PRODUCT AND MAINTENANCE MANUAL
SA350 SEMI-AUTOMATIC SAW

YOUR NORTH AMERICAN BROBO WALDOWN DISTRIBUTOR IS:
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- Metal Cutting Saws
TECHNICAL SPECIFICATION

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TECHNICAL SPECIFICATION

STANDARD BLADE SIZES

<table>
<thead>
<tr>
<th>Outer Diameter (Ø mm)</th>
<th>Thickness (mm)</th>
<th>Bore Size (mm)</th>
<th>Number of Teeth</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>2.0</td>
<td>32</td>
<td>140</td>
</tr>
<tr>
<td>300</td>
<td>2.5</td>
<td>40</td>
<td>160</td>
</tr>
<tr>
<td>350 *</td>
<td>2.5</td>
<td>40</td>
<td>180</td>
</tr>
<tr>
<td>400</td>
<td>3.0</td>
<td>40</td>
<td>200</td>
</tr>
</tbody>
</table>

TABLE 1. Standard Blade Sizes

Blade Type: High-Speed Steel (HSS) 180 Tooth Blade (Ø 350mm x 40mm Bore)

Pin Holes (Qty x Ø x PCD): 2 x 8mm x 55mm

MOTOR SPECIFICATIONS/BLADE RPM

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Phase</th>
<th>Voltage</th>
<th>RPM</th>
<th>Kilowatt (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50Hz Power Supply</td>
<td>3</td>
<td>415</td>
<td>1400/2800</td>
<td>1.5/2.2</td>
</tr>
<tr>
<td>50Hz Power Supply</td>
<td>3</td>
<td>415</td>
<td>2800</td>
<td>2.2</td>
</tr>
<tr>
<td>60Hz Power Supply</td>
<td>1</td>
<td>220/440</td>
<td>3400</td>
<td>2.2</td>
</tr>
<tr>
<td>50Hz Power Supply</td>
<td>1</td>
<td>220</td>
<td>2800</td>
<td>1.5</td>
</tr>
</tbody>
</table>

TABLE 2. Motor Specifications/Blade RPM

Spindle Speed: Dual Speed Selection (21/42 RPMs)

Worm-Gear Drive Ratio (300/315/350/400): 1:33 reduction

Average Cutting Speeds (Full-Size Blade): 4780 m/min (15700 ft/min)

VICE CLAMP

Air Requirements: Dry, filtered, lubricated air supply

Air Consumption: 1/6 Litre per cycle per vice-cylinder

Vice Clamp Working Pressure: 600kPa (6 Bar = 87psi)

Maximum Pressure: 1000kPa (10 Bar = 145 psi)

Vice Clamp Range: 0 - 135 mm

Pneumatic Stroke: 10mm

Clamping Force: 1620 N / 1 Bar air pressure (365 lb force). At 600 kPa, Clamping force = 9720 N

= 991 kg force

= 2185 lb force

DIMENSIONAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Base Dimensions (L x W):</th>
<th>560 x 530 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Working Height:</td>
<td>968 mm</td>
</tr>
<tr>
<td>Total Weight (Packed):</td>
<td>155kg</td>
</tr>
<tr>
<td>Cross Sectional Profile</td>
<td>Angle</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>90°</td>
</tr>
<tr>
<td></td>
<td>45°</td>
</tr>
<tr>
<td>■</td>
<td>90°</td>
</tr>
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<td>45°</td>
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<td>90°</td>
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<tr>
<td>■■</td>
<td>45°</td>
</tr>
<tr>
<td>■■■</td>
<td>90°</td>
</tr>
</tbody>
</table>

TABLE 3. Cutting Range
CHAPTER 1 - Installation of the Machine

1.1 Unpacking and Handling the Machine

**WARNING – HEAD HEAVY MACHINE**

*The semi-automatic saw is heaviest where the saw head is fitted and as such, care must be taken while relocating or moving the machine.*

Upon receiving the *Brobo Waldown SA350 Semi-Automatic Saw*, the machine should be standing upright and positioned centrally on top of a wooden pallet. While the machine is situated on the pallet, position the forklift arms under the pallet between the runners, keeping in mind that the machine is *head heavy*. Move the entire unit to an accessible area as close as possible to the final location.

Carefully remove the wooden frame surrounding the saw unit (Figure 1). Once completed, proceed by elevating the machine away from the pallet base using a sling harness wrapped around the cutting head of the semi-automatic saw. Ensure that the floor is as level as possible before finally positioning the machine to the desired location.

*PLEASE OBSERVE AND FOLLOW THE INSTALLATION INSTRUCTIONS ON PAGE 2*
1.2 Parts Checklist

Along with the semi-automatic saw unit, check that the following accessories, packed "loose", are included as follows:

A. STANDARD ACCESSORIES
   i. 1 x Saw Blade (as specified on page )
   ii. 1 x Operating Handle
   iii. 1 x Service Kit (Hexagon wrenches 5", 10", 14", 3/8")
   iv. 1 x Operating Manual

B. OPTIONAL ACCESSORIES
   i. 1 x Stock Support
   ii. 2 x Hexagonal Head Screws (M10 x 25mm) with Washers for Stock Support
   iii. 1 x Roller
   iv. 1 x Length Stop Bar
   v. 1 x Length Stop
   vi. 1 x Spare Mechanical/Pneumatic Vice
   vii. 1 x Additional Blade(s) - Custom to Client Requirements
   viii. 1 x Coolant Tank Unit Assembly (Part No. 9601150)
   ix. 1 x Fabricated Sheet Metal Stand or Angle Iron Stand

1.3 Minimum Requirements

For the machine to function correctly, the room in which the semi-automatic saw is to be installed must be in the vicinity of, and satisfy the following conditions:

- **240VAC Power Supply**
- **Working Pressure** - Not less than 600kPa (6 Bar) and no greater than 900kPa (9 Bar)
- **Ambient Temperature** - From -10 to +50 degrees C.
- **Relative Humidity**: Not more than 90%.
- **Lighting**: More than 500 LUX.

