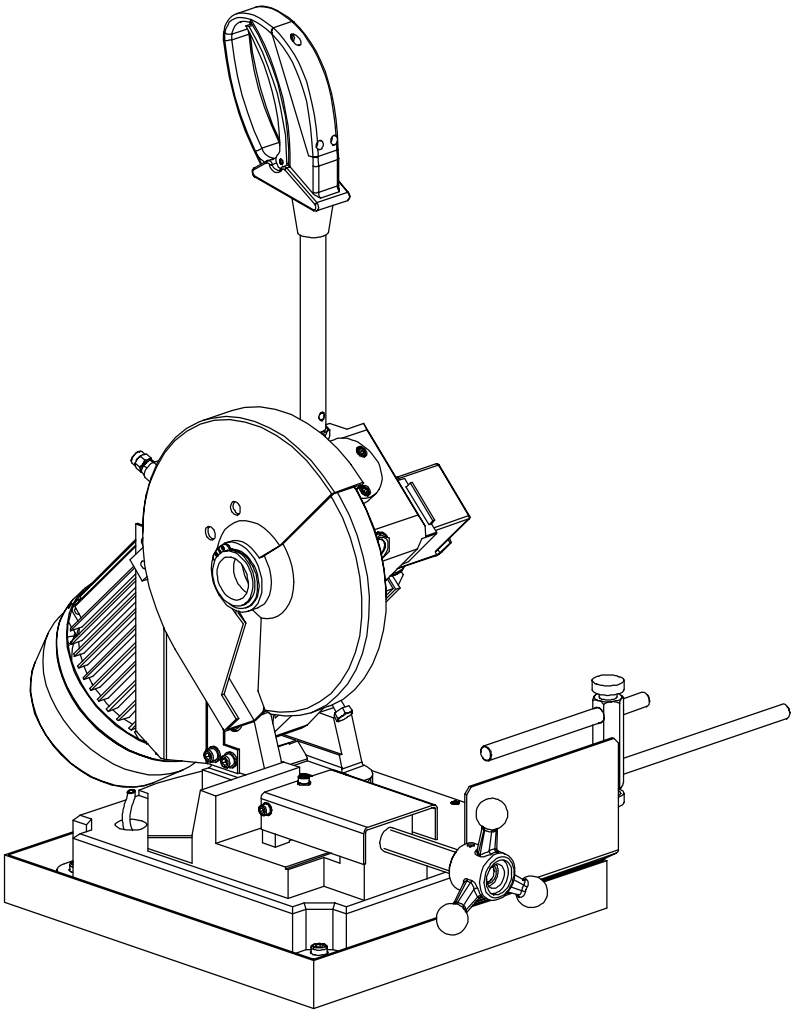
USE AND MAINTENANCE MANUAL

EN P 225

YEAR OF MANUFACTURE: _____



FOREWORD

The machine **P 225** is a pendulum bench sawing machine designed for cutting metals.
Operation is manual: after turning on the electrical power supply to the machine and clamping the workpiece in the vice, the operator starts the blade by pressing the microswitch located on the control lever; he then moves the head downwards in order to cut the material; after completing the cut, the cutting head returns to position ready for a new cutting cycle.

TECHNICAL DATA TABLE

P 225	U.M.	DATA
DISC BLADE		
External blade diameter – profiles / solid pieces	mm	225
Diameter of internal hole	mm	32
Blade thickness	mm	2
CUTTING SPEED		
Standard speed	rpm	50
VALUES OF POWER AND CONSUMPTION		
Head spindle motor 2–4 poles std. 2 speed	kW	0.8
Maximum installed electrical power	kW	0.8
Oil for lubrication/cooling liquid (concentration 5–6 %)	capacity kg	0.7
Transmission box oil	capacity Lt.	2.5

INTRODUCTION

This working tool has been designed to provide a simple and reliable solution to the needs of DIY enthusiasts and fitters who work with metals and require a practical and versatile machine.

The **P 225**, is a compact, lightweight pendulum sawing machine that can perform cuts angled by 45° to the left; these features make the P 225 a versatile and economical machine.

Congratulations on choosing the **P 225**. This machine will give you many years of trouble-free operation provided you **follow the instructions** given in this operation and maintenance manual.

MACHINE SPECIFICATIONS

IDENTIFICATION PLATE:

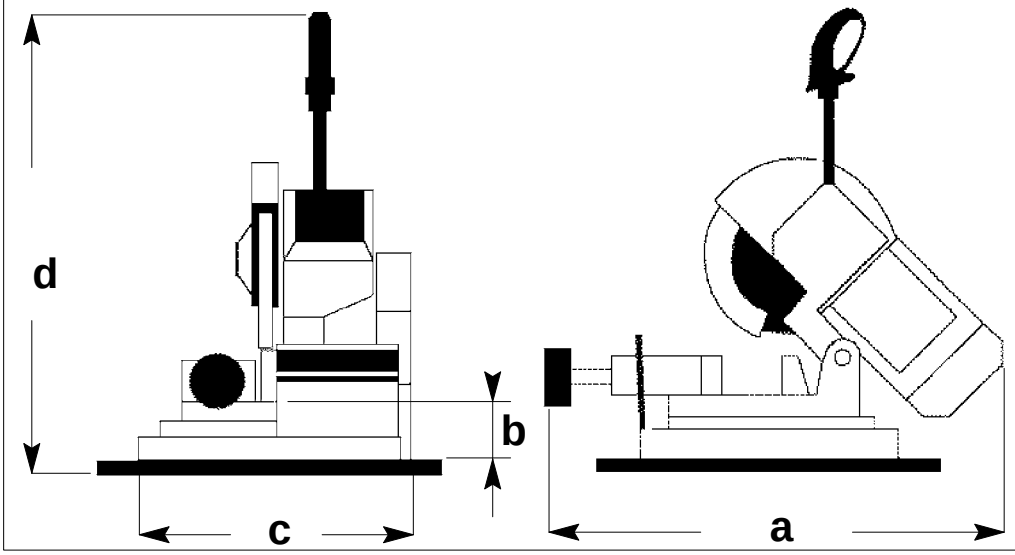
The anodized aluminium identification plate is riveted to the side of the machine.

IMPORTANT: every time you contact the Service Centre make sure you quote the model, serial number and year of manufacture given on the plate.

HYD·MECH *The Rock Solid Solution*

model	**HYD-MECH**				
air pressure	bar		*oil pressure*	bar	
data code	–	–	–	–	
1 PH	V	A	3 PH	V	A

DIMENSIONS:



a = 640 mm
b = 90 mm
c = 370 mm
d = 710 mm
weight = 38 kg

CUTTING CAPACITY FOR PROFILES :

Cross-section	Blade diameter	○	□
0 degrees	**225**	65	60
45 degrees left	**225**	55	50

CUTTING CAPACITY FOR SOLID PIECES :

Cross-section	Blade diameter		
0 degrees	**225**	45	45
45 degrees left	**225**	40	40

Max. opening of cutting vice: 70 mm

DISC BLADE:

Dimensions: HM **225 x 32 x 2** mm for solid pieces and profiles

Cutting speed: standard 50 r.p.m.

SPINDLE MOTOR:

Spindle motor: single phase 4 poles; 50 Hz; IP 54.
Characteristics:

	Voltage Volt	Absorption Amp.	Power kW	r.p.m.
4 poles	230	5.8	0.8	1.355

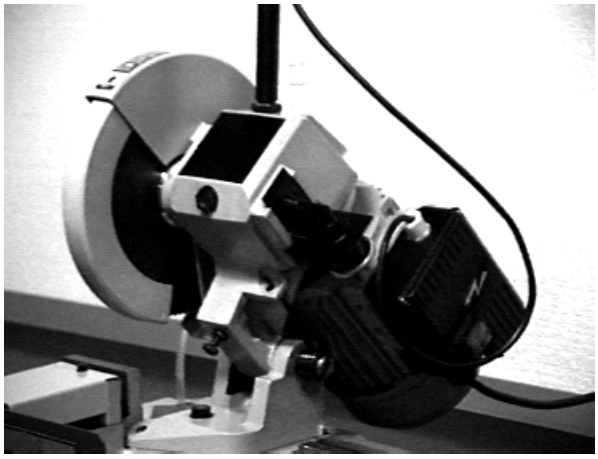
Stator winding in enamelled copper class H 200° C;
Insulation class F (limit temperature T_L=155° C);
Example of class F insulation : in air-cooled machines at a room temperature of 40° C (in accordance with CEI 2-3 and IEC 85) the admissible overtemperature is 100° C (where 100° C represents the admissible ΔT).
IP 54 protection rating (total protection against contact with live parts and against water sprayed from any direction).
Complies with CEI standards, IEC publication 34 of 1 July 1985.

CHAPTER 1 - *Functional parts of the machine*

In order to gain a good understanding of the machine, which will be described in detail in the chapter "MACHINE OPERATION", we will look at its main units and their respective positions.

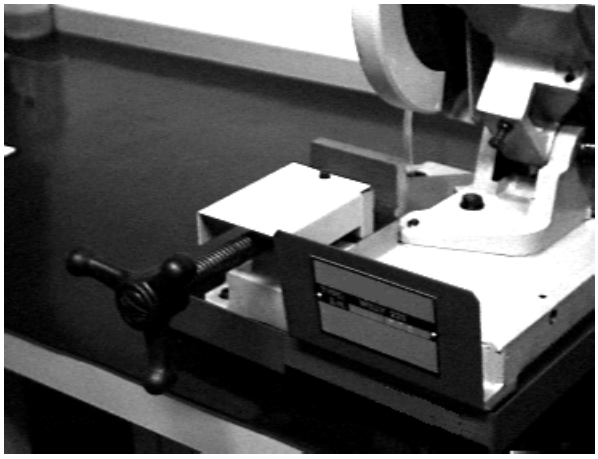
1.1 - Cutting head

The cutting head is the unit that performs the cut and consists of a cast iron section on which the following parts are mounted: the blade, the blade support units, the drive transmission unit and the spindle motor. The cutting head is fixed to the turntable by means of a hinge and travels downwards to perform the cut. The upwards and downward movement of the head is controlled manually by the operator.



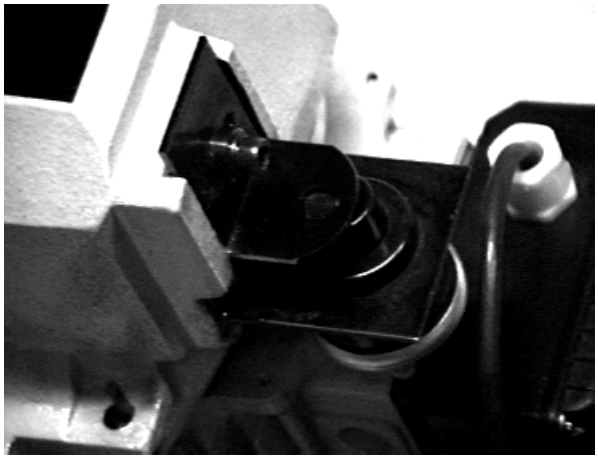
1.2 - Vice

The vice is the unit that holds the workpiece steady during cutting; it consists of a vice support on which the slide with the mobile jaw and the fixed jaw is mounted. The vice support is fixed to the upper section of the base.



1.3 - Lubricant/coolant system

The lubricant/coolant system consists of a membrane pump driven by a cam mechanical system located on the shaft onto which the blade is flanged.



CHAPTER 2 - Safety

The **P 225** has been designed and constructed to comply with European standards.
It is extremely important that you follow the instructions given in this chapter, as they are essential for **correct use of the machine**.

2.1 – Intended use of the machine

The pendulum disc sawing machine **P 225** is intended to be used exclusively for cutting metal profiles. **The machine's specific characteristics make it unsuitable for other types of material or process.**

Personnel training is the responsibility of the employer, who must inform operators about risks of accident, safety devices, risks related to noise emission and general safety precautions laid down by international directives and legislation of the country in which the machine is used. **The operator must be fully aware of the position and operation of all the machine's controls.**

The instructions, warnings and general safety precautions described in this manual must be followed completely by the personnel using the machine.

In accordance with the **MACHINERY DIRECTIVE 98/37/CE EEC** and subsequent supplements and amendments **91/368-93/44-93/68,** the following definitions are used:

- **"Danger zone":** any zone within and/or around machinery in which an exposed person is subject to a risk to his health or safety.
- **"Exposed person":** any person wholly or partially in a danger zone.
- **"Operator":** the person or persons given the task of installing, operating, adjusting, maintaining, cleaning, repairing or transporting machinery.

WARNING: The manufacturer is released from all civil and criminal liability if one or more parts or units of the machine are tampered with and/or replaced without due authorisation, or if any accessories, tools and expendable materials are used other than those recommended by the manufacturer, or if the machine is inserted in a complex system or it is used in any way that is different from the intended use.

2.2 – General recommendations

LIGHTING

A lack of adequate lighting for the intended type of operation could lead to risks for the safety of personnel. For this reason the user of the machine must ensure that suitable lighting is provided for the working environment in order to eliminate any areas of shadow or irritating glare. (Reference standard ISO 8995-89 "Lighting in working environments").

