

CONTINUOUS MIXED FLOW GRAIN DRYERS

Operating and Maintenance Instructions

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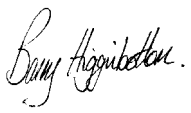
Operating Instructions

This Manual has been carefully prepared to give you a better understanding of your KENTRA Grain Dryer. Please read it carefully as it provides useful information on Installation, Use and Maintenance.

The Supply of Machinery (Safety) Regulations 1992 (S.I. 1992/3073)	
Manufacturer	Kentra Grain Systems Limited Station Road Kirk Hammerton YORK YO26 8DN England
Machine	Continuous Flow Grain Dryer

The above machine when installed and commissioned correctly by the manufacturer, or his approved agent, will conform with the provisions of the Supply of Machinery (Safety) Regulations 1992 (S.I. 1992/3073)

In order to ensure, so far as is practical, that the Equipment is safe and without risk to health when properly used, regular servicing and inspection should be carried out in accordance with the details given in this Manual or available on request. It is expected that users will employ safe working practices and will observe any related legal requirements when installing, operating, maintaining and overhauling. The attention of U.K. users is drawn to the Health and Safety at Work Act 1974.

Date of Purchase	
Installation Date	
Name	Barry J. Higginbottom (Director) 

Operating Instructions

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Document Conventions

To help you locate and interpret information easily, this manual uses consistent visual clues. These conventions are explained as follows.

This	Represents
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<BRACKETS>	All text enclosed in angle brackets refers to a particular push button or switch on the dryer control panel, e.g. <UP> means the pushbutton labeled 'UP'
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1. INTRODUCTION

a. Type 20,25,40 & 50 Grain Dryers

The range of KENTRA Continuous Flow Grain Dryers are based on the mixed flow principle, where the grain passes vertically through the Drying Column over alternate layers of Inlet and Exhaust Ducts. This design allows much higher drying air temperatures to be used than in "Cross Flow Dryers" with consequently greater efficiency.

b. Reserve Holding Section

Wet grain enters the Holding Section at the top of the Dryer, the main purpose of which is to maintain an effective air seal above the Drying Column. As standard the Reserve Section is fitted with a magnetic level switch to sense the level of grain in the Holding Section. If the level of grain falls below this switch, due to say a break in feed, then the Dryer will automatically shut down. In circumstances that prevent the Dryer being "flood-fed" (i.e. with a permanent grain overflow) arrangement can be made for the Dryer to control the grain feed equipment, by calling for feed "on-demand". This arrangement calls for the fitting of two additional level switches in the Dryer Holding Section above the level of the "Grain Feed Failure" level switch. When the bottom switch of this pair is uncovered a signal is sent from the Dryer Control Panel calling for the dryer feed equipment to start which then continues to run until the top switch is covered.

c. Drying Column

From the Holding Section the grain passes into the Drying Column where the heated air from the Furnace evaporates the water present in the grain. As the grain passes through the Drying Sections its temperature gradually increases, however, due to the mixed flow principle as previously described the grain does not reach the temperature of the drying air.

d. Furnace Unit

The drying air is heated by a three stage oil burner in a Direct-Fired Furnace, which is fitted with a special heat distribution unit. This type of arrangement is unique to Kentra Grain Systems Limited and ensures even temperature distribution in the Inlet Air Plenum together with the widest possible operating temperature range without the need for constant nozzle changing as is more usually the case with the more conventional two stage oil burner.

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e. Cooling Section

After passing through the Drying Column the grain then enters the bottom cooling sections of the Dryer where ambient air is used to cool the grain before it is discharged into the Discharge Hopper. As the grain is cooled using ambient air it is obvious that the discharged grain temperature will always be a few degrees above the ambient air temperature. It is for this reason that we always recommend that some form of low volume ventilation is available in the grain store to ensure that the grain can be cooled to a safe temperature necessary for long term storage.

f. Discharge Unit

After passing through the Cooling Section the grain then passes through the Discharge Unit which is used to control the grain discharge rate through the Dryer and hence the water evaporation rate. The discharge unit in the KENTRA Dryer is innovative in that it is a twin-roller unit having twice the number of rollers normally used by other manufacturers. This ensures an even flow of grain through the drying column significantly reducing any risk of blockages. In operation the rollers, which are mounted above the discharge trays, slowly rotate, turning the grain off the discharge trays into the bottom discharge hopper. Adjustment of the speed of the rollers, and hence the discharge rate, is by means of a variable speed drive unit.

g. Dryer Control Panel

The Dryer Control Panel contains all the necessary components and is wired to ensure safe and efficient operation of the Dryer. All controls and indicator lamps are clearly labelled for ease of recognition and use.

i. Dryer Status Display

This section of the control panel incorporates a 4 line by 40 character backlit LCD display. Information on this display guides the operator in the setting up of the different operating parameters and is also used for displaying alarms, shutdown information and the operating status of the dryer. Three pushbuttons marked <ACCEPT>, <UP> and <DOWN> are used to change the display parameters.

ii. Fans

The dryer exhaust fans are controlled by the red and green pushbuttons. The green pushbutton is used to start the fan units, if the burner and discharge are selected these will start in the correct sequence after the fans are up to speed. The LCD display will always reflect the current dryer

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operational status. Pressing the red pushbutton will initiate the dryer shutdown procedure, it will NOT stop the fans immediately but will shut the dryer down in a controlled fashion.

iii. Burner

The burner unit can be operated as either a two stage burner for low temperatures or a three stage burner for high temperature operation. If the selector switch is left in either the <2 STAGE> or <3 STAGE> position then the burner will automatically start approximately 30 seconds after the fans have run up to speed.

iv. Discharge

The dryer discharge unit can be operated either under manual or automatic speed control. In manual control the speed of the discharge rollers and hence the drying rate are controlled by the operator by selecting the required discharge rate on the dryer status display. In automatic mode, once correctly set by the operator, the dryer regulates itself to maintain a constant output moisture content if the incoming grain moisture content varies.

To prevent condensation forming inside the control panel it is fitted with a 60W panel heater. The heater only operates when the main isolator is in the 'ON' position and the emergency stop button has been locked in the 'OFF' position by pressing it in. It is recommended that the panel is left in this mode when not in use, particularly during the winter months.

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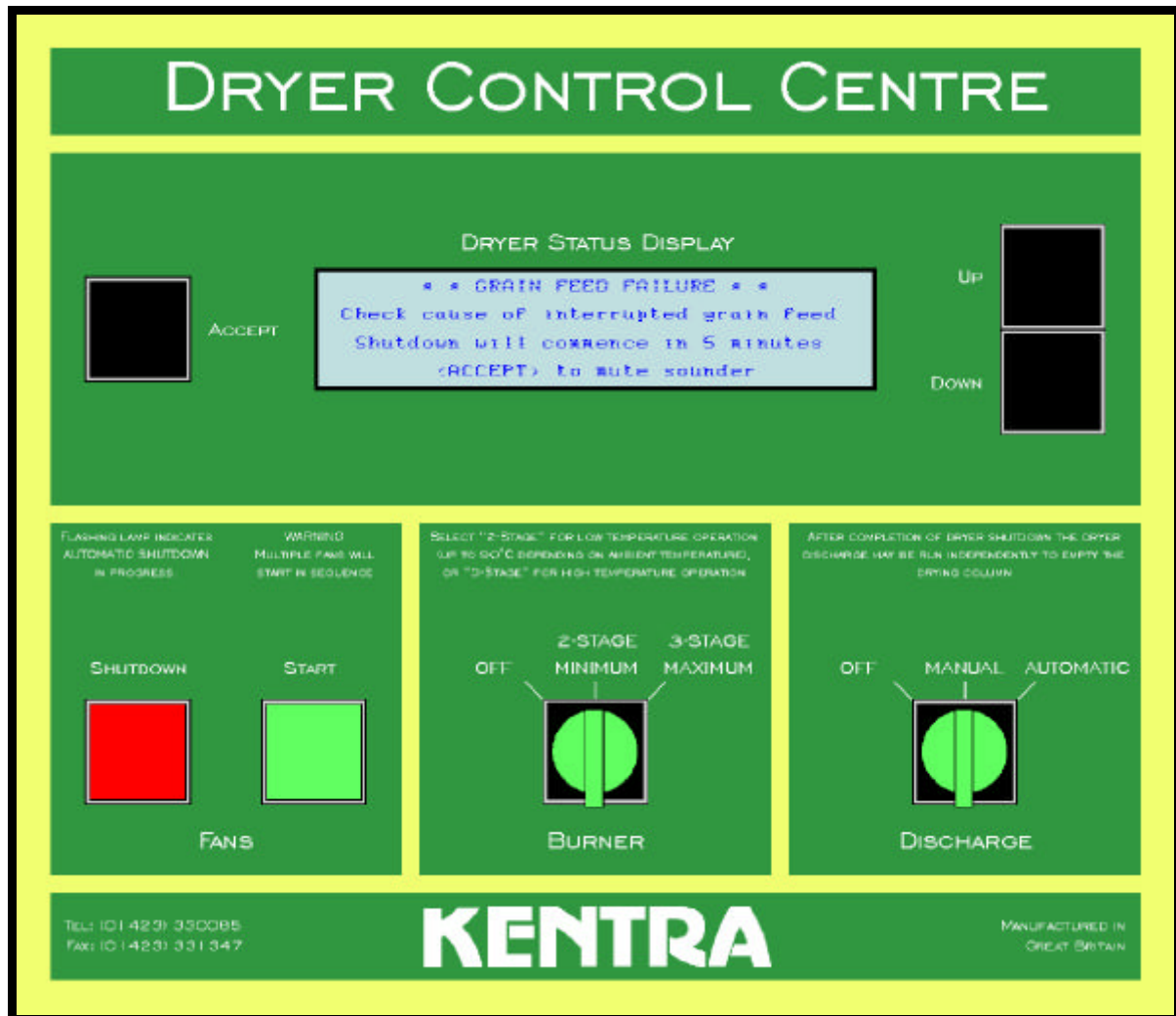


Figure 1 - Dryer Control Centre

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h. Maximum Air and Grain Temperatures

For the safe and economical operation of your Kentra Grain Dryer it is essential that you thoroughly read and understand this section.

The grain and air temperatures in the accompanying table refer to the moisture extraction rate shown; if the moisture extraction rate is GREATER than that shown then the values in the table must be reduced, similarly if the moisture extraction rate is LESS than that shown then the values in the table may be increased, but care must be taken particularly if the crop being dried is required for seed or malting.

Where germination is important it is your responsibility to have the germinative capacity of the crop checked both BEFORE and AFTER drying.

As a general rule of thumb for every percentage point increase in the moisture extraction rate above that shown in the table reduce the drying air temperature by 2° Celsius.