**WARNING – OPERATING VOLTAGE VARIATION**

The semi-automatic saw has an inbuilt safety system to protect it against voltage variations. However, for the machine to operate efficiently, ensure that the inverter saw operates within ±10% limits of the recommended voltage of the motor.

1.4 Anchoring the Saw

Prior to anchoring the saw unit, take into considerations the requirements mentioned in Section 1.3 and Section 2.2, and other aspects regarding the usage of the machine such as accessibility to cut parts and safe access for the operator.

The base of fabricated stand, in which the inverter saw rests on, is anchored to the floor by 4 x M12 bolts provided. For added stability, it is strongly recommended that the machine stand be fastened to the floor by using loxins (not provided). When positioning and fastening the semi-auto unit, please refer to the hole locations shown in Figure 2.
1.5 **Connection to Compressed Air Supply**

To ensure the ideal operation and long service life, it is recommended that the semi-auto saw is connected to a compressed air system with similar characteristics shown in *Figure 3* below.

### LEGEND

1 - Down Pipe  
2 - Condensate Collector  
3 - Drain Cock  
4 - Air Filter  
5 - Drain Cock  
6 - Connecting Hose

*Figure 3. Ideal Air Supply Connection*
1.6 **Connection to Power Source**

Before connecting the machine to the power supply, check that the socket is not connected in series with other machines. SA 350 runs off of single-phase mains power. To connect the machine to the power supply, proceed as follows:

1) Insert the power plug into the socket, while ensuring that the mains voltage is compatible for which the inverter saw is operating at.

2) Inspect that the power switch on the main control unit is closed and turned 90° counter-clockwise to "ON", as shown in *Figure 5* below.

3) Make sure that the saw is NOT currently in an emergency condition, whereby the *EMERGENCY STOP* button is depressed. If so, twist the red mushroom button until it is released and returned to neutral state.

4) Check that the motor is operating in the *correct* direction, that is the blade is rotating downwards and into the direction of the vice clamps.

5) If all of the above procedures have been carried out correctly, the blade and the feed motors should now be operational.

The *Brobo Waldown SA350 Semi-Automatic Saw* is now ready for use. *Chapter 3* provides a detailed description of the various functional features of the inverter saw and its operating cycles. In addition, *Chapter 3* provides instructions on semi-automatic cutting using the saw.
CHAPTER 2 - Safety and Accident Prevention

The Brobo Waldown SA350 Semi-Automatic Saw has been designed and manufactured in accordance to Australian Standards. It is HIGHLY RECOMMENDED that the instructions and warnings contained in this chapter be carefully followed for correct usage of the machine.

2.1 Operation of the Machine

The Brobo Waldown SA350 Semi-Automatic Saw is designed to cut ferrous and non-ferrous metal cross sections with solid or thin-walled profiles. Other types of material and machining are not compatible for use with the specifications of the saw. This machine involves a high-speed blade rotation; therefore extreme caution is required when operating the device.

The employer is responsible for instructing the personnel who, in turn, are obliged to inform the operator of any accident risks, safety devices, noise emission and accident prevention regulations provided for by national and international laws governing the use of the machine. The operator must be perfectly aware of the position and functions of all the machine’s controls.

All those concerned must strictly adhere to ALL instructions, warnings and accident prevention standards in this manual.

The following definitions are those provided for by the EEC DIRECTIVE ON MACHINERY No. 98/37/CE:

- Danger Zone - any zone in and/or around a machine in which the presence of a person constitutes a risk for the safety and health of that person.
- Person Exposed - any person finding himself or herself, either completely or partly in a danger zone.
- Operator - the person or persons given the responsibility of installing, operating, adjusting, maintaining, cleaning, repairing, and transporting the machine.

WARNING – UNAUTHORISED MODIFICATIONS/REPLACEMENTS/USE

The manufacturer declines any responsibility whatsoever, either civil or criminal, in the case of unauthorised interference or replacement of one or more parts or assemblies on the machine, or if accessories, tools and consumable materials are used that are different from those recommended by the manufacturer himself or if the machine is inserted in a plant system and its proper function is altered.

2.1.1 Noise Level

The noise level of an idling inverter saw, fitted with a 180-tooth blade (as supplied by Brobo Waldown) has been measured to be below 85 dBA. This complies with the Australian Occupational Health and Safety (Noise) Regulations 1992.

Please note that peak impulse noise levels will be experienced due to variables including blade characteristics, type, and condition. This will also vary accordingly depending on the size and type of sample being cut. Under these circumstances, management should make available to the operator(s) the appropriate hearing protection equipment as prescribed under the above stated act.
2.1.2 **Power Supply**

The 240V AC power supply requirements for this machine are of a high level and unauthorised interference and or inadequate maintenance could result in a situation that could put the operator at risk. A *qualified* electrical engineer should be assigned to maintain and repair the system.

