

Band Saw Machine - Technical Training

PILANA TOOLS Metal Saws spol. s r.o.

A. INSTALLATION AND OPERATION TEST

Pilana Tools Metal Saws Company maximally accents on keeping conditions which guarantee optimal quality of products delivered by this company. For this reason all our products as machines (band saws) as all accessories and tooling subjects to multigrade quality and completeness. Except for running production quality inspections output inspection and long-time load tests can be mentioned. Such sophisticated quality inspection method helps us to reach minimum claim causes, maximum reduction of defects correcting expenses of „in serial production“ machines and particularly high contentment of our customers. Though all products delivered by Pilana Tools Metal Saws pass through output inspection it is necessary to inspect each machine after its delivery to the customer, to erect the machine and to realise trial run.

Machine erection and activation process description.

During realisation of all categories of machine erection and activation is necessary to meet all basic conditions for machine operation. Correct machine function is guaranteed by supplier if following conditions are held:

a. The manufacturer warrants the correct function of the machine for these conditions:

1. At temperature air from +5°C to +40°C, the temperature average during 24 hours must not exceed over +35°C.
2. At relative humidity cannot be over 90% (not concentrate).
3. Altitude not higher than 1000 metres (important for machines with speed control by inverter)
4. Do not expose the machine to the radiation (for example microwave radiation, ultra-violet radiation, laser radiation, X – ray radiation). Radiation can cause problems with the machine function and deteriorating condition of the isolation.

b. Machine installing and leveling

Check the floor supporting capacity before machine installing. If the floor capacity does not agree with requirements, you must prepare the necessary base for the machine.

c. Minimal requirement

machine weight (chapter **Technical data**)

+ weight of accessories

+ maximum weight of material

1. The machine must be levelled at the horizontal position. All feet of the machine must touch with the floor after levelling.
2. The machine must be levelled by means of the calibrated spirit level. Spirit level is put on the vice area. Set the roller conveyors according to the spirit level.
3. For machine levelling, take care that there is sufficient available space for operation, repair work, servicing of the machine and handling the material.
4. The machine including appended parts and accessories must be visible from the place of operation.

d. Electrical connection

ATTENTION! Only a qualified professional must carry out the servicing and repairs of the electric equipment! Take special care during work with electrical equipment. High voltage shock can have fatal consequences! Always keep notes about work safety!

Before connecting switch off the main switch of the power supply circuit for the machine and ensure dry place when doing connecting works!

Service voltage must agree with the line voltage!

Crosscut of the supply line must respond with rated current for max. machine load. *Note:* The values of the crosscut of the conductor and the rated current are in the norms.

Connect the service cable of the machine on the clamps of the electric distribution. *Note:* The socket with the fork can be used only at the machines with the rated current less than 16A and total input less than 3 kW.

e. Check the direction of the saw band

After the machine has been successfully connected, briefly switch on the machine and put the driving engine of the band in the running position. The direction must be in accordance with the arrow direction on the saw band cover. In case the direction of the saw band does not match, two phases at the terminal strip must be switched.

f. Filling of the cooling system

1. This operation is executing in all saw machines except PMS 100/150 MO which has not cooling system.
 2. Prepare the mixture of the water and the cooling liquid. Keep the concentration specified by manufacturer.
 3. Fill the mixture of the water and the cooling liquid to the tank of the cooling system. Area of the tank for the cooling liquid is discovered from the chapter „**Technical data**“.
 4. Filling the tank with the cooling liquid, take care that the liquid does not drip out of the tank and the tank does not overflow.
- 15.f the machine is equipped with Microniser (see **Special accessory**), fill the tank of the Microniser by specified cooling liquid.

g. Check machine functions

Before starting the check machine functions, you must read the chapter „**Machine operation**“. Do not carry out check machine functions, if you do not comprehend meaning of all buttons and all machine functions.

1. Check, if the machine or some parts of the machine were not damaged during transport.
2. Check, if covers are installed and functional.
3. Check by means of the Tenzomat (see **Special accessory**), if the saw band is correctly stretched. If it is necessary, you can stretch the saw band according to chapter „**Selection and replacement of the saw band**“. Values of the saw band stretching are on the Tenzomat.

1. Switch on the main switch and check the motors and systems (saw band drive, hydraulic pump, cooling pump, chips conveyor).

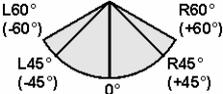
2. Open and close the main vice and the feeding vice. Drive the front feeder from the front position to the rear position. Turn the saw frame of the band saw from one outer position to other outer position. Raise the saw frame to the top position and drop the saw frame to the lowest position.

3. Start the machine with the cooling pump and let it run without load until the cooling system will be filled with cooling liquid. As soon as the cooling liquid starts to escape from the nozzles of the cooling system, the cooling system is ready for the operation.

4. Carry one cycle of cutting without material. Check, if the machine runs with no irregularities. If all machine functions are right, the machine is ready for operation.

B. SERVICE – ERROR DIAGNOSTICS

1. Setting of the angular cuts

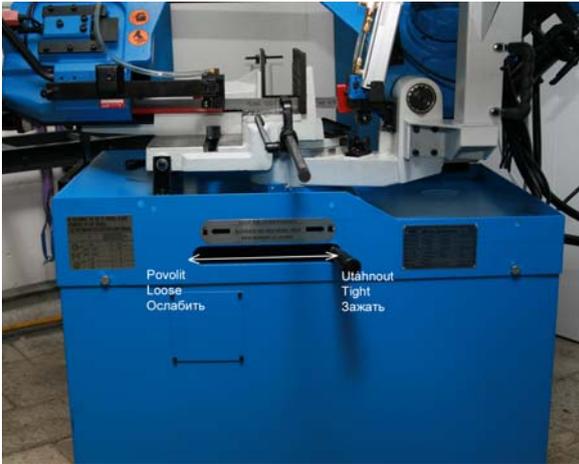


The cut angle is possible set from **-60°** to **+60°** (according band saw).

1) Lift the saw frame.



2) Loosen the securing lever of the console, release fixing knob and set the desired cut angle.



3) Tighten the securing lever of the console.

Optimal adjusting of the guide cubes span

If you want to achieve a smooth and precise cut, it is helpful to position the guide cube as close as possible to the material.



