



# Instructions for use

## AUTOMATIC DISPENSER OF

### Detia Gas-€x-B bags

in accordance with the Law on Food Safety, HACCP and GMP



# **AUTOMATIC DISPENSER**

## **for dispensing and dispersal of**

### **DETIA GAS-Ex-B BAGS**

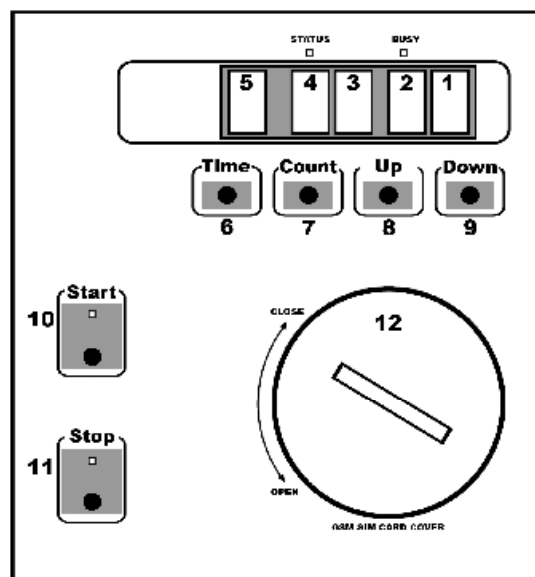
Automatic, modern and economical device for dispensing and dispersal of Detia Gas-Ex-B bags for curbing of warehouse pests in grainy products for human and animal food.

PH<sub>3</sub> gas in specially produced application forms (tyvek material), has been internationally accepted as the most suitable and most efficient fumigant. Modern vertical and horizontal facilities for stocking and keeping of grainy products, as well as legal regulations on food safety, have contributed to accelerated introducing into practice of Detia Gas-Ex-B bags as the safest application form of fumigants for application in silos cells, machine equipment in mills and silos, and similar devices of the food industry. In fact, these requirements have resulted in development of the modern device for automatic dispensing of Detia Gas-Ex-B bags, as a completely safe fumigant in the sense of the Law on Food Safety, HACCP, GMP and Regulation (EC) No 1107/2009 that the remains of aluminum phosphide and magnesium phosphide must be completely removed from the product prior to marketing.



Figure 1. Automatic dispenser for dispensing and dispersal of Detia Gas-Ex-B bags

### **DIAGRAM OF THE DISPENSER'S CONTROL BOARD**



## Explanation of controls:

1. } Fields 1 and 2 – to enter seconds of necessary time for dispensing (expulsion) of bags
2. } Fields 1 and 2 – to enter the number of bags put into the rotor
3. } Fields 3 and 4 – to enter minutes of necessary time for dispensing (expulsion) of bags
4. }
5. Fields 1, 2, 3, 4 and 5 – to report errors under designation **Err** from **01** to **04**, and the service **Err 99**.
6. **Time** button – to program time in minutes, and, with a repeated push, in seconds
7. **Count** button – to program the number of bags put into the rotor
8. **Up** button – to increase the number of entered parameters
9. **Down** button – to decrease the number of entered parameters
10. **Start** button – to start dispensing bags
11. **Stop** button – to stop the dispenser's operation
12. Chamber to put in and accommodate the SIM card

## TEHNIQUE OF PROGRAMMING THE DISPENSER DEPENDING ON TECHNOLOGY (quantity of grain flow and PH<sub>3</sub> gas concentration)

The device has on its backside an alcove where the main switch and two connectors for cables are located. The connector of smaller diameter is used for connecting the micro-switch which controls the grain flow. For connecting cables to the device, micro-switch cable is connected first. The connector has 2 pins and a notch on its external rim. When connectors on the cable of the micro-switch are switched one onto another, they are connected with a safety nut, which is a constituent part of the connector on the cable, by turning ¼ on the right. If the micro-switch is not connected to the device and if it is not pushed into position „grain-flows”, the device shall not work and shall report error **Err 04** on the display and mobile phone of the operator.

The next operation is connecting of the power cable. The connector has 3 pins distributed into a triangle with the top turned upwards. They are connected by simple pushing.

