GRAVIMIX®

GRAVIMETRIC BLENDER

MANUAL

FGB EB/3 HANDHELD

Ferlin Plastics Automation
Galileistraat 29
7701 SK Dedemsvaart

The Netherlands

EC DECLARATION OF CONFORMITY OF THE MACHINERY

Declaration according to Directive 2006/42/EC, as amended (hereafter called Machinery Directive). This language version of the declaration is verified a translated version.

We (manufacturer):

Business name:	Ferlin Plastics Automation
Address:	Galileistraat 29, 7701 SK DEDEMSVAART
Country:	Nederland

declare for the product described below:

Generic denomination:	Dosing-blending system
Commercial name:	GRAVIMIX
Model:	FGB
Type:	
Serial number:	
Function:	The GRAVIMIX blendingsystem FGB is suitable for efficient and accurate dosing of dry and free-flowing thermoplastic materials.

that all the relevant provisions of the Machinery Directive are fulfilled;

that the product also complies with the provisions of the following European Directives:

- 2004/108/EC | Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC | OJ L 390, 31.12.2004, p. 24–37

that the following harmonized standards have been used:

- EN-ISO 12100:2010 | Safety of machinery - General principles for design - Risk assessment and risk reduction
- EN 349:1993+A1:2008 | Safety of machinery — Minimum gaps to avoid crushing of parts of the human body
- EN 1088:1995+A2:2008 | Safety of machinery — Interlocking devices associated with guards — Principles for design and selection
- EN ISO 13849-1:2008/AC:2009 | Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design
- EN ISO 13849-2:2008 | Safety of machinery — Safety-related parts of control systems — Part 2: Validation
- EN ISO 13850:2008 | Safety of machinery — Emergency stop — Principles for design
- EN ISO 13857:2008 | Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs
- EN 60204-1:2006 | Safety of machinery — Electrical equipment of machines — Part 1: General requirements
- EN 61000-6-4 | Electromagnetic compatibility (EMC) - Part 6-4: General standards – Emission standards for industrial environments
- EN 61000-6-2 | Electromagnetic compatibility (EMC) - Part 6-2: General standards - Immunity for industrial environments
- EN 1037:1995+A1:2008 | Safety of machinery — Prevention of unexpected start-up
- EN-ISO 4414:2010 | General rules for pneumatic systems

and that the following natural or legal person established in the Community is authorized to compile the technical file:

Business name:	Ferlin Plastics Automation
Name and position:	Wouter Maathuis, Managing Director
Address:	Galileistraat 29, 7701 SK DEDEMSVAART
Country:	Nederland

Dedemsvaart 2017

Wouter Maathuis
Managing Director, Ferlin Plastics Automation

CONTENTS

Chapter Page

1 INTRODUCTION

When precision and quality comes in first place.
In the modern plastics processing industry with constantly rising quality demands and the necessity of cost reduction require efficient, high-precision dispensing and blending of materials for all applications.
GRAVIMIX doses all material components gravimetrically, exactly to the programmed recipe. In this way, fluctuations in bulk density, changes in particle size, or changes in the flow properties have no effect on the dispensing accuracy. The GRAVIMIX records the exact usage of materials, allowing for a precise calculation of the production costs. The simple operation and self-calibration of the system guarantee fast recipe and material changes, even during night or weekend shifts when few personnel are present.

Due to these features, GRAVIMIX is particularly suitable for use in the following applications: Injection-moulding, Extrusion, Blow-moulding and Central-blending.
Due to the high, consistent dispensing accuracy of GRAVIMIX, the additive percentage can be reduced to lower tolerance limits without rejects or a loss in quality. The resulting savings in additives lead to a direct reduction in production costs.

Further advantage of GRAVIMIX:
- direct entry of the desired percentages of all components, even during operation
- gravimetric recording of individual and total throughput
- continuous monitoring of dispensing process
- constantly updated display of actual and desired setpoints
- monitoring of manufacturing process due to event and time journals
- fast, simple material changes due to self-calibration of the system
- reduction in downtime due to very simple, fast set-up
- savings in material due to precise gain-in-weight dispensing
- individual regrind processing due to adjustable regrind priority circuit

The compact and modular construction allows for problem-free adaption and expansion of the system, as required. All parts, which are in contact with the materials, are made of wear resistant, stainless steel. Refill systems are generally mounted directly to the dispensing hoppers, without additional support frames. With up to 10 stations, throughputs of a maximum of 2500 kg/h can be achieved. In the process, up to four stations and for larger systems up to eight stations with slide valves are used for the free-flowing components. In addition, one to two precision screw feeders can be used for small quantities of additives, which are free flowing.

Due to the self-calibration of the system, the sample dispensing of new material required with volumetric devices is no longer necessary. In case of a change in colour or material, the device can be taken apart and cleaned without tools in a very short period of time. GRAVIMIX can be mounted or installed on, above, or even next to the processing machine. Also the use of larger systems as central-blender for the simultaneous supply of several processing machines is possible.

The components are dosed one after the other and weighed in a weighing container. If all components have been added precisely to the recipe, they will be mixed homogeneously in the separate mixing chamber. From there, the mixture is conveyed directly to the processing machine or deposited in a vacuum take-off box.
The high dispensing accuracy with which GRAVIMIX works is based on the most modern weighing and control technology and proven application-specific software. The microprocessor controlled closed-loop control system constantly monitors all dispensing and weighing functions. The first signs of any deviations are recognised and compensated immediately. The optimised material feed system is unaffected by the height of the material in the feed hopper. GRAVIMIX achieves a total dispensing accuracy up to ± 0,1 %. This also applies to small quantities and extreme dispensing conditions.

GRAVIMIX-controls demonstrate how easy it is to operate a gravimetric blending system in spite of high technical standard. The desired component ratio or percentages are directly entered and can even be changed during operation.

Features of GRAVIMIX-controls:
- microprocessor- or computercontrol
- easy operating through simple entering
- menu-driven operation
- storage of components and recipes
- different languages on the display
- password protection for unauthorised access
- gravimetric / volumetric mode
- printing of used materials and data
- adjustable regrind processing
- additive to regrind control
- operating several systems from one control

2 CONTROLS

When all components are available the dispense of a batch starts. The cycle begins with closing the weigh-pan. Then each of the requested components is dispensed and weighed in the weigh-pan. When all the components of the recipe are correctly weighed, the blend is discharged into the mixing-chamber. A horizontal mixer mixes the components to a uniform blend, which discharges to a storage bin, or directly into the machine hopper.

2.1 Blender start-up

In this section is a short description of the normal start-up action of the blending system. More details of the controls are described in the following sections. **An emergency stop can be made by switching the machine off with the main switch on the control box.**

Steps to follow for the start-up of the blending system:

[1] Plug the communication cable into the user-interface and control box on the blender.
[2] Connect air pressure to the blender and turn it on, **6 bar** is recommended.
[3] Turn on the power. On the user-interface and control-box.
[4] Make a recipe with select recipe.
[5] Confirm with Accept
[6] Be sure there is no alarm active.
[7] Start the blender, press the green start button.

The blender will now operate automatically on the recipe you made.

2.2 Blender status

The control of the blender is based on a number of status. Each status gives an exact description in which situation the controller is. The controller knows the following status:

Idle
: At the start-up of the blender several internal tests will be done automatically if the controller can't find a recipe. In this status the blender will not start until a recipe is edited.

Standby
: The blender is complete in rest but can be started any moment by giving the start-command. In this status recipes, parameters and debug-commands can be sent to the controller.

Profibus
: The machine is controlled through a SCADA bundle or a PLC control. In this case the Plug-in control can only be used for monitors. By releasing the control through Profibus the control can be used for local control again.

Operating
: The blender will now produce a blend for the selected recipe.

Stop requested
: The blender is operating but has received a stop-command. The stop-command will be executed at the end of a batch-cycle. This status will be replaced automatically with 'standby' if nothing is done. If a start-command is given during the status 'stop requested' the status will be 'operate' again.

Error
: The controller has detected an error and therefore the system will stop. In a sub-menu at the operator-interface the error will be displayed. The error situation can be recovered using the command. The error should be solved then.

2.2.1 Operation Local / Remote

The operation of a Gravimix can happen in different ways. An industrial PC (standard control) or a plug-in control can be used. Also a combination of both is possible. To avoid any conflicts and to exclude unexpected situations, a certain protocol is used while operating with more than one control. Through the recipe status the protocol with which the machine operates is made visible to the operator.
Below the explanation of the different status.

Local

Local is reflected in ***Menu → interface → system***. When the machine operates on local it is possible to make a new recipe in the menu “change recipe”. This new recipe will be stored in the standard control under recipe number 0 in case of a combined operation.

Remote

Remote is reflected in ***Menu → interface → system***. The machine is operated with more than one control. The standard control sends the recipes. Only percentages can be adjusted in the recipe, also in specific menu’s the access rights have expired. Only through the standard control now those orders can be carried out of which the access rights were denied.

2.3 Production-modes

The production-mode of the blender indicates how the production will stop in automatic-mode. This parameter can be changed using the menu ***Menu → parameters***. The production-mode has three options:

Continue

The blender will not stop automatically after the start-command. The blender will continue the production, unless the blender runs out of material or an error occurs.

Alarm-Weight

If 'Alarm-Weight' has been chosen, a requested weight has to be given. After a start the requested weight will be compared with 'produced-weight'. If both are the same or the 'produced-weight' higher, the controller will send an alarm to the operator-interface. The production will continue.

The alarm can be recovered setting the 'produced-weight' to zero (0). This reset command is part of the production status. Go to totals and reset.

