GRAINSAFE 7000

AERATION COOLING / DRYING CONTROLLER

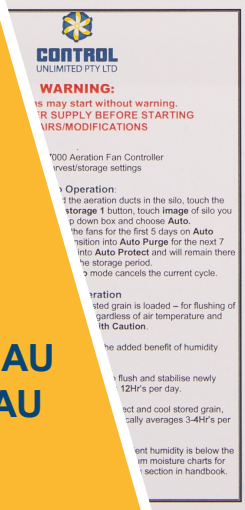
Grain Aeration Controllers

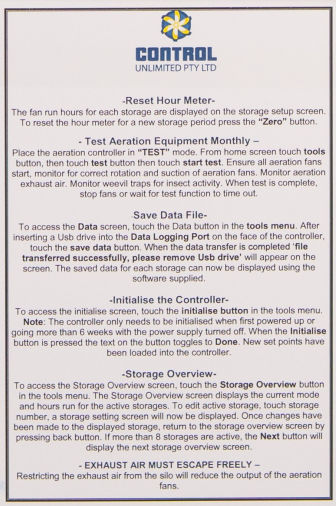
Site Automation

Electrical Switchboards

Loading & Unloading Stations

Grain Storage Accessories & Parts





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Contents

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Included Parts

1 x GRAINSAFE 7000 Aeration Controller

1 x RHT Sensor

1 x 25mm Compression Gland

1 x Stainless Steel Sensor Protector

2 x Self Drilling Screws (8 Gauge x 12 mm)

4 x Stainless Steel Panel Mounting Brackets

8 x Self Tapping Screws (8 Gauge x 9mm)

4 x Tank Bolts and Nuts (3/16 x 3/8)

1 x Connection Cable (17 Pin) up to 14 output Controller

1 x Operators Manual

1 x Set of Operational Stickers

1 x Connection Cable (10 Pin) 18 and 24 output Controller (If required)

1 x Connection Cable (9 Pin) Generator Start Controller (If required)

1 x Wifi Module and Antenna (If required)

Introduction

Overview:

The Grainsafe 7000 aeration Controller will optimize the cooling capacity and insect control of aerated grain storages.

This is achieved by selecting small amounts of suitable air to cool the grain and remove any free moisture from the storage.

Suitable air is cool/dry air late at night or in the early morning. However suitable air can be found at other times, such as when air with a low relative humidity results in a high level of evaporative cooling.

This is where the Grainsafe 7000 optimizes the cooling process by monitoring the ambient dry bulb temperature and relative humidity to calculate the wet bulb temperature.

The advantage of using wet bulb temperature as the control method allows for selection of dry air (warm or cold) to achieve evaporative cooling in the storage.
This is achieved by using air that is of lower relative humidity compared to the Equilibrium Moisture Content (EMC) of the grain that is being aerated.

The controller will cease the aeration process if the relative humidity of the ambient air goes above 85%. This is done to ensure grain is not re-wetted.

One of the often overlooked advantages of using an aeration controller is that it will not choose air that is unsuitable for aeration. Unsuitable air is often selected because the aeration system is being operated manually, by time clock, by thermostat and/or humidistat controllers.

Unsuitable air can be HOT AIR; as this can rewarm the grain, encourage mould and mildew growths, provide an ideal environment for weevils which allows a weevil population explosion. High grain temperatures can reduce germination rates and grain quality.

Unsuitable air can also be AIR OF A HIGH RELATIVE HUMIDITY; causing re-wetting of the grain which causes the grain to spoil, encourages mould and mildew growths and causes the grain temperature to increase. This provides an ideal environment for the weevil population to explode.
The GrainSafe 7000 has an optional Drying Set Point Control which allows the operator to dry grain in storages with high air flow rates. The decision making process is enhanced using the supplied EMC charts.

Features:

- 7” Removable Tablet
- WIFI Connectivity for Remote Access (Optional)
- User-Friendly Interface
- Variable Air – Flow Rate technology
- Full Automatic Operation Modes
- Adjustable Stagger Start Delays
- Data Logging
- Storage Overview Screens
- Set Point Drying Option
- Humidity Override
- Resettable Hour Meters
- Test Mode
- Remote Generator start feature
- Generator warm up/cool down timer
- Real Time Clock
- Expandable from 4-24 outputs

Setting Up

Mounting Options:

There are 2 mounting options available for the GRAINSAFE 7000:

- (Note: the GRAINSAFE 7000 is not waterproof, and should not be mounted in a location where exposure to moisture is possible)
- **Base mount -** the base mount allows the unit to be mounted on a flat surface either vertically or horizontally using 4 mounting brackets supplied with suitable screws, bolts and nuts.

- **Panel mount –** the panel mount allows the unit to be mounted inside an electrical cabinet using 4 mounting brackets supplied with suitable bolts and nuts- only the front part of the unit will protrude through the mounting panel.

- Note. The GrainSafe 7000 should always be mounted facing South or in a shaded position. This is to ensure the display is easy to read at any time during the day.

- **Mounting RHT Sensor –** Once Controller installation is complete, a 25mm diameter hole needs to be drilled in the gland plate at the bottom of the electrical cabinet (ensure the senor doesn’t foul on inner door or electrical equipment). Then using the Stainless Steel Sensor Protector as a template, place it over the compression gland hole until the hole is roughly centred, then mark the two drill holes that are required to mount the Stainless Steel Sensor Protector. Drill these two holes with a 3mm drill bit then use the two 8 gauge x 12mm self drilling

supplied to mount the Stainless Steel Sensor Protector to the Gland Plate. Mount the sensor through the compression gland fitted into the gland plate until the probe is all the way through the gland but not protruding below the Stainless Steel Sensor Protector, tighten the compression gland to keep the sensor in place. Connect the 4 pin connector cable to the 4 pin plug on the side of the sensor and tighten the threaded locking ring.

Power:

The GRAINSAFE 7000 operates best when continuously connected to a power supply. This allows the controller to keep track of current conditions and be ready to aerate protected storages using ambient conditions that are optimum for protecting the grain stored.
The Generator start option, which come in 12 DC supply, would be suitable for sites where a 240v power supply isn't available. The controller is powered from the Generator batteries; generally a solar panel is used to keep batteries fully charged.

Connections:

The GRAINSAFE 7000 has several types of connections:

- Connector #1 = the power/fans connector at the bottom, left of the unit (Up to 14 output Controllers).
- Connector #2 = the fans connector at the bottom to the right of connector #1 (18 and 24 output Controllers)
- Connector #3 = Generator Start connector.
- Note: When connecting any of the connectors, carefully align the plug and socket keyway pin and slot, then push the connector on while tightening the outer, threaded locking ring.

First Time Operation of Controller:

- Turn Controller on using button on the top centre of tablet. (Hold button down for 4 seconds, tablet will power up within 8 seconds of releasing button)
- Once tablet has loaded, select the GrainSafe App on Home screen
- A Bluetooth device list will appear, with the devices serial number listed on the left. Tap Connect, and the App is now launched and ready to use.
- Controller is now ready for Operation

Grainsafe 7000 Operation

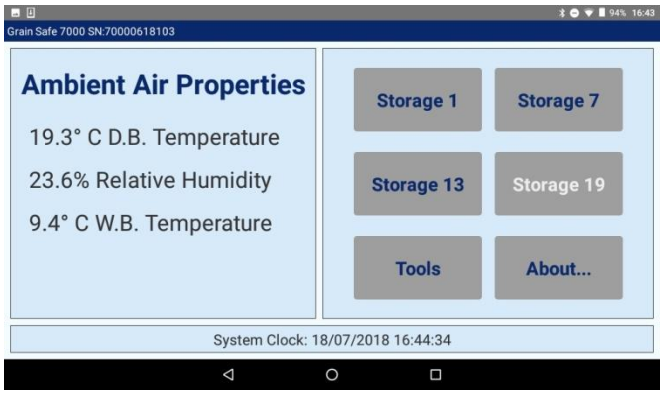
Check the Aeration Installation:

Ensure that the Aeration Installation has been connected and initialised correctly before use. It is important for the user to check that the aeration system is operating correctly monthly as it is always possible that a fan may have failed, circuit breaker/overloads tripped or the system may have been damaged by a storm or power surge etc.