2.1.3 **Compressed Air Supply**

Various functions of the inverter saw are carried out via the use of 6kPa compressed air. During these operations, situations would arise where machine parts and materials are clamped together and would potentially pose a serious safety issue to an inexperienced operator. Operators should be thoroughly instructed about these hazards. *Only a qualified electrician should carry out regular maintenance of this system.*

2.2 **General Requirements**

**Lighting**

Insufficient lighting during the operation of the saw unit would constitute a safety hazard for the people concerned. For this reason, the user of the machine must provide adequate lighting in the working area to eliminate areas in shadow, whilst also preventing dazzling illumination sources (reference standard *ISO 8995 - 2002 'Lighting of Indoor Workplaces’*).

**Connections**

Check that the power supply cables, compressed air supply and coolant system complies with, and are operating within the acceptable range of the saw capabilities. *Faulty, damaged or worn components must be replaced immediately.*

**Earthing Systems**

The installation of the earthing system must comply with the requirements stated in the *IEC Standards Part 195: Earthing and Protection Against Electric Shocks 1998.*

**Position of the Operator**

The user controlling the inverter saw operations must be positioned as shown in the diagram below.

![Figure 6. Correct Position for Operating Saw Unit](image)
2.3 **Advice for the Operator**

**Protective eyewear or goggles must be worn at all times** while attending and operating the semi-automatic saw.

**Do not attempt to operate the machine unless all safety guards are in operation.** The guard must fully cover the blade when the head is in the uppermost position.

**Ensure that hands and arms are kept clear of the cutting zone when the machine is operating.**

**Do not wear oversize clothing** with long sleeves and oversize gloves, bracelets, necklaces or any other loose object that may become entangled in the machine’s blade during cutting. Long hair must be tied back or placed in a hair net.

**Always disconnect the power supply to the machine before carrying out any maintenance work or adjustments.** This includes cases of abnormal operations of the machine.

**Any maintenance work performed on the hydraulic, pneumatic or coolant systems must be carried out only after the pressure in the system has been released.**

The operator **MUST NOT** conduct any risky operations or those not required for the cutting in course (eg. remove swarf shavings from the machine while cutting). **Never move the semi-auto saw while the machine is operating.**

**Always keep the workplace area as clean as possible.** Remove equipment, tools or any other objects from the cutting zone.

**Support the work piece on both sides of the machine** to prevent it falling or jamming during the cutting cycle.

**Ensure that the specimen being cut is secured firmly in the vice clamps and the machine has been correctly set.** Figure 7 show some examples on how to correctly clamp different specimen profiles. Before commencing the cut, be sure the vice(s) are securely clamped and the machine set-up is correct.
Do not use cutting blades of different sizes to those recommended to the machine’s specifications. Always follow safe practices and inspection procedures when installing blades (Please refer to section 5.1 Changing the Blade).

When cutting very small specimens, ensure that the workpiece is not dragged behind the back fence support, where it could get lodged behind the blade.

If the blade jams during a cut, press the emergency stop push button immediately. Do not continue forcing the blade through. This could damage the blade, the specimen or be a cause for potential injury to the operator.

Always turn off the machine before carrying out any repair work. Consult the Brobo Waldown Engineering Department in the country in which the machine was initially purchased.

2.4 Machine Safety Devices

This product and maintenance manual is a guide for safe and correct usage, operation and maintenance of the saw. The following standards listed in section 2.4.1, which are applicable to the Brobo Waldown SA350 Semi-Automatic Saw, are those specified by the EEC Committee that governs safety of machinery, health and safety at work, personal protection and safeguarding of the work environment. In addition, the saw also complies with the Australian Standards regarding the safeguarding and general requirements for electrical equipment.

2.4.1 Reference Standards

MACHINE SAFETY

- AS4024.1 - 1996 - Safeguarding of Machinery

HEALTH AND SAFETY AT WORK

- AS3100 - 2002 - General Requirements for Electrical Equipment
- OH. & S. 1995.81/1995 - Compliance References
- EEC Directive No. 80/1107; 83/477; 86/188; 88/188; 88/642 - Protection of Workers against risks caused by exposure to physical, chemical and biological agents in workplace
- EEC Directive No. 73/23 and Special EEC Directives No. 89/654; 89/655 - Improvements in health and safety at work
3.1.1 Saw Cutting Head

As the name suggests, the cutting head is the focal area where most of the specimen cutting takes place. Thus, correct saw blade selection such as size, number of teeth and tooth pitch are all critical factors that determine the overall performance and quality of the final cuts. In addition, the use of correct saw blade provides minimum burr to the workpiece while maximizes the safety to the operator during each cutting procedure.

3.1.2 Actuation Unit

Actuation unit is a lead screw electric linear drive with special functions purpose-developed for cold cutting:

- Auto cut-piece size detection and setting of saw stroke
- Constant force cutting
- Active Overload Feed Control
- Adjustable forward stroke sensor
3.1.3 **Cutting Speed Selection**

SA 350 unit comes with fully adjustable RPM and saw feeding speed. RPM is adjusted on the RPM radio button (Figure 8). Feeding speed is adjusted at the feed speed radio button (Figure 8). Actuation unit feeds at constant force hence cutting speed will vary also according to the thickness of the cut section. Recommended cutting RPM for Mild Steel is 40 to 60 RPM, for galvanised and stainless steels recommended cutting speed is 20 to 25 RPM.

3.1.4 **Dual Start Button**

The primary purpose of the dual start buttons is to prevent the user from accidentally activating the machine. Assuming power is connected to the machine, both buttons must be depressed simultaneously before cutting cycle will activate.