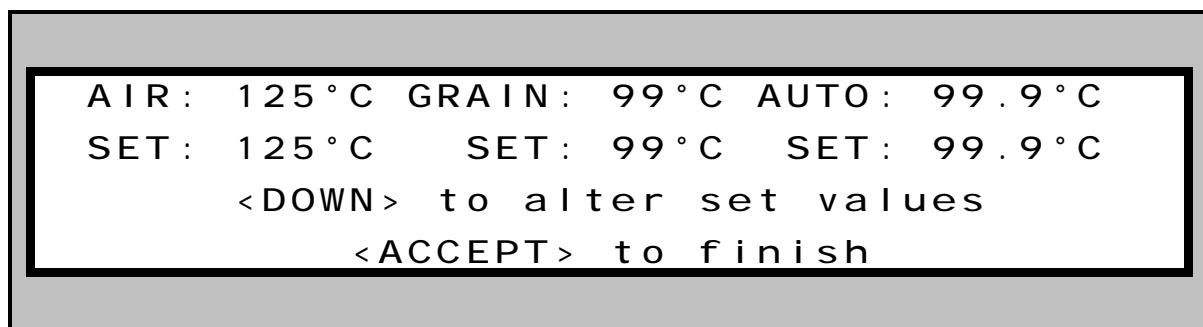


Figure 2 - Master Temperature Setup Screen

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Table 1 - Maximum Air & Grain Temperatures

Crop Type	Moisture Extraction Rate	Maximum Drying Air Temperature	Maximum Grain Temperature
Feed Barley	20 - 15%	125° Cel	62° Cel
Feed Wheat			
Milling Wheat	20 - 15%	85 °Cel	48 °Cel
Malting Barley	24 - 15%	60 °Cel	44 °Cel
Malting Barley	20 - 15%	70 °Cel	44 °Cel
Malting Barley	18 - 12%	70 °Cel	44 °Cel
Seed Grains	20 - 15%	70 °Cel	44 °Cel
Oil Seed Rape	21 - 16%	85 °Cel	48 °Cel
†Oil Seed Rape	16 - 8%	85 - 90°Cel	50 °Cel
‡Oats for Human Consumption	15 - 10%	70 °Cel	45 °Cel
Peas/Beans	20 - 15%	85 °Cel	50 °Cel

† If the input moisture content exceeds 18% MCwb the rape must either be dried in two passes or batch dried. Do NOT dry continuously.

‡ If the maximum grain temperature is exceeded (regardless of input moisture content) the oats should either be batch dried or dried in several passes.

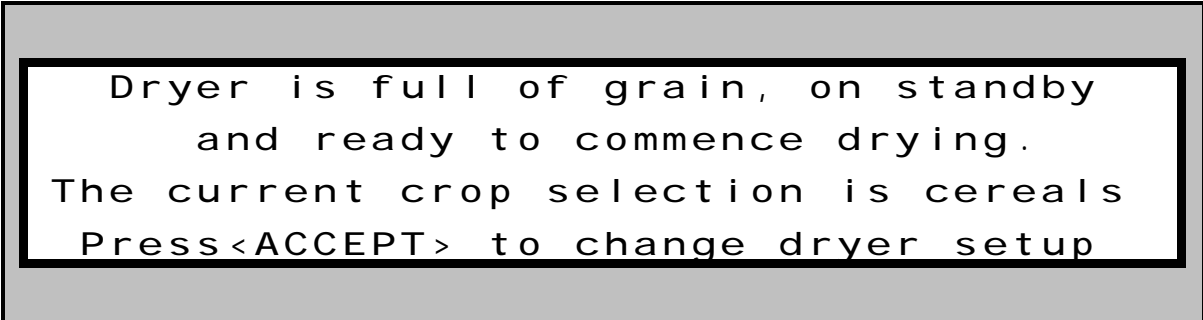
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2. DRYER OPERATION

Before filling the Dryer with grain, check that all the cleanout doors and access hatches are shut, and that the discharge trays are in the working position. When you are happy that the Dryer is ready to run switch on the control panel mains isolator and press the Emergency Stop <RESET> button. The Control Panel will then follow a preset self test which includes a lamp and audible alarm test. When the audible alarm test has completed (5 second delay) the dryer is ready to run and the dryer status display will show whether the dryer requires filling with grain.

a. Setting up the Dryer

Prior to starting the dryer it is necessary to select the various operating temperatures and the correct crop type. The dryer setup is changed from the initial standby screen by pressing the <ACCEPT> push button which then leads through the various steps necessary to select the dryer operating temperatures and crop type.



```
Dryer is full of grain, on standby
and ready to commence drying.
The current crop selection is cereals
Press <ACCEPT> to change dryer setup
```

Figure 3 - Dryer Full and on Standby Screen

b. Filling the Dryer

Fill the Dryer with wet grain. If the Dryer is equipped for "Feed-on-Demand" it is necessary to have the Dryer Control Panel switched on before starting the external feed equipment, when the dryer is full the external feed conveyor controlled by the dryer will then stop automatically.

c. Starting with Wet Grain

After filling the Dryer with grain, select the required operating temperatures. Press the <START> push-button and switch on the burner. The Dryer Fan(s) will automatically start in sequence followed a short while later by the Burner which will build up the drying air temperature to the set value and then automatically regulate itself to maintain the set value.

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Once the fan(s) are up to full speed it may be necessary to regulate the airflow through the dryer to prevent 'lift-off' of the crop. This is most likely to happen with light seeded crops such as oil seed rape and linseed, but may occur in some instances with cereals if the seed is abnormally small. To regulate the airflow it is necessary to 'bleed' air into the exhaust air plenum below the fan(s) using the outer slides at the bottom of the plenum. The inner slides, adjacent to the column are for cleaning out only. Using them to bleed air in will cause a venturi effect on the lower laterals making any 'lift-off' problem worse.

After approximately 15 minutes start the dryer discharge by selecting <MANUAL>. Please note that if the discharge switch is already in either <MANUAL> or <AUTOMATIC> before starting the fans the discharge unit will automatically start.

MAKE SURE ALL THE NECESSARY CONVEYORS ARE RUNNING!

The Wet Grain in the Cooling Section of the Dryer should now be recirculated back to the top of the Dryer until the output moisture content of the grain is within 2% of the target value.

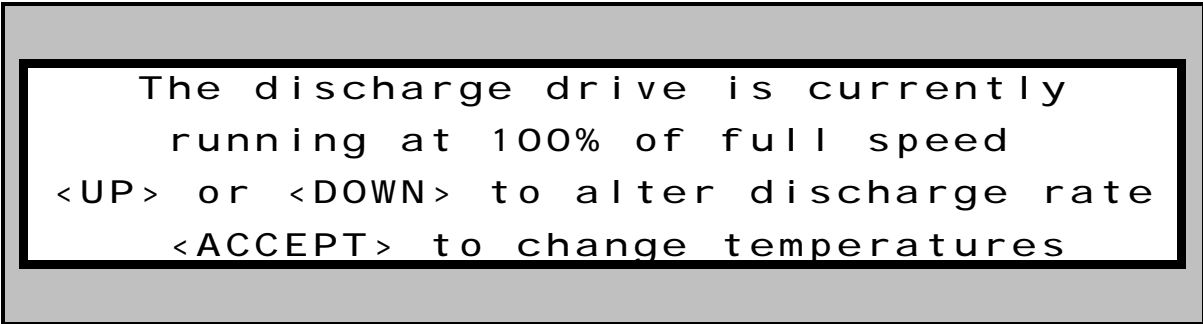
If, due to the plant design, it is not possible to recirculate the grain the following procedure should be adopted:

After pre-heating the grain in the drying column select <MANUAL> discharge to start continuous drying, ensuring that there is an adequate feed of grain to the Dryer to prevent it from running empty. However, as the grain that is initially discharged from the Dryer is still wet it should either be diverted to a trailer or to a convenient place in the store where it can be easily returned to the intake pit for processing later. Again, when the output moisture content is within 2% of the target value the discharged grain should be diverted to the store.

Once grain is being sent to the store and <MANUAL> mode has been selected regular checks should be maintained every 30 minutes of the grain output moisture content. If the grain remains WETTER than desired the discharge speed should be slightly REDUCED, or if the grain remains DRYER than desired the discharge speed should be slightly INCREASED.

During the initial period after re-circulation it is not uncommon for the grain temperature to vary erratically for no apparent reason. This is due to partially dried grain passing through the grain column for a second time and should quickly settle down once fresh wet grain from the intake enters the Dryer.

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The discharge drive is currently
running at 100% of full speed
<UP> or <DOWN> to alter discharge rate
<ACCEPT> to change temperatures

Figure 4 - Discharge Speed Screen

After approximately 2 hours the Dryer should have stabilised sufficiently to allow automatic operation, which is described in more detail later in this section.

d. Re-starting a Full Dryer

When re-starting a Dryer full of grain from a previous drying session, first ensure that the Reserve Holding section is full of grain. It is not necessary to recirculate as the cooling sections of the Dryer are full of dried grain. However it is still necessary to pre-heat the Dryer for approximately 5 - 10 minutes before starting to discharge grain.

If the Dryer has been run previously on automatic and provided the previous settings have been retained automatic operation can be resumed after initially running the discharge on manual for 10-15 minutes.

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e. Dryer Shutdown

To finish a drying session it is only necessary to press the <SHUTDOWN> push-button. This immediately stops the Discharge and switches off the Oil Burner, the Dryer Fans continue to run, however, for 30 minutes. This is essential to both cool the grain and to prevent condensation occurring in the drying column.

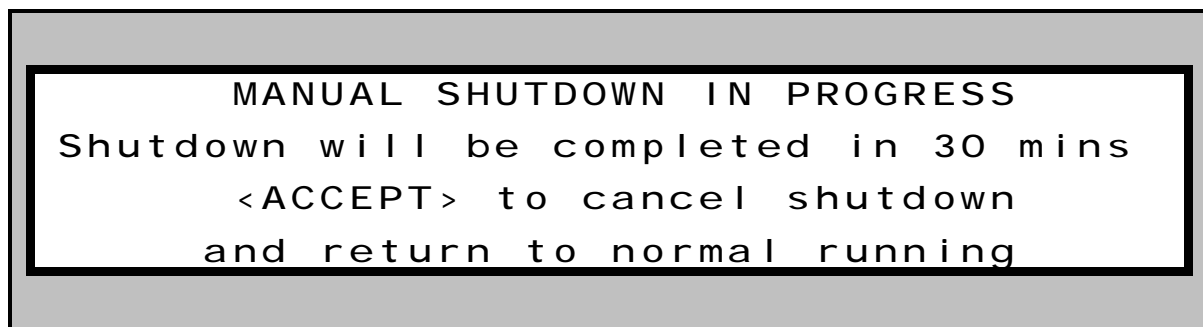


Figure 5 - Manual Shutdown Screen

An alternative method of stopping the Dryer is to cut off the grain feed. The Dryer will continue to run, of course, until the grain feed failure magnetic level switch is uncovered whereupon an alarm will be activated causing the Dryer to automatically go into shutdown. This has an added advantage in that it clears all the Dryer feed equipment of grain.

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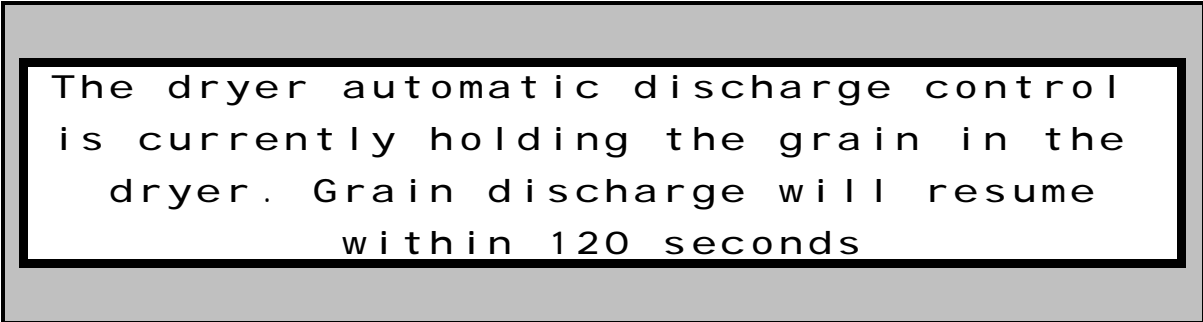
3. AUTO-DISCHARGE CONTROL

a. Description

The purpose of the Auto-Discharge controller is to maintain a constant grain output moisture content irrespective of the input grain moisture content. It is however only possible to maintain any level of accuracy ($\pm 1\%$) within a finite range of input moisture content. (typically $\pm 5\%$)

It is now a known fact that for a constant drying air temperature with a constant moisture extraction rate the Dryer exhaust temperature also remains constant. If the input moisture content INCREASES the exhaust temperature will DECREASE and similarly if the input moisture content DECREASES the exhaust temperature will INCREASE. By monitoring these changes in temperature it is possible to control the grain output moisture content by varying the discharge rate of the Dryer.