CONNECTIONS

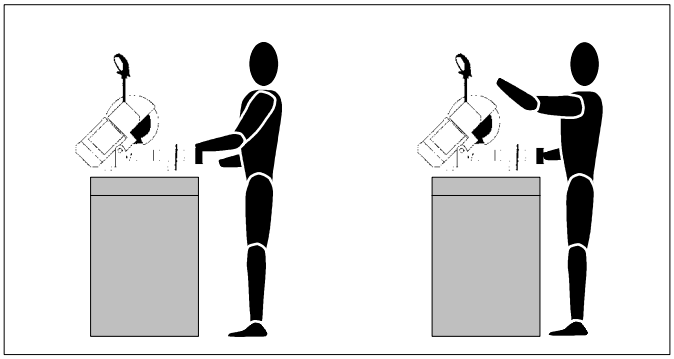
On the basis of the machine's power absorption levels given in the "Machine specifications" tables on page 2, check that the electric and pneumatic power supply lines are able to withstand the machine's maximum absorption levels and make any necessary changes.

EARTHING SYSTEM

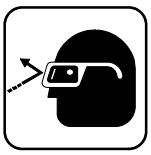
The earthing system must meet precise specifications as prescribed by the **IEC STANDARD 204**.

OPERATOR POSITION

The operator using the machine must be in the position shown in the diagram below.



2.3 – Recommendations for the operator



Always wear adequate safety glasses.

Do not use the machine without the guards in position.

Do not place your hands or arms in the cutting zone while the machine is working or the tool is still turning.

Do not wear loose-fitting clothing, long sleeves, gloves of the wrong size, bracelets, chains or anything else that might get caught in the machine during operation; tie back long hair.

Always disconnect the machine from the electrical power supply before carrying out any maintenance work on the machine or changing the blade. This also applies to operations that lie outside the normal use of the machine.

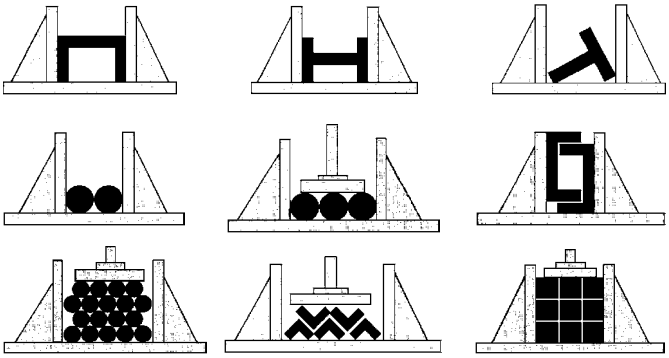
Before starting to cut, make sure that the material is adequately supported on both sides of the machine.

Work may be carried out on the hydraulic and pneumatic systems only after the pressure inside them has been released.

The operator must **avoid** operations that are unsafe or not appropriate for the job being performed (e.g. removing swarf from the machine while cutting).

Clear the cutting area of tools, implements and all other objects; keep the working area as clean as possible.

Before starting the cutting operation, make sure that the workpiece is held securely by the vice and that the machine is correctly set up. The following are examples of how different section bars can be locked on our sawing machines.



Do not use the machine for cutting workpieces that exceed the capacity stated on the technical sheet.

Do not move the machine while it is cutting.

Do not use blades with different dimensions from those declared in the machine specifications.

When cutting extremely short workpieces, make sure that they are not dragged behind the rest shoulder as this gives rise to a risk of the blade seizing.

When operating the saw, wear gloves only for handling material and for adjusting or changing the blade. Carry out only one operation at a time and do not fill your hands with more than one object at the same time. Keep your hands as clean as possible.

Warning: if the blade seizes while cutting, immediately press the machine's emergency stop button. If the blade does not free, open the vice slowly, remove the workpiece and check that the blade and the teeth are not broken. If they are, replace the blade.

Before carrying out any repair work on the machine, contact the Technical service centre or if necessary its representatives in the country in which the machine is used.

2.4 – Machine safety devices

This operation and maintenance manual is not intended to be solely a guide to using the machine for the purposes of production, but provides instructions to ensure that it is used correctly with a view to the safety of workers. Below is a list of the standards prescribed by the EEC council contained in directives regarding the safety of machinery, safety at the workplace, personal protection and environment protection. These standards have been applied to the P 225.

2.4.1 – Reference standards

SAFETY OF MACHINERY

- *EEC directive no. 98/37/CE* of 14.06.1989 known as the "**Machinery directive**".
- *EEC directives nos. 91/368;93/44;93/68* amending EEC directive no. 98/37/CE regarding the safety of machinery.
- *EEC directive no. 73/23* known as the "**Low tension directive**".

SAFETY AT THE WORKPLACE

- *EEC directives nos. 80/1107; 83/477; 86/188; 88/188; 88/642* relating to the safeguarding of workers against risks deriving from exposure to chemical, physical and biological agents during work.
- *EEC directive no. 89/391 and Special EEC directives no. 89/654 and no. 89/655* relating to the improvement of health and safety of workers at work.
- *EEC directive no. 90/394* relating to the safeguarding of workers against risks deriving from exposure to carcinogenic agents during work.
- *EEC directives no. 77/576 and no. 79/640* regarding safety signs at the workplace.

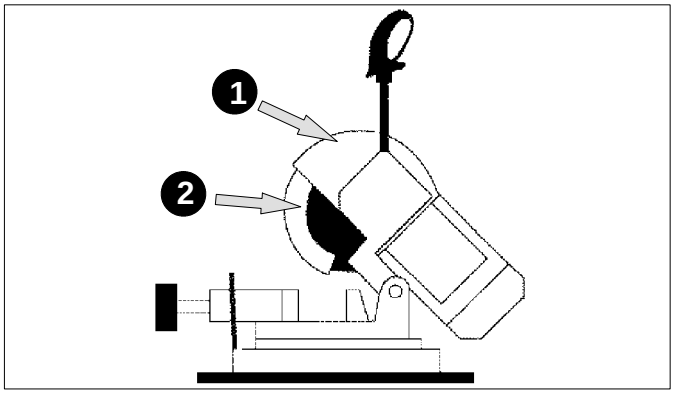
INDIVIDUAL PROTECTION

- *EEC directives no. 89/656 and no. 89/686* regarding the use of individual protective devices.

ENVIRONMENT PROTECTION

- *EEC directive no. 75/442* regarding waste disposal.
- *EEC directive no. 75/439* regarding the disposal of used oil.

2.4.2 – Protection against accidental contact with the blade



1 Metal blade guard fixed to the cutting head;
2 mobile blade guard attached to the fixed guard and the machine body to ensure that the blade is covered and that only the part of the blade engaged in cutting is left free, as prescribed by the DPR 547/55 art.108.

2.4.3 – Electrical equipment

In accordance with the Italian standard CEI 60204-1, September 1993, deriving from the European standard EN 60204-1 IEC publication 204-1, 1992:

- ❑ Accessibility to the electrical panel restricted by screws;
- ❑ earthing of all parts subject to risk of contact accidentally or during work;
- ❑ the power supply sectioning device realised with a socket/plug combination in accordance with 5.3.2 sub-section c.

2.5 – Airborne noise from the machine

Noise causes damage to hearing and is a problem that many countries tackle by laying down specific regulations. In conformity with the regulations established by the Machinery Directive 98/37/CE/EEC, we hereby inform you of the standards prescribing the sound level threshold for machine tools. This chapter provides the values of airborne noise levels generated by the **P 225** in the various stages of its operation and the method used for measuring the sound level values. This situation is regulated in ITALY by the **D.M.no.277/91** which has adopted the **Community Directives 80/1107/EEC, 82/605/EEC, 83/477/EEC, 86/188/EEC, 88/642/EEC**.

2.5.1 – Methods of measuring sound level values

The sound level measurements are carried out using an instrument called an **Integrating sound level meter** which serves to measure the weighted equivalent continuous sound pressure level at the workplace.

The damage caused by noise depends on three factors: level, frequency distribution and duration. The concept of equivalent level L_{eq} combines the three factors so as to provide just one simple parameter. The L_{eq} is based on the equal energy principle and represents the continuous stationary level with the same energy content, expressed in dBA, as the real fluctuating level in the same period of time.

This calculation is performed automatically by the integrating sound level meter. Each measurement lasts for 60 seconds to allow the value to stabilise; the value obtained remains on the display to give the operator time to read it.

Measurements are made with the equipment held at a distance of about 1 metre from the machine and at a height of 1.60 m from the operator's workplace platform. Two measurements are made: the first while the machine is performing a manual cut without a workpiece; the second while the material is being cut manually.

2.5.2 – Noise level values

Identification	
Machine type	Band saw for metal applications
Model	P 225
Reference standard	ISO 3746

Results		
Test 1	**Description**	50x15 mm pipe in FE37 steel Disc blade HSS-DMO5 Ø 225x32x2
	Results	**MEAN SOUND LEVEL (L_{eq}) 101.25 dB (A)** Environmental correction (K) 2.78 dB(A) Peak sound power (Lw) 111.82 dB(A)
Test 2	**Description**	35 mm Ø solid tube in FE37 steel. Disc blade HSS-DMO5 Ø 225x32x2
	Results	**MEAN SOUND LEVEL (L_{eq}) 93.16 dB(A)** Environmental correction (K) 2.78 dB(A) Peak sound power (Lw) 102.34 dB(A)
Test 3	**Description**	20 mm Ø solid tube in FE37 steel. Disc blade HSS-DMO5 Ø 225x32x2
	Results	**MEAN SOUND LEVEL (L_{eq}) 89.67 dB(A)** Environmental correction (K) 2.78 dB(A) Peak sound power (Lw) 98.40 dB(A)

2.6 – Electromagnetic compatibility

As from 1 January 1996 all electrical and electronic appliances bearing the CE marking that are sold on the European market must conform to Directive 89/336/EEC and decree law no. 476/92 concerning electromagnetic compatibility, i.e. the compatibility of electrical/electronic devices and systems with the electromagnetic environment in which they are located. The prescriptions regard two specific aspects in particular:
1 “EMISSIONS: during its operation, the appliance or system must not emit spurious electromagnetic signals of such magnitude as to contaminate the surrounding electromagnetic environment beyond clearly prescribed limits”;
2 “IMMUNITY: the appliance or system must be able to operate correctly even when it is placed in an electromagnetic environment that is contaminated by disturbances of defined magnitude”.
The following text contains a list of the applied standards and the results of the electromagnetic compatibility testing of machine model P 225; Test report no. 051200.

2.6.1 – Emissions

❍ EN 55014–1 (1998) + A2 (1999) Electromagnetic Compatibility – Requirements for household appliances, electric tools and similar apparatus part 1: Emission – Product family standard.
❍ EN 61000 – 3 – 2 (1995) + A1/A2 (1998) Electromagnetic compatibility (EMC) – Part 3: Limits – Section 2: Limits for harmonic current emissions (equipment input current < 16 A per phase).
❍ EN 61000 –3 – 3 (1995) Electromagnetic compatibility (EMC) – Part 3: Limits – Section 3: Limitation of voltage fluctuations and flicker in low–voltage supply systems for equipment with rated current < 16 A.

CONDUCTED EMISSIONS				
Port	**Freq. (MHz)**	**Q–peak limit (dBuV)**	**Limit average (dBuV)**	**Result**
A.C. mains	0.15 – 0.5 0.5 – 5 5 – 30	66 – 56 (decreasing linearly with the logarithm of the frequency) 56 60	56 – 46 (decreasing linearly with the logarithm of the frequency) 46 50	Pass

CONDUCTED EMISSIONS – ANALYSIS OF DISCONTINUOUS DISTURBANCE	
Port	**Result**
A.C. mains	Not applicable

HARMONIC CURRENTS EMISSIONS		
Port	**Limit (class)**	**Result**
A.C. mains	A	Pass

FLICKER AND VOLTAGE VARIATIONS				
Port	**Flicker limit**	**Result**	**Voltage variation limit**	**Result**
A.C. mains	pst = 1 plt: not applicable	Pass	dc = 3% d max = 4 % d(t) = 200 ms	Pass

2.6.2 – Immunity

❍ EN 55014 – 2 (1998) Electromagnetic compatibility – Requirements for Household appliances, electric tools and similar apparatus Part 2: Immunity – Product family standard.

