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7 Station Rotary Washing Machine for

Jaguar AJ200 Cylinder Heads - OP40 Intermediate Wash

Operation and Maintenance Manual

HMM Project Numbers	1180
Customer	Jaguar Land Rover
Plant	Coventry
Customer Order No.	EJQ PO12 H77415
Asset Numbers	EMC1-00136

7 Station Rotary Washing Machine for AJ200 Cylinder Head OP40 Intermediate Wash Operation and Maintenance Manual

A publication of:

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Section 1 - Preliminaries

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1.1 Manual Contents

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12	Training : Task Certification Lists



Before starting work on the machine for the first time all persons must read and fully understand the complete 'Section 2 Safety' and apply its recommendations.

1.2 Proprietary and Disclaimer

These maintenance instructions, drawings and all information therein, are the confidential properties of Harry Major Machine-UK Ltd.

Nothing in this manual may be copied or made public without the express written consent of Harry Major Machine-UK Ltd.

This manual is constructed using the latest engineering at the time your equipment is shipped. Any updates or changes after the original ship date will **not** be reflected in this manual unless requested, and the changes were the responsibility of Harry Major Machine-UK Ltd.

This machine is designed to process the specified part, which has agreed dimensions and shape. Use of the machine to process other parts without Harry Major Machine-UK Ltd written agreement may invalidate the warrantee.

1.3 Amendment Record

Amdt No	Date	Text Affected	Incorporated by
-	20140115	First issue	Gerard Middleton
1	20141125	Amend Section 5 on Preventative Maintenance Add Spares List to Section 8 Complete list of drawings numbers to Section 9	Tim Webb
2	20150107	Amend Section 5.2.22 and Spares list section 8	Tim Webb

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Spray Heads

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Magnetic Filtration - Filter Mag - Drimag

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Wide Track Roller / Bearings / Shafts

HYDAC International
Industriegebiet Grube Konig
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Fax: +49 (0) 68 97 / 509-1277
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Wash Fine Filters

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www.ina.co.uk

KSB Pumps Ltd

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LOSMA (UK)

Filtration

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Worcester

WR5 2WU

www.losma.co.uk

Micronfilter srl

Extraction System

Corso Europa, 597

10088 Volpiano –(TO)

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www.micronfilter.it

NDA Engineering Equipment Ltd

Rubber Seals & Extrusions [Flowtech]

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Blowers

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Starters, Controls Etc (Telemecanique etc)

Sew Eurodrive
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Controls

SKF Bearings Ltd
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Sterling Hydraulics Ltd
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Oil Separation Systems

www.separator.nl

Valbia Valves, refer to Bonomi (UK) Ltd

Vokes Air Filtration

Henley Park

Guildford

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GU3 2AF

Willy Vogel Aktiengesellschaft

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D-12277 Berlin

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Autolub Systems

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(See Driveline Technologies)

Section 2 - Safety

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Before starting work on the machine for the first time all persons must read and fully understand the complete 'Section 2 Safety' and apply its recommendations.

2.1 Personal Safety

Personal safety recommendations are listed below:

- Staff must only perform those tasks for which they are authorized and qualified.
- All persons who are to work with or on the machine must read and fully understand the safety instructions.
- Staff must have received the appropriate safety training.
- A copy of this manual must be accessible to all persons who are to work with or on the machine.
- Maintenance and servicing of high-pressure equipment must only be performed by those who are properly accredited.
- All safety hazards must be reported immediately.



Make sure that all power has been disconnected and the machine locked out in accordance with established ECPL procedures before starting any repair work on this machine.



You must check the air receiver gauge to make sure the pressure is released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.

2.1.1 General Safety Reminders

General safety reminders are listed below.

- HMM UK supplies a manual with each machine. The employer must ensure that the manual is available at all times.
- It is the employers' responsibility to ensure that competent and qualified employees are selected to operate the machine.
- Safety devices, guards and safety doors must be in place at all times.
- Appropriate safety equipment must be used at all times.
- Management personnel are responsible for ensuring that operating personnel are warned about any unsafe practices that take place.
- All employees should be made aware of first-aid facilities and should be encouraged to use them regardless of the severity of the injury.
- Employees should be encouraged to report any hazardous conditions to their supervisors.
- It is recommended that air hoses are not available for use on or near the machine as flying debris or waste can cause injury.

2.1.2 Machine Operating Staff

The machine must be operated by qualified Operating Staff only. Operators must be familiar with the machine operating system. They must not perform any of the following activities:

- Improper use.
- Repairs.
- Opening of, and working with, electrical equipment.
- Modification of protective equipment and covers.
- Immobilization and / or defeating of protective equipment and covers.
- Manipulation of hardware and software.
- Defeating safety interlocks.

The operating staff may rectify faults if the necessary measures are not included in the above-mentioned restrictions and providing that the operating system has the capability to rectify faults.

2.1.3 Workwear, Protective Clothing and Safety Equipment

All responsible persons must wear appropriate and suitable protective clothing and use appropriate safety equipment when working at or on the machine.

For example:



Safety Shoes or Boots



Safety Helmets



Face Shields



Eye Protection



Ear Protectors



Face Masks



Safety Gloves



Safety Harnesses



Welding Masks

Potential dangers are:

- Loose clothing - Clothing should be comfortable, but long sleeves, neckties, and long legged trousers, should not be worn.
- Accessories - Do not wear rings, watches or jewellery.
- Long hair - Should be maintained so that it does not present a hazard.

2.1.4 Maintenance and Repair Staff

Maintenance and repairs, particularly in the hydraulic, pneumatic, mechanical, electrical and programming fields, should only be undertaken by staff possessing the necessary qualifications. In this case, the personnel are to be trained regarding safety. This must be followed by instruction in the machine operating system. Exceptional features of the operating of individual control systems, differing from and / or in addition to the control system are to be taken from the operating instructions. Maintenance staff must be instructed in these features.

- 1 Having the necessary authority and permission.
- 2 Qualified by means of training, experience and qualifications.
- 3 Accreditation by training course approved by appropriate governing body, for example, BFPA, CETOP or approved plant specific training programmes.

2.1.5 Machine Condition

The machine, including the floor, must be kept clean, free of foreign objects and oil. The safety zones, footpaths, driving paths and escape routes must never be obstructed.

2.1.6 Entering the Machine

Authorized and qualified personnel only are to enter the machine. This is only permitted after the machine is switched off and locked out by a qualified person. Before entering the machine note all potentially dangerous parts. Typical items are as follows:

- Components which may be held in grippers, mounted on loading plates or similar items. These components could drop or slide if impacted by external forces or if they are insufficiently supported because of a mechanical failure.
- All horizontal or inclined shafts. Although such shafts may be locked or braked when the machine is switched off, they should be treated as potentially moveable.
- All freely moveable components, for example, shafts, slides etc. Such items may be designed to be moveable when the machine is switched off and, accordingly, must be treated with caution.
- Spaces within machines. The space within the machine is often restricted and surfaces may be made slippery by lubricants or cleaning fluids.

2.1.7 Repairs and Maintenance

Repairs and maintenance must only be done after a safety shut down according to ECPL procedure by a trained person, checking of the condition of the machine, and after the machine has been safeguarded against starting.

Before dismantling or removing a component, checks must be made to determine if movement of other parts will be caused by such actions. In each case the movement must be prevented by safeguarding.

2.2 Machine Safety

HMM Machines utilise the following:

- Manual operation
- Automatic operation
- Rapidly moving parts
- High pressure pneumatics
- High voltage
- High horsepower

All are potential hazards!

2.2.1 Emergency Stop Buttons

- EMERGENCY STOP buttons are red mushroom buttons on a yellow background.
- The EMERGENCY STOP buttons may only be actuated in case of emergency. Do not use these buttons to stop the machine under normal conditions.
- Pressing an EMERGENCY STOP button will stop all machine movements.
- Always test the operation of EMERGENCY STOP buttons during start-up of the system. They must not be tested during normal operation.

2.2.2 Energy Control and Power Lockout (ECPL)

EMC1-00136		OP40 AJ200 CYLINDER HEAD WASHING MACHINE	
NOTICE THIS PRIMARY MACHINE MAY HAVE MORE THAN ONE TYPE OF PRIMARY ENERGY AND MULTIPLE SOURCES OF THE SAME PRIMARY ENERGY, INCLUDING: ELECTRICAL, HYDRAULIC, PNEUMATIC, GAS, WATER, STEAM/CHEMICAL, ETC. - LOCK IT OUT! THIS PRIMARY MACHINE MAY HAVE MULTIPLE STORED ENERGY SOURCES, INCLUDING MOTION, GRAVITY, SPRING, EXTREME HEAT OR COLD, TRAPPED PRESSURE, CAPACITOR, ETC. - RELEASE IT! IF THIS PRIMARY MACHINE HAS ASSOCIATE MACHINERY, YOU MUST ALSO READ THE ECPL PLATES OF THESE MACHINES - LOCK IT OUT! RELEASE IT! DO NOT WORK ON THIS MACHINE UNLESS YOU HAVE HAD ENERGY CONTROL & POWER LOCKOUT (ECPL) TRAINING AND THOROUGHLY UNDERSTAND THE PROCEDURES EXPLAINED BELOW AND IN THE LOCKOUT MANUAL. UNLESS OTHERWISE SPECIFIED BELOW, TO RESTART THIS MACHINE, VERIFY THAT SAFEGUARDS ARE REPLACED, NON-ESSENTIAL ITEMS REMOVED, CONTROLS NEUTRALIZED, AND PERSONNEL ARE CLEAR. THEN REVERSE THE LOCKOUT PROCEDURE AND NOTIFY AFFECTED EMPLOYEES. IF YOU HAVE ANY QUESTIONS REGARDING PROPER LOCKOUT PROCEDURES, ASK YOUR ADVISOR, SUPERVISOR OR CONTACT THE SAFETY DEPARTMENT.			
NOTICE CHECK IT! PREP IT! LOCK IT! RELEASE IT! VERIFY IT!			
ENERGY TYPE AND SOURCE	LOCK OUT LOCATION	PROCEDURE FOR LOCKING OUT AND/OR RELEASING ENERGIES	VERIFY PROCEDURES
ELECTRICAL 415 VOLTS	E1 MAIN ELECTRICAL CONTROL PANEL	PLACE DISCONNECT HANDLE IN OFF POSITION AND ATTACH MULTIPLE LOCKOUT DEVICE, LOCK AND TAG.	AT THE CONTROL PANEL, ATTEMPT TO RESTART THE MACHINE. START-UP PROCEDURES: ALL MACHINE ELECTRICAL FUNCTIONS AND INDICATORS SHOULD NOT TURN ON AND NO ACTION SHOULD OCCUR.
ELECTRICAL 415 VOLTS	E2 MAIN ELECTRICAL CONTROL PANEL	PLACE DISCONNECT HANDLE IN OFF POSITION AND ATTACH MULTIPLE LOCKOUT DEVICE, LOCK AND TAG.	TRANSFORMER ELECTRICAL CIRCUITS AND INDICATORS POWERED BY THIS DISCONNECT SWITCH SHOULD NOT TURN ON AND NO ACTION SHOULD OCCUR.
PNEUMATIC 5 BAR	P1 MAIN AIR SUPPLY	CLOSE VALVE AND APPLY SAFETY LOCK. STOPS THE FLOW OF AIR TO PRESS. 1 ONLY. MANUALLY VENT AIR PRESSURE.	VERIFY THAT THE GAUGE GOES FROM OPERATING PRESSURE TO ZERO.
WATER 2.5 BAR	W1 MAIN WATER SUPPLY SYSTEM	CLOSE VALVE AND APPLY SAFETY LOCK. STOPS WATER BACKFLOW TO THE BODY SIDE ASSEMBLY ONLY.	VERIFY THE VALVE IS CLOSED AND THE LOCK IS PROPERLY ATTACHED.
CONTROL GRAVITY	CG VERTICAL DOORS BETWEEN ZONES	SET MACHINE TO MANUAL, RAISE DOOR USING BUTTONS ON HMI. SHUT OFF AIR AND LOCK OUT. CHECK THE DOOR TO PREVENT ANY UNPREDICTABLE MOVEMENT.	VERIFY THAT SHUT OFF VALVE IS LOCKED OFF. VERIFY THAT CHECK IS IN PLACE, ENSURE DOOR IS COMPLETELY SECURED AND NOT CAPABLE OF MOVEMENT.
CONTROL GRAVITY	CG GANTRY RAISE AND LOWER	RAISE THE VERTICAL AXIS TO MAINTENANCE HEIGHT. TURN OFF THE POWER OPERATING THE MIXER SAFETY BRAKE.	VERIFY THAT SHUT OFF VALVE IS LOCKED OFF. ENSURE VERTICAL AXIS IS COMPLETELY SECURED AND NOT CAPABLE OF MOVEMENT.
CONTROL GRAVITY	CG VERTICAL LIFT OR ROLLOVER UNIT (DRY STATION)	SET MACHINE TO MANUAL, RAISE ROLLOVER UNIT USING BUTTONS ON THE HMI. SHUT OFF AIR AND LOCK OFF ATTACHED MULTIPLE LOCK TAG. FIT GRAVITY SAFETY PLATE (2 UNITS) TO VERTICAL AXIS.	VERIFY THAT THE LOCKOUT DEVICES ARE ATTACHED TO POWER SOURCES. VERIFY THAT THE SAFETY PLATES HAVE BOTH BEEN FITTED TO THE VERTICAL AXIS (ONE EACH SIDE OF THE UNIT).
CONTROL GRAVITY	CG ROLLOVER UNIT (DRY STATION)	TURN OFF THE POWER. SHUT OFF POWER SUPPLIES OPERATING THE PNEUMATIC SAFETY CLAMP UNITS ON THE ROLLOVER. ATTACH MULTIPLE LOCK OUT TAGS TO POWER SOURCES.	VERIFY THAT SHUT OFF VALVE IS LOCKED OFF. ENSURE ROLLOVER IS COMPLETELY SECURED AND NOT CAPABLE OF MOVEMENT.
DANGER THIS PRIMARY MACHINE HAS ASSOCIATED MACHINERY WITH ASSOCIATED ENERGY SOURCES. FOLLOW PROCEDURES LISTED BELOW.			
ASSOCIATE MACHINERY	LOAD/UNLOAD CONVEYOR	FOLLOW ECPL PROCEDURES AS POSTED ON MAIN ELECTRICAL PANEL.	FOLLOW ECPL VERIFICATION PROCEDURES POSTED ON INDICATED EQUIPMENT.
MANUFACTURER HARRY MAJOR MACHINE AT No. EMC1-00136 PLACARD OP40 AJ200 CYLINDER HEAD WASHING MACHINE		ELECTRICAL M1-EL-0002021-001 PNEUMATIC M1-PN-0002031-001	
Management Signature		Date Revised: 06/01/2014 rev. No. 0	

2.2.3 Recommended Machine Safety Precautions

Recommended machine safety precautions are listed below:

1. Before you start a machine, read and make sure that you fully understand the machine operating instructions.
2. Make sure that you are familiar with the procedure for stopping the machine before you start it.
3. Make sure you know the location of each emergency stop button.
4. The machine must be correctly maintained.
5. Never try to clean the machine when it is in operation.
6. Report machine malfunctions immediately.
7. If you are assigned an assistant, you have the responsibility to discuss and decide who will be in command of the machine and its controls. Only one person should control the machine. Anyone else should stand clear and be visible to the person who is assigned to operate the machine controls. Be alert for any bystanders or unauthorized persons who may be in the area. An area that may not pose a hazard to the machine operator may be life-threatening to someone else.
8. Keep the immediate area clean. Avoid slippery floors, remove debris, obstacles, swarf etc.
9. All leaks of liquid from the machine must be reported. These should be corrected immediately and not allowed to accumulate causing an area to become unsafe or a hazard.
10. Report all pneumatic leaks. These should be corrected immediately to avoid energy loss.
11. Never try to perform maintenance or lubrication while the machine is in operation. The operator and the person(s) performing maintenance must be aware of each other's presence in the machine area.
12. Never use wrenches, cutters, or other tools unless they fit the equipment.
13. Make sure that all protective guards are in place before the machine is started. Do not open any doors, grates, latches or gates unless you are certain that the equipment has been de-energized off and locked out.
14. Never apply a wrench to moving parts.
15. Do not clean a piece of equipment with pressurized air from a hose. Flying debris can cause personal injury or damage the machine.
16.  Never climb on the machine or equipment. It could result in a slip-and-fall accident causing bodily harm. Use approved safety ladders only. Use a safety harness.
17. Do not try to use the machine beyond its designated capabilities.
18. When making repairs, be sure to take all necessary precautions to prevent personal injury from loosened or unsupported machine parts.

19. Be aware of potential fire hazards, such as explosive liquids or machining materials with a low flash point.
20. A common cause of injury is attempting to perform maintenance or cleaning while a machine is in operation.
21. A further cause of injury is accidental start-up of the machinery by a second person while a person is carrying out maintenance.
22. Accidents may also be caused by improper material handling. Be sure to use proper equipment (if necessary) when handling parts or machinery.
23. Your work area may change during the day as materials appear or are removed. Be alert for pinch points and work hazards created by component storage.



24. Safety boots must be worn.

25. Do not wear loose-fitting clothes. Clothing should be comfortable, but long sleeves, neckties, etc., should not be worn.
26. Do not wear rings, watches, or jewellery around moving equipment.
27. Long hair should be braided or maintained so that it does not present a hazard.



28. Wear ear protectors in all noisy environments.

29. Never misuse compressed air. Improper use of a pressurized air hose may cause permanent disability or even death.
30. When filing, the file must have a handle firmly attached. The pointed tag must be covered.
31. Hand tools, especially those with points and sharp edges, should never be carried in pockets or under trouser belts. Use a tool box or a tool belt.
32. Never handle sharp objects bare handed. Wrap parts with a cloth or use gloves.

2.2.4 Recommended Electrical Safety Precautions

Recommended electrical safety precautions are listed below:

1. Electrical or electronic troubleshooting and repair should only be undertaken by qualified personnel who are properly trained and have appropriate knowledge and skill.
2. Assume that the power is ON at all times. Treat all machinery and wiring as LIVE. This cautious approach may help to prevent accidents.
3. Remove the load from circuit or equipment.
4. The machine must be switched off and locked out according to ECPL procedures.
5. Ensure that you have opened the circuit by using the correct test equipment.

NOTE: Test equipment must be checked at regular intervals.

6. Capacitors must be given time to discharge. If necessary, they should be discharged manually with care.

2.2.5 Troubleshooting 'Live' Equipment

When troubleshooting 'Live' Equipment it is recommended that the following precautions are taken:

1. Take extra care in damp areas.
2. Be alert and avoid outside distraction.
3. Establish without doubt that all persons are clear before applying power to any equipment.
4. Only open the control panel doors when it is necessary to check the electrical equipment or wiring. After closing the doors, make certain that the disconnect handle mechanism is properly engaged.
5. All covers on junction boxes must be replaced before leaving a job.
6. Before starting, read and understand all warning markings and notices.
7. Read all nameplates and identification plates.
8. Do not alter circuits unless authorised to do so by the manufacturer.
9. Do not alter or bypass protective interlocks.
10. Do not place jumper wires across fuses.
11. Do not alter overcurrent protective devices.
12. Conductor replacements shall conform to the manufacturer's specifications, including proper colour coding.
13. Ground connections cause fault currents to flow directly into the ground instead of through the body and into the ground. All electrical apparatus must be properly grounded.
14. Use caution when connecting test-equipment probes to test points. Shock hazards could exist at the test points or in the test-point area, and / or transients created by electrical problems could cause a machine action.
15. Avoid wearing glasses that have a metal frame.
16. Avoid wearing necklaces or chains made of metallic substances.
17. All electrical wiring and items related to electrical controls are, and shall always be, in compliance with the current national electrical regulations.
18. **CAUTION: Remove and shut in the teach pendant whenever it is not used! The teach pendant must be used by authorized, qualified personnel only.**

2.2.6 Recommended Pneumatic Safety Precautions

Recommended pneumatic safety precautions are listed below:

1. The machine must be switched off and secured according to ECPL procedures before commencing work.
2. The supply of compressed air must be cut off at an appropriate position in accordance with ECPL procedures.
3. The system must be depressurised in accordance with ECPL procedure. Air pressure must be removed from the system to be repaired or maintained before dismantling the pneumatic components.
4. Report all pneumatic leaks. These should be corrected immediately to avoid energy loss.
5. Never misuse compressed air. Improper use of an air hose may cause permanent disability or even death.

2.2.7 Repairs and Maintenance of the Pneumatic System

Before working on a pneumatic system, personnel must be familiar with the relevant instructions.

The following safety precautions must be observed:

Before Starting Work:

- Safety Disconnection - The machine must be switched off and secured according to ECPL procedure.
- Cutting Off the Compressed Air - The supply of compressed air must be cut off at an appropriate position.
- Depressurisation of the System - Air pressure must be removed from the system to be repaired or maintained before dismantling the pneumatic components (ECPL procedure).
- Cleanliness - When working on an open pneumatic system no foreign bodies or debris must be allowed to enter the system.
- Replacement of Components – Only spare parts that conform to the technical requirements of the manufacturer can be used.
- Interrupted Work - If work on the open pneumatic system is interrupted, all openings must be closed by appropriate means eg. plugs, to keep out dirt.

After Finishing Work:

- Check work carefully.
- Clean work area and remove all scrap material.
- Remove supports and blockings carefully.
- Remove safety locks and switch power on.

Put the machine into operation and test in Manual and Automatic Mode. If you are unable to operate the machine in Automatic Mode notify the team leader or supervisor.

2.2.8 Repairs and Maintenance of the Electrical Equipment

Before working on an electrical system, personnel must be familiar with the relevant safety instructions.

The following safety precautions must be observed:

Before Starting Work:

- Safety Disconnection - The machine must be switched off and secured according to ECPL procedure.
- Tools and Measuring Systems - It must be especially noted that only appropriate, voltage insulated tools can be used for repairs and maintenance.
- Measurements during the operation or after clearing of a machine should only be executed using appropriate measuring instruments.
- Observation of Safety Instructions - It is not permitted to check the components of the electrical equipment during operation by pulling out plugs as this may be dangerous. The safety instructions for individual components of the electrical equipment are to be observed. Touching live parts; even after separation from the network can be dangerous. Covers on live components should not be removed.
- Alterations to the Electrical Equipment - Alterations may only be executed if they do not alter the operation of the machine as specified in the Design Specification, and must be documented accordingly. Alterations affecting safety require the approval of the manufacturer.
- Replacement of Components - Only spare parts that conform to the technical requirements of the manufacturer can be used. Only fuse links of the correct size and capacity as described in the operation instructions may be used.

After Finishing Work:

- Check work carefully.
- Clean work area and remove all scrap material.
- Remove supports and blockings carefully.
- Remove safety locks and turn power on.

Put the machine into operation and test in Manual and Automatic Mode. If you are unable to operate machine in Automatic Mode notify the team leader or supervisor.

2.2.9 Software

Alterations to the software are not permitted. This applies to all software packages, including all parameters, which were programmed and/or delivered with the station by Harry Major Machine - UK Ltd. It is also not permitted to alter software, including parameters, which are linked to the station software.

If alterations are made to the described software, even if the instructions of the software manufacturers are observed, Harry Major Machine - UK Ltd will not assume any liability for resulting damages.

Parameters, which may be altered for the purposes of test and assembly processes, are not subject to the alteration restriction. However, the alterations must not exceed the allowed limits.

2.2.10 Adjustment

The adjustment of components and movements of all types may only be carried out by staff qualified for repairs and maintenance.

The affected area is to be closed off for the adjustments and secured by appropriate signs. Due to safety reasons the adjustments may not be done by only one person; a second person must stand by at all times.

Before adjustments are done, the relevant technical documents are to be consulted. The instructions show whether the adjustments are to be done from the station panel or externally (mobile). Any other method other than that described in the instructions is not permitted. Relevant heights, lengths and interfering dimensions are to be taken from the instructions (drawings).

All safety instructions concerning adjustments must be firmly observed. If uncertainties occur when adjusting, the manufacturer is to be consulted before continuing work.

2.2.11 Cleaning

Before and during cleaning, the machine must be in a safe condition ie. isolated from all energy sources. The cleaning must be performed by qualified staff.

Do not use compressed air for cleaning; there is a danger of injury, and damage to components and machines.

Do not use solvents that are not provided or designed for cleaning purposes. It is also necessary to note the material compatibility of the components to be cleaned in advance (synthetic material, rubber, colour etc.). In general, vacuum cleaners, brooms and non-fibre cloths are to be preferred for cleaning.

2.2.12 Chemicals

All chemicals must be handled with regard to the instructions contained in the appropriate data sheets. Personnel should be familiar with the following general rules for the safe handling of chemicals.

- All bulk chemicals should be handled with care. Any damaged or leaking containers should be isolated promptly and the appropriate action taken for repackaging or destruction of the material.
- Chemical products should, as a general rule, never be allowed to come into contact with the eyes, skin or clothing. Protective clothing should always be worn when handling chemicals.
- Contamination resulting from contact with skin, eyes or clothing should be removed promptly by washing with water (or soap and water); never use powerful cleaning agents or chemicals to remove anything from skin and eyes as this action may cause more damage than the original contact. It is advisable to seek medical attention following any incident involving chemicals entering the eye, or severe cases of skin exposure, and in all cases of contact with materials of known high contact risk. Contaminated clothing should be removed for cleaning.
- Breathing of chemical fumes or dusts should be avoided by the use of adequate ventilation, extraction, or the use of dust filters or respirators. Severe cases of inhalation should be removed to fresh air and medical attention sought.
- Ingestion of chemicals should always be avoided. It is advisable to prohibit eating, drinking and smoking in areas where chemicals are handled (this does not refer to properly installed and maintained drinking points).
- Operators should always wash after removal of protective clothing and before doing anything else such as eating, smoking or entering other areas. Protective clothing should be regularly changed, cleaned, maintained and replaced as necessary.

- Containers of chemicals should always be labelled clearly, stored tidily and in such a manner as to be easily accessible and in accordance with any special provisions. Any leakage or spillage in the storage area should be dealt with promptly, using the recommended procedure.
- All areas in which chemicals are stored, handled and used should be well lit, well ventilated and designed for this purpose.
- If any persons who are exposed to chemicals show any abnormal or unusual behaviour or illness, they should be immediately removed to another area whilst medical advice/attention is sought.
- In case of accidents, always show the chemical label to those attending the incident.

2.2.13 Lubricants

All lubricants must be handled with regard to the instructions contained in the appropriate data sheets. Personnel should be familiar with the following general rules for the safe handling of lubricants:

- All lubricants should be handled with care. Any damaged or leaking containers should be isolated promptly and the appropriate action taken for repackaging or destruction of the material.
- Lubricants should, as a general rule, never be allowed to come into contact with the eyes, skin or clothing. Protective clothing should always be worn when handling lubricants.
- Containers of lubricants should always be labelled clearly, stored tidily and in such a manner as to be easily accessible and in accordance with any special provisions. Any leakage or spillage in the storage area should be dealt with promptly, using the recommended procedure.

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3.1 Machine Layout

A plan view of the machine showing the main features is shown below:

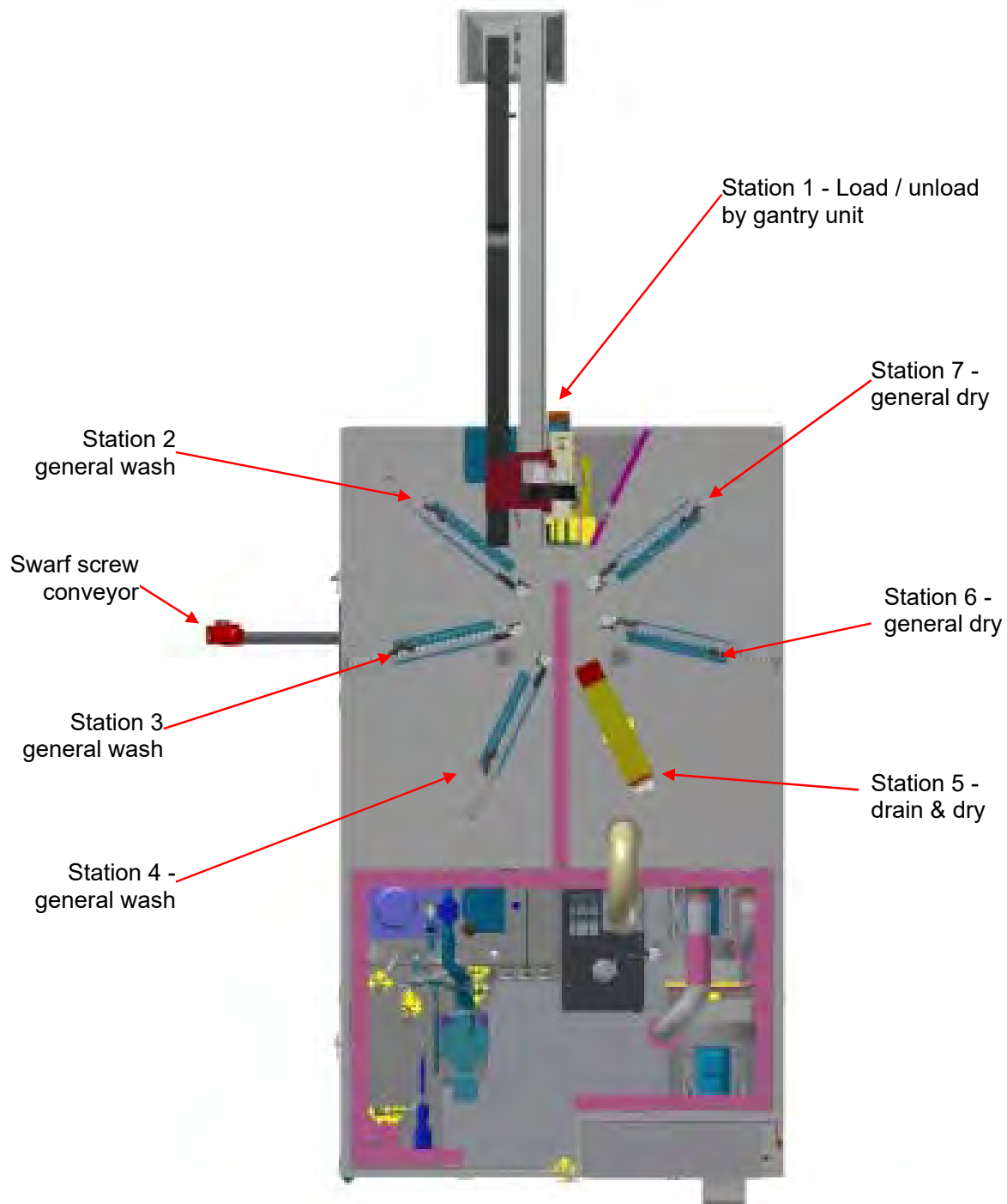


Figure 1 - Machine Plan View A

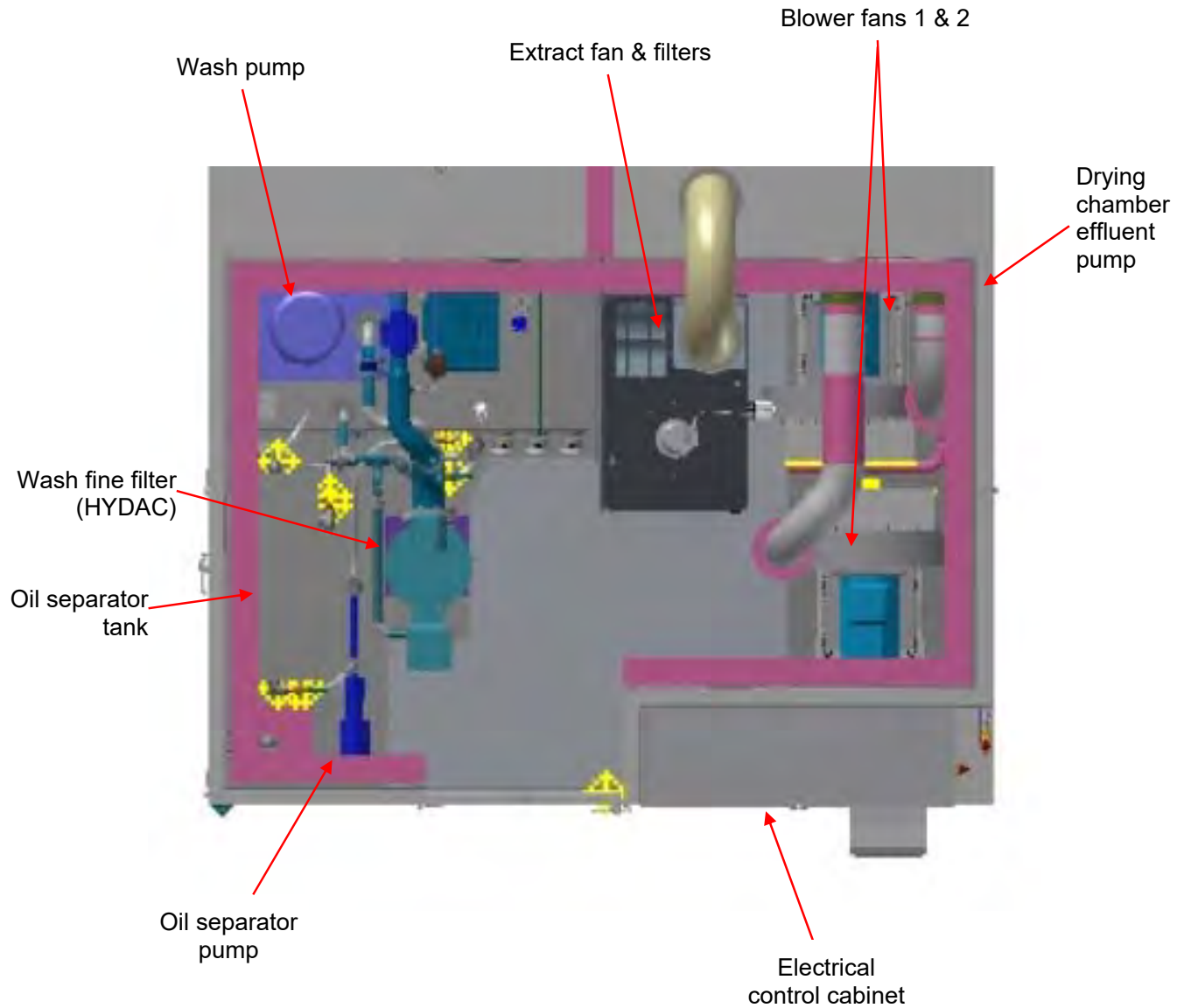


Figure 2 - Machine Plan View B

3.2 Machine Description

The 7 Station Rotary Washing Machine is designed to wash OP40 Intermediate Cylinder Heads and uses filtered wash solution from the machine reservoir, which is automatically kept full of wash solution. The machine provides three general washes. The cleaning process is fully automatic incorporating programmable washing and drying driven by servo controlled encoded motors.

The cylinder heads are mounted on adaptor plates, and are loaded from and to the roller conveyor using a pick & place gantry unit at the front of the machine.

3.3 Component Route Through the Machine

The route of the head through the machine is as follows:

3.3.1 Station 1 – Load / Unload

A clean cylinder head is removed from the machine by the gantry unit and put on the unload roller conveyor. A dirty cylinder head is then taken from the feed automation and put in the machine and starts the wash process as it is indexed into Station 2.

3.3.2 Station 2 - Wash

Target washing is achieved using a continuous manifold which travels along the length of the component and fixture creating a full curtain of wash jetting around the head as the manifold moves along the length of the part. The manifold is supported by a carriage on a MBL1 linear drive unit. The carriage is pulled along the guides of the drive unit by a belt which is driven by a servo controlled encoder motor driving the belt drive sprocket. Wash jets on the manifold are precisely positioned to target specific features of the head and using the servo motor they are precisely positioned for washing the features being targeted. Fixed end manifolds are positioned to a general wash for the ends of the head as it arrives in station.

3.3.3 Station 3 - Wash

Station 3 is a repeat of wash station 2

3.3.4 Station 4 - Wash

Station 4 is a repeat of wash station 2

3.3.5 Station 5 – Drain and Dry

Station 5 uses a rollover unit to assist with draining the interior of the cylinder head, releasing wash solution trapped in the casting features.

The gripper unit is lowered and positioned at a height, once the part is indexed into station, to allow the gripper to collect the part. **(see 3.4.5 for description and operation of the unit)**

The unit gripper system will clamp the adapter plate carrying the head which is then lifted and rotated as it is dried in front of rows of fixed air nozzles.

3.3.6 Station 6 - Dry

Target drying is achieved using a continuous manifold which travels along the length of the component and fixture creating a full curtain of air, from the centrifugal fans, around the head as the manifold moves along the length of the part. The manifold is supported from a carriage on a MBL1 linear drive unit. The carriage is pulled along the guides of the drive unit by a belt which is driven by a servo controlled encoder motor driving the belt drive sprocket. The fish tail drying jets on the manifold are precisely positioned to target specific features of the head and using the servo motor they are positioned for drying the features being targeted. Fixed end manifolds are positioned to a general drying for the ends of the head as it arrives in station.

3.3.7 Station 7 - Dry

Station 7 is a repeat of drying station 6

3.4 Machine Construction - Upper Housing

The fully welded housing, process chamber and wash solution reservoir is double skinned. The inner skin is fabricated from a stainless steel plate of all welded construction on a heavy mild steel framework. The outer skin is mild steel sheet, the space between the two skins is filled using Rockwool installation to assist with reduction of noise break out from the machine interior. Parts will index round from station to station, through apertures in the 3 dividing plates separating the machine process compartments (i.e. Load/Wash/Drying). The apertures are fitted with vertically opening doors which close after the table has indexed to retain process products within each compartment preventing overspray, mist and noise from the washing and drying compartments. The machine housing is equipped with interlocked doors down each side of the machine to gain access to each of the process stations. The machine is supported on a base-frame of mild steel RHS.

3.4.1 Machine Loading / Unloading

Machine Loading / Unloading from the conveyor is done by a Gudel pick & place gantry unit.

3.4.2 Component Transfer

Transfer through the machine is by an circular electromechanically driven indexing profiled table structure segmented into seven equal sections. Each section has a part location fixture which will hold a single component. Particular attention is paid to close side guidance and damage free handling of the components, along with good access for maintenance and removal of internal equipment.

3.4.3 Rotary Turntable (Carousel)

The turntable comprises a large diameter bearing (slewing ring) with gear teeth all-round the outside edge of the moving part of the bearing. The bearing is mounted on a plough ground plate supported on a tubular box frame with an integral coolant / swarf shed plate. Equally-spaced part fixtures are mounted on the slewing ring. A drive gear is mounted on the output shaft of a right angle gearbox and is meshed with the slewing ring. The input shaft of the gearbox is connected to a synchronous servo motor. The drive unit is located at the front of the machine in the Loading / Unloading Station. The motor / gearbox drives the turntable, with the servo unit providing both speed control and positional indexing accuracy.

3.4.4 Manifold Transfer System

The Wash Stations and two of the Dry Stations use a linear slide manifold system. The manifold is supported from a carriage on a MBL1 linear drive unit. The carriage is pulled along the guides of the drive unit by a belt which is driven by a servo controlled encoder motor driving the belt drive sprocket. The encoder controlled geared motor providing control over the speed, dwell and back and forth periods. Servo control allows process flexibility by simple software programming. The ability to slow down, stop and cycle at critical areas of the part enables the size of the manifolds to be reduced. This results in a reduction in air and water requirements and consequent energy saving of the machine.

3.4.5 Rollover Unit (Station 5 – Drain and Dry)

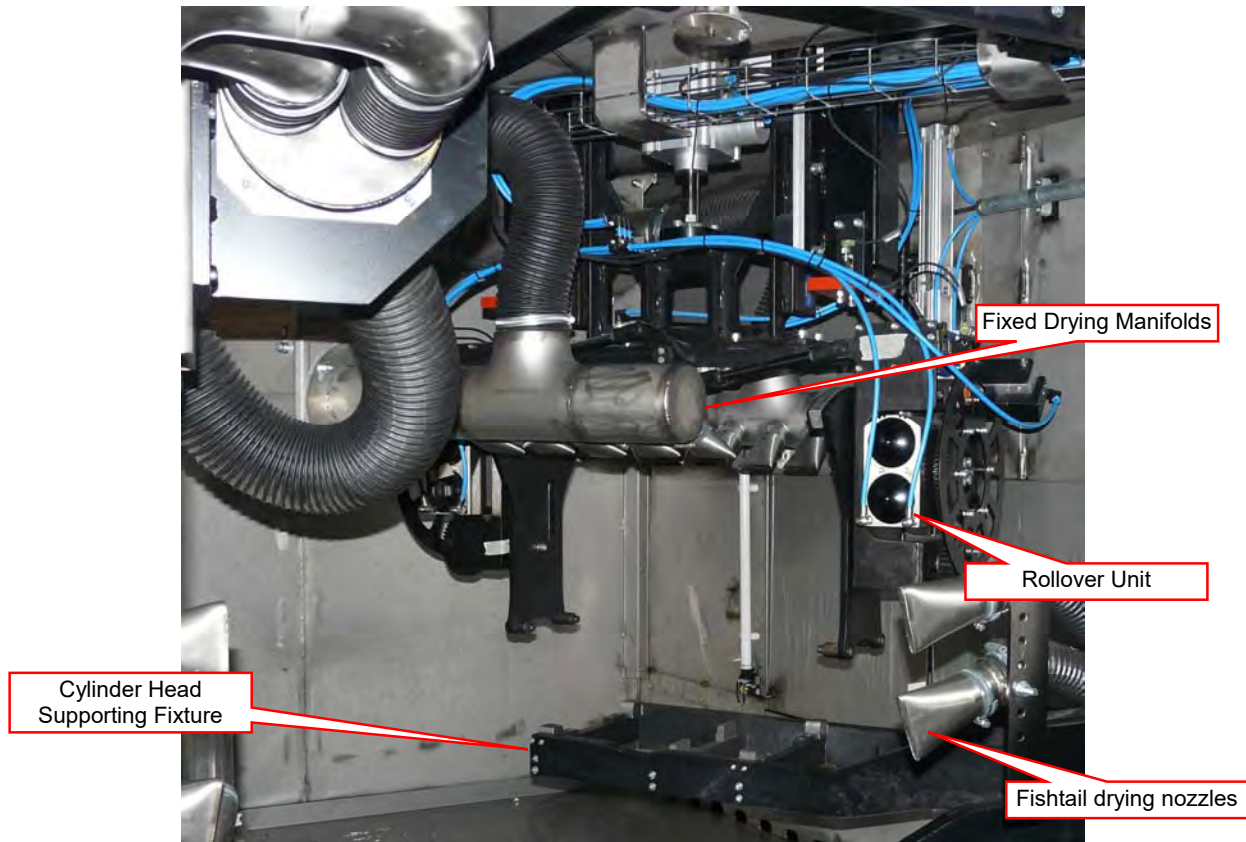


Figure 3 - Drying Station 5 Roller Unit

The rollover unit is supported from a vertically mounted cylinder, fitted with a rod lock. The body of the cylinder is attached to a plate mounted on the roof of the machine at Station 5. The rod cylinder is attached to the lift frame of the rollover unit using a flexible coupling screwed to the end of the cylinder rod. The frame is guided vertically using linear slide units mounted on each side of the frame.