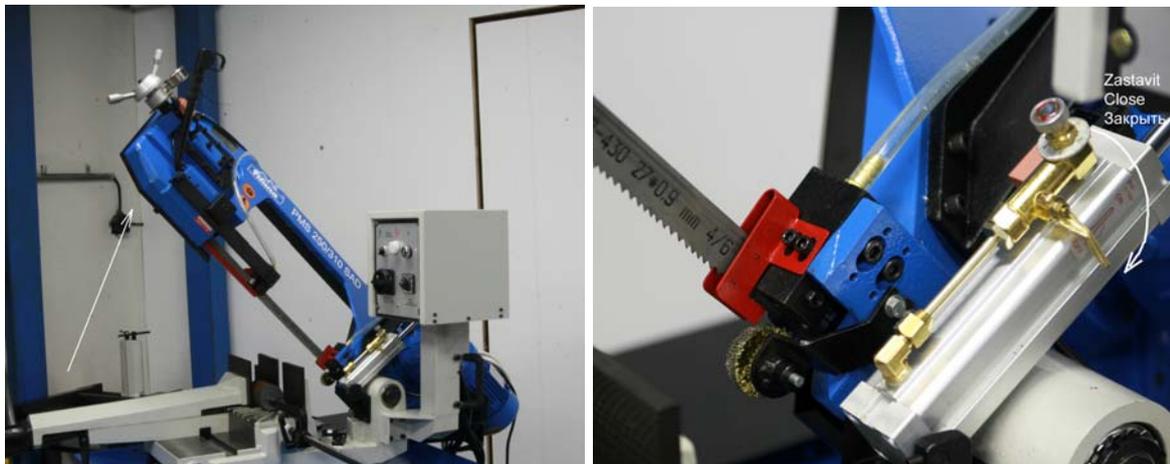
1) Release the lever of the left listel and move left part of the guide apparatus so that the left guide cube edge is as close to the cut material as possible.

2) Lower the frame to the lower position and check the position of the guide cube towards vice loading area. The guide cube must be a distance of at least 10 mm from the vice loading area.

3) Tighten the lever of the gib and check the guide cube setting once more for possible collision with binding table or vice jaw.

2. Cutting

1) Lift the saw frame and fix in top position by stop lever on hydraulic cylinder.

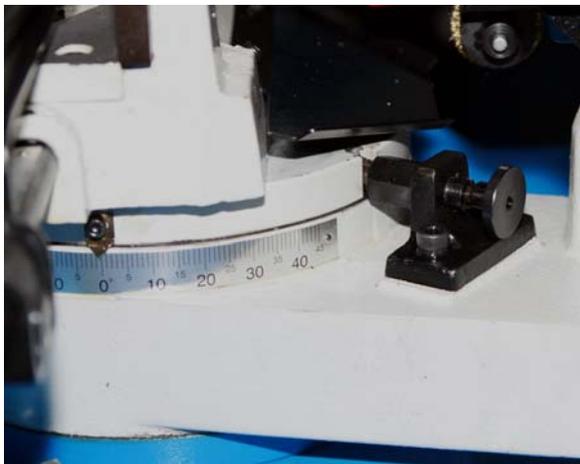


2) Open vise jaws.

3) Adjust length stop to required length of cutted piece



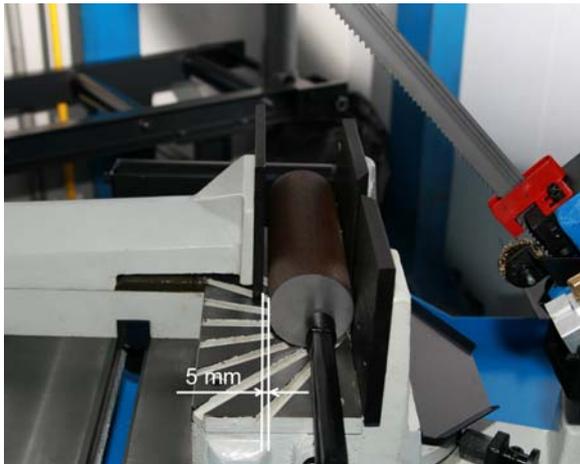
4) Adjust required angle of cut



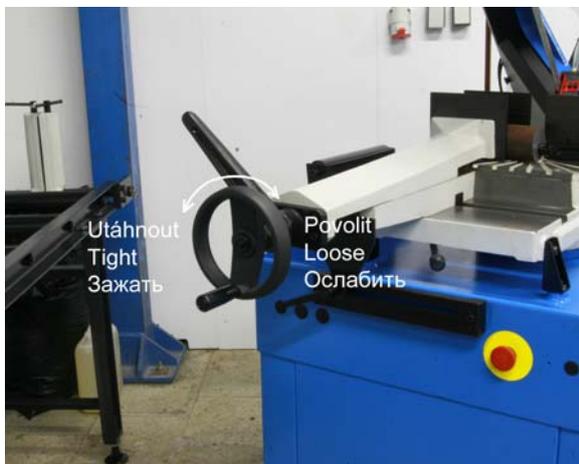
5) Insert the material a carefully move against the length stop.



6) Move with jaws of vise approx. 5 mm from cutted piece.



7) Clamp the material by lever.



8) Adjust blade speed

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9) Start blade running by the START knob



10) Adjust downfeed of saw frame by knob on hydraulic cylinder and open the cylinder.

11) After finishing the cut, close the cylinder and lift saw frame. At semi-automatic machines saw arm is lifted to the top position automatically and vise is opened.

12) Remove break-out. Now you can repeat the procedure.

3. 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.



Selection of the saw band tooth system

Pilana Tools Metal Saws company 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:

TPI, ZpZ – teeth number on one inch.

N – tooth with zero angle of the teeth.

H – tooth with positive angle of the teeth.

V-0 – variable toothing zero angle

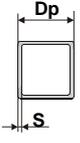
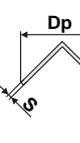
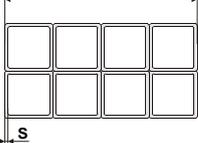
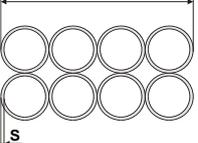
V-POS – variable toothing possitive angle

Examples of the tooth system marking:

18 N – number „18“ means 18 teeth on one inch (that means constant tooth system), letter „N“ marks teeth with zero angle of the tooth.

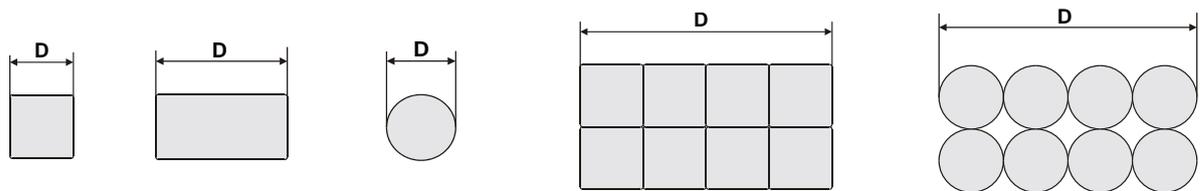
4/6 V – number „4/6“ means 4 till 6 teeth on one inch (that means variable tooth system); letter „V“ marks teeth with positive angle of the teeth.

