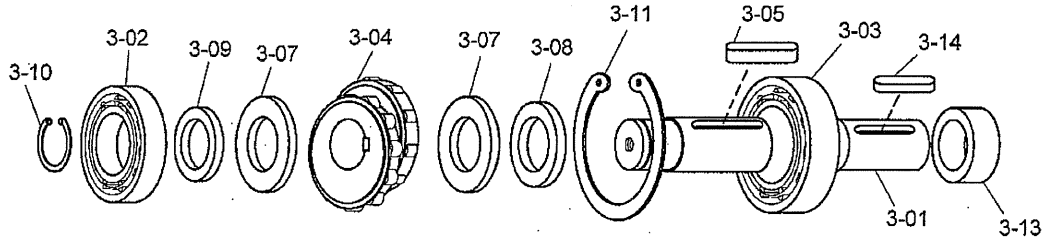
Slow Speed Shaft Assembly



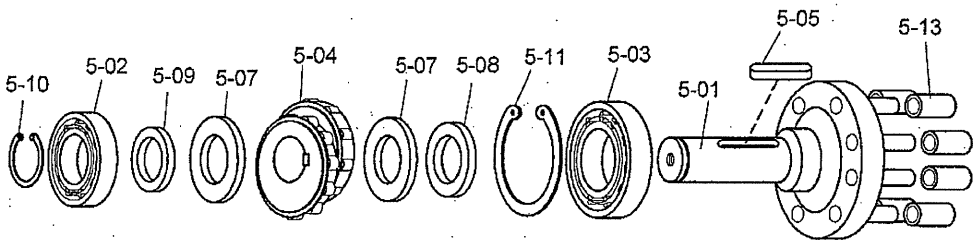
Reduction Parts Sub-Assembly



High Speed Shaft Assembly



Intermediate Shaft Assembly



Lubricants

Grease Lubricated Models

Those models listed in Tables A-3 ~ A-6 as grease lubricated are filled with grease before shipment to the customer and are ready for use.

Table A-7. Standard Greases[1]

Ambient Temperature[2]		SM-Cyclo® Speed Reducer
°F	°C	Shell Oil
14 to 122	-10 to 50	Shell Alvania® Grease 2 (NLGI Grade #2)

Table A-8. Grease Replenishment and Change Interval

Model	Condition		Interval[3]
Single and Double Reduction Maintenance Free Type	Replenishment		NOT REQUIRED
	Overhaul[4]		Every 20,000 Hours or Every 4 ~ 5 Years
Double Reduction	Replenishment	Less Than 10 Hours Per Day Operation	Every 3 ~ 6 Months
		10 ~ 24 Hours Per Day Operation	Every 500 ~ 1000
	Change	Speed Reducer Mechanism, High Speed Shaft Bearings (Speed Reducer Type)	Every 2 ~ 3 Years
		Slow Speed Shaft Bearings	Every 3 ~ 5 Years

Replenishment and Change Guidelines

Replenish grease to the reduction mechanism 1/3 to 1/2 of the quantity listed in Table A-9 or A-10 for the first reduction stage at the interval recommended in Table A-8.

When the unit is disassembled for overhauling, refill with the grease quantities indicated in Table A-9 or A-10. Or alternatively, 80% of the space around the reduction mechanism and slow speed shaft bearings of single reduction units, and 50% around the reduction mechanism of both the first and second stage of double reduction units.

Slightly larger quantities may be supplied to lower reduction ratio units, and somewhat smaller quantities for high reduction ratio units.

Apply grease liberally to the central part (i.e., around the eccentric bearings) of the mechanism. Apply grease to both the slow speed and high speed shaft bearings as you would to ordinary bearings at the time of re-assembly.

If excessive grease is added, agitation heating of the grease will raise the operating temperature of the unit. Avoid excessive greasing, but do not supply an insufficient amount of grease. When the grease is insufficient, it will raise the unit's operating temperature due to breakdown of the lubrication films on the eccentric bearing. In this case, if the operating temperature rises, supply grease immediately.

Notes: [1] Avoid the use of grease other than shown in Table A-7.
[2] Consult the factory when the drives are used under widely fluctuating temperatures, ambient temperatures other than those listed in Table A-7, or any other special conditions.
[3] Single reduction frame sizes 6060 ~ 612H and double reduction frame sizes 6060DA ~ 6125DB are maintenance free units. Grease replenishment is not necessary. Where longer life of the drive is expected or if re-lubricating is preferred before the recommended interval, refer to Tables A-7, A-8, A-9 and A-10.
[4] Overhauling consists of disassembling the unit, replacing the seals and gaskets, cleaning the internal parts and then repacking the unit with designated grease.

DISASSEMBLY/ASSEMBLY

Disassembly

SM-CYCLO® Reducers are designed to provide maximum ease when disassembing and reassembling; they require no special maintenance skills.

1. Remove the complete SM-CYCLO® Reducer with adaptor (motorized type) from the driven machine.

2. Remove the plug at the bottom of the oil gauge to drain all oil from the unit.

3. Remove the cooling fan cover and fan from those Speed Reducers (not motorized) equipped with a cooling fan, and stand the unit on a solid base with its high speed shaft side down. Remove the through bolts for the high speed end shield, ring gear housing, and lift the slow speed side, thus separating the unit into two parts so that the inner mechanism can be removed (Figs. A-12 ~ A17).

Note: If the reducer is motorized (C-adaptor and coupling) remove the motor and coupling before following the procedure outlined above. As a final step, remove the adaptor and cooling fan.

4. If the unit will not separate easily, gently drive a wedge at the line X shown in Fig. A-1 on page A-3 (if this produces a burr, be sure to remove it before reassembly).

5. To lift the slow speed side, attach an eyebolt to the tapped hole on the end of the slow speed shaft and use a hoist or chain block (Fig. A-12).

6. Take out the slow speed shaft rollers, item 1-06, page A-3 (Fig. A-13). Check the slow speed shaft pins (1-01) to see whether any rollers have adhered to them.

7. Using both hands, lift out the top cycloid disc (2-04) on the slow speed side (Fig. A-14).

8. Remove the spacer ring (2-05).

9. The eccentric (3-04) can be removed from the input shaft (3-01) after taking out the retaining ring (3-10) and the inner bearing raceway (Figs. A-15, A-16).

Note: In certain sizes, the eccentric bearings are roller bearings without a retainer. Remove bearings of the top disc before proceeding with the next step.

10. Take out the second disc located on the motor side. (Also remove second disc bearings and eccentric with inner bearing raceway if required.)

11. Remove the ring gear housing (2-01).

12. Follow these steps to remove the slow speed shaft (1-01) with its bearings from the casing (26): (a) Remove the horizontal oil seal housing (25). (b) With a wooden or hard rubber mallet, rap the inner end of the slow speed shaft to expose the retaining ring* from the outer raceway of the bearing. (c) Remove the retaining ring. (d) Rap the outer end of the slow speed shaft with a wooden or hard rubber mallet, and remove it from the casing.

13. The high speed shaft (3-01) with bearings is removed from the high speed shaft end shield (8) by tapping the shaft end after first taking off the retaining ring (3-11).

14. The cycloid disc is made from heat-treated bearing steel and the spacer ring is cast iron. Take care not to strike them together while handling.

The above instructions cover complete disassembly. In ordinary cases, however, only the removal of the cycloid discs and the eccentric, and removal of the slow speed shaft from the slow speed end cap is necessary.

***Note:** Retaining ring is part of bearing A (Part No. 1-02).

Assembly

SM-CYCLO® Reducers are reassembled by reversing the disassembly procedure. Care must be taken to exclude dust or foreign matter from the moving parts, and to see that gaskets are properly placed to make the assembly oil-tight.

Following are some helpful points to remember when assembling SM-CYCLO® Reducers.

1. Set the ring gear housing and insert the ring gear pins and rollers; then test-rotate the pins and rollers by hand. (Apply grease liberally to the ring gear pins and rollers before they are inserted in grease lubricated SM-CYCLO® Reducers.)

2. Cycloid discs are a matched pair. Each carries the same number stamped on one side of the disc.

3. Set the cycloid disc with the stamped number face up as shown in Fig. A-17.

4. Insert the spacer (3-07) and then insert the eccentric with bearings by rapping with a wooden or hard rubber mallet (Fig. A-16).

5. Insert the other spacer and the inner bearing raceway. Secure them with the retaining ring (Fig. A-15).

6. Set the spacer ring in place.

7. Insert top disc in such a way that the mark is 180° opposed to the mark on the bottom disc (Fig. A-13).

8. Insert slow speed shaft rollers (Fig. A-13).

9. Put the slow speed shaft pins into the rollers (Fig. A-12). The above instructions are for **eccentric bearings with retainer.** Following are the instructions suggested for **roller bearings without retainer.**

a. First insert the eccentric with inner raceways of bearings by rapping with a wooden or hard rubber mallet.

Fig. A-12

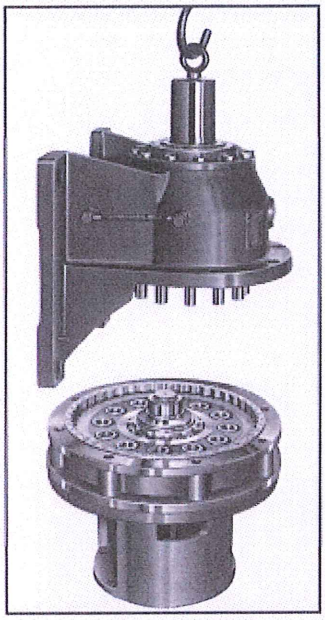


Fig. A-13

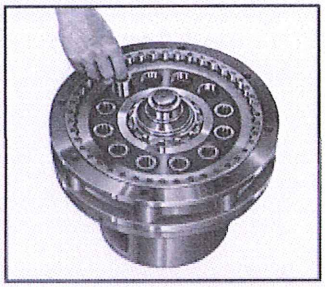


Fig. A-14

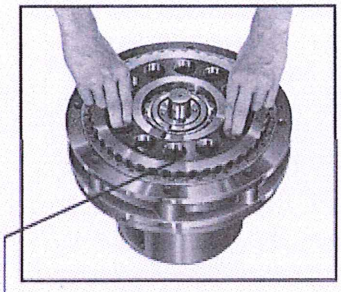


Fig. A-15

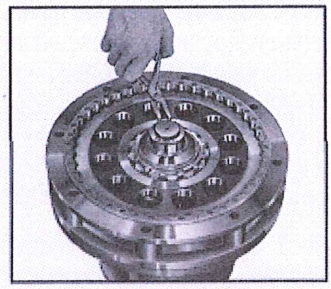


Fig. A-16

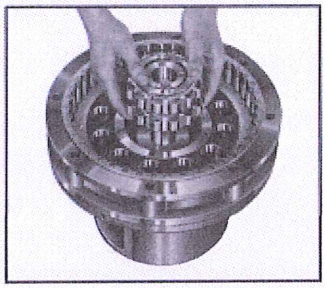
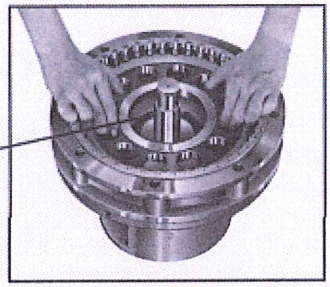


Fig. A-17



Note: Insert second disc with number facing slow speed side, exactly 180° opposed to number on first disc.

Note: Set disc with number facing slow speed side.

b. Apply grease to the raceway of the eccentric on the disc. Fix the rollers and set disc in place.

c. Insert the spacer ring and set second disc in such a way that mark is 180° opposed to mark on the bottom disc.

Eccentric Bearing Replacement Precautions

The eccentric bearings are specially designed for installation on SM-CYCLO® Reducers. They are special roller bearings without outer raceways (refer to the list of bearings on pages A-12 ~ A-13).

It is necessary to insert replacement bearings with numbered surfaces of the inner raceways facing outward. Note that incorrect insertion of the bearings (i.e., insertion of bearings with numbered surfaces inside) causes trouble.

Disassembly and Assembly of Sizes 6060-6095 SM-CYCLO® Reducers

Small sizes 6060-6095 have a single disc system, so they differ in construction from larger sizes in the following ways:

1. A balance weight is provided in lieu of the two-disc system. Refer to figure A-18.

2. The balance weight must be positioned exactly 180° as opposed to that of the eccentric.

3. There are no end plates on either side of the eccentric. In all other respects, 6060-6095 have exactly the same construction as the larger sizes. Follow the instructions given under "Disassembly and Assembly".

Disassembly Of Output Side (6060-612H)

1. With casing supported, tap output shaft until it is disengaged from casing.

2. Remove bearing "A" by using pulling tool.

3. Replace all bearings, gaskets and seals when reassembling. (Pages A-11 ~ A-13).

Assembly Of Output Side (6060-612H)

1. Assemble the "B" bearing (Part No. 1-03) on the slow speed shaft (Part No. 1-01). Heating of "B" bearing is recommended for easier assembly.

Note: Do not exceed temperature of 200°F.

