

Ing. BONFIGLIOLI s.r.l.

GRINDING MILL

Model

DRAKE

INSTRUCTIONS FOR USE

Manufacturer: **Ing. BONFIGLIOLI s.r.l.**
Via S. Andrea, 11 – 40050 Castello d'Argile
BOLOGNA - ITALIA

Type of machine: **Grinding mill for metallic scrap with system for separating ferrous and non-ferrous materials**

First of all we would like to thank you for the confidence which you have shown in us by buying this machine. As a result of years of study, experimental tests and improvements it has been possible to produce high-tech products capable of meeting the most difficult production needs and ensuring the safety of the user. Correct use of the machine and its regular maintenance are fundamental for maintaining its efficiency, reliability and security over a long period.

This manual provides all the information necessary for the installation, use and maintenance of our machine. We would therefore advise you to read it carefully and scrupulously follow what is written. If some parts should not be clear, do not hesitate to contact our technical service.

Even if the procedures and advice in this manual might seem obvious, they are aimed at familiarizing the operators with the machine and to bring to their attention those aspects which could be important for maintaining the machine or protecting their safety. Therefore the contents of this manual must be made known to whoever uses the machine.

Ing. BONFIGLIOLI s.r.l.

INDICE**Pag.**

1	GENERAL INFORMATION	6
1.1	Terminology and symbols used	6
1.2	Persons to whom the manual is directed.....	7
1.3	Training and instruction required of the operator	7
1.4	Guarantees	7
1.5	Glossary of pictographs attached to the machine	8
1.6	Identification tag in compliance with EEC regulations	9
1.7	Attachments	9
2	GENERAL CHARACTERISTICS	10
2.1	Description of the machine	10
2.2	Technical characteristics.....	13
2.2.1	Noise emissions.....	13
2.2.2	Minimum space dimensions.....	14
2.2.3	System Specifications	14
2.2.4	Intended, non intended, incorrect use.....	15
2.2.5	Minimum light requirement	16
2.2.6	Controls – Description of controls and signs	16
2.2.7	Hydraulic lubrication system	20
2.2.8	Lubrication system of basic machine.....	20
2.2.9	Lubrication system of the rotor bearings and conductor shaft in the diesel motor version... 20	20
3	SAFETY FACTORS	22
3.1	Machine safety	22
3.1.1	Emergency buttons.....	22
3.1.2	Mechanical protection of moving parts	22
3.1.3	Warning stickers	23
3.1.4	Electric earth connection.....	23
3.1.5	Battery disconnect key (diesel engine only).....	23
3.1.6	Safety when not in use	23
3.1.7	Professional profile of user.....	24
3.1.8	General rules for operator safety.....	25
3.1.9	Activity up high	26
3.1.10	Moving loads	26

3.1.11	Operator safety rules.....	27
3.1.12	General maintenance engineer safety rules	28
3.1.13	Maintenance engineer safety rules	29
4	MACHINE INSTALLATION	31
4.1	Ground support and stabilization.....	31
4.2	Safety distance from slopes and trenches.....	32
4.3	Safety distance from electricity lines.....	32
4.4	Descent and ascent of stabilizers.....	32
4.5	Earthed electricity connection	33
5	TESTING AND COMMISSIONING	34
6	USE OF THE MACHINE	35
6.1	6.1 Logic of PLC functioning.....	35
6.2	Automatic processing cycle	36
6.3	Opening bolt	37
6.4	Operation in “manual mode”	39
6.5	Safety control of the main bearings.	39
6.6	Safety control of the main bearings	39
7	STARTING THE MACHINE	40
7.1	PRE- START actions	40
7.2	Preparation moves	41
7.3	Starting the machine	41
7.4	Starting the systems	41
	7.4.1 Main electrical panel	41
	7.4.2 Activating the electrical panel	42
	7.4.3 Start controls	42
	7.4.4 Starting the suction system:	43
	7.4.5 The operating panel.....	44
7.	STOPPING THE MACHINE	50
8	PROTECTION AND STORAGE.....	51
8.1	Inactive for a short periods	51
8.2	Inactive for a long periods.....	51
9	CLEANING OPERATIONS	51
10	MAINTENANCE.....	52
10.1	Special maintenance.....	52
10.2	Ordinary maintenance.....	52

10.2.1 Table of scheduled maintenance.....	54
10.2.2 Images of points to check in the pre-start phase and scheduled maintenance	56
10.2.3 Breakdown or wear and tear maintenance.....	61
10.3 Radiator checks and maintenance	77
10.4 Suction checks and maintenance	77
11 WELDING.....	78
12 OPERATIONS ON HYDRAULIC SYSTEMS.....	78
12.1 Lubrication.....	80
1.2 Motoreductor oil (95DN) conveyor belts	80
12.1 Hydraulic oil filter (102DN).....	80
13 DISMANTLING	81

1 GENERAL INFORMATION

1.1 Terminology and symbols used

It is fundamental to pay the utmost attention to the following symbols and their significance since they are there to highlight particular information, situations requiring maximum attention, practical advice or general information. Consult this page if there are any doubts about the meaning of symbols found during the reading of the manual.



IT IS PROHIBITED

This symbol is used to indicate operations which could cause serious harm to the equipment itself or be dangerous for people if the instructions are not followed or the machine parts and/or devices are interfered with. These operations must absolutely be avoided, so they are **prohibited**.



ATTENTION !

This symbol is used to highlight dangerous situations which could cause serious harm to people if the instructions are not respected. This refers to safety rules which **must be followed** to guarantee your safety and that of others.



This symbol is used to highlight actions for correct use of the machine to avoid possible harm to oneself, the surrounding environment or invalidation of the guarantee.



This symbol is used to highlight general information and/or useful advice concerning any issue..

Operator/s: Personnel responsible for for the various activities linked to use of the machine such as moving, installation and use. This includes regulation and control aswell as ordinary maintenance.

Maintenance Engineer(s): Qualified personnel who carry out ordinary or special maintenance (mechanical and electrical)..

Qualified technician (technical assistance service): Qualified personnel responsible for the installation, commissioning and/or special maintenance which lies within the competence of technical assistance as authorized by the manufacturer.

1.2 Persons to whom the manual is directed

These service rules are essentially directed to the operators in the company using the machine who are assigned to operate it and are informed about using it safely.

1.3 Training and instruction required of the operator

Use of the machine is **exclusively** reserved for operators who have correctly learnt all the information in the use and maintenance manual; who have acquired the necessary operating practice as explained by the manufacturer's technician during all the various phases of installation and final testing of the machine.

The responsibility regarding the correct training and instruction of the operators is exclusively that of the head of the company using the machine.

1.4 Guarantees

The conditions of guarantee of supply are explained in the contractual document. Ing. Bonfiglioli s.r.l. is not responsible for any damage if the machine:

- is used for ends other than those for which it is intended;
- is used outside of the intended conditions of use;
- is operated, manoeuvred or activated in a way which does not comply with the instructions for use.
- is not correctly maintained and/or original replacement parts are not used;
- has its mechanical, hydraulic or electrical components changed without the manufacturer's authorization;
- has its electrical and/or mechanical devices interfered with;
- is used to crush materials containing corrosive, polluting, inflammable, detonating or explosive agents and which do not correspond with for intended use.

**ATTENTION**

All assistance operations under guarantee, special maintenance and repairs are not the responsibility of the operators and maintenance engineers. These are the responsibility of the qualified technician from the manufacturer's technical assistance service. Ing. Bonfiglioli s.r.l. reserves the power to use technicians outside of its own structure for specific interventions by the technical assistance service.

Ing. Bonfiglioli s.r.l. reserves the right to make technical changes to this manual without asking for authorization.

The reproduction of this manual is prohibited: Ing. Bonfiglioli s.r.l. protects its own rights over designs and technical documentation in accordance with the law. Further copies can be requested from the technical assistance service at Ing. Bonfiglioli s.r.l..

1.5 Glossary of pictographs attached to the machine

To encourage safe use the following signs are placed on the machine. If these deteriorate or come off, copies should be requested from the manufacturer's technical assistance service and be positioned before the machine is used.

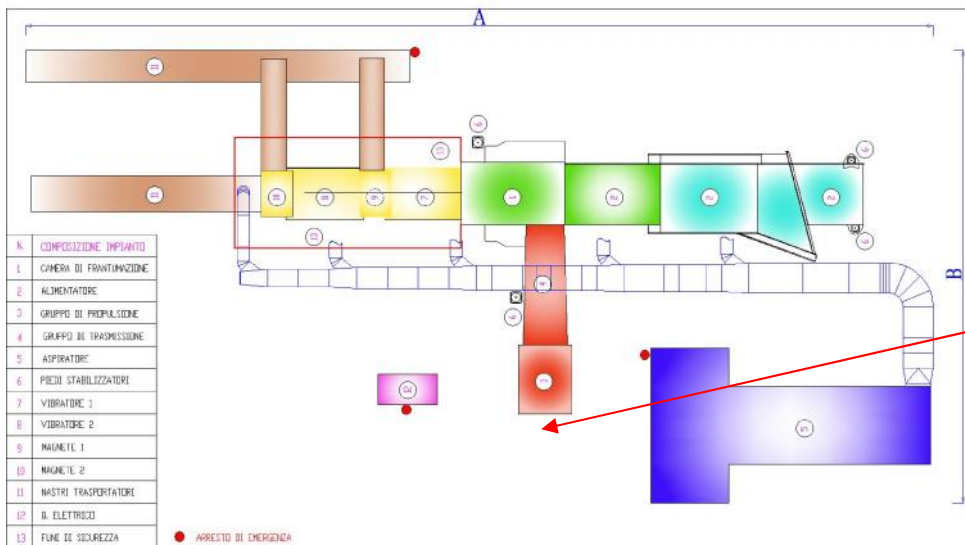
The signs must always be present and visible on the machine.

DANGER SIGNS				
	General danger		Crushing of hands and/or feet	
	Danger of shearing hands (sharp blade)		Danger of crushing hands	
	Fire danger (flammable material)		Danger of explosion (Explosive material)	
	Presence of live parts			High temperature
OBLIGATION SIGNS				
	Obligation to protect hearing (headphones)		Obligation to protect airways (mask)	
	Obligation to wear correct clothing		Obligation to wear safety footwear	

	Obligation to wear gloves		Obligation to link point indicated to earthed socket
PROHIBITION SIGNS			
	Access prohibited to persons with pacemaker		Climbing on machine prohibited
	Access prohibited to non authorized persons		Smoking prohibited
	Operation on moving devices prohibited		Removal of protection prohibited
			
	Introduction of inflammable or explosive material prohibited		Climbing on to the conveyor belt prohibited

1.6 Identification tag in compliance with EEC regulations

The following identification tag is on the machine



1.7 Attachments

The following technical documents for the systems not produced by Ing. BONFIGLIOLI s.r.l. are attached to this manual;

- Use and maintenance manual for power units (diesel engine or electric engine)
- Dust suction manual;
- Machine's electrical plan

These booklets complete the present manual.

2 GENERAL CHARACTERISTICS

2.1 Description of the machine

The machine in question breaks up metallic materials subsequently discharging ferrous only material.

The processing cycle is described in the diagram in the figure. The metallic material to be broken up is loaded (by a polyp crane) into the mill's feeder where a driver pushes it into the grinding chamber; here a hammer rotor beaks up the material.

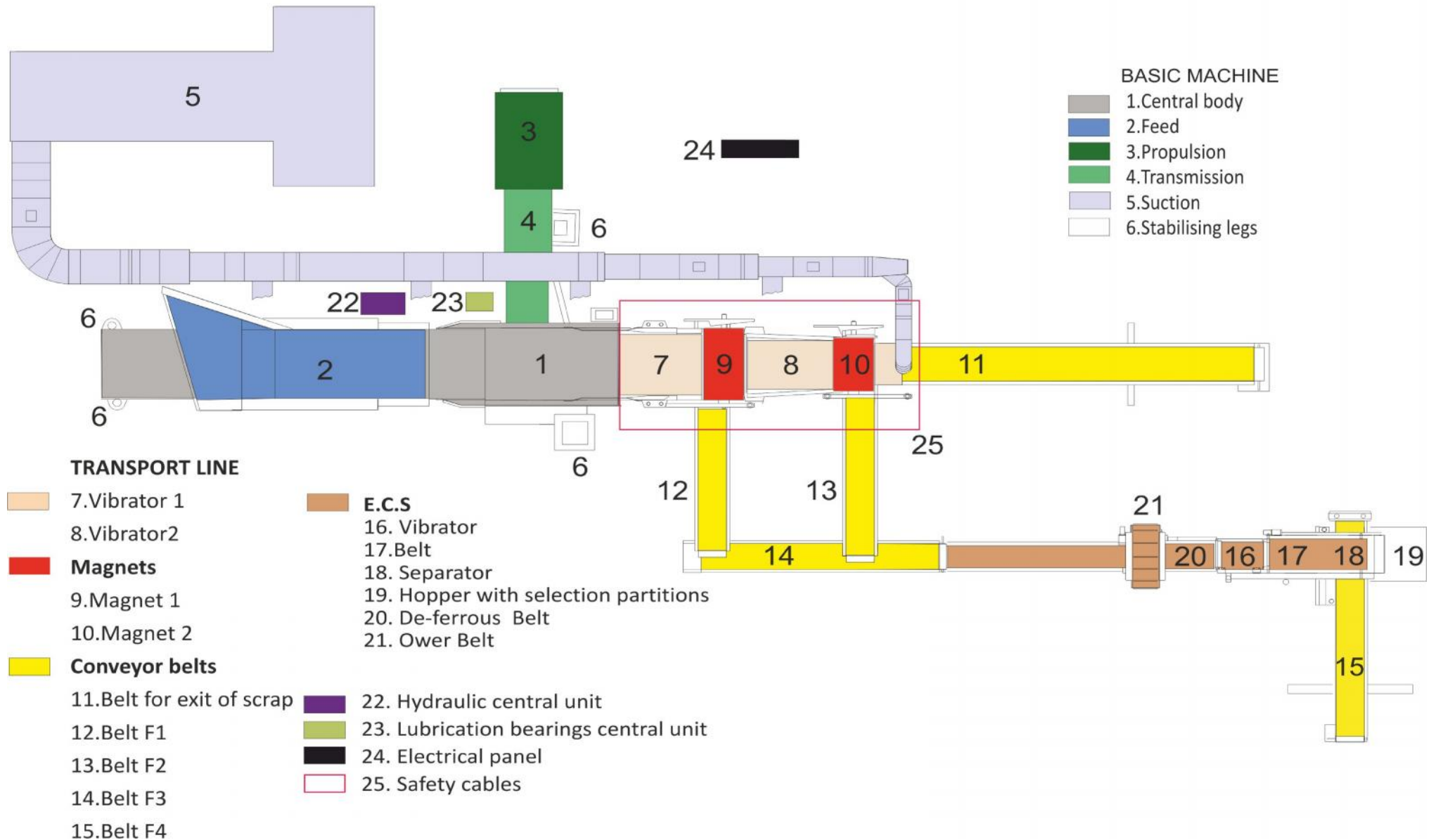
A suction system placed in the vicinity of the machine itself, removes the dust which is released during the various phases of the processing cycle; this dust is suitably treated.

The broken material flows, via vibrating surfaces, to one or more rotating magnets (according to the type of system supplied) which are arranged in succession and separate the ferrous from the non ferrous material.