Weight->Error

When using the option 'Weight->Error' a weight has to be given. After a start the requested weight will be compared with 'produced-weight'. If both are the same or the 'produced-weight' higher, the controller will send an error to the operator-interface. The production will not continue in this case.

2.4 Mixer-mode

When all components are dispensed, the contents of the weighbin will be emptied. The mixer in the mixing chamber, which contains the dispensed components, can be put in different modes. Choose the menu ***Menu → parameters***.

Normal

The mixer is off during production. If the components are dumped from the weighbin into the mixer chamber the mixer will be on for a predefined number of seconds, defined by 'mixerOnTime'. This parameter can only be changed if this option is chosen.

Pulsing

The mixer will pulse during production. Both on- and off-time can be defined by using the parameters mixerPulseOnTime (time on) and mixerPulseOffTime (time off). These parameters can only be changed if this option is chosen.

Off

The mixer is always off.

On

The mixer is on, during the production.

2.5 Dispense modes

The blender has two ways of dispensing: gravimetric and volumetric. One mode can be selected or a combination of both. This can be defined choosing menu ***Menu → parameters***.

Gravimetric

All component of the batch are dispensed and measured separately. Gravimetric is more accurate than volumetric, but takes more production time, i.e., lower output.

Volumetric

All components of the batch are dispensed at the same time using the dispense time of each component (calculated by the system). The components are dumped directly in the mixer chamber. No measurement is done in this mode. Therefore this method is less accurate, but the production time is faster, i.e., maximum output

Combination

When combination is defined, one gravimetric will be followed by a defined number of volumetric dispenses. This is defined by the parameter combinationRatio. This parameter can only be defined if 'combination' is chosen. This mode has the best of gravimetric and volumetric.

Use: normally the defined combination will be done (ex. 1:3). However, if the mixer chamber is full, the process will automatically do a gravimetric dispense instead of a (possible) volumetric one.

2.6 Batch handling

2.6.1 Production control

After a start-command the controller will calculate the requested weights of all components of the selected recipe.

2.6.2 Recipe to weight calculation

A recipe can be defined in two ways: 'Standard'(R,N,A) and 'Percentage'(P). These methods can be defined in the recipe choosing menu ***Menu → recipe***. The methods 'Standard' and 'Percentage' define the relation of the components (Regrind, Natural and Additive) in a recipe.

2.6.2.1 Standard Method

The different components are defined as follows:

(REG)Regrind : Percentage of the batch weight
(NAT)Natural : Relation between other naturals
(ADD)Additive : Percentage of the totals of all naturals

Example

Batchweight	2000.0 gr.
Regrind	20.0%
Natural 1	4
Natural 2	1
Additive	5.0%

Regrind: 20.0% of 2000.0 gr.		400.0
Naturals: naturals + additive = 80.0%		
naturals + (0,05 * naturals) = 80.0%		
naturals = 80.0/1.05 = 76.2%		
natural 1 = 4/5 * 76.2 = 61.0%		1220.0
natural 2 = 1/5 * 76.2 = 15.2%		304.0
Additive: 80.0 - 61.0 - 15.2 = 3,8%		76.0
	TOTAL	2000.0

2.6.2.2 Percentage Method

The different component are defined as follows:

(REG)Regrind : Percentage of the batch weight
(NAT)Naturel : Percentage of the batch weight
(ADD)Additief : Percentage of the batch weight

Total sum must be 100%.

Example

Batchweight	2000 gr.
(REG) Regrind	20.0%
(NAT Naturel 1	60.0%
(NAT Naturel 2	15.0%
(ADD) Additive	5.0%

(REG) Regrind:	20.0% of 2000.0		400.0
(NAT) Naturel 1:	60.0% of 2000.0		1200.0
(NAT) Naturel 2:	15.0% of 2000.0		300.0
(ADD) Additive:	5.0% of 2000.0		100.0

		TOTAL	2000.0

2.6.3 Dispensing

Dispensing of the different components will start after the calculation of the related weights.
The components are dispensed in the order as defined in the recipe (gravimetric only). In volumetric mode all components are dispensed at the same time.

Every mechanical valve has a reaction time. The controller uses the 'Hardware Reaction Time' to calculate the time which the dispense valve must be activated. The 'Hardware Reaction Time' is the maximum active time of the valve when no material is dispensed. The controller uses a pulse of 5ms in the following algorithm:

OpenTime = Weight [g] / dipenseSpeed [g/s]

OpenPulses = (OpenTime [s] / 0.005 [s]) + HardwareReactionTime [Puls]

To dose small quantities, the machine will switch automatically to pulse dispension. This means that the slide valve every time during the dispense opens for set times, which are adjusted in the ***Menu → calibrate → hardware reaction time*** and will close for a set time (off). Pulse dispension will only work if there is a dispension under the regulated weight (W) in ***Menu → calibrate → hardware reaction time***. It is adaptable for every hopper.

After every dispense cycle the weight is measured. The weight bin must be stable before the weight can be measured, therefore a time delay is inserted between dispense and measuring. When the controller starts measuring the signal must be stable for at least 1 sec. (signal within the 'Weighbin-variationband')

After measuring the weight of the first dispense some calculations can be done and with the results parameters can be changed. Result is a more accurate next dispense. After the first dispense of a material one of the following situation occurs:

Dispense is correct
The difference between calculated- and measured weight is less then the dispense accuracy. In this case extra dispense tries of this material are not necessary.

Dispense not correct (too little)
The difference between calculated and measured weight is more than the dispense accuracy but there is less dispensed (measured) than calculated. In this case the controller reacts according to the chosen 'alarm-type'. The following 'alarm-types' are possible:

IGNORE No extra dispense-tries. Relations within the recipe will corrected by re-calculations.

WARNING The controller tries to reach the dispense-accuracy by extra dispenses. The extra dispenses are limited by the parameter 'dispenseTry'. When after a maximum number of dispense tries, the accuracy is not reached the controller sends a warning only to the user (= The controller continues with the next material).

ERROR The reaction of the controller is equal to 'WARNING' only an error is sent to the user when the accuracy is not reached. Now the controller waits for a start-command to initiate new dispense tries of the same material. This process goes on until the dispense accuracy is reached.

Dispense not correct (too much)

Too much material has been dispensed so there is nothing the controller can do. Of course the relations within the recipe will corrected by re-calculations.

After the first dispense try in all of the above mentioned cases a new dispense rate will be calculated. If the measured dispenserate (measured weight / dispense time) differs from the used dispenserate a correction can be made. A correction is only made if the difference between the measured- and used dipenserate is less then the boundary (dispenseRateVarBand). This method prevents the controller calculating incorrect values e.g. if a hopper runs out of material. The new dispenserate is calculated by the next algorithm:

dispenseRate = ((4 * dispenseRate) + (measuredWeight/dispenseTime))/5

Is there an unusual value, the dispenserate is calculated by the following algorithm:

DispenseRate= ((9 * dispenseRate) + (measuredWeight/dispenseTime))/10

When all components of a recipe are dispensed the content of the weighbin is dumped in to the mixer chamber. The weighbin dumps the material by opening a valve for a given time. This time (weighbinDumpTime) is a parameter, which can be changed. It is also possible to start the mixer at this time (see mixer-mode). There are two conditions for opening the weighbin valve:

Condition 1. The mixbin-vale may not be open (if present)

Dispensed material must be mixed first before it can be used. Therefore the mixbin-valve and weighbin-valve may not be open at the same time.

Condition 2. The mixerchamber may not be full

If the input-device indicates a full mixerchamber no material may be dumped into it (it is full)

2.6.4 Calculations

In order to be able to dispense with high accuracy, the actual measured weights will be used to recalculate the requested weight of the next component. The dispense will be optimised if possible in order to guarantee a good batch (good relation).

IMPORTANT

Best dispense order is:

Regrind, Natural, Additive

2.7 Datalogging

Some production data is stored. This is shown at the user interface.

* Batch data
  - measured weight (each component)
  - dispenserate of each component
  - recalculation to recipe
  - share in the batch of each component

* Total data
  - Sum of dispensed weight per hopper
  - Percentage of the dispensed weight
  - Sum of the produced weight after reset
  - Sum of the produced weight

* General
  - throughput per hour
  - number of cycles

The controller saves all data in battery-backup memory. This means that the power supply, during a power loss, will be taken over by the battery

3 USER INTERFACE

The machine is operated with the aid of a handheld control. This control can be located near the machine or in a control room. The maximum distance between machine and control is 25 meter. The control can also be used together with a central control; this is called combined control.
One control can be used for more than one machine; all data is kept per machine.
The control only serves to visualise the data in the machine and the machine works independent of the control.

3.1 Operator-interface

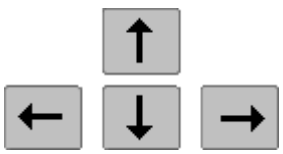
3.1.1 Controller

Operation is menu driven via a touch screen; data can be entered in the menus with the aid of a numerical keyboard. The start/stop command keys are used to start/stop the dosing.