To control the discharge rate of the Dryer the controller is allowed to stop the discharge drive, however to prevent the possibility of grain over-heating this stop period is limited to a maximum time of 2 minutes. In addition the automatic discharge controller will also regulate the speed of the dryer discharge, either speeding up or slowing down the discharge as required.

A screenshot of a control screen with a grey background and a black border. The text is displayed in a monospaced font and reads: "The dryer automatic discharge control is currently holding the grain in the dryer. Grain discharge will resume within 120 seconds".

The dryer automatic discharge control
is currently holding the grain in the
dryer. Grain discharge will resume
within 120 seconds

Figure 6 - Automatic Discharge on Hold Screen

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IMPORTANT

After making any adjustment always wait for at least 30-45 minutes (dependent on moisture extraction rate) and note what effect that adjustment has before making any further adjustments, and NEVER make large changes.

For example a Dryer rated at 20 tonnes per hour will have a holding capacity of approximately 25 tonnes and under normal conditions (drying from 20% - 15% at 125°Cel.) will have a residence time of 1¼ hours. However, the MINIMUM throughput capacity of the machine will be of the order of 5 tonnes per hour. You can see that at minimum speed the residence time is approximately 5 hours. To reduce speed from normal rated throughput (20 tonnes per hour) to minimum (5 tonnes per hour) would mean that the effect of that adjustment would not be seen for at least 3 to 4 hours!!! Unfortunately by then the damage is done as the drying column will contain at least 20 tonnes of excessively over dried grain and to recover from that misadjustment will take at least a further 3 - 4 hours. The nett result, of course, is the LOSS OF A FULL DAYS DRYING.

b. Auto-Discharge Control Set-Up Procedure

To be successful in operating the Dryer on Automatic Control it is essential that the drying process is stabilised before attempting to switch to automatic, under normal circumstances this takes about 2 hours.

After stabilising the Dryer the discharge rate is INCREASED by 2% (e.g. from 40% to 42%) by pressing the <UP> pushbutton while the discharge speed screen is displayed. It is necessary to increase the discharge rate initially to ensure that the Automatic Discharge Control can react successfully to reductions in Input Moisture Content.

The Automatic Discharge Temperature set value is now set to the same value as the actual reading, e.g. if the actual value displayed is 34.6°C then the set value is set to 34.6°C also. Finally <AUTOMATIC> is selected on the discharge switch.

c. Automatic Discharge Control Fault Finding

If the Automatic Discharge Controller is incorrectly set the output grain moisture content will either be higher or lower than required.

If the grain output moisture content is lower than required and the discharge drive is running constantly then the discharge speed needs INCREASING.

If the grain output moisture content is higher than required and the discharge drive

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4. FAULT FINDING

a. Fault Protection and Shutdown Procedure

To ensure safety and efficiency the Dryer Control Panel constantly monitors the Dryer whilst it is in operation. If any fault occurs whilst the Dryer is in operation the Dryer Control Panel will activate the shutdown procedure immediately switching off the oil burner and dryer discharge and activating the automatic

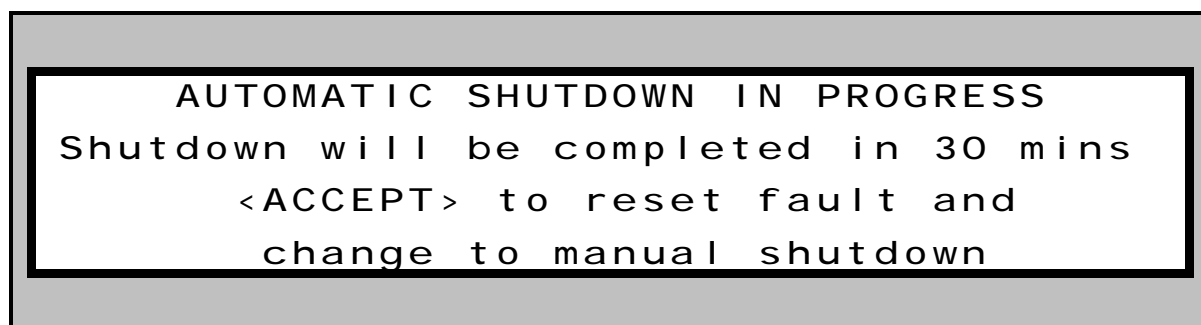


Figure 8 - Automatic Shutdown in Progress Screen

shutdown procedure which allows the fan(s) to run for a further 30 minutes. An external alarm sounder (if fitted) will also activate which can be cancelled by pressing the <ACCEPT> push-button on the Control Panel. Indication of the cause of the fault remains on the status display until the fault has been rectified by following the instructions as displayed.

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b. Grain Feed Failure

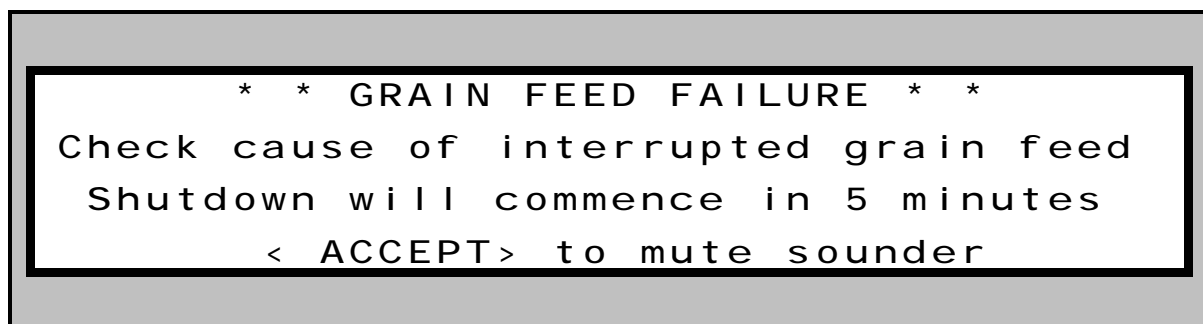


Figure 9 - Grain Feed Failure Warning Screen

The dryer is protected from running out of grain by a magnetic level switch situated in the reserve section at the top of the dryer. If the supply of grain is interrupted and the level switch is uncovered the alarm sounder will be activated and the message as shown above will be displayed on the dryer status display. The operator has 5 minutes to re-establish the grain supply, or top up the dryer if it is being recirculated, before an alarm is initiated and the dryer shuts down.

c. Discharge Blockage

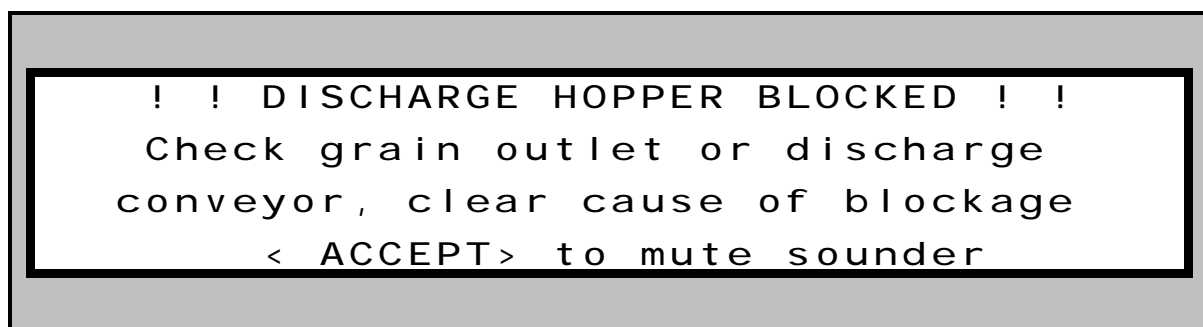


Figure 10 - Discharge Hopper Blocked Screen

Fitted into the dryer discharge hopper is a proximity switch which if covered with grain will initiate a discharge hopper blocked alarm as shown above. It will be necessary to clear the blockage before the fault can be reset on the control panel.

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d. Grain Temperature Overheat

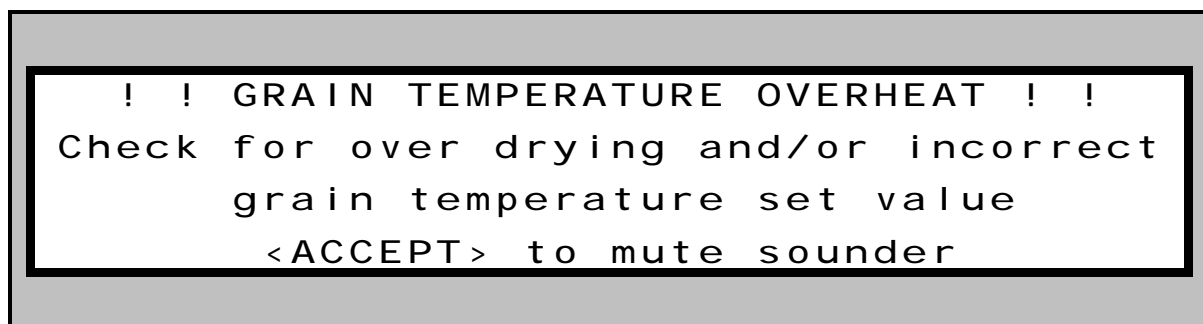


Figure 11 - Grain Temperature Overheat Screen

If the actual grain temperature exceeds the value set by the operator then the dryer will go into alarm and shut down. Once the grain temperature has cooled below the set value it will be possible to cancel the alarm as prompted on the display screen and restart the dryer after establishing the cause of the overheat. Typically grain temperature overheat is caused by overdrying, particularly at start up when the dryer is being recirculated and partially dried grain is returning to the top of the drying column. In this situation it is acceptable to temporarily increase the grain temperature set value whilst the dryer is stabilised and then resetting the correct value once the dryer has settled down. Do not leave the dryer unattended whilst using this procedure!

e. Hot Air Temperature Overheat

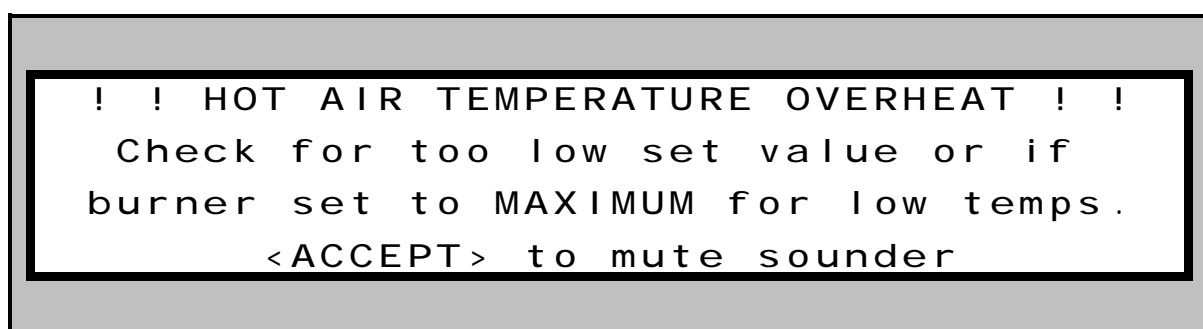


Figure 12 - Hot Air Temperature Overheat Screen

Hot air temperature overheats are caused either by switching the burner to the 3 stage position for operating temperatures lower than 80-90°C or by a fault with the burner servo motor or solenoid valves. This is a very rare occurrence but if a burner fault is suspected please call us for advice.

