1.3.4 CONSTRUCTION DATA AND TECHNICAL CHARACTERISTICS

The chart 1.3.A shows the most important technical characteristics of the die casting machine; other informations regarding weights, dimensions of machine and dies and also acoustic levels can be found in the foundation drawing and on the lay-out of the machine (chapter 3 paragraph 4) and at chapter 2 paragraph 2.5 (acoustic levels).

CHART 1.3.A – TECHNICAL CHARACTERISTICS OF COLD CHAMBER DIECASTING MACHINE MODEL PFO 750

Locking force	*Ton*	785
Opening force	*Ton*	16,3
Max. injection force	*Ton*	66
Min. injection force	*Ton*	21,5
Central ejection force	*Ton*	37,9
Backward central ejection force	*Ton*	19,7
Max. movable platen stroke	*mm*	750
Min. movable platen stroke	*mm*	400
Injection stroke	*mm*	650
Central ejection stroke	*mm*	170
Max. die height	*mm*	950
Min. die height	*mm*	400
Distance between tie bars	*mm*	800 x 800
External platen dimensions	*mm*	1270 x 1270
Tie bars diameter	*mm*	170
Max. projected area (400 kg/cmq)	*cm²*	1960
Max. empty cycles	*N°/1'*	6
Pump motor rating	*KW*	45
Auxiliaries rating (Movable guards, Shifters, Control multiplier, and Quick phase, Cooling circuit)	*KW*	1,1/ 1,8/ 0,74 / 4
Transal rating ... *(if present)*	*KW*	1,87
Rotofast rating ... *(if present)*	*KW*	2,05
Automatic sprayer rating ... *(if present)*	*KW*	6
Work pressare	*Bar*	140
Tank capacity	*lt*	2110
N° of injcetion position/difference	*n/mm*	4/-76.2, -101.6, -152.4, -177.8
Max. weight of casting (AL)	*Kg*	12,5
Min. die dimensions	*mm*	565 x 565

(continuation of chart 1.3.A–part1)

Dimensions of the machine (width x lenght x height)	*mm*	2600x8295x3300
Total weight	*Kg*	35500
Nytrogen accumulator pre-charge pressure	*Bar*	125
Multiplier nytrogen accumulator pre-charge pressure	*Bar*	125
Standard work tension	*Volt*	480
Work frequency	*Hz*	60
Auxiliaries tension	*Volt*	24

1.2.2 ASSISTANCE

The Colosio S.r.l. gives a technical assistance service to the Customers; if You have any problem on the machine please consult immediately this instruction manual. If the problem persist after making the intervention written in the manual please contact Colosio S.r.l. at the number indicated in charter 1 paragraph 1.1.5 (identification data of the manufacturer).

1.2.3 MACHINE IDENTIFICATION PLACE POSITION

The plate can be found on the basement, camping side, near the hole of the motor (fig. 1.2.A).