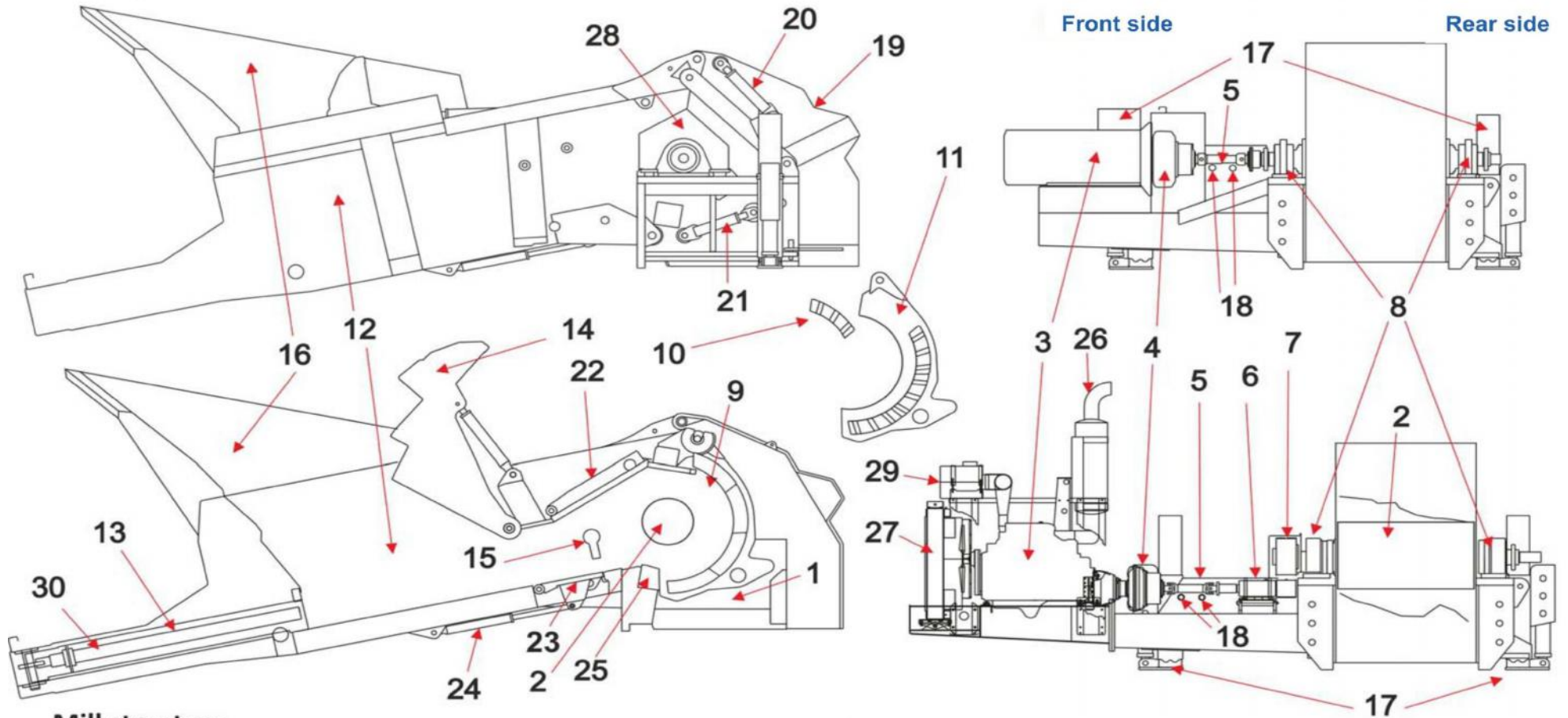
The recovered ferrous material is sent to the collection area while the non ferrous material is further selected (if the ECS system is present) or sent to the area for waste collection.

Because of the ECS system non ferrous metallic material can be recovered, with the exception of stainless steel.

Composition and nomenclature of TAV1



Composition and Nomenclature of TAV2



Mill structure

- 1. Central Body
- 2. Hammer rotor
- 3. Main propulsor
- 4. Hydraulic joint
- 5. Cardan transmission
- 6. Conductor shaft (diesel only)
- 7. Group of pulleys and belts (diesel only)

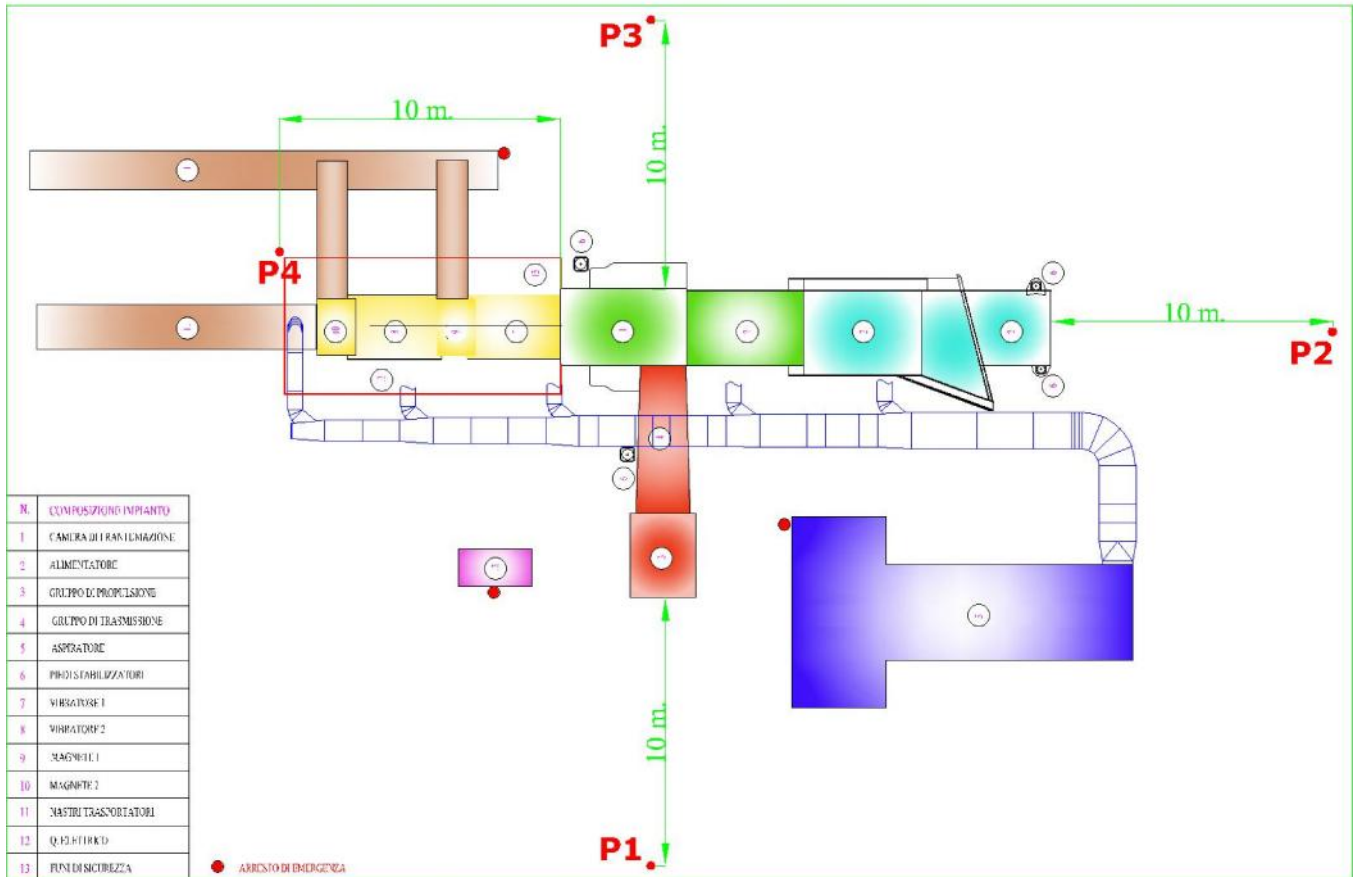
- 8. Rotor bearing support
- 9. Grille
- 10. Grille elements
- 11. Grille sides
- 12. Feeder
- 13. Driver
- 14. Compactor (flipper)
- 15. Bolt

- 16. Feeder hopper
- 17. Stabilising bases
- 18. Cardan safety pivot
- 19. Grille door
- 20. Grille door jacks
- 21. Grille opening jacks
- 22. Upper rotor door
- 23. Lower rotor door

- 24. Lower rotor door jack
- 25. Anvil
- 26. Silencer
- 27. Fan radiator
- 28. Carter rotor cover
- 29. Diesel engine air filter
- 30. Rear driver jack

2.2 Technical characteristics

2.2.1 Noise emissions



Position	Microphone height	Acoustic Pressure Level dB(A)		
		mill 10	mill 12	mill 16
P1	m.2	94.0	94.7	95.2
	m. 4	93.0	94.0	94.5
P2	m.2	89.1	89.2	89.4
	m.4	88.2	88.3	88.5
P3	m.2	93.8	94.0	94.2
	m.4	92.7	93.0	93.3
P4	m.2	96.8	97.3	97.6
	m.4	95.5	96.4	97.0

2.2.2 Minimum space dimensions

Parameter	10 hammers	12 hammers	16 hammers
A length [mm]	34500	34500	35000
B width [mm]	14550	14800	21200
H height [mm]	9500	9500	9500
P body weight 1 [kg]	36000	40000	60000

2.2.3 System Specifications

Parameter	10 hammers	12 hammers	16 hammers
Electrical requirements (Europe and Pacific Countries)	400 V – CA, 50 Hz		
Electrical requirements (North America and Middle East)	440-480 V – CA, 60 Hz		
Electric power absorbed [kW] (*)			
Diesel engine mechanical power [kW] (*)			
Hydraulic system [l/min]			
Atmospheric temperature	- 5 ° a + 50 °C (32°F a 114 °F) (**)		
Atmospheric humidity	0% a 100%		

(*) The power will be indicated depending on the machine the client has directly chosen.

(**) temperatures different from the intervals indicated must be authorized by Ing. Bonfiglioli s.r.l.

2.2.4 Intended, non intended, incorrect use

Normal intended use

The machine is planned for the crushing of metallic materials so:



The following must not be put into the machine:



Inflammable materials (eg, petrol tanks, liquid propane gas cylinders- GPL, gas tubes, containers for solvents and/or varnish etc.)

Explosive materials (eg, any kind of ammunition)

Corrosive and/or polluting materials

-

The emergency stopping devices installed have priority over any start control and the mill can be stopped by pressing any of the emergency stop buttons.

The subsequent restarting of the machine must be controlled from the general control panel but cannot be executed without the consent of the connected machines (re-operating the emergency stop button which caused the machine to stop).

The machine normally functions in “automatic” mode sequentially.

It can only function in “manual” mode in certain functions connected to maintenance, regulation and control.

The “automatic” and “manual” modes are selected by a selector on the control panel. These modes are described in this manual.

Non intended and not consented use

No other use is provided for unless expressly authorized by the manufacturer. The manufacturer is therefore exonerated of any responsibility for non observance of these regulations.

Incorrect or misuse

Likewise, the manufacturer is not responsible for the consequences of incorrect or mistaken use of the mill. From general observation it can be deduced that the most frequent cases are normally due to:

- inadequate preparation of assigned personnel
 - inadequate psychophysical condition of the operators (tiredness, stress) or distraction
 - negligence due to superficiality, inexperience or incorrect habits.
- It should be remembered that it is essential to entrust supervision and operation to expert personnel who are well trained and able to:
- use the mill correctly in normal functioning conditions

- manage possible emergencies (very important!)

2.2.5 Minimum light requirement

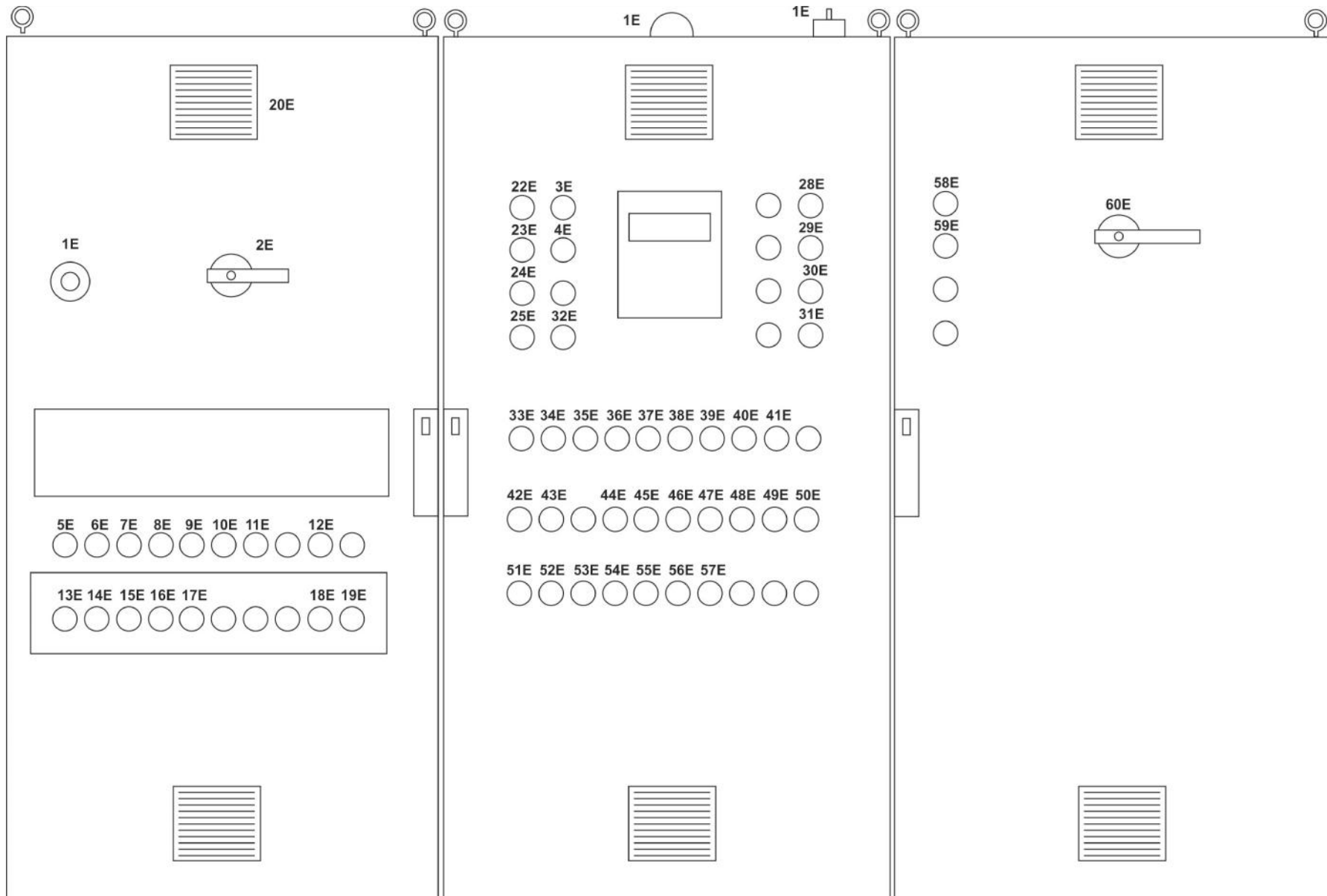
part of the machine requires a minimum light of >300 LUX.

2.2.6 Controls – Description of controls and signs

We now give a description of the machine controls which will be mentioned in the following section (we should point out that Ing. Bonfiglioli could possibly change the position of the commands as a consequence of clients requesting personalized machines; therefore, clients placing specific requests should check what is written on the panel with what will now be explained).