Check the following regularly:

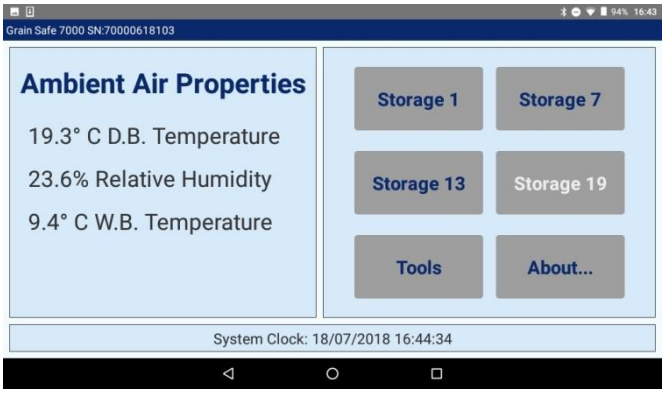
- Check that the controller has power and is running correctly by verifying that the **Power** light on the bottom right of controller is solid green and the **Run** light is flashing green continuously.
- Check that the Red **Fault** light is not illuminated on bottom right. Refer to troubleshooting section if so
- Check Bluetooth and WIFI connectivity are operational by checking lights on the face of controller
- Check that the fans are actually drawing air when they are switched on - to do this, use the test function to run the fans and then verify that the fan is actually running and drawing air into the inlet. When done, stop the test mode or wait for the test mode to time out (10 Minutes).
- Check that the hour meter for each storage silo is increasing by 80 – 90 hours per week when in Auto-Purge mode and by 20 – 30 hours per week in Auto-Protect mode. These are approximate hours only and will decrease if cooling airflow rates are set above 2 Lts/S/T.
- Inspect the condition of the grain in each silo.

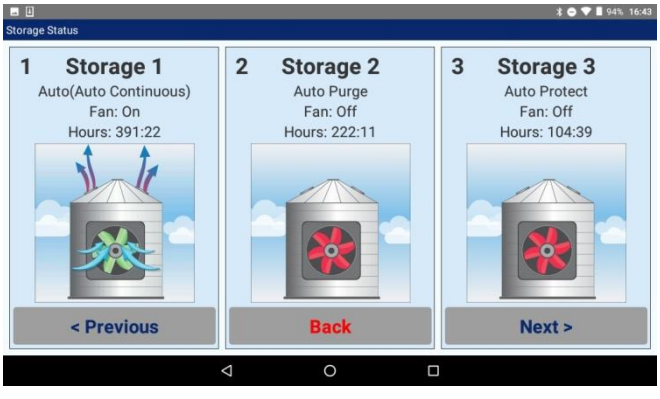
Home Screen:



Displayed on the **Home Screen** is the current Ambient Air Properties of Temperature, Relative Humidity and Wet Bulb Temperature. Also displayed on the Home screen is **Storage**, **Tools** or **About** buttons.

Select a Storage:





To access the Storage Status screen, touch a **Storage** button, the **Storage Status** screen will appear. Displayed will be Storage #, Current Mode, Fan State, Fan Run Time and animated image of the storages. To select storage, touch the image.

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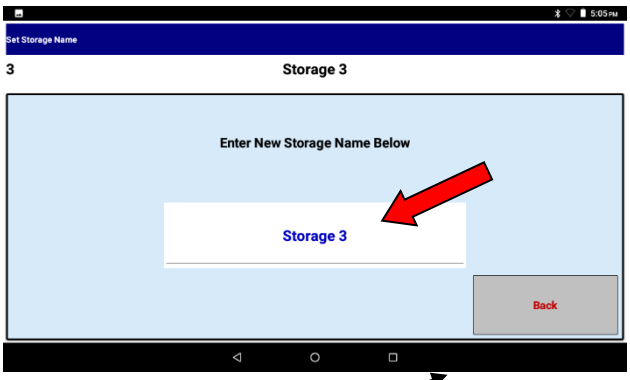
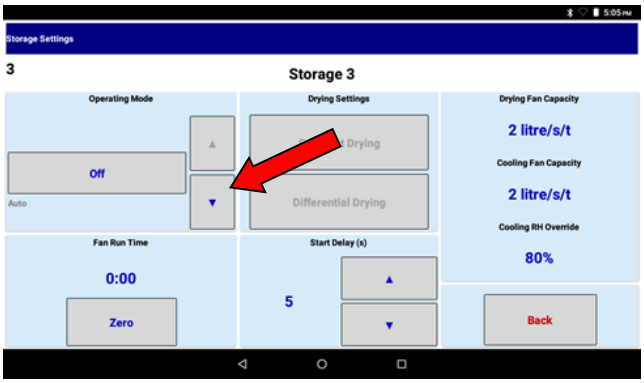
Changing Storage Name:

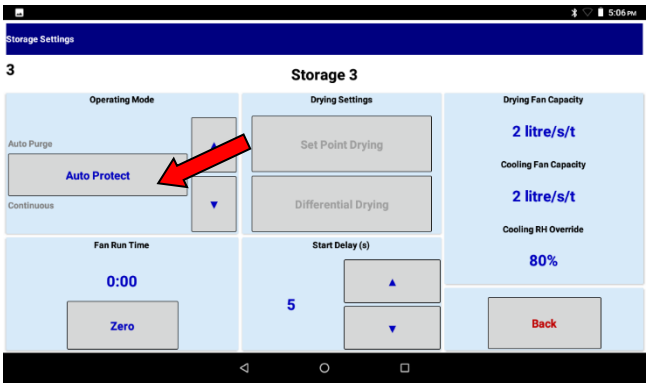


Select the storage that is to be renamed. When **Storage Settings Screen** appears, touch where the red arrow indicates. The **New Storage Name** screen should then appear and the new name can be entered. Once complete select the Back button to return to the **Storage Settings Screen**

Change Storage Setting:



Touching the down arrow will allow the user to scroll through the list of operational modes. To make a selection the grey shaded box must be highlighting the required mode. **The box must me selected and the text will turn blue once the mode has been ACTIVATED (see image below).**



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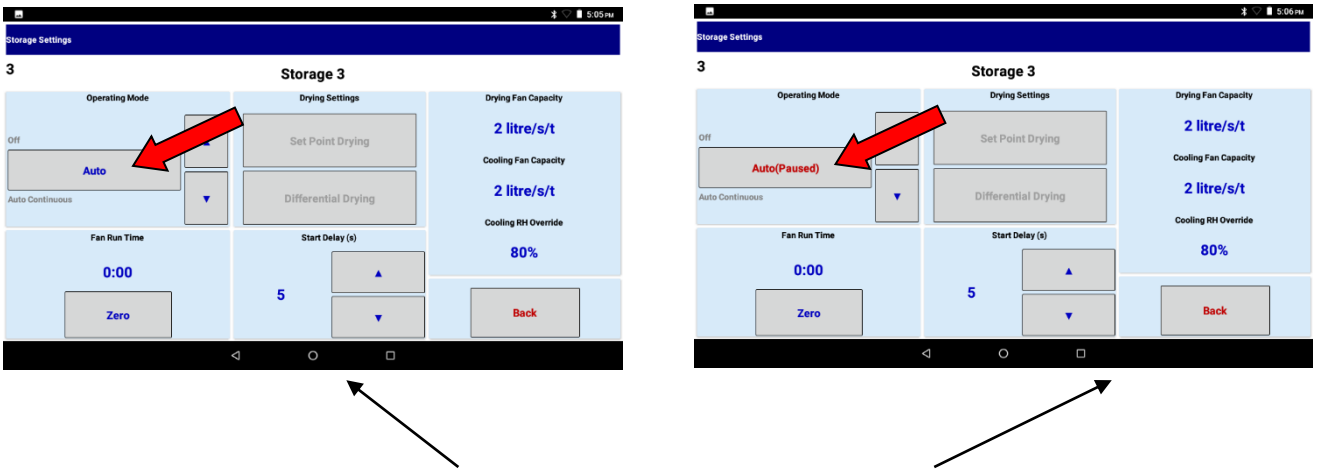
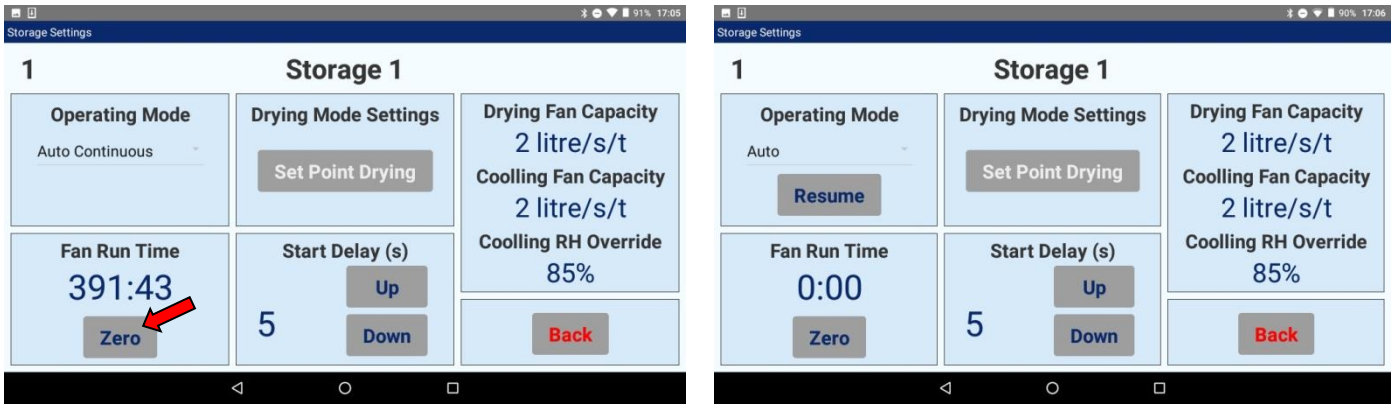
Pausing & Resuming 'AUTO' Storage Setting:



When the controller is operating in the **AUTO** setting, it is possible to pause the controller operation whilst any silo alterations or checks are being performed, and then resume the auto process from where it was paused. This can simply be done by touching the grey box once when in AUTO mode to pause and touching it again to resume operation. (Please note that a paused storage will automatically resume again after 1 hour to ensure that no storages are accidently left paused permanently).