Extraction of telescope for expulsion of bags is the next step. The telescope is on the bottom side of the device. It is extracted by simple pulling downwards, since external pipe is held in the upper – transport position only by a magnet. If the telescope is not extracted, after switching on the main switch, designation for error **Err 02** shall appear on the display.

**Important note:** before switching on the main switch for power supply of the dispenser the device must be empty, i.e., bags must not be set in the rotor beds.

### Level of the GSM signal

After switching on the dispenser, if on the location where dispenser is placed level of the GSM signal is low, designation **Err 03** shall appear on the display. This designation indicates that informing the operator of the dispenser's work via mobile phone shall not work, i.e.: reporting on jamming of a bag at the position of its falling through, reporting that the number of bags in the dispenser has fallen to 4 pieces, and reporting that there is no grain flow. In this case the operator must, based on the speed of grain flow and the desired concentration of gas, determine the time when it is necessary to start filling in the dispenser with bags again, and must perform regular check-up of dispenser's functioning. This type of designation shall not appear later during work of the dispenser, when the signal is normalized.

### **Starting up the device for finding the zero – initial position**

When we have connected connectors of the micro-switch and the power cable, and extracted the telescopic tube for extraction of bags, we shall inspect the rotor to see if it is empty, and, if yes, we shall press the green button on the back side of the main switch into the position *switched on*. Each time when the device is switched on, the rotor moves counterclockwise and is searching for its „zero position“. Then display shows „**Ho**“. In the „zero position“ the rotor stops, and display shows “**O**“. The device is ready for programming.

If the rotor, for any reason, cannot find (stand on) the zero position, it shall report on the display error **Err 99**. In this case dispenser should be reset, by switching off and then switching on voltage. **This error is of a servicing character**, and if it is not repeated after resetting of device, dispenser should be taken to servicing.

Programming of time for expulsion of bags is done by pressing the button “**Time**“. Display shows then two separate groups of numbers. The first group of two numbers viewing from the right presents seconds, and another group minutes. Change of value is done with buttons „**Up**“ and „**Down**“ while the group of numbers is blinking. Time may be set from 0 to 60 seconds and from 0 to 30 minutes.

Entering – programming the number of bags we wish to dispense is done by pressing the button „**Count**“, and then with buttons „**Up**“ and „**Down**“ we define the number of bags we shall put into the drum.

The smallest number of bags which may be programmed for putting into the drum is 5, and the largest 40.

When we have set the time for dispensing of bags we wish, and display says „**Stop**“, the device is ready for filling in.

We then start filling in the device with bags. The first bag is always put on the position for falling-through, which is located exactly in the middle of the circle, opposite to the front side of the device, above the flap and the opening for falling-through of bags. Filling in is done in the opposite direction from rotor`s moving. The rotor must be filled in starting from the zero position, without skipping of beds, so that the first bag is put on the flap. It is not necessary to fill all 40 rotor beds with bags.

### **Starting up the dispenser for dispensing of bags**

When filling in is completed, device is ready to start work. By pressing the „**Start**“ button programmed counting off of the time for dispensing begins. During dispensing, when the number of bags in the rotor falls to 4, the device shall send a message to the operator`s mobile phone „**Warning: 4 bags left**“, by which it indicates that the rotor should be filled in with the necessary number of bags. If the rotor during renewed filling in is filled in with the same number of bags, the operator shall, when the rotor stops and display shows „**Stop**“, press the button for start. When the number of bags is smaller or larger, he shall enter that as a new program and press the button for start.

### **Removing of delays**

In case a bag for any reason has stuck at the place of its falling-through, device shall report on the display and operator`s mobile phone error with designation **Err 01**. For such intervention operator opens dispenser`s lid, himself wearing personal equipment for PH<sub>3</sub> gas, extracts the jammed bag upwards or, if possible, pushes it with gentle pressure into the dispensing tube. In both cases for continuation of dispensing the operator shall first press the button „**Stop**“ and then the text on display shall change and say „**Stop**“. Then new programming is to be done for the remaining number of bags in the dispenser, and only then, by pressing the button „**Start**“, we shall continue with the dispensing process.

