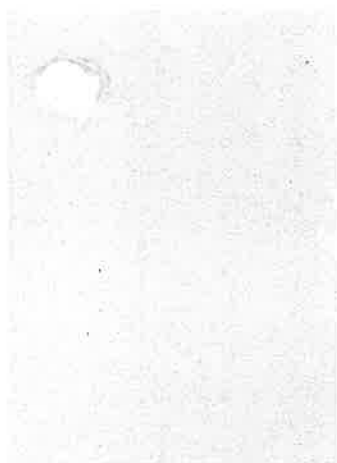
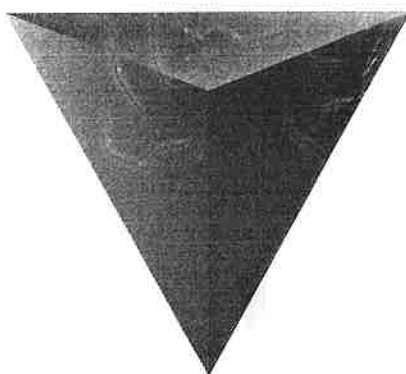


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NPM
PAPER METAL

650



INSTALLATION, USE AND MAINTENANCE MANUAL

**INJECTION-MOULDING MACHINE FOR
THERMOPLASTICS**

Model: **unyka 650**

serial number:5347.....

year of construction:2007.....

PLASTIC METAL S.p.A.

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F

FEED HOPPER: inverted-cone-shaped container, open at top and bottom, that is filled with plastic and dye granules and serves to feed the plasticizer.

FLOOR LOAD CAPACITY: ability of the floor under the machine to bear the stress of its weight.

FLOW (RATE): volume of fluid traversing a cross-section in a given period of time.

H

HAZARDOUS MOVEMENT: movement of a machine part that may cause injury.

HEATING ELEMENTS: electrical devices around the plasticizer barrel that heat the plastic material and thus cause it to melt.

HIGH-VOLTAGE PANEL: constituted of all those control and power devices characterized by high voltage (disconnects, transformers, switches, etc.).

HYDRAULIC MOTOR: a motor activated by fluid (or other liquid) under pressure.

I

INTAKE FILTER: device used to purify oil before it enters the pump.

L

L/D RATIO: length/diameter of the plasticizer screw.

LIMIT SWITCH: cutoff switch actuated by a moving part (mechanical) or operating on the basis of magnetic properties (inductive)

LOADER: device used to load plastic granules into the machine.

M

MAIN DISCHARGE: return connection to the drain, common to all cooling zones.

MANIPULATOR: device (= robot) for handling the moulded parts from a distance as soon as they are ejected from the mould cavities.

MICROPROCESSOR: data processing device that runs the program resident in memory and takes the most suitable actions according to input values and operator settings.

MICROSWITCH: mechanical element that is part of the machine's safety devices.

MOTOR PUMP: pump driven by an electric motor, which serves to regulate the flow of fluids in the cylinders, motors and piping.

MOTOR: a machine that converts electrical energy into mechanical energy.

N

NITROGEN CHARGE: operation effected by filling the accumulator tanks with gas.

NOZZLE: the terminal section of the plasticizer, used for the outflow of melted plastic material.

O

OPERATOR: person(s) assigned to install, operate, adjust, maintain, clean, repair and transport a machine. Personnel must be informed that they are obliged to read this manual.

P

PLASTICIZING CAPACITY: characterizes the injection group. It is the maximum quantity of material that can be plasticized within a given period of time. It is measured in kg/h.

PLASTICIZER: electrical-mechanical assembly, composed of screw, barrel and heating elements, that transports the material, plasticizes it and then injects it into the mould.

POWER BOX: element on the machine that houses the high-voltage panel (q.v.).

POWER CIRCUIT: circuit used to provide the electrical power necessary to run the machine.

PRESSURE: physical quantity defined as the ratio between the normal component of the force pressing on a surface and the surface itself.

PRESSURE GAUGE: device that measures the pressure of a fluid.

PROTECTIVE PANEL: metallic cover that protects the gears and moving parts of the machine.

PUMP: machine designed to move fluids.

R

RADIAL JACKS: auxiliary cylinders that move parts of a mould.

RESIDUE: in this specific case, a deposit left by oil in its reservoir.

S

SAFE DISTANCE: minimum interval necessary to prevent access during hazardous movements.

SOLENOID VALVE: device controlled by electrical signal that serves to regulate the flow of fluids in cylinders, motors and piping.

SOLVENT: liquid (carbon tetrachloride, gasoline, etc.) used to clear certain parts of the machine. Solvents are used to clean protecting substances off all the chrome-plated parts (column, cylinders, etc.).

T

THEORETICAL INJECTION VOLUME: the theoretical volume of plastic material available within the plasticizer barrel. It is found by using the screw diameter and injection distance.

THERMOCOUPLE: sensor used to measure temperature. It is used to measure the temperature in various zones of the plasticizer and the mould.

TOGGLE: system of levers, activated by a cylinder, used to open and close the mould.

U

UNSCREWING: act of extracting a piece so shaped that it must be removed by rotating to preserve its integrity (e.g. threaded bottle cap).

V

VIBRATION-DAMPER: support placed under each bearing point of the machine to reduce self-induced vibrations.

VOLUNTARY STOP: effected at cycle-end by place the cycle selector in the manual position. At this point the motor can be stopped or manual movement effected.

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2 - DESCRIPTION OF THE MACHINE AND TECHNICAL SPECIFICATIONS

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2.1 - GENERAL DESCRIPTION OF THE MACHINE

Injection-moulding machines for plastics are machines that takes plastic material in granular form and transform it into articles of various shapes by injecting the melted material into the cavities of moulds. The machines are basically composed of a mould-closing unit, an injection unit and command and control systems. The microprocessor-based control system manages all the machine functions.

Sensors, limit switches and transducers furnish the control system a precise, constant report on the status of the process during all phases of the cycle; solenoid valves, proportioning valves and other actuators implement the commands received by acting on the hydraulic and electric power circuits.

The hydraulic system is driven by pumps coupled directly to the electric motor, supported and insulated from the machine by vibration-dampers.

The mould-closing group effects its movements by virtue of a double-toggle, particularly compact and rugged, driven by a hydraulic cylinder. Another smaller hydraulic cylinder inside the mould-closing group commands the knockout plate for extracting the moulded piece from the mould.

The injection group, which slides on two columns, is driven by two hydraulic cylinders. In addition to moving the injection group, they bring the nozzle into correct contact with the mould, avoiding alignment errors.

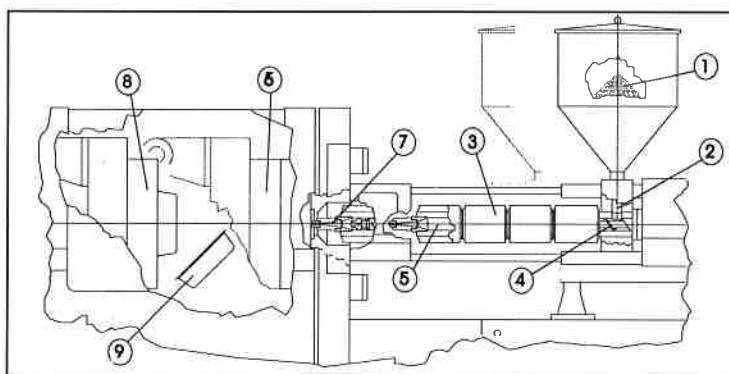
The moving parts of the press are lubricated by means of an automatic lubrication system.

Other machines can be connected to the injection-moulding machine (manipulator, loader, conveyor belt, etc.) to automate the process and reduce operator intervention.

2.1.1 - OPERATING PRINCIPLE

The purpose of the machine is to obtain products by injecting thermo-plastic material into the cavity of a mould.

The material to be processed is loaded into the feed hopper (1), enters by gravity into the plasticizer (2) and through the combined action of the heated barrel (3) and the rotation of the plasticizer screw (4) is melted and transported forward to the nozzle (5), ready to be injected into the mould.



The mould is closed (6) and the nozzle brought into contact with the mould (7), the material is injected, there is a cooling period to permit the material to solidify, the mould is opened (8) and the finished piece is expelled (9). The extracted piece may be removed either manually or by robot or simply be allowed to fall out by gravity.

Figure 2.1

2.1.2 - PRINCIPAL MACHINE GROUPS

The machine is composed of three mechanical groups—1) the base, 2) mould movement and 3) injection groups—and the hydraulic, lubricating, cooling, pneumatic and electrical systems.

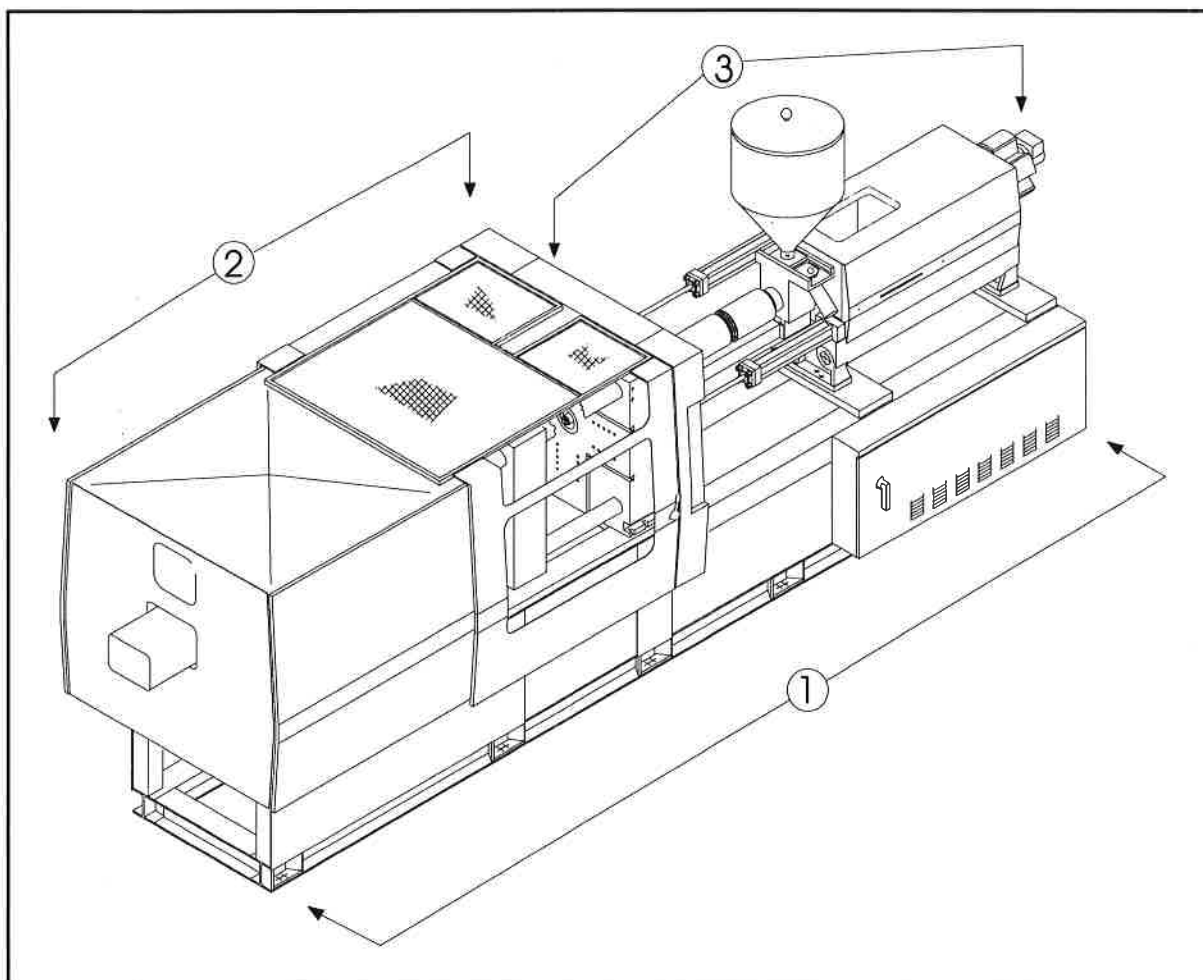


Figure 2.2

2.2 - TECHNICAL CHARACTERISTICS

Unyka 650

Screw diameter	85	mm
L/D ratio	21	
Specific pressure on material	1630	bars
Theoretical injection volume	2555	cm ³
Effective polystyrene injection capacity	2410	cm ³
Injection flow rate	550	cm ³ /sec
Plasticizing capacity	320	kg/h
Screw speed	0-200	rpm
Motor torque	4070	Nm
Heating power	39	kW
Heating zones	4	no.
Nozzle approach force	125	kN
Mould clamping force	6350	kN
Maximum moulding area	2600	cm ²
Distance between columns	920 x 800	mm
Moving platen stroke	900	mm
Mould thickness	300-900	mm
Mould dimensions	918x1230	mm
Hydraulic extractor force	123	kN
Hydraulic extractor stroke	300	mm
Empty cycle rate with maximum stroke	20	cycles/min
Power voltage (three-phase + N)	400	V
Power frequency	50	Hz
Motor power	75	kW
Total installed power	114	kW
Operating pressure	160	bars
Weight	32500	kg
Euromap designation	6500H/4165	EUROMAP
Overall dimensions (LxWxH)	8,87x2,1x2,55	m

2.2.1 GRAPH - SPECIFIC PRESSURE ON MATERIAL - THEORETICAL INJECTION VOLUME

Specific pressure on material

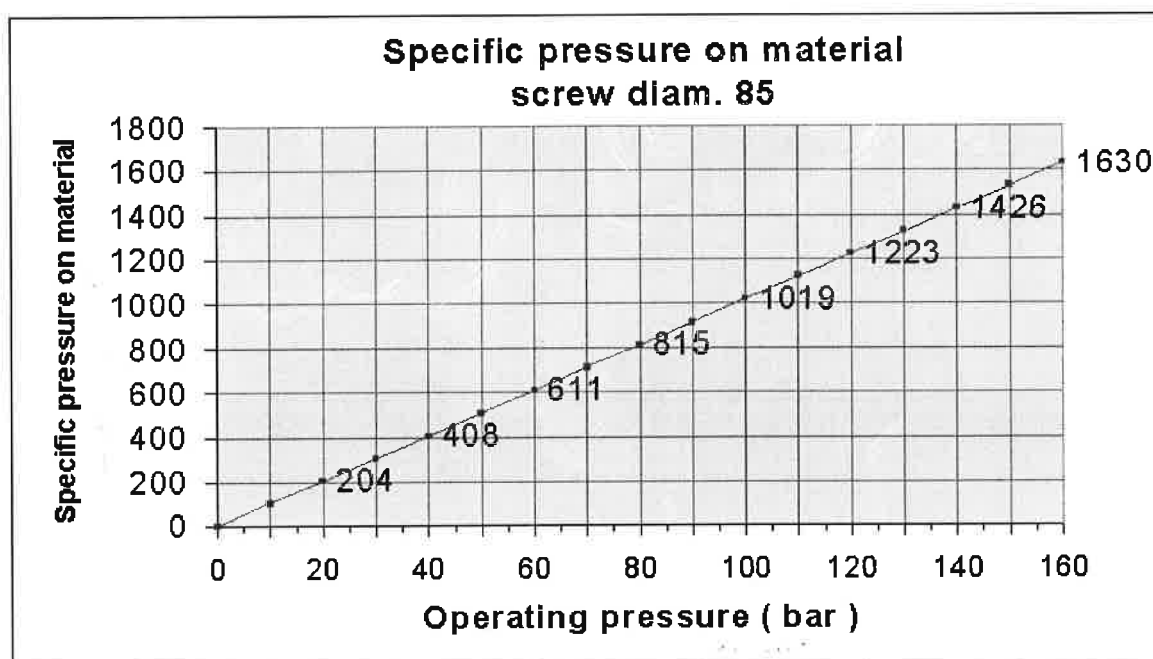


Table 2.1

Theoretical injection volume

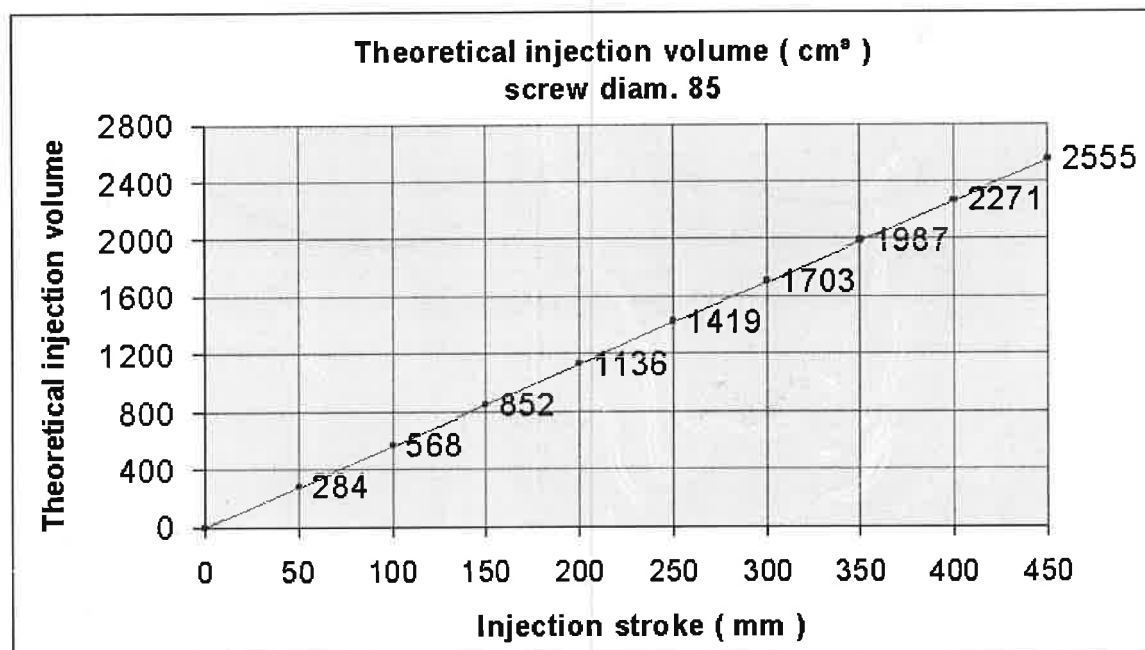
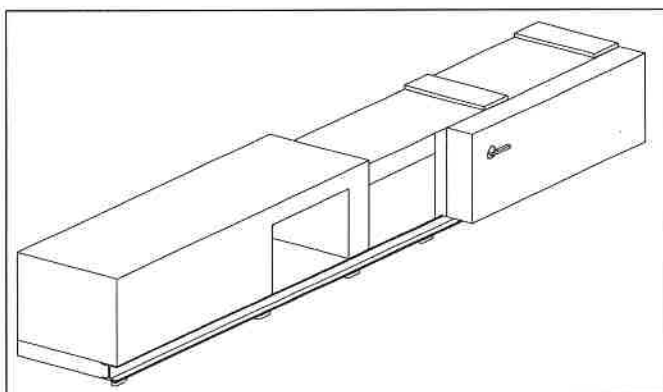


Table 2.2

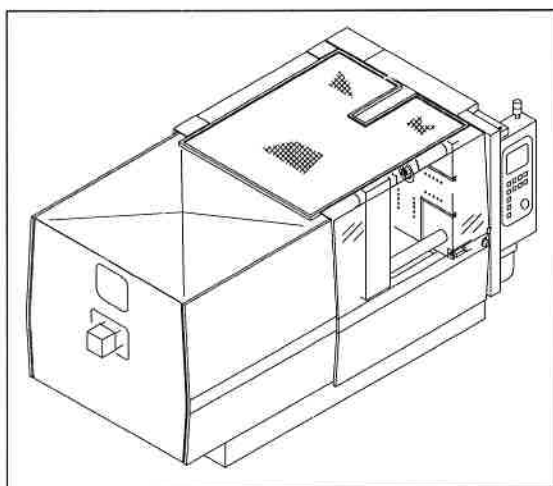
2.3 - BASE GROUP



The function of the base group is to support the other two groups, sustaining the stress of the weight and the vibrations developed by the other groups. It also houses the systems (electrical, hydraulic, etc.) necessary for machine operation.

