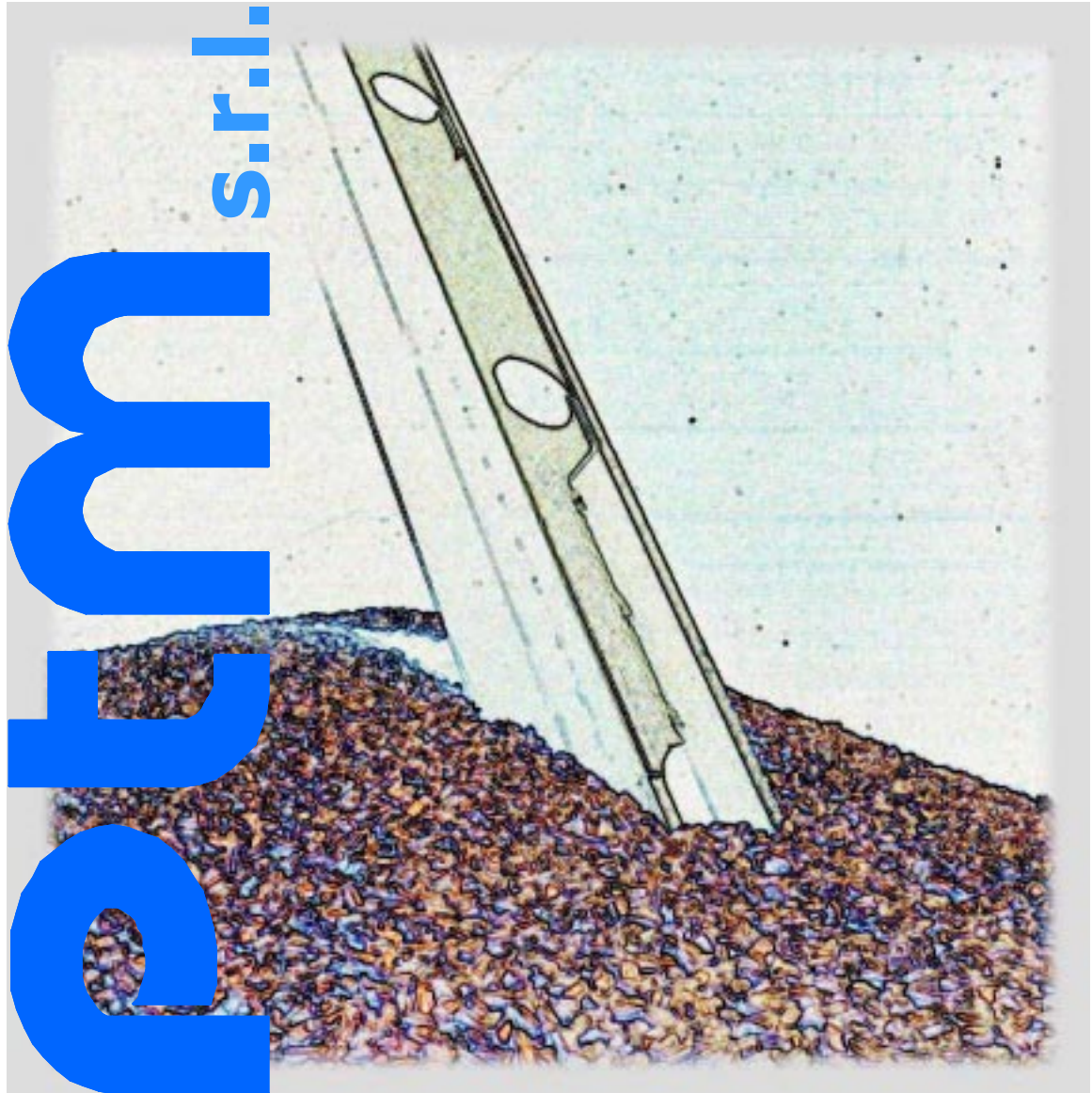


Rev. 00/00



Automatic sample collector *PREVRAC*

GENERAL DESCRIPTION

The collection of samples upon receipt of a product represents a problem for all centres that store and process cereals and oleaginous seeds.

In fact, the product's quality characteristics constitute an increasingly important parameter in the determination of the sale price. Furthermore, knowledge of the parameters which relate to the humidity, impurity and whether or not there are any insects present (just to mention the most recurrent), allows better management of the delicate receiving phase for sending the product, advisedly, towards its storage or its processing.

The aspects determining the sampling are:

- the sample's representativity
- the automatism of the collection phase
- the speed of the collection

The *PREVRAC* offers solid answers for each of these aspects.

SAMPLE REPRESENTATIVITY

The collected sample must have characteristics similar to those that on an average are comparable to the whole heap from which the product originates. Therefore, mechanical or pneumatic collection systems cannot be adequate, as the parameters concerning the product's impurities and humidity would be altered. In fact, a mechanical system (for example: an Archimedian screw) would undoubtedly determine some breaks or cracks in the grains, just as a pneumatic system would favour, likewise undoubtedly, the collection of the lightest parts and so alter the representativity of the sample taken in any case.

Equally, during the transport (especially for certain products), the different specific weights of the various parts of the heap (dusts, broken grains, empty grains, good product, etc.) could cause the product's stratification. It is, therefore, indispensable to know the average characteristics of what is being received sufficiently, by collecting samples at various heights of the heap.

The *PREVRAC* collection system (figure 1) eliminates these problems insofar as:

- the probe is equipped with 7 openings, placed at different levels
- the slots open progressively from the bottom towards the top, to ensure a meaningful sample of the heap
- the collection is performed by gravity, in a completely natural manner (taking advantage of the pressure difference between the product mass and the cavity of the probe), without any mechanical or pneumatic intervention, which could alter the original characteristics of the product.