- Start (start dosing)

- Menu (return to main menu)

-Stop (stop dosing; 2 x stop is emergency stop)



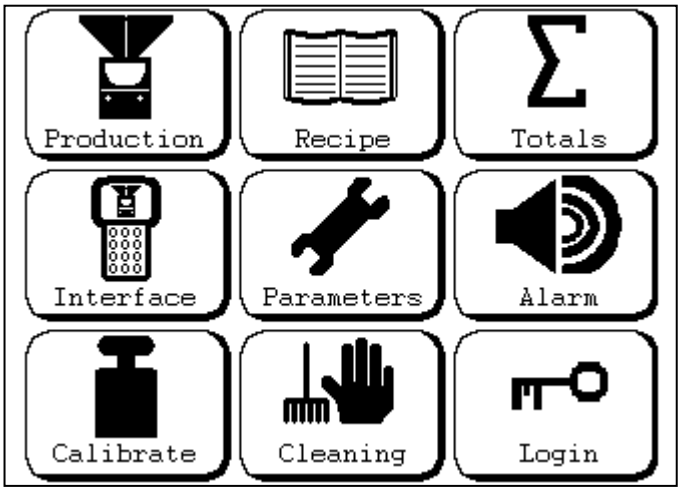
- Arrow keys (Select menu items)

3.1.2 Control

The user interface is controlled via a touch screen driven menu which allows you to select various screens. These screens are made up of objects that may be selected.

Object (on screen)

After an object has been activated, a command is performed which is indicated by the name of the button. The name is shown on the button. The "***MENU***" button on the keyboard allows you to return to this screen.



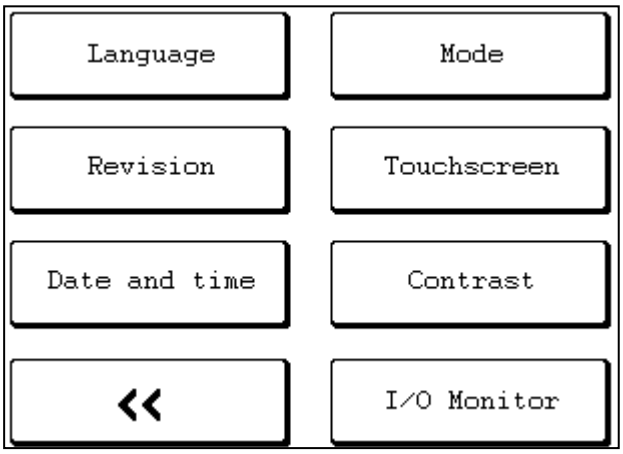
Main menu

Numerical infeed field

A numerical infeed field, which is selected with the arrow keys, is activated automatically by pressing a key on the numerical keyboard.

3.2 Interface

The control can also be configured; the required parameters are in the Interface menu.



3.2.1. Language

Select ***Menu → Interface → Language*** to change the language. A selected language is activated immediately.

3.2.2 Revision code

Selecting ***Menu → Interface → Revision*** displays the revision date and the revision number of the software in the control terminal and the GRAVIMIX control. This information is important when you need to report a failure.

3.2.3 Date and Time

Menu → Interface → Date and time enables you to change the system time (with the aid of the numerical keys).

3.2.4 System

Combination control is PLUG-IN interface control in combination with a Central computer. Combination control enables starting the machine from 2 different positions; this may cause safety problems. The machine can also be started during material replacement.
To ensure that this does not happen, the machine can be switched to local control ('LOCAL') via ***Menu → Interface → System***; this means that the machine can only be started with the PLUG-IN control, which can be connected to the machine. The machine can be released again after selecting "**REMOTE".** The machine has the status indicated on the button.

3.2.5 Touchscreen

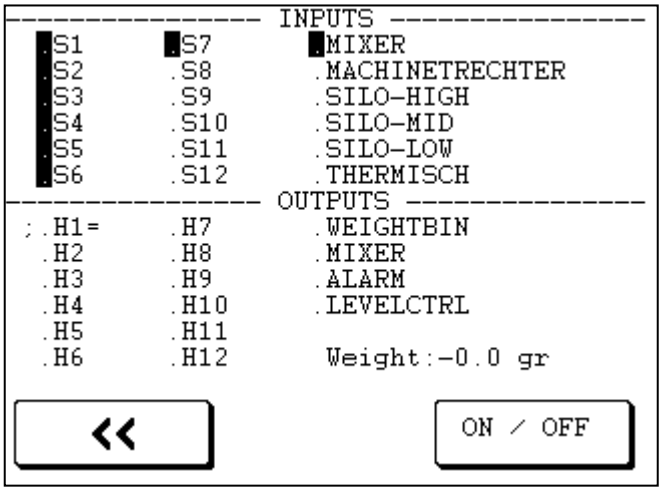
The touch screen can be calibrated via the touch screen menu ***Menu → Interface → Touchscreen***. A touch screen calibration is needed in the event of deviation of the touch screen through ageing or temperature.

3.2.6 Contrast

Contrast can be selected via ***Menu → Interface → Contrast.*** It allows you to set the brightness of the screen.

3.2.7 Digital Input & Output monitor

The input & output monitor ***Menu → Interface → I/O monitor*** provides an overview of all "output" and "input" signals in the control.
The outputs can be activated manually, **but only in the machine status: STANDBY**.
The outputs can be selected in the screen with the arrow keys. The selected output can then be switched with the "*on/off*" button.

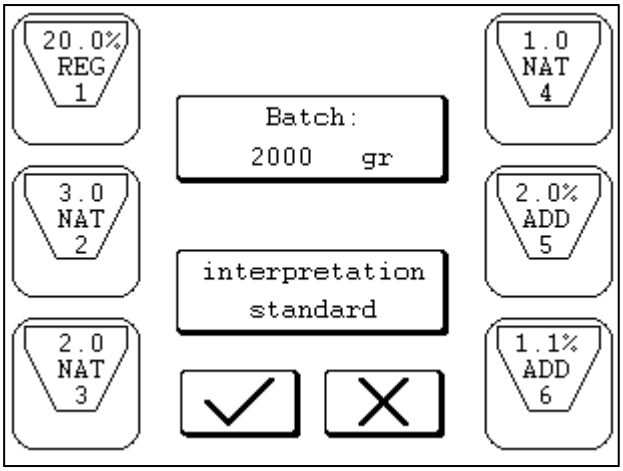


3.3 Recipes

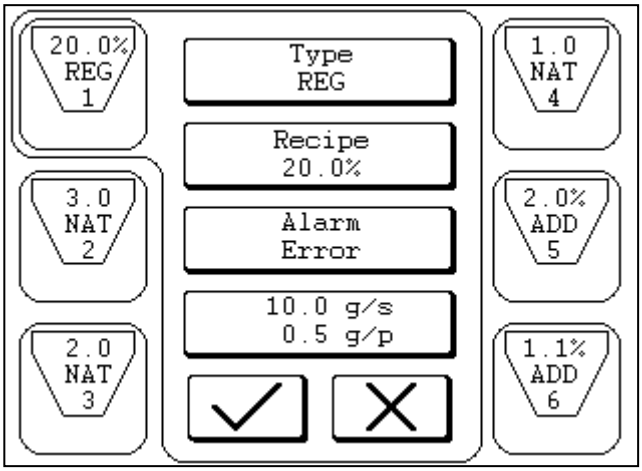
The recipe is the core of the control; this is where the material to be produced is defined. A recipe can be entered via ***Menu → Recipe.*** The recipe consists of a number of components.

3.3.1 Entering a recipe

The controller has a storage capacity of 1 recipe



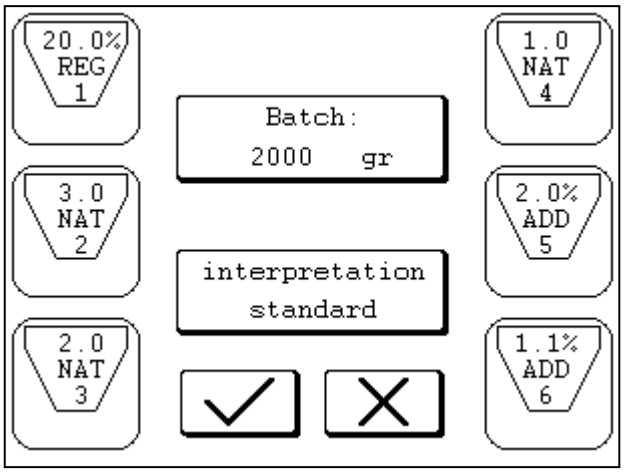
The screen displays a maximum of 6 hopper input fields. These can be changed by selecting a hopper. Depending on the configuration of the machine, a maximum of 10 hoppers can be displayed. Below follows a list of hopper input fields with a brief description.
In the example, hopper 1 has been selected.



FIELDS OF A RECIPE		
TYPE	REG, NAT, ADD	Type of material (§2.6.2) in the hopper.
ALARM	IGNORE, WARN FAILURE	Type of alarm (§2.6.3) for the hopper concerned
GR/S	g/s	Dump speed of material in hopper concerned
GR/PLS	Gr/pls	Dump speed during pulsed dosing

When all hopper filed have been provided with data, you can leave the screen via "***confirm***". If the values have not been entered correctly, the recipe can no longer be changed and a message with the error will be generated.

The input field "***Volume ratio"*** shows the required total weight of the components to be dosed. This is a percentage of the set batch weight in the protected parameters.



The dosing sequence can be changed by simply selevting a hopper and move it up or down with the arrow keys.

The input field "***INTERPRETATION***" allows you to define a recipe in two ways, namely 'Standard' (§2.6.2.1) and 'Percentage' (§2.6.2.2). The methods 'Standard' and 'Percentage' indicate the proportion of the various components Regrind (REG), Natural (NAT) and Additive (ADD) in a recipe.

IMPORTANT

When a new recipe has been selected, the hoppers must be completely filled with the material in connection with the calibration of the system

3.3.2 Changing recipes

If a new product or product composition needs to be dosed, the operator must change the recipe.

A recipe can be changed via ***Menu → Production*** *by* selecting one of the hoppers in the production screen.

3.3.3 Recipes in combination control

Combination control is a PLUG-IN interface control in combination with a central computer.
During combination control, recipes can be selected from 2 different places.