Figure 2.3

2.4 - MOULD OPENING/CLOSING GROUP

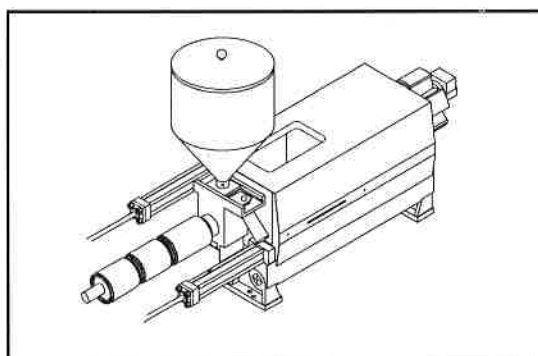


The opening/closing group is composed of a toggle system driven by a hydraulic cylinder. Its function is to close and clamp the mould to permit the injection of melted material and then open it to permit the extraction of the moulded piece.

A highly important part of this group is the extraction system, which depending on the mould may be a central extractor, auxiliary core pulls, air jets, electric or hydraulic motors for unscrewing or combinations of these devices.

Figure 2.4

2.5 - INJECTOR GROUP



The injector group is composed of the plasticizer, the material feed hopper, the injection cylinder, the screw drive motor and two hydraulic pistons that move it toward and away from the mould, since it is mounted on a sliding saddle attached to the base. Its function is to load the material in granular form, located in the feed hopper, into the plasticizer, plasticize it (i.e. melt and amalgamate the material and dye) and then inject it into the mould.

Figure 2.5

2.6 - HYDRAULIC SYSTEM

The hydraulic system is located primarily in the machine base and serves to generate the movements necessary for machine operation, utilizing fluid pressurized by a pump driven by an electric motor. These movements are performed by means of cylinders and hydraulic motors controlled by a system of solenoid valves and proportioning valves for regulating pressure and flow.

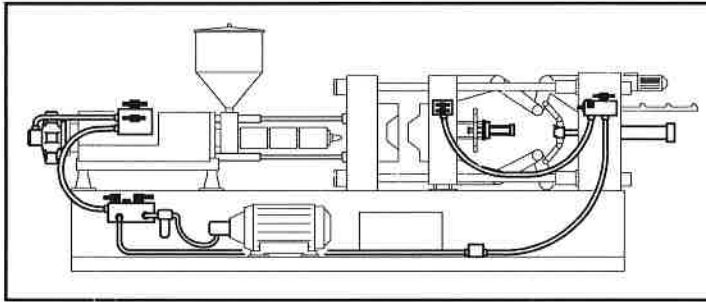


Figure 2.6

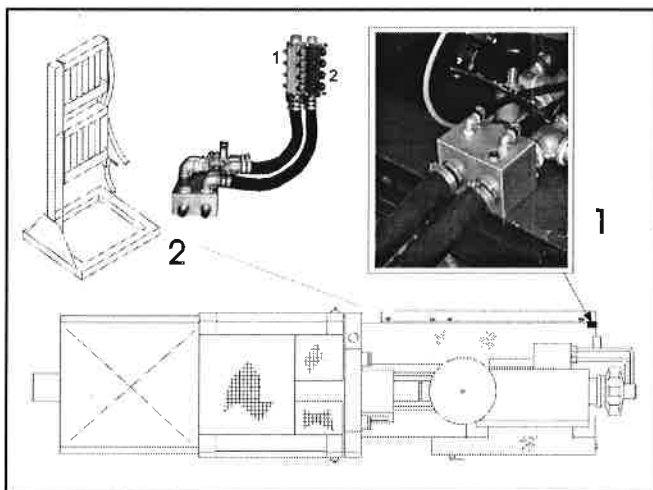
2.7 - LUBRICATION SYSTEM

The function of the lubrication system is to keep the mechanical moving parts lubricated (linkage of the mould opening/closing group, sliding guides, etc.). It is composed of a motor pump with a 3-liter reservoir, maximum flow rate 350 cm³/min at a pressure of 40 bars, safety pressure gauge, intake filter with a filtering capacity of 260 microns, rigid (copper-plated steel) and flexible (nylon) connection tubing and feed valves of 0.905, 0.10 and 0.5 cm³/min.

The lubrication system may be operated manually, by means of the pushbuttons on the control panel, or automatically at the machine cycle speed selected.

There are also grease points for manual lubrication for areas that do not require frequent lubrication.

2.8 - COOLING SYSTEM



The cooling system is divided into two groups: machine cooling (1) and mould cooling (2).

The function of machine cooling is to keep the hydraulic fluid at an optimal temperature, to prevent deterioration of the fluid and the hydraulic system components (seals, valves, etc.). This is accomplished by means of a heat-exchanger where the hydraulic fluid and water circulate in two adjacent but separate circuits.

Figure 2.7

The machine cooling system also includes the granular material feed zone between the feed hopper and the plasticizer, since high temperatures could cause the granules to aggregate and obstruct feeding to the plasticizer.

The function of mould cooling is to cool the material injected into the mould so that it can be extracted.

2.9 - PNEUMATIC SYSTEM

The pneumatic system is used solely for extraction (blowing system) in cases where the mould requires it, or for operating an automatic gate on the operator side, if installed.

2.10 - ELECTRICAL SYSTEM

The electrical system is divided into two main sections: command and control. The former manages the power actuators (motors, solenoid valves, plasticizer heating elements, etc.), while the latter directs the machine operating cycle, monitoring the state of the machine (with limit switches, transducers, etc.) and reacting to operator commands given through pushbuttons, selectors, etc.

The electrical system conforms to EN 60204-1 standards.

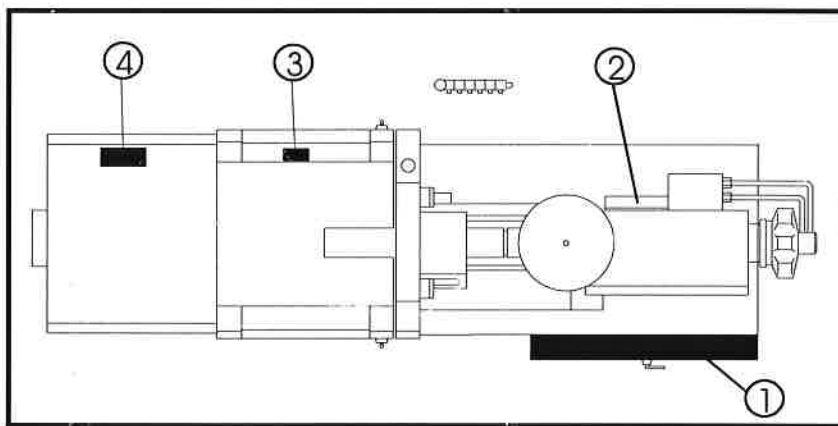


Figure 2.8

In the figure:

- 1) Electrical power box
- 2) Plasticizer heating element cable junction box
- 3) Extractor/jack cable junction box
- 4) Mould group cable junction box.

2.11 - CONTROL PANEL

The machine is equipped with a control panel ideally positioned to permit the manual movements of the machine.

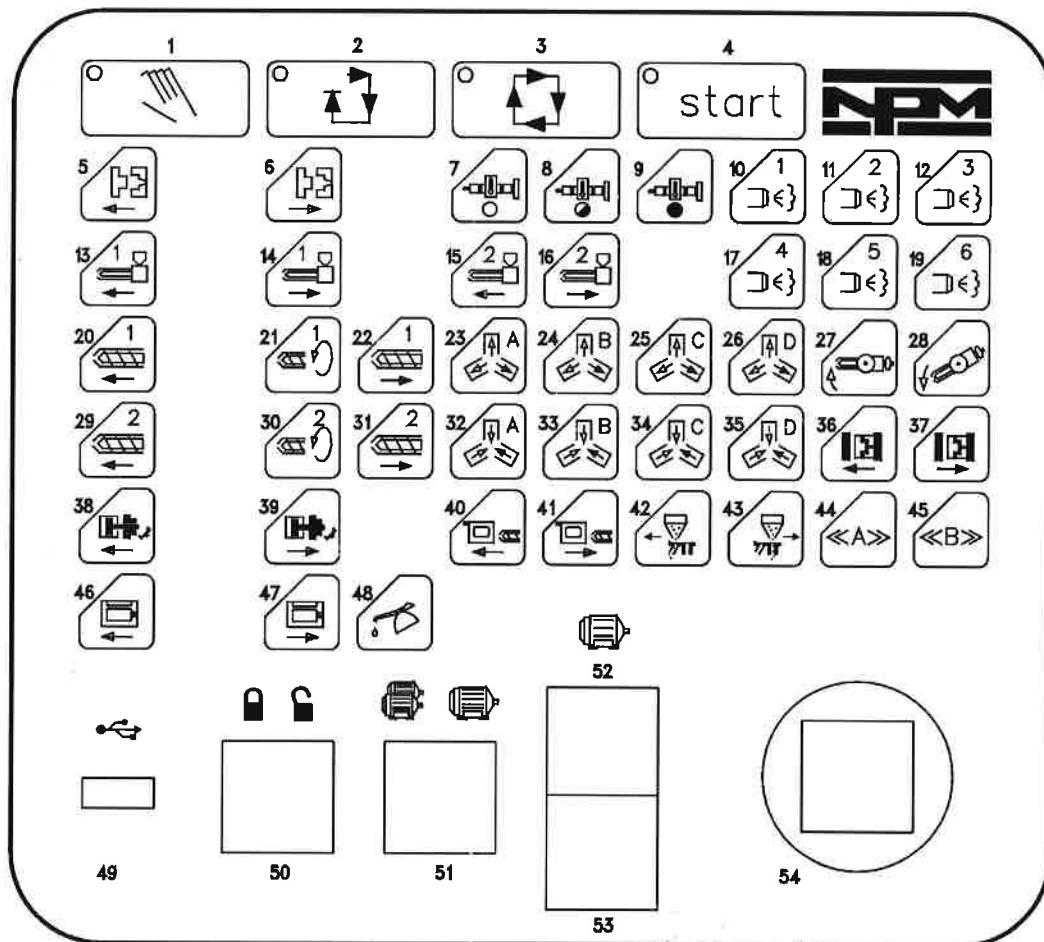


Figure 2.9

- 1 - Operating mode button: manual
- 2 - Operating mode button: semiautomatic
- 3 - Operating mode button: automatic
- 4 - START button for semiautomatic or automatic cycle
- 5 - Mould open button
- 6 - Mould close button
- 7 - Plasticizer heat button: off
- 8 - Plasticizer heat button: maintain
- 9 - Plasticizer heat button: on
- 10 - Air jet 1 button
- 11 - Air jet 2 button
- 12 - Air jet 3 button
- 13 - Saddle forward button
- 14 - Saddle back button
- 15 - Saddle forward button 2

-
- 16 - Saddle back button 2
 - 17 - Air jet 4 button
 - 18 - Air jet 5 button
 - 19 - Air jet 6 button
 - 20 - Injection button 1
 - 21 - Screw rotation button 1
 - 22 - Decompression button 1
 - 23 - Core pull "A" out button
 - 24 - Core pull "B" out button
 - 25 - Core pull "C" out button
 - 26 - Core pull "D" out button
 - 27 - Injection unit clockwise swivel button
 - 28 - Injection unit clockwise button
 - 29 - Injection button 2
 - 30 - Screw rotation button 2
 - 31 - Decompression button 2
 - 32 - Core pull "A" in button
 - 33 - Core pull "B" in button
 - 34 - Core pull "C" in button
 - 35 - Core pull "D" in button
 - 36 - Mould thickness increase button
 - 37 - Mould thickness decrease button
 - 38 - Central extract back button
 - 39 - Central extract forward button
 - 40 - Nozzle safety gate closing button
 - 41 - Nozzle safety gate opening button
 - 42 - Hopper in unloading position button
 - 43 - Hopper in working position button
 - 44 - Not used
 - 45 - Not used
 - 46 - Opening gate button
 - 47 - Closing gate button
 - 48 - Manual lubrication button (lights up when pushed)
 - 49 - USB Plug
 - 50 - Key selector for data input
 - 51 - One/two motors selector
 - 52 - Pump motor START button
 - 53 - Pump motor STOP button
 - 54 - Emergency STOP button

2.12 - STANDARDS - CERTIFICATIONS - LIMITATIONS - ERGONOMICS ECOLOGY

2.12.1 - TECHNICAL STANDARDS APPLIED

The following standards and documents were followed in designing and constructing this machine:

- 98/37/ EEC and subsequent amendments 91/368 - 93/44 - 93/68 - Machine Directive
- EN 292-1 Machine safety - Terminology, basic methodology
- EN 292-2 Machine safety - Specifications and technical principles
- EN 294 Machine safety - Safe distances to prevent upper limbs from reaching hazardous areas
- EN 60204-1 Machine safety - Electrical equipment of machines
- EN 201 Safety devices for machines for processing plastics
- prEN 563 Temperature of exposed surfaces - Ergonomic data to establish limit values for hot surfaces.

2.12.2 - CERTIFICATION OF MACHINE AND COMPONENTS

The certificate of conformity to existing standards is included among the technical documentation of the machine, as indicated on the plate applied to the machine.

2.12.3 - ENVIRONMENTAL OPERATING CONDITIONS

Nuova Plastic Metal S.r.l. guarantees that its machines will run properly with ambient temperatures between +10 and +40 C, with maximum relative humidity of 80% (without condensation) and protected from atmospheric agents.

If the machine is used in special environments (corrosive, for example), appropriate maintenance methods and timetables should be adopted to prevent deterioration of the machine.

2.12.4 - ATMOSPHERE WITH RISK OF EXPLOSION AND/OR FIRE

This machine should never be operated in an explosive atmosphere.

Users are therefore restricted from using the machine under this condition, even if only partially explosive.

2.12.5 - LIGHTING

The buyer must provide for proper lighting of the premises where the machine is installed, according to current standards.

In fact, with normal lighting it is easy to operate the machine safely, since both the control area (which includes the emergency button) and the working areas will be sufficiently illuminated.

During routine and special maintenance, the lighting must be bright enough to permit the

maintenance crew to perform their operations safely. Again in this case, the responsibility for providing adequate lighting is deferred to the user on the basis of current standards.

2.12.6 - VIBRATIONS

To avoid undesired movements and vibrations that could damage persons or property, the machine must be installed on properly adjusted vibration-damping supports (see chapter 4.4). If vibrations of a hazardous level occur despite this precaution, the machine must be stopped immediately and the problem reported to the technical assistance service (for address and phone/fax numbers, see the first page of this manual).

2.12.7 - NOISE

The level of acoustical pressure generated by the machine has been measured as follows:

- Weighted acoustical pressure A - off	72 dB
- Weighted acoustical pressure A - running	79 dB
- Weighted acoustical power A - running	92,3 dB

If the machine is installed in an environment with a noise level above 85 dB, the buyer must provide for all the means and devices for the personal protection of the operator.

2.12.8 - RESIDUES AND ENVIRONMENTAL CONTAMINATION

When using plastic materials that can generate gases that are toxic or harmful to the health, the buyer is responsible for informing the operators about the rules of conduct and equipping them with the protective measures necessary for handling these materials in conformity with local standards and existing EU directives. The same standards must be observed in disposing of the fluids and oils used in the machine.

2.12.9 - DEMOLITION OF THE MACHINE

Premise: since different requirements apply in the various countries, the procedures imposed by law and by competent agencies in each country must be observed.



WARNING

The machine must be demolished by specialized personnel, both electrical and mechanical. Before beginning disassembly, a space must be created around the machine large and orderly enough to ensure completely safety of movement.

- 1 - Disconnect the machine from the electric power and water systems.
- 2 - Disconnect all cables leading into the control panel.
- 3 - Close the water inlet valve to the cooling system and disconnect the delivery and return piping from the machine.
- 4 - Disconnect the machine from the compressed air system.



WARNING

When these operations have been completed, the area around the machine will be wet, so it is best to dry the floor before proceeding.

Follow this disassembly sequence:

- remove the electrical panel from the machine
- remove the principal parts of the machine (see chapter 2 section 2.1.2)
- sort the machine parts according to their material (e.g. ferrous metals, plastics, etc.) and forward them to the respective collection centres.

NOTE: comply with all the legal requirements in your country regarding the disposal of machinery.

3 - SAFETY AND ACCIDENT PREVENTION

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3.1 - GENERAL INFORMATION - USES - AREAS

3.1.1 - GENERAL INFORMATION

The employer must arrange for his personnel to be briefed on the risks of accidents, the devices intended to protect the operator, the risks from noise and the general accident prevention regulations envisaged by international directives and legislation in the country where the machine is installed.



