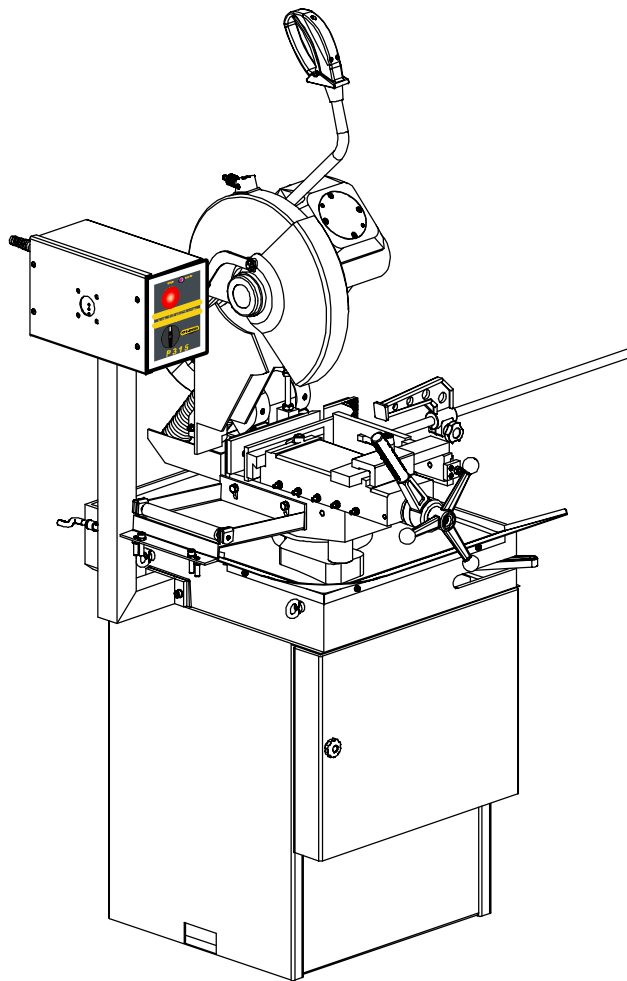


USE AND MAINTENANCE MANUAL

EN **P350**

YEAR OF MANUFACTURE: _____



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Use and maintenance manual for P 350

PREFACE

The machine **P 350** is a pendulum bench sawing machine for cutting metals.

The operation of the machine is manual: after clamping the material in the vice, the operator selects a cutting speed from the control panel and presses the microswitch located on the head control lever to start the disc. The downward movement of the head controls the cutting of the material. At the end of the cut, the cutting head returns to position ready for new cutting cycle.

In the MA model, supplied complete with pedestal, **the vice closes automatically** when the head is lowered and reopens when the head returns to its rest position.

TECHNICAL DATA

P 350	UNIT	VALUE
DISC BLADE		
External disc diameter	mm	250-350
Internal hole diameter	mm	32
Blade thickness	mm	2.5
CUTTING SPEED		
Standard speeds 1 / 2	rpm	30/60
POWER AND CONSUMPTIONS		
Head spindle motor 4-8 poles std. 2 speeds	KW	2.2/1.1
Lubricant/coolant electric pump motor	KW	0,045
Maximum electrical installed power	KW	2,245
Oil for lubricant/coolant (conc. 5-6%)	capacity lt	4,2
Oil for transmission box	capacity lt	2,6

N.B. The value for "air consumption for vice" refers to standard conditions (temperature 0° and pressure 1,013 bar, i.e. density $1,3 \times 10^{-3}$ Kg/l) where 1 Kg/min = 772 Nl/min.

INTRODUCTION

This work tool has been designed to provide a simple and reliable solution to the various needs of workshops and departments that work with metals and require a high degree of flexibility from the machine. The **P 350** is a pendulum sawing machine that can perform cuts angled from 45° left to 45° right. This capability and the high cutting capacity make the **P 350** an extremely versatile and economic machine.

We congratulate you on your choice of the **P 350** which, together with careful following of the operating and maintenance instructions in this manual, will provide you with first class results for many years to come.

MACHINE SPECIFICATION

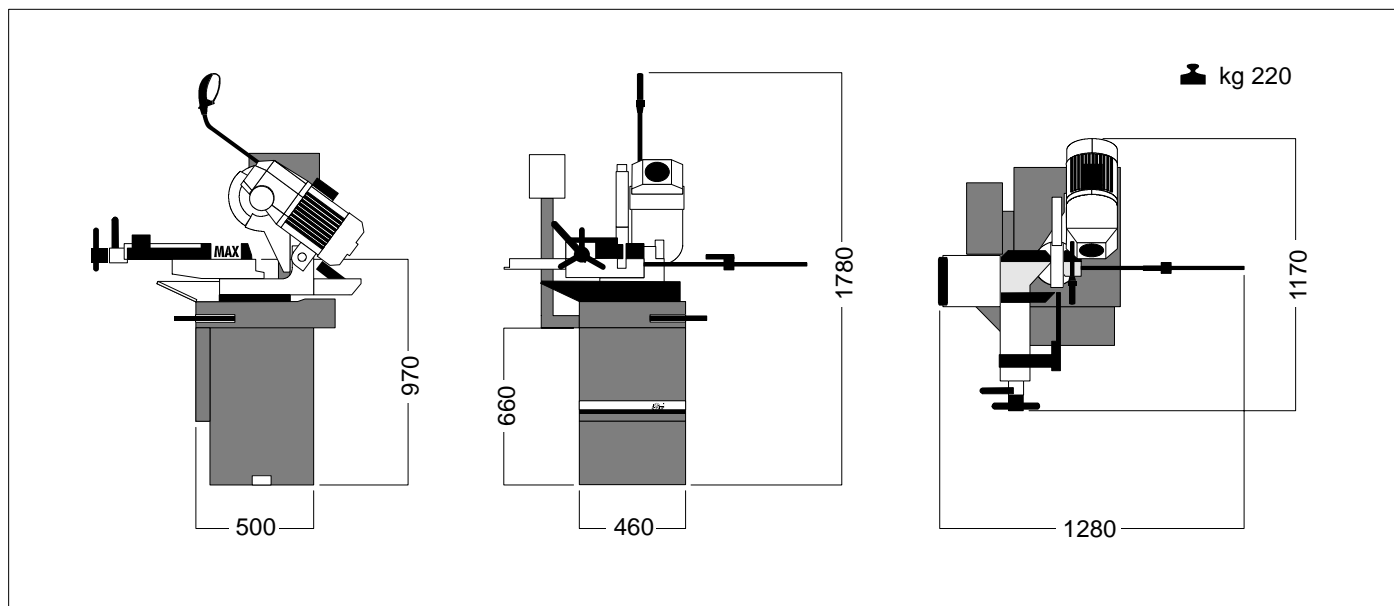
NAME PLATE:

The anodised aluminium name plate is rivetted on the side of the machine.



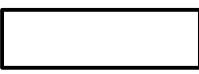
IMPORTANT: when communicating with the Technical Service department, the model, serial number and year of manufacture of the machine must be quoted.

HYD-MECH		<i>The Rock Solid Solution</i>			
model		HYD-MECH			
air pressure		bar		oil pressure	
		bar			
data code		- -		- -	
1 PH		V	A	3 PH	



DIMENSIONS:



CUTTING CAPACITY:

Cross-section	Blade diameter			
0 degrees	350	115	100	130x80
45 degrees left	350	100	85	90x80
45 degrees right	350	75	75	90x65

CUTTING CAPACITY FOR SOLID BARS:

Cross-section	Blade diameter		
0 degrees	250	50	50X50
45 degrees left	250	40	40X50
45 degrees right	250	40	40X50

Max vice opening: 130 mm

Working pressure: 6 bar

DISC BLADE:

Dimensions: **HM 250 x 32 x 2 mm**

Cutting speed: standard 30/60 rpm

SPINDLE MOTOR:

Spindle motor: asynchronous three-phase 4-8 poles; 50 Hz.

Characteristics:

	Voltage Volt	Absorption Amp.	Power kW	rpm
4 poles	400	4.12	2.2	1.400
8 poles	400	3.75	1.1	2.830

Stator winding in enamelled copper class H 200 °C;

Insulation class B (temperature limit $T_L=130^{\circ}\text{C}$);

Example of class B insulation: in air-cooled machines at ambient temperature of 40°C (in accordance with CEI 2-3 and IEC 85), the allowable overtemperature is 80°C (where 80°C represents the allowable ΔT).

Protection rating IP54 (total protection against contact with live parts and against water sprayed from all directions).

Complies with CEI standards publication IEC 34 of 1st July 1985.

EXTRACTOR MOTOR (OPTIONAL)

Submerged electric pump for coolant/refrigerant fluid: single phase 48 Volt; 50 Hz.

Characteristics:

Voltage Volt	Absorption Amp.	Power watt	rpm	Delivery rate lt/min	Head (mt.)
48	1,6	36	2.800	10	1,7

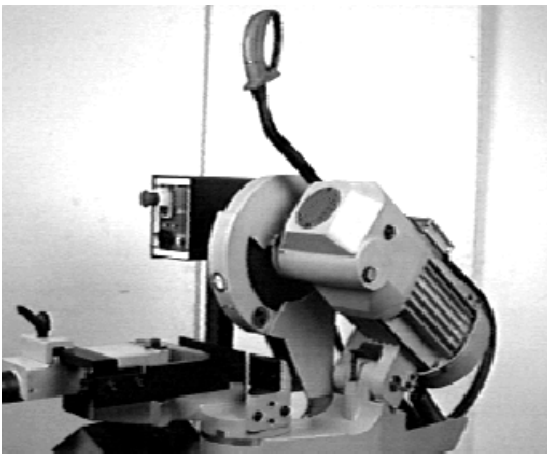
Complies with CEI Standards publication IEC 34 of 1 July 1985.

CHAPTER 1 - Main functional parts of the machine

In order to fully understand how the machine works, described in detail in the chapter "MACHINE CYCLES", lets first consider the main units and their relative location.

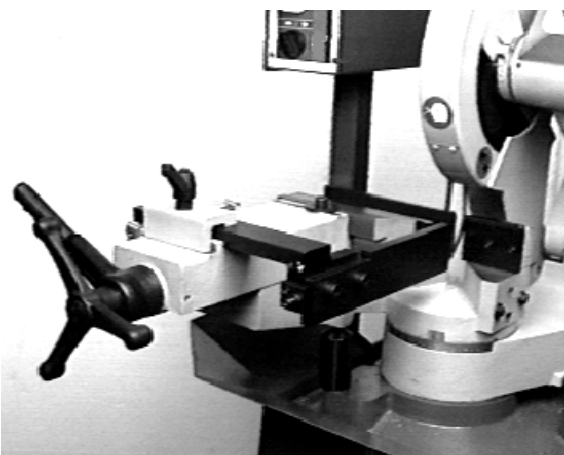
1.1 - Cutting head

The cutting head is the unit that actually performs the cut and consists of a cast iron section on which the following parts are mounted: the disc, the disc support units, the drive transmission unit and the spindle motor. The cutting head is fixed to the turntable by means of a hinge and performs a downward travel to cut the material. The upward and downward movements of the head are controlled manually by the operator.



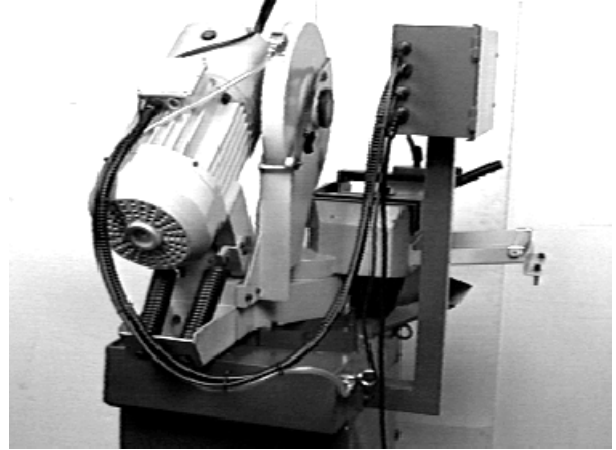
1.2 - Vice

The cutting vice is the unit that clamps the material during the cut. It consists of a vice support, commonly known as a "lead nut", on which the slide with the mobile jaw and fixed jaw are mounted. The lead nut is fixed to the upper part of the base.



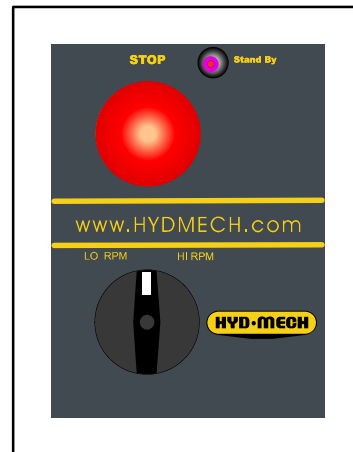
1.3 - Lubricant/coolant system

The lubricant/coolant system consists of a submerged electric pump located inside the base and an outflow nozzle fixed to the blade protective cover.



1.4 - Control Panel

The control panel has a protection rating of IP 54 and contains the electrical equipment. Access to the control panel is safeguarded by screws and the operator's safety is ensured by a key-operated safety switch, which is designed to prevent any kind of deliberate tampering. Whenever the control panel is removed from its housing, the key is automatically extracted from the switch, thus disconnecting the power supply from the machine.



CHAPTER 2 - Safety and accident prevention

The **P 350** has been designed and produced in accordance with European standards.

For the **correct use of the machine** we would recommend that the instructions contained in this chapter are carefully followed.

2.1 - Use of the machine

The **P 350** pendulum circular saw is designed to cut exclusively metal profiles. **Other types of materials and machining are not compatible with the specific characteristics of the machine.**

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

The instructions, warnings and accident prevention standards in this manual must be respected without question by all those concerned.

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

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

WARNING!

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

2.2 - General requirements

LIGHTING

Insufficient lighting for the types of operation envisaged could constitute a safety hazard for the persons concerned. For this reason, the user of the machine must provide lighting in the working zone sufficient to eliminate areas in shadow and prevent dazzling light sources (reference standard ISO 8995-89 "Lighting in working environments").

CONNECTIONS

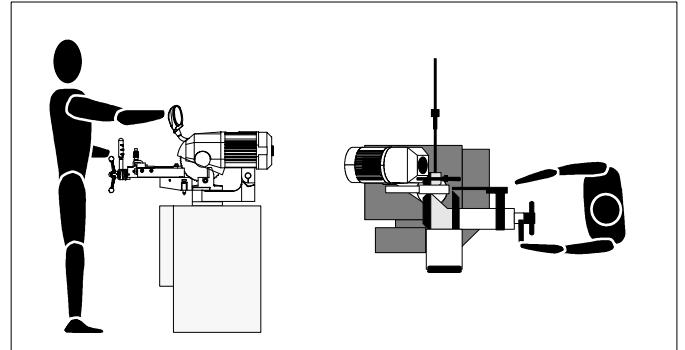
Check that the power supply cables and pneumatic feed system comply with the maximum machine absorption values listed in the "Machine Specification" tables; replace if necessary.

EARTHING SYSTEM

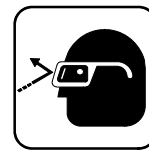
The installation of the earthing system must comply with the requirements of **IEC Standard 204**.

POSITION OF THE OPERATOR

The position of the operator controlling machining operations on the machine must be as shown in the diagram below.



2.3 - Advice for the operator



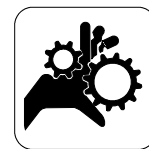
Always wear proper goggles or protective glasses.



Do not use the machine without the guards in position. Replace the polycarbonate windows, if subject to corrosion.



Do not allow hands or arms to encroach on the cutting zone while the machine is in operation.



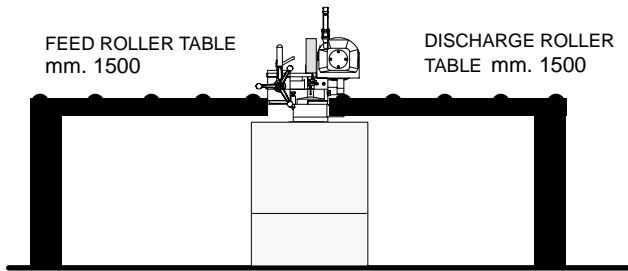
Do not wear oversize clothing with long sleeves, oversize gloves, bracelets, necklaces or any other object that may become entangled in the machine during working; long hair must be tied back and bunched.



Always disconnect the power supply to the machine before carrying out any maintenance work whatsoever, including in the case of abnormal operation of the machine.



Before starting cutting operations, support the material at both ends of the machine using the support arm - standard, or OPTIONAL accessories such as the feed and discharge roller tables shown in the diagram below. Before removing the devices supporting and moving the material, fasten the latter in place using the machine's clamping devices or other suitable equipment.



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



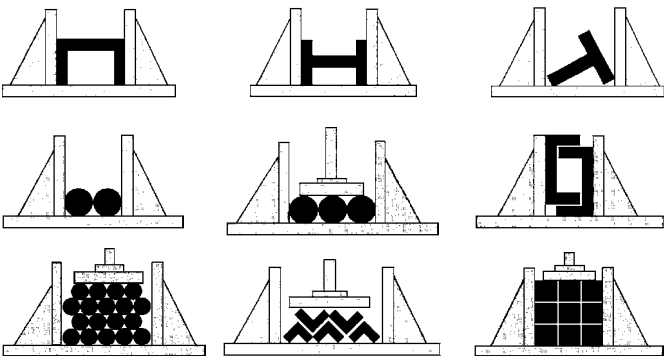
The operator **MUST NOT** perform any risky operations or those not required for the machining in course (e.g. remove swarf or metal shavings from the machine while cutting).



Remove equipment, tools or any other objects from the cutting zone; always keep the working area as clean as possible.



Before starting any cutting operations, ensure that the workpiece is securely held in the vice and the machine has been set correctly. A number of examples of how to clamp the different profiles correctly in our machines are shown below.