The gripper is manufactured using a horizontal support plate carrying a jaw at each end of the plate. The interface between the plate and jaws are a set of linear slide units to allow the jaws to open and close to the component. The jaws are moved using a pneumatic cylinder to move the master jaw, with the second jaw closing an equal amount using a connecting linkage between the two jaws.

Each jaw carries a Schunk rollover unit each driving the gripping jaws through spur gears to achieve part rollover.

The part, carried on an adapter plate, is indexed into station on the table. The gripper is lowered to the part with the jaws opened. The jaws are then closed. When the jaws are fully closed, the unit is raised to take the part clear of the machine fixture. The jaws are then rotated to roll the part to achieve draining. During rotation, fixed air nozzles blow on the faces of the block. On completion the part is returned to the fixture on the slewing ring for indexing on to the next station.

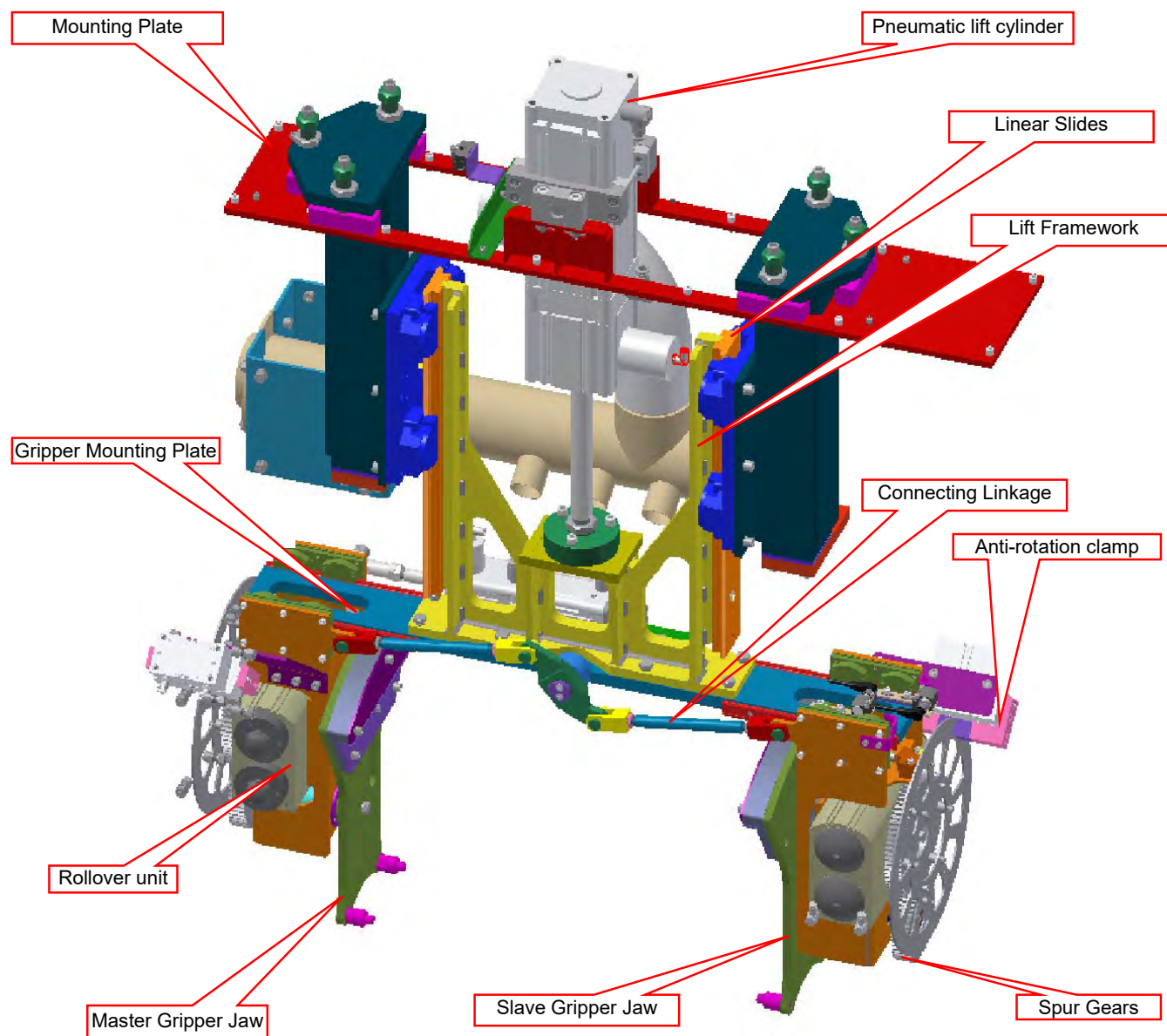


Figure 4 - Drying Station 5 Roller Unit (Minus Drying Manifolds)

3.5 Flow of Solution

The machine employs a close-coupled pump rated at 10 bar with a flow rate of 750 litres / hour to pump the solution from the reservoir through a fine filter to the high pressure water jets and nozzles to remove the swarf from the components. The used solution falls to the bottom of the wash area and then flows into the reservoir through the hopper and filter of a screw conveyor that removes the swarf from the solution. The low level switching in the tank and a flow switch fitted in the delivery pipework between the pump and solution jets, as well as a bypass pipe, are used to provide pump protection. Any solution that collects in the reservoir of the dry stations side of the machine is pumped to the main reservoir.

Oil particles suspended in the solution are removed using a Suparator Filter, the oil discharging to the effluent tank and the solution to the reservoir.

Normal losses of wash solution that occur are made up automatically by the make-up system and there is a large bore, hand operated valve for manual rapid fill of the tank that bypasses the Dosatron unit.

The tank is drained for cleaning by opening a hand valve to release the solution to the effluent tank. The effluent tank has a waste connector mounted on the cover plate and this is used to remove the effluent.

3.5.1 Coarse Filtration

The machine is fitted with a swarf screw conveyor which continuously removes swarf from the reservoir.

3.5.2 Wash Fine Filter

This is a HYDAC 30 m³/hour (500 l/min) @ 100 micron self-cleaning filter and it will remove any large or fine solids from the pumped solution on its way from the reservoir to the wash jets / nozzles. Any waste from the back flushing of the filter goes to the effluent tank.

3.5.3 Immersion Heating

Three 15 kW immersion heaters are provided for rapid heating of the wash reservoir to the required operating temperature after a water change. In normal machine operation, the temperature can be set as dictated by experience and can be varied using the HMI screen.

3.5.4 Low Level Float Switch

If the solution level falls sufficiently, the switch will stop the pump to avoid damage.

3.5.5 Wash Pump

The Wash Pump is rated at 750 litres / hour @ 10 bar. It pumps wash solution from the reservoir through the Wash Fine Filter to the wash jets and nozzles.

3.5.6 Water Make-Up Control

The incoming water flows through a 25 mm pipe, a manual valve and a fill solenoid valve which is controlled by level switching in the reservoir or manually from the HMI. The incoming water is treated by a Dosatron unit before flowing into a tun dish, the air gap acting as an anti-siphon, and then into the reservoir.

There is a weir between the main reservoir and the effluent tank, any overspill will flow in either direction.

3.5.7 Dry Chamber Washdown

A rotary spray head is installed in the Dry Compartment so that the walls and equipment can be manually flushed down when dirty. The controlling valve handle is situated at back top centre in the machine equipment compartment.

3.6 Dry Air and Lubrication

3.6.1 Centrifugal Blowers

Two centrifugal blowers each rated at 2250 cfm are externally mounted adjacent to the drying compartments. The units have inlet baffles to assist with noise reduction. Air from the blowers is fed via air dampers to air nozzles strategically placed to displace moisture on the components.

3.6.2 Exhaust Extraction/ Filtration Unit

Mist is extracted and filtered from both drying stations by a single Extraction / Filtration Unit. Mist laden air is evacuated from the drying stations by a powerful turbine impeller located inside the unit. The mist passes downward through three initial levels of filtration which includes a mechanical separating device, a helical element and a metal screen. Due to the centrifugal force created, the mist and oil droplets impact against the metal screen in the separator. The low velocity in the separator prevents the liquid from returning back to the air flow. The droplets slide along the walls of the separator to their collection point at the end of hopper. Large droplets are now separated as the air flow reverses direction and is pulled up the wire metal mesh pre filter which coalesces out the finer droplets. To remove remaining impurities, the air passes through a large pleated filter cartridge which contains a large volume of filtering surface area for long life. A pre filter coalescing band made from polypropylene protects the final pleated filter and removes any further smaller droplets. The high quality pleated HEPA final filter ensures that the exiting air is free of any contamination. The air is finally exhausted through a grating located on the top of the unit. Effluent is piped to the drying chamber effluent tank.

3.6.3 Auto Lubrication System

The SKF Autolube system provides automatic lubrication for the rotary turntable and the bearing surfaces on the linear slides mounted on the roof of the machine. The lubrication pump will run for a set period of time when a specific number of components have been processed. The number of components can be adjusted from the HMI.

The system is monitored with appropriate warning messages displayed on the HMI for:

- Low pressure (indicating a leak).
- High pressure (indicating a blockage).
- Reservoir empty.

3.7 Machine Controls

The machine is controlled from a single panel complete with all the necessary interlocks and interfaces. The panel utilizes the ASI system to connect control elements to the specified PLC and conforms to the preferred supplier list and project specifications.

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4.1 Main Control Panel

The main control panel is shown below.

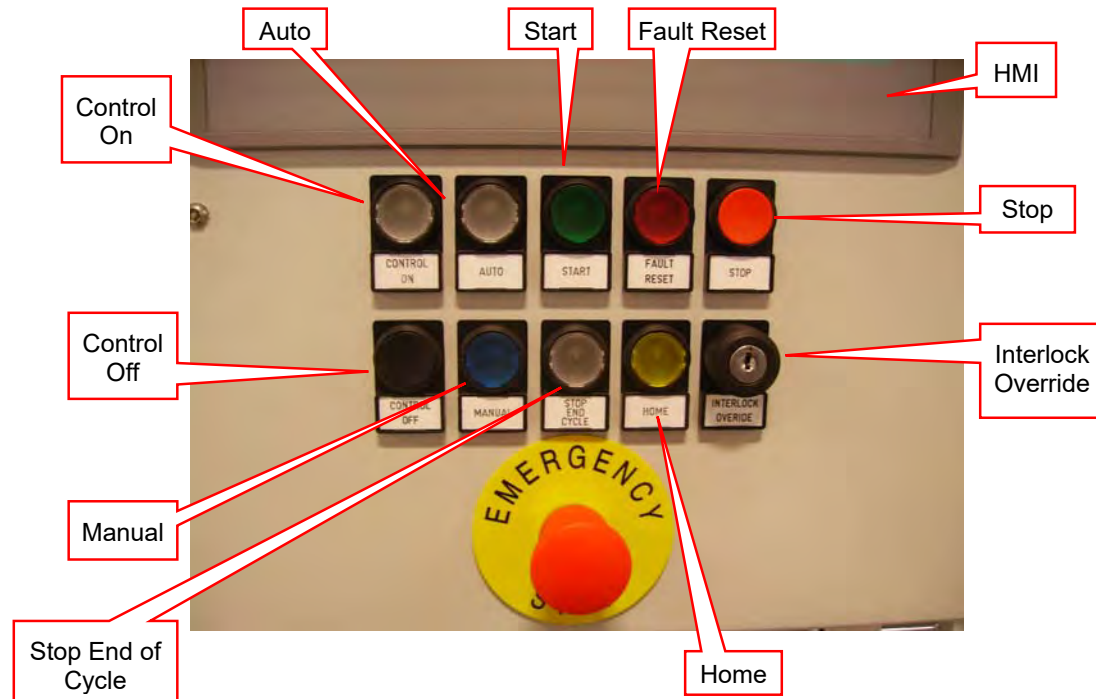


Figure 1 - Main Control Panel

4.2 Main Screen Features

Main Screen features are shown below.



Figure 2 - Main Screen Features

4.2.1 Machine Status

When the machine is running, the current status of the machine is displayed on the area at the top of the screen including out of position and error messages.

4.3 Starting and Stopping the Machine

This section describes how to run the machine in automatic and manual modes.

4.3.1 Start Up Sequence - Automatic Operation

Before starting the machine make the following checks.

1. Make sure that all emergency safety stop switches have been reset.
2. Make sure that electrical supplies are available.
3. Make sure that the pneumatic supply is available.
4. At the Electrical Panel, switch on the main electrical isolator switch. The system runs through a software check and displays the Main Screen.



Figure 3 - Start Up Main Screen

5. Press the *Process* button.
6. Press the *Fault Reset* button to reset the emergency stops
7. Press and hold the *Home* button until it changes colour to yellow.
8. Press the *Automatic* button until it goes white.
9. Press and hold the *Start Cycle* button for 5 seconds until it changes colour to green. When you press start cycle, the sounder will start and will stop when the button changes colour to green.
10. Press and hold the *Stop End of Cycle* button for 2 seconds to stop the machine at the end of its cycle. Alternatively, press the *Stop Cycle* button to stop the machine immediately.

4.3.2 Movement / Function Interface

Movement or function status is indicated by colour changes on the function interface.

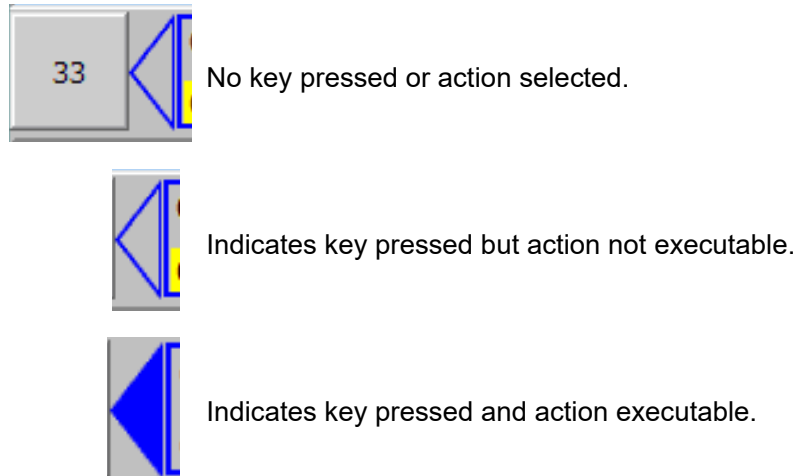


Figure 4 - Movement / Function Status Indicators

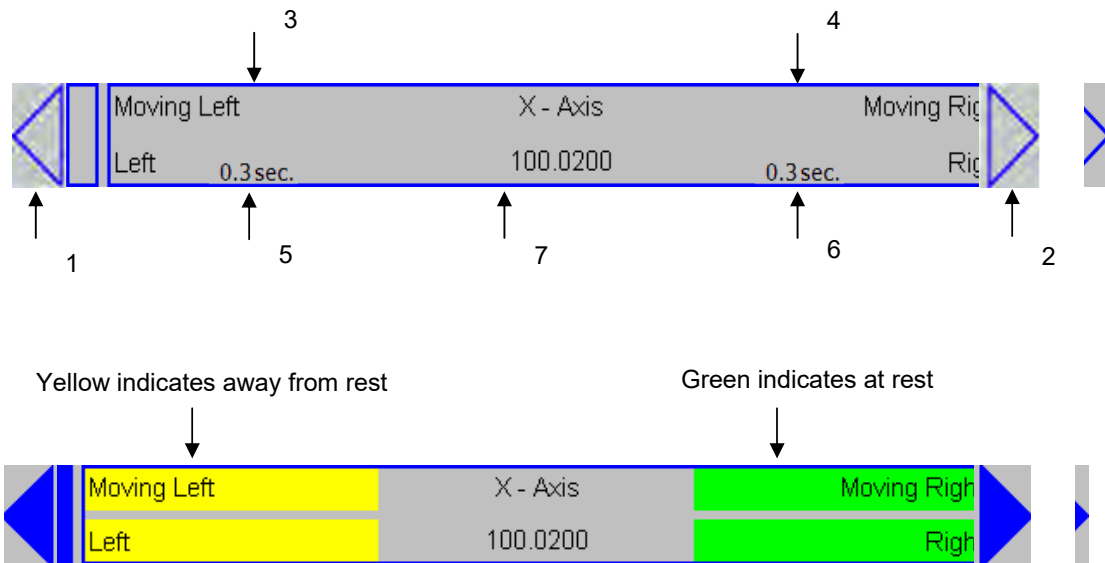


Figure 5 - Position Indicators

1. Left-hand function status
2. Right-hand function status
3. Left-hand moving confirmation
4. Right-hand moving confirmation
5. Travel time
6. Travel time
7. X axis position and description of item to be controlled.

4.4 Manual Operation

The manual screens allow you to manually control machine functions.

1. Make sure that all emergency safety stop switches have been reset.
2. Make sure that electrical supplies are available.
3. Make sure that the pneumatic supply is available.
4. At the Electrical Panel, switch on the main electrical isolator switch. The system runs through a software check and displays the main screen.



Figure 6 - Main Screen

5. Press the *Fault Reset* button.
6. Press the *Manual Mode* button until it changes colour to blue.
7. You can now select manual options from the Menu Screens.

4.4.1 Manual Screen

Press the *Manual* button on the main screen to display the manual movement screen 1. Use the *Page Up* and *Page Down* buttons to navigate to the screen you require. The example screen below is manual screen 4.

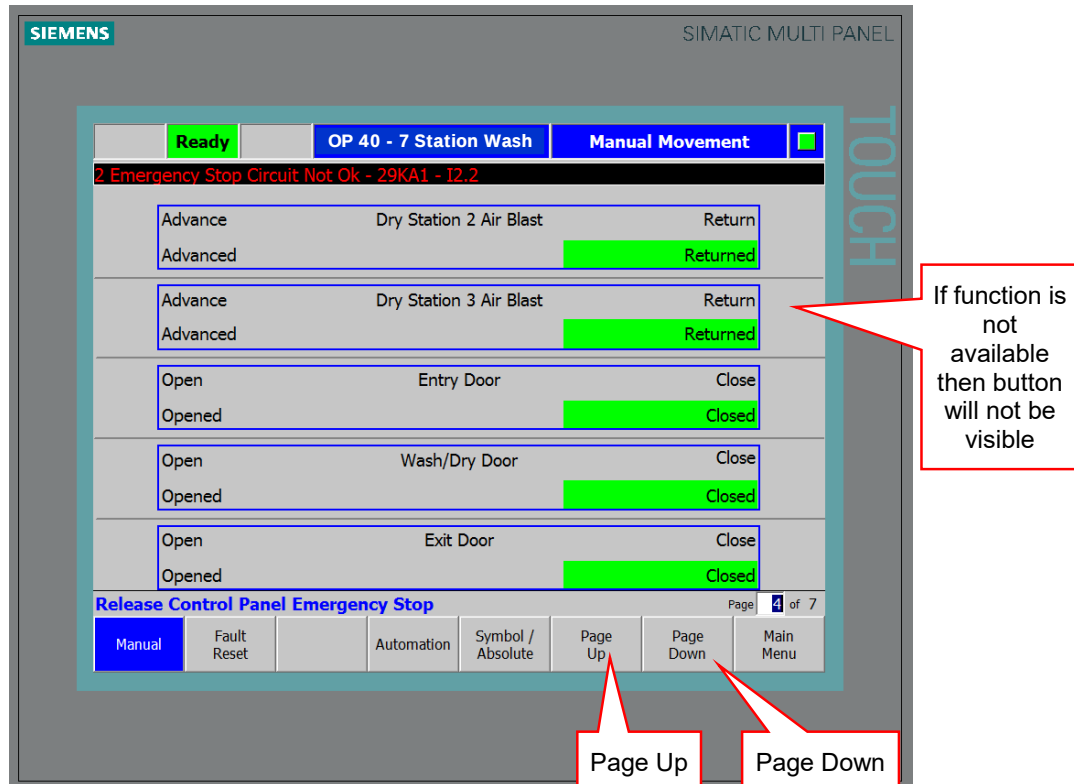


Figure 7 - Manual Screen 4

Manual screen 4 allows you to advance and return the air blasts on dry stations 2 and 3. The screen also allows you to open and close the:

- Entry Door
- Wash/Dry Door
- Exit Door

4.4.2 Diagnostics

Press the *Diagnostics* button to display the Alarm screen.

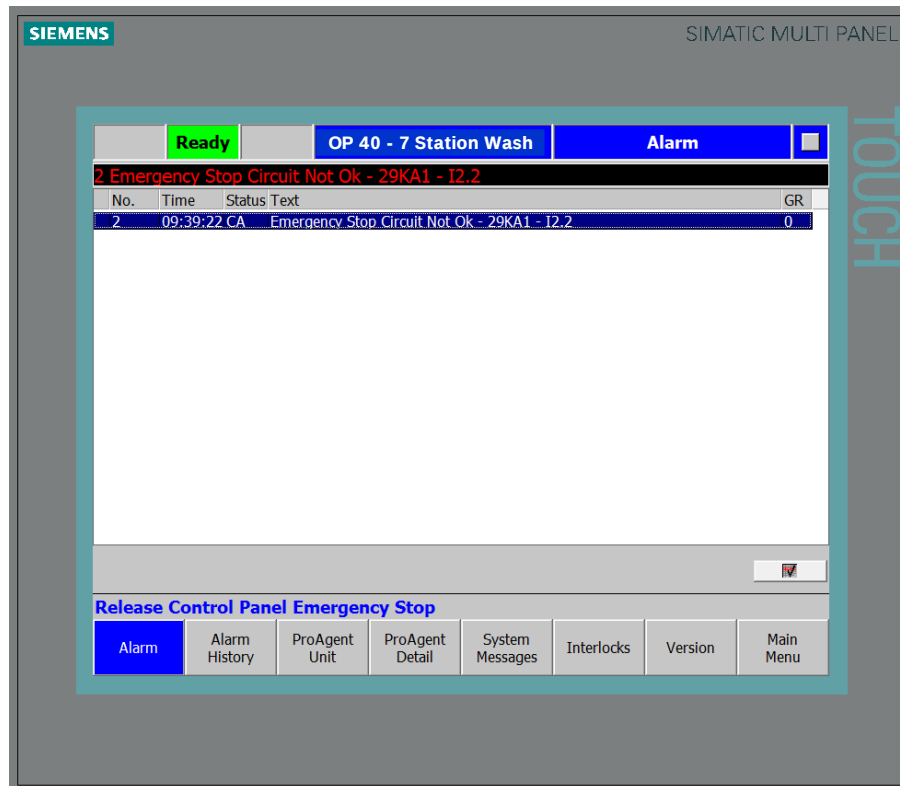


Figure 8 - Alarm Screen 1

The system message screen provides message details:

- Message reference number
- Message time and date
- Message text

4.4.3 Alarm History

Press the *Alarm History* button on the Alarm screen.

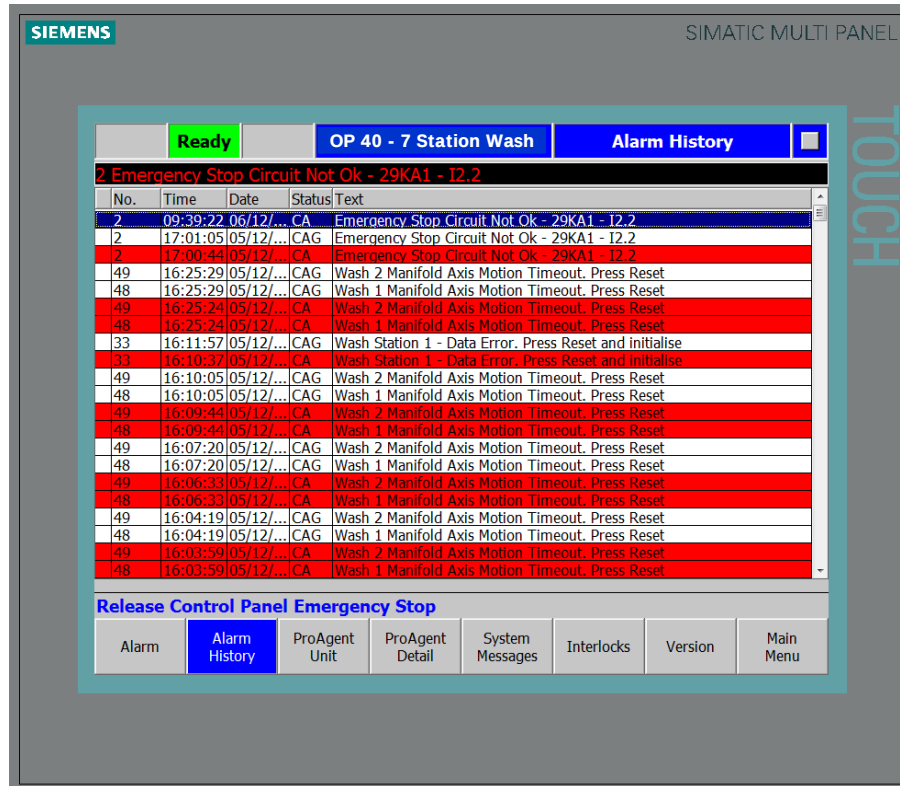


Figure 9 - Alarm History

4.4.4 ProAgent Unit Overview

Press the *ProAgent Unit* button on the alarm history screen to display the ProAgent Unit Overview screen. An example screen is shown below.

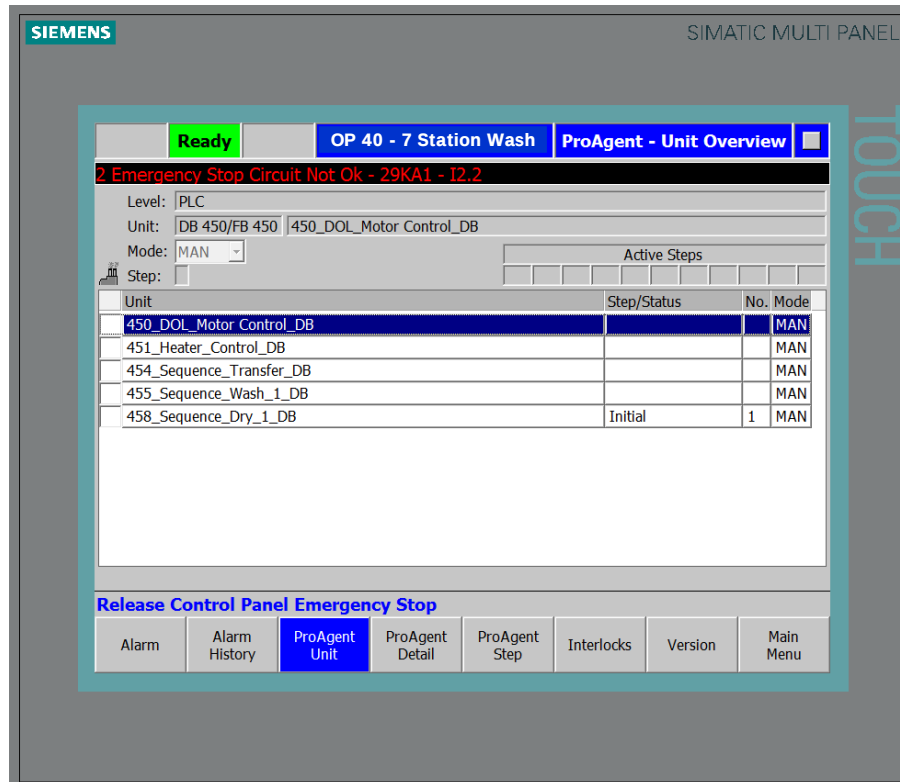


Figure 10 - ProAgent Unit Overview

4.4.5 System Messages

Press the *System Messages* button on the alarm history screen. An example screen is shown below.

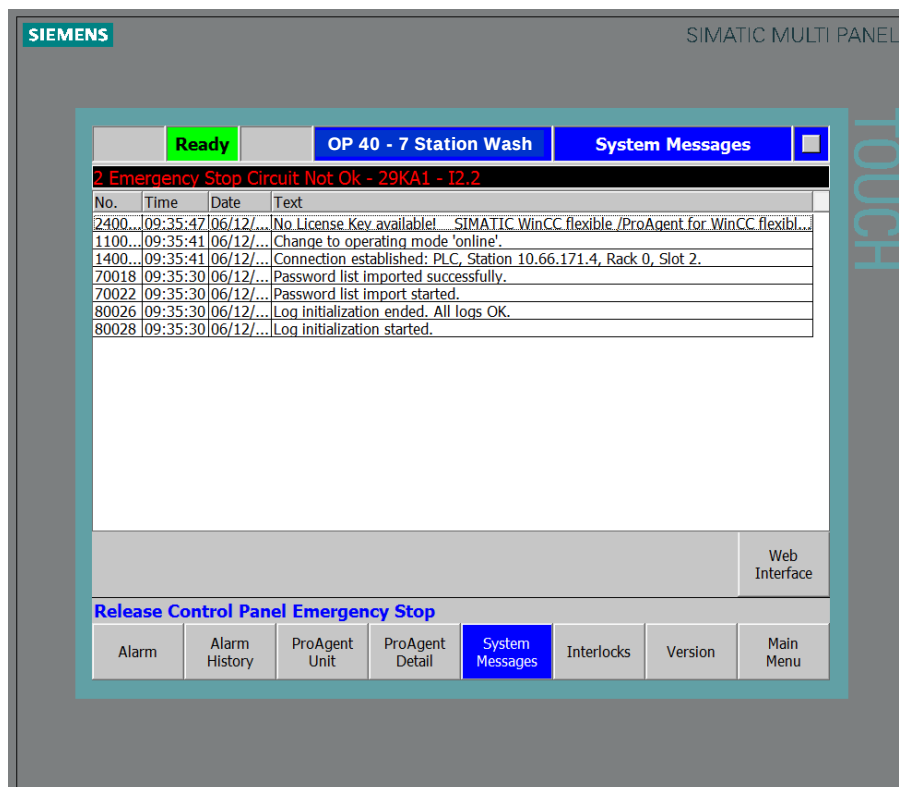


Figure 11 - System Messages

4.4.6 ProAgent Step

Press the *ProAgent Step* button on the ProAgent Overview screen to display the ProAgent Step View screen.

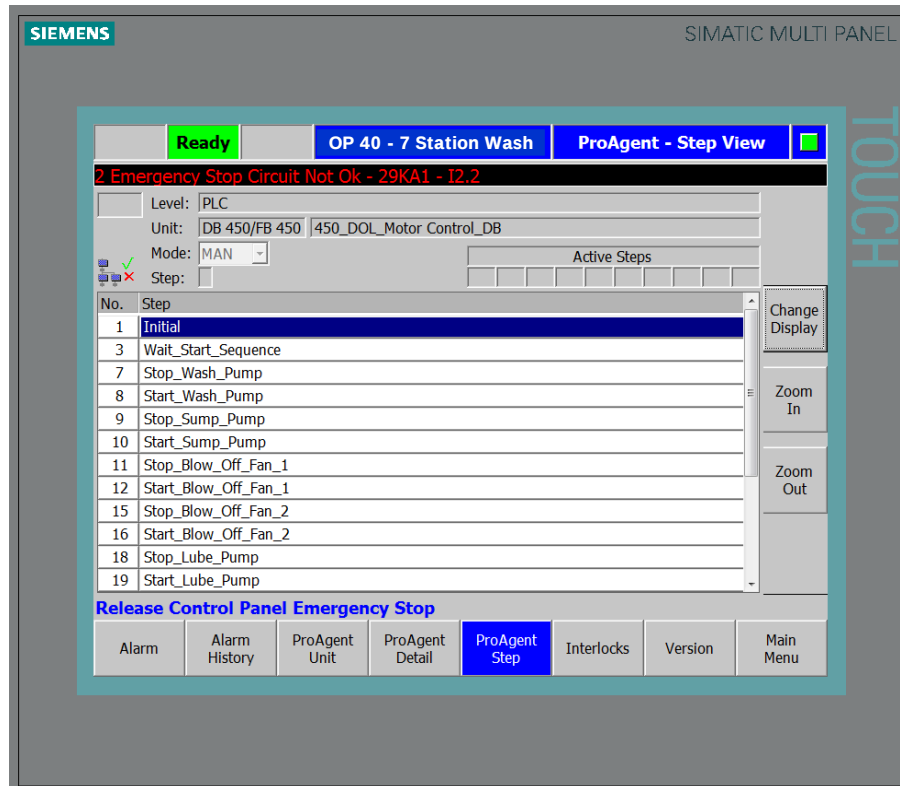


Figure 12 - ProAgent Step Screen

4.4.7 Hardware Diagnostics

Press the *Hardware Diagnostics* button on the main screen. An example screen is shown below.

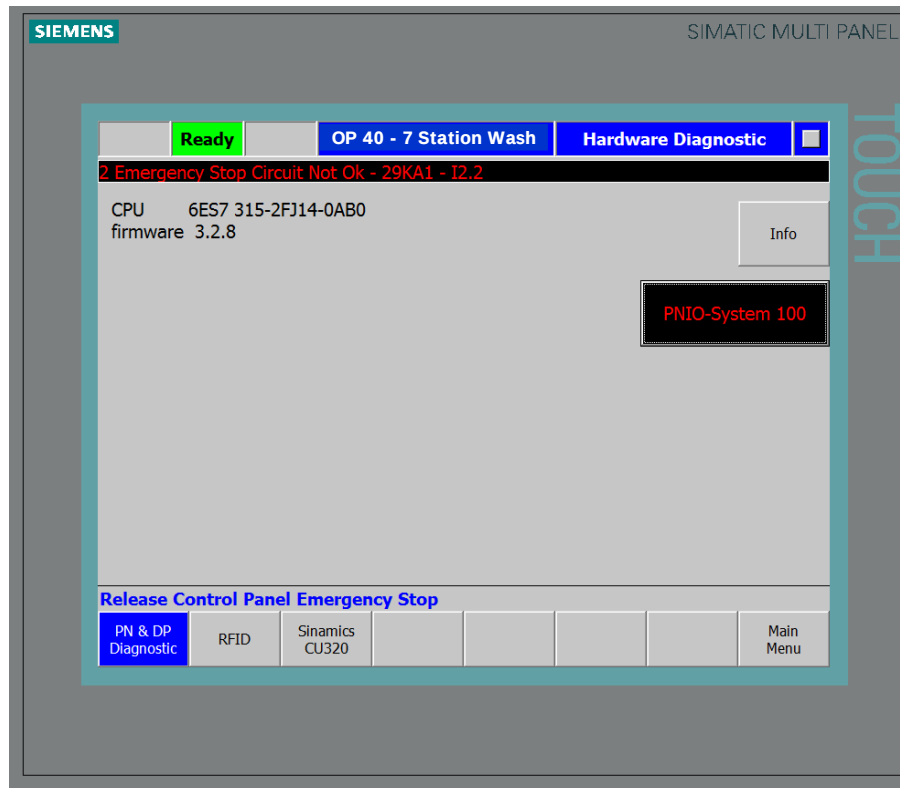


Figure 13 - Hardware Diagnostics

4.4.8 Process Screen

Press the *Process* button on the main screen to display the HMM Process Screen.

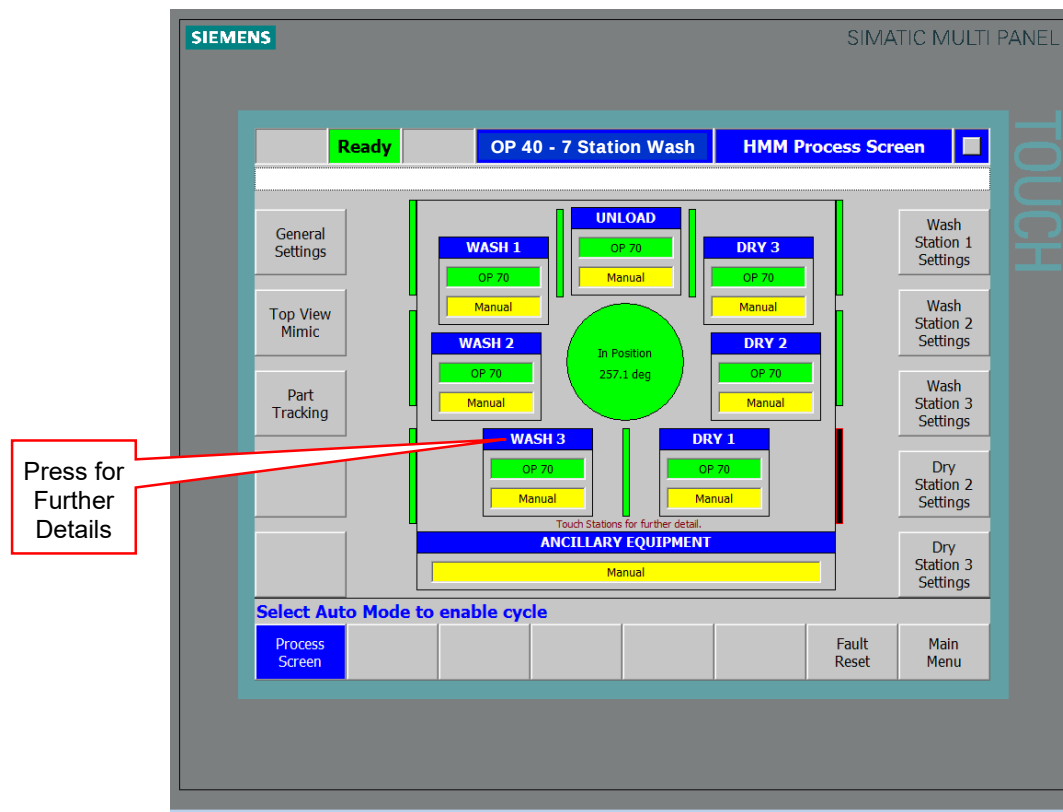


Figure 14 - Process Screen

Press an individual station button to display further process details.

4.4.9 General Settings

Press the *General Settings* button on the process screen to display the screen.

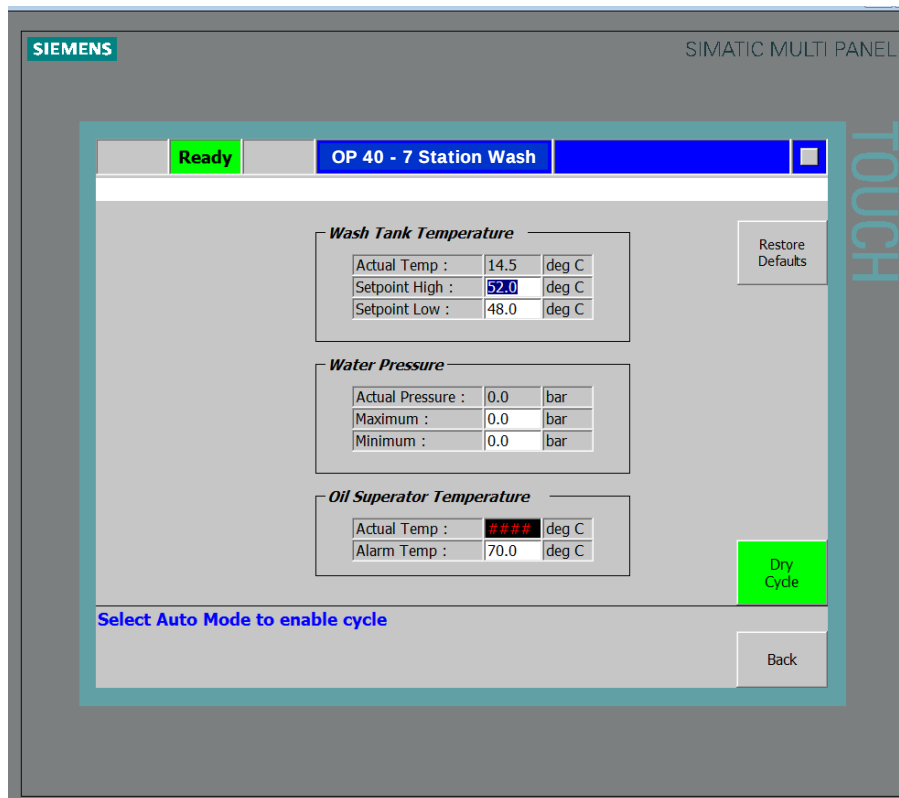


Figure 15 - General Settings

The general settings screen allows you to view:

- Actual Wash tank and Superator temperatures
- Actual Water Pressure
- Actual Superator Oil Temperature

You can also:

- Define wash tank high and low temperature set points
- Set the maximum and minimum water pressure
- Set the alarm temperature for the Oil Superator.

