



# LUGGAGE POINT INLET STRUCTURE UPGRADE PROJECT

## 1.1 Background

Luggage Point Sewage Treatment Plant (STP) serves the S1 catchment that encompasses approximately half of the population of the City of Brisbane. The plant is located at 200 Main Beach Rd, Pinkenba. The plant receives flow from a combination of domestic and industrial sources but is principally treating domestic sewage.

Prior to the inlet structure upgrade project, the inlet works operated on mechanically raked bar screens. Their primary purpose was to remove coarse solids and rags from the influent stream to protect downstream equipment. The inlet screens and associated mechanical/civil structure consisted of;

- Main stilling chamber
- Four inlet channels
- Eight coarse screens (15mm aperture) with mechanically raked drives, two per inlet channel
- Four outlet penstocks
- Screenings conveyor and screenings press

A feasibility study was undertaken to assess options to address the need for better screening removal at the inlet works to prevent blockages at downstream pumps and valves and to avoid the impacts of ragging on downstream processes within the STP.

The feasibility report recommended the installation of new fine screen units to the existing inlet works structure and upgrade the inlet works for an ultimate hydraulic load of 11,600 L/s, with provision to bypass the new fine screens in the event of screen failure.

Other objectives included;

- Eliminate current WH&S issues
- Maximise the hydraulic capacity of the inlet structure, while satisfying the design criteria, for both screen flows and bypass flows.
- Improve screenings removal efficiency (for downstream operation)
- Meet fine screening requirements as per Development Approval Permit, and
- Be able to retrofit odour control (at a later date).

The inlet screen upgrade project was carried out by Stirloch Constructions Pty Ltd between December 2013 and early 2015.



## 1.2 OVERVIEW OF THE UPGRADED SYSTEM

The Luggage Point STP inlet screens process removes gross solids from the incoming sewage and handles the screening until it is loaded into transportable storage bins.

The inlet works consists of following main process sections:

- 8 x Inlet Screens with 8 associated Inlet and 4 associated outlet penstocks.
- 2 x transfer water sluices.
- 2 x splitter boxes.
- 3 x wash presses for de-watering of the screenings.
- 3 x storage bins for screenings storage and off-site disposal.
- 2 x drainage pumps.
- 1 x wash water pressure system.

Luggage Point STP Inlet Works is designed with a common deep receiving bay where the three pipelines from Eagle Farm Pumping Station discharge Raw Sewage. From this compartment, influent enters the fore bay or stilling area, which comprises four wide individual channels.

These four channels are then split by divider walls to make eight individual 1980mm wide channels where eight band screens are located. Each of the eight inlet channels is isolated, upstream of the screen, by a double isolation package comprising an electrically actuated penstock and a manually inserted stop board.

Each channel has an ANDRITZ AQUA SCREEN which captures and removes the rubbish and debris from the raw sewage in the inlet works. The eight screens are labelled SC-0210-001 to SC-0210-008 and are staggered to form two banks, (Bank A and Bank B). Screenings are automatically removed from the continuous perforated plates of the screens by spraying service water, which is initiated by the backwash cycle of the screens.

Channels 1 and 2, 3 and 4, 5 and 6, 7 and 8 merge downstream of the screens to make four wider channels followed by a penstock in each of these four wider channels.

There are bypass weirs downstream of the screens SC-0210-001, SC-0210-003, SC-0210-005 and SC-0210-007 cut into the divider walls. In the event of the screens become blinded or flow exceeds the screen capacity, the incoming flows overtop the bypass weirs and flow passes to the adjacent inlet channel upstream of SC-0210-002, SC-0210-004, SC-0210-006 and SC-0210-008 respectively.

The screens 1, 3, 5 and 7 (Bank A) drop their screenings onto Screenings Sluice No.1 (SL-0210-001). The spray water provided during the screen backwashing cycle transports the screenings along the sluice launder to discharge into Splitter Box No.1 (DG0210-001). The Splitter Box can direct the screenings to either Wash Press No.1 (WPR-0220-001) or alternatively to Wash Press No.3 (WPR-0220-003).

The screens 2, 4, 6 and 8 (Bank B) drop their screenings onto Screenings Sluice No.2 (SL-0210-002). The spray water provided during the screen backwashing cycle transports the screenings along the sluice launder to discharge into Splitter Box No.2 (DG0210-002). The Splitter Box can direct the screenings to either Wash Press No.2 (WPR-0220-002) or alternatively to Wash Press No.3 (WPR-0220-003).



The Wash Presses wash and compress the screenings and discharge them into an associated Storage Bin. The de-watered screenings from Wash Press 1 is transferred to Storage Bin 1 (BN-0220-001) and from Wash Press 2 to the Storage Bin 2 (BN-0220-002).

Normal operation is for the screenings from Bank A to be delivered to Wash Press 1 and for the screenings from Bank B to be delivered to Wash Press 2. Wash Press 3 and Storage Bin 3 are used as a standby storage destination for both Bank A and Bank B, while the full Storage Bins 1 or 2 are removed and replaced by empty bins.

The Splitter Boxes are arranged so that screenings from both Bank A and Bank B can be diverted to Wash Press 3 at the same time.

A pressure booster pump station is provided for effluent wash water supply to the inlet screening equipment. These pumps are controlled by VSD to maintain constant pressure in the spray and wash water line. This equipment is located remotely from the Inlet Works at the north side of Stage 1A between PST1 and Bioreactor 1.

A drain water sump with two level-controlled submersible pumps return the drain water from the wash presses and floor drains to the inlet collection chamber.

### **1.3 Format of the O&M Manual(s):**

The O&M Manual has been split up into 6 folders/sections. Folder 1 acts as a directory for the O&M utilizing an overall index of what is contained in each section/folder.

Folder 1 provides an overall picture of the project and includes the functional specification which describes the operation of the plant.

Folders 2, 3, 4 & 5 provide specific installation, operation & maintenance documentation from specific vendors and suppliers and also include factory testing, test certificates and commissioning checksheets and procedures.

Folder 6 contains IOM documentation on free issue materials provided by QUU. This information has been included in the Stirloch manuals for the convenience of the QUU operators.



## **1.4 INDEX:**

### **FOLDER 1 : OVERVIEW FOLDER (TMS830)**

**Section 1: Background, Overview, Format, Index**

**Section 2: Functional Specification**

**Section 3: As Constructed Drawings**

**Section 4: Commissioning Plan/Program**

**Section 5: Equipment List & Asset Register**

**Section 6: Electrical Installation - O&M (Draft)**

### **FOLDER 2: DRAINAGE PUMP STATION O&M MANUAL (TMS831)**

**Section 1 – Drainage Pump Station Drawings**

**Section 2 – 3127 Submersible Pump IOM**

**Section 3 – 3127 Submersible Pump Technical Specifications**

**Section 4 – 3127 Submersible Pump Service & Repair Instructions**

**Section 5 – 3127 Submersible Pump Parts List**

**Section 6 – 3127 Submersible Pump Test Reports**

**Section 7 – Multitrode Level Sensor IOM**

**Section 8 – Multitrode Level Sensor Install & Troubleshooting**

**Section 9 – Multitrode Level Sensor Brochure**

**Section 10 – Multitrode Level Sensor Chemical Information**

**Section 11 – Drainage Pump Station Control Cabinet & Wiring Drawings**





## **FOLDER 3: BOOSTER PUMP STATION O&M MANUAL (TMS832)**

### **Section 1 – Grundfos**

- 1.1 MPC I&O Manual Cover Page**
- 1.2 Pre-commissioning Checksheet**
- 1.3 Table of Contents**

### **Section 2 – Grundfos Commissioning Agreement**

### **Section 3 – Grundfos System Operation Description**

- 3.1 Hydro MPC I&O**
- 3.2 CU3X2 I&O + IO 351 I&O**

### **Section 4 – Grundfos Pumps**

- 4.1 Installation and Operation**
- 4.2 Curves**

### **Section 5 – Grundfos Hydro MPC Quick Guide**

### **Section 6 – Grundfos Electrical Details and Wiring Diagrams**

### **Section 7 – Grundfos Mechanical System Drawings**

### **Section 8 – Grundfos Test Details and Settings**

### **Section 9 – Amiad SAF 6000 Filter**

- 9.1 IOM SAF 6000 Filter**
- 9.2 IOM Manual Strainer**

### **Section 10 – Amiad SAF 6000 Filter**

- 10.1 Drawings**
- 10.2 Test Documents and Reports**



## **FOLDER 4: WASH PRESS AND SLUICE LAUNDER O&M MANUAL (TMS833)**

**Section 1: Equipment Lists, Table of Contents, Commissioning Plan**

**Section 2: Wash Press Operating Instructions**

**Section 3: Wash Press Control Concept**

**Section 4: Motox Gearbox Operating Instructions**

**Section 5: Siemens Low Voltage Motors Operating Instructions**

**Section 6: Wash Press Solenoid Valves Operating Instructions**

**Section 7: Sluicing Launder**

**Section 8: Distribution Box - Festo Cylinder Information**

**Section 9: Installation and Acceptance ITP's, FAT Documents**

**Section 10: Drawings**

## **FOLDER 5: MISCELLANEOUS ITEMS – VALVES, FLOWMETER, PENSTOCKS (TMS834)**

**Section 1: AWE Double Isolation Module O&M**

**Section 2: AWE Double Isolation Module Drawings**

**Section 3 : ABB Flowmeter Data Sheet + Calibration Certificates**

**Section 4: ABB Flowmeter User Guide**

**Section 5: ABB Flowmeter Transmitter Guide**

**Section 6: Swingflex Check Valve Data Sheet + IOM**

**Section 7: Resilient Seat Gate Valve Data Sheet + IOM**

**Section 8: Heavy Duty Knifegate Valve Data Sheet + IOM**

**Section 9: SS316 Ball Valve Data Sheet + IOM**

**Section 10: ARI Combination Air Valve Data Sheet + IOM**

## **FOLDER 6: QUU SUPPLIED INFORMATION (TMS835)**

**Section 1-9: ANDRITZ Screens O&M Manual**

**Section 12-15: Spirac Bin and Retractable Chute IOM + Miscellaneous Info**

# **Section 1-9: ANDRITZ Screens O&M Manual**

**For Andritz Screens O&M, refer TMS579**

Models

Screen widths (mm)	Discharge heights (mm)	Screen mesh (mm)	Flow rates
500 to 2500	1500 to 10000	3, 6, 10	300 to 2500 litres/sec.



Typical applications

- Screening at inlet of municipal or industrial sewage treatment plants
- Water intake of water treatment plant (river, lake, ...)

Industry

- Pulp and paper
- Meat processing, slaughterhouses
- Vegetable and fruit processing
- Food industry
- Wineries, breweries
- Textile industry
- Tanneries, bleaching, dyeing



**Aqua-Screen**  
Perforated plate fine screen



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SE.AquaScreen.EN.1012



# Aqua-Screen

## Perforated plate fine screen

The ANDRITZ Aqua-Screen is based on the design and construction of the ANDRITZ AQUA-GUARD which has proved itself a durable and reliable fine screen with over 5000 units sold worldwide since 1980.

### Operating principle

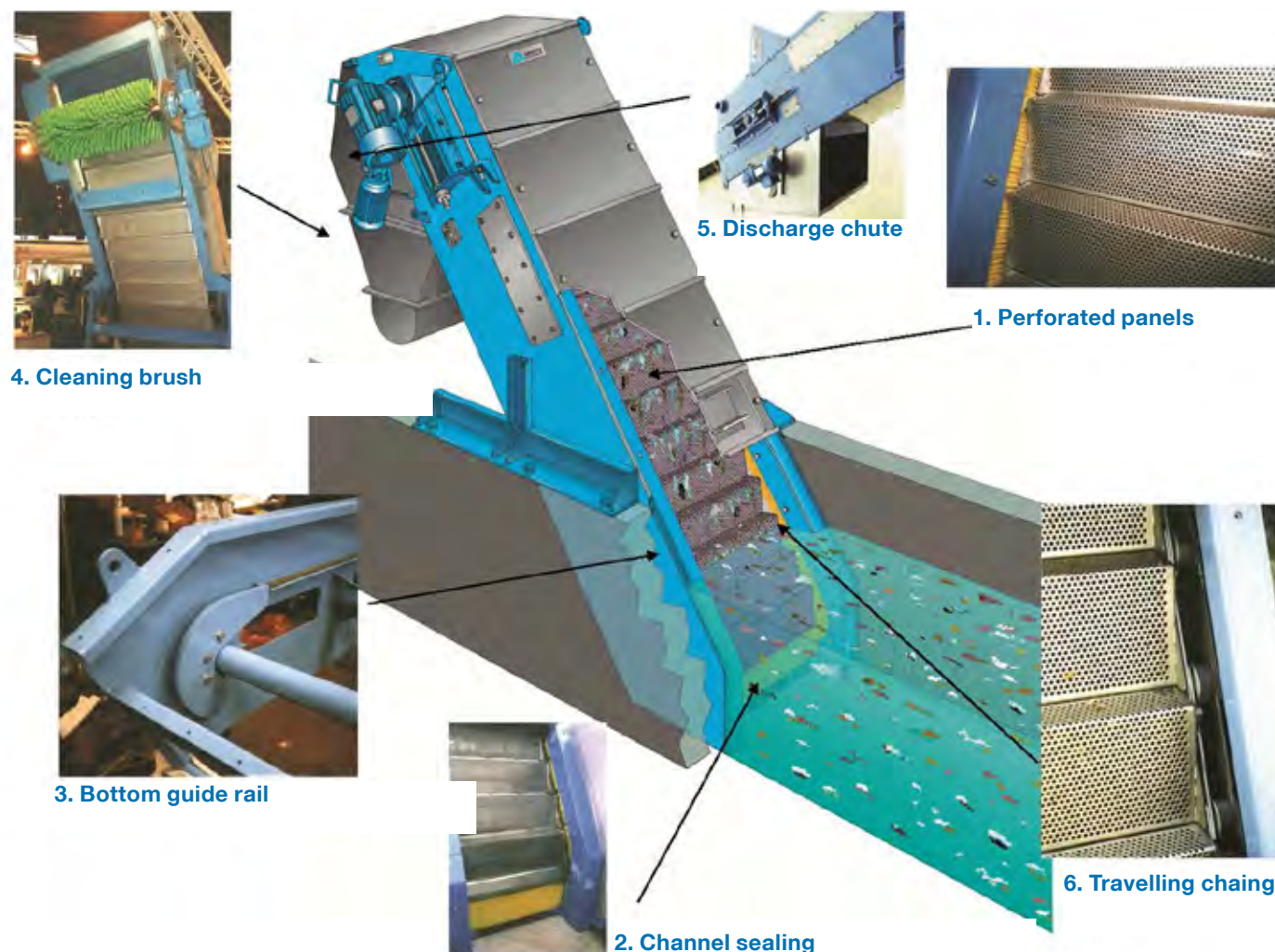
The Aqua-Screen is a continuous belt fine screen which can be easily installed in all types of channels. The flow capacity is dependant on the screen width, the perforation size, the open area of the filter panels and the upstream water level in the channel.

The Aqua-Screen uses interlocking perforated plate panels to remove floating and suspended solids in the effluent flow. The stepped panels are carried on heavy duty travelling chains which are protected from the ingress of debris by Polyester bristle brushes. The captured screenings are elevated out of the flow and automatically ejected down a totally enclosed discharge chute.

Cleaning of the belt is done in two stages: firstly the screen panels are backwashed with a high pressure spraybar (or low pressure Deluge) then the high speed rotating brush removes any remaining debris including fatty and fibrous material. The pendular adjustment on the brush allows it to be moved closer to the belt to compensate for any wear that may take place. Intermittent operation of the AQUA-SCREEN fine screen minimizes wear and optimizes the screening efficiency in relation to the filter area.

- The material piles up, thus blinding the screen and increasing the effectiveness and the fineness of filtration.
- Large quantities of screening material form layers, which can be more easily discharged.

This is why ANDRITZ recommends intermittent operation for AQUA-SCREEN fine screens by measurement of the headloss (DH = difference between the upstream and downstream water levels).



### Construction

The Aqua-Screen is of robust construction throughout and the heavy duty frame is fully reinforced. It is available in Epoxy Coated Carbon Steel or Stainless Steel whilst the travelling chain and filter plate panels are made in Stainless Steel.

#### 1. Perforated panels

The interlocking filter panels are perforated with 6 mm diameter holes (other sizes available) and fabricated in either 2 mm or 3 mm thick Stainless Steel. The panels are available with a range of open areas which allows the optimum screen width to be selected thus achieving both the maximum

flow and minimum headloss. The angled step on each panel ensures that large debris is captured.

#### 2. Channel sealing

The Polyester bottom brush ensures that no solids pass under the screen. The screen frame is sealed against the channel sides by Stainless Steel plates with plastic inserts.

#### 3. Bottom guide rail

The travelling drive chain is guided round the base of the screen by a curved solid Hardened Steel rail which is designed for an extended life and should require no

routine maintenance. Submerged bearings are not fitted.

#### 4. Cleaning brush

The high speed rotating brush comprises several individual brush elements mounted on a large diameter shaft. Typically, a more flexible bristle is better at removing grease and fat whilst a rigid bristle is more suited to effluents with a high rag content. Full pendular adjustment ensures that the brush can be moved closer to the belt to compensate for periodic wear thus ensuring cleaning efficiency is optimised and washwater consumption is minimised. The brush is directly driven by a separate geared electric motor.

#### 5. Discharge chute

This is fabricated in Stainless Steel and completely encloses the discharge area which ensures safety from aerosolling. Hinged inspection hatches with wire mesh internal guards are provided so that a visual inspection of the cleaning brush and discharge chute areas can be made without removing the complete chute assembly.

#### 6. Travelling chain

The perforated plate panels are connected to heavy duty Stainless Steel double link travelling chains which run on Hardened Steel guide rails. The chains are protected from contamination from the debris by a continuous Polyester sealing brush.

### Washwater options

The Aqua-Screen is designed to use a minimum of washwater and the standard spray bar extends the full width of the screen. The nozzles are designed for use with filtered water (final effluent or potable water) and the washwater cycle is automatically controlled by a solenoid valve. When filtered water is not available then the Aqua-Screen can be fitted with the Deluge pumped washwater system instead of the conventional spraybar. This unique system uses screened effluent to backwash the filter panels which substantially reduces washwater costs, operates without blockages and creates no harmful aerosolling effect.

## Advantages

### Mechanical

- Robust frame reinforced
- Heavy duty travelling drive chain
- Hardened steel guide rails
- No submerged bearings
- Fully adjustable cleaning brush
- Interchangeable brush sections

### Process benefits

- High capture rate
- Low headloss
- Low washwater consumption
- Low power requirements
- Intermittent operation
- Easy installation

### Operational advantages

- Low maintenance requirements
- Perforated panels easily removed
- Spraybar or deluged washwater

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CERTIFIED CORRECT FOR INSTALLATION

BY: K. Nguyen DATE: 3/22/13


PROJECT No. M816645

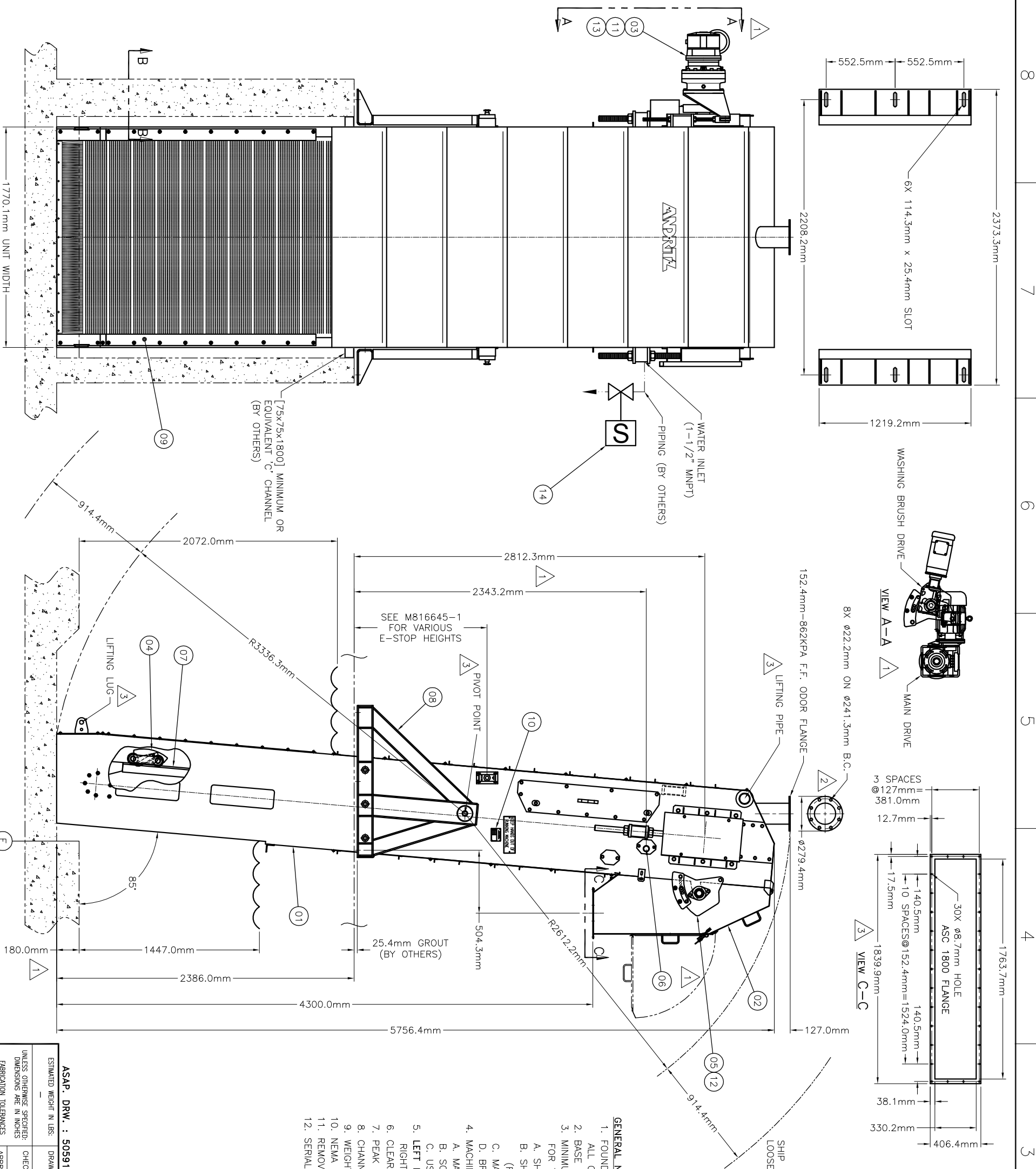
THESE DRUGS REFLECT CUSTOMER'S CHANGES  
AND APPROVAL ON PREVIOUS DRUG TRANSMITTALS

ESTIMATED WEIGHT IN LBS.	DRAWN BY:	DATE
—	QC	02/05/13
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES	CHECKED BY:	DATE
FABRICATION TOLERANCES .XXX(.040) ANG±1° HOLE±0.020	APPROVED BY:	DATE
MACHINING TOLERANCES .XXX(.005) ANG±.5° HOLE±0.020	<i>WJL</i>	2/15/13
MIL. FINISH ALL OVER	THIRD ANGLE PROJECTION	

USE SILICONE SEALER TO SEAL TIGHTNESS STRIPS TO CHANNEL WALL

VIEW B-B

- GENERAL NOTES (PER ASC):**
1. FOUNDATION DESIGN AND CONSTRUCTION TO BE FURNISHED BY OTHERS.  
ALL CONNECTING PIPING MUST BE SELF SUPPORTING.
  2. BASE FRAME TO BE INSTALLED LEVEL IN ALL DIRECTIONS WITHIN 0.79mm.
  3. MINIMUM UTILITIES REQUIRED TO BE FURNISHED BY THE OPERATOR. THE FIGURES BELOW ARE FOR THE MACHINE ONLY. ANY ANCILLARY EQUIPMENT WILL REQUIRE ADDITIONAL UTILITIES.  
A. SHOWER: 269 LITERS/MIN AT AMBIENT TEMPERATURE AND 414 kPa (MIN).  
B. SHOWER WATER TO BE FILTERED TO 200 MICRONS TO PROTECT NOZZLES (FILTER BY OTHERS). ALTERNATIVE IS POTABLE WATER.
  4. MACHINE SPECIFICATIONS:  
A. MATERIAL OF CONSTRUCTION: 316L SST. & CS.  
B. SCREEN SIZE: 6.35mm DIA. HOLE.  
C. USE SPREADER BARS WHEN LIFTING.
- 
5. **LEFT HAND MACHINE SHOWN.**  
RIGHT HAND MACHINE OPPOSITE SHOWN.
  6. CLEARANCE REQUIRED FOR MAINTENANCE: 914.4mm PER SIDE UNLESS OTHERWISE SPECIFIED.
  7. PEAK FLOW: 1664 LITERS/SEC.
  8. CHANNEL UPSTREAM: 0.35 METERS/SEC  $\leq$  **UPSTREAM INFLUENT VELOCITY**  $\leq$  0.60 METERS/SEC.
  9. WEIGHT OF MACHINE: APPROX. 3062 KG.
  10. NEMA 7 EMERGENCY STOP MOMENTARY PUSHBUTTONS PROVIDED FOR DRIVES.
  11. REMOVE SPREADER PIPE FROM FRAME ASSEMBLY PRIOR TO INSTALLING AQUA-SCREEN INTO CHANNEL.
  2. SERIAL NUMBERS: ASC--13--???



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Luggage Point  
8 – Aqua Screen  
SEQUENCE OF OPERATION

Project 816645

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**Separation**  
816645SEQr0.doc  
MMU  
2/20/13

## **SEQUENCE OF OPERATION**

(For Reference Only)

### **STARTUP**

1. Make sure the Main Control Panel is turned ON 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. **Hand mode is for service and emergencies only. The brush drive should be running when screen drive is running to prevent damage to the brush drive.**
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. The compactor will start with the screen and continue to run for an adjustable time period after the screen stops.

### **SPRAY WASH MODES OF OPERATION**

When the screen is requested to run with the Aqua-Screen shower selector placed in the auto position, the shower will be delayed for an adjustable time period to allow the matt to reach the brush, and then the shower will run for an adjustable time period while the matt is under the brush.

### **ALARM CONTROL**

In either Manual or Auto mode, the following conditions will shut down the motor control circuits, 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 the alarm reset will extinguish the alarm indicator after the condition has been cleared:

- Aqua-Screen brush drive motor overload
- Aqua-Screen drive motor overload
- Aqua-Screen drive over torque
- Compactor drive motor overload
- Channel level high-high (**Alarm only no shutdown**)



## **Luggage Point**

### **MAJOR SCOPE OF SUPPLY**

<b>Item</b>	<b>Quantity</b>	<b>Model #</b>	<b>Description</b>
1)	8	ASCI 1800x4300x6	Aquascreen Influent Channel Screen
2)	8		Local Screen Operator Stations
3)	8		Shock Relays
4)	8		Pulsar Ultra 3 with DB3
5)	2 Hard / 3 CD		Operation & Maintenance Manuals
6)	2 trips/19 days		Installation Check, Start-Up, Training

### **SPARE PARTS**

<b>Item</b>	<b>Quantity</b>	<b>Description</b>
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)	10.5	Feet of Chain Link



Luggage Point  
8 – Aqua Screen  
Control System Description

Project 816645



816645PNLPARTSr0.doc

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## **MAJOR COMPONENT LISTING**

(Typical For 8 Aqua-Screens)

### **Local Control Panel**

Item #	Component	Manufacturer	Part #	Quantity
1.	Enclosure <i>NEMA 7, with 1"NPT for conduits, and three holes for selector switches, Hinge kit, Steel mounting panel</i>	ADALET	XCE101406 N4  XHB-2 Installed XSM 1014	1
2.	3 Position Selector Switch <i>NEMA 7</i>	Allen Bradley	800H-JP5KB7AXXX	3
3.				
4.				
5.				

### **Shipped Loose**

Item #	Component	Manufacturer	Part #	Quantity
6.	E-Stop Control Station <i>NEMA 7, 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
7.	Shock Relay	Tsubaki	TSBSA10	2
8.	Ultrasonic Level Controller	Pulsar	Pulsar Ultra 3	1
9.	Ultrasonic transducer <i>NEMA 7</i>	Pulsar	dB40	1
10.				

Luggage Point  
8 – Aqua Screen  
Control System Description

Project 816645

**ANDRITZ**  
**Separation**  
**816645CSDr0.doc**  
MMU  
2/20/13

## **CONTROL SYSTEM DESCRIPTION**

(Typical for all 8 Aqua Screens)

The Aqua-screens will be 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

Components 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



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ENVIRONMENT AND PROCESS TECHNOLOGIES

**OPERATION AND MAINTENANCE TRAINING  
AQUA-SCREEN™  
COURSE OUTLINE**

**I. Course Overview**

It is recommended that each trainee have a basic knowledge of the Andritz Aqua-Screen™ and has reviewed the Andritz Operation and Maintenance Manual, the drawings provided and the process requirements of the equipment in the facility.

Course Date: TBC

Course Length: Classroom training is estimated at one hour in length.  
Field training is estimated at one hour in length.

Course Materials: Andritz Aqua-Screen™ Operation & Maintenance Manual

Instructor: Andritz Authorized Field Technician

**II. Course Description**

The Owner's personnel will be trained on the appropriate procedures for start-up, operation, emergency shut down, preventative and corrective maintenance requirements, and personnel safety to ensure long equipment life and operation. The Owner's personnel will first be given an overview of the Operation and Maintenance Manual and knowledge on how to use it. The Andritz Aqua-Screen™ system components are shown and discussed. The sequence of operations will be discussed based on plant requirements and will include initial start-up after installation, normal pre-start check, and start-up procedures for future operations and shut down requirements. Trainees will also be instructed on emergency procedural requirements.

During the field training, component identification will occur. Start-up operation, shut down and safety issues will be discussed again. Lubrication points and requirements will be shown and discussed, if conditions allow, the equipment operated enabling trainees to see first hand the operation of equipment and maintenance requirements.

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ENVIRONMENT AND PROCESS TECHNOLOGIES

### III. Classroom Training

#### A. Overview of the Operation and Maintenance Manual

1. How to use the manual
2. How to contact the supplier if a part is required

#### B. Overview of the Andritz Aqua-Screen™ System

1. How the system works
2. Identifying the system components

#### C. Operating Procedures

1. Pre-start check
2. Start-up
3. Normal operation
4. Shutdown
5. Emergency procedures

#### D. Maintenance Procedures

1. Preventative maintenance procedures
2. Lubrication points and requirements
3. Chain tensioning procedure
4. Screen panel replacement
5. Cleaning brush adjustment
6. Spray bar maintenance
7. Overview of the troubleshooting guide

#### E. Question and Answers

### IV. Field Training (This training is dependent upon power availability and whether or not the equipment is operational)

#### A. Operation of the Aqua-Screen™ System

1. Basic demonstration of the system operation
2. Operation precautions

#### B. Maintenance and Lubrication Demonstration

1. Identifying the parts
2. Illustrate what, where, and when to perform preventative maintenance practices

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**CUSTOMER NAME**

**FACILITY NAME**

**CITY, STATE**

**Preliminary or Final  
Operation & Maintenance  
Manual**

**Aqua-Screen™ 1500x4700x6**

**Serial No. ASC-09-160**

**Compactor**

**Serial No. RPSA-09-070**

**ANDRITZ Separation, Inc.**

**Job No:**

**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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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 (817) 465-5611 or write to:

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



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# **CHAPTER 1**

## **EQUIPMENT DESCRIPTION AND DESIGN CRITERIA**

### **1.1 EQUIPMENT DESCRIPTION**

#### **1.1.1 General Description of the Aqua-Screen®**

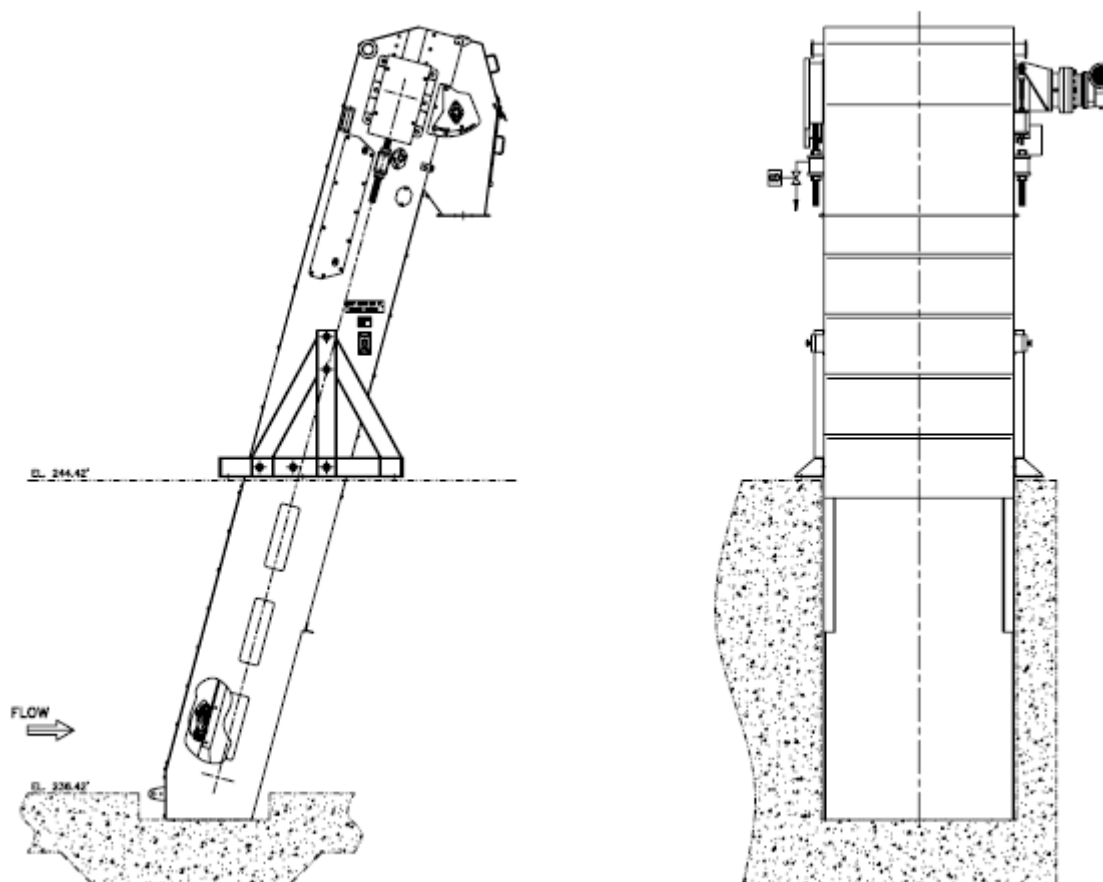
The Andritz Aqua-Screen® is a continuous perforated plate system designed to extract solids from all types of channels. Flow capacity depends on screen width, perforation size, the open area of the perforated panels, and the upstream level in the channel. Each screen is designed to suit prevailing hydraulic 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.



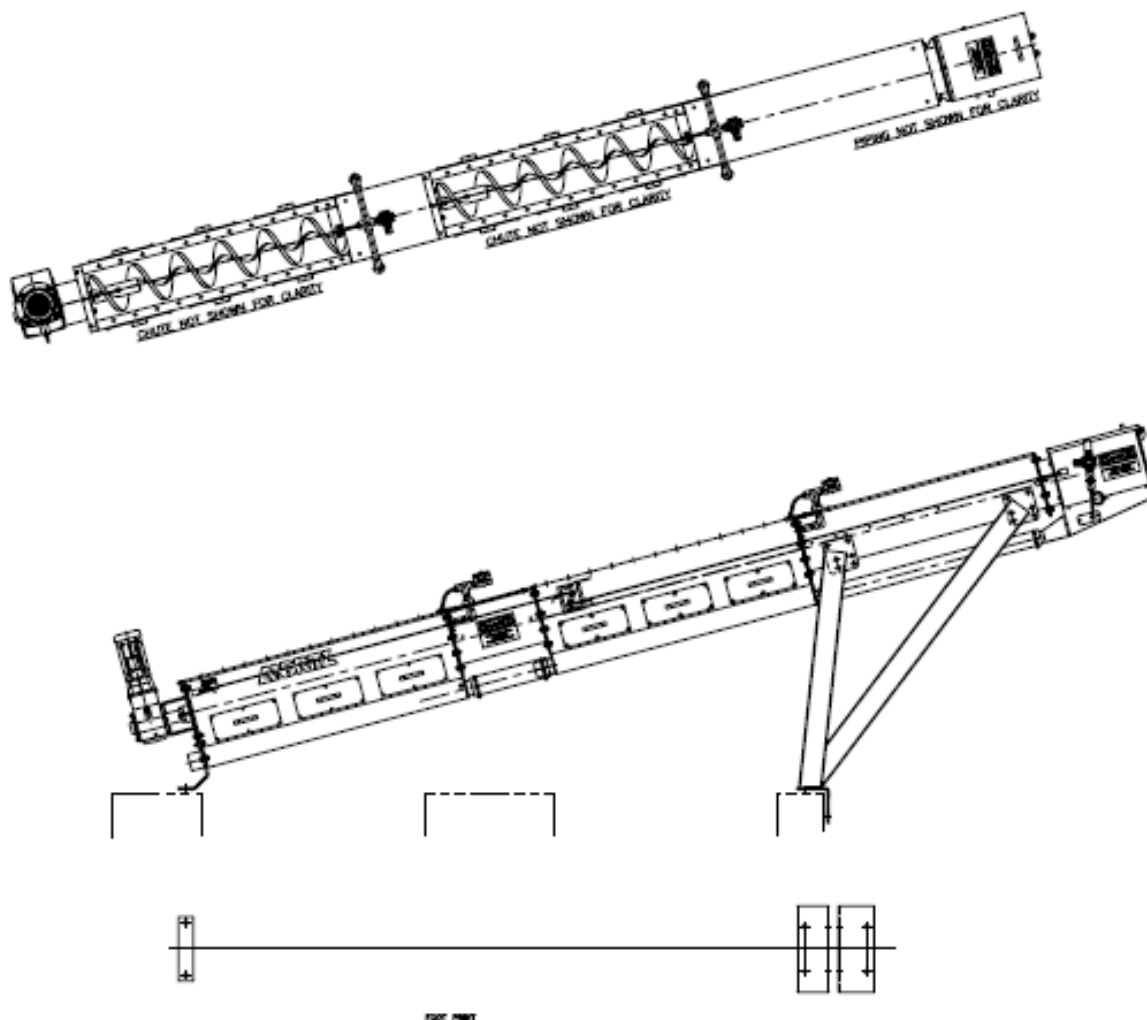
**Figure 1-1. The Aqua-Screen® in the Channel**

### 1.1.2 Description of the Compactor

The **ANDRITZ** Compactor is a self-cleaning screw conveyor with a drainage/washing section for screenings washings and a friction barrel for pressing solids to remove water. This unit is designed to accept the screened solids from an **ANDRITZ** screen or screenings washer.

Solids are flumed into the Compactor drainage section where they are washed. The screw flight in this section is fitted with a brush to scour the perforated trough to allow free liquid to drain. The solids are then carried up into the pressing barrel by the screw flights. The Compactor section consists of a perforated sheet drainage section and a removable solid barrel section. The perforated drainage section allows excess liquid to be drained away. Pressed solids discharge from the barrel of the pressing section. Excess water squeezed out in the pressing section is caught in a stainless steel enclosure from where it is drained away.

Build-up of solids on the outside of the pressing section perforated sheet is prevented by the spray nozzles in the shower system.





**Figure 1-2. The Compactor**



## 1.2 TECHNICAL SPECIFICATIONS

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

Application:		
Screen Opening Size:		
Total Flow:	Peak:	
	Average:	
Flow/Channel:	Peak:	
	Average:	
Channel Dimensions:	Width:	
	Depth:	
Velocity Upstream:	Peak:	
	Average:	
Upstream Water Level:	Peak:	
	Average:	
Head Loss:	Peak:	
	Average:	
Composition of Solids:		
Size of Solids:	Max:	
	Min:	
Total Suspended Solids:		
Fats, Oils, Greases (FOG):		
Number of Screens:		

**1.3 SCOPE OF SUPPLY**

Item	Quantity	Model #	Description
1	2	ASCI 1500x4700x6	Aqua-Screen® influent channel screen
2	1	RPS-280A	Screenings compactor
3	1		Control panel
3	5 print/2 CD		Operation & maintenance manuals
4	1 trips/2 days		Installation check, startup, training

**1.4 EQUIPMENT CHARACTERISTICS**

<b>AQUA-SCREEN® 1500x4700x6mm</b>	
Width	58.125 inches
H1 (Channel Bottom to Discharge)	177.039 inches
Approximate Weight with Drive	8,520 lb
Angle of Installation	75 degrees
<b>COMPACTOR RPS-180A</b>	
Spiral Diameter	11.5 inches
Overall Length	281.237 inches
Approximate Weight with Drive	5,000 lb
Angle of Installation	15 degrees

**1.5 MATERIALS OF CONSTRUCTION**

<b>AQUA-SCREEN® 600x3000x6MM</b>		
Frame	304 SST	3/8" thick
Perforated Screen	304 SST	14-gauge
Drive Sprocket	Epoxy-Coated AR400	3/4" thick
Drive Shaft	8620 Carbon Steel	4" diameter
Upper Guide Rail	304 SST	3/4" x 1/2" thick
Lower Guide Rail	Epoxy-Coated AR400	3/4" thick
Covers	304 SST	14-gauge
Transition Chute	304 SST	14-gauge
Chain Links	304 SST	See Chain Data Sheet
Chain Rollers, Bushings, Pins	403 SST	See Chain Data Sheet
Spray Bar	304 SST	1 1/2" NPT male
Cleaning Brush	Polyester	
Fasteners	316 SST	
Anchor Bolts	By Others	
<b>COMPACTOR RPS-180A</b>		
Perforated Trough	304 SST	12-gauge
Spiral	Hardened CS	1/2" thick, 3" flight height
Trough Housing	304 SST	10-gauge
Trough Liner	UHMW	3/8" thick
Covers	304 SST	16-gauge
Perforated Compaction Barrel	304 SST	12-gauge
Drain Pan	304 SST	14-gauge
Spray System	304 SST	See drawings
Support Legs	304 SST	1/4" thick



**1.6 AQUA-SCREEN® CHAIN DATA**

<b>1. Roller</b>		
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
<b>2. Bushing</b>		
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
<b>3. Pin</b>		
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
<b>4. Chain Link</b>		
Material	316 Stainless Steel	ASTM Standard A167-84
Heat Treatment	Non-heat-treated	
Length (CL-to-CL)	7.874 inches	
Width	2.520 inches	
Thickness	0.156 inches	
Min. Breaking Load	13,230 lb	

## 1.7 MOTOR DRIVE LISTS

### 1.7.1 Aqua-Screen® Drives

<b>AQUA-SCREEN® MAIN DRIVE GEAR MOTOR: DRV-C-2H4V762-BONF05 — LEFT-HAND UNIT</b>	
Motor:	Baldor VM7037 2 HP, 230/460 VAC, 3-phase, 60 Hz, 1725 rpm, C-face, NEMA N56C, explosion proof, Class I, Group D
Main Gear Reducer:	Bonfiglioli, W110, UFC2 30 N56C, AA, Ratio 30:1 (worm gear reducer)
Secondary Reduction:	Bonfiglioli, 307 L, 2, 24.5 FP EoVE GOA, Ratio 24:5:1 (planetary gear reducer)
<b>ROTARY BRUSH DRIVE GEAR MOTOR: DRV-C-2H4V19-BONF01 — LEFT-HAND UNIT</b>	
Motor:	Baldor VM7037 2 HP, 208-230/460 VAC, 3-phase, 60 Hz, 1725 rpm, C-face, NEMA N56C, explosion proof, Class I, Group D
Gear reducer:	Bonfiglioli, W63 U 19 N56C, B3, Ratio 19:1 (worm gear reducer)

### 1.7.2 Compactor Drive

<b>COMPACTOR GEAR MOTOR: DRV-C-5H4V120-N01</b>	
Motor:	Baldor VM7044T 5 HP, 230/460 VAC, 3-phase, 60 Hz, 1725 rpm, C-face, NEMA 184TC face frame, explosion proof, Class I, Group D
Gear Reducer:	NORD Helical-Bevel Type SK9032.1AZB-N180TC Ratio: 120.03:1, output 15 rpm based on 1750 rpm input, mounting position M4

## **1.8 CONTROL SYSTEM DESCRIPTION (PRELIMINARY)**

The Aqua-Screens® and Compactor are supplied with one control panel. This control panel measures 36 x 48 x 8 inches and is housed in a NEMA-4X stainless steel enclosure with a single door. Subpanel components consist of the following items:

- A fused main disconnect switch to accept 460/480 VAC, 3-phase power
- A through-door operator
- Fused control power transformer
- Motor starters with overloads for the drives
- Control relays
- Timing relays
- Terminals for internal and external connections

### **1.8.1 Major Control Panel Components**

Operator controls provided on the Aqua-Screen® control panel door consist of the following items. There are two switches for the Aqua-Screen® brush drive, main drive, and shower, one for each unit.

- System control power: OFF/ON selector switch and emergency stop (E-Stop) pushbutton
- Aqua-Screen® brush drive: HAND/OFF/AUTO selector switch
- Aqua-Screen® drive: HAND/OFF/AUTO selector switch
- Aqua-Screen® shower: HAND/OFF/AUTO selector switch
- Compactor drive: HAND/OFF/AUTO selector switch
- Compactor upper shower: HAND/OFF/AUTO selector switch
- Compactor lower shower: HAND/OFF/AUTO Selector switch
- Alarm control: SILENCE/RESET pushbuttons

Indicators provided on control panel door consist of the following items. As above, there are separate indicators for each Aqua-Screen® brush drive, main drive, and shower.

- System control power: White ON
- Emergency Stop: Red ACTIVATED

- Aqua-Screen® brush: Green ON
- Aqua-Screen® drive: Green ON
- Aqua-Screen® shower: Green ON
- Compactor drive: Green ON
- Compactor upper shower: Green ON
- Compactor lower shower: Green ON

### **1.8.2 Alarms**

The following alarms are provided. There are separate alarms for each Aqua-Screen® brush drive, main drive, and channel level.

- Aqua-Screen® brush drive: Amber motor overload
- Aqua-Screen® drive: Amber motor overload
- Aqua-Screen® drive: Amber over torque
- Compactor drive: Amber motor overload
- Channel level : Amber high-high
- Alarm horn

### **1.8.3 Control Panel Interface Requirements**

- Outputs to customer (dry contacts):
  - System control power
  - System common alarm
  - Channel high-high level alarm
  - Aqua-Screen® running
- Components shipped loose to be installed by contractor:
  - Wash water solenoid valve
  - Level transducer

**1.9 CONTROL PANEL COMPONENT LIST (PRELIMINARY)**

<b>COMPONENT</b>	<b>MANUFACTURER</b>
Control panel enclosure	UL listed 12-gauge NEMA 4X 304 SS wall mount
Shock relay	Tsubaki, TSBSA05
Transformer	Squared 9070T500D1 or equal
Motor overloads	Allen-Bradley 140M-C2E
Motor starters	Allen-Bradley 100-CogD10
Selector, 2-position	Allen-Bradley 800H-16HRG2KB6DX
Switch, E-Stop, illuminated	Allen-Bradley 800H-FRXTTP16RD4
Selector, 3-position, illuminated	Allen-Bradley 800H-16JRG2KB7AX
Pilot lights	Allen-Bradley 800H-PR16A
Control relays	IDEC RH Series or equal
Disconnect	Allen-Bradley 194R-NJ030P3 w/194R-HM4 or equal
Terminal blocks	Enterlec
Wire duct	Panduit or equal
Wire/cable	UL listed
Horn	Federal Horn 350
Timing relays	ABB SSAC
Solenoid valve	ASCO EF8221G11
Level controller	Pulsar Ultra 3
<b>SHIPPED LOOSE</b>	
Solenoid valve	ASCO EF8221G011; EF8221G007
Ultra Sonic Transducer	Pulsar DB6

**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	M16x40	66 ft-lb
Main drive torque arm bolts	M12x60	Std
Main drive cover bolts	M10x100	Std
Main drive safety cover bolts	M6x16	Std
Main drive secondary reducer shrink disc bolts (Bonfiglioli 307)	M10	Std
Rotary brush drive support bolts	M16x45	Std
Rotary brush drive bearing bolts	M12x30	25 ft-lb
Rotary brush drive cover bolts	M8x25	Std
Rotary brush drive torque arm bolts	M8x20	Std
Rotary brush retaining bolts	M6x20	Std
Upper side seal/seal support bolts	M8x35	Std
Lower seal top side bolts	M8x30	Std
Lower seal retaining bolts	M8x35	Std
Fitting angle retaining bolts	M10x30	16 ft-lb
Foot brush retaining bolts	M8x60	Std
Chain link securing bolts (button head socket screws)	M10x30	Std
Screen panel socket head cap screws	M10x30	16 ft-lb

## 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 32 °F.<sup>1</sup> 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  $\pm 1/16$  inch. Anchor bolt locations are shown in the mechanical drawings.

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



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.

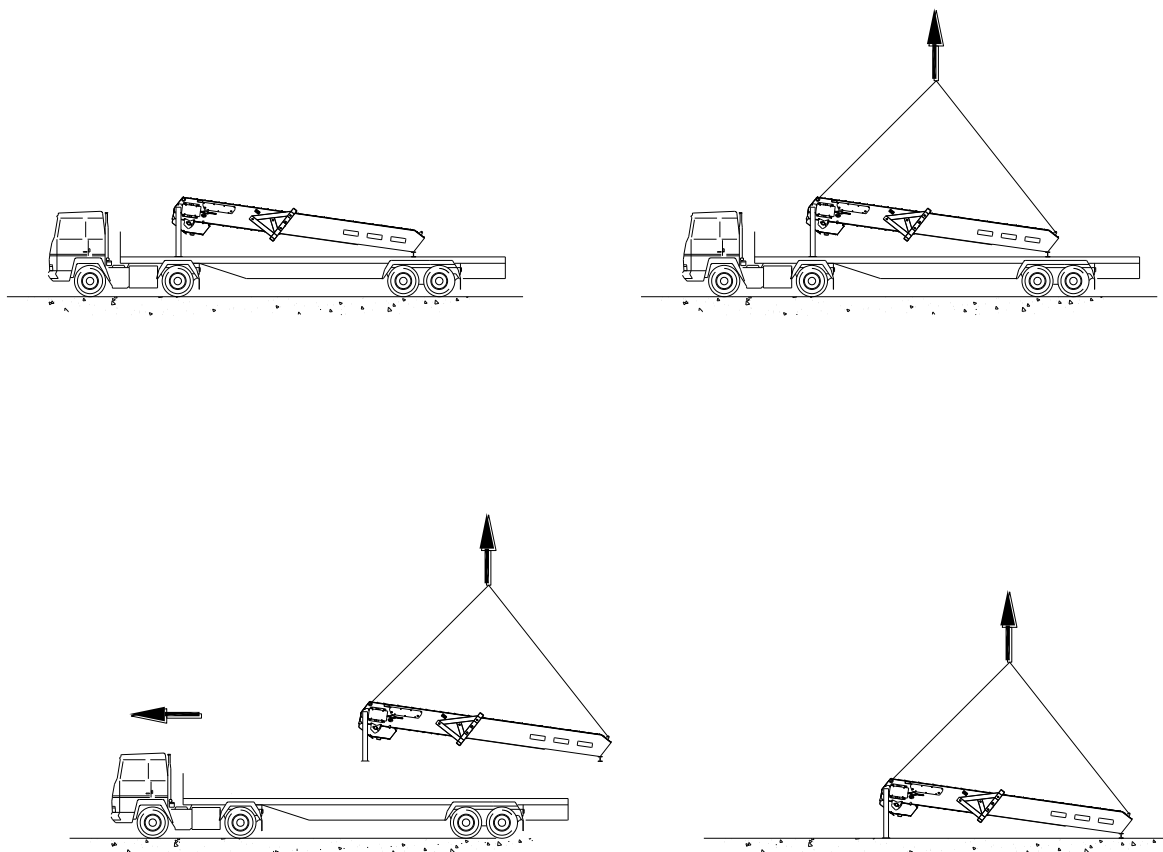
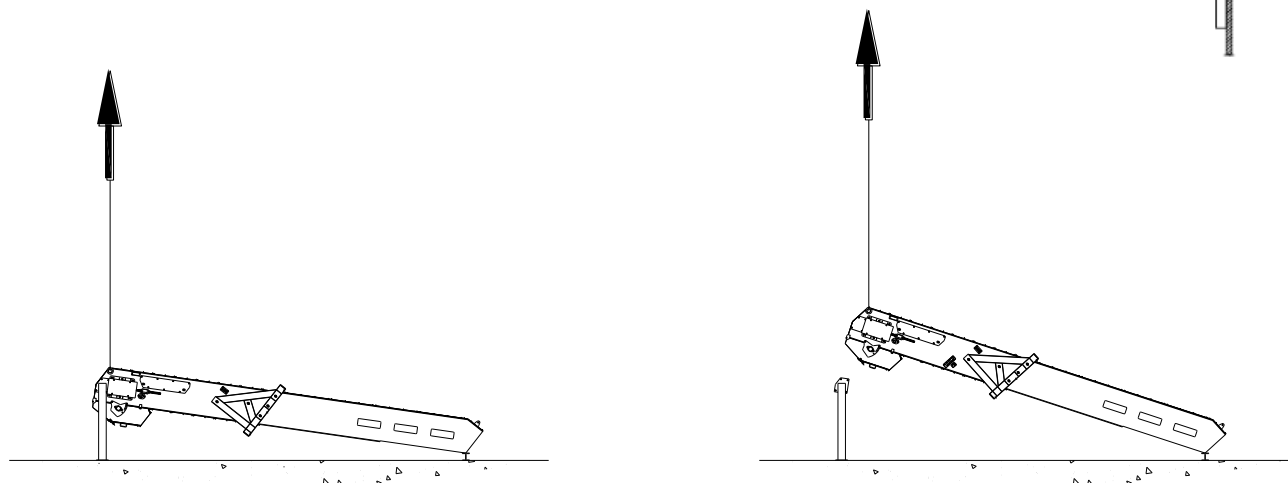
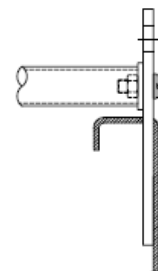


Figure 2-1. Aqua-Screen® Unloading Procedure



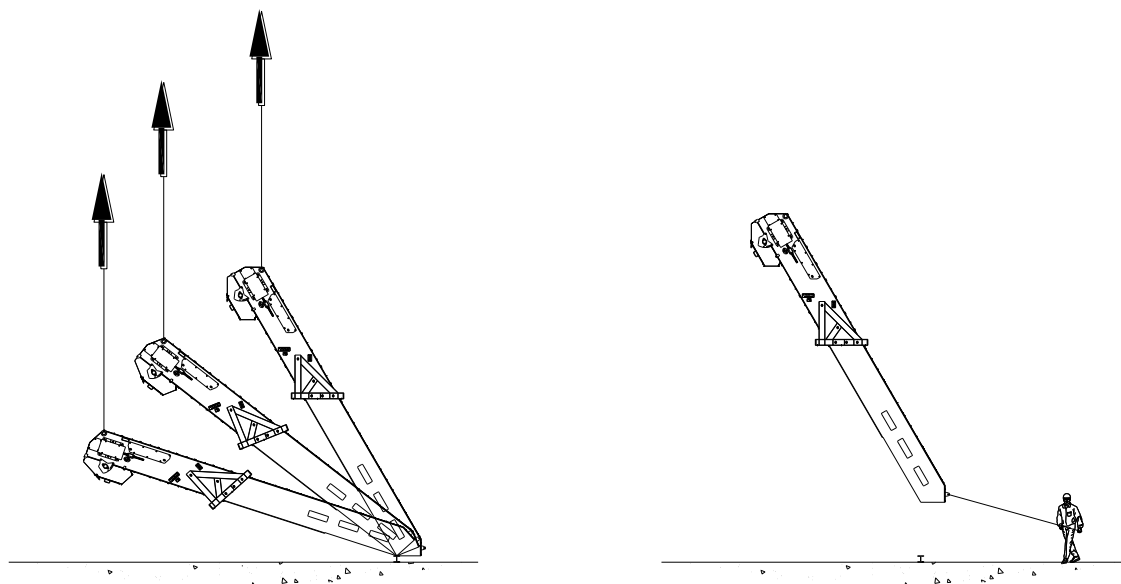
**CAUTION:** Always use the spreader beam when lifting. All cable slings and shackles must be selected to handle the weight of the machine. Only those who are professionals in moving, handling, and placing heavy equipment may conduct sizing and rigging. Otherwise, damage to the equipment may occur or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

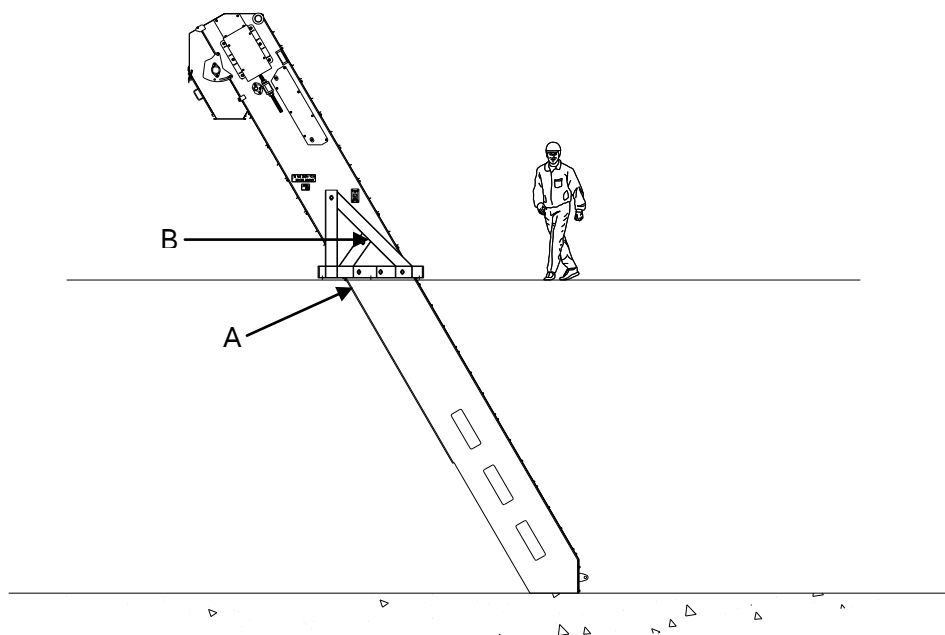


**Figure 2-3 Attaching Tag Lines**

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 60-inch 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® (75°) 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 1-inch anchor bolts as specified on the -2 project-specific drawing (detail A). Torque the anchor bolts. Torque the upper bolts in the center 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®**

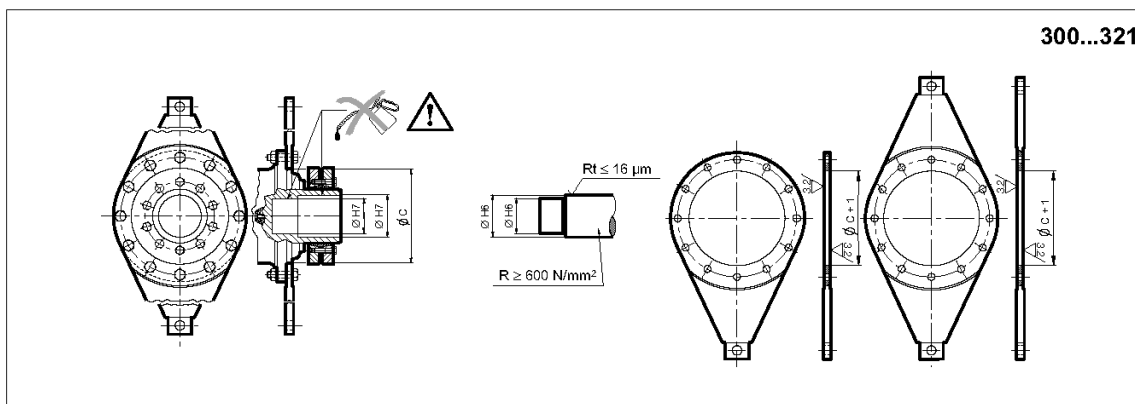
Check the oil level in the gearbox. Follow the supplier instructions located in chapter 4, Equipment Maintenance, concerning the type of oil to be used. First check that the upper plug of the gearbox is the breather plug. Otherwise, replace this plug with a breather plug.

Use the following procedure to install the main drive:

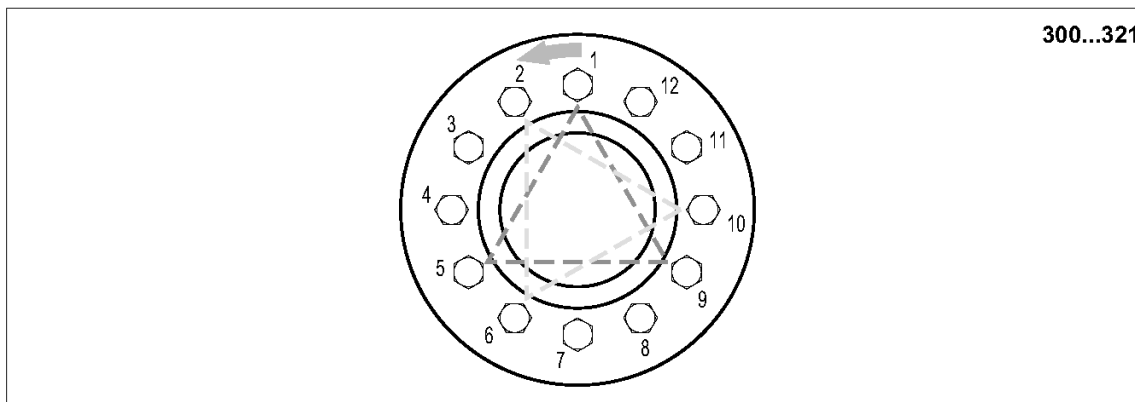
1. Mount the gear motor set on the drive shaft.
2. Slide the torque arm and gear motor towards one another and towards the Aqua-Screen® frame until proper contact is made between the other end of the torque arm and its bracket on the frame. Take care to align the torque arm so that no twisting or bending 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
<b>Bolt</b>	M6	M6	M8	M8	M10	M10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24
<b>Quantity</b>	8	10	12	12	9	12	8	8	10	10	12	15	18	21	24	21
<b>Class</b>	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
<b>Tightening torque (Nm)</b>	12	12	30	30	58	58	250	250	250	250	490	490	490	490	490	840

**Figure 2-5. Main Drive Installation Information**

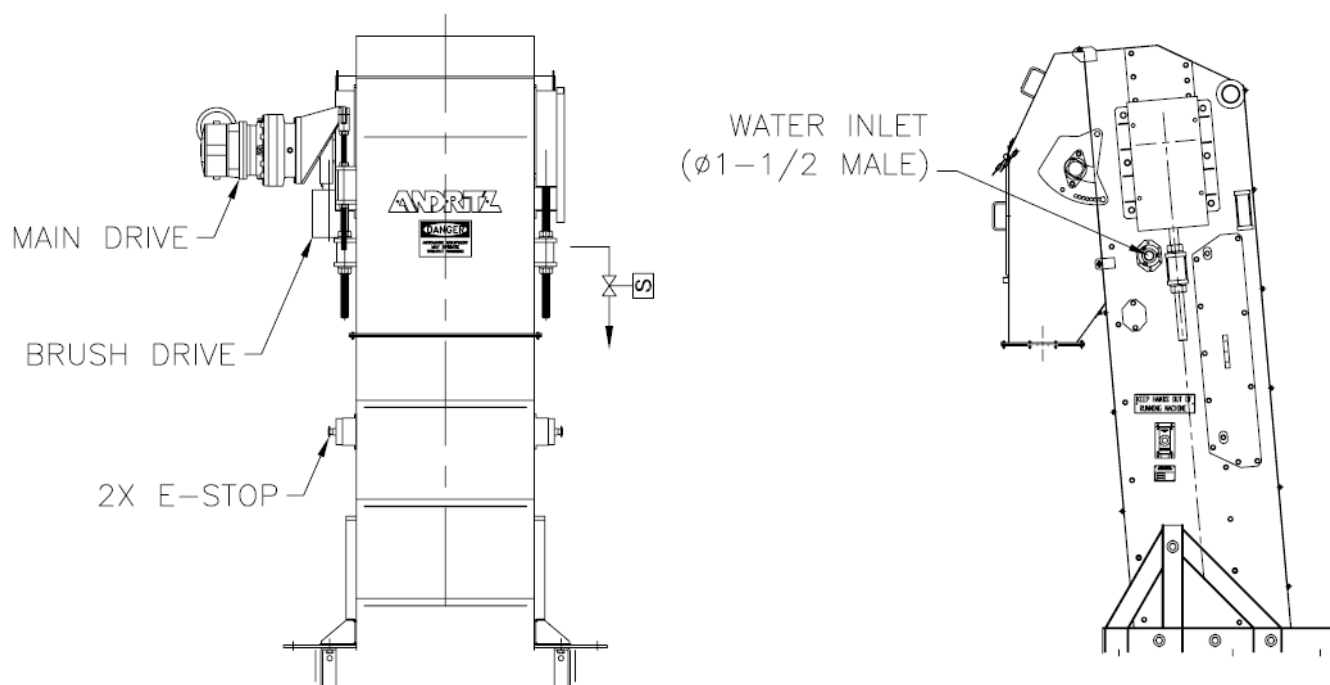
After making the electrical connections to the motor and completing the cabling installation, check the direction of rotation by switching the motor on and off very quickly. When the direction is correct, the upper part of the screen moves upwards. Also check that the insulation resistance of the motor 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 60 psig 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 1-1/2 NPT threaded pipe cap.



