



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C112-022
OPERATION & MAINTENANCE MANUAL

QUEENSLAND UTILITIES AUTHORITY

LUGGAGE POINT BRISBANE, QLD, AUSTRALIA

Operation & Maintenance Manual

Aqua-Screen™ 1800x4300x6

Serial No's. ASC-013-187, ASC-013-188, ASC-013-189

ASC-013-190, ASC-013-191, ASC-013-192

ASC-013-193, ASC-013-013-194

***ANDRITZ* Separation, Inc.**

Job No: C-12-816645-539

IMPORTANT!

This manual should be read in its entirety before attempting to install, operate, or repair the equipment supplied by **ANDRITZ**. At least one copy must be kept in the area of equipment installation and be available to operators and maintenance personnel. Failure to follow the instructions contained herein could result in invalidation of warranties or injury to personnel.

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QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C112-022
OPERATION & MAINTENANCE MANUAL

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SAFETY INSTRUCTIONS

Read This First



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

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

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

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



LIMITED WARRANTY

MATERIAL AND WORKMANSHIP

- a. Seller warrants to Buyer that the Products will be delivered free from defects in material and workmanship. This warranty shall commence upon delivery of the Products and shall expire on the earlier to occur of 12 months from initial operation of the Products and 18 months from delivery thereof (the "Warranty Period"). If during the Warranty Period, Buyer discovers a defect in material or workmanship and gives Seller written notice thereof within 10 days of such discovery, Seller will, at its option, either deliver to Buyer a replacement part or repair the defect in place. Seller will have no warranty obligations under this paragraph (a) if
 - i. Buyer fails to ensure that the Products are operated and maintained in accordance with generally approved industry practice and with Seller's specific written instructions;
 - ii. If the Products are used in connection with any mixture or substance or operating condition other than that from which they were designed;
 - iii. If Buyer fails to give Seller such written 10-day notice;
 - iv. If the Products are repaired by someone other than Seller or have been intentionally or accidentally damaged; or
 - v. Corrosion, erosion, ordinary wear and tear or in respect to any parts which by their nature are exposed to severe wear and tear or are considered expendable.
- b. Seller further warrants to Buyer that at delivery, the Products will be free of any liens or encumbrances. If there are any such liens or encumbrances, Seller will cause them to be discharged promptly after notification from Buyer of their existence.
- c. The express warranties Seller makes in these paragraphs are the only warranties it will make. There are no other warranties, whether statutory, oral, express, or implied. In particular, there are no implied warranties of merchantability or fitness for a particular purpose.
- d. The remedies provided in paragraphs (a) and (b) are Buyer's exclusive remedy for breach of warranty.

Remedy: To report any problems or request parts, contact our Aftermarket Department at +1 817 465-5611 or write to:

Andritz Separation, Inc.
1010 Commercial Blvd S
Arlington, TX 76001, USA

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Chapter 1: Equipment Description and Design Criteria

CHAPTER 1

EQUIPMENT DESCRIPTION AND DESIGN CRITERIA

1.1 EQUIPMENT DESCRIPTION

1.1.1 General Description of the Aqua-Screen®

The Andritz Aqua-Screen® is a continuous perforated plate system designed to extract solids from all types of channels. Flow capacity depends on screen width, perforation size, the open area of the perforated panels, and the upstream level in the channel. Each screen is designed to suit prevailing hydraulic conditions and can be operated manually, on a timer, or in fully automatic mode with level controls.

The Andritz Aqua-Screen® uses close fitting perforated plates to remove floating and suspended solids (screenings) in the effluent flow. The panels are shaped to form steps, which are carried on heavy-duty chains protected from the ingress of debris by a bottom polyester bristle sealing brush, stainless steel side plates, and flexible seals.

The captured screenings are elevated from the effluent channel on the stepped perforated plates over the top of the Aqua-Screen®, and ejected through a totally enclosed discharge chute. The continuous perforated plate is cleaned in two stages:

Back washing using a high-pressure spray bar (or low-pressure deluge).

A rotary washing brush that removes any remaining debris, including fatty and fibrous material.

The rotary washing brush is mounted on pivoting plates that are adjusted to compensate for wear. The tail end runner has no bearing and is made from a wear-resistant material requiring no maintenance. This means that normal maintenance is carried out above ground.

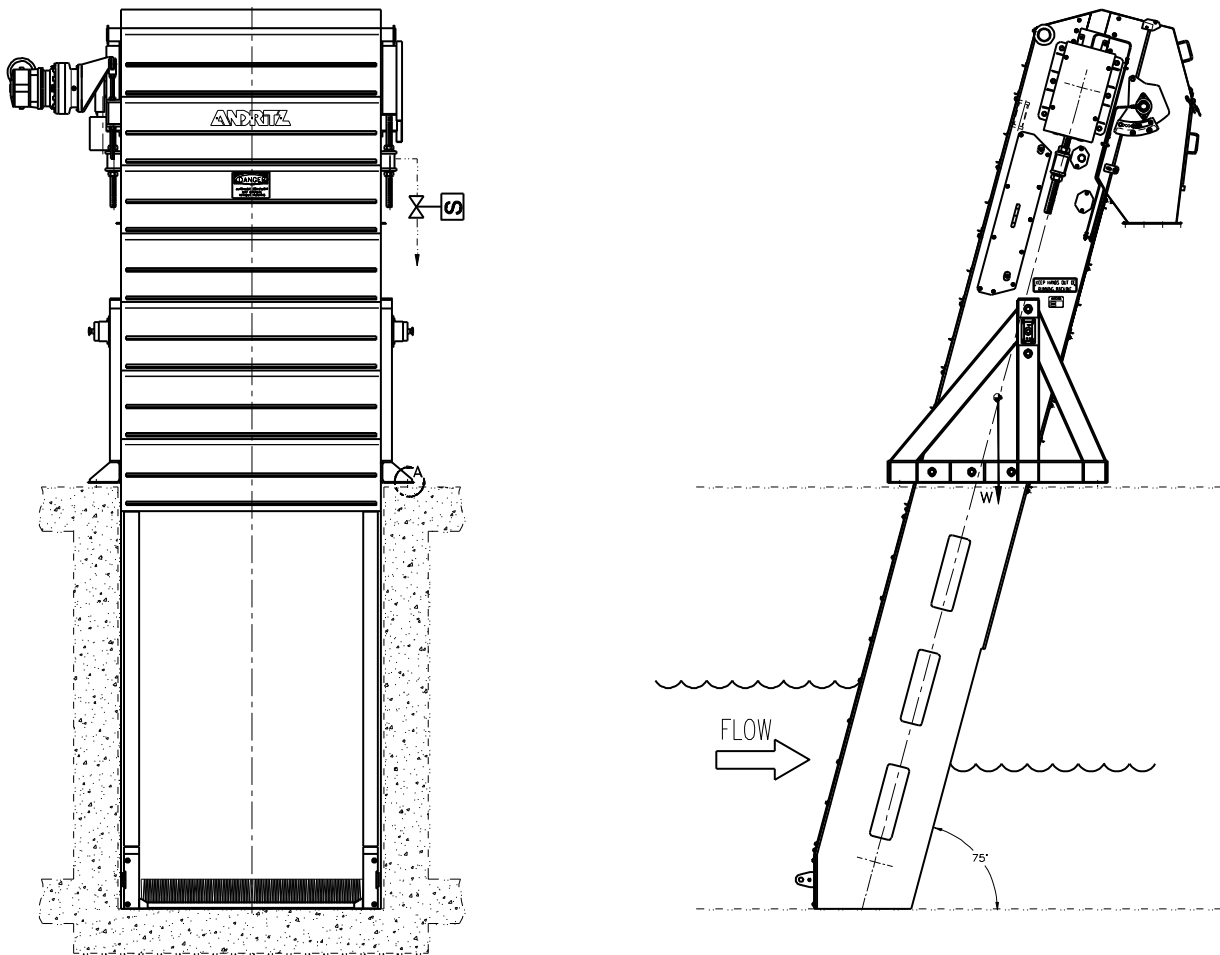


Figure 1-1. The Aqua-Screen® in the Channel

1.2 TECHNICAL SPECIFICATIONS

The Aqua-Screen® has been designed to the following process specifications:

Application:		Wastewater
Screen Opening Size:		6mm, 51% O.A.
Total Flow:	Peak:	1,664 litres/ sec
	Average:	1,165 litres/ sec
Flow/Channel:	Peak:	1,164 litres / sec
	Average:	1,165 litres/ sec
Channel Dimensions:	Width:	1,900-1983 mm
	Depth:	2,200 mm
Velocity Upstream:	Max.	0.60 m/sec
	Min:	0.35 m/sec
Downstream Water Level:	Peak:	1,447 mm
	Average:	1,352 mm
Head Loss:	Peak:	625 mm
	Average:	424 mm
Composition of Solids:		Domestic Sewage
Size of Solids:	Max:	100 mm
	Min:	6 mm
Total Suspended Solids:		<250 mg/L
Fats, Oils, Greases (FOG):		<150 mg/ L
Number of Screens:		8

1.3 SCOPE OF SUPPLY

Item	Quantity	Model #	Description
1	8	ASCI 1800x4300x6	Aqua-Screen® influent channel screen
2	8		Local Screen Operator Stations
3	8		Shock Relays
4	8		Pulsar Ultra 3 with DB3
5	2 print/3 CD		Operation & maintenance manuals
6	2 trips/19 days		Installation check, Start-Up, training

SPARE PARTS

Item	Quantity	Description
1	48	Screen Panel
2	96	Side Plate
3	2	Foot Brush
4	8	Rotating Brush Kits
5	120	Spray Nozzle
6	128	Spray Nozzle
7	192	Screen Panel Mounting Bolt
8	4	Wash Brush Bearing
9	4	Take up Bearing
10	3.048 metre	Chain Link

1.4 EQUIPMENT CHARACTERISTICS

AQUA-SCREEN® 1800 x 4300 x 6mm	
Width (nominal)	2,000 mm
H1 (Channel Bottom to Discharge)	4,300 mm
Approximate Weight with Drive	3,062 kg
Angle of Installation	85 degrees

1.5 MATERIALS OF CONSTRUCTION

AQUA-SCREEN® 1800 x 4300 x 6mm		
Frame	316 SST	6.4 mm thick
Perforated Screen	316 SST	11-gauge
Drive Sprocket	Epoxy-Coated AR400	19.5 mm thick
Drive Shaft	8620 Carbon Steel	101.6 mm diameter
Upper Guide Rail	316 SST	19.5 mm x 12.7 mm thick
Lower Guide Rail	Epoxy-Coated AR400	19.5 mm thick
Covers	316 SST	14-gauge
Transition Chute	Nitrile Neoprene	
Chain Links	316 SST	See Chain Data Sheet
Chain Rollers, Bushings, Pins	403 SST	See Chain Data Sheet
Spray Bar	316 SST	38.1 mm NPT male
Cleaning Brush	Polyester	
Fasteners	316 SST	
Anchor Bolts	By Others	

1.6 AQUA-SCREEN® CHAIN DATA

1. Roller		
Material	403 Stainless Steel	ASTM Standard number A167-89
Heat Treatment	Through Hardened	
Hardness	RC38 or better	
Flange Diameter	90mm	No Surface Finish
Roller Diameter	75 mm; tolerance -0.4 to 0 mm	Surface Finish: 200 RMS
Bore Diameter	50.7 mm; tolerance 0 to +0.25 mm	Surface Finish: 200 RMS
2. Bushing		
Material	403 Stainless Steel	ASTM Standard number A167-89
Heat Treatment	Through Hardened	
Hardness	RC38 or better	
Outside Diameter	50.6 mm; tolerance 0 to -0.1 mm	Surface Finish: 200 RMS
Inside Diameter	43.4 mm; tolerance +0.2 to 0 mm	Surface Finish: 200 RMS
3. Pin		
Material	403 Stainless Steel	ASTM Standard number A167-89
Heat Treatment	Through Hardened	
Hardness	RC38 or better	
Outside Diameter	43 mm; tolerance 0 to -0.1 mm	Surface Finish: 200 RMS
Inside Diameter	35.8 mm; tolerance +0.2 to 0 mm	Surface Finish: 200 RMS
4. Chain Link		
Material	316 Stainless Steel	ASTM Standard A167-84
Heat Treatment	Non-heat-treated	
Length (CL-to-CL)	200 mm	
Width	64 mm	
Thickness	4 mm	
Min. Breaking Load	590 kg	

1.7 MOTOR DRIVE LISTS

1.7.1 Aqua-Screen® Drives

AQUA-SCREEN® MAIN DRIVE GEAR MOTOR: LEFT-HAND UNIT	
Gear Motor:	Baldor CECP83661T-4-M15B 2 HP, 415 VAC, 3-phase, 50 Hz, 1450 rpm, C-face, NEMA N182TC, TEFC, 1.15 Service Factor.
Main Gear Reducer:	Bonfiglioli, W110 UFC2 23 N180CTC AA, Worm Gear reducer, ratio 23:1, NEMA N184C
Secondary Reduction:	Bonfiglioli, 307 L 2 28 FP EOVE A GOA, Planetary Gear Reducer, ratio 28:1
ROTARY BRUSH DRIVE GEAR MOTOR:— LEFT-HAND UNIT	
Motor:	Baldor CECP83587T-4-M15B 1.5 HP, 415 VAC, 3-phase, 50 Hz, 1465 rpm, C-face, NEMA N145TC, 1.15 Service factor.
Gear reducer:	SEW Eurodrive, KT37AM145-KS Helical-bevel gear reducer, ratio 15.31:1, NEMA N145TC Mounting position M1A

AQUA-SCREEN® MAIN DRIVE GEAR MOTOR: RIGHT-HAND UNIT	
Gear Motor:	Baldor CECP83661T-4-M15B 2 HP, 415 VAC, 3-phase, 50 Hz, 1450 rpm, C-face, NEMA N182TC, TEFC, 1.15 Service Factor
Main Gear Reducer:	Bonfiglioli, W110 UFC1 23 N180CTC AA, Worm Gear reducer, ratio 23:1, NEMA N184C
Secondary Reduction:	Bonfiglioli, 307 L 2 28 FP EOVE A GOA, Planetary Gear Reducer, ratio 28:1
ROTARY BRUSH DRIVE GEAR MOTOR:— RIGHT-HAND UNIT	
Motor:	Baldor CECP83587T-4-M15B 1.5 HP, 415 VAC, 3-phase, 50 Hz, 1465 rpm, C-face, NEMA N145TC, 1.15 Service Factor
Gear reducer:	SEW Eurodrive, KT37AM145-KS Helical-bevel gear reducer, ratio 15.31:1, NEMA N145TC Mounting position M1B

1.8 CONTROL SYSTEM DESCRIPTION (PRELIMINARY)

Typical for all 8 Aqua-Screens

The Aqua-Screens® are supplied with a NEMA 7 Local Control Panel (LCP).

The LCP consists of the following operators:

- Emergency Stop - ESTOP Pushbutton
- Aqua-Screen Motor - HAND/OFF/AUTO selector switch
- Brush Motor - HAND/OFF/AUTO selector switch
- Aqua-Screen Shower - HAND/OFF/AUTO selector switch

The following components are shipped loose, to be installed by contractor:

- Wash water solenoid valve
- Pulsar Ultra 3 level controller for upstream level control
- Pulsar Db3 Ultrasonic Transducer
- Shock Relay
- NEMA 7 Control Station with HAND/OFF/AUTO Selector switches with Estop pushbutton

1.9 MAJOR COMPONENT LIST (PRELIMINARY)

Typical for 8 Aqua-Screens.

ITEM	COMPONENT	MANUFACTURER	PART	QUANTITY
1	Enclosure – IP66 Rated <i>NEMA 7, with 1"NPT for conduits, and three holes for selector switches, Hinge kit, Steel mounting panel</i>	ADALET	XCEX101406 N4 XHB-2 Installed XSM 1014	1
2	3 Position Selector Switch <i>NEMA 7</i>	Allen Bradley	800H- JP5KB7AXXX	3

SHIPPED LOOSE				
3	E-Stop Control Station <i>NEMA 7, IP66 Enclosure, Cover – 1 hole, 2-Pos. Push-Pull, Non-Illum, Sealing Kit, Drain Plug, Estop Tag</i>	Allen Bradley	800H-1HVX7M1 800H-NP30 800H-FPX6A1 800H-N479F 800H-NP21 800H-Y4J	2
4	Shock Relay	Tsubaki	TSBSA10	2
5	Ultrasonic Level Controller	Pulsar	Pulsar Ultra 3	1
6	Ultrasonic transducer <i>NEMA 7</i>	Pulsar	dB40	1

1.10 BOLT/TORQUE CHART

Use the following chart and the drawings in the Parts Manual, Chapter 5, when installing or maintaining the Aqua-Screen®.

ITEM	SIZE	TORQUE
Main drive bearing support bolts	M16 x 40	89.5 Nm
Main drive torque arm bolts	M12 x 60	Std
Main drive cover bolts	M10 x 100	Std
Main drive safety cover bolts	M6 x 16	Std
Main drive secondary reducer shrink disc bolts (Bonfiglioli 307)	M10	Std
Rotary brush drive support bolts	M16 x 45	Std
Rotary brush drive bearing bolts	M12 x 30	33.9 Nm
Rotary brush drive cover bolts	M8 x 25	Std
Rotary brush drive torque arm bolts	M8 x 20	Std
Rotary brush retaining bolts	M6 x 20	Std
Upper side seal/seal support bolts	M8 x 35	Std
Lower seal top side bolts	M8 x 30	Std
Lower seal retaining bolts	M8 x 35	Std
Fitting angle retaining bolts	M10 x 30	21.7 Nm
Foot brush retaining bolts	M8 x 60	Std
Chain link securing bolts (button head socket screws)	M10 x 30	Std
Screen panel socket head cap screws	M10 x 30	16 ft-lb

Chapter 2: Installation and Setup

CHAPTER 2

INSTALLATION AND SETUP

2.1 SAFETY INSTRUCTIONS FOR AQUA-SCREEN® INSTALLATION

The installation of the ANDRITZ Aqua-Screen® Wet Separation System must be carried out with attention to all details given in this chapter. It is imperative that all safety measures be taken when moving and placing the machines, including, but not limited to, the following:

- All equipment must be checked for damage immediately upon arrival. A damaged component cannot be operated.
- Use of electrical equipment in hazardous locations is controlled by national regulations and instructions. The manufacturer of original equipment and the owner must read, understand, and comply with these instructions for installation and operation of all equipment and ensure that these regulations are observed at all times.
- Motors destined for use in specific locations must be designed, tested, and approved for use in designated locations only.
- Only lifting gearing with sufficient load-bearing capacity may be used during handling. Use only correctly attached cable with sufficient load-bearing capacity on the lifting gear.



Caution: Lifting by hand is dangerous. If you drop the equipment, you could damage the equipment and injure yourself.



Warning: Do not walk or stand below a suspended load! If the load falls, you could be seriously injured or killed.

2.2 AQUA-SCREEN® STORAGE INSTRUCTIONS

When the Aqua-Screen® is stored for any length of time, ANDRITZ recommends the following instructions:

- The Aqua-Screen® may be stored outdoors with caution when the temperature falls below 0°C.¹ When stored outside, the Aqua-Screen® must be covered with a tarp, and drive motors must be sealed and covered to protect them from moisture.
- Damage may occur if the Aqua-Screen® is stored indoors in a dusty environment or construction area. Therefore, the Aqua-Screen® must be covered with a tarp and kept out of high-traffic areas.
- The drive motor must be covered and sealed with plastic wrap to protect it from moisture. Additionally, the motors must be rotated every 6 months. Remove the fan cover before rotation and replace it afterward.
- The roller bearings must be greased once a month to displace any moisture that may accumulate.
- The Aqua-Screen® must be covered with a tarp to prevent any damage from nearby welding or painting.

Note: Particular attention should be paid to miscellaneous tools and other small items. It is essential that the customer keep a good inventory record of all equipment in storage. This equipment has been accepted as complete during the signing of the shipping bill of lading. Therefore, any missing parts shown on the packing list will be the customer's responsibility.

2.3 INSTALLING THE AQUA-SCREEN®

2.3.1 Basic Aqua-Screen® Installation Instructions

The Aqua-Screen® arrives without the main drive unit and chain guard mounted. These items are removed before shipment to prevent damage to them and to better balance the Aqua-Screen® during installation.

The customer is responsible for providing a proper foundation for the ANDRITZ Aqua-Screen®. This includes, but is not limited to, ensuring that the foundation is strong enough to support the floor loads and that the concrete is resistant to any chemicals which may be present in the filtrate.

The primary concern is that the foundation is level. Exact leveling is critical in achieving optimal performance of the Aqua-Screen®. The foundation must be level to within a tolerance of ± 1.6 mm. Anchor bolt locations are shown in the mechanical drawings.

The Aqua-Screen® must be placed into position by lifting it with an overhead crane. The equipment must first be offloaded from the truck using the lifting eyes at the drive end of the unit and the lifting eyes welded to the outside of the frame. See figure 2-1.

¹ If the Aqua-Screen is subjected to freezing temperatures, then all lubrication must be replaced before use.

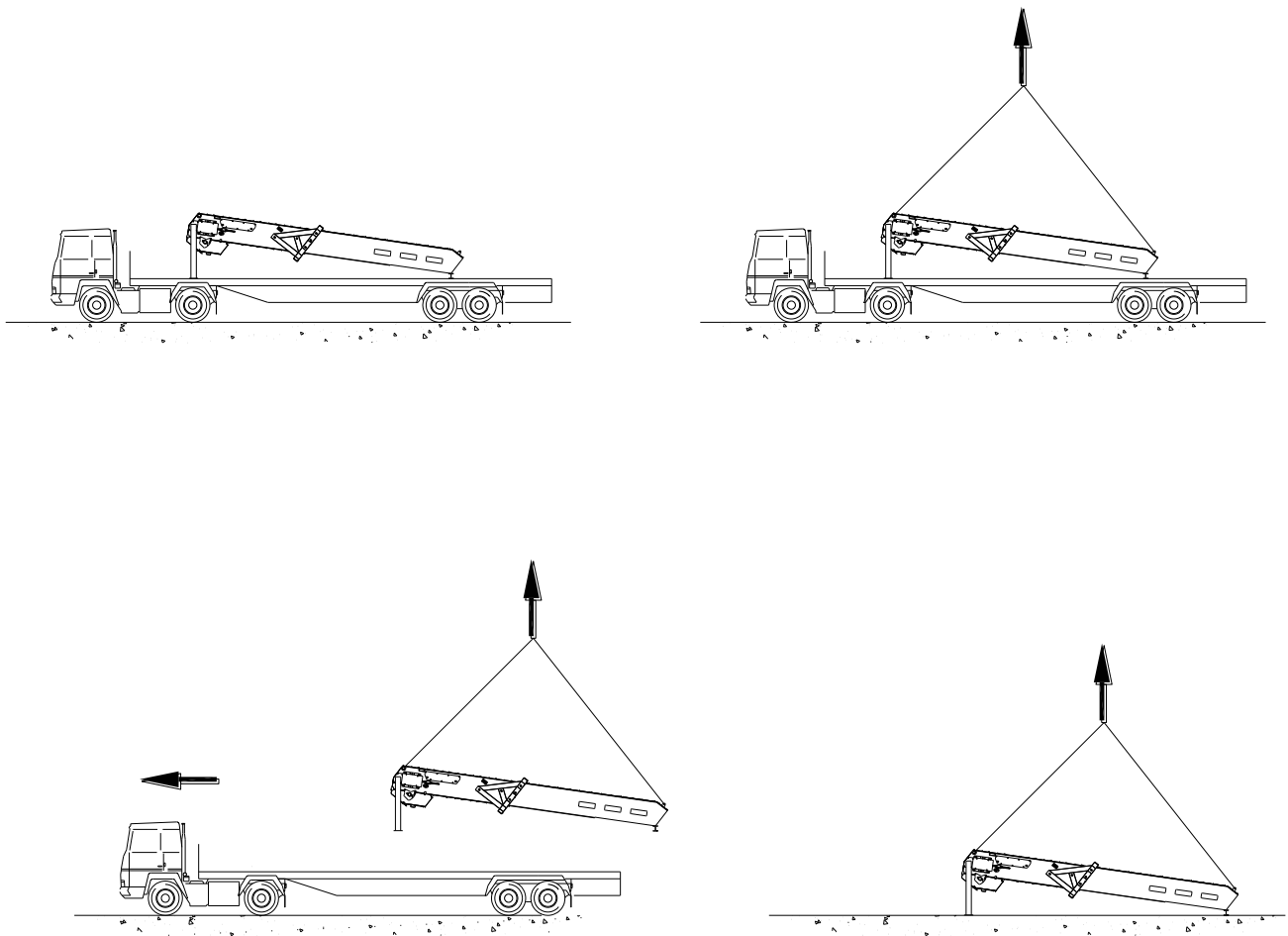


Figure 2-1. Aqua-Screen® Unloading Procedure



CAUTION: Always use the spreader beam when lifting. All cable slings and shackles must be selected to handle the weight of the machine. Only those who are professionals in moving, handling, and placing heavy equipment may conduct sizing and rigging. Otherwise, damage to the equipment may occur or workers may be injured.

Once the Aqua-Screen® has been removed from the truck and placed on the ground, remove the spreader bar (see side illustration) and re-rig the unit for an overhead lift. A small crane is required as a tag to prevent damage to the base of the unit while lifting from horizontal to vertical. Once the drive-end stand has cleared the ground, remove the stand by unbolting it (figure 2-2).

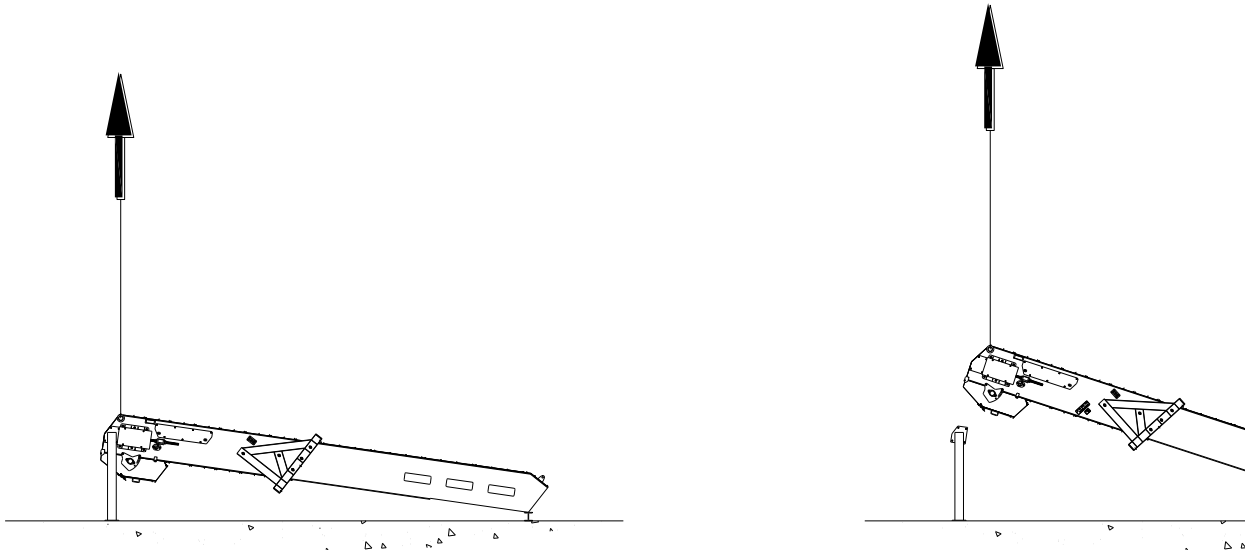
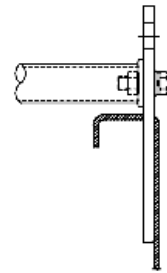


Figure 2-2. Removing the Stand

Once the unit has been completely suspended, remove the lower shipping beam and attach tag lines to the lower lifting eyes. See figure 2-3.

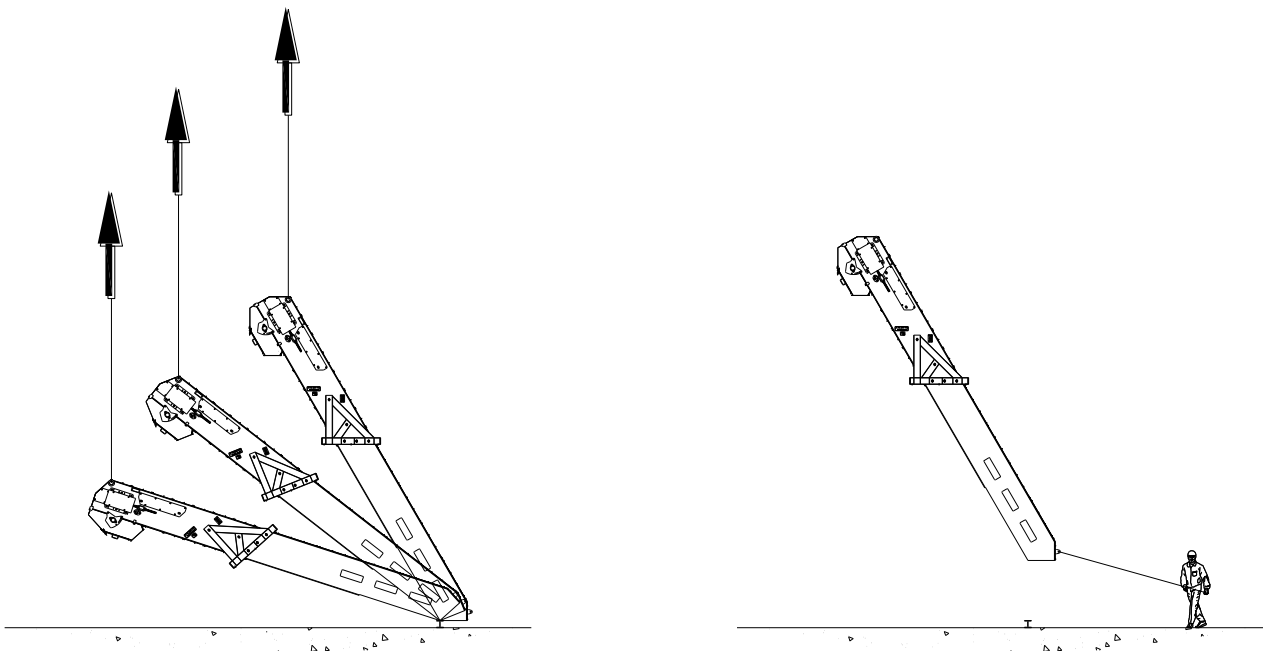


Figure 2-3 Attaching Tag Lines

Lift the Aqua-Screen® into the building, positioning it above the channel. Guide it into the channel. Any contact between the sides of the screen and the walls at the channel must be avoided. See figure 2-4.

Once the Aqua-Screen® is in the channel, use the following procedure to secure it:

1. Using a 152.4 cm level, check that the lower member of the support stand ("A" in figure 2-4) is level in perpendicular angles along the ground. Check that the middle member of the support stand ("B") is plumb and that the angle of the Aqua-Screen® (85°) is correct. If necessary, carefully place shims under the lower member of the support frame ("A" in figure 2-4 below). Grout if needed.
2. Attach the support stand assembly. Secure the support stand to the floor with anchor bolts. Use 25.4 mm anchor bolts as specified on the General Arrangement -1 project-specific drawing (anchor detail B). Torque the anchor bolts. Torque the upper bolts in the centre member of the support stand ("B" in figure 2-4).
3. Position the channel wall seal supports to match drill-mounting holes in the channel and secure with resin-style anchor bolts.
4. Attach side seals to the channel wall seal supports.
5. Adjust the channel wall seal inward toward the screen frame to create the proper seal between the screen and the channel wall support.

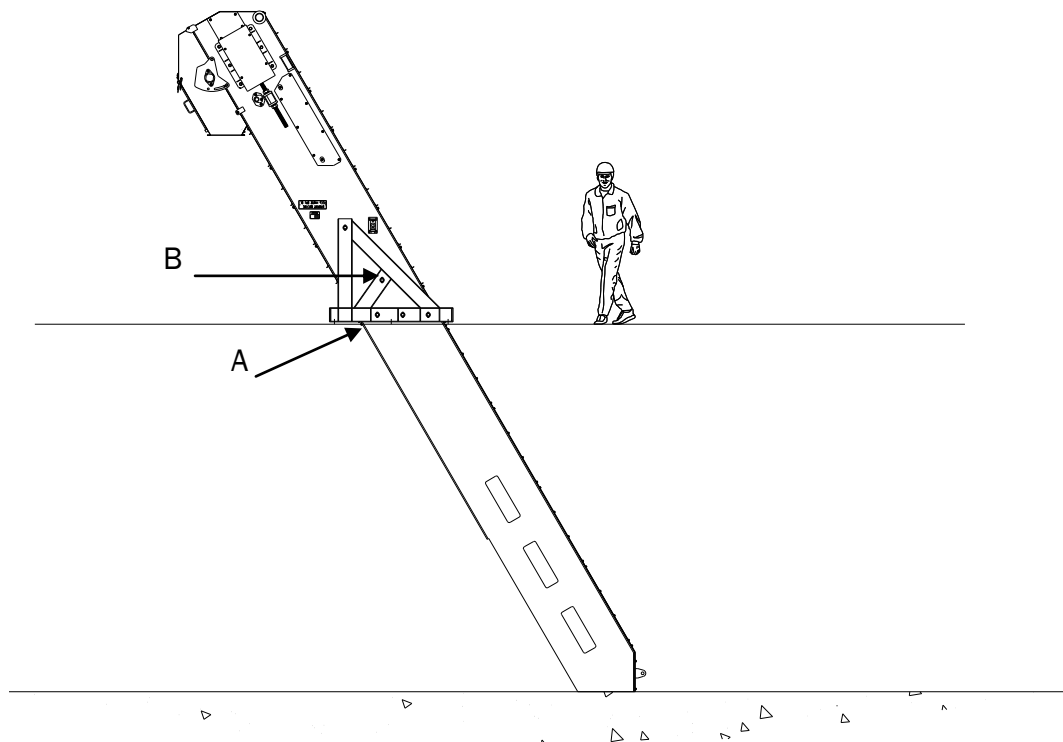


Figure 2-4 Positioning the Aqua-Screen® in the Channel

To set up the remaining equipment, use the following procedures:

1. Attach the motors for the main drive and brush drives (procedure in § 4.3.6 and 4.3.7).
2. Check alignment of drive shaft and gearbox with torque arm and shrink disc before tightening fasteners.
3. Adjust the chains for correct tension (procedure in § 4.2.5).
4. Remove the brace bar inside the discharge chute.
5. Attach the discharge boot assembly to the discharge chute.
6. Hook up plumbing and electrical connections.
7. Bump the motors to check rotation before starting the unit. All water lines must be flushed to eliminate debris before making the last connection.

2.3.2 Connecting the Geared Main Drive Motor to the Aqua-Screen®

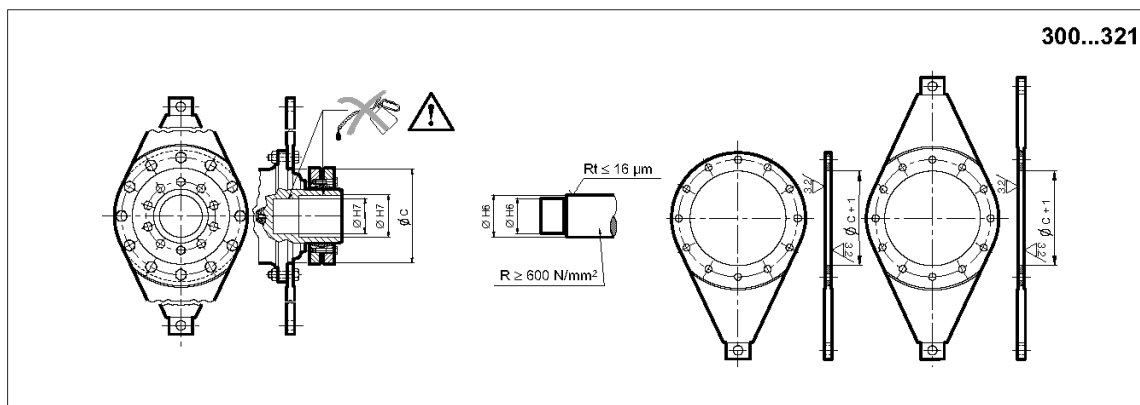
Check the oil level in the gearbox. Follow the supplier instructions located in Chapter 4, Equipment Maintenance, concerning the type of oil to be used. First check that the upper plug of the gearbox is the breather plug. Otherwise, replace this plug with a breather plug.

Use the following procedure to install the main drive:

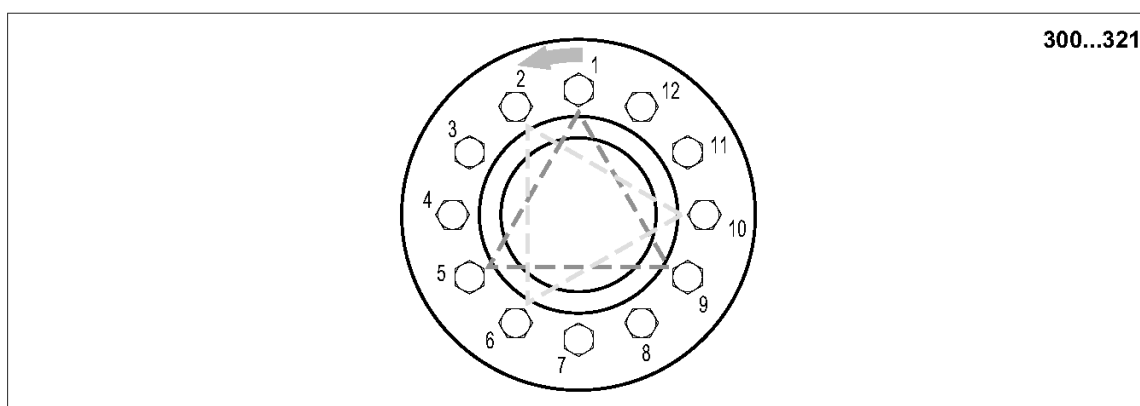
1. Mount the gear motor set on the drive shaft.
2. Slide the torque arm and gear motor towards one another and towards the Aqua-Screen® frame until proper contact is made between the other end of the torque arm and its bracket on the frame. Take care to align the torque arm so that no twisting or bending occurs at the frame bracket end.
3. Locate the closed oil plug supplied for shipping, and replace it with the breather plug supplied in the shipment.
4. Place the gear unit near the installation area.
5. Mount the gear unit and secure it to the structure at the points provided. The gear unit must be secured to the structure at all the mounting points (bores) on the mount provided (feet or flange).
6. Tighten the mounting bolts and check that the service plugs are screwed down.
7. Mount the torque arm with bolts of at least class A4-70 (stainless steel fasteners) tightened to the correct torque value. See bolt/torque chart in chapter 1.
8. Clean and degrease both the internal coupling surface of the gear unit shaft and the external coupling surface of the drive shaft.
9. Mount the shrink disk to the gear unit shaft after lightly lubricating its entire outer surface. Use the bolt and torque value corresponding to the size of gear reducer.

10. Snug down a first set of three bolts located at the corners of an equilateral triangle (for example: bolts in positions 1-5-9 of figure 2-5). Fit the gear unit to the drive shaft.
11. Tighten the bolts (following the triangular pattern) in a circular direction, repeating the operation several times until all bolts are tightened to the correct torque, in accordance with the type of disk/gear unit shown at the bottom of figure 2-5.

N.B.: Do not tighten down diametrically opposed bolts in sequence.



! Do not use molybdenum bisulphide or any other grease, which could reduce the friction of the mating surfaces and affect the performance of the shrink disk.



Shrink disk mounting bolts

	300	301	303	305	306	307	309	310	311	313	315	316	317	318	319	321
Bolt	M6	M6	M8	M8	M10	M10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24
Quantity	8	10	12	12	9	12	8	8	10	10	12	15	18	21	24	21
Class	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque (Nm)	12	12	30	30	58	58	250	250	250	250	490	490	490	490	490	840

Figure 2-5. Main Drive Installation Information

After making the electrical connections to the motor and completing the cabling installation, check the direction of rotation by switching the motor on and off very quickly. When the direction is correct, the upper part of the screen moves upwards. Also check that the insulation resistance of the motor is above acceptable limits.



CAUTION: Avoid turning the screen in the opposite direction. The bristles of the foot brush could enter the holes of the perforated plates and jam the screen and pull bristles from the brush itself, leaving a bald brush.

2.3.3 Connecting the Washing Spray Pipe to the Aqua-Screen®

Connect the spray pipe to a water supply. Insulate the pipe work if there is a risk of freezing. A water pressure of 413.69 kPa minimum is required during operation. Connect the actuated valve electrically to the spray pipe and check its operation. This valve must be open at all times during operation of the Aqua-Screen®. See figure 2-6 for details and refer to the project-specific drawing.

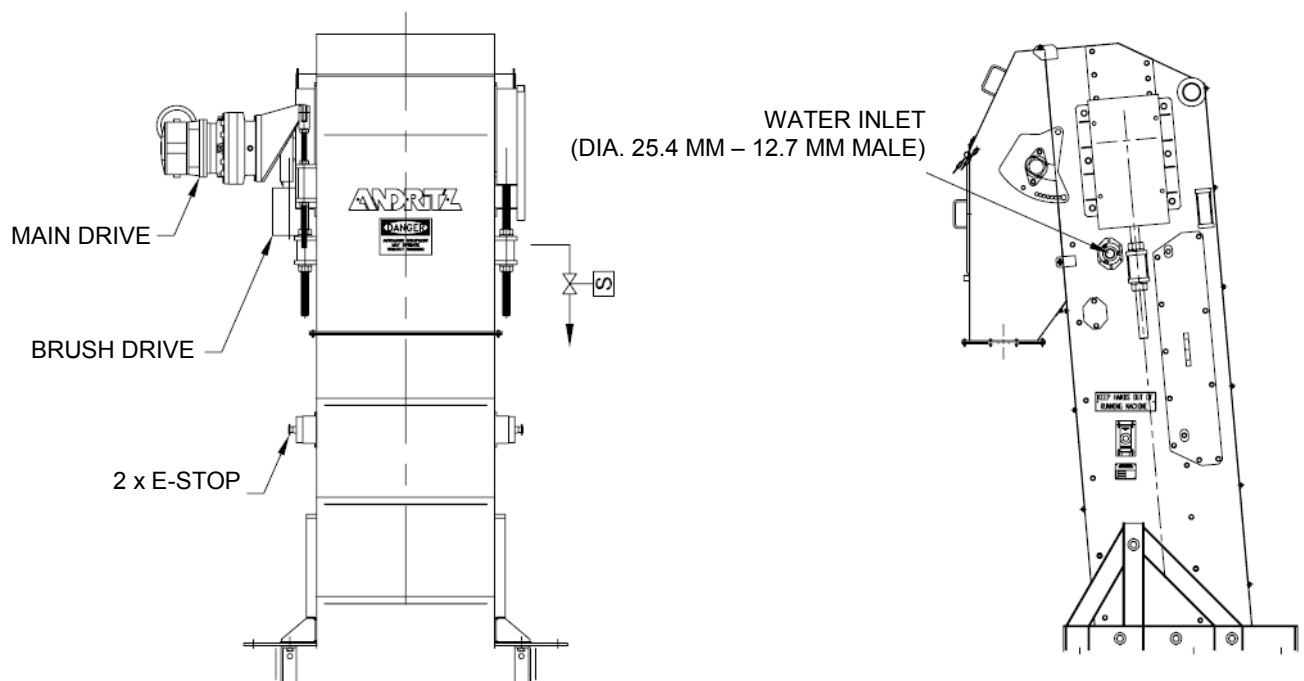


Figure 2-6. Connections for the Washing Spray Pipe

Note: For the spray pipes, industrial water must be filtered at 200 microns.

The spray bar assembly is shipped with slip-on PVC caps. Remove the caps before connecting the spray pipe to a water supply on one end and secure the other end with a 38.1 mm NPT threaded pipe cap.



CAUTION: In the event of hard frost ($< 0^{\circ}\text{C}$), make sure that the effluent does not freeze, even partially on the surface, when the Aqua-Screen[®] is stopped. When the Aqua-Screen[®] starts, the presence of ice in the effluent can cause serious damage, notably the twisting of perforated panels. When there is a risk of freezing, a temperature sensor must be installed. This sensor can then be used to command either uninterrupted operation of the screen (not recommended) or intermittent operation (though more frequent than usual) to prevent solidification of the effluent upstream of the Aqua-Screen[®].



CAUTION: During periods of frost, care must be taken to avoid an accumulation of waste on the chute plate, since excessive accumulations of waste can cause extensive damage to the perforated panels.

2.3.4 Electrical Connections for the Aqua-Screen[®]

Electrical connections on the Aqua-Screen[®] consist of the main drive motor, brush drive motor, and two E-Stop switches located at the operating floor level.

All electrical connections from the Aqua-Screen[®] to the control panel are the responsibility of the owner.

2.3.5 Connecting the Geared Brush Drive Motor

Check the oil level in the gear box. Follow the supplier instructions located in chapter 4 concerning the type of oil to be used. First check that the upper plug of the gearbox is the breather plug. Otherwise, replace this plug by a breather plug.

Use the following procedure to install the brush drive:

1. Place a key on the drive shaft.
2. Mount the gear motor set on the drive shaft.
3. Check to be sure that there is a 3.17 mm gap on both sides of the torque arm bracket.
4. Attach torque arm and gearbox safety cover.
5. Screw down the large nuts on the torque arm. Use care with the torque arm to avoid any misalignment.
6. Insert the bolts and place the washer on the gear box.



CAUTION: Avoid turning the screen in the opposite direction. The bristles of the foot brush could enter into the holes of the perforated plates and jam the screen and pull bristles from the brush itself, leaving a bald brush.



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Chapter 3: Equipment Operation

CHAPTER 3

EQUIPMENT OPERATION

3.1 SAFETY INSTRUCTIONS FOR EQUIPMENT OPERATION

Caution should be exercised in all aspects of system operation. Safeguards against potentially hazardous situations have been provided by ANDRITZ, but common sense is the operator's best protection.

These are the most important safety instructions for operating the Aqua-Screen®:

1. Confirm that guards, access doors, and covers are securely fastened before operating the equipment.
2. During equipment operation, manual intervention in the machine is strictly prohibited. Such interventions, such as lifting and adjusting the machine, or cleaning the shower nozzles, can be performed only by approved operating personnel at the appropriate servicing points, with the power locked out.
3. If it is necessary to clean the equipment during operation or no-load operation, use only a hose and water pressure at a safe distance from rotating and pull-in areas of the equipment.
4. Power must be disconnected before touching any internal panel or drive part. High voltage may be present even when the machine is not running. If used with rectifier power supply, all AC line connections to power supply must be disconnected. With other power supplies, all DC lines and field connections must be disconnected, as well as power from auxiliary devices such as pumps, conveyors, fans, and the like.

The screen must be grounded properly to avoid serious injury to personnel. Grounding must be in accordance with the National Electrical Code and consistent with standard local practices.

3.2 STARTUP AND OPERATION OF THE AQUA-SCREEN®

Before starting the Aqua-Screen® for the first time, check the following items:

1. The channel is clear of debris.
2. All bearings have been greased.
3. All protection devices — such as emergency stop push buttons — are operational.
4. Operate the filter screen and look at the direction of rotation, the state of the perforated plates, and lateral side sealing plates and polyurethane seals.
5. Abnormal noises or knocking during operation; if any abnormal noises are detected, stop the Aqua-Screen® immediately and contact ANDRITZ.

6. Start the waste conveying system downstream from the Aqua-Screen®.
7. Introduce the water into the channel progressively, preferably from downstream. A sudden rush of water can cause irreparable damage (breaking of the fixing bolts, displacement of the Aqua-Screen®, and the like).
8. As soon as the hydraulic conditions are normal, perform the following procedure:
9. Measure the head loss (difference between the upstream and downstream water levels) when the screen is operating continuously. This measurement is the minimum value that will be obtained under the same hydraulic conditions during operation.

Ideally, the screen should not turn until the upper level limit has been reached. The screen should therefore start when this setpoint is reached and should stop when the channel level returns to within 10–20 mm of the minimum value previously measured. This extra margin is necessary to ensure that the Aqua-Screen® stops at the low water level. Ideally, the installation is equipped with a system for continuous measurement of the level (upstream and downstream sensors). In this case, the operational control is easy to implement. When the system has only a timer or a single level sensor to control the operation of the screen, tests are required to find the best compromise value.



CAUTION: The maximum head loss defined for each project must not be exceeded, otherwise abnormal wear, partial, or total damage to the unit may occur. Check the correct operation of the washing spray pipe to verify that the nozzles are not blocked. If it is necessary to remove the pipe, make sure that the nozzles point in the right direction when the pipe is reinstalled.

3.2.1 Tsubaki Shock Relay Setup Procedure

Description of the Tsubaki Shock Relay

A Tsubaki shock relay is designed to sense small changes in the current drawn by drive motors. By sensing small changes in load, it can react to a change that a standard motor overload cannot. Therefore, this shock relay provides good protection against damage caused by mechanical jamming.

The current draw of a typical three-phase induction motor at the instant the power is applied is six times the full load amps. The current drops rapidly, as the motor begins rotating and reduces to the running current as the motor comes to full speed. The shock relay has a start delay timer that allows the motor startup current to pass. The start time must be set at just an instant longer than is required for the motor to start under normal conditions. This delay minimizes the chance for damage if the equipment is jammed when it is started.

The shock relay has an adjustable shock current. This adjustment allows the user to tailor the trip current to exact application needs. Once the load is started and running under normal conditions (the start delay is timed out), the shock relay will detect any current reading higher than the shock current setting, and it will trip. The shock current should be set at just slightly more current than normal motor running current.

To eliminate nuisance tripping, the shock relay has a shock delay time setting. This setting is the period of time excessive current is allowed to occur before the relay trips. This time should be set as short as possible. This setting should be zero unless nuisance tripping occurs. Do not exceed to 0.2 second, maximum.

Field Setup Procedure for the Tsubaki Shock Relay

Follow these general rules before setting up the Tsubaki shock relay:

Rule #1 — The shock relays must be set.

Rule #2 — Each relay must be set individually to its motor.

Rule #3 — When a motor is replaced, its shock relay must be reset.

Rule #4 — If you don't understand or the shock relay does not work after setup, call **ANDRITZ** immediately.

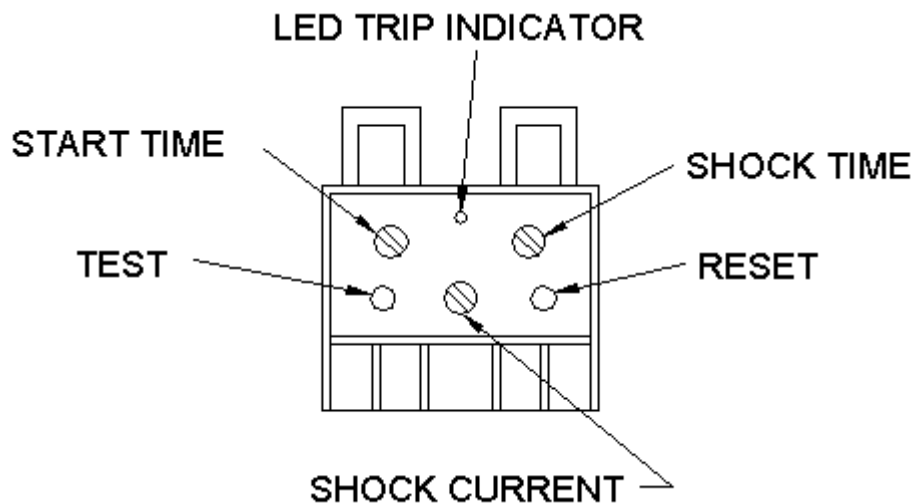


Figure 3-1. Parts of the Tsubaki Shock Relay



CAUTION: The mechanical checkout of equipment such as motor rotation direction must be performed before setting up the Tsubaki shock relay. The system should be reset after the normal loading is reached, this is after the Compacter builds a full plug and the channel has actual influent, not test water.

Use this procedure to set up the Tsubaki shock relay in the ANDRITZ Aqua-Screen®:

1. Record the FLA (full-load amps) of the motors associated with each shock relay (see electrical diagrams and motor name plates).
2. Set the SHOCK CURRENT (the center potentiometer shown in figure 3-1) to the FLA recorded in Step 1.
3. Set SHOCK CURRENT to 0 seconds (the potentiometer on right in figure 3-1)
4. Set START TIME to 5 seconds (the potentiometer on left in figure 3-1). Start the motor in hand mode. Stop the motor. Reduce the START TIME setting slightly (about 1/2 second). Start the motor in HAND mode. Stop the motor.

Repeat this sequence of four steps until the relay trips and the high-torque alarm sounds as the motor is started.

Press the alarm silence on the panel, press RESET on the shock relay and press the alarm RESET on the front of the panel.

To continue the Tsubaki shock relay, follow these steps:

1. Set START TIME just slightly higher than where it is. This is a slight clockwise rotation of the potentiometer. Make sure the motor will start without tripping the alarm. If the motor does not start without tripping the alarm, turn the potentiometer slightly more and attempt to start the motor. Repeat until the motor starts. The objective is to obtain the minimum start time setting for maximum protection.
2. Set SHOCK TIME to 5 seconds (the potentiometer on right in figure 3-1)
3. Start the motor in HAND mode. Slowly reduce SHOCK CURRENT (the center potentiometer) until the trip indicating LED starts blinking. Increase SHOCK CURRENT slowly until the LED stops blinking. Repeat to check that the SHOCK CURRENT is set as low as possible.

Note: If the light blinks for 5 seconds, the relay will trip and the alarm will sound.

4. Set SHOCK TIME to 0 seconds. Make sure the motor will run. If it does not, call ANDRITZ immediately

3.2.2 Aqua-Screen® Sequence of Operation

To start up the Aqua-Screen®, follow this procedure:

1. Make sure the main disconnect switch is turned the ON position and all Estops are de-energized.
2. Each component on the Aqua-Screen has two modes of operation, hand and Automatic. Each component in hand mode will run continuously.
3. In Auto mode, the Aqua-Screen® will run upon receiving a high level signal, or a high – high level signal command from the ultrasonic level controller. It will also run when the screen minimum cycle timer is done. The unit will continue to run for an adjustable time after the run request is cleared.



CAUTION: HAND mode is for service and emergencies only. The brush drive should be running when screen drive is running, or damage to the brush may result.

Spray Wash Modes of Operation

When the screen is requested to run with its shower selector placed in the AUTO position, the shower is delayed for an adjustable time period to allow the mat to reach the brush. Then the shower runs for an adjustable time period while the mat is under the brush.

Alarm Control

The following conditions will shut down the motor control circuits in MANUAL or AUTO mode, sound the horn, and illuminate the respective amber indicator lights on the Main Control Panel. The alarm SILENCE pushbutton will acknowledge and silence the horn, and alarm RESET will extinguish the alarm indicator after the condition has been cleared.

These are the alarms:

1. Aqua-Screen® brush drive motor overload
2. Aqua-Screen® drive motor overload
3. Aqua-Screen® drive overtorque
4. Channel level high-high (alarm only, no shutdown)

3.2.3 Troubleshooting for the Aqua-Screen®

Manual Mode:

1. Turn the main isolator and drive isolator on.
2. Select MANUAL at the point of control.
3. Reset any standing faults on the control panel.

If the machine fails to start, check the following items:

1. Overload is reset
2. Motor fuses
3. Operation of any relevant limit switches
4. Local isolators (where fitted) are turned on

Auto Mode

1. Failure to start in AUTO may be caused by various faults:
 - a) No power to panel (usually indicated by SUPPLY ON light failing to illuminate):
 - b) Check isolator is switched ON.
 - c) Check supply is reaching panel.
 - d) Check control transformer primary and secondary MCB.
2. Emergency Stop Operated:
 - a) Check that panel Emergency Stop button has been reset (twist to reset).
 - b) Check that remote Emergency Stop buttons have been reset (twist to reset).
3. Fault in System:
 - a) Switch off panel and test to ascertain cause of trip, reset any standing faults when the cause has been illuminated and the power restored.
 - b) Check that the motor and control fuses are healthy.
 - c) Check motor protection / overload relay has not tripped.
 - d) Check the local isolator (where fitted) is turned on.
4. General:
 - a) Overloads are generally caused by some foreign material entering the Aqua-Screen® or a deformation of components in the screen. Although overloading of the Aqua-Screen® resulting in the tripping out of a motor is rare, it can happen.



Shower Water Will Not Spray

- 1) Make sure that water is filtered to 200 microns.
- 2) Check all spray nozzles for clogs or obstructions. This should not occur if the water is filtered properly.

Too Much Liquid in Discharge

10. Check screens for clogs or obstructions. Spray wash with high-pressure water.

3.2.4 Aqua-Screen® Troubleshooting Checklist

Symptom	Inspection	Action
Vibration or hammering sound	Check guides and sprockets for obstructions	See ¶ 4.2.5 for screen chain adjustment
Carryover of screenings material	Check lateral side seals	Replace if damaged
	Check rotating brush for proper adjustments	See for ¶4.2.6 adjustments
	Check side and center seal plates for damage	See ¶ 4.2.7 for replacement
	Check foot brush for damage	See ¶ 4.2.8 for replacement
	Check shower nozzle for blockage	See ¶ 4.3.4 for replacement
Shower will not spray	Make sure that water is filtered to 200 microns	
	Check all spray nozzles for clogs or obstructions	See¶ 4.3.4 for replacement
General notes	Some foreign material entering the Aqua-Screen® generally causes overloads or a deformation of components in the screen. Although overloading of the Aqua-Screen® resulting in the tripping out of a motor is rare, it can happen	
Torque overload alarm	Check current at screen motor.	Ensure lower than VFD torque parameter
	Check for mechanical drag causing high current condition	Correct mechanical drag causing high-current condition
Brush overload	Check current at screen motor	Ensure lower than VFD torque parameter
	Check for mechanical drag causing high current condition	Correct mechanical drag causing high-current condition
Brush motor high temperature	Check current at screen motor	Ensure lower than VFD torque parameter
	Check for mechanical drag causing high current condition	Correct mechanical drag causing high-current condition
Screen motor high temperature	Check current at screen motor	Ensure lower than VFD torque parameter
	Check for mechanical drag causing high current condition	Correct mechanical drag causing high current condition



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Symptom	Inspection	Action
System will not run	Check for incoming power at remote control panel	
	Check for alarms: reset or correct fault	
	Check that no E Stops are tripped	
	Check PLC in remote panel and make sure PLC RUN LED is on. If not, set PLC switch from REMOTE to RUN, and back.	
	Check PLC for fault LED. If illuminated, PLC will not allow system to run; replace or download as needed.	
	Check level indicators for power.	
	Check for proper indication of level.	
	Check for 4–20 ma coming to remote panel.	
Manual Mode	Check overload is reset	Turn the main isolator on and select MANUAL at the point of control. Reset any standing faults on the control panel.
	Check motor fuses.	
	Check operation of any relevant limit switches	
	Check the local isolators (where fitted) are turned on.	
Auto Mode	Failure to start in AUTO may be caused by various faults	
No Power to Panel	Usually indicated by SUPPLY ON light failing to illuminate.	
	Check isolator is switched on.	
	Check supply is reaching panel.	
	Check control transformer primary and secondary MCD.	
Emergency Stop Operated	Check panel Emergency Stop button is reset.	
	Check remote Emergency Stop buttons are reset.	
Fault in System	Switch off panel and test to a certain cause of trip, reset any standing faults when the cause has been illuminated and the power restored.	
	Check that the motor and control fuses are healthy.	
	Check motor protection/overload relay has not tripped	
	Check the local isolator (where fitted) is turned on.	



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Chapter 4: Equipment Maintenance

CHAPTER 4

EQUIPMENT MAINTENANCE

4.1 SAFETY INSTRUCTIONS FOR MAINTENANCE WORK

For safety reasons, as well as for operating efficiency, personnel responsible for maintaining the Aqua-Screen® and Compactor must be thoroughly familiar with the procedures outlined in this manual. Failure to follow recommended guidelines can result in personal injury or damage to the equipment. The following is a list of safety considerations while performing maintenance tasks:

Removal of gratings, catwalks, and guard rails increases the risks of accidents. All access equipment and components should be maintained in their appropriate positions.

Before starting any maintenance work, all drives must be switched off and secured against being switched on inadvertently by unauthorized persons. Electric current must be disconnected before removing safety guards.

All connections for air, oil, water, limit switches, and the like, must be removed from parts to be dismantled or serviced, even if this step is not explicitly mentioned in the maintenance instructions.

When maintenance work calls for machine parts and/or protective devices to be removed, these components must be duly replaced immediately upon termination of the work and before restarting.

4.2 PREVENTIVE MAINTENANCE FOR THE AQUA-SCREEN®

4.2.1 Aqua-Screen® Routine Maintenance



CAUTION: If the effluent contains sand, the sand can cause rapid wear of the main chains. To avoid costly and frequent replacement of worn parts, the installation should be modified to separate sand from the effluent upstream of the Aqua-Screen®.



CAUTION: Before any work is done on the screen, consult the safety instructions.

For all equipment not manufactured by ANDRITZ (gearboxes, motors, sensors, and the like), consult the manufacturer's technical manuals.

Although daily inspection is not strictly necessary in many cases, it is always desirable since the type, size, and volume of waste arriving at the Aqua-Screen® varies widely. Certain objects — such as steel wire, wooden beams, metal cans — can cause damage.

General maintenance guidelines are given in table 4-1.

TABLE 4-1. GENERAL MAINTENANCE GUIDELINES FOR THE AQUA-SCREEN®

Weekly: Check for...	Monthly	Annually: Check for...
Any waste which might damage the Aqua-Screen® (iron rods, large cans) in the channel upstream of the screen.	Clean all screen surfaces using a high-pressure hose to eliminate accumulations of grease or other matter.	Wear of the screen chains
Damaged perforated plates. This prevents waste from passing behind the side plates.	Clean the rotating brush and the chute plate. Remove accumulations of grease and other sticky waste using a scraper or high-pressure hose.	Tension of the screen
The condition of the lateral side sealing plates and flexible seals.	Check that the nozzles in the spray pipe are open, not blocked.	
The condition of the rotating brush.	Grease the bearings of the two shafts: drive shaft and rotating brush. Use type SKF-LG-EP-2 or equivalent grease. This grease includes extreme pressure, anti-corrosion, and anti-oxidant additives	



CAUTION: Broken or twisted parts must be replaced immediately as they themselves cause damage to the Aqua-Screen®.

Note: Illustrations in this section are representative of Aqua-Screens. The illustrations are not exact drawings of any project-specific equipment. Refer to the drawings in the parts manual (Chapter 5) for project-specific information.

4.2.2 Maintenance Schedule Summary

After initial commissioning, maintenance should be carried out at the end of the first month of operation if the Aqua-Screen® is operating 8 hours per day. If the Aqua-Screen® is operating more frequently, perform the maintenance at the end of the first week of operation. Thereafter, it is sufficient to perform maintenance every 3 months or every month if operating more frequently than 8 hours per day. At some point, the operators will have enough experience with the Aqua-Screen® and the specific operating conditions to judge when to perform maintenance. However, maintenance must always be performed every 3 months.

The Aqua-Screen® performs best when operated frequently—long periods of idleness lead to corrosion and deterioration of parts. If it is necessary to shut down the Aqua-Screen® for a long time, dry run the screen every 2 to 4 weeks and perform full maintenance before restarting.



CAUTION: Isolate the Aqua-Screen® from the plant electrical system before performing maintenance to avoid injuries associated with an unexpected power-on of the Aqua-Screen®. Perform lock-out/tag-out procedures every time.

Table 4-2 is the maintenance schedule table.

TABLE 4-2. MAINTENANCE SCHEDULE FOR THE AQUA-SCREEN®				
Part	Component	1 Month	3 Month	Overhaul
Drive motor	Gearboxes		Check for leaks.	
	Hold down bolts (gearbox to frame)		Check bolts are tight.	Clean out and repack with grease.
Bearing	Insert		Gears until old grease is purged	
Seal plates	Side seal plates	Examine for damage. Replace if necessary.		
Skirts	Side seals		Examine for wear and adjust if necessary	
Brush rollers	Brush roller	Examine for wear and adjust if necessary		
Brushes	Sealing brushes		Examine for wear and adjust if necessary.	
General			Check all bolts for tightness. Clear and clean Aqua-Screen®.	

4.2.3 Aqua-Screen® Housekeeping

The ANDRITZ Aqua-Screen® has been designed and manufactured to provide extended service life when operated and maintained properly. One of the most important factors in prolonging the life of the Aqua-Screen® is practicing good housekeeping — regular cleaning and visual inspections.

ANDRITZ recommends that the Aqua-Screen® and auxiliary components be cleaned thoroughly with a moderately high-pressure water spray when buildup occurs and when stopping the screen for any length of time.

The area around and on the Aqua-Screen® should be kept neat for safety reasons as well as to avoid mishaps that could cause damage to the machine. A hand tool or piece of hardware inadvertently left near the screen could destroy the screen and/or do extensive damage to other components on the Aqua-Screen®.

4.2.4 Aqua-Screen® Chain Wear

Check the wear of the screen chains routinely. This can be done easily by removing the inspection plates and measuring the pitch of the chain. The maximum permissible wear is 8 inches between roller centers, that is, per pitch, after which the chains must be changed. To replace the screen chains, contact ANDRITZ.

4.2.5 Aqua-Screen® Chain Tension

Check the tension of the screen chains. See figure 4-1. Elongation of the screen chain links tends to lower the bottom point of the Aqua-Screen®. Beyond a certain degree of elongation, the angles of the perforated plates start to rub on the base of the Aqua-Screen® or on the channel bottom. Any unusual vibration or consistent hammering noise is a good indication that the chain requires tensioning. A damaged or bent side seal plate may also indicate that chain tensioning is needed.

The best method of control and correction is as follows:

1. Drain the channel.
2. Remove two perforated screen panel plates. (Refer to § 4.3.1 for the procedure for removing these plates.)
3. Rotate the perforated screen panel plates to bring these two openings to the lowest point of return section of the chain loop (near the bottom of the channel).
4. Look through the openings and note the position of the chain rollers on the half moon plate. The perforated screen panel plates run around the half moon plate at the bottom of their loop.
5. Advance the perforated screen panel plates by short distances until a chain roller is at the lowest point of the half moon plate.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

6. Correct tension adjustment of the perforated screen panel plates implies two conditions:
 - a. The roller of the lower point must be in contact with the half-moon plate, as shown on figure 4-1.
 - b. The roller immediately to the rear must be located about 13 mm to 19 mm from the half-moon plate.

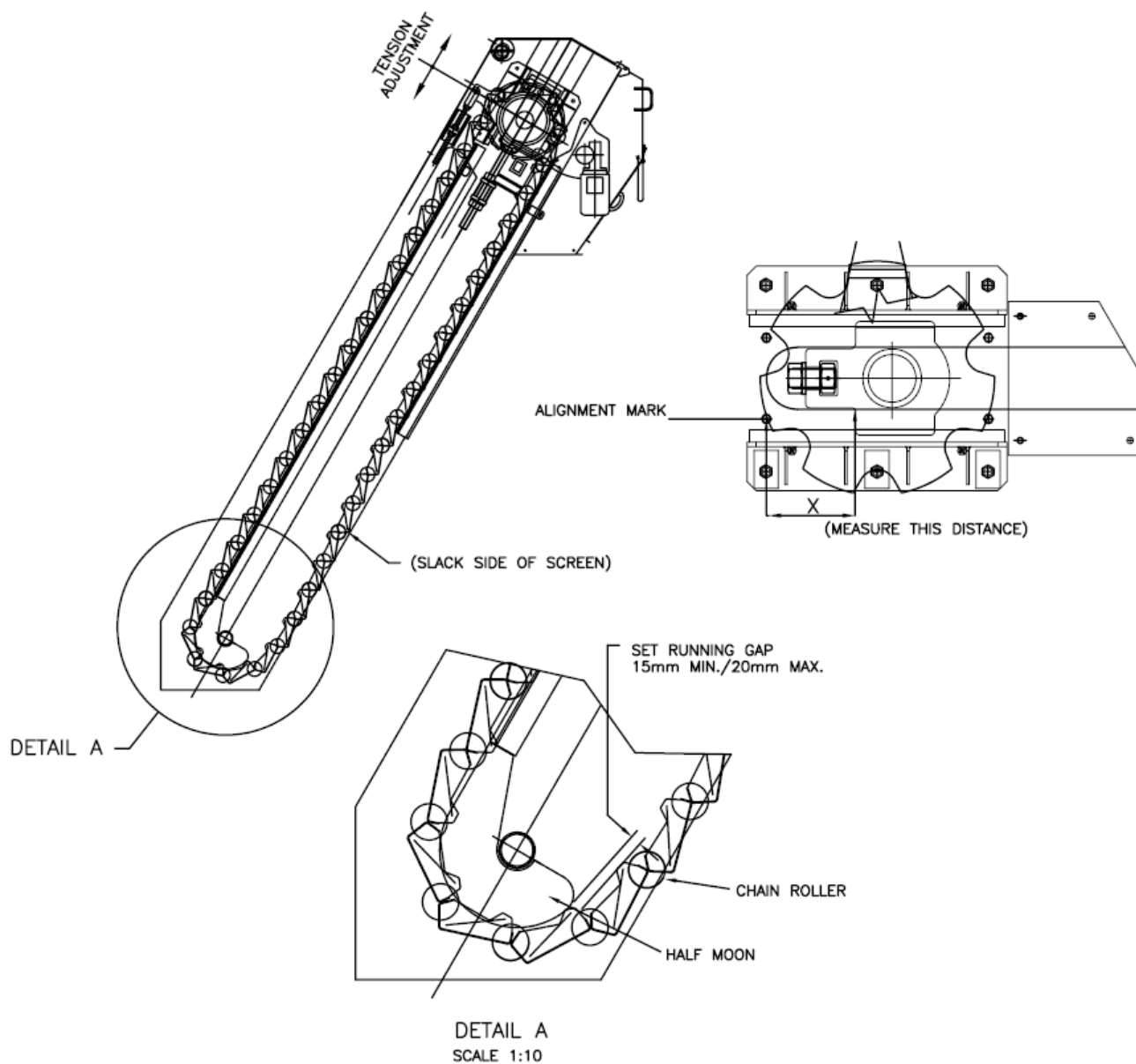


Figure 4-1. Aqua-Screen® Chain Tensioning Diagram

To tighten the chain, adjust the takeup screws on the drive shaft bearings. Adjust the takeup screws until the tension is correct and both bearings are aligned with one another. Make the same adjustment on both sides of the Aqua-Screen®. For example, if you make one full turn on the right, make one full turn on the left side.

Continue tensioning the chain until the chain rollers are located just above the bottom edge of the frame.



CAUTION: An Aqua-Screen® that is overtightened will cause intermittent strain on the drive and will induce abnormal wear with risks of failure.



CAUTION: The takeup bearings must be aligned on both sides of the Aqua-Screen® so that the perforated screen panel plates and chain run correctly.

Alignment marks are stamped into the bearing slide bar. When adjusting, always measure from this mark to the front side of the bearing housing directly above the slide bar. It is important that this measurement be taken at the same point on the bearing housing. See figure 4-1.

4.2.6 Adjusting the Rotary Washing Brush

The rotary washing brush is adjusted to counter normal wear and tear that erodes the bristles. Basically, you will be pivoting the brush assembly so that more of the bristle length will be in contact with the perforated screen panel plates.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.



CAUTION: Do NOT drop any component, hardware, or tool into the Aqua-Screen®. This will damage the Aqua-Screen®.

Use the following procedure to make the adjustments.

1. Loosen the bolts on the rotary washing brush support on both sides. See chart in Chapter 1 for bolt sizes for this project.
2. Remove the lower bolt "A" so that the support plate pivots on the upper bolt "B" shown in figure 4-2.
3. Pivot the rotary washing brush support plate inward and fasten bolt "B" in the next available hole.
4. Re-tighten the bolts.

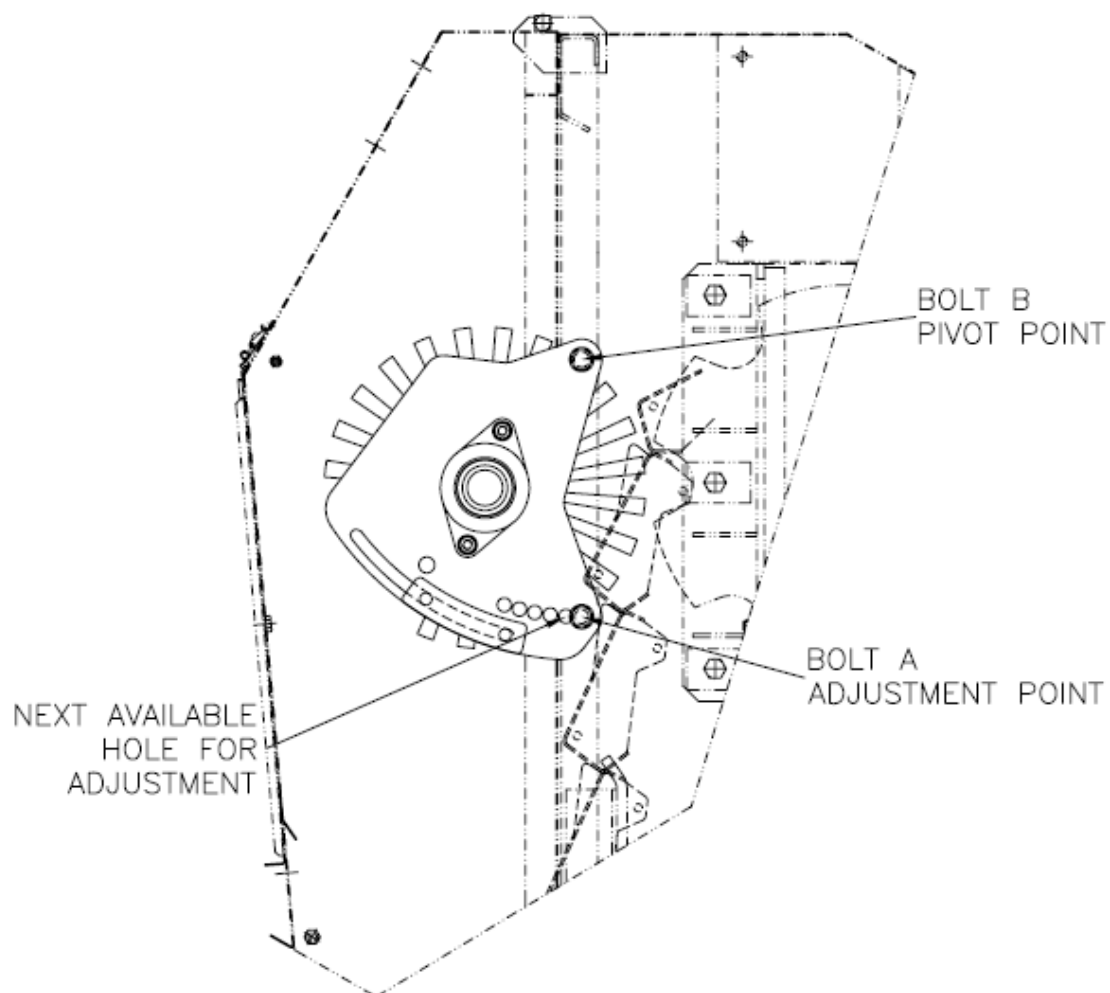


Figure 4-2. Rotary Washing Brush Adjustment

4.2.7 Adjusting the Upper Seal

The upper seal is adjusted to compensate for normal wear and tear that erodes the seal material. Basically, you will be moving the seal downward in small increments to maintain the original amount of seal surface exposure. Use the following procedure to make the adjustments.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.



CAUTION: Do NOT drop any component, hardware, or tool into the Aqua-Screen®. This will damage the Aqua-Screen®.

1. Loosen the bolts on the outside of the seal. See bolt/torque chart in Chapter 1.
2. With a pry bar or chisel push the flexible seal downward to the desired position (which is 1.6 mm to 3.17 mm from the top of the screen panels) to restore the original amount of seal surface exposure.
3. Retighten the bolts on the outside of the seal.

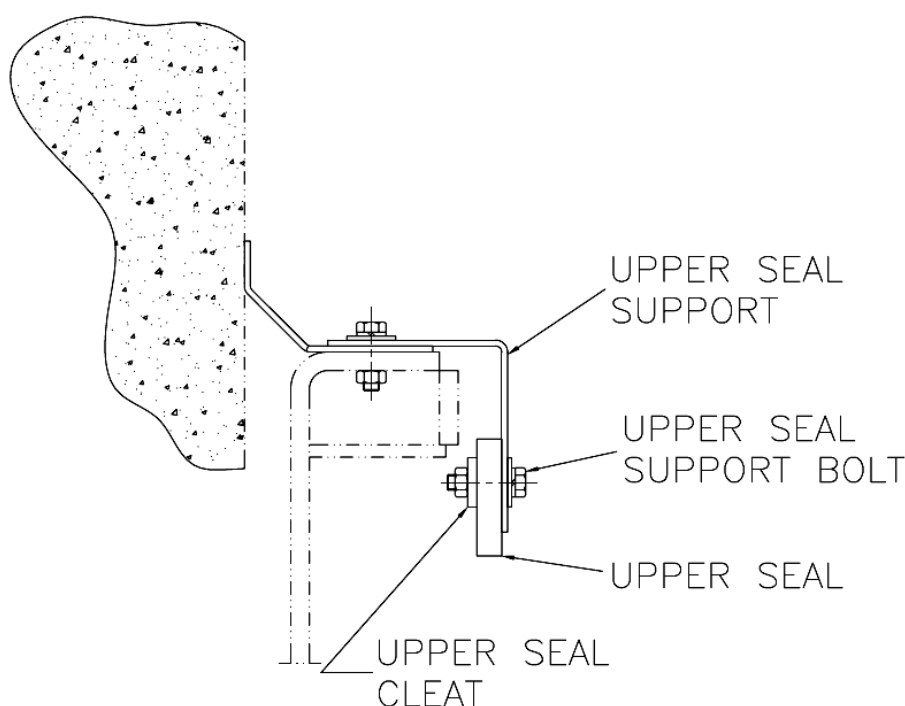


Figure 4-3. Adjusting the Upper Seal

4.2.8 Adjusting the Lower Seal

The lower seal is adjusted to compensate for normal wear and tear that erodes the seal material. Basically, you will be moving the seal downward in small increments to maintain the original amount of seal surface exposure. Use the following procedure to make the adjustments.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.



CAUTION: Do NOT drop any component, hardware, or tool into the Aqua-Screen®. This will damage the Aqua-Screen®.

1. Remove the bolts above the top side of the lower seal section and set aside.
2. Loosen the retaining bolts on the outside of the seal.
3. With a pry bar or chisel push the flexible seal downward to the desired position (which is 1.6 mm inch to 3.17 mm from the top of the screen panels) to restore the original amount of seal surface exposure.
4. Retighten the retaining bolts on the outside of the seal.
5. Reinstall the bolts above the top side of the lower seal section.

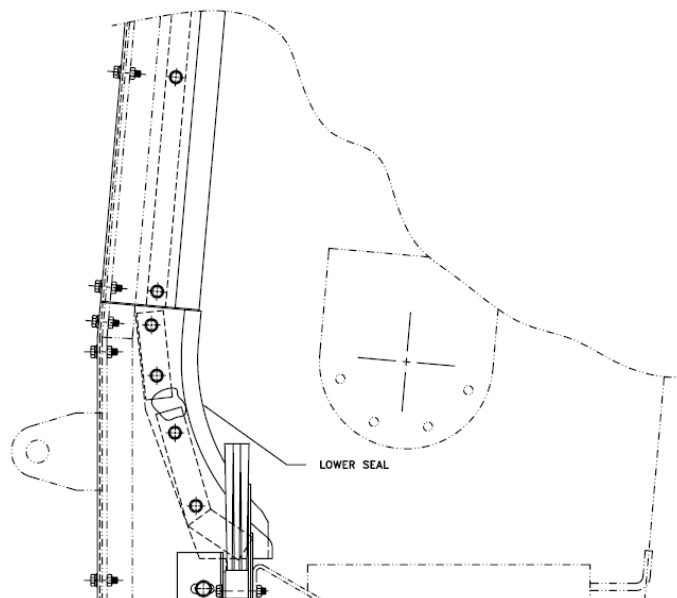


Figure 4-4. Lower Seal Adjustment

4.2.9 Aqua-Screen® Lubrication

The main gear and brush drive reducers are sealed for life and requires no lubrication. The main drive secondary reducer is supplied with the recommended lubricant, and the blind plug is left in place for shipping purposes. Before startup, be sure to replace the blind plug with the breather plug. Check for the oil level on the gear box.



CAUTION: Do not operate the gear boxes without the breather plug. The internal pressure will build up and damage the seal, which will cause leakage after a period of time in operation.

Strict adherence to the following Lubricant Specifications and Lubrication Schedule is essential to obtaining the maximum achievable life from a bearing. The life expectancy of a bearing differs, based upon a number of factors, such as the load placed on the bearing and its speed of rotation, but it is most affected by the type of lubricant used. Use lubricant shown in § 4.2.10 below.

4.2.10 Aqua-Screen® Lubrication Recommendations

TABLE 4-3 LUBRICATION RECOMMENDATIONS				
Lubrication Point	Item	Original Lubrication Supplied		
		Mobil	Shell	Texaco
A	Brush shaft bearing	MOBILTH SHC 460	ALBIDA PP Grease 1	MILTEX EP 1-1/2
B	Main bearing	MOBILTH SHC 460	ALBIDA PP Grease 1	MILTEX EP 1-1/2
C	Main bearing	MOBILTH SHC 460	ALBIDA PP Grease 1	MILTEX EP 1-1/2
D	Brush shaft bearing	MOBILTH SHC 460	ALBIDA PP Grease 1	MILTEX EP 1-1/2
E	Main gearbox	MOBIL GEAR 630	OMALA OIL 220	MEROPA 220

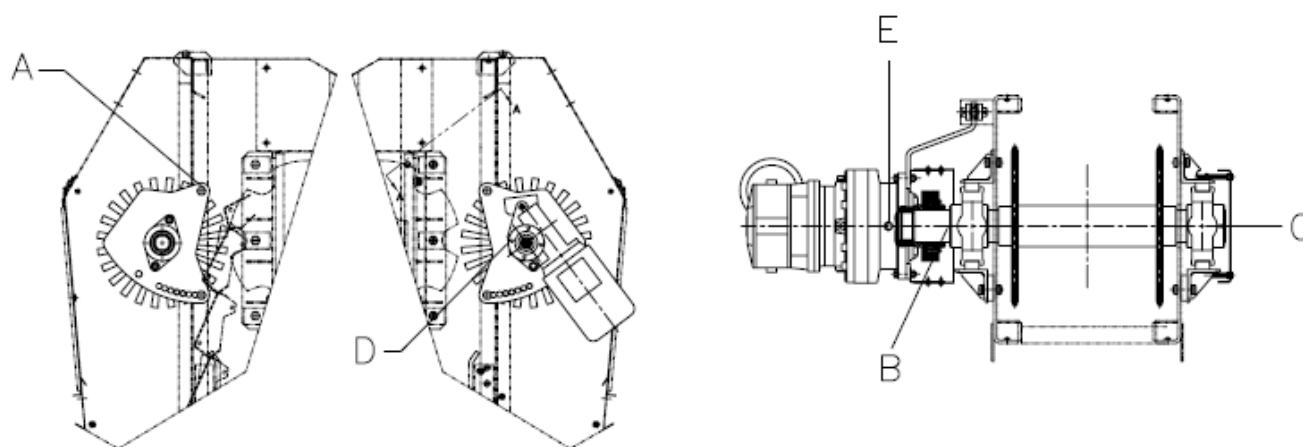


Figure 4-5. Lubrication Points on the Aqua-Screen®



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

4.2.11 Aqua-Screen® Lubrication Schedule

TABLE 4-4 MANUAL LUBRICATION SCHEDULE					
EQUIPMENT LOCATION	FREQUENCY	LUBRICATION TYPE (GREASE/OIL)	LUBRICANT AMOUNT	LUBRICATION SUPPLIER	LUBRICATION PRODUCT
(Drive Side) A. Brush Shaft Bearing	Monthly	Grease	42.5 grams	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
(Drive Side) B. Main Bearing	Monthly	Grease	283.5 to 340.2 grams	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
(Non Drive Side) C. Main Bearing	Monthly	Grease	283.5 to 340.2 grams	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
(Non Drive Side) D. Brush Shaft Bearing	Monthly	Grease	42.5 grams	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2

TABLE 4-5 LUBRICATION SCHEDULE FOR MOTORS					
EQUIPMENT LOCATION	FREQUENCY	LUBRICATION TYPE	LUBRICANT AMOUNT	LUBRICATION SUPPLIER	LUBRICATION PRODUCT
Aqua-Screen® Main Drive Secondary Gearbox (307)	1. Initial oil change after 300 hours operation 2. Check oil level every 3 months and for leakage 3. Change oil every 4,000 hours or each year	Oil	5.7 litres	Mobil	Mobil Gear SHC 630
				Shell	Tivela Oil WB
				BP	Ernesyn HTX220
				Texaco	Meropa 220
Aqua-Screen® Main Gear Reducer (W 110)	Unit arrives unlubricated. Change oil every 4,000 hours.		1.7 litres	Shell	Tivela Oil S320
Aqua-Screen® Brush Gear Reducer (KT37)	Change oil every 4,000 hours or each year.			Mobil	Mobil Gear SHC 630

4.3 AQUA-SCREEN® CORRECTIVE MAINTENANCE AND REPAIR



CAUTION: Before beginning any maintenance or replacement of parts, switch off and lock out all-electrical power in accordance with local plant standards and procedures. Failure to do so will result in personnel injury and damage to equipment.

4.3.1 Replacing Perforated Plates and Side Seal Plates

To replace perforated screen panel plates and side seal plates, you will work through the side inspection hatches. Use the following procedure to replace perforated screen panel plates and side seal plates:

1. Position the screen panel plate and/or side seal plate to be replaced at the center of the side inspection hatch.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

2. Remove the two side inspection hatch covers. Readjust the item you wish to replace to make sure it is centered in the opening of the side inspection hatch.



CAUTION: Do NOT drop any component, hardware, or tool into the Aqua-Screen®. This will damage the Aqua-Screen®.

3. Secure the perforated screen panel plate with a suitable restraint (such as steel wire) to prevent it from falling into the Aqua-Screen® during the next three steps.
4. Unscrew the four securing bolts (two per side) located on the links of the chain and discard the bolts. See bolt/torque chart in Chapter 1.
5. Remove the side seal plates. Discard if damaged.
6. Remove the perforated screen panel plate towards the front of the Aqua-Screen®.

To mount a new perforated screen panel and seal plate, reverse the procedure and do the following. **New bolts are required.** The nuts are welded to the back of the perforated screen panels.

1. Clean and degrease thoroughly the mating surfaces of new bolts and nuts before assembling any parts.
2. Replace the perforated screen panel plate.
3. Replace the side seal plate.
4. Use Loctite 262 and primer N7669 on the bolts before screwing them in place. Allow the Loctite 262 to cure 20 to 30 minutes for temperatures above 21°C. For temperatures below 21°C, allow more time, up to 3 to 6 hours as temperatures approach freezing.
5. Install new securing bolts on the links of the screen chain. Take care not to overtighten the bolt. Set the tightening torque at the correct value for the bolt size. See the bolt/torque chart in Chapter 1.
6. Remove any securing device from the perforated screen panel plate.
7. Replace the side inspection hatch covers.

4.3.2 Replacing Chain Links

To replace chain links, you will work through the side inspection hatch and you will need to fix the chain rollers in place so that you can remove a chain link without damaging the chain or the Aqua-Screen®. Refer to the screen panel assembly drawing in chapter 5, Parts Manual, for an overall view of the parts to be removed and replaced. Use the following procedure to replace chain links:

1. Position the chain link to be replaced at the center of the side inspection hatch.
2. Line up the chain link roller below the link you will be replacing with securing hole "A" in the frame as shown in figure 4-6.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

3. Remove the two side inspection hatch covers. If necessary, readjust the chain link you wish to replace to make sure it is centered in the opening of the side inspection hatch and that the chain roller is lined up with the securing hole. Refer to figure 4-6.



CAUTION: Do NOT drop any component, hardware, or tool into the Aqua-Screen®. This will damage the Aqua-Screen®.