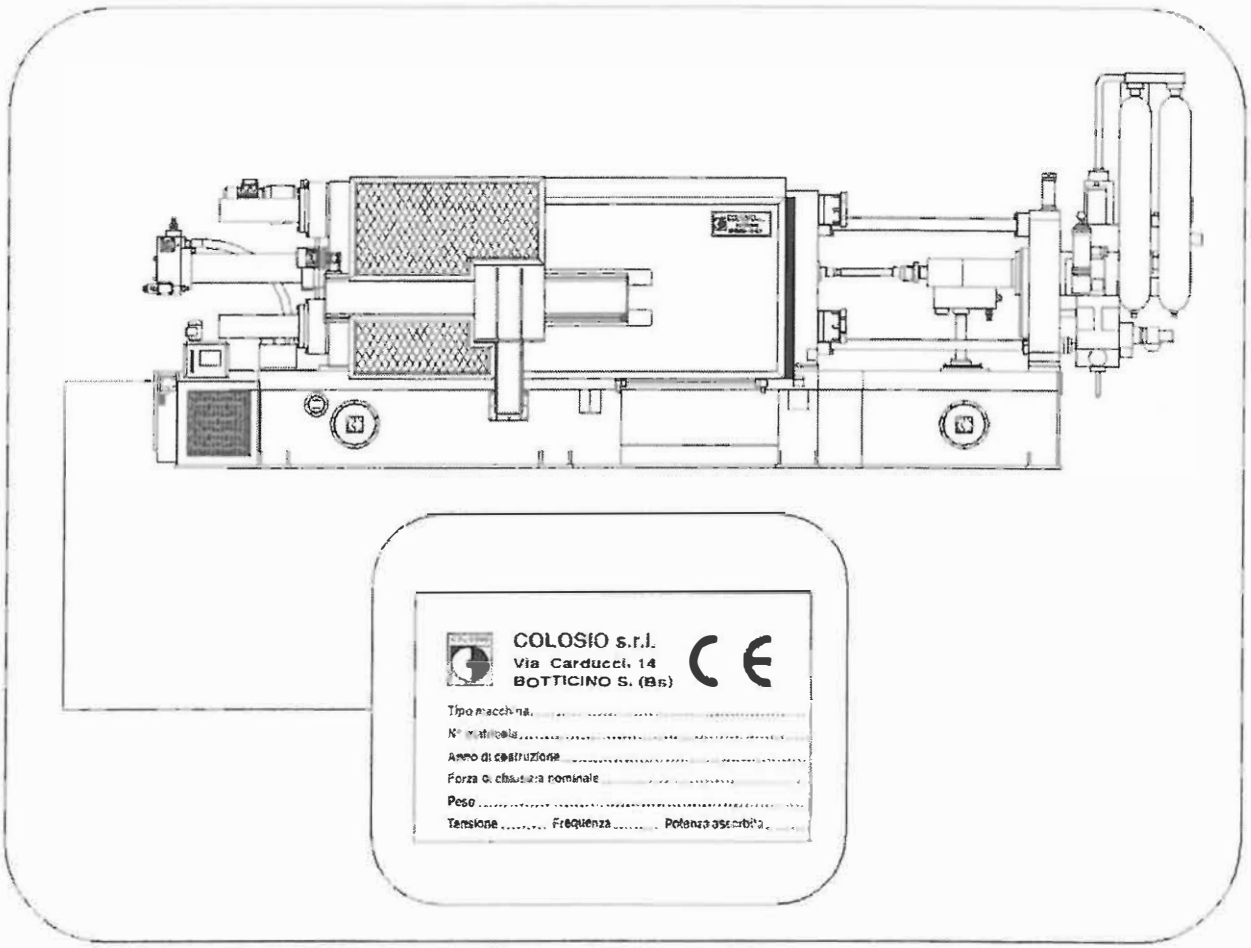


fig. 1.2.A –machine identification plate position

1.3 MACHINE DESCRIPTION

1.3.1 MACHINE COMPOSITION

When the machine is delivered to the forwarding agent the « machine block » (standard) includes:

- Diecasting machine with cold chamber with the following characteristics:

  a) Central ejection group
  b) Central lubrication system
  c) Automatic lubrication of injection plunger
  d) Pre-arrangement for core puller on movable platen
  e) Pre-arrangement for core puller on fixed platen
  f) Direct potentiometer on the camping unit
  g) Digital injection with limit switch
  h) Regulation with inductive limit switch
  i) Automatic injection position adjustment
  j) Motorized control of the multiplication speed.
  k) Proportional control of the first phase speed
  l) Motorized control of the second phase speed
  m) Electro-hydraulic safety on die closing.
  n) Push button panel on the fixed platen

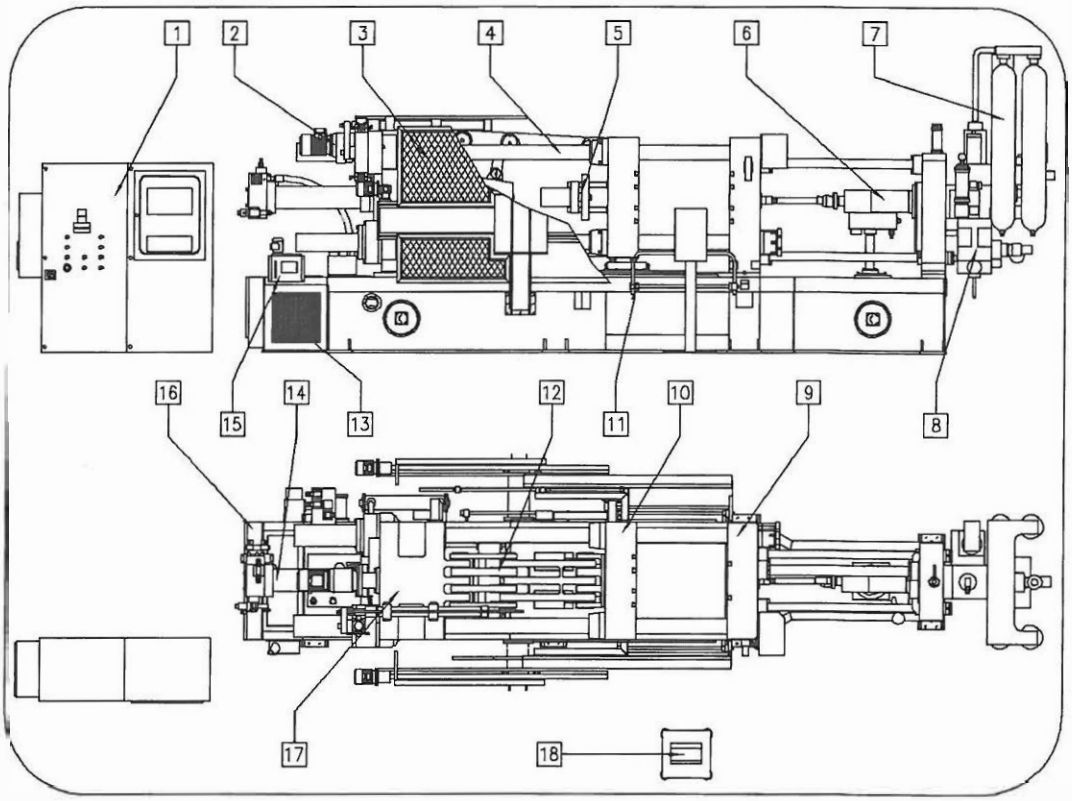
- Electronic devices and control
- N°1 instruction manual in english
- N°1 electric and electronic manual in english
- N°1 box with the following material:
  - Screws and nuts to fix the machine
  - Greaser
  - Series of keys
  - Special keys and tools (if necessary)
  - Pipe for nitrogen re-charge
- N°3 tools for lifting the machine (2 on the tie-bars and one on the camping unit)
- N°1 ring for shot sleeve for machine from 140 up to 320 ton and N°2 blocks for machine from 400 up to 2200 ton
- N°1 plunger holder
- N°2 mechanical blocks for injection positions
- N°1 bottle for injection plunger lubrication complete with flexible pipes