**CAUTION:** In the event of hard frost (< 32°F), 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 1/8-inch 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.

## **2.4 INSTALLATION OF THE COMPACTOR**

### **2.4.1 Storage Instructions for the Compactor**

If the Compactor is to be stored for any length of time before going into service for the first time, it must be stored in a dry, secure environment. If the Compactor has been in service prior to storage, it is recommended that all solid particles be removed from the perforated sheet in the drainage section and in the pressing section with high-pressure water jets. The unit should be stored flat on a cradle to prevent roll-over.

### **2.4.2 Inspection upon Receipt**

Inspect the pallet or crate for obvious impact and damage before uncrating. Once the Compactor has been uncrated, inspect it for any obvious damage during transit. If there are any obvious signs of damage externally and internally, contact your **ANDRITZ** supplier.

Your packing slip lists all loose ancillary items supplied with the Compactor, such as optional extras and spare parts. If the packing slip is not in the envelope (normally, the envelope is taped to the top of the motor guard), contact your receiving department.

Check that all items listed on the packing slip have been supplied. If any discrepancy occurs, contact your receiving department to ascertain whether any items have been removed. If it is confirmed that there are discrepancies, immediately contact your **ANDRITZ** supplier.

### **2.4.3 Lifting the Drainer Compactor**

The overall dimensions of the Compactor are specified in the project-specific drawings in this manual.

Select suitable straps or slings to lift the Compactor in compliance with local lifting/handling standard regulations and procedures. Slings or straps must be arranged so as not to damage the Compactor.

### **2.4.4 Mechanical Connections**

The Compactor may be supplied with support stands and mounting brackets. If so, the details of the supports and the mounting hole diameters and centers are shown on the project-specific drawings. Before moving the Compactor into its final position, check that the supporting base/structure is level and clean. Place the Compactor on the support structure and bolt the brackets firmly in place.





**CAUTION:** The base must be free of any foreign objects. Likewise ensure that the undersides of the mounting brackets on the unit are clean and free of any foreign matter. Otherwise, damage could occur.

### 2.4.5 Water Connections

For shower water connections, refer to the drawing in chapter 6 and provide water supply lines compatible with the fittings specified.

A clean water supply is required. If the product being handled contains fat, it may be necessary for the water supply to be heated.

The Compactor is supplied with three showers as follows:

- **Drainer section shower assembly:** These showers are fitted in the drainage section and are used to wash the screenings and to clear any blockage of the perforated sheet. A timer may be used to operate this shower. The duty cycle is site specific.
- **Press section shower:** This is a ring shower fitted in the press section and designed to keep the outside of the perforated tube clean. This shower is equipped with a manual ball valve. Usage is site specific.
- **Compactor drain and pan shower:** This shower is connected to the press section shower and is operated in conjunction with the press section shower.

The project-specific drawings show for water consumption of each shower.

## 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®:

- Confirm that guards, access doors, and covers are securely fastened before operating the equipment.
- 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.
- 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.
- 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:

- The channel is clear of debris.
- All bearings have been greased.
- All protection devices — such as emergency stop push buttons — are operational.

- 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.
- Abnormal noises or knocking during operation; if any abnormal noises are detected, stop the Aqua-Screen® immediately and contact **ANDRITZ**.
- Start the waste conveying system downstream from the Aqua-Screen®.
- 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).

As soon as the hydraulic conditions are normal, perform the following procedure:

- 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.

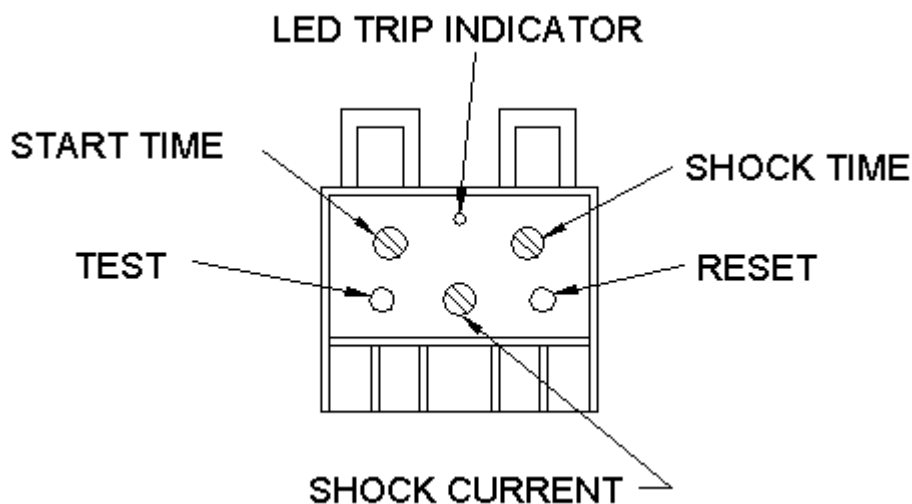


Figure 3-1. Parts of the Tsubaki Shock Relay



**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. Turn the main disconnect switch to the ON position. This provides 460/480 VAC 3-phase power to the motor circuits and the control power transformer.
2. Place the system control power selector switch to the ON position. Correct placement is indicated by a white illuminated system control power ON light. The master control relay should now have power. The emergency stop pushbuttons on the panel and the unit de-energize the master control relay and cause an immediate shutdown of the showers and the drives.
3. Each component on the Aqua-Screen® has two modes of operation, HAND and AUTO. Each component in HAND mode runs continuously.



**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.**

4. In AUTO mode, the Aqua-Screen® runs upon receiving a high or high-high command signal from the ultrasonic level controller or the screen minimum cycle timer. The Aqua-Screen® continues to run for an adjustable time after the run request or alarm has been cleared. The compactor starts with the screen and continues to run for an adjustable time period after the screen stops.

### 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. When the compactor is requested to run with the compactor upper and/or lower shower selector placed in the AUTO position, the shower is delayed for an adjustable time period, then the shower runs for an adjustable time period.

### Alarm Control

The following conditions will shut down the complete system in MANUAL or AUTO mode, sound the horn, and illuminate the respective amber indicator light. 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:

- Aqua-Screen® brush drive motor overload
- Aqua-Screen® drive motor overload

- Aqua-Screen® drive overtorque
- Compactor drive motor overload
- Channel level high-high (alarm only, no shutdown)

### **3.2.3 Troubleshooting for the Aqua-Screen®**

#### **Manual Mode:**

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

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

- Overload is reset
- Motor fuses
- Operation of any relevant limit switches
- 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 MCB.
- Emergency Stop Operated:
  - Check that panel Emergency Stop button has been reset (twist to reset).
  - Check that remote Emergency Stop buttons have been reset (twist to reset).
- Fault in System:
  - Switch off panel and test to ascertain 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.

- General:

- 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**

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

### **Too Much Liquid in Discharge**

- 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

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.	

### **3.3 STARTUP AND OPERATION OF THE COMPACTOR**

#### **3.3.1 Compactor Startup Checklist**

- Check that main bearing is charged with grease. See the Maintenance Summary form located in Chapter 4 for proper lubricant.
- Check oil level in drive gearbox. Depending on the final angle at which the unit is installed, oil may have to be added or drained. See the Maintenance Summary Form for proper lubricant.
- Tighten all nuts and bolts.
- Secure all connections.
- Rotate the screw through 280 degrees by jogging with the electric motor to ensure that there is no fouling and to verify correct forward rotation.

#### **3.3.2 Compactor Startup Procedures**

- Dry run screw for 10 minutes and check all running gear for satisfactory operation.
- Turn on wash water to Compactor. Verify that all nozzles are functioning correctly.
- Start the Compactor before feeding screenings into the drainage section.

#### **3.3.3 Compactor Sequence of Operation**

##### **Process Overview**

When the screen begins rotation, the Compactor showers and drive are energized. The Compactor will run a washing and compaction sequence under normal flow conditions. When placed in AUTO position, the Compactor showers will cycle off and on according to adjustable timing relay setpoints. Typical timing is 20 seconds on and 60 seconds off. As the Aqua-Screen® shuts down, the Compactor will stay in operation for a preset time.

##### **Recommended Initial Sequence**

- As screen starts, begin running Compactor and Compactor showers.
- Under normal operation, the showers will cycle on and off.
- The Compactor will continue to run for 5 minutes after the Aqua-Screen® has stopped.

#### **3.3.4 In-Service Checks for the Compactor**

Check for any obvious leaks around Compactor. Check packing gland at main bearing for leaks. Tighten if required. Listen for any unusual vibrations or noises. Check gearbox and motor temperature.

### 3.3.5 Fine Tuning the Compactor

Check the consistency of the pressings as they exit the machine. If they are too dry or stalling is occurring in the machine then adjust the shower water so as to increase the shower flow. Wetting of the solids in the compaction tube may be required to prevent stalling.

If the pressings are too wet it may be necessary to adjust the shower water so as to decrease the shower flow.

### 3.3.6 Compactor Shutdown Procedures

The in-feed should be stopped and the screw should be kept running until all of the solids have been discharged from the Compactor. A solids plug will remain in the Compactor barrel. If the unit is down for an extended period of time, this plug may need to be watered down as it will become hard and difficult to discharge. Operate the showers for a complete washing cycle to prevent drying up of solids on the outside of the perforated drainage section. The manual shower system on the Compactor barrel should be turned on to clean the perforated tube. This will also turn on the shower located on the collection pan below the Compactor tube to flush material away.

### 3.3.7 Compactor Troubleshooting Checklist

SYMPTOM	POSSIBLE CAUSE	CURE
Free liquid is washing out end of Compactor	Excessive shower	Check shower frequency and duration. Check nozzle orientation for correct spray pattern. Check to ensure that the manual shower in Compactor section is off.
Screw not rotating	Motor runs	Check whether there is output from the gearbox. If there is, then check the shear bolts between the screw input shaft and the tubular screw flight center.
	Motor not running	Have fuses and starter checked by a qualified electrician. If the supply is found to be correct, have the motor windings checked out.
Screw stalling	Excessive pressing action	Remove solid compactor tube to decrease press length.

## 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.

<b>TABLE 4-1. GENERAL MAINTENANCE GUIDELINES FOR THE AQUA-SCREEN®</b>		
<b>Weekly: Check for...</b>	<b>Monthly</b>	<b>Annually: Check for...</b>
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.

<b>TABLE 4-2. MAINTENANCE SCHEDULE</b>				
<b>Part</b>	<b>Component</b>	<b>1 Month</b>	<b>3 Month</b>	<b>Overhaul</b>
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:

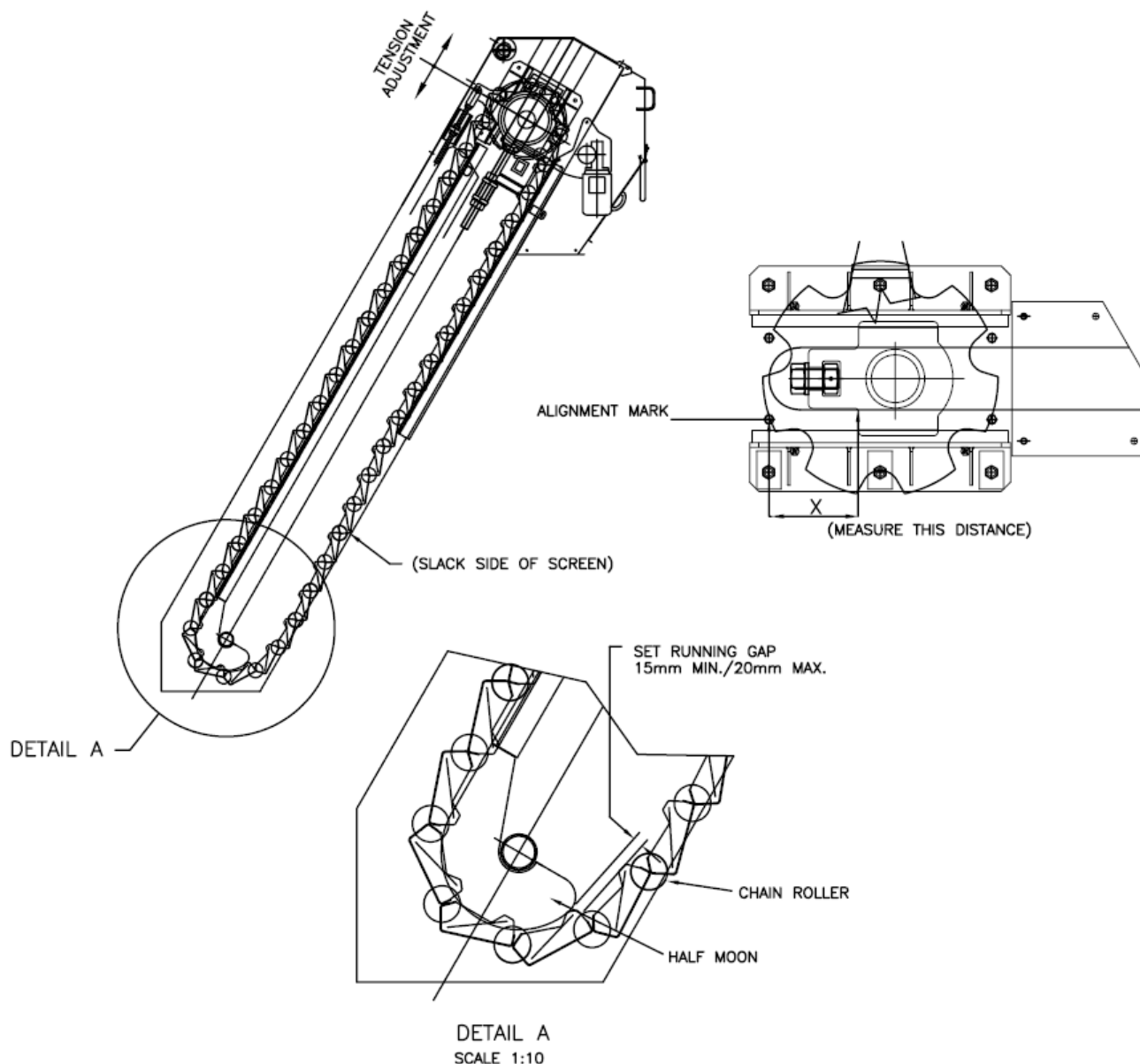
1. Drain the channel.
2. Remove two perforated screen panel plates. (Refer to § 4.3.1 for the procedure for removing these plates.)
3. Rotate the perforated screen panel plates to bring these two openings to the lowest point of return section of the chain loop (near the bottom of the channel).
4. Look 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:

- The roller of the lower point must be in contact with the half-moon plate, as shown on figure 4-1.
- The roller immediately to the rear must be located about 1/2 inch to 3/4 inch from the half-moon plate.



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

7. 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.
8. 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.

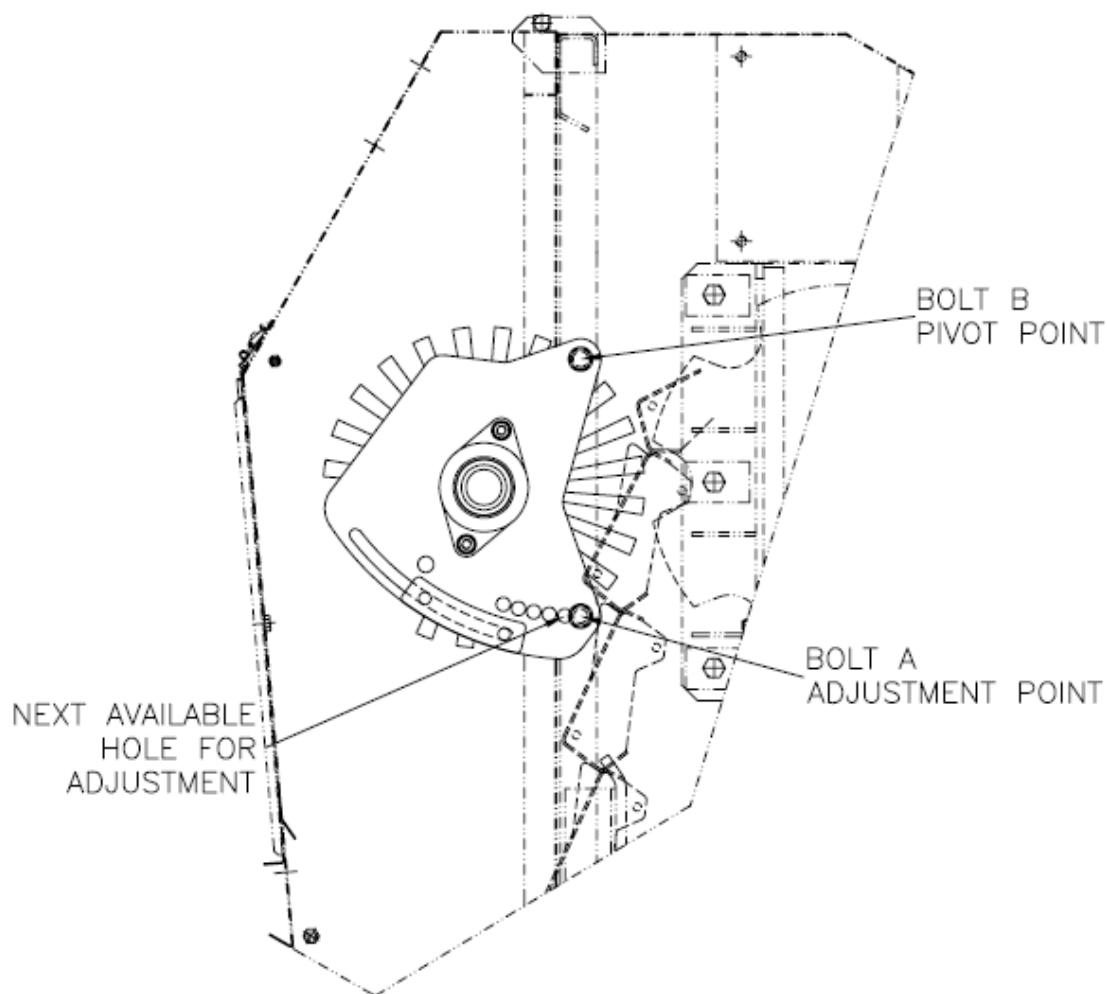


**CAUTION:** Do NOT drop any component, hardware, or tool into the Aqua-Screen®. This will damage the Aqua-Screen®.

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. Retighten 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.

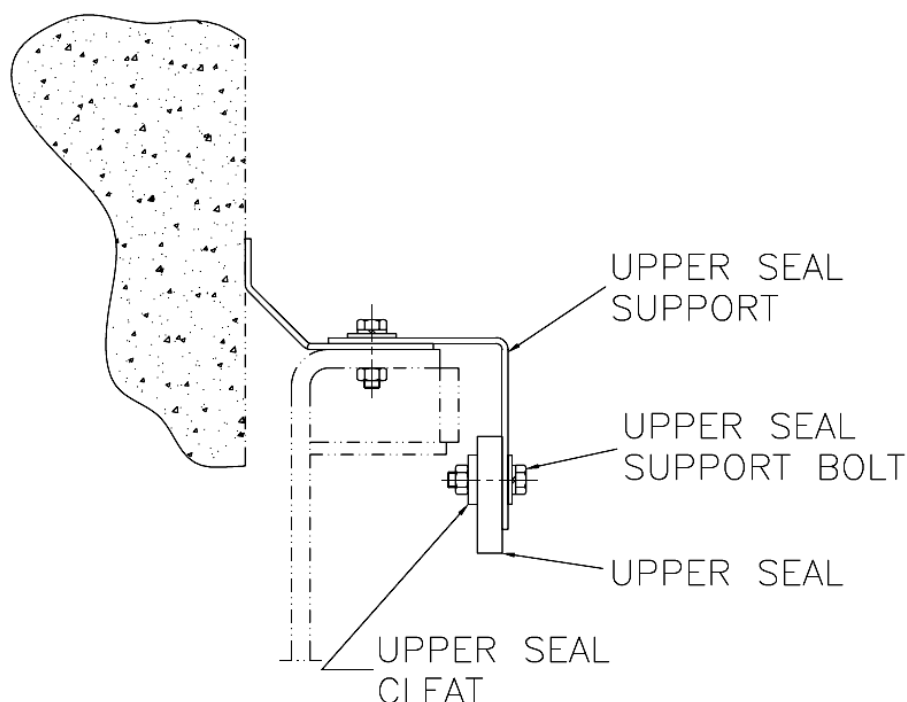


**CAUTION:** Switch off and lock out/tag out the electrical switches of the two motors.



**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 1/16 inch to 1/8 inch 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.

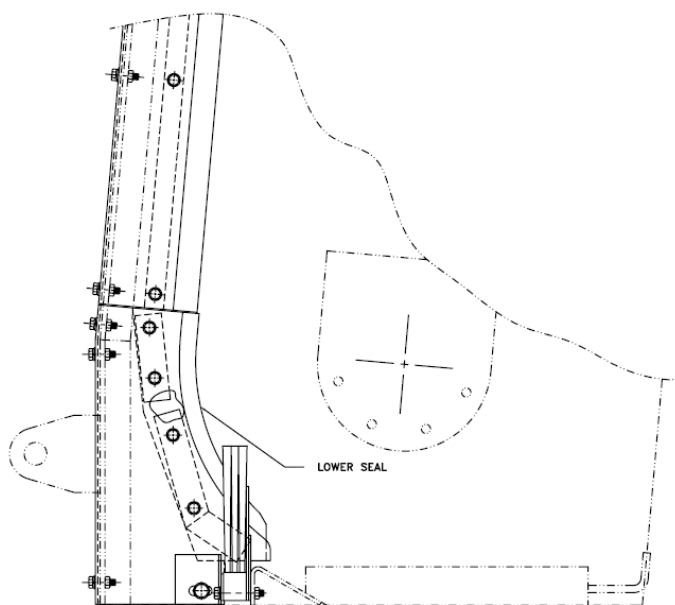


**CAUTION:** Switch off and lock out/tag out the electrical switches of the two motors.



**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 1/16 inch to 1/8 inch 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.

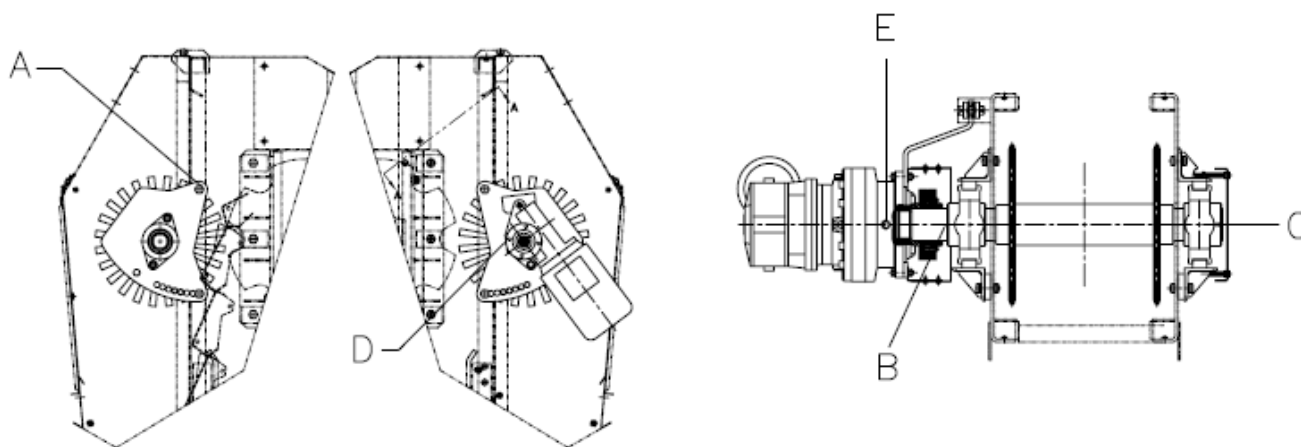


**CAUTION:** Do not operate the gear boxes without the breather plug. The internal pressure will build up and damage the seal, which will cause leakage after a period of time in operation.

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

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®**

**4.2.11 Aqua-Screen® Lubrication Schedule**

MANUAL LUBRICATION SCHEDULE					
EQUIPMENT LOCATION	FREQUENCY	LUBRICATION TYPE (GREASE OR OIL)	LUBRICANT AMOUNT	LUBRICATION SUPPLIER	LUBRICATION PRODUCT
(Drive Side) A. Brush Shaft Bearing	Monthly	Grease	1.5 ounces	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
(Drive Side) B. Main Bearing	Monthly	Grease	10-12 ounces	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
(Non Drive Side) C. Main Bearing	Monthly	Grease	10-12 ounces	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
(Non Drive Side) D. Brush Shaft Bearing	Monthly	Grease	1.5 ounces	Mobil	Mobil SHC 460
				Shell	Albida PP Grease 1
				Texaco	Miltex EP 1-1/2
AQUASCREEN LUBRICATION SCHEDULE					
EQUIPMENT LOCATION	FREQUENCY	LUBRICATION TYPE	LUBRICANT AMOUNT	LUBRICATION SUPPLIER	LUBRICATION PRODUCT
Aqua-Screen® Main Drive Secondary Gearbox (305)	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	1.5 Gallons	Mobil	Mobil Gear SHC 630
				Shell	Tivela Oil WB
				BP	Ernesyn HTX220
				Texaco	Meropa 220
Aqua-Screen® Main Gear Reducer (W 63)	Not Required – Supplied with Life Lubrication				
Aqua-Screen® Brush Gear Reducer (W 63)	Not Required – Supplied with Life Lubrication				



### 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 70°F. For temperatures below 70°F, 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.

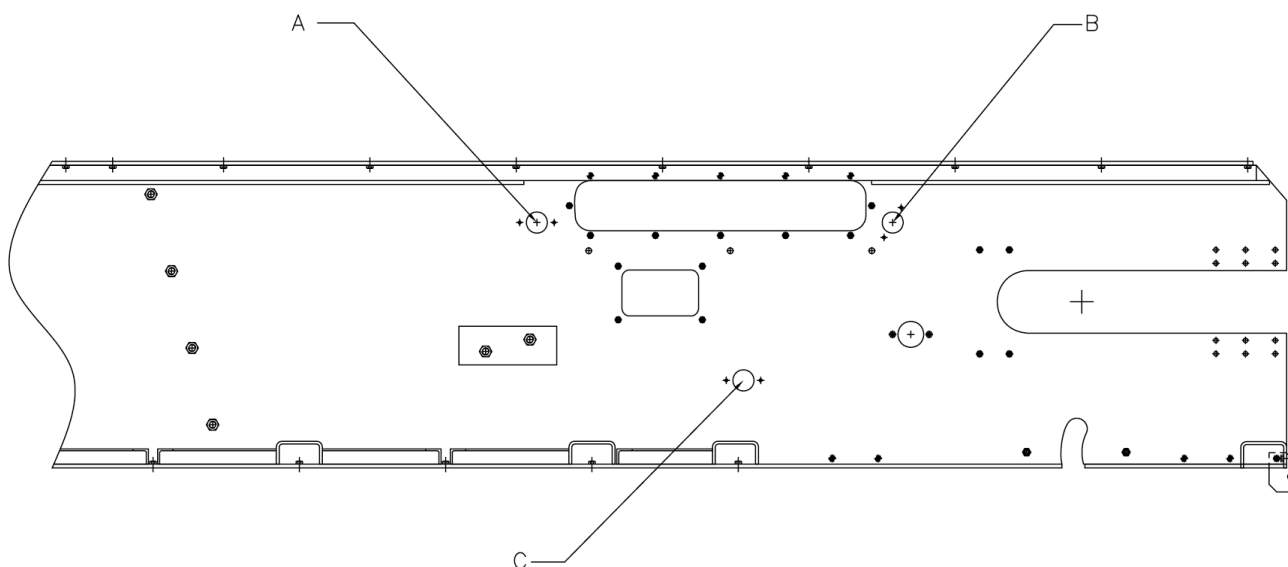


**CAUTION: Switch off and lock out/tag out the electrical switches of the two motors.**

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 1 3/8 inches in diameter and a sufficient length to protrude at least 12 inches 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 70°F. For temperatures below 70°F, 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**

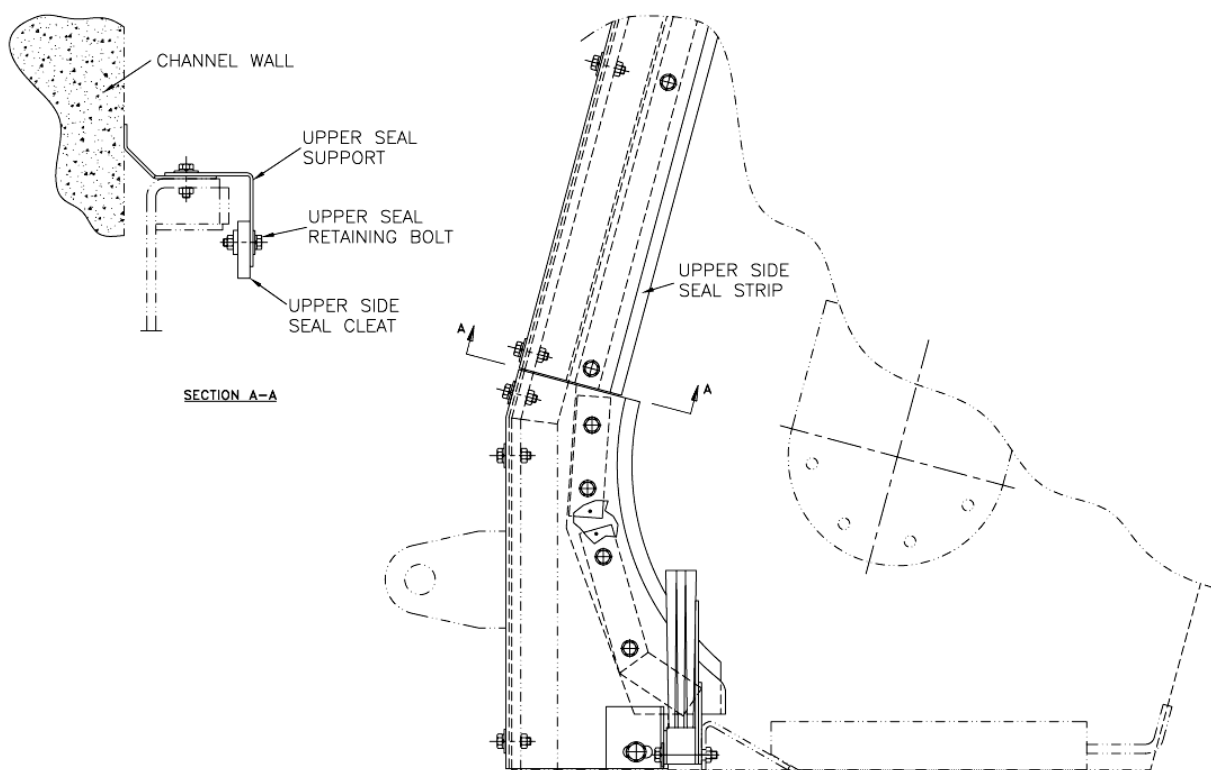
To replace flexible seals, you will drain the channel and work on the lower end of the Aqua-Screen®.



**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 70°F. For temperatures below 70°F, 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.

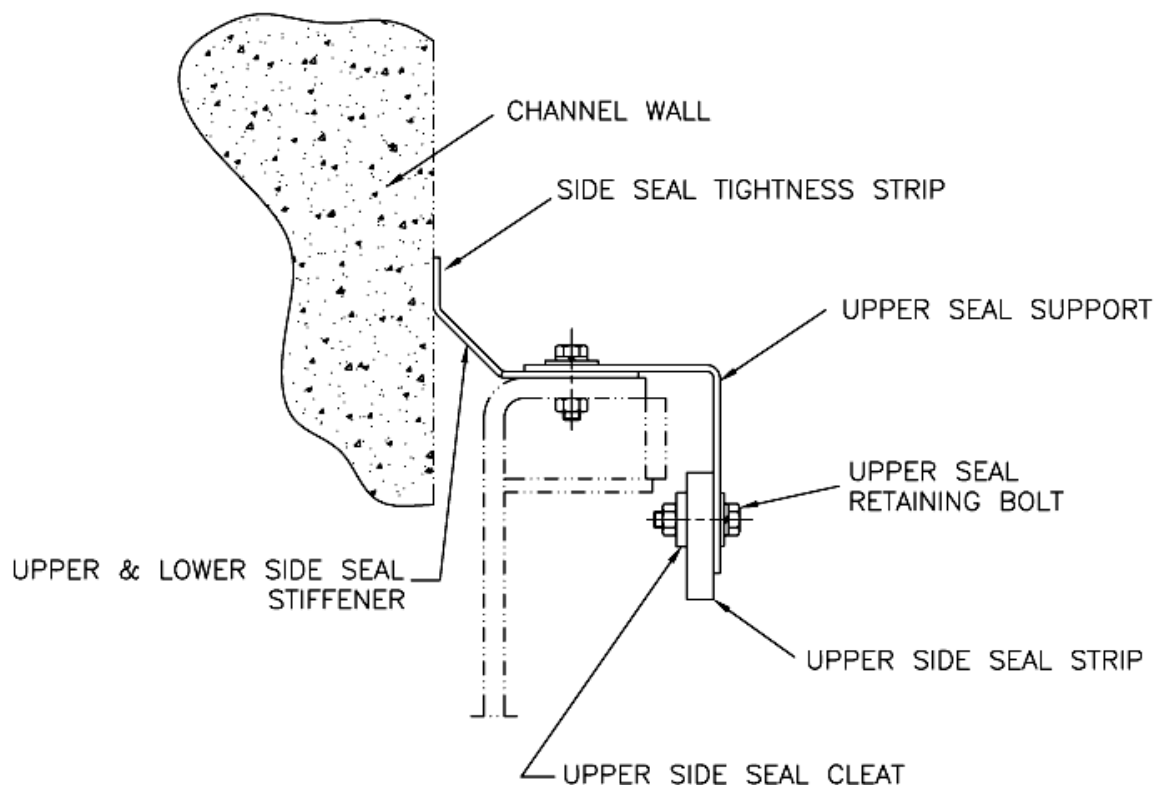


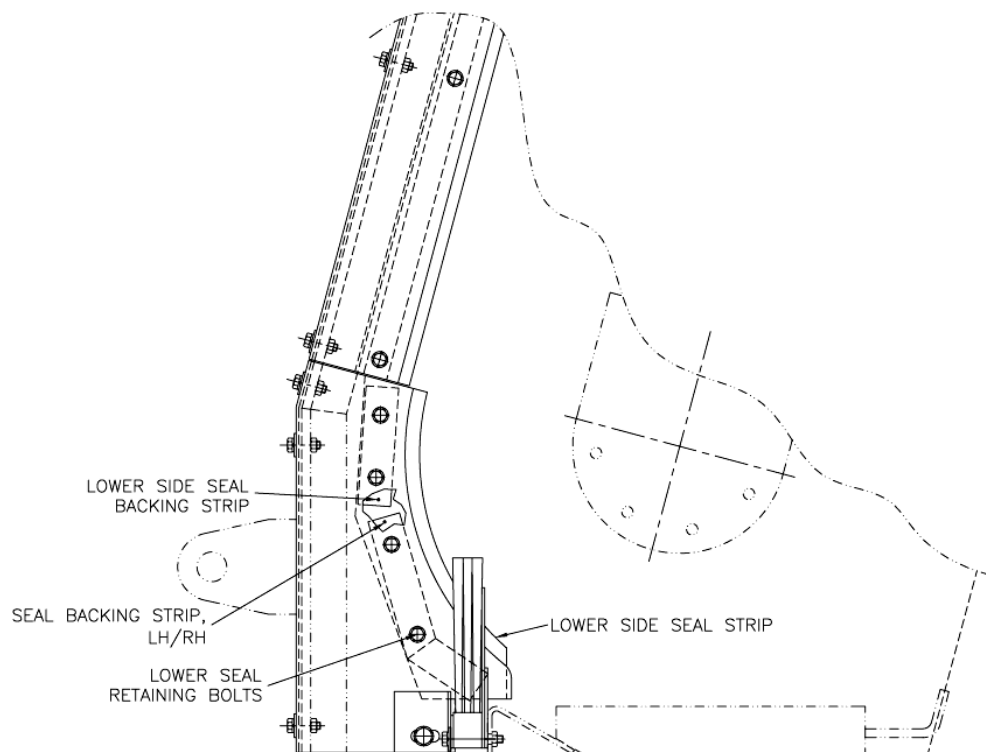
Figure 4-8. Upper Seal Replacement Components Diagram

#### **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 70°F. For temperatures below 70°F, 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.



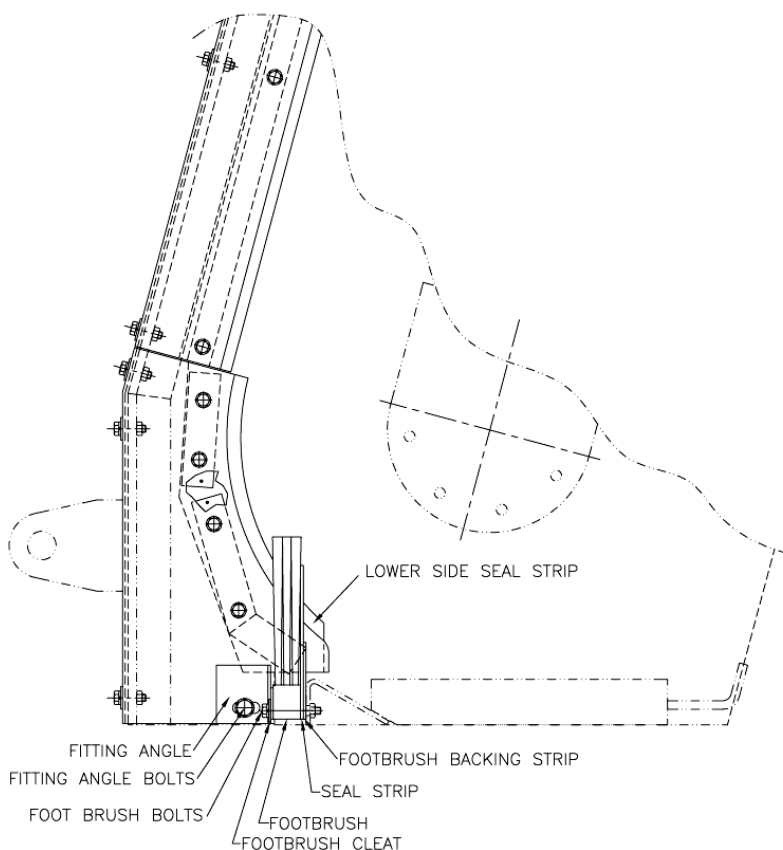
**Figure 4-9. Detail of Lower Seal Area**

### **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 70°F. For temperatures below 70°F, 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**



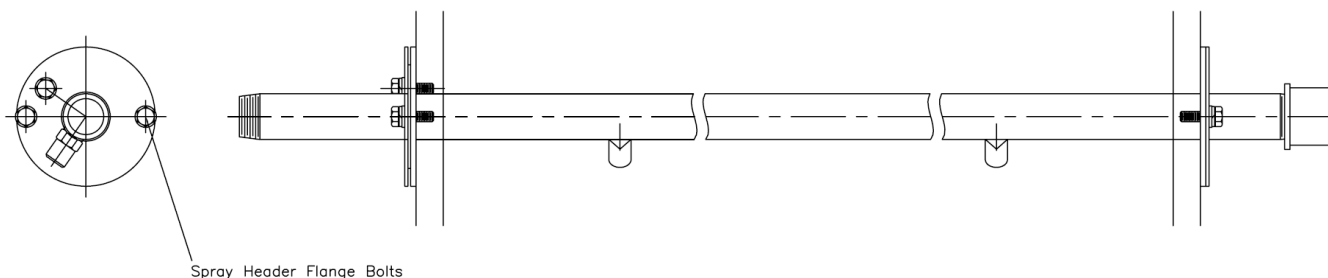
#### 4.3.4 Replacing the Shower Nozzles

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, 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:

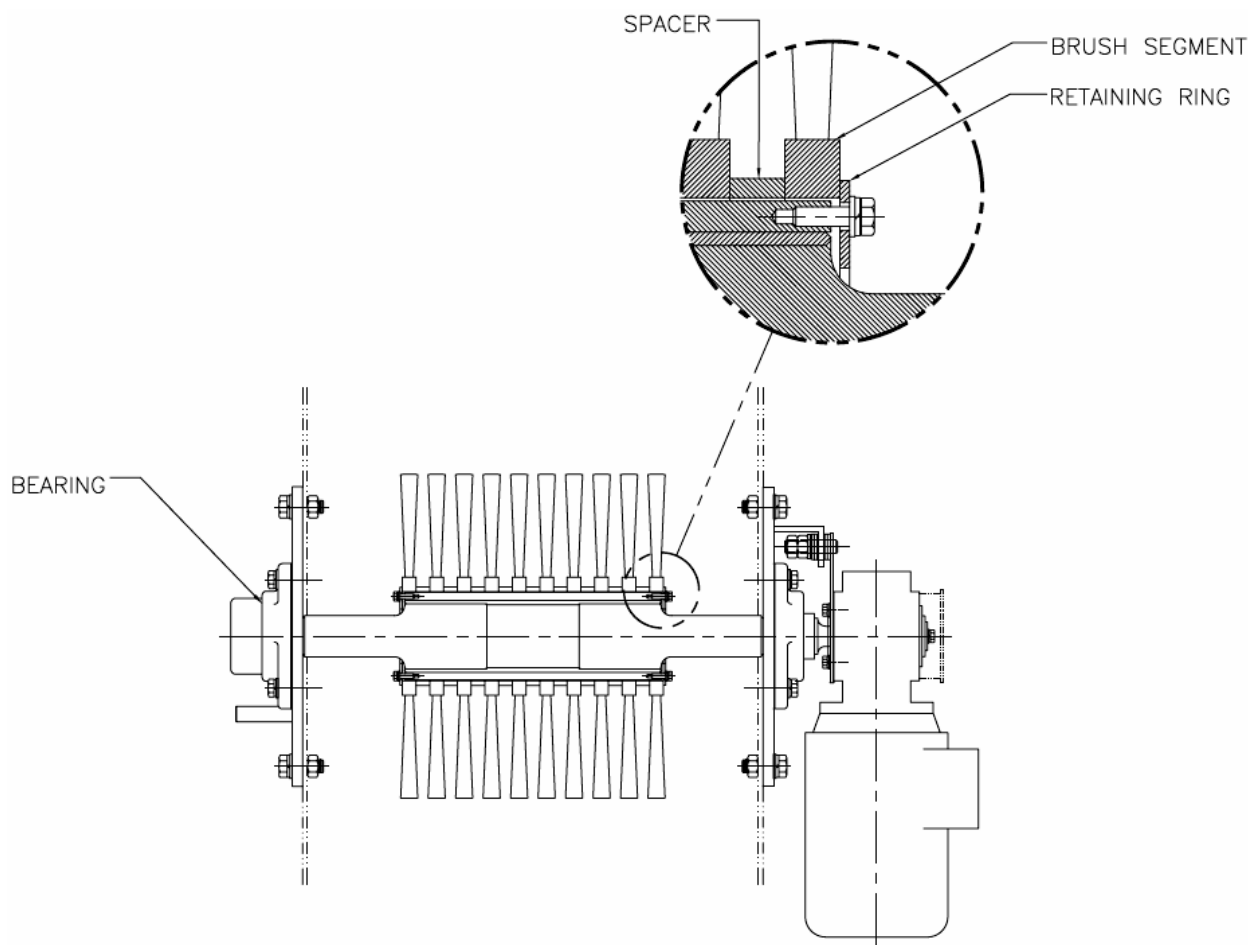
1. Thoroughly clean and degrease the shaft and reusable spacers.
2. Reinstall the brush rings and undamaged spacers on the drive shaft. Add new spacers as required to replace discarded spacers.
3. Reinstall the brush ring retaining rings and screw down the brush retaining bolts.
4. Put the brush assembly 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:

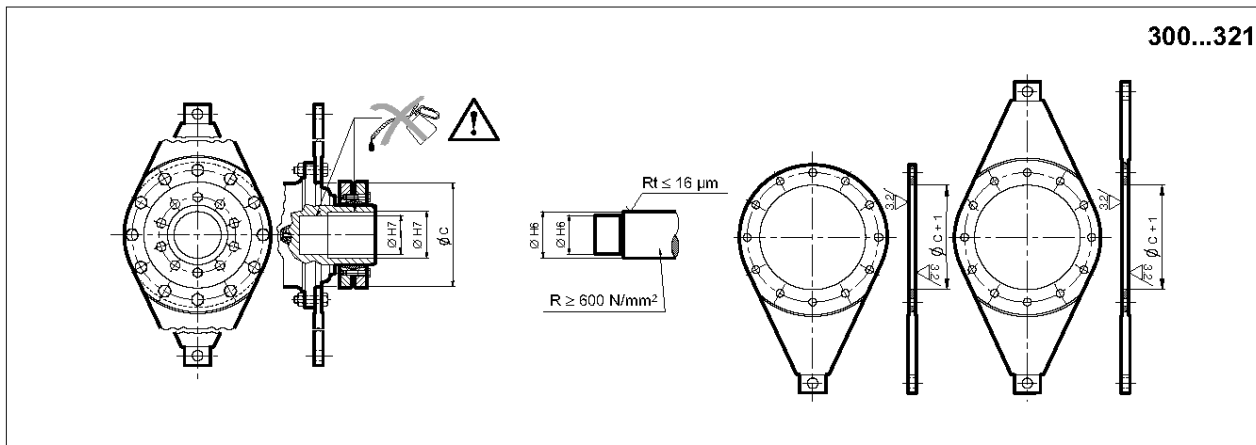
1. Use an overhead crane to relieve the weight of the gear box from the shaft.
2. Loosen the hex head bolts from the shrink disk.
3. Remove the safety cover.
4. Remove the bolts from the torque arm brackets.
5. Disconnect the torque arm from the clevis by removing the split pin.
6. Remove the main drive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

Use the following procedure to replace the main drive:

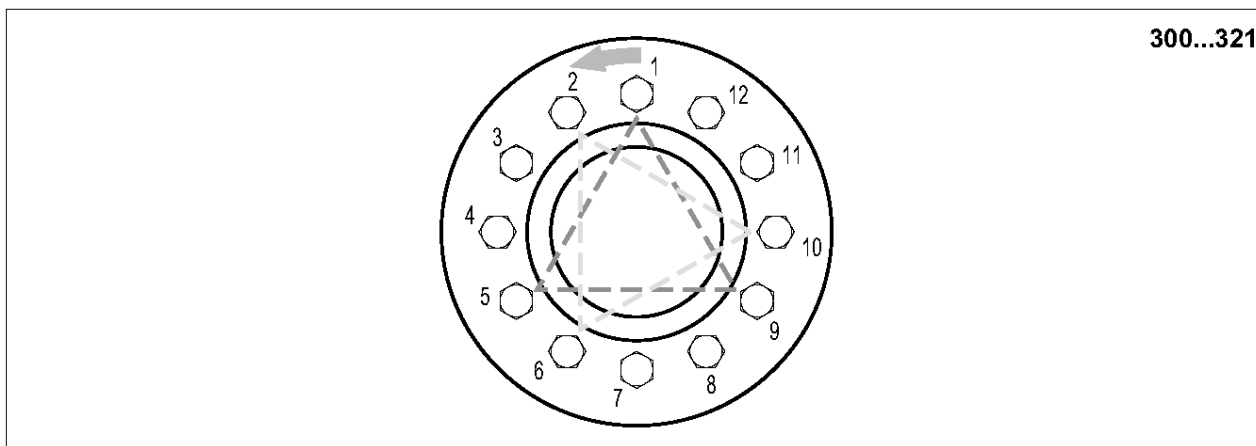
1. Clean and degrease the mating surfaces of the gear box output bore and the drive shaft.
2. Check for gouged spots on the mounting area and smooth the rough spots with sand paper if needed.
3. Mount the new gear motor set on the drive shaft.
4. Slide the torque arm and gear motor towards one another 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
<b>Bolt</b>	M6	M6	M8	M8	M10	M10	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24
<b>Quantity</b>	8	10	12	12	9	12	8	8	10	10	12	15	18	21	24	21
<b>Class</b>	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
<b>Tightening torque (Nm)</b>	12	12	30	30	58	58	250	250	250	250	490	490	490	490	490	840

**Figure 4-13. Main Drive Replacement Information**

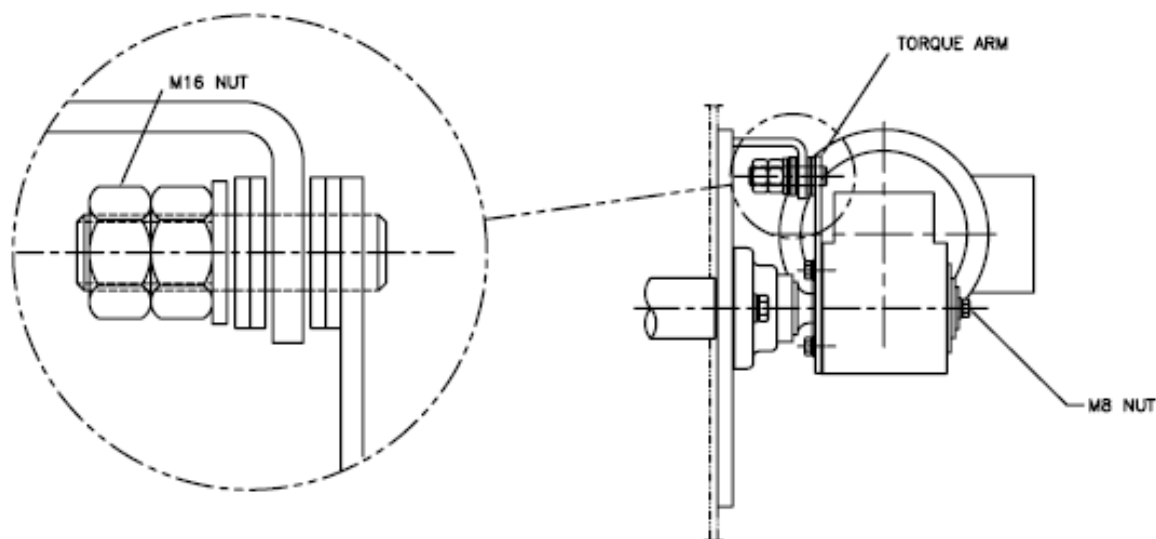
### 4.3.7 Replacing the Rotary Washing Brush Drive (Gear Box)



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

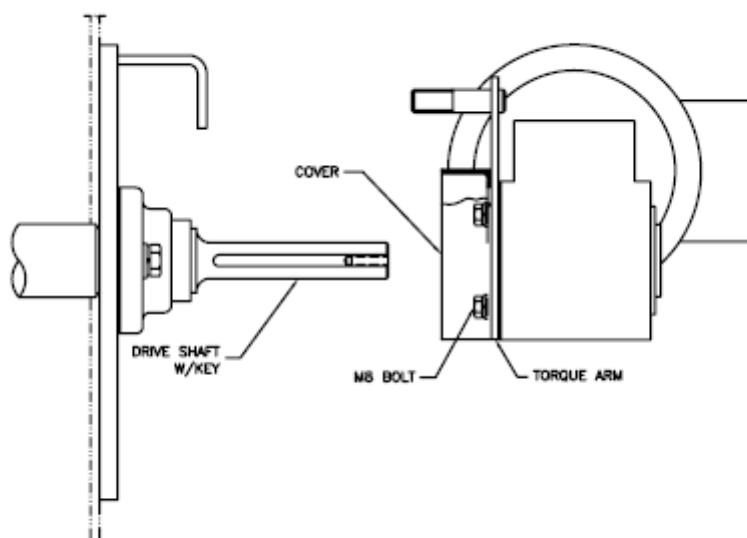
Use the following procedure to remove the brush drive:

1. Remove the safety cover and the cover retaining bolts and retaining rings from the exterior of the brush drive gear box. See figure 4-14.
2. Remove the two large nuts from the torque arm bolt.



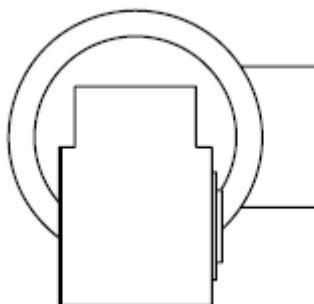
**Figure 4-14. Removing the Brush Drive from the Aqua-Screen®**

3. Slide the geared motor toward you along the brush drive shaft to remove it.
4. Remove the key from the drive shaft and discard. See figure 4-15.
5. Remove the safety cover and the cover retaining bolts from the gearbox. See figure 4-15.



**Figure 4-15. Disconnecting the Torque Arm from the Brush Drive**

6. Remove the torque arm. Now the brush drive is free and can be set aside. See figure 4-16.



**Figure 4-16. The Fully Disconnected Brush Drive**



Use the following procedure to replace the brush drive:

1. Clean and degrease the mating surfaces of the gearbox output bore and the drive shaft.
2. Place a new key on the drive shaft.
3. Check for gouged spots on the mounting area and smooth the rough spots with sand paper if needed.
4. Mount the new gear motor set on the drive shaft.
5. Check to be sure that there is a 1/8-inch gap on both sides of the torque arm bracket.
6. Attach torque arm and gearbox safety cover.
7. Screw down the two large nuts on the torque arm bolt. Use care with the torque arm to avoid any misalignment.
8. Replace the torque arm bolts and the retaining arm on the gear box.



### 4.3.8 Maintenance Summary Form for the Aqua-Screen®

<b>PROJECT NO.</b>	807163				
<b>1. EQUIPMENT ITEM</b>	ASCI 1500 x 4700 x 6				
<b>2. MANUFACTURER</b>	Andritz Separation Inc. 1010 Commercial Blvd S Arlington, TX 76001 (817) 433-5161 or (817) 465-5611				
<b>3. EQUIPMENT SERIAL NO.</b>	ASC-09-160; -161				
<b>4. WEIGHT OF COMPONENTS</b>	DRY WEIGHT OF ASC = 8,520 lb with drive				
<b>5. MOTOR NAMEPLATE DATA</b> <b>Main Gear Reducer</b> <b>Secondary Gear Reducer</b>	Baldor VM7037, 2 hp, 460 VAC, 3-ph, 60 Hz, 1725 rpm, NEMA N56C Bonfiglioli, W110 UFC2 40 N56C, AA, Ratio 30:1 Bonfiglioli, 307L, 2, 24.5 FP EOVE GOA, Ratio 24:5:1				
<b>6. BRUSH MOTOR NAMEPLATE</b> <b>Gear Reducer</b>	Baldor VM7037, 2 hp, 460 VAC, 3-ph, 60 Hz, 1725 rpm, NEMA N56C Bonfiglioli, W63, U19, N56C, Ratio 19:1				
<b>7. MAINTENANCE REQUIREMENTS</b>					
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, oil change	Initial oil change after 3000 hours. Check every 3 months. Change oil every 4000 hours			B	
<b>8. LUBRICANT LIST</b>					
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

## 4.4 MAINTENANCE OF THE COMPACTOR

### 4.4.1 Housekeeping

The collection tray under the pressing section should be cleaned every 1 to 2 months, or more frequently if required, to remove accumulated settled material.

The perforated sheet in the drainer section should be checked for blinding or buildup, such as biological growth, which may affect the hydraulic capacity of the unit. Regular high-pressure cleaning using a hand-held Hydro Blitz or equal (up to 1,000 psi) is recommended. Cleaning solutions must be free of chloride ions. If any doubt, call **ANDRITZ**.

### 4.4.2 Recommended Maintenance Schedule

Before inspection, disconnect and lockout/tagout power to the motor. Remove the covers and visually inspect for loose mounting bolts, damage, and wear.

- Grease main bearing every 100 hours.
- Check shower nozzles every 3 months.
- Inspect drive assembly every 1,500 hours.
- Check packing gland every 100 hours.

Make any necessary adjustments.

The gearbox is to be maintained in accordance with the enclosed supplier manual. See chapter 7.

### 4.4.3 Routine Maintenance Procedures for the Compactor

#### Brush Replacement



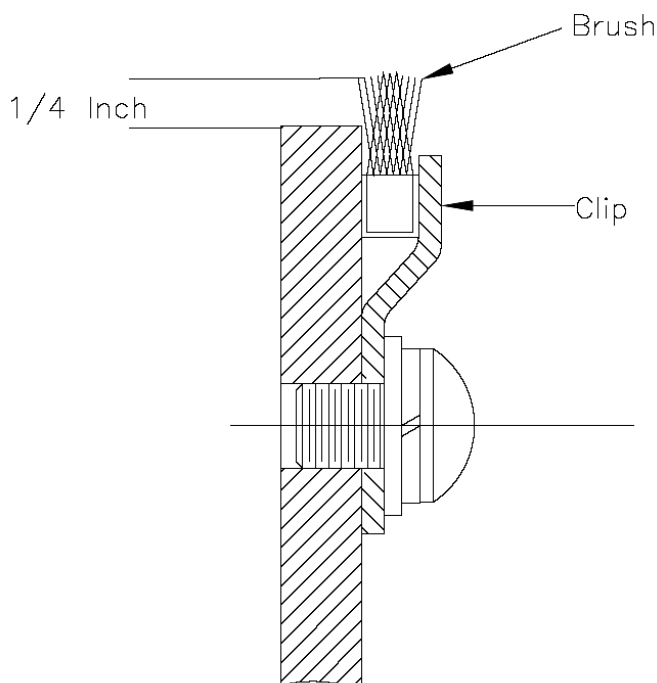
**CAUTION:** Switch off and lock out/tag out the electrical switches of the motor.

Remove compactor from service and use the following procedure to replace the brush.

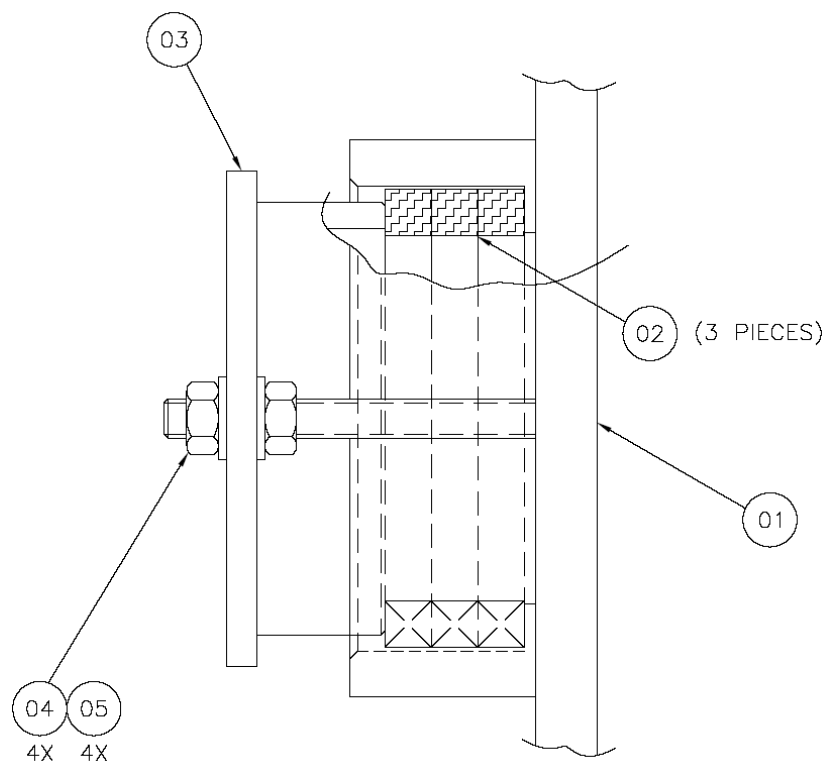
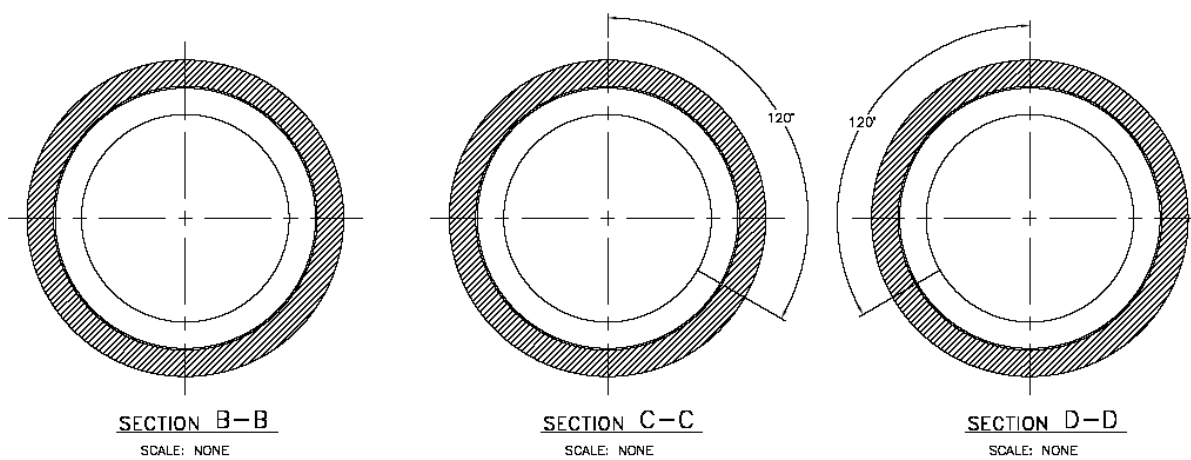
- Remove fan shroud on motor to expose the cooling fan.
- Starting at the bottom, loosen clips and pull brush segments out.

- Replace with new brush segment. Each new segment should be the same length as the segment removed. Brush should be positioned  $\frac{1}{4}$ " above flight. See figure 4-17.
- Tighten clips on this segment.

Continue to work up the screw flight until all segments have been replaced. Rotating the fan on the motor will expose additional flighting or brush removal.



**Figure 4-17. Brush Replacement**

**Figure 4-18. Seal Packing Replacement****Figure 4-19. Alternating Seal Joints**

## Seal Packing Replacement

Remove the compactor from service and use the following procedure to replace the seal packing:



**CAUTION: Switch off and lock out/tag out the electrical switches of the motor.**

- Remove four mounting bolts that hold packing gland follower in place as shown in figure 4-18.
- Remove and discard old packing material. Replace with recommended material. Alternate joints as shown in figure 4-19.
- Install packing gland follower. Do not to overtighten as this could cause the unit to bind and stall.

## Shower Nozzle Replacement

Shut off water supply to the compactor and use the following procedure to replace the nozzles:



**CAUTION: Switch off and lock out/tag out the electrical switches of the motor.**

- Disconnect header at union and remove the header mounting bolts.
- Remove header from compactor and replace nozzles as required.
- Replace gasket and apply a bead of silicone to both sides of gasket.
- Secure header in place with mounting bolts.
- Reconnect union.