The handheld PLUG-IN control box has a storage capacity of 1 recipe. To choose from more recipes, the recipes from the central control can be displayed. A recipe can now be selected via "**select recipe**".

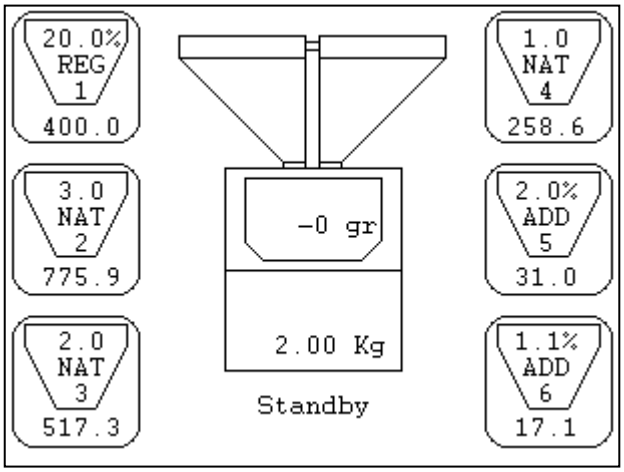
A recipe can be searched according to a recipe number with the aid of "**Search Number**".

3.4 Actual information

The user interface allows the actual control to be displayed. Two screens in the user interface can be displayed: status screen and material consumption screen.

3.4.1 Production screen

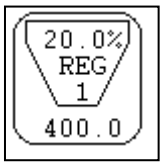
The status screen can be opened via the ***menu*** → ***Production*** and displays the actual control. From the control, the status screen is provided with new data several times a second.



Note:

Pressing and holding down the shift button shows the results of the previous batch

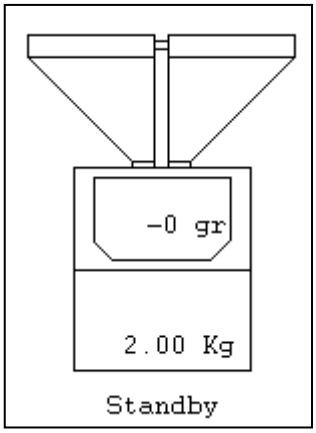
A full overview is available of all the hoppers defined in the recipe. The figure below gives an explanation of the data in hopper 1.



20% = Percentage or share in the batch
REG = Material type
1 = Hopper number
400.0 = Required weight

By pressing down and holding the FN button (.) the values of the previous batch will be shown.

The centre of the screen gives an overview of the batch weight, total produced weight and the machine status. By selecting the illustration, the batch weight and the recipe interpretation can be changed.



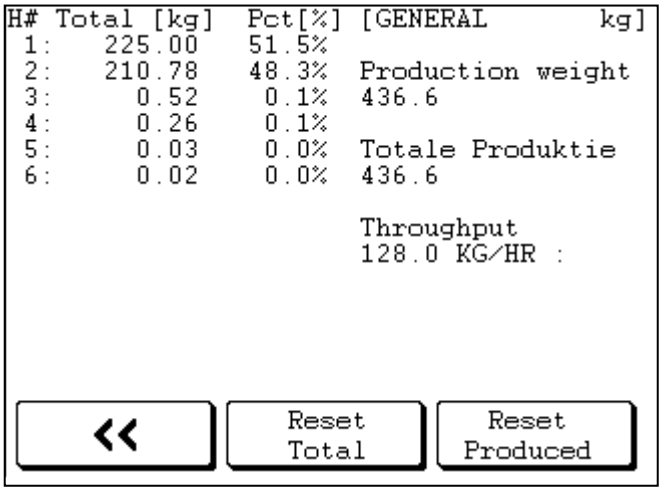
0 gr. = actual batch weight

2.00 Kg = total produced weight

STANDBY = Machine status

3.4.2 Material consumption screen

The material consumption screen ***menu→ totals*** gives an overview of the material used for each hopper. The quantities have been entered per hopper and therefore do not depend on the actual recipe.
The material consumption overview can only be deleted by a command by the operator.
This can be done by pressing "***Reset***". The overview also shows an indicative production speed in kg/hour.

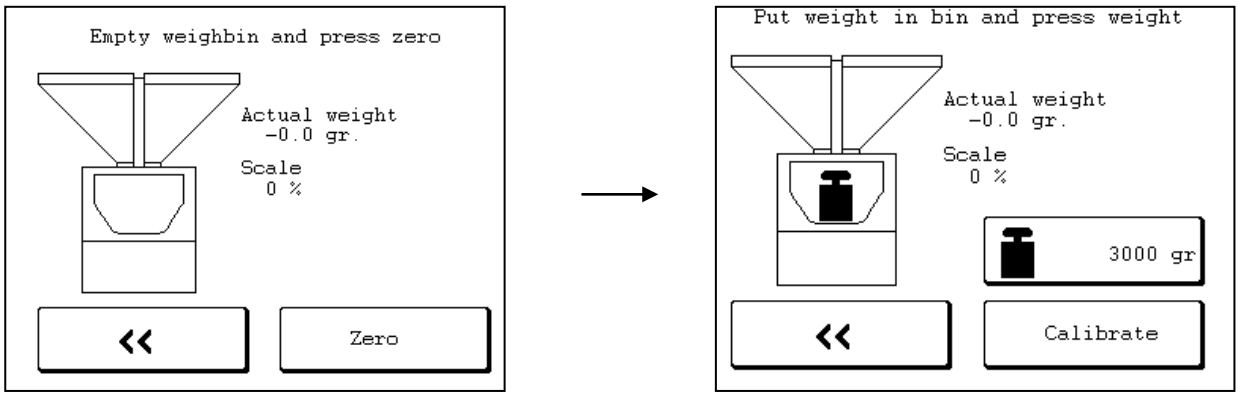


3.5 Calibrating the dosing and blending system

3.5.1 Calibrating the weigh bin

The control calculates a weight line through two (entered) points. These lines enable to determine a weight at an input signal of the weighing cells (weigh bin). The two points should be entered by the operator via the ***menu → calibrate → calibrate***.

The weigh bin is calibrated in two steps, which both need to be performed.



The screen provides the operator with extra instructions regarding the step to be taken. The weigh bin must first be emptied and the value of the empty bin will then be weighed and saved by the control by pressing zero point. The weigh bin must then be filled with a known weight; this value must correspond with the value entered on the display. After pressing ***Calibrate,*** this second point is copied and the calibration will be complete.

IMPORTANT:
The second weight must always be higher than the first.

3.5.2 Taring the weigh bin

External circumstances, temperature, age, overloading etc. may cause the weight line of the weigh bin to shift. The operator will see this by a deviation in the zero weight when the machine is standby. This deviation can be eliminated by performing a new calibration but this is a lengthy procedure and not really necessary. The weight line is correct, only the starting point has shifted. The taring function makes sure that the deviation is eliminated and the screen will show approximately 0 grams.
Taring is performed via the ***menu → Calibration → tarration→ tarration***.

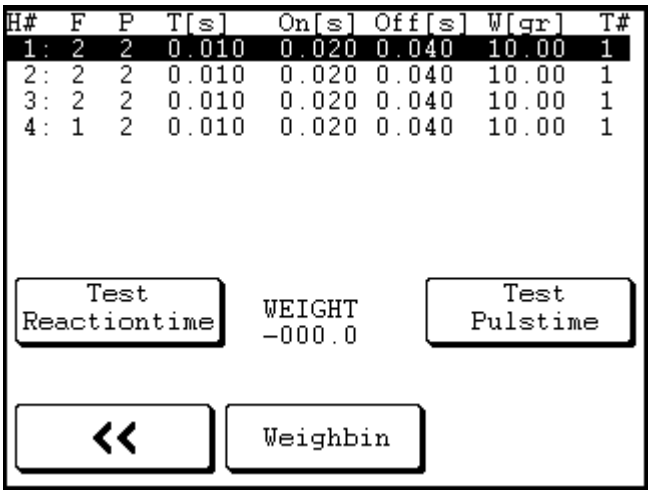
3.5.3 Hardware reaction time

The control uses several pulses to control the dispensing valves and dispensing screws (one pulse can be compared with 5ms) The reaction time of the valve and screw however is larger. Therefore there is a minimal reaction time for the valves and screws. This time will be added to the calculated time so that failures caused by mechanical slowness will be eliminated. That this failure can be considerably appears in the following calculation:

Dispensing without hardware reaction time (assumed 6 pulses = 30ms)						
Dispensing	Dispensing speed	Desired	Dispensing time	Dispensing time excl hrt	Really	Abnormality
Screw	7 g/s	14 g	2 sec	1,97 sec	13,79 g	1,5 %
Valve	800 g/s	600 g	0,75 sec	0,72 sec	576 g	4 %

Dispensing with hardware reaction time(assumed 6 pulse = 30ms)						
Dispensing	Dispensing speed	Desired	Dispensing time	Dispensing time excl hrt	Really	Abnormality
Screw	7 g/s	14 g	2 sec	1,97 + 0,03 = 2 sec	14 g	0 %
Valve	800 g/s	600 g	0,75 sec	0,72 + 0,03 = 0,75 sec	600 g	0 %

The hardware reaction time is set via the ***Menu → Calibrate → Hardware reaction time***. To change a value, a whole row should be selected, followed by "***Enter***". After a value has been changed, the output can be tested via the test function. This is explained below per column.



