Labotek
Power in Plastics

# MANUAL

# GraviMaster-FGB-M05 (S)
# Gravimetric Blender

**Serial No. .....**
**ISO 08.01.02.064.GB**
**986731**
**Rev. May 2001**

# 1.0 INTRODUCTION

## GRAVIMETRIC FEEDING

An efficient materials blending system is an essential feature of the modern plastics processing industry. Dosing each component on the basis of weight shows distinct advantages over traditional volumetric systems. The quantity of material delivered is precise and unaffected by variations in bulk density, flow characteristics and particle size.

Ferlin Plastics Automation now have a range of more than twenty blenders that deliver the benefits of gravimetric blending at a price that makes other gravimetric ... and most volumetric systems ... look distinctly expensive.

## FGB SERIES GRAVIMETRIC BLENDERS

“GraviMaster” blending systems are available in more than twenty different models with a throughput capacity range from 10 to 750 kg/hr for the standard units. The number of components on the standard unit is two to six. But purpose-built units may designed for additional feeds up to a maximum of ten and a throughput capacity up to 1500 kg/hr. The blending units may either flow-control-valve design or have a combination with auger-feeders. The proven “GraviMaster” blending systems are being used successfully in Injection-moulding, Blow-moulding, Sheet-extrusion and Film-extrusion.

## ACCURATE WEIGH SYSTEM

Each component is dispensed into a weigh-pan using one set of load cells. When all the components are correctly weighed, the blend is discharged into a mixing chamber. A high efficiency horizontal mixer is programmed to give a uniform blend which discharges to a storage bin with suction device, or directly into the processing machine hopper.

The system is capable of extremely accurate measurements of additive, even at very small percentages or ratios. Load cells of the highest accuracy are used, weighing to within 0.01 gm. The accuracy of the process is enhanced by the software system which is designed to compensate in a subsequent batch for any errors arising in a preceding batch. Overall accuracy of 0.1% can be achieved.

## COMPACT AND MODULAR CONSTRUCTION

The units are designed and built as a modular construction using standard components where possible, so that all components are readily obtainable. All components which are in contact with the raw material are made in stainless steel. This includes hoppers, valves, augers, weigh pan, mixer and mixing chamber. When auger feeders are installed, these can be quickly accessed for easy cleaning. The mixing chamber and weigh pan can be removed easily for cleaning and access. The construction is in accordance with the essential requirements under the CE regulations.

## RELIABLE PROCESS CONTROL

The FGB control system incorporates the latest in computer and microprocessor technology for total automation of recipe entry and storage, inventory control and process monitoring. The control panel (user-interface) is provided with a micro-controller and industrial PC with LCD-display, functional keyboard, fiber optic communication cable (or RS-422) and parallel printer port.

**Features are:**

- data storage of all plant raw materials.
- easy call up of materials for the formulation of recipes.
- fast identification of recipes and call up for machine operation.
- automatic regrind control within chosen limits, so that regrind generation is matched with usage.
- automatic additive to regrind control.
- a fixed weight of blended material can be produced according to any of the stored formulations.
- screen display of all process operation.
- reports of material used and batch histories can be printed on an optional printer regularly.
- storage facility for components and recipes.
- functions are menu driven and take the operator through the required sequence of actions with simple instructions.
- the software is pre-programmed with many options for the future, these are blenders you won't outgrow.

**Options are:**

- automatic stock silo control.
- extra level control of the blender hoppers.
- extra level control of the machine hopper.
- control and data for materials management systems.
- different language on the display.
- automatic loading of the hoppers can be provided separately with Ferlin loaders or others of your choice.
- several blenders may be linked to a central user-interface to give integrated inventory control over the whole process.

## 2.0 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 to shut-down the machine by pushing the button as indicated in drawing 1 in § 7.7.1.**

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] Select the right language. The selected language is indicated.
Select a different language through key <↑> or <↓> and press <ENTER>.
[5] If necessary adjust date and time.
[6] Select the blender to be started.
[7] Select on the interface the desired recipe from the menu (F1)
*'controller / select recipe'*
[8] Be sure there is no alarm active.
[9] Start the blender, press <START>.

The blender will now operate automatically on the select recipe.

### 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:

**Inactive**
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.

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

**Pause**
When the pause-command is given for a temporary stop the blender will stop after the cycle is complete.

**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 <ENTER> command. The error must be solved then.

## 2.3 Machine-mode

The controller can be in two modes: Automatic and Manual. The operator can change the mode using the menu item ‘controller’. This changing of mode is only possible while the blender has status ‘standby’.

If a controller is in Automatic-mode, the recipe will be executed without the need of an operator. This mode is used for production purposes and is only dependent on the settings ‘production-mode’.

In automatic mode the keys mentioned below mean:

F5 Start-command (start-key)
F6 Stop-command (stop-key)
F7 Pause-command
F8 Continue-command (clear pause)

After a start-command in Manual-mode one batch will be executed. After this the machine-status will be ‘standby’ again. The weighbin and mixbin-valve can be controlled manually.

In manual mode the keys mentioned below meaning:

F5 Step-command (One component of a batch)
F6 Reset-command (Back to the first component of a batch)
F7 Empty weighbin
F8 Empty mixbin

## 2.4 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 (F1) *'controller / 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.

**Weight->Alarm**
If 'Weight->Alarm' 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 'production-weight' to zero (0). This command is part of the option-menu (F2) of the status screen.

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

## 2.5 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 (F1) *'controller/public 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 ca be defined 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 always on, when the machine status is active.

## 2.6 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 (F1) *'controller / public parameters'*.

**Gravimetric**
All component of the batch are dispensed and measured separately. Gravimetric is more accurate than volumetric, but takes more production time, ie., 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, ie., 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.

## 2.7 Batch handling

### 2.7.1 Production control

If a start command is given the controller will check if the blender actually can start. If a hopper has a low-indication **(optional)** the controller will alarm.

Also the parameters are checked. These can be in conflict with the recipe to be executed. The following items will be checked (if applicable):

* Empty Regrind control
  - The controlled hopper must contain regrind (according to recipe)

* Stock silo control (optional)
  - Controlled hopper must contain regrind (according to recipe)

* Additive to regrind
  - Controlled hopper must contain additive (according to recipe)

The blender will not start unless all conditions are met. A message will be sent to the user interface.

### 2.7.2 Recipe to weight calculation

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

A recipe can be defined in two ways: 'Standard' and 'Percentage'. These methods can be defined in the recipe choosing menu (F1) *'recipes / edit recipes'*. The methods 'Standard' end 'Percentage' define the relation of the components (Regrind, Natural and Additive) in a recipe.

#### 2.7.2.1 Method Standard

The different components are defined as follows:

| | | |
|---|---|---|
| Regrind | : | Percentage of the batch weight |
| Natural | : | Relation between other naturals |
| 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 |

#### 2.7.2.2 Method Percentage

The different component are defined as follows:

| | | |
|---|---|---|
| Regrind | : | Percentage of the batch weight |
| Natural | : | Percentage of the batch weight |
| Additive | : | Percentage of the batch weight |

Total sum must be 100%.

**Example**

| | |
|---|---|
| Batchweight | 2000 gr. |
| Regrind | 20.0% |
| Natural 1 | 60.0% |
| Natural 2 | 15.0% |
| Additive | 5.0% |

| | | | |
|---|---|---|---|
| Regrind | : | 20.0% of 2000.0 | 400.0 |
| Natural 1 | : | 60.0% of 2000.0 | 1200.0 |
| Natural 2 | : | 15.0% of 2000.0 | 300.0 |
| Additive | : | 5.0% of 2000.0 | 100.0 |
| | | TOTAL | 2000.0 |

### 2.7.3 Adding extra materials

The defined amount of the component defined in the recipes can be changed external using some special parameters. The controller has two methods: ‘Additive to regrind’ and ‘Regrind Control’.

**IMPORTANT**

Addition of extra material using ‘Additive to regrind’ and ‘Regrind Control’ is only possible when a ‘standard’ recipe is used.

### 2.7.4 Additive to regrind

It is possible to dispense more additive in relation to the amount of regrind. Choose for this definition menu (F1) *'controller / public parameters'*. A maximum of two hoppers (additive) can be defined (additiveToRegrindHopper). The definition must be completed defining the requested percentage (additiveToRegrindPerc).

| ADDITIVE TO REGRIND | | | | |
|---|---|---|---|---|
| | Not activated | | Activated with 2.0% | |
| Component | Recipe | Weight (g) | Recipe | Weight (g) |
| Regrind | 20.0% | 400.0 | 20.0% | 400.0 |
| Natural 1 | 4 | 1219.0 | 4 | 1213.0 |
| Natural 2 | 1 | 304.8 | 1 | 303.2 |
| Additive | 5.0% | 76.2 | 5.0% + 2.0% | 83.8 |

### 2.7.5 Regrind control

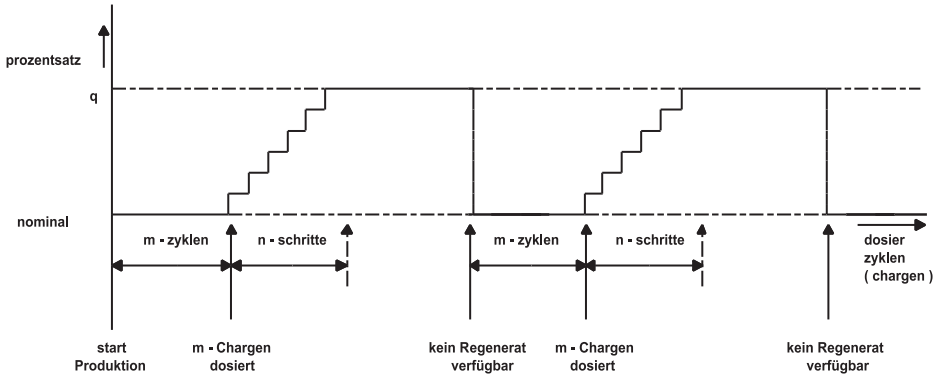
The flow of 'regrind' is very often not continuous due to the process. There are two methods to adjust the amount of regrind to the actual process: 'Empty Regrind' or 'Stock Silo'.

#### 2.7.5.1 Empty regrind Control

Empty regrind control means: keep the regrind-hopper empty. The material must be dispensed, because otherwise another parts of the process can be destroyed (regrind return mechanism).