3.1.5 **Air Vice**

Operating at 600kPa, the vice clamps firmly secure the workpiece in preparation for cutting. The pressure of each vice clamp could be modified using the pressure regulators located on the main electrical unit door. Each vice must be adjusted manually to accommodate various cross sectional profiles.
3.2 Preparation for Operation

The following procedure is recommended for the correct cutting using the *Brobo Waldown SA350 Semi-Automatic Saw*.

**PROCEDURE**

i) Ensure that compressed air supply and mains power are connected to the machine. Switch power on at the main switch, which should be illuminated indicating saw is operational. Check Emergency Stop button is not depressed.

ii) Upon power-up saw needs to be calibrated. Immediately upon power-up pushing HOME / RESET button will calibrate the saw. Saw will not respond to any other buttons until it is calibrated. Saw calibrates by seeking both forward and back. Saw will first seek back then forward and MUST home forward against its base. Ensure there are no bars placed across the cutting area. Saw will detect this and register a failed calibration. If calibration has been successful, saw will briefly run the blade. Saw is ready for cutting.

iii) To adjust the angle of the cutting surface, if necessary, loosen the 4 bolts, as shown in Figure 12. Fine-tune the angle required, then replace and re-tighten the 4 bolts.

iv) Place the cutting specimen you wish to cut into the vice clamps. Manually adjust the clamps so that the jaws are clamped firmly to the workpiece, or with a clearance of 3 - 7mm. (For correct clamping of material, please refer to section 2.3 Advice for the Operator). NOTE - The vice clamps advance with an approximate 10mm pneumatic stroke to apply a clamping pressure of 6 Bar (87 psi).

v) Position the vice clamps as close to the blade as possible without interfering with the travel of the blade or guard. Vice relocation is required whenever the head angle is altered.

vi) When ready, press both START (CUT) buttons at once to commence a cut. Saw will clamp piece, complete forward search finding where the piece is, and upon detection, start the blade motor and complete the cut. Saw will return to position detected, ready to cut the same size piece again. To continue cutting this piece, simply place more tube in vice and press two START buttons at the same time.

vii) When ready to cut different size piece, simply press STOP / RESET button. This will return the saw to home position after which cutting procedure can be repeated again.

viii) If operator wishes to auto-detect and set start position of the saw but without doing a cut, SET button can be used. Once start position is set pressing two START (CUT) buttons completes the cut.

ix) Press STOP button during any operation to immediately stop the saw and have it return to home / start position. If operator wishes to re-do a homing of the saw, without cycling the power, the following procedure should be used:

- Press and hold HOME button
- While holding HOME, press SET, then release both buttons

**WARNING - BLADE MOTOR OVERLOAD**

*Saw is equipped with overload monitoring system which detects main motor overload in case of blade jam or inadvertent misuse. In case of overload saw reverses feed, re-establishes correct running of motor and continues the cut. If the saw overload system is reversing feed regularly during a cut, it indicates the blade is worn. Replace the blade promptly at this occurrence.*
3.3 **Operation Recommendations**

- Your SA saw is designed to automatically cut with the following range of blade sizes:
  - SA-400: 350 to 400 mm
  - SA-350: 320 to 350 mm

  Operator should NOT use the saw with blades outside of this specification.

- Select the correct saw blade with the correct tooth pitch and form to suit the material to be cut to provide minimum burr and maximum blade lifespan.

- Use the smallest diameter blade and coarsest pitch that is practical within the required speed and material limitations.

- Generally use a tooth pitch to give 2 - 4 teeth engagement with the material during cutting.

- Ensure that sufficient coolant is flowing over the cutting teeth.

- Do not allow machine gearbox to run idle in the upright position for more than 3 minutes otherwise, damage can occur to the drive system.

- The rate of feed affects the quality of the final cut and blade life. This varies also by the material and cross-sectional dimensions. When cutting stainless steel or high carbon steel (*Brinnel Hardness above 200*), the slowest speed machine should be used together with a cobalt type high speed steel blade.

- When deciding on the feed rates, keep in mind to maintain a steady, continuous pressure, thus *avoiding work hardening* on the cutting piece.
CHAPTER 4 - Drawings, Layouts, Assembly and Spare Parts

4.1.1 Assembly Drawing (Sheet 1 of 5)
4.2.1 Power Distribution 415VAC, 3PH, 50/60Hz Circuit Diagram

DATE: OCTOBER 24, 2005
FILENAME: SAIC001AB
Feed AC Drive 0.37kW Circuit

NOTE: ALL CONTROL WIRING 18-20 AWG (≈ 0.5 mm²)
4.2.3 Main Saw Drive 2.2kW Circuit

Supply Ground

GND U V W

Motor

M

GND X1 X2 X3 X4

14 AWG (1.5 mm²)

20G MAIN AC MOTOR
2.2 KW, 2400 RPM, 6.5 A, 4 Poles
415 VAC, 50/60 Hz

20G AC MOTOR

220VAC 220-240VAC

STOP PB COMMAND

ON AUTO SWITCH

START PB COMMAND

FEED DRIVE RUNNINGS

FEED MOTION POSITION CONTACT

FEED EXTEND POSITION CONTACT

0 V

130M

RF/A

RF/B

VDC SWITCH
OFF / AUTO

DIR-15 MAIN SPEED ADJUST SETPOINT 10K

GND

130E

0 V COMMON

ANR1 SPEED REFERENCE +10 VDC REF

DIN8

DIN1 RUN FORWARD COMMAND

DIN2

DIN3

DIN4

DIN7

SEMIAUTOMATIC SAW INVERTER CONTROL
ELECTRICAL SCHEMATIC SHEET 3
MAIN SAW AC DRIVE 2.2 KW
DATE: FEB 21, 2006
FILENAME: SAIC0034AB
CHAPTER 5 - *Adjustments for the Saw Unit*

5.1 **Changing the Blade**

To replace a worn saw blade:

---

**DANGER – UNEXPECTED STARTUP**

Make sure power to the saw is turned off before proceeding with changing the blade.