4.4.10 Top View Mimic

Press the *Top View Mimic* button on the HMM Process screen. The Mimic screen is displayed. Machine Mimic shows an animated real time view of machine functions. Green indicates that a particular function is active. Red indicates that a function is inactive. To display further details for a device touch a blue box. See Section 4.4.11.

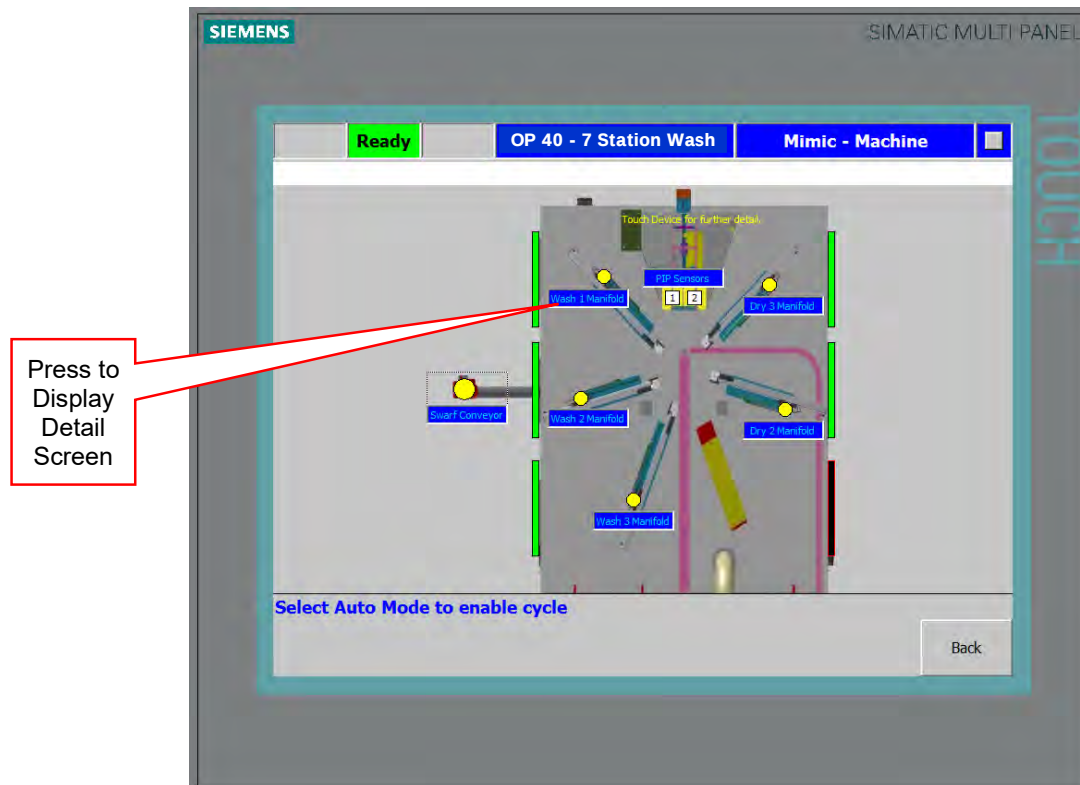


Figure 16 - Top View Mimic Screen

4.4.11 Machine Mimic

Press a device on the Top View Mimic screen to display a mimic screen. The example below is Mimic Wash 1.

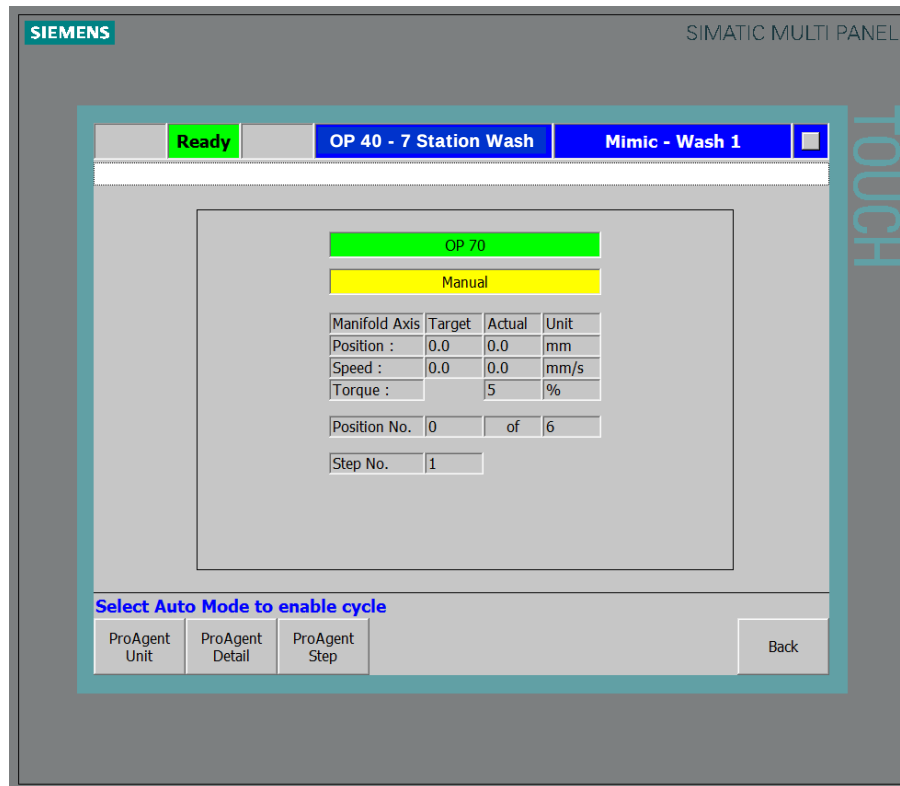


Figure 17 - Machine Mimic Screen

4.4.12 Part Tracking

This screen shows the station and the part type. Press the *Part Tracking* button on the main menu. The system displays the following screen.

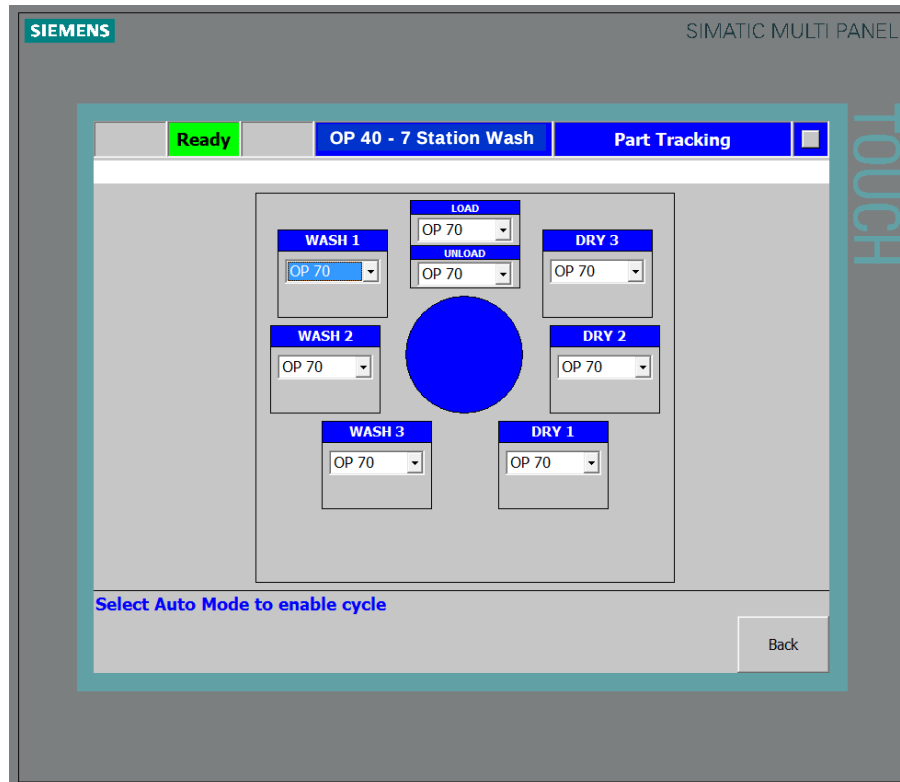


Figure 18 - Part Tracking Screen

4.4.13 Station Settings

Press a button on the right hand side of the HMM process screen to select one of the wash or dry stations. The appropriate set up screen is displayed. The example below is for wash station 1.

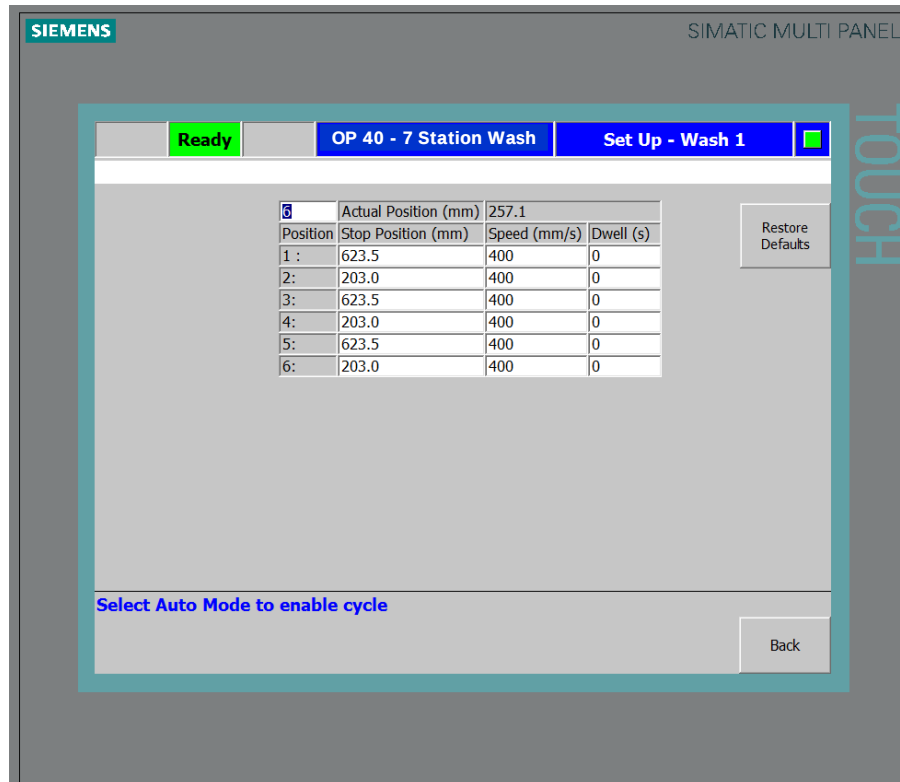


Figure 19 - Set Up Screen

4.4.14 Pendant

This machine is equipped with a pendant HMI, permitting limited control of the machine in manual mode by authorised personnel only.

The machine has 6 interlocked access doors and 3 pendant sockets. These are situated at the front door and at each side door. When the pendant is connected, the machine can be operated in manual mode, with certain restrictions, with the associated access door open. Only one access door may be open at any one time while the pendant is in use.



WARNING: Be aware of moving parts, use of the pendant does not guarantee freedom from accident or injury.

When using the pendant, only manual operation is allowed. All items that can be speed controlled have their speed reduced to 250 mm/s @ 100% selected from the pendant at 10% increments (ie 90,80/70% etc. This is the turntable and wash/dry manifolds. Any other equipment (doors, valves etc) will be inhibited.

Instructions for use are as follows:



WARNING: Do not use the pendant at the front loading door unless the gantry is disabled and locked out.

1. Select manual mode on the main HMI, then press "Unlock Doors" All 3 access doors will unlock.
2. Open the relevant door.
3. Connect the pendant to the associated socket and wait for the pendant to power up.

4. The main HMI will now be displaying a large warning screen (shown below) as it is now inhibited.

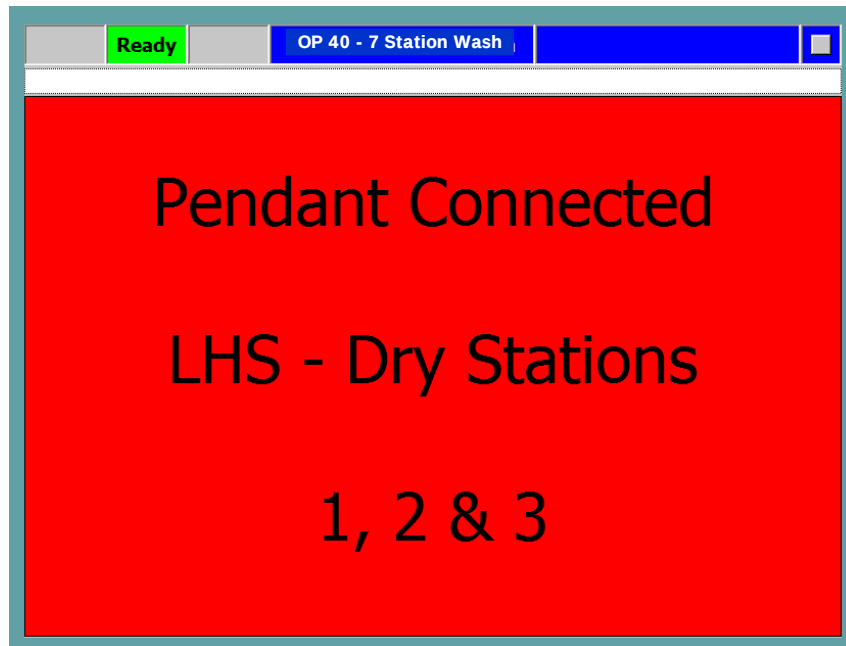


Figure 20 - Pendant Warning Screen

5. The pendant screen is a smaller version of the main HMI screen - follow the instructions shown in the message area. Before and during any movements taking place, the liveman's handle must be depressed halfway. If the handle is fully depressed OR released, the machine safety circuits will disable the pneumatic and electrical supplies.

When you have finished with the pendant, disconnect from the socket. Close and lock the access door. Store the pendant on the bracket provided.

Section 5 - Preventive Maintenance

This section contains all the preventive maintenance task procedures to enable the machine to reach predicted MTBF & MTTR.

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WARNING: You must check the air receiver gauge to make sure the air pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.

5.1 Preventive Maintenance Summary Sheet

Tasks	Machine ON / OFF	Frequency	FMEA Reference	Maintenance Manual Reference	Estimated Time Req. Minutes	Performed by Operator	Performed by Skilled Trades
Air Nozzles - Check For Damage	OFF	30 days		5.2.1	10		X
Autolube Reservoir - Check/Top Up Level	ON	7 days		5.2.2	5	X	
Oil Lubrication Lines - Inspect	OFF	30 Days		5.2.3	30		X
Door Seals - Inspect	OFF	365 days		5.2.4	15	X	
Door Drip Collector Tray – Clean Tray and Tube	OFF	30 days		5.2.5	20	X	
Door Drainage Holes – Clean Out	OFF	30 days		5.2.6	20	X	
Dosatron Maintenance	OFF			5.2.7			
Extract Fan / Filtration Unit - Check	ON / OFF	1 day		5.2.8	5		X
Gauge - Check Reading	ON	7 days		5.2.9	5	X	
Laser Part Detection Sensors - Check	OFF	30 days		5.2.10	30		X
Component Guides / Fixtures - Check Security	OFF	120 days		5.2.11	60		X
Oil Separator Unit	OFF	1 day		5.2.12			X
Steam Clean Machine	OFF	120 days		5.2.13	30		X
Swarf Screw Conveyor Motor Gearbox – Check Oil	OFF	500 hours running / 365 days		5.2.14	10		X
Turntable Gearbox – Check for Leaks	OFF	365 days		5.2.15	10		X
Wash Fine Filter	OFF	1 day		5.2.16		X	
Wash Nozzles - Inspect	OFF	30 days		5.2.17	15		X
Wash Solution - Check	ON	3 days		5.2.18		X	
Wash Solution Change	OFF			5.2.19			X

5.2 Preventive Maintenance Instructions

5.2.1 Air Nozzles - Check for Damage

Frequency: 30 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Inside Wash / Dry Chamber
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Open access doors to drying chambers.
3. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.
4. Check that each air nozzle / probe is securely mounted and not damaged.
5. Tighten any loose fittings.



Figure 1 : Drying Air Nozzle

6. Initiate any corrective action necessary.
7. Close access door.
8. Return the machine to service

5.2.2 Autolube Reservoir - Check Level

Frequency: 7 days
Safety: Read Section 2 Safety
Part Location (s): Inside maintenance compartment
Spares: Castrol Cosmolubric G220
Special Tools Required:

The autolube system provides automatic lubrication for the rotary turntable and the bearings on the linear slides mounted on the roof of the machine. The lube pump will run for a set period of time when a set number of components have been processed. The number of components can be adjusted from the HMI.

The system is monitored with appropriate warning messages displayed on the HMI for:

- Low pressure (indicating a leak)
- High pressure (indicating a blockage)
- Reservoir empty

NOTE: If oil usage is excessive do the procedure **Oil Lubrication Lines . Inspect (5.2.3)**

1. Open maintenance access door.
2. Check oil level in auto lube reservoir sight glass.



Figure 2 : Autolube Reservoir

3. If more oil is necessary, unscrew plastic filler cap.
4. Add oil as necessary.
5. Install filler cap.
6. Return the machine to service.

5.2.3 Oil Lubrication Lines - Inspect

Frequency: 30 days or as required 5.2.2
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Switch off machine and lockout
2. Check the air pressure gauge to make sure the pressure has been released before you work on the machine. Follow the ECPL procedure if there is any pressure in the system
3. Inspect the lubrication pipework for oil leaks, from the Autolube reservoir (Figure 2) to the
 - a. Turntable slewing ring inside the machine
 - b. Linear drives on the roof of the machine
4. If necessary initiate corrective action
5. Return machine to service on completion of inspection or any remedial work.

5.2.4 Door Seals - Inspect

Frequency: 365 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.
3. Make sure that all washing solution is drained from behind any door before opening it.
4. Open access doors.
5. Inspect seals.
6. The contact surfaces of the seal and the mating surface must be clean.

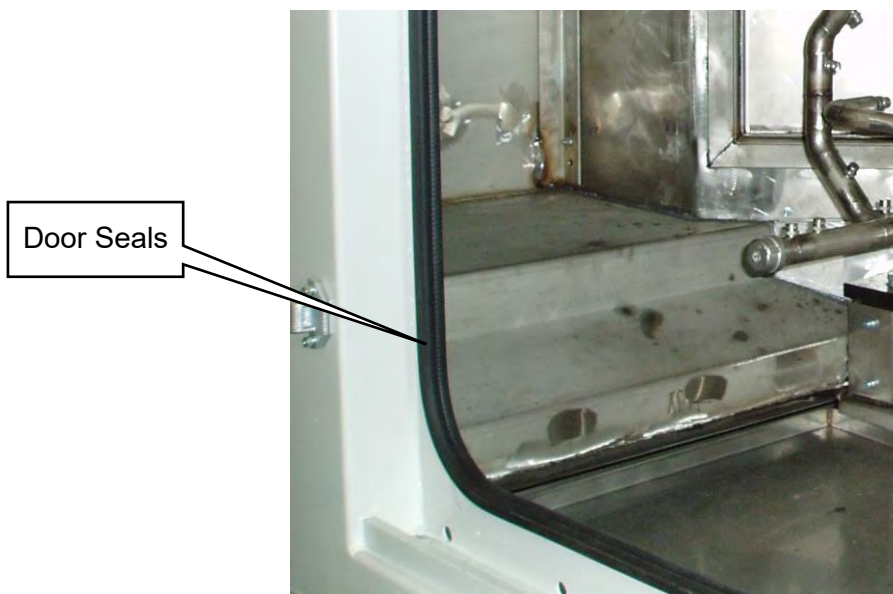


Figure 3 : Door Seals

7. The seal must:
 - have sufficient flexibility and shape to properly seal the door when it is shut.
 - not have any holes, tears or cracks.
 - be securely fixed in position.
8. If the doors do not seal properly take steps to initiate any corrective action.
9. Return the machine to service.

5.2.5 Door Drip Collector Tray - Clean Tray and Tube

Frequency: 30 Days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the system.
3. Make sure that all washing solution is drained from behind any door before opening it.
4. Open each door and inspect the tray and tube.
 - a. Clean out the tray and tube to ensure tray can drain down through the tube
 - b. Close the door, ensuring the tube goes inside the process compartment and not between the door and machine housing.
5. Return the machine to service

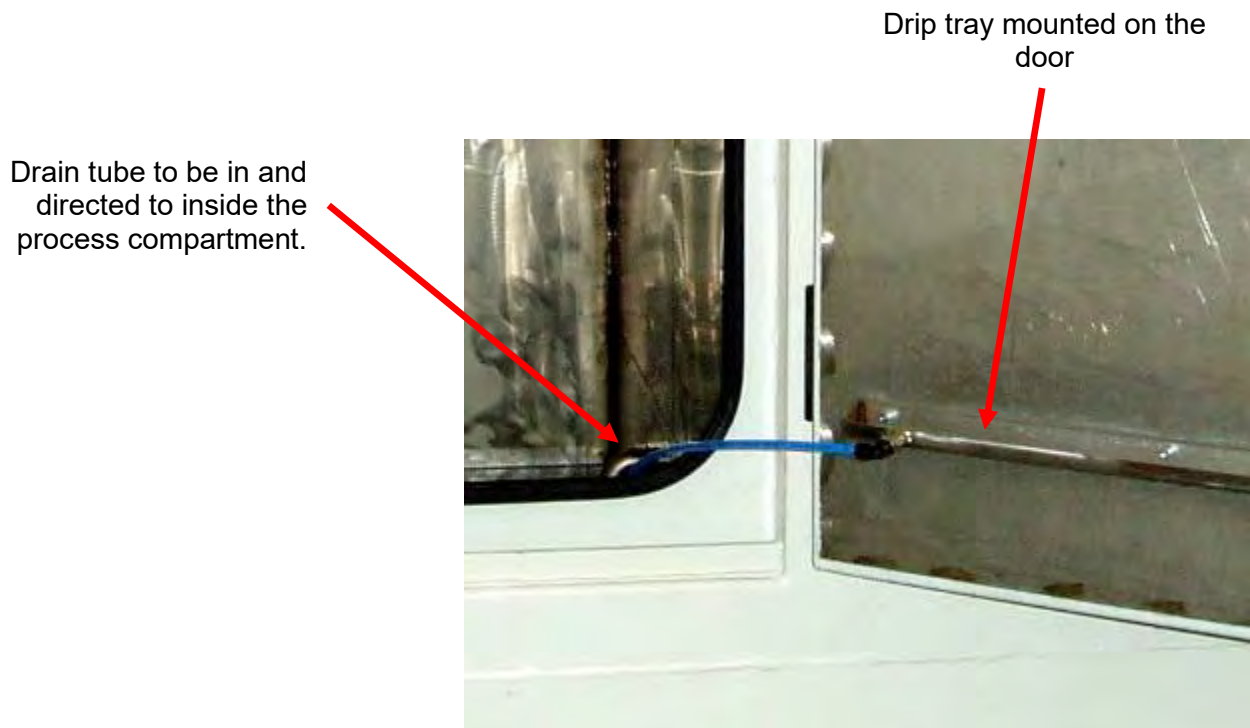


Figure 4 : Door Drip Tray

5.2.6 Door Drainage Holes - Clean Out

Frequency: 30 Days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the system.
3. Make sure that all washing solution is drained from behind any door before opening it.
4. Open each door and inspect the holes in door surround structure.
 - a. Clean out the holes as necessary.
5. Return the machine to service

Door surround
drainage holes



Figure 5 : Door Drainage Holes

5.2.7 Dosatron Maintenance

Frequency: 365 days
Safety: Stop machine and lockout. Read Section 2 Safety. Read safety section of Dosatron manual.
Part Location (s): Mounted on water tank
Spares: Dosatron Spares
Special Tools Required:

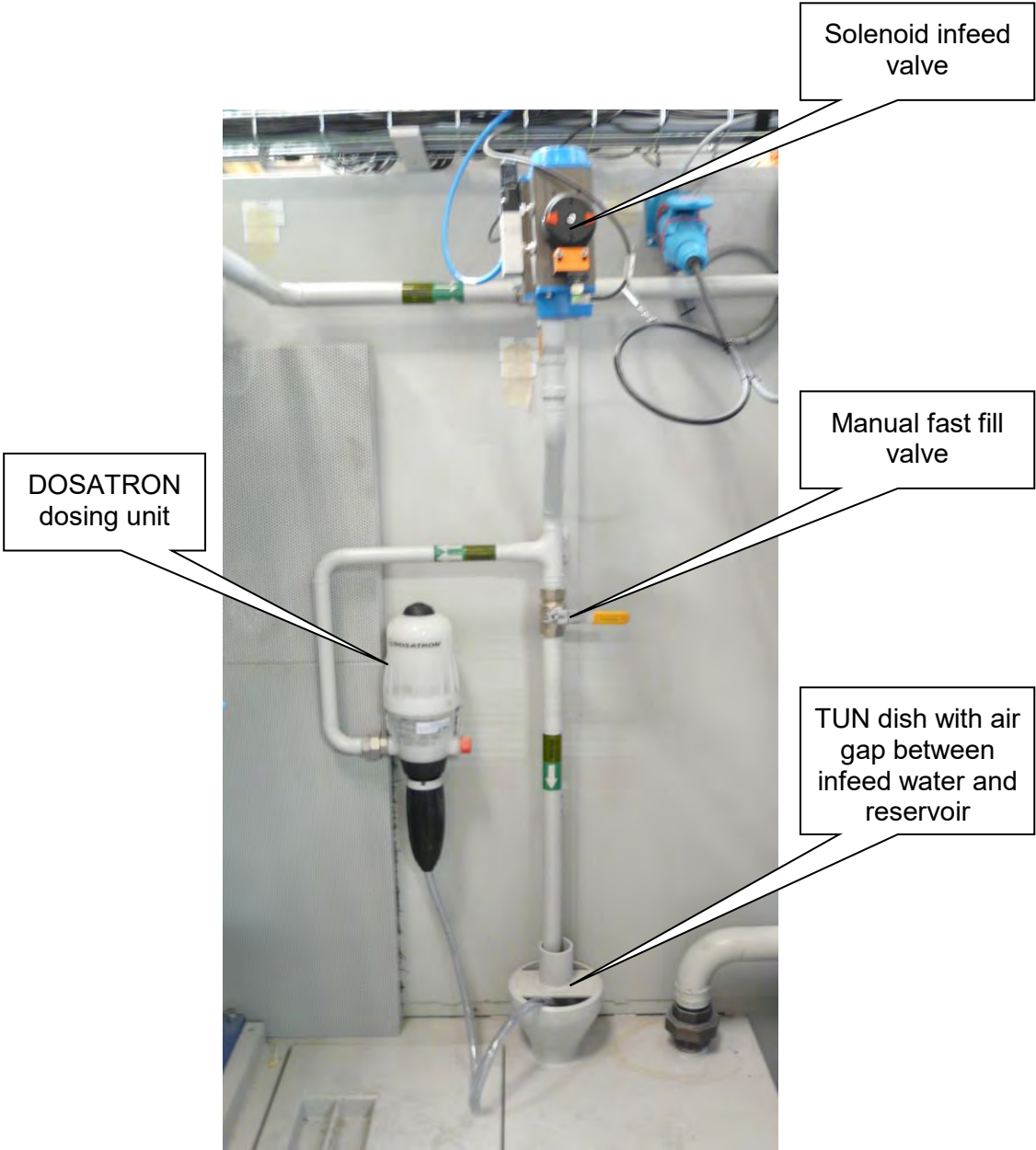


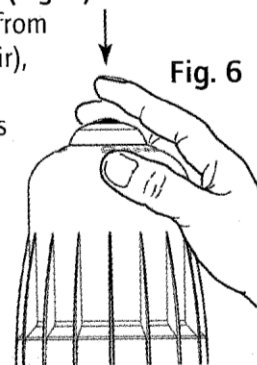
Figure 6 : Dosatron Installation

5.2.7.1 Using Dosatron for the first time

Putting the DOSATRON into order

USING FOR THE FIRST TIME

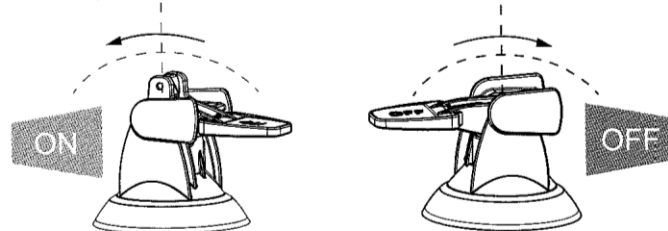
- Partially open the water inlet valve.
- Press the bleed button on the top of the DOSATRON (Fig. 6).
- When a constant flow of water is seen coming from around the bleed button (no more «spitting» of air), release the button.
- Open the water inlet valve slowly, the DOSATRON is self-priming.
- Operate the DOSATRON until the product to be injected is drawn up into the doser body (the product is visible through the plastic tube).
- The DOSATRON makes a characteristic "click-clack" noise when working.



NOTE: The time required to prime the suction tube depends on the water flow-rate, the ratio setting and the length of the suction tube. To bleed the air from the suction tube and accelerate the priming, set the injection rate at maximum. Once the DOSATRON is primed, adjust to the required injection rate (see § ADJUSTING THE INJECTION RATE).

The DOSATRON may be fitted in its upper part with the function by-pass (optional equipment):

- By-pass in **ON**, the DOSATRON works and the concentrate is drawn up.
- By-pass in **OFF**, the DOSATRON is stopped and does not draw up the product.



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5.2.7.2 Maintenance Recommendations

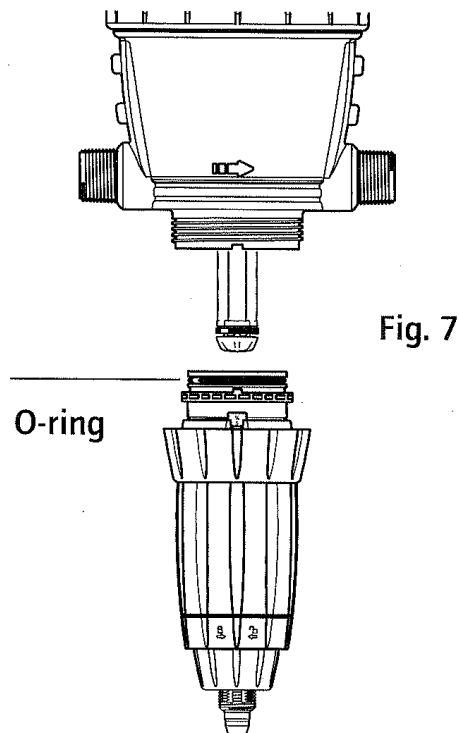
Maintenance

RECOMMENDATIONS

1 - When using soluble products to be made up into solutions, we recommend the periodic dismantling of the entire dosing part (see : § CLEANING AND REFITTING THE SUCTION VALVE, § CHANGING SEALS IN THE INJECTION ASSEMBLY).

Thoroughly rinsing all the elements of the dosing part with water and re-assembling them after having previously lubricated the seal (**Fig. 7**) with a silicone lubricant, in the case of difficulty in re-fitting.

2 - Before putting the DOSATRON into operation after a non-use period, remove the motor piston and soak it into lukewarm water < 40° C [104° F] overnight. This helps to dissolve any deposits which may have dried onto the piston motor.

**HOW TO DRAIN THE DOSATRON (in case of freezing temperature)**

- Turn off the water supply and let the pressure drop to zero.
- Remove the injection assembly, see § CHANGING THE MOTOR PISTON.
- Remove the bell and the motor piston.
- Disconnect the water inlet and outlet fittings.
- Remove the lower pump body from the mounting bracket and empty any remaining water.
- The DOSATRON can now be reassembled, having first cleaned the seal.

5.2.7.3 Fitting Suction Tube and Adjusting Injection Rate**INTERNATIONAL CONVERSIONS**

Principle : Setting at 1% $\Rightarrow 1/100 = 1$ part of concentrate for 100 parts of water.

Ex. : Setting at 2% $\Rightarrow 2/100 = 2$ parts of concentrate for 100 parts of water.

Ratio $\Rightarrow 1/50$.

FITTING THE SUCTION TUBE

If the DOSATRON has already been used, please **imperatively** refer to § **PRECAUTIONS**.

- Unscrew the nut (Fig. 11) at the bottom of the injection assembly and put it onto the tube.
- Push the tube onto the barbed fitting as far as it will go and screw up the nut by hand (Fig. 12).

Fig. 11

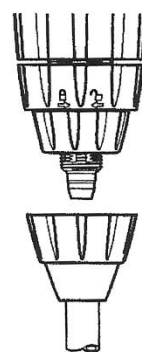
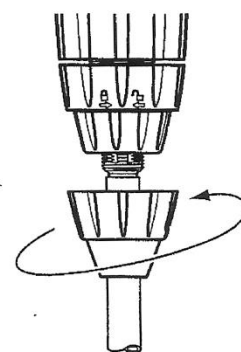


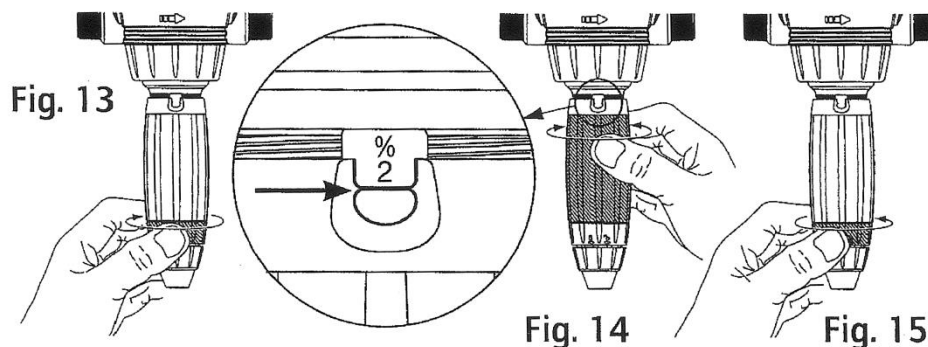
Fig. 12

**ADJUSTING THE INJECTION RATE (with pressure off)**

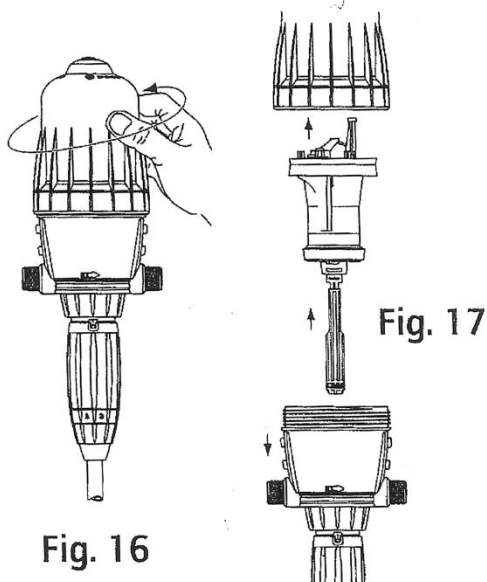
IMPORTANT ! Use no tools.

Adjustment must be made when there is no pressure in the DOSATRON.

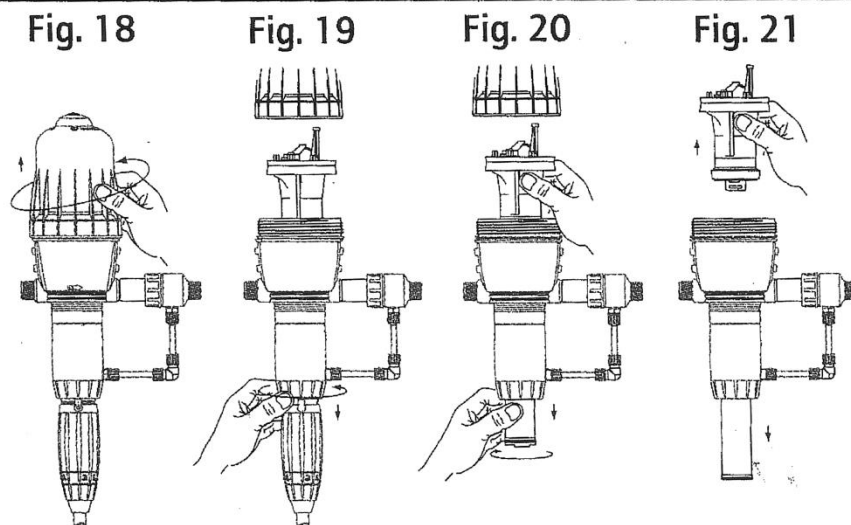
- Turn off the water supply and allow the pressure to drop to zero.
- Unscrew the blocking ring (Fig. 13).
- Screw or unscrew the adjusting nut in order to line up the 2 peaks of the eyelet with the desired ratio on the scale (Fig. 14).
- Tighten the blocking ring (Fig. 15).



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5.2.7.4 Changing Motor Piston**CHANGING THE MOTOR PISTON (with pressure off)**

- Turn off the water supply and allow the pressure to drop to zero.
- Unscrew and remove bell-housing by hand (Fig. 16).
- Remove the motor piston (Fig. 17) by pulling it up.
- Rod and plunger piston are fixed to the motor piston and taken out simultaneously.
- Change and reassemble in the reverse order to the above.
- Refit the bell-housing (take care not to damage its seal) and tighten by hand.

CHANGING THE MOTOR PISTON D3RE25IE (with pressure off)

- Shut the water supply and let the pressure drop to zero.
- Unscrew the bell by hand (Fig. 18) and remove it.
- Unscrew the fixing nut of the dosing part (Fig. 19) and remove it.
- Retain the motor piston while turning the plunger piston $\frac{1}{4}$ turn (Fig. 20).
- Change parts and reassemble in the reverse order to the above.
- Refit the bell taking care not to damage its seal and screw by hand (Fig. 21).
- Refit the dosing part assembly.

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5.2.7.5 Changing Seals in Injection Assembly

CHANGING SEALS IN THE INJECTION ASSEMBLY (with pressure off)

Frequency : Once per year.

IMPORTANT ! Use no tool or metallic utensils

ADVICE: Before dismantling any part of the injection assembly it is advisable to operate the DOSATRON, injecting clean water so as to rinse through the injection system. In this way, risks of contact with concentrated solutions in the injection assembly are minimized.

During any such intervention, wear protective eyewear and gloves !

METHOD OF REMOVING SEAL

Fig. 22 : Between finger and thumb, pinch the component and the seal ; push towards one side to deform the seal.

Fig. 23 : Increase the deformation to grip the part of the seal thus exposed and pull it out of its groove.

Clean the seal seating without any tools.

Refitting is done by hand.

It is very important that the seal is not twisted once in place as this would impair its efficiency.

Fig. 22

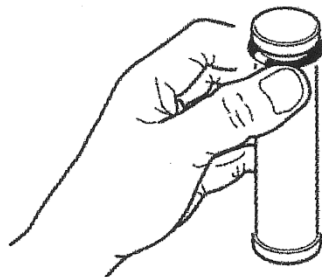
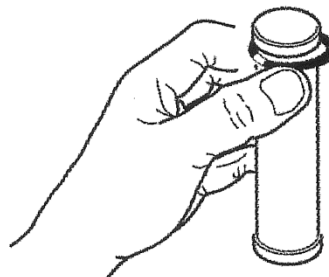


Fig. 23



5.2.8 Extract Fan / Filtration Unit Check

Frequency: Daily or as necessary according to use.
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Stop the machine and lockout.
2. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Do ECPL procedures if there is pressure in the system.
3. Check the condition of the electrical wiring.
4. Open the filter chamber door and check the condition of the Coalescence Prefilter Cartridge, install new cartridge filter if necessary (refer to Replace the Coalescence Prefilter Cartridge).
5. Check the condition of the metal mesh coalescing prefilter located under the Coalescence Prefilter Cartridge, clean or install new filter as necessary.
6. Check that the fan is not vibrating excessively.

NOTE: The effluent drains into the dry chamber effluent tank.

7. If necessary initiate corrective action.
8. Return the machine to service.

5.2.8.1 Replace the Coalescence Prefilter Cartridge

1. Stop the machine and lockout.
2. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the system.
3. Open the upper maintenance door to the filter chamber.
4. Use the box spanner to turn the retaining screw partially clockwise until the cam pressure is released and the cartridge filter is loose.
5. Turn the filter cartridge and the plate anticlockwise.
6. Remove the old filter cartridge and install a clean cartridge on the plate.
7. Turn the filter cartridge and the plate clockwise and position the cartridge-top seal a few mm from the inside roof of the filter chamber.
8. Use the box spanner to turn the retaining screw anticlockwise until the cam pressure pushes the filter against the top of the chamber.
9. Close and secure the filter chamber door.
10. Return the machine to service.



Figure 7 : Coalescence Prefilter Cartridge

5.2.9 Gauge, Air Supply - Check Reading

Frequency: 7 days
Safety: Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Locate the Main air supply gauge and check that the reading is within the operating limits:
2. Initiate corrective action if gauge reads outside the operating limits.



Figure 8 : Pneumatic Supply Gauge

5.2.10 Laser Part Detection Sensors in Load Station

Frequency: Every 30 days and as required.
Safety: Stop machine and lockout and load gantry. Read Section 2 Safety
Part Location (s): Load Station
Spares: None
Special Tools Required: None



Figure 9 : Part Detection Laser Sensors

1. Empty the parts from the machine.
 - 1.1. With the machine in cycle, press 'Select Mode'
 - 1.2. Press 'Without Parts'
 - 1.3. The machine will then unload all parts.
2. Switch off machine and lockout.
3. Open access door.
4. Clean the front lenses of the laser sensors.
5. Close door and return power to machine.
6. Check sensors are facing each other by viewing through the glass aperture in the load station door and checking the light at rear of the laser unit is illuminated indicating the sensors are facing each other correctly.

