

Trade of Metal Fabrication	
Module 1:	Basic Fabrication
Unit 7:	Band Saw
	Phase 2



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## Document Release History

Date	Version	Comments
15/08/06	First draft	
13/12/13	SOLAS transfer	

## Module 1 – Basic Fabrication

### Unit 7 – Band Saw

**Duration – 14 Hours**

**Learning Outcome:**

By the end of this unit each apprentice will be able to:

- Safely set up and operate the band saw
- Fabricate mitred angle frame

**Key Learning Points:**

<b>Sk</b> <b>Rk</b>	Operations of band saw.
<b>Rk</b>	Blades, feed and speed, coolants, work supports, clamping, batch cutting, backstop.
<b>Sk</b> <b>Rk</b>	Blade changing - safety precautions.
<b>H</b>	Blade guards, loose clothing, safe and dry working area.
<b>M</b>	Arithmetic calculation needed for cutting components measurements 45° angle.
<b>P</b>	Neat and tidy work area, acceptable standard of work.

**Training Resources:**

Fabrication workshop and materials, band saw, apprentice toolkit, handouts on machine use and safety, safety clothing and equipment.

**Key Learning Points Code:**

**M** = Maths      **D** = Drawing      **RK** = Related Knowledge      **Sc** = Science  
**P** = Personal Skills      **Sk** = Skill      **H** = Hazards

## Operation of Band Saw

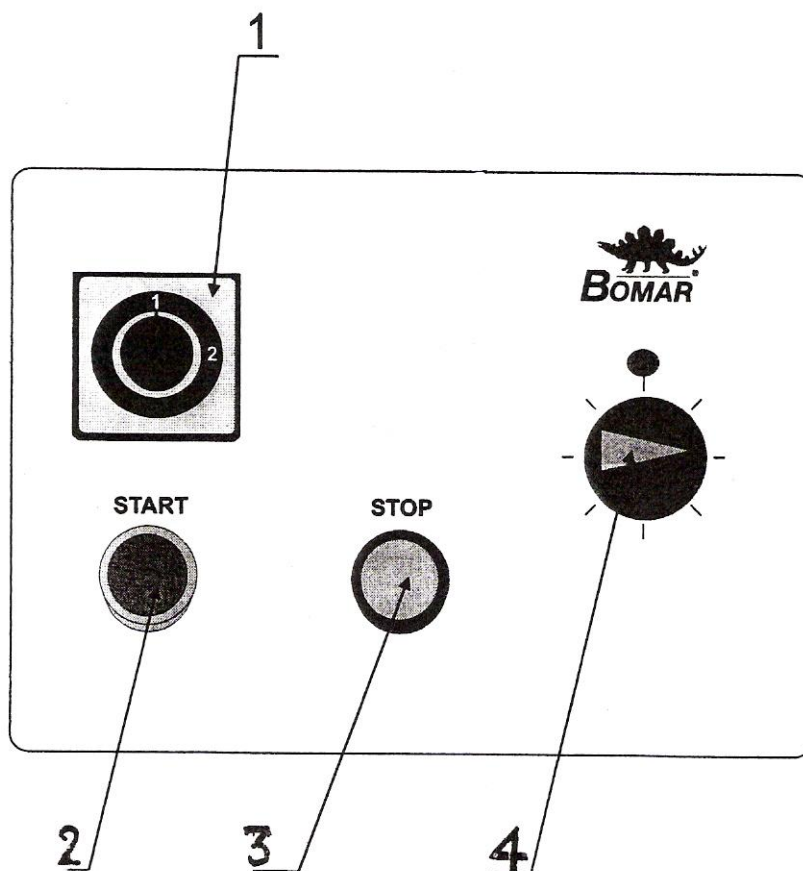


Figure 1 - Control Panel

1. Switch for the cutting speed.  
Choice of cutting speed during cutting (40 or 80m. min<sup>-1</sup>)
2. START  
Start the saw band drive.
3. STOP  
Stop the saw band drive.
4. Governing Valve  
Adjust the speed of the arm sinking to the cut by governing valve.  
**Note:** If you keep closing the throttle valve too tightly, the valve seat may wear off which causes its leakage. Therefore, always close the valve gently.