WARNING

The content of this paragraph is intended as a safety condition for the operator, and anyone working on the machine must first have read and understood this information, as well as all the other information contained in this manual.

Plastic Metal S.p.A. declines all responsibility in the event of operations effected by the buyer or his delegates not in conformity with the indications contained in this manual.



CAUTION

The machine may be operated by unspecialized personnel, except for the adjustment of process parameters, which must be performed by qualified personnel.

Routine maintenance also requires qualified personnel familiar with electrical, hydraulic and mechanical problems.



WARNING

The clothing of persons operating the machine or performing maintenance must conform with the basic safety requirements in effect in your country. In general, the operator must wear safety shoes: loafers, clogs, slippers or other types of footwear that could limit mobility are not allowed.

For maintenance operations in areas where heat is emitted, heat- and fire-resistant gloves must be worn.

Other special measures concern bracelets, watches, rings and chains, which must not hang loosely or inhibit the movements of the operator. In any event, it is always better to avoid wearing such objects for maximum safety.

The work area must ALWAYS be free, so that nothing can interfere with the operator's freedom of movement. Assigned personnel must always have immediate access to the machine in the event of an emergency.

Access to this area is denied to persons who are not directly assigned to operation of the machine, so as to avoid hazards due to distractions or neglect during the execution of a task.

3.1.2 - USES: PROPER AND IMPROPER

The Plastic Metal injection-moulding machine should be used exclusively for injection-moulding thermoplastic materials. It must be operated within the limits specified in the technical characteristics (chapter 2.2).

Any other use must be considered improper, so Plastic Metal S.p.A. will decline all responsibility for any damage caused to persons or property and withdraw all forms of warranty on the machine itself.

3.1.3 - WORK, COMMAND AND SAFETY AREAS

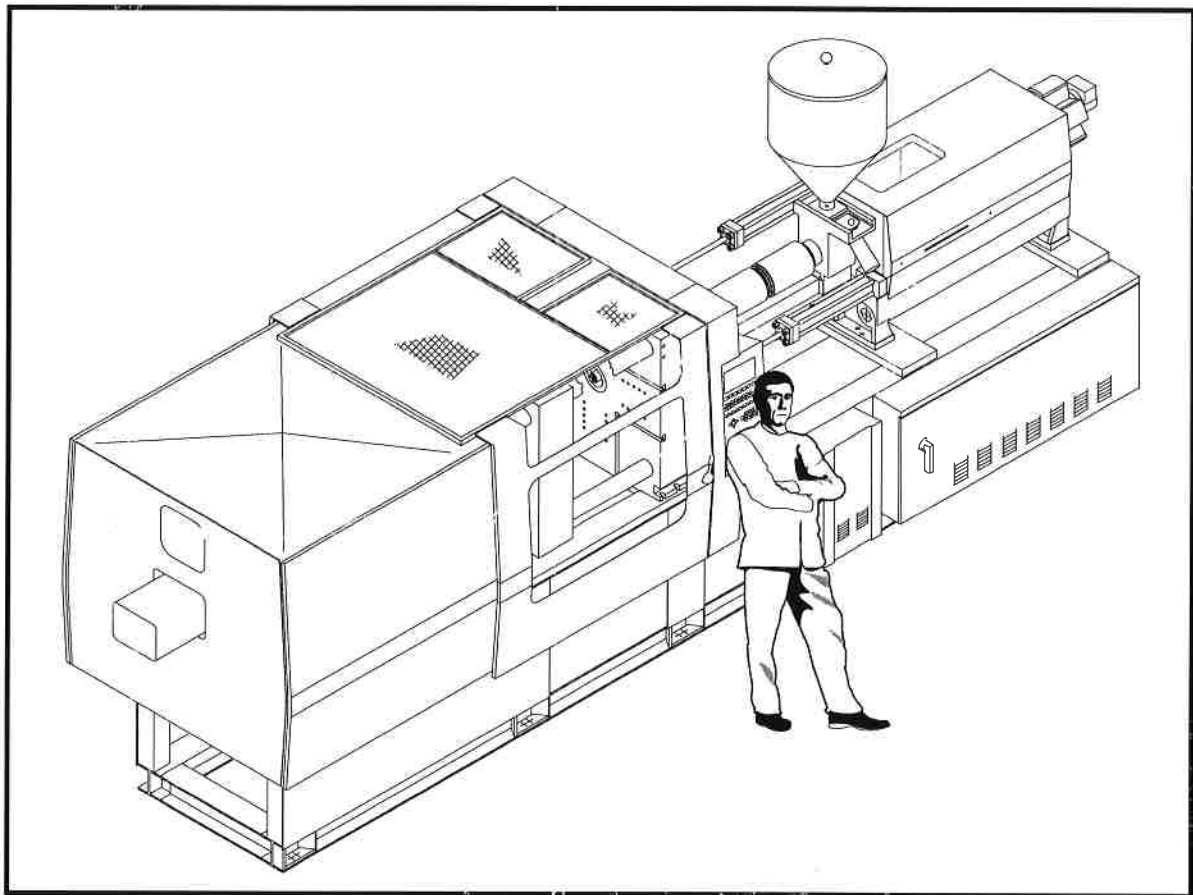


Figure 3.1

Work and command area

The correct area the operator must occupy when running the machine is in front of the pushbutton panel. From this area, in fact, he will have ready access to both the pushbutton panel and the control console.

From this area, he can also normally see the hazardous areas of the machine (mould opening/closing group, injection group) and can therefore intervene in emergencies.

Filling the feed hopper

To fill the feed hopper, the operator must use a ladder with a handrail, rest the bag of material on the ladder platform and pour in the granules with a scoop.



WARNING

The operation must be performed without leaning from the ladder and generally without assuming dangerous positions.

Not until the bag is practically empty may the operator lift it and pour the contents into the feed hopper.



CAUTION

When performing this operation, be careful not to let foreign objects fall into the feed hopper.

Material feed zone

In the discharge position, the feed hopper leaves the material feed throat uncovered.



WARNING

Do not effect injection, screw rotation or decompression operations under these conditions.

Should these operations become necessary to help the material to feed down, never introduce screwdrivers or other tools into the cavity.

Do not watch the screw movement directly through the feed opening. When necessary, use a mirror, for example, or other system that permits inspection while remaining in the safety area.

High-temperature areas

The plasticizer barrel zone is characterized by high temperatures during operation. When working in the immediate vicinity, therefore, the operator should take precautions to protect himself.



WARNING

When working in this area, always wear personal protection devices, such as heat-resistant gloves, safety glasses, etc.

Another area subject to overheating is the mould, because it absorbs the temperature of the material injected into it. Although there is no specific danger of burns, it is a good idea to wear protective gloves for handling moulded pieces or for mould maintenance operations.

Masses in motion

During the working cycle, some of the machine parts are in motion. More specifically, the

injection group may have to withdraw after each machine cycle.

**WARNING**

The operator must never stand near the injection group (behind the hydraulic motor) when the machine is running.

3.2 - RISKS, PROTECTION, WARNINGS AND CAUTION

3.2.1 - GENERAL SAFETY

The machine has been equipped with safety measures composed of fixed guards, movable guards, protective panels, microswitches and hydraulic and mechanical interlocks to ensure the health and safety of the exposed persons and prevent damage to the machine and the moulds.

**CAUTION**

Any tampering with these safety devices will release Plastic Metal S.p.A. from any civil or criminal liability.

If they must be deactivated (for maintenance operations or repairs, for example), personnel must work on the machine without electric power.

**CAUTION**

Remind the operator of the importance of checking these safety device frequently to ensure that they always work properly.

Operator-side gate

The front gate prevents access to the mould area.

As prescribed by European standard EN 201, the gate is equipped with an electrical safety circuit with two limit switches and a hydraulic circuit. When the gate is opened, this activates the limit switches, which interrupt the commands for hazardous movements (mould opening/closing, exit/withdrawing of the extractor, jacks, etc.) and trigger the mechanical safety interblock, and commands the safety hydraulic distributor which interrupts the flow of fluid to the closing chamber of the mould cylinder.

Rear gate

The gate also prevents access to the mould area but, unlike the front gate, it is only protected by two electrical limit switches which, when activated, immediately switch off the pump motor. Afterwards, when you have closed the gate, you must switch on the motor again to resume the cycle.

Nozzle protection

This device prevents access to the nozzle area and protects the operator from possible emission of melted plastic during the discharge phase.

When this protection is opened, the safety limit switch blocks the saddle-forward, injection and loading movements.

Power box

The door cannot be opened, and the electrical system accessed, unless the switch is in the "O" position (power-off condition).

Emergency button

The emergency stop device is a mushroom-head pushbutton located on the control panel, on the operator side; another is located on the fixed guard behind the stationary platen.

Pushing these emergency buttons directly shuts off power to the pump motor.

To resume the cycle after each stop, you must first release the emergency button twisting it to the left and at the same time pulling up) and then pressing the START button.

3.2.2 - RISKS IN THE AREA AROUND THE MACHINE

The following risks may be present in the area where the machine is installed:

-Floor: the surface where the vibration dampers rest must ensure proper long-term support and leveling for the machine.

-Temperature: the ambient temperature must be between +10 and +40 C; otherwise, there may be problems with cooling (motors and hydraulic system) or problems with the electronic control circuit.

-Materials: the presence of powder in the atmosphere may cause the outside seals to deteriorate faster; corrosive gases may attack unprotected exposed surfaces; the proximity of high-voltage lines may cause electromagnetic disturbances in the electronic equipment. All these factors may also be harmful to the health of exposed persons.

Regarding environments which are hazardous because of the type of processing (due to excessive noise, development of harmful gases, danger of explosions, etc.), the use should refer to the reference standards.



CAUTION

It is the buyer's responsibility to ensure that the premises are suitable so as to ensure the integrity of the machine. It is also the buyer's responsibility to equip the workplace and the operator with the means necessary to reduce the risks associated with the type of processing.

3.2.3 - RISKS ON THE MACHINE

As prescribed by EEC directive 98/37, the manufacturer has analyzed all the areas that present dangers inherent in the nature of the process or the structure of the machine.

Wherever possible, measures were taken to eliminate, or at least reduce, possible risks to exposed persons. We suggest that anyone cleared to run the machine study the following description carefully. It indicates the machine areas with residual hazards and the safety measures adopted.

High-risk areas and description of safety measures.

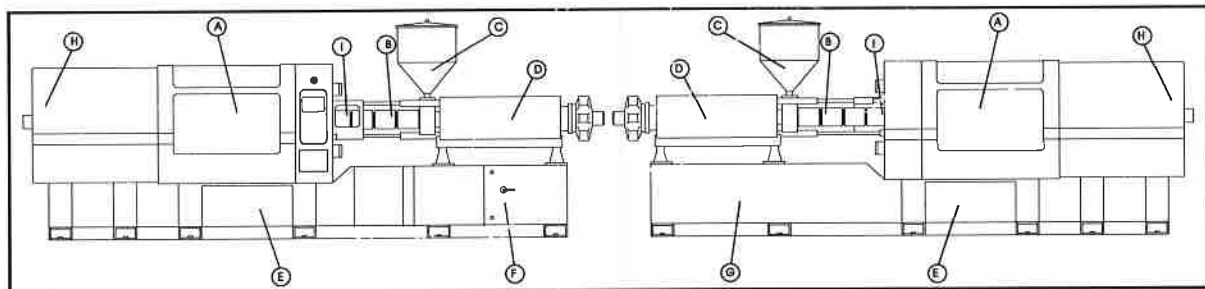


Figure 3.2

- **Mould area (A):** There is a risk of crushing because of the movements of the platens and the movable parts of the mould. The area is protected with movable gates and safety devices that inhibit dangerous movements when one of the gates is open, as set forth in standard EN 201.

- **Closing mechanism area (H):** Because of the structural nature of the toggle mechanism, there are crushing and shearing risks due to the rapid movement of toggle arms and platens. This area has been protected with stationary guards as prescribed by standards EN 294, WN 811, prEN 953 and WN 201.

- **Plasticizer area (B):** Due to the high temperatures necessary, despite the safety measures taken to insulate the heating elements and the plasticizer screw, there is still a risk of burns if the operator comes into contact with this area.

- **Feed area (C):** The feed area of the plasticizer presents the risk of crushing and shearing due to the movement of the plasticizer screw inside its barrel. Access to this area has been impeded by lengthening the feed throat and tapering it so that even if a hand is introduced it cannot reach the screw.

- **Screw movement area (D):** The area where motion is transmitted to the plasticizer screw presents risks of crushing and dragging. The area has been protected with stationary guards.

- **Electric system housing area (F):** The electrical equipment is housed in a box whose door can only be opened after turning the general switch to POWER OFF.

- **Injected piece discharge area (E):** This area presents risks of crushing because of moving part of the mould group and the fall of injected pieces. The area has been protected with stationary guards to limit access.

- **Hydraulic system housing area (G):** The area where most of the hydraulic system components are located (pump motor, filters, valves, accumulator, distributors and proportioning valves). The risk here is the spurting of fluid in the event of a rupture. It has been protected with a stationary guard, easily removable by means of thumb screws fastened to a stationary frame.

3.2.4 AREAS AND OPERATIONS OF RESIDUAL RISK

Residual risk operations are those that despite the safety measures adopted are still extremely hazardous. The following is a list of these dangers and the measure and precautions to adopt.

Residual risks are:

- **risk of slipping and falling when loading material into the feed hopper:** see paragraph 3.1.3.
- **static electricity when inspecting material in the feed hopper:** anyone performing such an inspection should wear a metallic armband connected to earth
- **high temperatures when inspecting or servicing the nozzle and plasticizer area:** maintenance personnel should wear heat-resistant gloves.
- **high temperatures of materials discharged from the plasticizer barrel:** maintenance personnel should wear heat-resistant gloves or use instruments (screwdriver, brass or copper rod, etc.) to remove material discharged from the plasticizer barrel
- **harmful gases when processing certain materials (PVC, HOSTAFORM, CA, etc.):** the machine should be equipped with exhaust fans.
- **risks of abrasions or lacerations when removing pieces manually from the mould during semiautomatic operation:** the operator should wear gloves and there should be a platform where he can move safely.

3.3 - GUARDS - ACCIDENT PREVENTION

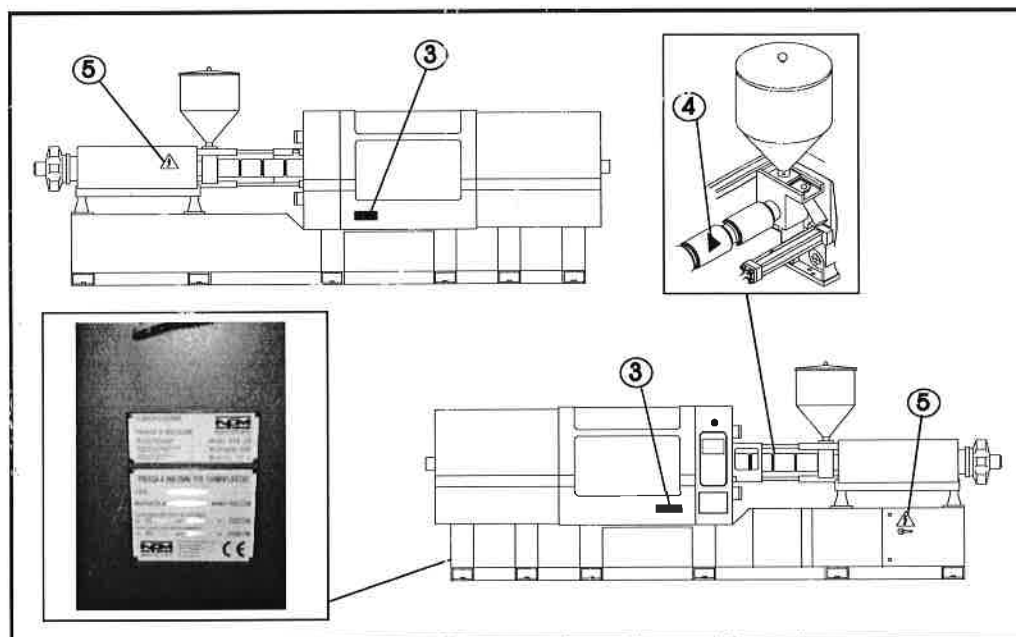


Figure 3.3

PRESSA A INIEZIONE PER TERMOPLASTICI					
TIPO	EUROMAP				
MATRICOLA		ANNO			
CARATTERISTICHE MOTORE ELETTRICO					
kW		Volt		A	Hz
CARATTERISTICHE RISCALDAMENTO					
kW		Volt		A	Hz
max A		massa kg			
		PLASTIC METAL SpA Via FRANCA N°6 38053 GAMBELLARA (VI) ITALY Tel. 0444/440320 Fax 0444/440844 www.plasticmetal.it			

The plates applied to the machine are:

1 - on the base, under the hydraulic motor:
identification of the machine in conformity with the provisions of EEC directive 98/37

Figure 3.4

LUBRIFICAZIONE		
PRESSE A INIEZIONE		
IMPIANTO OLEODINAMICO HYDRAULIC EQUIPMENT		Paxelo Raisoi Oil 3
IMPIANTO DI LUBRIFICAZIONE LUBRICATION SYSTEM		Pakelo Erolube EP C 220
PUNTI DI INGRASSAGGIO GREASING POINTS		Pakelo Bearing EP Grease 2

2 - on the base, under the hydraulic motor:
identification of the fluid, oil and grease used in the machine

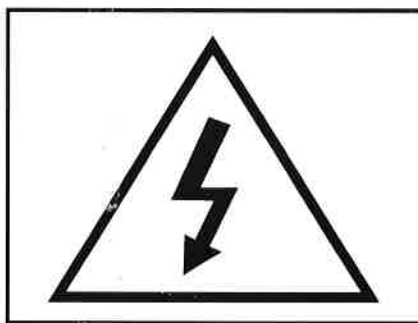
Figure 3.5

3 - on the movable guards, warning not to tamper with the safety devices of the movable guards: **WARNING ALL OUR MACHINES ARE EQUIPPED WITH SAFETY DEVICES AND ACCIDENT-PREVENTION GUARDS. WE RECOMMEND YOU AVOID TAMPERING WITH THE DEVICES AND OBSERVE SAFETY STANDARDS DURING OPERATION.**



4 - on the plasticizing barrel: warning of danger due to high temperatures, in accordance with ISO 7000 standards.

Figure 3.6



5 - on the doors of the electrical box and the junction boxes of the electric cables: danger - electric power.