Zero Fan Run Time:



To reset the fan run time touch the **Zero** button, the fan run time will reset to zero.

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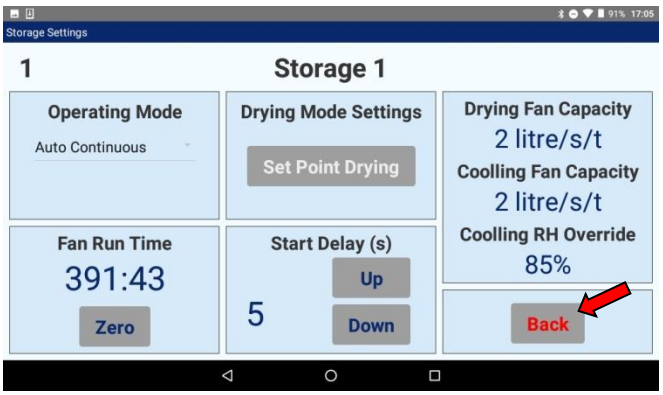
Changing the Start Delay Time:

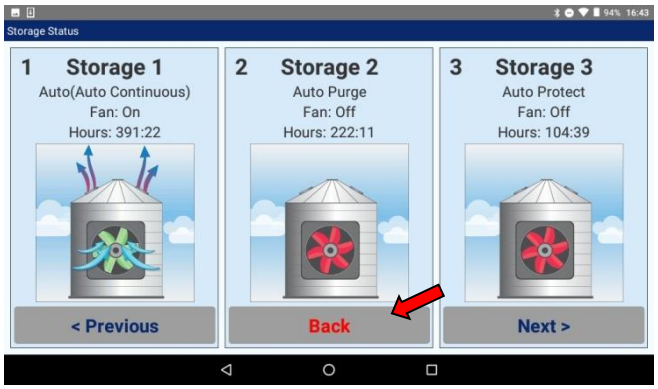
To change the **START DELAY** time, touch the **Up** or **Down** buttons to increase or decrease the start delay. (Minimum 5 seconds and maximum 60 seconds).

Returning to the Storage Status Screen:



To return to the Storage Status screen touch the **Back** button. Touch the **Previous** or **Next** buttons to view more storages.

Returning to the Home Screen:



To return to the Home screen, touch the **Back** button on the Storages Status screen.

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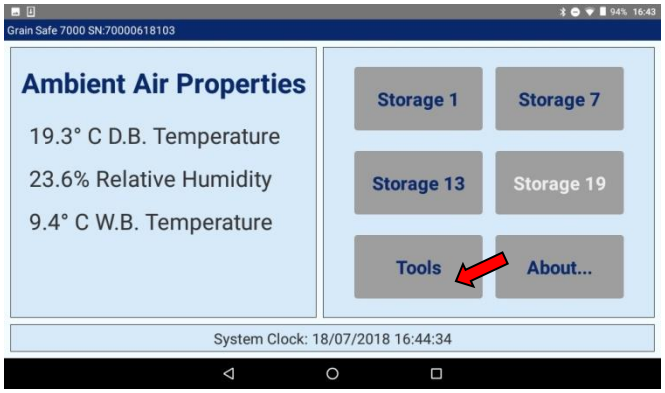
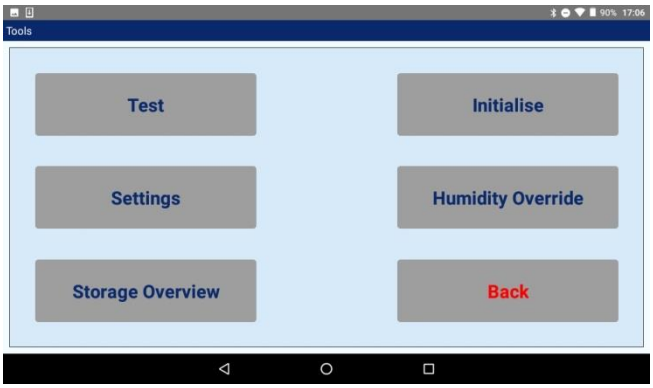
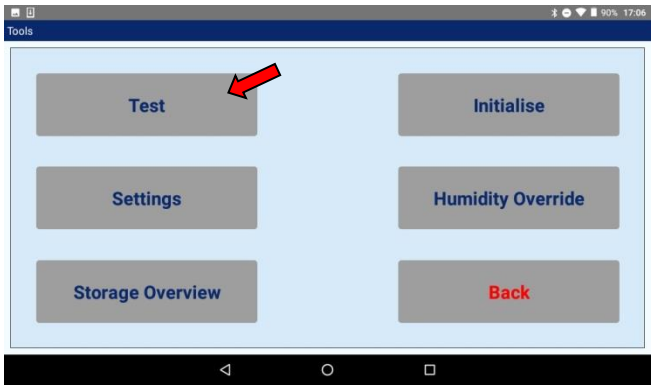
Accessing the Tools Menu:

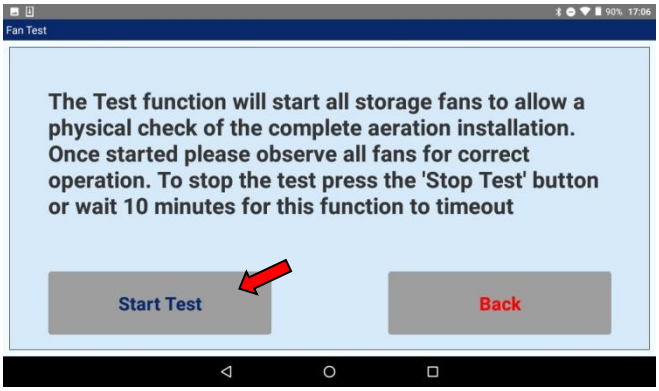




To access the Tools Menu touch the **Tools** button.

- ## Running a Test:





To access the Test screen, touch the **Test** button on the Tools Menu, now touch the **Start Test** button. When finished, press the **Stop Test** button. The operator can then return to the Tools menu by touching the **Back** button.

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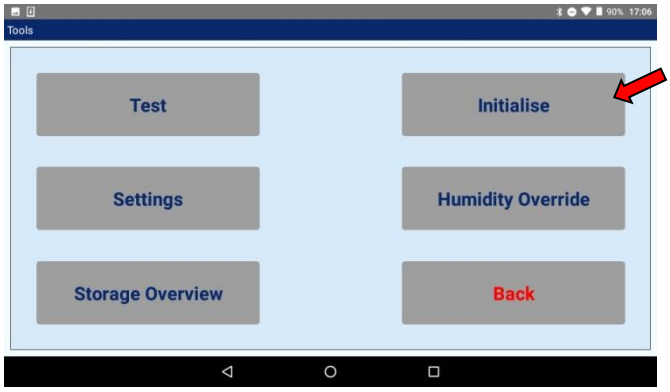
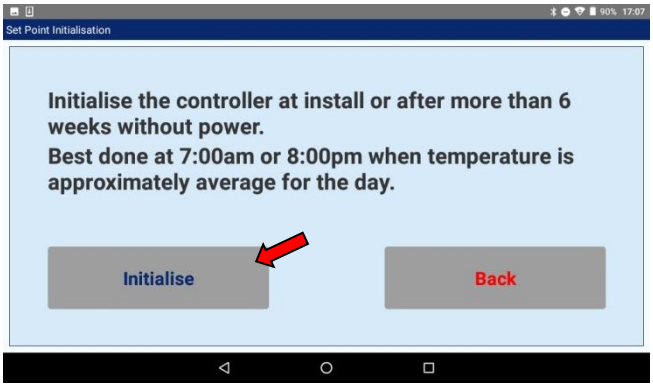
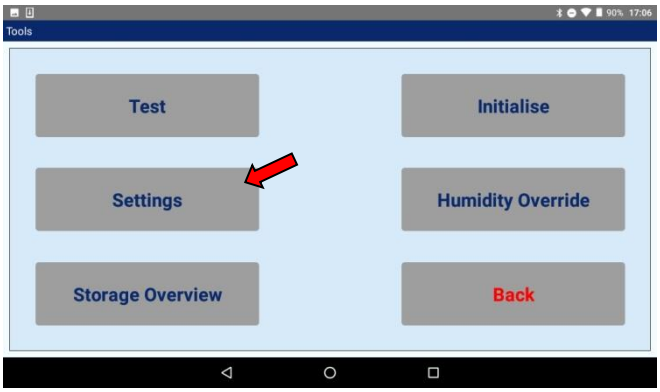
- **Initialising the Controller:**