NOTE: The software also monitors if the lasers are correctly set during each load cycle.

7. Return the machine to service.

5.2.11 Component Guides/Fixtures

Frequency: 120 days
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s): Inside the machine
Spares:
Special Tools Required:

1. Operate the machine until it contains no parts
 - a. With machine in cycle , PRESS Select Mode'
 - b. PRESS without parts'

THE MACHINE WILL THEN AUTOMATICALLY RUN THROUGH NORMAL WASH CYCLES , INHIBITING PARTS BEING LOADED INTO THE MACHINE, CAUSING THE MACHINE TO EMPTY ISELF OF PARTS.

2. Switch off the machine and LOCKOUT.
3. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the system.
4. Open access doors
5. Check that each component locating guide / fixture is securely mounted and all fittings are also secure.
6. Check all component location pieces for damage.
7. Tighten any loose fixing and initiate any necessary corrective actions.
8. Close all access doors and return the machine into operation.

5.2.12 Oil Separator Unit

5.2.12.1 Oil Separator Unit – Adjustments

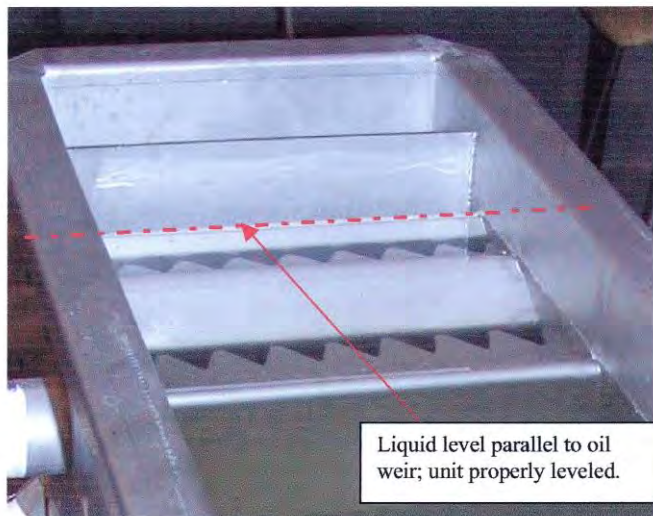
ADJUSTMENT

General Considerations

Make sure the unit is properly leveled (once filled up). If leveled, the liquid surface at the oil weir should be exactly parallel to the edge of the weir.

Make changes in little steps, and pause in between. It requires some time for the adjustments to take effect.

If possible, adjust with water or clean fluid (no oil, foam etc.) initially. Oil and foam make it difficult to see the effect of adjustments and to determine if settings are correct.

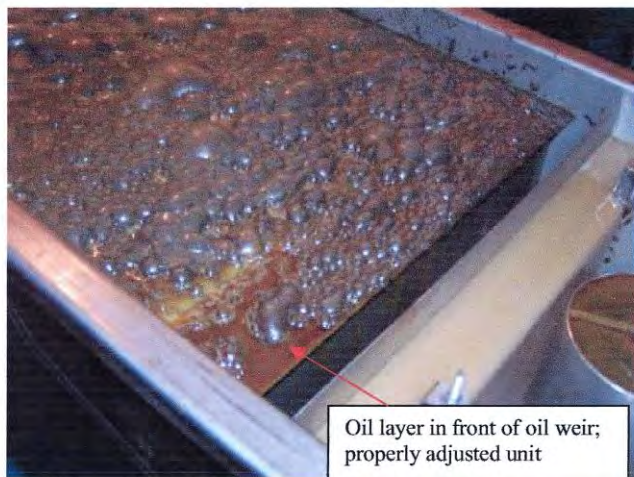


Liquid level parallel to oil weir; unit properly leveled.

There should always be a layer of oil inside the Suparator[®] device. Do not try to adjust the unit so that only a thin oil-layer remains as this will result in considerable amounts of water being separated with the oil.

Be aware of varying process conditions (flow rate, amount of oil or grease). This can easily lead to misinterpretation of the effects that are observed resulting in unnecessary or incorrect adjustments.

The Suparator[®] construction is sensitive to level variations which may result from variations in the flow. Therefore use the correct type of transfer pump with a constant flow rate. Be aware of any possible flow variations, influencing the settings and adjustment of the unit.



Oil layer in front of oil weir; properly adjusted unit

Foam and air in the incoming flow effectively reduce the liquid flow going through the unit. If excessive bubbling is observed, this should be resolved first.

5.2.12.2 Oil Separator Unit - Preparing

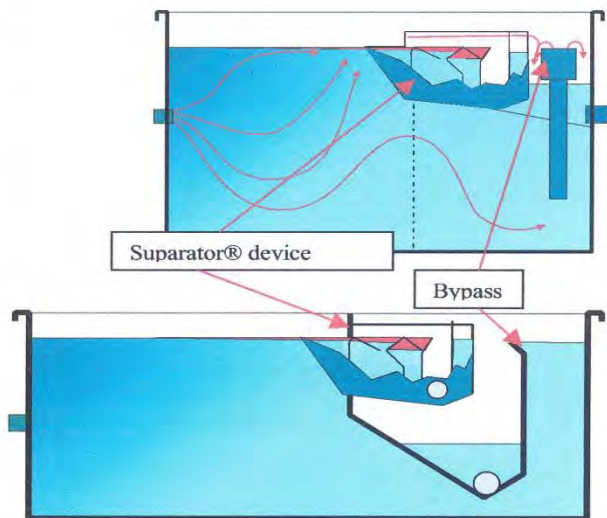
ADJUSTMENTS

Preparing

Adjusting a Suparator® unit is fairly simple, provided the unit is leveled properly and the flow is controlled adequately (correct pump, constant flow rate, no excessive amounts of air).

Most Suparator® systems have two adjustments, of which only one relates to the Suparator® mechanism. The second one is a bypass and is used to change and set the amount of liquid, passing through the Suparator® device.

The two sketches at the right show the arrangement of an 86 series tank (top) and an 84 series tank. Both have a bypass which, although constructed differently, has exactly the same function. The same goes for the Suparator® device.



It is possible that, while adjusting the Suparator® unit, fluid overflows into the oil trough and out the oil outlet. To prevent this, you may want to adjust the bypass to a low position, making overflow impossible.

Note: This does not apply to units that come with a transfer pump. These units have been pre-adjusted in the workshop and should only require fine tuning (see hereafter).

With Suparator® units with a bypass siphon, like the 86 series, rotate the siphon collar clockwise to lower it. On other units, the bypass is constructed as a weir or valve.

Lower the bypass approximately 10mm below the nose of the Suparator® device to limit the liquid level in front of the device, eliminating the possibility of an overflow.

Now you can fill up the unit and start the normal flow through the unit, for instance by starting the transfer pump. Make sure that during the remainder of the adjustment procedure the right flow passes through the unit at all times.

5.2.12.3 Oil Separator Unit - Initial Adjusting

Initial adjusting

The sketch to the right shows the Suparator® device in cross section view, with all the components identified for reference.

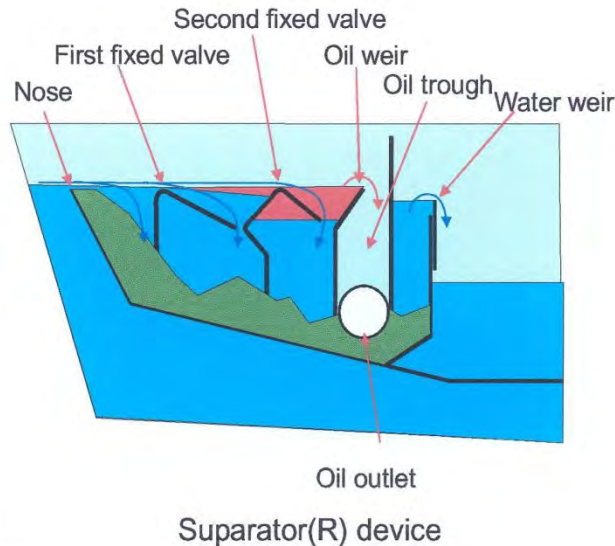
Raise the bypass until fluid flows over the nose of the Suparator® device. The fluid fills up the device until it flows out over the water weir.

Continue raising the bypass until fluid flows over the first fixed weir. The liquid level at the oil weir should stay below the edge of the weir.

If the liquid level at the oil weir is more than 2 mm below the edge of the weir, the water weir must be raised.

If the liquid level at the oil weir is less than 2 mm from the edge of the weir, the water weir must be lowered.

Adjust the water weir in a number of small steps and pause in between to give the level time to rise.



If the unit is adjusted properly, the surface at the Suparator® device should look more or less like in the picture to the left.

Notice the tops of the fixed weirs shine through the thin fluid layer that flows over them.

Any oil, that is present in the system, will immediately start to accumulate at the oil weir.

Note:

Oil will not separate until a sufficiently thick layer has accumulated at the oil weir. Depending on the device this may require 1 to 2 liters of oil!

The adjustments described here will satisfy for most applications. The following paragraph discusses adjusting the settings for optimal performance.

5.2.12.4 Oil Separator Unit - Check Flow

Frequency: 7 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location: Reservoir / Filtration Module
Spares:
Special Tools Required:

CAUTION: The progressing cavity pump must never be energized when dry. Damage will be caused immediately.

1. Check if there is too much oil in the main water tank and only a small amount in the effluent tank, if there is, the flow is too low.
2. Check if there is air bubbling inside the Suparator tank, if there is, the flow is too low.
3. If the flow is low, check the items that follow:

NOTE: If it is necessary to do work that needs parts to be removed, do all the other checks first. All repairs can be done at the same time.

- a. Check for obstructions like rags, caps or a blocked strainer. This can cause a noisy pump.
 - i. Switch off machine and lockout.
 - ii. Remove the obstructions.
- b. Check for air entering the suction piping at leaking joints or at the pump shaft. This condition can easily be identified from the air bubbling inside the Suparator tank.
 - i. Switch off machine and lockout.
 - ii. Check for leaking joints.
 - iii. Tighten the packing gland or replace the seal as necessary (refer to Section 5.3.8 of this manual).
 - iv. Inspect the surface of the stator. A worn or damaged stator and whether a stator needs replacement can be determined from the actual flow through the system. If the flow is considerably less than it used to be, it is almost certainly due to wear of the stator. When replacing a stator, check the condition of the rotor and change if necessary. A severely grooved rotor will grind down a new stator very quickly
 - v. Switch off machine and lockout.
 - vi. Replace the stator See Section 5.2 12.6 of this manual.
- c. Inspect the surface of the rotor. A worn or damaged rotor and whether a rotor needs replacement is determined by inspecting the surface of the rotor. When replacing a rotor, check the condition of the stator and change if necessary. If the stator is in bad condition it will cause the new rotor to wear very quickly.
 - i. Switch off machine and lockout.
 - ii. Replace the rotor See Section 5.2.12.13.

5.2.12.5 Oil Separator Unit - Liquid Flow

OPTIMIZATION OF SETTINGS

Optimizing settings during normal operation must be done in small steps and relatively long intervals, since adjustments require a considerable time to take effect. Always make minimal adjustments.

The following conditions can be observed and influenced:

1. The liquid flow through the Suparator[®] device.
2. The oil layer thickness at the oil weir.

THE LIQUID FLOW

The flow through the Suparator[®] device is changed by raising or lowering the bypass.

More flow means **floating** oil is carried off faster and more efficiently. However, it also means more turbulence and less efficient oil separation. A high flow is indicated for large amounts of oil or thick oil or grease layers.

Less flow means more quiescent flows, giving oil a better opportunity to separate and build a floating layer. A low flow is indicated for applications where there is little oil and where the oil is light and instable.

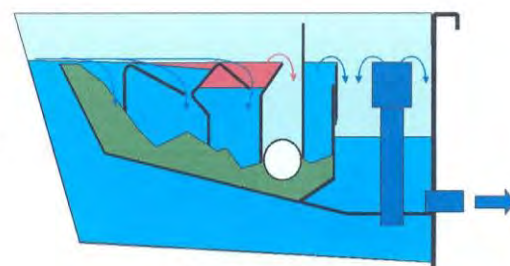
Oil should not be allowed to build up and cover the entire surface in front of the Suparator[®] device.

Sketches to the right:

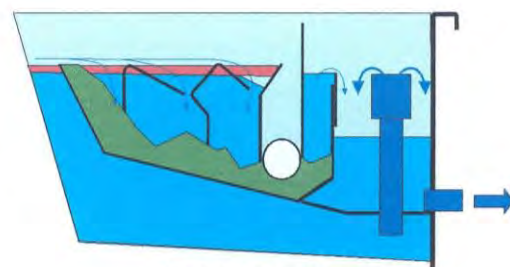
Top: Set properly, oil layer builds up in front of the oil weir mainly. There may be some oil in front of the second fixed valve.

Middle: Flow too low. The tops of the fixed valves cut through the liquid surface. Oil can be observed everywhere.

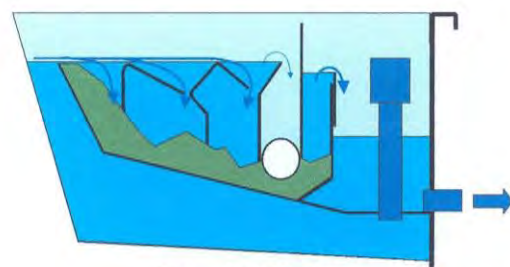
Bottom: Flow too high. No oil layers visible at all, or only a very thin oil layer in front of the oil weir. The flow over the fixed valves is clearly turbulent.



Flow correct



Flow too low



Flow too high

5.2.12.6 Oil Separator Unit - Stator Replacement

Frequency: 185 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Reservoir / Filtration Module
Spares: Stator
Special Tools Required:

CAUTION: The progressing cavity pump must never be energized when dry. This will cause immediate damage to the pump.

1. Switch off the machine and lockout.
2. Remove the pump run-dry protection sensor, as described below.
3. Open pump and inspect the stator as described below.
4. Replace stator as necessary
5. Complete the pump service, continuing as described in the procedure that follows.
6. Return the machine to service

5.2.12.7 Oil Separator Unit - Stator Replacement (Job Steps Part-01)

REMOVING RUN-DRY PROTECTION SENSOR.



Disconnect the cable and the wing from the sensor as shown in the picture. Loosen the terminal box by loosening the screws at the side.



Carefully remove the terminal box by pulling it upwards.



Remove the sleeve that serves to mount the terminal box to the stator. You can loosen the sleeve with a wrench first and then unscrew it by hand. Be careful not to hit the sensor mount in the middle.

5.2.12.8 Oil Separator Unit - Stator Replacement (Job Steps Part-02)

Now loosen the nut which holds the sensor in place. Make sure the metal sleeve, which protrudes from the stator, does not turn. If necessary, use a wrench to prevent the sleeve from turning.



Carefully remove the sensor from the sleeve by pulling it upward. Observe the small plastic sleeve that serves as a gland seal for the sensor. The metal sleeve, which is sealed in the stator remains as it is.



This is how the sensor should look if removed correctly.

You can now do any maintenance on the pump as required.

5.2.12.9 Oil Separator Unit - Stator Replacement (Job Steps Part-03)

Re-install the sensor in the reverse order as described above.

By hand, fit the sensor back into the metal sleeve. Under NO CIRCUMSTANCES twist or turn the metal sensor sleeve. It is glued into the rubber from the stator and turning it will result in leakage. Use a wrench to prevent the sleeve from turning.

STATOR REPLACEMENT

How frequently the stator needs replacement very much depends on the application. The pumps used on Suparator® systems, and all pump parts, are specifically selected for the application. This should result in optimal stator life which should be between 6 and 12 months, sometimes even more.

However, if the fluid contains abrasive materials, fines or chips, the life time of a stator may be significantly reduced. If that is the case, it is recommended to install a strainer in the pump suction line. Do not use filters as these will block due to the oil.

Whether a stator needs replacement can be determined from the actual flow through the system. If the flow is considerably less than it used to be, it is almost certainly due to wear of the stator. Note that reduced liquid flow can also be due to air entering the suction piping at leaking joints or at the pump shaft. This condition however can easily be identified from the air hissing inside the Suparator® unit.

When replacing a stator, check the condition of the rotor too. A severely grooved rotor will grind down a new stator very quickly.

If the pump is fitted with a temperature sensor on the stator, follow the instruction above to remove it.

Normally, replacing the stator can easily be done without removing the pump from its seat. All that is necessary is that the piping at the front of the pump is disconnected, and that sufficient free space is available to actually remove the stator.



After removing the connecting piping at the front end of the pump, loosen the nuts

5.2.12.10 Oil Separator Unit - Stator Replacement (Job Steps Part-04)

.... and take off the pump front.



The stator can easily be removed by pulling it forward. In very rare situations, removing the stator may be difficult. This would be the case if the wrong rotor or stator type (material) is used, causing the stator to stick on the rotor.



If the new stator is provided with a connection for a temperature sensor, there will be a protection sleeve protect the sensor sleeve from getting hit or being twisted. Only remove the protection sleeve after the stator has been installed and you are ready to mount the temperature sensor back on.



To mount the new stator, apply some lubrication on the rotor and ...

5.2.12.11 Oil Separator Unit - Stator Replacement (Job Steps Part-05)



.. slide the stator onto the rotor. If there is a connection for a temperature sensor (in the picture at the left), make sure it is positioned at the suction side of the pump, pointing upwards.

Finish assembling the pump by mounting the front piece and fitting the nuts. When tightening the nuts, check that the rotor is in line with the motor axis. Alternate tightening the nuts to make sure the rotor is mounted straight and with evenly distributed tension.

After the pump has been assembled and the piping has been reconnected, be sure to fill the pump, and connecting piping, with water before running it. If run protection is provided, using a temperature sensor on the stator, you will need to reconnect the cabling.

If the pump was disconnected from the power cable, check the rotation direction before taking the pump into service.

5.2.12.12 Oil Separator Unit - Rotor Inspection

Frequency: 185 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Reservoir / Filtration Module
Spares: Rotor
Special Tools Required:

CAUTION: The progressing cavity pump must never be energized when dry. This will cause immediate damage to the pump.

1. Switch off the machine and lockout.
2. Remove the pump run-dry protection sensor.
3. Open pump and inspect the rotor as described below.
4. Replace rotor as necessary.
5. Complete the pump service, continuing as described below.
6. Return the machine to service.

5.2.12.13 Oil Separator Unit - Rotor Inspection (Job Steps Part 01)

REMOVE ROTATING PART FROM THE PUMP



To replace the rotor it is necessary to remove the rotating section (rotor, coupling and pump shaft) from the pump. The pump shaft slides over the gear shaft and is held in place by a pin through both shafts. The pin is held in place by a rubber sleeve. Push the rubber sleeve aside and use a thin object and a hammer to push out the pin. No force is necessary.



Do not exercise force and be careful when using tools. The soft, stainless steel, parts may easily be damaged which can make assembly difficult or even impossible.



The pump housing comes off easily, held in place only by a sticking packing ring. After removing the pin, the pump shaft must be removed from the gear shaft. By applying some very fine lubricating oil if separating the shafts proves to be difficult.



To break loose the pump and gear shaft try unmount the pump shaft while preventing the gear shaft from turning, by holding the motor fan.

5.2.12.14 Oil Separator Unit - Rotor Inspection (Job Steps Part-02)

Now loosen the nut which holds the sensor in place. Make sure the metal sleeve, which protrudes from the stator, does not turn. If necessary, use a wrench to prevent the sleeve from turning.



Carefully remove the sensor from the sleeve by pulling it upward. Observe the small plastic sleeve that serves as a gland seal for the sensor. The metal sleeve, which is sealed in the stator remains as it is.



This is how the sensor should look if removed correctly.

You can now do any maintenance on the pump as required.

5.2.12.15 Oil Separator Unit - Rotor Inspection (Job Steps Part-03)

Make sure the gear shaft and the pump shaft (internal) are absolutely clean and apply some lubricant to ease assembly.

Place the assembly (rotating part plus shaft sealing) into the pump lantern. Slide the pump shaft over the gear shaft and carefully align the holes in the pump shaft and gear shaft.



If necessary, use a plastic hammer (not a steel one) to help the pump shaft slide onto the gear shaft. Support the coupling while doing this.



Fit a new packing ring onto the pump lantern to seal the pump housing.



Slide the pump housing over the rotor and mount the new stator.

5.2.12.16 Oil Separator Unit - Check Oil in Pump Gearbox

Frequency: 90 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location: Reservoir / Filtration Module
Spares: Gearbox oil; Mobilgear 630
Special Tools Required:

1. Switch off machine and lockout.
2. Check the oil level in the pump gearbox and add oil as necessary.
3. Return the machine to service.

Filler

**Figure 10 : Oil Separator Pump Gearbox**

5.2.13 Steam Clean Machine

Frequency: 120 days
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required: Steam Cleaner



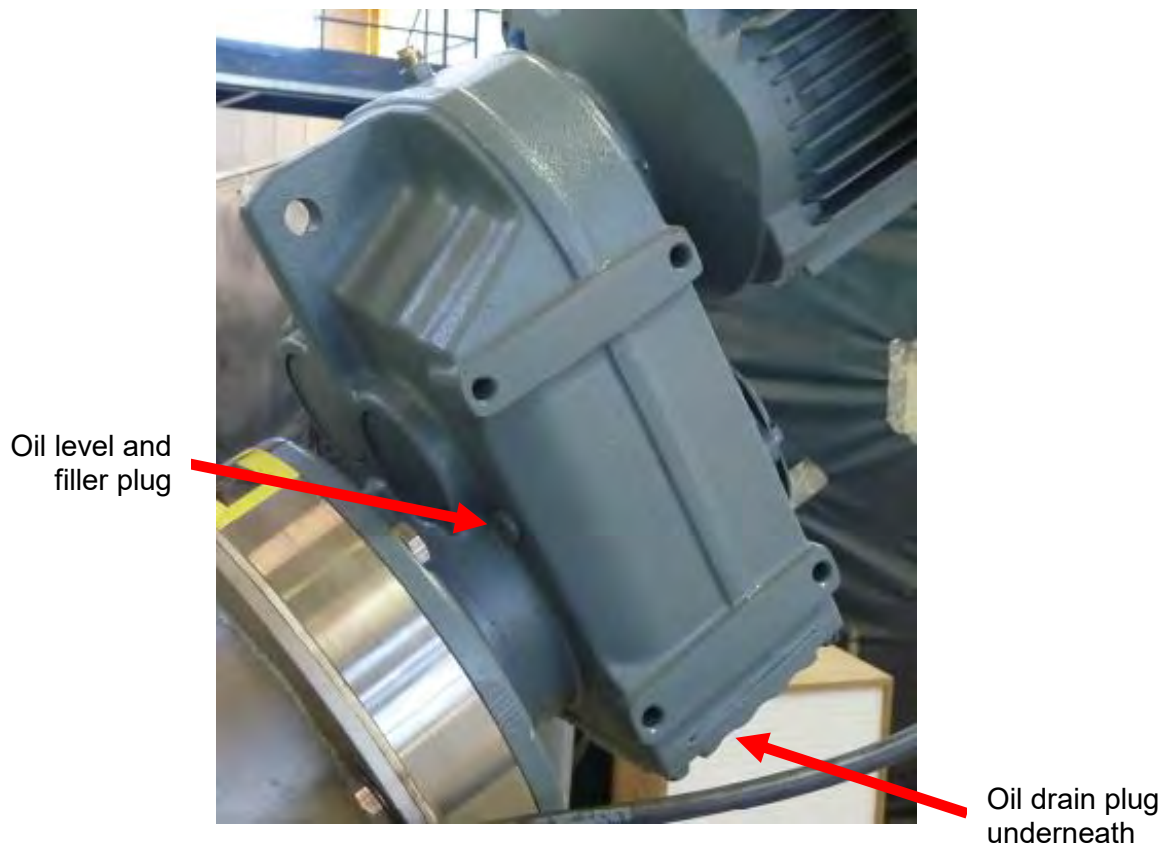
CAUTION: Avoid electrical switches, electrical connectors and other vulnerable components.

1. Switch off machine and lockout.
2. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the system.
3. Steam clean the machine.
4. Return the machine to service.

5.2.14 Swarf Screw Conveyor Motor Gearbox Check Oil

Frequency: 500 hours or every 365 days thereafter (synthetic oil)
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares: Oil (CLP220) 0.3 litres
Special Tools Required:

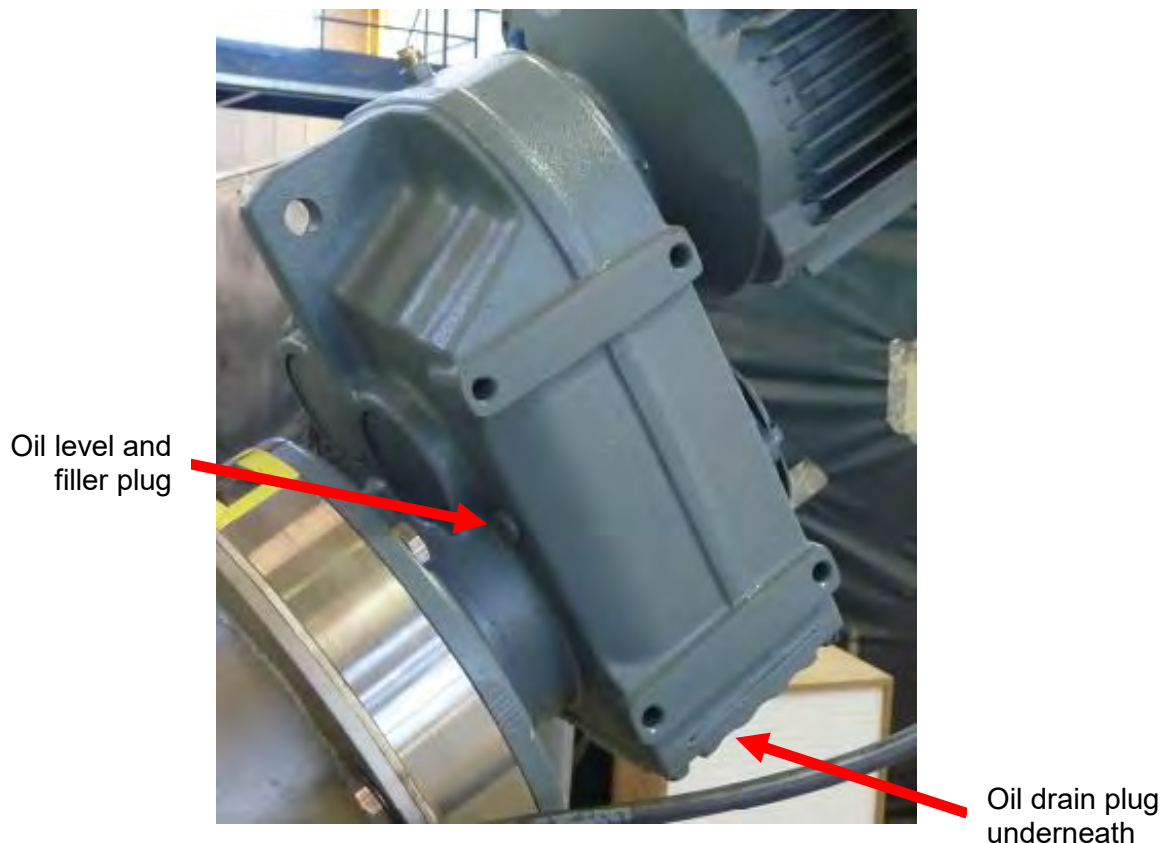
1. Switch off machine and lockout.
2. Remove level plug.
3. Check oil level.
4. Add oil as necessary through filler point.
5. Install level plug.
6. Return machine to service.

**Figure 11 : Swarf Screw Conveyor Motor Gearbox - Oil Drain & Fill Plugs**

5.2.15 Swarf Screw Conveyor Motor Gearbox Change Oil

Frequency: 5 years (synthetic oil)
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares: Oil (CLP220) 1.5 litres
Special Tools Required:

1. Switch off machine and lockout.
2. Remove level plug.
3. Remove drain plug and drain oil into a suitable container.
4. Install drain plug.
5. Add oil as necessary through filler point.
6. Install level plug.
7. Return the machine to service.

**Figure 12 : Swarf Screw Conveyor Motor Gearbox - Oil Drain & Fill Plugs**

5.2.16 Turntable Gearbox - Check for Leaks

Frequency: 365 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Behind access door
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Inspect the gearbox for oil leakage.
3. If a leak is suspected, check the lubricant level by removing the plug in the side of the gearbox.
4. If the gearbox is leaking the whole unit must be replaced with a good unit and the faulty unit returned to the manufacturer for repair.

NOTE: Refer to Section 6 Turntable Gearbox – Remove, and Section 6 Turntable Gearbox – Replace.



Level Plug

Figure 13 : Turntable Level Plug

5.2.17 Wash Fine Filter Daily Inspection

Frequency: Daily
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s): Behind Machine
Spares:
Special Tools Required:

1. Check the gear unit and the filter housing for leakage and damage.
2. With the pump and filter in operation check the filter gearbox for unusual noise.

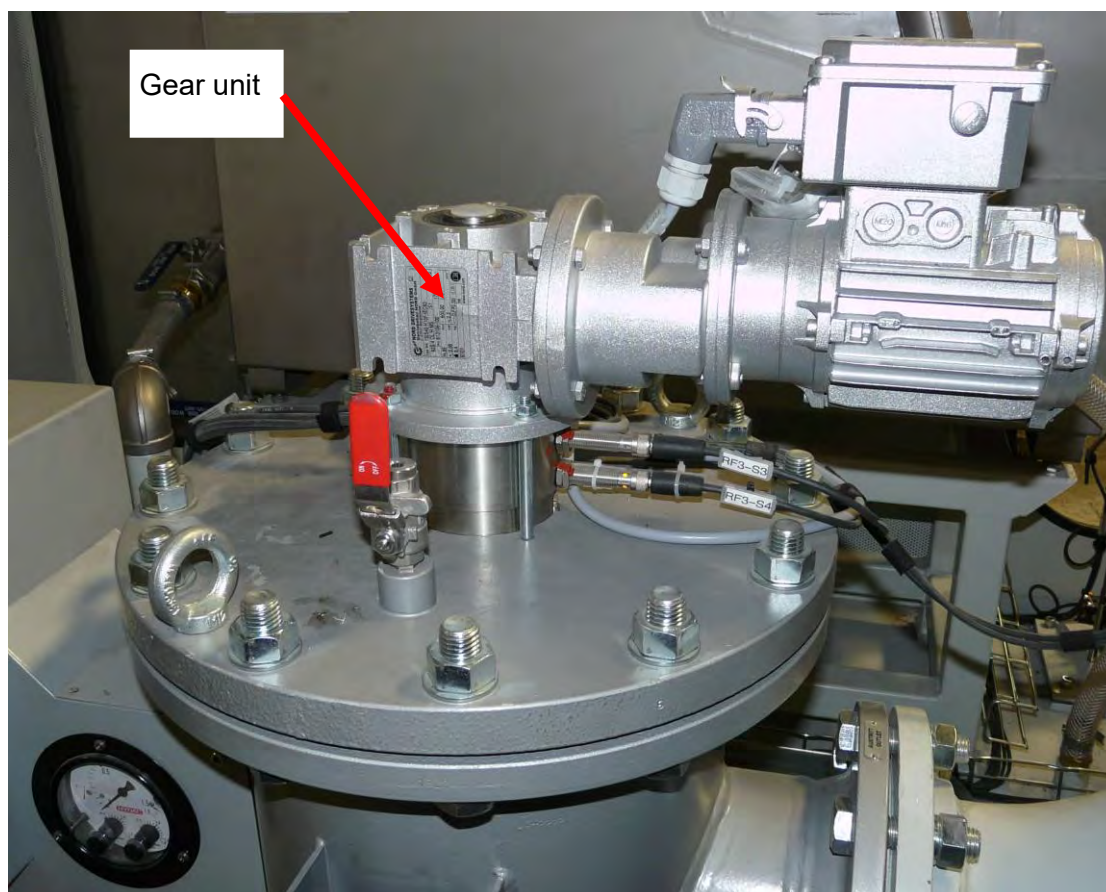
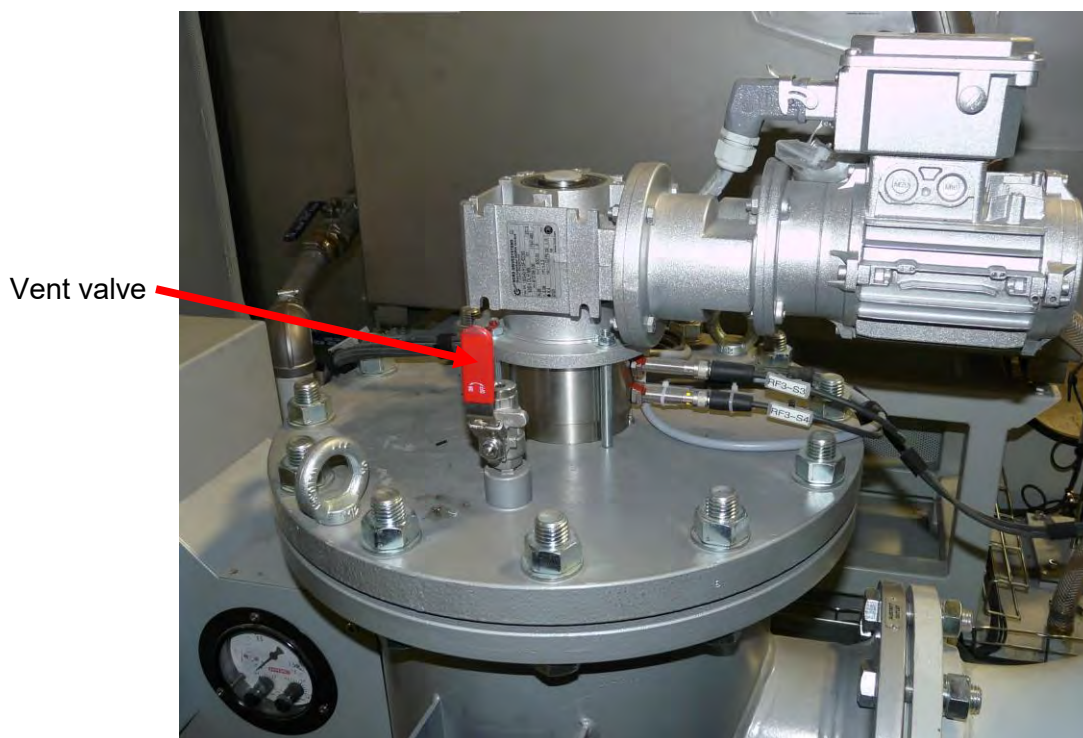


Figure 14 : Fine Filter Gearbox Unit

5.2.18 Wash Fine Filter Vent Air

Frequency: AS REQUIRED
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s): Behind Machine
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Operate the vent valve to release any air in the filter.
3. Return the machine to service.

**Figure 15 : Wash Fine Filter Vent Valve Location**

5.2.19 Wash Fine Filter Clean Vent Valve

Frequency: 90 days
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s): Behind Machine
Spares:
Special Tools Required:

1. Switch off machine and lockout.
2. Close the isolating valves on the Suparator oil filter.
3. Inspect the vent valve. If the vent valve is dirty; remove it and clean it in cleaning fluid.
4. Install the clean vent valve
5. Open the vent valve to release any air in the filter.
6. Open the isolating valves on the Suparator oil separator.
7. Operate the vent valve to release any air in the filter.
8. Return the machine to service.

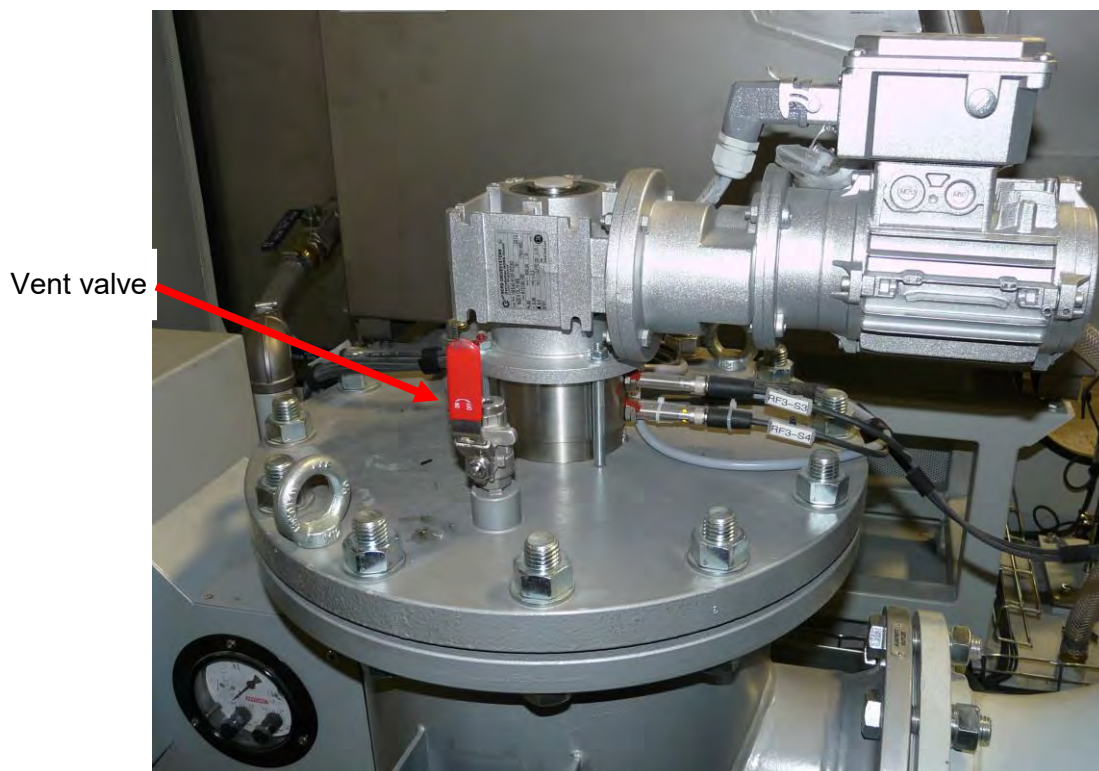


Figure 16 : Wash Fine Filter Vent Valve Location

5.2.20 Wash Fine Filter Gear Unit Initial Oil Change

Frequency: 2000 hours or after 3 years whichever is the sooner.
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s): Behind Machine
Spares: Synthetic oil CLP-PG-220. Quantity = 0.6 litre
Special Tools Required:

1. Switch off machine and lockout.
2. On the gear unit remove the oil filler plug.

WARNING: **WEAR PROTECTIVE GLOVES** Do not touch the oil. The oil may be hot and cause burns.

3. Remove the drain plug and drain the oil into a suitable container.
4. Install the drain plug.
5. Fill the gearbox with 0.6 litre of synthetic oil.
6. Install the filler plug.
7. Return the machine to service.

