Metso Minerals (Australia) Limited

Single Deck Low Head Screen

A7890

METSO

Installation, Operation and Maintenance Manual

Single Deck Low Head Screen

Metso Minerals (Australia) Limited

Serial No:

A7890

MINERALS

Screen Installation, Operation and Maintenance Manual

Metso Minerals (Australia) Limited

Single Deck Low Head Screen

Serial Number

A7890

Metso Minerals (Australia) Limited
45 Hargrave Street
CARRINGTON NSW 2294
Phone Number +61 2 4978 8100
Fax + 61 2 4962 2309

www.metsominerals.com

Installation, Operation and Maintenance Manual

Single Deck Low Head Screen

SERIAL Number: A7890
Customer: Metso Minerals (Australia) Limited
Project: N/A

Supplied 2007 by
Metso Minerals (Australia) Limited
PO Box 4,
CARRINGTON NSW, 2294.
Phone Number: +61 2 4978 8100.
Facsimile Number: +61 2 4962 2309.

2.4m x 6.1m Single Deck Low Head Screen

This manual is a part of the equipment to which it relates. It is written for the use of installers, commissioning engineers, operators and maintainers. It should be kept for the life of the equipment and, in case of re-sale, passed on to any subsequent purchaser.
Information contained in this manual is specific to the equipment and is correct at the date of publication. As improvements are continually being made, Metso Minerals reserve the right to make alterations to the equipment design and specification without giving prior notice.
Any amendments issued by Metso Minerals should be promptly inserted into this manual.

NOTE:

Before beginning installation or operation of the supplied equipment, it is strongly recommended that this manual be studied in detail by all personnel involved with the project.

If the information and instructions contained in this manual are disregarded then there is a risk of serious injury to personnel and/or damage to your equipment.

Warranty Validation Form

The attached manual depicts and describes the correct procedures to install and commission your screen for optimum performance.

You will note that contained in **Appendix B** of this manual is a **Commissioning / Audit Checklist Form**, which is to be actioned as follows.

1 When the screen installation and commissioning is supervised by Metso Minerals (Australia) Limited personnel the form will be completed and signed by them and an authorised officer of the owner to validate the warranty.

2 When the installation and commissioning is carried out by the owner, this Warranty Validation Form, together with the test cards are to be completed, signed and forwarded to Metso Minerals (Australia) Limited. (Refer addresses in the front of this manual.)

The form will be signed and returned by **Metso Minerals (Australia) Limited** to validate the warranty prior to putting the screen into operation.

We would like to take this opportunity and thank you for your support and business and look forward to being of service to you in the future.

Signed; installing engineer

Name: ……

Signature: ……

Signed; customers representative:

Name: ……

Signature: ……

GENERAL DETAILS

Item	Description
Customer:	Metso Minerals (Australia) Limited
Location:	Xstrata MIM, Mount Isa, QLD
Quantity / Size / Type	1 / 2.4m x 6.1m / Single Deck Low Head Screen
Number of Decks	One (1)
Mount Type	Floor Mounted
Mechanism	4 – 3F
Number of Mechanisms	Two (2)
Screen Slope	Horizontal
Design Throw	12mm
Design Speed	900 rpm
Drive Type	Cardan shaft/jack shaft /Vee-Belt
Hand	Left
Motor kW/Frame Size	22kW / D180L
Speed / Poles	1460 rpm; 4 poles
Voltage / Hertz	415V / 3 / 50 Hz

PARTS AND SERVICE ENQUIRIES

Metso Minerals
PO Box 1028
Eagle Farm, QLD 4009
Australia
Phone: +61 7 3623 2999
Facsimile: +61 7 3623 2997

Metso Minerals
45 Hargrave Street,
Carrington, NSW 2294
Australia
Phone: +61 2 4978 8100
Facsimile: +61 2 4962 2309

Metso Minerals
PO Box 399
West Perth, WA 6872
Australia
Phone: +61 8 9420 5555
Facsimile: +61 8 9320 2500

GENERAL ENQUIRIES

Metso Minerals
PO Box 1028
Eagle Farm, QLD 4009
Australia
Phone: +61 7 3623 2999
Facsimile: +61 7 3623 2998

Metso Minerals
PO Box 4
Carrington, NSW 2294
Australia
Phone: +61 2 4978 8100
Facsimile: +61 2 4962 2309

Metso Minerals
PO Box 399
West Perth, WA 6872
Australia
Phone: +61 8 9420 5555
Facsimile: +61 8 9320 2500

MANUAL SECTIONS

1. General Information

1.1 Introduction

Metso Minerals manufacture equipment intended for the feeding, crushing, grinding, scrubbing, sizing and sorting of minerals and similar solid materials. Examples of products are feeders and screens of various types and sizes, double toggle and single toggle jaw crushers, gyratory and cone crushers with or without computerised control systems, vertical and horizontal shaft impactors and scrubber barrels. During the design and manufacture of the equipment, a lot of effort is put into the avoidance of health and safety risks.

A single machine, delivered from Metso Minerals, will always be used as a component in a mineral processing plant. It is therefore virtually impossible for us as suppliers to provide operator instructions for every conceivable control system configuration in which the machine could operate.

This manual gives information on safe installation, operation and maintenance. It is not intended as a detailed manual for a specific machine. Its purpose is instead to alert customers, operators and maintenance personnel to the general hazards and risks which can be encountered in a crushing plant.

Our maintenance instruction manuals for individual machines give more detailed information regarding your equipment. Despite this, additional training by Metso Minerals may be necessary.

Historically, most injuries in crushing and screening plants occur during maintenance, although some occur during the inspection of moving parts or while clearing material blockages, so this safety manual emphases safety precautions when these activities are undertaken.

To avoid potential safety risks it is important that:

- The recommendations in instruction manuals are studied and followed.
- Personnel are regularly given training on maintenance and safety.
- General and official safety regulations are followed.
- Dangerous areas are marked with warning signs.
- The appropriate equipment and tools are available.
- The owner and management live up to their responsibility to make sure that effective safety programmes and regulations are worked out and are followed by all personnel.

When writing to the company or ordering replacement parts, always refer to the **Serial Number** listed on the front cover of the manuals. Also, refer to the drawing or assembly number, part number and description, along with the quantity needed.

1.2 General Safety Considerations

The general safety precautions listed on the pages following should be considered as a guide only. There may be other conditions and variations in the operation of this equipment that are not covered in these general safety precautions. The purpose of the general safety precautions is to make all personnel aware of the general hazard and dangerous situations that exist around the equipment and the work area.

WARNING!
Machines are used for the handling and/or processing of minerals and other materials which may give rise to health risks for human beings and animals. It is the responsibility of the user to follow the relevant rules and regulations intended to prevent health risks – for example specific regulations applying to asbestos, quartzite, radon, etc.

During screening the main hazards are ejected stones, dust or noise emissions. The following can be supplied by Metso Minerals to reduce these hazards

- The screen can be fully enclosed. This will not only eliminate dust and reduce noise emissions, but also provide the operator protection from ejected stones.
- Noise levels can also be reduced by utilising non–metallic screen surfaces such as rubber or polyurethane. Screening surface changes will also be less frequent – reducing the risk of accidents. Rubber–lined feed boxes and discharge lips reduce wear and also absorb impact – reducing noise levels.

1.2.1 Notes, Cautions and Warnings

Three levels of advisory and cautionary statements are used throughout this manual to call attention to special information, operating procedures and safety precautions.

NOTE:
A general advisory statement intended to alert personnel to conditions affecting equipment operation, maintenance and servicing practices.

CAUTION!
A specific advisory statement or procedure intended to prevent damage to the equipment or associated components.

WARNING!
Intended to alert personnel to dangerous situations and hazards that exist around the equipment and work area. Failure to follow the instructions presents serious risk of personal injury or death.

1.2.2 Personnel Safety

- Read and understand each of the warning, cautions and instructions in the operator's manual and on signs fixed to the equipment.
- Report all accidents, immediately to your supervisor. Consult a doctor or medical facility as soon as possible if personal injury is involved.
- Keep a list of emergency telephone numbers close to the telephone and instruct all work area personnel as to the location of the list.
- Do not operate or work around equipment while under the influence of alcohol, medicines, tranquillisers or other drugs that can make you less alert or affect your judgement.
- Use the handgrips, ladders, guardrails and other safety devices when getting on or off equipment; and when moving around while on the equipment. Use a safety belt when necessary.
- Take precautions to keep hair, ties, scarves, sleeves, trouser legs and other loose fitting clothing from being caught on moving parts or controls.
- Wear safety glasses, whenever there is any danger of flying debris, chips, object or dust that could be operating regulations. Be extra safe – always wear eye protection.
- Wear gloves whenever possible to protect hands and fingers from cuts, scrapes, burns and solvents.
- Always wear a hard hat and safety shoes when working under equipment, when work is being done above you, and when required for the area in which you are working.
- Remove rings, watches and bracelets before handling, lifting or working on any parts and equipment.
- In areas where loud noise is a problem, wear hearing protection devices.
- Wear a breathing apparatus or respirator whenever painting or working with chemicals, solvents and other substances that may be hazardous to your health.
- Do not take chances with your back. Use lifting and moving devices to help you with your work. Always lift with your legs, NOT with your back.
- Remove power source by means of ‘do not operate’ tags to eliminate accidental start up of screen.

1.2.3 Work Area Safety

- Keep the general work area clean and free of debris. Avoid stone or other material build–ups on walkways, platforms and ladders. Always keep the walking surfaces or platforms under conveyor transfer points free of debris or material build–up.
- Do not allow unauthorised personnel in or around the work area. Know who is in your work area at all times. Use a head count when necessary.
- Keep equipment surfaces that will be touched by hands and feet clean, dry and free of oil or grease.
- Keep controls, push–buttons, levers and switches dry and free of oil or grease. Avoid operating controls, pushbuttons, levers or switches with wet or oily hands.
- Keep hand grips, guard rails, ladders and platforms clean, dry and free of oil or grease.
- Store parts and tools in a designated place when not in use.
- Keep safety equipment in a designated place and ensure that work area personnel know the location and the proper use of the safety equipment.
- Make a daily check of starting alarms and warning devices in the work area, and ensure that each device is properly working before starting or operating the equipment.
- Do not stand under or allow anyone else to stand under equipment that is being hoisted or suspended. Use a safety hook or hook with safety latch when hoisting equipment and use spreader bars when necessary. Always use a signal man when hoisting or moving equipment.
- Learn the weight limitations and clearances in and around your work area and for the equipment in use.
- Be alert to conditions such as dust, smoke, fog, machinery and the general surroundings that may obscure the vision around your work area.
- Ensure guards and trip mechanisms are sourced and working correctly.

1.2.4 Equipment Safety

- Do not alter, deface, or remove any factory installed information CAUTION, WARNING or DANGER signs affixed to the equipment.
- Never climb aboard equipment while it is in transit or being hoisted, or allow anyone else to do so.
- Inspect all equipment components before each operating shift to ensure that no parts are damaged or suspected of being damaged. Repair or replace damaged parts before starting or operating the equipment.
- Before starting or operating equipment, walk around the work area and the equipment to check that no personnel, animals, tools, parts or other foreign objects are in, on, under or around the equipment. Make sure that all guards and safety devices or properly installed and in good working condition. Check for warning tags or equipment components or controls before starting or operating the equipment.
- Before starting equipment, make sure that all work area personnel and visitors know that the equipment is going to be started. Use appropriate warning devices such as horn, alarms, or flashing lights to warn personnel and visitors that equipment is going to be started. Use a head count to make sure that you know where all work area personnel and visitors are located.
- When starting equipment, follow the manufacturer's recommended starting sequence.
- Do not allow unskilled persons to start or operate any equipment without the proper supervision of a skilled operator.
- Never leave equipment controls unattended. Always have a qualified operator relieve you if you must leave.
- During start–up and while equipment is operating, be alert for improper readings, visual defects, odours or unusual sounds that could be a warning of a potential hazard. Shut down equipment immediately, following established shutdown procedures, if any unsafe condition should arise.
- Do not work on equipment while it is in operation. Perform all required inspection, maintenance, lubrication or adjustments before starting or operating the equipment, or after the equipment is shut down. Use extreme caution during an inspection, maintenance, lubrication or adjustment procedure.
- Perform all inspection, maintenance, lubrication and adjustment procedures with caution in accordance with manufacturer's recommended procedures.

1.2.5 Flammable and Hazardous Materials

- Store flammable, combustible or hazardous materials in a safe place and in containers specifically designed and clearly marked for that purpose.
- Store used cleaning and oil rags in the proper designed container as required by federal, state and local rules and regulations, and away from flammable and combustible materials.
- Do not store flammable or combustible materials in, or around equipment.
- Do not permit smoking or open fires around fuel tanks or other combustible materials storage facilities and operating equipment.
- Keep several fully charged fire extinguishers located throughout the work area. Know their location and how to operate them. Have them readily available during fuelling operations or when other fire hazards are present. Check the charge on each fire extinguisher at least once a month or when otherwise specified.
- Shut down all engines and motor (with the exception of material transfer systems) when fuelling or transferring flammable, combustible or hazardous materials. Follow the recommended fuelling and transfer procedures for the substance of material being worked with.
- Fill fuel storage tanks and other combustible materials storage facilities in a well ventilated area, away from smoking materials, open flames, heaters or other heat sources that could cause ignition of the material.
- When refuelling or transferring flammable or combustible materials, ground the nozzle or spout against the storage facility filler neck to prevent static electrical sparks.
- Never start a diesel or gasoline engine in an enclosed area unless there is adequate ventilation, exhaust fumes can kill.
- Do not use flammable or combustible substances such as gasoline, kerosene or diesel fuel for cleaning parts. Always use a non–flammable solvent for cleaning.
- When using epoxy–resin based materials, follow the manufacturers recommended procedures and precautions. Mix and pour epoxy materials in an open or well ventilated area. Do not burn cured resin without adequate ventilation. Avoid skin contact with uncured epoxy–resin materials.
- Always inspect and charge batteries in an open or well ventilated area. Do not permit smoking materials or open flames near batteries.
- Properly dispose of waste, drain fluids and hazardous materials with due regard and in full accordance with all federal, state and local environmental, safety, transportation and other regulatory agencies' rules, regulations and ordinances.
- Think before you act, when working with flammable combustible or hazardous materials. Wear the appropriate clothing and protection devices, and follow the recommended procedures when working with these materials.
- Do not weld or oxy cut on or near the polyurethane and rubber screen surfaces.

1.2.6 Pressurised Systems

- Do not perform maintenance on pressurised system components without first relieving ALL pressure to the system.
- Do not make internal checks on pressurised oil or fluid system reservoirs or levels until ALL pressure to the system is relieved. Pressurised oils and fluids are dangerous, if released incorrectly. Oil and fluids under pressure can get very hot; use extreme caution and allow the system to cool before working on it.
- Do not attempt to remove an air or hydraulic cylinder clevis from its connection unless ALL pressure to the system is relieved.
- Do not operate pressurised systems with worn or damaged hoses, valves or fittings. Replace defective components before pressurising the system.
- Do not attempt to disassemble air or hydraulic cylinders unless trained and authorised, and you have the correct equipment for such maintenance. Some air and hydraulic cylinders contain a heavy spring which, if improperly released, could injure or kill anyone in its path.
- Never adjust pressure relief valves beyond recommended values to get higher operating pressures. The manufacturer's recommended pressures give the safest performance with the longest life.
- Follow the manufacturers recommended inspection and maintenance procedures for pressurised systems to ensure that safe operating conditions exist at all times.

1.2.7 Welding

- Any welding or cutting operations should only be performed by experienced welders who are familiar with the welding equipment and the materials to be welded.
- Take all necessary precautions to avoid dropping sparks or welding splatter on belts, hoses, tanks, other parts of equipment and work area personnel. Have several fully charged fire extinguishers close by whenever any welding or cutting operation is being performed.
- Attach the welding ground cable to the piece being welded to avoid damage to the equipment and potential injury to personnel.
- Always consult with the manufacturers of the equipment to be welded on before performing any welding operation.
- Never use the screen to ground welding equipment

1.2.8 Electrical Safety

- Permit only licensed electricians to work on electrically live parts or any plant or equipment.
- Always assume that an electrical circuit is live until it is proven dead by proper testing procedures.
- Lockout and tag electrical/mechanical controls before performing any inspection, maintenance, lubrication or adjustment procedures.
- Repair or replace electrical wires, cables and connectors that are frayed, cut, broken or damaged in any way.
- Check that electrical ground wires, motor plugs and power cable connections are properly and securely connected before starting any equipment.
- Know the location of all power lines and underground cables. Use extreme caution when working around these areas. Know the locations of all main electrical shut–off boxes.
- Never work on electrical equipment while it is raining or while standing in water or on wet surfaces unless you know that the power is disconnected.
- Be alert when working around with electricity. Report any electrical hazard immediately to your supervisor.

1.2.9 Ten Commandments of Safety

1. Support efforts to make your workplace safe and healthy. Do your part; observe safety regulations and established work practices.
2. Act responsible and with concern for the safety of others, as well as your own.
3. Check all tools and protective equipment frequently, to make sure they are in safe working order.
4. Educate yourself and others in the hazards associated with your job and safe ways to perform familiar tasks.
5. Ask others how to perform tasks with which you are unfamiliar. Playing it "by ear" can lead to costly accidents.
6. Think over accident and injury possibilities before starting on any project. Take appropriate precautions to protect yourself and others.
7. Warn others of the possibility of accidents and injuries if you see them working unsafely or creating potential hazards.
8. Stay alert for changes in work conditions and the work process.
9. Report unsafe acts and conditions immediately to your supervisor. Don't assume that someone else will do it.
10. Keep your work area clean. Keep tools and materials picked up and properly stored.

1.3 Screen Terminology

Certain terms are used throughout this manual to describe the screen and its operation. These terms are defined to avoid the possibility of confusion or misunderstandings, and to assure proper communication between users of this equipment and Metso Minerals.

Definitions are those common to Metso Minerals Limited (Australia) operations.

Base Mounted Screens: Screen supported by the building support structure.
Example: Floor mounted on coil springs.

Clamp: A plate located above the screening surface at each side plate, designed to hold the edge of the screening surface and act as a seal to the side plate.

Cross Member: Structural shapes extending the width of the screen, on which the longitudinal bars are mounted.

Crown (or "Camber"): Screen deck convexity, the difference in elevation between high and low points on the screen surface support.

Deck: Component consisting of cross members having spaced longitudinal bars carrying the support frame, screen surface and associated accessories.

Discharge Spout: Screen deck extension at the discharge end.

Driving Mechanisms (Mechs): The 'throw' (amplitude) inducing component mounted on the mechanism beam, comprising of four geared counter rotating eccentric masses encased by a cast iron shell, driven by a straight through shaft.

Dynamic Loads: Forces applied to the screen support structure due to screen vibration. These are expressed in terms of load, load direction and frequency. Dynamic loads are caused by deflection and extension of the screen support springs due to screen body motion.

Metso Minerals specifies these forces at both operating and resonant speeds on the Outline Installation Drawing provided.

Feed: Material presented to the screen for processing.

Feed Box: A feed end extension of the vibrating frame which accepts the feed.

Feed-Rate: Output of the screen is usually measured in tonnes per hour (t/h) or in cubic metres per hour (m^3/h).

"G's": The number of times the screen acceleration exceeds the force of gravity, expressed as the formula:

Hand (of drive): The location of the drive motor with respect to the screen body, determined by standing at the feed end of the screen and facing the discharge end in the direction of material flow.

Isolation Frame: A frame within which the screen is mounted, thus reducing the level of structural vibration.

Live Mass: Mass of that portion of the screen that either rests on the spring mounts or is suspended from cables. Does not include springs, spring bases, cable spring-seats, guides, motor, motor pulleys, belts and safety guards.

Longitudinal Bars: Angle or plate metal running down the screen, in the direction of travel, used to secure the screen surface.

Mechanism Beam: Heavy beam structure extending across the full width of the screen. The support beam transmits the motion generated by the vibrator motor to the screen body.

Operating Speed: Rotational mechanism speed, expressed in RPM; or the frequency of the screen body vibration.

Resonant Speed: Frequency at which the screen operating speed corresponds to the natural frequency of the screen body-mass spring system - expressed in RPM.

Screening Surface: Medium such as woven wire, perforated plate, rubber or polyurethane fabrications, containing apertures for passage of undersized materials.

Shipping Mass: Live mass of the screen plus all other parts making up the suspension system, plus any boxing or crating mass.

Side Plates: Structural components of the vibrating body to which the mechanisms and support deck are attached.

Slope: Screen surface angle from horizontal in degrees.

Static Load: Loads in kilograms which the screen structure must support due to total screen mass (see Screen Installation Drawing).

Support Frame: Deck component, which supports the screening surface and adds structural rigidity to the screen body. It includes cross and side members and longitudinal bars.

Throw: Total movement of the vibrating body at operating speed. For Low-Head screens, this represents the distance of screen vibration from highest to lowest point inscribed on motion ("throw") cards attached to the screens side plates. Refer to Section 3.

Total Mass: Shipping mass less boxing.

Vibrating Body: Complete vibrating screen other than stationary items.

Vibrating Frame: Structural portion of the body, including side plates and support frame; not including mechanisms, surfacing or suspension parts.

1.4 Shipping, Receiving and Handling

Equipment is assembled as completely as possible for delivery, unless transportation in this manner is impractical, illegal, or may result in damage to the equipment. Items which are packed separately, for installation on site, include:

- Springs and Spring Bases
- Screen Surfaces
- Motors and ancillary drive equipment.
- Water Spray Systems
- Dust Enclosures
- Drive Guards

1.4.1 Check for Damage or Loss in Shipment

The equipment is thoroughly inspected and carefully prepared for shipment. However, it is possible for machinery to be damaged or lost in shipment.

Check each item carefully with the shipping manifest, freight bill or bill of landing.

Please inform the carrier immediately should you discover any damages or discrepancies. They will take your statement. This will assist in settling your claims promptly.

1.4.2 Screen Handling

- When loading or off-loading screen for transport, or when lifting screens, care must be taken to prevent any sideways loads on the side plates and protect them from pinching and bending.
- Always use the fixed lifting lugs on the screens to suspend.

CAUTION:
Do not use slings or hooks at any other points.

- When handling screens care must be taken that slings or chains used for lifting do not chafe surface protection.
- Raise the screen equally on all four corners.
- Use spreaders on slings to obtain only vertical pull on the lifting lugs.
- Refer to Outline Installation Drawing for static weights, screen dimensions and location of lifting lugs.

CAUTION:

Be sure that the screen is not dropped or otherwise mishandled. Metso Minerals cannot assume responsibility for damage caused by improper handling after the screen leaves the factory.

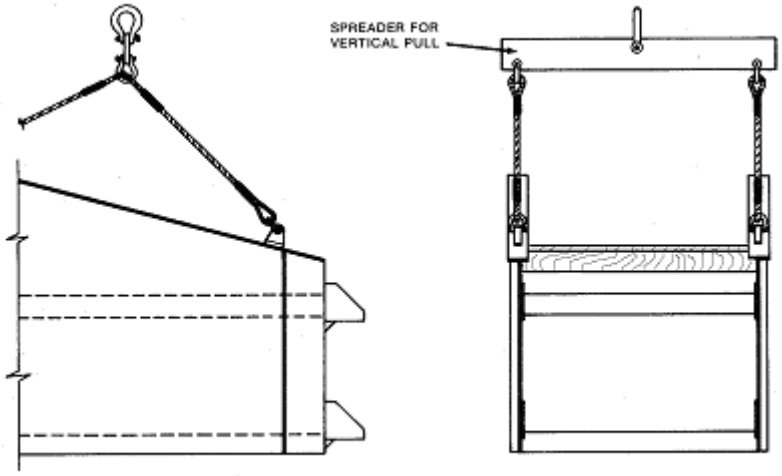


Figure 1.1 Use of spreaders when lifting the screen

1.5 Storage Considerations

Metso Minerals recommends storing screens in a building that is free of excessive moisture. If screens must be stored out of doors and exposed to the weather, protect them with well-fitted tarpaulins.

NOTE:
Periodically inspect all stored equipment for damage or corrosion, and take any necessary preventative measures.

Remove the screen surfaces from the screen body and store indoors to prevent corrosion damage or breakage from objects placed or dropped on the surface. If conditions do not warrant removal of surfaces, take precautions to prevent damage.

1.5.1 Mechanism Storage

Low-Head mechanisms are shipped from the factory filled to the correct level with lubricating oil. This oil has a vapour corrosion inhibitor added that will prevent corrosion of interior mechanism parts for a six-month period, if the screen is not in operation.

If the screen and mechanism are to be held in storage for a period longer than six months, completely drain the oil after six-months and refill completely with oil and vapour corrosion inhibitor.

1.5.2 Storage

Close off shaft openings with mastic tape to exclude moisture. Replace the housing breather vent with a plug (3041-0).

Provided that it has not been in storage for more than 60 days, the screen can be operated for up to 40 hours with the factory supplied oil.

Before putting the mechanism into operation (after more than 60 days in storage) drain the oil used for storage and refill the mechanism to the correct level with new oil.

If screen mechanisms are taken out of services and stored for extended periods, take the following precautions to prevent corrosion damage to mechanism parts.

1. Drain the oil and refill completely with storage oil and vapour corrosion inhibitor.
2. Close off shaft openings with mastic tape to exclude moisture.
3. Replace the housing breather vent with a plug (3041-0).

During storage, follow the same procedure as with new screens in storage. Use the same precautions when storing spare mechanisms.

1.6 Spare Parts

Wearing and replacement parts for Low-Head screens are carried in stock by Metso Minerals (Australia) Limited. Spare parts are not included as standard equipment or regular machine purchases, but are ordered separately.

NOTE:

Long service life is a characteristic of properly maintained vibrator mechanisms. One reason for this is the use of precision bearings in these mechanisms, built to Metso specifications.

Experience has shown that standard commercial bearings will not provide the same high level of performance, and that premature bearing failure can result in extensive damage to mechanism components.

Precision bearings designed specially for your mechanism, are available from Metso Minerals (Australia) Limited. All mechanism parts including hardware, O-rings and gaskets should be carefully inspected whenever bearing replacement is required.

Any damage to a mechanism or bearing housing resulting from the substitution of "standard" bearings will be the responsibility of the screen operator. Insist on "genuine" Metso Minerals (Australia) Limited replacement parts.

1.6.1 Recommended Spare Parts

To reduce down-time in emergencies, Metso Minerals recommends that, as a minimum, the parts listed in the *Recommended Spare Parts* list (attached) be held in your stock inventory.

If multiple units of the same size, or multiple mechanism or vibrator units of the same description (mechanism number and counterweight value) are being used in your plant, increase the recommended quantity of each item to best suit your situation.

A characteristic of Low-Head screens is that the mechanisms are fully encapsulated and housed separately from the vibrating body. Entire mechanisms can be removed as a unit and taken to a repair facility away from the plant area. This makes it practical to keep a spare mechanism on hand in “as-new” condition, as a change-out unit (especially where multiple identical mechanism units are in use), for interchange with a mechanism due for repair. This precaution keeps down-time for mechanism repairs at a minimum.

1.6.2 Ordering Spares

When ordering service parts, include the following information:

- Screen size
- Screen serial number – look for the serial number plate affixed on the screen side plate – or look for the serial number on the covering page of this manual
- Part description by name, along with catalogue numbers where applicable and part numbers
- Quantity of each part required
- Complete shipping instructions, including whether shipment should be via mail, express, surface or airfreight.

This information should be sent to the nearest Metso Minerals workshop, as listed in the covering pages of this manual.

18/9/2007

RECOMMENDED SPARE PARTS

Serial No.: A7890

Model.: Low Head Screen

Size.: 2.4m Wide x 6.1m Long S/D

Mechanism (s).: 2 x 4-3F Mechanisms – 26-101-498-503

Item	Qty Per Screen	Rec. Order Qty	Description	Part Number	Recomm. Sell Price, ea
1	8	4	Compression Spring – Outer	99-A40-001-009	$0:00
2	4	2	Compression Spring - Inner	99-A40-001-010	$0:00
3	4	4	Vee Belt – C3210	99-A30-028-328	$0:00
4	4	2	Friction Check Block	07-149-482-002	$0:00
5	4	2	Friction Check Springs	99-A40-001-036	$0:00

NOTES:-

1) All prices are F.O.T Metso Minerals Newcastle and are valid for 30 days from the above date.
2) Those items marked * are ex-stock, subject to prior sale.
3) Part Numbers ending with 801 or 802 etc, include hardware ie bolts, nuts, washers etc.
4) For Spare Parts enquires, please contact:-

   Telephone.: 02 4978 8100 or Facsimile.: 02 4962 2309
5) All the above items are painted to our standard Metso Minerals Paint Specification – Tan Beige

2. Installation

2.1 General Considerations

2.1.1 Foundations and Structural Supports

Screen location is usually determined by the process flow. The standard design configuration for Low-Head screens is for base mounting on the supporting structure. Cable suspension can be provided as an optional arrangement.

The design of supporting structures and foundations for vibrating screen installations is complicated by the dynamic forces involved.

Review the specific conditions of your installation with an engineer who is experienced in this field. Maintenance requirements must also be considered during the structural design stage.

Provide adequate accessibility to screens to promote better servicing and repair.

CAUTION!

Vibration levels in the screen supporting structure should not exceed 10mm/s (peak level), measure at the bottom of the spring pedestals in tri-axial direction.

All exceptions from this requirement must be authorised by Metso Minerals (Australia) Limited.

2.1.2 Feed and Discharge Arrangements

Arrange feed and discharge chutes to provide clearance for removing screen sections. Possible measures include bolting or hinging the discharge chute or arranging it for easy removal away from the screen.

Provide room to facilitate inspection of the screen body and mechanism, as well as access between the screen and hopper or flume to permit a man to get underneath the screen, if necessary.

CAUTION!

When installing the screen, maintain a minimum clearance of 75 mm between it and stationary spouts, chutes, hoppers, etc.

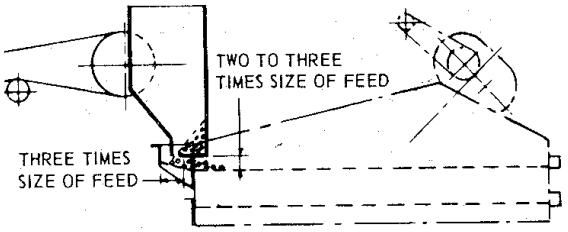
Screen movement will increase slightly in all directions during starting and stopping, when the mechanism speed coincides with the natural frequency of the screen and suspension.

For totally-enclosed screens with vibrating enclosures, provide sufficient slack in flexible feed and discharge fittings to allow for increased screen motion.

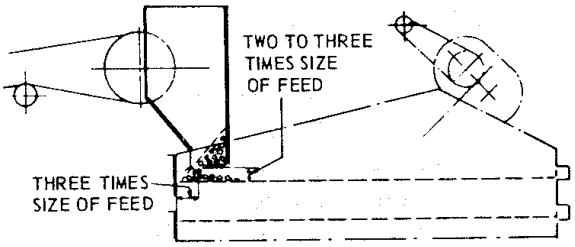
Several recommended feed arrangements are shown on the facing page.

For maximum screening efficiency, arrange the feed spout to distribute material evenly over the screen width, to utilise the full surface area.

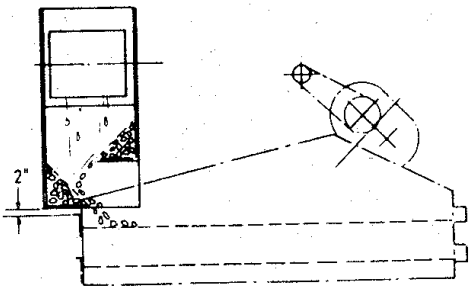
- Reduce material velocity before it impacts the screen to prevent excessive surface wear and noise.
- Design feed chutes to be approximately 300 mm narrower than the screen width.
- Feed boxes are recommended and available on new screens as a standard option.



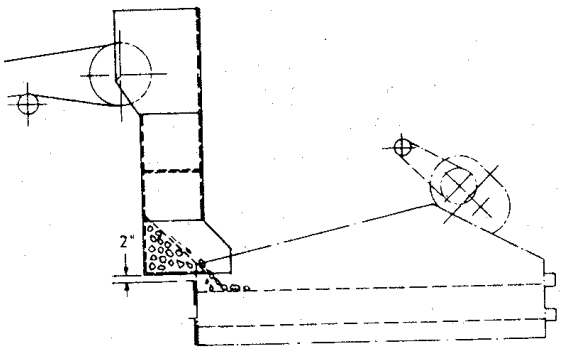
For small material (2.5" max.), using feed box.



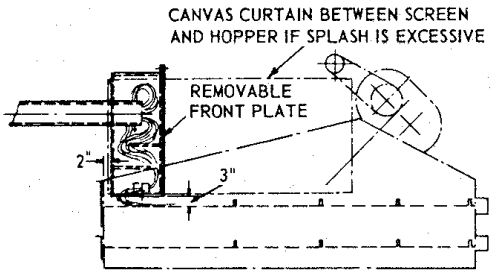
For small material (2.5" max.). without feed box.



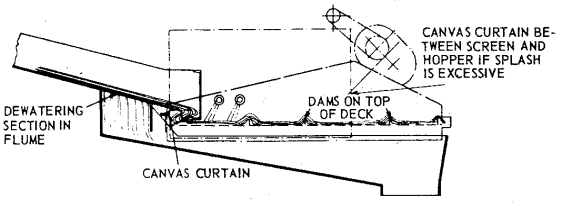
For small material, max feed size 2.5"



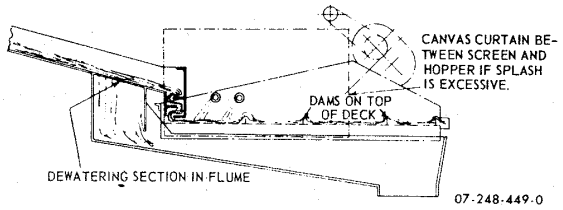
For two screens, max feed size 2.5"



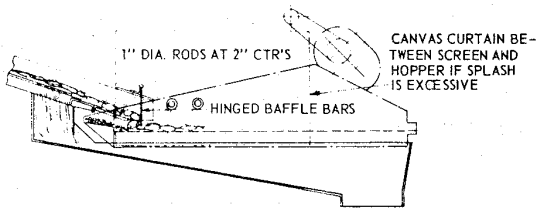
For slurries.



For de-watering and coal operations.



For de-watering and de-sliming, with baffles in feed chute to reduce feed velocity.



For feeding large material to de-watering screen.

Figure 2.1 – Feed Chute Combinations

Hanging chains, rails or tractor treads (Figure 2.2) in the material flow ahead of the screen will help control feed velocity. Skirt plates installed above, and independently of the screen, will help eliminate material spillage and bouncing over the top of the side plates.

A stationary impact plate can be built into the skirt plates to lessen impact on the screen surface and help to spread material across the deck.

