Weaver
CONSTRUCTION MANAGEMENT
3679 S Huron Street, Suite 404 Englewood, Colorado 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

February 2, 2012
Submittal No: 14555-002 (OM)

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **WesTech Engineering, Inc.**
3665 S West Temple
Salt Lake, UT 84115
801-265-1000

SUBJECT: Preliminary O&M for the Horizontal Spiral Conveyor - Model CVH260 & Control Panel Tag: CV-1

SPEC SECTION: 14555 – Shaftless Screw Conveyors

PREVIOUS SUBMISSION DATES:

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by WCM and approved with respect to the means, methods, techniques, & safety precautions & programs incidental thereto. Weaver General Construction also warrants that this submittal complies with contracted documents and comprises on deviations thereto:

Contractor's Stamp:	Engineer's Stamp:
Date: 2/02/12 Reviewed by: Chuck Berry ( ) Reviewed Without Comments (X) Reviewed With Comments ENGINEER'S COMMENTS:_____	

Project: HDTWRF

Location: Fountain, CO

Supplier: WesTech Engineering Inc. / Goble Sampson Assoc.

Date: 2/2/12

Submittal No: 14555-002 OM

WCM O&M Submittal Review Comments:

1. **On the title page of the O&M, per spec section 01730, indicate: Headworks Building.**
2. **On the title page of the O&M, indicate the equipment number as shown on the contract drawings. For this equipment the number is CV-1.**
3. **The contract requires that the warranty is for two years from the date of substantial completion regardless of the date of delivery.**

WESTECH AN EMPLOYEE OWNED COMPANY

OPERATION & MAINTENANCE MANUAL

EQUIPMENT:

ONE (1) CVH260 HORIZONTAL SPIRAL CONVEYOR

FOR:

HAROLD D THOMPSON RWRF

FOUNTAIN, CO

USA

FURNISHED BY:

WESTECH ENGINEERING, INC.

SALT LAKE CITY, UTAH

WESTECH JOB NUMBER 21393B

JANUARY, 2012

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WESTECH AN EMPLOYEE OWNED COMPANY

OPERATION AND MAINTENANCE MANUAL

ONE (1) CVH260 HORIZONTAL SPIRAL CONVEYOR

FOR:

HAROLD D THOMPSON WATER RECLAMATION FACILITY

FOUNTAIN, CO USA

ENGINEER:

GMS, Inc. Consulting Engineers
611 North Weber, Suite 300
Colorado Springs, Colorado 80903-1074

WESTECH AGENT:

GOBLE SAMPSON ASSOCIATES
6805 N. BROADWAY
DENVER, CO 80221
CONTACT: JOSH QUEEN
PHONE: (303) 770-6418
FAX: (303) 770-7549
jqueen@goblesampson.com

MANUFACTURER:

WESTECH ENGINEERING, INC.
3625 SOUTH WEST TEMPLE
SALT LAKE CITY, UTAH 84115
PHONE: (801) 265-1000
FAX: (801) 265-1080
24 Hour Emergency Assistance (801) 267-4220
www.westech-inc.com

WESTECH JOB NUMBER **21393B**
JANUARY, 2012

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SUMMARY OF WARNINGS

This page lists all warnings contained in this manual and the page numbers on which they are found.

WesTech will not accept responsibility for damage to equipment which has not been handled in accordance with the manufacturer's instructions. Please read the General Precautions, General Safety Instructions, and Storage and Shutdown Precautions sections of this manual before storing, installing, or operating this equipment.

- Insure that all lifting equipment is properly sized to handle the load. (See p. 2-3)
- Anti-seize compound MUST be used on all stainless steel fasteners to prevent galling or seizing. (See p. 2-3)
- If grouting is necessary (see general arrangement drawing(s)), do not grout under support stands until final leveling is completed and verified. (See p. 2-4)
- In order to avoid corrosion, touch-up any paint or galvanizing damaged during installation. (See p. 2-4)
- To prevent personal injury, the Horizontal Conveyor must be shut down before any maintenance or adjustments requiring personal contact are made. If the unit is opened for inspection, cleaning, or observation, the motor must be locked out electrically in such a manner that it cannot be restarted by anyone during the inspection, cleaning, or observation. (See p. 3-3)
- The helical auger will act as a torsional spring and store a tremendous amount of energy if it becomes caught or jammed in the basket. This could cause serious injury or death if released suddenly. Ensure that no energy is stored in the auger before performing any maintenance on the equipment. (See p. 3-3)
- Running the conveyor empty should be avoided to prevent premature wear to the trough liner and spiral. (See p. 3-5)
- All fasteners should be checked regularly and tightened as required. (See p. 4-3)
- Regularly examine the trough liner for excessive wear or misalignment. The. See Recommended Equipment Maintenance Schedule for suggested intervals. **Failure to maintain wear liner will void warranty.**
- (See p. 4-3)
- The equipment must be routinely lubricated according to the Lubrication Schedule and the accessory item instructions enclosed. **Failure to do so will shorten the lifetime of the equipment and void the equipment warranty. (See p. 4-3)**
- If reducer unit is removed, keep driveshaft clean of all debris and dirt. Any contamination will make replacing the reducer more difficult and perhaps impossible. (See p. 4-11)

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1 EQUIPMENT INFORMATION

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WESTECH

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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EQUIPMENT RECORD FORM

NOTE: To keep your warranty in force, this form must be completed and returned to WesTech regularly as indicated on the schedule at the bottom.

WESTECH PROJECT NUMBER:_____
EQUIPMENT I.D. NO.:_____
DATE:_____

MOTOR LOADS:
DATE READ:_____ AMPS #1_____ #2_____ #3_____LINE VOLTAGE:
DATE LUBRICATED:_____TYPE OF GREASE USED:_____

REDUCER:
DATE LUBRICATED:_____
BRAND OF OIL:_____WEIGHT OF OIL:_____

TROUGH LINER: **FASTENERS:**
DATE CHECKED:_____ DATE CHECKED:_____

GENERAL FASTENERS: DATE CHECKED:_____

Any other observations or comments:_____

_____

SIGNED:_____

TITLE:_____

REPORTS DUE: At regular three (3) month intervals after start-up.

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WesTech Municipal Water Products

GROUNDWATER TREATMENT

Aeration

- Cascading Aerator
- Forced Draft Aerator
- Induced Draft Aerator

Sedimentation/Clarification

- Ballasted Flocculation
- ClariCell™ Package Treatment Plant
- Conventional Clarifier
- Flocculating Clarifier
- High Rate Clarifier
- solids CONTACT CLARIFIER™
- SuperSettler™ Inclined Plate Settler

Filtration

- AeraFilter™ Iron and Manganese Removal Plant
- AltaFilter™ Ultrafiltration Membrane System
- AltaPac™ Ultrafiltration Membrane System
- Circular and Rectangular Open Top Gravity Filter
- ClariCell-B™ Package Treatment Plant
- Horizontal and Vertical Pressure Filter
- ModTech™ Cluster Filter

Residuals Handling

- Backwash Water Clarifier
- Decant Mechanism
- Gravity Sludge Thickener
- SuperSettler™ Inclined Plate Settler
- Vacuum Drum Filter

Softening

- Cation Exchange Softener
- Solids CONTACT CLARIFIER™

SURFACE WATER TREATMENT

Flocculation

- Ducted Impeller Flocculator
- Horizontal Paddle Wheel Flocculator
- Vertical Paddle Wheel Flocculator

Sedimentation/Clarification

- ClariCell™ Package Treatment Plant
- Conventional Clarifier
- Flocculating Clarifier
- High Rate Clarifier
- Solids CONTACT CLARIFIER™
- SuperSettler™ Inclined Plate Settler

Filtration

- AltaFilter™ Ultrafiltration Membrane System
- AltaPac™ Ultrafiltration Membrane System
- Circular and Rectangular Open Top Gravity Filter
- ClariCell-B™ Package Treatment Plant
- Horizontal and Vertical Pressure Filter
- ModTech™ Cluster Filter
- PolyBloc™ Roughing Filter

Package Treatment Plants

- AltaFilter™ Ultrafiltration Membrane System
- AltaPac™ Ultrafiltration Membrane System
- ClariCell-B™ Package Treatment Plant

Ion Exchange

- Cation Exchange Softener
- GAC Contactor

Residuals Handling

- Backwash Water Clarifier
- Decant Mechanism
- Gravity Sludge Thickener
- SuperSettler™ Inclined Plate Settler
- Vacuum Drum Filter

Services

- Bench Scale Feasibility Testing
- Field Pilot Studies
- Full Scale Rental Equipment
- Installation and Erection Services
- Mechanical Evaluations
- Plant Process Audits

Tankage

- Supply and Erection

Tel: 801.265.1000
Fax: 801.265.1080
www.westech-inc.com

WESTECH
Process Equipment. Process Driven.

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WesTech Municipal Wastewater Products

Anaerobic Digestion Equipment
- Digester Cover - Radial Beam Style
- Digester Cover - Truss Style
- DuoSphere™ Dual-Membrane Gas Holder
  - Slab and Tank Mount
- Extreme Duty™ Mechanical Sludge Mixer
- Sludge Heating System

Biological Treatment
- Landox™ Oxidation Ditch
- OxyStream™ Advanced Oxidation Ditch Process
- Slow Speed Surface Aerators
- STM-Aerotor™ IFAS Systems
- ClearLogic™ MBR System
- HydroDoc™ Rotary Distributor
- BioDoc® Rotary Distributor

Clarifiers
- C.O.P.™ Clarifier Optimization Package
  - Spiral Blades
  - Sludge Ring
  - Dual Gate EDI
- Suction Header
- solids CONTACT CLARIFIER™
- Conventional Scraper Blade
- Suction Pipe

Combined Sewer Overflow
- CleanFlo™ ROMAG CSO Screens

Dissolved Air Flotation
- Pretreatment Clarifiers
- Sludge Thickeners
- Rectangular & Circular

Electrical Controls
- PLC Based Control Systems
- UL Listed Panels (UL508A/CSA)

Filters
- AltaFilter™ Ultrafiltration Membrane System
- SuperSand™ Continuous Backwash Filter
- Granular Media Gravity Filter
- Multi-Media Pressure Filter
- SuperDisc™ Cloth Media Disc Filter

Headworks
- CleanFlo™ Rotoscreen®
- CleanFlo™ Monoscreen®
- CleanFlo™ ALL-IN-ONE (Complete Plant)
- CleanFlo™ Element Continuous Belt Screen
- CleanFlo™ Perf Perforated Plate Belt Screen
- CleanFlo™ Shear (Internally Fed Drum Screen)
- CleanFlo™ SludgeScreen®
- CleanFlo™ Spiral Screen
- CleanWash™ Screenings Washer / Compactor
- Counter Pressure Screw
- CleanGrit™ Grit Washers
- Gritt Mitt™ Grit Classifiers
- Vortex Grit Separators

Laboratory & Pilot Plant Test Equipment
- Bench Scale Testing
- Pilot Plant Testing

Parts and Service Support
- 24 Hour Hot-Line
- Regional Service Technicians
- Full Service Parts Department

Rectangular Basin Skimming
- Helical Scum Skimmers
- Rotating Scum Pipes

Replacement Drives
- Adaptable to All Other Manufacturers
- Precision Bearing
- Grease Lubricated Option
- Clarifiers
- Thickeners

Septage Receiving Station
- Screening and Grit Removal Options
- Hauler Access Stations
- Customer Management / Billing Software

Tankage
- Material Supply
- Field Erection

Thickeners
- Center Feed
- Rake Lifting Devices
- Side Feed

WesTech

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WesTech Mining and Metallurgical Products

Clarifiers
- Buoyant Media Clarifier
- Flocculating Clarifier
- Metallurgical Contact Clarifier
- Solids CONTACT Clarifier™
- SuperSettler™ Inclined 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

Services
- Bench Scale Feasibility Testing
- Field Pilot Studies
- Installation and Erection Services
- Mechanical Evaluations
- Plant Process Audits
- Pilot Rental Equipment
  - AltaFlo™ High Rate Thickener
  - AltaPac™ Ultrafiltration Package System
  - Buoyant Media Clarifier
  - 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

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Aeration
Cascading Aerator
Forced / Induced Draft Aerator
Pressure Aerator

Barrier/Media Filtration
AeraFilter™ Iron / Manganese Removal
AltaFiler™ Ultrafiltration Membrane Systems
AltaPac™ Ultrafiltration Package Systems
AltaPak™ Ultrafiltration Systems
ClariCell-B™ Package Treatment
ModTech™ Cluster Filter
Open Top Gravity Filter (Circular or Rectangular)
PolyBloc™ Roughing Filter
Pressure Filter (Vertical or Horizontal)
Reverse Osmosis Systems
SuperSand™ Continuous Backwash Filter

Biological Treatment
BioDoc® Rotary Distributor
Biotreater
ClearLogic MBR Systems
DuoSphere™ Dual Membrane Gasholder (Slab or Tank Mount)
HydroDoc™ Rotary Distributor
Oxidation Ditches
Slow Speed Surface Aerators
Slow Speed Surface Aerators
STM Aerator™ IFAS Systems

Clarification/Sedimentation
Conventional Clarifier
COP™ Clarifier
Draft Tube™ Clarifier
Flocculating Clarifier
Metallurgical Contact Clarifier
Solids CONTACT Clarifier™
Suction Header
SuperSettler™ Incline Plate Settler

Clarifier / Thickener Drives
Adaptable to All Other Manufacturers
Precision Bearing

Dewatering
Belt Press
Horizontal Vacuum Belt Filter
Precoat Drum Filter
Recessed Plate Filter Press
Rotary Drum Vacuum Filter

Dissolved Gas Flotation
Circular
Rectangular
Sludge Thickener

Electrical Controls
PLC Based Control Systems
UL Listed Panels (UL508A / CSA)

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

Pilot Rental Equipment
AltaFilter™ Ultrafiltration Membrane Systems
AltaFlo™ High Rate Thickener
AltaPak™ Ultrafiltration Units
Buoyant Media Clarifier
High Rate Thickener
Horizontal Belt Filter
Linear Screen
Paste Thickener
Pilot Rental Equipment
Precoat Filter
Reverse Osmosis
Solids CONTACT Clarifier™
Vacuum Drum Filter

Oil / Water Separation
DAF Units (Circular or Rectangular)
DNF Units (Circular or Rectangular)
Oil / Water Separator (Circular or Rectangular)

Screens
CleanFlo™ Element Continuous Belt Screen
CleanFlo™ Monoscreen®
CleanFlo™ Rotoscreen®
CleanFlo™ Shear (Internally Fed Drum Screen)
CleanFlo™ Spiral Screen
CleanWash™ Screenings Washer / Compactor
Counter Pressure Screw
Gritt Mitt™ Grit Classifiers
Linear Screen

Softening
Cation Exchange Softener
Cold Lime Softening
Warm Lime Softening

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

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

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GENERAL DESCRIPTION

The WesTech Horizontal Conveyor uses a shaftless spiral to transport screenings, sludge, and other solid wastes. The shaftless spiral eliminates the center shaft to allow stringy solids to convey freely to the discharge point without wrapping around a center shaft.

To perform as described, the Horizontal Conveyor will consist of the following:

CONVEYOR SECTION

An inlet hopper (if provided) will direct screenings into the conveyor trough. The trough consists of a U-trough with a liner constructed of Ultra High Molecular Weight Polyethylene (UHMW PE). The shaftless helical screw rests on the wear liner and when the spiral rotates, solids are positively conveyed to the discharge point and into a solids receptacle. If provided, a drain will be provided to allow liquid to drain from the trough.

DRIVE UNIT

The conveyor drive unit consists of an electric motor directly driving a flange-mounted, hollow shaft, helical gear reducer. This unit attaches to the end of the trough housing and is bolted to the drive shaft.

GENERAL PRECAUTIONS

The erection instructions enclosed are provided to assist in the assembly and adjustment of this mechanism. These procedures are not intended to be substituted for the experience of the persons assigned to the task of erecting and assembling this equipment. WesTech strongly suggests that these instructions be studied prior to erecting, assembling, and adjusting.

During assembly of this equipment, it will be necessary to install, adjust, and maintain certain accessory items which are not manufactured by WesTech. This accessory equipment must be stored, handled, adjusted, and maintained in accordance with instructions provided by the manufacturer of that equipment. This is absolutely necessary in order to be assured of prompt and full participation in the 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.

PACKING LIST

The Contractor's packing list consists of a sheet containing an itemized listing of parts.

The packing list contains:

1. A description of the item.
2. Sizes and lengths of nuts and bolts. These fasteners will be tagged with an item number.
3. The quantity of parts per assembled unit.
4. Total quantity of parts shipped.
5. An indication of direct shipment from the supplier or the fabricator.
6. The date and job number of the shipment.

The packing list will be found in one of the cartons which are shipped directly from Salt Lake City, Utah. The list should be kept in a readily accessible and safe place. Many contractors prefer to keep this list in some type of binder for protection and quick reference.

This list is particularly useful during erection for locating small parts and fasteners. When coordinated with the erection drawings, equipment tagging, and piece marking, the contractor's packing list can become an invaluable erection tool.

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 assembly drawing.

RECEIVING MATERIAL:

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 job site, it is important to coordinate the receiving and storage of all items accordingly. All material has been thoroughly checked and inspected before shipment. However, there may be times when equipment is missing, damaged in transit or received with broken packaging. When receiving equipment, it is necessary to properly acknowledge receipt and any shortage or damage on the shipping documents. This must be done in a manner that helps assign responsibility to the proper party for the various parts of shipping and receiving equipment.

When receiving a shipment, the following procedures must be followed. These procedures are also listed on the Bill of Lading the shipping company provides and must be signed to prove delivery of the goods. If the following procedures are not followed, WesTech will not be liable for any shortages or damage on your shipments.

RECEIVING PROCEDURE

1. BEFORE signing the Bill of Lading (BOL) in receipt of the goods shown thereon, and BEFORE the driver leaves, do the following:

   A. After inspecting the shipment, NOTE any damage or shortages (according to what is listed on the BOL). Be as detailed as necessary.

   B. Have the driver sign the notation in acknowledgment.

   C. Retain a copy (of the notated BOL) for use in filing a freight claim.

   D. If there is damage, NOTIFY WesTech (801) 265-1000 IMMEDIATELY so that arrangements can be made with the carrier, if necessary, to have the damaged goods inspected by their agent.

2. AFTER signing the BOL and receiving the shipment, do the following:

   A. Use the attached/enclosed packing list to further inspect the entire shipment for shortages and/or damage and retain this list for future reference.

   B. NOTIFY WesTech within THREE (3) working days from date of receipt, of any further shortages or concealed damage. If certain items are missing or damaged, make notes of this on the shipping papers to protect all interests and notify WesTech (801) 265-1000 IMMEDIATELY.

HANDLING & STORAGE

Please handle the equipment properly when unloading and erecting. All cartons, electrical equipment, and gear 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 erection and proper alignment of the equipment.

Long structural shapes should be checked for the proper camber. This would include beams, trusses, walkways, etc. The equipment has been designed with a positive camber so items do not appear to be sagging after erection.

PAINTING:

The material supplied for this job may have received surface preparation and paint in accordance with the specific contract plans and specifications.

Any indentations, mars, and/or scratches caused by loading and unloading the equipment must be IMMEDIATELY touched up in the field prior to storage.

NOTE: SHOP PRIMER PAINT DURABILITY

In the event the equipment supplied has been painted with only a primer coat, this notification should be adhered to. Shop primer paints are intended to serve only as a bonding coat between the metallic surface and the protective finish and serve only as a minimal protective finish. Unless otherwise noted in the contract documents, WesTech will not be responsible for condition of primed or finish painted surfaces after the equipment leaves our shops. Customers are invited to inspect coatings in our shops for proper surface preparation and application prior to shipment. WesTech assumes no responsibility for field surface preparation or touch up of shipping damage to paint. Painting of surfaces requiring touch up or painting of fasteners will be by the customer's painting contractor after the mechanism is erected.

Shop primed surfaces should be finish coated within the time specified by the paint manufacturer. WesTech cannot be held responsible for shop primed surfaces that have deteriorated due to time and exposure.

FASTENERS:

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

ANCHOR BOLTS:

If Provided, anchor bolts must be placed accurately to avoid future erection difficulties. Where applicable and upon request, WesTech can furnish a template for positioning the anchor bolts. If a template has not been furnished, remember that 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 the threads of all anchor bolts.

OPERATION & MAINTENANCE MANUAL:

Keep an O&M Manual in the area where the operators can familiarize themselves with it and have it for reference. The manual is useless if the operator and foreman do not have access to it.

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 (801) 265-1000 or fax (801) 265-1080. See also our website at www.westech-inc.com.

SHORTAGES, DISCREPANCIES, AND FIELD CHARGES

Please notify WesTech Engineering, Inc. immediately if any apparent manufacturing discrepancies or shortages are encountered with machinery, since no field charges for alterations or shortages will be accepted unless authorized in writing by our authorized representative.

Fabricated steel parts and assemblies furnished by WesTech Engineering, Inc. 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 ASD, Ninth Edition, or LRFD, First Edition, "Code of Standard Practice", will apply to erection of this equipment. It reads as follows:

> "7.12. Corrections and Errors
>
> Normal erection operations include the correction of minor errors by moderate amounts of reaming, chipping, welding or cutting, and the drawing of elements into line through the use of drift pins. Errors which cannot be corrected by the foregoing means or which require major changes in member configuration are reported immediately to the owner and fabricator by the erector, to enable whoever is responsible either to correct the error or to approve the most efficient and economic method of correction is to be used by others."

Company policy dictates that no field charges will be allowed without prior approval. Written authority must be given in the form of a WesTech Inspection and Change Work form with an attached 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.

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2 INSTALLATION INSTRUCTIONS

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BASIC INSTALLATION

The sequence and procedures listed below are suggested and should not take precedence over the experience of the erector if, due to special circumstances or available equipment, he should decide to vary the given steps.

NOTE: Figures depicted in this section and throughout the manual are graphical examples only. Actual configuration of supplied unit may vary.

If installation is not immediately started upon delivery of the equipment, the appropriate short- or long-term storage procedure, as prescribed in the Storage and Shutdown Precautions section of this manual, must be followed.

The Horizontal Conveyor is preassembled in the shop. If the conveyor length exceeds 40 feet, it will be shipped in multiple sections and will require field assembly and welding of the spiral.

Only minor field assembly is required.

Insure that all lifting equipment is properly sized to handle the load.

IMPORTANT: Anti-seize compound MUST be used on all stainless steel fasteners to prevent galling or seizing.

The concrete and concrete dimensions shown on the general arrangement and assembly drawing(s) are nominal. Place the assembled equipment in correct position prior to fixing anchor bolt positions to verify proper fit and discharge location. Refer to the general assembly drawing(s) and parts list enclosed in this manual during all installation steps.

1. Mark anchor bolt positions for Horizontal Conveyor support frame. Check anchors for correct spacing and orientation with respect to the support legs and the entire Horizontal Conveyor.

2. Install Horizontal Conveyor anchors per the anchor manufacturer's instructions and the general arrangement drawing(s).

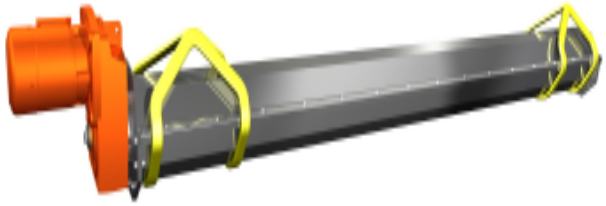
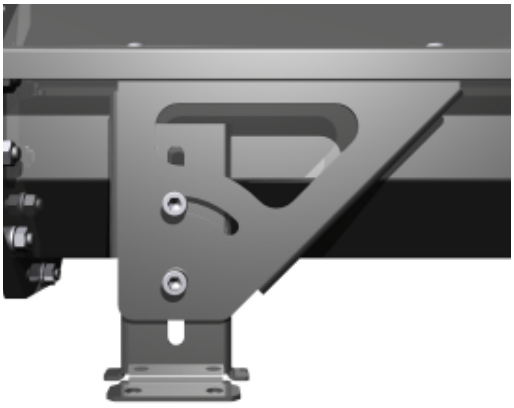


Figure 2-1: Proper Lifting instructions

3. If Horizontal Conveyor unit support legs are to be placed on a bed of grout (see general arrangement drawing(s)), follow the next steps. If unit is to be placed directly on floor without grout, proceed to step 4 and make certain the floor is flat and the legs are flush with the floor before securing the unit. Level or shim under the feet as required to prevent any distortion to the equipment when it is secured to the floor.

   a. Install support legs to the trough, if required. Adjust leveling nuts until level in all directions. Finger-tighten locking nuts to secure bases in position. Refer to the Final Check for Level procedures in this manual before permanently tightening nuts



b. Adjust each anchor leveling nut face to the same elevation (approximately 1 inch from concrete surface).

IMPORTANT: If grouting is necessary (see general arrangement drawing(s)), do not grout under support stands until final positioning is completed and verified.

4. If the motor is shipped separately, install the motor to the reducer. Be sure to engage the motor and reducer shaft couplings with the flexible motor spider. See Trough Assembly (if required) instructions below.

5. Install the Horizontal Conveyor unit in position and tighten all the fasteners for the support frame.

6. If a trough drain is provided, connect the drain hose and place the other end of the hose to direct the drain liquid to a floor drain or channel.

7. A qualified electrician should wire the Horizontal Conveyor drive motor and emergency stop pushbutton. Jog the drive motor. Ensure that the drive shaft rotates in the proper direction so as to cause the screw to convey material towards the discharge point.

8. Ensure proper screenings receptacle is in place.

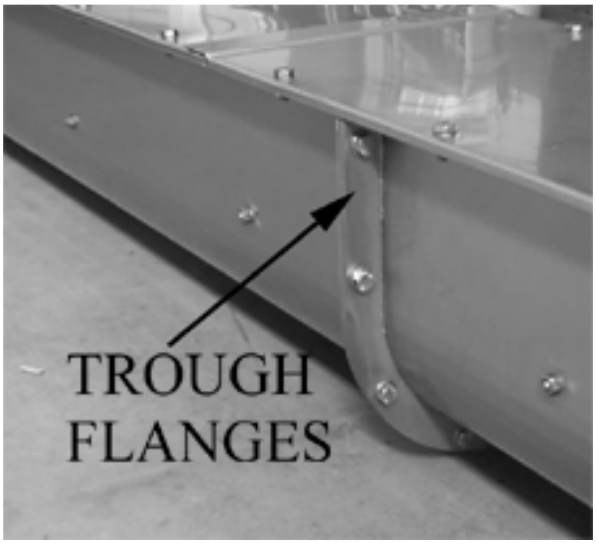
NOTE: In order to avoid corrosion, touch-up any paint or galvanizing damaged during installation.

TROUGH AND SPIRAL ASSEMBLY (IF REQUIRED)

If the trough length is over 40', the trough will be provided in multiple sections and require field assembly. To facilitate the assembly, all the trough pieces have end flanges which are bolted together. Each part of trough is marked at each end with a number/letter: ALWAYS JOIN THE PARTS HAVING THE SAME NUMBER/LETTER.

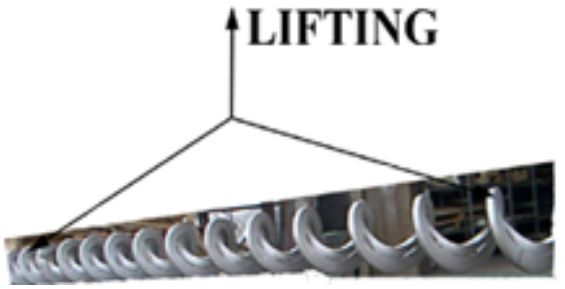
- Check the number/letter signed on the trough, close to the fixing flange and match the two parts having the same number/letter.
- Seal the two flanges with a generous amount of silicone sealant.
- Fix the two connecting flanges by means of the supplied nuts and bolts.

Confirm the trough is perfectly aligned and tighten the bolts



All the spiral terminals have been machined in order to facilitate the welding.
The spiral sections are not painted close to the ends where they have to be welded. They must be painted after the welding.

The spiral can be welded inside or outside the trough.
If the spiral is welded inside the trough, it is necessary to protect the liner with suitable protection (for example. sheet metal).
In case of welding outside the trough it is necessary to put the spiral sections on a flat surface in order to guarantee the perfect alignment of the spiral and to have suitable lifting equipment to position the welded spiral inside the trough.
The spiral must be lifted using lifting hooks in order to avoid any dangerous deflection.



Necessary Tools.

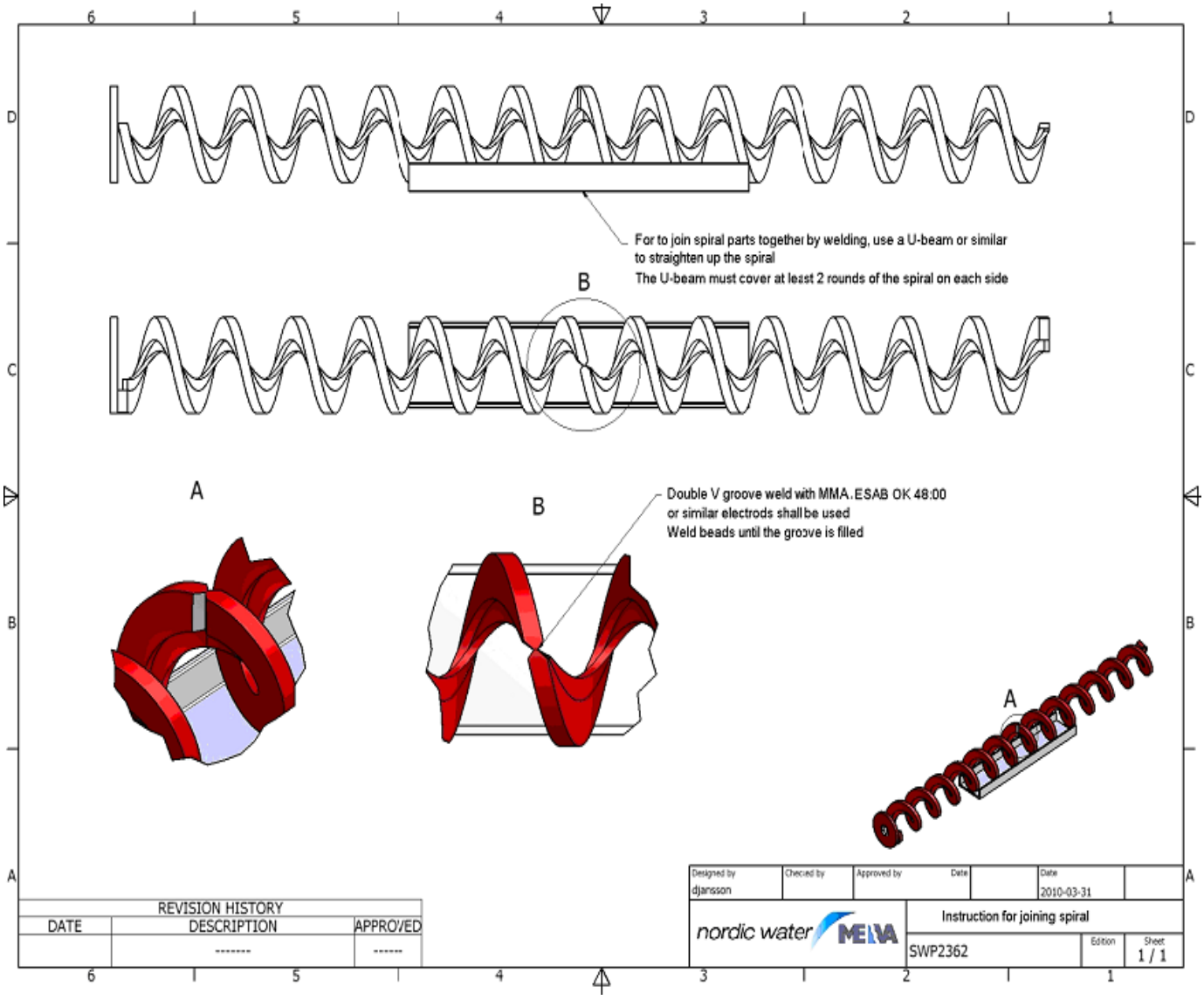
- Welding machine, arc or wire type, 200/300 A.
- Portable Grinder.

Working Procedure.

- The spiral ends must be cleaned and any corrosion shall be removed from the spiral. If there are multiple sections, the welding shall start at the drive end of the spiral. The end of the spiral will have a rounded end and all intermediate sections are interchangeable.
- Position all the sections in order to obtain the required length of spiral. Before welding, check the total length of the spiral: it must be as per the technical data sheet attached to the machine. **THE TOTAL LENGTH OF**

THE SCREW MUST BE APPROX. 2 INCHES LESS THAN THE TROUGH.

- Weld the connections.
- Grind the welding in order to obtain a "continuous structure" of the spiral.



MOTOR INSTALLATION

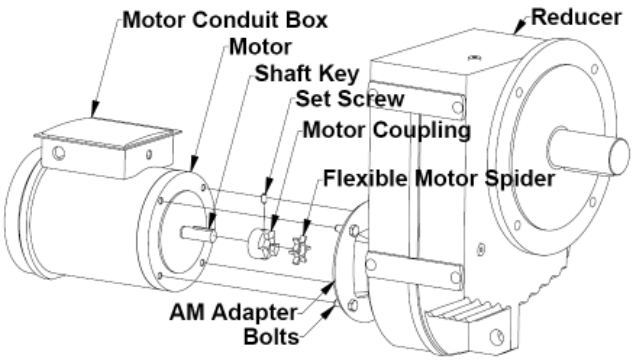


Figure 2-2: Helical Reducer Assembly

If motor is not already installed to reducer:

1. Place motor coupling and key in location on motor shaft as per Figure 2-3 and Table 2-1 below for all SEW Eurodrive brand reducers. Also, check the manufacturer's instructions in the Accessory Equipment section of this manual.

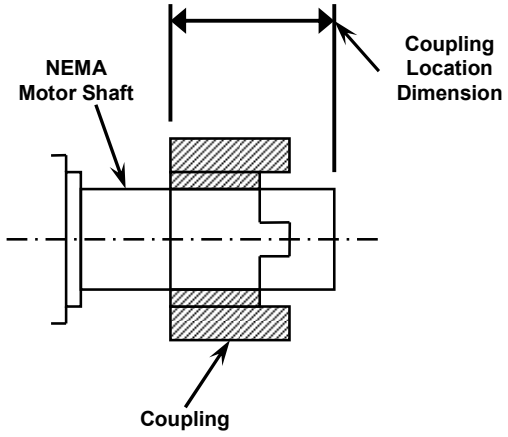


Figure 2-3: SEW Reducer/Motor Coupling Location

Table 2-1: SEW Reducer/Motor Coupling Location

SEW Reducer Adapter Size	NEMA Motor Frame	Coupling Location Dimension (in.)
AM56	56C	1.23
AM143/145	143/145TC	1.68
AM182/184	182/184TC	2.10
AM213/215	213/215TC	2.76

2. Tighten set screw.

3. Place the flexible motor spider between the teeth of the motor coupling.

4. Align the motor coupling so that the teeth on the reducer coupling (installed in AM adapter) mesh with the motor coupling.

5. Install motor to reducer using bolts.

FINAL CHECK OF POSITION

If Horizontal Conveyor unit is not to be placed on a bed of grout (see general arrangement drawing(s)), disregard this section.

To ensure that the Horizontal Conveyor is positioned properly, it is necessary to make a final check.

1. The leveling nuts were used earlier to adjust the support frame.

2. Use a carpenter's level to level each support frame base or use an inclinometer to confirm the proper inclination. Make sure that the inlet and discharge connections properly fit up to adjacent equipment.

3. If adjustment is necessary, lower or raise the corresponding leveling nuts, as required.

4. When the Horizontal Conveyor is properly located, secure the support frame base with top locking nut and grout with a non-shrink grout (not by WesTech).

ELECTRICAL

All wiring external to motors and controls is by others.

CONTROL PANEL

1. Install the electrical control panel in desired location.

2. Complete external wiring to motor, emergency stop pushbutton and any other electrical components indicated on the control panel drawings (if provided).

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3 START-UP AND OPERATION

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GENERAL SAFETY INSTRUCTIONS

1. Only trained operators who have been schooled in safety procedures should be allowed to work on or around this equipment. Exercise caution at all times. Allow access to authorized personnel only.

2. Anyone entering the area should be wearing adequate safety equipment, such as safety glasses, safety shoes, hard hats, etc. Long hair and loose clothing must be tied back, and jewelry must be removed.