Sample representivity also means the quality of the product collected and even for this aspect the *PREVRAC* offers satisfactory guarantees: a good 2,5 litres of product per collection.

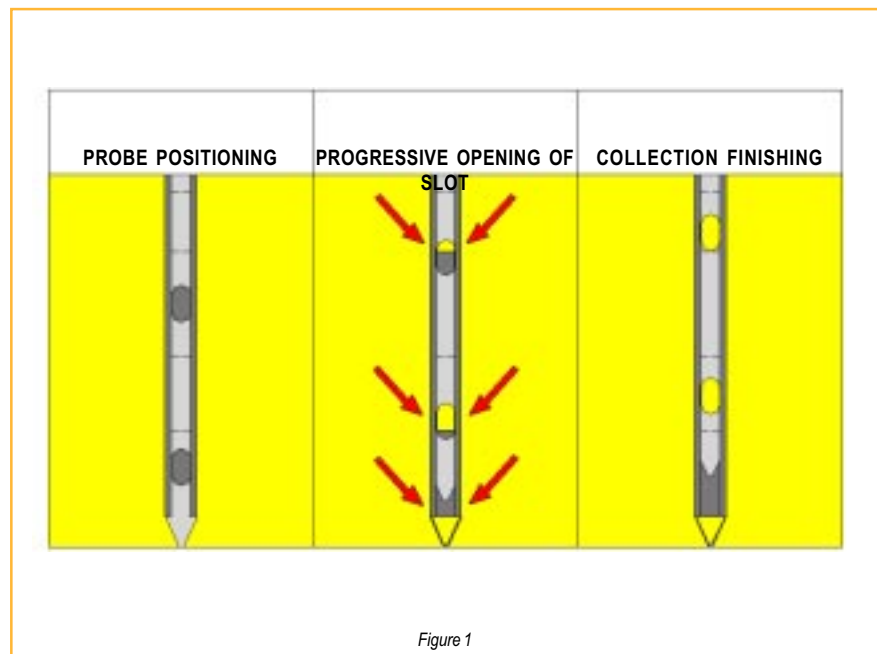


Figure 1

COLLECTION AUTOMATISM

The collection does involve the operators carrying out special operations upon receipt, as they are generally busy with other tasks.

Moreover, the operations must be carried out in sequences and in a standardised manner, so that the sample's characteristics are not in any way influenced by either the operator or the sequence of the collection. These risks are completely eliminated with the *PREVRAC*: the operator must choose, by means

of the joystick placed on the command panel, the position in which to do the collection and to start the automatic cycle (controlled by PLC): the sample will arrive, within a few seconds, at the predestined collection point - without any further operations by the operator.

COLLECTION SPEED

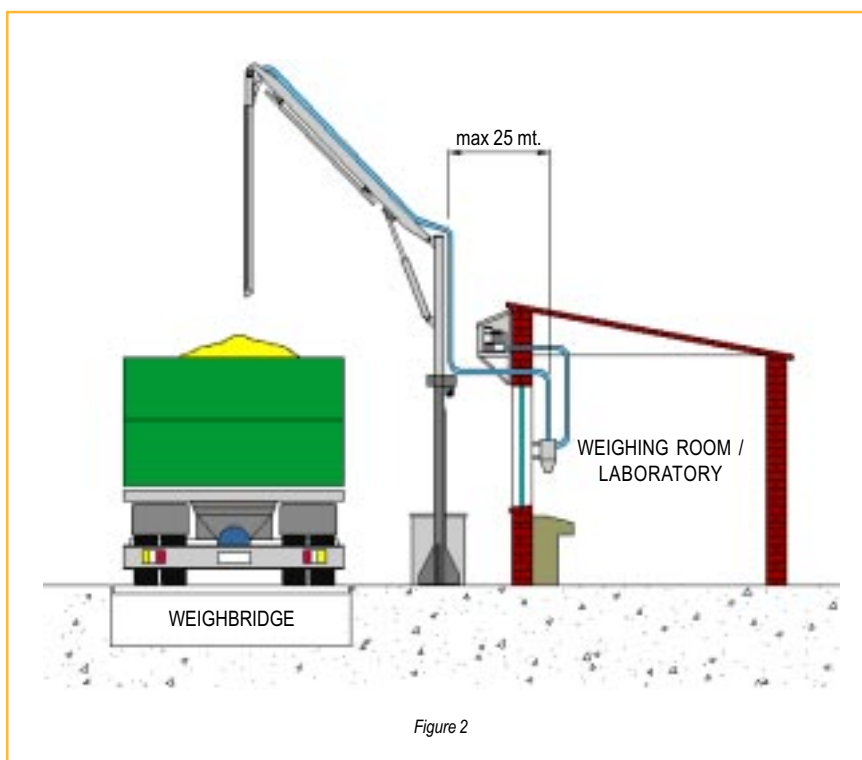
The receipt phase can be expedited, especially in storage and drying plants, generally tied to seasonal factors. The need to know the characteristics of the product being received could be in contrast, in certain situations, with the necessity to accelerate to the maximum those operations tied to its weighing and offloading.

If the collection system involves muddled and long operations, in such situations it would probably not be used and be replaced by traditional, empirical systems. Therefore, actually in situations with a high risk of receiving lots that have very variable and sometimes questionable characteristics, it is possible to determine the presuppositions to abandon the sampling systems even though they are correct, but are not sufficiently automated and quick.