Tables for teeth selection:

Pipes and structures (Dp, S = mm)								
								
<p>Note: Table shows tooth system selection for cutting one piece of the profile. For cutting of more pieces of the profiles (bundle), you must think of the size of the wall as double size of the wall of one profile (that means, size „S“ equates to 2 x S). In table, there are tooth systems constant and variable.</p>								
Wall Thickness	Recommended TPI for pipes and structures – thin walls							
	Outer Diameter – size of pipe, structure (mm)							
	20	40	60	80	100	120	150	200
2	14	14	14	14	14	14	10/14	10/14
3	14	14	14	14	10/14	10/14	8/12	8/12
4	14	14	10/14	10/14	8/12	8/12	6/10	6/10
5	14	10/14	10/14	8/12	8/12	6/10	6/10	6/10
6	14	10/14	8/12	8/12	6/10	6/10	6/10	6/10
8	14	8/12	6/10	6/10	5/8	5/8	5/8	5/8
10		6/10	6/10	5/8	5/8	5/8	5/8	4/6
12		8/12	6/10	6/10	5/8	5/8	4/6	4/6
Wall Thickness	Recommended TPI for pipes and structures – thick walls							
	Outer Diameter – size of structure, pipe (mm)							
	80	100	120	150	200	300	500	750
10	5/8	5/8	5/8	4/6	4/6	4/6	3/4	3/4
15	4/6	4/6	4/6	4/6	3/4	3/4	2/3	2/3
20	4/6	3/4	3/4	3/4	3/4	2/3	2/3	2/3

30	4/6 3/4	4/6 3/4	3/4	3/4	3/4 2/3	2/3	2/3	2/3 1/2
50			3/4	3/4 2/3	3/4 2/3	2/3	2/3 1/2	2/3 1/2
80					2/3	2/3 1/2	2/3 1/2	1/2
100						1,4/2	0,75/1,2 5	0,75/1,2 5

Solid Material (D = mm)



Standart Toothing		
Size mm	TPI	Shape
380 - 800	1,25	H
200 - 400	2	H
120 - 200	3	H
80 - 120	4	H/N
50 - 80	6	N
30 - 50	8	N
20 - 30	10	N
10 - 20	14	N
do 10	18	N

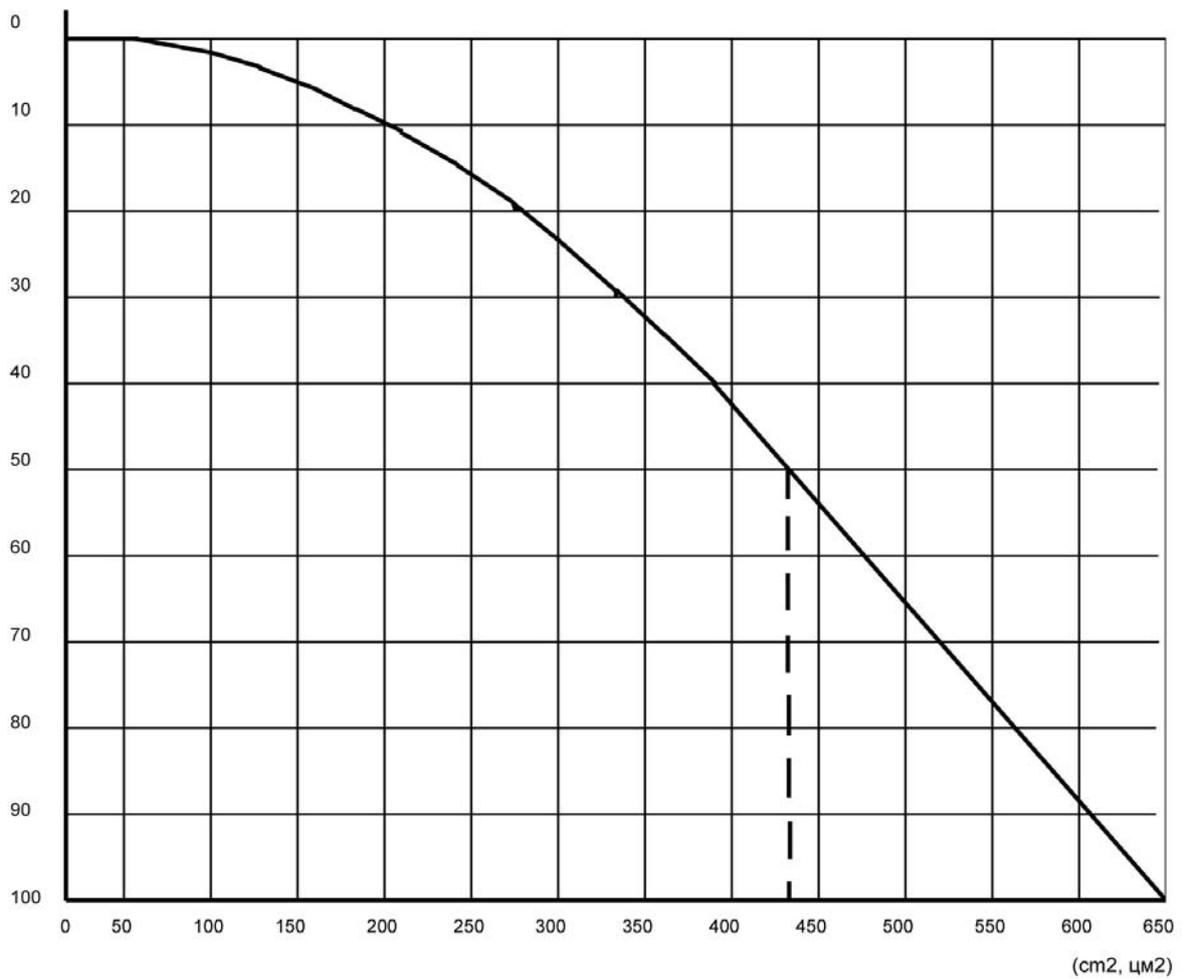
Variable Toothing		
Size mm	TPI	Shape
nad 550	0,75/1,25	V-POS
300 - 600	1/2	V-POS
120 - 350	2/3	V-POS
80 - 140	3/4	V-POS
60 - 110	4/6	V-POS
40 - 70	5/8	V-0
30 - 60	6/10	V-0
do 25	10/14	V-0

Saw band running – in

Cutting edges of quite new band are very sharp and being fully loaded by cut on standard cutting conditions the edges can be broken in short time. Running-in process adapts this sharp edges to real cutting state. Edges are slightly rounded and after that they are more resistant against eventual overloading during the cut.