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f. Burner Lockout

The LAL burner control can be found inside the control panel enclosure. Reference to the lock out indicator on the LAL 2.25 and the accompanying table will enable you to isolate the cause of the burner lock out.

◀ No start e.g. because the closed signal has not been supplied to terminal 8 of the LAL (via control panel terminal 16) by the limit switch on the burner servomotor or because a contact has not been closed between terminals 12 and 4 or 4 and 5 of the LAL 2.25.

▲ Controlled shut down because the open signal has not been supplied to terminal 8 of the LAL 2.25 by the limit switch on the burner servomotor.

○ Lockout due to a fault in the flame supervision circuit.

▼ Controlled shutdown because the position signal for the low flame position has not been supplied to terminal 8 by the auxiliary switch on the burner servomotor.

1 Lockout because no flame signal has been received on completion of the 1st safety time. Any flame signal failure after completion of the 1st safety time also causes the control to go to lockout.

* Lockout because the flame signal has been lost during burner operation.

◀ Lockout on completion of control programme sequence due to extraneous light or fault in the flame supervision circuit.

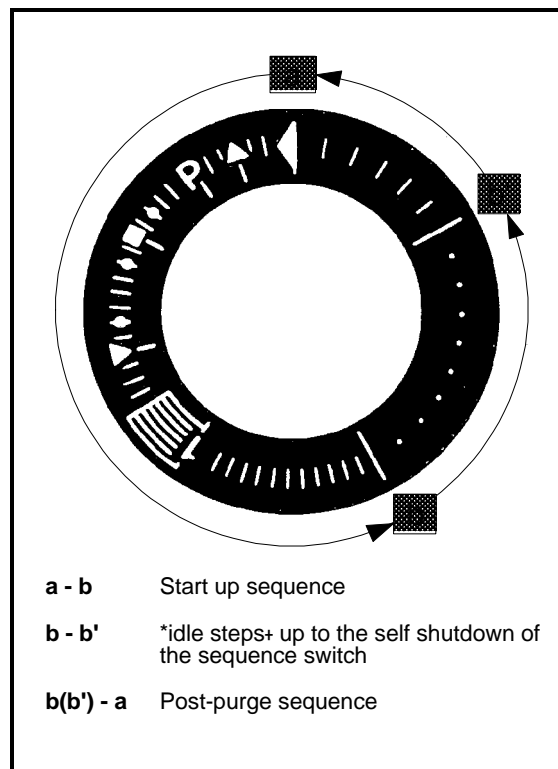


Figure 13 - LAL Indicator

If lockout occurs at any other point between start and pre-ignition, which is not marked by a symbol there is normally a premature i.e. faulty flame signal.

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Figure 14 - LAL 2.25 Burner Control Box

g. Electrical Fault Finding Procedure

Should a fault occur in the Dryer Control Panel all fuses and circuit breakers should first be checked for correct function, and all electrical connections should be checked to ensure good contact. In general, most dryer electrical problems occur because of an external wiring fault, (wires eaten by mice, etc) and so annual electrical checks become essential both for uninterrupted operation during harvest and safety. (fire risk!!)



Figure 15 - PKZM Circuit breaker

If basic checks do not solve the problem, reference to the circuit diagram supplied with the Dryer should enable any competent electrician to rectify the fault. Should the fault appear to be in the PLC Controller and you are at all unsure what to do, please do not hesitate to contact us either directly or through your Dealer for advice.

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h. Fault Finding Chart

FAULT	POSSIBLE CAUSE	REMEDY
Hot Air Temperature Overheat Warning	This may occur when the Dryer is started from cold. Faulty Burner Servo Motor.	Carry out fault reset procedure. Call Service Engineer.
Grain Temperature Overheat Warning	Hot Grain Temperature set value is too low. Grain Temperature Setting Correct but drying air temperature set too high for product being dried.	Set to correct value and carry out fault reset procedure. Reset air temperature to correct value and carry out fault reset procedure.
Grain Feed Failure Alarm during drying, burner and discharge stop.	Wet grain supply interrupted.	Restore wet grain supply and carry out fault reset procedure.
Discharge Blockage Alarm during drying.	Dry grain build up in discharge hopper.	Clear discharge hopper outlet and rectify cause of blockage. Carry out fault reset procedure
Burner will not start, no LOCKOUT warning	Burner not firmly secured by locknut.	Tighten locknut.
Burner will not start, LOCKOUT warning	Burner motor circuit breaker tripped. Fuel filter blocked or no fuel supply. No spark at electrodes, due to wear or maladjustment.	Reset trip and investigate cause. Remove and clean dirty components, and/or restore fuel supply. Carry out fault reset procedure Replace if necessary and re-adjust. Carry out fault reset procedure
Burner ignites but flame goes out after ~15 seconds, LOCKOUT warning	Photocell dirty.	Clean or replace photocell. Carry out fault reset procedure

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FAULT	POSSIBLE CAUSE	REMEDY
Flame ignites but is very orange in colour, possible black smoke.	Too little combustion air.	Check for loose or worn nozzles. Check servo motor cam switch settings. (see oil burner manual).
	Worn nozzle.	Replace nozzle.
	Build up of dust on flame diffuser.	Clean diffuser.
	Badly adjusted diffuser.	Check and adjust.
Flame ignites but is harsh and blue, fumes from fan exhaust sting eyes, possible white smoke.	Incorrect oil pressure.	Check and adjust.
	Too much combustion air.	Check for restrictions in fuel supply e.g. blocked oil filter. Check servo motor cam switch settings. (see oil burner manual).
	Blocked nozzle	Clean nozzle
	Build up of dust on flame diffuser.	Clean diffuser.
Badly adjusted diffuser.	Check and adjust.	
	Incorrect oil pressure.	Check and adjust.

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5. HEALTH & SAFETY CONSIDERATIONS

a. Noise Hazard

If the dryer is installed inside the grain store along with other grain handling equipment it will be necessary to check the total noise level of the plant to ensure that the operator is not subjected to an excessive noise level in the workplace. 'Action Levels' are values of 'daily personal exposure to noise', shortened to $L_{EP,d}$. These depend on the noise level in the working areas and how long people spend in them during the day. The first action level is an $L_{EP,d}$ of 85 dB(A) and the second action level is an $L_{EP,d}$ of 90 dB(A).

Decide whether you might have a problem

If people have to shout or have difficulty being understood by someone about two metres away, you might have a problem. To be sure about this you will need to get the noise assessed. Your local dealer should be able to help you with this, otherwise we can put you in touch with a noise consultant.

Ear protection

If people have to work in noise-hazardous areas they will need ear protectors (ear muffs or ear plugs). However, these should not be regarded as a substitute for noise reduction.

Between the first and second action levels you should make sure that:

- ! protection is freely available
- ! the workers know that unless they wear it there is some risk to their hearing.

b. Electrical Hazard

All electrical equipment must be installed in accordance with the latest IEE regulations, currently 16th edition, BS7671 1992 incorporating Amendment No1 1994 (amd. 8536).

The dryer control panel incorporates a number of circuit protection devices such as circuit breakers and thermal overloads. These devices are for your protection and if they operate they do so for a reason! Always find out the reason why a safety device operates before resetting it and if in doubt ask us or your local qualified electrician for guidance.

Before working on any electrical components or circuits the dryer control panel

Operating Instructions

MUST be isolated from the mains supply by switching off the door mounted isolator. Do not rely on emergency stop buttons, these only isolate the dryer control circuits, NOT the main 3 phase power circuits. If you wish you can padlock the isolator in the OFF position, this is recommended if it is your intention to work inside the dryer whilst carrying out routine maintenance, etc.

c. Fire Hazard

The process of drying grain at high temperatures requires the input of extremely large amounts of energy. To reduce the risk of fire occurring within the dryer it is necessary to maintain the dryer in good mechanical condition and to keep the dryer clean. A build up of chaff and dust within the dryer plenums and drying column will ultimately lead to blockages creating 'dead areas' where grain flow is impaired. In these 'dead areas' the grain starts to overheat and overdry, any chaff becoming tinder dry. A stray spark from the dryer furnace will ignite this dry material very easily. In case of fire it is essential to stop the dryer fans and extinguish the burner as quickly as possible, this can be achieved by pressing the <EMERGENCY STOP> which is situated on the front of the dryer control panel (Your electrician may have fitted further Emergency Stops around the plant, please make sure you are aware of all their positions). Having stopped the dryer get it emptied as quickly as possible so that the emergency services, if required, can deal with the burning material easily, on the ground. However, DO NOT TAKE ANY RISKS, if you are at all unsure what to do, call the Fire Brigade.

6. LUBRICATION

a. Worm Gear Unit

Gear unit size NMRV70 as fitted to Type 20 & 25 Dryers is supplied lubricated for life, packed with synthetic grease; accordingly, this unit has a filler and drain plug, but no level indicator plug. Gear unit size NMRV90 as fitted to Type 40 & 50 Dryers is supplied filled with mineral oil, and is provided with filler, drain and level plugs; care must be taken once the unit is installed that the breather plug fitted to this unit is kept clear.

Operating Instructions

Table 2 - Recommended Lubricants, Worm Gear Units

<i>GEARBOX TYPE</i>	<i>QUANTITY</i>	<i>LUBRICANT Ambient Temperature (0÷30)°C</i>	<i>MANUFACTURER</i>
NMRV70	0.50kg	Telesia Compound B Tivela Compound A	IP SHELL
NMRV90	1.50ltr	Omala oil 320 Mellana oil 320 Mobilgear 632 Spartan EP	SHELL IP MOBIL ESSO

N.B.:

1. For ambient temperatures above 35°C, oil with a higher rated viscosity should be used.
2. For ambient temperatures below 0°C, oil with a lower rated viscosity should be used.
3. Synthetic greases for longlife lubrication can be used in ambient temperatures of -15°C to 40°C.

7. PRE SEASON MAINTENANCE

Maintenance Schedule

To ensure trouble free service during the drying season the dryer should be fully serviced in good time beforehand by a competent engineer familiar with grain dryers and pressure jet oil burners.

- a. **THOROUGHLY** clean down the dryer, including the plenum chambers, the drying column and the furnace heat exchanger.
- b. The oil burner should be thoroughly cleaned and the nozzle head, combustion tube and diffuser checked for carbon contamination and oil leaks. A build up of carbon would indicate that the burner was incorrectly set. Each nozzle should be removed and the nozzle filter should be cleaned. **DO NOT ATTEMPT TO CLEAN THE NOZZLE ORIFICE UNLESS YOU ARE ABSOLUTELY SURE OF THE CORRECT PROCEDURE.**
- c. The burner electrodes should be cleaned and checked for correct adjustment.

Operating Instructions

- d. Remove and clean the fuel filter and check for water contamination.
- e. Remove, clean and check for correct operation of the QRB flame sensor.
- f. Lightly lubricate all burner linkages.
- g. Inspect all fuel lines for leaks and damage.
- h. Check all PT100 temperature sensors are clean, undamaged, in the correct positions and function correctly.
- i. Check all proximity switches are clean and functioning correctly.
- j. Check and lubricate the discharge drive chain.
- k. Check all drive sprockets for wear and/or misalignment. Rectify if necessary.
- l. LIGHTLY grease discharge roller bearing housings. (One stroke from a grease gun will be sufficient)
- m. Check that all the discharge trays can open fully and that all the gas springs are functioning correctly.
- n. Operate the discharge throughout its full speed range and ensure that minimum and maximum speed can be attained.
- o. Inspect all electrical cables for fraying, damage, loose connections, rat or mice damage and repair/replace as necessary.
- p. Clean the inside of the control panel and check for correct function of all overload relays, etc. Ensure all electrical connections are tight with no signs of contact corrosion.