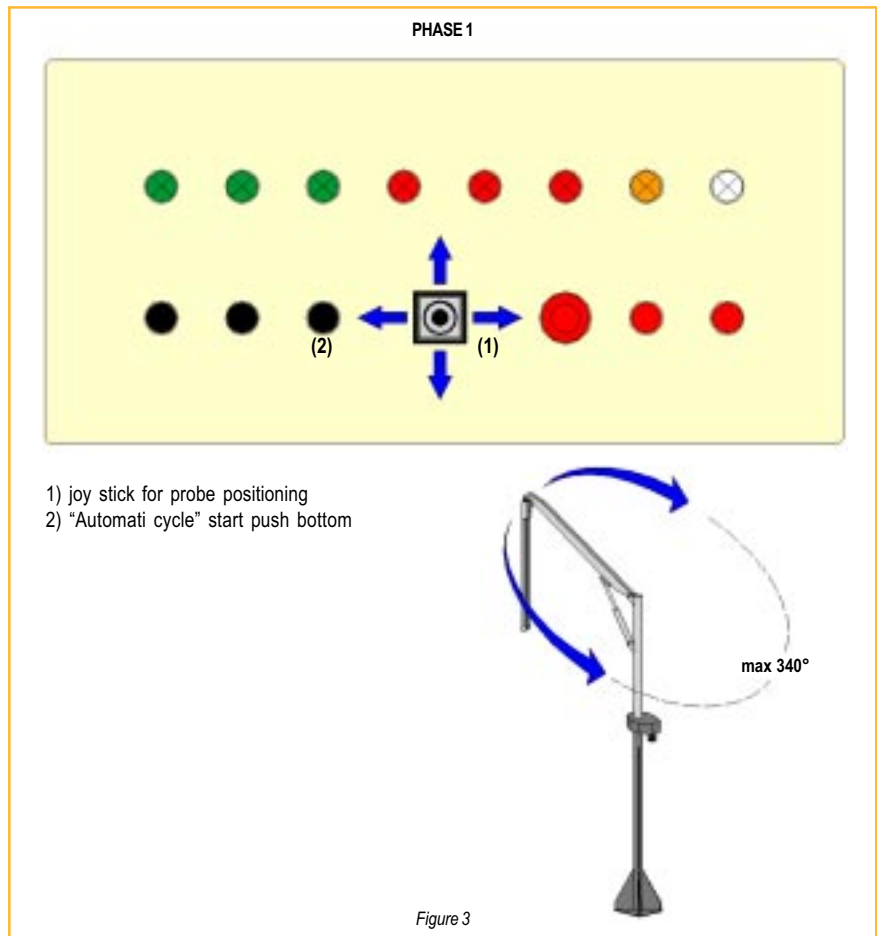
The PREVRAC represents a valid answer to this aspect. The running automatism which has already been described, together with the remarkable speed of the collection cycle, allows samplings to be performed during the product's weighing phases, without involving any slow down in the receiving procedures: in less than 40 seconds the articulated lorry is free to move, and another collection cycle can be started within 60 seconds.

OPERATING PRINCIPLES

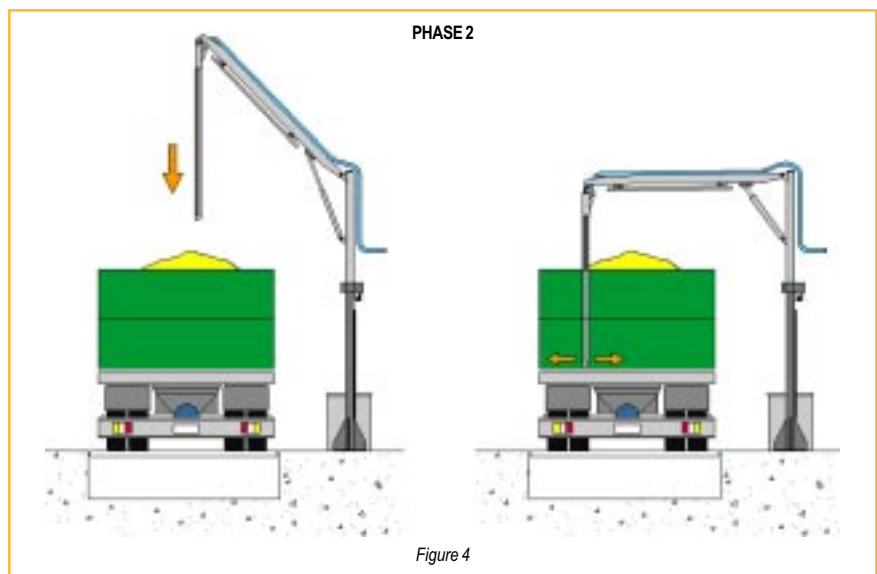
The PREVRAC allows samples to be collected from articulated lorries, automatically sending them to the laboratory for analysis, or, to another place near the collection point. The sample's pneumatic transport system, in its standard version, allows a maximum distance of about 25 m (such length depends upon the number of curves and upwards sections that the sample has to perform). Therefore, the machine's distance must not be greater than such limit with respect to the length from where the sample has to be collected. Generally, a good position corresponds with that of the weighing bridge (figure 2). In this manner, the operator can carry out the collection during the usual operations of weighing the product.



The operator (using the electrical control panel's joystick) determines the rotation of the upper part of the base column (max. 340°), up to the point in which it is decided to perform the collection; thereafter he starts the automatic collection procedure by simply pressing the appropriate key on the panel (phase 1). The panel is provided with a PLC and therefore all the sequences, subsequent to the initial phase, are carried out in a completely automatic manner according to the pre-programmed methods and times.



