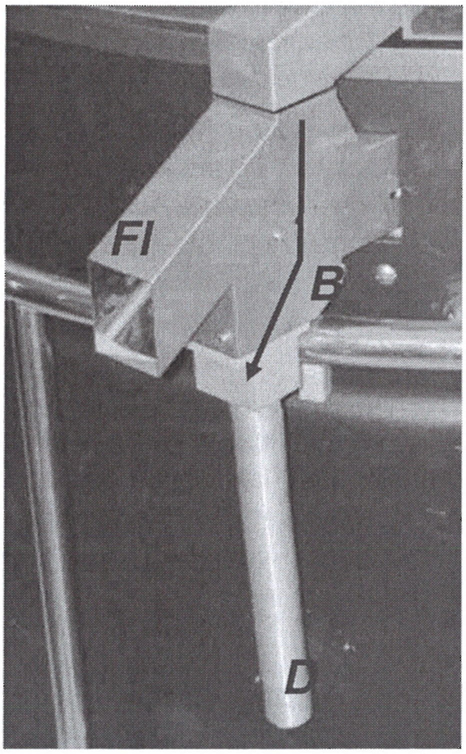
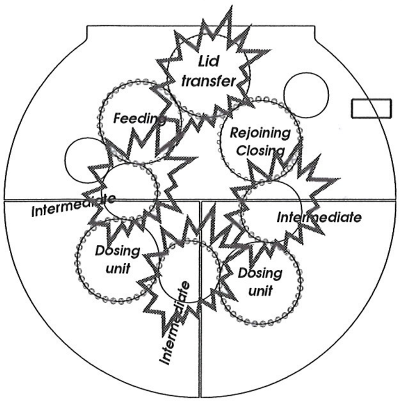
When a reject capsule is detected, the control system generates a reject capsule signal.



The flap ***Fl*** located in the production chute diverts the capsules into a hose ***B*** which transfers them to a collection container ***D***.

To ensure that the reject capsules are actually eliminated the system can be programmed to reject a set number of capsules before and after the one detected as the reject.

8.9 Intermediate units



The intermediate units are essentially transfer wheels described as idle (i.e. not motorised).
The intermediate units consist mainly of:

- ***Capsule body transfer unit***
- ***Capsule lid transfer unit***
- ***Dosed capsule body transfer units***
- ***Transfer unit during capsule body closing***

The intermediate units connect the various motorised units (capsule handling units, dosing units) and they are designed to transfer the bush support belt from one unit to another.

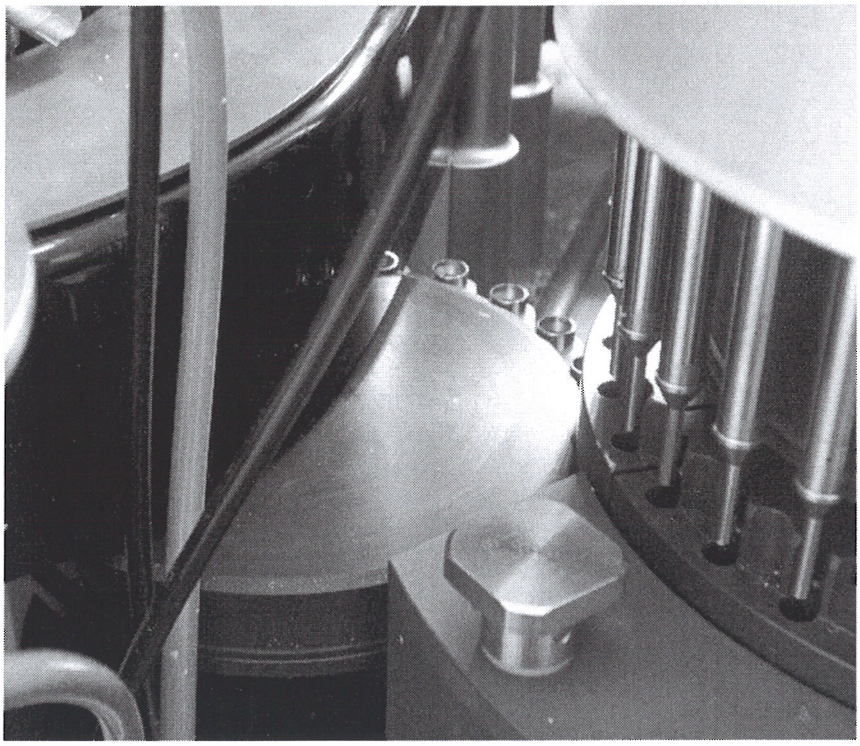
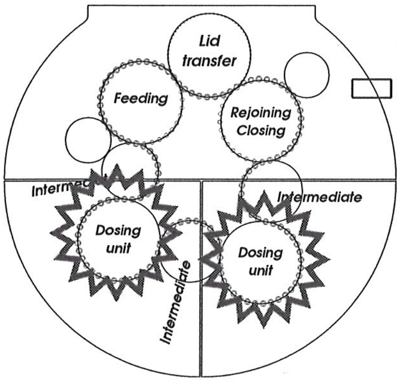


Figure 28 – The photo shows an intermediate unit.