## Material Insertion

Insert material to the vice and ensure that the material cannot move in the vice or fall from the vice after the clamping.

If you cut long pieces of the material (for example rod, tube), you must use the roller conveyors for material shifting to the band saw.

Make sure the conveyor is long enough and the material cannot tip off the conveyor.

Be especially careful with round materials that it always stays on two vertical rollers and that it cannot fall off the conveyor!

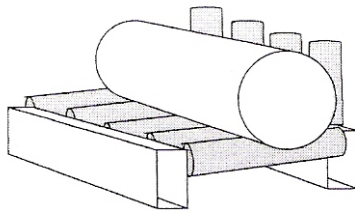
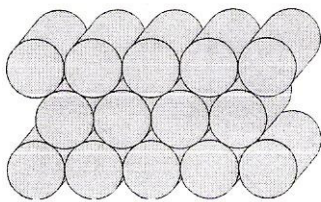


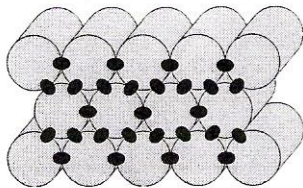
Figure 2 - Round Material on Conveyor

## Bundle Material Cutting/Batch Cutting

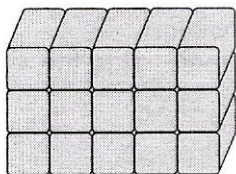


If you want to cut the material in the bundle, there are suggestions for the positioning of bundles.

**Round material bundle.** Take care especially with round material that the bars are put according to the picture. If the bars are put differently, you may have problems with movement.



Always weld the material at the rear end of the bundle to secure it from moving. **ATTENTION!** Before welding always, switch the machine off at the main switch! The magnetic fields, which often occur during welding, may damage the controls!



**Square material bundle.**

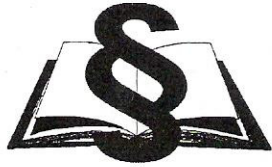


**Angled material bundle.**

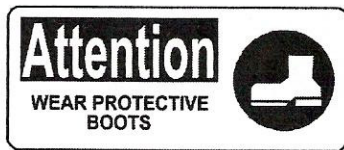
***ATTENTION! Not all material shapes are suitable for bundle cuts. Keep the recommendation of your supplier of the saw bands for material insertion to the bundle.***

## Band Saw Adjusting

### Safety Notes



*Keep the safety notes! Work the machine with the highest safety!*



Wear protective boots!

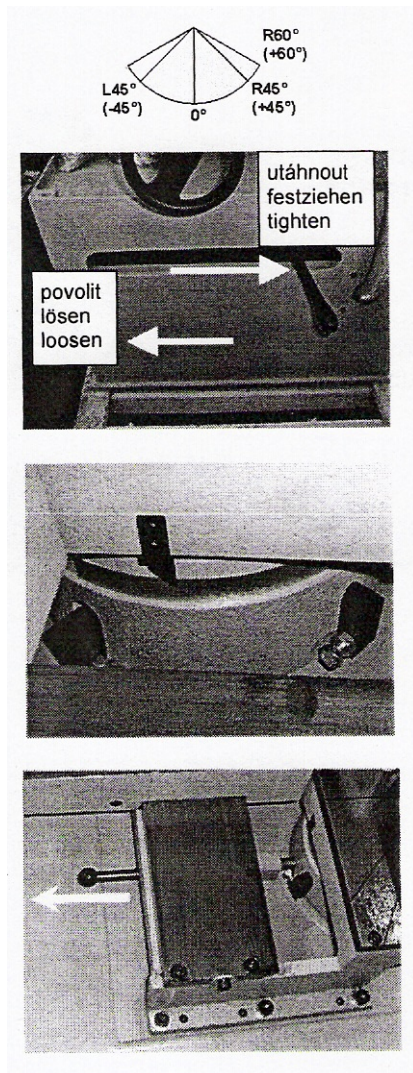
Falling cut pieces can cause serious injuries.



