WP-310DS

HORIZONTAL METAL CUTTING BAND SAW

✳Study Carefully Before Operating

CE

Specifications

Capacity:			
90°	250mm	240x240mm	310x210mm
45°	200mm	180x180mm	200x140mm
60°	120mm	95x95mm	120x95mm
45°(L)	150mm	150x150mm	170x90mm
Blade Size	27x0.9x2725mm		
Blade Speed	50Hz 4P 72 m/min	8P 36 m/min	

Motor	1.1kW (1.5HP)
Packing Size (L xWxH)	1676x749x1054mm
Container Loads	20 units/20' 40 units/40'
Weight	**NW:** 302kgs **GW:** 352kgs

Contents

1 *ACCIDENT PREVENTION AND SAFETY REGULATION*

This machine has been designed to comply with national and community accident-prevention regulations. Improper use and/or tampering with the safety devices will relieve the manufacturer of all responsibility.

1.1 Advice for the Operator

- Check that the voltage indicated on machine motor is the same as the line voltage.
- Check the efficiency of your electric supply and grounding system; connect the power cable of the machine to the socket and the ground lead (yellow-green in color) to the grounding system.
- When the saw frame is in suspended mode (or raised) the blade must not move.
- Only the blade section used for cutting must be kept unprotected. To adjust the blade guards use on the blade guides.
- It is forbidden to use the machine without its shields
- Always disconnect the machine from the power socket before blade change or carrying out any maintenance job, even in the case of abnormal machine operation.
- Always wear suitable eyes protection.
- Never put your hands or arms into the cutting area while the machine is operating.
- Do not shift the machine while it is cutting.
- Do not wear loose clothing like: shirts with sleeves that are too long, gloves that are too big, bracelets, chains or any other object that could get caught in the machine during operation. Tie back long hair.
- Keep the area free of equipment, tools, or any other object.
- Perform only one operation at a time. Never have several objects in your hands at the same time. Keep your hands as clean as possible.
- All internal operations, maintenance or repairs, must be performed in a well-lit area or where there is sufficient light from extra sources so as to avoid the risk of even slight accidents

1.2 The electrical equipment according to European Standard" CENELEC EN 60204-1"

- The electrical equipment ensures protection against electric shock as a result of direct or indirect contact. The active parts of this equipment are housed in a box to which access is limited by screws that can only be removed with a special tool; the parts are fed with alternating current as low voltage (24V). The equipment is protected against splashes of water and dust.
- Protection of the system against short circuits is ensured by means of rapid fuses and grounding; in the event of a motor overload, protection is provided by a thermal probe.
- In the event of a power cut, the specific start-up button must be reset.
- The machine has been tested in conformity with point 20 of EN 60204

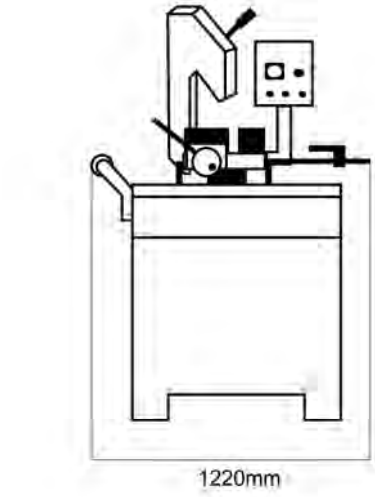
1.3 Emergencies according to European Standard "CENELEC EN 60204-1"

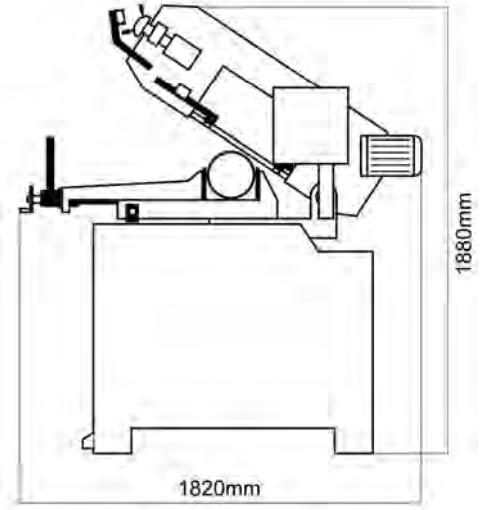
- In the event of incorrect operation or of danger conditions, the machine may be stopped immediately by pressing the red mushroom button.
- The casual or voluntary removal of the protection shield of the flywheels causes the stepping-in of a micro-switch that automatically stops all machine functions.

NOTE: Resetting of machine operation after each emergency stop requires specific restart button.

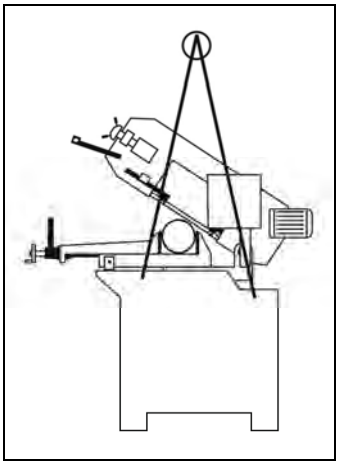
2 MACHINE DIMENSIONS TRANSPORT INSTALLATION DISMANTLING

2.1 Machine Dimensions





2.2 Transportation of Your Machine

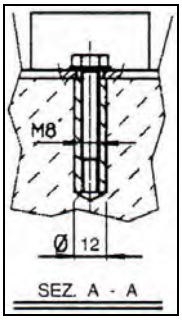


To move the machine, the machine needs to be moved in its own packing, use a forklift truck or sling it with straps as illustrated in the drawing above.

2.3 Minimum Requirements for Housing the Machine

- Main voltage and frequency must comply with the machine's motor requirements.
- Environment temperature should fall within –10 ºC to +50 ºC.
- Relative humidity cannot be over 90%.

2.4 Anchoring the Machine



Position the machine on a firm cement floor, maintaining, at the rear, a minimum distance of 800 mm from the wall; anchor it to the ground as shown in the diagram, using screws and expansion plugs or tie rods sunk In cement, ensuring that it is sitting level.

2.5 Instructions for Assembly of the Loose Parts and Accessories

Fit the components supplied:
Detail 1 Mount bar-stop rod
Detail 2 Mount and align the roll-supporting arm as per the vise table.

2.6 Deactivation of Machine

- If the sawing machine is to be out of use for a long period, it is advisable to proceed as follows:

1) Detach the plug from the electric supply panel
2) Loosen blade
3) Release the saw bow's counter-balance spring
4) Empty the coolant tank
5) Carefully clean and grease the machine
6) If necessary, cover the machine.

2.7 Dismantling (due to deterioration and/or obsolescence)

General rules

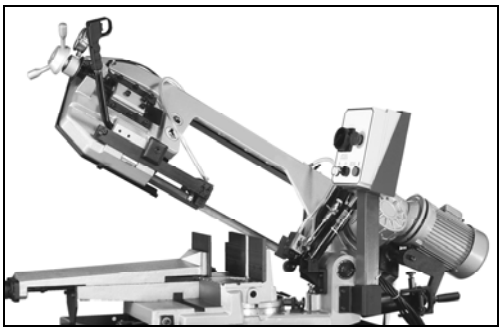
If the machine is to be permanently demolished and/or scrapped, divide the material to be disposed of according to type and composition, as follows:
1) Non-composite cast iron or ferrous materials are recyclable raw materials, so they may be taken to an iron foundry for re-smelting after having removed the contents (classified in point 3).
2) Electrical components, including the cable and electronic material (magnetic cards, etc.), fall within the category of material classified as being assimilated to urban waste according to the laws of your local, state, or federal government, so they may be set aside for collection by the public waste disposal service;
3) Old mineral and synthetic and/or mixed oils, emulsified oils and greases are considered hazardous or special refuse, so they must be collected, transported and disposed of at a special waste disposal service.

NOTE: The standards and legislation concerning refuse is in a constant state of evolution, therefore is subject to changes. The user must keep informed of the regulations at the time of disposal as these may differ from those described above.

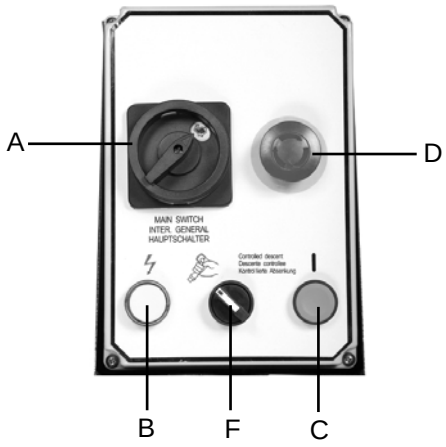
3 *THE MACHINE'S FUNCTIONAL PARTS*

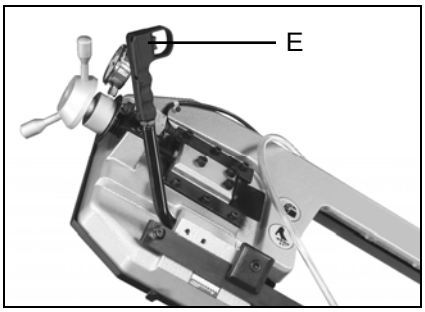
3.1 The Saw Bow

The saw bow is a collection of machine parts consisting of a saw bow, drive members (gears transfer, motor, blade wheel), blade tension system, blade guides, and blade guards. The WP-310DS model also includes a hydraulic cylinder and adjustable counter-balance spring.



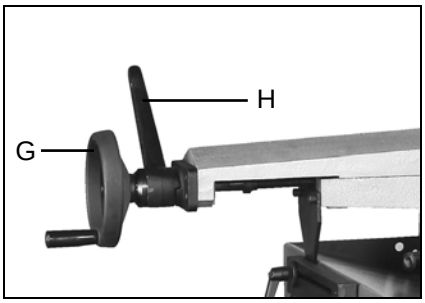
3.2 Controls





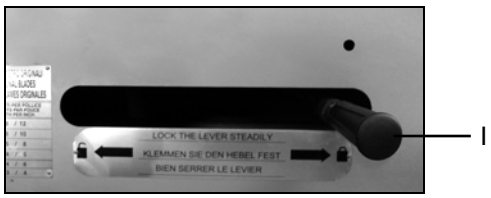
A. Main Connect Switch, blade speed selector, Low speed (turtle) or high speed (rabbit).
B. Power Indicator Light
C. Start Push Button
D. Emergency Stop Push Button
E. ON/OFF Trigger and Control Handle
F. Manual/Hydraulic Selector

3.3 Vise Adjustment



Clamping the Work Piece
- Place the work piece between the vise jaws and have it rest next to the fixed vise jaw.
- Rotate the hand wheel (G) clockwise to close the free vise jaw on to the work piece, and tighten.
- Rotate the hand wheel (G) counter-clockwise to release.
- Lever (H) can be used to rapidly lock and release the work piece by allowing a shallow gap between the vise and work piece. Then rotate lever (H) counter-clockwise to lock and clockwise to release.