3. To prevent personal injury, the Horizontal Conveyor must be shut down before any maintenance or adjustments requiring personal contact are made. If the unit is opened for inspection, cleaning or observation, the motor must be locked out electrically in such a manner that it cannot be restarted by anyone during the inspection, cleaning, or observation.

4. Locate "WARNING" signs to alert people of moving parts. Keep hands, clothing, etc. away from all moving parts.

5. Keep all flammable or explosive materials away from the equipment area at all times.

6. Keep people whose abilities may be impaired due to drinking alcohol, using drugs, taking medication, etc. away from the equipment.

7. Inspect equipment frequently for loose bolts, leaks, or other malfunctions. Problems should be fixed immediately.

8. Do not walk on conveyor covers or guards.

9. Do not poke or prod material in the conveyor unless the drive is off and power has been locked-out.

10. Do not place hands, feet, or any other object in any conveyor opening.

11. The helical auger will act as a torsional spring and store a tremendous amount of energy if it becomes caught or jammed in the basket. This could cause serious injury or death if released suddenly. Ensure that no energy is stored in the auger before performing any maintenance on the equipment.

HORIZONTAL CONVEYOR PRE-STARTUP CHECKLIST

The following is a checklist of items that should be in place and verified as correct prior to the arrival of a WesTech representative, if field service and start-up services have been arranged.

- ☐ Confirm the position of the conveyor relative to the adjacent equipment (see assembly drawing(s) for correct angle).
- ☐ Verify motor is wired correctly and screw rotates in the proper direction (see assembly drawing(s)).
- ☐ If supplied, ensure electrical controls including emergency stop pushbutton are fully operational. THE CURRENT MONITOR MUST BE ADJUSTED TO IMMEDIATELY SHUT THE UNIT DOWN WHEN THE CURRENT DRAW IS SLIGHTLY ABOVE THE OPERATING LOAD. FAILURE TO DO THIS CAN RESULT IN DAMAGE TO THE SPIRAL.
- ☐ Have solids available to witness successful operation of the screen.

START-UP AND OPERATION

1. Be sure the mechanisms are lubricated in accordance with the lubrication instructions found in the Maintenance and Parts section of this manual.

2. Before the equipment is operated, a final mechanical checkout should be performed. **All fasteners must be verified as tight**. All moving parts must be properly aligned. To ensure that there is no binding or misalignment in the systems, rotate the conveyor slowly by hand, apply power only momentarily, and check for any problems.

3. In start-up of the Horizontal Conveyor, operate several minutes empty as a break-in period. Observe any abnormal heat build-up, unusual noises, or drive misalignment. Should any of these occur, refer to the Recommended Equipment Maintenance Schedule in the Maintenance and Parts section of this manual and take necessary corrective steps.

4. Begin normal operation. Do not overload the conveyor. Do not exceed conveyor speed, capacity, material density, or solids feed rate for which the conveyor and drive were designed.

5. Normal operation: The unit will accept screenings or sludge. After a short period of time, solids will accumulate in the trough. After the trough fills to at least half full, the conveyor will start and the transport the solids to clear the inlet area, and then stop. The conveyor will be controlled by the use of timers and will require field adjustment to operate as required by the site conditions. After the conveyor has run, it will stop and wait for more solids to accumulate.

IMPORTANT: Running the conveyor empty should be avoided to prevent premature wear to the trough liner and spiral.

Refer to control panel drawings in the Enclosures section to review all control functions for the provided equipment.

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4 MAINTENANCE AND PARTS

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EQUIPMENT MAINTENANCE

1. All fasteners should be checked regularly and tightened as required.

2. Regularly examine the trough liner for excessive wear or misalignment. The UHMW is two-toned in inlet area, to allow easy visual indication when the liner needs replacing. See Recommended Equipment Maintenance Schedule for suggested intervals. **Failure to maintain wear liner will void warranty.**

3. Keep the equipment and surroundings clean.

4. Inspect all painted and galvanized surfaces frequently to check for corrosion. Remove any rust found and apply touch-up paint. All painted steel should be inspected once every year and repainted if required.

5. Corrosion may start to appear even on high-grade stainless steels due to external rust or rust films, dirt, chemical or similar residues that settle on the surface and corrode. Dirty stainless steel surfaces should be cleaned regularly as part of regular maintenance. Stainless steel surfaces should be treated with Stainless Shine™ surface cleaner/protector or an equivalent agent that DOES NOT contain hydrochloric acid and/or chlorides.

6. If the mechanism is to be shut down for an extended period of time, the appropriate Storage and Shutdown Precautions must be followed.

7. The equipment must be routinely lubricated according to the Lubrication Schedule and the accessory item instructions enclosed. **Failure to do so will shorten the lifetime of the equipment and void the equipment warranty.**

8. The equipment should be checked regularly for unusual sounds, irregular motion, or other signs of improper operation. If any of these symptoms are discovered, it must be investigated immediately to determine the source of the problem. The mechanism must not be allowed to operate if such problems exist.

9. The following maintenance procedures may require that the screen be removed from its operating position:

   A. Replacement of UHMW Trough Liner

   B. Replacement of Spiral

   C. Replacement of the Packing Gland

   D. Helical Reducer Removal

   E. Helical Reducer Replacement.

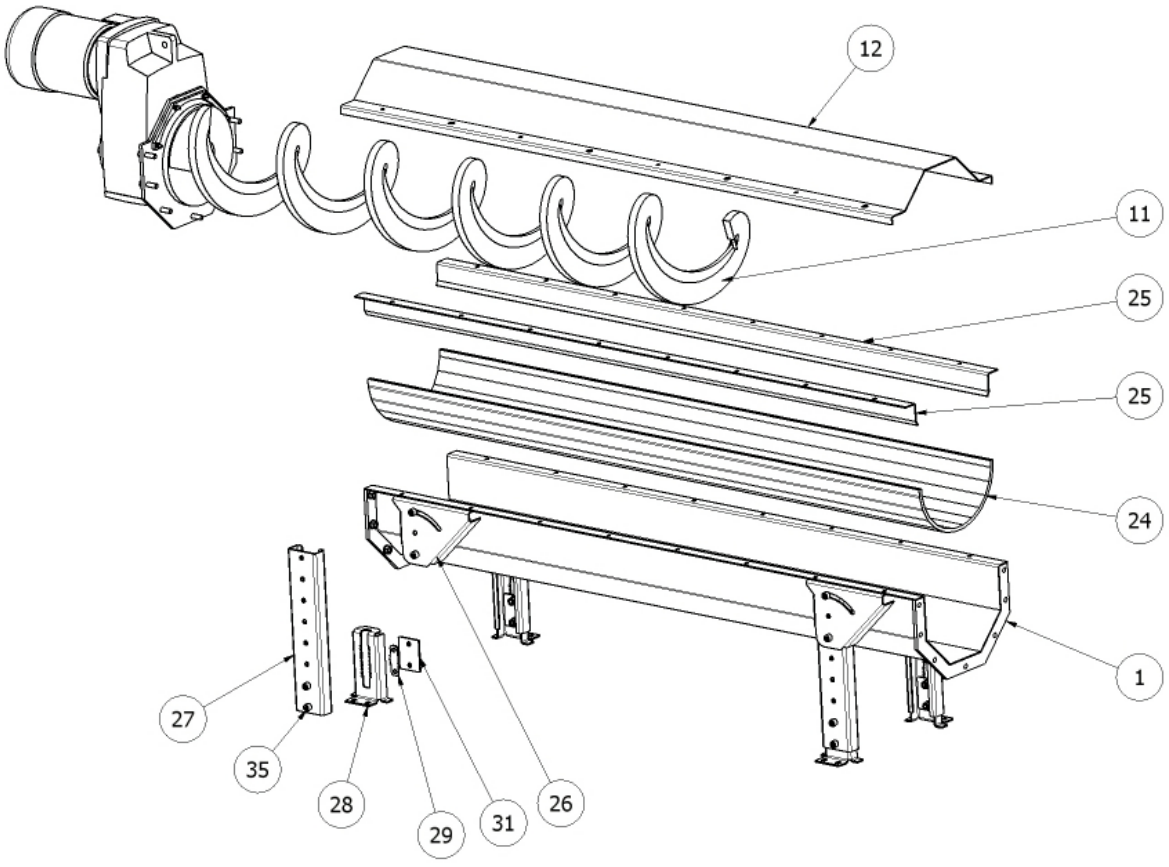
REPLACEMENT OF UHMW TROUGH LINER

Prior to working on equipment, the power supply to the motor is to be disconnected in a manner which will disallow anyone from reconnecting power without the knowledge of the person who is performing the maintenance.

1. Prevent any solids from entering the equipment.

2. Unbolt the screws holding the covers (12) in place and remove.

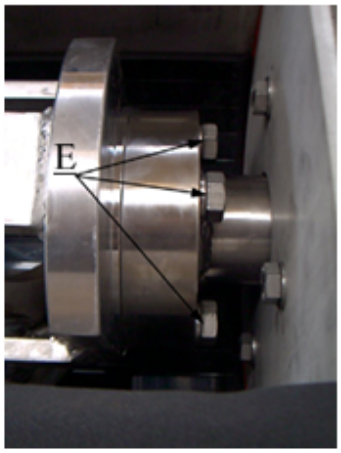
3. Remove the screws connecting the spiral drive flange to the flange of the conveyor.
4. Remove the spiral from the trough, by means of suitable lifting system.
5. Remove one of the liner retaining profiles (25).
6. Remove the old liner (24).
7. Clean the trough.
8. Install the new liner. To facilitate the installation rotate it inside the trough.
9. Repeat the operation above written in reverse sequence, steps 6 through 2.
10. Before installing the trough covers, test the running of the spiral. To avoid the seizure of the spiral add some water on the liner.

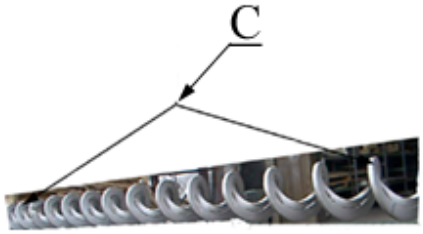


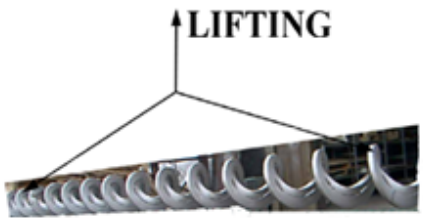
REPLACEMENT OF SPIRAL

Prior to working on equipment, the power supply to the motor is to be disconnected in a manner which will disallow anyone from reconnecting power without the knowledge of the person who is performing the maintenance.

1. Prevent any solids from entering the conveyor.
2. Unbolt the screws holding the covers in place and remove.
3. Remove the screws fixing the spiral driven flange to the flange of the gearmotor.
4. Remove the spiral from the trough, by means of suitable lifting system.
5. Repeat the operation above written in reverse sequence, replacing the spiral.
6. Before installing the trough covers, test the perfect running of the spiral. To avoid seizure of the spiral add some water, in case of HMDW Polyethylene, or grease/oil in case of S.S. strip.



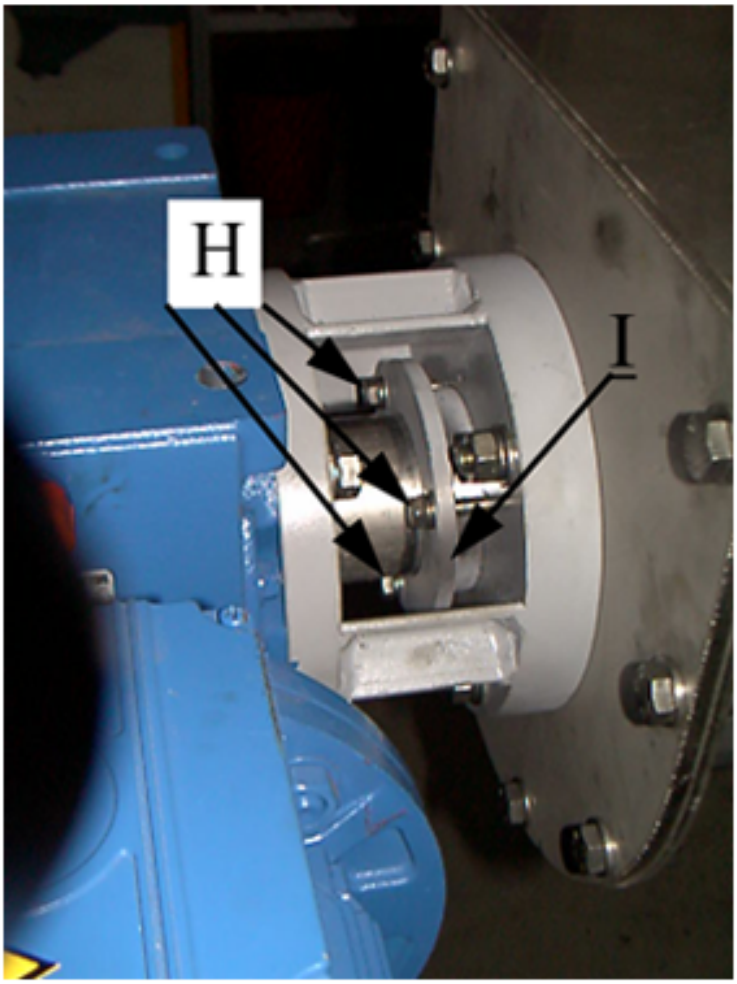




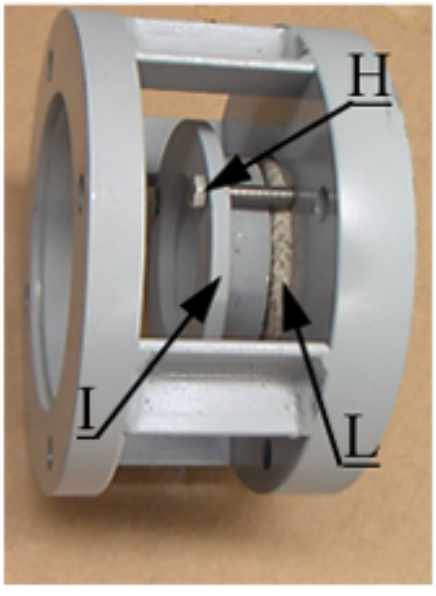
REPLACEMENT OF PACKING GLAND (IF PROVIDED)

Prior to working on equipment, the power supply to the motor is to be disconnected in a manner which will disallow anyone from reconnecting power without the knowledge of the person who is performing the maintenance.

1. Divert flow away from screen channel.
2. Unscrew the bolts (H) fixing the gland (I) of the stuffing box.
3. Pull back the gland (I) in order to reach the packing.
4. Remove the old packing and replace it with the new one (L).
5. Tighten the bolts (H) in order to give the right preloading to the packing.



INSTALLATION
OF
THE NEW PACKING



HELICAL REDUCER REMOVAL

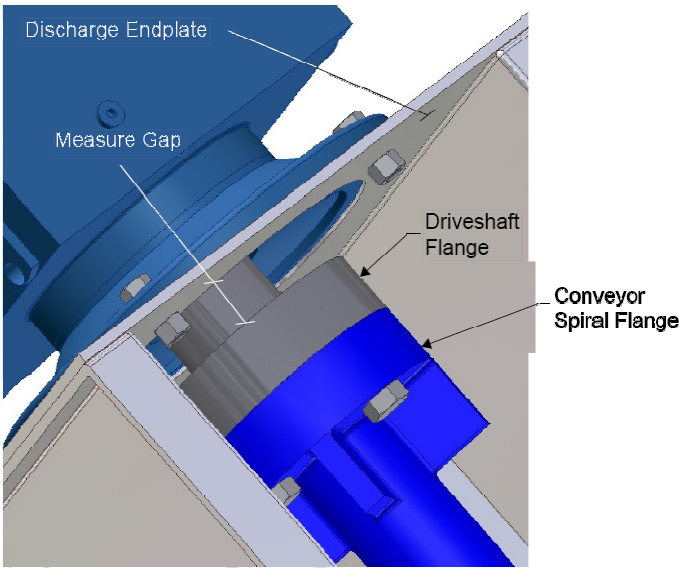
1. Disconnect motor from power supply.

2. Measure and record the gap between the driveshaft flange and the discharge endplate. This measurement will be used when replacing the reducer to ensure proper spiral position.

3. Remove bolts attaching the spiral flange to the driveshaft flange.

4. Remove bolts attaching the reducer flange to the discharge endplate. **Be sure that the reducer is adequately supported before doing this.**

5. Remove reducer, exercising care when extracting driveshaft through discharge endplate hole. Place detached reducer in a safe and convenient working location.



6. Remove dust cap and existing retaining bolt and washer as per Figure 4-1.

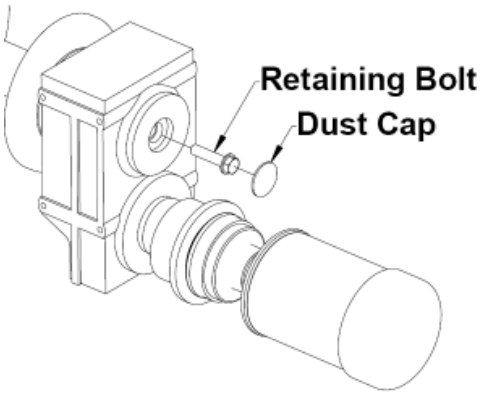


Figure 4-1: Helical Reducer Dust Cap and Retaining Bolt

7. Insert a jack between the driveshaft flange and the reducer flange. If necessary, cover the flanges with a cloth to prevent damage from the jack. Steadily jack the driveshaft away from the reducer.

IMPORTANT: Keep driveshaft clean of all debris and dirt. Any contamination will make replacing the reducer more difficult and perhaps impossible.

HELICAL REDUCER REPLACEMENT

NOTE: Apply anti-seize to driveshaft before inserting into reducer hollowshaft. Be sure driveshaft is free of dirt and contaminants before applying anti-seize.

1. Insert driveshaft into reducer hollow shaft with shaft key inserted into its proper groove. Be sure that the gap between the driveshaft flange and the discharge endplate is the same as recorded before the reducer was removed. This ensures that the spiral will be in proper position.

2. Replace retaining bolt and dust cap on reducer.

3. Attach reducer flange to the discharge endplate with bolts. See assembly drawings for proper reducer mounting orientation.

4. Pull up spiral flange into place to meet flush with the driveshaft flange. Attach and secure both flanges with original bolts.

RECOMMENDED EQUIPMENT MAINTENANCE SCHEDULE

DESCRIPTION	CHECK FOR	INTERVAL	ACTION	TOOLS
General Fasteners	Loose	Weekly	Tighten	
Solids Inlet	Clogging	Daily	Clear	
Solids Discharge	Clogging	Daily	Clear	
Packing Gland (if provided)	leakage	Weekly	Clear drain, tighten gland if necessary	
Liner	Wear	Monthly		
Screw, Reducer & Motor	Vibration & Noise	Monthly	Repair or Replace	Wrench
Reducer	Lubrication	Yearly	Lubricate (if required) (See Accessory Equipment Section)	Wrench

LUBRICATION SCHEDULE

Description	Lube Type	Fill Amount	Check / Change
Drive Reducer	Exxon Mobil - Mobilgear 600XP 220	See Accessory Equipment Section	See Accessory Equipment Section
Motor	Exxon Mobil – Polyrex EM	See Accessory Equipment Section	See Accessory Equipment Section

STORAGE AND SHUTDOWN PRECAUTIONS

SHUTDOWN OF HORIZONTAL CONVEYOR

To shut down the Horizontal Conveyor, stop flow to the unit and lock out power to drive. If the conveyor is to be inoperative for a prolonged period of time, operate conveyor until cleared of all material and open drain valve to drain unit of all liquid. This is particularly important when the material conveyed tends to harden or become more viscous or sticky, if allowed to stand for a period of time.

Check that all valves and drains are tightly closed and that the drive is operating normally.

STORING BEFORE INSTALLATION

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

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 stream. These steps are required to protect against corrosion and assure operating condition.

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

SHORT TERM STORAGE OR SHUTDOWN
(From 30 to 120 days)

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

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.

LONG TERM STORAGE OR SHUTDOWN
(Over 120 days)

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. 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.

MOTOR TROUBLESHOOTING GUIDE

SYMPTOMS	CAUSE	RESULT	REMEDY
1. MOTOR DOES NOT START	A. INCORRECTLY CONNECTED	A. BURNOUT	A. CONNECT CORRECTLY PER DIAGRAM ON MOTOR
	B. INCORRECT POWER SUPPLY	B. BURNOUT	B. USE ONLY WITH CORRECT RATED POWER SUPPLY
	C. FUSE OUT, LOOSE OR OPEN CONNECTION	C. BURNOUT	C. CORRECT OPEN CIRCUIT CONDITION
	D. OPEN CONTROL CIRCUIT	D. NONE	D. CORRECT OPEN CIRCUIT CONDITION
	E. ROTATING PARTS OF MOTOR MAY BE JAMMED MECHANICALLY	E. BURNOUT	E. CHECK AND CORRECT: 1.BENT SHAFT 2.BROKEN HOUSING 3.DAMAGED BEARING 4.FOREIGN MATERIAL IN MOTOR
	F. DRIVEN MACHINE MAY BE JAMMED	F. BURNOUT	F. CORRECT JAMMED CONDITION
	G. NO POWER SUPPLY	G. NONE	G. CHECK FOR VOLTAGE AT MOTOR AND WORK BACK TO POWER SUPPLY
2. MOTOR STARTS BUT DOES NOT COME UP TO SPEED	A. SAME AS 1- A,B,C ABOVE	A. SAME AS 1- A,B,C ABOVE	A. SAME AS 1- A,B,C ABOVE
	B. OVERLOAD	B. BURNOUT	B. REDUCE LOAD TO BRING CURRENT TO RATED LIMIT. USE PROPER FUSES AND OVERLOAD PROTECTION
3. MOTOR NOISY ELECTRICALLY	A. SAME AS 1- A,B,C ABOVE	A. SAME AS 1- A,B,C ABOVE	A. SAME AS 1- A,B,C ABOVE
4. MOTOR RUNS HOT (EXCEEDS RATING)	A. SAME AS 1- A,B,C ABOVE	A. SAME AS 1- A,B,C ABOVE	A. SAME AS 1- A,B,C ABOVE
	B. OVERLOAD	B. BURNOUT	B. REDUCE LOAD
	C. IMPAIRED VENTILATION	C. BURNOUT	C. REMOVE OBSTRUCTION

	D. FREQUENT START OR STOP	D. BURNOUT	D. 1. REDUCE NUMBERS OF STARTS OR REVERSALS 2. SECURE PROPER MOTOR FOR THIS DUTY
	E. MISALIGNMENT BETWEEN ROTOR AND STATOR LIMITATIONS	E. BURNOUT	E. REALIGN
5. NOISY MECHANICALLY	A. MISALIGNMENT OF COUPLING OR SPROCKET	A. BEARING FAILURE, BROKEN SHAFT, STATOR BURNOUT DUE TO MOTOR DRAG	A. CORRECT MISALIGNMENT
	B. MECHANICAL IMBALANCE OF ROTATING PARTS	B. SAME AS 5-A	B. FIND UNBALANCED PART, THEN BALANCE
	C. LACK OF OR IMPROPER LUBRICANT	C. BEARING FAILURE	C. USE CORRECT LUBRICANT, REPLACE PARTS AS NECESSARY
	D. FOREIGN MATERIAL IN LUBRICANT	D. SAME AS 5-C	D. CLEAN OUT AND REPLACE BEARINGS
	E. OVERLOAD	E. SAME AS 5-C	E. REMOVE OVERLOAD CONDITION, REPLACE DAMAGED PARTS
	F. SHOCK LOADING	F. SAME AS 5-C	F. CORRECT CAUSES AND REPLACE DAMAGED PARTS
	G. MOUNTING ACTS AS AMPLIFIER OF NORMAL NOISE	G. ANNOYING NOISE	G. ISOLATE MOTOR FROM BASE
	H. ROTOR DRAGGING DUE TO WORN BEARINGS, SHAFT, OR BRACKET	H. BURNOUT	H. REPLACE BEARINGS, SHAFT, OR BRACKET AS NEEDED
6. BEARING FAILURE	A. SAME AS 5-A,B,C,D,E	A. BURNOUT, DAMAGED SHAFT, DAMAGED HOUSING	A. REPLACE BEARINGS AND FOLLOW 5-A,B,C,D,E
	B. ENTRY OF WATER OR FOREIGN MATERIAL INTO BEARING HOUSING	B. SAME AS 6-A	B. REPLACE BEARINGS AND SHIELD AGAINST ENTRY OF FOREIGN MATERIAL (WATER, DUST, ETC.) USE PROPER MOTOR

TYPICAL MOTOR BURNOUT PATTERNS

SYMPTOM	CAUSED BY	APPEARANCE
SHORTED COIL	MOISTURE, CHEMICALS, FOREIGN MATERIAL IN MOTOR, DAMAGED WINDINGS	BLACK OR BURNED COIL WITH REMAINDER OF WINDING GOOD
100% FAILURE	OVERLOAD STALLED IMPAIRED VENTILATION FREQUENT REVERSAL OR STARTING INCORRECT POWER	EQUALLY BURNED ALL AROUND WINDING
SINGLE PHASE CONDITION	OPEN CIRCUIT IN ONE LINE. THE MOST COMMON CAUSES ARE LOOSE CONNECTIONS, ONE FUSE OUT, LOOSE CONTACT IN SWITCH	IF 1800 RPM - FOUR EQUALLY BURNED GROUPS AT 90 DEGREE INTERVALS IF 1200 RPM - SIX EQUALLY BURNED GROUPS AT 60 DEGREE INTERVALS IF 3600 RPM - TWO EQUALLY BURNED GROUPS AT 180 DEGREES NOTE: IF Y CONNECTED, EACH BURNED GROUP WILL CONSIST OF TWO ADJACENT PHASE GROUPS. IF DELTA CONNECTED, EACH BURNED GROUP WILL CONSIST OF ONE PHASE GROUP
OTHER	IMPROPER CONNECTION GROUND	IRREGULAR BURNED GROUPS OR SPOT BURNS

EQUIPMENT TROUBLESHOOTING GUIDE

SYMPTOMS	CAUSE	REMEDY
1. SPIRAL DOES NOT TURN	A. NO POWER TO MOTOR	A. CHECK MOTOR TROUBLESHOOTING GUIDE
	B. MOTOR COUPLER	B. INSTALL NEW MOTOR COUPLER
	C. JAMMED SPIRAL	C. CHECK OVERLOAD AND OVERCURRENT DEVICE. CHECK RESET PUSHBUTTON
2. NOT DISCHARGING SOLIDS	A. CHECK ROTATION DIRECTION	A. PUT CONVEYOR IN FORWARD. REVERSE LEADS IF NECESSARY
	B. PLUGGED DISCHARGE	B. UNPLUG DISCHARGE
3. WET SOLIDS DISCHARGE	A. DRAIN PLUGGED	A. UNPLUG DRAIN

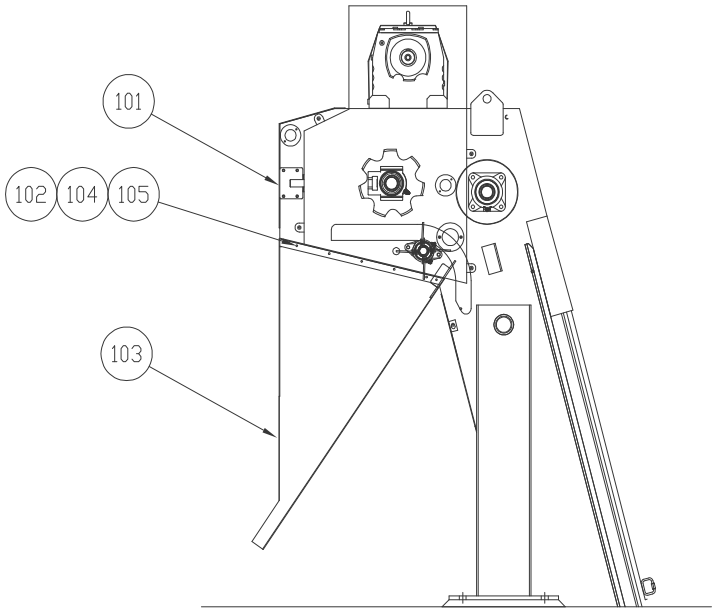
EXPLANATION OF PARTS LIST

ITEM NUMBERS

Item numbers identify a part shown on an erection or assembly drawing. Item numbers are in circles 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. Item numbers are three digit numbers.

PART NUMBERS

Part numbers identify drawing numbers for shop drawings. Shop drawings are not included in operation and maintenance manuals.



ASSEMBLY: 20039A REV: B DWG #: 20039A-D101.DWG
PART DESCRIPTION: FALMOUTH, ME WWTF DWG REV: A
WRITTEN BY: MWB CHKD BY: PCH APP: MJG
DATE: 1/25/2007 DATE: 1/25/2007 DATE: 1/25/2007

ITEM	SP	PART NUMBER	DRAWING NUMBER	DWG REV	MATL CODE	PART DESCRIPTION	QTY	B/M	B/M REV
101	F	20039A-D102/A4	20039A-D102.DWG	0	SS	MAIN ASSEMBLY, CFKS75, 3X8, 6MM, LH	1	Y	A
102	F	WFL-037	-	-	304SS	WASHER, FLAT, 3/8"	17	N	-
103	F	20039A-D108/4	20039-D108.DWG	0	304SS	CHUTE, CFK	1	N	-
104	F	BHH-037C0125	-	-	304SS	CAPSCREW, HH, 3/8"-16 X 1 1/4" LG	15	N	-
105	F	WLO-037	-	-	304SS	WASHER, LOCK, 3/8"	15	N	-

Figure 4-2: Parts List Identification

REPLACEMENT OR SPARE PARTS

Should you require assistance in determining which spare parts are appropriate for your particular situation, please don't hesitate to contact WesTech PARTS SERVICES DEPARTMENT.

PROCEDURE FOR ORDERING REPLACEMENT OR SPARE PARTS:

Spare or replacement parts may be ordered from the Parts Services Department at:

WESTECH ENGINEERING, INC.
3625 SOUTH WEST TEMPLE
SALT LAKE CITY, UT 84115
PHONE: (801) 265-1000
FAX: (801) 265-1080

24-HOUR SERVICE/EMERGENCY:
(801) 265-1000 8:00 am to 5:00 pm
(801) 263-4093 5:00 pm to 8:00 am

E-MAIL ADDRESS:
parts@westech-inc.com

WEB ADDRESS:
www.westech-inc.com

If you would like to talk directly to a parts representative during normal business hours (8:00 am to 5:00 pm MST), dial (801) 265-1000 and ask for the Spare Parts Dept.
You may Fax your order to (801) 265-1080

To use the 24-hour service/emergency line after hours (5:00 pm to 8:00 am), dial (801) 263-4093. Please indicate to the Answering Service Operator whether your facility is Water, Waste Water, or industrial. She will inform you that a WesTech representative will call and assist you with your problem.

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

Parts may also be ordered directly from our web page (www.westech-inc.com). Simply go to the web page, click on Parts and Service, click on Contact the WesTech Spare Parts Department and fill out the online form. A WesTech representative will process your order and follow up with an Order Acknowledgement, or a return phone call to confirm that your order has been received.

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.

Identify equipment using the WesTech job number as indicated on the cover sheet.

1. Identify the part by name and give the number of the drawing on which this part or assembly appears. If it is a part of a motor, pump, electrical control, or any part not manufactured by WesTech Engineering, the information will be found in the manufacturer's reference data included in this manual, or on the manufacturer's nameplate.

1. Identify the part number and / or item number.

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

3. If parts being ordered are electrical in nature, give all pertinent data; voltage, amperage, wattage, cycles, speed, power factor, or other information given on the part's nameplate or included in the part's brochure.

4. Submit your written purchase order or request for quotation. Be sure to **sign and print** your full name so that we will know whom to contact should further clarification of the inquiry be necessary. ALL VERBAL ORDERS MUST BE VERIFIED IN WRITING ON COMPANY LETTERHEAD.

5. Give a return address and a shipping address.

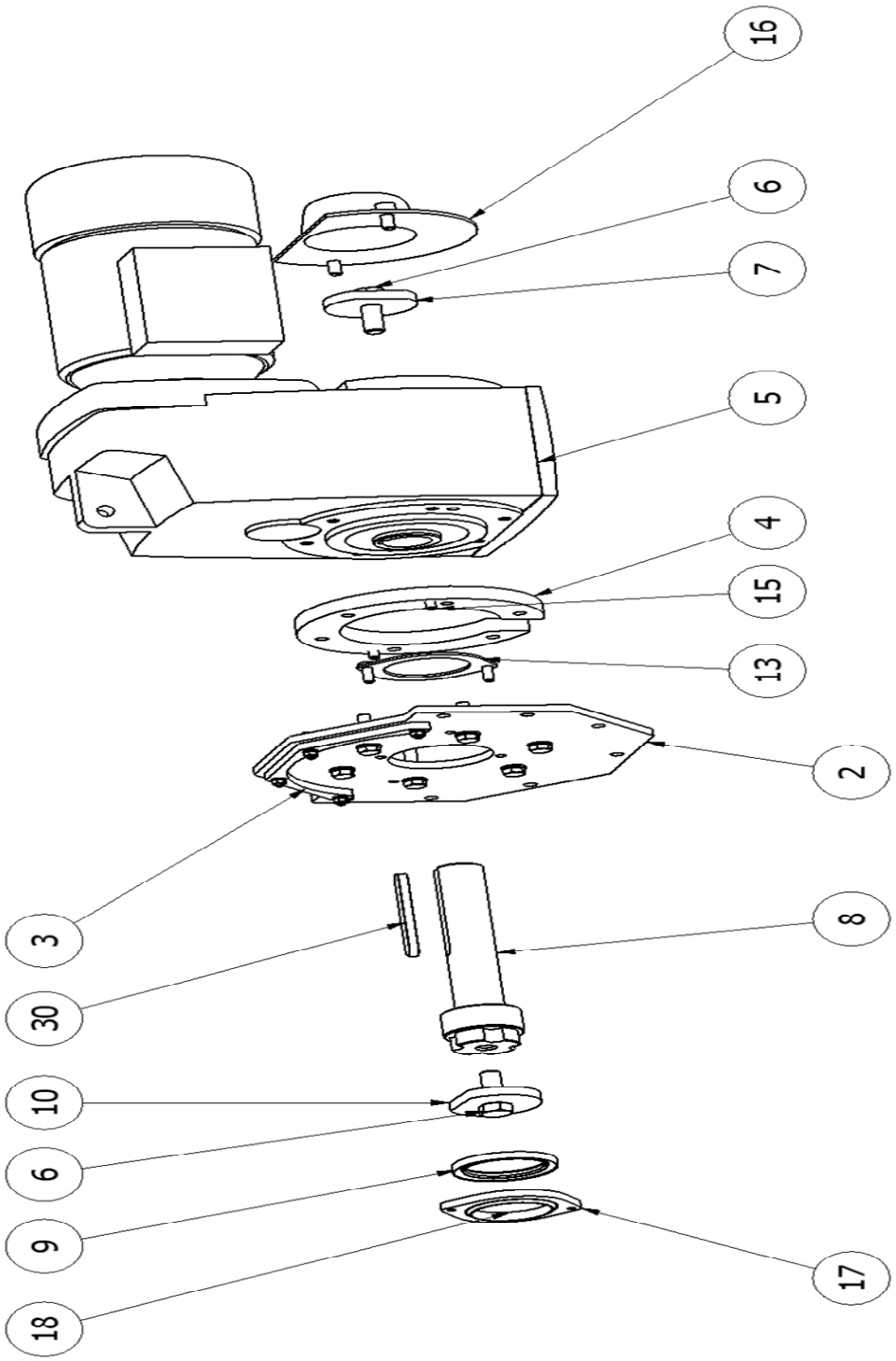
6. Give the preferred method of shipping (parcel post, truck freight, rail freight, air express, etc.).