---

i) Disengage the linkage arm that is between the guard linkage system and pivot block (at the pivot block by compressing the spring and moving the bolt through the slot).

ii) Slide the saw guard up as far as possible (as if it was opening during a cutting cycle) to gain access to the spindle nose.

iii) Loosen the spindle screws (LH thread), using the 14mm hexagonal wrench provided, and remove the counter plate. To loosen the spindle screw, insert the wrench (short end) into the socket head cap screw and firmly knock the wrench with the palm of your hands until the screw is loosened. If this method fails to free the screw, either:

- Remove the belt guard using the two handscrews, and hold the belt against the loosening (or tightening) action of the screw.

- Place a piece of timber under the blade of the machine, and loosen (or tighten) the screw while holding the saw head of the machine down (blade against the timber).

iv) Remove the worn saw blade away from the spindle hub. Using a soft brush, clean the face of the spindle, counter plate and mounting faces of the blade of any dirt or swarf that was trapped by the previous cutting cycles.

v) Place the old saw blade into the new blade packaging and disposed of it safely. Carefully mount the new blade onto the spindle hub and replace the counter plate utilising the drive pins as guides as it passes through the pinholes on the blade.

vi) Firmly retighten the spindle screws, ensuring that the saw blade spins uniformly and aligned parallel with the safety guard.

vii) Lower the outer guards and make certain the pin of the linkage arm is reengaged with the track on the inner guard and reconnect the guard linkage.

viii) The new blade is ready for use. To check that the blade is performing correctly, carry out a sample cut on a piece of off-cut.
5.2 Adjusting the Cutting Angle

The back jaw wear plates on the *Metal Cutting Saw* are typically fitted in the following manner. For angular cutting, the wear plates should be repositioned to provide the maximum support on one side and clearance on the other (Figure 11).

![Figure 11: Angular Cut Positions](image)

i) To adjust the angle of the cutting surface, loosen the socket head screws shown in *Figure 12*, located on the back jaw face that clamps the table, using the hexagonal wretch provided.

ii) Fine-tune the angle required. The shot-pins have positive locations at 90° and 45° right and left.

5.3 Cutting and Feeding Speeds

The quality of the cut is affected by the rate of saw feed. Blade life too is also dependent on the feed rate, as well as material type and cross section dimensions. Saw has feed speed adjustment radio button for changing the cutting speed, however cutting action is constant-force hence cutting speed will vary also according to thickness being cut. In case blade overload system intervenes regularly during a cut, it indicates that blade is worn and, accordingly, blade should be changed.

The cutting action also generates a large amount of heat within the cutting sample due to frictional contact. Should this heat affect the material you are cutting in any way, the heat should be dissipated using the coolant system.
5.4 Refilling the Lubricator

To refill the lubricator bowl, twist the bowl anti-clockwise and slide it down to detach it from the lubricator unit (There is no need to disconnect the air supply to the unit). The unit can now be refilled to the line positioned near the top of the bowl, which is approximately 10 millimetres from the top edge of the bowl. Do not fill the bowl above this line, as the lubricator unit will not function properly. Replace the lubricator bowl in the reverse manner by sliding the bowl upwards, ensuring that the feed tube is located inside the bowl, and twist it clockwise to lock it into position.

5.5 Adjusting the Brobolube Unit

When assembled, the Brobolube unit is a precise instrument that supplies an accurate quantity of lubricant directly to the saw blade before it contacts the work piece. There are 2 control variables available for the operator:

1) Air Flow (Volume) Delivery
Regulated with the tap (needle valve), this can be adjusted from initial, completely closed to fully open states. It is highly recommended that the upper end of the flow range be utilised to allow an adequate airflow to deposit and evenly distributed the lubricant onto the blade, while maintaining a fine lubricant mix. If the needle valve is not open sufficiently, the air to lubricant ratio may vary, and may result in a substandard distribution of lubricant to reach the blade teeth.

2) Lubricator Flow Rate
This controls the fluid flow rate and is adjustable via the slotted needle valve situated on top of the lubricator. The consumption of Brobolube is factory set to 4 drops per minute. This has been examined to produce a sufficient mix of air and lubricant, and it is recommended to use this initial setting. On this setting, approximately 55 cubic centimetres (lubricator capacity) should last for 20 hrs of continual cutting. If for some reason the setting needs to be altered, the needle valve should be turned clockwise to reduce or anti-clockwise to increase the fluid flow respectively.