	The machines up to 320 ton have a standard manual version; in this case points f), g), h),j), k) e l) will be in their manual version.

1.3.2 MACHINE STRUCTURE

Thanks to many years' experience in this field, as well as the use of most modern technology and high-quality materials, COLOSIO Die Casting Machines are products that do not fear competition and grant the Production Operator reliability and first-class technical service; in order to guarantee the absolute dimensional stability the machine is placed on an oversized bed-plate made of metal structural work normalized; the internal part of the bed-plate is used as tank for the hydraulic fluid. Large manholes both on the side and on the upper surface allow an easy and careful cleaning when changing the hydraulic fluid.
The machine can be divided in the following groups:

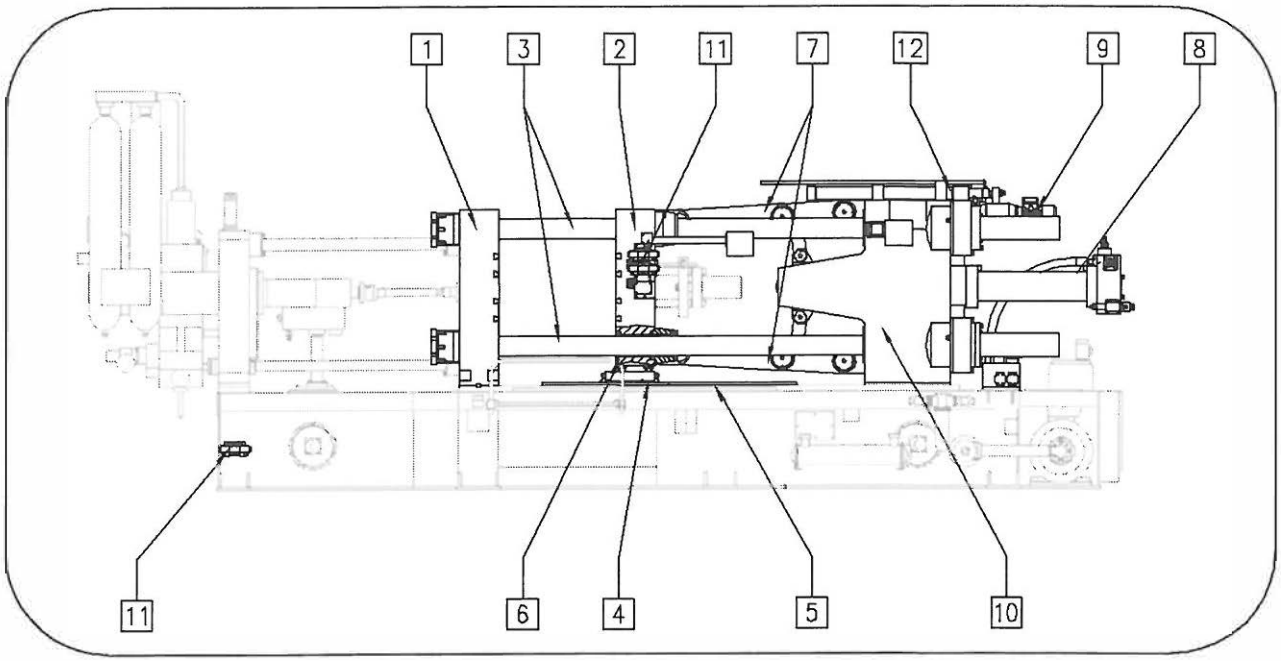
- double toggle camping group;
- injection group;
- central ejection group;
- telescopic gates and protections;
- oleo-dynamic system;
- pneumatic system;
- lubrication system;
- electric and electronic system;
- electric control panel.