NOTE:
Do not add skirt plates, baffle plates, feed boxes, discharge spouts, etc. to an existing screen without consulting Metso Minerals. Such additions will alter the location of the screen's centre of gravity and directly affect screen motion.

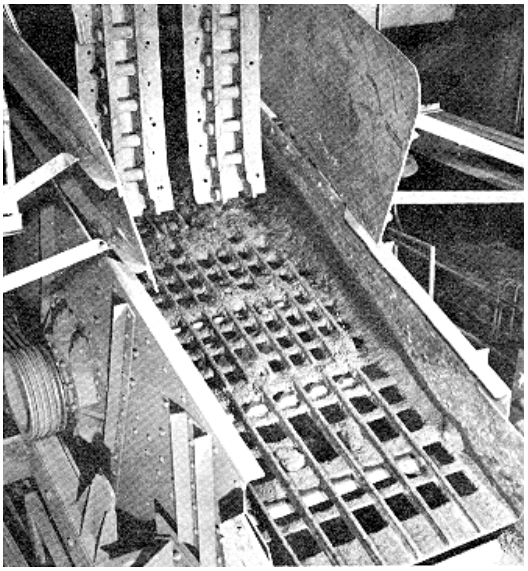


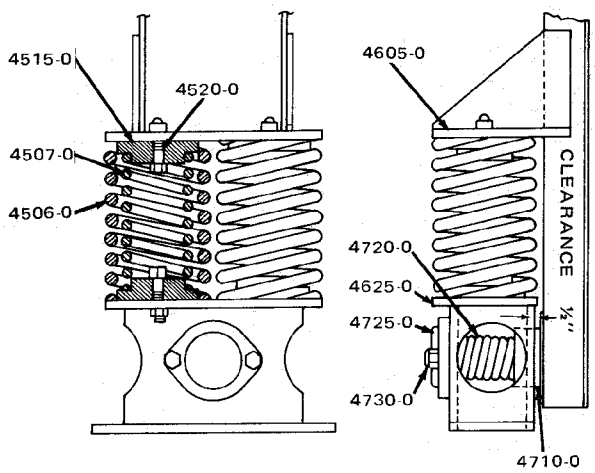
Figure 2.2 Tractor tread in flow of material

2.2 Installing Base-Mounted Screens

Standard base-mounted screens are furnished with pedestal-type support bases which can be mounted on and secured to either structural steel or reinforced concrete.

The concrete or steel supporting structure must be level and plumb. Use shims between the supporting structure and the spring bases, if necessary.

Figure 2.3 shows the fixed bracket mountings with four springs per mount, including two larger diameter outer springs and two smaller diameter inner springs. A spring-loaded **friction check** is located in the pedestal base.



Catalogue Number	Description
4506-0	Outer Compression Spring
4507-0	Inner Compression Spring
4515-0	Spring Guide Washer
4520-0	Bolt, Washer and Locknut
4605-0	Fixed Support Bracket
4625-0	Spring Pedestal Base
4710-0	Friction Check
4720-0	Friction Check Spring
4725-0	Cover
4730-0	Cover-to-Support Base Bolt

Figure 2.3 Fixed bracket mounting with inner and outer steel coil springs.

2.2.1 Placing the Screen

1. Locate each pedestal base so that there is a 12.7mm clearance between it and the friction check plate on the screen body. Be sure that the two pedestal bases on opposite sides of the screen at the feed and discharge ends are level with each other. Shim between the pedestal base and support structure to level, if necessary.
2. Assemble the steel coil springs on the spring guide washers located on the pedestal bases. If inner compression springs are provided, locate inner springs on the spring guide washers and then place the outer coil springs over the inner springs.

NOTE:
Set all supporting springs vertically. Ensure a snug fit with springs, guidewashers and bases.

3. Fixed bracket mounts are pre-installed so that they are set horizontally when the screen is located on the slope shown on the *Outline Installation* drawing.
4. Lower the screen in position on the supporting springs making sure that the bracket spring guides are properly seated on the springs.
5. Ensure that all supporting springs are positioned vertically on each pedestal base and located by the spring guides on the bases and support brackets.

NOTE:
If springs are not vertical, shift pedestal bases until vertical alignment is obtained.

6. Bolt pedestal bases securely to the steel or concrete supporting structure.
7. Install friction checks as shown in Figure 2.3.

2.3 Checking Spring Deflection

After the screen has been installed check to ensure that supporting springs have the same “deflected length” in comparison to the springs located on the opposite side of the screen at the same end of the screen (i.e. either feed end or discharge end). The deflected length of the springs may vary from one end of the screen to other.

NOTE:
The two spring sets at the feed end of the screen must have the same deflected length (± 3 mm) when compressed under the static load.
The two spring sets at the discharge end of the screen must have the same deflected length (± 3 mm) when compressed under the static load.
For future reference, these measurements should be recorded in the Installation Check List provided.

CAUTION!
Operating the screen with uneven support springs could result in premature failure of the screen body.

2.4 Drive Considerations

Use a high torque, 250% FLT, TEFC Industrial motor. The next larger size normal torque motor may be substituted, if the high torque motor is not available.

NOTE:
When locating motor bases for V-belt drives, be sure to allow for belt installation and tension adjustment.
A shorter centre distance (drive pulley to driven pulley) is required to allow easy belt installation.
A longer centre distance is needed for belt take-up and adjustment.

2.4.1 Motor Starter and Electrical Wiring

Across-the-line magnetic starters with the proper enclosure to suit the operating conditions are recommended for electric motors.

Most motors are high-torque, TEFC design. Follow the motor manufacturers notes (located in section 5 - if supplied with screen) on equipping starters, to take care of high momentary current requirements.

Install wiring to the motor in accordance with the relevant Australian Standards and requirements of any local inspection authority with jurisdiction in the territory in which the motor and starter are installed.

2.4.2 Motor Mounting

After the screen is located in the proper operating position, install the motor on its independent mount. Be sure the motor is readily accessible for inspection and maintenance. It should be rigidly supported, level and mounted on the base with sufficient allowance for future belt take-up.

Install the motor after the screen has been mounted in the operating position. Locate the motor so that the drive centre-line is at an angle of 35 - 45^{O} to horizontal, in a direction perpendicular to the line of stroke, and in the correct location for tensioning the V-belt drive.

2.4.3 Drive Mounting – Outboard Jack Shaft

After the screen is located in the proper operating position install the Cardan Shaft / Jack Shaft arrangement using the procedure below and Drawing Number 26-A43-667 or *Outline installation*, found in Section 5. Before mounting the drive assembly ensure you are familiar with the installation procedure and be careful when handling bearings, shaft and shaft components.

1. Mount base frame weldment to supporting structure.
2. Mount plummer bearings, guides and motor on base frame.
3. Mark midpoint of jack shaft and equidistant from this point at each shaft end mark the location of the inner and outer faces of the plummer blocks on the jack shaft.
4. Slide adapter sleeve into both bearings and attach locking nut with a few turns, ensuring all components are clean prior to assembly.
5. Clean jack shaft and slide one labyrinth seal then adapter sleeve / bearing assembly then final labyrinth seal onto both ends of jack shaft using markings to get approximate component location.

NOTE:
When locating bearing components on jack shaft ensure adapter sleeve thread faces each end of jack shaft and the o-ring on each labyrinth seal faces away from the bearing housing.

6. Lower jack shaft evenly between plummer bearing housings, aligning labyrinth seals and bearing assemblies into plummer block.
7. Mount taper lock and driven pulley to one end and shaft adapter to other end of jack shaft, secure as shown in Section 2.5.1.

NOTE:
Support taper lock bushes evenly on jack shaft, ensuring even shaft and bush overlap either end of shaft assembly. Support jack shaft evenly with plummer block bearings.

8. Align driven pulley with drive pulley, lightly secure bearing adapter sleeve nut to one shaft and insert spacer rings into plummer block. Once one bearing is secure lightly attach the other bearing to the jack shaft with sleeve nut.
9. Clean bore of shaft adapter and fit onto drive shaft of mechanism making sure it is pulled firmly onto taper.
10. Attach cardan shaft to jack shaft and mechanism shaft adapters, ensuring to tighten bolts evenly in accordance with Section 6. Apply Loctite to all screw threads on final assembly.
11. Grease cardan shaft elbows and plunger.

CAUTION:
The angle between motor/mechanism shaft and cardan shaft cannot exceed 8^0 in any plane, if greater than 8^0 is required contact the Engineering Department at Metso Minerals (Australia) Limited.

12. If required reposition coupling to allow even plunge of cardan shaft. Re-align pulleys if necessary.

NOTE:
Ensure the cardan shaft has even plunge (-55mm to +55mm) before running screen.

13. Tighten bearing adapter sleeve nuts to ensuring jack shaft is locked tight with bearing, fasten plummer block housing cap and grease bearings.

NOTE:
Metso Minerals typically supply SSN 513 bearings with jack shaft drive arrangements, these need 180g of grease for initial fill. If a different bearing model is used contact Metso Minerals (Australia) Limited Engineering Department for correct grease amount.

14. Rotate driven pulley slowly to ensure assembly functioning correctly
15. Install V-belts to pulley arrangement in accordance with Section 2.6.

16. Install guards if provided, making sure enough room is left around guard for start up and shutdown screen amplitude, approximately 75mm, lock down with bolts provided. If no guard supplied ensure guard fitted complies with A.S. 4024.

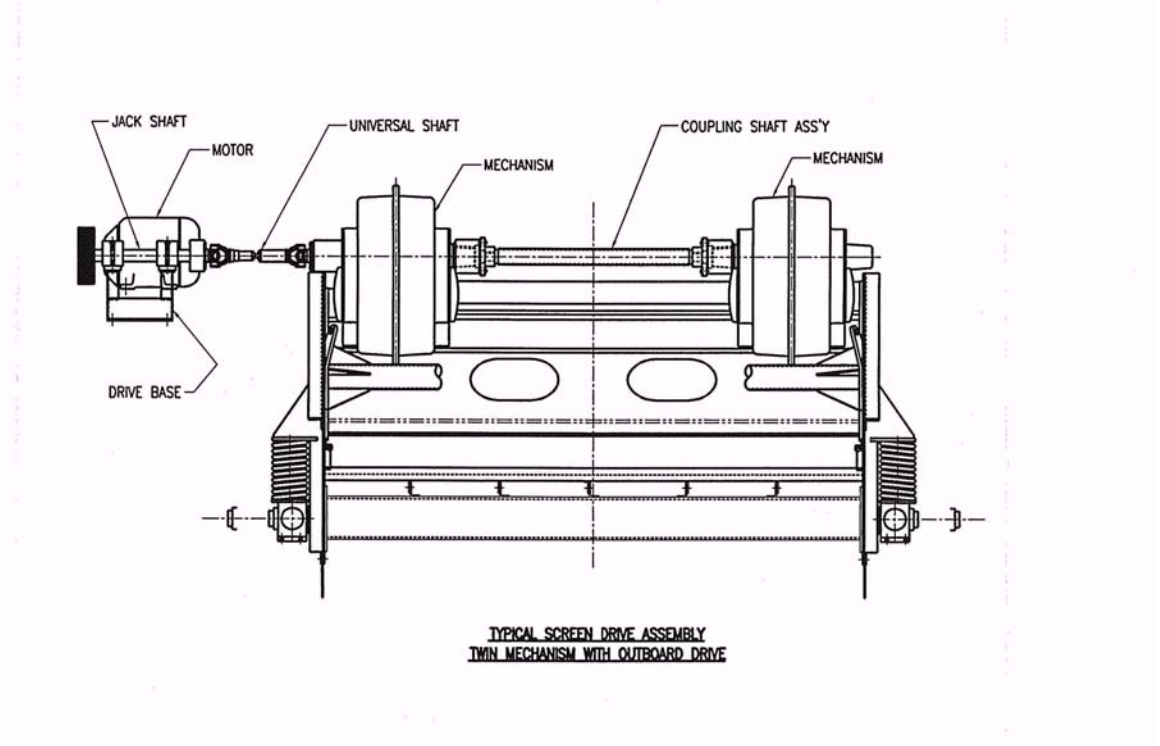


Figure 2.4 - Cardan Shaft /Jack Shaft Arrangement

2.4.4 Drive Mounting – Outboard Direct Drive

After the screen is located in the proper operating position install the direct drive arrangement using the procedure below.

1. Clean bore of shaft adapter and fit onto drive shaft of mechanism using key, retaining washer and bolt, ensuring it is pulled firmly onto taper. Mount other shaft adapter to motor shaft using taper lock bush supplied.
2. Locate motor in estimated position and insert cardan shaft between adapters adjusting the location of shaft adapters as required to ensure cardan shaft has even plunge.

CAUTION:
The angle between motor/mechanism shaft and cardan shaft cannot exceed 8^0 in any plane, if greater than 8^0 is required contact the Engineering Department at Metso Minerals (Australia) Limited.

NOTE:
Ensure the cardan shaft has even plunge (-55mm to +55mm) before mounting the flanges to shaft adapters.

3. Mount motor to supporting structure.
4. Bolt cardan flanges onto shaft adapters, ensuring to tighten each bolt in accordance with Section 6, then moving to the bolt on the opposite side, ensuring even pressure around the adapter. Apply Loctite to all screw threads on final assembly.

5. Grease cardan shaft elbows and plunger.
6. Assemble guard over cardan shaft in a position that will leave enough room for start up and shutdown screen amplitude, approximately 75mm, lock down with bolts supplied. If no guard is supplied with drive arrangement, ensure guards fitted comply with A.S 4024.

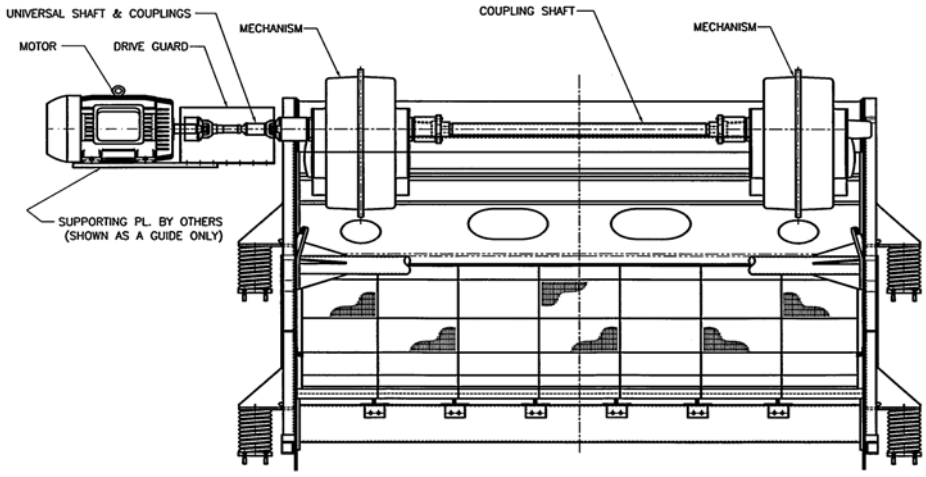


Figure 2.5 Direct Outboard Drive Arrangement.

2.5 Taperlock Bushes

2.5.1 To Install Taperlock Bushes:

1. Remove the protective coating from the bore and outside of bush, and bore of hub. After ensuring that the mating tapered surfaces are completely clean and free from oil or dirt, insert bush in hub so that holes line up.
2. Sparingly oil thread and point of grub screws, or thread and under head of cap screws. Place screws loosely in holes threaded in hub, shown thus ⊙ in Figure 2.6.

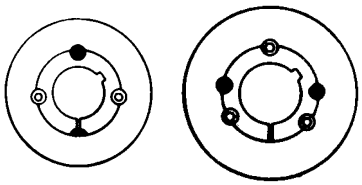


Figure 2.6

3. Clean shaft and fit hub to shaft as one unit and locate in position desired, remembering that bush will nip the shaft first and then hub will be slightly drawn on to the bush.

Insert screws and locate on Shaft

Tighten screws finger tight

Tighten screws alternately

Figure 2.7

4. Using a hexagon wrench tighten screws gradually and alternately.

Bush Size	Number of Screws	Tightening Torque
1008	2	5.6 Nm
1108	2	5.6 Nm
1210	2	20 Nm
1610	2	20 Nm
2012	2	30 Nm
2517	2	50 Nm
3020	2	90 Nm
3535	3	115 Nm
4040	3	170 Nm
4545	3	190 Nm
5050	3	270 Nm

5. Hammer against large end of bush, using a block or sleeve to prevent damage. (This will ensure that the bush is seated squarely in the bore.) Screws will now turn a little more.
6. Repeat this alternate hammering and screw tightening once or twice to achieve maximum grip on the shaft.
7. If a key is to be fitted place it in the shaft keyway before fitting the bush. It is essential that it is a parallel key and has TOP CLEARANCE.
8. After drive has been running under load for a short time stop and check tightness of screws.
9. Fill empty holes with grease to exclude dirt.

2.5.2 To Remove Taperlock Bushes:

1. Slacken all screws by several turns, remove one or two according to number of jack holes shown thus ● in diagram. Figure 2.8.

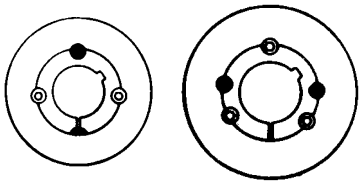


Figure 2.8

2. Insert screws in jack holes after oiling thread and point of grub screws or thread and under head of cap screws.

Figure 2.9 Removing a Taper Lock® bush

3. Tighten screws alternately until bush is loosened in hub and assembly is free on the shaft.
4. Remove assembly from shaft.

2.6 Drive Pulley Arrangement

The V-belt drive must be carefully aligned in order to be able to transmit the design power and minimise wear on the drive belts. After fitting the pulley/bush onto the shaft, use a straight-edge to check that the belt pulley grooves are correctly aligned.

Common types of misalignment are shown below.

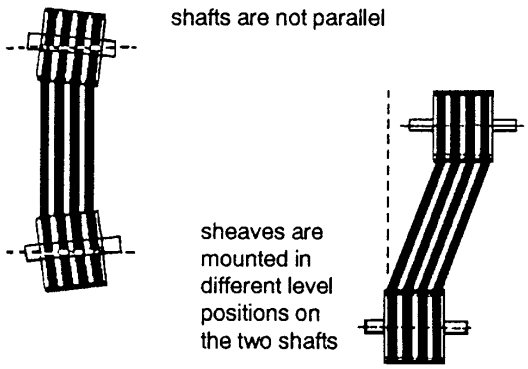


Figure 2.10

2.6.1 Fitting V-Belts

V-Belts are classified according to a length tolerance and matched sets in accordance with manufacturer's recommendations should only be fitted. The belts are installed as follows:

1. Adjust distance between shafts to the minimum that will allow the belts to be fitted without the use of screw drivers, levers etc.

CAUTION!
Never use tools to roll or pry belts into the pulley grooves. This can damage belt cords and lead to belt roll-over, short life or breakage. It is also a difficult and unsafe practice.

2. Insert the belts into the pulley grooves.
3. Tension the belts as specified by the higher value of the deflection force stated in the table given in Figure 2.11.

2.6.2 Adjusting Belt Tension

Belt tension should be checked after 50 hours operating time. Approximately 80% of the total elongation of the belts will occur during this initial period of operation. Regular checks of belt tension every 200 hours is recommended.

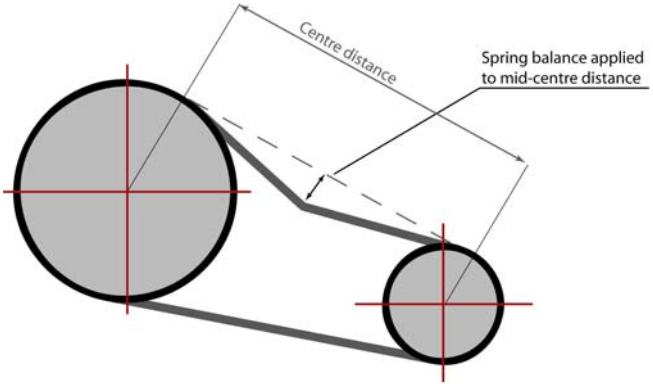
Tension is controlled as follows:

1. Measure the distance between shafts
2. Check the necessary force for deflecting each belt 16mm per metre of distance between shafts.
3. Increase tension of belts if the necessary deflection force is less than what is stated in table, and vice versa if the deflection force turns out to be higher than that specified.

At normal operating conditions it is recommended to have a belt tension of approximately 80% of maximum deflection force stated in the table.

Increased tension may be necessary if start conditions are more severe.

If belts squeal during start-up or operation, refer to the *Trouble-Shooting Guide* in Section 3 for the appropriate action.



Belt Type	Force required to deflect belt 16mm per metre of span		
	Small Pulley Diameter (mm)	Newton (N)	Kilogram force (kgf)
SPZ	56 to 95	13 to 20	1.3 to 2.0
	100 to 140	20 to 25	2.0 to 2.5
SPA	80 to 132	25 to 35	2.5 to 3.6
	140 to 200	35 to 45	3.6 to 4.6
SPB	112 to 224	45 to 65	4.6 to 6.6
	236 to 315	65 to 85	6.6 to 8.7
SPC	224 to 355	85 to 115	8.7 to 11.7
	375 to 560	115 to 150	11.7 to 15.3

Figure 2.11 Belt tensioning diagram

2.6.3 Drive Guards

The drive guards supplied with each screen are a Metso Minerals standard design, which allow for custom fitting on site. Metso Minerals ensures that the drive guards are designed in accordance with relevant Australian Standards, however, the final fitting, and approval for subsequent use is the responsibility of site operators and management.

Equipment users bear responsibility for the fitting of drive guards conforming to statutory requirements and safety rules. Guards must have no gaps or openings allowing personnel to reach inside and get caught in the drive.

WARNING!

Never operate belt-driven equipment without adequate drive guards, properly placed and secured. Do not be lulled into a false sense of security by a temporary or makeshift guard

3. Operation

3.1 Safety Considerations

Be extremely cautious when moving near steel coil springs because there is risk due to nip points between the spring coils.

There should always be a suitable clearance between the screen body and adjacent structures and components in order to avoid nip risks and to allow the screen body to move freely.

Always make sure that all safety guards are fitted prior to operation.

If possible, avoid welding work on the screen body. Such work can increase stresses in the plates and possibly damage the screen body.

Be extremely observant when moving around vibrating screens in operation.

To avoid injuries, always wear a safety helmet and protective goggles.

3.2 Pre-Commissioning Checks

1. Check for any damage that may have occurred during installation.
2. Check that the screen is installed at the correct slope.
3. Check clearance between the screen and surrounding structure for compliance with minimum specifications.
4. Check hold-down bolt tightness.
5. Check that all replaceable liners are fitted - especially on feed box, feed chute and side plates.
6. Check that the screen deck is installed and tensioned correctly, and modular panels, if fitted, are secure.
7. Check that motors are correctly installed and conform to manufacturer’s specifications. Verify that rotation checks have been signed off, and rotation is correct.
8. Check that all guards are secure and will not interfere with drive belts and pulleys.
9. Check drive arrangement for loose items, and correct belt tension.
10. Check mechanism lubrication. Note that factory-supplied lubricant is not to be used for more than 40 hours operation. Any auto-lube systems must be checked for correct operation.
11. Ensure that the design operating speed is known and that actual operating speed can be verified on start-up and recorded.
12. Check that all ancillary devices are securely installed and do not interfere with operation of the screen.
13. Check the mechanism oil level.

3.3 Commissioning

3.3.1 Before Introducing Feed Material

1. Check for abnormal noises.
2. Check the operating speed and throw (see Section 3.4).

CAUTION!
If an abnormal speed condition exists, contact Metso Minerals immediately.
Operation of the screen prior to Metso review and approval of the screen commissioning throw cards may void the warranty and result in premature failure of the equipment.

3. Check the mechanism(s) for oil leaks.
4. Check that vibration in the surrounding structure is not adversely influenced (increased significantly) by operating the screen.

CAUTION!
Do not continue operating the screen without rectifying any abnormal conditions identified in the pre-commissioning and commissioning checks.

3.3.2 After The Screen Has Been Operating For One Hour

1. Check hold-down bolts for tightness.
2. Check compression of screen suspension springs is consistent with measurements recorded during screen installation
   (refer to *check sheets* located in the covering pages of this manual).
3. Check that all components of the screen deck are secured/tensioned correctly.
4. Check the temperature of the mechanism bearings and lubricating oil.
5. Check for loose bolts.

CAUTION!
All measures, which may effect the screen acceleration (changing the mass of the screen deck, changes in the belt drive ratio etc.) must only be carried out in consultation with Metso Minerals.

WARNING!
DO NOT OPERATE THE SCREEN ABOVE OR BELOW THE SPEED RECOMMENDED BY METSO MINERALS.

3.4 Checks on Critical Speed

Critical speed (as related to vibrating screens) is defined as the natural frequency of the screen body. This is not the same as the natural frequency of the screen body/suspension spring system, which can be observed at low speeds during the starting and stopping cycles.

Critical speed depends on screen body stiffness, mass balance and bolt tightness. Although screen suspension does not normally affect critical speed, uneven compression of suspension springs can alter the screen's motion pattern.

CAUTION:
Do not operate the screen above or below the speed shown on the cover page of this manual without first consulting Metso Minerals.

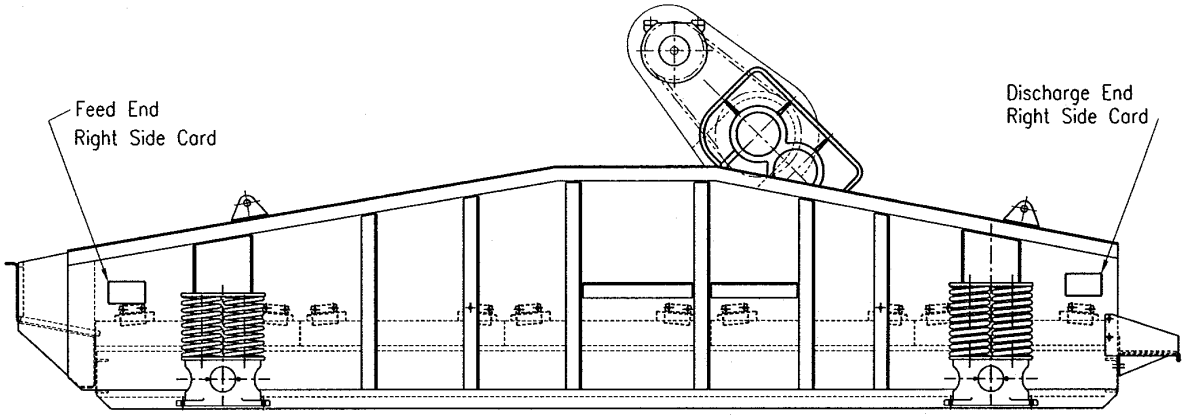
Make the following checks on critical speed conditions after installation checks are completed:

1. Securely fasten **throw cards** to the screen body in the four corner positions, using adhesive or masking tape. A master layout for the required throw cards is attached. Position cards on approximately the same location on both feed end and discharge end corners. After cards are attached draw a true horizontal line on the top of each card so that the true angle of motion can be determined.
2. Use any support that enables you to hold a pencil or fine-point pen securely at the same height as the cards. Place the bottom of the support on the floor, vertical to the cards, so that a pencil or ballpoint pen supported or secured to the support just touches the card. It is NOT possible to accomplish this by holding a pencil freehand against the cards.
3. With screen operating at full speed and pencil or fine-point pen at right angles to the side plate, momentarily touch the card in a series of spots. Be sure pencil or fine-point pen is held firmly and rigidly to prevent any secondary motion.
4. Fill out each of the four test cards, noting where each card was attached to the screen. List the serial number and where, when and by whom the test was conducted.
5. If the motion pattern recorded on the feed end cards is not similar to each other, a critical speed condition may have developed. A critical speed condition usually exists if the amplitude of the screen on two diagonal corners is considerably smaller than on the other two diagonal corners. When this condition exists, the screen body usually has a slight side vibration. Therefore, the full motion may not be recorded on the card when the pencil is held at right angles to the side plate. To record the full motion on a card in this case it is necessary to hold the pencil at a large angle to the side plate.

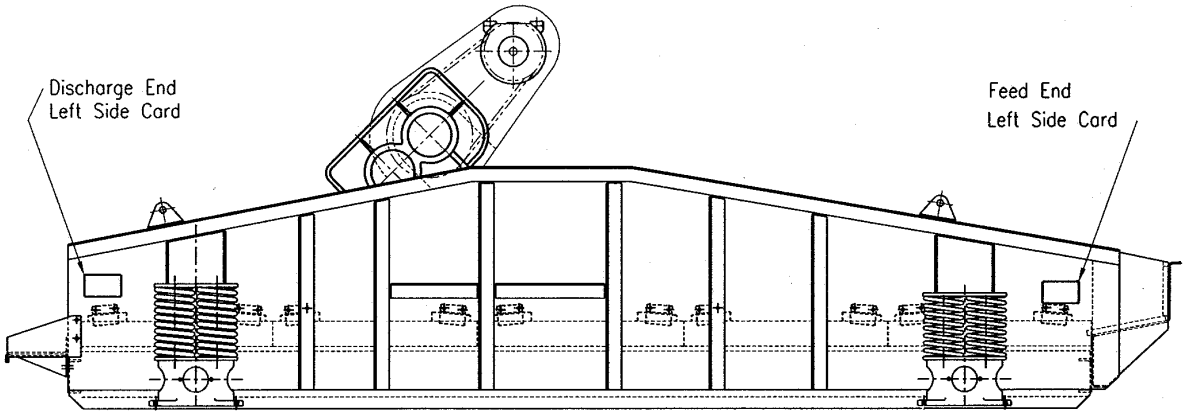
If a critical speed condition does exist, check the following:

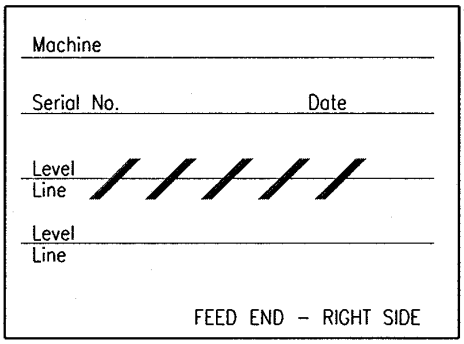
1. Compression of the suspension springs. Ensure that springs at feed and discharge end are compressed alike.
2. Screening surface and clamps. Be sure they are tight.
3. If screening surface is clogged with build-up of packed material on surface, remove packed material and clean the surface, as well as body parts such as support frames.
4. Bolts for tightness.

After all these points have been checked, make a second test pattern on the same cards. If the motion pattern is still uneven from side to side at each end of the screen, mail the test cards to **Metso Minerals (Australia) Limited** (address given at the beginning of the Manual). All test cards are to be marked with the screen serial number and include any additional notes relevant to the screen installation. Do this promptly, as continued operation of a screen in critical speed may cause damage to the screen body.



Locate Throw Cards in the same position
on both Feed End corners
and both Discharge End corners.





THROW CARD

3.5 Lubrication

Low-Head screen mechanisms are oil lubricated, with continuous splash lubrication during operation, as the counterweights pass repeatedly through the reservoir pool of oil in the housing's lower portion. Splashing action causes an oil spray inside the mechanism enclosure during operation, and assures an adequate distribution of lubricant to the bearings and gears.

Proper and adequate lubrication will be the single most contributing factor for long mechanism life, therefore follow lubrication recommendations closely. Many premature failures can be traced to inadequate or improper lubrication. Lubrication of the screen must be part of your daily maintenance schedule.

The lubricant used in screen mechanisms must meet a variety of requirements. The primary demand on oil lubricants is the ability to support load, while minimising bearing wear. Secondary demands include protection against corrosion formation, resistance to oil deterioration and heat transfer capability.

The recommendations which follow are general in nature, but have been found to give good results under most operating conditions. In any specific problem area, consult the nearest Metso Minerals Field Service Engineer.

Operators of multiple units of vibrating screens should note that the same oil lubricant specifications apply to both Low-Head and Ripl-Flo screens with oil lubricated mechanisms. However, depending on variations in ambient conditions for specific screen locations, it may be advisable to use oils with different viscosities because of temperature variations, refer to the lubricants listed in table 3.2.

The oil lubricant should conform to the following specifications for high quality extreme pressure gear oils:

- High stability against oxidation with mild extreme pressure characteristics.
- Minimum foaming tendency.
- Neutralisation number for an oil that will not attack highly polished anti-friction bearings over long operating periods.
- Timken film strength of 21 kg minimum.
- Minimum viscosity index of 90 must be a natural property of the oil.
- Oil viscosity in the temperature ranges, given in table 3.1, with some allowable variance for manufacturing tolerances.

These oils have much greater film strength, adhesiveness, resistance to shock loading and lower pour points than straight mineral oils of the same viscosity. Reputable brands are sufficiently stable and non-corrosive, and will not attack roller bearing surfaces.

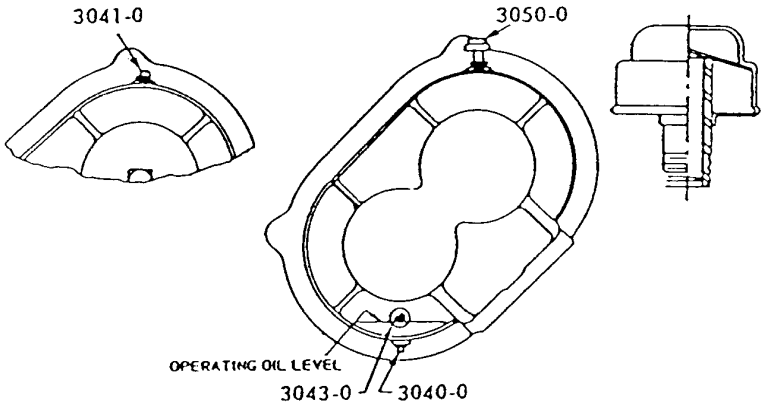
Property	ISO VG 150	ISO VG 220	ISO VG 320
Mid-point Viscosity cSt at 40 ^{O}C min.	150	220	320
Min. Kinematic Viscosity cSt at 40 ^{O}C	135	198	288
Max. Kinematic Viscosity cSt at 40 ^{O}C	165	242	352
Viscosity index	90.	90	90
Pour Point max.	20^{O}C.	15 ^{O}C	15 ^{O}C
Timken OK Load min.	21 kg	21 kg	21 kg

Table 3.1 ISO/ASTM Viscosity System.

CAUTION!
Depending on the ambient temperature conditions, only 220 or 320 grade oils should be used for **Number** 5 and 5 ½ type mechanisms

3.5.1 Oil Fill Quantity

The amounts listed below should be sufficient to bring oil level in the lower portion of the mechanism housing to the operating level, which is determined by the housing **oil level indicator plug** (3043-0). Maintain oil level at this point at all times.