IMMUNITY TESTS	
EUT classification	**Result**
Category I (Apparatus containing no electronic control circuitry)	Pass (Category 1 apparatus are deemed to fulfil the immunity requirements without testing)

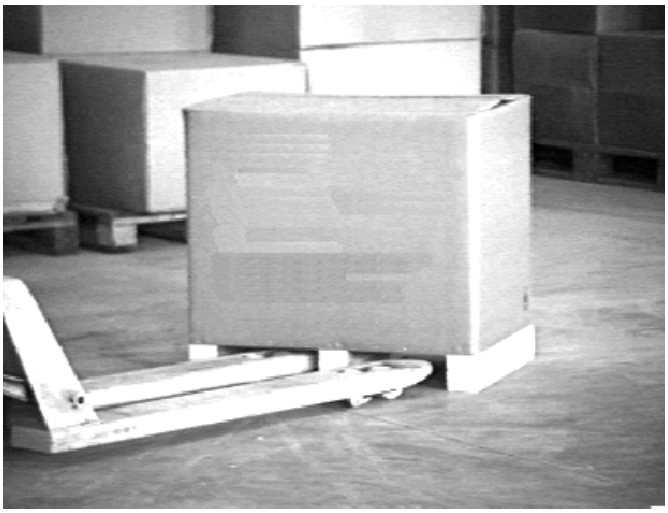
CHAPTER 3 - *Installing the machine*

3.1 – Unpacking the machine

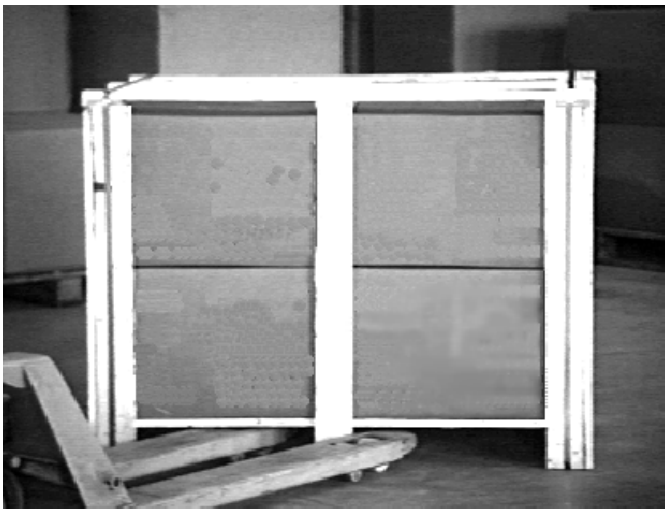
Hyd–Mech uses packaging that is appropriate for protecting the machine from damage during transport right up until the time it is delivered to the customer.

The type of packaging used for the machine depends on the dimensions, weight and destination, so the customer will receive the machine in one of the two following ways:

- package including pallet, straps and cardboard box with lid.

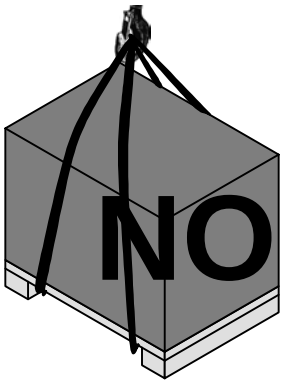


- package with pallet, cardboard boxes (for more than one machine) and wooden crate.



In either case, lift the machine using a fork lift truck, inserting the forks at the points marked by the arrows and following the instructions given on the box.

WARNING! Do not handle the packaged machine by harnessing with a sling.



Before installing the machine, remove the packaging, taking care not to cut electric cables or hydraulic hoses and using pliers, a hammer and a cutter as required. To place the machine in its working position, follow the instructions given in paragraph 3.4. The working position must be chosen taking into consideration the **machine dimensions** and the **space required** to allow the operator to perform all necessary manoeuvres to ensure his **safety**.

3.2 – Check list

Before beginning to install the machine, check the standard and optional accessories provided with the machine. The standard version of the P 225 1 SPEED sawing machine is supplied complete with:

- pedestal with tank for coolant;
- membrane pump for lubrication and cooling of blade;
- IP 55 head control lever;
- mobile guard to cover part of blade not engaged in cutting;
- rotating head with screw locking facility to perform angled cuts;
- possibility of performing cuts from 0° to 45° to the left;
- 1 speed single–phase electric motor;
- bag of accessories.

The bag of accessories is enclosed in the machine before packaging and contains the following accessories:

- 4, 5, 6, 10 mm Allen keys;
- rod for measured cuts;
- this operation and maintenance manual;

OPTIONAL

ACCESSORIES AVAILABLE ON REQUEST:

- HSS DMo5/M2 D.225x32x2 circular blade for cutting solid bars and profiles;
- 5 l can of emulsible oil.

3.3 – Minimum requirements

The following are the minimum environmental requirements needed to ensure correct operation of the machine:

- mains voltage / frequency: see values given on the data plate;
- room temperature: from – 10 to + 50 °C;
- relative humidity: no higher than 90%;
- room lighting: no lower than 500 Lux.

WARNING !

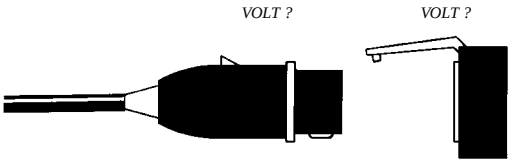
Although the machine is protected against voltage variations, good operation can only be ensured by stable voltage, which should not vary by more than ±10%.

3.5 – Connecting electrical power supply

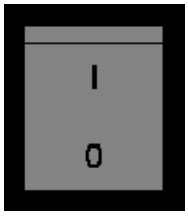
Before connecting the machine to the electrical power supply, check that the power socket is not connected in series with other machines.
This is essential in order to ensure good operation of the machine.
To connect the machine to the mains electric power supply proceed as follows:

1 – connect the machine's power cable to a plug which is suitable for the socket you have decided to use, EN 60204–1 para. 5.3.2.

2 – Insert the plug in the socket, checking that the mains voltage corresponds to the voltage the machine was designed for.

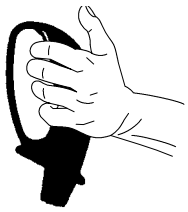


3 – Press the red button on the blade motor box. The button lights up and the machine is now on STAND–BY.

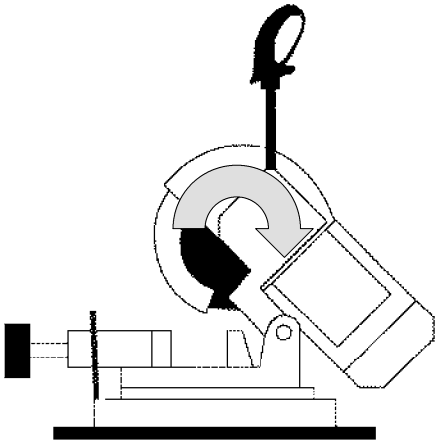


4 – Check that the motor turns in the **correct direction**. To do this, proceed as follows:

a) press the jog button on the head control lever;



b) if the operations have been performed successfully, the blade motor will start up and the blade will start to turn.



Check that the blade turns in the right direction as shown in the diagram.

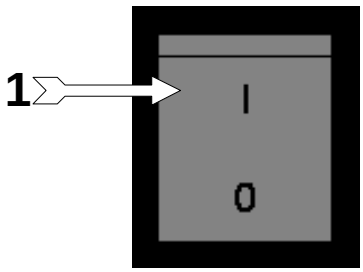
The saw is now ready to start work. See Chapter 4 for a detailed description of the operation of the machine.

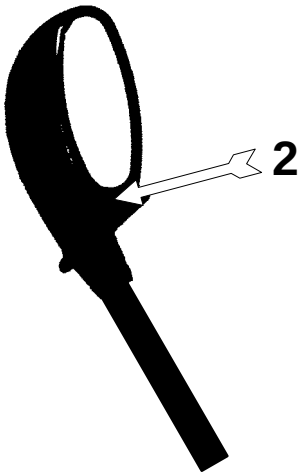
CHAPTER 4 - *Machine operation*

In this chapter we will look at all the functions of the machine, starting with a description of the control panel buttons and components.

4.1 – Description of controls

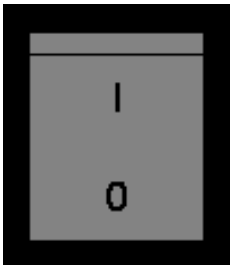
The drawing below shows the controls of the P 225; each numbered arrow corresponds to a description given in the following text.





Head control lever.

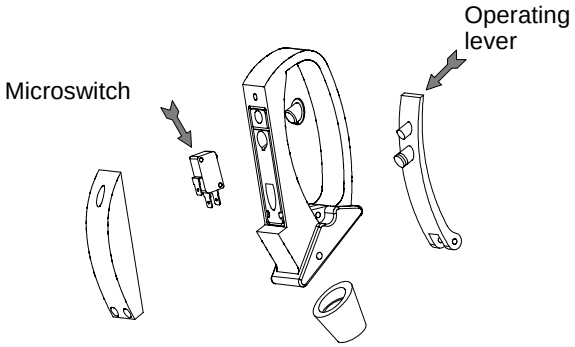
1 – ON/OFF SWITCH



Press this button to turn on the power supply to the machine. The switch lights up when it is in the ON position, letting the operator know that the machine is on stand–by.

2 – HEAD CONTROL LEVER MICROSWITCH

The microswitch controlling the blade motor is located on the head control lever knob.



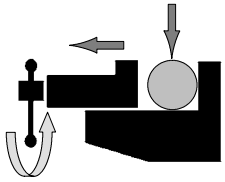
Providing no emergency condition has occurred, this is enabled when the machine is turned on. The voltage is 24 Volt in accordance with applicable legislation. The microswitch is mounted in an enclosure (blue knob) isolated from external agents, such as dust and humidity, with a protection rating of IP 55.

4.2 – Manual operating cycle

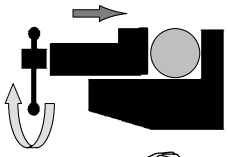
Sequence of operations to be performed when making any cut:

1) Turn the machine's power supply on by pressing the ON/OFF switch.

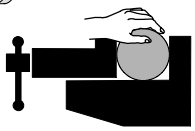
2) Place the material inside the vice and calculate the length of the cuts (using the rod for measured cuts).



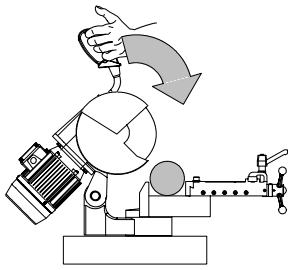
3) Clamp the workpiece in the cutting vice.



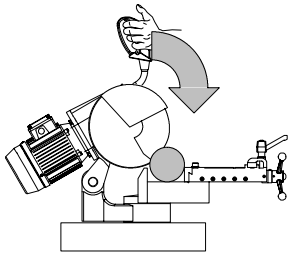
4) Make sure the workpiece is securely clamped in the vice by trying to move it manually.



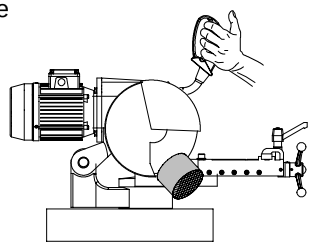
5) Grip the head control lever and start the blade turning by pressing the microswitch on the handgrip; the head is guided manually by the operator at the desired speed.



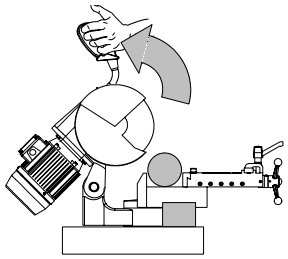
6) The motor starts, causing the blade to turn. **At the same time the lubricant/coolant pump starts up**.



7) When the cut is completed, move the head back upwards.



8) Free the workpiece from the vice by turning the handwheel.
The machine is now ready for a new operation.



CHAPTER 5 - Drawings, exploded diagrams and spare parts

This chapter provides the functional and exploded diagrams for the P 225. This documentation will help you locate the parts that make up the machine so as to allow you perform repair and/or maintenance work; it will also enable you to indicate the spare part you require without any risk of misunderstanding by defining it correctly with its position number and code.