Do not use the machine for cutting pieces which exceed the cutting capacity described in the technical specifications or are less than 5mm



Never move the machine while it is cutting.



Do not use blades of different sizes to those recommended in the machine's specifications.



When cutting very short pieces, make sure that they are not dragged behind the support shoulder, where they could jam in the blade.



When working on the circular saw, only wear gloves when handling materials and tool change or adjustment operations. Only carry out one operation at a time and do not hold more than one item or operate more than one device simultaneously. Keep hands as clean as possible.



Warning: if the blade jams in the cut, press the emergency stop pushbutton immediately. If this does not free the blade, slowly release the vice, remove the piece and check that the blade or its teeth for damage, if need be replace the blade.



Before carrying out any repair works on the machine, consult the Technical Service; this can also be done through an agency in the country in which the machine is being used.

2.4 - Machine safety devices

This use and maintenance manual is not intended as purely a guide for the use of the machine in a strictly productive environment, it is instead an instrument providing information on how to use the machine correctly and safely. The following standards are those specified by the EEC Committee in the directives regarding safety of machinery, health and safety at work, personal protection and safeguarding of the environment. These standards have been applied to the P 350 circular saw.

2.4.1 - Reference standards

MACHINE SAFETY

- EEC Directive No. 98/37/CE of 14.06.1989 known as "Machines directive".
- EEC Directive No. 91/368 - 93/44 - 93/68 which modifies EEC Directive No. 98/37/CE relating to machine safety.
- EEC Directive No. 73/23 known as "Low voltage directive"

HEALTH AND SAFETY AT WORK

- EEC Directive No. 80/1107; 83/477;86/188;88/188; 88/642 for the protection of workers against risks caused by exposure to physical, chemical and biological agents during working.

- EEC Directive No. 89/391 and Special EEC Directives No. 89/654 and No. 89/655 for improvements in health and safety at work.
- EEC Directive No. 90/394 for the protection of workers against risks deriving from exposure at work to carcinogenic substances.
- EEC Directive No. 77/576 and No. 79/640 on safety signs at work.

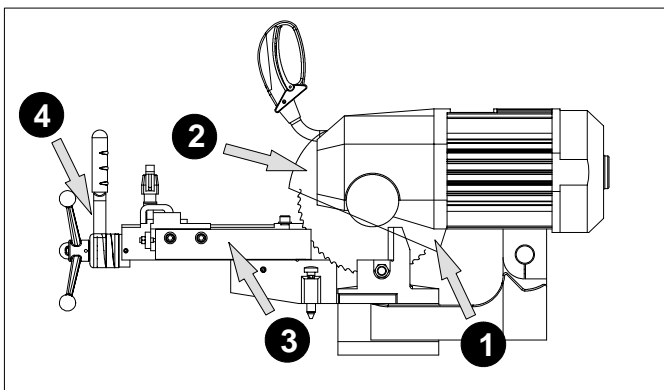
PERSONAL PROTECTION

- EEC Directive No. 89/656 and No. 89/686 on the use of personal protection devices.

ENVIRONMENTAL PROTECTION

- EEC Directive No. 75/442 on waste disposal.
- EEC Directive No. 75/439 on the disposal of used oil.

2.4.2 - Protection against accidental contact with the blade



- ① Metal disc cover fixed to the cutting head;
- ② mobile disc guard fixed to the cover and the lead nut body so as to ensure that the blade is covered and the only part of the disc exposed is that used for the actual cutting in accordance with DPR 547/55 art. 108;
- ③ vice with rag prevention device and double workpiece clamping to ensure optimum fixing of the material.

2.4.3 - Electrical equipment

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

- Access to electrical board limited by screws and automatic electro-thermal main switch with Minimum Voltage Coil.
- 24 Vac Control voltage for actuators, in accordance with chapter 6 of European Standard "Control and indication circuits" paragraph 2 "Control Circuits" sub-section 1 "Preferential voltage values for control circuits".
- Plant protected against short circuits by quick blowing fuses and earthing of all work and accidental contact parts.

- Protection from accidental start-up by a minimum voltage relay in the case of power failure

2.4.4 - Emergency devices

In accordance with Standard CEI 204-1.

- **Chapter 5 Section 6 Sub-section 1 "Emergency stop device"**:
 «the emergency stop device immediately stops all the dangerous and other functions of the machine».
- ...Emergency devices applicable to the P 350:
 - **Emergency stop**: a non-return mushroom-head pushbutton, colour red on yellow background, is located on the control panel of the machine. To release the pushbutton, the actuator must be rotated 45°. After the emergency situation has been resolved, the machine must be reset.
 - **Key operated safety switch**: the door on the base has a key operated safety switch that operates directly on the minimum voltage coil (BMT), shutting off the electricity supply to the machine every time the base door is opened.

2.5 - Noise level of the machine

Noise can cause hearing damage and represents one of the problems faced by many countries who adopt their own standards. In accordance with the EEC Machine Directive 98/37/CE, we are listing the standards that specify noise levels for machine tools. This chapter also reports the noise levels produced by the P 350 during its various operating phases and the methods used for measuring these levels. The Italian standard governing this aspect is D.M.n.277/91 drawn from EEC Directives 80/1107, 82/605, 83/477, 86/188, 88/642, UNI EN ISO 4871 (1998).

2.5.1 - Noise level measurement

Noise levels are measured using an instrument known as an **Integrator noise-meter** which registers the equivalent continuous acoustic pressure level at the work station.

The damage caused by noise depends on three parameters: level, frequency and duration. The equivalent level concept L_{eq} combines the three parameters and supplies just one indication. The L_{eq} is based on the principle of equal energy, and represents the continuous stationary level containing the same amount of energy, expressed in dBA, as that actually fluctuating over the same period of time.

This calculation is made automatically by the integrator noise-meter. The measurements are taken every 60 seconds, in order to obtain a stabilised value. The reading stays on the display for a sufficient time to enable a reading to be taken by the operator.

Measurements are taken by holding the instrument at approximately 1 metre from the machine at a height of 1.60 metres above the platform at the operator's work station. Two measurements are taken: the first while the machine operates without cutting anything, the second while cutting in manual mode.

2.5.2 - Noise level values

Identification	
Machine type	Band saw for metal applications
Model	P 350
Reference standard	ISO 3746

Results		
Test 1	Description	80x80 mm pipe in FE37 steel Disc blade HSS-DMO5 0 350 T6
	Results	MEAN SOUND LEVEL (L_{eq}) 94.39 dB (A) Environmental correction (K) 2.97 dB(A) Peak sound power (L_w) 104.80 dB(A)
Test 2	Description	35x55 mm solid tube in C40 steel. Disc blade HSS-DMO5 0 250 T6
	Results	MEAN SOUND LEVEL (L_{eq}) 79.45 dB(A) Environmental correction (K) 2.97 dB(A) Peak sound power (L_w) 89.87 dB(A)
Test 3	Description	40x40 mm solid tube in C40 steel. Disc blade HSS-DMO5 0 250 T6
	Results	MEAN SOUND LEVEL (L_{eq}) 80.56 dB(A) Environmental correction (K) 2.97 dB(A) Peak sound power (L_w) 91.87 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 70/23/CEE and 98/37/CEE. 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 350; Test report no. 061200.

2.6.1 - Emissions

○ CEI EN 61000-6-4 (2002) Electromagnetic Compatibility (EMC) - Generic standard regarding emissions. Part 6-4: Industrial Environment.

○ EN 55011 (1999) Industrial, scientific, and medical radio frequency appliances (ISM). Characteristics of radio frequency disturbance - Limits and methods of measurement.

○ EN 55014-1 (2002) Electromagnetic Compatibility - Prescriptions for domestic appliances, electric power tools, and similar equipment. Part 1: Standard Emission in relation to product family.

CONDUCTED EMISSIONS				
Gate A	Freq. (MHz)	Q-peak limit (dBuV)	Mean value limit (dBuV)	Result
A.C. power supply input	0.15 – 0.5	66 – 56 (linear reduction with log of frequency)	56 – 46 (linear reduction with log of frequency)	Complies
	0.5 – 5	56	46	
	5 – 30	60	50	

CONDUCTED EMISSIONS – ANALYSIS OF INTERMITTENT DISTURBANCES	
Gate	Result
A.C. power supply input	Not applicable

IRRADIATED EMISSIONS			
Gate	Freq. (MHz)	Q-peak limit (10 m) (dBuV/m)	Result
Enclosure	30 – 230	40	Complies
	230 – 1000	47	

2.6.2 - Immunity

○ CEI EN 61000-6-2 (2000) Electromagnetic Compatibility (EMC) - Generic standard on immunity. Part 6-2: Industrial Environment.

The EUT is deemed to fulfil the immunity requirements without testing, because it contains no electronic control circuitry.

CHAPTER 3 - Installation of the machine

3.1 - Unpacking the machine

Hyd-Mech use packing materials that guarantee the integrity and protection of the machine during its transport to the customer. The type of packing differs according to the size, weight and destination. As a consequence, the customer will receive the machine in one of two following ways.

- packaging with pallet, straps and wooden box with lid.



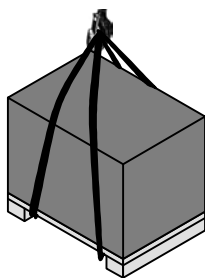
- packaging with pallet, straps and cardboard box with lid.



In both cases, the machine must be handled using a fork-lift truck, inserting the forks at the points indicated by the arrows in the photo and the marks on the crate.

WARNING! Do not handle the packed machine using slings.

NO



To install the machine, first remove the packing, paying particular attention not to cut any electric wires or hydraulic hoses; if necessary use pincers, a hammer and cutters. To install the machine at the work station, follow the procedures indicated in paragraph 3.4.

When selecting the site, take into account the **overall dimensions of the machine**, stated previously, and the **necessary space** required for the operator to work in complete **safety**.

3.2 - Check list

Before starting to install the machine, check all the accessories, whether standard or optional, supplied with it. The basic version of the P 350 2-SPEED sawing machine is supplied complete with:

- pedestal with coolant liquid tank and turntable locking system;
- 24 V electric pump for the lubrication and cooling of the disc;
- IP 55 head control lever;
- mobile guard to cover the part of the blade not being used for the cut;
- vice with rag prevention device and double workpiece clamping;
- option of performing cuts from 0° to 45° right and 45° left;
- rapid vice clamping system;
- 2-speed electric motor;
- key-operated safety switch, magneto-thermal overload cutout, minimum voltage coil, emergency device and low voltage system (24 Volt);
- steel coated jaw that can be moved sideways to clamp the workpiece as close as possible to the line of the cut;
- bag of accessories.

The bag of accessories is enclosed in the machine before it is packed and contains:

- 3, 4, 5, 6, 8, 10 mm Allen keys;
- 40 mm open-end wrench;
- 20 mm Ø rod for cuts to measure with an 8 mm Ø ratchet fork and lever + VCE M8x35 Allen grub screw;
- arm with roller on which material to be cut is rested and for fitting the feed side roller table;
- this use and maintenance manual.

OPTIONAL

OPTIONALS WITH SUPPLEMENT:

- double vice.

ACCESSORIES AVAILABLE ON REQUEST

- metal pedestal with drawer;
- circular blade HSS DMO5/M2 D.350x32x2.5 for hollow sections;
- circular blade HSS DMO5/M2 D.250x32x2 for solid bars;
- bar support;
- K35 roller table module for feed side, 1500 mm.
- discharge side roller table adaptor;
- K35 roller table for discharge side 1500 mm;
- K35 roller table for discharge side 3000 mm;
- K35 roller table for discharge side 4500 mm;
- K35 roller table for discharge side 6000 mm;
- 5 l can of emulsible oil.

3.3 - Minimum requirements

In order for the machine to function correctly, the room in which it is to be installed must satisfy the following requirements:

- power supply voltage/frequency: refer to the values on the spindle motor rating plate.
- ambient temperature: from -10 to +50 degrees C.
- relative humidity: not more than 90%.
- lighting: not less than 500 LUX.

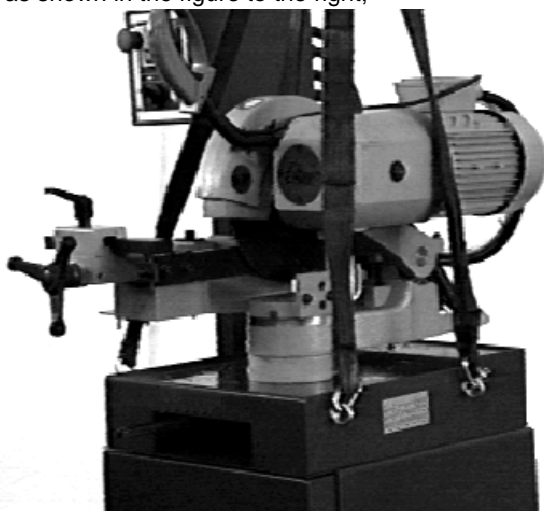
WARNING!

The machine is already protected against voltage variations occurring at the installation; However, the machine will only run trouble-free if the variations do not exceed ±10%.

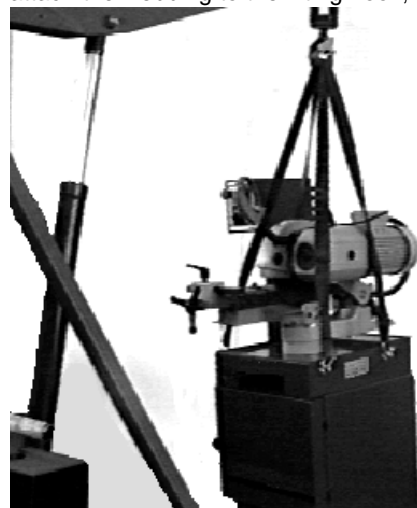
3.4 - Handling the machine

If the machine has to be moved from its seat, use a fork lift truck if the machine is mounted on a pallet or webbing and a crane if the machine is on the ground:

when lifting and moving the machine with webbing, harness the saw as shown in the figure to the right;



attach the webbing to the lifting hook, taking care not to tilt it.



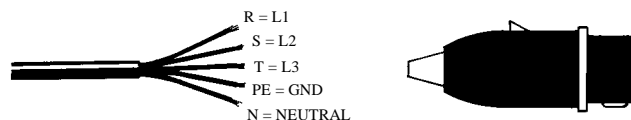
3.6 - Connection to the power supply

Before connecting the machine to the power supply, check that the socket is not connected in series with other machines. This requirement is fundamental for the good operation of the machine.

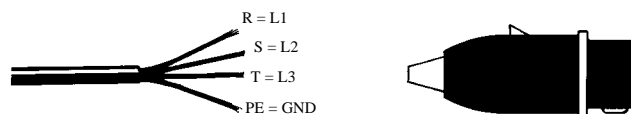
To connect the machine to the power supply, proceed as follows:

1 - connect the power supply cable of the machine to a plug which matches the socket to be used. (EN 60204-1; par. 5.3.2)

CONNECTION FOR "5-CORE" WIRE SYSTEMS WITH NEUTRAL



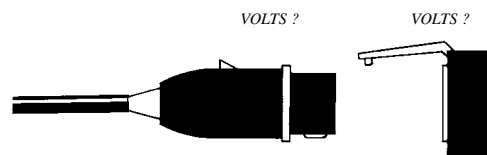
CONNECTION FOR "4-CORE" WIRE SYSTEMS WITH NEUTRAL



WARNING!

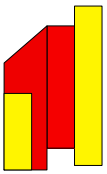
When using systems with a neutral wire, special care must be taken when connecting the **blue** neutral wire, in that if it is connected to a phase wire it will discharge the **phase voltage** to the equipment connected for **voltage: phase-neutral**.

2 - Insert the plug in the socket, ensuring that the mains voltage is the same as that for which the machine has been setup.



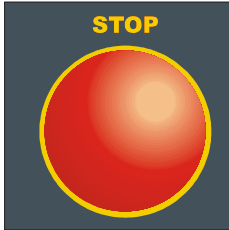
Installation of the machine

3 - Rotate the minimum voltage coil reset selector.

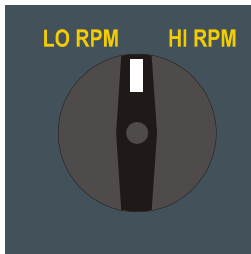


4 - Check that the motor is rotating in the **correct** direction, as follows:

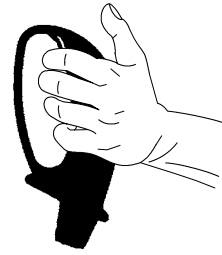
a) Make sure that the machine is not in an emergency condition (red mushroom-head pushbutton released).



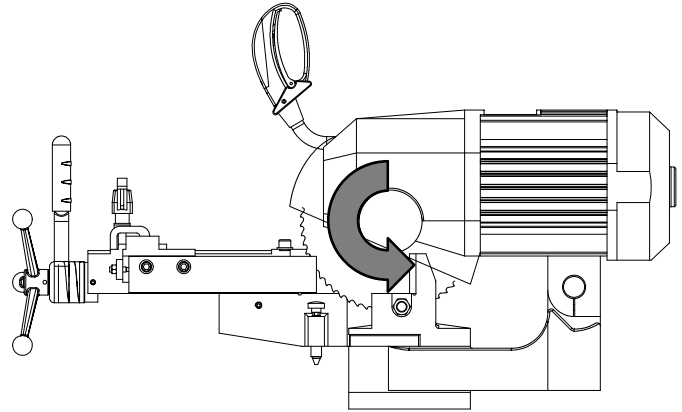
b) Select a cutting speed using the polarity change switch.



c) Operate the jog pushbutton on the manual head control lever



d) if all the above operations have been carried out correctly, the blade motor will now start up and the disc will start to turn.



Make sure that the disc turns in the correct direction as shown in the above diagram. If it does not, simply reverse two of the phase wires on the machine's power supply input.