**4.4.4 Maintenance Summary Form for the Compactor**

<b>PROJECT NO.</b>	807163				
<b>1. EQUIPMENT ITEM</b>	RPS-280A				
<b>2. MANUFACTURER</b>	Andritz Separation Inc. 1010 Commercial Blvd S Arlington, TX 76001 (817) 433-5161 or (817) 465-5611				
<b>3. EQUIPMENT SERIAL NO.</b>	RPSA-09-070				
<b>4. WEIGHT OF COMPONENTS</b>	DRY WEIGHT OF RPS = 3,010 lb				
<b>5. MOTOR NAMEPLATE DATA</b>	Baldor VM7044: 5 hp, 230/460 VAC, 3-ph, 60 Hz, 1725 rpm, NEMA N56C				
<b>6. REDUCER NAMEPLATE DATA</b>	NORD Helical-Bevel SK9032.1AZB-N180TC, Ratio 120.03:1				
<b>7. MAINTENANCE REQUIREMENTS</b>					
Maintenance Item	Frequency			Lubricant	
Visually inspect bearings	Weekly				
Grease bearings	100 hours			A	
Check main drive reducer lubricant level	100 hours				
Change main drive reducer oil	10,000 hours (2 years)			B	
Repack main drive motor bearings	20,000 hours (4 years)			C	
Check shower nozzles	3 months				
Inspect brushes	Monthly				
Inspect trough liner	Quarterly				
Inspect/clean perforated trough screen	Quarterly				
Inspect shaft seal (packing gland)	Weekly				
Inspect compactor screen and for blockage	Weekly				
Inspect drain hose for blockage	Weekly				
<b>8. LUBRICANT LIST</b>					
Ref Symbol	Mobil	Shell	Chevron/Texaco	Union 76	Equal
A — Grease	MOBLITH SHC 460				None
B — Oil	MOBILGEAR SHC 630	Omala Oil 220	Meropa 200		None
C — Grease	Mobilux EP2		Multifak EP2		



## **CHAPTER 5**

# **SPARE PARTS**

This chapter contains a separate parts 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 sparts parts. Spare parts are available from ***ANDRITZ***.



## **CHAPTER 6**

# **DRAWINGS AND DATA**

### **6.1 PROJECT MECHANICAL DRAWINGS**

The following mechanical drawings are included in this manual:

- |           |   |
|-----------|---|
| M807163-1 | General Arrangement, ASC 1500x4700x6 with Compactor |
| M807163-2 | General Arrangement, Aqua-Screen                    |
| M807163-3 | General Arrangement, Compactor                      |
| M807163-4 | Lower Transition Assembly                           |
| M807163-5 | Upper Transition Assembly                           |

## **6-2 PROJECT ELECTRICAL DRAWINGS**

The following electrical drawings are included in this manual:

<b>E807163-1</b>	Control Panel Layout
<b>E807163-2</b>	Electrical Schematic
<b>E807163-3</b>	Electrical Schematic
<b>E807163-4</b>	Electrical Schematic
<b>E807163-5</b>	Electrical Schematic
<b>E807163-6</b>	Electrical Schematic
<b>E807163-7</b>	Point to Point



## **6.3 ELECTRICAL CUTSHEETS**

## **CHAPTER 7**

# **MOTOR DRIVE DATA**

The following data is included in this section:

- Baldor motor installation and operating manual
- Bonfiglioli Riduttori User's Manuals
- Bonfiglioli Riduttori Spare Parts
- Nord Installation & Operating Instructions



## Final Inspection Report

### Aqua-Screen™

**Project Name:** \_\_\_\_\_

**Project Number:** \_\_\_\_\_

**Project Manager:** \_\_\_\_\_

**Machine Size & Hand:** \_\_\_\_\_

**Serial Number:** \_\_\_\_\_

**Date Shipped:** \_\_\_\_\_

**Inspector:** \_\_\_\_\_

**ANDRITZ SEPARATION INC.**  
1010 Commercial Blvd. S.  
Arlington, Texas 76001  
Tel. (817) 465-5611  
Fax (817) 468-3961  
environ.us@andritz.com



I. Verify all assemblies for compliance to Engineering specifications. Transfer all applicable in process inspection stamp(s) for the following assemblies, functions and observations.

A. Frame

1. Materials of construction
2. External width on topside
3. External width on backside
4. Squareness (diagonal)
5. Straightness

Top: _____	Middle: _____	Bottom: _____
Top: _____	Middle: _____	Bottom: _____
_____		
_____		

B. Shaft Assemblies

1. Aligned and complete
2. Bearing assy. Lubricated

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Grease type: _____

C. Chain Tension Assembly

1. Aligned and Complete
2. Number rows of chain

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

D. Shower Assemblies

1. Assemblies aligned & complete

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

E. Brush Assemblies

1. Aligned and complete

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

F. Screen Panel Assembly

1. Part No. of panels used
2. Screen panel perforation size
3. Chain part no.
4. Total number of panels
5. Side seal plate interference
6. Loctite grade
7. Bolts torque properly
8. Clearance between panels

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

G. Lubrication Assembly

1. Assembly complete

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

H. Machine Electrical

1. E-stops installed
2. Terminal box (if required)
3. Conduit and wiring (if required)

Yes	No	N/A	Comments
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



## I. Drive Assembly

Yes No N/A Comments

1. Sprockets aligned

--	--	--	--

## J. Guide Rail Assemblies

Yes No N/A Comments

1. Aligned with sprockets

--	--	--	--

2. Chain center on rails

--	--	--	--

## K. Gearbox/Motor Information

Yes No N/A Comments

1. Main Drive

--	--	--	--

- A. Part No:

--	--	--	--

- B. Ratio:

--	--	--	--

- C. Service factor:

--	--	--	--

- D. S/N:

--	--	--	--

- E. Motor HP:

--	--	--	--

- F. Motor Part No.:

--	--	--	--

- G. Explosion Proof:

--	--	--	--

- H. Electrical:

--	--	--	--

2. Brush Drive

--	--	--	--

- A. Part No:

--	--	--	--

- B. Ratio:

--	--	--	--

- C. Service factor:

--	--	--	--

- D. S/N:

--	--	--	--

- E. Motor HP:

--	--	--	--

- F. Motor Part No.:

--	--	--	--

- G. Explosion Proof:

--	--	--	--

- H. Electrical:

--	--	--	--

## L. Test Run

Date:

Yes No N/A Comments

1. Screen Speed

--	--	--	--

2. Motor Loads

--	--	--	--

- A. Main drive @ 60 Hz

--	--	--	--

- B. Brush drive @ 60 Hz

--	--	--	--

3. Tracking

--	--	--	--

4. Binding or interference

--	--	--	--

5. Drives operate correctly

--	--	--	--

6. Vibration or noise

--	--	--	--

7. Angle at test run

--	--	--	--

8. Test run elapsed time

--	--	--	--

9. Chain tension measurement

--	--	--	--

## ANDRITZ SEPARATION INC.

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Arlington, Texas 76001

Tel. (817) 465-5611

Fax (817) 468-3961

environ.us@andritz.com

1. Any noted loose fasteners
2. Covers fitted and sealed
3. Safety guards installed
4. Stainless steel clean of debris, rust and over spray
5. Legend plates and/or equipment tags installed

[illegible]

## This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

☐ Approved      ☐ Incomplete

Date \_\_\_\_\_

## Quality Control Manager

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## ENVIRONMENT AND PROCESS TECHNOLOGIES

## START-UP PROCEDURE AQUA-SCREEN™

### I. Mechanical Inspection – Upon arrival of the Andritz Technician (Supervisor on site) check the installation to ensure that the equipment is properly set in place.

Inspection	Check
Visually check for any damages from shipping and handling.	
Unit is mounted securely at channel surface to the operating floor with adequate fasteners, grouted and levelled to 1/16" side to side.	
Unit is in contact with the bottom of channel, floor grouted to 1/16" side to side.	
Drive are mounted and fastened correctly. Check for oil leaks from drive assemblies.	
Confirm that gearboxes have vent plugs correctly installed.	
All wash water supply lines are properly connected.	
All wiring is secured properly in conduit; no loose wires.	
Set shock relay parameters for overload protection.	
Bump the main drive motor to check drive rotation direction.	
Bump the brush drive motor to check drive rotation direction.	
The control panel is securely mounted.	
Check and adjust drive chain tension.	
Check brush adjustment and shower alignment.	
Check and tighten all bolts/nuts.	

### II. Control Checks – Confirm that the following signals are communicated properly to and from the control panel.

- A. Analog Inputs
  - ◆ Level Transducer (Channel Level)
- B. Discrete Inputs
  - ◆ Machine mounted e-stop left
  - ◆ Machine mounted e-stop right
- C. Analog Outputs – N/A
- D. Discrete Outputs
  - ◆ System Control Power
  - ◆ Aqua-Screen Running
  - ◆ Common Alarm
  - ◆ High Level Alarm
  - ◆ High-High Level Alarm

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Fax (817) 472-8589




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ENVIRONMENT AND PROCESS TECHNOLOGIES

### III. Calibration – Set the necessary parameters on the level controller and record the settings in the chart

Parameter	Description	Directions	Record Field Setting
P100	Mode of Measurement	Enter '2'	
P101	Transducer Model	Enter '1'	
P102	Material	Enter '1'	
P104	Units	Enter '5'	
P105	Empty Distance	Measure and enter the distance (inches) from the transducer face to bottom of channel	
P106	Span	Measure and enter the distance (inches) from the bottom of the channel to the max water level	
P210	Alarm Function	Enter '1'	
P212	Alarm Type	Enter '3'	
P213	Relay 1 ON Set point	Enter the water depth at which the screen should turn ON	
P214	Relay 1 Alarm Set point	Enter the water depth at which the channel high level alarm is to turn ON	
P216	Relay 1 Allocation	Enter '5'	

### IV. Component Performance Testing – Channel may be dry for this step

- A. Test each component in HAND Mode
  - ◆ Brush Drive
  - ◆ Aqua-Screen Shower
  - ◆ Aqua-Screen Drive
- B. Test the system in AUTO Mode
  - ◆ Turn all H-O-A switches to the AUTO position
  - ◆ Simulate water level in the channel by placing a flat object under the ultrasonic transducer.
  - ◆ Confirm that all components start in the correct sequence.
  - ◆ Confirm that all components shut down in the correct sequence.

#### ANDRITZ SEPARATION INC.

1010 Commercial Blvd. S.  
Arlington, Texas 76001  
Tel. (817) 465-5611  
Fax (817) 472-8589



## START-UP CHECKLIST

Customer: Queensland Urban Utilities (QUU)

Project No.: C-12-816645-539

Reference: C1112-022

Start-up Engineer:

Model No:

Equip. No.

ITEM	INSPECTION	OK	DATE	REMARKS
1	Visually check for any damages from shipping and handling			
2	Unit is mounted securely at channel surface to the operating floor with adequate fasteners, grouted to 1/16" side to side.			
3	Unit is in contact with the bottom of channel, floor grouted to 1/16 side to side.			
4	Drive are mounted and fastened correctly. Check for oil leaks from drive assemblies			
5	Confirm that EVERY gearbox has a vent plug correctly installed			
6	All wash water supply lines are properly connected.			
7	All wiring is secured properly in conduit; no loose wires.			
8	Set shock relay or VFD parameters for overload protection.			
9	Bump the main drive motor to check drive rotation direction.			
10	The control panels are securely mounted and all components are functional.			
11	Calibrate level sensor to the requirements if the device is supplied			
12	In auto mode, all components start in the correct order.			
13	Check for any water leaking around covers, inspection hatches, and drive assemblies.			
14	The brush and shower assemblies are cleaning screen elements properly.			
15	Check and tighten all bolts/nuts			
16	Review O&M manuals with operators			
17	Confirm O&M manual with tagging information (model and serial numbers)			
18	RUN UNIT WITH INFLUENT			
Description of deviations, remarks, annexes:				
Customer:		Andritz:		Consultant or Main Contractor:

<u>Approval Signatures:</u>	<u>Dates:</u>
-----------------------------	---------------



**SEPARATION TECHNOLOGIES**

Project Title:

**Luggage Point Inlet Aqua Screens**

Project City and State:

**Brisbane, Australia**

**ANDRITZ Job No. 816645**

**CERTIFICATION OF INSTALLATION**

This form serves as acknowledgment that the equipment supplied by Andritz Separation Inc. (c/o Andritz Pty Ltd) to the above-mentioned Owner according to the referenced Purchase Order has been installed to the satisfaction of both parties. The signatures below indicate that both parties agree the equipment is capable of being placed into permanent operation.

\_\_\_\_\_  
Service Representative  
(Andritz Separation Inc.)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Authorized Representative  
(Owner)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

Comments:

\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_

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Fax: 817/472-8589



**SEPARATION TECHNOLOGIES**

Project Title:

**Luggage Point Inlet Aqua Screens**

Project City and State:

**Brisbane, Australia**

**ANDRITZ Job No. 816645**

**CERTIFICATION OF START-UP**

This form serves as acknowledgment that the equipment supplied by Andritz Separation Inc. (c/o Andritz Pty Ltd) to the above-mentioned Owner according to the referenced Purchase Order has been shown capable of operating as specified. The signatures below indicate that both parties agree the equipment satisfies all mechanical guarantees made by Andritz Separation Inc. in the contract documents. Full responsibility for the operation of the equipment is transferred to the Owner on the date noted beside the signature of the Owner's representative.

\_\_\_\_\_  
Service Representative  
(Andritz Separation Inc.)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Authorized Representative  
(Owner)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

Comments:

\_\_\_\_\_  
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SEPARATION TECHNOLOGIES

Project Title:

**Luggage Point Inlet Aqua Screens**

Project City and State:

**Brisbane, Australia**

**ANDRITZ Job No. 816645**

**CERTIFICATION OF TRAINING**

This form serves as acknowledgment that Andritz Separation Inc. (c/o Andritz Pty Ltd) has provided training on the operation and maintenance of the equipment supplied according to the referenced Purchase Order.

Service Representative  
(Andritz Separation Inc.)

Date

Authorized Representative  
(Owner)

Date

Print Name

Print Name

Print Trainees Names/Signature/Date:



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SEPARATION TECHNOLOGIES

Project Title:

## Luggage Point Inlet Aqua Screens

Project City and State:

**Brisbane, Australia**

**ANDRITZ Job No. 816645**

### **CERTIFICATION OF PERFORMANCE / FINAL ACCEPTANCE**

This form serves as acknowledgment that the equipment supplied by Andritz Separation Inc. (c/o Andritz Pty Ltd) to the above-mentioned Owner according to the referenced Purchase Order has met all obligations defined in the contract documents.

\_\_\_\_\_  
Service Representative      Date  
(Andritz Separation Inc.)

\_\_\_\_\_  
Authorized Representative      Date  
(Owner)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

**ANDRITZ Separation Inc.**  
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Fax: 817/472-8589



## Luggage Point

### EQUIPMENT DATA SHEET

#### ASCI 1800x4300x6

#### CHARACTERISTICS

Width	69.690 inches
H1 (Channel Bottom to Discharge)	169.290 inches
Approximate Weight with Drive	6,750 lbs
Angle of Installation	85 degrees

#### MATERIALS

Frame	316 SST	1/4" thick
Perforated Screen	316 SST	11-gauge
Drive Sprocket	Epoxy-Coated AR400	3/4" thick
Drive Shaft	8620 Carbon Steel	4" diameter
Upper Guide Rail	304 SST	3/4" x 1/2" thick
Lower Guide Rail	Epoxy-Coated AR400	3/4" thick
Covers	304 SST	14-gauge
Transition Chute	Nitrile Neoprene	1/4" thick
Chain Links	316 SST	See Chain Data Sheet
Chain Rollers, Bushings, Pins	403 SST	See Chain Data Sheet
Spray Bar	316 SST	1-1/2" NPT male
Cleaning Brush	Polyester	
Side Seal	Nitrile (Buna N)	1/8" thick
Fasteners	316 SST	
Anchor Bolts	By Others	





## Luggage Point

### PROCESS CONDITIONS

<b>Application:</b>		Wastewater
<b>Screen Opening Size:</b>		6 mm
<b>Total Flow</b>	<b>Peak:</b>	1664 liters/sec
	<b>Average:</b>	1165 liters/sec
<b>Flow/Channel</b>	<b>Peak:</b>	1664 liters/sec
	<b>Average:</b>	1165 liters/sec
<b>Channel Dims.</b>	<b>Width:</b>	1900-1983 mm
	<b>Depth:</b>	2200 mm
<b>Velocity Upstream</b>	<b>Min:</b>	0.35 m/sec
	<b>Max:</b>	0.60 m/sec
<b>Downstream Water Level</b>	<b>Peak:</b>	1447 mm
	<b>Average:</b>	1352 mm
<b>Headloss</b>	<b>Peak:</b>	625 mm
	<b>Average:</b>	424 mm
<b>Composition of Solids:</b>		Domestic Sewage
<b>Size of Solids</b>	<b>Max:</b>	100 mm
	<b>Min:</b>	6 mm
<b>Total Suspended Solids:</b>		<250 mg/L
<b>Fats, Oils, Greases (FOG):</b>		<150 mg/L
<b>Number of Screens:</b>		8

In the case of pump fed influent, pumps must be ramped up with VFD's to keep flow from "slamming" the screens. Channel velocity upstream must never fall below 1.0 ft/sec or exceed 3.0 ft/sec.



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## PAINT SPECIFICATION

### AQUA-SCREEN

#### **Surface Preparation for Stainless Steel**

Sandblasting: Commercial Bead Blast: (SSPC-SPC5)  
For burr removal and color uniformity

#### **Standard Painting for Gearboxes, Motors, etc.**

##### Surface Preparation

Solvent Cleaning: (SSPC-SP1)

All parts and components to be painted shall be cleaned of all grease and oil using a mild solvent.

Allow to air dry completely before proceeding to the next step.

##### Prime Coat:

Immediately apply one wet coat (6-7 mils) of Porter International Interseal Hydrocarbon Epoxy series 670 HS primer. Allow to dry 4 hours @ 90°F before applying mixing, pot life, type of

##### Finish Coat:

After prime coat has cured apply two wet coats (4 mils) of Porter International Interthane 990 H.S. Polyurethane recoatable finish. Allow to dry 4 hours @ 90°F before recoat. Allow to dry 3 hours @ 90°F before handling.

See the attached manufacturers product data sheets for more information regarding mixing, pot life, type of equipment, etc.

The total dry film paint thickness shall be 4-7 mils.

##### Final Color:

RAL 5015 (Sky Blue)



## Luggage Point

### AQUA-SCREEN CHAIN MATERIALS DATA SHEET

#### 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	75mm Tolerance -0.4 to 0mm	Surface Finish 200RMS
Bore Diameter	50.7mm Tolerance 0 to +0.25mm	Surface Finish 200RMS

#### 2. Bushing

Material	403 Stainless Steel	ASTM Standard number A167-89
Heat Treatment	Through Hardened	
Hardness	RC38 or better	
Outside Diameter	50.6mm Tolerance 0 to -0.1mm	Surface Finish 200RMS
Inside Diameter	43.4mm Tolerance +0.2 to 0mm	Surface Finish 200RMS

#### 3. Pin

Material	403 Stainless Steel	ASTM Standard number A167-89
Heat Treatment	Through Hardened	
Hardness	RC38 or better	
Outside Diameter	43mm Tolerance 0 to -0.1mm	Surface Finish 200RMS
Inside Diameter	35.8mm Tolerance +0.2 to 0mm	Surface Finish 200RMS

#### 4. Chain Link

Material	316 Stainless Steel	ASTM Standard number A167-84
Heat Treatment	Non heat treated	
Length (CL-to-CL)	7.874 inches	
Width	2.520 inches	
Thickness	0.156 inches	
Min. Breaking Load	13,000 lbs	



## 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®:

- Confirm that guards, access doors, and covers are securely fastened before operating the equipment.
- 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.
- 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.
- 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:

- The channel is clear of debris.
- All bearings have been greased.
- All protection devices — such as emergency stop push buttons — are operational.

- 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.
- Abnormal noises or knocking during operation; if any abnormal noises are detected, stop the Aqua-Screen® immediately and contact **ANDRITZ**.
- Start the waste conveying system downstream from the Aqua-Screen®.
- 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).

As soon as the hydraulic conditions are normal, perform the following procedure:

- 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.



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OPERATION & MAINTENANCE MANUAL

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.

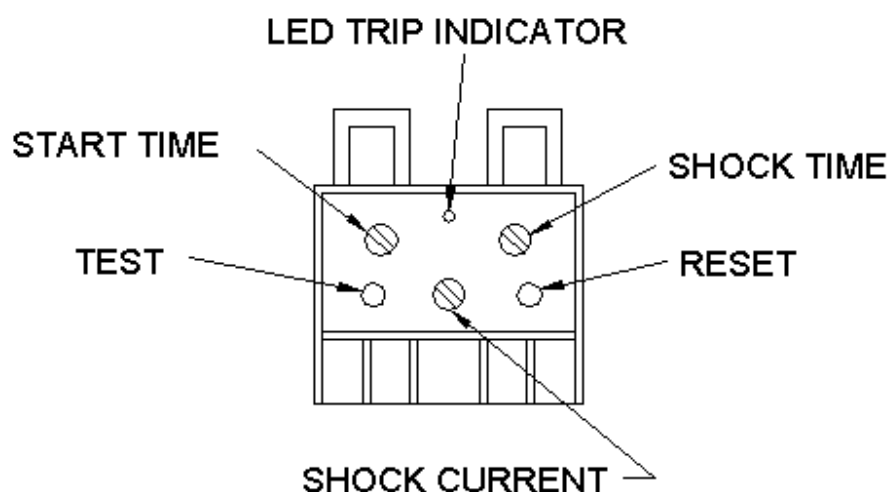


Figure 3-1. Parts of the Tsubaki Shock Relay



**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. Turn the main disconnect switch to the ON position. This provides 460/480 VAC 3-phase power to the motor circuits and the control power transformer.
2. Place the system control power selector switch to the ON position. Correct placement is indicated by a white illuminated system control power ON light. The master control relay should now have power. The emergency stop pushbuttons on the panel and the unit de-energize the master control relay and cause an immediate shutdown of the showers and the drives.
3. Each component on the Aqua-Screen® has two modes of operation, HAND and AUTO. Each component in HAND mode runs continuously.



**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.**

4. In AUTO mode, the Aqua-Screen® runs upon receiving a high or high-high command signal from the ultrasonic level controller or the screen minimum cycle timer. The Aqua-Screen® continues to run for an adjustable time after the run request or alarm has been cleared. The compactor starts with the screen and continues to run for an adjustable time period after the screen stops.

### 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. When the compactor is requested to run with the compactor upper and/or lower shower selector placed in the AUTO position, the shower is delayed for an adjustable time period, then the shower runs for an adjustable time period.

### Alarm Control

The following conditions will shut down the complete system in MANUAL or AUTO mode, sound the horn, and illuminate the respective amber indicator light. 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:

- Aqua-Screen® brush drive motor overload
- Aqua-Screen® drive motor overload

- Aqua-Screen® drive overtorque
- Compactor drive motor overload
- Channel level high-high (alarm only, no shutdown)

### **3.2.3 Troubleshooting for the Aqua-Screen®**

#### **Manual Mode:**

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

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

- Overload is reset
- Motor fuses
- Operation of any relevant limit switches
- 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 MCB.
- Emergency Stop Operated:
  - Check that panel Emergency Stop button has been reset (twist to reset).
  - Check that remote Emergency Stop buttons have been reset (twist to reset).
- Fault in System:
  - Switch off panel and test to ascertain 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.



## OPERATION &amp; MAINTENANCE MANUAL

- Check the local isolator (where fitted) is turned on.
- General:
  - 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**

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

**Too Much Liquid in Discharge**

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



## OPERATION &amp; MAINTENANCE MANUAL

**3.2.4 Aqua-Screen® Troubleshooting Checklist**

<b>Symptom</b>	<b>Inspection</b>	<b>Action</b>
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



## OPERATION &amp; MAINTENANCE MANUAL

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.	



### **3.3 STARTUP AND OPERATION OF THE COMPACTOR**

#### **3.3.1 Compactor Startup Checklist**

- Check that main bearing is charged with grease. See the Maintenance Summary form located in Chapter 4 for proper lubricant.
- Check oil level in drive gearbox. Depending on the final angle at which the unit is installed, oil may have to be added or drained. See the Maintenance Summary Form for proper lubricant.
- Tighten all nuts and bolts.
- Secure all connections.
- Rotate the screw through 280 degrees by jogging with the electric motor to ensure that there is no fouling and to verify correct forward rotation.

#### **3.3.2 Compactor Startup Procedures**

- Dry run screw for 10 minutes and check all running gear for satisfactory operation.
- Turn on wash water to Compactor. Verify that all nozzles are functioning correctly.
- Start the Compactor before feeding screenings into the drainage section.

#### **3.3.3 Compactor Sequence of Operation**

##### **Process Overview**

When the screen begins rotation, the Compactor showers and drive are energized. The Compactor will run a washing and compaction sequence under normal flow conditions. When placed in AUTO position, the Compactor showers will cycle off and on according to adjustable timing relay setpoints. Typical timing is 20 seconds on and 60 seconds off. As the Aqua-Screen® shuts down, the Compactor will stay in operation for a preset time.

##### **Recommended Initial Sequence**

- As screen starts, begin running Compactor and Compactor showers.
- Under normal operation, the showers will cycle on and off.
- The Compactor will continue to run for 5 minutes after the Aqua-Screen® has stopped.

#### **3.3.4 In-Service Checks for the Compactor**

Check for any obvious leaks around Compactor. Check packing gland at main bearing for leaks. Tighten if required. Listen for any unusual vibrations or noises. Check gearbox and motor temperature.



### 3.3.5 Fine Tuning the Compactor

Check the consistency of the pressings as they exit the machine. If they are too dry or stalling is occurring in the machine then adjust the shower water so as to increase the shower flow. Wetting of the solids in the compaction tube may be required to prevent stalling.

If the pressings are too wet it may be necessary to adjust the shower water so as to decrease the shower flow.

### 3.3.6 Compactor Shutdown Procedures

The in-feed should be stopped and the screw should be kept running until all of the solids have been discharged from the Compactor. A solids plug will remain in the Compactor barrel. If the unit is down for an extended period of time, this plug may need to be watered down as it will become hard and difficult to discharge. Operate the showers for a complete washing cycle to prevent drying up of solids on the outside of the perforated drainage section. The manual shower system on the Compactor barrel should be turned on to clean the perforated tube. This will also turn on the shower located on the collection pan below the Compactor tube to flush material away.

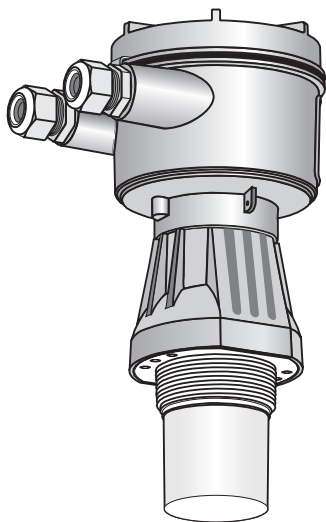
### 3.3.7 Compactor Troubleshooting Checklist

SYMPTOM	POSSIBLE CAUSE	CURE
Free liquid is washing out end of Compactor	Excessive shower	Check shower frequency and duration. Check nozzle orientation for correct spray pattern. Check to ensure that the manual shower in Compactor section is off.
Screw not rotating	Motor runs	Check whether there is output from the gearbox. If there is, then check the shear bolts between the screw input shaft and the tubular screw flight center.
	Motor not running	Have fuses and starter checked by a qualified electrician. If the supply is found to be correct, have the motor windings checked out.
Screw stalling	Excessive pressing action	Remove solid compactor tube to decrease press length.

## **Section 12-15: Spirac Bin and Retractable Chute IOM + Miscellaneous Info**



## Instruction Manual • January 2003



# pointek

## ULS 200

**MILLTRONICS**

## Safety Guidelines

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

## Qualified Personnel

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

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

**Note:** Always use product in accordance with specifications.

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# Pointek ULS 200

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**Note:** Pointek ULS 200 is to be used only in the manner outlined in this instruction manual.

Pointek ULS 200 is an ultrasonic based process level switch providing high or low switch action on liquids or solids. The process part (sensor) is Tefzel® or Kynar Flex®, allowing it to be used in a wide variety of industries.

Pointek ULS 200 contains an ultrasonic transducer and temperature sensing element. The transducer emits a series of ultrasonic pulses. Each pulse is reflected as an echo from the material and sensed by the transducer. Pointek ULS 200 processes the echo using Milltronic's proven Sonic Intelligence® techniques. Filtering is applied to help discriminate between the true echo from the material and the false echoes from acoustical and electrical noises and agitator blades in motion. The time for the pulse to travel to the material and back is temperature compensated and then converted into distance for display and relay actuation.

The Pointek ULS 200 is an excellent primary detection device, but should not be used as a backup device. For backup devices use a contacting technology such as the Pointek CLS 200. The optional sanitary version affords quick removal and ease of cleaning as demanded by the food, beverage, and pharmaceutical industries.

## Pointek ULS 200 Outputs

- switch outputs programmable for high-high, high, low, and low-low level actions
- fail-safe programmable

## Pointek ULS 200 Features

- 2" NPT, 2" BSP or PF2 or 4" 3A approved Tri-clamp process connection
- 2 conduit connections, 1/2 "NPT or PG 13.5
- non-corrosive enclosure and wetted parts
- 2 button programming
- level run/program LCD display

## Pointek ULS 200 Applications

- liquids, slurries, and fluid materials
- foods and pharmaceuticals
- chemicals

# Specifications

---

## ac Version

### Power

- 100 - 230 V ac,  $\pm 15\%$ , 50/60 Hz, 12 VA (5W) max.

### Fuse

- Slow-Blow, 0.25 A, 250 V ac

### Output:

- repeatability: 0.25 % of full range
- resolution: 3 mm (0.1")
- relay: 2 form C (SPDT) contacts, rated 5A at 250 V ac, non-inductive

## dc Version

### Power

- 18 to 30 V dc, 3 W

### Output:

- repeatability: 0.25 % of full range
- resolution: 3mm (0.1")
- relay: 2 form C (SPDT) contacts, rated 5 A at 48 V DC  
OR
- transistor: 2 transistor switches, rated 100 mA maximum at 48 V DC

## Environmental

- location: indoor/outdoor
- altitude: 2000m max
- ambient temperature: - 40° to 60° C (- 40° to 140° F)  
\* - 20° C (-5° F) if metal mounting
- relative humidity: suitable for outdoor (Type 6 / NEMA 6 / IP67 enclosure)
- installation category: II
- pollution degree: 4

### Process Pressure:

- vented to atmosphere

## Switching Range

- liquids: 0.25 to 5m (0.8 to 16.4 ft)
- solids: 0.25 to 3m (0.8 to 9.8 ft)

## Memory

- non-volatile EEPROM

## Programming

- 2 keys

## Temperature Compensation

- built-in to compensate over the operating range

## Display

- liquid crystal
- three 9mm (0.35") digits for reading of distance between sensor face and material, multi-segment graphic for operation status

## Electronics/Enclosure

- termination: terminal block, 2.5mm<sup>2</sup> (14 ga) solid 1.5 mm<sup>2</sup> (16 ga) stranded, maximum
- material: plastic  
**OR**  
epoxy coated aluminum with gasket
- ingress protection: Type 6 / NEMA 6 / IP67<sup>1</sup>
- conduit: aluminum, 2 connections } 1/2" NPT  
plastic, 2 connections } PG 13.5

## Sensor

- material: Tefzel<sup>2</sup> or Kynar Flex<sup>3</sup>
- mounting: threaded:
  - 2" NPT, 2" BSP or PF2
  - optional flange adapter, to 3" ANSI, DIN 65PN10, and JIS 10K3B
 sanitary:
  - 4" 3A compliant Tri-clamp fitting

## Approvals

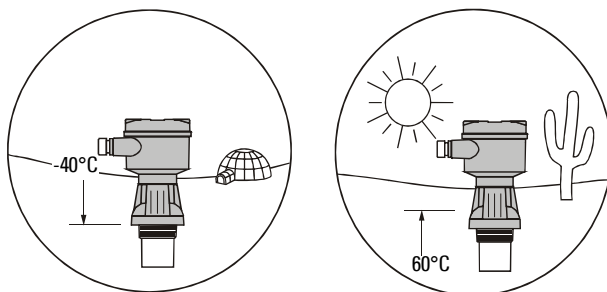
- CE (EMC performance available upon request.), CSA **NRTL/C**, FM, 3A
  - CSA/FM Class 1, Division 1, Group A, B, C, D; Class II, Group E, F, G; Class III
  - Europe: ATEX II 2G, EEx md IIC T5
- (see product nameplate for approval details)

- 
- Use only approved, suitable size hubs for watertight applications.
  - Tefzel<sup>®</sup> is a registered trademark of Dupont.
  - Kynar Flex<sup>®</sup> is a registered trademark of Elf Atochem North America.

# Installation

The Pointek ULS 200 should be mounted in an area within the temperature range specified and suitable to the housing rating and materials of construction. Make sure the cover is accessible to allow programming, wiring, and access to the display.

Keep the Pointek ULS 200 away from high voltage or current runs, contactors, and SCR control drives.

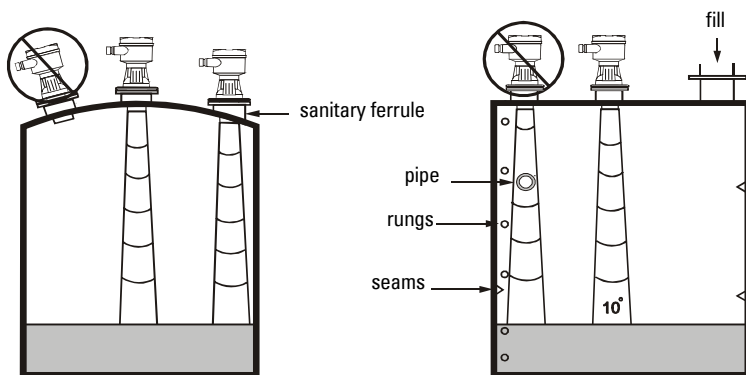


**Warning: Explosion Hazard. Substitution of components may impair suitability for Class 1, Division 2 applications.**

## Location

Locate the Pointek ULS 200 so that it has a clear sound path perpendicular to the material surface.

The Pointek ULS 200 sound path should not intersect the fill path, rough walls, seams, rungs, or any other obstruction.



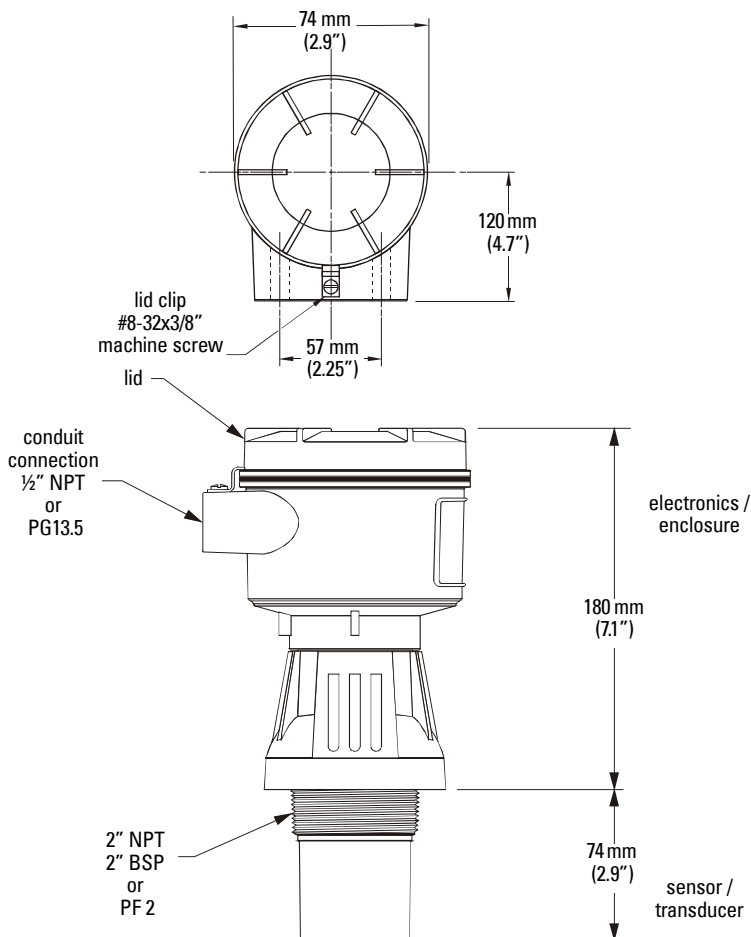
# Mounting and Dimensions

Mount the ULS 200 with sensor face at least 25cm above the highest anticipated level.

## Threaded

The Pointek ULS 200 is available in three thread types: 2" NPT, 2" BSP, or PF2.

Before mounting the Pointek ULS 200, ensure that the mating threads are of the same type, otherwise the threads can be damaged.

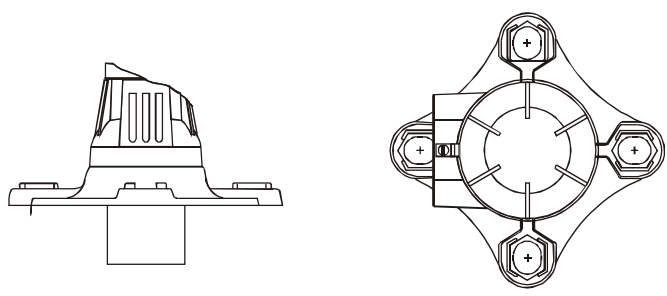


### Notes:

- Dimensions are nominal and may vary with material types.
- Non-metallic enclosure does not provide grounding between connections.
- Use grounding type bushings and jumpers.



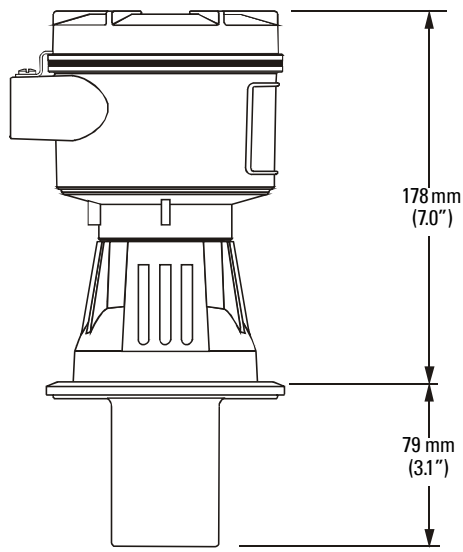
The Pointek ULS 200 can be fitted with the optional 75 mm (3") flange adapter for mating to 3" ANSI, DIN 65PN10 and JIS 10K 3B flanges.



**Note:** For CSA/FM approved Hazardous Location Models, see Siemens Milltronics drawing 0-9440026Z-DI-A.

## Sanitary

The Pointek ULS 200 also comes in a sanitary version for use in the food and pharmaceutical industries.



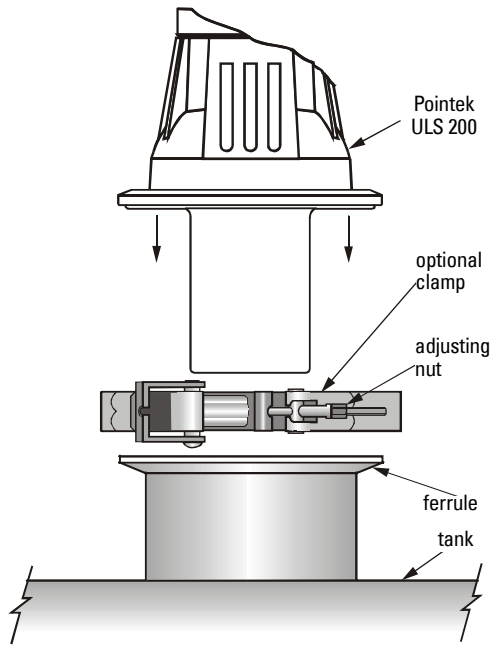
**Notes:**

- Dimensions are nominal and may vary with material types.
- Refer to threaded for other dimensions.

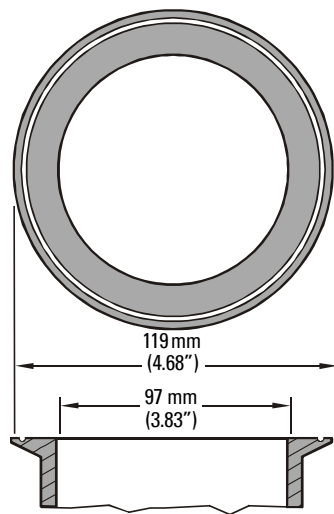
Mount the Pointek ULS 200 onto the top of the tank's sanitary ferrule.

Secure mating by surrounding the joint with the optional clamp.

Tighten the adjusting nut with your hand. Do not use a wrench.



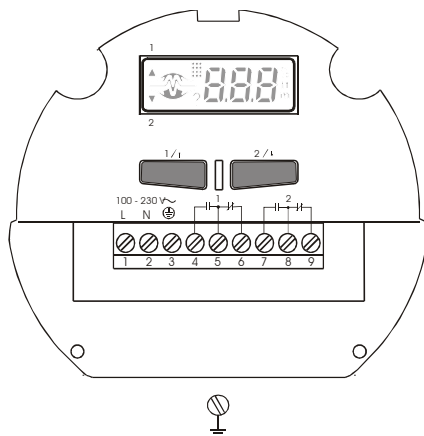
Sanitary Ferrule, 4" FDA Approved  
(U.S. Food and Drug Administration)



\*dimensions are approximate

# Interface

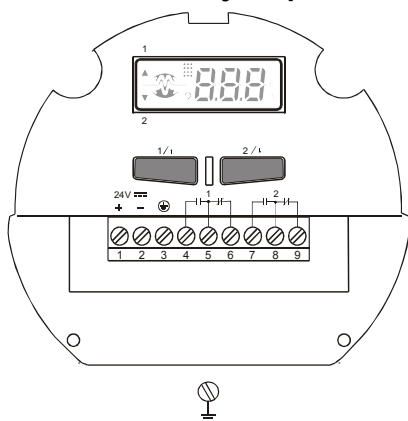
## ac Version



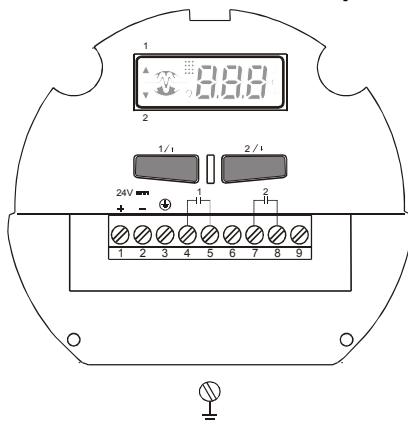
### Notes:

- A circuit breaker or switch in the building installation, marked as the disconnect switch, shall be in close proximity to the equipment and within easy reach of the operator.
- Relay contact terminals are for use with equipment having no accessible live parts and wiring having insulation suitable for at least 250 V.

## dc Version - Relay Output



## dc Version - Transistor Output



**Note:** dc terminals shall be supplied from an SELV source in accordance with IEC 1010-1 Annex H.

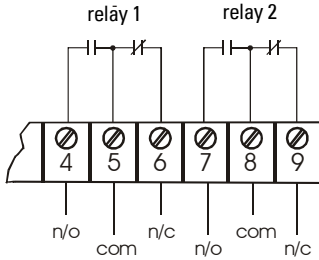
# Interconnection

## Notes:

- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.

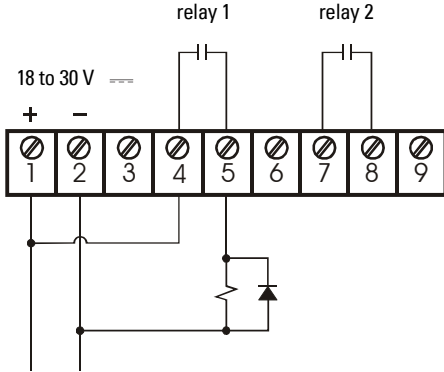
Separate cables and conduits may be required to conform to standard instrumentation wiring or electrical codes.

## Relay Output

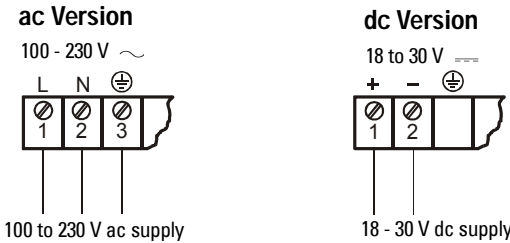


All relays are shown in their de-energized (unpowered) state.

## Optional Transistor Output – dc Version only



## Power



# Operation

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## Start Up

With the Pointek ULS 200 correctly installed (or aimed at a wall 0.25 to 5 m away), apply power and observe the Pointek ULS 200 start up sequence. The unit will cycle through the following screens:

1. Lighting of all possible LED values
2. Product revision number
3. Product model number
4. Run mode

The display and operation sequence arrives within a few seconds at the run mode, which is the measurement of the distance from the transducer face to the material level in the units indicated. Full instructions on setting up the unit are found at Applications on page 13 and Adjustments on page 19.

## Quick Start

Use this setup method if you have a basic high/low application and you are setting up the unit in a place where you can easily adjust the measured distance.

The Pointek ULS 200 relays are preset as: relay 1 = alarm 1, high alarm at 0.25 m

relay 2 = alarm 2, low alarm at 5.00 m

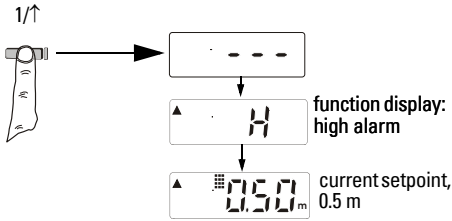
To change the setpoints by reference method, set the material or target to the distance as displayed. Press the `1 / ↑` or `2 / ↓` key. The display responds by displaying the current setpoint function and value. By pressing the alarm key a second time, the Pointek ULS 200 changes the setpoint to the value currently being measured.

After viewing or changing the setpoint, the Pointek ULS 200 reverts to the run mode.

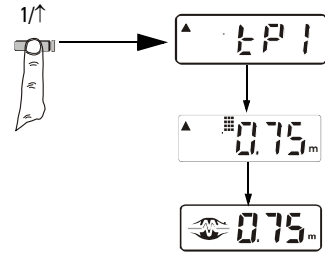
## relay 1

1. Position the unit so that it reads 0.75 m.

2.



3.



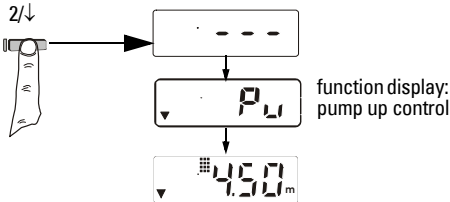
4. Once installed, the unit will register a high alarm at 0.75 m from the sensor face.

Loss of Echo  
if **LOE** retry

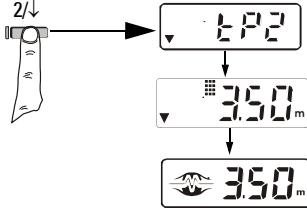
## relay 2

1. Position the unit so that it reads 3.50 m.

2.



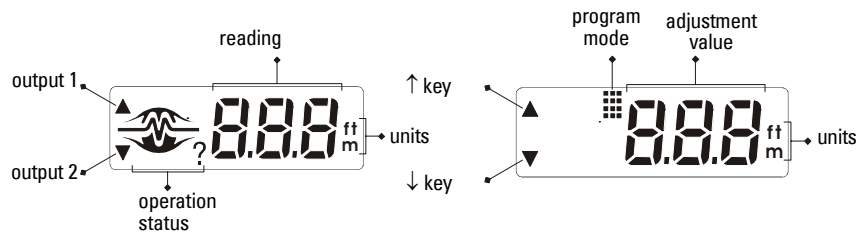
3.



4. Once installed, the unit will register a low alarm at 3.50 m from the sensor face.

Loss of Echo  
if **LOE** retry

# Display / Operation Status



## Operation Status - Run Mode



- echoes are valid and within range.



-echoes are lost due to poor conditions or out of range. This may be typical in applications where there are deep vessels and the material level is normally out of range. Refer to Troubleshooting.



-extended loss of echo period. Operation has gone into fail-safe. Refer to Troubleshooting.

# Applications

Pointek ULS 200 is designed for use as a process level switch. The local display is used only as an aid during start up. The instrumentation interface is comprised solely of the two relay outputs. Switching applications are based on the relay functions adjustment.

The outputs can be set to function in the desired mode.

Application	Function	Relay 1	Relay 2
High / Low level switch	*1	High Alarm	Low Alarm
High level switch with two height alarms	2	High Alarm	High Alarm
Low level switch with two height alarms	3	Low Alarm	Low Alarm
High level switch with loss of echo alarm	4	High Alarm	LOE Alarm
Low level switch with loss of echo alarm	5	Low Alarm	LOE Alarm
Pump down control with low level alarm	6	Pump Down	Low Alarm
Pump down control with high level alarm	7	Pump Down	High Alarm
Pump up control with low level alarm	8	Pump Up	Low Alarm
Pump up control with high level alarm	9	Pump Up	High Alarm
Pump down control with loss of echo alarm	10	Pump Down	LOE Alarm
Pump up control with loss of echo alarm	11	Pump Up	LOE Alarm
Pump up control and Pump down control	12	Pump Down	Pump Up
Dual pump down control	13	Pump Down	Pump Down
Dual pump up control	14	Pump Up	Pump Up

\* Factory setting

Alarm: the relay de-energizes to set the alarm 'ON'

Control or Pump: the relay energizes to set the device 'ON'



## High Level Alarm Switch

This application uses Pointek ULS 200 to provide an alarm output, high and/or high-high alarm, when the process material rises to a high level. The device range applies to its switching capability, and not the process range of the material.

It is therefore common to apply the switch on vessels where the material is normally below the unit's range. Under such a condition the Pointek ULS 200 loses echo, and if prolonged, defaults to fail-safe operation. As this would be a normal occurrence, it is not advisable to select the fail-safe high option.

If the high level switch is being applied to a vessel within the 3 / 5 m range, a loss of echo and ensuing fail-safe condition would not be a common occurrence. The fail-safe default would then be at the user's discretion.

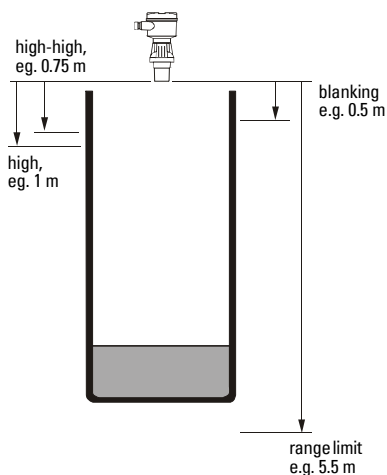
### Application Adjustments

alarm function 2 - high / high-high alarm  
4 - high / Loss of Echo (LOE)

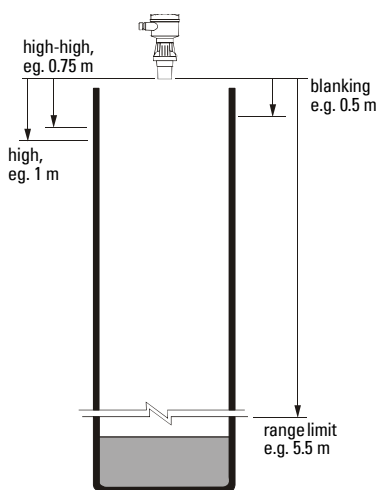
alarm setpoint set the high and / or high-high alarms to the desired values

fail-safe mode 1 - high, except if the process range is beyond the Pointek ULS 200 operating range (3 / 5 metres)  
2 - low  
3 - hold

#### fail-safe = 1, 2 or 3



#### fail-safe = 2 or 3



## High / Low Level Alarm Switch

This application uses Pointek ULS 200 to provide high and low level alarms. The device range applies to its switching capability, and not the process range of the material. As such the low and/or low-low level setpoints must be within the device's range (3 / 5 metres).

If the material can fall below the unit's range, the Pointek ULS 200 loses the echo, and if prolonged, defaults to fail-safe operation. The fail-safe default should be set to suit the application.

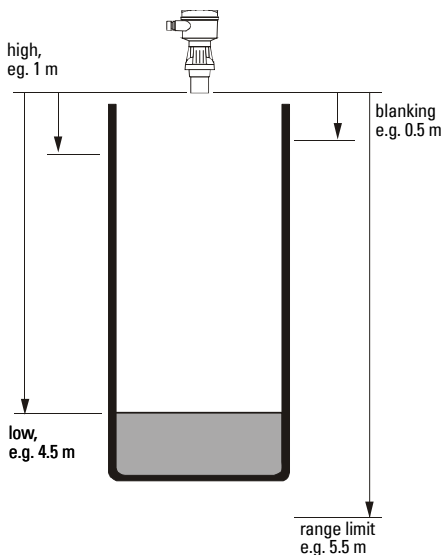
### Application Adjustments

alarm function 1 - high / low alarm

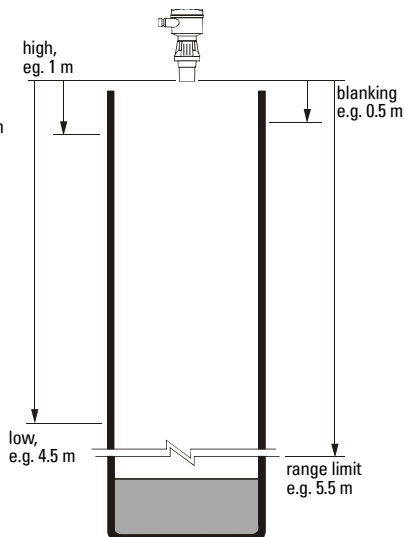
alarm setpoint set the high and/or low alarms to the desired values

fail-safe mode 1 - high  
2 - low  
3 - hold

**fail-safe = 1, 2 or 3**



**fail-safe = 2 or 3**



## Low Level Alarm Switch

This application uses the Pointek ULS 200 to provide one or two low level alarms. The device range applies to its switching capability, and not the process range of the material. As such the low and / or low-low level setpoints must be within the device's range (3 / 5 metres).

If the material can fall below the unit's range, the Pointek ULS 200 loses the echo, and if prolonged, defaults to fail-safe operation. The fail-safe default should be set to suit the application.

### Application Adjustments

alarm function 3 - low / low-low alarm

5 - low / LOE alarm

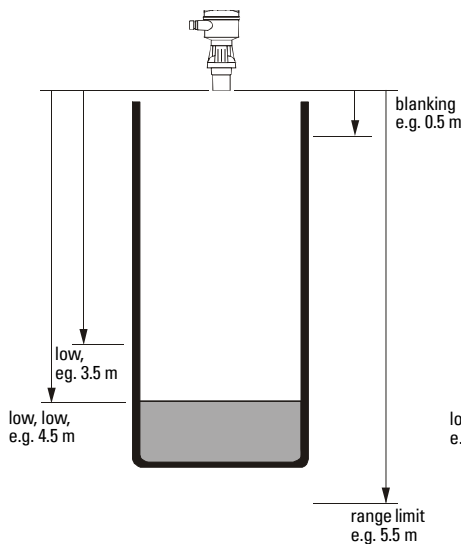
alarm setpoint set the low and / or low-low alarms to the desired values

fail-safe mode 1 - high

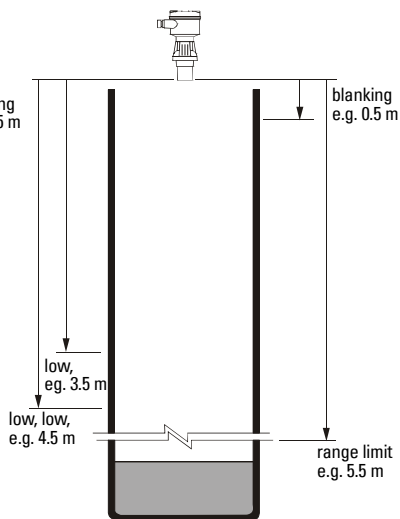
2 - low

3 - hold

**fail-safe = 1, 2 or 3**



**fail-safe = 2 or 3**



## Dual Pump Control

This application uses Pointek ULS 200 to provide a control output when the process material rises to a high level. The device range applies to its switching capabilities, and not to the process range of the material. As such, the level setpoints must be within the device's range (3 / 5metres).

Typically, wet wells are used to temporarily hold storm and/or waste water. When the water surface reaches a high level setpoint, the wet well is pumped down. The process material will be pumped down by the deadband value to another setpoint where the control will turn off.

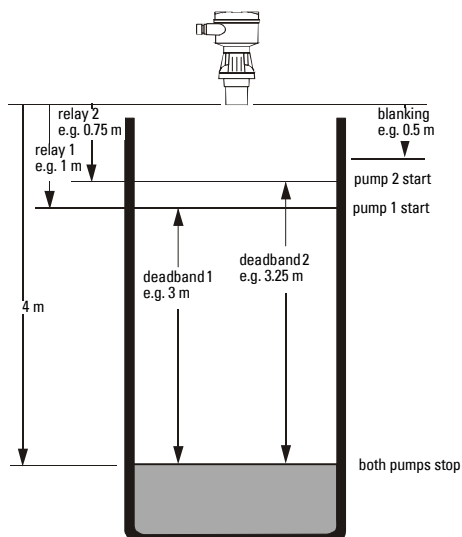
### Application Adjustments

relay function    6 - high control / low alarm  
                          7 - high control / high alarm  
                          10 - high control / LOE alarm  
                          13 - high control / high control

relay setpoints: set to desired values

deadband values: referenced from relay setpoints  
 (distance from Pump Start setpoint to Pump Stop setpoint)

### Relay Function 13: Dual Pump Down



## Pump Control with Level Alarm

This application uses the Pointek ULS 200 to provide pump control and one level alarm. The device range applies to its switching capability, and not the process range of the material. As such the low level setpoints must be within the device's range (3 / 5 metres).

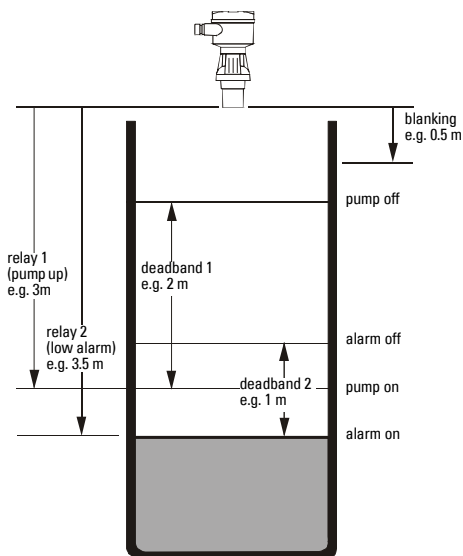
If the material reaches a control setpoint, the well is pumped down or up respectively. If the material reaches an alarm setpoint, the alarm will sound until the material moves beyond the deadband value.

### Application Adjustments

- relay function    6 - high control / low alarm  
                       7 - high control / high alarm  
                       8 - low control / low alarm  
                       9 - low control / high alarm  
                      10 - high control / LOE alarm  
                      11 - low control / LOE alarm

alarm setpoint    set the low alarm to the desired values

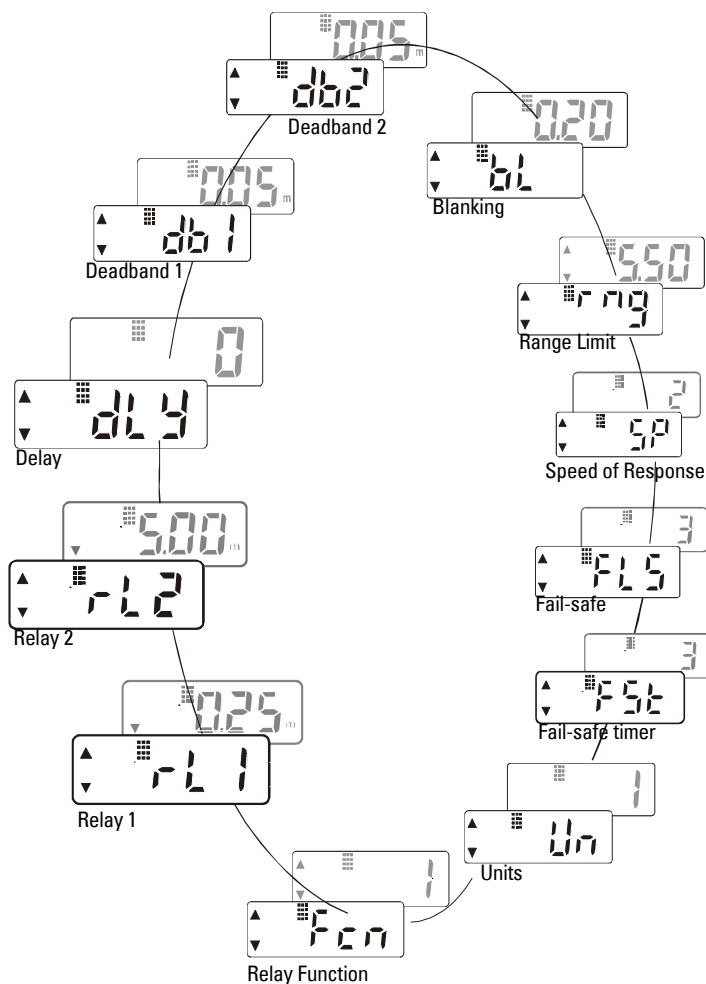
### Relay Function 8: Pump Up Control with Low Alarm



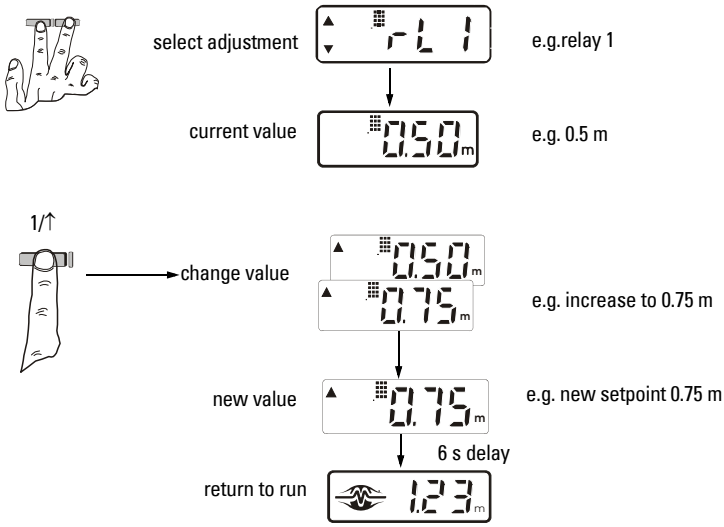
# Adjustments

There are several operating adjustments that can be made to the Pointek ULS 200.

To access the operating adjustments, simultaneously press both keys repeatedly until the desired adjustment is obtained. A viewing period of the adjustment value is initiated. During this time the value can be changed by pressing either the 'up' or 'down' key. After viewing or changing, operation automatically reverts to the run mode.



To adjust a value:



For faster scrolling, hold the key depressed and release when the desired value is obtained.

# Output Function



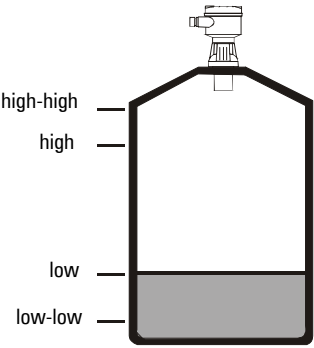
The alarms can be set to function in the desired mode.