H# = Hopper number
Dispensing hopper number

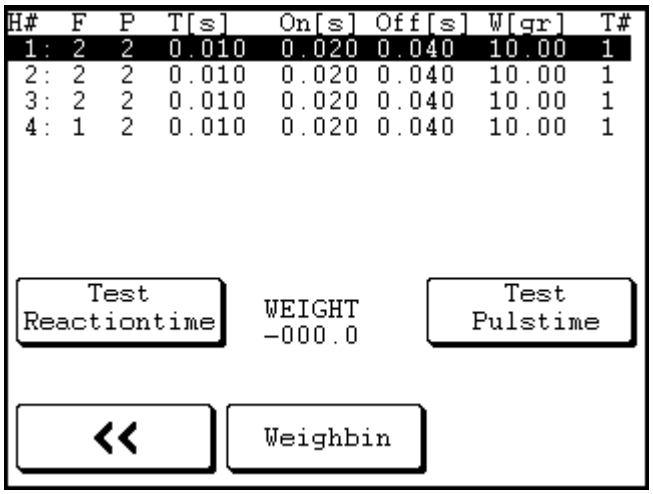
F = Factor
Factor times the pulse time is the minimum opening time at a dosing effort. If the machine calculates an opening time lower than the factor times pulse time (2x0,010 s = 0,020 s) the machine will use the 0,02 seconds for controlling the output. When facing problems with empty hopper alarm while the hopper is filled with material, increase the factor. The maximum setting is 10.

P = Pulse
The hardware reaction time is expressed in pulses of 0.005 seconds

T = Time
The reaction time in seconds

3.5.4 Pulse dispensing

In some cases it is better to use pulse dispensing. This is possible until a certain weight, which can be adjusted. It will be at the expense of the maximum throughput capacity. The adjustment of the pulse time is ***Menu → Calibrate → Hardware reaction time***. The screen consists of different columns, the following will give an explanation per column. To change a value a whole row should be selected by pressing "***Enter***".



Pulsed dosing may not always have the desired result; it is therefore possible to set a limit for pulsed dosing "W[gr]".

The adjustment of the dump speed depends on the material used. The times should therefore be adjusted manually. This is done as follows:

Close the weigh bin with the "*weigh bin*" button, note down the actual weight, and select in the menu the hopper you want to test. After a value has been changed, press "***test pulse time",*** so that one test pulse will follow. Check the increase in weight. By increasing or decreasing the 'On time' (0.010 – 0.040 sec.), more or less material will fall from the hopper. The 'Out time' (0.050 – 0.300 sec.) will give the material more time to fall from the hopper on the slide. The 'Off time' must therefore not be too short.

H#
Hopper number

F
Factor, minimum opening time, not used at pulse dispensing.

ON[s]
Time the valve is open per pulse

Off[S]
Time before a next pulse is executed

W[gr]
If the dispensing quantity is beneath the weight entered here, it will be switched over to pulse dispensing.

Test
The machine will perform a test on Reactiontime or Pulstime.

3.6 Overview of parameters

The controller has a great number of parameters. The parameters are necessary to control the machine with all its features. The parameters are broken down into two groups; public-parameters and protected-parameters. Free parameters may be changed by an operator and protected parameters may only be changed if the password is given.

3.6.1 Parameters

Below a list is given of all parameters with are attainable by ***Menu → Parameters***.

PARAMETERS		
Parameter	Description	Init
ProductionMode	Actual production-mode. There are three possible modes; CONTINUE, WEIGHT and ALARM_WEIGHT. If the mode WEIGHT os ALARM_WEIGHT has been selected the parameter productionWeight must also be given.	CONTINUE
ProductionWeight	The FGB stops his production when the productionWeight is reached. (productionMode must be WEIGHT or ALARM_WEIGHT).	100 [Kg]
DispenseMode	Actual dispense-mode. There are three possible modes; GRAVIMETRIC, VOLUMETRIC and COMBINATION. If the mode COMBINATION is chosen the parameter combinationRatio must be given.	GRAVIMETRIC
CombinationRatio	Relation between the volumetric and gravimetric dispenses. (one gravimetric dispense and x volumetric dispenses).	3
WeighbinDumpTime	Time the weighbin is activated (dumping of material into the mixerchamber).	5 [s]
LevelControlWaitTime	Time between the full signal of the mixerchamber sensor and opening the mixerchamber-valve.	8 [s]
LevelControlDumpTime	Time between the free signal of the mixerchamber sensor and closing the mixerchamber-valve.	1 [s]
MixMode	Actual mixermode. There are four possible modes; ON, OFF, NORMAL and PULSE. In normal-mode the parameter mixerOnTime must be given. In the mode pulse the parameters mixerPulseOnTime and mixerPulseOffTime must be given.	PULSE
MixerOnTime	Time the mixer is activated after the material is dumped out of the weighbin.	10 [s]
MixerPulseOnTime	Time the mixer is activated in pulse-mode.	2 [s]
MixerPulseOffTime	Time the mixer is not activated in pulse-mode.	15 [s]

3.6.2 Production-modes

The production-mode of the blender indicates how the production will stop in automatic-mode. This parameter can be changed using the menu *public parameters*. The production-mode has three options:

Continue

The blender will not stop automatically after the start-command. The blender will continue the production, unless the blender runs out of material or an error occurs.

Alarm-Weight

If 'Alarm-Weight' has been chosen, a requested weight has to be given. After a start the requested weight will be compared with 'produced-weight'. If both are the same or the 'produced-weight' higher, the controller will send an alarm to the operator-interface. The production will continue.

The alarm can be recovered resetting the produced-weight in the "***Totals***" screen. This reset command is part of the production status. Go to totals and reset.

Weight->Error

When using the option 'Weight->Error' a weight has to be given. After a start the requested weight will be compared with 'produced-weight'. If both are the same or the 'produced-weight' higher, the controller will send an error to the operator-interface. The production will not continue in this case.

3.6.3 Dispense modes

The blender has two ways of dispensing: gravimetric and volumetric. One mode can be selected or a combination of both.

Gravimetric

All component of the batch are dispensed and measured separately. Gravimetric is more accurate than volumetric, but takes more production time, i.e., lower output.

Volumetric

All components of the batch are dispensed at the same time using the dispense time of each component (calculated by the system). The components are dumped directly in the mixer chamber. No measurement is done in this mode. Therefore this method is less accurate, but the production time is faster, i.e., maximum output

Combination

When combination is defined, one gravimetric will be followed by a defined number of volumetric dispenses. This is defined by the parameter combinationRatio. This parameter can only be defined if 'combination' is chosen. This mode has the best of gravimetric and volumetric.

Use: normally the defined combination will be done (ex. 1:3). However, if the mixer chamber is full, the process will automatically do a gravimetric dispense instead of a (possible) volumetric one.

3.6.4 Times

After the various components have been dosed, the contents of the weigh bin are dumped in the mixing chamber. The dump time in the mixing chamber and the mixing time after g the required level in the mixing chamber has been reached(sensor full message) are set via ***menu → parameters***.

Weigh bin dump time

The time that the weigh-bin valve is open.

Level control waiting time

The time between the full message of the mixing chamber and the opening of the level control valve (bottom flap)

Level control dump time

The time the level control valve stays open from the time when the mixing chamber sensor is released.

3.6.5 Mix mode

When all components are dispensed, the contents of the weighbin will be emptied. The mixer in the mixing chamber, which contains the dispensed components, can be put in different modes. Choose the menu "***Parameters***".

Normal

The mixer is off during production. If the components are dumped from the weighbin into the mixer chamber the mixer will be on for a predefined number of seconds, defined by 'mixerOnTime'. This parameter can only be changed if this option is chosen.

Pulsing

The mixer will pulse during production. Both on- and off-time can be defined by using the parameters mixerPulseOnTime (time on) and mixerPulseOffTime (time off). These parameters can only be changed if this option is chosen.

Off

The mixer is always off.

On

The mixer is on, during the production

3.7 Protected parameters

Below a list is given of all parameters with are attainable by ***Menu → Parameters → Protected***.

PROTECTED PARAMETERS		
Parameter	Description	Init
DispenseTries	Maximum number of tries per component to reach maximum accuracy	4
DispenseAccuracy	Minimum accuracy for each component.	15 [%]
DispenseCorrectionBand	Maximum deviation when a re-calculation of the dispense-speed is done	20 [%]
Batch Weight	Total weight of all dispensed components	
Loadcell Range	Maximum weight in the weighbin. The controller initiates an error on this point.	3.0 [kg] *)
Maximum tara variation	Maximal absolute abnormality of the zero point for the weighbin	40 [g] 100 [g] 10 + 25 kg
An alarm at overdosing	An alarm will be triggered in the event of a component overdose	No
Weight in	Weights in kilograms (Kg.)/ grams (gr.) or in pounds (lb.)/ ounces (oz)	Kg – gram
Dispense Guard	Dosing monitoring checks the dosed weight of a component during dosing	Recipe change
Maximum Hoppers	Number of hoppers on the machine.	1 - 10
Weight settle time	Waiting time between the dispense of a component and the measuring of the weight, to stabilise the weigh bin	1.0 s
Weight variation band	Superior weightings should be within this band, with regard to the average weight	2 [g]
Make recipe adaptive	Adapt components to firstly dosed component in percentage mode	Yes
Infinite dosage retry's	Continue to try to dose material when hopper is empty	No
Autostart production	Start production by separate button	No **
Autostart production alarm	Start production by separate button, alarm notification	No **
Weighbin clatter cycles	Opening and closing weigh bin flap before dosing start	No
CSV Batch report	Start storing data usage report	No ***
CSV Clear after copy	Renew CSV file after copy	No ***

*) *Depends on the type of GRAVIMIX*

- *0,5 kg unit* *0.8 kg* *(FGB-MINI and FGB MECS)*
- *1 kg unit* *1.2 kg* *(FGB-1)*
- *1,5 kg unit* *2.0 kg* *(FGB-1,5 and FGB FLECS)*
- *2 kg unit* *3.0 kg* *(FGB-2)*
- *5 kg unit* *6.0 kg* *(FGB-5)*
- *10 kg unit* *12.0 kg* *(FGB-10)*
- *25 kg unit* *30.0 kg* *(FGB-25)*

**) Optional

***)

In order to be able to store production data automatically on to a flash drive you need to have a formatted SD card inserted in the SD lock in the print. On this card, all the usage data is being stored continuously, including any possible alarms.
In the protected parameters you need to set 'CSV batchreport' to 'yes', in order to activate storing. This way, when a flash drive is put into the USB portal of the control cabinet, the usage data will automatically be copied from the SD card onto the flash drive. During this process of copying data, the alarm light will flicker. As soon as all the data is copied, the light will stop flickering and you can take the flash drive out. The data has now been stored on to the flash drive.
There are two possible ways to store the data, one way will save the file on the SD card and the other will delete the file and creates a new file. Setting the protected parameter 'CSV reset after copy' to 'no' means the file will be saved, setting it to 'yes' means a new file will be created.