1. Electric control panel
2. Shifters
3. Protections
4. Tie-bar
5. Central ejection group
6. Injection cylinder
7. Nitrogen bottles - accumulators
8. Multiplier cylinder
9. Fixed platen
10. Movable platen
11. Camping safety
12. Toggle
13. Motor place
14. Camping cylinder
15. Lubrication unit
16. Terminal board
17. Reaction head
18. Push button panel

fig. 1.3 A – general view of PFO diecasting machine

1.3.2.1 CLAMPING GROUP WITH DOUBLE TOGGLE



1. fixed platen
2. movable platen
3. tie-bars
4. bronze slides
5. guides
6. bronze bushings
7. toggle
8. camping cylinder
9. camping shifters moto-reducteur
10. reaction head
11. core pullers distribution

fig. 1.3.B – camping group with double toggle

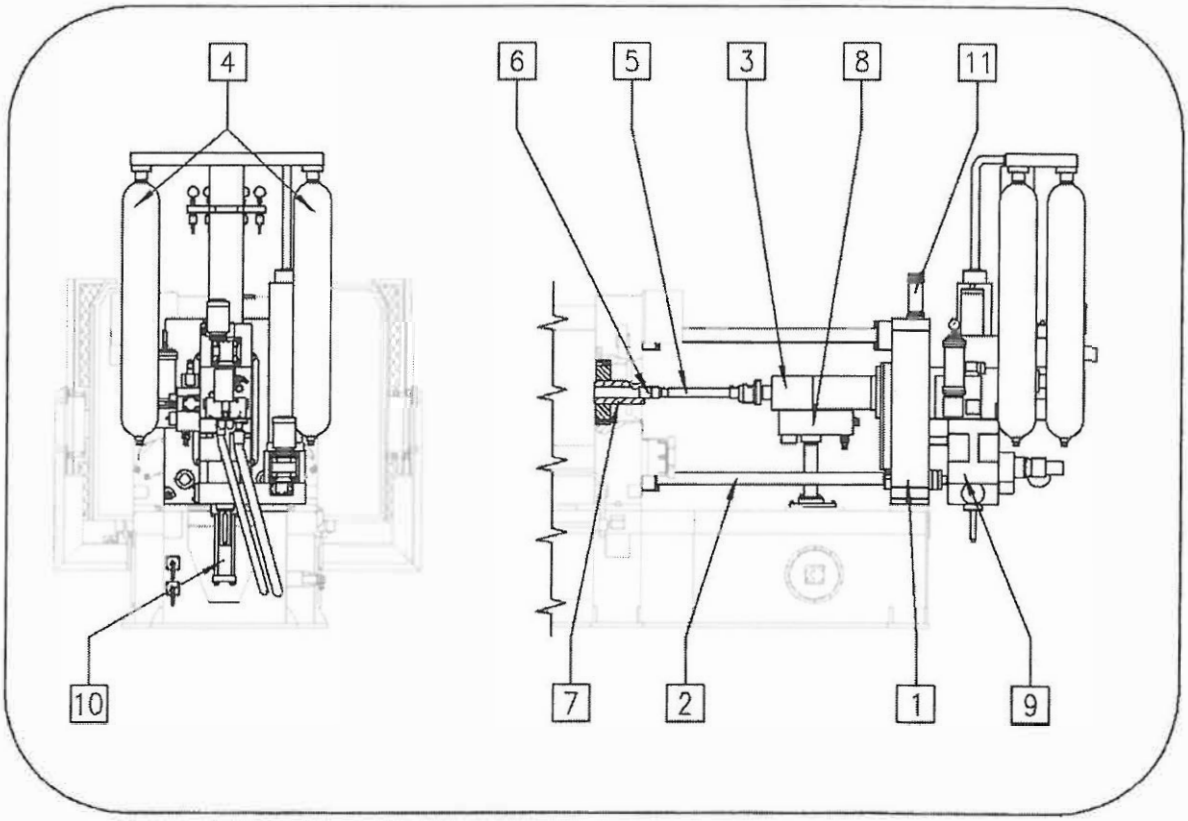
The clamping group (fig. 1.3.B) is made by a fixed platen (1) strongly connected to the basement and by a movable platen (2) that slides on four thick chromium plated tie bars (3) made of forged high yield point and is guided by LD bronze bushings (6), with special scrapers ensuring long life to sliding surfaces and with two adjustable shoes (4) on two steel slides (5) to lighten the load weighing of the platen upon the columns.
The movement is guaranteed by a double toggle system (7) working with an hydraulic cylinder (8) that guarantees an high level clamping of the machine; this group is adjustable by a moto-reducer (9) placed on the reaction head (10) in order to allow the die assembling of different sizes.
On the movable platen and on the fixed platen there is an hydraulic pre-arrangement (11) to control up to 3 (four) core pullers for particular dies. The opening of the movable platen can be reduced if the machine is pre-arranged (optional).