9. Dosing units



The capsules are dosed at two stations which are considered a single dosing unit.
The two dosing units are connected by an intermediate idle wheel.

The dosing units consist mainly of:

- ***Drive parts***
- ***Rotary containers for the product***
- ***Sector containers***
- ***Product infeed system***
- ***Dosators***

Dosing units available for **PLANETA/PLANETA 100** machine are the following:

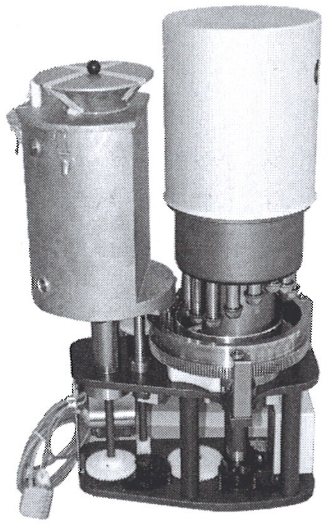
- ***Powder Dosing unit***
- ***Pellets Dosing unit***
- ***Tablet Microtablet Dosing unit***
- ***Universal tablet Dosing unit***

10. Powder dosing unit

*The powder dosing unit fills the capsule bodies with the required quantity of product (**powder**).*
Powder is dosed volumetrically by filling the dosing chambers inside the dosators.
The product volume is then dosed in the previously opened capsule body.
*The powder dosing unit can be installed in position **C** or in position **E** or in both positions **(C+E);** In fact, the unit can function in combination with another **POWDER** dosing unit or with any other dosing unit (among those provided for the machine). In case of 2 powder dosing units **(C+E)**, the unit in position **C** will dose the odd-numbered capsules and the unit in position **E** will dose the even-numbered capsules.*

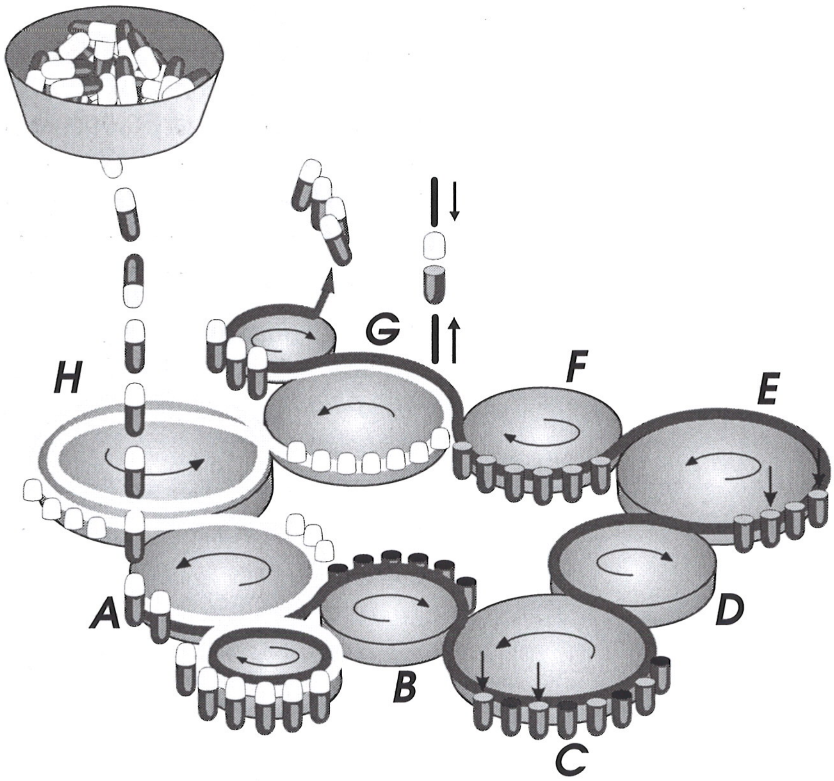
The powder dosing unit consists mainly of:

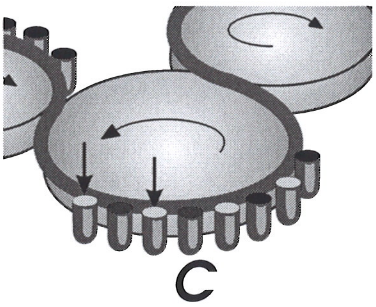
- ***Feeding hopper with mixer blade***
- ***Rotary container***
- ***Sector container***
- ***Dosators, pistons and springs.***



10.1 Functioning principles

The even numbered capsules are dosed in the first station *C*. Unit *D* is an intermediate unit. The odd numbered capsules are dosed in the second station *E*. All the capsules are then transferred by intermediate station *F* to the closing unit *G* where a third sensor detects the presence of the full capsule body.