This panel is situated in the immediate vicinity of the machine:

TAV3: Electrical Panel



Description of controls

- 1E General emergency control
- 2E General switch logic section
- 3E Thermal alarm indicator recycle water pump suction system
- 4E Start/stop control recycle water pump suction system
- 5E Start/stop control lubrication pump
- 6E/a Start/stop control main electric engine (electric mill)
- 6E/b Engine activated indicator (diesel mill)
- 7E Start/stop control water pump suction system
- 8E Start/stop control hydraulic central unit
- 9E Start/stop control fan suction system
- 10E Start/stop control dust exit belt (and restart vibrator where provided)
- 11E Start/stop control belt F4
- 12E Selector mode maintenance/transport work
- 13E Indicator E.C.S motor activated
- 14E Start/stop control belt and E.C.S motor
- 15E Start/stop control E.C.S vibrator
- 16E Start/stop control overbelt belt
- 17E Start/stop control de-ferrous belt
- 18E Indicator overload E.C.S motor inverter
- 19E Indicator overload motor inverter vibrators and N.C.S belt (where provided)
- 20E Air vent
- 21E Flashing light and alarm siren
- 22E Tension indicator
- 23E Tension indicator
- 24E Tension indicator
- 25E Cumulative indicator thermal alarm
- 26E Operator panel
- 27E
- 28E Fire procedure control
- 29E Auxiliary general start control/indicator
- 30E Indicator testing mode switched on
- 31E Cumulative alarm indicator and siren silencer
- 32E General machine key
- 33E Selector grinding programme recipe
- 34E Start control automatic cycle
- 35E Pre-forward driver indicator

- 36E Forward driver indicator
- 37E Backward driver indicator
- 38E Maximum pressure indicator
- 39E Open bolt indicator
- 40E High flipper indicator
- 41E Key selector enabling auxiliary controls
- 42E Selector automatic/manual mode
- 43E Stop automatic cycle control
- 44E Forward/rear driver control
- 45E Up/down flipper control
- 46E Open/close bolt control
- 47E Rear stabilizer control (in upward position, controls consent for hammer extractor)
- 48E Forward stabilizer control
- 49E Open/close grille control
- 50E Open/close grille door control
- 51E Start/stop control belt F3
- 52E Start/stop control belt F2
- 53E Start/stop control belt F1
- 54E Start/stop control rotation magnet 2
- 55E Start/stop control vibrator 2
- 56E Start/stop control rotation magnet 1
- 57E Start/stop control vibrator 1
- 58E Auxiliary power starter indicator switched on (electric mill)
- 59E Thermal intervention indicator main diesel (electric mill)
- 60E General starter switch (electric mill)
- 61E G.S.M antenna for tele assistance
- 62E Setup
- 63E Setup

PLEASE NOTE: This description applies when the power to the suction system is supplied by electric engine; when the power is supplied by diesel engine, control 7 is not activated. In this situation, for security reasons, the suction system's diesel engine is started and stopped via the relevant control panel directly on the suction system, with the same sequence as described for starting the crushing system (see starting procedure).

2.2.7 Hydraulic lubrication system

The machine's hydraulic lubrication system is formed by two components:

- Hydraulic central unit for lubricating the basic machine (No 22 TAV1);
- Hydraulic central unit for lubricating the rotor bearings and conductor shaft (if with diesel engine) (No 23 TAV1).

2.2.8 Lubrication system of basic machine

- 2.2.8 The hydraulic oil central unit is separate from the machine and positioned in its immediate vicinity. The hydraulic oil permits the following machine components to function: material driver, lateral driver (bolt), sheet press, leg stabilizers, movement of grille and opening the grille's access door.

The hydraulic oil level is monitored by a level sensor in the tank.

If the level of oil is insufficient, the PLC will go into alarm mode, switching off the hydraulic central unit in order to avoid damaging the hydraulic system.

2.2.9 Lubrification system of the rotor bearings and conductor shaft in the diesel motor version.

The main rotor system is supported by two bearings with a double row of oscillating barrel rollers. In the diesel motor version there is also a conductor shaft on bearings of the same type of rotor. The lubrication of these bearings is guaranteed by a forced system comprised of:

1. Lubricating oil tank with visible electric level control, with a system for clearing the oil going in, hatch for inspection and periodic cleaning and preparation of system for heating the lubricant.
2. Electromotor unit pumps and cogs.
3. Cooling radiator with electric fan.
4. Thermostatic control switch for electric fan.
5. Lubricating filters with obstruction sensors.
6. Analog temperature sensors installed inside the bearings boxes
7. Analog pressure sensors installed where oil goes into the bearings
8. Minimum measure for external pressure gauge installed where oli goes into the bearings
9. Throttle valves for pressure regulation installed where oil goes into the bearings

The lubricant is sucked by the chamber which is cleared by the pumps, one for every bearing (2 for the electric version, 3 for the diesel version) first passing from the cooling radiator. It is sent from the pumps to the filters (2 for the electric version, 3 for the diesel version) to then arrive at the bearings through 3/8" flexible pipes passing by the throttle

valves which regulate its pressure with minimum values of: 0.5 bar and maximum values of: 9 bar.

Inside the bearing boxes are the temperature sensors which control the minimum values: -5 °C and maximum values: 100°C.

The main rotor bearing boxes are equipped with a special type of oil seal which allows them to be replaced without removing the boxes themselves from the rotor.

The lubricant returns from the boxes to the tank in the clearing chamber by $\frac{3}{4}$ " flexible pipes.

A $\frac{3}{4}$ " drainage pipe is also in the bearing boxes and is connected to a chamber which collects the drained lubricant from the oil container which is mounted on the part towards the exterior of the rotor. The resistance of this chamber is guaranteed by a grafitized cable system which takes the drained lubricant into the tank's clearing chamber.

The lubricant which flows to the clearing chamber will rise until it goes beyond the clearing barrier to then flow into the cleared chamber where the level is controlled by electric sensor.

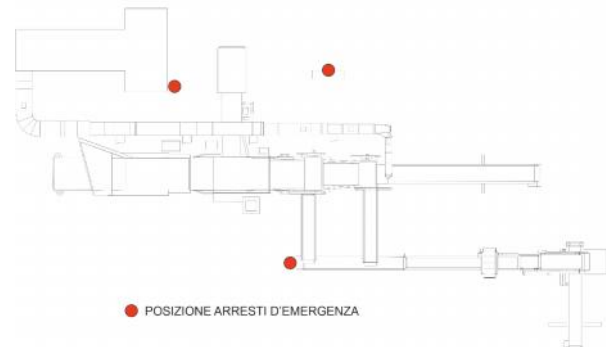
3 SAFETY FACTORS

3.1 Machine safety

3.1.1. Emergency buttons

The red emergency buttons on a yellow background are positioned:

- On the machine's ignition and general command panel;
- In correspondence with the suction system;
- In the conveyor belt area



The emergency button switches off the supply moving the machine, in the case of danger, causing it to stop.

.Function control

Press the emergency button, checking that the supply is disconnected and that the machine has stopped moving. To reset the functioning rotate the button in a clockwise direction.



Resetting the emergency button does not cause the machine to start again.
To restart the machine press the "general start" control on the control panel..



ATTENTION

Before restarting the machine check that all dangerous situations have ceased.

3.1.2. Mechanical protection of moving parts

The moving parts which can be reached have been protected with mechanically fixed fairings which can be removed using manual tools, while the terminals, vibrators, magnets and belts have perimeters and are connected by cables to micro switches which stop their functioning if they accidentally collide or if they are subjected to intentional manual traction.

**IT IS ABSOLUTELY PROHIBITED:**

- To remove the fixed protection when the parts are moving

3.1.3 Warning stickers

Different warning stickers are placed on the machine aimed at warning people of the main dangers from using the machine.

**ATTENTION**

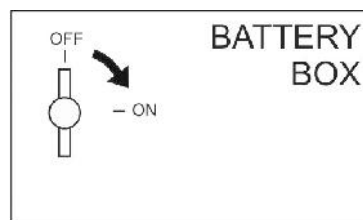
If the stickers deteriorate they must be immediately repaired.

3.1.4 Electric earth connection

The machine must be connected to an efficient earthed electric system (to be prepared by the user) at the points indicated by the signs. The presence of a differential switch on the electrical panel completes the protection from indirect contact.

3.1.5 Battery disconnect key (diesel engine only)

The machine is equipped with a key placed next to the battery holder which is used to disconnect the machine before every maintenance operation.



Note: The diesel engine (if present) in the suction system has its own battery independent from that of the main motor and so is not deactivated by the battery removal key.

3.1.6 Safety when not in use

Whenever it is decided not to use the machine anymore it is necessary to make it inoperative disconnecting the supply from the electrical network and inserting the necessary safety devices.

3.1.7 Professional profile of user

It is the responsibility of the company using the machine to check that the people assigned to the various tasks of managing the machine:

- read and understand the manual;
- receive adequate training and instruction regarding their tasks so that they can be carried out safely;
- receive specific training for the correct use of the machine.

The operator must have at least the following characteristics:

- knowledge of the technology and specific experience in controlling the machine;
- sufficient general and technical education to read and understand the contents of the manual, including correctly interpreting the designs;
- sufficient technical knowledge (in the fields of electrics, mechanics and pneumatics) to securely carry out the interventions within his remit as specified in the manual.
- knowledge of general accident prevention regulations (health and safety at work) and specific ones (for the machine's production type) in force in the country in which it is installed.



ATTENTION

Operator tasks

Only the operator is allowed to use the controls and instruments available on the machine. He is however obliged to:

- carry out all the checks and controls requested for the safe use of the machine before starting it;
- supervise the regular and safe functioning of the machine;
- immediately report any anomaly or breakdown, according to the company's procedure.



IT IS ABSOLUTELY PROHIBITED for the operator to:

- Interfere with electrical parts such as the panel, terminal board, derivation box etc.

- Interfere with the protection and/or safety systems such as sensors, switches etc.
- Remove the mechanical protection and/or fairing which protect the moving parts
- Remove the cable perimeter system which protects the magnets and belts

Maintenance engineers must have the same characteristics as the operators but with more complete specific technical skills (regarding the product type as well as the specific machine) and specialist skills (mechanics, electrics, pneumatics) necessary to carry out skillfully and safely their responsibilities as laid out in the manual.

3.1.8 General rules for operator safety

Most accidents occurring from using the machine arise from the non observance of safety rules and lack of basic precautions; haste is ill advised whether with regards to the approximation of operations carried out or lack of consultation of the necessary technical documentation. In these situations there is a very high risk of suffering serious accidents or damaging the machine. Therefore the following general measures are recommended:



ATTENTION

- Always keep this manual near to the machine.
- Use the machine as indicated in this manual.
- Read this manual carefully before carrying out any operations on the machine or on its packing. For clarification or integrative information contact the manufacturer's technical assistance service.
- Only allow staff who are adequately trained and instructed to use the machine.
- Use the suggested individual protection devices (IPD)



The responsibility for the correct application of procedures, improper use of the machine and methods of working which do not respect the rules and information in this manual and could cause workers to have accidents as well as cause damage to the environment and objects, is solely that of the machine user and excludes any involvement of Ing. Bonfiglioli s.r.l..

3.1.9 Activity up high



ATTENTION

- Carry out high up activity using specific equipment to raise people (eg, mobile scaffolding, mobile ladders etc.)
- Portable ladders must be adequately fixed to the structure.
- Use the intended individual protection devices (eg safety belt)



IT IS ABSOLUTELY PROHIBITED to use elevator carriages for carrying out activities up high, even if they have a basket, crane or any other means not specifically intended for raising people.

3.1.10 Moving loads

For the correct and secure movement of loads it is necessary to follow the following instructions:



ATTENTION

Before lifting:

- Use equipment (crane) which has the most appropriate specifications and carrying capacity.
- Check that the lifting accessories (lifting clamps, cables etc) have the most appropriate specifications and carrying capacity and are in good general condition.
- Consider the carrying capacity of the lifting cables/chains related to the angle of the opening at the top.
- Check the security device on the hook.
- Check for the presence of aerial obstacles (eg electricity lines) in the area of the manoeuvre.

Lifting the load

- Remove people from the area of the manoeuvre.

- Ensure that the load is stable and correctly fixed
- Raise the load very slowly to avoid oscillation and components colliding (eventually deposit the load and grasp it in the most suitable way).

Transporting the load

- Avoid passing above people with the load suspended.
- Visually check the entire area of the manoeuvre; if the crane driver does not have sufficient visibility in some areas he should be helped by someone (signaler).
- Guide the load using a pole and a hook and staying away from the load's vertical fall. **DO NOT USE HANDS.**
- In the case of dangerous situations interrupt the manoeuvre and deposit the load.

Placing the load

- Deposit the load on a flat area
- Deposit the load on supports with adequate resistance so as to be able to easily unwind the surrounding cables.
- Do not deposit the load in front of doors, in passage ways or in front of emergency devices (extinguishers, alarm systems, electric panels, emergency exits, etc).
- Do not overlap containers which are damaged or which are not stable.



IT IS ABSOLUTELY PROHIBITED TO LEAVE THE LOAD SUSPENDED FROM THE CRANE

3.1.11 Operator safety rules

The machine was planned and built based on most current state of the art and regulations. The materials used and the parts of the equipment, as well as the production processes and quality guarantee and control, comply with the maximum demands for safety and reliability. If they are used for their intended purpose, according to service regulations and manoeuvred correctly, they will offer a high performance and last a long time.



ATTENTION

- Operating the machine must be entrusted to expert personnel who are technically prepared and are familiar with the contents of this manual.
- All the security devices provided, and particularly the emergency stop button, must be checked before using the machine.

- Any cleaning or maintenance operations must take place when the machine is off. Starting the machine again can happen only after the operator has visually checked that no worker is in a dangerous position and that all the safety devices have been put back into operation.
- The intended DPI must be used while the machine is functioning.
- Any unconnected people present during the functioning of the machine must immediately move away. Should they not respect the request to move away the machine must be stopped.

**ABSOLUTELY PROHIBITED**

- Any improper use of the machine or use for ends other than those provided for.
- Using the machine outside of the intended parameters for its functioning.
- Removal of the fixed protection (carter).
- Removal of the perimeter cables.
- Removal of or tampering with security mechanisms (micro switches, luminous signs, acoustic warnings etc).
- Abandoning the place where a load is being manoeuvred leaving the load suspended.



IT IS ABSOLUTELY PROHIBITED to introduce into the machine



- **Inflammable materials** (eg petrol tanks, liquid propane gas cylinders, solvent and/or varnish containers).
- **Explosive materials** (eg any kind of ammunition).
- **Corrosive or polluting materials** (eg radioactive metal)

3.1.12 General maintenance engineer safety rules

Maintenance is amongst the biggest risk activities for accidents. It is therefore fundamental to operate with skill and care to avoid risks to ones own safety and that of others.

**ATTENTION**

It is absolutely necessary that cleaning and maintenance operations are carried out when the machine is switched off. Such operations must however be:

- Carried out by technically qualified personnel (trained and instructed) according to the information in this manual
- Adequately planned regarding necessary time, required materials and auxiliary equipment. With this in mind it is necessary to consult the available

technical documents and to understand their contents. Integrative information needed can be requested from the manufacturer's technical assistance service.

- Carried out with appropriate auxiliary equipment.
- Carried out correctly wearing individual protection equipment such as safety shoes, gloves, glasses, headphones-plugs, and anything else provided for.
- Carried out with skill and care for ones own safety and that of others.
- Completed checking that all safety devices (fixed and mobile protection, , electric switches, luminous signs etc) which were removed or interfered with during the operation are correctly put back into operation before authorizing use of the machine.



IT ABSOLUTELY PROHIBITED TO:

- Operate on moving mechanical parts.
- Operate on the hydraulic or cooling circuits when there is pressure or burning liquids.
- Operate on hot burning parts.
- Operate on live electric parts or when live parts are directly accessible.
- Lift heavy machine parts without using a hoist or other suitable lifting gear.