For big dimension dies, with core pullers, creating problem during the die assembly mode, the machine can be equipped with a system of tie-bar removal (one or two upper tie-bars) (12). The working cycle of the system is explained later on (cap. 4 par. 4.3.5.2)
The two platens are equipped with T caves allowing a quick and simple fitting of the semi-dies; on the fixed platen is present a place for an interchangeable block (or two steel caps) to place the shot sleeve in the correct injection position.

– AUTOMATIC REGULATION CYLINDER (optional)

This accessory allows the automatic regulation of the opening stroke limit of the movable platen planing a mechanical lock assuring a constant and precise stop position (setup directly on the video). This system guarantees the position repeatability where it is necessary (extraction and lubrication of the piece) and also optimise the cycle time of the machine.

1.3.2.2 INJECTION GROUP



1. injection support
2. injection tie-bars
3. injection cylinder
4. bottles and accumulators
5. piston holder
6. injection plunger
7. shot sleeve
8. quick discharge
9. multiplier cylinder
10. lifting cylinder
11. injection height blocks

fig. 1.3.C – injection group

The injection group sliders on a beam (1) strongly connected to the basement and connected to the fixed platen with 3 tie-bars (2); it is basically made by an hydraulic cylinder (3) moved by a piston accumulators system (4), and connected with an extension (5) to the injection plunger (6). The injection of the metal in the die happens in three phases, the first phase is a movement with a progressive acceleration on the pioston until the end of the shot sleeve (7), after this there is the second phase in which, with a quick discharge system (8) and with the pressure of the bottles, the piston pushes the liquid metal in the die at a very high speed. Immediately after there is the intervention of the multiplier (9) that multiplies the pressure used for the injection (with a value changeable by the operator) squeezing the metal in the die and helping the return

during the solidification (third phase). After die opening there is the slug ejection phase, pushed by the injection during the first stroke of the opening.
Accordingly to the shape of the piece the injection height can be regulated with a cylinder (10) in predetermined positions respect to the axis of the machine. The injection height is automatically locked with hydraulic cylinders and a mechanical safety (11) (in order to have better description on the injection height please see charter 4 paragraph 4.3.7).

– "FUTURA V2 SYSTEM" INJECTION

The "Futura **V2 System**" developed by Colosio, consist essentially in two independent circuits with dedicated accumulators, to check the injection phases and multiplication, independently and with flexibility.

The flexibility consist in the possibility to set every parameter (stroke, speed or pressure), accordingly to the production process, by reducing almost to zero, if necessary, the delay time of the multiplication phase. With this system is possible to anticipate the entrance of the multiplier (not in line with the injection and easily controllable by the operator), being able, in particular cases, to compensate some errors or problematic of some dies.

The first phase of injection is also progressive, controlling the forward movement of the piston with a progressive acceleration avoiding turbulence in the liquid metal and presence of air, problematic for the good results on the piece.

In the digital version, everything is controlled by the control panel, that allows to control every injection parameter through servo valves and axis control.

– INJECTION BRAKE (optional)

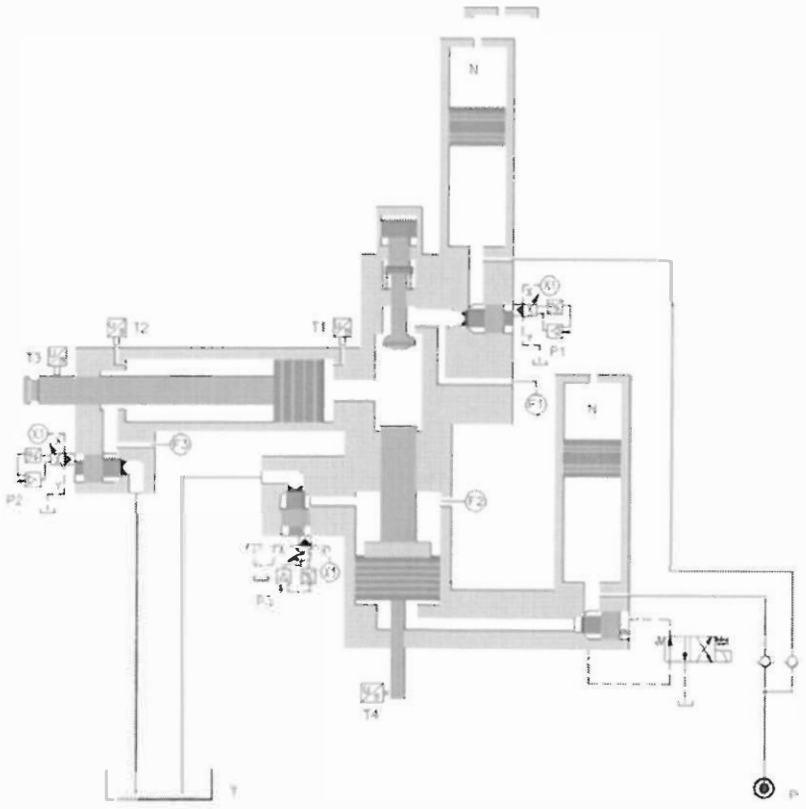
The injection brake, studied for the closet loop system, can be fitted, by request, also on a machine with a "Futura" injection system.
It is a system studied to reduce drastically the pressure peaks that happens during the filling time of the pieces (multiplication phase) and is done essentially by a proportional valve optimised, placed on the discharge of the injection cylinder, with which it is possible to control the discharge flux and also the inertial masses of the piston and of the fluid in movement that would inevitably discharge in the die with the creation of dangerous pressure peaks.
The intervention quote of the brake (the position where the piston will start to decrease his speed) and the breaking value (the percentage of closing of the valve on the discharge) are directly changeable on the control panel (see electric and electronic manual attached).