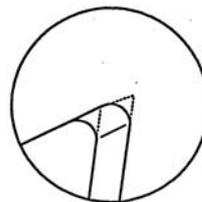
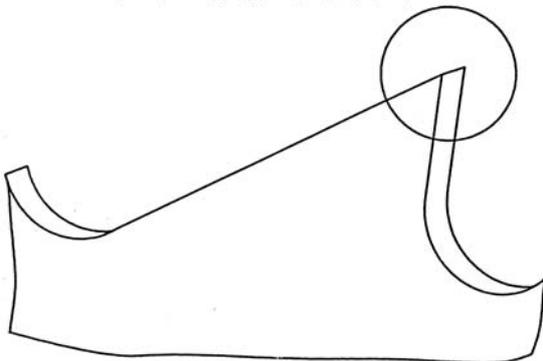
- 1) Install new blade, apply recommended blade tension and let it go free for 5-10 minutes. No nois or vibration stall appear.
- 2) Redukce cutting speed on approx. 80% of recommended value and feed speed on approximately 40 - 50% of recommended feed.
- 3) When total area approx. 300 – 650 sq.cm, see graph presented below, was cutted feed and speed can be gradually increased on recommended values in 2-3 cuts.
- 4) Follow the chips – form and colour – and jodidy cutting parameters if necessary for this process use the same material which which is intended to be cut.

Řezná rychlost, Cutting Speed (m/min), Скорость резания (м/мин)

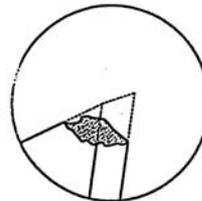


Runnig - in procedure – cutting edge adaptation:

Ostrá řezná hrana, Sharp Cutting Edge, Острая режущая кромка



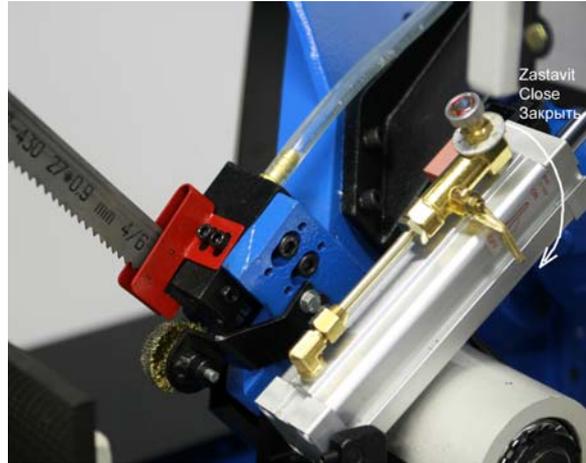
Optimálně zaoblená řezná hrana díky správnému zaběhnutí
Ideal rounded cutting edge
Оптимально закругленная режущая кромка благодаря правильному закруглению



Mikroúlomky na řezné hraně způsobené neodpovídajícím zaběhnutím
Micro-breaks on the cutting edge
Микрообломки на кромке, причиной которых является несоответствующая обкатка

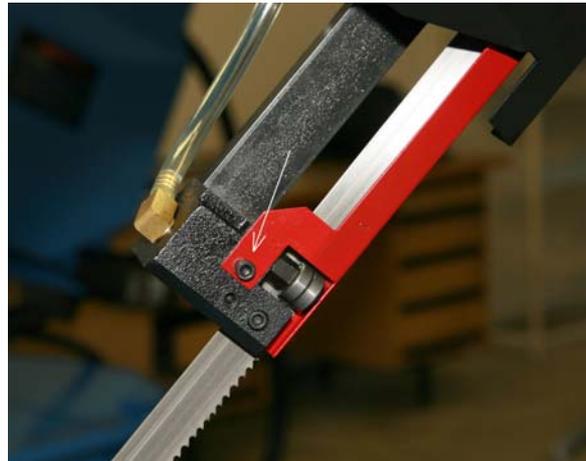
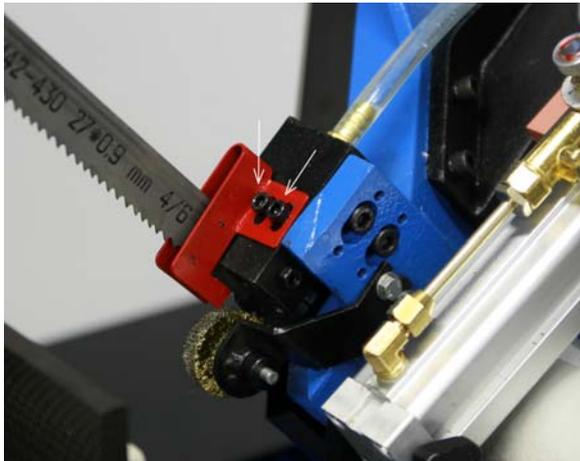
4. Saw band dismantling:

1) Lift saw arm to highest position and by regulation valve stop the arm



2) Dismantle left and right cover of saw band

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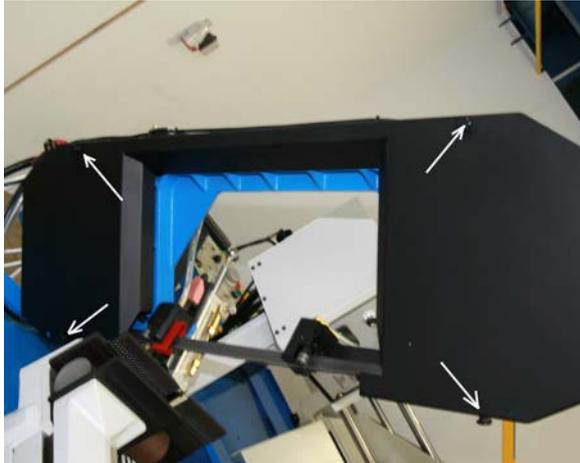


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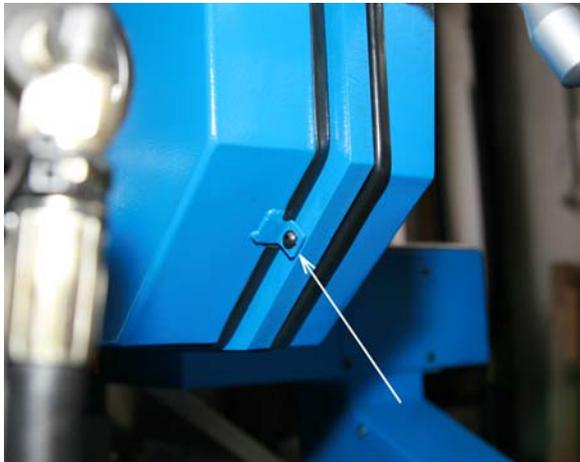