8. POST SEASON MAINTENANCE

Maintenance Schedule

- a. Remove all grain, straw and other residues from the bottom of the plenum chambers and the whole of the drying column. It may be necessary to use an industrial vacuum cleaner or even a high pressure hot water cleaner to properly remove any oil seed residues. (If high pressure water is used ensure all electrical connections are water tight and that mains power is OFF before starting)
- b. Check the inside of all the air ducts for build up of chaff and straw and remove if

Operating Instructions

present using a long handled brush.

- c. Check the fans for damage and/or loose blades and clean.
- d. Thoroughly clean the dryer discharge unit and check the roller drive chain for correct tension and lubricate.
- e. Clean down the oil burner, check for fuel leaks and repair if required.
- f. Switch off the control panel, open the door and thoroughly clean out the interior of the panel removing all traces of dust, chaff, spiders webs, etc.
- g. With all the hatches open run the dryer fan(s) until the dryer has been thoroughly ventilated and dried out. If you wish to run the oil burner do not set the air temperature higher than 50° Cel.
- h. Keep the dryer well ventilated when it is not in use and DO NOT use the drying column as a storage silo.

Regular maintenance saves energy and protects the environment

Operating Instructions

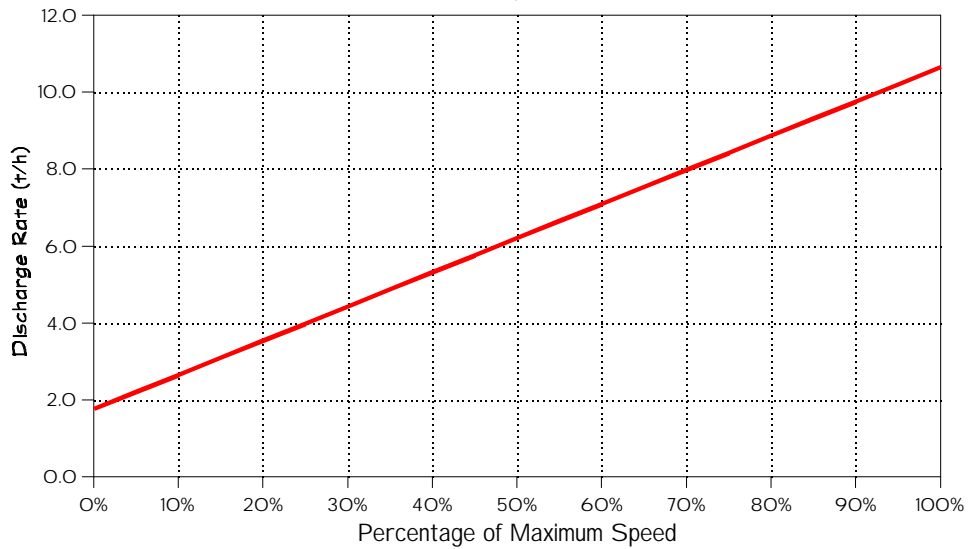
Operating Instructions

APPENDIX A
Discharge Rate Graphs

Operating Instructions

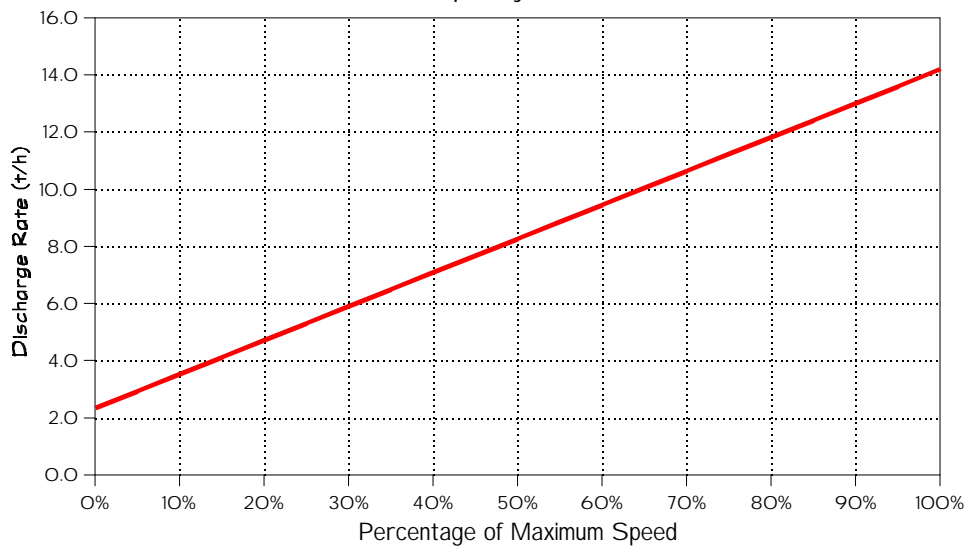
Dryer Model 720

Rated Capacity 6.3 t/h



Dryer Model 920

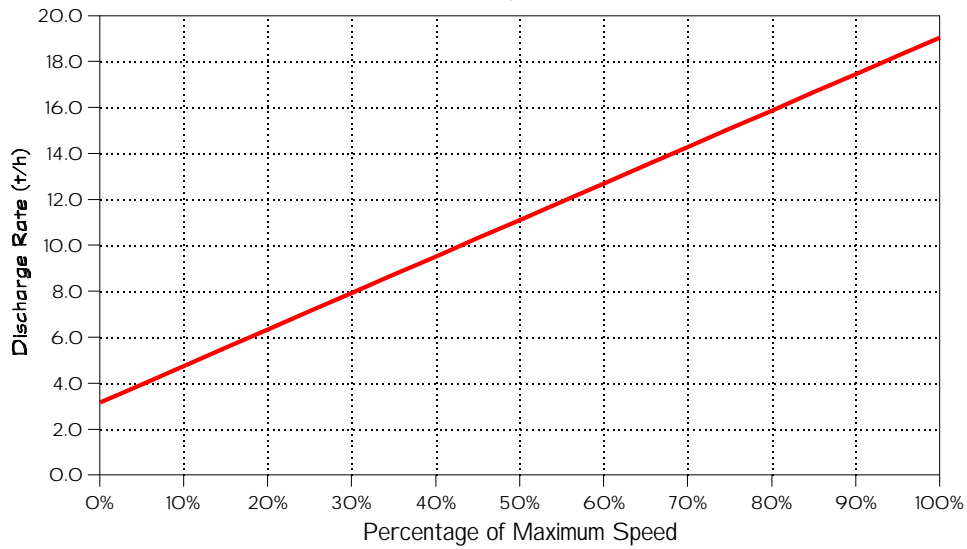
Rated Capacity 8.3 t/h



Operating Instructions

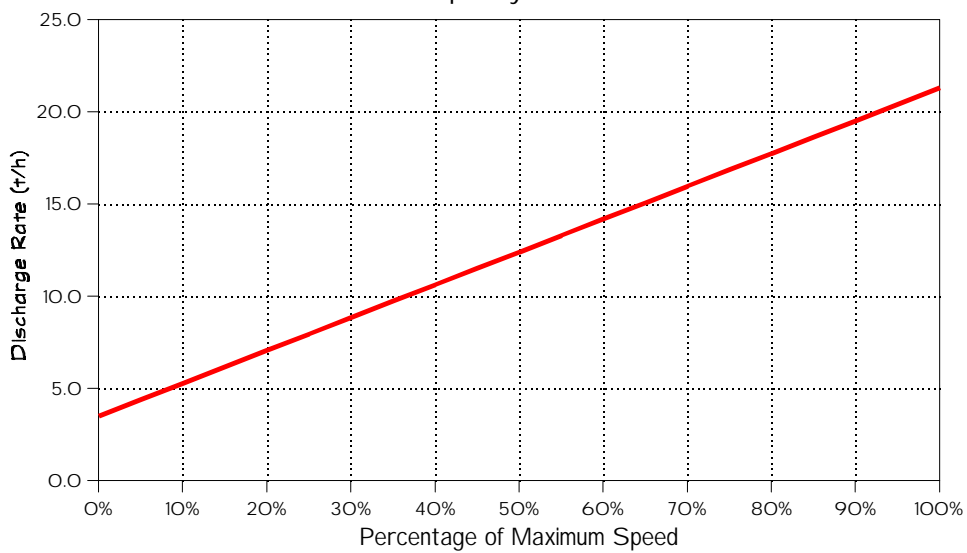
Dryer Model 1120

Rated Capacity 10.4 t/h



Dryer Model 1320

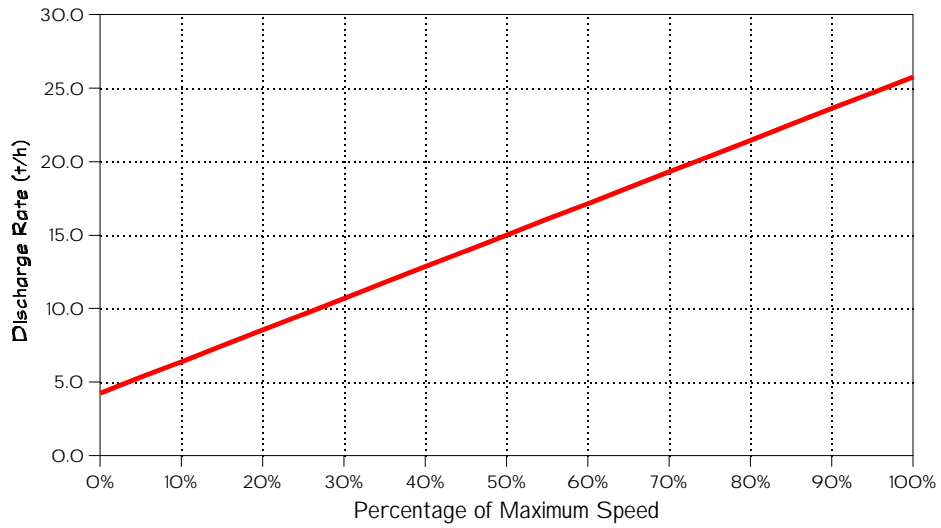
Rated Capacity 12.5 t/h



Operating Instructions

Dryer Model 1520

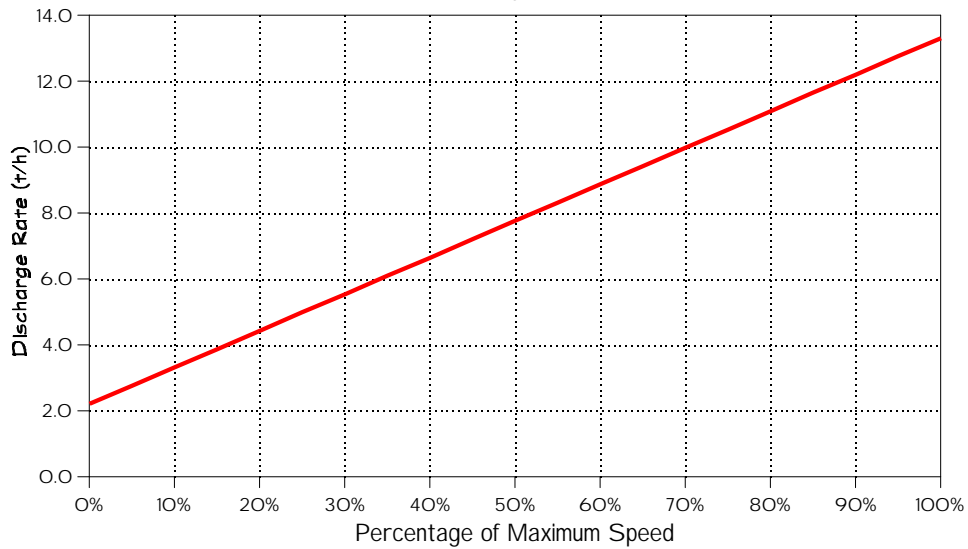
Rated Capacity 14.6 t/h



Operating Instructions

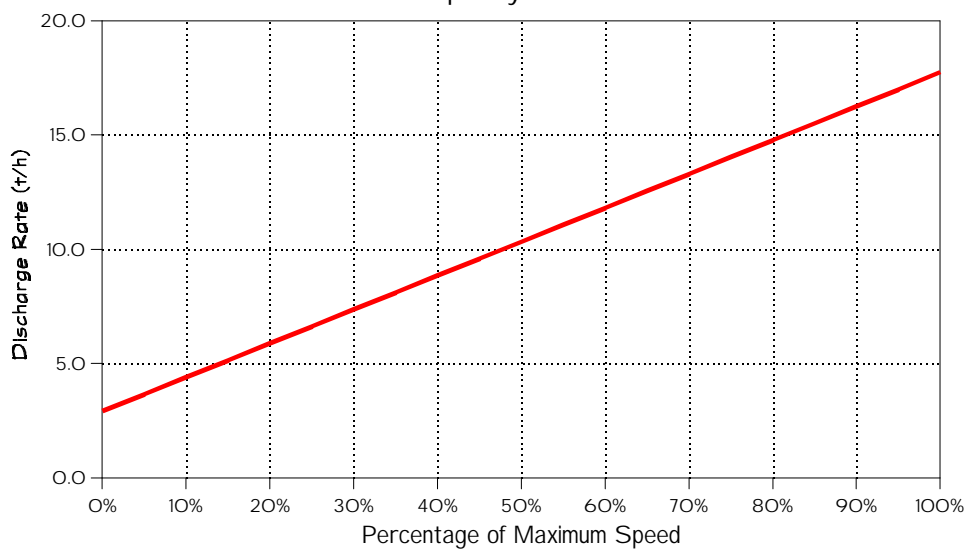
Dryer Model 825

Rated Capacity 8.0 t/h



Dryer Model 1125