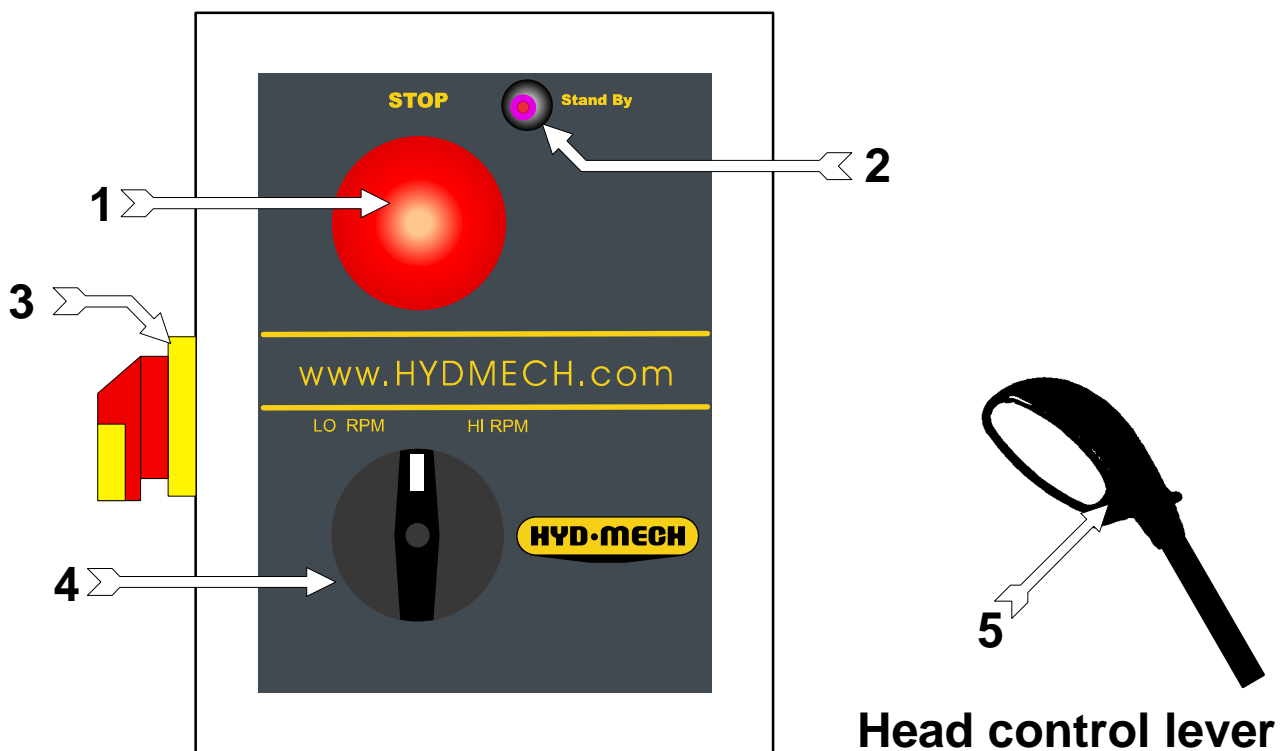
The sawing machine is now ready to start the work for which it was designed. Chapter four provides a detailed description of the various functions of the machine and its operating cycles.

CHAPTER 4 - Description of machine operation

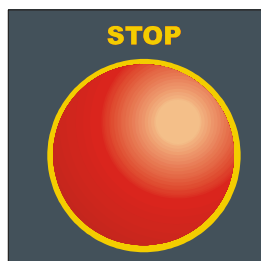
This chapter analyses all the machine's functions. We shall therefore start with a description of the pushbuttons and other components on the control panel.

4.1 - Description of the control panel

The components of the P 350 control panel are shown on the diagram below: Each arrow has a number which corresponds to the descriptions that follow.

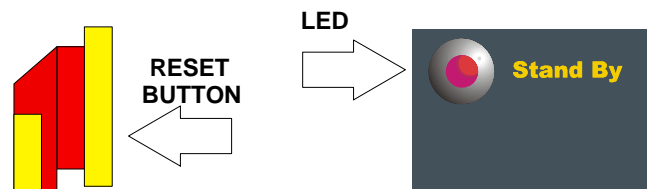


1 - EMERGENCY STOP PUSHBUTTON



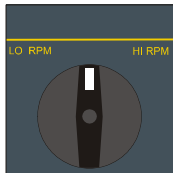
Pressing this pushbutton stops the machining operations immediately and stops any blade movement. The emergency pushbutton, designed in accordance with all relevant safety standards, is installed in a position that makes it easily accessible at any moment of potential danger. Its red colour on a yellow background makes it extremely visible. To reset the pushbutton, rotate it 45°.

2 / 3 - MINIMUM VOLTAGE COIL RESET BUTTON/STANDBY LED



The **reset pushbutton** switches on the power to the machine (lighting the LED) through the MINIMUM VOLTAGE COIL RESET and the BLADE MOTOR MAGNETO-THERMAL RESET. This device is in fact fitted with three protection systems against voltage drops. In the event of a voltage drop, all three electrical devices are tripped, stopping the machine instantly and preventing it from being reset automatically when the power returns. Another function of the device is to reset the thermal relay that protects against current overloads. The LED indicates that the electric power supply is connected to the machine.

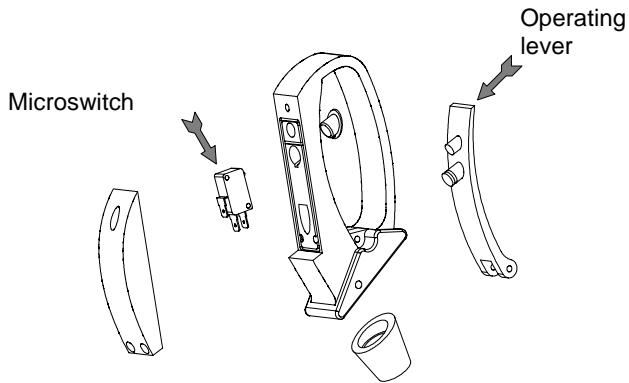
4 - POLARITY CHANGE SWITCH



This selects the cutting speed of the disc: 30/60 m/min on standard two-speed machines.

5 - HEAD CONTROL LEVER MICROSWITCH

The top of the manual head control lever incorporates a microswitch for controlling the blade motor.

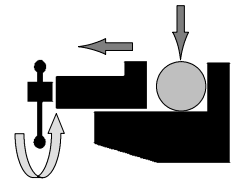


This microswitch is enabled when the machine is not in emergency condition. In accordance with the relevant standards in force, the voltage is 24V and the microswitch is installed in a housing (blue knob) sealed against external agents such as dust or moisture with a protection rating of IP 55.

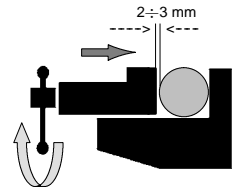
4.2 - Manual cycle

Sequence of operations for making a cut with the manual cycle:

- 1) switch on the machine at the reset switch;
- 2) position the material in the vice and calculate the length of the cut (using the rods for cuts to measure).



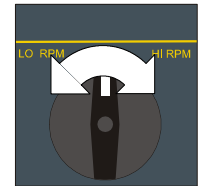
- 3) Clamp the workpiece in the vice;



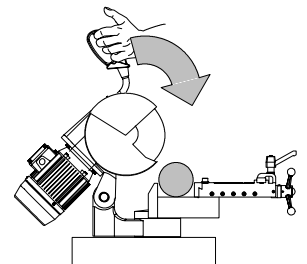
- 4) Make sure the workpiece is securely clamped in the vice by trying to move it manually.



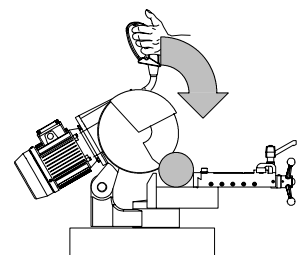
- 5) Select the cutting speed using the Polarity change switch according to the type of material to be cut (shape, thickness, hardness, etc.).



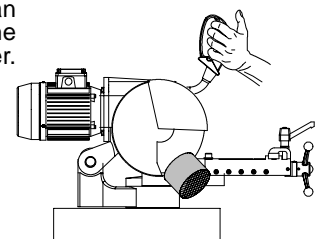
- 6) Grip the head control lever and start the blade by pressing the microswitch on the handgrip. The head descent speed is controlled manually by the operator.



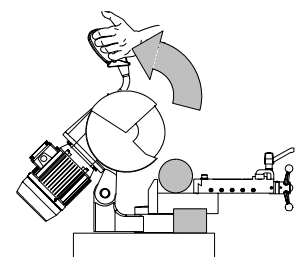
- 7) The motor starts up and starts the blade moving, **at the same time starting the lubricant/coolant pump.**



- 8) At the end of the cut the head can be raised; the springs behind the head make this operation easier.



- 9) Release the workpiece from the vice using the handwheel.



CHAPTER 5 - Diagrams, exploded views and spare parts

This chapter contains functional diagrams of the machine and exploded views of the P 350. This document will allow you to identify the location of the various components making up the machine, thus enabling repairs and/or maintenance work to be carried out. In addition, this document will also enable you to order spare parts, correctly identifying them by part number and position number.

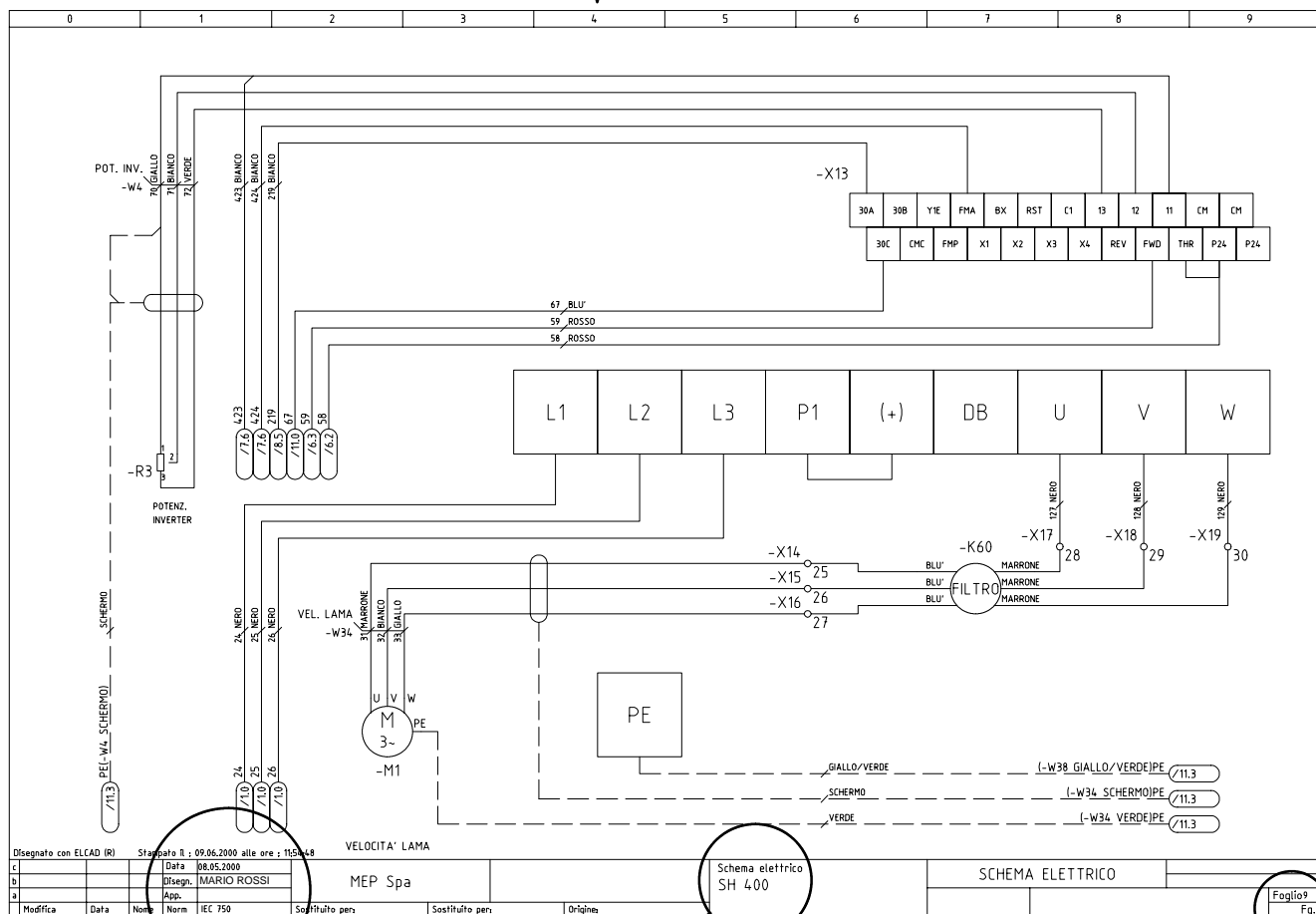
5.1 - Diagrams

5.1.1 - Electrical system

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

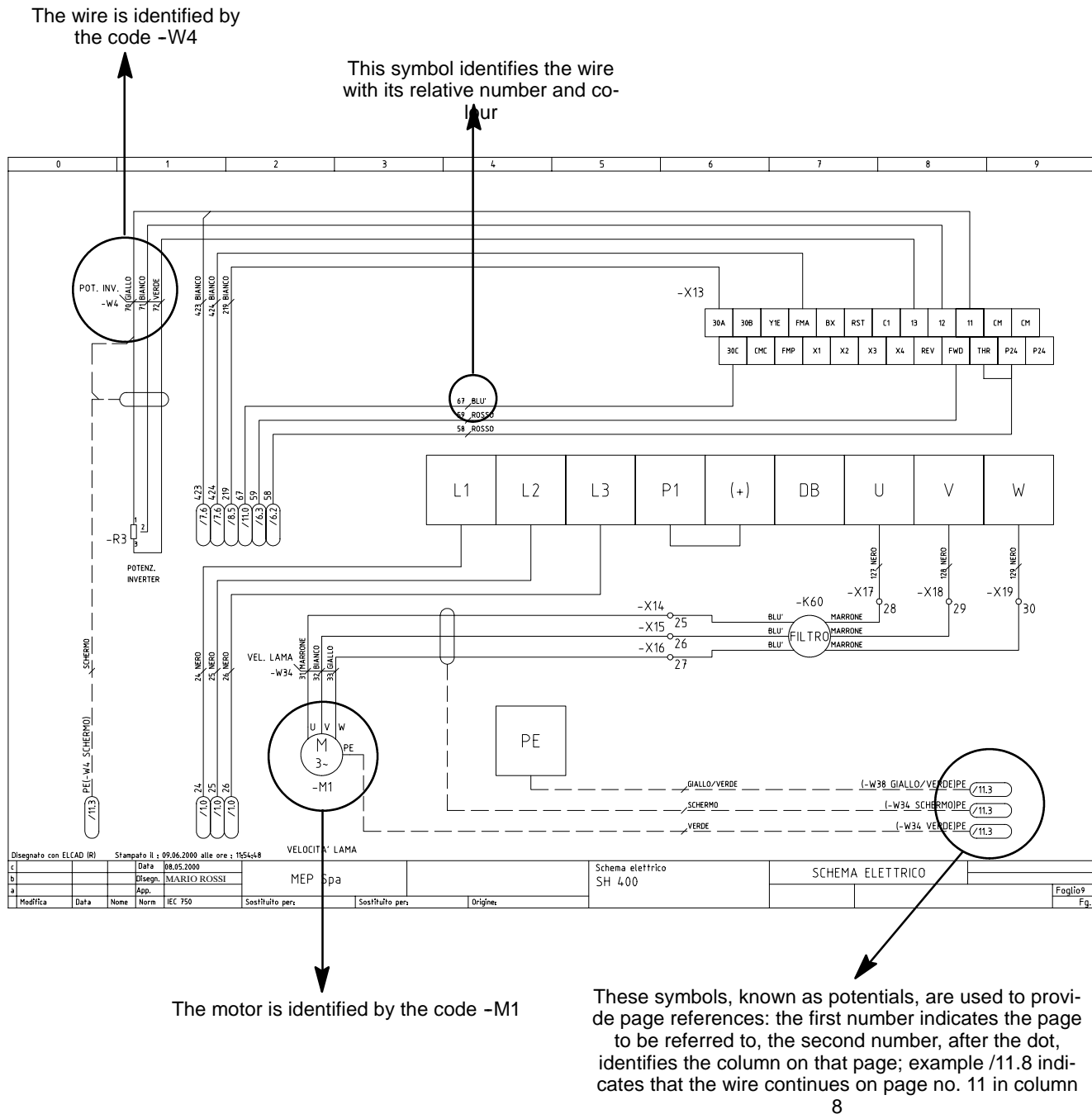
Data	08.05.2000
Disegn.	MARIO ROSSI
App.	
Norm	IEC 750

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:



Disegnato con ELCAD (IRI)		Stampato il - 09.06.2000 alle ore : 15:54:40		Data 08.05.2000		Schema elettrico SH 400		SCHEMA ELETTRICO		Foglio 9	
a		Disegn. MARIO ROSSI		MEP spa							
b		App.		Sostituto pers.		Sostituto pers.		Origine		Fg.	
c		Norm IEC 750									

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 (mm²);
- 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