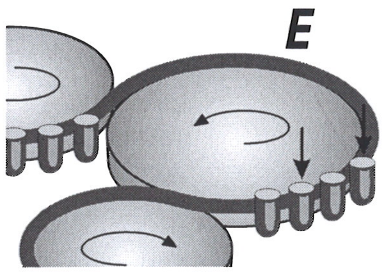


With powder dosing units, odd-numbered capsules, i.e., 1, 3, 5, 7... 31, are dosed in station *C*.

Even-numbered capsules, i.e., 2, 4, 6, 8 ...32 are dosed in station *E*.

This maintains the same progressive numbering as the capsule infeed unit, so:

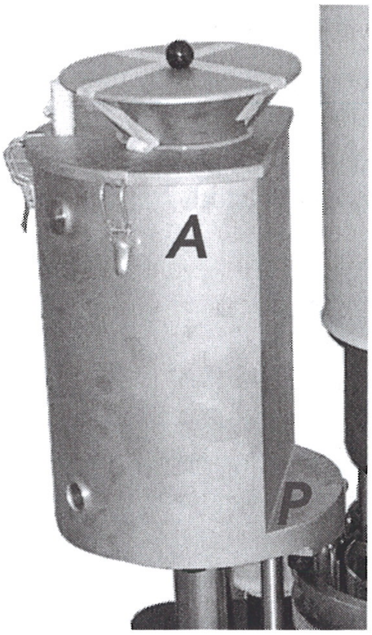
the capsule descending from bush **no. 1** will end up under dosator **no. 1** of powder unit *C*.



The capsule descending from bush **no. 2** will end up under dosator **no. 2** of powder unit *E*.

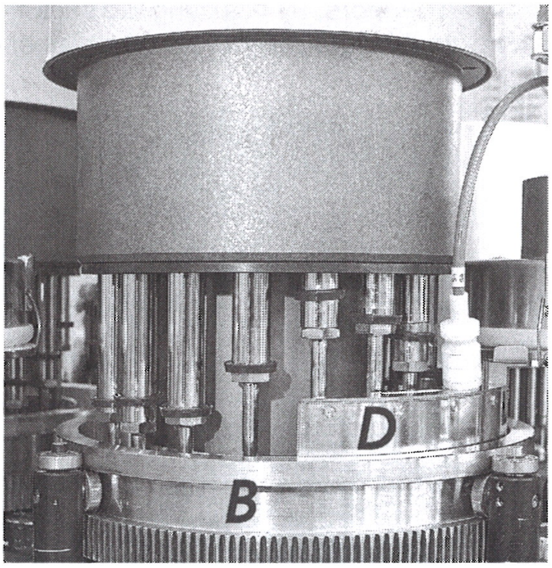
When dosing with a pellet unit (i.e., suitable for dosing up to 100,000 capsules only on *C* or only on *E*), the numbering goes from 1 to 32.

IMPORTANT: *For all speeds below 100,000 (50,000, 25,000 etc...) you only consider the subtraction of dosing elements, so that, for example, at 50,000 you dose with bushes 1, 3, 5,...31, at 25,000 you dose with bushes 1, 5, 9...29.*
In practice, number 1 remains no. 1 for all speeds.
This aspect, which at first may seem complicated, is very useful for achieving successive speed upgrades (for example, from 50,000 to 100,000) without upsetting the mechanics or the electrical phases, which remain identical. Lastly, in case of speeds below 100,000, the holes that remain open are closed with plugs.



10.2 Powder infeed system not centralized

Powder product is contained in the hopper ***A*** located to the side of the dosing unit. Thanks to rotating blade ***P*** inside the hopper, the product is transferred to the sector container ***D*** and fills rotary container ***B***.

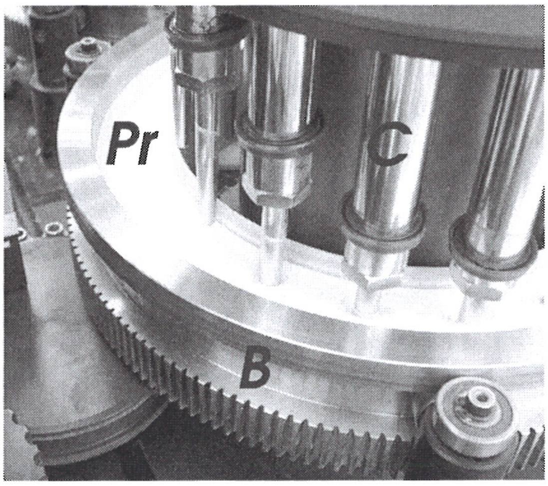


10.3 Dosing phases

The sector container, contrary to the rotary container, does not rotate because it is secured to the infeed hopper.