Mechanical Size	Quantity (Litres)
1	0.95
2	1.9
3	2.3
4	5.6
5	13.2
5 ½	14.2

Figure 3.1

3.5.2 Checking Oil Level

1. Stop the screen for a sufficient length of time to allow all oil to drain to the bottom of the housing.
2. Remove the oil level indicator plug from housing (3043-0).
3. The correct oil level is to the bottom edge of the indicator hole.

CAUTION!
The oil level plug should only be removed when the screen is not in operation and has had time to cool. Replace the plug before resuming screen operation.

3.5.3 Adding Oil

Remove the breather vent (3050-0) on top of the housing and the oil level indicator (3043-0). Add only enough oil to bring the reservoir pool to the correct level.

CAUTION!
Never add oil without first removing the oil level indicator plug.
Do not exceed the indicated oil level. Too much oil in the housing will cause overheating, and may cause motor overloads to trip.

3.5.4 Checking Oil Temperature

Stop the screen and insert a thermometer into the oil pool through the hole for the oil level indicator plug.

NOTE:
Oil temperature rise over that of the surrounding air should stabilise at no more than 32^{O}C. New mechanisms may run at a slightly higher temperature during the running-in period.

If higher than recommended temperature readings are experienced during normal operation, check the lubrication specification and make certain that the oil level is not too high.

NOTE:
Limit of ambient air temperature 70^{0}C
Limit of mechanism temperature 100^{0}C
If the service temperature is higher, consult with Metso Minerals about possible measures to which may cool the mechanism.

3.5.5 Recommended Lubricants

A tabulation of lubricating oil suppliers and brand name of products that have been found to give good results under the specified conditions. These are offered only as typical examples, and other brand names may be used with equally good results.

Supplier	Ambient Temperature Range		
	5 to 38^{O}C	30 to 50^{O}C	39 to 66^{O}C
Ampol	Gearlube-SP150	Gearlube-SP220	Gearlube-SP320
BP	Energol GR-XP15	Energol GR-XP220	Energol GR-XP320
Castrol	Alpha SP150	Alpha SP220	Alpha SP320
Caltex	Meropa 150	Meropa 220	Meropa 320
Esso	Spartan EP150	Spartan EP220	Spartan EP320
Mobil	Mobilgear 629	Mobilgear 630	Mobilgear 632
Shell	Omala Oil 150	Omala Oil 220	Omala Oil 320
Valvoline	Valmega 150	Valmega 220	Valmega 320

Table 3.2 Oil brands information

3.5.6 Oil Change

Drain the oil from the mechanism after the first **40 hours of operation**.

Oil should be drained from the mechanism as soon as possible after screen shutdown, while it is still warm and drains easily. This will maximise the benefit of fresh oil by removing old oil before any sedimentation occurs.

Following the initial oil change, subsequent oil changes should occur at regular intervals.

The recommended interval between oil changes is **1000 hours of operation**, or six months, whichever comes first and the recommended interval between oil level checks is **200 hours of operation**.

At the same time, check the housing for oil leaks. And tighten bolts if necessary.

Extreme operating conditions may require more frequent lubrication changes.

To change the oil, proceed as follows:

1. Remove the oil drain plug (3040-0), housing oil level indicator plug (3043-0) and housing breather vent (3050-0).

NOTE:
Before removing the vent and plugs, wipe the area around them clean to avoid getting contaminants inside the mechanism through the opened parts

2. After the oil has drained completely reinstall the drain plug (3040-0).
3. Add the correct grade of new oil through the port exposed by removing the housing breather vent (3050-0).
4. Add oil until it overflows out of the port exposed by removal of the oil level indicator plug (3043-0).

NOTE:
The approximate quantity of oil required for the mechanism is listed in Section 3.6.1.

5. Clean the housing breather vent (3050-0) and install.
6. Install the oil level indictor plug.

If the oil is very dirty and/or the mechanism is operating at high temperatures, reduce the time between oil changes and implement an oil condition monitoring programme to establish the optimum oil change period for local site conditions, a better grade of oil may be required.

3.5.7 Lubricating Plummer Bearings

The plummer bearings have labyrinth seals and need adequate lubrication to ensure the drive assembly will function correctly. Certain operating conditions, such as high temperature and regular screen start/stops necessitate more frequent re-lubrication. For this reason dimples can be found at five positions on the housing cap to indicate where a grease nipple can be installed. The two outer positions are for the seals and the three inner positions for the bearing. These locations should be utilised to allow better access for and increase lubrication effectiveness depending on conditions, ensure the type of grease used is suited to the running temperature.

NOTE:
Ensure the plummer bearings are adequately lubricated in high temperature operating environments.

SSN 513 Plummer bearings need an initial fill of 180g of grease. The bearing should be completely filled with grease while the free space in the housing should only be partially (between 30% to 50%) filled with grease and should be supplied from the shaft end cover side. When operating temperatures are below 70^0C it is recommended to replenish (top up) grease levels after 1000 hours and the complete grease fill should be replaced after three replenishments.

CAUTION:
An excess of lubricant will cause the operating temperature to rise rapidly and cause premature decay of the grease and excessive loading.

3.5.8 Lubricating Cardan Shaft

The cardan shaft has grease lubrication points. They are equipped with pressure grease nipples. Clean nipples before lubricating, press in grease until fresh grease emerges at the individual sale points. Do not exceed a pressure of 80 bar.

Grease cardan shaft before commissioning, subsequently after every 250 hours of operation or at the latest after a month.

CAUTION:
Grease universal joints and spline connection. Each joint is provided with two grease nipples so that they can be lubricated in any position. Do not stick lever into universal joints in order to turn shaft.

Use a lithium saponified grease, penetration 2, dripping point approximately 185^0C. Metso Minerals recommends any of the following in Table 3.3.

ARAL	BP	CALYPSOL	ESSO	MOBIL	SHELL	SUNOCO	VALVOLINE
Aral LF 2	Energrease LS 2	Calypsol H 442	Esso Beacon 2	Mobilgrease MP	Shell Retinax A	Multi Duty 2	Valvoline LB 2

Table 3.3 Recommended Grease Brands

3.6 Trouble-Shooting

3.6.1 Screen Stoppage

Possible Cause	Symptoms/Corrective action
Overheating of Mechanism	Too much or too little lubricant will cause bearing to overheat and lose internal diametrical clearance, resulting in seizing of bearing. Check the oil level. Correct level, and allow mechanism to cool prior to restarting.
Failed Bearing	After the mechanism has cooled, rotate it by hand for indication of bearing trouble. If the mechanism does not rotate freely, one or more bearings may have failed. Replace all mechanism bearings after thoroughly cleaning out the mechanism housing.
V-Belt Drive (if fitted) (See also; page 3-9)	Belt breakage or jumping off pulley resulting in loss of speed and bogging down of screen. If necessary to replace belts do so in matched sets to maintain uniform belt stretch. Loss of belt tension due to a motor coming loose on support and not maintaining required belt centres or. On cable-suspended screens the tension spring assembly not installed correctly, or having come loose or broken (check tension spring assembly as per instructions). Locate spring on building structure with cable attached to screen body.
Power Failure	Check power and motor leads

3.6.2 Uneven Screen Motion

Possible Cause	Symptoms/Corrective action
Build-Up Material	Material clinging to the screen becomes dead weight and will affect both throw and motion. Inspect screen surfaces, support frames, boxes and discharge spouts for material build-up. Remove all material from body.
Screen Support	Inspect springs for indication of coil breakage or possible build up of material around spring coil. Check possible setting of building support beams. Check level of all support points. On cable-suspended screens, check height of suspension springs. It is important that the suspension spring compression is equalised and that the screen is level. Uneven compression of the springs may cause distortion in the screen body - resulting in uneven vibration.
Critical Speed	Refer to the instructions for checking the critical speed in Section 3.4.
Feed Arrangement	Check feed arrangement to screen. Check for possible surge loading of screen. Install a surge hopper ahead of screen to provide an even steady feed rate.
Loose Body Parts	Check all body bolts for tightness. Inspect screen surface for possible looseness.

3.6.3 Spring Breakage

Possible Cause	Symptoms/Corrective action
Uneven Loading	It is important that loading of springs be equal to avoid possible bottoming and overstressing of spring. Check spring alignment.
Corrosion	Inspect springs for corrosive action. If necessary, spray or dip springs in corrosion preventive mixture.
Wobble	Excessive wobble will result in reduced spring life. Refer to Metso Minerals for recommendations on eliminating spring wobble.
Material Build-Up	Material build-up around spring coils will reduce number of active coils and increase spring stress, causing premature failure.
Unlike Springs	It is important that pairs of springs be of like characteristics: height, wire diameter, outside diameter and spring rate. Unlike springs can cause uneven loading and premature failure.

3.6.4 Loss Of Amplitude (Throw)

Possible Cause	Symptoms/Corrective action
Material Build-Up	Material build-up on the screen will increase body weight and cause a decrease in throw. Remove the build-up.
Belt Slippage	Loss of speed will result in reduced conveying capacity and increase bed depth and body weight - resulting in decreased throw. Replace worn belts and pulleys.
Power Fluctuation	Low plant voltage can result in slower motor speed with results similar to those stated in 'belt slippage'

3.6.5 Loss Of Oil

Possible Cause	Symptoms/Corrective action
Loose Plugs	Check all plugs in housings for possible looseness.
Worn Bearing	Excessive wear in bearing results in oval motion of seal and subsequent loss of oil. Replace all bearings.
Housing Vent	Check housing vent for possible looseness. Excessive dripping of oil from top vent indicates too much oil in mechanisms.
Seal Leakage	Oil seal not assembled in seal plate correctly. Damaged seal. Damaged contact area on drive shaft. Remove the seal plate and inspect thoroughly Air pressure build-up in the housing due to a clogged housing vent can cause oil leakage through the seal Clean out the vent to correct.
Damaged Gaskets	Check all gaskets for possible leakage or damage
Cracked Housing	Check housing for possible cracks. It may be necessary to run mechanism until housing is hot before cracks can be observed.

3.6.6 V-Belt Drive (if fitted)

Possible Cause	Symptoms/Corrective action
Belt Slip	Grooves are shiny, not enough tension. Increase tension - refer to section 2. Overloaded drive. Correct overload condition.
Drive Belts Squeal (during operation)	Overloaded drive. Correct overload condition. Not enough arc of contact. Increase centre distance. Heavy starting load. Increase belt tension. Look for ways to reduce load.

Mismatched Belts	New belts installed with old. Replace with full matched sets only. Improper groove angle - worn groove. Replace pulley Non-parallel shafts. Realign drive - refer to section 2.
Belt Turned Over	Cord broken due to prying or forcing on belt and pulley Correctly replace new set of belts. Overloaded drive. Correct overload. Impulse loading. Apply proper tension - refer to section 2. Pulley and shaft misaligned. Realign drive - refer to section 2. Worn pulley grooves. Replace pulley
Breaking Belts	Shock loading. Apply proper tension - refer to section 2. Recheck drive alignment - refer to section 2. Review machine installation for ways to relieve shock load conditions. Foreign objects in drive. Provide drive shroud
Belts Wear Rapidly	Pulley grooves worn. Replace pulley - refer to section 2. Mismatched belts. Replace with matched belts! Belts slipping. Increase tension - refer to section 2. Pulleys misaligned. Realign drive arrangement Grease on belts. Eliminate source of grease. Clean belts with soap and water.
Loss in Driven Speed	Belt slipping. Shut down drive and test pulley temperature by feel. Excessive heating can result from belt slippage. Increase tension - refer to section 2.

4 . Maintenance

4.1 General Considerations

Operating conditions vary widely, and it is impractical to try to set up one schedule of preventive maintenance for all screen installations. Follow a systematic pattern of regular inspection and keep a log of the periodic inspections and maintenance-related activities for each screen.

Metso Minerals recommends that a log of maintenance performed on the equipment include the following:

- Machine serial number;
- Date and description of maintenance activity; and
- Operating hours and Tonnage produced since installation

One of the best rules in screen maintenance is to keep a record of actual operating hours. After a predetermined operational period, give the screen a thorough major inspection. The length of time in this initial operating period will vary with the type of application and can best be determined by experience.

Examine new equipment after a relatively short operation period. Then lengthen the time before the next major inspection. Follow this system until you have a pattern that best suits your installation, and adhere to it as your operating schedule.

Systematic inspection will result in less maintenance and consequently lower repair bills. Maintenance checks will help detect wear and other problem areas before they cause serious damage.

Observe the following general precautions when performing maintenance repairs on screen components.

- Handle machined or bearing surfaces carefully to prevent damage. Before removing parts with machined surfaces, place planking or timbers on the ground or floor to avoid contact of finished surfaces with the ground or floor.
- Protect and oil machine parts to prevent rust. Cover them with a rust preventative if they are kept out of the machine for more than a few hours.
- Refer to the comments on storage of screens, mechanisms and spare parts in Section 2.
- Clean, inspect all bolts and friction connections before reassembling in screen. Replace any damaged or worn parts before reassembly. Replace roll pins and the housing gasket with every reassembly.
- Do not drive or pound on cast mechanism parts. It may result in damage and breaking or cracking that will show up after the parts heat up during operation.
- Carefully inspect all mechanism parts whenever bearing replacement is required and replace any worn or damaged components.
- When assembling O-rings on mechanism parts, slide or roll them into position to ensure a snug fit - **do not stretch them.**
- Grease the oil seal rubbing surface and the corresponding contact area on the drive shaft before assembly.
- Be sure body bolts are properly tightened.
- Use equipment of sufficient capacity for lifting or removing parts. Refer to the *General Arrangement* drawing for component weights.

4.2 Repair Work on Vibrating Body

On-site repairs are an integral part of successful operation and maintenance of the screen. It should be noted however that, when carried out by the operator, certain on-site repair work must only proceed after consultation with Metso Minerals Engineering personnel.

Metso Minerals (Australia) Limited will provide supervision for on-site repair works if requested, and can also offer training for site maintenance staff, thus ensuring that the most effective methods are employed in future repair work.

Major repairs may necessitate urgent replacement of components to avoid total structural failure.

Welding auxiliary parts to a screen in the field is **not recommended**. However, should weld repairs be deemed necessary contact Metso Minerals for factory-approved procedures to ensure a satisfactory weld repair.

WARNING!
Never use the screen to ground welding equipment for surrounding work, it can damage the mechanism and pose a safety risk.

4.2.1 Screen Design Considerations

Screen designs are continually being developed to minimise the need for difficult repair work and maximise the use of replaceable sacrificial components as part of a regular maintenance program. Examples of these developments include:

- replaceable wear liners
- replaceable subframe/deck support items

For all options to maximise maintenance advantages on Metso Minerals screens, please consult Metso Minerals at any time.

Friction grip bolts are usually employed to secure components that can be dismantled for maintenance purposes (Eg. mechanism, liners etc.). For certain applications, Metso Minerals has permitted the use of Huck bolts on its equipment. Unless a replacement bolt is being used where originally installed, please contact Metso Minerals to establish whether Huck bolting is appropriate. Bolt-tightening procedures are given in Section 6.3.

CAUTION!
If (without any clear reason) Huck bolts breakage occurs, contact Metso Minerals for advice immediately - the performance/integrity of the screen may be adversely affected if the cause of the breakage is not identified, or the bolt is not replaced, as soon as possible.

4.2.2 Critical Components

All Metso Minerals Series screens larger than 2.0 metres wide are subject to stress relieving of welded (critical) components, including:

- Support frames;
- Mechanism beams;
- Individual/Integral cross members;
- Feed and discharge end channels.

CAUTION!
On no account must these items be weld repaired before consultation with Metso Minerals Engineering personnel - to establish a suitable procedure for rectifying the problem.

On all Low-Head screens over 2.4 metres wide the side plates are manufactured without any welding in critical areas and all interfacing components are bolted to the side plates. Therefore, in the first instance, repairs to the side plates must be a drilling and bolting operation.

CAUTION!
Do not cut holes in the vibrating body with an oxy-torch - it will induce stresses around the cut area. Flame cutting on the vibrating body in the field will be done at the operator's responsibility. When it is necessary to add holes to the vibrating body in the field
DRILL THEM.

If holes are inadvertently cut in the body with a torch, file or grind the edges of the hole smooth. Failure to remove indentations may cause cracking due to the stress concentration.

4.2.3 Bolt Maintenance

Check the tightness of all bolts after the first few hours of initial operation of the machine. During the first week of operation, check the bolts for tightness daily and then periodically thereafter. Metso Minerals recommends every 750 hours for Huck bolts and every 100 hours for standard bolts. This procedure also applies to parts and components that have been disassembled and reassembled during normal maintenance periods.

WARNING!
Machinery must be inspected frequently to insure that all bolts are tight.

4.3 Mechanism Disassembly, Repair and Re-Assembly

The short shafted, encapsulated design of Low-Head mechanisms makes it possible to remove a complete mechanism unit from the screen for repair and install a spare replacement unit in its place to minimise screen down time while repairs are being accomplished.

Metso Minerals offers a comprehensive and cost effective mechanism refurbishment and exchange program. This will ensure mechanism availability and reliability, and also offer warranty support after fitting an overhauled mechanism.

CAUTION!

Incorrect set-up of a mechanism during repair or overhaul can result in premature screen structural failure, preceded by reduced equipment performance.

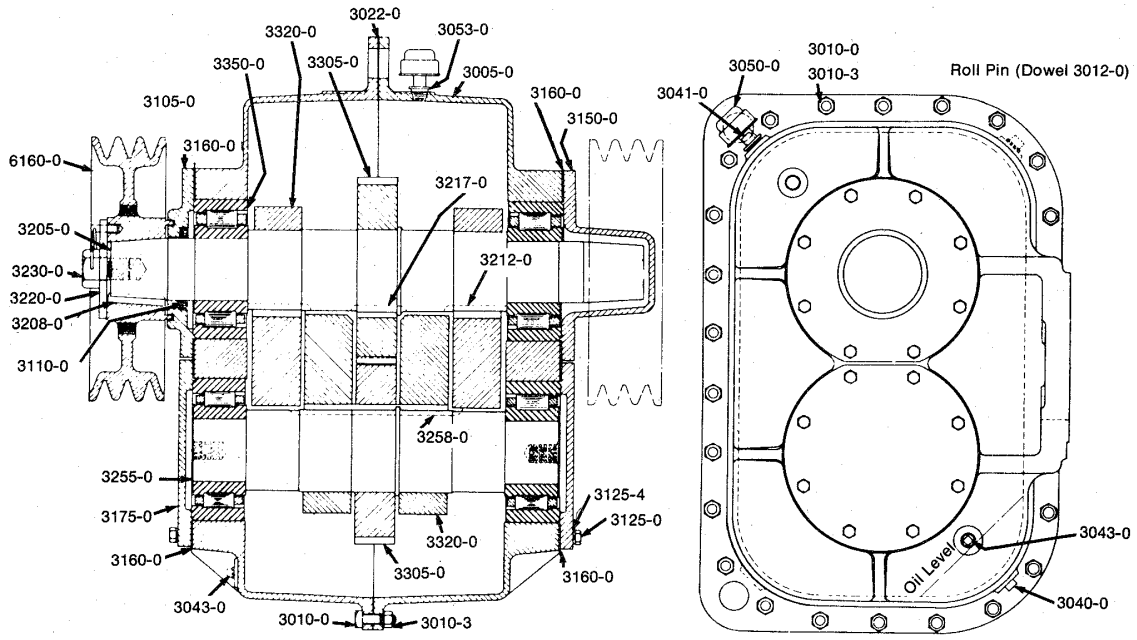


Figure 4.1 Typical Cross Section through Low-Head Mechanism.

Cat. No.	Description	Cat. No.	Description
3001-0	Mechanism Assembly complete	3125-4	Lockwasher
3005-0	Mechanism Housing	3150-0	Bearing Cap, non drive end
3010-0	Bolt -- housing halves	3160-0	Gasket -- bearing cap
3010-1	Nut	3175-0	Bearing Cap -- driven shaft
3010-2	Washer	3205-0	Drive Shaft
3010-3	Locknut	3208-0	Key – mechanism sheave
3010-4	Lockwasher	3212-0	Key -- counterweight to drive shaft
3012-0	Dowel -- housing halves	3217-0	Key -- gear to drive shaft
3022-0	Gasket -- housing halves	3220-0	Retainer
3040-0	Plug -- housing drain	3230-0	Bolt -- retainer to drive shaft
3041-0	Plug -- housing inlet	3230-4	Lockwasher
3043-0	Plug -- housing oil level	3255-0	Driven Shaft
3050-0	Vent--- housing breather	3258-0	Key -- gear and counterweight
3053-0	Reducing Bush -- vent	3305-0	Gear
3105-0	Bearing Cap -- drive end	3320-0	Counterweight
3110-0	Oil Seal -- drive shaft bearing	3350-0	Bearing
3125-0	Bolt -- seal plate or bearing cap	6160-0	Mechanism sheave

4.3.1 Mechanism Disassembly

Before attempting to work on a mechanism, study the parts relationship on the cross sectional view, Figure 4.1. Disassemble the mechanism for inspection, or to replace bearings, gears and other parts, following this sequence.

1. Drain oil from the mechanism by removing the oil drain plug (3040-0) and housing breather vent (3050-0). See Section 3 for the quantity of oil to be handled for each mechanism.
2. Remove mechanism hold-down through and tap bolts (3420-0 and 3425-0, see Figure 4.12).
   Note that these fastening devices are torqued up tightly during installation.
3. Penetrating oil will aid in loosening nuts and tap bolts. Avoid damaging the fits between the mechanism support and housing feet. Replace any damaged fastener parts before assembly.

NOTE:
Do not attempt to change the bearings without removing the mechanism from the screen.

4. Use a lifting device to remove the mechanism from the support beam. There are two cored holes in the housing flange for lifting. Take the mechanism to an authorised Metso Minerals screen service facility or other clean workplace for dismantling and rebuilding.
5. Place the mechanism on its side, on wooden supports, with the mechanism sheave side up, Figure 4.2. Remove the mechanism sheave and the bearing cap on the drive shaft (3175-0). At this point, check the accessible end of the driven shaft and determine if it has a tapped hole that can be used for lifting purposes. If the hole is not on the accessible end of the shaft, replace the bearing cap and turn the mechanism over. This should make the tapped end of the shaft accessible for later use in lifting the shaft. The driven shaft is tapped on one end only, except for No.1 mechanism, while the drive shaft is tapped on both ends.
6. Remove the bolts (3010-0) holding the housing halves together. Roll pins for specific mechanism sizes are located on Figure 4.2. Remove both roll pins (3012-0). The roll pins serve as dowels to accurately locate the housing joint and maintain the correct bearing and shaft alignment.

NOTE:
Replace roll pins with every mechanism assembly.

7. Two tapped holes are located in opposite corners of the housings, at the joint, for mounting jacking screws, see Figure 4.2 for location. To part the housing halves, take two of the joint bolts previously removed in Step 5 and insert them in the two tapped holes for use as jacking bolts. Work both screws, on opposite corners of the housing, at the same time to prevent binding. Remove and discard the housing gasket (3022-0).
8. Insert two eye-bolts (See Figure 4.2 for eyebolt diameter) in the two tapped holes designated for this purpose. Secure a safety hitch through each eyebolt and raise the upper housing half with a lifting device.

CAUTION!

Be careful when raising the housing half (Step 8). It is possible for the bearing outer races (if damaged) to fall out of housing and cause personal injury.

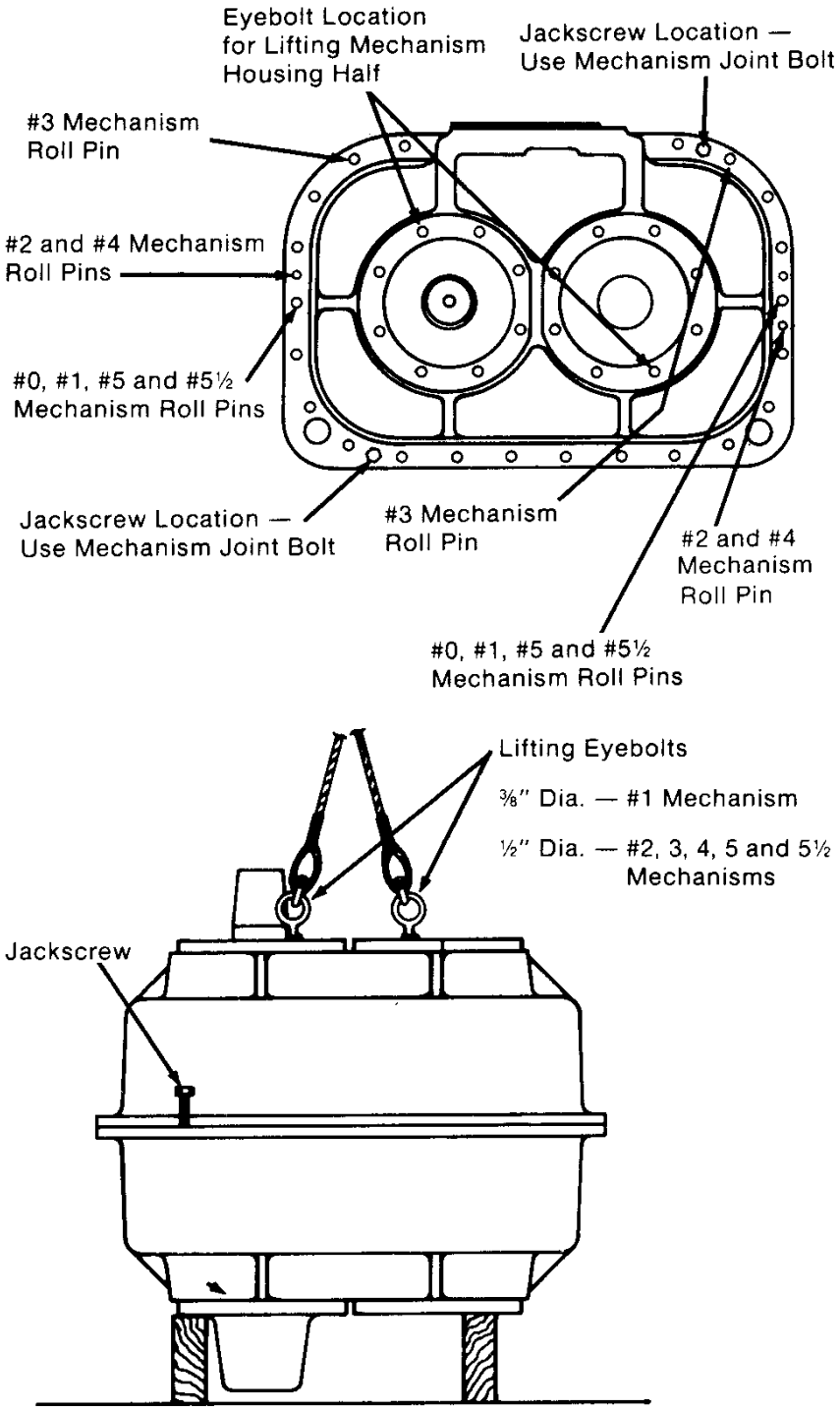


Figure 4.2 Method of dismantling housing halves (lower) Roll pin, eyebolt and jackscrew locations (upper)

4.4.1 Mechanism Disassembly (cont'd)

9. Lift shaft assemblies from the lower housing half, using eyebolts in the tapped hole or holes provided in the end of each shaft. Refer to Step 5 above, for comments on the tapped end of the shaft. Tapped hole sizes are tabulated below.

WARNING!
Be careful, when lifting shafts, to avoid personal injury due to damaged bearing parts falling off the raised components.

Mech. Size	Drive Shaft	Driven Shaft
1	3/4" - 10 UNC**	1/2" - 13 UNC**
2-3-4	1 1/4" - 7 UNC**	3/4" - 10 UNC*
5 or 5 1/2	1 1/4" - 7 UNC**	1 1/4" - 7 UNC*

** Tapped hole in each end of the shaft.

* Tapped hole in one end of the shaft only.

Table 4.1 Tapped hole sizes for mechanism shafts.

10. Invert the lower housing half and remove the two bearing caps (3175-0 and 3150-0).

WARNING!
Be careful, when raising the housing half. It is possible for damaged bearing races to fall out of the housing and result in personal injury.

11. Carefully drive the four outer bearing races out of the housing bores using a 38 mm to 51 mm diameter copper rod.

CAUTION!
Do not scar, scuff or otherwise damage bearing housing bores when removing or installing outer bearing races.

12. Match-mark all interior mechanism parts, such as shafts, gears and counterweights, before disassembly, as a guide when re-assembling the mechanism.
13. The inner bearing race, with the roller cage assembly in place, as well as the A, B, C, D and E counterweights (3320-0) and gears (3305-0) can be quickly removed from the shafts, if a 100-tonne capacity press is used.

CAUTION!
Do not press the "F" counterweights off the shaft. Use pull rods, installed in tapped holes located in "F" counterweight hubs, to remove them. See Figure 4.3 and Figure 4.4.

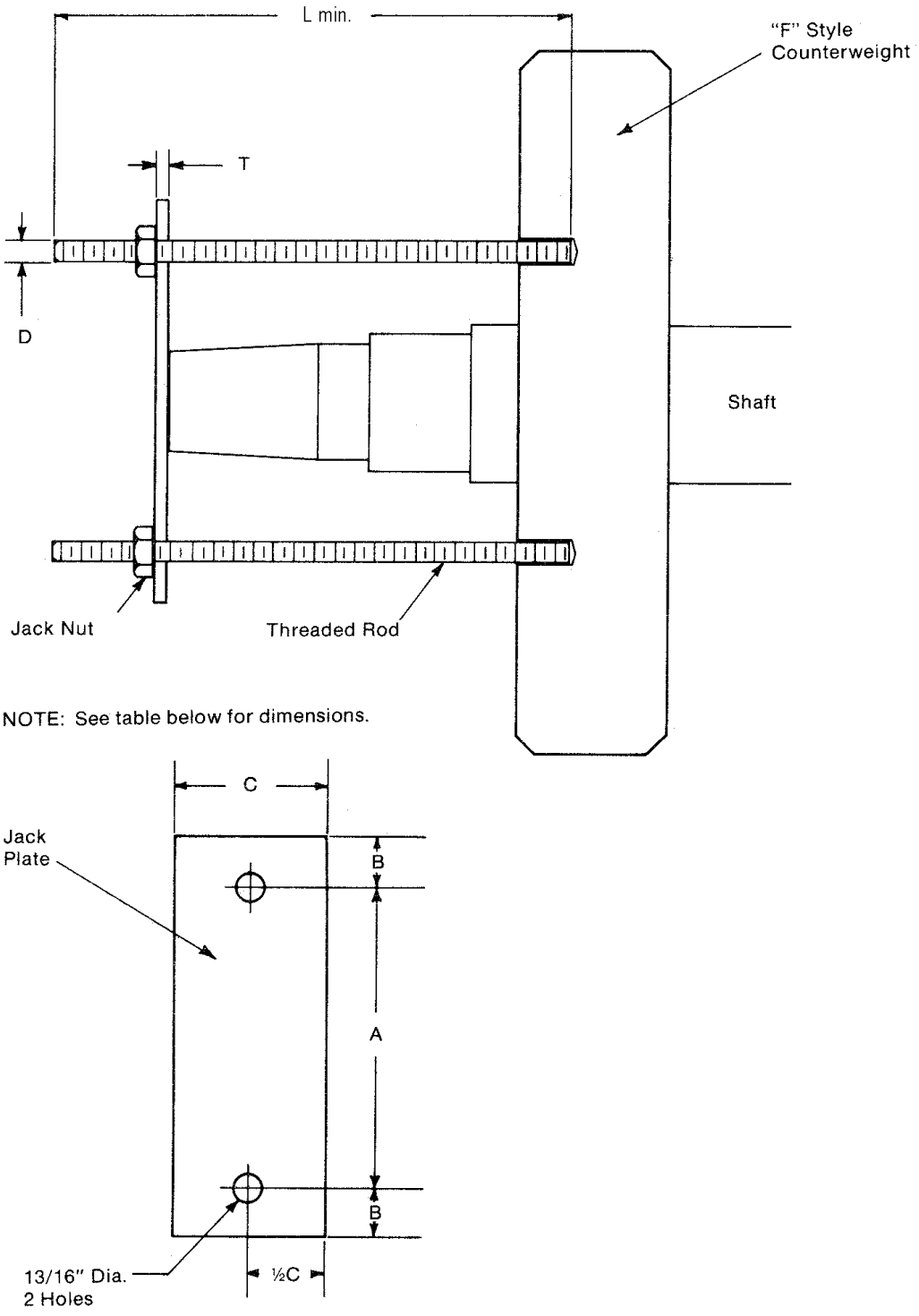


Figure 4.3 Method of pulling 'F' type counterweight off shaft.

4.4.1 Mechanism Disassembly (cont'd)

Mech.	D	L min.	T	A	B	C
2	3/4" - 10 UNC	280	38	152	38	50
3	3/4" - 10 UNC	305	38	197	38	50
4	3/4" - 10 UNC	355	38	241	38	50
5	3/4" - 10 UNC	406	38	292	38	50
5 1/2	3/4" - 10 UNC	406	38	292	38	50

Table 4.2

14. If a 100-tonne capacity press is not available, the roller cage assemblies and inner bearing races can be removed in the following manner, which will make them unsuitable for further use.
    a) Use a cold chisel and split the brass retainers of the roller cage assemblies, by making cuts on each side, at 180^{O} apart.
    b) Heat a 12 mm wide strip across the full width of the inner race, using a large tipped acetylene torch, until the strip becomes red in colour. This should expand the metal so that the inner race can be driven off the shaft, using copper rod.

CAUTION!
Do not use a steel rod for driving inner bearing races off the shaft. Use a copper rod and avoid damaging shaft surfaces.

15. The largest diameter on a mechanism shaft has a circumferential lip against which the gear is located, see Figure 4.4. To remove a worn gear, use a 100 tonne capacity press and press the bearing counterweight and gear off the gear side of the lip.
16. If the counterweights and gear are not being removed from the shaft during the mechanism assembly, check and make sure they are tightly mounted on the shafts.
17. Outer races of precision bearings built to Metso Minerals standards are sized for an interference fit with mechanism housing bores. If bores have been damaged, return the mechanism to the factory or to an authorised Metso Minerals service facility for repairs.