Function	Relay 1	Relay 2
1 *	high alarm	low alarm
2	high alarm	high alarm
3	low alarm	low alarm
4	high alarm	LOE alarm
5	low alarm	LOE alarm
6	pump down	low alarm
7	pump down	high alarm
8	pump up	low alarm
9	pump up	high alarm
10	pump down	LOE alarm
11	pump up	LOE alarm
12	pump down	pump up
13	pump down	pump down
14	pump up	pump up

\* Factory setting

## Function display:

high alarm	H
high-high alarm	HH
low alarm	L
low-low alarm	LL
loss of echo alarm	LOE
pump up control	PU
pump down control	PD



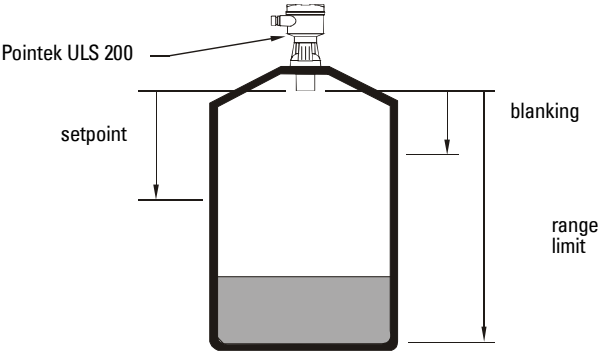


# Setpoints



The setpoints can be set where reference levels, either from the material in the vessel or from a target, cannot be provided. This method can also be used to trim the output levels obtained by the Reference Method (Quick Start).

The setpoints are referenced from the face of the sensor. They should not be set at or above the blanking value, or at or below the range limit.



Factory Setting: Relay 1 = 0.5 m (1.64 ft)  
Relay 2 = 4.50 m (14.76 ft)

# Relay Delay



Adjust the time delay, in seconds, from when the material reaches the relay level and the relay is actuated. If the material level withdraws from the setpoint level, the delay is reset to 0.

The set time delay applies to both relays and all functions except 'Loss OF Echo'.

Factory setting: 0 seconds.

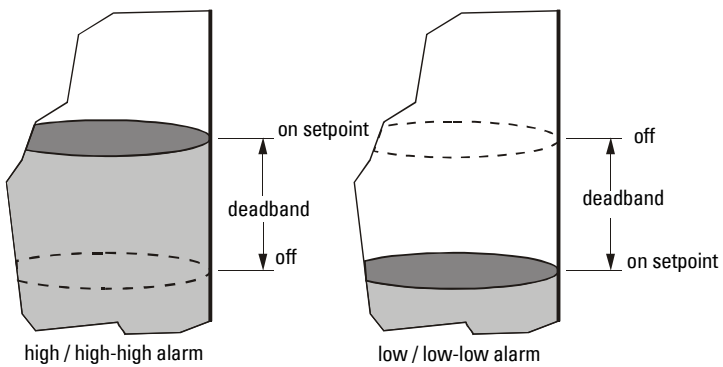
# Relay Deadband (Reset)



Deadband (sometimes referred to as hysteresis) prevents relay chatter due to material level fluctuations at the set point. These fluctuations are often waves or turbulence on a fluid's surface caused by agitators in the tank.

Once a relay is tripped the detection level must move beyond the deadband value before it is reset. The direction in which the deadband is measured depends on the application of the relay. If the relay is for a high state then the deadband is measured below the set point. If the relay is for a low state then the deadband is measured above the set point. Refer to the diagram below.

Deadband 1 is used for Relay 1 and Deadband 2 is used for Relay 2.



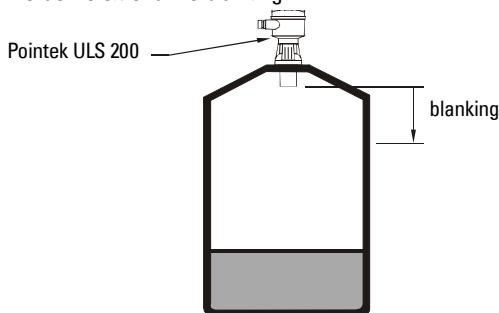
The deadband value is entered in the units selected, and applies to both relays and all alarm or control functions except 'Loss Of Echo'.

Factory setting: 0.05 m (0.16 ft)

## Blanking



Blanking is used to ignore the zone in front of the transducer where false echoes are at a level that interfere with the processing of the true echo. It is measured outward from the sensor face. The minimum recommended blanking value is 0.25 m (0.82 ft) but can be increased in order to extend the blanking.

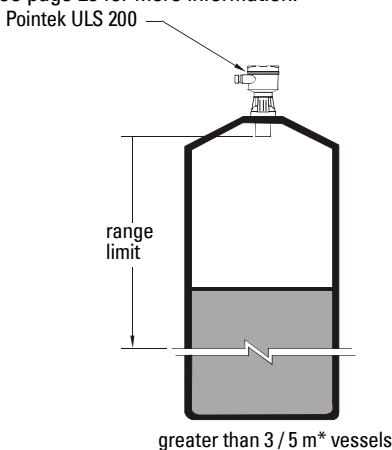
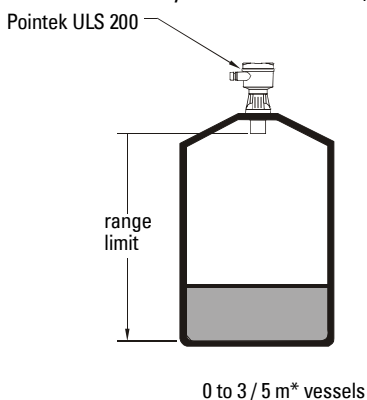


Factory setting: 0.20 m (0.66 ft)

## Range Limit



The range limit is the distance at which measurements are ignored. Generally this refers to the bottom of the container being measured. If a measurement is detected beyond the range limit it results in a Loss Of Echo (LOE) reading. The result of this reading is determined by the Fail-Safe Mode, see page 25 for more information.



Factory setting: 5.50 m (18.0 ft)

\* solids range 3 m maximum  
liquids range 5 m maximum

# Speed of Response

The speed of response adjustment allows the user to collectively set a number of operating parameters.

measurement response: is the limit to which the Pointek ULS 200 is able to keep up with rates of change.

If the Pointek ULS 200 measurement cannot keep up with the rate of level change, set the adjustment from `1' to `2'.  
If the Pointek ULS 200 still cannot keep up with the rate of level change, set the adjustment option to `3'. Avoid choosing an option that is too fast for your application.

agitator discrimination: discriminates between agitator blades in motion and the material (target) surface.

filter: discriminates between false echoes from acoustical and electrical noise and the material (target) surface.

fail-safe timer: establishes the `Waiting' period from the time a loss of echo or operating fault condition starts until the fail-safe default is effected.

SP	measurement response	agitator discrimination	filter	FLS timer
1	0.3 m / min (0.1 ft / min)	on	on	10 min
2*	1 m / min (3.3. ft / min)	on	on	10 min
3	5 m / min (16.4 ft / min)	on	on	3 min
4	immediate	off	off	3 min

\* Factory setting

# Fail-Safe Mode



In the event that a loss of echo condition exceeds the fail-safe timer (speed of response variable), '?' appears in the display; and if a relay is assigned to `LOE' (alarm function option), it is engaged. This function must be used with the Output Function on page 22.

fail-safe	mode	function		reading
		high and high-high	low and low-low	
1	high	on	off	hold
2	low	off	on	hold
3*	hold	hold	hold	hold

\* Factory setting

# Fail-Safe Timer



The fail-safe timer allows the user to vary the waiting period from the time of a loss of echo or operating fault condition begins, until the fail-safe default is effected. The waiting period is adjustable from 1 to 15 minutes, in 1 minute increments.

**Note:** The fail-safe timer will default to settings determined by the speed of response (see page 26). If a different value is desired, the fail-safe timer should be adjusted after the speed of response is set.

# Units



The units of the measurement reading can be selected as follows:

1 = metres, m (Factory setting)

2 = feet, ft

The selected units are also applicable to the `Blanking' and `Relay' adjustments.

# Troubleshooting



The echo is not reliable and Pointek ULS 200 is waiting for a valid echo before updating the measurement.

Probable causes are:	Remedy
material or object in contact with sensor face	lower material level or raise Pointek ULS 200
Pointek ULS 200 is not perpendicular to the material surface	check Pointek ULS 200 mounting if angle of repose is too steep, angle Pointek ULS 200 mounting
change in level too fast	adjust speed of response
material out of range	acceptable on some high level switch applications
foam on liquid surface	mount Pointek ULS 200 via stilling well or pipe
too much dust or interference from material filling	relocate Pointek ULS 200
high level of vibration in the mounting structure	relocate Pointek ULS 200 or limit vibration
material inside blanking zone or below range limit	adjust blanking or range limit



Fail-safe default after prolonged Loss Of Echo.  
Investigate the probable causes listed above.

# Maintenance

---

The Pointek ULS 200 requires no maintenance or cleaning.

# Certifications

---

The following instructions apply to equipment covered by certificate number SIRA 00ATEX1205:

1. The equipment may be used with flammable gases and vapours with apparatus group IIC and temperature class T5.
2. The equipment is certified for use in an ambient temperature range of -20 to 60°C (-4 to 140°C).
3. The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
4. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
5. Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. EN 60079-19 within Europe).
6. Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.
7. The certification of this equipment relies upon the following materials used in its construction:

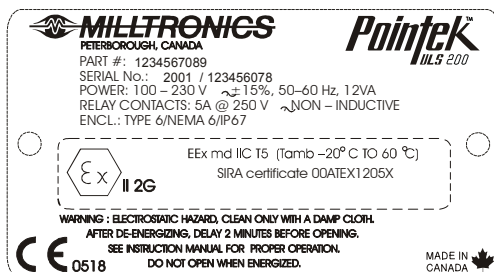
Aluminum alloy T356 T6 (main enclosure) and A356 T6 (lid)  
 GE Lexan 943A polycarbonate  
 Two-part epoxy encapsulant  
 Silicon based coating  
 Santophrene 111-55 gasket  
 Polysulphide encapsulant (transducer)  
 Dupont Tefzel 210 (transducer)  
 Epoxy syntactic foam (transducer)

If the equipment is likely to come in contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

**Aggressive substances:** e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials  
**Suitable precautions:** e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.



8. **Equipment Marking:** The equipment marking contains at least the following information:



9. **Special Condition for Safe Use:** The apparatus must only be supplied from a circuit containing a suitable rate fuse having a breaking capacity of at least 4000 A.





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**Rev. 1.2**

## M20 Shear pin setup guide

1. Read and record the motor rated power and FLC Amps directly from the tag plate. (not from drawings or any other documentation as this may be incorrect)
2. Client to install the shear pin and CT. Check that one of the motor phase wires is wound through the CT and check against table 1.
3. With the M20 display powered on. Motor off. Press NEXT until you reach window 41. Set the Motor rated power to the figure listed on the motor tag plate. **You need to press ENTER to save any new values.**
4. Press NEXT until you reach window 42. Set the Motor rated full load current to the figure listed on the motor tag plate.
5. Check window 43 to ensure the correct 3ph is listed.
6. Change Window 5 so that only 1 line is at the top. This indicates over current monitoring only.

At this point the system should be operational, however the over current setpoints still need to be calibrated for the shear pin to be effective at protecting the equipment. In order to do this, the equipment needs to be operating under load conditions with product, simulating near capacity load on the drive.

7. Start the drive and once under indicative load conditions, press and hold the auto set button for 3 seconds. The display should indicate that the values have been set.
8. Move to windows 11 and 12 to check that the values have changed. (default setting is 100%).
9. Monitor the operation and observer for any fault / alarm conditions.

At this point the settings are in place to provide protection. These may however be too marginal depending on the product and type of equipment. The values for window 11 and 12 may be changed manually to suit. Window 12 is the warning setting only and when the system reaches the window 12 input setting a warning symbol will appear on the screen. It does not initiate the alarm. Window 11 is the alarm point which sends the fault to the PLC. Therefore the window 12 should be slightly lower than window 11.

Once this is all set most systems are good to run from here. It is good practice to record the values as a commissioning check. See attached form. Edit as required to be job specific.

On some occasions there are further tweaks required. Window 31 for start delay may be extended in the case of systems that start under considerable load. This may be things like livebottom units. Window 32 for max delay can be extended for units that fluctuate around the alarm point on occasion. It is preferable though to increase the max alarm point to a reasonable limit though, as extending the response time reduces the speed of the system in responding to a real problem.

### Control Terminals

- 1 S1 Current transformer input
- 2 S2 Current transformer input
- 3 + Analogue output
- 4 - Analogue output
- 5 DIG External RESET or AUTO SET or Block Pre-Alarm
- 6 C Common: RELAY, DIG
- 7 R1 Main Alarm Relay 1\*
- 8 R2 Pre-Alarm Relay 2

### AUTO SET Key

Press for 3 seconds during normal and stable load to apply the automatic setting of the alarm levels. Not available if Parameter Locked.

### RESET Key

To reset ALARM

### +/- Keys

For increasing and decreasing value

### Monitor Supply Terminals

- 9 L1 Motor phase
- 11 L2 Motor phase
- 13 L3 Motor phase

### Display

- 12 Function (window) number
- 123 Function Value
- ⚠ Warning signal
- ⌚ Start, response delay or block timer active
- 🔒 Parameter locked
- V Voltage indicator
- A Current indicator
- mA Milliampere indicator
- kW Kilowatt indicator
- S Second indicator
- % Per cent indicator

### NEXT Key

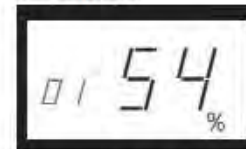
Proceeds to next window. If no key is pressed for 1 minute the display returns to window 01 automatically. Scroll back by pressing and holding ENTER at the same time as the NEXT key is pressed.

### ENTER Key

Confirm (save) changes.

After Power up window 01 appears, the actual load value is shown.

Default view (example shows 54% load):



Use the NEXT key to scroll through the function menu.

\* For alternative relay function, see Special functions in chapter 9.

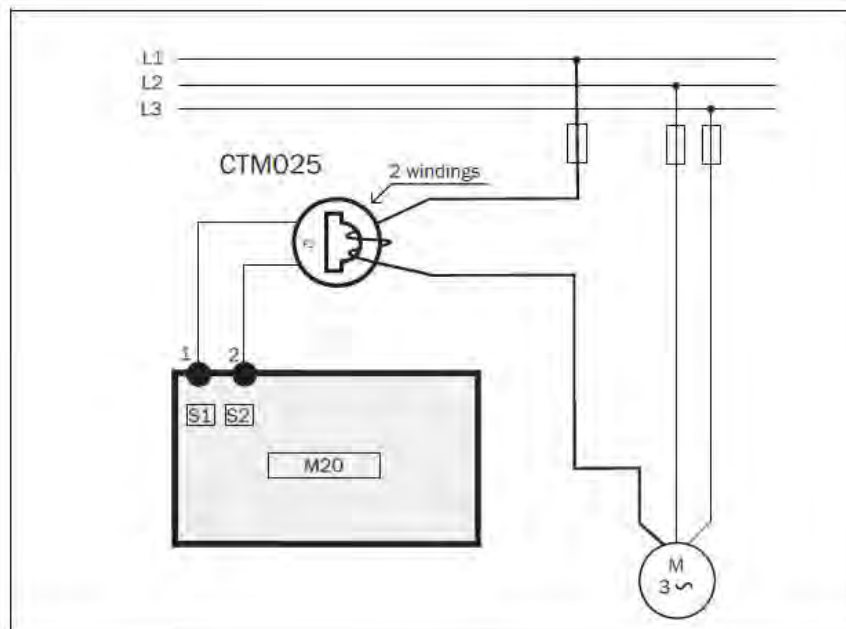


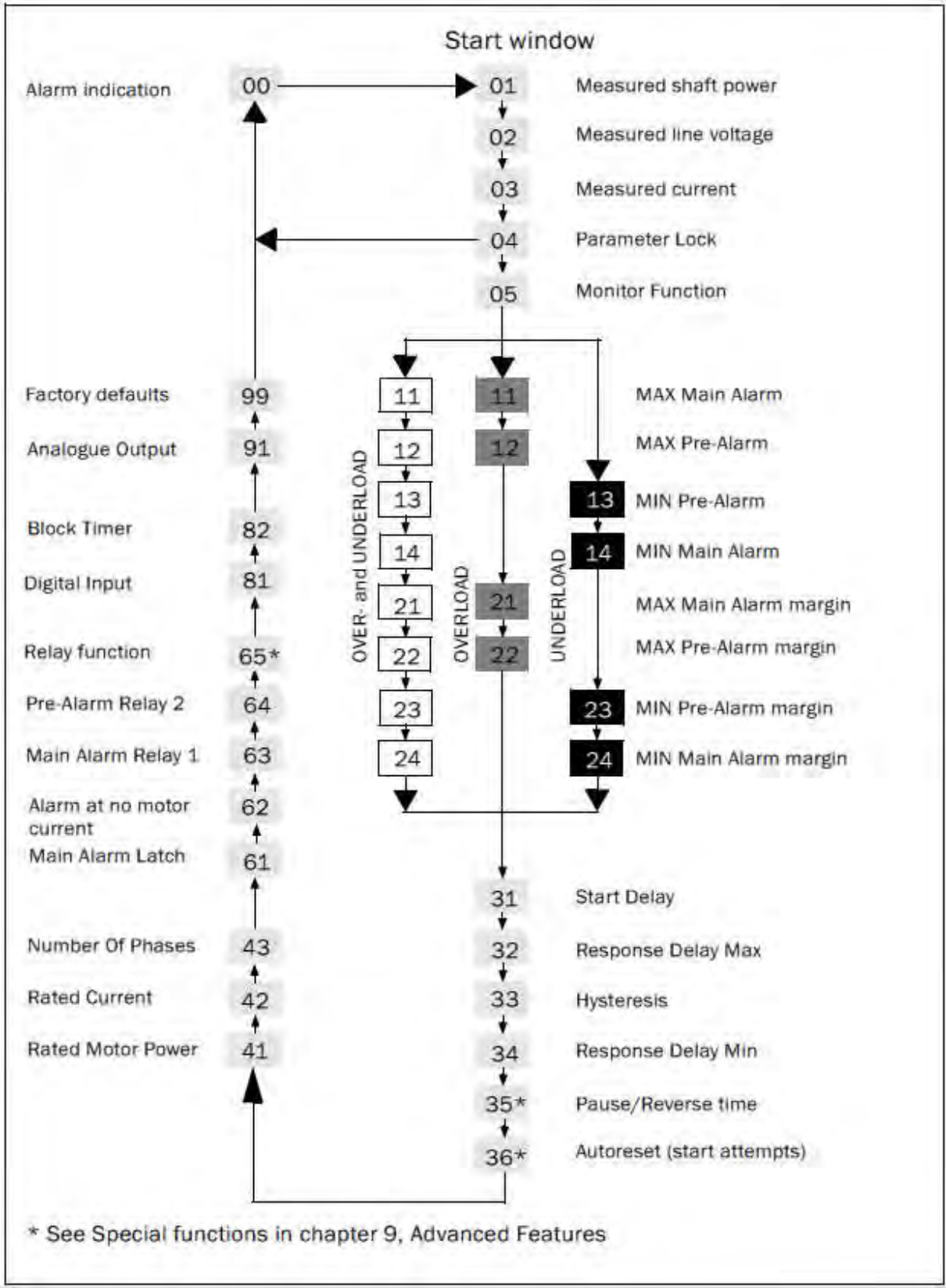
**Example**

- Rated motor current = 12 A.
- Select 10.1-12.5 A from the first column in Table 1.
- This gives:  
CTM025 with 2 windings (the motor wire is drawn through the CT's hole twice).

*Table 1 Motors and CT less than 100 A*

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF WINDINGS			
	CTM 010	CTM 025	CTM 050	CTM 100
0.4 – 1.0	10			
1.01 – 2.0	5			
2.01 – 3.0	3			
3.1 – 5.0	2			
5.1 – 10.0	1			
10.1 – 12.5		2		
12.6 – 25.0		1		
26.0 – 50.0			1	
51.0 – 100.0				1



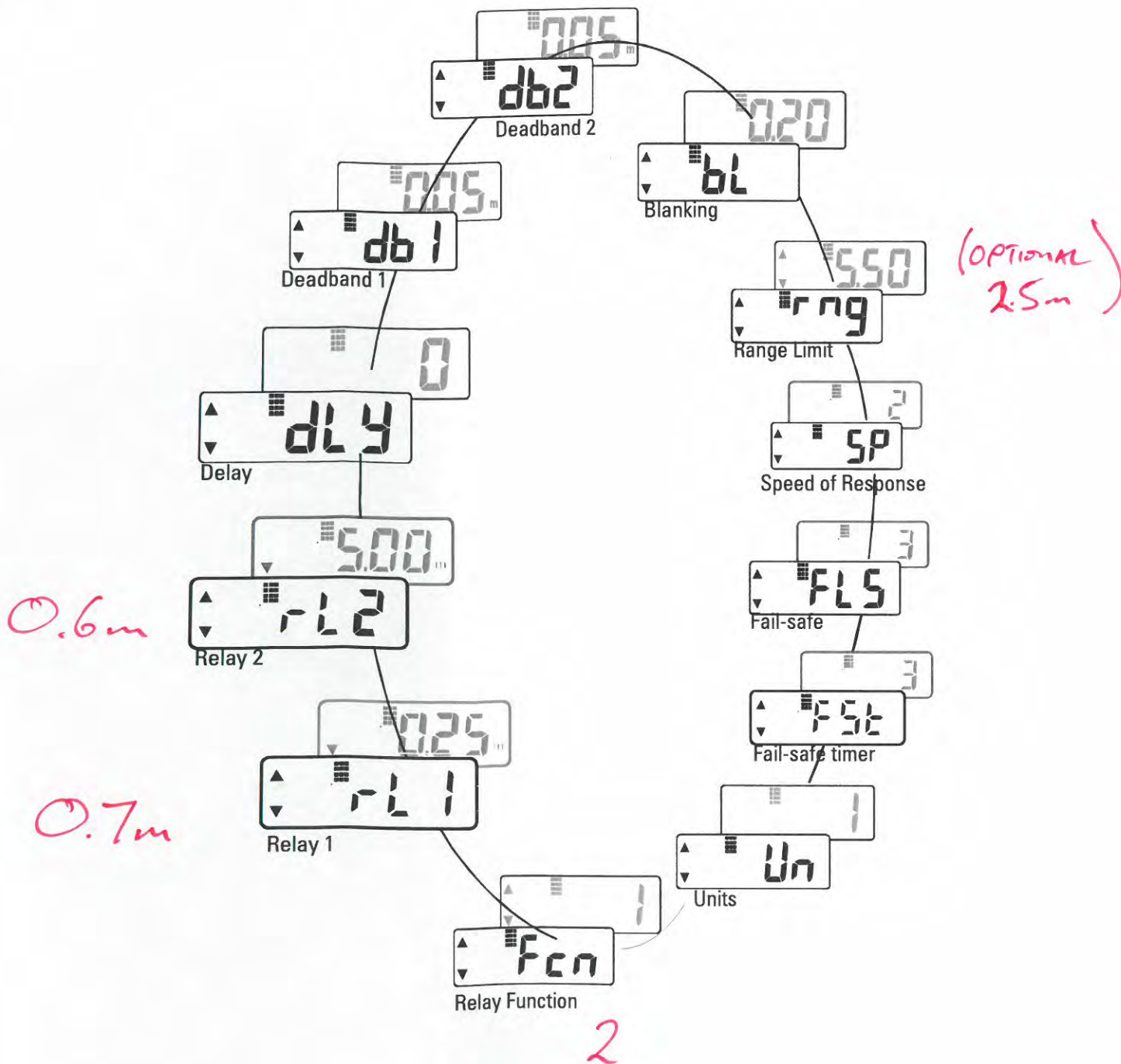




# Adjustments

There are several operating adjustments that can be made to the Pointek ULS 200.

To access the operating adjustments, simultaneously press both keys repeatedly until the desired adjustment is obtained. A viewing period of the adjustment value is initiated. During this time the value can be changed by pressing either the 'up' or 'down' key. After viewing or changing, operation automatically reverts to the run mode.





# RETRACTABLE CHUTE

## INSTALLATION, OPERATION & MAINTENANCE MANUAL

Doc No : 7149-IOM-02

Rev : A

Compiled By : RC

Date Compiled : 27-3-14

Project : **Luggage Point WWTP**  
SPIRAC Client : **Veolia Environmental Services**  
Contract / PO No. : **4502709865**  
SPIRAC Project No : **7149**



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APPENDIX

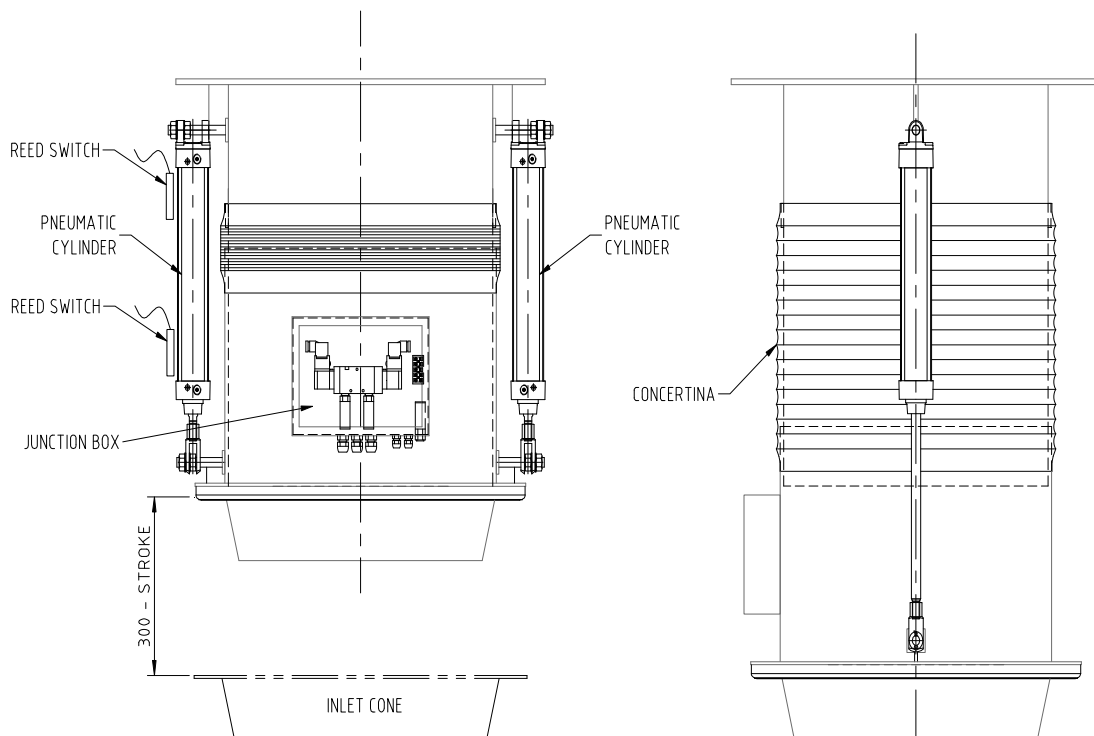
Reference	Contents
A	RETRACTABLE CHUTE DRAWING
B	ACTUATOR DETAILS
C	POSITION SWITCH DETAILS
D	SOLENOID VALVE DETAILS

## 1.0 DESCRIPTION

The SPIRAC Retractable Chute consists of a 316SS construction, fully enclosed (except the openings) with a concertina flex section to allow smooth operation. The chute is operated by a pair off pneumatic cylinders. This are bolted to each side of the chute. A control box is normally located near the chute.

Confirmation of the chute being lowered / raised is via two position switches located on one of the pneumatic cylinders. These switches pickup the location of the piston. These may be adjusted to suit the final resting positions of the chute.

Actuation of the pneumatic cylinder is via a 5 port, 3 position solenoid valve located in a junction box. The junction box is supplied loose for convenient location on site. All terminations (power, air and signal) are within this junction box.



Retractable Chute Description

## 2.0 TECHNICAL DATA

### *Pneumatic Cylinder*

Type:	Double Acting
Manufacturer:	SMC
Model:	2 x SMC CP96SD B63-300-XC68
Materials of Construction:	Aluminium Body, SS piston rod
Air Supply:	Max 900kPa, filtered to 10um, temp -10°C to +60°C

### *Solenoid Valve*

Type:	Five port, three position, solenoid operated.
Manufacturer:	SMC
Model:	SY7320-5LZ-C8
Materials of Construction:	Aluminium Body, SS spool
Power Supply:	24 V DC, DIN entry, 700kPa max pressure, 2x0.5W power consumption

### *Position Switch*

Manufacturer: IFM  
Model: IG0006  
Power Supply: 24VDC  
Operating range: 8mm

## **3.0 PRINCIPLES OF OPERATION**

Energizing one solenoid will move the valve spool to direct air to one end of the cylinders. Energizing the other solenoid will move the valve spool to direct air to the other end of the cylinders. Where no power is applied the valve will stay in the center and maintain the position of the chute. Therefore the chute will maintain position on a power failure. The position switch will sense the position of the cylinder piston and return a signal to the control system to confirm either open or closed.

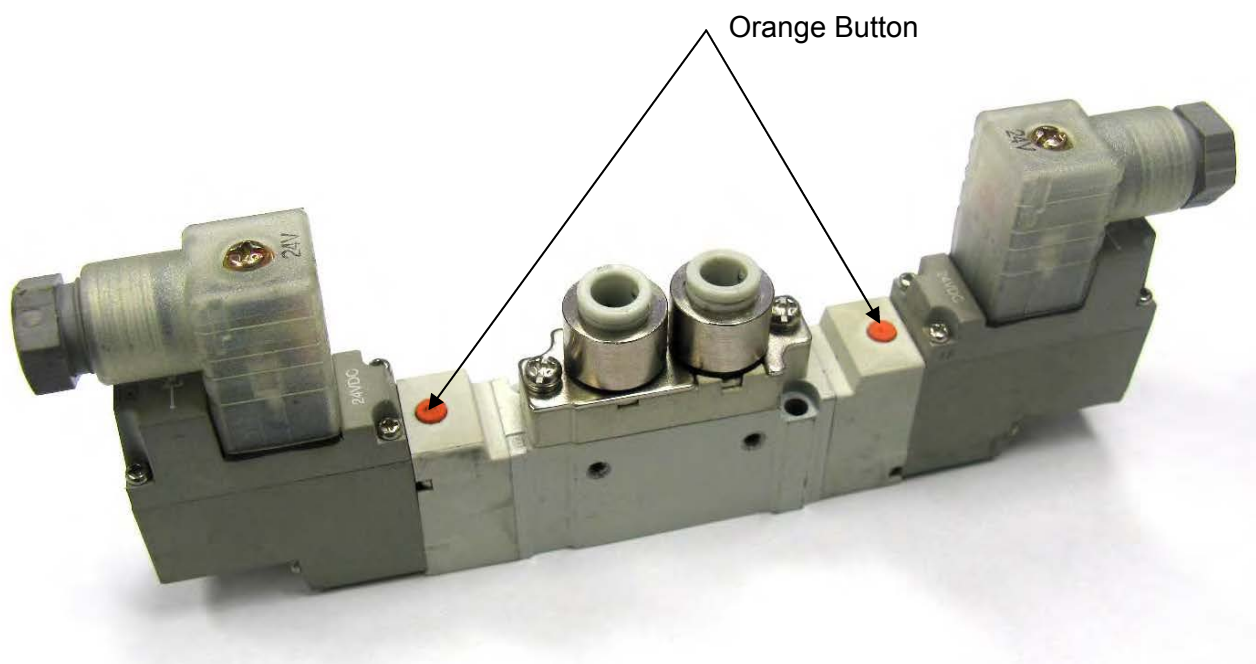
## **4.0 OPERATING INSTRUCTIONS**

### *Automatic*

The plant control system (by others) will provide a signal to activate the solenoids. This will either open or close the retractable chute. The position switches will confirm either open or closed.

### *Manual*

The retractable chute can be open or closed by depressing the orange button (see picture below) and holding. Releasing the button will stop cylinder movement.



## **5.0 INSTALLATION + COMMISSIONING INSTRUCTIONS**

### *Installation*

The SPIRAC retractable chute is fitted with a mating flange for connection to the conveyor inlet/outlet flange. It is a simple case of positioning the gasket (if supplied) over the connection flange, then positioning the chute and securing by bolts supplied. Air and electrical connections to be made as required.

## Commissioning

Once all connections have been made – air supply and electrical supply – initially apply air to the chute and using the manual over-ride button stroke the gate a couple of times to ensure smooth movement. To determine if position switches are working, again manually stroke the chute and note if the small LED on the proximity sensor lights up in either position. Adjust as required.

## 6.0 ROUTINE MAINTENANCE

It is important, particularly with all new equipment that it be monitored for performance / potential hazards and as a result specific procedures developed. Specific procedures for use on site need to be developed by the client which capture OHS and site access requirements. These should also be developed according to frequency of use and adapted to individual site process requirements.

<b>PREVENTIVE MAINTENANCE</b>	
<b>PERIOD</b>	<b>ACTIVITY</b>
<b>Weekly</b>	Check that air supply pressure is OK.
<b>Monthly</b>	If possible, manually stroke the chute to ensure sensors are operating OK and running smoothly.
	Check for build up of material, clean as required.

## 7.0 REPAIR & OVERHAULING

In general the cylinders and solenoid should operate for many years without the need for repair or overhaul. It is more cost effective to replace the cylinder or solenoid than to repair.

## 8.0 TROUBLESHOOTING

<b>PROBLEM</b>	<b>CAUSE</b>	<b>REMEDY</b>
Chute will not move	No power on solenoid.	Connect to suitable power supply.
	Not enough system pressure.	Ensure all air lines are rated as per specification, and no line blockages apparent.
	Physical obstruction	Remove obstruction
No LED indication on Proximity Sensors	No power connected.	Connect to suitable power supply.
	Sensor too far away from piston to pick up movement.	Adjust to within 5-6mm of piston position.
	Chute has not fully retracted or extended.	Material caught in chute preventing closure.
Chute does not fully extend / retract.	Material caught in chute preventing closure.	Clean down the chute and remove material.

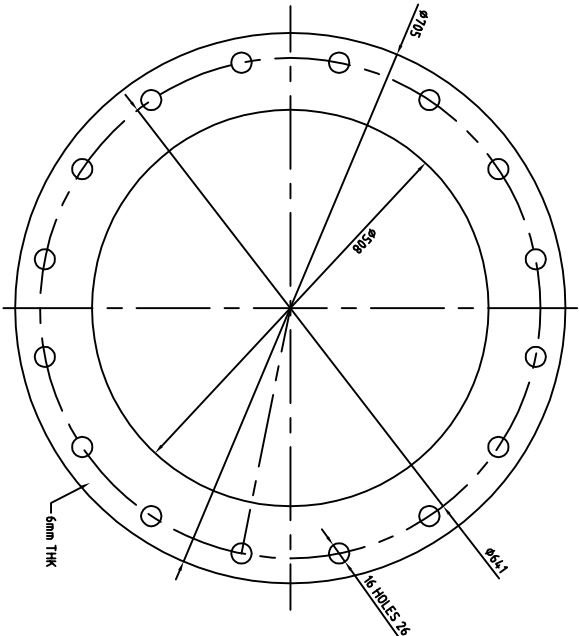
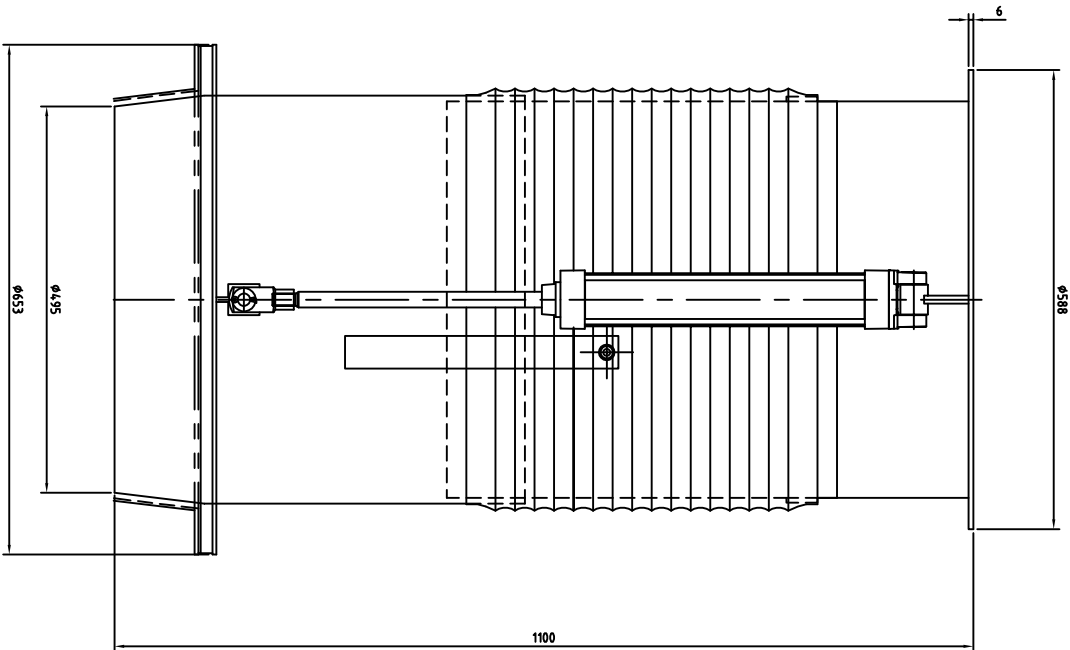
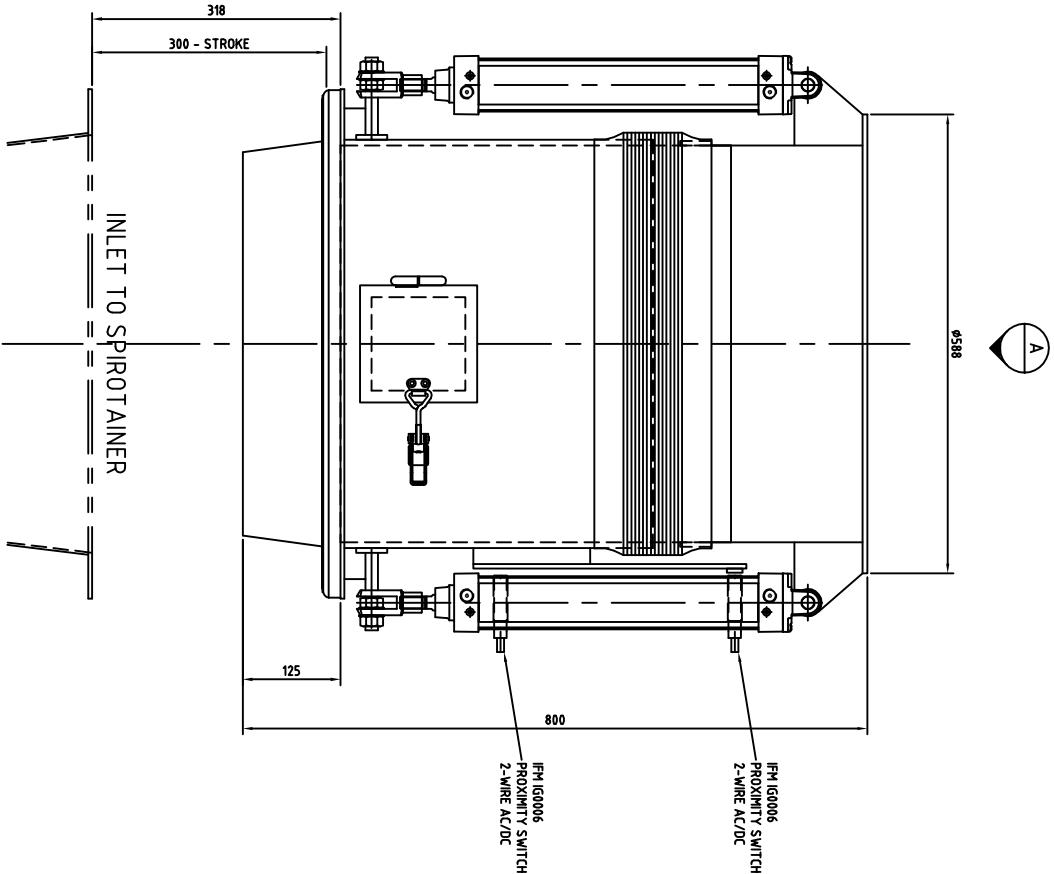
## **9.0 PARTS LIST**

For required parts refer to the specific drawing provided with the equipment.

Parts may vary depending on the application.



**APPENDIX A**  
**RETRACTABLE CHUTE DRAWING**

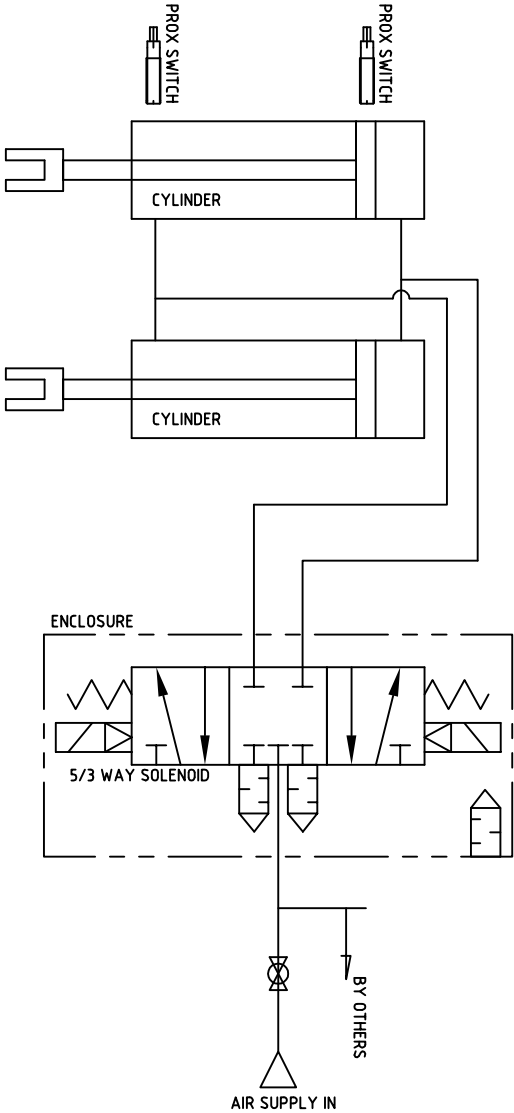


FRONT ELEVATION

RHS ELEVATION

MOUNTING FLANGE DETAIL

VIEW ON 'A'



PNEUMATIC CIRCUIT DIAGRAM

ALL MAIN MATERIALS 316SS  
UNLESS STATED OTHERWISE



SOLENOID VALVE :

MODEL -  
POSITION -  
VOLTAGE -  
ELECTRIC ENTRY -  
RESPONSE TIME -  
POWER CONSUMPTION -  
PROTECTION STRUCTURE -  
DUST PROOF  
FAIL MODE -

3 POSITION  
24V DC  
DIN TYPE  
15mm PUSH TYPE  
15mm PRESS AT 500mA  
2 x 0.5 A  
IP67  
IP67

PNEUMATIC CYLINDER :  
MODEL -  
MATERIALS -  
CONTROL BOX :  
SIZE -  
PROXIMITY SWITCH :  
MODEL -  
ELECTRIC DESIGN  
CONTACT  
VOLTAGE  
MAX LOAD CURRENT  
CONNECTION

2 x ISO STD #43 BORE x 300 STROKE  
ALUMINIUM WITH 316SS RODS & FASTENERS  
APPROX 275x200x900mm IP 65  
APPROX 275x200x900mm IP 65  
IG0006  
2-WIRE AC/DC IP67  
NORMALLY OPEN  
20-250V AC/DC  
2mA  
PVC CABLE / 2m, 2x0.5mm<sup>2</sup>

SOLENOID VALVE :

MODEL -  
POSITION -  
VOLTAGE -  
ELECTRIC ENTRY -  
RESPONSE TIME -  
POWER CONSUMPTION -  
PROTECTION STRUCTURE -  
DUST PROOF  
FAIL MODE -

3 POSITION  
24V DC  
DIN TYPE  
15mm PUSH TYPE  
15mm PRESS AT 500mA  
2 x 0.5 A  
IP67  
IP67

PNEUMATIC CYLINDER :  
MODEL -  
MATERIALS -  
CONTROL BOX :  
SIZE -  
PROXIMITY SWITCH :  
MODEL -  
ELECTRIC DESIGN  
CONTACT  
VOLTAGE  
MAX LOAD CURRENT  
CONNECTION

2 x ISO STD #43 BORE x 300 STROKE  
ALUMINIUM WITH 316SS RODS & FASTENERS  
APPROX 275x200x900mm IP 65  
APPROX 275x200x900mm IP 65  
IG0006  
2-WIRE AC/DC IP67  
NORMALLY OPEN  
20-250V AC/DC  
2mA  
PVC CABLE / 2m, 2x0.5mm<sup>2</sup>

REV	DATE	ISSUED FOR INFORMATION	DESCRIPTION	BY	CHK	APP	CONFIDENTIAL INFORMATION	COPYRIGHT	SPIRAC Engineering Pty Ltd	TOLERANCES EXCEPT WHERE OTHERWISE STATED:-	PROJECT:	FILE:
A	25-2-14	ISSUED FOR INFORMATION		RC			THIS DRAWING AND DESIGN IS SUPPLIED AS CONFIDENTIAL INFORMATION AS SPECIFIED IN THE CONTRACT OR AS DETERMINED IN SPIRAC ENGINEERING AS PART OF THE COMPANION SALES	THIS DRAWING AND STYLE SUPPLIED BY SPIRAC ENGINEERING PTY LTD IS COVERED BY COPYRIGHT AND IS NOT TO BE USED OR IN ANY WAY COPIED TO ANY OTHER PARTY WITHOUT THE WRITTEN CONSENT OF SPIRAC ENGINEERING PTY LTD	P.O. Box 1216, Bibra Lake, DC WA 6065 Australia 30 Cocos Drive, Bibra Lake, WA 6163 Australia Tel +61 8 9434 0777 Fax +61 8 9434 0778 ABN 81 009 415 169	UP TO 200mm ±2.0mm 200mm AND OVER ±3.0mm HOLE CENTRES ±1.0mm HOLE DIA ±1.0mm ALL ANGLES ±1° DIMENSIONS IN MILLIMETRES DO NOT SCALE	VEOLIA ENVIRONMENTAL SERVICES LUGGAGE POINT WWTP	KAPRETRACTABLE CHUTE DRAWN: RC DATE: 25-2-14 SHEET: 1 OF 1 DRG. No: 714.9-04
											CHECKED: RC	APPROVED: 1/5
												REV: A

## **APPENDIX B**

### **ACTUATOR DETAILS**



## ISO 15552 Cylinders Series C96/CP96

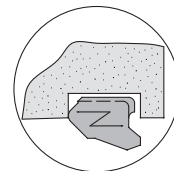
## Unique combination of light weight and top mechanical specifications

### The easy adjustment of the cushion valves allow optimum control of cylinder speed and cycle time

Since the adjustment of the cushion valve is performed with a hexagon wrench key, even fine control can be easily accomplished. Furthermore, the cushion valve has been recessed so that it does not protrude from the cover.

### End of stroke air cushions provide smooth operation

Piston rod lurching has been eliminated at the end of the stroke positions by means of a floating seal mechanism.

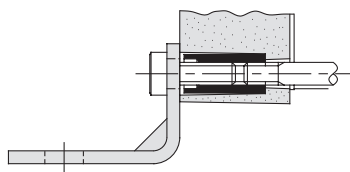


### Minimum piston rod deflection enhances the accuracy levels of your machine

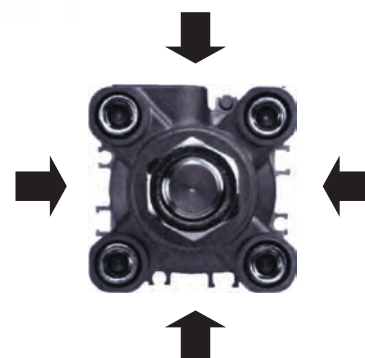
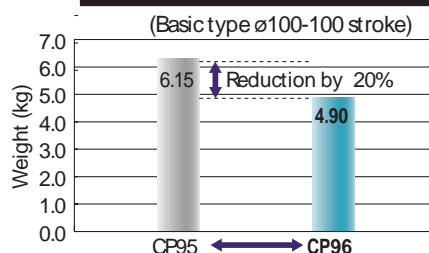
Deflection of the piston rod has been reduced by increasing the precision of the bushing and piston rod, and reducing the tolerances.

### Improved mounting accuracy ensures a secure position of the cylinder during machine operation

High accuracy covers and tie rod nuts simplify the mounting process and also extend cylinder life.



### CP95/CP96 Weight Comparison



### Maximum flexibility for auto switch mounting

- CNOMO and circular grooves are set on all four sides.
- Auto switches can slide in the round grooves with no need for accessories.

### How to Order

Pro le cylinder

CP96SD B 32 100 W

Round tube cylinder

C96SD B 32 100 W

Built-in magnet

Mounting

B	Basic/Without bracket
T	Centre trunnion*

\* For C96 only.

Bore size

32	32 mm
40	40 mm
50	50 mm
63	63 mm
80	80 mm
100	100 mm
125	125 mm

Stroke (mm)

(Refer to "Standard Stroke" below)

Rod

—	Single rod
W	Double rod

### Standard Stroke

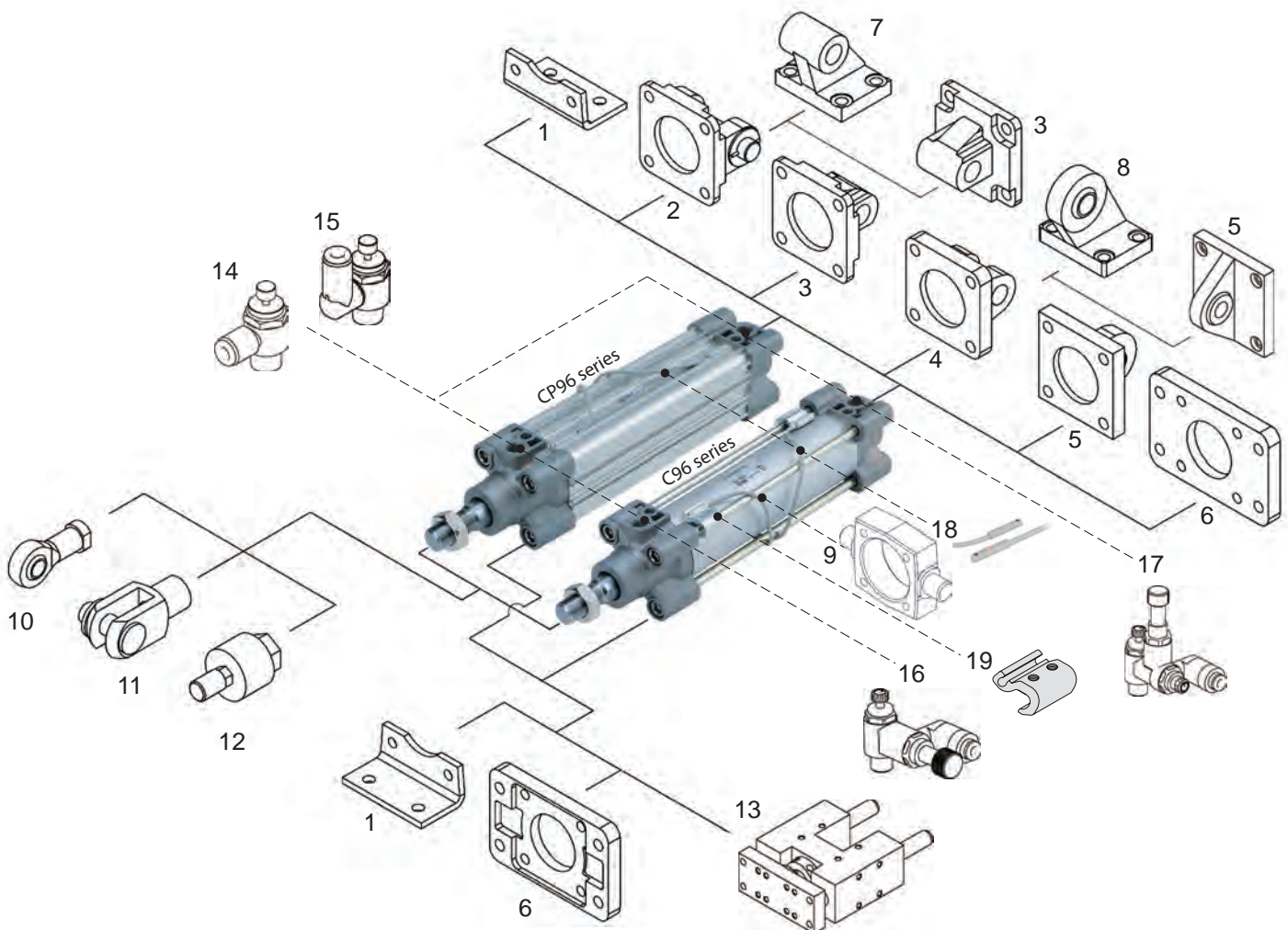
Bore size (mm)	Standard stroke (mm)	CP96* Max. stroke	C96* Max. stroke
32	25, 40, 50, 75, 80, 100, 125, 150, 160, 200, 250, 300, 320, 350, 400, 450, 500	2000	1000
40	25, 40, 50, 75, 80, 100, 125, 150, 160, 200, 250, 300, 320, 350, 400, 450, 500	2000	1900
50	25, 40, 50, 75, 80, 100, 125, 150, 160, 200, 250, 300, 320, 350, 400, 450, 500, 600	2000	1900
63	25, 40, 50, 75, 80, 100, 125, 150, 160, 200, 250, 300, 320, 350, 400, 450, 500, 600	2000	1900
80	25, 40, 50, 75, 80, 100, 125, 150, 160, 200, 250, 300, 320, 350, 400, 450, 500, 600, 700, 800	2000	1900
100	25, 40, 50, 75, 80, 100, 125, 150, 160, 200, 250, 300, 320, 350, 400, 450, 500, 600, 700, 800	2000	1900
125	Manufactured to order	2000	2000

Intermediate strokes are available.

\* Please consult with SMC for longer strokes.



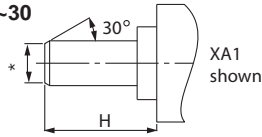
## With the most innovative range of related products to achieve the best performance



Bore size (mm)	1	2	3	4	5	6	7	8	9	10	11	12	13
	Foot (double)	Female head end clevis	Male head end clevis	Female head end clevis	Male head end clevis with ball joint	Rod/Head end flange	Angled head end clevis	Angled head end clevis with ball joint	Trunnion mount C96 only	Piston rod ball joint (ISO 8139)	Rod clevis (ISO 8140)	Floating joint	Guide unit
32	L5032	D5032	C5032	DS5032	CS5032	F5032	E5032	ES5032	Centre trunnion for 32~125	KJ10D	GKM10-20	JA30-10-125	GUMF32-*
40	L5040	D5040	C5040	DS5040	CS5040	F5040	E5040	ES5040		KJ12D	GKM12-24	JA40-12-125	GUMF40-*
50	L5050	D5050	C5050	DS5050	CS5050	F5050	E5050	ES5050		KJ16D	GKM16-32	JA50-16-150	GUMF50-*
63	L5063	D5063	C5063	DS5063	CS5063	F5063	E5063	ES5063		KJ16D	GKM16-32	JA50-16-150	GUMF63-*
80	L5080	D5080	C5080	DS5080	CS5080	F5080	E5080	ES5080	Adjustable trunnion for 32~100	KJ20D	GKM20-40	JAH50-20-150	GUMF80-*
100	L5100	D5100	C5100	DS5100	CS5100	F5100	E5100	ES5100		KJ20D	GKM20-40	JAH50-20-150	GUMF100-*
125	L5125	D5125	C5125	DS5125	CS5125	F5125	E5125	ES5125		KJ27D	GKM30-54	JA125-27-200	GUMF125-*

Bore size (mm)	14		15		16		17		18			19
	Speed controller elbow type		Speed controller universal type		Air saving valve Pressure valve		Air saving valve Flow valve		Auto switch			Auto switch mount bracket C96 only
	ø tube	Part number	ø tube	Part number	ø tube	Part number	ø tube	Part number	Solid state type			
32	4	AS2201F-01-04S	4	AS2301F-01-04S		—		—	Part number	Wiring	Cable	32~40 bore size (mm)
	6	AS2201F-01-06S	6	AS2301F-01-06S								
	8	AS2201F-01-08S	8	AS2301F-01-08S					D-M9BZ	2 wire	5 m	BMB5-032
40~50	4	AS2201F-02-04S	4	AS2301F-02-04S	D-M9BSAPC	M8-3pin 0.5 m						
	6	AS2201F-02-06S	6	AS2301F-02-06S	6	ASR430F-02-06S	6	ASQ430F-02-06S	3 wire NPN	5 m	50~63 bore size (mm)	
	8	AS3201F-02-08S	8	AS3301F-02-08S	8	ASR530F-02-08S	8	ASQ530F-02-08S		M8-3pin 0.5 m		
	10	AS3201F-02-10S	10	AS3301F-02-10S	10	ASR530F-02-10S	10	ASQ530F-02-10S	D-M9PZ	5 m	BA7-040	
	12	AS3201F-02-12S	12	AS3301F-02-12S	12	ASR530F-02-12S	12	ASQ530F-02-12S	D-M9PSAPC	M8-3pin 0.5 m		
63~80	6	AS3201F-03-06S	6	AS3301F-03-06S	6	ASR530F-03-06S	6	ASQ530F-03-06S	Reed type			80~100 bore size (mm)
	8	AS3201F-03-08S	8	AS3301F-03-08S	8	ASR530F-03-08S	8	ASQ530F-03-08S	Part number	Wiring	Cable	
	10	AS3201F-03-10S	10	AS3301F-03-10S	10	ASR530F-03-10S	10	ASQ530F-03-10S				
	12	AS3201F-03-12S	12	AS3301F-03-12S	12	ASR530F-03-12S	12	ASQ530F-03-12S				
100~125	10	AS4201F-04-10S	10	AS4301F-04-10S	10	ASR630F-04-10S	10	ASQ630F-04-10S	D-A93Z	2 wire	5 m	125 bore size (mm) BA7-080
	12	AS4201F-04-12S	12	AS4301F-04-12S	12	ASR630F-04-12S	12	ASQ630F-04-12S	D-A93SAPC		M8-3pin 0.5 m	

## C(P)96 made to order options in Australia

Symbol	Details	How to order
<b>-XA0~30</b> 	<b>Change of rod end shape</b> Thirty typical diagrams are available. Fill in any special dimension you desire.	Please use SMC's simple special system and configurators
<b>-XB6</b>	<b>Heat resistant cylinder (-10 ~150° C)</b> Air cylinder in which the materials of the seals and the grease have been changed so that the cylinder can be operated at high ambient temperature of up to 150°C.	C(P)96SB□-□- <b>XB6</b>
<b>-XC4</b>	<b>Heavy duty scraper</b> As it uses a powerful scraper for the wiper ring, this cylinder is suitable for use in an area that is dusty, or in an environment in which mud splashes on cylinder, such as when operating casting equipment, construction equipment, or an industrial vehicle.	C(P)96SDB□-□- <b>XC4</b>
<b>-XC7</b>	<b>Tie rod, cushion valve, and tie rod nut, made of stainless steel</b> This enables the cylinder to be used in an area subject to rust or corrosion.	C(P)96SDB□-□- <b>XC7</b>
<b>-XC14, -XC14A, -XC14B</b>	<b>Change of trunnion bracket mounting position</b> Trunnion position is fixed inside front rod cover XC14A or inside rear head cover XC14B. For customer specified position between the front and rear covers XC14 please use SMC's simple special system.	C(P)96SDB□-□- <b>XC14</b> □
<b>-XC22</b>	<b>Fluoro rubber seals</b> For applications where chemical splash can damage standard NBR seals.	C(P)96SDB□-□- <b>XC22</b>
<b>-XC35</b>	<b>Metal coil scraper</b> Removes frost, weld spatter, cutting dust adhered to the piston rod and protects the seals.	C(P)96SDB□-□- <b>XC35</b>
<b>-XC68</b>	<b>Piston rod made from chrome plated stainless steel with stainless steel rod end nut</b> Suitable for rusty and/or corrosive area subject to water splashing.	C(P)96SDB□-□- <b>XC68</b>

For additional options please consult Technical Engineering.

- Non-rotating cylinder
- Low friction cylinder
- Cylinder with locking unit
- Cylinder with positioner



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 F (02) 9354 8253  
 E nswsales@smcaus.com.au  
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 Monash Business Park  
 Notting Hill VIC 3168  
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 Frankton Hamilton 3204  
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 3/3 Birmingham Drive  
 Middleton Christchurch 8024  
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**Palmerston North**  
 2/639 Tremaine Avenue  
 Palmerston North 4410  
 T (06) 357 6724  
 F (06) 357 6728

**Wellington**  
 2B Udy Street  
 Petone Wellington 5012  
 T (04) 589 1495  
 F (04) 589 1496

## **APPENDIX C**

### **POSITION SWITCH DETAILS**

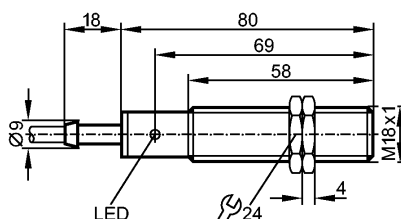




## IG0006

IG-2008-ABOA

Inductive sensors



Made in Germany



### Product characteristics

Inductive sensor

Plastic thread M18 x 1

Cable

Sensing range 8 mm; [nf] non-flush mountable

### Electrical data

Electrical design	AC/DC
Operating voltage [V]	20...250 AC/DC
Protection class	II
Reverse polarity protection	no

### Outputs

Output function	normally open
Voltage drop [V]	< 6.5 AC / < 6 DC
Minimum load current [mA]	5
Leakage current [mA]	< 2.5 (250 V AC) / < 1.3 (110 V AC) / < 0.8 (24 V DC)

### Current rating

- Current rating (continuous) [mA]	350 AC (...50 °C) / 250 AC (...80 °C) / 100 DC
- Current rating (peak) [mA]	î: 2.2 A (20 ms / 0.5 Hz)
Short-circuit proof	no
Overload protection	no
Switching frequency [Hz]	25 AC / 50 DC

### Range

Sensing range [mm]	8
Real sensing range (Sr) [mm]	8 ± 10 %
Operating distance [mm]	0...6.5

### Accuracy / deviations

Correction factors	mild steel = 1 / stainless steel approx. 0.7 / brass approx. 0.4 / Al approx. 0.3 / Cu approx. 0.2
Hysteresis [% of Sr]	1...15
Switch-point drift [% of Sr]	-10...10

### Environment

Ambient temperature [°C]	-25...80
Protection	IP 67

### Tests / approvals

EMC	EN 60947-5-2 EN 55011: class B
MTTF [Years]	604

### Mechanical data

**IG0006**

IG-2008-ABOA

**Inductive sensors**

Mounting	non-flush mountable
Housing materials	PBT
Weight [kg]	0.112

**Displays / operating elements**

Output status indication	LED	yellow
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**Electrical connection**

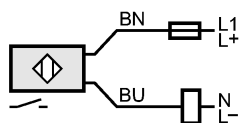
Connection	PVC cable / 2 m; 2 x 0.5 mm <sup>2</sup>
------------	--

**Wiring**

Core colours

BN brown

BU blue



Note: miniature fuse to IEC60127-2 sheet 1,  
≤ 2 A (fast acting)

**Accessories**

Accessories (included)	2 lock nuts
------------------------	-------------

**Remarks**

Remarks	Recommendation: check the unit for reliable function after a short circuit.
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Pack quantity [piece]	1
-----------------------	---

ifm electronic gmbh • Friedrichstraße 1 • 45128 Essen — We reserve the right to make technical alterations without prior notice. — GB — IG0006 — 06.03.2003

# **APPENDIX D**

## **SOLENOID VALVE DETAILS**

# 5 PORT SOLENOID VALVE SY/SX SERIES

## BODY PORTED TYPE/ BASE MOUNTED TYPE

- ✓ Compact design with large flow rate
- ✓ Fast response 10ms or less
- ✓ Low power consumption-0.5W(SY)/0.6W(SX)
- ✓ Long life,50 million cycles or more
- ✓ Improved anti-drain performance

### MANIFOLD VARIATION

Large flow &amp; compact size

SY/SX 3000 10mm width 0.3CV

SY/SX 5000 15mm width 0.7 CV

SY/SX 7000 18mm width 1.2CV

SY3000/5000/7000



SX3000/5000/7000

One side pilot valve with SI Unit



### TECHNICAL SPECIFICATIONS

Series		SY3000 SX3000	SY5000 SX5000	SY7000 SX7000
Fluid		Air		
Operating pressure range of internal pilot kPa	2 position single	150~700kPa		
	2 position double	100~700kPa		
	3 position	200~700kPa		
	Operating pressure range	0~700kPa		
Operating pressure range of external pilot kPa	Pilot pressure range	2 position single	150~700kPa	
		2 position double	100~700kPa	
		3 position	200~700kPa	
Cv factor (Effective orifice mm <sup>2</sup> )	Body ported type	0.23(4.1)	0.59(10.6)	1.0(18.0)
	Base ported type(with sub plate)	0.3(5.4)	0.7 (12.6)	1.2(21.6)
Ambient and fluid temperature °C		Max.50		
Response time (ms) (At 500kPa)	2 position single	10 or less	15 or less	20 or less
	2 position double	15 or less	25 or less	35 or less
Max.operating frequency (Hz)	3 position	10	5	5
	Operating pressure range	3	3	3
Manual override		Non-locking push type (tool type)		
Pilot exhaust	Internal pilot	Common exhaust for main and pilot valve		
	External pilot	Individual pilot exhaust		
Lubrication		Not required		
Mounting		Free		
Impact / Vibration resistance (G)		15/3 (8.3~200Hz)		
Protection structure		Dust proof		

### SERIES SX SOLENOID SPECIFICATIONS

Electrical entry		Grommet (G),L type plug connector (L), M type plug connector (M)
Coil rated voltage (V)	DC	24, 12, 6, 5, 3
		*100,*115
Allowable voltage		± 10% of rated voltage
Power consumption (W)	DC	0.6 (With light : 0.65)
Surge voltage suppressor		Diode
Indicator light		LED

### SERIES SY SOLENOID SPECIFICATIONS

Electrical entry			Grommet (G),L type plug connector(L), M type plug connector (M)
Coil rated voltage (V)	DC		24, 12, 6, 5, 3
	AC <sup>50</sup> Hz		*100, *115
Allowable voltage			± 10% of rated voltage
Power consumption (W)	DC		0.5 (With light : 0.55)
	AC	100V	1.25 (With light : 1.4)
		115V	1.45 (With light : 1.6)
Surge voltage suppressor			Diode
Indicator light			LED

\*100 and 115 VAC are applicable only to L and M-type L plug connectors.  
Use them in combination with a connector ass'y equipped with a rectifier.