Through menu (F1) *'controller / protected parameters'* the process can be activated. After the process is started a defined amount of batches (Empty regrind wait count) must be awaited before the percentage will be increased. The percentage will be increased in the defined number of steps (Dispensevariation cycl.) until the requested percentage is reached (Dispense increase).

If not enough material can be dispensed from the regrind hopper, then regrind will be reset to the original setting (recipe).

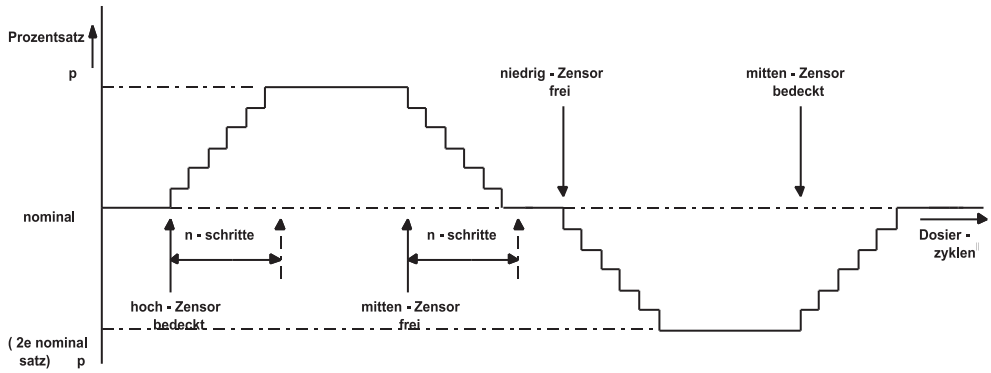



### 2.7.5.2 Stock Silo Control

A regrind silo can have (optional) three sensors to detect high- low- and middle. If the controller has these sensors, 'Stock-Silo' regrind control can be activated, choosing menu (F1) *'controller / protected parameters'*.

If the high-sensor is true, the silo is almost full. Therefore more regrind will be dispensed. This is the same as described in 'empty regrind control'. This will be done until the middle sensor is not true anymore. In a defined number of steps the process will dispense the original setting of the recipe.

If the low-sensor is true, the silo is almost empty. Therefore less regrind will be dispensed. This is the inverse as described in 'empty regrind control'. This will be done until the middle sensor will become true. In a defined number of steps the process will dispense the original setting of the recipe.



### 2.7.6 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]

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 confirmation (enter) to initiate new dispense tries of the same material. This process goes on until the dispense accuracy is reached.

**Dispense not correct (too much)**
To 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

When all components of a recipe are dispensed the contents 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)

### 2.7.7 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).

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**IMPORTANT**

Best dispense order is:

Regrind, Natural, Additive

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## 2.8 Datalogging

Some production data is stored. This is shown at the user interface and can also be printed.

* Batch data
  - measured weight (each component)
  - dispenserate of each component
  - recalculation to recipe

* Total data
  - Sum of batch data

* Material usage
  - dispensed amount of each hopper
  - percentages

The controller saves all data in battery-backup memory.

## 2.9 EQ-Net Certificate

EQNet

THE EUROPEAN NETWORK FOR QUALITY SYSTEM ASSESSMENT AND CERTIFICATION

*This is to state that*

**Labotek A/S**
Strøbjergvej 29, P.O.Box 100
DK-3600 Frederikssund

**Labotek A/S**
Dageløkkevej 4, DK-5953 Tranekær

*holds the Quality System Certificate*

DS-CERTIFICATE NO. 162

Issued 1993-02-16

*for the standard from the*
*ISO 9000 / EN 29000*
*series, and the scope as specified therein*

*Signed for and on behalf of EQNet member*

*DATE* April 1993

B. Axelsen
Bjarne Axelsen
Certification Manager

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The issuing member holds all other EQNet members harmless for any claims arising from the existence of this document

## 2.10 ISO Certificat

DANSK STANDARD

# Kvalitetsstyringssystem Certifikat
*Quality System Certificate*

**Certifikat nr. 162.1**
*Certificate No. 162.1*

**Det attesteres hermed, at kvalitetsstyringssystemet hos**
*This is to certify that the Quality System of*

**Labotek A/S**
**Strøbjergvej 29, P.O.Box 100**
**DK-3600 Frederikssund**

**Labotek A/S**
**Dageløkkevej 4, DK-5953 Tranekær**

**er i overensstemmelse med kravene i**
*fulfils the requirements in*

**DS/EN ISO 9001:1994**

**Certifikatets gyldighedsområde er:**
*The scope of this certificate is:*

**Periferiudstyr til plastindustrien.**
*Ancillary Equipment for The Plastics Industry.*

**Dette certifikat er udstedt i overensstemmelse med DS' bestemmelser vedrørende certificering af kvalitetsstyringssystemer. Certifikatets danske tekst betragtes som den juridisk gældende i tilfælde af tvivl om oversættelsens korrekthed. Certifikatet er gyldigt 1 år efter udstedelse eller 1 år efter sidste opfølgningsaudit gennemført med tilfredsstillende resultat, og såfremt dokumentation herfor fremgår af bilag A til dette certifikat.**
*This certificate is granted in conformity with the DS rules for the Certification of Quality Systems. The Danish certificate text of the certificate is considered legally binding in case of doubt with regard to the correctness of the translation. The certificate is valid for one year from the date of issue, or for one year from the latest surveillance audit carried out with a satisfactory result and only if attestation to this effect appears from Annex A of this certificate.*

**Mark Krølner**
**Ledende auditor, sagsverifikator**
*Lead auditor, Verifier*

**1996-01-19**
**Revisionsdato**
*Date of revision*

**1993-02-16**
**Udstedelsesdato**
*Date of issue*

**Steen Djursgård**
**Ledende auditor**
*Lead auditor*

DANAK
Reg. nr. 5002

DS
DANSK STANDARD
DANISH STANDARDS ASSOCIATION
Baunegårdsvej 73, DK-2900 Hellerup

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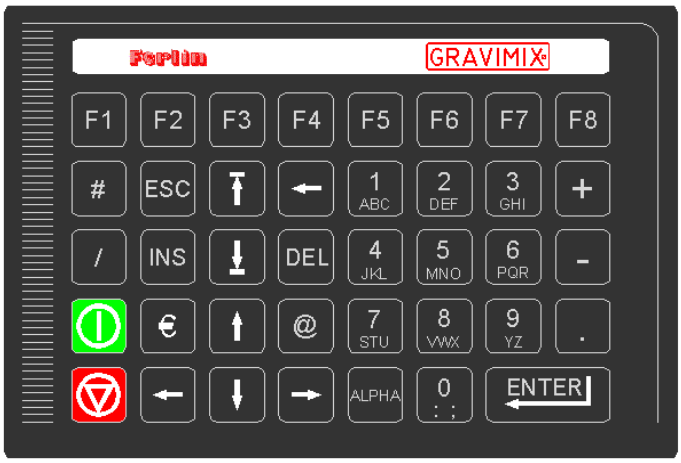
# 3.0 USER INTERFACE

## 3.1 Operator-interface

### 3.1.1 Keyboard




Description:

F1 Open main menu. All other sub-menu's can be selected
F2 Open option menu. The contents is dependent of the actual screen.
F3 Will be used during calculation
F4 Choose node number

The function keys F5 up to F8 is dependent of the machine mode (automatic, manual).

| FUNCTION KEY IN MACHINE-MODE | | |
|---|---|---|
| Function key | Automatic | Manual |
| F5 | Start production | Dispense one component |
| F6 | Stop production | Mixer |
| F7 | Pause | Dump weightbin |
| F8 | Start after pause | Dump mixer chamber |

Besides the function key there are some special keys:

| DIRECT MACHINE-CONTROL KEYS | |
|---|---|
| **Key** | **Description** |
| # or F4 | Select FGB |
| START | Start command, the same as F5 |
| STOP | Stop command, the same as F6 |

| DATA ENTRY KEYS | |
|---|---|
| **Key** | **Description** |
| 0-9 | Entry of numbers |
| +/- | Increase and decrease function (value of field can be changed by step) |
| ENTER | Select function. (choise is made and entered values are saved) |
| . | Decimal point |
| ESC | Escape, Leave menu without choice |
| (Home) | (Arrow up with line) Jump to first element of row |
| (End) | (Arrow down with line) Jump to last element of row |
| INS | Insert function to add recipes and components |
| DELL | Delete function to delete recipes and components |
| ← | Backspace (above DELL-key) delete the character left of the cursor |
| ← ↑ → ↓ | Cursor-keys, move cursor and menu-items |

### 3.1.2 User control

The user-interface consists of several screens which can be selected by a menu. A screen consists of objects only one object in a screen is active (selected). By using the ↓ en ↑ arrow keys the actual selected object can be changed. Pressing <ENTER> activates the selected object.

**Button**
After activating the button a command (or set of commands) is (are) executed. The name of the button represents the functionality of the button.

**Number input field**
When a number input field is selected it can be activated by either the <ENTER> key or just typing the numbers. The activated input field shows a cursor at the position where the next number will be placed. To deactivate (leave) the input field use one of the the following keys <ENTER>, <ESC>, ↓ or ↑

**Text input field**
The text input field is equal to a number input field but it also accepts characters. Because the keyboard doesn't have character-keys a special method is implemented to enter characters.

To enter a character in a text inputield first activate the object with the <ENTER> key. When the input field is activated a cursor is shown at the first position. At this moment it possible to select a character with the <+> and <-> keys. After a character is chosen the next position can be selected with the → arrow key.

**Option field**
Option fields are objects with a toggle function (yes/no) or (true/false). When the button according to the option field is activated the value is toggled. The actual value of the option field is displayed by a cross. When the cross is visible the object has the value 'yes' or 'true' otherwise the value is 'no' or 'false'.

**Optionlist**
Optionlist fields are fields that can contain a limited set of values. The optional values become visible as the object is activated. Now the required value can be selected by using the ↑ and ↓ key and select it with <ENTER>.

## 3.2 Recipes

Recipes constitute the core of the controller. They contain all information about the material to be produced. By the menu (F1) *'recipes / edit recipes'* it is possible to add recipes to the controller. One recipe consists of one or more (max 12) components which can be changed independently.