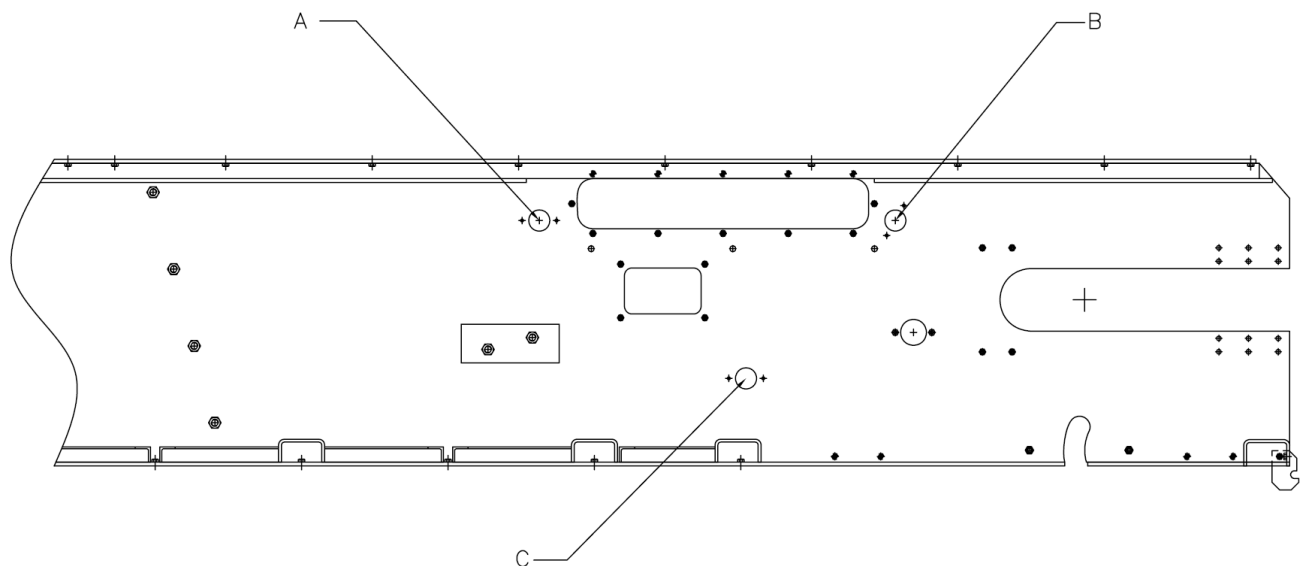


Figure 4-6. Securing Holes for Chain Link Replacement

4. Secure the perforated screen panel plate with a suitable restraint (such as steel wire) to prevent it from falling into the Aqua-Screen® during the next steps.
5. Remove the plastic caps on the ends of the roller.
6. Insert a steel pin through hole “A” and the chain roller directly below the roller of the chain link you wish to replace. Run the pin through the roller and frame on the opposite side of the Aqua-Screen®. The pin must be 35 mm in diameter and a sufficient length to protrude at least 30 cm on EACH side of the Aqua-Screen®. This pin is not a special tool and is not supplied by ANDRITZ.
7. Insert another pin of the same dimensions through either securing hole “B” or “C” to anchor the other end of the chain link you wish to replace.
8. Turn the threaded rod enough to release the tension from the chain so it drops slightly from its normal position.
9. Unscrew the four securing bolts located on the links of the chain. See bolt/torque chart in chapter 1.
10. Remove the side seal plates.
11. Remove the perforated screen panel plate attached to the link you wish to replace.
12. Remove the retaining rings from the hollow pin on the chain link.
13. Remove the hollow pin.
14. Remove the link you wish to replace.

To reassemble, follow this procedure. New bolts are needed to complete reassembly.

1. Clean and degrease thoroughly the mating surfaces of new bolts and nuts and all other parts before assembling any parts.
2. Insert the replacement chain link.
3. Insert the hollow pin.
4. Replace the retaining rings for the hollow pin.
5. Replace the perforated screen panel plate.
6. Replace the side seal plate.
7. Use Loctite 262 and primer N7669 on the bolts before reinserting them. Allow the Loctite 262 to cure 20 to 30 minutes for temperatures above 21°C. For temperatures below 21°C, allow more time, up to 3 to 6 hours as temperatures approach freezing.
8. Screw down the securing bolts in the links of the chain. Take care not to overtighten the bolts. Set the tightening torque as shown in the bolt size/torque chart in chapter 1.
9. Turn the threaded rod to re-establish correct chain tension, so that the chain is not loose.
10. Remove the securing pin from hole "B" or "C."
11. Remove securing pin from hole "A."
12. Remove any securing wire or device from the perforated screen panel plate.
13. Replace the side inspection hatch covers.

4.3.3 Replacement of Flexible Seals

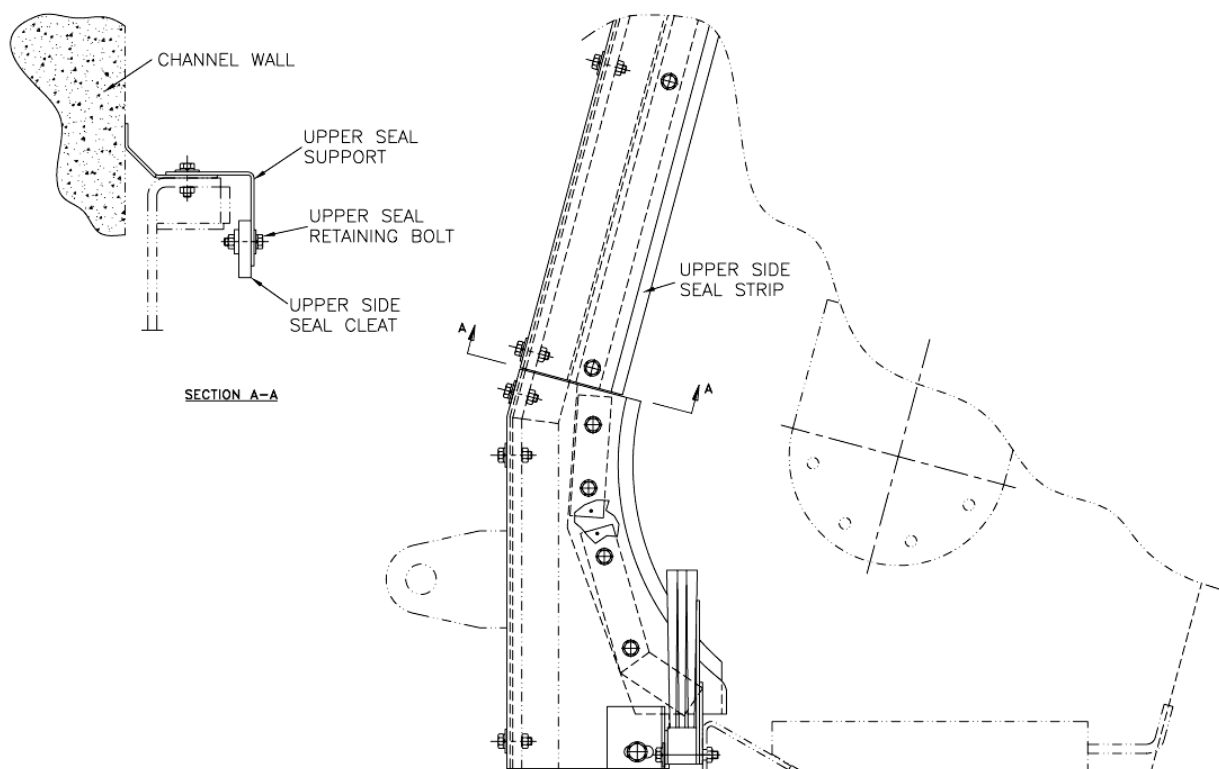
To replace flexible seals, you will drain the channel and work on the lower end of the Aqua-Screen®.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

Replacing the Upper Seal:

1. Drain channel.
2. Remove grit and solids from the base of the Aqua-Screen®.
3. Remove the retaining bolts from the upper seal cleat. See figures 4-7 and 4-8. The seal cleat will come loose.
4. Remove the upper seal tightness strip.
5. Thoroughly clean and degrease the upper seal support.

**Figure 4-7. Upper Seal Location Diagram**

Use the following procedure to reassemble the upper seal:

1. Replace the upper seal.
2. Reinstall the upper seal cleat.
3. Adjust the seal to the desired position.

4. Use Loctite 262 and primer N7669 on the bolts before reinserting them. Allow the Loctite 262 to cure 20 to 30 minutes for temperatures above 21°C. For temperatures below 21°C, allow more time, up to 3 to 6 hours as temperatures approach freezing.
5. Screw down the bolts in the upper seal cleat. Take care not to overtighten the bolts.

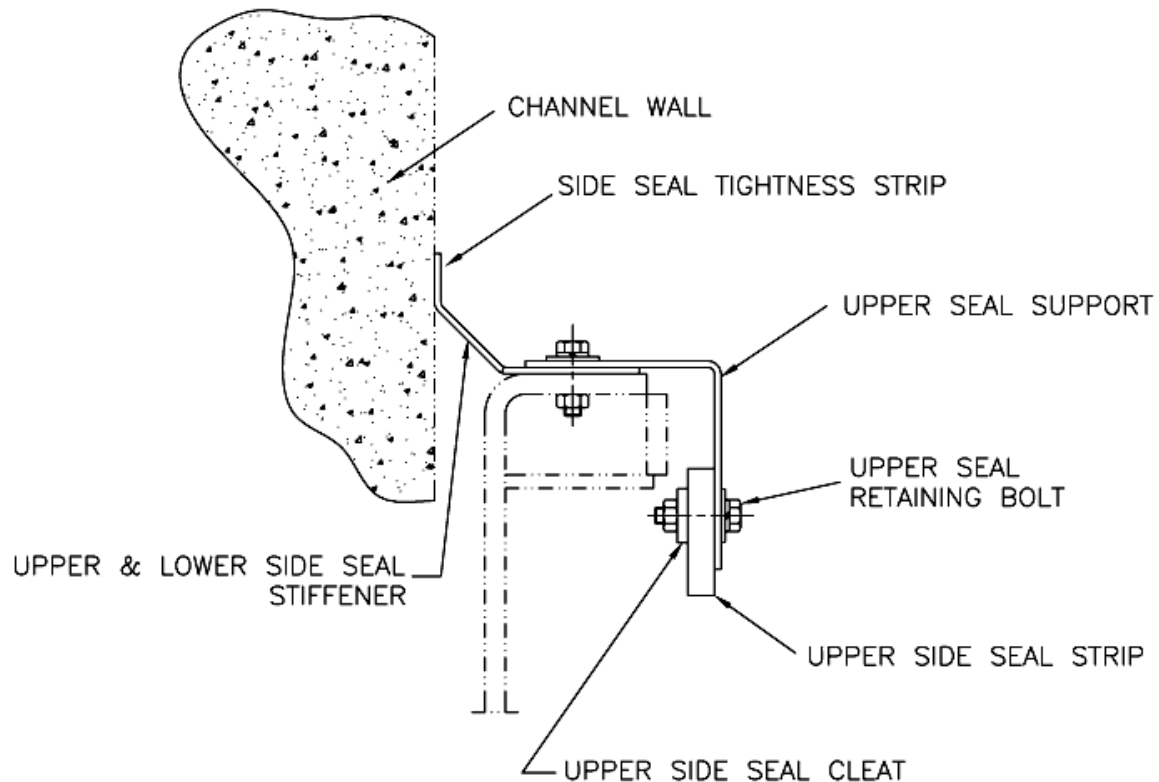


Figure 4-8. Upper Seal Replacement Components Diagram

Replacing the Lower Seal:

1. Drain channel.
2. Remove grit and solids from the base of the Aqua-Screen®.
3. Remove the bolts from the lower seal cleats. See figure 4-9.
4. Remove the lower seal cleats.
5. Remove the lower seal.

Use the following procedure to reassemble the lower seal (see figure 4-9):

1. Thoroughly clean and degrease the mounting surfaces.
2. Replace the outer and center seals.
3. Reinstall the lower seal cleats.
4. Use Loctite 262 and primer N7669 on the bolts before reinserting them. Allow the Loctite 262 to cure 20 to 30 minutes for temperatures above 21°C. For temperatures below 21°C, allow more time, up to 3 to 6 hours as temperatures approach freezing.
5. Screw down the bolts in the lower seal cleats. Take care not to overtighten the bolts.

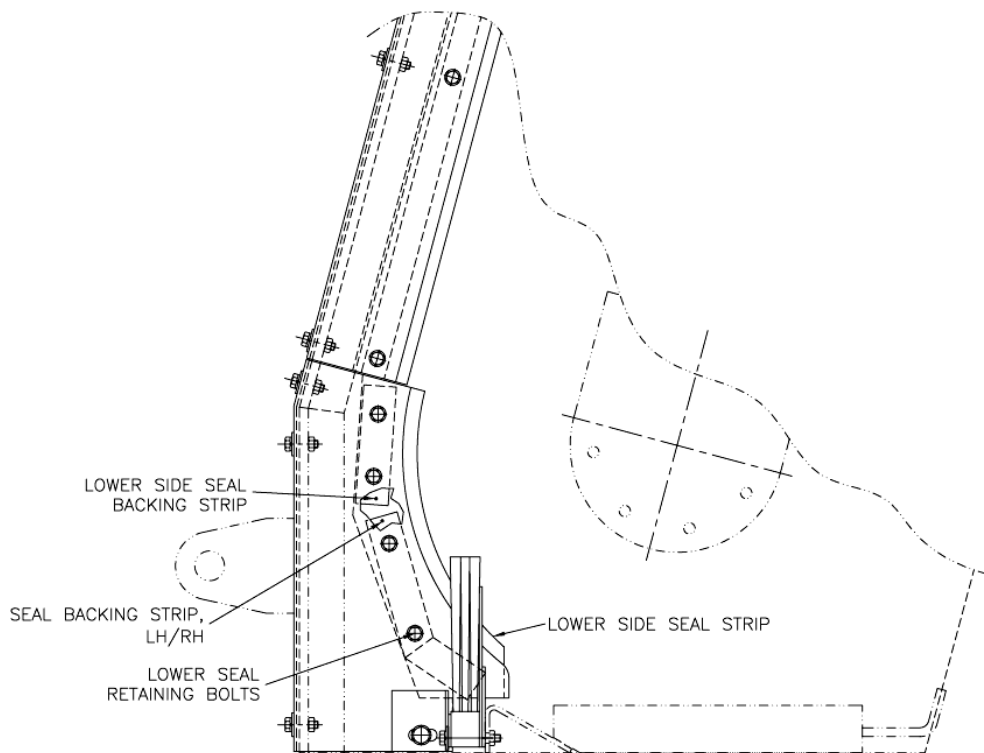


Figure 4-9. Detail of Lower Seal Area

Replacing the Foot Brush and Foot Brush Bottom Seal Strip:

1. Drain channel.
2. Remove grit and solids from base of the Aqua-Screen®.
3. Loosen the securing bolts from the mounting angle on the frame of the base of the Aqua-Screen®. See figure 4-10.
4. Remove the bolts and set aside the mounting angle and bolts.
5. Remove the foot brush and foot brush seal strip.

To replace the foot brush and foot brush seal, use the following procedure:

1. Thoroughly clean and degrease all mating surfaces, including nuts and bolts.
2. Replace the foot brush and foot brush seal.
3. Put the fitting angle in its normal position against the frame.
4. Use Loctite 262 and primer N7669 on the bolts before reinserting them. Allow the Loctite 262 to cure 20 to 30 minutes for temperatures above 21°C. For temperatures below 21°C, allow more time, up to 3 to 6 hours as temperatures approach freezing.
5. Screw down the securing bolts to secure the footbrush and install the mounting angle with the mounting angle bolts. Take care not to overtighten the bolts.

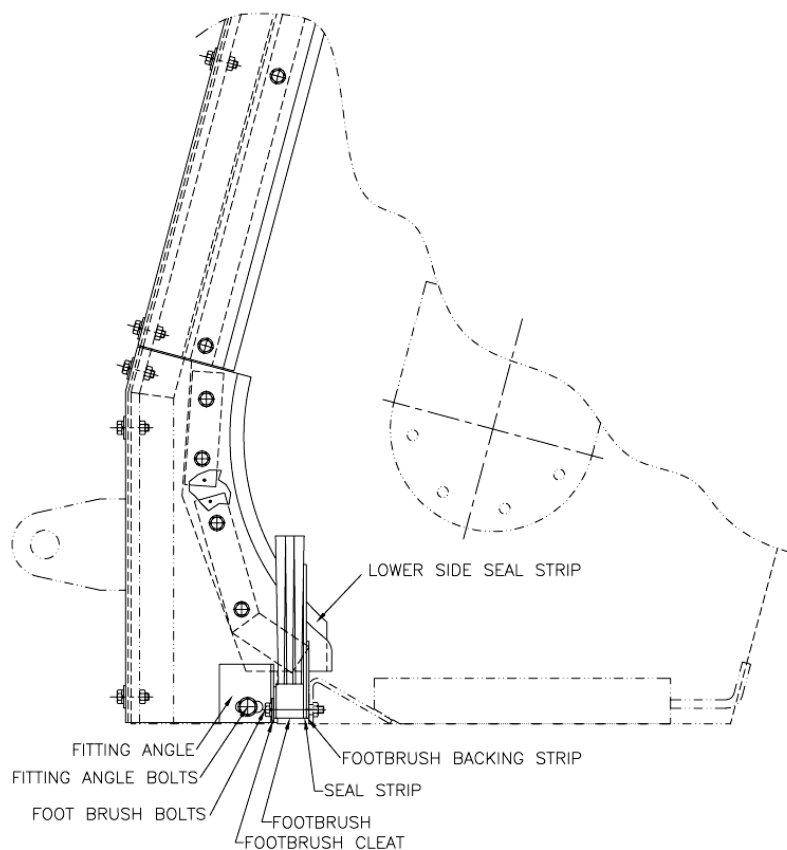


Figure 4-10. Foot Brush and Bottom Seal Diagram

4.3.4 Replacing the Shower Nozzles

From time to time it will be necessary to replace the shower nozzles on the spray bar. Basically, you will remove the spray nozzle header, remove any worn nozzles, replace the nozzles, and reinstall the header. Use the following procedure to remove shower nozzles on the spray bar.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

1. Shut off the water source.
2. Disconnect piping from spray nozzle header.
3. Remove spray bar flange bolts. See figure 4-11.
4. Pull spray bar from the Aqua-Screen®.
5. Remove the shower nozzles.

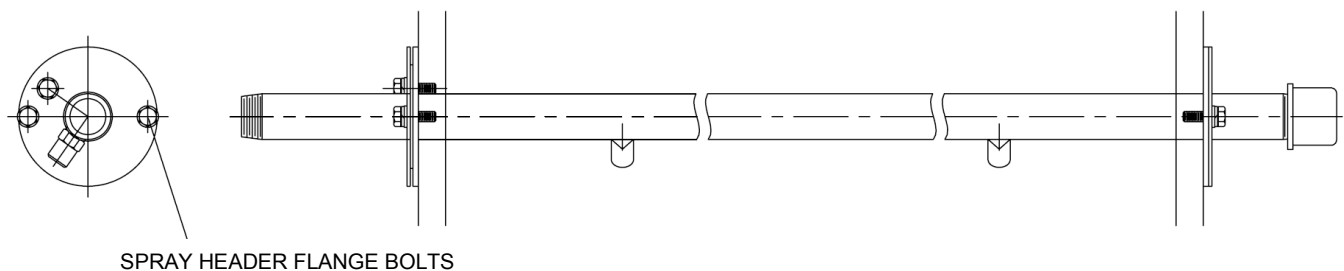


Figure 4-11. Replacement of the Shower Nozzles

To reassemble the spray bar, use the following procedure:

1. Replace the shower nozzles.
2. Reinsert the spray bar.
3. Set the angle of the spray nozzles so that water sprays ABOVE the doctor blades.
4. Reconnect piping to the spray bar.
5. Turn on the water.

4.3.5 Replacing the Rotary Washing Brush

The rotary washing brushes wear out over time and need to be replaced. Basically, you will work through the inspection door to remove the brush assembly and replace brush rings and spacers as needed. Use the following procedure to replace the rotary washing brush. Figure 4-12 shows the major items noted in this procedure. See the bolt/torque chart in chapter 1 for bolt sizes and torque values.



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

1. Remove the bolts and the retaining rings from the exterior of the gear box.
2. Remove the bolts from the torque arm.
3. Remove the geared motor from the brush drive shaft.
4. Remove bolts from the bearings (two per bearing).
5. Pull the two bearings from the shaft.
6. Remove the rotary washing brush support and gasket from the frame.
7. Remove the brush assembly from the frame of the Aqua-Screen®. Slide the drive shaft toward the drive end, and then lower it. Slide the brushes down the shaft through the inspection door.
8. Remove one of the two retaining rings (remove the bolts) that capture the brush rings and spacers.
9. Slide all the brush rings and spacers from the shaft. Set aside spacers that can be reused and discard worn or damaged spacers and brush rings.

Reassemble all the parts by reversing the process:

1. Thoroughly clean and degrease the shaft and reusable spacers.
2. Reinstall the brush rings and undamaged spacers on the drive shaft. Add new spacers as required to replace discarded spacers.
3. Reinstall the brush ring retaining rings and screw down the brush retaining bolts.
4. Put the brush assembly back on the drive shaft.
5. Reinstall the brush assembly support plate and gasket on the frame.
6. Replace the two bearings on the brush drive shaft.
7. Screw down the bolts for the bearings.

8. Replace the geared motor on the brush drive shaft.
9. Screw down the bolts on the torque arm. Use care with the torque arm to avoid any misalignment.
10. Replace the bolts and the retaining ring on the exterior of the gear box.

Adjust the pressure of the bristle just enough to ensure correct cleaning of the screen using the alignment holes in the brush support plates (the bearings are attached to a support plate on both ends). Make sure that the same alignment hole is used on both sides to keep the brush level.



CAUTION: If the pressure is too high, the bristles will experience excessive wear.

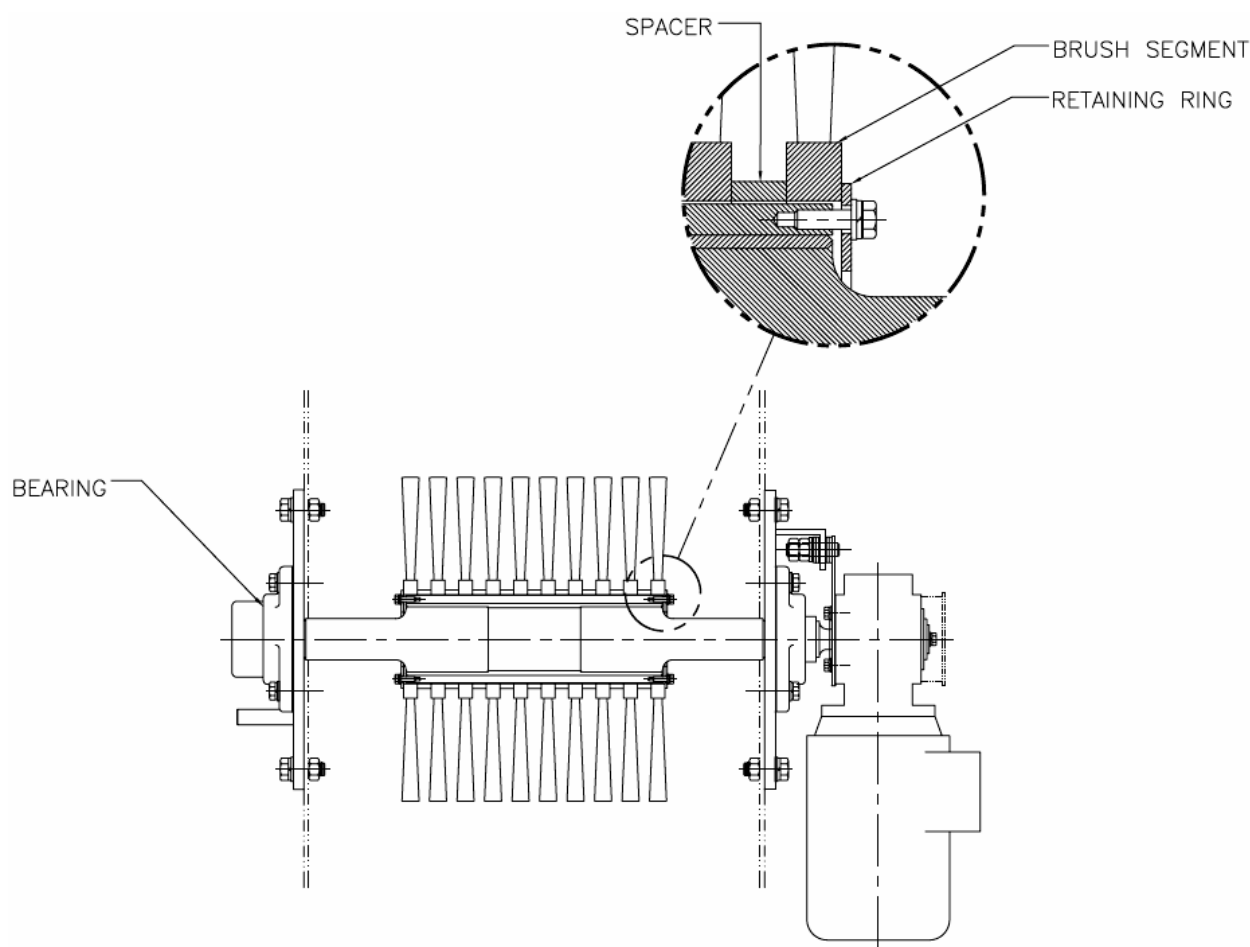


Figure 4-12. Parts of the Rotary Washing Brush

4.3.6 Replacing the Main Drive (Gear Box)



CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

Use the following procedure to remove the main drive:

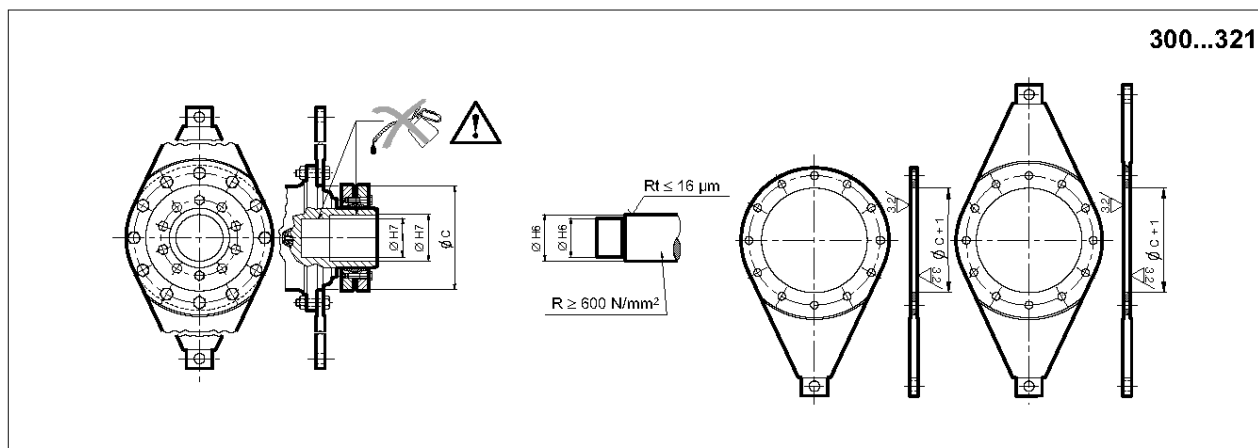
1. Use an overhead crane to relieve the weight of the gear box from the shaft.
2. Loosen the hex head bolts from the shrink disk.
3. Remove the safety cover.
4. Remove the bolts from the torque arm brackets.
5. Disconnect the torque arm from the clevis by removing the split pin.
6. Remove the main drive gear box from the shaft by sliding it outward towards the shaft end.

Use the following procedure to replace the main drive:

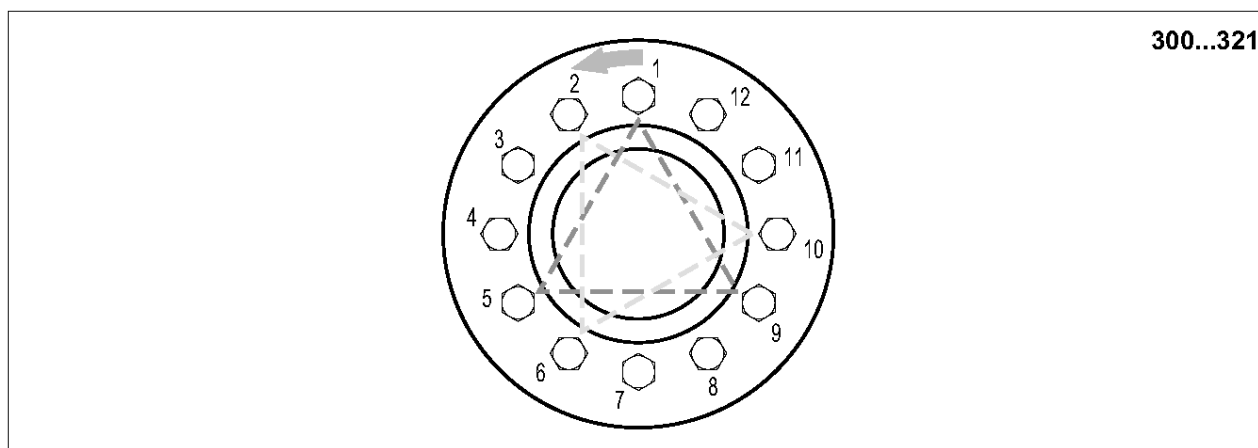
1. Clean and degrease the mating surfaces of the gear box output bore and the drive shaft.
2. Check for gouged spots on the mounting area and smooth the rough spots with sand paper if needed.
3. Mount the new gear motor set on the drive shaft.
4. Slide the torque arm and gear motor towards one another and towards the Aqua-Screen® frame until proper contact is made between the other end of the torque arm and its bracket on the frame. Take care to align the torque arm so that no twisting or bending occurs at the frame bracket end.
5. Reconnect the torque arm with the clevis by reinstalling the split pin.
6. Locate the closed oil plug supplied for shipping, and replace it with the vent plug supplied in the shipment.
7. Place the gear unit near the installation area.
8. Mount the gear unit and secure it to the structure at the points provided. The gear unit must be secured to the structure at all the mounting points (bores) on the mount provided (feet or flange).
9. Tighten the mounting bolts and check that the service plugs are screwed down.
10. Mount the torque arm with bolts of at least class A4-70 (stainless steel fasteners) tightened to a torque as shown in figure 4-13.
11. Clean and degrease both the internal coupling surface of the gear unit shaft and the external coupling surface of the machine's drive shaft.

12. Mount the shrink disk to the gear unit shaft after lightly lubricating its entire outer surface.
13. Snug down a first set of three bolts located at the corners of an equilateral triangle (for example: bolts in positions 1-5-9 of figure 4-13). Fit the gear unit to the drive shaft.
14. Tighten the bolts (following the triangular pattern) in a circular direction, repeating the operation several times until all bolts are tightened to the correct torque, in accordance with the type of disk/gear unit.

N.B.: Do not tighten down diametrically opposed bolts in sequence.



Do not use molybdenum bisulphide or any other grease, which could reduce the friction of the mating surfaces and affect the performance of the shrink disk.



Shrink disk mounting bolts

	300	301	303	305	306	307	309	310	311	313	315	316	317	318	319	321
Bolt	M6	M6	M8	M8	M10	M10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24
Quantity	8	10	12	12	9	12	8	8	10	10	12	15	18	21	24	21
Class	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque (Nm)	12	12	30	30	58	58	250	250	250	250	490	490	490	490	490	840

Figure 4-13. Main Drive Replacement Information

4.3.7 Replacing the Rotary Washing Brush Drive (Gear Box)

CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.

1. Remove the gear box safety cover and the M8 x 20 bolts from the exterior of the brush drive gear box. See figure 4-14.
2. Remove the cotter pin from the torque arm bolt.

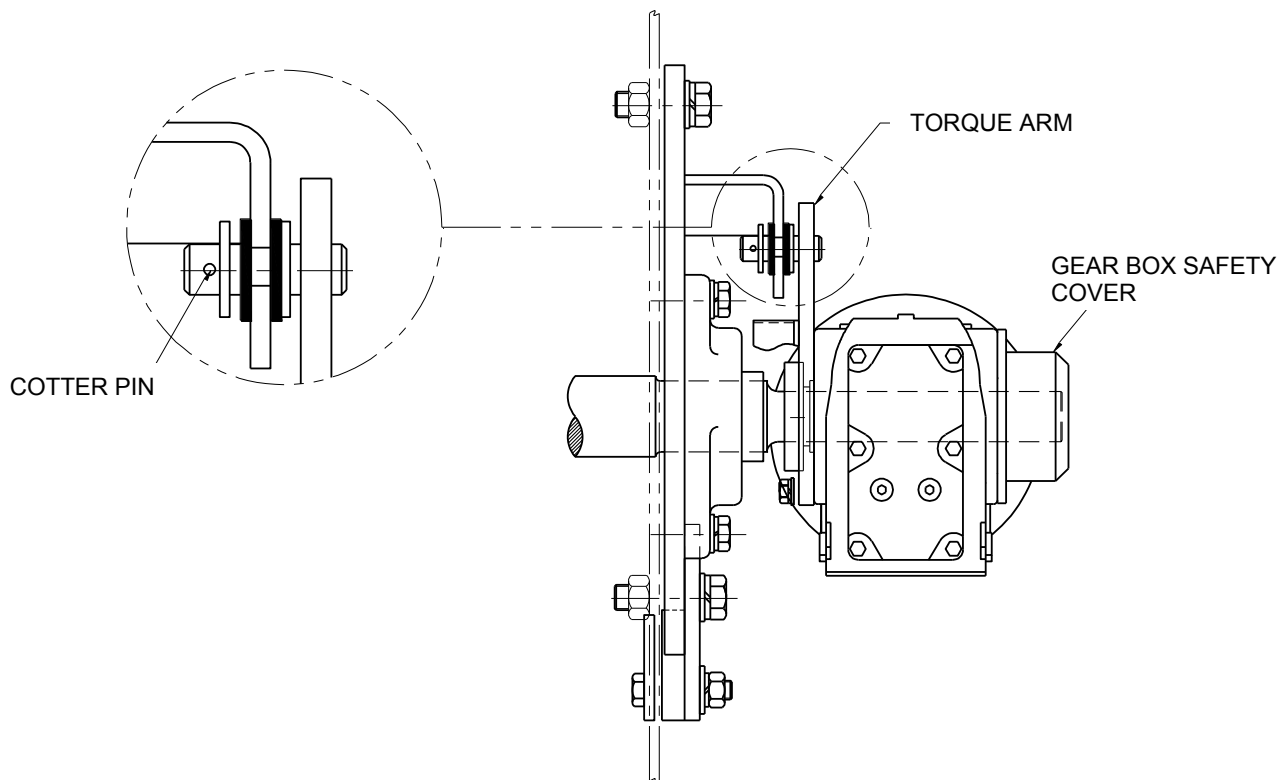


Figure 4-14. Removing the Brush Drive from the Aqua-Screen®

3. Unscrew the bolts on the shrink disc evenly one after the other. To avoid jamming the collars, loosen each bolt only 1/4 turn. Once each bolt has been loosened, the bolts can be removed in sequence.
4. Remove the torque bushing. If necessary, use the collar as a puller. To do this, first remove all tightening bolts, and then use the bolts to pull the collars apart and extract the bushing. See figure 4-15.

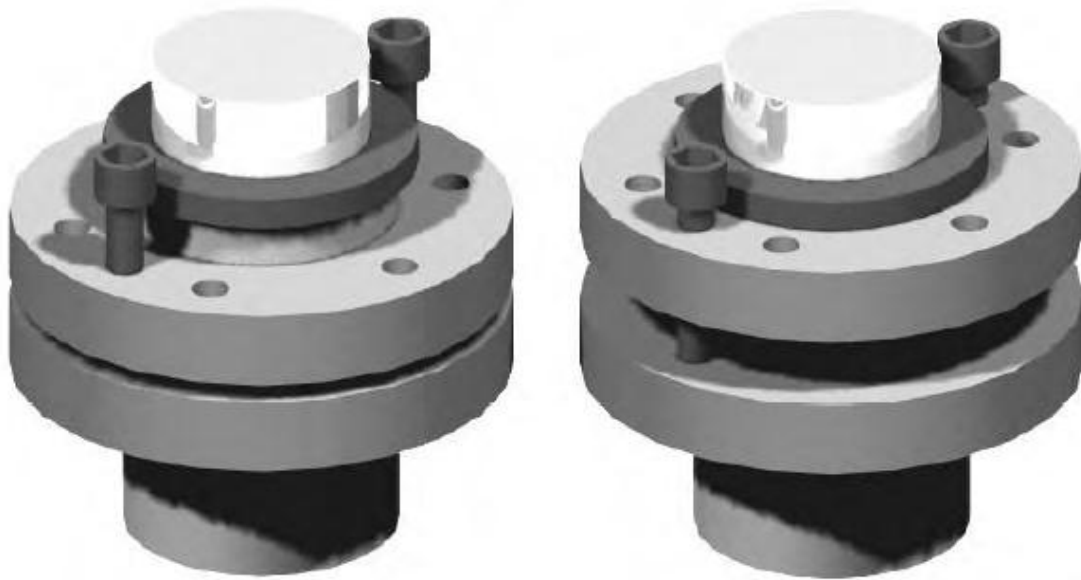


Figure 4-15. Removing the Torque Bushing

5. Slide the geared motor toward you along the brush drive shaft to remove it.
6. Remove the torque arm safety cover and the M8 bolts from the gearbox. See figure 4-16.
7. Remove the torque arm. Now the brush drive is free and can be set aside. See figure 4-17.

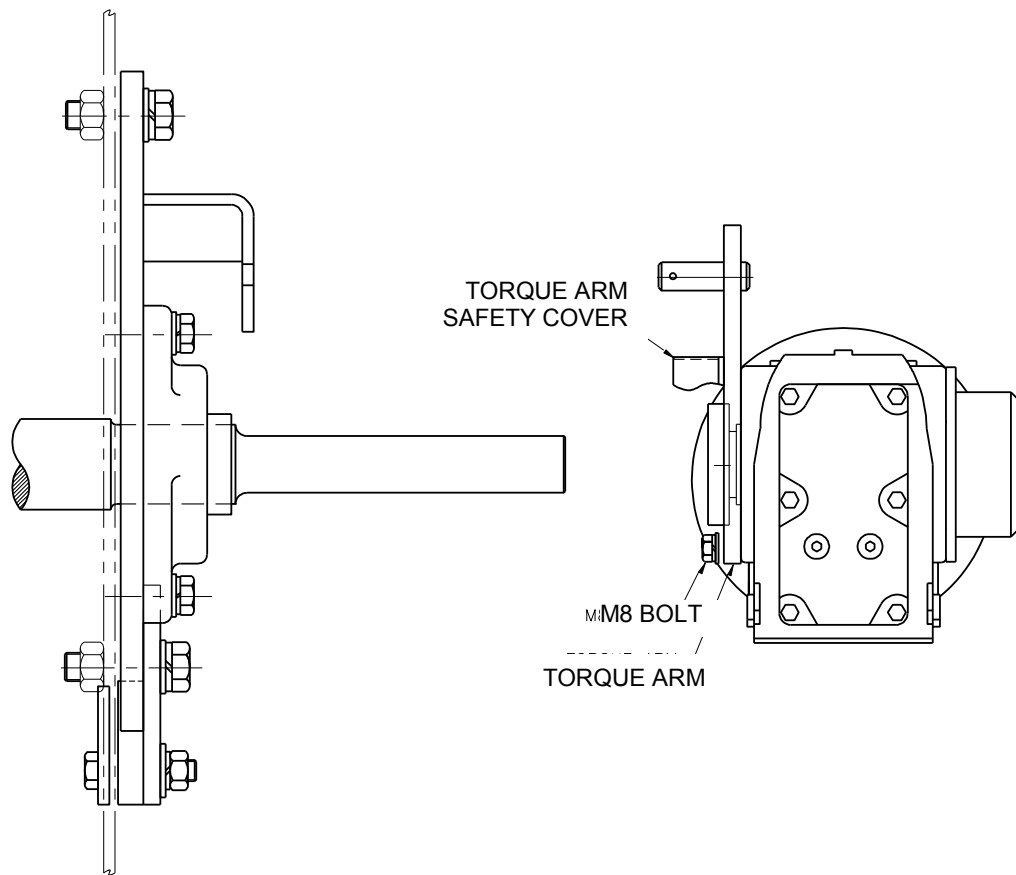


Figure 4-16. Disconnecting the Torque Arm from the Brush Drive

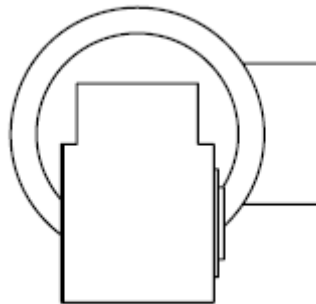
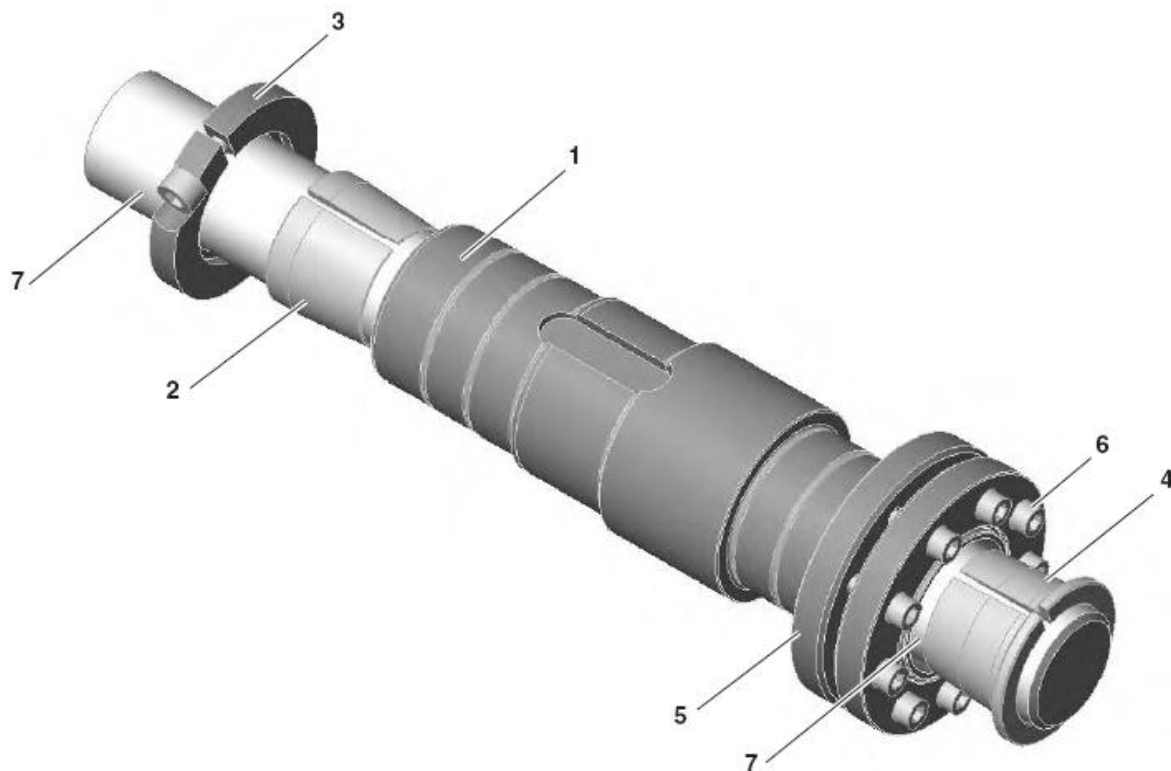


Figure 4-17. The Fully Disconnected Brush Drive

Refer to figure 4-18 and use the following procedure to replace the brush drive:



1	Hollow Shaft
2	Support Bushing
3	Clamping Ring
4	Torque Bushing
5	Shrink Disk
6	Locking Bolts
7	Machine Shaft

Figure 4-18. Parts of the Gearbox Mounting System

Thoroughly clean inside the hollow shaft and machine shaft. Ensure that there are no traces of grease or oil.

Refer to figure 4-19. Position the support bushing (2) on the machine shaft (7).

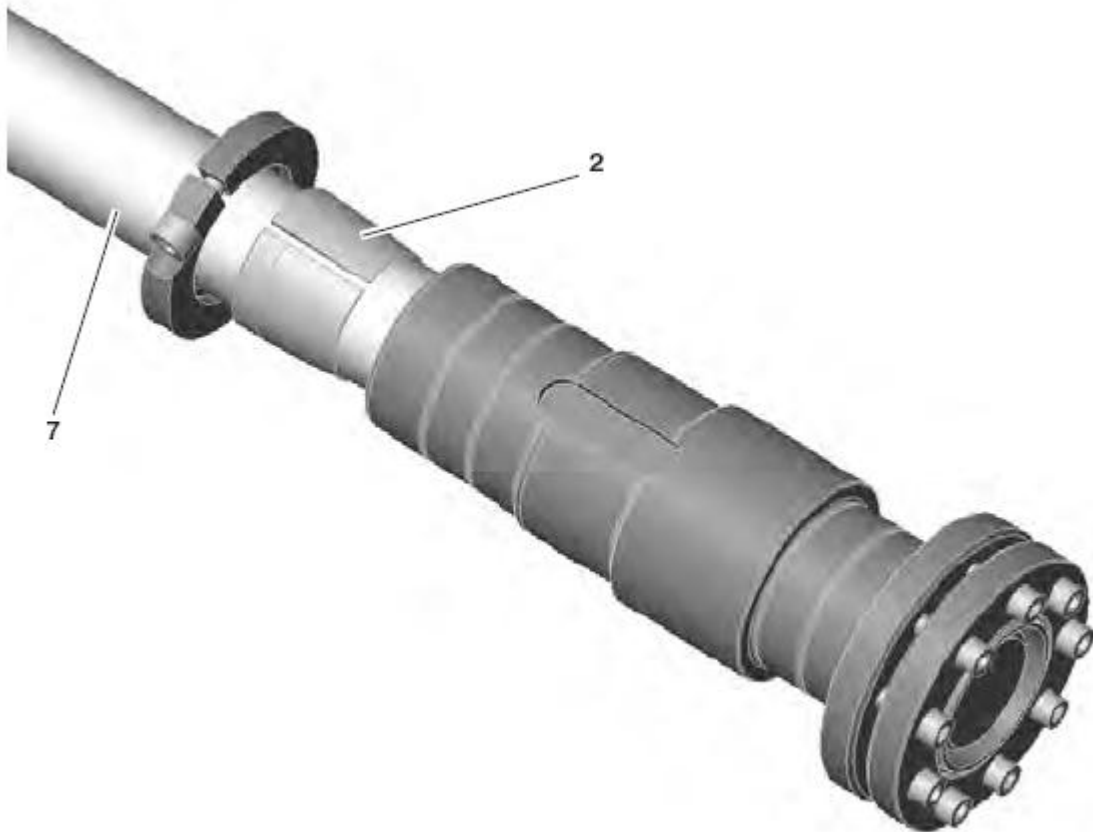


Figure 4-19. Positioning the Support Bushing

Refer to Figure 4-20. Secure the support bushing with the clamping ring (3).

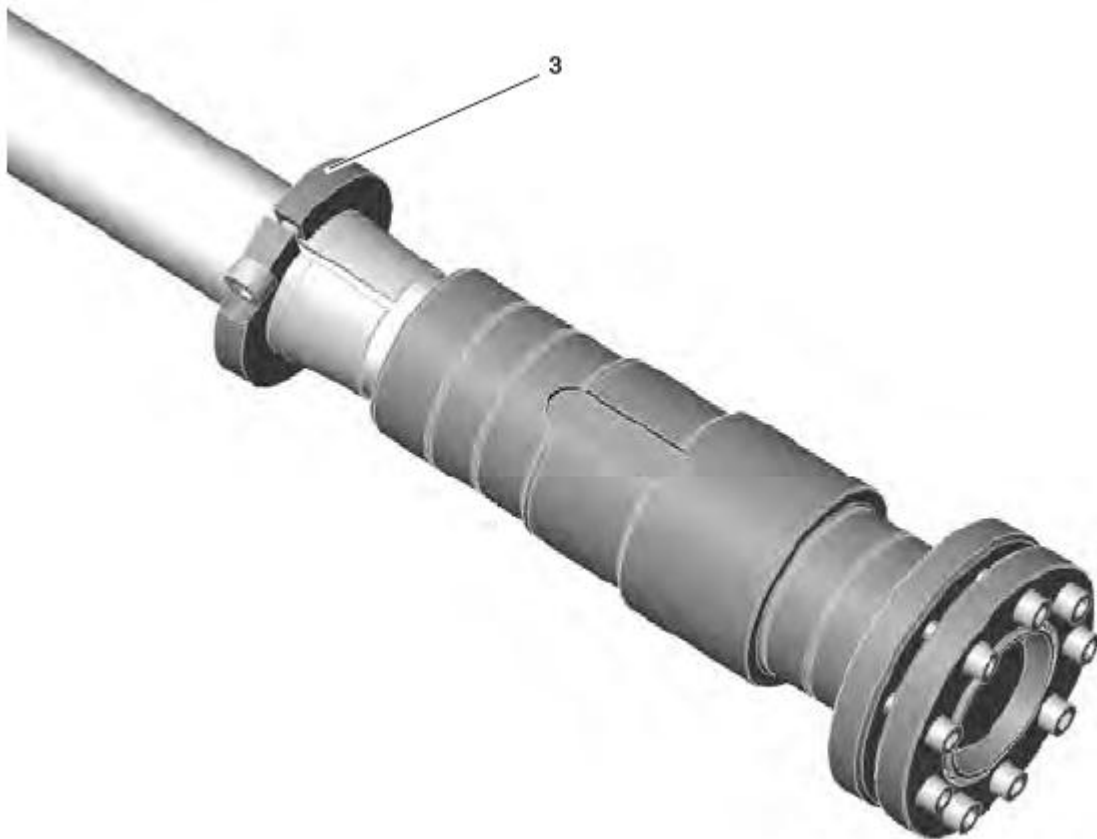


Figure 4-20. Securing the Support Bushing

Refer to figure 4-21. Slide the gear box (1) on the machine shaft until it stops against the support bushing.

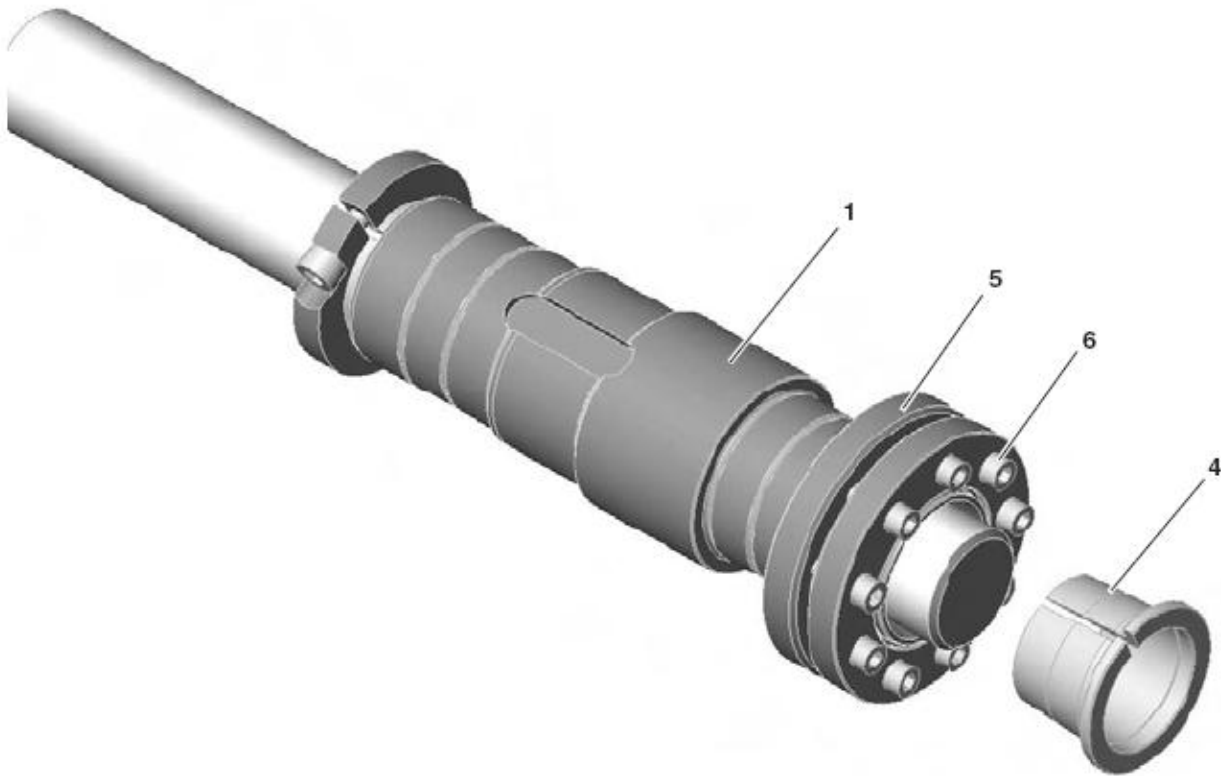


Figure 4-21. Installing the Gear Box

1. Make sure all bolts (6) in the shrink disc (5) are loose. Slide the torque bushing (4) on the machine shaft until it is completely seated. Tighten the shrink disc bolt finger tight only and make sure that the collars on the shrink disc are parallel.
2. Tighten the bolts on the shrink disc by working around, from one bolt to the next, in a circular pattern. Do not turn each bolt more than 1/4 turn at a time. Verify the bolts are not turning at 9 ft-lbs torque.
3. Replace the M8 x 20 bolts and the retaining arm on the gear box.

4.3.8 Inspection for Wear

Drive Shaft:

After six months of operation, inspect the drive sprocket teeth for wear. Refer to Figure 4-22.

If WT is greater than or equal to 4.78 mm or WS is greater than or equal to 1.6 mm, replace the drive shaft.

If WT is greater than 3.18 mm (but less than 4.78 mm), begin inspecting for wear every three months.

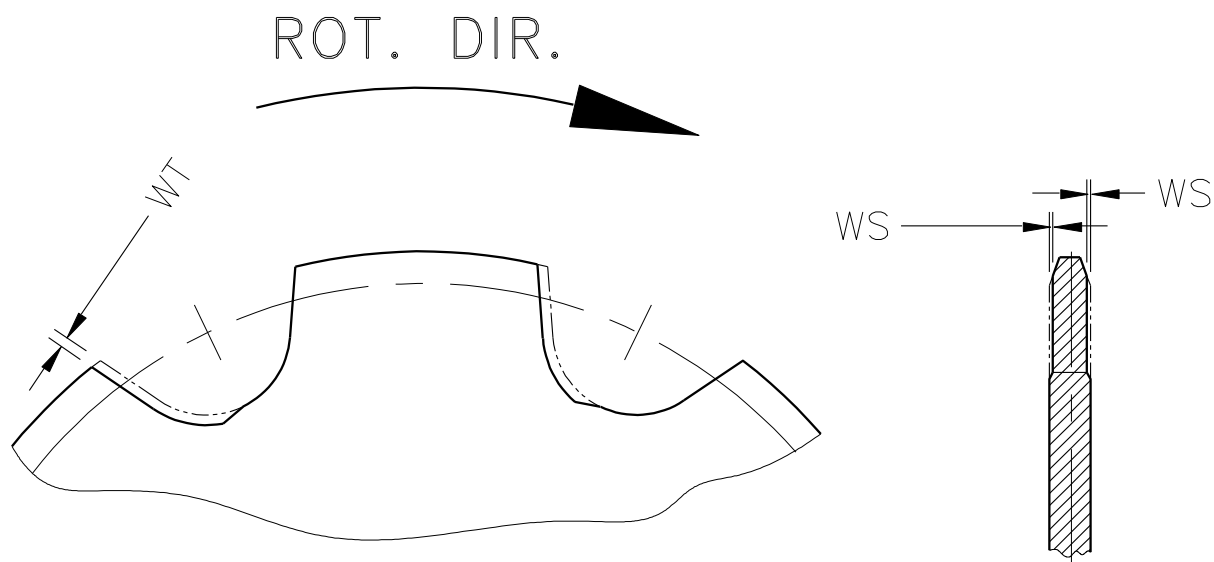


Figure 4-22. Drive Sprocket Wear Measurements

Refer to Figure 4-23. If drive sprocket wear is uneven but still within tolerance for WS, check and adjust the level of the drive shaft.

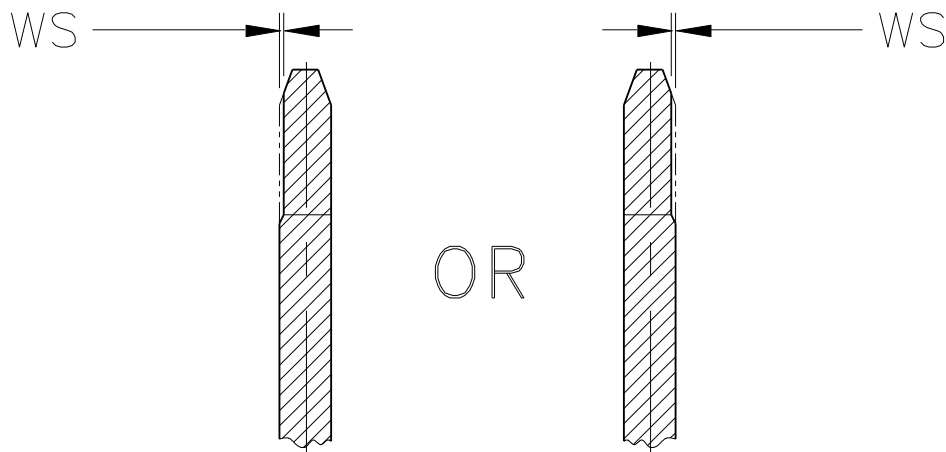


Figure 4-23. Uneven Drive Sprocket Wear

Chain Rails:

After six months of operation, inspect the chain rails for wear. Refer to Figure 4-24.

For rails with an original rail thickness of 12.7 mm

- a) If the straight rail thickness is less than or equal to 8 mm, replace the straight and circular rails.
- b) If circular rail wear value WS is 4.78 mm or greater, replace the straight and circular rails.

For rails with an original rail thickness of 19.5 mm:

- a) If the straight rail thickness is less than or equal to 12.7 mm, replace the straight and circular rails.
- b) If circular rail wear value WS is 6.4 mm or greater, replace the the straight and circular rails.

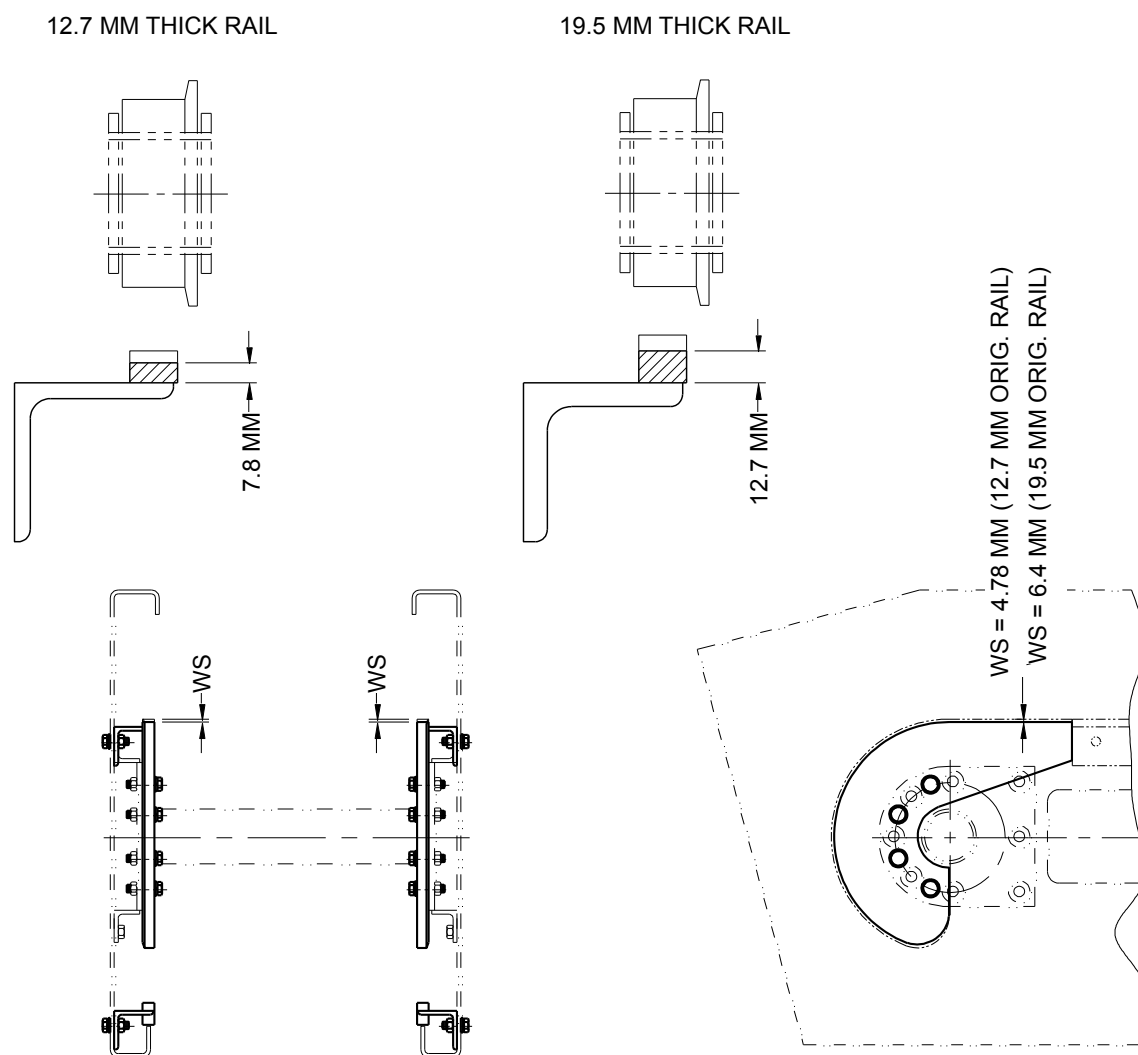


Figure 4-24. Chain Rail Wear Thickness Values

Upper Side Seal Strip:

Refer to Figure 4-25. After six months of operation, check the wear thickness (WS) of the seal strip. If WS is greater than or equal to 3.2 mm replace the seal strip.

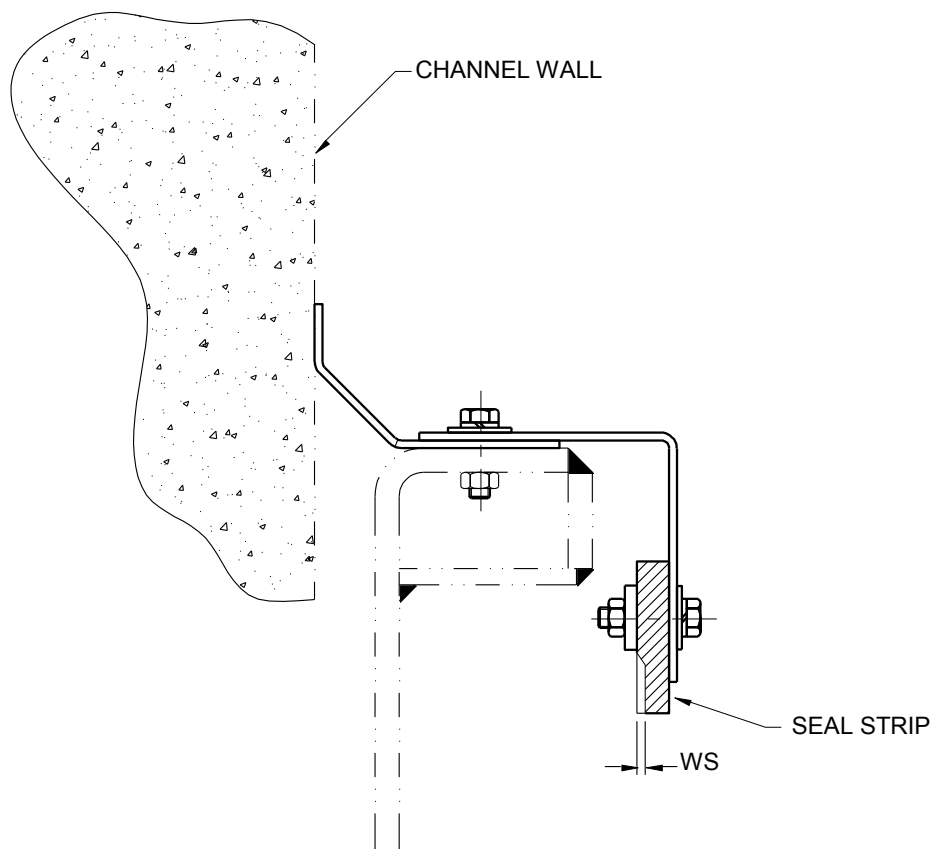


Figure 4-25. Upper Side Seal Strip Wear Measurement



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4.4 MAINTENANCE SUMMARY FORM FOR THE AQUA-SCREEN®

PROJECT NO.	816645	
1. EQUIPMENT ITEM	ASCI 1800 x 4300 x 6	
2. MANUFACTURER	Andritz Separation Inc. 1010 Commercial Blvd S Arlington, TX 76001, USA Ph:+1 817 433-5161 or +1 817 465-5611	
3. EQUIPMENT SERIAL NO'S.	ASC-013-187; -188, -189, -190, -191, -192, -193, -194	
4. WEIGHT OF COMPONENTS	DRY WEIGHT OF ASC = 8,520 lb with drive	
5. MOTOR NAMEPLATE DATA LEFT HAND: Gear Motor Main Gear Reducer Secondary Gear Reducer	Baldor IDXM7542T-M15B, 2 hp, 208/415 VAC, 3-ph, 50 Hz, 1460 rpm, NEMA N182TC Bonfiglioli, W110 UFC2 23 N180CTC, AA, Ratio 23:1 Bonfiglioli, 307L, 2, 28 FP EOVE GOA, Ratio 28:1	
6. BRUSH MOTOR NAMEPLATE LEFT HAND: Motor Gear Reducer	Baldor VM7037T-M15B, 1.5 hp, 208/415 VAC, 3-ph, 50 Hz, 1450 rpm, NEMA N145TC SEW Eurodrive KT37AM145-KS, NEMA N145TC, Ratio 15.31:1	
7. MOTOR NAMEPLATE DATA RIGHT HAND: Gear Motor Main Gear Reducer Secondary Gear Reducer	Baldor IDXM7542T-M15B, 2 hp, 208/415 VAC, 3-ph, 50 Hz, 1460 rpm, NEMA N182TC Bonfiglioli, W110 UFC1 23 N180CTC, AA, Ratio 23:1 Bonfiglioli, 307L, 2, 28 FP EOVE GOA, Ratio 28:1	
8. BRUSH MOTOR NAMEPLATE RIGHT HAND: Motor Gear Reducer	Baldor VM7037T-M15B, 1.5 hp, 208/415 VAC, 3-ph, 50 Hz, 1450 rpm, NEMA N145TC SEW Eurodrive KT37AM145-KS, NEMA N145TC, Ratio 15.31:1	
7. MAINTENANCE REQUIREMENTS		
Maintenance Item	Frequency	Lubricant
Examine side seal plates for damage and replace if necessary	Monthly	
Examine brush rollers for wear and adjust if necessary	Monthly	
Check drive gearboxes for leaks	3 months	
Check drive hold-down bolts for tightness	3 months	
Examine sealing brushes for wear and adjust if necessary	3 months	
Check all bolts for tightness. Clear and clean machine.	3 months	
Grease brush shaft bearing	Monthly	A
Grease main bearing on drive side	Monthly	A
Grease main bearing on non-drive side	Monthly	A
ASC drive secondary gearbox, Brush drive gearbox, oil change	Initial oil change after 3000 hours. Check every 3 months. Change oil every 4000 hours	B



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8. LUBRICANT LIST					
Ref Symbol	Mobil	Shell	Chevron Texaco	Union 76	Equal
A — Grease	MOBLITH SHC 460	Albida PP Grease 1	Milltex WP 1-1/2	Triton 460	None
B — Oil	MOBILGEAR SHC 630	Tivela Oil WB	Meropa 200	Conoco gear oil 220 Union Extra 5EP	None

Chapter 5: Spare Parts

CHAPTER 5

SPARE PARTS

This chapter contains a separate part manual for each of the components supplied by ANDRITZ. Each parts manual includes drawings, parts lists, the drive motor specification (where applicable), and a list of recommended spare parts.

5.1 SPARE PARTS/SERVICE

All parts inquiries can be handled through the following office:

Andritz Separation Incorporated
1010 Commercial Blvd South
Arlington, TX 76001, USA
Phone: +1 817-465-5611
Fax: +1 817-468-3961

5.2 ANDRITZ DIRECT RETURN POLICY

All returns require a Return Material Authorization (RMA) number. ANDRITZ will not process a return or issue credit without an approved RMA number.

All returns must be complete and must be received within 21 days of the issue date of the RMA number.

The RMA number must appear on all boxes being returned. Nonconformance with this policy will result in replacement delays and unsolved credit issues.

COD shipments cannot be accepted.

5.3 PARTS MANUAL

Parts drawings and lists are given in the manual included in this chapter.

5.4 RECOMMENDED SPARE PARTS LIST

The list of recommended spare parts is given at the end of the Parts Manual.



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PARTS MANUAL

AQUA-SCREEN® 1800 x 4300 x 6

LEFT AND RIGHT HAND MACHINES

JOB NO. 816645

QUEENSLAND UTILITIES AUTHORITY

LUGGAGE POINT

LOCATION: BRISBANE, QLD, AUSTRALIA

APPROVED BY: KN

DATE: 7-23-2013

ANDRITZ SEPARATION, INC.
1010 COMMERCIAL BLVD S.
ARLINGTON, TX 76001, USA
PHONE: +1 817-465-5611
FAX: +1 817-419-1929



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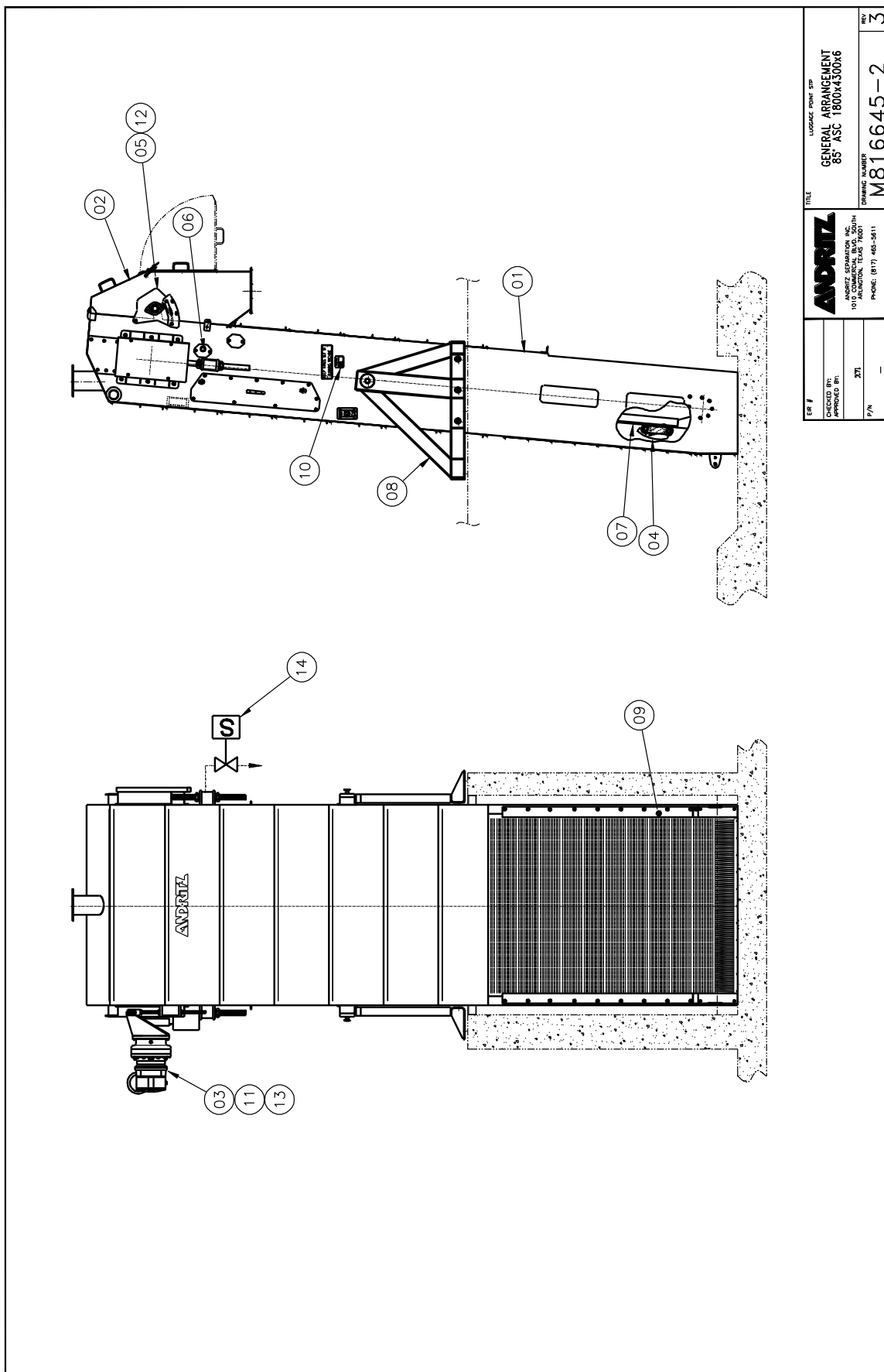
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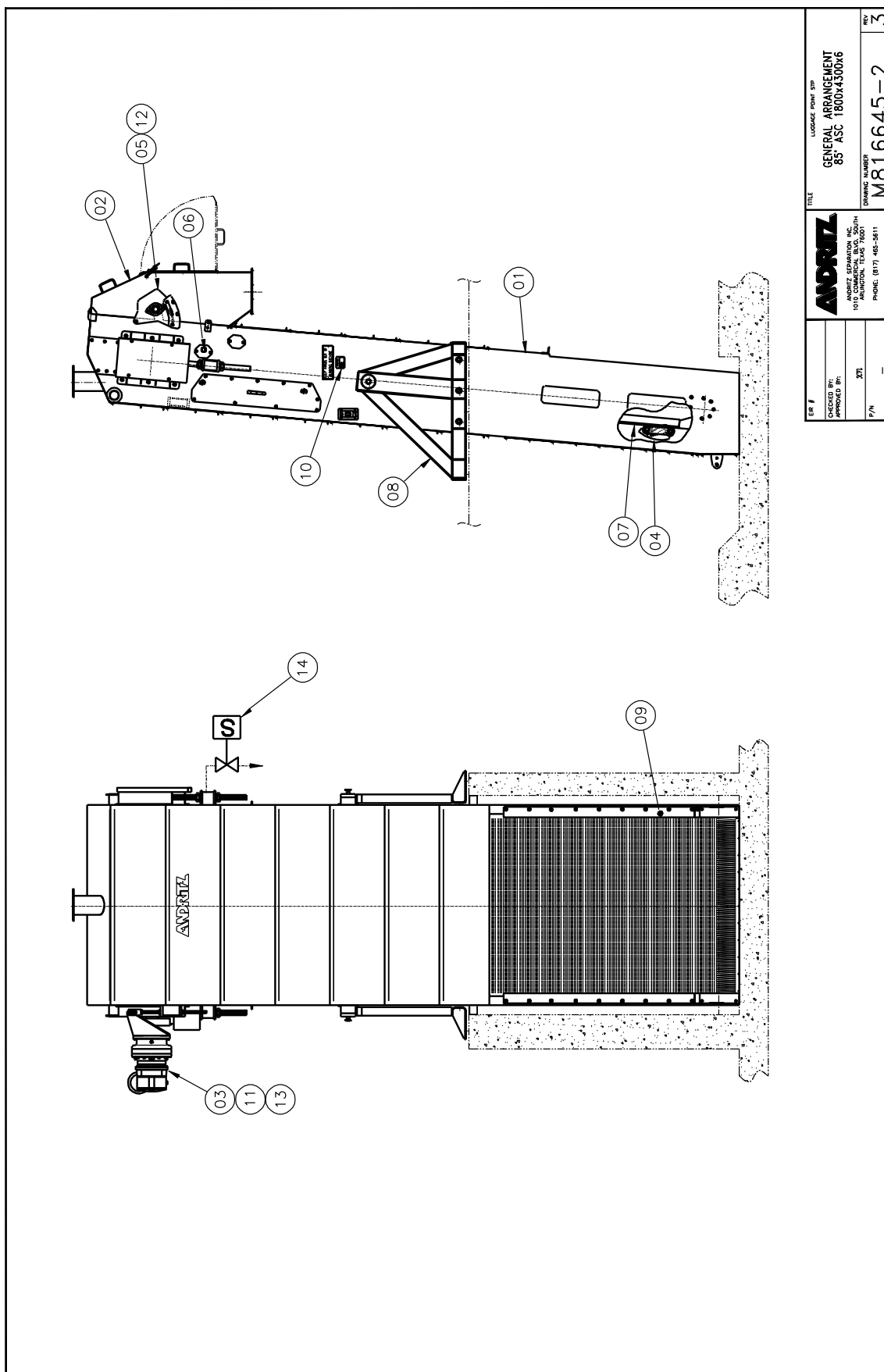
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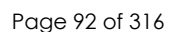


ANDRITZ ANDRITZ SEPARATION INC. 10101 ANDRITZ DRIVE, SUITE 100 ARLINGTON, TEXAS 76010 PHONE: (817) 462-5411	TITLE LUGGAGE POINT STP GENERAL ARRANGEMENT 85' ASC 1800x4300x6 DRAWING NUMBER M816645-2
REV 3	P/N —

QUU CONTRACT NO: C1112-022
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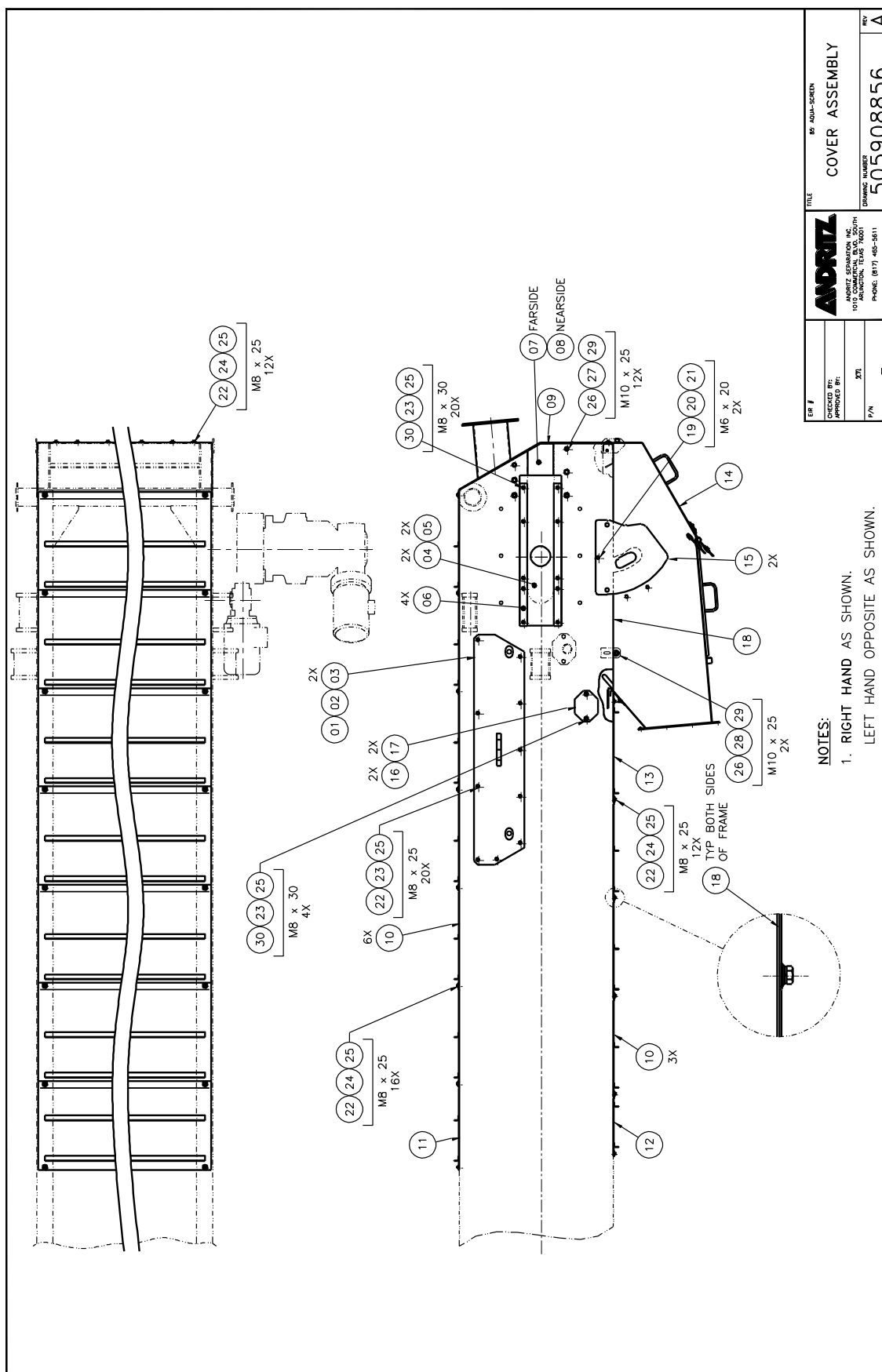
PARTS LIST

PART NUMBER		DRAWING NUMBER		DESCRIPTION
300155249 (LH) 300155280 (RH)		505897664		FRAME ASSEMBLY, LEFT SIDE FRAME ASSEMBLY, RIGHT SIDE
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	1	PC	300155281	FRAME SIDEWALL, 2 HP, LEFT HAND
2	1	PC	300155282	FRAME SIDEWALL, 2 HP, RIGHT HAND
3	1	PC	131479901	TORQUE ARM BRACKET
4	1	PC	300155305	CROSS SUPPORT ANGLE, BOTTOM
5	1	PC	300055054	SHIELD, SPRAY BAR
6	2	PC	131480779	SUPPORT PLATE #1
7	1	PC	300053173	CROSS MEMBER, LOWER, BRUSH SUPPORT
8	1	PC	300155307	CROSS MEMBER UPPER, TOP COVER SUPPORT
9	1	PC	300055245	CROSS MEMBER WELDMENT, LOWER, M16
10	3	PC	300055254	CROSS MEMBER , FRAME, WELD IN TYPE
11	2	PC	131409840	ADJUSTMENT BRACKET WELDMENT
12	2	PC	300129154	STIFFENER, LOWER SIDE
13	2	PC	131479872	GUSSET
14	1	PC	300055293	CROSS MEMBER, LIFTING PIPE
15	2	PC	131512399	CROSS BEAM END RING
16	2	PC	131512400	COVER SUPPORT, ROTATING BRUSH COVER
17	2	PC	300158149	LIFTING EYE MODIFICATION.
18	1	PC	300055258	SPREADER PIPE WELDMENT, LOWER
19	1	PC	300052008	STIFFENER, LOWER BACK
20	1	PC	300155517	CROSS MEMBER, PIVOT PIPE WELDMENT
21	2	PC	300155789	SPACER PLATE, SHORT, PIVOTING FRAME
22	2	PC	300155810	SPACER PLATE, LONG, PIVOTING FRAME
23	10	FT	131410755	LABEL
24	2	PC	100003184	HEX HEAD SCREW, M16 X 50
25	18	PC	131161098	SPRING WASHER, M16
26	2	PC	100004458	PLAIN WASHER, M16
27	16	PC	100003217	HEX HEAD SCREW, M16 X 55



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ANDRITZ ANDRITZ SEPARATION INC. 100 BROADVIEW AVENUE AUSTIN, TEXAS 78701 PHONE: (817) 482-5611	TITLE COVER ASSEMBLY	DRAWING NUMBER 505908856	REV A



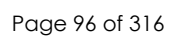
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PARTS LIST

PART NUMBER		DRAWING NUMBER		DESCRIPTION
300156633		505908856		COVER ASSEMBLY, LEFT & RIGHT SIDES
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	1	PC	300012052	INSPECTION HATCH, LEFT HAND
2	1	PC	131451325	INSPECTION COVER - HATCH, RIGHT HAND
3	2	PC	131698721	GASKET, INSPECTION HATCH
4	2	PC	131451684	SAFETY COVER SHAFT
5	2	PC	131721935	GASKET, SHAFT SAFETY COVER
6	4	PC	131451687	SAFETY COVER STIFFENER
7	1	PC	131514074	COVER FITTING PLATE WELDMENT LH
8	1	PC	131514071	COVER FITTING PLATE WELDMENT RH
9	1	PC	300154875	TOP COVER, M8 BOLTS, WITH 6 INCH FLANGE
10	9	PC	300056837	COVER, FOR M8 BOLTS
11	1	PC	300156713	LOWER COVER, M8 BOLTS
12	1	PC	300156715	LOWER COVER, M8 BOLTS
13	1	PC	300156719	TOP COVER - CHUTE SIDE, M8 BOLTS
14	1	PC	300156761	DISCHARGE COVER ASSEMBLY
15	2	PC	300010955	WASHING BRUSH SUPPORT SEAL
16	2	PC	300056878	COVER, LOWER INSPECTION
17	2	PC	131698722	SEAL, LOWER INSPECTION
18	16.67	M	131454214	FLAT GASKET
19	2	PC	100003153	HEX HEAD SCREW, M6 X 20
20	2	PC	131045498	PLAIN WASHER, M6
21	2	PC	131398617	SPRING WASHER, M6
22	60	PC	100003159	HEX HEAD SCREW, M8 X 25
23	44	PC	100004455	PLAIN WASHER, M8
24	40	PC	100004711	PLAIN WASHER, M8
25	84	PC	131070103	SPRING WASHER, M8
26	14	PC	100003167	HEX HEAD SCREW, M10 X 25
27	12	PC	100004456	PLAIN WASHER, M10
28	2	PC	131398431	PLAIN WASHER, M10
29	14	PC	131069990	SPRING WASHER, M10
30	24	PC	100003160	HEX HEAD SCREW, M8 X 30

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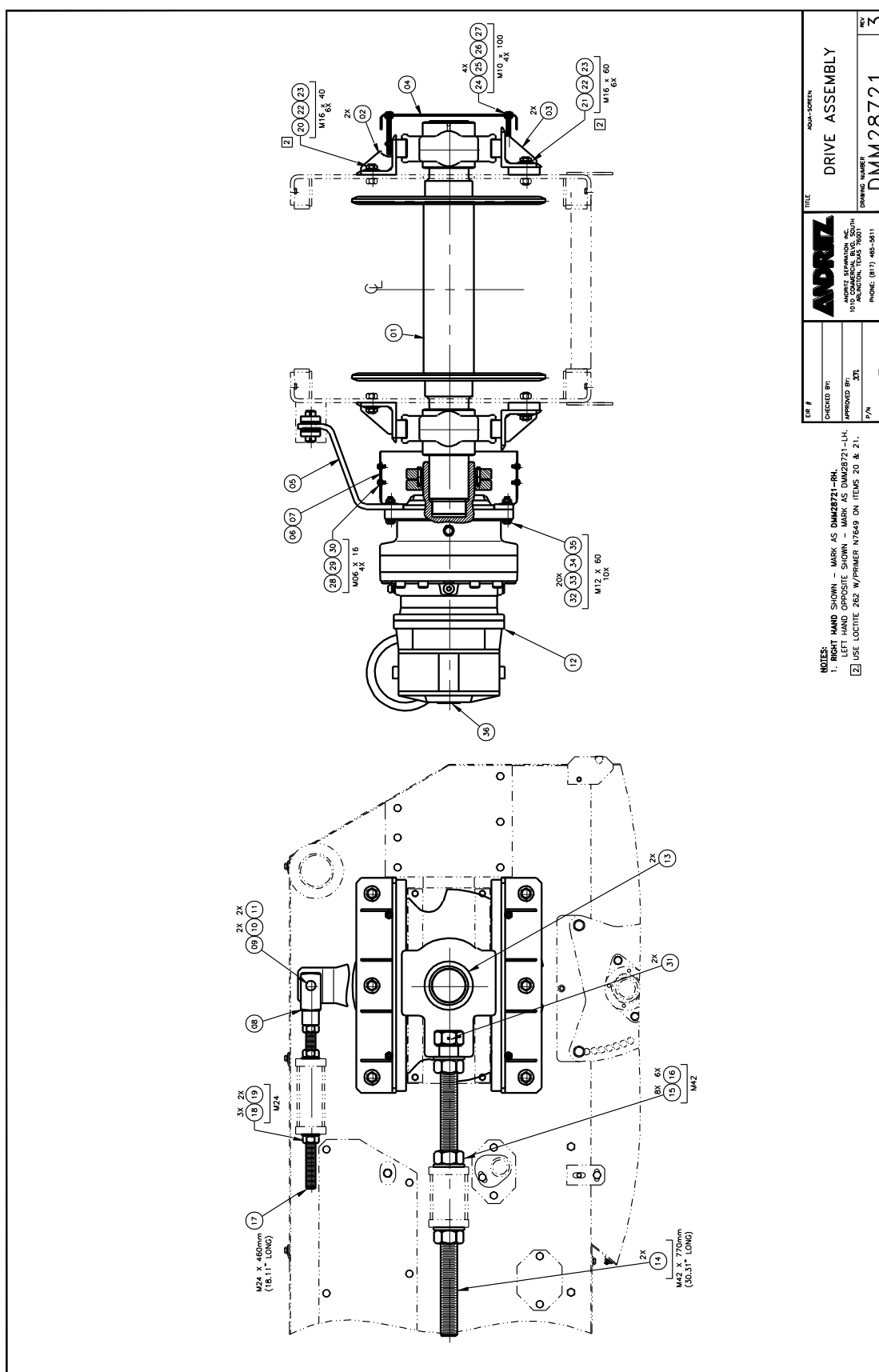
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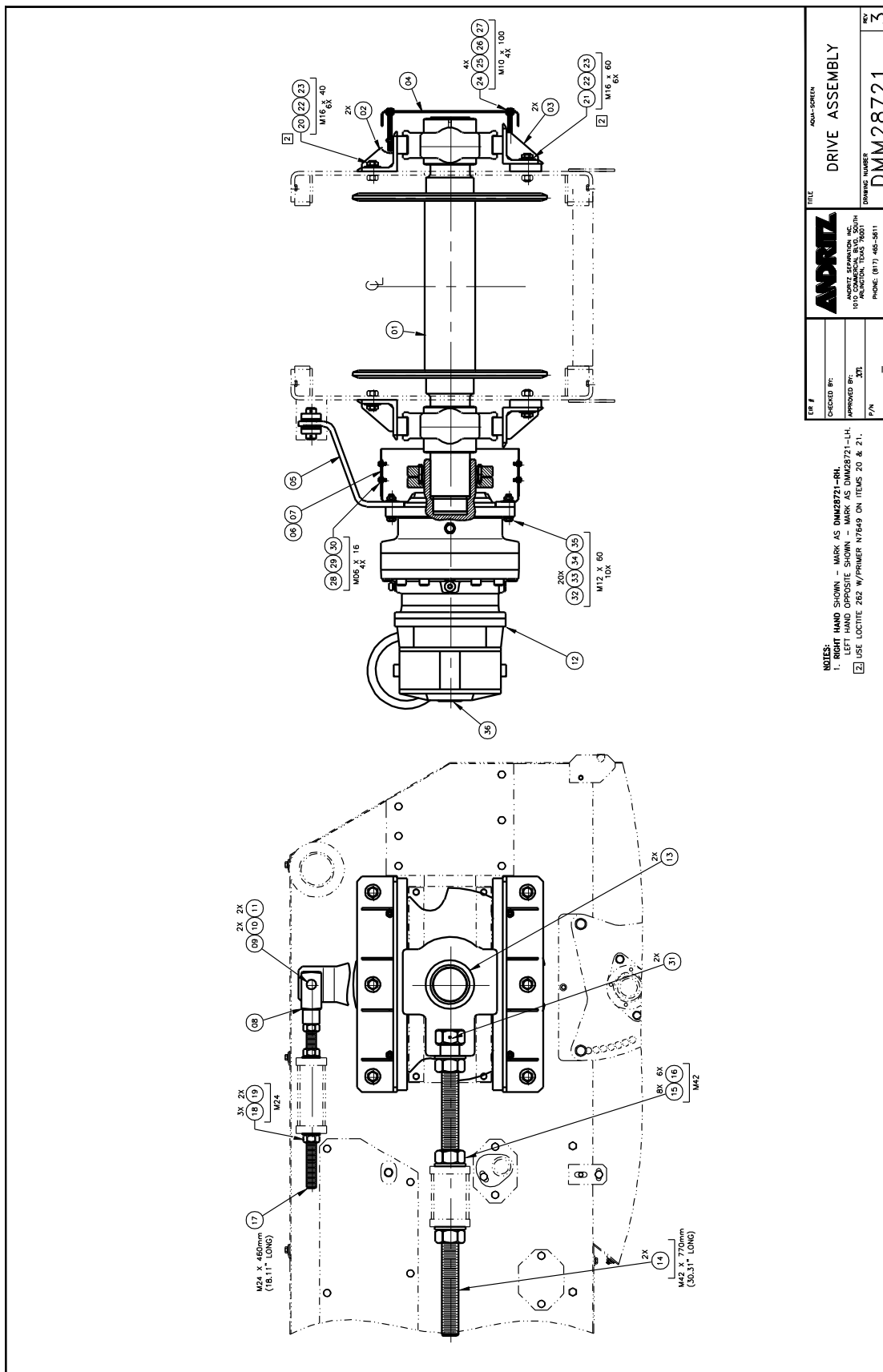
PARTS LIST

PART NUMBER		DRAWING NUMBER		DESCRIPTION
300157071		DMM28721-14		DRIVE ASSEMBLY, LEFT SIDE
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	1	PC	300157073	DRIVESHAFT WELDMENT
2	2	PC	131518427	TENSION SHAFT UPPER BEARING SUPPORT
3	2	PC	131518434	TENSION SHAFT LOWER SUPPORT
4	1	PC	131518435	BEARING COVER
5	1	PC	131518436	TORQUE ARM MAIN DRIVE
6	2	PC	131518437	SAFETY COVER, DRIVE MOTOR
7	2	PC	131518439	SAFETY COVER SUPPORT BRACKET
8	1	PC	131407373	TORQUE ARM CLEVIS
9	1	PC	131518483	CLEVIS PIN, TORQUE ARM
10	2	PC	131143738	SPLIT PIN, 6.3 X 40
11	2	PC	131002057	PLAIN WASHER, M24
13	2	PC	131471320	TAKE-UP BEARING
14	2	PC	131405425	THREADED ROD
15	8	PC	100002120	HEX NUT, M42
16	6	PC	100004522	PLAIN WASHER, M42
17	1	PC	131405423	THREADED ROD
18	3	PC	100002086	HEX NUT, M24
19	2	PC	131002057	PLAIN WASHER, M24
20	6	PC	100003182	HEX HEAD SCREW, M16 X 40
21	6	PC	100003185	HEX HEAD SCREW, M16 X 60
22	12	PC	131401287	PLAIN WASHER, M16
23	12	PC	131161098	SPRING WASHER, M16
24	4	PC	100003266	HEX HEAD SCREW, M10 X 100
25	8	PC	100004456	PLAIN WASHER, M10
26	4	PC	131069990	SPRING WASHER, M10
27	4	PC	100002082	HEX NUT, M10
28	4	PC	100003152	HEX HEAD SCREW, M6 X 16
29	4	PC	100004454	PLAIN WASHER, M6
30	4	PC	131398617	SPRING WASHER, M6
31	2	PC	100022584	SPRING TYPE STRAIGHT PIN, M8
32	10	PC	100003255	HEX HEAD SCREW, M12 X 60
33	20	PC	100004457	PLAIN WASHER, M12
34	10	PC	131398633	SPRING WASHER, M12
35	10	PC	100002083	HEX NUT, M12



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NOTES:
1. RIGHT HAND SHOWN - MARK AS DM28721-RH.
LEFT HAND OPPOSITE SHOWN - MARK AS DM28721-LH.
2. USE LOCTITE 262 W/PRIMER N7649 ON ITEMS 20 & 21.