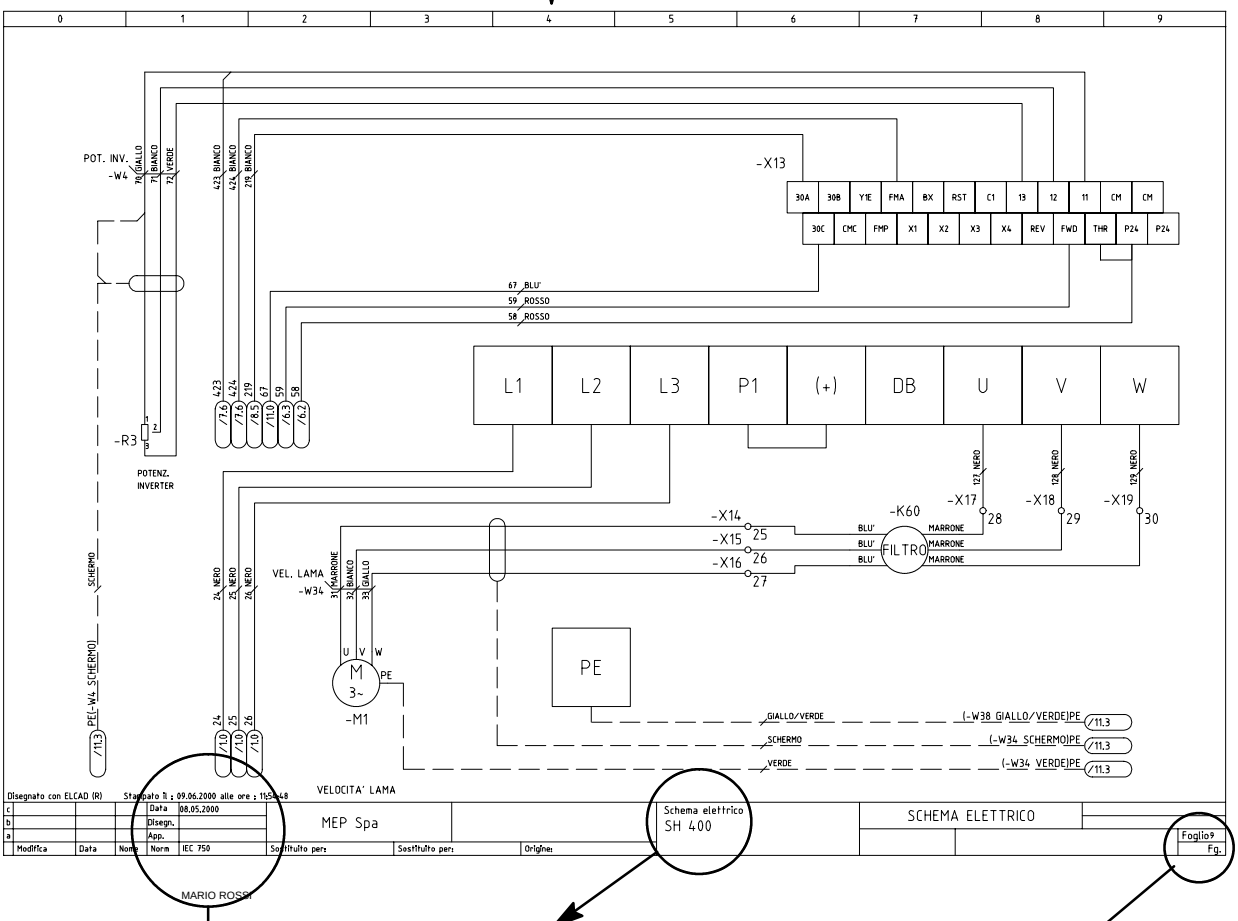
5.1 – Diagrams

5.1.1 – Electrical diagrams

How to read the wiring diagrams

With the introduction of the new standardised wiring diagrams, the following gives an illustration of the way in which they have been drawn up. Each sheet of the project contains a box which gives the following information:

The numbers indicate the columns into which the entire drawing is divided



Schema elettrico
SH 400

Indications of the model of machine

Data	08.05.2000
Disegn.	MARIO ROSSI
App.	
Norm	IEC 750

Indications of the date production started

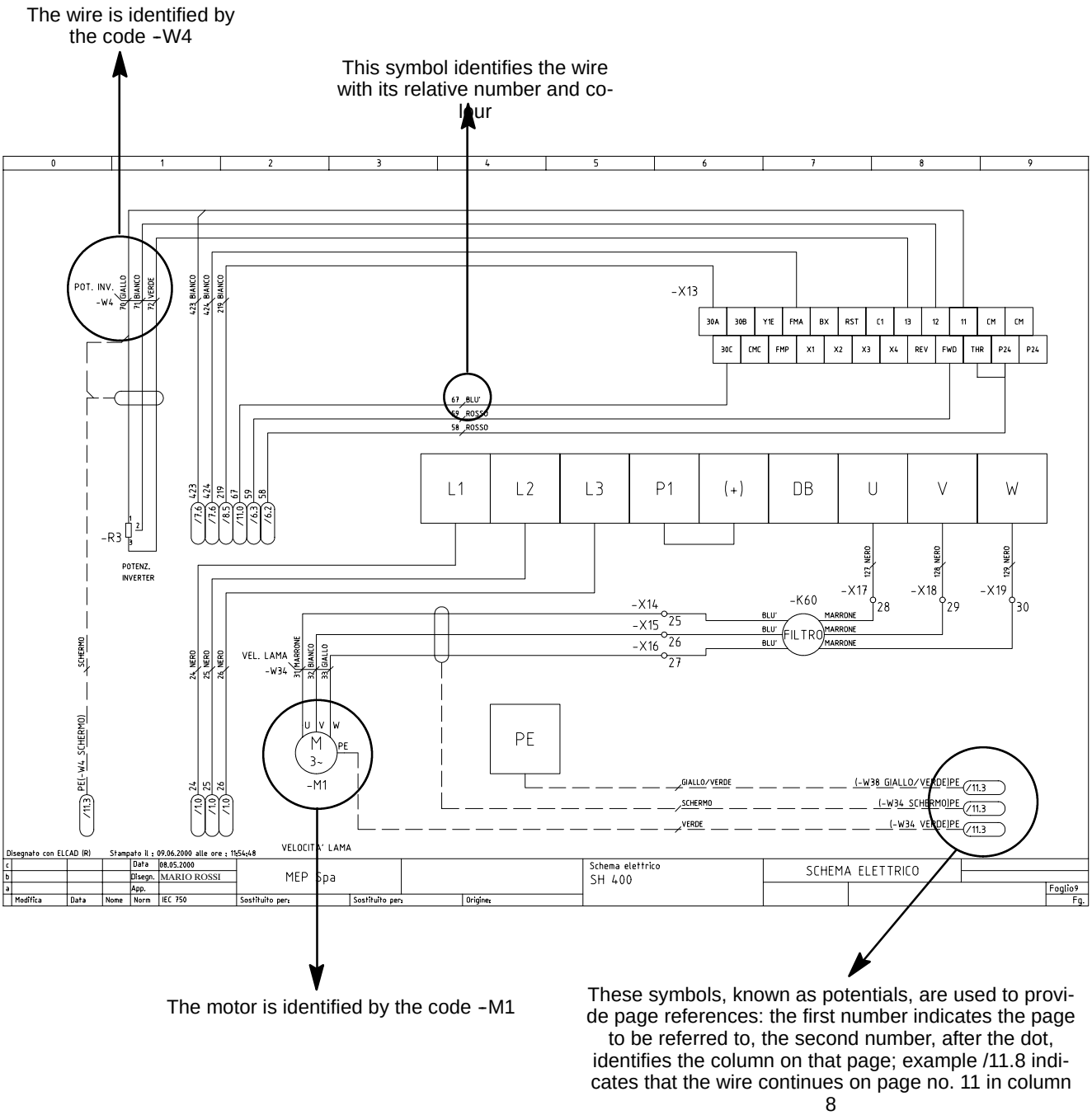
Identification of the designer

Identification of the Reference Standard

Foglio9
Fg.

Indication of the page number

Each component in the wiring diagram is identified by a unique alphanumeric identification code, in compliance with regulations:



The pages following the wiring diagrams contain the following lists:

1. components list (list of all components) and terminals list (list of all the terminals) with the following information:
    - in-house article code;
    - identification code;
    - reference, no. of the page and column on which it can be found;
    - description;
    - manufacturer

ART. COD.	ID	PRES.REF	DESCRIPTION	MANUFACTURER
022.2151	-B1	/5.2	Strain gauge	Deltatec

2. wires list (list of all wires) with the following information:
   - in-house article code;
   - identification code;
   - description
   - section of wire (mm^2);
   - colour of wire;
   - start: indicates the component (identification code and contact number) at which the wire starts;
   - end: indicates the component (identification code and contact number) at which the wire ends; e.g.

CODE	CABLE	DESCRIPTION	SECTION	NO.	COLOUR	START		END	
022.0141	-W7	RESET+EMERGENCY	0.50	317	WHITE	-S3	4	-K10	14

In this example, wire no. 317 white, identified as −W7, starts from contact no. 4 on component −S3, and ends at contact no. 14 on component −K10.

Enclosed below is Appendix D2 to European Standard EN 60204−1

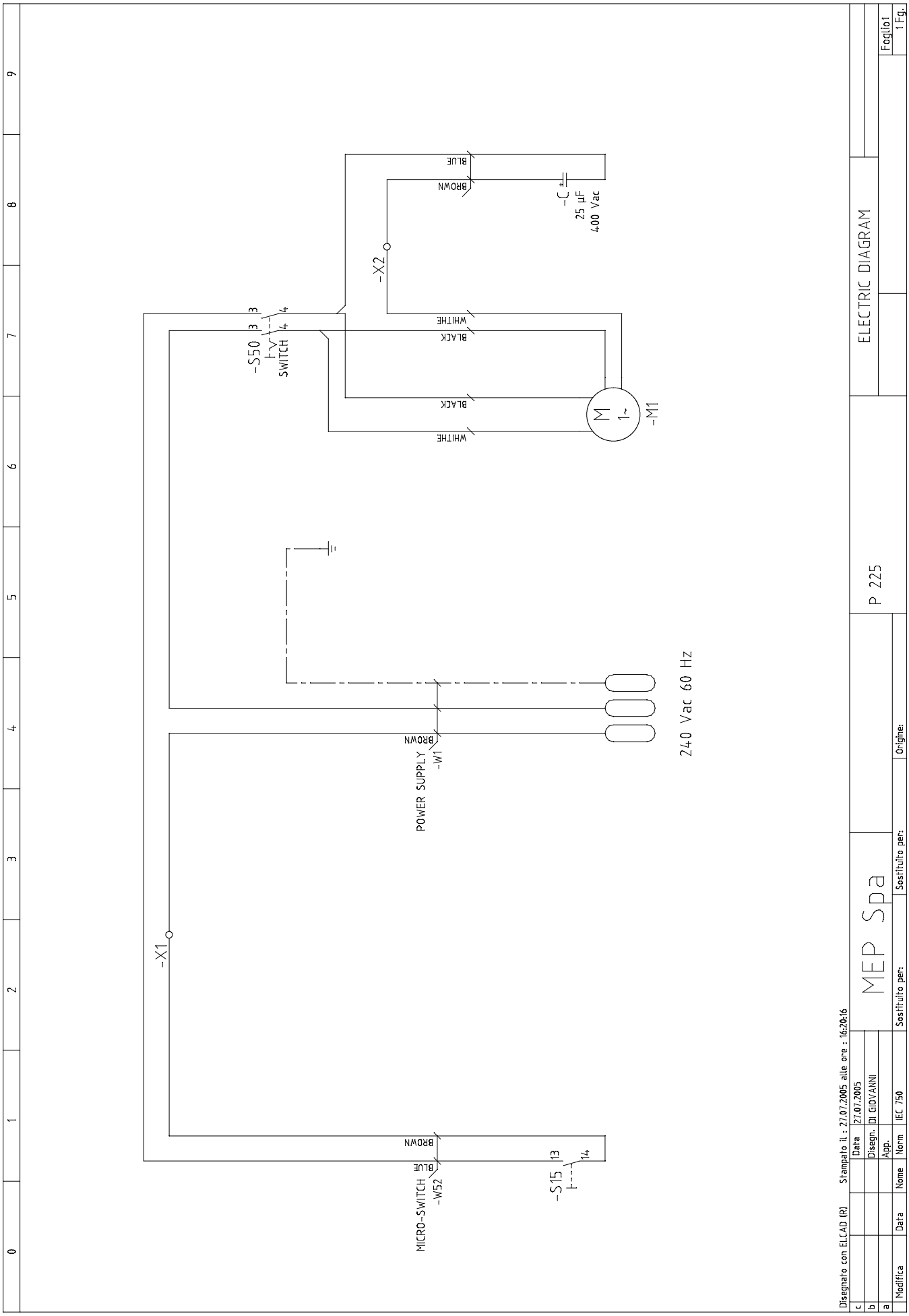
D2−Letter codes used to designate the type of component

LETTER	TYPE OF COMPONENT	EXAMPLES	IDENTIFICATION OF THE APPLIANCE
A	Complex units	Laser Maser Regulator	A
B	Transducers converting a non electrical signal to an electrical signal and vice versa	Transistor amplifier IC amplifier Magnetic amplifier Valve amplifier Printed circuit board Drawer Rack	AD AJ AM AV AP AT AR
C	Capacitors		C
D	Binary operators, timing devices, storage devices	Digital integrated circuits and devices: Delay line Bistable element Monostable element Recorder Magnetic memory Tape or disk recorder	D
E	Various materials	Devices not specified in this table	E
F	Protective Devices	Lightning protectors Arrestors	F
		Instant action current threshold protector Delayed action current threshold protector Instant and delayed action current threshold protector Fuse Voltage threshold protector	FA FR FS FU FV

LETTER	TYPE OF COMPONENT	EXAMPLES	IDENTIFICATION OF THE APPLIANCE
G	Generators, feeders	Rotating generators Crystal oscillators	G
		Accumulator battery Rotating or static frequency converter Power feeder	GB GF GS
H	Signaling Devices	Buzzer Optical signal, indicator light device	HA HL
J			
K	Relays, Contactors	Instant all or nothing relays or instant contactors Bistable relays or interdependent contactors (All or nothing contactors with mechanical contact or permanent magnet etc.) Contactors Polarised relays Reed relays All or nothing timed relays (timers)	KA KL KM KP KR KT
L	Inductors, reactors	Inductor Stop coil Reactor	L
M	Motors		M
N	Analogue intgrated circuits	Operational amplifiers Hybrid analog/digital appliances	N
P	Measurement equipment, test devices	Indicator, recorder and integrator measurement devices Signal generators	P
Q	Power circuit switching appliances	Automatic switch Engine saver switch Knife switch	QF QM QS
R	Resistors	Fixed or variable resistor (rheostat)	R
S	Command or control devices	Selector or switch Button (including electronic proximity switch) Numerical all or nothing sensors (single step) of mechanical and electronic type: – Liquid level sensor –Pressure sensor Position sensor (including proximity) –Rotation sensor –Temperature probe	SA SB SL SP SQ SR ST