Please contact  
SMC for more  
details

# 5 PORT SOLENOID VALVES SERIES SY/SX

## New Technology

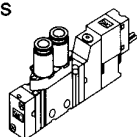


### SY SERIES VARIATION

### NEW

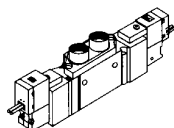
BODY PORTED  
TYPE SINGLE

With one-touch  
fittings

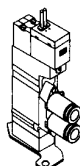


SY3 □ 20•5 □ 20•7 □ 20

Screwed type



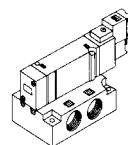
With  
blacket



BASE PORTED  
TYPE SINGLE

SY3 □ 40•5 □ 40•7 □ 40

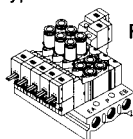
Screwed type



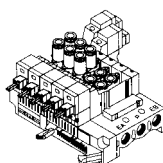
MANIFOLD  
SINGLE  
BASE TYPE

20

Individual wiring type



Flat cable type

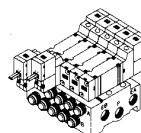


MANIFOLD

41

Single base type  
SY3 □ 40•5 □ 40

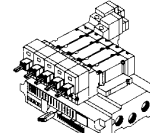
Individual wiring type



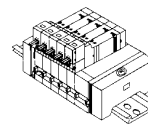
45

Individual base type  
SY3 □ 40•5 □ 40

Flat cable type



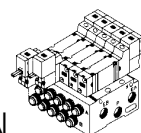
Individual wiring type



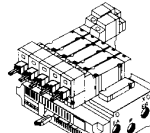
42

Common and external pilot type  
SY3 □ 40•5 □ 40•7 □ 40

Individual wiring type

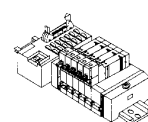


Flat cable type



45

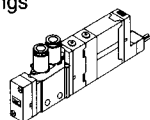
Flat cable type with  
connector box



### SX SERIES VARIATION

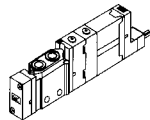
BODY PORTED  
TYPE SINGLE

With one-touch  
fittings

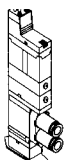


SX3 □ 20•5 □ 20•7 □ 20

Screwed type



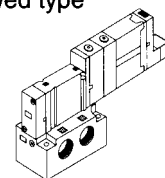
With  
blacket



BASE PORTED  
TYPE SINGLE

SX3 □ 40•5 □ 40•7 □ 40

Screwed type

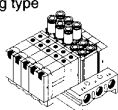


MANIFOLD

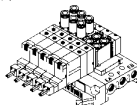
20

Single base type  
SX3 □ 20•5 □ 20•7 □ 20

Individual wiring type



Flat cable type

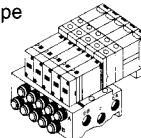


MANIFOLD

41

Single base type  
Compact type  
SX3 □ 40•5 □ 40

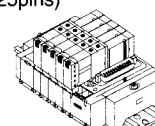
Individual  
wiring type



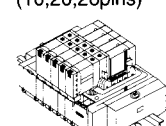
45

Individual base type/DIN rail  
Plug-in type  
SX3 □ 40•5 □ 40

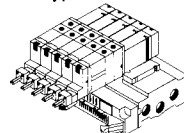
D sub connector type  
(25pins)



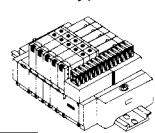
Flat cable type  
(10,20,26pins)



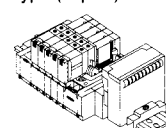
Flat cable type



Terminal type



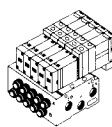
Serial transmission  
type (20pins)



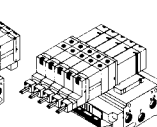
42

Common and external pilot type  
SX3 □ 40•5 □ 40•7 □ 40

Individual wiring type

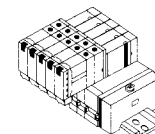


Flat cable type



45

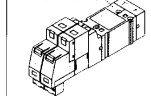
Non plug-in type  
SX3 □ 40•5 □ 40



Valve can be easily relocated  
to new DIN rail positions.

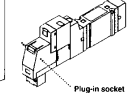
Double solenoid

Block for pilot air passage

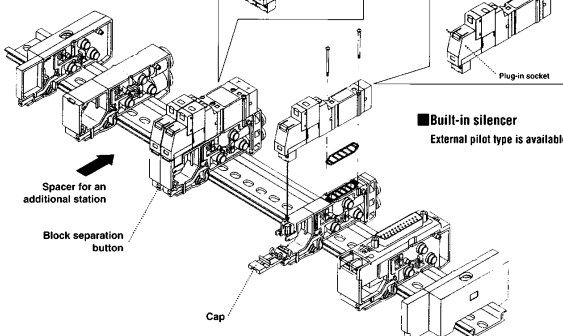


Non-polar type surge voltage  
suppressor employed allows  
valves to be mounted on either  
a positive or negative common  
manifold base.

Single solenoid



Built-in silencer  
External pilot type is available.



Spacer for an  
additional station

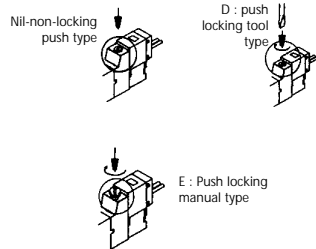
Block separation  
button

Cap

How To  
ORDER

NEW

MANUAL OVERRIDE



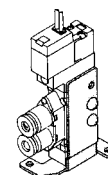
PORT SIZE

Port size		Model
M5	M5x0.8	SY3000
C4	one-touch fitting	
C6	one-touch fitting	
O1	Rc(PT)1/8	SY5000
C6	one-touch fitting	
C8	one-touch fitting	
O2	Rc(PT)1/4	SY7000
C8	one-touch fitting	
C10	one-touch fitting	

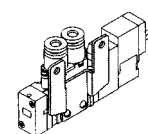
BLACKET

Nil ...Without Blacket  
F1 ...With foot Blacket  
F2 ...With side Blacket

F1 :



F2 :



Body ported type SY 5 1 2 0 - 5 G \* \* - M 5 - \*

Base mounted type SY 5 1 4 0 \* - 5 G \* \* - \*

SYMBOL  
3 .....CV 0.3  
5 .....CV 0.7  
7 .....CV 1.2

SYMBOL  
1:2 position single solenoid  
2:2 position double solenoid  
3:3 position closed centre  
4:3 position exhaust centre  
5:3 position pressure centre

PILOT VALVE SPECIFICATION

Nil ...Internal pilot  
R .....External pilot

VOLTAGE

3 .....VDC  
5 .....24VDC  
6 .....12 VDC  
V .....6VDC  
S .....5VDC  
R .....3VDC  
\*D1 ...100VAC,50/60Hz  
\*D3 ...115VAC,50/60Hz  
\*D4 ...230 VAC  
\*) ...100VAC and 115VAC is applicable only to L-type and M type plug connector  
Use with connector Ass'y with rectifier.

PORT SIZE

Nil ...without subplate  
O1 ...With subplate

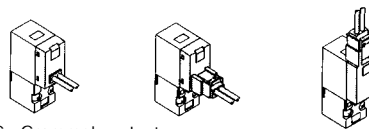
LAMP & SURGE

VOLTAGE SUPPRESSOR

Nil ...Without lamp,surge voltage suppressor  
S .....With surge voltage suppressor  
Z .....With lamp,surge voltage suppressor  
Note)AC: No S type since the generation of surge voltage is prevented by connector Ass'y with rectifier.

ELECTRICAL ENTRY

DC24V,12V,6V,5V,3V / AC110V



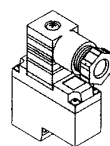
G : Grommet

L : type

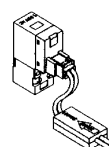
M : type

DC24V,12V  
AC110V,220V

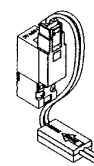
AC230V(D4) with rectifier



D : DIN type



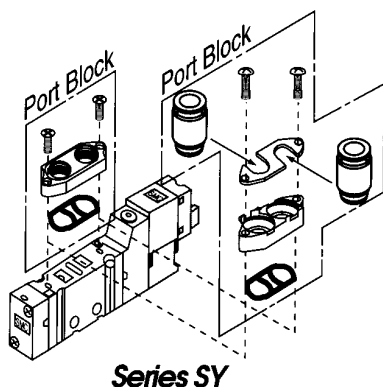
L : type



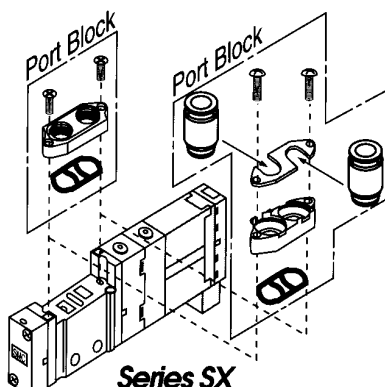
M : type

## CHANGEABLE CYLINDER PORT SIZE (DIRECT PIPING TYPE)

Changeable port size/ one touch fitting			
SY3000 SX3000	C4	C6	M5
SY5000 SX5000	C6	C8	Rc1/8
SY7000 SX7000	C8	C10	Rc1/4



Series SY



Series SX

For further technical  
deails on this product,  
request catalogue from  
SMC



# SPIRAC SPIROTAINER

## INSTALLATION, OPERATION & MAINTENANCE MANUAL

Doc No : 7149-IOM-01

Rev : A

Compiled By : RC

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SPIRAC Client : **Veolia Environmental Services**  
Contract / PO No. : **4502709865**  
SPIRAC Project No : **7149**



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# 1.0 INTRODUCTION

## 1.1 GENERAL

We welcome you as a user of SPIRAC Spirotainers. Your Spirotainer is a product of careful engineering and skilled workmanship. We believe you have the best Spirotainer possible for the service intended. With reasonable care and preventive maintenance it will give you long, efficient, trouble-free service.

**Your attention is drawn to this manual's Safety sheet in section 7.SAFETY.**

This manual is furnished to acquaint you with some of the practical ways to install, operate and maintain this Spirotainer. Read it completely before doing any work on your unit and keep it handy for future reference.

All SPIRAC Spirotainers are built to convey different types of materials that may be wet, half fluid, sludgy, uneven or hygienically demanding etc. However every Spirotainer is custom built to give maximum efficiency for the specified material being conveyed. It is not acceptable to convey any product other than that noted in the Specification Sheets.

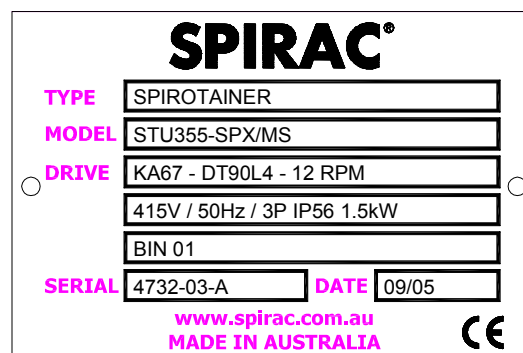
Any modification, change or rebuilding of the Spirotainer must be approved in writing by SPIRAC so that machine damage and personal injury are avoided and that documentation is relevant.

Only trained or instructed staff with clearly defined responsibilities for the operation, set up, maintenance or repair on the conveyor should be used.

In the event of any queries please contact your nearest SPIRAC representative.

## 1.2 PRODUCT IDENTIFICATION

There is one identification plate (ID) on each Spirotainer. *Figure 1.2a* shows an example of a typical ID plate.

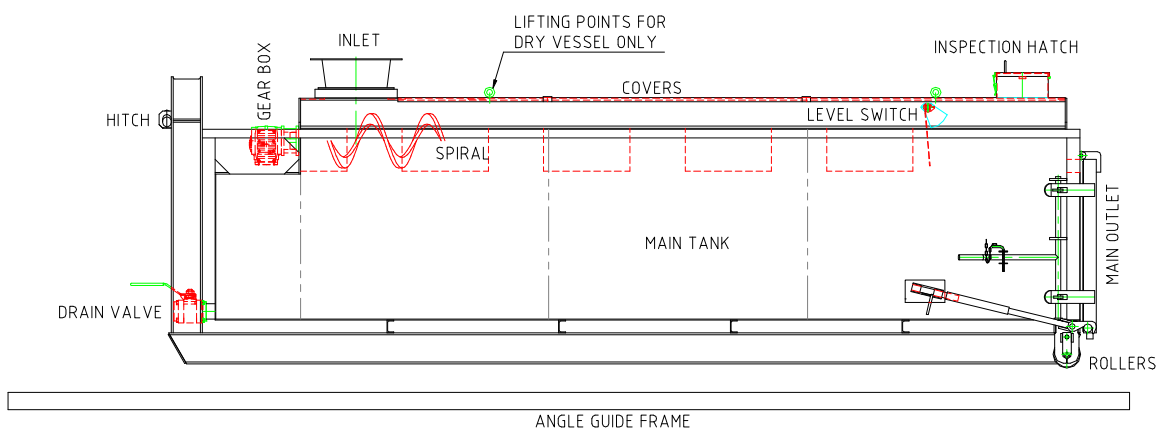


*Figure 1.2a*

Permanent records for this Spirotainer are kept by Serial Number and it must, therefore, be used with all correspondence and spare parts orders. The last sequence of numbers is specific to that Spirotainer and is utilised on orders of more than one Spirotainer. This sequence of numbers is also the end users equipment tag numbers.

### 1.3 **PRODUCT DESCRIPTION**

The Spirotainers' parts can vary in appearance due to the fact that all SPIRAC Spirotainers are custom built. The figure below (*Figure 1.3a*) shows the principal parts of the Spirotainer. Drawings of each particular Spirotainer can be found in Appendix 'General Arrangement Drawings'.



*Figure 1.3a - Principal Parts of the Spirotainer*

The material is fed into the spiral via the inlet knifegate. The spiral moves the material with a rotating steel spiral. Various openings along the trough within the main tank allow the material to be evenly distributed within. The spiral's diameter and pitch are relevant to the material being conveyed. The steel spiral has only one bearing, at the drive end. The spiral is a helix without a centre shaft. This gives the conveyor more space for and less sensitivity to the material being conveyed. Because the spiral has no centre shaft it is always in contact with the trough when it rotates. A replaceable liner therefore protects the trough. The liners are available in several different materials (plastic, steel, etc.) depending on the material being conveyed.

The lifting hitch located at one end of the main tank allows the unit to be hoisted onto the back of a suitably equipped vehicle. Wheels (optional) at the opposite end allow for easy movement during the hoisting stage. Lifting eye bolts must be removed after delivery. These are supplied for lifting the vessel while empty with the use of a crane.

The rear door is closed via two side clamp mechanisms and one central underside clamping mechanism that seal the entire door area. When discharging the main tank contents, these clamps have to be released prior to tipping. Industry regulations should be adhered to during dumping of the waste product. A drain valve located at the hitch end at the lowest most point allows for drainage of excess moisture from the main tank during filling. This valve needs to be closed during transit.

The inlet to the main tank has a manual knifegate fitted. A spring bolt allows the blade to be locked in either open or closed state. The knifegate should be closed during transit.

Optional items can be fitted such as ;

- Level switches to indicate that tank is full.
- Motion sensors on the spiral to indicate breakage or blockage.
- Load cells under guide frame, again to indicate if main tank is full.
- Proximity switches on the inlet knifegate to indicate open or closed.
- Secondary inlet.
- Motor/instrument leads c/w plug and sockets.

## **2.0      INSTALLATION**

### **2.1      GENERAL**

These instructions must be carried out in the order stated to prevent machine damage and personal injury.

Check Spirotainer for shortages and damage immediately upon arrival (an absolute must!). Prompt reporting to the carriers agent, with notations on the freight bill, will expedite satisfactory adjustment by the carrier.

Spirotainers are normally shipped from the factory uncovered and sitting on top of their guide frame.

Before the Spirotainer is installed its dimensions must be checked against the dimensions on the installation drawing.

Make sure the inlets to the Spirotainer are angled to suit the equipment feeding it.

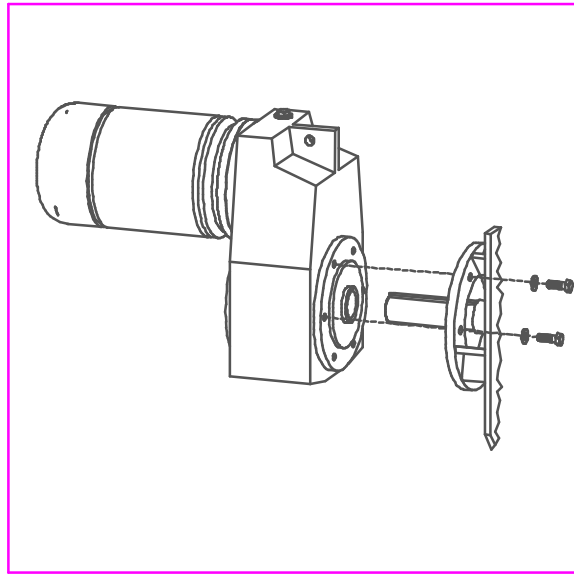
The foundation must be substantial enough to absorb vibration (recommendations of the foundation to weigh at least 5 times the weight of the Spirotainer). The foundation must form a permanent and rigid base for the Spirotainer guide frame. This is important in maintaining the alignment of the Spirotainer when removing / re-installing.

Check to make sure that there are drains if these are required.

### **2.2      MOUNTING THE DRIVE ASSEMBLY**

Occasionally the drive assembly is delivered not attached to the Spirotainer. If your Spirotainer has the drive assembly sent separately, it is delivered ready to be attached.

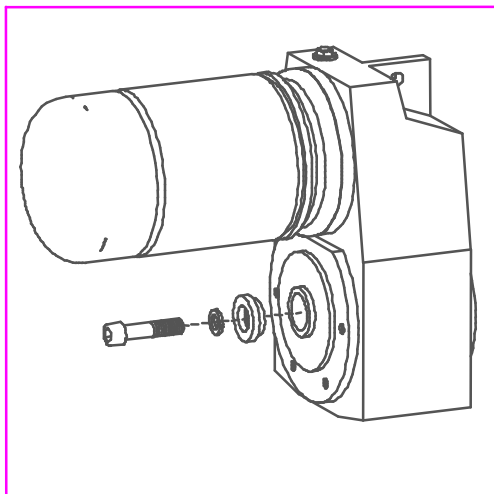
1. Remove the transport lock from the spirals' drive shaft.
2. Remove the tape holding the key to the drive shaft.
3. If the drive shaft is not stainless steel it is treated with rust inhibitor. Use degreaser to remove this.
4. Remove the cover from the motors cooling fan so that the drive shaft can be turned using the fan.
5. Turn the drive shaft so that the key-way comes to the right position for the spirals' drive shaft and then push the gearbox onto the drive shaft.
6. Bolt the gearbox to the bell housing flange with the bolts, nuts and washers provided (see *Figure 2.4a*).



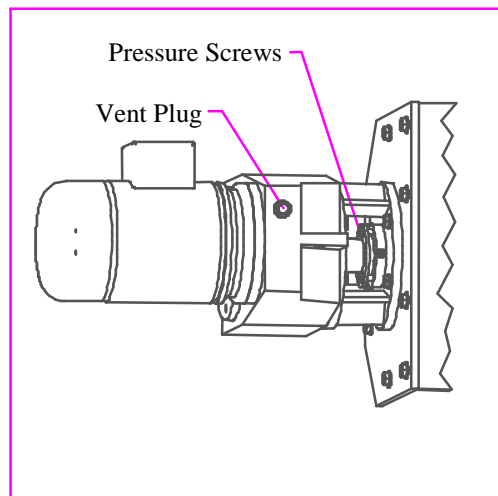
*Figure 2.4a - Mounting the Drive Assembly*

7. Fasten the locking bolt, spring washer and stepped spacer to the spirals drive shaft in order to fasten this in the gearboxes drive bore (see Fig 2.4b). When the spiral's drive shaft is firmly positioned in the drive bore the locking bolt should be tightened to the torque specified (refer Sect. 2.1).

*NB - The spiral must be pushed back towards the drive so that the locking bolt can be threaded into the drive shaft.*



*Figure 2.4b - Fastening the Motor*



*Figure 2.4c - Tightening the Pressure Screws*

8. Tighten the pressure screws until the gap between the packing box and the gland is only about 7mm wide. Tighten the screws alternately and check the gap is even after the screws are tightened (see Fig 2.4c).
9. Fill the packing box with grease (see Sect. 4.3).
10. Replace the cooling fan cover to the motor.
11. Remove the screw on the top of the gearbox and attach the vent plug that is provided. (If not already done so.)
12. Check level of oil in the gearbox (see Appendix 'Lubrication Check Sheet' for position of filler plug).

## **2.3 CONNECTION TO SUPPORT STRUCTURE**

All Spirotainers are supplied with channel runners under the main container that run on top of a weigh or guide frame. No permanent fixing is required for the Spirotainer. The weigh/guide frame must be bolted down to the surface that it is intended. This must be positioned such that the spirotainer is located correctly with the connecting equipment.

## **2.4 ELECTRICAL**

Spirotainer component manufacturers generally do not provide electrical equipment to control the Spirotainers. In selecting electrical control equipment to be used with any Spirotainer installation, the purchaser must use equipment conforming to the local electrical regulations. Consideration should be given to some or all of the following devices and to others that may be appropriate.

- Overload Protection - Devices such as electronic shear pins, torque limiters and so forth are used to shut off power whenever operation of the conveyor is stopped as a result of excessive material, foreign objects, excessively large lumps and so on.
- No-Speed Protection - Devices such as zero speed switches to shut off the power in the event of any incident that might cause the conveyor to stop operating.
- Safety shut off switch with power lock-out provision at conveyor drive.
- Emergency stop switches readily accessible whenever required.
- Electrical inter-locking to shut down feeding conveyors whenever a receiving conveyor stops.
- Signal devices to warn personnel of imminent start-up of conveyor, especially if started from a remote location.
- Special enclosures for motors and controls for hazardous atmospheric conditions.

## **2.5 WELDING**

When welding it should be noted that the steel is affected by heat. Overheating should therefore be avoided. If welding stainless steel ensure that the consumable material is as resistant to corrosion as the parent metal. The consumable should therefore contain as much alloy as the parent metal. Welding together two dissimilar materials should be avoided due to the risks for hair-line fractures, reduced weld strength and a greater propensity to corrode due to electrolytic action.

The weld surfaces should be degreased with acetone (or an equivalent solvent) immediately prior to welding. The material should be degreased at least 60mm from the weld surface.

The following electrodes should be used for arc welding;

<b><i>ELECTRODE TYPES</i></b>	
OK 4800	For spirals of special steel (the electrode dimension should be at least 2mm to avoid overheating).
OK 4800	For mild steel or HTMAS.
OK 6130	For stainless steel.
OK 6330	For acid resistant stainless steel to mild steel (or to HTMAS).
OK 6333	For stainless to mild steel (or to HTMAS).

Suitable electrode sizes are 2.0 to 3.25mm depending on where the weld is placed.

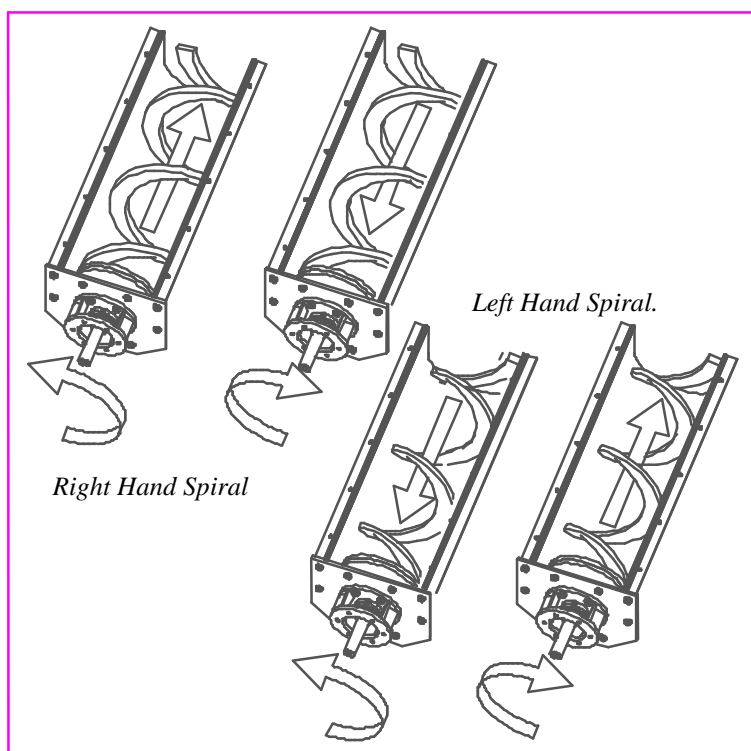
## 3.0 OPERATION

### 3.1 PRE-START CHECKS

Only persons completely familiar with the safety aspects (as detailed in Sect. 7.0) should be permitted to operate the Spirotainer. The operator should thoroughly understand these instructions before attempting to use the Spirotainer. Failure to follow these precautions may result in serious personal injury or damage to equipment.

Before the initial start-up of the conveyor, make the following inspections;

1. Check to make sure the gearbox is securely fastened to the Spirotainer bulkhead.
2. Check all connections to the motor and starting device with the wiring diagram. Check the voltage, phase and frequency on motor nameplate.



*Figure 3.1a - Direction of Rotation*

3. Remove motor cooling fan cowl and rotate spiral via fan to ensure that it rotates freely. At the same time check spiral rotation and that material will flow towards outlet.
4. Check gland packing box adjustment, lubrication and piping (if supplied).
5. Check gearbox lubrication level.
6. Make sure all covers, guards and safety equipment are properly installed.

### **3.2 OPERATIONAL CHECK-LIST**

The following should be used upon initial start-up and after extended shut-down periods.

1. Operate Spirotainer empty for 15-30mins, making a continuous check for heating of gearbox bearings and noisy operation.
2. Check that the discharge of the conveyor inside the Spirotainer is clear before feeding any material.
3. Increase feed rate gradually until rated capacity is attained.
4. Stop and start Spirotainer several times, and allow to operate for several hours.
5. Shut off Spirotainer and lock out power supply. Remove covers and check coupling bolts for tightness.
6. Replace covers.
7. Ensure material is "flowing" in the correct direction.
8. Make certain that the conveyor controls (e.g. motion sensor, slide gates) are interlocked correctly and functional.



### **3.3 LOADING AND UNLOADING OF BINS**

Care should be taken to load and unload the bins. Things to consider are:

1. Adhere to the correct safe operating procedures for the vehicle and bin lift mechanisms.
2. Be watchful of potential risk to personnel in the area.



3. If provided, activate the bin unloading function. This is sometimes provided to prevent material discharge to the bin during the change over / unloading period.
4. Look for any possible points of contact and remove the obstructions. I.e. retractable chutes, other surrounding equipment
5. Ensure the electrical plugs are disconnected and secured in the dummy sockets. Use appropriate access facilities if required.
6. Disconnect drain lines as required.
7. Ensure the lifting hook is correctly located on the lifting bar at all times
8. Ensure the spirotainer is running well between the rear rollers on the truck. Using the tapered section of the rollers may result in deformation of the lower rails. Ensure the bin is located in line with the truck.
9. If there is a strengthened area of the lower rails, ensure that the rollers at the end of the truck come in contact with the re-enforcement. This should be at approximately 30 deg inclined angle.
10. Ensure the load is secure and the door fastened before transportation.



### Weigh Frame specific notes

1. When loading the bin onto the weigh frame it is important that any direct point load is not taken by any unsupported sections of the weigh frame.
2. The bin should be positioned ahead of the weigh frame and pushed back in the horizontal position. This is done to effectively distribute the load on the weigh frame.
3. To collect the bin. It should be dragged forwards clear of the weigh frame or positioned such that the load point on the frame is directly over the load cells prior to elevation.

These steps will ensure long life of the load cell and weigh frame system.

Any irregular loading onto the frame may cause failure of the weigh frame system.

### **3.4 DISCHARGING CONTENTS**

1. Reverse truck to dumping position – make sure bin is still horizontal.
2. Operator to actuate ratchet in Location A and extend far enough center locking arm to clear the center pin under the door. This releases the lower central hook point.

**Location A**



3. Operator to slide handle in Location B (do not walk behind bin, go around front of cab) forward (towards truck cab) and push lever as far downwards as possible. This release's the lower door hooks on both sides via a common shaft.

**Location B**



4. Operator to actuate ratchet in Location C on both sides (do not walk behind bin, go around front of cab) and extend until side hooks have been released and clear the side tabs.

Location C  
(Both  
Sides)



5. The Spirotainer is now ready to be elevated on an angle to empty contents.
6. Never stand directly behind rear door during tipping.
7. Whilst the Spirotainer is still in the elevated position, check to see if all contents have been removed and clean off back sealing strip and contact faces of any clinging material.
8. Lower Spirotainer and seal off rear door by following reversal of above steps

### **3.5 EXTENDED SHUT-DOWN**

If the Spirotainer is to be inoperative for a long period of time, it is advisable to permit it to operate for a period of time after the feed has been cut-off in order to discharge as much material as possible from the trough. The trough should be cleaned completely after the Spirotainer has been emptied, shut down and the power locked out. Clean out the contents of the bin.

## 4.0 MAINTENANCE

### 4.1 GENERAL

Generally it is necessary to establish routine periodic inspections of the entire Spirotainer to ensure continuous maximum operating performance. Practice good house keeping. Keep the area around the Spirotainer and drive assembly clean and free of obstacles to provide easy access and to avoid interference with the function of the Spirotainer or drive.

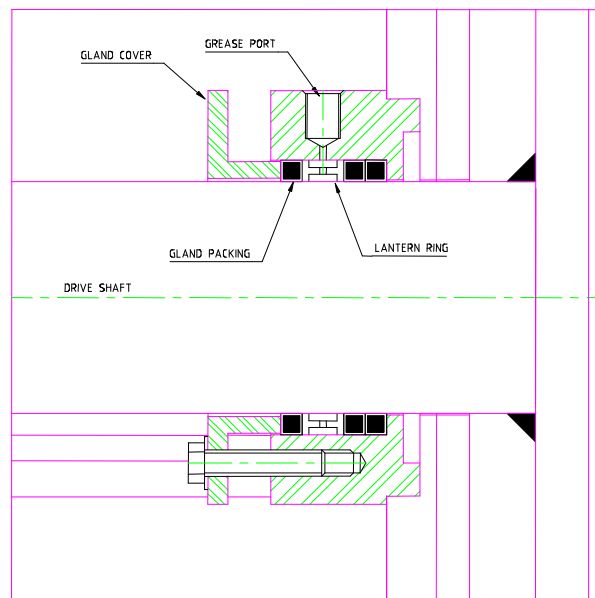
Always –

1. Follow the established local regulations and/or procedures for isolation of equipment.
- Or-
2. Lock-out power to motor before doing any maintenance work preferably with a padlock on control panel or isolator.
  3. Do not remove padlock from control, nor operate Spirotainer, until covers and guards are securely in place.

### 4.2 PACKING GLAND ADJUSTMENT

Packing gland bolts should be evenly adjusted so they are little more than finger tight. Over tightening of the packing gland may result in premature packing failure and possible damage to the shaft and gland.

When packing is new, frequent minor adjustments during the first few hours (if material being conveyed is very fluid) of operation are recommended in order to compress and seal the packing.



*Figure 4.2a - Packing Box Arrangement*

### **4.3 LUBRICATION**

Please refer to the Appendix 'Lubrication Check Sheets' for Grease and Oil types for your particular Spirotainer.

### **4.4 SURFACE COATING**

This section describes how the conveyors surfaces should be treated, if made of stainless steel or not. The materials of construction for your particular Spirotainer are specified in the Appendix 'Spirotainer Data Sheets'.

Operation in sewage treatment plants or damp environments exposes the Spirotainer to air that may contain chemically or biologically corrosive particles. In these cases painted, galvanised and stainless steel surfaces can be damaged. It is therefore important that personnel follow the operating instructions and remedy any corrosion or damage to coatings as soon as they occur.

#### **Standard Procedure for Surface Repair**

- **Painted**

Please refer to United Water Surface Coating Specification , System 7 for paint types, thickness and repair.

- **Hot Dip Galvanised.**

The Spirotainer main tank, trough and protective cover have been Hot Dip Galvanised to AS1650 and AS1214.

Rust may be ground back to bare metal and the surface carefully cleaned before application of a suitable "Cold Galvanising" agent.

- **Stainless Steel.**

The materials used are 304 or 316SS (refer to Appendix 'Spirotainer Data Sheets'). These materials do not need any special treatment but the following should be observed.

Grinding or welding in close vicinity of the conveyor must be avoided. Showering sparks onto the stainless steel can cause a rust brown discolouration.

All stainless steel surfaces must be handled so that the corrosive resistance is not impaired. As a minimum the stainless steel should not come into contact with steel of other qualities during transportation or assembly. Wood, cloth or plastic should be used to pad the stainless steel when lifting or transporting the Spirotainer.

The heat input during welding leads to the formation of chromium oxides on the steel surface. The underlying material is depleted of chromium, increasing the risk for corrosion. Passivating removes the oxides, scale and slag. The surface is cleaned to bare metal and a thin protective layer, or "passive" layer, is built up. This restores optimal corrosion resistance and ensures that the weld will have the longest possible life.

## 4.5 MAINTENANCE TIME TABLE

The following checks outlined below are recommendations only. They can be adjusted to suit the operation time of the conveyor or incorporated into existing site maintenance procedures. It is important, particularly with all new equipment that it be monitored for performance / potential hazards and as a result specific procedures developed. Specific procedures for use on site need to be developed by the client which capture OHS and site access requirements. These should also be developed according to frequency of use and adapted to individual site process requirements.

<b>PREVENTIVE MAINTENANCE</b>	
<b>PERIOD</b>	<b>ACTIVITY</b>
<b>Weekly</b>	Check bell housing packing box temperature with a thermometer, not by hand. If over 60°C it may be due to lack of grease.
	Check for any unusual vibration or noise. Locate and rectify.
<b>Monthly</b>	Clean the Spirotainer inside and outside (if necessary). This is usual if the Spirotainer has been standing idle for long periods.
	Check the liner for wear. If yellow backing is showing through replace damaged section.
	Check gland packing box for leaks (if very moist materials). Re-tighten if necessary.
	Check the spiral for any excessive wear or unusual damage. A maximum of 20% of the spirals original sectional dimension can be worn away before it requires replacement. If the spiral is extremely long (>15m) it should be replaced before this level is reached.
<b>Half Yearly</b>	Check all fasteners (rear door latches, covers etc.).
	Check all main tank welds.
	Check the oil level in the gearbox and its colour. If the oil is heavily emulsified (cream-like) there is water in the oil. Rectify and replace.
	Check the control system, i.e. emergency stops, sequential control etc.

## 5.0 SERVICE

### 5.1 REPLACING THE GLAND PACKING

1. Empty Spirotainer of all material. Unscrew the gland cover screws and slide the cover back along the drive shaft.

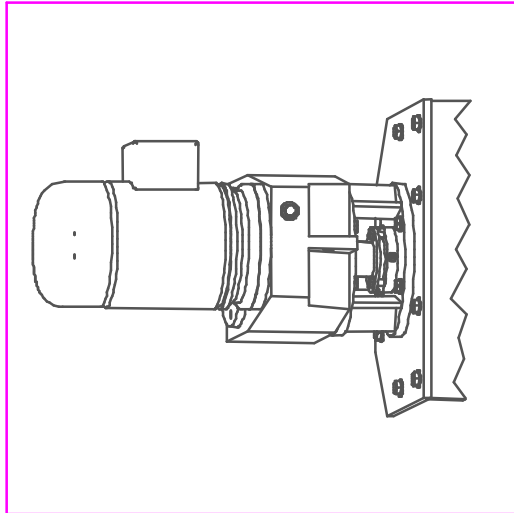


Figure 5.1a - Gland Cover Screws

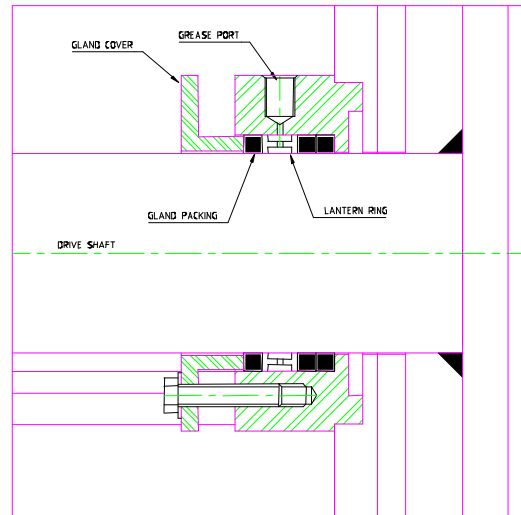


Figure 5.1b - Packing Box Assembly

2. Remove the packing and clean the packing box seats.
3. Cut the new packing with an angle (45 Degrees). Put tape around the packing before it is cut to prevent the ends from fraying.
4. Push the new packing into the packing box seat cut ends first.
5. Repeat this process for the other packs. Check that each is in place before the next is put in. The packs should be rotated by 90° to each other so that the joins are in different places.
6. Replace the gland cover and tighten the screws so that the packing is properly formed in the packing box seats.
7. Lubricate as per the Appendix 'Lubrication Check Sheets'.
8. Test run the Spirotainer with material to make sure the packing box does not leak.

### 5.2 REPLACING THE LINERS

Depending on what is to be conveyed the Spirotainer trough can be lined with different materials. There are three different types of liners -

- Plastic or UHMW Polyethylene
- Steel Bar
- Steel Plate

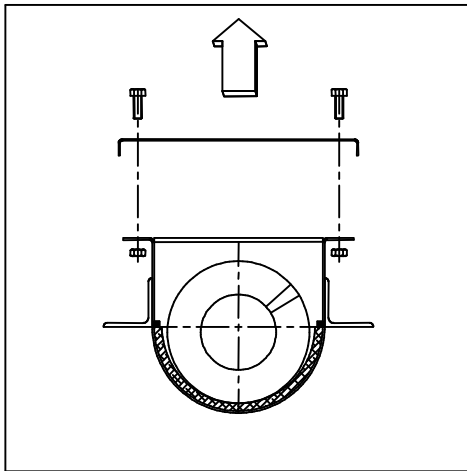
Technical data concerning the liners steel and plastic qualities is specified on the drawings.

Liners can often be replaced without the spiral being totally removed. However servicing is easier without the spiral in the trough.

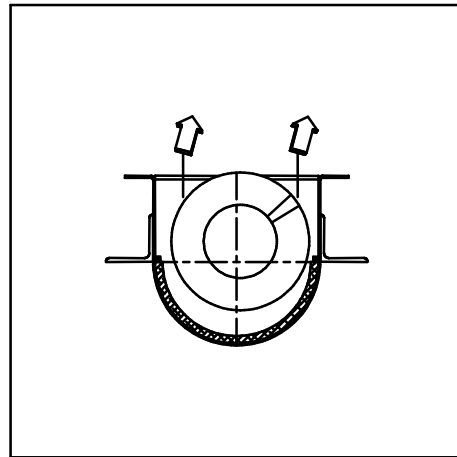
**Replacing the Plastic Liner -**

The new plastic liners are either delivered ready shaped or flat. The shaped liners should not be removed from their packaging until immediately before they are to be fitted. Once the liner has been removed from its packaging it takes only one hour for it to become flat and needs reshaping.

1. Empty the Spirotainer of material. Unfasten the lid and remove or push back from the trough (see Fig 5.2a).
2. Unfasten the nuts on the coupling disc bolts holding the spiral to the coupling disc.
3. Remove the spiral from the trough or lift it to increase accessibility (see Fig 5.2b).

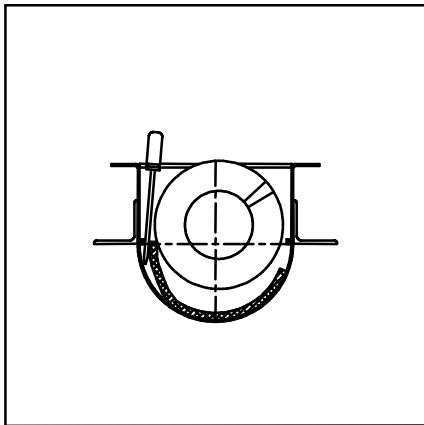


*Figure 5.2a - Taking off the Cover*

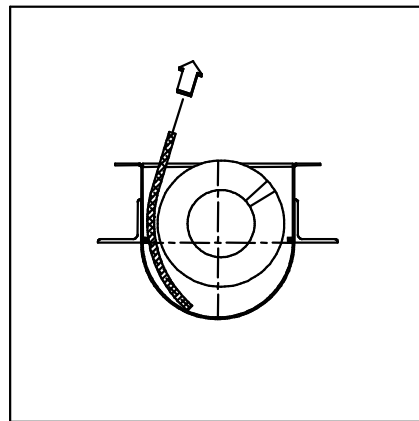


*Figure 5.2b - Lifting the Spiral*

4. Insert a heavy duty screw driver or lever down between the trough and the plastic liner so that it releases from its steel block retainers (see fig 5.2c).
5. Take hold of the liner and pull it out (see fig 5.2d).



*Figure 5.2c - Levering Out the Liner*



*Figure 5.2d - Pulling Out the Liner*

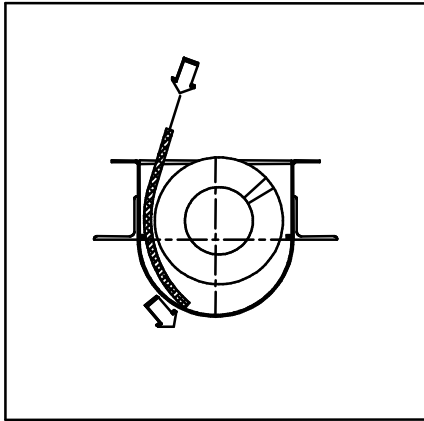


Figure 5.2e

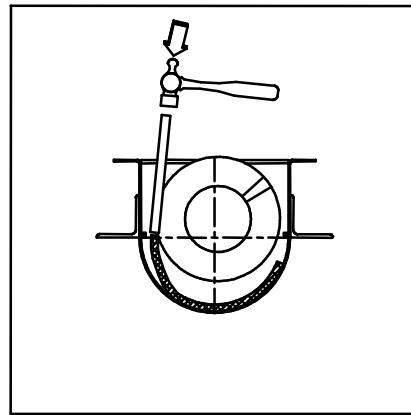


Figure 5.2f

6. Push the new liner under the spiral, making sure the wear indicator strip is at the bottom. It is important to secure the liner under the retainer blocks on each side of the trough (Figure 5.2e & 5.2f).
7. Replace the bolts holding the spiral to the coupling disc.
8. Replace the lid to the trough (Figure 5.2g).

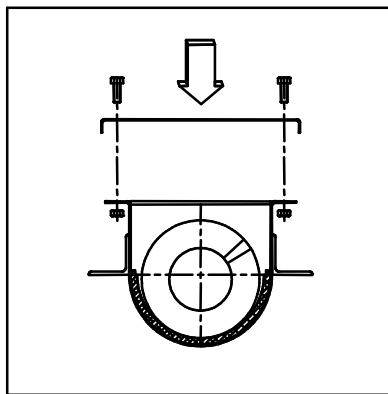


Figure 5.2g Replacing the Liner

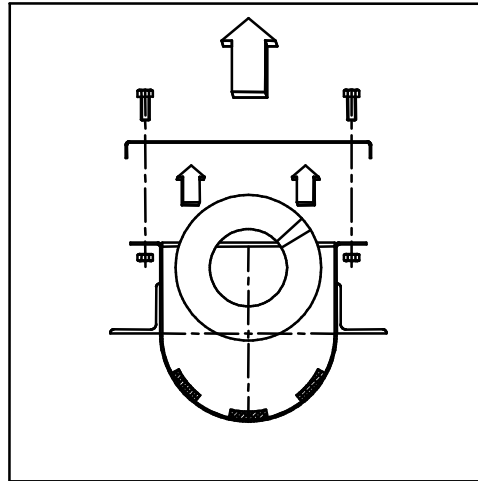
### **Replacing the Steel Bar and Steel Plate Liner -**

This section describes the replacement of both steel bar and steel plate liners.

The majority of the steps are common to both procedures. Where the steps differ, this is noted in the text. This procedure requires welding. See *Section 2.8 "Welding"* before commencing to weld.

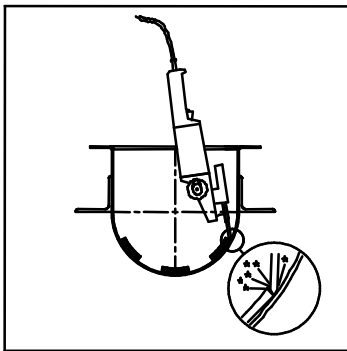
1. Unfasten the lid and remove or push back from the trough.
2. Unfasten the nuts on the coupling disc bolts holding the spiral to the coupling disc.
3. Remove the spiral from the trough or lift it to increase accessibility (fig 5.2h).



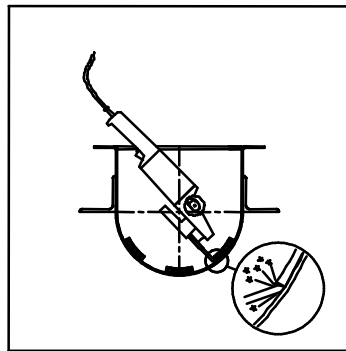


*Figure 5.2h - Taking off the Cover, Removing the Spiral*

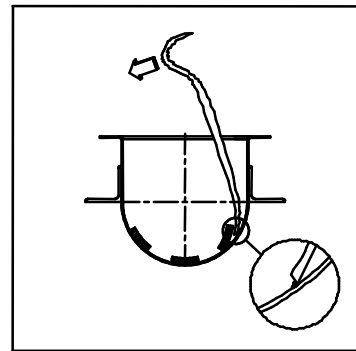
4. Use a grinder to grind away the welds from both sides of the steel bars (or steel plate liner) and remove the bars (liner) from the trough.



*Figure 5.2i*



*Figure 5.2j*



*Figure 5.2k*

5. Grind clean the surfaces where the old welds were positioned.
6. Degrease the surfaces (with acetone or a similar solvent) to prepare for the new steel bars (liners).
7. Take a new steel bar (steel plate liner) and fasten it in the position of the old one.
8. Check that the bars are all in line.
9. For steel plate liner:-place welds opposite each other along the length of the trough.  
For steel bars:- Put welds (75run/250pitch) along the length of the bar. The welds should alternate from the left to the right hand side of the bar (125pitch). Make sure the ends of the bars are welded to the trough (fig 5.2l).
10. Repeat this procedure for the other steel bar liners.
11. Replace the spiral to the trough and fasten it to the coupling disc.
12. Replace the protective cover to the trough (fig. 5.2m).

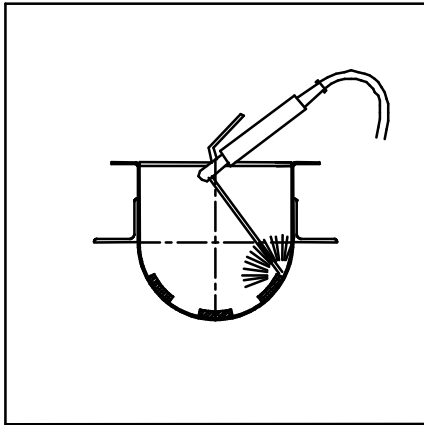


Figure 5.2l

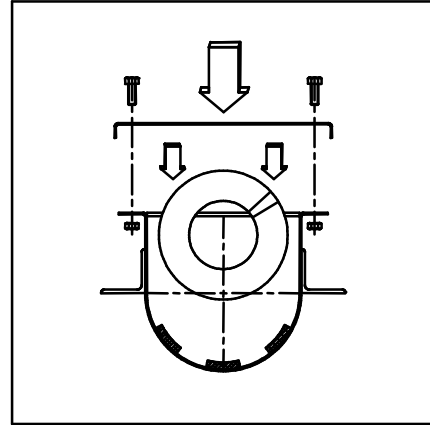


Figure 5.2m

### **5.3 REPLACING THE SPIRAL**

There should be no welded joints in the spiral closer than 4 spiral-turns to the spirals coupling disc.

1. Undo the bolts holding the protective cover and remove it from the trough.
2. Check the new spiral has the dimensions given on the drawing and check against the existing spiral.
3. Un-bolt the spirals coupling disc from the drive shafts coupling disc.

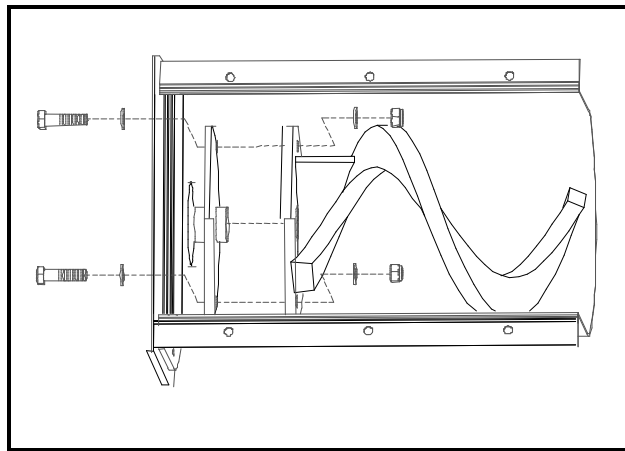
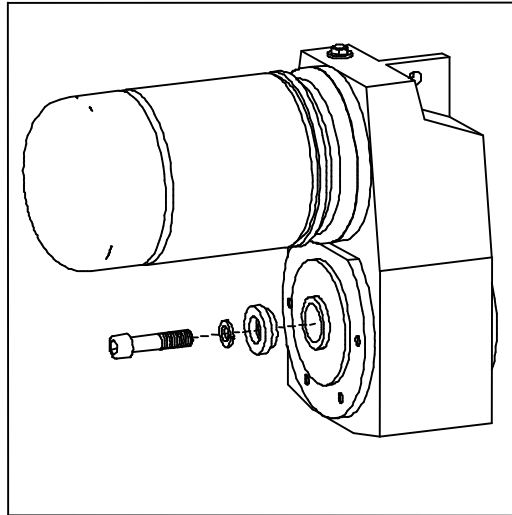


Figure 5.3a - Removing the Spiral

4. Lift the spiral from the trough. Depending on the local facilities the spiral can be removed in several ways. The spiral can be either lifted, pushed out through the troughs opening or cut into sections etc.
5. Place the new spiral in the trough.
6. Fasten the coupling discs together (use new locking nuts each time).
7. Replace the protective cover to the trough.

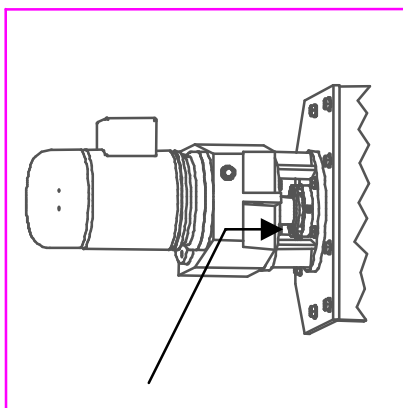
## **5.4 REPLACING THE DRIVE SHAFT**

1. Undo the bolts holding the protective cover and remove it from the trough.
2. Un-bolt the spirals coupling disc from the drive shafts coupling disc.
3. Remove the spiral from the trough or move it forward enough so that the drive shaft can be removed via the trough.
4. Unscrew the locking bolt, spring washer and stepped spacer from the drive shaft, located at the rear of the gearbox (see fig. 5.4a).
5. Remove the gland cover screws from the packing box (see Fig 5.4b).

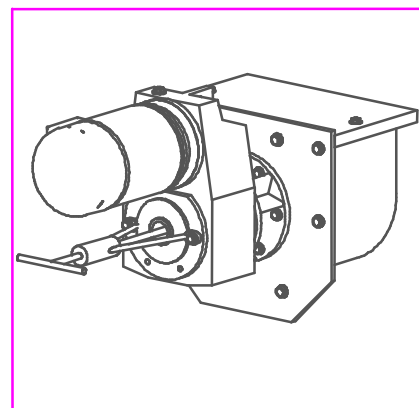


*Figure 5.4a - Remove the Locking Bolt, Spring Washer and Stepped Spacer*

6. Use an extractor tool to push the drive shaft into the trough. Remove the key from the gearbox keyway before the drive shaft goes through the packing box.  
*NB - The end of the drive shaft must be protected so that the threads are not damaged. A screw can be threaded into the end of the shaft before this is placed under pressure*
7. Remove the old drive shaft from the trough and lift in the new one .



*Figure 5.4b - Gland Cover Screws*



*Figure 5.4c - Using an Extractor Tool*

### **REPLACING THE DRIVE SHAFT cont.....**

8. Turn the gearbox hollow shaft so that the key way is in the correct position in relation to the spirals drive shaft. Push the new drive shaft in so that it takes the place of the old shaft. Place the key in the key way before the drive shaft goes into the gearboxes hollow shaft.
9. Screw the locking bolt, spring washer and stepped spacer into the new drive shaft.  
*NB - The spiral must be pushed towards the drive end in order for the locking bolt to thread into the drive shaft.*
10. Tighten the gland cover screws so that only a 7mm (approx.) gap remains between the packing box seat and the gland. Tighten the screws alternately and check the remaining gap after each turn.
11. Fasten the coupling discs together (use locking nuts).
12. Replace the protective cover to the trough.
13. Lubricate packing box as per Appendix 'Lubrication Check Sheets'.
14. Test run Spirotainer with material to make sure that the packing box does not leak. If there is heavy leakage tighten the gland cover screws.

*NB - DO NOT OVERTIGHTEN.*

## 6.0 TROUBLESHOOTING

### 6.1 GENERAL

Between regular maintenance inspections, be alert for signs of motor or Spirotainer trouble. Common symptoms are listed below. Correct any trouble immediately and AVOID COSTLY REPAIR AND SHUTDOWN.

Troubleshooting shall be done with the power supply disconnected and locked off, except for those checks which cannot be performed without voltage.

Always make sure there is no one near the Spirotainer when the power supply is turned on. Use the following table as an aid to troubleshooting. It is assumed the Spirotainer and installation have formerly functioned satisfactorily.

### 6.2 TROUBLESHOOTING CHART

PROBLEM	CAUSE	REMEDY
Spirotainer Conveyor Fails to Start	Blown Fuse	Determine and correct cause of failure and replace fuse
	Motor protection device activated	Reset protective device. Identify and correct cause for failure
	Motor protection device faulty or will not reset	Check protection device for faults
	Motor not connected for proper voltage	Check connection diagram in conduit box cover and correct the wiring.
Spirotainer Conveyor starts but motor protection device trips immediately	Spiral jam from foreign object entering trough.	Remove object and restart
	Gearbox seizure due to no oil	Remove gearbox and service
	Settings on motor protection incorrect	Check and re-set
	Motor improperly connected	Check connection diagram in conduit box cover and correct the wiring
Excessive vibration	Loose drive station	Check and re-tighten fixing bolts
	Unstable ground conditions	Rectify
	Loose support/trough connections	Check and re-tighten
Spirotainer Conveyor output is too low	Worn spiral screw	Replace spiral
	Material being conveyed is not as originally specified	Contact SPIRAC

**TROUBLESHOOTING CHART cont. . . . .**

<b>PROBLEM</b>	<b>CAUSE</b>	<b>REMEDY</b>
Motor overheats	Motor not connected for proper supply voltage	Check connection diagram on conduit box cover and correct wiring
	Insufficient cooling air volume due to obstructed air flow	Provide clearance around fan area
	Motor allowable duty cycle is exceeded. Too many starts per hour	The problem may not be solved by a larger unit. Review with manufacturer
	Single phasing due to break or loose connection in supply line or blown fuse	Repair supply line. Replace fuse
Spiral screw jamming	Excess material causing spiral to rise and interfering with lids/cross bars	Reduce material inflow. Install anti-lift bars
	Foreign object in conveyor	Remove object
	Liner has come loose and wedged itself inside the spiral	Remove and replace liner
	Incorrect alignment of screw when welding causing eccentric rotation	Confirm and replace/re-weld
Spirotainer Conveyor runs in wrong direction	Electrical cable leads wired incorrectly	Reconnect two phase wires.
Rear door seal leaking	Dee Seal worn.	Replace Dee Seal
	Dee Seal damaged during opening at waste site.	Replace Dee Seal
	Foreign object stuck between Dee seal and door jam.	Remove object, check Dee seal is OK and replace if necessary
Manual knifegates hard to open/close	Spring bolt is in the closed position.	Ensure spring bolt in the open position.
	Gradual build up of material in knifegate runner grooves.	Remove gate from main frame and flush out runner grooves.

## 7.0 SAFETY

### 7.1 GENERAL

The following instructions should always be observed when handling or working with the Spirotainer –

1. SPIRAC equipment is supplied conforming to AS 4024.1 - 2006 - Safeguarding of Machinery and complies providing all guards remain locked in place with the bolts supplied. Any work that necessitates removal of any guarding must be carried out in strict accordance with the SPIRAC Operation and Maintenance manual supplied. However Local work practices and regulations should be applied to the selection of any protective equipment or labeling that may be required.
2. Ensure the Spirotainer is maintained in accordance with section 4. MAINTENANCE of this manual.
3. Any person who will install, operate, service, repair or supervise the operation of this equipment must be trained and informed in accordance with local regulations and legislation.
4. Where local regulations dictate that Work method statements, Safe working practice statements, Job Safety Analysis, Pre-commencement Hazard checks and attendance to tool box meeting be adhered to, it is the responsibility of the owner/operator of this equipment to ensure the forenoted is actioned and recorded.
5. Always isolate the Spirotainer main power source and ensure that the Spirotainer cannot be started before commencing any servicing work.
6. Ensure that all service equipment, such as but not restricted to, chain blocks, slings, staging is well maintained and is in accordance with local regulation and legislation.
7. Never try to lift more than one item at a time i.e. protective covers (or lids).
8. Take care to avoid compression injuries when removing or replacing the spiral. Note that the spiral can slide out of the trough when the Spirotainer is inclined.
9. Personnel operating or servicing the Spirotainer should be equipped with the correct protective wear should a biological or mechanical hazard be present. Local work practices and regulations should be applied to the selection of the protective equipment.
10. Personnel working frequently in these areas where Spirotainers have remote control or automatic start/stop, must be informed of the operation.
11. On completion of any service work, please refer to this manuals section 3. OPERATION, for the necessary instruction on re-starting.
12. Ensure that no one is working on the Spirotainer before it is started.
13. Never use the Spirotainer for other purposes other than which it is designed or above its given capacity.
14. Personnel should never use the Spirotainer as a walkway to go to other areas.

### 7.2 NOISE

The equivalent continual A-wave noise level during normal operation is <70dB.

In cases where the equivalent continual A-wave noise level exceeds 70 dB, ear protection must be worn.

## 8.0 SPARE PARTS

### 8.1 SPIROTAINER PARTS DESCRIPTION

The list of spare parts gives the correct names for the parts of the conveyor and therefore eases the ordering of spare parts.

The dimensions and technical data for your conveyor are specified in Appendix 'General Arrangement Drawings'. Make sure you have the drawing available when ordering parts by telephone. Also refer to Technical Specifications in Appendix 'Conveyor Data Sheets'.

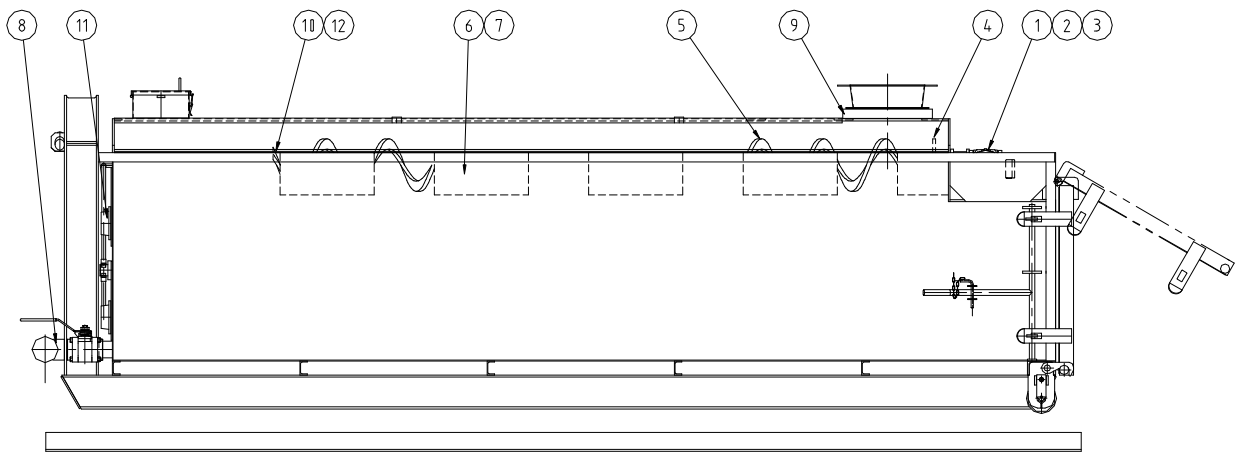


Figure 8-1. Spirotainer Parts

Conveyor Standard Parts		Accessories	
1	Motor and gearbox	8	Drain hose and gate valve
2	Bell Housing	9	Slidegate (Knifetype)
3	Drive shaft and coupling disc	10	Prox switch on discharge of spiral (opt)
4	Spiral and coupling disc	11	Diaphragm level switches (opt)
5	Spiral	12	Spiral motion sensor (opt)
6	Trough		
7	Liner		



## **8.2 RECOMMENDED SPARE PARTS**

SPIRAC have endeavoured to provide you with equipment that will give you continued and long lasting service. However, we recommend that the following wear items be kept as a minimum to ensure uninterrupted service:

<b>Drive Station</b>	Gland Packing	1 Set (for each size gearbox supplied)
<b>Conveyor</b>	Liners – Duraflo (with coloured wear backing) or Steel	Depends on conveyor length and type of liner originally supplied - Refer to Drawing
<b>Rear Door</b>	Dee Seal	1 x 10m section
<b>Instrumentation (Where applicable)</b>	Motion Sensing Probe	1 required (for each area)

For actual part numbers and descriptions, please refer to Technical Specifications in Appendix 'Spirotainer Data Sheets' and the Appendix 'General Arrangement Drawings', also quoting the drawing number.