REV #	3
DATE	DM28721
TITLE	DRIVE ASSEMBLY
ANDRITZ	ANDRITZ SEPARATION INC. 10100 ANDRITZ DRIVE HOUSTON, TEXAS 77060 PHONE (817) 465-5811
CHECKED BY:	371
APPROVED BY:	371
P/N	---

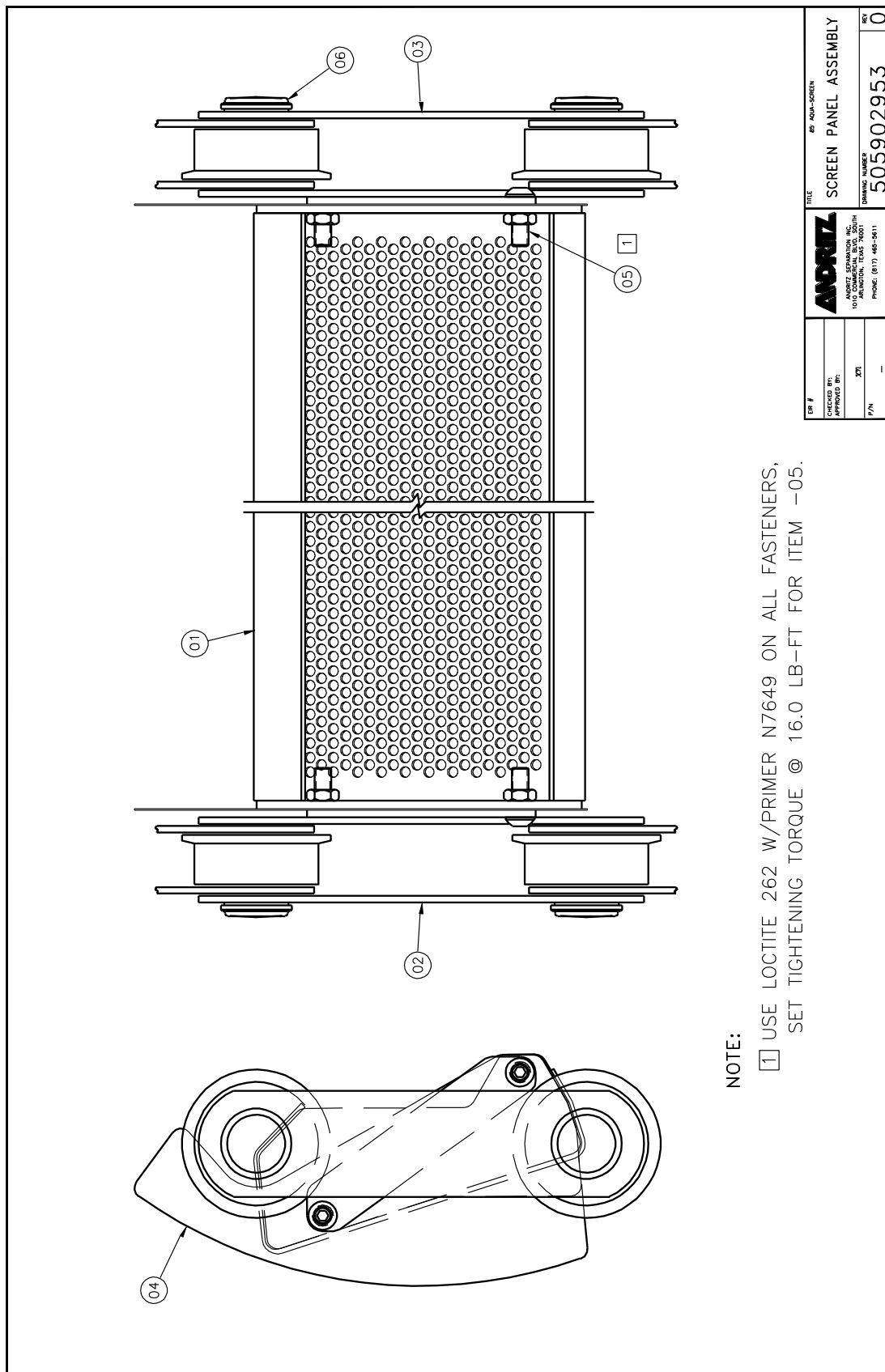


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PARTS LIST

PART NUMBER		DRAWING NUMBER		DESCRIPTION
300157072		DMM28721-14		DRIVE ASSEMBLY, RIGHT SIDE
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	1	PC	300157073	DRIVESHAFT WELDMENT
2	2	PC	131518427	TENSION SHAFT UPPER BEARING SUPPORT
3	2	PC	131518434	TENSION SHAFT LOWER SUPPORT BRACKET
4	1	PC	131518435	BEARING COVER.
5	1	PC	131518436	TORQUE ARM
6	2	PC	131518437	SAFETY COVER
7	2	PC	131518439	SAFETY COVER SUPPORT BRACKET
8	1	PC	131407373	TORQUE ARM CLEVIS
9	1	PC	131518483	CLEVIS PIN, TORQUE ARM
10	2	PC	131143738	SPLIT PIN,, 6.3 X 40
11	2	PC	131002057	PLAIN WASHER, M24
13	2	PC	131471320	TAKE-UP BEARING
14	2	PC	131405425	THREADED ROD
15	8	PC	100002120	HEX NUT, M42
16	6	PC	100004522	PLAIN WASHER, M42
17	1	PC	131405423	THREADED ROD
18	3	PC	100002086	HEX NUT, M24
19	2	PC	131002057	PLAIN WASHER, M24
20	6	PC	100003182	HEX HEAD SCREW, M16 X 40
21	6	PC	100003185	HEX HEAD SCREW, M16 X 60
22	12	PC	131401287	PLAIN WASHER, M16
23	12	PC	131161098	SPRING WASHER, M16
24	4	PC	100003266	HEX HEAD SCREW, M10 X 100
25	8	PC	100004456	PLAIN WASHER, M10
26	4	PC	131069990	SPRING WASHER, M10
27	4	PC	100002082	HEX NUT, M10
28	4	PC	100003152	HEX HEAD SCREW, M6 X 16
29	4	PC	100004454	PLAIN WASHER, M6
30	4	PC	131398617	SPRING WASHER, M6
31	2	PC	100022584	SPRING TYPE STRAIGHT PIN, M8...
32	10	PC	100003255	HEX HEAD SCREW, M12 X 60
33	20	PC	100004457	PLAIN WASHER, M12
34	10	PC	131398633	SPRING WASHER, M12
35	10	PC	100002083	HEX NUT, M12



DR #	FILE	REV
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APPROVED BY:	SCREEN PANEL ASSEMBLY	
X71	DRAWING NUMBER	505902953
P/N		

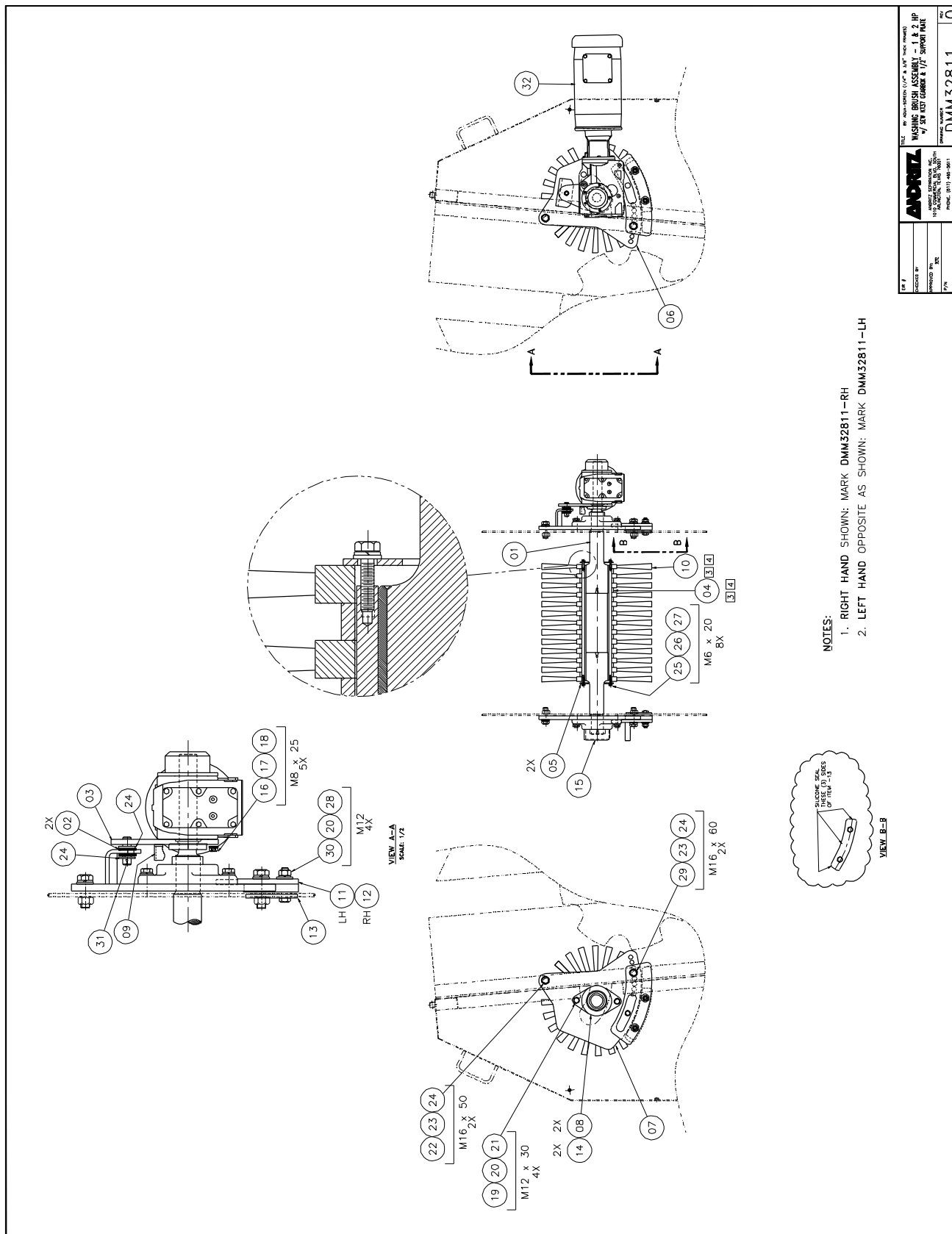
ANDRTZ
 ANDRTZ SEPARATION INC.
 1100 COMMERCIAL BLVD. SUITE 100
 FARMINGTON, CT 06031
 PHONE (811) 445-5611

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

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DATE	REVISION	DESCRIPTION	APPROVAL

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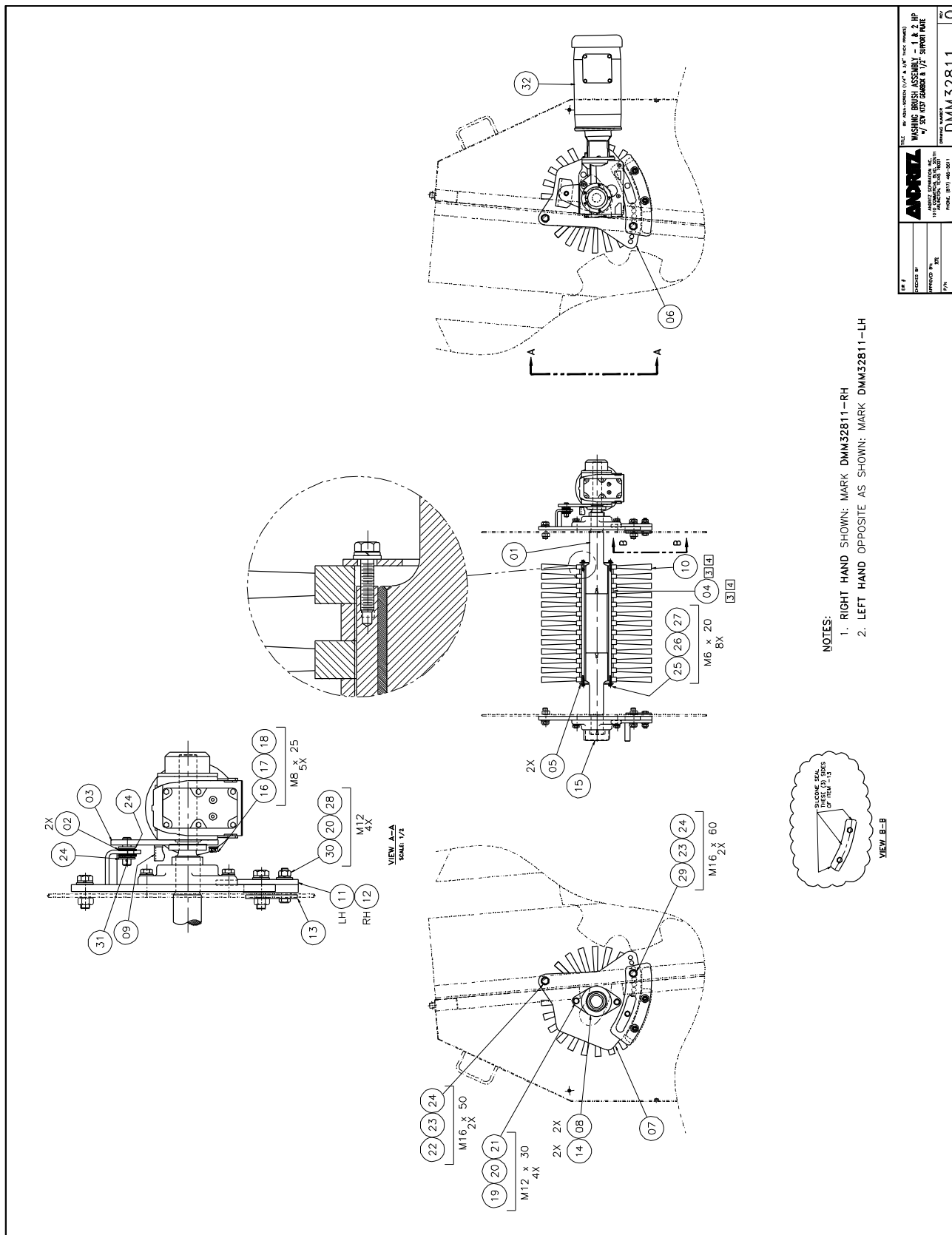
QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

PARTS LIST

PART NUMBER		DRAWING NUMBER		DESCRIPTION
300157075		DMM32811-14		WASHING BRUSH ASSEMBLY, LEFT SIDE
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	1	PC	300157077	DRIVESHAFT WELDMENT
2	2	PC	131406806	RUBBER WASHER
3	1	PC	300129463	TORQUE ARM, LEFT HAND
4	44	PC	131422618	SPACER
5	2	PC	131516730	RETAINING RING
6	1	PC	131680436	ROTARY SUPPORT WELDMENT
7	1	PC	131680438	ROTARY SUPPORT WELDMENT
8	2	PC	131406256	GASKET
9	1	PC	300067539	SAFETY COVER, BRUSH DRIVE
*10	46	PC	131422619	CIRCULAR WASHING BRUSH
11	1	PC	300076907	CLAMPING PLATE, LEFT HAND
12	1	PC	300076908	CLAMPING PLATE, RIGHT HAND
13	2	PC	300076931	CLEAT, INNER, M12 BOLTS
*14	2	PC	131471315	FLANGE BEARING
15	1	PC	131410487	BEARING COVER
16	5	PC	100003159	HEX HEAD SCREW, M8 X 25
17	5	PC	131070103	SPRING WASHER, M8
18	5	PC	100004455	PLAIN WASHER, M8
19	4	PC	100003174	HEX HEAD SCREW, M12 X 30
20	8	PC	131398633	SPRING WASHER, M12
21	4	PC	100004457	PLAIN WASHER, M12
22	2	PC	100003184	HEX HEAD SCREW, M16 X 50
23	4	PC	131161098	SPRING WASHER, M16
24	6	PC	100004458	PLAIN WASHER, M16
25	8	PC	100003153	HEX HEAD SCREW, M6 X 20
26	8	PC	131398617	SPRING WASHER, M6
27	8	PC	100004454	PLAIN WASHER, M6
28	4	PC	100002083	HEX NUT, M12
29	2	PC	100003185	HEX HEAD SCREW, M16 X 60
30	4	PC	131401286	PLAIN WASHER, M12
31	1	PC	131359827	COTTER PIN, 1/8 x 1-1/2"

*Recommended spare part. See page 46.





QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

PARTS LIST

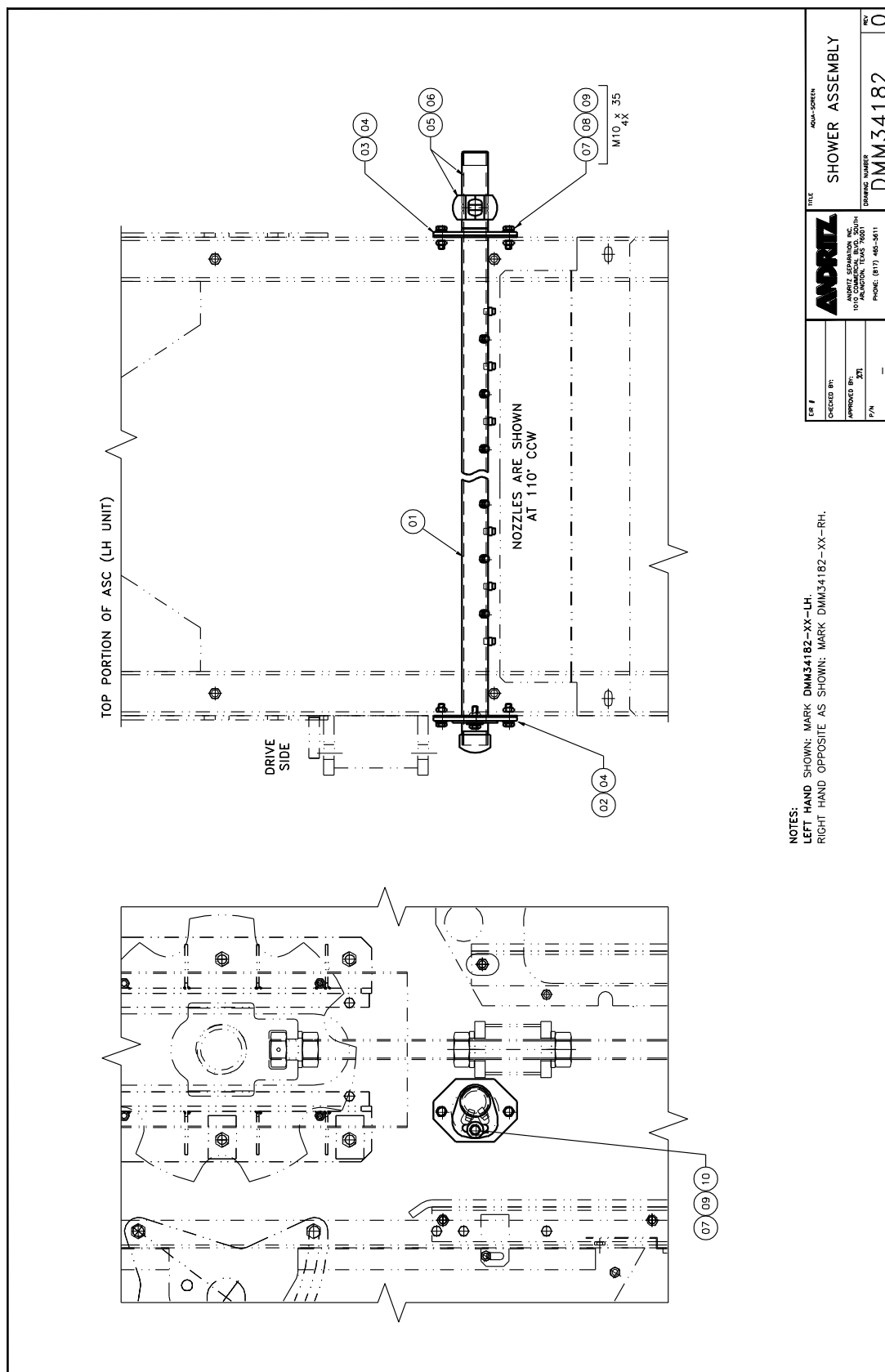
PART NUMBER		DRAWING NUMBER		DESCRIPTION
300157076		DMM32811-14		WASHING BRUSH ASSEMBLY, RIGHT SIDE
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	1	PC	300157077	DRIVESHAFT WELDMENT
2	2	PC	131406806	RUBBER WASHER
3	1	PC	300157078	TORQUE ARM, RIGHT HAND
4	44	PC	131422618	SPACER
5	2	PC	131516730	RETAINING RING
6	1	PC	300078944	ROTARY, SUPPORT WELDMENT
7	1	PC	300078945	ROTARY, SUPPORT WELDMENT
8	2	PC	131406256	GASKET
9	1	PC	300067539	SAFETY COVER
*10	46	PC	131422619	CIRCULAR WASHING BRUSH
11	1	PC	300076907	CLAMPING PLATE, LEFT HAND
12	1	PC	300076908	CLAMPING PLATE, RIGHT HAND
13	2	PC	300076931	CLEAT, INNER, M12 BOLTS
*14	2	PC	131471315	FLANGE BEARING
15	1	PC	131410487	BEARING COVER
16	5	PC	100003159	HEX HEAD SCREW, M8 X 25
17	5	PC	131070103	SPRING WASHER, M8
18	5	PC	100004455	PLAIN WASHER, M8
19	4	PC	100003174	HEX HEAD SCREW, M12 X 30
20	8	PC	131398633	SPRING WASHER, M12
21	4	PC	100004457	PLAIN WASHER, M12
22	2	PC	100003184	HEX HEAD SCREW, M16 X 50
23	4	PC	131161098	SPRING WASHER, M16
24	6	PC	100004458	PLAIN WASHER, M16
25	8	PC	100003153	HEX HEAD SCREW, M6 X 20
26	8	PC	131398617	SPRING WASHER, M6
27	8	PC	100004454	PLAIN WASHER, M6
28	4	PC	100002083	HEX NUT, M12
29	2	PC	100003185	HEX HEAD SCREW, M16 X 60
30	4	PC	131401286	PLAIN WASHER, M12
31	1	PC	131359827	COTTER PIN, 1/8 x 1-1/2"

*Recommended spare part. See page 46.



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

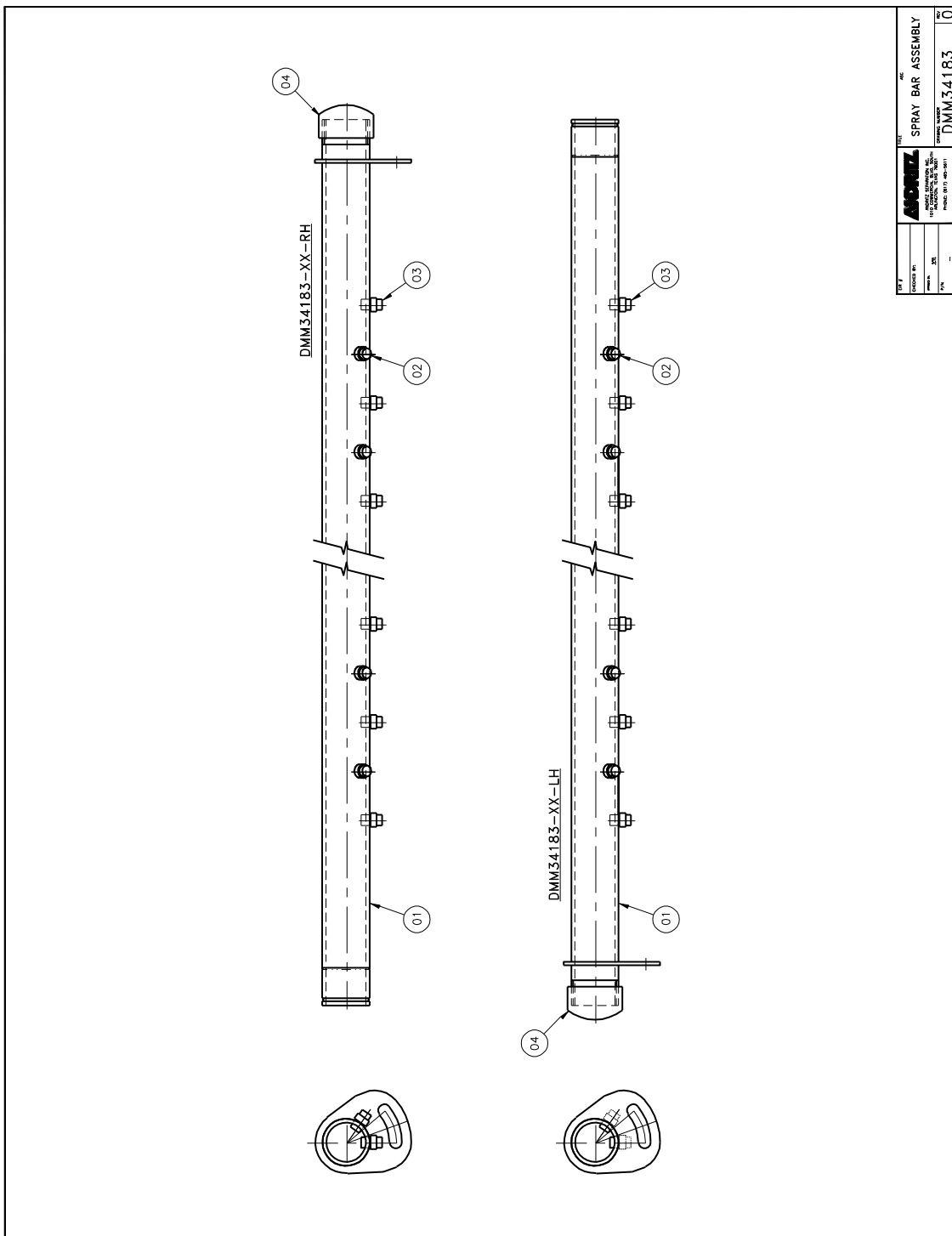
QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL



QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

[illegible]

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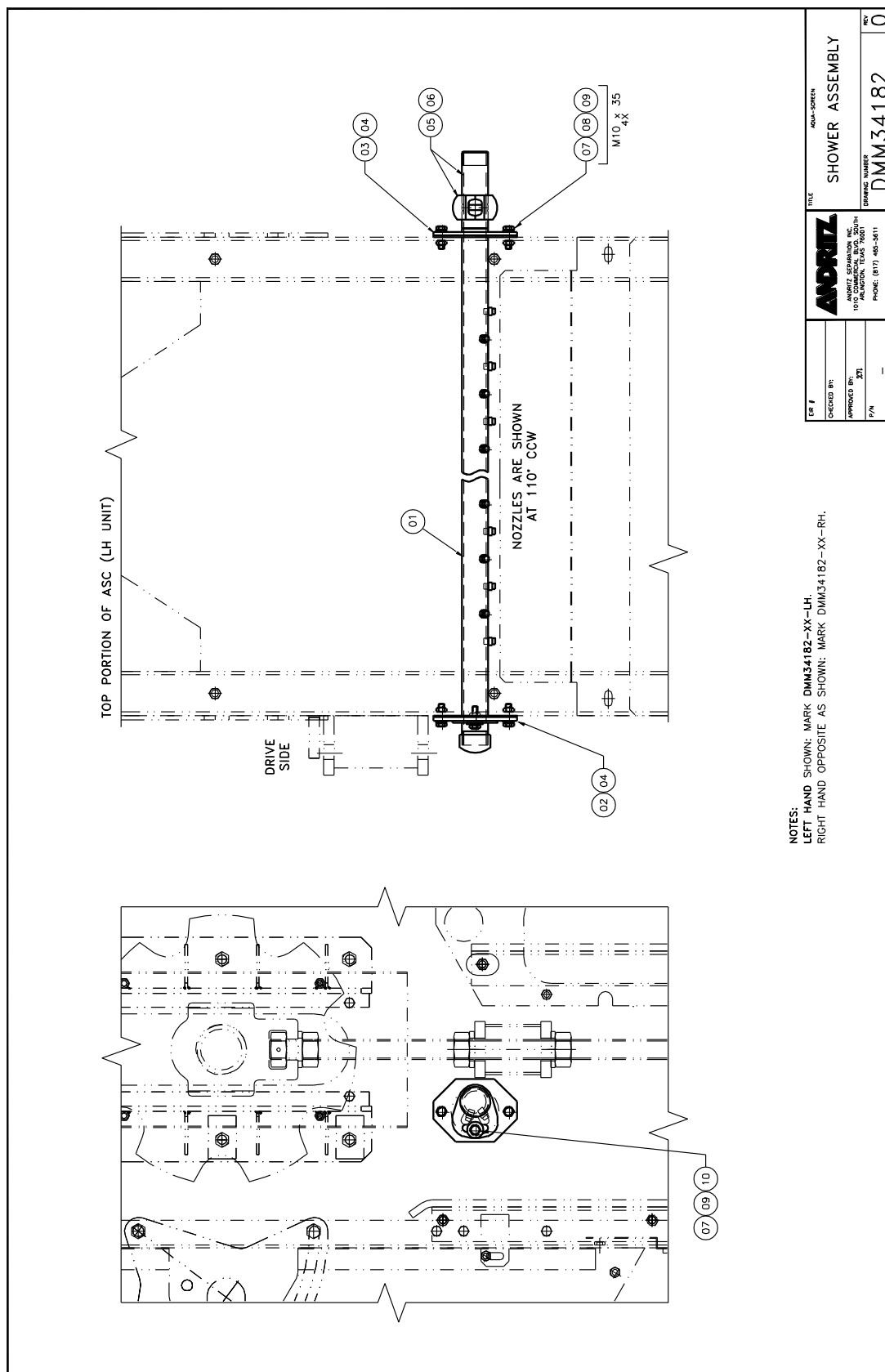
QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

[illegible]Page 29 of 46
Page 111 of 316



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL



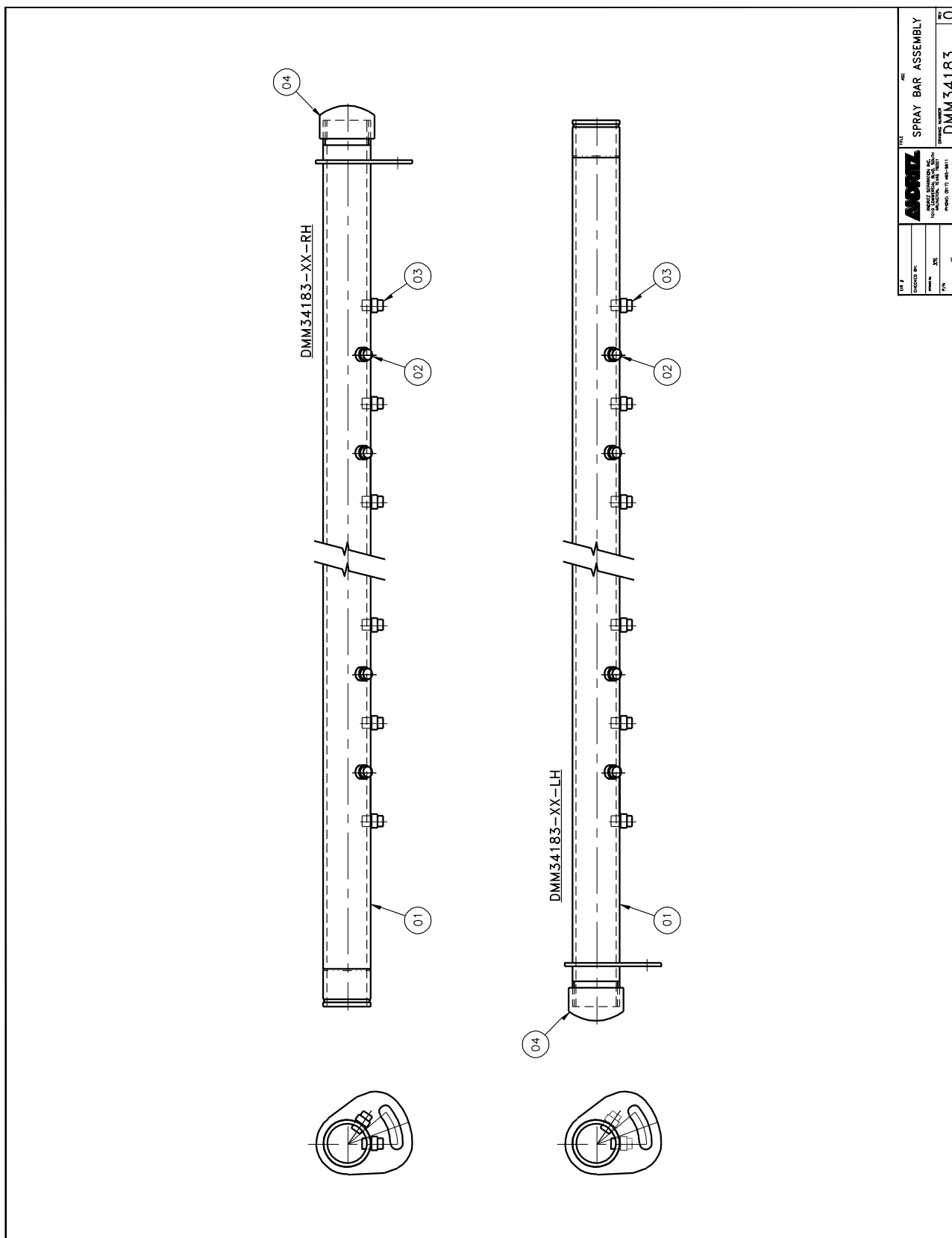
QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

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QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

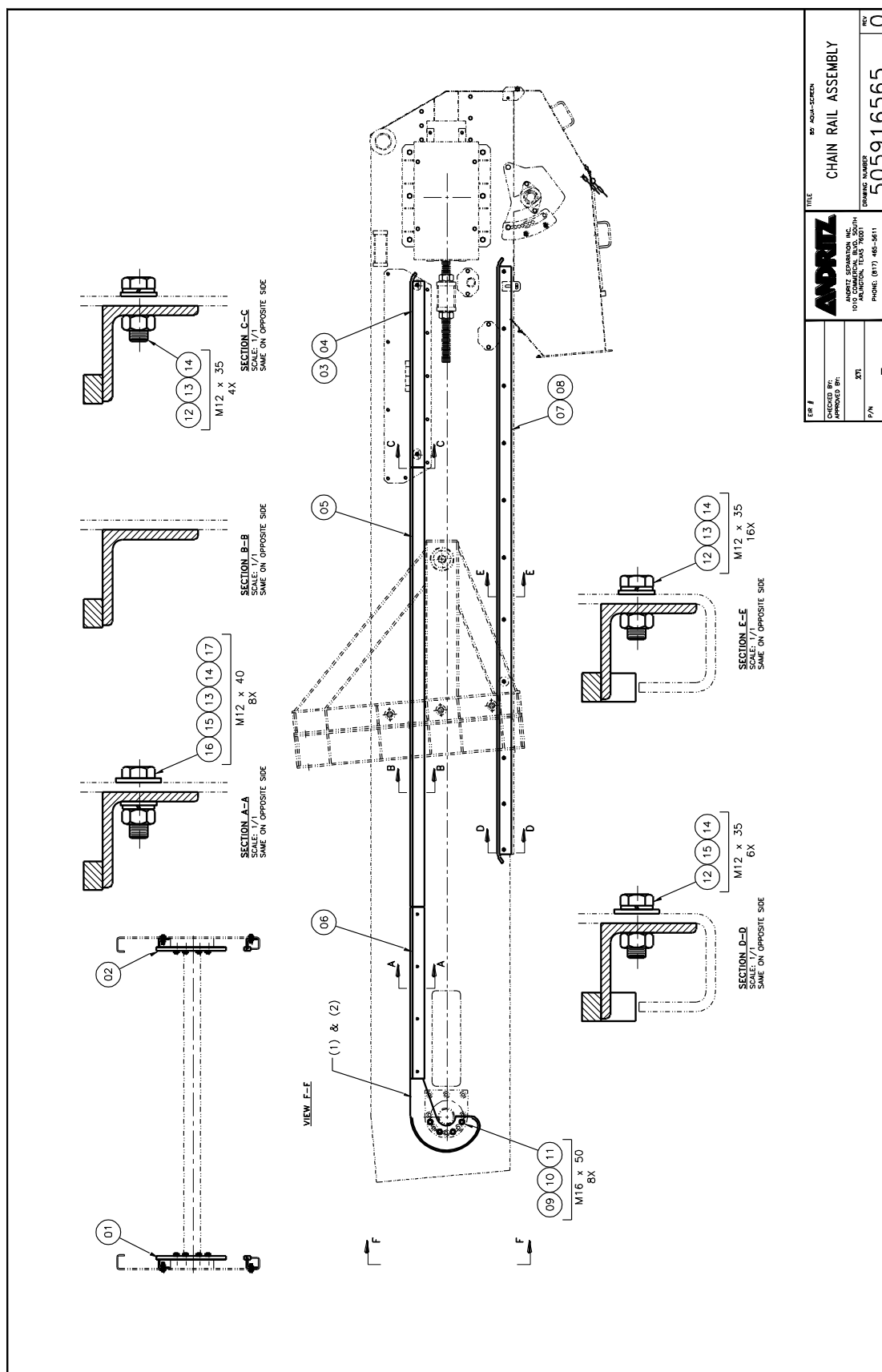


QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

[illegible]Page 33 of 46
Page 115 of 316

QUEENSLAND URBAN UTILITIES LUGGAGE POINT STP/LUGGAGE POINT

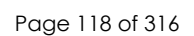
QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL



QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

[illegible]Page 35 of 46
Page 117 of 316

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL



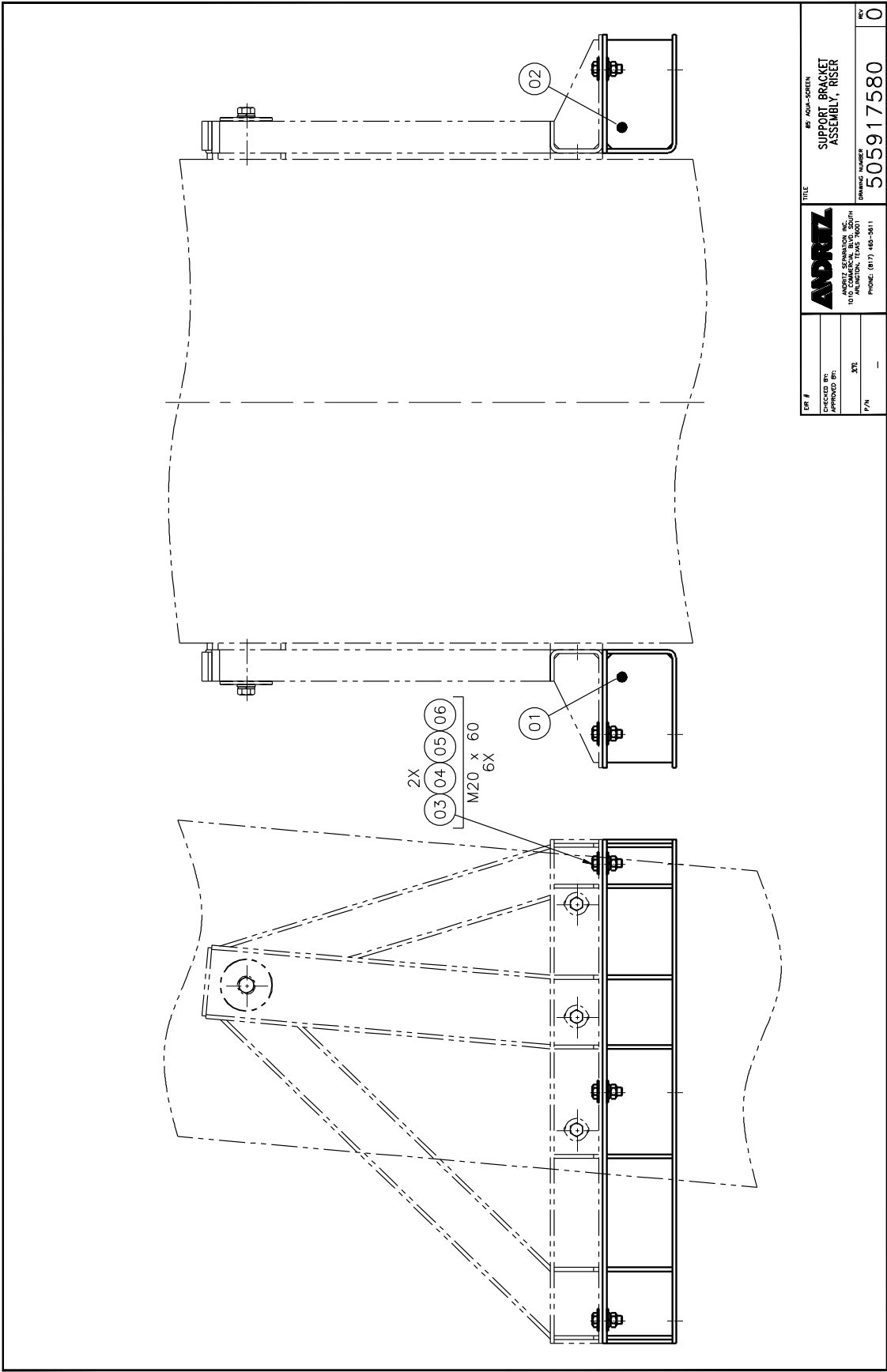
QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

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QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL



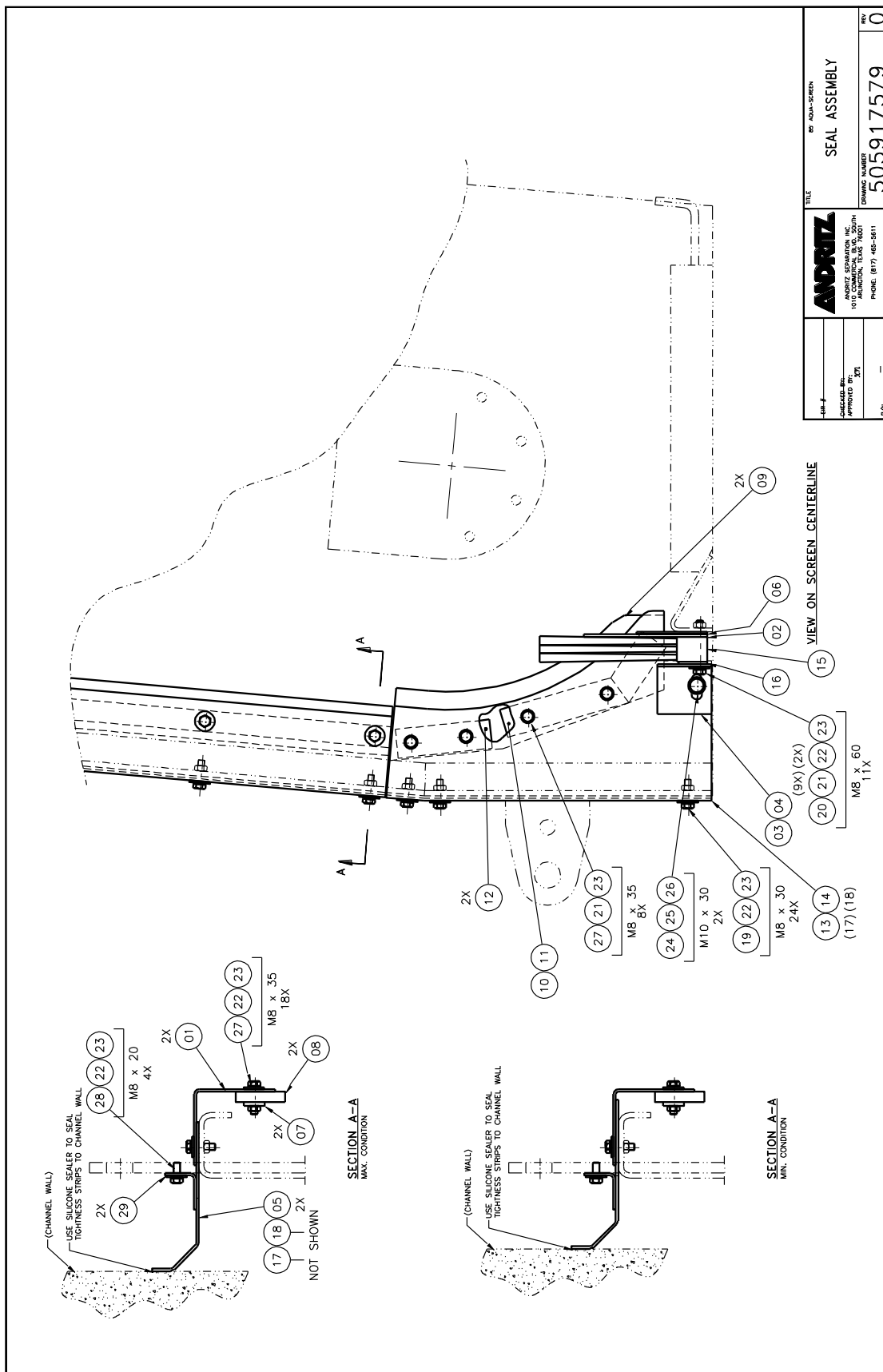
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OPERATION & MAINTENANCE MANUAL

[illegible]



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL





QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

PARTS LIST

PART NUMBER		DRAWING NUMBER		DESCRIPTION
300158592		505917579		SEAL ASSEMBLY, LEFT & RIGHT SIDES
ITEM NO.	QUANTITY	UNIT	PART NUMBER	PART DESCRIPTION
1	2	PC	300158593	SEAL SUPPORT, UPPER
*2	1	PC	300158717	SEAL STRIP, FOOT BRUSH
3	1	PC	131516655	SEALING, BRUSH FITTING ANGLE, LH
4	1	PC	131516654	SEALING, BRUSH FITTING ANGLE RH
5	2	PC	300158594	TIGHTNESS STRIP, UPPER SIDE SEAL
6	1	PC	300028379	BACKING STRIP FOOT BRUSH
7	2	PC	300158595	CLEAT, UPPER SIDE SEAL
*8	2	PC	300158597	SEAL STRIP, UPPER SIDE SEAL
*9	2	PC	300005742	SEAL STRIP, LOWER SIDE
10	1	PC	131680607	SEAL RETAINER, LOWER BACKING STRIP
11	1	PC	131680608	SEAL RETAINER, LOWER BACKING STRIP
12	2	PC	300130647	BACKING STRIP, LOWER SIDE SEAL
13	1	PC	300130652	SEAL SUPPORT, LOWER, LEFT HAND
14	1	PC	300130653	SEAL SUPPORT, LOWER, RIGHT HAND
*15	1	PC	300028428	SEALING BRUSH
16	1	PC	300028370	SEAL RETAINER, FOOT BRUSH
17	1	PC	300158598	TIGHTNESS STRIP, LOWER SIDE SEAL
18	1	PC	300158599	TIGHTNESS STRIP, UPPER SIDE SEAL
19	24	PC	100003160	HEX HEAD SCREW, M8 X 30
20	11	PC	100003161	HEX HEAD SCREW, M8 X 60
21	17	PC	100004455	PLAIN WASHER, M8
22	48	PC	100004711	PLAIN WASHER, M8
23	65	PC	131070103	SPRING WASHER, M8
24	2	PC	100003168	HEX HEAD SCREW, M10 X 30
25	2	PC	131398431	PLAIN WASHER, M10
26	2	PC	131069990	SPRING WASHER, M10
27	26	PC	131034864	HEX HEAD SCREW, M8 X 35
28	4	PC	100003158	HEX HEAD SCREW, M8 X 20
29	2	PC	300158715	COVER, SEAL ASSEMBLY

*Recommended spare part. See page 46.

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

[illegible]



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

DRIVE LIST

AQUA-SCREEN® MAIN DRIVE GEAR MOTOR: LEFT-HAND UNIT	
Gear Motor:	Baldor CECP83661T-4-M15B 2 HP, 415 VAC, 3-phase, 50 Hz, 1450 rpm, C-face, NEMA N182TC, TEFC, 1.15 Service Factor.
Main Gear Reducer:	Bonfiglioli, W110 UFC2 23 N180CTC AA, Worm Gear reducer, ratio 23:1, NEMA N184C
Secondary Reduction:	Bonfiglioli, 307 L 2 28 FP EOVE A GOA, Planetary Gear Reducer, ratio 28:1
ROTARY BRUSH DRIVE GEAR MOTOR:— LEFT-HAND UNIT	
Motor:	Baldor CECP83587T-4-M15B 1.5 HP, 415 VAC, 3-phase, 50 Hz, 1465 rpm, C-face, NEMA N145TC, 1.15 Service factor.
Gear reducer:	SEW Eurodrive, KT37AM145-KS Helical-bevel gear reducer, ratio 15.31:1, NEMA N145TC Mounting position M1A

AQUA-SCREEN® MAIN DRIVE GEAR MOTOR: RIGHT-HAND UNIT	
Gear Motor:	Baldor CECP83661T-4-M15B 2 HP, 415 VAC, 3-phase, 50 Hz, 1450 rpm, C-face, NEMA N182TC, TEFC, 1.15 Service Factor
Main Gear Reducer:	Bonfiglioli, W110 UFC1 23 N180CTC AA, Worm Gear reducer, ratio 23:1, NEMA N184C
Secondary Reduction:	Bonfiglioli, 307 L 2 28 FP EOVE A GOA, Planetary Gear Reducer, ratio 28:1
ROTARY BRUSH DRIVE GEAR MOTOR:— RIGHT-HAND UNIT	
Motor:	Baldor CECP83587T-4-M15B 1.5 HP, 415 VAC, 3-phase, 50 Hz, 1465 rpm, C-face, NEMA N145TC, 1.15 Service Factor
Gear reducer:	SEW Eurodrive, KT37AM145-KS Helical-bevel gear reducer, ratio 15.31:1, NEMA N145TC Mounting position M1B

RECOMMENDED SPARE PARTS

Quantities are per machine, left and right

DESCRIPTION	PART NO.	QTY	NOTE
DISCHARGE COVER ASSEMBLY			
DOCTOR BLADE	300156921	1	
SCREEN PANEL ASSEMBLY			
SCREEN PANEL	300155902	56	
CHAIN WELDMENT	300058319	28	LEFT-HAND
	300058320	28	RIGHT-HAND
SIDE SEAL PLATE	131507680	112	
WASHING BRUSH ASSEMBLY			
CIRCULAR BRUSH	131422619	46	
WASHING BRUSH BEARINGS	131471315	2	
SPRAY BAR ASSEMBLY			
SPRAY NOZZLES	131410769	15	
	131410767	16	
CHAIN RAIL ASSEMBLY			
CIRCULAR CHAIN RAIL	131515074	1	
CHAIN RAIL	300040857	1	
SEAL ASSEMBLY			
SEAL STRIP, FOOT BRUSH	300158717	1	
SIDE SEAL STRIPS	300158597	2	UPPER SIDE
	300005742	2	LOWER SIDE
	300028428	1	SEALING BRUSH

Chapter 6: Drawings

CHAPTER 6

DRAWINGS AND DATA

6.1 PROJECT MECHANICAL DRAWINGS

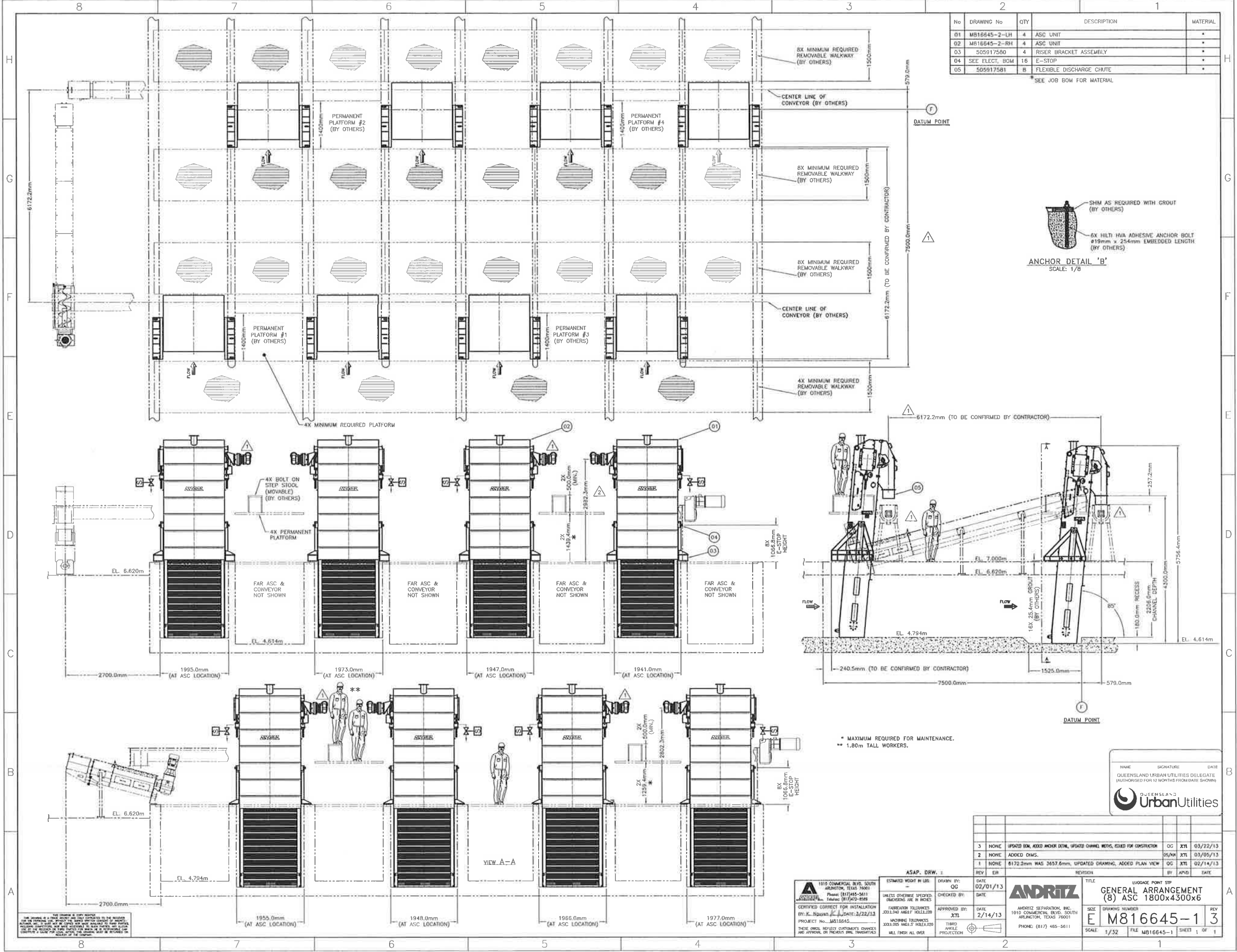
The following mechanical drawings are included in this manual:

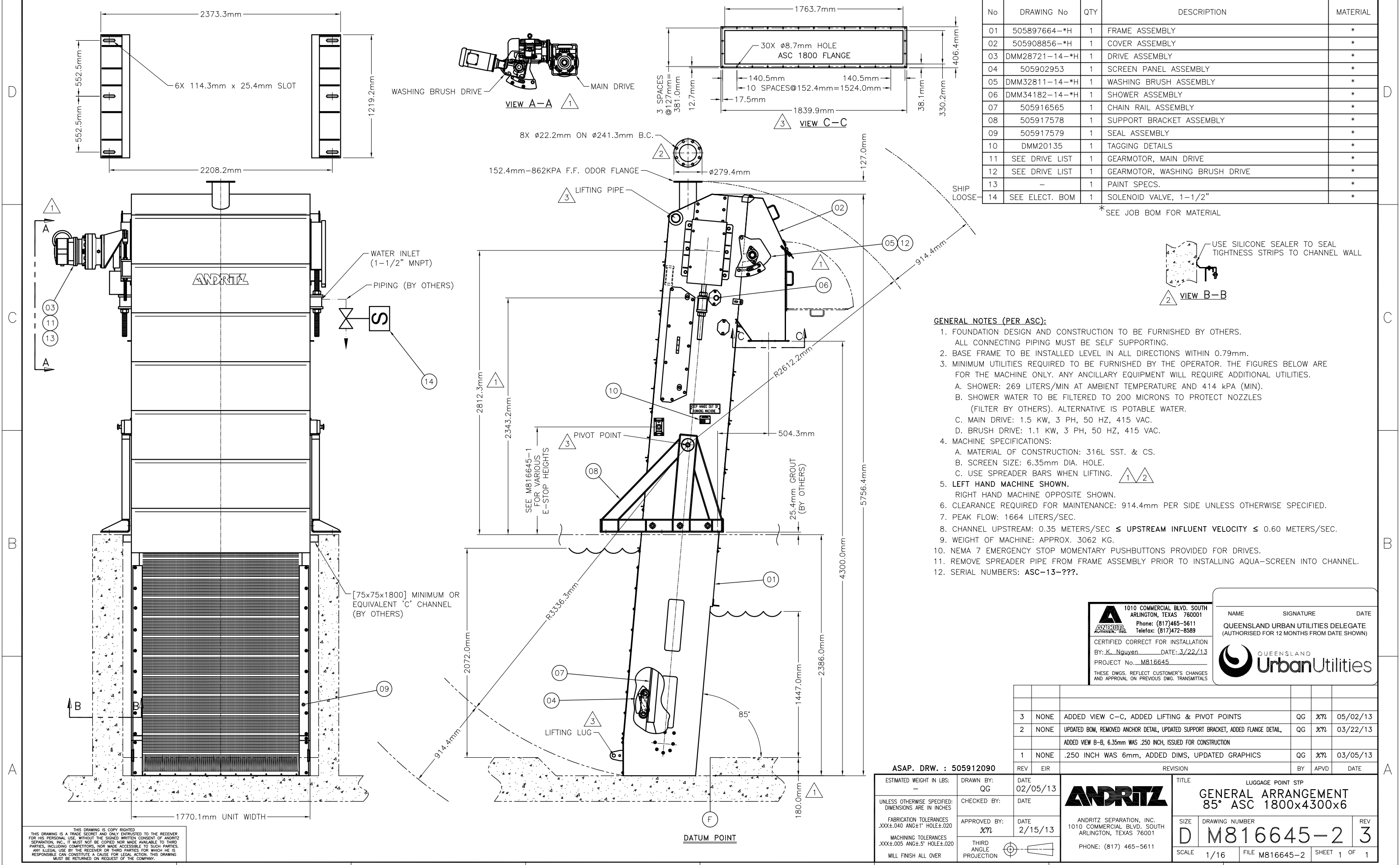
M816645-1	General Arrangement (8), ASC 1800x4300x6
M816645-2	General Arrangement, 85° 1800x4300x6
M816645-3	Pivoting ASC
M816645-4	Channel Seal, ASC 1800x4300 (86.850" Channel)



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

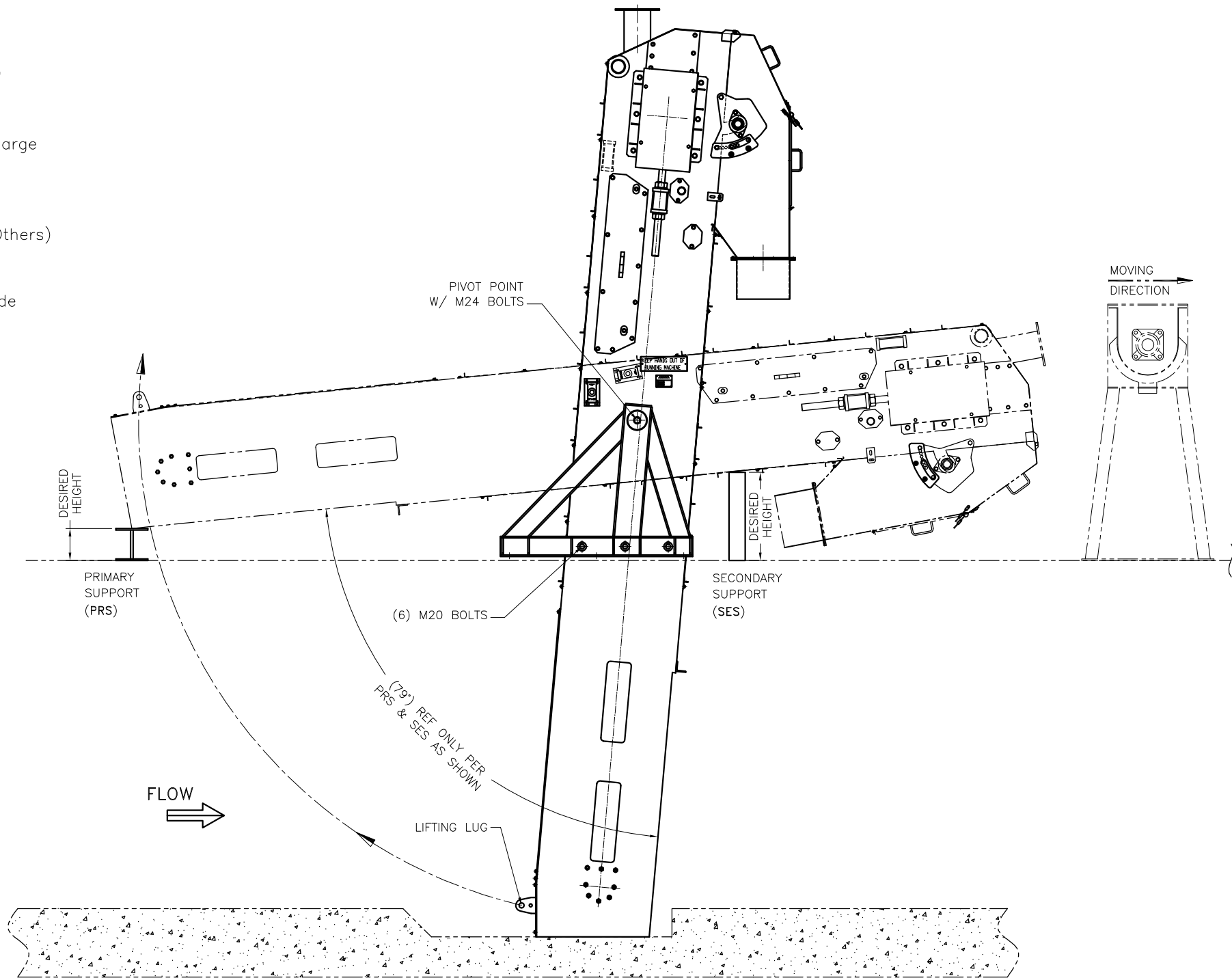
QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL





PIVOTING THE AQUA-SCREEN (ASC) FOR CHANNEL CLEANING

1. The unit weight is approx. 3062 kg
2. Remove the Transition Chute (if it is existing)
3. Remove the Conveyor (or any equipment connecting to the ASC unit)
4. Prepare the cross-channel desired height supports for the ASC unit
 - a. The primary support (PRS) is at the bottom of the ASC frame
 - b. The secondary support (SES) is at the location between the discharge chute & frame support
5. Disconnect the washing water pipe
6. Disconnect the Electrical wiring
7. Connect the overhead hoist lifting cable (pivoting mechanism – By Others) to the lifting lug at the base of the ASC frame. Allow clearance for the lifting cable in the pivoting path
8. Position the SES at the approximated location on the downstream side
9. Loosen the M24 hex head bolts at the pivot points
10. Remove (6) M20 bolts from the supports
11. Slowly lift the frame end to the desired position (it's slightly higher than the PRS height)
12. Position the PRS directly beneath the lifted end of the frame
13. Lower the lifted end until it resting on the support
14. Position the SES at the required position
15. Tighten the M24 hex head bolts



NOTE:

ALL METAL SURFACES ARE TO BE FREE OF ALL BURRS, WELD SLAG, SHARP EDGES, SCALE, AND ANY OTHER SURFACE CONTAMINANTS.

NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



1010 COMMERCIAL BLVD. SOUTH ARLINGTON, TEXAS 760001
Phone: (817)465-5611
Telefax: (817)472-8589
CERTIFIED CORRECT FOR INSTALLATION
BY: K. Nguyen DATE: 5/02/13
PROJECT No. M816645
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

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

DRAWN BY: KN
CHECKED BY: *KN*
APPROVED BY: *KN*
DATE: 5/01/13
DATE: 5/02/13
THIRD ANGLE PROJECTION



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

TITLE 85" AQUA-SCREEN
PIVOTING ASC
SIZE D DRAWING NUMBER M816645-3 REV 0
SCALE 1/16 FILE M816645-3 SHEET 1 OF 1

ADJUSTING THE CHANNEL WALL SEAL STRIPS

1. Loosen the hex head bolts, M8 x 30, on the frame
2. Loosen the hex head bolts, M8 x 20, on the lifting lug
3. Slide the tightness strips against the channel wall
(0.0mm gap between the channel wall & tightness strips)
4. a. Hold the gaps between the channel wall & tightness strips
b. Hold the lower & upper UHMW side seal strips against the stainless steel panel seal strips.
5. Tighten all M8 bolts.

D

C

B

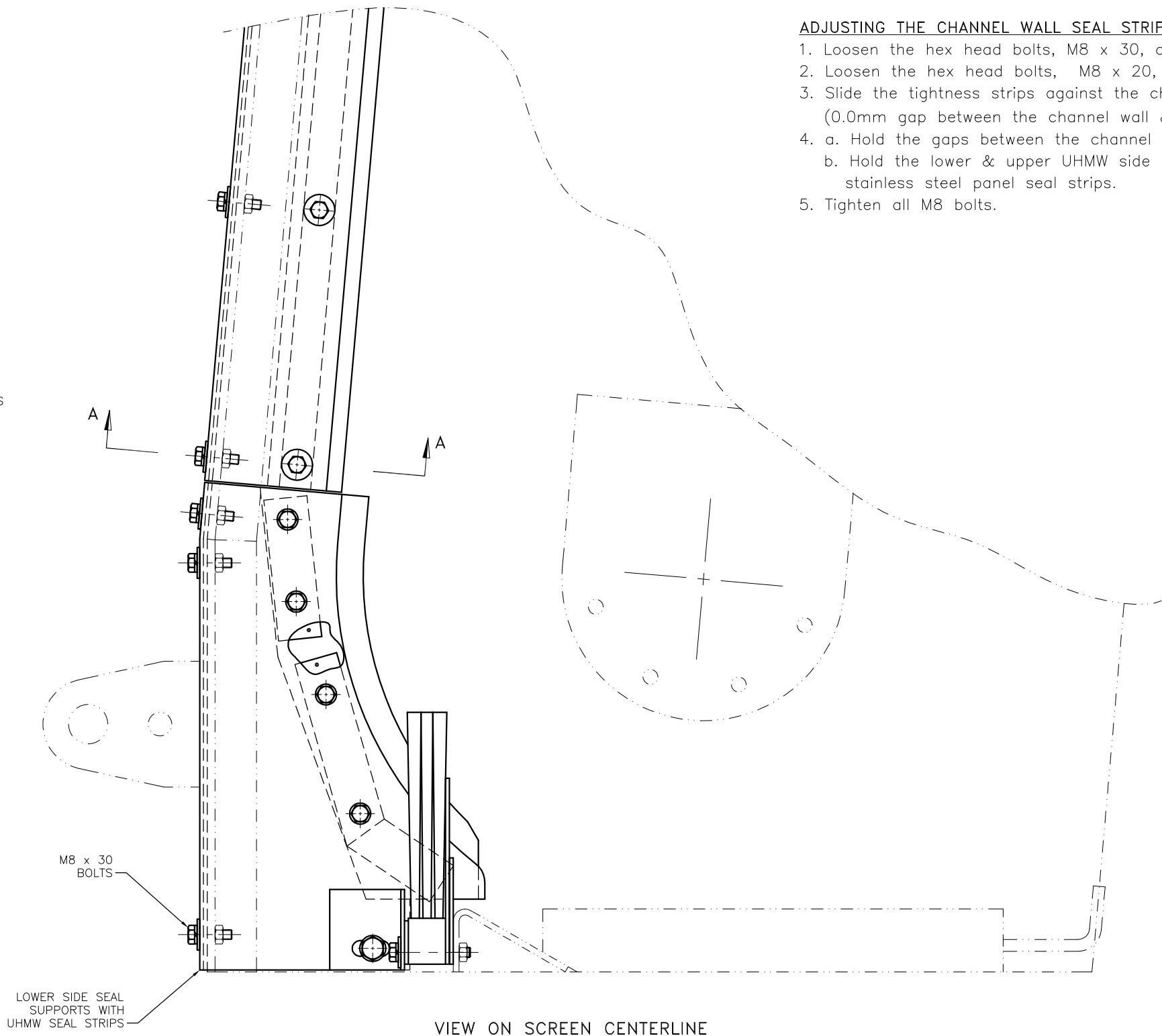
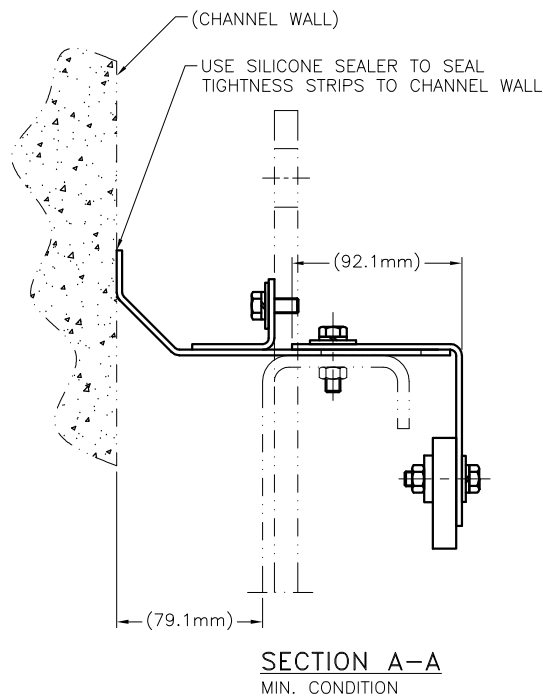
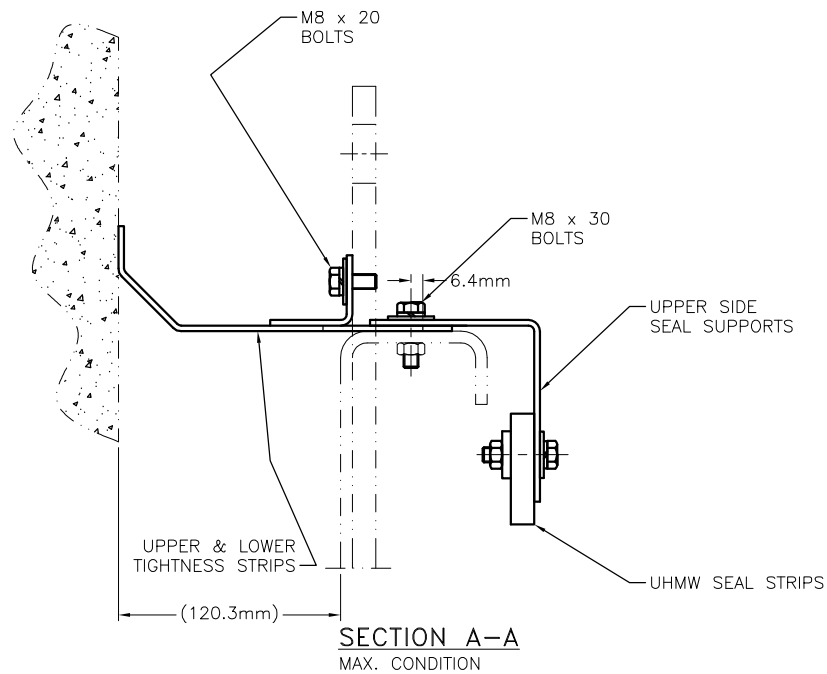
A

D

C

B

A



NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 760001
Phone: (817)465-5611
Telefax: (817)472-8589
CERTIFIED CORRECT FOR INSTALLATION
BY: K. Nguyen DATE: 5/02/13
PROJECT No. M816645
THESE DWGS. REFLECT CUSTOMER'S CHANGES
AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

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

DRAWN BY: KN
CHECKED BY:
APPROVED BY: *KN*
DATE: 5/01/13
DATE: 5/02/13
THIRD ANGLE PROJECTION



TITLE 85" AQUA-SCREEN
CHANNEL SEAL
ASC 1800x4300 (86.850" CHANNEL)
SIZE D DRAWING NUMBER M816645-4 REV 0
SCALE 1/2 FILE M816645-4 SHEET 1 OF 1

THIS DRAWING IS A TRADE SECRET AND ONLY ENTRUSTED TO THE RECEIVER FOR HIS PERSONAL USE. WITHOUT THE SIGNED WRITTEN CONSENT OF ANDRITZ SEPARATION, INC., IT MUST NOT BE COPIED NOR MADE AVAILABLE TO THIRD PARTIES, INCLUDING COMPETITORS, NOR MADE ACCESSIBLE TO SUCH PARTIES. ANY ILLEGAL USE BY THE RECEIVER OR THIRD PARTIES FOR WHICH HE IS RESPONSIBLE CAN CONSTITUTE A CAUSE FOR LEGAL ACTION. THIS DRAWING MUST BE RETURNED ON REQUEST OF THE COMPANY.



6.2 PROJECT ELECTRICAL DRAWINGS

The following electrical drawings are included in this manual:

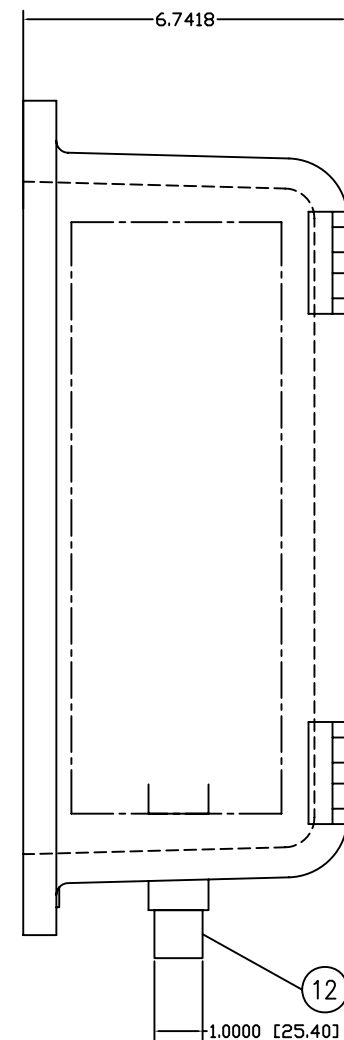
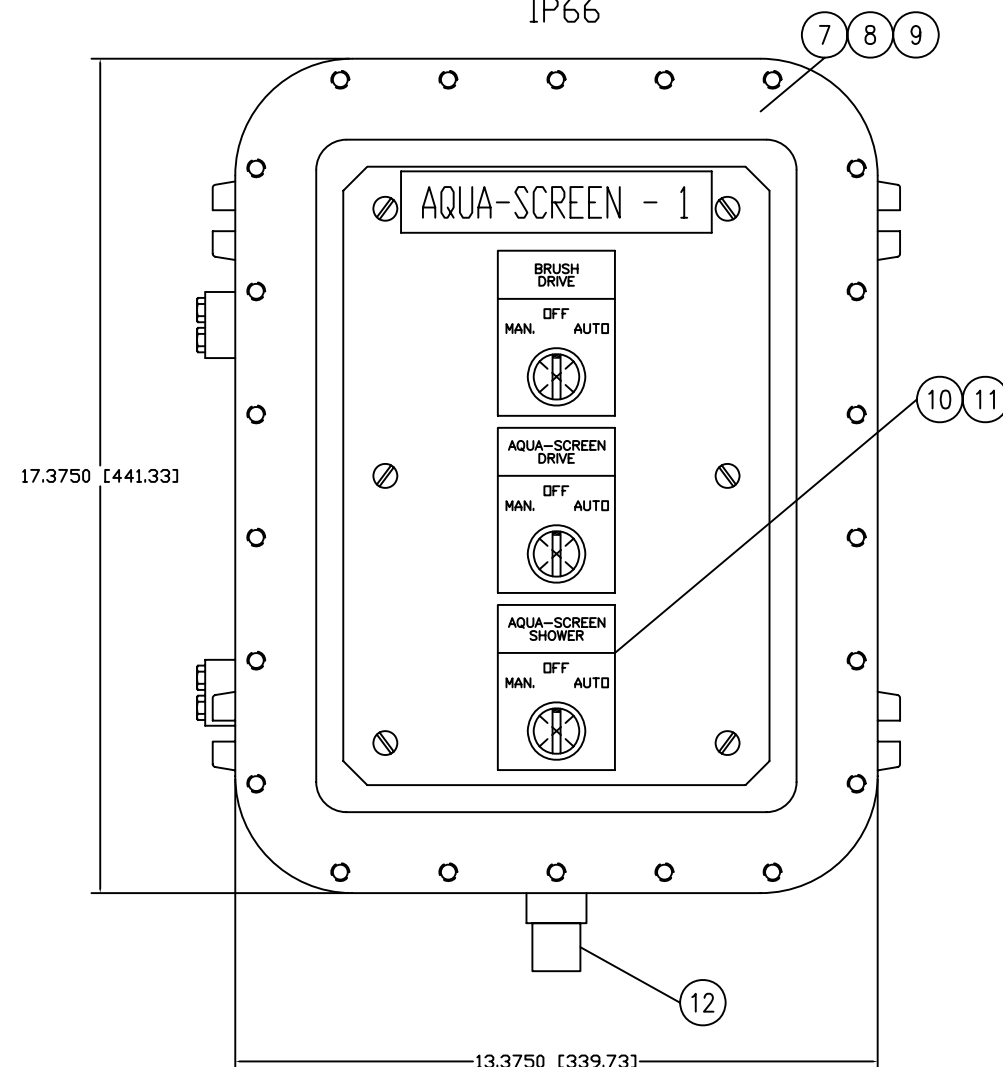
- E816645-1 Aqua-Screen Control Stations
- E816645-2 Aqua-Screen Electrical Schematic



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

SAP ASSEMBLY BOM XXXXXXXXXX
AQUA-SCREEN
CONTROL STATION
CLASS 1, DIVISION 1,
GROUP D, NEMA 7
IP66



- 1 ENCLOSURE, AB #800H-1HVX7M1 (131523076)
- 2 1 HOLE COVER, AB #800H-NP30 (131365207)
- 3 SEALING KIT, AB #800H-N479F (131843519)
- 4 DRAIN PLUG, AB #800H-NP21 (131843520)
- 5 PUSHBUTTON, AB #800H-FPX6A1 (131395790)
- 6 E-STOP TAG, AB #800H-Y4J (131395797)
- 7 ENCLOSURE, ADALET XCEX101406 N4
- 8 3 HOLE COVER, ADALET XCEX101406 N4
- 9 SEALING KIT, ADALET
- 10 3 POSITION SELECTOR SWITCH, AB #800H-JP5KB7AXXX (132101370)
- 11 HAND-OFF-AUTO TAG, AB #800H-Y11
- 12 1" NPT CONDUIT ENTRANCE

THIS DRAWING IS COPY RIGHTED
THIS DRAWING IS A TRADE SECRET AND ONLY ENTRUSTED TO THE RECEIVER
FOR HIS PERSONAL USE. WITHOUT THE SIGNED WRITTEN CONSENT OF ANDRITZ
SEPARATION INC., IT MUST NOT BE COPIED NOR MADE AVAILABLE TO THIRD PARTY
INCLUDING COMPETITORS NOR MADE ACCESSIBLE TO SUCH PARTIES. ANY ILLEGAL
USE BY THE RECEIVER OF THIS DRAWING FOR WHICH HE IS RESPONSIBLE CAN
CONSTITUTE A CAUSE FOR LEGAL ACTION. THE DRAWING MUST BE RETURNED ON
REQUEST OF THE COMPANY.