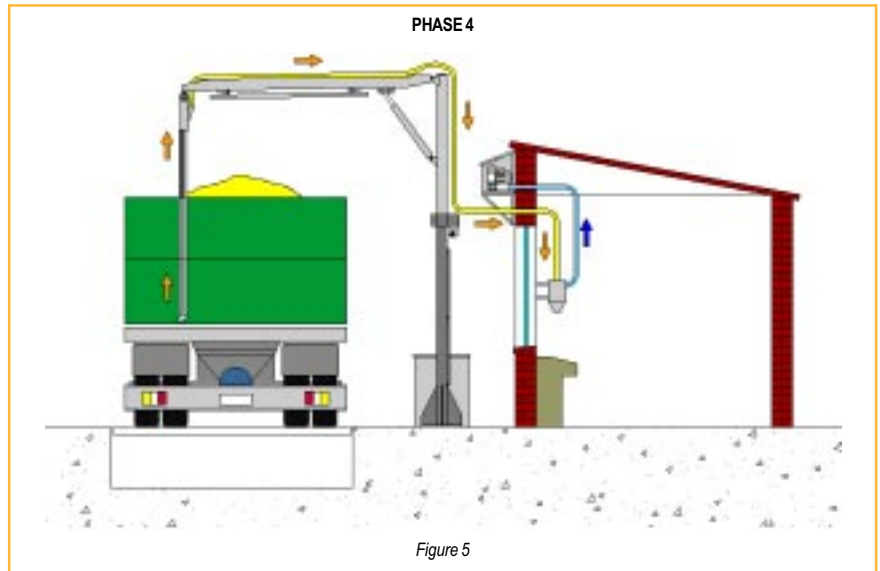
The hydraulic system makes the probe descend into the heap. A suitable sensor halts such movement when the probe touches the bottom of the dump body (phase 2).



At this point the 7 collection slots, situated on the probe, open in a progressive manner, from bottom to top, to allow gradual filling of the probe itself with the product to be collected (phase 3). This filling takes place by means of gravity, exploiting the pressure exerted by the product itself.

The first slot is at 6,0 mm from the bottom of the dump body, so as to allow a collection to be carried out at the bottom of the heap (see figure 1).

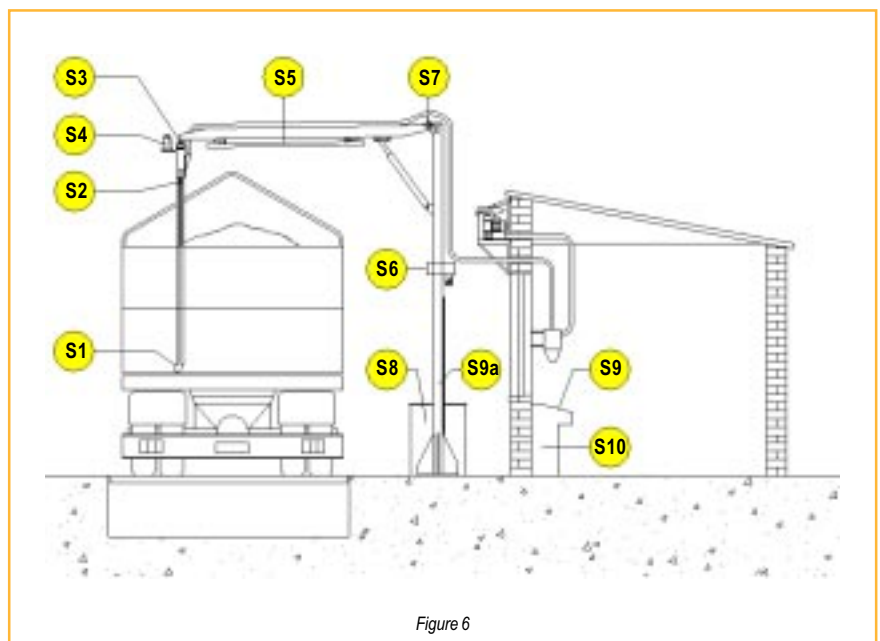
The slots close and therefore the sample's transport cycle is started, by means of a pneumatic installation supplied with a turbine, transport duct and collection hopper (phase 4). The probe starts rising simultaneously with the start up of the turbine, thus allowing the articulated lorry to be moved.



A complete cycle has a 60 second duration, but the programmed working sequence allows the lorry to move after just 40 seconds from the start of the automatic collection cycle. In the meantime, the operator is completely free to dedicate himself to other operations such as the weighing of the lorry, or the labelling of the sample, or even its immediate analysis.

SAFETY SYSTEMS

Careful attention has been given to the safety systems to guarantee that the PREVRAC works properly and to prevent damage to people or objects, in the event the operator makes a mistake. In fact, each machine is equipped with (figure 6):



- an automatic stop system of the downwards movement (**S1**) that intervenes when the probe comes into contact with the bottom of dump body of the articulated lorry;
- a maximum level sensor (**S2**) which stops the downwards movement of the probe in the event that the product heap exceeds the height allowed;
- a safety flexible joint to prevent damage in the event of accidental movement of the articulated lorry during the collection cycle (**S3**);
- a rotating flashing light to signal the machine's operating state (**S4**);
- an automatic cycle and rising stop system in the event of contact of the probe's supporting arm with a panel or the possible camber of the articulated lorry (**S5**);
- some sensors for recording the rotation of the revolving column (**S6**);
- a rotation stop sensor when the probe's supporting arm is not in the "up" position, to avoid damage to people and objects (**S7**);
- a stop system for the probe's supporting arm in the event the hydraulic system breaks down (**S8**);
- emergency buttons on the electrical control panel and on the fixed column (**S9-S9A**);
- a PLC on the electrical control panel with software capable of preventing the accidental opening and closing of the collection slots (**S10**).

The combination of these mechanisms, together with the completely automatic operation of the machine, allows the operators to work in complete safety, even in the most difficult of working situations, and to avoid the risks typical of moving mechanisms in environments not only open to adequately trained personnel but also to those people who are not familiar with this type of equipment such as drivers, clients, etc.