## **8.3 SUPPLIER CONTACT**

SPIRAC has Sales Offices throughout the world. Manufacturing is undertaken in Australia and Sweden. If you are unsure of your Agent, please make your initial contact to –


SPIRAC Pty Ltd  
PO Box 1216  
BIBRA LAKE, DC WA 6965  
Western Australia  
  
Ph : +61 (08) 9434 0777  
Fax : +61 (08) 9434 0778  
Email: [info@spirac.com.au](mailto:info@spirac.com.au)

Or-

SPIRAC Pty Ltd  
Unit 43/5 - 7 Inglewood Place  
Norwest Business Park  
Baulkham Hills, NSW, 2153  
  
Ph : +61 (02) 9839 3700  
Fax : +61 (02) 9838 3777

**APPENDIX A**

**CONVEYOR DATA SHEETS**

	<b>Document Number :</b>	7149-CDS-01		
	<b>Project :</b>	Luggage Point WWTP		
	<b>SPIRAC Client :</b>	Veolia Environmental Services		
	<b>Conveyor Type :</b>	STU355-SPX/MSP		
	<b>SPIRAC Conveyor Tag :</b>	7149-01		
	<b>Drawing No :</b>	7149-01	<b>Rev :</b>	-

## CONVEYOR DATA SHEET

<b>Application Details</b>	
Mat to Convey/Store	Screenings
Particle Size	> 100mm (theoretical)
Capacity Bin (m3)	20
Density (kg/m3)	800
Temperature (°C)	17 - 24
pH	7 – 8


<b>Spiral Details</b>	
Main Spiral Dia / Pitch	A440/470
Main Spiral Section	75x25mm
Insert Spiral Section	NA
Rein Spiral Section	NA
Direction of spiral wind	Right hand wound
Pushing / Pulling	Pushing
Material	HTMAS

<b>Construction Details</b>	
Main Tank / Lids	3+5mm 316SS
Liner (Mat'l/Thickness)	DURAFLO SPX 15mm
Packing Gland	Buraflon 5846 / 6.35
Drive Shaft	316LSS
End Plates	10mm 316SS
Trough Sect Lgth (mm)	3 x 750mm Long
No. of Outlets	4 – Vert Down
No. of Inlets	1 – Vert Up
Guide Frame	1 x 316SS
Wgt – Dry (kg)	4000
Wgt – Wet (kg)	25000

<b>Motor Details</b>	
Manufacturer	SEW Eurodrive
Frame Size	DRE90L4
Rated Power (kW)	1.5
Motor Speed (rpm)	1400
Rated Current (A)	3.7
Insulation Class	'F'
Voltage / Hertz / Phase	415 / 50 / 3
IP Rating / Classification	IP56
Wgt (kg)	16

<b>Gearbox</b>	
Manufacturer	SEW Eurodrive
Model	KA67
Gearbox Ratio ( I )	90.04 : 1
Output Speed (rpm)	16
Max Output Torque (Nm)	910
Mounting Position	Horiz M1A 180
Oil Capacity (litres)	1.1
Wgt (kg)	28

<b>Optional</b>	
Local Control Panel	NA
Knifegates	Manual (x1)
Inspection Hatch	300x300 (x1)
Odour Outlet	NA
Drain Outlet	3" Valve c/w Kamlock
Motor / Socket	Marechal Male 4 Pin DSN1
Inst. / Socket	Amphenol Male 10 Pin
Prox Switch (knifegate)	NA
Level Switch (tank)	ULS200

	<b>Document Number :</b>	7149-CDS-02		
	<b>Project :</b>	Luggage Point WWTP		
	<b>SPIRAC Client :</b>	Veolia Environmental Services		
	<b>Conveyor Type :</b>	STU355-SPX/MSP		
	<b>SPIRAC Conveyor Tag :</b>	7149-02		
	<b>Drawing No :</b>	7149-01	<b>Rev :</b>	-

## CONVEYOR DATA SHEET

<b>Application Details</b>	
Mat to Convey/Store	Screenings
Particle Size	> 100mm (theoretical)
Capacity Bin (m3)	20
Density (kg/m3)	800
Temperature (°C)	17 - 24
pH	7 – 8


<b>Spiral Details</b>	
Main Spiral Dia / Pitch	A440/470
Main Spiral Section	75x25mm
Insert Spiral Section	NA
Rein Spiral Section	NA
Direction of spiral wind	Right hand wound
Pushing / Pulling	Pushing
Material	HTMAS

<b>Construction Details</b>	
Main Tank / Lids	3+5mm 316SS
Liner (Mat'l/Thickness)	DURAFLO SPX 15mm
Packing Gland	Buraflon 5846 / 6.35
Drive Shaft	316LSS
End Plates	10mm 316SS
Trough Sect Lgth (mm)	3 x 750mm Long
No. of Outlets	4 – Vert Down
No. of Inlets	1 – Vert Up
Guide Frame	1 x 316SS
Wgt – Dry (kg)	4000
Wgt – Wet (kg)	25000

<b>Motor Details</b>	
Manufacturer	SEW Eurodrive
Frame Size	DRE90L4
Rated Power (kW)	1.5
Motor Speed (rpm)	1400
Rated Current (A)	3.7
Insulation Class	'F'
Voltage / Hertz / Phase	415 / 50 / 3
IP Rating / Classification	IP56
Wgt (kg)	16

<b>Gearbox</b>	
Manufacturer	SEW Eurodrive
Model	KA67
Gearbox Ratio ( I )	90.04 : 1
Output Speed (rpm)	16
Max Output Torque (Nm)	910
Mounting Position	Horiz M1A 180
Oil Capacity (litres)	1.1
Wgt (kg)	28

<b>Optional</b>	
Local Control Panel	NA
Knifegates	Manual (x1)
Inspection Hatch	300x300 (x1)
Odour Outlet	NA
Drain Outlet	3" Valve c/w Kamlock
Motor / Socket	Marechal Male 4 Pin DSN1
Inst. / Socket	Amphenol Male 10 Pin
Prox Switch (knifegate)	NA
Level Switch (tank)	ULS200

	<b>Document Number :</b>	7149-CDS-03		
	<b>Project :</b>	Luggage Point WWTP		
	<b>SPIRAC Client :</b>	Veolia Environmental Services		
	<b>Conveyor Type :</b>	STU355-SPX/MSP		
	<b>SPIRAC Conveyor Tag :</b>	7149-03		
	<b>Drawing No :</b>	7149-01	<b>Rev :</b>	-

## CONVEYOR DATA SHEET

<b>Application Details</b>	
Mat to Convey/Store	Screenings
Particle Size	> 100mm (theoretical)
Capacity Bin (m3)	20
Density (kg/m3)	800
Temperature (°C)	17 - 24
pH	7 – 8

<b>Spiral Details</b>	
Main Spiral Dia / Pitch	A440/470
Main Spiral Section	75x25mm
Insert Spiral Section	NA
Rein Spiral Section	NA
Direction of spiral wind	Right hand wound
Pushing / Pulling	Pushing
Material	HTMAS

<b>Construction Details</b>	
Main Tank / Lids	3+5mm 316SS
Liner (Mat'l/Thickness)	DURAFLO SPX 15mm
Packing Gland	Buraflon 5846 / 6.35
Drive Shaft	316LSS
End Plates	10mm 316SS
Trough Sect Lgth (mm)	3 x 750mm Long
No. of Outlets	4 – Vert Down
No. of Inlets	1 – Vert Up
Guide Frame	1 x 316SS
Wgt – Dry (kg)	4000
Wgt – Wet (kg)	25000

<b>Motor Details</b>	
Manufacturer	SEW Eurodrive
Frame Size	DRE90L4
Rated Power (kW)	1.5
Motor Speed (rpm)	1400
Rated Current (A)	3.7
Insulation Class	'F'
Voltage / Hertz / Phase	415 / 50 / 3
IP Rating / Classification	IP56
Wgt (kg)	16

<b>Gearbox</b>	
Manufacturer	SEW Eurodrive
Model	KA67
Gearbox Ratio ( I )	90.04 : 1
Output Speed (rpm)	16
Max Output Torque (Nm)	910
Mounting Position	Horiz M1A 180
Oil Capacity (litres)	1.1
Wgt (kg)	28

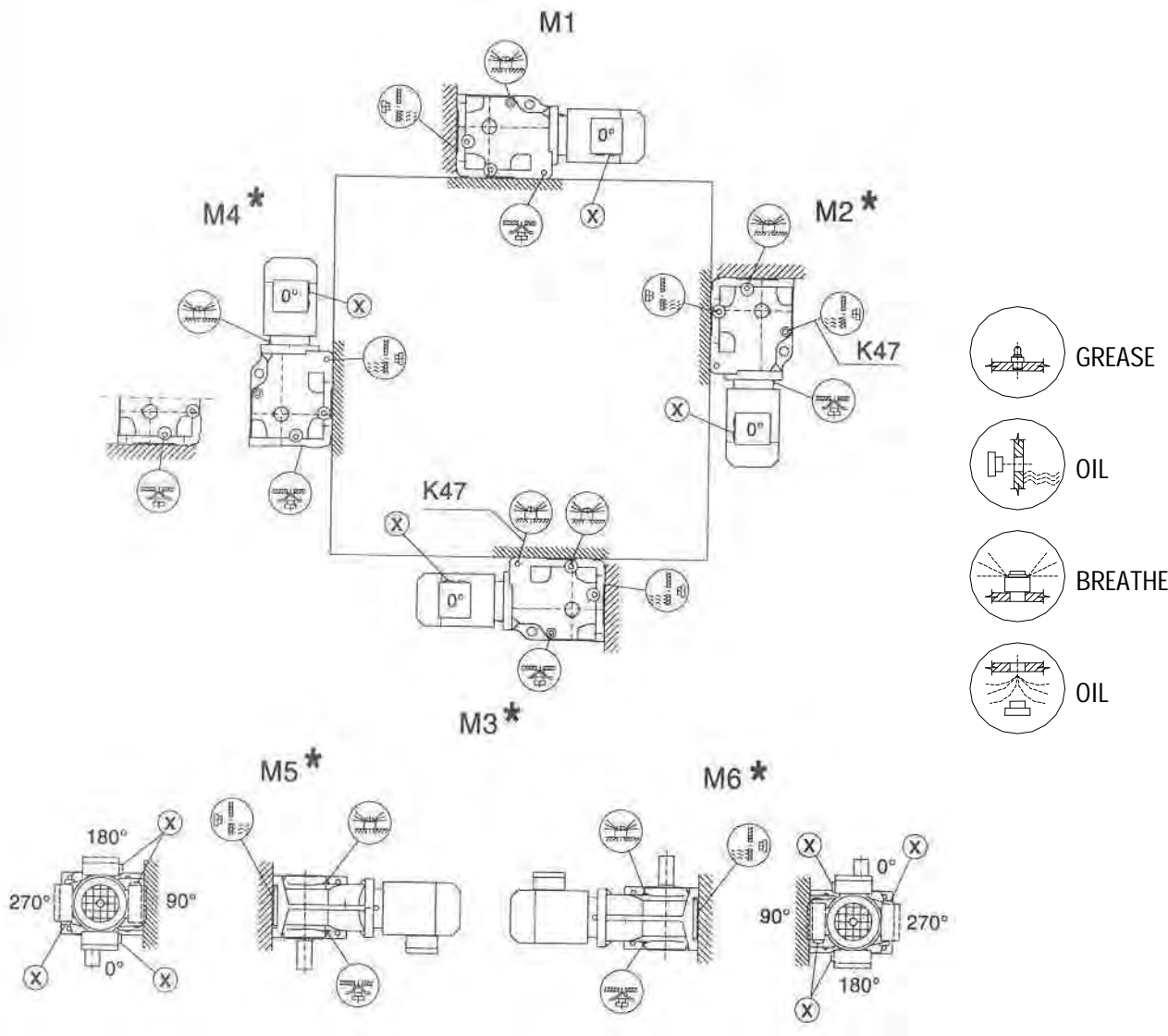
<b>Optional</b>	
Local Control Panel	NA
Knifegates	Manual (x1)
Inspection Hatch	300x300 (x1)
Odour Outlet	NA
Drain Outlet	3" Valve c/w Kamlock
Motor / Socket	Marechal Male 4 Pin DSN1
Inst. / Socket	Amphenol Male 10 Pin
Prox Switch (knifegate)	NA
Level Switch (tank)	ULS200

**APPENDIX B**  
**LUBRICATION CHECK SHEETS**

## LUBRICANT CHECK SHEET

Part to be lubricated	Gearbox
Recommended lubricant	BP Energol GR-XP 220 (or equiv)
Change Frequency	6 - 12 months
Oil Volume	Refer Conveyor Data Sheet
Part to be lubricated	Bell Housing Gland Packing – Buraflon 5846 / 6.35
Recommendable lubricant	Castrol Grease EPL2 Multi Purpose Extreme Pressure
Change Frequency	Every 6 months
Filling method	Grease Gun
Part to be lubricated	Roller Axel (If grease nipple fitted)
Recommendable lubricant	Castrol Grease EPL2 Multi Purpose Extreme Pressure
Change Frequency	Every 2 months
Filling method	Grease Gun
Part to be lubricated	Load Binders (3 off)
Recommendable lubricant	Castrol Grease EPL2 Multi Purpose Extreme Pressure
Change Frequency	Every 2 months
Filling method	Grease Gun

Gearbox Mounting Positions and Relevant Lubrication Points





# **APPENDIX C**

## **DRAWINGS**



**APPENDIX D**

**GEARBOX PARTS LISTS**

# Parts List

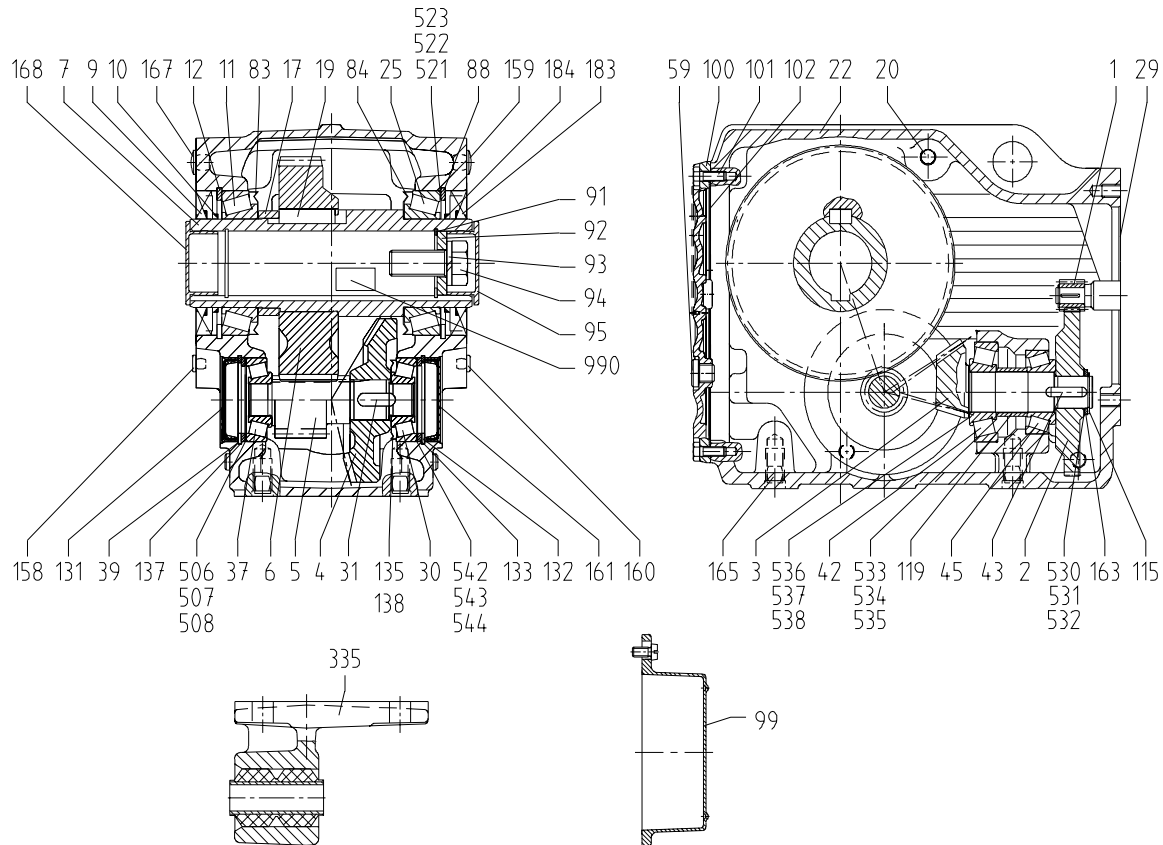
## Helical-bevel gear unit

### KA67A

#### Reinforced bearing

**38 251 497**

Page 1 of 2



No.	Description	DIN standard label	Part No.	Qty	No.	Description	DIN standard label	Part No.	Qty
1	Pinion		*	1	31	Key	DIN6885 AB8x7x20-55HRC	0 013 543 7	1
2	Gear Wheel 2		*	1	37	Tapered Roller Bear.	DIN720 303 04	0 012 476 1	1
3	Pinion shaft		*	1	39	Circlip/Snap r.	DIN472 52x2	0 010 319 5	1
4	Gear wheel		*	1	42	Tapered Roller Bear.	DIN720 303 05	0 013 938 6	1
5	Pinion Shaft 5		*	1	43	Key	DIN6885 B6x6x20-55HRC	0 011 600 9	1
6	Wheel		*	1	45	Tapered Roller Bear.	DIN720 322 05 B	0 013 924 6	1
7	Hollow. Shaft Key	Ø 40 mm	0 042 466 8	1	59	Screw Plug	M10x1	0 011 426 X	7
9	Oil Seal	BA-SF55x90x10/7-NBR	0 017 764 4	1	83	Nilos Ring	32011X AV	0 013 657 3	1
9	Oil Seal a) h)	BA-SF55x90x10/7-FKM	0 017 804 7	1	84	Nilos Ring	32011X AV	0 013 657 3	1
10	Oil Seal b) h)	B1-SF55x84x8/11,5-FKM	0 017 364 9	1	88	Circlip/Snap r.	DIN472 90x3	0 010 326 8	1
11	Tapered Roller Bear.	DIN720 320 11X	0 013 921 1	1	91	Circlip/Snap r.	DIN472 40x1,75	0 010 316 0	1
12	Circlip/Snap r.	DIN472 90x3	0 010 326 8	1	92	Disc	17x39,5x6	0 103 973 3	1
17	Distance Piece	Ø56x Ø65x13,2 mm	0 042 468 4	1	93	Lock Washer	DIN128 A 16	0 010 995 9	1
19	Key	DIN6885 B14x9x36-55HRC	0 011 489 8	1	94	Hexagon Head Screw	ISO4017 M16x40-8.8	0 010 127 3	1
20	Vent Valve	M10x1-MS	0 013 030 3	1	95	Protection Cap	40,6	0 114 093 0	1
22	Gear Housing		0 643 003 1	1	100	Gear Cover Plate		0 643 210 7	1
25	Tapered Roller Bear.	DIN720 320 11X	0 013 921 1	1	101	Hexagon Head Screw	ISO4017 M6x16-8.8	0 010 105 2	8
29	Surface sealing compound		0 910 255 8	X)	102	Gasket		0 643 505 X	1
30	Tapered Roller Bear.	DIN720 303 04	0 012 476 1	1	115	Circlip/Snap r.	DIN471 20x1,2	0 010 271 7	1

\* Gearing parts have embossed part numbers which must always be quoted.

X) As required

a) optional oil seal in FKM (Viton)

b) double sealing

e) Only for mounting position M5A (or mounting position M5B with inverted rotating direction)

f) Only for mounting position M6B (or mounting position M6A with inverted rotating direction)

h) ATEX model according to category II2G, II2D, II3G, II3D

When ordering spare parts always quote nameplate data with serial number and designation with part number!

Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted at the drive end. For parts see appropriate parts list.

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# Parts List

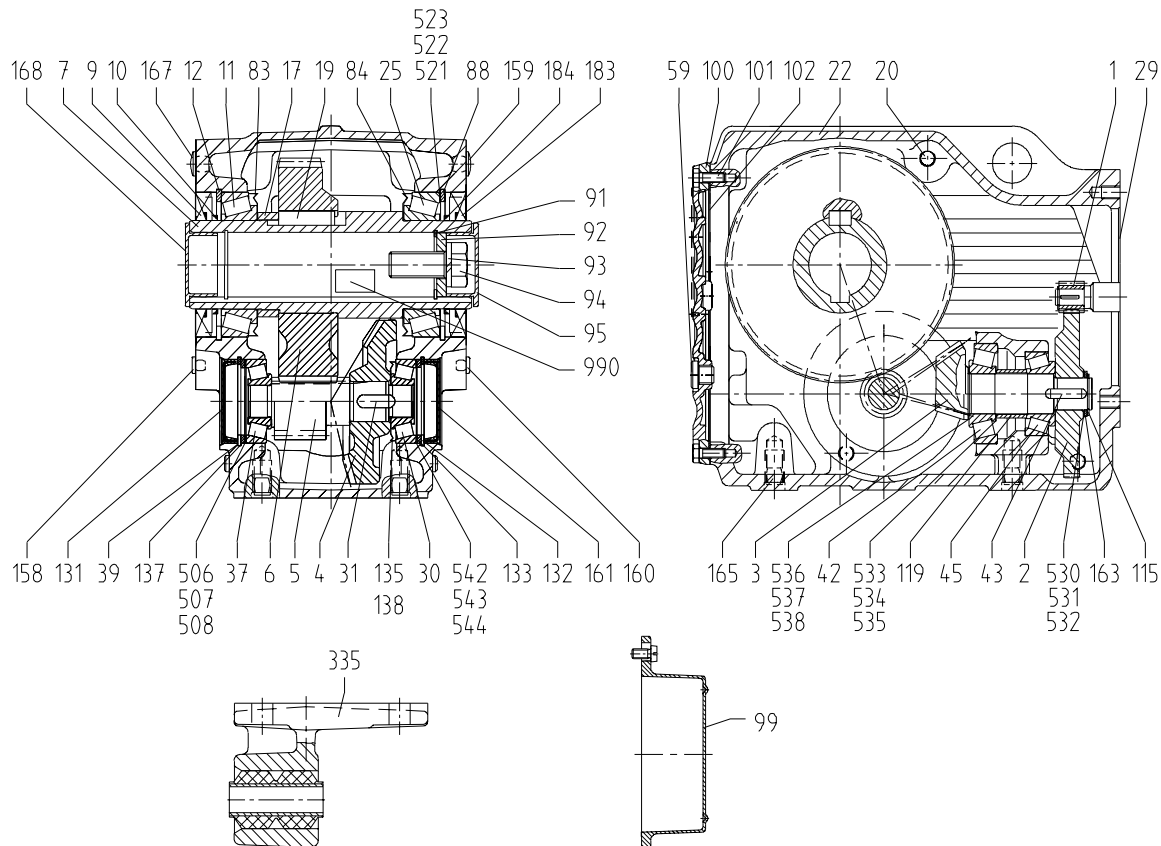
## Helical-bevel gear unit

### KA67A

#### Reinforced bearing

**38 251 497**

Page 2 of 2



No.	Description	DIN standard label	Part No.	Qty	No.	Description	DIN standard label	Part No.	Qty
99	Fixed Hood Cover cpl compl.		0 643 515 7	1	506	Shim	DIN988 42x52x0,1	0 010 375 6	X)
119	Distance Piece	Ø25,6x Ø30x19,5 mm	0 643 343 X	1	507	Shim	DIN988 42x52x0,3	0 010 399 3	X)
131	Closing Cap	52x10	0 010 691 7	1	508	Shim	DIN988 42x52x0,5	0 012 041 3	X)
132	Circlip/Snap r.	DIN472 52x2	0 010 319 5	1	521	Shim	DIN988 80x90x0,1	0 012 393 5	X)
133	Spacer	DIN988 S42x52x2,5	0 010 363 2	1	522	Shim	DIN988 80x90x0,3	0 012 394 3	X)
135	Nilos Ring e)	30304AV	0 013 724 3	1	523	Shim	DIN988 80x90x0,5	0 012 395 1	X)
137	Spacer	DIN988 S42x52x2,5	0 010 363 2	1	530	Shim	DIN988 20x28x0,1	0 010 368 3	X)
138	Nilos Ring f)	30304 AV	0 013 724 3	1	531	Shim	DIN988 20x28x0,3	0 010 392 6	X)
158	Closing Plug	7,1	0 013 604 2	2	532	Shim	DIN988 20x28x0,5	0 010 415 9	X)
159	Closing Plug	10,5	0 011 372 7	6	533	Shim	DIN988 25x35x0,1	0 010 369 1	X)
160	Closing Plug	7,1	0 013 604 2	2	534	Shim	DIN988 25x35x0,3	0 010 393 4	X)
161	Closing Cap	52x10	0 010 691 7	1	535	Shim	DIN988 25x35x0,5	0 010 416 7	X)
163	Spacer	DIN988 S20x28x2	0 010 343 8	1	536	Shim	DIN988 25x35x0,1	0 010 369 1	X)
165	Plug	10,5	0 011 372 7	4	537	Shim	DIN988 25x35x0,3	0 010 393 4	X)
167	Plug	10,5	0 011 372 7	6	538	Shim	DIN988 25x35x0,5	0 010 416 7	X)
168	Protection Cap	40,6	0 114 093 0	1	542	Shim	DIN988 42x52x0,1	0 010 375 6	X)
183	Oil Seal	BA-SF55x90x10/7-NBR	0 017 764 4	1	543	Shim	DIN988 42x52x0,3	0 010 399 3	X)
183	Oil Seal a) h)	BA-SF55x90x10/7-FKM	0 017 804 7	1	544	Shim	DIN988 42x52x0,5	0 012 041 3	X)
184	Oil Seal b) h)	B1-SF55x84x8/11,5-FKM	0 017 364 9	1	990	Contactcorros.Inhib.		0 910 503 4	1
335	Torque Arm Cpl.		0 643 431 2	1					

\* Gearing parts have embossed part numbers which must always be quoted.

X) As required

a) optional oil seal in FKM (Viton)

b) double sealing

e) Only for mounting position M5A (or mounting position M5B with inverted rotating direction)

f) Only for mounting position M6B (or mounting position M6A with inverted rotating direction)

h) ATEX model according to category II2G, II2D, II3G, II3D

When ordering spare parts always quote nameplate data with serial number and designation with part number!

Mount-on gear units have motors, variable speed gear units or special input shaft assemblies mounted at the drive end. For parts see appropriate parts list.

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# **APPENDIX E**

## **MOTOR PARTS LISTS**

## Parts List

**08 116 00 05**

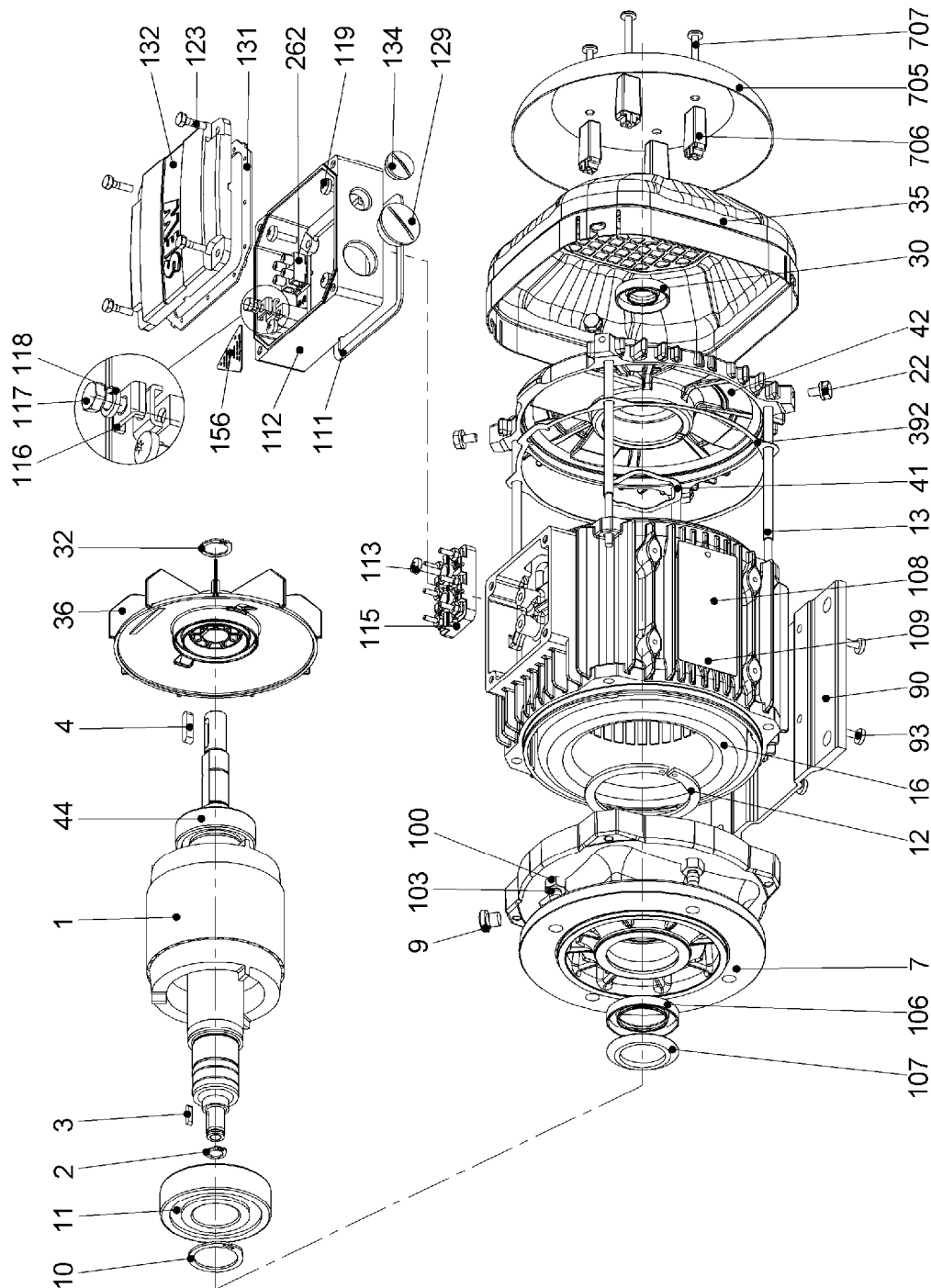
AC motor

DR90M+L/FG/FM/2W/C/AL/Z

Gear unit version

EN Page 1 / 3

EM 10.11.2006



When ordering spare parts always quote nameplate data with serial number and designation with part number!

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# Parts List

# 08 116 00 05

AC motor

EN Page 2 / 3

DR90M+L/FG/FM/2W/C/AL/Z

EM 10.11.2006

Gear unit version

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
1	Rotor	pinion shaft end 14	DR90M4	13721402	1
1	Rotor	pinion shaft end 16	DR90L4	13721909	1
1	Rotor	pinion shaft end 14; 2W 14x30	DR90M4	13721607	1
1	Rotor	pinion shaft end 16; 2W 14x30	DR90L4	13722107	1
2	Circlip	for RZ 14	DIN471 14x1	00102660	1
2	Circlip	for RZ 16	DIN471 16x1	00102687	1
3	Key	for RZ 14	DIN6885 A3x3x14-C45K	00100692	1
3	Key	for RZ 16	DIN6885 A4x4x18-C45K	00114383	1
4	Key	2W	DIN6885 A5x5x22-C45K	00100072	1
7	Flange	for RZ 14	FG100 D120	13612859	1
7	Flange	for RZ 16	FG100 D120	13612344	1
7	Flange		FG130 D160	13612379	1
7	Flange		FG165 D200	13612395	1
7	Flange		FG215 D250	13612417	1
7	Flange		FG265 D300	13612433	1
7	Flange	only for DR90L	FG300 D350	13612468	1
9	Screw plug	for flange FG100, FG130	W4085 M10x1-ST-A2L	0011426X	1
9	Screw plug	for flange FG165, FG215	W4085 M12x1,5-ST-A2L	00114308	1
9	Screw plug	for flange FG265, FG300	W4085 M22x1,5-ST-A2L	00114316	1
10	Circlip		DIN983 30x1,5	00114626	1
11	Deep groove ball bearing		DIN625 6306-2Z-J-C3-K2P-20	13236571	1
12	Circlip		DIN472 72x2,5	00103225	1
13	Machine screw	DR90M	ISO14580 M6x168-8.8-DP8	13237209	4
13	Machine screw	DR90L	ISO14580 M6x188-8.8-DP8	13237217	4
16	Stator			*	1
22	Hex head screw		W4045 M5x10-8.8-A2F	13237616	4
30	Oil seal	with Item no. 998	DIN3760 AS18x35x7/8-NBR	13235656	1
32	Circlip		DIN471 17x1	00102695	1
35	Fan Guard			13610384	1
35	Fan guard 2nd shaft end	2W		13614622	1
36	Fan			13610651	1
36	Aluminum fan	AL		13611178	1
36	High Inert.Flywheel	Z		13611224	1
41	Equalizing ring		W4253 42x51x0,5	00115908	1
42	B bearing end shield			13611372	1
44	Deep groove ball bearing		DIN625 6205-2Z-J-C3-K2P-20	13236628	1
90	Sole plate	DR90S FM		13610953	1
90	Sole plate	DR90L FM		13616315	1
93	Pan head screw	FM	W4046 M5x14-TX-ST-DP8-GM	13237144	4
100	Hex nut	for flange FG100	ISO4032 M6-10	00128678	4
100	Hex nut	for flange FG130	ISO4032 M8-8	00101990	4
100	Hex nut	for flange FG165	ISO4032 M10-8	00102008	4
100	Hex nut	for flange FG215, FG265	ISO4032 M12-8	00102016	4
100	Hex nut	for flange FG300	ISO4032 M16-8	00102032	4
103	Stud	for flange FG100; for gear unit size 27	W4061 M6x16-8.8	00131687	4
103	Stud	for flange FG100	DIN939 M6x18-8.8-A2C	00134074	4
103	Stud	for flange FG130	DIN939 M8x20-8.8-A2C	00100749	4
103	Stud	for flange FG165	DIN939 M10x22-8.8	00118451	4
103	Stud	for flange FG215, FG265	DIN939 M12x30-8.8	00100811	4
103	Stud	for flange FG300	DIN939 M16x35-8.8	00100854	4
106	Oil seal		DIN3760 A30x47x7-NBR	00106178	1
107	Oel finger		W4291 30-ST-ZN	00116637	1
108	Nameplate			*	1
109	Grooved Pin		ISO8746 2x4-X5CRNi18-12	00107646	2
111	Gasket for lower part			01355635	1
112	Terminal box lower part		1x M25x1,5 ; 1x M16x1,5	13610570	1

\* order-dependently

When ordering spare parts always quote nameplate data with serial number and designation with part number!

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# Parts List

# 08 116 00 05

AC motor

EN Page 3 / 3

DR90M+L/FG/FM/2W/C/AL/Z

EM 10.11.2006

Gear unit version

No.	Description	Additional specifications	SEW standard label	Part No.	Qty.
112	Terminal box lower part		2x NPT 1/2"-14	13612018	1
113	Pan head screw	parts included in stator complete	W4046 M5x16-Tx-SZ-ST-A2C-GM	00130591	1
115	Terminal block with Stocko	parts included in stator complete	W4723 KTM4-FS804	13226193	1
116	Terminal clip		DIN46282 C10-MS-VN	00104426	2
117	Hex head screw		W4044 M5x16-ST-A2F-GM	13237136	1
118	Lock washer		DIN7980 5-FST-VN	00118206	1
119	Pan head screw		W4046 M5x16-Tx-SZ-ST-A2C-GM	00130591	4
123	Hex head screw		W4044 M5x16-ST-A2F-GM	13237136	4
129	Screw Plug with O-Ring		W4411 M25x1,5-FS NBR-OZ	00131385	1
129	Screw plug	for Screw thread UN	W4410 1/2-14 NPT-10	00125067	2
131	Gasket for cover			01355627	1
132	Terminal Box Cover			13611763	1
134	Screw Plug with O-Ring		W4411 M16x1,5-FS-NBR-OZ	00131334	1
156	Reference Plate	for TF version		01366815	1
262	Terminal clip	2 pole		01823183	1
392	Gasket			13740342	1
705	Protection canopy	C		13611933	1
706	Spacer	C		01869884	4
707	Pan head screw	C	W4036 REMFORM 5,0x35-TX-VZ	00159409	4
998	Synthetic grease	for Item no. 30		04963458	X)

X) if required

When ordering spare parts always quote nameplate data with serial number and designation with part number!

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**APPENDIX F**

**MOTOR TYPE TEST CERTIFICATES**

## Typ - Test

type - test

Motortyp : type :	<b>DRE 90 L 4</b>	Bemessungsleistung : rated power :	<b>1,5 kW</b>
Spannung : voltage :	<b>400 V</b>	Frequenz : frequency :	<b>50 Hz</b>
Wicklungswiderstand kalt : winding resistance cold :	<b>6.812/6.811/6.809 <math>\Omega</math></b>	Schaltung : connection :	<b>Y</b>
		bei : at :	<b>23,3 °C</b>

### Leerlaufmessung bei Bemessungsspannung

No load measurement at rated voltage

Leerlaufstrom : no load current :	<b>1,92 A</b>	Eisenverluste : core losses :	<b>50 W</b>
Reibungsverluste : friction losses :	<b>11 W</b>		

### Erwärmungslauf

Heat run

Spannung : voltage :	<b>400 V</b>	Strom : current :	<b>3,33 A</b>
Drehzahl : speed :	<b>1436 min<sup>-1</sup></b>	aufgenommene Leistung : input power :	<b>1762 W</b>
Abgabeleistung output power (nach / in accordance to IEC 60034-2:1972 + IEC 60034-2A:1974 + A1:1995 + A2:1996; Einzelverlustverfahren / separated losses method) :	<b>1491 W</b>	Wicklungsübertemperatur : winding temperature rise :	<b>42,8 K</b>

### Belastungsmessung

load test

nach : CSA - C390  
in acc. :

	25% Last 25% load	50% Last 50% load	75% Last 75% load	100% Last 100% load	125% Last 125% load
Strom : current : [A]	1,97	2,30	2,76	<b>3,33</b>	3,99
cos $\varphi$ : p.f. :	0,36	0,56	0,69	<b>0,77</b>	0,82
Wirkungsgrad : efficiency : [%]	77,0%	84,0%	85,2%	<b>84,5%</b>	82,8%
Drehzahl : speed : [min <sup>-1</sup> ]	1484	1470	1452	<b>1432</b>	1411

### Kurzschlussmessung

locked rotor test

Spannung : voltage :	<b>400 V</b>	Strom : current :	<b>21,7 A</b>
aufgenommene Leistung : input power :	<b>11,82 kW</b>	Drehmoment : torque :	<b>32,1 Nm</b>

### Drehmoment - Messung

torque measurement

Sattelmoment : pull up torque :	<b>27,9 Nm</b>	Kippmoment : breakdown torque :	<b>33,6 Nm</b>
------------------------------------	----------------	------------------------------------	----------------

Datum / date : 08.08.06

Ort / location : Bruchsal

# **APPENDIX G**

## **WELDING PROCEDURES**

<b>SPIRAC</b> engineering pty ltd	<b>WELDING PROCEDURE SPECIFICATION</b>		
	<b>STD SPIRAL</b>	Rev: A	Page 1 of 2

<i>Welding Code :</i>	AS 1554 - 1991 - Part 1 (SP)
<i>Welding Process :</i>	Gas Metal Arc Welding Process
<i>Edge Preparation :</i>	By Flame Cutting and Grinding
<i>Joint Type :</i>	Double Vee Butt Joint
<i>Joint Position :</i>	1G (or Downhand Position)
<i>Weld Progression :</i>	Right to Left

JOINT TOLERANCES		MATERIAL SPECIFICATION		THERMAL TREATMENT	
DIMENSION	AS DETAILED				
ROOT OPENING 'RO'	3mm Approx	GRADE	HTMAS	PREHEAT	20°C Approx
ROOT FACE 'RF'	2mm Approx	PLATE THICKNESS	25mm	MAX INTERPASS	300°C
GROOVE ANGLE 'OC'	50° Approx	RANGE QUAL	18.75 to 37.5mm	P.W.H.T.	Not Req'd

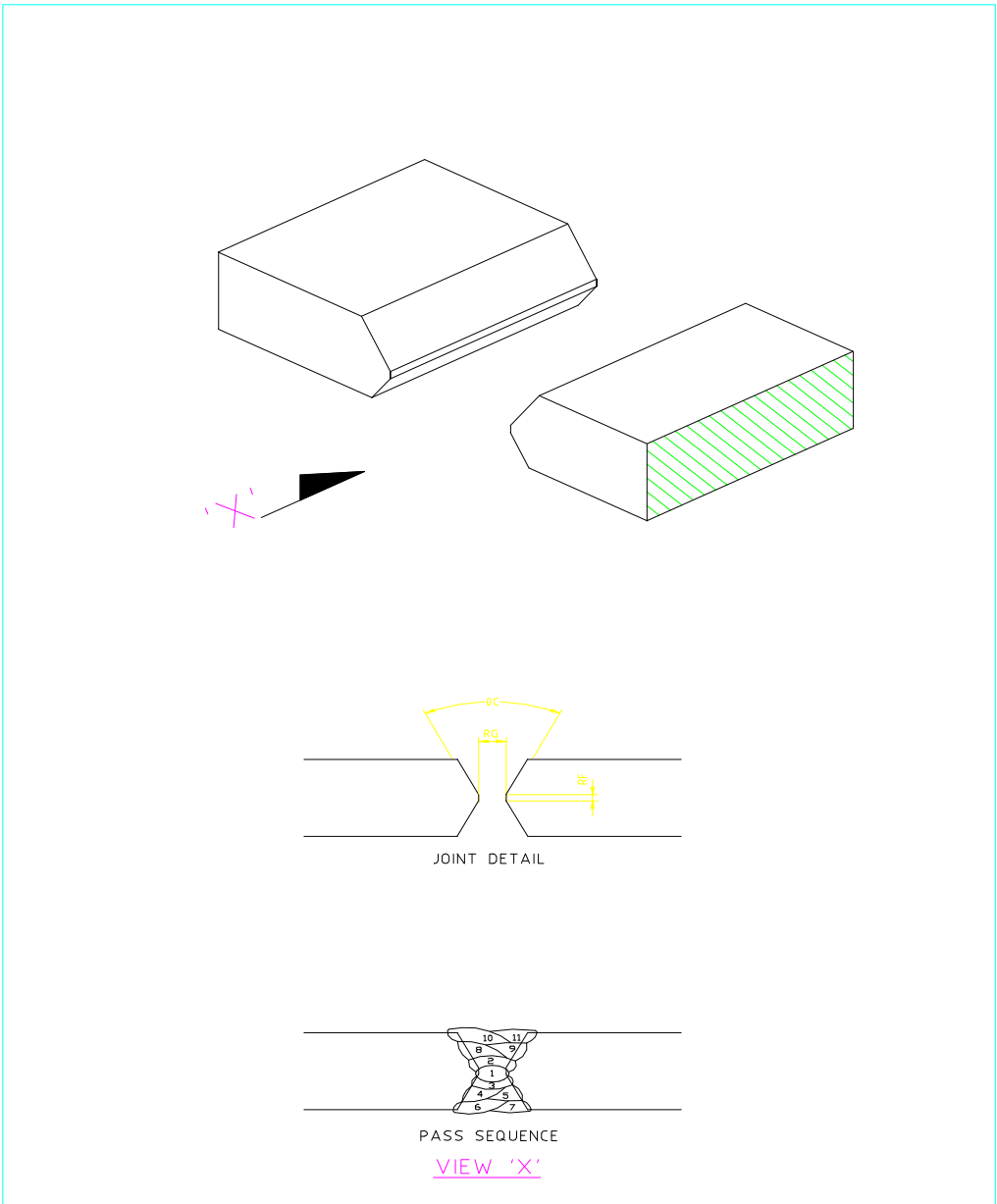
WELD PASS DETAILS			ELECTRODE DESCRIPTION				Flux / Gas	WELDING PARAMETERS				INTER PASS temp	Heat Input KJ/mm
No	Side	Pos	Type	Size	Spec.	Batch		Amp	Volts	Pol	Speed		
1	1	1G	1-LM	0.9	ER70S-4		10 Lit	170	25	DC+	180	100°C	1.41
2	1	1G	1-LM	0.9	ER70S-4		10 Lit	170	24	DC+	160	110°C	1.53
3	2	1G	1-LM	0.9	ER70S-4		10 Lit	185	23	DC+	160	120°C	1.59
4-5	2	1G	1-LM	0.9	ER70S-4		10 Lit	185	22	DC+	200	150°C	1.22
6-7	2	1G	1-LM	0.9	ER70S-4		10 Lit	185	22	DC+	195	180°C	1.25
8-9	1	1G	1-LM	0.9	ER70S-4		10 Lit	185	22	DC+	200	140°C	1.22
10-11	1	1G	1-LM	0.9	ER70S-4		10 Lit	185	22	DC+	190	185°C	1.28

CONSUMABLE DETAILS			N.D.E	
<i>Stickout</i>	10mm Approximately		<i>Visual</i>	1
<i>Shield Gas</i>	Liquid Arc Welding Grade		<i>M.T.</i>	N/R
<i>Flux</i>	Mixture		<i>R.T.</i>	N/R
<i>Electrode</i>	Liquid Arc Steelmig 1-LM ER70S-4		<i>U.T.</i>	N/R

FORM No. : WS-0004

<b>SPIRAC</b> engineering pty ltd	<b>WELDING PROCEDURE SPECIFICATION</b>		
	<b>STD SPIRAL</b>	Rev: A	Page 2 of 2

Preparation of Standard Spiral prior to welding -



NOTE : 1. All the production welding to be carried out by qualified welders only.

FORM No. : WS-0004

# **APPENDIX H**

## **OTHER EQUIPMENT**



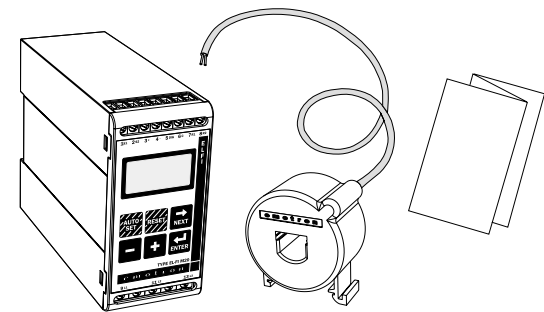
**EL-FI® M20**  
**SHAFT POWER MONITOR**  
**INSTRUCTION MANUAL**  
Motor shaft output power measurement

**1 INSIDE THE BOX ...**

This instruction manual describes the installation and commissioning of the M20 load monitor. The M20 supervises induction motor driven equipment and provides alarms when abnormal conditions are detected. The M20's ability to provide reliable monitoring & protection ensures production equipment is optimised and expensive break-downs and interruptions are minimized. Due to the special method of subtracting motor power losses, the monitor is able to accurately measure the shaft power supplied by the motor to the application. This advanced technique allows the M20 to monitor the "application" load only as opposed to the "total" motor load, which includes the varying motor losses.

- Check the delivery. Your shipment should contain the M20 load monitor, a current transformer and this instruction manual.
- Check carefully that the ordered equipment complies with the motors input voltage and that the current transformer rating is as stated on the delivery packaging.
- Check that the contents have not been damaged in shipping.

**Note!**  
If in doubt contact your supplier before starting to install or commissioning the product.



**2 SAFETY**

- Study this manual thoroughly before installing and using the monitor.
- The monitor must be installed by qualified personal.
- Always disconnect supply circuits prior to installing.
- The installation must comply with standard and local regulations.
- Pay special attention to this SAFETY section and the part marked "CAUTION!" in the OPERATION section.
- Should questions or uncertainties arise, please contact your local sales outlet or see section 11 SERVICE.

**Note!**  
Do not remove or break the seal on the housing. The warranty will be cancelled.

**3 WIRING**

This wiring example shows how the M20 can be used to control the starting and stopping circuit of the motor. Other wiring configurations are possible.

1. The current transformer CTMxxx must be placed in the same phase that is connected to terminal 9, phase L1.
2. For single-phase connection see fig 2.

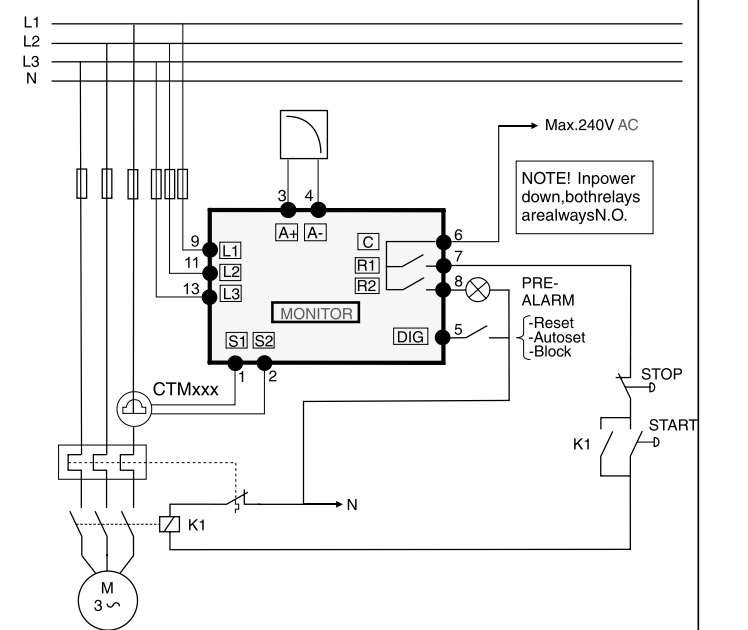


Fig 1. Connection example

**Note!**  
If the START/STOP is connected according to fig. 1, it is recommended that terminals 6 and 7 be by-passed during programming. After the programming is completed the by-pass must be taken out.

**3 Continue**

**ALTERNATIVE EXAMPLE FOR SINGLE-PHASE CONNECTION**

This wiring example shows the deviant power connection to be made with regard to a single-phase connection. Refer to fig. 1 for the remaining wiring.

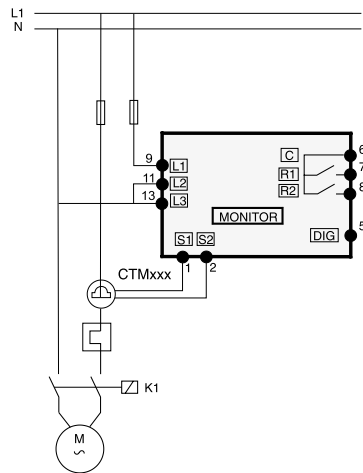


Fig 2. Single-phase connection example.

**EXAMPLE - DIGITAL INPUT**

The Digital Input use the terminals 5 (DIG) and 6 (C-reference). It can have either a VAC or a VDC signal. See also section 7 ADVANCED FEATURES.

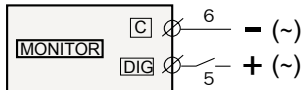


Fig 3. Wiring example for digital input.

**4 SELECTION CURRENT TRANSFORMER**

**FOR MOTORS LESS THAN 100A**

1. Check the rated motor current on the motor plate.
2. Compare this value with the current in table 1.
3. From table 1, select the current transformer and the appropriate numbers of windings.

**Note!**  
Max length of the CTM cable is 1 m (39.37 in).

**EXAMPLE:**

- Rated motor current = 12A.
- Select 10.1-12.5A from the first colon in table 1.
- This gives:  
- CTM025 with 2 windings.

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE NUMBER OF WINDINGS			
	CTM 010	CTM 025	CTM 050	CTM 100
0.4 – 1.0	10			
1.01 – 2.0	5			
2.01 – 3.0	3			
3.1 – 5.0	2			
5.1 – 10.0	1			
10.1 – 12.5		2		
12.6 – 25.0		1		
26.0 – 50.0			1	
51.0 – 100.0				1

Table 1. CT less than 100A.

**Note!**  
Normally the appropriate Current Transformer (CT) will have been ordered and shipped with the M20, check that this is the case; contact the supplier if in doubt.

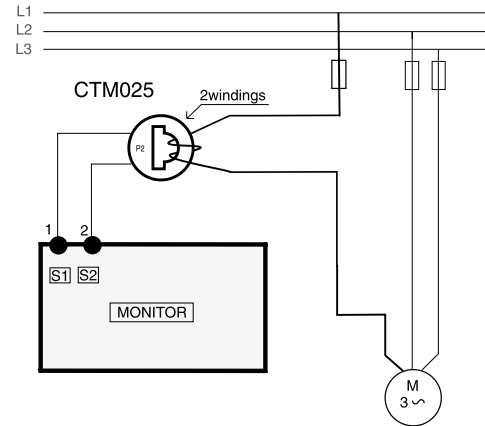


Fig 4. Example CTM 025 with 2 windings for an 12 A motor.

**Note!**  
The transformer connection and orientation are not polarity sensitive.

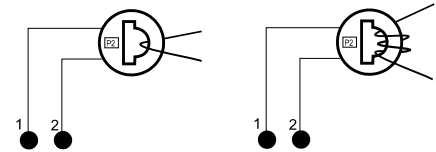


Fig 5. Example 1 and 3 windings.



FOR MOTORS GREATER THAN 100A

- 1. Check the rated motor current on the motor plate.
- 2. Compare this value with the current in table 2.
- 3. Select from table 2 the primary and the secondary current transformer and the appropriate numbers of windings.

EXAMPLE :

- Rated motor current = 260A.
- Select 251-500A from the first colon in table 2.
- This gives:
  - Primary transformer 500:5, 1 winding.
  - CTM010 with 2 windings.

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF PRIMARY WINDINGS
101 – 150	150:5 + CTM 010 1 + 2
151 – 250	250:5 + CTM 010 1 + 2
251 – 500	500:5 + CTM 010 1 + 2
501 – 999	1000:5 + CTM 010 1 + 2

Table 2. CT greater than 100 A

**Note!**  
Normally the appropriate Current Transformer (CT) will have been ordered and shipped with the M20, check that this is the case; contact the supplier if in doubt.

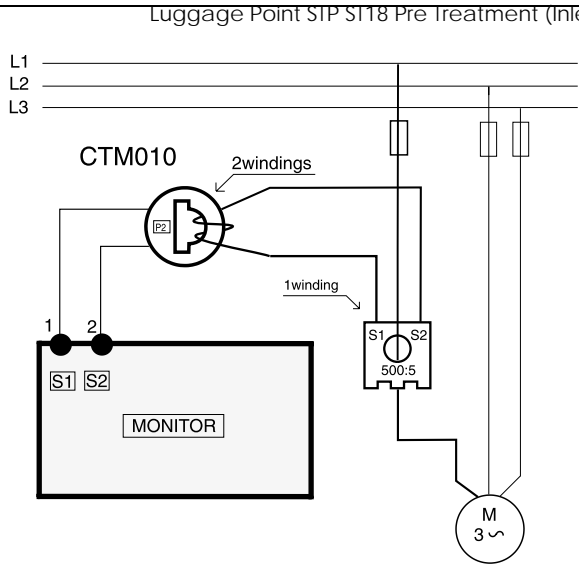


Fig 6. Example of a CTM 010 with 2 windings and a primary transformer 500:5 with 1 winding for a 260 A motor.

**Note!**  
The transformer connection and orientation are not polarity sensitive.

5 OPERATION

Overview

Control terminals:

- 1 S1 Current transformer input
- 2 S2 Current transformer input
- 3 + Analog output
- 4 - Analog output
- 5 DIG External RESET or AUTO SET or Block Pre-Alarm
- 6 C Common: RELAY, DIG
- 7 R1 Main Alarm Relay 1
- 8 R2 Pre-Alarm Relay 2

LCD display:

- i2 Function (window) number
- i23 Function Value
- Δ Warning signal
- ⌚ Start-, response delay or block timer active
- 🔒 Parameter locked
- V Voltage indicator
- A Current indicator
- mA Milliamp indicator
- kW Kilowatt indicator
- S Second indicator
- % Per cent indicator

AUTO SET key:

Press for 3 seconds during normal and stable load to apply the automatic setting of the alarm levels. Not available if Parameter Locked.

NEXT key:

Proceeds to next window. If no key is pressed for 1 minute the display returns to window 01 automatically.

RESET key:

To reset ALARM

ENTER key:

Confirm (save) changes.

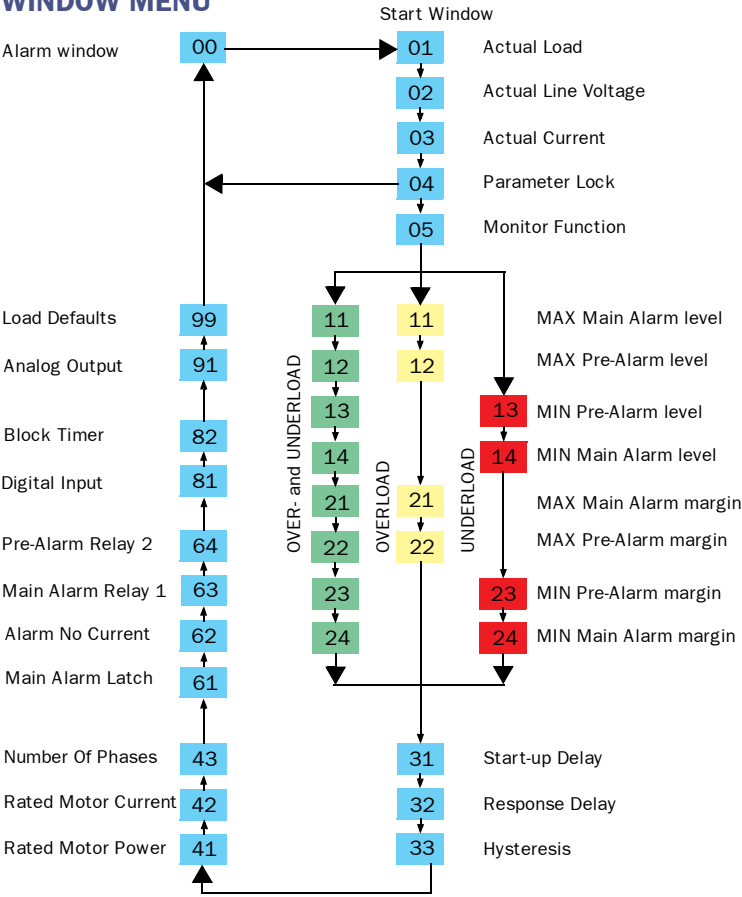
+/- keys:

Increasing and decreasing value

Motor terminals:

- 9 L1 Motor phase
- 11 L2 Motor phase
- 13 L3 Motor phase

WINDOW MENU



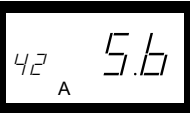
- The ALARM window 00 only appears if an Alarm output is active.
- The Actual Load window 01 Appears after power up.
- Use the → key to scroll through the menu.

- The Actual Load window will appear automatically if no keys are pressed for longer than 1 minute.
- If the PARAMETER LOCK is on, only windows 01 02 03 04 are visible.
- Window 05 selects the monitor function, see section 6:4.

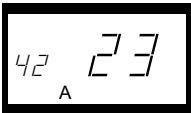
HOW TO CHANGE A VALUE

Example setting the RATED MOTOR CURRENT in window 42.

- 1. Press → until the window number 42 appears.



- 2. Press + or - until the desired value is reached (e.g. 23A).



- 3. Press ← to confirm and save the change.

Note!

If the value is NOT to be changed, press the → before the ← is pressed.

CAUTION!

Make sure that all safety measures have been taken before switching on the supply voltage and starting the motor/machine in order to avoid personal injury.

6 PROGRAMMING

6:1 Set Measurement Unit “HP” or “kW”

Selecting the unit of measurement

The unit of measurement can be set to kilowatts or Horsepower both as absolute or relative values. This setting is valid for the alarm levels, rated motor power and the actual load readout in window 01.

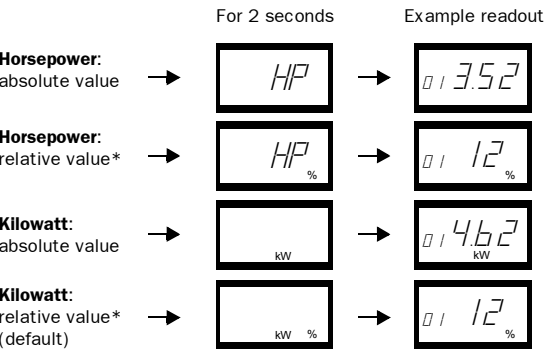
Measurement Unit	Readout load window 01	Rated power window 41	Alarm levels windows 11,12,13,14
Kilowatt relative value (def.)*	%	kW	%
Horsepower absolute value	HP	HP	HP
Horsepower relative value*	%	HP	%
Kilowatt absolute value	kW	kW	kW

\* Measured shaft power as % of rated power.

Programming

- 1. Go to window 01.
- 2. Press and hold RESET and + simultaneously for 3 seconds.
- 3. The next unit of measurement is set and appears for 2 sec, (see examples).

Repeat to select the desired measurement unit according to the table.



6:2 Set RATED MOTOR POWER and CURRENT (Windows 41, 42)

The RATED MOTOR POWER and the RATED MOTOR CURRENT must be set in window 41 and 42. Example motor plate:

TYPE: T56BN / 4	NR: 948287	Prot. IP: 54
Serv: S1	Cos φ: 0.78	Is. Cl:F
V:Y/Δ	Hz	HP kW RPM A:Y/Δ
240 / 415	50	3 2.2 1400 5.6 / 9.4
260 / 440	60	3 2.2 1680 5.8 / 9.2
ASYNCHRONOUS THREE-PHASE MOTORS		

Programming

- 1. Go to window 41 (default = 2.2kW).
- 2. Press - or + to set the RATED MOTOR POWER as indicated on the motor plate (see example).
- 3. Press ← to confirm the change.
- 4. Go to window 42 (default = 5.6A).
- 5. Press - or + to set the RATED MOTOR CURRENT as indicated on the motor plate (see example).
- 6. Press ← to confirm the change.

6:3 Set NUMBER OF PHASES (Window 43)

The NUMBER OF PHASES must be set according to number of motor phases. Default is 3 phase.

Programming

- 1. Go to window 43 (default = 3PH).



- 2. Press - or + to set the NUMBER OF PHASES to 1 if a single-phase motor is used.
- 3. Press ← to confirm the change.



6:4 Monitor Function (Window 05)

Monitor (Protection)	Indication in window 05	Alarm	Output Relay (default)
OVER- and UNDER-LOAD (default)	<div>—</div> <div>—</div>	MAX Main-Alarm	Relay 1 (NC): 6-7
		MAX Pre-Alarm	Relay 2 (NO): 6-8
		MIN Pre-Alarm	Relay 2 (NO): 6-8
OVERLOAD	<div>—</div>	MAX Main-Alarm	Relay 1 (NC): 6-7
		MAX Pre-Alarm	Relay 2 (NO): 6-8
UNDERLOAD	<div>—</div>	MIN Pre-Alarm	Relay 2 (NO): 6-8
		MIN Main-Alarm	Relay 1 (NC): 6-7

Over- and underload monitor

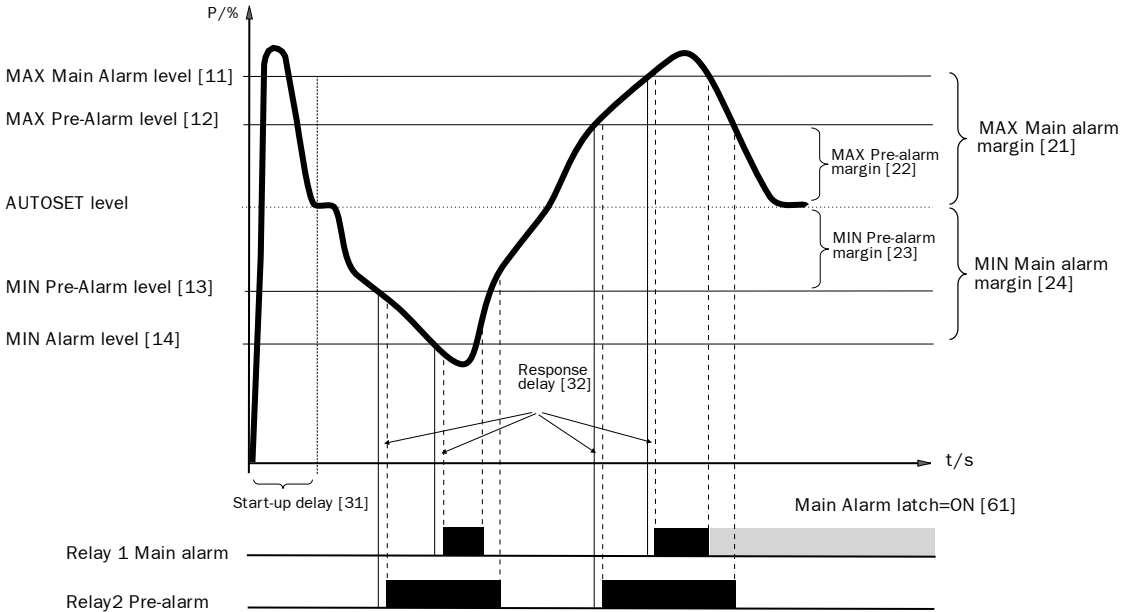


Fig 7. Over- and underload monitor.