Figure 3.7



CAUTION

It is absolutely forbidden to remove the stationary and movable guards, tamper with or neutralize the safety devices. If such alterations are discovered, Plastic Metal will decline all responsibility for machine safety.

4 - INSTALLATION

CONTENTS

4.1 - Packing, handling and transport	4 - 2
4.2 - Site selection and pre-installation verification	4 - 3
4.3 - Pre-installation procedures	4 - 4
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4.1 - PACKING, HANDLING AND TRANSPORT

According to the cases, the machine may be shipped:

- without packing by truck, suitably blocked and covered
- in a wooden case, blocked on a platform, with protective packing
- in a container, blocked on a platform, with protective packing

NOTE: When the machine arrives, ensure the packing is undamaged and that it has suffered no damage during shipment and has not been intentionally opened to steal the parts inside.

Make sure the shipment corresponds to order specifications. In the event you discover damage or missing parts, this should be reported immediately in detail to the forwarding agent and to Plastic Metal.



WARNING

The handling and unloading of the machine must be performed only by authorized npm staff. This operation should be performed by trained personnel (forklift operators, crane operators, etc.). When the dimensions of the load do not permit sufficient visibility, a person should be stationed on the floor to give signals.

In no instance is the personnel authorized to pass under or near to the load (DPR 547/55 Article 228).

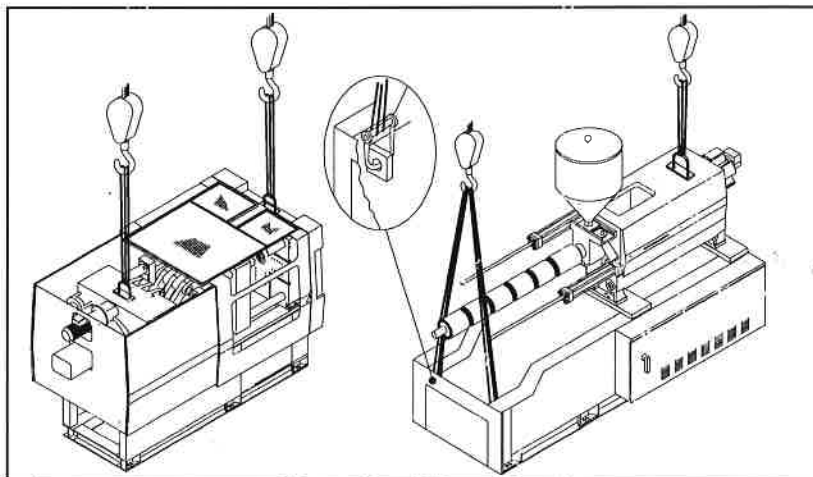
Plastic Metal makes it qualified personnel available to perform all the operations of installing and preparing the machines.



CAUTION

Before performing any operation, ensure that the crane and available equipment have sufficient weight ratings to ensure the hoisting and handling in total safety.

The machine should be hoisted and positioned as shown in figure 4.1, observing the following rules:



- 1) use hoisting cables with a proper weight rating (see section 2.2 - Technical Characteristics - for the machine weight);
- 2) attach the cables only in the places shown
- 3) raise the machine slowly so that any imbalance can be corrected immediately.

Figure 4.1

**WARNING**

Bars that are too long or too thin could bend, creating hazardous situations for machine and operators. We also recommend you not use cables so short that they not only interfere with the protective panels but also cause the hoisting angle to increase and thus increase tension on the cable.

Unpacking

To unpack the machine, proceed as follows:

- open the packing protecting the machine and remove any covers.
- remove any pieces shipped separately
- free the machine from the blocks
- remove the machine.

**CAUTION**

If the machine is not used for a long period of time, apply rust-proofing to its unpainted metallic parts, ensure there is no water in the cooling system that could freeze and disconnect the power cables.

NOTE: The recipient shall be responsible for disposing of packing materials, in conformity with the regulations in effect in the country where the machine is installed.

4.2 - SITE SELECTION AND PRE-INSTALLATION VERIFICATION

For the machine to be properly installed, the floor supporting it should be of reinforced concrete with sufficient load capacity.

The machine may be installed with a suitable vibration-damping support beneath each contact point.

The machine should also have minimum free space around it for safe operation and to facilitate maintenance (figure 4.2 indicates the minimum recommended distances).

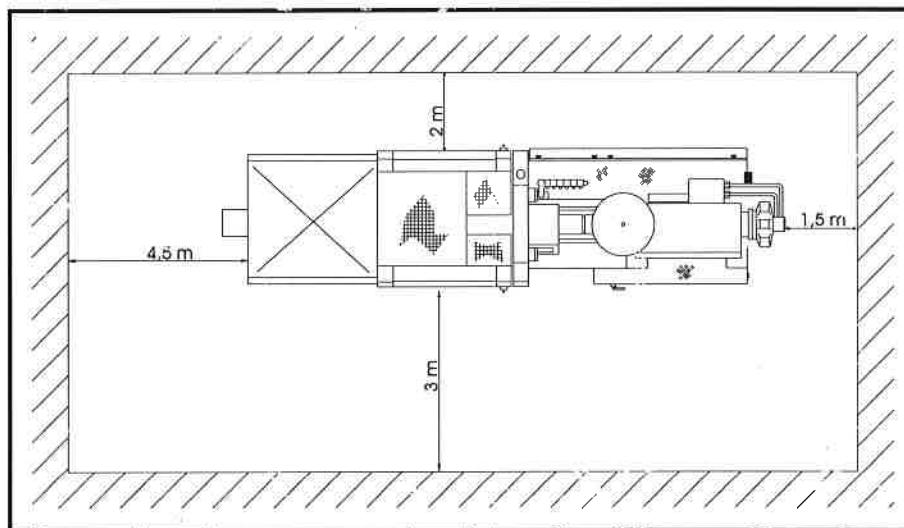


Figure 4.2

4.3 - PRE-INSTALLATION PROCEDURES

Before the machine can be started up, a suitable environment must be created with the following characteristics:

- floor level, smooth and antislip
- lighting in conformity with existing standards
- electrical system earthed (grounded) in accordance with CEI standard 64-8
- electrical system in conformity with EN standard 73-23; connection provided with differential circuit-breaker with the following characteristics:
 - Voltage 3/N/PE AC 50Hz 400V +/- 10%
 - Current 250 A
- cooling water system, average consumption 3 m³/h at 8 C
- pneumatic system

The locations of the various utility inputs are shown in the figure.

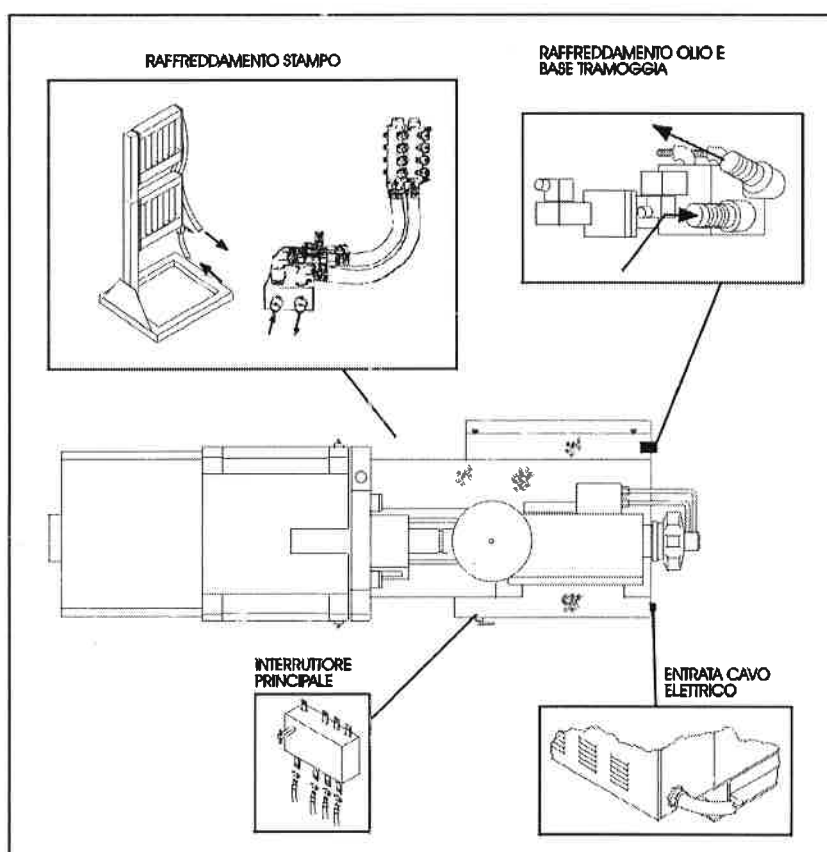


Figure 4.3

4.4 - INSTALLATION

Positioning the vibration-dampers

To prevent the machine from shifting hazardously, vibration-damping supports must be mounted on it (18 with a total capacity of 72000 kg and diameter of 225 mm).

For installation, proceed as follows:

- loosen the locknuts (2) on the adjustment screws (1) in the machine base
- raise the machine slightly and position a vibration-damping support under each screw (3)
- rest the machine and tighten the adjustment screws until they come into contact with the vibration-damper.

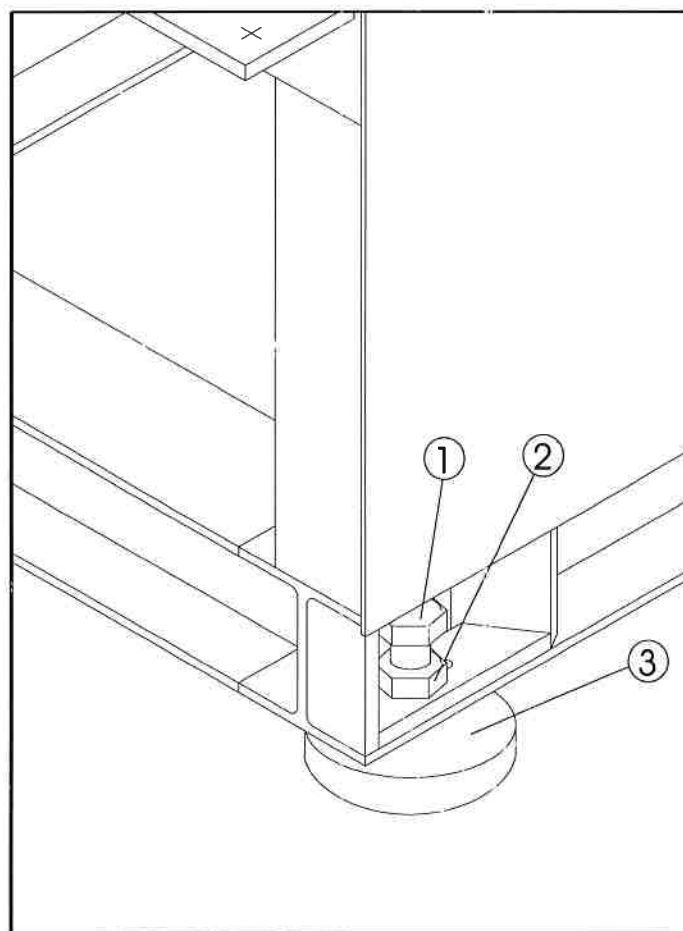


Figure 4.4

Leveling

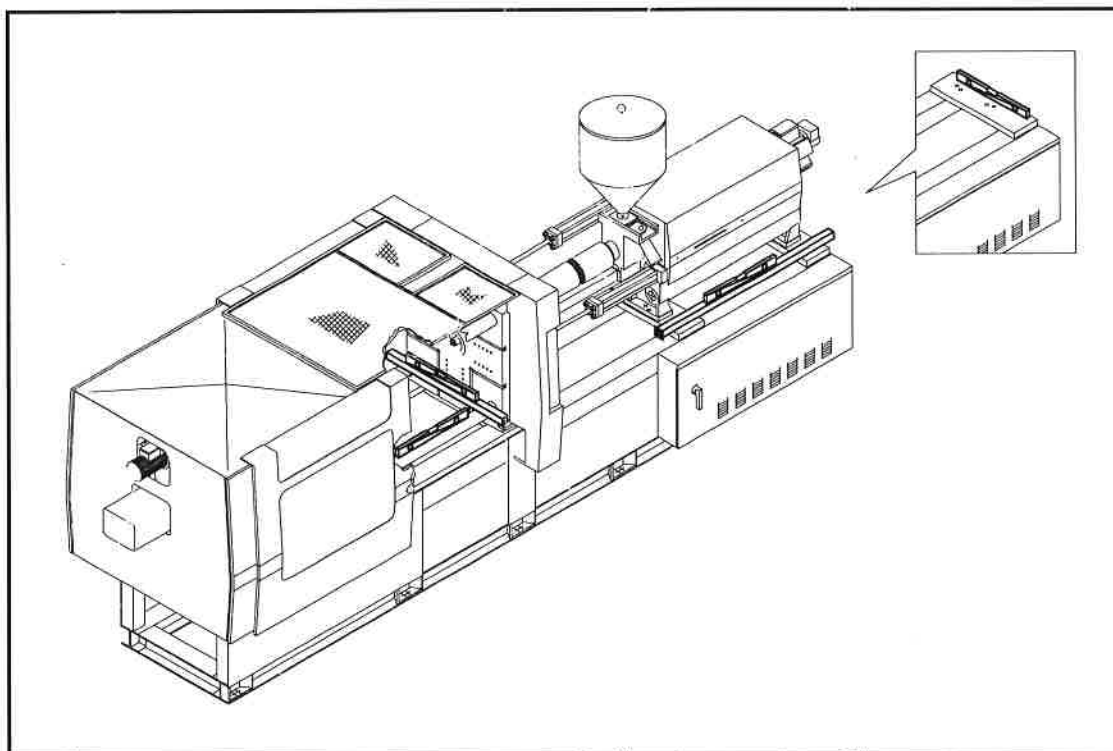


Figure 4.5

The purpose of this operation is to ensure that the moving parts of the machine operate on parallel planes, thus avoiding friction that could compromise their movement.

The level should be checked with a bubble-level both horizontally and transversely on the slide columns (figure 4.5).

The level is adjusted by means of the adjustment screws at the anchor points of the machine (figure 4.4) until the horizontal error is less than 0.02 cm per meter.

Ensure that all the bearing points are loaded as uniformly as possible.

NOTE: the manufacturer will respect the warranty only if the machine has been correctly leveled and the leveling periodically controlled

4.4.1 - CLEANING THE MACHINE

Once installation is completed, carefully clean the protective substance off all the chrome-plated parts (columns, cylinders, etc.) with the help of a solvent (carbon tetrachloride or gasoline) and lubricate.

To clean the machine, you should:

- place the machine in manual mode
- select the Mount Moulds function and bring the mould halves together without clamping
- draw back the injection group
- witch off the motor

-
- switch off the plasticizer heating and allow the temperature to drop below 50 C
 - turn off the main switch
 - proceed with cleaning as described below.

**WARNING**

The following dangers are encountered during these operations:

- falling
- inhaling cleaning solvents
- collision with protruding objects
- flying impurities due to the use of compressed air

Cleaning the mould-closing group

This purpose of this operation is to remove excess lubricant from the various points of the toggle mechanism and oil collectors:

- remove the stationary guards from the mould-closing group (toggle and mould thickness adjustment mechanisms)
 - remove all oil deposits and any moulded pieces or sprues in the area
 - empty the oil collection cup
 - clean the mechanical groups with non-aggressive solvents
- Be particularly careful not to damage the electrical devices.

Cleaning the injection group

Using compressed air, blow away the granules of material that have fallen in this area, beginning at the top, and clean with a non-aggressive solvent.

Cleaning the feed hopper

Make sure the hopper bears no traces of dye; if so, clean with alcohol.

Cleaning the base

Use the most suitable means to remove the dust and dirt caused by machine installation.

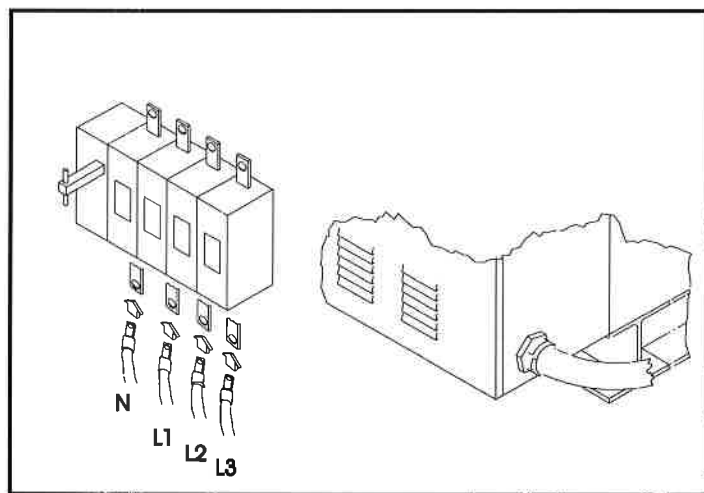
External cleaning

Remove accumulated dust from the machine panels.

4.5 - UTILITY CONNECTIONS

4.5.1 - ELECTRIC POWER CONNECTION

Connect the power cable, which must consist of five conductors of the property cross sectional area (see table 4.1), inserting it in the opening provided on the right side of the machine (figure 4.6) and connecting it to the terminals on the selector.

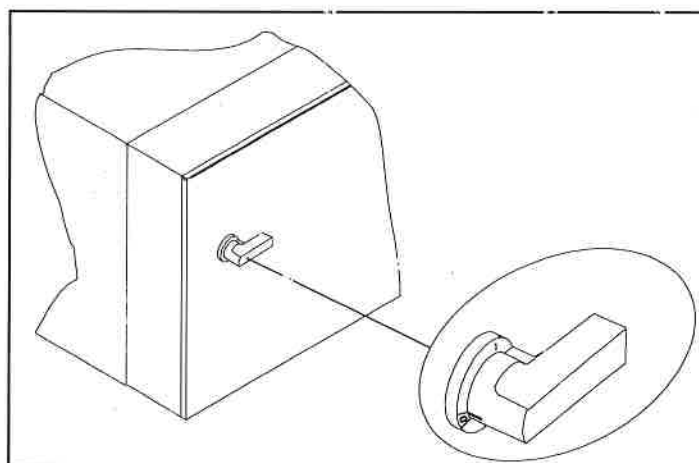


The machine must be connected to the mains in compliance with the standards in effect in the buyer's country.