MANUFACTURING CHARACTERISTICS

The PREVRAC sampler is made up of the following main components:

- support column
- support arm with collection sampler
- sample's pneumatic transport system
- hydraulic control system
- electrical command and control panel

The various elements are assembled directly at the installation site, where the connections of the hydraulic and electrical systems are also carried out.

SUPPORT COLUMN

It is made up of three elements and these are:

- an anchorage base on the flooring
- a fixed base column
- a revolving upper column

The whole structure is manufactured in very thick steel piping, strengthened against the elements and appropriately shaped to ensure an adequate resistance, even in the heaviest working conditions.

A hydraulic motor, coupled with two microswitches (ref. S6) for regulation of the angle of rotation (max. 340°), ensures the rotating movement of the upper column.

SUPPORT ARM WITH COLLECTION SAMPLER

The probe's support arm is manufactured in structured reinforced steel and has the task of supporting the collection probe, at the same time ensuring the upwards and downwards movements, by means of a suitable hydraulic cylinder. It is equipped with a shaft in aluminium mounted on springs and connected to two microswitches (ref. S5), intended for signalling possible contacts with the motorvehicle underneath the PREVRAC (figure). In fact, in the event of an accidental collision with a panel or a hoop of the articulated

lorry, this system stops the automatic work cycle and returns the probe's arm to the "up" position so that the collection procedure can be repeated in conditions of greater safety (figure 7).

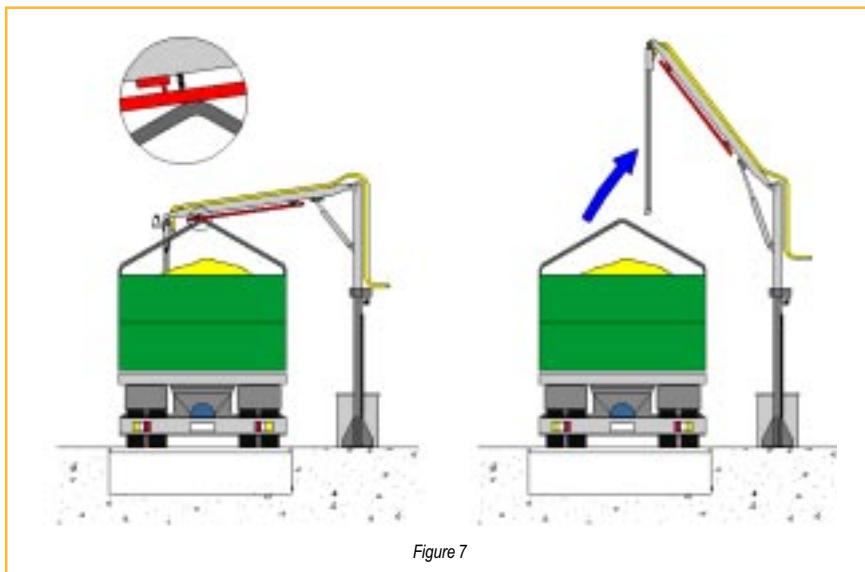


Figure 7

The downwards movement is controlled by two different systems:

- when the collection probe touches the bottom of the motorvehicle, a suitably calibrated pressure switch stops the hydraulic cylinder's action (ref. S1);
- in the event of an excessively high heap, the downwards movement is stopped by a microswitch placed directly into the upper part of the collection probe (ref. S2).

COLLECTION PROBE

The collection probe is connected to the support arm by means of a special articulated safety joint (ref. S3), that allows it to move freely in several directions. So, in the event of the accidental departure of the motorvehicle with the probe still inserted in the product, the articulated joint allows (within certain limits) compensation for such a situation - avoiding possible damage to the PREVRAC (figure 8).

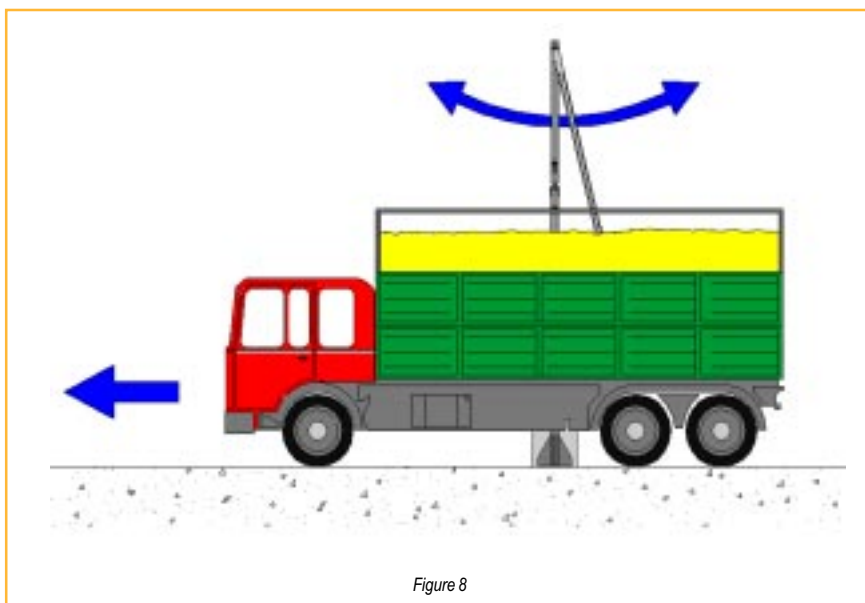
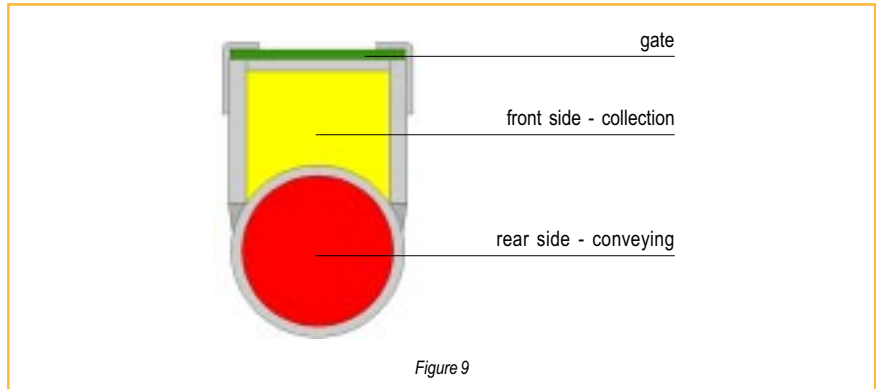