6:7 Set the RESPONSE DELAY (Window 32)

A RESPONSE DELAY allows the machine to remain in an over- or underload condition for a specific time before the alarm relays are activated.

Programming

- Determine in seconds, how long an under- or overload condition is allowed. This depends on machine properties and behavior. This will be the RESPONSE DELAY.
- Go to window 32 (default = 0.5s).
- Press 

—

 or 

+

 to set the determined RESPONSE DELAY time in seconds.
- Press 

ENTER

 to confirm the change.

Example: RESPONSE DELAY

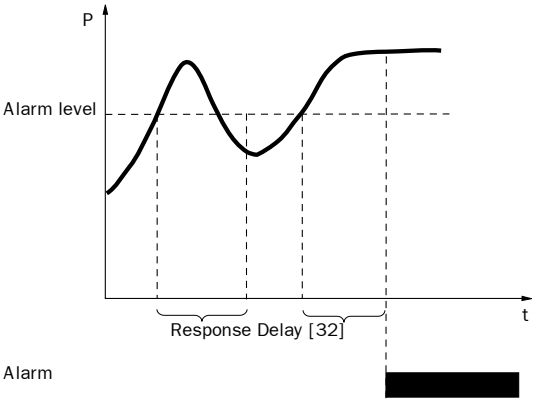


Fig 9. Response Delay.  
— Q-Pulse Id TMS835

Programming

- Go to window 05. The default selection is OVER- and UNDER-LOAD monitor.
- Press 

—

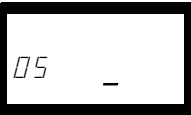
 or 

+

 to select UNDERLOAD or OVERLOAD monitor.



OVER- and UNDERLOAD



UNDERLOAD



OVERLOAD

- Press 

ENTER

 to confirm the change.

7 ADVANCED FEATURES

Set ALARM LEVELS manually (Window 11-14)

The alarm levels can be set manually, without using the AUTOSET. Also after an AUTOSET has been performed, these levels can be readjusted e.g. for fine-tuning.

Protection (Monitor function window 05)	Alarm levels (Window)	Default
OVER- and UNDERLOAD (Default)	11: MAX Main Alarm	100%
	12: MAX Pre-Alarm	100%
	13: MIN Pre-Alarm	0%
	14: MIN Main Alarm	0%
OVERLOAD	11: MAX Main Alarm	100%
	12: MAX Pre-Alarm	100%
UNDERLOAD	13: MIN Pre-Alarm	0%
	14: MIN Main Alarm	0%

Set MARGINS (window 21-24)

The MARGINS for the AUTOSET can be changed manually. After the adjustment, the AUTOSET action must be performed once again to activated the new margins.

Protection (Monitor function window 05)	Window	Default
OVER- and UNDERLOAD (Default)	21: MAX Main Alarm margin	16%
	22: MAX Pre-Alarm margin	8%
	23: MIN Pre-Alarm margin	8%
	24: MIN Main Alarm margin	16%
OVERLOAD	21: MAX Main Alarm margin	16%
	22: MAX Pre-Alarm margin	8%
UNDERLOAD	23: MIN Pre-Alarm margin	8%
	24: MIN Main Alarm margin	16%

Luggage Point STP ST18 Pre Treatment (Inlet Works Upgrade) - Andritz Screens And Spirac Bin OM Manual) General

6:5 Set the START DELAY (window 31)

A START DELAY must be set to allow the motor and machine to speed up and to allow the power in-rush currents to be ignored by the monitor.

Programming

- Determine in seconds, how long it takes for the motor and machine to reach speed and for the power in-rush to pass. This will be the minimum START DELAY.
- Go to window 31 (default = 2.0s).
- Press 

—

 or 

+

 to set the determined START DELAY time in seconds.
- Press 

ENTER

 to confirm the change.

Example: Start Delay 2.0 s

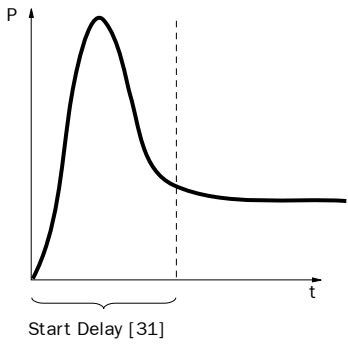


Fig 8. Start Delay.

Set HYSTERESIS (Window 33)

The HYSTERESIS of an Alarm level prevents the alarm relay “chattering” if the load fluctuates even in a normal “stable” condition . Apply also for pre-alarm. This feature is normally only used if the “Main Alarm Latch” (Window 61) is set to “OFF”. Default = 0%.

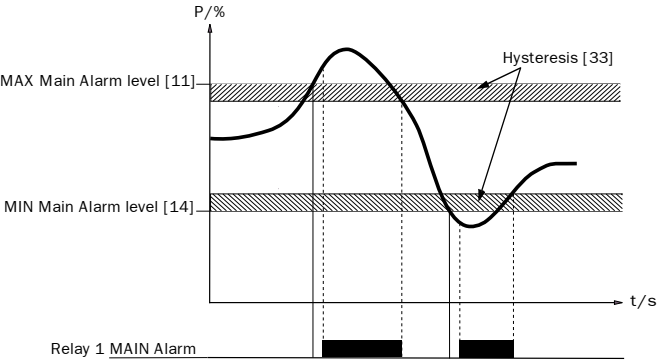


Fig. 10 Hysteresis

Set MAIN ALARM LATCH (Window 61)

The MAIN ALARM LATCH keeps the MAIN ALARM output active, even if the alarm condition has been removed (relay R1). A latched alarm output can be reset by:

- the reset key
- external reset via Digital input (see window 81).
- switching of the power of the monitor (see also “Wiring”).

Default = OFF.

Set ALARM AT NO MOTOR CURRENT (Window 62)

The “ALARM AT NO MOTOR CURRENT” gives an alarm if the motor current becomes zero (ON). Default = OFF (No alarm at no motor current).

6:6 Set Alarm levels with AUTOSET

The AUTOSET command performs a measurement of the actual motor load and automatically sets the relevant Alarm levels depending on the selected monitor function.

Protection (Monitor function window 05)	Alarm	Margin Value (Default margins)	Margins (Windows)	Alarm Level at AUTOSET
OVER- and UNDERLOAD (Default)	MAX Main-Alarm	16%	21: MAX Main Alarm margin	Normal machine load+Window 21
	MAX Pre-Alarm	8%	22: MAX Pre-Alarm margin	Normal machine load+Window 22
	MIN Pre-Alarm	8%	23: MIN Pre-Alarm margin	Normal machine load-Window 23
	MIN Main-Alarm	16%	24: MIN Main Alarm margin	Normal machine load-Window 24
OVERLOAD	MAX Main-Alarm	16%	21: MAX Main Alarm margin	Normal machine load+Window 21
	MAX Pre-Alarm	8%	22: MAX Pre-Alarm margin	Normal machine load+Window 22
UNDERLOAD	MIN Pre-Alarm	8%	23: MIN Pre-Alarm margin	Normal machine load-Window 23
	MIN Main-Alarm	16%	24: MIN Main Alarm margin	Normal machine load-Window 24

Programming

- Start the motor and let it run at the normal machine load, until the START DELAY has expired.
- Press 

AUTO SET

 for 3 seconds. This can be done in any window.
- The display shows “SET”, to confirm that the AUTOSET level has been measured and the Alarm levels have been set. The display reverts to window 01.
- If the alarm levels are too high or too low, readjust the appropriate MARGINS (see table above) and perform a new AUTOSET. Alternatively, alarm levels can be set manually - see section 7.

Set RELAY OUTPUTS (Window 63 and 64)

The RELAY OUTPUTs R1 and R2 can be set to NO or NC contacts.

**Note!**  
If the power to the load monitor is switched off the relay contacts are always in the NO.

Set DIGITAL INPUT (window 81)

The DIGITAL INPUT can be set for:

RES: External RESET (Default)	to reset an Alarm.
AU: External AUTOSET	to perform an AUTOSET with an external command.
bLo: Block Pre-Alarm	to block the Pre-Alarm function and start the Block timer. If the input is high a Pre-Alarm is blocked, e.g. it is neglected. See also window 82.

Set BLOCK TIMER (window 82)

To set the timer for the blocking time after the Block command is released (see also window 81). Default = 0.0 sec.

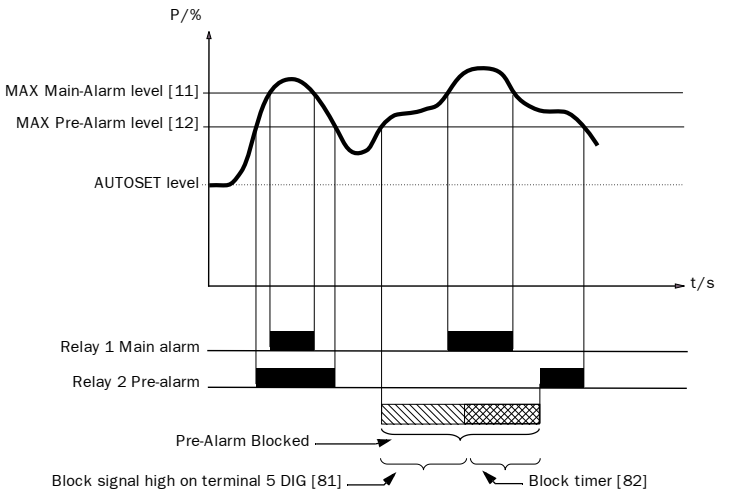


Fig 11. Block timer

Set ANALOG OUTPUT (Window 91)

The ANALOG OUTPUT provides an analog signal of either 0-20 mA or 4-20 mA signal which represents the motor shaft power. The signal can be inverted. Full scale: rated motor power.

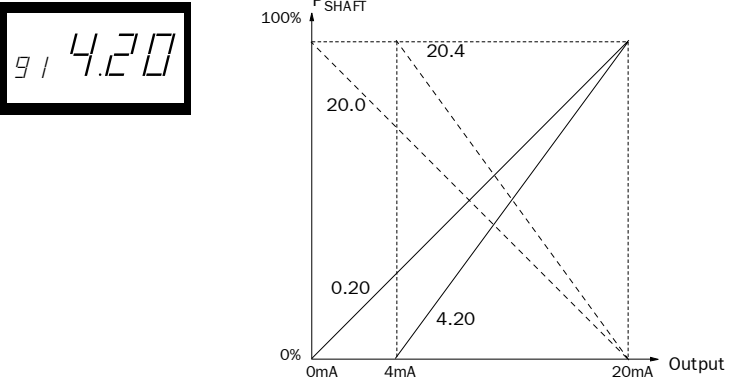


Fig 12. Analog Output.

LOCK PARAMETERS (Window 04)

To avoid unintentional change of parameter settings the program-ming can be locked by entering the code “369” in window 04. Now only the motor variables LOAD [01], VOLTAGE [02] and CURRENT [03] can be checked. Follow the same procedure to UNLOCK the monitor. The AutoSet button is disabled when parameters are locked. AutoSet via Digital Input is always active if window 81 is set to AU (AutoSet).



**Note!**  
The “Lock” symbol appears in all windows.

Dismantling and disposal

The housing is made of recyclable plastic, PC/ABS and the circuit board contain small amount of tin and lead. When disposing, the parts must be handled and recycled in accordance with local regulations.

EU (European Union) specifications

EMC	EN 50081-1, EN 50081-2, EN 50082-1, EN 61000-6-2
Electrical safety	IEC 947-5-1
Rated insulated voltage	690 V
Rated impulse withstand voltage	4000V
Pollution degree	2

Terminals 3, 4, 5, 6, 7 and 8 are basic insulated from the line.  
Terminals 3 and 4 are basic insulated from terminals 5, 6, 7 and 8.

US specifications

FCC (Federal Communications Commission). This equipment has been tested and found to comply with the limits for a class A digital device pursuant to the Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruc-tion manual, may cause harmful interference, in which case, the user will be required to correct the interference at their own expense.

Canada specifications

DOC (Department of communications). This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Canadian interference-Causing Equipment Regulations. Le présent appareil numérique n'émet pas de bruits radio-électriques dépassant les limites applicables aux appareils numériques de la Classe A prestite dans le Régelement sur le brouil-lage radioélectrique édicté du Canada.

Reset to FACTORY DEFAULTS (Window 99)

The FACTORY DEFAULTS are reset by entering “dEF” in window 99. If Window 99 shows “USr” it indicates that the settings have been changed to user specific settings.

View ALARM MESSAGE (Window 00)

In an alarm condition, the window 00 appears automatically. The window indicates the following Alarm conditions. Window 00 is always blinking.

Pre-Alarm MAX level reached

Under voltage, switch off the supply!

Alarm MAX level reached

Over voltage, switch of the supply!

Pre-Alarm MIN level reached

No motor current Window 62=on

Alarm MIN level reached

Out Of Range. This message appears only in window 01 (actual load) or 03 (actual current)

10 PARAMETER LIST

Window	Function	Range	Default	Custom	Symbol
00	Alarm indication				
01	Measured shaft power in % rated power	0-125	0-125		%
	Measured shaft power in kW	0-745			kW
	Measured shaft power in % rated power	0-125			%
	Measured shaft power in HP	0-999			
02	Measured line volt-age	90-760 V			V
03	Measured current	0.00-999 A			A
04	Parameter lock	0-999			🔒
05	Monitor function	OVER- and UNDER-LOAD, OVERLOAD, UNDERLOAD	OVERLOAD and UNDERLOAD		
11	MAX Main Alarm (relay R1)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
12	MAX Pre-Alarm (relay R2)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
13	MIN Pre-Alarm (relay R2)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		

8 TROUBLESHOOTING

Problem	Solution
Window 01 always shows zero load, even if the motor is running	- Check the connection of the current transformer(s). - Check that value of the rated motor power in window 41 is the same as the rated motor power on the motor plate. - Check that window 03 shows a phase current value in correspondents with the rated motor current.
Window 03 shows an improper value of the phase current	- Check that current transformer has been selected according to the tables 1 and 2. - Check that the number of windings is according to table 1 and 2. - Check that the value of the motor current in window 42 is the same as the value of the motor current on the motor plate.
The monitor never gives an alarm	- Check that window 01 shows a value greater than zero. - Check the alarm levels in windows 11 to 14. If not correct readjust the levels or perform an AUTOSSET.
The monitor always gives an alarm	- Check the alarm levels in windows 11 to 14. If not correct readjust the levels or perform an AUTOSSET. - Check if the monitor is programmed for “latched alarm” (window 61=on). If so reset the monitor by pressing the reset key.
Window 00 shows “LU” or “OU”. Under- or over voltage alarm.	Switch off the supply: - Check that the supply voltage is corresponding with the voltage range on the monitor type plate.
Window 01 shows “oor”. "Out Of Range" alarm.	- The measured shaft power is higher than 125% of the rated motor power programmed in window 41.
Window 03 shows “oor”. “Out Of Range” alarm.	- The measured motor current is higher than 125% of the rated motor current programmed in window 42.
The alarm relays are not switching	- Check that the wire links between terminals 6 and 7 are removed according to “Wiring”.

9 TECHNICAL DATA

Dimensions (WxHxD)	45x90x115 mm (1.77" x 3.54" x 4.53") 
Mounting	35 mm DIN-rail 46277
Weight	0.30 kg (10.5 oz)
Supply voltage (±10%)	1x100-240 VAC, 3x100-240 VAC, 3x380-500 VAC, 3x525-600 VAC, 3x600-690 VAC
Frequency	50 or 60 Hz
Current input	Current transformer; CTM 010, 025, 050 and 100 (>100A extra transformer needed)
Power consumption	max 6 VA
Start-up delay	1-999 s
Hysteresis	0-50% of rated motor power
Response delay	0.1-90 s
Relay output	5 A/240 VAC Resistive, 1.5 A/240 VAC Pilot duty/AC12
Analog output	max load 500 ohm
Digital input	max 240 VAC or 48 VDC. High:>24 VAC/DC. Low:<1 VAC/DC
Fuse	max 10 A
Terminal wire size	Use 75°C copper (CU) wire only. 0.2-4.0 mm <sup>2</sup> single core (AWG12). 0.2-2.5 mm <sup>2</sup> flexible core (AWG14), stripped length 8 mm (0.32")
Terminal tightening torque	0.56-0.79 Nm (5-7 lb-in)
Accuracy	±2%, ±1 unit cos phi>0.5; excl. current transformer; +20°C (+68°F)
Repeatability	±1 unit 24h; +20 °C (+68°F)
Temperature tolerance	max 0.1%/°C
Operating temperature	-20 to +50 °C (4°F to +122°F)
Storage temperate	-30 to +80 °C (22°F to +176°F)
Protection class	IP20
Approved to	CE, cUL (UL and CSA up to 600 V)

11 SERVICE

This manual is valid for the following model:  
EL-FI M20

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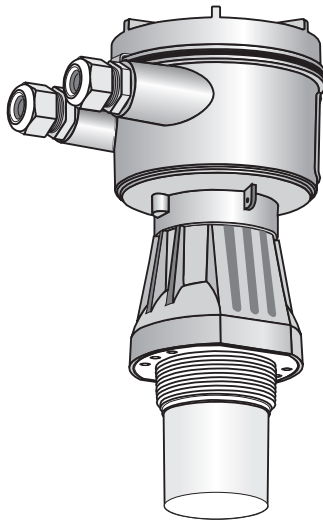
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## Instruction Manual • January 2003



# pointek

## ULS 200

***MILLTRONICS***

## Safety Guidelines

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

## Qualified Personnel

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

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

**Note:** Always use product in accordance with specifications.

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# Pointek ULS 200

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**Note:** Pointek ULS 200 is to be used only in the manner outlined in this instruction manual.

Pointek ULS 200 is an ultrasonic based process level switch providing high or low switch action on liquids or solids. The process part (sensor) is Tefzel® or Kynar Flex®, allowing it to be used in a wide variety of industries.

Pointek ULS 200 contains an ultrasonic transducer and temperature sensing element. The transducer emits a series of ultrasonic pulses. Each pulse is reflected as an echo from the material and sensed by the transducer. Pointek ULS 200 processes the echo using Milltronic's proven Sonic Intelligence® techniques. Filtering is applied to help discriminate between the true echo from the material and the false echoes from acoustical and electrical noises and agitator blades in motion. The time for the pulse to travel to the material and back is temperature compensated and then converted into distance for display and relay actuation.

The Pointek ULS 200 is an excellent primary detection device, but should not be used as a backup device. For backup devices use a contacting technology such as the Pointek CLS 200. The optional sanitary version affords quick removal and ease of cleaning as demanded by the food, beverage, and pharmaceutical industries.

## Pointek ULS 200 Outputs

- switch outputs programmable for high-high, high, low, and low-low level actions
- fail-safe programmable

## Pointek ULS 200 Features

- 2" NPT, 2" BSP or PF2 or 4" 3A approved Tri-clamp process connection
- 2 conduit connections, 1/2 "NPT or PG 13.5
- non-corrosive enclosure and wetted parts
- 2 button programming
- level run/program LCD display

## Pointek ULS 200 Applications

- liquids, slurries, and fluid materials
- foods and pharmaceuticals
- chemicals

# Specifications

---

## ac Version

### Power

- 100 - 230 V ac,  $\pm 15\%$ , 50/60 Hz, 12 VA (5W) max.

### Fuse

- Slow-Blow, 0.25 A, 250 V ac

### Output:

- repeatability: 0.25 % of full range
- resolution: 3 mm (0.1")
- relay: 2 form C (SPDT) contacts, rated 5A at 250 V ac, non-inductive

## dc Version

### Power

- 18 to 30 V dc, 3 W

### Output:

- repeatability: 0.25 % of full range
- resolution: 3mm (0.1")
- relay: 2 form C (SPDT) contacts, rated 5 A at 48 V DC  
OR
- transistor: 2 transistor switches, rated 100 mA maximum at 48 V DC

### Environmental

- location: indoor/outdoor
- altitude: 2000m max
- ambient temperature: - 40° to 60° C (- 40° to 140° F)  
\* - 20° C (-5° F) if metal mounting
- relative humidity: suitable for outdoor (Type 6 / NEMA 6 / IP67 enclosure)
- installation category: II
- pollution degree: 4

### Process Pressure:

- vented to atmosphere



## Switching Range

- liquids: 0.25 to 5m (0.8 to 16.4 ft)
- solids: 0.25 to 3m (0.8 to 9.8 ft)

## Memory

- non-volatile EEPROM

## Programming

- 2 keys

## Temperature Compensation

- built-in to compensate over the operating range

## Display

- liquid crystal
- three 9mm (0.35") digits for reading of distance between sensor face and material, multi-segment graphic for operation status

## Electronics/Enclosure

- termination: terminal block, 2.5mm<sup>2</sup> (14 ga) solid 1.5 mm<sup>2</sup> (16 ga) stranded, maximum
- material: plastic  
OR  
epoxy coated aluminum with gasket
- ingress protection: Type 6 / NEMA 6 / IP67<sup>1</sup>
- conduit: aluminum, 2 connections } 1/2" NPT  
plastic, 2 connections } PG 13.5

## Sensor

- material: Tefzel<sup>2</sup> or Kynar Flex<sup>3</sup>
- mounting: threaded:
  - 2" NPT, 2" BSP or PF2
  - optional flange adapter, to 3" ANSI, DIN 65PN10, and JIS 10K3B
 sanitary:
  - 4" 3A compliant Tri-clamp fitting

## Approvals

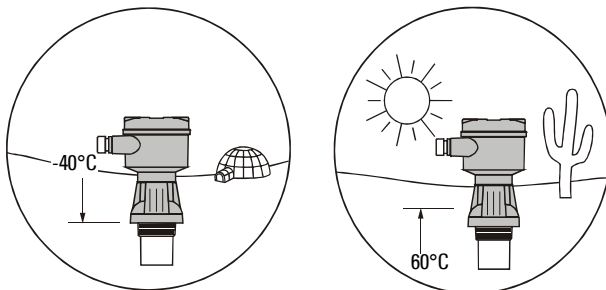
- CE (EMC performance available upon request.), CSA <sup>NRTL/C</sup> FM, 3A
  - CSA/FM Class 1, Division 1, Group A, B, C, D; Class II, Group E, F, G; Class III
  - Europe: ATEX II 2G, EEx md IIC T5
- (see product nameplate for approval details)

- 
- Use only approved, suitable size hubs for watertight applications.
  - Tefzel<sup>®</sup> is a registered trademark of Dupont.
  - Kynar Flex<sup>®</sup> is a registered trademark of Elf Atochem North America.

# Installation

The Pointek ULS 200 should be mounted in an area within the temperature range specified and suitable to the housing rating and materials of construction. Make sure the cover is accessible to allow programming, wiring, and access to the display.

Keep the Pointek ULS 200 away from high voltage or current runs, contactors, and SCR control drives.

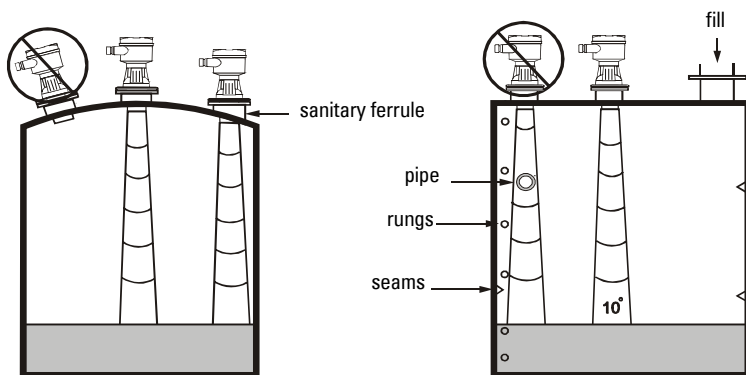


**Warning: Explosion Hazard. Substitution of components may impair suitability for Class 1, Division 2 applications.**

## Location

Locate the Pointek ULS 200 so that it has a clear sound path perpendicular to the material surface.

The Pointek ULS 200 sound path should not intersect the fill path, rough walls, seams, rungs, or any other obstruction.



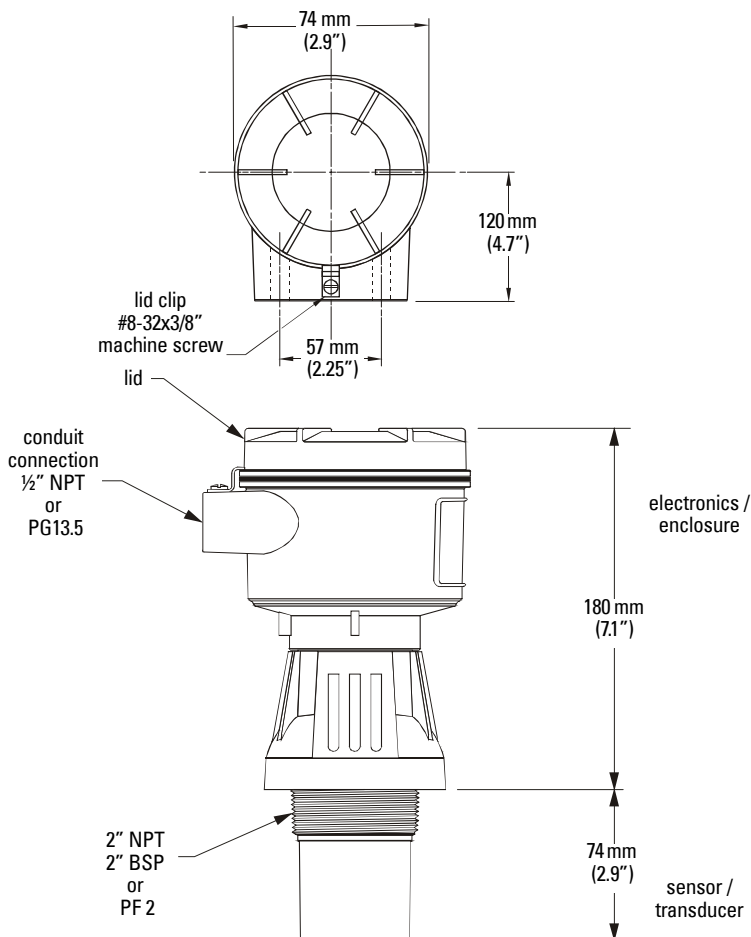
# Mounting and Dimensions

Mount the ULS 200 with sensor face at least 25cm above the highest anticipated level.

## Threaded

The Pointek ULS 200 is available in three thread types: 2" NPT, 2" BSP, or PF2.

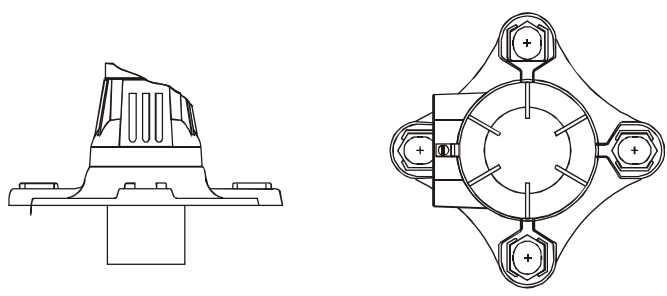
Before mounting the Pointek ULS 200, ensure that the mating threads are of the same type, otherwise the threads can be damaged.



### Notes:

- Dimensions are nominal and may vary with material types.
- Non-metallic enclosure does not provide grounding between connections.
- Use grounding type bushings and jumpers.

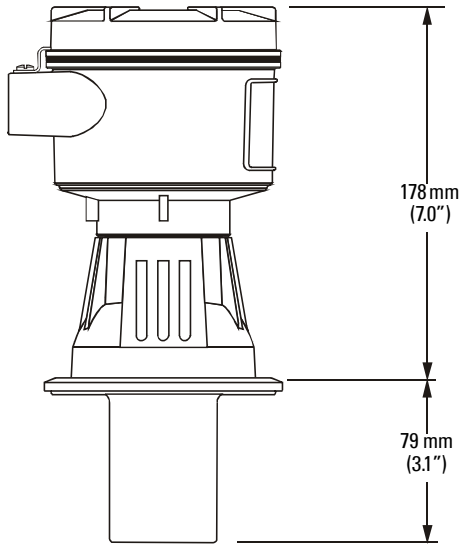
The Pointek ULS 200 can be fitted with the optional 75 mm (3") flange adapter for mating to 3" ANSI, DIN 65PN10 and JIS 10K 3B flanges.



**Note:** For CSA/FM approved Hazardous Location Models, see Siemens Milltronics drawing 0-9440026Z-DI-A.

# Sanitary

The Pointek ULS 200 also comes in a sanitary version for use in the food and pharmaceutical industries.



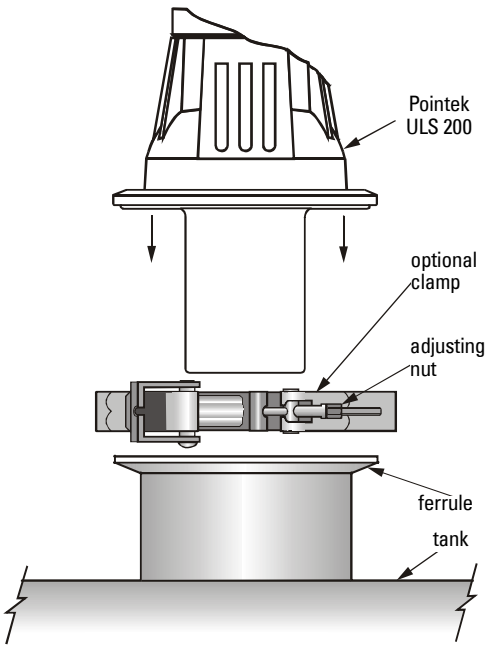
**Notes:**

- Dimensions are nominal and may vary with material types.
- Refer to threaded for other dimensions.

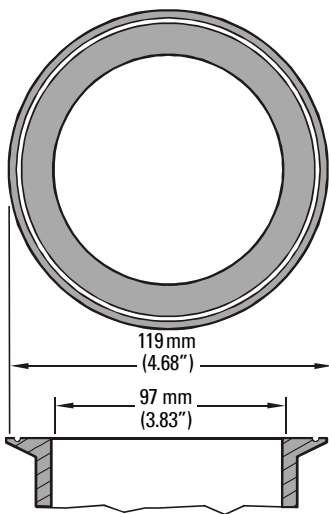
Mount the Pointek ULS 200 onto the top of the tank's sanitary ferrule.

Secure mating by surrounding the joint with the optional clamp.

Tighten the adjusting nut with your hand. Do not use a wrench.



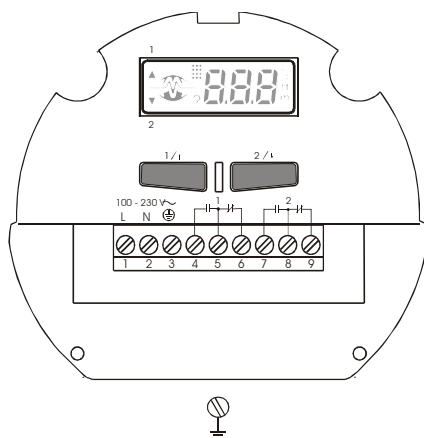
Sanitary Ferrule, 4" FDA Approved  
(U.S. Food and Drug Administration)



\*dimensions are approximate

# Interface

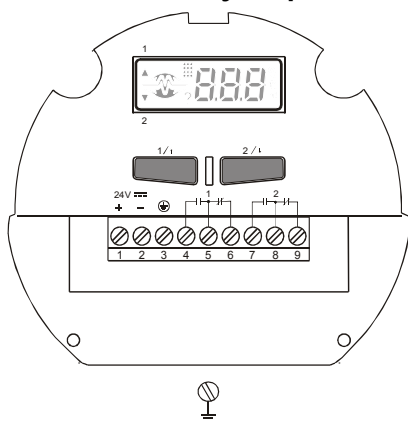
## ac Version



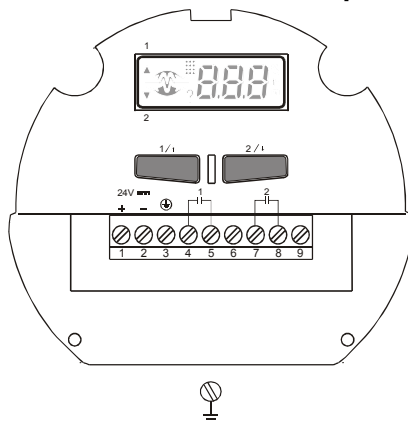
### Notes:

- A circuit breaker or switch in the building installation, marked as the disconnect switch, shall be in close proximity to the equipment and within easy reach of the operator.
- Relay contact terminals are for use with equipment having no accessible live parts and wiring having insulation suitable for at least 250 V.

## dc Version - Relay Output



## dc Version - Transistor Output



**Note:** dc terminals shall be supplied from an SELV source in accordance with IEC 1010-1 Annex H.

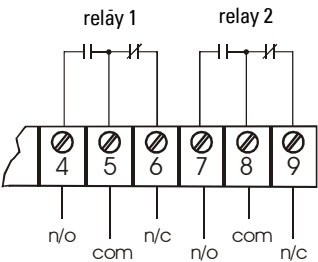
# Interconnection

**Notes:**

- Installation shall only be performed by qualified personnel and in accordance with local governing regulations.
- This product is susceptible to electrostatic shock. Follow proper grounding procedures.

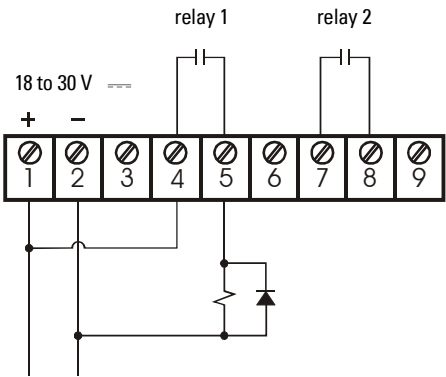
Separate cables and conduits may be required to conform to standard instrumentation wiring or electrical codes.

## Relay Output

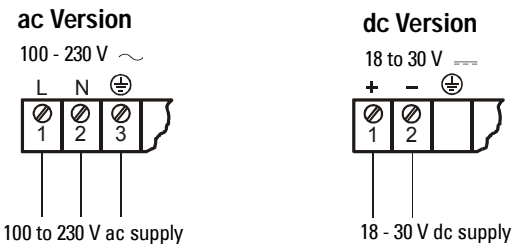


All relays are shown in their de-energized (unpowered) state.

## Optional Transistor Output – dc Version only



## Power



# Operation

---

## Start Up

With the Pointek ULS 200 correctly installed (or aimed at a wall 0.25 to 5 m away), apply power and observe the Pointek ULS 200 start up sequence. The unit will cycle through the following screens:

1. Lighting of all possible LED values
2. Product revision number
3. Product model number
4. Run mode

The display and operation sequence arrives within a few seconds at the run mode, which is the measurement of the distance from the transducer face to the material level in the units indicated. Full instructions on setting up the unit are found at Applications on page 13 and Adjustments on page 19.

## Quick Start

Use this setup method if you have a basic high/low application and you are setting up the unit in a place where you can easily adjust the measured distance.

The Pointek ULS 200 relays are preset as: relay 1 = alarm 1, high alarm at 0.25 m

relay 2 = alarm 2, low alarm at 5.00 m

To change the setpoints by reference method, set the material or target to the distance as displayed. Press the `1 / ↑' or `2 / ↓' key. The display responds by displaying the current setpoint function and value. By pressing the alarm key a second time, the Pointek ULS 200 changes the setpoint to the value currently being measured.

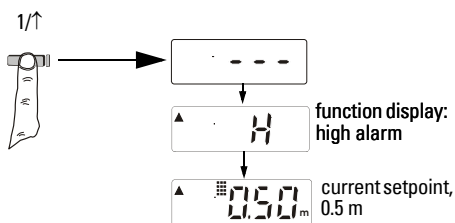
After viewing or changing the setpoint, the Pointek ULS 200 reverts to the run mode.



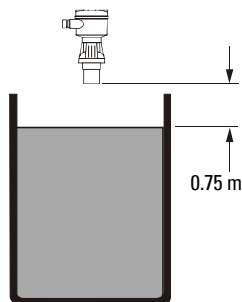
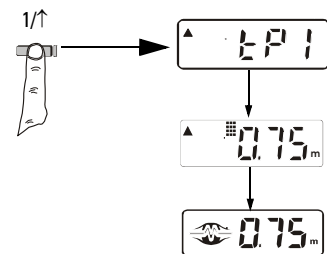
## relay 1

1. Position the unit so that it reads 0.75 m.

2.



3.



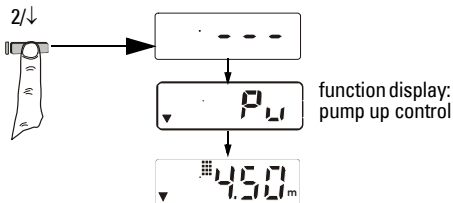
4. Once installed, the unit will register a high alarm at 0.75 m from the sensor face.

Loss of Echo  
if **LOE** retry

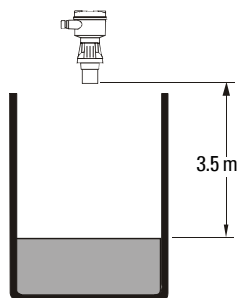
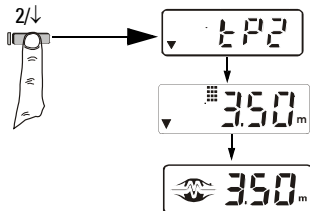
## relay 2

1. Position the unit so that it reads 3.50 m.

2.



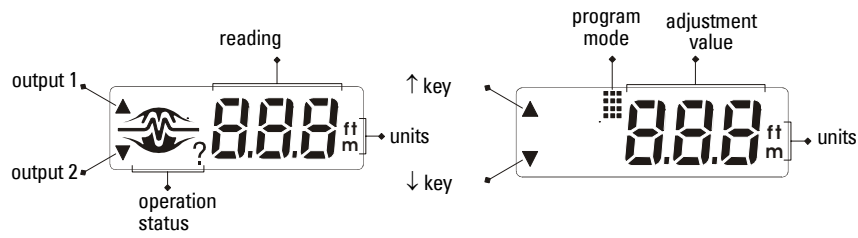
3.



4. Once installed, the unit will register a low alarm at 3.50 m from the sensor face.

Loss of Echo  
if **LOE** retry

# Display / Operation Status



## Operation Status - Run Mode



- echoes are valid and within range.



-echoes are lost due to poor conditions or out of range. This may be typical in applications where there are deep vessels and the material level is normally out of range. Refer to Troubleshooting.



-extended loss of echo period. Operation has gone into fail-safe. Refer to Troubleshooting.

# Applications

Pointek ULS 200 is designed for use as a process level switch. The local display is used only as an aid during start up. The instrumentation interface is comprised solely of the two relay outputs. Switching applications are based on the relay functions adjustment.

The outputs can be set to function in the desired mode.

Application	Function	Relay 1	Relay 2
High / Low level switch	*1	High Alarm	Low Alarm
High level switch with two height alarms	2	High Alarm	High Alarm
Low level switch with two height alarms	3	Low Alarm	Low Alarm
High level switch with loss of echo alarm	4	High Alarm	LOE Alarm
Low level switch with loss of echo alarm	5	Low Alarm	LOE Alarm
Pump down control with low level alarm	6	Pump Down	Low Alarm
Pump down control with high level alarm	7	Pump Down	High Alarm
Pump up control with low level alarm	8	Pump Up	Low Alarm
Pump up control with high level alarm	9	Pump Up	High Alarm
Pump down control with loss of echo alarm	10	Pump Down	LOE Alarm
Pump up control with loss of echo alarm	11	Pump Up	LOE Alarm
Pump up control and Pump down control	12	Pump Down	Pump Up
Dual pump down control	13	Pump Down	Pump Down
Dual pump up control	14	Pump Up	Pump Up

\* Factory setting

Alarm: the relay de-energizes to set the alarm 'ON'

Control or Pump: the relay energizes to set the device 'ON'

## High Level Alarm Switch

This application uses Pointek ULS 200 to provide an alarm output, high and/or high-high alarm, when the process material rises to a high level. The device range applies to its switching capability, and not the process range of the material.

It is therefore common to apply the switch on vessels where the material is normally below the unit's range. Under such a condition the Pointek ULS 200 loses echo, and if prolonged, defaults to fail-safe operation. As this would be a normal occurrence, it is not advisable to select the fail-safe high option.

If the high level switch is being applied to a vessel within the 3 / 5 m range, a loss of echo and ensuing fail-safe condition would not be a common occurrence. The fail-safe default would then be at the user's discretion.

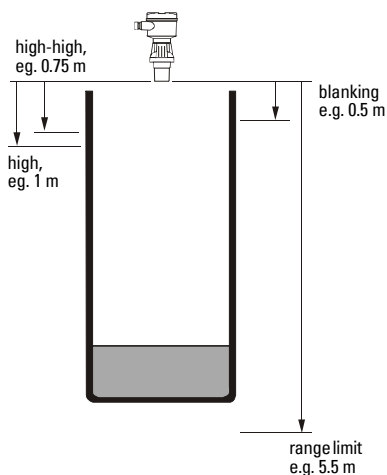
### Application Adjustments

alarm function 2 - high / high-high alarm  
4 - high / Loss of Echo (LOE)

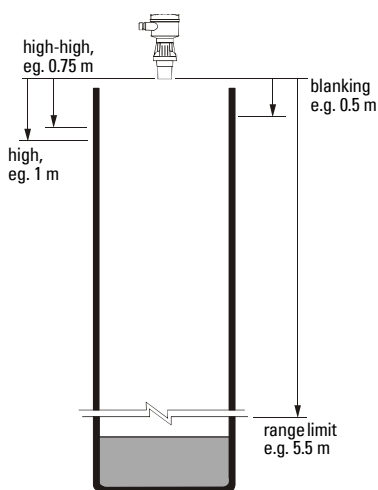
alarm setpoint set the high and / or high-high alarms to the desired values

fail-safe mode 1 - high, except if the process range is beyond the Pointek ULS 200 operating range (3 / 5 metres)  
2 - low  
3 - hold

#### fail-safe = 1, 2 or 3



#### fail-safe = 2 or 3



## High / Low Level Alarm Switch

This application uses Pointek ULS 200 to provide high and low level alarms. The device range applies to its switching capability, and not the process range of the material. As such the low and/or low-low level setpoints must be within the device's range (3 / 5 metres).

If the material can fall below the unit's range, the Pointek ULS 200 loses the echo, and if prolonged, defaults to fail-safe operation. The fail-safe default should be set to suit the application.

### Application Adjustments

alarm function 1 - high / low alarm

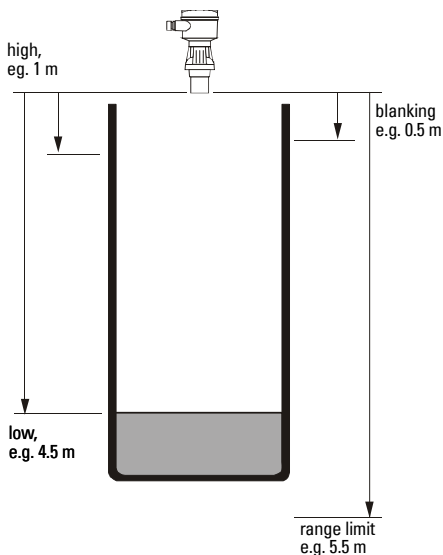
alarm setpoint set the high and/or low alarms to the desired values

fail-safe mode 1 - high

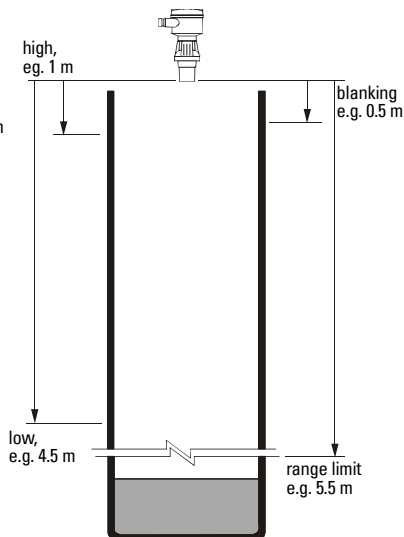
2 - low

3 - hold

**fail-safe = 1, 2 or 3**



**fail-safe = 2 or 3**



## Low Level Alarm Switch

This application uses the Pointek ULS 200 to provide one or two low level alarms. The device range applies to its switching capability, and not the process range of the material. As such the low and / or low-low level setpoints must be within the device's range (3 / 5 metres).

If the material can fall below the unit's range, the Pointek ULS 200 loses the echo, and if prolonged, defaults to fail-safe operation. The fail-safe default should be set to suit the application.

### Application Adjustments

alarm function 3 - low / low-low alarm

5 - low / LOE alarm

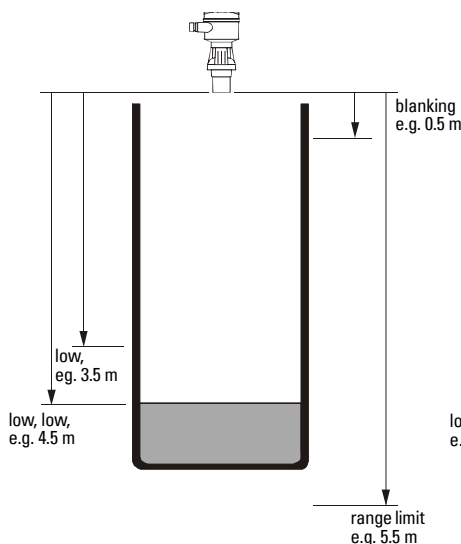
alarm setpoint set the low and / or low-low alarms to the desired values

fail-safe mode 1 - high

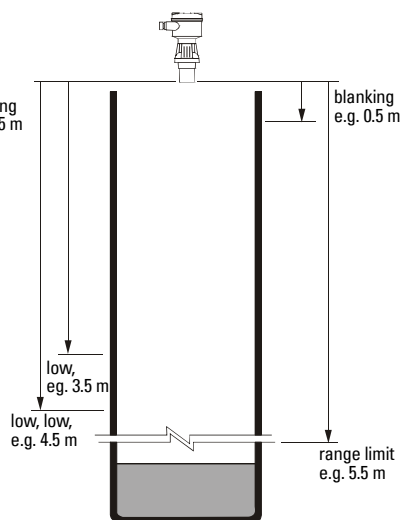
2 - low

3 - hold

**fail-safe = 1, 2 or 3**



**fail-safe = 2 or 3**



## Dual Pump Control

This application uses Pointek ULS 200 to provide a control output when the process material rises to a high level. The device range applies to its switching capabilities, and not to the process range of the material. As such, the level setpoints must be within the device's range (3 / 5metres).

Typically, wet wells are used to temporarily hold storm and/or waste water. When the water surface reaches a high level setpoint, the wet well is pumped down. The process material will be pumped down by the deadband value to another setpoint where the control will turn off.

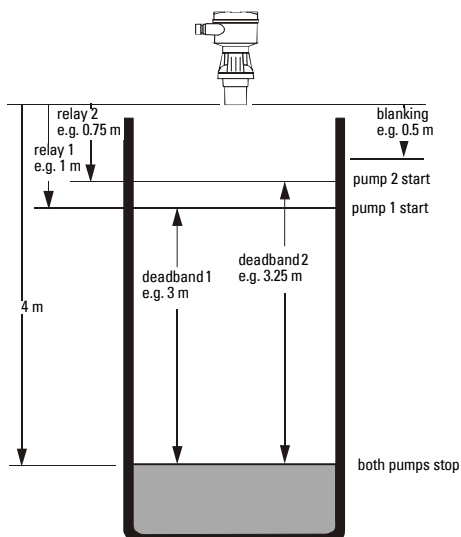
### Application Adjustments

relay function    6 - high control / low alarm  
                          7 - high control / high alarm  
                          10 - high control / LOE alarm  
                          13 - high control / high control

relay setpoints: set to desired values

deadband values: referenced from relay setpoints  
 (distance from Pump Start setpoint to Pump Stop setpoint)

### Relay Function 13: Dual Pump Down



## Pump Control with Level Alarm

This application uses the Pointek ULS 200 to provide pump control and one level alarm. The device range applies to its switching capability, and not the process range of the material. As such the low level setpoints must be within the device's range (3 / 5 metres).

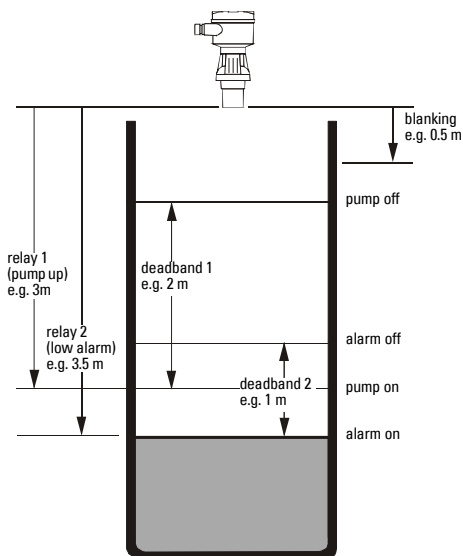
If the material reaches a control setpoint, the well is pumped down or up respectively. If the material reaches an alarm setpoint, the alarm will sound until the material moves beyond the deadband value.

### Application Adjustments

- relay function    6 - high control / low alarm  
                       7 - high control / high alarm  
                       8 - low control / low alarm  
                       9 - low control / high alarm  
                      10 - high control / LOE alarm  
                      11 - low control / LOE alarm

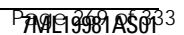
alarm setpoint    set the low alarm to the desired values

### Relay Function 8: Pump Up Control with Low Alarm





To access the operating adjustments, simultaneously press both keys repeatedly until the desired adjustment is obtained. A viewing period of the adjustment value is initiated. During this time the value can be changed by pressing either the 'up' or 'down' key. After viewing or changing, operation automatically reverts to the run mode.



To adjust a value:



select adjustment

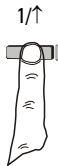


e.g. relay 1

current value



e.g. 0.5 m



change value



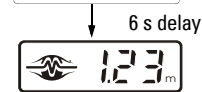
e.g. increase to 0.75 m

new value



e.g. new setpoint 0.75 m

return to run



For faster scrolling, hold the key depressed and release when the desired value is obtained.

# Output Function



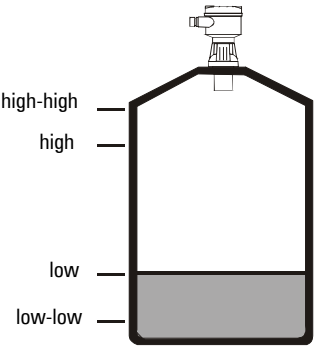
The alarms can be set to function in the desired mode.

Function	Relay 1	Relay 2
1 *	high alarm	low alarm
2	high alarm	high alarm
3	low alarm	low alarm
4	high alarm	LOE alarm
5	low alarm	LOE alarm
6	pump down	low alarm
7	pump down	high alarm
8	pump up	low alarm
9	pump up	high alarm
10	pump down	LOE alarm
11	pump up	LOE alarm
12	pump down	pump up
13	pump down	pump down
14	pump up	pump up

\* Factory setting

## Function display:

high alarm	H
high-high alarm	HH
low alarm	L
low-low alarm	LL
loss of echo alarm	LOE
pump up control	PU
pump down control	PD

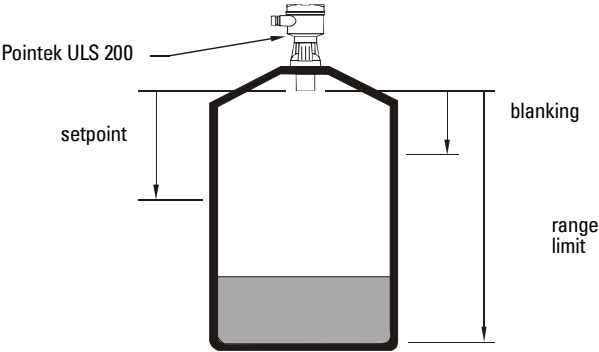


# Setpoints



The setpoints can be set where reference levels, either from the material in the vessel or from a target, cannot be provided. This method can also be used to trim the output levels obtained by the Reference Method (Quick Start).

The setpoints are referenced from the face of the sensor. They should not be set at or above the blanking value, or at or below the range limit.



Factory Setting: Relay 1 = 0.5 m (1.64 ft)  
Relay 2 = 4.50 m (14.76 ft)

# Relay Delay



Adjust the time delay, in seconds, from when the material reaches the relay level and the relay is actuated. If the material level withdraws from the setpoint level, the delay is reset to 0.

The set time delay applies to both relays and all functions except 'Loss OF Echo'.

Factory setting: 0 seconds.

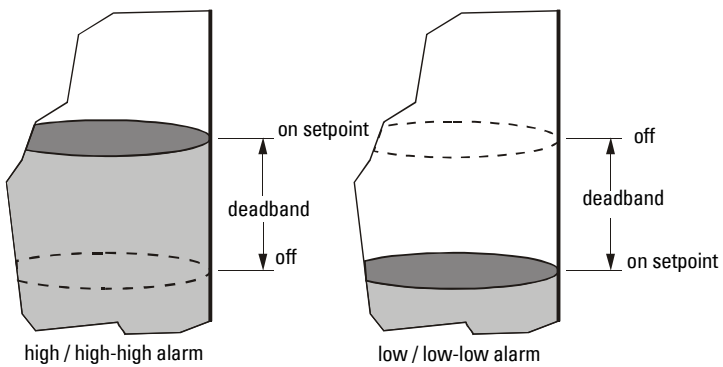
# Relay Deadband (Reset)



Deadband (sometimes referred to as hysteresis) prevents relay chatter due to material level fluctuations at the set point. These fluctuations are often waves or turbulence on a fluid's surface caused by agitators in the tank.

Once a relay is tripped the detection level must move beyond the deadband value before it is reset. The direction in which the deadband is measured depends on the application of the relay. If the relay is for a high state then the deadband is measured below the set point. If the relay is for a low state then the deadband is measured above the set point. Refer to the diagram below.

Deadband 1 is used for Relay 1 and Deadband 2 is used for Relay 2.



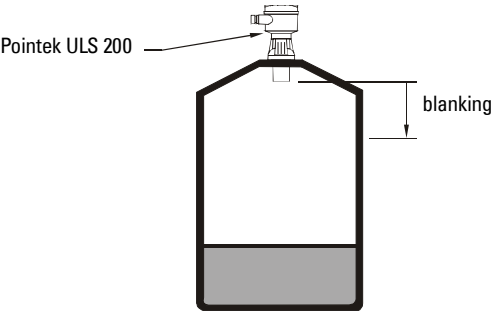
The deadband value is entered in the units selected, and applies to both relays and all alarm or control functions except 'Loss Of Echo'.

Factory setting: 0.05 m (0.16 ft)

# Blanking



Blanking is used to ignore the zone in front of the transducer where false echoes are at a level that interfere with the processing of the true echo. It is measured outward from the sensor face. The minimum recommended blanking value is 0.25 m (0.82 ft) but can be increased in order to extend the blanking.

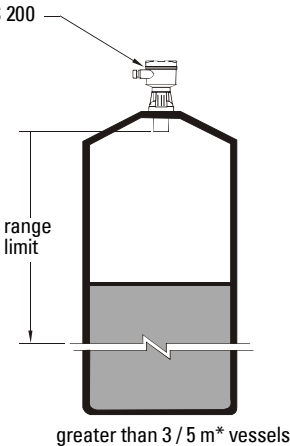
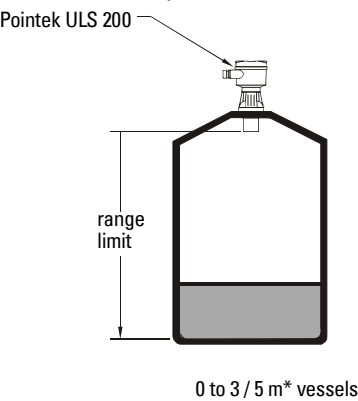


Factory setting: 0.20 m (0.66 ft)

# Range Limit



The range limit is the distance at which measurements are ignored. Generally this refers to the bottom of the container being measured. If a measurement is detected beyond the range limit it results in a Loss Of Echo (LOE) reading. The result of this reading is determined by the Fail-Safe Mode, see page 25 for more information.



Factory setting: 5.50 m (18.0 ft)

\* solids range 3 m maximum  
liquids range 5 m maximum

# Speed of Response

The speed of response adjustment allows the user to collectively set a number of operating parameters.

measurement response: is the limit to which the Pointek ULS 200 is able to keep up with rates of change.

If the Pointek ULS 200 measurement cannot keep up with the rate of level change, set the adjustment from `1' to `2'.  
If the Pointek ULS 200 still cannot keep up with the rate of level change, set the adjustment option to `3'. Avoid choosing an option that is too fast for your application.

agitator discrimination: discriminates between agitator blades in motion and the material (target) surface.

filter: discriminates between false echoes from acoustical and electrical noise and the material (target) surface.

fail-safe timer: establishes the `Waiting' period from the time a loss of echo or operating fault condition starts until the fail-safe default is effected.

SP	measurement response	agitator discrimination	filter	FLS timer
1	0.3 m / min (0.1 ft / min)	on	on	10 min
2*	1 m / min (3.3. ft / min)	on	on	10 min
3	5 m / min (16.4 ft / min)	on	on	3 min
4	immediate	off	off	3 min

\* Factory setting

# Fail-Safe Mode



In the event that a loss of echo condition exceeds the fail-safe timer (speed of response variable), '?' appears in the display; and if a relay is assigned to 'LOE' (alarm function option), it is engaged. This function must be used with the Output Function on page 22.

fail-safe	mode	function		reading
		high and high-high	low and low-low	
1	high	on	off	hold
2	low	off	on	hold
3*	hold	hold	hold	hold

\* Factory setting

# Fail-Safe Timer



The fail-safe timer allows the user to vary the waiting period from the time of a loss of echo or operating fault condition begins, until the fail-safe default is effected. The waiting period is adjustable from 1 to 15 minutes, in 1 minute increments.

**Note:** The fail-safe timer will default to settings determined by the speed of response (see page 26). If a different value is desired, the fail-safe timer should be adjusted after the speed of response is set.

# Units



The units of the measurement reading can be selected as follows:

1 = metres, m (Factory setting)

2 = feet, ft

The selected units are also applicable to the 'Blanking' and 'Relay' adjustments.



# Troubleshooting



The echo is not reliable and Pointek ULS 200 is waiting for a valid echo before updating the measurement.

Probable causes are:	Remedy
material or object in contact with sensor face	lower material level or raise Pointek ULS 200
Pointek ULS 200 is not perpendicular to the material surface	check Pointek ULS 200 mounting if angle of repose is too steep, angle Pointek ULS 200 mounting
change in level too fast	adjust speed of response
material out of range	acceptable on some high level switch applications
foam on liquid surface	mount Pointek ULS 200 via stilling well or pipe
too much dust or interference from material filling	relocate Pointek ULS 200
high level of vibration in the mounting structure	relocate Pointek ULS 200 or limit vibration
material inside blanking zone or below range limit	adjust blanking or range limit



Fail-safe default after prolonged Loss Of Echo.  
Investigate the probable causes listed above.

# Maintenance

---

The Pointek ULS 200 requires no maintenance or cleaning.

# Certifications

The following instructions apply to equipment covered by certificate number SIRA 00ATEX1205:

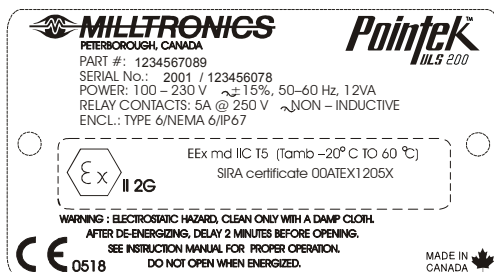
1. The equipment may be used with flammable gases and vapours with apparatus group IIC and temperature class T5.
2. The equipment is certified for use in an ambient temperature range of -20 to 60°C (-4 to 140°C).
3. The equipment has not been assessed as a safety related device (as referred to by Directive 94/9/EC Annex II, clause 1.5).
4. Installation and inspection of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (EN 60079-14 and EN 60079-17 in Europe).
5. Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice (e.g. EN 60079-19 within Europe).
6. Components to be incorporated into or used as replacements in the equipment shall be fitted by suitably trained personnel in accordance with the manufacturer's documentation.
7. The certification of this equipment relies upon the following materials used in its construction:

Aluminum alloy T356 T6 (main enclosure) and A356 T6 (lid)  
 GE Lexan 943A polycarbonate  
 Two-part epoxy encapsulant  
 Silicon based coating  
 Santophrene 111-55 gasket  
 Polysulphide encapsulant (transducer)  
 Dupont Tefzel 210 (transducer)  
 Epoxy syntactic foam (transducer)

If the equipment is likely to come in contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials  
 Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

8. **Equipment Marking:** The equipment marking contains at least the following information:



9. **Special Condition for Safe Use:** The apparatus must only be supplied from a circuit containing a suitable rate fuse having a breaking capacity of at least 4000 A.

[www.siemens-milltronics.com](http://www.siemens-milltronics.com)

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**Rev. 1.2**

# Emotron M20 Shaft Power Monitor



Instruction manual  
English



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# 1 Inside the Box

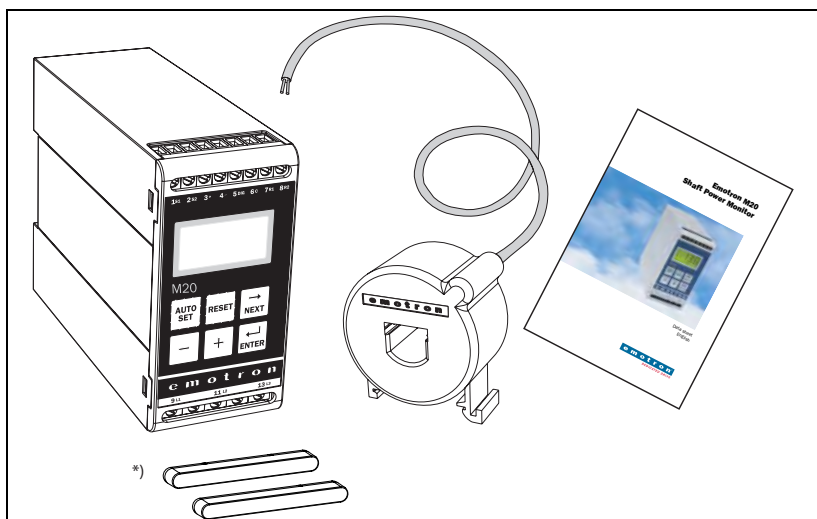
Please check the delivery. Despite the fact that all products from Emotron are carefully inspected and packed, transport damage may occur:

- Your shipment should contain the Emotron M20 shaft power monitor, a current transformer, 2x terminal covers (option\*) and this instruction manual.
- Check carefully that the equipment ordered complies with the motor's input voltage and that the current transformer rating is as stated on the delivery packaging.
- Check that the contents have not been damaged during shipping.
- If something is missing, or has been damaged, contact the supplier as well as the forwarding agent within 48 hours of receipt.