Wear protective hardhat!

Falling work pieces can cause severe head injuries.

## Angular Cut Setting



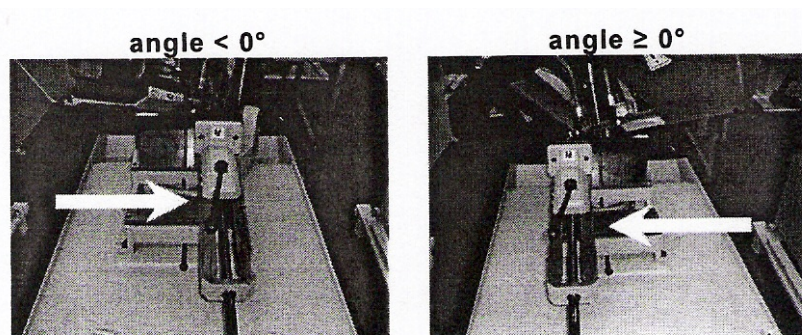
The cut angle can be varied from  $-45^\circ$  to  $60^\circ$ . The angles  $-45^\circ$ ,  $0^\circ$ ,  $+45^\circ$  and  $60^\circ$  is set by means of the fixed stop.

1. Lift the saw frame and release-securing lever of the console.

2. Set the desired angle of the cut according to the scale on the turning console.

3. If you want set the angle of the cut bigger than  $45^\circ$  or less than  $0^\circ$ , you must pull up the stop pivot.
4. Tighten the securing lever of the console.

5. Shift the vice according to setting angle of the cutting. Shift the vice to the right for angle of the cut, which is less than  $0^\circ$ , shift the vice to the left for angle of the cut  $0^\circ$  or for angle of the cut, which is bigger than  $0^\circ$ .



## Selection and Replacement of the Saw Band

### Safety Notes



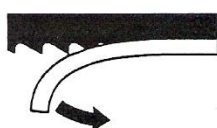
Wear protective gloves!

The saw band has sharp teeth and can cause serious injuries to your hands.



Wear protective goggles!

The saw band can snap during assembly and seriously injure your eyes.



Refit the saw band cover only after you have installed and tightened the saw band.

### Saw Band Size

**2910 x 27 (25) x 0,90 mm**

### Selection of the Saw Band Tooth System

The manufacturers provide the saw bands with constant and variable tooth system. The important factor for selection of the tooth system is length of the cutting canal with respect to the size of the product.

1. *Constant tooth system* - the saw band has parallel tooth pitch all over length. This way is suitable for cutting of solid material.
2. *Variable tooth system* - tooth pitch is variable. Variable tooth system is used for profiled materials and bundle cutting. Variable tooth pitch lowers vibration of the saw band, increases service life of the saw band and quality of the cutting area.

In tables, there are advised type of the tooth system depending on sizes and form of the cutting material.

*Footnotes:*

ZpZ - teeth number on one inch.

S - tooth with zero angle of the teeth.

K - tooth with positive angle of the teeth.

*Examples of the tooth system marking:*

32 S - number „32" means 32 teeth on one inch (that means constant tooth system), letter „S" marks teeth with zero angle of the tooth.

4-6 K - number „4-6" means 4 till 6 teeth on one inch (that means variable tooth system); letter „K" marks teeth with positive angle of the teeth.

## Saw Band Running in “Tempering the Blade”

To ensure a full service life of the saw bands, we strongly recommend that you carry out the „RUN-IN" process.

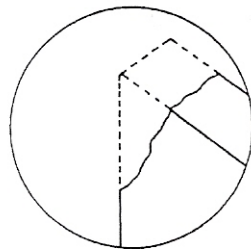
**Running in:** Cut the material with the frame lowering reduced to 50% only. When vibrations occur increase or decrease the band speed.

When cutting small pieces run the band until approximately 300 cm<sup>2</sup> of material has been cut.

When cutting large pieces run the band for 15 minutes approximately.