The responsibility for the incorrect application of procedures, improper use of the machine and methods of working which do not respect the rules and information in this manual and could cause workers to have accidents aswell as cause damage to the environment and objects, is soley that of the machine user and excludes any involvement of Ing.Bonfiglioli s.r.l..

3.1.13 Maintenance engineer safety rules

In addition to the general regulations described above, the following further regulations must be followed in order to safely carry out maintenance operations.



ATTENTION

- All maintenance operations must be carried out when the **machine is motionless** with the engine switched off and without supply from the electric panels.
- Before carrying out any maintenance or repair operation, or accessing

electric cabins or panels **IT IS NECESSARY** to disconnect the machine from the electric supply network using the general switch "**1E**" **which is in the electric panel and to block the switch with the lock in the "OFF" position** in order to prevent imprudent starting of the machine.

- In the same way, the batteries must be disconnected using the special key which is in the space on the battery holder.
- The keys to block the supply (locks, electric panel, batteries etc.) must be kept by the person responsible for the operation throughout its duration.
- For all maintenance operations on burning elements (eg, engines, hydraulic oil tubes, crusher hammers) wait at least 1 hour from switching off the machine but also checking the temperature.



IT IS ABSOLUTELY PROHIBITED TO:

- Operate below components suspended and held by lifting equipment (the loads must be placed securely on supports with adequate resistance).
- Leave pipes and tubes and couplings for transporting fuel and hydraulic fluid disconnected. If they become damaged they should be immediately replaced by new ones.
- Bend or hit the pipes with loads.



In order to guarantee the correct functioning of the machine and maintain its service over time it is recommended that:

- Lubrication operations be regularly carried out on all the required parts.
- The maintenance activity be carried out as shown. Never put off repairs, above all if they place personal safety at risk.
- **The original replacement parts intended by the manufacturer be used (or authorized by him).**

4 MACHINE INSTALLATION

Installing the machine must be carried out under the direct control of the manufacturer's technical assistance service. Installation must be carried out on flat areas that are sufficiently large and allow the safe circulation of transport used for feeding and unloading the machine.

4.1 Ground support and stabilization

The place chosen to install the machine must have the following characteristics:

- Level surface, sufficiently compact and resistant to support the pressure of the stabilizers without causing the machine to sink.
- Absence of trenches or slopes near the machine.
- Absence of hidden buried pipes, conduits or drainage systems.

Indicative values for ground support: TYPE OF GROUND	SUPPORT - S (kg/cm ²)
Backfilled ground, not artificially rammed	da 0,0 a 1,0
Backfilled ground, evidently virgin:	
- Mud, peat, marshy	0,0
Non coherent ground but sufficiently compact:	
- fine and medium sand	1,5
- thick sand and gravel	2,0
Coherent land:	
- muddy	0,0
- soft	0,4
- rigid	1,0
- semisolid	2,0
- solid	4,0
Rock with minimum fissures in healthy state, not altered by atmospheric agents and favourable stratification:	
- closed stratification	15,0
-solid or supported formations	30,0



ATTENTION

- For every stabilizer it is necessary to guarantee a ground support of:



S 10 kg/cm²



If there are doubts about the ground support, it is advisable to carry out an examination of the ground (penetrometric test) or provide a concrete slab sufficiently in advance.

4.2 Safety distance from slopes and trenches

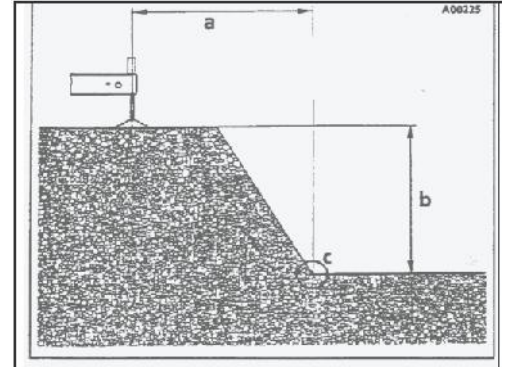
The machine must be installed at a sufficiently safe distance from slopes or trenches.

Empirical rules:

If the ground is subsidence prone or backfilled, safe distance (a) must be double that of the depth of the trench (b). **$a=2xb$**

If the ground is hard and not subsidence prone, safe distance (a) must be equal to the depth of the trench (b). **$a=1xb$**

The safe distance is measured from the base of the trench (c).



4.3 Safety distance from electricity lines

The machine must be installed at a sufficiently safe distance from electrical lines. This distance should be established thus:

- Electroduct 380KV 7 metres
- Other lines 5 metres



ATTENTION

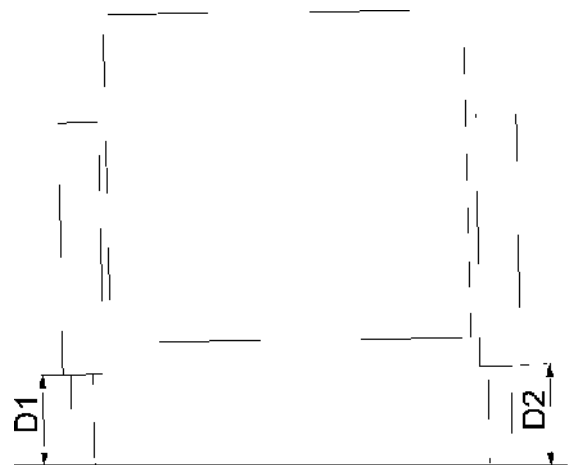
This value is intended as a minimum value; during the manoeuvre **no part of the equipment or load can be closer.**

4.4 Descent and ascent of stabilizers



ATTENZIONE

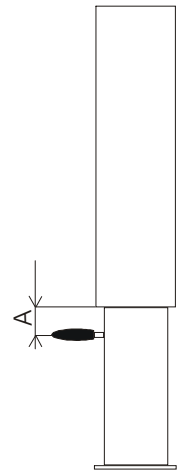
As the stabilizers are ascending or descending all the legs must move homogeneously avoiding creating differences in height which could cause the machine to be unbalanced. It is however necessary that the difference between D1 and D2 be not more than half of the distance between the two adjacent holes in the stabilizer leg extensions (where the safety plugs are inserted).



**ATTENTION**

During the ascent or descent of the stabilizers the machine must always be secure. It is also necessary for the safety plugs to be in the relevant holes on every stabilizer and for them to be continually, gradually moved (one at a time) as the leg is raised or lowered, so that there is not more than one hole free between the inserted plug and the lower part of the stabilizer case (various plugs are provided for this).

Once the desired position is obtained the stabilizers must be blocked ensuring that the plugs are correctly positioned.



IT IS ABSOLUTELY PROHIBITED to remove the safety plugs from the stabilizers.

4.5 Earthed electricity connection

Connect the machine to the earthed electrical system at the points  indicated.

If necessary scrape the varnish to guarantee a secure electrical contact.

5 TESTING AND COMMISSIONING

After positioning the machine it is necessary to carry out the following checks and tests:



- Check that the stabilizers are blocked with the relevant plugs.
- Check the oil in the hydraulic system and regulate the capacity of the pump.
- Check the quantity of fuel in the diesel engine tank (if present).
- Check the cooling systems (radiators free from covering and correctly connected).
- Check the quantity of water in the suction system.
- Test the suction system.
- Test the propulsion unit.
- Check the correct functioning of the rotating magnets.
- Check the correct functioning of the vibrators.
- Test the functioning of the conveyor belts.



- Check that the fixed protection devices are correctly assembled
 - Test all the security devices (safety switch; emergency stop).

When all the checks and controls have been carried out the machine must function on “empty” for some minutes in order to highlight any possible anomalies.

6 USE OF THE MACHINE

This chapter describes how to use the machine. Whenever there is a reference to levers or controls always check they correspond exactly with those shown in the relevant chapter.



In order to guarantee the correct functioning of the machine and to maintain its secure condition and performance over time, the following is recommended:

- Regularly clean the machine removing any dirt present.
- Regularly check the safety devices present and their efficiency.
- Check for oil loss.
- Regularly check the correct tightening of the nuts.
- Immediately point out any functioning anomaly found.

6.1 6.1 Logic of PLC functioning

The machine is run by a PLC whose logic control depends on the function mode set by two selectors named “Work” and “Maintenance”.



IT IS PROHIBITED to use the machine in “Maintenance” mode

“Work” selector

This selector (42E TAV3) allows the system to function in “Automatic” or “Manual” mode. In both modes the PLC:

- enables the electromechanical systems to start;
- imposes respect of the set waiting times to avoid dangerous overload of the current which could damage the safety and longevity of the components;
- immediately interrupts the execution of the automatic cycle and stops all the higher up components in a system stopped for emergency reasons, thus avoiding an accumulation of material along the conveyor belt.

“Maintenance” selector

With the “Maintenance” selector (12E TAV3) the PLC:

- Allows the systems to be used autonomously and independently
- Does not impose respect of the waiting times (current overloads are therefore possible, damaging the components);
- The higher up components will not be automatically stopped when the system is stopped for emergency reasons;



When the system is running the operator has the responsibility for avoiding current overloads which could damage the components. In the same way, if the system is switched off an accumulation of material along the conveyor belt should also be avoided.

6.2 Automatic processing cycle

The machine has an electric panel which controls;

- the automatic cycle for processing the scrap loaded into the feeder;
- the hydraulic control unit which controls all the machine's movements;
- the activation of all the electromotors;
- possible emergency episodes.

The system for controlling the automatic cycle has the following sensors:

1. Analog hydraulic oil pressure sensor.
2. Digital hydraulic oil pressure sensor.
3. Backward driver end stop.
4. Forward driver end stop.
5. Pre-forward driver end stop.
6. High compactor end stop.
7. Open bolt end stop

The control system for the automatic cycle takes note of two fundamental parameters:

- The speed of the main rotor.
- The load of the main motor.

The system has a three position selector which, still in automatic mode, allows the selection of three different programmes (recipes) for scrap processing.

The automatic cycle is divided into the 4 sequences which will now be listed.

- 1. Opening** – is composed of the following contemporaneous movements which cease when the respective end stops are reached.

6.3 Opening bolt

- 1.1. High compactor
- 1.2. Backward driver

2. **Scrap compacting** – lower compactor – the compactor compresses the scrap until it reaches the maximum pressure set in the system, but it stops if it goes beyond the parameters of the rotor speed and the motor load as set in the recipe in use, and then re-enters the said parameters.
3. **Reascending compactor** – the compactor reascends. The sequence ends when the end stop sensor of the upper compactor is reached.
4. **Crusher chamber feed** – The driver advances and introduces the material in the crushing chamber. The sequence ends when the driver reaches the forward end stop sensor.

It is important to observe that the driver does not advance continuously but is controlled by the PLC in relation to the speed of the rotor and the load of the main motor, parameters which are pre-set and are different for each recipe used.

At the beginning of the fourth sequence the driver approaches the scrap, compressing it with a continuous forward movement until one of the parameters indicated goes out of the “range” value. This causes the driver to stop and it becomes active again only when all the parameters have gone back to their intended values.

The driver feeds the crushing chamber advancing with intermittent steps determined by the “ON/OFF” pauses whose values depend on the recipe selected.

The machine load is controlled by the number of rotor revolutions (RPM). Two thresholds are set: one pre-alarm and one alarm. When the RPM pre-alarm threshold is reached following a lowering of the number of revolutions, the driver is moved back for a set time and once this is over it begins its action again. If, however, the RPM alarm threshold is reached, the system interrupts the cycle with a further backward movement of the driver and closure of the bolt, and then, unlike with the pre-alarm threshold, it passes to the first sequence of the cycle.

The values of the pre-alarm and alarm thresholds are the same for all the recipes.

At the same time the main motor load is controlled by:

- Electric motor: current absorption (Ampere –A)
- Diesel motor: by the temperature of the discharged gases (°C) or the torque provided (%).

Even in this case, whenever the set range values are exceeded, the driver is stopped.

If during the advancement of the driver the maximum hydraulic pressure set is reached, the obstructed driver alarm will sound signaling the impossibility of pushing the scrap into the crushing chamber.

The driver reaches the pre-forward driver sensor before the forward driver sensor and this triggers the set time to be counted. Once this time is exceeded, the system passes to sequence one without touching the end stop of the forward driver.

When the automatic cycle is activated the system always begins with the first sequence of the cycle, independently of the position the machine is in and provided that the rotor speed and motor load go back to the parameters determined by the recipe in use (selected according to the material to be processed). Therefore, it proceeds with the other sequences, operating cyclically until the cycle itself is stopped by the operator or an alarm.



The definition of the control parameters of each recipe and of the threshold of the RPM pre-alarm and alarm are set by Ing. Bonfiglioli s.r.l.'s service technician and are aimed at reaching the machine's maximum productivity values taking account of the type of scrap being processed.



It is the task of the user to select the recipe suitable for the scrap to be processed. If there should be a mistake in selecting the recipe, there could be a fall in production or the intervention of the safety devices in place to protect the machine (eg, those of the hydraulic joint or main engine) which could mean the machine being stopped to put these safety mechanisms back into action. If the machine stops with the crushing chamber full this could lead to subsequent difficulties in starting the machine.

All 4 of the sequences can also be controlled manually by the operator using the controls on the electric panel.

6.4 Operation in “manual mode”

If there should be anomalies in the compacting cycle, the various sequences can be done by the operator in “manual” mode, coming out of the “automatic cycle” mode and operating as follows;

- Stop the automatic cycle pressing the “STOP” button
- Place the cycle mode selector in “Manual” position
- At this point it is possible to move the driver (**No 13 Tav.2**), the flipper (**No 14 Tav.2**) and the bolt (**No 15 Tav.2**).



It is advisable to always select the first of the grinding recipes so as to be less likely to overload the machine.



IT IS ABSOLUTELY PROHIBITED to open the access door to the grille (No 19 Tav.2) when the mill is activated.

6.5 Safety control of the main bearings.

If the cooling liquid in the diesel engine should rise in an irregular way, the PLC will firstly cause the automatic activity cycle to stop and then the motor itself.

6.6 Safety control of the main bearings

In order to guarantee that it remains efficient and lasts over time the machine has a system to control the temperature, pressure and cleaning of the bearing lubricant which is also controlled by the PLC.

If the temperature and/or pressure of the lubricant exceeds the minimum and/or maximum threshold, the system will immediately switch off the mill to prevent damage and limit any consequences.

In the case of alarm due to obstruction of one or more of the filters, the system will act immediately to stop the automatic process cycle, inhibiting the hydraulic movements of the bolt, flipper and driver, and then stop the main engine 45 minutes after the alarm began. This delay is to avoid useless obstruction of the crushing chamber with consequent difficulty /impossibility in restarting the mill.