### 3.2.1 Change components

There is a components list available in the controller. The list can be used by the operator to define recipes. The components list stores the name and type of a component and is maximised to 100 components. The operator is free to chose a name for a component. There are only three options namely:

| | |
|---|---|
| Regrind | Scrap-material |
| Natural | Basic-material |
| Additive | Additive-material (e.g. masterbatch) |

One component of every type is already present in the list. These components have the name ‘no name’ and can not be deleted from the list.

To add or modify components chose the menu (F1) *‘recipes / edit components’*. The next screen will be displayed:

```
[0]OPERATING    AUTO[ ]                  [ ]                  [ ]
STATN:[0] FGB#00: (No name)              STATUS       OPERATING
MODE: AUTOMATIC
------------------------                 [Edit components]
 Name                      Type

 SCR GARDEN CHAIR          REGRIND
 ADEG-2RN                  NATURAL
 ADEG-4RN                  NATURAL
 ANTISTATIC ALU            ADDITIVE

                                          <ENTER>   = edit component
                                          <INSERT>  = insert component
                                          <DELETE> = delete component

F1Menu  F2Option  F3      F4Clear        F5Start        F6Stop              F7Pauze
F8Cont.
```

In the screen it is possible to select a component with the arrow keys. After a component has been activated by <ENTER> the name and type can be changed. If the field type has been activated an option list will appear. One of the options (Regrind, Natural or Additive) must be chosen.

By pressing the <INS> insert-button a new component will be added to the list. The controller places a standard name and type into the fields. The operator now can change these fields to the correct name and type.

Deleting a component from the list can be done by pressing the <DEL> delete-key. The component pointed to by the highlighted line will be deleted from the list.

The option-key (F2) contains two functions in the screen *'edit components'*: print components and search components, activate one of them by selecting and push <ENTER>.

**Example: Add a new component**

**Goal:** Component with he name "WHITE" and type "ADDITIVE"

**Actions:**

Step: Menu (F1) *'recipes'* <ENTER>
Step: *'edit components'* <ENTER> (By using the arrow-keys)

| Name | Type |
|---|---|

Step: Press <INS> key (INS = insert)

| Name | | Type |
|---|---|---|
| < | > | [NATURAL] |

Step: Search for the character W by using the + or - key:
<+> Starts with special characters and numbers then the alphabet
<-> Starts at the end of the alphabet
When the + or - key is hold down the character will change fast.

If the character W has been found the ? key is pressed.

| Name | Type |
|---|---|
| <W> ? | [NATURAL] |

Step: Repeat the same procedure for the character H, I, T and E. When the whole name is given press <ENTER>. Now the name ‘WHITE” is stored.

| Name | Type |
|---|---|
| ?WHITE? | [NATURAL] |

Step: Press the ? key again to select the type-field.

| Name | Type |
|---|---|
| [WHITE] | NATURAL ? |

Step: Press <ENTER> to activate the field.

| Name | Type |
|---|---|
| [WHITE] | [NATURAL ] |
| | REGRIND |
| | NATURAL |
| | ADDITIVE |

Step: Select ADDITIVE by using the arrow keys and confirm by pressing <ENTER>.

| Name | Type |
|---|---|
| [WHITE] | ?ADDITIVE ? |

Step: To confirm the new component press the arrow key ? or use the <ESC> key.

Now the “ADDITIVE” component “WHITE” is added to the list. The maximum number of components is 100.

### 3.2.2 Add/change recipes

The terminal has the capacity for 340 recipes. This space is divided into 4 spices so every connected FGB can contain 85 recipes. If the menu item (F1) *'recipes / edit recipes'* is chosen a list with recipes will be displayed.

Now recipes can be added, changed or deleted. The <DEL>-key deletes the current recipe of course there will be a conformation for the operator. By adding <INS>-key or changing <ENTER> the current recipe the same screen is used.

```
[0]OPERATING    AUTO[ ]              [ ]              [ ]
STATN:[0] FGB#00: (No name)       STATUS  OPERATING       MODE: AUTOMATIC
+--------------------------EDIT RECIPE
Number          :          [  10]
Name            :          CRATE
 Colour         :          [YELLOW          ]
 Batch          :          [   2]Kg.
 Interpretation :          [STANDARD  ]

 H# Component             Quant             Alarm             Rate (g/s)
  1 noname          (r)   50.0              IGNORE            957.2
  2 noname          (n)   2.0               IGNORE            891.4
  3 noname          (n)   2.0               IGNORE            875.5
  5 noname          (a)   4.0               IGNORE              8.3
  4                                         <ENTER>   = edit line
  5                                                     <INSERT>  = insert line
  6                                                     <DELETE> = delete line
  7                                                     <HOME>    = sort up
  8                                         <END>     = sort down
  9
 10
 11
 12
+-------------------------------------------------------------------------

F1Menu   F2Option       F3      F4Clear  F5Start     F6Stop   F7Pauze
F8Cont.
```

All fields of the recipe are visible in the screen. By selecting the objects with the arrow-keys and activate them with the <ENTER>-key it is possible the change the them. Below a list is given with every field of the recipe giving some extra information about the field.

| FIELD OF A RECIPE | |
|---|---|
| Fields | Description |
| Number | Unique recipe number |
| Name | Recipe name |
| Colour | Characterfield for the colour-name |
| Batch | Total batchweight |
| Interpretation | Recipe calculation |
| Component | Link hopper to component |

The screen can be left by pressing the <ESC>-key. Now the terminal checks the recipe and if it is correct it will be stored. If the recipe is not correct the operator can chose either changing the recipe or discard all changes.

The option-key (F2) contains other functions in the screen *'edit recipes'*. The next functions are available:

| OPTION MENU IN EDIT-RECIPE | |
|---|---|
| Option | Description |
| Copy recipe | Copies the recipe to the same or other terminal. |
| Find number | Searches for the recipe with the given number. |
| Find colour | Searches for the recipe with the given colour. |
| Find name | Searches for the recipe with the given name. |
| Print recipe | Sends the current recipe to the printer. |
| Print all recipes | Prints all recipes of the actual controller. |

**Example: Add a new recipe**

Goal: Add a 2 kg standard recipe .
Remark: The required component names should have been added.

Actions:
Step: Menu (F1) *'recipes'* <ENTER>
Step: *'edit recipes'* <ENTER>

| Name | Nr. | Colour |
|---|---|---|

Step: Press the <INS> key (INS = insert)

```
Number:          [1]
Name:            ?                                   ?
Colour:          [                                   ]
Batch:           [ 2.0] kg
Interpretation:  [ STANDARD  ]
H#  Component    Quantity.   Alarm   Speed (g/s)  1  2  :  : 10 11 12
```

The name and colour of the recipe is entered in the same way as the components name (§ 3.2.1).

Step: Press the arrow key <↓> to select the batch.

| Batch: | < 2.0> | kg |
|---|---|---|

When the batchweight must be changed it can be done by the use of the numeric-keys

**IMPORTANT** Never enter a batchweight higher then the standard value.

Step: Press the arrow-key <↓> once

| Interpretation: | < STANDARD> |
|---|---|

Step: When the interpretation must be changed into PERCENTAGE press the <ENTER> key. Now select PERCENTAGE with the arrow keys and confirm with <ENTER>.

| Interpretation: | STANDARD |
|---|---|
| | PERCENTAGE |

Step: Press the arrow key <↓> once.

| H# | Component | QTY | Alarm | Speed (g/s) |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| : | | | | |
| 12 | | | | |

Step: Select the hopper you want to edit with the arrow-keys and press <ENTER> to activate.

| H# | Component | Quantity | Alarm | Speed (g/s) |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| : | | | | |
| 12 | | | | |

Step: Press <ENTER>.

| Name | Type |
|---|---|
| Noname | REGRIND |
| Noname | NATURAL |
| Noname | ADDITIVE |
| WHITE | ADDITIVE |

Step: Use the arrow-keys <↓> to select a component and press <ENTER>.
Use the arrow-key <?> to select Quantity. Enter the quantity and press <ENTER>.
Use the arrow-key <→> to select Alarmtype and press <ENTER>.

| |
|---|
| Alarm |
| Ignore |
| Ignore |
| Warning |
| Error |

Step: Select an alarm type by using the arrow-keys and press <ENTER>.

It is not necessary to enter a speed (g/s) because the terminal already has entered standard values and the GraviMaster calculates new speeds and updates the recipe.

Step: Press the arrow-key <o> to select the next hopper number.

Depending on the model, it is possible to use upto 12 hoppers.

The terminal has a keyboard but the keyboard doesn't contain characters. Therefore it is possible to connect a standard AT keyboard to the terminal. This keyboard must connect to a connector which is placed on the PCB in the terminal. When using a AT keyboard, than:

- Switch power off the terminal
- Disconnect the internal keypath from the PC board
- Connect the AT keyboard on the PC board
- Switch on the terminal

Now you can use the AT-keyboard. When you are ready, than connect the terminal-keyboard again. This has to be done when the terminal is switched off.

### 3.2.3 Change current recipe

When an operator wishes to produce a new product a change of the current recipe must be done. To change the current recipe select menu (F1) *'controller / select recipe'*. The terminal now shows a list with all recipes. The recipe which is marked with an <↓> is the actual recipe, this recipe is also loaded in the controller.

**IMPORTANT**

When a new recipe is selected be sure that all hoppers are filled with material. The controller calculates new dispense-rates by a fast algorithm in the first 5 batches.

## 3.3 Timely information

It is possible to get an over view of one of the connected controllers. Therefore three screens are available on the terminal: production-screen, material usage-screen and input/output-screen.