2. Assemble the casing (Part No. 26) over the slow speed shaft (Part No. 1-01), being sure to maintain "X" (Fig. A-18).

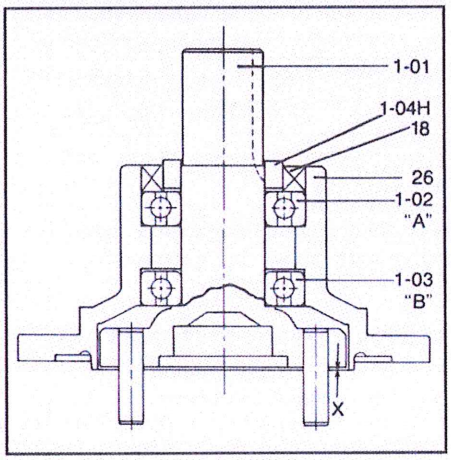
3. Carefully tap bearing "A" (Part No. 1-02) onto the slow speed shaft (Part No. 1-01) until the bearing is flush with the shoulder of the casing.

4. Place the collar (Part No. 1-04H) onto the slow speed shaft (Part No. 1-01). Heating the collar is recommended for easier assembly.

5. Insert the oil seal (Part No. 18), lip in, into the casing (Part No. 26).

Note: Measure for dimension "X" preferably in 3 places to insure proper spacing.

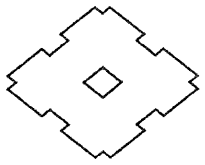
Fig. A-18



X" Dimension (inches)

Frame Size	Dimension
6060/65	0.046 ± 0.007
6070/75 6080/85	0.042 ± 0.007
6090/95	0.046 ± 0.007
6100/05 610H	0.046 ± 0.007
6110/15/20/ 25, 612H	0.042 ± 0.007

TROUBLESHOOTING AND REPAIR



This troubleshooting guide is to help you identify and overcome common problems of reducers. If you have a problem not listed below, please consult factory.

PROBLEM WITH THE REDUCER		POSSIBLE CAUSES	SUGGESTED REMEDY
Runs Hot	Overloading	Load exceeds the capacity of the reducer.	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce load.
	Improper Lubrication	Insufficient lubrication.	Check lubricant level and adjust up to recommended levels.
		Excessive lubrication.	Check lubricant level and adjust down to recommended level.
		Wrong lubricant.	Flush out and refill with correct lubricant as recommended.
Runs Noisy	Loose Foundation Bolts	Weak mounting structure.	Inspect mounting of reducer. Tighten loose bolts and/or reinforce mounting and structure.
		Loose hold down bolts.	Tighten bolts.
	Worn Disc	Overloading unit may result in damage to disc.	Disassemble and replace disc. Recheck rated capacity of reducer.
	Failure of Bearings	May be due to lack of lubricant.	Replace bearing. Clean and flush reducer and fill with recommended lubricant.
		Overload.	Check rated capacity of reducer, replace with unit of sufficient capacity or reduce load.
	Insufficient Lubricant	Level of lubricant in the reducer not properly maintained.	Check lubricant level and adjust to factory-recommended level.
	Damaged Pins & Rollers	Overloading of reducer.	Disassemble and replace ring gear pins and rollers. Check load on reducer.
Output Shaft Does Not Turn	Input Shaft Broken	Overloading of reducer can cause damage.	Replace broken shaft. Check rated capacity of reducer.
		Key missing or sheared off on input shaft.	Replace key.
	Eccentric Bearing Broken	Lack of lubricant.	Replace eccentric bearing. Flush and refill with recommended lubricant.
		Coupling loose or disconnected.	Properly align reducer and coupling. Tighten coupling.
Oil Leakage	Worn Seals	Caused by dirt or grit entering seal.	Replace seals. Breather filter may be clogged. Replace or clean filter.
		Overfilled reducer.	Check lubricant level and adjust to recommended level.
		Vent clogged.	Clean or replace element, being sure to prevent any dirt from falling into the reducer.
		Improper mounting position, such as wall or ceiling mount of horizontal reducer.	Mount horizontally or rework reducer to wall or ceiling mount.

PARTS LIST

WESTECH

Description **DRIVE UNIT SL43**

Parts List No **32105** Rev.
Job Name **COAL INNOVATIONS**
Job No **22157A**
Model No **SL43-100K-10TON**

Qty **1**
Size **43**
Type **CLARIFIER**
Weight **6085** lbs

Date **11/15/2013**
Proj. By **HO42**
Proj. Chkd. **BU23**
Proj. Aprvd. **WA105**

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
							DRIVE FABRICATION/ASSEMBLY NOTES			
					22157A-D02	0	SHAFT DRIVE ASSEMBLY - ELEVATION			0
					22157A-D03	0	SHAFT DRIVE ASSEMBLY - PLAN			0
							REFERENCE DRAWINGS:			
	1	1			22157A-D05	0	EQUIPMENT LUBRICATION & NAME TAG			0
			EACH	A60B-001A-D	A60B-001A-D	E	FABRICATION AREA CLEANING REQ GRADE "D"	----		
			EACH	DRV103	DRV103	E	DRIVE ASSEMBLY PROCEDURES FASTENER TORQUE	----		
			EACH	DRV105	DRV105	B	SEALANT ADHESIVE SPECIFICATION PRODUCTS AND PURPOSE	---		
			EACH	DRV111	DRV111	0	STANDARD SPECIFICATION - DRIVES TOLERANCES FABRICATION WELDING DIMENSIONS MATERIALS			
				SL43-OGA1-LC	SL43-OGA1-LC	0	ASSEMBLY DIAGRAM			
				SL43-OGA2-LASER	SL43-OGA2-LASER	0	ASSEMBLY DIAGRAM - 10 TON AUTO LIFT			
	1	1	EACH	MS-0303A	MS-0303A	0	STICKER, DIRECTION OF ROTATION CLOCKWISE	VINYL		

WesTech Engineering, Inc Telephone: 801.265.1000 Fax: 801.265.1080 www.WesTech-inc.com

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
	1	1	EACH	MS-0305A	MS-0305A	0	STICKER, STORAGE PROCEDURE BLACK TEXT YELLOW BACKGROUND	---		
	1	1	EACH	MS-0315A	MS-0315A	A	STICKER, MIN MAX	VINYL		
	2	2	EACH	MS-0335A	MS-0335A	0	STICKER, LIFT LIMIT	VINYL		
	1	1	EACH	MS-0379A	MS-0379A	0	STICKER, ATTENTION SEE INSTALLATION INSTRUCTIONS	VINYL		
	1	1	EACH	MS-0384A	MS-0384A	0	TAG, LUBRICATION AND INSPECTION 2 5/8 X 5 1/4 WATERPROOF	TYVEK		
			EACH	DRV109	DRV109	0	REQUIRED COATING APPLICATION STEPS	----		
							SURFACE PREPARATION AND PAINTING:			
			EACH	DRV113	DRV113	0	STANDARD SPEC, DRIVE ASSEMBLY - COATING SUBMITTAL DATA SHEET	---		
							ASSEMBLY FASTENER MATERIAL: ASTM A449 ZINC PLATED STEEL			
							HARDENED FLAT WASHERS TO BE F436 OR A325 ZP STL			
101	1	1		TBLOADCELL			TORQUE CONTROL DEVICE	SST	46	
	1	1					LOADCELL			
103	1	1		----------			SPEED REDUCER	CI-STL	518	
	1	1		119-014A00	119-014A00	0	REDUCER SHAFT MODIFICATION	---		
105	1	1		00318EP3ER182TC			RAKE DRIVE MOTOR	CI-STL	57	
109	1	1		900-580B03	900-580B03	0	GUARD	SST	3	
111	1	1		111-396	111-396	0	TORQUE ARM (L.H.)	STL	41	0

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
112	1	1	EA	312-156C05	312-156C05	0	UPPER BEARING HOUSING- CASTING	CI	42	
	1	1		312-155C05	312-155C05	D	UPPER BEARING HOUSING-MACHINING & ASSEMBLY			
113	1	1	EA	3100-375	RR-0002A	0	RETAINING RING, 3 3/4" EXT	STL		
114	1	1	EA	36185	MS-0194A	0	LOWER SHAFT SEAL, BRG HSG	NBR-STL	1	
115	1	1	EA	415045	MS-0289A	0	UPPER SHAFT SEAL, BRG HSG	NBR-STL	1	
116	2	2	EA	6019	BR-0053A	0	BALL BEARING, DEEP GROOVE	STL	6	
117	1	1	EA	3100-275	RR-0027A	0	RETAINING RING, 2 3/4" EXT	STL		
118	1	1		FAB			UPPER BEARING LUBE LINE (112 TO 412)	BRS-CU		
119	1	1		FAB			GREASE FITTING 1/4 NPT	STL		
120	1	1		120-196C09	120-196C09	B	REDUCER SHAFT ADAPTER	ALLOY STL	47	
121	1	1		121G183C09	121G183C09	0	PINION SHAFT	ALLOY STL	40	
123	1	1		123G026B05	123G026B05	0	PINION GEAR 13T	ALLOY STL	35	
124	1	1	EACH	NUP314ECP	BR-0001A	B	ROLLER BEARING	STL	7	
125	1	1		KEY087X087X700			KEY 7/8 X 7/8 X 7 (103 TO 120)	ALLOY STL		
126	1	1	EA	1093K1	MS-0154A	0	PRESSURE RELIEF FITTING	STL		
127	1	1	EA	3000-575	RR-0018A	0	RETAINING RING 5 3/4" INT	STL		
128	1	1	EA	3100-350	RR-0003A	0	RETAINING RING, 3 1/2" EXT	STL		
129	1	1		FAB			KEY 7/8 x 7/8 x 4 1/4 (123 TO 121)	4140		
130	7	7		FAB			CAPSCREW HEX HD 5/8 x 2 W/LW (112 TO 407)	STL		
131										
132	1	1					SHAFT COUPLING W/KEY (ORDERED W/103)	STL		
133	8	8		FAB			HEX HD CAPSCREW 5/8 X 1-1/2 W/LW (120 TO 121)	STL		
134	2	2		FAB			SELF TAPPING SCREW 1/4 x 1 W/FW (109 TO 411)	SST		
135	4	4		FAB			CAPSCREW HEX HD 3/8 X 1 W/LW (105 TO 103)	STL		
136	2	2		FAB			SETSCREW 1/2 X 3/4 (120 TO 103 & 125)	STL		

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
141	5	5		FAB			CAPSCREW HEX HD 5/8 x 3 W/N,LW (103 TO 111)	STL		
146	1	1	EACH	9452K365			O-RING, PRICE PER EACH, (5 PER PKG), 1/8"W X 8"I.D. X 8 1/4"O.D.,	BUNA-N		
403	1	1	EA	403G004C04	403G004C04	0	GEAR/BEARING 43" EXT PITCH DIA	ALLOY STL	450	
405	1	1		405G013D09	405G013D09	0	GEAR HUB	STL	540	
407	1	1		407G052D09	407G052D09	B	GEAR HOUSING	STL	874	
409	1	1		409G060C04	409G060C04	A	HOUSING COVER	STL	458	
411	1	1		312-157C05	312-157C05	A	TORQUE BOX ADAPTER SPACER	STL	54	
	1	1		312-033B05	312-033B05	0	TORQUE BOX ADAPTER SPACER BURNOUT	STL		
412	1	1		412-381	412-381	0	TORQUE BOX ADAPTER (L.H.)	STL	205	0
413	1	1		900-1286	900-1286	0	BACKSTOP SPACER	STL		
415	10	10	FT	ORG-018	MS-0066A	B	O-RING SEAL	NPRN		
416	8	8	LFT	MS-0382A	MS-0382A	0	SEAL STRIP	NPRN		

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
417	1	1		417D045D05	417D045D05	0	ADAPTER SHAFT	STL	1377	
418	2	2		FAB			LUBE LINE (403 TO 407)	BRS-CU		
419	2	2		FAB			GREASE FITTING 1/4 NPT	STL		
420	8	8	LFT	6542K64			BANDING	304		
	1	1	EA	6542K74			BUCKLE	304		
424	30	30		FAB			CAPSCREW HEX HD 5/8 X 1-1/2 W/N, HDND FW (403 TO 407)	STL		
425	16	16		FAB			CAPSCREW HEX HD 5/8 x 1-1/2 W/N, HDND FW (405 TO 403)	STL		
431	12	12		FAB			CAPSCREW HEX HD 5/8 X 2 1/2 W/N,LW (409 TO 407)	STL		
	4	4		FAB			CAPSCREW HEX HD 5/8 X 1 1/4 W/LW (409 TO 407)	STL		
437	8	8		FAB			CAPSCREW HEX HD 1/2 x 1-3/4 W/N,LW (412 TO 411)	STL		
438	4	4		FAB			CAPSCREW HEX HD 1-12NF x 3 (LEVELING DRIVE)	STL		
439	3	3		FAB			GEAR HUB LUBE LINE	BRS-CU		
441	1	1	EA	LSP51-09-01	GA-0005A	A	OIL LEVEL SITE GAUGE	NP STL	1	
									6	
443	1	1		FAB		0	OIL/CONDENSATE DRAIN PIPE (PIPE NIPPLE 3/4 NPTx 7)	STL	1	