The product **Pr** inside the rotary container is levelled by the sector container during rotation of the former.

Therefore, by adjusting the sector container, the product layer height in the rotary container can be adjusted.



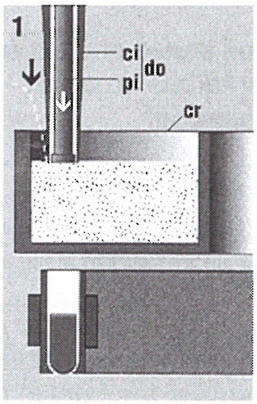
The rotary container rotates eccentrically and more slowly than the dosing drum.

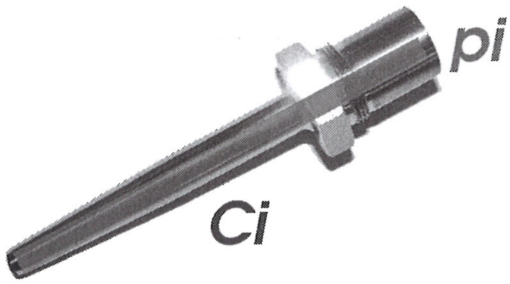
The dosators ***C*** are fitted to the outside of the dosing drum at equal distances from each other.

As well as rotating together with the dosing drum, the dosators also move vertically.

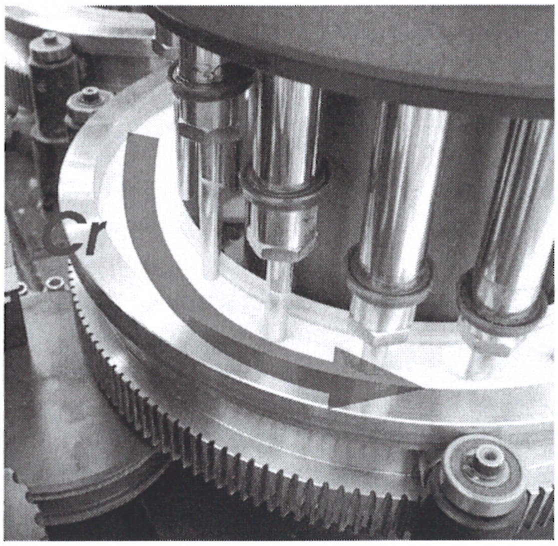
Each dosing phase is described below

STEP	OPERATION
①	Each dosator **do** is made up of a cylinder **Ci** inside which there is a piston **pi** whose height can be adjusted.

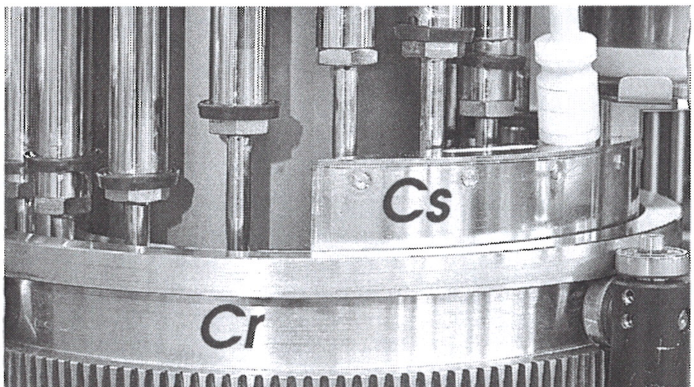




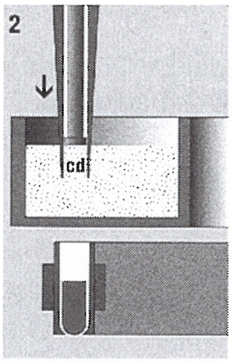
The dosators that had already loaded product in the capsules during the previous cycle rise and descend along an oblique trajectory until they reach the product layer inside the rotary container ***Cr***.



When the rotating dosator descends into the rotary container up to the product level, the piston is aligned with the lower edge of the cylinder. As mentioned, the height of the product layer in the rotary container ***Cr*** depends on the height setting (manual or motorised) of sector container ***Cs***.



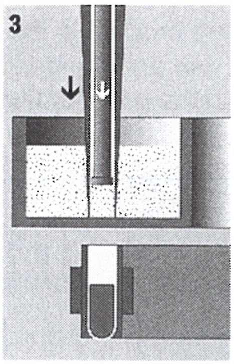
②



When the rotating dosator descends into the product, the piston keeps its position to set the dosing chamber ***Cd*** (syringe effect), i.e., the quantity of product to inserted in the capsule.

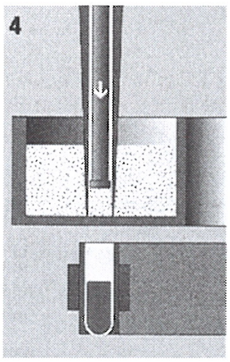
The eccentricity and different rotation speed of the rotary container enables the dosators to enter the product obliquely and always in a different position.