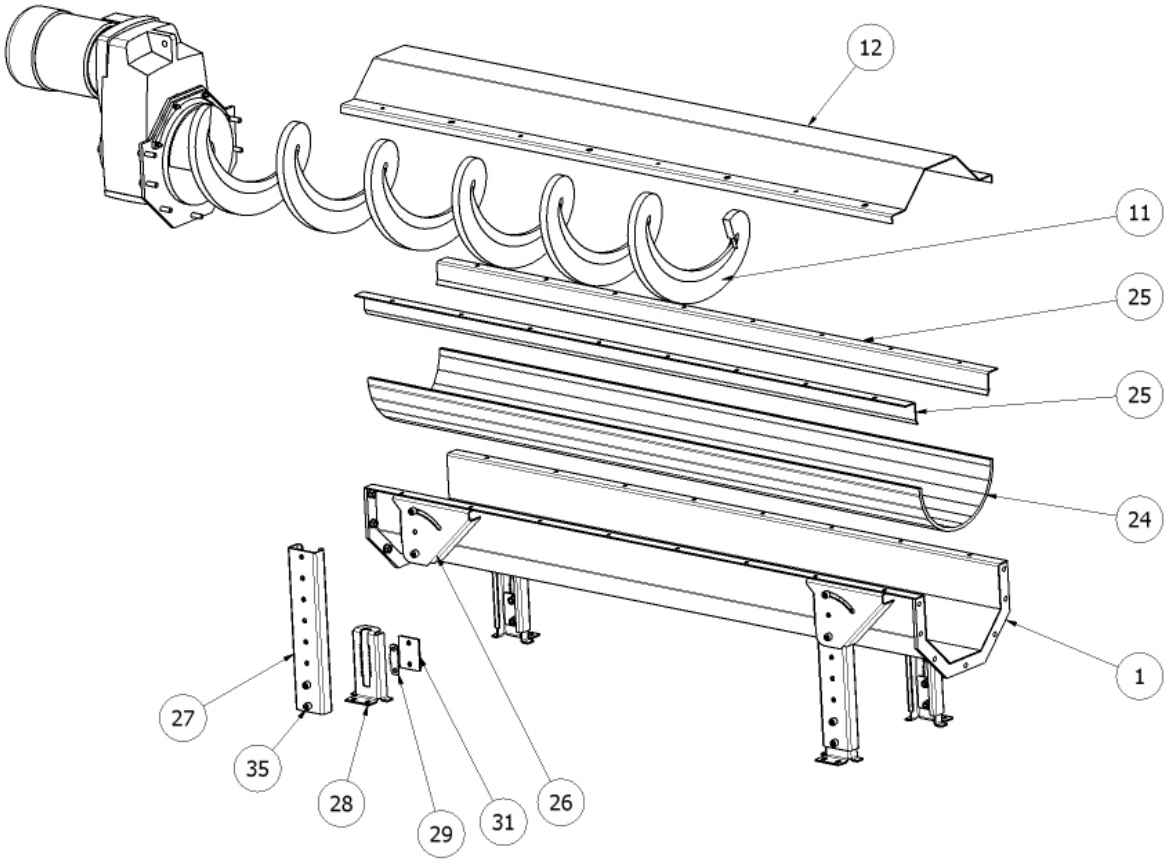
7. Show the quantity desired.

8. Provide instructions for proper invoicing.

9. All parts orders are subject to a $100.00 minimum order charge.

10.




12
11
25
25
24
1
27
35
28
29
31
26

ID #	Name		Qty
1	Trough		1
2	Flange for gearbox		1
3	Support for cover		2
4	Distance flange-gearbox		1
5	Gearbox		1
6	Screw		2
7	Washer for shaft		1
8	Driveshaft		1
9	Sealing		2
10	Washer for driveflange		1
11	Transportscrew		1
12	Cover		1
13	Sealing support		1
14			
15	Positioning pin		2
16	Cover for gearbox		1
17	Holder for seal		1
18	Scraper		1
19			
20			
21			
22			
23			
24	Wear liner		1
25	Clamp piece for wear liner		2
26	Bracket for support leg		*
27	Support leg		*
28	Feet for support leg		*
29	Lock for feet		*
30	Key		1
31	Plate for lock for feet		*
32			
33			
34			
35	Screw		*
36			
37			
38			
39			

5 ACCESSORY EQUIPMENT

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WESTECH AN EMPLOYEE OWNED COMPANY

GEAR REDUCER

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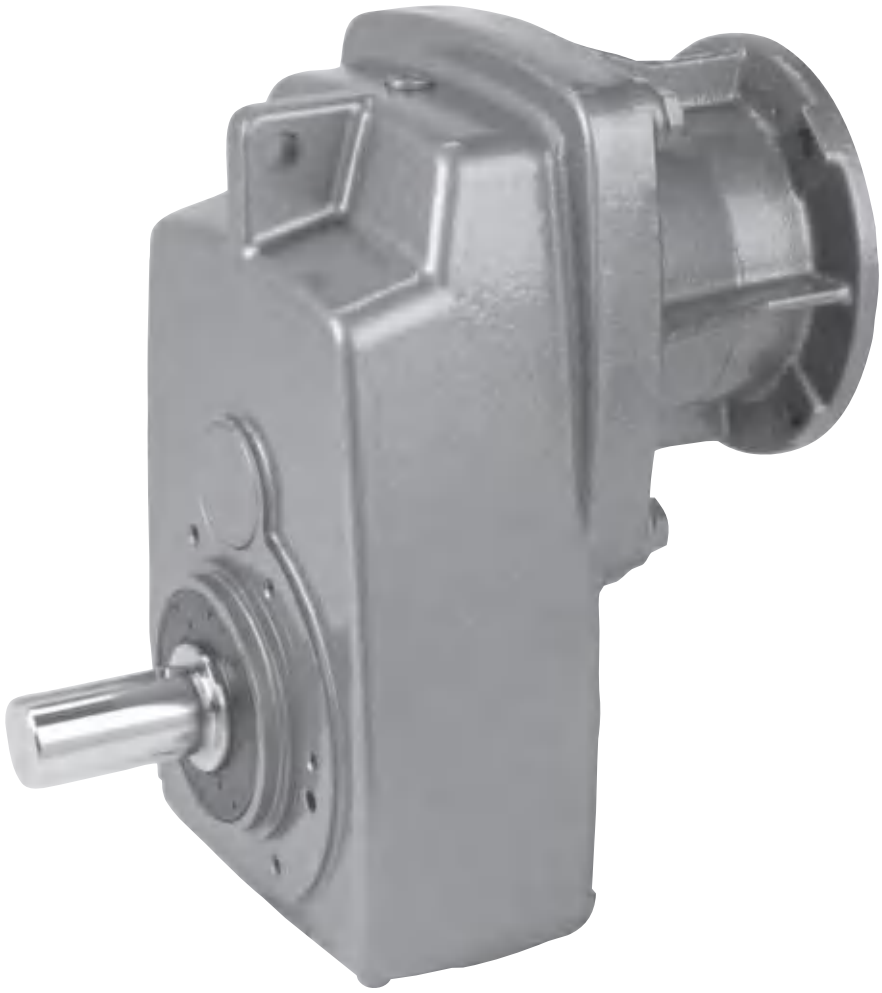
Clincher™ Shaft Mount Reducers
Selection & Combinations

Selection

- SK 0182NB
- SK 0282NB
- SK 1382NB
- SK 1282/02
- SK 1282
- SK 2282
- SK 2382
- ~~SK 3282/02~~
- SK 3282
- ~~SK 3382~~
- SK 3282/12
- SK 4282
- SK 4382
- SK 4282/12
- SK 5282
- SK 5382
- SK 5282/12
- SK 6282
- SK 6382
- SK 6282/22
- SK 7282
- SK 7382
- SK 7382/22
- SK 7382/32
- SK 8282
- SK 8382
- SK 8382/32
- SK 8382/42
- SK 9282
- SK 9382
- SK 9382/42
- SK 9382/52
- SK 10282
- SK 10382
- SK 10382/52
- SK 11282
- SK 11382
- SK 11382/52
- SK 12382



NORD

www.nord.com

UNICASE™

odel Type	Gear Ratio i_{tot}	Output Speed n_2 1750 rpm [rpm]	Output Torque* $T_{2\,max.}$ [lb-in]	Maximum input p Solid input shafts typ Input Speed 1750 rpm [hp]	1150 rpm [hp]	875 rpm [hp]
SK 2282	4.51	388	1646	5.00	3.30	2.50
	5.72	306	1876	5.00	3.30	2.50
	6.43	272	2000	5.00	3.30	2.50
	7.48	234	2151	5.00	3.30	2.50
	8.37	209	2266	5.00	3.30	2.50
	9.03	194	2965	5.00	3.30	2.50
	10.15	172	3151	5.00	3.30	2.50
	11.81	148	3398	5.00	3.30	2.50
	13.23	132	3584	5.00	3.30	2.50
	16.53	106	4168	5.00	3.30	2.50
	18.51	95	4301	5.00	3.30	2.50
	21.90	80	4248	5.00	3.30	2.50
	23.96	73	3850	4.46	2.94	2.23
	24.97	70	4337	4.82	3.18	2.41
	26.83	65	3885	4.01	2.64	2.00
	29.65	59	4425	4.14	2.73	2.07
	31.23	56	3938	3.50	2.31	1.75
	36.54	48	4434	3.38	2.23	1.69
	37.18	47	4071	3.04	2.00	1.52
	43.71	40	4983	3.16	2.09	1.58

Gearbox Selection

A number of factors are considered when selecting a gear unit, including gearbox rating, service factor, speed and speed variation, horsepower, thermal capacity, ratio, physical size, ambient conditions and cost. Below are some guideline steps to help aid in the gear unit selection.

1. Determine the speed and/or gear ratio
2. Determine the required power or torque
3. Determine Service Factor
4. Select the basic gearbox type and input
5. Determine the required mounting position
6. Select options
7. Checks – overhung load, thrust load, NEMA motor weight, thermal considerations, and other application considerations

1. Speed and Gear Ratio

The first step in selecting a gear unit is determining the final output speed or speeds you need. This speed is normally described in revolutions per minute (rpm). This output speed or speeds is determined by the input speed to the gear unit divided by its gear ratio. Their relationship is described by the following formulas.

$$i\ (\text{gear ratio}) = \frac{\text{Input speed [rpm]}}{\text{Output speed [rpm]}}$$

$$\text{Output speed [rpm]} = \frac{\text{Input speed [rpm]}}{i\ (\text{gear ratio})}$$

To specify a gear unit, you can identify either gear ratio needed or the output speed (rpm) if the input speed is known.

2. Power and Torque

The second step for selecting a gear unit is the required power or torque needed to power the load. Torque in this catalog is normally expressed in pound-inches [lb-in].

$$\text{Power [hp]} = \frac{\text{Torque [lb-in]} \times \text{speed [rpm]}}{63025}$$

$$\text{Torque [lb-in]} = \frac{\text{Power [hp]} \times 63025}{\text{speed [rpm]}}$$

For a proper selection you must ensure that the motor or other prime mover can produce enough torque or power and that the gear unit has adequate torque or power capacity. You must also consider if the power or torque is specified at the input or output of the gear unit. The Helical-worm gear units have lower efficiency than in-line or bevel gear units, therefore helical-worm products efficiency may need to be considered in the selection.

To specify a gear unit you can identify either torque or power.

3. Service Factor or Service Class

In addition to power or torque, service factor must also be considered. A service factor is essentially the ratio of extra capacity in a gear unit compared to the power or torque that is needed to run that application. The goal of selecting a gear unit with extra capacity (service factor) is to provide adequate service life in operation.

One reason to apply a larger service factor is if a unit operates more hours per day. If a unit runs 24 hours per day it should normally have a higher service factor than a unit that runs 8 hours per day if you expect the same calendar life.

A second reason for applying a larger service factor is to cope with a more difficult application. Even if it takes the same power and speed to operate a rock crusher as a fan, the rock crusher needs a stronger gearbox (higher service factor) to give the same calendar operating life as the gear unit powering the fan.

The real question is how to determine the proper service factor for a gear unit in an application. Following are four possible methods.

Customer or User Specification

Many customers will have their own service factor guidelines or specifications.

AGMA Service Factoring

American Gear Manufacturers Association (AGMA) publishes lists of recommended service factors for different applications. These service factor recommendations have been determined form the experience of many gear manufactures and are in AGMA standard 6010. See page 68 for additional detail.

AGMA Service Classes

American Gear Manufactures Association (AGMA) has another method for selecting gear units service factors. AGMA standard 6009 lists many applications by a service class (I, II, III) with class I being the simplest applications and class III being the hardest. These application service classes are associated with a range of service factors by the following table.

AGMA Service Class	Service Factor
I	1.00 to 1.39
II	1.40 to 1.99
III	2.00 and above

In the gearmotors selection table each unit is also classified by an AGMA service class. See page 64 for additional detail.

Selection Information

NORD Mass Acceleration Service Factoring

NORD often uses a calculation based system to properly assign a service factor. This system considers hours of operation per day, the severity of the application and the number of times the equipment is cycled. See page 62 for additional detail.

4. Gearbox Type & Input

NORD gear drives are available in a number of mechanical configurations including:

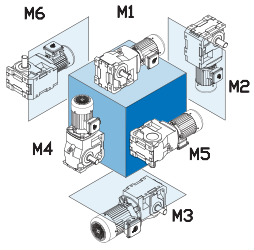
- Helical in-line
- Clincher™ shaft mount
- Right-angle helical-bevel
- Right-angle helical-worm

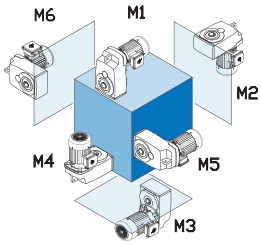
NORD's modular design allows for a number of different inputs to be added to NORD reducers including:

- Integral motor
- NEMA-C and IEC motor adapter
- Solid input shaft
- Servo motor adapter
- Sugar scoop mount
- Top motor mount platform
- NORDISC™ variable speed friction drives
- Titan™ variable speed belt boxes

5. Mounting Position

The gearbox mounting position is an important and often overlooked specification. The mounting position determines how much oil the gear reducer requires, in addition to determining the position of the oil drain, oil fill and vent on the gear drive. NORD offers six basic mounting positions. If your application requires a variation from the six basic mounting positions, please contact NORD.



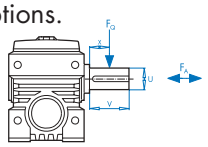


Many gearbox and motor options require a location designation. For example a right-angle helical-bevel unit with a single solid shaft extension requires a shaft extension side location. Please see page 18 for additional options that require location designation.

6. Options

NORD offers a number of mechanical, protective, paint and lubrication options for gear reducers and motors. Please see pages 19 for gear unit options and refer to the motor section (Section G) for motor options.

7. Checks



Overhung Load

An overhung or radial load exists when a force is applied at right-angles to a shaft beyond the shaft's outermost bearing. Pulleys, sheaves and sprockets will cause an overhung load when used as a power take-off. The amount of overhung load will vary, depending on the type of power take-off used and where it is located on the shaft.

Overhung load [FQ] can be found in the gearmotor rating tables and input shaft overhung load ratings [FQ1] can be found on pages 52 - 59. Overhung load capacities should not exceed the values in the table to ensure long bearing life. Overhung load capacities are to be applied at the midpoint of the shaft extension and without thrust loads.

To calculate overhung load see page 52.

Thrust Loads (Axial)

Loads that are directed towards or away from the gearbox along the axis of the shaft are called thrust or axial loads. Output shaft thrust capacity [FA] can be found in the gearmotor rating tables. Input shaft capacity [FA1] can be found on pages 52. Thrust load capacities should not exceed the values listed in the tables to ensure long bearing life. Thrust load capacities are listed for pure axial loads with no overhung load. Contact NORD for combination loads or a more exact examination of the application.

NEMA C-face Motor Weight Limits

When mounting a motor to a NORD NEMA C-face motor adapter it is important to consider the motor's weight. Following is a table that includes the maximum motor weight the NEMA adapter can support. If the motor exceeds the listed weight is must be externally supported. When a C-face mounted motor is externally supported care must be taken to ensure that the support system does not impose additional pre-loads on the NEMA motor adapter.

NEMA Weights

Motor FRAME	**56C**	**143TC**	**145TC**	**182TC**	**184TC**
Max Weight [lb]	66	88	110	130	175
Motor FRAME	**210TC**	**250TC**	**280TC**	**324TC**	**326TC**
Max Weight [lb]	220	450	550	770	1100
Motor FRAME	**365TC**				
Max Weight [lb]	1550				

General Warnings & Cautions

Applications with risk of personal injury should be reviewed together with NORD. Examples of these are hoist, lifts or other applications where people may be at risk.

Helical-worm

Efficiency

NORD worm gear units can reach efficiencies up to 92%.

Worm gears require a run-in period to reach their peak efficiency. Due to this the unit efficiency will be lower when the gear unit is new. The effect is greater at lower worm incline angles meaning with worms that have a low number of worm starts (or leads). Based on experience the following reduction in efficiency should be considered before the run-in is completed

Worm Starts (leads)	Reduction in efficiency
1	12%
2	6%
3	3%
6	2%

The number of worm starts is listed in the gear ratio tables in the helical-worm reducer ratings tables.

The run-in period is approximately 25 hours operating time at maximum load.

Following conditions must be met in order to reach the catalog efficiency values.

- Gear unit is fully run-in
- Gear unit has reached a constant temperature
- The required type of lubricant is used
- The required lubrication quantity is used
- The unit is operating at full rated torque

Vertical Mounting Position for Gear Units & Gear Motors

Observe thermal limit rating – see page 14. For motors which are mounted vertically upwards (Mounting position M4) and ratios < 24, we highly recommend oil expansion chambers in order to avoid leakage through the vent plug.

NEMA and IEC adapters use in hoist, lifts and other applications with danger of personal injury should be reviewed together with NORD.

NEMA/IEC adapter have additional shaft coupling and additional bearing seats compared to integral motors so there are higher no-load losses with NEMA or IEC adapters. We recommend mounting the motor directly, since it offers both technical and cost advantages.

External Installation, Tropical Use

Gearboxes installed outside, in damp rooms, or used in the tropics may require special seals and anti-corrosion options. Please contact NORD for application assistance.

Special conditions

If special environmental or other conditions exist in transit, storage or operation these need to be considered in the unit selection. Special conditions may include (but are not limited to) the following:

- Exposure to aggressive corrosive materials (contaminated air, gasses, acids, bases, salts, etc.)
- Very high relative humidity
- Direct contact between t he motor and liquid
- Material build- up on the gear unit or motor (dirt, dust, sand, etc.)
- High atmospheric pressure
- Radiation
- Extreme temperatures, high, low or large temp. changes
- High vibration, accelerations, shock or impacts
- Other abnormal conditions

Storage Before Installation

The gear units and motors should be stored in a dry area before they are to be installed. Special measures are required for longer storage. Please request long term storage instructions from NORD Gear or from the NORD web site.

Multi-stage Gear Units

With 4-, 5-, 6-stage multi-stage gear units, there are additional no-load loss due to the added rotating parts and the relatively small drive input power. Thus, a no-load loss of approximately 40 watts for 4-pole motors up to 1 HP (0.75 kW) is accounted for in the performance tables.

NEMA C-Face Adapter Capacity

The NEMA adapters are designed to handle the torques produced by the standard NEMA power assignment at 4 pole (1800 rpm) motor speeds. If a larger motor power is used than the power below NORD should be consulted. Also if a NEMA adapter is being used for other than an AC induction motor NORD should be consulted.

Adapter	Max Power [hp]	Adapter	Max Power [hp]
56C	1	250TC	20
140TC	2	280TC	30
180TC	5	320TC	50
210TC	10	360TC	75

Selection Information

Gear Reducer Ratings

The permissible continuous power limit of gear reducers is limited by both the mechanical rating and the thermal rating. The mechanical rating depends upon the material strength of the gear reducer's gears, bearings, housing, shafts, etc. The mechanical input power limit to the reducer is also a function of the mechanical power rating divided by the relevant reducer service factor.

The thermal rating or thermal limit depends upon the amount heat generated within the reducer and is influenced by a variety of factors including:

- Churning or splashing losses in the lubricant which depend upon reducer type, ratio, input style, mounting position or oil fill-level, and the circumferential travel velocities of the gear wheels.
- The actual speed and load conditions. These factors determine load-dependent losses in the gears and frictional losses in the gears, bearings and seal areas.
- Ambient Conditions:
  - Ambient Temperature.
  - Amount of free air circulation around the drive.
  - Possible near-by heat sources.
  - Heat dissipation or the ability of the reducer to transfer heat through the housing, shafts, and the mating substructure or mounting surface.

Observing the Reducer's Thermal Limit

When to Contact NORD

Through computer program analysis NORD can evaluate application conditions and the impact they have on a reducer's thermal capacity.

When applying helical in-line, Clincher™ shaft mount, and helical-bevel gear units of case sizes 6 and larger (SK62, SK6282 and SK9072.1 and larger), consult NORD if any two or more of the following conditions apply:

- Gear ratio, $i_{total} \leq 24{:}1$ or $\leq 48{:}1$ for helical-bevel units
- Input power, $P_1 \geq 60$ hp (45 kw)
- Input speed, $n_1 > 1800$
- Vertical positioning (mounting position M2 or M4)
- Input configuration: NEMA C-face, IEC, servo adapter or solid-shaft input (Type-W)
- Elevated ambient temperature ≥ 86° F (30 °C)

When applying helical-worm or worm gear units, please consult NORD if any one of the following conditions applies:

- Input speed, $n_1 > 1800$
- Vertical positioning (mounting position M2 or M4)
- Input configuration: NEMA C-face, IEC, servo adapter or solid-shaft input (Type-W)
- Elevated ambient temperature ≥ 86° F (30 °C)

Advise NORD of any special application considerations:

- Confined space or limited air circulation
- Exposure to other near-by radiant heat sources
- Dirty or dusty environments
- High altitude operation > 3,280 ft (1000 m) a.s.l.

Dangers of Reducer Overheating

The following problems may result when the reducer's thermal capacity or maximum oil sump temperatures are exceeded:

- Lubrication oxidation, breakdown and deterioration.
- A decrease in lubrication viscosity and film thickness.
- Loss of critical bearing and gear clearances required for proper lubrication.
- Increased contact pressures and increased operating temperatures in the critical load zones of the gearing and bearings.
- An increased possibility for metal-to-metal contact and premature component wear.
- A significant reduction in the lubricant's ability to prevent scuffing, pitting, and in extreme cases galling or welding.

Maximum Oil Sump Temperature Limit

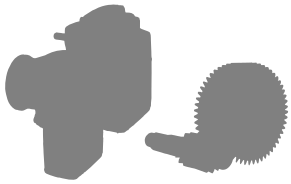
To prevent reducer overheating, the reducer's maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation, depending upon reducer size).

Oil Type	Maximum Oil Temperature Limit	
	NORD	AGMA 9005-D94
Mineral	80-85 °C (176-185 °F)	95 °C (203 °F)
Synthetic	105 °C (220 ° F)	107 ° C (225 ° F)

Measures to Expand the Application Range

There are a variety of measures that may be taken in order to protect against thermal overload and expand the application range of the gear reducer. Common examples include the following:

- Recommending a change in lubrication viscosity and/or a specific synthetic lubricant type.
- Applying high-temperature seals.
- Increasing air flow around the gear unit.
- Shielding or protecting the reducer from high heat sources.
- Considering an integral motor instead of the bolt-on input assembly covers. In many cases the motor fan will substantially increase air-flow around the gear unit.
- Add an Oil Expansion/Overflow Chamber (Option "OA") or an Oil Reservoir (Option "OT").
- Oil Cooler (Option "OC").
- Water Cooling Cover (Option "WC")



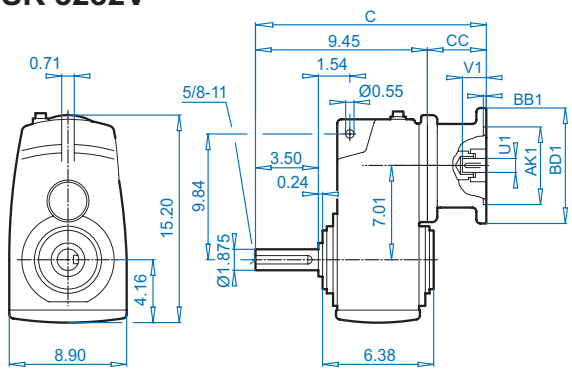
SK 3282
NEMA-C + W
Ratings & Combinations

Model Type	Gear Ratio	Output Speed	Output Torque*	Maximum input power◈ Solid input shafts type "W"				NEMA C-Face* Available Combinations							
				Input Speed											
	i_{tot}	n_2 1750 rpm	$T_{2\ max}$	1750 rpm	1150 rpm	875 rpm	580 rpm								
		[rpm]	[lb-in]	[hp]	[hp]	[hp]	[hp]	56C	140TC	180TC	210TC	250TC	280TC	320TC	360TC
SK 3282	4.48	391	4080	10.00	6.60	5.00	3.30	X	X	X	X				
	5.74	305	4964	10.00	6.60	5.00	3.30	X	X	X	X				
	6.70	261	5372	10.00	6.60	5.00	3.30	X	X	X	X				
	8.31	211	5983	10.00	6.60	5.00	3.30	X	X	X	X				
	9.80	179	7425	10.00	6.60	5.00	3.30	X	X	X	X				
	11.38	154	7266	10.00	6.60	5.00	3.30	X	X	X	X				
	14.11	124	7584	10.00	6.60	5.00	3.30	X	X	X	X				
	16.67	105	7443	10.00	6.60	5.00	3.30	X	X	X	X				
	20.18	87	7275	10.00	6.60	5.00	3.30	X	X	X	X				
	21.38	82	6390	8.31	5.49	4.16	2.74	X	X	X	X*				
	22.45	78	7080	8.76	5.78	4.38	2.89	X	X	X	X*				
	23.71	74	7124	8.36	5.52	4.18	2.76	X	X	X	X*				
	25.88	68	7487	8.08	5.33	4.04	2.67	X	X	X	X*				
	28.70	61	7700	7.45	4.92	3.73	2.46	X	X	X	X*				
	31.93	55	7761	6.77	4.47	3.39	2.24	X	X	X	X*				
	37.77	46	7390	5.39	3.56	2.70	1.78	X	X	X					
	38.62	45	5611	4.01	2.64	2.00	1.32	X	X	X*					
	42.02	42	8222	5.48	3.62	2.74	1.81	X	X	X*					
	44.85	39	6522	4.04	2.66	2.02	1.33	X	X	X*					
	48.04	36	4885	2.79	1.84	1.40	0.92	X	X						
	52.97	33	7478	3.92	2.58	1.96	1.29	X	X	X*					
	55.79	31	5682	2.79	1.84	1.40	0.92	X	X						
	64.12	27	8983	3.85	2.54	1.92	1.27	X	X	X*					
	65.89	27	6708	2.87	1.90	1.44	0.95	X	X						
	70.56	25	4991	1.98	1.31	0.99	0.65	X	X*						
	79.76	22	7523	2.63	1.73	1.31	0.87	X	X						
	88.74	20	8363	2.65	1.75	1.33	0.88	X	X						
	100.88	17	7142	1.93	1.27	0.96	0.64	X	X*						
	112.23	16	6815	1.73	1.14	0.86	0.57	X	X*						

* Caution - The motor power may exceed the gear unit's mechanical torque capacity
◈ The mechanical power limit of the solid input shaft type "W" may limit the reducer rating.
All ratings are mechanical. See page 14 for thermal considerations.

lb	W	56C	140TC	180TC	210TC
SK 3282	110	106	115	123	143

SK 3282V



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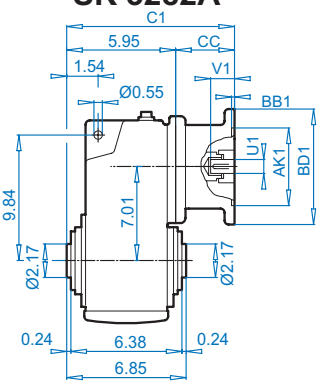
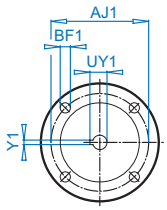
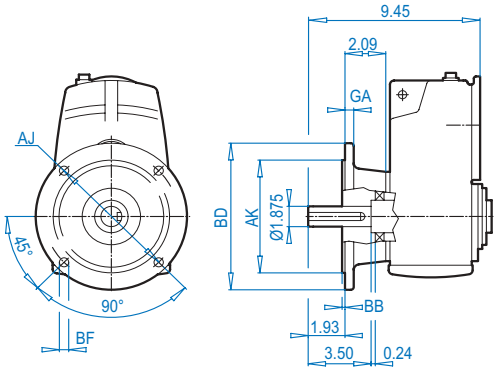


NEMA Input



SK 3282VF



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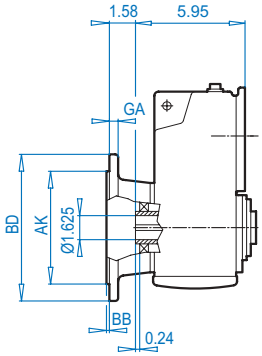
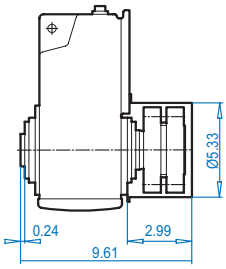


SK 3282ASH



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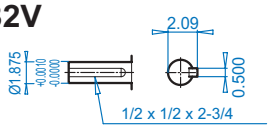
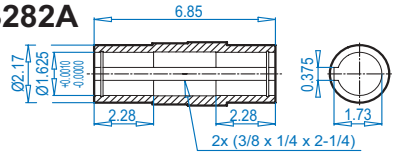
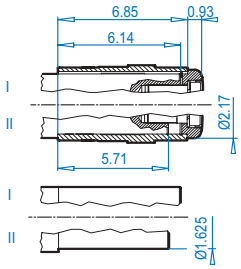


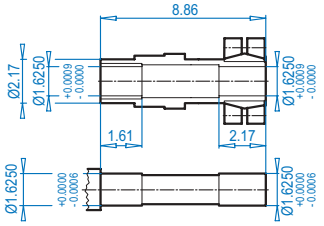
SK 3282A



SK 3282AB ⇨📖 394



SK 3282AS ⇨📖 72



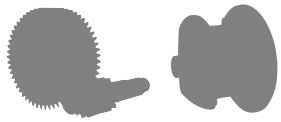
Mounting Flange

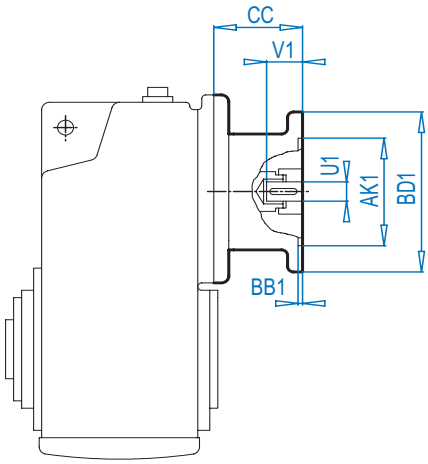
BD (mm)	AJ	AK	BB	BF	GA
9.84 (250)	8.46	7.09 +0.0006 -0.0005	0.16	0.55	0.63
11.81 (300)	10.43	9.06 +0.0000 -0.0013	0.16	0.55	0.79

NEMA Dimensions

Type	AJ1	AK1	BB1	BD1	BF1	U1	V1	UY1	Y1	C	C1	CC
56C	5.88	4.500	0.18	6.54	0.43	0.625	2.06	0.71	0.188	14.04	10.54	4.60
140TC	5.88	4.500	0.18	6.54	0.43	0.875	2.12	0.96	0.188	14.04	10.54	4.60
180TC	7.25	8.500	0.23	9.17	0.59	1.125	2.62	1.24	0.250	16.04	12.54	6.60
210TC	7.25	8.500	0.39	9.17	0.59	1.375	3.12	1.52	0.312	16.04	12.54	6.60

IEC Inputs





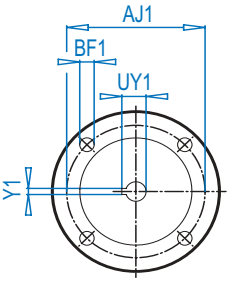


Figure 1
4 Bolt Flange

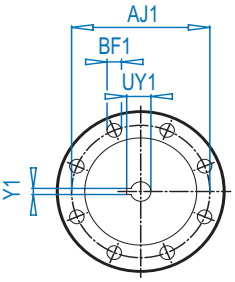


Figure 2
8 Bolt Flange
(For IEC 225-315)

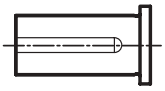
IEC Dimensions (mm)

Input	AJ1	AK1	BB1	BD1	BF1	U1	V1	UY1	Y1	Flange
IEC 63	115	95	3.5	140	M8	11	23	12.8	4	Fig. 1
IEC 71	130	110	4.0	160	M8	14	30	16.3	5	Fig. 1
IEC 80	165	130	4.0	200	M10	19	40	21.8	6	Fig. 1
IEC 90	165	130	4.0	200	M10	24	50	27.3	8	Fig. 1
IEC 100	215	180	5.0	250	M12	28	60	31.3	8	Fig. 1
IEC 112	215	180	5.0	250	M12	28	60	31.3	8	Fig. 1
IEC 132	265	230	5.0	300	M12	38	80	41.3	10	Fig. 1
IEC 160	300	250	6.0	350	M16	42	110	45.3	12	Fig. 1
IEC 180	300	250	6.0	350	M16	48	110	51.8	14	Fig. 1
IEC 200	350	300	6.0	400	M16	55	110	59.3	16	Fig. 1
IEC 225	400	350	6.0	450	M16	60	140	64.4	18	Fig. 2
IEC 250	500	450	6.0	550	M16	65	140	69.4	18	Fig. 2
IEC 280	500	450	6.0	550	M16	75	140	79.9	20	Fig. 2
IEC 315	600	550	7.0	660	M20	80	170	85.4	22	Fig. 2

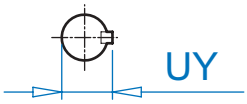
CC Dimensions

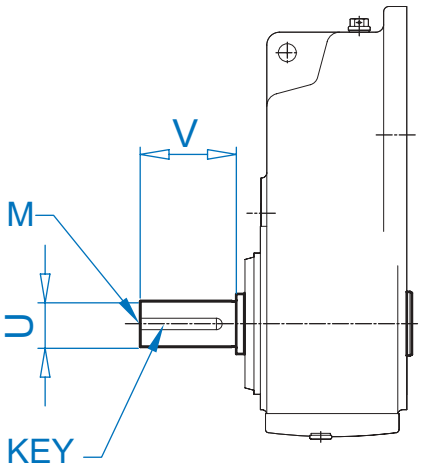
Unit	IEC63	IEC 71	IEC 80	IEC 90	IEC 100	IEC 112	IEC 132	IEC 160	IEC 180	IEC 200	IEC 225	IEC 250	IEC 280	IEC 315
SK 0182NB	3.35	3.35	4.06	4.06	4.96	4.96	–	–	–	–	–	–	–	–
SK 0282NB	3.35	3.35	4.06	4.06	4.96	4.96	–	–	–	–	–	–	–	–
SK 1382NB	3.35	3.35	4.06	4.06	4.96	4.96	–	–	–	–	–	–	–	–
SK 1282	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 1282/02	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 2282	–	3.46	4.25	4.25	4.92	4.92	6.14	–	–	–	–	–	–	–
SK 2282/02	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 2382	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 3282	–	3.46	4.25	4.25	4.92	4.92	6.14	–	–	–	–	–	–	–
SK 3282/12	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 3382	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 4282	–	–	–	4.29	5.24	5.24	7.48	7.64	7.64	–	–	–	–	–
SK 4282/12	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 4382	–	3.46	4.25	4.25	4.92	4.92	6.14	–	–	–	–	–	–	–
SK 5282	–	–	–	4.29	5.24	5.24	7.48	7.64	7.64	–	–	–	–	–
SK 5282/12	3.35	3.50	4.13	4.13	5.12	5.12	–	–	–	–	–	–	–	–
SK 5382	–	3.46	4.25	4.25	4.92	4.92	6.14	–	–	–	–	–	–	–
SK 6282	–	–	–	–	5.00	5.00	6.97	10.47	10.47	9.02	11.93	11.93	11.93	–
SK 6382	–	–	–	4.29	5.24	5.24	7.48	7.64	7.64	–	–	–	–	–
SK 6382/22	–	3.46	4.25	4.25	4.92	4.92	6.14	–	–	–	–	–	–	–
SK 6382/32	–	3.46	4.25	4.25	4.92	4.92	6.14	–	–	–	–	–	–	–

Solid Shaft Dimensions

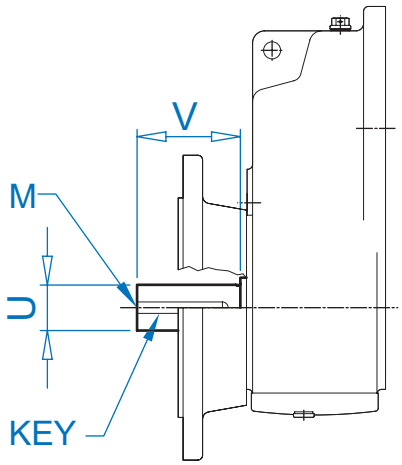


Solid Shaft Dimensions (VZ/VF)