If the dispenser stops because of jamming of a bag when less than 4 bags are left in it, in order for it to be able to be programmed again it must be refilled to contain at least 5 bags.

### **Servicing errors of the dispenser**

All possible servicing errors of the dispenser shall be marked with designation **Err 99**. This designation shall be shown on the dispenser`s display, as well as on operator`s mobile phone. In this case dispenser should be reset by switching off and then switching on voltage. If this error also repeats after resetting of device, since the error is of servicing character, the dispenser should be taken to servicing.

Of the above stated errors, only errors under designations **Err 02** and **Err 03** shall not appear on the operator's mobile phone. The reason for this is that their appearance is possible during starting of the dispenser when the operator is beside it, so this type of information via phone is unnecessary.

### Dispenser's capacity

We may program the automatic dispenser Detia Gas-Ex-B bags to satisfy any capacity of grain flow starting from 10t/h up to 600t/h. Thus, at facilities where grain flow is maximal, it is sufficient to install only one dispenser.

### FORMULAS FOR CALCULATION OF THE NECESSARY TIME INTERVAL FOR EXTRACTION (DISPERSAL) OF DETIA GAS-EX-B BAGS

$$N = \frac{A \times B}{11,3}$$

**N** – Dose of bags per hour

**A** – Elevation capacity (ton/hour)

**B** – Dose of PH<sub>3</sub> gas per ton

**11,3** – 1 Detia Gas-Ex-B bag releases 11.3g of PH<sub>3</sub> gas

#### Example:

In a silo with elevation capacity of 60 ton/hour, when we wish to realize the concentration of 3g of PH<sub>3</sub> gas per ton of goods, and we know that 1 Detia Gas-Ex-B bag releases 11.3g of PH<sub>3</sub> gas, dose of bags per hour (**N**) is obtained in the following manner:

$$N = \frac{60 \text{ (t/h)} \times 3 \text{ (g/t)}}{11.3 \text{ (g)}} = \frac{180 \text{ g/h (grams of PH}_3\text{ gas per hour)}}{11.3 \text{ g (constant – 1 bag releases 11.3g of PH}_3\text{ gas)}} \approx 16 \text{ bags per hour}$$

Programming on the display of the time necessary for dispensing one bag of gas is done in the following manner:

$$T = \frac{3600 \text{ seconds (1 hour)}}{16 \text{ bags per hour (N)}} = 225 \text{ seconds} : 60 \text{ seconds} = 3.75 \text{ minutes}$$

Then on the display, viewed from right to left, in the third field 3 minutes should be entered, and 0.75 minutes we convert into seconds by multiplying the amount of 0.75 with 60 seconds. That amount is 45 and should be entered into the first and second field from right to left, where seconds are entered. This means that for a grain flow of 60 tons/hour and a dose of 3g of PH<sub>3</sub> gas per ton, we should dispense 1 bag at each 3 minutes and 45 seconds.

Detia Gas-Ex-B bags are packed 10 or 20 pieces in one hermetically closed alu-foil pouch, and the pouches are packed in a metal barrel. By opening of one such pouch all 10 or 20 bags begin reacting, so all 10 or 20 bags should be used.

Capacity of dispenser's rotor is 40 bags. Since the bags are packed with 10 or 20 pieces, we may fill the rotor in with 10, 20, 30 or 40 bags.

Depending on the elevation capacity in a silo and the concentration of PH<sub>3</sub> gas per ton we wish to realize, time needed to expel these 10, 20, 30 or 40 bags differs. In the above example, time interval for expulsion of 1 bag is 225 seconds, and this is seen on the display as 3 min and 45 seconds, which means that for 60 tons of elevation per hour, at each 3 min and 45 sec one bag should be dispensed in order to realize the concentration of 3g of PH<sub>3</sub> gas per ton.

Doses would then be as follows:

- 10 bags for 2250 seconds (37 minutes and 30 seconds),
- 20 bags for 4500 seconds (1 hour and 15 minutes),
- 30 bags for 6750 seconds (1 hour 52 minutes and 30 seconds),
- 40 bags for 9000 seconds (2 hours 30 minutes).