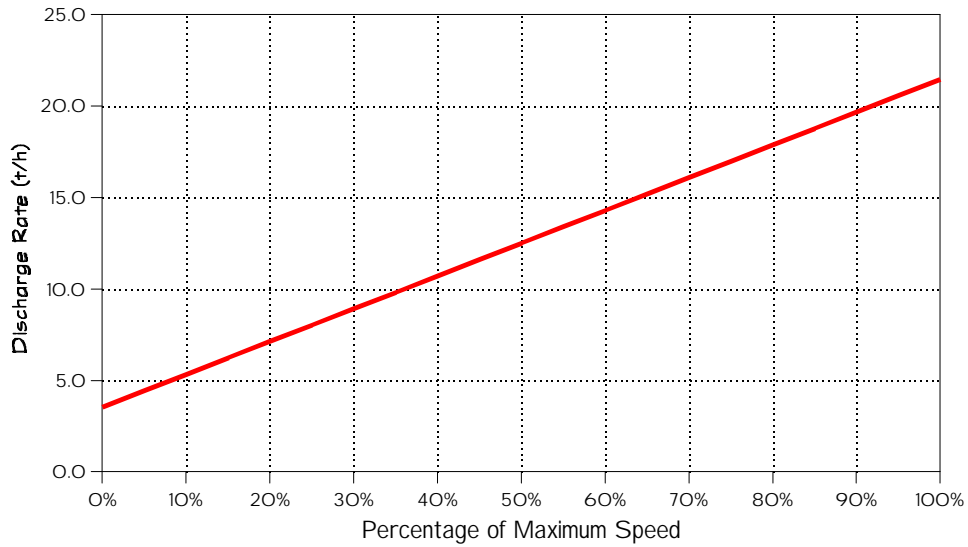
Rated Capacity 10.5 t/h



Operating Instructions

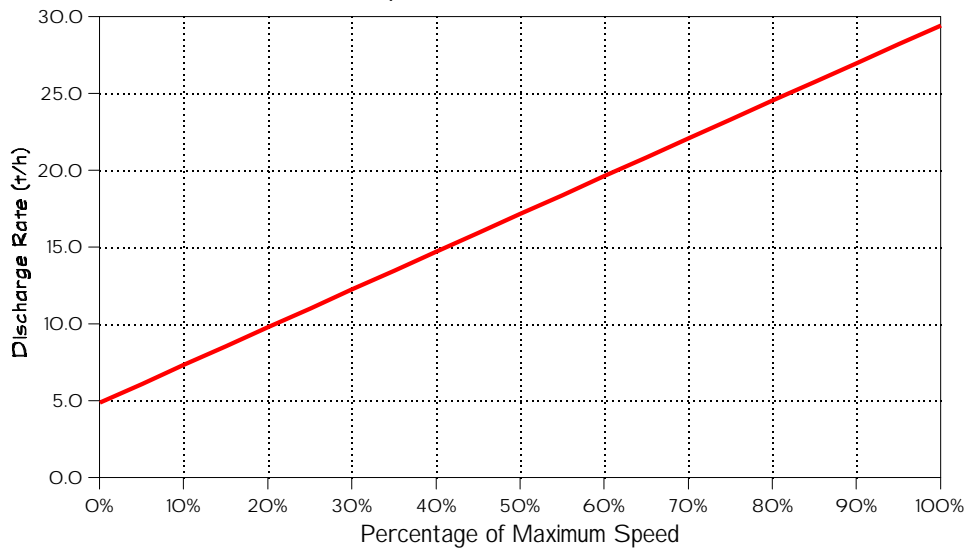
Dryer Model 1325

Rated Capacity 13.0 t/h



Dryer Models 1625 & 1925

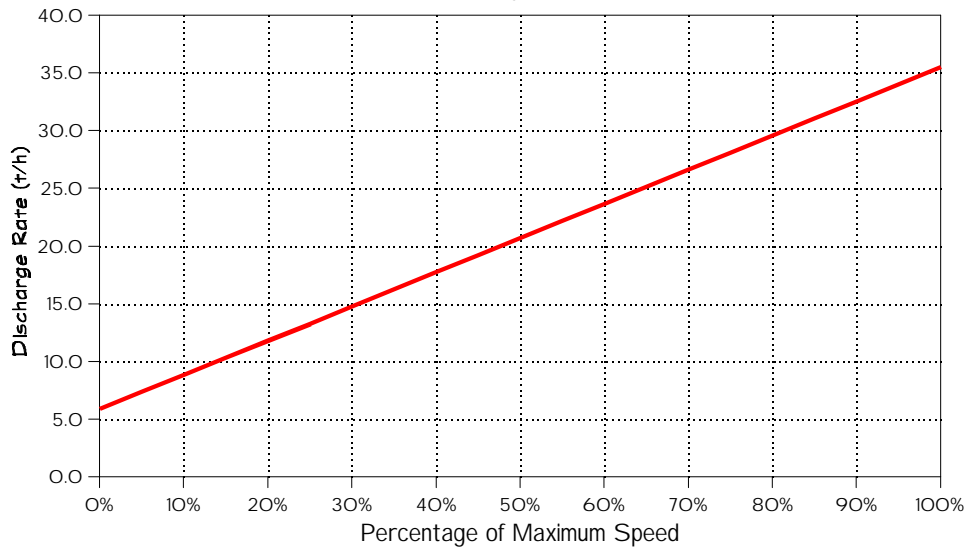
Rated Capacities 16.0 & 18.5 t/h



Operating Instructions

Dryer Model 2225

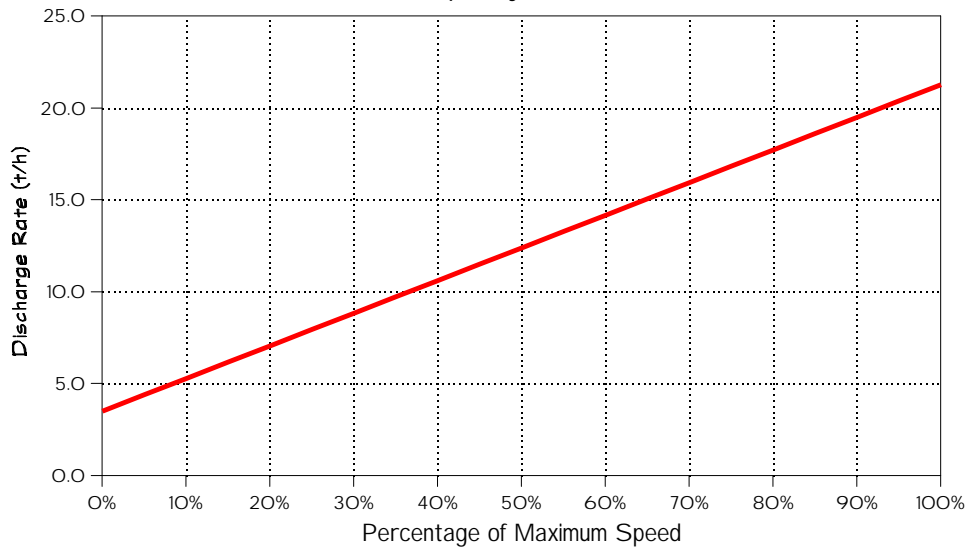
Rated Capacity 21.5 t/h



Operating Instructions

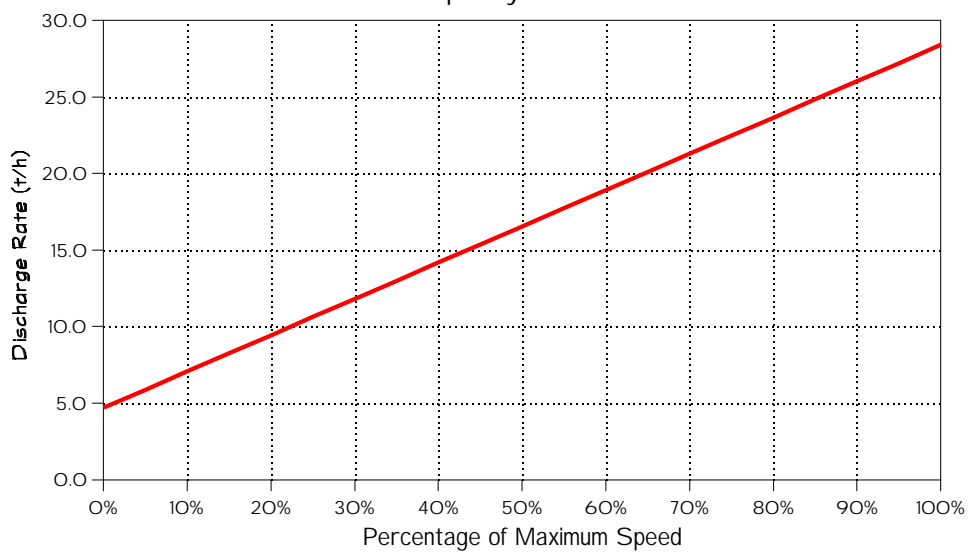
Dryer Model 1340

Rated Capacity 12.6 t/h



Dryer Model 1740

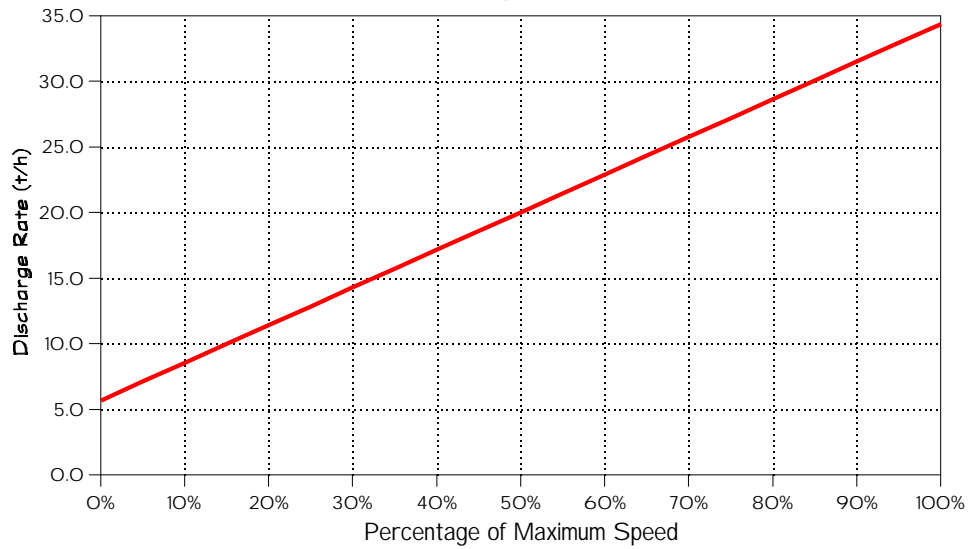
Rated Capacity 16.6 t/h



Operating Instructions

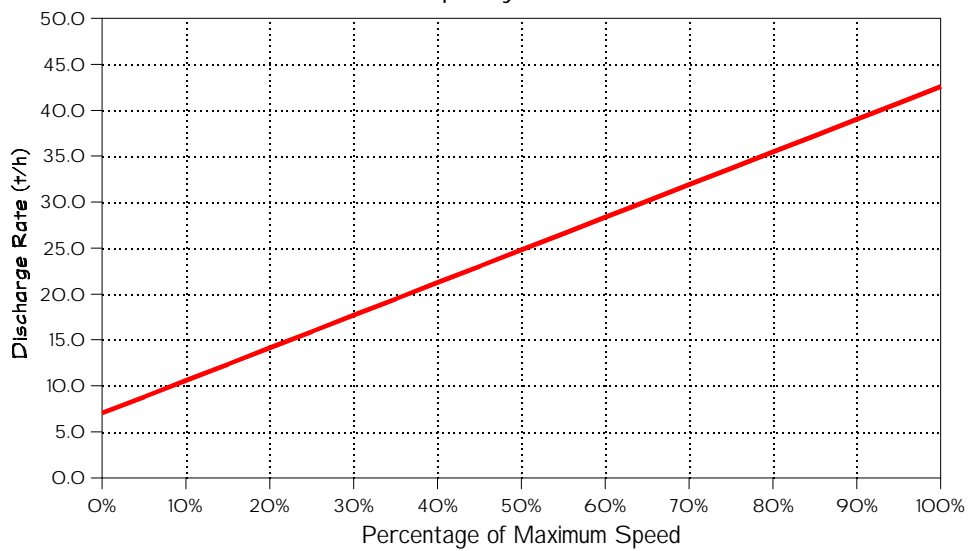
Dryer Model 214O

Rated Capacity 20.8 t/h



Dryer Model 254O

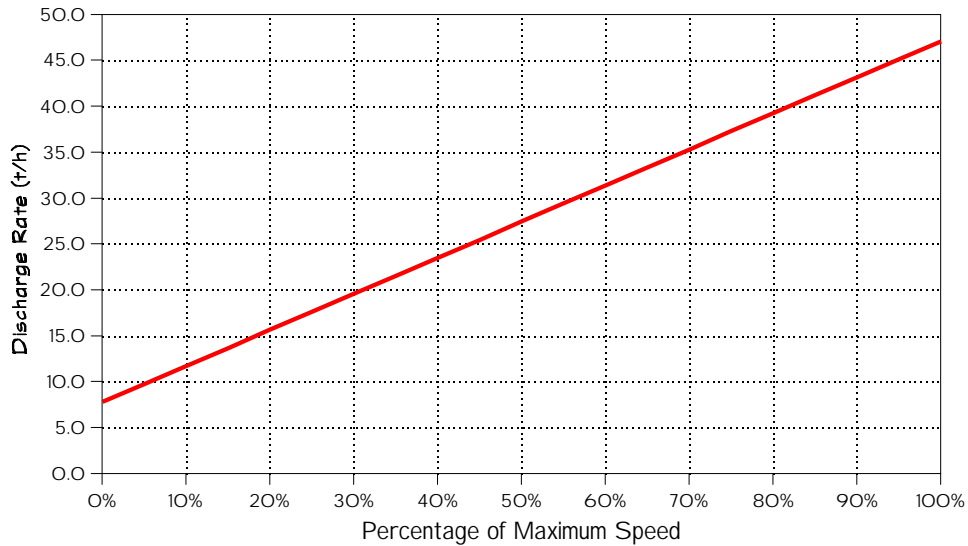
Rated Capacity 25.0 t/h



Operating Instructions

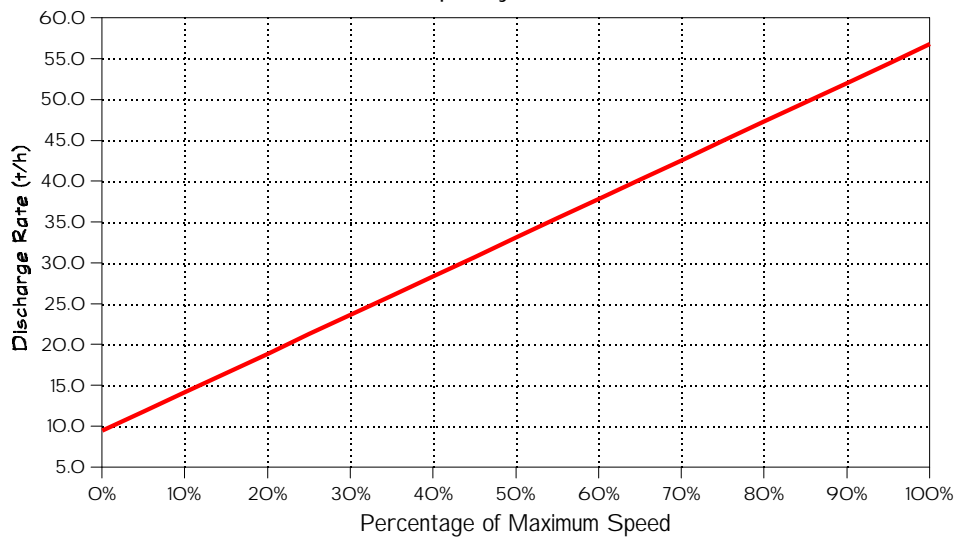
Dryer Model 3040

Rated Capacity 29.2 t/h



Dryer Model 3440

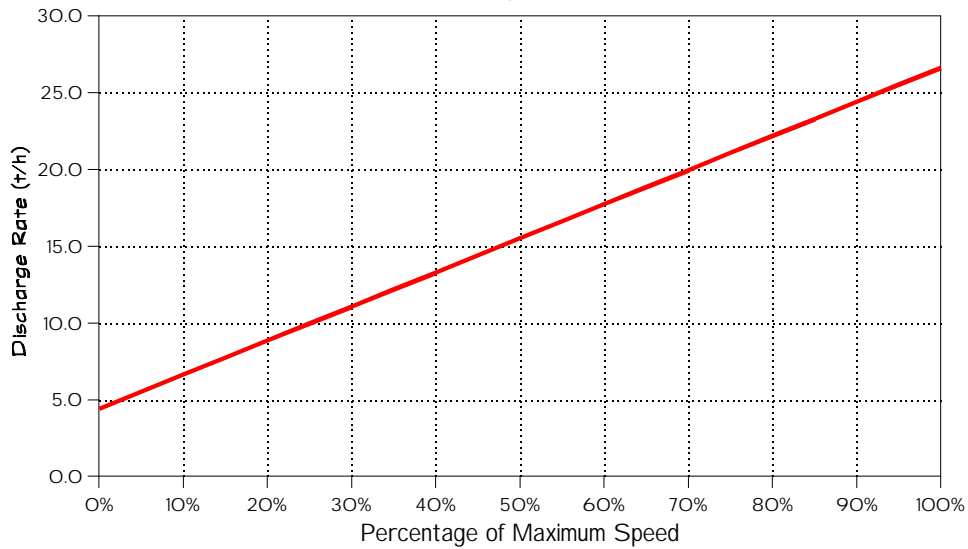
Rated Capacity 33.4 t/h



Operating Instructions

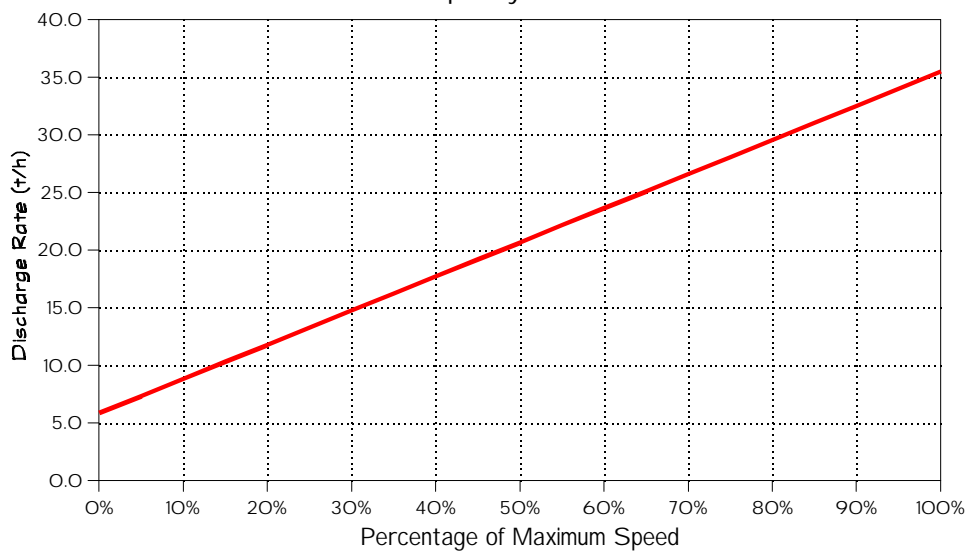
Dryer Model 1650

Rated Capacity 16.0 t/h