VZ

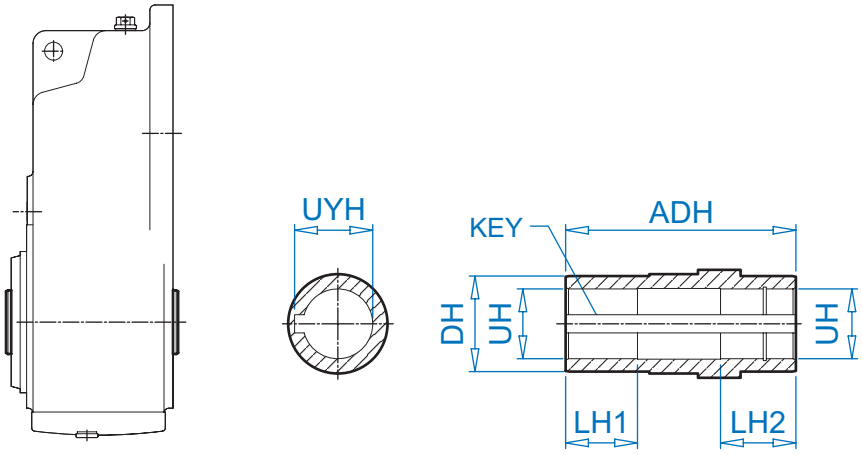


VF

UNIT	U	DIAMETER TOLERANCE	V	UY	KEY SIZE w x h x l	KEY QTY	DRILL & TAP M
SK 0182NB VZ/VF	0.750	+0.0000 / -0.0005	1.50	0.83	3/16 x 3/16 x 1-1/4	1	1/4-20
	25mm	+0.015 / +0.002mm	50mm	28.0mm	8 x 7 x 40mm	1	M10
SK 0282NB VZ/VF	1.000	+0.0000 / -0.0005	2.13	1.11	1/4 x 1/4 x 1-5/8	1	3/8-16
	25mm	+0.015 / +0.002mm	50mm	28.0mm	8 x 7 x 40mm	1	M10
SK 1382NB VZ/VF	1.250	+0.0000 / -0.0005	2.75	1.36	1/4 x 1/4 x 2-1/4	1	1/2-13
	30mm	+0.015 / +0.002mm	60mm	33.0mm	8 x 7 x 50mm	1	M10
SK 1282 VZ/VF	1.250	+0.0000 / -0.0005	2.75	1.36	1/4 x 1/4 x 2-1/4	1	1/2-13
SK 1382 VZ/VF	30mm	+0.015 / +0.002mm	60mm	33.0mm	8 x 7 x 50mm	1	M10
SK 2282 VZ/VF	1.375	+0.0000 / -0.0005	2.75	1.51	5/16 x 5/16 x 2-1/8	1	5/8-11
SK 2382 VZ/VF	35mm	+0.018 / +0.002mm	70mm	38.0mm	10 x 8 x 60mm	1	M12
SK 3282 VZ/VF	1.875	+0.0000 / -0.0010	3.50	2.09	1/2 x 1/2 x 2-3/4	1	5/8-11
SK 3382 VZ/VF	45mm	+0.018 / +0.002mm	90mm	48.5mm	14 x 9 x 80mm	1	M16
SK 4282 VZ/VF	2.250	+0.0000 / -0.0010	4.00	2.47	1/2 x 1/2 x 3-1/4	1	3/4-10
SK 4382 VZ/VF	55mm	+0.030 / +0.011mm	110mm	59.0mm	16 x 10 x 90mm	1	M20
SK 5282 VZ/VF	2.500	+0.0000 / -0.0010	5.00	2.77	5/8 x 5/8 x 4	1	3/4-10
SK 5382 VZ/VF	65mm	+0.030 / +0.011mm	130mm	69.0mm	18 x 11 x 100mm	1	M20
SK 6282 VZ/VF	3.000	+0.0000 / -0.0010	5.50	3.33	3/4 x 3/4 x 4-1/2	1	3/4-10
SK 6382 VZ/VF	75mm	+0.030 / +0.011mm	140mm	79.5mm	20 x 12 x 125mm	1	M20
SK 7282 VZ/VF	3.500	+0.0000 / -0.0010	6.75	3.88	7/8 x 7/8 x 5-1/2	1	3/4-10
SK 7382 VZ/VF	90mm	+0.035 / +0.013mm	170mm	95.0mm	25 x 14 x 140mm	1	M24
SK 8282 VZ/VF	4.250	+0.0000 / -0.0010	8.50	4.69	1 x 1 x 7-1/4	1	1-8
SK 8382 VZ/VF	110mm	+0.035 / +0.013mm	210mm	116mm	28 x 16 x 180mm	1	M24
SK 9282 VZ/VF	5.250	+0.0000 / -0.0010	9.84	5.80	1-1/4 x 1-1/4 x 8-3/8	1	1-8
SK 9382 VZ/VF	140mm	+0.040 / +0.015mm	250mm	148mm	36 x 20 x 200mm	1	M24
SK 10282 VZ/VF	6.250	+0.0000 / -0.0010	11.81	6.91	1-1/2 x 1-1/2 x 10	1	1-8
SK 10382 VZ/VF	160mm	+0.040 / +0.015mm	300mm	169mm	40 x 22 x 250mm	1	M24
SK 11282 VZ/VF	7.000	+0.0000 / -0.0010	11.81	7.77	1-3/4 x 1-3/4 x 10	1	1-8
SK 11382 VZ/VF	180mm	+0.040 / +0.015mm	300mm	190mm	45 x 25 x 250mm	1	M24
SK 12382 VZ/VF	7.000	+0.0000 / -0.0010	11.81	7.77	1-3/4 x 1-3/4 x 10	1	1-8
	180mm	+0.040 / +0.015mm	300mm	190mm	45 x 25 x 250mm	1	M24

- Dimensions are in inches unless otherwise noted.
- Metric Keys are captured in keyways.
- For shaft sizes not shown, consult NORD.

Hollow Shaft Dimensions (AZ-AF-AX)



Type	UH	DIAMETER TOLERANCE	ADH	LH1	LH2	DH	UYH	KEY SIZE w x h x l	KEY QTY
SK 0182 NB AZ/AF/AX	0.750*	+0.0010 / -0.0000	3.94	1.18	1.18	1.38	0.84	3/16 x 3/16 x 1-1/2	2
	0.500	+0.0010 / -0.0000	3.94	1.18	1.18	1.38	0.56	1/8 x 1/8 x 1-1/2	2
	25mm	+0.021 / -0.000 mm	100mm	30mm	30mm	35mm	28.3 mm	8 x7 x 40mm	2
SK 0282NB AZ/AF/AX	1.000*	+0.0010 / -0.0000	4.80	1.57	1.57	1.57	1.11	1/4 x 1/4 x 2-1/8	2
	1.1875	+0.0010 / -0.0000	4.80	1.57	1.57	1.57	1.30	1/4 x 1/4 x 2	2
	0.750	+0.0010 / -0.0000	4.80	1.57	1.57	1.57	0.84	3/16 x 3/16 x 1-1/2	2
	25mm	+0.021 / -0.000 mm	122mm	40mm	40mm	40mm	28.3 mm	8 x 7 x 40mm	2
	30mm	+0.021 / -0.000 mm	122mm	40mm	40mm	40mm	33.3 mm	8 x 7 x 40mm	2
SK 1382NB AZ/AF/AX	1.375*	+0.0010 / -0.0000	6.93	1.69	3.15	1.97	1.52	5/16 x 5/16 x 2-1/2	2
	1.4375	+0.0010 / -0.0000	6.93	2.36	2.36	1.97	1.61	3/8 x 3/8 x 2-1/2	2
	1.250	+0.0010 / -0.0000	6.93	2.36	3.15	1.97	1.37	1/4 x 1/4 x 2-1/4	2
	35mm	+0.025 / -0.000 mm	176mm	60mm	80mm	50mm	38.3 mm	10 x 8 x 60mm	2
SK 1282 AZ/AF/AX	1.1875*	+0.0010 / -0.0000	4.80	1.57	1.57	1.77	1.31	1/4 x 1/4 x 1-5/8	2
	1.250	+0.0010 / -0.0000	4.80	1.57	1.57	1.77	1.37	1/4 x 1/4 x 1-5/8	2
	1.000	+0.0010 / -0.0000	4.80	1.57	1.57	1.77	1.11	1/4 x 1/4 x 1-5/8	2
	0.750	+0.0010 / -0.0000	4.80	1.57	1.57	1.77	0.84	3/16 x 3/16 x 1-1/2	2
	30mm	+0.021 / -0.000 mm	122mm	40mm	40mm	45mm	33.3 mm	8 x 7 x 40mm	2
SK 2282 AZ/AF/AX	1.4375*	+0.0010 / -0.0000	5.47	1.97	1.97	1.97	1.61	3/8 x 3/8 x 2	2
SK 2382 AZ/AF/AX	1.500	+0.0010 / -0.0000	5.47	1.97	1.97	1.97	1.61	3/8 x 1/4 x 2	2
	1.375	+0.0010 / -0.0000	5.47	1.97	1.97	1.97	1.52	5/16 x 5/16 x 2	2
	1.250	+0.0010 / -0.0000	5.47	1.97	1.97	1.97	1.37	1/4 x 1/4 x 2-1/8	2
	35mm	+0.025 / -0.000 mm	139mm	50mm	50mm	50mm	38.3 mm	10 x 8 x 42mm	2
SK 3282 AZ/AF/AX	1.625*	+0.0010 / -0.0000	6.85	2.28	2.28	2.17	1.73	3/8 x 1/4 x 2-1/4	2
SK 3382 AZ/AF/AX	1.500	+0.0010 / -0.0000	6.85	2.28	2.28	2.17	1.61	3/8 x 1/4 x 2-1/4	2
	1.4375	+0.0010 / -0.0000	6.85	2.28	2.28	2.17	1.61	3/8 x 3/8 x 2-1/2	2
	40mm	+0.025 / -0.000 mm	174mm	58mm	58mm	55mm	43.3 mm	12 x 8 x 50mm	2
SK 4282 AZ/AF/AX	2.0625*	+0.0012 / -0.0000	7.68	2.56	2.56	2.76	2.22	1/2 x 3/8 x 2-5/8	2
SK 4382 AZ/AF/AX	1.9375	+0.0012 / -0.0000	7.68	2.56	2.56	2.76	2.16	1/2 x 1/2 x 2-3/4	2
	2.000	+0.0012 / -0.0000	7.68	2.56	2.56	2.76	2.22	1/2 x 1/2 x 2-3/4	2
	1.6875	+0.0012 / -0.0000	7.68	2.56	2.56	2.76	1.86	3/8 x 3/8 x 2-1/2	2
	50mm	+0.025 / -0.000 mm	195mm	65mm	65mm	70mm	53.8 mm	14 x 9 x 63mm	2

* standard size

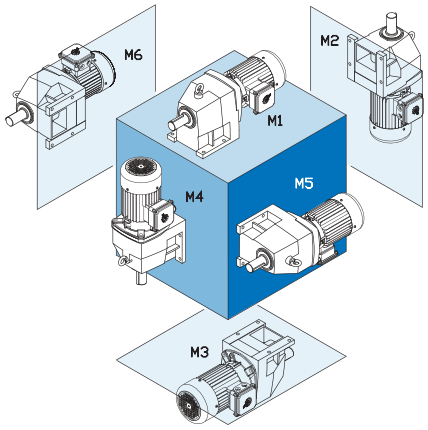
- Dimensions are in inches unless otherwise noted.
- For shaft sizes not shown, consult NORD.

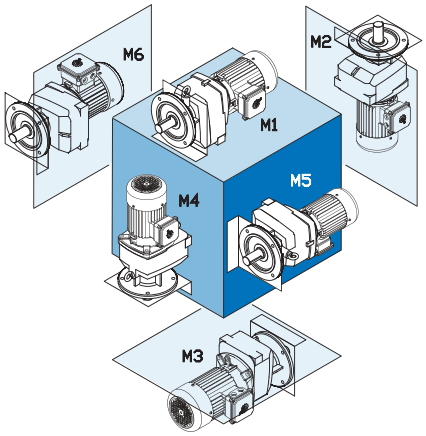
Mounting Positions

Mounting Positions

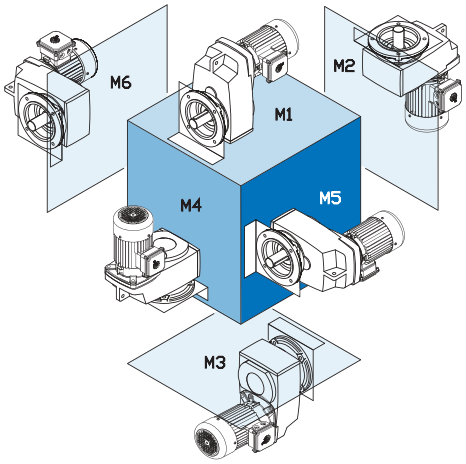
The reducer mounting position determines the approximate oil fill level and the appropriate vent location. In some cases mounting position may dictate possible variation in final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering.

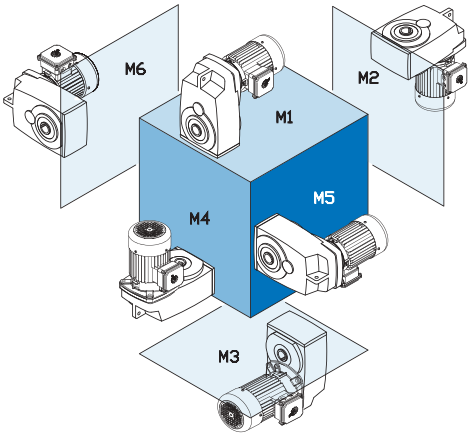
In-line



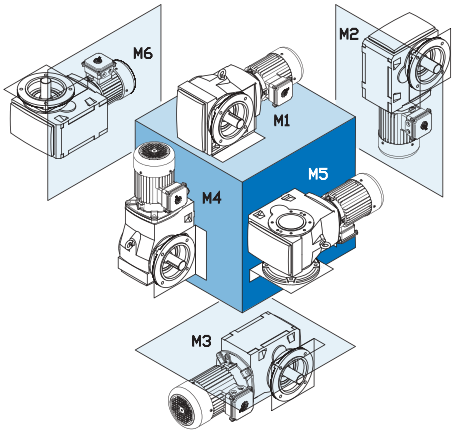


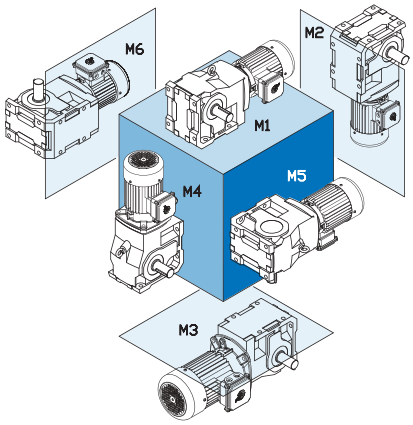
Clincher™





Right-Angle





Lubrication

Lubrication Types

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective "fluid boundary" between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

Mounting position not only determines the proper fill-level but may also have some effect on final reducer assembly. If considering any mounting positions that are not shown as catalog-standard options, it is critical that the customer consult with NORD prior to ordering. Unless otherwise specified, NORD supplies most all gear units (*) factory-filled with the standard lubrication type and the appropriate amount of lubricating oil.

* Gear units SK10282, SK10382, SK11282, SK11382, SK12382, and SK9096.1 are supplied without oil.

Standard Oil Lubricants

Gear Unit Type	Ambient Temperature	Oil Type	ISO Viscosity	Manufacturer Brand / Type
Helical-Inline, Parallel-Shaft, & Helical-Bevel	-4 to 104 °F (-20 to 40 °C)	MIN-EP	VG 220	Shell / Omala 220 ♦
	-40 to 140 °F (-40 to 60 °C)	PAO	VG 220	Mobil SHC 630 ♦
	23 to 104 °F (-5 to 40 °C)	FG	VG 220	Shell / FM 220 ♦
Helical-Worm	-22 to 122 °F (-30 to 50 °C)	PAO	VG 680	Mobil SHC 636 ♦

Optional Oil Lubricants

Gear Unit Type	Ambient Temperature	Oil Type	ISO Viscosity	Manufacturer Brand / Type
Helical-Inline, Parallel-Shaft, & Helical-Bevel	-31 to 176 °F (-35 to 80 °C)	PAO	VG 460	Mobil SHC 634
	-40 to 77 °F (-40 to 25 °C)	PAO	VG 150	Mobil SHC 629
	-40 to 140 °F (-40 to 60 °C)	FG-PAO	VG 220	Shell / Cassida GL 220
Helical-Worm	-40 to 122 °F (-40 to 50 °C)	FG-PAO	VG 460	Shell / Cassida GL 460

Standard Bearing Grease Lubricants

Grease Type / Thickener	Ambient Temperature	NLGI Grade	Manufacturer Brand / Type
Standard (Li-Complex)	-22 to 140 °F (-30 to 60 °C)	NLGI 2	Shell Albida EP LC2 ♦
High Temp (Polyurea)	-13 to 176 °F (-25 to 80 °C)	NLGI 2	Mobil Polyrex EP 2 ♦
Food-Grade (Al-Complex)	-13 to 104 °F (-25 to 40 °C)	NLGI 2	Mobil Grease FM 222 ♦

♦ Stocked Lubricant

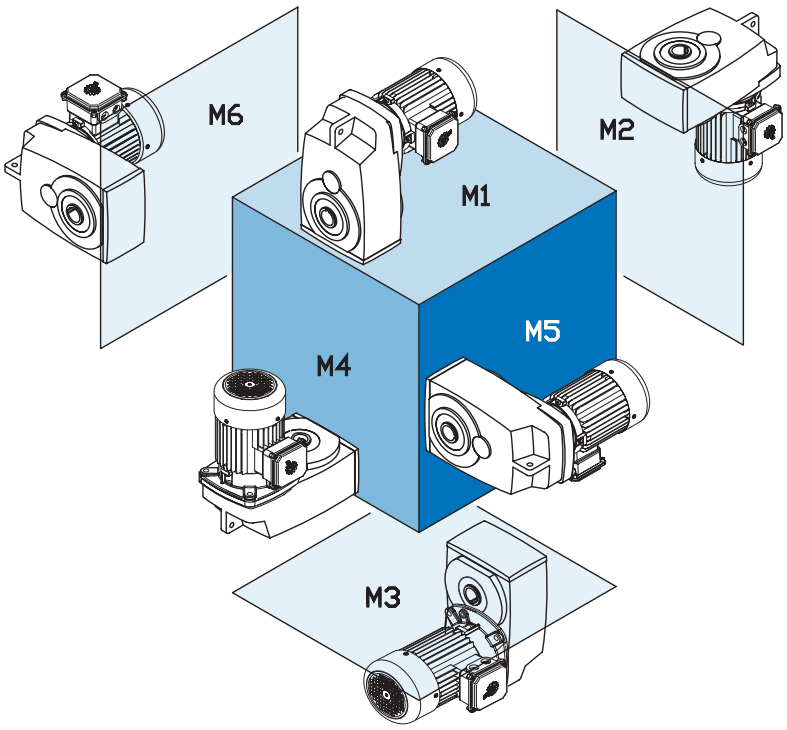
Oil Formulation Codes

MIN-EP	Mineral Oil with EP Additive
PAO	Synthetic Polyalphaolefin Oil
PG	Synthetic Polyglycol Oil
FG	Food-Grade Oil
FG-PAO	Food-Grade, Synthetic Polyalphaolefin Oil

Important Notes

- In worm gears avoid using (EP) gear oils that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacture for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil, or Polyalphaolefin (PAO) oil.
- Please Consult NORD if considering cold-temperature oils below an ISO Viscosity VG100 or lower.

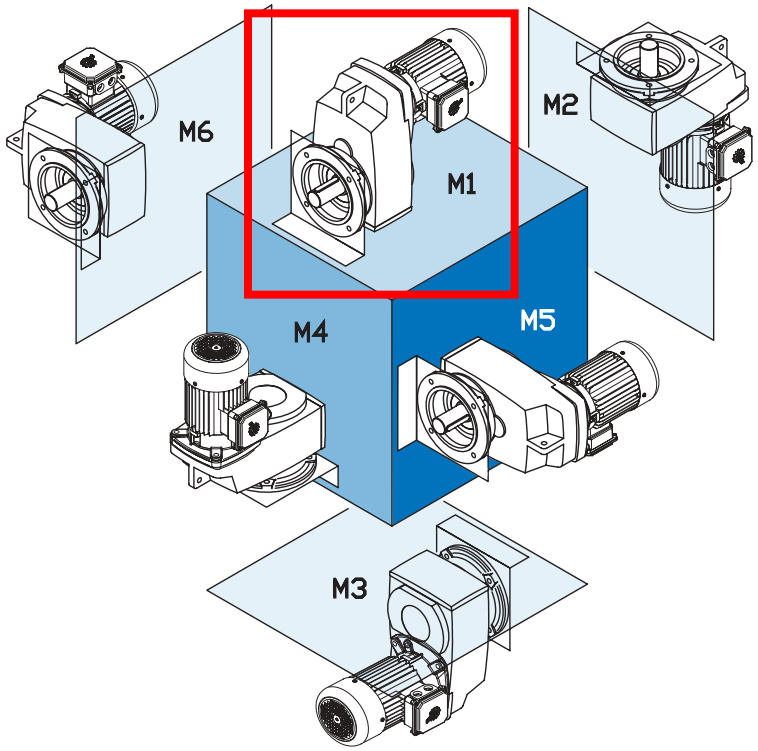
Clincher™ Shaft Mount Positions & Oil Fill Quantities



Mounting Position	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK0182NB	0.42	0.40	0.58	0.55	0.63	0.60	0.58	0.55	0.37	0.35	0.37	0.35
SK0282NB	0.74	0.70	1.06	1.00	0.85	0.80	1.16	1.10	0.95	0.90	0.95	0.90
SK1382NB	1.37	1.30	2.43	2.30	1.48	1.40	2.22	2.10	2.11	2.00	2.01	1.90
SK1282	0.95	0.90	1.37	1.30	0.95	0.90	1.27	1.20	1.00	0.95	1.00	0.95
SK2282	1.74	1.65	2.54	2.40	2.01	1.90	2.11	2.00	1.90	1.80	1.90	1.80
SK2382	1.80	1.70	2.75	2.60	2.01	1.90	3.28	3.10	1.59	1.50	1.59	1.50
SK3282	3.33	3.15	4.33	4.10	3.44	3.25	4.33	4.10	3.33	3.15	3.33	3.15
SK3382	4.33	4.10	5.18	4.90	3.49	3.30	5.92	5.60	3.49	3.30	3.49	3.30
SK4282	4.97	4.70	6.45	6.10	5.02	4.75	5.71	5.40	4.97	4.70	4.97	4.70
SK4382	6.24	5.90	7.19	6.80	5.18	4.90	8.77	8.30	5.18	4.90	5.18	4.90
SK5282	7.93	7.50	9.30	8.80	7.93	7.50	9.30	8.80	7.61	7.20	7.61	7.20
SK5382	13.2	12.5	12.7	12.0	7.08	6.70	14.8	14.0	8.77	8.30	8.77	8.30
SK6282	18.0	17.0	14.8	14.0	12.7	12.0	18.5	17.5	10.6	10.0	14.8	14.0
SK6382	17.4	16.5	13.7	13.0	10.1	9.60	19.0	18.0	14.8	14.0	13.2	12.5
SK7282	26.4	25.0	22.2	21.0	21.1	20.0	28.5	27.0	16.9	16.0	22.2	21.0
SK7382	23.3	22.0	21.1	20.0	16.9	16.0	26.4	25.0	24.3	23.0	20.1	19.0
SK8282	39.1	37.0	34.9	33.0	31.7	30.0	43.3	41.0	32.8	31.0	32.8	31.0
SK8382	35.9	34.0	33.8	32.0	26.4	25.0	40.2	38.0	37.0	35.0	31.7	30.0
SK9282	78.2	74.0	74.0	70.0	58.1	55.0	76.1	72.0	63.4	60.0	62.4	59.0
SK9382	77.2	73.0	74.0	70.0	47.6	45.0	78.2	74.0	68.7	65.0	63.4	60.0
SK10282*	95.1	90.0	95.1	90.0	42.3	40.0	95.1	90.0	63.4	60.0	86.7	82.0
SK10382*	89.8	85.0	106	100	77.2	73.0	106	100	84.6	80.0	84.6	80.0
SK11282*	174	165	169	160	153	145	206	195	106	100	148	140
SK11382*	169	160	164	155	148	140	222	210	164	155	143	135
SK12382*	169	160	164	155	148	140	222	210	164	155	143	135

* These units shipped without oil

Clincher™ Flange Mount Positions & Oil Fill Quantities



Mounting Position	M1		M2		M3		M4		M5		M6	
	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters	Quarts	Liters
SK0182NB	0.42	0.40	0.58	0.55	0.63	0.60	0.58	0.55	0.37	0.35	0.37	0.35
SK0282NB	0.74	0.70	1.06	1.00	0.85	0.80	1.16	1.10	0.95	0.90	0.95	0.90
SK1382NB	0.95	0.90	1.37	1.30	0.95	0.90	1.27	1.20	1.00	0.95	1.00	0.95
SK1282	1.37	1.30	2.43	2.30	1.48	1.40	2.22	2.10	2.11	2.00	2.01	1.90
SK2282	1.74	1.65	2.54	2.40	2.01	1.90	2.11	2.00	1.90	1.80	1.90	1.80
SK2382	1.80	1.70	2.75	2.60	2.01	1.90	3.28	3.10	1.59	1.50	1.59	1.50
SK3282	3.33	3.15	4.33	4.10	3.44	3.25	4.33	4.10	3.33	3.15	3.33	3.15
SK3382	4.33	4.10	5.18	4.90	3.49	3.30	5.92	5.60	3.49	3.30	3.49	3.30
SK4282	4.97	4.70	6.45	6.10	5.02	4.75	5.71	5.40	4.97	4.70	4.97	4.70
SK4382	6.24	5.90	7.19	6.80	5.18	4.90	8.77	8.30	5.18	4.90	5.18	4.90
SK5282	7.93	7.50	9.30	8.80	7.93	7.50	9.30	8.80	7.61	7.20	7.61	7.20
SK5382	13.2	12.5	12.7	12.0	7.08	6.70	14.8	14.0	8.77	8.30	8.77	8.30
SK6282	18.0	17.0	14.8	14.0	12.7	12.0	18.5	17.5	10.6	10.0	14.8	14.0
SK6382	17.4	16.5	13.7	13.0	10.1	9.60	19.0	18.0	14.8	14.0	13.2	12.5
SK7282	26.4	25.0	22.2	21.0	21.1	20.0	28.5	27.0	16.9	16.0	22.2	21.0
SK7382	23.3	22.0	21.1	20.0	16.9	16.0	26.4	25.0	24.3	23.0	20.1	19.0
SK8282	39.1	37.0	34.9	33.0	31.7	30.0	43.3	41.0	32.8	31.0	32.8	31.0
SK8382	35.9	34.0	33.8	32.0	26.4	25.0	40.2	38.0	37.0	35.0	31.7	30.0
SK9282	78.2	74.0	74.0	70.0	58.1	55.0	76.1	72.0	63.4	60.0	62.4	59.0
SK9382	77.2	73.0	74.0	70.0	47.6	45.0	78.2	74.0	68.7	65.0	63.4	60.0
SK10282*	95.1	90.0	95.1	90.0	42.3	40.0	95.1	90.0	63.4	60.0	86.7	82.0
SK10382*	89.8	85.0	106	100	77.2	73.0	106	100	84.6	80.0	84.6	80.0
SK11282*	174	165	169	160	153	145	206	195	106	100	148	140
SK11382*	169	160	164	155	148	140	222	210	164	155	143	135
SK12382*	169	160	164	155	148	140	222	210	164	155	143	135

* These units shipped without oil

MOTOR

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BALDOR • RELIANCE

Product Information Packet

VCP3584T

1.5HP,1740RPM,3PH,60HZ,145TC,0524M,TEFC

Product Detail

Revision:	E	**Status:**	PRD/A	**Change #:**		**Proprietary:**	No
Type:	AC	**Prod Type:**	0524M	**Elec. Spec:**	05WGW498	**CD Diagram:**	CD0005
Enclosure	TEFC	**Mfg Plant:**		**Mech Spec:**	05E248	**Layout:**	05LYE248
Frame:	145TC	**Mounting:**	F1	**Poles:**	04	**Created Date:**	
Base:	N	**Rotation:**	R	**Insulation:**	F	**Eff. Date:**	05-28-2008
Leads:	9#18					**Replaced By:**	

Nameplate NP1258E

CAT.NO.							
SPEC.	05E248W498H2						
HP	1.5						
VOLTS	208-230/460						
AMP	4.5-4.2/2.1						
RPM	1740						
FRAME	145TC	**HZ**	60	**PH**	3		
SER.F.	1.15	**CODE**	K	**DES**	B	**CL**	F
NEMA-NOM-EFF	84	**PF**	79				
RATING	40C AMB-CONT						
CC		**USABLE AT 208V**	4.5				
DE	6205	**ODE**	6203				
ENCL	TEFC	**SN**					

Nameplate NP0090E

FRONT	6203
PULLEY	6205
LUBRICATE WITH	

GREASE	POLYREX EM

Parts List

Product ID	Description	Quantity	List Price
SA093541	SA 05E248W498H2	1.000	307.00
RA086118	RA 05E248W498H2	1.000	256.00
S/P101-000-000	EPACT PROCEDURES-FS PLANT-POLYREX EM, NO	1.000	
HW3201A05	3/8-16 EYEBOLT	1.000	17.00
06CB1000A02G	CONDUIT BOX, MACH GRAY	1.000	31.00
RM1016	LEAD SEPARATOR GASKET - 305/306 C.P.MOTO	1.000	16.00
51XW2520A12	.25-20 X .75, TAPTITE II, HEX WSHR SLTD	2.000	2.00
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000	2.00
HW3001A01	D3019 BRASS WASHER(STIMP)	1.000	2.00
10XN2520S06	1/4 20X3/8 HX HD CAP S.S.	1.000	2.00
WD1000B16	KPA-4C BURNDY TERMINAL	1.000	4.00
35EP1100A55G	SPL FR ENDPLATE, MACH 05M 143-5TD, CP &	1.000	67.00
HW4500A19	1/4-28X1/4 SLOTTED PLUG F/S	1.000	2.00
HA4001A01SP	DRAIN PLUG, PLASTIC (MICRO PLAS)	1.000	2.00
HW5100A03SP	WAVY WASHER (W1543-017)	1.000	2.00
35EP1300A53G	PU ENDPLATE, GRAY.	1.000	137.00
HW4500A19	1/4-28X1/4 SLOTTED PLUG F/S	1.000	2.00
HA4001A01SP	DRAIN PLUG, PLASTIC (MICRO PLAS)	1.000	2.00
51XN1032A20	10-32 X 1 1/4 HX WS SL SR	2.000	2.00
HA3100A47	THRUBOLT 10-32 X 7.625	4.000	2.00
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000	2.00
35FH1000A04G	35FH1000A04 W/GRAY EPOXY	1.000	57.00
10XN2520A16	1/4-20 X 1 HEX HEAD CAP SCR, ZINC PLATED	3.000	2.00
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	3.000	2.00

Parts List (continued)

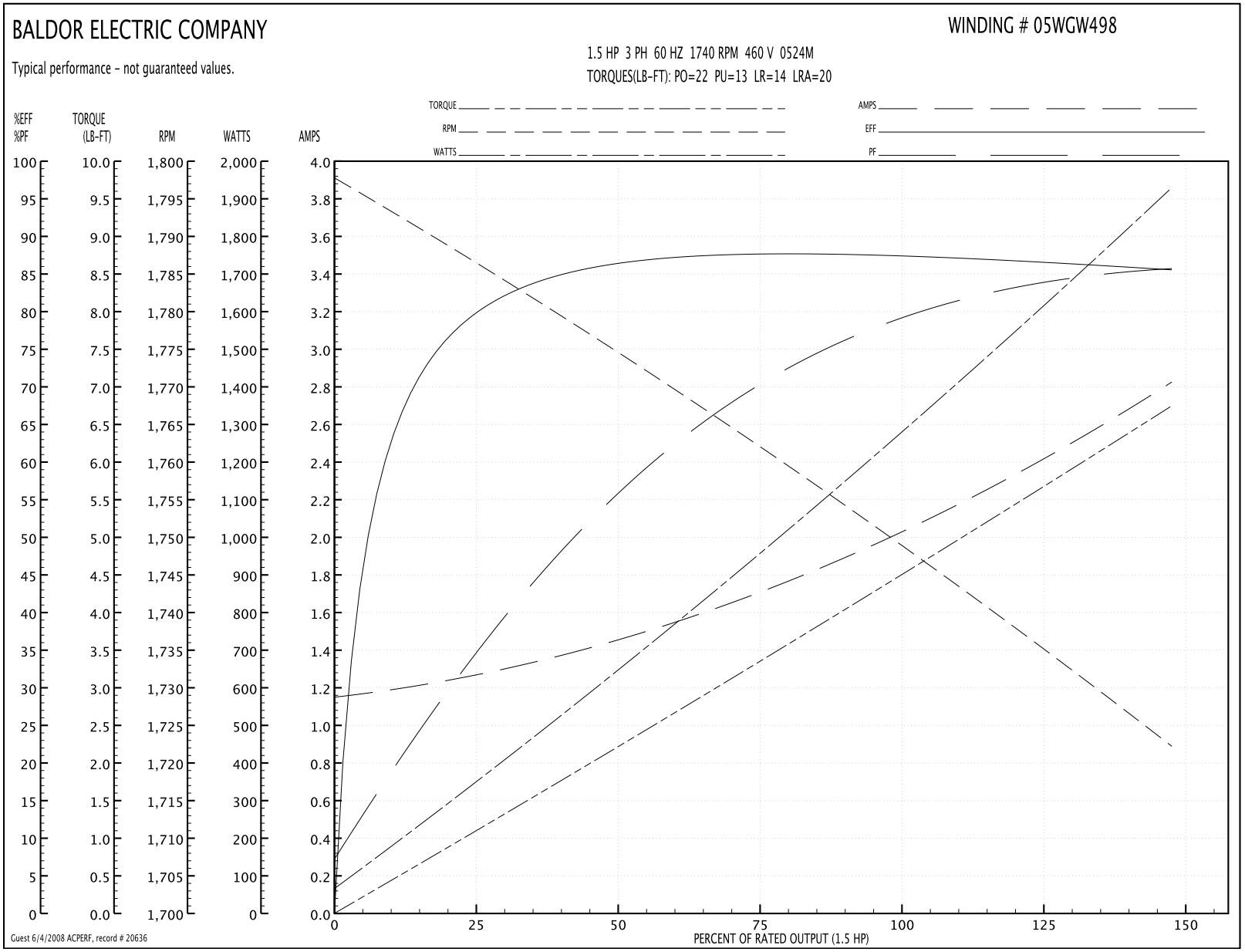
Product ID	Description	Quantity	List Price
WD4100A03	DE-750 HEYCO PLUG 62MP0750 MICRO PLASTIC	1.000	2.00
35FH4500A11	DRIPCOVER(W/ AUTOPHERETIC PRIMER)	1.000	10.00
HA2001A13	35-10103 SPACER WELKER	3.000	5.00
51XN1032A20	10-32 X 1 1/4 HX WS SL SR	3.000	2.00
06CB1500A01G	CONDUIT BOX LID, MACH GRAY	1.000	23.00
06GS1003	GASKET, KOBX LID, 1/8" THICK BLACK NEOPR	1.000	2.00
10XN2520A12	1/4-20X 3/4 HEX HEAD CAP	2.000	2.00
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	2.000	2.00
HW4600B32SP	V-RING SLINGER 1.000 X 1.540 X 0.240	1.000	6.00
HA1005A05SP	35-309 SLINGER	1.000	2.00
HW2501D13SP	KEY, 3/16 SQ X 1.375	1.000	2.00
HA7000A01	KEY RETAINER 7/8" DIA SHAFT	1.000	2.00
MJ5001A01	46-665 RED SEALER	0.001	57.00
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	4.000	2.00
LB1002	LABEL,MARINE DUTY (ON ROLLS)	1.000	2.00
MJ1000A02	GREASE, POLYREX EM EXXON	0.050	10.00
MG1025Z02	ACTIVATOR WILKOFAST 060-02	0.010	194.00
MG1025G05	PAINT DRK MET.GRAY,W/ACTIVATOR	0.022	182.00
35FN3002A05SP	EXTERNAL FAN, PLASTIC, FOR .637 DIA JOUR	1.000	22.00
LB1125C04	STD-E (STOCK CTN LABEL STD-E WITH FLAG)	1.000	2.00
LC0005E01	CONN.DIA./WARNING LABEL (LC0005/LB1119)	1.000	2.00
LB1115	LABEL,LIFTING DEVICE (ON ROLLS0	1.000	2.00
LB1115	LABEL,LIFTING DEVICE (ON ROLLS0	1.000	2.00
NP1258E	STD NAMEPLATE CP UL CSA, CC, NP STAMPED	1.000	