③



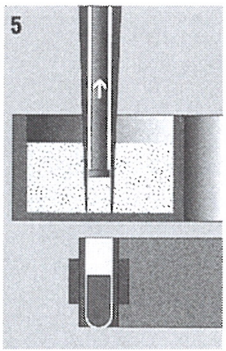
The rotating dosator and the piston, keeping the dosing chamber setting, lower into the product to the bottom of the rotary container.

④

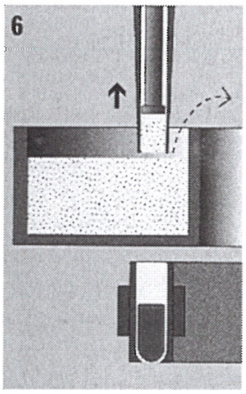


If the product's physical characteristics so require, the piston can lower further (by adjusting the height of the compression cam).
This setting can be manual or motorised, and is called **compression setting.**
In this way, a product slug is created in the dosator due to compression of the quantity of product filling the dosing chamber.

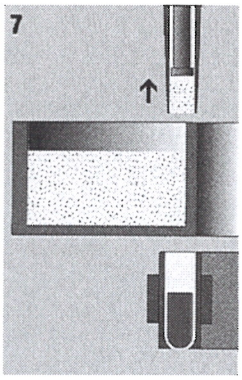
⑤



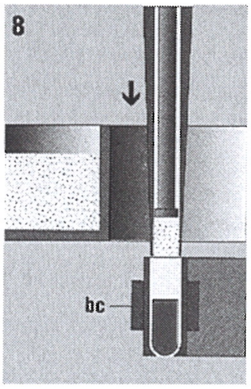
The internal piston is then raised slightly to hold the product quantity that has just been picked up in the dosing chamber.

⑥


The rotating dosator and the piston rise simultaneously.

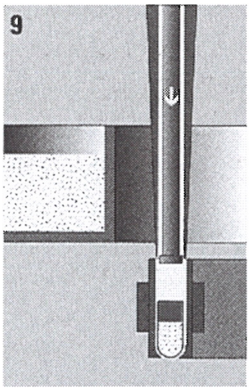
⑦


The piston and dosator pass over the rotary container thanks to its eccentricity.

⑧


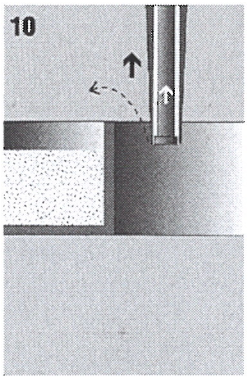
The dosator and the piston descend simultaneously until they meet the capsule body contained in the special conveyor belt bush.
The unit drives the conveyor belt in such a way that each dosator is aligned with a capsule body bush **bc** when the dosator descends.

⑨



The piston descends and extends slightly from the dosator to transfer the product slug into the capsule body.

⑩



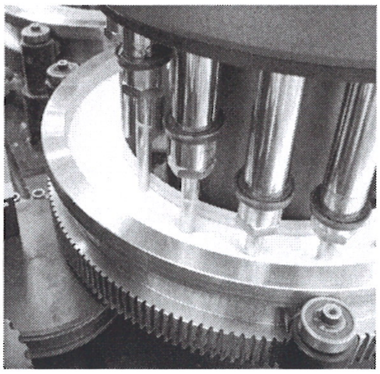
The rotating dosator rises to start a new cycle. At the same time, the piston realigns with the lower edge of the dosator.

10.4 Dosing properties

Rotation speed

The rotary product container and the dosing head rotate at different speeds so that product is not picked up from the same position until a large number of cycles have been carried out.

This ensures that the layer of powder is properly leveled again when powder is picked up from the same position the next time.



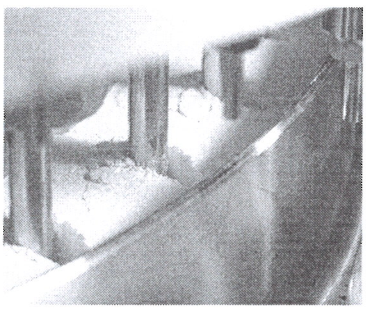
Rotation axes

The rotary product container and the dosing head have different axes of rotation to enable the dosators first to sink into the product layer and then to discharge the product into the capsule bodies.

The dosators are driven into the product layer at an angle which makes a "furrow" in the product layer rather than a vertical hole. This is especially important when the physical properties of the powder make dosing difficult.