– "REAL TIME" INJECTION SYSTEM WITH CLOSED LOOP

The "REAL TIME" system to control the injection in closed loop in the cold chamber machines COLOSIO, is an high technology implementation, made by hardware elements both hydraulic and electric with very high performances and by a sophisticated special software created to control this hardware. All this with an intuitive and easy interface.

This system uses for the oleo dynamic part basically 3 valves (P1-P2-P3) servo proportional with high dynamic and integrated electrical control, used respectively for the control of the oil in arrival, the first, the modulation of the speed and the brake (speed closet loop), the second, and the control of the final pressure working on the multiplier (pressure closet loop) the third.

A series of pressure transducers (T1-T2) and position transducers (T3-T4) are placed to check the pressures and the instantaneous positions in the multiplier and in the injection piston. An accurate filtration of the fluid before the injection group and specific (X1), on the servo proportional valves, guarantees a constant precision of the answers of the servo controls, reducing drastically the maintenance interventions.



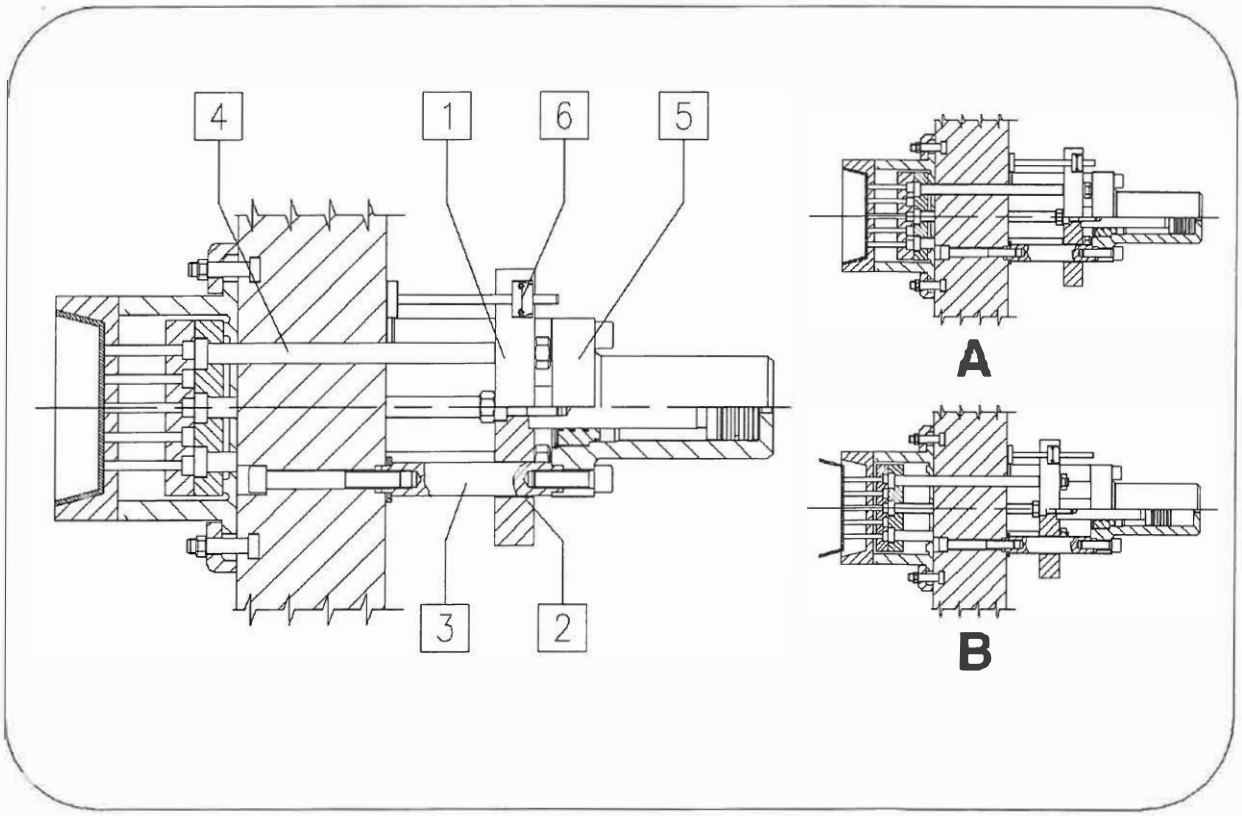
The electronic control allows a system of automatic check with closet loop for speed and pressure, allowing to determinate before the best injection profile for a particular die and this can be regulated directly in the control panel of the machine.