LETTER	TYPE OF COMPONENT	EXAMPLES	IDENTIFICATION OF THE APPLIANCE
T	Transformers	Current transformer Control circuit supply transformer Power transformer Magnetic stabiliser Voltage transformer	TA TC TM TS TV
U	Modulators, converters	Discriminator Demodulator Frequency converter Coder Converter Inverter Telegraphic repeater	U
V	Electronic pipes, semiconductors	Electronic pipe Gas discharge pipe Diode Transistor Thyristor	V
W	Transmission lines, wave guides, antennas	Conductor Cable Bar Wave guide Wave guide directional coupler Dipole Parabolic antenna	W
X	Terminals, sockets, plugs	Connector bar Test plug Plug Socket Terminal connector band	XB XJ XP XS XT
Y	Electrically operated mechanical appliances	Electromagnet Electromagnetic brake Electromagnetic clutch Magnetic table spindle Electromagnetic valve	YA YB YC YH YV
Z	Transformers, impedence adapters, equalizers, band limiters	Line equalizer Compresser Crystal filter	Z

STANDARDISED ELECTRICAL DIAGRAMS



CABLE LIST

CODE	CABLE	TYPE	DESCRIPTION	COLOR	LENGTH	START	END
022,1901	-W1	AWM	Power Supply	BROWN	2500mm		-X1
022,1901	-W1	AWM	Power Supply	BLUE	2500mm		-S50:3
022,1901	-W1	AWM	Power Supply	YELLOW/GREEN	2500mm		PE
022.0139	-W52	AWM	Microswitch	BLUE	1000mm	-S50:3	-S15:3
022.0139	-W52	AWM	Microswitch	BROWN	1000mm	-X1	-S15:4

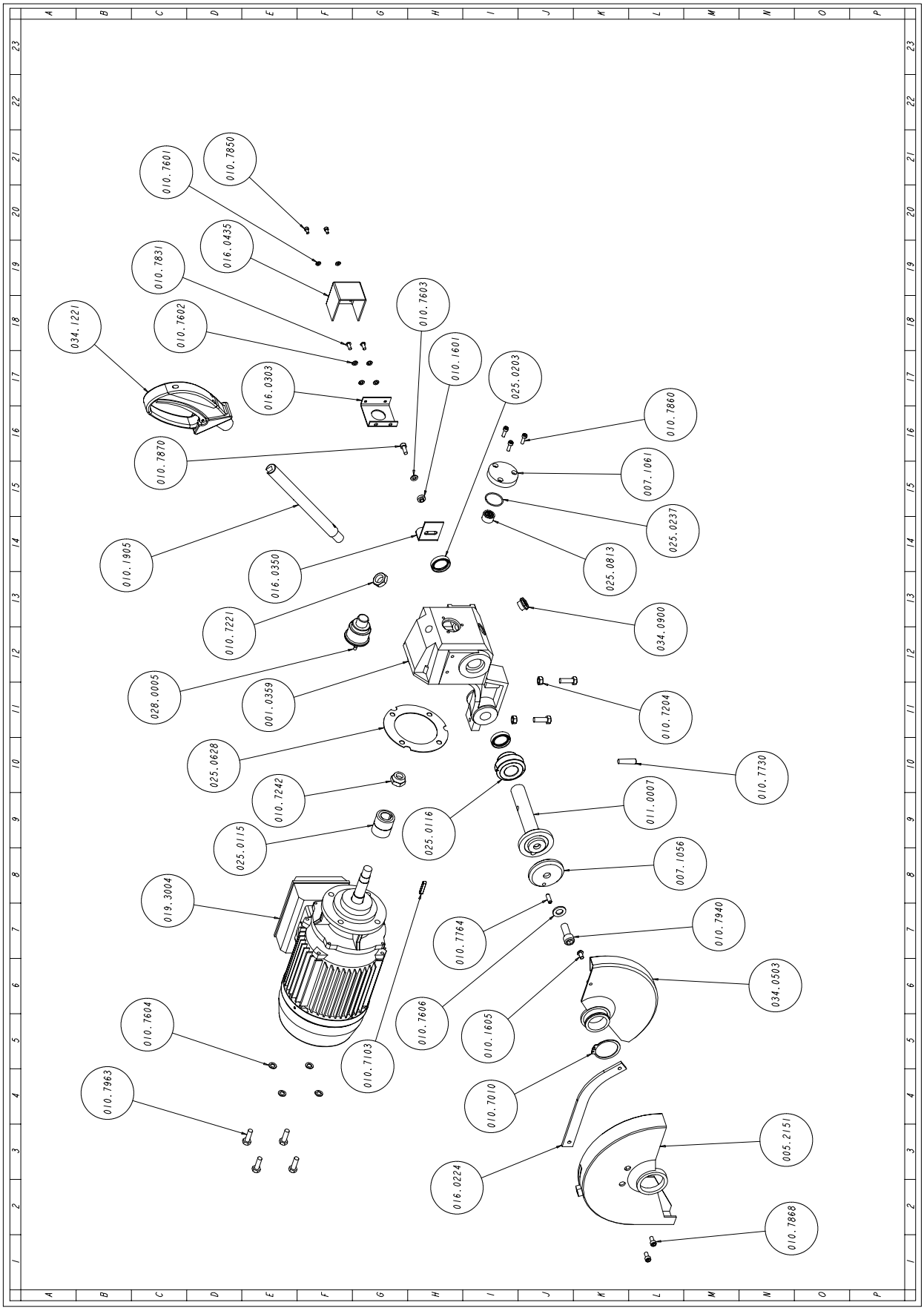
COMPONENT LIST

CODE	DESCRIPTION	TYPE	ID,	REF.
019,1722	BLADE MOTOR	HP 2/2,5 2/4P 230 Vac 60 Hz	-M1	/1.5
022,0515	MICRO-SWITCH	SWITCH	-S15	/2.5
034,1221	KNOB	KNOB	-S15	/2.5
010,0928	SPRING	SPRING	-S15	/2.5
025,0691	KNOB SEAL	SEAL	-S15	/2.5

5.2 – Exploded views

This part of the manual contains the exploded views of the P 225 which will assist in gaining a thorough knowledge of the machine.

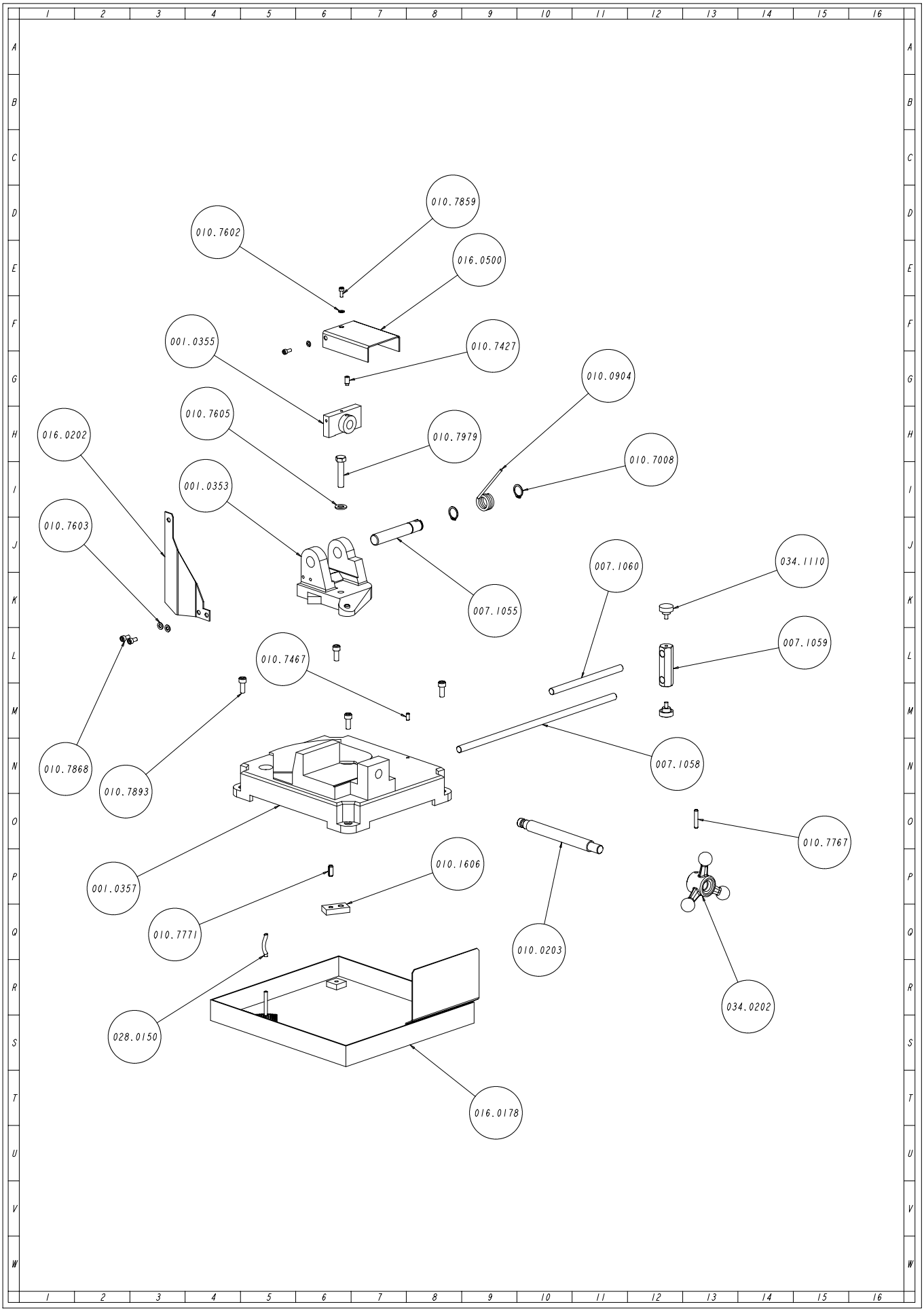
5.2.1 – Head assembly



PARTS

Code	Description	UofM	Quantity
001.0359	TEMP. HEAD	NR	1,000
005.2151	BLADE COVER 0 225	NR	1,000
007.1056	BLADE FLANGE	NR	1,000
007.1061	FRONT TAP	NR	1,000
010.1601	PUMP ECCENTRIC BUSHING WY	NR	1,000
010.1605	GUARD SCREW	NR	1,000
010.1905	LEVER WILLY N.S.	NR	1,000
010.7010	0 45 SEEGER RING	NR	1,000
010.7103	5 X 5 X 30 KEY	NR	1,000
010.7204	M8 SCREW NUT	NR	2,000
010.7221	M16 LOW SCREW NUT	NR	1,000
010.7242	M17 LOW SELF-LOCKING SCREW NUT	NR	1,000
010.7601	0 4 WASHER	NR	2,000
010.7602	0 5 WASHER	NR	4,000
010.7603	0 6 WASHER	NR	1,000
010.7604	0 8 WASHER	NR	4,000
010.7606	0 12 WASHER	NR	1,000
010.7730	CONIC PIN DIAM. 8 X 35	NR	1,000
010.7764	ELASTIC PIN DIAM. 6 X 20	NR	1,000
010.7831	5 X 12 BUTON SCREW	NR	2,000
010.7850	TCEI 4 X 8 SCREW	NR	2,000
010.7860	TCEI 5 X 15 SCREW	NR	3,000
010.7868	TCEI 6 X 12 SCREW	NR	2,000
010.7870	TCEI 6 X 16 SCREW	NR	1,000
010.7940	TCEI 12 X 30 SCREW	NR	1,000
010.7963	TE 8 X 25 SCREW	NR	6,000
011.0007	BLADE SHAFT	NR	1,000
016.0224	GUARD BRACKET	NR	1,000
016.0303	PUMP SUPPORT	NR	1,000
016.0350	PUMP SMALL PLATE	NR	1,000
016.0435	PUMP GUARD	NR	1,000
019.1706	HP 2/2,5 2/4P V.380	NR	1,000
019.3004	HP 1 V.220 1-PH. 4PS6B4 W. FLANGE	NR	1,000
025.0115	WORM SCREW	NR	1,000
025.0116	BRONZE GEAR	NR	1,000
025.0203	SEAL 35X25X7	NR	3,000
025.0237	O RING 2118	NR	1,000
025.0628	MOTOR GASKET	NR	1,000
025.0813	ROLLER BUSHING INA HK 1512	NR	1,000
028.0005	LUBRICATING PUMP	NR	1,000
034.0503	BLADE GUARD	NR	1,000
034.0900	SLNT 38 3/8 OIL LEVEL CAP	NR	1,000
043.0269	CL 1500 6/4 1/8 STRAIGHT JOINT	NR	1,000
090.0271	COMPLETE MEP HANDLE	NR	1,000