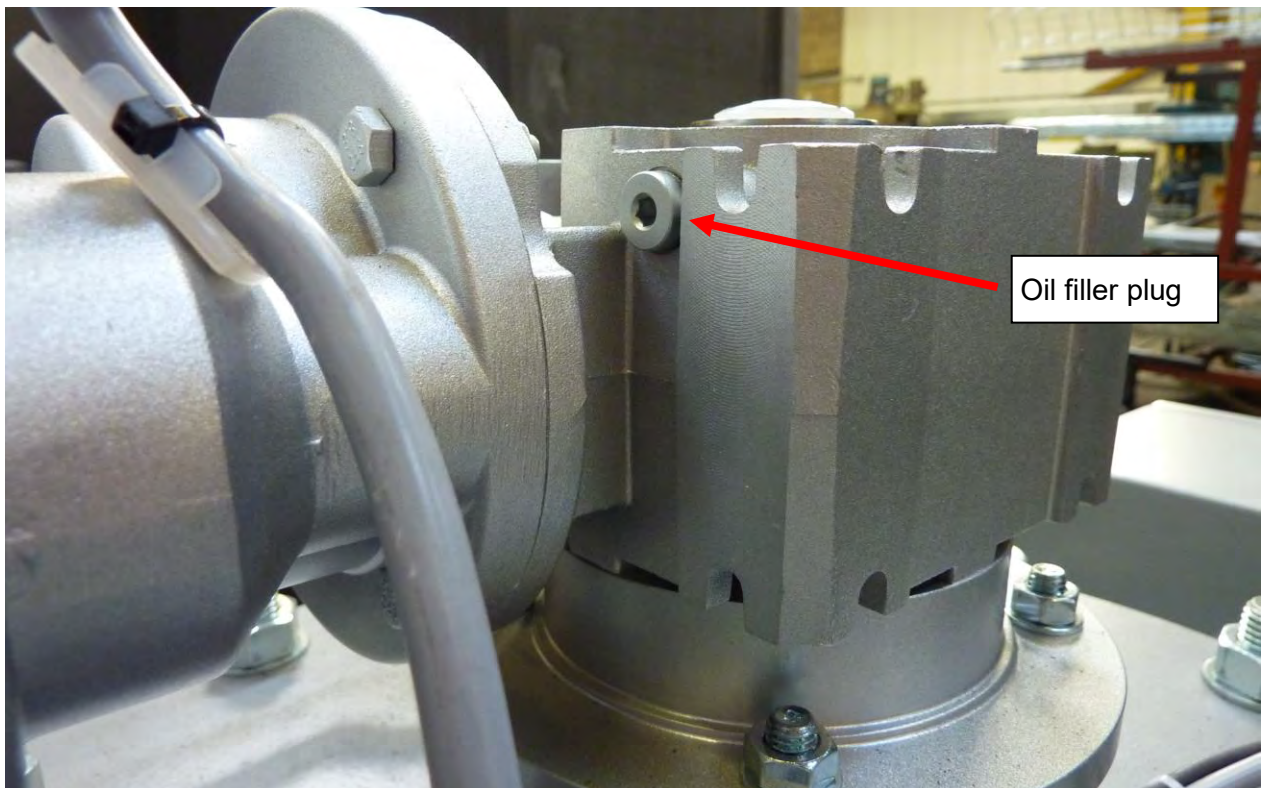


Figure 17 : Wash Fine Filter - Oil Filler Plug Location

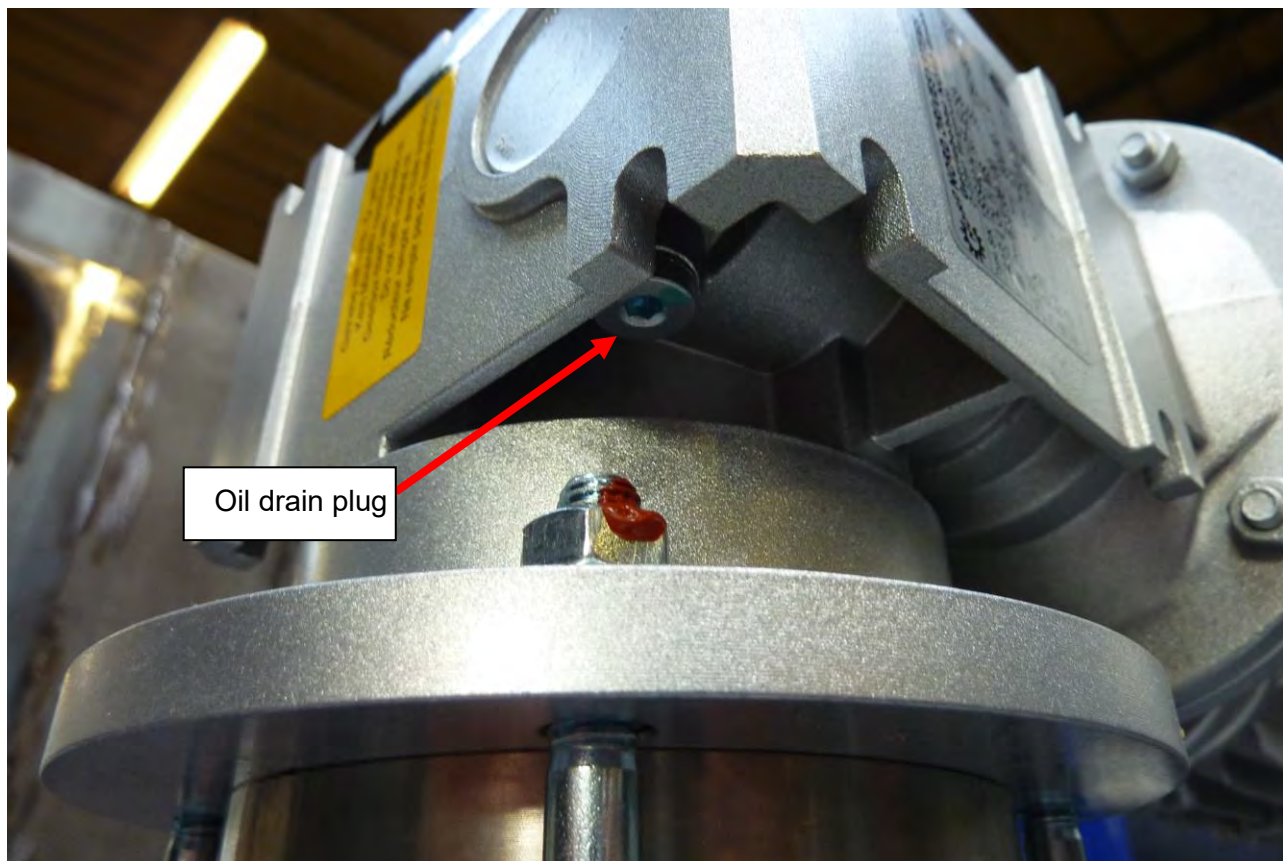


Figure 18 : Wash Fine Filter Oil Drain Plug Location

5.2.21 Wash Fine Filter Gear Unit Oil Change

Frequency: 1000 hours or 3 years whichever is the sooner.
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s): Behind Machine
Spares: Synthetic oil CLP-PG-220. Quantity = 0.6 litre
Special Tools Required:

1. Switch off machine and lockout.
2. On the gear unit remove the oil filler plug.

WARNING: **WEAR PROTECTIVE GLOVES** Do not touch the oil. The oil may be hot and cause burns.

3. Remove the drain plug and drain the oil into a suitable container.
4. Install the drain plug.
5. Fill the gearbox with 0.6 litre of synthetic oil.
6. Install the filler plug.
7. Return the machine to service.

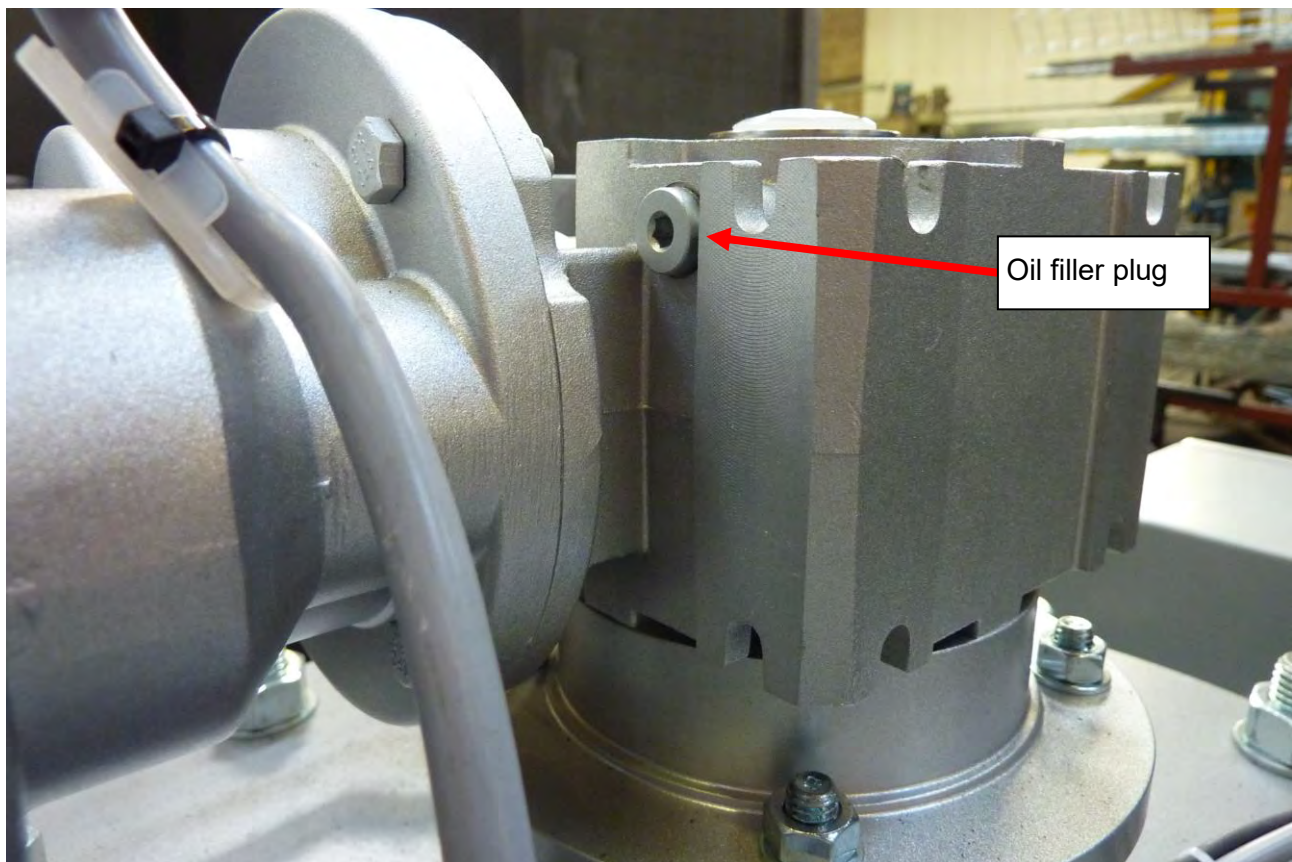


Figure 19 : Wash Fine Filter Oil Filler Plug Locations

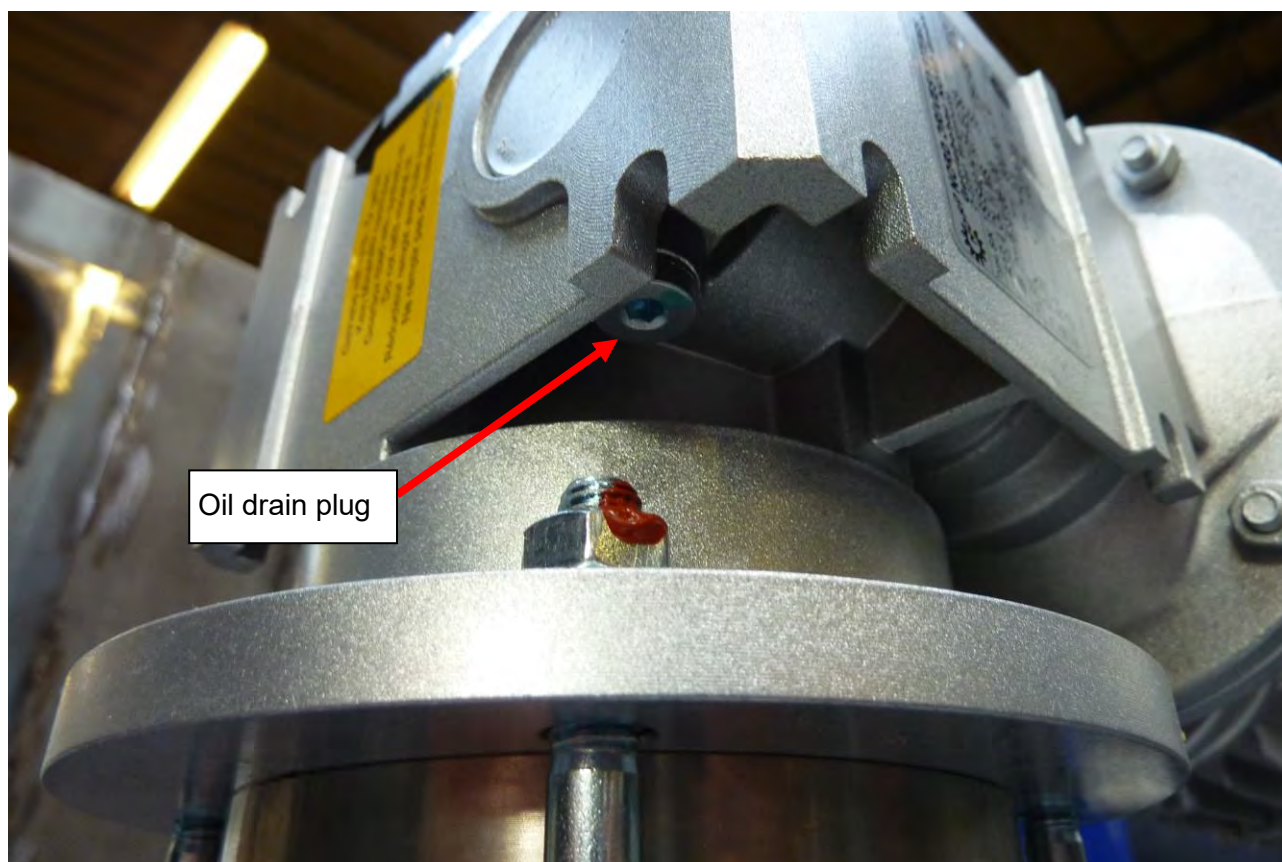


Figure 20 : Wash Fine Filter Oil Drain Plug Location

5.2.22 Wash Fine Filter Annual Inspection

Frequency: 365 days
Safety: Switch off machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required: Lifting gear for 50 kg cover plate. SEE ALSO SECTION 8.4 OF THE HYDAC MANUAL

NOTE: Refer to the – Fine Filter Cover Plate and Housing Torque Ratings and Fine Filter Geared Unit Torque Ratings tables at the end of this procedure for torque settings.

1. Switch off machine and lockout
2. Inspect the filter elements for blockage using the procedure that follows.
3. Close the oil separator isolating valves.
4. Open vent valve.
5. Drain solution from the filter.
6. Disconnect the electric plug from the geared motor.
7. Remove the position switches.
8. Disconnect the vent valve.
9. Loosen the bolts on the cover plate of the back-flushing filter by progressively loosening diagonally opposite bolts in an alternating pattern.

WARNING: Use lifting gear to remove the cover. The cover weighs 50 kg

10. Remove the bolts, the cover plate and the gasket of the filter housing.
11. Pull out the intermediate shaft.
12. Loosen the mounting bolts of the filter elements.
13. Remove the spacers and the upper element mounting plate.
14. Now carefully pull the filter elements out of the lower element mounting plate.
15. Remove the filter element seals from the lower element mounting plate and keep the seals in a safe place
16. Check the filter elements and clean with high pressure water hose or obtain new filter elements if necessary.
17. Check that all the seals are in good condition and install new seals where needed. Refer to the figure Fine Filter Seal Locations .

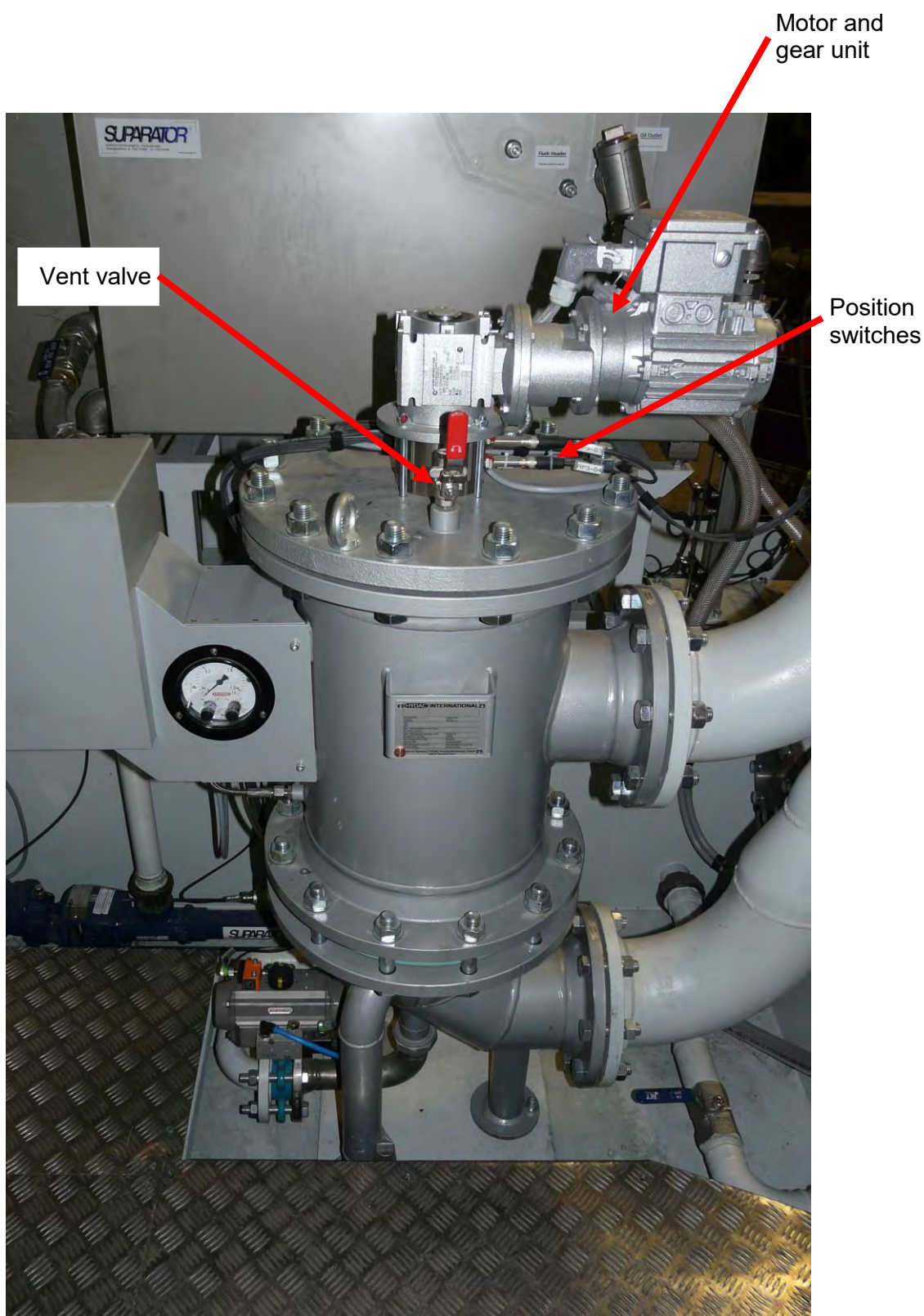


Figure 21 : Wash Fine Filter General View (showing vent & nuts)

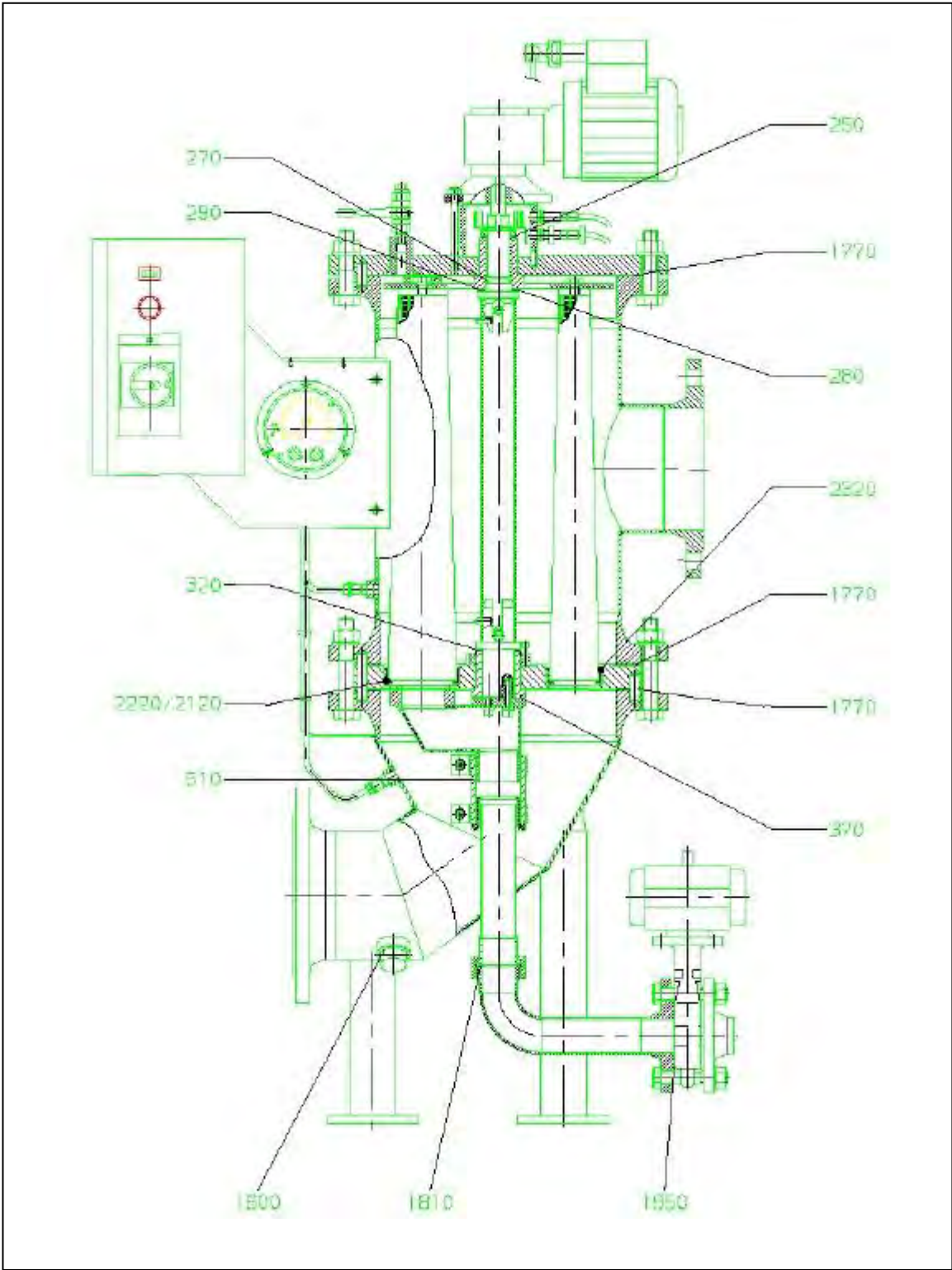


Figure 22 : Wash Fine Filter Seal Locations

18. Carefully install the filter elements into the lower element mounting plate of the back-flushing filter.
19. Carefully install the spacers and the upper element mounting plate into the back-flushing filter.
20. Tighten the mounting bolts of the filter elements.
21. Insert the intermediate shaft.
22. Place the gasket onto the housing of the back-flushing filter.
23. Make sure the location pin is in the correct alignment and install the cover plate onto the housing of the back-flushing filter
24. Tighten the bolts on the cover plate of the back-flushing filter by progressively tightening diagonally opposite bolts in an alternating pattern. Use the torque table shown in Figure 23 for tightening up the bolts
25. Connect the vent valve.
26. Tighten the drain plug if loosened.
27. Open the oil separator isolating valves.
28. Connect the electric plug to the geared motor and install the position switches.
29. Check the gear unit and valve body fixing bolts are tight.
30. Check that the differential pressure gauge hoses are in good condition.
31. Check that the position switch is indicating correctly.
32. Check that the back flush valve is opening and closing
33. Return the machine to service.

Bolt	Bolt Torque Rating Without Rubber Coating in Nm	Torque Rating Rubber Coated in Nm
M20	200	75
M24	320	200
M27	470	230
M30	640	320
M33	870	430

Figure 23 : Wash Fine Filter Cover Plate and Housing Torque Ratings

Thread Size	Torque Rating in Nm
M6	10
M8	25
M10	50
M12	90
M16	210
M20	450
M24	750
M30	1500
M36	2500

Figure 24 : Wash Fine Filter Geared Unit Torque Ratings

Operation and Maintenance Manual

5.2.23 Wash Nozzles - Inspect

Frequency: 30 days
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Open access doors.
2. Switch off machine and lockout.
3. Check the air pressure gauge to make sure the pressure has been released before you work on this machine. Do ECPL procedures..
4. Check jets for damage and deposits.



Figure 25 : Typical Wash Jet Damage

5. If nozzles need to be removed for cleaning or replacement, refer to Section 6 - Wash Nozzle Replacement.
6. Tighten any loose fixings.
7. Check hoses for damage and leaks.



Figure 26 : Worn Hose



Figure 27 : Split Hose

8. Initiate any corrective action required.
9. Return the machine to service.

5.2.24 Wash Solution Check

Frequency: 3 days.
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares: Wash concentrate
Special Tools Required:

1. Remove sample from sampling point.
2. Test sample.
3. If necessary add wash additive to bring solution up to strength.
4. Change the solution if solution is dirty.

NOTE: The Dosatron may need adjustment if the solution concentration is not correct. If necessary initiate corrective action.



Figure 28 : Sample Tap

5.2.25 Wash Solution Change

Frequency: Four monthly and as required.
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Rear of the machine in service area
Spares: Wash concentrate; Castrol
Special Tools Required:

1. Switch off machine and lockout
2. Drain machine reservoir
 - 2.1. Connect JLR supplied drainage unit to connector on top the effluent tank

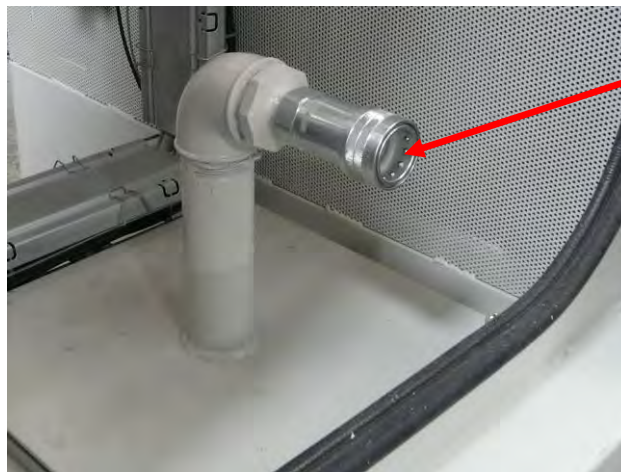


Figure 29 : Effluent drainage quick release connection

- 2.2. Open wash tank drain valve to allow wash solution to flow into the effluent tank

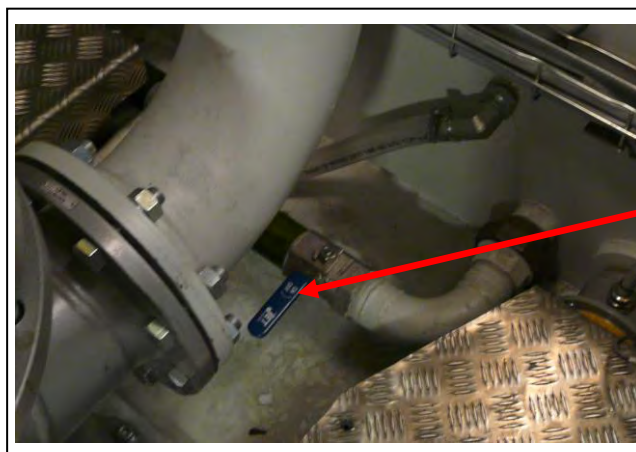


Figure 30 : Reservoir Drainage Valve

- 2.3. Remove solution using JLR supplied unit

3. Clean machine reservoir
4. Close reservoir drain valve
5. Remove lock and switch on power to machine
6. Open fast fill valve.
7. Pour into the machine reservoir the correct amount of wash chemical as shown in table Figure 30 below.
8. Put machine in auto mode. The machine will fill automatically with the water flow being arrested once the level switch in the reservoir indicates that the level is at operating level.
9. Return the machine into service

TANK CAPACITY = 3500 Litres	
3.0% =	105 Litres
3.5% =	122 Litres
4.0% =	140 Litres
4.5% =	158 Litres
5.0% =	175 Litres

Figure 31: Wash Chemical percentages

Section 6 - General Maintenance

This section contains the procedures required to be performed in order to repair and restore the machine to its operational condition, after the occurrence of a fault or failure.

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WARNING: You must check the air receiver gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.

6.1 Turntable Drive Motor - Remove

Frequency: As required
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Using the Index button on the HMI, nudge the slewing ring to the 'home' position. (See step 10).
2. Lockout the machine.
3. Check the air receiver gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.

Make sure that the slewing ring is in the home position. This is indicated by blue paint on the slewing ring teeth which should be visible from the front of the machine. The blue painted teeth should be at the load station with the fixture perpendicular to the front of the machine with the support rails between the two scribed lines in the crash protection plate..

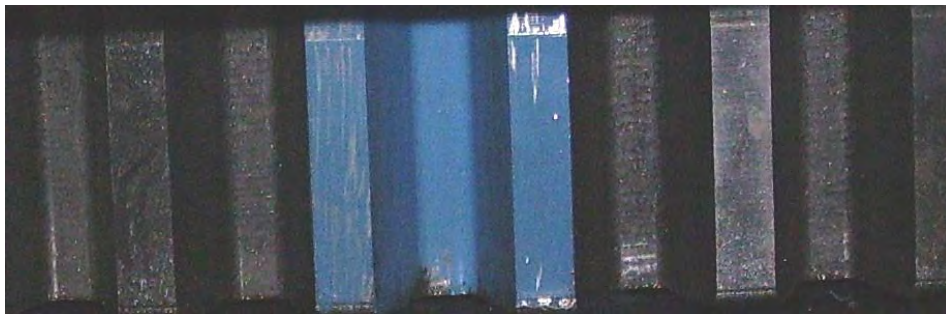


Figure 1 : Marked Tooth on Slewing Ring

4. The slewing ring home position is also indicated by the letter 'D' stamped to the left of the fixture position on the upper face of the slewing ring.
5. Bolt the slewing ring locking tool into position on the machine table.

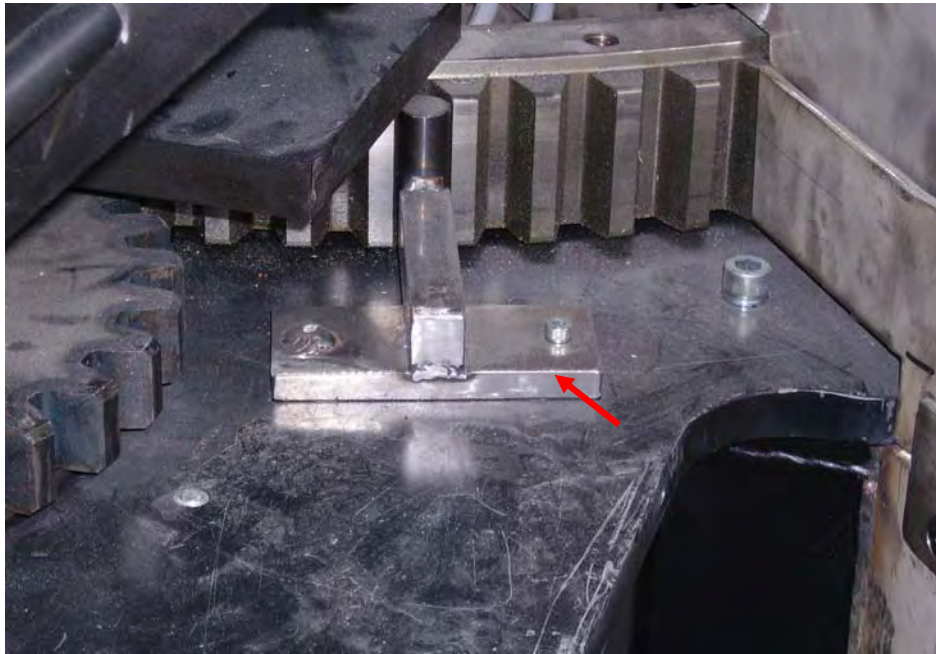


Figure 2 : Slewing Ring Locking Tool

NOTE: The slewing ring must remain locked in the home position until the turntable drive motor is replaced as described in section 6.3

6. Support the fixture using a hoist and sling. Remove 4 off retaining bolts and remove fixture.

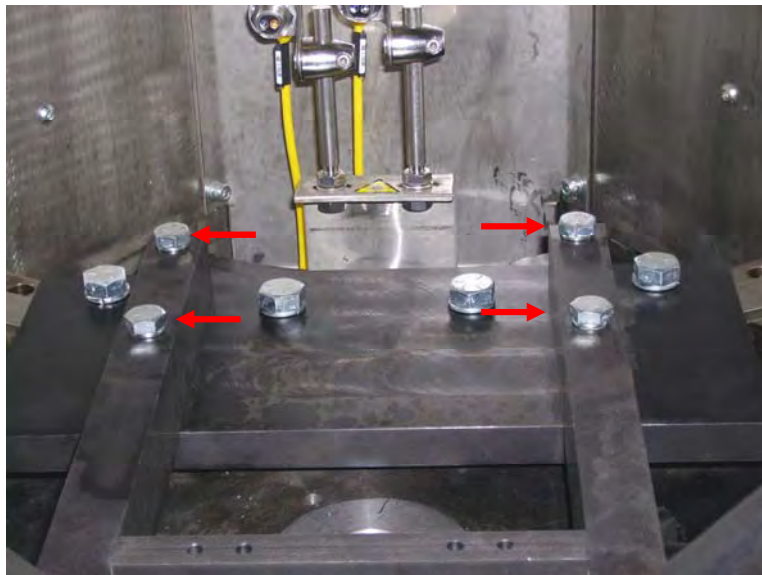


Figure 3 : Fixture Retaining Bolts

7. Unscrew and unplug the drive motor supply cable plug and the control cable plug from the motor. Move to a safe position.



Figure 4 : Turntable Drive Motor Supply and Control Cable Plugs / Leads

8. Remove the plug in the gearbox housing aperture to gain access to the coupling clamping bolt.



Figure 5 : Gearbox Access Aperture



Figure 6 : Coupling Clamping Bolt

9. Loosen coupling clamping bolt.



Figure 7 : Motor Coupling (with motor removed)

10. Use hoist and sling to take weight of motor.
11. Loosen and remove 4 off mounting bolts.

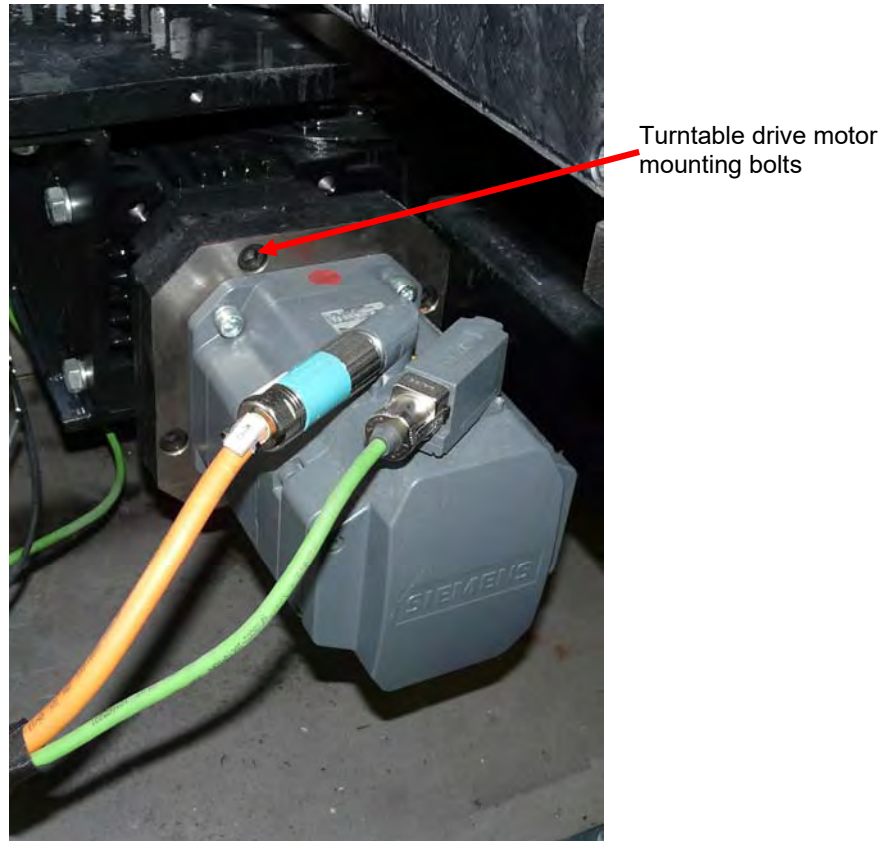


Figure 8 : Turntable Drive Motor

12. Withdraw motor from gearbox shaft

6.1.1 Turntable Drive Motor – Install

NOTE: The turntable drive motor must have been removed as described in section 6.1. The slewing ring must remain locked in the home position as described in section 6.1.

1. Lockout the machine.
2. Check the air receiver gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.
3. Install the coupling to the motor shaft so that the slot in the coupling is vertical. Tighten the clamping bolt. The coupling mounting bolt (on the gearbox end) must be aligned with the access aperture in the gearbox housing.
4. Using a hoist and sling to support the motor, slide the motor shaft coupling onto the gearbox shaft.
5. Make sure that the coupling clamping bolt is aligned with the centre of the access aperture in the gearbox housing.
6. Install and tighten the 4 off mounting bolts.



Figure 9 : Coupling Clamping Bolt



Figure 10 : Gearbox Access Aperture

7. Tighten the coupling clamping bolt and replace plug.
8. Connect the drive motor supply cable and control cable to the motor.
9. Support the fixture using a hoist and sling. Install fixture using 4 off retaining bolts.

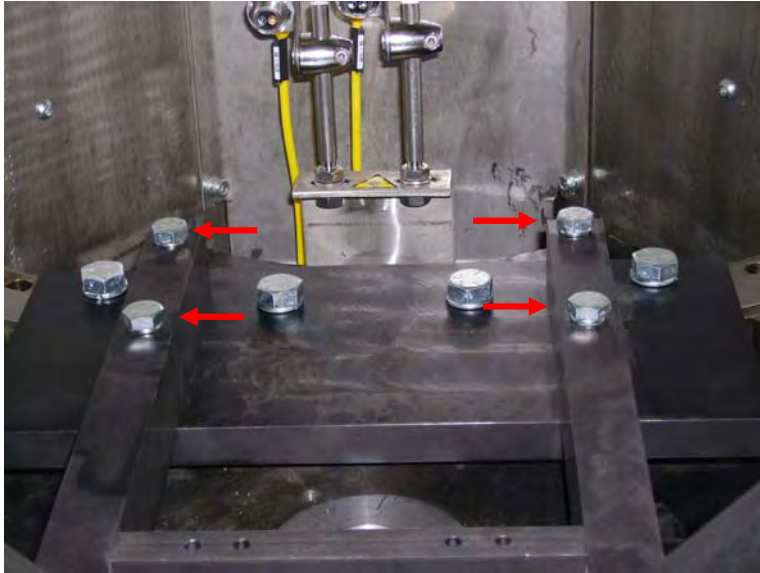


Figure 11 : Fixture Retaining Bolts

10. Check to make sure that the fixture is parallel and set at 90° to the front of the machine and lines up with the scribed mark on the crash plate before fully tightening the fixture retaining bolts.
11. Check fixture alignment.
12. Power up machine and connect laptop. Use SEW software to set the absolute reference to zero.
13. Switch off machine and lockout.
14. Loosen bolts and remove the slewing ring locking tool from the machine table.

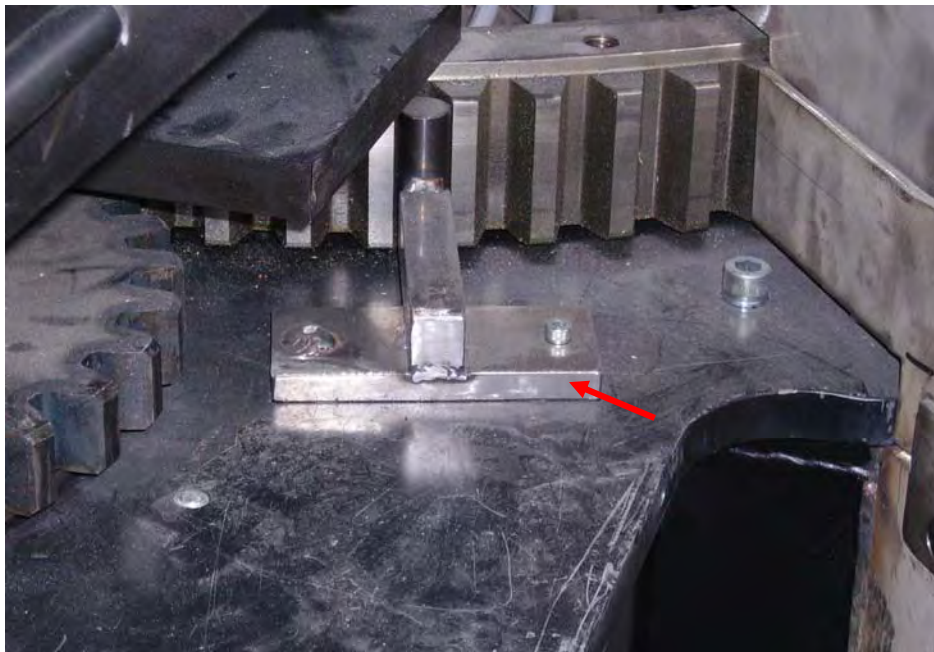


Figure 12 : Slewing Ring Locking Tool

15. Test machine and return to service.

6.2 Turntable Gearbox – Remove

The turntable gearbox is a lubricated for life unit. If the gearbox is leaking or faulty, the whole unit must be replaced with a good unit and the faulty unit returned to the manufacturer for repair.

1. Lockout the machine.
2. Check the air receiver gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.
3. Remove the fixture and turntable drive motor as described in Section 6.1.
NOTE: The slewing ring must remain locked in the home position as described in Section 6.1.
4. Unscrew bolts on framework and remove.