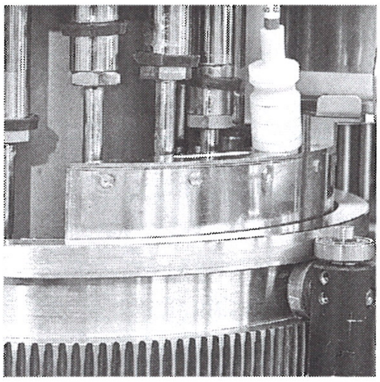
Dosators

The dosator is made entirely of stainless steel.
Internally, it is cylindrical, whilst its outside surface is conical, with a slight downward taper.
This simple yet effective form, combined with the special surface finish facilitates its immersion in the layer of product, reduces its compacting effect on the powder, improves the flowability during both the pickup and expulsion stages so that the powder does not stick to the sides of the dosator causing inaccurate dosing.



Speed of dosator immersion in the product layer

The profile of the dosator drive cam is such that the dosators move down into the product layer at a speed lower than production speed, which is itself relatively low. This reduced speed, which is itself relatively low,
enables the product to fill into the dosator gradually and allows all the air to be expelled from the "dosing chamber" through the hole in the top of the dosator itself. This and other technical characteristics guarantee the maximum dosing accuracy.



Adjustment of powder layer by sector container

The height of the product layer in the rotary container is determined by the distance between the base of the rotary container itself and the sectored container.
It may be adjusted manually with a knob or automatically from the console where the settings appear on a digital display unit.
The amount of product in the sectored container can be adjusted using another knob.
The convenience of being able to adjust the dosing assembly so quickly, easily and accurate is especially apparent when working very fine powder, with high specific weight, low flowability and other properties which would otherwise make dosing highly problematical.

Adjusting weight and compression

Weight may be controlled by adjusting the height of the dosing chamber.
The height may be varied in relation to capsule size and quantity of product to be filled into each capsule. The compression of the product inside the dosing chamber may be zero or gradually increased to very high values.

The settings for these adjustments are a function of product characteristics, production requirements and the need to mantain specified break-up times.

The weight and compression adjustments are applied to mechanical parts controlled manually with handwheels or automatically.
The adjustments are micrometric and are applied to all dosators simultaneously. The settings are expressed in millimetres and may be read off two graduated scales if adjustment is manual or off digital display units on the control console if adjustment is power driven.

10.5 Lubrication system

*The lubrication system is made of one or two **oil pumps** and relevant **circuits**. It lubricates cams and dosator support shafts for the dosing units.*
The pump is housed below the machine surface (see the photograph below).

From the oil pumps start the lubrication circuit. Each branch of the circuit ends with a nozzle for the oil distribution on the parts to lubricate.

When two dosing units are installed there are 2 oil pumps (one for a single dosing unit).

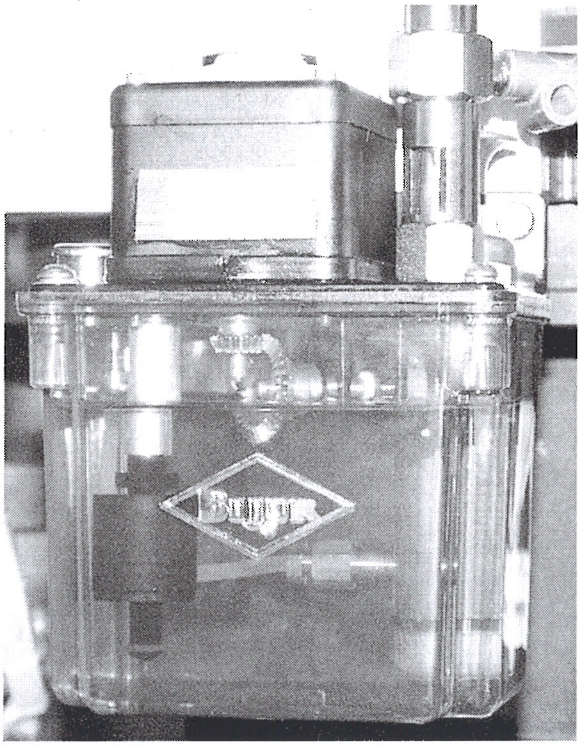


Figure 28 – The photo shows the oil pump.

The operator can set lubrication timing directly from the control panel by configuring a function for pump activation intervals.

Dosing cams lubrication

Dosing unit cams are lubricated by means nozzles that distribute the oil on the interested parts. Cams are oiled by means a periodic distribution of single oil drops.

Dosator shafts lubrication

The dosing shafts are lubricated by a direct micro-mist on the shafts which, during their rotary movement, travel in front of the nozzle at the end of the lubrication circuit.

Oil nebulization intervention time is programmable by means MCI control system.
A single manual nebulization can be performed by the operator using the special control panel function.

Lubrication timing

The operator can set lubrication timing directly from the control panel by configuring a function for pump activation intervals.