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)		



ANDRITZ
PULP & PAPER

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

APPROVED FOR CONSTRUCTION
BY: KV DATE: 3/19/13
PROJECT No. E816645

[illegible]

A 1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001
Phone: (817)485-5611
Telex: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION

BY: MMU DATE 3/19/13

PROJECT No.E816645

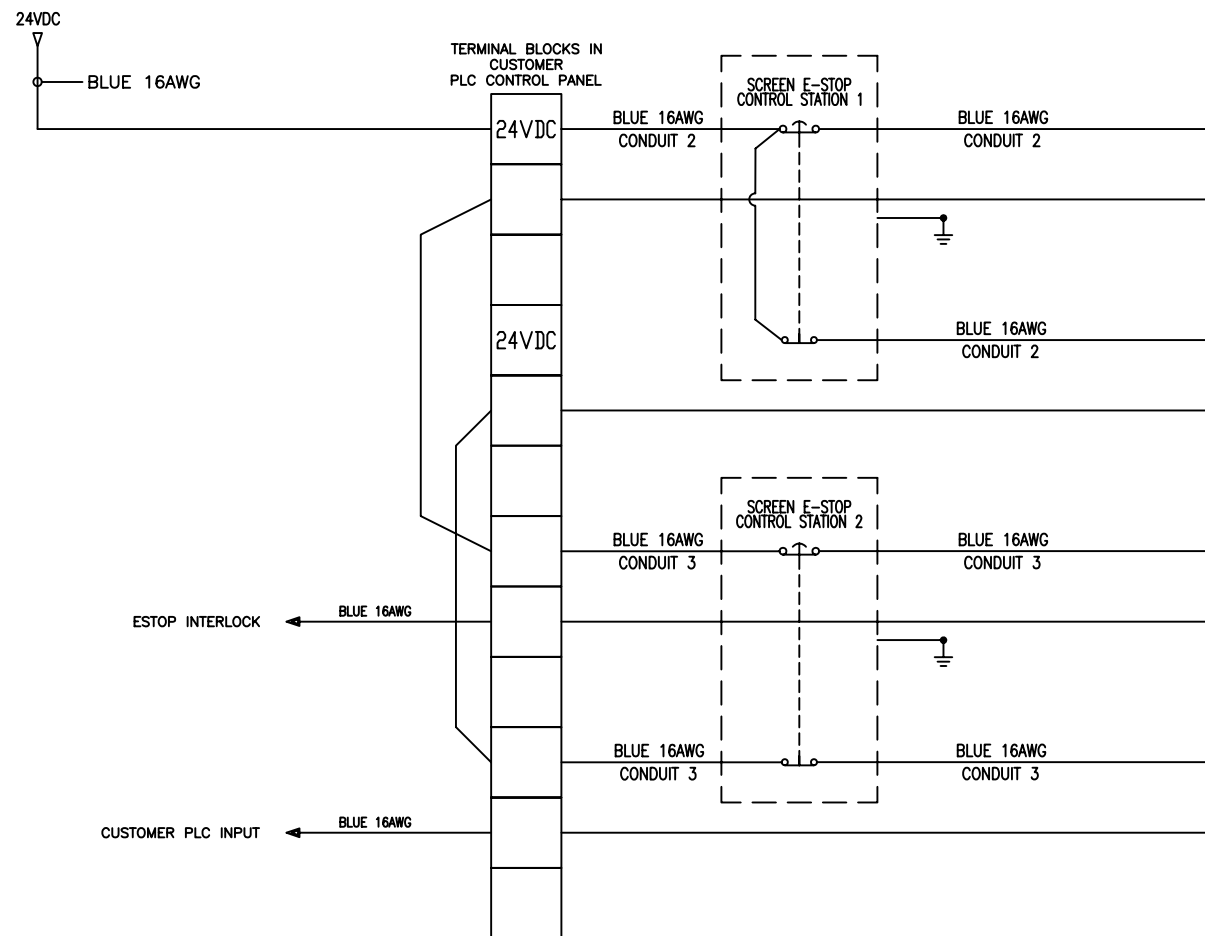
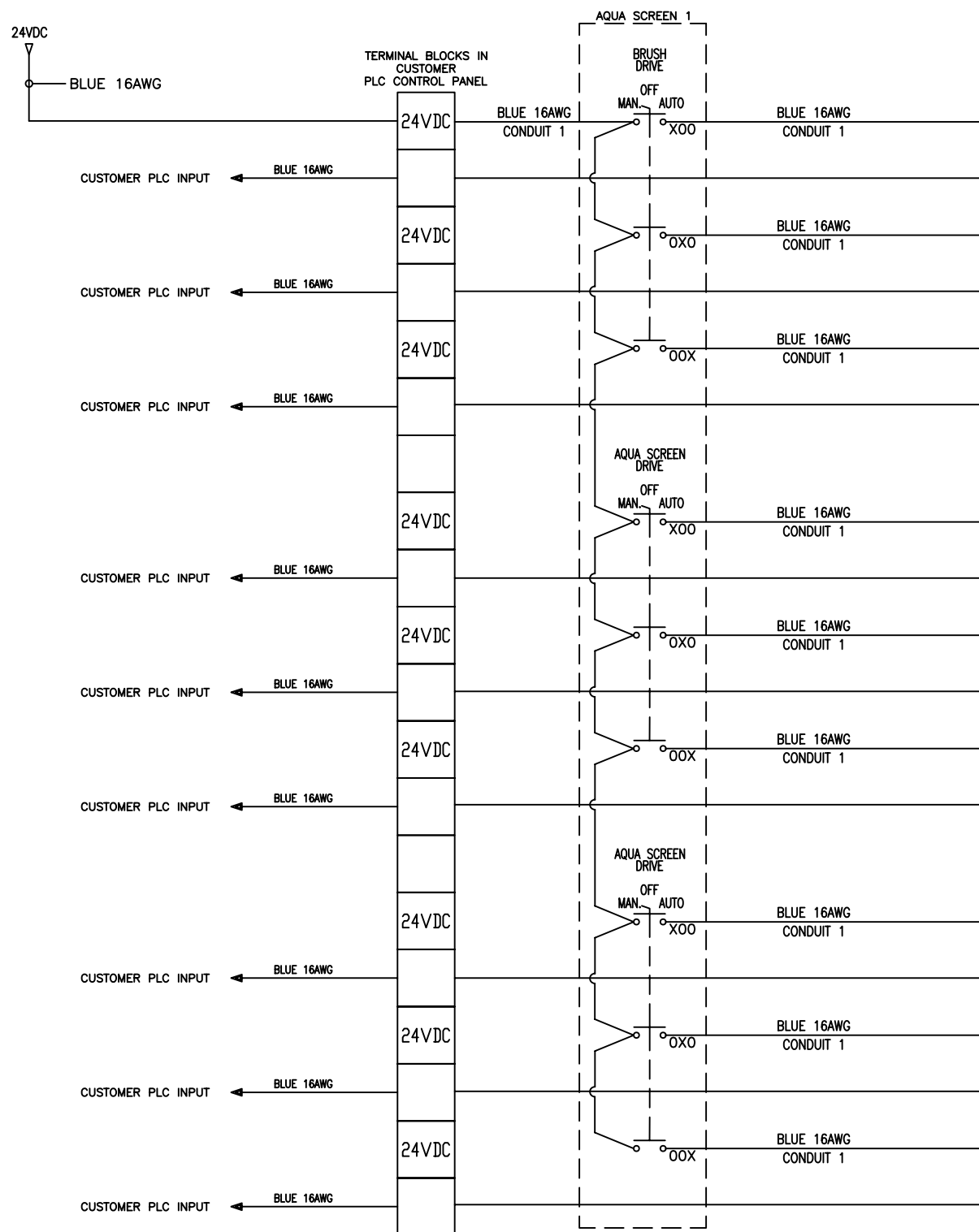
THESE DWGS. REFLECT CUSTOMER'S CHANGE
AND APPROVAL ON PREVIOUS DWG. TRANSMITTAL

ESTIMATED WEIGHT IN LBS:	DRAWN BY: MMU	DATE 2/21/13
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY: MMU	DATE 2/21/13
FABRICATION TOLERANCES .XXX±.040 ANG±.1° HOLE±.020	APPROVED BY: MMU	DATE 2/21/13
MACHINING TOLERANCES .XXX±.050 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		



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

REVISION	DATE	BY	APPROVED	SHEET
TITLE		LUGGAGE POINT AQUA-SCREENS CONTROL STATIONS		
SIZE	DRAWING NUMBER			REV
B	E816645-1			3
SCALE	FILE	SHEET	OF	
	E816645-1	1	2	



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ADRIZ
CONSTRUCTION, INC.


1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76001

Phone: (817)465-5611
Telefax: (817)472-8589

APPROVED FOR CONSTRUCTION

BY: KV DATE: 3/19/13

PROJECT No E816645

ESTIMATED WEIGHT IN LBS:	DRAWN BY: DAK	DATE 3/4/13
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY: mmu	DATE 3/4/13
FABRICATION TOLERANCES .00X±.040 ANG±1° HOLE±.020	APPROVED BY: scv	DATE 3/4/13
MACHINING TOLERANCES .00X±.005 ANG±.5° HOLE±.020	THIRD ANGLE PROJECTION	
MILL FINISH ALL OVER		

ANDRITZ

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

TITLE	LUGGAGE POINT AQUA-SCREEN ELECTRICAL SCHEMATIC
-------	--

SIZE	DRAWING NUMBER
B	E816645-2

REV
3

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)		



3		PLC WIRING CHANGED FOR CLARIFICATION	DAK	<i>mmu</i>	6/11/13
2		ISSUED FOR CONSTRUCTION	DAK	<i>mmu</i>	3/19/13
1		REVISED P&ID	DAK	<i>mmu</i>	3/14/13
REV	EIR	REVISION	BY	APVD	DATE



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

6.3 ELECTRICAL CUTSHEETS



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL

XCE: Explosionproof Control Enclosures

XCEX: Flameproof Control Enclosures

XCEQ: Explosionproof Quad-Lead Control Enclosures

XJF: Explosionproof Junction Boxes



Adalet NEMA 7/9 XCE series and XJF enclosures are used in the installation of electrical/electronic components for control, measurement or monitoring applications in hazardous environments. XCE control enclosures can be modified for installation of a variety of explosionproof operator devices, viewing windows (XJF models can not accommodate holes in cover) and accessories permitting the development of customized enclosure systems.

FEATURES

- Copper-free aluminum, lightweight and corrosion resistant
- Integral, cast-on mounting lugs, slotted for ease of field installation
- Drilling and tapping for left hand hinges and mounting pan (hinges and pan optional)
- Uniform wall thickness for ease of installation of control devices, windows and conduit openings
- External flange provides maximum accessibility of components mounted inside.
- Tumblast finish for quality appearance
- Premium high strength steel cover bolts, plated and coated for maximum corrosion resistance (stainless steel optional)
- Enclosures certified for field drill and tap of conduit entrances and XGC windows
- Internal grounding screw standard
- Covers exceeding approximately 75 lbs. are provided with two removable eye bolts for ease of handling
- XCE/XCEQ/XCEX certified drillable for operators at the factory or in the field
- IP66 gasket standard on XCEX
- XCEX includes IEC certification
- XCEX includes external earthing assembly

DESIGN OPTIONS

- Quad-lead bolt (quick thread bolt) option - designate XCEQ when ordering. Not available with XCEX.
- **NEMA 4 (WATERTIGHT)/IP66:** Features a nitrile O-Ring retained in the cover flange in a machined groove. When ordering, add N4 to the catalog number. *Option may affect certifications - consult factory.
- **NEMA 6 (SUBMERSIBLE):** Consult factory.
- Cast-on mounting buttons, bosses and pads: Per customer specifications.
- Captive cover bolts: Consult factory, may affect approvals.
- **Hinges:** Left side removable standard, other locations and non-removable covers optional.
- **Windows:** Circular window sizes ranging from 1" to 8" diameter viewing area. Rectangular window sizes ranging from 3" x 3" to 13" x 13" viewing area.
- Stainless steel cover bolts. Consult factory for NEMA 4X rating.
- Mounting Pans: Available in galvanized steel, aluminum or phenolic.
- Sidewall auxiliary device installation or machining available on XCE/XCEQ/ XCEX series enclosures – Consult Factory.
- Factory machined metric sidewall threads up to M75 approved on XCE and XCEX series for Groups C & D. Group B enclosures may only have up to M30 holes.

NOTE: Where reference is made to Class I and Class II hazardous locations, the equipment is suitable for both Division 1 and Division 2 locations.

XCE SERIES & XJF

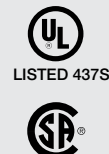
CERTIFICATIONS

XJF SERIES

Certifications

Class I, Groups B*,C,D	UL 1203
Class II, Groups E,F,G	CSA C22.2 No. 25 & 30
TYPE 4 (w/N4 suffix)	UL 50
IP 40 without gasket	
IP 66 with gasket	

*N4 suffix may affect Group B approval, consult factory.



XCE/XCEQ SERIES

Certifications

Class I, Groups B*,C,D	UL 1203
Class II, Groups E,F,G	CSA C22.2 No. 25 & 30
Class III	
TYPE 4, (w/N4 suffix)	UL 50
TYPE 4X (w/SS cover bolts)	

*Specify Group B if required w/N4 suffix



XCEX SERIES

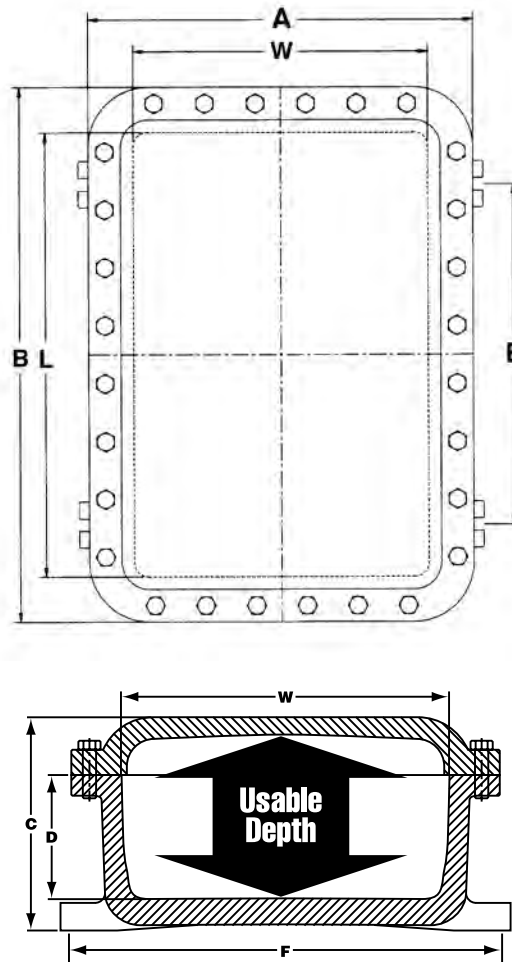
Certifications

Class I, Groups C,D	UL 1203
Class II, Groups E,F,G	CSA C22.2 No. 25 & 30
Class III	
Class I, Zone 1, AEx d IIB	UL 60079-0/UL 60079-1
Ex d IIB	CSA 60079-0/CSA 60079-1
0539 Ex II 2GD (Optional)*	ATEX Directive 94/9/EC
EEx d IIB (Optional)*	EN 50014, EN50018
IP 40	
IP 66 (w/N4 suffix)	IEC 60529
TYPE 4, (w/N4 suffix)	UL 50
TYPE 4X (w/SS cover bolts)	

*Specify ATEX if required



NOTE: Where reference is made to Class I and Class II hazardous locations, the equipment is suitable for both Division 1 and Division 2 locations.

**DESIGN OPTION DETAILS****MOUNTING PANS Three Materials Available:**

Steel: (XSM) Galvanized 12 gauge steel plate. The catalog number includes the steel mounting pan complete with 1/4" high spacers and stainless steel mounting screws.

Aluminum: (XSA) Consult factory for availability.

Phenolic: (XSB) A special phenolic laminated material that has high mechanical and dielectric strength. It is excellent for mounting and wiring control equipment. The catalog number includes the phenolic board, 3/8" thick, complete with 1/4" high spacers and stainless steel mounting screws.

- NOTES**
1. No installation charge when customer specifies factory installation of mounting pan.
 2. Enclosures are pre-drilled for mounting panel unless otherwise specified.

HINGE SETS

Made of extruded aluminum alloy consisting of two sections, female and male (with stainless steel pin) and four stainless steel hex head bolts. Designed to allow right or left hand removable or non-removable installation. Unless specified, left hand removable hinge installation will be furnished by factory when hinged enclosures are ordered.

- NOTES**
1. Catalog numbers represent complete hinge sets necessary for enclosure assembly.
 2. Enclosures are pre-drilled for hinge kit unless otherwise specified.

XCE SERIES & XJF

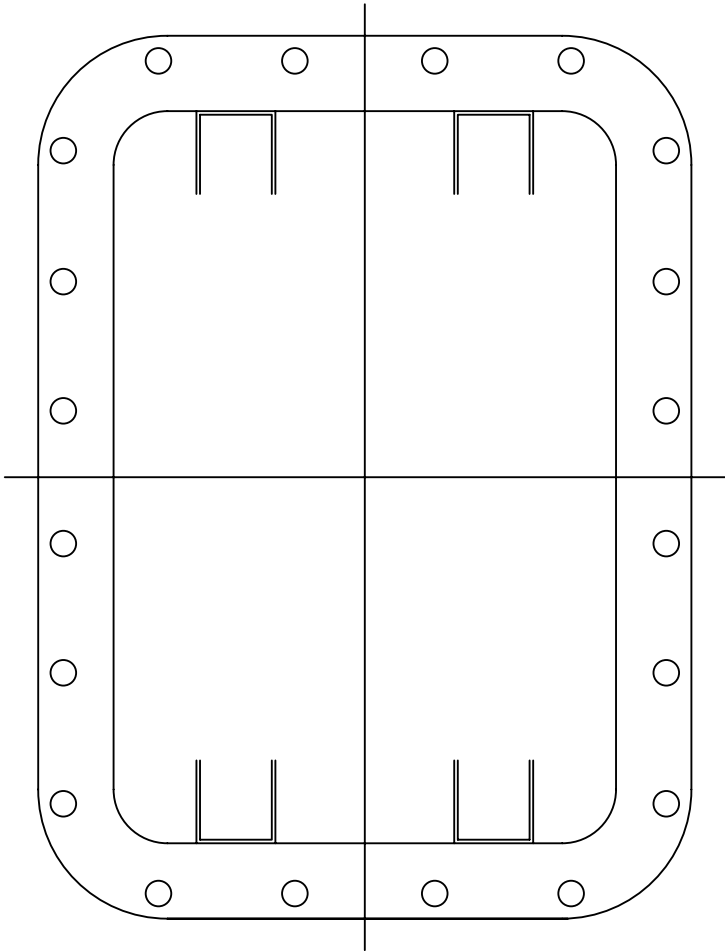
ENCLOSURE												PANS AND HINGES						
XCE/XJF Catalog #	Inside Nom. Dimensions			Usable Depth	Overall Dimensions			Mounting Lug CL to CL		Mtg. Bolt Size	Ship Weight	Pan Catalog #			Nom. Dimensions		Steel Pan Weight	Hinge Cat #
	W	L	D		A	B	C	E	F			Steel	Alum.	Phen	W	H		
041604	4	16	4	4 3/4	7 1/4	19 1/4	6	12 1/2	6 3/4	3/8	25	XSM0416	XSA0416	XSB0416	3 1/4	15 1/4	1 1/2	XHB-2
060804	6	8	4	4 3/4	9 1/4	11 1/4	5 1/8	4 1/2	9 1/8	3/8	21	XSM0608	XSA0608	XSB0608	5 1/8	7 1/8	1	XHB-2
060805	6	8	5	5 3/8	9 1/4	11 1/4	6 1/8	4 1/2	9 1/8	3/8	23	XSM0608	XSA0608	XSB0608	5 3/8	7 1/8	1	XHB-2
060806	6	8	6	6 3/8	9 1/4	11 1/4	7 1/8	4 1/2	9 1/8	3/8	25	XSM0608	XSA0608	XSB0608	5 3/8	7 1/8	1	XHB-2
061105	6	11	5	5 3/8	9 1/4	14 1/4	7 3/8	7 1/2	9 1/8	3/8	24	XSM0611	XSA0611	XSB 0611	5 3/8	10 1/8	1 1/2	XHB-2
061204	6	12	4	4 3/4	9 1/4	15 1/4	6 1/8	8 1/2	9 1/8	3/8	24	XSM0612	XSA0612	XSB 0612	5 3/8	11 1/8	1 3/4	XHB-2
061206	6	12	6	6 3/4	9 1/4	15 1/4	8 1/8	8 1/2	9 1/8	3/8	29	XSM0612	XSA0612	XSB 0612	5 3/8	11 1/8	1 3/4	XHB-2
061305	6	13	5	5 3/8	9 1/4	16 1/4	7 3/8	9 1/2	9 1/8	3/8	26	XSM0613	XSA0613	XSB0613	5 3/8	12 1/8	2	XHB-2
071004	7	10	4	4 3/4	10 3/8	13 3/8	6 3/8	6 1/2	9 3/4	3/8	27	XSM0710	XSA0710	XSB0710	6 1/8	9 3/8	1 1/4	XHB-2
071006	7	10	6 1/8	6 3/4	10 3/8	13 3/8	8 3/8	6 1/2	9 3/4	3/8	31	XSM0710	XSA0710	XSB0710	6 1/8	9 3/8	1 1/4	XHB-2
071805	7	18 1/4	5	5 3/4	10 3/8	21 3/8	7 3/8	14 1/2	9 3/4	3/8	55	XSM0718	XSA0718	XSB0718	6 1/8	17 3/8	2 1/2	XHB-2
080804	8	8	4	4 13/16	11 3/8	11 3/8	6 3/8	4 1/4	11	3/8	24	XSM0808	XSA0808	XSB0808	7	7	1 1/4	XHB-2
080806	8	8	6	6 13/16	11 3/8	11 3/8	8 3/8	4 1/4	11	3/8	28	XSM0808	XSA0808	XSB0808	7	7	1 1/4	XHB-2
080808	8	8	8	8 13/16	11 3/8	11 3/8	10 3/8	4 1/4	11	3/8	35	XSM0808	XSA0808	XSB0808	7	7	1 1/4	XHB-2
081004	8	10	4	4 3/4	11 3/8	13 3/8	6 1/4	6 1/2	10 3/4	3/8	30	XSM0810	XSA0810	XSB0810	7	9 3/8	1 1/2	XHB-2
081006	8	10	6	6 3/4	11 3/8	13 3/8	8 1/4	6 1/2	10 3/4	3/8	34	XSM0810	XSA0810	XSB0810	7	9 3/8	1 1/2	XHB-2
081008	8	10	8	8 3/4	11 3/8	13 3/8	10 1/4	6 1/2	10 3/4	3/8	39	XSM0810	XSA0810	XSB0810	7	9 3/8	1 1/2	XHB-2
081204	8	12	4	4 3/4	11 3/8	15 3/8	6 1/4	8 1/2	10 3/4	3/8	34	XSM0812	XSA0812	XSB0812	6 7/8	10 7/8	2 1/4	XHB-2
081206	8	12	6	6 3/4	11 3/8	15 3/8	8 1/4	8 1/2	10 3/4	3/8	42	XSM0812	XSA0812	XSB0812	6 7/8	10 7/8	2 1/4	XHB-2
081208	8	12	8	8 3/4	11 3/8	15 3/8	10 1/4	8 1/2	10 3/4	3/8	48	XSM0812	XSA0812	XSB0812	6 7/8	10 7/8	2 1/4	XHB-2
091105	9	11	5	5 3/4	12 3/8	14 3/8	7 3/8	7 1/2	12	3/8	41	XSM0911	XSA0911	XSB0911	8	10	2 1/2	XHB-2
101004	10	10	4	4 3/4	13 3/8	13 3/8	6 3/8	6 1/2	13	3/8	34	XSM1010	XSA1010	XSB1010	8 7/8	8 7/8	2 1/2	XHB-2
101006	10	10	6	6 3/4	13 3/8	13 3/8	8 3/8	6 1/2	13	3/8	44	XSM1010	XSA1010	XSB1010	8 7/8	8 7/8	2 1/2	XHB-2
101008	10	10	8	8 3/4	13 3/8	13 3/8	10 3/8	6 1/2	13	3/8	50	XSM1010	XSA1010	XSB1010	8 7/8	8 7/8	2 1/2	XHB-2
101206	10	12	6 1/4	7 1/4	13 3/8	15 3/8	8 7/8	8 1/2	13	3/8	46	XSM1012	XSA1012	XSB1012	10 7/8	8 7/8	3	XHB-2
101404	10	14	4	4 3/4	13 3/8	17 3/8	6 7/8	10 3/8	13	3/8	42	XSM1014	XSA1014	XSB1014	8 7/8	12 7/8	3 1/2	XHB-2
101406	10	14	6	6 3/4	13 3/8	17 3/8	8 7/8	10 3/8	13	3/8	49	XSM1014	XSA1014	XSB1014	8 7/8	12 7/8	3 1/2	XHB-2
101408	10	14	8	8 3/4	13 3/8	17 3/8	10 1/2	10 3/8	13	3/8	57	XSM1014	XSA1014	XSB1014	8 7/8	12 7/8	3 1/2	XHB-2
121204	12	12	4	5	16 1/4	16 1/4	6 1/8	8 3/8	16	1/2	60	XSM1212	XSA1212	XSB1212	10 7/8	10 7/8	3 3/4	XHC-2
121206	12	12	6	7	16 1/4	16 1/4	8 1/8	8 3/8	16	1/2	68	XSM1212	XSA1212	XSB1212	10 7/8	10 7/8	3 3/4	XHC-2
121208	12	12	8	9	16 1/4	16 1/4	10 1/8	8 3/8	16	1/2	80	XSM1212	XSA1212	XSB1212	10 7/8	10 7/8	3 3/4	XHC-2
121804	12	18	4	4 3/4	16 1/4	22 1/4	6 3/4	14 1/8	16	1/2	85	XSM1218	XSA1218	XSB1218	10 1/2	16 1/2	5 1/2	XHC-2
121806	12	18	6	6 3/4	16 1/4	22 1/4	8 3/4	14 1/8	16	1/2	93	XSM1218	XSA1218	XSB1218	10 1/2	16 1/2	5 1/2	XHC-2
121808	12	18	8	8 3/4	16 1/4	22 1/4	10 3/4	14 1/8	16	1/2	101	XSM1218	XSA1218	XSB1218	10 1/2	16 1/2	5 1/2	XHC-2
122005	12	20	5	5 3/4	16 1/4	24 1/4	8 3/8	14 3/8	16	1/2	104	XSM1220	XSA1220	XSB1220	11	19	6 1/2	XHC-2
122406	12	24	6	6 13/16	16 1/4	28 1/4	9 1/4	18 3/8	16	1/2	127	XSM1224	XSA1224	XSB1224	11	23	8	XHC-2
122408	12	24	8	8 13/16	16 1/4	28 1/4	11 1/4	18 3/8	16	1/2	142	XSM1224	XSA1224	XSB1224	11	23	8	XHC-2
122410	12	24	10	10 13/16	16 1/4	28 1/4	13 1/4	18 3/8	16	1/2	154	XSM1224	XSA1224	XSB1224	11	23	8	XHC-2

NOTES

1. To indicate Quad-Lead bolt option, add suffix "Q" after XCE. (Not available on XCEX models.)
2. Operators, windows and hinges are ordered separately.
3. XCEX EEx d approval optional.
4. To indicate NEMA 4/IP66 option, add suffix "N4" after size (catalog number).
5. Where reference is made to Class I and Class II hazardous locations, the equipment is suitable for both Division 1 and Division 2 locations.
6. Enclosures are pre-drilled for mounting panel and hinge kit unless otherwise specified.

Customer Design Sheets

Cover Layout



DIMENSION ALL MODIFICATIONS
FROM CENTER LINES OF COVER

CENELEC (ATEX)/IEC
☐ DEMKO U Cert.
REF.DS483

UL
☐ UL APPROVED
REF.DS361 & B301

CSA
☐ CSA APPROVED
REF.DS327 & B301

HINGES
☐ LEFT HAND
☐ RIGHT HAND
☐ LONG SIDE
☐ SHORT SIDE
☐ NON REMOVABLE

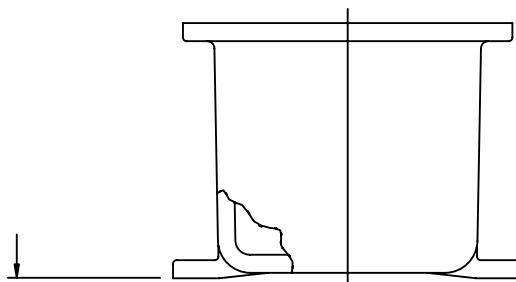
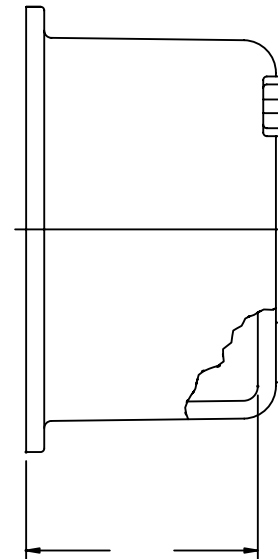
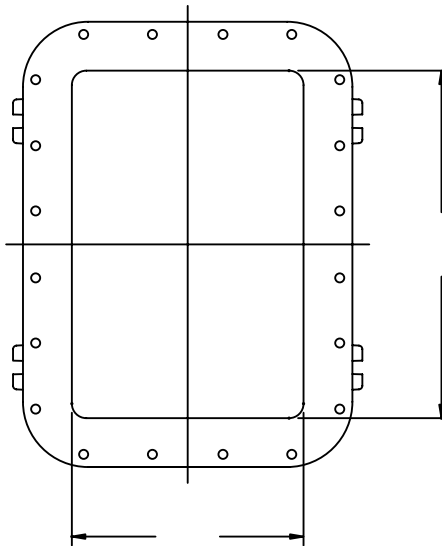
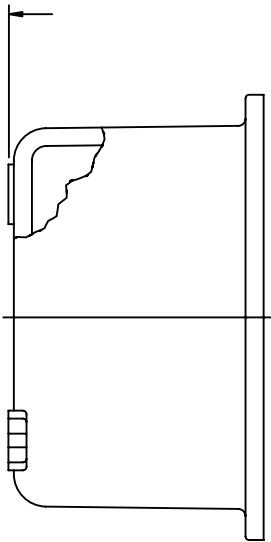
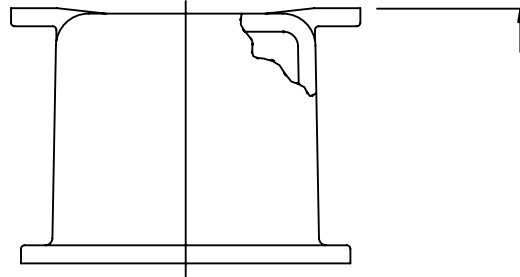
NEMA 4/ IP66
☐ N4 GROOVE

CAT #: X _____

EXPLOSIONPROOF
XCE/XJF Enclosures

Customer Design Sheets

Box Layout



ATEX (CENELEC)/IEC

- ☐ DEMKO U Cert.
REF. DS483

UL

- ☐ UL APPROVED
REF. DS248 & B301

CSA

- ☐ CSA APPROVED
REF. B301

MTG. PANS

- ☐ XSA PAN
☐ XSB PAN
☐ XSM PAN

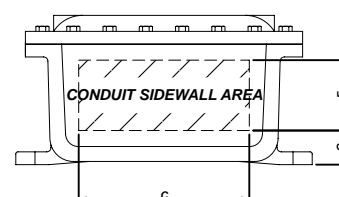
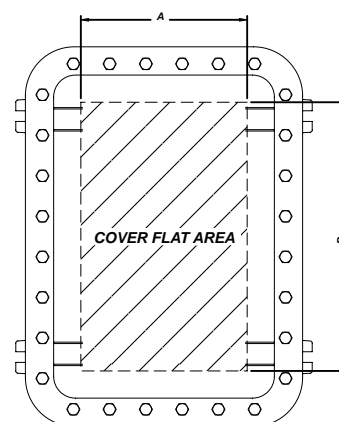
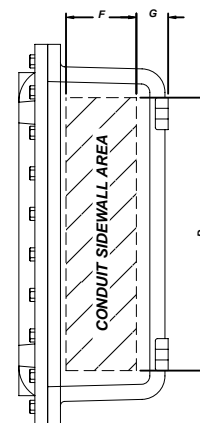
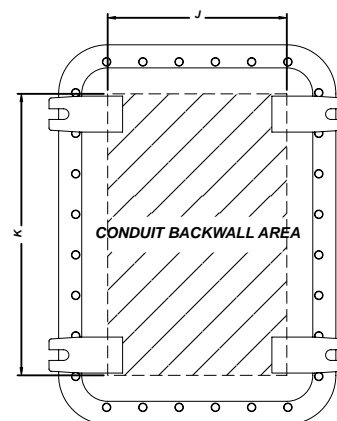
HINGES

- ☐ LEFT HAND
☐ RIGHT HAND
☐ LONG SIDE
☐ SHORT SIDE
☐ NON REMOVABLE

DIMENSION ALL MODIFICATIONS FROM
CENTER LINES AND BOTTOM OF MOUNTING
LUGS WHENEVER POSSIBLE.

Cover & Sidewall Area

Enclosure Series	COVER FLAT		CONDUIT - SIDEWALL				BACKWALL	
	A	B	C	D	F	G	J	K
041604	2 1/8	14 1/8	2 11/16	14 11/16	2 7/8	1	3 1/8	15 1/8
060804	3 7/8	5 7/8	4 11/16	6 11/16	2 7/8	1	5 1/8	7 1/8
060805	3 7/8	5 7/8	4 5/8	6 5/8	3 7/8	1	5 1/16	7 1/16
060806	3 7/8	5 7/8	4 9/16	6 9/16	4 7/8	1	4 15/16	6 15/16
061105	3 7/8	8 7/8	4 5/8	9 5/8	3 3/8	1	5 1/8	10 1/8
061204	3 7/8	9 7/8	4 11/16	10 11/16	2 7/8	1	5 1/8	11 1/8
061206	3 7/8	9 7/8	4 9/16	10 9/16	4 9/16	1 5/16	4 7/16	10 7/16
061305	3 7/8	10 7/8	4 5/8	11 5/8	3 5/8	1	5 1/8	12 1/8
071004	4 7/8	7 7/8	5 5/8	8 5/8	2 1/2	1 3/8	5 5/8	8 5/8
071006	4 7/8	7 7/8	5 9/16	8 9/16	4 5/8	1 3/8	5 9/16	8 9/16
071805	5	16 1/4	5 7/16	16 11/16	3 1/2	1 3/8	5 7/16	16 11/16
080804	5 7/8	5 7/8	6 5/8	6 5/8	2 11/16	1 1/8	7 1/8	7 1/8
080806	5 7/8	5 7/8	6 9/16	6 9/16	4 11/16	1 1/8	7 1/16	7 1/16
080808	5 7/8	5 7/8	6 7/16	6 7/16	6 11/16	1 1/8	6 15/16	6 15/16
081004	5 7/8	7 7/8	6 5/8	8 5/8	2 1/2	1 3/8	6 5/8	8 5/8
081006	5 7/8	7 7/8	6 9/16	8 9/16	4 1/2	1 3/8	6 9/16	8 9/16
081008	5 7/8	7 7/8	6 7/16	8 7/16	6 1/2	1 3/8	6 7/16	8 7/16
081204	5 7/8	9 7/8	6 5/8	10 5/8	2 1/2	1 3/8	6 5/8	10 5/8
081206	5 7/8	9 7/8	6 9/16	10 9/16	4 1/2	1 3/8	6 9/16	10 9/16
081208	5 7/8	9 7/8	6 7/16	10 7/16	6 1/2	1 3/8	6 7/16	10 7/16
091105	6 7/8	8 7/8	7 5/16	9 5/16	3 3/8	1 9/16	7 5/16	9 5/16
101004	7 7/8	7 7/8	8 3/8	8 3/8	2 3/8	1 9/16	8 3/8	8 3/8
101006	7 7/8	7 7/8	8 5/16	8 5/16	4 3/8	1 9/16	8 5/16	8 5/16
101008	7 7/8	7 7/8	8 3/16	8 3/16	6 3/8	1 9/16	8 3/16	8 3/16
101206	7 3/4	9 3/4	8 1/4	10 1/4	4 5/8	1 9/16	8 1/4	10 1/4
101404	7 7/8	11 7/8	8 3/8	12 3/8	2 3/8	1 9/16	8 3/8	12 3/8
101406	7 7/8	11 7/8	8 5/16	12 5/16	4 3/8	1 9/16	8 5/16	12 5/16
101408	7 7/8	11 7/8	8 1/16	12 1/16	6 1/4	1 3/4	7 5/8	11 5/8
121204	9 3/4	9 3/4	10	10	2 1/8	1 7/8	10	10
121206	9 3/4	9 3/4	9 13/16	9 13/16	4 1/8	1 7/8	9 13/16	9 13/16
121208	9 3/4	9 3/4	9 11/16	9 11/16	6 1/8	1 7/8	9 11/16	9 11/16
121804	9 3/4	15 3/4	10 1/8	16 1/8	2 1/8	1 7/8	10 1/8	16 1/8
121806	9 3/4	15 3/4	9 13/16	15 13/16	4 1/8	1 7/8	9 13/16	15 13/16
121808	9 3/4	15 3/4	9 11/16	15 11/16	6 1/8	1 7/8	9 11/16	15 11/16
122005	9 3/4	17 3/4	10 1/16	18 1/16	3 3/16	2	10 1/16	18 1/16
122404	9 5/8	21 5/8	10 1/8	22 1/8	2 1/8	2	10 1/8	22 1/8
122406	9 5/8	21 5/8	10 1/16	22 1/16	4 1/8	2	10 1/16	22 1/16



Minimum Spacing for Operators in Covers

Catalog #	STANDARD OPERATORS				MINIATURE OPERATORS				COVER WALL
	Max #	Max Rows	Max Per Row	Spacing CL to CL	Max #	Max Rows	Max Per Row	Spacing CL to CL	Thickness
XCE041604	5	5	1	2 ½	13	13	1	1	½
XCE060804	2	2	1	2 ½	8	4	2	1	½
XCE060805	2	2	1	2 ½	8	4	2	1	½
XCE060806	2	2	1	2 ½	8	4	2	1	½
XCE061105	3	3	1	2 ½	14	7	2	1	½
XCE061204	4	4	1	2 ½	16	8	2	1	⅝
XCE061206	4	4	1	2 ½	16	8	2	1	⅝
XCE061305	4	4	1	2 ½	18	9	2	1	½
XCE071004	6	3	2	2 ½	18	6	3	1	⅝
XCE071006	6	3	2	2 ½	18	6	3	1	⅝
XCE071805	12	6	2	2 ½	45	15	3	1	⅝
XCE080804	4	2	2	2 ½	16	4	4	1	1 ¼
XCE080806	4	2	2	2 ½	16	4	4	1	1 ¼
XCE080808	4	2	2	2 ½	16	4	4	1	1 ¼
XCE081004	6	3	2	2 ½	24	6	4	1	1 ¼
XCE081006	6	3	2	2 ½	24	6	4	1	1 ¼
XCE081008	6	3	2	2 ½	24	6	4	1	1 ¼
XCE081204	8	4	2	2 ½	32	8	4	1	1 ¼
XCE081206	8	4	2	2 ½	32	8	4	1	1 ¼
XCE081208	8	4	2	2 ½	32	8	4	1	1 ¼
XCE091105	6	3	2	2 ½	35	7	5	1	1 ¼
XCE101004	9	3	3	2 ½	36	6	6	1	1 ¼
XCE101006	9	3	3	2 ½	36	6	6	1	1 ¼
XCE101008	9	3	3	2 ½	36	6	6	1	1 ¼
XCE101206	12	4	3	2 ½	48	8	6	1	¾
XCE101406	12	4	3	2 ½	60	10	6	1	¾
XCE101408	12	4	3	2 ½	60	10	6	1	¾
XCE101410	12	4	3	2 ½	60	10	6	1	¾
XCE121204	9	3	3	3	64	8	8	1	⅞
XCE121206	9	3	3	3	64	8	8	1	⅞
XCE121208	9	3	3	3	64	8	8	1	⅞
XCE121804	15	5	3	3	92	14	8	1	1 ⅝
XCE121806	15	5	3	3	92	14	8	1	1 ⅝
XCE121808	15	5	3	3	92	14	8	1	1 ⅝
XCE122005	18	6	3	3	128	16	8	1	1 ⅞
XCE122406	21	7	3	3	150	20	8	1	1 ⅞

NOTE For closer spacing consult factory for details. Hydro test may be necessary for closer hole spacing.

Conduit Drilling and Tapping Guidelines

When drilling & tapping enclosures for conduit, proper installation requires compliance with the following:

1. Must be tapped with at least 5 full NPT threads in enclosure back or sides only; min. 1/2" conduit size for XJF and XCE series.
2. Depth of NPT holes must be plus 1/2 turn min. to plus 2 turns max. past standard NPT plug gage notch.
3. Inner end of conduit openings shall be smooth and well-rounded.

TABLE I

THREAD SIZE OF CONDUIT Inches (NPT)	MINIMUM WALL THICKNESS AT CONDUIT ENTRANCE EXCLUDING XCEX	
	Explosionproof	Dust Ignition Proof / Weather Proof
1/2 - 3/4	3/8 inch	1/4 inch
1 - 2	7/16 inch	5/16 inch
2 1/2 - 5	5/8 inch	7/16 inch

TABLE II

Conduit size, inches (NPT)	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5
Minimum Distance from conduit CL to inside corner or back of box	1 5/16	1 7/16	1 1/16	1 3/4	1 7/8	2 1/8	2 3/8	2 11/16	2 15/16	3 1/4	3 7/8
Approximate diameter of union	1 7/8	1 7/8	2 1/16	2 7/8	3 1/4	3 7/8	4 7/8	5 1/2	6	6 1/2	7 1/2

TABLE III

SIZE	5	4	3 1/2	3	2 1/2	2	1 1/2	1 1/4	1	3/4	1/2
1/2	4 1/2	3 5/8	3 3/8	3	2 5/8	2 3/8	2	1 7/8	1 3/4	1 5/8	1 1/2
3/4	4 3/4	3 3/4	3 1/2	3 1/8	2 3/4	2 1/2	2 1/8	2	1 7/8	1 3/4	
1	4 7/8	4	3 5/8	3 1/4	3	2 5/8	2 3/8	2 1/4	2		
1 1/4	5 1/8	4 1/8	3 7/8	3 1/2	3 1/8	2 7/8	2 1/2	2 3/8			
1 1/2	5 1/2	4 1/4	4	3 5/8	3 1/4	3	2 5/8				
2	5 3/4	4 5/8	4 1/4	3 7/8	3 5/8	3 1/4					
2 1/2	6	4 7/8	4 5/8	4 1/4	3 7/8						
3	6 1/4	5 3/8	5	4 5/8							
3 1/2	6 1/2	5 5/8	5 1/4								
4	6 3/4	5 7/8									
5	7 1/4										

- NOTES**
1. This information is compiled from data which we believe is reliable and is given in good faith. Since the methods of application and conditions under which our products are used are beyond our control, we are not able to guarantee the application and/or use of same. The user assumes all risks and liability in connection with the application and use of our products.
 2. All dimensions are in inches.
 3. Metric threads available from factory for most applications – Consult Factory.
 4. Consult Factory for special spacing arrangements. Hydro test may be required.

Auxiliary Device Drilling & Tapping Guidelines

Spacing For Auxiliary Devices Installed in Box Walls Of Control Panel Enclosures Used In Hazardous Locations.

When using an Auxiliary Device in the box wall of an enclosure used in hazardous locations, proper installation requires compliance with the following:

1. A minimum of (5) thread engagement, class 2 fit, required for group C & D applications.
A minimum of (7) thread engagement, class 2 fit, required for group B applications.
2. Table I shows minimum box wall thickness for Auxiliary Device threads.

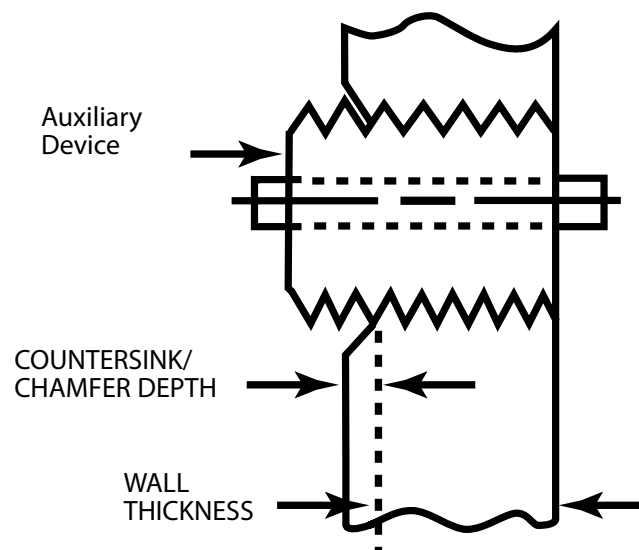
TABLE I

REQUIRED MINIMUM BOX WALL THICKNESS				
Thread Size (In.)	Group C & D min. (5) thread engagement	Group B min. (7) thread engagement	Typical Auxiliary Devices	Drill Dia.
½ -14 NPSM	¾ Inch	½ Inch	XBO, XHPB, XHSS, Standard Operators	.747/.759
¾ -14 NPSM	¾ Inch	½ Inch	XBO, XHPB, XHSS, Standard Operators	.958/.970
1 -11 ½ NPSM	7/16 Inch	5/8 Inch	XCBH Large Handle Assembly	1.201/1.211
¾ - 18 NPSM	9/32 Inch	13/32 Inch	XCBH Small Handle Assembly	.603/.612
¾ - 16 UNC	¾ Inch	7/16 Inch	XMOB, XMOSS, Mini Operators	¾

3. If Auxiliary Device contains undercut in engaging threaded section, the minimum wall thickness shown in Table I must increase to maintain the minimum required thread engagement. (Fig. A)

(continued next page)

FIG. A
SEE NOTE 3



Auxiliary Device Drilling & Tapping Guidelines

Spacing For Auxiliary Devices Installed in Box Walls Of Control Panel Enclosures Used In Hazardous Locations.

When using an Auxiliary Device in the box wall of an enclosure used in hazardous locations, proper installation requires compliance with the following (continued from previous page):

4. Table II provides the minimum distance an Auxiliary Device center can be placed from inside corner or back of box.

TABLE II

REQUIRED MINIMUM BOX WALL THICKNESS	3/8 - 16 UNC	3/8 NPSM	1/2 NPSM	3/4 NPSM	1 NPSM
Minimum Distance from auxiliary Device CL to corner or back of box	1 1/2	1 5/8	1 3/4	1 7/8	2

5. Table III shows minimum spacing between conduit and Auxiliary Device entrances.

TABLE III

AUXILIARY DEVICE THREAD (In.)	5	4	3-1/2	3	2-1/2	2	1-1/2	1-1/4	1	3/4	1/2
3/8	4 1/2	3 5/8	3 3/8	3	2 5/8	2 3/8	2	1 7/8	1 3/4	1 5/8	1 1/2
1/2	4 5/8	3 3/4	3 1/2	3 1/8	2 3/4	2 1/2	2 1/4	2 1/8	2	1 7/8	1 3/4
3/4	4 3/4	4	3 5/8	3 1/4	2 7/8	2 5/8	2 3/8	2 1/4	2 1/8	2	1 7/8
1	5	4 1/4	3 7/8	3 1/2	3	2 3/4	2 1/2	2 3/8	2 1/4	2 1/8	2

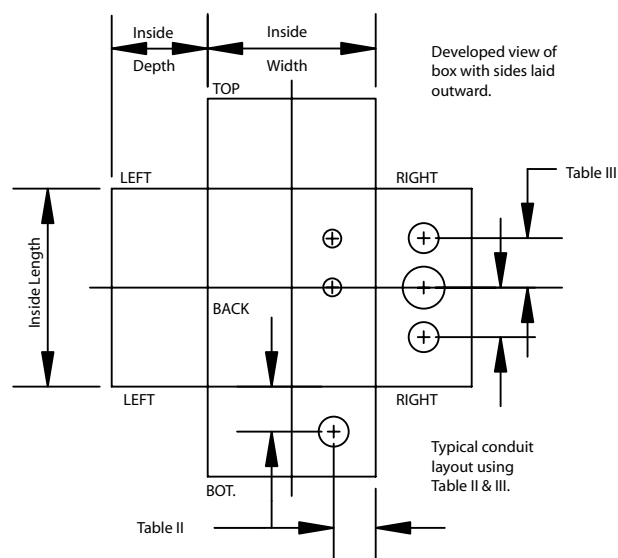
6. Table IV shows minimum spacing between auxiliary device entrances.

NOTE: Increase distance between devices as required to maintain minimum through air spacing of contacts required by electrical codes.

7. Double all distances in Table III and IV for holes located in back wall.

TABLE IV

MIN. SPACING BETWEEN AUX. DEVICE OF VARYING THREAD SIZES (INCHES)				
	3/8	1/2	3/4	1
3/8	1 1/2	1 1/2	1 1/2	2 1/2
1/2	1 1/2	2	2	2 1/2
3/4	1 1/2	2	2	3
1	2 1/2	2 1/2	3	3 1/2



Hazardous Location Push Buttons

Product Selection

3-Position Selector Switch Units, Non-Illuminated



Standard Knob Operator
Cat. No. 800H-JP2KB7AXXX



Knob Lever Operator
Cat. No. 800H-JP17KB7AXXX



Metal Wing Lever Operator
Cat. No. 800H-JP11KB7AXXX

Contact Type	Operator Position			M = Maintained S = Spring Return	Standard Knob	Knob Lever	Metal Wing Lever
					Cat. No.†	Cat. No.†	Cat. No.†
No Contacts	—	—	—	M M M	800H-JP2KB7	800H-JP17KB7	800H-JP11KB7
				S→M M	800H-JP4KB7	800H-JP18KB7	800H-JP15KB7
				M M←S	800H-JP5KB7	800H-JP19KB7	800H-JP16KB7
				S→M←S	800H-JP91KB7	800H-JP20KB7	800H-JP141KB7
	O X	O O	X O	M M M	800H-JP2KB7AXXX	800H-JP17KB7AXXX	800H-JP11KB7AXXX
				S→M M	800H-JP4KB7AXXX	800H-JP18KB7AXXX	800H-JP15KB7AXXX
				M M←S	800H-JP5KB7AXXX	800H-JP19KB7AXXX	800H-JP16KB7AXXX
				S→M←S	800H-JP91KB7AXXX	800H-JP20KB7AXXX	800H-JP141KB7AXXX
	O X O X	O O O O	X O X O	M M M	800H-JP2KB7AAXX	800H-JP17KB7AAXX	800H-JP11KB7AAXX
				S→M M	800H-JP4KB7AAXX	800H-JP18KB7AAXX	800H-JP15KB7AAXX
				M M←S	800H-JP5KB7AAXX	800H-JP19KB7AAXX	800H-JP16KB7AAXX
				S→M←S	800H-JP91KB7AAXX	800H-JP20KB7AAXX	800H-JP141KB7AAXX

Note: X = Closed/O = Open



3-Position Cylinder Lock Operator
Cat. No. 800H-JP42KB7AXXX

Contact Type	Operator Position			M = Maintained S = Spring Return	Cylinder Lock		
					Key Removal Left	Key Removal Center	Key Removal All*
No Contacts	O	X	X	M M M	800H-JP41KB7	800H-JP42KB7	800H-JP44KB7
				S→M*	—	800H-JP50KB7	800H-JP51KB7
				M←S	800H-HP5KL8DXXX	800H-JP38KB7	800H-JP73KB7
				M M	—	800H-JP631KB7	—
	O X	O O	X O	M M M*	800H-JP41KB7AXXX	800H-JP42KB7AXXX	800H-JP44KB7AXXX
				M←S	—	800H-JP50KB7AXXX	800H-JP51KB7AXXX
				M M←S	800H-JP69KB7AXXX	800H-JP38KB7AXXX	800H-JP73KB7AXXX
				S→M←S	—	800H-JP631KB7AXXX	—

Note: X = Closed/O = Open

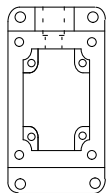
* Key removable in maintained positions only.

† For long barrel versions, add an **L** to the cat. no. **Example:** Cat. No. 800HL-JP41KB7.

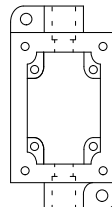
Hazardous Location Push Buttons

Product Selection

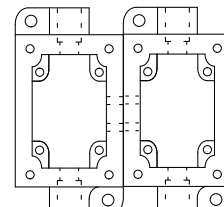
Assembled Bases (for Field Assembly and Custom Stations)

Enclosure Covers — See enclosure cover tables for a complete listing of covers for these bases.**Special Conduit Entries** — For conduit entries not listed, consult your local Rockwell Automation sales office or Allen-Bradley distributor.

1-Gang Shallow*

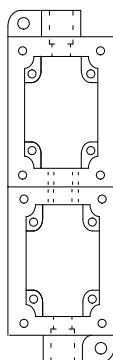


1-Gang Deep*

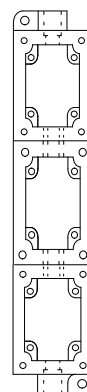


2-Gang Horizontal*

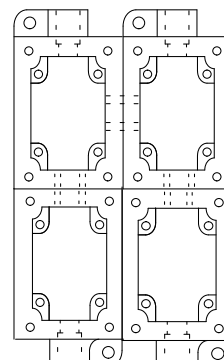
Conduit Entry	Cat. No.	Cat. No.	Cat. No.
3/4 in. Dead End	800H-1HZX7	800H-1HVX7	—
3/4 in. Feed Through	—	800H-1HVX7M1	—
1 in. Dead End	—	800H-1HVX7M2	800H-2HHX7
1 in. Feed Through	—	800H-1HVX7M3	—



2-Gang Vertical*

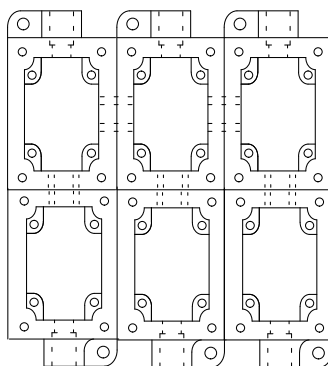


3-Gang Vertical*

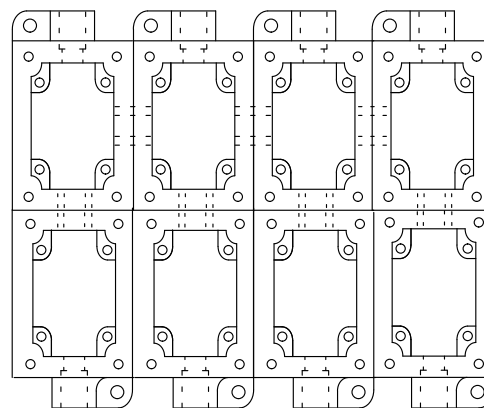


4-Gang*

Conduit Entry	Cat. No.	Cat. No.	Cat. No.
1 in. Feed Through	800H-2HYX7	800H-3HYX7	800H-4HVX7



6-Gang*



8-Gang*

Conduit Entry	Cat. No.	Cat. No.
1 in. Feed Through	800H-6HVX7	800H-8HVX7

* Shallow base cannot accommodate sealing well, sealed switched contact blocks, or stacked contact blocks. Shallow base rated for Group B.

* Deep base can accommodate sealing well, sealed switch contact blocks, or up to 2 deep standard contact blocks.

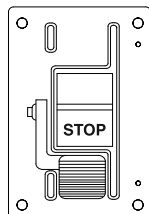
Bulletin 800H

Hazardous Location Push Buttons

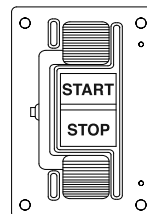
Product Selection

Covers, Lever Type Actuator

Note: Lever type covers are furnished without contact blocks. Legend plate for half lever is **STOP**; full lever momentary and maintained is a **START-STOP**. To order without legend plate, add suffix **X** to the cat. no.



Half Lever

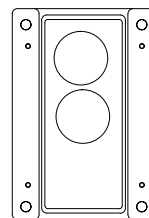
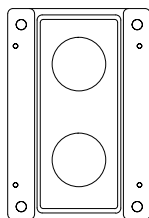
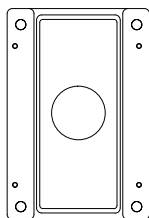
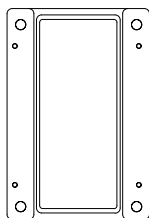


Double Lever Momentary

Half Lever	Double Lever Momentary	Double Lever Maintained	Double Lever Momentary/Maintained*
Cat. No.	Cat. No.	Cat. No.	Cat. No.
800H-NP14	800H-NP15	800H-NP16	800H-NP34

* A normally open circuit configuration is recommended for use behind this momentary lever and a late break normally closed circuit configuration is required for use behind the maintained lever to achieve proper functioning of the device.

Covers, Component Type Button



Blank	One Hole*	Two Hole†	Two Hole Special§
Cat. No.	Cat. No.	Cat. No.	Cat. No.
800H-NP32	800H-NP30	800H-NP31	800H-NP33

* One-hole covers use a jumbo legend plate only.

† Two-hole covers use a standard legend plate only.

§ This special two-hole cover can accommodate the pigtail pilot light (Bulletin 800H-LPK10 series), the dual push button or any non-illuminated unit. Legend plates (Cat. No. 800H-Y140J green and red split-field) and (Cat. No. 800H-Y141J grey full field), are the only legend plates suitable for use with this cover.






Hazardous Location Push Buttons

Product Selection

2-Position Push-Pull Units, Non-Illuminated



2-Position Push-Pull
Cat. No. 800H-FPX6A5

Contact Type	Operator Position		Button Color	Push-Pull Cat. No.*
	 Maintained	 Maintained		
	Out	In		
 N.C.L.B.	X	O	Red	800H-FPX6D4
 N.O. - N.C.L.B.	O X	X O	Red	800H-FPX6A1
 N.C.L.B. - N.C.L.B.	X X	O O	Red	800H-FPX6A5





Note: X = Closed/O = Open





* For long barrel versions, add an **L** to the cat. no. **Example:** Cat. No. 800HL-FPX6D4.

3-Position Push-Pull Units, Non-Illuminated



3-Position Push-Pull
Cat. No. 800H-FPXM6A7

Contact Type	Operator Position			Button Color	Push-Pull Cat. No.*
	 Momentary	 Maintained	 Maintained		
	Out	Center	In		
 N.C. - N.C.L.B.	X X	O X	O O	Red	800H-FPXM6A7

Contact Type	Operator Position			Button Color	Push-Pull Cat. No.*
	 Momentary	 Maintained	 Momentary		
	Out	Center	In		
 N.C. - N.C.L.B.	X X	O X	O O	Red	800H-FPXM6A7

Note: X = Closed/O = Open

* For long barrel versions, add an **L** to the cat. no. **Example:** Cat. No. 800HL-FPXM6A7.

Shock Relay



Shock Relay accepts single and three-phase motors up to 600 volts.

Shock Relay needs its own power supply, usually 115V or 230V single phase.

Shock Relay selection is simple; it is based on the motor amperage of your machinery.

Shock Relay has an unlimited life – it does not wear out.

Pioneered by Tsubaki, the Shock Relay protects your equipment against unexpected shock loads, overloads, and underloads *before* damage occurs. Shock Relay protects the mechanical parts of your equipment by monitoring the current on your motor and shutting it down when the motor works too hard for too long.

Advantages to you:

- Back to work with the press of a button
- No parts to replace
- Precision adjustment and setting
- Little potential for nuisance trips
- Monitors and protects equipment from up to 1,000 feet away









The Shock Relay adapts to virtually any kind of equipment that's driven by an electric motor and is used in applications in a broad variety of industries, including:

INDUSTRY	APPLICATION
Material handling	Conveyors, turntables, elevators
Water treatment plants	Pumps, scrapers, water screens
Food machinery	Screw and belt conveyors, bucket elevators
Machine tool	Tapping machines, drill presses
Chemical	Pumps, agitators, filters

We've thought of everything.

The Shock Relay knows when the motor driving your operation is working too hard. It's simple: you set the load current so Shock Relay knows where your motor should be operating. And it knows, too, when a surge is dangerous because you determine the time of an acceptable momentary surge, allowing Shock Relay to ignore small variations. Your adjustment of the start time setting prevents the Shock Relay from engaging during start up when the current draw of a motor is greater than the running current.

Unlike mechanical devices like the Shear Pin Sprocket, which requires downtime to fix, U.S. Tsubaki's Shock Relay resets at the press of a button. That's it.

	TSBED SERIES 2.77H x 2.20W x 3.04D	Designed to work with inverters. Digital display. Built-in tamper-proof cover and built-in test button. Choose between self-holding output relay and automatic reset.
	TSBSD SERIES DIGITAL 2.83H x 2.91W x 3.11D	Full featured top-of-the line. Digital real-time display, phase-loss protection, pre-alarm notification of impending problem. User can decide if self-holding or automatic reset.
	TSB150 SERIES 4.5H x 4.9W x 4.33D	The original Shock Relay with self-holding circuit and analog meter. Four series available: Standard Overload, Pre-Alarm notification, Impact detection, Over and Underload protection.
	TSBSS SERIES 2.44H x 2.13W x 2.60D	Overload protection with built-in reset button, test button, and fail-safe contacts.
	TSBSA SERIES 2.44H x 2.13W x 2.60D	Overload protection with automatic reset. When the motor stops, the Shock Relay resets and is ready to go.
	TSBSU SERIES 2.44H x 2.13W x 2.60D	If the load drops off due to a broken belt, chain, or no product, the Shock Relay senses that the motor is not working as hard and shuts down the line.
	TSB50 2.75H x 2.36W x 3.07D	Automatic reset with fixed start-time to accommodate motor in-rush current. Dual output contacts allow many wiring options. Two-piece construction aids fitting into crowded panels.
	TSBSM SERIES 2.96H x 2.16W x 3.03D	Compact, all-in-one, and economically priced. Limited features but perfect for the OEM customer. Special MTO amperages available.

MODEL	SIZE	AMPERAGE RANGE	START TIME RANGE	SHOCK TIME RANGE	OUTPUT CONTACT RATING	MOUNTING
TSBED	020 075 220 550	0.2 ~ 2.4A 1.2 ~ 5.8A 3.0 ~ 14A 6.0 ~ 34A	0.2 ~ 10s	0.2 ~ 5.0s	3A, 250VAC	35mm DIN or surface mount
TSBSD	10 60	0.5 ~ 10A 5 ~ 60A	0.3 ~ 12s	0.3 ~ 3s	3A, 250VAC	35mm DIN or surface mount
	100 200 300	60 ~ 100A 100 ~ 200A 200 ~ 300A	0.3 ~ 12s	0.3 ~ 3s	3A, 250VAC	TSBSD10 plus surface mount transformer
TSB150 Std, A, M, and W styles	151 152-100 152-200 152-300 152-400	0.3 ~ 16A 10 ~ 100A 60 ~ 200A 90 ~ 300A 120 ~ 400A	0.2 ~ 20s	0.2 ~ 3s	0.2A, 250VAC	Two components, both surface mount
TSBSS	05 30 60	0.5 ~ 5A 3 ~ 30A 5 ~ 60A	0.2 ~ 30s	0.2 ~ 10s	3A, 250VAC	35mm DIN or surface mount
	100 200 300	10 ~ 100A 20 ~ 200A 30 ~ 300A	0.2 ~ 30s	0.2 ~ 10s	3A, 250VAC	TSBSS05 plus surface mount transformer
TSBSA 	05 10 30 60	0.5 ~ 5A 1 ~ 10A 3 ~ 30A 5 ~ 60A	0.2 ~ 10s	0.2 ~ 5s	0.2A, 250VAC	35mm DIN or surface mount
	100 200 300	10 ~ 100A 20 ~ 200A 30 ~ 300A	0.2 ~ 10s	0.2 ~ 5s	0.2A, 250VAC	TSBSS05 plus surface mount transformer
TSBSU	05 30 60	0.5 ~ 5A 3 ~ 30A 5 ~ 60A	na	0.2 ~ 30s	3A, 250VAC	35mm DIN or surface mount
TSB50		0.4 ~ 16A	3s fixed	0.3 ~ 3s	0.1A, 250VAC	Two components, both surface mount
TSBSM	02	0.5 ~ 2A	1.5s fixed	1.0s fixed	3A, 250VAC	Surface mount

Setup is typically easiest when the max amperage of the Shock Relay is close to the motor amperage.

Technical Specifications

Ultra 3

Ultra 5

Relay contacts:	3 form C (SPDT) 5A, 240V ac	5 form C (SPDT) 5A, 240V ac
Outside dimensions (wall mount):	7.6 x 6.1 x 4.0 inches	9.4 x 7.2 x 4.6 inches.
Cable entry:	8 cable entries 3 x PG11, 1 x PG9 underside 4 x PG11 at rear	10 cable entries 5 x PG11, 1 x PG9 underside 4 x PG11 at rear

Common Features

Weight:	Nominal 2.2lbs (1kg)
Case material:	Polycarbonate, flame resistant to UL94-V2
Transducer cable:	Three conductor shield (Can be spliced with two conductor shield)
Maximum separation:	3000 Feet (1000m)
Rack mount:	10HP x 160mm deep x 3U (128.5mm) high
Panel mount:	72mm wide x 144mm high x 176mm deep
Fascia mount:	See separate technical update TU-001-Z
IP rating (wall mount):	NEMA 4X (IP65)
Fascia mount:	NEMA 12 (IP64)
IP rated panel mount (optional):	NEMA 4X (IP65)
Max and min temp. (electronics):	-4°F to 140°F (-20°C to +60°C)
Flammable atmosphere approval:	Safe area: compatible with approved dB transducers (FM Approved: Class 1, Div 1, Group A, B, C, D; Class 2, Div 1, Groups E, F, G)
CE Approval:	EMC approval to BS EN 50081-1:1992 for emissions and BS EN 50082-2:1995 for immunity, and to BS EN 61010-1:1993 for low voltage directive.
Accuracy:	0.25% of the measured range or 6mm (whichever is greater)
Resolution:	0.1% of the measured range or 2mm (whichever is greater), 1mm when using dBMACH3
Range:	Depending upon transducer, from 125mm to 40m (0 to 2.5m dBMACH3 for open channel flow)
Echo processing:	Patented DATEM (Digital Adaptive Tracking of Echo Movement)
Analog output:	Isolated output 4-20mA or 0-20mA into 500 ohms (user programmable and adjustable), 0.1% resolution
Display:	6 digits plus 12 character text, plus bargraph with direction indicators, remote communicator identifier and program/run/test mode indicators 8 digit on-board resettable and non-resettable flow totalizers
Remote programming:	Standard on rack and panel mount units via infra red communicator
On-board programming:	Standard on wall and fascia mount with integral keypad
PC Communication:	Full duplex RS232 via RJ11 port for Ultra PC Software
Programming security:	Via password (user selectable and adjustable)
Programmed data integrity:	Via non-volatile RAM, plus backup
Power supply:	115V ac +5% -10% 50/60Hz, 230V ac +5% -10%, 18-36V dc

All Pulsar *Ultra 3* and *Ultra 5* units must be mounted in a safe area. See transducer specification sheet for flammable atmosphere approval to suit.

Represented by:



Certificate No: 950136
U3/5 003 9/05

Pulsar Process Measurement Limited

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All in One:

- * Level and Volume Measurement
- * Advanced Pump Control
- * Differential Level and Control
- * Open Channel Flow



Ultra 3 & Ultra 5
non-contacting ultrasonic level
and flow instruments



fascia mount

Ultra 3 and Ultra 5 combine several world-class, full function, non-contacting ultrasonic level measurement instruments into one.

Making use of the latest microprocessor and clever software development, Pulsar engineers have created devices that can be simply configured by the user to become fully functioned control units. Through the use of ULTRA WIZARD, an integrated high level software configuration tool, you select your application and the *Ultra* unit configures itself. For example, if flow is chosen, you get the most accurate open channel flow meter available with all the PMD calculations preconfigured. Market-leading pump control features are built into both *Ultra 3* and *5*, and an extensive set of volume calculations and linearization features are available for tank or silo level measurement.

All applications enjoy the benefit of DATEM, the world's most advanced echo processing software for level measurement.

All you have to decide is whether you need *Ultra 3*, with three control relays, or to opt for *Ultra 5*, with the benefit of two extra relays, advanced pump control and an optional 4-20mA analog input.

Options include: Wall, panel, fascia or 19" rack mount, a full range of transducers available providing measurement from 0 to 40m.

High capacity data logging and digital communications using Modbus or Profibus via RS485 interface can also be specified. Ethernet Module available soon.



panel mount

Ultra 3

Level (Vanguard 90)

Perfect for a diverse range of level measurement applications found in food, pharmaceutical, chemical, power generation and many more industries. In level measurement configuration, *Ultra 3* has three control relays and a measurement range from 125mm to 40m.

Volume (Level Star 110)

Both *Ultra 3* and *Ultra 5* feature pre-programmed tank shape conversion for a wide variety of standard tank shapes including: cylindrical, rectangular, cone base, pyramid base, sloped base, horizontal including parabolic ended tanks and spherical. Unusual shapes are also accommodated through the linearization function.

Pump Control (Vantage 100)

Ultra 3 in pump control configuration has the basic fixed or lead/lag pump routines. Set it and forget it maintenance-free performance with three user-definable control relays for up to three pump or alarm configurations. The perfect choice for the common duplex pumping station.

Open Channel Flow (Flow Oracle 160)

Ultra 3 in open channel flow mode provides accurate flow measurement and control in a wide range of flumes and weirs. Three relays for alarms, control, automated samples and more. Also, with the new Mach3 Transducer you get the most accurate flowmeter in the world!

Ultra 5

Level (Vanguard 90)

In level measurement configuration, *Ultra 5* shares all the facilities of *Ultra 3*, with the addition of two extra relays for alarm setpoints or additional control flexibility.

Volume (Level Star 110)

As in *Ultra 3*, *Ultra 5* offers a range of 12 pre-programmed tank shapes for accurate volume measurement for inventory control, together with the capability to measure unusual shapes with up to 32 user defined linearization setpoints. *Ultra 5* adds the flexibility of five control and alarm relays for alarm or product re-order setpoints.

Pump Control (Advanced 120)

Ultra 5 is also a premium ultrasonic pump control unit offering many sophisticated features. Designed for performance in the toughest pump stations. Five relays are available for fixed, lead/lag, FOFO, ratio, and the new Pump-by-Time control routines. Cost-effective and efficient, *Ultra 5* is the best there is.

Differential (Advanced 120)

Ultra 5 offers further sophistication with the inclusion of differential level capability using two transducers. With one upstream and the other downstream of a bar screen, a control signal is initiated as the difference between the level exceeds a user-defined limit to automatically operate the cleaning mechanism.

Open Channel Flow (Flow Oracle 160)

Ultra 5 in open channel flow mode provides non-contacting, maintenance-free flow measurement and control in a wide range of flumes and weirs by calculating flow from the measured head preceding a primary element. Five control relays for complete control flexibility, including sample automation.

As with *Ultra 3*, a data logging board is an optional extra with RS485 connection and large data log capability together with Profibus or Modbus communications.

Ultra 5 also includes the capability to accept an input from a velocity sensor such as Pulsar's Speedy unit, so area x velocity ($Q=VA$) calculations for channels or pipes are available.

Functions

	Ultra 3				Ultra 5				
	Level	Volume	Pump control	Open channel	Level	Volume	Pump Control	Differential	Open Channel
Three control/alarm relays	✓	✓	✓	✓	✓	✓	✓	✓	✓
Five control/alarm relays									
Compatible with all dB family transducers for 125mm to 40m measurement range	✓	✓	✓		✓	✓	✓	✓	
High accuracy dBMACH3 transducer				✓					✓
Liquids, solids and dusty applications	✓	✓			✓	✓			
I.S. transducer (Ex ia) option	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wall, fascia, panel and 19" rack mount versions	✓	✓	✓	✓	✓	✓	✓	✓	✓
Volumetric conversion (12 tank shapes)		✓				✓			
Alarm Functions on changing level to provide:									
High/Low level	✓	✓	✓	✓	✓	✓	✓	✓	✓
In band/out of band	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rate of fill and empty	✓	✓	✓	✓	✓	✓	✓	✓	✓
High/Low temperature	✓	✓	✓	✓	✓	✓	✓	✓	✓
System fail (loss of echo)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pump efficiency (device fail/device alarm)							✓		
Fill/empty control (initiate/stop)	✓	✓			✓	✓		✓	
Differential control/alarm using two transducers								✓	
Pump control functions:									
Fixed duty assist			✓				✓	✓	
Fixed duty backup			✓				✓	✓	
Alternate duty assist			✓				✓	✓	
Alternate duty backup			✓				✓	✓	
Duty backup and assist			✓				✓	✓	
Service ratio duty assist			✓				✓	✓	
Service ratio duty backup			✓				✓	✓	
FOFO (first on first off alternate duty assist)			✓				✓	✓	
Standby			✓				✓		
2 pump sets (4 pumps total)							✓		
Advanced pump control functions:									
Pump run-on							✓		
Power on/off delay							✓		
Pump start/stop delay							✓		
Pump exercising							✓		
Pump start variation							✓		
Storm control feature							✓		
Aeration control							✓		
Flush valve control							✓		
Data logs:									
Pump running, run-on hours							✓		
Number of pump starts							✓		
Maximum and minimum recorded temperatures	✓	✓	✓	✓	✓	✓	✓	✓	✓
Optional datalogging board for expanded logging capacity and Modbus or Profibus connectivity	✓	✓	✓	✓	✓	✓	✓	✓	✓
Diferential (using two transducers)								✓	
Penstock control on level difference								✓	✓
Open channel flow									
Simple exponential (venturi, parshall, trapezoidal weir etc)				✓					✓
Selected primary element to BS3680:									
Flumes: rectangular, u-throated				✓					✓
Thin plate weirs (standard V-notch)				✓					✓
Thin plate weirs: Rectangular & V-notch 90° and 60°				✓					✓
Other types (Palmer-Bowlus, H-flume etc)				✓					✓
Universal flow calculation (32 setpoints)				✓					✓
Penstock control using step time								✓	
Analogue input for velocity sensor for area x velocity (Q=VA calculation) in channels or pipes								✓	✓





*Standard, short,
medium and long range
dB transducers*

Continued innovative design has led to the dB range of transducers being quite unlike anything seen in ultrasonic level measurement before.

Previously, there were high voltage, frequency dependent transducers, susceptible to electrical noise and requiring special, protected interconnection cables, or weak low voltage transducers designed with flammable atmosphere approval and not application performance in mind.

Pulsar's engineers have re-written the rules. The proven transducer design, which is **low power**, permitting certification to intrinsic safety standards and utilising standard screened cable, is capable of the **power and range necessary** to achieve industry's demands.

The Pulsarultra range of dB transducers have, as standard

- High Resolution
- Encapsulated ATEX (EEx m) for zones 1&2
On NPT threaded versions, FM approved Class I, Div 1, Group A, B, C & D
Class II, Div 1, Group E, F & G
Class III

Intrinsically Safe Barrier option

- I.S. ATEX (EEx ia) for zone 0 (option)
- Integral temperature compensation
- Narrow beam angles
- Robust IP68 construction
- Patented
- PZT ceramic transducer element



dB3

Liquid and solid level measurement

Range: 0.15m to 3m
Nominal operating frequency: 125kHz
Radiating face: 19mm
Beam angle: 10° @-3 dB (inclusive)

dB6

Liquid and solid level measurement

Range: 0.3m to 6m (0.2m deadband option available at 50 kHz - dB6 version)
Nominal operating frequency: 75 kHz
Radiating face: 30mm diameter
Beam angle: 10° @-3 dB (inclusive)

dB10

Liquid and solid level measurement

Range: 0.3m to 10m
Nominal operating frequency: 50 kHz
Radiating face: 45mm diameter
Beam angle of 10° @-3 dB (inclusive)

dB15

Narrow beam transducer for liquid & solid level measurement

Range: 0.5m to 15m
Nominal operating frequency: 41 kHz
Radiating face: 60mm diameter
Beam angle of 8° @-3 dB (inclusive)

dB25

Narrow beam, mid-range transducer for solid and liquid level measurement

Range: 0.6m to 25m
Nominal operating frequency: 30 kHz
Radiating face: 76mm diameter
Beam angle of 6° @-3 dB (inclusive)

dB40

Narrow beam, long range transducer for liquid & solid level measurement

Range: 1.2m to 40m
Nominal operating frequency: 20 kHz
Radiating face: 158mm diameter
Beam angle of 5° @-3 dB (inclusive)

dB transducers

Pulsar Process Measurement Ltd.

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e mail:
info@pulsar-us.com
web:
www.pulsar-us.com

Technical Specification: **PULSAR^{Ultra} dB transducers**

Data applicable to all transducers

Operating temperature range	-40°C to +90°C (Hazardous area versions +75°C max)
Hazardous area approval	Standard ATEX EEx m II T6 or optional EEx ia T6 (FM approved available)
Ingress protection (IP) rating	IP68 to BS EN 60068-2-17 : 1995 & BS EN 60529 (Nema 4x available)
Integral cable length	Standard 5, 10 or 20 metres
CE Approvals	EMC tested to BS EN 50081-1 : 1992 for emissions and BS EN 50082-2 : 1995 for immunity Electrical safety tested to BS EN 61010-1 : 1993
Bump, shock and vibration	To BS EN 60068-2-29, BS EN 60068-2-27 & BS EN 60068-2-6

Housing details

	Housing material	Housing diameter mm	Housing height mm	Mounting connection
dB3	Valox 357 *PBT	86	98	BSP or 1" NPT
dB6†	Valox 357 *PBT	86	106	BSP or 1" NPT
dB10†	Valox 357 *PBT	86	106	BSP or 1" NPT
dB15	Valox 357 *PBT	86	120	BSP or 1" NPT
dB25	Valox 357 *PBT	114	140	BSP or 1" NPT
dB40	Valox 357 *PBT	205	215	BSP or 1" NPT

† Available in optional PVDF body material (Polyvinylidene fluoride)

*PBT - Polybutylene terephthalate

Optional Flanges

All have PTFE full face on process side

Flanges	ANSI	2"	3"	4"	6"	8"	DIN	50	80	100	150	200	Sanitary	2"	3"
dB3		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
dB6		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
dB10		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
dB15			✓	✓	✓	✓			✓	✓	✓	✓			

Options

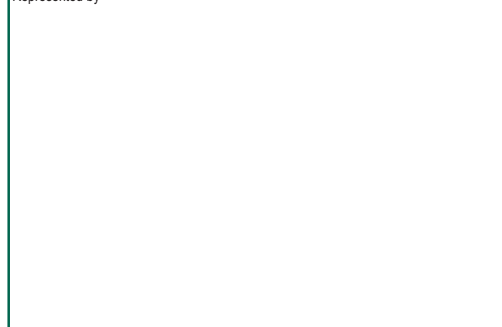
Facings	Closed cell soft foam for increased power in dry dusty environments PTFE standard on all flanged transducers for chemical compatibility
Submergence shield	For continuous operation in applications at risk of submergence
Beam aiming kit	Recommended for easy transducer aiming in solids applications (drawing available on request)



Certificate N°: 950136

Our policy is one of constant development and improvement. Pulsar reserves the right to amend technical details as necessary.

Represented by

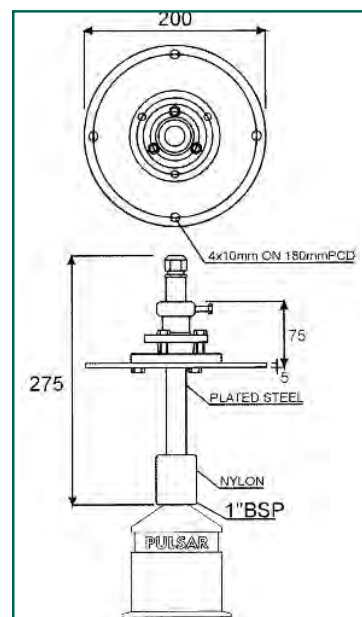


PulsarUltra 002 9/08 MH

Q-Pulse Id: TMS579

Aiming Kit

We recommend the installation of an aiming kit when measuring solids material. This kit allows the transducer to be aimed towards the draw off point at the bottom of the silo or tank. The location of the aiming kit should be as far away from the fill point as possible to avoid falling material. It should be aimed to co-incide with the material's angle of repose, enabling a more powerful signal return to the transducer.



Chapter 7: Motor Drive Data

CHAPTER 7

MOTOR DRIVE DATA

The following data is included in this section:

1. Baldor Motor Installation and Operating Manual
2. Bonfiglioli Riduttori User Manuals
3. Bonfiglioli Riduttori Spare Parts
4. SEW Eurodrive Installation & Operating Instructions



QUEENSLAND URBAN UTILITIES
LUGGAGE POINT STP/LUGGAGE POINT

QUU CONTRACT NO: C1112-022
OPERATION & MAINTENANCE MANUAL



Integral Horsepower AC Induction Motors

Installation & Operating Manual

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Section 1

General Information

- Overview** This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.
- Important:** **This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.**
- Before you install, operate or perform maintenance, become familiar with the following:
- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators.
 - The National Electrical Code
 - Local codes and Practices

Limited Warranty

www.baldor.com/support/warranty_standard.asp

- Safety Notice:** This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.
- Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** **Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.**
- WARNING:** **Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.**
- WARNING:** **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.**
- WARNING:** **Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.**
- WARNING:** **Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.**
- WARNING:** **This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.**
- WARNING:** **Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.**
- WARNING:** **Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.**
- WARNING:** **Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.**
- WARNING:** **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**
- WARNING:** **Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.**

Safety Notice Continued

- WARNING:** UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.
- WARNING:** Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying conductors and permanent magnet motors can result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay away from the area surrounding a permanent magnet motor.
- WARNING:** Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.
- WARNING:** Use only UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust.
- WARNING:** Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.
- WARNING:** Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.
- Caution:** To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.
- Caution:** Do not over-lubricate motor as this may cause premature bearing failure.
- Caution:** Do not over tension belts. Excess tension may damage the motor or driven equipment.
- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.
- Caution:** If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.
- Caution:** To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.
- Caution:** If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.
- If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

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

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

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

- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.
1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or the hood of a WP11 motor.
 2. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
 3. When lifting a WP11 (Weather Proof Type 2) motor, do not lift the motor by inserting lifting lugs into holes on top of the cooling hood. These lugs are to be used for hood removal only. A spreader bar should be used to lift the motor by the cast lifting lugs located on the motor frame.

4. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation.
Do not lift the assembly using the motor lugs or eye bolts provided. Lugs or eye bolts are designed to lift motor only. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Storage

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.

Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

A wooden crate "shell" should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and reclosing many times without damage to the "shell".

Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, which ever is greater. Minimum resistance is calculated as follows: **$R_m = kV + 1$**

where: (Rm is minimum resistance to ground in Meg-Ohms and
kV is rated nameplate voltage defined as Kilo-Volts.)

Example: For a 480VAC rated motor $R_m = 1.48$ meg-ohms (use 5 MΩ).

For a 4160VAC rated motor $R_m = 5.16$ meg-ohms.

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.
2. Store in a clean, dry, protected warehouse where control is maintained as follows:
 - a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit vibration isolation pads must be used.
 - b. Storage temperatures of 10°C (50°F) to 49°C (120°F) must be maintained.
 - c. Relative humidity must not exceed 60%.
 - d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional.
Note: Remove motor from containers when heaters are energized, reprotect if necessary.
3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
 - a. If motor insulation resistance decreases below the minimum resistance, contact your Baldor District office.
 - b. Place new desiccant inside the vapor bag and re-seal by taping it closed.
 - c. If a zipper-closing type bag is used instead of the heat-sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
 - d. Place the shell over the motor and secure with lag bolts.
4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.

5. Motors with anti-friction bearings are to be greased at the time of going into extended storage with periodic service as follows:
 - a. Motors marked "Do Not Lubricate" on the nameplate do not need to be greased before or during storage.
 - b. Ball and roller bearing (anti-friction) motor shafts are to be rotated manually every 3 months and greased every 6 months in accordance with the Maintenance section of this manual.
 - c. Sleeve bearing (oil lube) motors are drained of oil prior to shipment. The oil reservoirs must be refilled to the indicated level with the specified lubricant, (see Maintenance). The shaft should be rotated monthly by hand at least 10 to 15 revolutions to distribute oil to bearing surfaces.
 - d. "Provisions for oil mist lubrication" – These motors are packed with grease. Storage procedures are the same as paragraph 5b.
 - e. "Oil Mist Lubricated" – These bearings are protected for temporary storage by a corrosion inhibitor. If stored for greater than 3 months or outdoor storage is anticipated, connected to the oil mist system while in storage. If this is not possible, add the amount of grease indicated under "Standard Condition" in Section 3, then rotate the shaft 15 times by hand.
6. All breather drains are to be fully operable while in storage (drain plugs removed). The motors must be stored so that the drain is at the lowest point. All breathers and automatic "T" drains must be operable to allow breathing and draining at points other than through the bearings around the shaft. Vertical motors should be stored in a safe stable vertical position.
7. Coat all external machined surfaces with a rust preventing material.
An acceptable product for this purpose is Exxon Rust Ban # 392.

Non-Regreaseable Motors

Non-regreasable motors with "Do Not Lubricate" on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

All Other Motor Types

Before storage, the following procedure must be performed.

1. Remove the grease drain plug, if supplied, (opposite the grease fitting) on the bottom of each bracket prior to lubricating the motor.
2. The motor with regreasable bearing must be greased as instructed in Section 3 of this manual.
3. Replace the grease drain plug after greasing.
4. The motor shaft must be rotated a minimum of 15 times after greasing.
5. Motor Shafts are to be rotated at least 15 revolutions manually every 3 months and additional grease added every nine months (see Section 3) to each bearing.
6. Bearings are to be greased at the time of removal from storage.

Removal From Storage

1. Remove all packing material.
2. Measure and record the electrical resistance of the winding insulation resistance meter at the time of removal from storage. The insulation resistance must not be less than 50% from the initial reading recorded when the motor was placed into storage. A decrease in resistance indicates moisture in the windings and necessitates electrical or mechanical drying before the motor can be placed into service. If resistance is low, contact your Baldor District office.
3. Regrease the bearings as instructed in Section 3 of this manual.
4. Reinstall the original shipping brace if motor is to be moved. This will hold the shaft firmly against the bearing and prevent damage during movement.

Section 2

Installation & Operation

Overview

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

Location

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

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

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

Severe Duty, IEEE 841 and Washdown Duty enclosed motors are designed for installations with high corrosion or excessive moisture conditions. These motors should not be placed into an environment where there is the presence of flammable or combustible vapors, dust or any combustible material, unless specifically designed for this type of service.

Hazardous Locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers, or flyings. Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. In the US market, guidance is provided by the National Electric Code.

Caution:

Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.

Mounting

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

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

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

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

Alignment

Accurate alignment of the motor with the driven equipment is extremely important. The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible.

It is recommended to heat the pulley, sprocket, or gear before installing on the motor shaft.

Forcibly driving a unit on the motor shaft will damage the bearings.

1. **Direct Coupling**

For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.

2. **End-Play Adjustment**

The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.

3. **Pulley Ratio**

The pulley ratio should not exceed 8:1.

Caution:

Do not over tension belts. Excess tension may damage the motor or driven equipment.

4. **Belt Drive**

Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

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

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

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

WARNING: **Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**

Guarding Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions. This is particularly important where the parts have surface irregularities such as keys, key ways or set screws. Some satisfactory methods of guarding are:

1. Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
2. Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding during normal service.

Power Connection Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices. Flying leads must be insulated with two full wraps of electrical grade insulating tape or heat shrink tubing.

Conduit Box For ease of making connections, an oversize conduit box is provided.

The box can be rotated 360° in 90° increments.

Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

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

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

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

Figure 2-1 Accessory Connections

HEATERS

H1 ——— H2

H1 ——— H2

One heater is installed in each end of motor.
Leads for each heater are labeled H1 & H2.
(Like numbers should be tied together).

THERMISTORS



Three thermistors are installed in windings and tied in series.
Leads are labeled T1 & T2.

WINDING RTDS

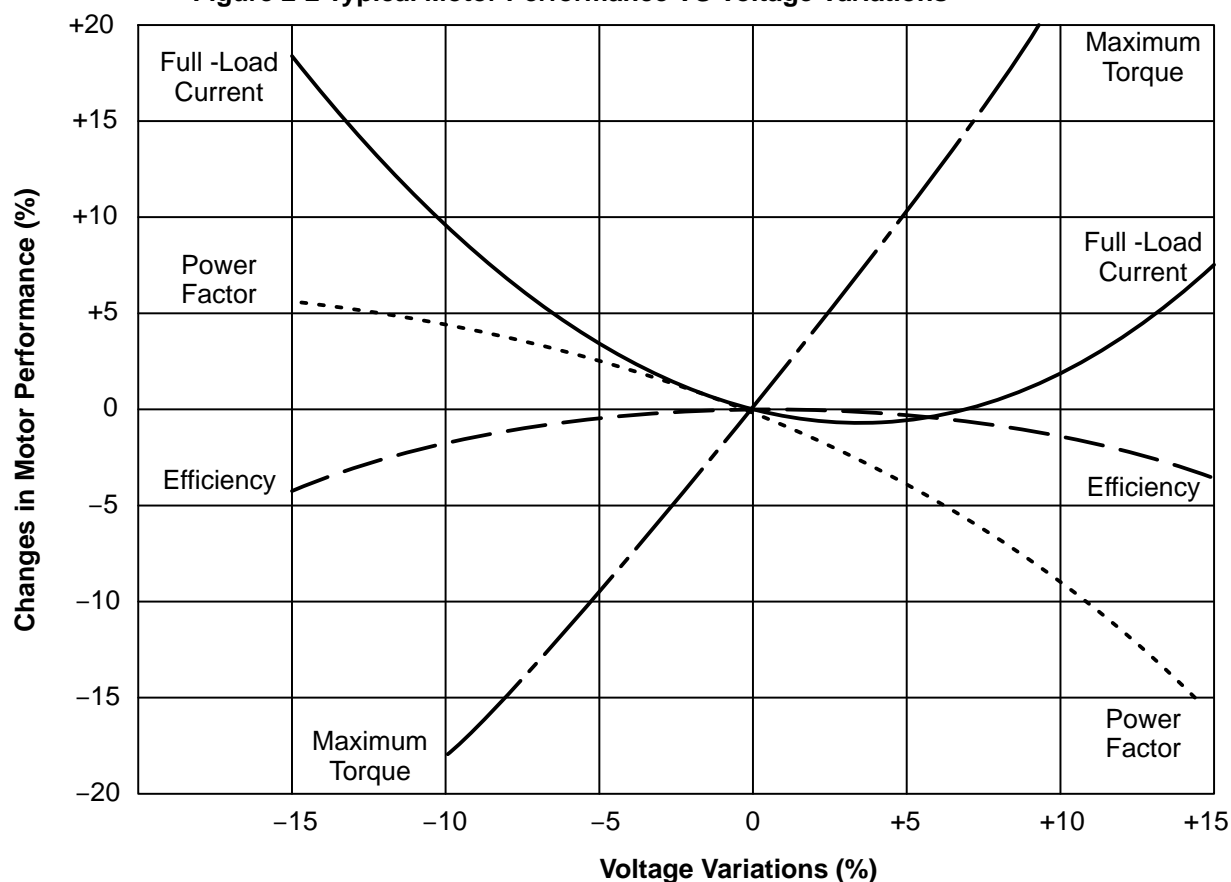


Winding RTDs are installed in windings (2) per phase.
Each set of leads is labeled W1, W2, W3, W4, W5, & W6.