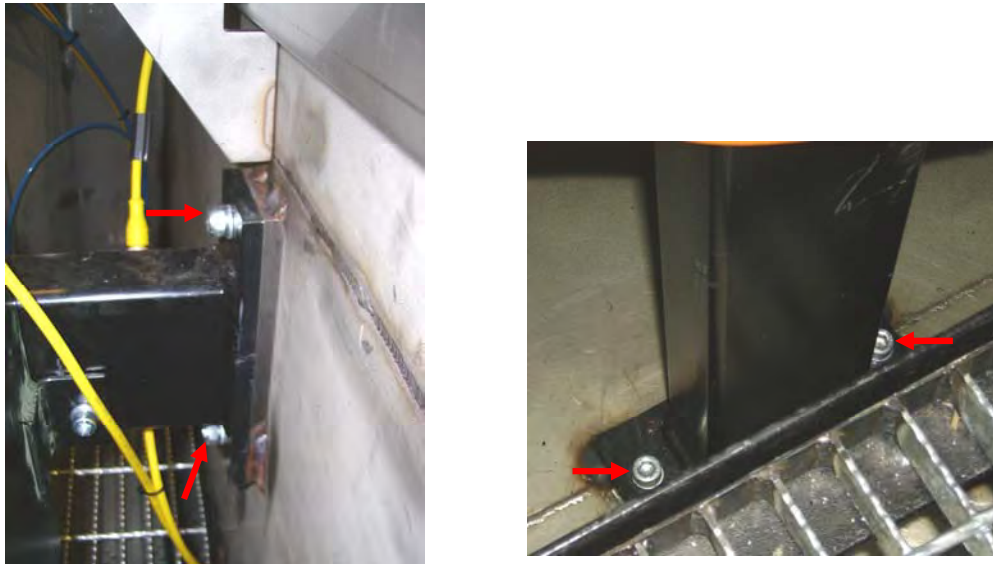


Figure 13 : Framework Fixing Bolts

5. Screw in and tighten 2 off 10 mm eye bolts into the gearbox drive gear (pinion).

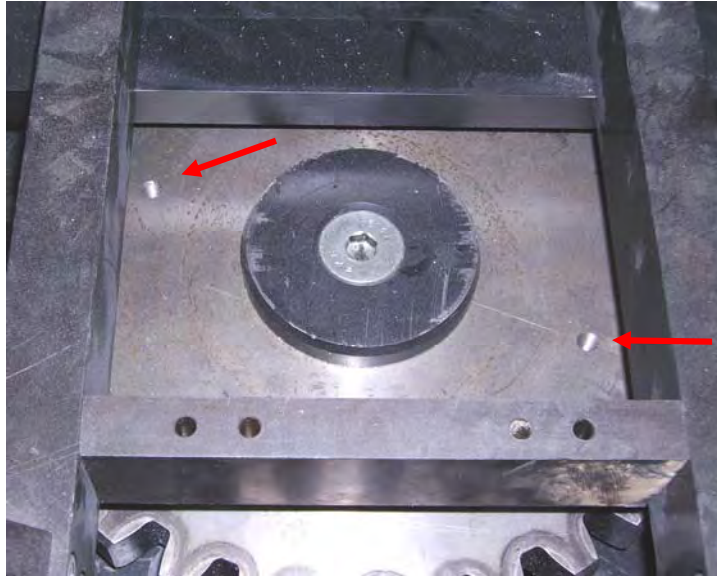


Figure 14 : Gearbox Drive Gear Eye Bolt Fixing Holes (Fixture Still in Position)

6. Support the weight of the gearbox and housing using a hoist and the eye bolts.
7. Loosen and remove 4 off gearbox housing bolts.



Figure 15 : Gearbox Housing Bolts

8. Adjust the hoist so that the drive gear is just resting on the machine table. Slide the gearbox towards the front of the machine until clear of the aperture in the machine table. Lift gearbox clear.

6.3 Turntable Gearbox - Install

Frequency: As required
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Inside machine
Spares:
Special Tools Required:

1. Lockout the machine.
2. Check the air receiver gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.
3. Lift the gearbox and housing into the machine using eye bolts screwed into the drive gear.
4. Line up the gearbox with the aperture in the machine table.
5. Adjust the hoist so that the drive gear is just resting on the machine table.
6. Position the gearbox housing so that the slots in the housing line up with the mounting holes in the machine table and the drive gear (pinion) engages with the slewing ring.
7. Fit the 4 off mounting bolts and tighten enough to ensuring that the gearbox housing can be adjusted.
8. By making small adjustments to the position of the gearbox, adjust the clearance between the drive gear and the slewing ring to give backlash of 0.25 mm +/- 0.05 mm
NOTE: In imperial measurements: .010 " + /-.002" (10 thousandths of an inch, plus or minus 2 thousandths of an inch)
9. Fully tighten 4 off mounting bolts.
10. Check the backlash.
11. Install the turntable drive motor as described in section 6.1.

6.4 Wash Nozzles – Replacement

Frequency: As required
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s):
Spares:
Special Tools Required:

1. Run out machine.
 - With the machine in cycle, press 'Select Mode'
 - Press 'Without Parts'The machine will then run out and empty all parts.
 2. Switch off machine and lockout.
 3. Open access door.
 4. Check the air receiver gauge to make sure the pressure has been released before you work on this machine. Follow ECPL procedures if there is pressure in the air receiver.
 5. Check nozzles for corrosion and deposits.
 6. Clean or renew nozzles as necessary. Refer to Figures for nozzle placement and orientation.
- NOTE: Minor variations in nozzle inclination or fan angle are not critical.
7. Tighten any loose fixings.
 8. Check hoses for damage and leaks.
 9. Initiate any corrective action required.
 10. Return machine to operation.

6.4.1 Wash Manifolds

See 6.4.2 For jet details of this
outer fixed manifold

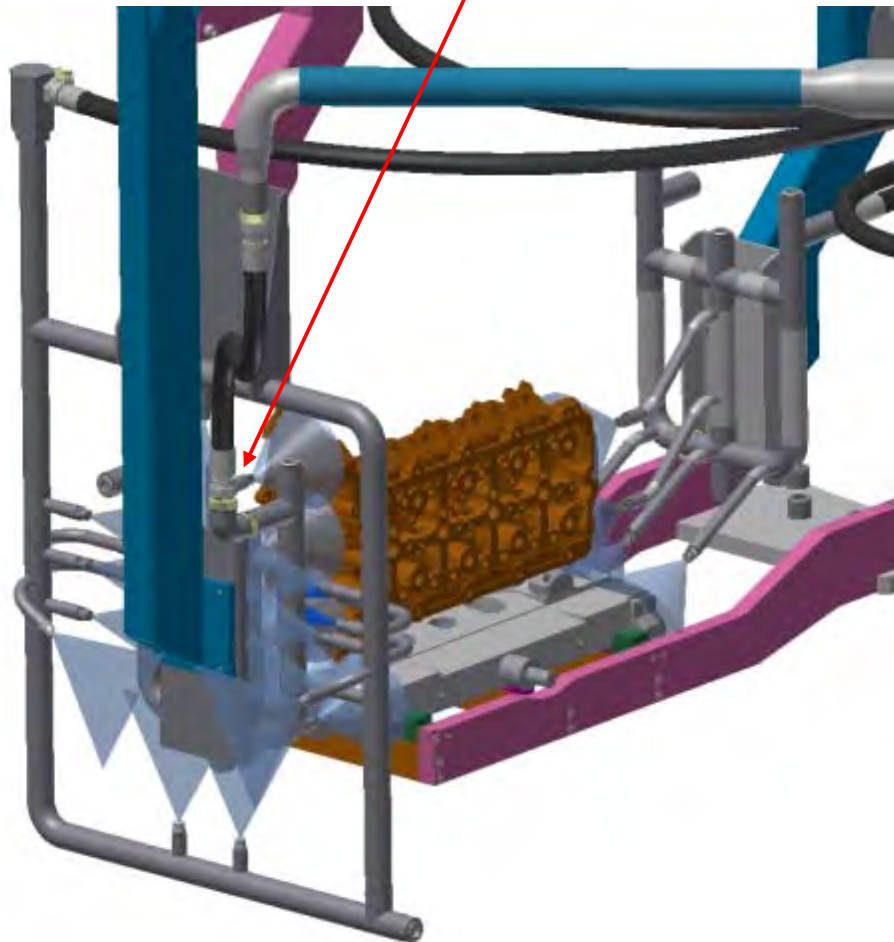
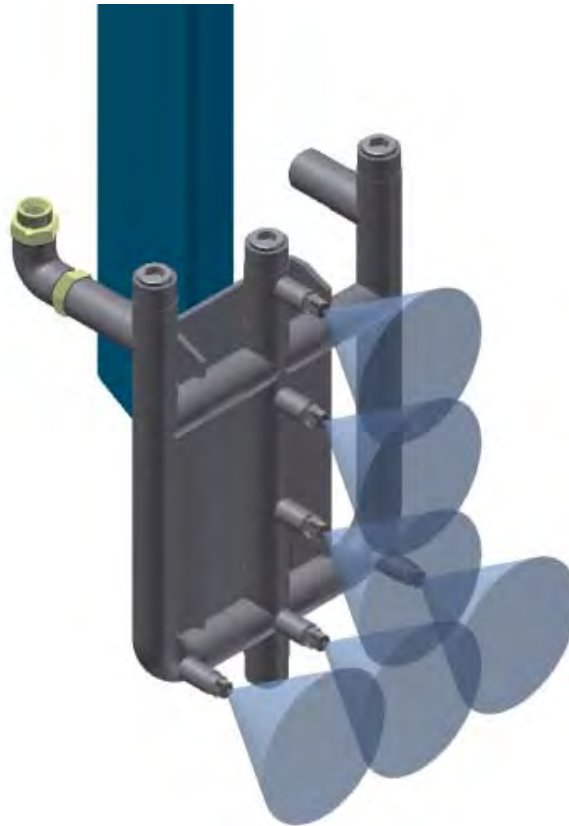


Figure 16 : Wash Manifolds

6.4.2 Outer Fixed Wash Manifold



Delavan Wash Jets
Full Cone
Stainless Steel
Type 1/4" BIM 8 (1/4" BSP)
Part # W025010064
6-off

Figure 17: Outer Fixed Wash Manifold

6.4.3 Inner Fixed Wash Manifold

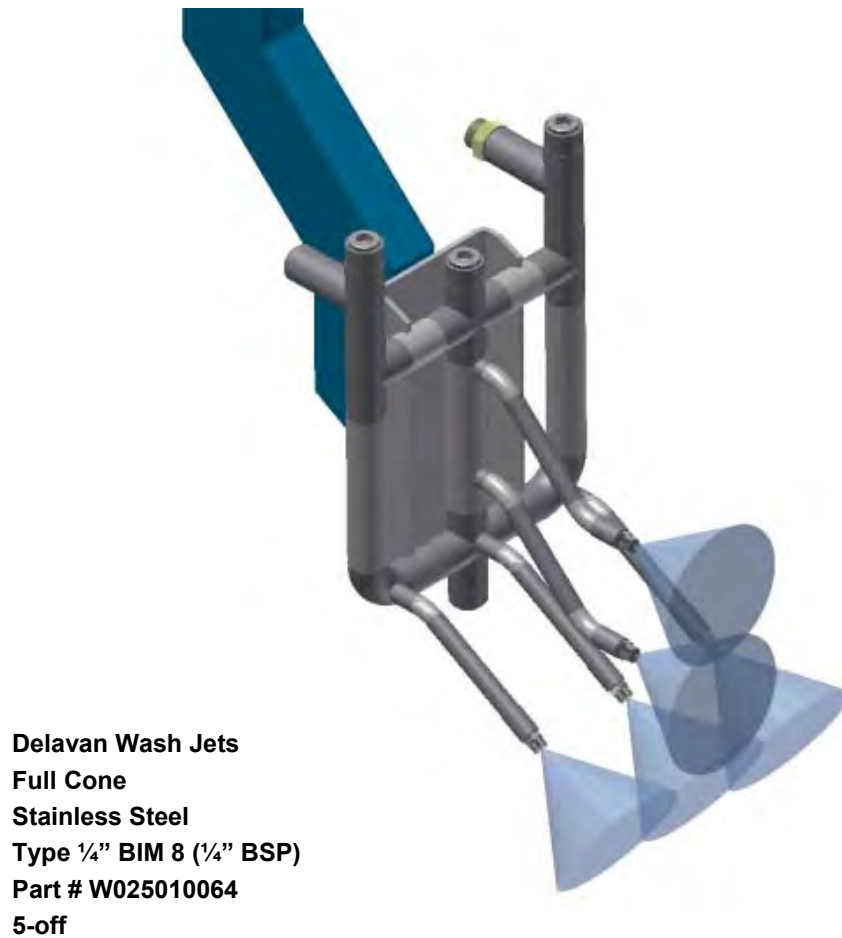
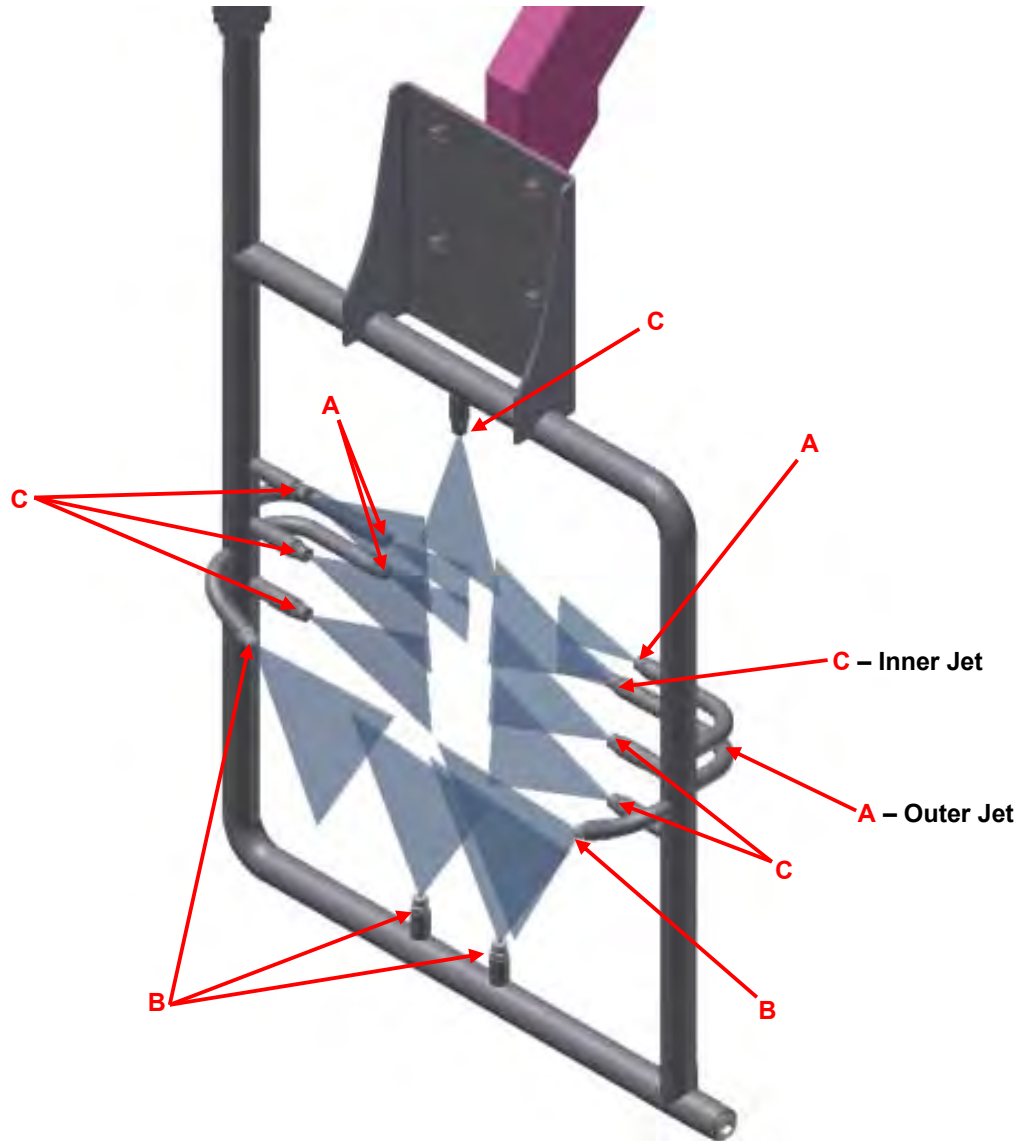


Figure 18 : Outer Fixed Wash Manifold

6.4.4 Moving Wash Manifold



- A** Delavan Wash Jets, Fan, Stainless Steel, Type 1/4" ACM 10 – 25 degrees (1/4" BSP), Part # W027482832, 4-off
- B** Delavan Wash Jets, Full Cone, Stainless Steel, Type 1/4" ACM 10 – 65 degrees (1/4" BSP), Part # W027602868, 4-off
- C** Delavan Wash Jets, Full Cone, Stainless Steel, Type 1/4" ACM 10 – 40 degrees (1/4" BSP), Part # W027522843, 7-off

Figure 19 : Inner Fixed Wash Manifold

6.5 Lubrication

The machine is fitted with a automatic lubrication system for the main table bearing unit and also lubricates the linear drive units on the roof. For components that require manual lubrication refer to Section 5- Maintenance Schedules

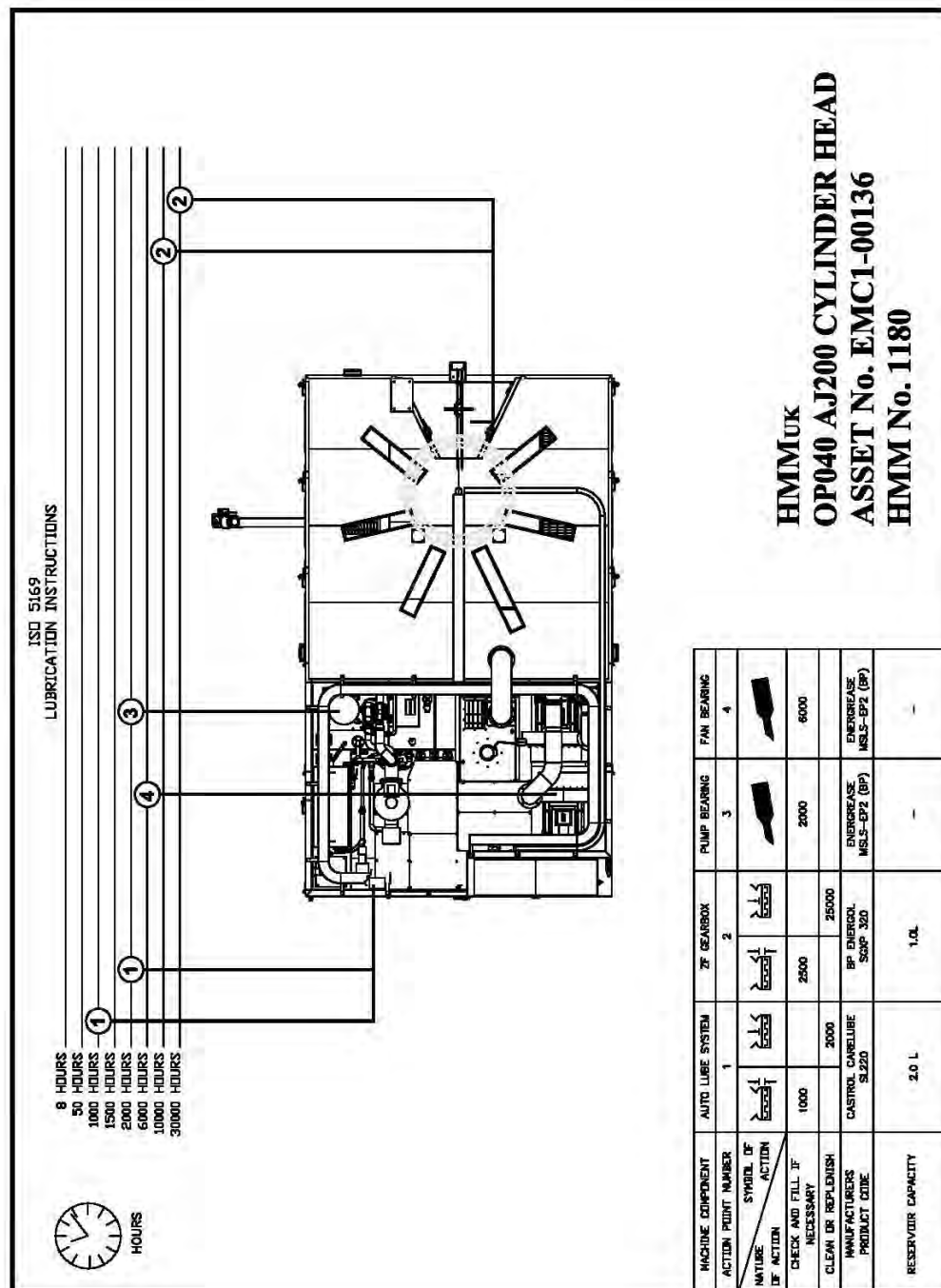


Figure 20 : Lubrication Diagram

6.6 Station 4 Rollover Unit

Frequency: As required.
Safety: Stop machine and lockout. Read Section 2 Safety
Part Location (s): Station 5 (Drying Station)
Spares:
Special Tools Required:

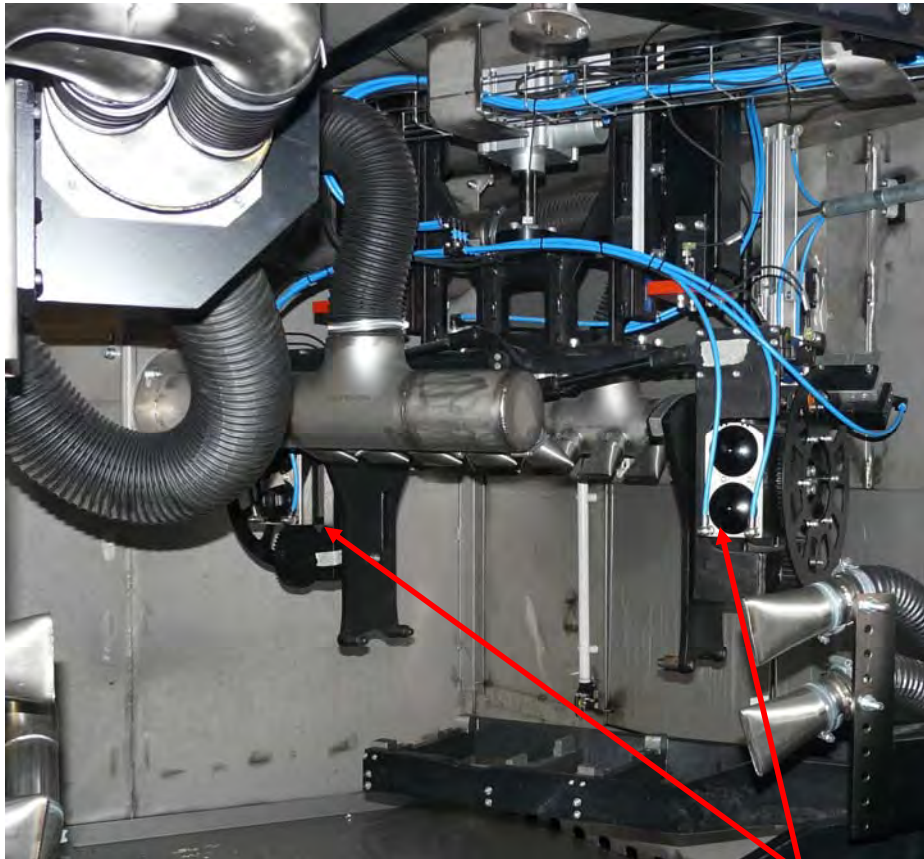


Figure 21 : Rollover Unit

Schunk rotary
drive units



WARNING: Switch off the power and vent any pressurized air from the unit before working on or near this unit. Refer to Schunk literature for information.

NOTE: Refer to Schunk literature on CD ROM attached to this manual for maintenance details and the safety instructions on the following page.

6.6.1 SCHUNK SRU Safety Information

1. The SRU rotary unit is built according to the level of technology available at the time of delivery and is safe to operate. However, the unit may still be dangerous if, for example:
 - a. the unit is used, assembled or maintained inappropriately or is used for purposes other than those it is intended for
 - b. the EC Machine Directive, the accident prevention regulations, the VDE guidelines, or the safety information and assembly instructions are not heeded.
2. Any persons who may be responsible for assembly, commissioning and maintenance of the unit are obliged to have read and understood all of the operating instructions, in particular chapter 1 "Safety". We recommend that the customer have this confirmed in writing.
3. The installation, deinstallation, assembly of all motion detectors, connection and commissioning may only be performed by authorized, appropriately trained personnel.
4. Modes of operation that adversely affect the function and/or the operational safety of the unit are to be refrained from.
5. Never move any parts by hand as long as the power supply is connected.
6. Never reach into uncovered mechanisms and never reach in the swivelling and gripper finger areas of the unit.
7. Always disconnect the power supply lines during assembly, conversion, maintenance and setting work.
8. Always carry out maintenance work, conversions and attachments outside of the danger zone.
9. During assembly, connection, setting, commissioning and testing, it is imperative to exclude the possibility that the fitter or any other person could accidentally activate the unit.
10. When using handling modules, protective covers must be used according to EC Machine Directive, Point 1.4.
11. There is a danger of injury and a risk of damages due to falling and catapulted components. Precautions must be taken to prevent any potentially dangerous objects (processed work pieces, tools, chips, debris, waste etc.) from falling or being catapulted out of the unit.
12. Some parts of units which are equipped with internal springs are subject to spring tension. Therefore, special care must be taken when dismantling such units.
13. In case of an "emergency stop", the unit may continue to move. If SCHUNK SDV-P valves are used, the final position of an "emergency stop" can be secured temporary in any end position.
14. Top jaws, especially those used for grippers with mechanic gripping force safety device, have to be designed in a way, that the gripper reaches one of its end-positions, "open" or "closed", when no pressure is applied. This prevents the release of any residual energy during the change of the top jaws.
15. Additional holes, threads or attachments which are not supplied as accessories by SCHUNK may only be applied after obtaining the prior consent of SCHUNK.
16. Above and beyond that, the safety and accident prevention regulations in force at the location of use apply.

6.7 Gudel Gantry Operation and Maintenance

See Gudel data in the appendix Section 11 and also on attached CD in wallet in front cover

6.8 Hydac Filter System Operation and Maintenance

See Hydac data in the appendix Section 11 and also on attached CD in wallet in front cover

6.9 Micronfilter Operation and Maintenance

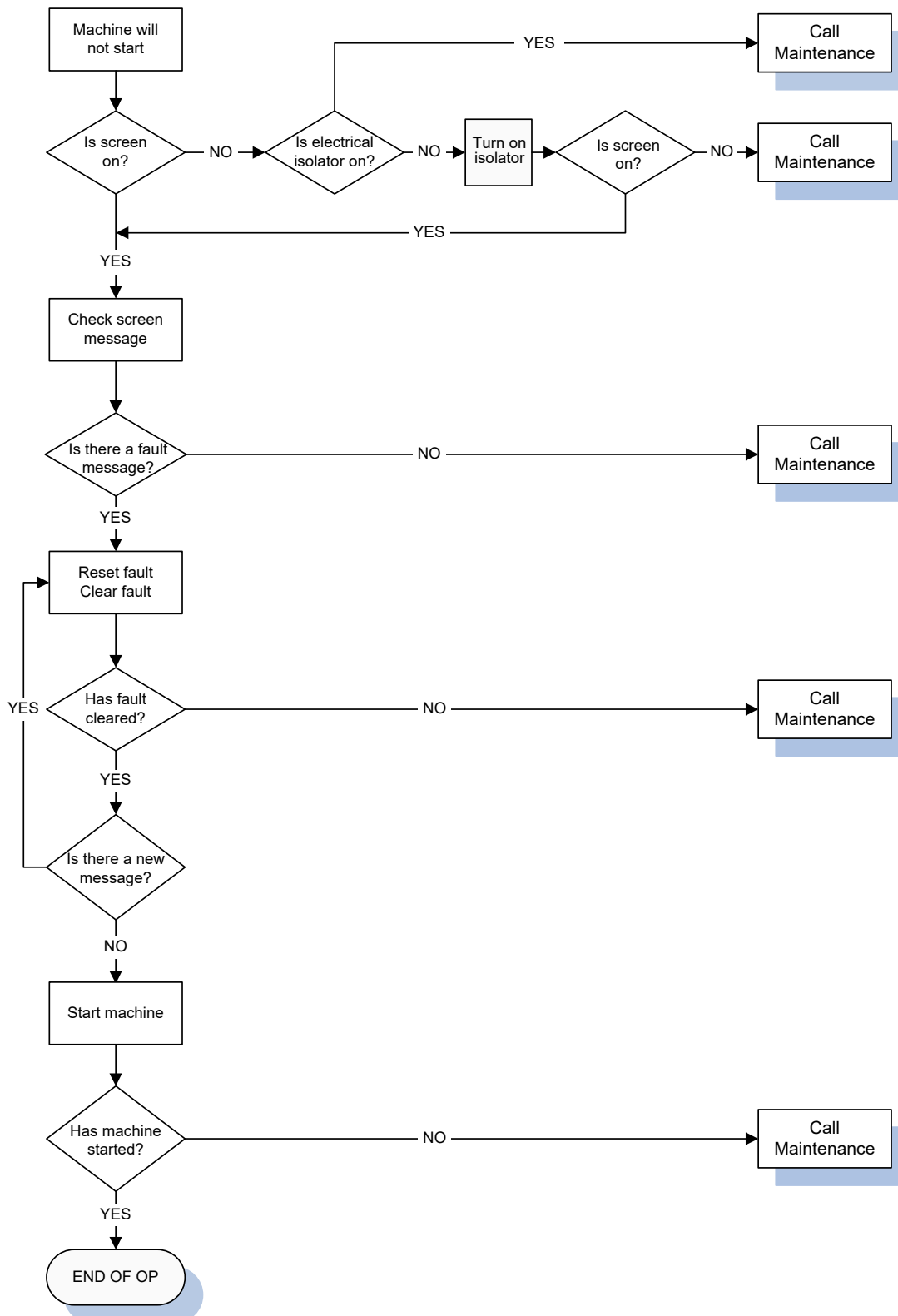
See Micronfilter data in the appendix Section 11 and also on attached CD in wallet in front cover

Section 7 - Trouble Shooting

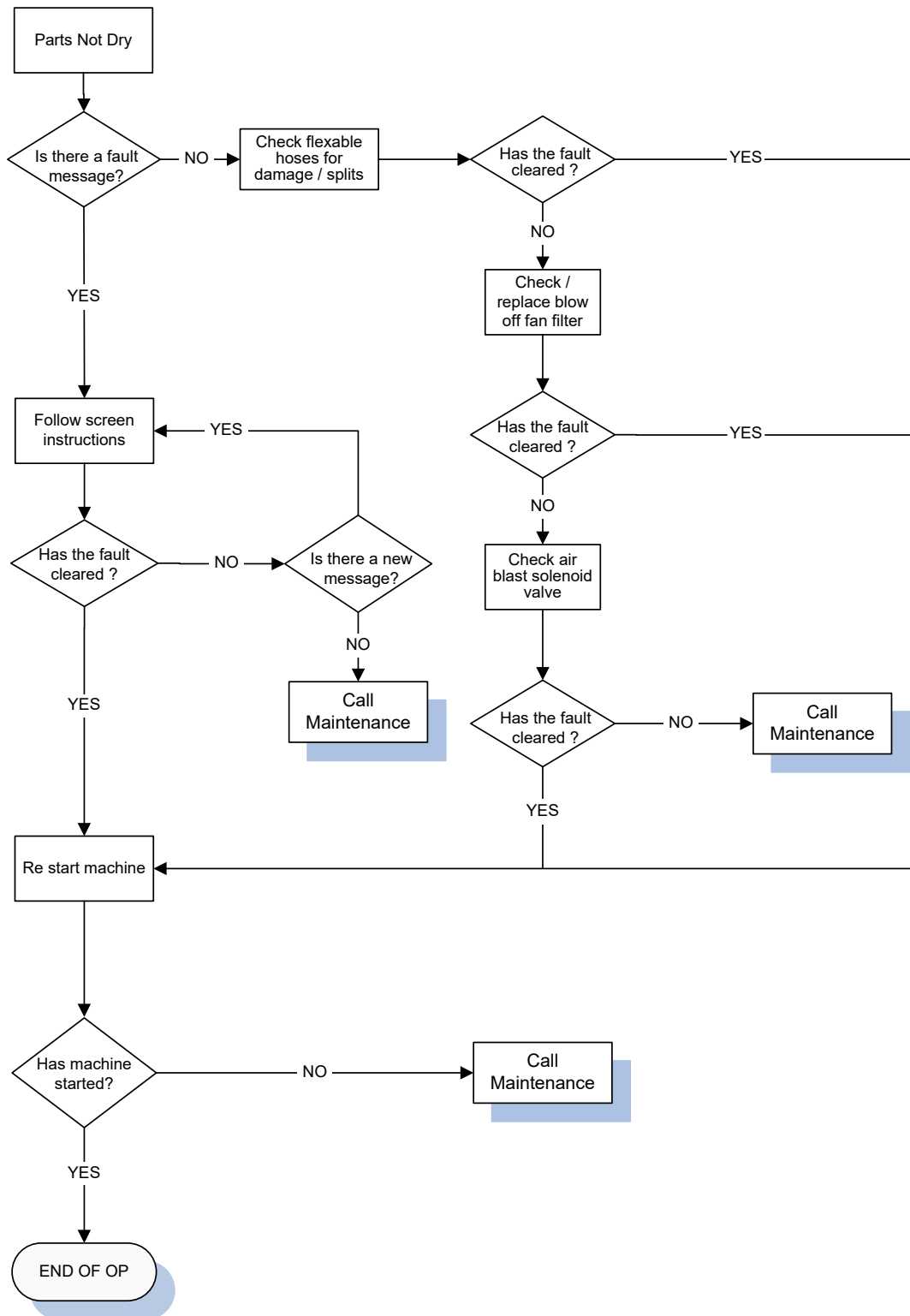
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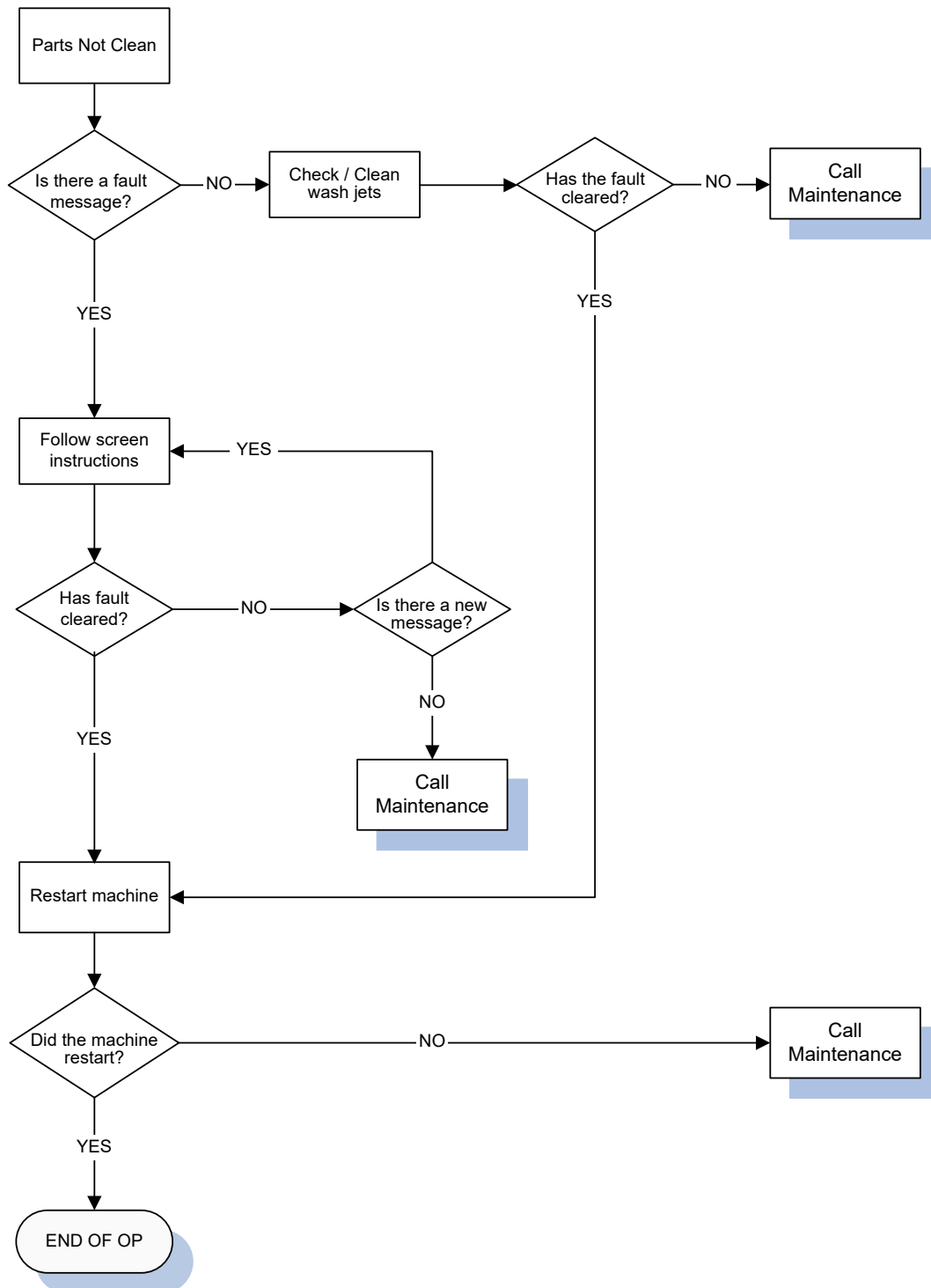
7.1 Fault Flow Chart - Machine Start Up



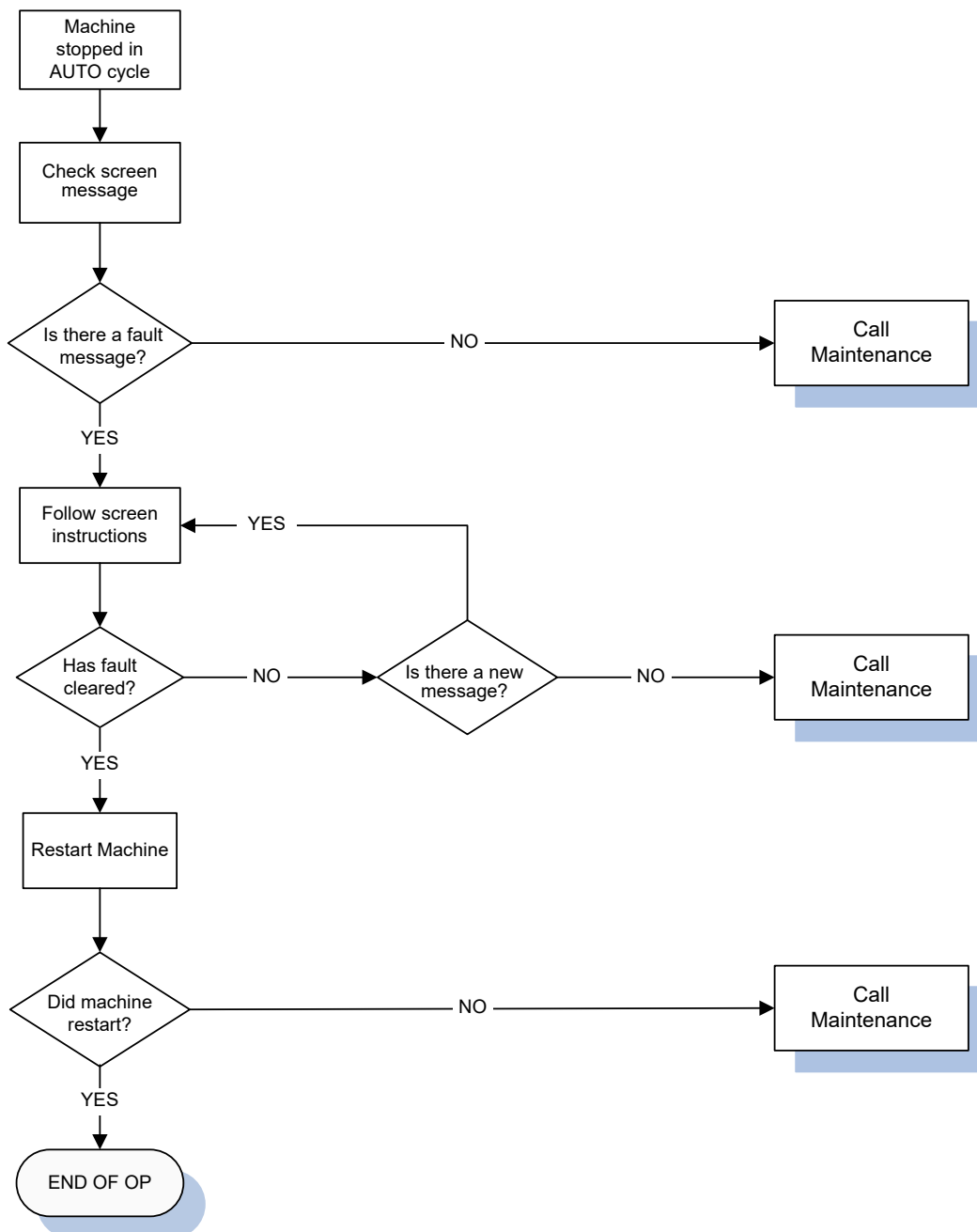
7.2 Fault Flow Chart - Parts Not Dry



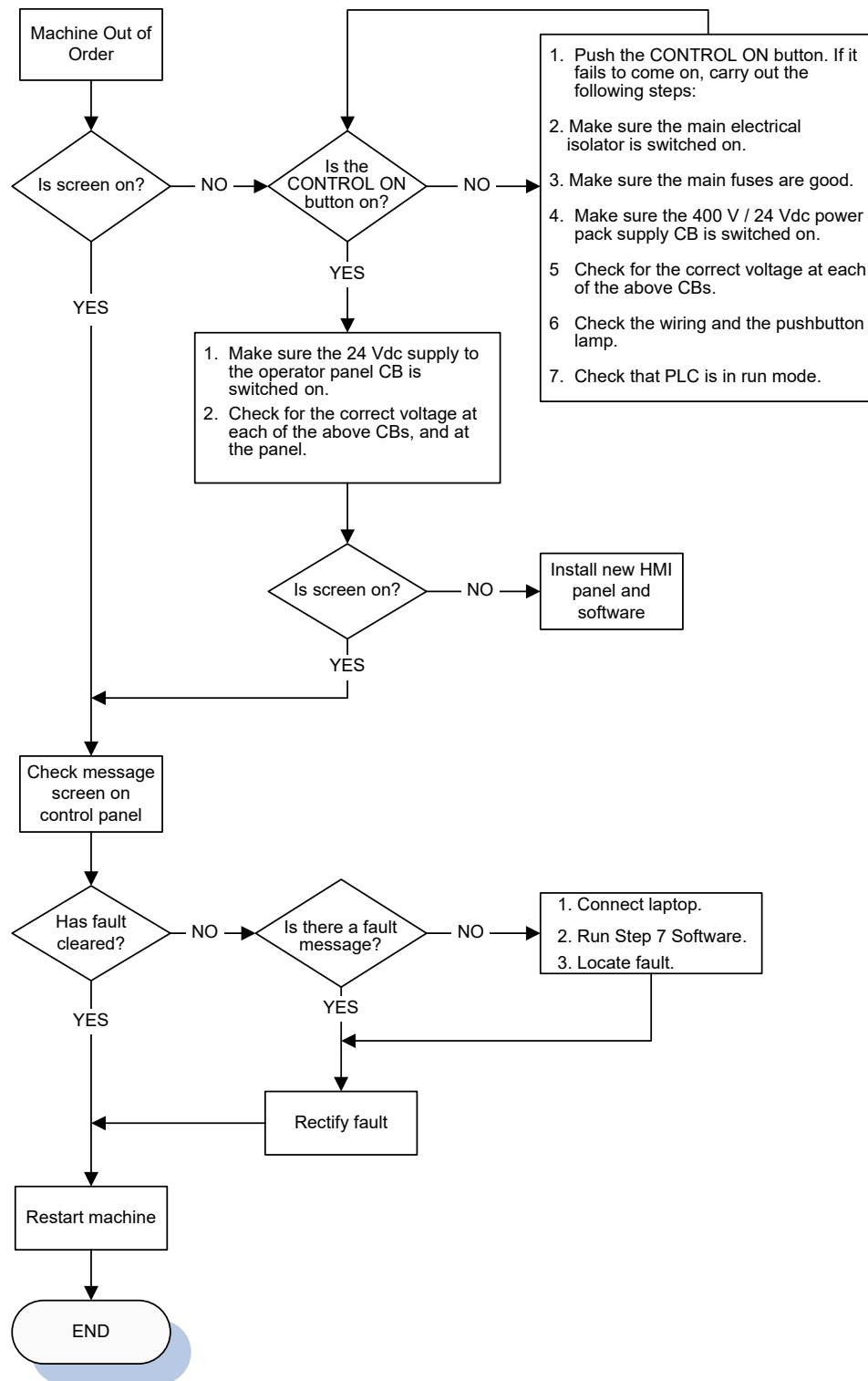
7.3 Fault Flow Chart - Parts Not Clean



7.4 Fault Flow Chart - Machine Stops



7.5 Fault Flow Chart - Maintenance



7.6 Blow-off Unit Diagnostics Chart

Problem	Cause
Low Flow / Pressure	Blower rotating backwards. (Incorrect wiring) Dirty or contaminated filter element Collapsed hose (check internal lining) - Air leaks in system Closed or damaged valve (if fitted) - Worn or damaged impeller
Electrical overloading	Exceeding rated flow Blower not piped to system Air leaks in system Blower speed too high (incorrect blower pulley size) Motor winding or bearing damage Electrical supply problems
Irregular / Excessive Noise	Blockage in airline (inlet or discharge side) Leakage in air line Inlet filter/silencer damaged internally Bolts loose on blower/motor assembly Motor mounts loose Blower bearings worn Motor bearings worn Blower speed too high Blower receiving vibration from external source

7.7 Dosatron Diagnostic Chart

Symptom	Cause	Remedy
MOTOR PISTON		
Dosatron does not start or stops	Piston stalled	Reset piston by hand
	Air has not been bled from unit	Bleed air from the unit, using bleed button
	Maximum flow exceeded	1. Reduce flow, start the unit. 2. Unscrew the bell. Remove the piston and check piston valves seals are in the correct position.
	Motor piston is damaged	Return unit to service centre for repair
INJECTION		
Water flowing back into concentration container	Contaminated, worn or missing check valve parts	Clean or replace with new parts
No suction of Concentrate	The piston motor has stopped	See MOTOR PISTON section
	Air leak (inlet) in the suction tube	Check the tightness between nut and suction hose
	Blocked suction tube or clogged strainer	Clean or replace it with new parts.
	Missing or worn suction check valve seal	Clean or replace it with new parts.
	Missing or worn plunger seal	Clean or replace it with new parts.
	Worn injection stem	Replace it with new parts.
Under Injection	Suction of air	1) Check the tightness of the nuts in the injection area. 2) Check suction tube.
	Dirty or worn check valve seal	Clean or replace it with new parts
	Maximum flow exceeded (cavitation)	Replace it with new parts
	Worn plunger seal	Replace it with new parts
	Worn injection stem	Replace it with new parts

Symptom	Cause	Remedy
Leaks		
Leaks near the fixing ring under the body housing	Injection sleeve seal is damaged or positioned incorrectly	Replace it with new parts
Leaks between the setting sleeve and the blocking ring	Injection stem seal damaged, positioned incorrectly or missing	Replace it with new parts
Leaks between the body and cover (bell)	The cover (bell) seal is damaged, positioned incorrectly or missing	Unscrew the cover (bell), clean the seal seating, replace or change the seal. Position correctly in the cover (bell).