*For more details on setting lubrication intervals, see the paragraph **"Oil pump adjustment"** in the chapter "**MACHINE SETTINGS**.*

*For further details on the lubrication system refer to the relevant **LUBRICATION DIAGRAM** diagram supplied.*

11. Universal tablet dosing unit

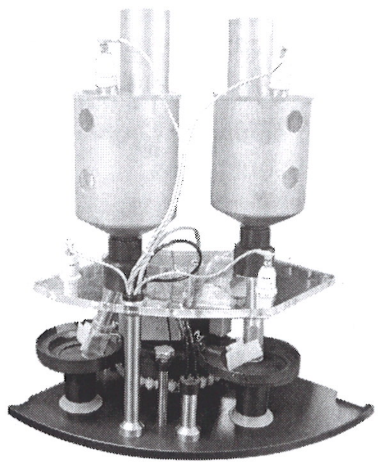


Figure 29 – The photo above shows the current universal tablet unit.

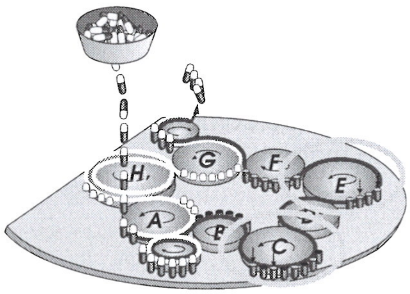


Figure 30 – The diagram above illustrates the machine positions in which you can install the **universal tablet unit**.

The universal tablet dosing unit can dose ***tablets of various shapes and sizes and similar solids****all into capsule bodies.*
The unit mechanics involves continuous rotating movements.

Dosing takes place by the force of ***gravity*** *which together with certain mechanical adjustments make it possible to insert one or more tablets at a time.*

The tablet dosing unit may be fitted in either position ***C or E****. The tablet dosing unit consists of:*

- ***Tablet infeed system***
  - 2 infeed hoppers and corresponding level sensors
  - 2 vibrating containers and corresponding level sensors

- ***Tablet dosing system***
  - 1 conveyor drum
  - 2 laser sensors count the number of tablets dosed
  - 2 laser sensors check for a blocked chute
  - tablet levellers

The unit is controlled by the machine PLC using certain dedicated functions.

The microtablets are contained in the hopper T.
The universal tablet unit doses tablets of all shapes and sizes, capsules and similar solid bodies (up to two different types at the same time) in the quantity established by the customer and not more than the maximum capacity of the capsule.

This new Unit does not have product-related size parts but requires simple adjustments which permit dosing of every solid mentioned in the capsules, in various quantities, combinations and shapes.
On this Unit, only one part needs to be replaced when production is changed over to capsules of another size.

The speed depends on the number of tablets or similar solids which you want to dose, their shape and size and the possible combinations of these.

The production speed and the possible dosing combinations may be doubled by fitting two Universal Tablet Units on the machine at the same time.

The universal tablet unit together with the other units available considerably increases the dosing potential for Customers.

The considerable versatility of the MG2 universal tablet unit and its production speed make it truly unique compared to similar units currently available on the market.

11.1 Tablet infeed system

Tablet infeed hopper

The tablets to be dosed are contained in the infeed hoppers ***T.*** there is one infeed hopper for each dosing unit.

Each hopper is fitted with a level sensor ***Se*** which signals the tablet level to the control system (PLC).

Automatic tablet loading system

When the automatic tablet loading system is used, the level sensor sends a signal to the PLC which restores the tablet level in the hopper.

Manual tablet loading

If the automatic tablet loading system is not used, the level sensor tells the operator to load the infeed hopper manually.

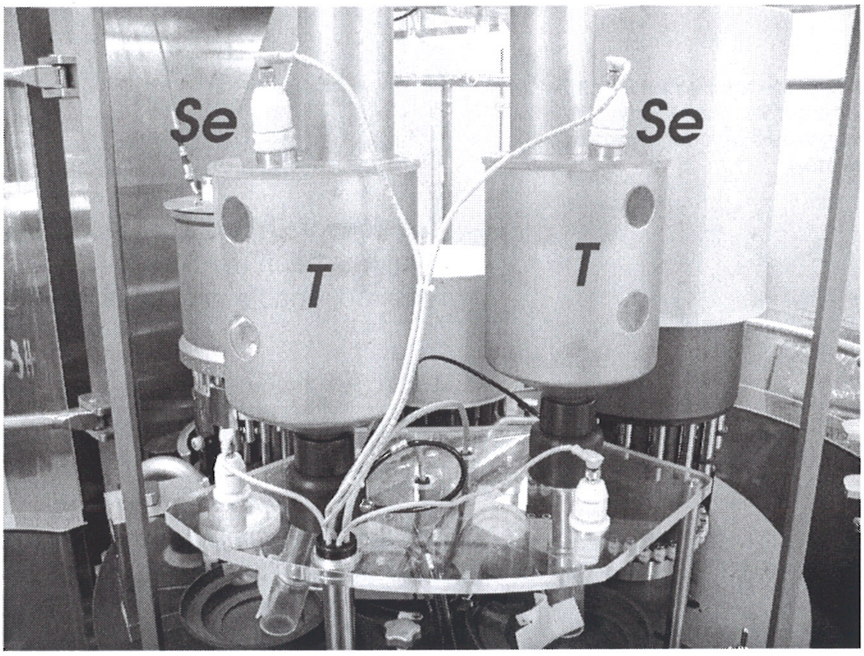


Figure 31 – Detailed view of the tablet infeed hoppers, with minimum level sensors highlighted.