### 3.3.1 Production screen

The production-screen can be reached by selecting menu (F1) *'production / production status'*. The production-screen displays information about the current controller. The information on the screen is updated every 0.3 sec.

```
OPERATING  AUTO[ ]            [ ]            [ ]
STATUS:[0] FGB#00: (No name)      STATUS  OPERATING      MODE: AUTOMATIC
                          PRODUCTION STATUS]
 Production mode :
 CONTINUE                        Dispense mode: GRAVIMETRIC
 Name:                    PIR-HOUSING          Mix mode          :      PULSE
 Recipe                   CRATES               YELLOW
                          [current]            [previous]                [total]

 H#  Type      Recipe   Requested        Dispensed  Recipe        Dispensed  Recipe Dispensed
  1  REG       [ 20.0]   400.0                      20.0           400.0       20.0   1600
  2  NAT       [  1.0]  1523.8                       1.0          1523.8        1.0   6095
  3  ADD       [  5.0]    76.2                       5.0            76.2        5.0    305
  4
  5
  6
  7
  8
  9
 10
 11
 12

 totals
 [ACCEPT]    [UNDO CHANGES]        0.1          2000.0          8000
                  Produced weight:      82000
F1Menu       F2Option       F3     F4Node   F5Start          F6Stop                F7Pauze
F8Cont.
```

During production it is possible to change the recipe without a change of the current recipe. The recipe can be changed in the production-screen by selecting a field (arrow-keys). Next enter a new value and press <ENTER> to confirm. Now the recipe is changed but the controller uses the new values at the start of a new batch.

### 3.3.2 Material usage screen

The material usage screen menu (F1) *'production / material usage'* displays the total quantity of material witch is used ordered by hopper number. The quantities which are stored doesn't depend on the current recipe. The material usage screen is erased from memory by one of the following actions:

* Command given by the operator
* After a operator prints the screen.

This is possible by using option-key (F2) and selecting the option you require and pressing <ENTER>.

Other values witch are stored in the material usage screen are: date of the last erase-action, number of batch-cycles and production speed (kg/hour).

### 3.3.3 Input & Output monitor

The input & Output screen menu (F1) *'controller / digital I/O monitor'* displays all digital input and output lines. Every object in the screen can be selected by using the arrow-keys. When a output line is selected and <ENTER> is given the digital output will toggle. The operator has control of the digital outputs when the controller is in 'manual mode'.

## 3.4 Adjustment of the gravimetric blender

The controller has some system-parameters. These parameters must be entered during the installation of the GraviMaster. The controller uses these parameters to read the weigh bin signal correctly, to open the weigh bin-valve, control the dispense-valves or motors etc.

### 3.4.1 Calibration of the weigh bin

The controller uses two known (entered) calibration-points to calculate a weighline. The controller uses this line to find a weight by every input-signal. The two calibration-points must be entered by the operator by the menu (F1) *'controller / calibration / loadcell'*.

The calibration-procedure of the loadcell has two steps. Extra information is given to the operator by every step. This information is displayed at the top of the screen. First be sure that the weighbin is empty and press (F3). The weight of the empty weighbin is measured and stored by the controller. Next step is to fill the weighbin with a reference-weight and be sure that the input field on the terminal has the same value. Now press (F3) again and the second calibration-point is measured and stored. The calibration-procedure is now ready.

---

**IMPORTANT**

The second calibration-point must be greater then the first one.

---

### 3.4.2 Tare of the weighbin

Due to temperature, age, overload etc. it is possible that the weighline of the controller 'moves'. When the line has moved a zero-weight will be displayed that isn't zero. To move the weightline back it is possible to start a new calibration procedure. But the calibration-procedure takes a lot of time and the weightline is correct (it only moved). The tare-function moves the line back to its zero-point. To start the tare function enter menu (F1) *'controller / calibration / loadcell-tarration'*.

### 3.4.3 Hardware-reactiontime

The adjustment of the number of pulses is very important for the autopulse system of the FGB-M05. When dosing less than 8 gram of material, the GraviMaster will switch over to the autopulse system. In the hardware-reactiontime the opening time can be adjusted by increasing the clockpulses. One clockpulse is 5 ms (0,005 s).
The autopulse system does not caculate the rate in g/s but in g/puls. It calculates how many pulses he needs for an amount of material. This is why it is very important that the opening time of the pulse is not too long, because it cannot dose accurate anymore.

| **Standard adjustment:** | | |
|---|---|---|
| Hopper | Clockpulses | Time (s) |
| 1 | 3 | 0,015 |
| 2 | 4 | 0,020 |
| 3 | 4 | 0,020 |
| 4 | 3 | 0,015 |

## 3.5 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, protected parameters may only be changed if the password is given.

### 3.5.1 Public parameters

Below a list is given of all parameters which are attainable by the menu (F1) *'controller / public parameters'*.

| PUBLIC PARAMETERS | | |
|---|---|---|
| **Parameter** | **Description** | **Init** |
| AlarmReport | Indicates if alarm-reports must be printed. | No *) |
| ProductionReport | Indicates if production-reports must be printed. If so the parameter interval-time must be given also. | No *) |
| Interval | Pauze (time) before printing the next production-report. | 01:00.00 |
| BatchReport | Indicates if batch-reports must be printed. | No *) |
| 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 production Weight must also be given. | CONTINUE |
| ProductionWeight | The FGB stops his production when the production Weight 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 |
| 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. | 5 [s] |
| MixerPulseOffTime | Time the mixer is not activated in pulse-mode. | 15 [s] |
| AdditiveToRegrind Percentage 1/2 | Percentage additive to regrind which must be added. | 0 [%] |
| AdditiveToRegrind Hopper 1/2 | Hoppernumber in which the additive is. | Hopper 5 |
| WeighbinDumpTime | Time the weighbinvalve is activated (dumping of material into the mixerchamber). | 4 [s] 0,5 kg unit 6 [s] 1,2,5 and 25 kg unit |
| 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] |

*) No = [ ], Yes = [X]

For example if the alarm report must be activated. First select the option field by using the up- and down-keys. Now press <ENTER> to activate the option field. If the option field displays a [X] the alarm report is activated. The parameters must be updated into the controller, so select the OK button and activate it by pressing <ENTER>. Updating the parameters into the controller must be done for every parameter.

### 3.5.2 Protected parameters

Below a list is given of all parameters with are attainable by the menu (F1) *'controller / protected parameters'*.

| PROTECTED PARAMETERS | | |
|---|---|---|
| Parameter | Description | Init |
| BatchWeight | Total weight of one batch. This value is copied into every recipe when it is created. | 0,5 [kg] |
| DispenseTry | Maximum number of tries per component to reach maximum accuracy | 4 |
| DispenseAccuracy | Minimum accuracy for each component. | 25 [%] |
| DispenseRate CorrectionBand | Maximum deviation when a re-calculation of the dispense-speed is done | 30 [%] |
| SiloPresent | Indicates the 'Stock-Silo' regrind control process is activated. | No |
| MaximumTare Variation | Maximum absolute deviation from the zeropoint of the weighbin. | 40 [g] |
| SiloHighCount | Number of batches with the highness activated before the controller initiates an alarm. | 100 |
| SiloLowCount | Number of batches with the lowsensor not activated before the controller initiates an alarm. | 100 |
| EmptyRegrind | Indicates the 'Empty Regrind' regrind control process is activated. | No |
| EmptyRegrindHopper | Indicates the hopper which is used in the empty regrind process | Hopper 1 |
| EmptyRegrindCycles | Number of batches empty regrind waits before increasing regrind (startprocess) | 1 |
| Dispense inc/dec | Maximum percentage for the regrind control processes | 10 [%] |
| Dispense VariationCycles | Number of steps in whitch the maximum must be reached. | 10 |
| LoadcellGain | Amplification-factor for the loadcell signal | 16 |
| LoadcellOverload | Maximum weight in the weighbin. The controller initiates an error on this point. | 800 [g] |
| LoadcellSettleTime | Time between the dispense of the last component and reading the weigbin-signal. (to eliminate vibrations). | 1 [s] |
| LoadcellWeight BandWidth | To read a correct weight 8 samples must fit to this absolute band. | 10 [g] |
| FGB-Name/Nr. | Name of the controller; This name is used in the user-interface of the terminal. | |

## 3.6 Reports and overviews

There is the possibility of printing several reports and overviews. Underneath a list is made with the reports and overviews with behind them the section and page where instructions for printing are given.

| | |
|---|---|
| * batch report | § 3.5.1 |
| * production report | § 3.5.1 |
| * material usage report | § 3.3.2 |
| * error report | § 3.5.1 |
| * recipe overview | § 3.2.2 |
| * component overview | § 3.2.1 |
| * alarm overview | § 5.1 |

## 3.7 Settings of the user-interface

### 3.7.1 Change the rights of an operator

The terminal has some area's which are protected by a password; protected-parameters, debug-monitor etc. Before an operator can use, modify or see these area's he has to perform a login procedure. This procedure starts by choosing menu (F1) *'system / login'* the controllers asks now for an ID (see below). When the ID is correct the menu item login changes to logout.

To lock the system select menu (F1) *'system / logout'* the menu item changes to login again.

### 3.7.2 Change entrycode

To change ID chose menu (F1) *'system / change ID'*.

**IMPORTANT**

Standard the ID is set to 1234. After it is changed the ID 1234 can't be used.
There is no way to display the current ID so store the actual ID in a safe place.
When you lost the new code, please contact your dealer.