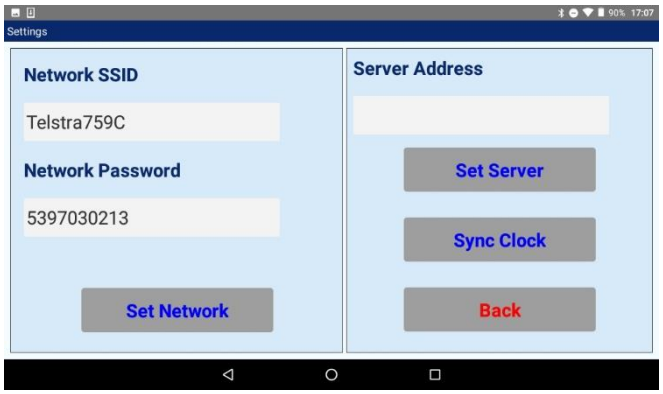




To access the Initialise screen, touch the **Initialise** button in the Tools menu.
Note: The controller only needs to be initialised when first powered up or going more that 6 weeks with the power supply turned off.
When the **Initialise** button is pressed the text on the button toggles to **Done**.
New set points have been loaded into the controller.
To return to the Tools Menu, touch the **Back** button.

- **Accessing Controller Settings:**





Under settings, the user can enter the network name (SSID) and password for WiFi connection.

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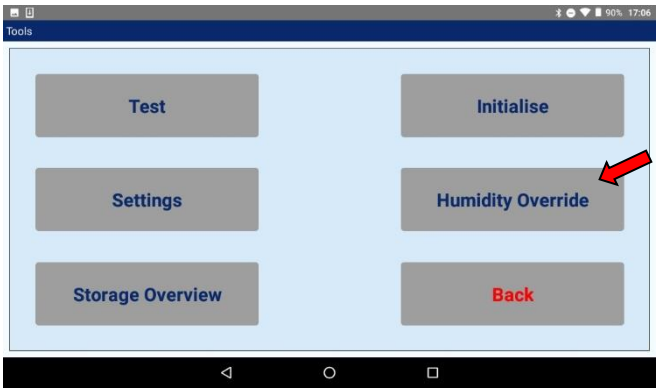
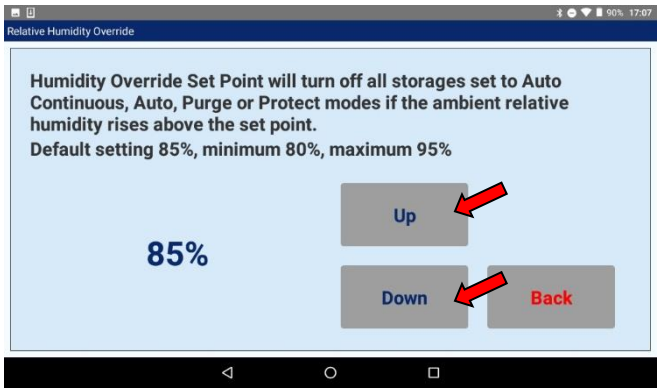
- **Humidity Override:**





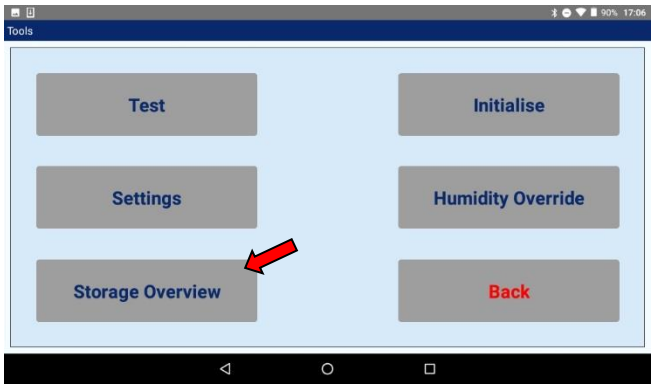
To access the Humidity Override screen, touch the **Humidity Override** button in the Tools menu.

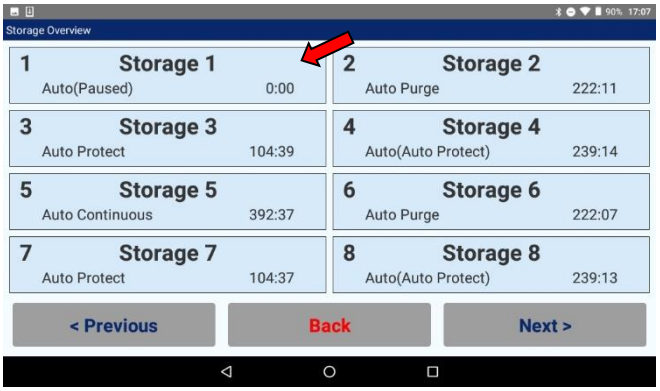
The Humidity Override can be adjusted between 80% and 95% Relative Humidity by touching the **Up** or **Down** buttons. Factory setting is 85% and should be left at this setting unless advised otherwise by your controller supplier.

Note: The Humidity Override feature stops the controller from running the fans in any of the **Auto** modes when the relative humidity is higher that the override set point.

Press **Back** button to return to the Tools menu.

Storage Overview:

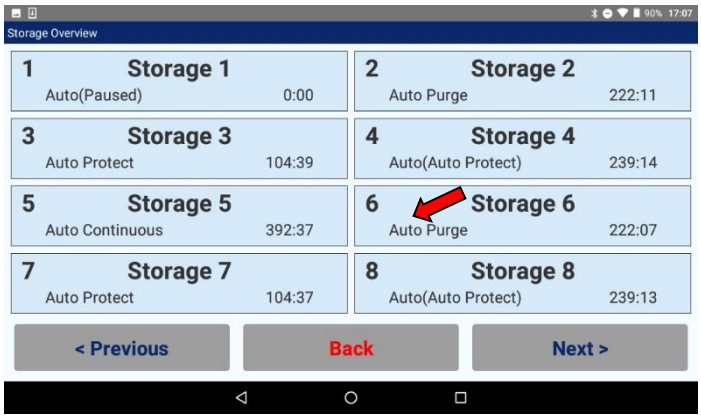




To access the Storage Overview screen, touch the **Storage Overview** button in the Tools menu.

The Storage Overview screen displays the current mode and hours run for the active storages. To edit active storage, touch storage number, a storage setting screen will now be displayed. Once changes have been made to the displayed storage, return to the Storage Overview screen by pressing the **Back** button. If more than 8 storages are active, the **Next** button will display the next Storage Overview screen.

Press **Back** button to return to the Tools menu.



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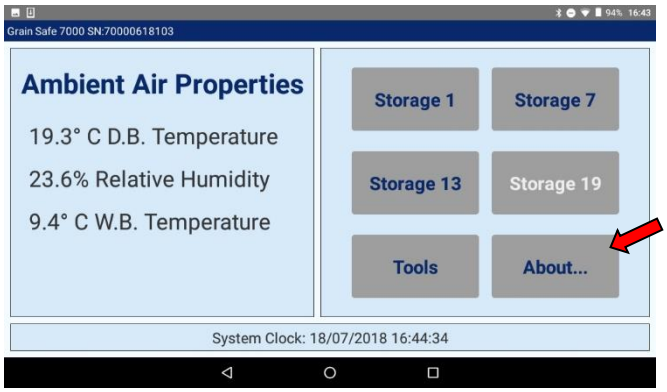
About Screen:



To access the About screen, touch the **About** button in the Tools menu.
The About screen displays the Firmware version and controller serial number.
Note: If the controller is to be upgraded, the firmware and serial number will need to be supplied.
Press **Back** button to return to the Tools menu.

Updating Software

Insert USB into the Data Port. The USB LED will start to flash; at this point the controller will update firmware and settings files if present on the USB device. It will then download data to the USB device. Once the controller has completed this process, the controller will beep once and the USB LED will turn off. It is now safe to remove the USB device.