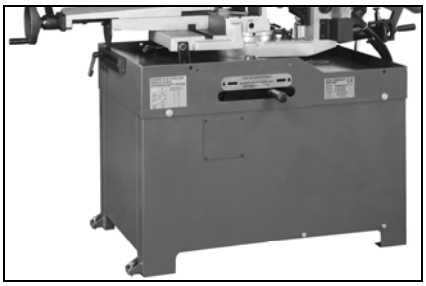
3.4 Cutting Angle Adjustment



Cutting at angles
- Angle can be cut up to 60°.
- Unlock lever (I) by pushing it to the left side.
- Rotate the saw bow to the desired angle by following the index on the scale.
- Lock lever (I) by pushing to the right side.

3.5 The Base

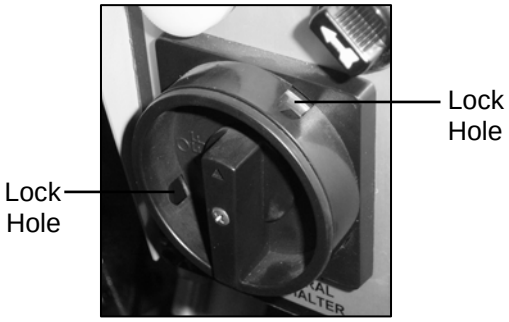
The base is a structure supporting the saw bow, the vise, the bar stop, the work piece supporter, pump, swing arm, and the coolant return plate for the support of the material. The base houses the cooling liquid tank.



4 OPERATING AND ADVICE ON USING YOUR BANDSAW

4.1 The Operation Cycle

Before operating the machine, all the main parts of the machine must be set to the optimum conditions.

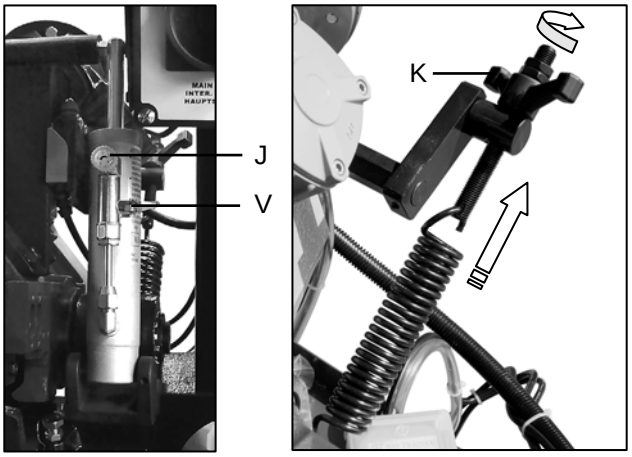


The main connect switch is designed with a lock hole. A lock can be used in the lock hole to prevent operation of the machine for safety or security.

If an emergency situation should be occurred.
- Press the emergency push button (D) down to shut off all functions. To release the emergency pushbutton rotate the mushroom shaped button in the clock-wise direction. The button will pop up, then the cutting cycle can be restarted.

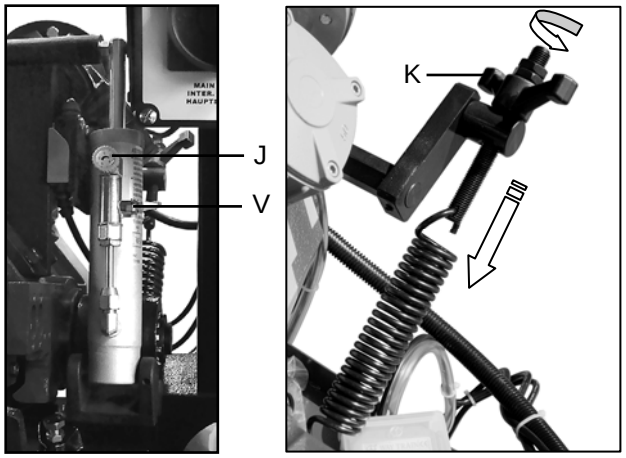
Operation Procedure:
The WP-310DS is equipped with a hydraulic flow control system and a bow weight adjusting system. This allows the machine to cut both manually and semi-automatically.

A. Manual Operation



- Reduce the bow weight. Rotate the wing nut (K) clockwise to increase the tension on the spring.
- Load work piece and clamp it properly.
- Turn on main connect switch (A) to the ON position. Check to see that the indicator light (B) is lit.
- Select manual control mode.
- Fully open the hydraulic regulation lever (V).
- Turn the control switch (F) to manual control mode for trigger operation.
- Hold the control handle (E) of the saw bow.
- Fully open the flow control knob (J) by rotating counter-clockwise to the maximum.
- Squeeze the trigger on the control handle (E) to start the blade and lower saw bow to begin cutting.
- When the saw bow reaches the bottom the micro-switch will activate and the blade will stop.
- Keep hold of the control handle to control the return to the start position.
- Close the hydraulic regulation lever (V).
- The cutting operation is complete. Reset the workpiece to continue the next cutting cycle.

B. Semi-auto Cutting Operation

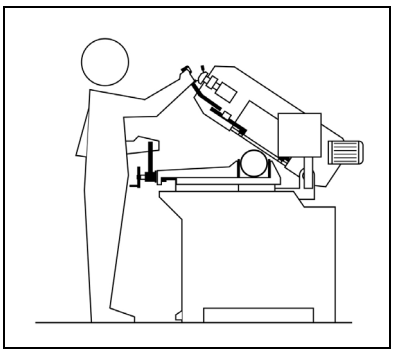


WARNING!
Failure to fully close the hydraulic flow control knob (J) and locking the hydraulic regulation lever (V) can result in serious injury. The saw bow may drop suddenly when changing the spring tension.

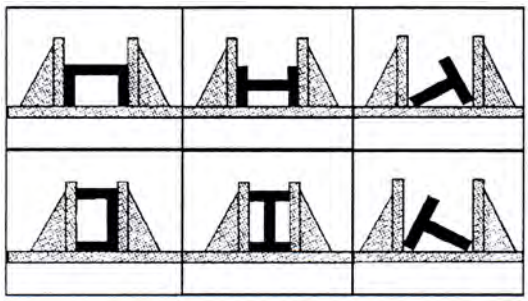
- Close the hydraulic regulation lever (V) by switching it clockwise.
- Increase the bow weight. Rotate the wing nut (K) counter clockwise to reduce the spring tension.
- Load work piece and clamp it properly.
- Turn main connect switch (A) to the ON position. Check to see that the indicator light (B) is lit.
- Select Hydraulic mode on control switch (F).
- Press the start button (C). The coolant system should activate at the same time.
- Open the hydraulic regulation lever (V) by switching it counter-clockwise.
- Slightly turn the hydraulic flow control knob (J) counter-clockwise from 2-3 to control the saw bow's descent rate.
- When the saw bow reaches the bottom the micro-switch will activate and the blade will stop.
- Lift the saw bow to the appropriate height close the hydraulic regulation lever (V) by rotating it clockwise all the way to the end.
- The machine is now ready for the next cutting operation.

If an emergency situation should occur:
- Press the emergency push button (D) down to shut off all functions. To release the emergency push button rotate the mushroom shaped button (D) clock-wise. The button will pop up, then the cutting cycle can be restarted.

4.2 Recommendations for Using the Machine
The machine has been designed to cut metal building materials, with different shapes and profiles, used in workshops, turner's shops and general mechanical structural work.
Only one operator is needed to use the machine, that must stand as shown in the picture.



- Before starting each cutting operation, ensure that the part is firmly clamped in the vise and that the end is suitably supported.
- These figures below show examples of suitable clamping of different section bars, bearing in mind the cutting capacities of the machine in order to achieve a good efficiency and blade durability.

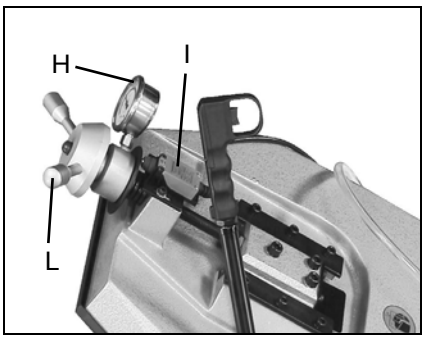


- Do not use blades of a different size from those stated in the machine specifications.
- If the blade gets stuck in the cut, release the running button immediately, switch off the machine, open the vise slowly, remove the part and check that the blade or its teeth are not broken. If they are broken, change the tool.
- Before carrying out any repairs on the machine, consult the dealer.

5 ADJUSTING YOUR MACHINE

5.1 Blade Tension Assembly

Blade tension is important to the proper operation of the saw. Proper blade tension as measured on a Blade Tension Gauge (H). Turn the handle lever (L) to tension the blade tension until the indicator point to the proper tension line as indicator gauge showing. (I) limit switch is for detecting blade broken or loose tension to stop the machine power to prevent any further damaged.

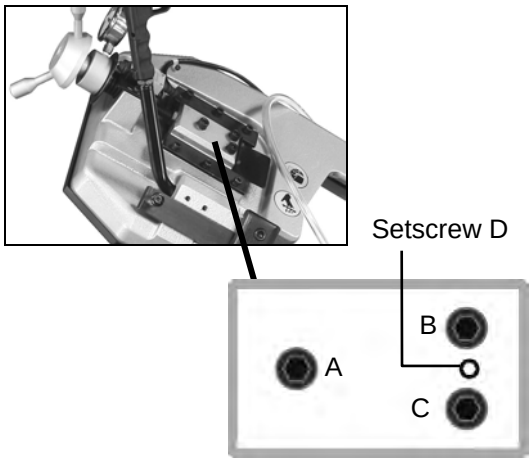


To set the blade tension without the use of a Blade Tension Gauge (H):

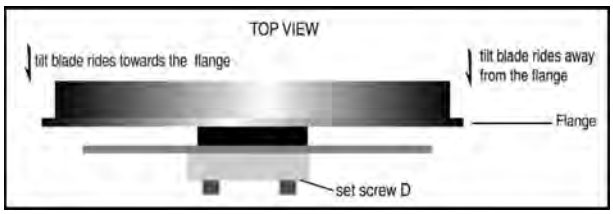
- Disconnect the machine from the power source.
- Install blade between wheel and insert blade between bearings on blade guides.
- Tension blade slightly to remove any sag in blade between blade wheels.
- Turn blade tension handle (L) one and three quarter to two revolutions clockwise. To test press the flat side of the blade with your thumb, if moves with 2mm-3mm range then it is set correctly.
- After blade has been completely installed, close covers, connect the power source, and run saw for two to three minutes so blade can seat properly.

5.2 Aligning the Flywheel

The flywheel's alignment may need adjustment to allow the saw blade to track correctly. Poor flywheel alignment can cause damage to the saw blade or to allow the blade to ride off the blade wheels.