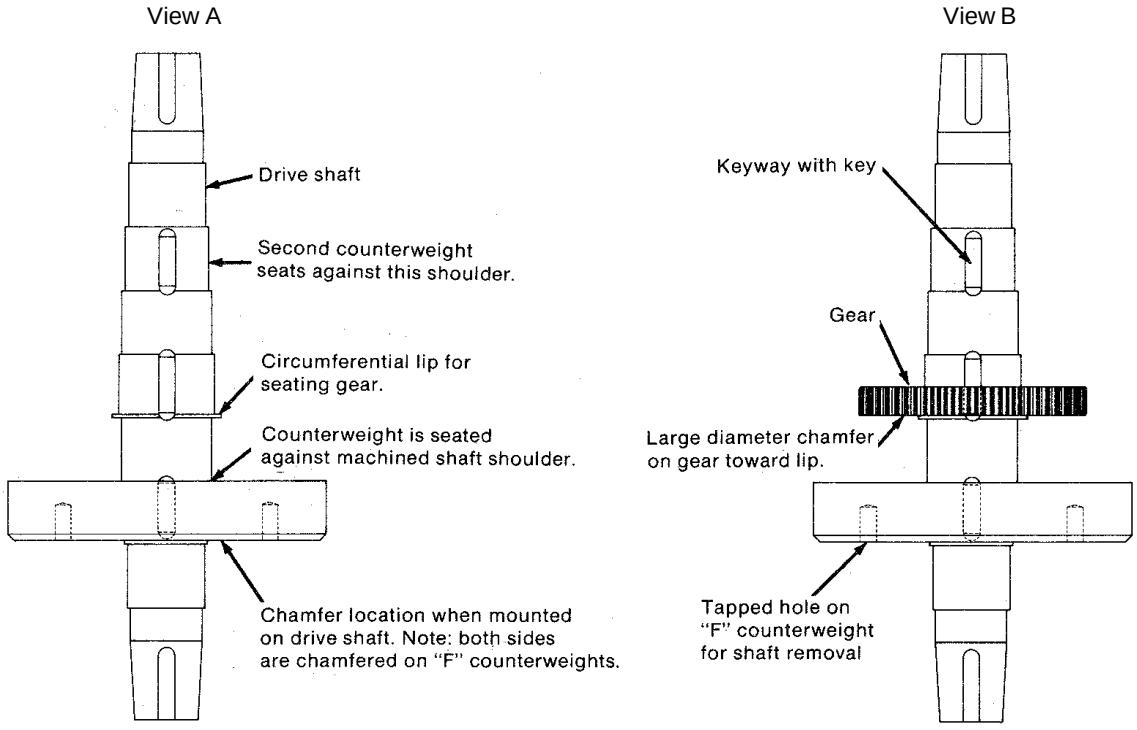


Figure 4.4 Mechanism shaft (key features)

4.3.2 Mechanism Re-Assembly

Before re-assembling a Low-Head mechanism, thoroughly clean all parts, including housing halves, with kerosene, using a brush. Wipe parts with clean rags - avoid leaving threads. Remove and discard oil gaskets and clean all machined surfaces. Dress burrs, scuffs or dents on machined surfaces with a file and emery cloth to obtain a smooth surface.

4.3.3 Handling and Installing Bearings

- Work with clean tools, in clean surroundings.
- Handle bearings only with clean, dry hands.
- Use clean, lint-free rags - no cotton waste.
- Store new bearings in the original, unopened package. Do not open the package until ready to install the bearing.
- Do not interchange bearing parts. Keep components of each bearing - inner and outer races and roller cages - together for assembly.
- Do not spin bearings with compressed air.
- Keep used bearings wrapped in oil-proofed paper until ready to install them.
- Wash used bearings in kerosene, or another approved solvent, then rinse them in light oil.

CAUTION!

When replacing bearings, use only precision bearings built to Metso specifications, and available from Metso Minerals service facilities. Do not use "standard" bearings. They will not give satisfactory service and may damage mechanism parts.

4.3.4 Heating Bearings, Gear and Counterweights

NOTE:

For proper mechanism operation, the gears on the drive and driven shafts must be correctly installed, with match marks lined up.

See Figure 4.10 for match marks and gear assembly. To make sure the gears are properly oriented during assembly, the large diameter chamfer on the bore on one side of each gear must be against the large circumferential lip on each shaft.

See Figure 4.4 and Figure 4.7 for lip locations on drive and driven shafts.

Bearings, gears and counterweights are installed on mechanism shafts with interference fits. These parts must be heated before installation to expedite placement of the parts on the shafts. Use a high flash point oil, and follow local fire regulations. Fully submerge items to be heated for 30 minutes, in oil heated to a temperature of no more than 120^{O}C (250^{O}F). Use a container with rolled, not soldered, seams. Counterweights may also be heated in oil, in an oven or with a torch. Do not exceed a maximum temperature of 176^{O}C (350^{O}F).

NOTE:
Use a thermometer to measure temperatures accurately. Do not depend on guesswork. Style "E" and "F" counterweights have lead inserts with a low melting point and must not be overheated.

WARNING!
Be extremely careful when handling hot oil or heated bearings.

Figure 4.5 Arrangement for assembling counterweight on shaft.

4.3.5 Assembling Gears, Counterweights and Bearings on Shafts

1. Remove one of the heated counterweights from the heat source and locate it horizontally on blocks, or a table top, as shown in Figure 4.4 and Figure 4.5. There must be provision for the drive shaft to extend below the counterweight after it is mounted in the counterweight bore.
2. Place the counterweight for assembly with the chamfered side down. This will assure that the chamfered side of each counterweight will face toward the drive shaft bearings, and away from the gear, when the mechanism drive assembly is completely assembled.

NOTE:
Assemble Style "F" counterweights so that the tapped holes in one face are away from the gear, and accessible for use in pulling the counterweight off the shaft. See Figure 4.3.

3. Install a lifting eyebolt in the tapped hole in one end of the drive shaft. See Table 4.1 for eyebolt dimensions.
4. Lift the shaft into position over the heated counterweight and lower it through the bore until the machined shoulder of the shaft contacts the counterweight solidly with the chamfered side away from the gear location, see Figure 4.4. Note the exception for Style "F" counterweights in Step 2 above.

4.3.5 Assembling Gears, Counterweights and Bearings on Shafts (cont'd)

5. Remove one of the heated gears from the heat source and assemble it on the drive shaft up against the circumferential lip, see Figure 4.4. Be sure to place the gear on the shaft so that the large chamfer in the gear bore is against the circumferential lip on the shaft.
6. Remove the second heated counterweight from the heat source and assemble it on the drive shaft with the chamfered side facing upward, away from the gear. The counterweight must be located securely against the shaft shoulder, see Figure 4.6. Note the exception for Style "F" counterweights, Step 2.
7. Installation of the hot counterweights and gear on the shaft may have caused it to become heated up. Allow it to cool to room temperature before proceeding with bearing installation.

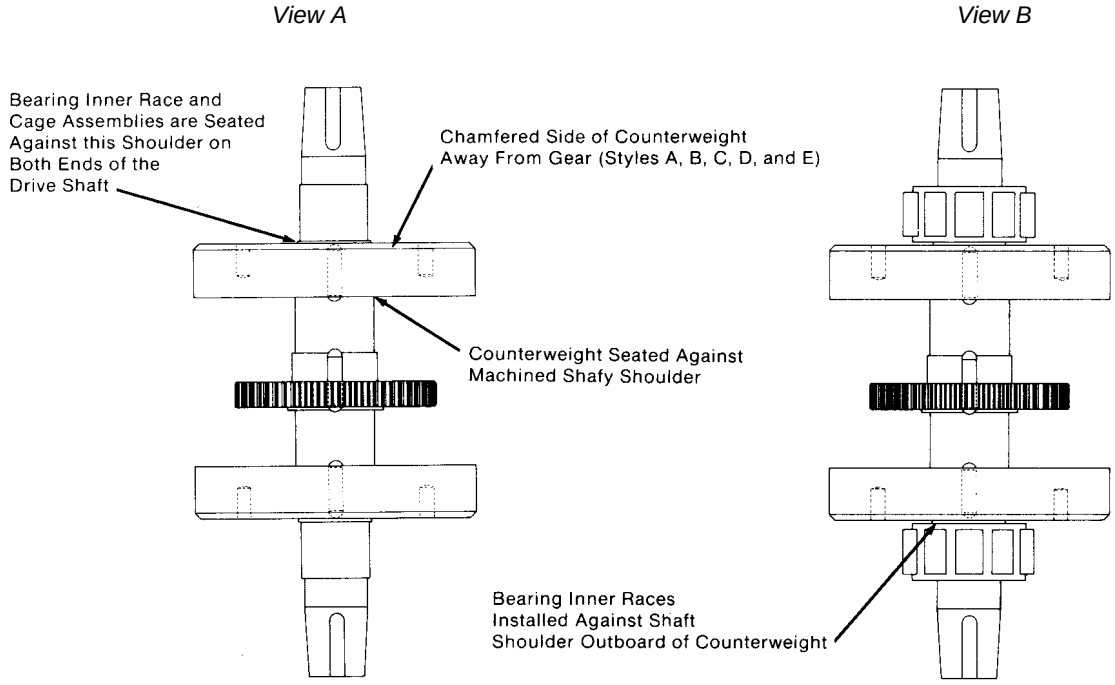


Figure 4.6 Installation of second counterweight and bearing inner races with roller cage assemblies on drive shaft.

8. Using the installed eyebolt and a lifting device, lift the drive shaft, gear and counterweight assembly, and place it on the table with the shaft horizontal, and the larger portion of the two counterweights in the down position.
9. Install one of the heated bearing inner races, along with the roller cage, on each end of the shaft with the identification numbers outward toward the near end of the shaft. Bearing inner races must bear snugly against the shaft shoulders.
10. Prepare to install the counterweights, gear and bearing parts on the driven shaft. Locate one of the heated counterweights on blocks, or a table, as shown on Figure 4.7 and similar to the arrangement pictured on Figure 4.5. There must be a provision for the shaft to extend below the counterweight after it is mounted in the counterweight. Place the counterweight with the chamfered side up for installation on the driven shaft. See Figure 4.4, View "B" for style "F" counterweights.
11. Install a lifting eyebolt in the tapped hole in the end of the driven shaft farthest from the circumferential lip on the shaft. See Table 4.1for eyebolt dimensions. Lift the shaft into position over the heated counterweight and lower it through the bore until the circumferential lip of the shaft contacts the counterweight solidly, with the chamfered side up, and toward the gear location. See View "A" Figure 4.7.

4.3.5 Assembling Gears, Counterweights and Bearings on Shafts (cont'd)

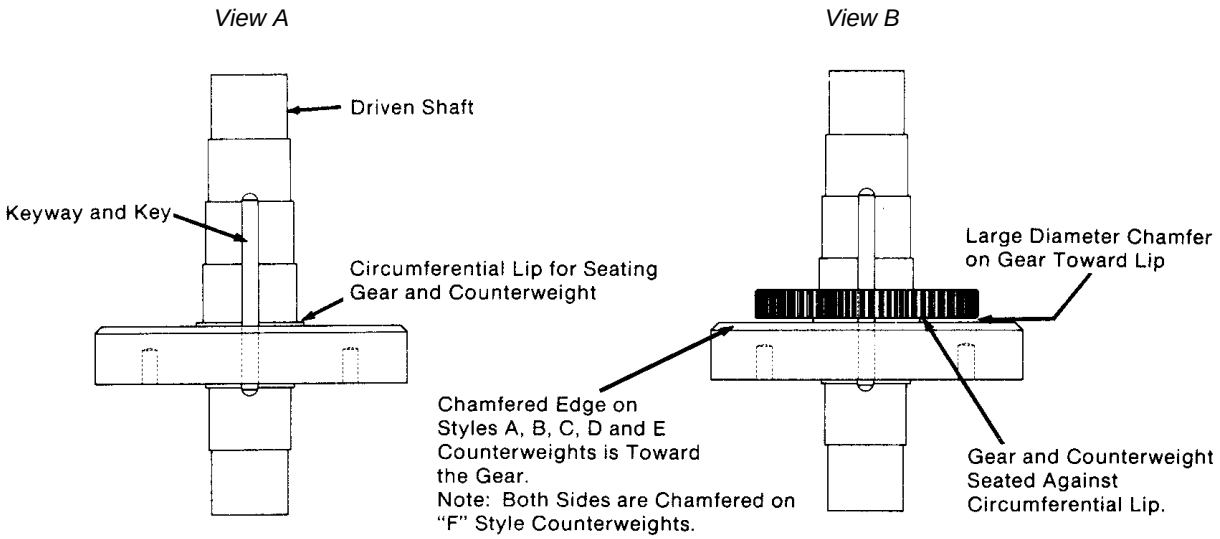


Figure 4.7 Installation of second counterweight and gear on driven shaft.

12. Remove the remaining gear from the heat source and assemble it on the driven shaft up against the circumferential lip on the shaft. Be sure to place the gear on the shaft so that the large chamfer in the gear bore is against the circumferential lip on the shaft.
13. Remove the remaining counterweight from the heat source and assemble it on the driven shaft, up against the shaft shoulder (View "A" Figure 4.8). Be sure that the chamfer is on the counterweight side toward the gear. See Figure 4.4, View "B" for style "F" counterweights.
14. Installation of the hot counterweights and gear on the driven shaft may have caused it to become heated up. Allow it to cool to room temperature before proceeding with bearing installation.
15. Using the installed eyebolt and a lifting device, lift the drive shaft and installed gear and counterweights, and place it on the table with the shaft horizontal and the larger portion of the two counterweights in the down position. Install one of the heated bearing inner races, along with the roller cage, on each end of the shaft with the identification numbers outward toward the near end of the shaft. See View "B" Figure 4.8. Bearing inner races must bear snugly against the shaft shoulders.

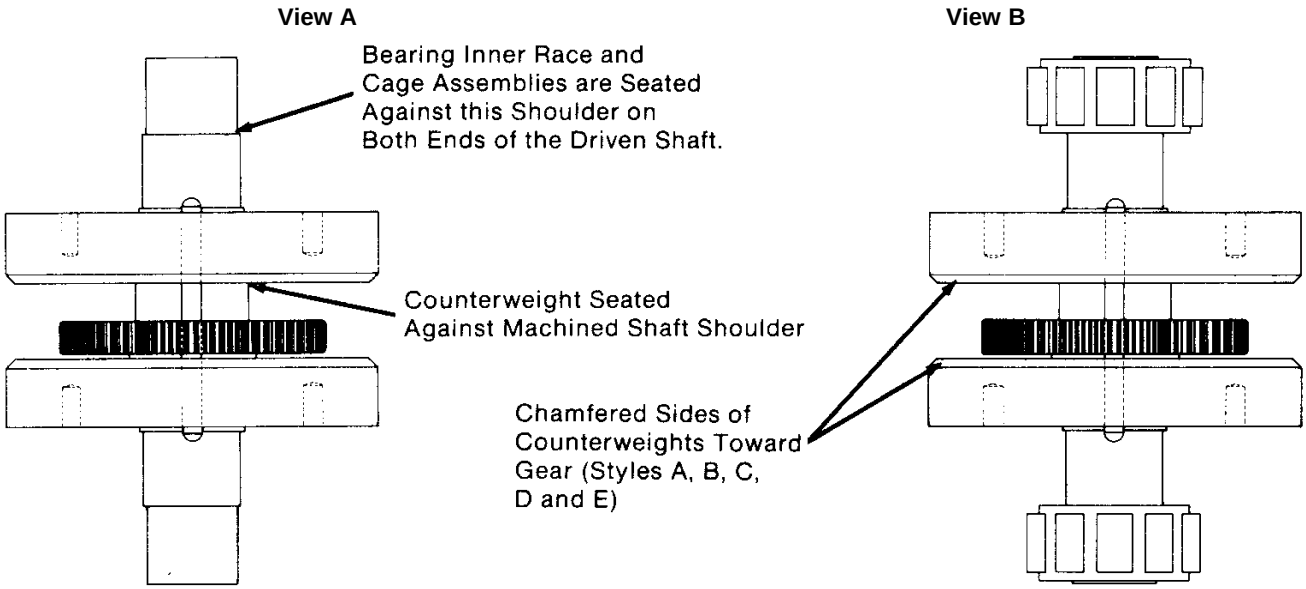


Figure 4.8 Installation of second counterweight and bearing inner races with roller cages on driven shaft.

4.3.6 Bearing Assembly in Mechanism Housing

Assemble the bearing outer races in the mechanism housing bores so that the lip of each race faces toward the outside of the housing (Figure 4.9). Coat the bore surfaces with a light oil or with micronised graphite to facilitate installation of the bearing races. Chilling the races before assembly will make installation easier.

CAUTION!
Use a rawhide hammer to tap the outer races into position in the housing bores. Pounding with a metal hammer can damage the race or housing fits.

CAUTION!
Component parts of each bearing - inner races and roller cages with outer races must be assembled together, as received.
DO NOT interchange bearing parts.

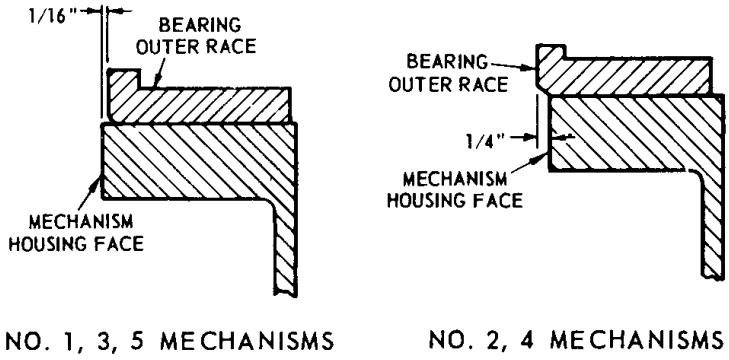


Figure 4.9 Position of bearing outer race in relation to mechanism housing face before assembling bearing caps.

Refer to Figure 4.9 for the correct location of bearing outer races with respect to the mechanism housing face. On No. 3, 5 and 5 1/2 mechanisms, tap the outer race into the housing bore, 1.5 mm beyond the housing face.

On No. 2 and 4 mechanisms, tap the outer race into the bore until the race projects 6 mm outside of the housing face when assembled in the housing. The bearing seal plate (3105-0) and bearing caps (3175-0 and 3150-0) will locate the bearing outer races in the correct position, and allow the required amount of end float for the shaft assembly in the bearings. Refer to Figure 4.1 for parts orientation.

4.3.7 Gasket for End Float

All mechanisms require 0.8mm thick gaskets (3160-0) between bearing caps (3175-0 and 3150-0) and bearing seal plate (3105-0) and the mechanism housing.

NOTE:
Always install new gaskets when re-assembling the mechanism.

4.3.8 Final Assembly Steps

1. Coat the groove in the bearing seal plate (3105-0) with a light paste-type gasket compound or shellac.
2. Install the drive shaft oil seal (3110-0) in the bearing seal plate (3105-0). Be sure that the knife-edge of the oil seal faces toward the inside of the mechanism.

CAUTION!
Do not dent or otherwise damage the oil seal. Grease the seal surface before installing it over the drive shaft.

3. Assemble the bearing caps (3175-0 and 3150-0) to the housing half with the capped drive shaft and place the housing half on blocks in a horizontal position, with the capped side down.
4. Install the drive and driven shaft assemblies individually into the housing half. Be sure that the match lines on the side of the gear rim line up when the gears are meshed together (See Figure 4.10).

NOTE:
When installing drive and driven shafts into mechanism housing. Ensure the driven, or short shaft, is on the end with the step.

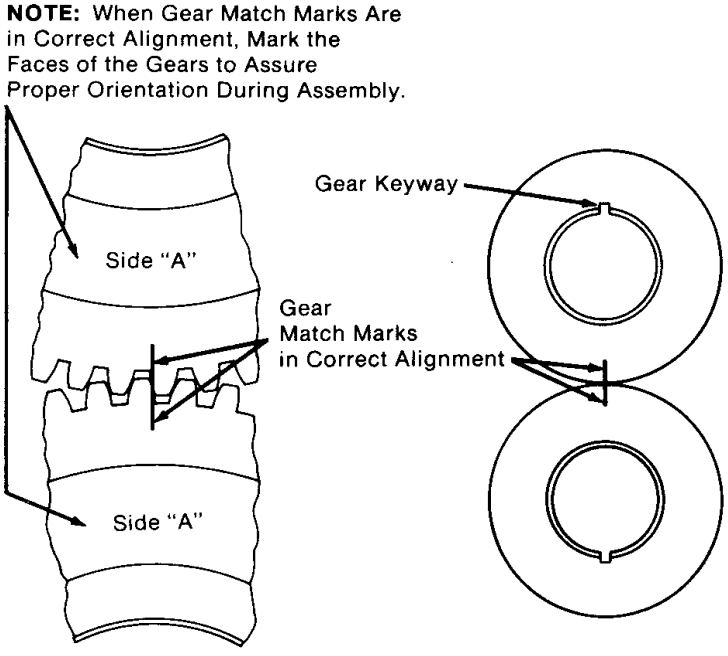


Figure 4.10 Match mark alignment of properly assembled gears.

5. Install a new 0.8 mm thick gasket on the housing half joint.
6. Assemble the other housing half over the shaft assemblies. Install roll pins (3012-0) in the designated locations (See Figure 4.2). Install housing joint bolts (3010-0) and draw them up tightly.

7. Assemble the bearing seal plate (3105-0) and caps (3175-0 and 3150-0) over the shaft ends, along with 0.8 mm gaskets for end float.

4.3.9 Check End Floats and Clearances

1. Insert an eyebolt into the tapped hole in the uncapped end of the drive shaft.
2. Tap the exposed shaft end with a rawhide hammer to make sure it is fully seated, position "A", Figure 4.11.
3. Install a dial indicator, positioned to check shaft travel and set the dial on zero. See Figure 4.11.
4. Lift the drive shaft as far as possible. At the same time, use the dial indicator to get a reading of the distance travelled by the shaft during the lifting operation. The distance travelled is the total end float for the drive shaft. Make a record of the reading, position "B", Figure 4.11.
5. Check for clearance of the rotating parts, with the drive lifted as far as possible, by rotating the shaft 360^{O}.
6. Lower the drive shaft and remove the lift and eyebolt, as well as the dial indicator.
7. Remove the bearing cap (3175-0) covering the end of the driven shaft.
8. Insert an eyebolt into the tapped hole in the driven shaft.
9. Tap the exposed end of the driven shaft with a rawhide hammer to make sure it is fully seated, position "A".
10. Install the dial indicator in a position to check shaft travel and set the dial on zero.
11. Lift the driven shaft as far as it will go. At the same time, use the dial indicator to get a reading of the distance travelled by the shaft during the lifting operation. This distance is the total end float for the driven shaft. Make a record of the reading, position "B".
12. Check for clearance of rotating parts, with the driven shaft lifted as far as possible, by rotating the shaft 360^{O}.
13. Lower the driven shaft and remove the lift and eyebolt, as well as the dial indicator.
14. Replace the bearing cap (3175-0) and gasket over the driven shaft.
15. Acceptable end float is given in Table 4.3.
16. If end float is less than minimum given in table 4.3 on both shafts, install an additional gasket between the housing halves.
17. If end float is less than the minimum given in table 4.3, on one shaft only, install additional gasket between the housing and bearing caps (3175-0 and 3150-0) relating to that shaft only. In addition, it will be necessary to reposition the outer bearing race (3350-0) against the seal plate (3105-0) or bearing cap (3150-0 and 3175-0) depending on which side the extra gasket is installed. Consult Metso Minerals before proceeding.
18. After adding gaskets per Step 16 check end float again, as outlined above.
19. If end float is more than the maximum given in Table 4.3, consult Metso Minerals immediately.

Mechanism Size	Minimum End Float (mm)	Maximum End Float (mm)
2	0.8	2.4
3	0.8	2.4
4	0.8	2.4
5	1.6	3.1
5 1/2	1.6	3.1

Table 4-3 Mechanism End Float Range

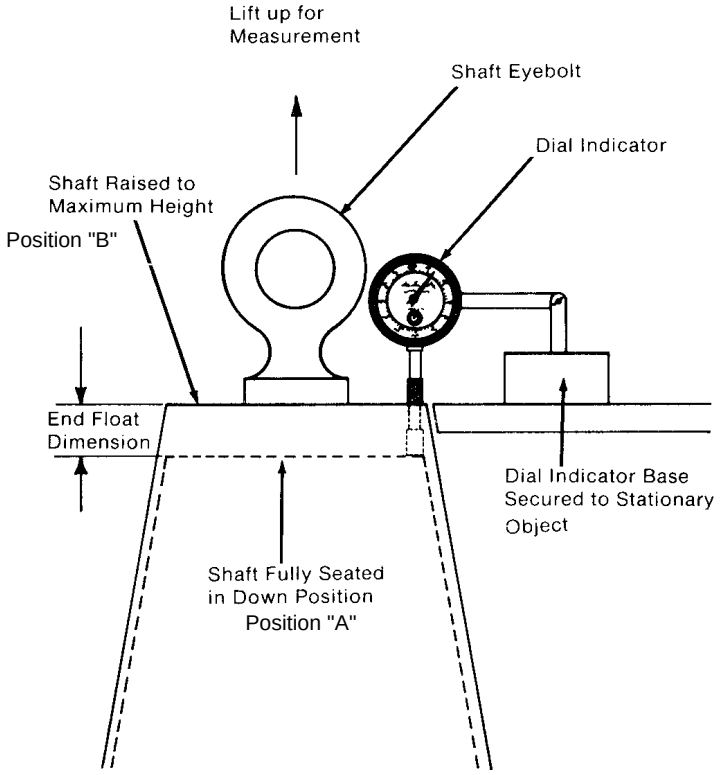


Figure 4.11 Dial indicator arrangement for checking shaft end float.

4.3.10 Mechanism Assembly on Screen

NOTE:
Before beginning the assembly operation, be sure that the mechanism support "face" is "true" and clean, so that the mechanism feet will have even bearing at all times.

Use a lifting device to place the mechanism on the mechanism support. The lifting mass is listed on the *General Arrangement* drawing provided.
If the support surface has been damaged due to operation with loose bolts and studs, it will be difficult to keep the replacement mechanism mounted tightly on the support.
As a temporary repair, use a paper shim 0.076 to 0.127 mm between the support and the mechanism feet, to obtain additional bearing surface. This is a short-term measure, and cannot be depended on for continuing service.

If bolt failure occurs, replace the mechanism support and return the mechanism to the factory for re-machining of the feet.
A ledge is machined on the lower edge of all mechanism supports to properly locate No. 2, 3, 4, 5 and 5 ½ mechanisms. A corresponding recess in the mechanism feet will facilitate assembling of mechanisms on supports.

4.3.11 Mechanism Hold-Down Bolts

No. 2, 3 and 4 mechanisms are attached to the mechanism supports with four through bolts (3425-0) which fit into tapped holes in the mechanism housing feet. Hardened steel washers (3420-2 and 3425-2) are used with these bolts.

No.5 mechanisms are attached to the mechanism support with eight close fitting through bolts (3420-2) and hardened steel washers (3425-2)

Holes are drilled in the mechanism supports for tap bolts provided 3.2 mm approx. clearance. See Figure 4.13. Hold-down bolts (3420-0) are high strength, made of alloy steel.

CAUTION!
Do not use standard bolts as a substitute for the specified high strength bolts.

Install through and tap bolts as shown in Figure 4.12 and Figure 4.13.
Tap bolts are not used with No.5 and 5 ½ mechanisms.

CAUTION!
Do not substitute bolt 3425-0 for 3420-0. It is not long enough.

In some installations, tap bolt (3425-0) requires two hardened steel washers (3425-2) instead of one to keep the tap bolt from bottoming out in the tapped hole. When reinstalling mechanism, use the same number of washers as is furnished with the bolts.

Tighten bolts and nuts, after installation, as follows: -

a) Place a short piece of bar stock between the side of No. 2, 3, and 4 mechanism housings and the flat of the nut (3420-1) to keep the nut from turning. On No.5 mechanisms use a socket wrench to keep the nut from turning.

b) Tighten the bolts with a socket wrench on the head of the bolt until 'snug-tight condition'.

c) Finally torque the bolts to the recommended torque value (Table 4.4) using suitable size torque multiplier.

NOTE:
Lubrication is not recommended on mechanism hold-down bolts.

Mech Size	Bolt Dia	Tightening torque (Nm)	
		UNC	UNF/12UN
No.2	1 ¼”	1410	1700
No.3	1 5/8”	2740	3290
No.4	1 7/8”	3850	4620
No.5	1 ¾”	3425	4110
No.5½	1 ¾”	3425	4110

Table 4.4 Hold-down bolt tightening torques.

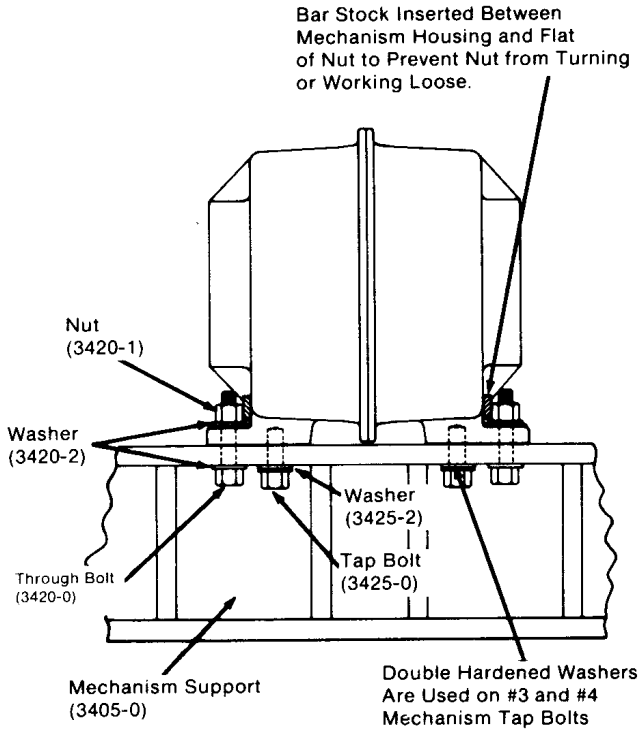


Figure 4.12 Mechanism mounting, No.2, No.3 and No.4.

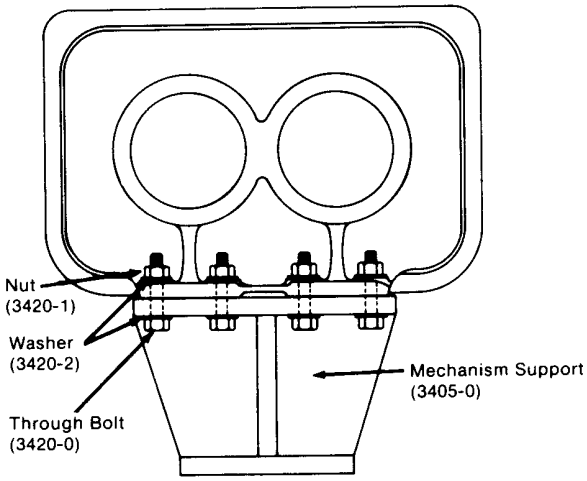


Figure 4.13 Mechanism mounting, No.5 only.

4.4 Multiple Mechanisms

To produce the amplitude required to perform the screening process, screens may be fitted with multiple mechanisms. This can be either twin or triple mechanism arrangements.

Multiple mechanisms must operate in synchronism to prevent induced torsional body stresses and premature screen failure

4.4.1 Multiple Mechanism

Procedure for fitting Multiple Mechanisms to Mechanism Beam.

1. Set mechanism beam in an upright position
2. Clean top face of mechanism beam ensuring there are no burrs on step or bolt holes.
3. Clean the underside of the mechanisms ensuring step and mating faces are free of paint and other contamination.
4. Fit mechanisms to mechanism beam ensuring that the step on the beam meets firmly with the step on the mechanism also ensuring the coupling faces are parallel.
5. Tighten mechanisms to required torque continually checking mechanism alignment and end float to ensure no movement during tightening.

4.4.2 Mechanism Gear Alignment

Refer to section 4.3 for information on aligning the driven shaft gear with the drive shaft gear in a mechanism. Installing the drive and driven shaft assemblies with gear match 'marks not in alignment will cause deviations in the screen motion angle from the standard 45 degrees.

When multiple mechanisms are used, misalignment in any of the mechanisms will cause the mechanisms to be out of phase with each other. This will produce a "couple", or torsional twist, to the screen body, which could result in premature mechanism support failure, and affect screen side plates and other parts.

4.4.3 Mechanism Failure

If one mechanism fails, stop machine immediately. Operating screen on one mechanism will induce stresses throughout the support frame and can cause premature screen failure.

WARNING:
Do not operate screen on one mechanism.

4.5 Twin Mechanisms

The following instructions apply to the shaft and couplings arrangement that transfer torque between twin mechanisms when they are to be driven from a motor fitted directly outside one of the mechanisms.

4.5.1 Connecting Shaft Assembly

1. Clean bore of shaft adaptors and fit onto drive shafts of mechanisms making sure they are pulled firmly onto taper.
2. Assembly Connecting Shaft to couplings as per Assembly Instructions on drawing 26-A41-697 in Section 5 of Manual.
3. Fit coupling bolts and torque to 88 Nm (65 ft/lbs).
4. Apply Loctite to all screw threads on final assembly.

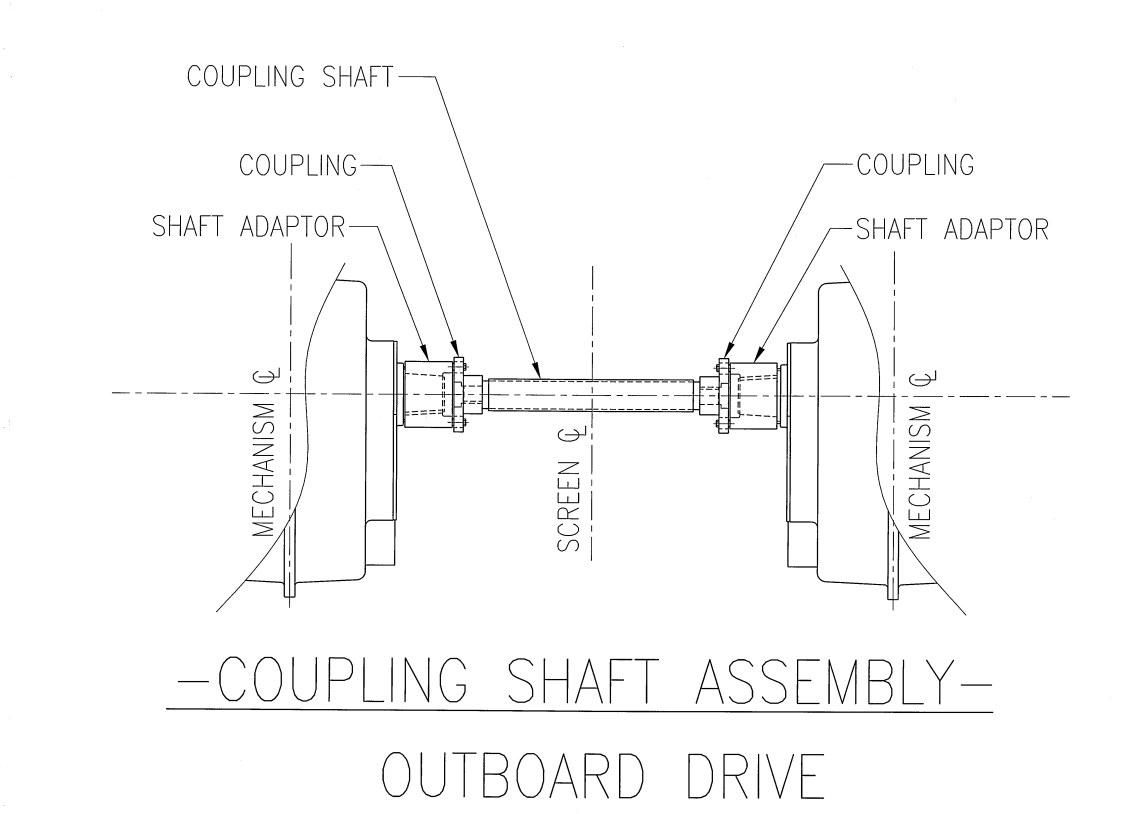


Figure 4.15 Outboard Connecting Shaft

4.5.2 Installing a Replacement Shaft Assembly

1. Fit mechanism to mechanism beam, see paragraph 4.5.1
2. Clean bore of shaft adapters and fit onto drive shafts of mechanisms using key, retaining washer and bolts, making sure they are pulled firmly onto taper.
3. Push end-float in both mechanisms in the same direction and measure the distance Dim. "A", (see Drawing 26-A41- 697 in Section 5) between both mechanism shaft adaptors.
4. Adjust the length of the shaft assembly to the dimension measured in step 3 (Dim. 'A') using spacer washers.
5. After a suitable combination of spacer washers (to produce Dim. 'A') has been found, the coupling key can be fitted; followed by excess spacer washers, retaining washers, and bolts.
6. Push end-float in one mechanism so as to maximise Dim.'A', then fit the connecting drive shaft to the shaft adaptors using coupling bolts and washers and torque to 88 N.m (65ft.lbs).
7. Check end-float of total assembly as detailed in Section 4.4.9, apply Loctite to all screw threads on final assembly.