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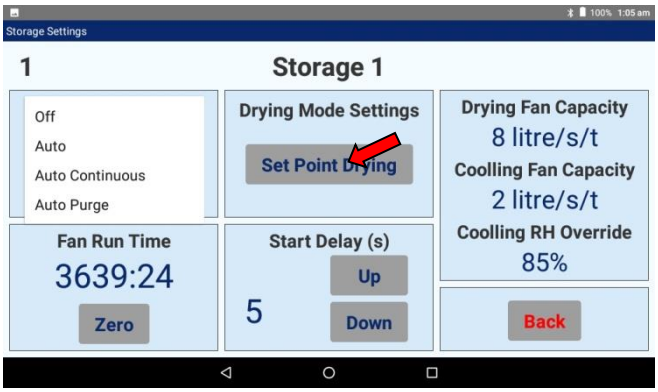
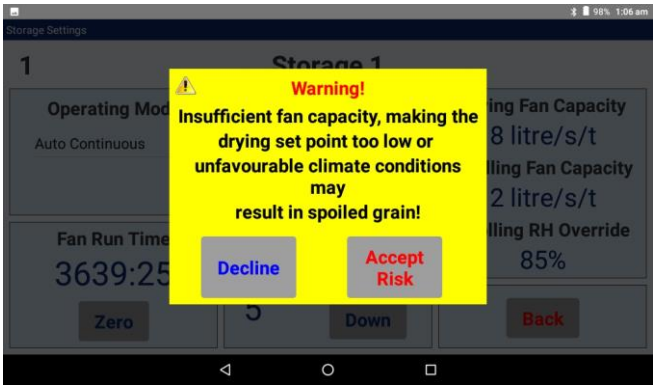
Set Point Drying [Optional]:



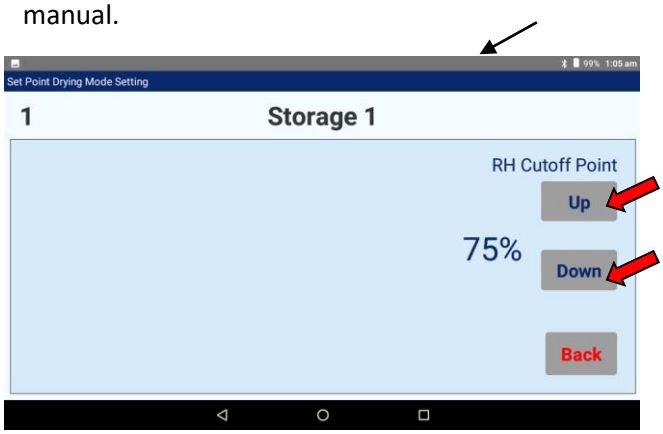
To access Set Point Drying follow steps for "Change Storage Setting" and select **Set Point Drying**

Note: A Warning Message will display once Set Point Drying is selected, this is to alert the operator that there are risks involved with using Set Point Drying, such as:

- Unfavourable climate conditions
- Bed depth of grain being too high
- Insufficient flow rates of aeration fans (above 15 l/s/t, ideally 25 l/s/t
- Setting the humidity set point too low



Drying set point can be adjusted by using the Up and Down buttons on the touch screen to set RH at a minimum of 30% and a maximum of 75%. Use in conjunction with EMC charts supplied at the back of this manual.



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Operation Mode Description

Selection of Storage Number: From the home screen, choose one of the highlighted storage buttons. The screen will now display 3 storages, by touching inside the outline of the image for the storage you wish to edit, that storage set up screen will be displayed.

Operation Modes:

Continuous, operates fan/s without temperature or humidity control. Use with caution. Typically first 5 days of storage period.

Auto Continuous, same as continuous with the added benefit of the humidity override. Typically first 5 days of storage period.

Auto-Purge, selects large volumes of cool dry air to flush and stabilise new-harvested grain. (At airflow rates of 2Lts/s/t, approximately 12Hrs per day averaged over a 30 day period). Humidity override feature is active in this mode. Typically next 7 days on storages with airflow rates of 2Lts/s/t.

Auto-Protect, selects best available air to protect and cool stored grain. (At airflow rates of 2Lts/s/t, approximately 3-4Hrs per day averaged over a 30 day period). Humidity override feature is active in this mode. Typically the remainder of the storage period.

Auto, automates the process of selecting auto continuous, then auto purge and finally auto protect for the remainder of the storage. Humidity override feature is active in all modes. Auto will vary the run times in auto continuous, auto purge and auto protect inline with the air flow rates entered into the cooling air flow rate info for each storage.

Set Point Drying: this mode allows storages with high air flow rates (8lts/s/t and above) to operate aeration fans when the ambient relative humidity is below the humidity setpoint for the selected storage. This mode has a built in hysteresis to stop the output cycling at the crossover point of the ambient relative humidity and the humidity set point. Use set point drying mode in conjunction with equilibrium moisture content charts supplied.

Drying set point RH: Use the up or down buttons to increase or decrease the RH set point for the Drying Set Point mode. Min 30%, Max 75% Rh.

Hours Reset: While storage setup screen is displayed, pressing the “Zero” button will reset the fan run time back to zero.

Start Delay: use the up or down buttons to increase or decrease the time delay for the displayed storage from the previous storage. Minimum time setting is 5 seconds, maximum time is 60 seconds.

Test Mode: Pressing the “Start Test” button will turn on (stagger start) all activated storages and will time out after 10 minutes, this allows the operator to visually inspect all aeration fans for correct operation. When satisfied all fans are operating correctly, press the “Stop Test” button.

Wet Bulb Trigger Point / Initialization: The controller needs to be initialised when it is first installed or has been turned off for a period of more than 6 weeks. Do not initialise the controller if it has been running for more than 4 weeks, it will have optimised it set points at this stage. Initialise the controller at 7Am or 8Pm for best results as this is approximately the average temperature for the day. Never initialise the controller in the middle

of the day, this will cause the controller to run excessive fan run hours in the early stages until it is able to adjust the set points back to a more realistic setting.
To initialise the controller press the “Initialise” button, the text will toggle to “Done” to show the process has been completed.

Data Screen.

Save Data: Insert Usb stick into Usb port and press “Save Data” button, after several seconds “Files transferred, please remove Usb stick” will appear at top left of the screen. All files have been transferred to the memory stick, this information can now be downloaded and viewed on a computer.

Update Settings: If at any stage the controller needs to be expanded or more options accessed, a file will be e-mailed to the client. “Update Settings” button will allow new setting to be loaded into the controller. These settings are serial # specific, settings for a given serial # will not load onto a controller with a different serial #!

Update Firmware: If at any stage a firmware update becomes available for the controller, the firmware update will be loaded by using the “Update Firmware” button in conjunction the instructions supplied with the firmware.

Humidity Override: The Humidity Override setting displayed is the relative humidity level that at which the controller will turn the fans off if exceeded. Can be adjusted down to a minimum of 80% and a maximum of 95%. Factory setting is 85%. The humidity override should be left at 85% unless advised otherwise by your controller supplier.

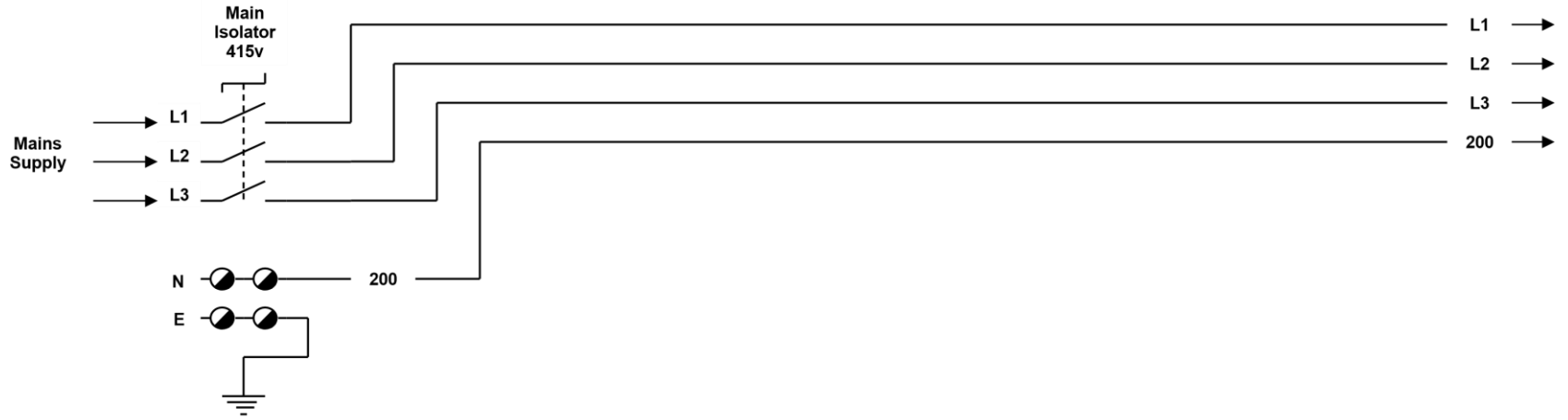
Storage Overview: This screen is used to look at up to 8 storages at a time, storage number, current mode and fan run time is displayed. Individual storages can be accessed by touching the desired storage number in the overview screen.