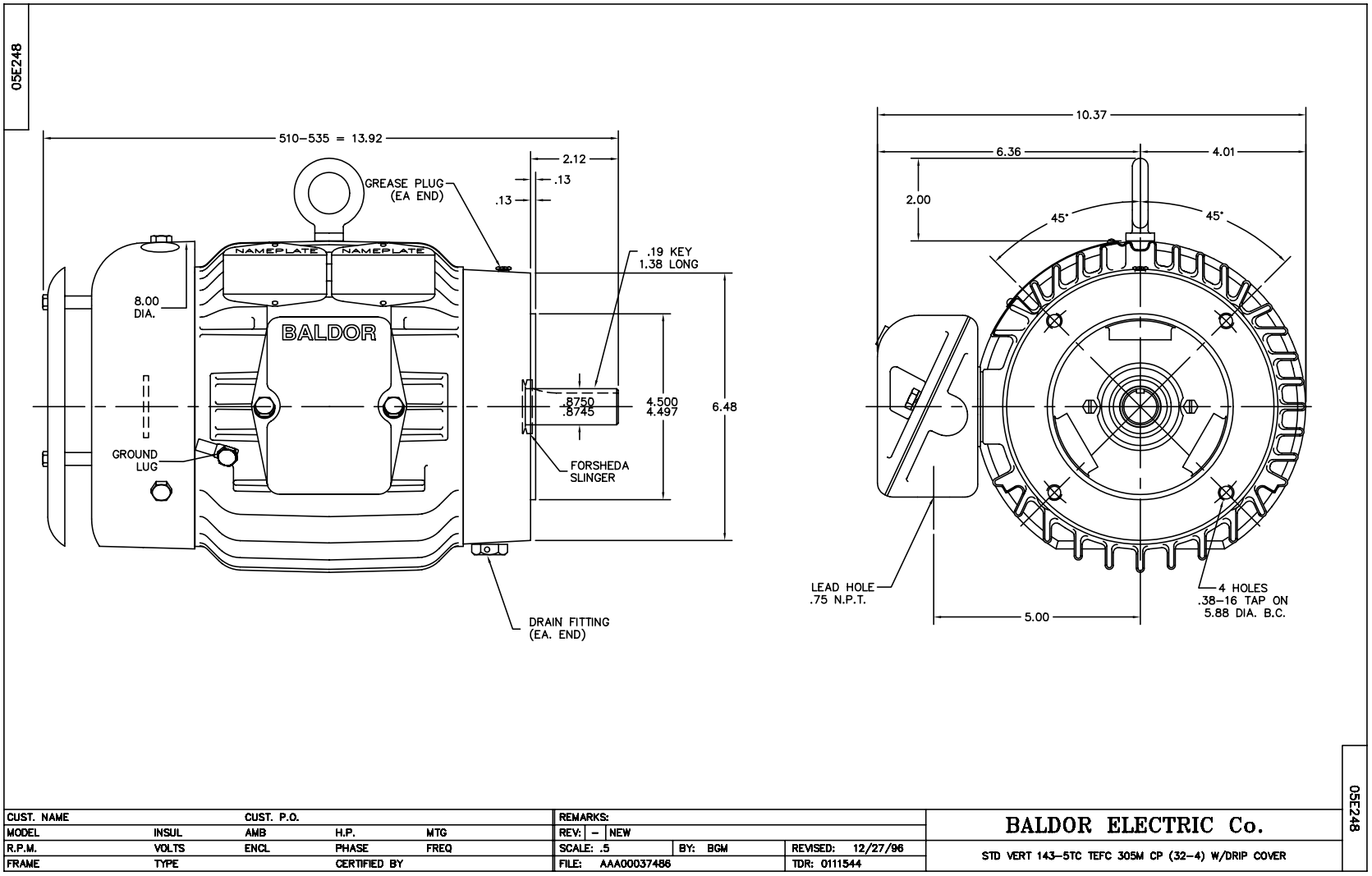
Parts List (continued)

Product ID	Description	Quantity	List Price
NP0090E	NP BRG INFO EMBOSSED	1.000	
36PA1000	PACK GROUP W/LB5001	1.000	17.00

Performance Data at 460V, 60Hz, 1.5HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	4.5 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	1.16 Amps			**Break-Down Torque:**		22.0 LB-FT	
Line-line Res. @ 25°C.:	10.5 Ohms A Ph / 0.0 Ohms B Ph			**Pull-Up Torque:**		13.0 LB-FT	
Temp. Rise @ Rated Load:	26ºC			**Locked-Rotor Torque:**		14.0 LB-FT	
Temp. Rise @ S.F. Load:	30ºC			**Starting Current:**		20.0 Amps	
Load Characteristics							
% of Rated Load:	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	36.0	57.0	71.0	78.0	83.0	86.0	0.0
Efficiency:	79.7	86.4	87.7	87.4	86.7	85.5	0.0
Speed:	1786.0	1774.0	1762.0	1749.0	1736.0	1722.0	0.0
Line Amperes:	1.26	1.45	1.73	2.01	2.43	2.81	2.28

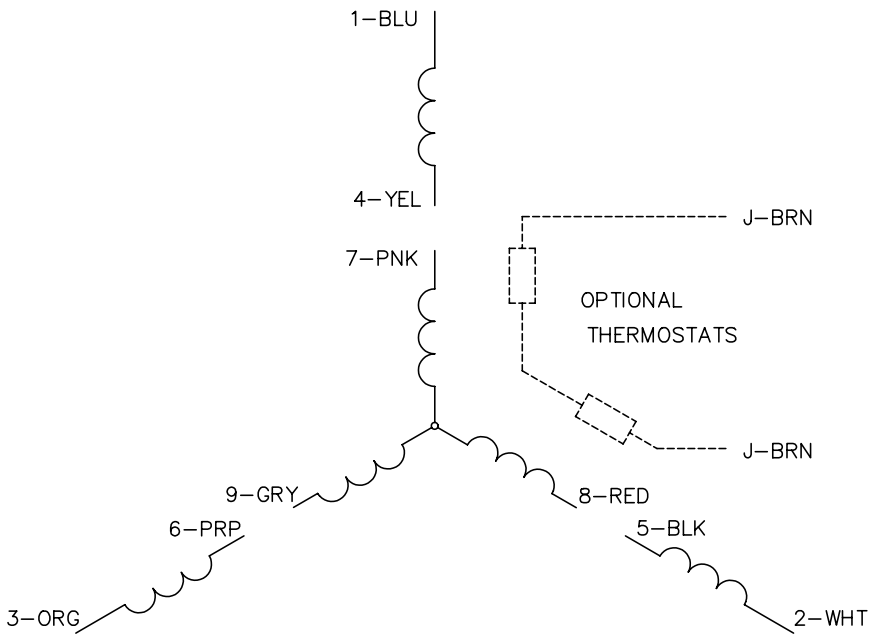
Performance Graph at 460V, 60Hz, 1.5HP (Typical performance - Not guaranteed values)

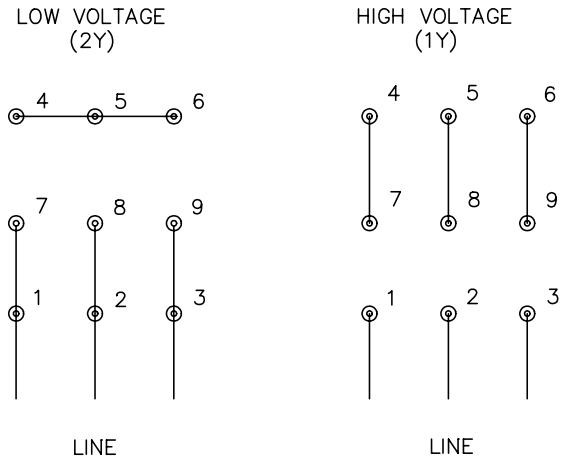




CUST. NAME		CUST. P.O.			REMARKS:		BALDOR ELECTRIC Co.
MODEL	INSUL	AMB	H.P.	MTG	REV: – NEW		
R.P.M.	VOLTS	ENCL	PHASE	FREQ	SCALE: .5 BY: BGM	REVISED: 12/27/96	STD VERT 143–5TC TEFC 305M CP (32–4) W/DRIP COVER
FRAME	TYPE		CERTIFIED BY		FILE: AAA00037486	TDR: 0111544	

CD0005





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

Modification Number	Motor Mod Express™ Description and List Price	Working Days Required

M21 Space Heaters

M21A Add Space Heaters to TEFC or Open Motors

Standard space heater voltage is 110VAC. Heaters for 230 or 460 volts are available. Specify circuit voltage.

TWO DAYS

NEMA Frame	List Price Per Motor
145T and Smaller	210
182 - 215T	265
254 - 365T	396
404 - 447T	450
449T - 5011U	817

NOTE: Strip type space heaters are standard. 5000 frame perform in Charlotte. Contact Baldor for time.

Does Not Apply to Explosion-Proof Motors

M21B Add Conduit Box for Thermostat or Heater Leads

(See M4E) Not for explosion proof motors.

CONTACT YOUR BALDOR REPRESENTATIVE

NEMA Frame	List Price
Up to 5011U Frame	356

NOTE: Perform in Charlotte. Contact Baldor for time and freight charges to ship motor to Charlotte plant.

M22 Textile Service

M22A Lint Proof Fan Cover for Textile Applications

Remove standard fan cover and replace with textile fan shroud and cover.

TWO DAYS

NEMA Frame	List Price Per Motor
48 - 145T	192
182 - 184T	251
213 - 215T	284
254 - 256T	405
284 - 286T	477
324 - 326T	528
364 - 365T	626
404 - 405T	681
444 - 447T	735

Section 1
General Information

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

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

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

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

Limited Warranty

1. Baldor Electric motors are warranted for a period of one (1) year, from date of shipment from the factory or factory warehouse against defects in material and workmanship. To allow for stocking and/or fabrication period and to provide one year of actual service, the warranty period is extended for an additional period of six (6) months for a total of eighteen (18) months from the original date of shipment from the factory or factory warehouse stock. In no case will the warranty period be extended for a longer period. Baldor extends this limited warranty to each buyer of the electric motor for the purpose of resale and to the original purchaser for use.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
   a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
   b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

   Note that **Baldor Super–E® Premium Efficiency** electric motors are warranted for a period of three (3) years. All other terms and conditions of the Limited Warranty statement apply.

Safety Notice:

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

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

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

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

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

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

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

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

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

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

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

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

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

Receiving

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

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

Storage

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

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

Unpacking

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

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

Handling

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

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft.
2. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

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

Section 2
Installation & Operation

Overview

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

Location

The motor should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles, and vibration. Exposure to these can reduce the operating life and degrade performance. Be sure to allow clearance for ventilation and access for cleaning, repair, service and inspections. Ventilation is extremely important. Be sure the area for ventilation is not obstructed. Obstructions will limit the free passage of air. Motors get warm and the heat must be dissipated to prevent damage.

These motors are not designed for atmospheric conditions that require explosion proof operation. They must NOT be used in the presence of flammable or combustible vapors or dust.

1. ODP motors are suitable only for indoor applications.
2. TEFC motors are suitable for indoor or outdoor standard service applications.

Mounting

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

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

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

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

Alignment

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

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

Caution: Do not over tension belts.

First Time Start Up

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

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

Coupled Start Up

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

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

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

Jogging and Repeated Starts

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

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

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

General Inspection

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

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

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

Lubrication & Bearings

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

Type of Grease

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

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

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

Lubrication Intervals

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

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

Table 3-1 Lubrication Intervals *

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

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

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

Lubrication Procedure

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

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

With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

   If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.
4. Re-install grease outlet plug.

Without Grease Outlet Plug

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

Note: Bearing is 1/3 full when only one side of bearing is completely full of grease.

3. Assemble motor.

Sample Lubrication Determination

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

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

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

Table 3-5 Troubleshooting Chart

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

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WESTECH AN EMPLOYEE OWNED COMPANY

MOTION SENSOR

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Instruction Manual · May 2008

million
in one

milltronics

MFA 4P

SIEMENS

Safety Guidelines: Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

Qualified Personnel: This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

Unit Repair and Excluded Liability:

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens Milltronics Process Instruments Inc.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Warning: This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Note: Always use product in accordance with specifications.

MILLTRONICS® is a registered trademark of Siemens Milltronics Process Instruments Inc.

Contact SMPI Technical Publications at the following address:
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- For a selection of Siemens Milltronics level measurement manuals, go to: **www. siemens.com/processautomation**. Under Process Instrumentation, select *Level Measurement* and then go to the manual archive listed under the product family.
- For a selection of Siemens Milltronics weighing manuals, go to: **www. siemens.com/processautomation**. Under Weighing Technology, select *Continuous Weighing Systems* and then go to the manual archive listed under the product family.

Table of Contents

Milltronics MFA 4p

Note: This product is intended for use in industrial areas. Operation of this equipment in a residential area may cause interference to several frequency based communications.

Milltronics MFA 4p is a highly sensitive, single setpoint motion sensor alarm unit, used with MSP and XPP probes. The probe detects an increase or decrease in the speed of rotating, reciprocating, or conveying equipment and sends the information to the MFA 4p. The MFA 4p works with a pre-amplifier which can be internal to the motion sensing probe, or remote from the motion sensing probe.

Pulses generated from the probe are continually compared to the adjustable setpoint. If the pulse rate is lower than the setpoint, the alarm relays operating in a fail-safe mode will de-energize, indicating failure. The relays will not energize until the pulse rate increases above the setpoint.

Safety Notes

Special attention must be paid to warnings and notes highlighted from the rest of the text by grey boxes.

! **WARNING means that failure to observe the necessary precautions can result in death, serious injury, and/or considerable material damage.**

Note: means important information about the product or that part of the operating manual.

The Manual

This instruction manual covers the installation, operation and maintenance of the Milltronics MFA 4p. It is essential that this manual be referred to for proper installation and operation of your unit. Adhering to the installation and operating procedures will insure a quick, trouble free installation and allow for the maximum accuracy and reliability of your motion sensing alarm unit and probes.

If you have any questions, comments, or suggestions about the manual contents, please email us at techpubs.smpi@siemens.com.

For the complete library of Siemens Milltronics manuals,
go to www.siemens.com/processautomation.

Specifications

Safety

Note: The Milltronics MFA 4p (Motion Failure Alarm) is to be used only in the manner outlined in this manual, otherwise protection provided by the equipment may be impaired.

Power

- 100/115/200/ 230 V AC ±15%, 50/60 Hz, 15 VA

Output

- 2 relays with Form C (S.P.D.T.) fail-safe contacts (relays operate in unison)

Resistive Rating:

- 8 A @ 250 V AC

Repeatability

- ± 1%

Temperature coefficient (setpoint variance)

- 0.018%/ °C (0.01% / °F)

Setpoint adjustment range

- 2 to 3,000 ppm (pulses per minute): standard model
- 0.15 to 15 ppm: slow speed version

Dynamic range

- 0 to 7,200 ppm

Weight

- polycarbonate enclosure: 1.5 kg (3.3 lb.)
- mild steel or stainless steel enclosure: 4.3 kg (9.5 lbs.)

Approvals[1]

- CE, $CSA_{(C/US)}$, FM
- EMC performance available on request

Environmental

- location: Indoor/outdoor
- altitude: 2000 m max.
- ambient temperature: –20 °C to 50 °C (–4 °F to 122 °F)
- relative humidity: suitable for outdoor (Type 4X / NEMA 4X / IP65)*
- installation category: II
- pollution degree: 4

*Type 4/ NEMA 4 /IP65 with mild steel enclosure

Related Equipment	Ambient Temperature Range	Approx wt.
RMA	–40 °C to 60 °C (–40 °F to 140 °F)	2.3 kg (5 lb)
MSP-12	–40 °C to 60 °C (–40 °F to 140 °F)	1.4 kg (3 lb)
XPP-5	–40 °C to 60 °C (–40 °F to 140 °F)	1.8 kg (4 lb)
MSP-1	–40 °C to 80 °C (–40 °F to 180 °F)	0.5 kg (1 lb)
MSP-3	–40 °C to 260 °C (–40 °F to 500 °F)	1.4 kg (3 lb)
MSP-9	–40 °C to 260 °C (–40 °F to 500 °F)	1.8 kg (4 lb)

1. EMC performance available upon request.

Installation

Milltronics MFA 4p

The MFA 4p (and RMA if applicable) must be mounted in a non-hazardous area that is clean, dry, vibration-free, within the ambient temperature range, and non-corrosive to the electronics or its enclosure. The door should be accessible for viewing and to allow calibration of the MFA 4p.

Note: Do not mount MFA 4p in direct sunlight.

Probe

The probe should be mounted onto a vibration free structure using the mounting flange. The gap between probe and target should be large enough to prevent the target from damaging the probe. The probe environment must be within the probe's ambient temperature range and non-corrosive to the probe's body. Refer to Applications drawings on page 23.

The probe design detects a changing magnetic field, typically caused by a ferromagnetic target disturbing the probe's magnetic field. Extremely strong magnetic fields (like those produced by the 30A/m requirements of 1EC 60004-8, Power Frequency Magnetic Field Immunity test) will be detected and will result in loss of functionality.

Functionality loss indicators:

- alarm conditions by relay trip
- false pulse readings in LED1

Consider the probe location carefully before installation. Avoid strong magnetic fields (50/60 Hz) from nearby power transformers, heater elements, or large industrial motors, because these can affect the probe’s performance.

Wiring

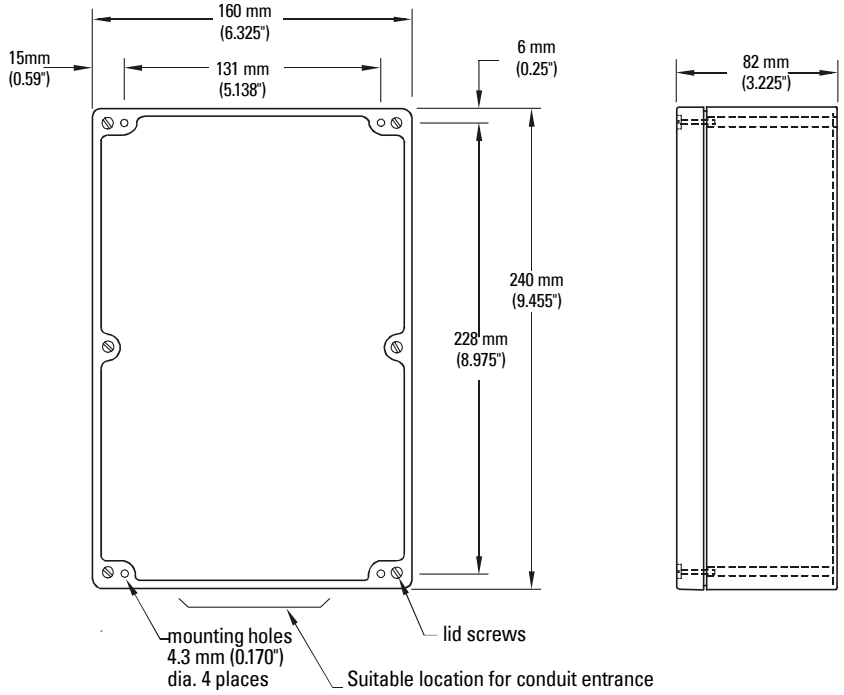
Where possible, the probe components should be interconnected via flexible conduit. This allows for easier removal or adjustment of the probe and mounting flange assembly.

Note: Installation shall only be performed by qualified personnel and in accordance with local governing regulations.

Dimensions

MFA 4p

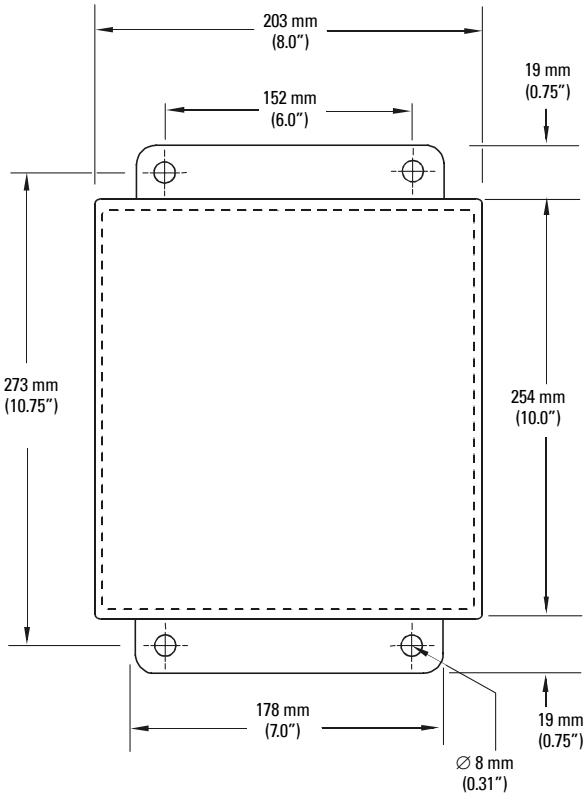
Type 4X / NEMA 4X / IP65 Polycarbonate Enclosure

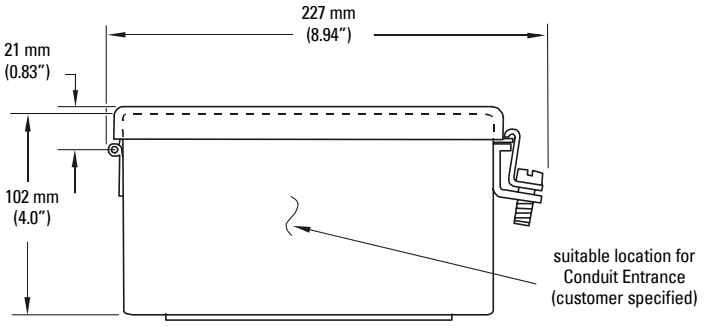


Notes:

- Non-metallic enclosure does not provide grounding between conduit connections: use grounding type bushings and jumpers.
- Use only approved, suitable size hubs for watertight application.

Type 4 / NEMA 4 / IP65 Painted Steel Enclosure & Type 4X / NEMA 4X / IP65 Stainless Steel Enclosure



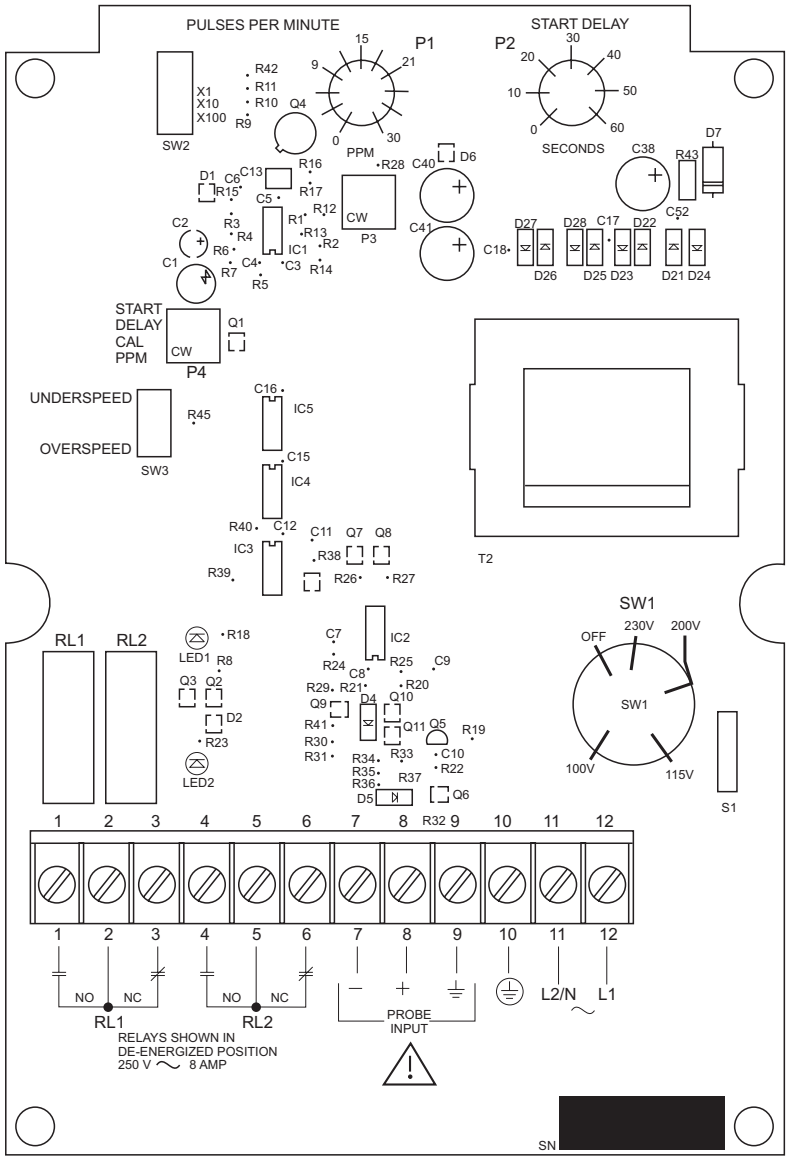


Notes:

- Painted steel enclosure does not provide grounding between conduit connections: use grounding type bushings and jumpers.
- Use only approved, suitable size hubs for watertight application.

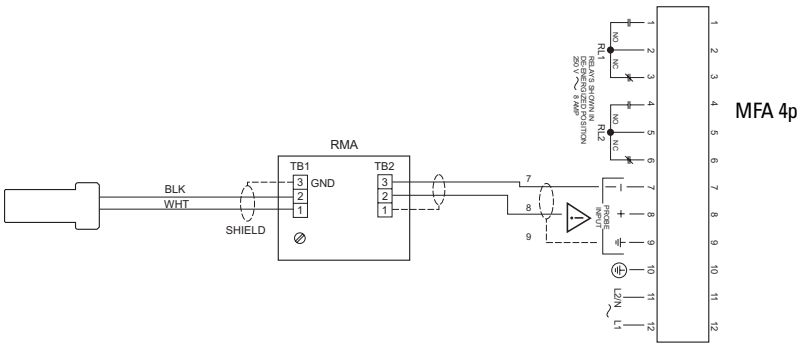
Layout

MFA 4p Circuit Board



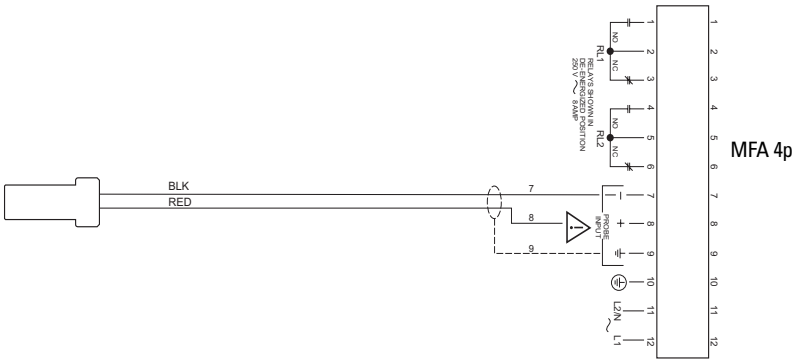
Interconnection

MSP-1, 3, or 9 Probe with RMA (remote mounted pre-amplifier)



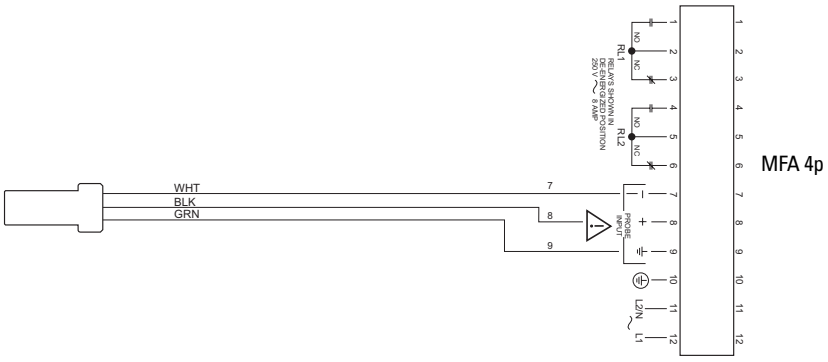
Maximum cable length from probe to RMA is 30 m / 100 ft of shielded cable, 18 ga. wire. See table on page 9 for cable lengths from RMA to main group.

MSP-12 Probe with IMA (internally mounted pre-amplifier)



Wire can be run in conduit common to motor supply or control wiring. Connection to probe leads can be made under probe cap. See table on page 9 for lengths from probe at MFA 4p.

XPP-5 with IMA (internally mounted pre-amplifier)



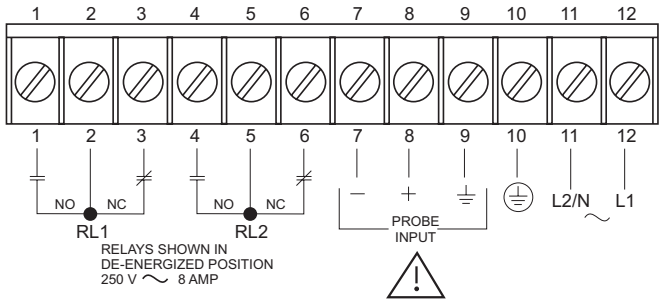
XPP-5 cable must be run in dedicated, approved metal conduit, boxes and fittings and to procedures in accordance with all governing regulations. See table below for lengths from probe at MFA 4p.

Note: Refer to Interconnection Diagram for the XPP-5 (drawing number 23650131) on page 21.

Cable length from RMA or IMA to MFA 4p

Wire gauge	Length in feet	Length in metres
22 AWG (0.34 mm^2)	2500	760
18 AWG (0.75 mm^2)	5000	1520
12 AWG (4 mm^2)	25000	7600

Connection to power:

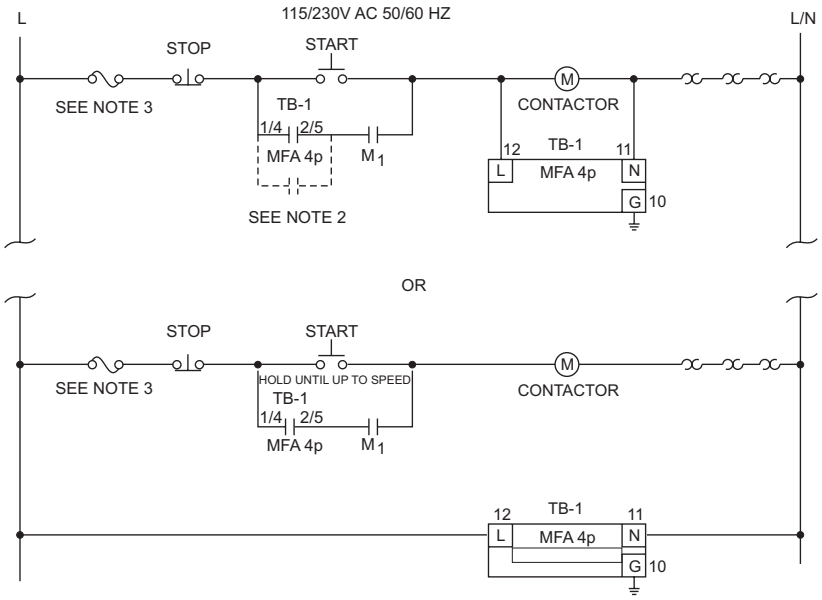


- Terminal 10 ⏚ must be connected to reliable ground.
- The equipment must be protected by a 15A fuse or circuit breaker in the building installation.
- A circuit breaker or switch in the building installation, marked as the disconnect switch, shall be in close proximity to the equipment and within easy reach of the operator.
- AC input circuit, relay circuits, min. 14 AWG copper wire
- Recommended torque on terminal clamping screws, 7 in.lbs. max.

! WARNING: All field wiring must have insulation suitable for at least 250 V.

Wiring

MFA 4p Wiring for Automatic Start Delay



Notes:

1. Interlocks and Safety Pull Switches are not shown.
2. If **START** is initiated by programmable logic controller, closure time may be too brief to allow MFA 4p contact to latch. In this case, program a timer contact into the circuit.
3. CSA requires an 8A or less fuse to protect contacts. For 240 V AC, protect the contacts with a 1500 VA transformer as well.

Should the **Time Delay** feature on start-up not be required, power should be applied continuously from a separate source and the potentiometer turned to zero. This is usually necessary for automatic up-stream start up of conveying devices after the down-stream drive has reached its operation speed.

Operating Principles

MFA 4p

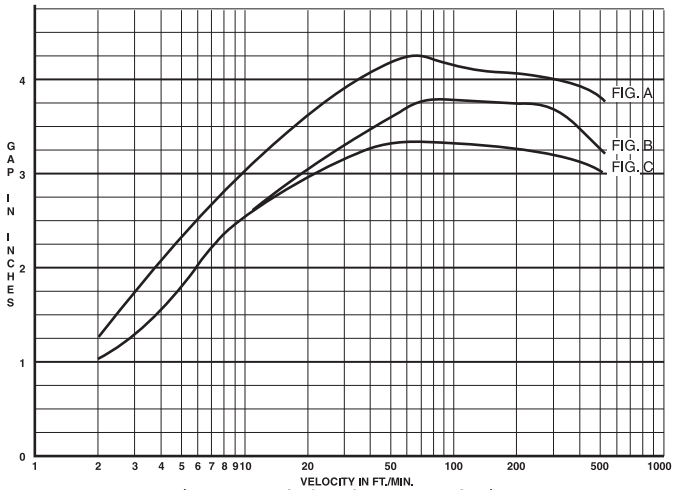
Milltronics MFA 4p is a highly sensitive, single setpoint motion sensor alarm unit, used with MSP and XPP probes. The probe detects an increase or decrease in the speed of rotating, reciprocating, or conveying equipment and sends the information to the MFA 4p. The MFA 4p works with a pre-amplifier which can be internal to the motion sensing probe, or remote from the motion sensing probe.

Pulses generated from the probe are continually compared to the adjustable setpoint. If the pulse rate is lower than the setpoint, the alarm relays operating in a fail-safe mode will de-energize, indicating failure. The relays will not energize until the pulse rate increases above the setpoint.

Probe

The Milltronics probes work on the principle of Faraday's Laws of Electromagnetic Induction. When a ferromagnetic object enters the probe's permanent magnetic field, it distorts the flux causing it to cut the coil windings and generate a voltage. This voltage is proportional to the strength of the magnet and the number of wire turns in the coil (constant in the Milltronics probes) and the speed at which the ferrous target passes through the flux. The generated voltage is also inversely proportional to the square of the distance between the target and the probe.

The relationship between speed and gap of a standard probe:



(25.4 mm = 1 inch and 305 mm = 1 foot)

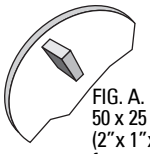


FIG. A.
50 x 25 x 50 mm
(2"x 1"x 2")
ferrous block

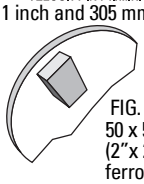


FIG. B
50 x 50 x 25 mm
(2"x 2"x 1")
ferrous block

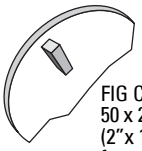


FIG C
50 x 25 x 25 mm
(2"x 1"x 1")
ferrous block

The resultant line indicates the threshold tolerance of the accompanying MFA 4p electronics. For example, in **FIG. A**, a 100 mm (4") gap requires a minimum velocity of about 10 m / minute (35 ft / minute): with a velocity of 0.61 m / minute (2 ft / minute), a maximum gap of 31 mm (1.25") is possible.

Note: 25.4 mm = 1 inch and 0.305 m = 1 foot

The graph was plotted from tests using four ferrous blocks set equidistantly on a 406 mm (16") diameter circle on a non-ferrous disc.

The physical shape of the ferrous target generally becomes important at low velocities or large gaps. At these points, tests indicate that a cubic shape gives the best results due to the sudden change it causes in the magnetic field.