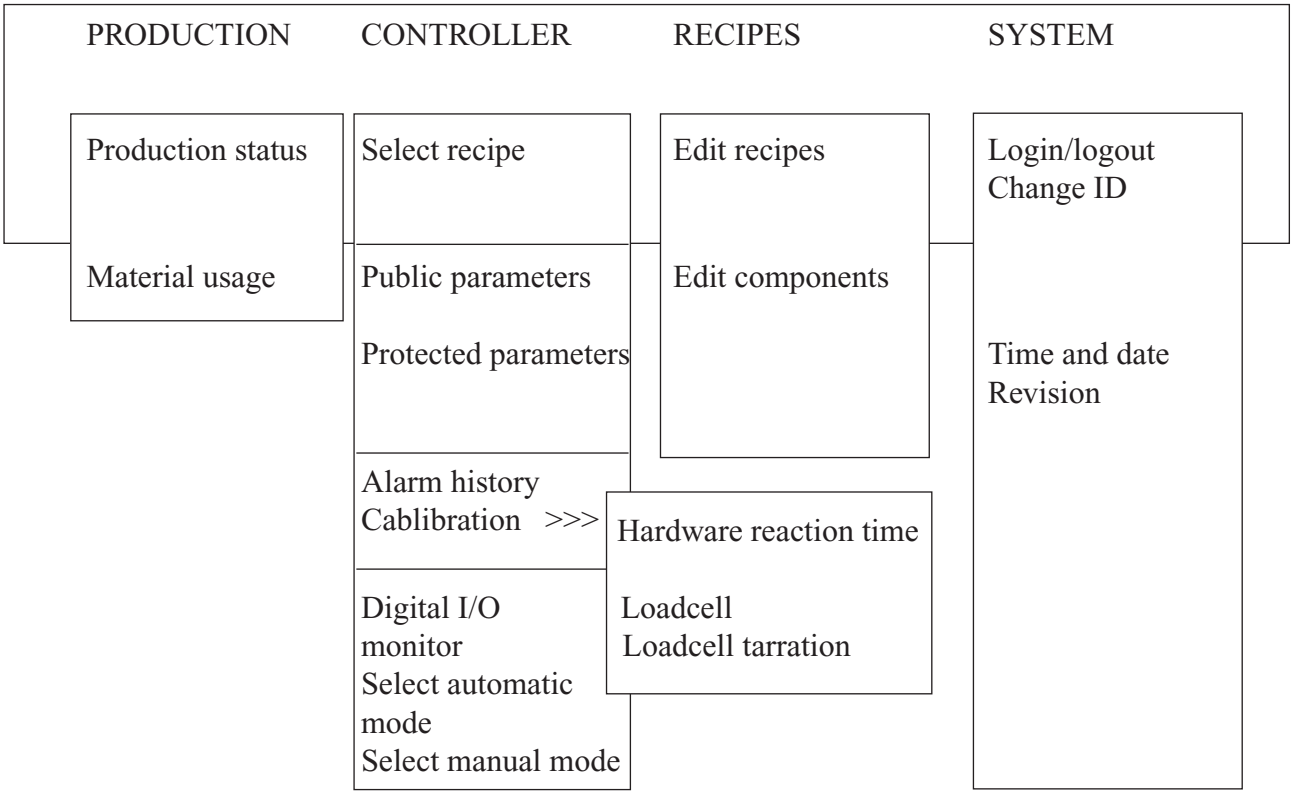
### 3.7.3 Change date and time

Date and time of the terminal can be changed by entering menu (F1) *'system / time and date'*.

### 3.7.4 Revision code of the system

The terminal has the possibility to display the revision and those of the connected controllers. This information can be important for system-errors when you inform the dealer. To display this information chose menu (F1) *'system / revision'*

## 3.8 Menu hierarchy



Reference to section:

| | | | |
|---|---|---|---|
| **Production** | | | |
| Production status | § | 3.3.1 | |
| Material usage | | § | 3.3.2 |
| **Controller** | | | |
| Select recipe | § | 2.1 | |
| Public parameters | § | 3.5.1 | |
| Protected parameters | § | 3.5.2 | |
| Alarm history | | § | 5.1 |
| Calibration | | | |
| Hardware reaction time | § | 3.4.3 | |
| Load cell | § | 3.4.1 | |
| Load cell tarration | § | 3.4.2 | |
| Digital I/O monitor | § | 3.3.3 | |
| Select automatic mode | § | 2.3 | |
| Select manual mode | § | 2.3 | |
| **Recipes** | | | |
| Edit recipes | § | 3.2.2 | |
| Edit components | § | 3.2.1 | |
| **System** | | | |
| Login/logout | § | 3.7.1 | |
| Change ID | § | 3.7.2 | |
| Time and date | | § | 3.7.3 |
| Revision | § | 3.7.4 | |

# 4.0 INSTALLATION

## 4.1 Services

For installation 1ph or 3ph supply is required dependent on type of unit and a 1/4" air supply with a minimum 6bar.

## 4.2 Mounting

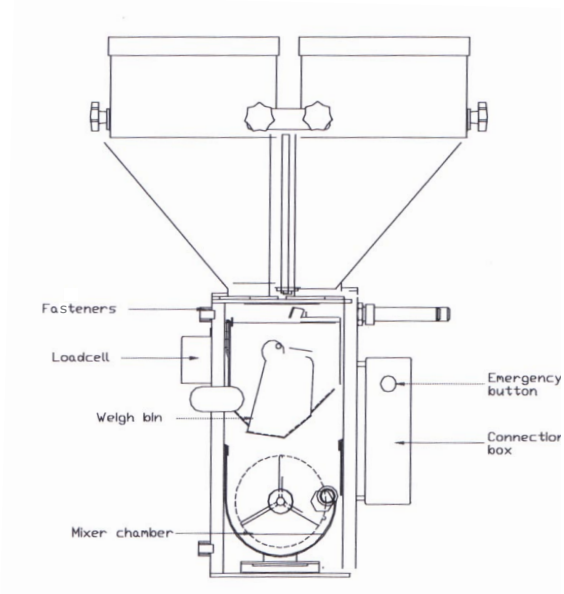
There are several ways where to place the GraviMaster, namely

- on a frame
- on a mezzanine
- on the machine

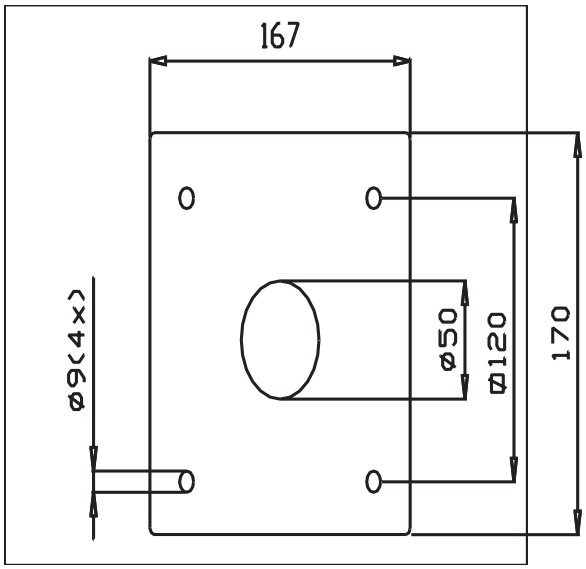
Before mounting the unit first open the front panel and take out the mixing chamber.
Make sure nothing is connected yet.

The front panel can be opened by opening the fasteners.

You can take out the mixer chamber and the weigh bin when the frontdoor is open.




4.2. Mountingplate




The foot plate of the GraviMaster should be attached on a steel attachment plate on the frame or mezzanine or flange pertinent to the machine.

The mounting holes are 9 mm and are positioned as shown in drawing 4.2

The unit should be mounted as stably as possible, in connection with the accuracy of the loadcell.

Now mixer chamber, the weighbin and the front panel can be replaced.

Connect the air pressure to the regulator (max. 12 bar). Put the plugs of the GraviMaster and the user interface in the sockets (220 V), these should be “clean”, without fluctuations and it must not be drawn off a 400 V wire. Then the communication cable should be plugged into the user-interface and the control-box.

The raw material supply should be connected to the hoppers. For startup refer to section 1 of chapter 2.

# 5.0 Alarms

## 5.1 Alarm reports and solutions

The operating system sends a message to the terminal when a failure is detected. The message will be displayed and stored with date and time in the alarm history. Underneath is a list of all possible messages, with the solutions.

| ALARMS | | |
|---|---|---|
| **Alarm-message** | **Description** | **Action to cancel alarm** |
| Press enter | Alarm already cancelled<br>Operator must confirm | Press enter |
| No control voltage | No 24V control voltage present | Turn on the main-switch or check fuses |
| Covers open | Security cover not present or mixerchamber removed | Place security-cover / mixer-chamber |
| Production weight reached | producedWeight equals produktionweight | Reset the producedWeight |
| No weighbin or calibrate | Zero weight of the weighbin is greater then 'maximumTareVariation' | Loadcell must be calibrated or a tare procedure must be done. |
| Parameters corrupted | The controller can't read his parameters correctly. All parameters will be filled with standard values. | Check the parameters *) |
| Data corrupted | The controller can't read the productiondata (production-screen). The data will be cleared. | Confirm *) |
| Hopper low | The hoppersensor (optional) indicates that a hopper runs out of material. | Fill hopper with material |
| Hopper empty | No material is dispensed so the controller indicates that a hopper must be empty. | Fill hopper with material and press the start-button.***) |
| Loadcell not calibrated | The controller can't read the loadcell parameters correctly. | Calibrate the weighbin |
| Loadcell overload | Weight of the weighbin is greater than the loadcellOverload parameter. | Remove material out of the weigbin.<br>Check in recipe the |
| Loadcell not stable | Weightsignal from the loadcell doesn't fit the band. | Press enter *) **) |
| Loadcell need more samples | Controller needs more samples to generate a stable weight. | Press enter *) |
| Loadcell boundary error | To much weight-samples doesn't fit the band. | Press enter *) |
| Silo high | Silo supply hopper is full for several batches. (High sensor is activated) | Counter will automaticaly cleared. |
| Regrind process par conflict | Given hoppernumbers doesn't contain regrind or percentage | Check the regrind control parameters |
| Additive regrind par conflict | Given hoppernumber doesn't contain additive | Check the AdditiveToRegind parameters |

*) If this error occurs frequently contact your dealer

**) Other problems which initiate this error are:
- The weighbinDumpTime too short
- Weighbin valve touches the material when mixerchamber is full
When the second problem occurs the position of the mixerchamber-sensor must be set lower. This actions affects the total production capacity of your system.

***) Through a too short dispense valve opening time, the machine could think that there is no material in the hopper. There are three possible reasons for this.
-1 dispense accuracy is too narrow
-2 dispense speed is too high
-3 number of dispense attempts is too low solutions:

-1 increase dispense accuracy (§ 3.5.2)
-2 adjust speed in recipe (§ 3.2.2)
-3 increase number of attempts (§ 3.5.2)

An error message on the terminal must be confirmed by pressing the <ENTER>-key. The terminal stores all error messages these can be displayed by the menu (F1) *'controller / alarm history'*. This screen shows the last 256 errors and the number of times the error occurred. The error-list can de cleared by pressing (F2) option button and choose clear, with this button it is also possible to print a report of alarms, select 'print alarm history' and push <ENTER>.

```
[0]OPERATING  AUTO[ ]            [ ]            [ ]

STATUS:[0] FGB#00: (No name)      STATUS  OPERATING
----------------------------[ALARM HISTORY]
 No control voltage                1      Loadcell overload                0
 Covers are open                   1      Loadcell not stable              0
 Production weight reached         0      Loadcell needs more samples      0
 No Weighbin / Need calibration    0      Loadcell boundary error          0
 Parameters are corrupted          0      Silo full error                  0
 Production data corrupted         0      Silo empty error                 0
 Hopper number (n) is empty        0      Conflict with regrind parameter  0
 Loadcell is not calibrated        0      Conflict with addi.-regr.param   0

      1  Date: 06-04-94 Time: 13:14:00 No control voltage
      0  Date: 06-04-94 Time: 13:14:00 Covers are open




                                          <Home>top of list
                                          <↑> scroll up
                                          <↓> scroll down


F1Menu       F2Option       F3      F4Clear              F5Start       F6Stop
F7Pauze      F8Cont.
```

If your problems can not be solved by these directives, please contact your dealer.