From the infeed hoppers, the tablets are gravity-fed through the descent chutes ***C*** directly into the corresponding vibrating containers ***V***.

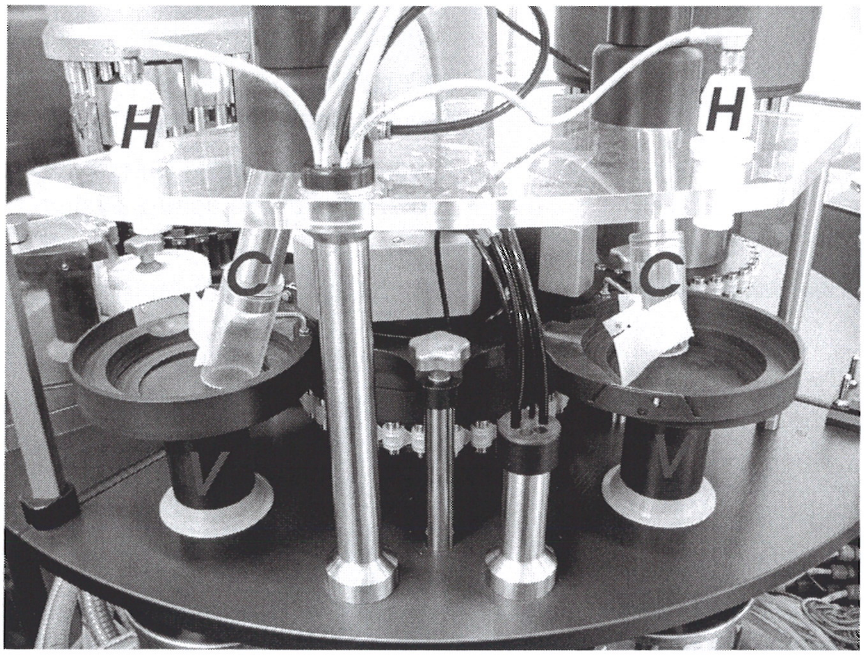


Figure 32 Detailed view of the tablet descent into the vibrating containers with corresponding sensors.

The sensors ***H*** (adjustable height) detect when the tablet level has been reached in the vibrating containers and, when required, enable loading of tablets from the upper hoppers.

Vibrating container

The tablets ***Co*** are positioned at random in the vibrating container in use.
As a result of vibration created by the vibrating base, the tablets are arranged and aligned along the vibrating container spiral ***S***. This creates an ordered row of tablets with an upwards circular movement.

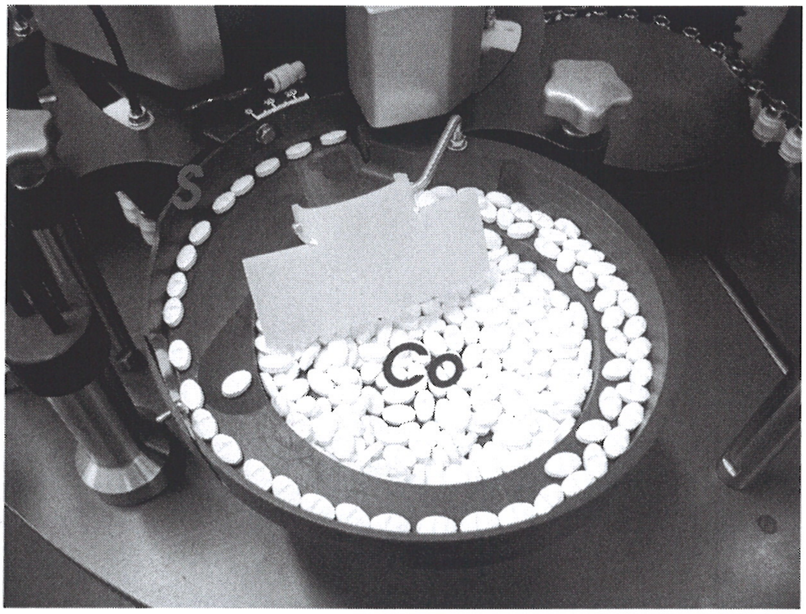


Figure 33 – Detailed view of the inside of the vibrating container