This is important because release of gas from the preparation gradually begins after 1 to 2 hours from pulling out bags from a bag and beginning of fumigation. This practically means that rotor of the dispenser may be filled in with 10, 20, 30 or 40 bags, depending on the elevation capacity and the desired doze of gas, and that freed and charged (set) bags into the rotor shall be used within up to 2 hours and 30 minutes.

### INSTALLATION – SELECTION OF LOCATION FOR THE DISPENSER

The dispenser may be placed on suitable locations such as:

- Tube for insertion grain with built-in tube plug and pedestal to set dispenser (Figure 2 and 3)
- Top of the trolley for filling in of silo cells with grain (Figure 4)
- Grid beside the main opening for filling in of silo cells (Figure 5)
- Control openings at filling tubes (Figures 6 and 7)



Figure 2. Dispenser is set by the pedestal on tube for insertion grain, on which was built-in tube plug for connection with a dispensers telescope.



Figure 3. Display of pedestal and tube plug for setting of dispenser on tube for insertion grain.



Figure 4. Dispenser is on top of the channel of the filling tube with trolley for filling in cells with grain, and sensor may be placed into the pipe opening under the dispenser.

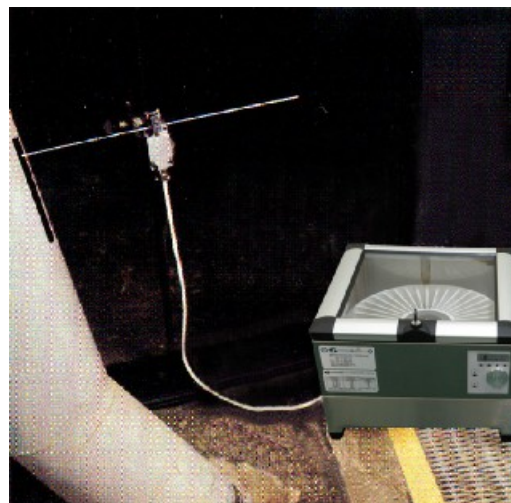


Figure 5. Dispenser is placed on the main opening, and the grain flow sensor is in the control opening of the tube for filling in of a cell.



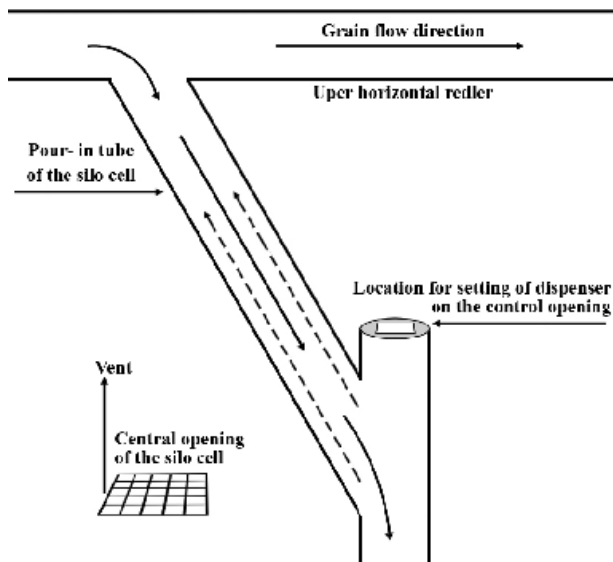


Figure 6. Location of the dispenser at the filling tube (position A).

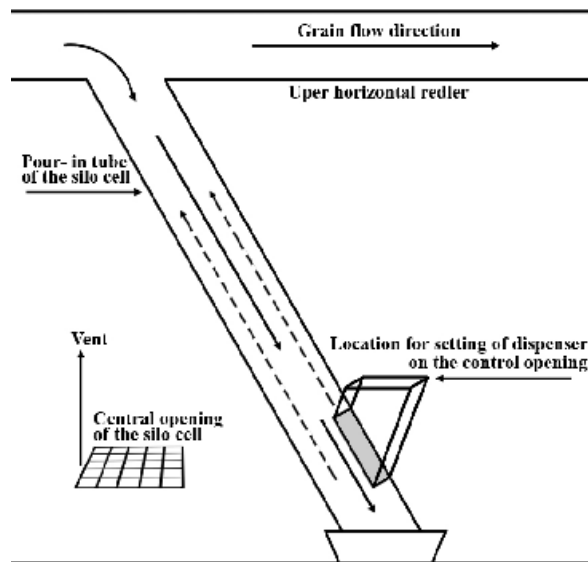


Figure 7. Location of the dispenser on the filling tube (position A1).