The created CSV file will be named BRxx.ddmmyy where xx stands for the node number of the blender. Node numbers are set by a hardware setting on the PCB board by so called DIP switches, please check wiring diagram for instructions.

4 ALARMS

When an error is detected, the control sends a message to the user interface. The user interface shows the error on the display and saves the messages with the date and time in an alarm history. Below follows a list of all possible messages with instructions on how to resolve the error.

ALARMS		
Alarm message	Description	Resolve
Press recover	Alarm has already been indicated, only needs to be confirmed	Press to confirm
No control voltage	No control voltage	Switch on control voltage and press to confirm
Panels are open	Front panel has been removed or mixing chamber has not been installed	Place protective cap and/or mixing chamber and press to confirm
Production weight reached	Set production weight has been reached. Resolve by resetting ‘produced weight'	Reset 'produced weight' in total screen
Parameters are corrupted	Control number of the stored parameters is incorrect; all parameters are given a default value	Only message, press to confirm
Production data corrupted	Control number of the stored data (status screen) is incorrect; all data are set to zero	Only message, press to confirm
Loadcell is not calibrated	Control number of the stored load cell parameters is incorrect	Calibrate the weigh bin
Loadcell overload	Weight in the weigh bin is higher than the set maximum 'load cell Overload'	Remove surplus weight and press to confirm
Loadcell not stable	Weight in the weigh bin does not reach a set band within specified time.	Press to confirm *) **)
Weighbin out of tare-band	'Zero weight' of the weigh bin deviates too much from 'maximum Tare Variation'	Tare or calibrate weigh bin
Connection with FGB broken	No communication between control and operation.	Check cable (connections and cable itself)
Silo full error	Storage silo remains full during set number of batches (high sensor made)	The regrind consumption is too low -> increase or add less
Silo empty error	Storage silo remains empty during set number of batches (low level sensor not made)	The regrind consumption is too high -> decrease or add more
Low level in hopper	The control detects via a sensor (optional) that a hopper is nearly empty (detection)	Replenish hopper
Hopper is empty	The control detects via a too low dose that a hopper must be empty.	Replenish hopper and start machine ***
Hopper is overdosing	An alarm is triggered after overdosing	Is component dependent
Emergency stop executed	The ***stop*** button has been pressed twice, emergency stop.	Confirm

*) If this message occurs more frequently, contact your dealer

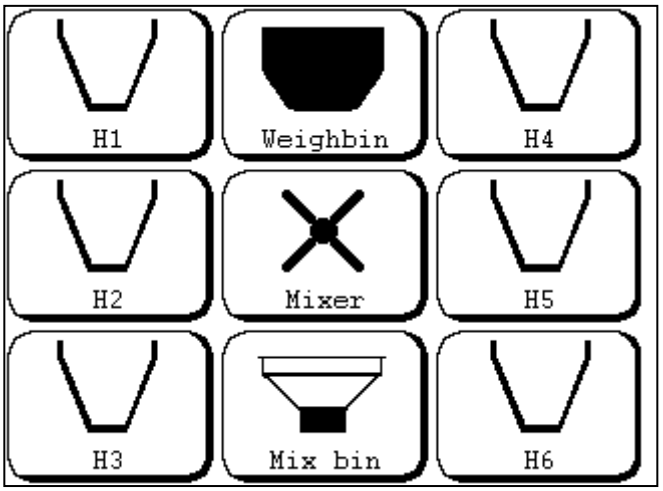
**) If this message occurs, the weigh bin dump time may be set too tight (free parameters). Another reason may be that the mixing chamber is too full and that the weigh bin cover is sticking in the material. In this case the sensor in the mixing chamber should be lowered or the batch weight decreased. The latter will lead to a decrease in the production capacity.

***) If the opening time of the dosing slide is too short, no material will be transported through and the machine will indicate that the hopper is empty. There may be 3 causes for this.
-1 dosing accuracy is too tight
-2 dosing speed is set too high
-3 number of dosing attempts is too low
Resolve:
-1 increase the dosing accuracy (see section 3.5.2)
-2 change speed in the recipe (see section 3.2.2)
-3 increase the number of dosing attempts (see section 3.5.2)

5 CLEANING

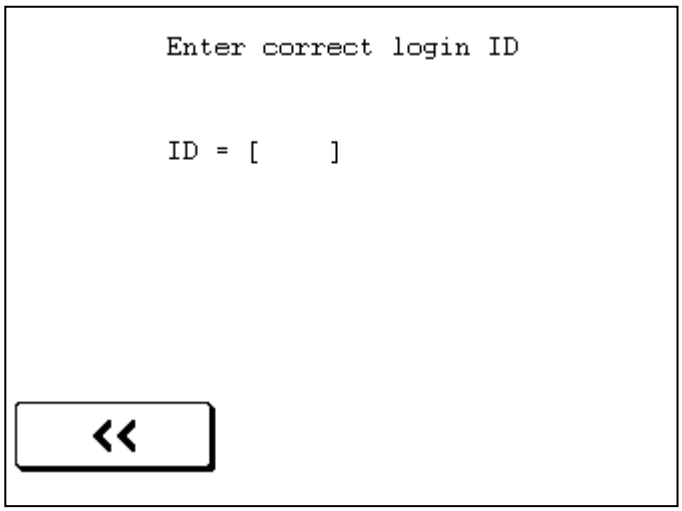
The hoppers are emptied with the aid of the cleaning menu. ***Menu → Cleaning*** gives an overview of all the machine parts needed to clean a machine. Of the hoppers, only one can be activated. Other parts can be activated independently.

The machine can only be cleaned in the **Standby** status and with the control voltage on.
This can only be done if the mixing chamber has been installed and the front panel is closed.
Instead of the front panel, the empty out funnel can also be used.



6 LOGGING IN

The menus contain components for which the operator needs special rights, for example protected parameters, I/O monitor screen, etc. The operator therefore needs to perform a so-called log-in operation.



This operation is started via ***Menu → Login***. The system will then ask for the LOGIN code (see below).
The operator currently has maximum rights. The manager has his own LOGIN code allowing him to make system adjustments, including the calibration.

IMPORTANT

The standard access code for the operator is 1111.
The standard access code for the manager is 2222.
Once the code has been changed, the old code can no longer be used. Therefore, keep the new access code in a safe place.
If you have forgotten the new code, please contact your supplier.

6.1 Logging out

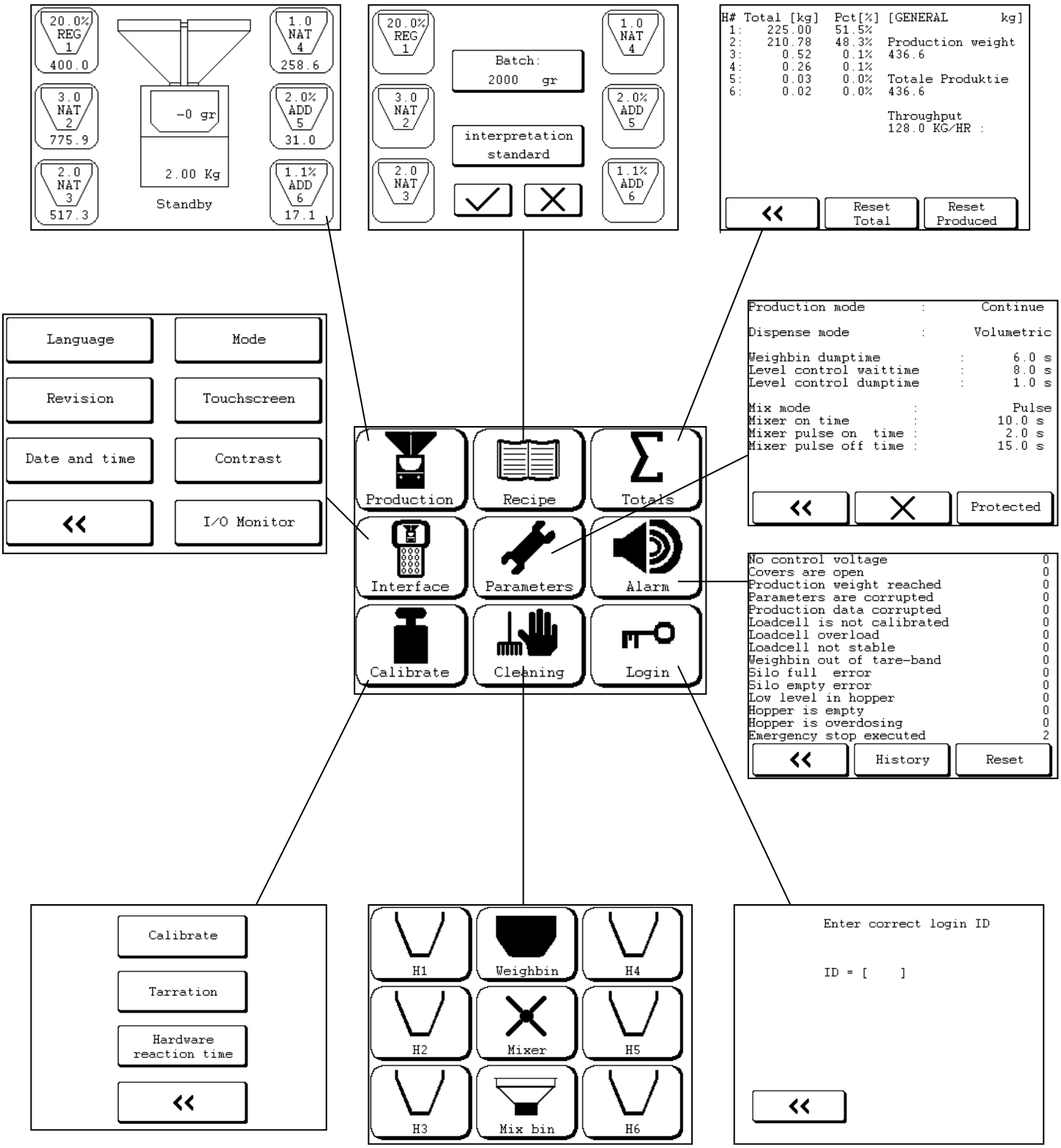
If the control is not used for longer than 2 minutes, you will be automatically logged out.
To block access immediately, you should open the same menu again ***Menu → Login → Logout***.