The transducers transmits in real time de return signal of the control system giving speed and position on the injection piston, a special microprocessor elaborates then the signal of the valves piloting the instantaneous speed of the piston accordingly with the speed inserted in the control panel and all this independently from the variables of the process, reducing at minimum the influence of these variables. Metal temperature, grips between piston and plunger, pressure peaks, temperature and viscosity of the oil will not touch the process so importantly anymore.

The complete programmability of the injection curve allows to reduce the speed in desired points, solving the problem of pressure peaks and saving the consumption of the machine's parts and also increasing the life of the dies.

This new injection system has been designed to have three independent closet loop systems, able to work perfectly together to maintain the programmed injection profile.

1.3.2.3 CENTRAL EJECTION GROUP



1. central ejection plate
2. sliding bushes
3. small tie-bars
4. ejection pin
5. cylinder
6. position transducer

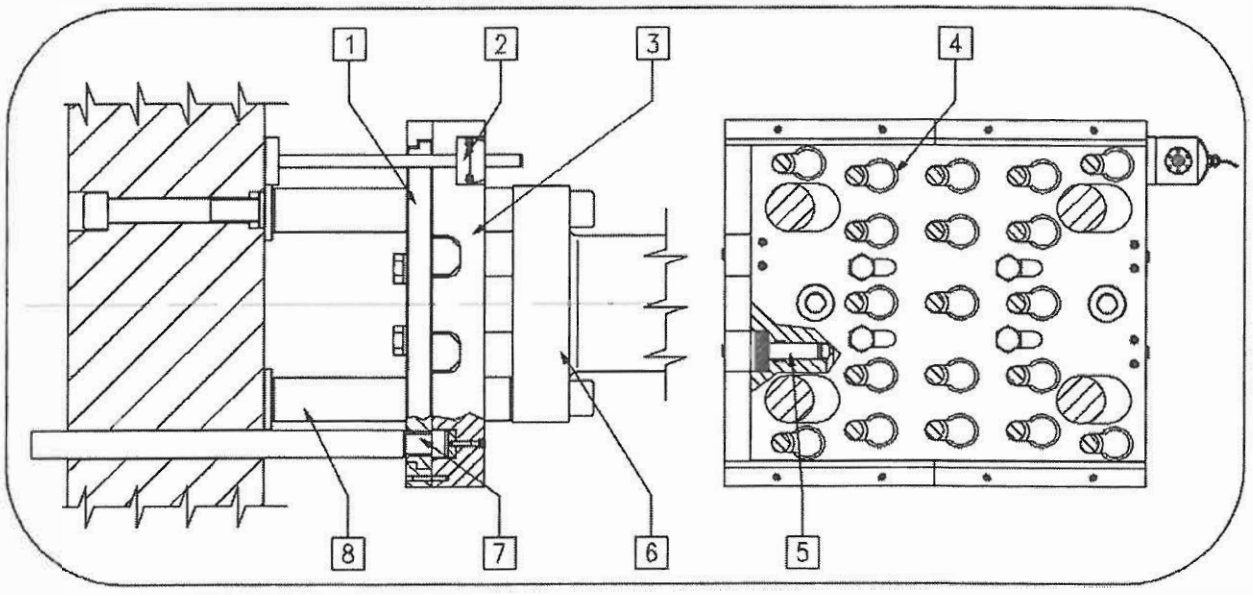
A – central ejection backward
B – central ejection forward

fig. 1.3.D – central ejection group

This group, mounted on the fixed platen inside the toggle, gives the movement to the central ejection movement of the casted piece (part of the die), both by pushing and by coming back; it is a plate (1) sliding through bushes (2) on 4 small tie-bars (3) fixed on the movable platen.
On this plate are fixed the ejector pins (4) giving the movement top push the casted piece; the movement of the plate is done with 2 hydraulic cylinders (5) moving accordingly with the tie-bars and can be regulated with limit switches (see cap. 4 paragraph 4.3.4) on manual machines or digital only on the injection. The setup can be done directly on the control panel with a position transducer (6) on the completely digital machines.