4.5.3 Outboard Direct Drive

This procedure should be used to replace the direct drive cardan shaft, taper locks and / or electric motor.

1. Remove bolts from cardan shaft flanges, check shaft for damage, replace if necessary.
2. Remove taper lock bushes, removal procedure given in Section 2.5.2, check for damage, replace if necessary.
3. If motor requires service or replacing this can now be done.
4. Clean all components to be used for reassembly including cardan shaft.
5. Fit shaft adapters onto the motor and mechanism drive shafts using key, retaining washer and bolt, ensuring they are pulled firmly onto taper.
6. Insert cardan shaft between adapters adjusting the location of shaft adapters as required to ensure cardan shaft has even plunge.

CAUTION:
The angle between motor/mechanism shaft and cardan shaft cannot exceed 8^0 in any plane, if greater than 8^0 is required contact the Engineering Department at Metso Minerals Limited.

NOTE:
Ensure the cardan shaft has even plunge (-55mm to +55mm) before mounting the flanges to shaft adapters.

7. Bolt cardan shaft flanges onto shaft adapters, ensuring to tighten each bolt in accordance with Section 6, then moving to the bolt on the opposite side, giving even pressure around the adapter. Apply Loctite to all screw threads on final assembly.
8. Grease cardan shaft elbows and plunger.
9. Assemble guard over cardan shaft in a position that will leave enough room for start up and shutdown screen amplitude, approximately 75mm, lock down with bolts supplied. If no guard is supplied with drive arrangement, ensure guards fitted comply with A.S 4024.

4.5.4 Outboard Jack Shaft Drive

Before disassembling the drive assembly ensure you are familiar with the installation procedure and Drawing Number 26-A43-667 or *Outline Installation*, in Section 5, and be careful when handling bearings, shaft and shaft components.

1. Remove V-belts and carryout any maintenance / replacement of motor.
2. Remove cardan shaft, check for damage, replace if necessary.
3. Remove driven pulley and taper lock, cardan shaft adapter and mechanism shaft adapter, check for damage, replace if necessary.
4. Remove plummer block caps, spacer washers (located in one plummer block) and jack shaft.
5. Remove labyrinth seals and adapter sleeves, check for damage, replace if necessary, remove and replace bearings.
6. Clean all parts to be used for reassembly, including plummer block housings.
7. Mark midpoint of jack shaft and equidistant from this point at each shaft end mark the location of the inner and outer faces of the plummer blocks on the jack shaft.
8. Slide adapter sleeve into both bearings and attach locking nut with a few turns, ensuring all components are clean prior to assembly.
9. On jack shaft slide one labyrinth seal then adapter sleeve / bearing assembly then final labyrinth seal onto both ends of jack shaft using markings to get approximate component location.

NOTE:
When locating bearing components on jack shaft ensure adapter sleeve thread faces each end of jack shaft and the o-ring on each labyrinth seal faces away from the bearing housing.

10. Lower jack shaft evenly between plummer bearing housings, aligning labyrinth seals and bearing assemblies into plummer block.
11. Mount taper lock and driven pulley to one end and shaft adapter to other end of jack shaft, secure as shown in Section 2.5.1.

NOTE:
Support taper lock bushes evenly on jack shaft, ensuring even shaft and bush overlap either end of shaft assembly. Support jack shaft evenly with plummer block bearings.

12. Align driven pulley with drive pulley, lightly secure bearing adapter sleeve nut to one shaft and insert spacer rings into plummer block. Once one bearing is secure lightly attach the other bearing to the jack shaft with sleeve nut.
13. Clean bore of shaft adapter and fit onto drive shaft of mechanism making sure it is pulled firmly onto taper.
14. Attach cardan shaft to jack shaft and mechanism shaft adapter, ensuring to tighten bolts evenly in accordance with Section 6.
15. Grease cardan shaft elbows and plunger.

CAUTION:
The angle between motor/mechanism shaft and cardan shaft cannot exceed 8^0 in any plane, if greater than 8^0 is required contact the Engineering Department at Metso Minerals (Australia) Limited.

16. If required reposition coupling to allow even plunge of cardan shaft. Re-align pulleys if necessary.

NOTE:
Ensure the cardan shaft has even plunge (-55mm to +55mm) before running screen.

17. Remove spacer washers, tighten bearing adapter sleeve nuts to ensuring jack shaft is locked tight with bearing, replace spacer washers, fasten plummer block housing cap and grease bearings.

NOTE:
Metso Minerals typically supply SSN 513 bearings with jack shaft drive arrangements, these need 180g of grease for initial fill. If a different bearing model is used contact Metso Minerals (Australia) Limited Engineering Department for correct grease amount.

18. Rotate driven pulley slowly to ensure assembly functioning correctly.
19. Install V-belts to pulley arrangement in accordance with Section 2.6.
20. Install guards if provided, making sure enough room is left around guard for start up and shutdown screen amplitude, approximately 75mm, lock down with bolts provided. If no guard supplied ensure guard fitted complies with A.S. 4024.

4.6 Routine Maintenance Schedule

4.6.1 Daily Checks

Screen Mechanism Refer to Section 3 for lubrication procedure.	Check mechanism oil level. Remove oil level indicator plug in housing. Check oil level prior to screen start up. In case of continuous operation, stop screen a sufficient length of time to allow all oil to drain to the bottom of the housing. Check mechanism vents. Clean or replace if necessary. Check for any indication of loose mechanism bolts
Drive Assembly Refer to Section 2 for V-belt adjustment procedures.	Check V-Belt drive for indication of looseness, turning, wear or breakage. Replace belts in sets to maintain uniform belt stretch. Check alignment of pulleys (visual check only) Be sure guards are secured in place.
Screen Body	Check for possible interference between screen body and stationary hoppers, chutes and building beams due to material build-up or insufficient operating clearance. Check screen decks for blinding, or build-up of material. Remove if present. Check deck arrangement for possible loose, or damaged surface, clamp bars/bolts, hold-down bars/bolts, buffer strips. Note that top deck wear (and damage) is usually much more severe than on lower decks. With screen running, check for loose bolts or parts. Stop screen prior to tightening of bolts or parts to avoid possible personnel injury. With screen running, check pattern of material flow over screen decks. Bed should be evenly distributed over full width of screen.
Screen Mounting	Check spring compression for even loading Check springs for breakage or material build-up around the coils Check snubber assembly.

CAUTION!

Do not continue operating the screen without rectifying any abnormal conditions identified in the daily maintenance checks.

4.6.2 Weekly Maintenance Checks

Screen Mechanism	Check oil for indication of contamination (metal particles similar to fish scales indicates spalling of bearing). If present, flush out mechanism and refill with correct amount of new oil. Refer to Section 3 for lubrication procedures. Check mechanism while running for possible noise.
Screen Body	Check side plate for loose bolts, excessive wear, or possible cracking. Check screen surface for wear, looseness or breakage. Check perforated plate hold-down bolts, where fitted. Check clamping bars for looseness and excessive wear, where fitted. Check support frames thoroughly for wear cracking or breakage. Repair if necessary (after consulting with Metso Minerals Engineering Department) Check buffer strips for wear. Worn buffer strips will reduce deck camber, resulting in loss of screen surface support and premature failure of deck cloth. Check the compressed length of the screen suspension springs and record any variation from the measurements recorded when the springs were initially installed.

CAUTION!

Do not continue operating the screen without rectifying any abnormal conditions identified in the weekly maintenance checks.

4.6.3 Monthly Maintenance Checks

Screen Mechanism	Check oil per lubricating instructions. Check mechanism hold down bolts for proper torque. Grease Cardan shaft
Screen Body	Thoroughly check all bolts for tightness and evidence of cracking in screen components and side plates.

5. Drawings

5.1 Drawings and Vendor Data

5.1.1 Drawings

SCREEN - S/N.: A7890

OUTLINE INSTALLATION:	26-Z57-890 PAGE 1 OF 2
OUTLINE INSTALLATION:	26-Z57-890 PAGE 2 OF 2
GENERAL ARRANGEMENT:	26-A52-693
CONNECTING SHAFT ARRANGEMENT:	26-A41-697
JACK SHAFT ARRANGEMENT:	26-A43-667

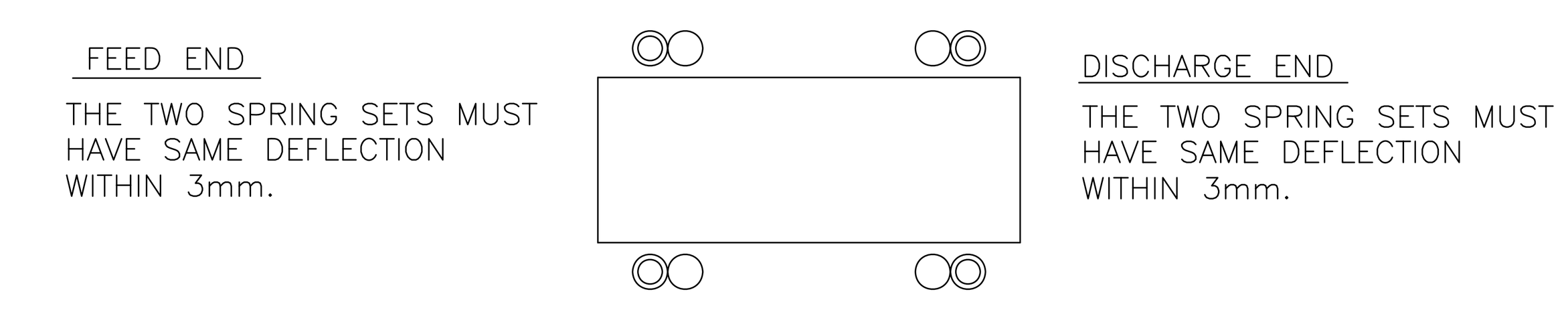
SCREEN SURFACE:	TRELLEX 305 LS
MOTOR BASE:	LEVERLINK 4G-3
MOTOR MANUAL:	TOSHIBA

SPRING IDENTIFICATION TABLE

SPRING LOCATION	FREE LENGTH	OUTSIDE DIAMETER	WIRE DIAMETER	TOTAL No OF COILS	PART No	MK
FEED END OUTER	470	242	32	10.875	99-A40-001	009
FEED END INNER	390	166	24	11.125	99-A40-001	010
DISCHARGE END OUTER	470	242	32	10.875	99-A40-001	009
DISCHARGE END INNER	390	166	24	11.125	99-A40-001	010

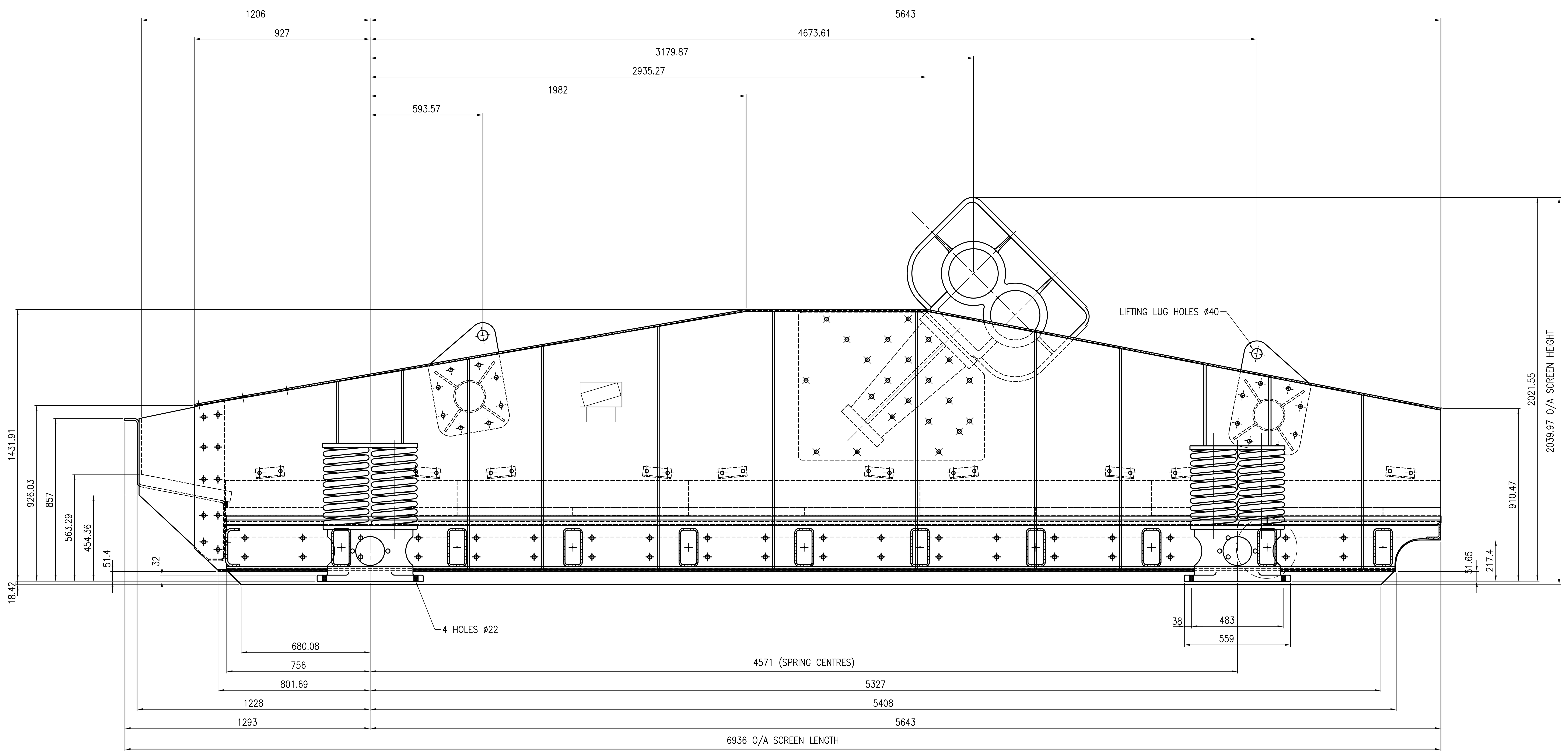
SPRING LOCATION DIAGRAM

FEED END
THE TWO SPRING SETS MUST HAVE SAME DEFLECTION WITHIN 3mm.



DISCHARGE END
THE TWO SPRING SETS MUST HAVE SAME DEFLECTION WITHIN 3mm.

FAILURE TO ACHIEVE THIS COULD RESULT IN PREMATURE FAILURE OF SCREEN.



-ELEVATION-

2225 kg
STATIC WEIGHT
PER CORNER

2675 kg
STATIC WEIGHT
PER CORNER

TOTAL SCREEN LIVE WEIGHT = 9150 KG.

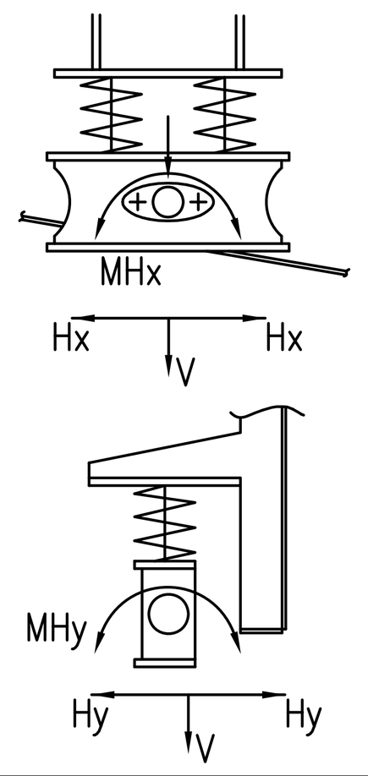
NOTE FOR SUPPORT STRUCTURE

VIBRATION LEVELS OF THE SUPPORTING STRUCTURE NOT TO EXCEED 10 MM/SEC PEAK LEVEL MEASURED AT THE BOTTOM OF THE SPRING PEDESTALS IN THE TRI-AXIAL DIRECTION. ALL EXCEPTIONS TO THIS REQUIREMENT HAVE TO BE AUTHORISED BY ENGINEERING DEPARTMENT, METSO.

DYNAMIC FORCES PER CORNER

VALUES DO NOT INCLUDE SAFETY FACTORS OR MATERIAL LOADS.

DESCRIPTION		FEED END OPERATING CONDITION	FEED END TRANSIENT CONDITION	DISCHARGE END OPERATING CONDITION	DISCHARGE END TRANSIENT CONDITION
VERTICAL (NEWTONS)	V	1394	13623	1394	13623
HORIZONTAL (NEWTONS)	Hx	764	4912	764	4912
LATERAL (NEWTONS)	Hy	MINIMAL	2358	MINIMAL	2358
MOMENTS (NEWTON-METRE)	MHx	316	2032	307	2032
MOMENTS (NEWTON-METRE)	MHy	MINIMAL	975	MINIMAL	946
SPEED	RPM	900	126	900	114



CUSTOMER NOTES

4) OPERATOR NOTE – BEFORE INITIAL START UP OF MACHINE REFER TO OPERATOR'S MANUAL FOR LUBRICATION OF MECHANISM / VIBRATOR DETAILS.
3) HAND OF DRIVE DETERMINED BY STANDING AT FEED END OF SCREEN LOOKING IN THE DIRECTION OF MATERIAL FLOW.
2) 75mm CLEARANCE REQUIRED BETWEEN ALL STATIONARY OBJECTS AND SCREEN BODY.
1) REFER TO ENGINEERING DATA SHEET 26x6673-05 FOR CALCULATING SUPPORT STRUCTURE.

Issue	Date	By	Description
04	30-07-07	SH	FEED END CROSS TIE MOVED FORWARD 350 MM TO ALLOW FITMENT OF FEED CHUTE
03	15-02-07	SH	SCREEN NOW SINGLE DECK WAS DOUBLE DECK WITH TWIN 5-3F MECHS
02	20-11-06	SH	DRIVE REVISED TO RH JACK SHAFT CARDAN SPEED NOW 850 RPM
01	28.09.06		

CERTIFIED FOR
METSO MINERAL PROCESSING

YOUR ORDER: PRM 10843 OUR ORDER: 2602-A7890
MACHINE: 2.4 x 6.1 SD LOW HEAD SCREEN
SERIAL No: A7890
Metso Minerals Limited. ACN 000197428
PER: *Shane Hickey* DATE: 28.09.06

DO NOT SCALE
IF IN DOUBT, ASK

DIMENSIONS IN MILLIMETRES

3rd ANGLE PROJECTION

TOLERANCES AND FINISH		
LINEAR	WHOLE NUMBER	±1.5
LINEAR	ONE DECIMAL PLACE	±0.5
ANGULAR	ALL ANGLES	±0.5
FINISH	6.3 UNLESS OTHERWISE STATED	

DRAWN: D.R.T. SCALE: 1 : 10
CHECKED: S.H. SHEET: 1 of 2
APPROVED: *S.HICKEY* ASSY DRG:
SIMILAR TO:

metso minerals

TITLE: OUTLINE INSTALLATION 2.4 x 6.1 SD LOWHEAD DUAL 4-3F MECHANSIMS HORIZONTAL, BASE MOUNTED.

SIZE A0 DRG No 26-Z57-890 ISSUE 04

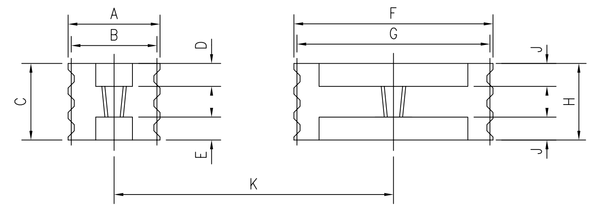
DRIVE PULLEY				
A	B	C	D	E
ø234.0	ø224.0	111.0	23.0	23.0

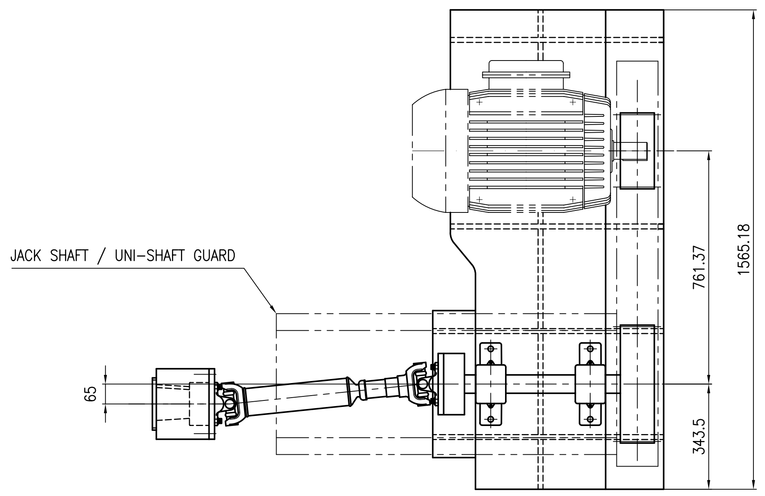
DRIVEN PULLEY				
F	G	H	J	K
ø385	ø375.0	111.0	23	851

MOTOR		
POWER	FRAME	SPEED
30kW	D200L	1495

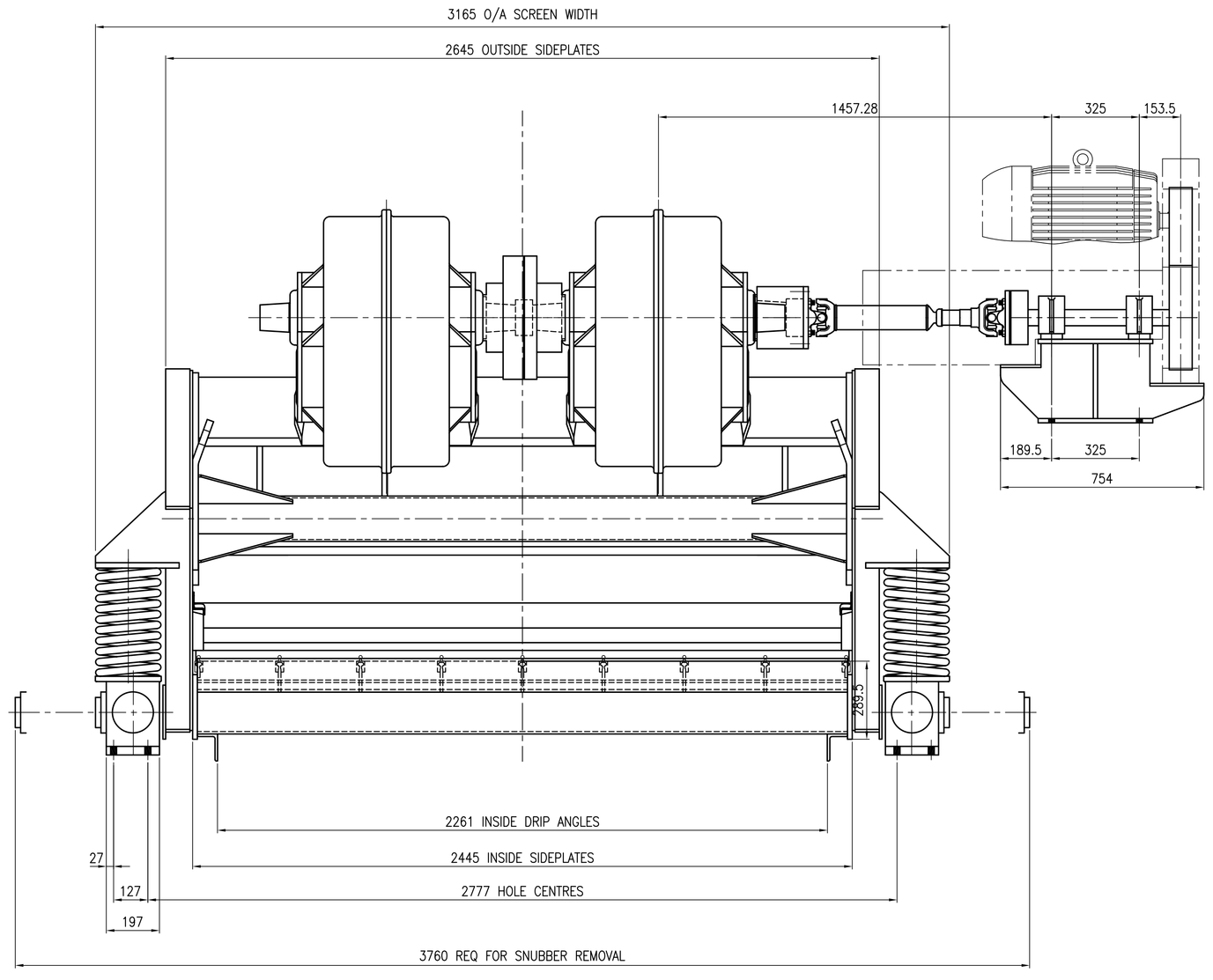
VEE BELTS	
NUMBER	TYPE
4	SPC2650

DRIVE DETAILS

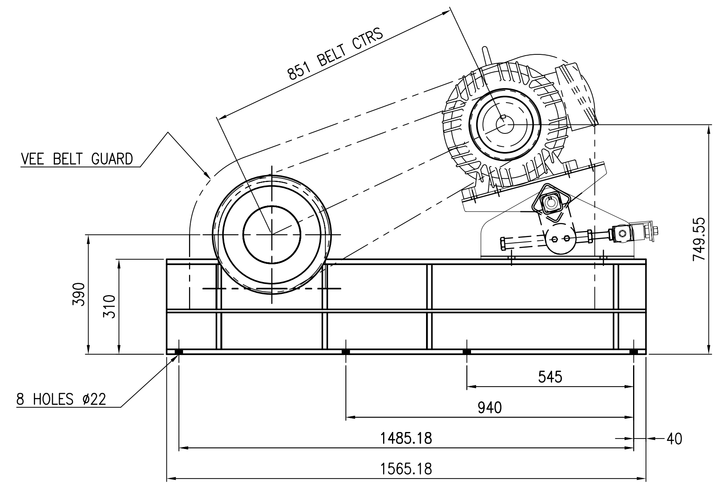




–DRIVE PLAN–



–END ELEVATION–



–DRIVE ELEVATION–

4) OPERATOR NOTE – BEFORE INITIAL START UP OF MACHINE REFER TO OPERATOR'S MANUAL FOR LUBRICATION OF MECHANISM / VIBRATOR DETAILS.
3) HAND OF DRIVE DETERMINED BY STANDING AT FEED END OF SCREEN LOOKING IN THE DIRECTION OF MATERIAL FLOW.
2) 75mm CLEARANCE REQUIRED BETWEEN ALL STATIONARY OBJECTS AND SCREEN BODY.
1) REFER TO ENGINEERING DATA SHEET 26x6673-05 FOR CALCULATING SUPPORT STRUCTURE.

CUSTOMER NOTES

CERTIFIED FOR
METSO MINERAL PROCESSING

YOUR ORDER: PRM 10843 OUR ORDER: 2602-A7890
MACHINE: 2.4 x 6.1 SD LOW HEAD SCREEN
SERIAL No: A7890
Metso Minerals Limited. ACN 000197428
PER: *Shane Hickey* DATE: 28.09.06

DO NOT SCALE IF IN DOUBT, ASK
DIMENSIONS IN MILLIMETRES
3rd ANGLE PROJECTION

TOLERANCES AND FINISH		
LINEAR	SINGLE NUMBER	±1.5
	ONE DECIMAL PLACE	±0.5
ANGULAR	ALL ANGLES	±0.5
FINISH	6.3 UNLESS OTHERWISE STATED	

DRAWN	D.R.T.	SCALE	1 : 10
CHECKED	S.H.	SHEET	2 of 2
APPROVED	S.HICKEY	ASSY DRG	
SIMILAR TO		SIZE	A0

DRG No 26-Z57-890 ISSUE 04

FILE PAGE 1 OF 2 DRAWINGS
01 28.09.06

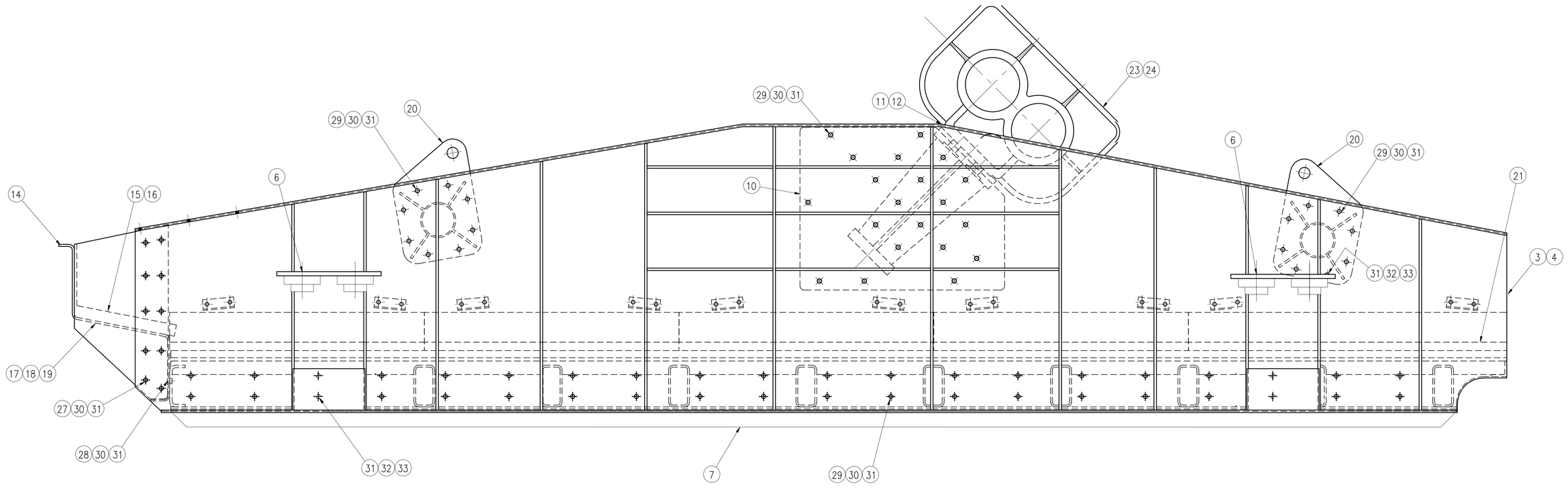
metso minerals

TITLE
OUTLINE INSTALLATION
2.4 x 6.1 SD LOWHEAD
DUAL 4-3F MECHANSIMS
HORIZONTAL, BASE MOUNTED.