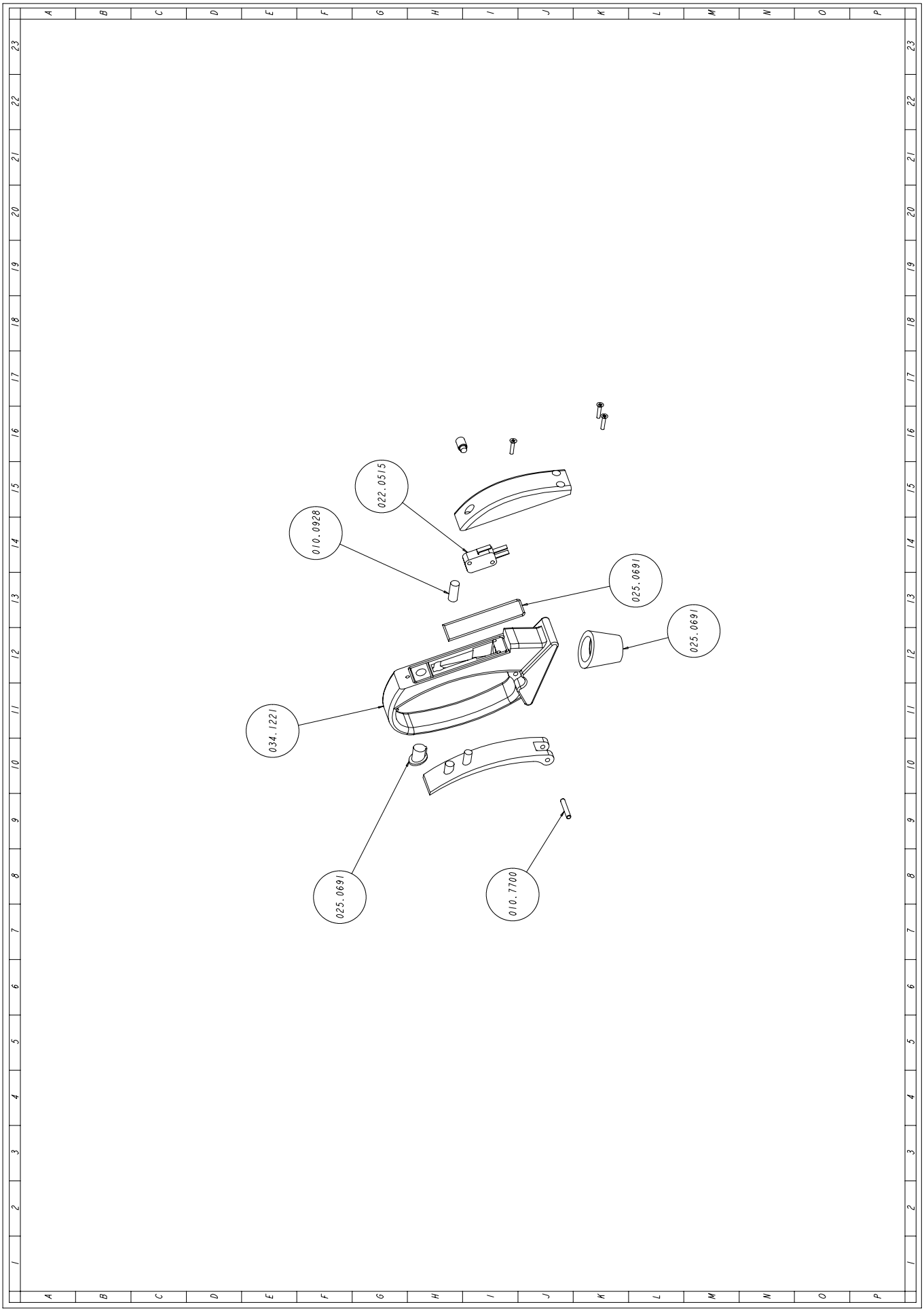
5.2.2 – Vice assembly



Parts

Code	Description	UofM	Quantity
090.0261	COMPLETE HANDLE	NR	1,000
001.0353	ROTATING TABLE	NR	1,000
001.0355	VICE JAW	NR	1,000
001.0357	FIXED PLATFORM WITH VICE	NR	1,000
007.1055	PIN	NR	1,000
007.1058	ROD	NR	1,000
007.1059	STOP SPACER	NR	1,000
007.1060	CUT TO MEASURE STOP PIN	NR	1,000
010.0203	VICE SCREW 205X20	NR	1,000
010.0904	HEAD RETURN SPRING	NR	1,000
010.1201	SCREWS AND BOLTS	NR	1,000
010.1606	ROTATING TABLE FIX PLATE	NR	1,000
010.7008	0 25 SEEGER RING	NR	2,000
010.7427	8 X 12 CYLIND.POINT VCE GRUB SCREW	NR	1,000
010.7467	6 X 12 FLAT POINT VCE GRUB SCREW	NR	1,000
010.7602	0 5 WASHER	NR	2,000
010.7603	0 6 WASHER	NR	2,000
010.7605	0 10 WASHER	NR	1,000
010.7767	ELASTIC PIN DIAM. 6 X 35	NR	1,000
010.7771	ELASTIC PIN DIAM. 8 X 20	NR	1,000
010.7859	TCEI 5 X 12 SCREW	NR	2,000
010.7868	TCEI 6 X 12 SCREW	NR	2,000
010.7893	TCEI 8 X 20 SCREW	NR	4,000
010.7979	TE 10 X 50 SCREW	NR	1,000
016.0178	VICE WATER COLLECTOR TANK	NR	1,000
016.0202	GUARD FIXED SUPPORT	NR	1,000
016.0500	VICE COVER	NR	1,000
028.0150	PLASTIC HOSE 04-6	KG	0,030
034.0202	SMALL VICE HANDWHEEL	NR	1,000
034.1110	O 30 M6 X 10 HANDWHEEL	NR	2,000

5.2.3 – Handgrip



Parts

Code	Description	UofM	Quantity
010.0928	MEP HANDLE SPRING	NR	1,000
010.7409	8 X 10 CYLIND.POINT VCE GRUB SCREW	NR	1,000
010.7700	CYLINDRICAL PIN DIAM. 4 X 24	NR	1,000
010.7800	2,9 X 15 SELF–THREADING SCREW	NR	3,000
022.0515	MICROSWITCH V–21–1C6	NR	1,000
025.0691	GASKETS FOR MEP HANDLE	NR	1,000
034.1221	MEP HANDLE	NR	1,000

CHAPTER 6 – Adjustments

This chapter provides the instructions to follow when adjusting the mechanical systems of the P 225 in order to use the machine correctly. These instructions allow you to customise your machine and keep operating times down to a minimum.

6.1 – Blade

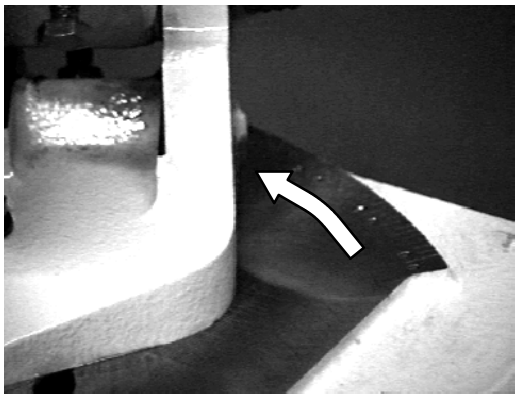
The HSS cutting discs can be used for any type of cut as they combine extremely high toughness and elasticity obtained by means of a number of tempering treatments, and also offer good cutting resistance.
The discs are made of a single piece of tungsten molybdenum steel with a hardness of about 64 ± 1 HRC.
These blades ensure that the cut surfaces have a good finish.

6.1.1 – Performing angled cuts

The P 225 can perform cuts angled at 45° to the left.
The following operation is necessary to perform a cut angled by 30°.

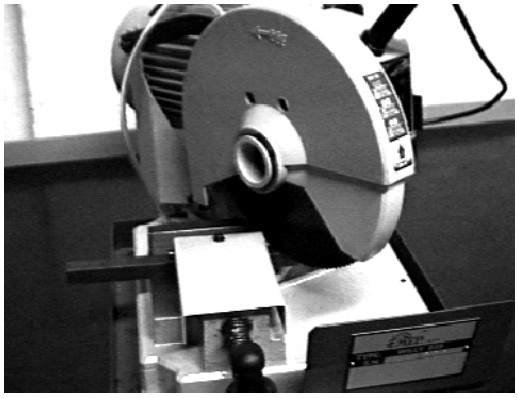
- Free the turntable by means of the locking screw locating between the vice and the motor support on the turntable itself;

- with the turntable free, turn the machine body to the desired angle (30°), reading off the position on the angle scale located on the bottom section of the turntable.



- Once you have reached the desired angle, secure the machine body by tightening the locking screw;

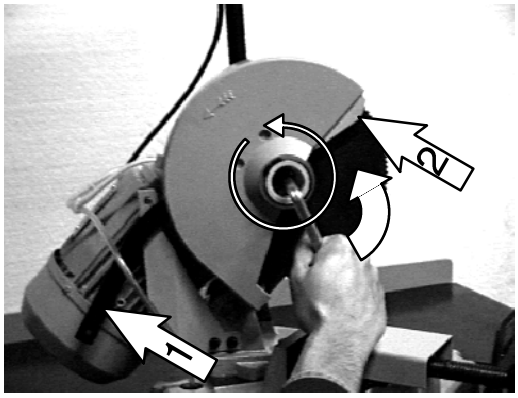
- the machine is now ready for performing cuts angled by 30° to the left.



6.2 – Changing blade

As we have already seen, this machine uses various types of blade depending on the material that has to be cut. However the following operations are the same for the various types of blade and also apply in the event of wear or breakage of the tool.

In order to replace, proceed as follows:
- turn off the power supply to the machine;
- free the mobile blade guard by removing it from the eccentric rod (1);
- move the mobile guard upwards (2);
- loosen the blade locking nut using a 10 mm Allen key;
- to undo the blade locking nut, turn it in the direction of disc rotation;



- remove the blade which needs to be replaced (because of wear or for other reasons) and insert the new blade, repeating the above operations in reverse order.

The above procedures are exactly the same when the tool has to be replaced because it is worn or broken.

Do not perform the above operations without first turning off the electrical power supply to the machine!

CHAPTER 7 - Maintenance and choice of expendable materials

The P 225 is a robust machine that ensures a good lifetime. It does not require any special maintenance although, like all machine tools, it is liable to deteriorate with time, especially if it is badly used and not serviced correctly.
This chapter therefore serves as a reminder to users who wish to keep their machine in good working order and thus ensure that it provides satisfactory operation for as long as possible.

7.1 - Role of the operator responsible for the machine

The person responsible for the **operation** and **maintenance** of the machine must follow these instructions in order to guarantee their **safety** and that of others and to ensure satisfactory operation of the machine:

- ❑ use the safety devices correctly and comply with the prescribed safety standards when working with the machine and ensure that other operators do so; ensure that the safety devices are correctly positioned and operative and that the individual safety standards are complied with.
- ❑ make sure that the machine performs the working cycle correctly so as to ensure maximum productivity, checking:
  - that the main machine parts operate correctly;
  - that the blade is sharp and the flow of cooling liquid is correct;
  - that the optimal working parameters for the type of material are complied with.
- ❑ ensure that cutting quality is satisfactory and that the final product does not show any machining defects.

7.2 - Recommendations for maintenance

- ❑ All routine and special maintenance operations must be carried out with the plug disconnected from the power supply.
- ❑ To ensure perfect operation only **Hyd-Mech.** original spare parts must be used.
- ❑ When maintenance work is finished, make sure that the replaced parts and any tools used have been removed from the machine before starting it up again.
- ❑ Any operations other than those described in the instructions for use and maintenance of the machine may be hazardous for the operator.
- ❑ It is therefore essential to **read and observe** all the instructions for the use and maintenance of this machine and any instructions regarding the product itself.

7.3 - General machine maintenance

7.3.1 - Daily

This section lists the daily maintenance procedures to be carried out on the machine:
- remove all swarf from the machine (using compressed air and preferably thread-free rags);
- top up with lubricant/cooling liquid to the required level;
- check the blade for wear and if necessary replace.

7.3.2 - Weekly

This section lists the weekly maintenance procedures to be carried out on the machine:
- clean the machine of all swarf;
- clean the vice and lubricate all the joints and sliding surfaces, preferably using good quality oil;
- check the oil level in the transmission box; if necessary fill up via the plug;
- check the sliding movement of the vice; if it is not precise and shows transversal play, adjust.

7.3.3 - Monthly

This section lists the monthly maintenance procedures to be carried out on the machine:
- check that the machine performs cuts perpendicular to the work table; if not, contact our service centre;
- check that the blade is perpendicular to the workpiece rest shoulder; if adjustment is required, contact our service centre;
- clean the water tank and the lubrication pump filter thoroughly.

7.4 - Maintenance of working units

The person responsible for carrying out maintenance on the P 225 must give particular attention to working units such as the transmission box.

7.4.1 - Transmission box

Transmission box maintenance:
- after the **first 100 hours of work,** empty the transmission box via the discharge plug on the bottom front section of the unit and replace all the oil. If impurities can be observed in the oil, take off the lid and clean inside thoroughly. Use washing oil to do this; avoid drying with cotton or stringy rags. Fill the transmission box with oil;
- replace the oil subsequently after **every 2000 hours of work**.