An increase in block size beyond 50 x 50 x 25 mm (2" X 2" X 1") is generally not as effective as minimizing the gap, except at very low velocities.

The Milltronics Mini Sensing Probe, MSP-1

- The MSP-1 is approximately one-quarter the size of the standard probe with about one-eighth the sensitivity.
- Divide all operating values by 0.125 to obtain the specifications of the MSP-1. For example, with a gap of 12 mm (0.5"), the minimum velocity is approximately 60 m / min. (200 ft / min.), and with a velocity of 0.6 m / min. (2 ft / min.) a maximum gap of 0.125" (3 mm) is possible.

Milltronics manufactures probes to suit a wide variety of environments: low temperature, high temperature, corrosive, and Class I, II and III applications.

Pre-Amplifier (IMA and RMA)

The pre-amplifier accepts the voltage pulses generated by the probe and converts them into noise-immune current pulses. Current levels are 12 mA low and 45 mA high. The pre-amplifier comes internally mounted in the probe, or in an enclosure for remote mounting.

Internally mounted pre-amplifiers are called IMAs. Remote mounted pre-amplifiers are called RMAs.

MFA 4p Operation

The MFA 4p provides a short circuit protected, +24 V DC unregulated supply to the pre-amp. In the event that the interconnecting wiring is shorted, output current from the MFA 4p is automatically limited and the on-board alarm relays are de-energized to indicate failure.

The output current pulses from the pre-amp are super-imposed onto the dc current supply. These are monitored by Probe LED 1, which is illuminated at the rate of the incoming pulses and is useful for positioning the probe.

The rate at which the pulses are received by the MFA 4p is compared to a setpoint reference signal from the time base generator.

Although two pulses within range are required to energize the relays, as long as the frequency of the incoming pulses exceeds the setpoint frequency (or is less than that of the setpoint in the case of overspeed detection), the MFA 4p keeps the alarm relays energized. The reference generator is frequency adjustable by the pulses per minute (ppm) switch and potentiometer.

The alarm relays will de-energize after two time constants of the setpoint when the frequency of the incoming pulses falls below that of the setpoint (or exceeds that of the setpoint in the case of overspeed detection). The relay status is indicated by Relay LED 2, which is illuminated when the relays are energized (normal).

The MFA 4p has a 0 to 60 second time delay feature, allowing the monitored device to accelerate to normal running speed before monitoring begins.

This feature is activated when power is applied to the MFA 4p in parallel with the motor starter contact coil. The time delay circuit simulates normal operating conditions for the amount of time as set by the **Start Delay** potentiometer, keeping the alarm relays energized. If the monitored device does not reach normal speed before the set time period, the relays will de-energize giving an alarm condition. This feature is not applicable in the overspeed detection mode.

Calibration

The probe and pre-amplifier require no calibration.

Connect the probe, pre-amp, and MFA 4p as shown in the Interconnection diagrams on pages 8 and 9. Connect the MFA 4p to power as shown in the Power Connection diagram on page 10, and if applicable, as shown for Automatic Start Delay on page 11.

Note: To help the calibration procedure, short N.O. contacts of relays to prevent motor shut-down (terminals 1 to 2 and/or 4 to 5). This allows the system to run uninterrupted until an operating setpoint is established.

MFA 4p (Refer to MFA 4p Circuit Board layout on page 7.)

1. Operate monitored equipment at its normal operating speed.
2. Confirm that Probe LED 1 is pulsing at a regular frequency.
3. Set **Start Delay** fully counter-clockwise **(CCW)** to **0** seconds.

Underspeed

1. Set switch **SW3** to **Underspeed**.
2. Set **pulses per minute (ppm)** switch **SW2** to **X 100** position.
3. Turn **ppm** potentiometer fully clockwise **(CW)** to **30**.
4. Determine incoming pulse rate by slowly turning **ppm** potentiometer **CCW** until relay LED 2 goes on. As the MFA 4p requires 2 pulses within range before energizing relays, low **ppm** applications (e.g. **2 ppm**) may require stepping of potentiometer at appropriate time intervals.

5. If no response is obtained when you set the **ppm** potentiometer to **3** (below this stability suffers), reset potentiometer fully **CW**, set switch **SW2** to **X 10** and then **X 1** if required, and repeat step 4.
6. When Relay LED 2 goes on, indicating the incoming pulse rate, turn potentiometer **CCW** slightly past this point to obtain an operating setpoint that allows for normal fluctuations due to load and voltage variations. For 50% of full speed, set potentiometer (and **SW2** if required) to halfway between incoming pulse rate of normal speed and **0** ppm.
7. Set **Start Delay** by adjusting potentiometer so that equipment being monitored can attain normal operating speed before LED 2 can turn off.

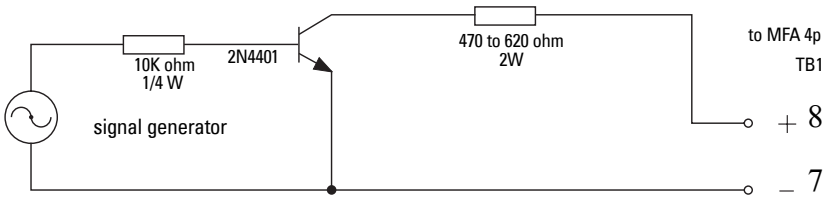
Overspeed

1. Set switch **SW3** to **Overspeed**.
2. Set **ppm** switch **SW2** to **X 1** position.
3. Set **ppm** potentiometer fully **CCW** to **0**.
4. Determine incoming pulse rate by slowly turning **ppm** potentiometer **CW** until Relay LED 2 goes on. Because the MFA 4p requires 2 pulses within range before energizing relays, low **ppm** applications (e.g. **2 ppm**) may require stepping of potentiometer at appropriate time intervals.
5. If no response is obtained when you set the **ppm** potentiometer to **3,** (below this stability suffers), re-set potentiometer fully **CCW** and set switch **SW2** to **X 10,** and then **X 1** if required, and repeat step 4.
6. When Relay LED 2 goes on, indicating the incoming pulse rate, turn potentiometer **CW** slightly past this point to obtain an operating setpoint that allows for normal fluctuations due to load and voltage variations.

Remember:
If N.O. contacts were shorted as described in final note of calibration preamble, remove them now as calibration is complete.

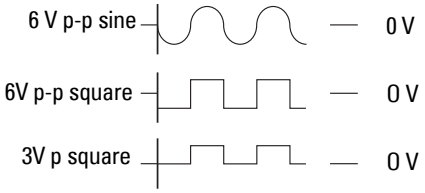
Signal Generator Interface

The following circuit may be used for calibrating or for troubleshooting the MFA 4p.



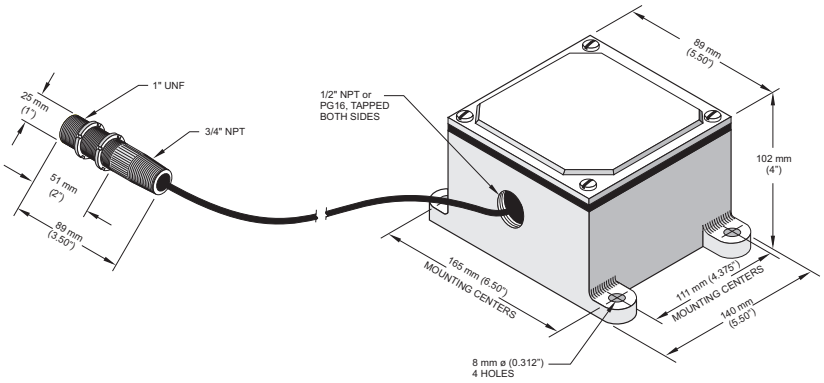
Circuit substitutes operating probe and pre-amp.

Set signal generator for:



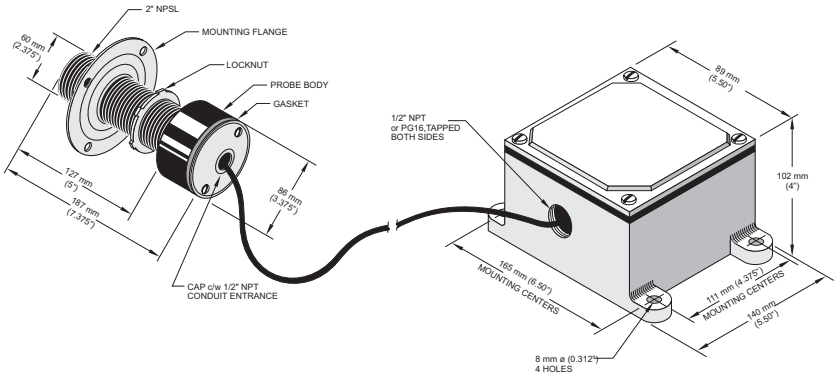
Probes

Mini Sensing Probe MSP-1



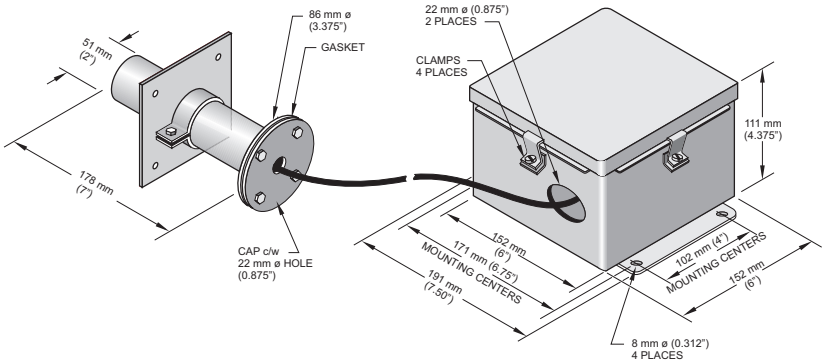
- CPVC body comes with 2 CPVC locknuts
- 180 cm (6 ft.) of Belden 8760 supplied potted in probe
- Remote mounted pre-amp in NEMA 4 cast aluminum enclosure.

High Temperature Probe MSP-3

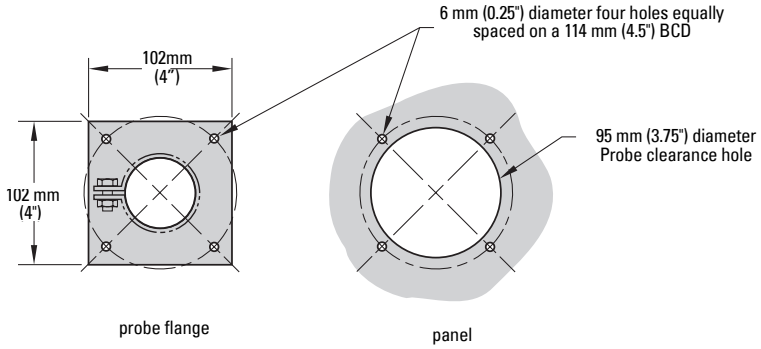


- Cast aluminum body comes with cast aluminum cap and zinc flange, zinc plated locknut, and silicone rubber gasket
- See page 22 for Flange and Mounting Details
- Pre-amp is mounted in a NEMA 4 cast aluminum enclosure

Stainless Steel Probe MSP-9



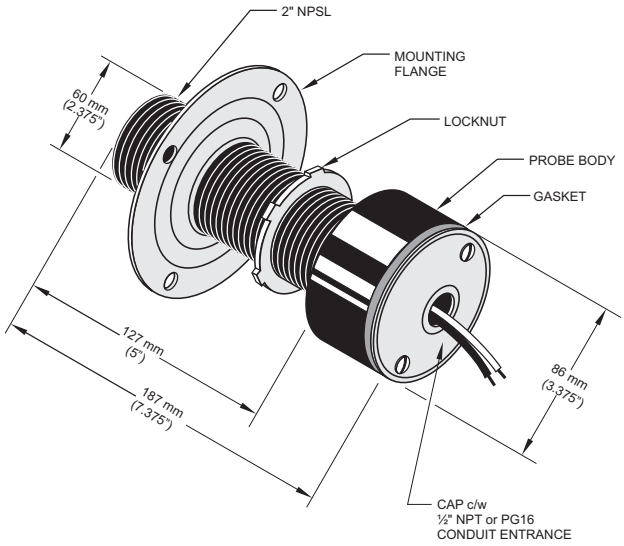
Mounting Details



- For high temperature and corrosion resistance applications
- 304 stainless steel body comes with stainless steel clamp and silicone gasket
- 1.5 m (5 ft.) Belden 83321 Teflon®[1] cable potted in probe
- Pre-amp is mounted in an enamel painted steel Hammond 1414N4E enclosure

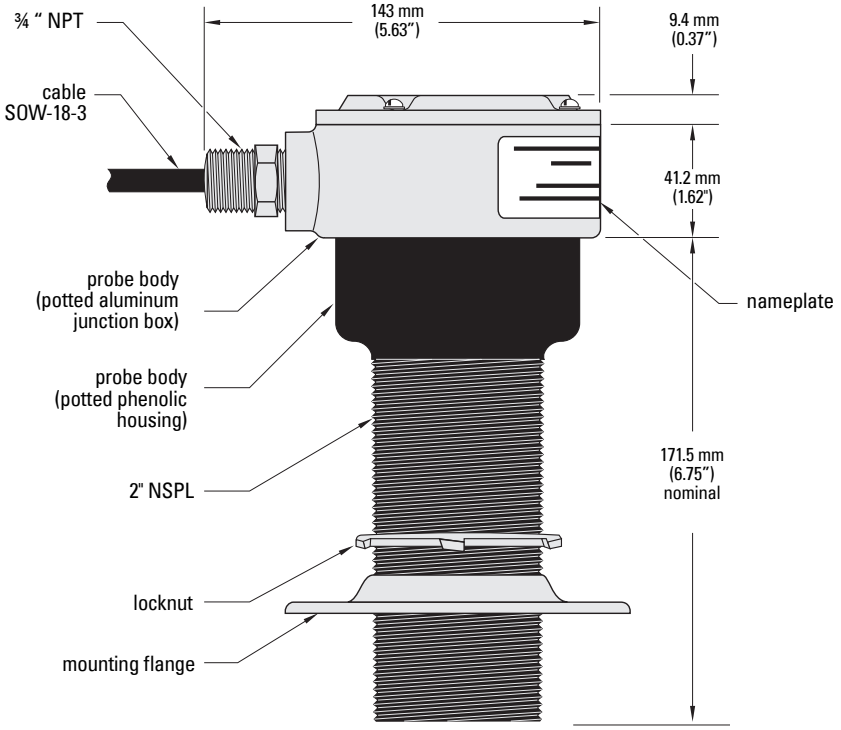
1. Teflon is a registered trademark of E.I. du Pont de Nemours and Company

Standard Probe MSP-12



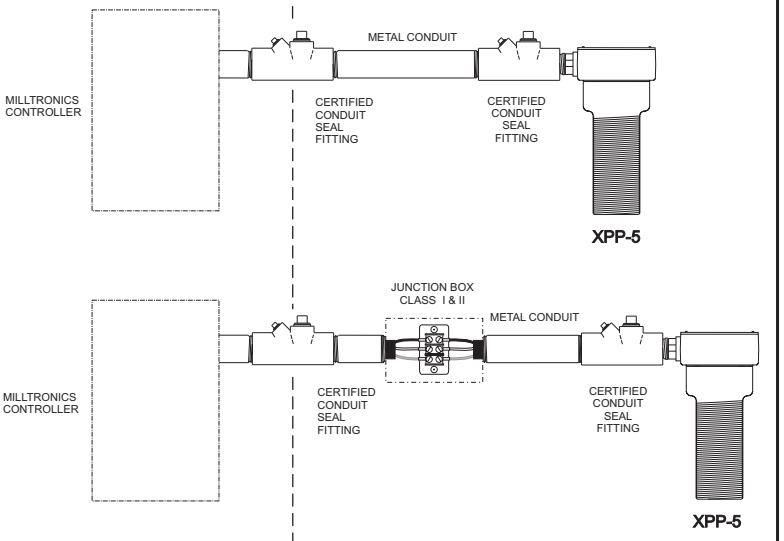
- Phenolic body comes with die-cast aluminum cap and zinc flange, zinc plated locknut, and neoprene gasket
- See page 22 for Flange and Mounting Details
- Pre-amp is potted in the probe body and comes with two 127 mm (5") long hook-up wires

Hazardous Locations XPP-5



- C.S.A Approved for:
  Class I, Div.1, Gr. A, B, C & D
  Class II, Div 1, Gr. E, F & G
  Class III
- phenolic/aluminum body with die-cast flange and zinc-plated locknut
- see page 22 for mounting details, and pages 9 and 21 for interconnection information.
- pre-amp and cable potted in the probe's body

Interconnection Diagram for the XPP-5



NOTES :

1) THE XPP-5 CABLE MUST BE TERMINATED IN AN AREA EXTERNAL TO HAZARDOUS LOCATIONS, CLASS I, DIV 1, GR. A,B,C,D & CLASS II, DIV 1, GR. E,F,G.

2) A SEAL SHALL BE INSTALLED WITHIN 50 mm OF THE XPP-5 CONDUIT HUB FOR CLASS I, DIV. 1 HAZARDOUS LOCATION ONLY.

3) INSTALLATION SHALL BE DONE IN ACCORDANCE WITH CANADIAN ELECTRICAL CODE PART 1 REQUIREMENTS.

4) DO NOT EXPOSE THE XPP-5 TO DIRECT SUNLIGHT, OTHERWISE PROVIDE SUN SHIELD.

5) STATIC HAZARD, DO NOT RUB WITH DRY CLOTH.

No.	REVISION DESCRIPTION	DWG BY	APPRO.	DATE
2	REVISED HOUSING THREADS PER ECN #00-000-0-0070	RWG	SN	JULY 11/00
1	REVISED CABLE AND TERMINAL CONNECTOR PER ECN #00-000-0-0037	RWG	SN	APRIL 18/00
0	FOR CONSTRUCTION	RWG	SN	MARCH 27/00

USE DIMENSIONS ONLY - DO NOT SCALE

DRAWING SCALE	N. T. S.
DRAWN BY	B. GRAY
CHECKED BY	R. CLOSS
APPROVED BY	S. NGUYEN

TOLERANCES UNLESS OTHERWISE NOTED
1 PLACE DECIMAL ±0.030" FRACTIONS ±0.030"
2 PLACE DECIMAL ±0.010" ANGLES ±0.5°
3 PLACE DECIMAL ±0.002"

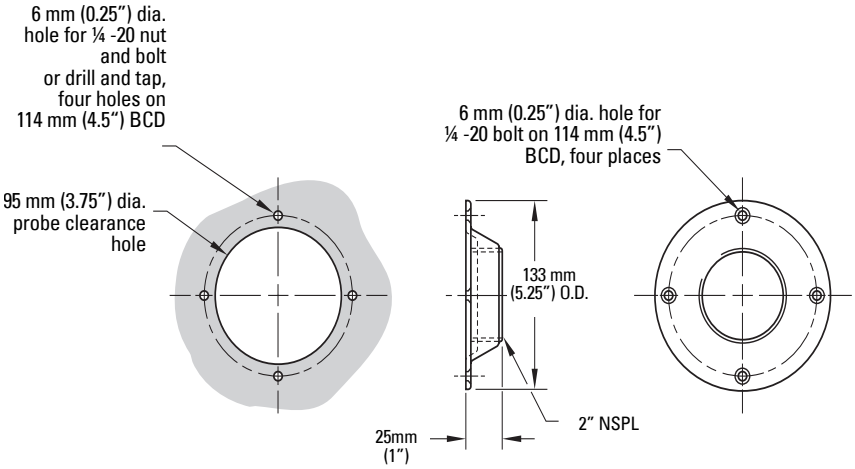
THIRD ANGLE PROJECTION

TITLE
XPP-5
INTERCONNECTION DIAGRAM

MILLTRONICS
Mass Dynamics Division

FILE No. 2365013102	SIZE	DRAWING No.	REV.
PLOT AT 1=1	A	23650131	2
JOB No.		SHEET 1 OF 1	

Mounting Details



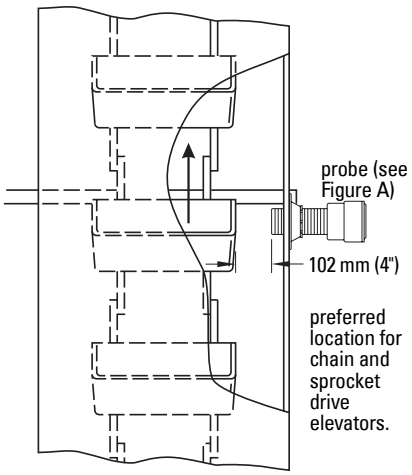
Mounting Flange

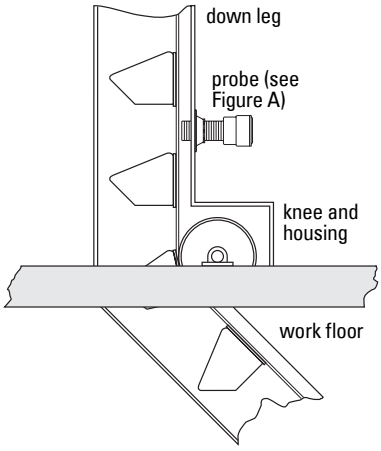
APPLICABLE TO ALL PROBES

EXCEPT MSP-1 AND MSP-9

Applications

Bucket Elevators



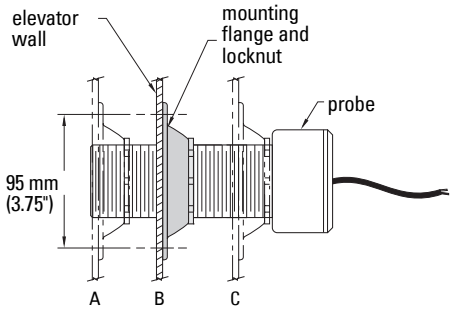


For chain and sprocket drive elevators, place the probe so that the gap between the bucket and the probe does not exceed 102 mm (4"). To prevent damage to the probe from eccentric bucket motion, ensure that the gap is not less than 12.5 mm (0.5") in the worst condition.

Preferred location for belt-driven elevators with ferrous bucket spacing greater than 76 mm (3"), and non-ferrous buckets with ferrous bolts.

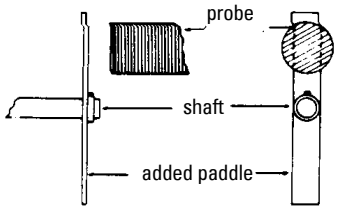
For ferrous buckets with spacings less than 76 mm (3") locate probe on the front of the leg.

Figure A

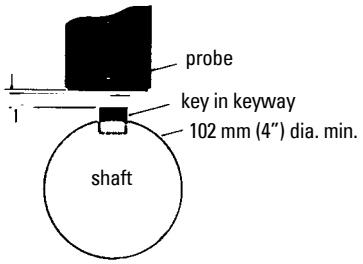


For elevators with ferrous walls, cut 88 mm to 95 mm (3.5" to 3.75") hole in the elevator wall. Any position from A to C may be used to maintain the gap.

Shafts



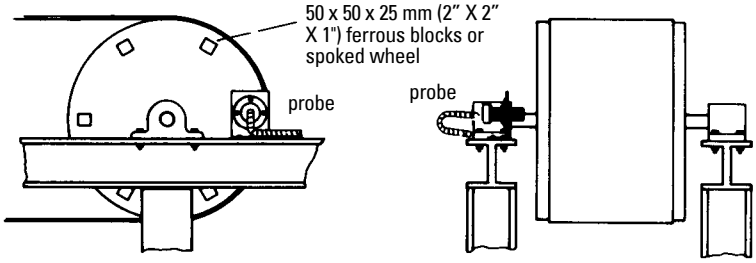
safety shield not shown



These methods are viable if the speed is such that the blades or key will provide the number of pulses required at a minimum velocity of 1.5 m / minute (5 ft. / minute). In applications where exposed moving parts are required, safety shields and precautions should be applied.

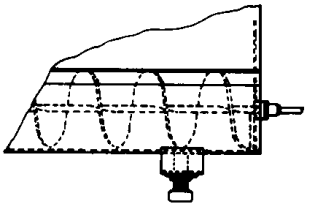
Where conditions prevent the sensing of buckets, a belt pulley or paddle mounted on an exposed shaft end, preferably the tail pulley, may be used.

Belt Conveyors

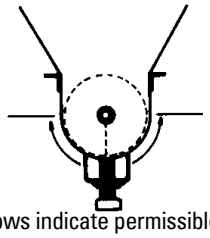


Potential for damage in each application governs the minimum gap allowable. Maximum gap for operation is 102 mm (4"), optimum 25 mm to 50 mm (1" to 2").

Screw Conveyors



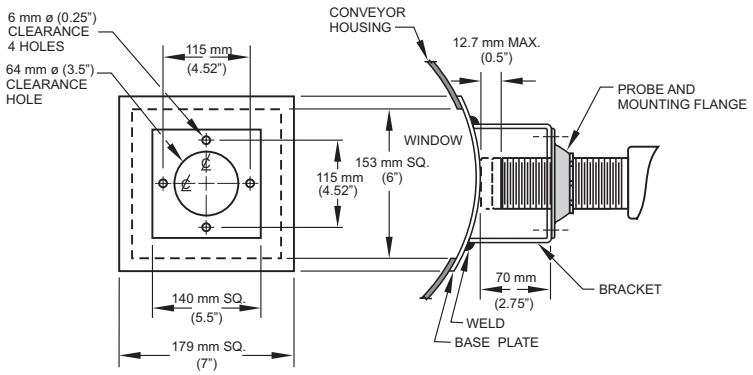
The probe should be located at the idler end (usually feed end)



Arrows indicate permissible placement range of the probe

A ferrous mass added behind the flight of a screw conveyor, where it passes the probe aids Borderline Operation. This mass must be added for all non-ferrous screws.

Non-Ferrous Window

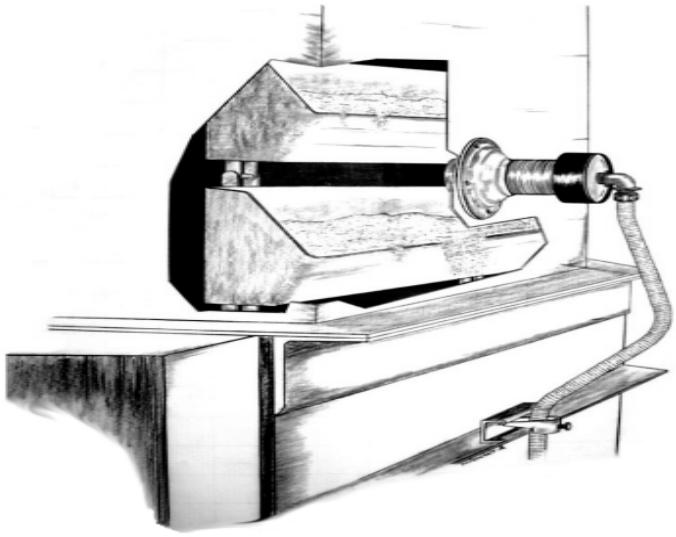


MINIMUM RECOMMENDED DIMENSIONS SHOWN

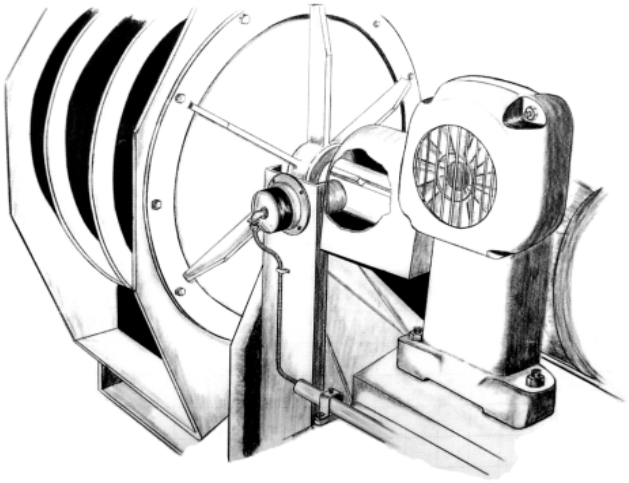
For screw conveyor with trough over 3.1 mm (0.125") thick or for high temperature applications. The dimensions shown for the base, window, and bracket are the minimum recommended with tolerances of ± 0.8 mm (0.031"). Use 305, 310, or 316 stainless steel, brass, or aluminum.

The probe may not touch the window if temperatures are in excess of 60 °C (140 °F) when using the low temperature probes or 260 °C (500 °F) when using the high temperature probes.

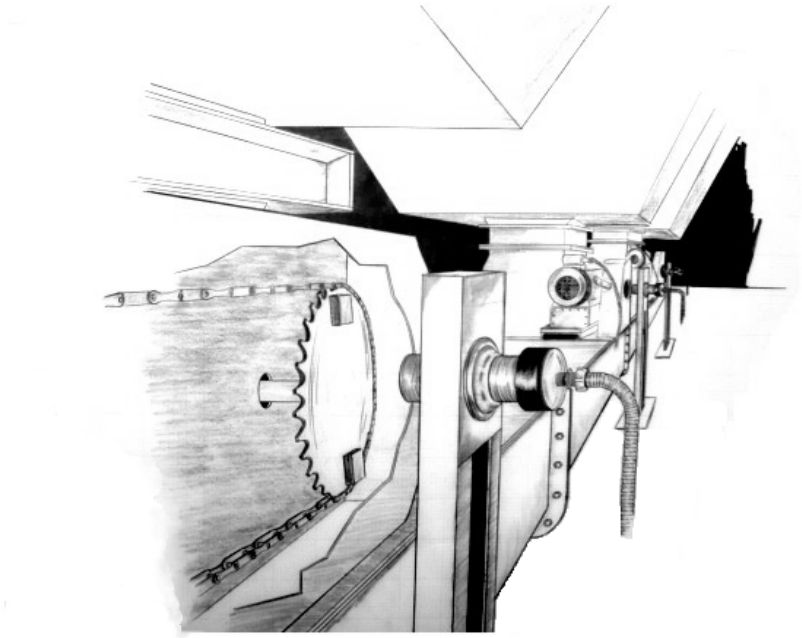
Bucket Elevator



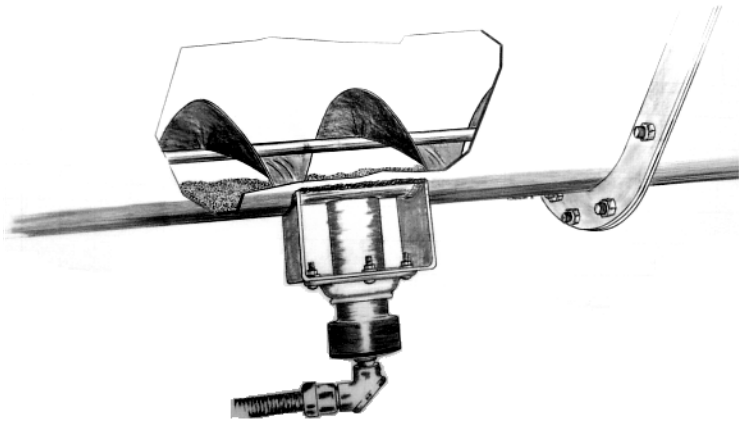
Rotating Shaft of Rotary Feeder



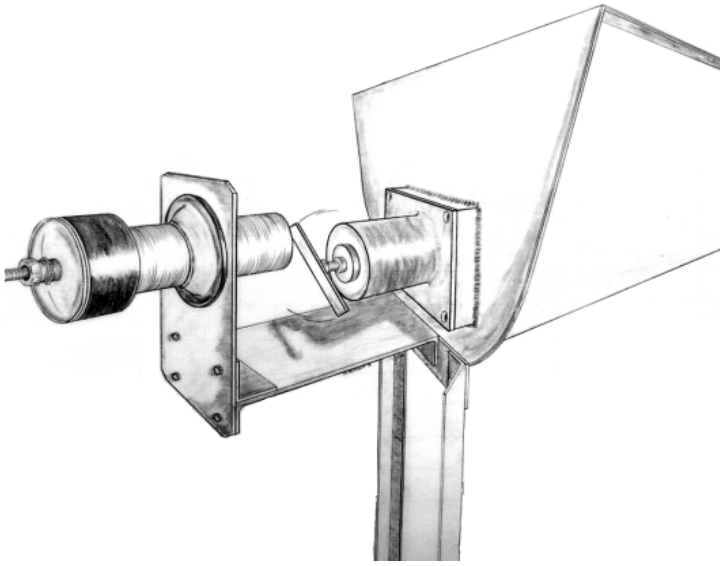
Drive Sprocket on Rotary Feeder



Screw Conveyor Flights



End Bearing on Screw Conveyor



Troubleshooting

	LED 1	LED 2	term 7/8 (note 1)	C8	term 1/2 relay 1 out	term 4/5 relay 2 out
normal	pulsing	on	24 V	27 V	closed	closed
alarm	pulsing	off	24 V	27 V	open	open
probe reversed polarity	on	off	20 V	27 V	open	open
probe wiring open circuit	off	off	27 V	27 V	open	open
probe wiring short circuit	off	off	0 V	27 V	open	open
relay defective	pulsing	on	24 V	27 V	open	open

Notes:

- Voltage levels are dc, nominal values, and may appear to be pulsing, coincidental with LED 1.
- If diagnosis does not solve the malfunction, the probe, pre-amp or MFA 4p may be defective.
- If no spare circuit boards or probes are available for interchanging, the MFA 4p may be tested as follows in order to determine which section is defective:

  a. To find out if the MFA 4p is defective:
     i. Disconnect the pre-amp.
     ii. Set ppm switch **SW2** to **X 1** position and turn potentiometer to **15**.
     iii. Connect one lead of a 530 ohm, 1 watt resistor to terminal 7 and then momentarily contact terminal 8 at a rate of once per second. If the MFA 4p is functional, the relays will energize after two pulses and de-energize approximately 8 seconds after last pulse.

  b.To find out if the RMA is defective:
     i. Disconnect pre-amp from the MFA 4p. Attach probe across terminals TB1 1/2 and a 24V DC(floating) power supply across terminals TB2 3/2, according to the RMA Interconnectiondiagram on page 8.
     ii. Run equipment to be monitored at normal operating speed or pass a ferrous object in front of and as close to probe as possible at a continuous rate.
     iii. With an oscilloscope, look for approximately 6V peak to peak pulses or alternating hi/lo levels across ground and link 3. Or with an amp meter connected in series between the RMA and the 24V DC power supply, look for hi/lo levels of approximately 12mA/40mA alternating at the rate of the passing ferrous objects.

c.To find out if the probe is defective (non-IMA type only; i.e. MSP-1 , MSP-3, and MSP-9):

i. Disconnect probe from pre-amp.

ii. Connect an ohmmeter across the black and white leads.

iii. Nominal probe impedances are as follows

MSP-1	115 ohms
MSP- 3 and MSP- 9	750 ohms

If impedance deviates substantially from these values, an open or short circuit condition is indicated.

Maintenance

The Motion Failure Alarm MFA 4p requires no maintenance: however, we recommend a program of periodic checks.

If it is necessary to clean the enclosure and circuit boards:

1. First, make sure the power is disconnected at the main breaker.
2. Use a vacuum cleaner and a clean, dry paint brush.
3. Check all electrical contacts for corrosion and arcing.

It is a good idea to periodically check the face of the probe: it should be free of material build-up, corrosion or deformation.