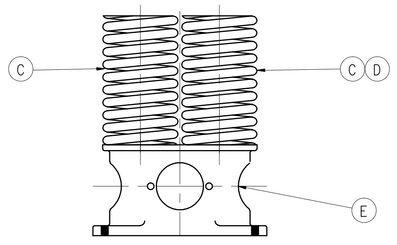
MARK No					ITEM	DESCRIPTION	PART NUMBER		MASS EA kg	
				801			DRG No.	MK	RGH	FIN
				X	1	GENERAL ARRANGEMENT	26-A52-693	801		
				X	1	2	SIDE PLATE ASSEMBLY	26-A52-724	801		1285
				1		3	SIDE PLATE WELDMENT - RH	26-A52-724	501		601
				1		4	SIDE PLATE WELDMENT - LH	26-A52-724	502		601
				1		5	IDENTIFICATION ASSEMBLY	26-A10-888	801		
				8		6	SPRING GUIDE ASSEMBLY	26-A11-077	801		10
					1	7	SUPPORT FRAME ASSEMBLY	26-A52-718	501		2445
						8					
		X			1	9	MECHANISM BEAM ASSEMBLY	07-449-820	802		1240
		1				10	MECHANISM BEAM WELDMENT	07-449-820	502		
		8				11	MECHANISM BOLT	26-101-098	001		
		8				12	MECHANISM BOLT ASSEMBLY	26-A10-535	801		
	X				1	13	FEED BOX ASSEMBLY	26-A43-571	801		470
	1					14	FEED BOX WELDMENT	26-A43-571	501		325
	1					15	PAN LINER TRELLEX PP55	26-A43-571	007		70
	1					16	PAN LINER TRELLEX PP55	26-A43-571	008		70
	16					17	HUCK BOLT, ø20 GRIP No.12 (19.0/26.0)	99-A20-086	004		
	16					18	HUCK COLLAR, ø20.	99-A20-086	001		
	32					19	WASHER, STRUCTURAL ø20.	65-659-046	020		
					2	20	CROSS TIE	26-A32-117	502		136
					1	21	SCREEN SURFACE ASSEMBLY	26-A52-783	801		428
						22					
					2	23	MECHANISM 4-3F	26-101-498	503		1168
					1	24	MECHANISM COUPLING	26-A20-850	002		1168
						25					
						26					
					20	27	HUCK BOLT ø20 GRIP No. 12 (19.0/26.0)	99-A20-086	004		
					8	28	HUCK BOLT ø20 GRIP No. 16 (25.5/32.5)	99-A20-086	002		
					156	29	HUCK BOLT ø20 GRIP No. 20 (32.0/38.5)	99-A20-086	003		
					184	30	HUCK COLLAR ø20	99-A20-086	001		
					392	31	WASHER ø20 - STRUCTURAL	65-659-046	020		
					12	32	BOLT M20 x 65 LG HEX. HD.	65-611-197	372		
					12	33	NUT M20 HEX. CONELOK	65-631-CLN	020		
					1	34	DECALS	99-A50-005	801		

NOTE: ITEMS LISTED BELOW ARE CALLED UP ON THE DRAWING INDEX 26-A02-182-401

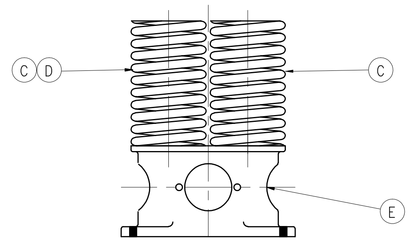
1	A	DRIVE ASSEMBLY	26-A43-667 802
1	B	MOTOR WEG 30 kW 4 POLE D200L	26-A11-637 001
8	C	COMPRESSION SPRING - OUTER	99-A40-001 009
4	D	COMPRESSION SPRING - INNER	99-A40-001 010
4	E	SNUBBER BASE	07-349-368 807



MK801 ASSEMBLY - ELEVATION



SPRING DETAILS - FE



SPRING DETAILS - DE

01	02-07-07
DRG. UPDATED TO SUIT SIDE PL REVISION.	
01	20-09-07

DO NOT SCALE IF IN DOUBT, ASK

DIMENSIONS IN MILLIMETRES

3rd ANGLE PROJECTION

TOLERANCES AND FINISH

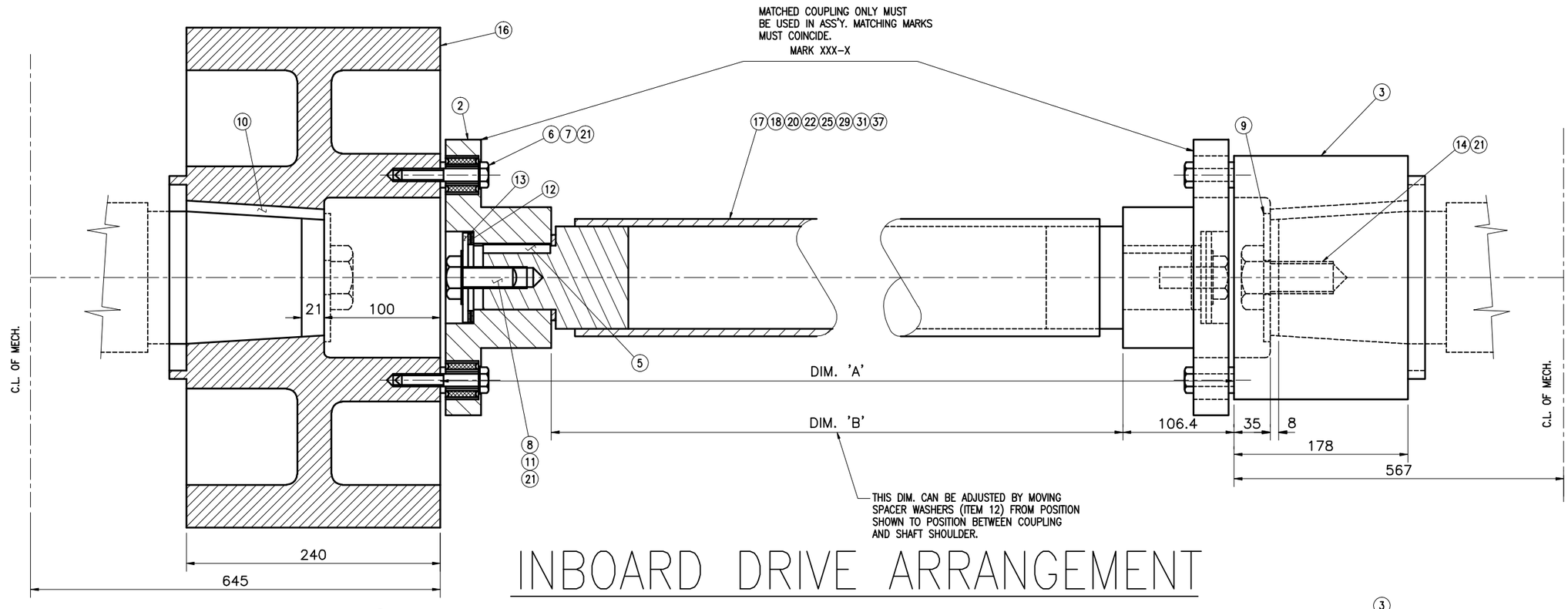
LINEAR	WHOLE NUMBER	±1.5
	ONE DECIMAL PLACE	±0.5
ANGULAR	ALL ANGLES	±0.5
FINISH	UNLESS OTHERWISE STATED	

DRAWN	S.H.	SCALE	1 : 10
CHECKED	S.H.	SHEET	1 of 1
APPROVED	S.HICKEY	ASSY DRG	
SIMILAR TO			

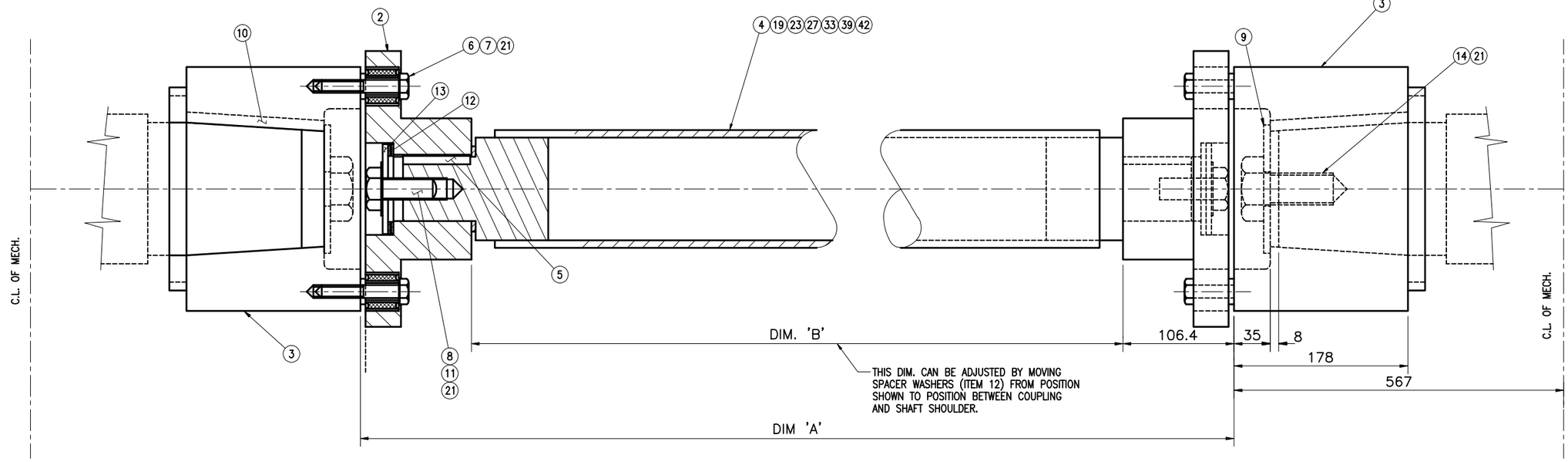
metso minerals

TITLE: GENERAL ARRANGEMENT
2.4 x 6.1 SD LOWHEAD
TWIN 4-3F MECHANISMS
A7890

SIZE A0 | DRG No 26-A52-693 | ISSUE 02



INBOARD DRIVE ARRANGEMENT



OUTBOARD DRIVE ARRANGEMENT

MK 816 ADDED.	ITEM 31 ADDED. MK 812 ADDED.	01 07-10-81
21 30/09/03 SH	17 28-4-98 MAH	MK.809 ADDED. ITEMS 25 & 26 ADDED. DRAWING REDRAWN.
MK 817 ADDED.	ITEM 32 ADDED. MK 813 ADDED.	14 12-01-94 PJW
22 26-10-05 SH	18 03-06-99 TG	MK.810 ADDED. ITEMS 27 & 28 ADDED.
MK 818 & ITEM 42 ADDED.	MK 814 ADDED.	15 02-05-94 PCW
23 18.01.06 DRT	19 29-03-01 SH	MK.811 ADDED. ITEMS 29 & 30 ADDED.
ITEM 42 WAS 26-A41-695-517	ITEM 37 ADDED. MK 815 ADDED.	16 07-02-97 T.G.
24 19.05.06 SH	20 17/5/02 MAH	

DO NOT SCALE IF IN DOUBT, ASK

DIMENSIONS IN MILLIMETRES

3rd ANGLE PROJECTION

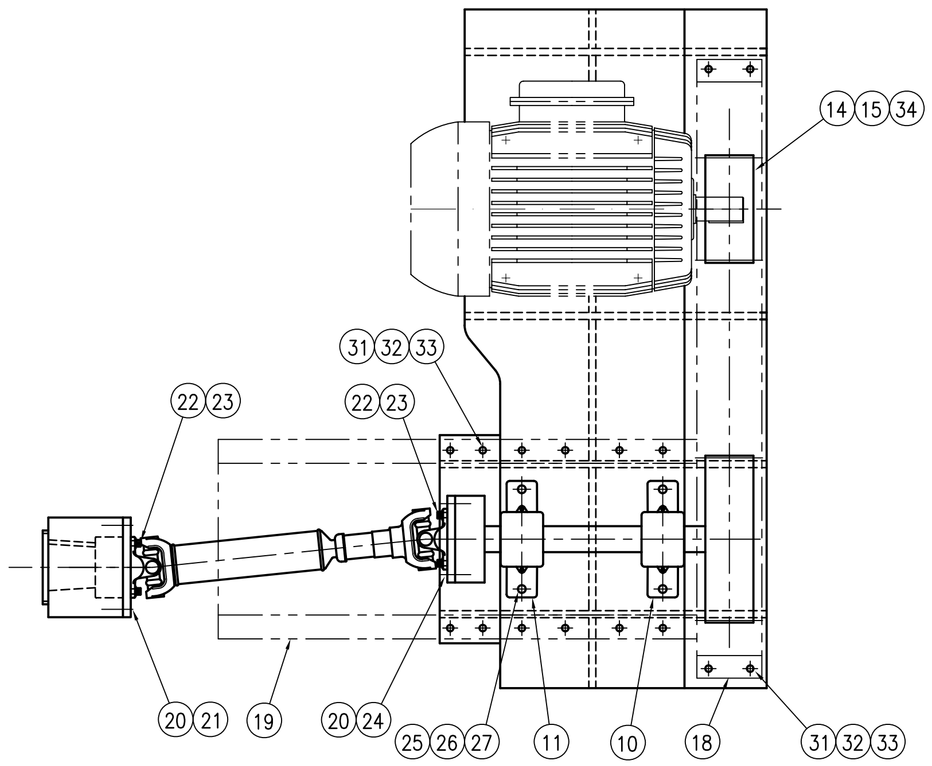
TOLERANCES AND FINISH		
LINEAR	WHOLE NUMBER	±1.5
	ONE DECIMAL PLACE	±0.5
ANGULAR	ALL ANGLES	±0.5
FINISH	UNLESS OTHERWISE STATED	

DRAWN ASH | SCALE N.T.S.
CHECKED MWH | SHEET 2 of 2
SIMILAR TO
ASSY DRG

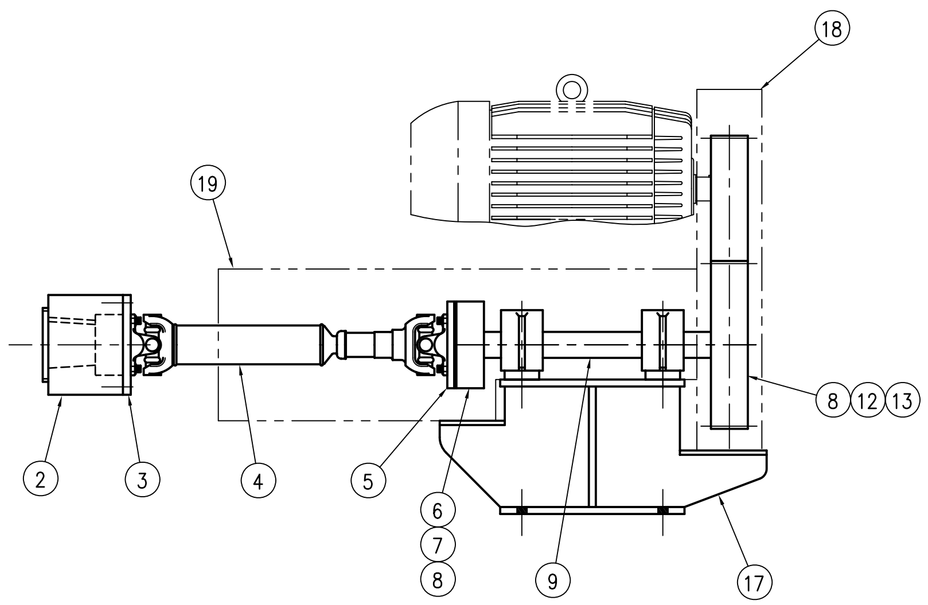
metso minerals

TITLE
CONNECTING SHAFT & COUPLING ASSEMBLY. TWIN 5-3 MECHANISMS LOW HEAD SCREEN

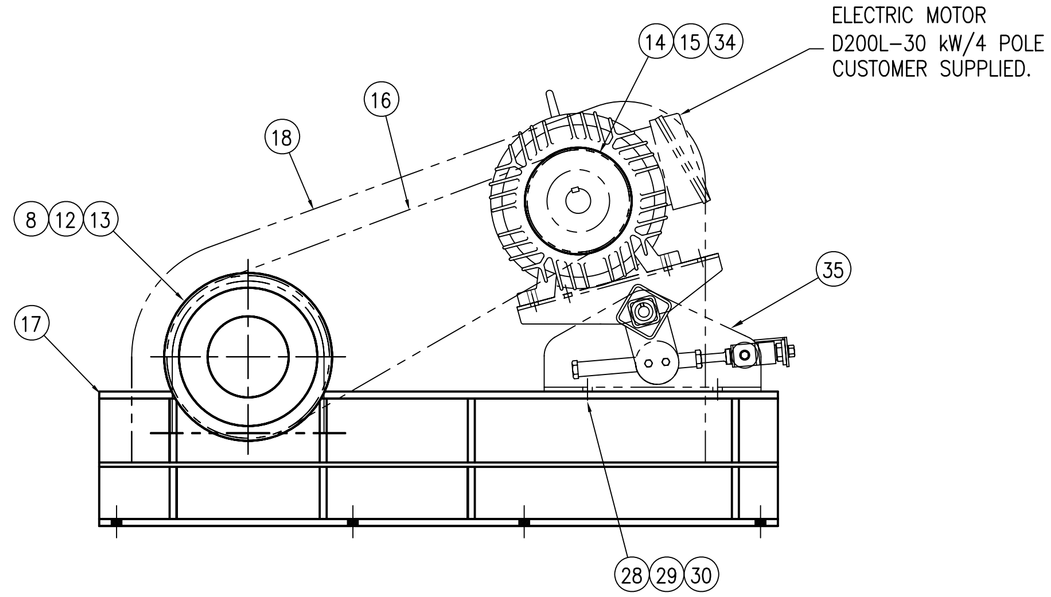
SIZE A1 DRG No 26-A41-697 ISSUE 24



-PLAN-



-END ELEVATION-



-ELEVATION-

MK No. 802	MK No. 801	ITEM	DESCRIPTION	PART NUMBER DRG No.	PART NUMBER MK	MASS EA kg RGH	MASS EA kg FIN
	X	1	DRIVE ARRANGEMENT – TWIN 4–3 LH	26–A43–667	801		
1	1	2	COUPLING (MECHANISM TO UNI–SHAFT)	26–A30–988	001		
1	1	3	ADAPTOR PLATE	26–A21–190	001		
1	1	4	UNIVERSAL SHAFT	99–A20–018	007		
1	1	5	ADAPTOR PLATE	26–A21–680	001		
1	1	6	COUPLING (UNI–SHAFT TO JACK SHAFT)	26–A31–168	001		
1	1	7	TAPERLOCK BUSH #2525 x ø60 BORE	99–A40–002	131		
2	2	8	KEY 18 x 11 x 75 LG	99–A30–023	025		
1	1	9	JACK SHAFT	26–A21–047	001		
1	1	10	PLUMMER BLOCK	12–400–406	811		
1	1	11	PLUMMER BLOCK	12–400–406	812		
1	1	12	DRIVEN PULLEY – ø375 PCD 4 GROOVE SPC – 3525 BUSH	99–A30–016	268		
1	1	13	TAPERLOCK BUSH #3525 x ø60 BORE	99–A40–002	238		
	1	14	MOTOR PULLEY – ø236 PCD 4 GROOVE SPC – 3535 BUSH	99–A30–016	228		
1	1	15	TAPERLOCK BUSH #3525 x ø55 BORE	99–A40–002	030		
4	4	16	WEDGE BELTS SPC2650	99–A30–015	306		
1	1	17	DRIVE BASE WELDMENT	26–A43–668	501		
1	1	18	VEE BELT GUARD	26–A52–326	001		
1	1	19	JACK / UNI–SHAFT GUARD	26–A52–326	002		
12	12	20	SPRING WASHER ø12	65–655–021	012		
8	8	21	BOLT HEX. HEAD 0.5" UNC x 2.5" LG	00–611–314	556		
8	8	22	BOLT SOCKET HEAD M10 x 25 LG	26–A10–477	003		
8	8	23	SPRING WASHER ø10	65–655–021	010		
4	4	24	BOLT HEX. HEAD M12 x 40 LG	65–611–197	243		
4	4	25	BOLT M16 x 90 LG HEX. HD.	65–611–197	315		
4	4	26	NUT M16 HEX.	65–631–011	016		
8	8	27	WASHER ø16 – STRUCTURAL	65–659–046	016		
4	4	28	BOLT M20 x 65 LG HEX. HD.	65–611–197	372		
8	8	29	NUT M20 HEX.	65–631–011	020		
8	8	30	WASHER ø20 – STRUCTURAL	65–659–046	020		
16	16	31	BOLT M12 x 40 LG HEX. HD.	65–611–197	243		
16	16	32	NUT M12 HEX.	65–631–011	012		
32	32	33	WASHER ø12 – STRUCTURAL	65–659–046	012		
1		34	MOTOR PULLEY – ø224 PCD 4 GROOVE SPC – 3535 BUSH	99–A30–016	223		
1		35	LEVERLINK MOTOR BASE – 4G–4	99–A20–151	004		
X		36	DRIVE ARRANGEMENT – TWIN 4–3 LH	26–A43–667	802		

01	22–04–04	MK802 ADDED.
02	19–09–07	

DO NOT SCALE IF IN DOUBT, ASK

DIMENSIONS IN MILLIMETRES

3rd ANGLE PROJECTION

TOLERANCES AND FINISH		
LINEAR	WHOLE NUMBER	±1.5
	ONE DECIMAL PLACE	±0.5
ANGULAR	ALL ANGLES	±0.5
FINISH	6.3 UNLESS OTHERWISE STATED	

DRAWN	MAH	SCALE	1 : 10
CHECKED	S.H.	SHEET	1 of 1
APPROVED	S.HICKEY	ASSY DRG	
SIMILAR TO			

metso minerals

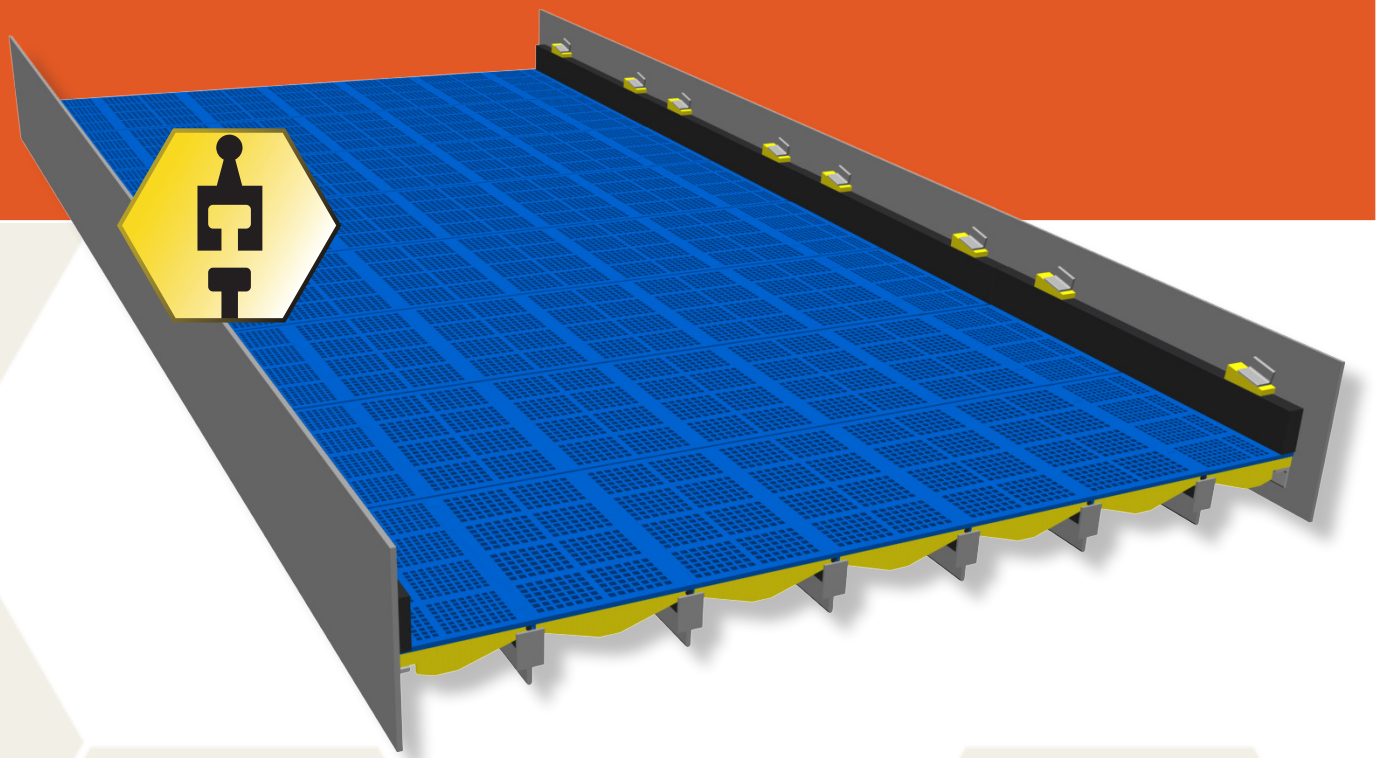
TITLE

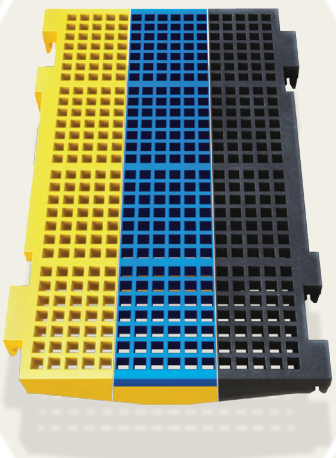
DRIVE ASSEMBLY
JACK SHAFT / UNI–SHAFT
TWIN 4–3 MECHANISMS

SIZE A1 | DRG No 26–A43–667 | ISSUE 02

Trellex 305 LS

Screen Media Installation Guideline for LS Rail



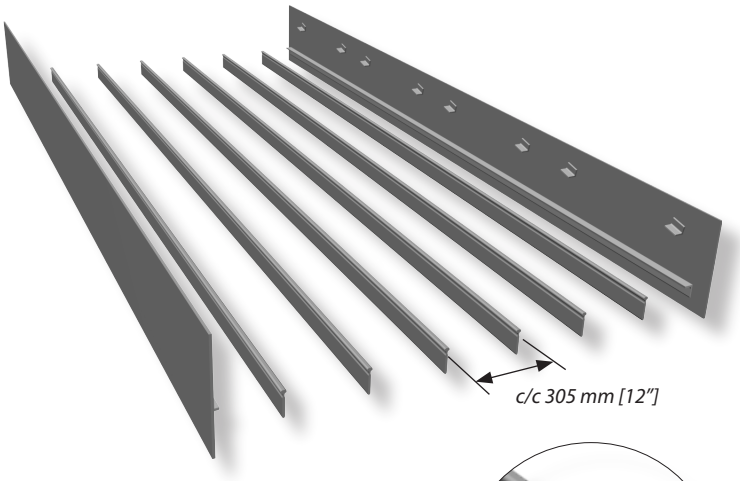


metso minerals

EN

Trellex Screening Media

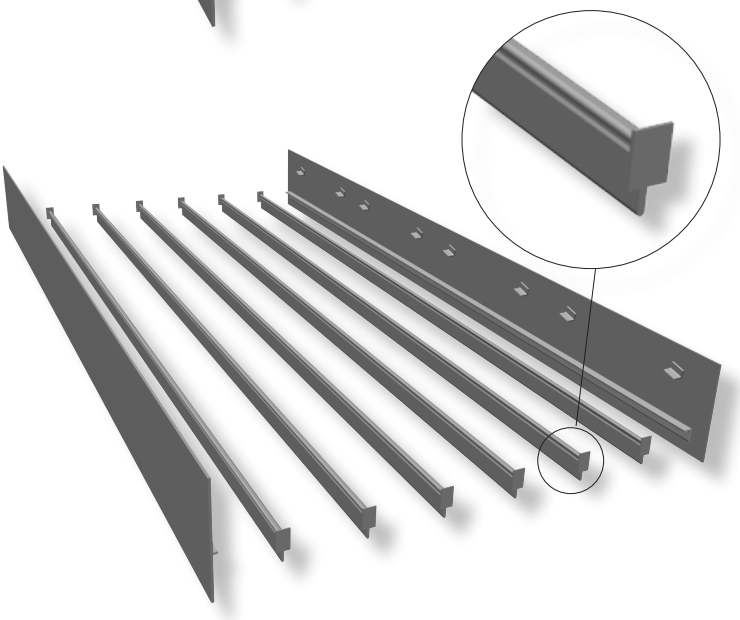
www.metsominerals.com/Trellex



1. Preparations (of support frame + stringers)

Start this procedure by inspecting all the longitudinal stringers to ascertain that they're not damaged or deformed. Verify transversal distance between stringers (c/c 305 mm [12"]) and clean them if required.

Do not install Trellex 305 LS prior to inspection mentioned above.

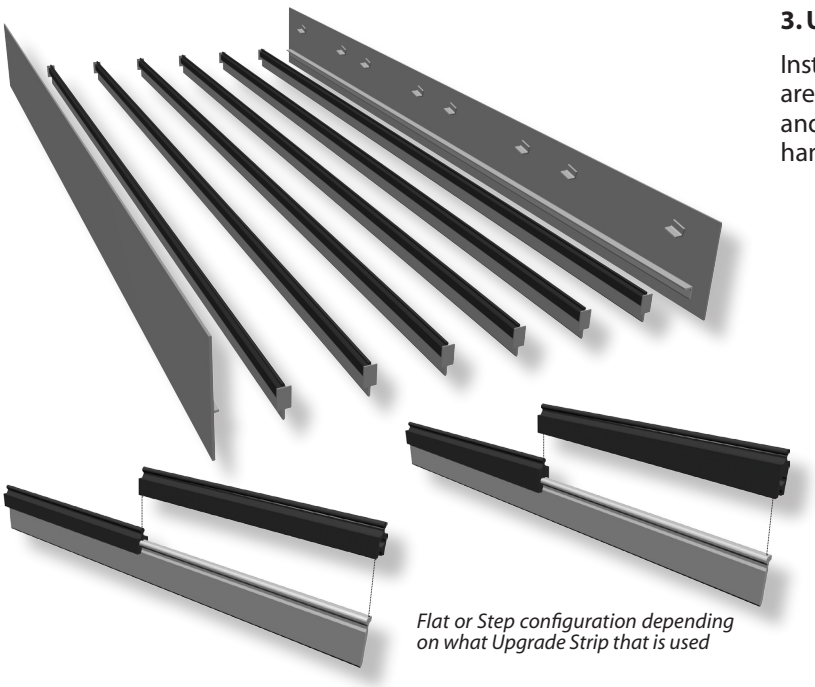


2. Stringer stop

Every screen deck needs to have a mechanical stop, both in the feed end of the screen as well as the discharge end. This prevents the modules from moving longitudinally during operation. Furthermore, the stops will enable the modules to be compressed during installation.

A stringer stop can be applied in many different ways. The most common way is to weld a small steel plate to the discharge end of the stringer. In some cases a flat steel bar is applied across the full width of the screen.

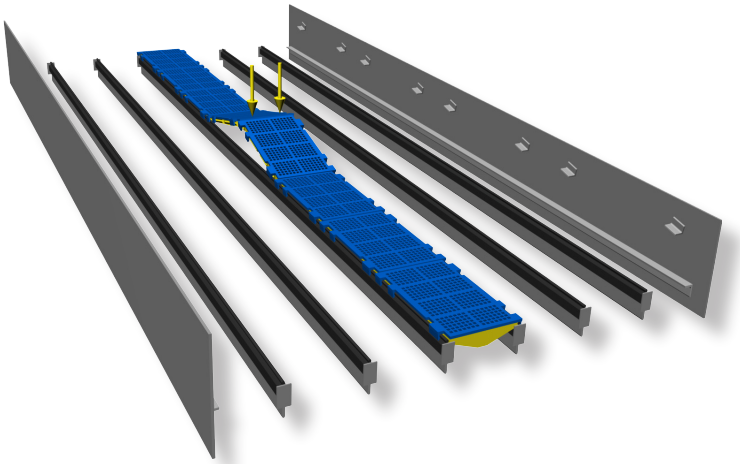
In some cases feed box or discharge spout can act as a stop.



Flat or Step configuration depending on what Upgrade Strip that is used

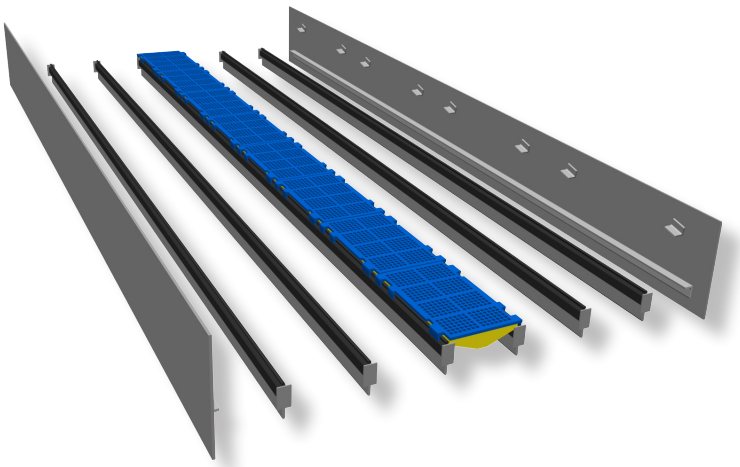
3. Upgrade strips

Install upgrade strips on every stringer. Upgrade strips are available for a variety of stringer types both in flat and step version. Use appropriate tools – such as a hammer – to move the upgrade strips into location.



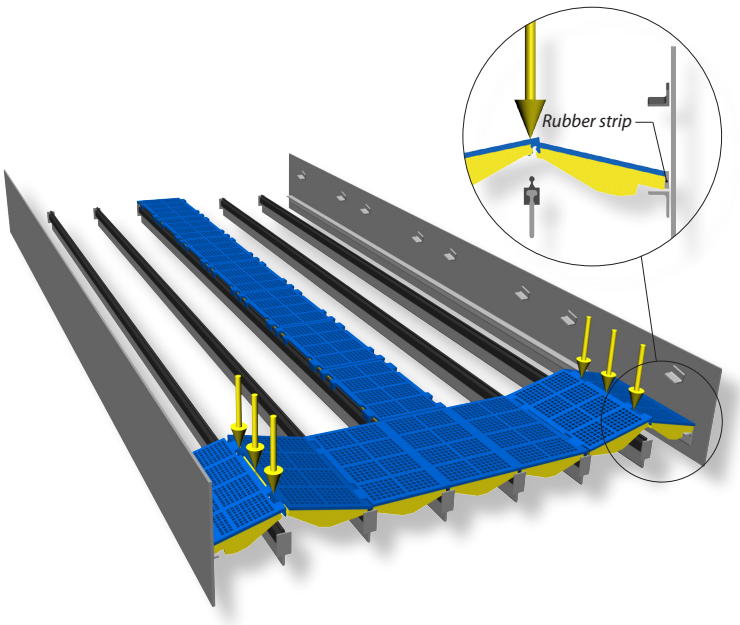
4. Centerline

Start by installing modules from feed end and discharge end along a centreline in the screen. The last modules are used to compress this centreline into the correct location. Usage of soap mixed with water is recommended to facilitate fitting. Wedge down the modules as indicated.



5. Verifying the centreline

Verify that the modules are evenly distributed along the centreline. There should be no play or extreme pressure between any modules. The adjusted centreline indicates the correct position for all rows.

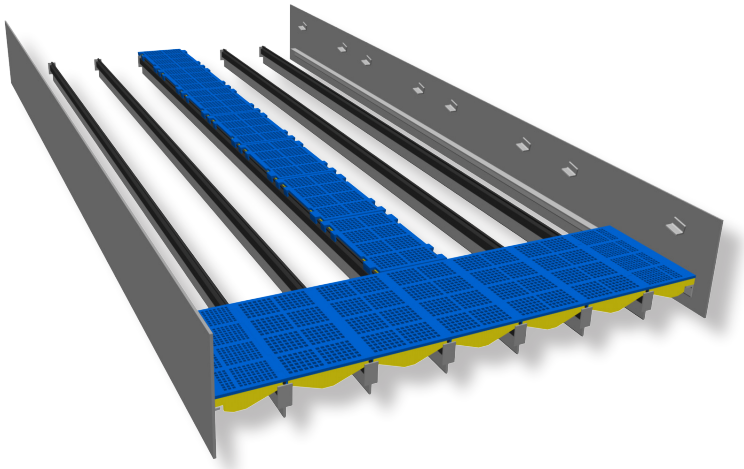


6. Installation – row by row

Install module rows in the screen, typically by starting at the discharge end. Work your way from the centre towards the side plates. Compress the row by wedging the modules close to the side wall as indicated.