7 STARTING THE MACHINE

7.1 PRE- START actions

Before activating the machine always carry out the following controls-operations:

1. Check the tightness of the rotor ties
2. Check the tightness of the bolts on the outer case of the crushing chamber
3. Check the tension of the conveyor belts (not valid for toothed belts)
4. Lubricate the conductor shaft bearings (No 6 TAV2) (excluding versions with forced lubrication- Photo 10- Point 6.8)
5. Check and if necessary clean the end stops (Photo 14 + Photo 15 includes 2 elements + Photo 16 + Photo 17 – Point 6.8)
6. Clean the hydraulic control unit cooling radiators
7. Clean the radiators of all the electric motors
8. Clean the diesel engine radiator in the suction system (if present)
9. Clean the main diesel engine radiator (if present – Photo 25- Point 10.2.2) externally as well as internally entering via the relevant slot
10. Clean the grille of the motor cooling fan (Photo 22 – Point 10.2.2)
11. Inspect and if necessary clean the diesel engine air filter cartridges (Photo 11-Point 10.2.2)
12. Clean all the electric panels with compressed air
13. Visually control all the tubes and eliminate possible loss of liquid
14. Ensure that the vibrating surfaces and all the ECS devices are cleaned (No 7+ No 8 TAV1).
Check that all the bearing air holes are free and that no ferrous dust has accumulated on the rubber roller which pulls the belt
15. Check all the levels of the lubricating and refrigerating liquids and if necessary restore them (Photo 27+Photo 29B+Photo 30B – Point 10.2.2 – note: the visual control can also check the correct functioning of the level indicators)
16. Check and, if necessary, replace the suction system filter bags (where installed – Photo 12 – Point 10.2.2)
17. Wash the suction system's small filter baskets (wash them earlier if they are blocked – Photo 12B – Point 10.2.2)
18. Check and, if necessary, restore the suction system's water level (replacement/purification of water as needed – Photo 12C- Point 10.2.2)
19. Empty the heavy dust container in the suction system (Photo 24 – Point 10.2.2)
20. Check that the suction system's conduits are clean, they should be freed of the dust deposited in them

Once the checks and controls have been carried out it is possible to proceed to start the equipment respecting this sequence:

7.2 Preparation moves

1 a) Machine with electric engine

- Activate the electric panel using the on/off lever on the panel
- Activate the starter which is moved electrically by the on/off lever on the panel

1 b) Machine with diesel engine

- Close the battery disconnectors
 - 2) Place the starter key in position 1
 - 3) Press the general “START” button on the auxiliary controls
 - 4) Press the reset alarm and silence siren button (if necessary reset the alarms which are registered in the operator panel with the yellow ACK key on the panel itself)
 - 5) Place the selector on the conveyance system in the “Work” position

7.3 Starting the machine

Starting the machine must be carried out respecting the following procedure.



Starting will however only be possible when, whatever the position of the various selectors, the main engine (electric or diesel) has all the permissions provided for in the safety protection



Starting the machine needs to be carried out on “empty”. **It is prohibited** to start the machine if there is material inside the crushing chamber.

7.4 Starting the systems

7.4.1 Main electrical panel



7.4.2 Activating the electrical panel

- a) Rotate the lever on the general door blocking switch on the right-hand door to the ON position (for the diesel mill option).
- b) Rotate the lever on the general door blocking switch on the left-hand door to the ON position.
- c) If necessary put back into operation emergency buttons pressed and then press the “general start” button.

7.4.3 Start controls

12E – Position the selector in “Work” mode

5E – Push the “start” lubrication button

7.1.1 Starting the main engine:

- Electric engine: Press the “start” main engine button - **6E**
- Diesel engine:
 - Rotate the key in position “1” in the engine control panel
 - Keep the low oil pressure button/indicator pressed down and at the same time move the key to position “2” (when it starts, release the key and then after the indicator has gone out, release the button)



Immediately after the main propulsion is activated check that the crushing rotor has begun to rotate . If it has not, immediately stop the propulsor to avoid the hydraulic joint overheating and the protection fuse consequently breaking.

7E – Press the “start” water pump button

8E – Press the “start” hydraulic control unit button

7.4.4 Starting the suction system:

Electric engine: Press the “start” suction system button **9E**

Diesel engine: starting the diesel engine suction system takes place on the electrical panel on the system itself with the following procedure.

Rotate the key to position “1” on the control engine panel

- Keep the low oil pressure button/indicator pressed down and at the same time move the key to position “2” (when it starts, release the key and then after the indicator has gone out, release the button)

10E – Press the “start” scrap belt button

11E – Press the “start” belt F4 button

14E – Press the “start” separator button

15E – Press the “start” ECS vibrator button

16E – Press the “start” over belt button

17E – Press the “start” deferrous button

51E – Press the “start” belt F1 button

52E – Press the “start” belt F2 button

53E - Press the “start” belt F3 button

54E -Press the “start” magnet 2 button

55E - Press the “start” vibrator 2 button

56E - Press the “start” magnet 1 button

57E - Press the “start” vibrator 1 button

When the system is correctly activated the “**Automatic**” mode function is set

Position the mode selector on automatic

- a) Using the relevant selector choose the grinding programme (recipe)
- b) Press the green “start cycle” button

At this point the machine can be fed with the scrap to be processed trying to keep the feeder loader full; avoid useless accumulation which could block the regular descent of the driver.



- Remember that setting the work cycle in “manual” mode is strongly not advised because of the possibility of damaging the system. This is exclusively reserved for the maintenance staff and is **prohibited for operators**.



- It is prohibited to work the machine if any parts are damaged.

The transport controls are merely a succession of go-stop buttons on the various motors. These are placed on the panel in order of the activation sequence which must be followed for correctly starting the line.

An “AUTO”/“MANUAL” selection is also available which can be moved on the operating panel. Its function is described below.

7.4.5 The operating panel

The operating panel is useful for seeing the size of the values in play in the system such as the RPMs and the mill load and the pressure and temperature. In addition to these, it is possible to select some function modes useful to the operator in conditions anomalous to the functioning of the system. The alarms present in the system can be seen on the operating panel.

Here are the main screen image.

➤ Grinding

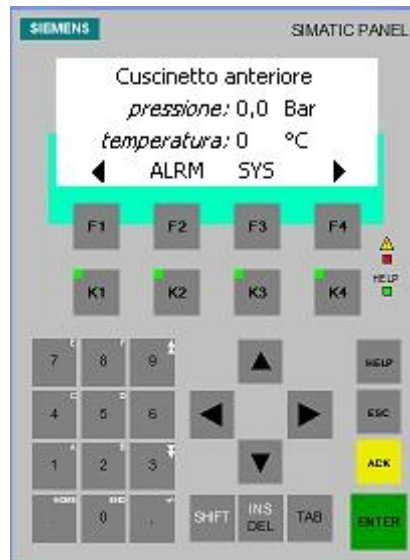


The following information can be seen:

- Functioning state of the grinding cycle
- Speed of the mill engine in RPM

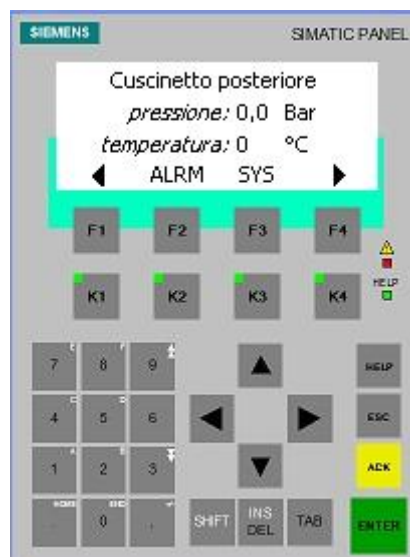
- c) The electric mill's engine load in amperes - % max torque o Tgas waste for diesel engines.

➤ **Front bearing**



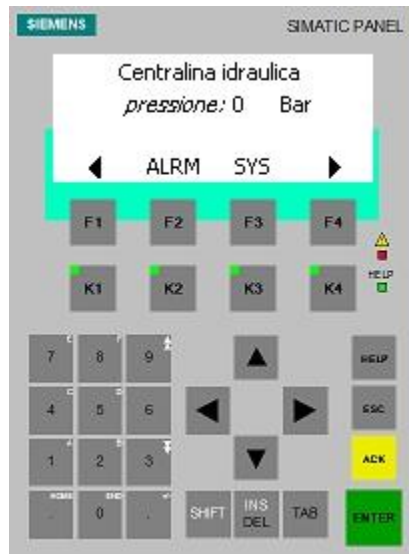
The pressure and temperature of the front bearing can be seen.

➤ **Rear bearing**



The pressure and temperature of the rear bearing can be seen

➤ Hydraulic central unit



The pressure of the hydraulic central unit can be seen.

➤ Transport maintenance

This screen image gives the operator the possibility of changing the conveyor function mode from "WORK" to "MAINTENANCE". In "WORK" mode, which is the normal functioning, the starting procedure for the various conveyor users are subject to an obligatory starting sequence and timing. Various motors will therefore be started sequentially and it is necessary to wait a brief period of a few seconds between the previous and subsequent start ups to avoid electrical overcharges.

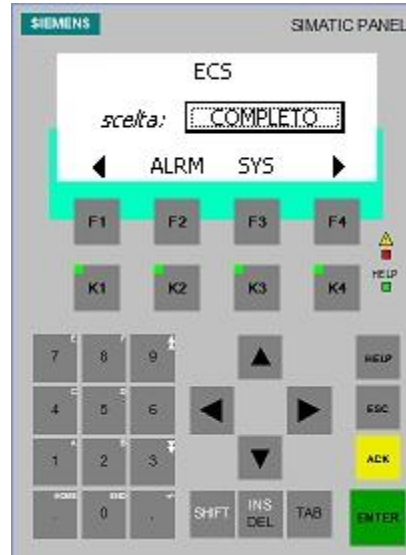
In "MAINTENANCE " mode this obligation no longer exists and the various users can be started without distinction. This mode is useful whenever the users are damaged which could impede the functioning of the bottom users. It is clear that this option should be used consciously taking care to only work with users which have stopped and will not cause the obstruction or piling up of material on the line.



- Remember that setting the work cycle in "maintenance" mode is strongly not advised because of the possibility of seriously damaging the system by imprudent manoeuvres.



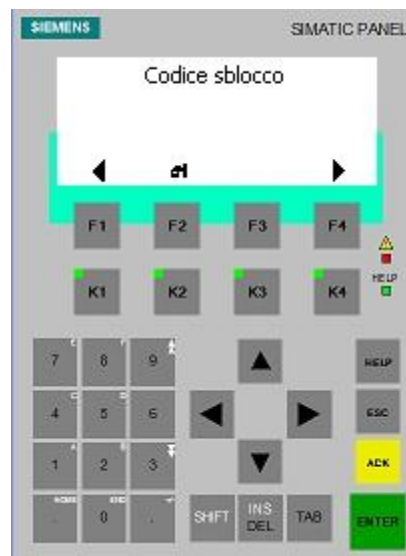
- This is exclusively reserved for expert maintenance staff and is **prohibited to the operator.**

➤ ECS

The ECS option, if it exists in the system, gives the possibility of working with the ECS functioning at a reduced mode.

The “COMPLETE” mode is the normal functioning one. To be able to grind, all the ECS motors must be on.

The Belt, Separator and Vibrator functions are excluded in the “REDUCED” mode.

➤ Unblock code

In the case of alarm “A069 High Pressure HYDRAULIC CENTRAL UNIT (insert unblock code)” the unblock numeric code must be introduced in order to reset the alarm. Ing. Bonfiglioli must be asked for the code by phone..

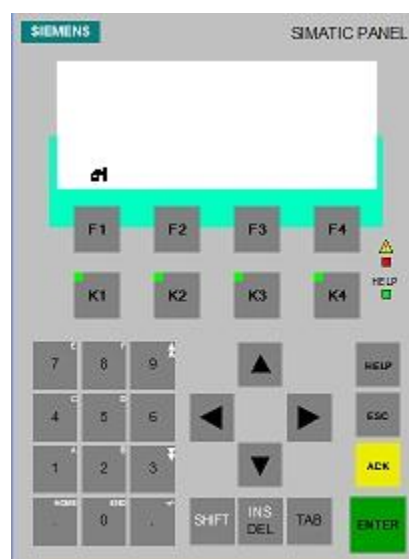
To insert it, it is sufficient to dial the number and press the “enter” key. Once the number has been correctly introduced the number returns to “0”. If, on the other hand, the number which has just been introduced remains, it means that it is wrong.

➤ Working hours



The actual working hours of the mill (starting engine) can be seen.

➤ Alarm List



Whenever alarms are present the red indicator light which is on the right side of the “F” and “K” keys flashes, as well as the flashing indicator on the cover of the electrical panel. By pressing the key under “ALRM” the page with the list of alarms can be seen on any screen image on the panel. Using the arrow keys it is possible to run through the list. They are seen one at a time. To reset the alarm the “Reset alarm” key on the electrical panel to the right of the operator panel must be pressed. The description of the alarms can, however, still be seen in the alarm list to inform that the alarm has occurred, even if the conditions which generated it are no longer active. Recognition by the operator is therefore necessary for these to be cancelled definitively from the list. This happens by visualising the alarm with the arrow keys and pressing the yellow “ACK” key on the operator panel..

To return to the normal functioning screen image just press the button under the “home” symbol on the panel. Pressing the “Reset alarms” button on the electrical panel to the right of the operator panel also silences the alarm siren, whether the alarm has been effectively reset or not.

7. STOPPING THE MACHINE

The following procedure is aimed at stopping the main engine (electric or diesel), **guaranteeing that the grinding chamber is completely empty** of material being processed which could accumulate between the rotor and the grille causing problems for when it subsequently starts again.

Stop placing scrap in the feeder and wait for the mill to finish grinding the material in the feed zone and in the grinding chamber; this can be ascertained by observing the driver which will only carry out a forward movement (the feeder chamber being empty the driver will advance to the end stop) and the lack of crushed material on the first vibrator.



To make the objective of the operation easier it is advisable to finish the process by introducing material already processed into the crushing chamber.

1. Place the machine in “manual cycle” mode.
2. Bring the driver to the “completely backwards” position (check the relevant indicator on the control panel).
3. Open the bolt (check the relevant indicator on the control panel).
4. Lower the flipper as far as the maximum pressure shown on the pressure gauge indicator.
5. Select recipe 1
6. Advance with the driver to the “completely forwards” position.
7. With the bolt, carry out closing and opening movements repeated several times until the scrap falling into the grinding chamber can no longer be heard and the bolt itself is completely closed.
8. Raise the flipper and bring the driver to the “completely backwards” position.
9. Stop all of the conveyor belts and the suction system.
10. Switch off the main engine (if it is diesel set the minimum regime and wait a few minutes for the temperature to stabilize before switching it off).
11. To guarantee lubrication of the bearings, only switch the lubrication off when the main rotor has completely stopped.

8 PROTECTION AND STORAGE

8.1 Inactive for a short periods

- Proceed to general cleaning and lubricating of all parts with grease;

8.2 Inactive for a long periods

- Proceed to general cleaning and lubricating of all parts with grease;
- Spray all the machine with protective oil;
- Protect the machine from bad weather with plastic covering.

9 CLEANING OPERATIONS

Cleaning operations can be carried out by the workers in the company using the machine. It is also the responsibility of the user company to guarantee adequate training and instruction of their own workers for carrying out such operations.

Operations which require the removal of fixed mechanical protection or the deactivation of safety systems must be carried out when the machine is inactive and without electric supply (opening the general switch 1E and disconnecting the battery).



ATTENTION:

- Use correct equipment (brushes, shovels, rakes,.....).
- Once cleaning has ended restore all protection and security before restarting system.



- It is advisable that cleaning always be carried out by at least two workers at the same time **at the end of the working day**.

10 MAINTENANCE

There are two categories of maintenance, special and ordinary.

10.1 Special maintenance

This is always the responsibility of the manufacturer's specialist technicians.



IT IS ABSOLUTELY PROHIBITED

- **For the user to carry out special maintenance operations**

Example but not exhaustive list of special maintenance operations:

- R.R. (Removal-Reattachment) of:
feeder, rotor, rotor bearings, grille, outer casings, anvils, hammers, hydraulic pumps, hydraulic components, structural elements, electrical and electronic components, electrical connections, operating pulleys and relevant bearings in the diesel version;
- various operations on the bearing lubrication systems;
- new welding;
- structural modifications.

SOME LESS IMPORTANT OPERATIONS ON THIS LIST CAN BE CARRIED OUT BY THE USER WITH PRIOR FORMAL AUTHORIZATION FROM THE MANUFACTURER

10.2 Ordinary maintenance

This is the responsibility of the user company.

Ordinary maintenance should be carried out according to the typology, method and time rhythms set out in this manual.