BEARING RTD



- * One bearing RTD is installed in Drive endplate (PUPE), leads are labeled RTDDE.
- * One bearing RTD is installed in Opposite Drive endplate (FREPE), leads are labeled RTDODE.
- * Note RTD may have 2-Red/1-White leads; or 2-White/1-Red Lead.

Figure 2-2 Typical Motor Performance VS Voltage Variations

Rotation All three phase motors are reversible. To reverse the direction of rotation, disconnect and lock out power and interchange any two of the three line leads for three phase motors. For single phase motors, check the connection diagram to determine if the motor is reversible and follow the connection instructions for lead numbers to be interchanged. Not all single phase motors are reversible.

Adjustable Frequency Power Inverters used to supply adjustable frequency power to induction motors produce wave forms with lower order harmonics with voltage spikes superimposed. Turn-to-turn, phase-to-phase, and ground insulation of stator windings are subject to the resulting dielectric stresses. Suitable precautions should be taken in the design of these drive systems to minimize the magnitude of these voltage spikes. Consult the drive instructions for maximum acceptable motor lead lengths, and proper grounding.

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

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

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

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

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

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

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

Section 3

Maintenance & Troubleshooting

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

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

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

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

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

Type of Grease A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is **Polyrex EM (Exxon Mobil)**. Do not mix greases unless compatibility has been checked and verified.

Equivalent and compatible greases include:

Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

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

Refer to additional information contained in Tables 3-2, 3-3 and 3-4.

Table 3-1 Relubrication Intervals *

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

* Relubrication intervals are for ball bearings.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-2 Service Conditions

Severity of Service	Hours per day of Operation	Ambient Temperature Maximum	Atmospheric Contamination
Standard	8	40° C	Clean, Little Corrosion
Severe	16 Plus	50° C	Moderate dirt, Corrosion
Extreme	16 Plus	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion, Heavy Shock or Vibration
Low Temperature		<-29° C **	

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

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

Table 3-3 Relubrication Interval Multiplier

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

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate. In this case, the larger bearing is installed on the motor Drive endplate. For best relubrication results, only use the appropriate amount of grease for each bearing size (not the same for both).

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	Weight of Grease to add * oz (Grams)	Volume of grease to be added	
			in ³	teaspoon
56 to 140 (90)	6203	0.08 (2.4)	0.15	0.5
140 (90)	6205	0.15 (3.9)	0.2	0.8
180 (100-112)	6206	0.19 (5.0)	0.3	1.0
210 (132)	6307	0.30 (8.4)	0.6	2.0
250 (160)	6309	0.47 (12.5)	0.7	2.5
280 (180)	6311	0.61 (17)	1.2	3.9
320 (200)	6312	0.76 (20.1)	1.2	4.0
360 (225)	6313	0.81 (23)	1.5	5.2
400 (250)	6316	1.25 (33)	2.0	6.6
440 (280)	6319	2.12 (60)	4.1	13.4
5000 to 5800 (315-450)	6328	4.70 (130)	9.2	30.0
5000 to 5800 (315-450)	NU328	4.70 (130)	9.2	30.0
360 to 449 (225-280)	NU319	2.12 (60)	4.1	13.4
AC Induction Servo				
76 Frame 180 (112)	6207	0.22 (6.1)	0.44	1.4
77 Frame 210 (132)	6210	0.32 (9.0)	0.64	2.1
80 Frame 250(160)	6213	0.49 (14.0)	0.99	3.3

* Weight in grams = .005 DB of grease to be added

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

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

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

Caution: Do not over-lubricate motor as this may cause premature bearing failure.

With Grease Outlet Plug

1. With the motor stopped, clean all grease fittings with a clean cloth.
2. Remove grease outlet plug.

Caution: Over-lubricating can cause excessive bearing temperatures, premature lubrication breakdown and bearing failure.

3. Add the recommended amount of grease.
4. Operate the motor for 15 minutes with grease plug removed.
This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

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

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

Sample Relubrication Determination

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

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-4 shows that 1.2 in³ or 3.9 teaspoon of grease is to be added.

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

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings. Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $\frac{3}{4}$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $\frac{3}{4}$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked and repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

Suggested bearing and winding RTD setting guidelines

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

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

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

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

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

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

Note: • Winding RTDs are factory production installed, not from Mod-Express.

• When Class H temperatures are used, consider bearing temperatures and relubrication requirements.

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

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

Note: * Bearing temperature limits are for standard design motors operating at Class B temperature rise.

** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as “standard” lubricants) include the following:

- Texaco Polystar
- Mobilith SHC-100
- Darmex 707
- Rykon Premium #2
- Pennzoil Pennzlube EM-2
- Darmex 711
- Chevron SRI #2
- Chevron Black Pearl
- Petro-Canada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation.

Contact Baldor application engineering for special lubricants or further clarifications.

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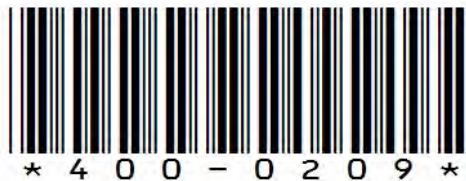
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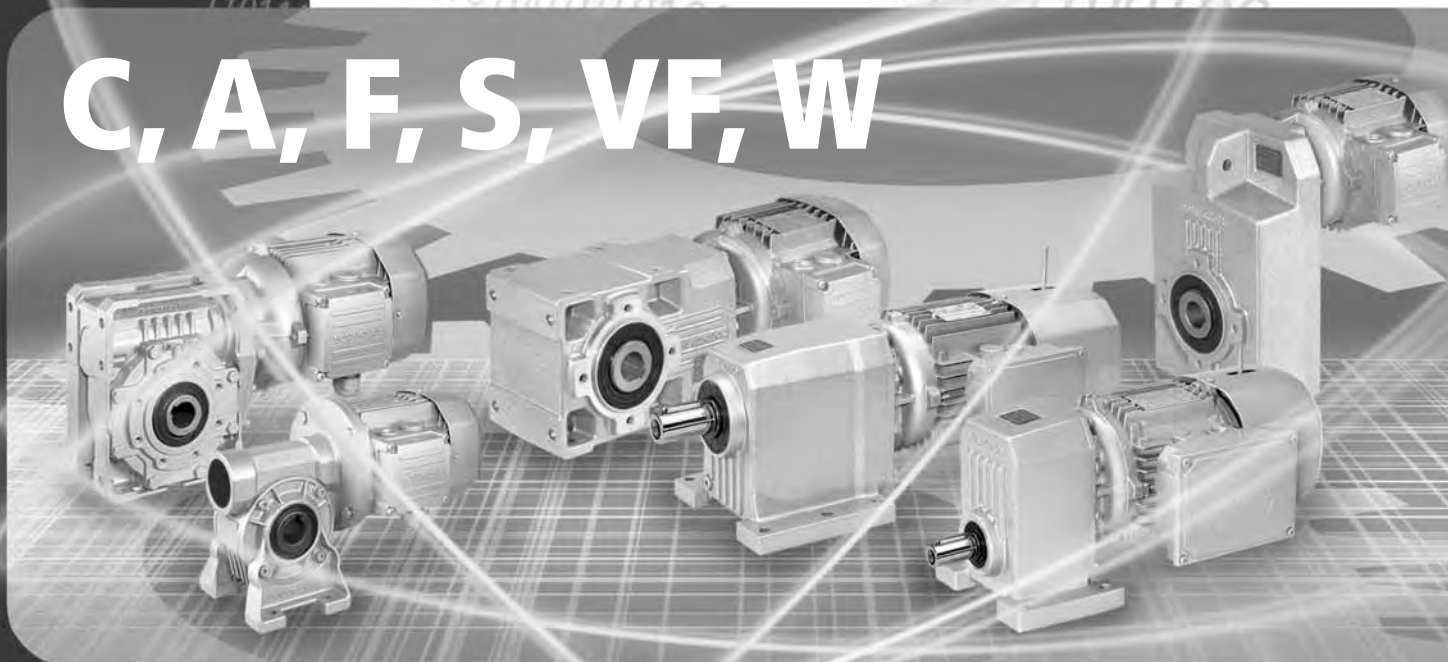
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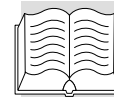


Installation, use and service manual



C, A, F, S, VF, W





INSTALLATION, USE AND SERVICE MANUAL



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Revisions

Refer to page 50 for the catalogue revision index. Visit www.bonfiglioli.com to search for catalogues with up-to-date revisions.



1.0 - GENERAL INFORMATION

1.1 - PURPOSE OF THE MANUAL

This manual has been compiled by the Manufacturer to provide information on the safe transport, handling, installation, maintenance, repair, disassembly and dismantling of the gear units.

All purchasing and design criteria is provided in the Sales Catalogue. Apart from adhering to established engineering practices, the information given in this manual must be carefully read and applied rigorously.

The information regarding the electric motor that can be found matching the speed reducer is supplied with the owner's manual relevant to the specific electric motor.

Failure to adhere to the information provided herein may result in risk to personal health and safety, and may incur economic damages.

This information, provided in the original language (Italian) of the Manufacturer, may also be made available in other languages to meet legal and/or commercial requirements.

The documentation must be stored by a person with the correct authority and must always be made available for consultation.

In case of loss or damage, replacement documentation must be requested directly from the Manufacturer, quoting the code of this manual.

The manual reflects the state of the art at the time of commercialisation of the gear unit.

The Manufacturer reserves the right to modify, supplement and improve the manual, without the present publication being for that reason considered inadequate.

Particularly significant sections of the manual and important specifications are highlighted by symbols whose meanings are given below.

SYMBOLS:



DANGER - WARNING

This symbol indicates situations of serious danger which, if ignored, may result in serious risks to the health and safety of personnel.



CAUTION - ATTENTION

This symbol indicates the need to adopt specific precautions to avoid risks to the health and safety of personnel and possible economic damages.



IMPORTANT

This symbol indicates important technical information.



The instructions indicated on a yellow background next to these symbols refer exclusively to equipment conforming to the "ATEX" Directive 94/9/EC.

The operations highlighted by these symbols must be carried out by qualified professionals specially trained in the safety requirements for zones characterised by potentially explosive atmospheres.

Failure to observe these instructions may result in serious risks to personal and environmental safety



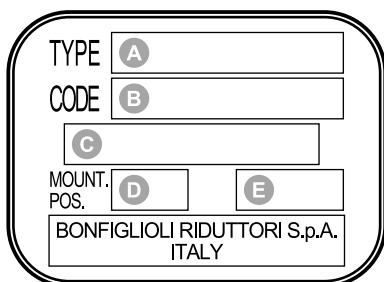


1.2 - EQUIPMENT IDENTIFICATION

The gear unit bears the following nameplate. The nameplate bears all references and indispensable safety instructions. The gear unit's identifying code is explained in the Sales Catalogue.

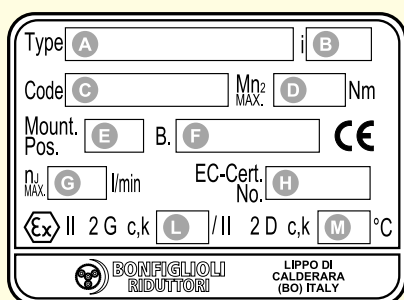
If the gear unit is supplied complete with electric motor (garmotor), all information regarding the motor itself is supplied in the motor manual.

Nameplate data



- A** Gear unit type.
- B** Product code.
- C** Month / Year of manufacture.
- D** Mounting position.
- E** Gear ratio.

Nameplate for ATEX-specified gear units:



- A** Gear unit type.
- B** Gear ratio.
- C** Product code.
- D** Transmissible torque at $n_1=1400$ rpm [Nm].
- E** Mounting position.
- F** Month / Year of manufacture.
- G** Maximum drive speed.
- H** Certification Nr.
- L** Temperature class, or maximum surface temperature.
- M** Maximum surface temperature.

CE - ExMark

- Environmental limits (ambient temperature range between - 20°C and + 40°C).
- Maximum surface temperature: temperature class **T4** for 2G and **130°C** for 2D. Some types of gear unit, shown in the catalogue, are exceptions to this rule and are marked temperature class **T3** for 2G or **160°C** for 2G and 2D.
- Certifying agency with whom the technical file has been deposited.

Readability of the nameplate

The nameplate and the information thereon must be readable at all times and consequently cleaned from time to time.

Should the nameplate wear and/or become damaged so as to affect its readability or that of even one of the items of information thereon, the User must request a new nameplate from the Manufacturer, quoting the information given in this manual, and replace the old one.



1.3 - GLOSSARY AND TERMINOLOGY

Some of the frequently occurring terms used in this manual are described below so as to unequivocally define their meaning.

Routine maintenance: the set of operations required for maintaining the functionality and efficiency of the gear unit. These operations are usually scheduled by the Manufacturer, who defines the qualifications required and tasks in question.

Non-routine maintenance: the set of operations required for maintaining the functionality and efficiency of the gear unit. These operations are not scheduled by the Manufacturer and must be done by an expert maintenance technician.

Expert maintenance technician: an authorised technician selected by means of having the qualifications, skills and mechanical and electrical training to do repairs and non-routine maintenance work on the gear unit.

Overhaul: an overhaul consists in the replacement of bearings and/or other mechanical components which have worn to such an extent as to compromise the operation of the gear unit. The overhaul also includes verification of the condition of all gear unit components (keys, seals, gaskets, vents, etc.). If any such components are damaged they must be replaced and the reason for the damage identified.

1.4 - REQUESTING TECHNICAL ASSISTANCE

For any technical service needs, contact the Manufacturer's sales network, quoting the information on the unit's nameplate, the approximate hours of service and the type of defect.

1.5 - MANUFACTURER'S LIABILITY

The Manufacturer declines all liability for cases of:

- use of the gear unit in violation of local laws on safety and accident prevention at work.
- incorrect installation, disregard or incorrect application of the instructions provided in this manual.
- incorrect or defective power supply (garmotors).
- modifications or tampering.
- work done on the unit by unqualified or unsuitable persons.

The safety of the gear unit also depends on scrupulous observance of the instructions given in this manual, in particular:

- always operate the unit within its operating limits.
- diligently observe the routine maintenance schedule.
- only authorise trained operators to inspect and service the unit.
- use only original spare parts.



- the configurations given in the gear unit catalogue are the only ones permitted.
- do not attempt to use the unit contrary to the instructions supplied.
- the instructions given in this manual do not substitute but summarise the provisions of applicable safety legislation.



2.0 - TECHNICAL INFORMATION



2.1 - GEAR UNIT DESCRIPTION

The gear unit has been designed and constructed for integration, if required, driven by an electric motor, into an assembly of interlocking parts or mechanisms as part of a specific application.

Depending on the requirements of the application, the gear unit can be supplied in a variety of executions and configurations. It is capable of satisfying a range of specific requirements in the mechanical, chemical, agricultural and food industries, etc.

BONFIGLIOLI RIDUTTORI supplies a range of accessories and optionals to make their products as versatile as possible. For further technical information and descriptions, refer to the Sales Catalogue.



The User is responsible for using the products recommended for installation and maintenance of BONFIGLIOLI gear units in an appropriate manner and in accordance with instructions.

 	<p>SAFETY SPECIFICATIONS FOR ATEX SPECIFIED GEAR UNITS</p> <ul style="list-style-type: none"> • use of synthetic lubricants only (oil and grease) • VITON[®] seal rings • thread locker on all external bolts • vent caps with anti-intrusion valve • double oil seals on series C gear units, and oil seals with dust traps on all other types • components and products operable at above the maximum rated operating temperature • no metal moving parts external to the gear unit • no plastic parts capable of building up electrostatic charge • irreversible temperature indicator supplied along with each unit • for installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme of all surfaces and recesses to avoid a build up of dust of more than 5 mm in depth • to prevent dust build-ups in difficult to access areas, the units are equipped with a variety of seals in proximity to the couplings of moving parts, mounting flanges and external threaded holes.
---	---

2.2 - CONFORMITY TO STANDARDS

All gear units or gearmotors (when supplied complete with electric motor) are designed in compliance with the provisions of all applicable Essential Health and Safety Requirements, "Machinery Directive" 98/37/EC and, if requested, can be supplied complete with Manufacturer's Declaration – Annex IIB as provided by said directive.

The electric motors of all BONFIGLIOLI RIDUTTORI gearmotors conform to the provisions of Low Voltage Directive 73/23/EEC and Electromagnetic Compatibility Directive 89/336/EEC.

 	<p>Furthermore, if specified for use in potentially explosive atmospheres, the gear units are designed and constructed to conform with the Essential Health and Safety Requirements (EHSR) of Annex II of ATEX Directive 94/9/EC and conform to the following classification:</p> <ul style="list-style-type: none"> • Equipment group: II. • Class: Gas 2G – Dust 2D. • Zone: Gas 1 – Dust 21. • Maximum surface temperature: temperature class T4 for 2G and 130°C for 2D. <p>Some types of gear units, given in the catalogue, are exceptions to this rule and are marked temperature class T3 for 2G or 160°C for 2G and 2D.</p>
--	---



2.3 - OPERATING LIMITS AND CONDITIONS



Modification of the gearbox configuration or mounting position is only permitted if previously authorised by the BONFIGLIOLI RIDUTTORI technical service.



Failure to obtain said authorisation voids the ATEX certification.

Ambient conditions

- Operation of gear units is permitted at ambient temperatures between -20°C and +40°C. However, for temperatures between -20°C and -10°C unit may only start up after it has been progressively and evenly pre-heated, or otherwise initially operated unloaded. Load may then be connected to the output shaft when the gear unit has reached the temperature of -10°C, or higher.
- Do not use the gear unit, if not explicitly intended for the purpose, in a potentially explosive atmosphere or where the use of explosion-proof equipment is specified.



The nameplate data on the maximum surface temperature, refer to measurements made in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) could have a significant impact on the build up of heat.



• Lighting



If the unit is to be serviced in a poorly lit area, use additional lamps and ensure that the work is done in compliance with applicable safety legislation.

• Noise - Vibration

During operational testing at the Manufacturer's premises, the acoustic pressure measured under full load at a distance of 1 m from the unit and 1.6 m above ground level without vibration was less than 85 dB(A).

The vibrations produced by the gear unit do not constitute a health risk for personnel. Excessive vibration may be the result of a fault and should be immediately reported and eliminated.



3.0 - SAFETY INFORMATION

3.1 - SAFETY STANDARDS

- Carefully read the instructions given in this manual and those posted directly on the gear unit, especially those regarding safety.
- Persons charged with working on the gear unit at any time in its service life must be trained specifically for the purpose with special abilities and experience in this area as well as being equipped with the appropriate tools and individual safety equipment (as per Legislative Decree 626/94). Failure to meet these requirements constitutes a risk to personal health and safety.
- Use the gear unit only for the applications envisaged by the Manufacturer. Improper use can result in risks to personal health and safety and economic damages.



The applications defined by the Manufacturer are those industrial applications for which the gear unit has been developed.

- Keep the gear unit at its maximum efficiency by following the routine maintenance schedule. Good maintenance enables the unit to operate at maximum performance over a long service life in compliance with safety regulations.
- When working on the unit in areas which are difficult to access or hazardous, ensure that adequate safety precautions have been taken for the operator and others in compliance with the provisions of law on health and safety at work.
- All maintenance, inspection and repairs must only be done by an expert maintenance technician fully familiar with the attendant hazards. It is, therefore, essential to implement operating procedures which address potential hazards and their prevention for the entire machine. The expert maintenance technician must always work with extreme caution in full compliance with applicable safety standards.



If the gear unit is to be serviced in a potentially explosive atmosphere, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning.



Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- During operation wear only the apparel and safety equipment indicated in the User instructions provided by the Manufacturer or laid down by applicable laws on safety at work.
- Replace worn components with original spare parts. Use the lubricants (oil and grease) recommended by the Manufacturer.
- Do not dump polluting materials into the environment. Dispose of all such materials as stipulated by applicable legislation.
- After replacing lubricants clean the gear unit's surfaces and the walk-on surfaces around the work area.



4.0 - HANDLING AND TRANSPORT

4.1 - PACKAGING

The standard packaging, when supplied and unless otherwise agreed, is not proofed against rainfall and is intended for shipping by ground and not sea, and for environments which are under cover and not humid.

The material can be stored in suitable conditions for a period of two years under cover at a temperature between -15°C and $+50^{\circ}\text{C}$ at a relative humidity not in excess of 80%. Storage in all other conditions requires specific packaging.

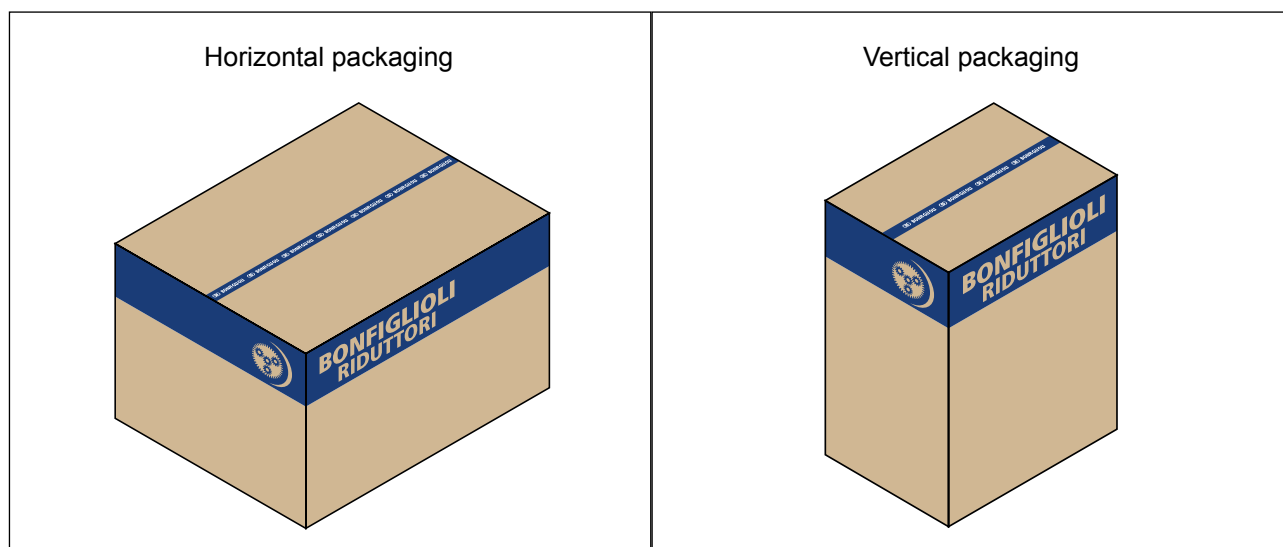
In order to facilitate handling, heavy packages can be loaded on pallets.

The most frequent types of packaging are shown in the figures below.

- Wooden crate for miscellaneous products shipped by sea.



- Carton pallet packaging for single products and kits.



On receipt of the gear unit, check that the delivery item corresponds to the purchase order and that it is not damaged or faulty in any way. Refer any nonconformity to your BONFIGLIOLI RIDUTTORI dealer.

Dispose of packaging materials as laid down by the provisions of law.



4.2 - HANDLING INSTRUCTIONS

Handle packages as per the Manufacturer's instructions and those marked on the packages themselves. Since the weight and shape of packages may make manual handling unfeasible, special equipment must be used to avoid damage and injury. Persons authorised for this purpose must be trained and experienced in the work in question to safeguard his safety and that of all other persons involved.



The person authorised to handle the product must take all necessary precautions to safeguard his safety and that of all other persons involved.

4.2.1 - Moving packages

- Prepare a suitable, delimited area with a level floor or surface for unloading the packages.
- Prepare the equipment required for handling the package. The lifting and handling equipment used (e.g. crane or lift truck) must have adequate capacity for the weight and size of the load, taking into account its attachment points and centre of gravity. If required, this information is indicated on the package itself. Harness heavy packages with chains, belts and steel ropes after checking that they are capable of sustaining the weight of the load, which is generally specified.
- When handling the load keep it level to avoid instability and/or tipping.

4.2.2 - Moving the equipment



All the following operations must be done with due care and caution and without sudden movements.

- Identify the attachment points for lifting the gear unit. Refer to Annex 4 of this manual for this information.
- Prepare the gear unit for lifting by attaching straps, hooks, shackles etc. to its attachment points, or alternatively, use a pallet for moving the load. If using a crane, first lift the gear unit vertically out of its packaging.
- If using a lift truck or pallet truck, remove the packaging and fit the truck's forks at the indicated positions.
- First lift the load very slowly to check that it is stable.
- Move the gear unit to the unloading area and lower it gently into position, taking care not to cause sudden oscillations while moving it.



If the gear unit is coupled to an electric motor, do not use the eyebolts on the motor for lifting the entire load, unless this is expressly indicated.





4.3 - STORAGE

Some recommendations for storing the gear unit are indicated below.

1. Do not store the unit in excessively humid conditions or where it is exposed to the weather (do not store outdoors).
2. Do not place the gear unit directly on the ground.
3. Place the gear unit on a stable base and make sure that it is not subjected to accidental displacement.
4. Store the packaged gear unit (if allowed) in accordance with the instructions on the packaging itself.

If the gear unit is stored for more than 6 months, the following **additional** precautions must be taken:

5. Cover all machined external surfaces with a rustproofing product such as Shell Ensis or equivalent product with similar properties and application range.
6. Fill the unit with lubricating oil.

 	<p>SAFETY PRECAUTIONS to be taken when returning the gear unit to service after storage.</p> <p>The output shafts and external surfaces must be thoroughly cleaned of all rustproofing product, contaminants and other impurities (use a standard commercial solvent). Do this outside any explosion hazard area.</p> <p>The solvent must not touch the seal rings as this can damage them and render them ineffective.</p> <p>If the oil or protective material used during storage is not compatible with the synthetic oil used during the machine's operation, the interior of the unit must be thoroughly cleaned before filling with the operating oil.</p> <p>The service life of bearing grease is reduced if the unit is stored for more than 1 year. The bearing grease must be synthetic.</p>
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5.0 - INSTALLATION

5.1 - INSTALLING THE GEAR UNIT



The entire installation process must be planned based on the general design of the machine. The person authorised to do the work must, if necessary, implement a safety plan to safeguard all persons directly involved and rigorously apply all applicable legislation.

If a gearmotor is going to be installed, please consult the owner's manual of the electric motor on beforehand.

1. Thoroughly clean all packaging materials and protective product residue from the gear unit. Pay particular attention to the coupling surfaces.
2. Check that the data on the nameplate corresponds to that which is specified on the order.
3. Ensure that the structure to which the gear unit is to be mounted is sufficiently robust and rigid to support its weight and operating stresses.
4. Check that the machine on which the gear unit is to be installed is switched off and cannot be accidentally switched on again.
5. Check that all coupling surfaces are flat.
6. Check that the shaft/shaft or shaft/bore are perfectly aligned for coupling.
7. Fit suitable guards to protect against the external moving parts of the gear unit.
8. If the work environment is corrosive for the gear unit or any of its parts, take the special precautions required for aggressive environments. In this case, contact the BONFIGLIOLI RIDUTTORI sales service.
9. We recommend applying a protective paste to all couplings between the gear unit/motor and other parts (Klüberpaste 46 MR 401 or equivalent product with similar properties and application range) to ensure optimal coupling and protection against fretting corrosion.
10. To ensure effective coupling, the driven shafts should be machined to the tolerances given in tables (A16), (A17), (A18), (A19), (A20) and (A21) in Annex 3 of this Manual.
11. In case of installation outdoors and when fitted with an electric motor, protect the latter from direct sunlight and the weather by means of guards or a casing. Also make sure that the assembly is properly ventilated.

Now proceed with the installation as follows:

1. Place the gear unit in the vicinity of the installation area.
2. Mount the gear unit and secure it to the structure at the points provided. The gear unit should be secured to the structure through all mounting points on the mount specified (feet or flange).
3. Locate the closed plug used for transportation (usually red) and replace it with the vented plug provided.
4. Tighten down the mounting bolts and check that the oil plugs are screwed down to the torque given in table (A0).



(A0)

Bolt size	Tightening torque [Nm] +5% /-10%	
	Bolt class	
	8.8	10.9
M4	3	3.8
M5	5.9	8.0
M6	10.3	13.0
M825.5		32
M10	50	64
M12	87.3	110
M14	138.3	180
M16	210.9	275
M18306		390
M20	432	540
M22	592	720
M24	744	930
M27	1100	1400
M30	1500	1850

Cap/vent thread	Pitch	Tightening torque [Nm]
1/8"	28	5
1/4"	19	7
3/8"	19	7
1/2"	14	14
3/4"	14	14
1"	11	25

5. Charge the gear unit with oil or top it up with reference to the method in which gear units of the type covered by this manual are filled in the factory. The standard charge of synthetic life-time lubricant is as follows:



(A1)



C 05	C 11	C 21	C 31	C 35	C 41	C 51	C 61	C 70	C 80	C 90	C 100
A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55	A 60	A 70	A 80	A 90
F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	0 90F			
S 10	S 20	S 30	S 40	S 50							
VF 27	VF 30	VF 44	VF 49	VF 130	VF 150	VF 185	VF 210	VF 250			
W 63	W 75	W 86	W 110								

Life-time lubrication.

Life-time lubrication with ATEX-specified unit only.



 	<p>Helical in-line gear units C 11, C 21 and C 31 are not equipped with service plugs for direct oil level checks.</p> <p>Bevel helical gear units A 10, A 20 and A 30 are not equipped with service plugs for direct oil level checks in mounting positions B6 and B7 only.</p> <p>For these types of gear units, refer to Annex 1 of this Manual.</p> <p>Before installing, check the unit as follows:</p> <ol style="list-style-type: none"> 1. Place the gear unit in the mounting position indicated for the gear unit in question in Annex 1. Wait 10 minutes for the oil level to stabilise inside the gear unit's casing. 2. Insert a dipstick through the hole shown in drawing (S4) or (S5) and measure the distance between the oil level and the exterior of the casing. This value must be compared with the values in mm given in Annex 1, tables (A7) and (A8), depending on the mounting position for the gear unit in question. 3. If the measurement gives a higher value than that prescribed, top up the oil to the correct level as indicated in the catalogue. <p>For all other types of gear unit the oil level must be checked via the oil plug (spill type) using the tool (out of scope for supply) described in Annex 1.</p> <p>For the first charge and subsequent top ups, only use the recommended oils.</p>
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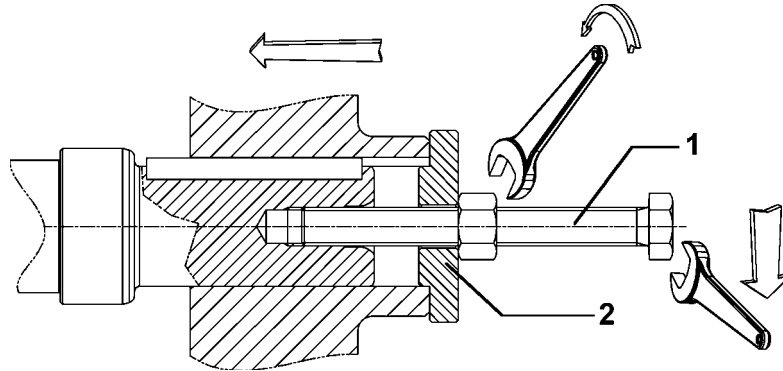
 	<p>Installation of gear units classified under Directive 94/9/EC</p> <ul style="list-style-type: none"> • Category 2D gear units must be installed in compliance with the provisions of standards EN 1127-1 and EN 50281-1-2. The installer must, therefore, be fully informed and trained for this application. • The installation technician must be aware of the ATEX class of the installation area, as well as the risks associated with the presence of a potentially explosive atmosphere, with particular attention to explosion and fire hazards, and thereby adopt the necessary safety precautions. • All maintenance, assembly and disassembly work must be done outside the explosion hazard area by trained personnel. • Check that all accessory components (cables, joints, cable glands, cooling units, etc.) comply with the Essential Health and Safety Requirements of the ATEX directives. Handle them with extreme care to avoid altering their characteristics. • Remove the bolts sealing the threaded holes if provided for securing the gear unit. Do not damage the coupling surfaces. • When assembling gear units with a torque arm, make sure that during operation, the metal parts which move relative to each other do not come into contact. If necessary, insert non-metal anti-friction elements in compliance with Directive 94/9/EC. • Do not connect any object with electrical resistance greater than $10^9 \Omega$ to the product. • Install guards to prevent the hazardous accumulation of dust and liquids on the seals of the solid shafts and to protect them mechanically. • In case of installation of the gearmotor in a vertically downward orientation, the electric motor must be equipped with a drip cover. • The output shaft and any pulleys or other transmission components must be perfectly aligned. • Only install the gear unit in the motor execution and mounting position specified on the order. Shaft-mounted gear units can be installed with a tolerance relative to the theoretical plane of installation of $\pm 5^\circ$. • If the gear unit is supplied without lubricant it must be installed as such and only filled with lubricant thereafter. • Secure the gear unit to a flat, vibration-free surface capable of bearing the torsional stresses it produces in operation. Make sure not to deform the contact surfaces, mounting feet and/or flanges by overtightening the bolts. • Use bolts of quality no lower than 8.8 for mounting the gear unit, and for heavy-duty installations use 10.9 bolts. For the tightening torque refer to table (A0). To prevent bolts from unscrewing, apply a thin film of Loctite 510, or equivalent, on threads of all bolts used to assemble the gear unit onto the structure and/or to the electric motor. • Make sure that the radial/thrust loads and operating torques do not exceed those specified for the unit. • The vent caps and oil level caps must be easy to access for inspection. • Clean the gear unit thoroughly after installation.
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5.1.1 - Gear units with solid output shaft

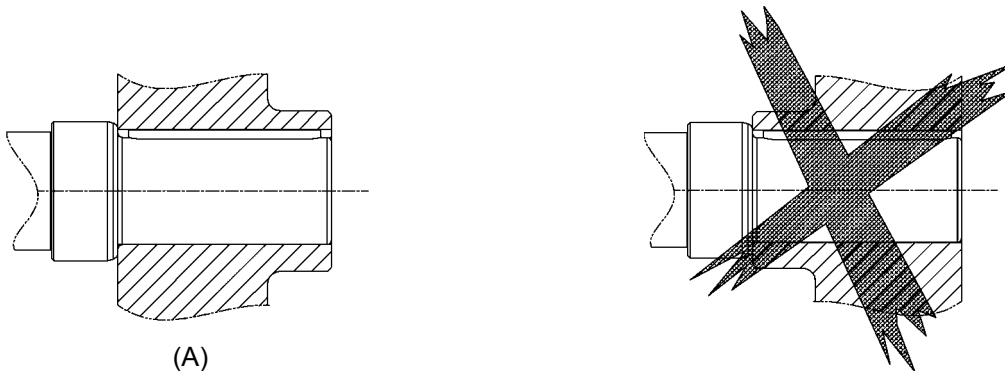


For mounting external parts do not use hammers or other tools which might damage the gear unit's shafts or bearings. Instead, proceed as indicated in the diagram below:



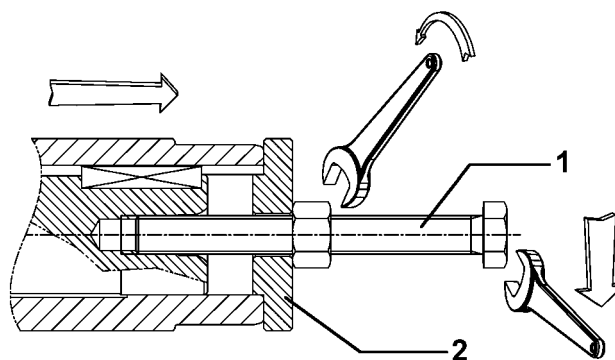
Bolt (1) and spacer (2) are to be supplied by customer.

To minimise the loads on the shaft bearings, when mounting transmission elements with asymmetrical hubs, the preferred layout is shown in diagram (A) below:

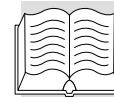


5.1.2 - Gear units with hollow output shaft

To facilitate mounting hollow shaft gear units onto the machine's driven shaft, proceed as indicated in the diagram below. Also refer to Annex 3 of this Manual for dimension information on customer's shaft.



The bolt (1) and spacer (2) are to be supplied by customer.



5.1.3 - Gear units with shrink disk

Series A and F gear units may be specified with a shrink disk for coupling onto the driven shaft. When installing a unit of this type, proceed as follows:

1. Loosen the locking bolts gradually and in sequence and remove the entire shrink disk.
2. Clean and carefully degrease the coupling surface between the gear unit's output shaft and the customer shaft.



Do not use molybdenum bisulphide or any other grease which would affect the friction coefficient of the coupling surfaces and reduce the performance of the shrink disk.

3. Fit the gear unit onto the machine sliding its output shaft onto the driven shaft.
4. Fit the shrink disk to the gear unit shaft.
5. Fully tighten down the shrink disk bolts gradually following a circular sequence using a torque wrench. This operation usually must be repeated several times to reach the tightening torque **Mt** specified in the table below:

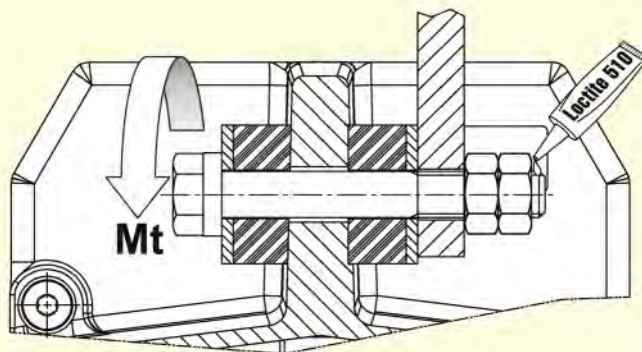
(A2)

		A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55	A 60	A 70	A 80	A 90
	Mt [Nm]	14,5	14,5	14,5	14,5	14,5	14,5	35	35	35	35	69	69
		F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	F 90			
	Mt [Nm]	8,5	14,5	14,5	14,5	14,5	35	35	69	69			

5.1.4 - Shaft mounted gear units series F

Anchoring the torque arm

Use the original vibration-damping kit to ensure optimal operation of the assembly, as it is specifically designed and constructed, along with the gear unit, for operation in explosion hazard areas. Failure to use the original accessory on gear units classified under 94/9/EC voids the ATEX certification.



	Mt [Nm]
F 10	10
F 20	10
F 30	20
F 40	20
F 50	50
F 60	50

The torque arm shown in the diagram is to be supplied by customer.



5.2 - INSTALLING AN IEC-STANDARD FLANGED MOTOR

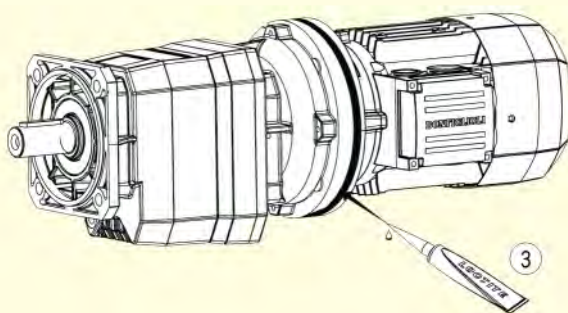
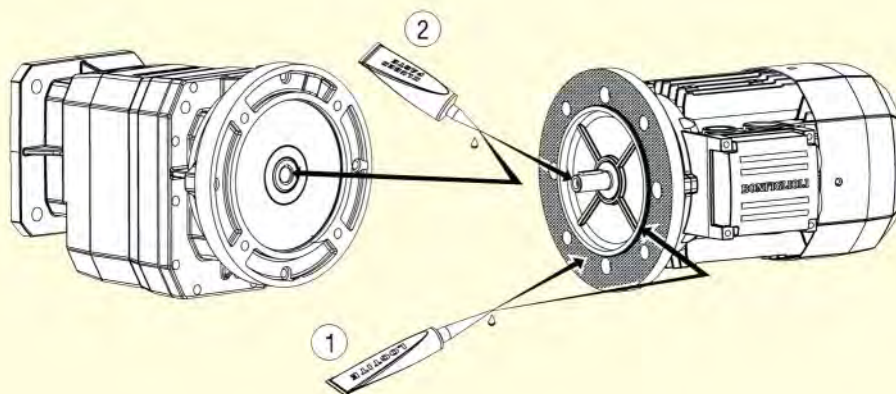
Further to all the precautions indicated above, when installing a IEC-flange mount electric motor the following precautions must also be observed:

- Do not force the coupling and do not use inappropriate tools during assembly. Take care not to damage the flat and/or cylindrical coupling surfaces.
- Do not force the shaft with large radial and/or thrust loads.
- To facilitate assembly, use a lubricating synthetic oil paste such as Klüberpaste 46 MR 401 or equivalent product with similar properties and application range.
- Tighten down all motor/gear unit mounting bolts to their prescribed torque. For the tightening torques, refer to table (A0).

When the gear unit is mounted to an IEC electric motor, proceed as follows:

- Apply a layer of sealant (Loctite 510 or equivalent product with similar properties and application range) to the motor/gear unit mounting flanges, spigot and frontal coupling surfaces as shown in diagram (S1).

(S1)



- 1 - Apply "Loctite 510" to both the flange surface and spigot.
- 2 - Apply "Klüberpaste 46MR401" to the input shaft bore and motor shaft.
- 3 - Use "Loctite 5366" to seal the area of contact between the gear unit and motor, taking care to fill in any gaps between the two flanges (e.g. disassembly slots).

- After mounting the motor, apply a layer of sealant (Loctite 5366 or equivalent product with similar properties and application range) around the edges of the flanges so as to close any gaps between their surfaces.
- If the gearbox is of the flanged type, the User must take similar precautions to prevent dust deposits forming in the gaps between the flanges or in the vicinity of the couplings.







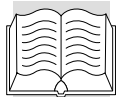
6.0 - TESTING THE GEAR UNIT

The gear unit has been factory tested by the Manufacturer.

Before starting the unit, check that:

- The machine incorporating the gear unit complies with the provisions of the “Machinery Directive” 98/37/EC and any other applicable safety legislation.
- The gear unit’s mounting position in the installation corresponds to that prescribed and indicated on the nameplate.
- The electrical power supply and control systems are suitable and operational as stipulated in standard EN 60204-1, and grounded as per standard EN 50014.
- The motor power supply corresponds to that prescribed and is within $\pm 5\%$ of the rated value.
- The oil level is as prescribed and that there are no leaks from the caps or gaskets.
- The unit does not run noisily or with excessive vibration.

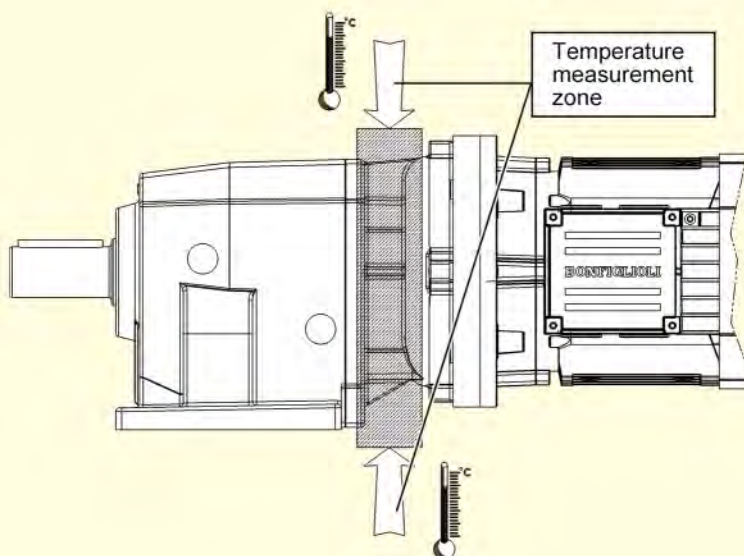
 	<p>Before starting up the unit, check and ensure that:</p> <ul style="list-style-type: none"> • Assembly is not carried out in a potentially explosive atmosphere (oil, acid, gas, vapour or radiation) and that there is no dust deposits thicker than 5 mm on the gear unit. • During service the gear unit is sufficiently ventilated and that it is not subject to radiation from external heat sources. • During service the cooling air does not exceed 40 °C. • The oil level, drain and vent plugs are all easily accessible. • All accessories of any type mounted onto the gear unit are ATEX compliant. • Gear units with hollow shafts, with or without shrink disk, have been correctly mounted. • The gear unit is thoroughly cleaned after installation. • All guards installed to prevent accidental contact between operators and the gear unit’s moving parts or seals, are effective.
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Measuring the gear unit's surface temperature

- The gear unit's maximum surface temperature depends on the motor speed, gear ratio and motor execution and must never exceed 130 °C (160 °C if so specified on the nameplate).
- The nameplate specifications regarding the maximum surface temperature, refer to measurements made in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) could have a significant impact on the build up of heat.
- When commissioning the gear unit, the surface temperature must be measured in the same operating conditions as for the final application.
The surface temperature must be measured at the coupling between the gear unit and motor, and at the points which are most shielded from the motor's fan cooling.

(S2)



IMPORTANT:

The maximum surface temperature is reached after 3 hours' operation at full load. The temperature measured in these conditions must not differ (ΔT) from the ambient temperature by more than the following values:

(A3)

	ΔT [°C]
C 11...C 61	75
A 10...A 60	75
F 10...F 60	75
VF 44, VF 49	75
W 63...W 86	75
W 110	90

Should the temperature differential exceed these values, stop the gear unit at once and contact the BONFIGLIOLI RIDUTTORI technical service.



- If the temperature differential is within the above values, wait for the gear unit to cool down and then install the temperature indicator supplied with the gear unit at the point of maximum temperature.

Example:



- At the same time, check for excessive running noise and vibration.



 	<ul style="list-style-type: none"> • Provided all the above checks have been passed and that all other instructions in this manual have been strictly observed, an electric motor with ATEX rating equal or greater than that of the gear unit may be installed, thus forming a gearmotor which itself complies with the provisions of Directive 94/9/EC. <p>If, on the other hand, the installation of the motor to the gear unit requires actions other than those prescribed in this Manual and/or one or more of the manual's prescriptions has not been satisfied, the User shall be responsible for analysing the risks attendant on this particular motor/gear unit combination. The risk analysis is in any case mandatory if the motor is driven through an inverter.</p> <p>Only in this way, and subject to certification by the assembler, shall the assembly, including the gear unit itself, be compliant with the requirements of Directive 94/9/EC.</p>
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7.0 - USING THE EQUIPMENT

Before putting the gear unit into service, the User must ensure that the plant in which it is installed complies with all applicable directives, especially those regarding health and safety at work.



The gear unit may not be used in areas and environments:

- with highly corrosive and/or abrasive vapours, smoke or dust
- in direct contact with loose food products.



Danger zones and exposed persons:

The danger zone of the gear unit is the protrusion of the shaft which constitutes a hazard for exposed persons in direct contact with it (crushing, cutting, trapping). In particular, when the gear unit is operating in automatic mode and in an accessible area, the shaft must be protected by a guard.



8.0 - MAINTENANCE



Maintenance and replacement work must be done by expert maintenance technicians trained in the observance of applicable laws on health and safety at work and the special ambient problems attendant on the installation.



Before doing any work on the unit, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning (due to suspended loads or similar external factors).

Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc.).

- Before doing any maintenance work, activate all safety equipment and, if necessary, inform persons working in the vicinity. In particular, mark off the area around the unit and prevent access to any equipment which, if activated, might be the cause of unexpected health and safety hazards.
- Replace worn components with original spare parts only.
- Use the lubricants (oil and grease) recommended by the Manufacturer.
- When working on the gear unit always replace gaskets and seals with new original ones.
- If a bearing requires replacement, it is good practice to also replace the other bearing supporting the same shaft.
- We recommend replacing the lubricating oil after all maintenance work.

The above instructions are aimed at ensuring efficient and safe operation of the gear unit.

The Manufacturer declines all liability for injury and damage to components due to the use of non-original spare parts and non-routine work which modifies the safety requirements without the express prior authorisation of the Manufacturer.

Refer to the specific spare parts catalogue when ordering spare parts for the gear unit.



Do not dump polluting liquids, worn parts and maintenance waste into the environment. Dispose of all such materials as stipulated by applicable legislation.



- Observe the routine inspection and maintenance schedule to ensure suitable operating conditions and the effective explosion protection of the unit.
- Always apply fresh Loctite 510 paste or equivalent product with similar properties and application range to all disassembled threads.
- Before servicing or repairing internal components, allow the gear unit to cool down completely before opening the casing so as to avoid burns from parts which are still hot.
- Make sure, on completion of maintenance work, that all safety measures and equipment have been applied and reset.
- Clean the gear unit thoroughly after maintenance work and repairs.
- On completion of maintenance work, tighten all vent, filler and level plugs to their specified torque (table A0).
- On completion of any maintenance work, all seals must be refitted and sealed as prescribed. On gear units with double seal rings, the cavity between the two rings must be packed with synthetic grease (Fluorocarbon gel 880 ITP or equivalent product with similar properties and application range) before assembly.
- Regardless of the type of gear unit, whenever a seal ring is replaced its lips should be smeared with a thin layer of grease (Fluorocarbon gel 880 ITP or equivalent product with similar properties and application range) before assembly.
- Use only original spare parts for repairs.



8.1 - ROUTINE MAINTENANCE



Keep the gear unit at its maximum efficiency by following the routine maintenance schedule specified by the Manufacturer.

Good maintenance enables the unit to operate at its maximum performance over a long service life in compliance with safety regulations.

Frequency	Component	Type of work	Operation
1000 h	External seals and gaskets	Check oil level Check for leaks by eye	Maintain or replace components as required
3000 h	For gear units with torque arm: polymer bushings	Check for cracks/ageing	Replace if no longer fully effective
5000 h	Gear unit seals and gaskets	Inspect carefully for wear/ageing of external seals.	Replace if aged/worn

Depending on the temperature reached by the lubricant, it should be replaced at the intervals indicated in table (A4) below:

(A4)

Oil temperature t [°C]	Hours
$t < 65$	25000
$65 \leq t < 80$	15000
$80 \leq t \leq 95$	12500

For installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme for all surfaces and recesses to avoid build up of dust more than 5 mm in depth.

Every 1000 h of operation or after 6 months:

- Measure the surface temperature of the coupling between the gear unit and motor, at the points most shielded from the motor's fan cooling. The maximum temperature must not differ (ΔT) from the ambient temperature by more than the following values, nor may this differential be exceeded during operation.

(A3)

	ΔT [°C]
C 11...C 61	75
A 10...A 60	75
F 10...F 60	75
VF 44, VF 49	75
W 63...W 86	75
W 110	90





Check the condition of the temperature indicator previously installed on the gear unit during commissioning.

Example:



Limit temperature exceeded



Limit temperature NOT exceeded

Also check that the temperature is not excessive around the gear unit's bearings.

- Check the oil levels with reference to the tables and diagrams given in Annexes 1 and 2.
- Check that there are no signs of lubricant leaks near to the gear unit.
- **If any anomalies are found, identify their cause, repair the unit accordingly and top up the lubricant before putting the gear unit back into service.**

Every 3000 h of operation:

- For gear units with torque arm, check that the polymer bushings are not aged or damaged. If they are at all compromised, replace with original spare parts.

Every 5000 h of operation:

- Change the synthetic oil and bearing grease if the gear unit is not life-time lubricated.
- Replace all externally accessible seal rings unless this has already been done as a result of problems occurring before the scheduled maintenance deadline.



Every 5000 h of operation at rated torque:

(The minimum overhaul interval indicated here may increase considerably depending on actual conditions of service; see table (A5)).

- Overhaul the gear unit, unless this has already been done as a result of problems occurring before the specified deadline.

(An overhaul involves the replacement of bearings and/or other mechanical components which have worn to such an extent as to compromise the operation of the gear unit).

(A5)

$\frac{M_{n2}}{M_{r2}}$	Interval hours
1.0	5000
1.25	10000
1.5	17000
1.75	27000
2.0	40000

M_{n2} = nominal torque at output shaft

M_{r2} = required torque at output shaft



8.2 - LUBRICANTS

Before putting the gear unit into service, check the oil level. This must be done with the gear unit in the mounting position in which it will be used in the application. If necessary, if or top up the lubricant to the filling mark on the level cap which may be transparent or of the spill type.



Life-time lubricated gear units which are not subject to external contamination do not normally require periodic lubricant changes.



Do not mix oils of different nature or specifications and check that the oil is highly resistant to foaming and is EP rated.

If the same type of oil as that already in use is not available, drain the gear unit completely and flush its interior thoroughly with a light solvent before refilling with a new lubricant.

8.3 - OIL CHANGE

1. Place an adequate container under the drain plug.
2. Remove the filler and drain plugs and allow the oil to drain out.



The oil will drain better if it is warm.

3. Wait for a few minutes until all the oil has drained out, then screw the drain plug back on with a new gasket.
4. Fill the gear unit with the new oil (in its actual mounting position) to the centre of the level plug.
5. Tighten down the filler plug after fitting a new gasket.



The gear unit may be supplied with or without lubricant, as specified by the User. The quantity of oil to be filled is specified in the Sales Catalogue. This specification is, however, approximate, and reference must always be made to the centre of the level plug, the placement of which depends on the mounting position specified in the order.

Lubricants, solvents and detergents are toxic/harmful to health:



- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they can be fatal if swallowed.



Handle them with care using suitable individual safety equipment. Do not dump into the environment and dispose of in compliance with applicable legislation.

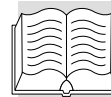


If a leak is found, identify the cause of the fault, repair it and refill with lubricant before operating the gear unit.



8.4 - RECOMMENDED/PERMITTED OILS

 	<p>OILS AND GREASES COMPATIBLE with Atex-certified gear units</p> <p>Greases:</p> <ul style="list-style-type: none"> • Klüber Asonic GHY 72 (for bearings) • Shell TVX Compound B (for greased gear trains) • Shell Tivela GL 00 (alternative for greased gear trains) • Klüberpaste 46 MR 401 (to facilitate coupling of cylindrical parts) • ITP Fluorocarbon gel 880 (for greasing contact seals) <p>Oils (as alternatives to Shell Tivela Oil S 320):</p> <ul style="list-style-type: none"> • Shell: Tivela Oil SC320 • Aral: Degol GS 320 • IP: Telium Oil VSF 320 (o Agip) • Klüber: Klübersynth GH 6 320 • Total: Carter SY 320 • Mobil: Glygoyle HE 320
--	--



		C	S	F	A		VF	VF R	VF_L	VF-EP	V		VR
		11...100	10...50	10...90	05...60	70...90	W	W R	W_L	W-EP	0.25-0.5	1...10	0.25...10
	Tivela S 220												
	Tivela S 320												
	Tivela S 460												
	Donax TX												
	Donax TA												
	Cassida Fluid WG 460	F	F	F	F	F	F	F		F			
	Cassida Fluid HF 46										F	F	
	Tivela GL 00							G					G
	Blasia S 220												
	Blasia S 320												
	Spartan EP 220												
	Spartan EP 320												
	Klübersynth GH 6 220												
	Klübersynth GH 6 320												
	Klübersynth UH1 6-460	F	F	F	F	F	F	F		F			
	Glygoyle 320												
	Glygoyle 460												
	Mobilgear SHC XMP 220												
	Mobilgear SHC XMP 320												
	Mobil SHC 630												
	Mobil SHC 632												
	Glygoyle 460 UH1	F	F	F	F	F	F	F		F			
	Alphasyn PG 220												
	Alphasyn PG 320												
	Carter SY 220												
	Carter SY 320												
	Carter SY 460												
	Nevastane SY 460	F	F	F	F	F	F	F		F			
	Degol GS 220												
	Degol GS 320												
	Degol PAS 220												
	Synlube CLP 220												
	Synlube CLP 320												
	Renoling PG 220												
	Renoling PG 320												

G = Grease

 Recommended

F = Food grade

 Permitted



8.5 - CHECKING EFFICIENCY

- Remove dust deposits from the gear unit and motor casings.
- Check that noise at constant load does not vary. Excessive vibration or noise can indicate wear of the gear train or failure of a bearing.
- Check the power absorption and voltage against the nominal values given on the motor's nameplate.
- Check the wear of linings on the brake motor (if used) and, if necessary, adjust the gap.
- Check for lubricant leaks from the gaskets/seals, caps and casings.
- Check all bolted couplings for wear, deformation or corrosion and tighten them down fully without overtightening.

8.6 - CLEANING

Clean all dust and process waste off the gear unit. Do not use solvents or other products which are incompatible with the construction material and do not direct high-pressure jets of water at the gear unit.

8.7 - PAINT COATING

In the factory, the cast-iron casing of the gear unit is magnetised and sprayed with polyester heat-setting resin which is then baked on. Aluminium casings are not paint coated.

Table (A6) shows in colour the types and gear frame sizes of gear units which are generally painted.

(A6)

C 05	C 11	C 21	C 31	C 35	C 41	C 51	C 61	C 70	C 80	C 90	C 100
A 05	A 10	A 20	A 30	A 35	A 41	A 50	A 55	A 60	A 70	A 80	A 90
F 10	F 20	F 30	F 40	F 50	F 60	F 70	F 80	0 90F			
S 10	S 20	S 30	S 40	S 50							
VF 27	VF 30	VF 44	VF 49	VF 130	VF 150	VF 185	VF 210	VF 250			
W 63	W 75	W 86	W 110								



If the gear unit is to be painted, tape the nameplate and seal rings to prevent contact with solvent.



9.0 - REPLACING PARTS



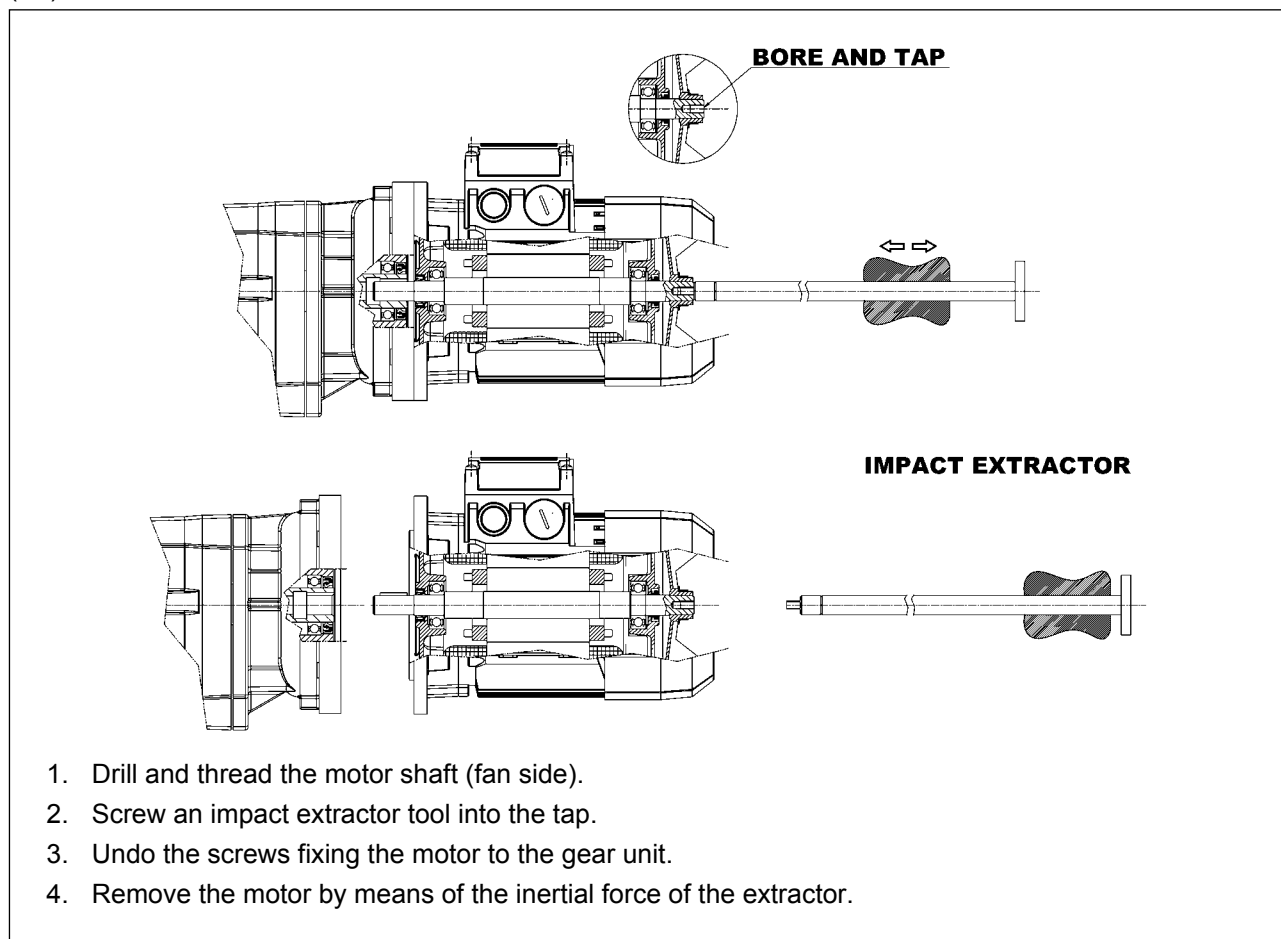
- Do not hesitate to replace parts and/or components if they are not able to guarantee safe and reliable operation.
- Never improvise repairs.
- The use of non-original spare parts not only voids the warranty but can compromise gear unit operation.

9.1 - TAKING APART OF THE IEC-STANDARD FLANGED MOTOR

If, during operation, the coupling area of the motor and gear unit has not rusted significantly, it should be possible to remove the motor without applying excessive force.

If, on the other hand, it proves difficult to remove the motor, do not use screwdrivers or levers to apply force as this can damage the flanges and coupling surfaces, but proceed as indicated below.

(S3)



9.2 - SCRAPPING THE GEAR UNIT

This must only be done by operators trained in the observance of applicable laws on health and safety at work.

Do not dump non-biodegradable products, lubricants and non-ferrous materials (rubber, PVC, resins, etc.) into the environment. Dispose of all such materials as stipulated by applicable environmental protection legislation.



Do not attempt to re-use parts or components which appear to be in good condition after they have been checked and/or replaced by qualified personnel and declared unsuitable for use.



10.0 - TROUBLESHOOTING

The following information is intended to serve as an aid in identifying and correcting defects and faults. In some cases, such problems may be caused by the plant or machine onto which the gear unit is assembled, and hence, the cause and eventual solution can be found in the Manufacturer's technical documentation for the machine/plant in question.

PROBLEM	CAUSE	SOLUTION
Bearing temperature too high	Oil level too low	Top up oil level
	Oil too old	Replace oil
	Defective bearings	Contact authorised workshop
Operating temperature too high	Oil level too high	Check oil level
	Oil too old	Replace oil
	Impurities in oil	Replace oil
Abnormal running noise	Gears damaged	Contact authorised workshop
	Bearing axial backlash too high	Contact authorised workshop
	Bearings defective or worn	Contact authorised workshop
	Service load too high	Correct service load to nominal values given in Sales Catalogue
	Impurities in oil	Replace oil
Abnormal noise at gear unit mounting	Mounting bolts loose	Tighten down to specified torque
	Mounting bolts worn	Replace bolts
Oil leaks	Oil level too high	Check oil level
	Casing/coupling seals inadequate	Contact authorised workshop
	Gaskets worn	Contact authorised workshop
Gear unit does not run or runs with difficulty	Oil viscosity too high	Replace oil (see table of recommended lubricants)
	Oil level too high	Check oil level
	Service load too high	Redesign drive for actual service load
Output shaft does not turn with motor running	Gears damaged	Contact authorised workshop



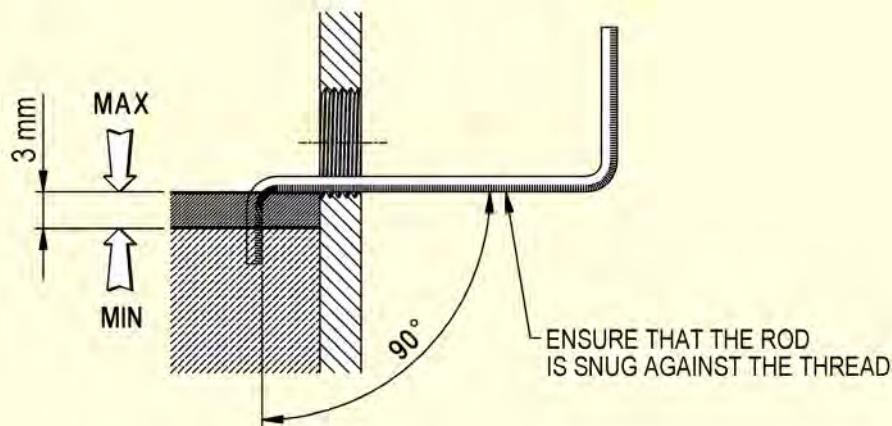
ANNEX 1 - CHECKING OIL LEVEL ON ATEX-SPECIFIED GEAR UNITS

Gear units are normally supplied with a yellow oil level plug of the spill type.

To check the oil level, first identify the yellow level plug.

Remove the plug and insert a bar of the right size for the hole and of the shape shown in the figure below.

If the level is more than 3 mm below the overflow level, top up and check the reason for the drop in oil level.

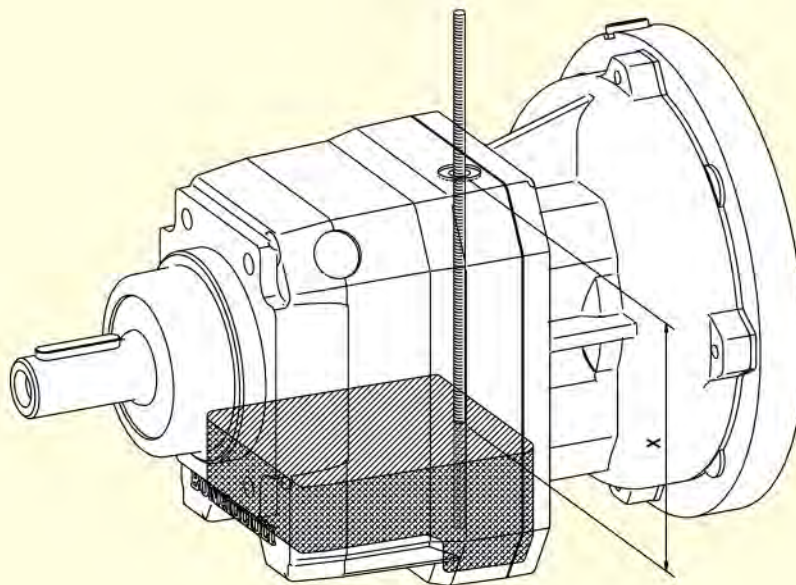


Helical in-line gear units C11, C21 and C31 (all mounting positions) and bevel helical gear units A10, A20 and A30 in mounting positions B6 and B7 only do not feature a level plug. The oil level must therefore be checked, not as described above, but via a hole provided for the purpose in the manner described hereafter.






Helical in-line gear units C 11, C 21, C 31

(S4)



(A7)



	 P						 F						 U-UF					
	B3	B6	B7	B8	V5	V6	B5	B51	B53	B52	V1	V3	B5	B51	B53	B52	V1	V3
C 11 2_ P63-P71	70	70	70	70	70	45	70	70	70	70	60	30	70	70	70	70	60	30
C 11 2_ P80...P112	75	75	75	75	75	45	75	75	75	75	70	30	75	75	75	75	70	30
C 21 2_ P63-P71, HS	70	70	70	70	70	40	70	70	70	70	70	45	70	70	70	70	70	45
C 21 2_ P80...P112	75	75	75	75	75	40	75	75	75	75	75	45	75	75	75	75	75	45
C 21 3_ P63-P71	50	50	50	50	50	30	50	50	50	50	50	30	50	50	50	50	50	30
C 21 3_ P80...P112	55	55	55	55	55	30	55	55	55	55	55	30	55	55	55	55	55	30
C 31 2_ P63...P112, HS	65	65	65	65	60	60	65	65	65	65	55	55	65	65	65	65	55	55
C 31 3_ P63...P112	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55

Values in the table are given in mm.

To check the oil level, proceed as follows:

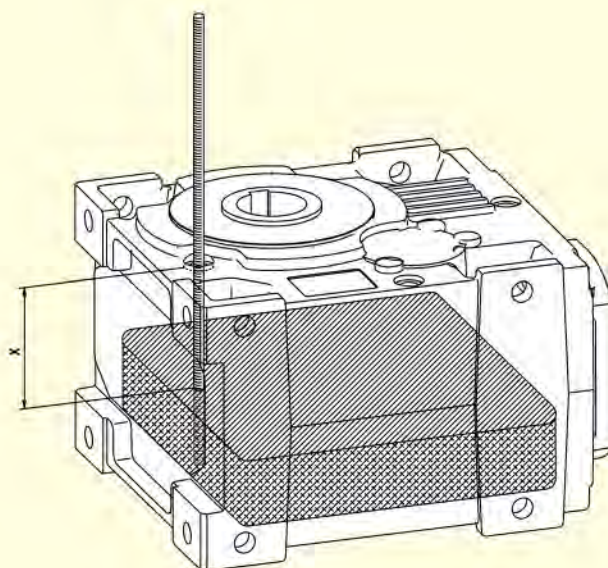
1. Place the gear unit in the mounting position as shown in diagram (S4).
2. Insert a dipstick through the yellow service cap (on top of the gear unit) until it touches the floor of the casing. Mark the level of the upper surface of the casing on the dipstick in this position.
3. Extract the dipstick and measure the distance **X** shown in diagram (S4) above.
4. The value **X** must be **less than** the value given in table (A7).



Bevel helical gear units A 10, A 20 and A 30 - Mounting positions B6 and B7



(S5)



(A8)

	B6	B7
A 10_ P63...P112	30	30
A 20_ P63...P112, HS	25	25
A 30_ P63...P112, HS	30	30

Values in the table are given in mm

To check the oil level, proceed as follows:

1. Place the gear unit in the mounting position as shown in diagram (S5).
2. Insert a dipstick through the yellow service cap (on top of the gear unit) until it touches the floor of the casing. Mark the level of the upper surface of the casing on the dipstick in this position.
3. Extract the dipstick and measure the distance **X** shown in diagram (S5) above.
4. The value **X** must be **less than** the value given in table (A8).










ANNEX 2 - LUBRICANT FILL QUANTITY


Helical in-line gear units, series C:

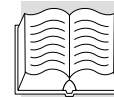
(A9)

	 																	
	P						F						U - UF					
	B3	B6	B7	B8	V5	V6	B5	B51	B53	B52	V1	V3	B5	B51	B53	B52	V1	V3
C 05 2	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	-	-	-	-	-	-
C 11 2	0.45	0.45	0.45	0.45	0.50	0.60	0.40	0.40	0.50	0.50	0.50	0.60	0.40	0.40	0.50	0.50	0.50	0.60
C 21 2	0.80	0.80	0.80	0.80	0.85	1.1	0.75	0.75	0.75	0.75	0.80	1.0	0.75	0.75	0.75	0.75	0.80	1.0
C 21 3	1.2	1.2	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2	1.3	1.4	1.2	1.2	1.2	1.2	1.3	1.4
C 31 2	1.4	1.4	1.4	1.4	1.5	1.5	1.3	1.3	1.3	1.3	1.5	1.5	1.3	1.3	1.3	1.3	1.5	1.5
C 31 3	1.6	1.6	1.6	1.6	1.81	1.6		1.6	1.6	1.6	1.8	1.81	1.6	1.6	1.6	1.6	1.81	1.8
C 35 2	1.6	1.5	1.5	1.3	2.1	2.4	-	-	-	-	-	-	1.6	1.5	1.5	1.3	2.1	2.4
C 35 3	1.5	1.4	1.5	1.3	2.0	2.3	-	-	-	-	-	-	1.5	1.4	1.5	1.3	2.0	2.3
C 35 4	2.3	2.1	2.3	2.1	2.7	3.1	-	-	-	-	-	-	2.3	2.1	2.3	2.1	2.7	3.1
C 41 2	2.2	2.0	2.1	1.9	2.7	3.4	-	-	-	-	-	-	2.2	2.0	2.1	1.9	2.7	3.4
C 41 3	2.1	1.9	2.1	1.9	2.6	3.2	-	-	-	-	-	-	2.1	1.9	2.1	1.9	2.6	3.2
C 41 4	2.8	2.6	2.8	2.6	3.5	3.9	-	-	-	-	-	-	2.8	2.6	2.8	2.6	3.5	3.9
C 51 2	3.1	3.0	3.1	3.0	4.3	5.0	-	-	-	-	-	-	3.1	3.0	3.1	3.0	4.3	5.0
C 51 3	3.0	2.8	3.0	3.0	4.1	4.9	-	-	-	-	-	-	3.0	2.8	3.0	3.0	4.1	4.9
C 51 4	4.3	4.1	4.4	4.2	5.4	6.1	-	-	-	-	-	-	4.3	4.1	4.4	4.2	5.4	6.1
C 61 2	4.2	4.0	4.2	4.1	6.0	6.7	-	-	-	-	-	-	4.2	4.0	4.2	4.1	6.0	6.7
C 61 3	4.2	4.0	4.2	4.1	6.0	6.7	-	-	-	-	-	-	4.2	4.0	4.2	4.1	6.0	6.7
C 61 4	6.1	5.9	6.1	6.0	7.9	8.6	-	-	-	-	-	-	6.1	5.9	6.1	6.0	7.9	8.6
C 70 2	6.5	8.5	8.5	7.5	11	7.5	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 70 3	6.5	8.5	8.5	7.5	11	7.5	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 70 4	6.5	8.5	8.5	7.5	11	8.0	6.5	8.5	8.5	7.5	11	7.5	-	-	-	-	-	-
C 80 2	11	14	14	13	1813		11	14	14	13	1813		-	-	-	-	-	-
C 80 3	11	14	14	13	1813		11	14	14	13	1813		-	-	-	-	-	-
C 80 4	11	14	14	13	1813		11	14	14	13	1813		-	-	-	-	-	-
C 90 2	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 90 3	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 90 4	19	25	25	22	31	22	19	25	25	22	31	22	-	-	-	-	-	-
C 100 2	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-
C 100 3	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-
C 100 4	27	37	37	33	45	33	27	37	37	33	45	33	-	-	-	-	-	-



 Life-time lubricated gear units.

 Life-time lubricated gear units only in combination with ATEX variants.



 Lubricant is not factory filled.

**Bevel helical gear units, series A:**


(A10)


						
	B3	B6	B7	B8	VA	VB
A 05 2	0.50	0.50	0.50	0.50	0.50	0.50
A 10 2	1.4	1.4	1.4	1.4	1.4	1.4
A 20 2	2.3	2.3	2.3	2.3	2.3	2.3
A 20 3	2.6	2.6	2.6	2.6	2.6	2.6
A 30 2	3.2	3.2	3.2	3.2	3.2	3.2
A 30 3	3.6	3.6	3.6	3.6	3.6	3.6
A 35 2	2.83.2		3.2	3.2	3.9	2.7
A 35 3	3.5	3.83.83.6			4.9	3.3
A 41 2	3.83.1		3.0	4.0	5.3	3.3
A 41 3	4.6	3.9	3.84.86.1			4.0
A 50 2	4.9	8.1	4.7	8.4	11	9.2
A 50 3	5.1	8.1	4.7	8.4	11	9.2
A 50 4	6.3	8.2	5.3	8.3	13	9.1
A 55 2	3.2	6.2	6.1	7.0	8.5	8.0
A 55 3	3.86.86.5			7.7	9.2	8.2
A 55 4	5.2	9.2	9.0	8.8	10.6	8.7
A 60 2	6.88	.1	12	15	18	15
A 60 3	6.88	.1	12	15	18	15
A 60 4	7.2	11	7.4	16	19	14
A 70 3	10	14	10	15	20	14
A 70 4	13	14	10	15	23	14
A 80 3	15	22	15	26	35	22
A 80 4	20	22	15	26	39	22
A 90 3	31	35	37	44	66	39
A 90 4	41	35	37	44	73	39

(A11)

						
	B3	B6	B7	B8	VA	VB
A 10 2	0.80	see Annex 1	see Annex 1	1.2	1.2	1.1
A 20 2	1.2			1.7	1.81.5	
A 20 3	1.5			1.7	2.4	1.6
A 30 2	1.82.3				2.6	2.1
A 30 3	2.3			2.4	3.5	2.3
A 41 2	4.0	4.1	4.1	4.7	5.2	4.4
A 41 3	4.0	4.0	4.0	4.7	6.1	3.9
A 50 2	4.9	8.1	4.7	8.4	11	9.2
A 50 3	5.1	8.1	4.7	8.4	11	9.2
A 50 4	6.3	8.2	5.3	8.3	13	9.1
A 60 2	6.88	.1	12	15	18	15
A 60 3	6.88	.1	12	15	18	15
A 60 4	7.2	11	7.4	16	19	14





 Life-time lubricated gear units.

 Lubricant is not factory filled.





Shaft-mounted gear units, series F:


(A12)


	 [I]					
	H1	H2	H3	H4	H5	H6
F 10 2	0.95	0.95	0.95	0.95	0.95	0.95
F 20 2	1.4	1.4	1.4	1.4	1.4	1.4
F 20 3	1.81.81.81	1.81.81.8				
F 30 2	2.6	2.1	1.5	2.1	2.9	2.1
F 30 3	2.6	2.1	1.5	2.1	2.9	2.1
F 30 4	2.9	2.4	1.7	2.4	3.2	2.4
F 40 2	5.0	3.9	4.0	3.1	5.1	4.0
F 40 3	5.0	3.9	4.0	3.1	5.1	4.0
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.2	6.7	7.6	4.7	9.2	6.7
F 50 3	9.2	6.7	7.6	4.7	9.2	6.7
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	10	7.4	10	14	10
F 60 4	15	12	8.0	11	15	11
F 70 3	23	20	9.7	16	24	19
F 70 4	23	20	9.7	16	27	19
F 80 3	40	34	16	29	42	31
F 80 4	40	34	16	29	4831	
F 90 3	71	59	32	49	76	55
F 90 4	71	59	32	49	86	55

(A13)

	 [I]					
	H1	H2	H3	H4	H5	H6
F 10 2	1.2	1.3	0.70	0.80	0.80	1.1
F 20 2	2.0	1.7	0.90	1.3	1.2	1.7
F 20 3	2.3	1.81.2		1.5	1.81.8	
F 30 2	2.6	2.6	1.5	1.7	2.5	2.6
F 30 3	2.5	2.5	1.5	1.6	2.4	2.5
F 30 4	3.0	2.7	1.9	2.0	3.3	2.7
F 40 2	5.5	4.4	4.5	3.6	5.6	4.9
F 40 3	5.5	4.4	4.5	3.6	5.6	4.9
F 40 4	5.3	4.3	4.3	3.3	5.5	4.4
F 50 2	9.7	7.2	8.1	5.2	9.7	7.6
F 50 3	9.7	7.2	8.1	5.2	9.7	7.6
F 50 4	9.7	7.4	8.1	5.1	9.9	7.4
F 60 3	14	11	7.9	11	15	11
F 60 4	15	12	8.0	11	15	11




 Life-time lubricated gear units.

 Lubricant is not factory filled.

**Worm gear units, series VF:**

(A14)

								
			B3	B6	B7	B8	V5	V6
VF 27	N - A - V - F	HS - P(IEC)	0.025	0.025	0.025	0.025	0.025	0.025
VF 30	N - A - V - F - P	HS - P(IEC)	0.045	0.045	0.045	0.045	0.045	0.045
VF 44	N - A - V - F - FA - P	HS - P(IEC)	0.075	0.075	0.075	0.075	0.075	0.075
VFR 44	N - A - V - F - FA - P	P(IEC)	0.050	0.050	0.050	0.050	0.050	0.050
VF 49	N - A - V - F - FA - P	HS - P(IEC)	0.12	0.12	0.12	0.12	0.12	0.12
VFR 49	N - A - V - F - FA - P	HS - P(IEC)	0.065	0.065	0.065	0.065	0.065	0.065
VF 130	N	HS - P(IEC)	2.3	2.5	2.5	3.0	3.2	3.4
VFR 130	N	HS - P(IEC)	0.70	0.50	0.50	0.40	0.40	0.50
VF 130	V	HS - P(IEC)	3.4	2.5	2.5	3.1	3.0	2.5
VFR 130	V	HS - P(IEC)	0.50	0.50	0.50	0.40	0.40	0.70
VF 130	A - F - FC - FR - P	HS	3.9	2.5	2.5	2.3	3.3	3.3
VF 130	A - F - FC - FR - P	P(IEC)	3.0	2.5	2.5	2.3	3.3	3.3
VFR 130	A - F - FC - FR - P	HS - P(IEC)	0.40	0.50	0.50	0.70	0.40	0.50
VF 150	N	HS - P(IEC)	3.0	3.5	3.5	4.3	3.84.0	
VFR 150	N	HS - P(IEC)	1.0	0.80	0.80	0.60	0.40	1.0
VF 150	V	HS - P(IEC)	4.0	3.5	3.5	3.6	4.3	3.0
VFR 150	V	HS - P(IEC)	1.0	0.80	0.80	0.40	0.60	1.0
VF 150	A - F - FC - FR - P	HS	4.5	3.5	3.5	3.0	3.9	3.9
VF 150	A - F - FC - FR - P	P(IEC)	4.3	3.5	3.5	3.0	3.9	3.9
VFR 150	A - F - FC - FR - P	HS - P(IEC)	0.60	0.80	0.80	1.0	0.40	1.0
VF 185	N	HS - P(IEC)	5.0	5.5	5.5	7.86.6		6.8
VFR 185	N	HS - P(IEC)	1.0	0.80	0.80	0.60	0.40	1.0
VF 185	V	HS - P(IEC)	6.85.5		5.5	6.4	7.85.4	
VFR 185	V	HS - P(IEC)	1.0	0.80	0.80	0.40	0.60	1.0
VF 185	A - F - FC - FR - P	HS	9.6	5.5	5.5	5.0	6.7	6.7
VF 185	A - F - FC - FR - P	P(IEC)	7.85.5		5.5	5.0	6.7	6.7
VFR 185	A - F - FC - FR - P	HS - P(IEC)	0.60	0.80	0.80	1.0	0.40	1.0
VF 210	N	HS - P(IEC)	7.5	9.5	9.5	7.3	9.2	9.0
VFR 210	N	HS - P(IEC)	1.3	1.1	1.1	0.80	0.70	1.3
VF 210	V	HS - P(IEC)	8.9	9.5	9.5	7.3	11	8.0
VFR 210	V	HS - P(IEC)	1.3	1.1	1.1	0.60	0.90	1.3
VF 210	A - F - FC - FR - P	HS	15	9.5	9.5	7.5	9.4	8.9
VF 210	A - F - FC - FR - P	P(IEC)	11	9.5	9.5	7.5	9.4	8.9
VFR 210	A - F - FC - FR - P	HS - P(IEC)	0.80	1.1	1.1	1.3	0.70	1.3
VF 250	N	HS - P(IEC)	11	17	17	11	17	17
VFR 250	N	HS - P(IEC)	1.3	1.1	1.1	0.80	0.70	1.3
VF 250	V	HS - P(IEC)	17	17	17	11	23	11
VFR 250	V	HS - P(IEC)	1.3	1.1	1.1	0.60	0.90	1.3
VF 250	A - F - FC - FR - P	HS	28 1	7	17	11	18 1	7
VF 250	A - F - FC - FR - P	P(IEC)	23	17	17	11	1817	
VFR 250	A - F - FC - FR - P	HS - P(IEC)	0.80	1.1	1.1	1.3	0.70	1.3

 VF permanent lubrication.

 VFR permanent lubrication.

For VFR units the lubricant charge refers only to the additional helical reduction.

**Worm gear units, series W:**

(A15)

				oil [I]						
				B3	B6	B7	B8	V5	V6	R
W 63	i = 7, 10, 12, 15			0.31	0.31	0.31	0.31	0.31	0.31	0.15
	i = 19, 24, 30, 38, 45, 64, 80, 100			0.380	0.380		0.380	0.380		
W 75	i = 7, 10, 15			0.480	0.480		0.480	0.480		0.25
	i = 30, 40			0.52	0.52	0.52	0.52	0.52	0.52	
	i = 20, 25, 50, 60, 80, 100			0.56	0.56	0.56	0.56	0.56	0.56	
W 86	i = 7, 10, 15			0.64	0.64	0.64	0.64	0.64	0.64	0.25
	i = 30			0.73	0.73	0.73	0.73	0.73	0.73	
	i = 20, 23, 40, 46, 56, 64, 80, 100			0.90	0.90	0.90	0.90	0.90	0.90	
				B3	B6	B7	B8	V5	V6	R
W 110	P80...P132	-	-	1.5	1.7	1.7	1.9	1.7	1.6	0.40
	-	M2 – M3	-	1.5	1.7	1.7	1.9	1.7	1.6	
	-	-	7 ≤ i ≤ 15	1.5	1.7	1.7	1.9	1.7	1.6	
			20 ≤ i ≤ 100	2.7	1.7	1.7	1.9	1.7	1.6	

Life-time lubricated gear units.

Life-time lubricated gear units only in combination with ATEX variants.

Lubricant is not factory filled.

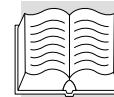
Single-stage helical gear units, series S:

(A16)

	oil [I]											
	P						F					
	B3	B6	B7	B8	V5	V6	B5	B51	B52	B53	V1	V3
S 10 1	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
S 20 1	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
S 30 1	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
S 40 1	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
S 50 1	1.7	2.2	2.2	3.0	3.0	2.0	1.7	1.7	1.7	1.7	3.0	2.0

Life-time lubricated gear units.

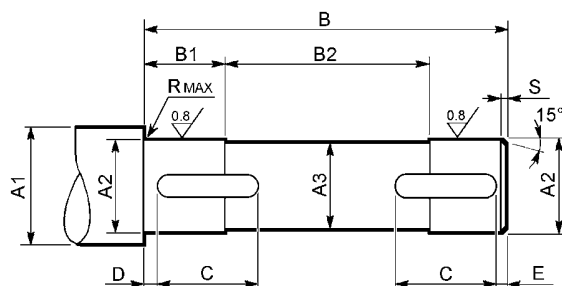
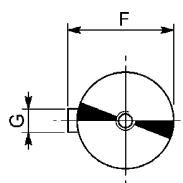
Lubricant is not factory filled.