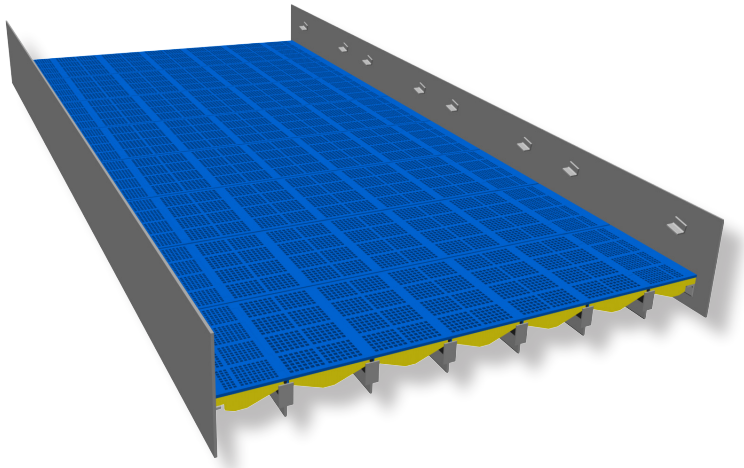
If the screen's side plate is equipped with longitudinal angle bar, then it is recommended to fill up the gap between the side module and the plate with rubber strip or similar. Thickness of this strip should be 10-25% thicker than the gap itself. Softer rubber qualities such as 40° Shore-A can be compressed easier.

Step side wall strips are required if parts of the deck (or the complete deck) is to be installed with step. The purpose of these profiles is to act as a support for the side modules.



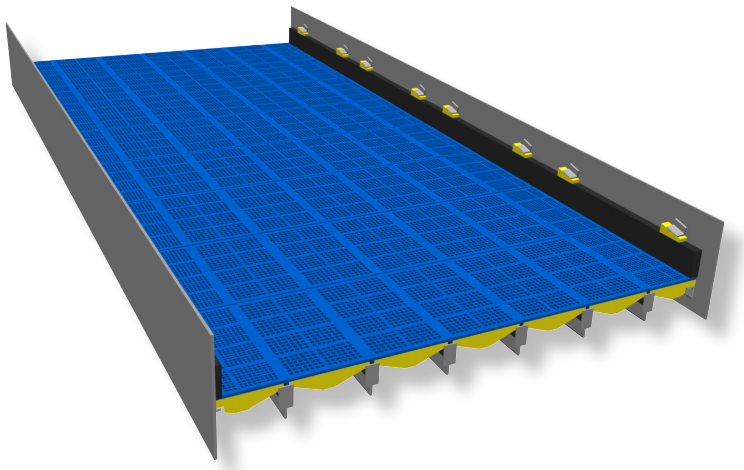
7. Verification of installed rows

Finish installation row by row, preferably from the discharge end towards the feed end. Check every row for gaps or tension. Verify also that the rubber strips between side modules and the side plate are located correct.



8. Complete installation

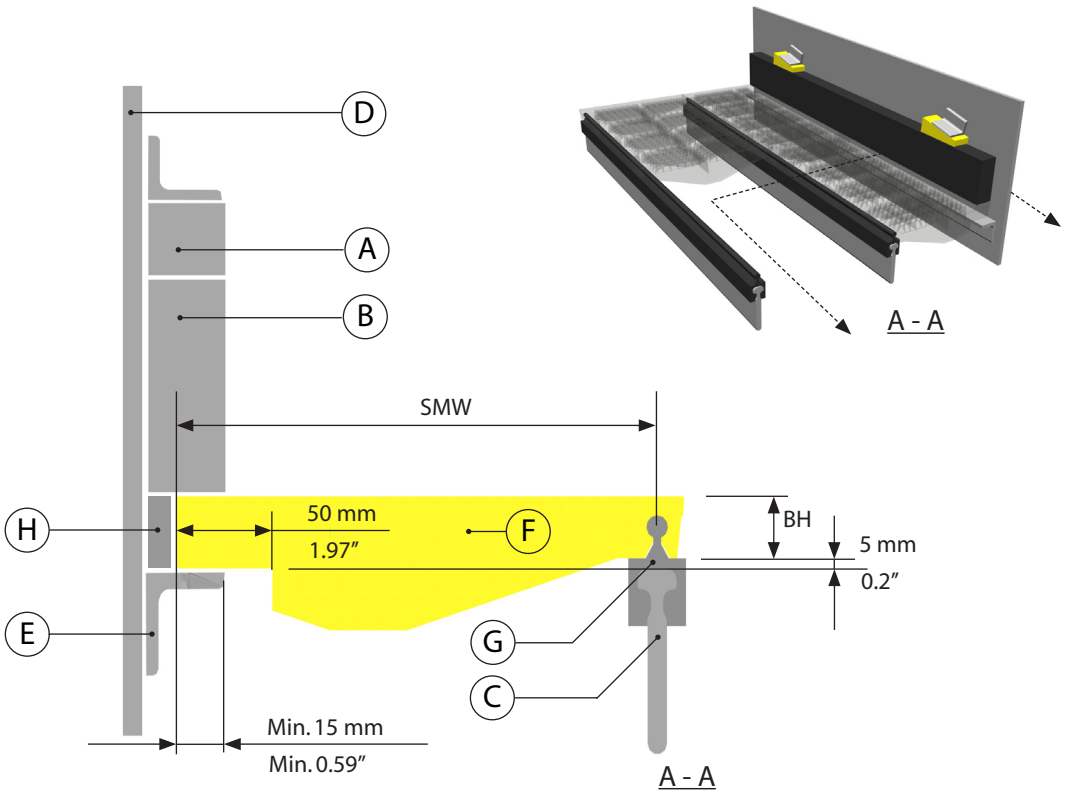
Repeat procedures listed under 6. and 7. until the entire screen deck is installed. Verify straightness of the rows installed and check for gaps or tension.



9. Side liners

Put all the sideliners in place along the side plate. Insert the wedges underneath the brackets and knock them in to secure sufficient vertical pressure onto the panels. Should there be another type of side lining, make sure that vertical pressure on the side modules is achieved. Screen deck is now complete.

Side module arrangement - Type SMA 1



Side module widths (SWM):

100 mm	3.94"	● ●
150 mm	5.91"	● ●
175 mm	6.89"	● ●
200 mm	7.87"	● ●
250 mm	9.84"	● ●
300 mm	11.81"	● ●
330 mm	12.99"	● ●
360 mm	14.17"	● ●
400 mm	15.75"	●

● Polyurethane
● Rubber

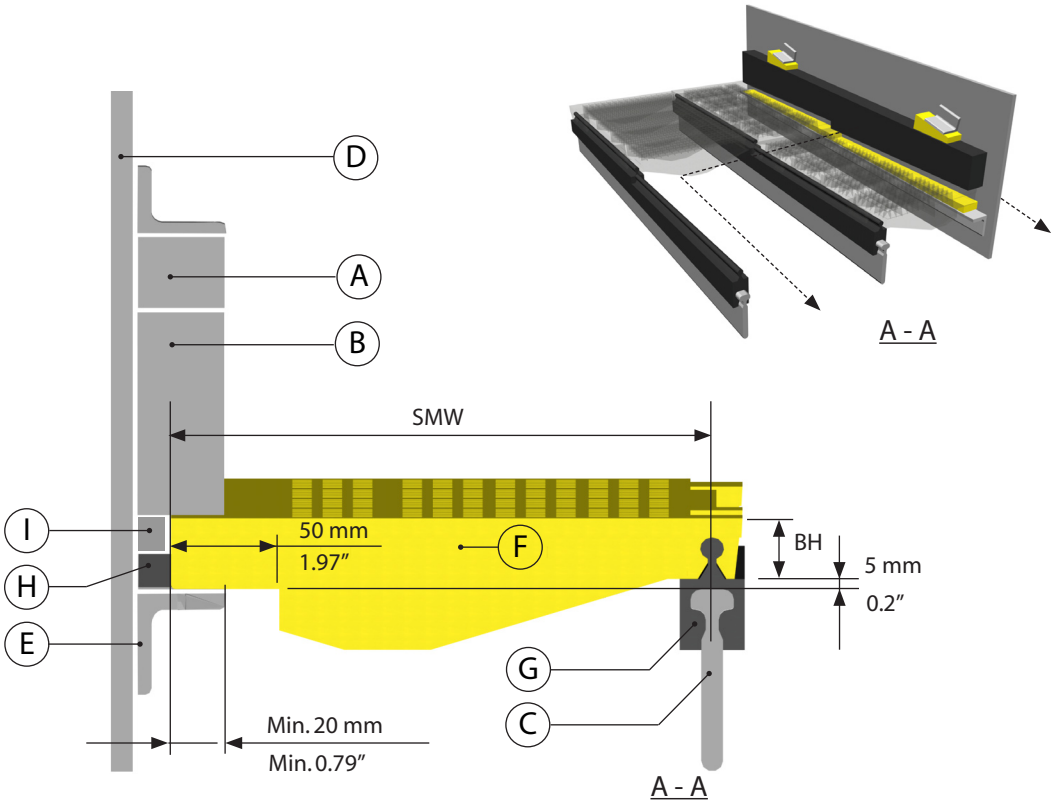
Building Height (BH):

30 mm	1.18"	● ●
40 mm	1.57"	● ●
60 mm	2.36"	●

Explanation:

- (A) Wedge
- (B) Sideliner (FLAT/FLAT)
- (C) Trellex LS Rail (C/C 305 mm [12"])
- (D) Screen Side Plate
- (E) Angle bar support
- (F) Trellex X LS-S Side module (X = Width)
- (G) Trellex Flat Upgrade Strip for LS Rail
- (H) Rubber Sheet to fill out gap (gap + 25%)

Side module arrangement - Type SMA 2



Side module widths (SWM):

100 mm	3.94"	●	●
150 mm	5.91"	●	●
175 mm	6.89"	●	●
200 mm	7.87"	●	●
250 mm	9.84"	●	●
300 mm	11.81"	●	●
330 mm	12.99"	●	●
360 mm	14.17"	●	●
400 mm	15.75"		●

● Polyurethane
● Rubber

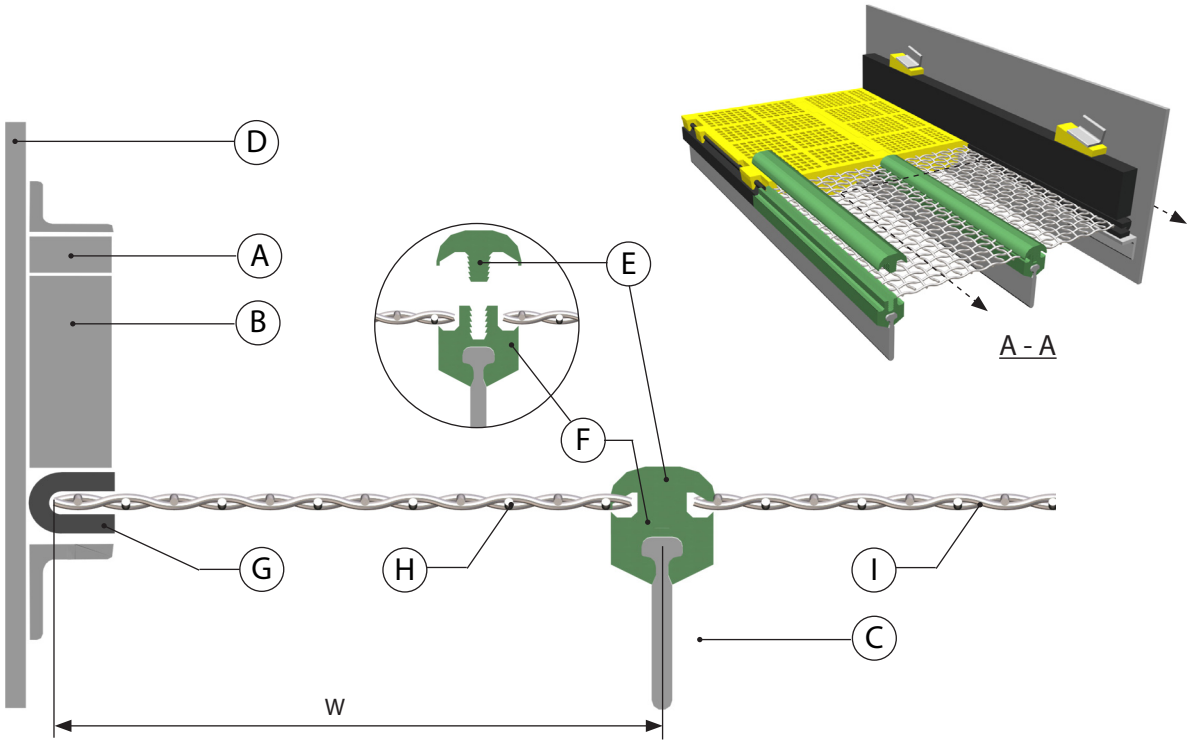
Building Height (BH):

30 mm	1.18"	●	●
40 mm	1.57"	●	●
60 mm	2.36"		●

Explanation:

- (A) Wedge
- (B) Sideliner (STEP/STEP, STEP/FLAT)
- (C) Trellex LS Rail (C/C 305 mm [12"])
- (D) Screen Side Plate
- (E) Angle bar support
- (F) Trellex X LS-S Side module (X = Width)
- (G) Trellex Step Upgrade Strip for LS Rail
- (H) Trellex STEP Side Wall Strip
- (I) Rubber Sheet to fill out gap (gap + 25%)

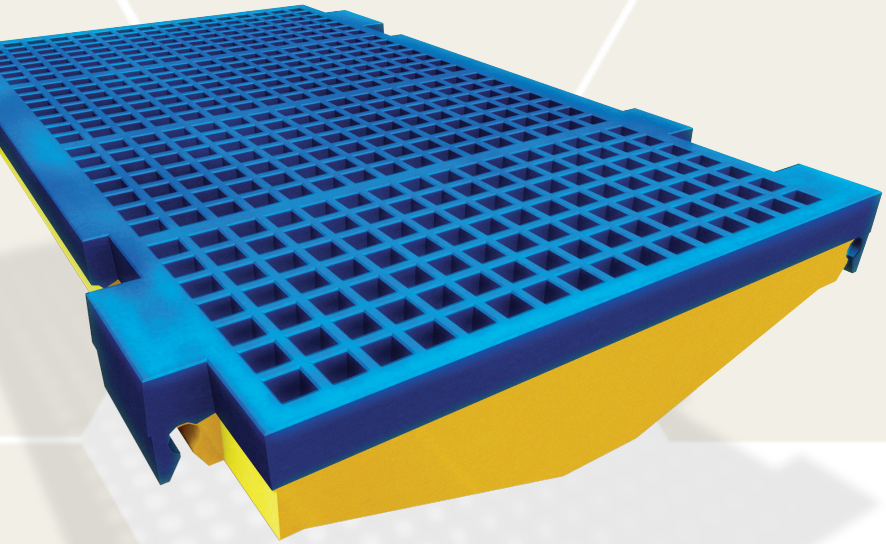
Side module arrangement - Type SMA 5



Explanation:

- (A) Wedge
- (B) Sideliner (FLAT/FLAT)
- (C) Trellex LS Rail
- (D) Screen Side Plate
- (E) Trellex LS Wire Insert Top Profile
- (F) Trellex LS Wire Insert Base Profile for LS Rail ([15]for wire diameter < 10 mm (0.39") or [10] 10 ≤ d ≤ 15 (0.39" ≤ d ≤ 0.59")
- (G) Trellex Flat Upgrade Strip for LS Rail
- (H) Wire cloth (max width = w - 15 mm (0.59")
- (I) Wire cloth (w=275 mm (10.83"), Length normally 1220 mm (4')). Other lengths also possible!

Time to screen towards a more profitable future!



Metso Minerals
Trellex Screening Media
P.O. Box 74
SE-231 21 Trelleborg
Sweden
Phone: +46 410 525 00
Fax: +46 410 526 04
screeningmedia@metso.com

www.metsominerals.com

To get in touch with your local Trellex representative, please visit www.metsominerals.com/trellex for information about the nearest sales office.

metso minerals

Installation Guideline Trellex 305 LS - LS Rail - English - 0612

Printed in Sweden

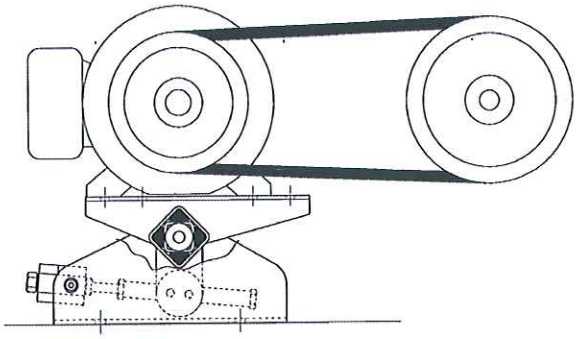
Installation & Tensioning Instructions

Leverlink®

4G-Series-"Australian Made".

Fitted with "One Touch Tensioning"

Motor Bases 7.5kW to 400kW



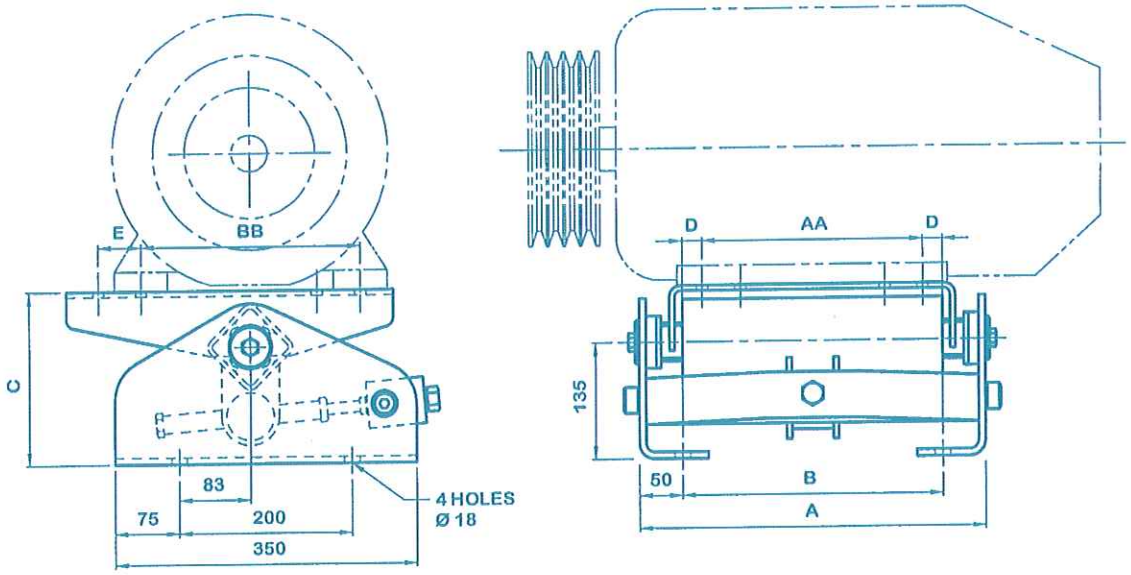
If in Doubt - Please Call our Engineering Department

Leverlink Australia Pty Limited

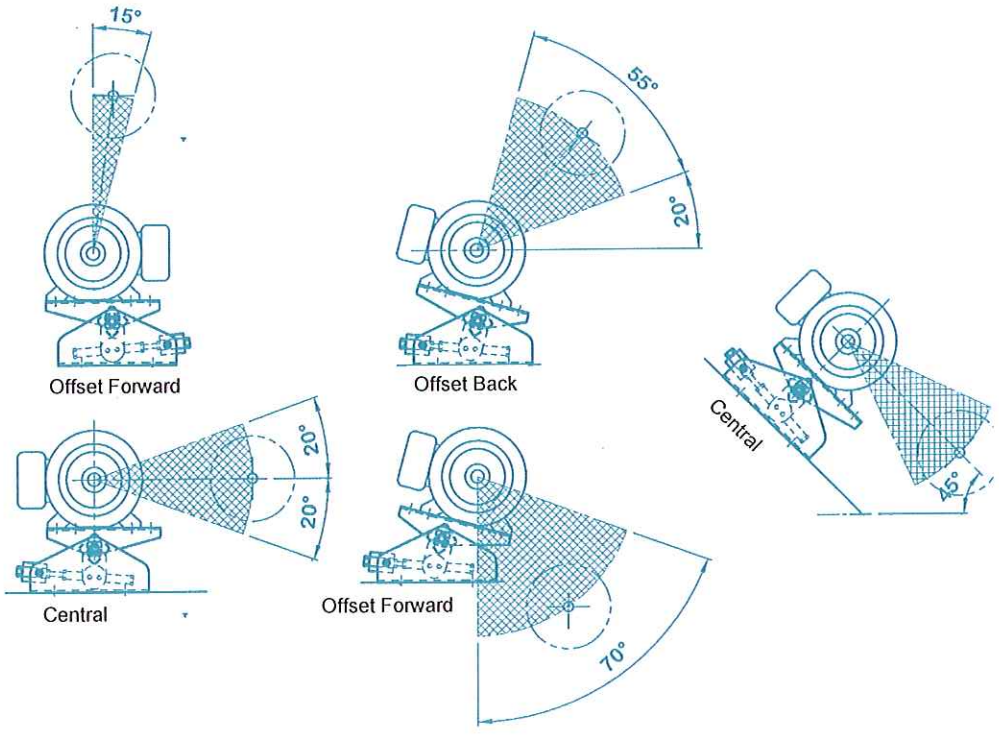
Ph: 07 3277 5440 or Fax: 07 3216 7095. Email: engineering@leverlink.com.au

Brisbane - Australia

Drawings & Mounting Positions



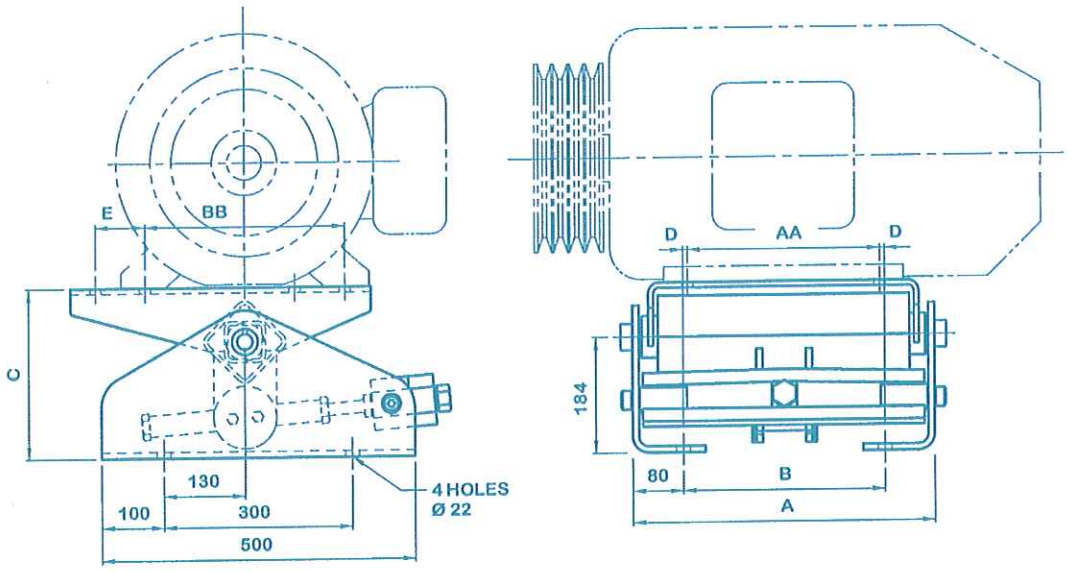
Model	Motor Information					Dimensions				
	Frame Size	6 Pole kW	4 Pole kW	AA	BB	A	B	C	D	E offset
4G-2	D160M D160L	7.5 11	11 15	210 254	254 254	400	300	200	23	50



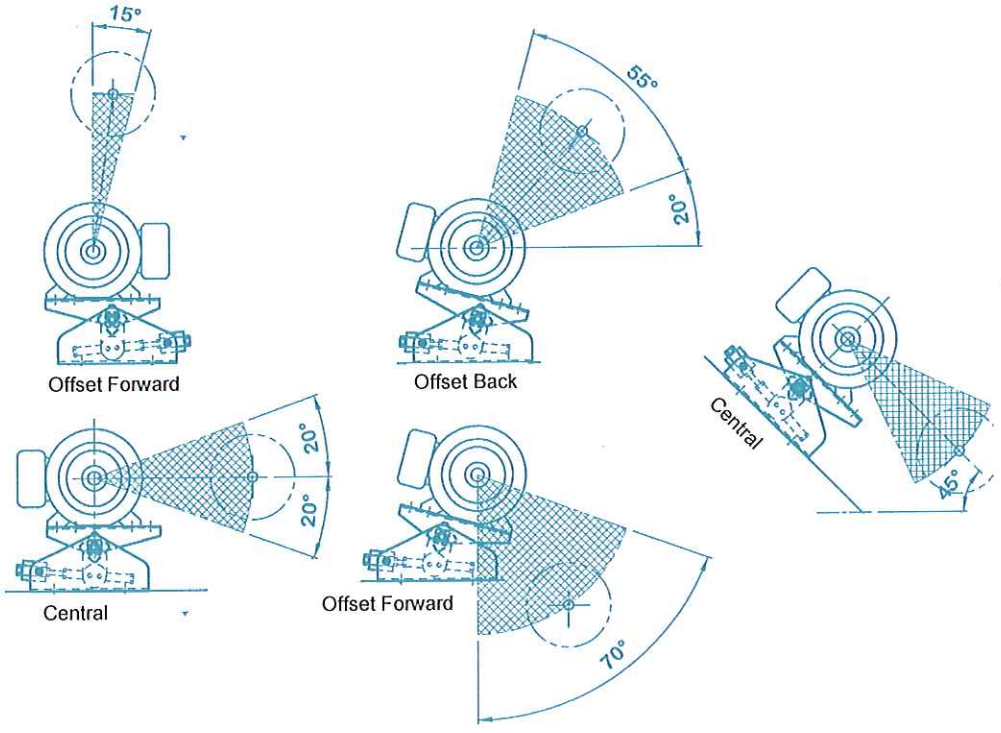
Mounting Positions

All mounting positions are shown.
Note OFFSET for some applications.

Drawings & Mounting Positions



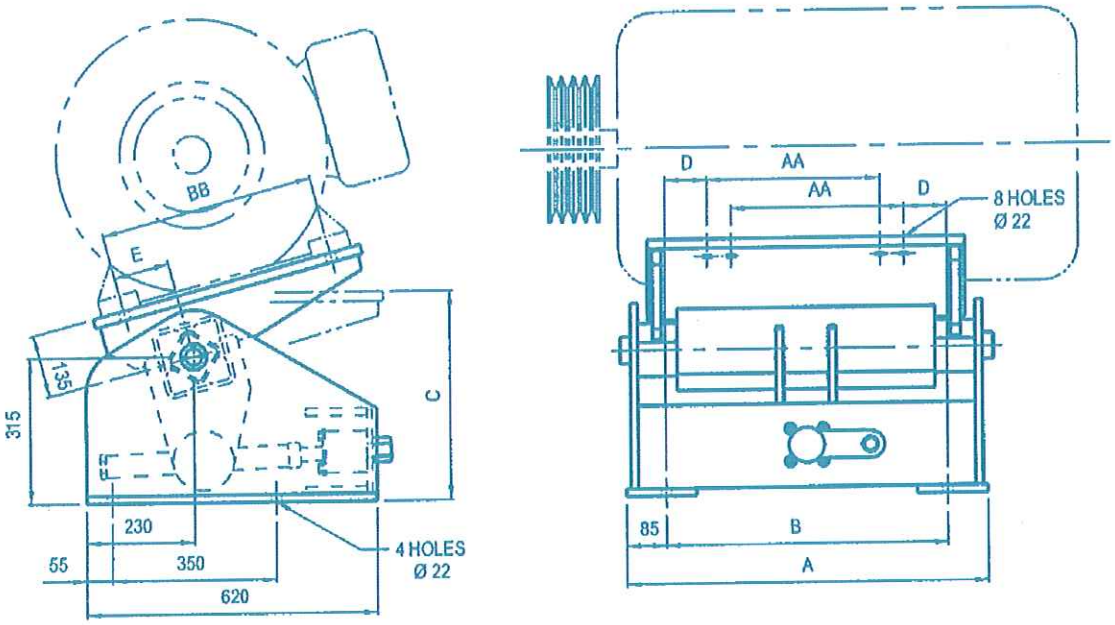
Model	Motor Information					Dimensions				
	Frame Size	6 Pole kW	4 Pole kW	AA	BB	A	B	C	D	E offset
4G-3	D180M D180L	- 15	18.5 22	241 279	279 279	460	300	270	11	80
4G-4	D200L	18.5-22	30	305	318	480	320	270	8	80
4G-5	D225S D225M	- 30	37 45	286 311	356 356	530	370	270	30	80



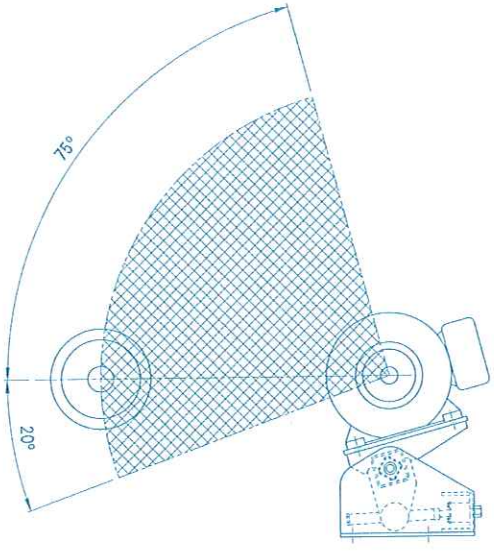
Mounting Positions

All mounting positions are shown.
Note OFFSET for some applications.

Drawings & Mounting Positions

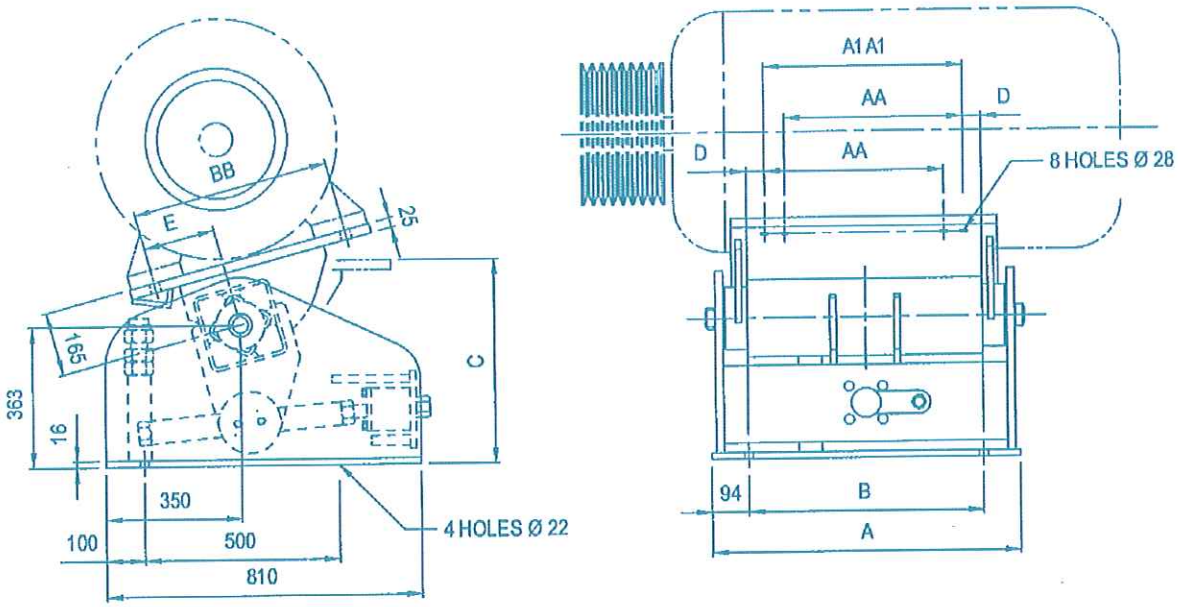


Model	Motor Information					Dimensions				
	Frame Size	6 Pole kW	4 Pole kW	AA	BB	A	B	C	D	E
4G-6	D250S	37	55	311	406	600	450	450	32	93
4G-7	D250M	37-45	55-75	349	406	600	450	450	32	93
4G-8	D280S	45-55	75-90	368	457	770	600	450	91	119

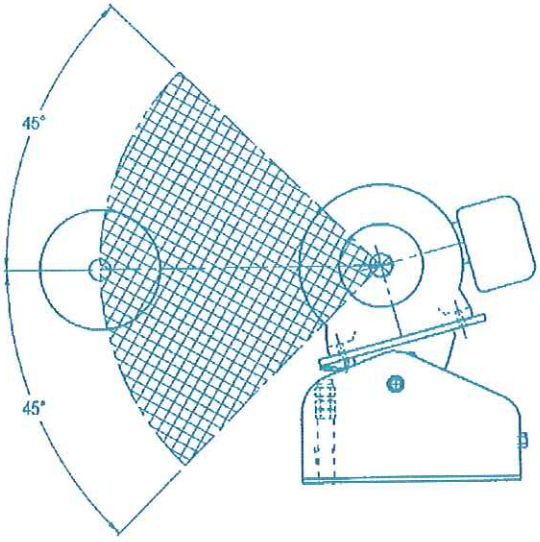


Mounting Positions

Drawings & Mounting Positions



Model	Motor Information						Dimensions				
	Frame Size	6 Pole kW	4 Pole kW	AA	A1A1	BB	A	B	C	D	E
4G-12	D315M D315L	132-160 110-132	185-200 160-200	457 -	- 508	508 508	788 788	600 600	528 528	46 46	185 185



Mounting Positions

4G-2 to 4G-8 Installation and Tensioning

Safety First - Isolate Equipment As Per Site Procedure.

Leverlink Motor Bases have been developed to simplify the changing and retensioning of Vee Belts.
We recommend the use of a *Ratchet* which will allow the Vee Belts to be adjusted or changed quickly and efficiently.

Installation

1. Bolt the Motor Base to the support structure in the predetermined position to suit the length of the drive belt(s). Refer to installation positions.

2. Bolt the motor to the base plate.

3. Check that the pulley faces are aligned before tightening all fixing bolts. This will ensure that the motor shaft axis is parallel to the driven shaft axis in all planes.

4. Remove the locking Cap. Using a ratchet , turn the **Adjusting Screw** in order to tilt the motor in the appropriate direction to allow the the drive belt(s) to be fitted.

5. Once again, using the Rattle Gun, turn the **Adjusting Screw** in the opposite direction to tension the belt(s), noting that in doing so, torque is being applied to the Motor Base rubber torsional spring. Tension the belts to the maximum tension recommended by the belt manufacturer.

6. Refit The locking Cap.

7. Test run and inspect belt(s).
   - ♦ Belts may stretch and settle in during test run.
   - ⇒ If belt tension is too low, remove locking cap before repeating step numbers 5 & 6.