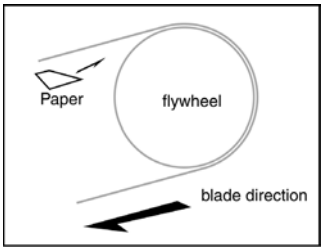
- Raise the saw bow to a usable work height.
- Disconnect the power supply.
- Loosen the Hex nut screws A, B, and C.
- Use and Allen wrench on setscrew D to adjust the tilt of the flywheel.
- Turning the setscrew, D clockwise will tilt flywheel so that the blade will ride closer to the flange.
- Turning the setscrew, D counter-clockwise will tilt the flywheel so that the blade will ride away from the flange. If the blade rides too far then it will come off.
- After the adjustment is finish, fasten the Hex nut screws in this order: A, B, and C.



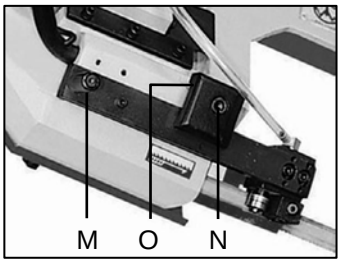
5.3 Checking the Adjustment of the Blade

Use a strip of scrap paper and slide it between the blade and the flywheel while it is running.

- If the paper is cut then the blade is riding too close to the flange. Readjust.
- If the paper folds or creases then the blade is seated properly.
- If you notice that the blade is riding away from the flange, then readjust.



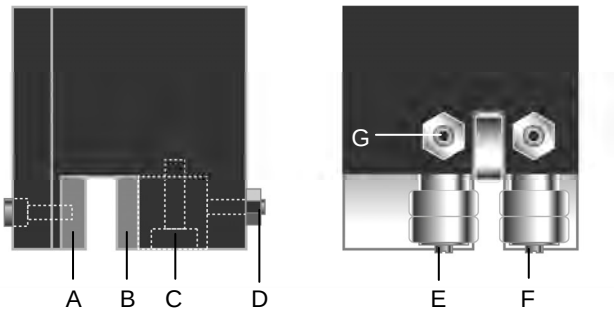
5.4 Adjusting the Blade Guide



- Disconnect the machine from the power source.
- Release the extension bar for the blade guide block. Use the hex socket screw (N) to loosen the clamping block (O).
- Hold the revolving handle (M) and slide the blade guide block to be as close as possible to the material without interfering with the cut.
- Tighten the hex socket screw (N).
- Reconnect the machine to power source.

Blade guide blocks

The blade is guided by means of pads and bearings that are set in place during inspection as per the thickness of the blade with minimum play as shown in the figure. In case the blade needs to be replaced, make sure to always install 0.9mm thick blades for which the blade guide pad and bearings have been adjusted.

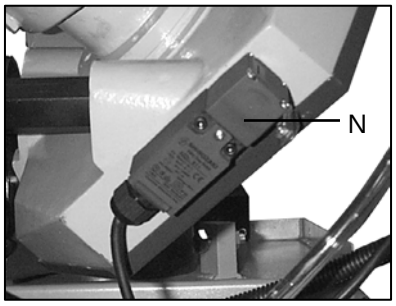


For saw blades with a different thickness, the adjustment should be carried out as follows:
Note: the position for pad (A) and bearing (F) are fixed and cannot be adjusted.

- Loosen screw (C), nut (D), and setscrew (D) to widening the passage between the pads (A and B).
- Loosen the nut (G) and setscrew (G) and rotate the shaft screw (E) with a flat head screwdriver to widen the passage between the bearings (E and F).
- To mount the new blade: adjust the pad (B) to the blade then loosen the setscrew to allow a play of 0.04 mm for the movement of the saw blade. Lock the nut (D), screw (D), and screw (C), Rotate the shaft (E) until the bearings rest against the blade as indicated in the figure and then secure the setscrew (G) and nut (G).

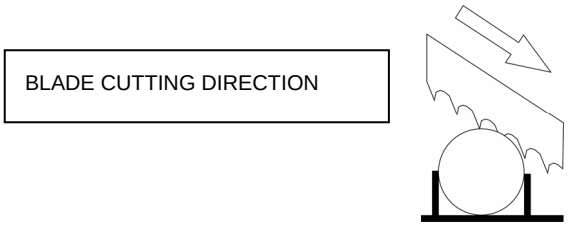
BEFORE PERFORMING THE FOLLOWING OPERATIONS, THE ELECTRIC POWER SUPPLY AND THE POWER CABLE MUST BE COMPLETELY DISCONNECTED.

5.5 Changing the Blade



To change the blade:

- Lift the saw bow.
- Loosen the blade with the blade tension hand wheel, remove the mobile blade-guard cover, open the flywheel guards and remove the old blade from the flywheels and the blade guide blocks.
- Assemble the new blade by placing it first between the pads and then on the race of the flywheels, paying particular attention to the cutting direction of the teeth.
- Tension the blade and make sure it perfectly fits inside the seat of the flywheels.
- Assemble the mobile blade-guide end, the flywheel guard, and fasten it with the relative knobs. Check the safety micro-switch (N) is activated otherwise when electricity is applied the machine will not start.



WARNING: Always assemble blades having dimensions specified in this manual and for which the blade guide heads have been set; otherwise, see chapter on "Description of the operating cycle" in the section Starting-up.

6 ROUTINE AND SPECIAL MAINTENANCE

THE MAINTENANCE JOBS ARE LISTED BELOW, DIVIDED INTO DAILY, WEEKLY, MONTHLY AND SIX-MONTHLY INTERVALS. IF THE FOLLOWING OPERATIONS ARE NEGLECTED, THE RESULT WILL BE PREMATURE WEAR OF THE MACHINE AND POOR PERFORMANCE.

6.1 Daily maintenance

- General cleaning of the machine to remove accumulated shavings.
- Clean the lubricating coolant drain hole to avoid excess fluid.
- Top off the level of lubricating coolant.
- Check blade for wear.

- Rise of saw frame to top position and partial slackening of the blade to avoid useless yield stress.
- Check functionality of the shields and emergency stops.

6.2 Weekly Maintenance
- Thorough cleaning of the machine to remove shavings, especially from the lubricant fluid tank.
- Removal of pump from its housing, cleaning of the suction filter and suction zone.
- Clean the filter of the pump suction head and the suction area.
- Use compressed air to clean the blade guides (guide bearings and drain hole of the lubricating cooling).
- Cleaning flywheel housings and blade sliding surfaces on flywheels.

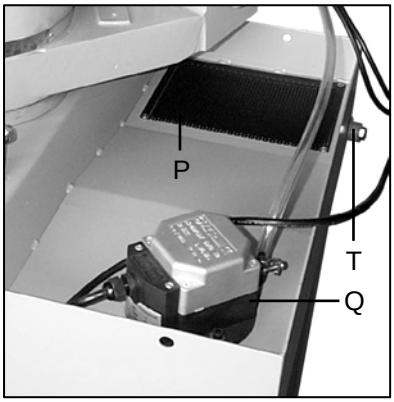
6.3 Monthly Maintenance
- Check the tightening of the motor flywheel screws.
- Check that the blade guide bearings on the heads are perfect running condition.
- Check the tightening of the screws of the gear motor, pump, and accident protection guarding.

6.4 Six-Monthly Maintenance
- Continuity test of the equipment potential protection circuit.

6.5 Oils for Lubricating Coolant
Considering the vast range of products on the market, the user can choose the one most suited to their own requirements, using as reference the type SHELL LUTEM OIL ECO. THE MINIMUM PERCENTAGE OF OIL DILUTED IN WATER IS 8 - 10 %.

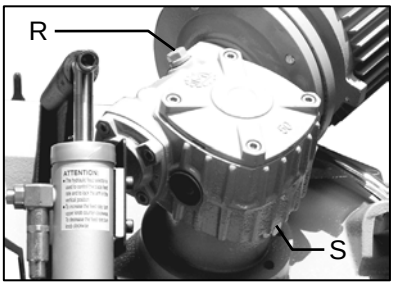
6.6 Oil Disposal
The disposal of these products is controlled by strict regulations. Please see the Chapter on "Machine dimensions Transport - Installation" in the section on *Dismantling.*

6.7 Coolant system



Cleaning the tank
- Use hex wrench to open the plug (T). Allow the coolant to drain-out.
- Remove the grate (P) by loosening the four setscrews.
- Remove the pump (Q) by loosening the four setscrews.
- Use a vacuum cleaner to vacuum chips and debris from the tank.
- Replace the plug (T).
- Thoroughly clean the pump (Q) and replace.
- Fill the tank with coolant to approximately 25mm below the grate (P).
- Replace the grate (P).

6.8 The Gearbox



The gearbox requires periodic changing of oil. The oil must be changed by the first 6 months of a new machine and every year thereafter.

To change the gear box oil
- Disconnect the machine from the power source.
- Raise the saw bow to vertical position.
- Release the drain hole (S) to draw off gear oil by loosening the oil fill bolt (R).
- Replace the drain plug bolt (S) after oil completely flows off.
- Place the saw bow back to horizontal position.
- Fill Gear box with approximately .3 liter of gear oil through the hole of the oil fill bolt (R).

For reference, use SHELL type gear oil or Mobile gear oil #90.

6.9 Special Maintenance
Special maintenance must be conducted by skilled personnel. We advise contacting your nearest dealer and/or importer. Also the reset of protective and safety equipment and devices (of the reducer), the motor, the motor pump, and other electrical components requires special maintenance.