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
444	1	1					OIL FILL CAP 2 NPT	STL	1	
	1	1		444-056A05	444-056A05	0	OIL FILL CAP MODIFICATION			
445	1	1	EACH	8901-07-3/4"	8901-07-3/4"		BALL VALVE, LOCKING 3/4" F.P. W/ LOCKING HANDLE	BRS		
446	1	1		445-322B11-A	445-322B11-A	0	PINION INSPECTION PORT COVER	STL	4	
447	1	1		445-322B11-B	445-322B11-B	0	PINION INSPECTION PORT GASKET	NPRN		
448	6	6		FAB			HEX NUT 3/8 W/LW (446 & 447 TO 407) (449 & 450 TO 409)	STL		
449	1	1		445-230B05-A	445-230B05-A	0	INSPECTION PORT COVER/OIL FILL	STL	2	
450	1	1	EACH	445-230B05-B	445-230B05-B	0	INSPECTION PORT COVER GASKET	NPRN		
503	1	1		WJ2410I2S27S TDXLA07S			LIFT JACK		674	0
504	1	1	EACH	00118EP3ER14 3TC-W22			MOTOR	CI-STL	32	
505	1	1		CNHJ6075			LIFT REDUCER	CI-STL	11	0
	1	1		MS-0185A	MS-0185A		LIFT MOTOR ROTATION STICKER			
507	1	1		L-095	SC-0006A	0	COUPLING HALF	STL	1	
	1	1		L-095	SC-0008A	A	COUPLING SPIDER	HYTREL		
	1	1		L-095	SC-0007A	0	COUPLING HALF	STL	1	
509	1	1		FAB			COUPLING GUARD (BUILD TO FIT)	STL		
511	1	1		511D041D05	511D041D05	C	LIFT HOUSING 24"	STL	415	
512	1	1		512-008C08	512-008C08	0	SHAFT ADAPTER	STL	33	
513	1	1		513-016C09	513-016C09	B	THRUST BEARING HOUSING	STL	33	
514	1	1		514-008B08	514-008B08	0	THRUST BEARING HOUSING ADAPTER	STL	25	
515	2	2	EA	29412E	BR-0003A	A	ROLLER BEARING	STL	6	
517	2	2		FAB			GREASE FITTING 1/4 NPT	STL		

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
519	1	1	EA	400600	MS-0186A	0	OIL SEAL, SHAFT SUPPORT	RBR		
520	2	2	EA	3100-125	RR-0020A	0	RETAINING RING, 1 1/4" EXT	STL		
521	1	1		521-003B08-A	521-003B08-A	0	SHAFT HANGER	STL	24	
522	1	1		521-003B08-B	521-003B08-B	0	SHAFT HANGER PIN	STL	2	
523	1	1	EA	523-001B-B	523-001B-B	C	SHAFT BELLOWS	---		
530	1	1	EA	7616DLTN	BR-0000A	A	POINTER BEARING, ROLLER	STL		
532	1	1					SHAFT COUPLING (ORDERED W/505)	NBR-STL		

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
534			EA	534-000B	534-000B	B	TERMINAL BLOCK MOUNT'G BRACKET FOR 5, 10, 15 TON JACKS	304		
536	1	1		900-1203	900-1203	0	LIFT TRANSMITTER ASSEMBLY (LASER)		9	
603	4	4		FAB			SOCKET HD CAPSCREW 3/4 x 1 1/2 W/LW (503 TO 511)	STL		
606	4	4		FAB			CAPSCREW HEX NUT 3/4 W/LW (503 TO 514)	STL		
608	8	8		FAB			CAPSCREW HEX HD 5/8 x 3-1/2 W/N, LW (514 TO 513)	STL		
612	8	8		FAB			CAPSCREW HEX HD 5/8 x 2 W/N,LW (511 TO 409)	STL		
616	4	4		FAB			CAPSCREW HEX HD 5/16-18NC x 1 W/LW (505 TO 511)	STL		
620	2	2		FAB			CAPSCREW HEX HD (SELF TAPPING) 1/4 x 3/4 W/LW (509)	STL		

Item No.	Qty / Assy	Qty / Order	Units	Part Number	Drawing Number	Dwg Rev	Description of Parts	Material	Weight per Item	Line Rev
624	7	7	LFT	6542K64			BANDING	304		
	2	2	EA	6542K74			BUCKLE	304		
628	4	4		FAB			CAPSCREW HEX HD 3/8 x 1 W/LW (504 TO 505)	STL		
636	6	6		FAB			CAPSCREW HEX HD 3/4 x 2 3/4 W/N,LW (512 TO 417)	STL		

SECTION 6: ENCLOSURES

WesTech
Process Equipment. Process Driven.

MECHANISM DRAWINGS

1. A STAR DENOTES VARIANCE FROM CONTRACT DOCUMENTS AND SHOULD BE PARTICULARLY NOTED. ★

2. CONTRACTOR TO VERIFY OR SUPPLY ON APPROVAL ALL DIMENSIONS SHOWN IN CLOUD.

3. THE FOLLOWING DEFINES THE RESPONSIBILITY OF WESTECH ENGINEERING INC. WITH REGARD TO THE INFORMATION AND DIMENSIONS SHOWN ON THE DRAWINGS.

   (A) THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION OR INSTALLATION PURPOSES UNTIL IT BEARS THE APPROVAL OF THE OWNER, THE ENGINEER, OR THEIR DULY AUTHORIZED REPRESENTATIVE.

   (B) DIMENSIONS, LOADS. AND OTHER INFORMATION ARE PROVIDED TO ACCOMMODATE THE EQUIPMENT TO THE STRUCTURE AS SHOWN.

   (C) WESTECH IS NOT RESPONSIBLE FOR CONCRETE DESIGN, THE CUSTOMER IS TO PROVIDE REINFORCING STEEL AND DETERMINE SIZES TO SUIT LOCAL REQUIREMENTS.

   (D) WESTECH IS NOT RESPONSIBLE FOR DAMAGE, INJURY, OR LOSS RESULTING FROM INCORPORATION OR USE OF THIS EQUIPMENT.

   (E) CHARGES FOR MODIFICATIONS, ADDITIONS, OR CORRECTIONS TO THE EQUIPMENT WILL NOT BE ACCEPTED BY WESTECH, UNLESS PRIOR APPROVAL IS OBTAINED IN WRITING FROM AN AUTHORIZED WESTECH REPRESENTATIVE.

4. THE MECHANISM SHOWN IS DESIGNED FOR DIRECTION OF ROTATION AS INDICATED, WESTECH DOES NOT ASSUME RESPONSIBILITY FOR DAMAGE IF OPERATED IN THE OPPOSITE DIRECTION.

5. WESTECH DOES NOT FURNISH CONCRETE, GROUT, CONCRETE REINFORCING, PIPING, VALVES, PIPE SUPPORTS OR FITTINGS, WALL BRACKETS, ELECTRICAL WIRING, CONDUIT, OR ELECTRICAL EQUIPMENT, ERECTION, FIELD PAINTING OR PAINT, FIELD WELDING OR WELD ROD. WATER FOR TESTING, GREASE, OR LUBRICATING OIL. (EXCEPT AS SPECIFICALLY NOTED)

6. ALL STRUCTURAL STEEL TO CONFORM TO AISC SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL AND BUILDINGS, 9TH EDITION. STEEL SHAPES TO CONFORM TO ASTM A36. ALL WELDING SHALL CONFORM TO THE LATEST STANDARDS OF THE AMERICAN WELDING SOCIETY. ALL SUBMERGED STEEL MEMBERS TO BE 1/4" MINIMUM THICKNESS UNLESS NOTED OTHERWISE.

7. CUSTOMER SHOP INSPECTION OF PAINTED ITEMS IS WELCOME TO VERIFY APPLICATION. ALL FIELD SURFACE PREPARATION, FIELD PAINT, TOUCH-UP AND REPAIR TO SHOP PAINTED SURFACES ARE NOT BY WESTECH. RESPONSIBILITY FOR COMPATIBILTY OF SHOP AND FIELD APPLIED COATING IS BY OTHERS.

8. SURFACE PREPARATION AND SHOP PAINTING SPECIFICATIONS: AS PER "COATING SUBMITTAL DATA SHEET(S)"

9. ALL ERECTION FASTENERS TO BE:
   SUBMERGED: HDG A307
   NON-SUBMERGED: HDG A307

10. WORK WITH DWGS. 1001, 1002, 1003, 1004, 1005, 1006, 1007, DRIVE & ELECTRICAL DRAWINGS.

11. WESTECH WILL PROVIDE: (1) 75'-0 DIA. SHAFT DRIVE THICKENER

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO.: 1178

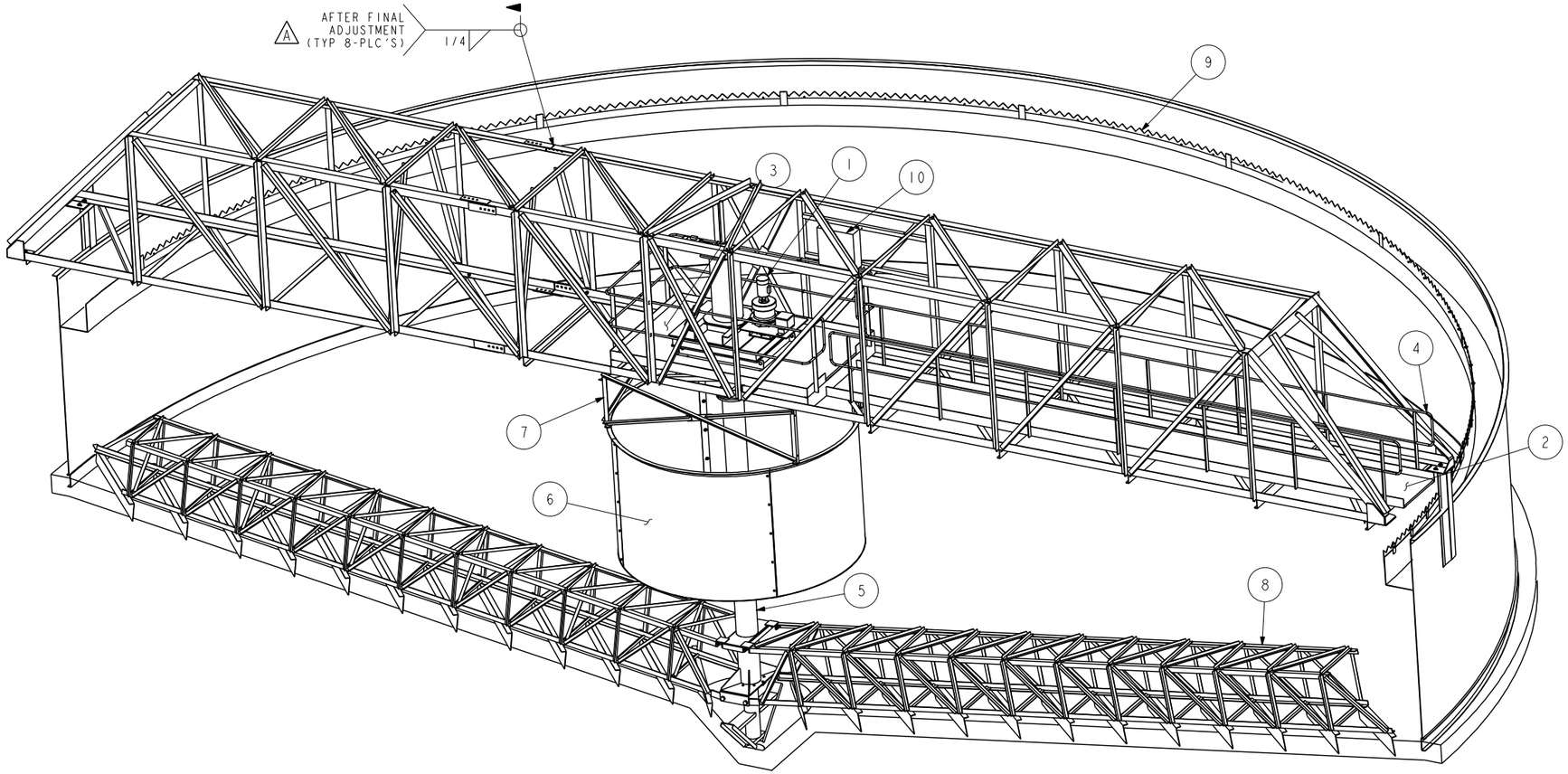
GENERAL NOTES

DESCRIPTION								(INPUTCHECK.PART) 1.000
THS32				75'-0 DIAMETER				
TYPE				SIZE				
				NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

REVISION	BY	CHKD	DATE	LTR
				D
				C
				B
				A

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1000	22157A	0



EQUIPMENT LIST	
ITEM	DESCRIPTION
1	43 IN. DRIVE UNIT W/ TORQUE CONTROL DEVICE 100000 FT. LBS. DUTY RATED TORQUE. W/ 24", 10 TON LIFT
2	3'-0 WIDE WALKWAY W/ 1 1/4 HDG STL GRATING AND WALK-THRU TRUSS
3	PLATFORM (W/ 24" CLEARANCE AROUND DRIVE UNIT) W/ 1 1/4 HDG STL GRATING.
4	STL HANDRAIL 1" DIA. x 42" HIGH 2-RAIL W/ 1/4" x 4" KICKPLATE
5	CENTER SHAFT - 12" DIA SCH 30 W/ CONE SCRAPER
6	FEEDWELL - 12'-0 DIA. x 7'-0 SIDE DEPTH (3/16" PLATE) W/ 3" DEFLECTOR SHELF
7	FEEDWELL SUPPORTS
8	TWO (2) RAKE ARMS W/ BLADES TO RAKE TWICE PER REVOLUTION
9	WEIR (NOT BY WESTECH)
10	ELECTRICAL CONTROL PANEL

NOTES:
1. SEE DRAWING 1000 FOR GENERAL NOTES.
2. SEE DRAWING 1002 FOR ELEVATION VIEW.
3. SEE DRAWING 1003 FOR PLAN VIEW.
4. SEE DRAWING 1004 FOR GENERAL ARRANGEMENT DETAILS.