NOTE
i) Although the lubricator is capable of delivering a much higher flow rate of lubricant, it is suggested that you do not increase the flow rate excessively because:

- No significant increase in blade life or lubricating efficiency will be achieved (confirmed by test results).
- Excessive application of Brobolube will only result in a waste of fluid.
- Excessive application will produce swarf that will be wet (oily) and harder to clean up than dry swarf produced from the correct supply of Brobolube.

ii) The amount of Lubricant (when set correctly) delivered by the lubricator is not easily visible by the naked eye. If in doubt that lubricant is being delivered, first check to see if lubricator itself is delivering droplets at its sight glass. If still unsure whether lubricant is being delivered, disconnect the supply tubing to the tap (needle valve) and hold the tube against some blotting paper for a few seconds while the lubricator is operating.
5.5.1 Lubricating Oil Precautions - Health Hazard Information

The Brobolube lubricating fluid has no known adverse health effects. "Brobolube" is non-toxic, odourless, non-flammable below approximately 350°C, and non-corrosive, although it may affect some types of rubber. There are no traces of sulphur, chlorine, phenol or nitrates found in Brobolube. When comes into contact with skin, the oil may be removed by wiping away the excess, then washing the contaminated area with detergent and water. If the oil is utilised at high temperatures, appropriate protective apparel should be worn as the oil could cause burns to skin or eyes. **If splashed by hot oil, immediately run cold water over the burn area and apply first aid burn treatment.**

If the Brobolube delivery line breaks or becomes disconnected during operation, ensure that the air supply to the system is disconnected before repairing the problem.

It is recommended that footwear with anti-slip soles be worn at all times. Any spills will result in potentially hazardous slippery surfaces and should be dealt with promptly to prevent physical injury resulting from falls. Do not use coarsely, combustible material like sawdust to soak up oil due to the potential risk of spontaneous combustion. Spilled oil should be transferred into non-porous containers of suitable strength. Any remaining oil should be cleaned up with sand or other non-combustible, absorbent material. Place the sand and oil mixture into containers and disposed of by an EPA approved landfill or alternatively, by a suitable non-polluting method.

In addition, **rags soaked in oil should be burned. Do not pour oil down the drain,** which would ultimately contaminate the water supply and pollute the environment.

**For fire fighting purposes, either only uses CO₂, dry chemical or foam retardant to extinguish the flames.**
6.1 Role of the Operator

The person operating and maintaining the Brobo Waldown SA350 Semi-Automatic Saw must familiarise themselves with these instructions for their own safety and that of the others, in addition to safeguarding the production of the machine. Responsibility must be taken by the user on the general maintenance and up keeping of the unit as specified in this chapter, with particular emphasis on:

- Check to ensure that other operators of the machine always aware of and comply with the relevant safety instructions and standards as specified in Chapter 2 – Safety and Accident Prevention. Therefore, check that the safety devices are operational and work perfectly and that personal safety requirements are complied with.
- Ensure that the working cycle is efficient and guarantees maximum productivity, inspect the:
  - Functions of the main components of the machine
  - Sharpness of the blade and coolant flow
  - Correct working parameters for the type of material being cut
- Verify that the quality of the cut meets the requirements and that the final product is free from any machining defects.

6.2 Maintenance Requirements

- All maintenance must be carried out with the power switched off and the machine in emergency stop condition.
- To guarantee perfection operation, all spare parts must be Brobo Group originals.
- On completion of maintenance works, ensure that the replaced parts or any tools used have been removed from the machines before starting it up.
- Any behaviour not in accordance with the instructions for using the machine specified in this manual may create hazards and/or safety risks for the operator.
- Therefore, read and follow all the instructions for use and maintenance of the machine and those on the product itself.

6.3 General Maintenance of Functioning Components

The general maintenance operations that should be carried out regularly are as follows:

i) Keep the vice clamps, overall machine and path of the cutting blade free of any offcuts, accumulated swarf and coolant using compressed air or preferably thread-free cloth.
ii) Lubricate the saw head pivot shaft and rotary table regularly (after every 40 hours operation or weekly) with an NLGI 2 extreme pressure grease, Shell Alvania No.1 grease or equivalent.
iii) Check that the guard and feed sensors are operating correctly and the sensing apertures are free of any foreign particles and dirt.
iv) The coolant compensation tank should be checked regularly. Coolant level would expect to naturally decrease over time due to natural evaporation. If necessary, topped up using either CoolTech 500 or SlideTech 88 coolants.

v) Observe the oil level on the gearbox. If necessary, refill using Caltech Tregear L50, or equivalent.

vi) Clean the vice and lubricate any moving joints or sliding surfaces with good quality oil.

vii) Clean the machine regularly and keep any unpainted surfaces lightly oiled to protect from rust and corrosion.

viii) The air supply for the semi automatic unit and/or pneumatic air vices should be checked regularly such that it is free of any condensed water molecules and the filter should be drained frequently.

ix) Ensure that the machine performs cuts perpendicular to the work surface. If not, contact Brobo Waldown engineering department.

x) Test that the blade is at right angles to the workpiece back fence. If not, contact Brobo Waldown engineering department.

xi) Check that the 0° notch on the fixed worktable is aligned with the graduation on the turntable. If not, adjust as described in Section 5.2.

xii) Examined that the precision of the 15°, 30°, 45° left and right stops are correct and accurate. If they are not adjusted properly, proceed as described in Section 5.2.

xiii) Regularly empty out the swarf catcher, resting directly above the compensation tank, of any offcuts and swarf that has collected during the numerous cutting cycles.
## Troubleshooting For Blade and Cutting Problems