7.8 Extract Fan Diagnostics Chart

Symptom	Cause	Remedy
The exhausted air is not clean	Dirty filters	Change cartridge filter and clean metal mesh coalescing prefilter.
Reduction of airflow	Dirty filters	Change cartridge filter and clean metal mesh coalescing prefilter.
The fan vibrates	Fan is unbalanced	Remove and clean the fan
The fan rotates but there is no airflow	The fan rotates in the wrong direction	Change over two of the phase connections to the motor

7.9 Oil Separator Diagnostics Chart

Symptom									Cause
No suction	Irregular pumping	Low volume pumped	Low pressure	Pump does not start	Pump is stopped or pumping stopped	Pump operates noisily	Motor becomes too warm	Stator wears out quickly	Shaft seal leaks
				X			X		Friction between rotor and stator excessive (as delivered). 1. Lubricate with soap between stator and rotor. 2. Then use the tool W2 to rotate the pump.
X									Check direction of pump rotation. • If rotation in wrong direction, correct the connections to the motor.
X	X	X			X	X			Suction pipe or shaft seal leak. • Correct the leak.
X	X	X				X			Suction head is too high. • Use a vacuum gauge to check suction head. • Increase the suction pipe diameter and / or install larger filters. • Open the suction valve.
X	X	X							Viscosity of solution is too high. • Correct solution viscosity. • Check that it is the correct pump for the viscosity.
		X		X			X		Wrong pump speed.

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Symptom									Cause
No suction	Irregular pumping	Low volume pumped	Low pressure	Pump does not start	Pump is stopped or pumping stopped	Pump operates noisily	Motor becomes too warm	Stator wears out quickly	Shaft seal leaks
									Correct the pump speed.
	X	X							Keep air out of the solution.
		X		X	X		X	X	Pressure head is too high. - Use a manometer to check the suction head. - Reduce the pressure head by increasing the pressure pipe diameter or by making the pressure pipe shorter.
X	X	X			X			X	Pump does not always run full with solution. - Check flow in the suction chamber. - Install dry running protection.
						X	X		Check the drive coupling. - If the pump shaft is not aligned to drive; align coupling. - If coupling is worn; install new part.
X		X							Speed too low. Increase the speed when high suction performances are necessary and when the solution viscosity is low.
X		X				X			Speed too high. Could cause cavitation.

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Symptom									Cause
No suction	Irregular pumping	Low volume pumped	Low pressure	Pump does not start	Pump is stopped or pumping stopped	Pump operates noisily	Motor becomes too warm	Stator wears out quickly	Shaft seal leaks
									Reduce the speed when pumping solution with high viscosity.
						X			Check the axial play in the coupling rod linkage. Check that the bush has been installed correctly.
X		X		X	X			X	Check for foreign material in the pump. Dismantle the pump, remove foreign material and replace worn parts with new parts.
X		X	X		X				Stator or rotor worn. Dismantle the pump and replace defective parts with new parts.
X		X			X	X			Joint parts worn. Replace worn parts with new parts and fill with special pin joint grease.
X		X			X			X	Suction pipework partially or completely blocked. Clean suction pipework.
X				X	X		X	X	Temperature of pumped solution too high. - Too much expansion of the stator. - Check temperature and install rotor with diameter smaller than specified.
X		X		X			X		X - Gland packing too compact or worn. - Loosen or tighten stuffing box.

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Symptom									Cause
No suction	Irregular pumping	Low volume pumped	Low pressure	Pump does not start	Pump is stopped or pumping stopped	Pump operates noisily	Motor becomes too warm	Stator wears out quickly	Shaft seal leaks
									Replace defective packing rings with new parts.
X				X	X			X	Solid contents and / or size of solids too large. Reduce pump speed and install perhaps a screen with suitable meshes. Increase fluid share.
X				X				X	X - When the pump is non-operational the solids settle out and become hard. - Clear and flush the pump immediately.
X				X	X			X	X - Solution increases in viscosity when temperatures fall to the limit. - Heat the pump.
				X	X		X	X	Stator expanded and unserviceable for the pumped solution. - Install the correct stator material. - Use rotor with diameter smaller than specified.
						X			X - The bearing in the drive casing of the pump or in the electric motor is defective. - Replace bearing with new part.
									X - Mechanical seal defective. - Check seal face and O-rings. - If necessary replace defective parts with new parts.

7.10 Wash Fine Filter (HYDAC) Diagnostics Chart

Symptom	Faulty Section	Cause	Remedy
Leakage at the filter	Pressure gauge hose	Cutting rings	Tighten cutting rings. If necessary replace hoses and cutting rings with new parts
	Leakage at the cover plate or bowl	Seal missing or damages	Replace seal with new part
		Bolts loose	Tighten bolts
No back flushing although the differential pressure gauge has exceeded the pre-set limit	The ON light does not come on Fuses	Fuse faulty	Check if there is a short-circuit or overload and correct fault
	Power supply	Filter is not connected to the power supply	Connect the power supply
	Main switch	Main switch is not switched on	Switch the main switch on
	Geared motor protection operated	Geared motor power consumption is too high	Check the geared motor
		Flushing arm is blocked by a foreign object	Stop the filter and remove foreign object. Refer to procedure "Fine Filter – Annual Inspection" for cover plate removal.
		Incorrect setting of motor protection	Correct setting
	Loose connector	Connector has vibrated loose	Check all electrical connections and tighten as necessary
	Geared motor	Fault in geared motor	Check motor and replace with new part if necessary

Symptom	Faulty Section	Cause	Remedy
Continuous back-flushing	Excessive contamination of solution	Differential pressure trigger has been exceeded.	Reduce solution contamination or replace solution with new solution
	Differential pressure switch	Setting of differential pressure switch is too low	Check the setting
	Pressure differential filtrate – back-flushing line	Pressure differential between filtrate outlet and back-flushing line is too low. Filter elements are dirty	Increase pressure at inlet. Reduce pressure of back-flushing line.
	Filter elements	Filter elements of permanently dirty	Stop the filter and do the procedure “ Fine Filter – Annual Inspection” for filter cleaning.
	Timer	Timer is ON without setting a time	Check the setting of the timer and increase time if needed
	Shut-off valve does not open	Compressed air supply to the pneumatic actuator is not connected	Connect compressed air supply. Minimum 4 bar – Maximum 6 bar.
		Solenoid valve is not connected to the control unit	Make sure that the solenoid valve on the flush position is supplied with electricity: LED K1 in the control panel will come on. If LED on: Check function of the solenoid valve and if necessary replace with a new part. If LED not on: Check connector and power cable and replace if necessary

Symptom	Faulty Section	Cause	Remedy
Continuous back-flushing (cont)		Shut-off valve excessive torque. Valve is blocked.	Stop the back-flushing filter. Disconnect shut-off valve. Remove foreign housing.
		Actuator defective	Replace actuator
	Geared motor wrong direction of rotation	Incorrect polarity	Compare the rotation direction of the geared motor with the direction arrow marked on the motor. If the direction is wrong, then the polarity of the power supply must be reversed.
Leakage at the shut-off valve	Leakage at the spindle seal		Tighten the spindle seal.

7.11 Water Pump Diagnostics Chart

Symptom	Cause	Remedy
Pump does not deliver	a) Wrong rotation	Change motor connections
	b) Suction pipe and pump insufficiently primed or foot-valve leaking	Re-prime pump and check foot-valve
	c) Leak or air pocket in suction piping or shaft seal leaking	Check suction piping and shaft seal, re-prime pump
	d) Speed too low	Check motor connections. Voltage and speed
	e) Suction lift excessive	Lower pump
	f) System head higher than total head of pump	Check suction and discharge head, contact our works
Pump does not operate at full capacity	a) Suction strainer clogged	Clean strainer, keep strainer free from debris
	b) Suction strainer insufficiently immersed, air drawn into pump	Lengthen suction piping or reduce output of pump to correspond with inflow of water, watch maximum suction lift
	c) Pump or piping clogged	Clean pump / piping
	d) Delivery head higher than anticipated	Verify actual delivery head. Contact our works
Pump does not run smoothly or bearings become warm	a) Base-plate misshapen during assembly. Coupling halves do not fit together exactly	Compensate for misshapen base-plate by putting thin tin sheets underneath pump or motor feet
	b) Worn buffers	As above, replace buffers
	c) Bearings over-lubricated	Remove superfluous grease, if necessary wash bearing with petroleum and re-lubricate

Symptom	Cause	Remedy
Pump does not deliver	a) Wrong rotation	Change motor connections
	b) Suction pipe and pump insufficiently primed or foot-valve leaking	Re-prime pump and check foot-valve
	c) Leak or air pocket in suction piping or shaft seal leaking	Check suction piping and shaft seal, re-prime pump
	d) Speed too low	Check motor connections. Voltage and speed
	e) Suction lift excessive	Lower pump
	f) System head higher than total head of pump	Check suction and discharge head, contact our works
Pump does not operate at full capacity	a) Suction strainer clogged	Clean strainer, keep strainer free from debris
	b) Suction strainer insufficiently immersed, air drawn into pump	Lengthen suction piping or reduce output of pump to correspond with inflow of water, watch maximum suction lift
	c) Pump or piping clogged	Clean pump/piping
	d) Delivery head higher than anticipated	Verify actual delivery head. Contact our works
Pump does not run smoothly or bearings become warm	a) Base-plate misshapen during assembly. Coupling halves do not fit together exactly	Compensate for misshapen base-plate by putting thin tin sheets underneath pump or motor feet
	b) Worn buffers	As above, replace buffers
	c) Bearings over-lubricated	Remove superfluous grease, if necessary wash bearing with petroleum and re-lubricate

7.12 Lubrication Pump Diagnostics Chart

Symptom	Cause	Remedy
Motor will not start when the operating voltage is applied	No operating voltage on motor	Check mains connection. Check mains plug / cable and if necessary connect properly. Check voltage on motor is correct. Check fuse. Check motor overload switch.
	Pump blocked.	Check motor current; If motor current is too high; remove pump and turn by hand. If turn resistance is high, replace the pump with a new one.
	Motor will not turn	Check motor current; If motor current is too high; remove motor and turn by hand. If turn resistance is high, replace the motor with a new one.
Motor does not run easily and at low speed	Slow pump	Check motor current; If motor current is too high; remove pump and turn by hand. If turn resistance is high, replace the pump with a new one.
	Motor turns too slow	Check motor current; If motor current is too high; remove motor and turn by hand. If resistance is high, replace the motor with a new one.
	Wrong lubricant	Remove all lubricant from the system and discard correctly. Fill with correct lubricant
	Pressure too high, pressure control valve will not move easily	Check pressure control valve and if necessary replace with a new one
	Ambient temperature too low	Increase ambient temperature

Symptom	Cause	Remedy
Pump does not move lubricant, no pressurization	Pump blocked.	Check motor current; If motor current is too high; remove pump and turn by hand. If turn resistance is high, replace the pump with a new one.
	Motor will not turn	Check motor current; If motor current is too high; remove motor and turn by hand. If turn resistance is high, replace the motor with a new one.
	Motor turns in wrong direction	Direction is shown by arrow. Change motor direction
	Pressure control valve will not close	Check pressure control valve to make sure that opening pressure is correct and that there is no contamination or damage. If opening pressure is incorrect or if the pressure control valve is damaged, change the valve. Only use original SKF spare parts. If dirty, clean the pressure control valve.
No pressurization in pipes	Air in main pipe	Bleed main pipe
	Main pipe leaks or has break in the pipe	Repair main pipe
	Pressure control valve does not close	Check pressure control valve to make sure that opening pressure is correct and that there is no contamination or damage. If opening pressure is incorrect or if the pressure control valve is damaged, change the valve. Only use original SKF spare parts. If dirty, clean the pressure control valve.
	Relief valve does not close	Clean or replace relief valve with a new one. Only use original SKF spare parts.
	Wrong lubricant	Remove all lubricant from the system and dispose of correctly. Refill with correct lubricant
	Fill level too low	Add more lubricant

Section 8 - Spare Parts

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 8.1 Recommended Spares..... 1

8.1 Recommended Spares

Please see CD ROM and also the attached spreadsheet lists

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
1	2	BONOMI	8P00350014 HMM PBMO	3" (80mm) CARBON STEEL ASTMA 105 WAFER PATTERN BALL VALVE. AISI 304 STAINLESS STEEL BALL AND STEM 15% GLASS REINFORCED PTFE SEALS AND SEATS. VITON O RINGS FLANGED PN16 FITTED WITH DOUBLE ACTING PNEUMATIC ACTUATOR SIZED ON 4 BAR AIR A NAMUR SOLENOID VALVE SOL/SPRING WITH MOMENTARY PUSH BUTTON MANUAL OVERRIDE AND IFM PUCK				
2	1	BONOMI	8P003706GS SMVS2	1" BALL VALVE, PN16 FLANGE c/w SINGLE ACTING ACTUATOR, SWITCH BOX, 24VDC NAMUR SOL/SPRING CONTROL VALVE,				
3	12	BRAMMER	P-3B_AV	POLYBOND MOUNT				
4	1	BRINKMAN	SFL650/570+001	VERTICAL TNK MOUNTED QUICK SUCTIONING IMMERSION PUMP 400 LITRES/MIN AT 8 METRES HEAD. 2.2KW MOTOR ~ 400V/3PH/50HZ SUPPLY		X		7
5	1	DRIVELINES LTD	SWG 1500B6052V2-AF060-32	ZF RIGHT ANGLED WORMWHEEL GEARBOX		X		8
6	3	EMKA	1011-42	EMKA - SEAL	X			3
7	6	EMKA	1011-45	EMKA - SEAL	X			3
8	10	EMKA	1054-U31	EMKA - HINGE RH				
9	10	EMKA	1054-U32	EMKA - HINGE LH				
10	6	EUCHNER	CET3-AR-CRA-AH-50X-SG-C2333-114512	2 CHANNEL SOLID STATE SAFETY SWITCH, TRANSPONDER TYPE. SUITABLE FOR DAISY-CHAINING. NOT PROFISAFE. WITH LOCKING - ENERGISE TO UNLOCK		X		6
11	3	EXHEAT	HBV15/27/AS	SCREWED IMMERSION HEATER 15KW ~ 415V-3-50HZ 2.25" BSP STAINLESS STEEL MOUNTING IP66 RATED + THERMOSTAT RANGE +5/+80C		X		5
12	2	FANS AND BLOWERS	268Q	CENTRIFUGAL FAN MODEL 268QZ : HANDING : R90 DUTY: 2250CFM @ 34"WG FITTED WITH SIEMENS 160L MOTOR : IE2 :IP55 400V 3PH 50HZ DRIVE ARRANGEMENT : No.4 DIRECT DRIVE SPECIAL : 8mm THICK FAN CASE AND FITTED WITH INLET SILENCER (TYPE B)		X		10
13	2	FESTO	2310	SILENCER : U-1/2				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
14	9	FESTO	6842	SILENCER : U-1/4-B				
15	14	FESTO	151172	FLOW CONTROL VALVE GRLA-1/4-B				
16	1	FESTO	151990	SILENCER : U-1-B				
17	2	FESTO	163302	PNEUMATIC CYLINDER : 32 BORE x 80 STROKE FITTED WITH ROD LOCK DNC-32-80-PPV-A-KP		X		3
18	1	FESTO	163334	PNEUMATIC CYLINDER : 40 BORE x 525 STROKE FITTED WITH ROD LOCK DNC-40-525-PPV-A-KP		X		3
19	2	FESTO	163366	PNEUMATIC CYLINDER : 50 BORE x 525 STROKE FITTED WITH ROD LOCK DNC-50-525-PPV-A-KP		X		3
20	1	FESTO	163398	PNEUMATIC CYLINDER : 63 BORE x 70 STROKE FITTED WITH ROD LOCK DNC-63-70-PPV-A-KP		X		3
21	1	FESTO	163494	PNEUMATIC CYLINDER : 125 BORE x 200 STROKE FITTED WITH ROD LOCK DNC-125-200-PPV-A-KP		X		3
22	1	FESTO	197130	SHUT OFF VALVE: HE-N1/2-LO				
23	2	FESTO	526074	MOUNTING BRACKET : MS6-WPB				
24	1	FESTO	526082	MS SERIES SUB BASE : MS6-AGD				
25	1	FESTO	529186	FILTER REGULATOR : MS6-LFR-1/2-D7-CRV-AS				
26	1	FESTO	529817	PRESSURE BUILD UP VALVE : MS6-DL-1/2				
27	1	FESTO	532799	MODULE CONNECTOR : MS6-MV				
28	1	FESTO	539143	PNEUMATIC CONTROL VALVE VSVA-B-B52-ZD-A1-2AT1L				
29	1	FESTO	539159	PNEUMATIC CONTROL VALVE VSVA-B-M52-MZD-A1-1T1L				
30	6	FESTO	539160	PNEUMATIC CONTROL VALVE VSVA-B-P53U-ZD-A1-1T1L				
31	1	FESTO	558326	DUMP VALVE : MS6-EE-1/2-V24-SA				
32	1	FESTO	571429	ON/ OFF VALVE : MS6-EM1-1/2-R-SA				
33	2	FESTO	1132953	ROLLOVER PARALLEL GRIPPER (SPRING SHUT POWERED OFF) HGPD-50-A-G2		X		5
34	4	FESTO	SMT8FPS24V-K03-M12	CYLINDER SENOR M12 ON SHORT FLYING LEAD	X			4
35	2	FORTRESS	AMDS1A1STOP024X001	INTERLOCKED ACCESS GATE SAFETY SWITCH WITH SOLENOID AND TRAPPED KEY 24VDC. SPECIAL FOR JLR.				
36	40	GUDEL	902250	GUDEL - M5 TEE NUT				
37	5	GUDEL	MLB1 Single Axis unit	GUDEL - 1.54m BEAM,1.1m STROKE,C/W SIZE 30 G/BOX,MOTOR FLANGE & COUPLING				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
38	1	HARRY MAJOR MACHINE-UK LTD	3133	FLOAT				
39	1	HARRY MAJOR MACHINE-UK LTD	3137	GUIDE BLOCK				
40	3	HARRY MAJOR MACHINE-UK LTD	3138	SENSOR BRACKET				
41	1	HARRY MAJOR MACHINE-UK LTD	3141	MOUNTING PLATE				
42	1	HARRY MAJOR MACHINE-UK LTD	3142	MOUNTING BRACKET				
43	1	HARRY MAJOR MACHINE-UK LTD	6011	HMM-STD - TANK LID GUIDE				
44	1	HARRY MAJOR MACHINE-UK LTD	6012	HMM STD - TANK LID TIE BAR				
45	1	HARRY MAJOR MACHINE-UK LTD	6013	HMM STD - TANK LID BRACKET				
46	40	HARRY MAJOR MACHINE-UK LTD	6257	HMM STANDARD 2" FISHTAIL NOZZLE	X			5
47	1	HARRY MAJOR MACHINE-UK LTD	7821	Ø 104mm INCLINED STAINLESS STEEL SCREW CONVEYOR				
48	2	HARRY MAJOR MACHINE-UK LTD	01019-01-02-0042-D	SWITCH MOUNTING PAD				
49	12	HARRY MAJOR MACHINE-UK LTD	01019-01-02-0054-D	DOOR SLIDE BRKT				
50	12	HARRY MAJOR MACHINE-UK LTD	01019-01-02-0061-D	DOOR PAD				
51	1	HARRY MAJOR MACHINE-UK LTD	01019-01-02-0067-D	DOOR RELEASE				
52	4	HARRY MAJOR MACHINE-UK LTD	01019-01-02-0140-D	DOOR SWITCH BRACKET				
53	2	HARRY MAJOR MACHINE-UK LTD	01019-01-02-0141-D	SWITCH MOUNTING PAD				
54	4	HARRY MAJOR MACHINE-UK LTD	01131-01-02-0105-D	CYLINDER SPACER				
55	2	HARRY MAJOR MACHINE-UK LTD	01131-01-02-0106-D	SWITCH STRIKER PLATE				
56	2	HARRY MAJOR MACHINE-UK LTD	01131-01-02-0108-D	DOOR RAISER LH				
57	1	HARRY MAJOR MACHINE-UK LTD	01131-01-02-0108-D	DOOR RAISER LH				
58	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0003-A	REAR INTERNAL DOOR ASSEMBLY				
59	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0004-A	LHS INTERNAL DOOR ASSEMBLY				
60	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0005-A	RHS INTERNAL DOOR ASSEMBLY				
61	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0006-A	LHS DOOR ASSEMBLY				
62	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0007-A	RHS DOOR ASSEMBLY				
63	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0008-A	RHS CENTRE DOOR ASSEMBLY				
64	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0009-A	LHS MAINTENANCE DOOR ASSEMBLY				
65	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0010-A	RHS MAINTENANCE DOOR ASSEMBLY				
66	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0011-A	RHS REAR MAINTENANCE DOOR ASSEMBLY				
67	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0012-A	REAR ACCESS DOOR ASSEMBLY				
68	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0013-A	PUMP & FILTER ASSEMBLY				
69	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0014-A	WATER FILL/AUTO MAKE-UP ASSEMBLY				
70	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0015-A	MAIN TANK DRAIN ASSEMBLY				
71	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0016-A	EFLUENT TANK LID ASSEMBLY				
72	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0017-A	FLOAT SWITCH ASSEMBLY				
73	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0018-A	SUPARATOR TANK ASSEMBLY				
74	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0019-A	SUPARATOR PUMP ASSEMBLY				
75	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0020-A	SUPARATOR FLOAT ASSEMBLY				
76	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0021-A	FAN & DAMPER ASSEMBLY				
77	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0022-A	LUL SUPPORT ASSEMBLY				
78	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0023-A	PIP ASSEMBLY (SENDER)				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
79	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0024-A	PIP ASSEMBLY (RECEIVE)				
80	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0025-A	DAMPER ASSEMBLY				
81	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0026-A	DAMPER ASSEMBLY OPPOSITE HAND				
82	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0027-A	DOOR DRIPTRAY ASSEMBLY				
83	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0028-A	ECOTECH DRAIN ASSEMBLY				
84	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0029-A	PNEUMATIC ON/OFF VALVE ASSEMBLY				
85	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0030-A	DRY PUMP PIPEWORK ASSEMBLY				
86	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0100-D	MACHINE HOUSING WELDMENT				
87	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0101-D	REAR INSIDE REAR DIVIDER WELDMENT				
88	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0102-D	REAR MAKEUP PLATE WELDMENT				
89	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0103-D	REAR INSIDE FRONT DIVIDER WELDMENT				
90	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0104-D	INTERNAL REAR DOOR WELDMENT				
91	6	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0105-D	DOOR GUIDE ASSY				
92	12	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0106-D	SPLASH GUARD MOUNTING BRACKET WELDMENT				
93	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0107-D	SPLASH GUARD				
94	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0108-D	SWITCH TAG WELDMENT				
95	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0109-D	DOOR BOBBIN				
96	6	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0116-D	INSULATED COVER TAP PAD				
97	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0118-D	SWITCH MOUNTING PAD				
98	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0119-D	DOOR SWITCH BRACKET OPEN				
99	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0120-D	DOOR OPEN SWITCH TAG				
100	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0121-D	DOOR RAISER LH				
101	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0122-D	DOOR BOBBIN				
102	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0123-D	CYLINDER SPACER				
103	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0124-D	RHS REAR DIVIDER WELDMENT				
104	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0125-D	RHS FRONT DIVIDER				
105	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0126-D	RHS DIVIDER MAKEUP PLATE WELDMENT				
106	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0127-D	WET SIDE DEFLECTOR				
107	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0128-D	RHS DOOR SWITCH TAG OPEN				
108	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0129-D	LHS REAR INSULATED COVER				
109	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0130-D	LHS FRONT INSULATED COVER				
110	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0131-D	RHS INTERNAL DOOR WELDMENT				
111	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0132-D	LHS DOOR WELDMENT				
112	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0133-D	SAFETY SWITCH TAP PAD				
113	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0134-D	SAFETY SWITCH ACTUATOR TAP PAD				
114	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0135-D	RHS DOOR WELDMENT				
115	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0136-D	RHS CENTRE DOOR WELDMENT				
116	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0137-D	RH MAINTENANCE DOOR WELDMENTMENT				
117	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0138-D	RH REAR MAINTENANCE DOOR WELDMENT				
118	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0139-D	RH REAR MAINTENANCE DOOR WELDMENT				
119	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0140-D	PUMP OUTLET TO NRV PIPE WELDMENT				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
120	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0141-D	PIPE WELDMENT - NRV TO FILTER				
121	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0142-D	PIPE WELDMENT - FILTER TO BALL VALVE				
122	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0143-D	PIPE WELDMENT - BALL VALVE TO HSG				
123	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0144-D	PIPE WELDMENT - PUMP BYPASS				
124	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0145-D	ORIFICE PLATE				
125	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0146-D	PIPE WELDMENT - WASH DOWN #1				
126	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0147-D	PIPE WELDMENT - WASH DOWN #2				
127	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0148-D	FILTER TAP PAD				
128	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0149-D	DOSATRON TAP PAD				
129	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0150-D	PIPE WELDMENT - MAINS TO DOSATRON				
130	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0151-D	DOSATRON TAP PAD #2				
131	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0152-D	PIPE WELDMENT - DOSATRON TO HSG				
132	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0153-D	PIPE WELDMENT - MAINS TO BALL VALVE				
133	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0154-D	PIPE WELDMENT - HSG TO DRAIN BV				
134	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0155-D	PIPE WELDMENT - DRAIN BV TO EFFLUENT TANK				
135	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0156-D	PIPE WELDMENT - FILTER TO DRAIN P/WORK				
136	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0157-D	EFFLUENT TANK LID WELDMENT				
137	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0158-D	FLOAT TUBE WELDMENT				
138	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0159-D	GUIDE TUBE WELDMENT				
139	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0160-D	GUIDE ROD				
140	4	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0161-D	SUPARATOR TANK FRAME TAP PAD				
141	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0162-D	SUPARATOR TANK FRAME WELDMENT				
142	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0163-D	SUPARATOR PUMP TAP PAD				
143	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0164-D	SUPARATOR PUMP OUTLET PIPE				
144	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0165-D	SUPARATOR GUIDE TAP PAD				
145	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0166-D	SUPARATOR GUIDE WELDMENT				
146	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0167-D	FAN OUTLET PIPE WELDMENT #1				
147	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0168-D	FAN OUTLET PIPE WELDMENT #2				
148	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0169-D	DAMPER INLET ADAPTOR				
149	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0170-D	DAMPER MTG BKT TAP PAD				
150	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0171-D	DAMPER MOUNTING BRACKET				
151	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0172-D	DAMPER GUARD WELDMENT #1				
152	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0173-D	DAMPER GUARD WELDMENT #2				
153	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0174-D	DAMPER GUARD #3				
154	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0175-D	DAMPER GUARD #4				
155	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0176-D	LUL SUPPORT WELDMENT				
156	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0177-D	LUL SUPPORT TAP PAD				
157	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0178-D	LUL SUPPORT SHIM				
158	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0180-D	LUL FIXTURE SUPPORT BAR				
159	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0181-D	LUL FIXTURE SUPPORT BAR SHIM				
160	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0183-D	PIP COVER				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
161	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0184-D	PIP INSIDE BRACKET WELDMENT				
162	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0185-D	DAMPER DUCT				
163	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0186-D	DAMPER SPINDLE				
164	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0187-D	DAMPER FLAP				
165	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0188-D	CLAMP PLATE				
166	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0189-D	DAMPER CLEVIS				
167	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0190-D	CLEVIS PIN				
168	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0191-D	DAMPER SPINDLE				
169	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0192-D	GANTRY MOUNTING WELDMENT				
170	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0193-D	ACCESS DOOR WELDMENT				
171	6	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0194-D	DOOR DRIP TRAY				
172	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0195-D	PIPE WELDMENT - DRY AREA PUMP				
173	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0196-D	DRY SHEDPLATE #1				
174	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0197-D	DRY SHEDPLATE #2				
175	3	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0198-D	DRY SIDE GRID				
176	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0199-D	PIPE WELDMENT - ECOTECH DRAIN				
177	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0200-D	ECOTECH DRAIN TAP PAD				
178	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0201-D	EXHAUST SPIGOT WELDMENT				
179	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0202-D	PIPE WELDMENT - DRY INTERNAL WASH				
180	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0203-D	LUBRICATION MOUNTING PLATE				
181	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0204-D	PNEUMATIC MOUNTING PLATE				
182	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0205-D	REAR DECKING PLATE #1				
183	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0206-D	REAR DECKING PLATE #2				
184	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0207-D	REAR DECKING PLATE #3				
185	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0208-D	REAR DECKING PLATE #4				
186	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0209-D	REAR DECKING PLATE #5				
187	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0210-D	REAR DECKING PLATE #6				
188	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0211-D	REAR DOOR STOP				
189	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0212-D	SCREW CONVEYOR GRID WELDMENT				
190	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0213-D	SCREW CONVEYOR BLANKING PLATE				
191	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0214-D	SHED PLATE WELDMENT - FRONT FRONT				
192	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0215-D	SHED PLATE WELDMENT - FRONT CENTRE				
193	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0216-D	SHED PLATE WELDMENT - FRONT REAR				
194	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0217-D	SHED PLATE WELDMENT - REAR FRONT				
195	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0218-D	SHED PLATE WELDMENT - REAR CENTRE				
196	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0219-D	SHED PLATE WELDMENT - REAR REAR				
197	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0220-D	PNEUMATIC VALVE BRACKET				
198	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0221-D	BLANK FLANGE 3"				
199	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0222-D	SENSOR BRACKET				
200	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0223-D	SENSOR BRACKET TAPPED PAD				
201	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0224-D	BRACKET, AIR DAMPER				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
202	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0225-D	DAMPER GUARD				
203	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0226-D	DAMPER TOP GUARD				
204	2	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0227-D	FAN STOOL				
205	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0228-D	SPACER				
206	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0229-D	WATER HAMMER PIPE				
207	1	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0230-D	WASH DOWN ATTACHMENT BRACKET				
208	15	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0231-D	TRUNKING MOUNTING BAR				
209	12	HARRY MAJOR MACHINE-UK LTD	01175-01-02-0232-D	TRUNKING MOUNTING PAD				
210	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0100-D	TABLE TOP				
211	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0101-D	DRIVE PINION 30T MOD 9				
212	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0102-D	FLINGER-PINION GEAR				
213	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0103-D	RING GEAR COVER - WASH #1				
214	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0104-D	RING GEAR COVER - WASH #2				
215	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0105-D	MOTOR COVER LH				
216	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0106-D	MOTOR COVER RH				
217	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0107-D	GEAR RETAINER				
218	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0108-D	GEARBOX SUPPORT BRACKET LH				
219	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0109-D	GEARBOX SUPPORT BRACKET RH				
220	4	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0110-D	TABLE TOP LEG SHIM				
221	2	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0111-D	DRIVE ADJUSTER BLOCK				
222	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0112-D	DRIVE GEAR COVER				
223	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0113-D	DRIVE MOTOR COVER OUTER				
224	1	HARRY MAJOR MACHINE-UK LTD	01175-01-03-0114-D	ADAPTOR PLATE				
225	3	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0003-A	SLIDE ASSEMBLY - WASH #1				
226	3	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0004-A	FIXED WASH MANIFOLD - OUTER				
227	3	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0005-A	FIXED WASH MANIFOLD - INNER				
228	1	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0006-A	WASH PIPING ASSEMBLY				
229	3	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0007-A	DRIVE ASSEMBLY				
230	3	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0101-D	CARRIER ARM - WASH #1				
231	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0102-D	DRIVE PLATE				
232	10	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0103-D	TAPPED PAD - SLIDE				
233	10	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0104-D	SHIM - SLIDE				
234	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0105-D	MOUNTING BRACKET - SLIDE O/HAND				
235	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0106-D	MOUNTING BRACKET - SLIDE				
236	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0107-D	SLIDE GUARD WELDMENT				
237	6	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0108-D	FIXED MANIFOLD TAPPED PAD				
238	6	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0109-D	FIXED MANIFOLD SHIM				
239	3	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0110-D	FIXED MANIFOLD BRACKET - OUTER				
240	1	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0114-D	WASH MANIFOLD WELDMENT #1				
241	1	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0115-D	WASH MANIFOLD WELDMENT #2				
242	1	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0116-D	SUPPORT BRACKET				

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243	2	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0117-D	SUPPORT BRACKET TAP PAD				
244	1	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0118-D	SUPPORT BRACKET #2				
245	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0119-D	MOUNTING PLATE				
246	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0120-D	LINEAR DRIVE BRACKET				
247	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0121-D	LINEAR DRIVE BRACKET OPPOSITE HAND				
248	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0122-D	DRIVE BACKPLATE				
249	5	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0123-D	DRIVE BLOCK				
250	7	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0124-D	SPLASH GUARD WELDMENT - WIDE				
251	7	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0125-D	SPLASH GUARD WELDMENT - NARROW				
252	10	HARRY MAJOR MACHINE-UK LTD	01175-01-05-0126-D	LINEAR DRIVE BRACKET SPACER				
253	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0003-A	LIFT CYLINDER ASSEMBLY				
254	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0100-D	STATION MOUNTING PLATE				
255	6	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0101-D	JACKING BLOCK				
256	6	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0102-D	LEVELING SCREW				
257	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0103-D	CARRIAGE MOUNTING				
258	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0104-D	MAINTENANCE PLATE SPACER				
259	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0105-D	MAINTENANCE PLATE				
260	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0106-D	SWITCH MOUNTING PLATE				
261	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0107-D	ROD CONNECTION FIXING				
262	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0108-D	CYLINDER ROD CONNECTION				
263	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0109-D	BRACKET - CYL RAISED #1				
264	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0110-D	BRACKET - CYL RAISED #2				
265	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0111-D	TOP COVER				
266	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0112-D	CYLINDER COVER				
267	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0113-D	LIFT MECHANISM SUPPORT				
268	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0114-D	LIFT PLATE				
269	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0115-D	GRIPPER JAW FABRICATION				
270	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0116-D	GRIPPER JAW FABRICATION OPP-HAND				
271	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0117-D	CYLINDER MOUNT				
272	3	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0118-D	ROD END SPACER				
273	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0119-D	PIVOT PIN				
274	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0120-D	PIVOT BAR				
275	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0121-D	BEARING CAP				
276	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0122-D	CLEVIS LH THREAD				
277	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0123-D	LOCKNUT LH THREAD				
278	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0124-D	LINK BAR				
279	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0125-D	CLEVIS RH THREAD				
280	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0126-D	GRIPPER BRACKET				
281	4	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0127-D	GRIPPER FINGER				
282	4	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0128-D	CLAMP PAD				
283	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0129-D	STROKE SENSOR SPACER				