6.2 Changing the log-in code

The operator or the manager, depending on who has logged in, can change the access code by selecting ***Menu →Login → Change ID.***

Enter the new code; the system will ask you to repeat the code. Enter the code again.

7 MENU HIERARCHY



8 INSTALLATION GRAVIMIX (Series FGB 5, 10 and 25)

8.1 Required connections

Before installation the following connections should be available:
- power supply 240V 50/60Hz (P+N+PE) and 400V 50/60Hz (3P+N+PE)
- clean and dry compressed air supply with a constant pressure; **minimum** 6 bar, 1/4" BSPconnection Figure 2.2

8.2 Installation

There are several ways to install the GRAVIMIX blender, for example;
- on a stand with integrated vacuum take-off box next to the processing machine (option)
- on a platform / frame above the processing machine
- directly on the processing machine

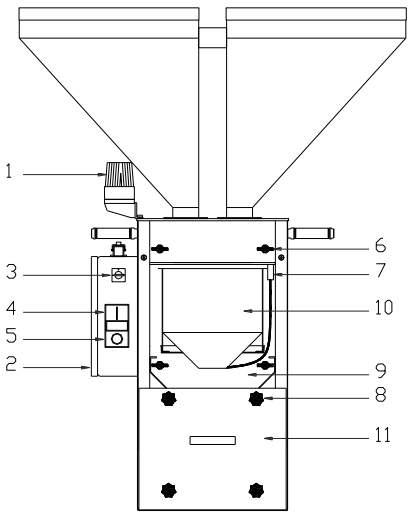
Before installation of the blender open or remove the front panel. At the same time remove the weighbin, mixing chamber and mixer.

To prevent the loadcells from damage during transport, the weighbin must be removed from the blender !

The frontpanel can be opened by turning the pawl latches. The weighbin can be removed after the quick release coupling air line is disconnected. The mixing chamber can be taken out by removing the star handles or by turning the pawl latches. The mixer blade (FGB 1, 2 and 5 series) can be removed by turning this in the direction of rotation (counter-clockwise) and pulling (bayonet coupling). The mixing chamber and mixer (FGB 10 and 25 series) can be removed completely. To reassemble reverse the process.

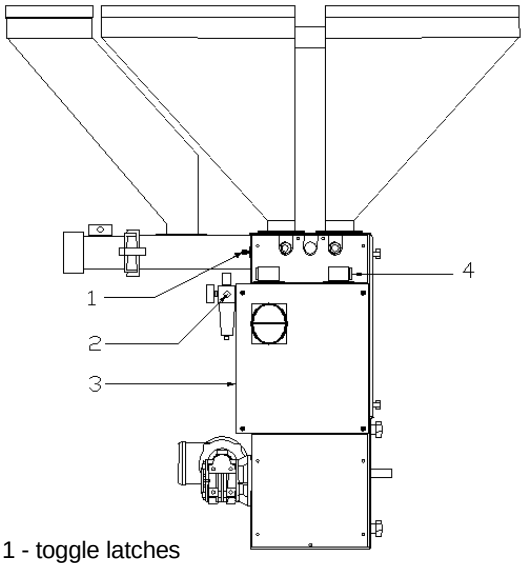
If the GRAVIMIX blender is provided with extra screw feeders at the back and/or the front side, then they should be removed before installation. The screw feeders can be removed from the mounting-pins as follows; disconnect the plug from the controlbox (draw. 2.2), open the toggle latches, remove the safety screw (draw. 2.3) and pull the complete screw feeder from the mounting-pins. The assembly takes place in the reverse way.

ATTENTION: **do not connect the power and compressed air before the GRAVIMIX blender is finally installed.**



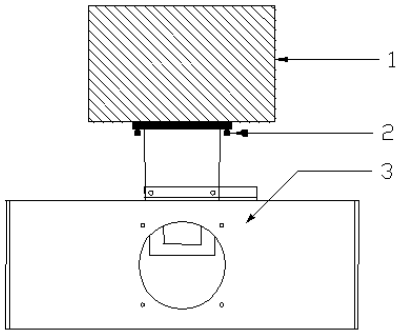
1 – alarm lamp
2 - controlbox
3 – main switch
4 - control voltage (on)
5 - control voltage (off)
6 - pawl latches
7 - compressed air coupling
8 - star handles / pawl latches
9 - frontpanel
10 - weighbin
11 - mixing chamber

Figure 8.1 Frontview GRAVIMIX



1 - toggle latches
2 - compr. air connection
3 - controlbox
4 - screw feeder connection

Figure 8.2 Sideview GRAVIMIX



1 - blender
2 - connections
3 - hopper

Figure 8.3 Extra screw feeder

8.3 INSTALLATION GRAVIMIX FGB MECS and FGB FLECS

8.3.1 Required connections

Before installation the following connections should be available:
- power supply 240V 50/60Hz (P+N+PE)
- clean and dry compressed air supply with a constant pressure; **minimum** 6 bar, ¼" BSPconnection

8.3.2 Installation

The GRAVIMIX FGB MECS (draw. 2.4) and FGB FLECS can be installed in several ways, for example:
- directly on the throat of a processing machine
- on a frame above the machinehopper of the processing machine

Before installation of the blender, open the frontpanel and remove the weighbin and mixing chamber.

To prevent the loadcell from damage during transport, the weighbin has to be removed from the blender !

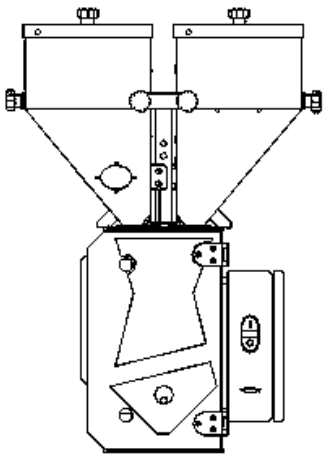


Figure 8.4 Frontview FGB MECS

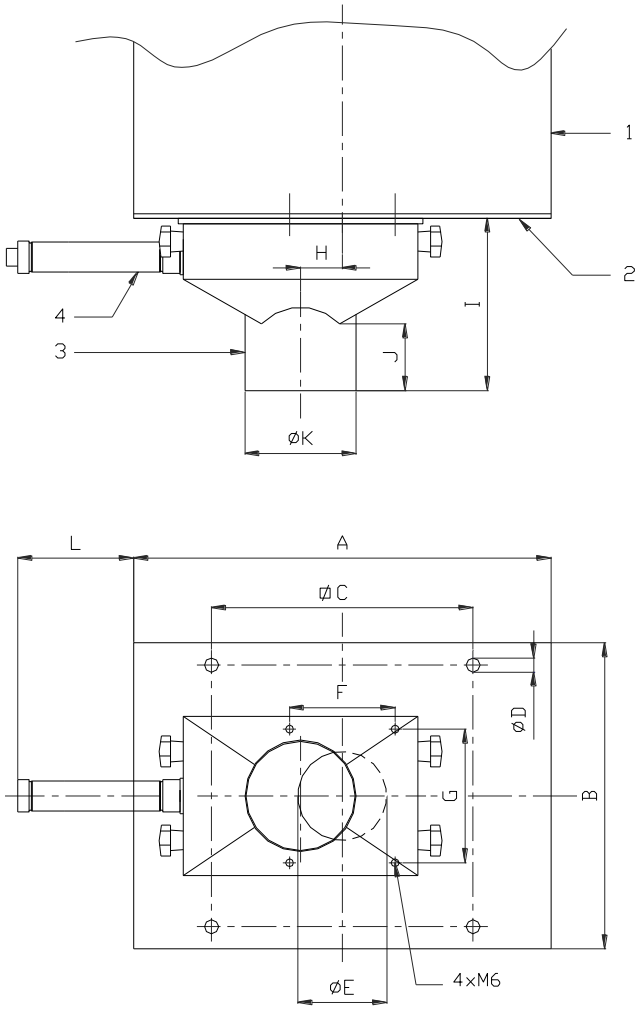
The frontpanel can be opened by releasing the toggle latches. The weighbin can be simply removed from the suspension to the front. The mixing chamber with shut off valve can be removed completely to the front side of the blender.