7 TECHNICAL CHARACTERISTICS

7.1 Table of Cutting Capacity and Technical Details

CUTTING CAPACITY			
0°	250mm	240mm	310x210mm
45°	200mm	180mm	200x140mm
60°	120mm	95mm	120x95mm
45°(L)	150mm	150mm	170x90mm

BLADE MOTOR	kW	1.1
BLADE SIZE	mm	27x0.9x2725
BLADE SPEED	m/min	36 / 72
WORKING TABLE HEIGHT	mm	900
MACHINE WEIGHT	kg	302

TYPES OF STEEL						CHARACTERISTICS		
USE	I UNI	D DIN	F AF NOR	GB SB	USA AISI-SAE	Hardness BRINELL HB	Hardness ROCKWELL HRB	R=N/mm²
Construction steels	Fe360 Fe430 Fe510	St37 St44 St52	E24 E28 E36	---- 43 50	---- ---- ----	116 148 180	67 80 88	360÷480 430÷560 510÷660
Carbon steels	C20 C40 C50 C60	CK20 CK40 CK50 CK60	XC20 XC42H1 ---- XC55	060 A 20 060 A 40 ---- 060 A 62	1020 1040 1050 1060	198 198 202 202	93 93 94 94	540÷690 700÷840 760÷900 830÷980
Spring steels	50CrV4 60SiCr8	50CrV4 60SiCr7	50CV4 ----	735 A 50 ----	6150 9262	207 224	95 98	1140÷1330 1220÷1400
Alloyed steels for hardening and tempering and for nitriding	35CrMo4 39NiCrMo4 41CrAlMo7	34CrMo4 36CrNiMo4 41CrAlMo7	35CD4 39NCD4 40CADG12	708 A 37 ---- 905 M 39	4135 9840 ----	220 228 232	98 99 100	780÷930 880÷1080 930÷1130
Alloyed casehardening steels	18NiCrMo7 20NiCrMo2	---- 21NiCrMo2	20NCD7 20NCD2	En 325 805 H 20	4320 4315	232 224	100 98	760÷1030 690÷980
Alloyed for bearings	100Cr6	100Cr6	100C6	534 A 99	52100	207	95	690÷980
Tool steel	52NiCrMoKU C100KU X210Cr13KU 58SiMo8KU	56NiCrMoV7C100K C100W1 X210Cr12 ----	---- ---- Z200C12 Y60SC7	---- BS 1 BD2-BD3 ----	---- S-1 D6-D3 S5	244 212 252 244	102 96 103 102	800÷1030 710÷980 820÷1060 800÷1030
Stainless steels	X12Cr13 X5CrNi1810 X8CrNi1910 X8CrNiMo1713	4001 4301 ---- 4401	---- Z5CN18.09 ---- Z6CDN17.12	---- 304 C 12 ---- 316 S 16	410 304 ---- 316	202 202 202 202	94 94 94 94	670÷885 590÷685 540÷685 490÷685
Copper alloys Special brass Bronze	Aluminium copper alloy G-CuAl11Fe4Ni4 UNI 5275 Special manganese/silicon brass G-CuZn36Si1Pb1 UNI5038 Manganese bronze SAE43 - SAE430 Phosphor bronze G-CuSn12 UNI 7013/2a					220 140 120 100	98 77 69 56,5	620÷685 375÷440 320÷410 265÷314
Cast iron	Gray pig iron G25 Spheroidal graphite cast iron GS600 Malleable cast iron W40-05					212 232 222	96 100 98	245 600 420

8 MATERIAL CLASSIFICATION AND CHOICE OF TOOL

Since the aim is to obtain excellent cutting quality, the various parameters such as hardness of the material, shape and thickness, transverse cutting section of the part to be cut, selection of the type of cutting blade, cutting speed and control of saw frame lowering. These specifications must therefore be harmoniously combined in a single operating condition according to practical considerations and common sense, so as to achieve an optimum condition that does not require countless operations to prepare the machine when there are many variations in the job to be performed. The various problems that crop up from time to time will be solved more easily if the operator has a good knowledge of these specifications.

8.1 Definition of materials

The table above lists the characteristics of the materials to be cut. So that the correct tools to use, can be chosen.

8.2 Selecting blade

First of all the pitch of the teeth must be chosen, in other words, the number of teeth per inch (25,4 mm) suitable for the material to be cut, according to these criteria:

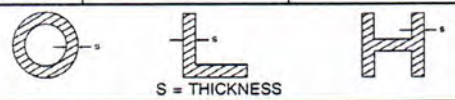
- Parts with a thin and/or variable section such as profiles, pipes and plate, need close tooth, so that the number of teeth used simultaneously in cutting is from 3 to 6;

- Parts with large transverse sections and solid sections need widely spaced tooth to allow for the greater volume of the shavings and better tooth penetration;
- Parts made of soft material or plastic (light alloys, mild bronze, Teflon, wood, etc.) also require widely spaced tooth;
- Pieces cut in bundles require combo tooth design.

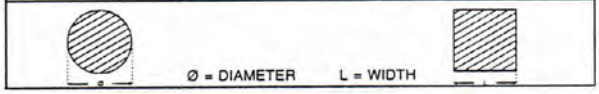
8.3 Teeth pitch
As already stated, this depends on the following factors:

- Hardness of the material
- Dimensions of the section
- Wall thickness.

BLADE TEETH SELECTION TABLE		
THICKNESS MM	Z CONTINUOUS TOOTH DESIGN	Z COMBO TOOTH DESIGN
TILL 1.5	14	10/14
FROM 1 TO 2	8	8/12
FROM 2 TO 3	6	6/10
FROM 3 TO 5	6	5/8
FROM 4 TO 6	6	4/6
MORE THAN 6	4	4/6



SOLID Ø OR L MM	Z CONTINUOUS TOOTH DESIGN	Z COMBO TOOTH DESIGN
TILL 30	8	5/8
FROM 30 TO 60	6	4/6
FROM 40 TO 80	4	4/6
MORE THAN 90	3	3/4



8.4 Cutting and advance speed
The cutting speed (m/min) and the advance speed (cm^2/min =area traveled by the disk teeth when removing shavings) are limited by the development of heat close to the tips of the teeth.
- The cutting speed is subordinate to the resistance of the material (R = $N/mm^{2)}$, to its hardness (HRC) and to the dimensions of the widest section.
- Too high an advance speed (= lowering of the saw frame) tends to cause the disk to deviate from the ideal cutting path, producing non rectilinear cuts on bath the vertical and the horizontal plane.

The best combination of these two parameters can be seen directly examining the chips.

Long spiral-shaped chips indicate ideal cutting.

Very fine or pulverized chips indicate lack of feed and/or cutting pressure.

Thick and/or blue chips indicate overload of the blade.

8.5 Blade running-in
When cutting for the first time, it is good practice to run in the tool making a series of cuts at a low advance speed (= 30-35 cm^2/min on material of average dimensions with respect to the cutting capacity and solid section of normal steel with R = 410-510 $Nimm^2$). **Generously spraying the cutting area with lubricating coolant.**

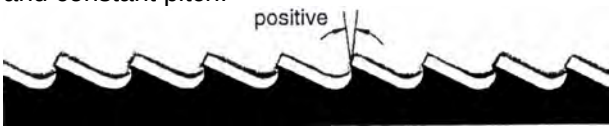
8.6 Blade structure
Bi-metal blades are the most commonly used. They consist of a silicon-steel blade backing by a laser welded high speed steel (HHS) cutting edge. The type of stocks are classified in M2, M42, M51 and differ from each other because of their major hardness due to the increasing percentage of Cobalt (Cc) and molybdenum (Mo) contained in the metal alloy

8.7 Blade type
They differ essentially in their constructive characteristics, such as:
- **Shape** and cutting **angle** of tooth
- **Pitch**
- **Set**

Shape and angle of tooth
REGULAR TOOTH: Oº rake and constant pitch.

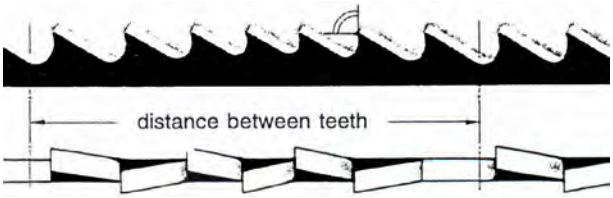
Most common form for transversal or inclined cutting of solid small and average cross-sections or pipes, in laminated mild steel and gray iron or general metal.

POSITIVE RAKE TOOTH: 9º - 10º positive rake and constant pitch.



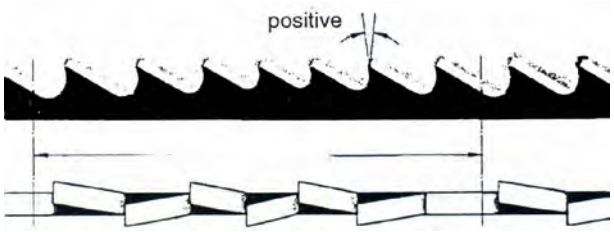
Particular use for crosswise or inclined cuts in solid sections or large pipes, but above all harder materials (highly alloyed and stainless steels, special bronze and forge pig iron).

COMBO TOOTH: pitch varies between teeth and consequently varying teeth size and varying gullet depths. Pitch varies between teeth, which ensures a smoother, quieter cut and longer blade life owing to the lack of vibration.



Another advantage offered in the use of this type of blade in the fact that with an only blade it is possible to cut a wide range of different materials in size and type.

COMBO TOOTH: 9º - 10º positive rake.



This type of blade is the most suitable for the cutting of section bars and large and thick pipes as well as for the cutting of solid bars at maximum machine capacity. Available pitches: 3-4/4-6.

SETS
Saw teeth bent out of the plane of the saw body, resulting in a wide cut in the workpiece.

REGULAR OR RAKER SET: Cutting teeth right and left, alternated by a straight tooth.

Of general use for materials with dimensions superior to 5 mm. Used for the cutting of steel, castings and hard nonferrous materials.

WAVY SET: Set in smooth waves.

This set is associated with very fine teeth and it is mainly used for the cutting of pipes and thin section bars (from 1 to 3 mm).

ALTERNATE SET (IN GROUPS): Groups of cutting teeth right and left, alternated by a straight tooth.

This set is associated with very fine teeth and it is used for extremely thin materials (less than 1mm).

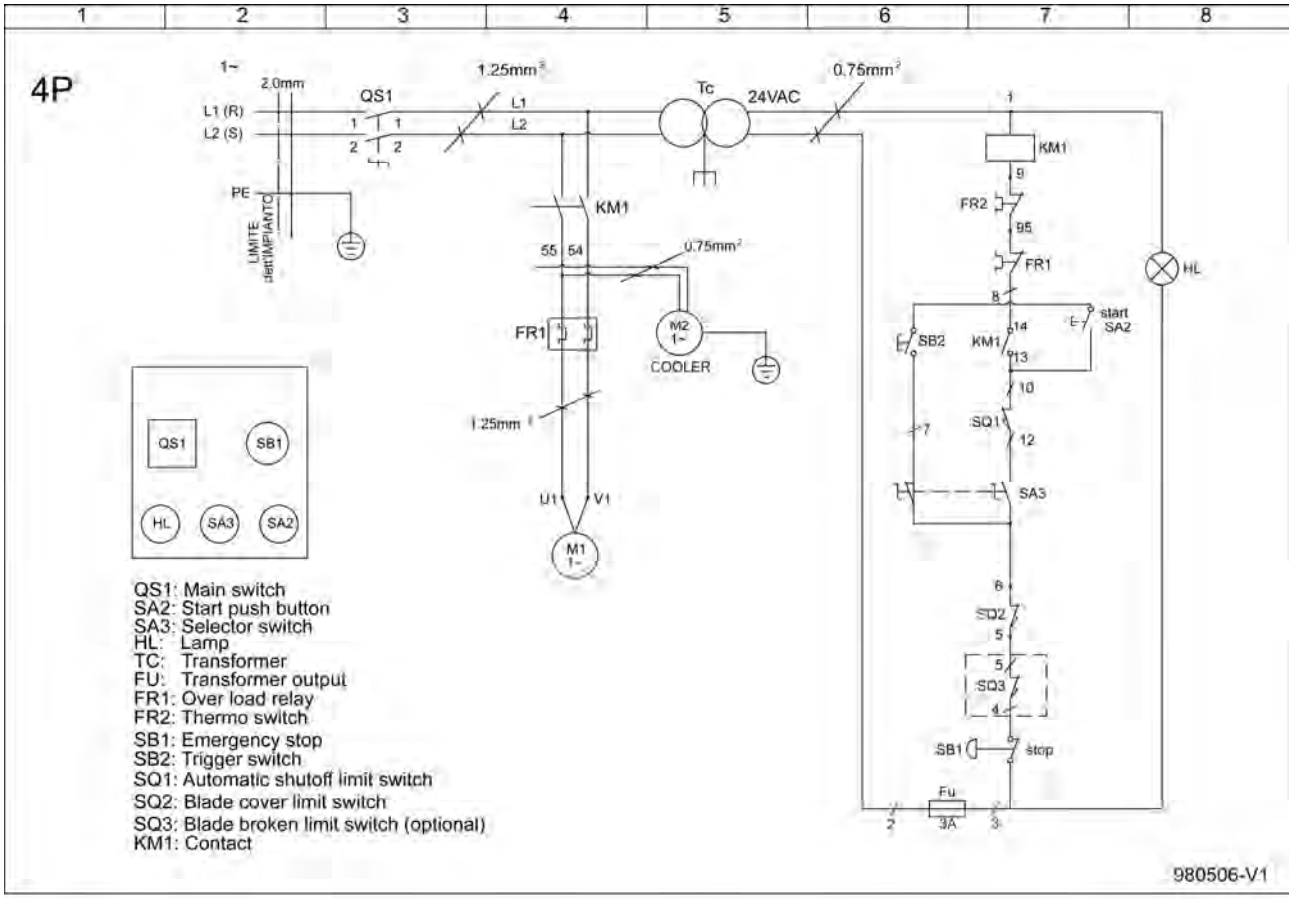
ALTERNATE SET *(INDIVIDUAL* TEETH): Cutting teeth right and left.