Figure 8

The collection probe is made up of shaped piping subdivided into (figure 9):

- front or collection part, equipped with 7 slots with differentiated sections;
- rear or transport part, structured to allow the depression necessary for transport of the sample.



At the front, the probe is completed by a lengthwise shutter which is also equipped with 7 slots, that are appropriately shaped to avoid breaking of the grains, activated by a hydraulic piston. As has already been stated, during the collection phase, the slots placed on the shutter cross the openings underneath in a progressive manner, from bottom to top. This allows the probe to be filled gradually, ensuring that the quantity of the collection is equal for each level of the heap.

The filling of the probe takes place by gravity: the pressure exerted by the surrounding mass pushes the product so that it fills the probe's cavity available at that moment (open slot). The overall volume of the sample is equal to about 2,5 litres.

The "support arm – collection probe" unit is completed by a rotating flashing light (ref. S4) which indicates that the PREVRAC is operating.



THE TRANSPORT SYSTEM COLLECTED

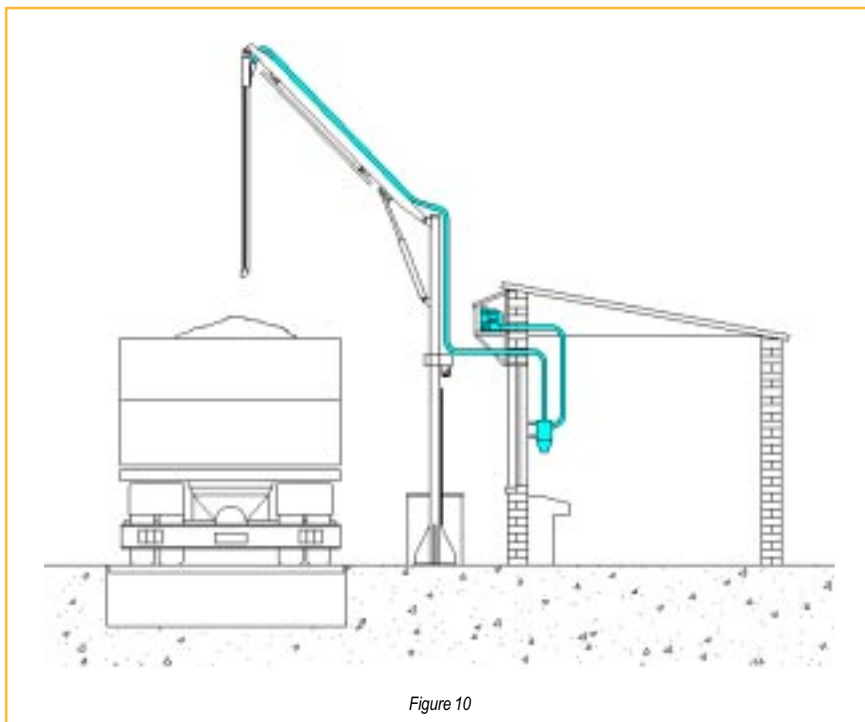
After the shutter on the collection probe has closed, the sample's transport cycle is started automatically. The transport system (figure 10) is pneumatic and is made up of:

- a vacuum pump
- a collection hopper with filter
- piping

The pump, the main characteristics of which are recorded in Table 1 – Chapter 3, is normally installed near the place where the samples are collected and is equipped with a supporting shelf and a protection carter. The sample is collected in a hopper, which is equipped with a shutter and a metallic mesh filter for the separation of air from the product.

The connector pipes are manufactured in a flexible polyvinyl chloride reinforced by galvanised steel wire with a diameter of 50 mm. Generally, except for special applications, such piping is supplied with a minimum length of 25 m. In any case, it is specified that the actual useful run (with the standard pump) depends upon the configuration of the distance planned for the sample. Curves and upwards sections can noticeably

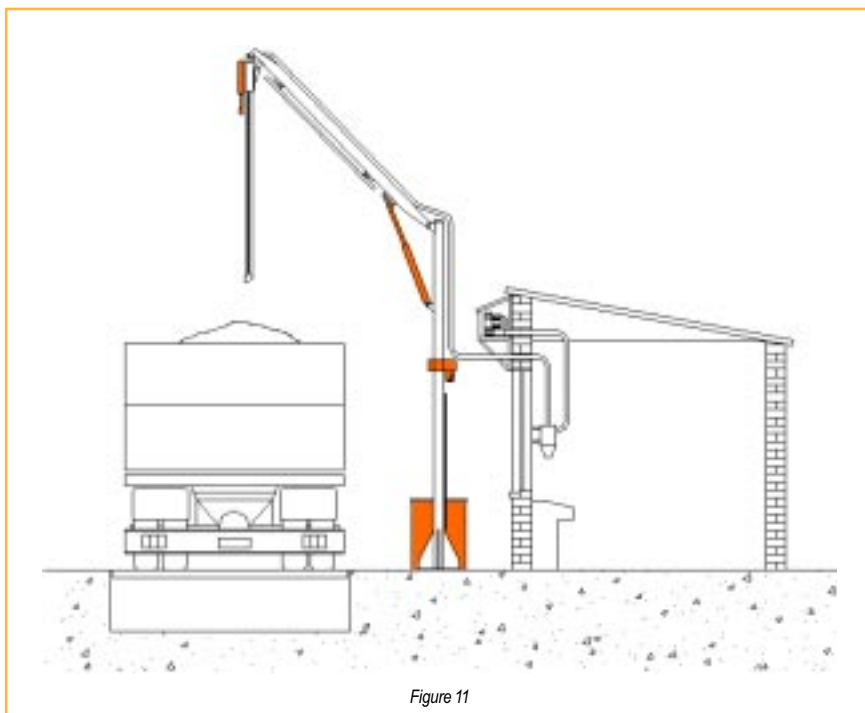
reduce such distance. In these case it is necessary to check, through our Technical Assistance, the dimensioning of the pump to avoid the risk of product losses along the run.