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO.: 1178

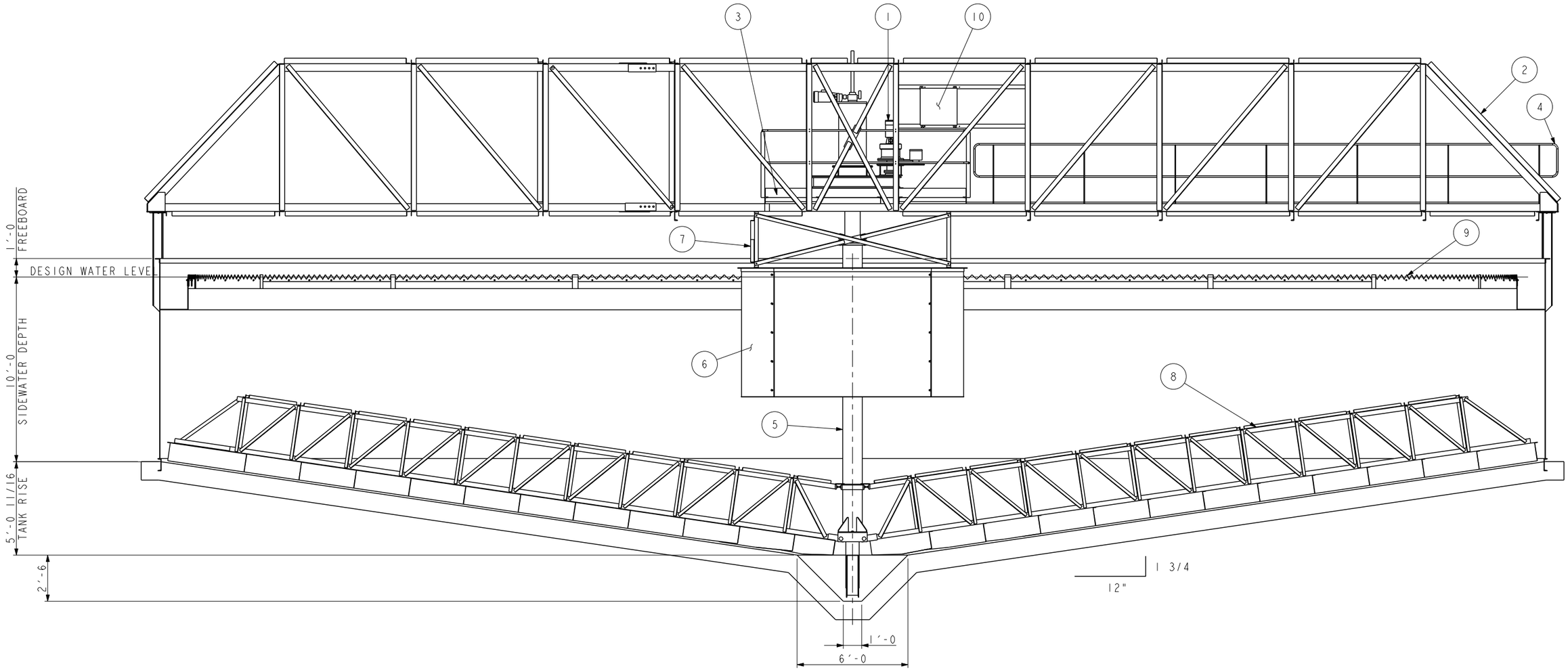
THICKENER GENERAL ARRANGEMENT - TANK CUTAWAY VIEW

DESCRIPTION								(CLS.HALF.FINAL.ASSEM) 0.025
THS32				75'-0 DIAMETER				
TYPE				SIZE				
10/00	KDB			NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

REVISION	BY	CHKD	DATE	LTR
ADDED FIELD WELD	KA02	GE40	10/22/13	A

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1001	22157A	A



NOTES:

1. SEE DRAWING 1000 FOR GENERAL NOTES.
2. SEE DRAWING 1001 FOR TANK AND MECHANISM CUTAWAY VIEW AND BALLOON NOTES.
3. SEE DRAWING 1003 FOR PLAN VIEW.
4. SEE DRAWING 1004 FOR GENERAL ARRANGEMENT DETAILS.

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO.: 1178

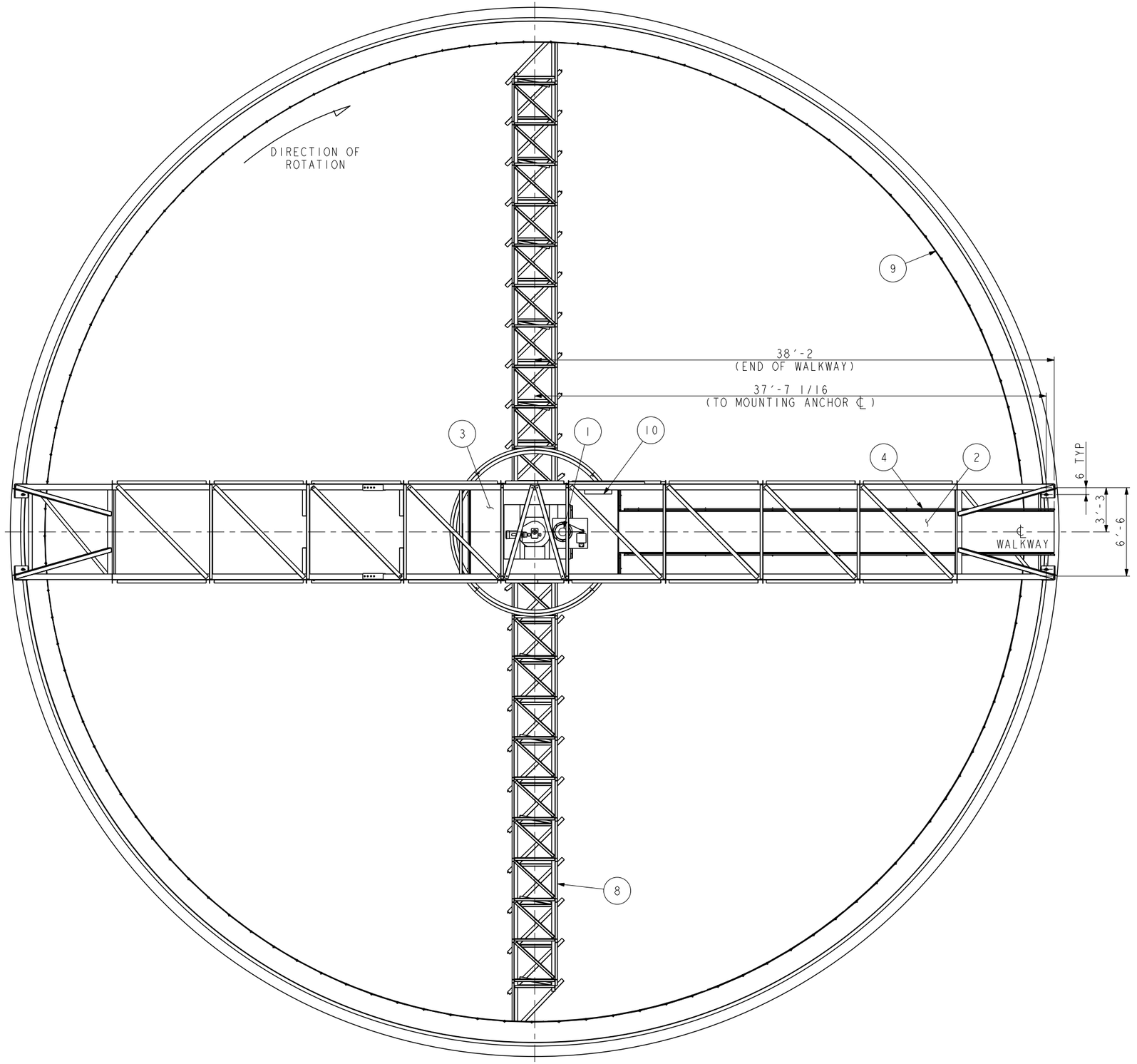
THICKENER GENERAL ARRANGEMENT - ELEVATION VIEW

DESCRIPTION								(CLS.HALF.FINAL.ASSEM) 0.030
THS32				75'-0 DIAMETER				
TYPE				SIZE				
10/00	KDB			NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD.	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

REVISION	BY	CHKD	DATE	LTR

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1002	22157A	0



NOTES:
1. SEE DRAWING 1000 FOR GENERAL NOTES.
2. SEE DRAWING 1001 FOR TANK AND MECHANISM CUTAWAY VIEW AND BALLOON NOTES.
3. SEE DRAWING 1002 FOR ELEVATION VIEW.
4. SEE DRAWING 1004 FOR GENERAL ARRANGEMENT DETAILS.

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO.: 1178

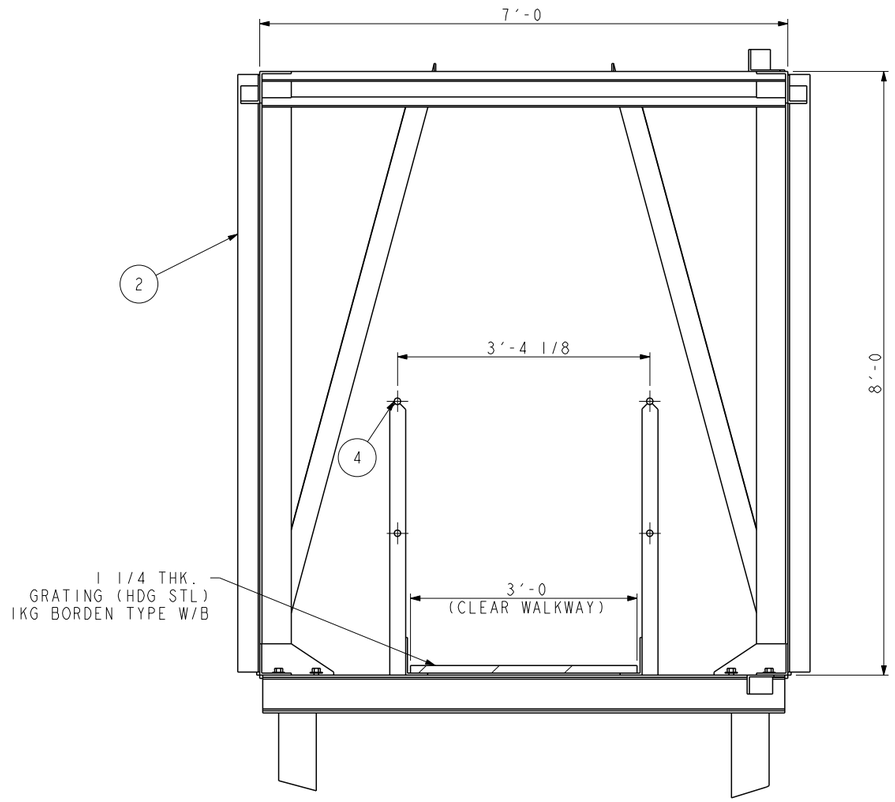
THICKENER GENERAL ARRANGEMENT - PLAN VIEW

DESCRIPTION					(CLS.FULL.FINAL.ASSEM) 0.021				
THS32					75'-0 DIAMETER				
TYPE					SIZE				
10/00	KDB			NONE	10/13	KA02	BR00	GR00	
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD	