Figure 4.6

Power cable cross section (machine)		
L1 - L2 - L3	N	PE
2 x 50 mm ²	50 mm ²	2 x 50 mm ²

Table 4.1



WARNING

When connecting the machine, there must be **NO POWER** to the power box on the machine (1 figure 4.7 in position 0).

Figure 4.7

4.5.2 - COMPRESSED AIR CONNECTION

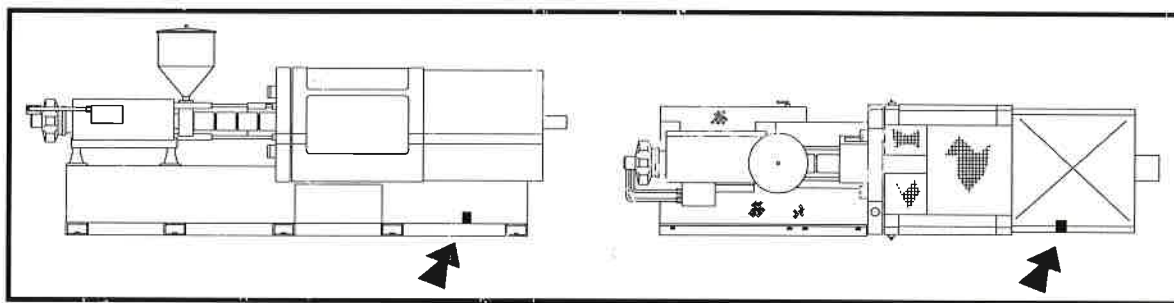
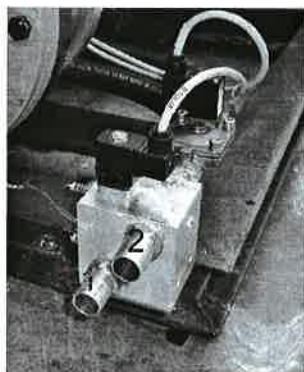


Figure 4.8

Connect the compressed air at the point indicated in figure 4.8 by means of a rapid disconnect. The circuit pressure must be at least 8 bars.

4.5.3 - COOLING GROUP CONNECTION



The machine has two cooling systems, one for the hydraulic fluid and feed hopper base, the other for the mould.

Connect the outside cooling system to the two units on the machine, using rubber tubing secured with metal clamps:

Hydraulic fluid and feed hopper cooling:

- 1 - Main discharge (1" clamp for 30 mm diameter tubing)
- 2 - Main delivery (1" clamp for 30 mm diameter tubing)

Figure 4.9

Mould cooling:

- 1 - Delivery adjustment taps
- 2 - Discharge adjustment taps
- 3 - Thermometers
- 4 - Main discharge (3/4" clamp for 20 mm diameter tubing)
- 5 - Main delivery (3/4" clamp for 20 mm diameter tubing)
- 6 - Main delivery (1 1/2" clamp for 40 mm diameter tubing)
- 7 - Main discharge (1 1/2" clamp for 40 mm diameter tubing)

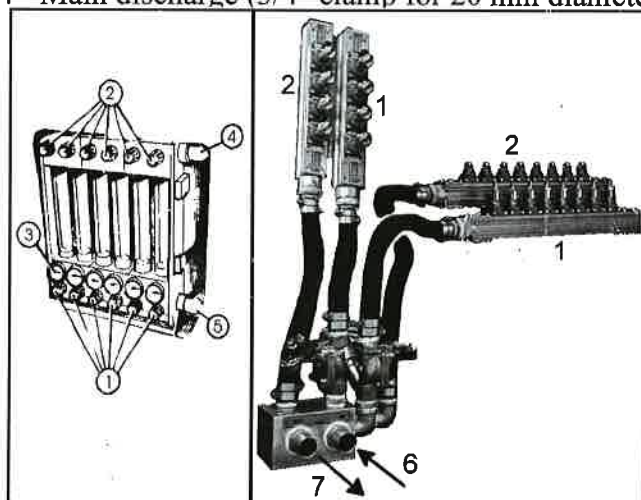
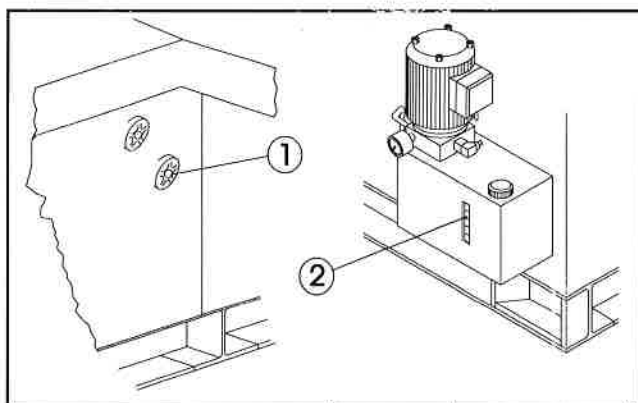


Figure 4.10

Total average water consumption: 3 m³/h at 8 C.

4.5.4 - FILLING THE HYDRAULIC SYSTEM



Check the level of hydraulic and lubricating oil

Figure 4.11

Fill the reservoir, if necessary, referring to the table below for the quantity and type of fluid and oil recommended.

OIL HYDRAULIC								
Quantity (Kg)	Symbol ISO	MOBIL	ESSO	AGIP	BP	CASTROL	IP	TOTAL
675	HM46	DTE25	NUTO H46	OSO46	ENERGOL HPL46	HYSPIN ASW46	HIDRUS 46	AZOLLA 46

Table 4.2

LUBRICATING OIL								
Quantity (Kg)	ISO Symbol	MOBIL	ESSO	AGIP	BP	CASTROL	IP	TOTAL
3	G220	MOBIL GEAR 630	SPARTAN EP 220	EXIDIA 220	MACCURAT 220	MAGNA CF 220	BANTIA 220	DROSELA MS 220

Table 4.3

The contamination level recommended for the fluid and oil to use in Plastic Metal presses must be below NAS class 9, corresponding to ISO class from 17/11 to 17/14 filtered to 12 microns.

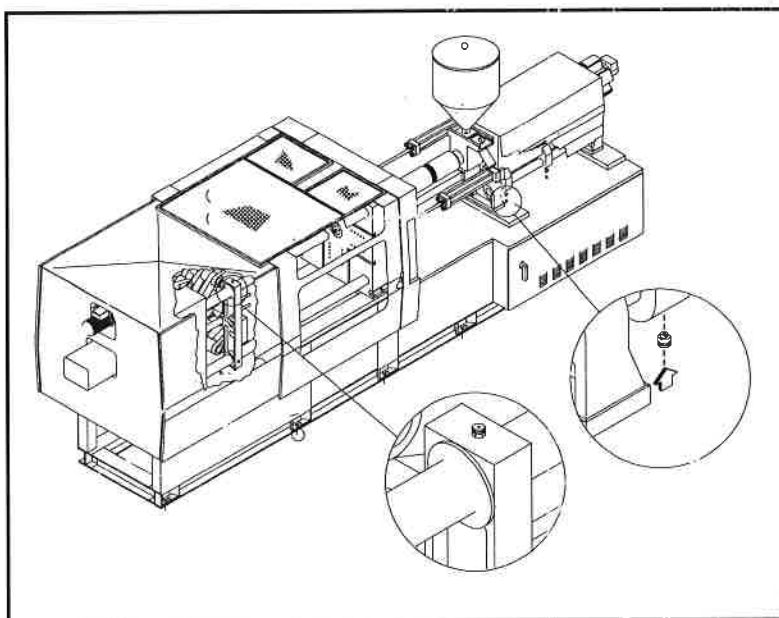


CAUTION

It is important to note that the oil contained in normal barrels, even if they are sealed, is contaminated and thus unsuitable for direct use in the machine. It must therefore be filtered with a pump mounting a 12-micron filter before transfer into the reservoir of the machine.

Remove the oil fill plug on the rear of the injection group, fill the reservoir until the level reaches the transparent indicator and top off after putting the machine through all its movements (opening, closing, injection, charging, decompression, etc.).

4.5.5 - LUBRICATION BEFORE FIRST STARTUP



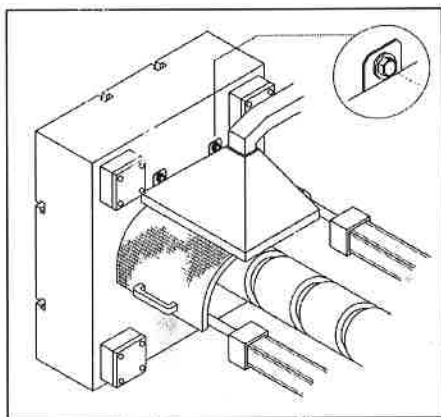
Normally the machine is shipped with components already lubricated.

The buyer should still take the precaution of lubricating these components. Inject grease with a manual pump at the points where grease nipples are located (in the column cross support, at the four columns and on the four guide rings of the injection group).

Figure 4.12

4.6 - TESTING AND INSPECTION BEFORE STARTUP

4.6.1 - AIR EXHAUST SYSTEM



In compliance with current regulations, the user must provide for the elimination of any harmful vapours generated in the moulding process, particularly during dumping operations.

The buyer is responsible for installing and using an air exhaust system.

Figure 4.13

4.7 - DEGASSING GROUP

When using materials like metacrylics, devices for exhausting the gases produced during plasticizing should be provided.

To resolve this problem, the plasticizer barrel should be replaced with one having an opening for exhausting these gases (for barrel replacement, see paragraph 5.13).



CAUTION

The user must provide for an exhaust unit near this opening to keep the operator from inhaling the harmful gases produced.

5 - STARTUP

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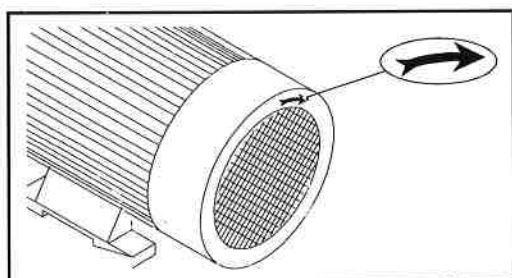
5.1 - PRE-STARTUP PROCEDURES

It is extremely important, before starting up the machine, to perform a series of preliminary procedures to prevent errors and accidents in the machine startup phase. You should also have already performed the operations described in Chapter 4.

Proceed as follows:

- make sure all the cables are connected to the proper terminals and that the connectors are inserted
- turn off the main switch and open the power box door.
- connect up the power leads and measure the voltage on the input terminals of the main switch to ensure that it is within 10% of the rated value
- close the power box door
- open the front and rear panels of the control console and ensure that the electronic boards are securely inserted in their connectors
- check the hydraulic fluid level through the inspection window in the reservoir and top off if necessary
- in the same way check the level of lubricating oil at the motor pump. If the level drops below minimum, top off with fresh oil.

5.1.1 - DIRECTION OF MOTOR ROTATION



WARNING

To check the rotation direction of the motor, it is not necessary to remove the guards. A plate mounted on the motor has an arrow indicating the proper direction of rotation, which can be checked through the grille on the rear of the motor (fan side).

Figure 5.1

To check the direction, proceed as follows:

- turn on the main switch
- press the START button (52 in figure 2.9) and then immediately press the emergency stop button (53 in figure 2.9)
- while the motor is slowing down, check whether the direction of rotation corresponds to the indication on the motor.

If the motor does not revolve properly, proceed as follows:

- turn off the main switch
- turn off the mains power (this is the circuit installed by the user to provide power to the machine from the plant power system)
- make sure there is no voltage at the main switch
- loosen the terminals and invert two of the three power cables on the main switch in the power box
- secure the terminals

- restore mains power and return the main switch to operation.



CAUTION

It is well to point out that if the pumps coupled to the electric motor were to operate in the opposite direction, or without oil, they would wear out almost immediately.

Also check after the first startup that there are no fluid leaks from the hydraulic system.

5.1.1.1 -PREPARING THE HYDRAULIC SYSTEM

Before starting up the hydraulic system, open the valves of the pressure gauges and make sure that when the machine is operated manually the gauges indicate a maximum pressure value equal to the machine's rated value (see Chap. 2.2 - Technical Characteristics).

NOTE: The hydraulic system is designed with a three-way adjustment. The hydraulic compensation system ensures that there is a constant pressure step upstream and downstream from the flow regulator. The machine movements are therefore executed at the pressure value necessary to obtain the speed specified.

The pressure will rise to the maximum specified value at the end-stop of the various movements, unless they are interrupted by the electronic control system. Example: the maximum pressure value is read when the nozzle is in contact with the mould.

5.1.2 - NOZZLE: SELECTION AND INSTALLATION

Depending on the mechanical structure of the mould and the type of material being moulded, you must select and install the most suitable type of nozzle, particularly with regard to the figure:

- only the nozzle tip (1)
- only the nozzle
- both.

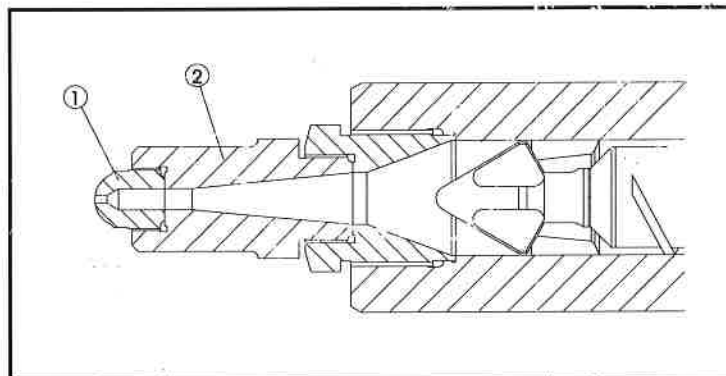


Figure 5.2



WARNING

Remember the hazards the operator is exposed to during this operation:

- risk of burns due to the temperatures in the plasticizer barrel area
- risk of spurts of melted plastic.

Therefore each operation should be performed by trained personnel wearing heat-resistant gloves.

The nozzle should be installed with the plasticizer barrel at working temperature.

To install the new nozzle you must first remove the one normally supplied with the machine:

- draw the saddle group back completely
- remove the nozzle by unscrewing it with the tool provided
- carefully clean the threads on the plasticizer barrel fitting, particularly the seal surface inside the fitting.

Install the nozzle as follows:

- carefully clean the threads and lubricate the nozzle with heat-resistant grease (type AGT/7HT)
- screw the nozzle in manually
- before tightening it, wait until it has reached a temperature close to that of the plasticizer barrel
- tighten fully using the tool
- if necessary, mount the heating element, plug in the connector and turn on the nozzle heater.

5.1.3 - PLASTICIZER: PRODUCTION CHANGEOVER

Depending on the desired production, it may be necessary to replace the plasticizer screw (1).

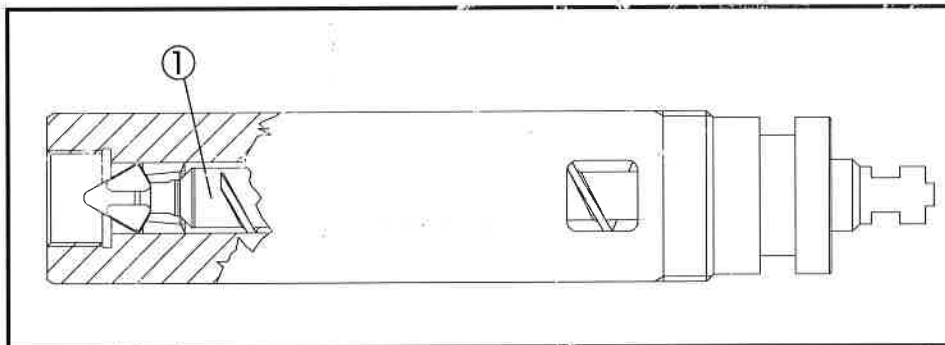


Figure 5.3



WARNING

The indications provided in the preceding paragraph regarding the hazards caused by high temperatures and the risk of spurting melted plastic also apply here. In addition, there is the additional risk of the weight of the plasticizer screw, which requires the use of proper equipment for hoisting and handling.

Replacing valve and check-valve

Before removing the valve and check-valve, which must be performed with the plasticizer at operating temperature, you should feed in and plasticize a certain amount of self-cleaning material (or polyethylene) to facilitate the cleaning of the plasticizer barrel.

Proceed as follows:

- a) select decompression and draw the screw all the way back
- b) move the saddle group back to the stop
- c) remove the nozzle and the stationary guard on the injection head
- d) remove the flange securing the rear end of the screw to the injection cylinder
- e) after disabling the saddle return, command a total injection and, with the decompression switched on, move the injection cylinder completely back
- f) grasp the rear end of the screw manually and, after removing the key, push it forward until it is partially outside the plasticizer barrel
- g) in this position, hold the screw firm and twist the check-valve clockwise until it is completely unscrewed.

Before replacing the check-valve, be sure to clean the threads and grease them with type AGT/7HT grease.

To reposition the plasticizer screw, first push it to the back, carefully centering the valve ring, and then insert the key and replace the blocking flange.

Replacing the plasticizer screw

If you have to replace the screw, first draw it partially out of the plasticizer barrel as described in point a) to f) then proceed as follows to extract the screw entirely:

- h) remove the screws securing the saddle to the base, except for the rotation pin
- i) remove the screws securing the saddle jack flanges
- j) press the SADDLE FORWARD button to reinsert the jack rods
- k) turn the injection group by pulling slowly on a cord tied to the lower jack until the screw can be completely extracted.

Reinstall everything proceeding in reverse order but without replacing the screws on the saddle: first you must be sure that the nozzle is aligned with the machine axis and centered on the mould. To do this, first remove the mould-half on the stationary platen and then:

- advance the saddle until the nozzle is almost touching the stationary platen inside the machine
- using a caliper measure to make sure the nozzle is centered on the centering hole of the stationary platen
- if necessary, loosen the locknuts securing the adjustment dowels to the sliding column supports of the injection head and adjust the dowels until the nozzle is centered
- tighten the locknuts and check the nozzle again for centering
- back off the injection group.

5.1.4 - MOULD: INSPECTION AND INSTALLATION

This operation must be performed by the maintenance personnel of the buyer, who assumes full responsibility for it.



WARNING

WARNING
The pump motor must absolutely be stopped whenever you are working inside the platens of the machine.



CAUTION

The mould installation procedure must be performed on manual cycle, selecting the function on the control panel that limits the mould opening/closing speed. It is also advisable to reduce the closing and extracting pressures.