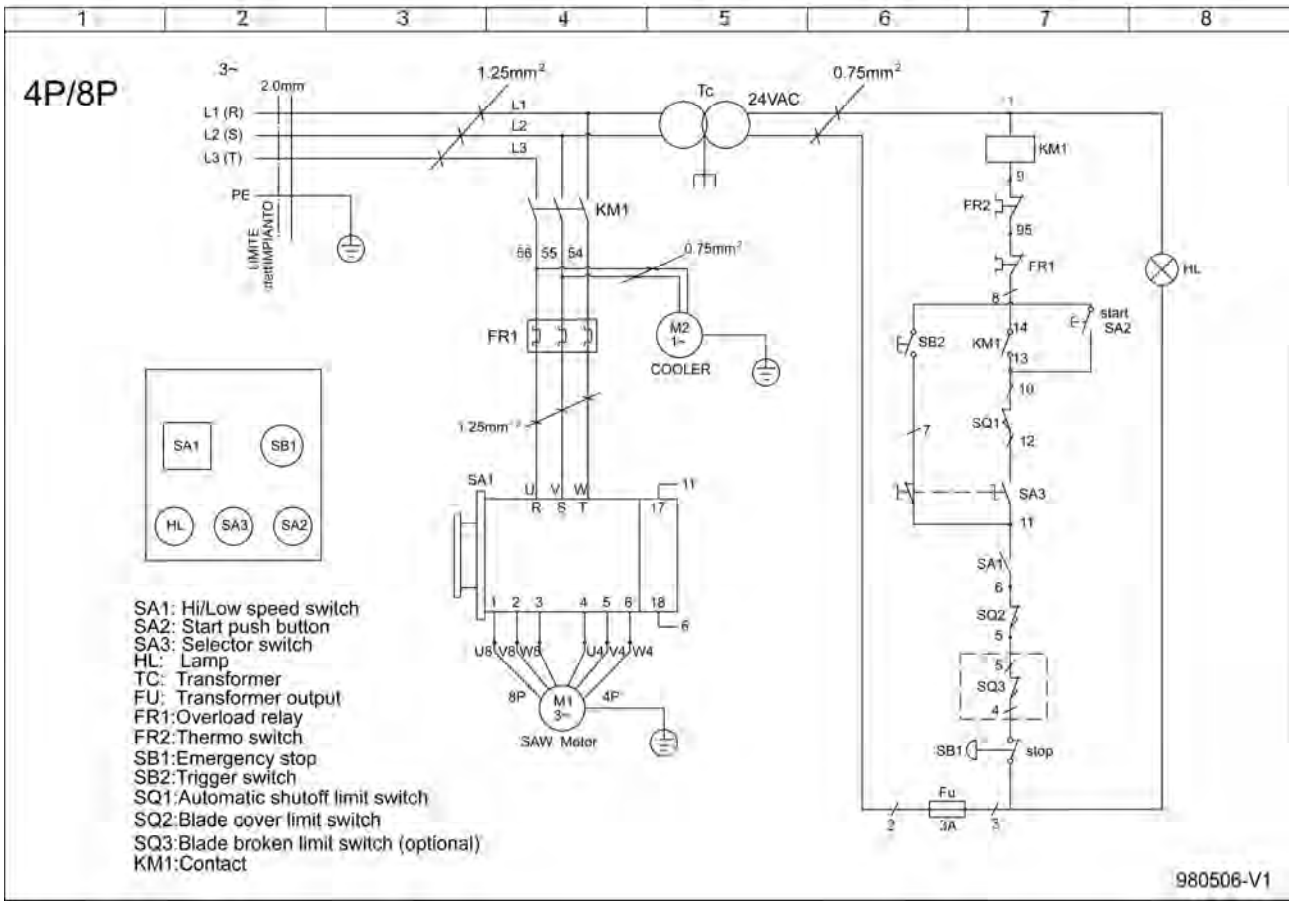
This set is used for the cutting of nonferrous soft materials, plastics and wood.

9 NOISE TESTS

The test was held under environmental noise levels of 65db. Noise measurements with the machine operating unload was 71db. Noise level during the cutting of mild carbon steel was 73db.
NOTE: with the machine operating, the noise level will vary according to the different materials being processed. The user must therefore assess the intensity and if necessary provide the operators with the necessary personal protection, as required by Law 277/1991.

10. *WIRING DIAGRAMS*

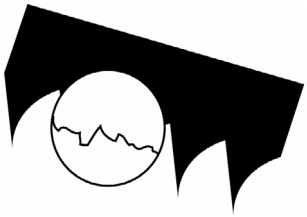
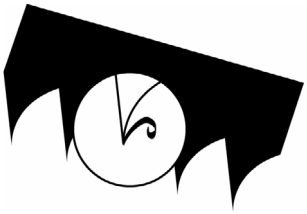


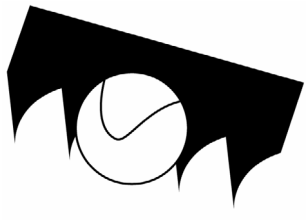
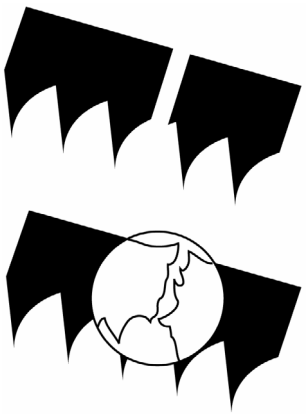


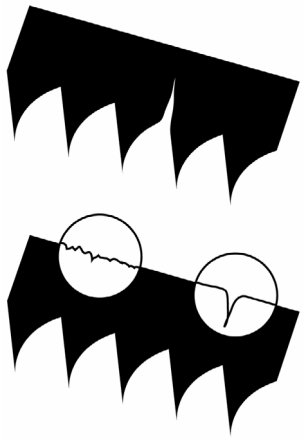
11 *TROUBLESHOOTING*

This chapter lists the probable faults and malfunctions that could occur while the machine is being used and suggests possible remedies for solving them.

11.1 Blade and cut diagnosis

FAULT	PROBABLE CAUSE	REMEDY
TOOTH BREAKAGE  	Too fast advance	Decrease advance, exerting less cutting pressure. Adjust the braking device.
	Wrong cutting speed	Change speed and/or type of blade. See chapter on "Material classification and blade selection", in the section *Blade selection table according to cutting and feed speed.*
	Wrong tooth pitch	Choose a suitable blade. See Chapter "Material classification and blade selection".
	Chips sticking onto teeth and in the gullets or material that gums	Check for clogging of coolant drain holes on the blade-guide blocks and that flow is plentiful in order to facilitate the removal of chips from the blade.
	Defects on the material or material too hard	Material surfaces can be oxidized or covered with impurities making them, at the beginning of the cut, harder that the blade itself, or have hardened areas or inclusions inside the section due to productive agents used such as casting sand, welding wastes, etc. Avoid cutting these materials or in a situation a cut has to be made use extreme care, cleaning and remove any such impurities as quickly as possible.
	Ineffective gripping of the part in the vise	Check the gripping of the part.
	The blade gets stuck in the material	Reduce feed and exert less cutting pressure.
	Starting cut on sharp or irregular section bars	Pay more attention when you start cutting.
	Poor quality blade	Use a superior quality blade.
	Previously broken tooth left in the cut	Accurately remove all the parts left in.
	Cutting resumed on a groove made previously	Make the cut elsewhere, turning the part.
	Vibrations	Check gripping of the part.
	Wrong tooth pitch or shape	Replace blade with a more suitable one. See "Material classification and blade selection" in the *Blade Types* section. Adjust blade guide pads.
	Insufficient lubricating, refrigerant, or wrong emulsion	Check level of liquid in the tank. Increase the flow of lubricating refrigerant, checking that the hole and the liquid outlet pipe are not blocked. Check the emulsion percentage.
	Teeth positioned in the direction opposite the cutting direction	Turn teeth to correct direction.

FAULT	PROBABLE CAUSE	REMEDY
PREMATURE BLADE WEAR 	Faulty running-in of blade	See "Material classification and blade selection" in the *Blade running-in* section.
	Teeth positioned in the direction opposite the cutting direction	Turn teeth in correct direction.
	Poor quality blade	Use a superior quality blade.
	Too fast advance	Decrease advance, exerting less cutting pressure. Adjust the braking device.
	Wrong cutting speed	Change speed and/or type of blade. See chapter on "Material classification and blade selection*,"* in the section *Blade selection table according to cutting and feed speed.*
	Defects on the material or material too hard	Material surfaces can be oxidized or covered with impurities making them, at the beginning of the cut, harder that the blade itself, or have hardened areas or inclusions inside the section due to productive agents used such as casting sand, welding wastes, etc. Avoid cutting these materials or perform cutting with extreme care, cleaning and remove such impurities as quickly as possible.
	Insufficient lubricating refrigerant or wrong emulsion	Check level of liquid in the tank. Increase the flow of lubricating coolant, checking that the coolant nozzle and pipe are not blocked. Check the emulsion percentage.
BLADE BREAKAGE 	Faulty welding of blade	The welding of the blade is of utmost importance. The meeting surfaces must perfectly match and once they are welded they must have no inclusions or bubbles; the welded part must be perfectly smooth and even. They must be evenly thick and have no bulges that can cause dents or instant breakage when sliding between the blade guide pads.
	Too fast advance	Decrease advance, exerting less cutting pressure. Adjust the braking device.
	Wrong cutting speed	Change speed and/or type of blade.
	Wrong tooth pitch	See chapter on "Material classification and blade selection", in the section *Blade selection table according to cutting and feed speed.*
	Ineffective gripping of the part in the vice	Choose a suitable blade. See Chapter "Material classification and blade selection."
	Blade touching material at beginning of cut	Check the gripping of the part.
	Remedy	At the beginning of the cutting process, never lower the saw bow before starting the blade motor.