The hoppers with dispensing-valve are removable and can be removed after the quick release lines are disconnected and the star handles are unscrewed. To reassemble reverse the operation.

ATTENTION: **do not connect the power and compressed air before the GRAVIMIX blender is completely installed.**

The GRAVIMX blender can be fixed by means of the mounting holes in the foot plate:
- on a frame with fixing plate and an integrated vacuum take-off box (option)
- on a platform on / or above the processing machine
- on a flange of the throat of a processing machine (if there is no such a flange or attachment present, there should be one designed in consultation with your supplier).

The mounting holes are positioned as mentioned in figure 2.5.



	FGB 0,5	FGB 15x	FGB 2
A	170	250	375
B	167	250	275
C	120	185	235
D	9	9	10,5
E	50	60	80
F	n.v.t.	95	95
G	n.v.t.	120	120
H	n.v.t.	38	38
I	n.v.t.	155	155
J	n.v.t.	60	60
K	n.v.t.	100	100
L	n.v.t.	170	105

	FGB 5	FGB 10	FGB 25
A	375	495	650
B	275	455	650
C	235	340	480
D	10,5	12,5	12,5
E	80	125	2 x 110
F	95	120	120
G	120	120	
H	38	0	
I	155	175	175
J	60	40	40
K	100	124	2 x 124
L	105	170	

1 - blender
2 - foot plate
3 - material control valve
4 - pneum. cylinder

Figure 8.5 Foot plate & Material control valve

The GRAVIMIX blender should be installed as stable as possible, in connection with the accuracy of the loadcells.

If the blender is provided with a material control valve (underneath the mixing chamber), then this valve should be mounted under the footplate of the blender with 4 screws after the blender is installed. Then the pneumatic cylinder of the control valve should be connected to the redesignated pneumatic solenoid valve (for instruction see chapter 13.4).

After the blender is finally installed, the mixer, mixing chamber and weighbin can be replaced and the frontpanel can be closed. The compressed air supply can be connected to the pressure regulator (max. 12 bar). The power supply (240V and/or 400V) can be connected to the controlbox of the blender and/or to the separate user-interface. The power supply should be “clean” with regard to fluctuation and interference. Then the communication cable between the user-interface and the controlbox should be plugged in. It is **not** permitted to put this cable (particularly the RS-422 communication cable) in a cableway with high power (flux) cables, this is in connection with interference (induction).

Finally the raw material supply should be connected to the hoppers of the GRAVIMIX blender.

It is advisable, that the hopper loaders mounted on the GRAVIMIX, are provided with a good connection with earth (PE). This because of the static electricity generated by the transport of raw materials.

For start-up of the blender refer to chapter 2.

9 MAINTENANCE AND REPAIR

ATTENTION: make sure, before maintenance or repair is carried out, the power is switched off *(by pulling out the plugs)* and the compressed air is shut off *(by disconnecting the air pressure).*

9.1 Maintenance

Everything is set right and tested in the factory, adjustments should be carried out only if one of the following is not working correctly.

Air pressure: Set air pressure to approximately 6 bar for the best results.
However, the blender will work with a lower air pressure (minimum 4 bar).

Level sensor: The level sensor should protrude into the mixing chamber for about 10 mm.
If it protrudes too far, it will detect the mixer blades. If it does not protrude far enough, it will detect the mounting plate itself and not the material. (The FGB-10 and FGB-25 are different)

Adjusting the sensor sensibility. In the sensor is a small screw, with this screw the sensibility can be adjust as follows:

step 1: fill the mixing chamber with material until the sensor is covered.
step 2: turn the screw counter-clockwise until the 'led' goes on (if the 'led' already is on, then turn clockwise until the 'led' goes off and proceed with step 4).
step 3: turn the screw clockwise until the 'led' goes off.
step 4: turn the screw another ¾ turn clockwise.
step 5: empty the mixing chamber and check to be sure the sensor does not detect the mixer blades.

Weighbin valve: The weighbin valve should close quietly. An airflow-regulating valve is mounted on the most left pneumatic valve. This can be adjusted by means of the screw on top of the valve. With the FGB-MINI the airflow-regulating valve on the cylinder of the weighbin.

9.2 Replacement of parts

9.2.1 Replacement of printed circuit

For the replacement of the printed circuit board of the controlbox the cover should be removed first. Unplug the connectors, which are attached to the printed circuit. Now unscrew all M3 screws and remove the circuit board. It is important to disconnect the connectors first and then unscrew the screws. Assemble the replacement circuit board in the reverse way. **It is wise to use a wristband with ground cord, which is connected with earth (PE). This because of the static electricity.**

IMPORTANT

When ordering spare parts always mention type- and serialnumber !
For partnumbers see list at the back of this manual.

9.3 Cleaning of the blender

The frequency of cleaning will depend on the number of times the raw material is changed.

For cleaning the blender the front panel, the weighbin, the mixing chamber and mixer should be removed (as described in chapter 2).

ATTENTION: **make sure, when cleaning is carried out, the power and compressed air are switched off.**

Clean the blender with a vacuum cleaner. Use safety-goggles when cleaning ! After cleaning the parts can be placed back in the reverse way.

9.4 Transportation of the GRAVIMIX blender

Before moving the blender the weighbin must be removed, to prevent the loadcells from being damaged, this can be done as described in the previous chapter. The blender can now be moved on a solid pallet.

10 TECHNICAL INFORMATION

10.1 General blender specifications

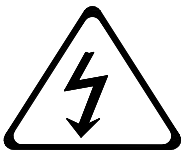
For general information and blender specifications we refer to the brochure at the back of this manual.

10.2 Safety measures

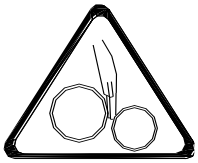
The GRAVIMIX blenders are protected by two safety devices, which are positioned on the front panel and the mixing chamber, if one of them is removed, the power will be cut-off and the blender stops.
Further some warning-stickers are placed on the motor(s), controlbox, user-interface and front panel.
Several warnings are mentioned the manual in order to work with the blender as safe as possible.

The blenders are provided with the following warning labels (diagram):

- Danger high voltage



- Caution rotating parts



- Direction of rotation motor(s)

10.3 Electric connections and diagrams

For the electric connections of the blender, the controlbox and the user-interface we refer to the diagrams in this manual.
For the specification of the electric motor(s) we refer to the data on the motors.

10.4 Pneumatics

The blender is standard supplied with a filter-pressure regulator and a number of pneumatic solenoid valves. The number of valves is equal to the number of material hoppers plus one or two for the weighbin and if present one or two for the material control valve underneath the mixing chamber (option).

For connection of the pneumatic valves see figure 13.4 and 13.5
The valve of the weighbin is sealed at connection (W1) so only connection (W2) can be used, except in the serie FGB- MINI and FGB-25 there both connections are used.
The connection of the dispense valves H1, H2, H3 etc. are as following;

* H1-1 of the valve to C1 of the cylinder, also H2-1 of the valve to C1 of the cylinder etc.
* H1-2 of the valve to C2 of the cylinder, also H2-2 of the valve to C2 of the cylinder etc.

H1-1 and H1-2 should be connected to the cylinder of hopper number 1, H2-1 and H2-2 to the cylinder of hopper number 2 etc.
If a material control valve is used it should be connected to B1 en B2, one of the lines has a mark like one side of the cylinder, connect the corresponding marks.

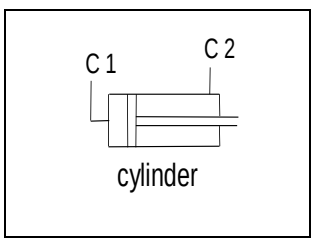


Figure 10.1

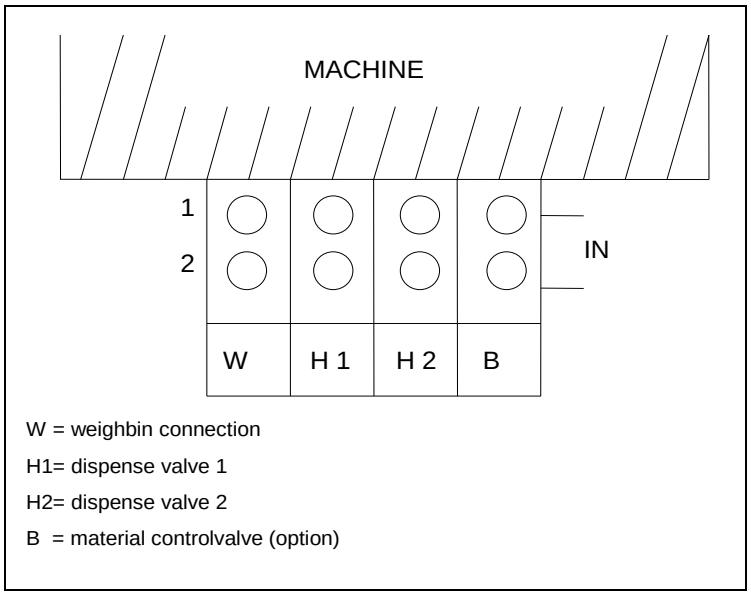


Figure 10.2 Topview pneumatic valves

Enclosures: electric diagrams