ANNEX 3 - CUSTOMER'S SHAFT

Series A

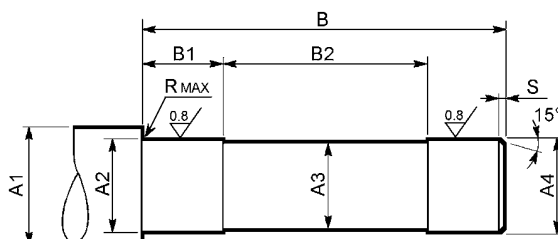
UH



(A17)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	UNI 6604
A 05	≥ 30	25 h7	24	102	21	62	20	2	2	288	h9	0.5	1.5	8x7x20 A
A 10	≥ 35	30 h7	29	118	16	87	20	2	2	33	8 h9	0.5	1.5	8x7x20 A
	≥ 30	25 h7	24	118	16	87	20	2	2	28	8 h9	0.5	1.5	8x7x20 A
A 20	≥ 42	35 h7	34	13820		98	20	2	2	38	10 h9	0.5	1.5	10x8x20 A
	≥ 35	30 h7	29	13820		98	25	2	2	33	8 h9	0.5	1.5	8x7x25 A
A 30	≥ 47	40 h7	39	15823		112	30	2	2	43	12 h9	0.5	1.5	12x8x30 A
	≥ 42	35 h7	34	15823		112	30	2	2	38	10 h9	0.5	1.5	10x8x30 A
A 35	≥ 47	40 h7	39	175	33	109	40	2	2	43	10 h9	1	1.5	12x8x40 A
	≥ 42	35 h7	34	175	33	109	40	2	2	3810	h9	1	1.5	10x8x40 A
A 41	≥ 52	45 h7	44	184	28	128	45	2.5	2.5	49.5	14 h9	1	2	14x9x45 A
	≥ 47	40 h7	39	184	28	128	50	2.5	2.5	43	12 h9	1	2	12x8x50 A
A 50	≥ 63	55 h7	54	226	37.5	151	55	2.5	2.5	59	16 h9	1	2	16x10x55 A
	≥ 57	50 h7	49	226	37.5	151	65	2.5	2.5	53.5	14 h9	1	2	14x9x65 A
A 55	≥ 70	60 h7	59	226	37.5	151	65	2.5	2.5	59	16 h9	2	2	18x11x65 A
	≥ 60	50 h7	49	226	37.5	151	75	2.5	2.5	53.5	14 h9	2	2	14x9x75 A
A 60	≥ 7870	h7	69	248	48	152	70	2.5	2.5	74.5	20 h9	2.5	2	20x12x70 A
	≥ 68	60 h7	59	248	48	152	80	2.5	2.5	64	18 h9	2.5	2	18x11x80 A
A 70	≥ 89	80 h7	79	303	58	187	90	3	3	85	22 h9	2.5	2.5	22x14x90 A
	≥ 7870	h7	69	303	58	187	110	3	3	74.5	20 h9	2.5	2.5	20x12x110 A
A 80	≥ 99	90 h7	89	358	78	202	120	3	3	95	25 h9	2.5	2.5	25x14x120 A
	≥ 89	80 h7	79	358	78	202	130	3	3	85	22 h9	2.5	2.5	22x14x130 A
A 90	≥ 111	100 h7	99	40878252			160	3	3	106	28 h9	2.5	2.5	28x16x160 A
	≥ 99	90 h7	89	408	78	252	190	3	3	95	25 h9	2.5	2.5	25x14x190 A

US

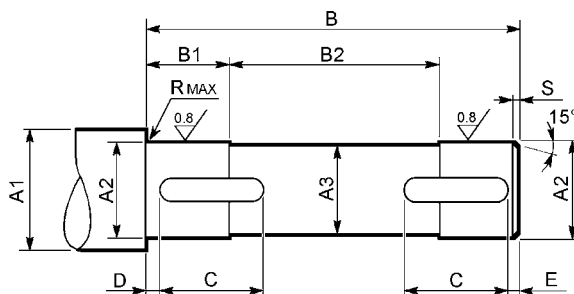
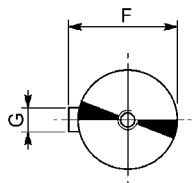


(A18)


	A1	A2	A3	A4	B	B1	B2	R	S
A 10	≥ 42	32 h7	29	30 h6	147.5	34	77.5	0.5	1.5
A 20	≥ 4837	h7	34	35 h6	170	40	89	0.5	1.5
A 30	≥ 54	42 h7	39	40 h6	191.5	4895.5		0.5	1.5
A 35	≥ 54	42 h7	39	40 h6	208.5	48	112.5	0.5	1.5
A 41	≥ 60	47 h7	44	45 h6	222	53	117	1	2
A 50	≥ 72	57 h7	54	55 g6	264	46	156	1	2
A 55	≥ 72	62 h7	59	60 g6	266	46	1582,5		2
A 60	≥ 90	72 h7	69	70 g6	293	48178		2.5	2.5
A 70	≥ 104	82 h7	79	80 g6	352.5	90	172.5	2.5	2.5
A 80	≥ 114	92 h7	89	90 g6	416	100	216	2.5	2.5
A 90	≥ 126	102 h7	99	100 g6	469	78321		2.5	2.5

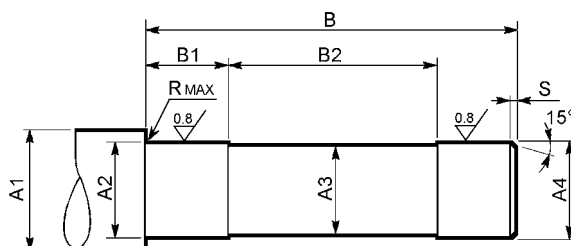


Series F



(A19)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	 UNI 6604
F 10	≥ 35	30 h7	29	79	15.5	4820		2	2	33	8 h9	0.5	1.5	8x7x20 A
	≥ 30	25 h7	24	79	15.5	4820		2	2	28	8 h9	0.5	1.5	8x7x20 A
F 20	≥ 42	35 h7	34	99	1863		22	2	2	38	10 h9	0.5	1.5	10x8x22 A
	≥ 35	30 h7	29	99	1863		22	2	2	33	8 h9	0.5	1.5	8x7x22 A
F 30	≥ 47	40 h7	39	104	2848	30		2	2	43	12 h9	0.5	1.5	12x8x30 A
	≥ 42	35 h7	34	104	2848	30		2	2	38	10 h9	0.5	1.5	10x8x30 A
F 40	≥ 52	45 h7	44	118	27.5	63	45	2.5	2.5	49.5	14 h9	1	2.0	14x9x45 A
	≥ 47	40 h7	39	118	27.5	63	45	2.5	2.5	43	12 h9	1	2.0	12x8x45 A
F 50	≥ 63	55 h7	54	139	33	73	50	2.5	2.5	59	16 h9	1	2.0	16x10x50 A
	≥ 57	50 h7	49	139	33	73	50	2.5	2.5	53.5	14 h9	1	2.0	14x9x50 A
F 60	≥ 78	70 h7	69	180	38	104	70	2.5	2.5	74.5	20 h9	1	2.0	20x12x70 A
	≥ 68	60 h7	59	180	38	104	70	2.5	2.5	64	18 h9	1	2.0	18x11x70 A
F 70	≥ 89	80 h7	79	229	58	113	75	3	3	85	22 h9	2.5	2.5	22x14x75 A
	≥ 78	70 h7	69	229	58	113	75	3	3	74.5	20 h9	2.5	2.5	20x12x75 A
F 80	≥ 99	90 h7	89	272	78	116	100	3	3	95	25 h9	2.5	2.5	25x14x100 A
	≥ 89	80 h7	79	272	78	116	100	3	3	85	22 h9	2.5	2.5	22x14x100 A
F 90	≥ 111	100 h7	99	333	87.5	158	110	3	3	106	28 h9	2.5	2.5	28x16x110 A
	≥ 99	90 h7	89	333	87.5	158	110	3	3	95	25 h9	2.5	2.5	25x14x110 A

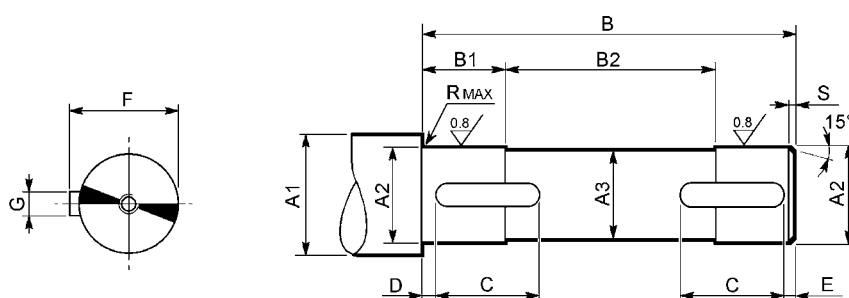


(A20)


	A1	A2	A3	A4	B	B1	B2	R	S
F 10	≥ 36	27 h7	24	25 h6	13834		70	0.5	1.5
F 20	≥ 42	32 h7	29	30 h6	160	388	4	0.5	1.5
F 30	≥ 50	38 h7	35	36 h6	155	40	73	1	2
F 40	≥ 58	44 h7	41	42 h6	177	46.5	82	1	2
F 50	≥ 68	54 h7	51	52 g6	201	48	91	1	2
F 60	≥ 84	67 h7	64	65 g6	248	53	133	1.5	2
F 70	≥ 104	82 h7	79	80 g6	308	78	140	2.5	2.5
F 80	≥ 114	92 h7	89	90 g6	365	88	177	2.5	2.5
F 90	≥ 126	102 h7	99	100 g6	429.5	98	221.5	2.5	2.5




Series VF and W



(A21)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	 UNI 6604
VF 30	≥ 19	14 f7	13	53	18.5	16	40	6.5	6.5	16	5 h9	0.5	1.5	5x5x40 A
VF 44	≥ 23	18f7	17	62	22.5	17	50	6	6	20.5	6 h9	0.5	1.5	6x6x50 A
VF 49	≥ 30	25 f7	24	80	20.5	39	20	2	2	28	8 h9	1	1.5	8x7x20 A
VF 130	≥ 52	45 f7	44	163	50.5	62	60	2.5	2.5	49.5	14 h9	2.5	2	14x9x60 A
VF 150	≥ 57	50 f7	49	173	53	67	70	2.5	2.5	53.5	14 h9	2.5	2	14x9x70 A
VF 185	≥ 68	60 f7	59	188	63	62	80	2.5	2.5	64	18 h9	2.5	2	18x11x80 A
VF 210	≥ 99	90 f7	89	258	83	92	80	3	3	95	25 h9	2.5	2.5	25x14x80 A
VF 250	≥ 121	110 h7	109	318	83	152	80	3	3	116	28 h9	2.5	2.5	28x16x80 A

(A22)

	A1	A2	A3	B	B1	B2	C	D	E	F	G	R	S	 UNI 6604
W 63	≥ 30	25 f7	24	11838		42	35	2	2	28	8 h9	1	1.5	8x7x35 A
W 75	≥ 35	28f7	27	125	38	49	40	2	2	31	8h9	1	1.5	8x7x40 A
	≥ 35	30 f7	29	125	3849		40	2	2	33	8 h9	1	1.5	8x7x40 A
W 86	≥ 42	35 f7	34	13843		52	40	2	2	38	10 h9	1.5	1.5	10x8x40 A
W 110	≥ 4842	f7	41	153	43	67	50	2.5	2.5	45	12 h9	1.5	2	12x8x50 A



ANNEX 4 - LIFTING



When lifting, use accessories such as eyebolts, snap hooks, screw clamps, straps, ropes, hooks etc. which are certified and adequate for the load.

The weight of the product to be lifted is given in the Sales Catalogue.

The method of attachment for the products covered by this Manual are detailed below according to the various product series, sizes and configurations.

The most suitable type of solution for safely lifting and handling each is indicated below.

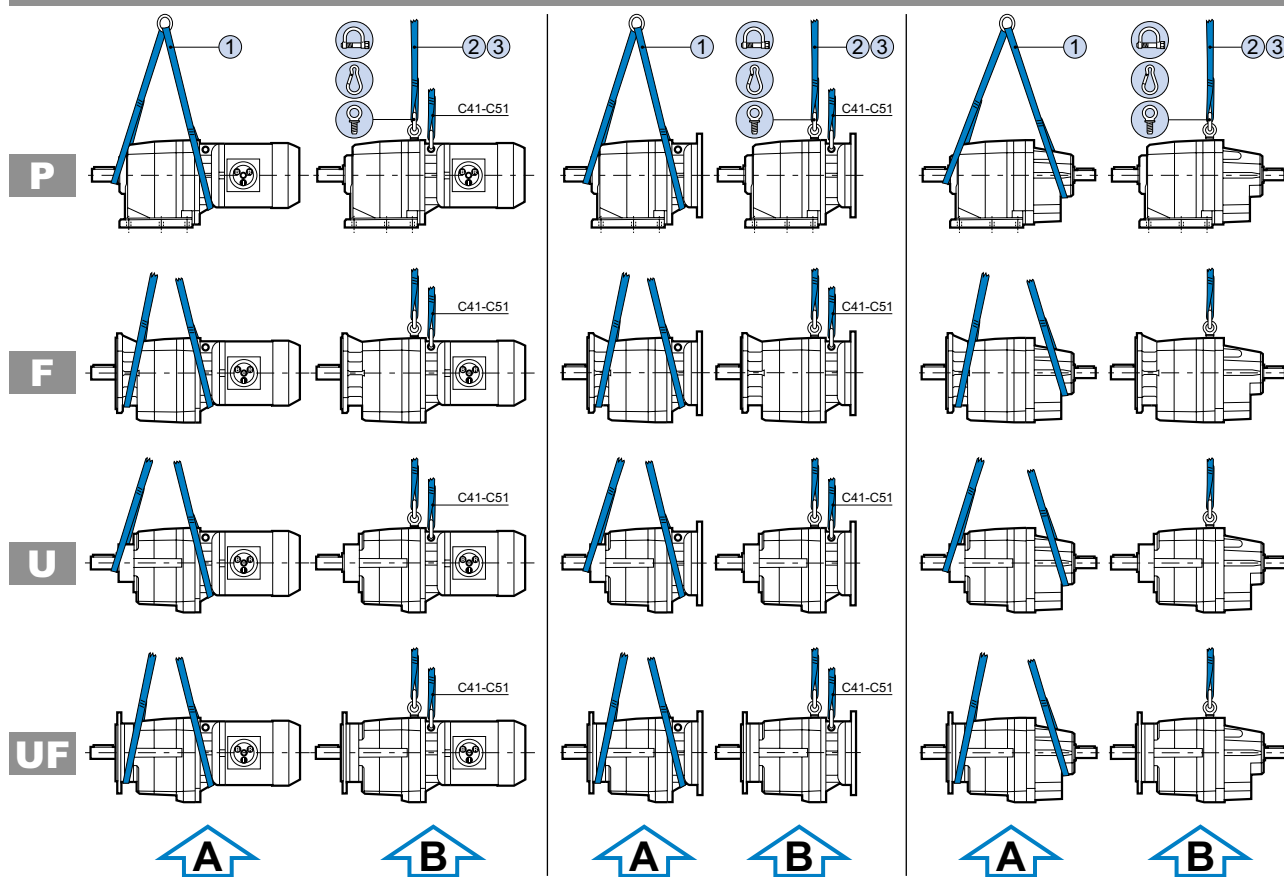
Symbols:

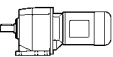
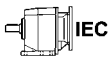
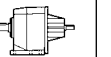
Lifting method	Manual	Through mechanical equipment	
Simbol	M	A	B
Approximate weight	≤ 15 Kg	> 15 Kg	
Instruction	—	Recommended method for positioning	Recommended method for handling and positioning
Warning	—	The load may be unstable	The load may sway or oscillate.
Solution	—	Slide the lifting ring to align it with the load's centre of gravity as shown in the diagrams below Lock the ropes under the ring with a cable clamp or similar device so as to prevent them sliding, and lift the load Observe all precautions regarding the handling of loads	Stabilise the moving load by hand. Observe all precautions regarding the handling of loads

The load must not be allowed to sway or oscillate by more than 15° in any direction when being lifted.
If the oscillation exceeds this limit, stop and repeat the lifting operation as instructed.






Series C

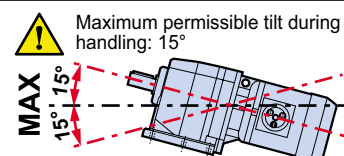


							 IEC	
	M05	M1	M2	M3	M4	M5		
C 05	M	—	—	—	—	—	—	—
C 11	M	A	—	—	—	—	M	M
C 21	M	A	—	—	—	—	M	M
C 31	M	A	—	—	—	—	M	M
C 35	A	—	—	—	—	—	A	A
C 41	A - B	—	—	—	—	—	A - B	A - B
C 51	—	A - B	—	—	—	—	A - B	A - B
C 61	—	A - B	—	—	—	—	A - B	A - B
C 70	—	A - B	—	—	—	—	A - B	A - B
C 80	—	A - B	—	—	—	—	A - B	A - B
C 90	—	A - B	—	—	—	—	A - B	A - B
C 100	—	A - B	—	—	—	—	A - B	A - B

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

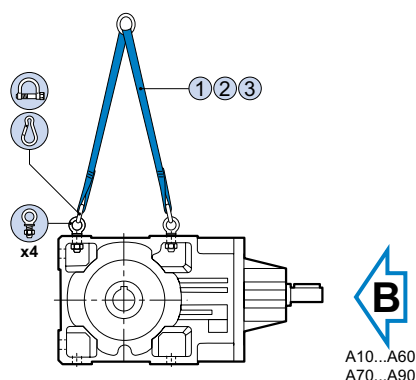
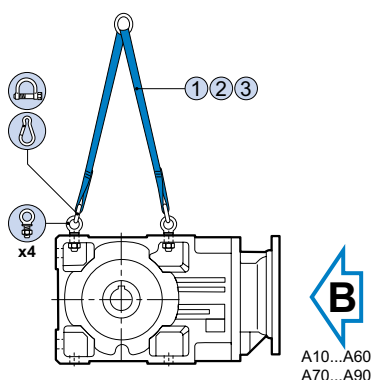
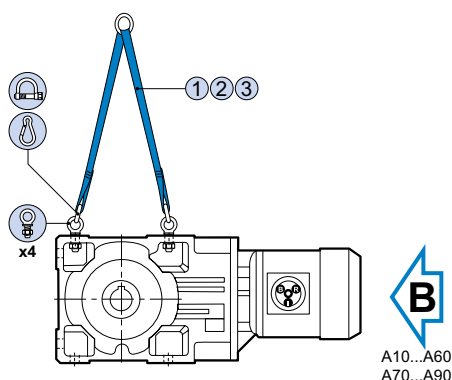
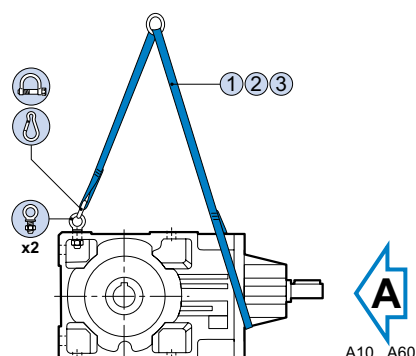
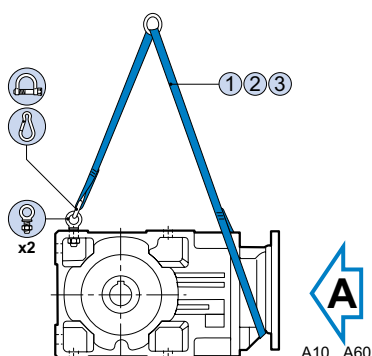
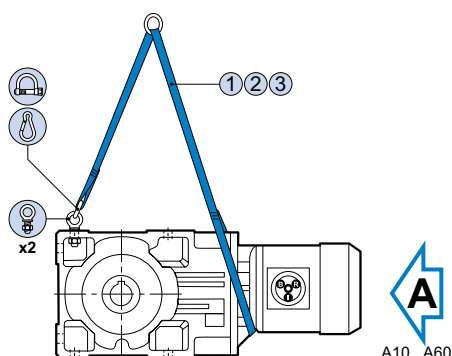
-  Screw clamp (use with harness)
-  Snap hook (use with rope)
-  Eyebolt (already fitted to gear units C50...C100)

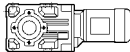

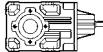
- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B





Series A



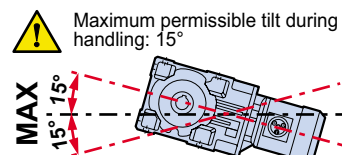
							 IEC	
	M05	M1	M2	M3	M4	M5		
A 05	M		A	—	—	—	M	—
A 10	M		A		—	—	M	M
A 20	A - B				—	—	M (P63...P90)	M
							A - B (P100...P112)	
A 30	A				—	—	A	A
A 35	A					—	A	A
A 41	A - B					—	A - B	A - B
A 50	—	A - B				—	A - B	A - B
A 55	—	A - B					A - B	A - B
A 60	—	B					A - B	A - B
A 70	—	B					B	B
A 80	—	B					B	B
A 90	—	B					B	B

Recommended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

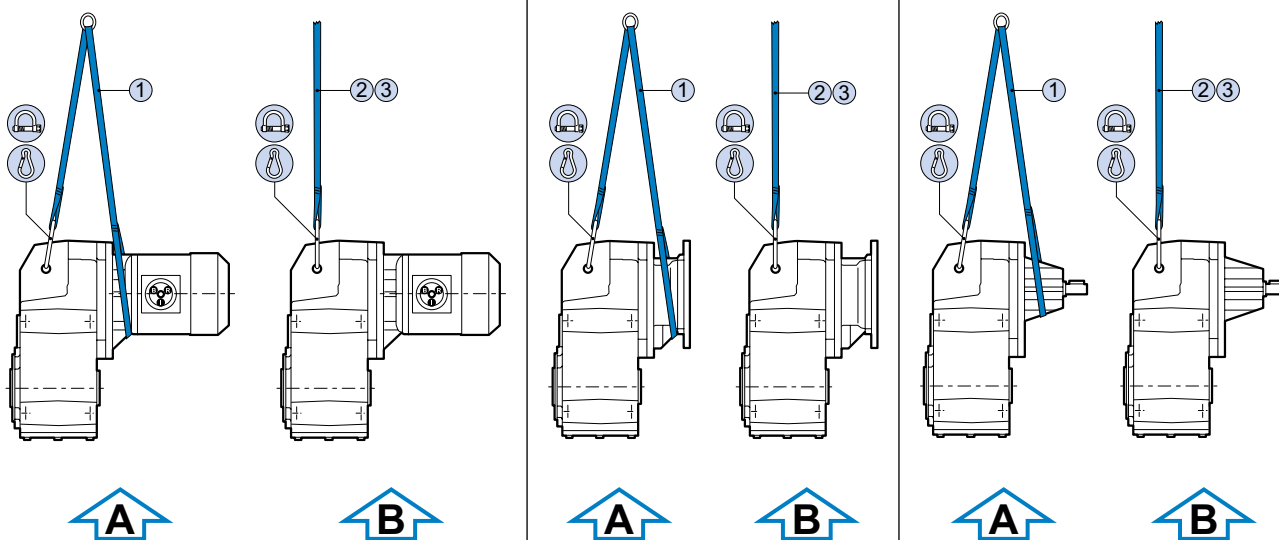
- Screw clamp (use with harness)
- Snap hook (use with rope)
- Eyebolt

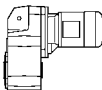


- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B







Series F



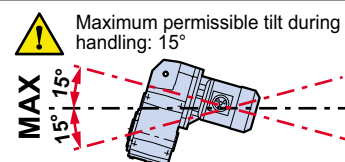
							 IEC	
	M05	M1	M2	M3	M4	M5		
F 10	M		A - B		—	—	M	M
F 20	A - B				—	—	M (P63...P90)	M
							A - B (P100...P112)	
F 30	A				—	—	A	A
F 40	A - B					—	A - B	A - B
F 50	—	A - B				—	A - B	A - B
F 60	—	A - B					A - B	A - B
F 70	—	A - B					A - B	A - B
F 80	—	A - B					A - B	A - B
F 90	—	A - B					A - B	A - B

Recommended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

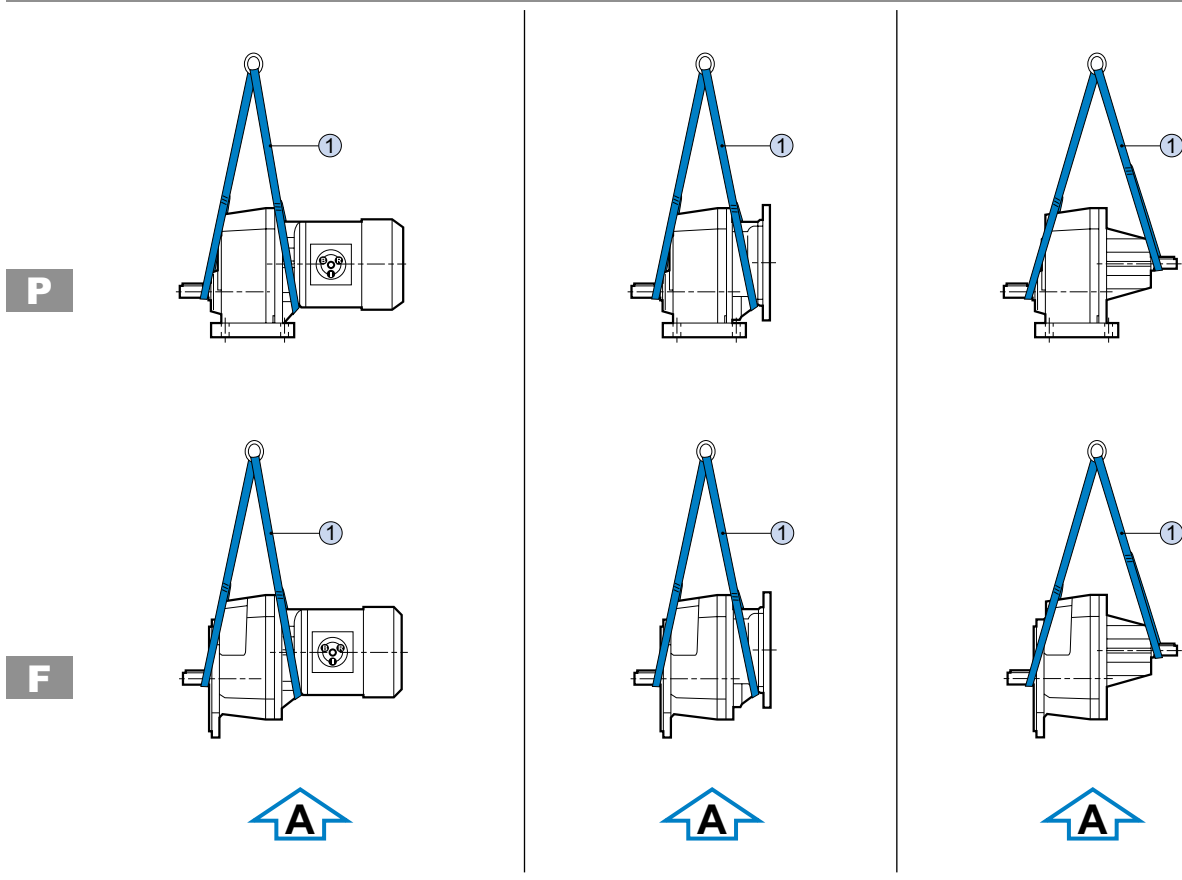
-  Screw clamp (use with harness)
-  Snap hook (use with rope)




- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B





Series S



							
	M05	M1	M2	M3	M4		
S 10 1	M		A		—	M	M
S 20 1	M		A		—	M	M
S 30 1	M		A		—	M	M
S 40 1			A			A	A
S 50 1			A			A	A

Reccomended:
solution A for positioning.

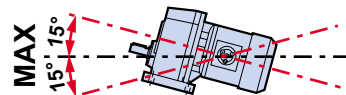
① Ring harness

M Lift manually
(weight ≤ 15 kg)

A Lift as per diagram A

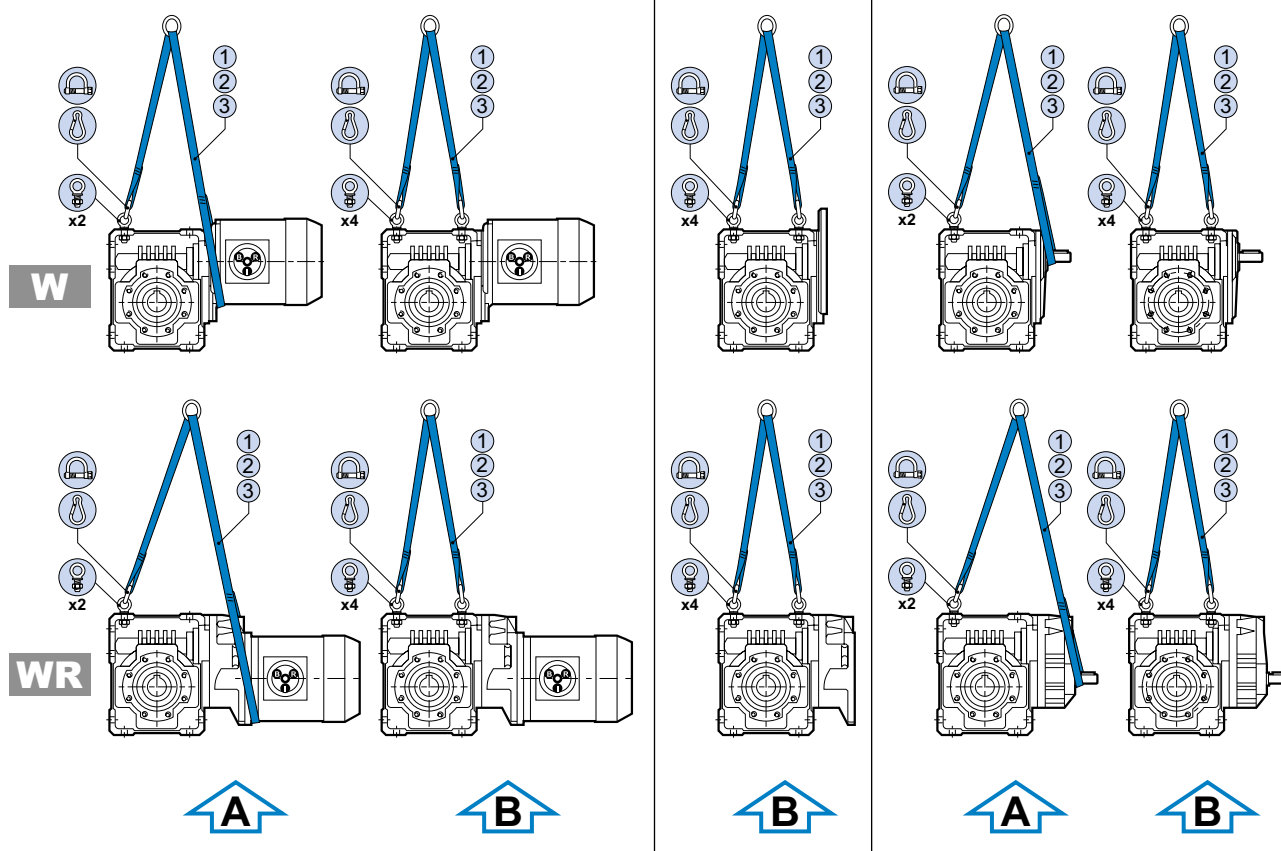





Maximum permissible tilt during
handling: 15°








Series W



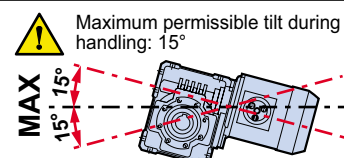
				
W 63	WR 63	M	M	M
W 75	WR 75	A - B	M	M
W 86	WR 86	A - B	M	M
W 110	WR 110	A - B	B	A - B

Reccomended:
solution A for positioning; solution B for positioning and handling.

- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

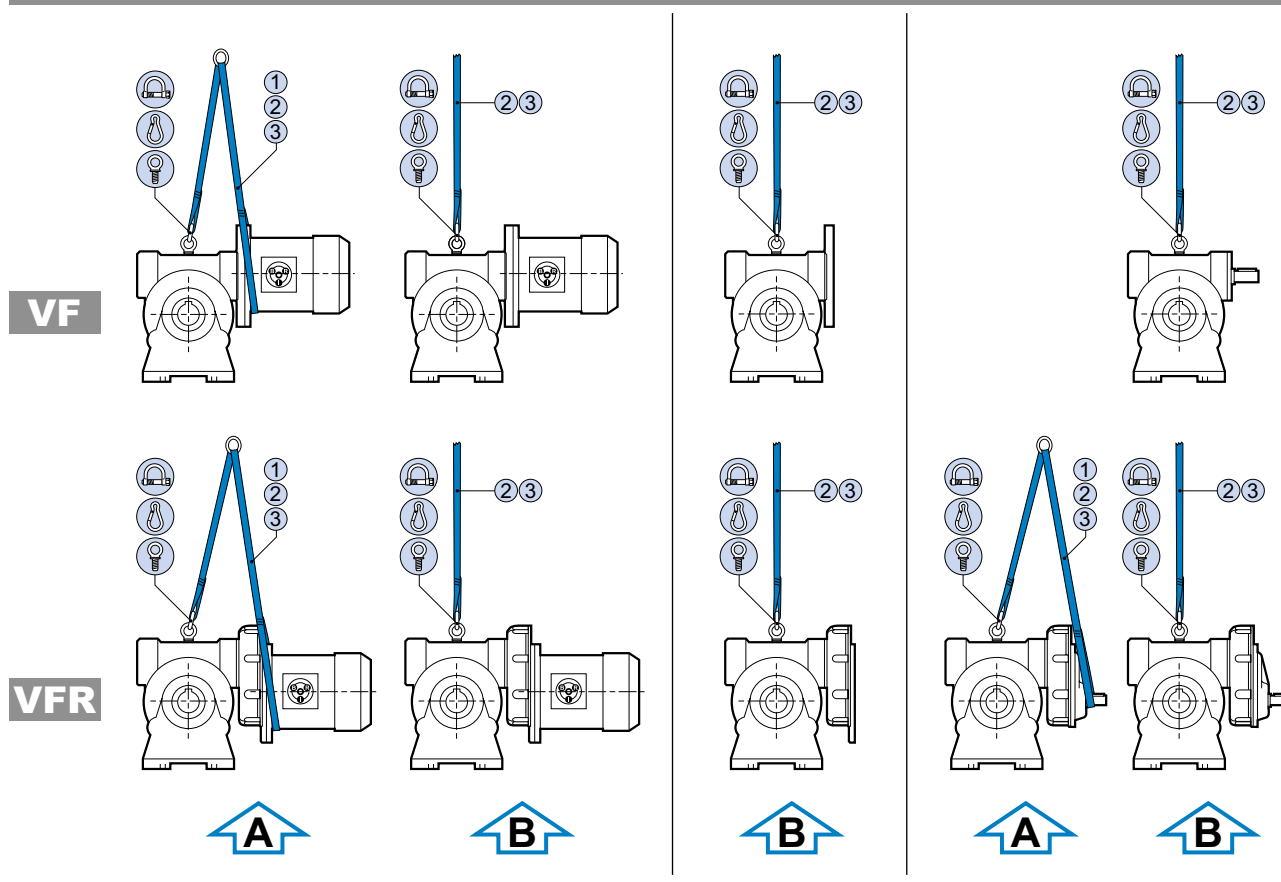
-  Screw clamp (use with harness)
-  Snap hook (use with rope)
-  Eyebolt

- M** Lift manually (weight ≤ 15 kg)
- A** Lift as per diagram A
- B** Lift as per diagram B





Series VF



VF 30	M		
VF 44 VFR 44			
VF 49 VFR 49			
VF 130 VFR 130	A - B	A - B	A - B
VF 150 VFR 150			
VF 185 VFR 185			
VF 210 VFR 210			
VF 250 VFR 250			

Reccomended:
solution A for positioning; solution B for positioning and handling.

① Ring harness

② Rope and hooks

③ Open harness
with eyelets



Screw clamp
(use with harness)



Snap hook
(use with rope)



Eyebolt (already fitted
to gear units VF130...VF250)

M Lift manually
(weight ≤ 15 kg)

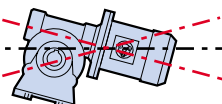
A Lift as per diagram A

B Lift as per diagram B



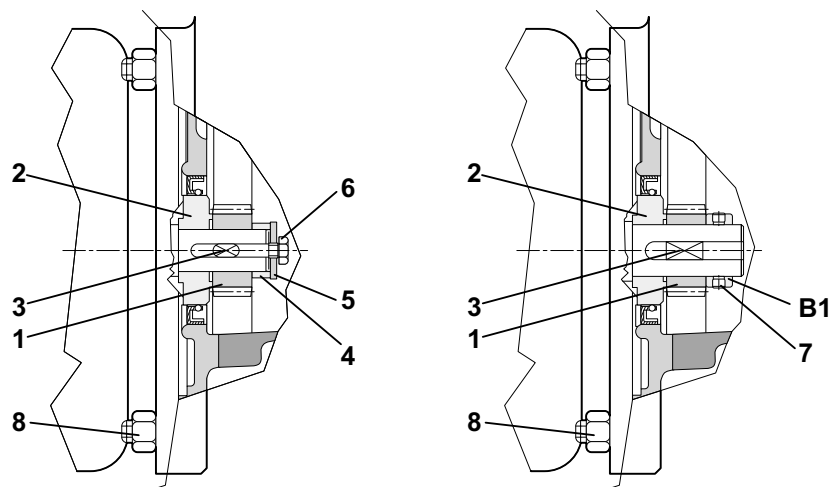
Maximum permissible tilt during
handling: 15°

MAX
15° 15°





ANNEX 5 - INSTALLING THE MOTOR ON TYPE VFR WORM GEAR UNITS



- 1) Thoroughly clean and degrease the motor shaft and pinion (1) and bushing (2) coupling surfaces.
- 2) Check the motor shaft tolerance meets the following specifications:

Shaft diameter - \varnothing [mm]	Tolerance
11 - 28 j	6
38- 48	k6

- 3) Preheat the bushing (2) and pinion (1) to 80-100 °C.
- 4) Quickly fit, the bushing (2), key (3) and pinion (1), in succession, to the motor shaft.
When fitting the bushing (2), ensure that the chamfered side is facing the operator.
To facilitate mounting, lightly press on the parts being fitted (e.g. with a tubular drift). Make sure that the reaction force in this case is supported at the opposite end of the shaft, and not by the fan cover.
After this procedure the pinion (1) should be snug against the bushing (2).
- 5) Lock the assembly with the spacer (4) and washer (5) by tightening down the bolt (6) or, for configurations which have this option, fit the stop bushing (B1) and tighten down the two grub screws (7) while holding it snug against the pinion (1); see figure on the right.
- 6) Lubricate the seal ring lips with a film of grease.
- 7) For type VFR 49 units, which are lubricated for life and, hence, do not have a service plug, fill with the quantity of lubricant specified in the corresponding chapter of the catalogue dealing with lubrication of VFR units.
- 8) Hold the motor firmly and, holding it in alignment, mount it to the flange of the additional helical reduction casing. Take the greatest care to avoid denting the pinion or gear wheel teeth.
- 9) With the motor and gear unit flanges in contact, fully tighten down the mounting bolts (8) gradually and in a cross-wise pattern.
- 10) For units VFR 110 to VFR 250 the lubricant must be changed periodically.
The lubricant charge (fil) for these gear units is given in the VF catalogue. Check that the correct level has been reached via the sight glass, with the gear unit in its specified mounting position. Top up as necessary.



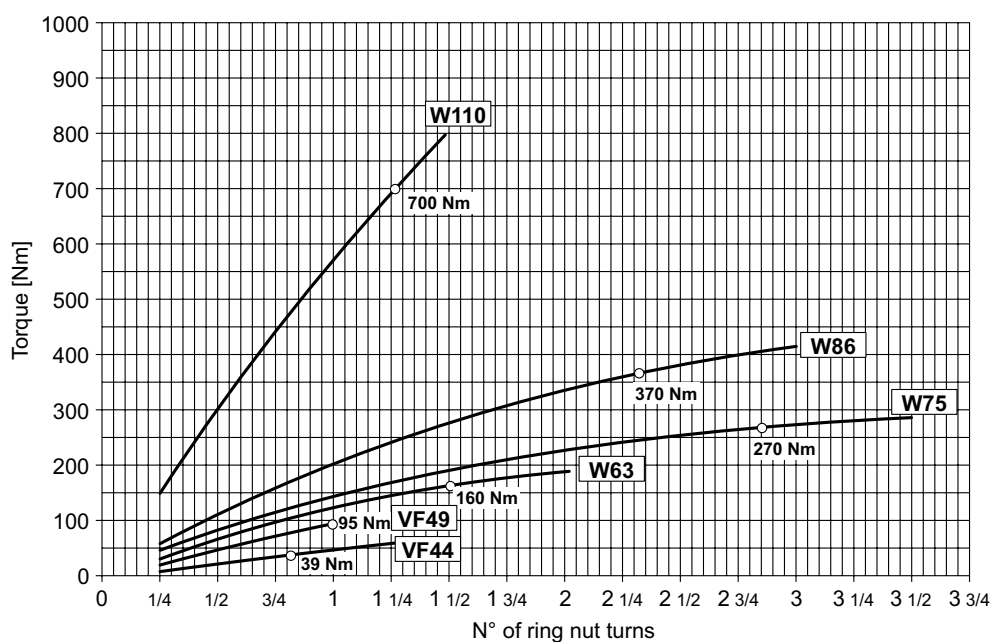
ANNEX 6 - CALIBRATING THE TORQUE LIMITER SLIP TORQUE

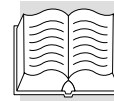
The torque limiter is an optional device available for worm gear units of the following types: VF 44L, VF 49L, W 63L, W 75L, W 86L and W 110L.

The device is factory calibrated to a slip torque which coincides with the nominal torque Mn_2 [$n_1 = 1400$] for the gear unit in question.

This is achieved as follows. The same operations, with exclusion of step (2), allow the User to calibrate the limiter to a torque different to that set in the factory.

1. The calibration ring nut is screwed in until the disk springs are loaded to the point that they cannot be turned freely by hand.
2. A centre punch is used to make two corresponding reference marks at the same angular position on the ring nut and the protruding section of the output shaft. This reference position is the starting point from which all further turns of the ring nut are counted, and thus, the torque calibration is measured.
3. The ring nut is now screwed in by the fractions of a turn which correspond to the nominal torque Mn_2 for the gear unit in question. The reference in this case is given by the diagram below, which is also to be used for any new settings required over time.







INDEX OF REVISIONS (R)

R4

12
15

25
26

Addition of new sizes A 05, A 35 and A 55.

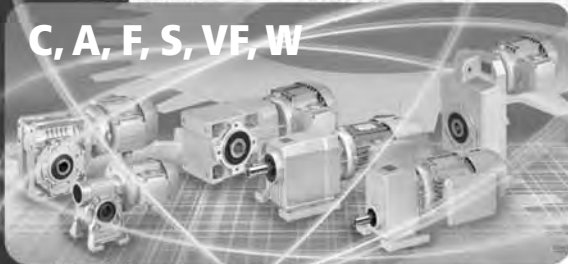
33
37

42

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INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

C, A, F, S, VF, W



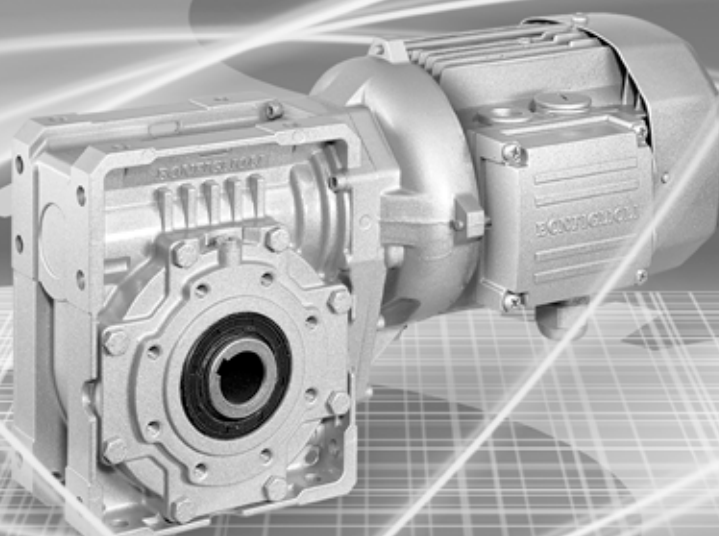
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 **BONFIGLIOLI**



Lista parti di ricambio - Spare parts list - Ersatzteilliste
Liste des pieces detachees - Lista de piezas de recambio

W



BONFIGLIOLI

LISTA PARTI DI RICAMBIO	SPARE PARTS LIST	ERSATZTEILISTE	LISTE DES PIECES DETACHEES	LISTA DE PIEZAS DE RECAMBIO	
Descrizione	Description	Beschreibung	Description	Descripción	
1 Layout generale e simbologia	General layout and symbols	Allgemeines Layout und Symbole	Schéma d'implantation et symboles	Presentación general y simbología	2
W 63 - W 75 - W 86 - WR 63 - WR 75 - WR 86					
2 Modulo base	Base module	Basismodul	Module base	Módulo base	3
W 63 - W 75 - W 86					
2.1.1 - Modulo entrata S	2.1.1 - S input module	2.1.1 - Antriebseinheit S	2.1.1 - Module entrée S	2.1.1 - Módulo de entrada S	4
2.1.2 - Modulo entrata HS	2.1.2 - HS input module	2.1.2 - Antriebseinheit HS	2.1.2 - Module entrée HS	2.1.2 - Módulo de entrada HS	5
2.1.3 - Modulo entrata P(IEC) B5	2.1.3 - Input module P(IEC) B5	2.1.3 - Antriebseinheit P(IEC)	2.1.3 - Module entrée P(IEC) B5	2.1.3 - Módulo de entrada P(IEC) B5	6
2.1.4 - Modulo entrata P(IEC) B14	2.1.4 - Input module P(IEC) B14	2.1.4 - Antriebseinheit P(IEC) B14	2.1.4 - Module entrée P(IEC) B14	2.1.4 - Módulo de entrada P(IEC) B14	7
WR 63 - WR 75 - WR 86					
2.2.1 - Modulo WR_HS	2.2.1 - Module WR_HS	2.2.1 - Antriebseinheit WR_HS	2.2.1 - Module WR_HS	2.2.1 - Módulo WR_HS	8
2.2.2 - Modulo WR_P(IEC) B5	2.2.2 - Module WR_P(IEC) B5	2.2.2 - Antriebseinheit WR_P(IEC) B5	2.2.2 - Module WR_P(IEC) B5	2.2.2 - Módulo WR_P(IEC) B5	9
W 110 - WR 110					
3 Modulo base	Base module	Basismodul	Module base	Módulo base	10
W 110					
3.1.1 - Modulo entrata S	3.1.1 - S input module	3.1.1 - Antriebseinheit S	3.1.1 - Module entrée S	3.1.1 - Módulo de entrada S	11
3.1.2 - Modulo entrata HS	3.1.2 - HS input module	3.1.2 - Antriebseinheit HS	3.1.2 - Module entrée HS	3.1.2 - Módulo de entrada HS	12
3.1.3 - Modulo entrata P(IEC) B5	3.1.3 - Input module P(IEC) B5	3.1.3 - Antriebseinheit P(IEC)	3.1.3 - Module entrée P(IEC) B5	3.1.3 - Módulo de entrada P(IEC) B5	13
3.1.4 - Modulo entrata P(IEC) B14	3.1.4 - Input module P(IEC) B14	3.1.4 - Antriebseinheit P(IEC) B14	3.1.4 - Module entrée P(IEC) B14	3.1.4 - Módulo de entrada P(IEC) B14	14
WR 110					
3.2.1 - Modulo WR_HS	3.2.1 - Module WR_HS	3.2.1 - Antriebseinheit WR_HS	3.2.1 - Module WR_HS	3.2.1 - Módulo WR_HS	15
3.2.2 - Modulo WR_P(IEC) B5	3.2.2 - Module WR_P(IEC) B5	3.2.2 - Antriebseinheit WR_P(IEC) B5	3.2.2 - Module WR_P(IEC) B5	3.2.2 - Módulo WR_P(IEC) B5	16
4 Accessori	Accessories	Zubehör	Accessoires	Accesorios	17
5 Motori elettrici	Electric motor	Elektromotoren	Moteur electriques	Motores eléctricos	20

Revisions
L'indice di revisione del catalogo è riportato a pag. 26.
Al sito www.bonfiglioli.com sono disponibili i cataloghi con le revisioni aggiornate.

Revisions
Refer to page 26 for the catalogue revision index.
Visit www.bonfiglioli.com to search for catalogues with up-to-date revisions.

Änderungen
Das Revisionsverzeichnis des Katalogs wird auf Seite 26 wiedergegeben. Auf unserer Website www.bonfiglioli.com werden die Kataloge in ihrer letzten, überarbeiteten Version angeboten.

Révisions
Le sommaire de révision du catalogue est indiqué à la page 26.
Sur le site www.bonfiglioli.com des catalogues avec les dernières révisions sont disponibles.

Revisiones
El índice de revisión del catálogo se indica en la pág. 26.
En el sitio de Internet www.bonfiglioli.com están disponibles los catálogos con las revisiones actualizadas.

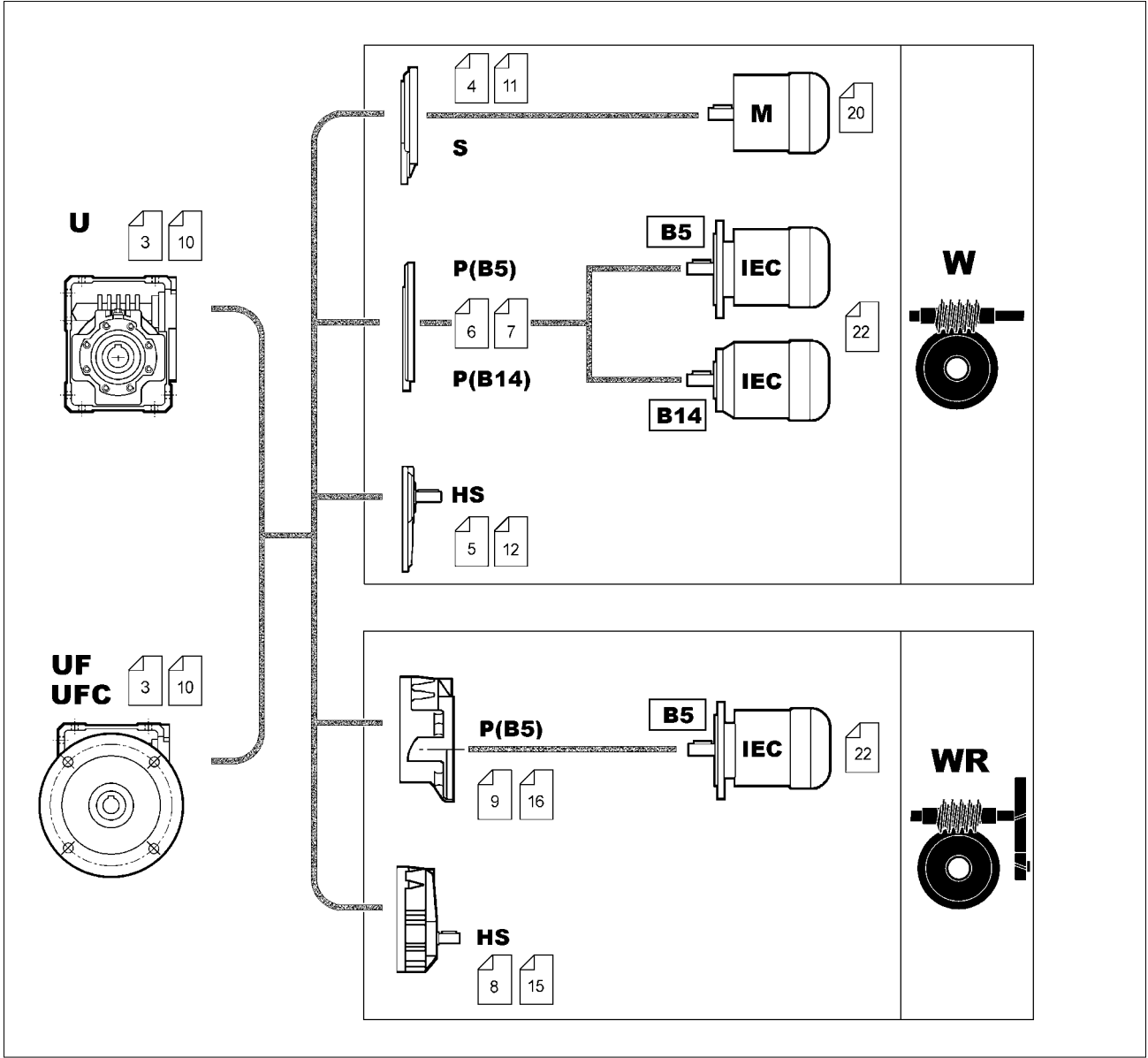
1 - LAYOUT GENERALE E
SIMBOLOGIA

1 - GENERAL LAYOUT AND
SIMBOLS

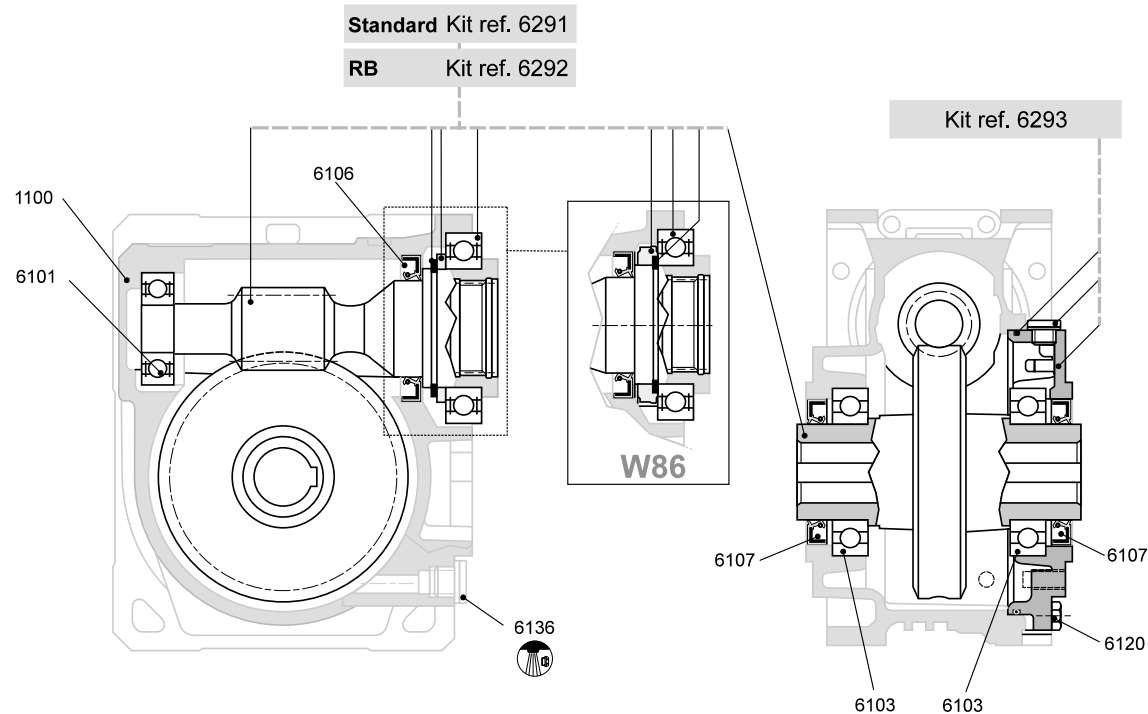
1 - ALLGEMEINES LAYOUT UND
SYMBOLE

1 - SCHÉMA D'IMPLANTATION ET
SYMBLES

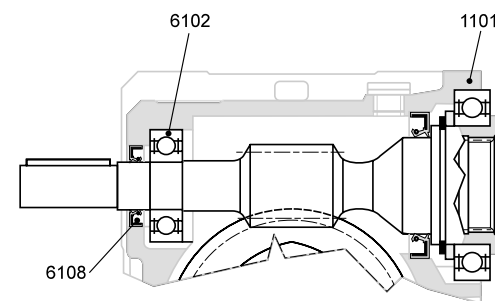
1 - PRESENTACIÓN GENERAL Y
SIMBOLOGÍA




		Marche consigliate Recommended make vorgeschlagenen Marken Producteurs conseillé Aconsejado marchas
	Cuscinetto Bearing Lager Roulement Cojinete	SKF - FAG
	Anello di tenuta Oilseal Simmerring Bague d'étanchéité Anillo de estanqueidad	CORCOS - STEFA
	O-Ring O-Ring seal O-Ring Bague O-Ring Anillo O-Ring	—
	V-Ring V-Ring seal V-Ring Bague V-Ring Anillo V-Ring	—
	Tappo olio Oil plug Ölverschluß Bouchon d'huile Tapón de aceite	—



W 63 ... W 86
WR 63 ... WR 86
2 - MODULO BASE
2 - BASE MODULE
2 - BASISMODUL
2 - MODULE BASE
2 - MÓDULO BASE


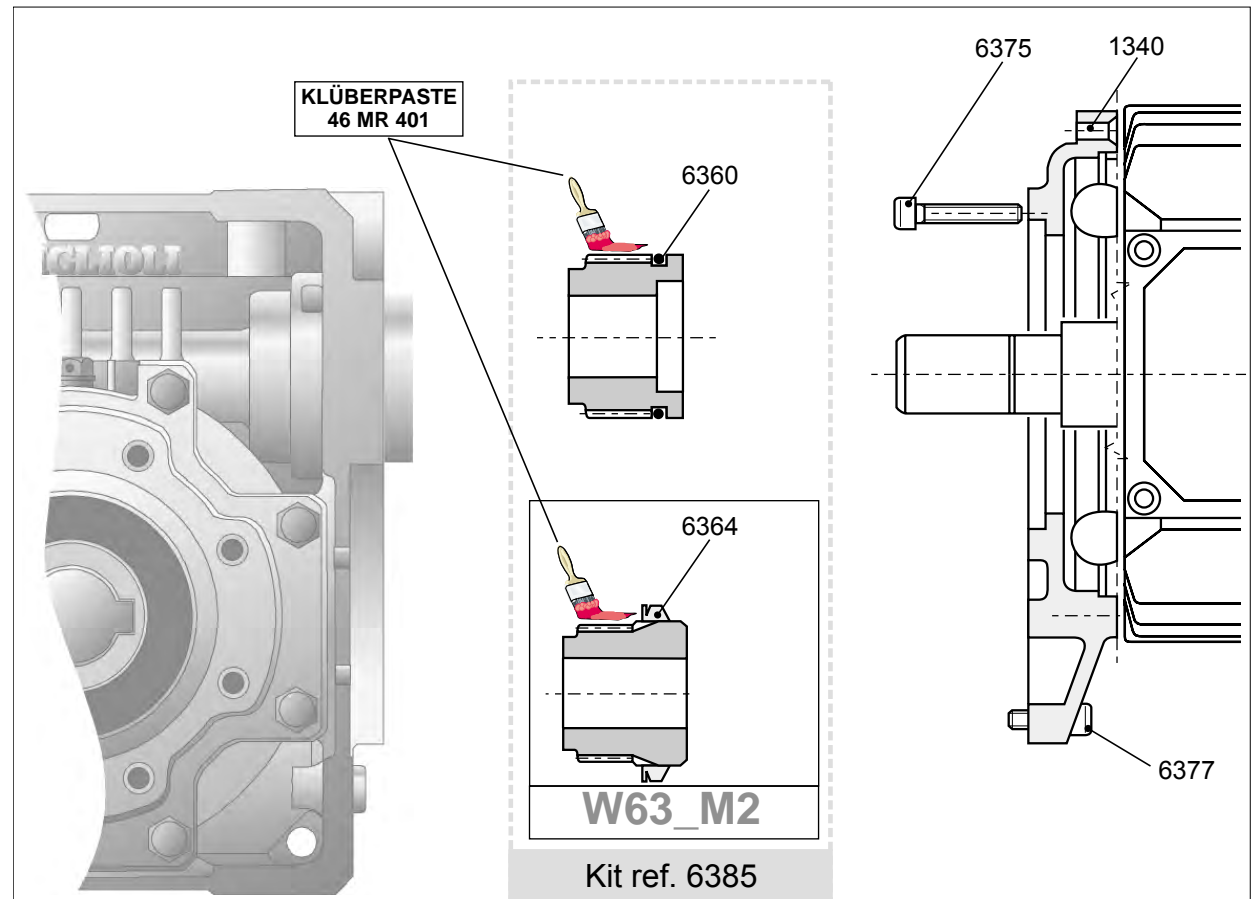
		W 63	W 75	W 86
	6101	6204 2RS	6205 2RS	6305 2RS
	6102	6204	6205	6206
	6103	6008	6010	6210
	6106 VITON®	40/62/7 L (i=7-30) 35/62/7 L (i=45-100)	45/72/8 L	50/80/8 L (i=7-30) 45/80/10 L (i=45-100)
	6107	40/62/7 DL	50/72/8 DL	50/80/10 DL
	6108	20/35/7 DL	25/40/7 DL	30/47/7 DL
	6112	OR 2450	OR 3550	OR 4625
	6137	1/4" Gas	1/4" Gas	1/4" Gas


Opzione RB / RB Option


W 63
W 75
W 86
2.1.1 - Modulo entrata S
2.1.1 - S input module
2.1.1 - Antriebseinheit S
2.1.1 - Module entrée S
2.1.1 - Módulo de entrada S

 O-RING	W 63	W 75	W 86
6360	OR 4131	OR 4150	OR 4150

 V-RING	W 63	W 75	W 86
6364	V-40S	—	—




W 63
W 75
W 86

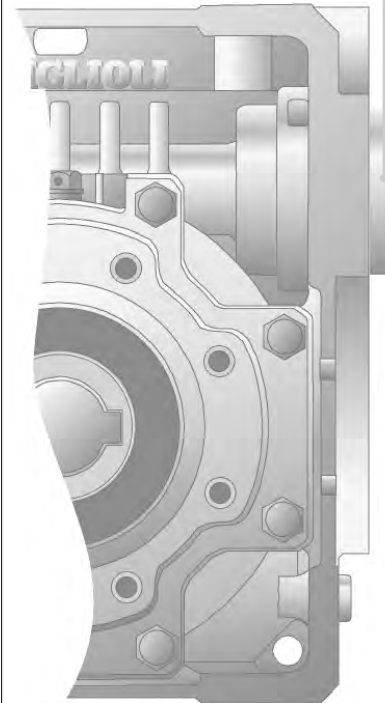
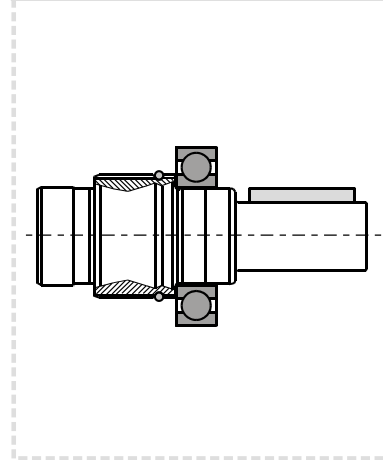
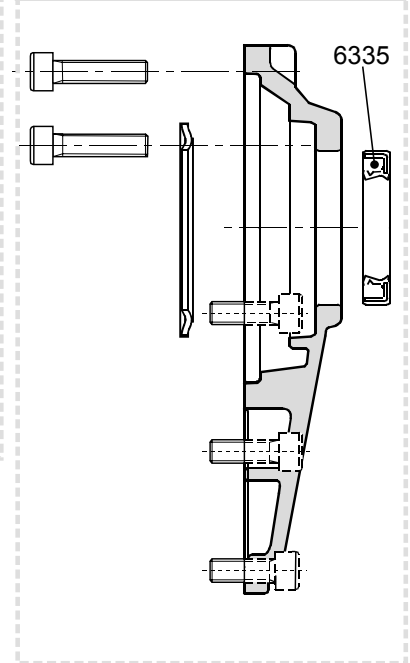
2.1.2 - Modulo entrata HS


2.1.2 - HS input module

2.1.2 - Antriebseinheit HS

2.1.2 - Module entrée HS

2.1.2 - Módulo de entrada HS

Standard Kit ref. 6291
RB Kit ref. 6292

Kit ref. 6355*

Kit ref. 6356


	W	W 75	W 86
6335	25x32x463 B10F	35x47x4.5 L	35x47x4.5 L


W 63
W 75
W 86


2.1.3 - Modulo entrata P(IEC) B5

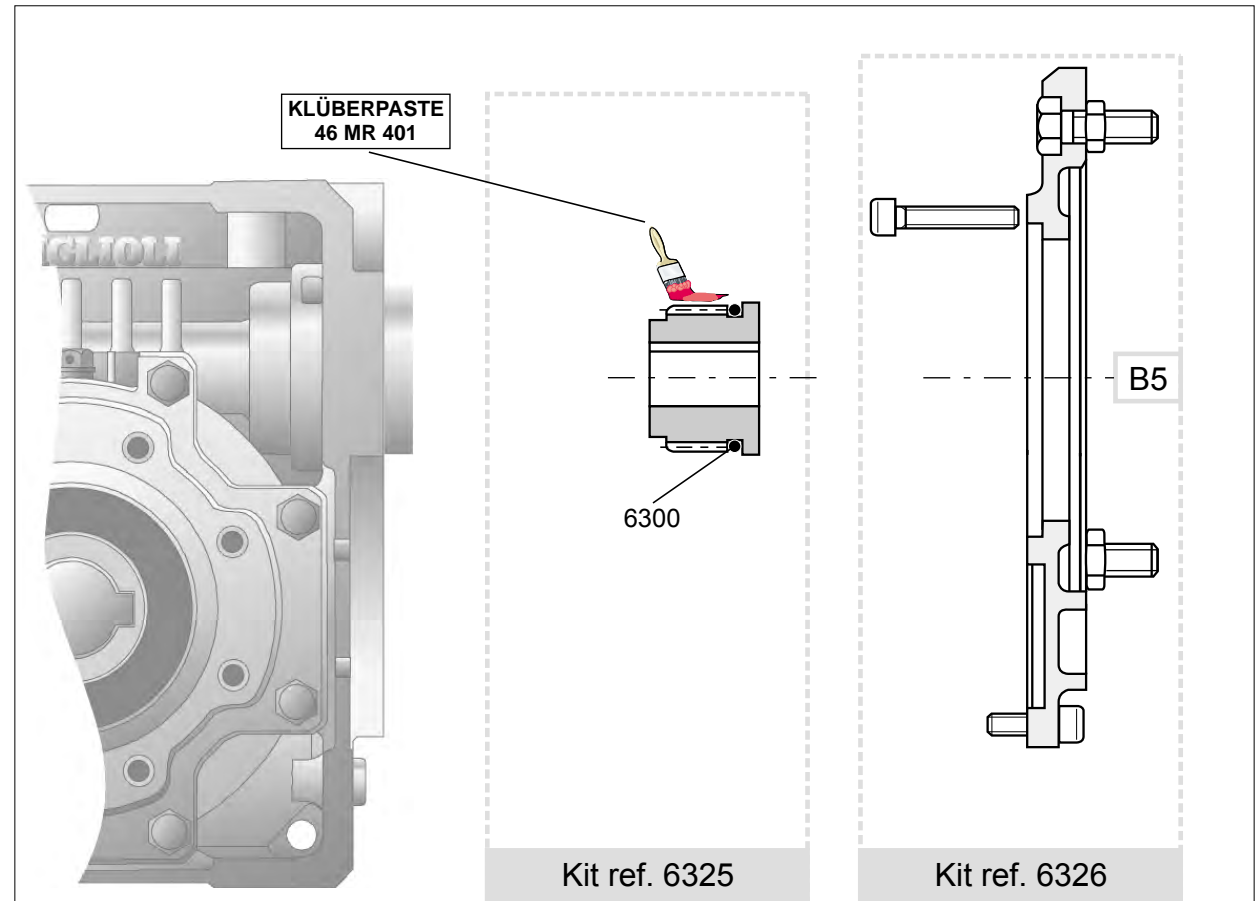
2.1.3 - Input module P(IEC) B5

2.1.3 - Antriebseinheit P(IEC) B5

2.1.3 - Module entrée P(IEC) B5

2.1.3 - Módulo de entrada P(IEC) B5

 O-RING	W 63	W 75	W 86
6300	OR 4131	OR 4150	OR 4150




W 63
W 75
W 86


2.1.4 - Modulo entrata P(IEC) B14

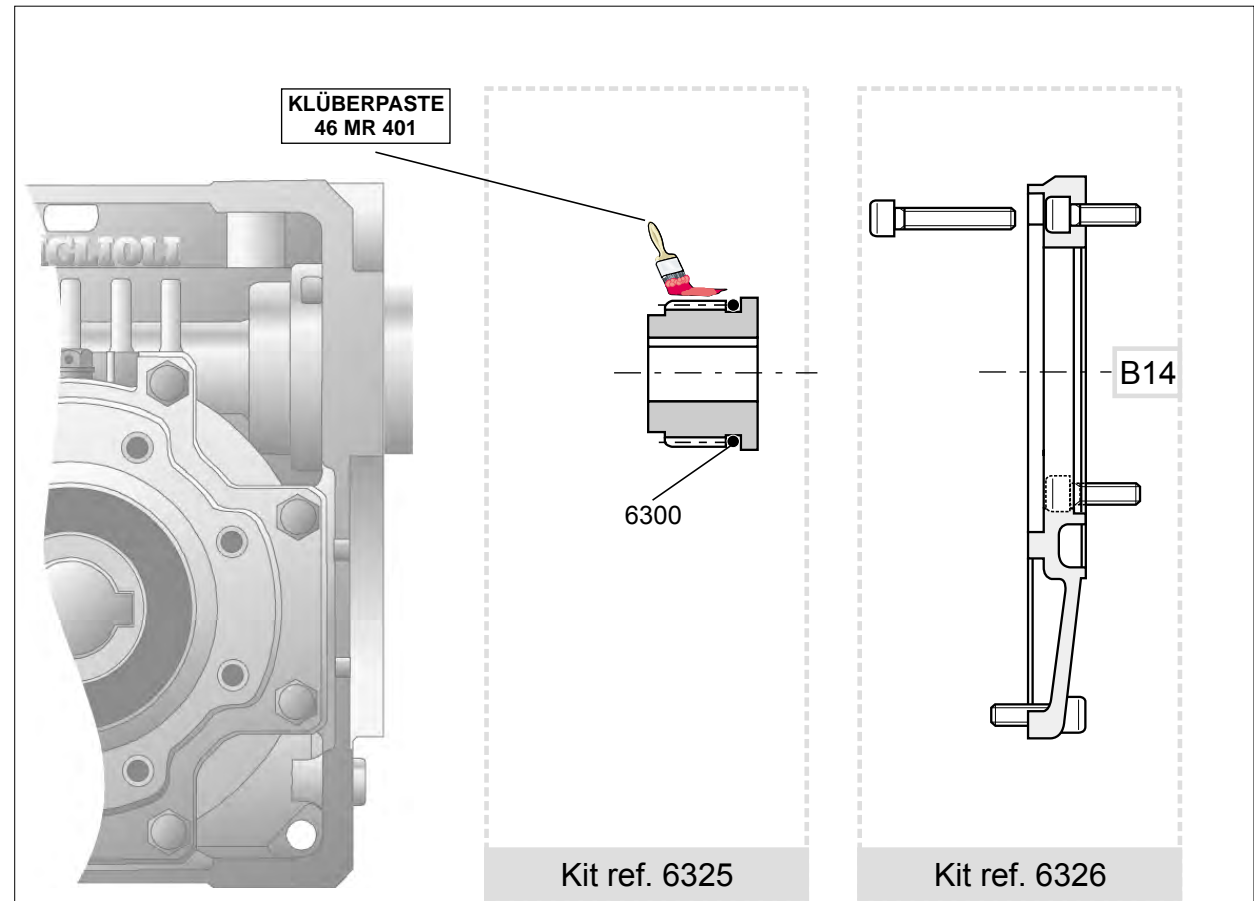
2.1.4 - Input module P(IEC) B14

2.1.4 - Antriebseinheit P(IEC) B14

2.1.4 - Module entrée P(IEC) B14

2.1.4 - Módulo de entrada P(IEC) B14

 O-RING	W 63	W 75	W 86
6300	OR 4131	OR 4150	OR 4150




WR 63
WR 75
WR 86


2.2.1 - Modulo WR_HS


2.2.1 - Module WR_HS


2.2.1 - Antriebseinheit WR_HS

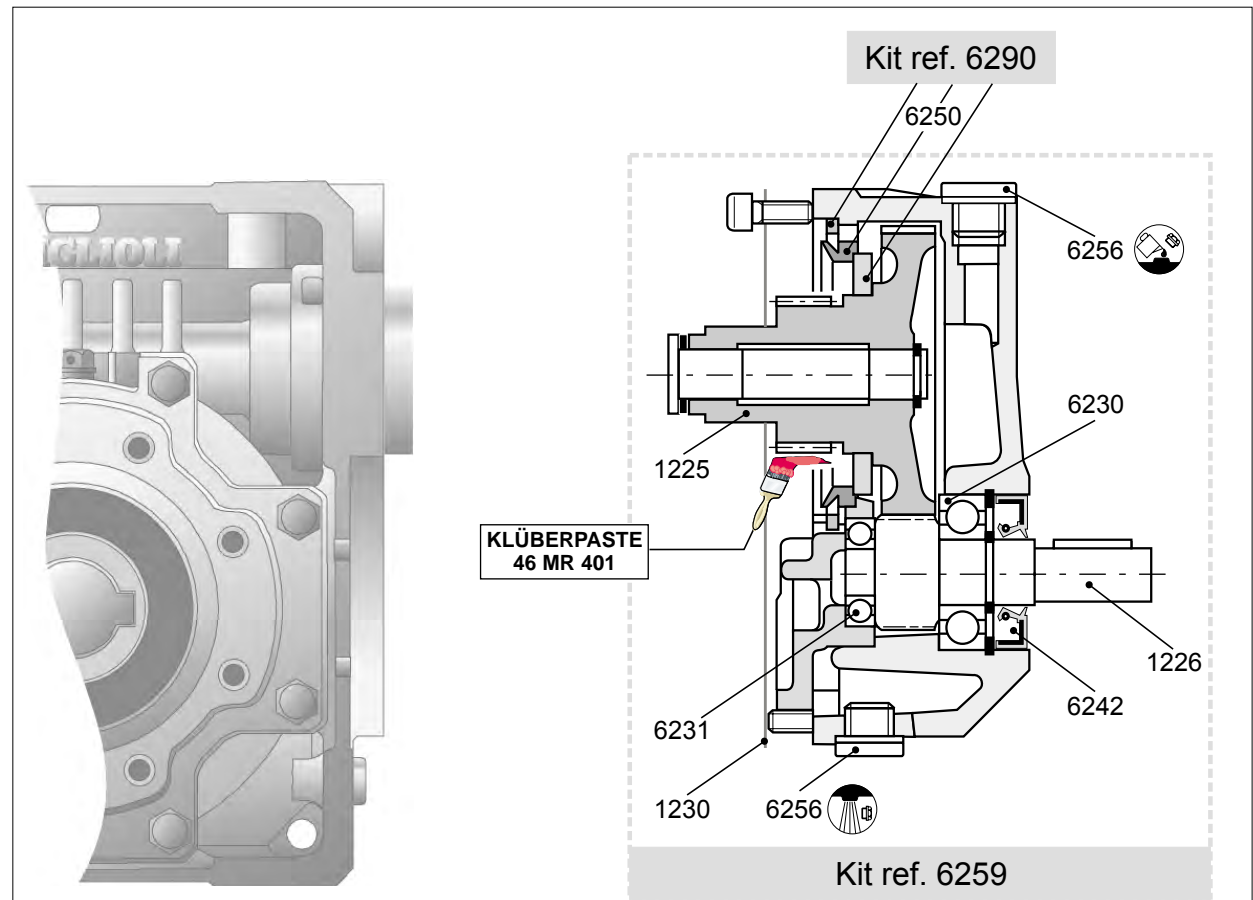
2.2.1 - Module WR_HS

2.2.1 - Módulo WR_HS

	WR 63	WR 75 - WR 86
6230	6203	6205
6231	6001	6203

	WR 63	WR 75 - WR 86
6242	17/40/7 DL	25/52/7 DL

	WR 63	WR 75 - WR 86
6256	1/4" Gas	1/4" Gas
6257	1/4" Gas	1/4" Gas



**WR 63****WR 75****WR 86**


2.2.2 - Modulo WR_P(IEC) B5


2.2.2 - Module WR_P(IEC) B5


2.2.2 - Antriebseinheit
WR_P(IEC) B5

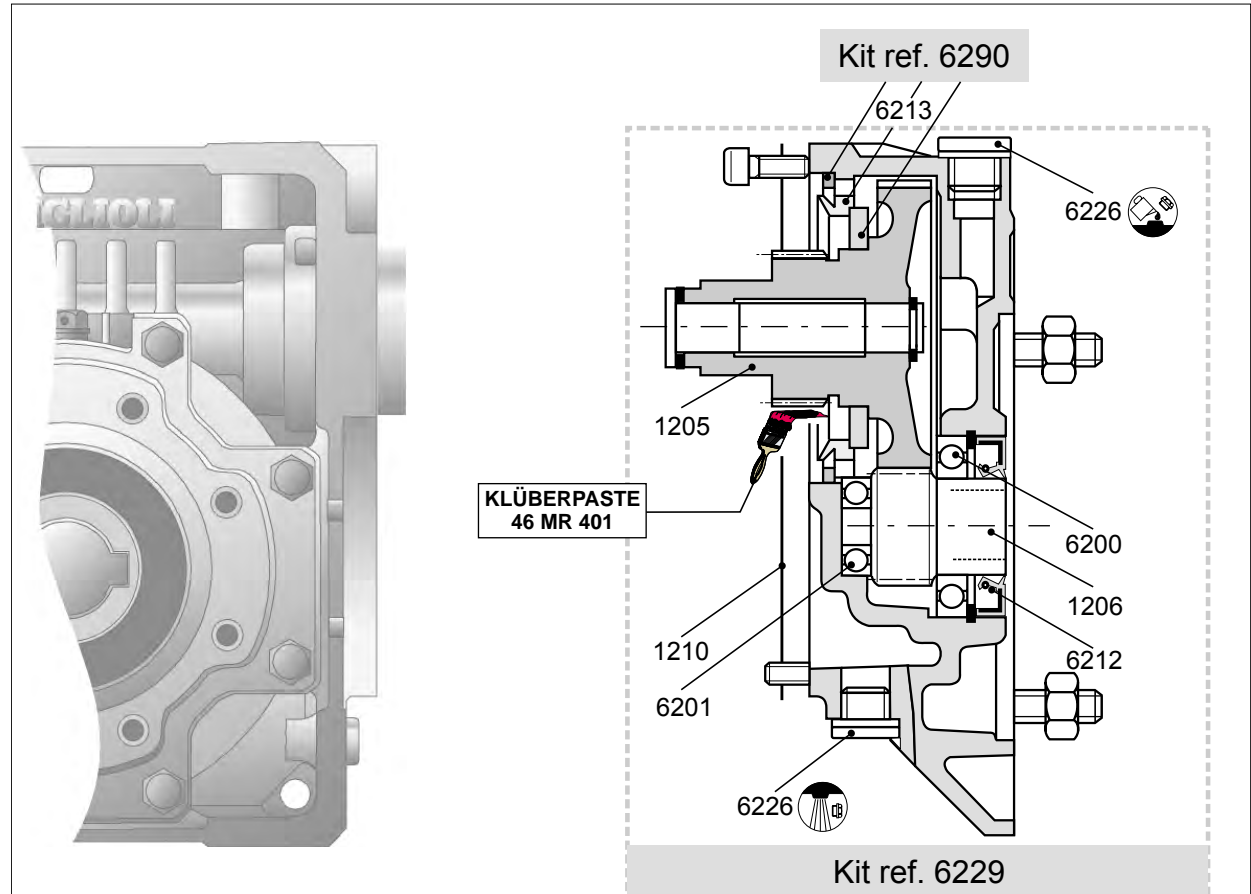
2.2.2 - Module WR_P(IEC) B5

2.2.1 - Módulo WR_P(IEC) B5

	WR 63	WR 75 - WR 86
6200	16005	16005 (P63-P71) 6206 (P80) 61908 (P90)
6201	609	609 (P63-P71) 6000 (P80-P90)

	WR 63	WR 75 - WR 86
6212	25/47/7 L	25/47/7 L (P63-P71) 30/62/7 L (P80) 40/62/7 L (P90)

	WR 63	WR 75 - WR 86
6226	1/4" Gas	1/4" Gas
6227	1/4" Gas	1/4" Gas





W 110

WR 110

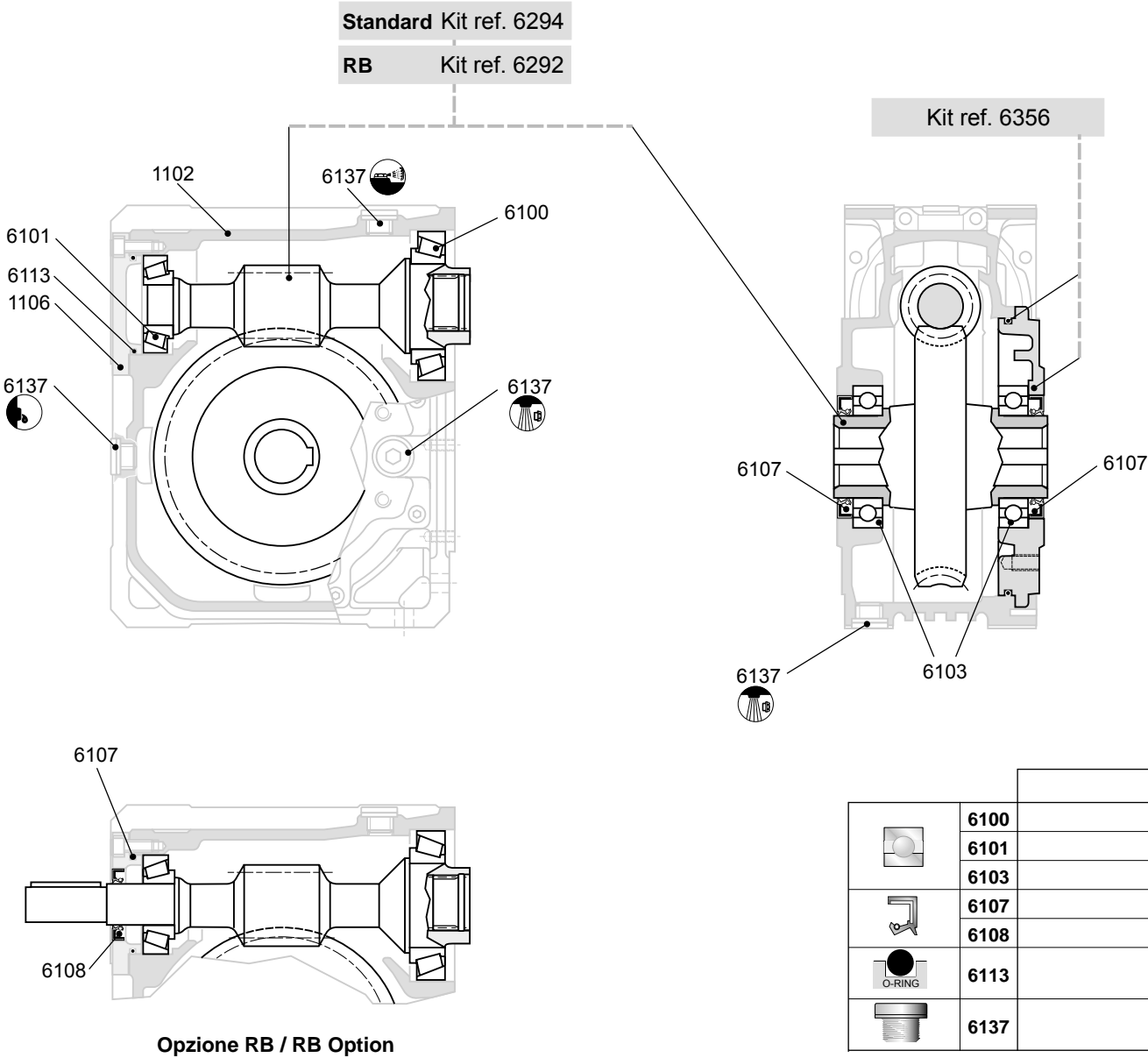
3 - MODULO BASE








3 - BASE MODULE

3 - BASISMODUL


3 - MODULE BASE


3 - MÓDULO BASE

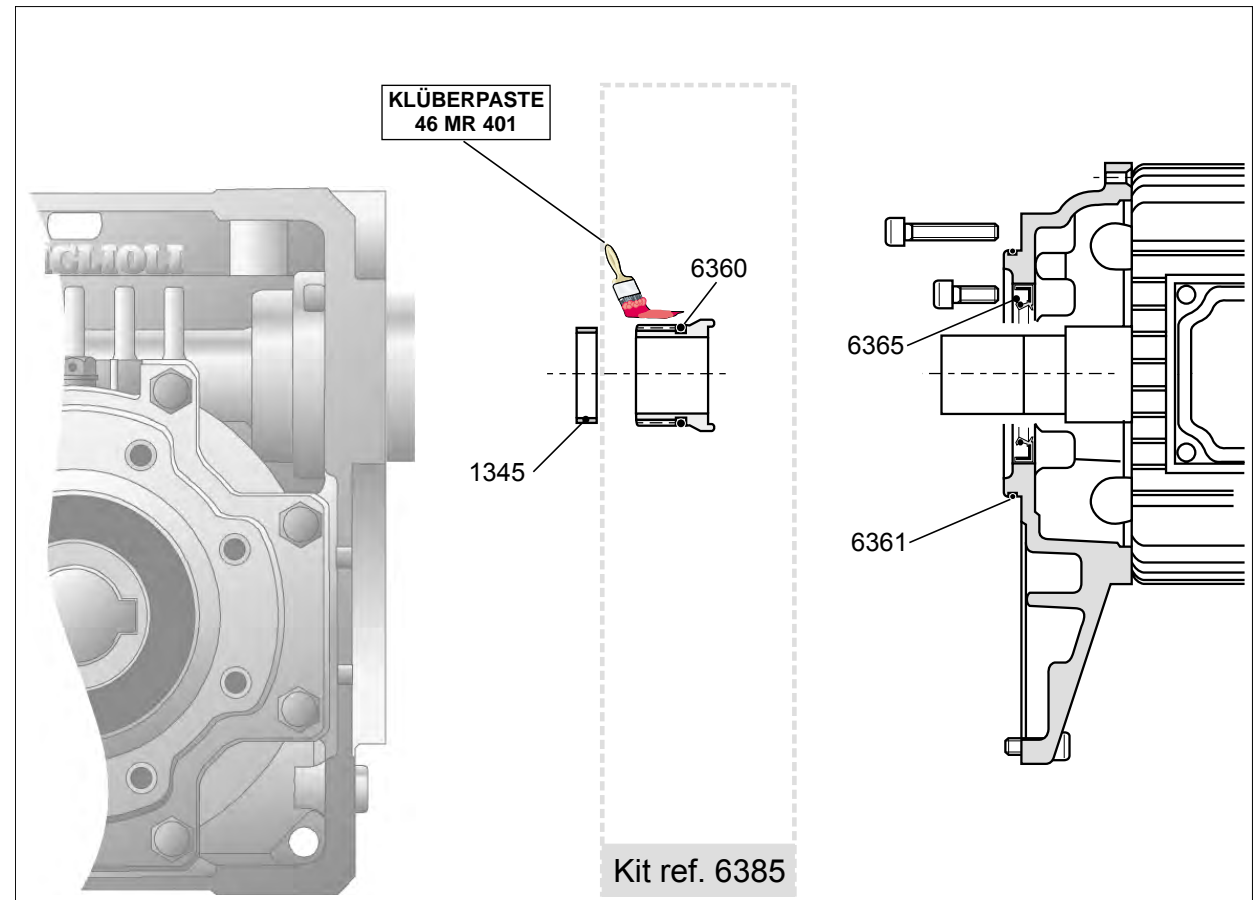


W 110		
	6100	30212
	6101	31306
	6103	6212
	6107	60/90/8 DL
	6108	30/52/10 DL
	6113	OR 3262
	6137	1/2" Gas


W 110
3.1.1 - Modulo entrata S
3.1.1 - S input module
3.1.1 - Antriebseinheit S
3.1.1 - Module entrée S
3.1.1 - Módulo de entrada S