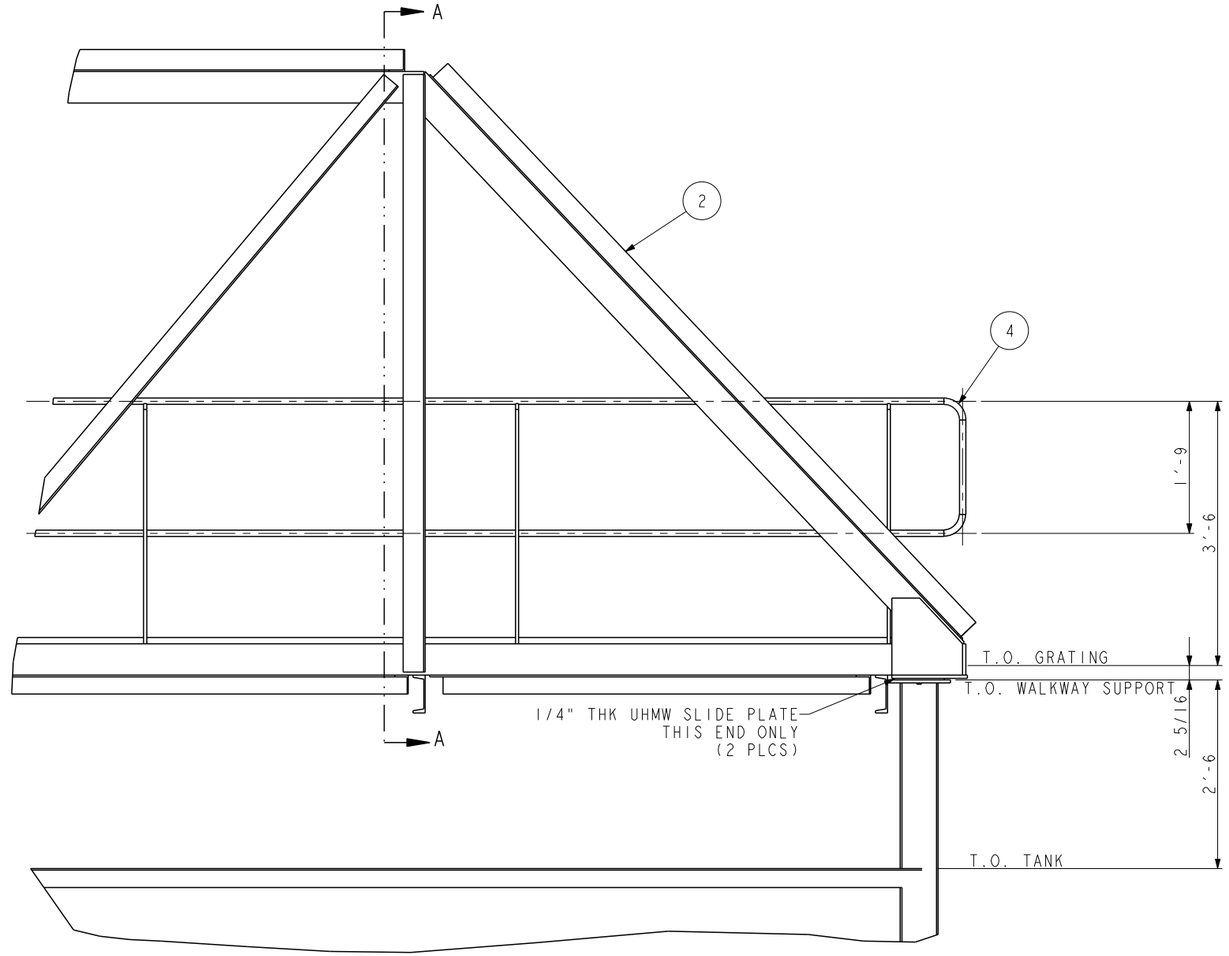
REVISION	BY	CHKD	DATE	LTR

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1003	22157A	0



SECTION A-A



WALKWAY END DETAIL

NOTES:
1. SEE DRAWING 1000 FOR GENERAL NOTES.
2. SEE DRAWING 1001 FOR TANK AND MECHANISM CUTAWAY VIEW AND BALLOON NOTES.
3. SEE DRAWING 1002 FOR ELEVATION VIEW.
4. SEE DRAWING 1003 FOR PLAN VIEW.

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO.: 1178

THICKENER GENERAL ARRANGEMENT DETAILS

DESCRIPTION								(CLS.FULL.FINAL.ASSEM) D.083
THS32				75'-0 DIAMETER				
TYPE				SIZE				
10/00	KDB			NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

REVISION	BY	CHKD	DATE	LTR
				4
				3
				2
				1

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1004	22157A	0

WESTECH ENGINEERING
COATING SUBMITTAL DATA SHEET

WESTECH PROPOSES THAT THE SURFACE PREPARATION AND PAINTING SHALL BE AS DESCRIBED BELOW.

1. EQUIPMENT DESCRIPTION:
   - A. TYPE OF EQUIPMENT/TAG NO. THICKENER MECHANISM
   - B. PARTS REQUIRING THIS PAINT SYSTEM: SUBMERGED MECHANISM .

2. PROCESS APPLICATION:

A. DESIGN/OPERATING TEMPERATURE	32°F /115°F
B. HUMIDITY	0% – 100%
C. SUBMERGED	YES
D. PROCESS ENVIRONMENT	PROCESS WATER
E. PH	5–9

3. FINISHING:

A. INSULATED	NO
B. FIREPROOFING	NO
C. MATERIAL TO BE COATED	CARBON STEEL
D. CATHODIC PROTECTION SYSTEM	NONE

4. SURFACE PREPARATION:

A. FABRICATION CLEANING SHALL BE AS DESIGNATED ON DWG. #A60B–001A. CLEANING REQUIREMENTS	D
B. SSPC NO./PROFILE	SSPC–SP10/ NACE 2

5. COATING SYSTEM SPECIFICATION:
   - A. COATING MANUFACTURER: TNEMEC

	1st COAT	2nd COAT
B. TYPE OF COATING	EPOXY	EPOXY
C. PRODUCT NUMBER	N140–1255	N140–B5712
D. DRY FILM THICKNESS (DFT) MINIMUM/MAXIMUM (MILS)	3–5	4–6
E. COLOR	BEIGE	WESTECH BLUE

   - F. TOTAL DRY FILM THICKNESS OF SYSTEM: 7–11 MILS.

6. ALL SURFACE PREPARATION & PAINTING WILL BE PER THE LATEST APPLICATION REQUIREMENTS FROM THE COATING MANUFACTURER
7. NATIONAL SANITARY FOUNDATION (NSF) CERTIFICATION REQUIRED: NO
8. HOLIDAY TESTING REQUIRED? (Y/N) NO
9. PIPE I.D.'S 24" DIAMETER OR LESS ARE NOT PAINTED.
10. RUST PREVENTATIVE FOR MACHINED SURFACES:
    - A. MANUFACTURER N/A
    - B. PRODUCT NAME & NO. N/A
11. ADDITIONAL INFORMATION: COATING WILL CHALK OVER TIME

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO. 1178

REVISION	BY	CHKD	DATE	LTR
				D
				C
				B
				A

SURFACE PREPARATION AND PAINTING – SUBMERGED STL

DESCRIPTION								CSDS–8
THS32				75'–0 DIAMETER				
MODEL				SIZE				
12/8/05	BD	BRT	MGG	NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1005	22157A	0

WESTECH ENGINEERING
COATING SUBMITTAL DATA SHEET

WESTECH PROPOSES THAT THE SURFACE PREPARATION AND PAINTING SHALL BE AS DESCRIBED BELOW.

1. EQUIPMENT DESCRIPTION:
   - A. TYPE OF EQUIPMENT/TAG NO. THICKENER MECHANISM
   - B. PARTS REQUIRING THIS PAINT SYSTEM: NON-SUBMERGED MECHANISM STEEL

2. PROCESS APPLICATION:

A. DESIGN/OPERATING TEMPERATURE	32°F /115°F
B. HUMIDITY	0% – 100%
C. SUBMERGED	NO
D. PROCESS ENVIRONMENT	ATMOSPHERE
E. PH	ATMOSPHERE

3. FINISHING:

A. INSULATED	NO
B. FIREPROOFING	NO
C. MATERIAL TO BE COATED	CARBON STEEL
D. CATHODIC PROTECTION SYSTEM	NONE

4. SURFACE PREPARATION:

A. FABRICATION CLEANING SHALL BE AS DESIGNATED ON DWG. #A60B-001A. CLEANING REQUIREMENTS	D
B. SSPC NO./PROFILE	SP6 / NACE 3

5. COATING SYSTEM SPECIFICATION:
   - A. COATING MANUFACTURER: TNEMEC

	1st COAT	2nd COAT
B. TYPE OF COATING	EPOXY	EPOXY
C. PRODUCT NUMBER	N140-1255	N140-B5712
D. DRY FILM THICKNESS (DFT) MINIMUM/MAXIMUM (MILS)	3-5	4-6
E. COLOR	BEIGE	WESTECH BLUE

   - F. TOTAL DRY FILM THICKNESS OF SYSTEM: 7-11 MILS.

6. ALL SURFACE PREPARATION & PAINTING WILL BE PER THE LATEST APPLICATION REQUIREMENTS FROM THE COATING MANUFACTURER
7. NATIONAL SANITARY FOUNDATION (NSF) CERTIFICATION REQUIRED: NO
8. HOLIDAY TESTING REQUIRED? (Y/N) NO
9. PIPE I.D.'S 24" DIAMETER OR LESS ARE NOT PAINTED.
10. RUST PREVENTATIVE FOR MACHINED SURFACES:
    - A. MANUFACTURER N/A
    - B. PRODUCT NAME & NO. N/A
11. ADDITIONAL INFORMATION: HANDRAIL & TOEPLATE TO BE SAFETY YELLOW (A)
    COATING WILL CHALK OVER TIME

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO. 1178

REVISION	BY	CHKD	DATE	LTR
ADDED NOTE	KA02	GE40	10/22/13	A

SURFACE PREPARATION AND PAINTING – NON-SUBMERGED STL

DESCRIPTION								CSDS-8
THS32				75'-0 DIAMETER				
MODEL				SIZE				
12/8/05	BD	BRT	MGG	NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1006	22157A	A

WESTECH ENGINEERING
COATING SUBMITTAL DATA SHEET

WESTECH PROPOSES THAT THE SURFACE PREPARATION AND PAINTING SHALL BE AS DESCRIBED BELOW.

1. EQUIPMENT DESCRIPTION:
   - A. TYPE OF EQUIPMENT/TAG NO. DRIVE UNIT
   - B. PARTS REQUIRING THIS PAINT SYSTEM: DRIVE UNIT

2. PROCESS APPLICATION:

A. DESIGN/OPERATING TEMPERATURE	32°F /115°F
B. HUMIDITY	0% – 100%
C. SUBMERGED	NO
D. PROCESS ENVIRONMENT	ATMOSPHERE
E. PH	ATMOSPHERE

3. FINISHING:

A. INSULATED	NO
B. FIREPROOFING	NO
C. MATERIAL TO BE COATED	CARBON STEEL
D. CATHODIC PROTECTION SYSTEM	NONE

4. SURFACE PREPARATION:

A. FABRICATION CLEANING SHALL BE AS DESIGNATED ON DWG. #A60B–001A. CLEANING REQUIREMENTS	D
B. SSPC NO./PROFILE	SP6 / NACE 3

5. COATING SYSTEM SPECIFICATION:
   - A. COATING MANUFACTURER: TNEMEC

	1st COAT	2nd COAT
B. TYPE OF COATING	EPOXY	POLYURETHANE ENAMEL
C. PRODUCT NUMBER	N140–1255	1074U/B5712
D. DRY FILM THICKNESS (DFT) MINIMUM/MAXIMUM (MILS)	3–9	2–5
E. COLOR	BEIGE	WESTECH BLUE

   - F. TOTAL DRY FILM THICKNESS OF SYSTEM: 5–14 MILS.

6. ALL SURFACE PREPARATION & PAINTING WILL BE PER THE LATEST APPLICATION REQUIREMENTS FROM THE COATING MANUFACTURER
7. NATIONAL SANITARY FOUNDATION (NSF) CERTIFICATION REQUIRED: NO
8. HOLIDAY TESTING REQUIRED? (Y/N) NO
9. PIPE I.D.'S 24" DIAMETER OR LESS ARE NOT PAINTED.
10. RUST PREVENTATIVE FOR MACHINED SURFACES:
    - A. MANUFACTURER N/A
    - B. PRODUCT NAME & NO. N/A
11. ADDITIONAL INFORMATION

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA. 15563

ENGINEER: BAYS TECHNICAL SERVICES

CUSTOMER P.O. NO. 1178

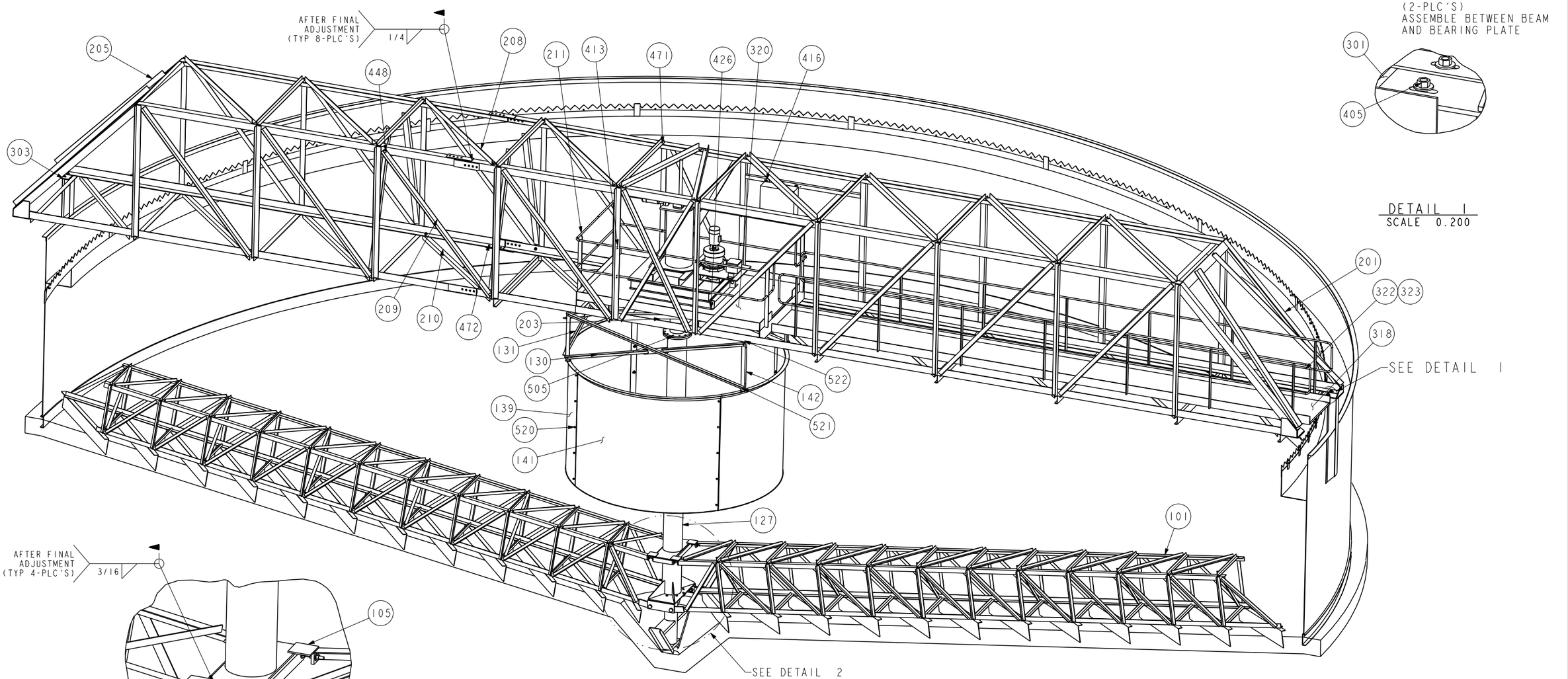
REVISION	BY	CHKD	DATE	LTR
				D
				C
				B
				A