FAULT	PROBABLE CAUSE	REMEDY
	Blade guide pads not regulated or dirty because of lack of maintenance	Check distance between pads (see "Machine adjustments" in the *Blade Guide Blocks* section): extremely accurate guiding may cause cracks and breakage of the tooth. Use extreme care when cleaning.
	Blade guide block too far from material to be cut	Approach head as near as possible to material to be cut so that only the blade section employed in the cut is free, this will prevent deflections that would excessively stress the blade.
	Improper position of blade on flywheels	The back of blade rubs against the support due to deformed or poorly welded bands (tapered), causing cracks and swelling of the back contour.
	Insufficient lubricating coolant or wrong emulsion	Check level of liquid in the tank. Increase the flow of lubricating refrigerant, checking that the hole and the liquid outlet pipe are not blocked. Check the emulsion percentage.
STEAKED OR ETCHED BANDS	Damaged or chipped blade guide pads	Replace them.
	Tight or slackened blade guide bearings.	Adjust them (see Chapter "Machine adjustments" in *Blade guide* section).
CUTS OFF THE STRAIGHT	Blade not parallel as to the counter service	Check fastenings of the blade guide blocks as to the counter-vice so that they are not too loose and adjust blocks vertically; bring into line the position of the degrees and if necessary adjust the stop screws of the degree cuts.
	Blade not perpendicular due to the excessive play between the guide pads and maladjustment of the blocks	Check and vertically re-adjust the blade guide blocks; reset proper side guide play (see Chapter "Machine adjustments" In *Blade guide* section).
	Too fast advance	Decrease advance, exerting less cutting pressure. Adjust the braking device.
	Worn out blade	Approach it as near as possible to material to be cut so that only the blade section employed in the cut is free, this will prevent deflections that would excessively stress the blade.
	Wrong tooth pitch	Replace it. Blade with major density of teeth is being used, try using one with less teeth (see Chapter "Material classification and blade selection" in the *Blade Types* section).

FAULT	PROBABLE CAUSE	REMEDY
	Broken teeth	Irregular work of the blade due to the lack of teeth can cause deflection in the cut; check blade and if necessary replace it.
	Insufficient lubricating refrigerant or wrong emulsion	Check level of liquid in the tank. Increase the flow of lubricating coolant, checking that the hole and the liquid outlet pipe are not blocked. Check the emulsion *percentage.*
FAULTY CUT	Worn out flywheels Flywheel housing full of chips	The support and guide flange of the band are so worn out that they cannot ensure the alignment of the blade, causing faulty cutting; blade rolling and drawing tracks can have become tapered. Replace them. Clean with compressed air.
STREAKED CUTTING SURFACE 	Too fast advance	Decrease advance, exerting less cutting pressure. Adjust the braking device.
	Poor quality blade	Use a superior quality blade.
	Worn out blade or with chipped and/or broken teeth	Replace it.
	Wrong tooth pitch	Blade used probably has too large teeth, use one with more teeth (see **"Material classification and blade selection"** in the *Blade Types* section).
	Blade guide block too far from material to be cut	Approach it as near as possible to material to be cut so that only the blade section employed in the cut is free, this will prevent deflections that would excessively stress the blade.
	Insufficient lubricating coolant or wrong emulsion	Check level of liquid in the tank. Increase the flow of lubricating coolant, checking that the hole and the liquid outlet pipe are not blocked. Check the emulsion percentage.
NOISE ON GUIDE BLOCKS	Chipped bearings Worn out or damaged pads	Dirt and/or chips between blade and guide bearings. Replace them. Replace them.

PART LIST

Part No.	Description	Size No.	Q'ty	Part No.	Description	Size No.	Q'ty
1	Base (Bottom Plate)		1	45	Hex. Cap Bolt	M12X25	2
2A	Base (Left Part)		1	46	Spring Washer	M12	2
2-1	Nut	M8	4	46-1	Washer	M12	2
3A	Base (Right Part)		1	47	Roller		1
4A	Base (Front Part)		1	48	Ball Bearing	6004 ZZ	2
4-1	Hex. Cap Bolt	M8X16	4	48-1	C-Ring	S-20	2
4-2	Washer	M8	4	49	Roller Shaft		1
5	Hex. Cap Bolt	M12X40	2	50	Hex. Socket Cap Screw	M10X20	2
6	Nut	M12	2	61	Handle		1
8	Hex. Cap Bolt	M8X16	6	62	Nut	M12	1
8-1	Washer	M8	6	63	Locking Lever		1
9	Plate		1	63-1	Set Screw	M10X16	1
10	Hex. Socket Cap Screw	M5X8	4	64	Hex. Socket Cap Screw	M10X35	1
11	Coolant Tank		1	64-1	Spring Washer	M10	1
12	Hex. Cap Bolt	M8X16	2	65	Shaft Nut		1
13	Coolant Gauge		1	66A	Shaft		1
14	Hex. Cap Bolt	3/16"	2	68	Swivel Arm		1
15	Tank Cover		1	68-1	Hex. Cap Bolt	M10X35	1
16	Filter		1	69	Scale		1
17	Pump		1	70	Rivet	2.3X4	3
18	Hex. Socket Cap Screw	M6X25	2	71	Pin		1
18-1	Washer	M6	2	72	Hollow Pin	∅ 2.5X16	1
22	Hose Clamp		1	73	Spring		1
23	Hose	5/16"X235cm	1	74	Bushing		1
23-1	Hose	1"X45cm	1	75	Bracket		1
24A	Coolant and Chip Tray		1	76	Spring Washer	M8	2
24A-1	Rubber Ring	4mm	1	77	Hex. Socket Cap Screw	M8X25	2
24A-2	Disk		1	78	Knob		1
24A-3	Spring Washer	M8	4	79	Jam Nut	M35	1
24A-4	Hex. Socket Cap Screw	M8X30	4	80	Star Washer	M35	1
24A-5	Block Plate		1	81	Anti-Dust Cover	M35	2
25	Mounting Bracket		2	82	Ball Bearing	32007	2
26	Spring Washer	M10	4	83	Shaft		1
27	Hex. Socket Cap Screw	M10X20	4	84	Hex. Cap Bolt	M10X45	1
28	Washer	M10	4	85	Nut	M10	2
29	Hex. Cap Bolt	M10X20	4	86A	Pointer		1
29-1	Washer	M10	4	87	Hex. Socket Cap Screw	M5X8	1
30	Hex. Cap Bolt	M12X40	2	88-2	Set Screw	M8X10	1
31	Nut	M12	2	92B	Table		1
36	Emergency Switch	∅ 25	1	92-1	Set Screw	M6X12	1
37-1	Hole Cover	HP-25	2	92-2	Changeable Plate		1
37-2	Hole Cover	HP-19	1	92-3	Hex. Socket Cap Screw	M8x16	4
38-1	Hole Cover	HP-22	1	94	Bar-Stop-Rod		1
39	Track		1	95	Bar-Stop		1
40	Hex. Socket Cap Screw	M8X35	2	96	Handle		1
40-1	Nut	M8	2	97	Scale		1
40-2	Spring Washer	M8	2	98	Rivet		3
41	Set Screw	M6X12	4	102	No-Burr Jaw		1
42	Washer		1	103	Hex. Socket Cap Screw	M6X15	2
43	Handle	M8X25	1	104	Counter Vise Jaw		1
44	Roller Stand		1	105	Hex. Socket Cap Screw	M6X15	2

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PART LIST

Part No.	Description	Size No.	Q'ty	Part No.	Description	Size No.	Q'ty
106	Vise Jaw		1	151-1	Vent Screw		1
107	Flat Head Machine Screw	M6X15	2	152	Key	8X8X30	1
108	Vise		1	153	Hex. Cap Bolt	M8X30	4
109	Dovetail Plate		1	153-1	Spring Washer	M8	4
110	Nut	M5	3	154	Motor		1
111	Set Screw	M5X25	3	155	Key	8X8X30	1
113	Key	5X5X15	1	186	Hex. Socket Cap Screw	M10X35	4
115	Spring Washer	M8	4	186-1	Spring Washer	M10	4
116	Hex. Socket Cap Screw	M8X20	4	193A	Saw Arm		1
117	Hand Wheel		1	193-1	Set Screw	M8X10	2
117-1	Spring Washer	M6	1	194	Hex. Socket Cap Screw	M10X30	4
117-2	Hex. Socket Cap Screw	M6X25	1	194-1	Spring Washer	M10	4
117-3	Bushing		1	195	Limit Switch		1
118	Set Screw	M8X10	1	195-1	Switch Pin		1
120	Vise Seat		1	196	Hex. Socket Cap Screw	M4X35	2
122	Vise Setting Plate		1	197	Hex. Socket Cap Screw	M10X35	4
123	Hex. Socket Cap Screw	M10X30	2	197-1	Spring Washer	M10	4
124	Setting Washer		1	198	Pipe Fitting Seat		1
125	Lock Lever Device		1	199	Hex. Socket Cap Screw	M5X30	2
127	Handle		1	200	Coolant Switch		1
128	Setting Plate		1	201	Hose Clamp		1
129	Bushing		1	203	Pipe Fitting	1/4PX5/16	2
130	Hex. Socket Cap Screw	M8X20	2	204	Hose	5/16"X40cm	1
130-1	Spring Washer	M8	2	205	Hose	5/16"X90cm	1
131A	Electric Box Holder		1	206	Drive Flywheel		1
132	Spring Washer	M8	4	207	Washer		1
133	Hex. Socket Cap Screw	M8X20	4	207-1	Spring Washer	M10	1
135	Hex. Socket Cap Screw	M10X25	2	208	Hex. Cap Bolt	M10X25	1
136	Spring Washer	M10	2	209A	Idle Flywheel Shaft		1
137	PVC Panel		1	210	Roller Bearing	32006	2
138	Start Button		1	211	Idle Flywheel		1
139	Manual / Auto Selector		1	212	Star Washer	M30	1
140	Power Indicator Light		1	212-1	Anti-dust Cover	M30	2
141	Emergency Switch		1	213	Jam Nut	M30	1
142	Main Connect Switch	3PH	1	214	Oil Inlet	1/16	1
142-1	0-1 Power Switch (not shown)	1PH	1	215A	Saw Blade		1
143	Plastic Box		1	216A	Blade Cover		1
144	Transformer		1	217	Plum Screw	M6X10	4
145	Fuse Seat		1	219	Round Head Screw	M4X8	2
146	Overload Relay		1	220	Nut	M4	2
147	Magnetic Connector		1	222	Handle		2
148	Control Bracket		1	223	Handle Wheel		1
148-1	Handle		1	223-1	Thrust Bearing	51103	1
148-2	Hex. Socket Cap Screw	M8x16	2	223-2	Blade Tension Gauge		1
148-3	Round Head Screw	M5x10	8	223-3	Plate		1
149	Supporting Bracket		1	224	Special Spring Washer		10
149-1	Shaft		1	225	Tension Shaft		1
150	Set Screw	M8X10	1	229	Plate		1
150-1	Hex. Socket Cap Screw	M8X25	4	230	Hex. Socket Cap Bolt	M6X12	2
150-2	Spring Washer	M8	4	231	Limit Switch		1
151	Reduction Unit		1	232	Hex. Socket Cap Bolt	M4X25	2