**ATTENTION**

- All maintenance operations must be done respecting the safety conditions illustrated in Chap 3



In order to guarantee the correct functioning of the machine and to maintain its safety performance over time it is indispensable **to use the original replacement parts as provided for by the manufacturer (or authorized by him).**

The request for spare parts must be complete with the production number as in the figure



Ordinary maintenance operations during the life cycle of the machine are aimed at:

- Maintaining or restoring the efficiency of the goods;
- Containing normal wear and tear;
- Guaranteeing the goods a useful life;
- Dealing with accidents;
- Protecting the safety and security of the machine user.
-

Ordinary maintenance operations reflect the maintenance policies necessary to protect the security and safety of the users and are aimed at guaranteeing the machine's productive efficiency over time.

→ These must be carried out according to the planned maintenance rhythms (ie, preventative maintenance, cyclical maintenance and maintenance required by the condition of the goods).

→ These may also be necessary where there are break downs or functional damage (ie break down or corrective maintenance).

The above mentioned do not change the the machine's original characteristics (sign information, dimensioning, manufacture values, do not change the essential structure and intended use, so they do not change the functions carried out, the values, nor the performance.

10.2.1 Table of scheduled maintenance

Determining the typology, method and time rythmns for carrying out scheduled maintenance by the user

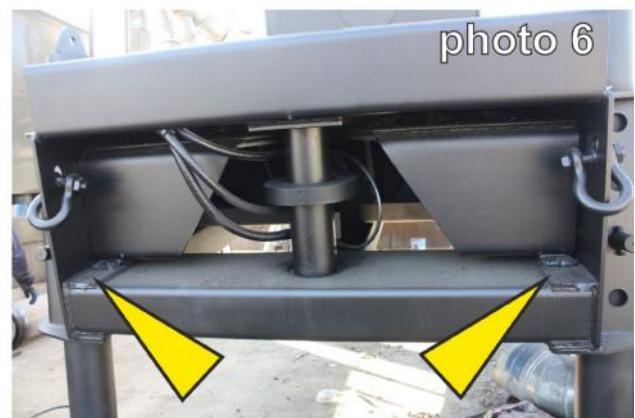
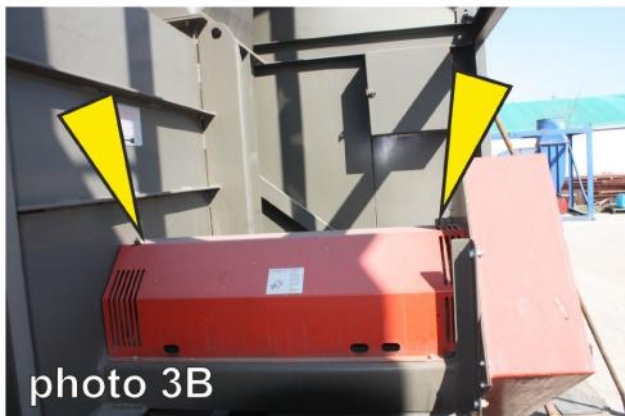
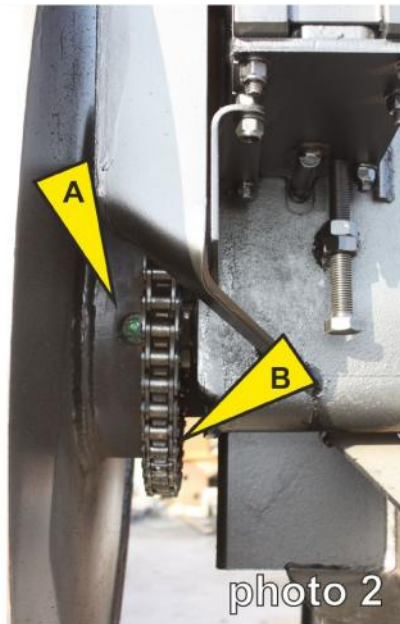
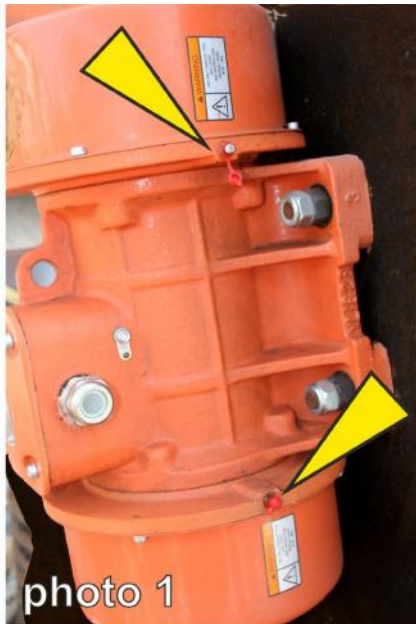
Description of operations	Intervals in hours				
	40	200	400	1000	2000
Lubrication of all the systems lubricating points: a) Vibrator motors (photo 1); b) Magnet support bearings (photo 2A + photo 5) c) Suction system motor (if electric – photo 3) d) Suction system fan shaft (also photo 3) e) Lubrication of the conductors (with brush –photo 6) f) Flipper jacks (photo 7) g) Conveyor belt bearings (photo 4 ;photo 8) h) Belt bearings in the vibrators and engine (photo 9)	X				
Cleaning and lubrication of magnet transmission chains and possible restoration of their tension (photo 2B)	X				
Inspection of the grinding chamber grille entering via the upper door (No19 TAV2) and lower door (No 23 TAV2), and removal of any scrap which might be obstructing its holes. (Note: this operation must be carried out respecting the machine's stop procedure as described in Para 6.5)	X				
Careful inspection of the transmission belts and their tension. Whenever it is necessary to restore the correct tension value see the specific procedure (photo 18; photo 19).	X				
Visual check of oil level in the engine coupling joint (photo 20)	X				
Visual check of oil in the motoredactors of conveyor belt (photo 23) and magnets (photo 26)	X				
Careful inspection of the strain prevention joints (where present), and possible replacement if damaged or worn	X				
Check tightness of the rotor ring nut bearing radial fasteners (where installed). (If anomalies are found communicate this to the manufacturer) (photo 28)	X				
Check the wear and tear of the hammers, the anvil and all of the grinding chamber including the casing of the loading feeder, replacing or repairing those parts which are excessively worn.	X				

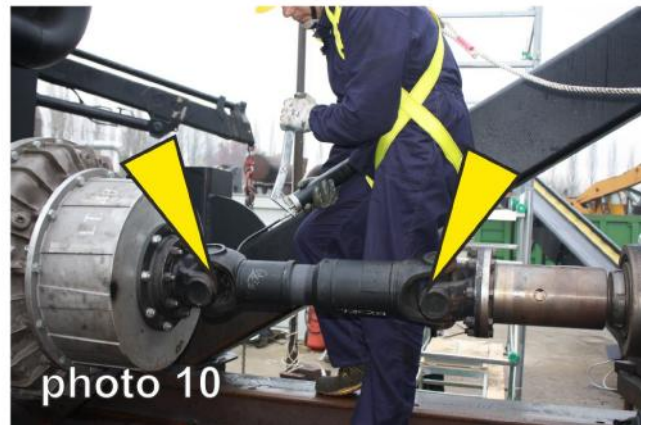
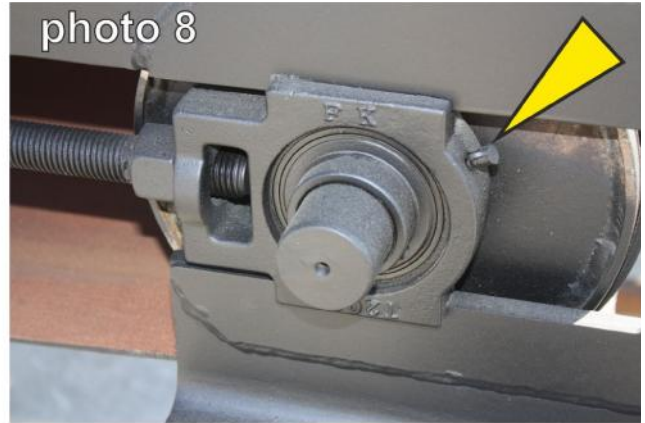
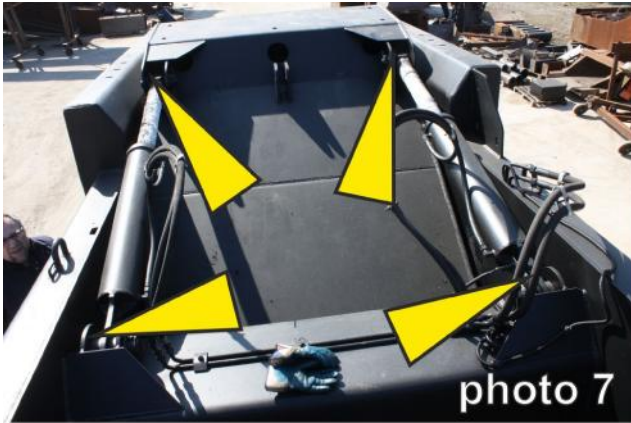
Description of operations	Intervals in hours				
	40	200	400	1000	2000
<i>Check that the flexible and rigid pipes are not leaking. Also check the tightness of the hydraulic system's connections and the tightness of all screws and nuts.</i>	X				
<i>Replace lubricating oil and all the diesel engine filters taking care to carry out the manufacturer's directives concerning these engines. (See specific manual)</i>		X			
<i>Replace oil filter cartridges in the rotor (if the "blocked filters" alarm is set bring forward their replacement - foto 30A)</i>		X			
<i>Replace the hydraulic oil cartridge (photo 29A)</i>		X			
<i>Replace lubricating oil in the rotor bearing lubrication system. Clean the tank entering by the relevant inspection plug.(No 23 TAV1)</i>			X		
<i>Replace hydraulic oil and clean tank. (No 22 TAV1)</i>			X		
<i>Replace the conductor wheel bearings and oil protector (No.6 TAV2) - (version without forced lubrication)</i>				X	
<i>Replace the bearings of the transmission rotor belt tightener pulley (where present)</i>				X	
<i>Replace oil in all the motoreductors placed on the belts and magnets. (photo 23)</i>				X	
<i>Replace the grease in the main electromotor bearings respecting the manufacturer's instructions.</i>					X

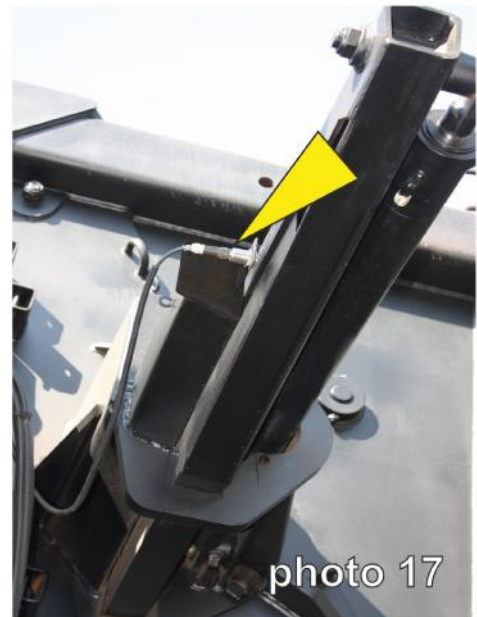
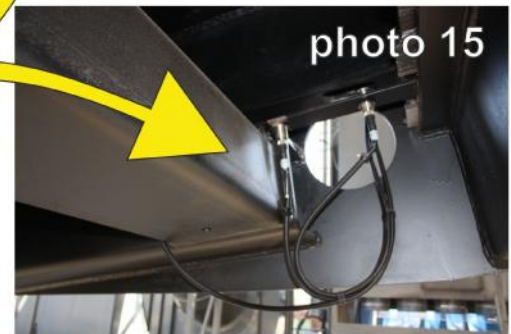
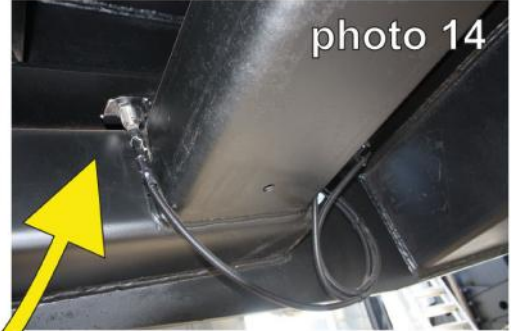
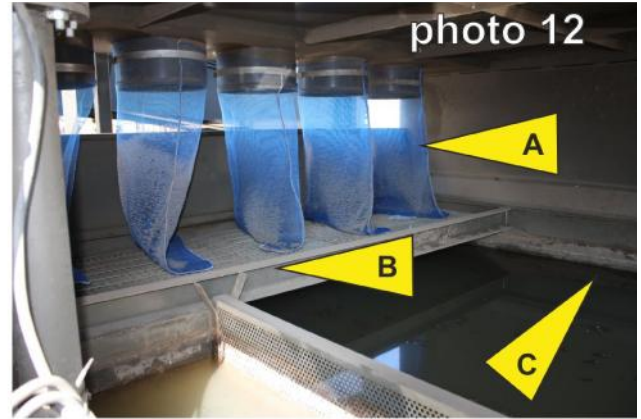
NOTE 1: With regard to diesel engines, over and beyond the oil replacement intervals indicated in this table, the remaining ordinary and extraordinary maintenance operations must be carried out in conformity with the instructions provided by the relative manufacturers and published in the specific use and maintenance manual.

NOTE 2: Ing. Bonfiglioli s.r.l.reserves the right to change the maintenance intervals and these changes will be communicated.