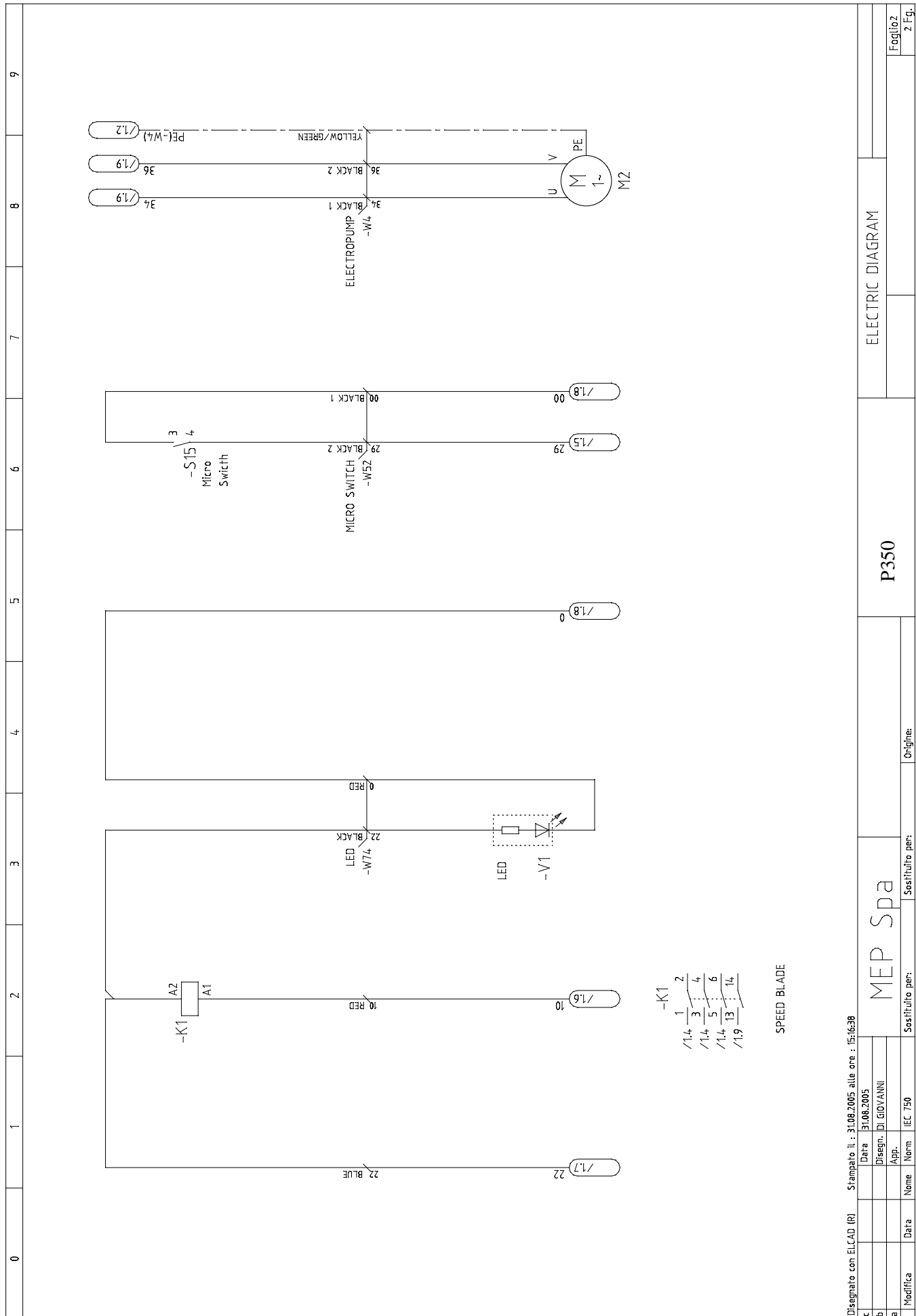
D2–Letter codes used to designate the type of component

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

G	Generators, feeders	Rotating generators Crystal oscillators	G
		Accumulator battery Rotating or static frequency converter Power feeder	GB GF GS
H	Signaling Devices	Buzzer	HA
		Optical signal, indicator light device	HL
J			
K	Relays, Contactors	Instant all or nothing relays or instant contactors	KA
		Bistable relays or interdependent contactors (All or nothing contactors with mechanical contact or permanent magnet etc.)	KL
		Contactors	KM
		Polarised relays	KP
		Reed relays All or nothing timed relays (timers)	KR KT
L	Inductors, reactors	Inductor Stop coil Reactor	L
M	Motors		M
N	Analogue integrated 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	QF
		Engine saver switch	QM
		Knife switch	QS
R	Resistors	Fixed or variable resistor (rheostat)	R
S	Command or control devices	Selector or switch	SA
		Button (including electronic proximity switch)	SB
		Numerical all or nothing sensors (single step) of mechanical and electronic type:	SL
		- Liquid level sensor	SP
		- Pressure sensor	SQ
		Position sensor (including proximity)	SR
- Rotation sensor	ST		
- Temperature probe			
T	Transformers	Current transformer	TA
		Control circuit supply transformer	TC
		Power transformer	TM
		Magnetic stabiliser	TS
		Voltage transformer	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, impedance adapters, equalizers, band limiters	Line equalizer Compressor Crystal filter	Z

STANDARDISED WIRING DIAGRAMS (CENELEC STANDARD)



Disegnato con ELLCAD (R) Stampato il : 31.08.2005 alle ore : 15:16:38

c	Data	31.08.2005
b	Disegn.	DI GIOVANNI
a	App.	
Modifica	Data	Nome Norm IEC 750

Sostituito per: **MEP SpA**
Sostituito per:

P350

ELECTRIC DIAGRAM

Foglio 2
2 Fg.

List of cables

CODE	CABLE	DESCRIPTION	SEC.	WIRE	COLOR	START	END
022.0138	-W4	Electropump	AWG20	34	BLACK 1	-F5	-M2:U
022.0138	-W4	Electropump	AWG20	36	BLACK 2	-T1:0(0-48)	-M2:V
022.0138	-W4	Electropump	AWG20		YELLOW/ GREEN	-X5:PE	-M2:PE
022.0139	-W52	Microswitch	AWG20	00	BLACK 1	-X6:D	-S15:3
022.0139	-W52	Microswitch	AWG20	29	BLACK 2	-S50:A	-S15:4
022.0862	-W74	LED	AWG20	0	RED	-X6:D	-V1
022.0862	-W74	LED	AWG20	22	BLACK	-K1:A2	-V1
022.0134Y/G	-W100	PE/T1:PE	AWG16		YELLOW/ GREEN	T1:0	PE
022.0134Y/G	-W101	PE/T1:0 Vac(0-24)	AWG16		YELLOW/ GREEN	T1:0	PE
022.0134Y/G	-W102	X5:PE/M1:PE	AWG16		YELLOW/ GREEN	-X5:PE	-M1:PE
022.0134Y/G	-W103	X5:PE/ PE:Sw.plate	AWG16		YELLOW/ GREEN	-X5:PE	PE
022.0134Y/G	-W104	X0:PE/X5:PE	AWG16		YELLOW/ GREEN	-X0:PE	-X5:PE
022.0314B	-W104	Q0:1/-S4:1	AWG16	1	BLACK	-Q0:1	-S4:1
022.0314B	-W105	Q0:3/K0:D2	AWG16	2	BLACK	-Q0:3	-K0:D2
022.0134B	-W106	K0:D1/S4:2	AWG16	11	BLACK	-K0:D1	-S4:2
022.0134B	-W107	Q0:2/F1	AWG16	5	BLACK	-Q0:2	-F1
022.0134B	-W108	Q0:4/F2	AWG16	6	BLACK	-Q0:4	-F2
022.0134B	-W109	F1/T1:240	AWG16	12	BLACK	-F1	-T1:240
022.0134B	-W110	F2:T1:0	AWG16	012	BLACK	-F2	-T1:0
022.0134B	-W111	Q0:2/K1:1	AWG16	5	BLACK	-Q0:2	-K1:1
022.0134B	-W112	Q0:4/K1:3	AWG16	6	BLACK	-Q0:4	-K1:3
022.0134B	-W113	Q0:6/K1:5	AWG16	7	BLACK	-Q0:6	-K1:5
022.0134B	-W114	K1:2/S50:3	AWG16	18	BLACK	-K1:2	-S50:3
022.0134B	-W115	K1:4/S50:14	AWG16	19	BLACK	-K1:4	-S50:14
022.0134B	-W116	K1:6/S50:16	AWG16	20	BLACK	-K1:6	-S50:16
022.0134BR	-W117	S50:5/M1:W1	AWG16	23	BROWN	-S50:5	-M1:W1
022.0134BR	-W118	S50:7/M1:V1	AWG16	25	BROWN	-S50:7	-M1:V1
022.0134BR	-W119	S50:8/M1:U1	AWG16	27	BROWN	-S50:8	-M1:W1
022.0134R	-W120	S50:4/M1:W2	AWG16	24	RED	-S50:4	-M1:W2
022.0134R	-W121	S50:13/M1:V2	AWG16	26	RED	-S50:13	-M1:V2
022.0134R	-W122	S50:15/M1:U2	AWG16	28	RED	-S50:15	-M1:U2
022.0133BL	-W123	T1:0/K1:A2	AWG20	22	BLUE	-T1:0	-K1:A1
022.0133R	-W124	T1:24 Vac/F4	AWG20	31	RED	-T1:24	-F4
022.0133R	-W125	F6/X6:D	AWG20	30	RED	-F4	-X6:D
022.0133R	-W126	S50:A/K1:A1	AWG20	10	RED	-S50:A	-K1:A1
022.0133R	-W127	T1:48/K1:13	AWG20	13	RED	-T1:48	-K1:13
022.0133R	-W128	K1:14/F5	AWG20	21	RED	-K1:14	-F5

List of components

CODE	ID,	REF.	DESCRIPTION	MANUFACTURER
022.1136	-F1	/1,5	FUSE 6,3x32	ITALWEBER
022.2252	-F1	/1,5	FUSE-HOLDER ST	PHOENIX CONTACT
022.1136	-F2	/1,5	FUSE 6,3x32	ITALWEBER
022.2252	-F2	/1,5	FUSE-HOLDER ST	PHOENIX CONTACT
022.1136	-F4	/1,8	FUSE 6,3x32	ITALWEBER
022.2252	-F4	/1,8	FUSE-HOLDER ST	PHOENIX CONTACT
022.1136	-F5	/1,9	FUSE 6,3x32	ITALWEBER
022.2252	-F54	/1,9	FUSE-HOLDER ST	PHOENIX CONTACT
022.0580	-K0	/1.3	LOW TENSION RELAY	ALLEN-BRADLEY
0220087	-K1	/2.2	CONTACTOR	MOELLER
019,1722	-M1	/1.4	BLADE MOTOR	CARPANELLI MOTORI
022,1261	-Q0	/1.4	MAIN-SWITCH OVER LOAD THERMAL PROTECTION	ALLEN-BRADLEY
022,0123	-Q0	/1.4	DOOR COUPLING HANDLE	ALLEN-BRADLEY
022,0123*	-Q0	/1.4	EXTENSION SHAFT	ALLEN-BRADLEY
022,1242	-S4	/1.3	EMERGENCY PUSHBUTTON	BRETER
022,0515	-S15	/2.6	MICRO-SWITCH	HONEYWELL
034,1221	-S15	/2.6	KNOB	BARDEGGIA
010,0928	-S15	/2.6	SPRING	ADRIATICA MOLLE
025,0691	-S15	/2.6	KNOB SEAL	BARDEGGIA
022,0023	-S50	/1.4	POLE CHANGE SWITCH	BRETER
022,0432	-T1	/1.6	TRANSFORMER INPUT 0-240 OUTPUT 0-24/0-48	ERC
022,0862	-V1	/2.3	SINGLE LED BOARD	MEP

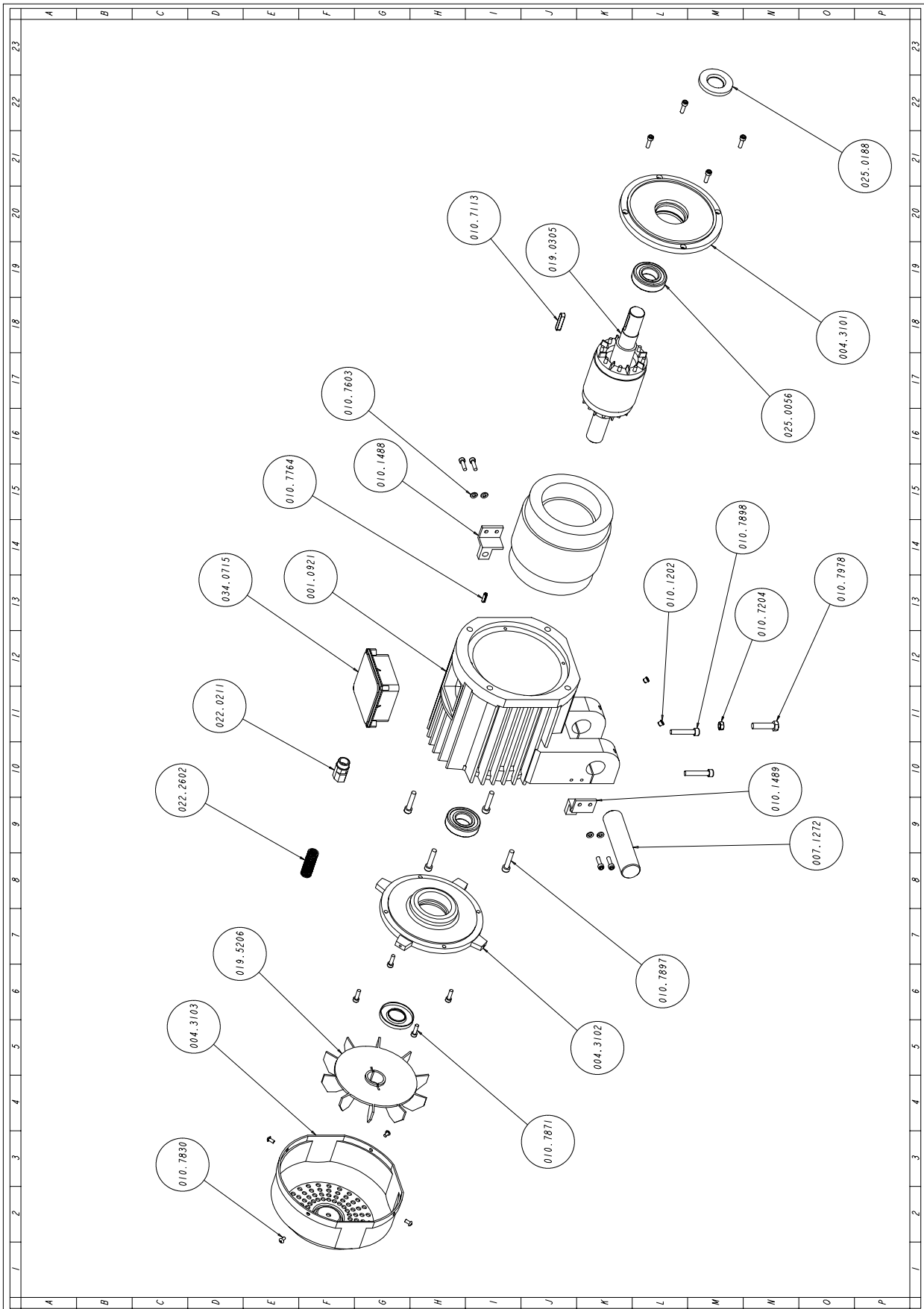
List of terminals

CODE	ID,	REF.	DESCRIPTION	MANUFACTURER
022.0377	-X0	/1,1	SINGLE GROUND TERMINAL	PHOENIX CONTACT
022.2243	-X1	/1,1	SINGLE TERMINAL	PHOENIX CONTACT
022.2243	-X2	/1,1	SINGLE TERMINAL	PHOENIX CONTACT
022.2243	-X3	/1,0	SINGLE TERMINAL	PHOENIX CONTACT
0222247	-X5	/1,2	QUADRUPLE GROUND TERMINAL	PHOENIX CONTACT
022.2245	-X6	/1,8	QUADRUPLE TERMINAL	PHOENIX CONTACT

5.2 - Exploded views

This part of the manual contains the exploded views of the P 350 which will assist in gaining a thorough knowledge of the machine.