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PART LIST

Part No.	Description	Size No.	Q'ty	Part No.	Description	Size No.	Q'ty
239	Nut	M16	1	286-2	Hex. Socket Cap Screw	M8x16	1
240A	Slide Bracket		1	286-3	Washer	M8	1
240A-1	Spring Washer	M10	3	287	Setting Seat		1
240A-2	Hex. Socket Cap Screw	M10X45	3	288	Lead Screw Seat		1
240A-3	Set Screw	M10X25	1	289	Bearing Bushing		1
244	Cover Plate		1	289-1	Ball Bearing	51104	1
245	Hex. Socket Cap Screw	M6X8	2	289-2	Nut		1
246	Gib		2	291	Trigger Switch		1
247	Spring Washer	M8	6	292	Pipe		1
248	Hex. Socket Cap Screw	M8X20	6	292-1	Nut		1
249	Blade Guide Movable Rod		1	293	Nut	M12	1
249-1	Hex. Socket Cap Screw	M6X8	1	294	Spring Hook		1
250	Set Screw	M6X12	4	295	Spring		1
251	Hex. Socket Cap Screw	M8X20	2	296	Spring Seat		1
252	Setting Bracket		1	297	Spring Bushing		1
253	Hex. Socket Cap Screw	M12X50	1	298	C-Ring	S-12	4
254	Handle		1	298-1	Washer	M10	2
256	Guide Bracket		1	299	Shaft		1
257	Nozzle		1	300	Pin		1
258	Nut	M10	1	301	Hollow Pin	∅2.5X16	1
259	Bolt		1	302	Spring		1
260	Hex. Socket Cap Screw	M6X8	1	303	Fork		1
261	Blade Guard		1	304	Nut	M10	1
262	Set Screw	M6X20	2	305	Adjusting Bracket		1
263	Nut	M6	2	306	Shaft		1
264	Centric Shaft		2	307	Knob		1
265	Ball Bearing	608ZZ	8	307-1	Bushing		1
265-1	Ball Bearing	608ZZ	2	308	Shaft		1
266	E-Ring	E-7	8	309	Arm		1
267	Blade Guide		2	310	C-Ring	S-12	2
268	Hex. Socket Cap Screw	M6X25	2	311	Hex. Socket Cap Screw	M10X25	1
269	Eccentric Shaft		2	312	Spring Washer	M10	1
270	Hex. Socket Cap Screw	M6X8	2	313	Post		1
271	Blade Guard		1	314	Set Screw	M10X16	3
272	Guide Bracket		1	315	Hydraulic Cylinder Post		1
272-1	Hex. Socket Cap Screw	M6X8	2	316	Spring Washer	M8	4
273	Pipe Fitting		1	317	Hex. Socket Cap Screw	M8X25	4
274	Blade Guide		2	318	Round Head Screw	M5X10	2
275	Ball Bearing Bracket		1	319	Limit Switch		1
276	Set Screw	M6X12	4	320	Hex. Socket Cap Screw	M6X8	2
277	Hex. Socket Cap Screw	M10X20	2	320-1	Washer	M6	2
279	Hex. Socket Cap Screw	M8X20	2	321A	Adjusting Bracket		1
280	Brush		1	322A	Hydraulic Cylinder		1
281	Brush Clamp		1	323	Hex. Socket Cap Screw	M10X40	1
282	Set Screw	M5X5	1	324	Nut	M10	1
283	Set Bushing		1				
284	Hex. Cap Screw	M6X12	2				
285	Washer	M6	2				
286	Lead Screw		1				
286-1	Spring		1				

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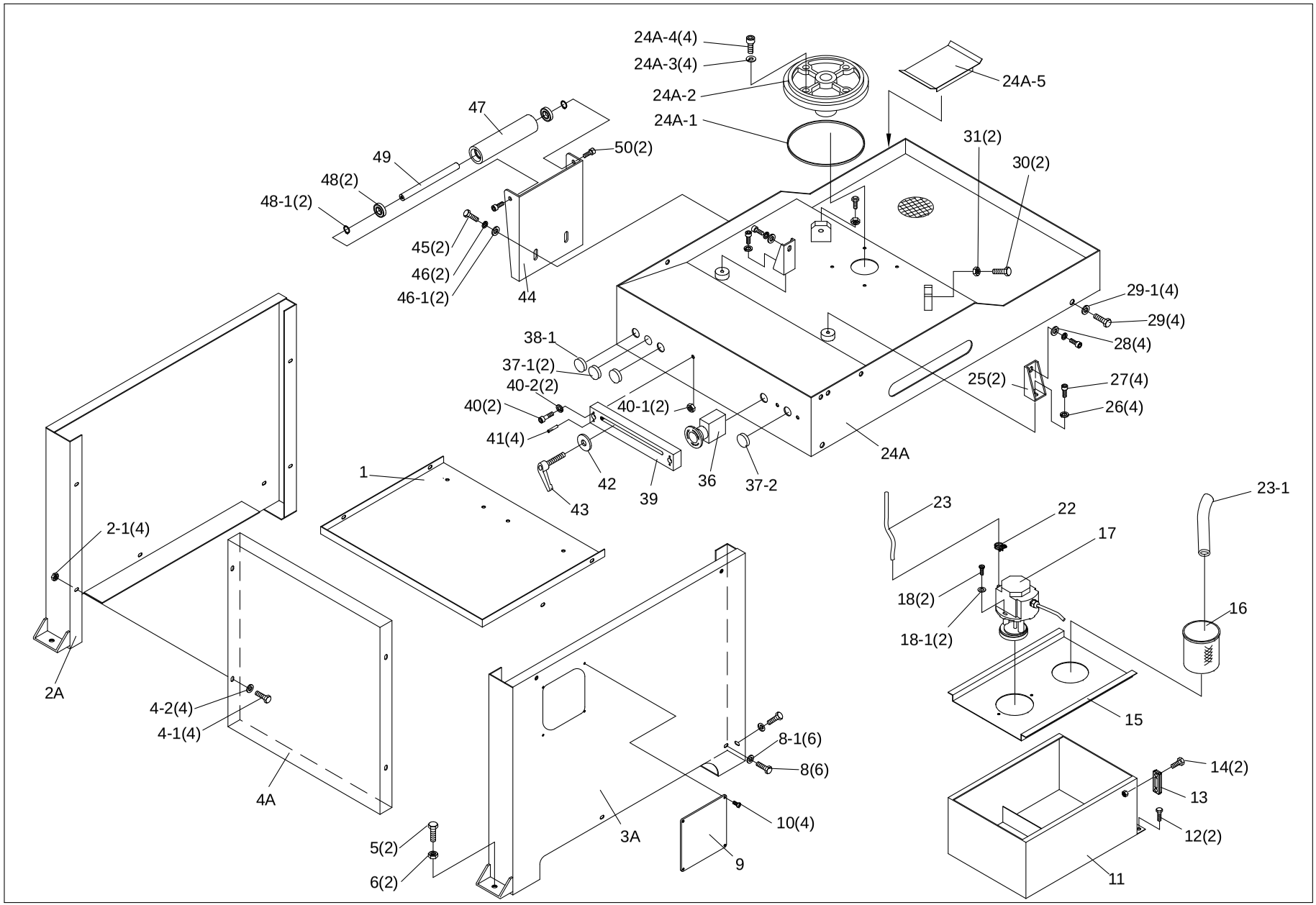

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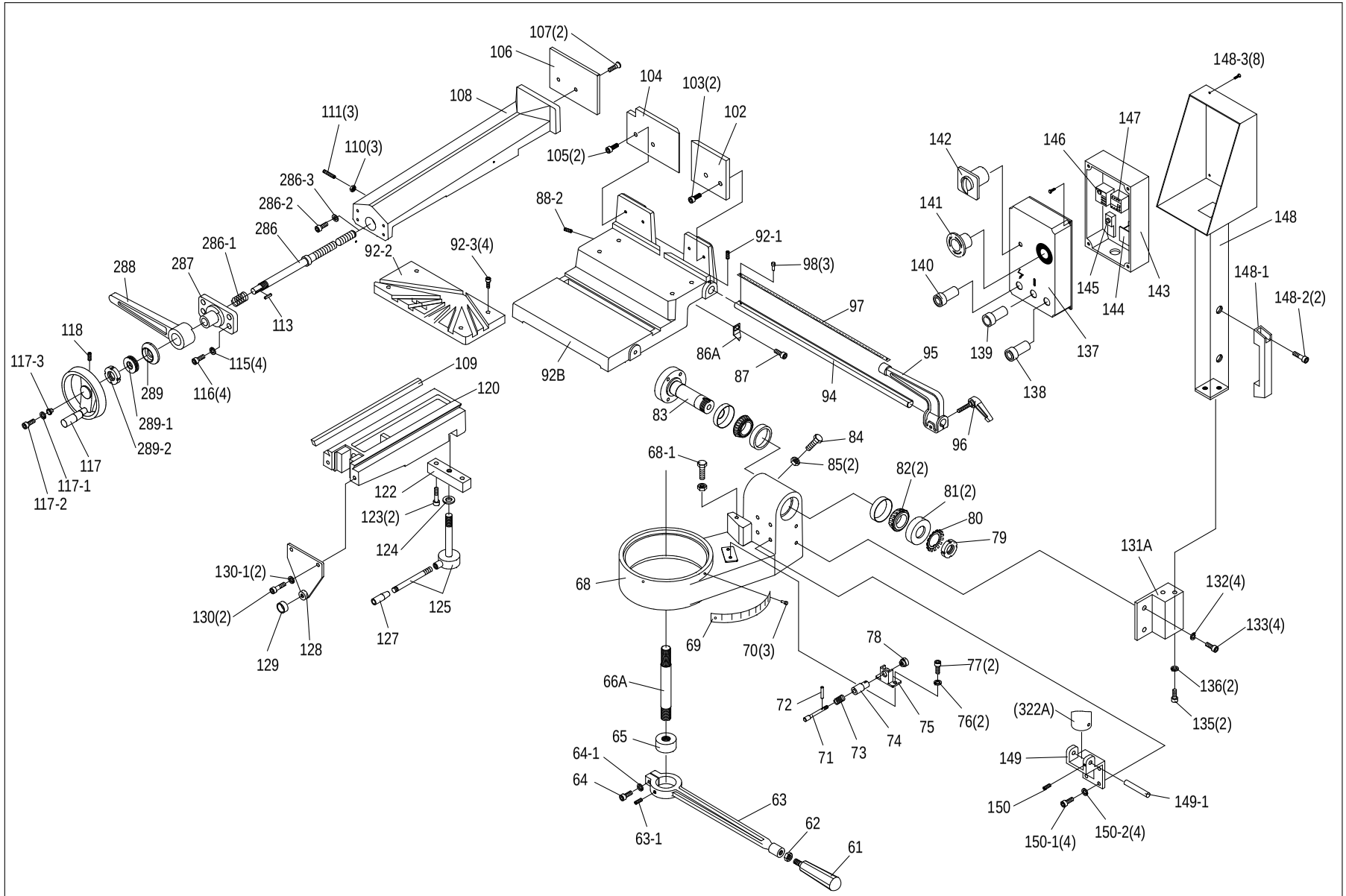
WP-310DS