	W 110
6365	55/80/8 L

	W 110
6360	OR 4150
6361	OR 2425




W 110



3.1.2 - Modulo entrata HS

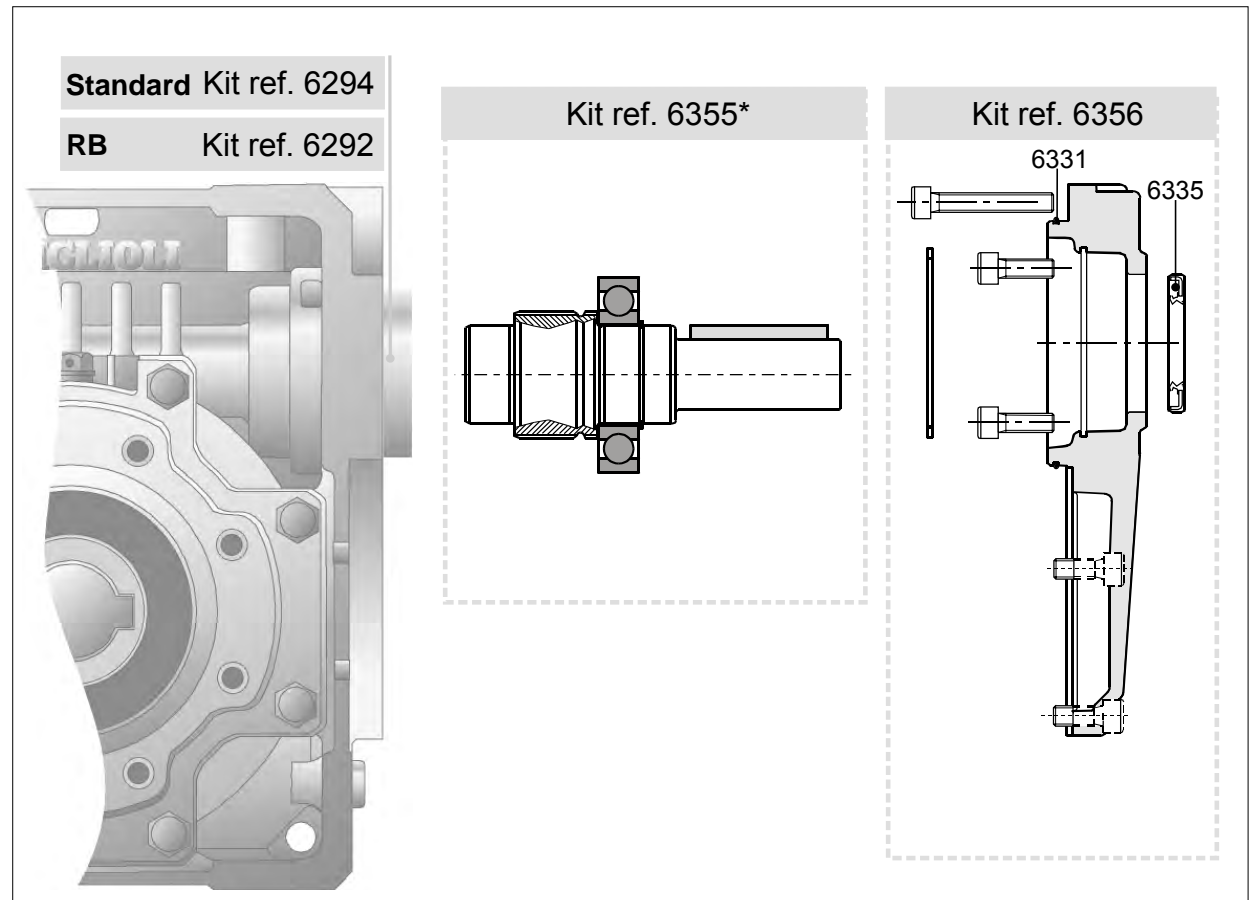
3.1.2 - HS input module

3.1.2 - Antriebseinheit HS

3.1.2 - Module entrée HS

3.1.2 - Módulo de entrada HS

	W 110
6335	35 x 62 x 7 DL
	W 110
6331	OR 2400





W 110



3.1.3 - Modulo entrata P(IEC) B5

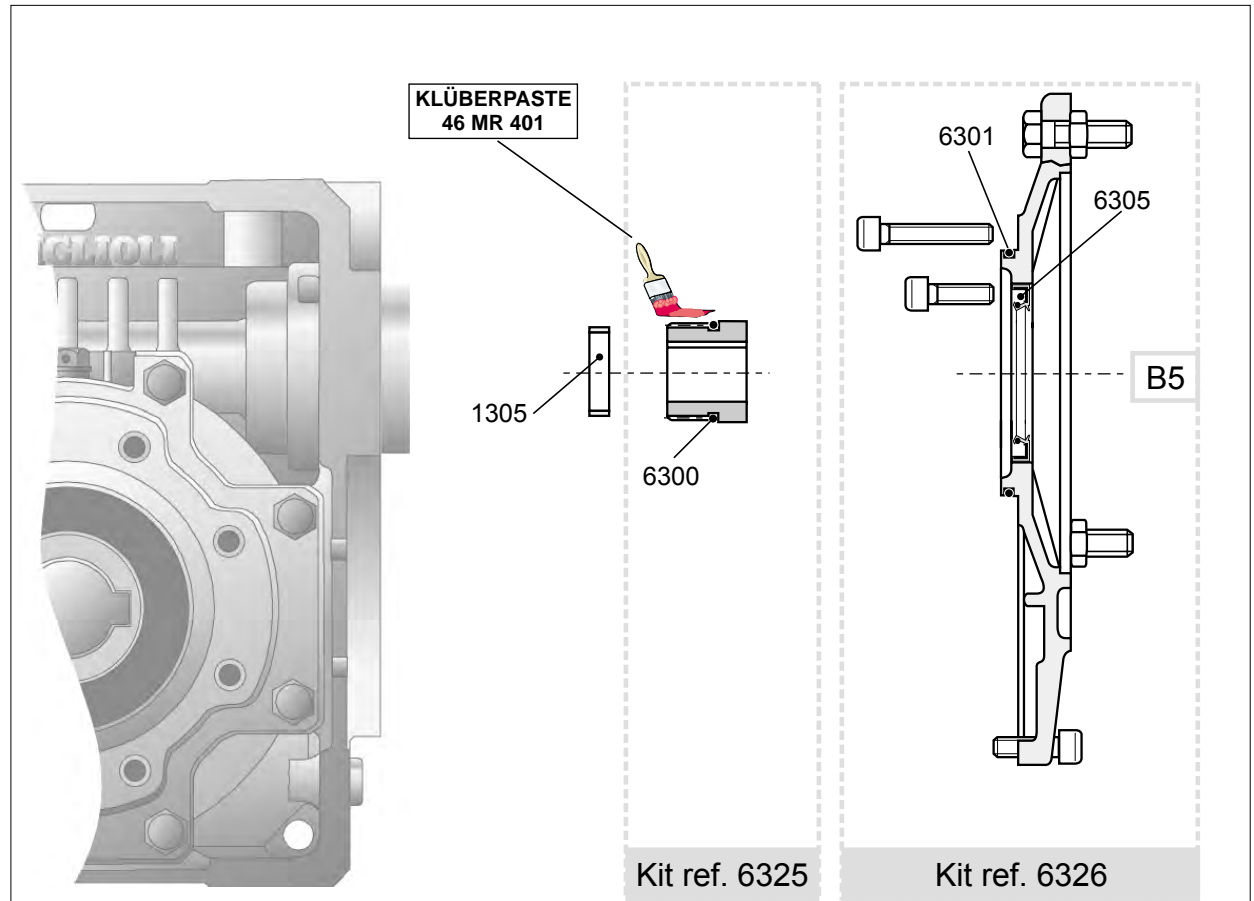
3.1.3 - Input module P(IEC) B5

3.1.3 - Antriebseinheit P(IEC) B5

3.1.3 - Module entrée P(IEC) B5

3.1.3 - Módulo de entrada P(IEC) B5

	W 110
6305	55/80/8 L
	W 110
6300	OR 4150
6301	OR 2425





W 110



3.1.4 - Modulo entrata P(IEC) B14

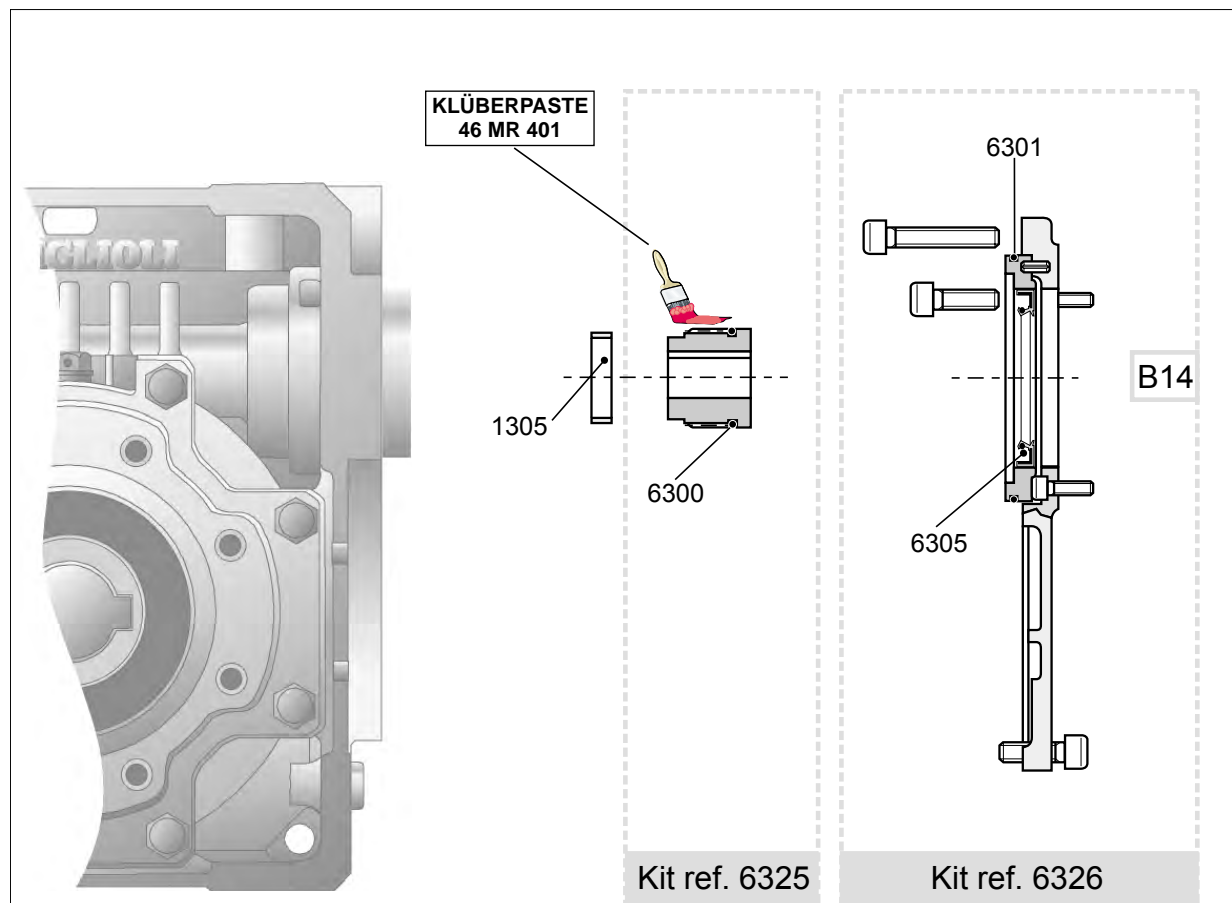
3.1.4 - Input module P(IEC) B14

3.1.4 - Antriebseinheit P(IEC) B14

3.1.4 - Module entrée P(IEC) B14

3.1.4 - Módulo de entrada P(IEC) B14

	W 110
6305	55/80/8 L
	W 110
6300	OR 4150
6301	OR 2425





WR 110

3.2.1 - Modulo WR_HS

3.2.1 - Module WR_HS

3.2.1 - Antriebseinheit WR_HS

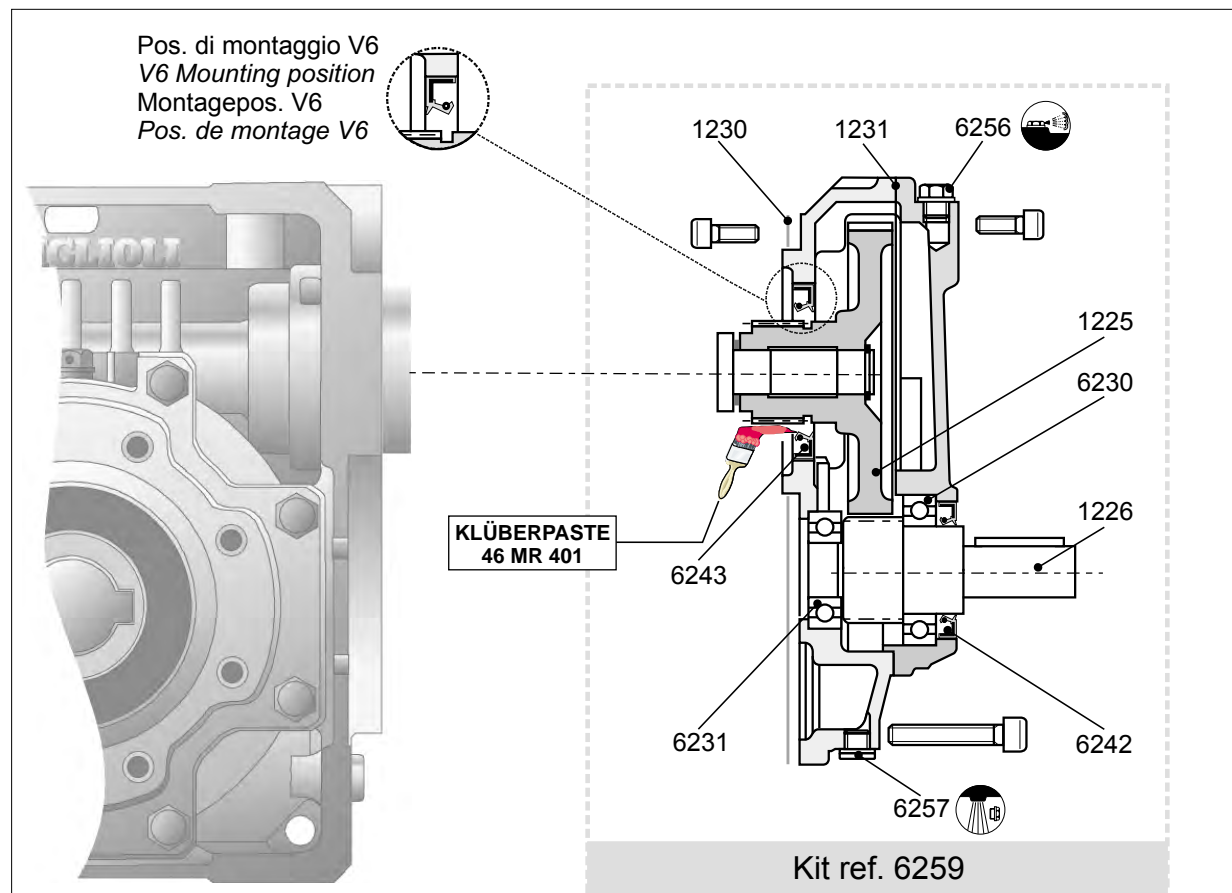
3.2.1 - Module entrée WR_HS

3.2.1 - Módulo de entrada WR_HS

	WR 110
6230	6008
6231	6205

	WR 110
6242	40/62/7 DL
6243	55/80/8 L

	WR 110
6256	1/4" Gas
6257	1/4" Gas





WR 110

3.2.2 - Modulo WR_P(IEC) B5

3.2.2 - Module WR_P(IEC) B5

3.2.2 - Antriebseinheit WR_P(IEC) B5

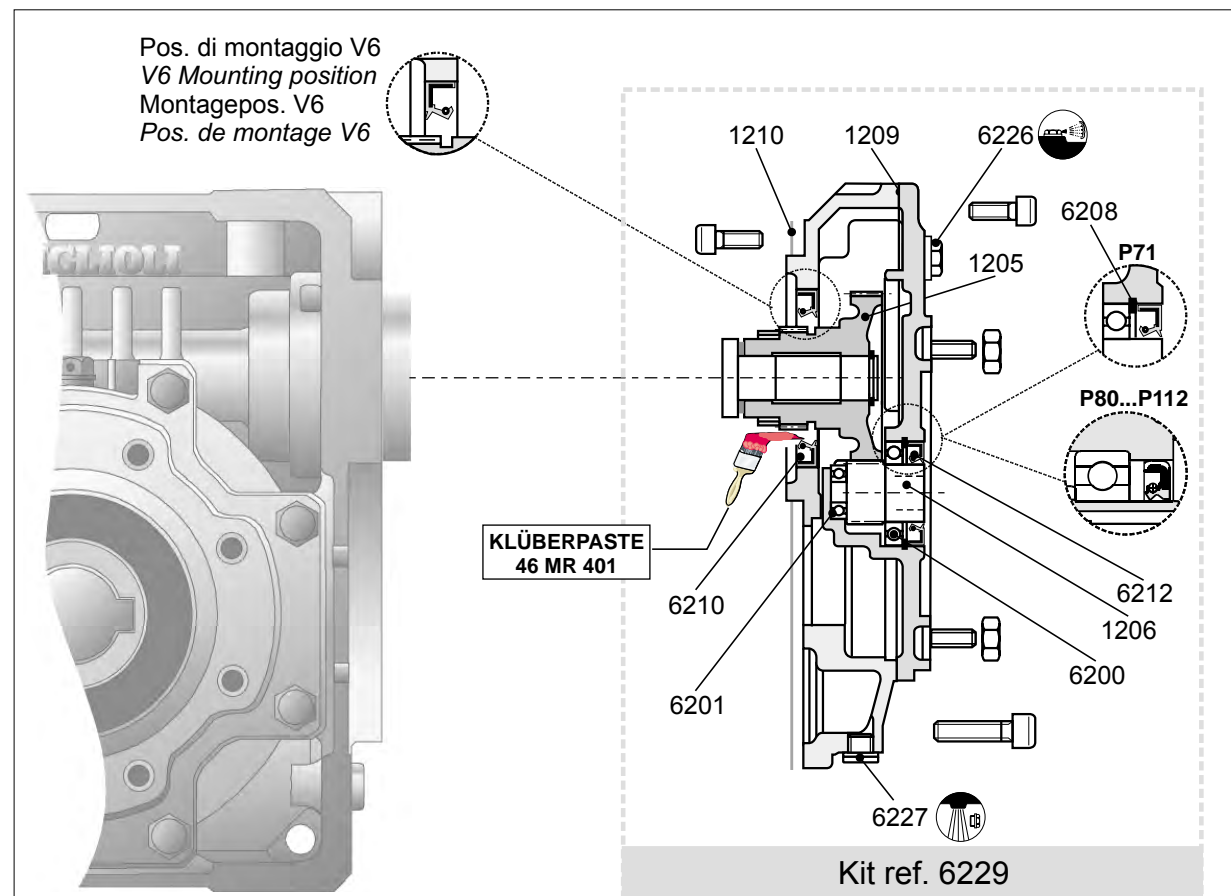
3.2.2 - Module entrée WR_P(IEC) B5

3.2.2 - Módulo de entrada WR_P(IEC) B5

	WR 110
6200	16005 (P71) 6008 (P80_P112)
6201	609 (P71) 6205 (P80_P112)

	WR 110
6210	55/80/8 L
6212	25/47/7 L (P71) 40/62/7 L (P80_P112)

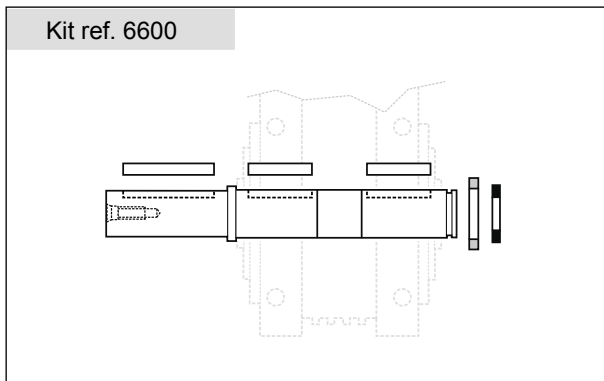
	WR 110
6226	1/4" Gas
6227	1/4" Gas



**W 63 ... W 86****WR 63 ... WR 86****4 - ACCESSORI****4 - ACCESSORIES****4 - ZUBEHÖR****4 - ACCESSOIRES****4 - ACCESORIOS**

(S39)

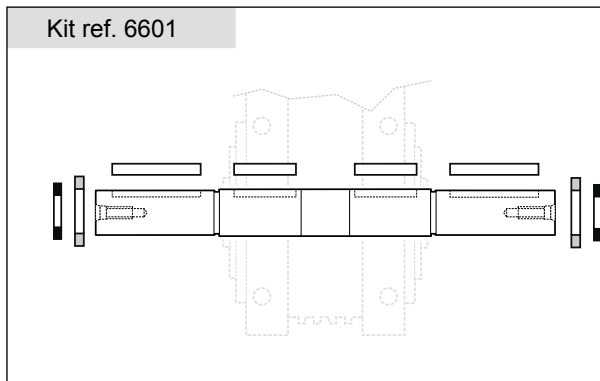
Kit ref. 6600



Kit albero lento semplice / *Plug-in single shaft*
 Kit - einfache Abtriebswelle / *Kit arbre de sortie simple*
 Kit del eje lento sencillo

(S40)

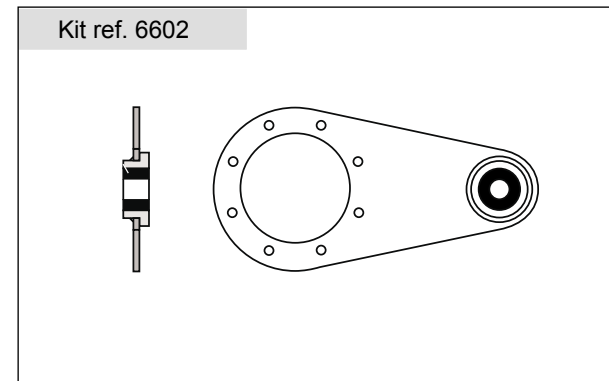
Kit ref. 6601



Kit albero lento doppio / *Plug-in double shaft*
 Kit - doppelte Abtriebswelle / *Kit arbre de sortie double*
 Kit del eje lento doble

(S41)

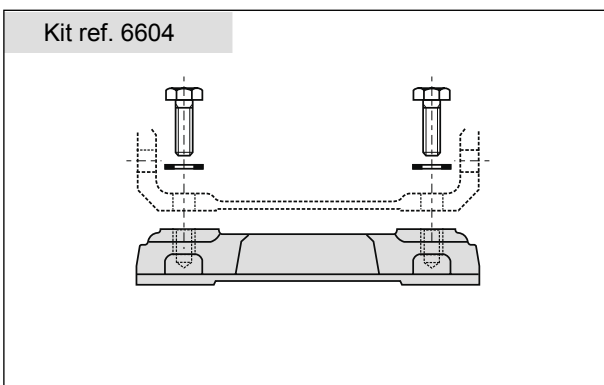
Kit ref. 6602



Kit braccio di reazione / *Torque arm*
 Kit - Momentenabstützung / *Kit bras de réaction*
 Kit del brazo de reacción

(S42)

Kit ref. 6604

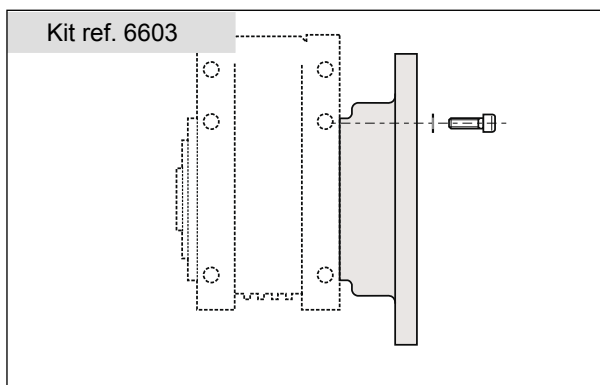


Kit piedi KA / *VF/A interchangeability Kit*
 Kit - Füße KA / *Kit pattes LA / VF/A*
 Kit de los pies KA

Kit piedi KV / *VF/V interchangeability Kit*
 Kit - Füße KV / *Kit pattes KV/ VF/V*
 Kit de los pies KA

(S43)

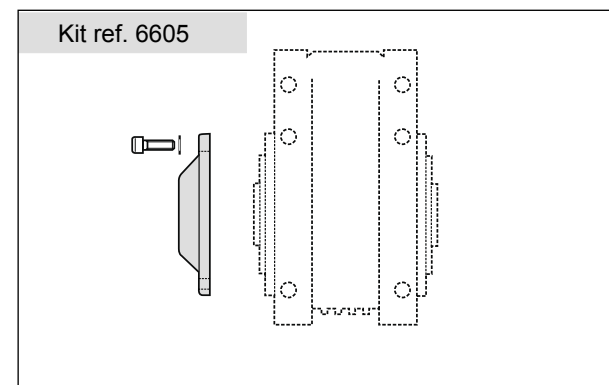
Kit ref. 6603



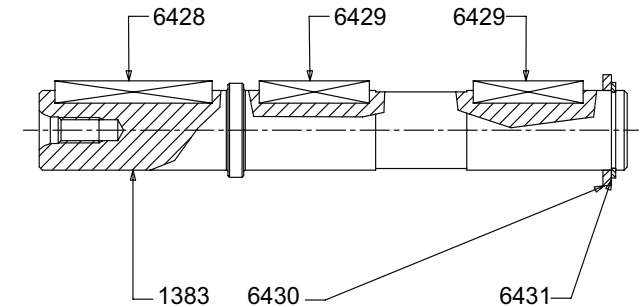
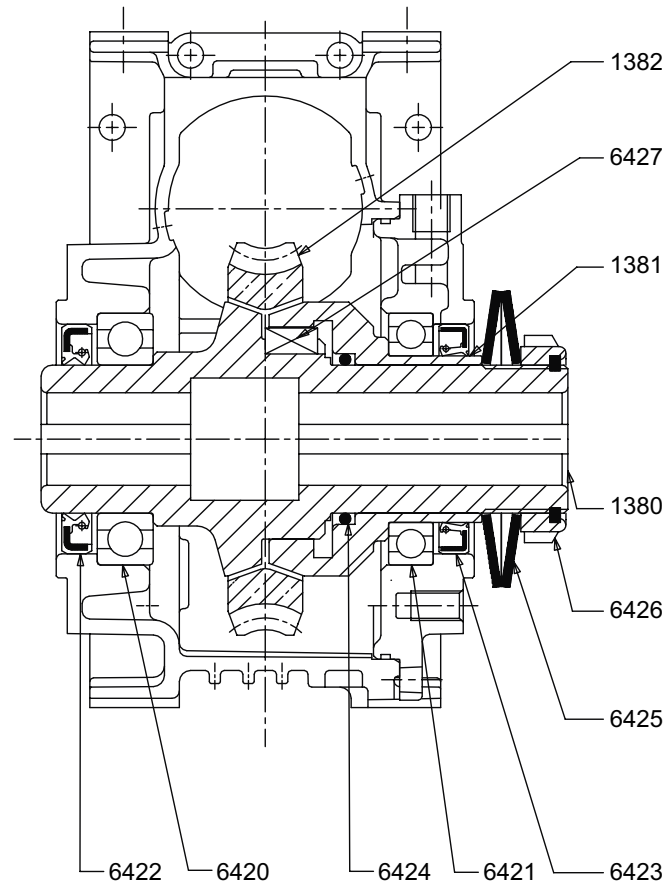
Kit flangia / *Bolt-on flange*
 Kit - Flansch / *Kit bride*
 Kit de la brida

(S44)

Kit ref. 6605



Kit cappellotto di protezione / *Safety cover Kit*
 Kit - Schutzkappe / *Kit capuchon protecteur*
 Kit del capuchón de protección

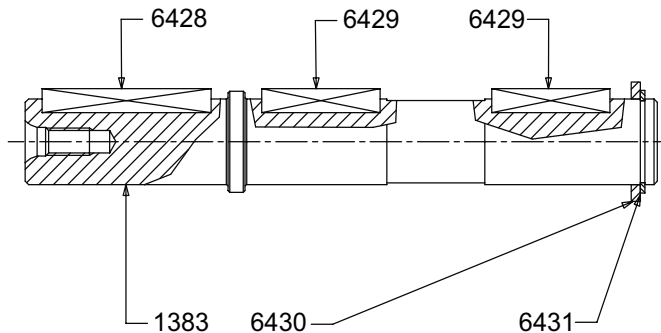
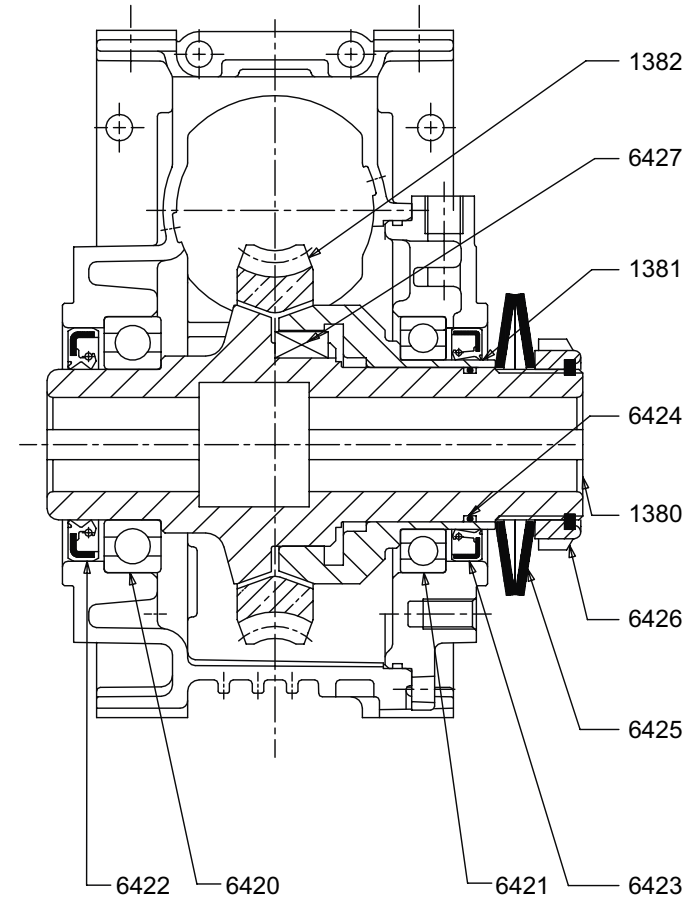
**W 63****Limitatore di coppia****Torque limiter****Rutschkupplung****Limiteur de couple****Limitadores de par**

		W 63 L...
	6420	6008 "FLT"
	6421	61909
	6422	40x62x7 "DL"
	6422	VITON® 40x62x7 "DL"
	6423	45x62x8 "DL"
	6423	VITON® 45x62x8 "DL"
	6424	OR144
	6425	C70x41x2
	6426	M40x1.5
	6427	8x7x14 "C"
	6428	8x7x50 "A"
	6429	8x7x35 "A"
	6430	25x35x2 R
	6431	De 25

	Denominazione	Description	Benennung	Dénomination	Denominación
1380	Mozzo per limitatore	<i>Torque limiter hub</i>	Vollwelle für Rutschkupplung	<i>Moyeu pour limiteur</i>	Buje para limitador
1381	Boccola per limitatore	<i>Sleeve</i>	Buchse für Rutschkupplung	<i>Douille pour limiteur</i>	Casquillo para limitador
1382	Corona	<i>Worm wheel</i>	Schneckenrad	<i>Roue</i>	Corona
1383	Albero lento sporgente	<i>Plug-in output shaft</i>	Ausgangswelle	<i>Arbre lent solid</i>	Eje lento saliente

**W 75****W 86****W 110****Limitatore di coppia****Torque limiter****Rutschkupplung****Limiteur de couple****Limitador de par**

		W 63 L...	W 75 L...	W 86 L...	W 110 L...
	6420	6008 "FLT"	6010 "FLT"	6210 "FLT"	6212
	6421	61909	61911	61913	6014
	6422	40x62x7 "DL"	50x72x8 "DL"	50x80x10 "DL"	60x90x8 "DL"
	6422 VITON®	40x62x7 "DL"	50x72x8 "DL"	50x80x8 "DL"	60x90x8 "DL"
	6423	45x62x8 "DL"	55x72x7 "DL"	65x80x7 "DL"	70x90x10 "DL"
	6422 VITON®	45x62x8 "DL"	55x72x7 "DL"	65x80x7 "DL"	70x90x8 "DL"
	6424	OR144	OR2162	OR2212	OR2224
	6425	C70x41x2	C90x46x2.5	C112x57x3	C125-61-5
	6426	M40x1.5	M45x1.5	M55x1.5	M60x1.5
	6427	8x7x14 "C"	0x8x20 "C"	14x9x20 "C"	22x9x22 "C"
	6428	8x7x50 "A"	8x7x50 "A"	10x8x50 "A"	12x8x60 "A"
	6429	8x7x35 "A"	8x7x40 "A"	10x8x40 "A"	12x8x45 "A"
	6430	25x35x2 R	30x42X2 R	35x45x2.5 R	42x52x5.5 R
	6431	De 25	De30	De 35	De 42



	Denominazione	Description	Benennung	Dénomination	Denominación
1380	Mozzo per limitatore	<i>Torque limiter hub</i>	Vollwelle für Rutschkupplung	<i>Moyeu pour limiteur</i>	Buje para limitador
1381	Boccola per limitatore	<i>Sleeve</i>	Buchse für Rutschkupplung	<i>Douille pour limiteur</i>	Casquillo para limitador
1382	Corona	<i>Worm wheel</i>	Schneckenrad	<i>Roue</i>	Corona
1383	Albero lento sporgente	<i>Plug-in output shaft</i>	Ausgangswelle	<i>Arbre lent solid</i>	Eje lento saliente

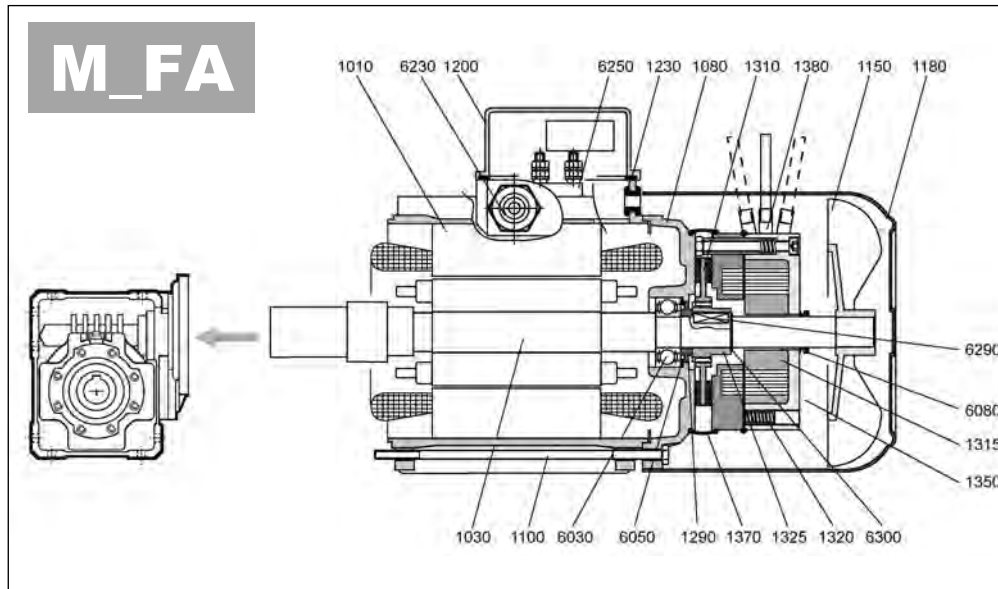
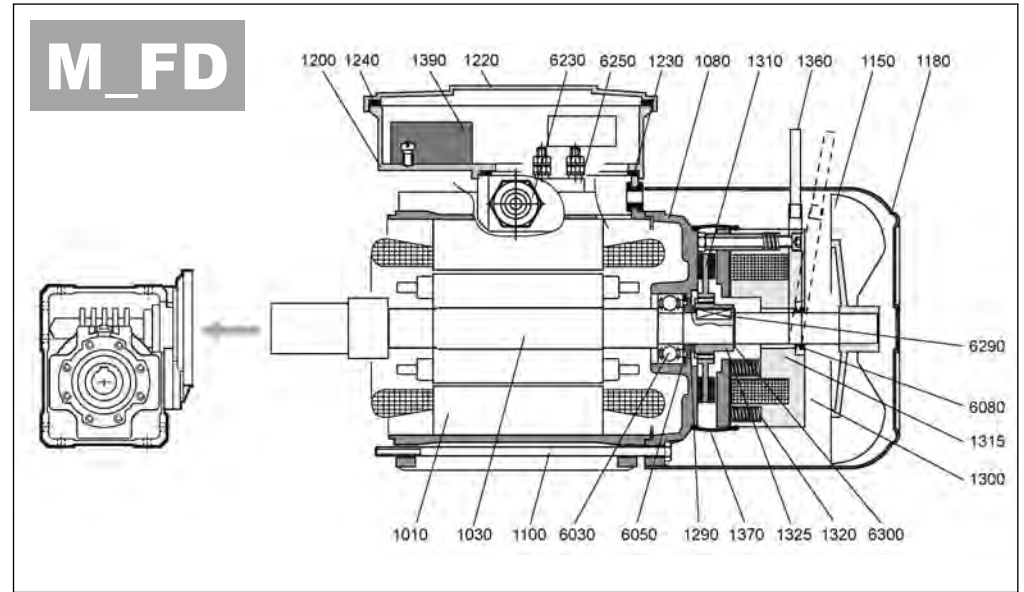
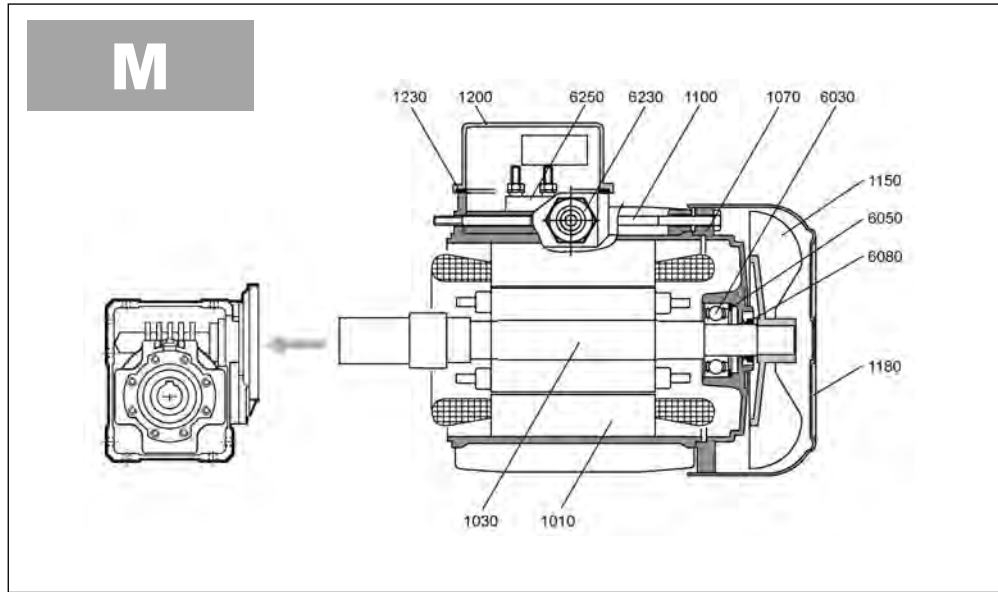
5 - MOTORI ELETTRICI

5 - ELECTRIC MOTORS

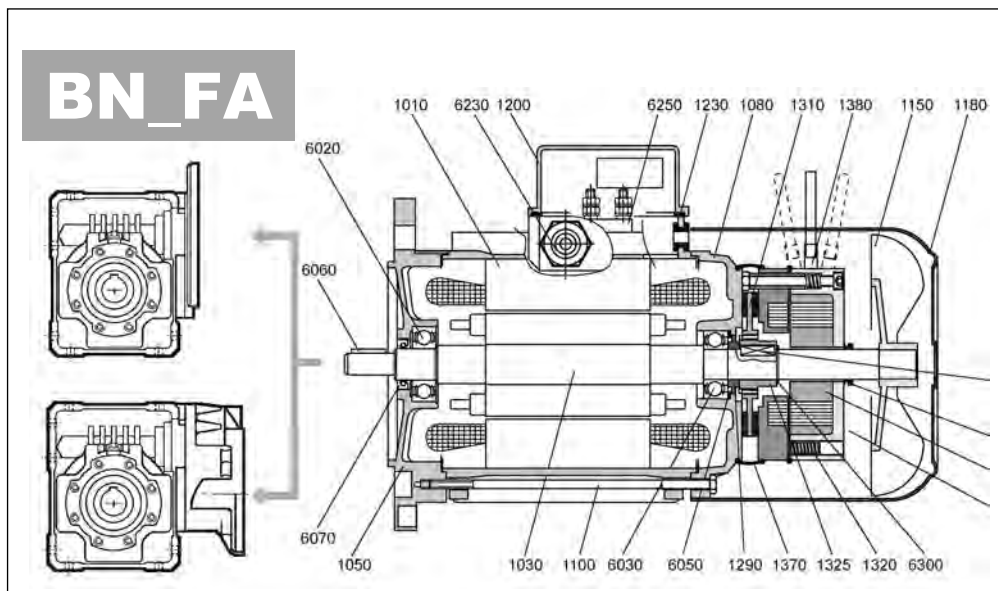
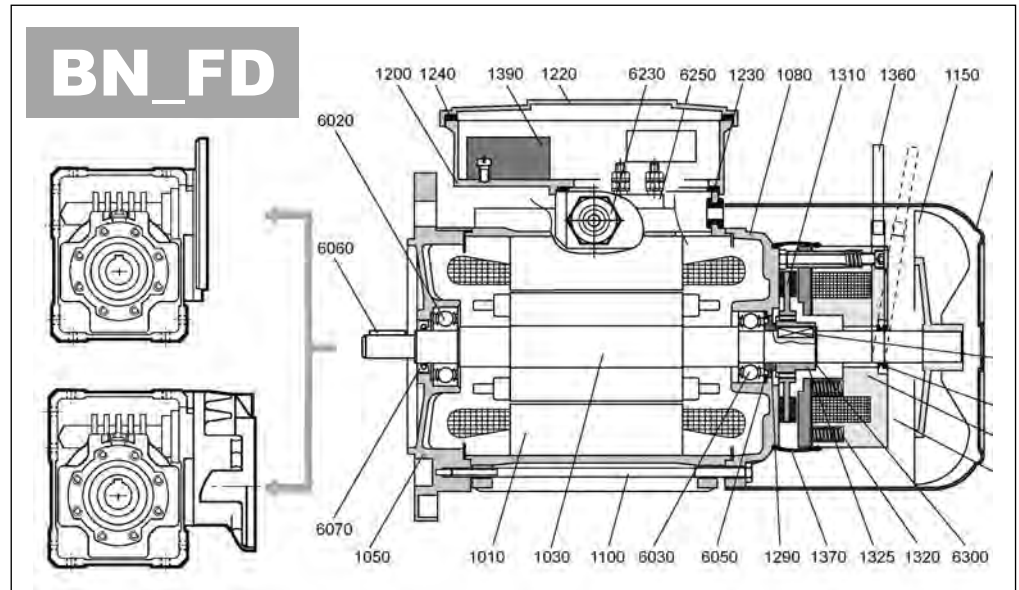
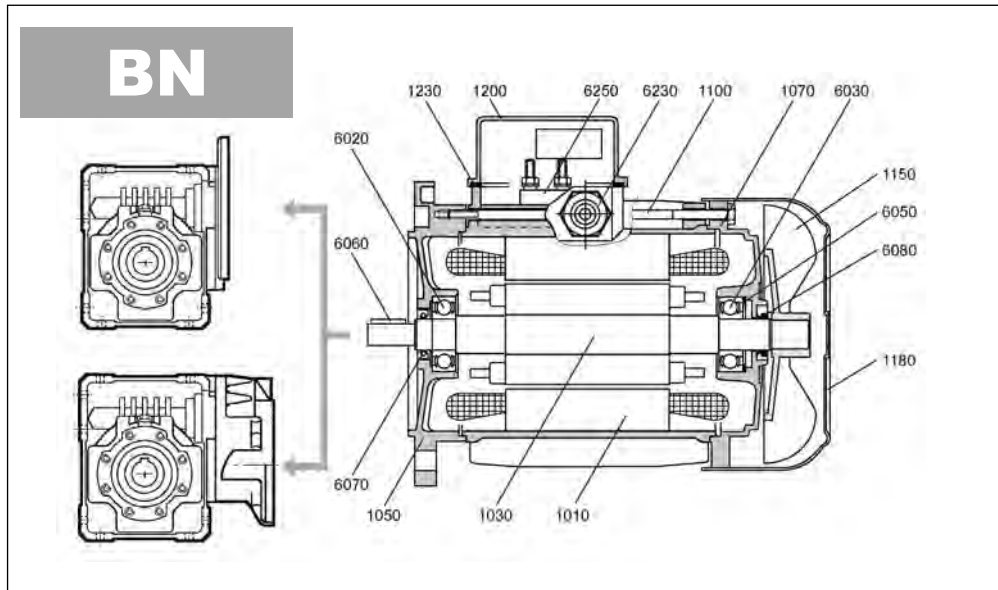
5 - ELEKTROMOTOREN

5 - MOTEUR ELECTRIQUES

5 - MOTORES ELÉCTRICOS



M	ref.	Denominazione	Description	Benennung	Dénomination	Denominación
M M_FD M_FA	1010	Statore	<i>Stator</i>	Stator	<i>Stator</i>	Estátor
	1030	Rotore	<i>Rotor</i>	Läufer	<i>Rotor</i>	Rotor
	1100	Tiranti	<i>Tie-rods</i>	Zugbolzen	<i>Entretoises</i>	Varillas
	1150	Ventola	<i>Fan</i>	Lüfterrad	<i>Ventilateur</i>	Ventilador
	1180	Copriventola	<i>Fan cowl</i>	Lüfterraddeckel	<i>Cache-ventilateur</i>	Cubreventilador
	1200	Scatola coprimorsettiera	<i>Conduit box</i>	Klemmkastendeckel	<i>Boîte cache-bornes</i>	Carcasa de la caja de bornes
	1230	Guarnizione scat. coprimors.	<i>Conduit box gasket</i>	Klemmkastendeckel dichtung	<i>Joint de la boîte à bornes</i>	Junta de la carcasa de la caja de bornes
	6030	Cuscinetto	<i>Bearing</i>	Lager	<i>Roulement</i>	Cojinete
	6050	Anello di compensazione	<i>Compensation ring</i>	Kompensationsring	<i>Bague de compensation</i>	Anillo de compensación
	6080	Anello V-RING	<i>V-ring</i>	V-Ring	<i>Bague V-ring</i>	Anillo V-ring
M	6230	Pressacavo	<i>Cable gland</i>	Kabelhalter	<i>Presse-étoupe</i>	Prensacable
	6250	Morsettiera	<i>Terminal board</i>	Klemmkasten	<i>Plaque à bornes</i>	Caja de bornes
M	1070	Scudo	<i>Rear shield</i>	Schild	<i>Bouclier</i>	Protección
M_FD M_FA	1080	Scudo per mot. autofrenante	<i>Shield for brake motor</i>	Schild für Bremsmotor	<i>Bouclier pour moteur frein</i>	Protección para motor autofrenante
	1290	Distanziale	<i>Spacer ring</i>	Distanzstück	<i>Entretoise</i>	Distanciador
	1360	Kit leva di sblocco	<i>Brake release kit</i>	Kit Handlüfterhebel	<i>Kit levier déblocage</i>	Kit de la palanca de desbloqueo
	1370	Kit guarnizioni freno	<i>Water/dust guard</i>	Kit Bremsdichtungen	<i>Kit bagues frein</i>	Kit de las guarniciones del freno
	6290	Linguetta (mozzo freno)	<i>Key (brake hub)</i>	Paßfeder (Bremsennabe)	<i>Clavette (moyeu frein)</i>	Chaveta (cubo del freno)
	6300	Anello seeger	<i>Circlip</i>	Seegerring	<i>Circlip</i>	Anillo Seeger
M_FD	1220	Coperchio scat.coprimorsett.	<i>Conduit box lid</i>	Klemmkastendeckel	<i>Couvercle boîte à bornes</i>	Tapa de la carcasa de la caja de bornes
	1240	Guarniz. coperchio coprim.	<i>Conduit box gasket</i>	Klemmkastendeckel dichtung	<i>Joint du couvercle de la boîte à bornes</i>	Junta de la tapa de la caja de bornes
	1300	Freno c.c. tipo FD	<i>d.c. brake type FD</i>	G.S.-Bremstyp FD	<i>Frein c.c type FD</i>	Freno cc tipo FD
	1390	Raddrizzatore	<i>ac/dc rectifier</i>	Gleichrichter	<i>Redresseur</i>	Rectificador
M_FA	1350	Freno c.a. tipo FA	<i>a.c. brake type FA</i>	D.S.-Bremstyp FA	<i>Frein c.a. type FA</i>	Freno ca tipo FA



BN	ref.	Denominazione	Description	Benennung	Dénomination	Denominación
BN BN_FD BN_FA	1010	Statore	Stator	Stator	Stator	Estátor
	1030	Rotore	Rotor	Läufer	Rotor	Rotor
	1050	Flangia (B5/B14)	Flange (B5/B14)	Flansch (B5/B14)	Bride (B5/B14)	Brida (B5/B14)
	1100	Tiranti	Tie-rods	Zugbolzen	Entretoises	Varillas
	1150	Ventola	Fan	Lüfterrad	Ventilateur	Ventilador
	1180	Copriventola	Fan cowl	Lüfterraddeckel	Cache-ventilateur	Cubreventilador
	1200	Scatola coprimorsettiera	Conduit box lid	Klemmkastendeckel	Boîte cache-bornes	Carcasa de la caja de bornes
	1230	Guarnizione scat. coprimors.	Conduit box gasket	Klemmkastendeckel dichtung	Joint de la boîte à bornes	Junta de la carcasa de la caja de bornes
	6020	Cuscinetto	Bearing	Lager	Roulement	Cojinete
	6030	Cuscinetto	Bearing	Lager	Roulement	Cojinete
	6050	Anello di compensazione	Compensation ring	Kompensationsring	Bague de compensation	Anillo de compensación
	6060	Linguetta	Key	Paßfeder	Clavette	Chaveta
	6070	Anello di tenuta	Oil seal	Dichtring	Bague d' étanchéité	Anillo de estanqueidad
	6080	Anello V-RING	V-ring	V-Ring	Bague V-ring	Anillo V-ring
	6230	Pressacavo	Cable gland	Kabelhalter	Presse-étoupe	Prensacable
	6250	Morsettiera	Conduit box	Klemmkasten	Plaque à bornes	Caja de bornes
BN	1070	Scudo	Rear shield	Schild	Bouclier	Protección
BN_FD BN_FA	1080	Scudo per mot. autofrenante	Shield for brake motor	Schild für Bremsmotor	Bouclier pour moteur frein	Protección para motor autofrenante
	1290	Distanziale	Spacer ring	Distanzstück	Entretoise	Distanciadador
	1360	Kit leva di sblocco	Brake release kit	Kit Handlüfterhebel	Kit levier déblocage	Kit de la palanca de desbloqueo
	1370	Kit guarnizioni freno	Kit brake seals	Kit Bremsdichtungen	Kit bagues frein	Kit de las guarniciones del freno
	6290	Linguetta (mozzo freno)	Key (brake hub)	Paßfeder (Bremsennabe)	Clavette (moyeu frein)	Chaveta (cubo del freno)
BN_FD	6300	Anello elastico	Circlip	Seegerring	Circlip	Anillo elástico
	1220	Coperchio scat.coprimorsett.	Conduit box lid	Klemmkastendeckel	Couvercle boîte à bornes	Tapa de la carcasa de la caja de bornes
	1240	Guarniz. coperchio coprim.	Conduit box gasket	Klemmkastendeckel dichtung	Joint du couvercle de la boîte à bornes	Junta de la tapa de la caja de bornes
	1300	Freno c.c. tipo FD	d.c. brake type FD	G.S.-Bremstyp FD	Frein c.c type FD	Freno cc tipo FD
BN_FA	1390	Raddrizzatore	ac/dc rectifier	Gleichrichter	Redresseur	Rectificador
	1350	Freno c.a. tipo FA	a.c. brake type FA	D.S.-Bremstyp FA	Frein c.a. type FA	Freno ca tipo FA

Opzioni motori elettrici:

Electric motors options:

Optionen - Elektromotoren:

Options moteurs électriques:

Opciones de los motores eléctricos:

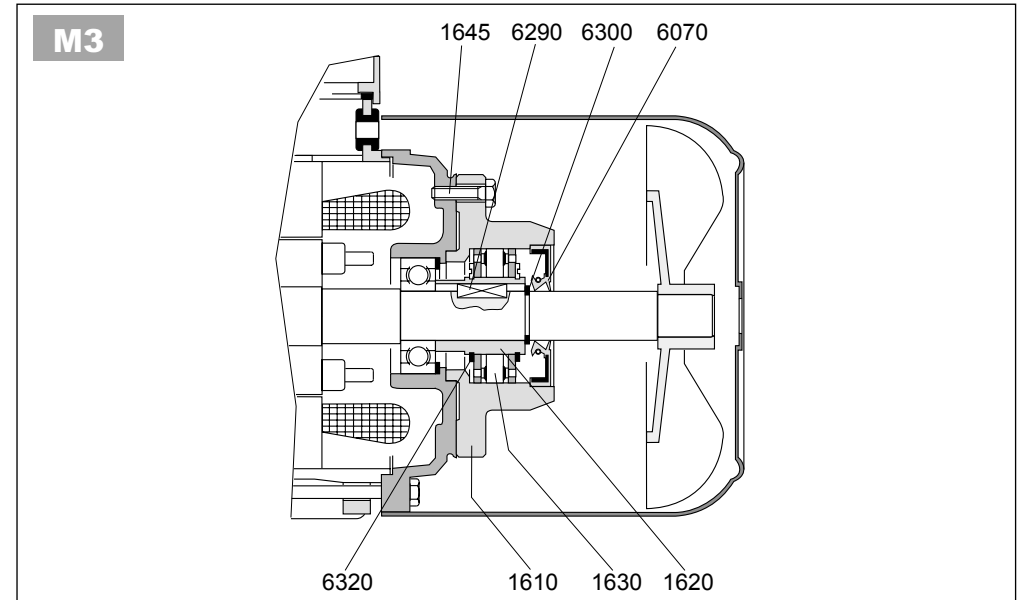
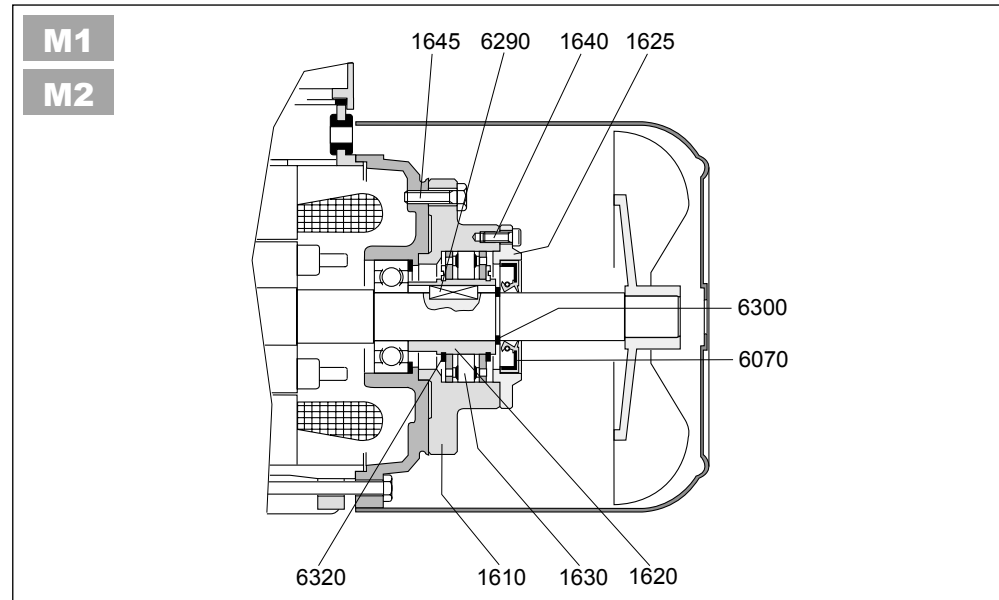
Antiritorno

Back stop

Rücklaufsperr

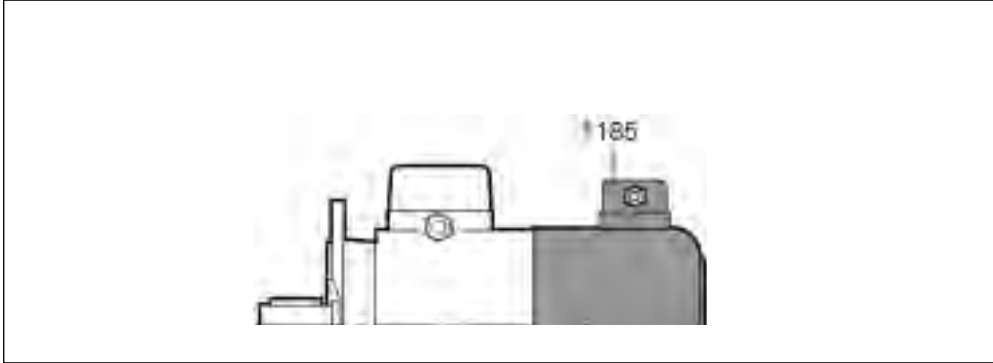
Anti-retour

Antirretorno



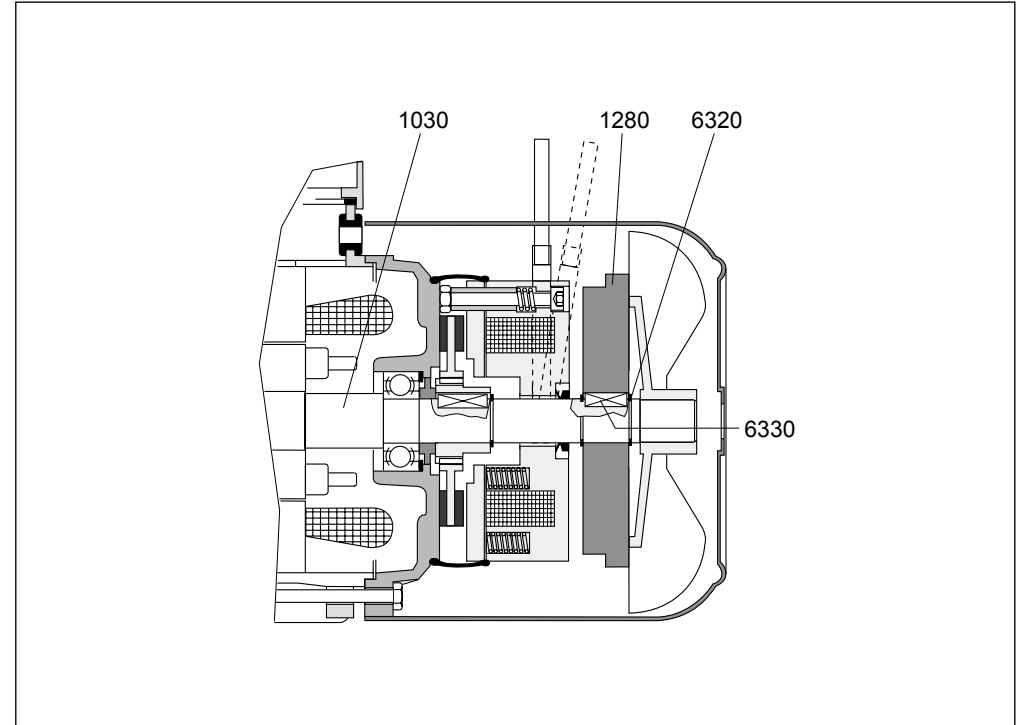
	ref.	Denominazione	Description	Benennung	Dénomination	Denominación
M1 - M2 - M3	1610	Boccola esterna	External bushing	Außenbuchse	Douille externe	Casquillo exterior
	1620	Boccola interna	Internal bushing	Innenbuchse	Douille interne	Casquillo interior
	1630	Ruota libera	Freewheel	Freilauf	Roue libre	Rueda interior
	1645	Vite di fissaggio	Bolt	Befestigungsschraube	Vis de fixation	Tornillo de fijación
	6070	Anello di tenuta	seal ring	Dichtungsring	Joint d'étanchéité	Anillo de estanqueidad
	6290	Linguetta	Key	Paßfeder	Clavette	Chaveta
	6300	Anello elastico	Circlip	Seegerring	Circlip	Anillo elástico
	6320	Anello elastico	Circlip	Seegerring	Circlip	Anillo elástico
M1 - M2	1625	Cappellotto	Cap	Deckel	Capuchon	Capuchón
	1640	Vite di fissaggio	Screw	Befestigungsschraube	Vis de fixation	Tornillo de fijación

**Servoventilatore / Separate supply forced ventilation
Servoventilator / Servo-ventilateur / Servoventilador**



		V - Hz	In [A] 50/60 Hz
BN 71	M1	1x 230V - 50/60 Hz	0.14
BN 80	M2		0.14
BN 90			0.25
BN 100	M3		0.25
BN 112	M4S	3x 230/400 V - 50/60 Hz	0.26/0.15
BN 132	M4L		0.38/0.22

**Volano / Flywheel
Schwungrad / Volant / Volante**



	ref.	Denominazione	Description	Benennung	Dénomination	Denominación
Servoventilatore / Forced cooling / Servoventilator / Servo-ventilateur / Servoventilador						
M - BN	1185	Servoventilatore	Forced cooling	Servoventilator	Servo-ventilateur	Servoventilador
Volano / Flywheel / Schwungrad / Volant / Volante						
BN_FA BN_FD	1030	Albero motore	Motor shaft	Motorwelle	Arbre moteur	Cigüeñal
	1280	Volano	Flywheel	Schwungrad	Volant	Volante
	6320	Anello elastico	Circlip	Seegerring	Circlip	Anillo elástico
	6330	Linguetta	Key	Paßfeder	Clavette	Chaveta

INDICE DI REVISIONE (R)	INDEX OF REVISIONS (R)	LISTE DER ÄNDERUNGEN (R)	INDEX DES RÉVISIONS (R)	ÍNDICE DE REVISIÓN (R)
R2				

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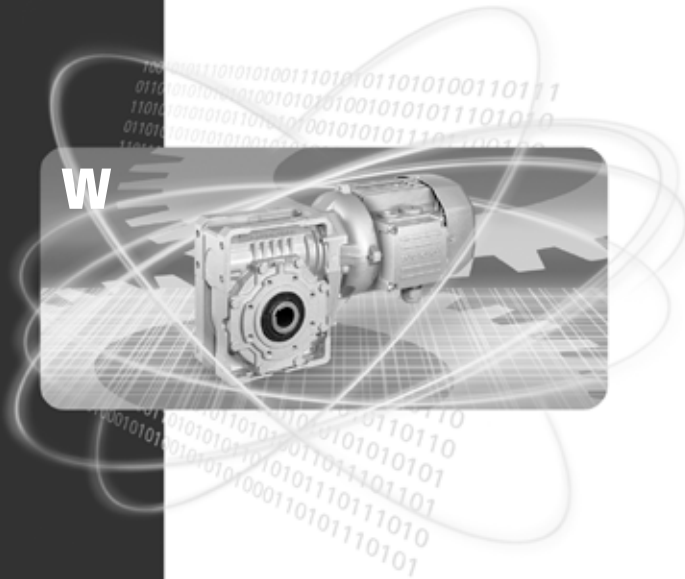
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INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS



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MOBILE EQUIPMENT
AND WIND ENERGY SOLUTIONS

INDUSTRY PROCESS
AND AUTOMATION SOLUTIONS

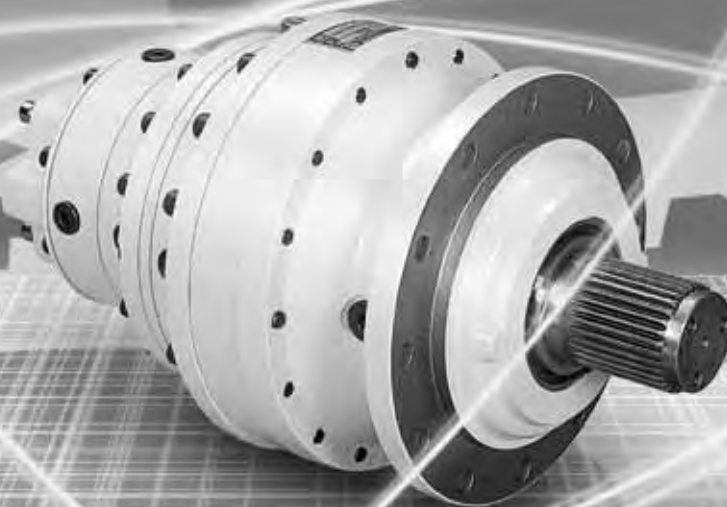


BONFIGLIOLI
TRASMITAL

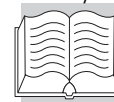
Installation, use and service manual



300



BONFIGLIOLI



USE, INSTALLATION AND MAINTENANCE MANUAL



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Revisions

The catalogue revision list is given on page 42. The most recent versions of the catalogue are available at www.bonfiglioli.com.



1.0 - GENERAL INFORMATION

1.1 - PURPOSE OF THE MANUAL

This Manufacturer's manual provides information regarding the safe transport, handling, installation, maintenance, repair, disassembly and dismantling of the gear unit.

All information for users and designers is given in the Sales Catalogue. As well as adhering to established engineering practices, the information given in this manual must be read carefully and rigorously applied.

Failure to observe the information provided herein may result in risks to personal health and safety, as well as economic damages.

This information, provided in the Manufacturer's original language (Italian), is also available in other languages to meet legal and commercial requirements.

The documentation must be stored by a person charged to do so in a suitable location so as to be always available in good condition for consultation.

In case of loss or damage, replacement documentation must be requested directly from the Manufacturer, quoting the code of this manual.

This manual reflects the state of the art at the time of commercialisation of the gear unit.

The Manufacturer reserves the right to modify, supplement and improve the manual, without the present publication being for that reason considered inadequate.

Particularly significant sections of the manual and important specifications are highlighted by symbols whose meanings are explained below.

SYMBOLS:



DANGER - WARNING

This symbol indicates situations of danger, which if ignored, may result in serious injury to the operator.



CAUTION - ATTENTION

This symbol indicates the need to adopt specific precautions to avoid personal injury and damage, as well as economic damages.



IMPORTANT

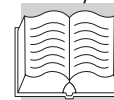
This symbol indicates important technical information.



Instructions marked by these symbols and highlighted in yellow, apply exclusively to equipment complying with "ATEX" Directive 94/9/EC.

The operations identified by these symbols must be executed by professionally qualified operators specially trained in the safety precautions required for working in potentially explosive atmospheres.

Failure to observe these instructions may result in serious safety and environmental risks.



1.2 - PRODUCT IDENTIFICATION

The information identifying the product is shown on its nameplate. Gearmotors are equipped with two nameplates; one on the gear unit which bears the gear unit data, and one on the motor (electric or hydraulic), bearing the motor data.

The drawing below illustrates the layout of the data.

The gear unit's identifying code is explained in the Sales Catalogue. If the gear unit is supplied fitted with an electric motor (garmotor), all information regarding the motor is supplied in the motor manual.

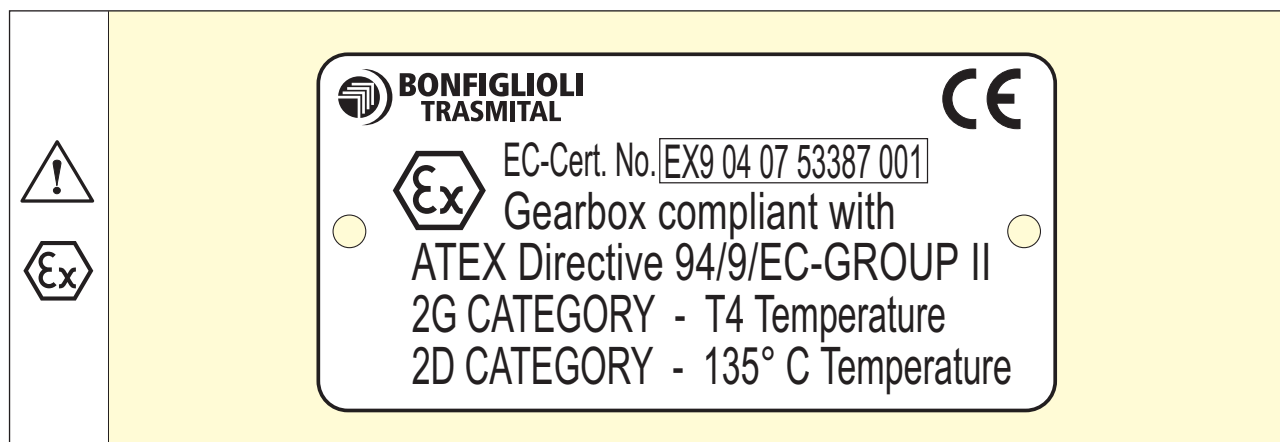
Nameplate data

The diagram shows a rectangular nameplate with the following layout:

- A**: Manufacturer logo and name (BONFIGLIOLI TRASMITAL).
- B**: Product identification field.
- C**: Bonfiglioli Trasmital product code field.
- D**: Reduction ratio field (RATIO 1/).
- E**: Serial number field (SERIAL N°).
- F**: Installation drawing code field (DRWG. N°).
- G**: Date of manufacture field (DATE).
- H**: Client product code field (COD. N°).
- MADE IN ITALY**: Text at the bottom right.

- A** Manufacturer
- B** Product identification
- C** Bonfiglioli Trasmital product code
- D** Reduction ratio
- E** Serial number
- F** Installation drawing code.
- G** Date of manufacture
- H** Client product code

Supplementary nameplate on ATEX-specified gear units



Readability of the nameplate

The nameplate and the information on it must be readable and, consequently must be cleaned from time to time.

Quote the nameplate data in all communications with the manufacturer, for example, when requesting spare parts, information and assistance.



1.3 - GLOSSARY AND TERMINOLOGY

Some of the frequently occurring terms used in this manual are described below to unequivocally define their meaning.

Routine maintenance

The set of operations required to preserve the functionality and efficiency of the gear unit. These operations are usually scheduled by the Manufacturer, who defines the qualifications and tasks involved.

Reactive maintenance

The set of operations required to preserve the functionality and efficiency of the gear unit. These operations are not scheduled by the Manufacturer and must be carried out by an expert maintenance technician.

Expert maintenance technician

An authorised technician with the qualifications, skills and mechanical and electrical training required to do repairs and non-routine maintenance work on the gear unit.

Overhaul

An overhaul consists in the replacement of bearings and other mechanical components which have worn to such an extent as to compromise the operation of the gear unit. An overhaul also includes verification of the condition of all gear unit components (keys, seals, gaskets, vents, etc). If any such components are damaged they must be replaced and the reason for the damage identified.

1.4 - REQUESTING TECHNICAL ASSISTANCE

For any technical service needs, contact the Manufacturer's sales network quoting the information indicated on the unit's nameplate, the approximate hours of service and the type of defect.

1.5 - MANUFACTURER'S LIABILITY

The Manufacturer declines all liability in the event of:

- use of the gear unit in contravention of local safety at work legislation
- incorrect installation, disregard or incorrect application of the instructions provided in this manual
- incorrect or defective electrical/hydraulic power supply (gearmotors)
- modifications or tampering
- work done on the unit by unqualified or unsuitable persons.

The safety of the gear unit also depends on scrupulous observance of the instructions given in this manual, and in particular:

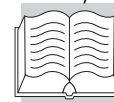
- always operate the unit within its operating limits
- diligently observe the routine maintenance schedule
- only allow trained operators to inspect and service the unit
- only use original spare parts
- the configurations given in the gear unit catalogue are the only ones permitted
- do not attempt to use the unit in any other way
- the instructions given in this manual do not substitute but rather supplement the provisions of established safety legislation.



1.6 - CONSIGNMENT CONDITIONS

Gear units are supplied by BONFIGLIOLI TRASMITAL in the following conditions:

- Configured for installation in the mounting position specified in the purchase order.
- Not charged with lubricant and with internal components protected by a film of oil compatible with the recommended lubricant.
- All surfaces and mating parts are treated with rustproofing products.
- Mating surfaces are not painted while the unit's exterior is treated with a coat of grey water-based rustproofing primer (RAL 7042/C441). Application of a top coat is the responsibility of the Client.
- Tested to factory standards.
- Packaged suitably for the final destination.



2.0 - TECHNICAL INFORMATION



2.1 - DESCRIPTION OF THE GEAR UNIT

The gear unit, driven by an electric or hydraulic motor, has been designed and constructed for integration into an assembly of interlocking parts or mechanisms as part of a specific application.

Depending on the requirements of the application, the gear unit can be supplied in a variety of motor executions and configurations. It is capable of satisfying a range of specific requirements in the mechanical, chemical, agricultural and food industries, etc.

BONFIGLIOLI TRASMITAL supplies a range of accessories and optionals to make their products as versatile as possible. For further technical information and descriptions, refer to the corresponding Sales Catalogue.



The User is responsible for using the products recommended for installation and maintenance of

 	<p>SAFETY SPECIFICATIONS OF GEAR UNITS COMPLYING WITH DIRECTIVE 94/9/EC</p> <ul style="list-style-type: none"> • unit selection must be made with a higher safety service factor • use only synthetic lubricants (oil and grease) • VITON® seal rings • vent plugs with spring-loaded anti-intrusion valve • oil plugs with aluminium washer • oil seals with dust trap • no metal moving parts external to the gear unit • no plastic parts capable of building up an electrostatic charge, or, if present, duly shielded • for installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme for all surfaces and recesses to avoid dust build ups of more than 5 mm in depth.
--	---



2.2 - CONFORMITY

All gear units or gearmotors (when supplied with electric motor) are designed in compliance with the provisions of applicable Essential Health and Safety Requirements, the "Machinery Directive" 98/37/EC and, if requested, can be supplied with a Manufacturer's Declaration - Annex IIB as provided by said Directive.

All BONFIGLIOLI gearmotor electric motors conform to the provisions of the Low Voltage Directive 73/23/EEC and the Electromagnetic Compatibility Directive 89/336/EEC.

 	<p>Furthermore, if specified for use in potentially explosive atmospheres, the gear units are designed and constructed to conform with the Essential Health and Safety Requirements (EHSR) of Annex II of the ATEX Directive 94/9/EC and conform to the following classification:</p> <ul style="list-style-type: none"> • Equipment group: II. • Category: Gas 2G - Dust 2D. • Zone: Gas 1 - Dust 21. • Maximum surface temperature: temperature class T4 for 2G and 130°C for 2D.
--	--

2.3 - OPERATING LIMITS AND CONDITIONS

 	<p>Modification of the motor execution or mounting position is only permitted if previously authorised by BONFIGLIOLI TRASMITAL's Technical Service.</p> <p>Failure to obtain said authorisation renders the ATEX certification null and void.</p>
--	---



Ambient conditions

- Ambient temperature: min. - 20°C; max. + 40°C.
- Do not use the gear unit, if not explicitly intended for the purpose, in a potentially explosive atmosphere or where the use of explosion-proof equipment is specified.

 	<p>The nameplate specifications regarding the maximum surface temperature, refer to readings taken in normal ambient and installation conditions.</p> <p>Even minimal variations to said conditions (e.g. smaller mounting cabinet) may have a significant effect on the unit's heat output.</p>
------	--

- Lighting

	<p>If the unit is to be serviced in a poorly lit area, use additional lamps and ensure that the work is done in compliance with the safety requirements of established legislation.</p>
--	---

3.0 - SAFETY INFORMATION

3.1 - SAFETY STANDARDS

- Carefully read the instructions given in this manual and those posted directly on the gear unit, especially those regarding safety.
- Persons charged with working on the gear unit at any time in its service life must be trained specifically for the purpose with special abilities and experience in the area as well as being equipped with the appropriate tools and individual safety equipment (as per Legislative Decree 626/94). Failure to meet these requirements constitutes a risk to personal health and safety.
- The gear unit must only be used for the applications permitted by the Manufacturer. Improper use can result in risks to personal health and safety and economic damages.

 	<p>The applications permitted by the Manufacturer are the industrial applications for which the gear units have been designed.</p>
------	---

- Keep the gear unit at its maximum efficiency by following the routine maintenance schedule. Good maintenance ensures the unit's maximum performance, extended service life and continued compliance with safety regulations.
- When working on the unit in areas which are difficult to access or hazardous, ensure that adequate safety precautions have been taken for the operator and others in compliance with established legislation on health and safety at work.
- All maintenance, inspection and repairs must only be carried out by an expert maintenance technician fully familiar with the attendant hazards. It is therefore essential to implement operating procedures that address potential hazards and their prevention for the entire machine. The expert maintenance technician must always work with caution in observance of applicable safety standards.
- During operation wear only the apparel and safety equipment indicated in the User Instructions provided by the Manufacturer or stipulated by legislation on safety at work.
- Replace worn components with original spare parts. Use the lubricants (oil and grease) recommended by the Manufacturer.
- Do not dump polluting materials into the environment. Dispose of all such materials as stipulated by applicable legislation.
- After replacing lubricants clean the gear unit's surfaces and the walk-on surfaces around the work area.



If the gear unit is to be serviced in a potentially explosive atmosphere, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning.



Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc).

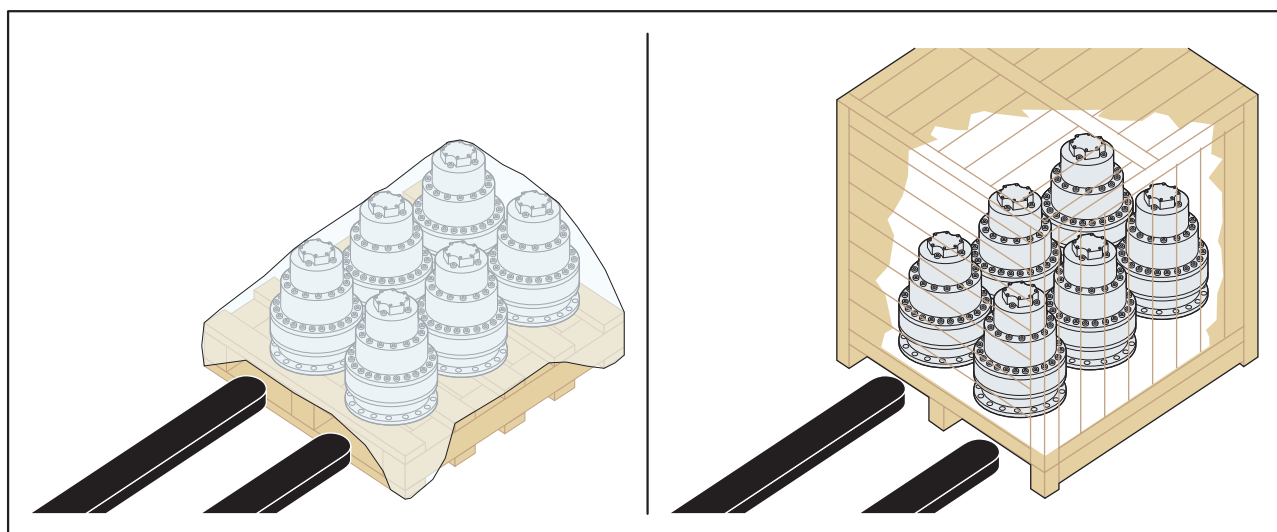
4.0 - HANDLING AND TRANSPORT

4.1 - PACKAGING

The standard packaging, if supplied and unless otherwise agreed, is not proofed against rainfall and is intended for shipping by ground and not sea, and for storage in areas which are under cover and not humid. The material can be stored in suitable conditions for a period of two years under cover at a temperature between -15 °C and +50 °C at a relative humidity not in excess of 80%. Storage in all other conditions requires specific packaging.

The most frequent types of packaging are shown in the figures below.

- Packaging on pallet with heat shrink film for ground shipping.
- Packaging in wooden crate for shipping by sea or air.



On receipt of the gear unit, make sure the delivery corresponds to the purchase order and that it is not damaged or faulty in any way.

Report any nonconformity to your BONFIGLIOLI TRASMITAL reseller.

Dispose of packaging materials as stipulated by applicable legislation.

4.2 - HANDLING INSTRUCTIONS

Handle packages as per the Manufacturer's instructions and those marked on the packages themselves. Since the weight and shape of the packages may make manual handling unfeasible, special equipment must be used to avoid damage and injury. Persons authorised for this purpose must be trained and experienced in the work in question to avoid risks to themselves and others.



The person authorised to handle the product must take all necessary precautions to safeguard his safety and that of all other persons involved.



4.2.1 - Moving the packages

- Prepare a suitable, delimited area with a level floor or surface for unloading the packages.
- Prepare the equipment required to handle the package. The lifting and handling equipment (e.g. crane or lift truck) must be of adequate capacity for the weight and size of the load, taking into account its attachment points and centre of gravity. If required, this information is indicated on the package itself. Harness heavy packages with chains, belts and steel ropes after checking that they are suitable for the weight of the load, which is always indicated.
- When handling the load keep it level to avoid tipping and instability.

4.2.2 - Moving the equipment



All the following operations must be carried out with care and caution and without sudden movements.



**When lifting, use accessories such as eyebolts, screw clamps, snap hooks, straps, ropes and hooks etc. which are certified and adequate for the load in question.
The weight of the product to be lifted is given in the Sales Catalogue.**

The following pages illustrate in detail the different attachment methods for the various product series, sizes and configurations described in this Manual.

The most suitable solution for lifting and handling the product in safety is indicated for each.

Symbols:

Type of lifting	Manual	With mechanical equipment	
Symbol	M	A	B
Approximate weight	≤ 15 Kg	> 15 Kg	
Instruction	—	Recommended method for positioning	Recommended method for handling and positioning
Warning	—	The load may be unstable	The load may sway or oscillate
Solution	—	<p>Slide the lifting ring to align it with the load's centre of gravity as shown in the diagrams below</p> <p>Lock the ropes below the ring with a cable clamp or similar device so as to prevent them sliding, and lift the load</p> <p>Observe all precautions regarding the handling of loads</p>	<p>Stabilise the moving load by hand</p> <p>Observe all precautions regarding the handling of loads</p>

The load must not be allowed to sway by more than 15° in any direction when being lifted.
If swaying exceeds this amount, stop and repeat the lifting operation as instructed.

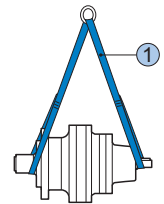
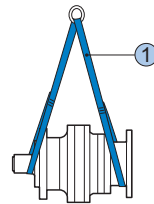
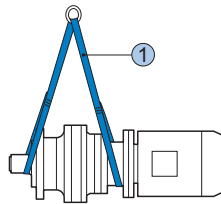


Identify the attachment points for lifting the gear unit. Refer to the diagrams given below.