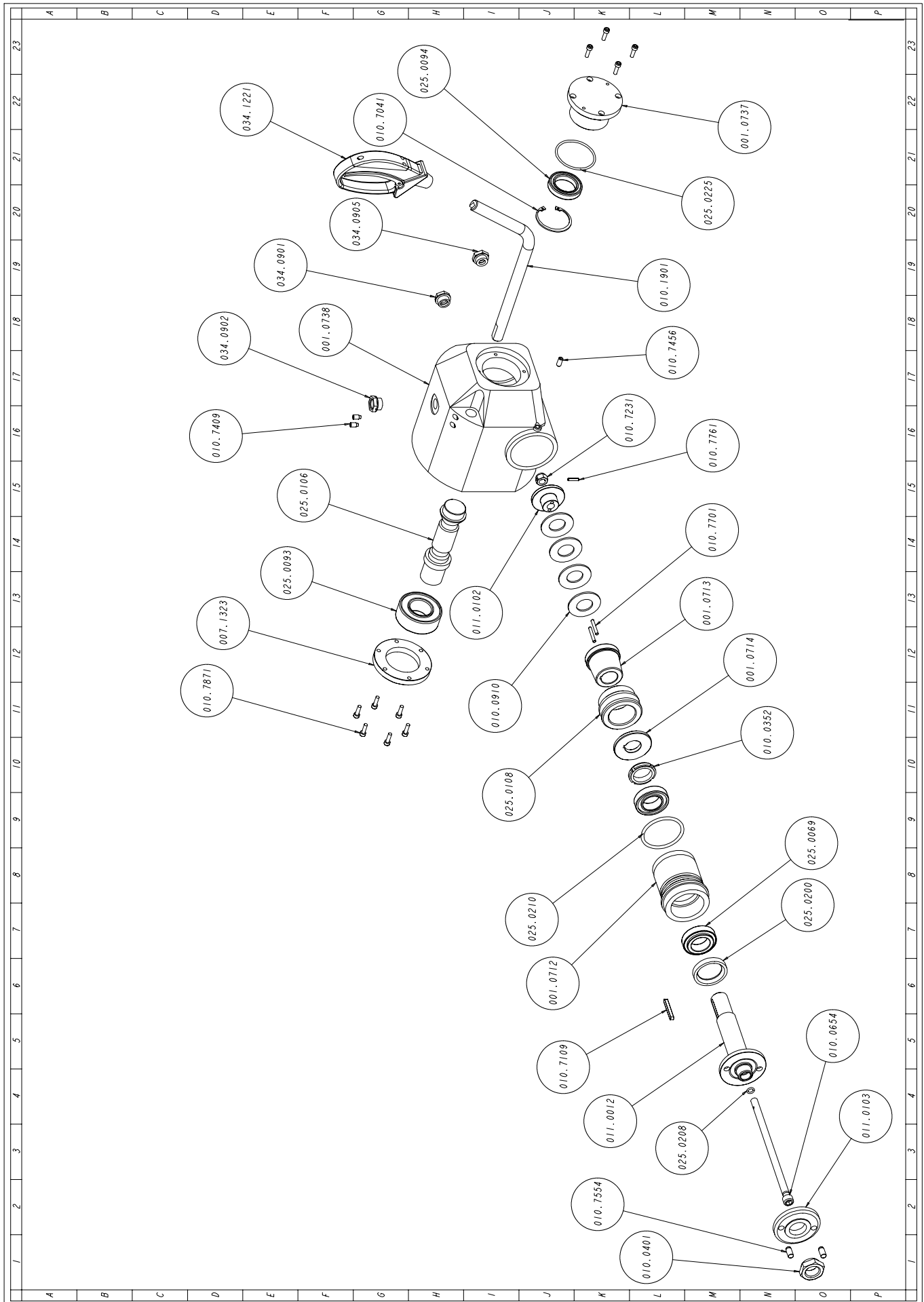
5.2.1 - Motor unit



Spare parts

Code	Description	U. of M.	Quantity
001.0921	MOTOR FRAME	NR	1,000
004.3101	FRONT MOTOR SHIELD	NR	1,000
004.3102	REAR MOTOR SHIELD	NR	1,000
004.3103	FAN COVER	NR	1,000
007.1272	PIN	NR	1,000
010.1202	OIL FILLER DIAM.8	NR	2,000
010.1488	RIGHT SPRING FIXING BRACKET	NR	1,000
010.1489	LEFT SPRING FIXING BRACKET	NR	1,000
010.7113	8 X 7 X 40 KEY	NR	1,000
010.7204	M8 SCREW NUT	NR	1,000
010.7603	0 6 WASHER	NR	4,000
010.7764	ELASTIC PIN DIAM. 6 X 20	NR	1,000
010.7830	5 X 10 BUTON SCREW	NR	4,000
010.7871	TCEI 6 X 20 SCREW	NR	12,000
010.7897	TCEI 8 X 40 SCREW	NR	4,000
010.7898	TCEI 8 X 45 SCREW	NR	2,000
010.7978	TE 10 X 40 SCREW	NR	1,000
019.0305	HP 3/4 4/8P. T112 V.380	NR	1,000
019.5206	NYLON FAN FOR MOTORS 3K112	NR	1,000
022.0211	RAPID JOINT SEM PG 13,5	NR	1,000
022.2602	POLIFLEX COVERING NW 14-1200143	MT	1,500
025.0056	BEARING 62.06 2Z C3	NR	2,000
025.0188	SEAL 62X30X7	NR	2,000
034.0715	TERMINAL BOARD HOUSING	NR	2,000

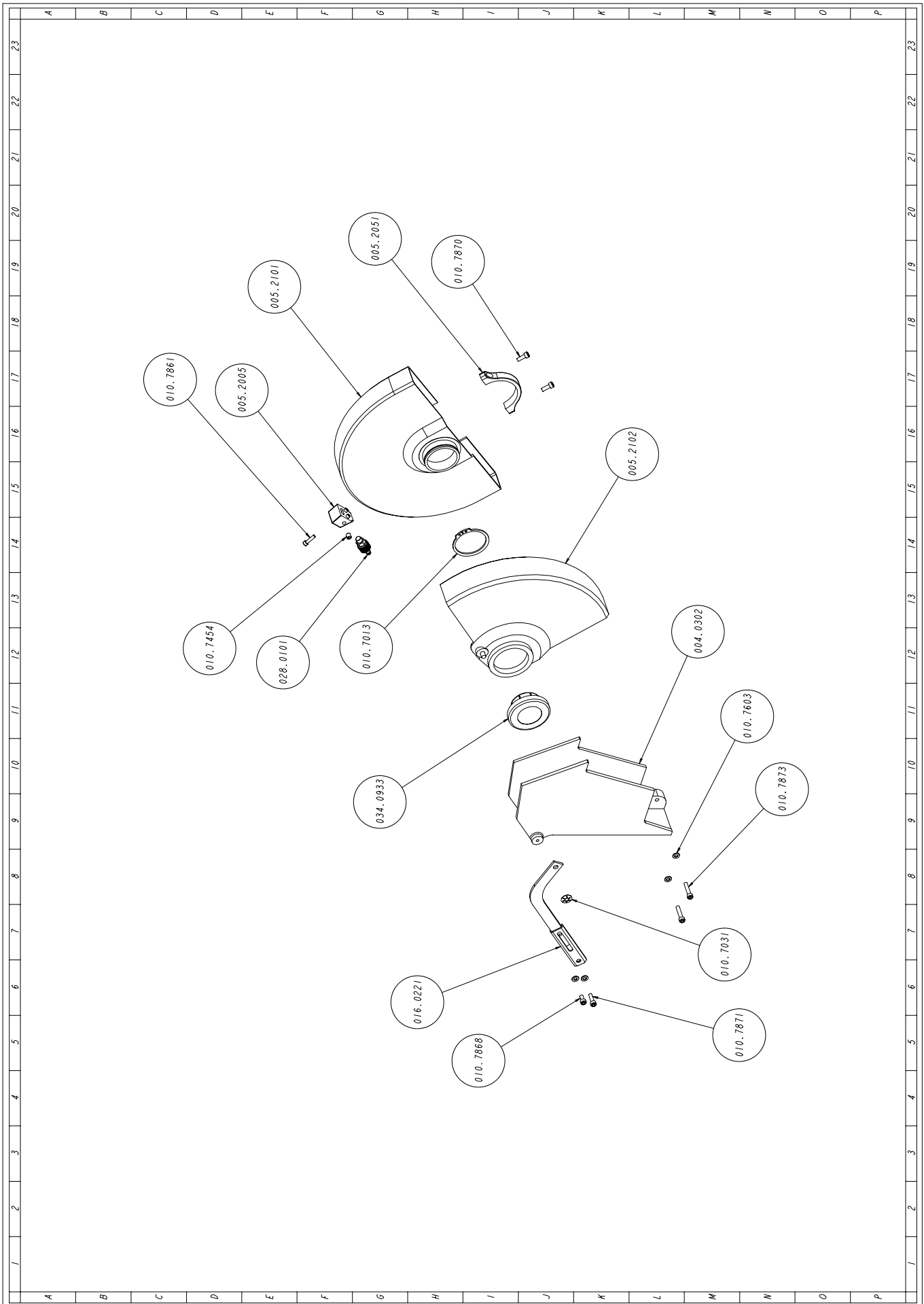
5.2.2 - Trasmission device



Spare parts

Code	Description	U. of M.	Quantity
001.0712	PAD MOD.114	NR	1,000
001.0713	CLUTCH CONE	NR	1,000
001.0714	WASHER MOD.116	NR	1,000
001.0737	TAP MOD.2057	NR	1,000
001.0738	GEAR BOX MOD.2058	NR	1,000
007.1323	REAR TAP	NR	1,000
010.0352	SELF-LOCKING RING NUT 35X1,5	NR	1,000
010.0401	M M.27 P.HEX NUT 2	NR	1,000
010.0654	SCREW 12X250 8G	NR	1,000
010.0910	SPRING 60X30,5X3	NR	4,000
010.1901	BT LEVER	NR	1,000
010.7041	0 65 SEEGER RING FOR HOLES	NR	1,000
010.7109	6 X 6 X 50 KEY	NR	1,000
010.7231	M12 SELF-LOCKING SCREW NUT	NR	1,000
010.7409	8 X 10 CYLIND.POINT VCE GRUB SCREW	NR	3,000
010.7456	8 X 16 CONICAL POINT VCE GRUB SCREW	NR	1,000
010.7554	10 X 20 FEEDING PIN	NR	2,000
010.7701	CYLINDRICAL PIN DIAM. 5 X 35	NR	2,000
010.7761	ELASTIC PIN DIAM. 4 X 20	NR	1,000
010.7871	TCEI 6 X 20 SCREW	NR	10,000
011.0012	BLADE SHAFT	NR	1,000
011.0102	SPRING PUSHING FLANGE	NR	1,000
011.0103	OUTER FLANGE	NR	1,000
025.0069	BEARING 32007X	NR	2,000
025.0093	BEARING 3208 ATN9 C3	NR	1,000
025.0094	BEARING 6908	NR	1,000
025.0108	BRONZE GEAR /11	NR	1,000
025.0106	WORM SCREW D.694/2	NR	1,000
025.0200	SEAL 62X45X10	NR	1,000
025.0208	O RING 109-9,13	NR	1,000
025.0210	O RING 6275-69,21	NR	1,000
025.0225	O RING 171-68,26	NR	1,000
034.0901	1/2"GAS. OIL LEVEL CAP	NR	1,000
034.0902	SFP 1/2" RED OIL CAP	NR	1,000
034.0905	TAO/3 1/2" BLACK OIL CAP"	NR	1,000
090.0271	COMPLETE MEP HANDLE	NR	1,000

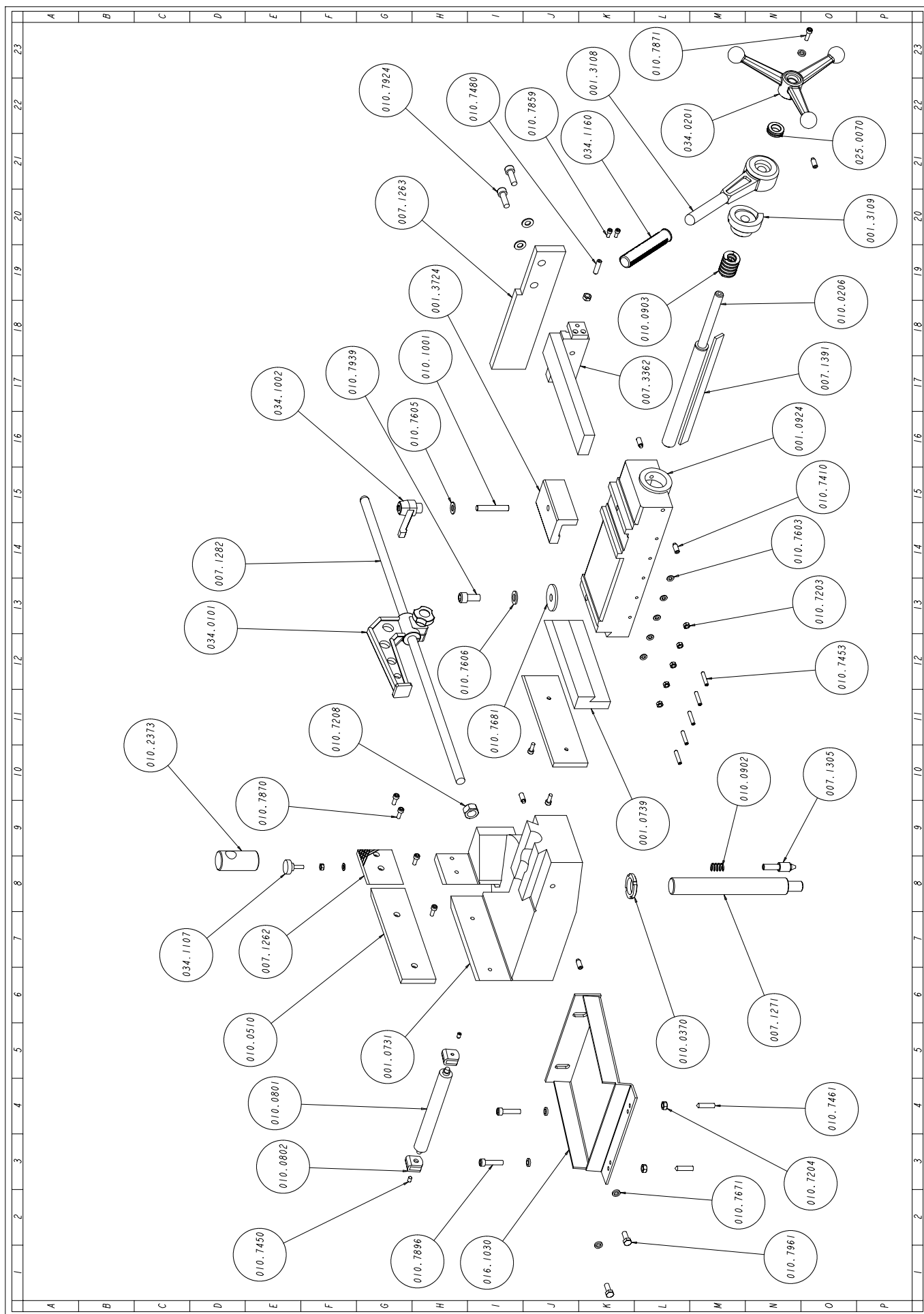
5.2.3 - Carter group



Spare parts

Code	Description	U. of M.	Quantity
004.0302	FIXED PROTECTION	NR	1,000
005.2005	TAP SPRAYER	NR	1,000
005.2051	BLADE FIXING CLAMP	NR	1,000
005.2101	BLADE COVER SC-RA	NR	1,000
005.2102	BLADE PROTECTION 0	NR	1,000
010.7013	0 62 SEEGER RING	NR	1,000
010.7031	SK 0 8 SEEGER RING	NR	1,000
010.7454	8 X 8 CONICAL POINT VCE GRUB SCREW	NR	1,000
010.7603	0 6 WASHER	NR	4,000
010.7861	TCEI 5 X 20 SCREW	NR	1,000
010.7868	TCEI 6 X 12 SCREW	NR	1,000
010.7870	TCEI 6 X 16 SCREW	NR	2,000
010.7871	TCEI 6 X 20 SCREW	NR	1,000
010.7873	TCEI 6 X 30 SCREW	NR	2,000
016.0221	GUARD BRACKET	NR	1,000
028.0101	TAP REGULATOR 8 X 1/4	NR	1,000
034.0933	BLADE COVER TAP	NR	1,000