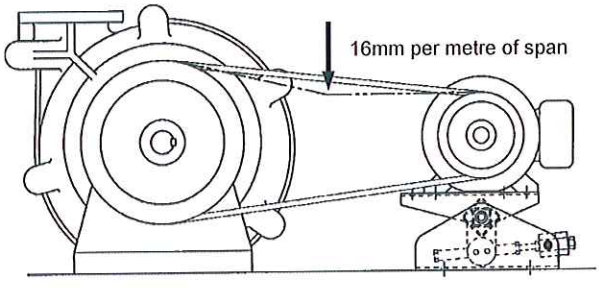
8. Fit Belt Guards.

Special Notes

- ♦ Always fit locking cap after tensioning or retensioning.
- ♦ Do not cut belts, while tensioned as motor will spring back and may cause injury.
- ♦ Avoid injury to hands,when new belts are being fitted.
- ♦ Screen drives differ from pump, fan and other fixed centre drives.....
- ⇒ **Overtensioning will pull screen on end or skew it sideways.**
- ⇒ **Undertensioning will cause belt slippage.**
- ♦ Static drives with fixed centres should be tensioned to belt manufacturer specifications using the force deflection method. Refer to table below or contact your belt manufacturer or supplier.

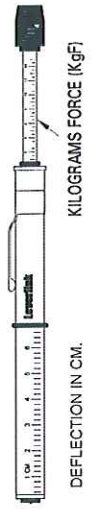
Tensioning Forces

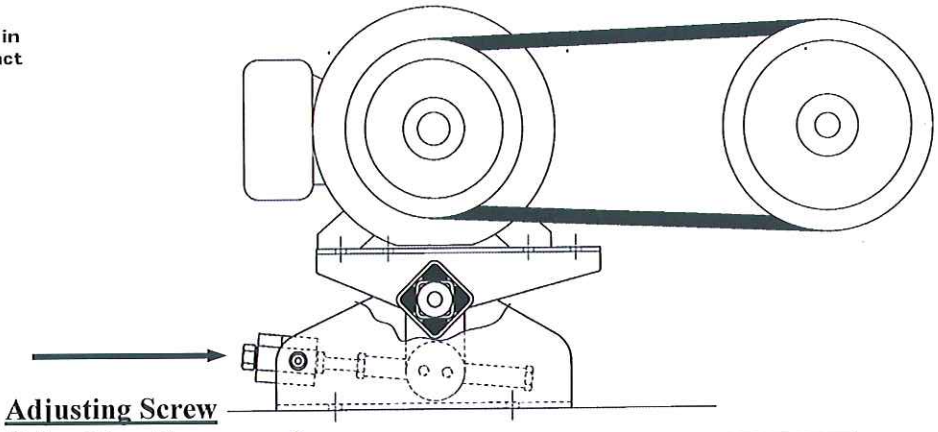
Belt Section	Force Required to Deflect Belt 16mm. per metre of span		
	Small Pulley	Newton	Kilogram
SPZ	56 to 95 100 to 140	13 to 20 20 to 25	1.3 to 2.0 2.0 to 2.5
SPA	80 to 132 140 to 200	25 to 35 35 to 45	2.5 to 3.6 3.6 to 4.6
SPB	112 to 224 236 to 315	45 to 65 65 to 85	4.6 to 6.6 6.6 to 8.7
SPC	224 to 355 375 to 560	85 to 115 115 to 150	8.7 to 11.7 11.7 to 15.3
DELTA	335 & above	150 to 200	15.3 to 20.4
Z	56 to 100	5 to 7.5	0.5 to 0.8
A	80 to 140	10 to 15	1 to 1.5
B	125 to 200	20 to 30	2 to 3.1
C	200 to 400	40 to 60	4.1 to 6.1
D	355 to 600	70 to 105	7.1 to 10.7



Leverlink® Motor Bases For All Vee Belt Drives

Always use a Leverlink® Vee Belt Tension Indicator.
(Instructions are available in another publication—contact sales@leverlink.com.au).



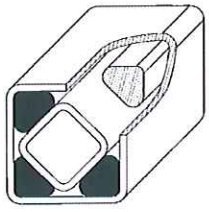


Leverlink Motor Bases have been developed to simplify the changing and retensioning of Vee Belts.
We recommend the use of a *Ratchet*, which will allow the Vee Belts to be adjusted or changed quickly and efficiently.

Safety First - Isolate Equipment As Per Site Procedure.

Retensioning - New belts should be checked and if necessary, retensioned after initial stretch has occured..

1. Check Belt Tension via window in guard or remove guard.
2. Remove Locking Cap.
3. Turn the **Adjusting Screw** to tension the belt(s). Tension the belts to the maximum tension recommended by the belt manufacturer.
4. Refit the locking Cap.
5. Test run and inspect belt(s).
6. Fit belt guards.



Changing - Drive Belts

1. Remove belt guard.
2. Remove Locking Cap.
3. Turn the **Adjusting Screw** in order to tilt the motor in the appropriate direction to allow the drive belts to be removed.
4. Fit the drive belt(s) to the pulleys, ensuring they are matching brand and length.
5. Turn the **Adjusting Screw** in the opposite direction to tension the belt(s), noting that in doing so, torque is being applied to the Motor Base rubber torsional spring. Tension the belts to the maximum tension recommended by the belt manufacturer.
6. Fit the Locking Cap.
7. Test run and inspect belt(s).
   - ♦ Belts may stretch and settle in during test run.
   - ⇒ If belt tension is too low, remove locking cap before repeating step numbers 5 & 6.
8. Refit Locking Cap.
9. Fit belt guards.

3 PHASE INDUCTION MOTOR

INSTALLATION & MAINTENANCE GUIDELINE - Premium Efficiency & Heavy Duty ranges

All Toshiba International Corporation motors comply with the Standard nominated on the nameplate.

Read this guideline carefully before installing & starting the motor

Standards referenced are the edition current at the date of publication of this document, unless specifically stated. Where the word Toshiba appears in this document, it refers to Toshiba International Corporation, Australia.

1. SAFETY

Careful consideration has been given to user safety during the design and manufacture of this equipment and it should be suitable for use in Industrial situations. Whilst every attempt has been made to eliminate hazards, careful consideration to safety matters during selection, installation, operation and maintenance is essential for safe operation. This section contains important information necessary for the safe use of this equipment.

	Danger
Prohibited	**Follow the points listed below to assist in the prevention of electric shock, fire, personal injury and/or damage:** • Do not install or operate the motor if it is defective, damaged or any part is missing. • Ensure the motor is properly grounded to the supply safety earth. • Do not use the motor in a hazardous area (ie. an area that contains explosive dust or gases). • The motor lifting facility is designed to carry the mass of the motor only. Lifting the motor whilst attached to other items eg driven equipment and base frames may cause the lifting facility to fail.
Mandatory	**Follow the points listed below to assist in the prevention of electric shock, fire, personal injury and/or damage:** • You should follow the instructions for safe use that are outlined in, but not limited to, this instruction guideline. • Prior to use, complete a hazard risk assessment on the motor, its implementation and site situation and take appropriate measures. This hazard risk assessment should include, but is not limited to, safe handling, electrical safety, strength of the mounting, protection against moving parts, operating environment, accessibility, inspection and maintenance competencies. • Do not use any optional devices other than those approved by Toshiba. The use of improper devices could lead to safety risks. • Safety practices must be observed at all times. Specific risks associated with electric motors that need to be considered are, but not limited to: - Electric shock by contact with exposed wiring or inadequately grounded motor - Burns and/or explosions caused by electrical faults - Physical injury by contact with rotating parts or improper handling. • A competent person with the necessary mechanical and electrical skills should install the equipment • Connect the motor to the power system in accordance to local rules and regulations (eg. in Australia wiring should comply with AS/NZS3000 and local supply authority rules and regulations). • Install guards to prevent accidental contact with rotating parts. • Mount the motor on a foundation suitable for the static and dynamic loads expected. • Install a suitable protective relay and fault current limiting device (such as fuse or circuit breaker) to disconnect the motor in the case of a fault or overload. • Install an emergency shutdown device, which matches the system (eg. a switch interlocked with the brake of the machine).

Warning	
⚠	**Follow the points listed below to assist in the prevention of diminished performance, reduced life and premature failure of the motor:** • The motor IP (International Protection) rating must be appropriate for its operational environment. • In critical applications, it is considered good practice to have a standby or spare motor. • Do not operate the motor outside its design limits (eg overload). • Perform recommended maintenance.

2. HAZARDOUS AREA MOTORS

This motor has been designed for use in heavy duty standard industrial applications.

Hazardous area motors are identified by their nameplates. Motors without hazardous area nameplates, have not been designed or certified for use in hazardous areas.

Please contact your local Toshiba representative for details on the extensive range of Toshiba motors designed for use in hazardous areas.

3. UNPACKING

Unpack the motor carefully and check for any damage. Check that the nameplate details match your requirements.

Check the packing list, making sure no parts or accessories are missing or are inconsistent with the specification and/or order. If you have any concerns, please contact Toshiba International Corporation.

Care should be taken when moving or lifting a motor. Use the motor lifting facilities, if provided (eg eye bolt).

Dispose of the motor's packaging in an environmentally responsible manner.

4. SHAFT LOCK

To prevent axial movement of rotors and damage to bearings (particularly roller bearings), motors of frame sizes 225 and above are fitted with shaft locks for transportation. Shaft locks must be removed before installation or the fitting of couplings or equipment.

Rotate the shaft manually to check that it rotates normally after removal of the shaft lock.

Note: Shaft should be locked before any further transportation.

5. OPERATING ENVIRONMENT

Toshiba 3 phase induction motors are designed for use in ambient temperatures up to 50^0C and at altitudes up to 1000 metres above mean sea level.

For temperatures and altitudes outside these parameters or in aggressive environments, please contact your Toshiba representative**.**

Motors should be installed in an easily accessible position, with provision for maintenance, cleaning and sufficient airflow to allow proper cooling. In addition the air paths must be regularly checked, and cleaned when necessary.

Below is the minimum distance of an obstruction from the air intake opening:

Frame Size	Clearance (min)	Frame Size	Clearance (min)	Frame Size	Clearance (min)
Up to 160	35 mm	180 to 225	85 mm	250 upwards	125 mm

IP code indicates a motor's ability to resist moisture and dust. Please ensure that the motor has the correct nameplate IP rating for the environment in which it will operate.

6. INSULATION RESISTANCE

Toshiba recommends, prior to installation and every 12 months, the motor windings (with all ancillary terminals connected to earth) should be checked with a 500v insulation tester. Insulation resistance should not be less than 10 megohms.

If insulation resistance is below this prior to initial start up or low during service, please contact your Toshiba representative.

7. GREASING

Motor bearings are greased during manufacture. To ensure long bearing life, Toshiba recommends during initial start up, that the bearings with grease nipples be relubricated. Sealed bearings do not have to be checked for relubrication.

Ensure that the grease exit ports are opened during lubrication.

For greasing information, please refer to sections 11.3 and 11.4.

8. COUPLING APPLICATIONS

All motors (excluding 2 pole) are suitable for normal vee-belt operation. 2 pole motors are generally suitable for direct coupling only. For heavy belt operation, a roller bearing configuration may be recommended.

Pulleys or couplings are only to be installed by utilising the threaded hole in the end of the shaft. This prevents impact that could damage the motor bearings.

Machines connected with the motor via couplings must be aligned in accordance with the directions of the coupling's manufacturer. Use only flexible couplings.

For confirmation of application suitability, please contact your Toshiba representative.

9. INSTALLATION - Mechanical

The mounting faces should be smooth, flat and clean to ensure good surface-to-surface contact.

If the mounting faces are misaligned or uneven, the correct fitting of the motor may be need to include appropriate shim packing. For foot mounted motors, soft foot should not exceed 0.2mm.

10. INSTALLATION - Electrical

Only persons with the relevant qualifications should connect or disconnect electrical apparatus.

Each motor should be checked individually. The following should be used only as a guide.

All wiring must be in accordance with AS/NZS3000 or local equivalent.

10.1 Motor terminating procedures

- To obtain clockwise rotation of shaft (viewed from the drive end), supply lines red, white & blue should be connected to terminals U1, V1 & W1 (respectively)
- Where terminal block links are to be used, check nameplate for the correct link configuration for the supply voltage.
- Ensure all lugs and links are in intimate contact with each other (no nut or washer should form part of the current path).
- Ensure the motor frame and terminal box are earthed in accordance with all relevant Standards and procedures.
- Ensure all cable lugs are sized and crimped correctly, and all cables, lugs and glands are in accordance with all relevant Standards and procedures.
- Check all nuts are tightened.
- Ensure all gaskets and any required sealants are present & correctly fitted
- Glands must maintain the motor's IP rating.
- Any unused cable entries must be plugged. If a gland is used, it must be capable of maintaining the IP rating.

10.2 Protection

To correctly protect the motor, approved on line protection devices eg thermal overloads may be used. Alternatively, thermistors (where fitted) should be connected to a thermistor control unit complying with AS1023.1.

The operating current must not exceed the full load current on the nameplate.

10.3 Motors used with Variable Speed Controllers

When a motor is used with a variable speed controller, a dv/dt filter should be installed on the output side of the variable speed controller to mitigate the possible harmful effects of non-sinusoidal supply on the motor.

Toshiba motors have been tested with Toshiba variable speed controllers. Toshiba recommends the use of output filters to provide optimum performance especially on long cable runs.

The load at different speeds should be verified for each application. Refer to your Toshiba representative for further details.

To promote high reliability, the peak voltage at the motor terminals should not exceed the limits defined in IEC 60034-17.

For variable speed controller application suitability and support, contact your Toshiba representative.

11. MAINTENANCE

It is the users responsibility to maintain the motor. Toshiba recommends regular maintenance by a competent person. Maintenance practices should be developed and approved by the end user/customer.

These practices should include but are not limited to:

1. periodic inspections relevant to site conditions
2. bearing lubrication practices
3. condition monitoring practices.

11.1 General Maintenance

- The motors air paths (including motor fins & air inlets) must be regularly checked and cleaned, when necessary.
- Ensure that any build up of dust, dirt etc is regularly cleaned off the motor.
- Certain motor configurations may require additional shields.
- To maintain the integrity of the motor's IP rating, ensure that all gaskets, glands, seals and sealing compounds are replaced correctly if disturbed.
- If your motor is fitted with a shaft earth brush and insulated bearings ensure that they are regularly and properly maintained.

11.2 Re-greasing

Motors with grease nipples will require periodic re-greasing. When re-greasing, use only recommended grease as per sections 11.3 and 11.4. The motor must be running and have grease exit ports opened during lubrication. *Note*: When regreasing a running motor ensure all safety precautions are observed.

Ensure that the motor runs for a sufficient time to allow the used grease to purge before the exit ports are closed. For motors requiring special types of lubricant, the specification and quantity of grease to be used are noted on the nameplate.

Motors without greasing facilities are fitted with sealed bearings. Sealed bearings are pre-lubricated for the life of the bearing but should be monitored by the user and replaced when necessary.

11.3 Recommended Grease

Toshiba recommends the use of Shell Alvania RL 2 lithium based grease. Always regrease bearings with the same grease type.

11.4 Re-greasing information table

Bearing No.	Grease Qty (Grams)	Replenish Intervals (days)				Bearing No.	Grease Qty (Grams)	Replenish Intervals (days)			
		2P	4P	6P	8P			2P	4P	6P	8P
6208	25	70	130	130	130	6317	80	N/A	100	130	130
6209	25	70	130	130	130	6318	80	N/A	100	130	130
6210	30	70	130	130	130	6319	80	N/A	100	130	130
6211	30	70	130	130	130	6320	80	N/A	100	130	130
6212	30	70	130	130	130	NU214	30	N/A	100	130	130
6213	30	50	130	130	130	NU215	30	N/A	100	130	130
6214	30	50	130	130	130	NU216	30	N/A	100	130	130
6310	30	50	130	130	130	NU217	30	N/A	100	130	130
6311	30	50	130	130	130	NU218	30	N/A	100	130	130
6312	30	50	130	130	130	NU219	50	N/A	100	130	130
6313	30	50	130	130	130	NU220	50	N/A	100	130	130
6314	50	40	100	130	130	NU318	80	N/A	70	130	130
6315	50	N/A	100	130	130	NU320	80	N/A	50	130	130
6316	50	N/A	100	130	130	NU2224	100	N/A	50	130	130

Note: the above table is based on a motor running for 24 hours per day. For an 8-hour duty cycle multiply the interval by 3.

***Note*: Excessive lubrication and/or incorrect grease type may cause an increase in bearing temperature. This may lead to an increased risk of premature bearing failure.**

BEARINGS FOR PREMIUM EFFICIENCY MOTORS *** ALSO REFERS TO HEAVY DUTY INDUSTRIAL**

Frame Number	D71	D80	D90S	D90L	D100L	D112M	D132S, M	D160M, L		D180M, L		D200L	
Poles	2, 4, 6, 8	2, 4, 6, 8	2, 4, 6, 8	2, 4, 6, 8	2, 4, 6, 8	2, 4, 6, 8	2, 4, 6, 8	2	4, 6, 8	2	4, 6, 8	2	4, 6, 8
Drive End	6203ZZ	6204ZZ	6205ZZ	6205ZZ	6206ZZ	6207ZZ	6308ZZ	6310C3	6310	6310C3	6310	6312C3	6312
Non-Drive End	6203ZZ	6204ZZ	6205ZZ	6205ZZ	6205ZZ	6206ZZ	6208ZZ	6208C3	6208	6210C3	6210	6212C3	6212

Frame Number	D225S, M		D250S, M		D280S, M		D315S, M		D315M		D315LL		D355LL
Poles	2	4, 6, 8	2	4, 6, 8	2	4, 6, 8	2	4, 6, 8	2	4, 6, 8	2	4, 6, 8	4, 6, 8
Drive End	6312C3	NU215	6313C3	NU218	6314C3	NU220	6314C3	NU320	6314C3	NU2224	6314C3	NU2224	NU2224
Non-Drive End	6312C3	6312	6313C3	6313	6313C3	6315	6313C3	6318	6313C3	6318	6313C3	6318	6320

12. CONSULTANCY SERVICE

TIC can provide a consultancy service to develop training and service procedures for your site specific practices. This consultancy service should be booked well in advance of any intended service work to ensure appropriate job planning can be established and verified.

For more information on this consultancy service, please contact your Toshiba representative.

13. WARRANTY

Warranty conditions are specified under Toshiba International Corporation's "Conditions of Sale", unless otherwise agreed in writing. For any warranty concerns (after completing the appropriate electrical & mechanical checks), please contact your Toshiba representative.

14. STORAGE

For short term storage (0-6 months) motors should be stored in a clean, dry and well-ventilated area that is free of vibration.

Please contact Toshiba International Corporation regarding the recommended procedures for long-term (over 6 months) storage of a motor.

15. RENEWAL OF PARTS

The use of only genuine Toshiba parts is recommended. When ordering, specify the full nameplate details, the quantity and description of the part/s.

For information and service, please contact your Toshiba representative.

16. MOTOR DISPOSAL

Dispose of the motor in a responsible manner and in compliance with all local environmental laws and regulations.

Toshiba International Corporation Pty Ltd

Australia

Toshiba International Corporation Pty Ltd (Head Office)
2 Morton St, Parramatta
NSW Australia 2153
Tel: (02) 9768-6600 **Fax:** (02) 9890-7546
Homepage: www.tic.toshiba.com.au. **Email:** motorsales@tic.toshiba.com.au

Victoria (Branch Office)
411 Ferntree Gully Road,
Mount Waverley, Vic 3149
Tel: (03) 8541-7960 **Fax:** (03) 8541-7970
Email: vicsales@tic.toshiba.com.au

Queensland (Branch Office)
Unit 4/20 Smallwood Place,
Murarrie, Qld 4172
Tel: (07) 3902-78770 **Fax:** (07) 3902-7878
Email: qldsales@tic.toshiba.com.au

Western Australia (Branch Office)
180 Daly Road,
Belmont, WA 6104
Tel: (08) 9479-4188 **Fax:** (08) 9479-4189
Email: wasales@tic.toshiba.com.au

NSW – Maitland (Representative Office)
Hunter Valley
PO Box 86 Maitland NSW 2320
Tel: (02) 4930-5036 **Fax:** (02) 4930-5038

Tasmania (Representative Office)
Contact Victorian Branch Office
Tel: (03) 8541-7960

Distributor Details

Singapore

Toshiba Asia Pacific Pte Ltd (Head Office)
152 Beach Head Rd, #16-00 Gateway East
Singapore 189721
Tel: (65) 6297-7689/ 6297/ 7686 **Fax:** (65) 6297-6551
Homepage: www.asia.toshiba.com **Email:** tapl_Inq@tasia.toshiba.co.jp

Thailand

Toshiba Asia Pacific Pte Ltd - Bangkok (Representative Office)
946 Dusit Thani Building Room 805A
8th floor Rama 4 Road, Silom,
Bangrak, Bangkok 10500 Thailand
Tel: (662) 236-6401 **Fax:** (662) 237-4682

Malaysia

Toshiba Asia Pacific Pte Ltd - Kuala Lumpur (Representative Office)
No.47-9, The Boulevard Mid Valley
City, Lingkaran Syed Putra 59200
Kuala Lumpur, Malaysia
Tel: (603) 2284-6222 **Fax:** (603) 2288-1952

Philippines

Toshiba Asia Pacific Pte Ltd - Manila (Representative Office)
37th floor, GT Tower International
6815 Ayala Ave, Makati City
Metro Manila, Philippines 1226

6. Appendices

6.1 Appendix A

6.1.1 Throw Card Master Sheet

Use this page as a master to make additional copies of these throw cards.

Machine		Machine	
Serial Number	Date	Serial Number	Date
Level		Level	
Line		Line	
Level		Level	
Line		Line	
Feed End Left Side		**Feed End Right Side**	

Machine		Machine	
Serial Number	Date	Serial Number	Date
Level		Level	
Line		Line	
Level		Level	
Line		Line	
Discharge End Left Side		**Discharge End Right Side**	

6.2 Appendix B – Pre-Commissioning

6.2.1 Pre-Commissioning Checks

Pre-commissioning checks are of vital importance to ensure safe, effective and efficient operation of the equipment.

Metso Minerals (Australia) has a trained field service team available to ensure that installation and commissioning procedures are completed satisfactorily.

If installation and commissioning is not performed / supervised by Metso Minerals field personnel, please ensure that the Commissioning/Audit Checklist (attached) are completed, signed and sent to Metso Minerals for review and approval – before putting the equipment into service

Check sheets should be faxed to the nearest Metso office as detailed in the covering pages of this manual.

CAUTION!

Any action taken to rectify a non-conformance before completing and submitting the installation/commissioning checks (for review by Metso Engineers) will seriously jeopardise warranty available on the equipment and can result in premature structural failure of the equipment.

6.2.2 Commissioning/Audit Check List For Screens and Feeders

COMMISSIONING / AUDIT CHECK LIST FOR SCREENS AND FEEDER

Customer	Serial Number	Date
Site	Location	
Machine Description		
Any comments – deviations from standards set by METSO including visual damage		

ENGINEERING DESIGN	ACTUAL ON SITE
1. Design Speed rpm ……	Recorded Speed ……RPM
Design Rotation …..……	
☐ With Flow	Recorded Rotation …….
☐ Contra Flow	With Flow
☐ Counter Rotation	Contra Flow
☐ (Vibrator motors, V Vibrators – for linear motion)	Counter Rotation
2. End Float	Recorded End Float
Feed End ……mm	Feed End …… mm
Discharge end ……mm	Discharge end ……mm
3. Design Frequencies	Recorded Frequencies
Vertical …….. cpm	Vertical …….. cpm
Horizontal …….. cpm	Horizontal …….. cpm
Longitudinal …….. cpm	Longitudinal …….. cpm
4. Design Throw	Recorded Throw
Left Hand Feed ……mm	Left Hand Feed ……mm
Right Hand Feed ……mm	Right Hand Feed ……mm
Left Hand Discharge ……mm	Left Hand Discharge ……mm
Right Hand Discharge ……mm	Right Hand Discharge ……mm
Comments……	Comments……
5. Design Spring Configuration (per corner)	Recorded Spring Configuration
Feed End ……..inner …….outer	Feed End ……..inner …….outer
Discharge End ……..inner …….outer	Discharge End ……..inner …….outer
Design Spring Heights (no live load)	Recorded Spring Heights
Feed End ……..mm	Feed End RH……..mm LH……mm
Discharge End ……mm	Discharge End RH……..mm LH……mm
Gap between Spring Base and friction check plate (13 mm nom)	……mm
Springs vertical in both planes (front / end) Yes….. No…	
6. Clearances around Machine	Recorded Clearances
Design (Vert. & Horizontal 75 mm min	Under pan …….mm
Design 25 mm min	Feed Box …….mm
Oil Level Checked yes…. No….	Spray Pipe …….mm
Mechanism Breather fitted (low head) yes…. No……	Other (Specify) …….mm

7. Vee Belt Drive			
Tension	-Satisfactory ☐	Requires Adjustment ☐	
Alignment	-Satisfactory ☐	Requires Adjustment ☐	

Design Criteria	Checked By
Prepared by ……. Date	…… Field Service Rep.

We have examined this report and will retain a copy, to the best of our knowledge it is correct.

……	……..	………..
Customer	By	Date

MANAGER FIELD SERVICE ……..DATE…….

6.3 Appendix C – Bolts Tightening Procedure

6.3.1 General

Successful operation of a machine depends upon good maintenance.

WARNING!
Machinery must be inspected frequently to insure that all bolts are tight.

Check the tightness of all bolts after the first few hours of initial operation of the machine. During the first week of operation, check the bolts for tightness daily and then periodically thereafter. This procedure also applies to parts and components that have been disassembled and reassembled during normal maintenance periods.

6.3.2 Procedure for Tightening Bolts

1. Deburr all bolt holes be for assembly to ensure a tight fit between parts being fastened together.
2. Contact surface of the parts attached with bolts must be free of dirt, oil, rust, loose scale, etc.
3. Use two hardened washers per bolt, one under the bolt head and one under the nut. See figure 1
4. Use the Proper size and grade of bolt for the job. The “Bolt Torque Value” chart lists the size, grade and head marking of the bolt, and provides a minimum and maximum torque value for each size and grade of bolt in “kilogram metres” and “foot pounds" (in parentheses).
5. Tighten bolts to the recommended torque value with a torque wrench.

6.3.3 If Torque Wrench Is Not Available

1. Install sufficient fitting-up bolts and tighten as required to bring the parts together.
2. Install bolts in the balance of holes. Tighten the nuts by the “turn of nut” method. This requires that bolts be brought to a snug-tight condition to insure at the joint material is properly compacted before the nut is rotated through the specified turn. "Snug-tight" is defined as
   “The tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench”.
   When using an impact wrench, snug condition is readily noticeable as that point at which the wrench starts impacting solidly.
3. Tighten nuts on fitting-up bolts to “snug-tight” condition and then give these nuts an additional 1/2 to 2/3 turn.

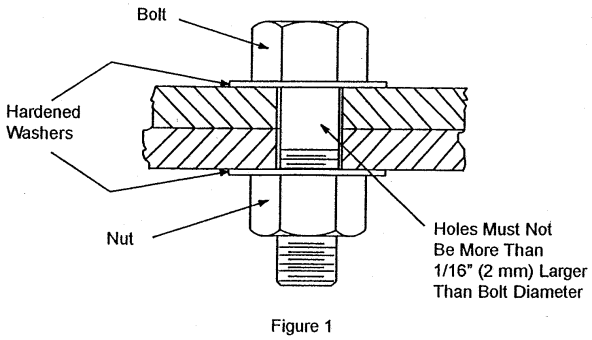
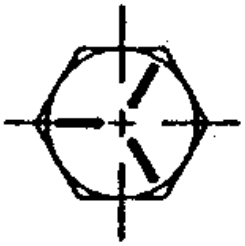


Figure 1: Cross section showing layout of bolts, washers and nuts

6.4 Process for Tightening Bolts (Friction Grip) Unplated.

WARNING!
Not to be used for bolting low head mechanisms to mechanism support beams.

1. Contact surface of parts attached with bolts must be free of dirt, oil, loose scale etc.
2. Use two hardened washers (for high strength bolts only) per bolt, one under the head and one under the nut.
3. Hand tighten bolts using a 300mm long spanner; check the gap between the plates with a feeler gauge. The maximum gap which allows contact with the shank of the bolt is 0.lm.
4. Bolts are to be tightened with a torque wrench within the range as tabulated below.



Imperial - grade 5 S.A.E. or structural

Metric - class 8.8

6.4.1 Tightening Torques – Grade 5 S.A.E. Or Structural

SIZE	THREAD	TIGHTENING TORQUE	
		MAX.	MIN.
3"/8"	U.N.C.	56 Nm. (41.5 lbs.ft.)	54 Nm. (40 lbs.ft.)
7/16	U.N.C.	89 Nm. (66 lbs.ft.)	86 Nm. *(63* lbs.ft.)
1"/2"	U.N.C.	137 Nm. (101 lbs.ft.)	130 Nm. (96 lbs.ft.)
5"/8"	U.N.C.	271 Nm. (200 lbs.ft.)	258 Nm. (190 lbs.ft.)
3"/4"	U.N.C.	480 Nm. (354 lbs.ft.)	456 Nm. (337 lbs.ft.)
7"/8"	U.N.C.	772 Nm. (569 lbs.ft.)	734 Nm. (541 lbs.ft.)
1"	U.N.C.	1169 Nm. (862 lbs.ft.)	1111 Nm. (819 lbs.ft.)
1 ¼"	U.N.C.	1871 Nm. (1380 lbs.ft.)	1778 Nm. (1311 lbs.ft.)
1 ½"	U.N.C.	3954 Nm. (2920 lbs.ft.)	3760 Nm. (2773 lbs.ft.)
1 5/8"	U.N.C.	5450 Nm. (4020 lbs.ft.)	5178 Nm. (3820 lbs.ft.)
1 ¾"	U.N.C.	6890 Nm. (5080 lbs. ft.)	6546 Nm. (4828 lbs. ft.)

6.4.2 Tightening Torques – Metric Class 8.8

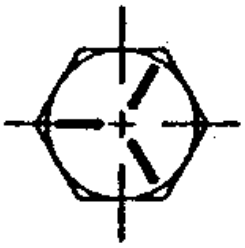
SIZE	TIGHTENING TORQUE	
	MAX.	MIN.
M10	67 Nm. (49 lbs. ft.)	64 Nm. (47 lbs. ft.)
M12	118 Nm. (88 lbs. ft.)	112 Nm. (84 lbs. ft.)
M16	292 Nm. (215 lbs. ft.)	277 Nm. (204 lbs. ft.)
M20	572 Nm. (422 lbs. ft.)	544 Nm. (401 lbs. ft.)
M24	985 Nm. (726 lbs. ft.)	934 Nm. (690 lbs. ft.)
M30	2020 Nm. (1491 lbs. ft.)	1920 Nm. (1417 lbs. ft.)
M36	3534 Nm. (2606 lbs. ft.)	3358 Nm. (2476 lbs. ft.)
M42	5648 Nm. (4156 lbs. ft.)	5366 Nm. (3957 lbs. ft.)
M48	8462 Nm. (6242 lbs. ft.)	8039 Nm. (5930 lbs. ft.)

Based on 100% to 95% of proof load for plated bolts refer to sheet 2

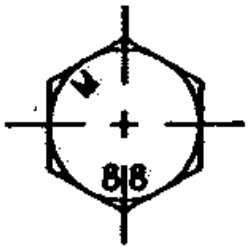
6.5 Process For Tightening Bolts (Friction Grip) Plated

WARNING!
Not to be used for bolting low head mechanisms to mechanism support beams.

1. Contact surface of parts attached with bolts must be free of dirt, oil, loose scale etc.
2. Use two hardened washers (for high strength bolts only) per bolt, one under the head and one under the nut.
3. Hand tighten bolts using a 300mm long spanner; check the gap between the plates with a feeler gauge. The maximum gap which allows contact with the shank of the bolt is 0.lm.
4. Bolts are to be tightened with a torque wrench within the range as tabulated below.



Imperial - grade 5 S.A.E. or structural



Metric – class 8.8

6.5.1 Tightening Torques – Grade 5 S.A.E. Or Structural

SIZE	THREAD	TIGHTENING TORQUE	
		MAX.	MIN.
3/8"	U.N.C.	39 Nm. (29 lbs.ft.)	38 Nm. (28 lbs.ft.)
7/16	U.N.C.	63 Nm. (46 lbs.ft.)	60 Nm. (44 lbs.ft.)
1/2"	U.N.C.	96 Nm. (71 lbs.ft.)	91 Nm. (68 lbs.ft.)
5/8"	U.N.C.	190 Nm. (140 lbs.ft.)	180 Nm. (133 lbs.ft.)
3/4"	U.N.C.	336 Nm. (248 lbs.ft.)	319 Nm. (236 lbs.ft.)
7/8"	U.N.C.	540 Nm. (398 lbs.ft.)	513 Nm. (378 lbs.ft.)
1”	U.N.C.	818 Nm. (603 lbs.ft.)	777 Nm. (573 lbs.ft.)
1 ¼”	U.N.C.	1310 Nm. (966 lbs.ft.)	1245 Nm. (918 lbs.ft.)
1 ½”	U.N.C.	2772 Nm. (2042 lbs.ft.)	2634 Nm. (1942lbs.ft.)
1 5/8”	U.N.C.	3816 Nm. (2814 lbs.ft.)	3625 Nm. (2673 lbs.ft.)
1 ¾”	U.N.C.	4822 Nm. (3556 lbs. ft.)	4581 Nm. (3378 lbs. ft.)

6.5.2 Tightening Torques – Metric Class 8.8

SIZE	TIGHTENING TORQUE	
	MAX.	MIN.
M10	47 Nm. (35 lbs. ft.)	45 Nm. (33 lbs. ft.)
M12	83 Nm. (61 lbs. ft.)	79 Nm. (58 lbs. ft.)
M16	204 Nm. (150 lbs. ft.)	194 Nm. (143 lbs. ft.)
M20	400 Nm. (295 lbs. ft.)	380 Nm. (280 lbs. ft.)
M24	689 Nm. (508 lbs. ft.)	655 Nm. (483 lbs. ft.)
M30	1414 Nm. (1043 lbs. ft.)	1344 Nm. (991 lbs. ft.)
M36	2747 Nm. (1825 lbs. ft.)	2351 Nm. (1734 lbs. ft.)
M42	4536 Nm. (3365 lbs. ft.)	4335 Nm. (3197 lbs. ft.)
M48	5923 Nm. (4368 lbs. ft.)	5623 Nm. (4150 lbs. ft.)

Based on 100% to 95% of proof load for unplated bolts refer to sheet 1

6.6 Appendix D – Trouble-Shooting Log Sheets

6.7 Appendix E – Maintenance Log Sheets