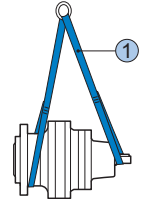
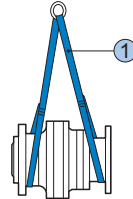
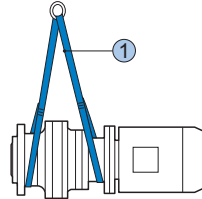
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300 L ... 316 L

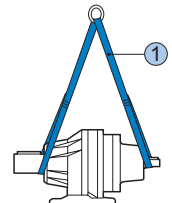
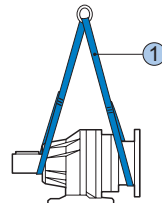
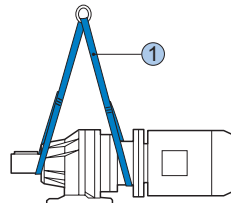
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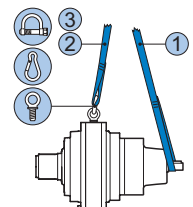
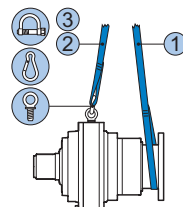
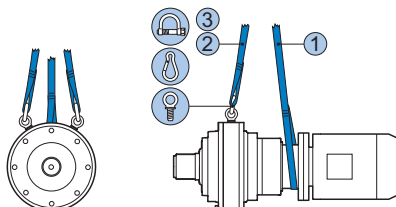
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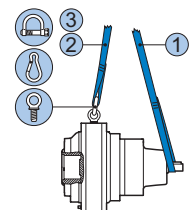
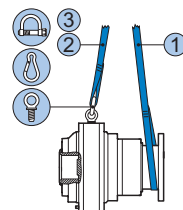
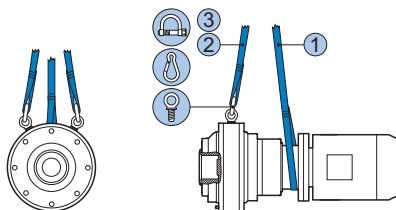
B

317 L ... 321 L

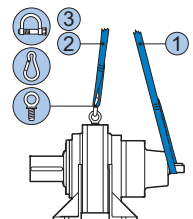
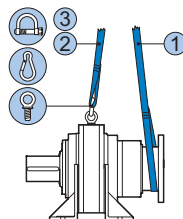
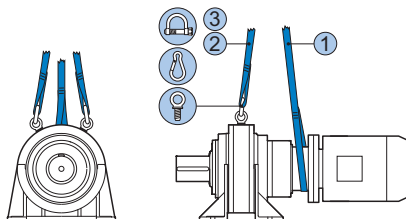
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F




P





① Ring harness

② Rope and hooks

③ Open harness with eyelets

 Screw clamp (use with harness)

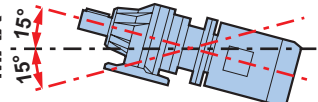
 Snap hook (use with rope)

 Eyebolt (already fitted on gear units 317-321)



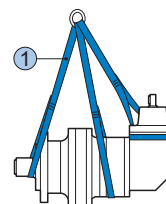
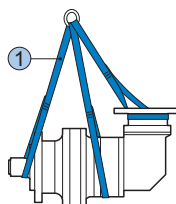
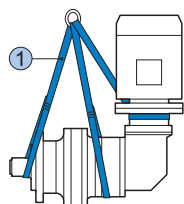
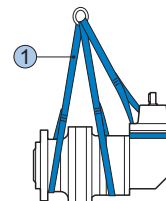
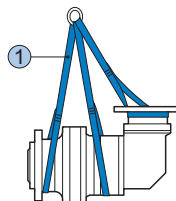
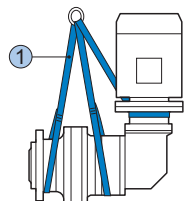
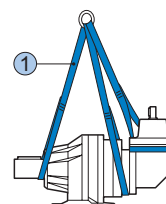
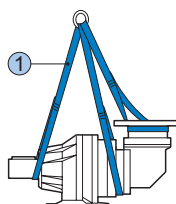
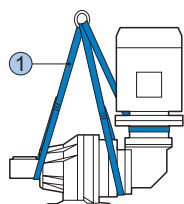
Maximum permissible tilt during handling: 15°

MAX
15°

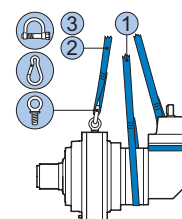
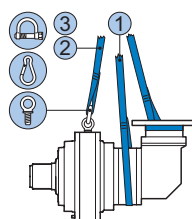
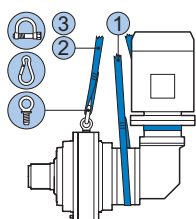
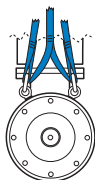
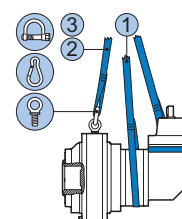
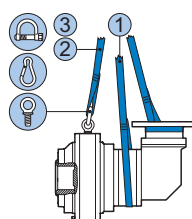
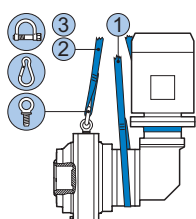
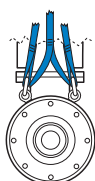
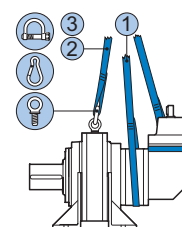
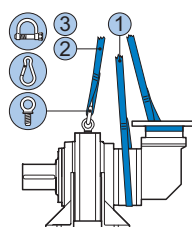
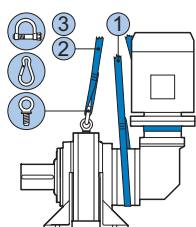
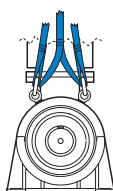



A

300 R ... 316 R

H

F

P

B

317 R ... 321 R

H

F

P


① Ring harness

② Rope and hooks

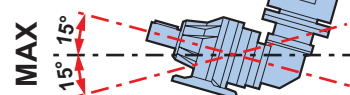
③ Open harness with eyelets

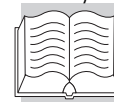
Screw clamp (use with harness)

Snap hook (use with rope)

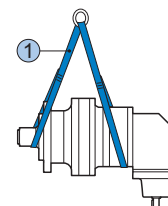
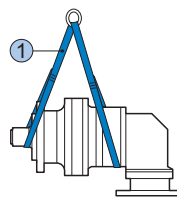
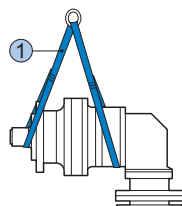
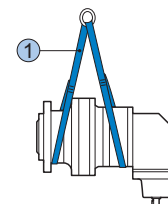
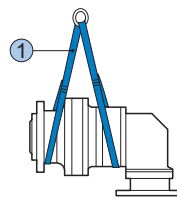
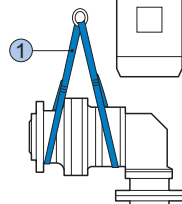
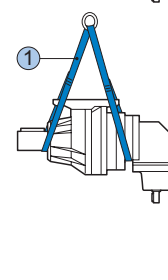
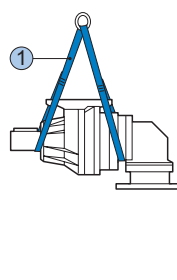
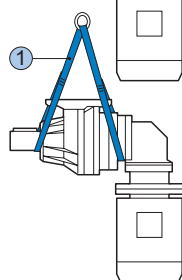
Eyebolt (already fitted on gear units 317-321)

Maximum permissible tilt during handling: 15°

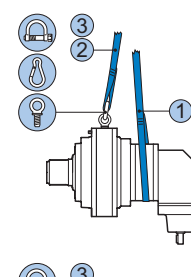
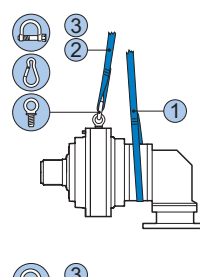
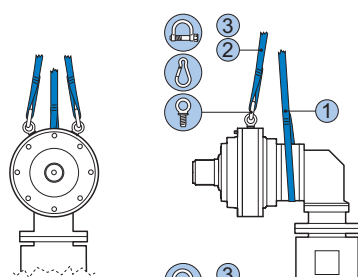
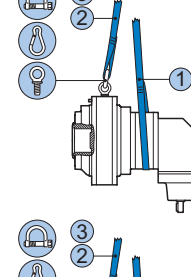
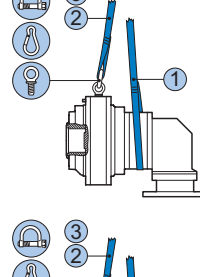
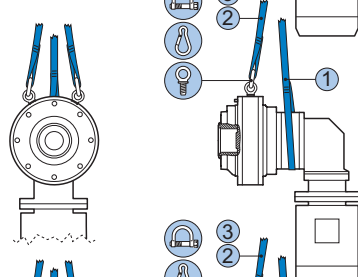
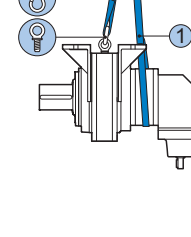
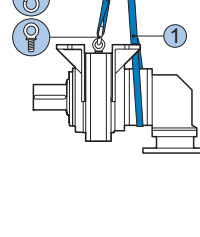
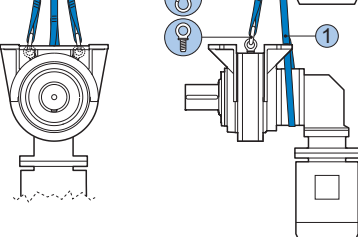



A

300 R ... 316 R

H

F

P

B


317 R ... 321 R


H

F

P



① Ring harness

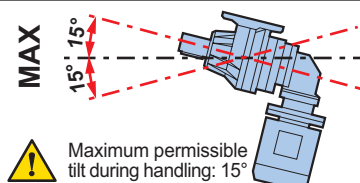
② Rope and hooks

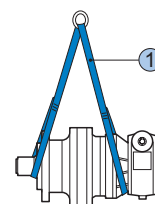
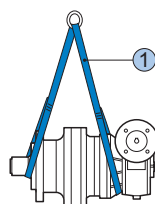
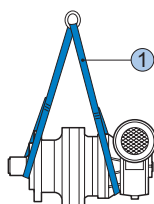
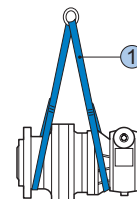
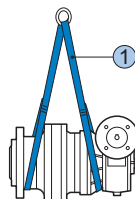
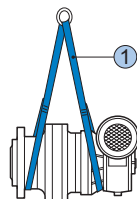
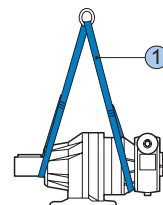
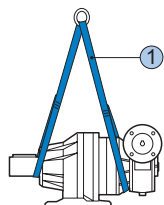
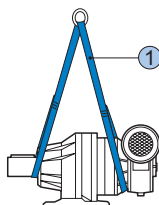
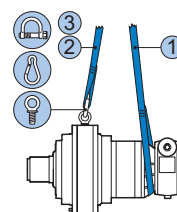
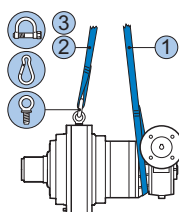
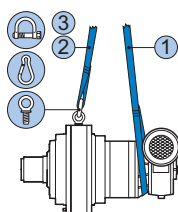
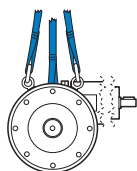
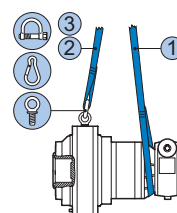
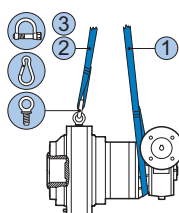
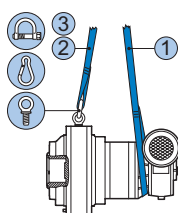
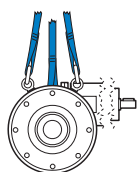
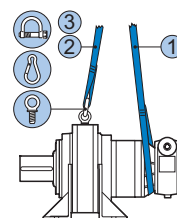
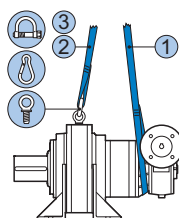
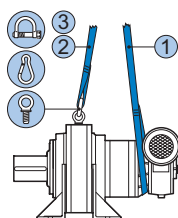
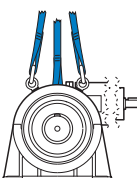
③ Open harness with eyelets

 Screw clamp (use with harness)

 Snap hook (use with rope)

 Eyebolt (already fitted on gear units 317-321)




A
3V 00 ... 3V 16
H

F

P

B
3V 17 ... 3V 21
H

F

P

1 Ring harness

2 Rope and hooks

3 Open harness with eyelets

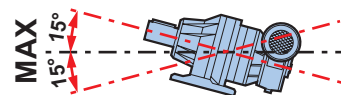
Screw clamp (use with harness)

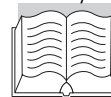
Snap hook (use with rope)

Eyebolt (already fitted on gear units 317-321)

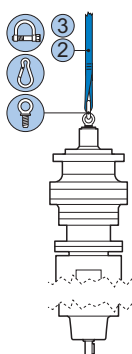
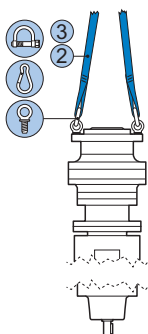
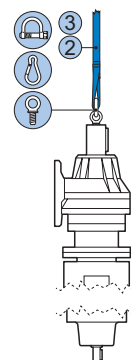


Maximum permissible tilt during handling: 15°

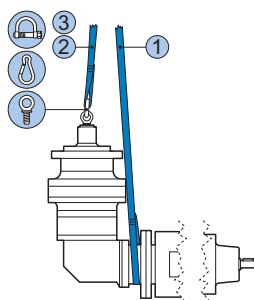
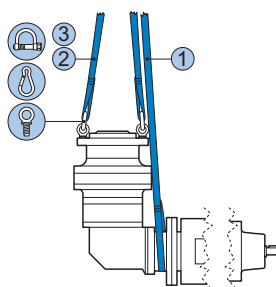
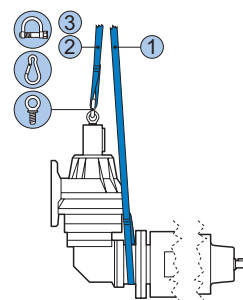




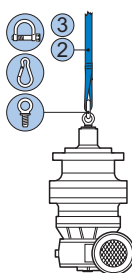
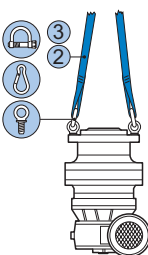
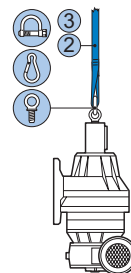
300 L ... 321 L

H

F

P





300 R ... 321 R

H

F

P


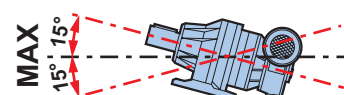
3V 00 ... 3V 21

H

F

P


- ① Ring harness
- ② Rope and hooks
- ③ Open harness with eyelets

-  Screw clamp (use with harness)
-  Snap hook (use with rope)
-  Eyebolt (already fitted on gear units 317-321)

 Maximum permissible tilt during handling: 15°





- Prepare the gear unit for lifting by attaching straps, hooks and screw clamps etc. to its attachment points. Alternatively, use a pallet to move the load. If using a crane, first lift the gear unit vertically out of its packaging.
- If using a lift truck or pallet truck, remove the packaging and insert the truck's forks at the indicated positions.
- First lift the load very slowly to check that it is stable.
- Move the gear unit to the unloading area and lower it gently into position, taking care not to tip it suddenly in transit.



If the gear unit is already equipped with an electric motor, do not use the eyebolts on the motor casing for lifting, unless expressly specified.

4.3 - STORAGE

The following recommendations should be followed when storing the gear unit.

1. Do not store the unit in excessively humid conditions or where it is exposed to the weather (do not store outdoors).
2. Do not place the gear unit directly on the ground.
3. Place the gear unit on a stable base and make sure that it is not subject to accidental displacement.
4. Store the packaged gear unit (if allowed) in accordance with the instructions on the packaging itself.

If the gear unit is to be stored for more than 6 months, the following **additional** precautions must be taken:

5. Cover all machined external surfaces with a rustproofing product such as Shell Ensic or other product with similar properties and application range.
6. Fill the unit with lubricating oil and make sure the vent plug is positioned uppermost. Before putting the unit into service, the oil used for storage must be drained and replaced with the correct quantity of recommended operating lubricant.

PRECAUTIONS to be taken when returning the gear unit to service after storage.

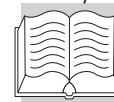
The output shafts and external surfaces must be thoroughly cleaned of all rustproofing product, contaminants and other impurities (use a standard commercial solvent).
Do this outside the explosion hazard area.

The solvent must not touch the seal rings as this may damage them, causing them to leak

If the oil or protective material used during storage is not compatible with the synthetic oil used during the machine's operation, the interior of the unit must be thoroughly cleaned before filling with the operating oil.

The service life of the bearing grease is reduced if the unit is stored for more than 1 year.
The bearing grease must be synthetic.





5.0 - INSTALLATION

5.1 - INSTALLING THE GEAR UNIT



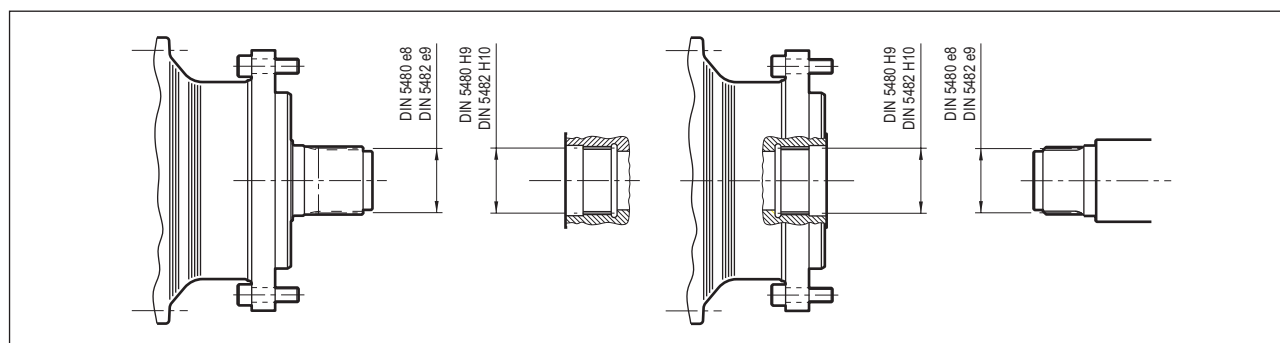
The entire installation process must be planned as early as the general design phase of the machine. The person authorised to do the work must, if necessary, set out a safety plan to protect the health and safety of all persons directly involved and apply all applicable legislation.

1. Carefully remove all packaging and protective product residue from the gear unit.
Pay particular attention to the mating surfaces.
2. Check that the data on the nameplate correspond to those specified in the purchase order.
3. Ensure that the structure to which the gear unit is to be mounted is sufficiently robust and rigid to support its weight and operating stresses.
4. Check that the machine to which the gear unit is to be installed is switched off and cannot be accidentally switched on again.
5. Make sure all mating surfaces are flat.
6. Make sure the shaft/shaft or shaft/ bore are perfectly aligned for coupling.
7. Fit suitable guards to protect against the gear unit's external moving parts.
8. If the work environment is corrosive for the gear unit or any of its parts, follow the special precautions required for aggressive environments. In this case, contact the BONFIGLIOLI TRASMITAL sales service.
9. We recommend applying a protective paste to all gear unit/motor mating surfaces and other parts (Klüberpaste 46 MR 401 or other product with similar properties and application range) to ensure optimal coupling and protection against fretting corrosion.
10. In the case of outdoor installations fitted with an electric motor, protect the latter from direct sunlight and the weather by means of guards or a casing. Also make sure that the assembly is properly ventilated.

5.1.1 - Flanged execution

Machine the coupling counterflange on the machine to which the gear unit is to be installed.

The flanges must be plane and machined with machine tools. Connect the output shaft to the driven component as indicated in the drawings below.

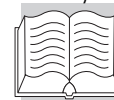


Recommended tolerances			
Loose coupling		Coupling with interference	
Solid shaft	Hollow shaft	Solid shaft	Hollow shaft
$\varnothing d \text{ h6}$	$\varnothing D \text{ G7}$	$\varnothing d \text{ h6}$	$\varnothing D \text{ P7}$
$\varnothing d \text{ k6}$	$\varnothing D \text{ F7}$	$\varnothing d \text{ k6}$	$\varnothing D \text{ M7}$
$\varnothing d \text{ m6}$	$\varnothing D \text{ F7}$	$\varnothing d \text{ m6}$	$\varnothing D \text{ K7}$
$\varnothing d \text{ r6}$	$\varnothing D \text{ E7}$	$\varnothing d \text{ r6}$	$\varnothing D \text{ H7}$



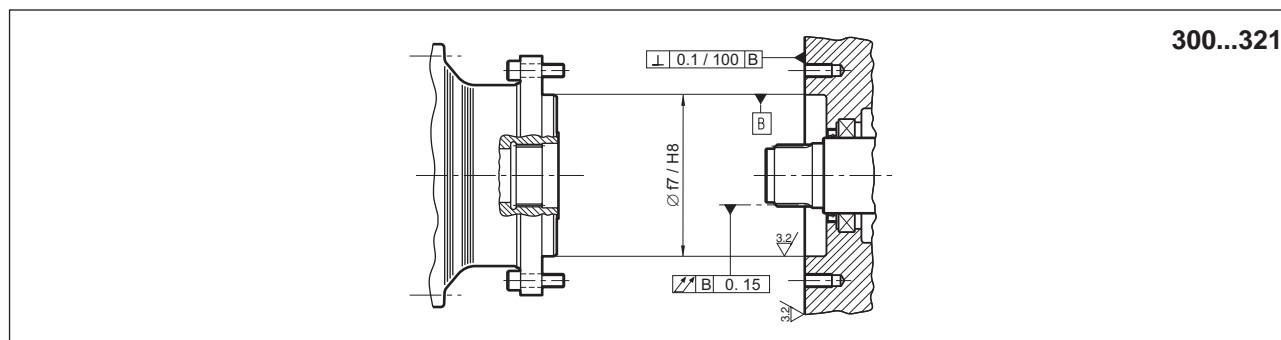
At the time of installation, move the spigots mounted on the gear unit forward into the counterflange by an amount equal to their diameter. See diagram below:


$$R \geq 60\% R_n$$



Mounting with hollow splined shaft

Ensure that the gear unit and driven shaft are aligned and that the latter is not subject to flexing during operation. See diagram below:



Flanged gear unit mounting bolts

	300	301	303	304	305	306	307	309	310	311	313	314	315	316	317	318	319	321
Bolt	M10	M10	M12	M12	M12	M14	M16	M16	M16	M16	M20	M20	M20	M20	M30	M24	M30	M30
Quantity	8	8	10	10	10	12	10	12	15	24	30	20	20	30	24	32	30	36
Class	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque (Nm)	50	50	85	85	85	135	200	200	200	200	400	400	400	400	1400	700	1400	1400

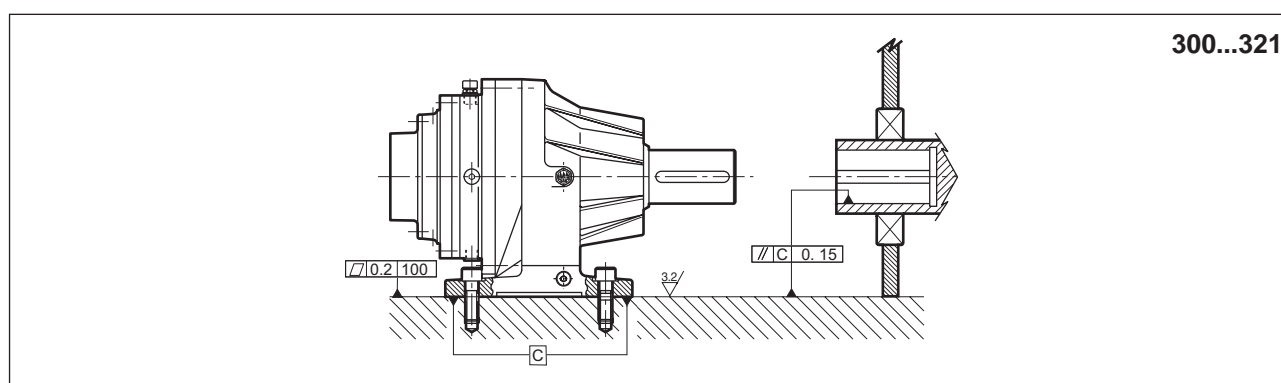
For maximum transmitted torques greater than or equal to 70% of the torque indicated as M_{2max} , and with frequent inversions of the direction of rotation, use at least class 10.9 bolts.

5.1.2 - Foot mounting

Foot-mounted motor execution

Gear units of this type must be mounted on a suitably rigid base, machined flat with a planarity error margin of no more than 0.2 mm / 100 mm.

See diagram below:



Foot-mounted gear unit mounting bolts

	300	301	303	304	305	306	307	309	310	311	313	314	315	316	317	318	319	321
Bolt	M16	M16	M16	M16	M16	M20	M24	M24	M24	M30	M30	M30	M30	M36	M30	M36	M48	M48
Quantity	4	4	4	4	4	4	4	4	4	4	4	8	8	8	8	8	4	8
Class	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Tightening torque (Nm)	200	200	200	200	200	400	700	700	700	1400	1400	1400	1400	2500	1400	2500	6000	6000



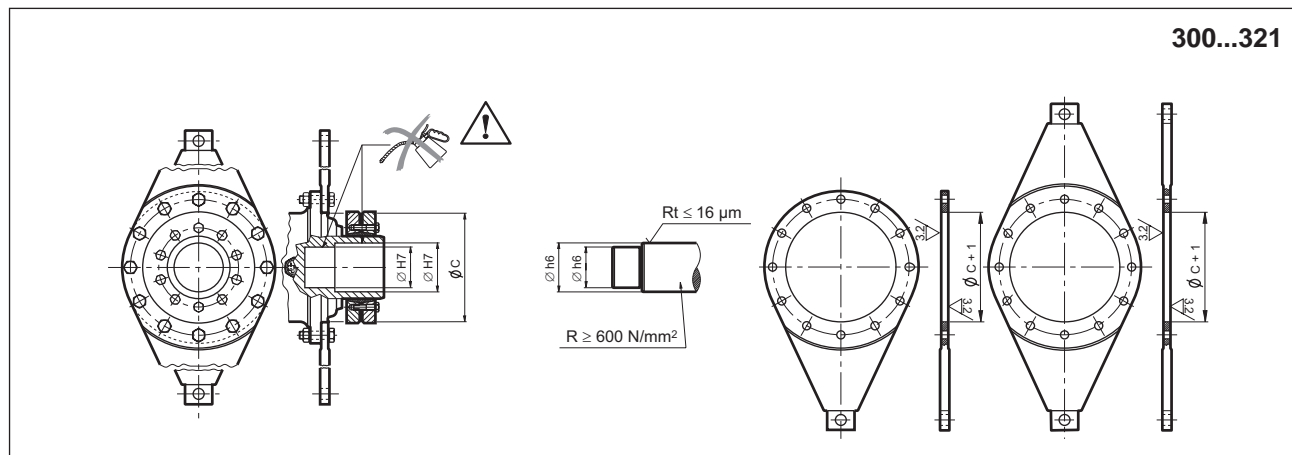
5.1.3 - Shaft mounting

Mount the torque arm with bolts of at least class 8.8 tightened to a torque of 70% of their failure stress. Clean and degrease both the internal coupling surface of the gear unit shaft and the external coupling surface of the machine's driven shaft.

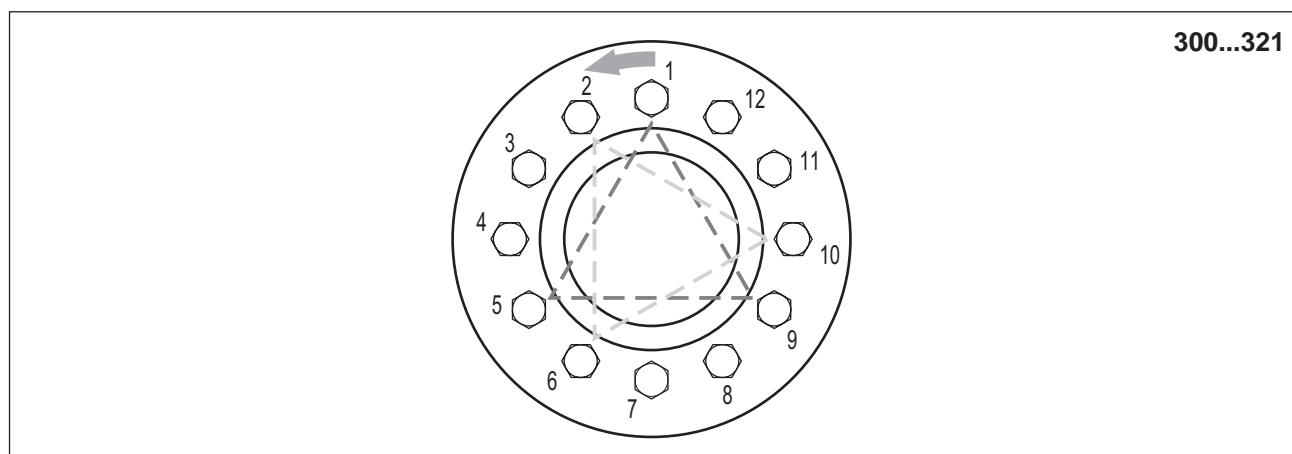
Mount the shrink disk to the gear unit's shaft after lightly lubricating its entire **outer surface**. Snug down a first set of 3 bolts located at the corners of an equilateral triangle (for example: bolts in pos. 1-5-9 of the diagram below). Fit the gear unit to the driven shaft.

Tighten down the bolts (following the triangular pattern) in a circular direction, repeating the operation several times until all bolts are tightened to the torque specified in chart 2, in accordance with the type of disk/gear unit.

N.B.: Do not tighten down diametrically opposed bolts in sequence.



Do not use molybdenum bisulphide or any other grease, which could reduce the friction of the mating surfaces and affect the performance of the shrink disk.



Shrink disk mounting bolts

	300	301	303	304	305	306	307	309	310	311	313	314	315	316	317	318	319	321
Bolt	M6	M6	M8	M8	M8	M10	M10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M20	M24
Quantity	8	10	12	12	12	9	12	8	8	10	10	12	12	15	18	21	24	21
Class	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Tightening torque (Nm)	12	12	30	30	30	58	58	250	250	250	250	490	490	490	490	490	490	840



Proceed with the installation as follows:

1. Place the gear unit in the vicinity of the installation area.
2. Mount the gear unit and secure it to the structure at the points provided. The gear unit should be secured to the structure at all the mounting points (bores) on the mount provided (feet or flange).
3. Tighten down the mounting bolts and check that the service plugs are screwed down to the torques given in the chart.

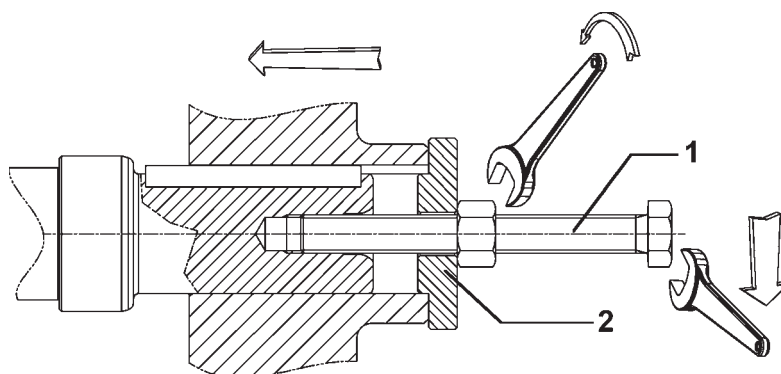


Locate the closed oil plug used during shipping and replace it with the vent plug supplied in the shipment.

5.1.4 - Installing accessories on solid input and output shafts

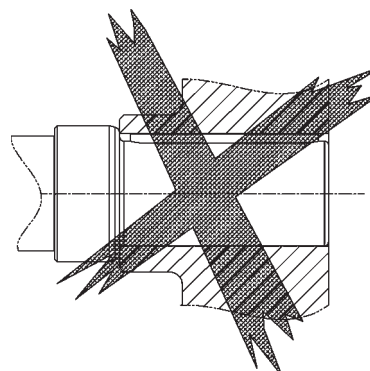
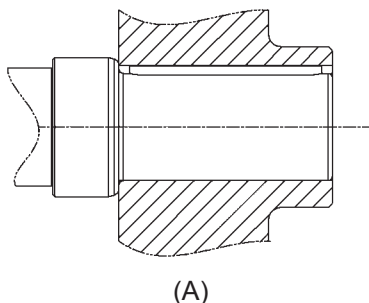


Do not use hammers or other tools that might damage the gear unit's shafts or bearings when mounting external parts. Instead, proceed as illustrated in the diagram below:



Bolt (1) and spacer (2) are not included in the consignment.

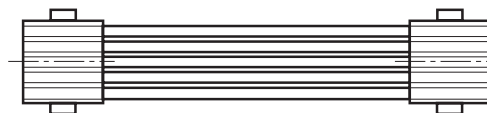
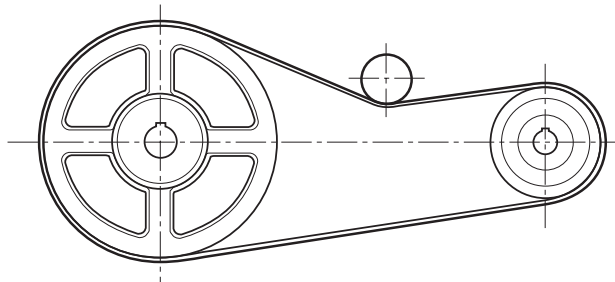
To minimise the loads on the shaft bearings, when mounting transmission mechanisms with asymmetrical hubs use the configuration shown in diagram **(A)** below:



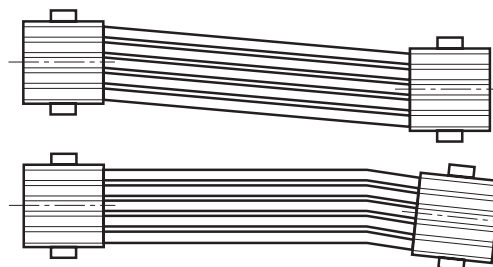
Mounting pulleys

Clean all parts before installing them. When installing belt drive pulleys, the shafts must be parallel with their pulleys aligned.

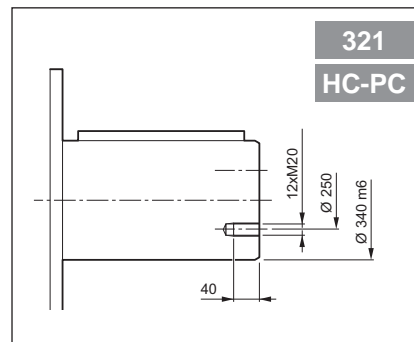
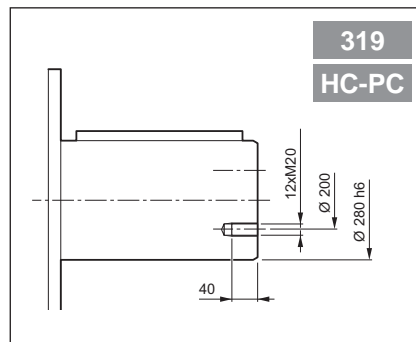
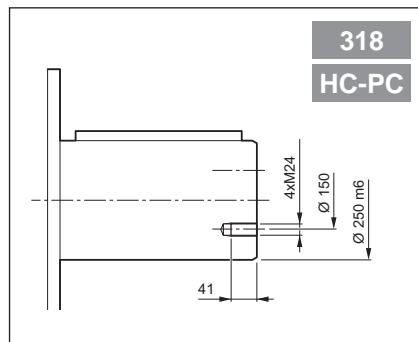
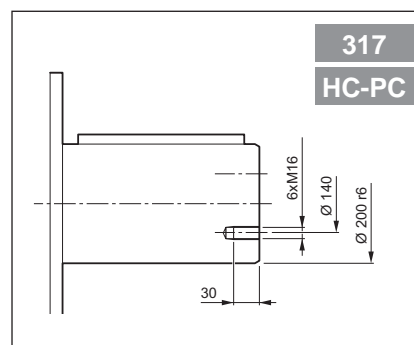
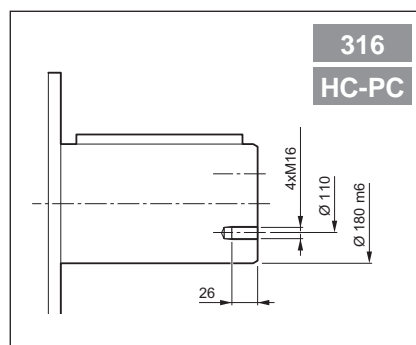
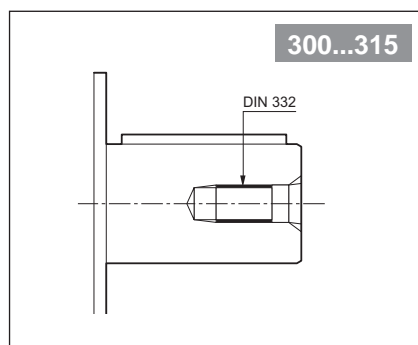
Do not over tension the drive belt as this can damage the bearings.



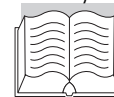
OK



Shaft end: threads



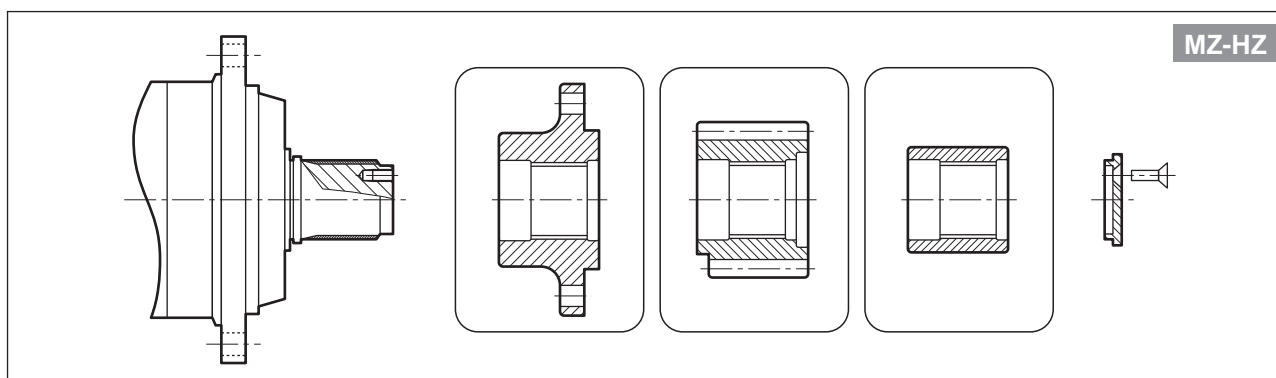
	300	301	303	304	305	306	307	309	310	311	313	314	315	316	317	318	319	321
MC	M12	M12	M20	M20	M20	M20	M20	—	—	—	—	—	—	—	—	—	—	—
HC	M16	M16	M20	M20	M20	M20	M20	M24	M24	M24	M24	M24	M24	—	—	—	—	—
PC	M12	M16	M20	M20	M20	M20	M20	M24	M24	M24	M24	M24	M24	—	—	—	—	—
VK	—	—	M20	M20	M20	M24	M24	M24	M24	M24	M30	M30	M30	—	—	—	—	—



Installing accessories on splined shafts



Do not use hammers or other tools that might damage the gear unit's shafts or bearings when mounting external parts. Instead, proceed as illustrated in the diagram below:

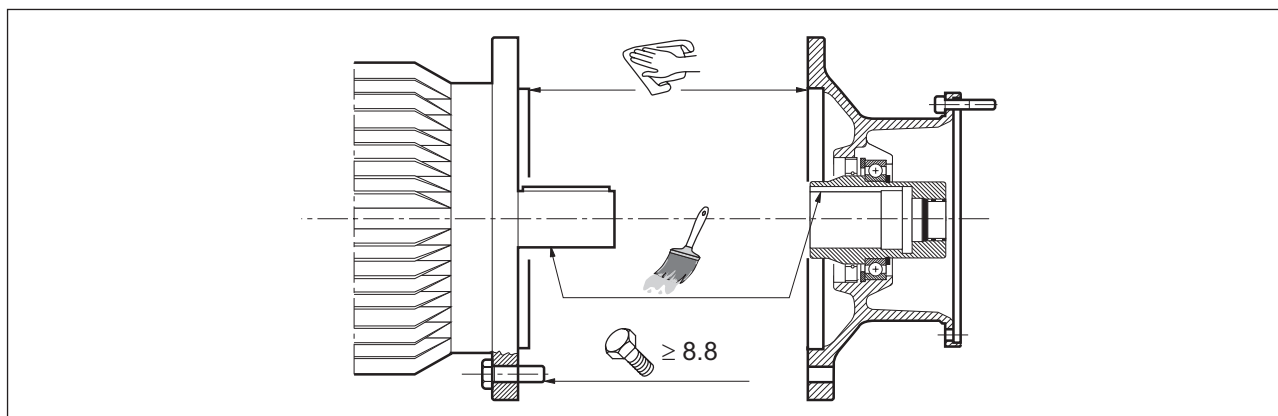


Always use the stop end plate supplied with the gear unit.

5.2 - INSTALLING THE ELECTRIC MOTOR

Further to all the precautions indicated above, when installing a standard IEC 72-1 electric motor, the following precautions must also be observed:

- Do not force the coupling and do not use inappropriate tools during assembly. Take care not to damage the flat/cylindrical coupling surfaces.
- Do not force the rotary coupling mechanisms with heavy overhung or thrust loads.
- To facilitate assembly, use a lubricating synthetic oil paste such as Klüberpaste 46 MR 401 or another product with similar properties and application range.



- Provided all the above checks have been performed and passed and all other instructions in this manual have been strictly observed, an electric motor with ATEX rating equal to or greater than that of the gear unit may be installed, thus forming a gearmotor which itself complies with the provisions of Directive 94/9/EC.

If, instead, the assembly of the motor to the gear unit requires actions other than those prescribed in this Manual or one or more of the manual's prescriptions have not been satisfied, the User shall be responsible for analysing the risks attendant on this particular motor/gear unit combination. The risk analysis is in any case obligatory if the motor is powered by an inverter.

Only in this way, and subject to self-certification by the assembler, shall the assembly, including the gear unit itself, be compliant with the requirements of Directive 94/9/EC.



5.3 - INSTALLING THE HYDRAULIC MOTOR

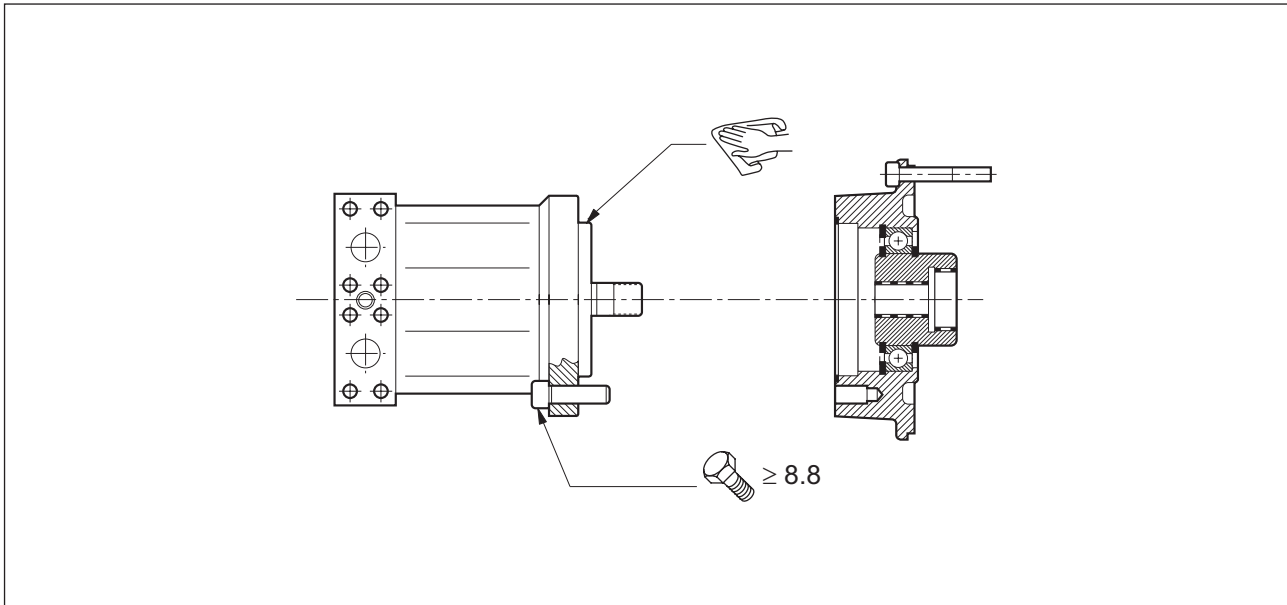
Connecting the hydraulic motor

Remove the protective plug.

Hydraulic motor mountings are available in two versions:

- a) Version with O-ring oil gasket between motor flange and gear unit.

In this case, mount the gasket to ensure an oil tight seal between the motor and gear unit, taking care to fit it correctly in its seat without damaging it.

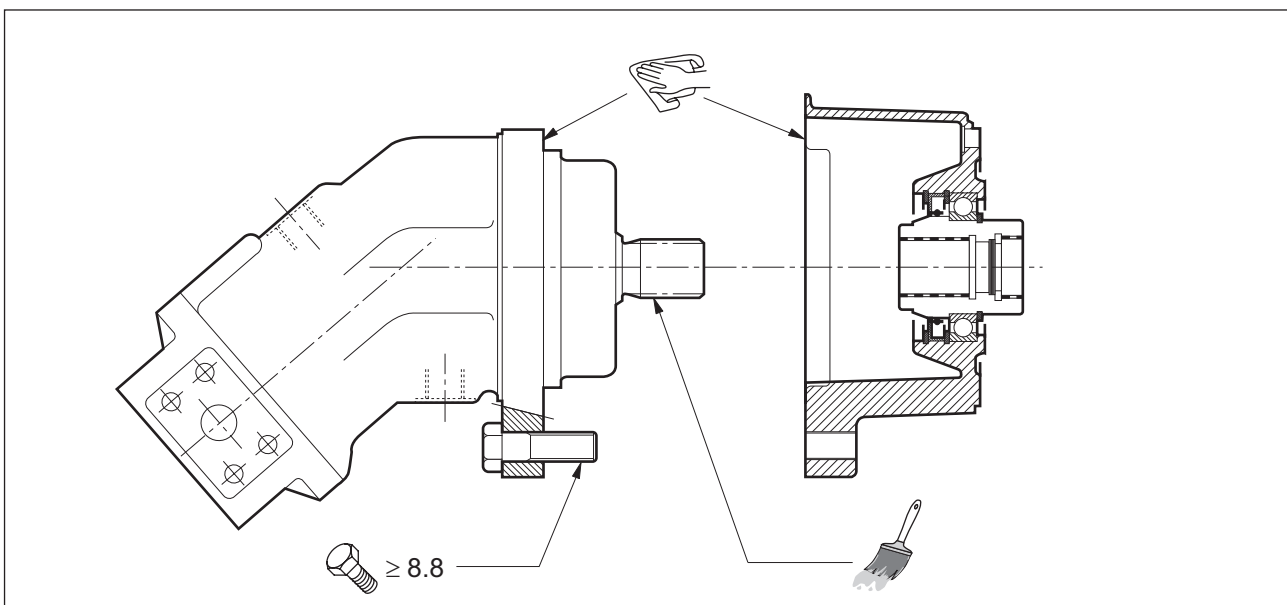


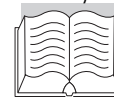
- b) Version with gasket already mounted to the coupling.

In this case no special intervention is required to ensure an oil tight seal since this is already provided by the motor coupling. Merely smear the motor shaft with grease.

In both cases, clean the spigot and the coupling where the motor is to be fitted, fit the motor and tighten down the flange mounting bolts.

Always use bolts rated to at least class 8.8.



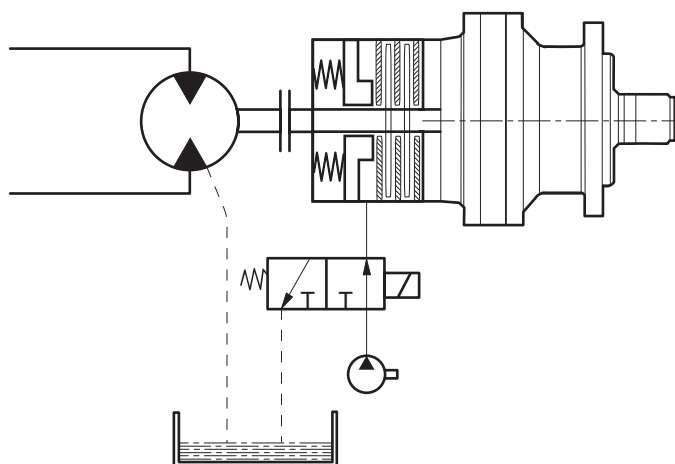


5.4 - CONNECTING THE HYDRAULIC BRAKE

On gear units designed for coupling to hydraulic motors and fitted with a brake, connect the brake control fitting to the hydraulic circuit at the time of assembly.

Start-up

The minimum pressure to release the brake (see chart) must be less than 320 bar.



Technical data

<div> <div>Brake</div> <div>Characteristics</div> </div>		4...							5...					6...					
		A	B	D	F	H	K	L	B	C	E	G	K	B	C	E	G	K	L
Braking torque	M_{bs} [daNm]	5	10	16	26	33	40	44	40	50	63	80	100	85	110	150	210	260	320
Minimum release pressure	bar	10	20	30	20	25	30	33	20	27	20	25	32	14	19	25	19	24	28
Max. pressure	bar	320																	
Weight	kg	10							18					35					

NOTE: The static torque M_{bs} is the maximum torque the brake can exert.

Under dynamic loads the braking torque is reduced. The actual M_{bs} values can vary from -5% to +15% of the rating given in the chart.

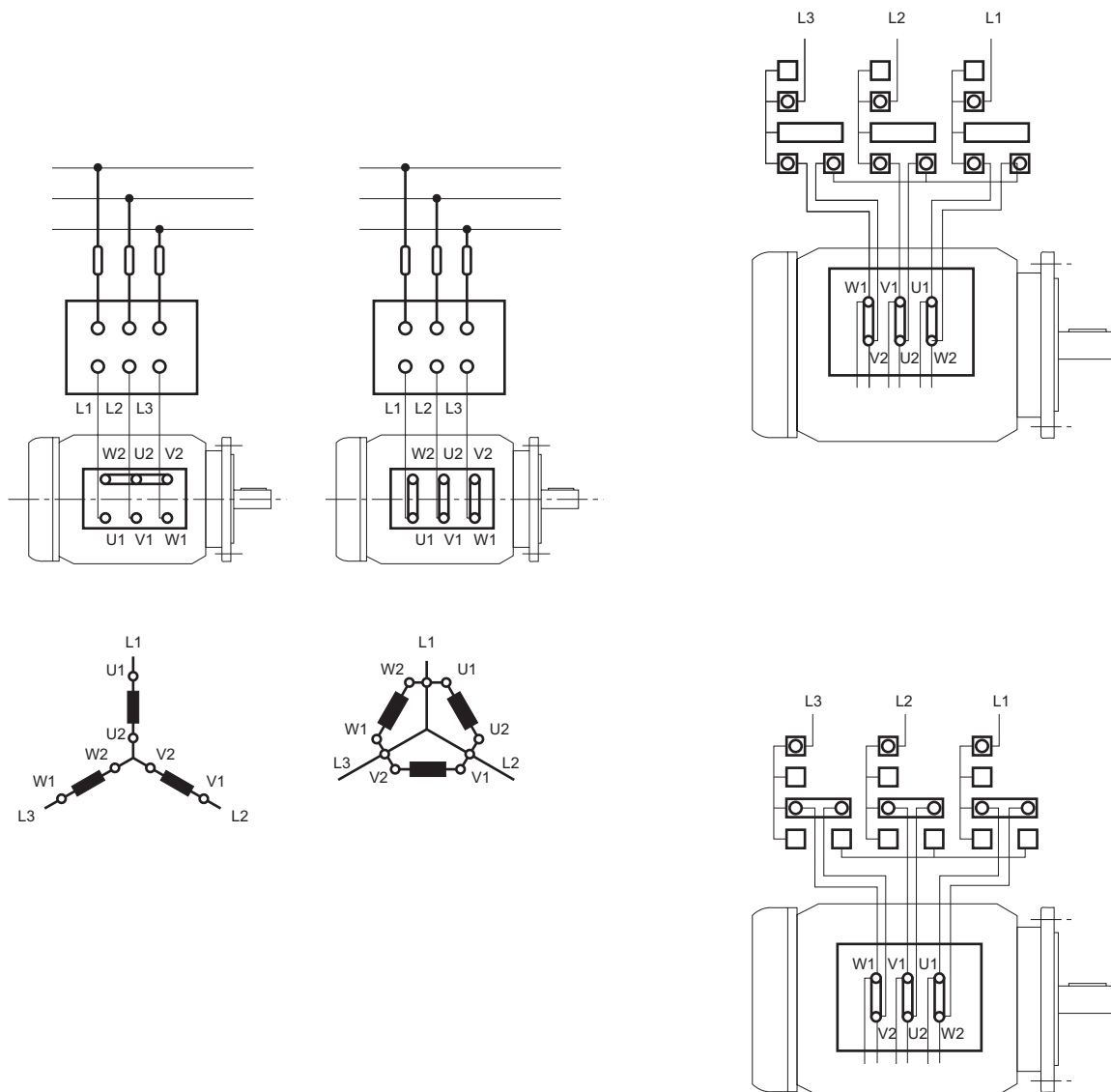


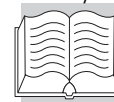
Installing the gearmotor

If a gearmotor is supplied fully assembled, follow the precautions and instructions given above when mounting to the machine.

For the electrical and hydraulic connection, refer instead to the two sample diagrams below. These are generic only since each specific installation has its own special requirements, which must be evaluated on a per case basis by the Manufacturer.

Drive with electric motor.





Drive with TRASMITAL MG orbital hydraulic motor

In addition to the instructions governing installation of the gear unit, the following instructions should also be observed when installing a hydraulic motor.

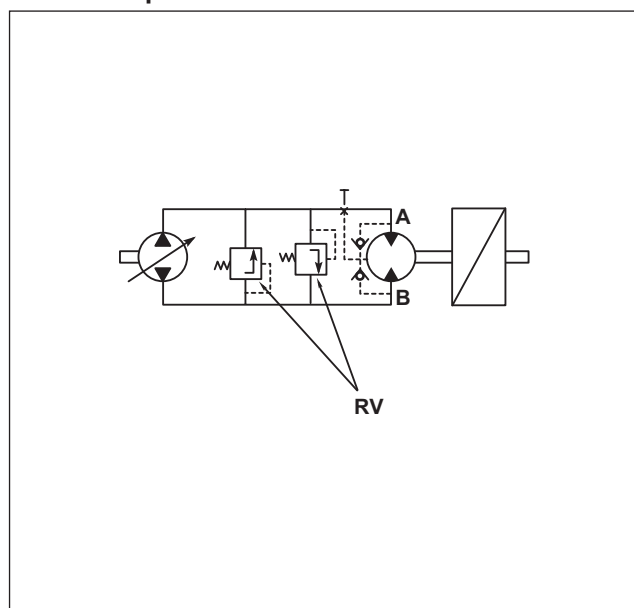
a) Connecting to the hydraulic circuit

The motor can be installed on both a closed and open loop circuit.

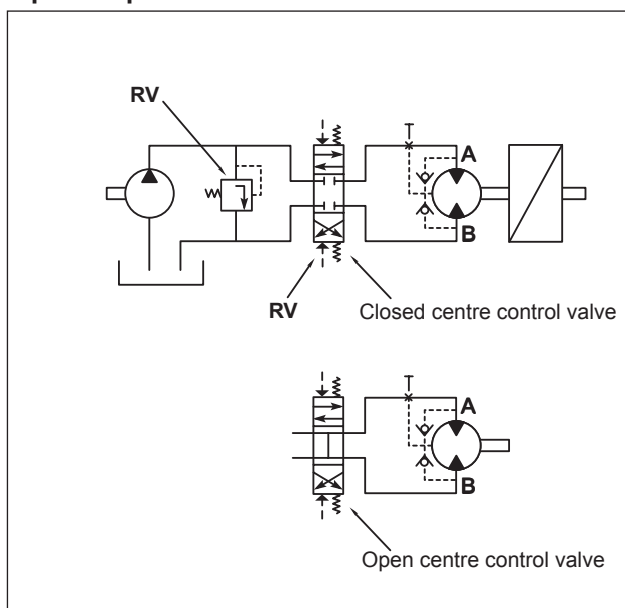
In the case of an open circuit installation, the solenoid valve or control valve may be of either the closed centre or open type.

The circuit line corresponding to the hydraulic motor delivery port must always be equipped with a pressure relief valve calibrated to a pressure no greater than the motor's p_{max} . Refer to the hydraulic circuit diagrams below.

Closed loop circuit

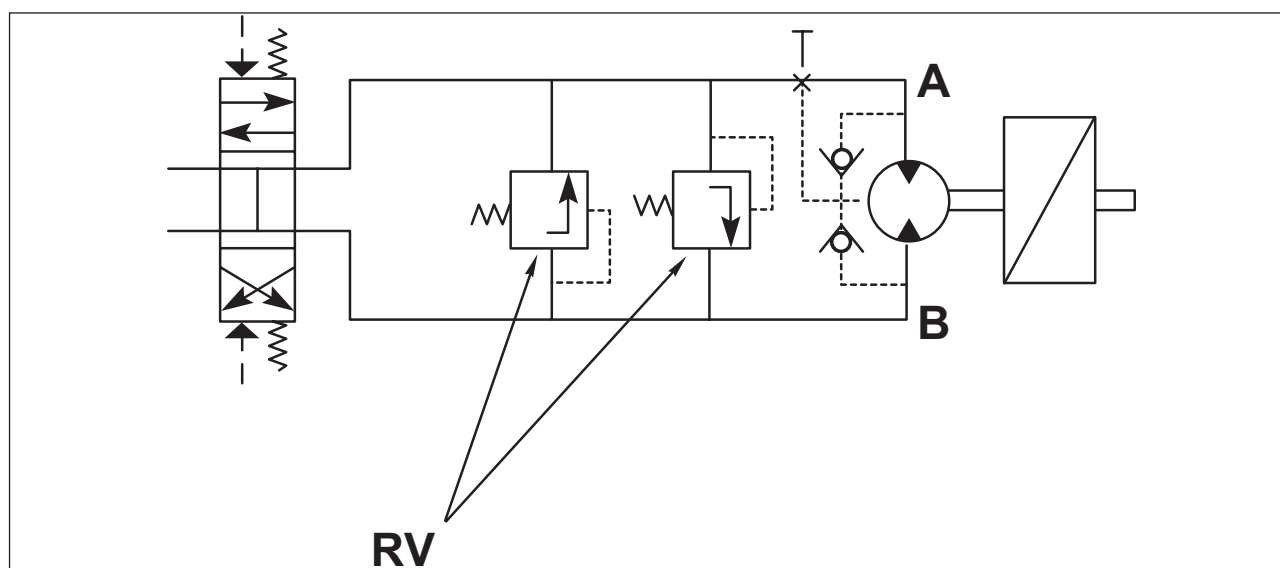


Open loop circuit



RV = pressure relief valves calibrated to $p_{RV} < p_{max}$.

If this is not possible because the circuit must also actuate other equipment at a higher pressure, or the control valve is of the closed centre type and the motor drives components with high inertia, auxiliary pressure relief valves must be installed as close as possible to the motor.



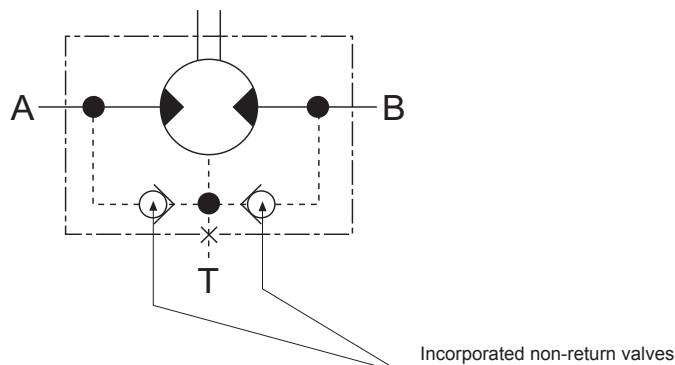
RV = pressure relief valves calibrated to $p_{RV} < p_{max}$.



b) Connecting drain port T

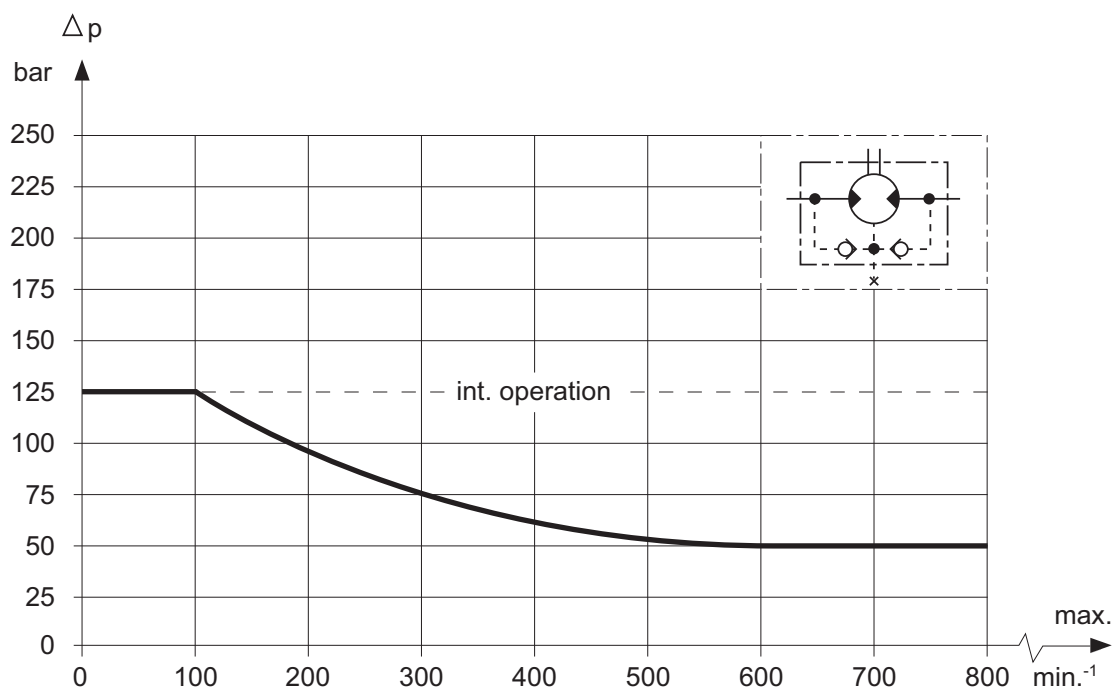
These motors have a 1/8" G drain hole in the centre of the cover. The motor is supplied with the port closed by a metal plug (see figure below).

Two non-return valves are incorporated in the motor casing to maintain internal pressure at the same level as the low pressure line A or B if the drain port is not connected to the tank.

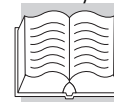


- 1) If the drain port is connected up, pressure at the shaft seal is always equal to the pressure in the drain line.
- 2) If the drain port is closed off, pressure at the shaft seal never exceeds pressure in the return line.

The maximum values for pressure in the drain line (case 1) or return line (case 2) are given in the following figure (for continuous and intermittent operating conditions).



The drain port must always be connected up when more motors are operated in series.



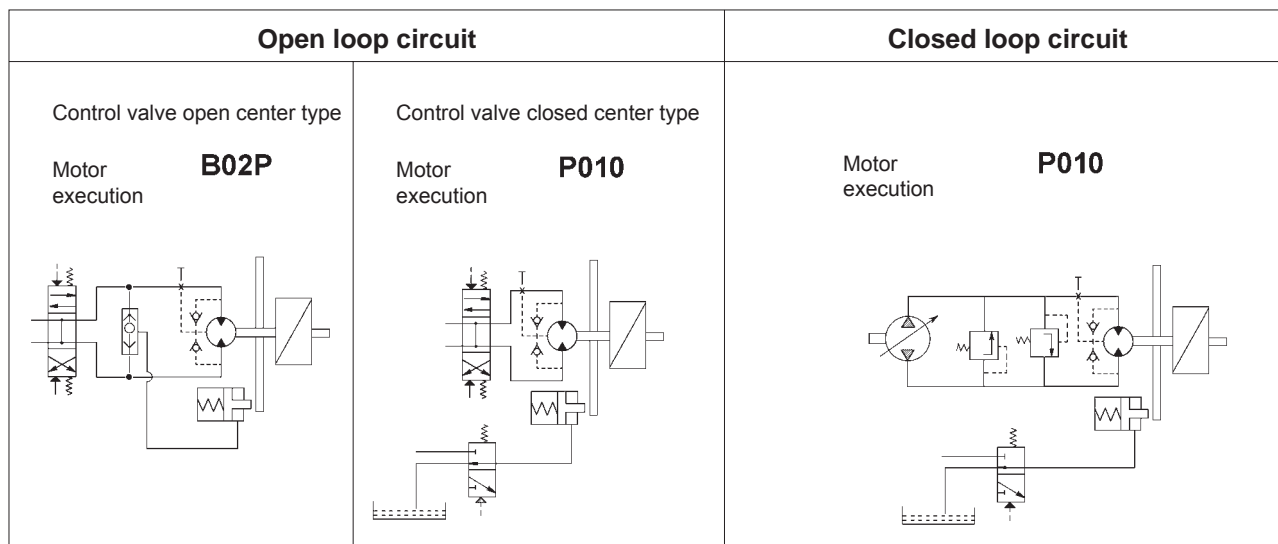
c) Brake control

For gearmotors equipped with brakes, there are two motor versions available, i.e. the B02P or P010 executions.

In the B02P version, the motor has an in-built, direct brake control system.

In the P010 version, an auxiliary branching is required to control the brake.

See the following diagram.



d) Hydraulic oil

Use hydraulic mineral oil with viscosity ISO VG 46 (46 Cst at $t = 40^{\circ}\text{C}$).

It is recommended the oil temperature should be between $+30^{\circ}\text{C}$ and $+70^{\circ}\text{C}$.

e) Oil filtering

For reliable motor operation and long life, it is important that the hydraulic circuit has a filter for a proper oil filtering according to the following degree:

degree 9 NAS 1638

degree 6 SAE

degree 18/15 SO DIS 4406

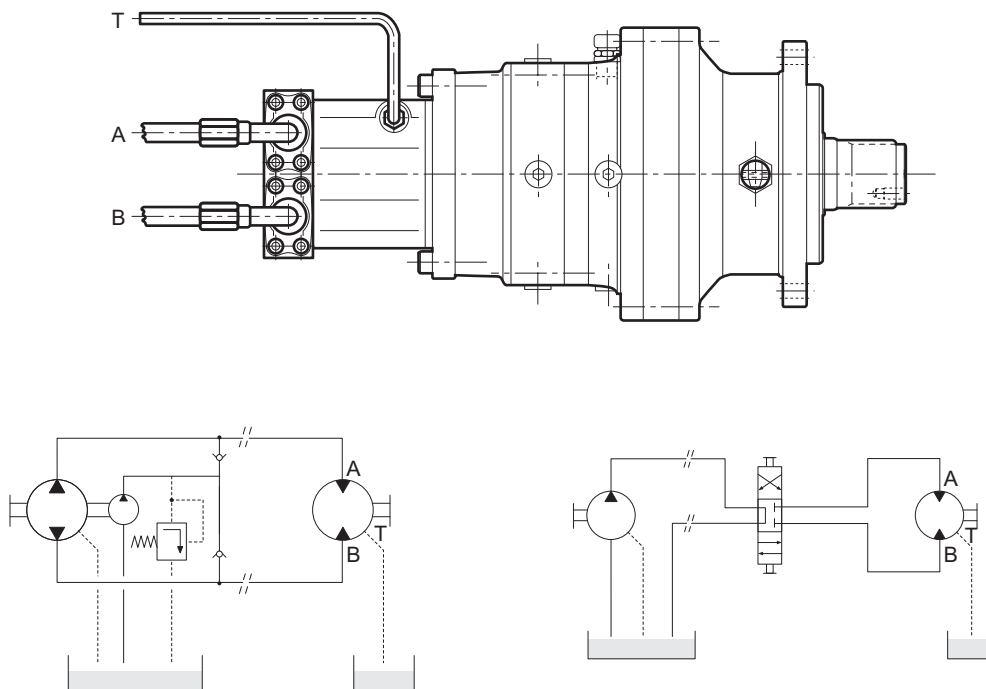


Drive with hydraulic motor

All motors must be charged with hydraulic fluid before being operated and during installation.

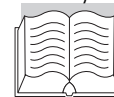
Position the drain hole so that it is positioned uppermost for charging with fluid.

Make sure the hoses are routed in such a way as to prevent the motor casing from emptying and hence, prevent air pockets from forming which may affect pump suction during operation.



A - B = Supply lines

T = Drainage



5.5 - LUBRICATION

Before starting up the gear unit, it must be charged with lubricant to the level corresponding to its specified mounting position.

The lubricant and its relative viscosity should be selected from the following chart, in accordance with the type of duty and ambient temperature.



If the gear unit is supplied ready charged with lubricant, replace the closed shipping plug with the vent plug included in the shipment before installing it.

(A1)

Plug thread	Pitch	Tightening torque [Nm]	Plug thread	Pitch	Tightening torque [Nm]
M14	1,5	15 - 20	1/8"	28	10 - 15
M16	1,5	15 - 20	1/4"	19	10 - 15
M18	1,5	15 - 20	3/8"	19	15 - 20
M20	1,5	20 - 30	1/2"	14	20 - 30
M22	1,5	20 - 30	3/4"	14	20 - 30
M24	1,5	20 - 30	1"	11	30 - 40
M30	2	30 - 40			
M42	3	40 - 50			

(A2)

	INDUSTRIAL PLANTS			MOBILE MACHINES	
	ISO standard .. EP grade			SAE standard .. API GL5 grade	
T _a	-10°C / +30°C	+10°C / +45°C	-20°C / +60°C	-20°C / +30°C	+10°C / +45°C
	ISO VG 150	ISO VG 220	ISO VG 150-220	SAE 80W/90	SAE 85W/140
AGIP	BLASIA150	BLASIA 220	BLASIA SX 220	ROTRA MP	ROTRA MP
ARAL	DEGOL BG 150	DEGOL BG 220	DEGOL PAS 150-220	GETRIEBEOL HYP	GETRIEBEOL HYP
BP	ENERGOL GR XP 150	ENERGOL GR XP 220	EVERSYN EXP 150-220	HYPOGEAR EP	HYPOGEAR EP
CASTROL	ALPHA SP 150	ALPHA SP 220	ALPHASYN EP 150-220	HYPOY	HYPOY
CEPSA	ENGRANAJES HP 150	ENGRANAJES HP 220	ENGRANAJES HPX 150-220	TRANSMISIONES EP	TRANSMISIONES EP
CHEVRON	N.L. GEAR COMPOUNDS EP 150	N.L. GEAR COMPOUNDS EP 220	TEGRA SYNTHETIC GEAR EP 150-220	RPM UNIVERSAL GEAR LUBRICANTS	RPM UNIVERSAL GEAR LUBRICANTS
ESSO	SPARTAN EP 150	SPARTAN EP 220	SPARTAN S EP 150-220	GEAR OIL GX	GEAR OIL GX
				PONTONIC MP	PONTONIC MP
FUCHS	RENOLIN CKC 150	RENOLIN CKC 220	RENOLIN UNISYN CKC 150-220	TITAN SUPER GEAR	TITAN SUPER GEAR
KLUBER	KLUBEROIL GEM1-150	KLUBEROIL GEM1-220	KLUBERSYNT EG 4-150 / 4-220		
Q8	GOYA 150	GOYA 220	EL GRECO 220		
MOBIL	MOBILGEAR 600 XP 150	MOBILGEAR 600 XP 220	MOBILGEAR SHC XMP 150-220	MOBILUBE HD	MOBILUBE HD
MOLYCOTE	L-0115	L-0122	L-2115 / L-2122		
REPSOL	SUPER TAURO 150	SUPER TAURO 220	SUPER TAURO SINTETICO 150-220		
SHELL	OMALA EP150	OMALA EP220	TIVELA OIL S	SPIRAXHD	SPIRAX HD
TOTAL	CARTER EP 1500	CARTER EP 2200	CARTER SH 150-220	TRANSMISSION TM	TRANSMISSION RS

■ Polyalphaolefin synthetic oils (PAO)

Brake lubrication

The hydraulic multi-disk brakes are lubricated with the same oil as the gear unit.





Only synthetic lubricants may be used on gear units conforming to European Directive 94/9/EC. Refer to the above chart for the brand and type.



6.0 - TESTING THE GEAR UNIT

The gear unit has been factory tested by the Manufacturer. Before start-up, make sure that:

- the machine incorporating the gear unit complies with the provisions of the “Machinery Directive” 98/37/EC and any other applicable safety legislation
- the gear unit’s mounting position in the installation corresponds to that prescribed and indicated on the nameplate
- the electrical power supply is suitable and operational as prescribed in EN 60204-1, and is grounded as per EN 50014
- the motor’s electric power supply corresponds to that prescribed and is within +/-5% of the rated value
- the hydraulic system is suitable and operational, and the oil in the hydraulic motor’s lubrication circuit conforms to ISO VG 46. It must be filtered with a maximum grade of 10 µm and contamination level less than or equal to class 9 as per NAS 1638 or 18/15 as per ISO/DIS 4406
- there are no signs of lubricant leaks from the plugs or gaskets
- the vent plug is not obstructed by dirt or paint
- the unit does not run noisily or with excessive vibration.

 	<p>Before starting up the unit, check and make sure that:</p> <ul style="list-style-type: none"> • the unit is not assembled in a potentially explosive atmosphere (oil, acid, gas, vapour, radiation) and is free of dust build ups greater than 5 mm in depth • during operation the gear unit is sufficiently ventilated and is not subject to radiation from external heat sources • during operation the cooling air does not exceed 40 °C • the oil level check and filler plugs and the vent plugs are all easily accessible • all accessories mounted to the gear unit are ATEX certified • gear units with hollow shafts, with or without shrink disk, have been correctly mounted as described in this manual • the gear unit has been thoroughly cleaned after installation • all guards are installed to prevent accidental contact between operators and the unit’s rotary moving parts, and seals are oil tight
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7.0 - USING THE EQUIPMENT

Before putting the gear unit into service, the User must ensure that the plant in which it is installed complies with all applicable directives, especially those regarding health and safety at work.

The gear unit may not be used in areas and environments:

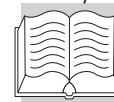


- with highly corrosive/abrasive vapours, smoke or dust.
- in direct contact with loose food products.

Danger zones and exposed persons:



The danger zone of the gear unit is the protrusion of the shaft which constitutes a hazard for exposed persons in direct contact with it (crushing, shearing, trapping). In particular, when the gear unit is operating in automatic mode in an accessible area, the shaft must be protected by a guard.



8.0 - MAINTENANCE



Maintenance and replacement work must be carried out by expert maintenance technicians trained in the observance of applicable laws on health and safety at work and the special ambient problems attendant on the installation.



Before doing any work on the unit, the operator must first switch off power to the gear unit and ensure that it is out of service, as well as taking all necessary precautions against it being accidentally switched on again or its parts moving without warning (due to suspended loads or similar external factors).

Furthermore, all additional environmental safety precautions must be taken (e.g. elimination of residual gas or dust, etc).

- Before doing any maintenance work, activate all the safety devices provided and, if necessary, inform persons working in the vicinity. Cordon off the area around the unit and prevent access to any equipment which, if activated, might be the cause of unexpected health and safety hazard.
- Replace worn components with original spare parts.
- Use the lubricants (oil and grease) recommended by the Manufacturer.
- When working on the gear unit always replace all gaskets and seals with original new ones.
- If a bearing requires replacement, it is good practice to also replace the other bearing supporting the same shaft.
- We recommend replacing the lubricating oil after all maintenance work.

The above instructions are aimed at ensuring efficient and safe operation of the gear unit.

The Manufacturer declines all liability for injury to persons and damage to components due to the use of non-original spare parts and non-routine work that modifies the safety requirements without the Manufacturer's express prior authorisation.

Refer to the specific spare parts catalogue when ordering spare parts for the gear unit.



Do not dump polluting liquids, worn parts and maintenance waste into the environment. Dispose of all such materials as specified by applicable legislation.



- Observe the routine inspection and maintenance schedule to ensure the unit's correct operation and the effectiveness of the explosion protection.
- Always apply fresh Loctite 510 or other product with similar properties and application range to all disassembled threads.
- Before servicing or repairing internal components, allow the gear unit to cool down completely before opening the casing so as to avoid burns from parts which are still hot.
- On completion of maintenance work, make sure that all safety measures and equipment have been applied and reset.
- Clean the gear unit thoroughly after maintenance and repair work.
- On completion of maintenance, tighten all vent, filler and level plugs to their specified torques (chart A1).
- On completion of any maintenance work all seals must be refitted and sealed as prescribed.
- Regardless of the type of gear unit, whenever a seal ring is replaced its lips should be smeared with a thin layer of grease (Fluorocarbon gel 880 ITP or other product with similar properties and application range) before assembly.
- Use only original spare parts for repairs.



8.1 - ROUTINE MAINTENANCE



Keep the gear unit at its maximum efficiency by following the routine maintenance schedule. Good maintenance ensures the unit's maximum performance, extended service life and continued compliance with safety regulations.

(A3)

Frequency	Component	Type of check	Action
at start	Gear unit casing	Check that the external temperature does not exceed 75-80 °C	Stop the machine and contact Bonfiglioli Trasmital's Technical Service
after 200 hrs	Original consignment lubricant	Replace	Replace with new lubricant
	External fasteners	Check locking torque	Tighten down to specified torque
1000 hrs	External seals and gaskets	Check oil level Check for leaks by eye	Service or replace components as required
2500 hrs	Lubricant	Replace	Replace with new lubricant
5000 hrs	Gear unit seals and gaskets	Inspect carefully for wear/ageing of external seals	Replace if aged/worn

For installations in zones 21 and 22 the User must schedule and implement a regular cleaning programme for all surfaces and recesses to avoid dust build-ups of more than 5 mm in depth.



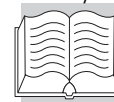
Every 1000 hrs. of operation or after 6 months:

- Measure the surface temperature at the coupling between the gear unit and motor, and at the points which are most shielded from the motor's cooling fan. The maximum temperature must not be more than 75-80°C, nor may this value be exceeded during operation.



Every 5000 hrs. of operation:

- Change the synthetic oil and bearing grease if the gear unit is not life lubricated.
- Replace all externally accessible seal rings unless this has already been done as a result of problems occurring before the scheduled maintenance deadline.



8.2 - OIL CHANGES

1. Place an adequate container under the drain plug.
2. Remove the filler and drain plugs and allow the oil to drain out.



The oil will drain better if it is warm.

3. Wait for a few minutes until all the oil has drained out, then screw the drain plug back on after first changing the plug seal.
4. Fill with new oil until it reaches the level mark. **Do not mix oils of different makes or specifications and check that the oil is highly resistant to foaming and is EP rated.**
5. Tighten down the filler plug after changing its seal.



The gear unit may be supplied with or without lubricant, as requested by the User. The quantity of charge oil required is specified in the Sales Catalogue. This specification is however, approximate, and reference must always be made to the mark on the level plug, the placement of which depends on the mounting position specified in the purchase order.

Life lubricated gear units which are not subject to external contamination do not normally require periodic lubricant changes. If the same type of oil as that already in use is not available, drain the gear unit casing completely and wash its interior thoroughly with a light solvent before refilling with the new lubricant.



If a leak is found, identify the cause of the fault and repair it before topping up the lubricant and operating the unit.

Lubricants, solvents and detergents are toxic/harmful to health:



- they may cause irritation in direct contact with the skin
- they may cause intoxication if inhaled
- they may be fatal if swallowed.

Handle them with care using suitable individual safety equipment. Do not dump them into the environment and dispose of in accordance with applicable legislation.

8.3 - CHECKING OPERATIONAL EFFICIENCY

- Remove any dust from the gear unit and motor casings.
- Check that the noise generated at continuous load does not vary. Excessive vibration or noise can indicate wear of the gear train or failure of a bearing.
- Check the power absorption and voltage against the rated values given on the motor's nameplate.
- Check the wear of the friction surfaces and braking gasket on the brake motors (if fitted) and, if necessary, adjust the gap.
- Check for lubricant leaks from the gaskets/seals, plugs and casings.
- Check all bolted couplings for wear, deformation and corrosion and tighten them down fully, but without over tightening.

8.4 - CLEANING

Remove all dust and process waste from the gear unit. Do not use solvents or other products that are incompatible with the unit's construction material and do not direct high pressure jets of water at the gear unit.



9.0 - REPLACING PARTS

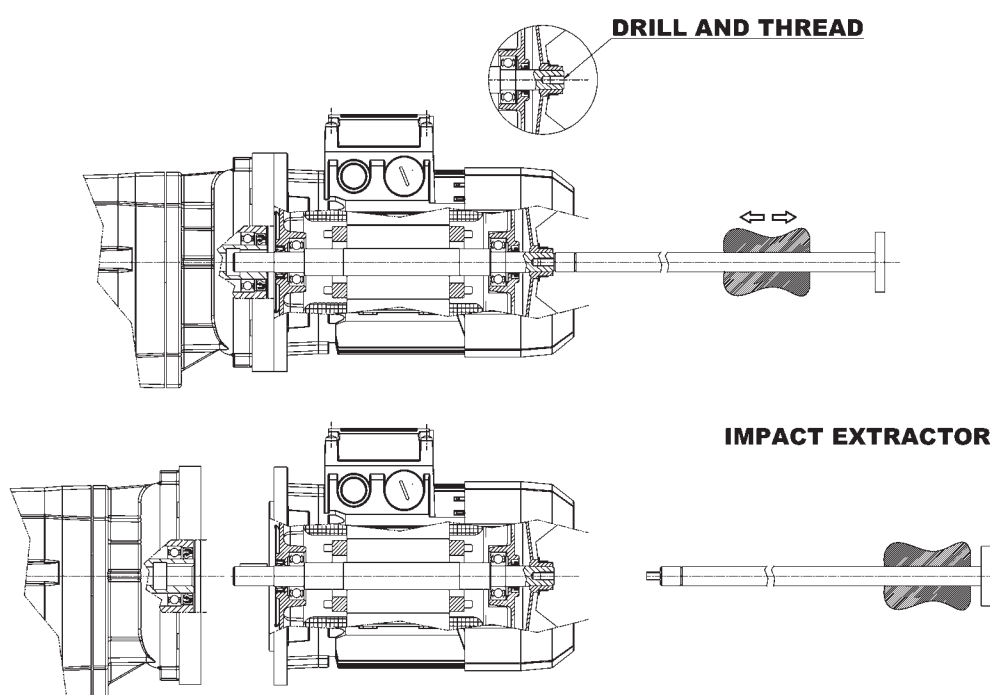


- Immediately replace parts and components if they are not able to guarantee safe and reliable operation.
- Never improvise repairs.
- The use of non-original spare parts not only renders the warranty null and void but can jeopardise the gear unit's operation.

9.1 - REMOVING THE MOTOR

If during operation the mobile coupling between the motor and gear unit has not rusted significantly, it should be possible to remove the motor without applying excessive force.

If instead, it proves difficult to remove the motor, do not use screwdrivers or levers to apply force as this may damage the flanges and mating surfaces, but proceed as illustrated below.



1. Drill and thread the motor shaft (fan side).
2. Screw an impact extractor tool into the bore.
3. Undo the bolts fixing the motor to the gear unit.
4. Detach the motor by means of the inertial force of the extractor.

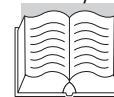
9.2 - DECOMMISSIONING THE GEAR UNIT

The unit must only be taken out of service by operators trained in the observance of applicable laws on health and safety at work.

Do not dump non-biodegradable products, lubricants and non-ferrous materials (rubber, PVC, resins, etc.) into the environment. Dispose of all such materials as stipulated by established environmental legislation.



Do not re-use parts or components which appear to be in good condition after they have been checked or replaced by qualified personnel and declared unsuitable for use.



10.0 - TROUBLESHOOTING

The following information is intended to serve as an aid in locating and eliminating defects and faults. In some cases, problems may be caused by the plant or machine to which the gear unit is assembled and hence, the cause and remedy will be described in the Manufacturer's technical documentation for the machine/plant in question.

FAULT	CAUSE	REMEDY
Bearing temperature too high	Oil level too low	Top up oil level
	Oil spent	Replace oil
	Defective bearings	Contact authorised workshop
Operating temperature too high	Oil level too high	Check oil level
	Oil spent	Replace oil
	Contaminant in oil	Replace oil
Abnormal running noise	Gears damaged	Contact authorised workshop
	Bearing axial backlash too high	Contact authorised workshop
	Bearings defective or worn	Contact authorised workshop
	Excessive load applied	Correct load to rated values given in Sales Catalogue
	Contaminant in oil	Replace oil
Abnormal noise at gear unit mounting	Mounting bolts loose	Tighten bolts to specified torque
	Mounting bolts worn	Replace bolts
Oil leaks	Oil level too high	Check oil level
	Casing/coupling seals inadequate	Contact authorised workshop
	Gaskets worn	Contact authorised workshop
Gear unit does not run or runs with difficulty	Oil viscosity too high	Replace oil (see recommended lubricant chart)
	Oil level too high	Check oil level
	Excessive load applied	Redesign drive for actual load required
Output shaft does not turn with motor running	Gears damaged	Contact authorised workshop



ANNEX 1 - CHECKING THE OIL LEVEL ON ATEX-SPECIFIED GEAR UNITS

Gear units are normally fitted with oil level check plugs.

To check the oil level, first identify the level plug.

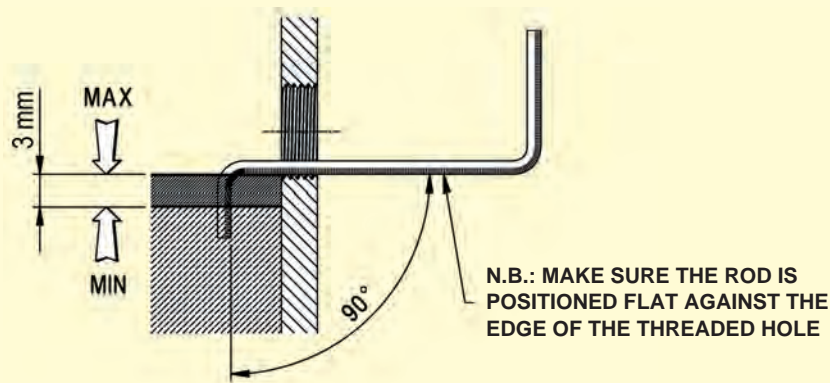
- Horizontal position:

Remove the plug and insert a bar of the right size in the hole and of the shape shown in the figure.

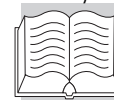
- Vertical position:

Use a rod to check that the oil level is between the MIN and MAX marks, then screw the plug back in.

If the level is more than 3 mm below the spill level, top up and check the reason for the drop in oil level.





Gear units conforming to Directive 94/9/EC and designed for a vertical mounting position, are normally equipped with an oil expansion chamber fitted with service plugs for filling, checking the oil level and venting internal overpressure.



ANNEX 2 - LUBRICANT CHARGE QUANTITY

3_L Series


		Mounting position		
		A	T	O
300	L1	0.6	1.0	0.9
	L2	0.9	1.3	1.2
	L3	1.2	1.6	1.5
	L4	1.5	1.9	1.8
301	L1	0.8	1.2	1.1
	L2	1.1	1.5	1.4
	L3	1.4	1.8	1.7
	L4	1.7	2.1	2.0
303	L1	1.3	2.3	2.0
	L2	1.6	2.6	2.3
	L3	1.9	2.9	2.6
	L4	2.2	3.2	2.9
304	L1	1.4	2.4	2.2
	L2	1.9	2.9	2.7
	L3	2.2	3.2	3.0
	L4	2.5	3.5	3.3
305	L1	1.6	2.6	2.4
	L2	2.1	3.1	2.9
	L3	2.4	3.4	3.2
	L4	2.7	3.7	3.5
306	L1	2.5	3.5	3.2
	L2	3.3	4.3	4.0
	L3	3.6	4.6	4.3
	L4	3.9	4.9	4.6
307	L1	3.5	5.0	4.5
	L2	4.5	6.0	5.5
	L3	5.0	6.5	6.0
	L4	5.3	6.8	6.3
309	L1	4.0	5.5	5.0
	L2	5.0	6.5	6.0
	L3	5.5	7.0	6.5
	L4	5.8	7.3	6.8


		Mounting position		
		A	T	O
310	L1	5.0	6.5	6.0
	L2	6.3	7.8	7.3
	L3	7.1	8.6	8.1
	L4	7.4	8.9	8.4
311	L1	7.0	12	10
	L2	9.0	14	12
	L3	10	15	13
	L4	11	16	14
313	L1	9.0	14	12
	L2	12	17	15
	L3	13	18	16
	L4	13	18	16
314	L2	17	25	21
	L3	19	27	23
	L4	20	28	24
315	L2	19	27	23
	L3	21	29	25
	L4	22	30	26
316	L2	22	30	26
	L3	24	32	28
	L4	25	33	29
317	L2	26	41	36
	L3	29	44	39
	L4	30	45	40
318	L3	40	55	50
	L4	43	58	53
319	L3	50	70	60
	L4	53	73	63
321	L3	56	76	66
	L4	60	80	70

N.B. Oil quantities are indicative. Check actual level after filling through the appropriate plug.

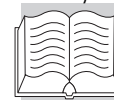















3_R Series

		Mounting position		
		B0	U_	P_
300	R2	1.2	1.7	1.5
	R3	1.5	2.0	1.8
	R4	1.8	2.3	2.1
301	R2	1.6	2.1	1.9
	R3	1.9	2.4	2.2
	R4	2.2	2.7	2.5
303	R2	2.2	2.8	2.6
	R3	2.5	3.1	2.9
	R4	2.8	3.4	3.2
304	R2	2.3	2.9	2.7
	R3	2.8	3.4	3.2
	R4	3.1	3.7	3.5
305	R2	2.5	3.1	2.9
	R3	3.0	3.6	3.4
	R4	3.3	3.9	3.7
306	R2	4.0	5.0	4.8
	R3	4.8	5.8	5.6
	R4	5.1	6.1	5.9
307	R2	6.0	8.0	7.0
	R3	7.0	9.0	8.0
	R4	7.5	9.5	8.5

		Mounting position		
		B0	U_	P_
309	R2	6.5	8.5	7.5
	R3	7.5	9.5	8.5
	R4	8.0	10	9.0
310	R2	13	15	14
	R3	11	13	12
	R4	12	14	13
311	R2	14	19	17
	R3	16	21	19
	R4	17	22	20
313	R2	16	21	19
	R3	19	24	22
	R4	20	25	23
314	R3	25	33	29
	R4	28	36	32
315	R3	27	35	31
	R4	30	38	34
316	R3	30	38	34
	R4	33	41	37
317	R3	38	52	48
	R4	42	56	52
318	R4	48	63	58

N.B. Oil quantities are indicative. Check actual level after filling through the appropriate plug.

**3/V Series**

	 [I]												
	AA - EA - FD			AF - EF - FE		AE - EE - FF		AD - ED - FA		TA - TE - TF TD - VA - VE VF - VD		OA - OE - OF OD - QA - QE QF- QD	
		input 	HS		input 		input 		input 		input 		input 
3/V 00 L3	0.9	0.12	0.12	0.9	0.12	0.9	0.12	0.9	0.12	1.3	0.12	1.2	0.12
3/V 01 L3	1.1			1.1		1.1		1.1		1.5		1.4	
3/V 03 L3	1.6	0.25	0.25	1.6	0.31	1.6	0.31	1.6	0.38	2.6	0.31	2.3	0.25
3/V 04 L3	1.9	0.38	0.38	1.9	0.43	1.9	0.43	1.9	0.52	2.9	0.52	2.7	0.38
3/V 05 L3	2.1			2.1		2.1		2.1		3.1		2.9	
3/V 06 L3	3.3	0.64	0.64	3.3	0.76	3.3	0.76	3.3	0.85	4.3	0.76	4	0.76
3/V 10 L4	7.1			7.1		7.1		7.1		8.6		8.1	
3/V 07 L3	4.5	2.4	2.8	4.5	2.6	4.5	2.6	4.5	1.7	6	1.9	5.5	1.9
3/V 11 L4	10			10		10		10		15		13	
3/V 13 L4	13			13		13		13		18		16	
3/V 09 L3	5	4.3	4.5	5	3.9	5.0	3.9	5	3.0	6.5	3.5	6	3.5
3/V 10 L3	6.3			6.3		6.3		6.3		7.8		7.3	
3/V 14 L4	19			19		19		19		27		23	
3/V 15 L4	21			21		21		21		29		25	
3/V 16 L4	24			24		24		24		32		28	
3/V 11 L3	9	7.8	9.6	9	6.7	9	6.7	9	5.0	14	5.5	12	5.5
3/V 13 L3	12			12		12		12		17		15	
3/V 14 L3	17			17		17		17		25		21	
3/V 17 L4	29			29		29		29		44		39	
3/V 15 L3	19	11	15	19	8.9	19	9.4	19	7.5	27	9.5	23	9.5
3/V 18 L4	40			40		40		40		55		50	
3/V 19 L4	50			50		50		50		70		60	
3/V 16 L3	22	23	28	22	16.8	22	17.5	22	10.7	30	17	26	17
3/V 17 L3	26			26		26		26		41		36	
3/V 21 L4	56			56		56		56		76		66	

 Life lubrication

NOTE: In combined gear units, lubrication of the planetary stage is separate from that of the worm (3/V) or helical bevel (3/A) stages.



3/A Series

	[1]											
	AA - EA - FD		TA - TE - TF TD- VA - VE VF - VD		OA - OE - OF OD - QA - QE QF- QD		AD - ED - FA		AF - EF - FE		AE - EE - FF	
3/A 00 L2	0.60	1.4	1.0	1.4	0.9	1.4	0.6	1.4	0.6	1.4	0.6	1.4
3/A 01 L2	0.80	2.3	1.2	2.3	1.1	2.3	0.8	2.3	0.8	2.3	0.8	2.3
3/A 03 L2	1.3	3.2	2.3	3.2	2.0	3.2	1.3	3.2	1.3	3.2	1.3	3.2
3/A 04 L2	1.4	3.8	2.4	3.9	2.2	3.9	1.4	4.5	1.4	5.0	1.4	4.2
3/A 05 L2	1.6	4.0	2.6	4.1	2.4	4.1	1.6	4.7	1.6	5.2	1.6	4.4
3/A 06 L2	2.5	4.9	3.5	8.1	3.2	4.7	2.5	8.4	2.5	11	2.5	9.2
3/A 07 L2	3.5	6.8	5.0	8.1	4.5	12	3.5	15	3.5	18	3.5	15

Life lubrication

NOTE: In combined gear units, lubrication of the planetary stage is separate from that of the worm (3/V) or helical bevel (3/A) stages.





INDEX OF REVISIONS (R)

R2

090320

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