When the band has been run, increase the lowering-speed to normal speed.

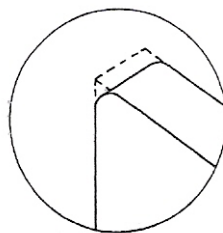
The running in of the saw band avoids micro-breaks on the cutting edges of new saw band ensuing from first excessive stress. This would decrease service life substantially.



**Figure 3 - Running In Process 1**

The optimal running in of the saw band produces ideal rounded cutting edges and therefore the conditions for an optimal service life.

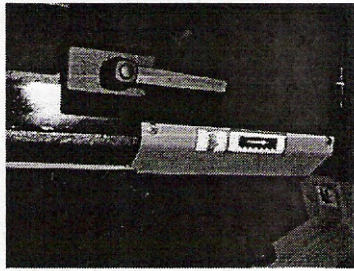
**Note:** Run regrinding saw bands too!



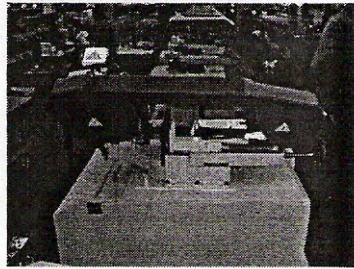
**Figure 4 - Running In Process 2**



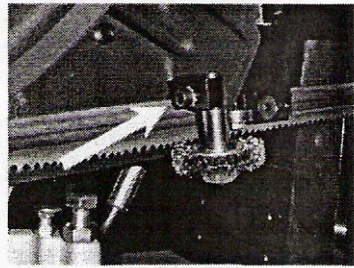
## Saw Band Dismantling/Changing Blade



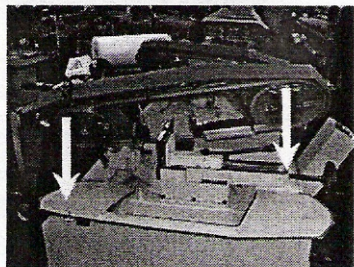
1. Lift the saw frame to the top position. Stop the saw frame in top position by control valve.
2. Dismantle yellow protective cover of the saw band. The cover is clamped with two screws.



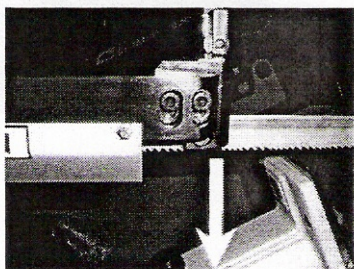
3. Dismantle back covering sheet metal of the saw frame. The covering sheet metal is clamped with two screws with plastic head.



4. Release brush holder and turn it. The brush must not defend saw band dismantling.

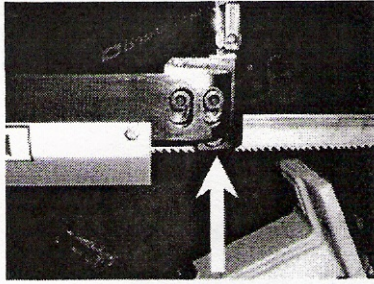


5. Turn by stretching star to the left side, release saw band stretching and pull saw band from blade wheels.

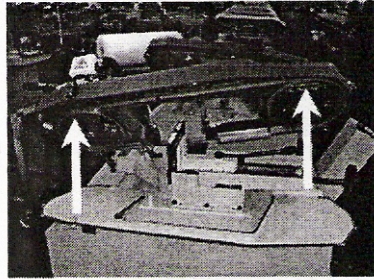


6. Pull up the saw band from the guiding cubes.

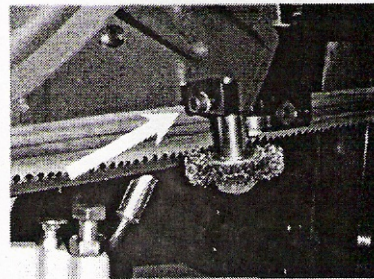
## Saw Blade Installation “Refit Blade”



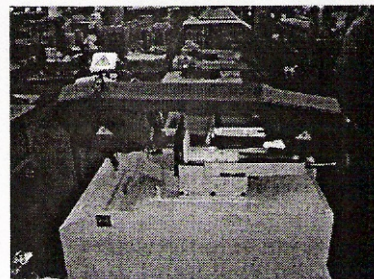
1. Prior to installation, clean all track wheels, guide cubes and inner side of the arm thoroughly of all traces of chips and dirt. Keep in mind the teeth direction when installing the saw band.
2. Insert new saw band in the guide cubes. Make sure the saw band runs between both guide rollers and it is pushed all the way to the top.