10.2.2 Images of points to check in the pre-start phase and scheduled maintenance







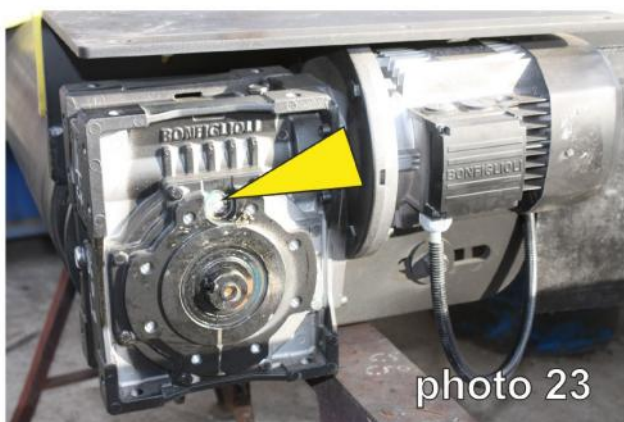
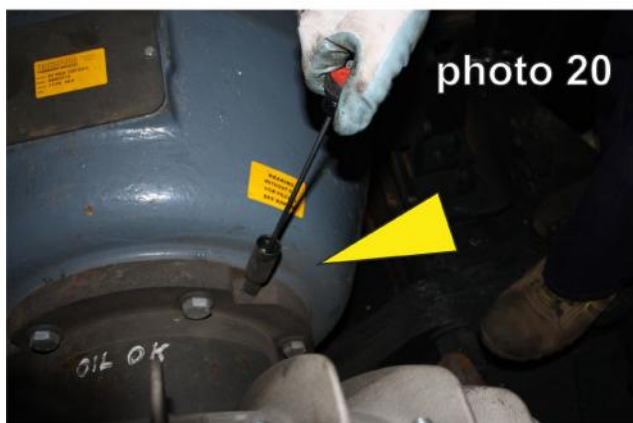
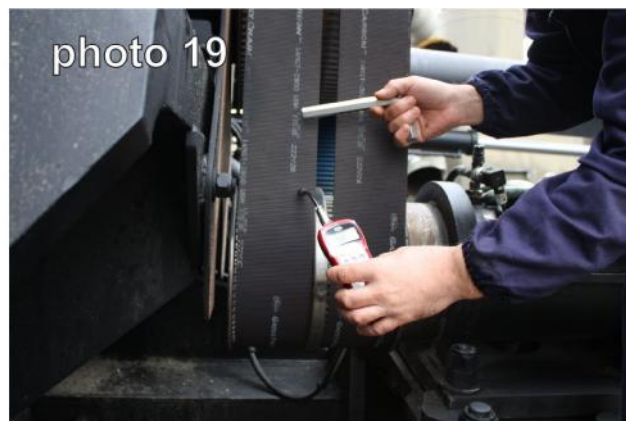
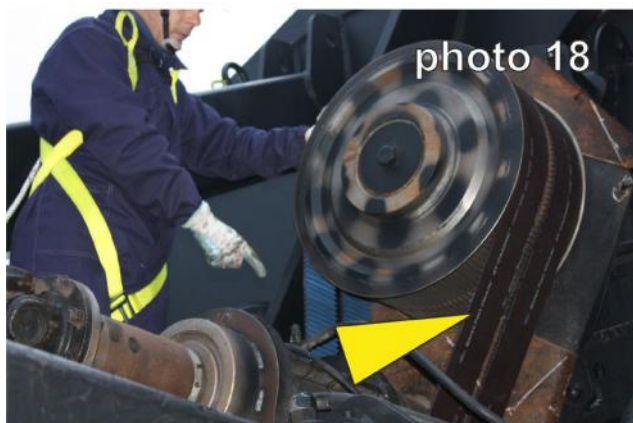


photo 24

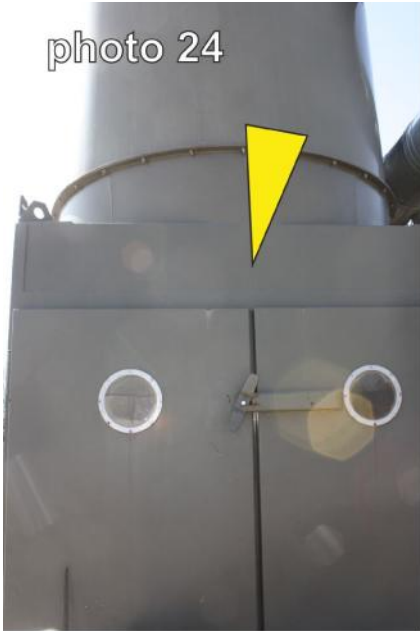


photo 25

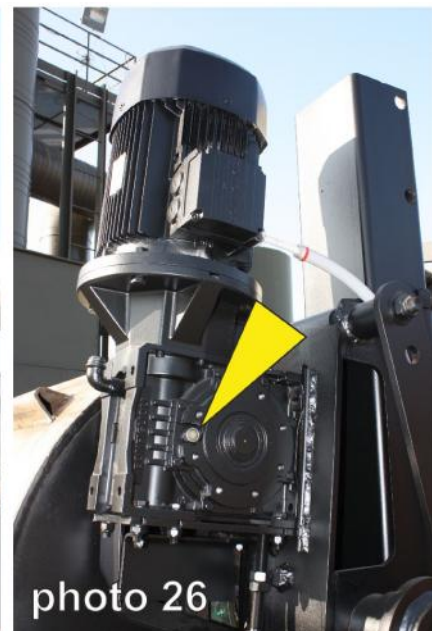
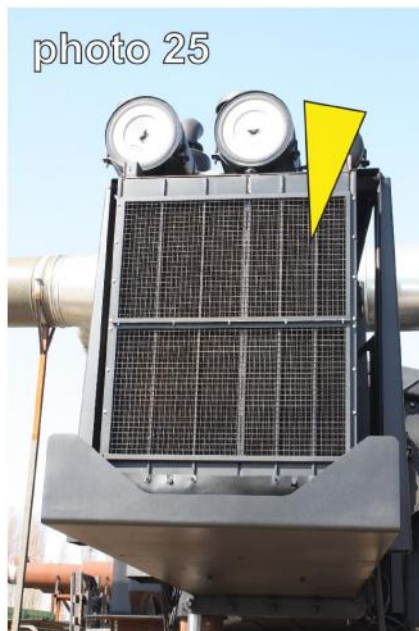


photo 26



photo 27

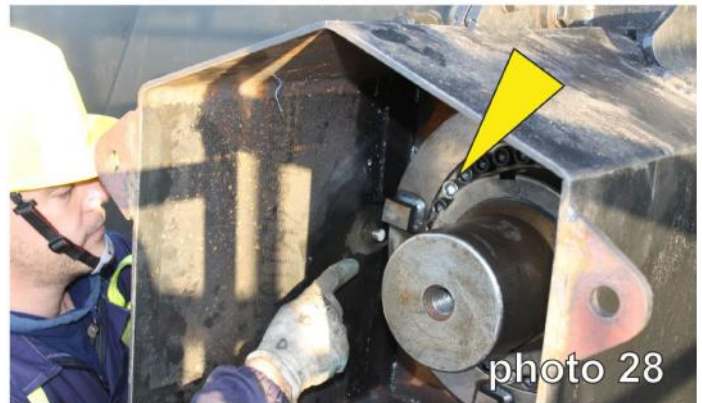


photo 28

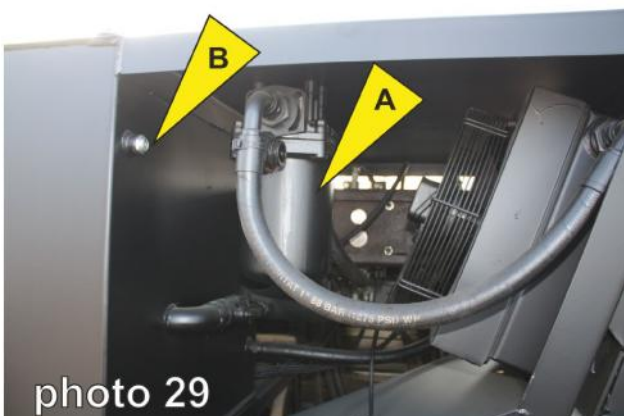


photo 29

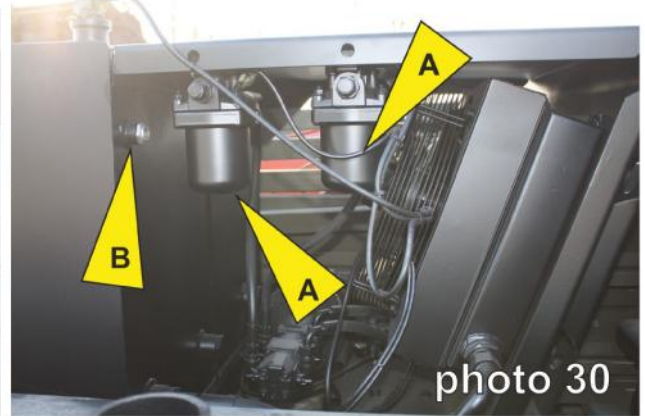


photo 30

10.2.3 Breakdown or wear and tear maintenance

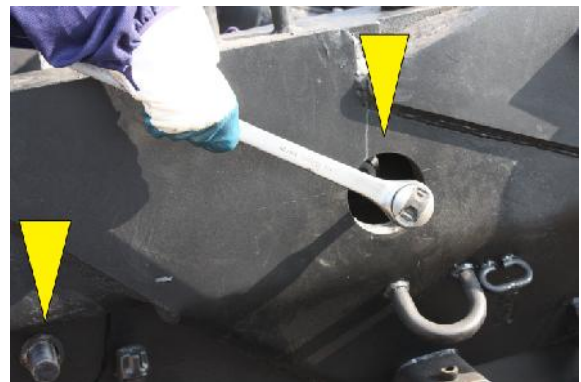
10.2.3.1 Hammer replacement

Operation sequence for replacing hammers first UNPLUG ALL ELECTRICAL SUPPLIES

1. Remove rotor (carter) covers on forward and rear sides.



2. Remove the four bolts which close the upper door (No 22 TAV2) and remove the plugs blocking the opening of the hatch.



3. Bring the flipper into the “high” position and hook the hatch with the steel cable (provided by the manufacturer) which is between the upper door (No 22 TAV2) and the flipper (No 14 TAV2), using adequate plugs.



4. With the hydraulic central unit switched on, operate the “flipper down” control (control list - 45E) until the door is completely open, which corresponds with the maximum range of the flipper. Then position the safety plugs (with anti-unthread fastener) to avoid accidental closure of the door and and switch off the hydraulic central unit.



5. Manually rotating the rotor bring the pins in the hammer that is to be extrated into the upper position corresponding with the vertical, Then block the rotor with wedges which are adequate for avoiding accidental rotation.
6. Now remove the radial fasteners on both sides (front side photo) of the hammer pin which can be found on the vertical of the rotor axis (note: the radial fastener on the side opposite to that of the pin extraction must also be removed because in the subsequent phase of inserting the new pin an excessive advance of the pin itself could damage the machine).



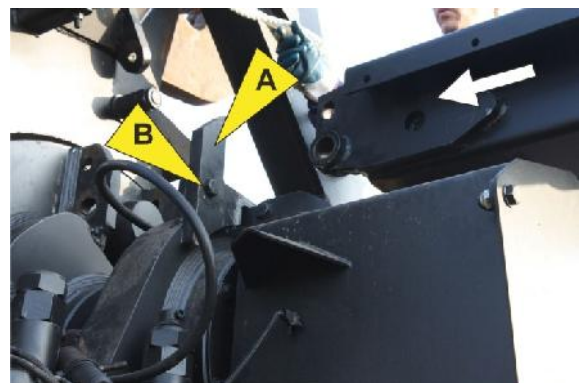
7. Remove the "T" collector in order to mount the extractor support.



8. Prepare the extractor by removing the extraction pin from the extractor stem and the coupling pins from the frame.




9. Mount extractor support (A) on the front bearing and seal it to the machine with the appropriate screw (B).



10. Raise the extractor with a crane and place it in correspondence with the back support (see previous point). Then apply the column support.



11. Operating the regulation holes on the column support and with the machine's front stabilizer, place the extractor in a horizontal and level position. 

12. Link the extractor frame to the rotor with the upper pin.



13. Remove the hydraulic pipes (both directions) of the front stabilizer's hydraulic cylinder. *(The stabilizer's resistance is guaranteed by both the hydraulic cylinder's no return valve and by the safety pin placed on the extension).*

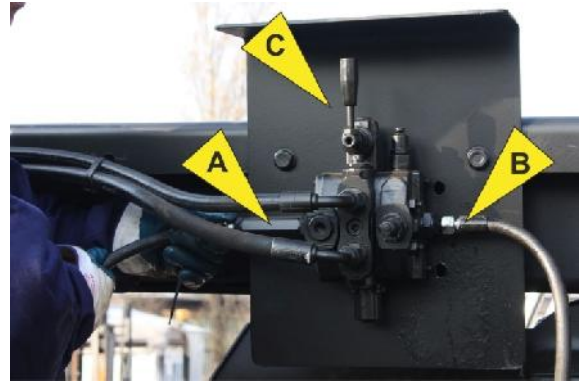


14. Connect the extractor distributor to the tubes which have been removed from the stabilizer taking care to correctly connect the outward and return tubes)

A = Return tube

B = Outward bound tube

C = Control lever



15. Place the main starter key (32E) on the mill control panel in position "2" (thus enabling activation of the hydraulic central unit and the post su stabilizer command, inhibiting any other possible action.



The starter key must not be left on the panel and in reach of non assigned staff for any reason..

The key must be removed and controlled according to company directives.

16. Start the hydraulic central unit and activate the stabilizer movements via the relevant key selector (41E) and move the "back leg" lever selector into the "up" position (47E)

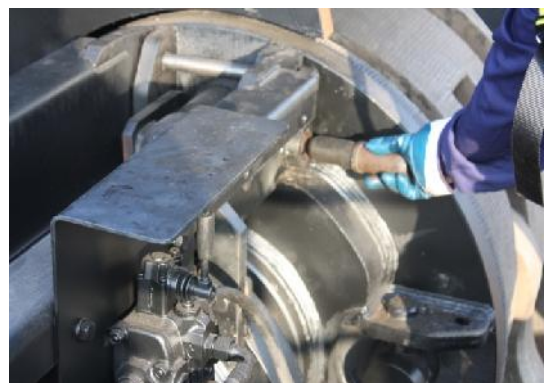
17. Operating the extractor control lever bring piston (A) nearer and hook the pin to be extracted inserting the relevant plug (B). Then fix the extractor to the machine inserting the plug in the lower part (C).



A



B



C

18. Then, manoeuvring the distributor control lever in the opposite direction, extract the pin from the seat of the rotor.



19. Unhook the piston pin taking the coupling plug out through the appropriate hole..



20. Remove the extractor pin grabbing it with a sling through the relevant window.



21. Check that the extracted pin does not present any structural harm.



It is prohibited to mount damaged pins.
Damaged pins must be replaced.

22. Now go into the grinding chamber and insert an eye bolt in the intended place above the hammer to be extracted and connect a suitable crane to the eye bolt itself, if the eye bolt attachment is damaged, ensure it is replaced.



23. Lift the hammer and bring it out, repeat the operation for all the hammers in the row.



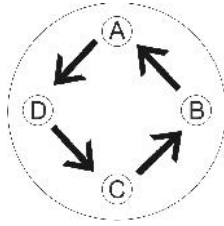
24. After having removed the hammers take care to clean the pin seat and the hammer pits.



25. Still with the help of the crane, lift the new hammer with the eye bolt (the hammers are supplied without an attachment for the eye bolt which is applied in the assembly site). And, after having greased it, position it in the rotor seat. Repeat the operation for all the pin's hammers.



26. It is possible to mount an extracted pin only if there is no structural damage. It is however advisable to invert the position of the pin (attached schema) and replace the pins after the first inversion.



It is prohibited to mount damaged pins
Damaged pins must be replaced.

27. Take care to grease the previously cleaned pin, if it is not replaced, and place it in its own seat by manoeuvring the extractor control lever.



28. After having inserted the new pin with inverse actions with regards to those previously described, remove the connecting plug in the rotor extractor frame.


29. Reposition the radial fasteners (cleaned, greased and with no structural damage) in both sides of the pin. On the rear side insert the safety bolts, positioning the square washer so as to limit as much as possible the radial fastener's axial play.



It is prohibited to mount damaged fasteners.
Damaged fasteners must be replaced.



30. With the help of a lever, move the extractor away from the rotor so as to allow the rotor to rotate without interfering with the extractor itself. Then very carefully remove the wedges to free the rotor which, because of the different weight from the row of new hammers, will rotate by 180°

- | | |
|---|--|
| <p>31. Repeat the operations described above and in the sequence reported for every pin (missing out the points about preparing the extractor) for the remaining 3 rows of hammers.</p> | <p style="text-align: center;"></p> <p>ATTENTION</p> <p>After the second pin, because of inactivity, the rotation of the rotor will be only 90°, to then rotate by 180° for the last pin.</p> |
| <p>32. After having completed the last row, position the rear leg selector to 0, disable the leg movements using the relevant key selector, switch off the hydraulic central unit and remove the extractor from the mill.</p> | |
| <p>33. Reconnect the outward and return pipes to the rear stabilizer.</p> | |
| <p>34. Insert the starter key in the panel in position "1"</p> | |
| <p>35. Switch on the hydraulic central unit</p> | |
| <p>36. Moving the flipper free the upper door safety plugs</p> | |
| <p>37. Close the upper door raising the flipper</p> | |
| <p>38. Reinstall the 4 bolts to block the door and remove the steel cable from the door to the flipper. .</p> | |
| <p>39. Switch off the central unit, remove the main starter key from the control panel</p> | |
| <p>40. Reinstall the rotor covers on the front and rear sides</p> | |

10.2.3.2 Assembling and dismantling the cover of the cardan shaft

Assembling and dismantling the cover of the cardan shaft must be carried out respecting the sequence of the previous operations **DETACH ALL ELECTRICAL SUPPLIES**

1. Remove the radial fasteners on one side of the cardan's anti-fall pins.



2. Extract the anti-fall pins from the cover.



3. Remove the bolts fixing the cover to the mill frame.
4. Using a suitable crane, lift and remove the cover.



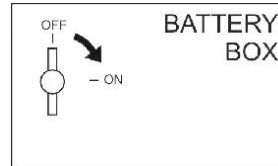
5. For reassembly follow the previous operations in reverse.