7.5 - Expendable materials

It is essential to use oils specifically designed for the lubricant/coolant circuit. Below is given a list of oils that are suitable for this circuit.

7.5.1 - Transmission box oils

The machine is supplied with AGIP BLASIA 460 type oil, ISO and UNI symbol CC 460; however the following is a list of suitable oils that have equivalent characteristics:

API DT 460 - CASTROL Alpha SP 460 - ARAL Degol BG 460 ARCO PENNANT NL 460 - BP Energol GR/XP 460 - ELF Reductelf SP 460 - ESSO Spartan EP 460

Transmission box:
- transmission box capacity 0.7 kg

7.5.2 - Oils for the lubricant/coolant fluid

The type of oil used for the machine's lubricant/coolant fluid is CASTROL Syntolin TFX. In the absence of any specific legislative requirements, Hyd-Mech has chosen this product as it is the one that provides the best quality/price ratio. In any case the following is a list of suitable oils that have equivalent characteristics:

AGIP NB 200 - SHELL Lutem TT - IP Utens Fluid-F

Cooling fluid tank:
- tank capacity 2.5 Lt.
- Oil concentration 5-6 %

CHAPTER 8 – Choice of blades

When using the P 225 pendulum saw it is important to select the correct type of blade for the material to be cut. This chapter explains the limitations and specific applications of the different types of blades.

8.1 – Choice of blade

The different types of blades that can be used on the P 225 must satisfy the following general requirements:

❑ FINE TOOTH PITCH – for thin walled materials such as steel plate, tubes and profiles;

❑ COARSE TOOTH PITCH – for large cross-sections;
– for soft materials (aluminium alloys and soft alloys in general);

8.1.1 – Tooth pitch

The choice of the most suitable tooth pitch depends on a number of factors:
a) the size of the section;
b) the hardness of the material;
c) the wall thickness.

Solid sections require discs with a coarse tooth pitch, whereas small cross-sections need blades with finer teeth. This is because when walls of small cross-section (1÷7 mm) profiles are cut, it is important that the number of teeth actually making the cut is not too small, otherwise the effect obtained will be one of tearing rather than of swarf removal, leading to a large increase in shearing stress.

On the other hand, when cutting thick materials or solid sections using a blade with an excessively fine tooth pitch, the swarf collects as a spiral inside the gullet, and since fine tooth pitches have small gullets, the accumulated swarf will exceed the gullet capacity and press against the walls of the workpieces, resulting in poor cutting (same situation with soft materials), greater shearing stress and hence breakage of the blade.

Choice of tooth pitch T as a function of cross-section to be cut for steel solid pieces and profiles

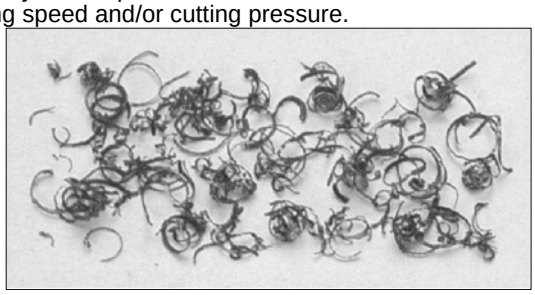
 S		 S sp	
S in mm	Pitch T	S and sp in mm	Pitch T
10	4	10 sp=0.5	3
30	6	30 sp=1.5	4-5
50	8	50 sp=2.5	5-6
70	10	70 sp=3.5	6-7
90	12	90 sp=4.5	7-8
130	16	130 sp=6.5	8

KEY:
s = diameter or width of the solid piece to be cut in mm
sp = thickness of the wall to be cut in mm
T = tooth pitch in mm

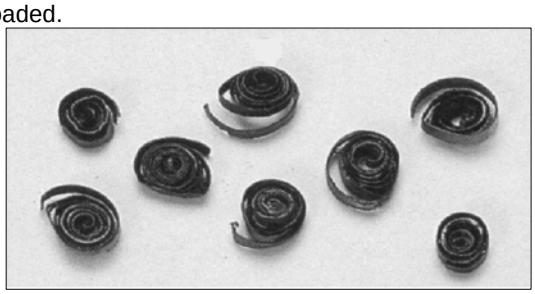
A larger pitch should be chosen when the cross-section at any given point exceeds the average cross-section given above as a result of the shape of the piece to be cut.

Type of swarf:

A – Very fine or pulverised swarf indicates an excessively low feeding speed and/or cutting pressure.



B – Thick and/or blue swarf indicates that the blade is overloaded.



C – Long, spiral swarf indicates that cutting conditions are ideal.

8.1.2 – Cutting and feeding speed

The cutting speed in m/min and the feeding speed in cm^2/min are limited by the amount of heat generated near the points of the teeth. If the feeding speed is too high, the cut will not be straight in either the vertical or the horizontal plane. As we have already seen, the cutting speed depends on the resistance (kg/mm^2) and hardness (HRC) of the material and the dimensions of the thickest sections. The feeding speed depends on the cross-section of the material. This means that large cross-section solid or thick-walled materials (s > 5 mm) can have a high feeding speed provided there is sufficient swarf removal by the blade; thin-walled materials, such as thin pipes or profiles, must be cut with a low and above all constant feeding speed. A new blade requires a wearing-in period, during which time a feeding speed of about half normal speed should be used.

8.1.3 – Lubricating/cooling fluid

The lubricating/cooling fluid must ensure that the blade teeth and material in the cutting area do not overheat. Furthermore the fluid must be supplied with a sufficient quantity and pressure to remove the swarf from the cutting area. It must be an excellent lubricant to prevent abrasion of the teeth and welding of the swarf to the teeth (seizing).

8.1.4 – Blade structure

The most widely used disc blades for sawing machines are made of a single piece of HSS-DMo5/M2 characterised by a high level of toughness and good cutting resistance. For non-ferrous materials, on the other hand, it is common to use circular blades with a brazed hard metal HM cutting edge, which have shown excellent wear resistance but low resistance to impact, which is in any case a minor problem with non-ferrous materials.

CHEMICAL COMPOSITION :

TYPE OF BLADE	***C***	***Cr***	***W***	***Mo***	***V***	***Co***	***HRC***
HSS-DMo5/M2	0.85	4.15	6.37	5.00	1.92		64+/-1

KEY:

C = Carbon Co = Cobalt Cr = Chromium
Mo = Molybdenum W = Tungsten V = Vanadium

The numbers in the columns indicate the % of the element present in the steel.

8.1.5 – Types of blade

The blades fitted on the P 225 have dimensions 225x32x2 and are made of HSS DMo5 since the machine is to be used for cutting ferrous materials. In addition to the size and pitch of the teeth, however, the blades also have different geometric characteristics in accordance with their specific use:

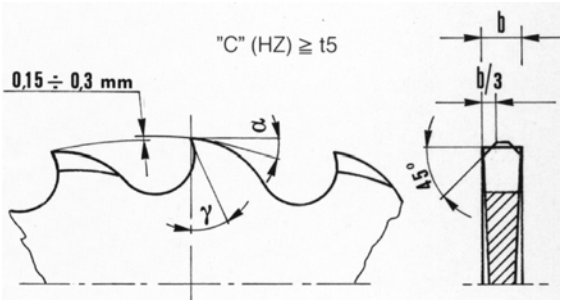
❑ **tooth sharpening**, which in this case may be BW with an alternate raked tooth or C with a roughing tooth raked on both sides and a non-raked finishing tooth.

❑ **tooth pitch,** the distance between the crest of one tooth and the crest of the next tooth (tooth pitch = T).

Shape of teeth:

"C" TYPE SHARPENING (HZ)

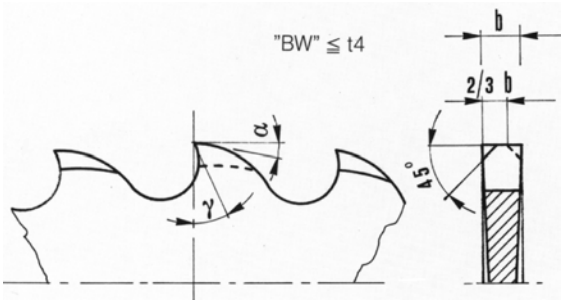
Coarse toothing with roughing tooth raked on both sides and non-raked finishing tooth. The roughing tooth is about 0.3 mm higher.



Coarse toothing with roughing tooth and finishing tooth. Used on saws with pitch greater than or equal to 5 mm for cutting ferrous and non-ferrous materials with solid or solid-profiled sections.

"BW" TYPE SHARPENING DIN 1838-UNI 4014

Coarse toothing with teeth alternately raked to the right and to the left.



Toothing generally used on sawing machines for cutting ferrous materials and alloys with tubular and profiled sections.

The P 225 uses 225x2x32 blades made of HSS DMo5 and with C type sharpening teeth for hollow sections. For solid sections, on the other hand, it uses blades of the same dimensions but with a different tooth pitch, as shown in the table below.

Table for choosing blades for the machine P 225; other blade characteristics are: dimensions – internal hole 32, distance between fixing holes 63; tooth shape type C.

P 225	Hollow profiles with thickness from 1 to 5 mm			Hollow profiles with thickness from 5 to 10 mm			Solid sections with dimensions that do not exceed the cutting capacity		
	D.	T	Z	D.	T	Z	D.	T	Z
225	225	4	180	225	5	140	225	6	120

This table can be used to facilitate the choice of toothing since it takes into account both the size of the material to be cut and the diameter of the blade.

	D. 200		225		250		275		300		315		350		370		400		425		450		500	
SOLID SECTIONS	S	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z	t z
	10	5 130	6 100	5 140	6 120	5 160	6 128	5 180	6 140															
	30	6 100	8 80	6 120	8 80	6 128	8 100	6 140	8 110	6 160	8 120	7 140	8 120											
	50			8 90	10 70	8 100	10 80	8 110	10 90	8 120	10 90	8 120	10 100	9 120	10 110	10 110	11 100								
	70							10 90	12 70	10 90	12 80	10 100	12 80	11 100	12 90	11 100	12 90	10 120	12 100	10 130	12 110	10 140	12 120	10 150	12 130
	90									12 80	14 70	12 80	14 70	12 90	14 80	12 90	14 80	12 100	14 90	12 110	14 94	12 120	14 100	12 130	14 110
	110											12 80	14 70	12 90	14 80	12 90	14 80	12 100	14 90	12 110	14 94	12 120	14 100	12 130	14 110
	130													14 80	16 70	14 80	16 70	14 90	16 80	14 94	16 84	14 100	16 90	14 110	16 100
	150																	14 90	16 80	14 94	16 84	14 100	16 90	14 110	16 100
HOLLOW SECTIONS S=0.005xD	D																								
	10	3 200	3 200	3 220	3 220	3 250	3 250	3 280	3 280																
	30	4 160	5 130	4 180	5 140	4 200	5 160	4 220	5 180	4 220	5 180	4 240	5 200												
	50			5 140	6 120	5 160	6 128	5 180	6 140	5 180	6 160	5 200	6 160	5 200	6 180	5 220	7 160								
	70							6 140	8 110	6 160	8 120	6 160	7 140	6 180	7 160	7 160	8 140	6 200	7 180	6 220	7 190	6 230	7 200	6 260	7 220
	90									8 120	10 100	7 140	8 120	7 160	8 140	7 160	8 140	7 180	8 160	7 190	8 160	7 200	8 180	7 220	8 200
	110											8 120	10 100	8 140	9 120	8 140	9 120	8 160	9 140	8 160	9 150	8 180	9 160	8 200	9 170
	130													9 120	10 110	9 120	10 110	9 140	10 120	9 150	10 130	9 160	10 140	9 170	10 150
	150															9 120	10 110	9 140	10 120	9 150	10 130	9 160	10 140	9 170	10 150