SURFACE PREPARATION AND PAINTING – DRIVE UNIT

DESCRIPTION								CSDS–8
THS32				75'–0 DIAMETER				
MODEL				SIZE				
12/8/05	BD	BRT	MGG	NONE	10/13	KA02	BR00	GR00
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

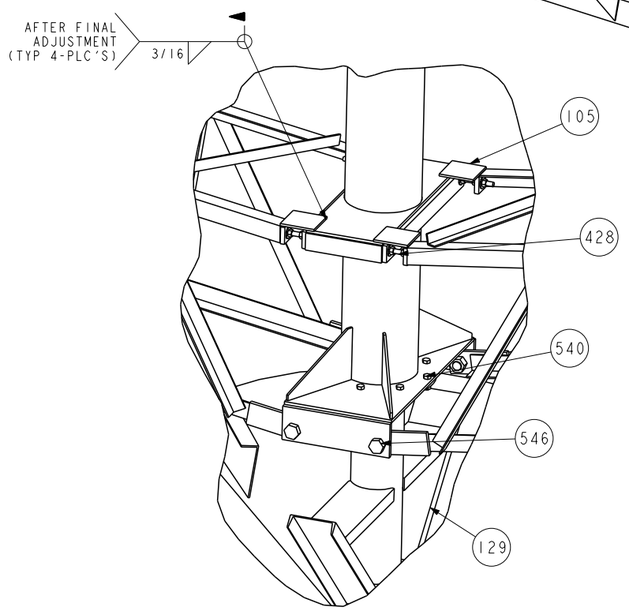
WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1007	22157A	0

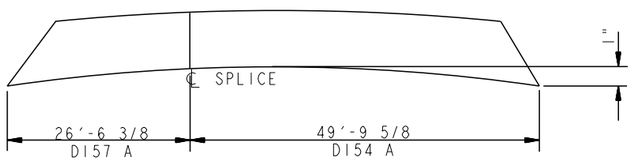


SLIDE PLATE @ THIS END ONLY (2-PLC'S) ASSEMBLE BETWEEN BEAM AND BEARING PLATE

DETAIL 1
SCALE 0.200



DETAIL 2
SCALE 0.080



BRIDGE CAMBER DIAGRAM

BACKCHARGES FOR FIELD WORK OF ANY KIND ARE NOT ACCEPTABLE WITHOUT PRIOR WRITTEN AUTHORIZATION BY WESTECH ENGINEERING, INC.

THICKENER ERECTION - TANK CUTAWAY VIEW

DESCRIPTION				(CLS.HALF.FINAL.ASSEM) 0.030				
THS32				75'-0 DIAMETER				
TYPE				SIZE				
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
10/00	KDB			NONE	10/13	KA02	GR37	GE40

REVISION	BY	CHKD	DATE	LTR
				4
				3
				2
				1

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
1010	22157A	0

WesTech
Process Equipment. Process Driven.

ELELCTRICAL

WESTECH

FOR:

COAL INNOVATIONS

FRIEDENS, PENNSYLVANIA, USA

THICKENER CONTROL PANEL

WORK WITH DOCUMENT(S):

E10D -E13D, PL 31754

WESTECH JOB NUMBER: 22157 A

WesTech

ELECTRICAL PARTS LIST

WESTECH

Description **THICKENER CONTROL PANEL**

Parts List No **31754** Rev. **A**
Job Name **COAL INNOVATIONS**
Job No **22157A**
Model No

Qty **1**
Size **T-2-1-2-3**
Type **THICKENER**
Weight **47** lbs

Date **10/17/2013**
Proj. By **KE32**
Proj. Chkd. **HE58**
Proj. Aprvd. **RU08**

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
101				E10D	A	PANEL LAYOUT	.	A
102				E11D	A	ELECTRICAL SCHEMATIC	.	A
103				E12D	A	ELECTRICAL SCHEMATIC	.	A
104				E13D	A	FIELD WIRING DIAGRAM	.	A
105							.	
106							.	
107	1	1		----------		WIRE, DUCT, BITS, FASTENERS, ETC	WESTECH	-
108							.	
109							.	
110	1	1	ENCLOSURE	CSD24208		ENCLOSURE, TYPE 4/12	HOFFMAN	-
111	1	1	ENCLOSURE	CP2420		BACK PANEL, 22.2 X 18.2	HOFFMAN	-
112	1	1	ENCLOSURE	CMFK		MOUNTING FOOT KIT	HOFFMAN	-
113							.	
114							.	
115	2	2	4,5	APD1126DNR		PILOT LIGHT, LED RED, 120V TRANSFORMER	IDEC	-
116							.	
117							.	
118	1	1	6	APD1126DNA		PILOT LIGHT, LED AMBER, 120V TRANSFORMER	IDEC	-
119							.	
120							.	
121	2	2	8,13	APD1126DNS		PILOT LIGHT, LED BLUE, 120V TRANSFORMER	IDEC	-
122							.	
123							.	
124	2	2	7,12	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
125	2	2	7,12	ABD1BNB		BLACK PUSHBUTTON HEAD ONLY	IDEC	-
126	2	2	7,12	BST010		CONTACT BLOCKS, NO	IDEC	-
127							.	
128							.	
129	1	1	9	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-
130	1	1	9	ABD1BNR		PUSHBUTTON, RED	IDEC	-
131	1	1	9	BST010		CONTACT BLOCKS, NO	IDEC	-
132							.	
133							.	
134	1	1	10	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-
135	1	1	10	ABD2BNR		PUSHBUTTON, RED EXTENDED, HEAD ONLY	IDEC	-
136	1	1	10	BST001		CONTACT BLOCKS, NC	IDEC	-
137							.	
138							.	
139	2	2	11,14	ABD100		PUSHBUTTON BASE, 30mm	IDEC	-
140	2	2	11,14	ABD1BNG		PUSHBUTTON HEAD ONLY GREEN	IDEC	-
141	2	2	11,14	BST010		CONTACT BLOCKS, NO	IDEC	-
142	2	2	11,14	BST001		CONTACT BLOCKS, NC	IDEC	-
143							.	
144							.	
145	1	1	AL	105STA-N5		BEACON ASSY.,AMBER, 120VAC	EDWARDS	-
146	1	1	AL	105PM		MOUNTING BRACKET, 3/4 PIPE MNT (FOR 105 SERIES BEACONS)	EDWARDS	-
147	1	1	AH	876-N5		HORN, 120VAC, W/BACKBOX TYPE 4X, 103 dB, .13A	EDWARDS	-
148							.	
149							.	
150							.	
151							.	
152	2	2	F1,2	FH8-1PC30L		FUSE HOLDER, 1 POLE, 30A CC	SPR	-
153	2	2	F1,2	FNQ-R-3		TIME DELAY FUSE, 3 AMP	BUSSMAN	-
154							.	

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
155							.	
156	1	1	PS1	2866446		POWER SUPPLY, 24VDC, 1.3 AMP MINI-PS-100-240AC/24DC/1.3	PHOENIX	-
157							.	
158							.	
159	1	1	CR1	RH4B-ULAC120V		RELAY, FOUR POLE, 120VAC W/INDICATION LIGHT	IDEC	-
160	1	1	CR1	SH4B-05C		FINGERSAFE RELAY BASE, FOUR POLE	IDEC	-
161							.	
162							.	
163	2	2	CR3,5	RH3B-ULAC120V		RELAY, THREE POLE, 120VAC W/INDICATION LIGHT	IDEC	-
164	2	2	CR3,5	SH3B-05C		FINGERSAFE RELAY BASE, THREE POLE	IDEC	-
165							.	
166							.	
167	2	2	CR2,6	RH2B-ULAC120V		RELAY, TWO POLE, 120VAC W/INDICATION LIGHT	IDEC	-
168	2	2	CR2,6	SH2B-05C		FINGERSAFE RELAY BASE, DOUBLE POLE	IDEC	-
169							.	
170							.	
171	1	1	CR4	RH1B-ULAC120V		RELAY,SINGLE POLE, 120VAC W/INDICATION LIGHT	IDEC	-
172	1	1	CR4	SH1B-05C		FINGERSAFE RELAY BASE, SINGLE POLE	IDEC	-
173							.	
174							.	
175	56	56	TB1-3	3044102		TERMINAL BLOCK, 6mm UT4	PHOENIX	-
176							.	
177	5	5	GND	0442079		TERMINAL BLOCK, GROUND	PHOENIX	-
178							.	
179							.	
180							.	
181							.	

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
182							.	
183							.	
184							.	
185	1	1		NP-2X9W		NAMEPLATE	WESTECH	-
186			1			RAKE DRIVE	.	-
187			2			LIFT DRIVE	.	-
188			3			EQUIPMENT ALARMS	.	-
189							.	
190	2	2		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
191			4-5			RUN	.	-
192							.	
193	1	1		LP-I30R		LEGEND PLATE - IDEC, 30mm, RED	WESTECH	-
194			6			CUTOUT	.	-
195							.	
196	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
197			7			START	.	-
198							.	
199	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
200			8			HIGH POSITION	.	-
201							.	
202	1	1		LP-I30R		LEGEND PLATE - IDEC, 30mm, RED	WESTECH	-
203			9			ALARM SILENCE	.	-
204							.	
205	1	1		LP-I30R		LEGEND PLATE - IDEC, 30mm, RED	WESTECH	-
206			10			STOP	.	-
207							.	
208	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
209			11			RAISE	.	-
210							.	
211	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
212			12			RESET	.	-

Item No.	Qty / Assy	Qty / Order	Electrical Location	Part No. / Drawing No.	Dwg Rev	Description of Parts	Manufacturer	Line Rev
213							.	
214	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
215			13			LOW POSITION	.	-
216							.	
217	1	1		LP-I30W		LEGEND PLATE - IDEC, 30mm , WHITE	WESTECH	-
218			14			LOWER	.	-

ELECTRICAL DRAWINGS

WIRE TYPES: (SIZED PER UL 508A)

POWER: THHN

CONTROL: THHN

WIRE COLORS:

WHITE – 120 VAC NEUTRAL

RED – 120 VAC CONTROL

RED WITH GREY – FOREIGN 120 VAC CONTROL

GREY – FOREIGN 120 VAC NEUTRAL

PURPLE – REMOTE (DRY)

BLUE – 24V DC POWER/CONTROL

GREEN – GROUND

NAME PLATES:

1 – RAKE DRIVE

2 – LIFT DRIVE

3 – EQUIPMENT ALARMS

LEGEND PLATES:

4 – RUN

5 – RUN

6 – CUTOUT

7 – START

8 – HIGH POSITION

9 – SILENCE

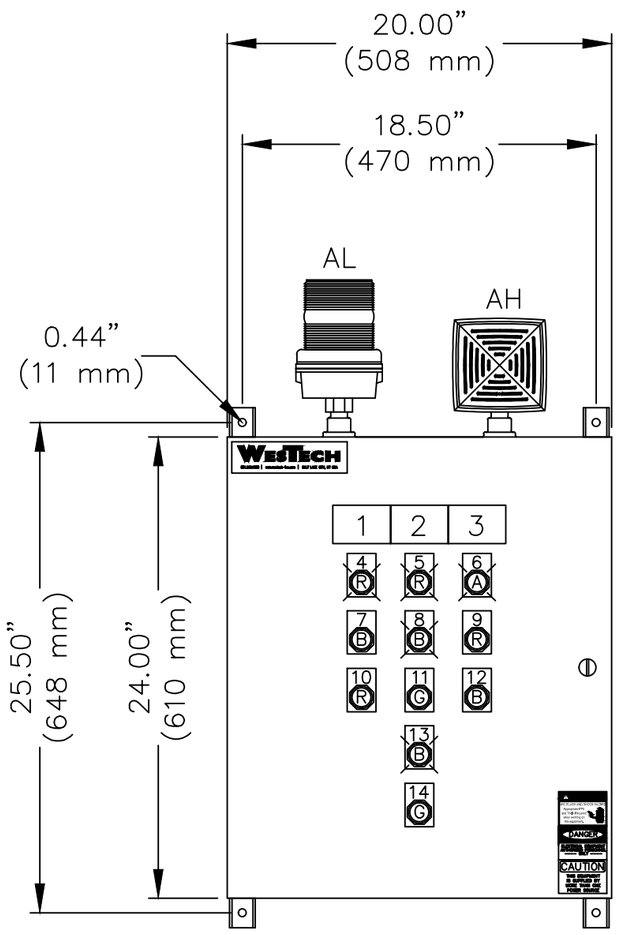
10 – STOP

11 – RAISE

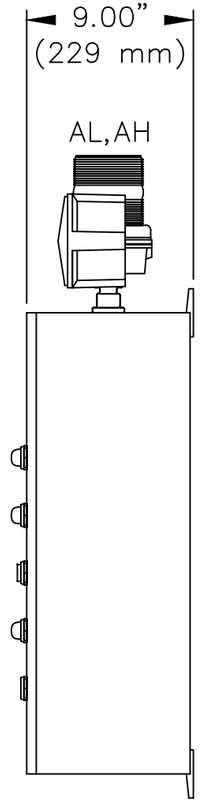
12 – RESET

13 – LOW POSITION

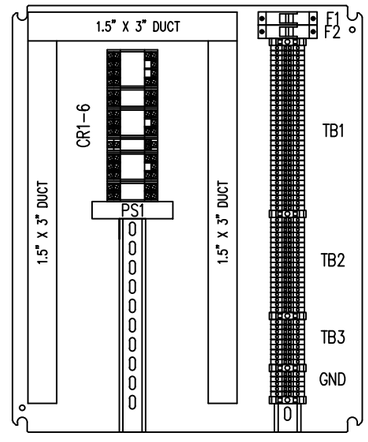
14 – LOWER



DOOR LAYOUT
NEMA 4 ENCLOSURE
(PAINTED MILD STEEL)



RIGHT
SIDE
VIEW



PANEL
LAYOUT

1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060

NOTES:

1– DASHED WIRING AND EQUIPMENT ARE NOT BY WESTECH ENG.

2– ROTATING DRIVE PARTS AND CAGE MAY DESTROY ELECTRICAL CONDUIT IF INSTALLED TOO CLOSE TO THE DRIVE UNIT.

3– OVER TORQUE CUTOUT REQUIRES MANUAL RESTART, OR RESET OF A LATCHED CUTOUT CIRCUIT THAT PREVENTS AUTO RESTART OF THE MOTOR. FAILURE TO DO SO WILL VOID THE DRIVE WARRANTY.

4– THIS DRAWING WORKS WITH PARTS LIST DOCUMENT# 31754

5– THIS DRAWING WORKS WITH DRAWINGS E10D – E13D

PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA 15563

ENGINEER: BAYS TECHNICAL SERVICES

CONTRACTOR:

CUSTOMER PO: 1178
CUSTOMER TAG NO:

REVISION	BY	CHKD	DATE	LTR
REVISED AS BUILT AND TESTED	RU08	GR70	12/20/13	A

PANEL LAYOUT

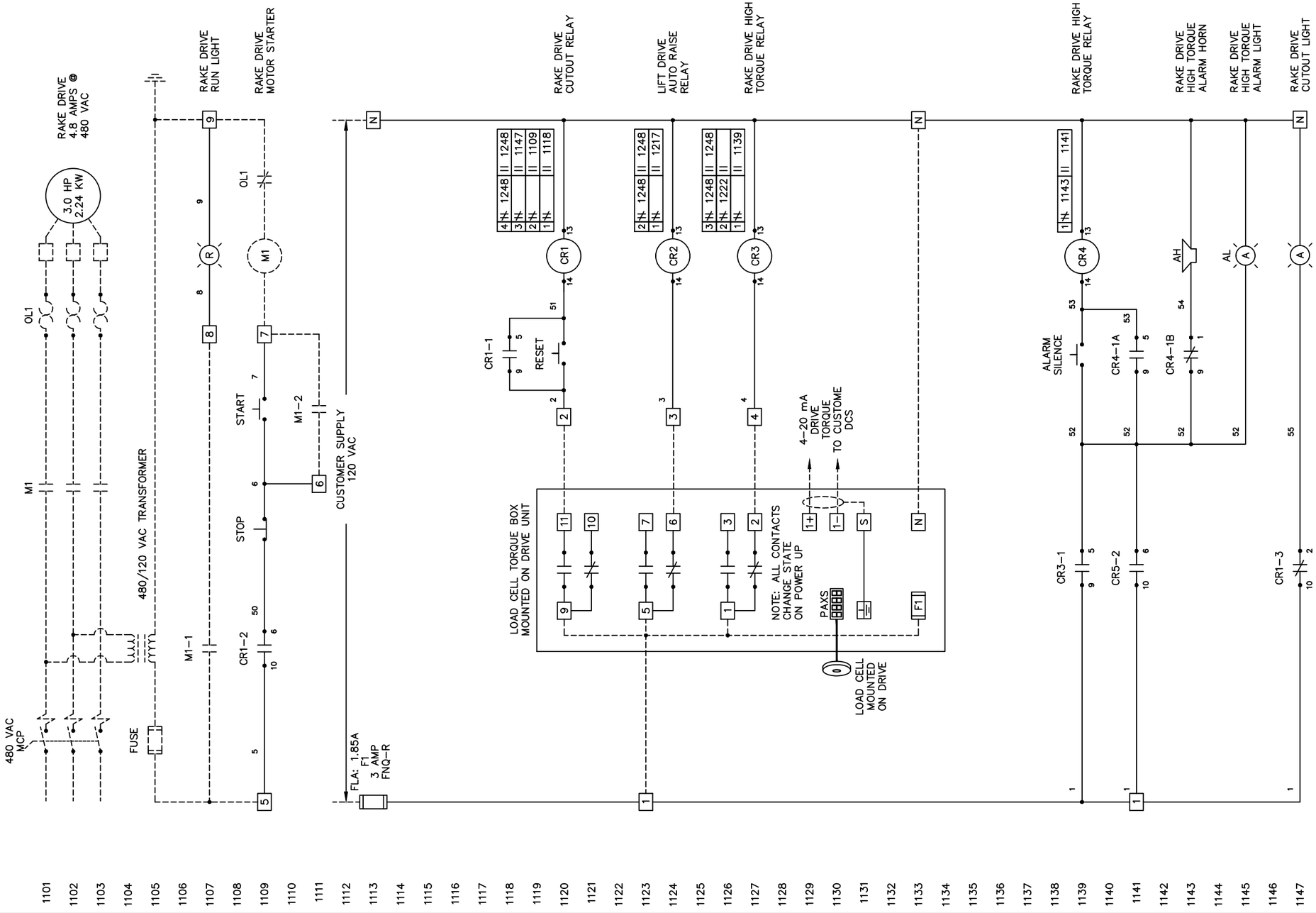
DESCRIPTION: THICKENER CONTROL PANEL | T-2-1-2-3

MODEL | SIZE: 1X1

DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				NONE	10–13	KE32	HE58	RU08

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
E10D	22157A	A



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CUSTOMER TAG NO:

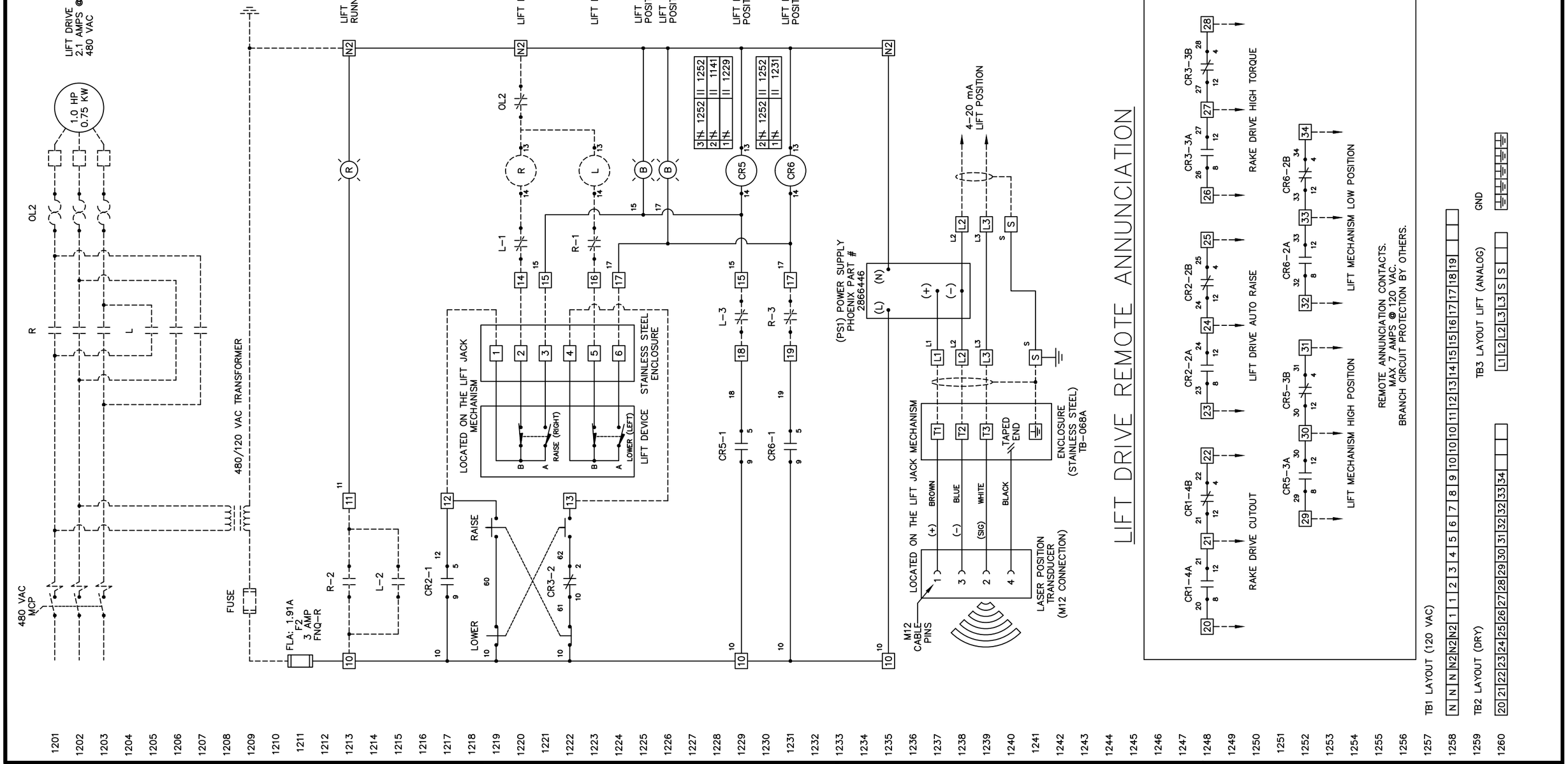
REVISION	BY	CHKD	DATE	LTR
REVISED AS BUILT AND TESTED	RU08	GR70	12/20/13	A

ELECTRICAL SCHEMATIC

DESCRIPTION								
THICKENER CONTROL PANEL					T-2-1-2-3			
MODEL					SIZE			1X1
				NONE	10-13	KE32	HE58	RU08
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
E11D	22157A	A



LIFT DRIVE REMOTE ANNUNCIATION

TB1 LAYOUT (120 VAC)

N	N	N	N2	N2	1	1	2	3	4	5	6	7	8	9	10	10	10	11	12	13	14	15	15	16	17	17	18	19		

TB2 LAYOUT (DRY)

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34		

TB3 LAYOUT LIFT (ANALOG) GND

L1	L2	L3	S	S		⏚

1201 1202 1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1213 1214 1215 1216 1217 1218 1219 1220 1221 1222 1223 1224 1225 1226 1227 1228 1229 1230 1231 1232 1233 1234 1235 1236 1237 1238 1239 1240 1241 1242 1243 1244 1245 1246 1247 1248 1249 1250 1251 1252 1253 1254 1255 1256 1257 1258 1259 1260

NOTES:

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PREPARED FOR: COAL INNOVATIONS
329 YELLOW CREEK ROAD
STOYSTOWN, PA 15563
ENGINEER: BAYS TECHNICAL SERVICES

CONTRACTOR:

CUSTOMER PO: 1178
CUSTOMER TAG NO:

REVISION	BY	CHKD	DATE	LTR
REVISED AS BUILT AND TESTED	RU08	GR70	12/20/13	A

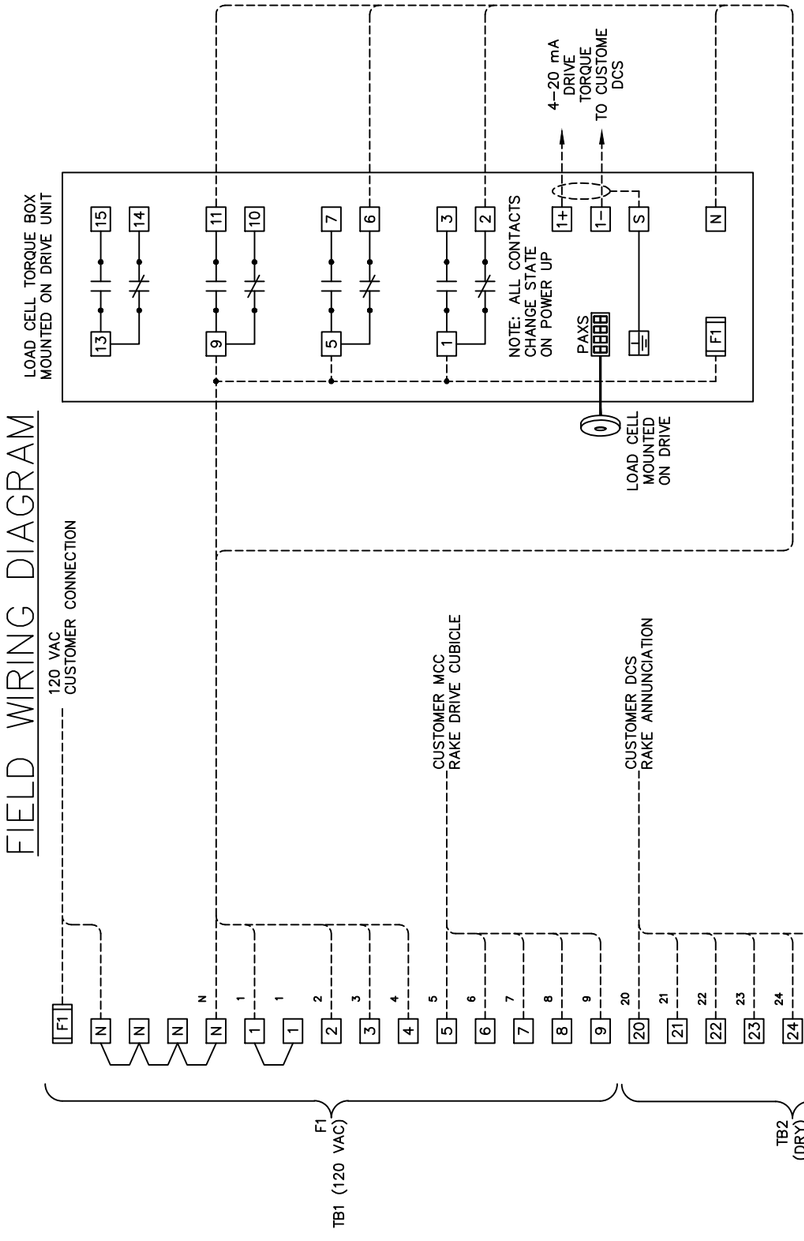
ELECTRICAL SCHEMATIC

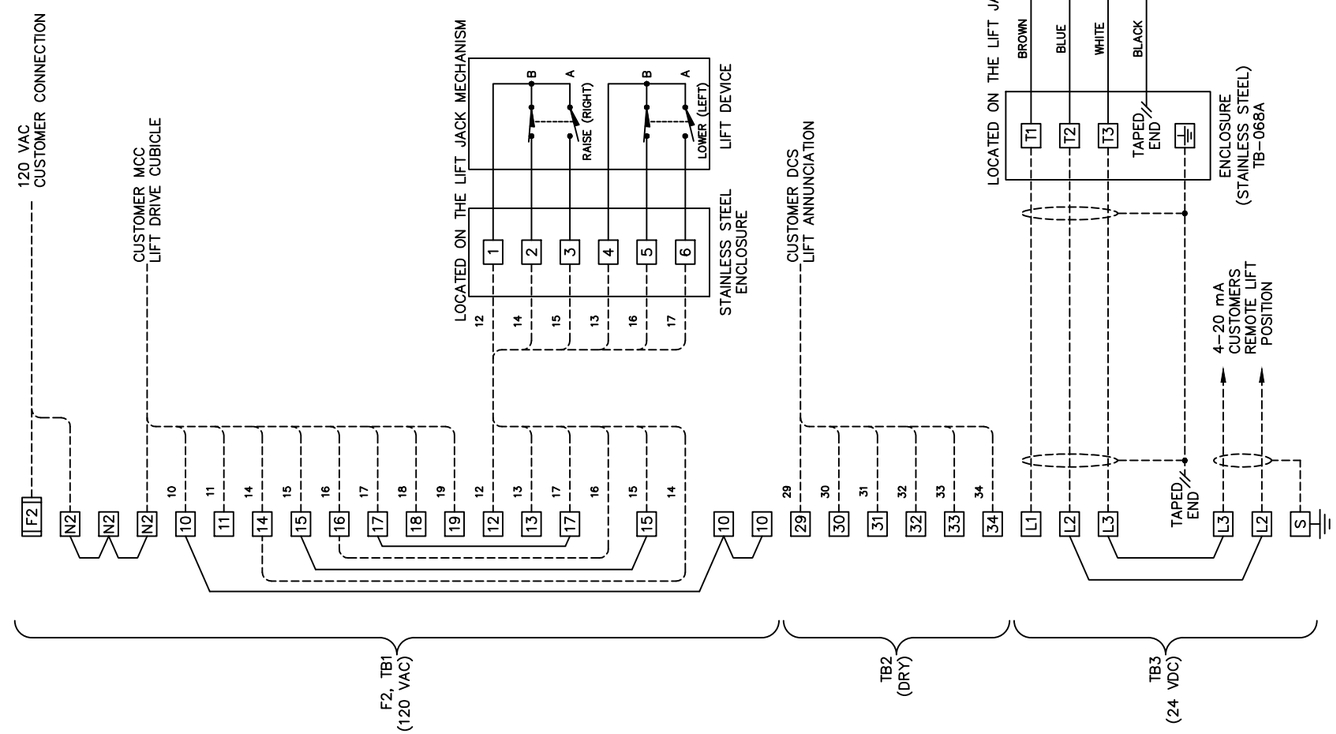
DESCRIPTION									
THICKENER CONTROL PANEL					T-2-1-2-3				
MODEL				SIZE					1X1
				NONE	10-13	KE32	HE58	RU08	
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD	

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
E12D	22157A	A

FIELD WIRING DIAGRAM





1301 1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321 1322 1323 1324 1325 1326 1327 1328 1329 1330 1331 1332 1333 1334 1335 1336 1337 1338 1339 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1350 1351 1352 1353 1354 1355 1356 1357 1358 1359 1360

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REVISION	BY	CHKD	DATE	LTR
REVISED AS BUILT AND TESTED	RU08	GR70	12/20/13	A

FIELD WIRING DIAGRAM

DESCRIPTION								
THICKENER CONTROL PANEL					T–2–1–2–3			
MODEL				SIZE				1X1
				NONE	10–13	KE32	HE58	RU08
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
E13D	22157A	A

WESTECH

MANUFACTURER USER MANUALS

POWER SUPPLIES

Extract from the online catalog

MINI-PS-100-240AC/24DC/1.3

Order No.: 2866446

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2866446

DIN rail power supply unit 24 V DC/1.3 A, primary switched-mode

Commercial data	
GTIN (EAN)	4 046356 073905
sales group	H041
Pack	1 pcs.
Customs tariff	85044082
Catalog page information	Page 596 (IF-2011)

Product notes

WEEE/RoHS-compliant since: 05/30/2006

http://www.download.phoenixcontact.com
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Product description

MINI POWER is the extremely slim power supply unit with constructional widths of 22.5 mm, 45 mm and 67.5 mm.

In addition to a 24 V version with output currents of 1.3 A, 2 A and 4 A, special voltages with 5 V/3 A and ±15 V/1 A and 10 V...15 V/2 A and 8 A are also available.

A reliable starting of complex loads is ensured by a power reserve of up to 100% – the POWER BOOST.

The high operational reliability is thus dependably guaranteed in complex global networks as well. MINI POWER also functions in applications where static voltage dips, transient failures of the supply voltage or phase failure are to be expected.

Generously dimensioned capacitors guarantee a mains buffering of more than 20 ms under full load.

Worldwide use is realized by the consistent implementation of a wide-range input.

In this way, your whole system can be tested at any manufacturing location in the world and be delivered to global destinations without switching over the input voltage, often a source of faults. This saves storage costs and reduces the logistical work.

An international approval package including UL 60950 for information technology equipment and UL 508 for industrial regulating devices pave the way for worldwide applications.

Technical data

Input data

Nominal input voltage	100 V AC ... 240 V AC
AC input voltage range	85 V AC ... 264 V AC
DC input voltage range	90 V DC ... 350 V DC
AC frequency range	45 Hz ... 65 Hz
DC frequency range	0 Hz
Current consumption	Approx. 0.65 A (120 V AC)
	0.25 A (230 V AC)
Inrush surge current	< 15 A (< 0.6 A^2s)
Power failure bypass	> 20 ms (120 V AC)
	> 110 ms (230 V AC)
Input fuse	1.25 A (slow-blow, internal)
Permissible backup fuse	B6
	B10
	B16
Type of protection	Transient surge protection
Protective circuit/component	Varistor

Output data

Nominal output voltage	24 V DC ±1%
Setting range of the output voltage	22.5 V DC ... 28.5 V DC (> 24 V constant capacity)
Output current	1.3 A (-25 °C ... 60 °C)
	1.6 A (with POWER BOOST, -25°C ... 40°C permanent)
Derating	60 °C ... 70 °C (2.5%/K)
Connection in parallel	Yes, for redundancy and increased capacity

Connection in series	Yes
Starting delay with capacitive load	(Unrestricted)
Max. capacitive load	Unlimited
Current limitation	Approx. 5 A (for short-circuit)
Control deviation	< 1 % (change in load, static 10% ... 90%)
	< 3 % (change in load, dynamic 10% ... 90%)
	< 0.1 % (change in input voltage ±10%)
Residual ripple	< 20 mV_{PP} (20 MHz)
Peak switching voltages nominal load	< 50 mV_{PP} (20 MHz)
Maximum power dissipation idling	0.9 W
Power loss nominal load max.	4.5 W

General data

Width	22.5 mm
Height	99 mm
Depth	107 mm
Net weight	0.2 kg
Operating voltage display	Green LED
Efficiency	> 85 % (At 230 V AC and nominal values)
Insulation voltage input/output	3 kV (routine test)
	4 kV (type test)
Degree of protection	IP20
Protection class	II (in an enclosed control cabinet)
MTBF (IEC 61709, SN 29500)	> 500000 h
Ambient temperature (operation)	-25 °C ... 70 °C (> 60 °C derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 95 % (at 25 °C, no condensation)
Mounting position	horizontal DIN rail NS 35, EN 60715
Assembly instructions	Can be aligned: Horizontal 0 cm, vertical 5 cm
Electromagnetic compatibility	Conformance with EMC Directive 2004/108/EC
Noise immunity	EN 61000-6-2:2005
Low Voltage Directive	Conformance with LV directive 2006/95/EC
Standard – Electrical equipment of machines	EN 60204
Standard - Safety of transformers	EN 61558-2-17
Standard - Electrical safety	EN 60950-1/VDE 0805 (SELV)

Standard – Electronic equipment for use in electrical power installations and their assembly into electrical power installations	EN 50178/VDE 0160 (PELV)
Standard – Safety extra-low voltage	EN 60950-1 (SELV)
	EN 60204 (PELV)
Standard - Safe isolation	DIN VDE 0100-410
	DIN VDE 0106-1010
Standard – Protection against shock currents, basic requirements for protective separation in electrical equipment	DIN VDE 0106-101
Standard – Limitation of mains harmonic currents	EN 61000-3-2
UL approvals	UL/C-UL listed UL 508
	UL/C-UL Recognized UL 60950
	UL/C-UL Listed UL 1604 Class I, Division 2, Groups A, B, C, D
	NEC Class 2 as per UL 1310
Surge voltage category	III

Connection data, input

Connection method	Pluggable screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	12
Stripping length	7 mm
Screw thread	M3

Connection data, output

Connection method	Pluggable screw connection
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	12
Stripping length	7 mm

Signaling

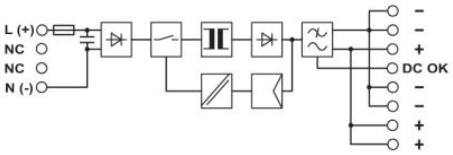
Output name	DC OK active
Output description	U_{OUT} > 21.5 V: High signal
Maximum switching voltage	≤ 24 V
Output voltage	+ 24 V DC (signal)
Continuous load current	≤ 20 mA
Status display	"DC OK" LED green
Note on status display	U_{OUT} > 21.5 V: LED lights up
Conductor cross section solid min.	0.2 mm²
Conductor cross section solid max.	2.5 mm²
Conductor cross section stranded min.	0.2 mm²
Conductor cross section stranded max.	2.5 mm²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	12
Tightening torque, min	0.5 Nm
Tightening torque max	0.6 Nm
Screw thread	M3

Certificates / Approvals

Certification	CUL, CUL Listed, GOST, UL, UL Listed
Certification Ex:	CUL-EX LIS, UL-EX LIS

Diagrams/Drawings

Block diagram



Dimensioned drawing