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www.siemens.com/processautomation

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Peterborough, ON, Canada K9J 7B1
Tel: (705) 745-2431 Fax: (705) 741-0466
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Rev. 1.2

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6 ENCLOSURES

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ASSEMBLY: 21393B-D101 REV: DWG #: 21393AB-D101

PART DESCRIPTION: GENERAL ARRANGEMENT DWG REV:

WRITTEN BY: MWB CHKD BY: PCH APP: JPW

DATE: 9/8/2011 DATE: 9/8/2011 DATE: 9/8/2011

ITEM	SP	PART NUMBER	DRAWING NUMBER	DWG REV	MATL CODE	PART DESCRIPTION	QTY	B/M	B/M REV
101	W	21393B-D102	21393AB-D101	0	304SS	MAIN ASSY, CVH260	1	Y	0
-	-	-	-	-	-	BUILD PER APPROVED DRAWING	-	-	-
-	-	-	-	-	-	LICENSOR MODEL: XC260	-	-	-
-	-	-	-	-	-	UNIT MATERIAL: 304 SS	-	-	-
-	-	-	-	-	-	SPIRAL MATERIAL: CARBON STEEL	-	-	-
-	-	-	-	-	-	UNIT LENGTH: 5610 mm	-	-	-
-	-	-	-	-	-	INSTALLATION ANGLE: 0 DEGREES	-	-	-
-	-	-	-	-	-	REDUCER:NORD, SK3282-AZ-BH-N140TC, RATIO 112.23	-	-	-
102	W	21393B-D103	21393B-D103		304SS	SUPPORT, CONVEYOR	2	N	
103	W	BHH-050C0200	-	-	304SS	CAPSCREW HH 1/2"-13 X 2" LG	16	N	-
104	W	WFL-050	-	-	304SS	WASHER, FLAT, 1/2"	16	N	-
105	W	WLO-050	-	-	304SS	WASHER, LOCK, 1/2"	16	N	-
106	W	NFI-050	-	-	304SS	NUT, HEX, 1/2"-13	16	N	-

Revision:

NOTES:

1. ALL 304 STAINLESS STEEL CONSTRUCTION EXCEPT FOR MOTOR, REDUCER, SPIRAL, DRIVE SHAFT, AND ELECTRICAL ITEMS.

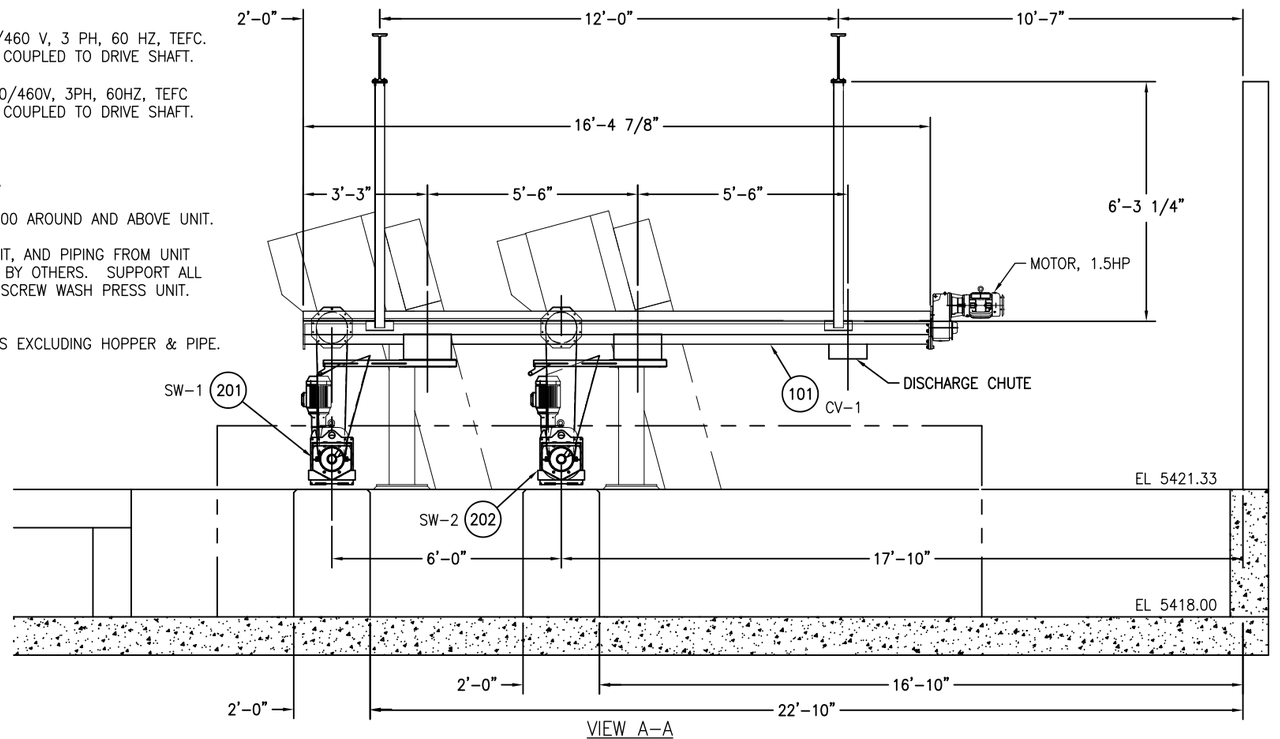
2. DRIVE SYSTEM
   SCREW WASH PRESSES:
   A. MOTOR: 5 HP, 1800 RPM, 230/460 V, 3 PH, 60 HZ, TEFC.
   B. REDUCER: HELICAL WORM GEAR COUPLED TO DRIVE SHAFT.
   CONVEYOR:
   C. MOTOR: 1.5 HP, 1800 RPM, 230/460V, 3PH, 60HZ, TEFC
   D. REDUCER: HELICAL WORM GEAR COUPLED TO DRIVE SHAFT.

3. SPIRAL SPEED:
   SCREW WASH PRESS: 15 RPM (A)
   CONVEYOR: 16 RPM

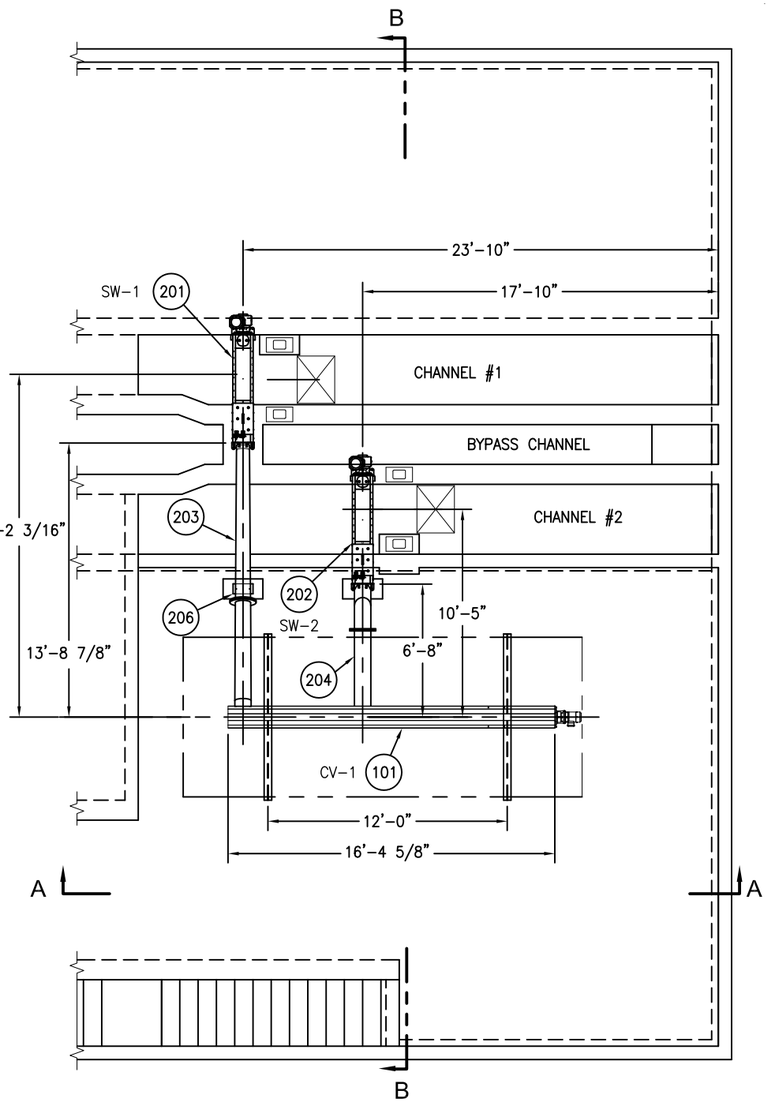
4. RECOMMENDED CLEARANCE TO BE 36.00 AROUND AND ABOVE UNIT.

5. ALL INTERCONNECTING WIRING, CONDUIT, AND PIPING FROM UNIT MOUNTED DEVICES WILL BE SUPPLIED BY OTHERS. SUPPORT ALL EXTERNAL PIPING INDEPENDENTLY OF SCREW WASH PRESS UNIT.

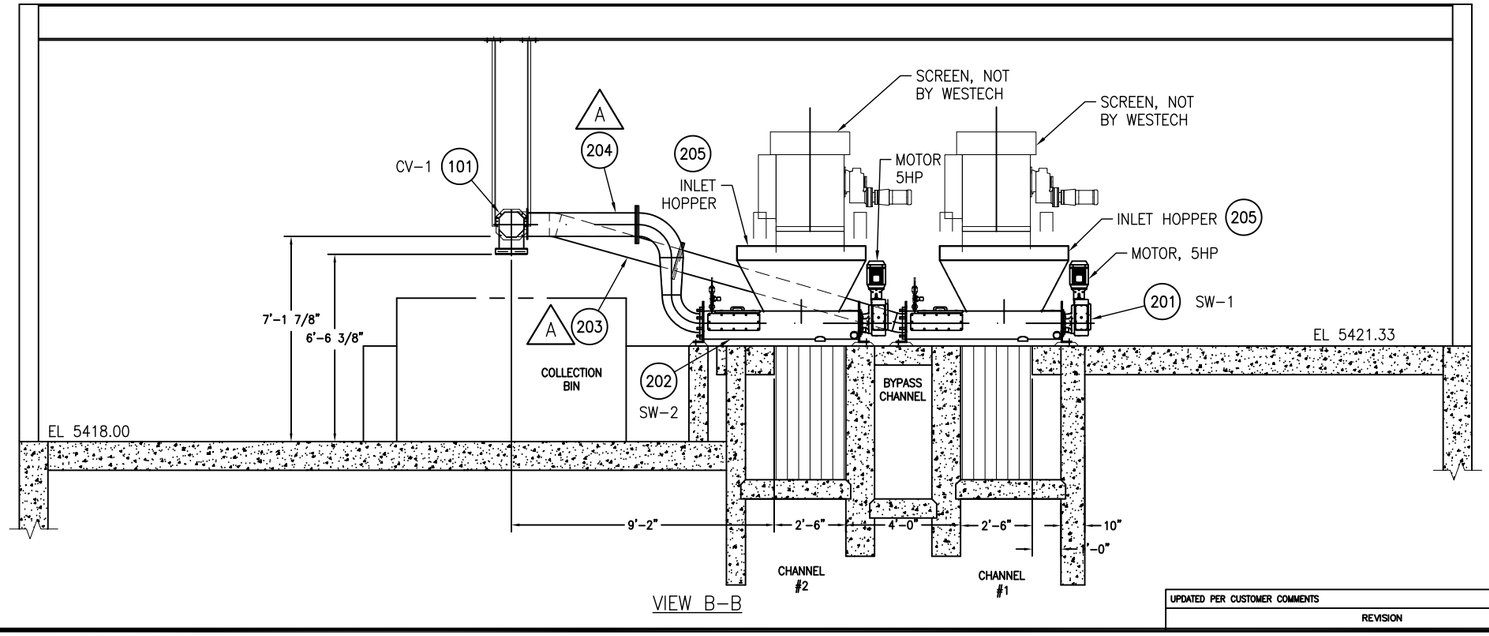
6. WEIGHTS:
   A. SCREW WASH PRESS – 620 LBS EXCLUDING HOPPER & PIPE.
   B. CONVEYOR: 1150 LBS



VIEW A–A



PLAN



VIEW B–B

PREPARED FOR: HAROLD D THOMPSON WRF
FOUNTAIN, CO
ENGINEER: GMS, INC.
COLORADO SPRINGS, CO
CONTRACTOR: WEAVER CONSTRUCTION MANAGEMENT, INC.
ENGLEWOOD, CO
PROJECT ORDER NO.: 9103 / 11360

GENERAL ARRANGEMENT – (2) SCREW WASH PRESS / (1) CONVEYOR
DESCRIPTION

SWP20–80 / CVH260–5000
TYPE

SIZE

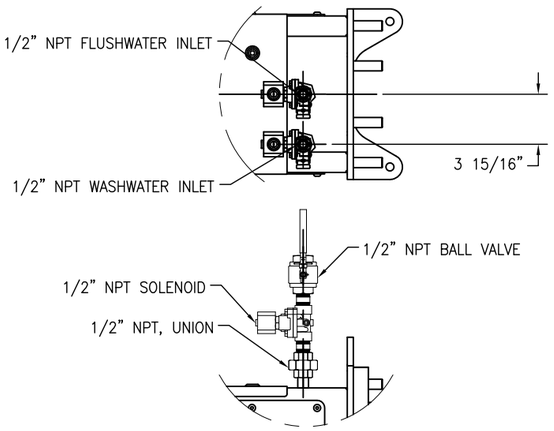
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				NONE	09–11	MWB	PCH	JPW

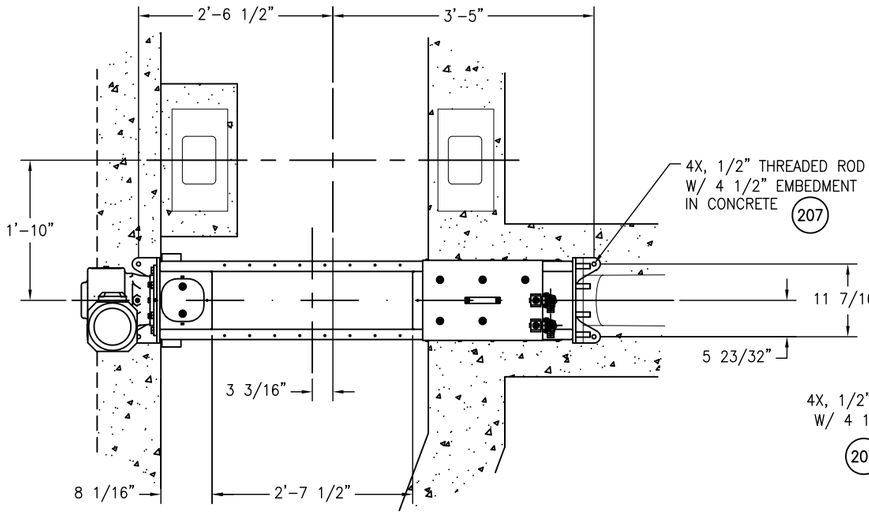
ALL COMPONENTS MUST BE FABRICATED AND MACHINED ACCORDING TO WESTECH STANDARD SPECIFICATION (DRAWING P24Z–024A), UNLESS SPECIFICALLY NOTED ON THIS DRAWING.

REVISION	BY	CHKD	DATE	LTR
UPDATED PER CUSTOMER COMMENTS	MWB	JPW	10–24–11	A

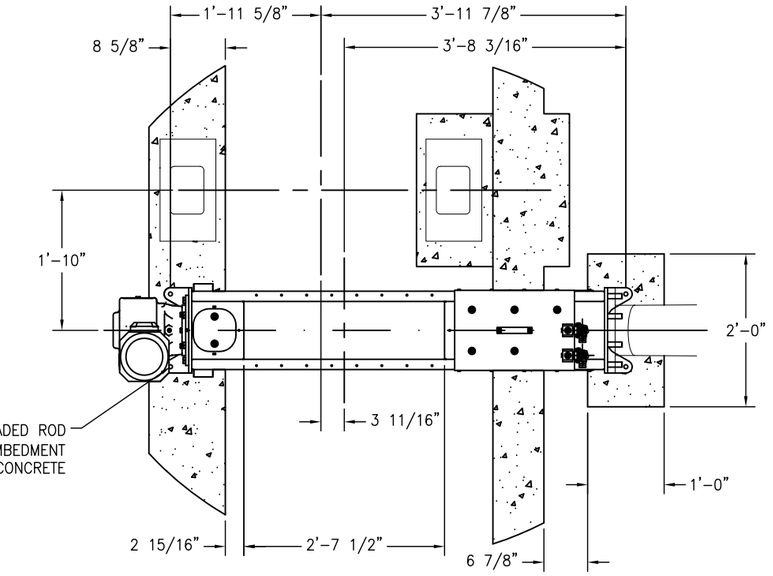
WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
21393AB–D101	21393AB	A

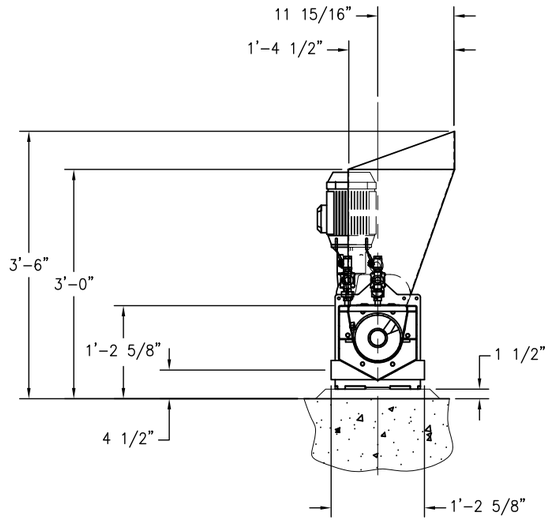




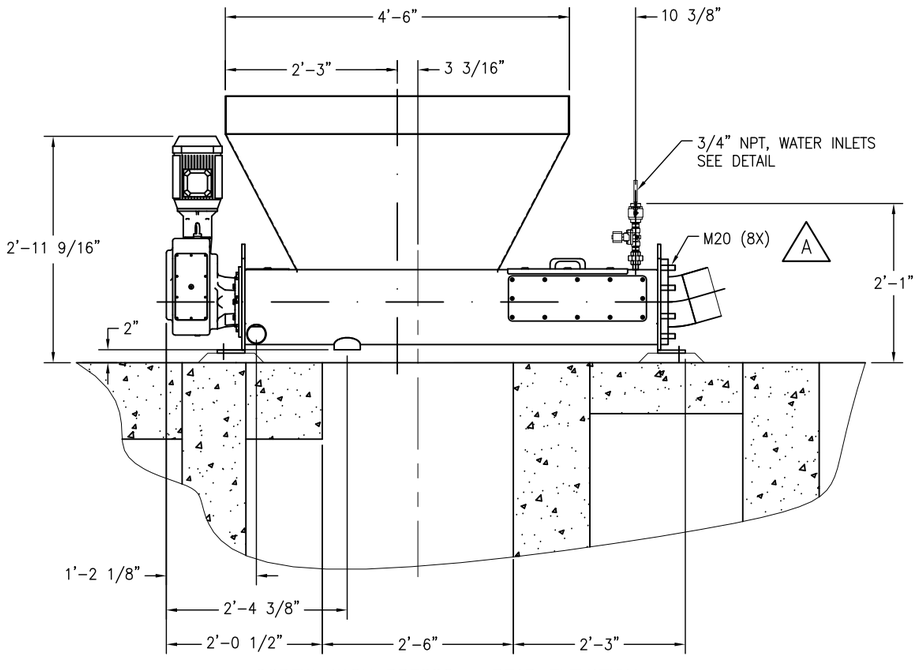
SCREW WASH PRESSS – PLAN
CHANNEL 1



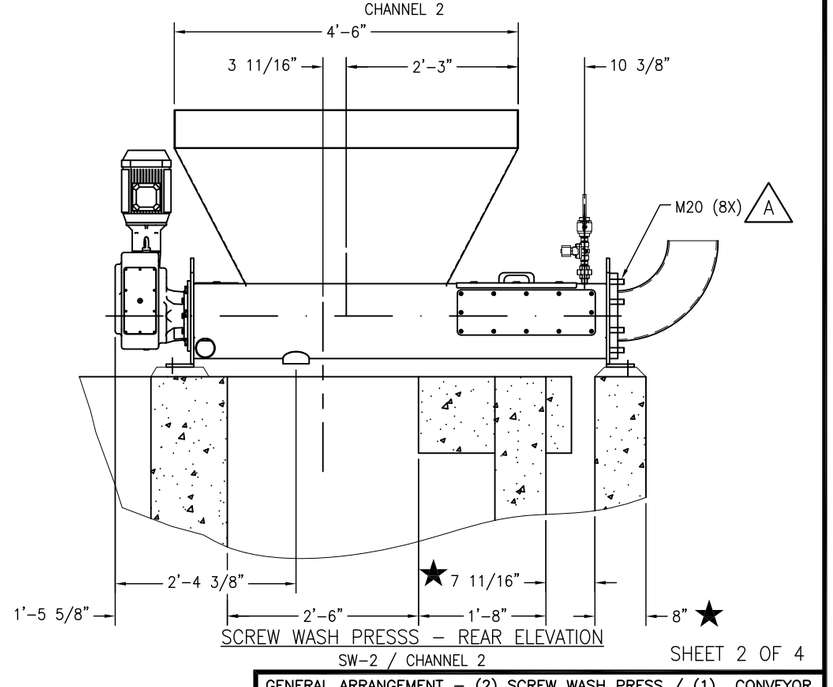
SCREW WASH PRESSS – PLAN
CHANNEL 2



SCREW WASH PRESSS – ELEVATION
TYP CHANNELS 1 & 2



SCREW WASH PRESSS – REAR ELEVATION
SW-1 / CHANNEL 1



SCREW WASH PRESSS – REAR ELEVATION
SW-2 / CHANNEL 2

GENERAL ARRANGEMENT – (2) SCREW WASH PRESS / (1) CONVEYOR

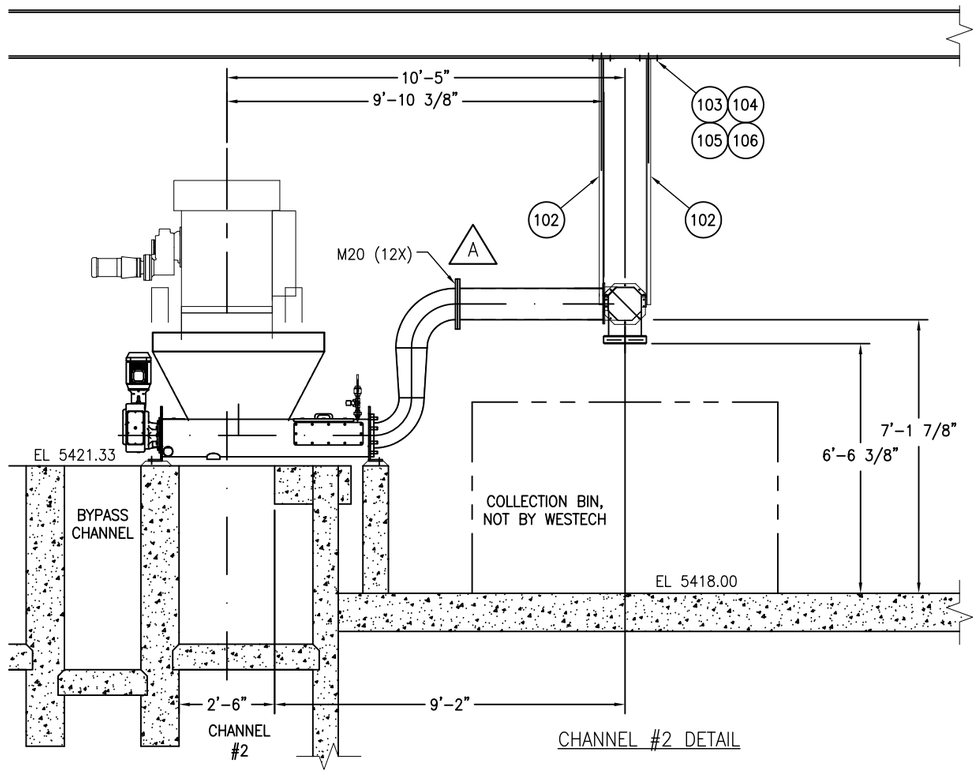
DESCRIPTION							
SWP20-80 / CVH260-5000							
TYPE				SIZE			
				NONE	09-11	MWB	PCH	JPW
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

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

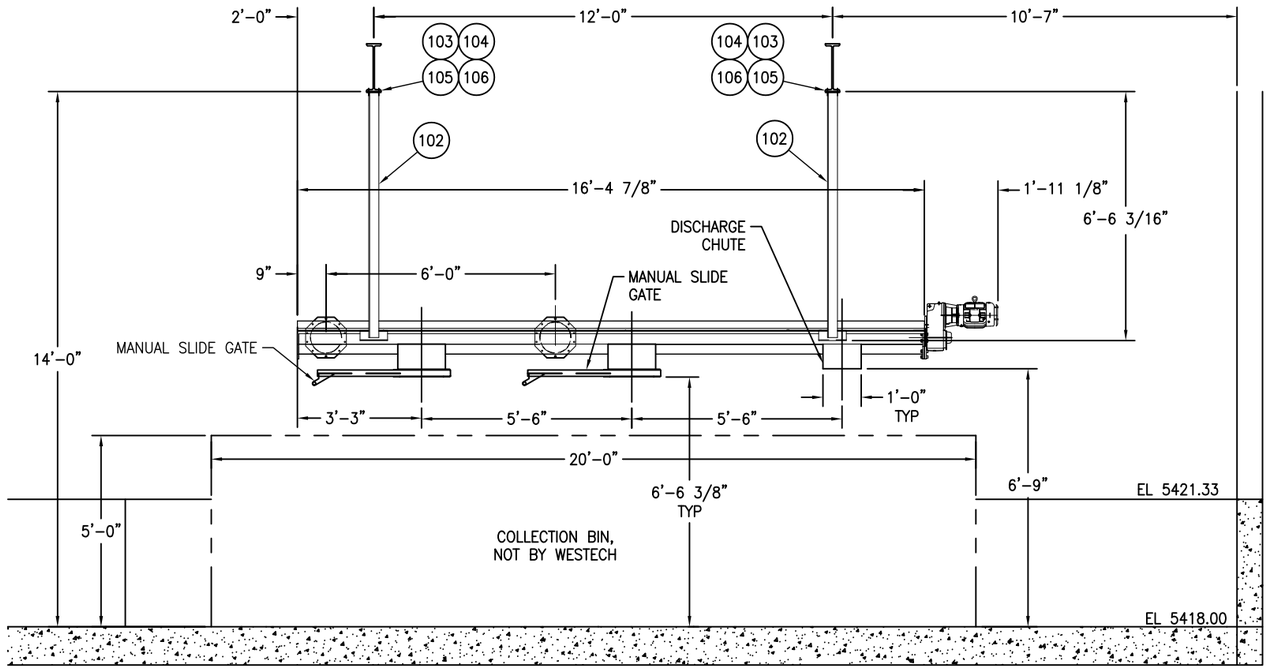
REVISION	BY	CHKD	DATE	LTR
UPDATED PER CUSTOMER COMMENTS	MWB	JPW	10-24-11	A

WESTECH

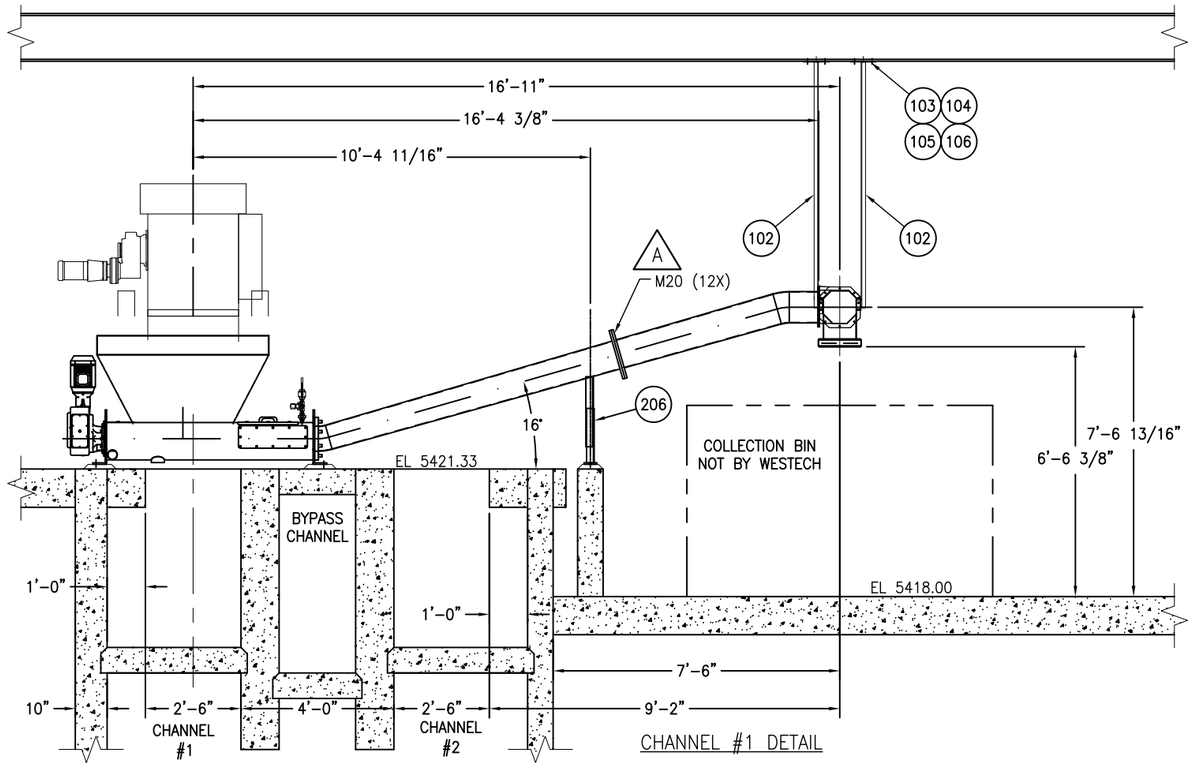
DRAWING NUMBER	PROJECT NUMBER	REV.
21393AB-D101	21393AB	A



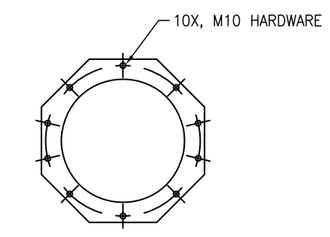
CHANNEL #2 DETAIL



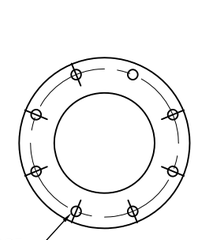
CONVEYOR DETAIL



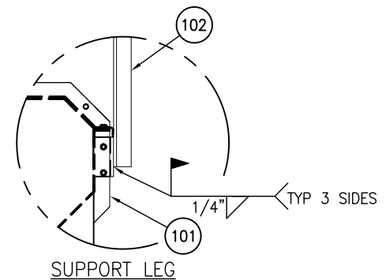
CHANNEL #1 DETAIL



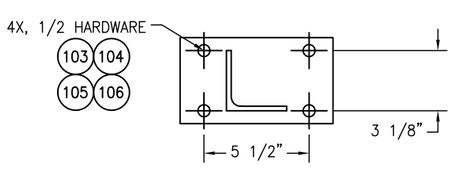
FLANGE
DISCHARGE PIPE / CONVEYOR
TYP 2 PLACES



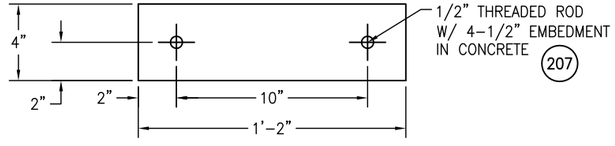
FLANGE
SCREW WASH PRESS / DISCHARGE PIPE
TYP 2 PLACES



SUPPORT LEG
COONVEYOR, TYP 4 PLACES



BASE PLATE
CONVEYOR, TYP 4 PLACES



BASE PLATE
SUPPORT PIPE, IT #206

SHEET 3 OF 4

UPDATED PER CUSTOMER COMMENTS	MWB	JPW	10-24-11	A
REVISION	BY	CHKD	DATE	LTR

GENERAL ARRANGEMENT – (2) SCREW WASH PRESS / (1) CONVEYOR

DESCRIPTION								
SWP20-80 / CVH260-5000								
TYPE				SIZE				
				NONE	09-11	MWB	PCH	JPW
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
21393AB-D101	21393AB	A

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. 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.

5. DRIVE SHALL BE FINISHED WITH MANUFACTURER'S STANDARD PAINT.

6. SURFACE PREPARATION TO CONSIST OF:
   STAINLESS STEEL: SOLVENT CLEANED
   STEEL SCREW: SSPC–SP10 NEAR WHITE METAL BLAST

7. SHOP PAINTING TO CONSIST OF:
   STAINLESS STEEL: NONE
   STEEL SCREWS: ONE (1) COAT OF EPOXY PRIMER (3–6 MILS)

8. ANCHORS:
   UNIT ANCHORAGE DESIGNED AROUND RED HEAD A7 ADHESIVE SYSTEM.
   ANCHOR BOLT DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.
   USE BASE PLATES & BRACKETS AS TEMPLATES TO LOCATE ANCHOR BOLTS.