Maintenance: The GrainSafe 7000 requires no maintenance, but the whole aeration system needs to be checked monthly. This is done by putting the GrainSafe 7000 into test mode, then checking all aeration fans are running correctly.

Generic Wiring Diagram:

The following wiring diagrams are not site specific and are to be used as an indication of how to connect the GrainSafe 7000 aeration controller into a existing mains powered system.

Gen Start controller will be supplied with its own wiring diagram.



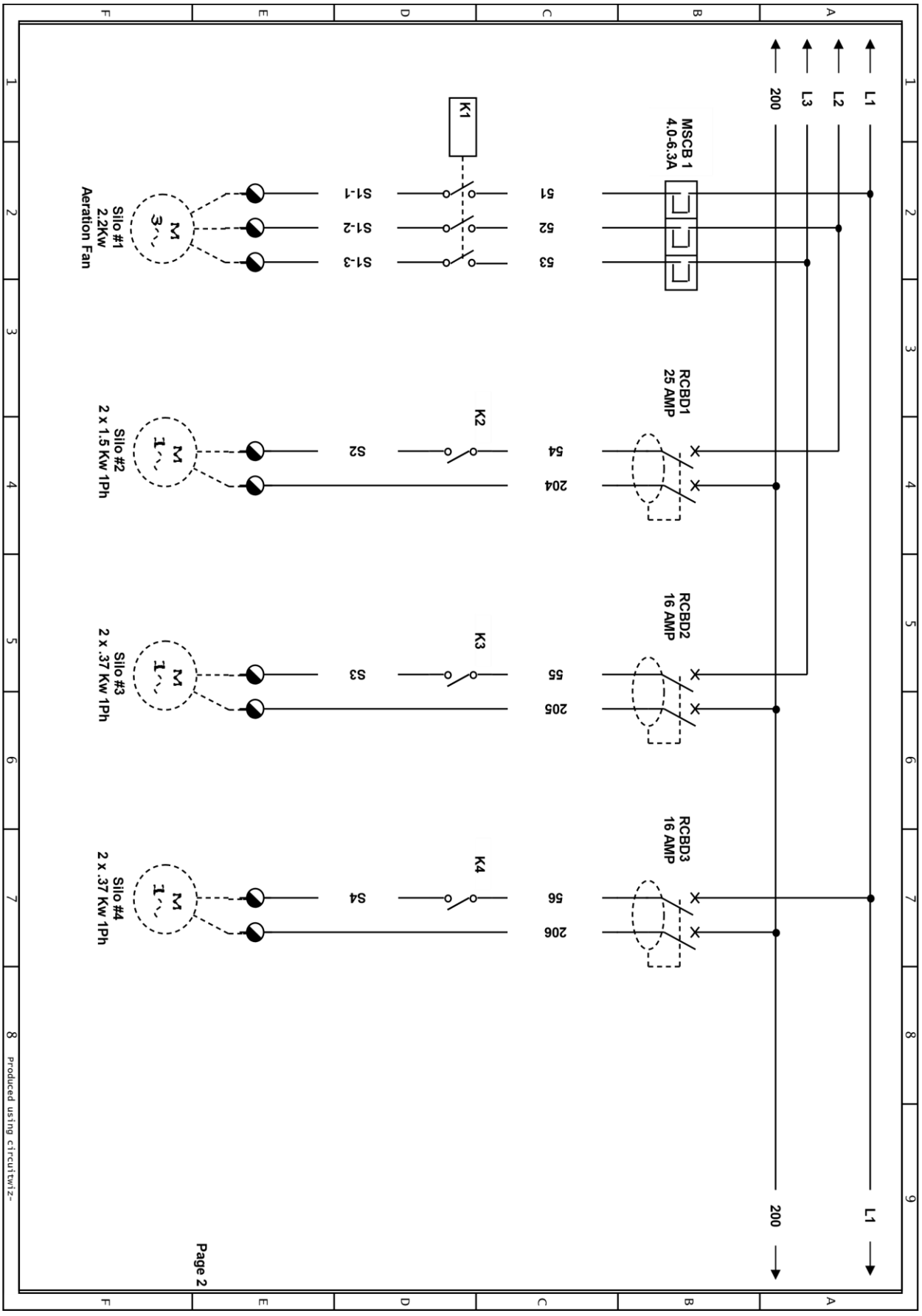
Page 1

-415V Aeration Control Cabinet-
4 x Silos:
1 with 1 x 2.2Kw 3Ph Aeration Fan
1 with 2 x 1.5Kw 1Ph Aeration Fans
2 with 2 x .37Kw 1Ph Aeration Fans

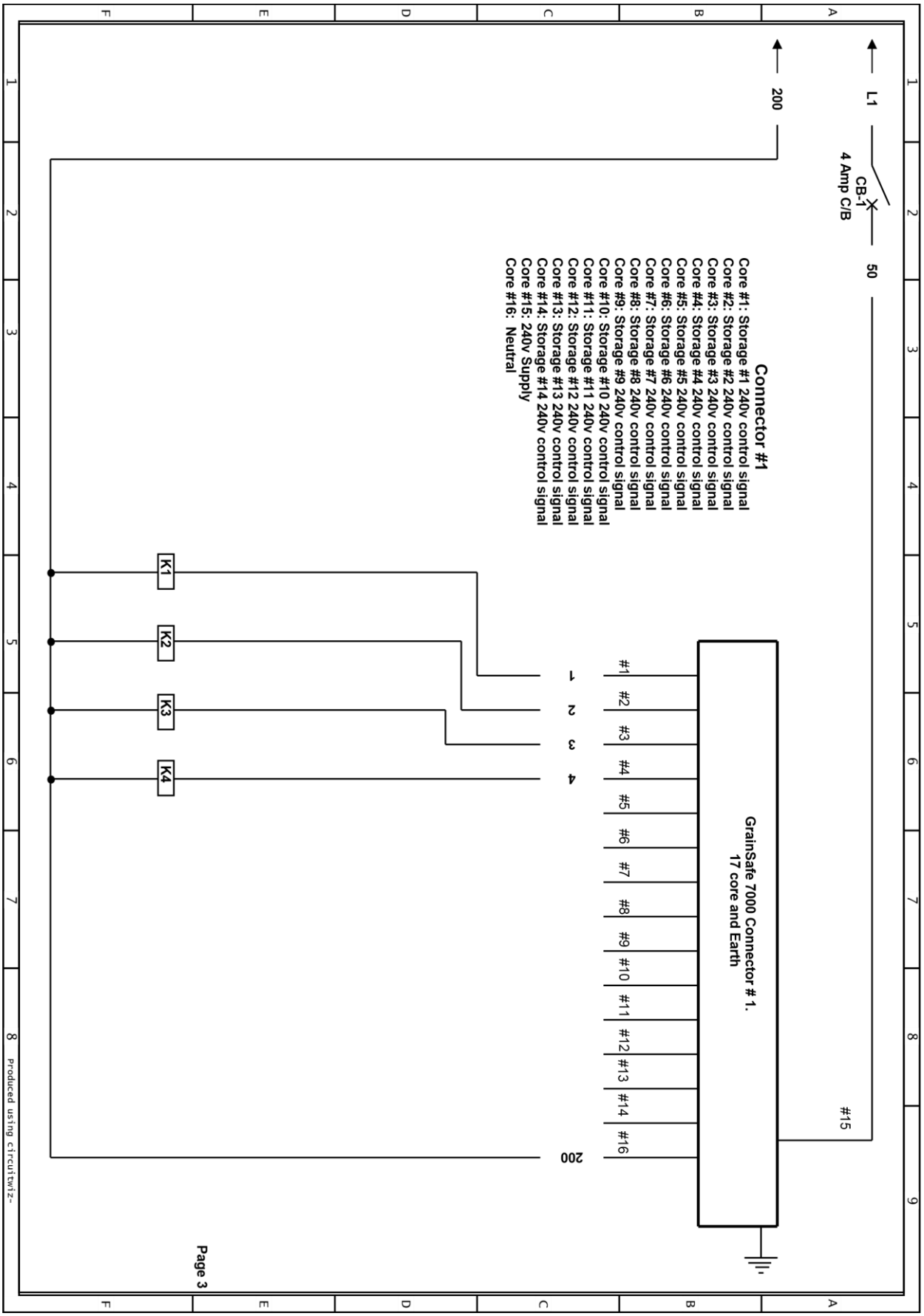
Client	Control	Contact	Mark	Drawn by	JG	Date	18 Sep 18	Rev. no.	
Control Unlimited Pty Ltd				**GS7000/4 415v Aeration Control Cabinet**					
Technical Design by: Control Unlimited Pty Ltd				for: Generic Farming.					