### Vertical silo with a mill



Figure 8. The most suitable facilities for keeping of grainy products for human and animal food are vertical and horizontal silos

### MANNER OF EXTRACTION (REMOVING) OF BAGS

Detia Gas-Ex-B bags, after application, exposition and the waiting period, need not be extracted from grainy goods. However, extraction of Detia Gas-Ex-B bags is mandatory when goods are delivered for processing or sale. Extraction of bags from grainy goods may be done through vibrational grid which is built-in in tubes under silo cells, as well as through the grid placed on the vehicle under the tube for emptying of the silo cell through gravitation fall. Similar grid may be placed also at the end of the tape at loading in vessels, wagons, trucks, etc. (Figures 9, 10 and 11).

The applicator which performs fumigation with Detia Gas-Ex-B bags must, among other things, enter into the report on fumigation the obligation of the stocker during delivery of goods to perform removal (extraction) from goods of Detia Gas-Ex-B bags which have finished reacting.

If for any reason Detia Gas-Ex-B bags are extracted before expiry of the necessary time for exposition and the waiting time, their removal must be done by an authorized professional who had performed the application. Such bags must be deactivated in the following manner: they must be perforated with a metal brush and sank into water at least 15 cm below the water surface for 24 hours. After such deactivation they are safe as well as those who had reacted fully and may be burned without negative effects on the environment, air properties and underground waterways. (Be sure to read Instructions for the safe treatment of packaging and the rest of the preparation.)

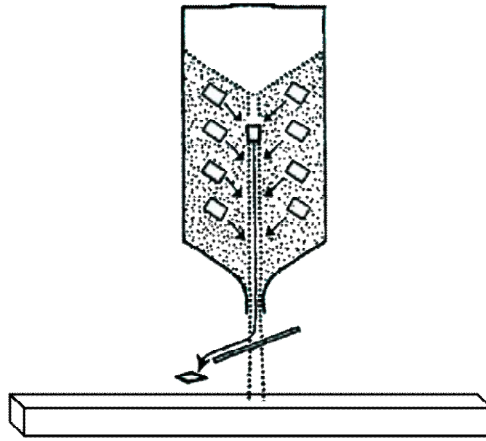


Figure 9. Extraction of Detia Gas-Ex-B bags by setting grid on drain parts of the silo cone cells above the lower horizontal lane.

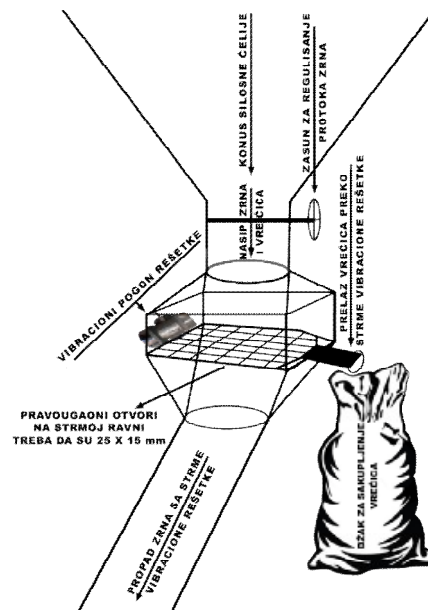


Figure 10. Display of adaptation output tubes under the silo cone cells to extract Detia Gas-Ex-B bags. Capacity grain passes through the vibrational grid to align with passage - the capacity of the first step collection plane of the grain refinement (trriage) tool or the roto-purifier.



Figure 11. By gravitation emptying of a silo cell, grainy goods pass through the set grid while Detia bags remain in the grid, and are removed after loading of a vehicle – vessel.