9. ALL ASSEMBLY FASTENERS TO BE: 18–8 SS

REVISION	BY	CHKD	DATE	LTR
NO CHANGES THIS SHEET	MWB	JPW	10-24-11	A

GENERAL NOTES – (2) SCREW WASH PRESS / (1) CONVEYOR

DESCRIPTION

SWP20–80 / CVH260–5000

TYPE

SIZE

DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				NONE	09–11	MWB	PCH	JPW

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

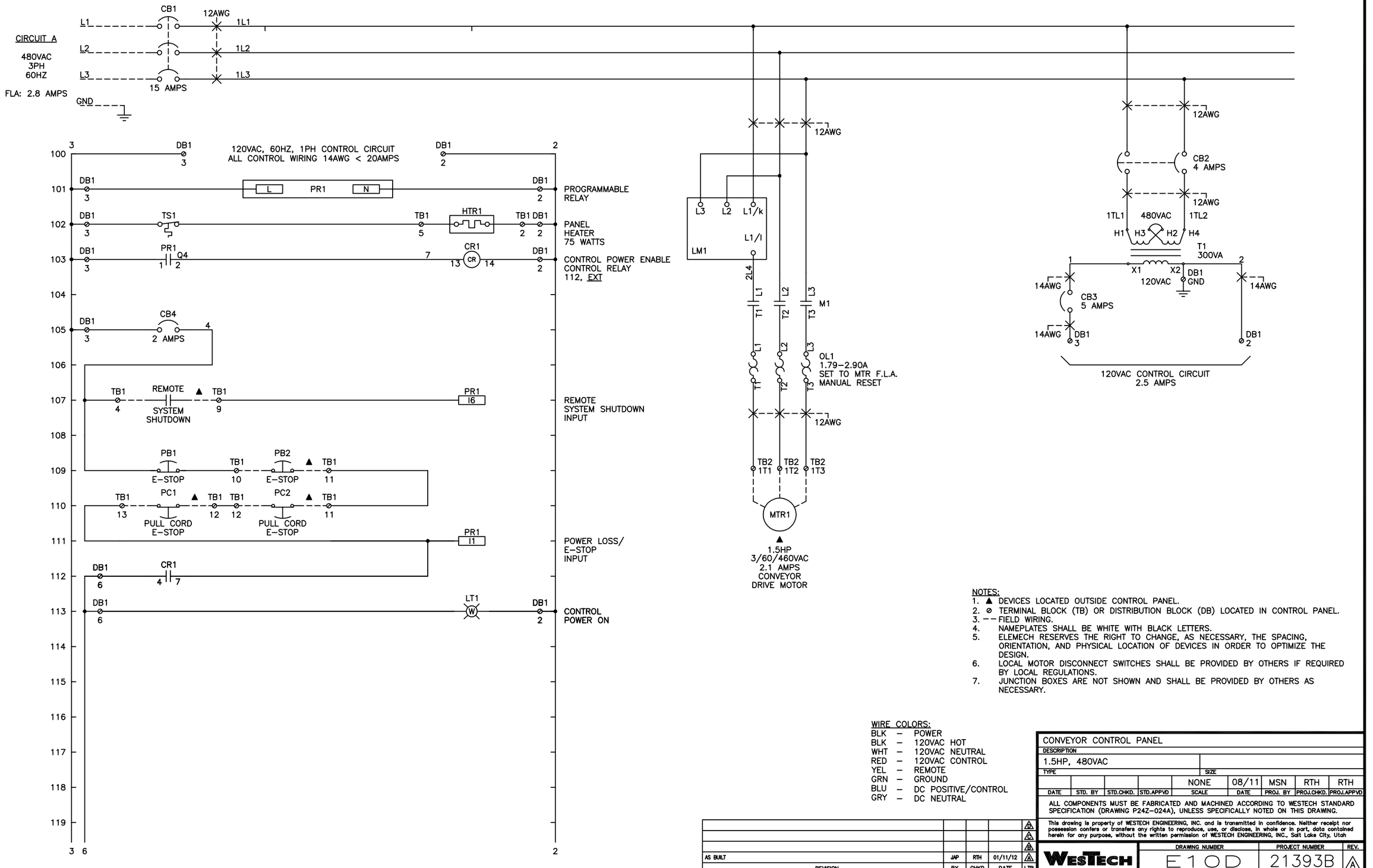
WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
21393AB–D101	21393AB	A

Item No	Component	Description	Manufacturer Part Number	QTY	Device
Conveyor Control Panel (Quantity: 1)					
1	00-000-000	Wire, Hardware, Wire labels, etc.	EleMech: Miscellaneous	1	
2	10-069-000	Wireway Duct Cover, 1.5"W, 6 Ft. Section, w/Panduit F Series	Panduit: C1.5WH6	3	
3	10-069-001	Wireway Duct Cover, 1"W, 6 Ft. Section, w/Panduit F Series	Panduit: C1WH6	3	
4	10-069-005	Wireway Duct, 1.5"Wx3"H, 6 Foot Section	Panduit: F1.5X3WH6	3	
5	10-069-007	Wireway Duct, 1"Wx3"H, 6 Foot Section	Panduit: F1X3WH6	3	
6	25-000-A001	Legendplate Assembly, Yellow E-Stop, Standard Encl.	EleMech: 25-000-A001 Assembly	1	
7	25-000-A002	Legendplate Assembly, White, Black Text, Standard Encl.	EleMech: 25-000-A002 Assembly	7	
8	25-000-A019	Nameplate Assembly, White: Power Supply - 3/60/480VAC	EleMech: 25-000-A019 Assembly	1	
9	42-063-007	Terminal Block, Din Rail, 35MM Wide, 15 High, 2 Meters Long	Wieland: 98.370.1000	1	
10	52-000-000	Label, Underwriters Laboratories 508A, w/Decal Set	EleMech: 508A	1	
11	03-001-A008	Circuit Breaker Assembly, 3 Pole, 480VAC, 15A, T1, 8" Depth	ABB: T1N015TL Assembly	1	CB1
12	03-056-024	Circuit Breaker, 1 Pole, 240VAC, 2A, 14kA, UL489, Type C	Siemens: 5SJ4102-7HG40	1	CB4
13	06-058-011	Control Relay, 3PDT,120VAC, 11Pin Spade, Indicator, Operator	Square D: RXM3AB2F7	3	CR1-3
14	06-058-012	Control Relay, Bus Jumper, 2-Pole, w/Telemec. RXM Relay	Square D: RXZ S2	2	CR1-3
15	38-058-003	Socket, 11 Pin Spade, Din, Screw Term., 3Tier, 250V w/3-Pole	Square D: RXZE2S111M	3	CR1-3
16	07-063-000	Distribution Block, End Cover, 4 Pole, 300V,10A, w/WK4E\V\VB	Wieland: 07.311.4053.1	1	DB1
17	07-063-001	Distribution Block, Jumper, 4 Pole, 300V,10A, w/WK4E\V\VB	Wieland: Z7.210.3427	3	DB1
18	07-063-002	Distribution Block, Single Pole, 10A, 300V, WK4E\V\VB	Wieland: 57.404.6955.1	7	DB1
19	42-063-004	Terminal Block, Ground, 30A, 600V, 6MM Wide, w/WK4/U	Wieland: 57.504.9055.0	1	DB1
20	11-035-027	Enclosure, NEMA 4, Painted Steel, 24"Hx24"Wx8"D, C. Hinge	Hoffman: A-24H24BLP	1	EN1
21	11-035-133	Sub-Panel, Painted Steel, w/24"Hx24"W C. Hinge Encl	Hoffman: A-24P24	1	EN1
22	15-011-000	Ground Lug	Blackburn: L70	2	GND
23	16-052-005	Elapsed Time Meter, 6 Digit, Round, 3-Hole, NEMA 4X	Redington: 722-0004	1	HM1
24	16-052-006	Elapsed Time Meter, Gasket, NEMA 4X (Use w/722-0004)	Redington: 5003-011	1	HM1
25	17-062-001	Heater, Silicone Rubber, Flat, 120VAC, 75 Watts, w/12" Leads	Watlow: 030050C1-A001B	1	HTR1
26	52-137-003	Label, Caution: Heater Element, 1.5"Wx0.75"H, White/Red	Nameplate Tech: 52-137-003	1	HTR1
27	52-137-002	Label, Multiple Supply Sources, Warning, 2.5"Wx1.5"H, Yellow	Nameplate Tech: 52-137-002	1	LBL1
28	52-137-000	Label, High Voltage, Danger, 2.25"Wx4.0"H, White/Black/Red	Nameplate Tech: 52-137-000	1	LBL2
29	34-001-002	PM, 1/3PH, 110-500VAC, 0.5-5A, 2)SPDT, 120VAC	ABB: 1SVR 450 330 R0000	1	LM1
30	32-005-046	Lens, Pilot Light, White, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26W	1	LT1
31	32-005-048	Pilot light, NEMA 4X, 120VAC, Transformer, No Lens	Allen-Bradley: 800H-PR16	5	LT1-5
32	32-005-044	Lens, Pilot Light, Green, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26G	1	LT2
33	32-005-045	Lens, Pilot Light, Red, NEMA 4X, Standard, w/A-B 800H	Allen-Bradley: 800T-N26R	3	LT3-5
34	22-018-000	Motor Starter, Non-Rev., NEMA 0, 1 NO Aux, 120VAC Coil, w/OL	Cutler-Hammer: AN16BNOAC	1	M1

35	22-018-006	Aux. Contact, Top mounted, 4NO, w/C-H Freedom	Cutler-Hammer: C320KGT13	1	M1
36	25-000-A010	Nameplate Assembly, White, Black Text, 1"Hx3"W	EleMech: 25-000-A010 Assembly	2	NP1,2
37	28-018-005	Overload Relay Heater Pack, 3PH, 1.79-2.90A, w/Freedom, C20	Cutler-Hammer: H2006B-3	1	OL1
38	29-005-010	Pushbutton E-Stop, NEMA 4X, Oper+1NCLB, Twist Rel. Red Head	Allen-Bradley: 800H-FRXT6D4	1	PB1
39	02-005-000	Contact Block, 1NO/1NC, w/A-B 800 Series	Allen-Bradley: 800T-XA	1	PB3
40	29-005-037	Pushbutton, NEMA 4X, Oper+1NC, Flush Head, Black	Allen-Bradley: 800H-AR2D2	1	PB3
41	33-183-010	PR, Zelio, 120VAC, 8)120VAC In, 4)Relay Out	Telemecanique: SR2B121FU	1	PR1
42	WES-52-P004	Program, PR, Zelio SR2B121FU, Standard	EleMech: WES-52-P004	1	PR1
43	13-000-A000	Spare Parts Box Assembly, Din Rail Mount	EleMech: 13-000-A000 Assembly	1	SP1
44	39-005-009	Selector Switch, NEMA 4X, 3 Pos. Maintained, 1NO-1NC	Allen-Bradley: 800H-JR2A	1	SS1
45	41-018-A026	Control Transformer Assembly, 480-120VAC, 300VA, w/C-Breaker	Cutler-Hammer: C0300E2A Assembly	1	T1,CB2,3
46	42-063-009	Terminal Block, End Clamp, w/WKN10/U	Wieland: Z5.522.8553	5	TB,DB
47	42-063-008	Terminal Block, Labels, Blank, w/WK4/U	Wieland: Z4.242.6353	22	TB1
48	42-063-015	Terminal Block, Jumper, w/WK4/U, 02 pole, Insulated	Wieland: Z7.281.1227	2	TB1
49	42-063-035	Terminal Block, Ground, 30A, 600V, 6MM Wide, w/WKFN 4/U	Wieland: 56.704.9055	1	TB1
50	42-063-033	Terminal Block, Single Pole, 30A, 600V, WKF4/U, Spring Clamp	Wieland: 56.704.0055	33	TB1,2
51	42-063-034	Terminal Block, End Plate, Beige, w/WKFN 4/U	Wieland: 07.312.9255	2	TB1,2
52	42-063-000	Terminal Block, Labels, Custom Printed, w/WK4/U	Wieland: 04.242.6353-CUSTOM	62	TB1,2,DB1
53	46-034-000	Thermostat, for heater control, N.C.contact, 6 amp,30-140 F.	Stego: 01140.9-00	1	TS1
Zero Motion Assembly, Milltronics MFA-4P, Nema 4X FRP (Quantity: 1)					
54	11-035-126	Sub-Panel, Painted Steel, w/12"Hx10"W Junction Box	Hoffman: A-12P10	1	EN
55	11-035-176	Enclosure Mounting Feet, Fiberglass, J box	Hoffman: A-50MFKR	1	EN
56	11-035-273	Enclosure, Nema 4X, Fiberglass, 13.53"Hx10"Wx7"D, w/Window	Hoffman: A-14107JFGQRPWR	1	EN
57	25-000-A010	Nameplate Assembly, White, Black Text, 1"Hx3"W	EleMech: 25-000-A010 Assembly	1	NP
58	65-043-001	Zero Motion Sensor, 120VAC, 2-SPDT Relays, 4X, Probe Req'd	Milltronics: MFA-4P	1	ZSC
LCS, 1 Hole, Nema 4/7/9, E-Stop (Quantity: 1)					
59	25-000-A005	Legendplate Assembly, Yellow E-Stop, LCS Encl.	EleMech: 25-000-A005 Assembly	1	
60	53-053-003	Conduit, Lockwasher, 3/4", Use w/3/4" Nipple	Steel City: LN102	1	
61	11-004-004	Local Control Station, NEMA 4/7/9, 1 Hole, 3/4"NPT Holes	Akron Electric: CXI-333-X1-N4-N5-2RP	1	LCS1
62	29-005-009	Pushbutton E-Stop, NEMA 7/9, Oper+1NCLB, Push-Pull Red Head	Allen-Bradley: 800H-FPX6D4	1	PB2
63	29-005-063	Pushbutton, Padlocking Cover, w/ 800T/H 30.5mm only	Allen-Bradley: 800H-N140	1	PB2
Safety Switch, Left/Right, NEMA 7/9, w/fitting, cable, plug (Quantity: 2)					
64	92-295-000	Safety Switch, Left/Right, NEMA7/9, 3/4"NPT, Flag Arm	Control Components Company: RS-1X	1	PC1
65	92-295-001	Safety Cable, Vinyl Coated, 3/16" O.D., Orange, per ft.	Control Components Company: RS-25	60	PC1
66	92-295-002	Safety Cable, End Fitting	Control Components Company: RS-28	2	PC1
67	92-295-003	Safety Switch, Conduit Plug, 3/4"	Control Components Company: RS-29	1	PC1

68	65-043-002	Zero Motion Sensor, Probe, Class 1, Div 1, 10M CBL w/ MFA-4P	Milltronics: XPP-5	1	ZSC



NOTES:
1. ▲ DEVICES LOCATED OUTSIDE CONTROL PANEL.
2. ⊘ TERMINAL BLOCK (TB) OR DISTRIBUTION BLOCK (DB) LOCATED IN CONTROL PANEL.
3. – – FIELD WIRING.
4. NAMEPLATES SHALL BE WHITE WITH BLACK LETTERS.
5. ELEMECH RESERVES THE RIGHT TO CHANGE, AS NECESSARY, THE SPACING, ORIENTATION, AND PHYSICAL LOCATION OF DEVICES IN ORDER TO OPTIMIZE THE DESIGN.
6. LOCAL MOTOR DISCONNECT SWITCHES SHALL BE PROVIDED BY OTHERS IF REQUIRED BY LOCAL REGULATIONS.
7. JUNCTION BOXES ARE NOT SHOWN AND SHALL BE PROVIDED BY OTHERS AS NECESSARY.

WIRE COLORS:
BLK – POWER
BLK – 120VAC HOT
WHT – 120VAC NEUTRAL
RED – 120VAC CONTROL
YEL – REMOTE
GRN – GROUND
BLU – DC POSITIVE/CONTROL
GRY – DC NEUTRAL

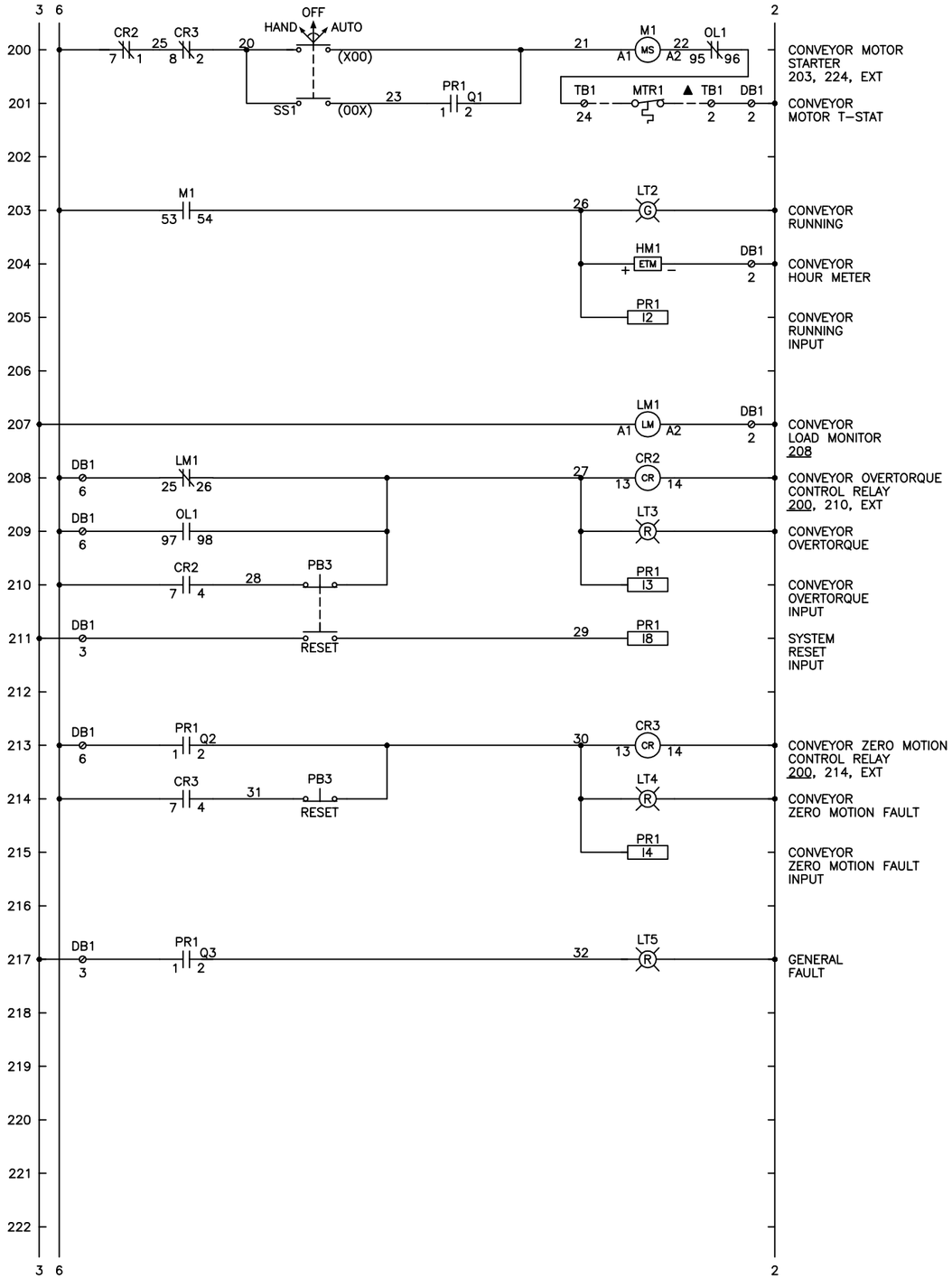
REVISION	BY	CHKD	DATE	LTR
AS BUILT	JAP	RTH	01/11/12	A

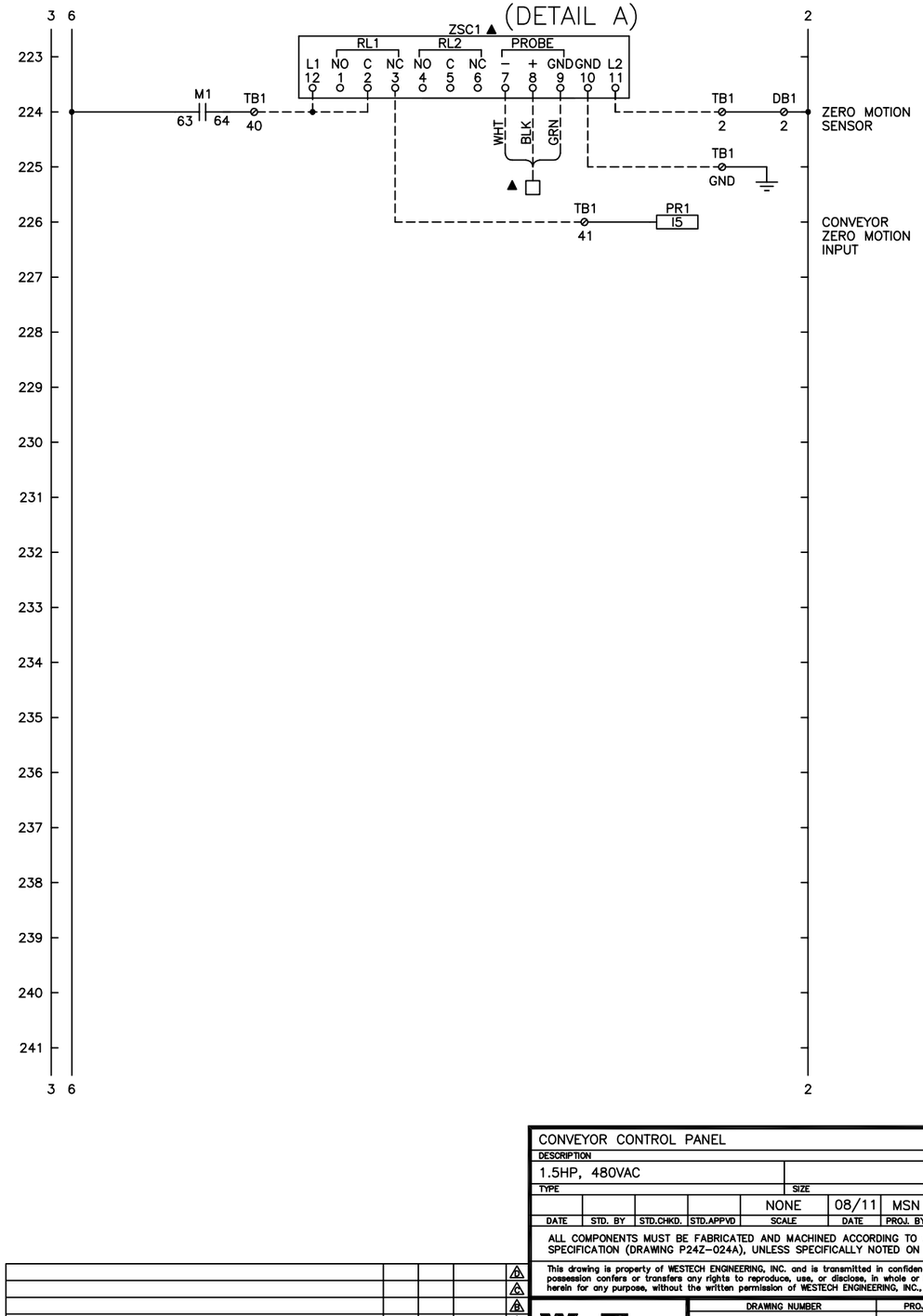
CONVEYOR CONTROL PANEL

DESCRIPTION								
1.5HP, 480VAC								
TYPE				SIZE				
				NONE	08/11	MSN	RTH	RTH
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
E10D	21393B	A





REVISION	BY	CHKD	DATE	LTR
				A
				A
				B
AS BUILT	JAP	RTH	01/11/12	A

CONVEYOR CONTROL PANEL

DESCRIPTION: 1.5HP, 480VAC

TYPE: NONE | SIZE

DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				NONE	08/11	MSN	RTH	RTH

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.
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SEQUENCE OF OPERATION

CONTROL POWER ON–DELAY:
EACH TIME THE CONTROL PANEL POWER SUPPLY IS CYCLED, THE PROGRAMMABLE RELAY WILL ALLOW ALL SOLID STATE DEVICES TO BECOME FULLY ENERGIZED BEFORE ENABLING THE CONTROL POWER CIRCUIT.

CONVEYOR MODES OF OPERATION:
HAND: WHEN THE CONVEYOR SELECTOR IS IN THE HAND POSITION, THE CONVEYOR WILL RUN CONTINUOUSLY.
AUTO: WHEN THE CONVEYOR SELECTOR IS IN THE AUTO POSITION, THE CONVEYOR WILL CYCLE OFF AND ON, OFF TIME FIRST, PER THE CONVEYOR REPEAT CYCLE TIMERS SET IN THE PROGRAMMABLE RELAY.

NOTE: ANY RUN OF THE CONVEYOR WILL RESET THE CONVEYORS REPEAT CYCLE OFF TIMER.

EMERGENCY STOP:
THE CONVEYOR WILL STOP IMMEDIATELY, THE CONTROL POWER ON LIGHT WILL DE–ENERGIZE, AND THE GENERAL FAULT LIGHT WILL ENERGIZE, IF ANY OF THE E–STOP PUSHBUTTONS ARE PRESSED OR E–STOP PULL CORDS ARE ENGAGED. TO RESET, ENSURE ALL THE E–STOPS ARE ENABLED AND PRESS THE SYSTEM RESET PUSHBUTTON.

REMOTE SYSTEM SHUTDOWN:
WHEN THE REMOTE SYSTEM SHUTDOWN SIGNAL IS RECEIVED THE CONVEYOR WILL STOP IMMEDIATELY, THE CONTROL POWER ON LIGHT WILL DE–ENERGIZE, AND THE PRESS GENERAL FAULT LIGHT WILL ENERGIZE. THE SYSTEM WILL RESET WHEN THE REMOTE SYSTEM SHUTDOWN SIGNAL IS REMOVED. A MANUAL RESET WILL NOT BE REQUIRED.

FAULTS:
1. A FAULT OCCURS WHEN THE CONVEYOR LOAD MONITOR IS TRIPPED.
2. A FAULT OCCURS WHEN THE CONVEYOR MOTOR STARTER THERMAL OVERLOAD IS TRIPPED.
3. A FAULT OCCURS WHEN THE CONVEYOR IS CALLED TO RUN AND ZERO MOTION IS DETECTED FOR THE TIME SET IN THE CONVEYOR ZERO MOTION FAULT DELAY TIME.
4. A FAULT OCCURS WHEN THE CONVEYOR MOTOR THERMOSTAT IS TRIPPED.

– WHEN FAULTS 1 OR 2 OCCUR, THE CONVEYOR WILL STOP IMMEDIATELY, THE GENERAL FAULT LIGHT WILL BE ENERGIZED, AND THE CONVEYOR OVERTORQUE LIGHT WILL BE ENERGIZED.
– WHEN FAULT 3 OCCURS, THE CONVEYOR WILL STOP IMMEDIATELY, THE GENERAL FAULT LIGHT WILL BE ENERGIZED, AND THE CONVEYOR ZERO MOTION LIGHT WILL BE ENERGIZED.
– WHEN FAULT 4 OCCURS, THE PRESS WILL STOP IMMEDIATELY.
– FAULT 1 AND 3 CAN BE RESET BY PRESSING THE SYSTEM RESET PUSHBUTTON.
– FAULT 2 CAN BE RESET BY PRESSING THE RESET BUTTON LOCATED ON THE MOTOR STARTER THERMAL OVERLOAD.
– FAULT 4 WILL AUTOMATICALLY RESET.

NOTE: THE GENERAL FAULT CONTACT WILL CLOSE DUE TO ANY OF THE FOLLOWING CONDITIONS:
- FAULTS 1, 2, OR 3 OCCUR
- ANY OF THE E–STOP PUSHBUTTONS ARE PRESSED
- ANY OF THE E–STOP PULL CORDS ARE ENGAGED
- THE REMOTE SHUTDOWN SIGNAL IS RECEIVED.
- INPUT POWER IS LOST

DEVICE SETTINGS

LM1 – MOTOR LOAD MONITOR

DIAL	SETTING
COS MAX	MIN
COS MIN	MIN
TIME S	MIN
TIME R	MIN

NOTES:
1. THE LOAD MONITOR DIAL SHALL BE SET TO MINIMUM FROM THE FACTORY.
2. FIELD CONFIGURATION SHALL BE PERFORMED BY THE STARTUP TECHNICIAN PER THE APPROPRIATE TECHNICAL DOCUMENT.

HTR1

HEATER ON/OFF	40 °F

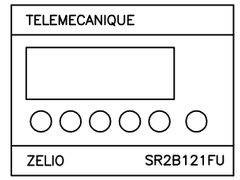
ZSC1 – ZERO SPEED CONTROLLER

PARAMETER	FACTORY SETTING	FIELD SETTING
VOLTAGE (S1)	115V	
MODE (S3)	UNDERSPEED	
PULSES (P1)	3	
PULSE MULTIPLIER (SW2)	X1	
START DELAY (P2)	10 SEC.	

NOTES:
1. RELAYS CHANGE STATE ON POWER–UP.

DEVICE SETTINGS

PR1 – I/O



PR INPUTS

I1	– POWER LOSS/E–STOP
I2	– CONVEYOR RUNNING
I3	– CONVEYOR OVERTORQUE
I4	– ZERO MOTION FAULT
I5	– CONVEYOR ZERO MOTION
I6	– REMOTE SYSTEM SHUTDOWN
I7	– SPARE
I8	– SYSTEM RESET

PR OUTPUTS

Q1	– CONVEYOR CALL TO RUN
Q2	– ZERO MOTION FAULT
Q3	– GENERAL FAULT
Q4	– CONTROL POWER ENABLE

PR1 – SETTINGS

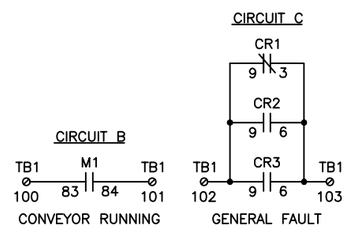
BIT REF.	DESCRIPTION	TIMER RESOLUTION	FACTORY SETTINGS
TT–1t	CONVEYOR REPEAT CYCLE OFF TIME	HR:MIN	00:30
TT–2t	CONVEYOR REPEAT CYCLE ON TIME	MIN:SEC	01:00
TT–3t	CONVEYOR ZERO MOTION FAULT DELAY TIME	MIN:SEC	00:05

NOTES:
1. ABOVE IS A LISTING OF ALL THE FIELD SELECTABLE SETTINGS IN THE CONTROLLER.

PR1 – SETPOINT CHANGE INSTRUCTIONS

TO ALTER THE VALUE OF A TIMER OR COUNTER:

1. PRESS THE GREEN "MENU/OK", PRESS ARROW DOWN TO "PARAMETER". PRESS "MENU/OK"
2. TO ACCESS THE REQUIRED TIMER PRESS THE "UP" ARROW KEY UNTIL THE DESIRED TIMER IS DISPLAYED.
3. PRESS THE "RIGHT" ARROW UNTIL TIME VALUE FLASHES.
4. MODIFY THE TIME VALUE USING THE "UP" OR "DOWN" ARROW KEYS.
5. VALIDATE THE CHANGES BY PRESSING THE "MENU/OK", PRESS "MENU/OK" AGAIN WHEN ASKED TO CONFIRM CHANGES.
6. PRESS "MENU/OK" TO RETURN TO MAIN SCREEN.



MAX. CONTROLLED LOAD: 10A @ 120VAC

NOTE: BRANCH CIRCUIT PROTECTION PROVIDED BY OTHERS PER N.E.C.

REVISION	BY	CHKD	DATE	LTR
				A
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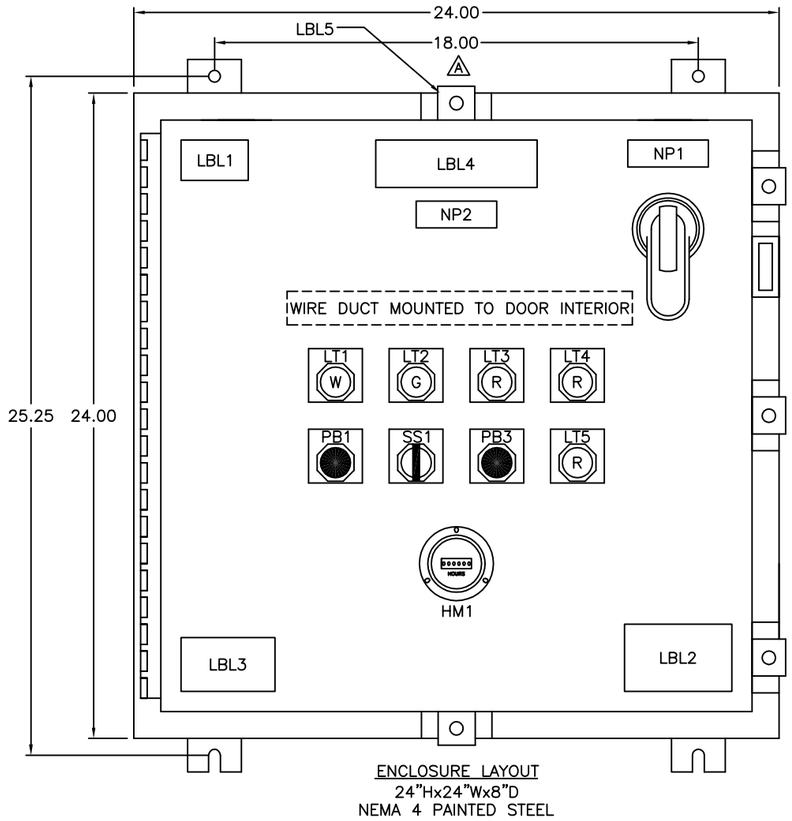
				A
AS BUILT	JAP	RTH	01/11/12	A

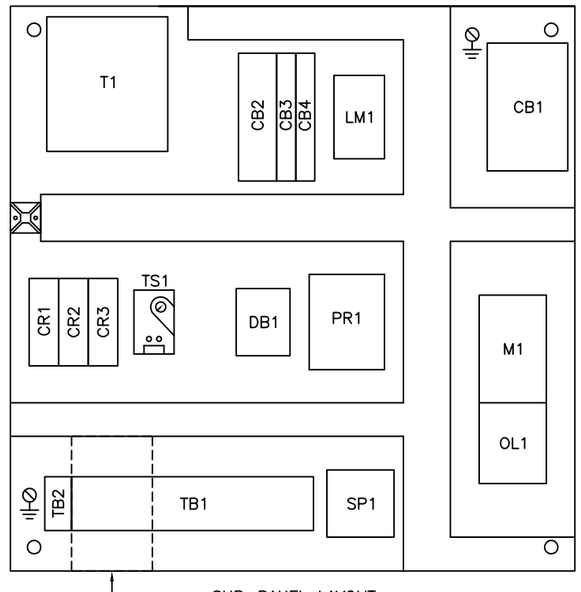
CONVEYOR CONTROL PANEL
DESCRIPTION
1.5HP, 480VAC
TYPE
SIZE

DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				NONE	08/11	MSN	RTH	RTH

WESTECH | DRAWING NUMBER: E10D | PROJECT NUMBER: 21393B | REV. A



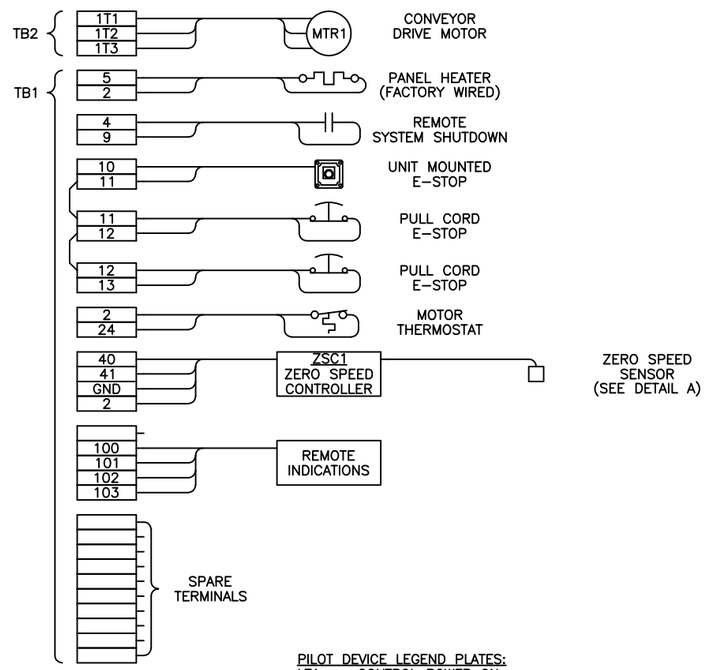
ENCLOSURE LAYOUT
24"Hx24"Wx8"D
NEMA 4 PAINTED STEEL



HTR1 MTD.
BEHIND
SUB–PANEL

SUB–PANEL LAYOUT
21"Hx21"W

FIELD WIRING DIAGRAM

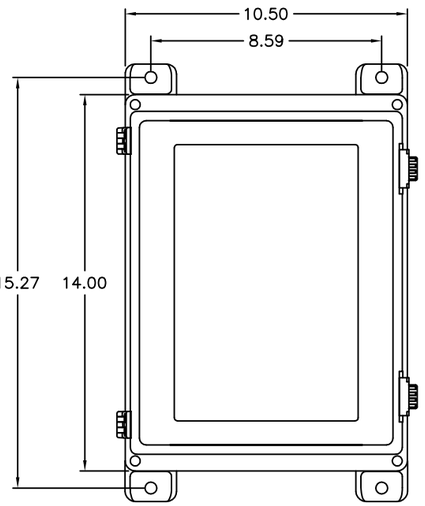


PILOT DEVICE LEGEND PLATES:
LT1 – CONTROL POWER ON
LT2 – CONVEYOR RUNNING
LT3 – CONVEYOR OVERTORQUE
LT4 – CONVEYOR ZERO MOTION
LT5 – GENERAL FAULT
PB1 – EMERGENCY STOP
PB2 – EMERGENCY STOP
PB3 – SYSTEM RESET
SS1 – CONVEYOR HAND–OFF–AUTO

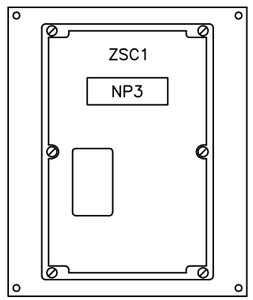
NAMEPLATES:
NP1 – 480VAC–3PH–60HZ
NP2 – LCP CV–1
NP3 – ZERO MOTION CONTROLLER

LABEL DESCRIPTION:
LBL1 – WARNING: MULTIPLE SUPPLY SOURCES
OPEN ALL DISCONNECTS BEFORE SERVICING
EQUIPMENT OR OTHER UNIT WIRING.
LBL2 – DANGER HIGH VOLTAGE
ENTRY BY QUALIFIED PERSON ONLY
LBL3 – ELEMECH ELECTRICAL CONTROL SYSTEMS
LBL4 – WESTECH
LBL5 – NOTICE:
– PENETRATIONS TO CONTROL CABINETS MUST BE FITTED WITH TYPE 4 FITTINGS, MYERS BRAND OR EQUAL
– ALL INTERIOR DEVICES MUST BE PROTECTED FROM INSTALLATION DEBRIS

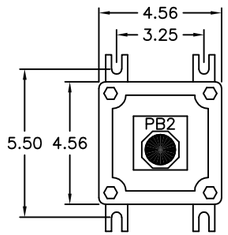
FAILURE TO ADHERE TO INSTRUCTIONS WILL VOID WARRANTY



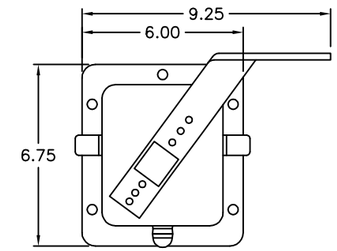
ENCLOSURE LAYOUT
14"Hx12.5"Wx7"D
NEMA 4X FIBERGLASS
10.28"Hx6.84"W WINDOW



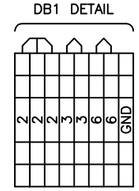
SUB–PANEL LAYOUT
10.75"Hx8.88"W



LCS1
NEMA 4/7/9
LOCAL CONTROL STATION
PUSHBUTTON LOCKABLE
IN DEPRESSED POSITION



PC1/2 – PULL CORD SAFETY SWITCH
6–3/4"Hx6"Wx8–7/16"D
NEMA 7/9 EXPOSION PROOF
CAST ALUMINUM



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AS BUILT	JAP	RTH	01/11/12	A
REVISION	BY	CHKD	DATE	LTR

CONVEYOR CONTROL PANEL								
DESCRIPTION								
1.5HP, 480VAC								
TYPE				SIZE				
				NONE	08/11	MSN	RTH	RTH
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.
E10D	21393B	A