HYDRAULIC CONTROL SYSTEM

The hydraulic control system (figure 11) is substantially made of:

- a hydraulic control unit
- a rotation hydraulic motor
- a pair of hydraulic cylinders with relative connector pipes



The control unit, the main characteristics of which are recorded in Table 2 – Chapter 3, generates the pressure of the hydraulic liquid suitable for running the *PREVRAC*. It in turn is made up of a tank for the hydraulic oil with a level indicator and a thermometer, a suction gear pump with suction filter and an electric motor, a solenoid valve unit complete with solenoid valves (one for each cylinder and one for the hydraulic motor), a pressure control system, a reducing valve and a pressure switch. A protection carter allows installation of the control unit outdoors (generally near the supporting column). The hydraulic diagram is recorded in scheme 1 - chapter 3.

The hydraulic motor, whose characteristics are shown in Table 3 – Chapter 3, creates the rotation movement of the rotating column and is fitted with a flow regulation valve designed to change the transfer speed.

The system is designed with two hydraulic cylinders, each performing a different set of the functions:

- to control the ascent/descent movement of the probe's arm;
- to activate the slots' opening/close shutter of the sampling probe.

The piston of the probe's arm is fitted with a safety valve whose purpose is to prevent the arm from dropping in the event of losses in the hydraulic circuit.

ELECTRICAL CONTROL AND COMMAND UNIT

The electrical panel is of the reading-desk type and is fitted with a PLC system in order to guarantee the automatic operation of the *PREVRAC*. As already mentioned, a handy joystick allows a quick positioning of the *PREVRAC* in the designated sampling position. The "automatic cycle" button starts the standard sampling sequence, so that the operator is free to perform other tasks.

Figure 12 shows the layout of the panel with the various buttons and lights installed.

As well as the electrical panel, we also contractually provide a junction box, installed at the foot of the support column, with a strip already designed for connection to the control unit and another strip on the hydraulic unit.