## 6.0 MAINTENANCE AND REPAIR

Make sure ,when maintenance or repair is carried out, the power is shut off (by pulling the plugs out) and the air pressure (by disconnecting the air pressure).

### 6.1 Maintenance

Everything is set right and tested in the factory, adjustments should only be carried out if a part of the machine is not working correctly

**Air pressure:** Set air pressure to about 6 bar for best accuracy. However, lower pressure will work. If your plant air fluctuates, set the regulator to the low end so that the dispense valves always see a consistent pressure.

**Level sensor:** The sensor should protrude into the mixer chamber about 1 cm past the inside surface of the stainless mounting plate. If it protrudes too far, it will sense the mixer blades. If it does not protrude far enough, it will sense the mounting plate itself.

**Adjusting sensor sensitivity:**

At the end of the sensor is a small screw, with this the sensitivity is adjustable.

step1: fill the mixer chamber until the sensor is covered.
step2: turn screw counter-clockwise until the led goes on (if the led already is on, then turn clockwise until led goes off and proceed with step 4).
step3: turn screw clockwise until led goes off.
step4: turn screw another 3/4 turn clockwise.
step5: Empty the mixer chamber and check to be sure the sensor does not react on the mixer blades.

**Weighbin dump valve:** The weighbin dump valve should open and close smoothly. Two airflow regulators are attached on the cylinder. This can be adjusted by the screw that is on top of it.

## 6.2 Replacement of parts

### 6.2.1 Replacement of printed circuit

For the replacement of the printed circuit of the control-box, the cover should be removed by unscrewing the bolts. unplug the connectors which are attached to the printed circuit. Now unscrew all M3 bolts and remove the circuit. It is important to first disconnect the connectors and then unscrew the bolts. attach the new printed circuit in the same way, but in reverse.
It is wise to use a wrist band with ground cord which is connected with earth (PE). This because of the of static electricity.

## 6.3 Cleaning the machine

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

For cleaning the machine the front panel, the mixer chamber, the weighbin and the mixer should be removed (as described in section 4.2). **Disconnect the electrical power and air supply.**

Clean the machine by using air pressure. Use safety-goggles when cleaning. After it has been cleaned, put it back together in the reverse way of stripping it.

## 6.4 Transportation of the GraviMaster

The weigh bin should be removed, before moving the GraviMaster, this can be done as described in the previous section. The weigh bin should be removed to prevent damaging the loadcell. The machine can now be transported on a firm pallet.

# 7.0 TECHNICAL INFORMATION

## 7.1 General machine specifications

| | | |
|---|---|---|
| Connecting voltage | : | 1-phase 240 V |
| Communication cable | : | Fiber optic cable (or RS–422) |
| Air pressure | : | max. connecting pressure: 12 bar (+/- 170 psi)<br>working pressure: 4-6 bar (+/- 57-86 psi) |
| Sound level | : | < 70 dB (A) |
| Surroundings temperature | : | -18°C to +50°C |
| Batch weight | : | 0,5 kg |
| Machine weight | : | 25 kg |
| Machine dimensions | : | 450 x 450 x 640 mm |

### 7.1.1 Safety measures

The GraviMaster is secured by 1 safety switch, which is positioned on the frontdoor. When the frontdoor is opened, the machine will stop.

## 7.2 User-interface specifications

| | | |
|---|---|---|
| Connecting voltage | : | 240 V |
| Printer connection | : | Parallel port |

## 7.3 Valves specifications

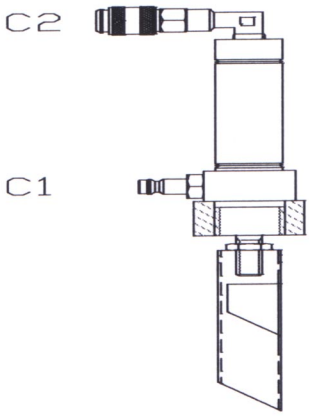
The machine is supplied with valves from the brand MAC, type 45A-SC1-DDAJ-1KJ. The number of valves is similar to the number of hoppers + 1 for the weighbin + 1 for the mixer chamber valve (optional).

**The connection:** (drawing 7 and 7.1) The valve of the weighbin is sealed at W1, so connection on W2 is the only possibility. Connecting dispenser valves H1 and H2 is as follows;

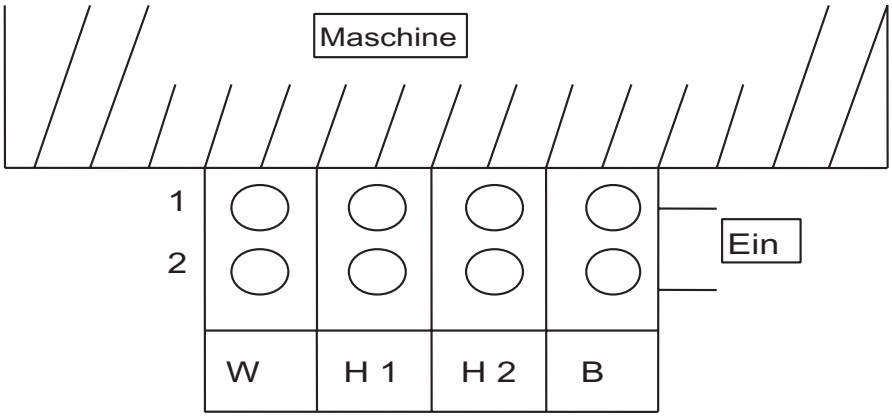
* H1-1 onto C1, as H2-1 onto C1 etc.
* H1-2 onto C2, as H2-2 onto C2 etc.

H1-1 and H1-2 should be connected to the cylinder under hopper 1, H2-1 and H2-2 to the one under hopper 2 etc.

If there is a mixer chamber valve, it should be connected to B-1 and B-2, one of the lines is numbered, like one side of the cylinder. Connect the concordant ones.




Drawing 7.1 Cylinder



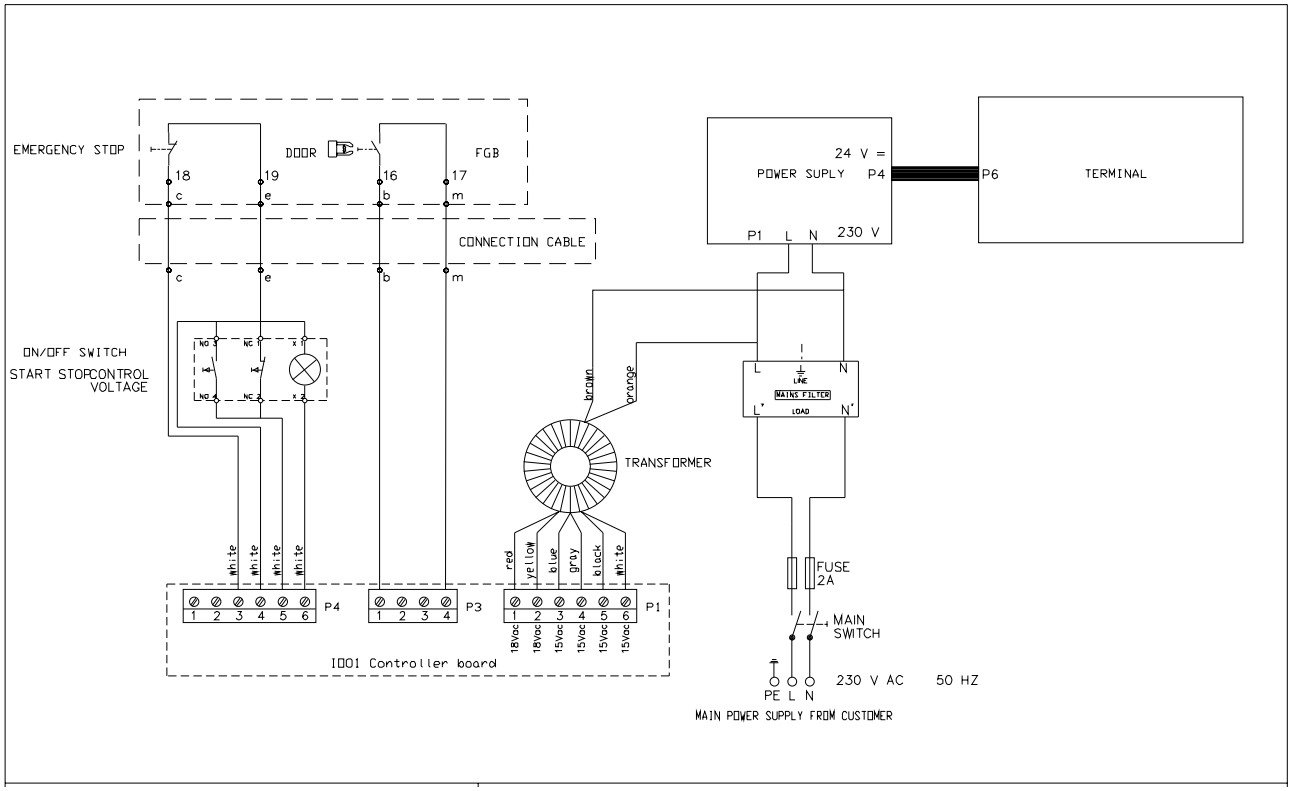

W= Wiegeschalenanschluss
H1= Dosierschieber 1
H2= Dosierschieber 2
B= Mischkammerschieber (Option)