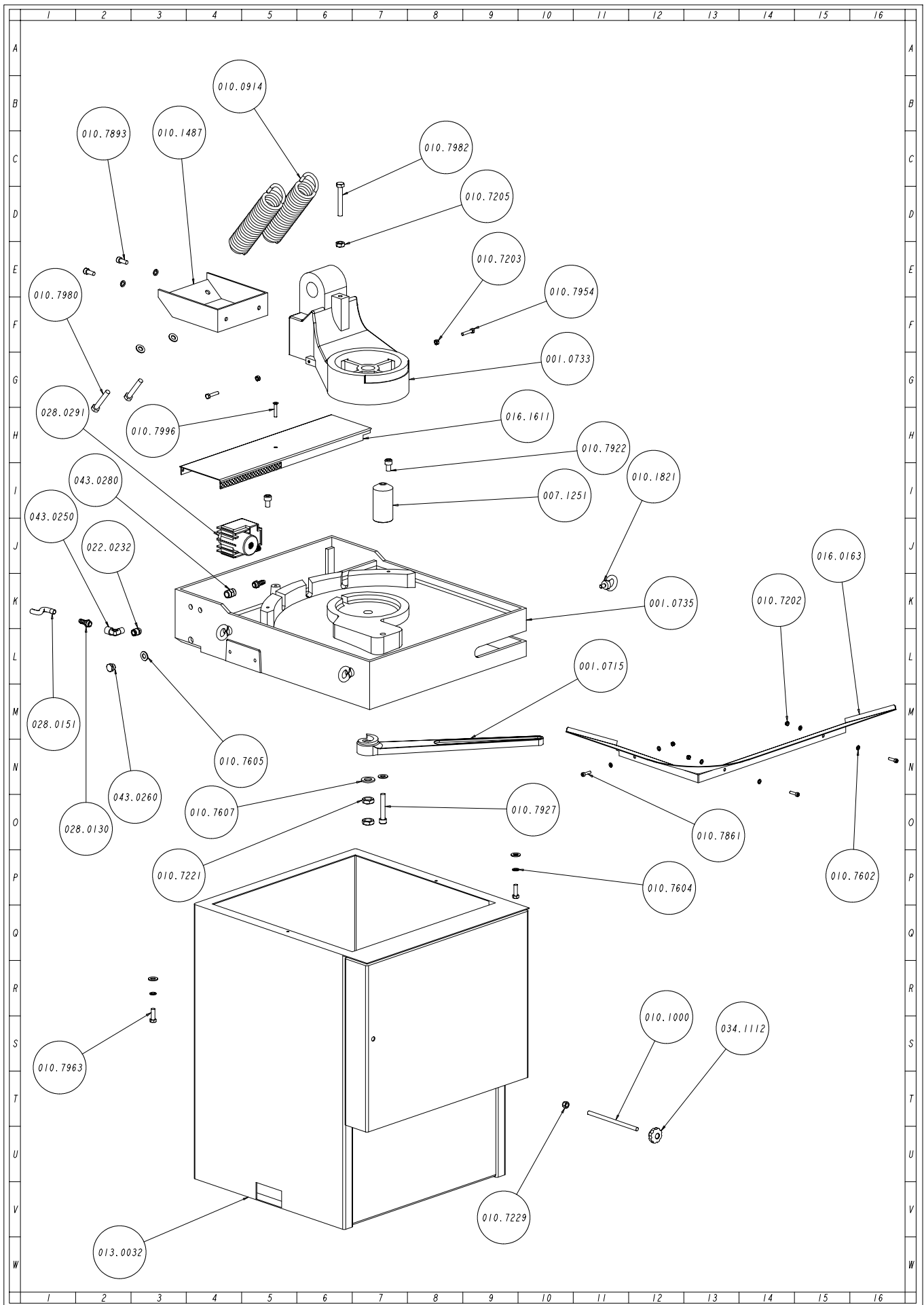
5.2.4 - Vice unit



Spare parts

Code	Description	U. of M.	Quantity
001.0731	LOWER VICE	NR	1,000
001.0739	SUPPORT	NR	1,000
001.0924	UPPER VICE MOD.2104	NR	1,000
001.3108	CLAMPING LEVER	NR	1,000
001.3109	BUSHING MOD.666	NR	1,000
001.3724	BRACKET	NR	1,000
007.1262	RIGHT VICE JAW	NR	1,000
007.1263	ANTI BURR JAW	NR	1,000
007.1271	CENTRE PIN	NR	1,000
007.1282	CUT TO MEASURE ROD	NR	1,000
007.1305	VICE LOCKING PIN	NR	1,000
007.1391	VICE GIB	NR	1,000
007.3362	ANTI BURR SLIDING ROD	NR	1,000
010.0206	VICE SCREW 381X24	NR	1,000
010.0370	RING NUT 5S 30X1,5	NR	1,000
010.0510	RIGHT VICE JAW TI350/LEFT	NR	2,000
010.0801	ROLLER 304011 0 24	NR	1,000
010.0802	ROLLER SUPPORT	NR	2,000
010.0902	HEAD FIXED POINT SPRING	NR	1,000
010.0903	RAPID VICE SPRING	NR	1,000
010.1001	10 MA THREADED BAR	MT	0,065
010.2373	VICE SCREW NUT	NR	1,000
010.7203	M6 SCREW NUT	NR	6,000
010.7204	M8 SCREW NUT	NR	3,000
010.7208	M16 SCREW NUT	NR	1,000
010.7410	8 X 16 CYLIND.POINT VCE GRUB SCREW	NR	5,000
010.7450	6 X 6 CYLINDRICAL POINT VCE GRUB	NR	2,000
010.7453	6 X 30 CONICAL POINT VCE GRUB SCREW	NR	5,000
010.7461	6 X 25 FLAT POINT VCE GRUB SCREW	NR	2,000
010.7480	8 X 30 FLAT POINT VCE GRUB SCREW	NR	1,000
010.7603	0 6 WASHER	NR	6,000
010.7605	0 10 WASHER	NR	3,000
010.7606	0 12 WASHER	NR	1,000
010.7671	THICKNESS WASHER DIAM. 8 X 3	NR	5,000
010.7681	THICKNESS WASHER DIAM. 12 X 48	NR	1,000
010.7859	TCEI 5 X 12 SCREW	NR	2,000
010.7870	TCEI 6 X 16 SCREW	NR	6,000
010.7871	TCEI 6 X 20 SCREW	NR	1,000
010.7896	TCEI 8 X 35 SCREW	NR	2,000
010.7924	TCEI 10 X 30 SCREW	NR	2,000
010.7939	TCEI 12 X 25 SCREW	NR	1,000
010.7961	TE 8 X 20 SCREW	NR	2,000
016.1030	BAR SUPPORT ARM	NR	2,000
025.0070	BEARING 51103	NR	1,000
034.0101	LARGE CUT TO MEASURE STOP	NR	1,000
034.0201	LARGE VICE HANDWHEEL	NR	1,000
034.1002	LEVER 10 MA	NR	1,000
034.1107	O 30 M6 X 20 HANDWHEEL	NR	1,000
034.1160	KNOB MOD. 1014 0 20	NR	1,000

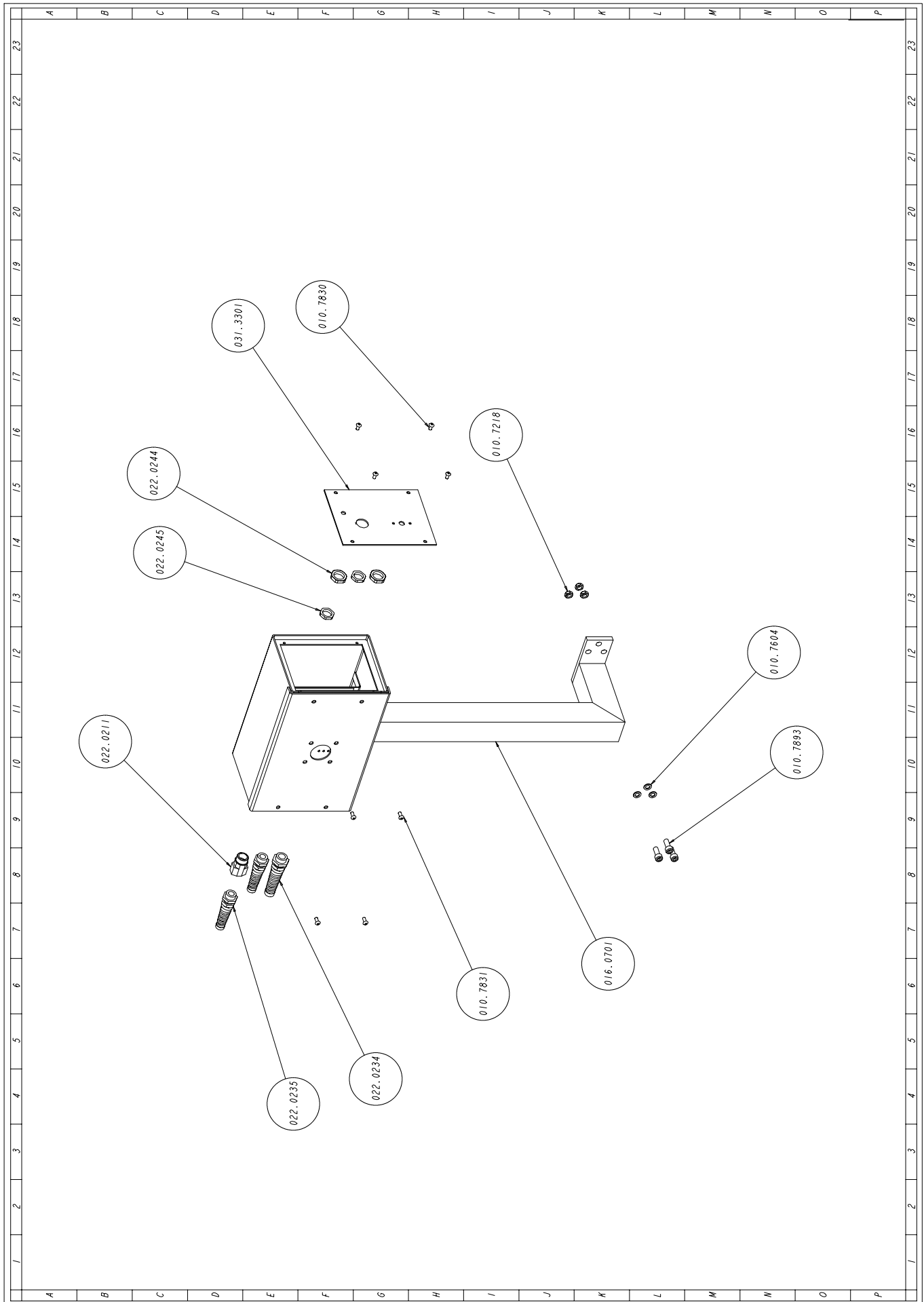
5.2.5 - Base assembly



Spare parts

Code	Description	U. of M.	Quantity
001.0715	VICE CLAMPING LEVER	NR	1,000
001.0733	ROTATING TABLE	NR	1,000
001.0735	BASE	NR	1,000
007.1251	SUPPORT _	NR	1,000
010.0914	HEAD RET.SPRING	NR	2,000
010.1000	8 MA THREADED BAR	MT	1,000
010.1487	SPRING FIXING BRACKET	NR	1,000
010.1821	ZINC MALE BOLT M 8	NR	4,000
010.7202	M5 SCREW NUT	NR	3,000
010.7203	M6 SCREW NUT	NR	2,000
010.7205	M10 SCREW NUT	NR	1,000
010.7221	M16 LOW SCREW NUT	NR	2,000
010.7229	M8 SELF-LOCKING SCREW NUT	NR	1,000
010.7602	0 5 WASHER	NR	6,000
010.7604	0 8 WASHER	NR	4,000
010.7605	0 10 WASHER	NR	6,000
010.7607	0 16 WASHER	NR	1,000
010.7861	TCEI 5 X 20 SCREW	NR	3,000
010.7893	TCEI 8 X 20 SCREW	NR	2,000
010.7922	TCEI 10 X 15 SCREW	NR	2,000
010.7927	TCEI 10 X 60 SCREW	NR	1,000
010.7954	TE 6 X 30 SCREW	NR	2,000
010.7963	TE 8 X 25 SCREW	NR	2,000
010.7980	TE 10 X 60 SCREW	NR	2,000
010.7982	TE 10 X 70 SCREW	NR	1,000
010.7996	TSPEI 6 X 30 SCREW	NR	1,000
013.0032	STEEL BASE	NR	1,000
016.0163	WATER COLLECTOR	NR	1,000
016.1611	TANK COVER	NR	1,000
022.0232	BRASS CABLE PRESSER 1/4 BM 2450	NR	1,000
028.0130	JOINT 1/4-9 CL 2601	NR	2,000
028.0151	PLASTIC HOSE 07-11	KG	0,080
028.0291	SUBMERGED PUMP SP/48 V.48.50	NR	1,000
034.1112	O 40 M8 HANDWHEEL X STEEL BASE	NR	1,000
043.0250	M.F. ELBOW 1/4 CL 2020	NR	1,000
043.0260	1/4 TAP TTE4	NR	1,000
043.0280	1/4 M 4/4 - CL 2543 SLEEVE	NR	1,000

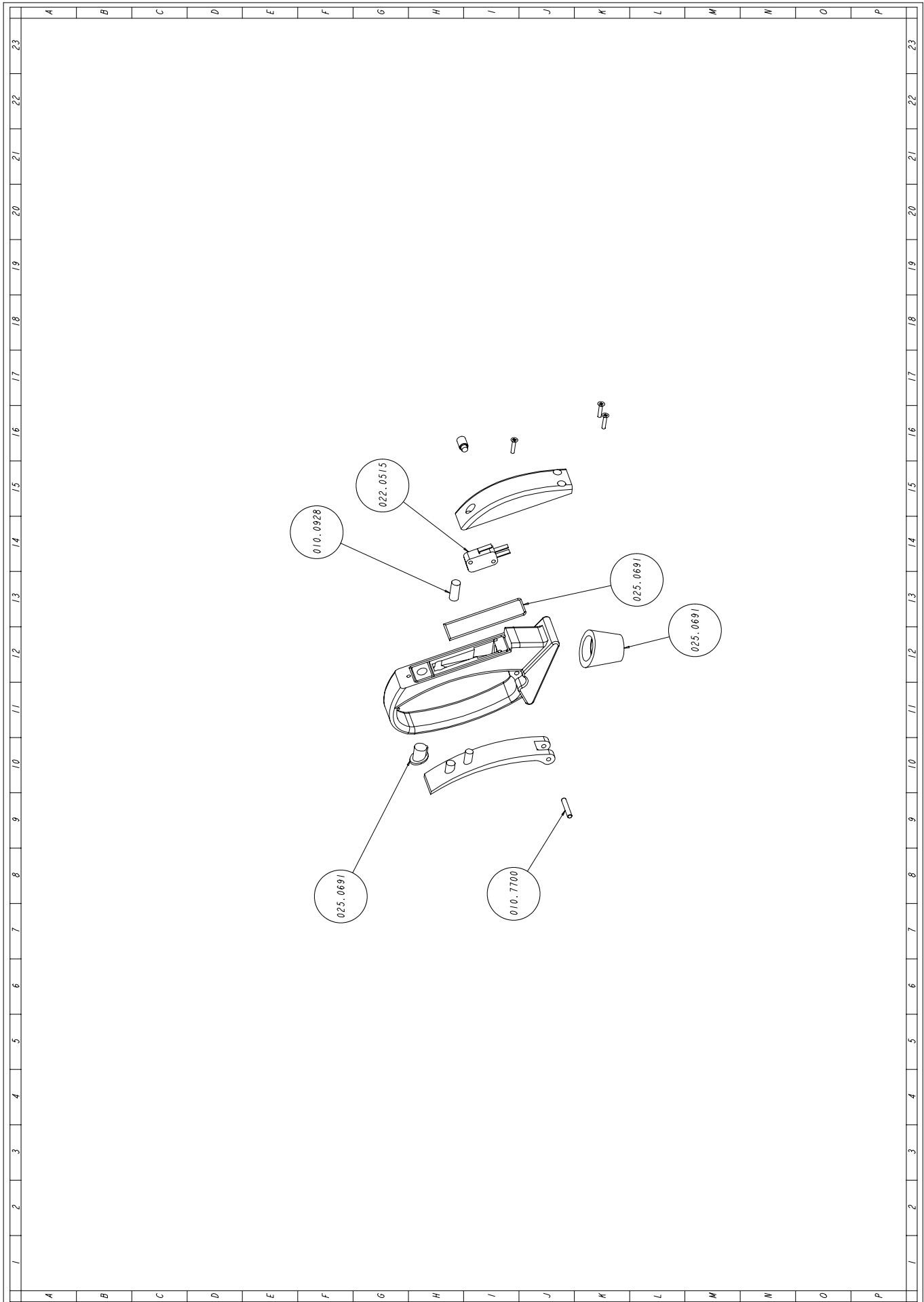
5.2.6 - Control panel



Spare parts

Code	Description	U. of M.	Quantity
010.7604	0 8 WASHER	NR	2,000
010.7830	5 X 10 BUTON SCREW	NR	8,000
010.7893	TCEI 8 X 20 SCREW	NR	2,000
016.0336	CONTROL PANEL	NR	1,000
022.0211	RAPID JOINT SEM PG 13,5	NR	1,000
022.0234	CORD PRESSER	NR	1,000
022.0235	CORD PRESSER	NR	2,000
022.0244	LOCK NUT 3217B GREY PG 13,5	NR	2,000
022.0245	LOCK NUT 3213B GREY PG 11	NR	2,000
031.3301	SWITCH PLATE	NR	1,000

5.2.7- Handgrip



Spare parts

Code	Description	U. of M.	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 describes the operations needed to adjust the mechanical, hydraulic and pneumatic systems enabling the P 350 to be used properly. These instructions will enable you to "customise" your machine to suit the type of cuts being carried out, optimising the time required to complete them.

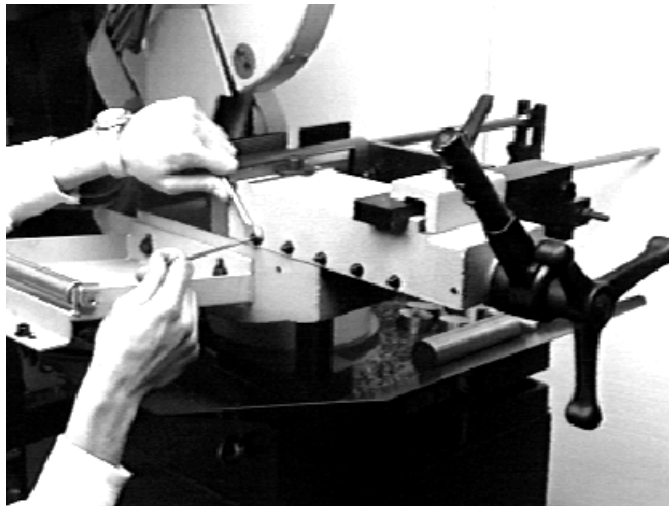
6.1 - Cutting vice

The cutting vice, mounted as standard on the P 350, is complete with a rag prevention device, a three-spoke opening and closing handwheel and a fast vice clamping device.

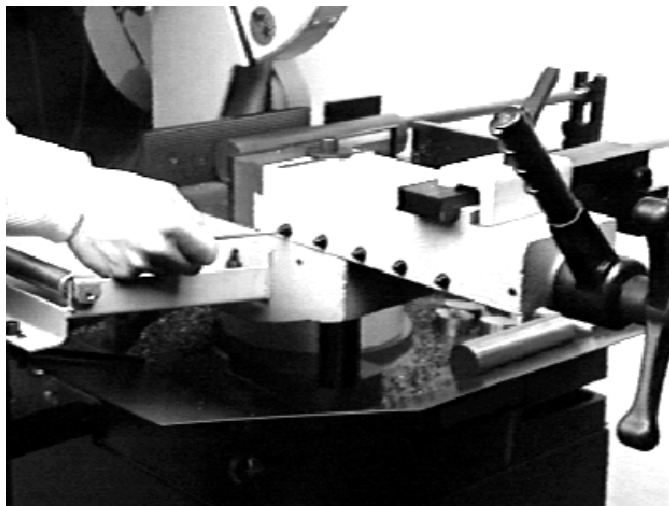
6.1.1 - Adjusting the vice play

Any play which develops between the slideway and the slide gibs on the vice must be compensated by adjusting the grub screws setting the distance between the gib and lead screw, proceeding as follows:

- slacken all the locknuts on the grub screws in the slide, holding the screws still using an Allen key.
- move the vice to its fully open position.