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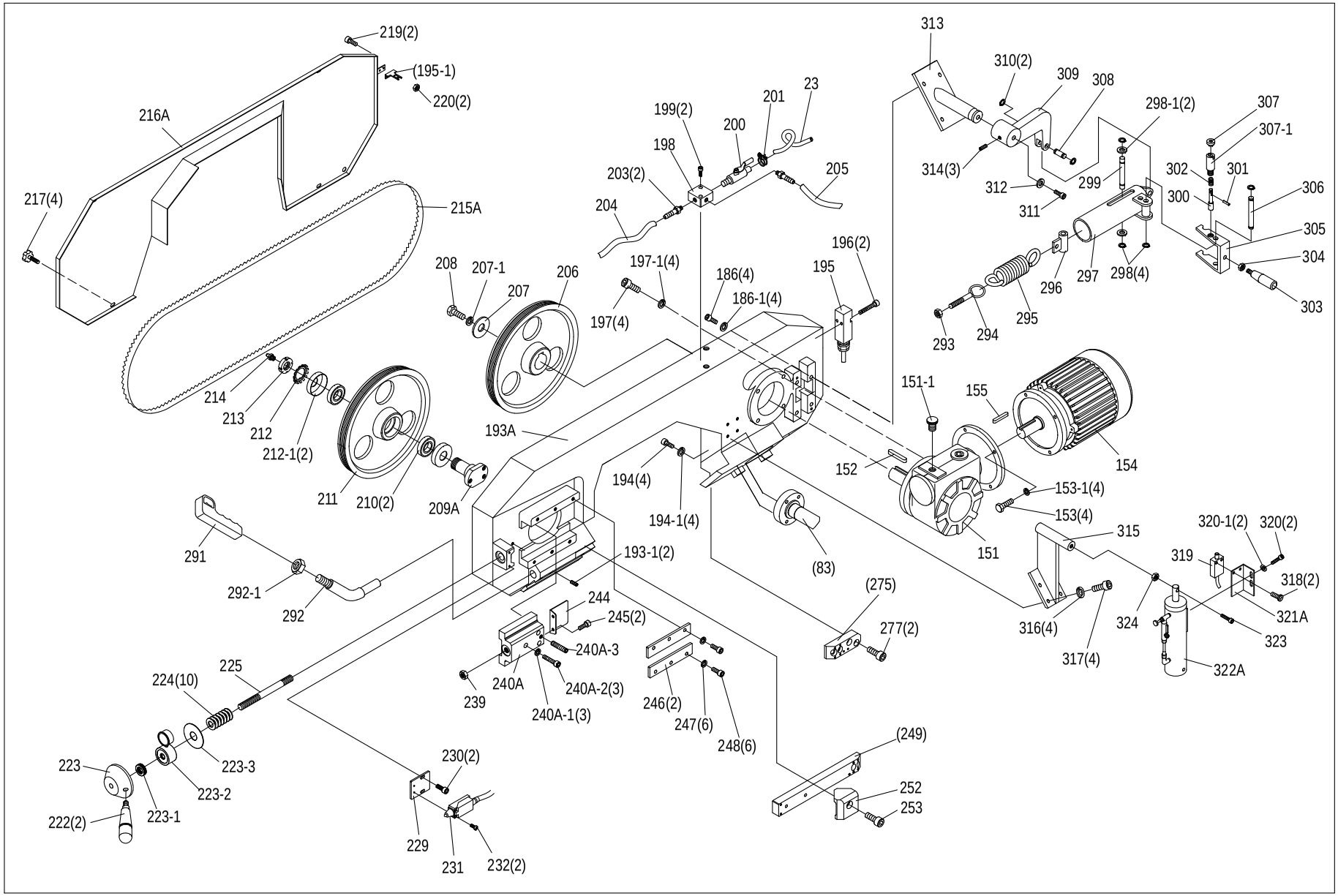

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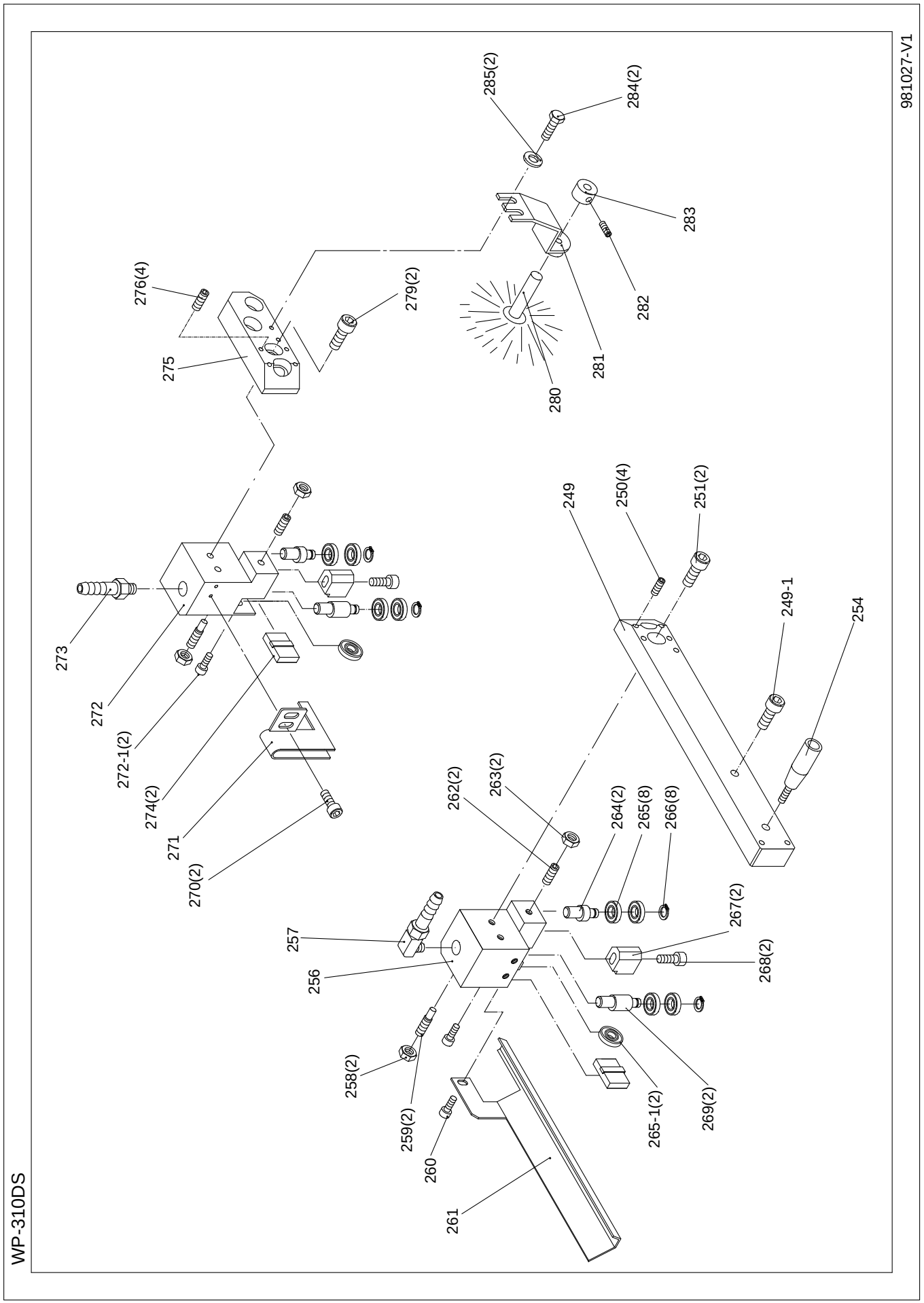
WP-310DS
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EC DECLARATION OF CONFORMITY

according to the following EC Directive
- Machinery Directive :2006/42/EC.
- EMC Directive :2004/108/EC.
- LVD Directive :2006/95/EC.
- RoHs Directive :2002/95/EC

The undersigned, Kuo Chuan-Lin , representing Way Train Industries Co., Ltd., No. 1008, Hou Chuang Rd., Pei Tun Chu, Taichung, Taiwan, R.O.C., manufacturer, declares that the machine described hereafter:

Bandsaw for metalworking,

Model: WP-310DS

Provided that it is used and maintained in accordance with the generally accepted codes of good practice and the recommendations of the instructions manual, meets the essential safety and health requirements of the Machinery Directive, EMC directive, LVD Directive, and RoHs Directive.

For the most specific risks of this machine, safety and compliance with the essential requirements of the Directive has been based on elements of :

- The European Standard EN 60204-1: 2007–Safety for the electrical equipment of machinery.
- The European Standard EN 55011: 1998+A1:2004 + A2:2007 - Limits and methods of measurement of radio interference characteristics of industrial electrical device.
- The European Standard IEC 61000-6-2: 2005 – Electromagnetic compatibility (EMC) – Part 6.2 – Generic standards – Immunity for industrial environments.
- The European Standard IEC 61000-6-4: 2001+A11/2004 – Electromagnetic compatibility (EMC) – Part 6.4 – Generic standards – Emission standards for industrial environments.
- The European Standard EN ISO 12100-1:2003 ; Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology.
- The European Standard EN ISO 12100-2:2003; Safety of machinery - Basic concepts, general principles for design - Part 2: Technical Principles.
- The European Standard EN ISO 14121-1 & 2: 2003; Safety of Machinery - Risk Assessment.
- The International Standard ISO 13852: 2003; Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs.
- EN 13898: 2003 - Machine tools – Safety – Sawing machines for cold metal.

Date: .

Signature: Kuo-Chuan Lin .

Qualification : General Manager .