– AUTOMATIC QUICK LOCK OF CENTRAL EJECTION (optional)

In case of frequent die changing, the central ejection system can be equipped with an hydraulic apparatus of automatic lock of the ejector pins, made by a sliding plate (in which are made special holes), moved by 4 small pistons (2 for opening and 2 for closing), controlled by an electro-valve.
Everything is easily movable by the operator directly on the push button panel.
On the push button panel You can find a selector for locking or unlocking the ejector pins, (see cap. 4 paragraph 4.2.2 – push button panel); moving the selector in the locking or unlocking position is possible to open or close the valve moving the small pistons of the plate. These pistons can unlock (or lock) the ejector pins, designed to guarantee the perfect connection to the plate without any regulation (the standard supply includes 4 ejection pins and drawing useful to make these pins for the future)
With this accessory the changing of the dies can be much more faster, it is eleiminated the necessity to fix or free, with long and problematic screws the pins on the plate, with a huge save of time on the operation.



1. connection plate
2. potentiometer
3. ejection plate
4. hole
5. small piston
6. ejection cylinder
7. ejection pins
8. guide tie-bar

fig. 1.3.E –automatic quick lock of central ejection

1.3.2.4 TELESCOPIC DOORS AND PROTECTIONS

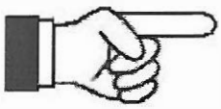
On the Colosio machines the doors are fixed to a support connected to the basement and are sliding on an external guide. With this solution is more easy to change the dies, specially for big and heavy dies equipped with core pullers, because the die area is completely free in both sides of the machine. In the past the problem was created by an upper sliding guide connected to the platen and the head. Another help in die changing process can be done by the automatic tie-bar withdrawal system (optional). The machine is equipped with movable and fixed protections to avoid the contact with potentially dangerous parts of the machine.

1.3.2.5 OLEODINAMIC SYSTEM

The oleo dynamic system, giving energy on form of hydraulic pressure needed for every movement of the machine, is essentially made by:

- motor-pump group with suction filter;
- max. Pressure valve;
- going and return filter;
- heat exchanger;
- proportional and manual speed regulators;
- valves to reduce the pressure;
- piloted distributors;
- electro-valves;
- accumulators;
- check equipments as monometers, thermometers, thermostats;
- safety valves.

This system is done with high quality components and the main brand, with their technical assistance, can guarantee international after sale service and perfect technical assistance all over the world. The manometers to control the line pressure and the working pressure are in glycerine bath and are equipped with exclusion taps.

	For a detailed description of the functioning of the system please refer to charter 4 paragraph 4.4 (oleo dynamic system).

1.3.2.6 PNEUMATIC SYSTEM

The pneumatic system is used to control the injection pyston lubrication, to lock the opposite operator's side door (in the manual version) and in case of presence of the sprayer, to make the lubrication cycle.
The system is done essentially by a group of fixed and flexible pipes, flux reducers, filtering elements, lubrication and connections to an external source of compressed air.

1.3.2.7 LUBRICATION SYSTEM

The lubrication of the moving elements on the machine is done by an automatic system of centralized lubrication made by a tank, a pump and a max pressure valve. Through a system of pipes connected to dosing valves, the system can lubricate point by point.

For the lubrication frequency, the regulations and the correct oils to use please refer to charter 4 paragraph 4.5 (central lubrication system) or to chapter 5 (maintenance or damages location).

1.3.2.8 ELECTRIC AND ELECTRONIC SYSTEM

The electrical circuit control the moving system of the machine, the loader, the sprayer and is able to manage the interface signals with robots or other island accessories.

This circuit is made by:

- Electric control panel: it contains the command circuit of the machine's motor, the PLC to control the valves and the limit switches of the accessories and the control panel;
- Electrical boxes: they contain plugs for electrical connections;
- Push button panel: it allows to make the movements of machine and accessories in automatic and in manual mode. In the digital cold chamber machines it contain also the PLC cards to move the buttons.
- Connection of electrical cables.
- Transducers: they allow to read the pressure of the machine (only on completely digital machines with Colosio Full Coltrol system);
- Electrical box on the basement: in the cold chamber digital machines it contains PLC cards moving the valves and the limit switches of the machine and the loader and some parts of the electric distribution on the machine.

For a detailed description of the functioning of the system please refer to charter 4 paragraph 4.2 (command and control equipments).

1.3.3 CONSTRUCTION NOTES

The cold chamber diecasting machines Colosio are identified by the acronym PFO (presso-fusione orizzontale) and by a number identifying the camping force of the machine expressed in tons:

For example:

PFO 560 - horizontal die casting machine with cold chamber with nominal closing force of 560 tons.

The PFO series includes machines going from 140 tons up to 2200 tons.

These machines have been projected and created to work in closed and non-explosive environment.

	It is absolutely forbidden to use the machine in explosive or potentially explosive environments.