Produced using circuitwiz-

CONTROL UNLIMITED PTY LTD



CONTROL
UNLIMITED PTY LTD



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Specifications

Model Range:

Outputs	240v Supply	Generator Start Model	Setpoint Drying
4	GS7000/4	GS7000/4GS	GS7000/4(GS)DR
8	GS7000/8	GS7000/8GS	GS7000/8(GS)DR
14	GS7000/14	GS7000/14GS	GS7000/14(GS)DR
18	GS7000/18	GS7000/18GS	GS7000/18(GS)DR
24	GS7000/24	GS7000/24GS	GS7000/24(GS)DR

Warranty

1: Control Unlimited Pty Ltd warrants to the original purchaser that the product will be free from defects in workmanship and materials under normal use for a period of 1 year from the date of purchase.

Warranty Conditions

2.1 This warranty covers parts found to be defective in workmanship and/or materials during the period of warranty and will be repaired or replaced at the discretion of the manufacturer.

2.2 Control Unlimited Pty Ltd will not be responsible for any cost in connection with freight or post of replacement products or parts.

2.3 This warranty will be void and accordingly no claim of any nature will be enforced against the manufacturer if the product is not installed and operated according to the printed instructions supplied with the product. Or if the product is subjected to abuse, neglect, misuse or an accident.

2.4 The Manufacturer and/or distributor will not be liable for any incidental or consequential loss or damage arising from any cause whatsoever including but not limited to loss or damage arising from the instillation or operation of the product and/or the failure of any part for any reason whatsoever.

2.5 There are no warranties expressed or implied except those above.

Frequently Asked Questions

1. **My GRAINSAFE-7000 Aeration Controller turns fans on at different times to another controller that I installed a few years ago ...**

... Other controllers may use different principles to select when to operate fans. They may be effective but will operate at different times. The GRAINSAFE-7000 uses 'wet bulb temperature' control instead of 'dry-bulb' control as used in some other (particularly older) controllers.

2. **My GRAINSAFE-7000 Aeration Controller turns fans on and off at different times to other storages set to the same mode...**

... As the GrainSafe 7000 has Variable Air Flow technology, storages which have cooling air flows rates set above 2Lts/S/T will have a tendency to turn on later than storages with low air flow rates.

3. Why does my GRAINSAFE-7000 Controller sometimes operate fans when air temperature is higher than I would expect ? …

... Fans may run at times when air temperature 'seems' too high. Here's a little background to the way the GRAINSAFE-7000 controller 'thinks'.

Wet-Bulb Control: >> The GRAINSAFE-7000 uses 'wet bulb temperature' control, not 'dry-bulb' control. This means that it sometimes takes advantage of air with a ***low WET-BULB*** *temperature (e.g. warm air of* ***LOW*** *humidity) to catch up on fan run hours. The frequency depends on what the weather has been doing e.g. the controller may 'catch-up' on fan hours after an unusually long period of high temperature and/or high humidity.*

As an example, air that is 'hotter' than 30degC but 'drier' than 20% humidity may have the ability to cool grain at 14%mc to less than 20degC. This feature means that the GRAINSAFE-7000 adapts better to extended periods of 'hot and/or high humidity' weather than some other controllers.

4. Why do we suggest that I run the aeration fans continuously for the first 5 day of storage once the storage is full....won't the warm daytime air reverse the cooling effect achieved at night time*...?*

In the first part of the storage period we are trying to rapidly cool the grain in storage and remove any free moisture from the storage. The grain (if harvested in Oct-Dec) could be put into the storage at 30-35 Deg C. As per the example above, hot dry air has the ability to cause an evaporative cooling effect in the storage, allowing the grain temperature to be driven down to a lower temperature than if the fans were turned off in this early stage of the storage period.

5. Won't running the fans at night time when the relative humidity tends to be higher, run the risk of re-wetting the grain in storage.

No..... as shown below, cold air for a give relative humidity (%Rh) hold less water than warmer air with the same relative humidity (%Rh).

Air Temperature	Relative Humidity	Water
30 C	100%	30 grams/cubic meter of air
20 C	100%	17 grams/cubic meter of air
10 C	100%	9 grams/cubic meter of air

Troubleshooting

Fault/Symptom	Possible Cause	Remedy
Fault light is illuminated	Senor Fault Controller Fault	Contact Supplier. Contact Supplier.
The display on the controller is blank!	The backlight has timed out. Tablet battery flat. Main switch is turned off. Control circuit breaker is off.	Touch "Silver Button" on top side of Tablet to turn on backlight. Plug charging cable in and give tablet one hour to reach sufficient charge to operate. Turn main switch on. Turn control circuit breaker on.
Dry bulb, relative humidity and wet bulb temperature displaying zero, reading error displayed, alarm sounding.	Rht sensor disconnected or damaged.	Check 4 pin connector on Rht sensor is connected/tight. Inspect Rht sensor for damage, replace if necessary.
Fans not running.	The fan mode is set to off. The fan has been disconnected. Fault with the fan motor or wiring.	Set the fan mode to appropriate mode for storage. Check and reconnect the fan. If possible, swap the fan for a known working one.
Fans have not run for several days.	Unseasonal warm conditions. Continuous period of high humidity when auto modes would normally be in operation.	Wait for normal conditions to return- the GrainSafe 7000 will make up hours when conditions are more favourable.

Fans are running more than expected.	Unseasonable cool conditions. GrainSafe 7000 making up hours after passing of warm or high humidity conditions.	GrainSafe 7000 taking advantage of cool conditions. Normal operation of controller responding to varying weather conditions.
Gen start controller- Nothing happens when I start a storage or use test mode.	Generator is not in Auto (remote start) Mode.	Put Generator in Auto (remote start) mode.
Gen start controller- Generator starts, but fans don't run when I start a storage or use test mode.	Voltage monitoring relay not sensing output from gen set. Warm up timer has not timed out.	No output from gen set, check output circuit breaker. Check control circuit breaker in electrical cabinet. Wait one minute for warm up timer to time out.
Gen start controller- Fans turn off but generator doesn't stop.	Generator is not in Auto (remote start) Mode. Cool down timer has not timed out. Gen set has its own cool down timer.	Put gen set in Auto (remote start) mode. Wait one minute for cool down timer to time out. Wait for gen set cool down timer to time out, can be up to five minutes.

Equilibrium Moisture Content

Equilibrium moisture Content (EMC) of Grain

Relative Humidity (RH) is a measure of how much water (moisture) is present in air compared to the MAXIMUM amount that could be held. For example … if a sample of
air (at a particular temperature) contains 25 units of water and the maximum amount that could be held is 50 units then the air is at 50% RH.

- When the Relative Humidity (RH) of air and the Moisture Content (MC) of grain are in '*equilibrium*' then no movement of moisture occurs between air and grain. The air and grain are at their ERH (Equilibrium Relative Humidity) and EMC (Equilibrium Moisture Content) points respectively.
- If the RH of air surrounding grain is LESS than the *ERH* value then moisture moves **from the grain** to the air.
- If the RH of air surrounding grain is HIGHER than the *ERH* value then moisture moves from the air **to the grain**.

- **FOR GENERAL GUIDANCE ONLY –**

Actual values may vary from those shown. Factors that affect ERH & EMC values include
temperature, variety, location AND whether grain is losing or absorbing moisture.
(Information is typical for temperatures between 25°C to 30°C)

Relative Humidity	***Equilibrium Moisture Content (%$_{wb}$)***					
	Sorghum	*Barley*	*Maize*	*Wheat*	*Soybean*	*Sunflower*
90%	*19*	*23*	*21*	*20*	*20*	*18*
80%	*16*	*17*	*17*	*16*	*15*	*11*
70%	*14*	*15*	*15*	*14*	*12*	*9*
60%	*12*	*13*	*13*	*13*	*9*	*7*
50%	*11*	*11*	*12*	*12*	*8*	*6*
40%	*10*	*10*	*11*	*11*	*7*	*5*

Example *(@25°C to 30°C):* The table shows that air at 70%RH is in equilibrium with Sorghum grain at 14%mc. This means that air with less than 70%RH has the potential
to remove moisture from 14%mc Sorghum.

But note that the rate of moisture removal will generally be SLOW until RH is well below the equilibrium value.

Corn Equilibrium Moisture Content

	Temperature (°C)							
% RH	15	18	21	23	26	30	32	35
	Moisture Content (% WB)							
30	8.5	8.3	8.1	8	7.8	7.7	7.6	7.4
35	9.3	9.1	8.9	8.8	8.6	8.4	8.3	8.2
40	10.1	9.9	9.7	9.5	9.3	9.2	9	8.9
45	10.9	10.7	10.5	10.3	10.1	9.9	9.7	9.6
50	11.7	11.4	11.2	11	10.8	10.6	10.5	10.3
55	12.5	12.2	12	11.8	11.6	11.4	11.2	11
60	13.3	13	12.8	12.6	12.4	12.1	12	11.8
65	14.2	13.9	13.6	13.4	13.2	13	12.7	12.5
70	15.1	14.8	14.5	14.3	14	13.8	13.6	13.4
75	16.1	15.8	15.5	15.2	15	14.7	14.5	14.3

How to use this chart:

Where the temperature column and RH row intersect, this is the Emc for Corn at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 13.4%.