<table>
<thead>
<tr>
<th>PROBLEM IDENTIFIED</th>
<th>DIAGNOSIS</th>
<th>SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cuts produced are not at 90° or are angled</strong></td>
<td>Head speed too low or too high</td>
<td>Reduce or increase head speed respectively.</td>
</tr>
<tr>
<td>Blade with worn teeth</td>
<td>Replace with new blade, with reference to Section 5.1 Changing the Blade.</td>
<td></td>
</tr>
<tr>
<td>Angularity of blade to workpiece back fence and vice clamps</td>
<td>Adjust the position of the blade so that it is at right angles to the workpiece back fence using the 0° notch as reference; set the stops at 45° left and right using the method described in Section 5.2 Adjusting the Cutting Angle.</td>
<td></td>
</tr>
<tr>
<td>Blade not perpendicular to work surface</td>
<td>Adjust the blade using the appropriate screws such that it is perpendicular to the work surface.</td>
<td></td>
</tr>
</tbody>
</table>

**Frequent and/or excessive teeth breaking**

<table>
<thead>
<tr>
<th>PROBLEM IDENTIFIED</th>
<th>DIAGNOSIS</th>
<th>SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broken teeth</td>
<td>Replace with new blade, with reference to Section 5.1 Changing the Blade.</td>
<td></td>
</tr>
<tr>
<td>Incorrect lubricant/coolant fluid</td>
<td>Check the water and oil mixture; check that the holes and/or hose are not blocked; direct the nozzles correctly; check that the lubricant/coolant fluid conforms to those specified in Section 6.3 General Maintenance of Function Components.</td>
<td></td>
</tr>
<tr>
<td>Material too hard</td>
<td>Check the cutting speed, feed speed, blade type and parameters are correct for the particular application.</td>
<td></td>
</tr>
<tr>
<td>Blade not worn in correctly</td>
<td>With a new blade, it is necessary to start cutting at half feeding speed. After a normalising period (cutting surface about 300cm² for hard materials and 1000cm² for softer materials), both cutting and feed speeds can be brought up to normal values.</td>
<td></td>
</tr>
<tr>
<td>Issue</td>
<td>Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Rapid teeth wear</td>
<td>Blade with incorrect and/or excessive fine tooth pitch</td>
<td>As excessive pressure is exerted of the incorrect teeth profile, replace the blade with correct tooth pitch dimensions and profile.</td>
</tr>
<tr>
<td></td>
<td>Workpiece not clamped firmly in place</td>
<td>Any movement of the workpiece during the cutting process can cause broken teeth; check the vice clamps, clamping jaws and clamping pressure is satisfactory.</td>
</tr>
<tr>
<td></td>
<td>Excessive vibrations</td>
<td>Specimen vibrates in the vice; check that the vice clamps are position correctly and the clamping pressure are adequate.</td>
</tr>
<tr>
<td>Broken blade</td>
<td>Head speed too slow or too high</td>
<td>The blade/slide runs over the material without cutting it; increase or decrease head speed respectively.</td>
</tr>
<tr>
<td></td>
<td>Cutting pressure to high</td>
<td>Reduce cutting pressure</td>
</tr>
<tr>
<td></td>
<td>Insufficient coolant</td>
<td>Check the coolant level and clean piping and nozzles</td>
</tr>
<tr>
<td></td>
<td>Non-homogenous material being cut</td>
<td>The material present may not be homogenous either on the surface, such as oxides or sand present, or in sections, such as under-cooled inclusions. The variances in grain development cause the premature wearing of teeth and consequently, break as the result. Homogenise or clean these materials.</td>
</tr>
</tbody>
</table>

### Rapid teeth wear

- **Blade with incorrect and/or excessive fine tooth pitch**
  - As excessive pressure is exerted of the incorrect teeth profile, replace the blade with correct tooth pitch dimensions and profile.

- **Workpiece not clamped firmly in place**
  - Any movement of the workpiece during the cutting process can cause broken teeth; check the vice clamps, clamping jaws and clamping pressure is satisfactory.

- **Excessive vibrations**
  - Specimen vibrates in the vice; check that the vice clamps are position correctly and the clamping pressure are adequate.

### Broken blade

- **Head speed too slow or too high**
  - The blade/slide runs over the material without cutting it; increase or decrease head speed respectively.

- **Cutting pressure to high**
  - Reduce cutting pressure

- **Insufficient coolant**
  - Check the coolant level and clean piping and nozzles

- **Non-homogenous material being cut**
  - The material present may not be homogenous either on the surface, such as oxides or sand present, or in sections, such as under-cooled inclusions. The variances in grain development cause the premature wearing of teeth and consequently, break as the result. Homogenise or clean these materials.

- **Reduced head speed**
  - Reduce head speed

- **Teeth in contact with material before commencing the cut**
  - Always check the position of the blade before starting a initiating a new cut or job

- **Insufficient coolant**
  - Check the coolant level and clean piping and nozzles

- **Excessive vibrations**
  - Specimen vibrates in the vice; check that the vice clamps are position correctly and the clamping pressures are adequate
7.2 General Troubleshooting

Below is a list of some of the most common problems associated with the Brobo Waldown SA350 Semi-Automatic Saw and the recommended troubleshooting procedures to undertake to rectify the situations. If the solutions provided do not resolve the problems, or the problem identified differs from those listed, immediately contact Brobo Group engineering department.