3) Dismantle rear cover of the frame

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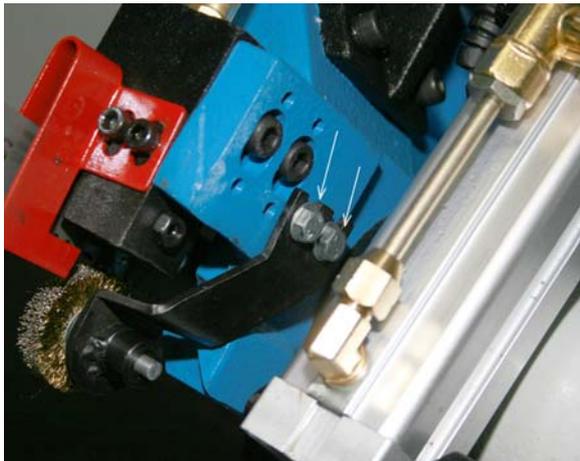


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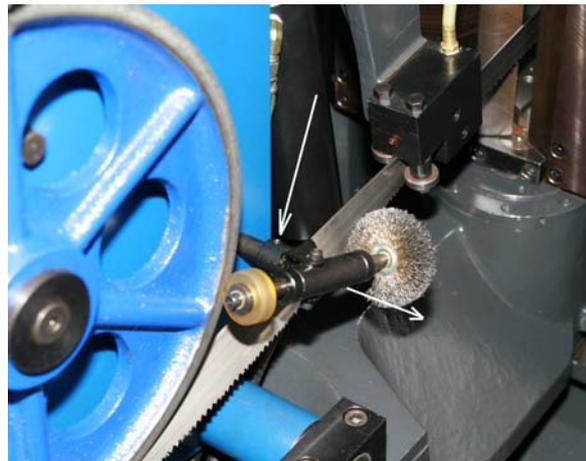


4) Dismantle cleaning brush

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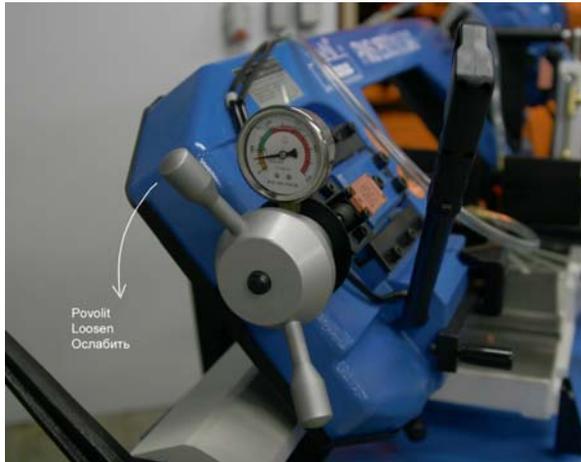


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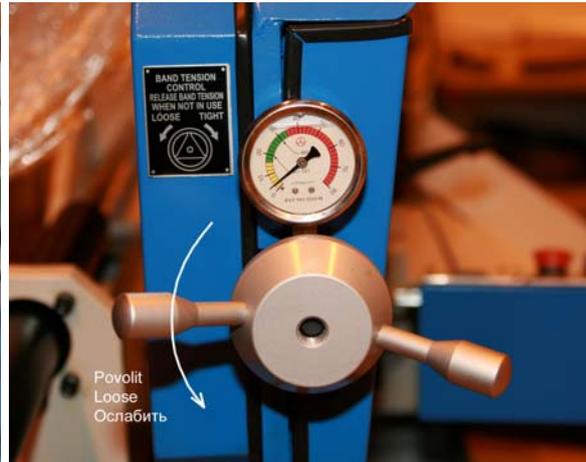


5) Loosen the saw band stretching

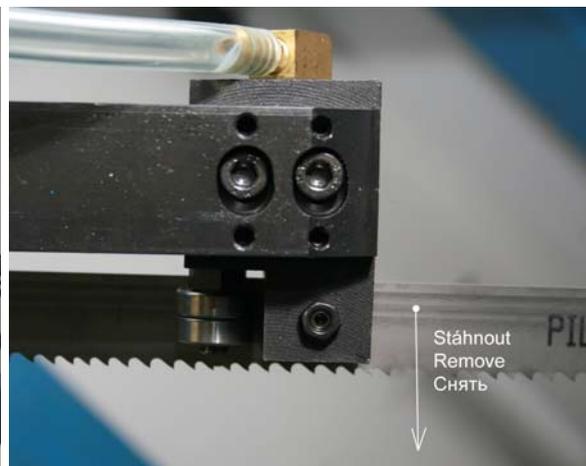
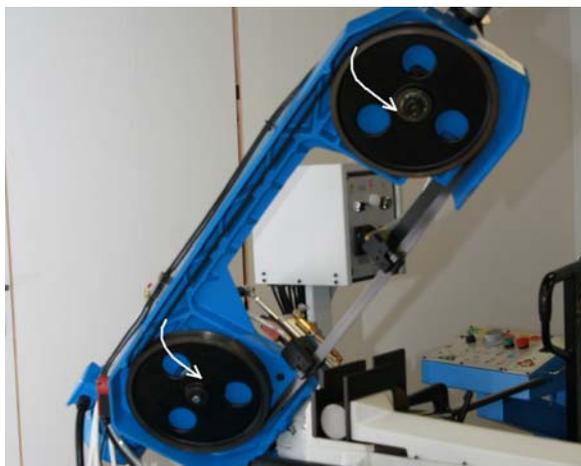
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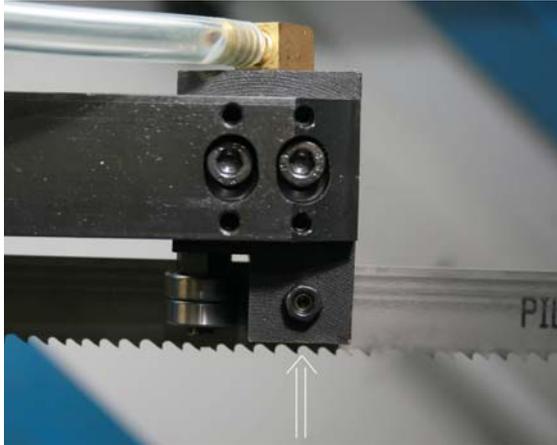
6) Carefully remove the saw band from wheels and from the guide cubes.