Dryer Model 2150

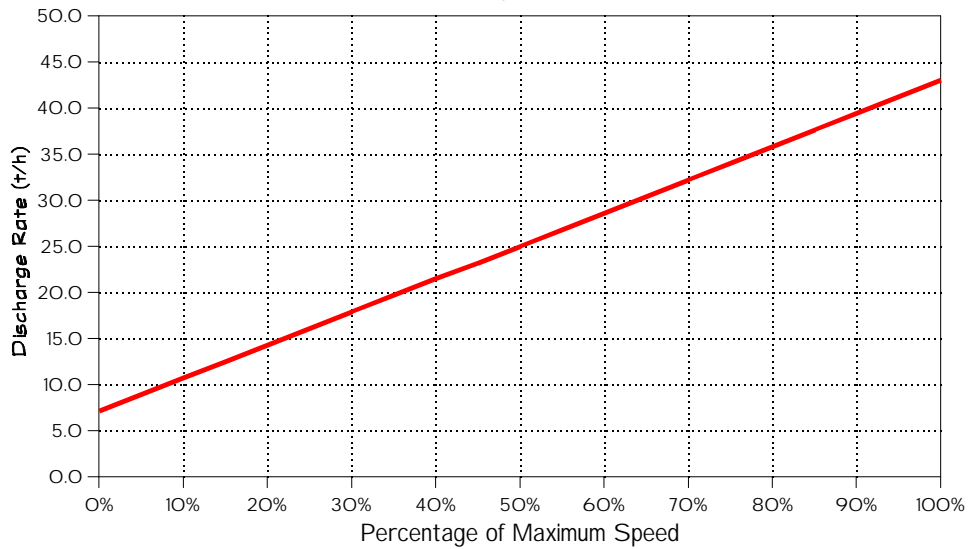
Rated Capacity 21.0 t/h



Operating Instructions

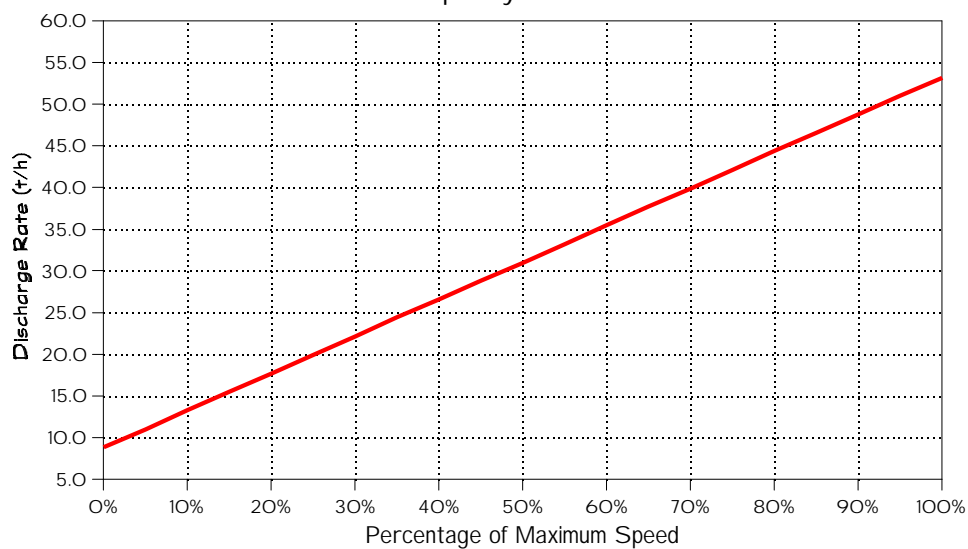
Dryer Model 2650

Rated Capacity 26.0 t/h



Dryer Model 3250

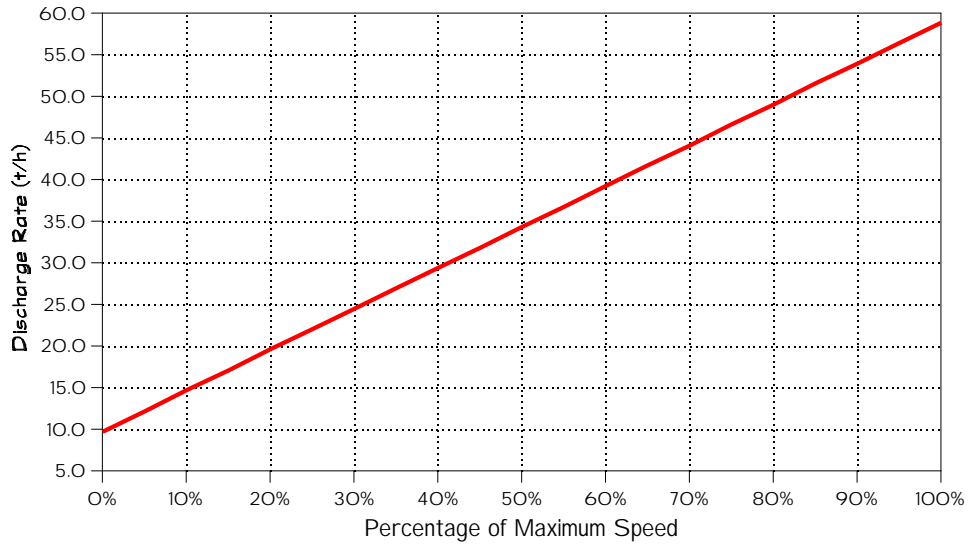
Rated Capacity 32.0 t/h



Operating Instructions

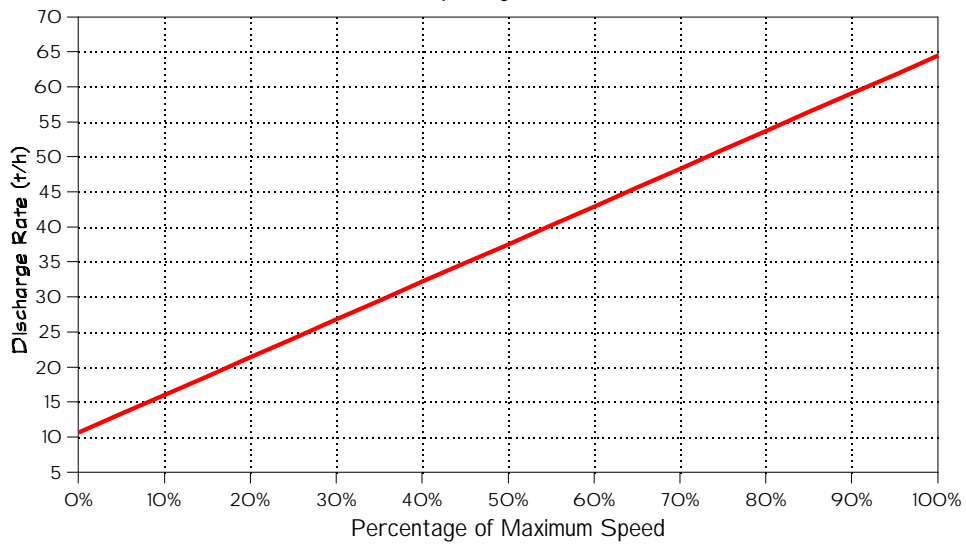
Dryer Model 3750

Rated Capacity 37.0 t/h



Dryer Model 4350

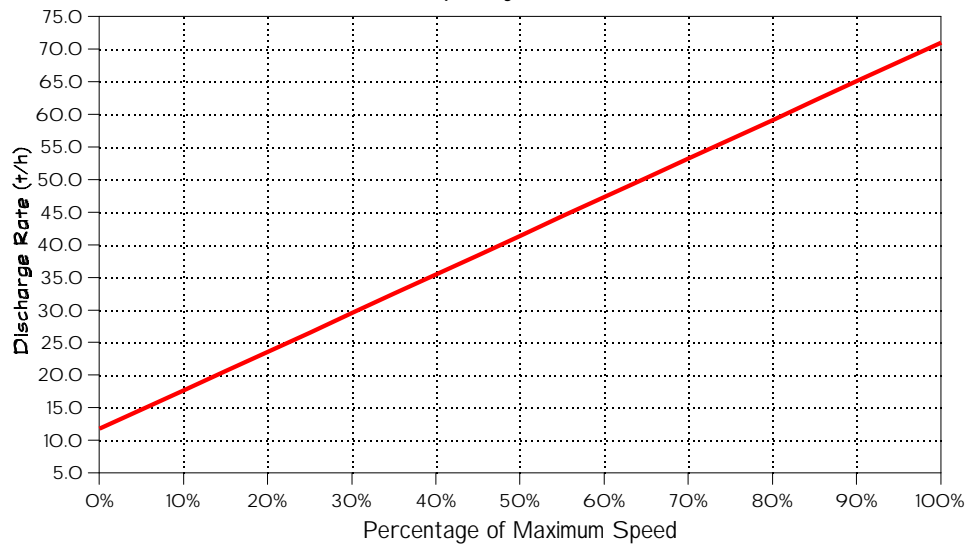
Rated Capacity 42.0 t/h



Operating Instructions

Dryer Model 4750

Rated Capacity 47.0 t/h



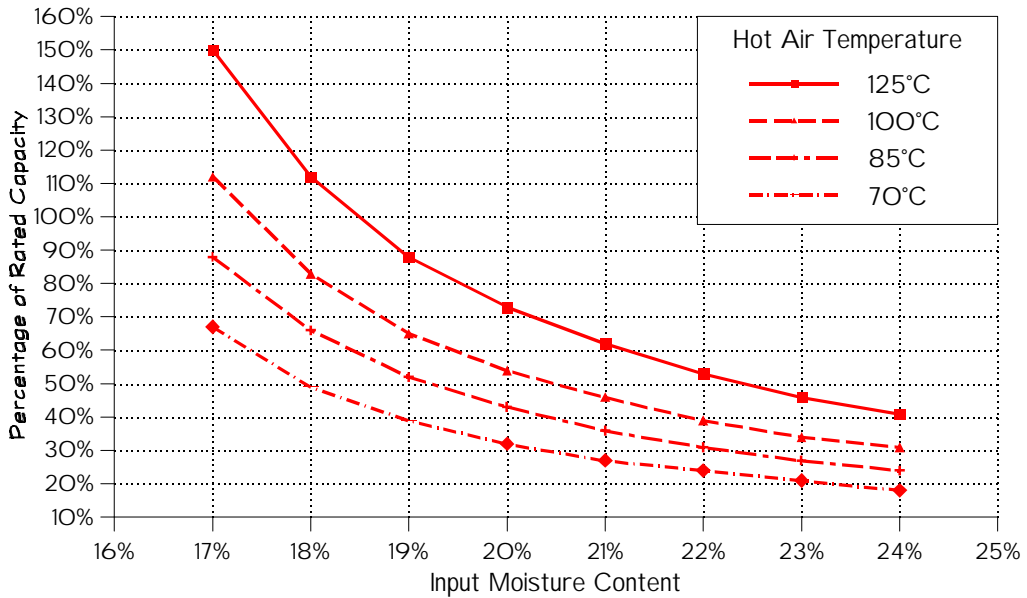
Operating Instructions

APPENDIX B Dryer Capacity Graphs

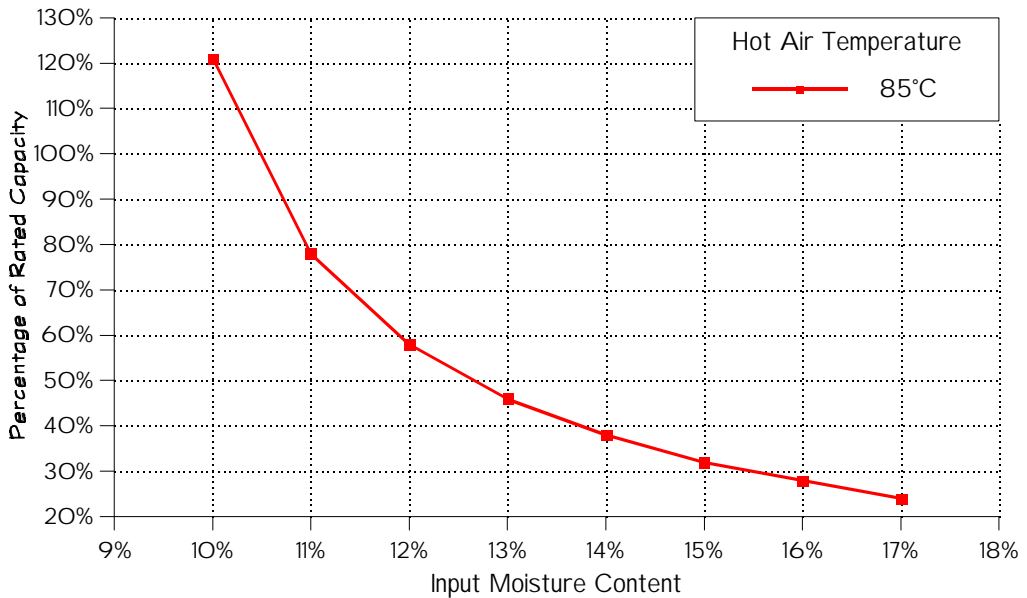
(Note: Information supplied in the following charts is for use as a guide only to assist with setting up the dryer, and does not guarantee dryer performance under any particular conditions)

Operating Instructions

Dryer Capacity Chart Drying Cereals to 14% MCwb



Dryer Capacity Chart Drying Oilseeds to 8½% MCwb



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