---

**NOTE: If in doubt contact your supplier before installing or commissioning the product.**

---



## 2 Safety

- Study this manual thoroughly before installing and using the monitor.
- The monitor must be installed by qualified personnel.
- Always disconnect supply circuits prior to installing.
- The installation must comply with standard and local regulations.
- Pay special attention to the information in this chapter and the parts marked CAUTION in the Operation and Programming chapters.
- Check that the monitor and the equipment are correctly connected before it is taken into use.
- Should questions or uncertainties arise, please contact your local sales outlet or see chapter 13, Service.
- Faults that arise due to faulty installation or operation are not covered by the warranty.

---

**NOTE: Removing or tampering with the seal on the housing will invalidate the warranty.**

---

### 3 Description

This instruction manual describes the installation and commissioning of the Emotron M20 shaft power monitor. The Emotron M20 supervises induction motor driven equipment and provides warnings when abnormal conditions are detected. It protects for example, pumps and other equipment. The M20’s ability to provide reliable monitoring and protection ensures that production equipment is optimized and expensive breakdowns and interruptions are minimized.

The Emotron M20 uses the motor as its own sensor and no external sensors or extra cabling are required. Due to the special method of subtracting motor power losses, the monitor is able to accurately measure the shaft power supplied by the motor to the application. This advanced technique allows the M20 to monitor only the “application” load rather than the “total” motor load, which includes the varying motor losses.

The shaft power is calculated by measuring motor input power, and subtracting the motor power loss calculated using a unique principle. The shaft power output is indicated on the monitor display in kW or HP, or as a percentage of rated power. Calculating shaft power gives more reliable supervision than non-linear techniques, such as current and phase angle measurements. Current measurement is only sufficient at high motor loads and phase angle only at low loads. Input power is sometimes called true or real power. Input power is linear, but ignores motor power loss.

The M20’s analogue output and two relay outputs allow the combination of direct and indirect control. The unit offers high accuracy in the event of very small load variations. The analogue output signal can be used to scale the machine load to represent the actual working range.

The monitor is very easy to install and set up and should be mounted on a standard DIN rail. It is also very easy to use. The “Auto set” function makes it possible to adjust the monitor automatically by pressing just one key.

The M20 provides complete flexibility in terms of the type of protection required for your application. You may select either overload and underload protection or simply overload with pre-alarm or underload with pre-alarm. Independent response delays can be selected for both overload and underload protection. Additional flexibility is provided in the form of programmable output relays, number of start attempts, number of reversing attempts etc.

The Emotron M20 shaft power monitor offers advanced multi-function monitoring and a display for load indication and parameter setting. It is ideal for protecting many different applications including pumps in general, centrifugal pumps, magnetic pumps, screw and impeller pumps, mixers, scrapers, crushers, conveyor systems, etc.




For further information, please see [www.emotron.com](http://www.emotron.com).

## 4 Getting Started

### 4.1 Please note

1. Pay special attention to the safety section in this manual and parts marked CAUTION.
2. Check that motor/supply voltage corresponds to values on the monitor product label at the side of the unit.
3. Make a note of the motor's rated power and full load amps from its name-plate. Confirm that the current transformer supplied is of the correct size according to tables 1 and 2 in chapter 6 of this manual.

### 4.2 Connection and set-up before first start


1. Connect the Emotron M20 according to chapter 5 and Fig. 1.
2. Make sure all safety measures have been taken and switch on the supply voltage.
3. Use the  key to scroll through the menu. Press and hold the  key and press the  key to scroll back.
4. Set rated motor power and current in windows 41 and 42. Additional settings to be programmed are discussed in chapter 8.
5. Set monitor function in window 05, overload and underload or only underload or only overload. See chapter 12, Parameter list, for range and default values.
6. Set start delay and response delay in window 31 and 32/34.
7. Compare all set values with the parameter list in chapter 12 to confirm that all relevant values are set. Advanced features will be found in chapter 9.

## 4.3 First start

---

**CAUTION: Make sure that all safety measures have been taken before switching on the supply voltage and starting the motor/machine in order to avoid personal injury.**

---

1. Start the motor/machine and let it run at normal load, until the Start Delay has expired.
2. Press  for 3 seconds.

### Hint!

Short-circuit the output relays during the set-up; this prevents the equipment from stopping unintentionally.

### More Hints!

The monitor can be set in three different ways:

1. **Automatically** by pressing the Auto set key as described above. The Auto set function performs a measurement (momentarily) of the actual load and sets relevant alarm levels for this actual load plus/minus the “margins” (Default; Max +16% and Min -16%).
2. If Auto set is used as above, the **margins can be re-adjusted** manually (windows 21-24). When the margin values are changed a new Auto set must always be performed to activate the changes and the new margins. More information is provided in chapter 9, Advanced Features.
3. **Manual setting** of alarm levels (windows 11-14). The alarm levels can be set manually, without using the Auto set. See sections Manual setting of alarm levels, alternative A, B and C.

---

**NOTE: If any window parameter is manually adjusted, the display will flash the new value to indicate that a change has been made. The Enter key must be pressed for the M20 to accept this new value.**

---

## 4.4 Manual setting of alarm levels, alternative A

### Running and setting at normal load

- Start the motor/machine or pump and let it run at normal load, until the Start Delay (window 31) has expired.
- Read off the load on the monitor display, e.g. 65%, window 01 (or kW/HP).
- Set the max. main alarm level to something between e.g. 70-85% in window 11. This must be set to the actual application requirements, maximum load for machine/process.
- Set the min. main alarm level to something between e.g. 60-45% in window 14. This must also be set to the actual application requirements.

See also Fig. 7 in section 8.4, Over- and underload monitor.

## 4.5 Manual setting of alarm levels, alternative B

### Running and setting at maximum load as well as at minimum load

- Start the motor/machine or pump and let it run at maximum load, until the Start Delay has expired. E.g. fill the conveyor with maximum allowed goods.
- Read off the load on the monitor display, e.g. 85% (window 01).
- Set the max. main alarm level to something between e.g. 90-95% in window 11. This must be set to the actual application requirements, maximum load for both machine and processes.
- Then run the motor/machine and let it run at minimum load, e.g. idling, until the Start Delay has expired.
- Read off the load on the monitor display, e.g. 30%.
- Set the min. main alarm level to something between e.g. 25-20% in window 14. This must also be set to the actual application requirements.

See also Fig. 7 in section 8.4, Over- and underload monitor.

## 4.6 Manual setting of alarm levels, alternative C

It is also possible to approximately calculate or estimate the alarm levels. If e.g. the motor used is 22 kW, 22 must be set in window 41. This means that each percentage point corresponds to 220 W ( $22 \text{ kW}/100 = 220 \text{ W}$ ), and the alarm limits in window 11- 14 can be set in steps of 220 W. If the max. alarm level is set to 80% in this example, the monitor will emit an alarm and stop the machine at approx. max. 17.6 kW shaft output power.

---

**NOTE: If the pre-alarm is not used, the values for Min. pre-alarm and Max. pre-alarm can be set to 0 (window 13) and 125% (window 12) respectively. This will eliminate pre-alarm warning indications in the monitor display when not in use.**

---

See also Setting alarm levels manually in chapter 9, Advanced Features.



## 5 Wiring

The following wiring diagram provides an example of how the M20 can be connected to control the start/stop circuit of a three-phase motor, Fig. 1. Connections to a single-phase motor are described later in this manual (Fig. 2) as are the programming changes necessary for such applications. The default setting for the M20 is 3-phase.

1. The current transformer CTMxxx must be placed in the same phase that is connected to terminal 9, phase L1, see Fig. 1. Failure to follow this requirement will result in the monitor failing to function.
2. For single-phase connection see fig 2.

When using DC voltage, terminal 6 should be connected to negative polarity (ground) and terminal 5 to positive polarity (max. 48 VDC). See also Alternative auxiliary circuit (Fig. 16) in chapter 9.

---

**Note: The current transformer (CTMxxx) must be placed in the same phase that is connected to terminal 9, phase L1, see Fig. 1.**

---

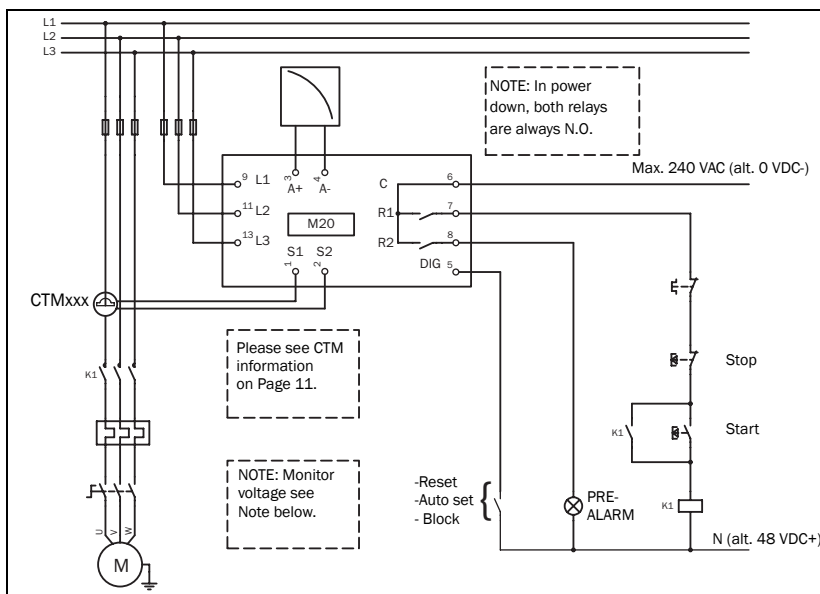


Fig. 1 Connection example

**NOTE: If the START/STOP is connected as per Fig. 1, it is recommended that terminals 6 and 7 be bypassed during programming. After the programming is completed the bypass must be taken out. Make sure that the monitor voltage range e.g. 3x380-500 VAC matches the connected motor/line voltage, e.g. 3x 400 V.**

Please use the enclosed plastic (rubber) insert (if ordered, optional) to cover the monitor terminals.

## 5.1 Alternative example for single-phase connection

This wiring example shows the connections required for single-phase applications. Refer to Fig. 1 for the remaining wiring.

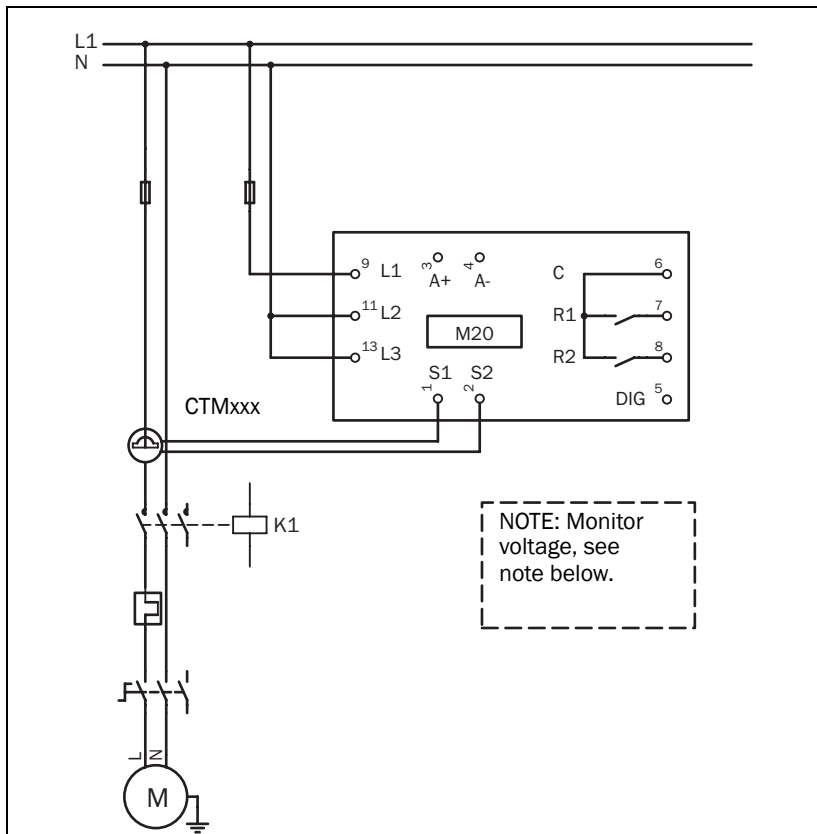


Fig. 2 Single-phase connection example.

**NOTE:** In Fig. 2 make sure that the monitor voltage range e.g. 1x100-240 VAC matches the connected motor/“line – neutral” voltage, e.g. 1x 230 V.

## 5.2 Example - digital input

The digital input uses terminals 5 (DIG) and 6 (C - reference). Either a VAC or a VDC signal may be used. Connect + to terminal 5 (DIG) and - to terminal 6 for VDC signal. Please note the polarity when DC voltage is used. See also Fig1 and terminal 6: Max. 240 VAC (or 0 VDC-) and on terminal 5: N (or 48 VDC+). See also chapter 9, Advanced Features.

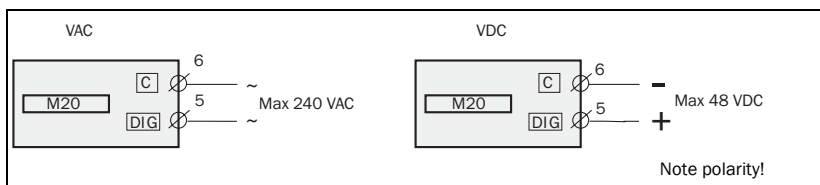


Fig. 3 Wiring example for digital input.

## 6 Selection of Current Transformer

### 6.1 Motors less than 100 A

1. Check the rated motor current on the motor plate.
2. Compare this value with the current in Table 1.
3. From Table 1, select the current transformer and the appropriate number of windings.

Fig. 5 shows the different types of current transformer (CT) windings. In Fig. 5:1 the motor wire is just drawn through the CT, in the text and tables below this is described as 1 (one) winding. Fig. 5:2 shows a CT with 2 windings and Fig. 5:3, 3 windings. In other words the number windings is equal to the number of times the motor wire "L1" is drawn through the hole of the current transformer.

---

**NOTE: Maximum length of the CTM cable is 1 m (39 inches).**

---

## Example

- Rated motor current = 12 A.
- Select 10.1-12.5 A from the first column in Table 1.
- This gives:  
CTM025 with 2 windings (the motor wire is drawn through the CT's hole twice).

Table 1 Motors and CT less than 100 A

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF WINDINGS			
	CTM 010	CTM 025	CTM 050	CTM 100
0.4 – 1.0	10			
1.01 – 2.0	5			
2.01 – 3.0	3			
3.1 – 5.0	2			
5.1 – 10.0	1			
10.1 – 12.5		2		
12.6 –25.0		1		
26.0 – 50.0			1	
51.0 – 100.0				1

In order to ensure an accurate calibration of the M20, it is essential that you use the correct CTM and apply the exact number of windings in accordance with the above table.

---

**NOTE: Normally the appropriate Current Transformer will have been ordered and shipped with the M20. Check that this is the case; contact the supplier if in doubt.**

---

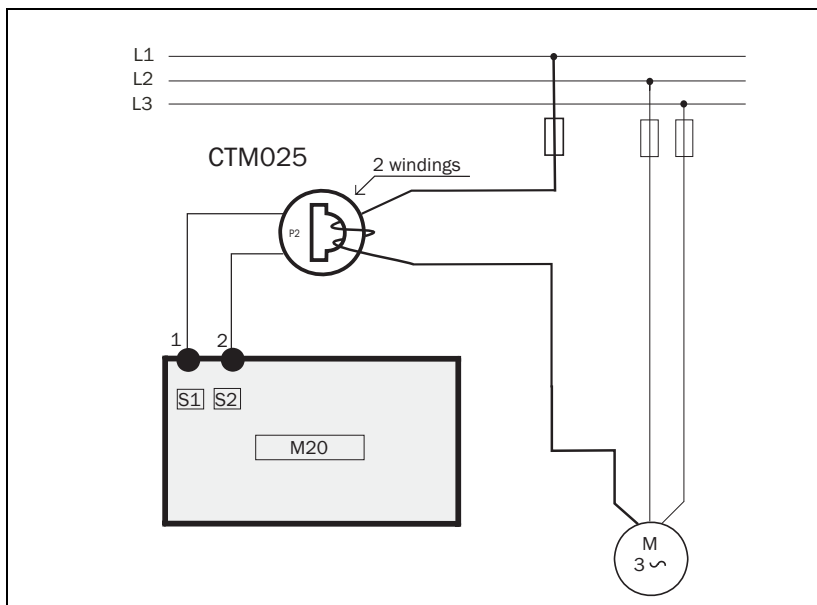


Fig. 4 Example CTM 025 with 2 windings for a 12 A motor

**NOTE: The current transformer connection and orientation are not polarity sensitive, but must be connected to the same phase that is being referenced for terminal 9 of the M20.**

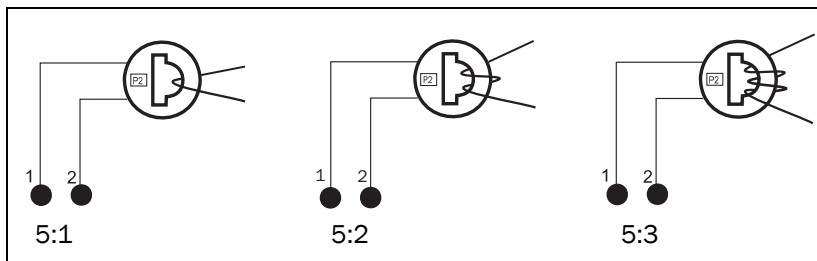


Fig. 5 Example 1, 2 and 3 windings.

## 6.2 Motors greater than 100 A

1. Check the rated motor current on the motor plate.
2. Compare this value with the current in Table 2.
3. Select the primary and secondary current transformer and the appropriate number of windings from the columns in Table 2.

Please note that the ratio of the primary transformer must be exactly as provided in the table below, otherwise the monitor power calculations will be inaccurate. This will affect power readings, settings etc.

### Example

- Rated motor current = 260 A.
- Select 251-500 A from the first column in Table 2.
- This gives:
  - Primary transformer 500:5, 1 winding. (The motor wire is drawn through the primary transformer once).
  - CTM010 with 2 windings. (The wire from the primary transformer is drawn through the hole in the CT, "CTM10", twice).

Table 2 CT greater than 100 A.

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF PRIMARY WINDINGS		
101 – 150	150:5 1	+ +	CTM 010 2
151 – 250	250:5 1	+ +	CTM 010 2
251 – 500	500:5 1	+ +	CTM 010 2
501 – 999	1000:5 1	+ +	CTM 010 2

---

**NOTE: Check that the appropriate Current Transformers has been ordered and shipped with the M20. Contact the supplier if in doubt.**

---

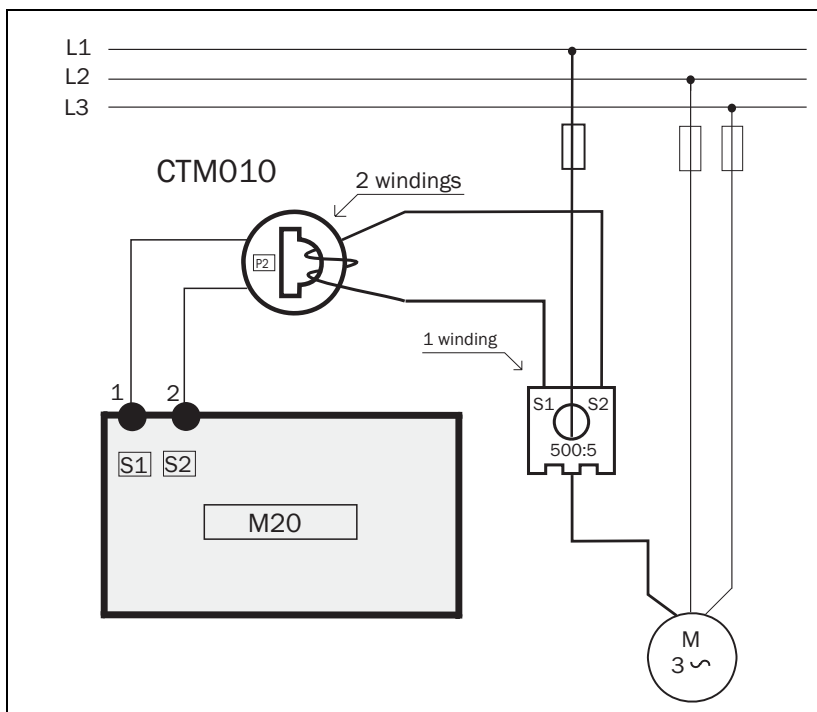


Fig. 6 Example of a CTM 010 with 2 windings and a primary transformer 500:5 with 1 winding for a 260 A motor.

**NOTE:** The transformer connection and orientation are not polarity sensitive, but must be connected to the same phase that is being referenced for terminal 9 of the M20.



## 7 Operation

Make sure the enclosed plastic (rubber) insert (if ordered, optional) covers the monitor terminals before you start programming.

### 7.1 Overview

#### Control Terminals

- 1 S1 Current transformer input
- 2 S2 Current transformer input
- 3 + Analogue output
- 4 - Analogue output
- 5 DIG External RESET or AUTO SET or Block Pre-Alarm
- 6 C Common: RELAY, DIG
- 7 R1 Main Alarm Relay 1\*
- 8 R2 Pre-Alarm Relay 2

#### AUTO SET Key

Press for 3 seconds during normal and stable load to apply the automatic setting of the alarm levels. Not available if Parameter Locked.

#### RESET Key

To reset ALARM

#### +/- Keys

For increasing and decreasing value

#### Monitor Supply Terminals

- 9 L1 Motor phase
- 11 L2 Motor phase
- 13 L3 Motor phase

#### Display

- 12 Function (window) number
- 123 Function Value
- ⚠ Warning signal
- ⌚ Start, response delay or block timer active
- 🔒 Parameter locked
- V Voltage indicator
- A Current indicator
- mA Milliampere indicator
- KW Kilowatt indicator
- S Second indicator
- % Per cent indicator

#### NEXT Key

Proceeds to next window. If no key is pressed for 1 minute the display returns to window 01 automatically. Scroll back by pressing and holding ENTER at the same time as the NEXT key is pressed.

#### ENTER Key

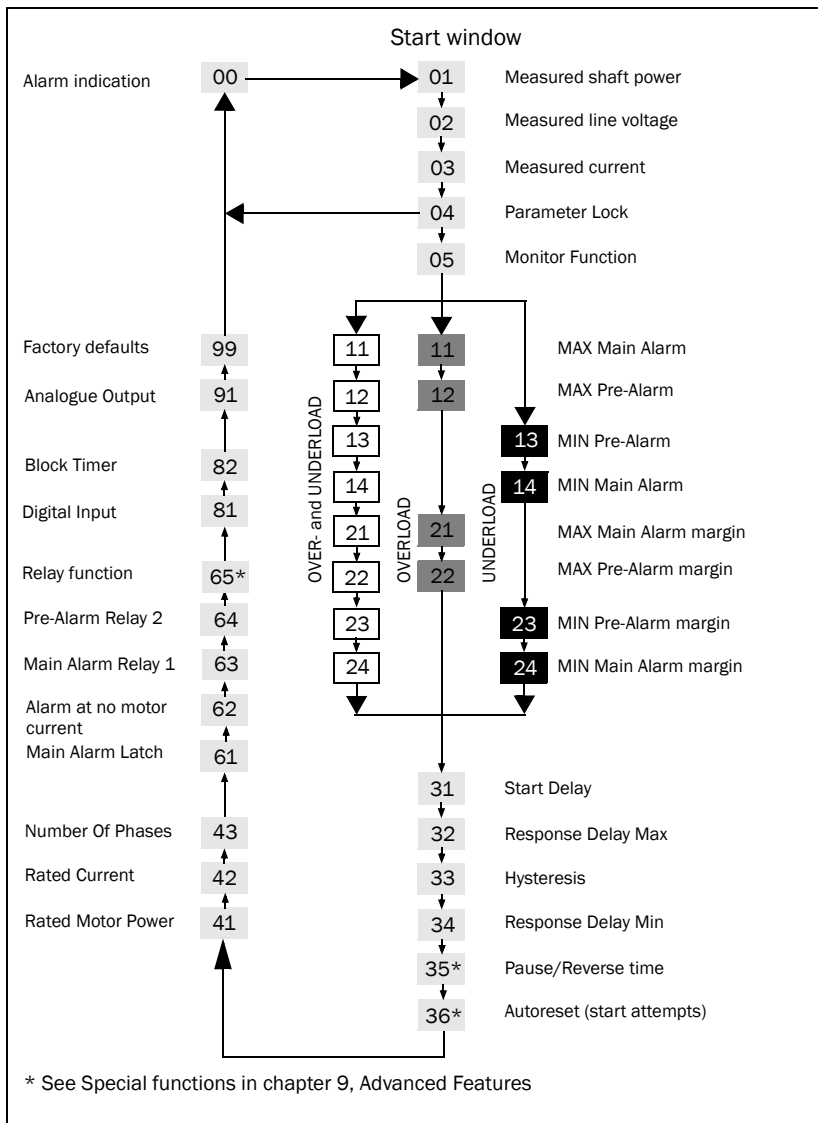
Confirm (save) changes.




After Power up window 01 appears, the actual load value is shown.

Default view (example shows 54% load):




Use the NEXT key to scroll through the function menu.





- The Alarm window **00** only appears if an Alarm output is active.
- The Actual Load window **01** appears after power up.
- Use the  key to scroll through the menu. Scroll back by pressing and holding  at the same time as the  key is pressed.
- The Actual Load window (or alternative alarm window) will appear automatically if no keys are pressed for longer than 1 minute.
- If the Parameter Lock is on, only windows **00** (if alarm active) **01** **02** **03** **04** are visible.
- Window **05** selects the monitor function, see section 8.4.

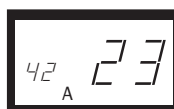
## 7.3 How to change a value


Example: setting the rated motor current in window 42.

1. Press  until the window number 42 appears.




2. Press  or  until the desired value is reached (e.g. 23 A), value flashes.



3. Press  to confirm and save the change, value stops flashing.

---

**NOTE:** If the value is NOT to be changed, press the  key.

---



---

**CAUTION:** In order to avoid personal injury, make sure that all safety measures have been taken before switching on the supply voltage and starting the motor/machine.

---

## 8 Programming

### 8.1 Set measurement unit, kW or HP

#### 8.1.1 Selecting the unit of measurement

The unit of measurement can be set to kilowatts or horsepower both as absolute or relative values. This setting is valid for the alarm levels, rated motor power and the actual load read-out in window 01.

Measurement unit	Read-out load window 01	Rated power window 41	Alarm levels windows 11, 12, 13, 14
Kilowatt relative value (def.)*	%	kW	%
Horsepower absolute value	HP	HP	HP
Horsepower relative value*	%	HP	%
Kilowatt absolute value	kW	kW	kW



\* Measured shaft power as % of rated power.









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**CAUTION: In order to avoid personal injury, make sure that all safety measures have been taken before switching on the supply voltage and starting the motor/machine.**

---

## Programming

- 1. Go to window 01.
  - 2. Press and hold  and  simultaneously for 3 seconds.
  - 3. The next unit of measurement is set and appears for 2 sec (see examples).
- Repeat to select the desired measurement unit according to the table.

	For 2 seconds	Read-out example
<b>Horsepower:</b> absolute value		
<b>Horsepower:</b> relative value*		
<b>Kilowatt:</b> absolute value		
<b>Kilowatt:</b> relative value* (default)		

\* Measured shaft power as % of rated power.







## 8.2 Setting rated motor power and current (window 41 and 42)

The rated motor power and the rated motor current must be set in windows 41 and 42.

Example motor plate:

TYPE: T56BN/4		NR: 948287		Prot. IP: 54	
Serv: S1		Cos $\varphi$ : 0.78		Is. Cl:F	
V:Y/ $\Delta$	Hz	HP	kW	RPM	A:Y/ $\Delta$
240/415	50	3	2.2	1400	5.6/9.4
260/440	60	3	2.2	1680	5.8/9.1
ASYNCHRONOUS THREE-PHASE MOTORS					

### 8.2.1 Programming

1. Go to window 41 (default = 2.2 kW).
2. Press  or  to set the rated motor power as indicated on the motor plate (see example).
3. Press  to confirm the change.
4. Go to window 42 (default = 5.6 A).
5. Press  or  to set the rated motor current as indicated on the motor plate (see example).
6. Press  to confirm the change.




### 8.3      Setting number of phases (window 43)

The number of phases must be set according to the number of motor phases.  
Default is 3 phases, see also chapter 5, Wiring.

#### 8.3.1    Programming

1. Go to window 43 (default = 3PH).



2. Press  or  to set the number of phases to 1 if a single-phase motor is used.
3. Press  to confirm the change.



### 8.4      Monitor function (window 05)

Monitor (Protection)	Indication in window 05	Alarm	Output Relay (default)
OVER- and UNDER- LOAD (default)	—  —	MAX Main Alarm	Relay 1 (NC): 6-7
		MAX Pre-Alarm	Relay 2 (NO): 6-8
		MIN Pre-Alarm	Relay 2 (NO): 6-8
		MIN Main Alarm	Relay 1 (NC): 6-7
OVERLOAD	—	MAX Main Alarm	Relay 1 (NC): 6-7
		MAX Pre-Alarm	Relay 2 (NO): 6-8
UNDERLOAD	—	MIN Pre-Alarm	Relay 2 (NO): 6-8
		MIN Main Alarm	Relay 1 (NC): 6-7

If separate output relays are required for overload and underload alarms, please refer to chapter 9 and chapter 12.

## Overload and underload Monitor

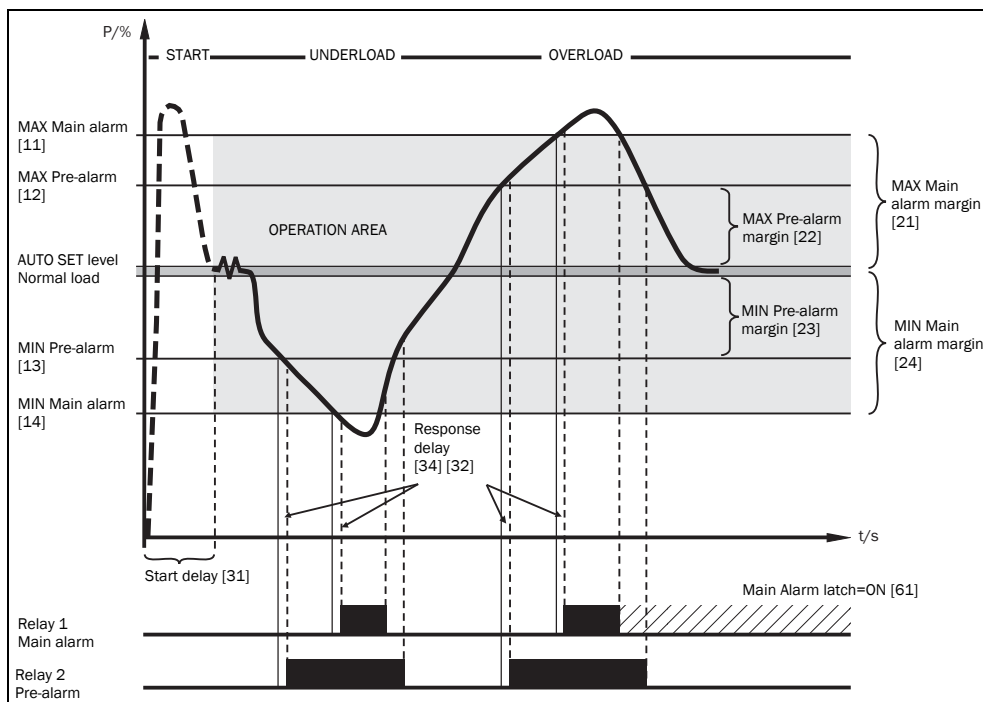
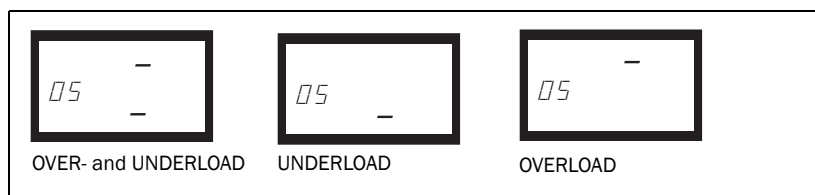


Fig. 7 Overload and underload monitor.

## Programming

- Go to window 05. The default selection is Overload and Underload monitor.
- Press **-** or **+** to select underload or overload monitor.






- Press **ENTER** to confirm the change.



## 8.5 Setting the Start Delay (window 31)

To avoid false alarms during start up a Start Delay must be set to allow the motor and machine to speed up and to allow the power in-rush currents.

### Programming

1. Determine in seconds how long it takes for the motor and machine to reach speed and for the power in-rush to pass. This will be the Start Delay.
2. Go to window 31 (default = 2.0 s).
3. Press  or  to set the determined Start Delay time in seconds.
4. Press  to confirm the change.

If the monitor is being used on a self-priming pump, it may also be necessary to set the Start Delay long enough to allow the pump to become fully primed.

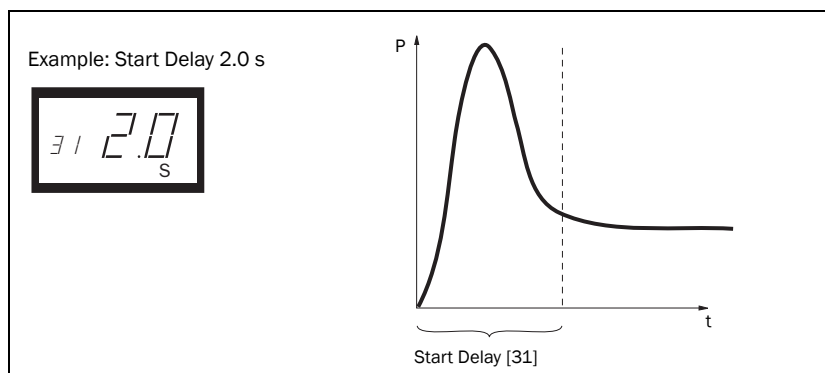



Fig. 8 Start Delay.

## 8.6 Setting alarm levels with Auto set

The Auto set command performs a measurement (momentarily) of the actual motor load and automatically sets the relevant alarm levels depending on the selected monitor function.

Protection (Monitor function window 05)	Alarm	Margin Value (Default margins)	Margins (Windows)	Alarm Level at Auto set
OVER- and UNDERLOAD (Default)	MAX Main Alarm	16%	21: MAX Main Alarm margin	Normal machine load + Window 21
	MAX Pre- Alarm	8%	22: MAX Pre- Alarm margin	Normal machine load + Window 22
	MIN Pre- Alarm	8%	23: MIN Pre- Alarm margin	Normal machine load - Window 23
	MIN Main Alarm	16%	24: MIN Main Alarm margin	Normal machine load - Window 24
OVERLOAD	MAX Main Alarm	16%	21: MAX Main Alarm margin	Normal machine load + Window 21
	MAX Pre- Alarm	8%	22: MAX Pre- Alarm margin	Normal machine load + Window 22
UNDERLOAD	MIN Pre- Alarm	8%	23: MIN Pre- Alarm margin	Normal machine load - Window 23
	MIN Main Alarm	16%	24: MIN Main Alarm margin	Normal machine load - Window 24

### Programming

1. Start the motor and let it run at the normal machine load until the Start Delay has expired.
2. Press  for 3 seconds. This can be done in any window.

3. The display shows “SEt”, to confirm that the Auto set level has been measured and the alarm levels have been set. The display reverts to window 01.






4. If the alarm levels are too high or too low, readjust the appropriate MARGINS (see table) and perform a new Auto set. Alternatively, alarm levels can be set manually, see chapter 9.

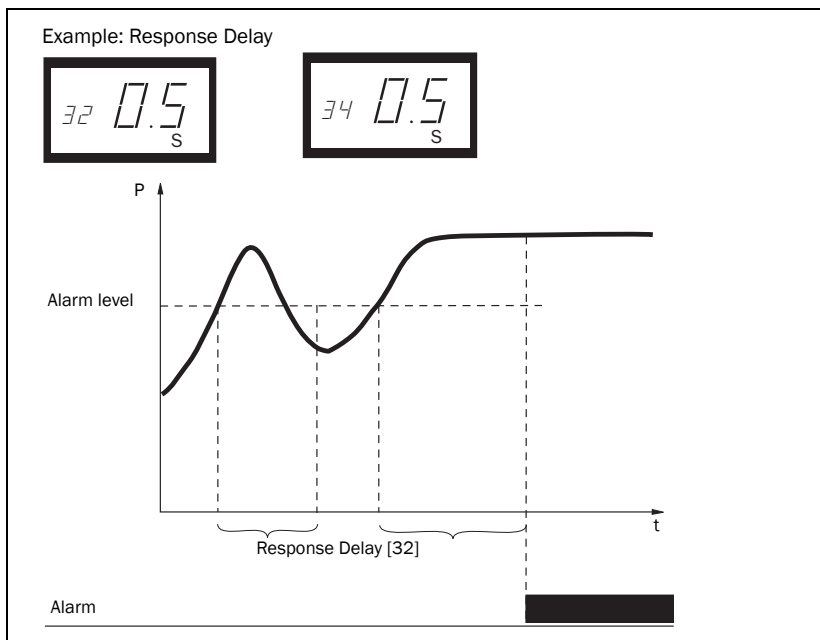
## 8.7 Setting the Response Delay (windows 32 and 34)

A Response Delay allows the machine to remain in an over- or underload condition for a specific time before the alarm relays are activated. Set the response delay for the overload condition in window 32 (max.), and set the response delay for the underload condition in window 34 (min.). The default value for both windows are 0.5 s. The valves may be adjusted upwards to avoid triggering a “false alarm”.

### Programming

1. Determine in seconds the response delay required for both overload and underload conditions. This is normally determined by the unique properties and behaviour of each application.
2. Go to window 32 (overload, default = 0.5 s).
3. Press  or  to set the determined Response Delay time in seconds.
4. Press  to confirm the change.

The response delay for the underload condition (min.) is set in window 34 in a similar way.



*Fig. 9 Response Delay.*

## 9      **Advanced Features**

### 9.1      **Setting alarm levels manually (windows 11-14)**

The alarm levels can be set manually, without using the Auto set. These levels can also be readjusted, e.g. for fine-turning, after an Auto set has been performed. See also section 4.3 to 4.6.

Protection (Monitor function window 05)	Alarm levels (Window)	Default
OVER- and UNDERLOAD (Default)	11: MAX Main Alarm	100%
	12: MAX Pre-Alarm	100%
	13: MIN Pre-Alarm	0%
	14: MIN Main Alarm	0%
OVERLOAD	11: MAX Main Alarm	100%
	12: MAX Pre-Alarm	100%
UNDERLOAD	13: MIN Pre-Alarm	0%
	14: MIN Main Alarm	0%

## Setting margins (windows 21-24)

The margins for the Auto set can be changed manually. After the adjustment, the Auto set action must be performed again.

Protection (Monitor function window 05)	Window	Default
OVER- and UNDERLOAD (Default)	21: MAX Main Alarm margin	16%
	22: MAX Pre-Alarm margin	8%
	23: MIN Pre-Alarm margin	8%
	24: MIN Main Alarm margin	16%
OVERLOAD	21: MAX Main Alarm margin	16%
	22: MAX Pre-Alarm margin	8%
UNDERLOAD	23: MIN Pre-Alarm margin	8%
	24: MIN Main Alarm margin	16%

## Setting hysteresis (window 33)

The hysteresis of an alarm level prevents the alarm relay “chattering” if the load fluctuates even in a normal “stable” condition. This also applies to a pre-alarm. This feature is normally only used if the main alarm latch (window 61) is set to Off. Default = 0%.

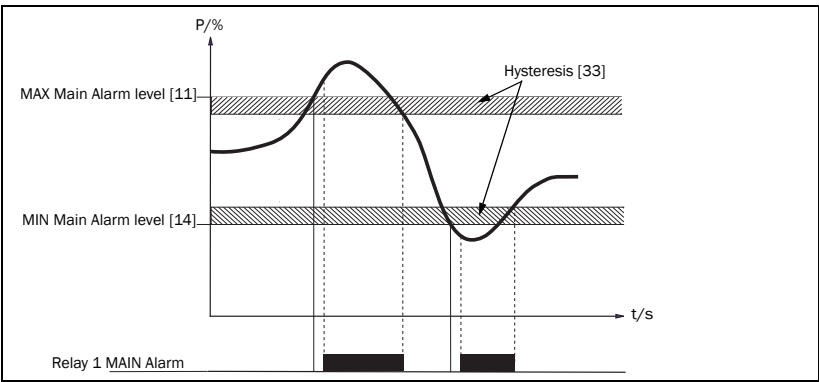


Fig. 10 Hysteresis

## Setting main alarm latch (window 61)

The main alarm latch keeps the main alarm output active, even if the alarm condition has been removed. A latched alarm output can be reset by:

- The reset key
- External reset via digital input (see window 81).
- Switching off the power to the monitor (see also Wiring).

Default = Off.

## Setting alarm at no motor current (window 62)

The alarm at no motor current gives an alarm if the motor current goes down to zero (62 = on). Default = Off (No alarm at no motor current).

## Setting relay output (window 63 and 64 alt. 65)

The relay outputs R1 and R2 can be set to NO or NC contacts.

---

**NOTE: If the power to the load monitor is switched off, the relay contacts are always in position NO.**

---

If separate output relays are required for overload (max., relay R1) and underload (min., relay R2), see Special functions in chapter 9 and chapter 12.

## Setting digital input (window 81)

The digital input can be set for:

RES: External RESET (Default)	To reset an alarm.
AU: External Auto set	To perform an Auto set with an external signal.
bLo: Block Pre-Alarm	To block the Pre-Alarm function and start the Block timer. If the input is high a Pre-Alarm is blocked, i.e. it is neglected. See also window 82.

## Setting block timer (Window 82)

To set the timer for the blocking time after the Block command is released (see also window 81). Default = 0.0 sec.

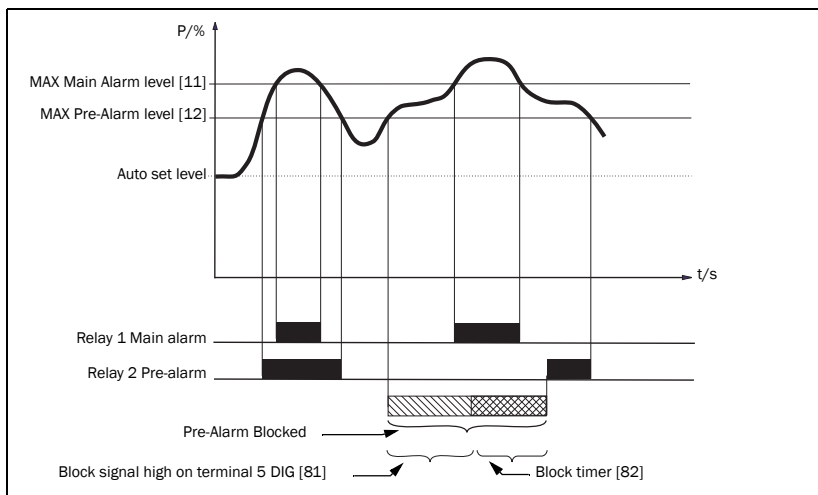


Fig. 11 Block timer

## Setting analogue output (window 91)

The analogue output provides an analogue signal of either 0-20 mA or 4-20 mA which represents the motor shaft power. The signal can be inverted (20-0 or 20-4 mA). Full scale: rated motor power, see Fig. 12. To set P-span/scaling (full scale) see Fig. 13.



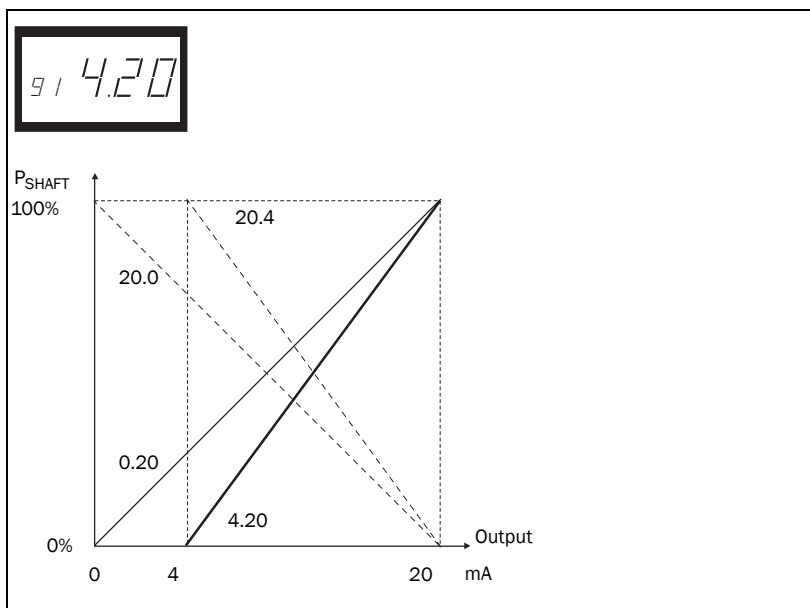


Fig. 12

## Setting analogue output load range: P-span (window 92-93)

With windows 92 and 93 the full scale of the analogue output can be set according to the minimum and maximum load (P-span).

1. In window 91, press RESET and + for two seconds until “on” shows. Windows 92 and 93 are now active.

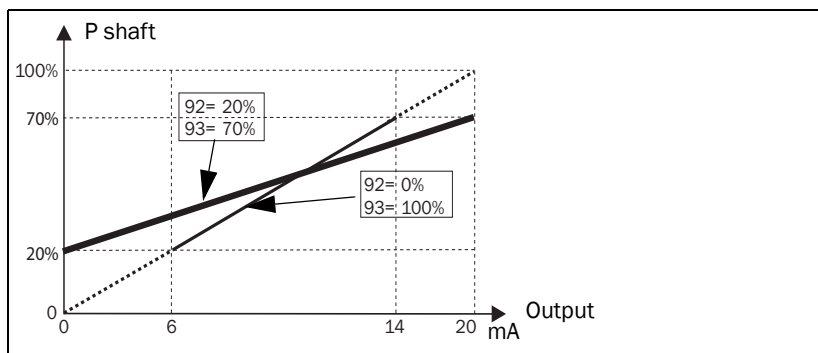


Fig. 13


2. Set the lowest load value in window 92 (e.g. 20%)
3. Set the highest load value in window 93 (e.g. 70%)

The full scale of the analogue output is now set between 20% and 70% load. See Fig. 13. To deactivate: Press RESET and + for two seconds until “Off” shows in window 91. Windows 92 and 93 are now inactive.

## Locking parameters (window 04)

To avoid the parameter settings being changed unintentionally, the programming can be locked by entering the code “369” in window 04. Now only Load [01], Voltage [02] and Current [03] can be checked. Follow the same procedure to unlock the monitor. The Auto set key is disabled when parameters are locked. Auto set via digital input is always active if window 81 is set to AU (Auto set).












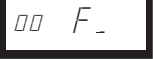






**NOTE:** The  symbol appears in all windows.

**Resetting to factory defaults (window 99)**

The factory defaults are reset by entering “dEF” in window 99. If window 99 shows “USr” it indicates that the settings have been changed to user specific settings.

**View alarm message (window 00)**

In an alarm condition, the window 00 appears automatically. The window indicates the following alarm conditions. Window 00 flashes at all times.

 	Pre-Alarm MAX level reached	 	Undervoltage, switch off the supply!
 	Alarm MAX level reached	 	Overvoltage, switch off the supply!
 	Pre-Alarm MIN level reached	 	No motor current Window 62 = on
 	Alarm MIN level reached	 	Out Of Range. This message appears only in window 01 (actual load) or 03 (actual current)

When the monitor is switched on (power up), the voltage on phases L1, L2 and L3 is checked. If the wrong voltage is detected, an LU (undervoltage) or OU (overvoltage) alarm is generated. No relay alarm will be indicated or activated.

## Special functions (windows 35, 36 and 65)

Special functions are separate relays for overload and underload alarm/stop, start attempts and a reverse function with start attempts:

- Window 65 = 0, Normal M20
- Window 65 = 1, Separate relays for overload and underload alarm (DLM)
- Window 65 = 2, Reverse function

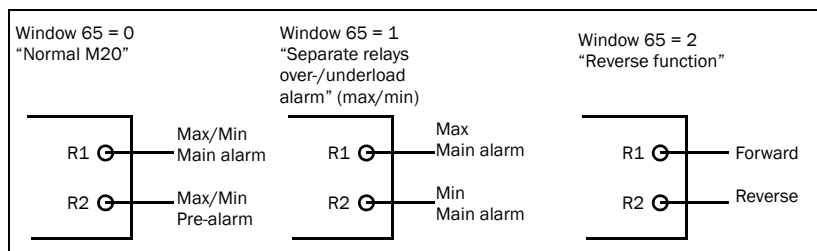


Fig. 14 Window 65 and relay functions

In all three cases the number of start attempts after a main alarm may be set in window 36. The pause time between start attempts may be set in window 35. This time is also used as the time to run the motor in the reverse direction when window 65=2. If a "jam" occurs on the reverse direction the M20 will stop the motor immediately and no more start attempts will be made until the alarm is reset.

The reverse function can be used to reverse e.g. a screw conveyor or pump when a "jum" occurs. Reversing the motor may remove the blockage. Should one reverse cycle not be enough to release the material, the M20 will repeat this operation up to a maximum of 5 cycles (window 36, 0-5 start attempts). Relay R1 = forward, relay R2 = reverse.

---

**NOTE: For special handling of analogue output in reverse mode, see below.**

---

The analogue output will go to its maximum e.g. 20 mA when the number of allowed start attempts has elapsed. Or if an overload condition occurs in reverse direction (window 65 = 2).

## Resetting an alarm

A reset will cause the start attempt counter to be reset (new start attempts may be performed).

**NOTE:** In order to accomplish the above result, it will be necessary for a forward and reversing motor starter to be installed. See Fig. 15 Example of connection with a forward and reversing motor starter (contactor).

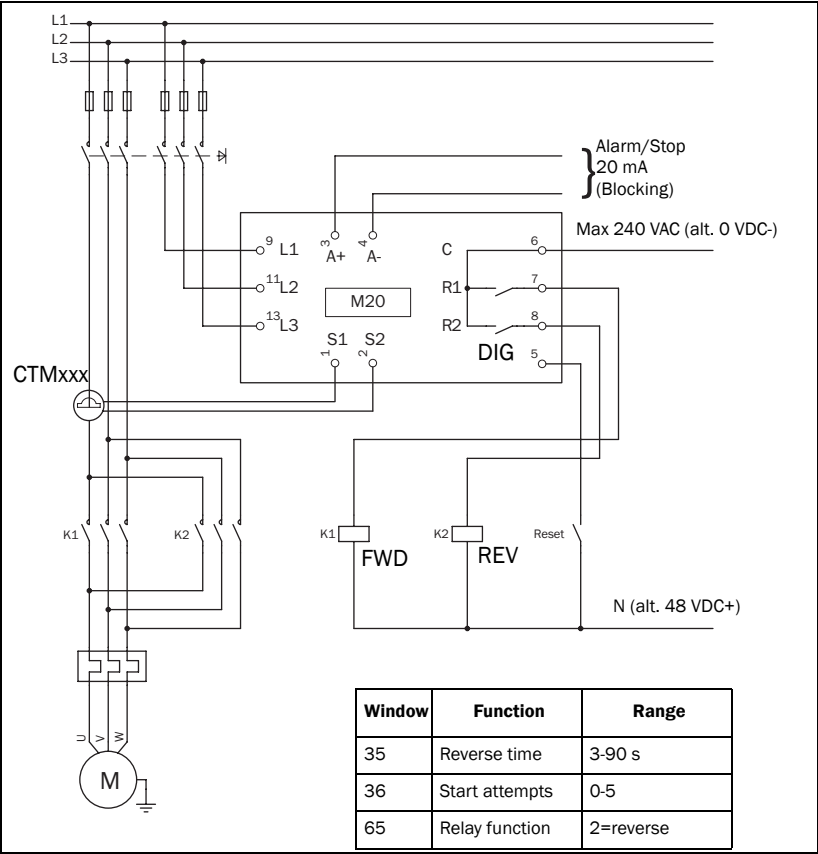
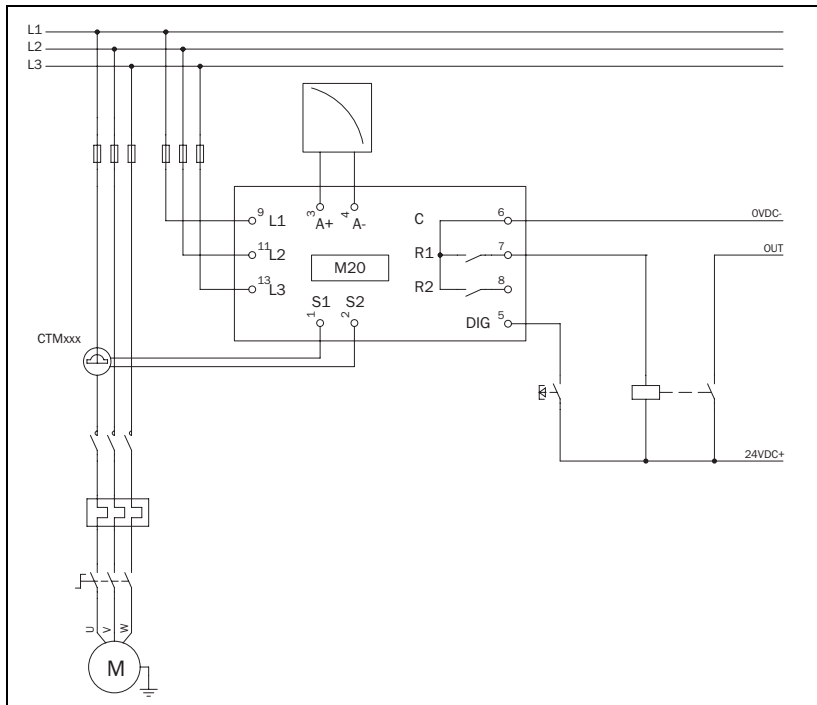


Fig. 15 Example of connection with a forward and reversing motor starter (contactor).

**NOTE: In Fig. 15, R1 and R2 (K1 and K2) must not be energized/on at the same time as this will generate a short circuit. Therefore it is important that window 65 = 2 before the relays are connected to the contactors.**

## Alternative auxiliary circuit



*Fig. 16 Example of auxiliary circuit when VDC is used.*

The example above can be used when a high VDC signal output is required.

## 10 Troubleshooting

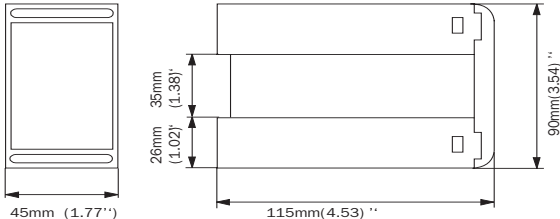
Ensure that the installation has been correctly carried out, e.g. check the terminals and that the cables are properly stripped. The monitor is maintenance-free. However, you should regularly check wirings and terminals etc.

Problem	Solution
Window 01 always shows zero load, even if the motor is running	<ul style="list-style-type: none"> <li>- Check the connection of the current transformer(s).</li> <li>- Check that the value of the rated motor power in window 41 is the same as the rated motor power on the motor plate.</li> <li>- Check that window 03 shows a phase current value that agrees with with the rated motor current.</li> </ul>
Window 01 shows an improper power value when the motor is running	<ul style="list-style-type: none"> <li>- Check that the motor is not oversized for its application, check power transmission and gear ratio.</li> <li>- Check that there is a load on the motor during normal operation.</li> <li>- Check that the change in motor load is greater than about 3% (window 01).</li> <li>- Check that the current transformer is connected in phase L1.</li> </ul>
Window 03 shows an improper value for the phase current	<ul style="list-style-type: none"> <li>- Check that the current transformer has been selected as per Tables 1 and 2.</li> <li>- Check that the number of windings is as per Tables 1 and 2.</li> <li>- Check that the value of the motor current in window 42 is the same as the value of the motor current on the motor plate.</li> </ul>
The monitor never gives an alarm	<ul style="list-style-type: none"> <li>- Check that window 01 shows a value greater than zero.</li> <li>- Check the alarm levels in windows 11 to 14. If incorrect readjust the levels or perform an Auto set.</li> </ul>

<b>Problem</b>	<b>Solution</b>
The monitor always gives an alarm	<ul style="list-style-type: none"> <li>- Check the alarm levels in windows 11 to 14. If incorrect readjust the levels or perform an Auto set.</li> <li>- Check if the monitor is programmed for “latched alarm” (window 61=on). If so reset the monitor by pressing the reset key.</li> </ul>
Window 00 shows “LU” or “OU”. Under- or over-voltage alarm.	Switch off the supply: <ul style="list-style-type: none"> <li>- Check that the supply voltage agrees with the voltage range on the monitor type plate.</li> </ul>
Window 01 shows “oor”. “Out Of Range” alarm.	<ul style="list-style-type: none"> <li>- The measured shaft power is higher than 125% of the rated motor power programmed in window 41.</li> </ul>
Window 03 shows “oor”. “Out Of Range” alarm.	<ul style="list-style-type: none"> <li>- The measured motor current is higher than 125% of the rated motor current programmed in window 42.</li> </ul>
Over and undervoltage is not detected	This is only detected at monitor power up and not during continued operation. The relays will not trip, only indication in the display.
The alarm relays are not switching	<ul style="list-style-type: none"> <li>- Check that the wire links between terminals 6 and 7 are removed as per “Wiring”.</li> </ul>
Not all windows are shown	When the special functions are used (windows 35, 65 etc.) blocked windows for settings are not shown.



# 11 Technical Data

Dimensions (WxHxD)	45x90x115 mm (1.77" x 3.54" x 4.53") 
Mounting	35 mm DIN rail 46277
Weight	0.30 kg (10.5 oz)
Supply voltage (±10%)	1x100-240 VAC, 3x100-240 VAC, 3x380-500 VAC 3x525-690 VAC
Frequency	50 or 60 Hz
Current input	Current transformer; CTM 010, 025, 050 and 100. Input 0-55 mA. (>100 A extra transformer needed)
Power consumption	Max. 6 VA
Start-up delay	1-999 s
Hysteresis	0-50% of rated motor power
Response delay max	0.1-500 s
Response delay min	0.1-500 s
Relay output	5 A/240 VAC Resistive, 1.5 A/240 VAC Pilot duty/AC12
Analogue output	Max. load 500 ohm
Digital input	Max. 240 VAC or 48 VDC. High: ≥24 VAC/DC, Low: <1 VAC/DC. Reset >50 ms
Fuse	Max. 10 A
Terminal wire size	Use 75 °C copper (CU) wire only. 0.2-4.0 mm <sup>2</sup> single core (AWG12). 0.2-2.5 mm <sup>2</sup> flexible core (AWG14), stripped length 8 mm (0.32")

Terminal tightening torque	0.56-0.79 Nm (5-7 lb-in)
Accuracy	±2%, ±1 unit cos phi>0.5; excl. current transformer; +20 °C (+68 °F)
Repeatability	±1 unit 24h; +20 °C (+68 °F)
Temperature tolerance	max 0.1%/°C
Operating temperature	-20 to +50 °C (-4 °F to +122 °F)
Storage temperature	-30 to +80 °C (-22 °F to +176 °F)
Protection class	IP20
Approved to	CE (up to 690VAC), UL and cUL (up to 600 VAC)

Article number	Designation
01-2520-20	Emotron M20 1x100-240/3x100-240 VAC
01-2520-40	Emotron M20 3x380-500 VAC
01-2520-50	Emotron M20 3x525-690 VAC

## Technical Data for Current Transformer (CT)

Type	Dimensions (WxØ)	Weight*	Mounting
CTM 010	27 (35) x Ø48 mm	0.20 kg	35mm DIN rail 46277
CTM 025	27 (35) x Ø48 mm	0.20 kg	35mm DIN rail 46277
CTM 050	27 (35) x Ø48 mm	0.20 kg	35mm DIN rail 46277
CTM 100	45 (58) x Ø78 mm	0.50 kg	35mm DIN rail 46277

\* Weight including 1m (39 inch) cable. Please note that max. length of the CTM cable is 1 m and this cable cannot be extended.

## Accessories and documentation

Article number	Designation
01-2471-10	Current Transformer (CT) CTM010, max. 10 A
01-2471-20	Current Transformer (CT) CTM025, max. 25 A
01-2471-30	Current Transformer (CT) CTM050, max. 50 A
01-2471-40	Current Transformer (CT) CTM100, max. 100 A
01-2368-00	Front Panel Kit 1 (2x terminal covers included)
01-4136-01	2x Terminal covers
01-2551-00	Instruction manual (Swedish)
01-2551-01	Instruction manual (English)
01-2551-02	Instruction manual (German)
01-2551-03	Instruction manual (Dutch)
01-2551-04	Instruction manual (Spanish)
01-2551-08	Instruction manual (French)
01-2551-09	Instruction manual (Russian)

## Dismantling and disposal

As an example, the housing is made of recyclable plastic, PC/ABS. When disposing of parts they must be handled and recycled in accordance with local regulations.

## EU (European Union) specifications

EMC EN 50081-1, EN 50081-2,  
EN 50082-1, EN 61000-6-2

Electrical safety IEC 947-5-1

Rated insulated voltage 690 V

Rated impulse withstand voltage 4000 V

Pollution degree 2

Terminals 3, 4, 5, 6, 7 and 8 are basic insulated from the line.

Terminals 3 and 4 are basic insulated from terminals 5, 6, 7 and 8.


## US specifications

FCC (Federal Communications Commission). This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference, in which case the user will be required to correct the interference at their own expense.

## Canadian specifications

DOC (Department of Communications). This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the Canadian Interference-Causing Equipment Regulations. Le présent appareil numérique n'émet pas de bruits radio-électriques dépassant les limites applicables aux appareils numériques de la Classe A prescrite dans le Règlement sur le brouillage radioélectrique édicté du Canada.

## 12 Parameter List

Window	Function	Range	Default	Custom	Symbol
00	Alarm indication				
01	Measured shaft power in % of rated power	0-125			%
	Measured shaft power in kW	0-745			kW
	Measured shaft power in % of rated power	0-125			%
	Measured shaft power in HP	0-999			
02	Measured line voltage	90-760 V			V
03	Measured current	0.00-999 A			A
04	Parameter lock	0-999			
05	Monitor function	OVER- and UNDERLOAD, OVERLOAD, UNDERLOAD	OVERLOAD and UNDERLOAD		
11	MAX Main Alarm (relay R1)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
12	MAX Pre-Alarm (relay R2)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		

Window	Function	Range	Default	Custom	Symbol
13	MIN Pre-Alarm (relay R2)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		
14	MIN Main Alarm (relay R1)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		
21	MAX Main Alarm margin	0-100	16		%
22	MAX Pre-Alarm margin	0-100	8		%
23	MIN Pre-Alarm margin	0-100	8		%
24	MIN Main Alarm margin	0-100	16		%
31	Start delay	1-999	2		s
32	Response delay max.	0.1-500 s	0.5		s
33	Hysteresis	0-50	0		%
34	Response delay min.	0.1-500s	0.5		s
35*	Pause/Reverse time	3-90	5		s
36*	Autoreset (start attempts)	0-5	0		
41	Rated motor power	0.10-745	2.2		kW
		0.13-999	3		
42	Rated current	0.01-999	5.6		A
43	Number of phases	1PH/3PH	3PH		
61	Main alarm latch	on/OFF	OFF		
62	Alarm at no motor current	on/OFF	OFF		

Window	Function	Range	Default	Custom	Symbol
63	Main Alarm relay R1	nc/no	nc		
64	Pre-Alarm relay R2	nc/no	no		
65*	Relay function	0 = M20 1 = DLM 2 = Reverse	0		
81	Digital input	rES/AU/bLo	rES		
82	Block timer	0.0-90	0.0		s
91	Analogue output	0.20/4.20/ 20.0/20.4	0.20		
92**	Analogue output low value	0-100			
93**	Analogue output high value	0-125			
99	Factory defaults	dEF/USr	dEF		

\* See Special functions in chapter 9.

\*\* See Set analogue output range in chapter 9.

# 13     Service

This manual is valid for the following model:

Emotron M20 (from software version R3a)

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