<table>
<thead>
<tr>
<th>PROBLEM IDENTIFIED</th>
<th>DIAGNOSIS</th>
<th>SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spindle motor will not rotate</td>
<td>Electrical power supply not connected</td>
<td>Ensure that the main power cable is plugged in and switched on. Check the phases, cables, plugs and sockets for loose connection. Also check that the motor connections are in place.</td>
</tr>
<tr>
<td></td>
<td>Loose contactors</td>
<td>Verify that the contactors are not loose. If contacts are short-circuited, contact Brobo Group engineering department immediately.</td>
</tr>
<tr>
<td></td>
<td>Motor burnt out</td>
<td>Check that it has not burnt out, that it turns freely and there is no moisture in the main electrical unit. The winding can be rewound or replaced.</td>
</tr>
<tr>
<td></td>
<td>Blown fuses</td>
<td>Examine that the fuses are intact and fitted correctly, otherwise replace or tighten the fuse holders</td>
</tr>
<tr>
<td>Vice clamps does not engage</td>
<td>Air supply hose is not connected</td>
<td>Inspect that the air supply cable is connected to the air fittings located at the back of the saw</td>
</tr>
<tr>
<td></td>
<td>Emergency condition tripped</td>
<td>Check that the emergency stop button is released, specified in Section 3.1.4 Control Panels. Check the contacts and the cable connections</td>
</tr>
<tr>
<td></td>
<td>Air treatment unit obstructed</td>
<td>Check that the pneumatic input and inlet connections are not obstructed and that the supply hose is not blocked or kinked</td>
</tr>
<tr>
<td></td>
<td>Blocked pneumatic tubing</td>
<td>Check that it is not kinked, severed or blocked. Remove any blockages</td>
</tr>
<tr>
<td><strong>Cutting head will not ascend or descend</strong></td>
<td><strong>Power supply not switched on</strong></td>
<td>Ensure that the main power cable is plugged in and switched on. Check the phases, cables, plugs and sockets for loose connection. Also check that the motor connections are in place.</td>
</tr>
<tr>
<td></td>
<td><strong>Emergency condition tripped</strong></td>
<td>Check that the emergency stop button is released, specified in <em>Section 3.1.4 Control Panels</em>. Check the contacts and the cable connections.</td>
</tr>
<tr>
<td></td>
<td><strong>Loose connectors</strong></td>
<td>Check that orange power connector at the actuator is not loose.</td>
</tr>
<tr>
<td></td>
<td><strong>Faulty feed jog switches</strong></td>
<td>Contact Brobo Group engineering department for replacement of part</td>
</tr>
</tbody>
</table>

| **Coolant system not operational** | **Compensation tank is running low** | Check for any leaks present within the catchment unit. Top up the with coolant as recommended in *Section 6.3 General Maintenance of Functioning Components*. |
| | **Blocked coolant tubing** | Check that it is not kinked, severed or blocked. Flush out any blockages |
# APPENDIX - RISK/HAZARD ASSESSMENT

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Hazard Identification</th>
<th>Hazard Assessment</th>
<th>Hazard Management Strategies (Recommended for the Purchasing / Buyer / User)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>Cutting/Severing</td>
<td>Low/Med</td>
<td>▪ Keep machine correctly guarded and operational at all times.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Keep hands clear of rotating blade when cutting.</td>
</tr>
<tr>
<td></td>
<td>Entanglement</td>
<td>Low</td>
<td>▪ Do not wear loose jewellery, clothing or items that might get caught in the saw.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Always keep the work area free of unnecessary objects or tools.</td>
</tr>
<tr>
<td></td>
<td>Puncturing</td>
<td>Low</td>
<td>▪ Wear protective gloves when handling and/or changing the blades.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Power source is to be isolated prior to opening electrical enclosures.</td>
</tr>
<tr>
<td>Electrical</td>
<td>Electrocution</td>
<td>Low</td>
<td>▪ Remove the power supply when any maintenance and/or repairs are to be undertaken.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Power source is to be isolated prior to opening electrical enclosures.</td>
</tr>
<tr>
<td>Thermal</td>
<td>Burn</td>
<td>Low</td>
<td>▪ Under normal working conditions the gearbox can become hot thus, do not touch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Be careful when handling workpiece after cutting, as it might be very hot.</td>
</tr>
<tr>
<td>Noise</td>
<td></td>
<td>Low</td>
<td>▪ Under no load testing, the noise level measured is below 85db (A).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ If the noise level becomes too high during a cutting cycle, stop the process and inspect for problem, if any are present.</td>
</tr>
<tr>
<td>Substance</td>
<td></td>
<td>Low</td>
<td>▪ Care must be taken as some coolants may be harmful or cause allergic reactions. Please read the labels carefully.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Keep the work area clean and regularly remove excess coolant, oils and other impurities.</td>
</tr>
</tbody>
</table>

## Hazardous Events

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Hazard Identification</th>
<th>Hazard Assessment</th>
<th>Hazard Management Strategies (Recommended for the Purchasing / Buyer / User)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexpected Start Up</td>
<td></td>
<td>Low</td>
<td>▪ During a power failure, turn the machine off.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ If problem persists, please contact Brobo Group engineering department.</td>
</tr>
<tr>
<td>Failure of Control System</td>
<td></td>
<td>Low</td>
<td>▪ If the ON/OFF switch fails, isolate the machine at the power source.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Ensure that no fuses are blown and that all electrical circuitry are operating within normal parameters.</td>
</tr>
</tbody>
</table>

## Additional Hazards

<table>
<thead>
<tr>
<th>Hazard Type</th>
<th>Hazard Identification</th>
<th>Hazard Assessment</th>
<th>Hazard Management Strategies (Recommended for the Purchasing / Buyer / User)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator Error</td>
<td></td>
<td>Low</td>
<td>▪ Ensure blades, clamps and materials are correctly secured.</td>
</tr>
<tr>
<td>Impact</td>
<td></td>
<td>Low</td>
<td>▪ Wear safety glasses at all times during cutting cycle.</td>
</tr>
</tbody>
</table>