8.1.6 – Recommended cutting parameter table

RECOMMENDED CUTTING PARAMETERS	CUTTING ANGLES		SECTION TO BE CUT (IN MM)																					RECOMMENDED LUBRICANTS
			10–20			20–40			40–60			60–90			90–110			110–130			130–150			
	α	γ	T mm	Vt m/min.	Av mm/min.	T mm	Vt m/min.	Av mm/min.	T mm	Vt m/min.	Av mm/min.	T mm	Vt m/min.	Av mm/min.	T mm	Vt m/min.	Av mm/min.	T mm	Vt m/min.	Av mm/min.	T mm	Vt m/min.	Av mm/min.	
Mild steel R = 350–500 N/mm2	20	8	5	50	160	7	45	150	10	45	140	12	40	130	14	40	110	16	35	100	18	30	90	Emulsion – Cutting oil
Medium steel R = 500–700 N/mm2	18	8	4	30	130	6	30	120	9	25	110	12	25	110	14	20	100	16	20	90	16	15	80	
Hard steel R = 750–950N/mm2	15	8	4	20	110	6	20	110	8	18	100	11	17	50	14	15	80	16	14	70	16	12	60	
Super hard steel R = 950–1000 N/mm2	12	6	3	15	60	4	15	60	6	14	50	9	14	50	12	13	45	14	13	45	14	12	40	
Hardened and tempered steel R = 950–1300 N/mm2	10	6	2	9	35	3	9	33	4	9	30	6	8	28	8	8	25	10	7	25	12	7	22	
Austenitic stainless stee R = 500–800 N/mm2	12	8	4	20	50	6	19	45	8	18	45	11	17	40	14	15	40	16	14	35	16	12	35	
Mart. stainless steel R = 500–800 N/mm2	15	6	4	20	50	6	19	45	8	18	45	11	17	40	14	15	40	16	14	35	16	12	35	
Grey iron	12	8	4	25	100	6	23	100	8	22	90	11	20	80	14	19	880	16	17	70	16	16	60	
Aluminium and alloys R = 200–400 N/mm2	22	10	6	1100	1800	8	1000	1700	12	900	1600	16	800	1400	18	700	1300	20	600	1100	20	500	900	
Aluminium and alloys R = 300–500 N/mm2	20	8	5	200	400	7	180	400	10	160	350	12	160	300	14	140	300	16	130	250	16	130	250	
Copper R = 200–350 N/mm2	20	10	6	400	600	8	350	600	11	300	550	14	250	550	17	200	500	18	150	500	20	120	400	
Gun metal R = 600–900 N/mm2	15	8	5	400	800	7	400	700	10	350	700	12	300	600	14	250	600	16	200	500	18	150	400	
Phosphor bronze R = 400–600 N/mm2	12	8	4	120	160	8	110	150	8	100	140	10	90	130	12	70	110	14	60	100	16	50	90	
Brass R = 200–400 N/mm2	16	16	5	600	1100	6	600	1100	10	550	1000	12	550	900	16	500	900	18	500	800	18	450	800	Cutting oil
Alloy brass R = 400–700 N/mm2	12	16	5	500	700	7	400	600	10	350	600	12	350	500	16	300	500	18	300	400	18	200	400	
Titanium and alloys R = 300–800 N/mm2	18	8	4	50	160	4	45	150	6	45	140	10	45	130	12	40	110	14	35	100	16	30	90	
Profiles and pipes with wall thickness 0.05 D R = 300–600 N/mm2	18	8	3	19	130	4	18	120	5	18	110	6	17	110	6	16	100	8	16	90	10	15	80	Emulsion
Profiles and pipes with wall thickness 0.25 D R = 300–600 N/mm2	15	8	2	35	130	3	33	120	4	30	110	5	30	110	5	28	100	6	26	90	6	24	80	

8.2 – Classification of steels

This page gives tables that provide the user with specific information on the material to be cut. This enables these materials to be classified according to their hardness and therefore ensure that the right blade is used.

Type of steel				Hardness		
UNI	**DIN**	**BS**	**AISI**	**Brinel HB**	**Rockw.**	**Kg/mm2**
C 22 – C 35	CK 22 – CK 3	En 2 C – En 6	1022 – 1035	160 – 170	34 – 87	55 – 59
C 45	CK 45	En 8	1040	160 – 180	84 – 89	55 – 61
C 10 – C 15	CK 10 – CK 15	En 32 A – En 328	1010 – 1015	150 – 175	81 – 87	51 – 59
C 60	CK 60	En 9	1060	160 – 180	84 – 89	55 – 61
		4360 – 50 A		160 – 180	84 – 89	55 – 61
	17100	3706 – 1.2.3.	ASTMA – 36/68	160 – 180	84 – 89	55 – 61
45 Cr Si 9	17115	4360		160 – 180	84 – 89	55 – 61
		En 20 A		190 – 215	91 – 97	64 – 73
34 Cr Mo 5	17221	970 – 1955	1065	180 – 205	89 – 94	61 – 69
		En 18 B	5135 – 5145	180 – 200	89 – 93	61 – 67
35 Cr Mo 4	34 Cr Mo	En 19 B	4135	200 – 230	93 – 99	67 – 77
	36 Ni Cr 6	En 111	3135	190 – 230	91 – 99	64 – 77
		En 36	3310 – 3315	200 – 230	93 – 99	67 – 77
20 Nc Cr Mo 2		En 362	4315	200 – 225	93 – 98	67 – 75
		En 100 D	8645	190 – 220	91 – 97	64 – 74
	1880 X C 95	DX	W 1	150 – 190	80 – 91	51 – 64
100 Cr 6	100 Cr 6	En 31	52100	210 – 230	96 – 99	71 – 77
		B 2	L 6	190 – 230	91 – 99	64 – 77
52 Nc Cr Mo KU	56 Ni Cr Mo V 7			217 – 248	97 – 102	73 – 83
	2750 (280W18)	18 % W	T 1	217 – 248	97 – 102	73 – 83
		1507 – 825	1310	160 – 220	84 – 91	55 – 64
		A 2	M 13	200 – 230	93 – 99	67 – 77
	210 Cr 46	A 1	D 3	215 – 240	97 – 101	73 – 81
	4845	En 58 G	309 S	150 – 200	80 – 93	51 – 67
X 12 Cr 13	4001	En 56 A	410	150 – 200	80 – 93	51 – 67
X 6 Cr Ni 1810	4301	En 58 E	304	130 – 170	74 – 86	45 – 58
X Cr Ni 1910						
X 8 Cr Ni Mo 1713	4401	1501 – 845	316	160 – 200	84 – 93	55 – 67
Phosphor bronze				60 – 100	56.5	36
Aluminium bronze				70 – 90	49	32
Manganese bronze				95 – 120	51 – 69	34 – 42
Silicon bronze				70 – 100	56.5	36

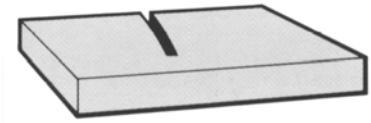
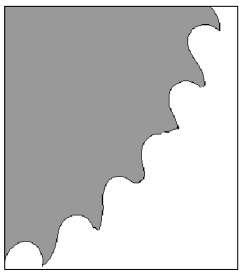
8.2.1 – Steel nomenclature table

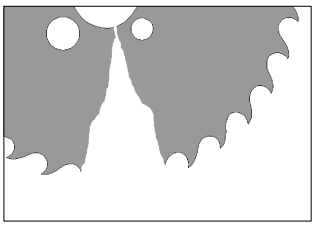
Material	SS Sweden	AISI U.S.A.	DIN Germany	BS UK	UNI Italy	AFNOR France
Carbon steels	1311 1572	1015 – 1035	C 22 – C 35 20 Mn 5 – 28 Mn 6 CK 22 – CK 50	050 A 20 080 M 46 – 50 120 M 19 150 M 28	C 15 – C 35 C 22 Mn C 28 Mn	XC 18 XC 38 H 1 20 M 5
Carbon steels	1650 1880	1040 – 1064 1770 – 1880	CK 60 – CK 101 36 Mn 5 Cm 45 – Cm 55	060 A 40 – 060 A 96 070 M 55 080 A 40 – 080 A 62	C 45 – C 60	XC 60 – XC 75 40 M 5 XC 42 H 1 XC 55 H 1
Alloy steels	2120 2255	1335 – 1345 4130 – 4140	25 Cr Mo 4 – 42 Cr Mo 4	1717 CDS 110 708 A 37 708 M 40	25 Cr Mo 4 – 42 Cr Mo 4	25 CD 4 42 CD 4
Alloy steels	2541 2230 2258	4337 – 4340 50100 – 52100 6145 – 6152 8630 – 8645	40 Ni Cr Mo 6 40 Ni Cr Mo 73 34 Cr Ni Mo 6, 100 Cr 6	735 A 50, 534 A 99 817 M 40 311 types 6 and 7	40 Ni Cr Mo 2 – 40 Ni Cr Mo 7 30 Ni Cr Mo 8 – 35 Ni Cr Mo 6 KB 50 Cr V 4, 100 Cr 6	35 NCD 6 50 CV 4 100 C 6
Tool steels	2310 – 12 2754 – 55	D – 2, D – 3	X 210 Cr 12 X 155 Cr V Mo 121	BD 2, BD 3	X 205 Cr 12 KU X 155 Cr V Mo 121 KU	Z 160 CVD 12 Z 200 C 12
Tool steel	2550 2710	S – 1	60 W Cr V 7 55 Ni Cr Mo V 6	BS 1	55 W Cr V 8 Ku 55 Ni Cr Mo V 6	55 NCVD 7
Stainless steels	2324 2333	201, 202 302, 304	X 2 Cr Ni 189 X 5 Cr Ni 189 G – X 2 Cr Ni 189	304 S 15 304 C 12 304 S 12	X 2 Cr Ni 18.11 X 5 Cr Ni 18.10 G – X 2 Cr Ni 19.10	Z 2 CN 18.10 Z 6 CN 18.09 Z 3 CN 19.10
Stainless steels	2343 2353	314, 316 317	X 15 Cr Ni Si 2520 X 5 Cr Ni Mo 1812 X 5 Cr Ni Mo 1713	316 S 16 317 S 16	X 16 Cr Ni Si 2520 X 5 Cr Ni Mo 1713 X 5 Cr Ni Mo 1815	Z 12 CNS 25.20 Z 6 CND 17.12

CHAPTER 9 - *Diagnostics tables*

This chapter describes the inspection and troubleshooting procedures required for the P 225. Regular inspection and adequate maintenance of the machine are essential in order to guarantee a long working life for the machine and trouble-free operation. This chapter consists of two sections: the first section, DIAGNOSTICS FOR BLADES AND CUTS, is intended specifically for solving problems relating to blades and cuts; the second section, TROUBLESHOOTING, aims to diagnose general machine operating faults. By using this troubleshooting guide you can take the action needed to solve problems.

9.1 – Diagnostics for blades and cuts

PROBLEM	*PROBABLE CAUSE*	*SOLUTION*
Cuts not perpendicular or angled 	Head descent speed too fast	Reduce head descent speed
	Blade with worn teeth	Replace blade.
	Perpendicularity of blade to workpiece rest shoulder	If this does not solve the problem, contact our Technical Service Centre.
	Perpendicularity of blade to workpiece rest table	If this does not solve the problem, contact our Technical Service Centre.
	Broken teeth	Check the hardness of the material you are cutting.
Teeth broken 	Incorrect lubrication/cooling fluid	Check the water and oil emulsion; check that the holes and the tubes are not blocked.
	Material too hard	Check the feeding speed and the type of blade you are using.
	Blade not worn-in correctly	With a new blade it is necessary to start cutting at half the usual feeding speed. After a wearing-in time (about 300 cm^2 for hard materials and about 1000 cm^2 for materials with a soft cutting surface) the feeding speed can be increased to normal values.
	Blade with excessively fine toothing	The swarf builds up at the bottom of the teeth, giving rise to an excessive pressure on the teeth.
	Introducing a new blade into a partially completed cut	The cutting surface may have undergone a local thermal alteration increasing its hardness: restart with lower cutting and feeding speeds. A tooth from the replaced blade may have remained in the cut: check and remove the tooth before resuming work.

PROBLEM	PROBABLE CAUSE	SOLUTION
	Workpiece not sufficiently clamped	If the workpiece moves during the cut it can cause the teeth to break: check the vice, the jaws and the pressure you use to clamp the workpiece.
	Vibrations	Workpiece vibrating in the vice: check that the slide is correctly adjusted; check the pressure you use to clamp the workpiece.
Rapid wear of teeth	Feeding speed too low	The blade runs over the material without removing it: increase feeding speed
	Lack of coolant	Check the coolant level and clean hoses and nozzles.
	Incorrect concentration of the fluid	Check and use the correct concentration.
	Material faults	The material may present altered areas both on the surface, such as oxides or sand, and within the sections, such as undercooled inclusions. These zones, which are much harder than the blade, cause the teeth to break: discard or clean these materials.
Broken blade	Feeding speed too high	Reduce the feeding speed.
	Teeth in contact with the material before starting the cut	Always check the position of the blade before starting a new job.
	Lack of coolant	Check the coolant level and clean the hoses and nozzles carefully.
	Vibrations	Workpiece vibrates in the vice: check that the slide is correctly adjusted; check the pressure you use to clamp the vice; increase if necessary.

9.2 – Troubleshooting

This section serves to solve problems which may arise during the operation of the P 225.

PROBLEM	*PROBABLE CAUSE*	*SOLUTION*
SPINDLE MOTOR DOES NOT TURN	Electrical power supply	Check: the phases; the cables; the plug; the socket. Also check that the motor connections are correctly placed.
	Motor	Check that it has not burned out, that it turns freely and that there is no moisture in the connecting terminal board box. Rewind or replace.

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Hyd-Mech Group warrants each new Cold Saw to be free from failure resulting from defective material and workmanship under proper use and service for a period of one year following the date of shipment to the user. Hyd-Mech's sole obligation under this warranty is limited to the repair or replacement without charge, at Hyd-Mech's factory, warehouse, or approved repair shop, of any part or parts which Hyd-Mech's inspection shall disclose to be defective. Return freight must be prepaid by the user.

This warranty, in its entirety, does not cover maintenance items, including but not limited to lubricating grease and oils, filters, V-belts, saw blades, etc., nor any items herein which show signs of neglect, overloading, abuse, accident, inadequate maintenance or unauthorized altering.

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