5. Saw band installation:

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) Install the saw band to both guiding cubes. Make sure the saw band lies on both track wheels and it is pushed all the way to the top.



3) Insert the saw band on both guiding wheels. Make sure the rear part of the saw band suits to the edge of the wheels.

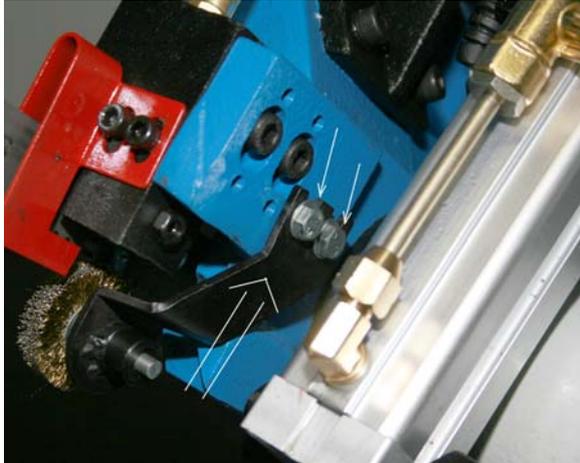


4) Stretch the saw band so it does not fall from the wheels.

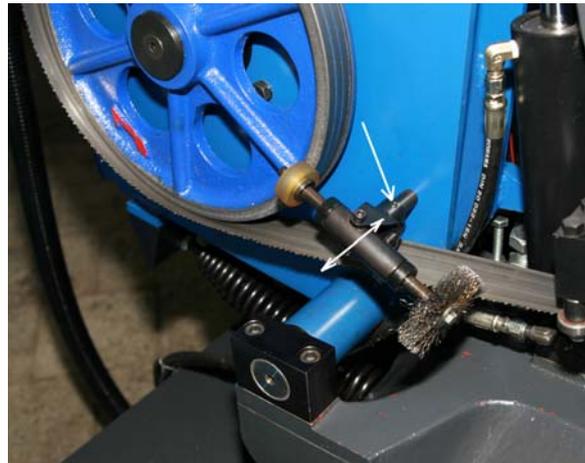


5) Adjust cleaning brush

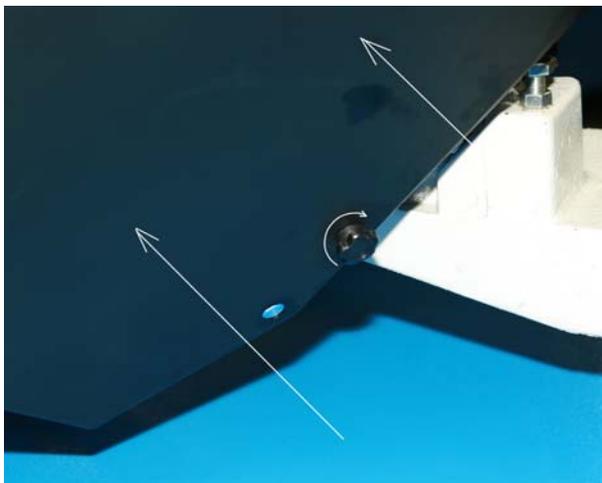
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6) Install rear cover of the frame



7) Instal protective covers of saw band, ensure saw band tooth direction (must agreed with arrow at saw arm)



6. Saw band stretching and inspection:

Right saw band stretching is one of the most important criteria's, which influents accuracy and saw band service life. Stretch the saw bands according to the selected saw band and the band saw. Keep the recommendation of your manufacturer.

The saw band must not fall from the wheels after setting.
Install the Tenzomat on the saw band and secure it with screws.



Stretch the saw band until it is stretched to the recommended value.



Band	MPa	PSI
Pilana Bimetal, 6 – 27 mm	177 - 245	25 000 – 35 000
Pilana Bimetal, 34 – 80 mm	206 – 275	30 000 – 40 000

Saw band inspection:

Check the saw band in the guiding cubes and on the wheels.

- 1) Check, if the saw band is right in the guiding cubes.
- 2) Switch on the saw band drive and then after 10 seconds switch off saw band drive. If the saw band drive is not possible to switch on, set the limit switch of the saw band stretching according to the chapter „**Servicing and adjustment**“.
- 3) Switch off the main switch.

4) Open cover(s) of the wheels and check position of the saw band on the both wheels



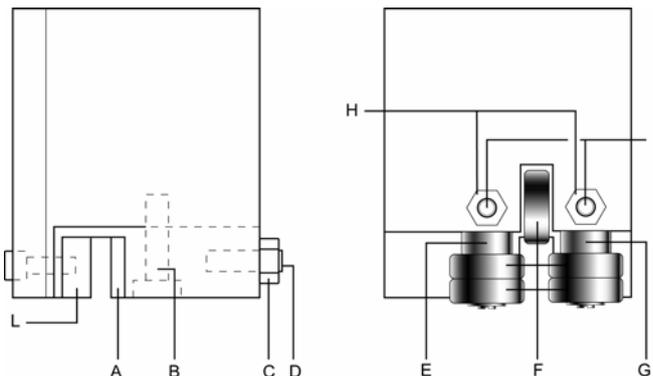
- if the distance between backside of the saw band and the offset wheel is **1 - 2 mm**, setting is right.

- if the distance is bigger than **1 – 2 mm**, or the saw band is on the offset of the wheel, set the saw band according to chapter „**Servicing and adjustment**“.

5) Close cover of the saw band.

7. Hard metal guides adjustment:

Hard metal guides adjustment is one of the most important criterions which influences cutting accuracy and saw band life. Therefore, it is essential to check regularly that hard metal guides adjustment is correct.



- 1) Loosen nut (C), screw (B) and loosen dowel (D) widening the passage between the pads.
- 2) Loosen the nuts (H) and the dowels (I) and rotate the pins (E - G) to widen the passage between the bearings (F).
- 3) To mount the new blade: place the pad (A) on the blade, loosening the dowel, allow a play of 0.04 mm for the sliding of the toothed blade, lock the relative nut and screw (B), Rotate the pins (E - G) until the bearings rest against the blade as indicated in the figure and then secure the dowels (I) and nut (H).
- 4) Make sure that between the blade and the upper teeth of the pad (L) this is at least 0.2 - 0.3 mm of play; if necessary, loosen the screws that fasten the blocks and adjust accordingly.

8. Guiding cubes adjustment

The guiding cubes are set from the manufacturer. Cubes are secured with two pins. It is not necessary to set the guiding cubes all the while of the lifetime.

Saw band run adjustment on stretching wheel:

Saw band run on the stretching wheel must be regularly inspected. The inspection has to follow every saw band replacement.