## PRECAUTIONS

- Rotor of the dispenser in which bags are put should be filled with the number of bags necessary for fumigation of a certain quantity of grain or other grainy goods. Upper part of the housing and rotor must be dry and completely clean before we fill it with bags and start up the dispenser. After filling in of the rotor, dispenser's lid must be lowered and firmly closed in the defined manner.
- All windows on the silo gallery must be open during application in order to provide ventilation of the working area. The dispenser has a sensor for registration of bags dropping, SIM card and PLC for reporting to the operator via a mobile phone, for controlling the dispenser with regard to renewed filling in of bags, possible stoppages or interruptions of grain flow. However, operator who performs fumigation must be in close contact with the operator at the control board of the silo where operation of the silo equipment is controlled (redler, elevator, grain refinement (trriage) tool, aspiration equipment, etc.). Still, to be on the safe side, he must personally check operation of the dispenser after an hour or hour and a half of operation, even when there have been no messages in the meantime that this is necessary.
- At the end of operation, if 2-3 bags are left in the rotor of the dispenser, they should be speedily dispensed into the finishing cell which is fumigated. If a larger number of bags has remained, because of an interruption of grain flow or similar reason, the same should be removed from the rotor and put into its original packing of alu-foil; alu-foil pouch should be placed horizontally, air pressed out from it, and its opening closed with a good sellotape. After removal of a defect or an interruption, bags should again be set into the rotor and fumigation work continued. Possible dust on the dispenser, upper part of the housing and rotor should be blown away with a compressor, or cleaned with an appropriate soft brush. These actions should be done in an open or part of the silo gallery where there is draught. Water must not under any circumstances be used for cleaning of the dispenser.
- Stocker who does not keep the goods in accordance with the regulations on stocking and keeping of grainy products according to the rules of profession for each product, and in case during work large vapors and humidity appear, fumigation works should be stopped, goods previously elevated and freed from superfluous humid vapors, and then fumigation of grainy goods started. Lid of the dispenser should always be firmly closed, even when dispenser is not in use. Wear and tear of joints between the lid and the upper part of the housing should regularly be checked, as well as all other joints on the dispenser.
- Postpaid SIM card is to be put into the device. When the SIM card is put in or changed, dispenser must be switched off from the electrical grid.
- Rotor must never be started by hand.
- All workers on fumigation work should have with them gas masks with the filter for PH<sub>3</sub> gas and should use them immediately when needed.

## EXPOSITION TIME

Air temperature	Relative air humidity	Exposition time in hours
Below 5 <sup>0</sup> C	60 %	Do not fumigate
5 - 10 <sup>0</sup> C	60 %	336
11 - 15 <sup>0</sup> C	60 %	168
16 - 25 <sup>0</sup> C	60 %	96
Above 25 <sup>0</sup> C	60 %	72

Access of people to fumigated facilities and goods is allowed when concentration of PH<sub>3</sub> gas falls below 0.1 ppm.

During interventions and regular checking and control of work of the dispenser, as well as during ventilating a facility, it is mandatory to wear gas masks with filters for PH<sub>3</sub> gas.

## STRUCTURE

The dispenser consists of: two-part metal housing, whose upper part accommodates rotor with beds (alveolas) for accommodation of 40 bags, control board with a display and buttons for setting of dispenser's work, sensor for zero (initial) positioning of rotor, as well as a chamber for input and accommodation of the SIM card on the PLC.

Bottom part of the housing accommodates engines with the accompanying electronics for driving the rotor and flaps for opening and closing of the opening for falling-through of bags into a silo cell. Parts of the housing are mutually statically well joined to make a whole, and through the central part of both housing parts axis passes for rotor's drive.

Dispenser is via PLC and SIM card connected with operator's mobile phone for sending messages on situations such as interruption of work of the dispenser, interruption of grain flow, or the need to fill it in again with Detia bags, while for other settings of work before starting up operator is next to the dispenser and reads them from the display.