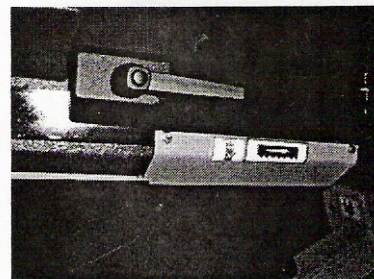
3. Put the saw band on both guide wheels. Make sure that the saw band ridge fits tightly to the wheel rim. Then push the saw band as far back as possible.
4. By turning the stretching star to the right, you will stretch the saw band slightly. Remove the plastic cover of the saw band teeth.



5. Put the brush into the function position and screw up the holder.



6. Install the rear protective cover of the frame.



7. Install the yellow protective cover of the band. The arrow on the cover must match the direction of the arrow on the band. If it does not, you must turn the band round.

## Cooling Agents and Chips Disposal

### Safety Notes



**Keep notes about work safety for handling cooling liquid!**



When handling cooling agents always wear hazardous fluid-proof gloves!



Wear protective goggles!

Cooling liquid can get in contact with your eyes and may cause permanent, severe injuries.

### Instructions for First Help

Pull off and safely remove polluted, soaked clothing. For breathing, go out in the fresh air or look for first aid treatment.

Wash with water or use creams for contact with the skin. Flush with water for eyes and look for first aid treatment. For swallowing, drink a lot of water and induce vomiting. Look for medical help.

### Cooling Liquid Preparation

Fill the mix of water and cooling liquid to the tank of the cooling system.

Keep manufacturer specified recommendations for adding the anticorrosive agents, the antifreeze or other agents! For mixture of two different mixes can produce toxic and aggressive mixes, which can peril your health or damage cooling system of the machine!



## Safety Notes

### General

The machine is equipped with safety and protective guarding for operator and machine protection. Nevertheless, this safety and protective guarding cannot prevent injury. Service personnel must read this chapter and comprehend it, before he starts to work on the machine. Always keep instructions about work safety! Service personnel must take into account other aspects of the risk, which refer to the ambient conditions and the material.

### Protective Suit and Personal Safety



Wear tight fitting overalls!

Loose fitting clothes may be caught by machine parts and cause serious injury.



Wear protective gloves!

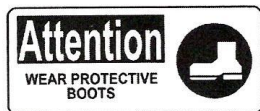
Material cuts and saw band have sharp edges and may cause serious injuries.



Attention! Gloves you can use only at working material replacement (saw band)! The machine and accessories must be inactive!



If the machine is running, you must not wear gloves! It is dangerous, because some parts of the machine can catch gloves!



Wear protective shoes with non-skid soles!

The unsuitable shoes may cause balance loss and following injury. Falling work pieces may cause serious injuries too.



Wear protective goggles!

Chips and cooling liquid may damage your eyes.



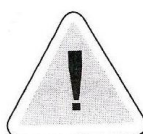
Always wear ear protections!

Most of the machines emit up to 80 dB and may damage your hearing.



Do not wear jewellery and always tie back long hair!

Moving machine parts can catch jewellery or loose hair and may cause serious injuries.

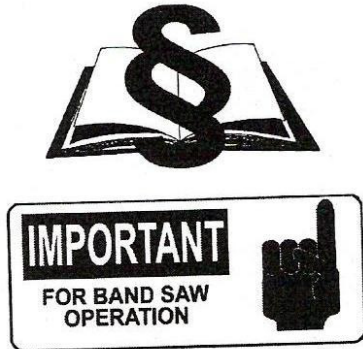


Operate the machine only when you are fit enough to work. Illnesses or injuries diminish concentration.