Saw band run inspection

If the run is not correct, the following problems may occur:

The saw band falls off the wheel

The saw band and protective cover can be damaged.

The saw band runs on the wheel rim

The saw band and wheel rim can be damaged.

- 1) Start and stop saw band drive.
- 2) Stop the main switch!
- 3) Open rear cover of the saw frame.
- 4) Check saw band placing on the wheels.
 - If the distance of the rear part of the saw band from wheel rim is **1 - 2 mm**, setting is right.
 - If the distance is bigger than **2 mm**, or the saw band runs on the wheel rim, saw band run must be set.

10. Saw band setting

The saw band run is set with screw in the stretching cube on the saw frame. Optimal distance has been determined at **1 – 2 mm**.

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Attention

Adjust setting only while bend is loosen!

- Turn by screw to the right, the saw band approximates to the stretching wheel rim.
 - Turn by screw to the left, the saw band departs from the stretching wheel rim.
- Check saw band run again after setting.

11. Brush adjustment

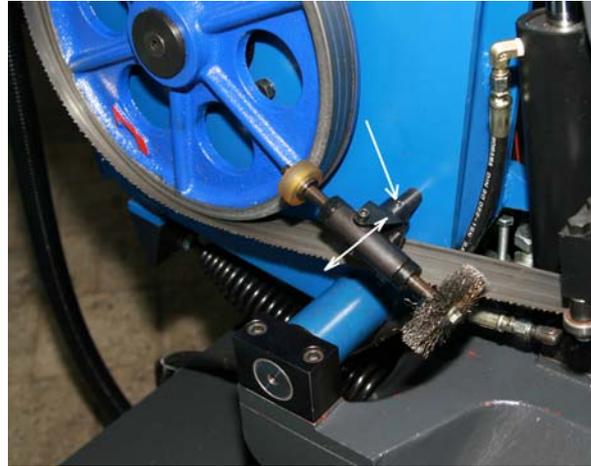
The brush for chip removal from the saw band influences cutting durability, saw band lifetime and wheels lifetime, hard metal guides and finally the cut accuracy. Brush adjustment must be checked every shift.

1) Release screws on the brush holder.

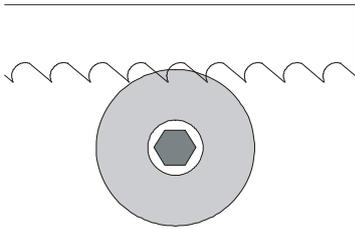
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2) Adjust the chip brush to saw band



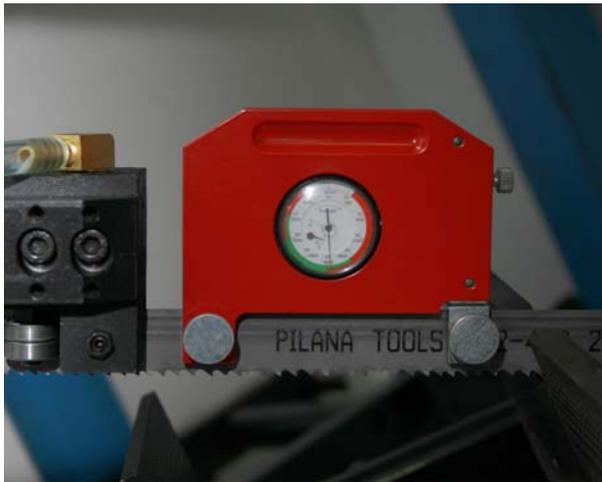
Attention! The brush **must not** touch the bottom of the saw teeth!

3) Tighten the screws on brush holder after brush adjustment.

12. Limit switch setting of the saw band stretching

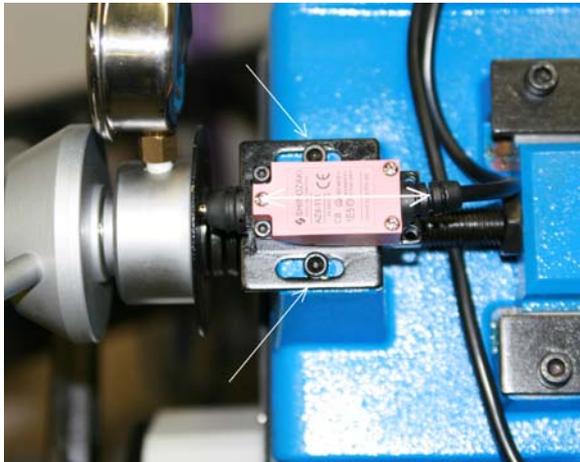
When the saw band is replaced, the saw band stretching must be checked by means of the TENZOMAT. Set the limit switch of the saw band stretching.

1) Stretch saw band by Tenzomat to optimum.

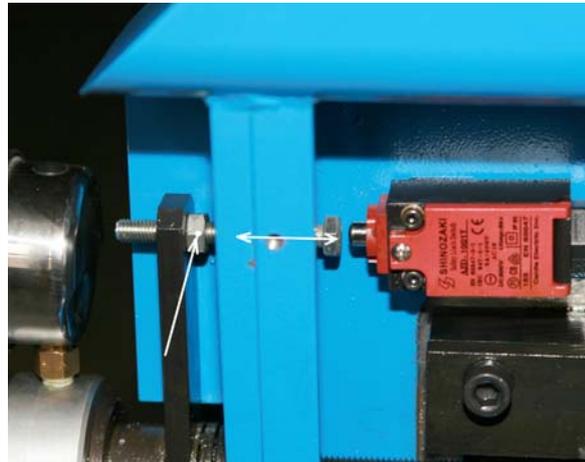


2) Unfasten limit switch

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3) Switch on main motor, two case may happen:

- a) If the motor is on, but not running, move end switch to motor start run.
- b) If motor running, move by switch to stop and than again move to run.

4) Fasten screws of limit switch holder.

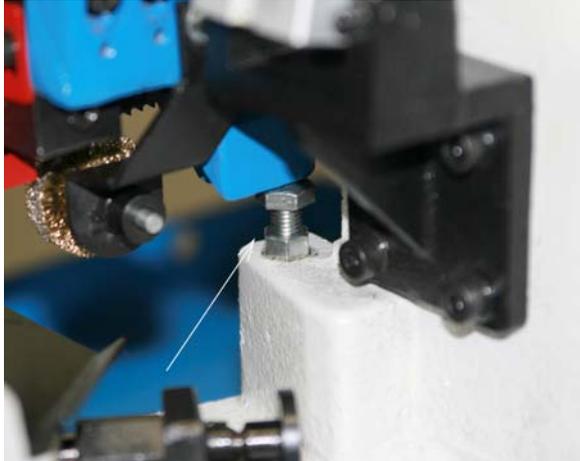
13. Saw frame lower stop position adjustment

The lower stop limits the lowest position of the saw frame. This stop point has to be checked at least once a month. If the lower stop point is incorrectly adjusted, the cutting table can be damaged or the material will not be cut completely.