To install the mould, refer to the technical characteristics regarding the dimensions and strokes of the opening/closing group and the extractor characteristics.

Use figure 5.4 to check the position and dimensions of the mould mounting points to the stationary and moving platens and the centering and extraction holes.

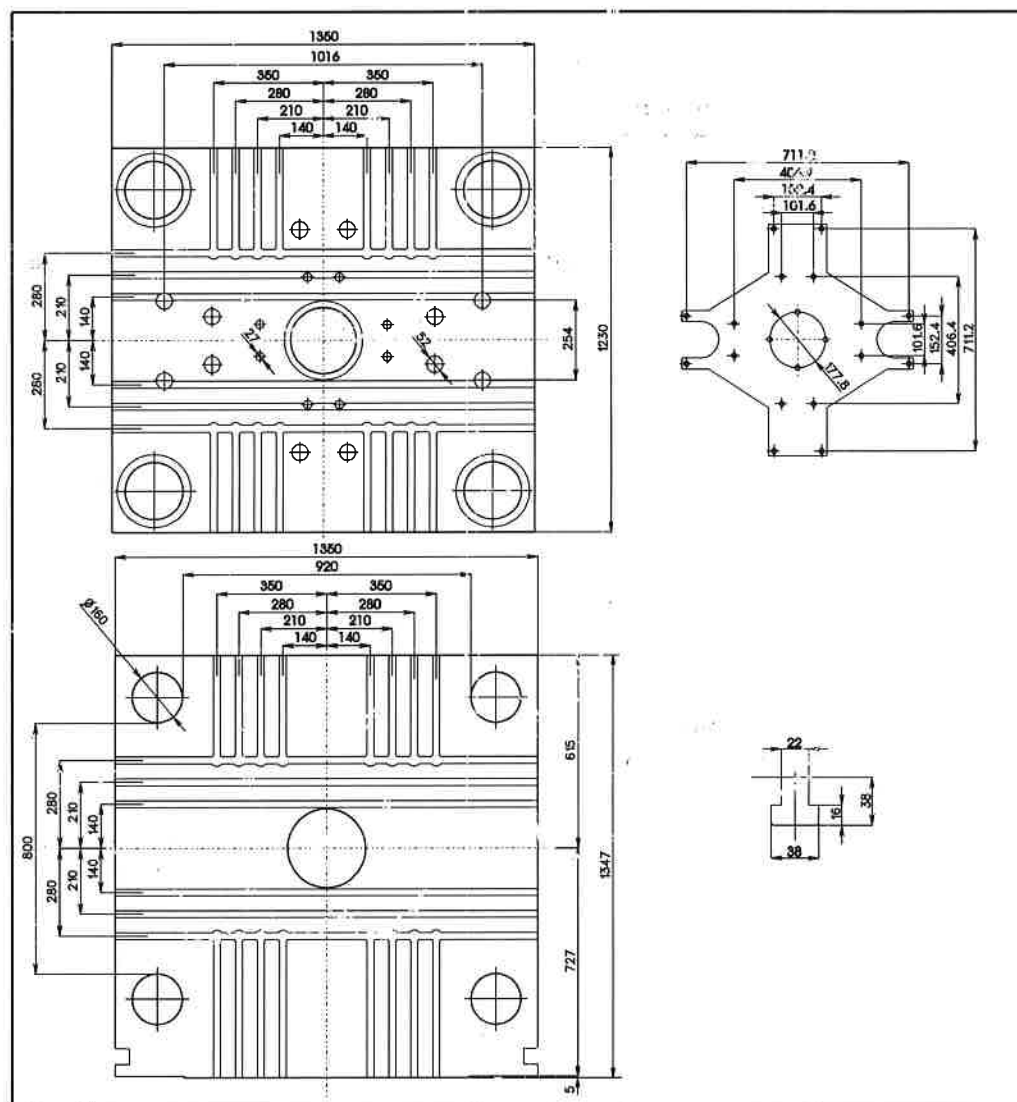


Figure 5.4

The steps in the mould installation process may be briefly summarized as follows:

- bring the injection group saddle back forward and open the movable guard of the nozzle to activate the safety device
- with the toggle extended, by means of the push-buttons (36-37 in figure 2.9), move the mould group until the distance between the platens is a few millimeters larger than the mould
- open the press and turn off the pump motor
- clean and lubricate the platens and mould faces with mineral oil
- make sure the two mould-halves are held together by a suitable device
- raise the mould using a hoist and position it inside the platens, bringing it into contact with the stationary platen and checking the position of the centering ring on the stationary platen
- secure the mould to the stationary platen by means of brackets or screws
- switch on the machine and close the press without extending the toggle completely
- push the platens together until the movable platen is flush against the mould
- switch off the pump motor
- secure the mould to the movable platen by means of brackets or screws
- remove the device holding the mould-halves together
- if necessary, connect the central extractor by means of the coupling provided
- make all the cooling system connections and any electrical and hydraulic connections for using the radial jacks
- start up the machine and slowly perform all the movements to ensure that the mould is correctly installed and that all the settings on the control equipment are suited to the mould
- gradually increase speeds and pressures until you find the optimal levels for correct injection-moulding.

5.2 - MACHINE ADJUSTMENTS

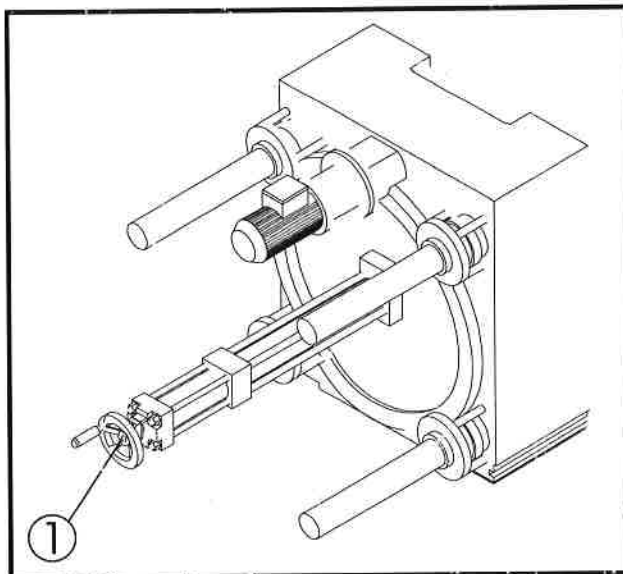
5.2.1 - ADJUSTING THE MOVING PLATEN STROKE (OPTIONAL)

This operation is performed by the maintenance personnel of the buyer, who assumes responsibility for it.

Depending on the characteristics of the mould being used and the moulded piece, the stroke of the moving platen during the mould opening movement should be adjusted to avoid either an excessive opening, which will lengthen the cycle, or an insufficient opening, which will prevent the moulded piece from falling out during extraction.

The stroke is adjusted in the following manner:

- with the machine on MANUAL, close the moulds partially, open the guard and stop the pump by means of the emergency button.



- loosen the locknut (1 in figure 5.5) on the handwheel for adjusting the moving platen stroke and turn the handwheel to the desired position.

- tighten the locknut, start up the machine, and make sure the opening stroke is as desired.

If not, repeat the above operation.

Figure 5.5

No other adjustments of the mechanical groups are necessary, since the machine is completely adjusted during testing by Plastic Metal.

5.2.2 - ADJUSTING THE HYDRAULIC GROUP

This group requires no adjustments, since it is adjusted during final testing in our plant and checked during testing by our technicians after the machine has been installed.

5.2.3 - OTHER ADJUSTMENTS

None required.

5.2.4 - CHECKING AND TESTING SAFETY DEVICES

The checks and functional tests were performed during final testing in our plant.

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6.1 - GENERAL INFORMATION

When you have performed the operations described above, and loaded the feed hopper with material, the machine is ready for use.

6.2 - USES, AREAS, PERSONNEL

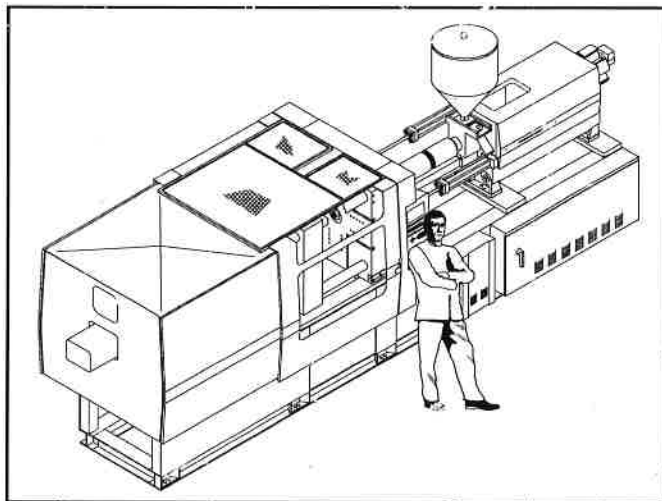


WARNING

- The Plastic Metal injection-moulding machine should be used only for the injection-moulding of thermoplastic materials. It should also be used within the limits defined by the technical characteristics (Chap. 2.2).

Any other use should be considered improper and therefore outside the responsibility of Plastic Metal.

- The personnel assigned to operate the machine must have a thorough knowledge of the contents of this manual and all safety-related information. If not, the manufacturer declines all liability deriving from failure to respect this condition.



The area normally occupied by the operator for running the machine is in front of the control console. From this area, in fact, he has ready access to both the pushbutton panel and the control console.

In this area he can also see the hazardous areas of the machine (mould opening/ closing group, injector), and the available instruments permit the operator to make commands in safety.

Figure 6.1

During ordinary operation, the machine represents no risk for the operator. It is important that such operations as maintenance, production changeover and various adjustments be performed by specialized personnel.

6.3 - OPERATING COMMANDS AND INDICATORS - MEASURING DEVICES

6.3.1 - GENERAL INFORMATION

This chapter will examine in detail the control instruments and devices available to the operator.

6.3.2 - ELECTRIC POWER PANEL

The electric power panel permits the operator to power up the machine, with the main switch, and control such devices as motors, heaters and transformers for powering the control devices (see enclosed drawing).

6.3.3 - SYNOPTIC PANEL: COMMANDS AND INSTRUMENTS

Each function is marked with a symbol depicting its characteristic function for recognition purposes.

The control panel is structured as follows:

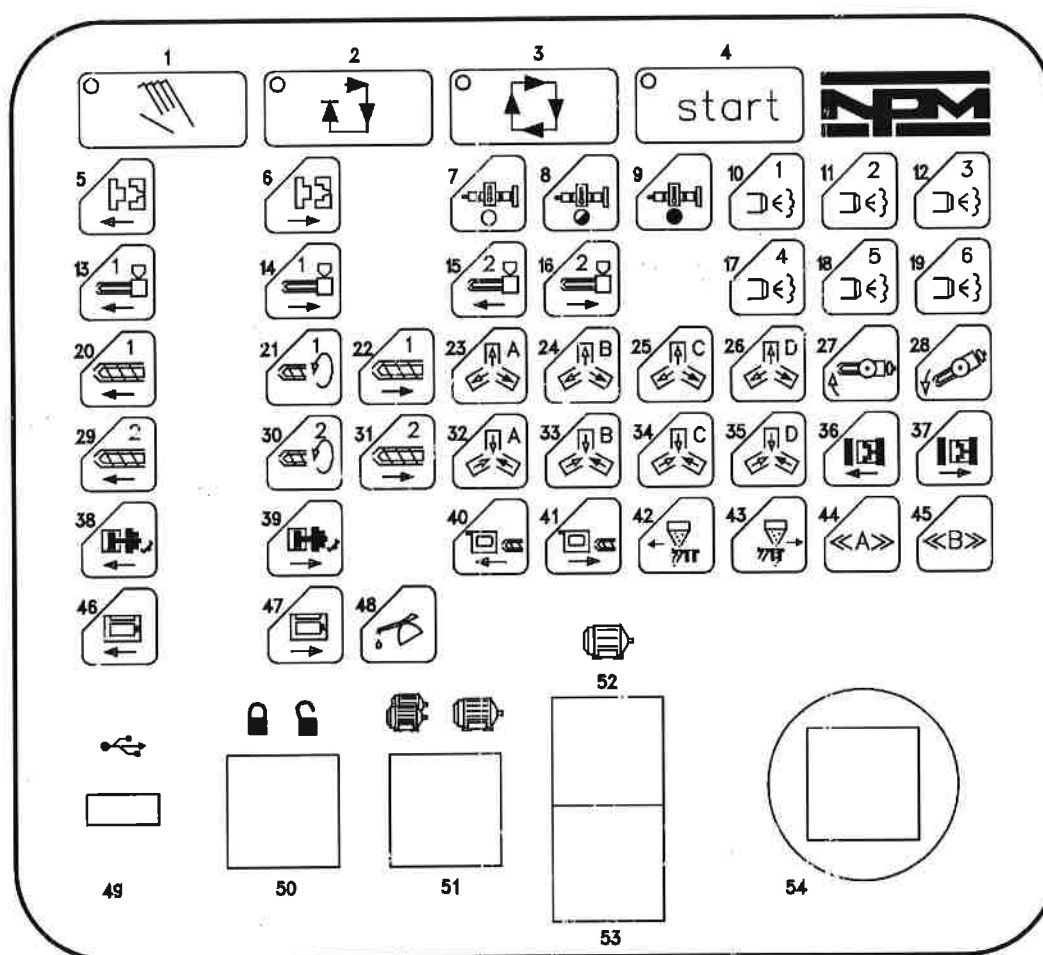


Figure 2.9

- 1 - Operating mode button: manual
- 2 - Operating mode button: semiautomatic
- 3 - Operating mode button: automatic

-
- 4 - START button for semiautomatic or automatic cycle
 - 5 - Mould open button
 - 6 - Mould close button
 - 7 - Plasticizer heat button: off
 - 8 - Plasticizer heat button: maintain
 - 9 - Plasticizer heat button: on
 - 10 - Air jet 1 button
 - 11 - Air jet 2 button
 - 12 - Air jet 3 button
 - 13 - Saddle forward button
 - 14 - Saddle back button
 - 15 - Saddle forward button 2
 - 16 - Saddle back button 2
 - 17 - Air jet 4 button
 - 18 - Air jet 5 button
 - 19 - Air jet 6 button
 - 20 - Injection button 1
 - 21 - Screw rotation button 1
 - 22 - Decompression button 1
 - 23 - Core pull "A" out button
 - 24 - Core pull "B" out button
 - 25 - Core pull "C" out button
 - 26 - Core pull "D" out button
 - 27 - Injection unit clockwise swivel button
 - 28 - Injection unit clockwise button
 - 29 - Injection button 2
 - 30 - Screw rotation button 2
 - 31 - Decompression button 2
 - 32 - Core pull "A" in button
 - 33 - Core pull "B" in button
 - 34 - Core pull "C" in button
 - 35 - Core pull "D" in button
 - 36 - Mould thickness increase button
 - 37 - Mould thickness decrease button
 - 38 - Central extract back button
 - 39 - Central extract forward button
 - 40 - Nozzle safety gate closing button
 - 41 - Nozzle safety gate opening button
 - 42 - Hopper in unloading position button
 - 43 - Hopper in working position button
 - 44 - Not used
 - 45 - Not used
 - 46 - Opening gate button
 - 47 - Closing gate button
 - 48 - Manual lubrication button (lights up when pushed)
 - 49 - USB Plug
 - 50 - Key selector for data input
 - 51 - One/two motors selector
 - 52 - Pump motor START button
 - 53 - Pump motor STOP button
 - 54 - Emergency STOP button

PRESSURE GAUGES

The pressure gauges indicate the pressure values at the main points in the hydraulic circuit.

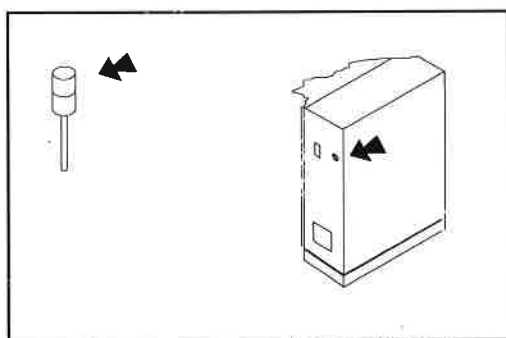


They are connected:

- on the main line of each pump
- on the injection cylinder circuit (injection side)

Figure 6.4

6.4 - LIST OF SIGNALS AND WARNING INDICATORS



Signal light

The signal light is located so that it can even be seen at a distance and has two colours, indicating:

STEADY GREEN: machine running (pump on)

BLINKING RED: machine in alarm condition

Figure 6.5

Acoustical alarm

The buzzer comes on at the same as the blinking red light, indicating the presence of an alarm condition.

6.5 - ADDITIONAL PRE-STARTUP INFORMATION

Before starting up, make sure you have activated the auxiliary devices (material heater, loader, chiller for cooling water, etc.) and enabled the cooling, pneumatic and electrical circuits.

6.5.1 - CONNECTING MANIPULATOR

The electronic control equipment on Plastic Metal machines is configured, at customer's request, for interfacing with a manipulator for automatically unloading moulded pieces.

This interface is designed to Euromap 12 standards.

6.5.2 - CONNECTING DYE BATCHER

This connection, provided only at customer request, includes a signal on the control panel of the batcher present throughout the material loading phase.

6.5.3 - CONNECTING CONVEYOR BELT, LOADER, DRYER

These devices can be applied to the machine without modifications to the machine, since they operate independently.

6.6 - STARTING UP THE MACHINE

6.6.1 INITIAL CHECKS

Check again to be sure the parameters of the opening/closing and extraction groups are correctly set.



WARNING

The operator must have sufficient knowledge and training to perform the initial maneuvers with care and expertise.

The operator must try the individual movements one last time before actually molding. Low speed and pressure values should be used during these tests to limit damage to equipment in the event of defects or errors in maneuver or setup.

6.6.2 - STARTUP SEQUENCE

Proceed as follows:

- set the temperature of the barrel heating zones
- switch on the heating of the plasticizer barrel by means of button 9 and wait for the temperature to stabilize
- load material into the feed hopper
- press the START button (52) and wait for it to light up
- open the gate to allow material to flow into the plasticizer, load the material with button 21 and check the pressure on the pump 1 pressure gauge (if the pressure is high, this may mean that the material requires a higher barrel temperature)
- discharge with button 20 and check the appearance of the melted material
- if necessary, keep loading and injecting until the material coming from the nozzle is sufficiently clean and plasticized. If deteriorated material is injected into the mould, it may be difficult to remove.