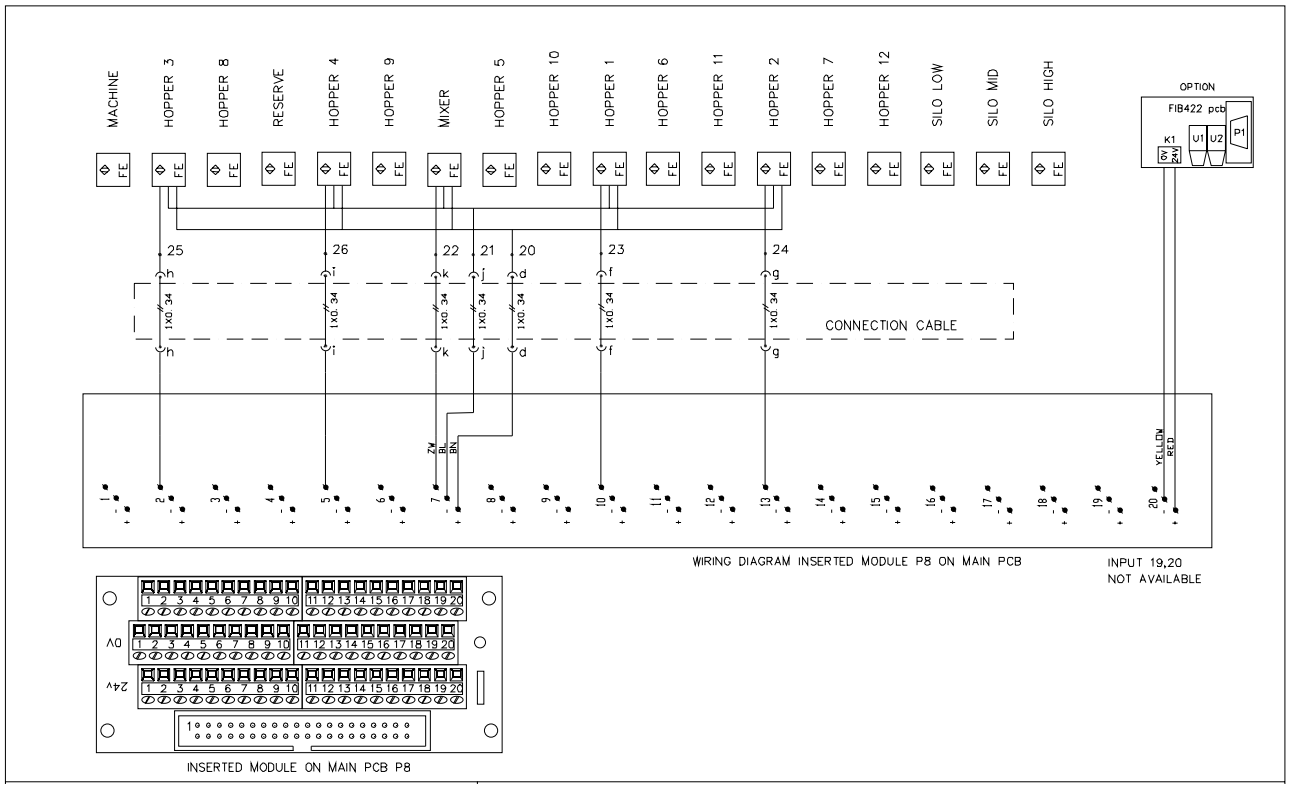
Drawing 7.2 Topview valves

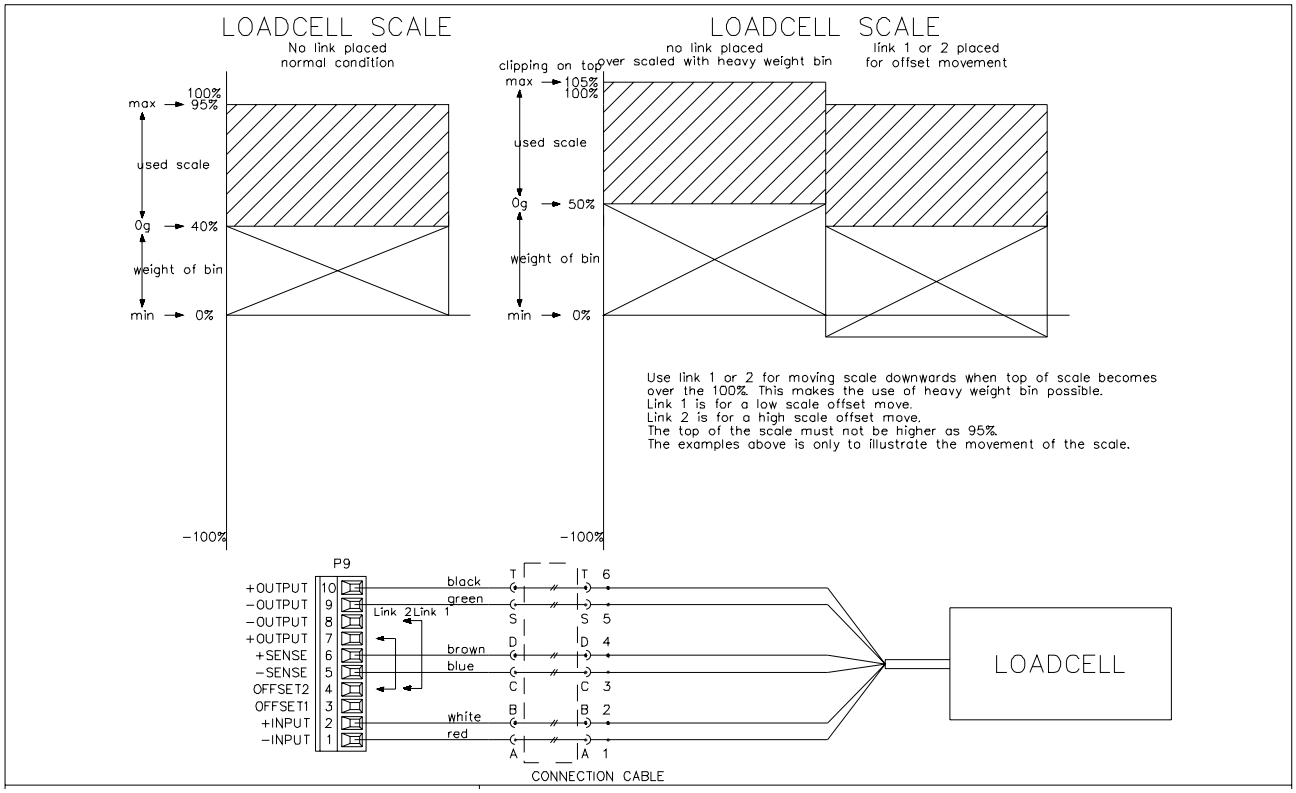
## 7.4 Air pressure cylinders specifications

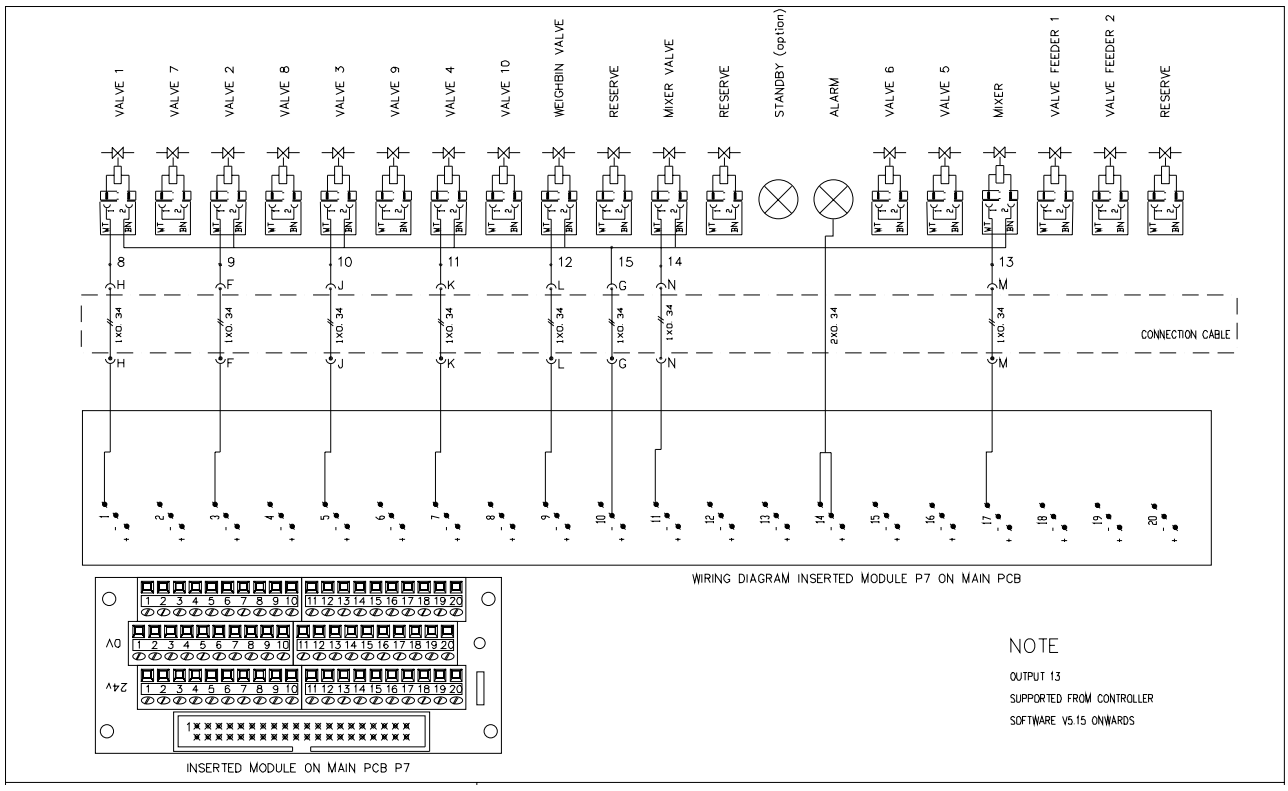
See specifications on cylinder.