## BASIC TECHNICAL DATA

Dispenser's height: ≈ 30 cm

Space it occupies: ≈ 40 x 40 x 30 cm

Weight: ≈ 14 kg

Engines: appropriate step engines with drivers

Power supply: single-phase current 220 V, 50 Hz

Cables length: cca 5 m, which may be separated from dispenser through appropriate connectors for work in the atmosphere of dust (they are not fixed-connected).

**Authorized service:** „FIDRA“ d.o.o.  
11080 ZEMUN  
Užička 8  
Tel/Fax: +381 11 3161 168

*“Those who do not invest in healthy food and ecology shall invest in oncology!”*

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**„GOMADJO & Co“ d.o.o.**  
**11040 BEOGRAD / SERBIA**  
**Stjepana Filipovića 28a**  
**Tel: +381 11 2648 730**  
**Web: [www.gomadjo.co.rs](http://www.gomadjo.co.rs)**

**In cooperation with:**

**„KOBEG“ d.o.o, Beograd**  
**„FIDRA“ d.o.o, Beograd**

## Programming of required interval for dispersion Detia Gas-Ex-B bags for different capacity of flow grain and dose of gas.

*- Attachment to Instruction for use -*

A Flow grain t/h	B	Time for dispensing bags for different doses of PH <sub>3</sub> gas and flow grain				
		3 g PH <sub>3</sub> /t	3,5 g PH <sub>3</sub> /t	4 g PH <sub>3</sub> /t	4,5 g PH <sub>3</sub> /t	5 g PH <sub>3</sub> /t
<b>30 t/h</b>		7m 32s	6m 27s	5m 39s	5m 01s	4m 31s
25 t/h		9m 03s	7m 44s	6m 46s	6m 01s	5m 25s
20 t/h		11m 18s	9m 41s	8m 28s	7m 30s	6m 46s
15 t/h		15m 04s	12m 54s	11m 18s	10m 02s	9m 02s
10 t/h		22m 36s	19m 22s	16m 57s	15m 04s	13m 33s
<b>60 t/h</b>		3m 46s	3m 13s	2m 49s	2m 30s	2m 15s
55 t/h		4m 07s	3m 31s	3m 04s	2m 44s	2m 27s
50 t/h		4m 32s	3m 48s	3m 23s	3m 01s	2m 42s
45 t/h		5m 02s	4m 18s	3m 46s	3m 20s	3m 01s
40 t/h		5m 39s	4m 48s	4m 14s	3m 46s	3m 23s
35 t/h		6m 28s	5m30s	4m 50s	4m 18s	3m 52s
<b>120 t/h</b>		1m 53s	1m 36s	1m 24s	1m 15s	1m 07s
110 t/h		2m 03s	1m 45s	1m 32s	1m 22s	1m 13s
100 t/h		2m 15s	1m 56s	1m 41s	1m 30s	1m 21s
90 t/h		2m 30s	2m 09s	1m 53s	1m 40s	1m 30s
80 t/h		2m 49s	2m 25s	2m 07s	1m 53s	1m 41s
70 t/h		3m 13s	2m 46s	2m 25s	2m 09s	1m 56s
65 t/h		3m 28s	2m 58s	2m 36s	2m 19s	2m 05s
<b>240 t/h</b>		56s	48s	42s	37s	34s
230 t/h		58s	50s	44s	39s	35s
220 t/h		1m 01s	52s	46s	41s	37s
210 t/h		1m 04s	55s	48s	43s	38s
200 t/h		1m 07s	58s	50s	45s	40s
190 t/h		1m 11s	1m 01s	53s	47s	42s
180 t/h		1m 15s	1m 04s	56s	50s	45s
170 t/h		1m 19s	1m 08s	59s	53s	47s
160 t/h		1m 24s	1m 12s	1m 03s	56s	50s
150 t/h		1m 30s	1m 17s	1m 07s	1m 00s	54s
140 t/h		1m 36s	1m 23s	1m 12s	1m 04s	58s
130 t/h		1m 44s	1m 29s	1m 18s	1m 09s	1m 02s

Most built equipment for vertical and horizontal transport of grain has capacities of 30 t/h, 60 t/h, 120 t/h i 240 t/h. There are larger capacities, but those are not yet in mass implementation, except in port facilities.