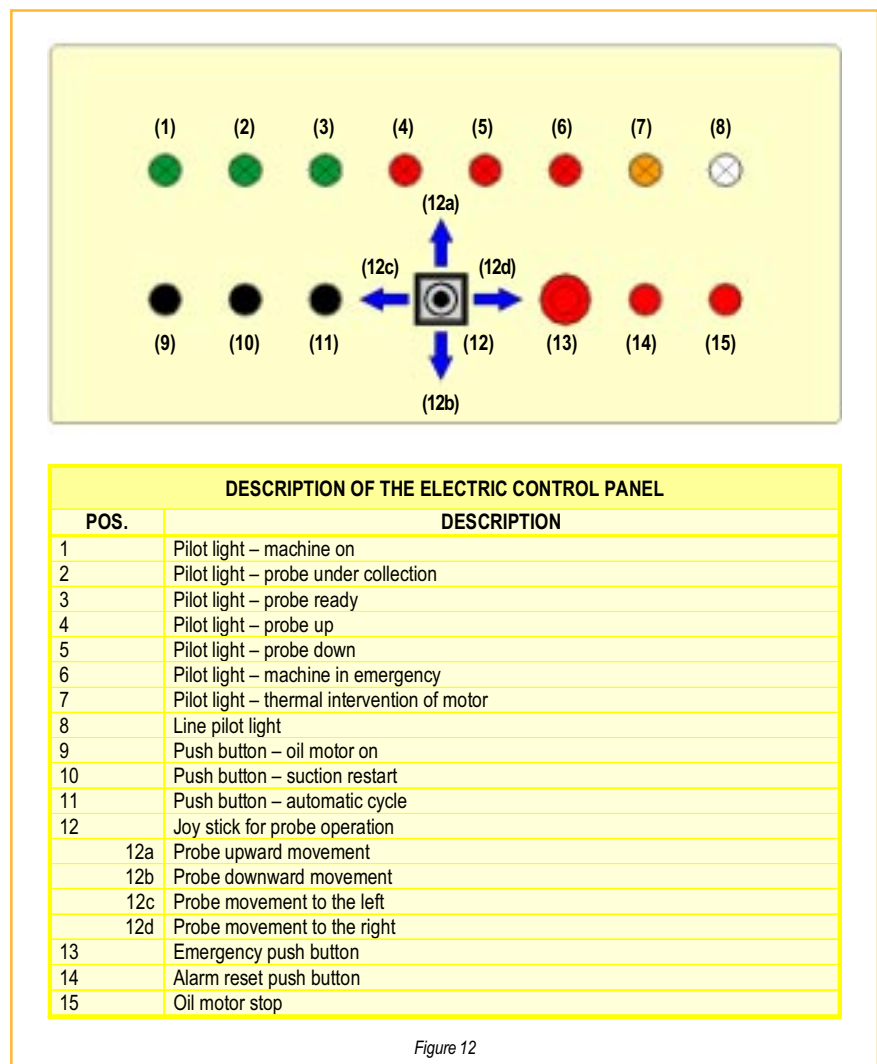
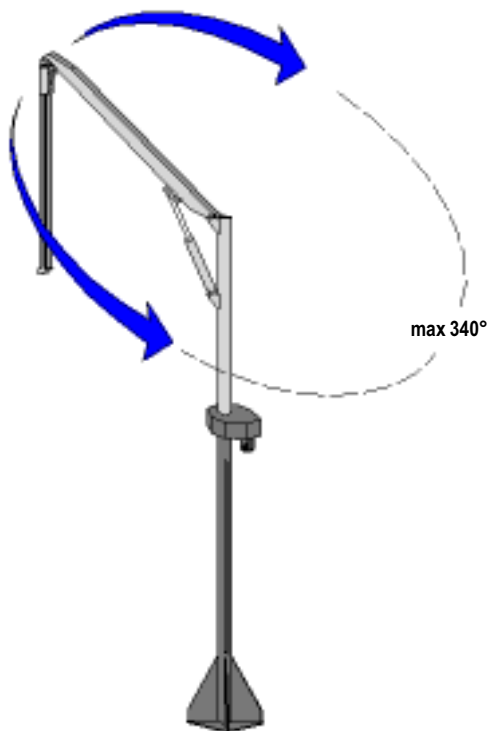
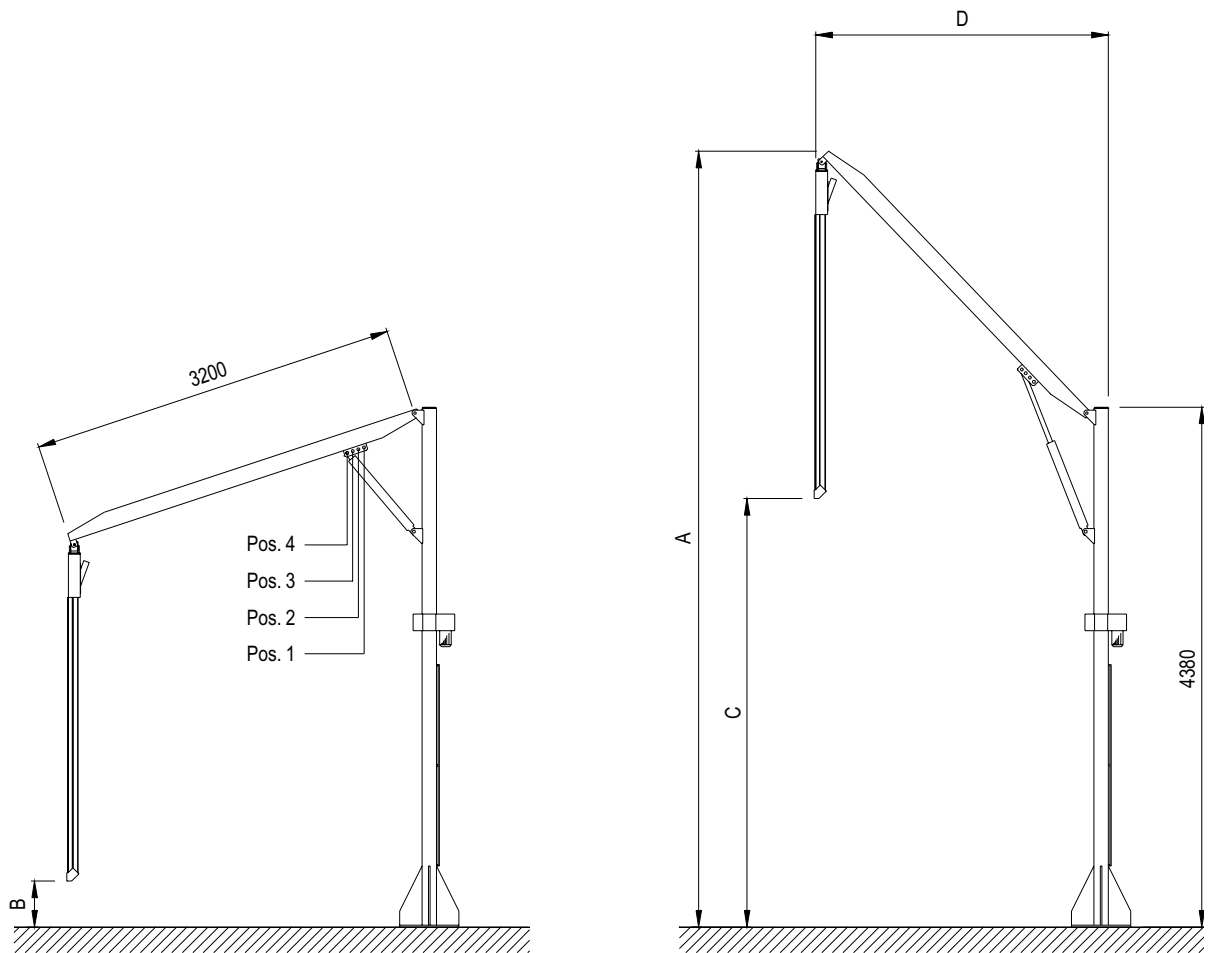


Figure 12



POSITION	1	2	3	4
A	7040	6750	6470	6220
B	705	635	585	515
C	4140	3850	3570	3320
D	2010	2330	2570	2750

ELECTRIC CHARACTERISTICS	
Voltage rating	380 V
Number of phases	3
Request of neutral	SI
Full-load power	4,4 kW
Full-load current	5 A
Breaking capacity	100 KA
Panel protection level	IP 55
Voltage of control circuits	24 V A.C.



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RETAILER

A large, empty rectangular box with a thin black border, intended for the retailer's name and contact information.