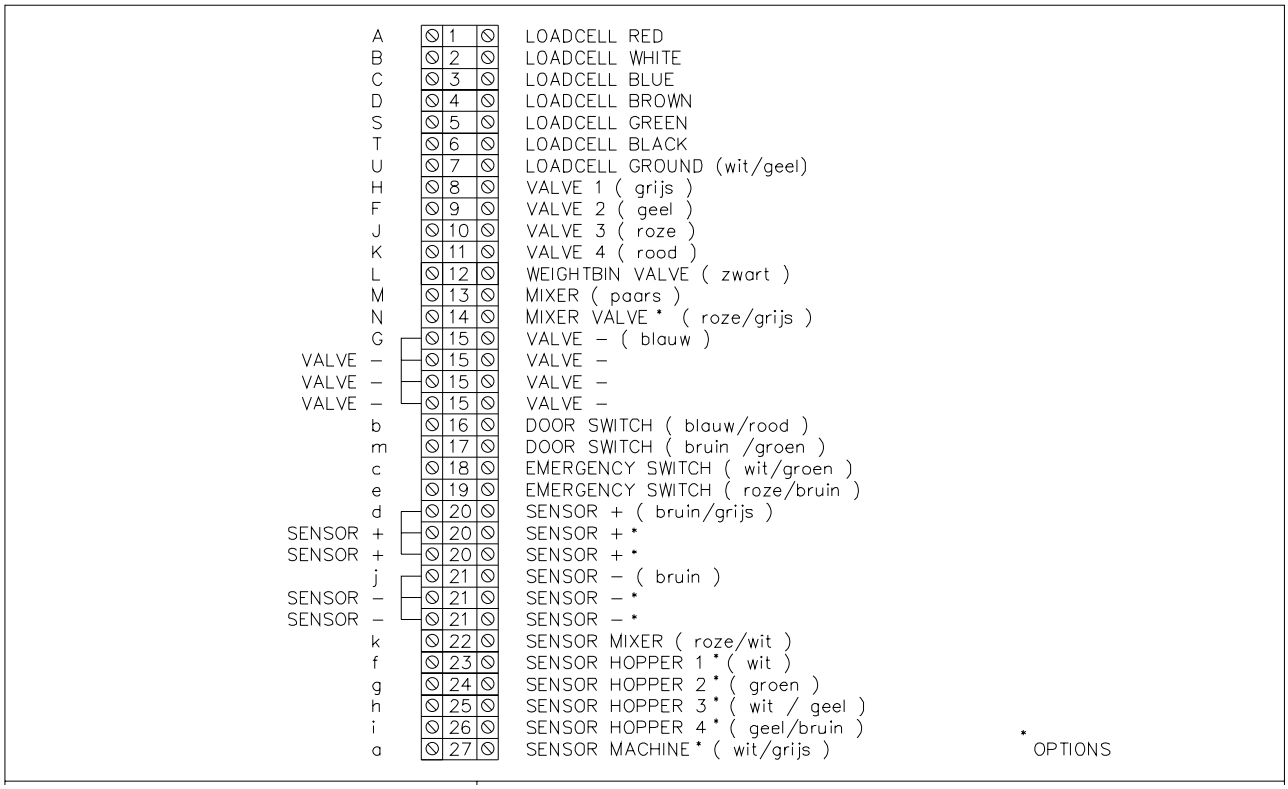
## 7.5 Electrical diagrams

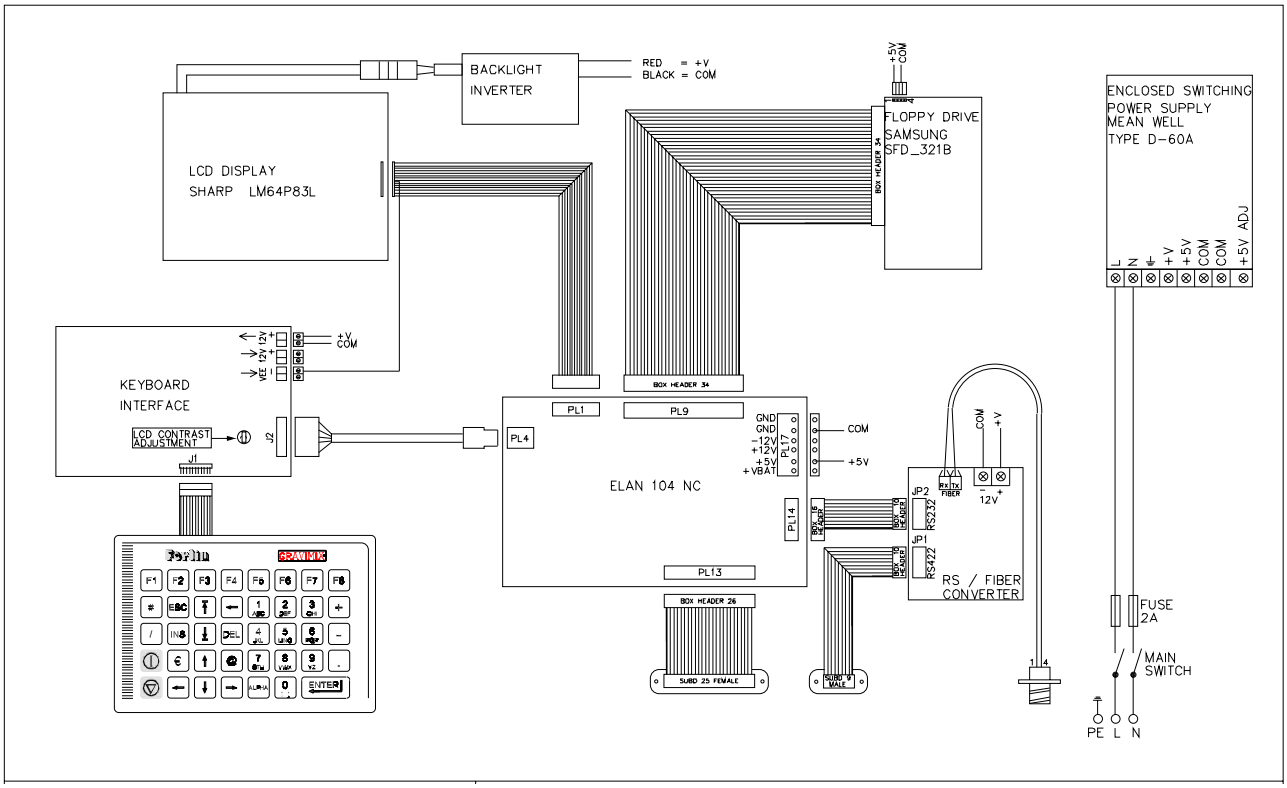



LOADCELL SCALE
No link placed
normal condition
max → 100%
95%
used scale
0g → 40%
weight of bin
min → 0%
−100%
LOADCELL SCALE
no link placed
over scaled with heavy weight bin
clipping on top
max → 105%
100%
used scale
0g → 50%
weight of bin
min → 0%
−100%
link 1 or 2 placed
for offset movement
Use link 1 or 2 for moving scale downwards when top of scale becomes over the 100%. This makes the use of heavy weight bin possible.
Link 1 is for a low scale offset move.
Link 2 is for a high scale offset move.
The top of the scale must not be higher as 95%.
The examples above is only to illustrate the movement of the scale.
P9
+OUTPUT 10
−OUTPUT 9
−OUTPUT 8
+OUTPUT 7
+SENSE 6
−SENSE 5
OFFSET2 4
OFFSET1 3
+INPUT 2
−INPUT 1
Link 2
Link 1
black
green
brown
blue
white
red
T 6
S 5
D 4
C 3
B 2
A 1
LOADCELL
CONNECTION CABLE


VALVE 1
VALVE 7
VALVE 2
VALVE 8
VALVE 3
VALVE 9
VALVE 4
VALVE 10
WEIGHBIN VALVE
RESERVE
MIXER VALVE
RESERVE
STANDBY (option)
ALARM
VALVE 6
VALVE 5
MIXER
VALVE FEEDER 1
VALVE FEEDER 2
RESERVE
CONNECTION CABLE
WIRING DIAGRAM INSERTED MODULE P7 ON MAIN PCB
0V
24V
INSERTED MODULE ON MAIN PCB P7
NOTE
OUTPUT 13
SUPPORTED FROM CONTROLLER
SOFTWARE V5.15 ONWARDS


A 1 LOADCELL RED
B 2 LOADCELL WHITE
C 3 LOADCELL BLUE
D 4 LOADCELL BROWN
S 5 LOADCELL GREEN
T 6 LOADCELL BLACK
U 7 LOADCELL GROUND (wit/geel)
H 8 VALVE 1 ( grijs )
F 9 VALVE 2 ( geel )
J 10 VALVE 3 ( roze )
K 11 VALVE 4 ( rood )
L 12 WEIGHTBIN VALVE ( zwart )
M 13 MIXER ( paars )
N 14 MIXER VALVE * ( roze/grijs )
G 15 VALVE – ( blauw )
VALVE – 15 VALVE –
VALVE – 15 VALVE –
VALVE – 15 VALVE –
b 16 DOOR SWITCH ( blauw/rood )
m 17 DOOR SWITCH ( bruin /groen )
c 18 EMERGENCY SWITCH ( wit/groen )
e 19 EMERGENCY SWITCH ( roze/bruin )
d 20 SENSOR + ( bruin/grijs )
SENSOR + 20 SENSOR + *
SENSOR + 20 SENSOR + *
j 21 SENSOR – ( bruin )
SENSOR – 21 SENSOR – *
SENSOR – 21 SENSOR – *
k 22 SENSOR MIXER ( roze/wit )
f 23 SENSOR HOPPER 1 * ( wit )
g 24 SENSOR HOPPER 2 * ( groen )
h 25 SENSOR HOPPER 3 * ( wit / geel )
i 26 SENSOR HOPPER 4 * ( geel/bruin )
a 27 SENSOR MACHINE * ( wit/grijs )
* OPTIONS


BACKLIGHT INVERTER
RED = +V
BLACK = COM
LCD DISPLAY
SHARP LM64P83L
FLOPPY DRIVE
SAMSUNG
SFD_321B
ENCLOSED SWITCHING
POWER SUPPLY
MEAN WELL
TYPE D-60A
L N ⏚ +V +5V COM COM +5V ADJ
KEYBOARD
INTERFACE
LCD CONTRAST ADJUSTMENT
+V
COM
PL1
PL9
PL4
PL14
PL13
PL17
GND
GND
-12V
+12V
+5V
+VBAT
COM
+5V
ELAN 104 NC
JP2
RS232
JP1
RS422
RS / FIBER CONVERTER
FUSE 2A
MAIN SWITCH
PE L N
BOX HEADER 34
BOX HEADER 26
SUBD 25 FEMALE
SUBD 9 MALE