Avoid machine work, which may compromise the safety of you and your colleagues!

## Safety Notes for Machine Operator

Keep instructions and orders about work safety!



Read the operating instructions, before you start to work on the machine! Keep the operating instructions in good condition!

Close covers before the machine starting and check, if the covers are not damaged. Damaged covers must be repaired or changed. Do not start the machine, if the cover is removed! Check, if the electric cables are not damaged.

Do not hold the material for clamping to the vice and for cutting!

Do not operate with the buttons and the switches on the control panel, if you have gloves!

For machine starting take care, that there is nobody in the working area of the machine (it means in the working area of the vice, the saw band, the saw arm etc.).

Work on the machine only when the machine is in good condition!

Check at least once in a shift, if the machine is not damaged. If the machine is damaged, you must bring the machine in order and you must inform your superior!

Keep your working area clean!

Ensure sufficient lighting in the working area.

Take off the spilt water or the oil from the floor and dry it!

Do not touch the cooling liquid with bare hands!

Do not set the nozzle of the cooling liquid, when the machine is started on!

Do not remove the chips from the working area of the machine, when the machine is started on!

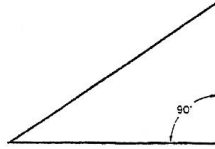
Do not use the compressed air for the machine cleaning or for the chips removing!

Use the protective instruments for chips removal!

## Triangles (Types of Triangles)

### Right Angled Triangle

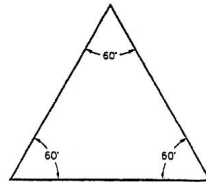
This triangle is shown in sketch and the right angle is usually indicated as shown. The longest side is always the side opposite the right angle.



**Figure 5 - Right Angled Triangle**

### Equilateral Triangle

In an equilateral triangle, all the sides are of equal length and each angle is  $60^\circ$ .

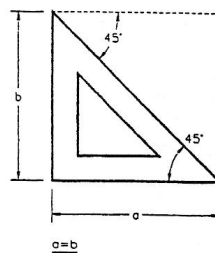


**Figure 6 - Equilateral Triangle**

### The Right Angle Triangle

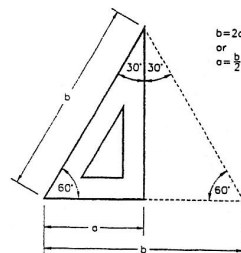
The right angled triangle appears in many situations involving mechanical engineering. The  $45^\circ/45^\circ/90^\circ$  set square and the  $30^\circ/60^\circ/90^\circ$  set square are two special cases.

The  $45^\circ/45^\circ$  triangle is half of a square where the diagonal of the square forms the longest side of the triangle. The remaining two sides are of equal length.



**Figure 7 -  $45^\circ/45^\circ$  Triangle**

The  $30^\circ/60^\circ$  triangle is half of an equilateral triangle as shown in Figure 8. The base of the  $30^\circ/60^\circ$  triangle is equal to half the length of the longest side.



**Figure 8 -  $30^\circ/60^\circ$  Triangle**

## Self Assessment

### Questions on Background Notes – Module 1. Unit 7

1. List two general guidelines when using the punching machine.

2. When using the punching machine, the punch has a taper of  $2^\circ$   
Why is this?

3. When using the Universal Ironworker and Shearing Machine, why is it important to have the correct adjustment on the hold-down clamp.

## Answers to Questions 1-3. Module 1. Unit 7

1.

- a. The Punch Stripper Plate must be adjusted correctly to allow for positioning and removal of material being punched.
- b. Do not punch material thicker than the punch diameter. This results in overloading the punch and can cause breakage or even shatter.

2.

To Stop Fiction Grip.

3.

If the hold-down is incorrectly adjusted the cutting edges of the blade can easily break off . Moreover the frame will be additionally subjected to excessive bending forces.

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