10.2.3.3. Replacement of toothed belts

Replacement of the toothed belts must be carried out in the operating sequence for which the first operation is DETACHMENT OF ALL ELECTRICAL SUPPLIES:

1. **Position the starter key (32E) in position “0” and remove it from the control panel.**
2. **Place the handle of the main selector on the control panel in position “0”**

3. Remove the batteries from the mill's diesel engine (if present) using the lever/switch positioned on the battery box.



4. With the help of a suitable crane, remove the cardan mast cover (see procedure) and then the belt cover, first removing all the side bolts which fix it to the frame.



5. Remove the belt tightener pull strap so as to free the horizontally pivoted system of the transmission's conductor shaft.

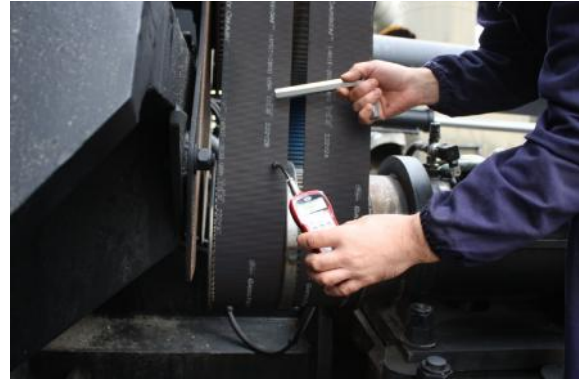


6. With the crane, lift the conductor shaft upwards so as to bring the conductor pulley near to the conducted one.



7. Now remove the belts.
8. Take care to clean the pulley's dentures with compressed air or liquid detergent so as to remove all residue from the old belts.
9. Insert the new belts in position.
10. Release the conductor shaft downwards and disconnect the crane.

11. Reposition the belt tightener pull strap and carry out a pre-tension test on the belts measuring with the given instrument.



12. Make the transmission complete at least one complete turn of the rotor to place the belts in position.
13. Now regulate the final tension to the prescribed value of 79 hz (new belt) or 68 hz (used belt) with a tolerance of 1 hz.
14. Complete another complete turn and check the tension once more and if necessary correct it.



15. Repeat point 14 until the tension value is stabilized. If there is a double belt the the maximum difference allowed between the two is 4 hz.
In case of difficulties contact the technical assistance service at Ing. Bonfiglioli s.r.l..
16. Block the pull strap of the horizontally pivoted system of the conductor shaft.
17. Reassemble covers of the belts and the cardan shaft.

10.2.3.4 Replacement of the conveyor belt fabric

BEFORE CARRYING OUT ANY WORK THE BELT MUST BE REMOVED FROM THE ELECTRICITY SUPPLY.



1. Remove the metallic protection panels unscrewing the bolts.

2. Remove the rubber side protectors unscrewing the bolts.



3. Remove the truss straps positioned on the belt

4. Dismantle the scraper as indicated in the photo



5. Remove the carter motoreductor



6. Dismantle the motoreductor after having disconnected the electric cables, this is done by opening the lid of the box. N.B Before being disconnected the electric cables must be efficiently marked in order to be correctly reconnected.



7. After having measured the distance between the bearings and the structure (measurement to be repeated in the reassembling phase) the pull straps on the rollers can be loosened.

8. Take off the rollers on both sides.





9. Unscrew the fasteners on the tightening rollers.

10. Remove the tightening rollers



11. Remove worn fabric



12. Clean the sliding surface of the belt and the roller conduit of all foreign bodies.

13. Check that the rubber surface of the conductor roller does not have any damage which could harm its functioning.



14. Place the new fabric in position



15. Reassemble the bearings and the tightening rollers after having adequately greased them all.



16. Restore the distance between bearing and structure respecting the measurement first revealed in the assembling phase, acting on the tighteners.

17. After having reassembled the motoreductor and all its protection, switch on the belt. Let it run for a few minutes and check that the belt is centred in relation to its walls. If not, use the tighteners to centre the fabric.



The belt must NEVER be switched on without relevant protection.

10.3 Radiator checks and maintenance

Heat exchangers with self inverter electric cooling fans controlled by the PLC are installed on the hydraulic central unit (No 22 TAV1) and on the bearing lubrication central unit.

To guarantee the correct thermic exchange it is very important that these elements be cleaned daily, as indicated in point 7.1 of this manual.

In case of necessity, and with the electric fan previously removed, a hydrocleaner can be used, taking care not to damage the dispersing tongues on the radiant mass.

In the case of diesel motorisation, daily washing is required with hydrocleaners, removing the relevant inspection windows situated near the conveyor.



- **For maintenance operations on the engine unit other than the operations indicated in the “Table of planned operations” in this manual, follow the instructions supplied by the respective engine manufacturers.**

10.4 Suction checks and maintenance

- Periodically check the tension of the fan unit conveyor belts and if necessary restore them to the correct tension using the belt tightener placed under the electric or diesel engine.

The shaft lubrication is under the carter 3AS which covers the fan and should be used after every 50 hours of work.

For the other maintenance operations see the “Table of planned operations” in this manual.



- **For maintenance operations on the suction unit, other than those indicated in the “Table of planned operations” in this manual, follow the information in the manuals supplied by the respective engine manufacturers.**

11 WELDING

Welding must only be carried out by qualified personnel able to:

- Correctly restore the damaged structure to how it was supplied by the manufacturer.
- Avoid damage to the machine caused by static current



ATTENTION:



- Welding must be carried out fixing the body earth clamp to the part that is to be welded or (if this is impossible) a part in its immediate vicinity in order to reduce to an absolute minimum the circulation of electric current on the body of the machine.



IT IS ABSOLUTELY PROHIBITED TO

- Carry out welding with the electric panels activated, the machine switched on (this can damage the electronic apparatus) or the batteries connected.

12 OPERATIONS ON HYDRAULIC SYSTEMS

If there should be any loss of oil the machine must be stopped and an operation carried out on what has caused the losses.



ATTENTION:

- Use adequate IPD to avoid direct contact..
- If oil comes into contact with eyes abundantly rinse them and go to the nearest accident and emergency department..
- If it should be ingested, do not provoke vomiting and go to nearest accident and emergency department..



- When hydraulic components or pipes are disconnected it is necessary to restore the connections in accordance with the initial set up when the machine was

supplied. In particular, the hydraulic pipes must not rub against each other or against parts of the machine to avoid their deterioration and possible emission of inflammable fluid..



- Quickly retrieve leaked oil to avoid contaminating the ground or water courses..

12.1 Lubrication

Below we carry the type of oil and grease used in the machine, with some alternatives to the main brands. Possible alternative products not indicated in the table must have the equivalent composition and performance.

<i>Application</i>	<i>Brand</i>	<i>Type</i>
ROTOR BEARINGS (AND MOTOR PULLEY TOW DIESEL VERSION)	ENI	DICREA SX 68
	Gazpromneft	COMPRESSOR OIL F SYNTH 68
	TEXACO	Cetus PAO 68
	CHEVRON	SYNTHETIC COMPRESSOR TEGRA68
CONVEYOR BELT REDUCTORS	ENI	TELIUM VSF320
	TEXACO	SYNLUBE CLP320
HYDRODYNAMIC JOINT	ENI	ARNICA 68
		<i>alternative devono essere validate dai nostri tecnici</i>
GREASE	ENI	GREASE SM2
	Gazpromneft	Grease L MOLY EP 2

1.2 Motoreductor oil (95DN) conveyor belts



- For maintenance operations go to the “Table of planned operations” in this manual..

12.1 Hydraulic oil filter (102DN)

The hydraulic oil filter is on the hydraulic oil central unit.



- For maintenance operations go to the “Table of planned operations” in this manual..

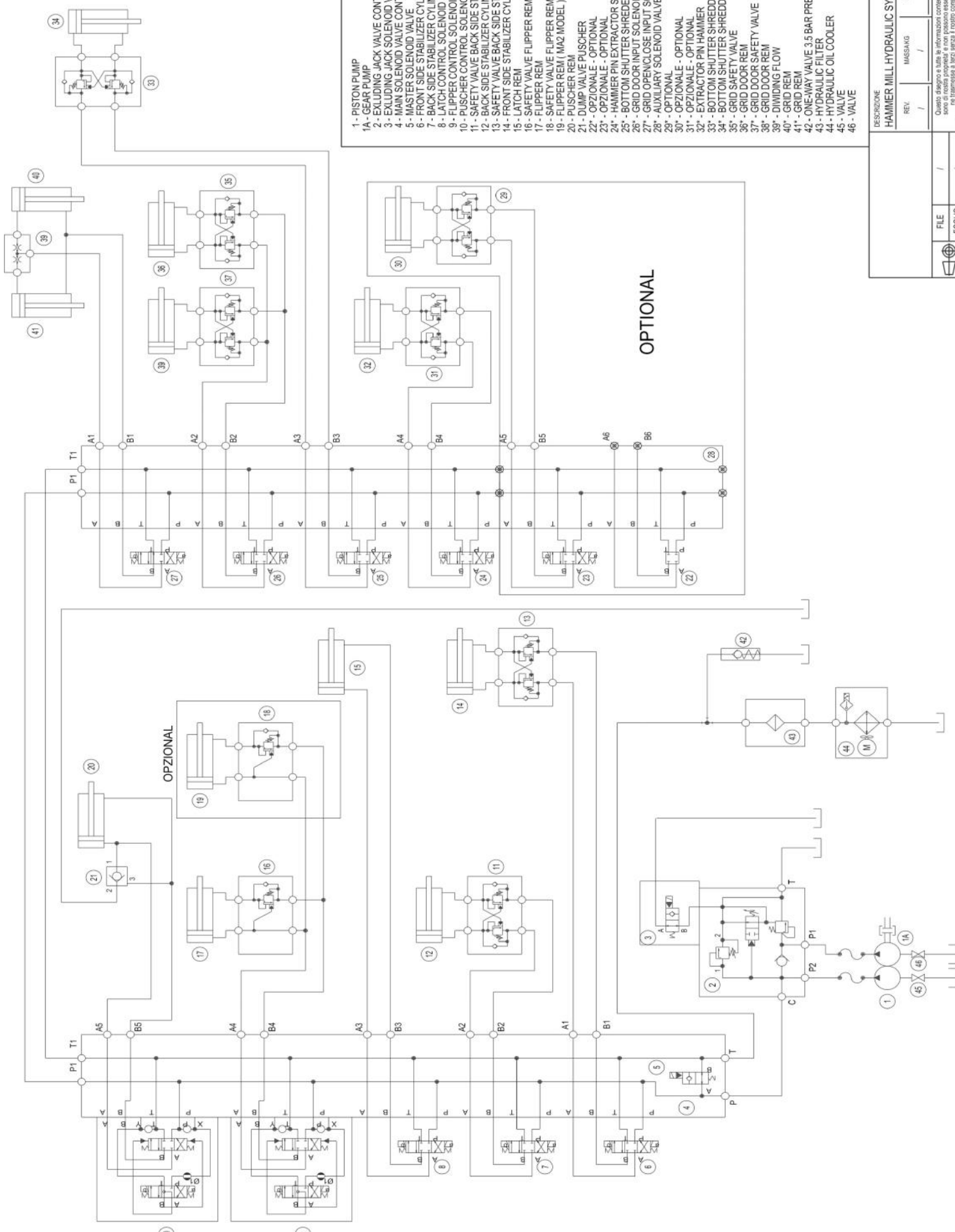
13 DISMANTLING

Whenever dismantling is to take place the following must be carried out:

- empty the grinding chamber of any residue;
- disconnect all hydraulic connections and retrieve oil avoiding dispersing it into the atmosphere.
- disconnect the joints of the transmission motoreductor and reductor – shaft pinion;
- dismantle engines, joints, shafts and magnets;
- dismantle hammers and rotor;
- dismantle all other assembled parts

All the operations must be carried out observing the accident avoidance regulations in force and those indicated in Chap 3 of this manual and the applicable procedures illustrated in Chap 8.

All resulting material must be disposed of in accordance with national legislation applicable to refuse material.



- 1 - PISTON PUMP
- 2 - GEAR PUMP
- 1A - EXCLUDING JACK VALVE CONTROL BLOCK
- 3 - EXCLUDING JACK SOLENOID VALVE
- 4 - MAIN SOLENOID VALVE CONTROL BLOCK
- 5 - MASTER SOLENOID VALVE
- 6 - FRONT SIDE STABILIZER CYLINDER CONTROL SOLENOID VALVE NG 10
- 7 - BACK SIDE STABILIZER CYLINDER CONTROL SOLENOID VALVE NG 10
- 8 - LATCH CONTROL SOLENOID VALVE NG 10
- 9 - FLIPPER CONTROL SOLENOID VALVE NG 16
- 10 - PUSCHER CONTROL SOLENOID VALVE NG 16
- 11 - SAFETY VALVE BACK SIDE STABILIZER CYLINDER
- 12 - BACK SIDE STABILIZER CYLINDER
- 13 - SAFETY VALVE BACK SIDE STABILIZER CYLINDER
- 14 - FRONT SIDE STABILIZER CYLINDER
- 15 - LATCH REM
- 16 - SAFETY VALVE FLIPPER REM (OPTIONAL)
- 17 - FLIPPER REM
- 18 - SAFETY VALVE FLIPPER REM (MA2 MOD. OPTIONAL)
- 19 - FLIPPER REM (MA2 MODEL)
- 20 - PUSCHER REM
- 21 - DUMP VALVE PUSCHER
- 22 - OPZIONALE - OPTIONAL
- 23 - OPZIONALE - OPTIONAL
- 24 - HAMMER PIN EXTRATOR SOLENOID VALVE NG 10
- 25 - BOTTOM SHUTTER SHREDDER INPUT SOLENOID VALVE NG 10
- 26 - GRID DOOR INPUT SOLENOID VALVE NG 10
- 27 - GRID OPEN/CLOSE INPUT SOLENOID VALVE
- 28 - AUXILIARY SOLENOID VALVE CONTROL BLOCK
- 29 - OPZIONALE - OPTIONAL
- 30 - OPZIONALE - OPTIONAL
- 31 - OPZIONALE - OPTIONAL
- 32 - EXTRACTOR PIN HAMMER
- 33 - BOTTOM SHUTTER SHREDDER SAFETY VALVE
- 34 - BOTTOM SHUTTER SHREDDER REM
- 35 - GRID SAFETY VALVE
- 36 - GRID DOOR REM
- 37 - GRID DOOR SAFETY VALVE
- 38 - GRID DOOR REM
- 39 - DIVIDING FLOW
- 40 - GRID REM
- 41 - GRID REM
- 42 - ONE-WAY VALVE 3,5 BAR PRELOADED
- 43 - HYDRAULIC FILTER
- 44 - HYDRAULIC OIL COOLER
- 45 - VALVE
- 46 - VALVE

OPTIONAL

DESCRIZIONE			
REV.	MSSANG	DISGNATO	SCALA
/	/	/	FIT
HAMMER MILL HYDRAULIC SYSTEM			DATA
			03-09-10
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* MA2 MODEL OPTION