Oil Sunflower Equilibrium Moisture Content

	Temperature (°C)							
% RH	7	10	13	15	18	21	23	26
	Moisture Content (% WB)							
30	5.5	5.4	5.3	5.2	5.1	5	5	4.9
35	6	5.8	5.7	5.6	5.5	5.5	5.4	5.3
40	6.4	6.3	6.2	6.1	6	5.9	5.8	5.7
45	6.8	6.7	6.6	6.5	6.3	6.2	6.2	6.1
50	7.2	7.1	7	6.9	6.7	6.6	6.5	6.4
55	7.7	7.5	7.4	7.3	7.1	7	6.9	6.8
60	8.1	8	7.8	7.7	7.6	7.4	7.3	7.2
65	8.6	8.4	8.3	8.1	8	7.9	7.7	7.6
70	9	8.9	8.7	8.6	8.4	8.3	8.2	8.1
75	9.6	9.4	9.2	9.1	8.9	8.8	8.7	8.5

How to use this chart:

Where the temperature column and RH row intersect, this is the Emc for Oil Sunflower at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 7.7%.

Barley Equilibrium Moisture Content

	Temperature (°C)							
% RH	15	18	21	23	26	30	32	35
	Moisture Content (% WB)							
30	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5
35	8.5	8.5	8.4	8.4	8.3	8.3	8.2	8.2
40	9.2	9.1	9.1	9	9	8.9	8.9	8.8
45	9.9	9.8	9.8	9.7	9.7	9.6	9.5	9.5
50	10.6	10.4	10.4	10.4	10.3	10.3	10.2	10.1
55	11.2	11.1	11.1	11	11	10.9	10.9	10.8
60	11.9	11.8	11.8	11.7	11.7	11.6	11.5	11.5
65	12.7	12.5	12.5	12.5	12.4	12.3	12.3	12.2
70	13.4	13.4	13.3	13.2	13.1	13.1	13	12.9
75	14.3	14.2	14.1	14	14	13.9	13.8	13.7

How to use this chart:

Where the temperature column and RH row intersect, this is the Emc for Barley at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 12.5%.

Hard Wheat Equilibrium Moisture Content

	Temperature (°C)							
	15	18	21	23	26	30	32	35
% RH	Moisture Content (% WB)							
30	9.5	9.4	9.2	9.1	9	8.9	8.8	8.7
35	10.3	10.1	10	9.8	9.7	9.6	9.4	9.3
40	11	10.8	10.7	10.5	10.4	10.2	10.1	10
45	11.7	11.5	11.3	11.2	11	10.9	10.7	10.6
50	12.3	12.2	12	11.8	11.7	11.5	11.4	11.2
55	13	12.8	12.7	12.5	12.3	12.2	12	11.9
60	13.7	13.5	13.3	13.2	13	12.8	12.7	12.5
65	14.4	14.2	14	13.9	13.7	13.5	13.3	13.2
70	15.2	15	14.8	14.6	14.4	14.2	14.1	13.9
75	16	15.8	15.6	15.4	15.2	15	14.8	14.6

How to use this chart:
Where the temperature column and RH row intersect, this is the Emc for Hard Wheat at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 13.9%.

Durum Wheat Equilibrium Moisture Content

	Temperature (°C)							
	15	18	21	23	26	30	32	35
% RH	Moisture Content (% WB)							
30	9.1	8.9	8.8	8.7	8.6	8.5	8.4	8.3
35	9.8	9.7	9.5	9.4	9.3	9.2	9.1	9
40	10.5	10.4	10.2	10.1	10	9.9	9.8	9.7
45	11.2	11	10.9	10.8	10.6	10.5	10.4	10.3
50	11.9	11.7	11.6	11.4	11.3	11.2	11.1	10.9
55	12.5	12.4	12.2	12.1	12	11.8	11.7	11.6
60	13.2	13.1	12.9	12.8	12.6	12.5	12.4	12.2
65	14	13.8	13.6	13.5	13.3	13.2	13	12.9
70	14.7	14.6	14.4	14.2	14.1	13.9	13.8	13.6
75	15.6	15.4	15.2	15	14.8	14.7	14.5	14.4

How to use this chart:
Where the temperature column and RH row intersect, this is the Emc for Durum Wheat at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 13.5%.

Soft Wheat Equilibrium Moisture Content

	Temperature (°C)							
	15	18	21	23	26	30	32	35
% RH	Moisture Content (% WB)							
30	9.1	9	8.9	8.8	8.7	8.6	8.5	8.4
35	9.8	9.6	9.5	9.4	9.3	9.2	9.1	9
40	10.4	10.2	10.1	10	9.9	9.8	9.7	9.6
45	10.9	10.8	10.7	10.6	10.5	10.3	10.2	10.1
50	11.5	11.4	11.3	11.1	11	10.9	10.8	10.7
55	12.1	12	11.8	11.7	11.6	11.4	11.3	11.2
60	12.7	12.5	12.4	12.3	12.1	12	11.9	11.8
65	13.3	13.1	13	12.8	12.7	12.6	12.4	12.3
70	13.9	13.7	13.6	13.4	13.3	13.2	13	12.9
75	14.6	14.4		14.1	14	13.8	13.7	13.6

How to use this chart:
Where the temperature column and RH row intersect, this is the Emc for Soft Wheat at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 12.8%.

Soybean Equilibrium Moisture Content

	Temperature (°C)							
	10	13	15	18	21	23	26	30
% RH	Moisture Content (% WB)							
30	5.3	5.2	5.1	5.1	5	4.9	4.9	4.8
35	6.1	6	5.9	5.9	5.8	5.7	5.6	5.6
40	7	6.9	6.8	6.7	6.6	6.5	6.4	6.3
45	7.9	7.8	7.6	7.5	7.4	7.3	7.2	7.1
50	8.8	8.7	8.6	8.4	8.3	8.2	8.1	8
55	9.8	9.6	9.5	9.4	9.3	9.1	9	8.9
60	10.8	10.7	10.5	10.4	10.2	10.1	10	9.9
65	11.9	11.8	11.6	11.5	11.3	11.2	11	10.9
70	13.2	13	12.8	12.7	12.5	12.3	12.2	12
75	14.6	14.4	14.2	14	13.8	13.7	13.5	13.3

How to use this chart:

Where the temperature column and RH row intersect, this is the Emc for Soybean at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 11.2%.

Edible Beans Equilibrium Moisture Content

	Temperature (°C)							
	10	13	15	18	21	23	26	30
% RH	Moisture Content (% WB)							
30	8.4	8.4	8.3	8.3	8.2	8.2	8.2	8.1
35	9.2	9.2	9.1	9.1	9	9	8.9	8.9
40	10	9.9	9.9	9.8	9.8	9.7	9.7	9.7
45	10.8	10.7	10.7	10.6	10.6	10.5	10.5	10.4
50	11.5	11.5	11.4	11.4	11.3	11.3	11.2	11.2
55	12.3	12.3	12.2	12.2	12.1	12	12	11.9
60	13.1	13.1	13	13	12.9	12.8	12.8	12.7
65	14	13.9	13.9	13.8	13.7	13.7	13.6	13.5
70	14.9	14.8	14.8	14.7	14.6	14.6	14.5	14.4
75	15.9	15.8	15.7	15.7	15.6	15.5	15.4	15.4

How to use this chart:

Where the temperature column and RH row intersect, this is the Emc for Edible Beans at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 13.7%.

Sorghum Equilibrium Moisture Content

	Temperature (°C)							
	15	18	21	23	26	30	32	35
% RH	Moisture Content (% WB)							
40	8.1	7.9	7.9	7.8	7.1	7	7	6
45	9.1	8.9	8.7	8.5	8.2	8.1	8	7.2
50	10.8	10.1	10	9.9	9.9	9.7	9.2	8.8
55	11.9	11.8	11.2	11.1	10.9	10.8	10.3	10.1
60	12.7	12.6	12.2	12.1	12	11.9	11.8	11.2
65	13.5	13.1	12.9	12.9	12.8	12.6	12.4	12.2
70	14	14	13.8	13.8	13.7	13.3	13.1	13
75	15.1	15	14.8	14.7	14.2	14	13.9	13.9

How to use this chart:

Where the temperature column and RH row intersect, this is the Emc for Sorghum at the given temperature and RH. In the example, 23°C and 65% Rh will give a Emc of 12.9%.