1) Lift the saw frame to the top position.

2) Release the nut of the screw and set it to the desired value.

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3) Secure the screw with nut.

4) Set the limit switch of the saw frame lower position.

14. Limit switch of the saw frame lower position adjustment

If the lower stop of the saw frame was set, the limit switch must be set again.

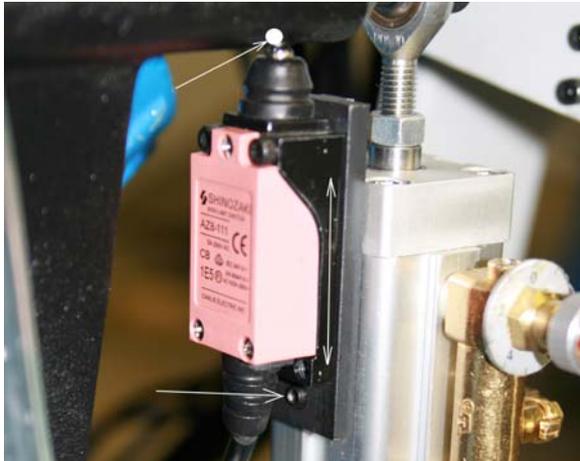
Check setting

Lower the saw frame to the bottom position. If the saw frame is on the lower stop and the limit switch was responded, the limit switch adjustment is right. If the limit switch is not right, it must be set.

Limit switch setting

1) Release screw on limit switch holder

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2) Lower the saw frame to the lower stop and start saw band drive

3) Move the limit witch with holder until saw band stop.

4) Tighten screw of limit switch holder.

15. Troubleshooting table

Problem	Possible causes	Repair
Slanting cut	- Wrongly adjusted hard metal guides.	Set according to the chapter „Servicing and adjustment“
	- Worn hard metal guides.	Replace to the chapter „Worn pieces replacement“
	- Wrongly adjusted cubes of the saw band guiding.	Set according to the chapter „Servicing and adjustment“
	- Worn bearings of the saw band guiding.	Replace according to the chapter „Worn pieces replacement“
	- Wrongly adjusted swarf brush.	Set according to the chapter „Servicing and adjustment“
	- Worn swarf brush.	Replace according to the chapter „Worn pieces replacement“
	- Insufficient saw band stretching.	Rise the saw band stretching and set the limit switch.
	- Wrongly chosen tooth system of the saw band.	Replace the saw band and keep the instructions of manufacturer on new saw band choice.
	- Worn saw band.	Replace the saw band.
	- Wrongly balanced roller conveyor.	Set the roller conveyor.
	- Dirty feeding board.	Cleanse the feeding board from debris, chip and residue material.
	- Guiding arm and guiding cube are loosened.	Clamp the guiding arm.
	- Guiding arm and cube are too far from the material.	Set the guiding cube to the material.
- Too fast cutting rate.	Lower the material feeding speed.	
- Unexpected oscillation in material quality.	Set the cut and feeding speed to the relevant material.	
The cut is not cut upon desired angle	- Securing lever is loosened.	Check the securing lever efficiency and carry out its adjustment according to chapter „Servicing and adjustment“.
	- Set angle does not match the cut angle.	Check the angle adjustment with a protractor and possibly set it according to chapter „Servicing and adjustment“.
	- Insufficient saw band stretching.	Stretch the saw band and set the limit switch according to chapter „Servicing and adjustment“.
	- Guiding arm and guiding cube are loosened.	Fasten the guiding arm and the cube.
	- Dirt between material and clamping jaw.	Cleanse the material and mating jaw.
Short lifetime of the saw band	- Insufficient saw band stretching.	Raise the tightening of the saw band set the scanner of saw band tightening according to chapter „Servicing and adjustment“.
	- Worn swarf brush.	Check the swarf brush condition and replace it in case of excessive use as described in chapter „Worn pieces replacement“

	- Wrongly adjusted swarf brush.	Check swarf brush adjustment, set it according to chapter „Servicing and adjustment“
	- Over stretched saw band	Lower stretching of the saw band and set the limit switch of the saw band stretching according to chapter „Servicing and adjustment“
	- Wrongly adjusted hard metal guides.	Check the adjustment of the hard metal guides and carry out adjustment as described in chapter „Servicing and adjustment“
	- Worn hard metal guides of the saw band.	Check the condition of the hard metal guide and if it is too worn, replace hard metal guides according to chapter „Worn pieces replacement“
	- Worn saw band guide bearings.	Check guiding bearings and if you notice some sort of excessive damage, replace them according to chapter „Worn pieces replacement“
	- Wrongly adjusted guiding cubes of the saw band.	Set guiding cube according to chapter „Servicing and adjustment“
	- Wrongly adjusted down feed and saw band speed.	Adjust the feeding and speed of a saw band according to values published by saw band manufacturer.
	- Different material quality.	Adjust feeding and speed of a saw band according to desired material (try cut-test).
	- Low-class saw band	Replace the saw band (contact your local accessory supplier for more information)
	- Wrongly chosen saw band tooth system.	Replace the saw band and keep instructions of the manufacturer on the choice.
	- Wrongly adjusted tracking.	Check the space between top of a saw band and driving wheel. Perhaps adjust the tracking as described in chapter „Servicing and adjustment“
Insufficient cut output.	- Worn saw band.	Replace the saw band and keep instructions of the manufacturer on the choice.
	- Wrong saw band tooth system.	Replace the saw band and keep instructions of the manufacturer on the choice.
	- Wrongly set down feed and speed of a saw band.	Set feed and speed of a saw band according to values published by saw band manufacturer.
Saw band drive cannot be started.	Pressure switch is adjusted wrong.	Set the pressure switch according to chapter „Servicing and adjustment“
	Pressure switch is defective.	Replace defective parts of the pressure switch.
	Material is deformed.	Use pressure control of the vices SDRA. SDRA is possible buy as additional load, parameters of the SDRA are in chapter „ Special accessories “

Cooling is not active	Lack of cooling agent. Input hosepipe is broken or obstructed. Cooling pump is defective.	Fill the tank with cooling agent. Check the cooling circuit and perhaps cleanse cooling system. Replace the cooling pump.
The cut is not finished.	Wrongly adjusted lower stop point of the saw frame. Stop point surface is messed-up.	Check lower limit switch and screw. Cleanse stop point surface of the limit switch from debris and residue material.