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284	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0130-D	STROKE SENSOR BRACKET				
285	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0131-D	STROKE SENSOR TAG - OPEN				
286	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0132-D	STROKE SENSOR TAG - CLOSED				
287	4	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0133-D	CLEVIS PIN				
288	4	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0134-D	FLAG				
289	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0135-D	CLAMP DISC				
290	12	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0136-D	CLAMP DISC SPACER				
291	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0137-D	SPUR GEAR 72T		X		10
292	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0138-D	SPUR GEAR 48T		X		10
293	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0139-D	GEAR RETAINING DISC				
294	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0140-D	GEAR SPACER				
295	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0141-D	BEARING SPACER OUTER				
296	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0142-D	BEARING SPACER INNER				
297	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0143-D	GRIPPER SHAFT				
298	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0144-D	BEARING COVERPLATE				
299	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0148-D	AIR MANIFOLD WELDMENT STATION #1				
300	4	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0149-D	CLAMP BRACKET				
301	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0150-D	MAIN AIR MANIFOLD #1				
302	1	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0151-D	MAIN AIR MANIFOLD #2				
303	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0152-D	AIR MANIFOLD BRACKET				
304	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0153-D	AIR MANIFOLD BRACKET TAP PAD				
305	2	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0101-D	SPLITTER WELDMENT				
306	2	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0102-D	CARRIER ARM WELDMENT				
307	10	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0104-D	ADJUSTABLE NOZZLE HOLDER WELDMENT				
308	3	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0105-D	OUTER END AIR BRACKET TAP PAD				
309	1	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0106-D	OUTER END AIR BRACKET				
310	6	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0107-D	AIR STUB 2"				
311	1	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0108-D	AIR STUB 3"				
312	1	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0109-D	INSIDE AIR MANIFOLD WELDMENT				
313	2	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0110-D	INSIDE AI MANIFOLD SHIM				
314	2	HARRY MAJOR MACHINE-UK LTD	01175-01-09-0111-D	INSIDE AIR MANIFOLD TAP PAD				
315	2	HARRY MAJOR MACHINE-UK LTD	01175-01-10-0100-D	OUTER END AIR BKT WELDMENT (STATION 7)				
316	1	HARRY MAJOR MACHINE-UK LTD	01180-01-02-0100-D	LUL FIXTURE SUPPORT WELDMENT				
317	1	HARRY MAJOR MACHINE-UK LTD	01180-01-02-0101-D	PIP BRACKET WELDMENT				
318	1	HARRY MAJOR MACHINE-UK LTD	01180-01-02-0102-D	PIP INSIDE BRACKET WELDMENT				
319	1	HARRY MAJOR MACHINE-UK LTD	01180-01-03-0002-A	TRANSFER ASSEMBLY				
320	7	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0003-A	FIXTURE ASSEMBLY				
321	7	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0100-D	MOUNTING PLATE				
322	7	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0101-D	SUPPORT BAR (LEFT)				
323	7	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0102-D	SUPPORT BAR (RIGHT)				
324	14	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0103-D	CROSS BEAM				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
325	7	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0104-D	CENTRE GUIDE CROSSBEAM				
326	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0105-D	REST PAD			X	6
327	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0106-D	REST PAD PACKER	X			4
328	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0107-D	REST PAD SHIM	X			4
329	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0108-D	SIDEGUIDE			X	6
330	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0109-D	SIDE GUIDE SPACER	X			4
331	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0110-D	CROSS BEAM SHIM				
332	14	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0111-D	CENTRE CROSS BEAM SHIM				
333	7	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0112-D	MOUNTING PLATE SPACER				
334	14	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0113-D	CENTRE LOCATOR			X	6
335	3	HARRY MAJOR MACHINE-UK LTD	01180-01-05-0100-D	WASH HALO WELDMENT				
336	3	HARRY MAJOR MACHINE-UK LTD	01180-01-05-0101-D	FIXED WASH MANIFOLD				
337	3	HARRY MAJOR MACHINE-UK LTD	01180-01-05-0102-D	FIXED WASH MANIFOLD INNER				
338	3	HARRY MAJOR MACHINE-UK LTD	01180-01-05-0103-D	FIXED MANIFOLD BRACKET - INNER				
339	1	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0003-A	ROLLOVER ASSEMBLY				
340	1	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0100-D	LIFT PLATE				
341	1	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0101-D	SPINNER PLATE				
342	1	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0102-D	SPINNER PLATE				
343	4	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0103-D	ROLLOVER PIN			X	6
344	4	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0104-D	CLAMPING WASHER				
345	2	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0105-D	COUNTER WEIGHT				
346	2	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0106-D	COUNTER WEIGHT				
347	2	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0107-D	COUNTER WEIGHT CLAMP PLATE				
348	2	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0108-D	COUNTER WEIGHT CLAMP PLATE				
349	2	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0109-D	LINK BAR				
350	1	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0110-D	CYLINDER MOUNTING BLOCK				
351	1	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0002-A	DRY # ARRANGEMENT				
352	1	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0003-A	HALO ASSEMBLY - DRY #2				
353	1	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0004-A	INSIDE FIXED DRYING ASSEMBLY				
354	1	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0005-A	OUTSIDE FIXED DRYING ASSEMBLY				
355	1	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0006-A	INSIDE AIR MANIFOLD ASSEMBLY				
356	2	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0100-D	DRY HALO WELDMENT				
357	2	HARRY MAJOR MACHINE-UK LTD	01180-01-09-0101-D	FIXED MANIFOLD BRACKET - INNER				
358	1	HARRY MAJOR MACHINE-UK LTD	01180-01-10-0002-A	DRY STATION 7 ASSEMBLY				
359	1	HARRY MAJOR MACHINE-UK LTD	01180-01-10-0003-A	HALO ARRANGEMENT				
360	1	HARRY MAJOR MACHINE-UK LTD	01180-01-10-0004-A	INNER FIXED DRYING ASSEMBLY				
361	1	HARRY MAJOR MACHINE-UK LTD	01180-01-10-0005-A	OUTSIDE FIXED DRYING ASSEMBLY (STATION 7)				
362	3	HEPCOMOTION LTD	0-132-4040	HEPCO - 40x40 ALUMINIUM EXTRUSION				
363	30	HEPCOMOTION LTD	1-242-1002	HEPCO - M8 TEE NUT				
364	2	HEPCOMOTION LTD	761-536	GUIDE UNIT				
365	4	HEPCOMOTION LTD	AU25265L135	HEPCO - SLIMLINE CARRIAGE				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
366	5	HEPCOMOTION LTD	AU7654L300	SLIDE CARRIAGE ASSY				
367	5	HEPCOMOTION LTD	NL76P3-1256	HEPCO - GUIDE RAIL 1256 Lg				
368	2	HEPCOMOTION LTD	NL76P3-536	HEPCO - GUIDE RAIL 536 Lg				
369	4	HEPCOMOTION LTD	NS25P2-266	HEPCO - SLIDE 266 Lg				
370	8	HEPCOMOTION LTD	SDP6	HEPCO - DOWEL PIN				
371	1	HINGEROSE LTD	D3RE5AFPVDF	DOSATRON 0.5-5% DOSE RATE WATER POWERED INJECTOR. 10 TO 3000 LITRES PER HOUR FLOW RATE WATER BEING DOSED. C/W AF SEALS AND PVDF BODY				
372	1	HYDAC	RF3-1-EPTO-NP-N-1-1-0/KS100-1-2406119	HYDAC - AUTO-BACKFLUSHING FILTER 750 l/min @ 10 bar				
373	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXX	GEARED MOTOR UNIT [XXXXXXXXXX]		X		6
374		HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXX	POSITION SWITCH FOR ELEMENTS (TOP) [XXXXXXXXXX]		X		4
375		HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXX	POSITION SWITCH FOR ZERO POSITION (BOTTOM) [XXXXXXXXXX]		X		4
376		HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXX	DIFFERENTIAL PRESSURE GAUGE [XXXXXXXXXX]		X		6
377		HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXX	BACK FLUSHING VALVE [XXXXXXXXXX]		X		7
378	AS REQUIRED	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXX	ELEMENT SET INCL. SEALS [XXXXXXXXXX]		X		5
379	107	IFM	E10803	M12 SENSORY CONNECTOR	X			4
380	15	IFM	IGT203	M18 PROXIMITY SWITCH 24VDC PNP NO M12 CONNECTOR IP69K	X			4
381	2	IFM	IN5327	DOUBLE PROXIMITY SWITCH (NO CONTACT)	X			4
382	1	IFM	KI5087	M30 CAPACITIVE PROXIMITY SWITCH 24VDC PNP NO M12 CONNECTOR	X			4
383	1	IFM	PA3523	ANALOGUE PRESSURE TRANSDUCER		X		4
384	1	IFM	PN7004	PRESSURE SWITCH 0-10 BAR 2 OUTPUTS	X			4

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385	1	IGUS	B07_16_038_0_560_1	IGUS - DRAG CHAIN 28 LINKS + END FITTINGS				
386	1	KSB	Etanorm GPV - D 050-250 SP	KSB - ETANORM GPV-D050-250SP PUMP 45cu m/hr @ 9.6 bar SIEMENS MOTOR EFFI (IE2) 30KW 400V 3PH 50Hz 2 POLE. IMMERSION DEPTH ET = 504mm STANDARD COVER PLATE : 550mm x 780mm		X		10
387	1	LEE	COMPRESSION SPRING	LC045H 14M				
388	1	LEGRAND	427 90	CONTROL TRANSFORMER IP20 230-400V +/- 15V TO 115V 630VA				
389	1	LEGRAND	6421 68	CONTROL TRANSFORMER IP20 230-400V +/- 15V TO 115V 630VA				
390	2	MANGANESE BRONNZE	1208DU	GLACIER - BUSH 12/14 x 8Lg				
391	2	MANGANESE BRONNZE	1212DU	GLACIER - BUSH 12/14 x 12Lg				
392	2	MANGANESE BRONNZE	BB2512DU	GLACIER - HEADED BUSH 25/28x10Lg				
393	1	MICRONFILTER	2MC050000101	ECOTECH 3000/2HP FILTER UNIT				
394	3	MICRONFILTER	CARTRIDGE:ECOTECH 3000	CELLULOSE FILTER CARTRIDGE CERTIFICATED IFA/BGIA CLASSIFICATION "M" EFFICIENCY > 98%	X			5
395	1	MICRONFILTER	PAD:ECOTECH 3000	COALESCING PAD PRE-FILTER	X			5
396	1	MURR	85068	COMPACT POWER SUPPLY UNIT MDG 400 VAC +/- 5% /24 VDC/20 A RESIDUAL RIPPLE <2%				
397	1	MURR	4000-68000-0030000	110V US STYLE SOCKET OUTLET FOR MOUNTING IN MSDD FRAME				
398	1	MURR	4000-68000-1210000	RJ45 SINGLE SOCKET OUTLET FOR MOUNTING IN MSDD FRAME				
399	1	MURR	4000-68123-0000000	DOUBLE MOUNTING FRAME FOR 2 MURR ACCESSORY PLATES. TYPICALLY 1 US SOCKET, 1 RJ45 SOCKET				
400	1	MURR	MET 0500-240-415/110-240	CONTROL TRANSFORMER 500VA 240/415 - 110-240V				
401	1	NBC GROUP LTD	E 1100 25 01 CC LM	SLEWING RING 120T MOD 9		X		16
402	2	PARKER	XV520P XV520P-16	BRASS BALL VALVE				
403	2	PARKER	XV520P XV520P-20	BRASS BALL VALVE				
404	1	PARKER	XV520P XV520P-24	BRASS BALL VALVE				
405	1	PARKER	XV520P XV520P-32	BRASS BALL VALVE				
406	33	PNR-UK LTD	DBQ-1370-B1	1/4"BSPT MALE WASH JET, 60° FULL CONE JET, 303 STAINLESS STEEL	X			6
407	12	PNR-UK LTD	JBC-1385-B1	1/4"BSPT MALE WASH JET, 20° FLAT JET, 303 STAINLESS STEEL	X			6
408	21	PNR-UK LTD	JBK-1385-B1	1/4"BSPT MALE WASH JET, 45° FLAT JET, 303 STAINLESS STEEL	X			6

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409	12	PNR-UK LTD	JBQ-1385-B1	1/4"BSPT MALE WASH JET, 65° FLAT JET, 303 STAINLESS STEEL	X			6
410	1	RITTAL	4118.000	DRAWING POCKET FOR INSIDE OF 800 WIDE DOOR				
411	4	RITTAL	4155.000	FLOURESCENT PANEL LIGHT 110V/230V AC	X			3
412	1	RITTAL	4590.700	MOUNTING PLATE INFILL SECTION				
413	1	RITTAL	8185.235	CUBICLE SIDES 1800H X 500D				
414	1	RITTAL	8601.050	PLINTH SIDES 100H FOR 500D CUBICLE				
415	1	RITTAL	8601.600	PLINTH 100H FOR 600W X 500D CUBICLE				
416	2	RITTAL	8611.100	TS8 LOCK INSERT 7MM SQUARE				
417	2	RITTAL	8611.290					
418	1	RITTAL	8800.430	PACK OF 4 BAYING BRACKETS (CORNERS)				
419	1	RITTAL	8800.500	PACK OF 4 BAYING BRACKETS (CENTRE)				
420	1	RITTAL	8800.850	BAYING COVER FOR 2 X 500D CUBICLES				
421	1	RITTAL	3304640	WALL MOUNTING COOLING DEVICE 400 V, 50/ 460 V 60 HZ				
422	1	RITTAL	3581000	BUSBAR E-CU 57 DIMENSION: 15X5MM, 2400MM LONG				
423	1	RITTAL	SV 9340.050	BUSBAR SUPPORT BRACKET				
424	1	RITTAL	SV 9340.070	END COVER				
425	1	RITTAL	SV 9340.120	BASE TRAY L = 900				
426	1	RITTAL	SV 9340.200	COVER L = 700				
427	1	RITTAL	SV 9340.220	SUPPORT FOR BUSBAR COVER				
428	16	RITTAL	SV 9340.350	COMPONENT MOUNTING ADAPTOR 45MM WIDE				
429	3	RITTAL	SV 9342.230	BUSBAR CONNECTION ADAPTOR TOP OUTLET				
430	2	RITTAL	TS 8886.500					
431	2	SCHUNK	0362820	ROTARY ACTUATOR UNIT SRU +60-W-180-3		X		8
432	5	SIEMENS	1FK7022-5AK71-1LH3	SIEMENS - SIMOTICS S SYNCHRONOUS SERVOMOTOR,1FK7 COMPACT,0.85 Nm,100K,6000RPM,0.38kW.		X		7
433	1	SIEMENS	1FK7083-5AF71-1FG3	SIEMENS - SIMOTICS S SYNCHRONOUS SERVOMOTOR,1FK7 COMPACT		X		7
434	3	SIEMENS	3RH1921-1HA22	AUX. SWITCH BLOCK, 22, 2NO+2NC, EN 50012, 4POLE, SCREW CONNECTION, FOR MOTOR CONTACTORS SZ. S0..S3 W/O ON-OFF INDICATOR				
435	1	SIEMENS	3RH21401BB40	CONTACTOR RELAY, 4NO DC 24V, SZ S00, SCREW TERMINAL ,				
436	8	SIEMENS	3RH2911-1FC22	RELAY AUXILLARY BLOCK FOR 3RH2 RELAY. SCREW TERMINALS. 2N) + 2NC				

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437	6	SIEMENS	3RK13045KS404AA0	ET 200PRO DSE ST DIRECT STARTER STANDARD, MECH. SWITCHING, ELECTRO. UE PROTECTION, 3PH 400 V/0.9KW, 0.12A...2.00 WITHOUT BRAKE CONTACT - HAN Q4/2 - HAN Q8/0				
438	2	SIEMENS	3RK13045KS405AA0	ET 200PRO RSE ST REVERSING STARTER STANDARD, MECH. SWITCHING, ELECTRO. UE PROTECTION, 3PH 400 V/0.9KW, 0.15A...2.00A WITHOUT BRAKE CONTACT HAN Q4/2 - HAN Q8/0				
439	2	SIEMENS	3RT1035-3BB40	CONTACTOR, AC-3 18.5 KW/400 V, DC 24 V, 3-POLE, SIZE S2, SCREW CONNECTION				
440	7	SIEMENS	3RT20231BB40	CONTACTOR, AC-3, 4KW/400V, 1NO+1NC, DC 24V, 3-POLE, SZ S0 SCREW TERMINAL ,				
441	14	SIEMENS	3RT20271BB40	CONTACTOR, AC-3, 15KW/400V, 1NO+1NC, DC 24V, 3-POLE, SZ S0 SCREW TERMINAL ,				
442	1	SIEMENS	3RV1021-1GA10	SIZE S0, SCREW-TYPE CONNECTION SETTING RANGE 4.5-6.3 A				
443	1	SIEMENS	3RV20110FA10	CIRCUIT-BREAKER SZ S00, FOR MOTOR PROTECTION, CLASS 10, A-REL. 0.35...0.5A, N-RELEASE 6.5A SCREW CONNECTION,, STANDARD SW. CAPACITY				
444	1	SIEMENS	3RV20111AA10	CIRCUIT-BREAKER SZ S00, FOR MOTOR PROTECTION, CLASS 10, A-REL. 1.1...1.6A, N-RELEASE 21A, SCREW CONNECTION,, STANDARD SW. CAPACITY				
445	3	SIEMENS	3RV20111DA10	CIRCUIT-BREAKER SZ S00, FOR MOTOR PROTECTION, CLASS 10, A-REL. 2.2...3.2A, N-RELEASE 42A, SCREW CONNECTION,, STANDARD SW. CAPACITY				
446	2	SIEMENS	3RV20111EA10	CIRCUIT-BREAKER SZ S00, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 2.8...4A, N-RELEASE 52A, SCREW CONNECTION,, STANDARD SW. CAPACITY				
447	2	SIEMENS	3RV20111GA10	CIRCUIT-BREAKER SZ S00, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 4.5...6.3A, N-RELEASE 82A SCREW CONNECTION,, STANDARD SW. CAPACITY				
448	1	SIEMENS	3RV20111JA10	CIRCUIT-BREAKER SZ S00, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 7...10A, N-RELEASE 130A, SCREW CONNECTION,, STANDARD SW. CAPACITY				

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449	3	SIEMENS	3RV20214DA10	CIRCUIT-BREAKER SZ S0, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 20...25A, N-RELEASE 325A, SCREW CONNECTION,, STANDARD SW. CAPACITY,				
450	2	SIEMENS	3RV20214EA10	CIRCUIT-BREAKER SZ S0, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 27...32A, N-RELEASE 400A, SCREW CONNECTION,, STANDARD SW. CAPACITY,				
451	2	SIEMENS	3RV20214FA10	CIRCUIT-BREAKER SZ S0, FOR MOTOR PROTECTION, CLASS 10, A-RELEASE 34...40A, N-RELEASE 480A, SPRING-L. CONNECTION,, STANDARD SW. CAPACITY,				
452	18	SIEMENS	3RV29011E	TRANSVERSE AUX. SWITCH, 1NO+1NC, SCREW CONNECTION, FOR CIRCUIT-BREAKERS, SZ S00/S0 ,				
453	1	SIEMENS	3RW44251BC44	SIRIUS SOFT STARTER, VALUES WITH 400 V, 40 DEG., STANDARD: 57A, 30KW, INSIDE-DELTA CIRCUIT 3: 99A, 55KW, 200-460 V AC, 230 V AC, SCREW TERMINALS		X		6
454	1	SIEMENS	3SB3201-0AA11	WITH FLAT BUTTON, BLACK 1NO+1NC, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
455	2	SIEMENS	3SB3201-0AA21	WITH FLAT BUTTON, RED 1NO+1NC, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
456	1	SIEMENS	3SB3202-0AD11-0CC0	KEYSWITCH BLACK 1NO,, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
457	8	SIEMENS	3SB3247-0AA21	1NO+1NC, INTEGRATED LED UC 24 V, RED, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
458	1	SIEMENS	3SB3247-0AA31	1NO+1NC, INTEGRATED LED UC 24 V, YELLOW, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
459	2	SIEMENS	3SB3247-0AA41	1NO+1NC, INTEGRATED LED UC 24 V, GREEN, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
460	1	SIEMENS	3SB3247-0AA51	1NO+1NC, INTEGRATED LED UC 24 V, BLUE, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				
461	3	SIEMENS	3SB3247-0AA71	1NO+1NC, INTEGRATED LED UC 24 V, CLEAR, WITH HOLDER, SCREW-TYPE CONNECTION, NOMINAL DIAMETER 22 MM				

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462	4	SIEMENS	3SB3400-0B	ACTUATOR-/INDICATOR COMPONENT CONTACT BLOCK WITH 1 CONTACT ELEMENT SPRING TERMINAL, 1NO				
463	4	SIEMENS	3SB3611-1TA20-0CC0	LATCHING RED, 1NO+1NC WITH HOLDER METAL SPRING TERMINALS				
464	1	SIEMENS	3VL2706-1DC33-OA	SETTING RANGE 50-63 A REQUIRES HANDLE AND SHROUDS				
465	1	SIEMENS	3VL3720-1DC36-0AA0	SETTING RANGE 160-200 A REQUIRES HANDLE AND SHROUDS				
466	1	SIEMENS	3VL9 300-3HG05	FRONT MOUNTING HANDLE FOR 3VL16-250 MCCB, RED				
467	13	SIEMENS	5ST3010	AUXILIARY SWITCH MOUNT. 1NO+1NC, F. LS-SWITCH T=70MM				
468	2	SIEMENS	5SX2 106-7					
469	13	SIEMENS	5SY4106-7	CIRCUIT BREAKER 230/400V 10KA, 1-POLE, C, 6A, D=70MM				
470	1	SIEMENS	6AV6644-0AA01-2AX0	SIEMENS HMI 12" TOUCH, NO BUTTONS, PN + DP				
471	1	SIEMENS	6AV6645-0CB01-0AX0	SIMATIC MOBILE PANEL 277 WITH INTEGRATED ENABLING BUTTON AND STOP BUTTON, CONFIGURABLE WITH WINCC FLEXIBLE STANDARD VERSION 2005 SP1 AND HIGHER				
472	3	SIEMENS	6AV6671-5AE00-0AX0	CONNECTIVITY BOX DP BASIC		X		6
473	1	SIEMENS	6EP1961-3BA00	24VDC BFFER MODULE		X		6
474	5	SIEMENS	6ES7141-4BF00-0AB0	SIMATIC DP, ELECTRONIC MODULE FOR ET 200PRO, 8 DI, DC 24V HIGH FEATURE, CHANNEL DIAGNOSTICS; SHORT CIRCUIT AND WIRE BREAK; INCLUSIVE BUS MODULE CONNECTING MODULE IO 6ES7194-4..00-0AA0 MUST BE ORDERED SEPERATELY				
475	5	SIEMENS	6ES7141-6BH00-0AB0	SIMATIC DP, ET 200ECO PN, 16 DI, 24V DC, 8 X M12, DOUBLE-ASSIGNMENT, DEGREE OF PROTECTION IP67		X		6
476	2	SIEMENS	6ES7142-6BF50-0AB0	SIMATIC DP, ET 200ECO PN, 8 DO, 24V DC/0,5A, 4 X M12, DOUBLE-ASSIGNMENT, 1 LOAD VOLTAGE SUPPLY DO, DEGREE OF PROTECTION IP67		X		6
477	1	SIEMENS	6ES7144-6KD00-0AB0	SIMATIC DP, ET 200ECO PN, 8 AI (4 U/I + 4 RTD/TC), 8 X M12, DEGREE OF PROTECTION IP67		X		6

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478	3	SIEMENS	6ES7154-4AB10-0AB0	SIMATIC DP, PROFINET INTERFACE MODULE IM154-4 PN HIGH FEATURE FOR ET 200PRO, INTEGRATED SWITCH, INCLUSIVE TERMINATING MODULE CONNECTING MODULE IM PN 6ES7194-4A.00-0AA0 MUST BE ORDERED SEPARATELY				
479	3	SIEMENS	6ES7194-4AJ00-0AA0	ET200 PRO CONNECTION MODULE. PN2, 24V SUPPLY IN AMD OUT				
480	1	SIEMENS	6ES7315-2FJ14-0AB0	CPU 315F-PN/DP APPROVED FOR JLR POWER SUPPLY DC 24 V MICRO MEMORY CARD REQUIRED COMPATIBLE FITH HF ET200PRO INTERFACE MODULE				
481	5	SIEMENS	6ES7321-1BH02-0AA0	ELECTRICALLY ISOLATED 16 DI, DC 24 V 20-POLE				
482	3	SIEMENS	6ES7322-1BH01-0AA0	ELECTRICALLY ISOLATED, 16 DO, DC 24 V, 0,5 A 20-POLE				
483	1	SIEMENS	6ES7326-1BK02-0AB0	SIMATIC S7, DIGITAL INPUT SM 326, F-DI 24 X DC 24V, FAILSAFE DIGITAL INPUTS FOR SIMATIC S7 FAILSAFE SYSTEMS WITH DIAGNOST. INTERRUPT, 1 X 40 PIN				
484	1	SIEMENS	6ES7326-2BF10-0AB0	SIMATIC S7, DIGITAL OUTPUT SM326, F-DO10 X DC24V/2A PP, FAILSAFE DIGITAL OUTPUT FOR SIMATIC S7F SYSTEMS WITH DIAGNOST. INTERRUPT, LVV, 1 X 40 PIN				
485	1	SIEMENS	6ES7365-0BA01-0AA0	SIMATIC S7-300, INTERFACE MODULE IM365 FOR CONNECTING AN EXPANSION RACK, W/O K-BUS, 2 MODULES + CONNECTING CABLE 1M				
486	2	SIEMENS	6ES7390-1AE80-0AA0	L=480 MM				
487	8	SIEMENS	6ES7-392-1AJ00-0AA0	WIRING ARM 20 PIN SREW TERMINALS FOR 16PT I/O CARD				
488	2	SIEMENS	6ES7-392-1AM00-0AA0	WIRING ARM 40 PIN SREW TERMINALS FOR SAFE INPUT/OUTPUT CARD				
489	1	SIEMENS	6ES7953-8LJ11-0AA0	MEMORY CARD FOR S7-300 CPU 0.5MB				
490	2	SIEMENS	6GK5005-0BA00-1AA3	5 PORT SWITCH		X		6
491	2	SIEMENS	6GK5005-0BA00-1AB2	5 PORT SWITCH		X		6
492	1	SIEMENS	6SL3000-0CE21-0AA0	SIEMENS S120 LINE CHOKE				
493	1	SIEMENS	6SL3000-0HE21-0AA0	SIEMENS S120 EMC FILTER				
494	2	SIEMENS	6SL3040-1MA01-0AA0	S120 CONTROL UNIT CU320-PN WITHOUT COMPACTFLASH CARD				
495	1	SIEMENS	6SL3120-1TE13-0AA3	SIEMENS S120 BOOKSIZE SINGLE MOTOR MODULE 3A				
496	2	SIEMENS	6SL3120-1TE21-0AA3	SIEMENS S120 BOOKSIZE SINGLE MOTOR MODULE 9A				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
497	1	SIEMENS	6SL3120-1TE21-8AA3	SIEMENS S120 BOOKSIZE SINGLE MOTOR MODULE 18A				
498	3	SIEMENS	6SL3120-2TE13-0AA3	SIEMENS S120 BOOKSIZE DOUBLE MOTOR MODULE 3A				
499	1	SIEMENS	6SL3130-6AE21-0AB0	SIEMENS S120 SMARTINE INFEED MODULE 10KW				
500	1	SIEMENS	RT1044-3BB40	CONTACTOR, AC-3 30 KW/400 V, DC 24 V, 3-POLE, SIZE S3, SCREW CONNECTION				
501	5	SIEMENS	SSE6400-4BD11-0AA0	BRAKING RESISTOR S120FSA 400V, 1.5KW INV MAX., 100W CONT., 2KW 5%DUTY 3900OHMS		X		6
502	4	SKF	6004-2RS	DEEP GROOVE BALL BEARING				
503	16	SOUTHCO	A2-10-501-21(Latch)	A2-10-501-21 LATCH - SOUTHCO				
504	1	SUPARATOR	862404003	STANDARD SUPARATOR UNIT 86/240/008 240LITRE UNIT WITH INTEGRATED SUPARATOR DEVICE, AISI 304				
505	1	SUPARATOR	910005010	91/001FHS500: HOSE SET : 1" x 500mm	X			8
506	1	SUPARATOR	11PTC2001	11/PTC-001 RUN-DRY PROTECTION PT-100 SENSOR		X		8
507	1	SUPARATOR	2116L3004	21/16L/VSA : ES PUMP, 450-1100 LITRES/HOUR NBR STATOR (EXCL. TSE) , CHROME HARDENED ROTOR, GLAND PACKING 400v / 3PH / 50HZ 0.55KW		X		8
508	1	SUPARATOR	912X504105	91/2x50/304F: 1" FLOATING SKIMMER				

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
1	1	BRINKMAN	SFL650/570+001	VERTICAL TNK MOUNTED QUICK SUCTIONING IMMERSION PUMP 400 LITRES/MIN AT 8 METRES HEAD. 2.2KW MOTOR ~ 400V/3PH/50HZ SUPPLY		X		7
2	1	DRIVELINES LTD	SWG 1500B6052V2-AF060-32	ZF RIGHT ANGLED WORMWHEEL GEARBOX		X		8
3	3	EMKA	1011-42	EMKA - SEAL	X			3
4	6	EMKA	1011-45	EMKA - SEAL	X			3
5	6	EUCHNER	CET3-AR-CRA-AH-50X-SG-C2333-114512	2 CHANNEL SOLID STATE SAFETY SWITCH, TRANSPONDER TYPE. SUITABLE FOR DAISY-CHAINING. NOT PROFISAFE. WITH LOCKING - ENERGISE TO UNLOCK		X		6
6	3	EXHEAT	HBV15/27/AS	SCREWED IMMERSION HEATER 15KW ~ 415V-3-50HZ 2.25" BSP STAINLESS STEEL MOUNTING IP66 RATED + THERMOSTAT RANGE +5/+80C		X		5
7	2	FANS AND BLOWERS	268Q	CENTRIFUGAL FAN MODEL 268QZ : HANDING : R90 DUTY: 2250CFM @ 34"WG FITTED WITH SIEMENS 160L MOTOR : IE2 :IP55 400V 3PH 50HZ DRIVE ARRANGEMENT : No.4 DIRECT DRIVE SPECIAL : 8mm THICK FAN CASE AND FITTED WITH INLET SILENCER (TYPE B)		X		10
8	2	FESTO	163302	PNEUMATIC CYLINDER : 32 BORE x 80 STROKE FITTED WITH ROD LOCK DNC-32-80-PPV-A-KP		X		3
9	1	FESTO	163334	PNEUMATIC CYLINDER : 40 BORE x 525 STROKE FITTED WITH ROD LOCK DNC-40-525-PPV-A-KP		X		3
10	2	FESTO	163366	PNEUMATIC CYLINDER : 50 BORE x 525 STROKE FITTED WITH ROD LOCK DNC-50-525-PPV-A-KP		X		3
11	1	FESTO	163398	PNEUMATIC CYLINDER : 63 BORE x 70 STROKE FITTED WITH ROD LOCK DNC-63-70-PPV-A-KP		X		3
12	1	FESTO	163494	PNEUMATIC CYLINDER : 125 BORE x 200 STROKE FITTED WITH ROD LOCK DNC-125-200-PPV-A-KP		X		3
13	2	FESTO	1132953	ROLLOVER PARALLEL GRIPPER (SPRING SHUT POWERED OFF) HGPD-50-A-G2		X		5
14	4	FESTO	SMT8FPS24V-K03-M12	CYLINDER SENOR M12 ON SHORT FLYING LEAD	X			4

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
15	40	HARRY MAJOR MACHINE-UK LTD	6257	HMM STANDARD 2" FISHTAIL NOZZLE	X			5
16	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0137-D	SPUR GEAR 72T		X		10
17	2	HARRY MAJOR MACHINE-UK LTD	01175-01-08-0138-D	SPUR GEAR 48T		X		10
18	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0105-D	REST PAD			X	6
19	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0106-D	REST PAD PACKER	X			4
20	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0107-D	REST PAD SHIM	X			4
21	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0108-D	SIDEGUIDE			X	6
22	28	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0109-D	SIDE GUIDE SPACER	X			4
23	14	HARRY MAJOR MACHINE-UK LTD	01180-01-04-0113-D	CENTRE LOCATOR			X	6
24	4	HARRY MAJOR MACHINE-UK LTD	01180-01-08-0103-D	ROLLOVER PIN			X	6
25	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXXXX	GEARED MOTOR UNIT [XXXXXXXXXX]		X		6
26	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXXXX	POSITION SWITCH FOR ELEMENTS (TOP) [XXXXXXXXXX]		X		4
27	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXXXX	POSITION SWITCH FOR ZERO POSITION (BOTTOM) [XXXXXXXXXX]		X		4
28	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXXXX	DIFFERENTIAL PRESSURE GAUGE [XXXXXXXXXX]		X		6
29	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXXXX	BACK FLUSHING VALVE [XXXXXXXXXX]		X		7
30	1	HYDAC	SEE PAGE 55 HYDAC MANUAL FOR INSTRUCTIONS ON TEXT XXXXXXXXXXXX	ELEMENT SET INCL. SEALS [XXXXXXXXXX]		X		5
31	107	IFM	E10803	M12 SENSORY CONNECTOR	X			4
32	15	IFM	IGT203	M18 PROXIMITY SWITCH 24VDC PNP NO M12 CONNECTOR IP69K	X			4
33	2	IFM	IN5327	DOUBLE PROXIMITY SWITCH (NO CONTACT)	X			4
34	1	IFM	KI5087	M30 CAPACITIVE PROXIMITY SWITCH 24VDC PNP NO M12 CONNECTOR	X			4
35	1	IFM	PA3523	ANALOGUE PRESSURE TRANSDUCER		X		4
36	1	IFM	PN7004	PRESSURE SWITCH 0-10 BAR 2 OUTPUTS	X			4

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
37	1	KSB	Etanorm GPV - D 050-250 SP	KSB - ETANORM GPV-D050-250SP PUMP 45cu m/hr @ 9.6 bar SIEMENS MOTOR EFFI (IE2) 30KW 400V 3PH 50Hz 2 POLE. IMMERSION DEPTH ET = 504mm STANDARD COVER PLATE : 550mm x 780mm		X		10
38	3	MICRONFILTER	CARTRIDGE:ECOTECH 3000	CELLULOSE FILTER CARTRIDGE CERTIFICATED IFA/BGIA CLASSIFICATION "M" EFFICIENCY > 98%	X			5
39	1	MICRONFILTER	PAD:ECOTECH 3000	COALESCING PAD PRE-FILTER	X			5
40	1	NBC GROUP LTD	E 1100 25 01 CC LM	SLEWING RING 120T MOD 9		X		16
41	33	PNR-UK LTD	DBQ-1370-B1	1/4"BSPT MALE WASH JET, 60° FULL CONE JET, 303 STAINLESS STEEL	X			6
42	12	PNR-UK LTD	JBC-1385-B1	1/4"BSPT MALE WASH JET, 20° FLAT JET, 303 STAINLESS STEEL	X			6
43	21	PNR-UK LTD	JBM-1385-B1	1/4"BSPT MALE WASH JET, 45° FLAT JET, 303 STAINLESS STEEL	X			6
44	12	PNR-UK LTD	JBQ-1385-B1	1/4"BSPT MALE WASH JET, 65° FLAT JET, 303 STAINLESS STEEL	X			6
45	4	RITTAL	4155.000	FLOURESCENT PANEL LIGHT 110V/230V AC	X			3
46	2	SCHUNK	0362820	ROTARY ACTUATOR UNIT SRU +60-W-180-3		X		8
47	5	SIEMENS	1FK7022-5AK71-1LH3	SIEMENS - SIMOTICS S SYNCHRONOUS SERVOMOTOR,1FK7 COMPACT,0.85 Nm,100K,6000RPM,0.38kW.		X		7
48	1	SIEMENS	1FK7083-5AF71-1FG3	SIEMENS - SIMOTICS S SYNCHRONOUS SERVOMOTOR,1FK7 COMPACT		X		7
49	1	SIEMENS	3RW44251BC44	SIRIUS SOFT STARTER, VALUES WITH 400 V, 40 DEG., STANDARD: 57A, 30KW, INSIDE-DELTA CIRCUIT 3: 99A, 55KW, 200-460 V AC, 230 V AC, SCREW TERMINALS		X		6
50	3	SIEMENS	6AV6671-5AE00-0AX0	CONNECTIVITY BOX DP BASIC		X		6
51	1	SIEMENS	6EP1961-3BA00	24VDC BFFER MODULE		X		6
52	5	SIEMENS	6ES7141-6BH00-0AB0	SIMATIC DP, ET 200ECO PN, 16 DI, 24V DC, 8 X M12, DOUBLE-ASSIGNEMENT, DEGREE OF PROTECTION IP67		X		6
53	2	SIEMENS	6ES7142-6BF50-0AB0	SIMATIC DP, ET 200ECO PN, 8 DO, 24V DC/0.5A, 4 X M12, DOUBLE-ASSIGNEMENT, 1 LOAD VOLTAGE SUPPLY DO, DEGREE OF PROTECTION IP67		X		6
54	1	SIEMENS	6ES7144-6KD00-0AB0	SIMATIC DP, ET 200ECO PN, 8 AI (4 U/I + 4 RTD/TC), 8 X M12, DEGREE OF PROTECTION IP67		X		6

ITEM No.	QUANTITY	MANUFACTURER	ASSEMBLY/PART NUMBER	DESCRIPTION	REQUIRED FOR PM	LONG LEAD CRITICAL ITEMS	PART TOUCHING	LEAD TIME (WEEKS)
55	2	SIEMENS	6GK5005-0BA00-1AA3	5 PORT SWITCH		X		6
56	2	SIEMENS	6GK5005-0BA00-1AB2	5 PORT SWITCH		X		6
57	5	SIEMENS	SSE6400-4BD11-0AA0	BRAKING RESISTOR S120FSA 400V, 1.5KW INV MAX., 100W CONT., 2KW 5%DUTY 3900OHMS		X		6
58	1	SUPARATOR	910005010	91/001FHS500: HOSE SET : 1" x 500mm	X			8
59	1	SUPARATOR	11PTC2001	11/PTC-001 RUN-DRY PROTECTION PT-100 SENSOR		X		8
60	1	SUPARATOR	2116L3004	21/16L/VSA : ES PUMP, 450-1100 LITRES/HOUR NBR STATOR (EXCL. TSE) , CHROME HARDENED ROTOR, GLAND PACKING 400v / 3PH / 50HZ 0.55KW		X		8

Section 9 - Drawing Numbers

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9.1 1180 Drawing Numbers (EMC1-00136)

Description	HMM Number	JLR Number
SITE PLAN	01180-01-01-0001	M1-ML-0002055
MACHINE GENERAL ARRANGEMENT	01180-01-02-0002	M1-DS-0002041-001
TRANSFER UNIT	01180-01-03-0001	M1-FX-0002093-001
WASH/DRY FIXTURE	01180-01-04-0001	M1-DS-0002094-001
WASH STATION	01180-01-05-0002	M1-DS-0002045-001
DRYING STATION #1	01180-01-08-0002	M1-DS-0002049-001
DRYING STATION #2	01180-01-09-0002	M1-DS-0002051-001
PNEUMATIC DRAWING	01180-01-12-0001	M1-PN-0002031
ELECTRICAL DRAWING	01180-01-14-0001	M1-EL-0002021

Section 10 - Glossary of Terms and Acronyms

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10.1 Glossary of Terms

A/R	As Required
ASRS	Automatic Storage and Retrieval System
ECPL	Energy Control and Power Lockout
ECSPMT	Energy Control for Setup and Permitted Minor Tasks
FMEA	Failure Mode and Effects Analysis
HMI	Human Machine Interface
LOTO	Lock-Out Tag-Out
MFMEA	Machine Failure Mode and Effects Analysis
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair / Replace
N/A	Not Applicable
NB	Nominal Bore
OEE	Overall Equipment Effectiveness
PLC	Programmable Logic Controller
PM	Preventive Maintenance
QPS	Quality Process System
R&M	Reliability and Maintainability
SGA	Small Group Activities
TEM	Total Equipment Management

Section 11 - Appendices

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11.1 Appendix 1 - Manufacturers Information

NOTE: Where possible, pdf files have been included separately on the CD with the manual.
Where the files are not available in pdf format they have either been scanned in and placed on the CD, or paper copies inserted in the hard copy manual.

The following manufacturers literature is included in this section

- **GUDEL**
- **HYDAC**
- **MICRONFILTER**

Section 12 - Task Certification Lists

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12.1 Task Certification List for Operator Training

Name: _____

Job Classification: _____

Machine: _____

Date: _____

The instructor/trainer is responsible for verifying that the trainee demonstrated proficiency on the following items and certifying that the trainee can correctly perform each task.

Machine/Equipment

System: _____

Vendor: _____

Operation # _____

Number of Stations: _____

The following checklist must be completed to ensure that all personnel assigned to operate, set-up, troubleshoot and maintain systems are properly trained:

	Tasks	Section Reference for Procedures *	Trainee Initials	Instructor Initials	Date
1.	Explain safety elements.	2			
2.	Demonstrate safety lockout procedures.	2.2.2			
3.	Explain using control elements.	4			
4.	Demonstrate correct procedure for starting machine from rest (no power) position.	4.2			
5.	Describe how to adjust a misloaded component.	4.1			
6.	Run machine in manual mode.	4.3			
7.	Run machine in automatic mode.	4.2			
8.	Restart machine after stopping mid cycle.	4			
9.	Demonstrate how to perform preventive maintenance procedures.	5			

	Tasks	Reference for Procedures *	Trainee Initials	Instructor Initials	Date
10.	Demonstrate the Emergency Stop Procedure.	2			
11.	Identify all shutoff and safety devices.	2			
12.	Demonstrate Power-down and Shutdown procedure.	4			

* Refer to the appropriate section in the HMM Operation and Maintenance Manual.

Signature of Trainee: _____

Date: _____

Signature of Instructor: _____

Date: _____

Signature of Launch Training Coordinator: _____

Date: _____

12.2 Task Certification List for Mechanical Training

Name: _____

Job Classification: _____

Machine: _____

Date: _____

The instructor/trainer is responsible for verifying that the trainee demonstrated proficiency on the following items and certifying that the trainee can correctly perform each task.

Machine/Equipment

System: _____

Vendor: _____

Operation # _____

Number of Stations: _____

The following checklist must be completed to ensure that all personnel assigned to operate, set-up, troubleshoot and maintain systems are properly trained:

	Tasks	Reference for Procedures *	Trainee Initials	Instructor Initials	Date
1.	Equipment description and machine functions.	3			
2.	Preventive maintenance schedule.	5			
3.	General maintenance tasks.	6			
4.	Unscheduled maintenance tasks.	6			

12.3 Task Certification List for Electrician Training

Name: _____

Job Classification: _____

Machine: _____

Date: _____

The instructor/trainer is responsible for verifying that the trainee demonstrated proficiency on the following items and certifying that the trainee can correctly perform each task.

Machine/Equipment

System: _____

Vendor: _____

Operation _____

Number of Stations: _____

The following checklist must be completed to ensure that all personnel assigned to operate, set-up, troubleshoot and maintain systems are properly trained:

	Tasks	Reference for Procedures *	Trainee Initials	Instructor Initials	Date
1.	Explain safety elements.	2			
2.	Demonstrate safety lockout procedures.	2.2.2			
3.	Explain using control elements.	4			
4.	Demonstrate correct procedure for starting machine from rest (no power) position.	4.1			
5.	Describe how to adjust a misloaded component.	4.1			
6.	Run machine in manual mode.	4.2			
7.	Run machine in automatic mode.	4.1.1			
8.	Restart machine after stopping mid cycle.	4			
9.	Demonstrate how to perform preventive maintenance procedures.	5			

	Tasks	Reference for Procedures *	Trainee Initials	Instructor Initials	Date
10.	Demonstrate the Emergency Stop Procedure.	2			
11.	Identify all shutoff and safety devices.	2			
12.	Demonstrate Power-down and Shutdown procedure.	4			