6.6.3 - MOULD THICKNESS AND CLAMPING FORCE ADJUSTMENTS

On the "MOULD GROUP" page insert the selection "MOULD INSTALLATION" to effect the mould movements at slow speed.

To adjust the mould group to the mould thickness measurement, act on the buttons 36/37 (in figure 6.2).

Measure the thickness of the mould and open the opening/closing group to a slightly smaller distance.

Open the mould and increase the mould thickness adjustment until the toggle is fully extended with the mould closing command (6 in figure 6.2).

Remove the selection "MOULD INSTALLATION", open the mould again and gradually reduce the mold thickness adjustment, checking each time whether the toggle is able to extend. Checking the pressure gauge, the machine will be closed with the maximum clamping force when the pressure reaches the maximum value toward the end of the closing sequence.

If the mould thickness is improperly adjusted, the mould may be clamped with insufficient force to counter the thrust of the material entering the mould during injection. This will result in partial opening of the mould with consequent flashing on the moulded pieces



CAUTION

To avoid damaging the mould thickness adjustment system, thickness adjustments must be performed with the mould open (toggle not extended).

6.7 - NORMAL OPERATION

At this point, if the pump motor is on (start button lighted and green section of warning light on), the barrel heating on (red LED on the heating selector lighted), no alarm signals (red warning light section and buzzer off and no alarm message on the monitor), the machine is ready to run.

6.7.1 - MANUAL MODE

Select the manual mode of operation (button 1 in figure 6.2) and run a complete cycle in the automatic cycle sequence to ensure that the speed, pressure and dimension settings are correct (the timers function only in semiautomatic or automatic mode).

The sequence of movement to perform is the following:

- close mould (6 in figure 6.2)
- injection group forward (13 in figure 6.2)
- injection (20 in figure 6.2)
- load material (21 in figure 6.2)
- injection group back (14 in figure 6.2)
- delay for cooling of moulded piece
- open mould (5 in figure 6.2)

- extract piece from mound (39 in figure 6.2)
- extractor retracted (38 in figure 6.2)

6.7.2 - SEMIAUTOMATIC MODE

Push the button 2 in figure 6.2 to prepare the machine to effect a cycle on semiautomatic, which is started by pressing the START button (4 in figure 6.2).

The cycle will not start unless the safety devices are activated properly, the extractor has been withdrawn and the core pulls (if any) are correctly positioned; otherwise, the monitor will show alarm messages corresponding to the situations created.

The semiautomatic function will execute one complete cycle to the end of extraction.

You must press the START button each time to start a new cycle.

6.7.3 - AUTOMATIC MODE

Pushing the button 3 in figure 6.2 puts the machine in automatic mode, which is started by pressing the START button (4 in figure 6.2).

Automatic operation will not start unless the conditions discussed in the previous paragraph have been satisfied. It will continue to execute complete cycles until the selector is moved off the automatic position or the motor is stopped.

6.8 - PERFORMANCE CHECKS AND ADJUSTMENTS

6.8.1 - GENERAL INFORMATION



WARNING

The machine can run independently, but an operator must be present to ensure that the expected production quality and quantity continue over time, and to safeguard the efficiency of the machine, the mould and the auxiliary equipment. He should occupy the position described in chapter 6.2 for the reasons explained there.

In any case the machine remains out of operator's control, it should be ALWAYS switched off.

To obtain top efficiency from the machine and equipment, you must:

- watch and listen to the machine and auxiliary equipment to ensure they are operating normally
- perform the specific maintenance and control operations generally prescribed during production (e.g. cleaning and lubrication of the mould)
- determine the causes of any alarm messages appearing on the monitor.

Control over product quality is performed as follows:

- check the moulded pieces against company quality standards
- in the case of substandard pieces, check the real values of temperature, speed and pressure displayed on the monitor

- modify the setting of the moulding parameters until the prescribed quality level has been restored.

6.8.2 - DISPLAY MESSAGES

See the enclosed booklet for use of the display terminal (para. 3.1).

6.8.3 - BARREL HEATING

The barrel is heated by heating bands (resistances) that wrap around the barrel itself. They are powered by static relays controlled in turn by the microprocessor. The temperatures in the various zones of the barrel are read by thermocouples.

The following is a list of indicative temperature values for the various materials.

Type of material	Abbreviation	Temperature (C)
Styrene copolymers	ABS	230
Cellulose acetate	CA	160
Polyamide 6	PA 6	220
Polyamide 66	PA 66	270
Polycarbonate	PC	290
Polyethylene	PE	230
Polymethyl methacrylate	PMMA	210
Polypropylene	PP	280
Polyphenylene oxide	PPO	300
Polystyrene	PS	230
Polyurethane	PUR	200
Polyvinyl chloride	PVC	170
Polyacetalic resins	POM	180



WARNING

These values are indicative, because the temperature of the material depends on how long it rests in the plasticizer, the length of material travel in the mould and thickness of the mould cavity. In general:

- the farther the material must travel in the mould, the less time it remains in the plasticizer chamber and the thinner the mould cavity, the higher the temperature in the barrel must be.

The operator must be especially careful in selecting the temperature of the plasticizer chamber to avoid overheating the material, in the case of excessive temperature, with the consequent formation of harmful gases which could also cause the involuntary expulsion of material from the nozzle.

If the heating is insufficient, on the other hand, attempting to inject it could cause the breakage of the check- valve and plasticizer screw.

6.8.4 - MOULD CLOSING

The mould can be closed when the gates are closed and the mechanical and hydraulic safety devices have been freed.

It is complete when the toggle is extended and limit switch S4 is activated.

Mould safety

Mould safety (obtained by reducing mold closing pressure until the moment the two mould-halves meet) is highly important for safeguarding the mould. In fact, when moving parts get blocked or moulded pieces fail to extract properly, the mould is unable to close. In this case, the machine will give an alarm and "MOULD CLOSING NOT EXECUTED" will appear on the monitor.

Speed

To avoid excessive impact between the mould-halves, the mould closing speed may be adjusted according to a three-step profile.

Other safety factors

To avoid damage caused by the mould closing with the extractors or core pulls (when present) out of position, or with the robot inside the mould area, the management program does not allow the mould to close unless all the devices are correctly positioned.

6.8.5 - MOULD OPENING

The mould may be opened after a sufficient delay to allow the injected piece to cool and terminates when the mould axis exceeds the value set on "RECYCLE DIMENSION" on the "MOULD GROUP" page.



CAUTION

It may happen that the mould cannot be opened, for example, due to seizing on the guide columns or sliding components of the mould or due to excessive filling of the mould which blocks those components. In this case, the operator must determine the cause of the failure before persisting with repeated MOLD OPEN commands.

Speed

The mould opening speed can also be adjusted according to a three-step profile. so that, for example, particularly slow speeds can coincide with movements of bins, extraction conveyors, etc.

Safety factors

The same safety measures exist for mold opening as those indicated for mould closing.

6.8.6 - EXTRACTOR

It enters into operation, in automatic or semiautomatic mode, when the mould axis exceeds the "EXTRACTION ADVANCE SETTING" on the "CENTRAL EXTRACTOR" page.

It extends until the extractor axis reaches the "EXTRACTOR SETTING" and then retracts completely.

It is functioning normally when the pieces fall properly and there are not jolts or noises associated with improper adjustment of the extractor extension speed.

Security factors

The movement of the extractors (central extractor and core pulls) is limited by the settings. The movement is always executed one device at a time.

Connection of central extractor to the mould

Take a look at this connection periodically to ensure that it is tight, as it may become loosened during processing.

6.8.7 - INJECTION

This occurs when the mould is closed and the saddle axis is less than the "START INJECTION SETTING". The injection axis must also be greater than the "END DISCHARGE SETTING".

It is divided into two phases:

- the mould filling phase, in which primarily the movement speed is controlled
 - the final mould filling and final pressure hold phase, during which an additional amount of material is injected to compensate for shrinkage due to cooling of the melted mass in the mould.
- The appearance of the product confirms that the two phases are properly adjusted:
- if it displays visual defects (burning, rippling, junction marks, etc.), they are caused primarily by the first phase
 - if it displays dimensional defects, they are due primarily to the second phase.

When the dimensional defects are significant, of course, they cannot be attributed entirely to the second phase.

Safety factors

The injection movement may be blocked if the core pulls are incorrectly positioned or if the temperature of the plasticizer barrel is too low.

6.8.8 - PLASTICIZING

This occurs from the end of injection until the injection axis is less than the "END OF CHARGE SETTING". In this phase the granules of material are heated and melted as they pass through the plasticizer, reaching optimal viscosity for injection. The mixing action of the screw also

determines the uniformity of the melted material.

Plasticizing defects may be corrected by altering the barrel temperature settings, the screw rotation speed and the back-pressure.

Safety factors

The charge movement may be blocked if the temperature in the plasticizer barrel is too low.



CAUTION

If you are unable to make any movement whatsoever, contact the technical assistance service of Nuova Plastic Metal rather than continuing to repeat the commands.

6.9 - ANOMALIES, EMERGENCIES, ALARMS

6.9.1 - GENERAL INFORMATION

The operator, through his systematic control of the machine, ensures its efficient operation, and the timely identification of problems also depends essentially on his diligence.

When operating anomalies occur (diagnostic messages on the monitor, oil leaks, irregular movements, unusual noises, etc.), the operator must take note of the status of the machine (movement being executed, state of inputs and outputs relative to the anomaly, emergency messages on the monitor, etc.) so that he may furnish the Plastic Metal technical assistance service as much information as possible.

It is advisable to always contact that service, in fact, for useful suggestions in every case for resolving the problem through the customer's maintenance personnel.

NOTE: When reporting malfunctions to the technical assistance service, always provide the machine serial number.



CAUTION

When the troubleshooting requires a halt in moulding with inspections and the disassembly of mechanical parts, control of electrical or hydraulic circuits, it becomes a problem for a qualified technician.

Immediate action in the event of trouble

It is important to react quickly to a malfunction situation, but this should never cause the operator to take improper or hasty action. The operator's intervention is limited to those actions which he has studied during training and of which he knows the consequences.

If you encounter:

- a warning light or buzzer: you should check the alarm messages on the monitor and determine, if possible, what cycle phase it occurred in
- an abnormal situation not diagnosed by the computer: you should determine how urgent the intervention should be, based on the seriousness of the risk (wait for the cycle to end before stopping, force an immediate cycle stop in manual mode, stop the motor immediately by pressing the emergency button).

**SUGGESTION**

- Stop the machine by pressing on the emergency button.
- If the risk involves the electrical system and the barrel heating, immediately shut off power to the machine by turning the main switch to 0.

6.9.2 - LIST AND DESCRIPTION OF ALARMS

See the enclosed instruction manual for the monitor (attachment 2, para. 3.1).

6.10 - STOPPING THE MACHINE**WARNING**

Before any operation inside the mould the injection unit must be retracted.

6.10.1 - VOLUNTARY STOP

The machine is stopped at the end of a cycle by setting the cycle selector on manual mode (button 1 in figure 6.2).

When the stop is not brief, the plasticizer barrel should be emptied of material, even when using materials that do not deteriorate when left in the plasticizer. It is necessary with the other materials.

Proceed as follows:

- close the feed gate shown in the figure and continue moulding until a considerable delay in injection time indicates the material is running low
- switch over to manual mode

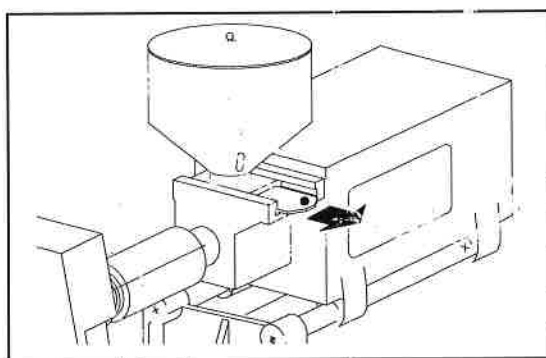


Figure 6.3

- open the mould (button 5).
- extract the moulded piece (button 39)
- retract the extractor (button 38)
- partially close the mould (button 6)
- stop the injection group (button 14)
- discharge the remaining material (button 20).

At this point, you may stop the motor (button 53) or effect the movements in manual mode. If the duration of the stop permits it, however, you may reduce the plasticizer barrel temperature to an intermediate value that permits a rapid return to production. To do this, push the button 8 and set the "HOLD TEMPERATURE" value on the monitor at the "BARREL TEMPERATURE" page.

6.10.2 - EMERGENCY STOP

There are two emergency buttons on the machine: one over the button panel and on the stationary rear guard of the stationary platen (figure 6.6). These buttons may be pressed whenever a situation of danger or serious malfunction arises to stop the pump motor and no further hazardous conditions are involved. Since these buttons have a mechanical block, the machine cannot be restarted until they are restored, done by twisting the button to the left

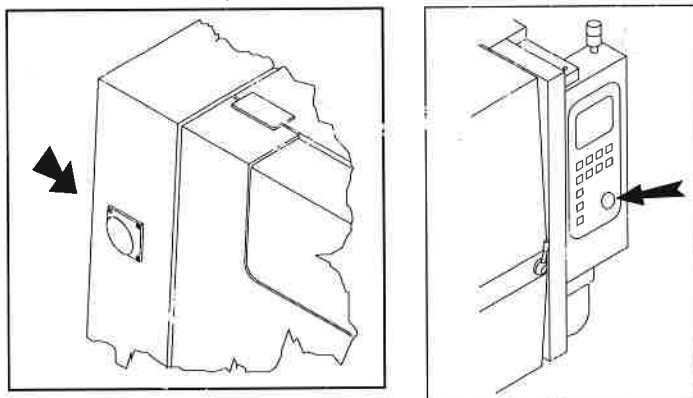


Figure 6.6

6.11 - CLEANING AND SHUTDOWN

The power must always be shut off before the machine can be cleaned. This should be done following the instructions in section 4.4.1.

When the machine is shut down for a long period of time, it is a good idea to empty the plasticizer as indicated in section 6.10.1. The unpainted metallic parts should also be protected against rust with a thin coat of grease or suitable oil. Protect the machine from dust with a cover (e.g. a sheet of polyethylene) and the electrical components by placing bags of hygroscopic material in the power box and control console.

For brief shutdowns, normal lubrication is sufficient.

Before the next startup, the machine should be cleaned and lubricated, as indicated in sections 4.4.1 and 4.5.5, with the procedures indicated in section 6.6.

7 - MAINTENANCE

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7.1 - SAFETY: PRECAUTIONS AND MAINTENANCE SHUTDOWNS

Maintenance, greasing and the adjustment of mechanical parts must be performed with the machine stopped, shutting off the power (figure 4.7, position 0) and compressed air.

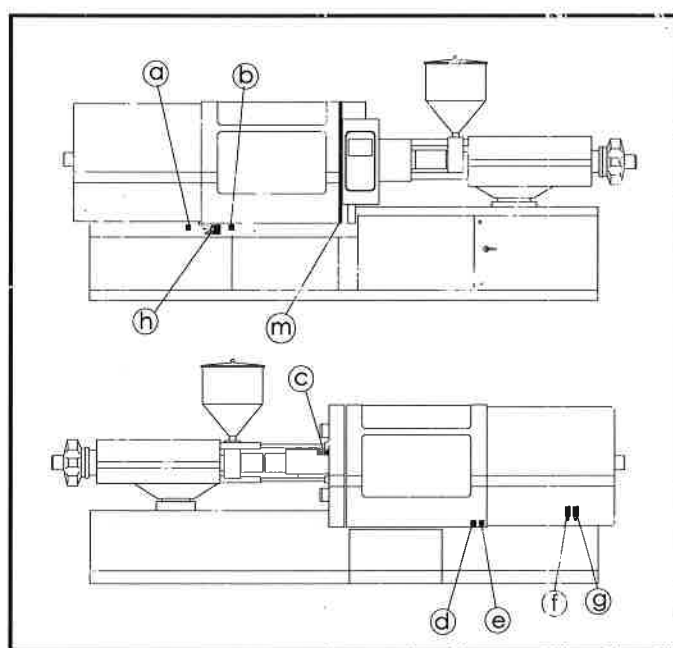
You should ensure that the settings for the mould being used have been recorded before beginning maintenance.

7.1.1 CHECK AND FUNCTIONAL TESTS ON SAFETY DEVICES



CAUTION

The manufacturer assumes no responsibility for accidents caused by tampering with or failing to maintain the safety devices.



Control of mould group limit switches

Make sure that the gates of the guards activate the respective safety limit switches (*a, b, d, e*) in figure 7.1.

Opening the front guard must activate limit switch *1*, while an impact against safety bar *m* must activate pressure gauge which stops closure of the guard. Opening the front guard does not stop the motor, but it must block the closing of the moulds.

Also check to see that limit switches *f* and *g* (minimum and maximum mould thickness) are working properly.

Figure 7.1

Control of hydraulic safety

Make sure that opening the movable guards causes activation of the lever that acts on the safety hydraulic distributor and that the linkage is working properly (*h* in figure 7.1)

Control of nozzle-protector electrical limit switch

The nozzle-open protection (limit switch S05 - *c* when the key is removed in figure 7.1-released) must block the saddle-forward, injection and material charge functions.

Make sure the power box door does not open when the main switch is on (position 1 in figure 4.7). Make sure that when this level is turned to the 0 position, all functions are shut off.

Also make sure the emergency button on the rear of the machine (figure 6.6) is working properly.

7.2 - GENERAL INFORMATION

Routine maintenance service can be performed by the buyer's maintenance personnel, since these are operations that require no particular expertise.

Special maintenance operations, however, may be performed by the buyer's maintenance personnel only if they have some experience with the problems of specific maintenance cases; otherwise, the technical assistance service of Plastic Metal should intervene.

7.3 - ROUTINE MAINTENANCE



WARNING

We would remind you that the power must be shut off before any maintenance operations can be performed on the machine. So first switch off the pump motor by pressing the emergency switch, then turn the main switch to 0 and block the compressed air and cooling circuits.