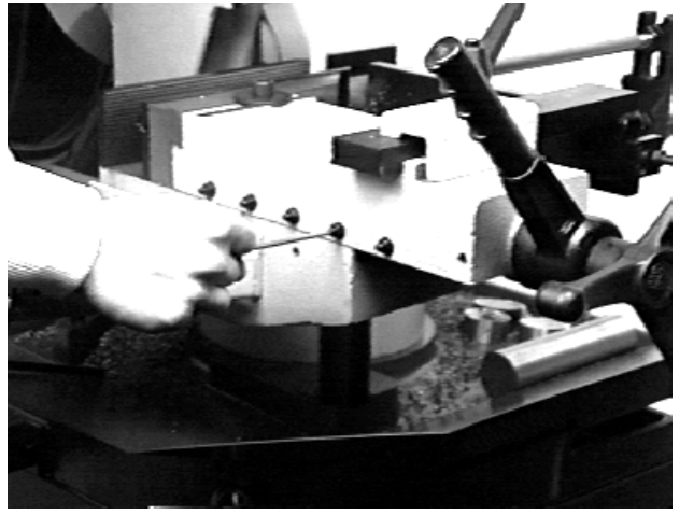


- adjust the slight pressure exerted by the grub screws on the gib, starting with the first two in contact with the lead screw.
- adjust these two grub screws and tighten the relative lock nuts, keeping the screws still with an Allen key.



- close the vice until the other two grub screws coincide with the lead screw.

- repeat this adjustment on the gib grub screws for the entire length of the slideway
- at the end of the operation, use the handwheel to move the slide backwards and forwards, identifying the zones where the grub screws exert greater pressure on the gib.
- repeat the adjustments if necessary.

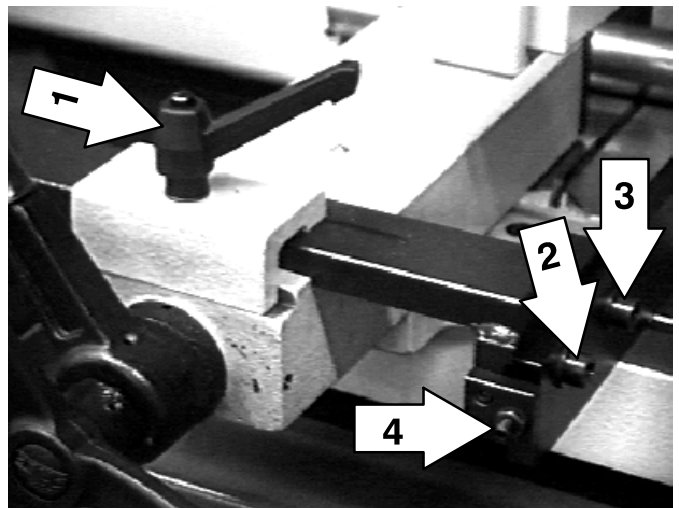


6.1.2 - Rag prevention device

The vice is fitted as standard with a rag prevention device that serves to support the material and prevent the formation of ragged edges at the end of the cut.

To adjust the rag prevention device transversely:

- loosen the release lever (1) located above the vice slide;
- movement the rag prevention device arm to the right or left;
- tighten the release lever.

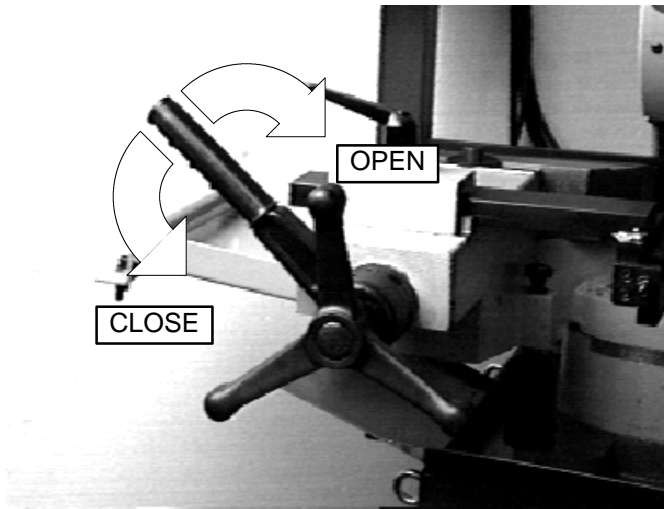


To adjust the longitudinal position of the vice jaw, proceed as follows:

- tighten the cutting vice completely;
- slacken the two screws located to the side of the rag prevention device (2-3);
- slacken the nut that locks the grub screw;
- adjust the longitudinal position of the rag prevention vice jaw by slackening or tightening the grub screw (4) until the position of the rag prevention jaw is aligned with that of the cutting jaw;
- hold the grub screw steady using the Allen key and tighten the locking nut.

6.1.3 - Fast vice clamping

In the standard version the cutting vice is complete with a fast clamping device that uses a cam system. Turning the lever located behind the vice clamping handwheel clamps or releases the vice rapidly. In any case, before being closed using the fast clamping system, the vice must be moved to within about 2-3 mm of the material to be cut.



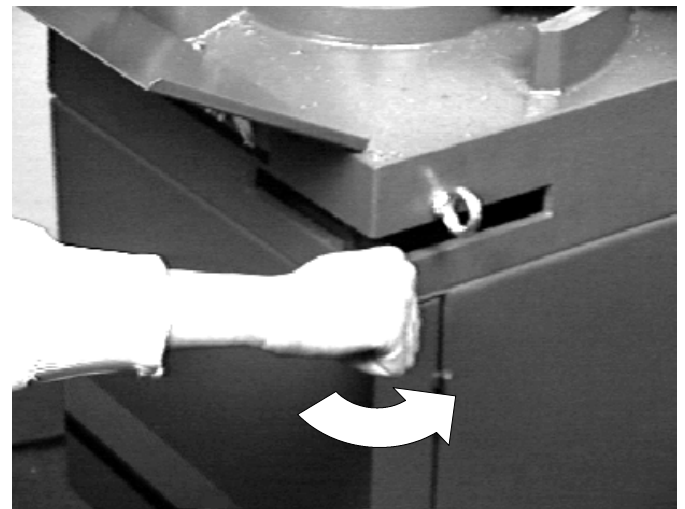
6.2 - Disc

The HSS cutting discs can be used for any kind of cut since they combine good levels of toughness and elasticity thanks to various coatings, along with a good cutting resistance. The discs are made of a single piece of Tungsten-Molybdenum super-rapid steel with a hardness of about 64 ± 1 HRC. A special characteristic of the discs during cutting is the excellent finish of the cut surfaces.

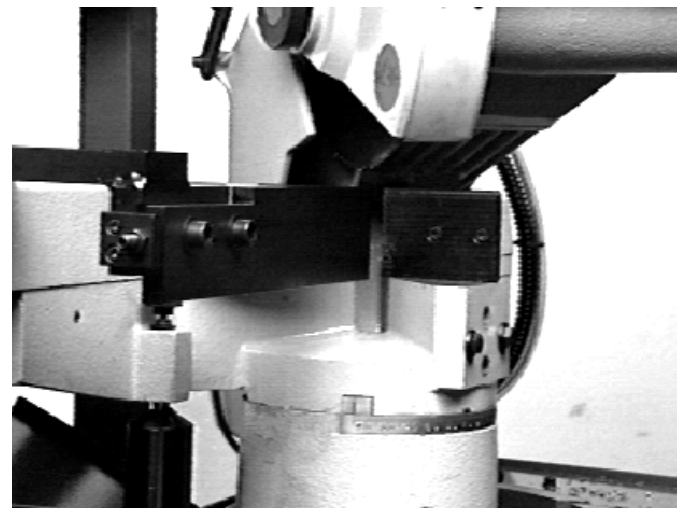
6.2.1 - Making angled cuts

The P 350 can make angled cuts from 45° left to 45° right. Carry out the following procedure to make a cut angled 45° to the left.

- Release the turntable by means of the locking lever located on the front right section of the base;



- with the turntable free, turn the body of the machine to the desired angle (45°), reading off the position on the graduated scale located on the front section of the turntable body. In the specific case of 45° , it is possible to use the fixed stops on the lead nut rotating table.

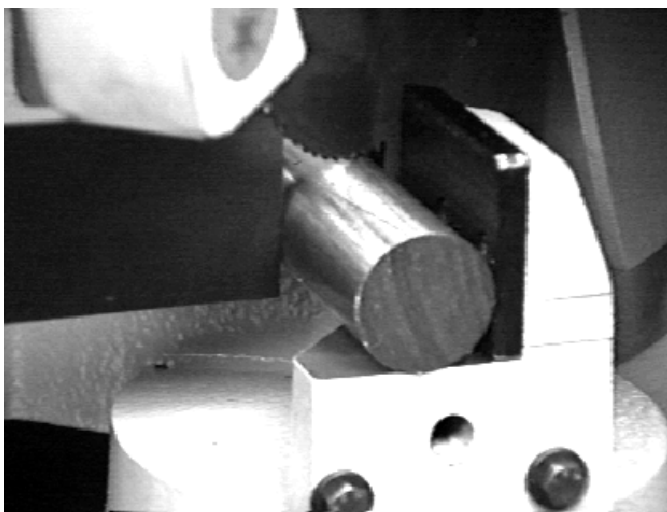


Adjustments

- once the desired angle has been reached, fix the body of the machine again by means of the locking lever;



- the machine is now ready for making angled cuts.



IMPORTANT: when making cuts angled to the right, check before making the cut that the blade does not touch the vice slide jaw. If it does:

- loosen the screw located above the vice slide jaw;
- move the jaw so that it does not touch the disc;
- tighten the screw while holding the jaw steady in its new position.

6.3 - Changing the blade

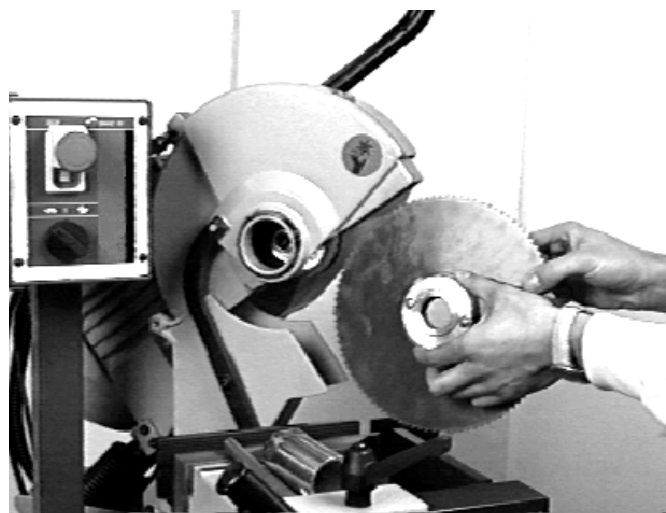
As we have already said, this machine uses different kinds of blades according to the material to be cut. The procedures described below, however, also apply in the event of wear or breakage of the blade.

To replace, proceed as follows:

- switch the machine off;
- free the mobile disc guard, separating it from the eccentric rod (1);
- move the mobile guard upwards (2);
- remove the cap (3) located in the central part of the guard and loosen the nut that locks the disc using a 40 mm spanner;
- the nut unscrews in the same direction of the blade's rotation;



- remove the worn or damaged disc and insert a new disc. Carry out the above procedure in reverse.



The procedure described above for changing the disc is the same irrespective of whether the disc is worn or broken.

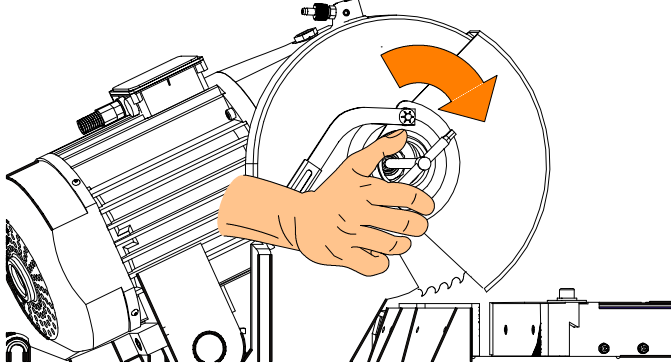
Do not carry out the operations described above without first switching off the machine!

6.4 - Drive unit

6.4.1 - Making angled cuts

If the disk blocks frequently when cutting, even when the head lowering speed is appropriately adjusted to the work material, the friction between the cone and the helical gear must be increased in the clutch unit:

- to increase friction, turn the torque wrench clockwise (see figure) to a tightening force of 4 kgm

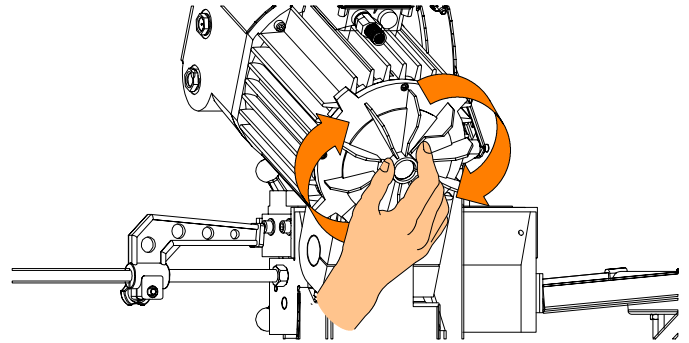


6.4.2 - Adjusting the worm and wheel backlash

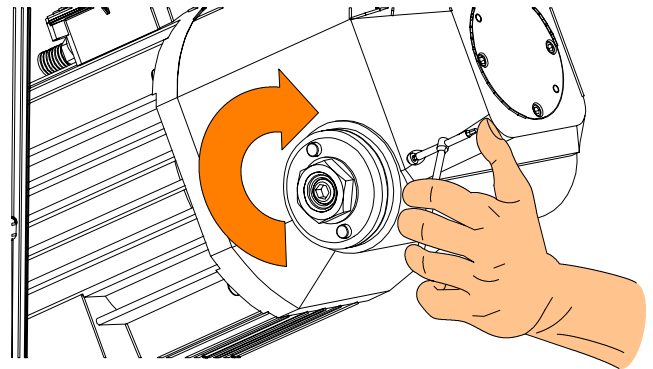
If the gears at the rear of the motor run noisily during normal operation, make certain that the backlash between the worm and wheel is correctly adjusted:

- remove the protective cover of the motor;
- rotate the motor fan manually first one way then the other; the ideal amount of backlash in the transmission corresponds to a

distance of 1 cm approx., measured at the circumference of the fan, whereas if the distance is 2.5 cm or more, adjustment is necessary;



- If the backlash needs taking up, loosen the grub screw indicated in the figure and, using a chain wrench, turn the clutch unit in the direction of rotation of the disk until the correct backlash setting is restored in the transmission.



CHAPTER 7 - Cutting speed

The cutting speed is determined by the speed of rotation of the disc and the head feed speed. While the feed speed is provided by the movement of the head and is manual, the disc rotation speed can be selected from the control panel using the selector. This chapter describes the two cutting speeds available with the basic version of the machine.

7.1 - Standard machine

The standard version of the P 350 is supplied with the following cutting speeds:

Speed 1 = 30 rpm
Speed 2 = 60 rpm

These speeds are selected using the polarity change switch on the control panel. The cutting speed must be set before starting the cutting cycle as described in paragraph 4.2 in this manual.

CHAPTER 8 - Maintenance and choice of consumables

The P 350 is a machine that has strength and long-life. In fact, no particular maintenance is required, even if, as with other machine tools, it may deteriorate in time especially if wrongly used or no maintenance at all is carried out. This chapter therefore serves as a guide to those who wish to preserve the characteristics of the machine for as long as possible.

8.1 - The role of the operator

The person **operating** and **maintaining** the machine must follow these instructions for his own safety and that of the others, in addition to safeguarding the production of the machine.

check that his own work and that of the other operators of the machine always complies with the relevant safety standards. Therefore, check that the safety devices are in position and work perfectly and that personal safety requirements are complied with.

ensure that the working cycle is efficient and guarantees maximum productivity, checking:

- the functions of the main components of the machine
- the sharpness of the blade and coolant flow
- the optimum working parameters for the type of material.

check that the quality of the cut is that required and that the final product does not have any machining defects.

8.2 - Maintenance requirements

All ordinary and extraordinary maintenance must be carried out with the power switched off and the machine in emergency condition.

To guarantee perfect operation, all spare parts must be **Hyd-Mech** originals.

On completion of maintenance works, ensure that the replaced parts or any tools used have been removed from the machine before starting it up.

Any behaviour not in accordance with the instructions for using the machine may create risks for the operator.

Therefore, **read and follow** all the instructions for use and maintenance of the machine and those on the product itself.

8.3 - General maintenance

8.3.1 - Daily

The daily maintenance operations to carry out on the machine are as follows:

- remove all swarf from the machine (using compressed air or preferably thread-free cloth);
- top up the coolant level;

- check the wear of the blade and change if necessary;
- empty the swarf out of the base.

8.3.2 - Weekly

This paragraph lists the operations to be carried out for weekly maintenance of 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 top up with oil through the filler plug;
- check the vice sliding mechanism; if it is not smooth or is subject to side play, adjust as described in para. 6.1.1.

8.3.3 - Monthly

This paragraph lists the operations to be carried out for monthly maintenance of the machine:

- check that the machine performs cuts perpendicular to the work surface; if not contact our technical service department;
- check that the blade is orthogonal to the workpiece rest shoulder; if adjustment is necessary, contact our technical service department;
- thoroughly clean the water tank and the electric pump filter.

8.4 - Maintenance of working parts

During maintenance work on the P 350, special attention should be paid to operating units such as the transmission box.

8.4.1 - Transmission box

Transmission box maintenance:

- after the **first 100 working hours**, drain the transmission box through the drain plug located in the rear lower section of the unit and refill with new oil. If, in addition to the yellow filings from the bronze rim, there are other impurities in the drained oil, remove the cover and thoroughly wash the inside. The washing should be carried out using flushing oil, avoiding the use of cotton or threadbare rags for drying. Refill the transmission box;
- after **every 2000 working hours** repeat the oil change operation.