Operation to be performed	Hours of operation						Reference section
	100	500	1000	1500	3000	5000	
Cleaning the machine	X						4.4.1
Leveling the machine					X		4.4
Descaling the cooling system				X			7.3
Topping of hydraulic fluid			X				4.5.4
Changing hydraulic fluid						X	7.3
Topping off lubricating oil	X						7.3
Manual greasing		X					4.5.5
Checking electrical limit switches			X				7.1.1
Checking hydraulic safety			X				7.1.1
Replacing intake filter					X		7.3
Replacing delivery filter				X			7.3
Checking flexible tubing					X		7.3
Checking Moving platen slides					X		7.3
Checking platen parallelism					X		7.3
Checking remote control switch contacts					X		7.3
Checking tightness of power line cables					X		7.3

Table 7.1

Cleaning the machine

Perform the cleaning as indicated in section 4.4.1.

Leveling the machine

Check the leveling of the machine as indicated in section 4.4.

Descaling the cooling system

The scale that deposits in the cooling system reduces its efficiency. The frequency of maintenance largely depends on the degree of hardness of the water used.

When a closed-circuit cooling system is used, we recommend the utilization of detergents and softeners directly in the coolant.

The system should be cleaned by flushing with a suitable product available on the market that will remove the scale deposit without attacking the circuit components.

Checking the hydraulic fluid level

Check the level indicator and, if necessary, top off the reservoir with hydraulic fluid (see section 4.5.4).

Replacing the hydraulic fluid

To completely replace the hydraulic fluid:

- siphon off the hydraulic fluid, being careful to leave the deposit on the bottom of the reservoir
- completely remove the bottom residue by removing the plug in the reservoir bottom and cleaning with synthetic solvent
- flush out the system with washing oil and fill with new fluid up to the level indicator
- also replace the delivery filter cartridge, unscrewing the filter block below the filter, with an identical spare (see spare parts booklet)
- screw the filter block back into place with a maximum torque of 20 Nm (2.04 mkg).

After the first 100 hours of operation, the reservoir and circuit should be thoroughly cleaned with washing oil and then the oil charge filtered. The purpose is to eliminate all the foreign substances caused by the initial wear of the various parts.

NOTE: When cleaning the fluid, it should first be decanted to permit the separation of any water and foreign substances present.

The fluid should then be filtered through paper filters after heating to 40-60 °C. For this purpose use electric heater plugs with a specific maximum power of 0.8 W/cm² to avoid local overheating.



WARNING

Used fluid must be disposed of in conformity with local regulations.

Checking the lubricating oil level

Check the oil level indicator and, if necessary, top off the reservoir with lubricating oil.

Manual greasing

Use a manual pump to grease the points where grease nipples are located, as indicated in section 4.5.5.

Checking the electrical limit switches

Perform the checks described in section 7.1.1.

Checking the hydraulic safety

Perform the checks described in section 7.1.1.

Replacing the intake filter

Shut off the connection between the filter and the oil reservoir by unscrewing part no. 1 in figure 7.2 and then removing the screws (2) along the outer edge of the cover.

NOTE: After replacing the filter cartridge and replacing the screws on the cover, remember to screw down part no. 1 to reopen the filter intake line; otherwise, when the motor is switched on the pump will have no oil to draw in and will be damaged.

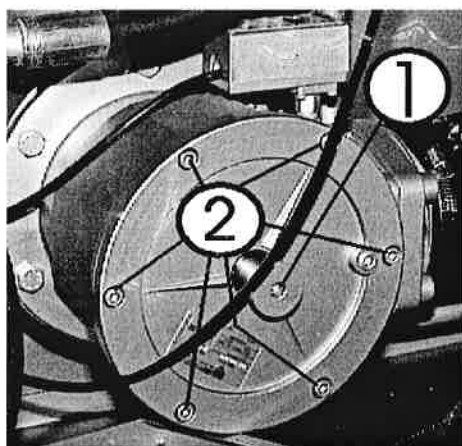


Figure 7.2

Replacing the delivery filter

Unscrew the filter block, clean the block with solvent, replace the filter cartridge and screw back on, being careful not to damage the seal gasket between head and block. This gasket should be replaced at least every 5 filter change.



Figure 7.3

**CAUTION**

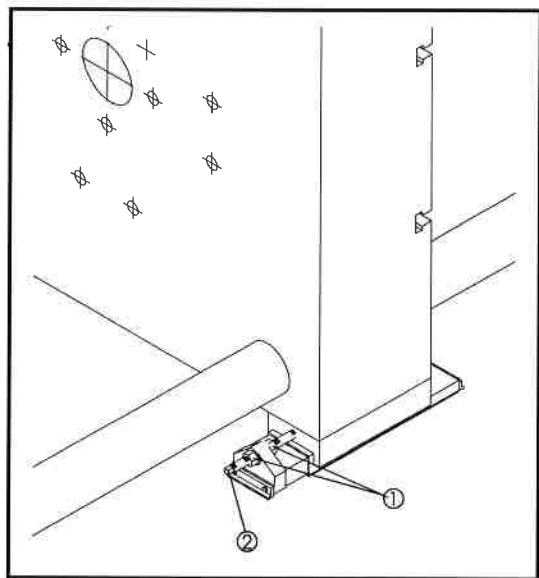
Maximum torque setting for tightening the block: 20 Nm (2.04 mkg).

Checking the flexible hoses

Visually check the condition of the flexible tubing to determine its condition at the points where it is fastened to the metallic terminals and where it rubs against other tubing or other parts of the machine. If any wear is observed, the tubing should be replaced immediately. Also check the clamps for tightness.

Adjusting the moving platen support slides

To register them:



- close the mold without letting the guide dowels enter the two mould-halves

- switch off the pump motor by means of the emergency button

- loosen the nuts (1 in figure 7.4) and adjust the spacers (2) until measuring with a thickness gauge shows that the column is centered with respect to the slide hole in the moving platen

- retighten the nuts.

The operation must be performed on both moving platen slides.

Figure 7.4

Checking platen parallelism

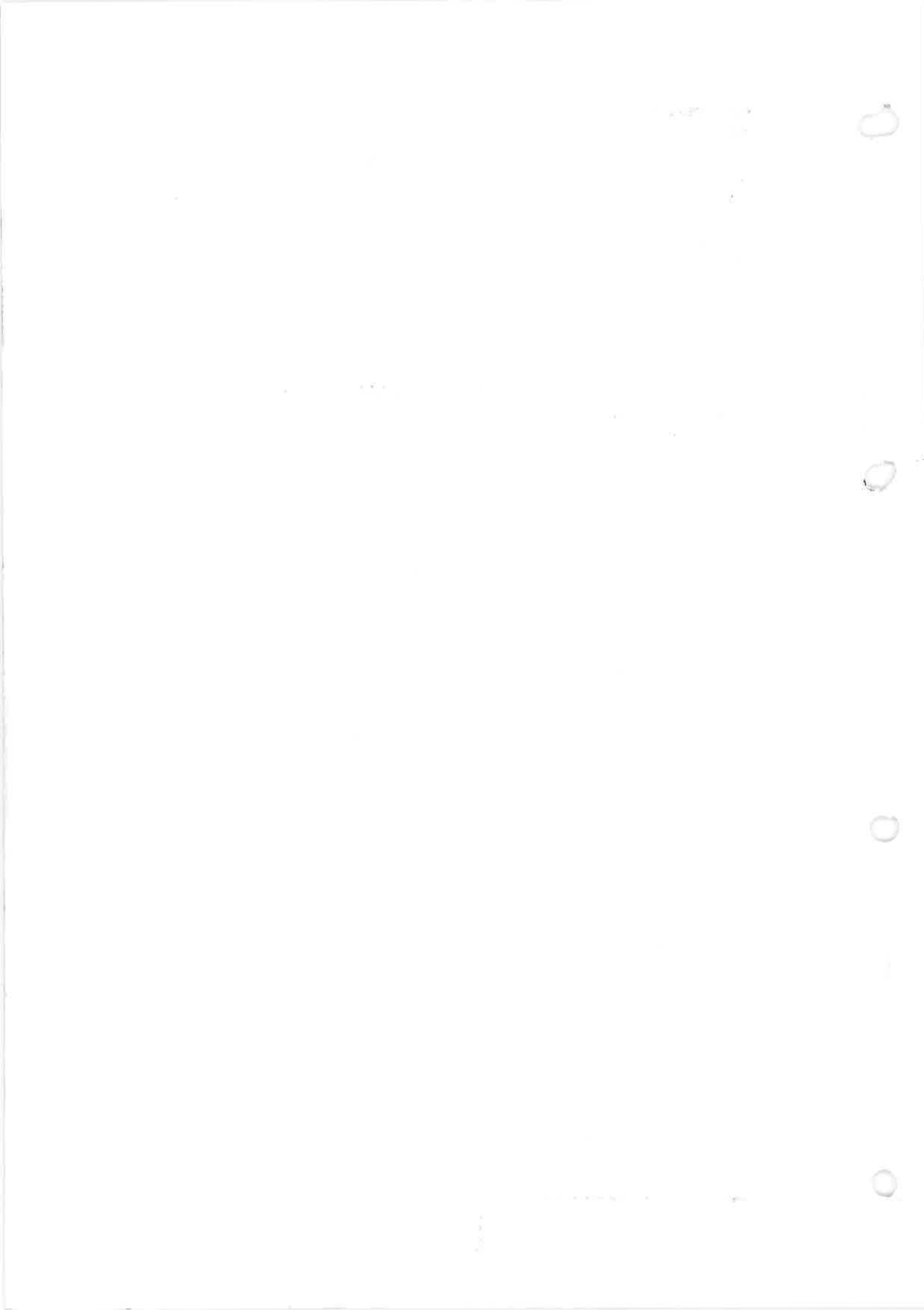
This check should be performed in two steps, as described in the Euromap 9 recommendations:

a) without the mould:

- move the mould group until the minimum mould thickness limit switch is activated
- close the mould group with the toggle complete extended
- switch off the pump motor by means of the emergency button
- measure the distance between the platens around an ideal circle 1050 mm in diameter in four points equidistant from the hole
- the maximum difference between the measurements must not exceed 0,40 mm.

b) with a test mould (second Euromap 7 recommendation: outside diameter = 630 mm, inside diameter = 500 mm, height = 630 mm):

- adjust the mould thickness
- close the mould group with the maximum clamping force
- switch off the pump motor by means of the emergency button
- measure the distance between the platens as described in point a)
- the maximum difference between the measurements must not exceed 0,2 mm.



If the measurements provide values that exceed the tolerances indicated, contact the Plastic Metal technical assistance service immediately.

Checking the remote control switch contacts

Perform the checks as indicated in the enclosed instruction sheets for the remote control switches.

Checking the tightness of power line cables

Check the tightness of the cables at the main switch, on the remote control switches, on the protective devices and on the static command groups in the barrel heating zones.

7.4 - SPECIAL MAINTENANCE

Special maintenance may involve the replacement or overhauling of parts.

Such operations require specific expertise and training and must therefore be performed by Plastic Metal technical personnel.

8 - TROUBLESHOOTING

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8.1 - TROUBLESHOOTING

Based on past experience with malfunctions, an integrated diagnostics program has been developed for the system which in most cases will pinpoint the cause of the malfunction. Refer, therefore, to the chapter "Causes, problems and remedies" in the enclosed instruction manual for the monitor or consult the Plastic Metal technical assistance service. There are series of defects in the finished pieces, however, that may be only partially identified by the control computer automatically. Here are few useful suggestions for the operator in these cases.

Defects observed	Possible remedies
Pieces incomplete	1 - 6 - 9 - 19 - 20 - 22 - 24 - 28
Pieces with flashing	2 - 4 - 5 - 7 - 8 - 19 - 20 - 23 - 25 - 32
Shrinkage - surface rippling	5 - 6 - 8 - 9 - 15 - 20 - 23 - 33 - 34
Colour halving	13 - 15 - 22
Burning	4 - 5 - 17 - 18 - 31 - 33

Table 8.1

- 1 - increase injection pressure - phase 1
- 2 - decrease injection pressure - phase 1
- 3 - increase injection speed - phase 1
- 4 - decrease injection speed - phase 1
- 5 - adjust injection speed profile - phase 1
- 6 - increase injection pressure - phase 2
- 7 - decrease injection speed - phase 2
- 8 - adjust injection speed profile - phase 2
- 9 - increase injection time - phase 2
- 10 - decrease injection time - phase 2
- 11 - increase cooling time
- 12 - decrease cooling time
- 13 - increase screw rotation speed
- 14 - decrease screw rotation speed
- 15 - increase back-pressure
- 16 - decrease back-pressure
- 17 - decrease decompression speed
- 18 - decrease decompression stroke
- 19 - adjust feed stroke
- 20 - adjust passage setting in injection phase 2
- 21 - adjust injection departure setting
- 22 - increase plasticizer barrel temperature
- 23 - decrease plasticizer barrel temperature
- 24 - increase nozzle temperature
- 25 - decrease nozzle temperature
- 26 - tighten nozzle
- 27 - clean nozzle
- 28 - check screw check-valve
- 29 - check alignment of nozzle and mould holes
- 30 - check curvature radii of nozzle and mould
- 31 - check mould air outlets
- 32 - check mould closing
- 33 - dry material better
- 34 - check descent of material from the feed hopper

9 - WASTE DISPOSAL**CONTENTS**

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9.1 - DEFINITION OF WASTE

The term waste is used to refer to any substance or object deriving from human activity or natural process that has been discarded or is intended to be discarded.

9.1.1 - WASTE DISPOSAL

The following is a list of the various types of waste that may be generated during the life of the machine:

- oil residues deriving from the lubrication points or hydraulic system
- contaminated water from the cooling system
- plastic residues deriving from scrap at the start and end of production
- rags or paper soaked in oil or solvent deriving from machine cleaning.



CAUTION

This waste, if discarded in the environment, may cause damage.



WARNING

Waste disposal is the responsibility of the user, who must comply with the procedures established by law in his own country.

9.1.2 - SPECIAL WASTE

The following should be considered special waste:

- waste from industrial processes and from farming, artisan, commercial or services activities which because of their characteristics or quantity cannot be classified as urban waste
- machinery and deteriorated, obsolete equipment
- motor vehicles and their discarded parts.

9.1.3 - TOXIC-HARMFUL WASTE

Toxic-harmful waste includes all waste that contains or is contaminated by the substances indicated in the annex to DPR 915/52, implementing EEC directives 75/442 and 768/319.

9.2 -TEMPORARY STORAGE

The temporary storage of toxic and harmful waste is permitted pending their disposal by treatment and/or permanent storage. In all cases the user must observe the laws in effect in his country concerning environmental protection.

9.3 - CHARACTERISTICS OF CONTAINERS

Stationary and mobile containers intended to contain toxic and harmful waste must be sufficient resistant with respect to the physical-chemical properties and hazardous nature of the waste they contain.

Containers in which hazardous or harmful products or materials are stored must bear appropriate indications and markings to disclose their contents.

9.4 -REGISTRATION REQUIREMENTS

According to the provisions of DPR of 23 August 1982 concerning implementation of EEC directive 75/439, regarding the elimination of used oils, entry/exit registers must be kept by all companies that produce special or toxic-harmful waste deriving from industrial or artisan processing.

9.5 - DISPOSAL

The withdrawal of special and/or harmful waste must be contracted out to expressly authorized firms, and anyone that materially transports it must possess the required authorizations and must be a registered transporter.

10 - SPARE PARTS

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10.1 - How to order spare parts

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10.1 - HOW TO ORDER SPARE PARTS

To order the spare parts, contact NPM sale service telephone 0444 448434 .

11 - ENCLOSURES

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Use and maintenance manual

Manual for using the SYSTEM REV GT

COMMERCIAL COMPONENTS:

Main electric motor

Motor pump

USE AND MAINTENANCE

REV GT

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CHAPTER 1: CONTROL CABINET

1.1 CONTROL SYSTEM

It is a multiprocessor command and control system for managing all the operating parameters of the PLASTIC METAL injection-moulding machines.

This system includes the graphic display of the moulding cycle, quality control, process diagnosis, connection to the printer and to the central computer. All the data are displayed on a 10-inch monitor and entered by means of a page recall and data entry keyboard.

1.1.1 TECHNICAL CHARACTERISTICS

High performance distributed I/O architecture. It is made by modules installed on a dedicated back-plane. The system heart is set up by gateway modules that are used both for manage, by means of the back-plane the installed I/O modules, and to communicate with control system. The modern architecture based on a 200 MHZ ARM processor and a parallel backplane bestow, to the system equipped with GDnet, the deterministic ethernet network, excellent performances. The system dates have been updated in 100 μ s and is synchronized and deterministic with a jitter close to 0 (zero). The realization of dedicated ethernet switches lets to hold unchanged the performances also with more gateway modules up to a maximum of 16 with 256 I/O each gateway module. The modules plug on the back-plane is by click and without the help of screws realizing automatically also the electrical connections necessary for the management. The insulation of all modules from the field makes them especially free from jams, giving in this way to the full system a high grade of reliability. The user connections are available on female removable connectors with spring terminals.

The control unit is PC based and extremely powerful and modular. Here is installed the application program for the operator interface video pages and the machine cycle. It is based on a Intel™ Celeron™ 400 MHZ upgradable microprocessor. The particular architecture lets a constant product upgrade to the technologic evolution. Thanks to the complete series of available ports like ethernet, USB, serial, parallel, PS/2 etc., it can connect to the several devices that by now can find application also in the industrial field. If to these we add the optional customized interfaces and the standard PCI, PC104 and PCMCIA extension slots, we obtain a very wide connectivity grade.

- connectable to local-area networks by modem;
- rapid machine troubleshooting with monitor alarm messages;
- option of printing out data at user-selected intervals;
- storage of process data on static module connected via USB located on the front panel for pen-drive and floppy disk, with the option of later reuse;
- display pages for entering settings, controlling the moulding process, diagnostics and statistic analysis with language change selectable directly by function keys.

1.1.2 CONTROL ELECTRONICS

The system is structured into a rack organized on one level. The control cabinet constitutes both an effective operator interface system and a processing center for data coming from the machine.

The cabinet console includes a keyboard where the operator can enter production parameters, with rapid page selection. A monitor displays the status of the moulding process by indicating the current positions of the moving components (carriage, moulds, etc.), the status of inputs and outputs, and so forth.

The system executes the program instructions in conformity with the parameters entered by the operator and the input values.

The proportional valve cards perform various functions, including commands to the pump control valves, control of the injection pressure and speed, etc.

Into the main electrical box transformers, fuses, terminal boards, relays and other components let to supply, protect, etc, the system.

The following chapters describe the system and the proportional valve cards and provides some drawings of the control cabinet, followed by a brief description of the components located in the power panel of the machine.

FIG. 1.1: CONTROL CABINET VIEW

NOTE: The input and output disposition could be changes.