8.5 - Consumable materials

It is essential to use specific oils for the pneumatic and lubricant/coolant circuits. The oils suitable for each of these circuits are listed below.

8.5.1 - Oils for transmission box

The machine is supplied with AGIP BLASIA 460 oil, ISO and UNI symbol CC460. However the following oils can be regarded as compatible or with 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:

- capacity 2,6 litres.

8.5.2 - Oils for lubrication/coolant liquid

The oil used for the lubrication/coolant fluid in the machine is CASTROL Syntolin TFX. Though there are no specific standards for these types of oils, Hyd-Mech considers that CASTROL Syntolin

TFX is the best product available with regard to quality:price ratio. Nevertheless, the following oils of similar characteristics can be said to be compatible:

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

Finally, one particular blade manufacturer (LENOX) recommends and supplies a coolant under the name of LENOX BAND-ADE SAWING FLUID.

Coolant tank:

- tank capacity 4,2 litres
- oil concentration 5-6%

CHAPTER 9 - Blades

When using the P 350, 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.

9.1 - Choice of blade

- FINE TOOTH PITCH** - for thin wall materials such as sheet steel, tubes and profiles;
- COARSE TOOTH PITCH** - for large cross-sections; - for soft materials (aluminium alloys and soft alloys in general).

9.1.1 - Tooth pitch





The choice of the most suitable tooth pitch depends on various factors:

- a) the size of the section;
- b) the hardness of the material;
- c) wall thickness.

Solid sections call for discs with a coarse tooth pitch, while small cross-sections require blades with finer teeth. This is because when cutting walls of small cross-section (1-7 mm) profiles, it is important that the number of teeth actually making the cut should not be 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 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 light alloy solid pieces and profiles			
 		 	
S in mm.	Pitch T	S and sp in mm.	Pitch T
10	6	10 sp=0.5	3-4
30	8	30 sp=1.5	4-5
50	10	50 sp=2.5	6-7
70	12	70 sp=3.5	8-9
90	14	90 sp=4.5	8-9
130	18	130 sp=6.5	10

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, as a result of the shape of

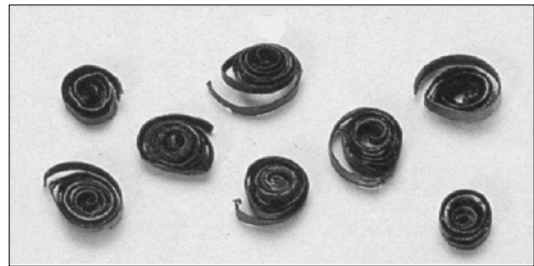
the piece to be cut, the cross-section at any given point exceeds the average cross-section given above.

Types of swarf:

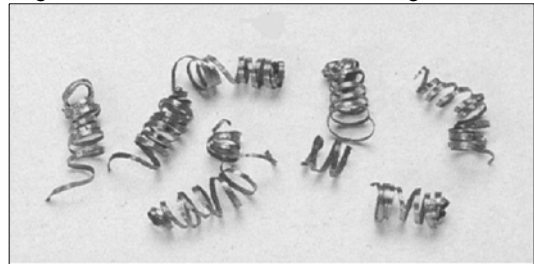
A - Very fine or fragmented swarf indicates that the downstroke speed and/or cutting pressure is too low.



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



C - Long coils of swarf indicate ideal cutting conditions.



9.1.2 - Cutting and feeding speed

The cutting speed, in m/min, and the head feeding speed, in cm²/min, are limited by the amount of heat generated near to the points of the teeth. If the head feeding speed is too high, the cut will not be straight in either the vertical or the horizontal plane. As we have already said, the cutting speed depends on the strength (kg/mm²) and hardness (HRC) of the material and the dimensions of the thickest section. The feeding speed depends on the cross-section of the material. Solid or thick-walled materials (thickness > 5mm) can therefore be cut at high speed providing there is sufficient swarf removal by the blade, while thin-walled materials such as tubes or thin profiles must be cut with a low feeding speed. A new blade requires a wearing-in period, during which time a feeding speed of about half normal speed should be used.

9.1.3 - Lubricant/coolant

The lubricating/cooling fluid must ensure that the blade teeth and material in the area of the cut do not overheat. Furthermore, the quantity and pressure must be sufficient to remove the swarf from the cutting zone. The fluid must be an excellent lubricant, such that prevents abrasion of the teeth and welding of the swarf to the teeth themselves (seizing).

9.1.4 - Blade structure

The circular blades most frequently used for cutting-off machines are HSS-DMo5/M2 consisting of a single piece and characterised by a high level of toughness and a good cutting resistance. With non-ferrous materials it is normal to use circular blades with brazed hard metal (HM) cutting edges, which offer excellent resistance to wear but low resistance to impact, which in any case is not generally a 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.

9.1.5 - Types of blades

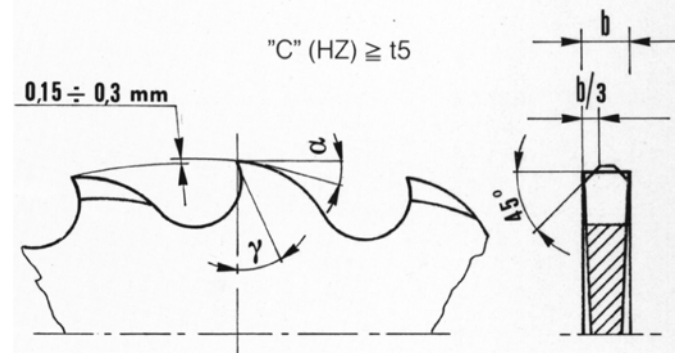
The blades fitted to the P 350 are of dimensions 350x32x2.5 and 250x32x2 and are made of HSS DMo5 since the machine is designed for cutting ferrous materials. In addition to the size and pitch of the teeth, the blades also have different geometric characteristics according to their different uses:

- tooth sharpening**, which in this case may be BW with alternate raked tooth or C with roughing tooth raked on both sides and non-raked finishing tooth;
- tooth pitch**, the distance between the crests of two subsequent teeth (tooth pitch = T).

Tooth shape:

"C" TYPE SHARPENING (HZ)

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

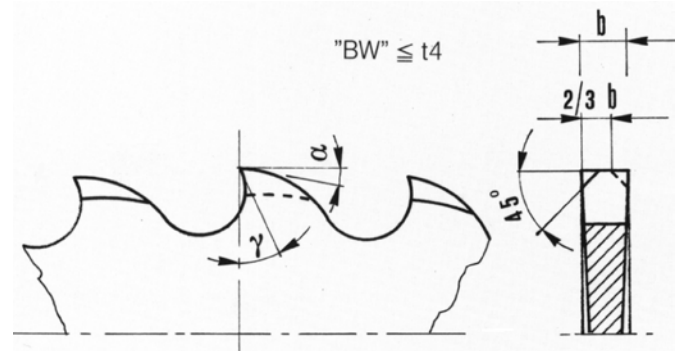


Coarse tothing with roughing tooth and finishing tooth. Used in saws with pitch greater than or equal to 5 mm for cutting ferrous and non-ferrous materials with solid or solid-profiled sections.



"BW" TYPE SHARPENING DIN 1838-UNI 4014

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



Tothing generally used on cutting-off machines for cutting ferrous and alloy materials with tubular and profiled sections.





The P 350 uses discs of dimensions 350x32x2.5 and 250x32x2.5 made of HSS DMo5 and with type C sharpened teeth for cutting hollow sections, while for solid sections it uses 250x32x2 HSS discs; however the tooth pitch is also important, as shown in the table below.

Disc selection table for P machine. Other disc characteristics are: dimensions: internal hole diam. 32 mm, distance between fixing holes 63 mm, tooth shape type C.

P	Hollow sections with thickness from 1 to 5 mm			Hollow sections with thickness from 5 to 10 mm			Solid bars with dimensions not exceeding the cutting capacity		
	D.	T	Z	D.	T	Z	D.	T	Z
350	350	5	220	300	6	160	250	8	100

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

		D. 200		225		250		275		300		315		350		370		400		425		450		500		
 SOLID SECTIONS	S	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	
	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	
	D																									
 HOLLOW $S=0,005xD$ SECTIONS	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	6 140	7 140	6 180	7 160	6 160	7 140	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	6 160	8 140	7 160	8 140	6 180	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		

9.1.6 - Blade selection table with respect to cutting speed and downstroke speed

RECOMMENDED CUTTING PARAMETERS	CUTTING ANGLE		CUTTING SECTION (IN MM)																				
	α	γ	10-20			20-40			40-60			60-90			90-110			110-130			130-150		
			T mm	Vt m/1'	Av mm/1'	T mm	Vt m/1'	Av mm/1'	T mm	Vt m/1'	Av mm/1'	T mm	Vt m/1'	Av mm/1'	T mm	Vt m/1'	Av mm/1'	T mm	Vt m/1'	Av mm/1'	T mm	Vt m/1'	Av mm/1'
Mild steel R = 350-500 N/mm ²	20	8	5	50	160	45	150	10	45	140	40	130	14	40	110	16	35	100	18	30	90	90	90
Medium steel R = 500-700 N/mm ²	18	8	4	30	130	30	120	9	25	110	25	110	14	20	100	16	20	90	15	15	80	80	80
Hard steel R = 750-950 N/mm ²	15	8	4	20	110	20	110	8	18	100	17	50	14	15	80	16	14	70	16	12	60	60	60
Super hard steel R = 950-1000 N/mm ²	12	6	3	15	60	15	60	6	14	50	14	50	12	13	45	14	13	45	14	12	40	40	40
Hardened and tempered steel R = 950-1300 N/mm ²	10	6	2	9	35	9	33	4	9	30	8	28	8	8	25	10	7	25	12	7	22	22	22
Austenitic stainless steel R = 500-800 N/mm ²	12	8	4	20	50	20	45	8	18	45	17	40	14	15	40	16	14	35	16	12	35	35	35
Martensitic stainless steel R = 500-800 N/mm ²	15	6	4	20	50	20	45	8	18	45	17	40	14	15	40	16	14	35	16	12	35	35	35
Grey iron	12	8	4	25	100	23	100	8	22	90	20	80	14	19	880	16	17	70	16	16	60	60	60
Aluminium and alloys R = 200-400 N/mm ²	22	10	6	1100	1800	1000	1700	12	900	1600	800	1400	18	700	1300	20	600	1100	20	500	900	900	900
Aluminium and alloys R = 350-500 N/mm ²	20	8	5	200	400	180	400	10	160	350	160	300	14	140	300	16	130	250	16	130	250	250	250
Copper R = 300-500 N/mm ²	20	10	6	400	600	350	600	11	300	550	250	550	17	200	500	18	150	500	20	120	400	400	400
Hard bronze R = 600-900 N/mm ²	15	8	5	400	800	400	700	10	350	700	300	600	14	250	600	16	200	500	18	150	400	400	400
Phosphor bronze R = 400-600 N/mm ²	12	8	4	120	160	110	150	8	100	140	90	130	12	70	110	14	60	100	16	50	90	90	90
Brass R = 200-400 N/mm ²	16	16	5	600	1100	600	1100	6	550	1000	550	900	16	500	900	18	500	800	18	450	800	800	800
Alloyed brass R = 400-700 N/mm ²	12	16	5	500	700	400	600	10	350	600	350	500	16	300	500	18	300	400	18	200	400	400	400
Titanium and alloys R = 300-800 N/mm ²	18	8	4	50	160	45	150	6	45	140	45	130	12	40	110	14	35	100	16	30	90	90	90
Profiles and tubes with wall thickness 0.05 D R = 300-600 N/mm ²	18	8	3	19	130	18	120	5	18	110	17	110	6	16	100	8	16	90	10	15	80	80	80
Profiles and tubes with wall thickness 0.25 D R = 300-600 N/mm ²	15	8	2	35	130	33	120	4	30	110	30	110	5	28	100	6	26	90	6	24	80	80	80

Emulsion - Cutting oil

Cutting oil

Emulsion

9.2 - Classification of steels

The tables on this page provide users with information on materials to cut, enabling their classification with respect to hardness and consequently the correct blade to use.

Types of steel				Hardness		
UNI	DIN	BS	AISI	Brinel HB	Rockw.	Kg/mm ²
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


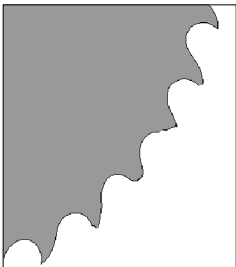
9.2.1 - Steel nomenclature table


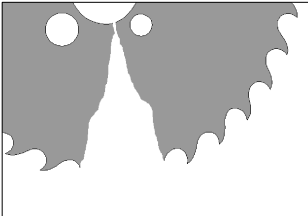
Material	SS Sweden	AISI U.S.A.	DIN Germany	BS Great Britain	UNI Italy	AFNOR France
Carbon steels	1311 1572	1015 - 1035	C 22 - C 35 20 Mn 5 - 28 Mn 6 CK 22 - CK 50	050 A 20 080 M 46 - 50 120 M 19 150 M 28	C 15 - C 35 C 22 Mn C 28 Mn	XC 18 XC 38 H 1 20 M 5
Carbon steels	1650 1880	1040 - 1064 1770 - 1880	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 tipo 6 e 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 steels	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 10 - Troubleshooting tables

This chapter describes the inspection and troubleshooting procedures for the P 350. Regular inspections and efficient maintenance are essential to ensure your machine gives you a long, trouble-free service life. The chapter is divided into two sections: the first being dedicated specifically to TROUBLESHOOTING BLADE AND CUTTING PROBLEMS, while the second TROUBLESHOOTING section concerns troubleshooting general machine operating faults. Taken together they form a comprehensive troubleshooting guide which will enable you to follow a methodical procedure for solving any problem.

10.1. - Troubleshooting blade and cutting problems

PROBLEM	PROBABLE CAUSE	SOLUTION
<p><i>Cuts not at 90 degrees or angled</i></p> 	<p>Head speed too high</p> <p>Disc with worn teeth</p> <p>Orthogonality of disc to workpiece rest shoulder</p> <p>Perpendicularity of disc to work surface</p> <p>Cutting speed too low</p> <p>Broken teeth</p>	<p>Reduce head speed</p> <p>Replace disc</p> <p>If this is not the case, contact our technical service department.</p> <p>If this is not the case, contact our technical service department.</p> <p>Increase cutting speed.</p> <p>Check the hardness of the material being cut.</p>
<p><i>Teeth breaking</i></p> 	<p>Incorrect lubricant/coolant fluid</p> <p>Material too hard</p> <p>Disc not worn-in correctly</p>	<p>Check the water and oil emulsion; check that the holes and hoses are not blocked; direct the nozzles correctly.</p> <p>Check the cutting speed, feed speed and disc pressure parameters and the type of disc you are using.</p> <p>With a new disc it is necessary to start cutting at half feeding speed. After the wearing-in period (a cutting surface of about 300 cm² for hard materials and about 1000 cm² for soft materials) the cutting and feed speeds can be brought up to normal values.</p>

PROBLEM	PROBABLE CAUSE	SOLUTION
	Disc with excessively fine tooth pitch	The swarf wedges into the bottom of the teeth causing excessive pressure on the teeth themselves.
	New blade inserted in a partially completed cut.	The surface of the cut may have undergone local thermal alteration, making it harder: when starting work again, use a lower cutting speed and head feed speed. A tooth from the old blade may be left in the cut: check and remove before starting work again.
	Workpiece not clamped firmly in place	If the workpiece moves during cutting it can cause the teeth to break: check the vice, the jaws and the clamping pressure.
	Vibration	The workpiece vibrates in the clamp: check that the slide is adjusted correctly; check the clamping pressure and if necessary increase.
<p>Rapid tooth wear</p>	Head speed too slow	The blade runs over the material without removing it: increase head speed.
	Cutting pressure too high	Reduce cutting pressure.
	Cutting speed too high	The teeth slide over the material without cutting it: reduce the cutting speed.
	Insufficient coolant	Check the coolant level and clean piping and nozzles.
	Incorrect fluid concentration	Check and use the correct concentration.
	Material defective	The materials may present altered zones either on the surface, such as oxides or sand, or in section, such as under-cooled inclusions. These zones, which are much harder than the blade, cause the teeth to break: discard or clean these materials.
<p>Broken blade</p>	Head speed too high	Reduce head speed.
	Teeth in contact with material before starting the cut	Always check the position of the blade before starting a new job.
	Insufficient coolant	Check the coolant level and clean piping and nozzles.
	Vibrations	The workpiece vibrates in the clamp: check that the slide is adjusted correctly; check the clamping pressure and if necessary increase.

10.2 - Troubleshooting machine faults

This section of the chapter concentrates on troubleshooting any machine faults or operating problems which may occur during work with the P 350.

PROBLEM	PROBABLE CAUSE	SOLUTION
Spindle motor will not turn	Electrical power supply	Check: the phases; the cables; the plug; the socket. Also check that the motor connections are in place.
	Key operated safety switch	Check that the phases are present both on the input and output. Otherwise replace.
	Contactor	Check that the phases in it are present both on the input and output, that it is not jammed, that it closes when powered and that it is not causing short circuits. Change if any of these problems are found.
	Thermal relay	Make sure it is closed, ie check that the phases are present in input and output, that it is not causing short circuits and responds when the reset coil is closed. If it has tripped to protect the motor, check that the absorption values are balanced and do not exceed the motor's rated values. Change if necessary.
	Motor	Check that it has not burnt out, that it turns freely and that there is no moisture in the connection terminal board box. The winding can be rewound or replaced.
BMT not energised (Minimum Tension Coil)	Electrical power supply	Check: the phases; the cables; the plug; the socket.
	BMT Reset switch	Make sure that the minimum tension coil is energised when switch is turned from 0 to 1. If it is not, replace the switch.
	Emergency stop pushbutton in	Make sure the emergency stop button is released: turn it clockwise through 1/4 of a turn to release it.

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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.

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