MIXED FLOW
GRAIN DRYERS

PRODUCT INFORMATION GUIDE
FOR DEALER USE ONLY

GSI Take control.

WARRANTY INFORMATION

The GSI Group, LLC ("GSI") warrants products which it manufactures to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months after sale to the original end-user or if a foreign sale, 14 months from arrival at port of discharge, whichever is earlier. The end-user's sole remedy (and GSI's only obligation) is to repair or replace, at GSI's option and expense, products that in GSI's judgment, contain a material defect in materials or workmanship. Expenses incurred by or on behalf of the end-user without prior written authorization from the GSI Warranty Group shall be the sole responsibility of the end-user.

Warranty Extensions: The Limited Warranty period is extended for the following products:

	Product	Warranty Period
AP Fans and Flooring	Performer Series Direct Drive Fan Motor	3 Years
	All Fiberglass Housings	Lifetime
	All Fiberglass Propellers	Lifetime
AP / Cumberland	Flex-Flo/Pan Feeding System Motors	2 Years
Cumberland Feeding & Watering Systems	Feeder System Pan Assemblies	5 Years ★★
	Feed Tubes (1.75" & 2.00")	10 Years ★
	Centerless Augurs	10 Years ★
	Watering Nipples	10 Years ★
Grain Systems	Grain Bin Structural Design	5 Years
GSI / Farm Fans / Zimmerman	Portable and Tower Dryers	2 Years
	Portable & Tower Dryer Frames and Internal Infrastructure †	5 Years

★ Warranty prorated from list price:
0 to 3 years – no cost to end-user
3 to 5 years – end-user pays 25%
5 to 7 years – end-user pays 50%
7 to 10 years – end user pays 75%

★★ Warranty prorated from list price:
0 to 3 years – no cost to end-user
3 to 5 years – end-user pays 50%

† Motors, burner components and moving parts not included. Portable Dryer screens included. Tower Dryer screens not included.

GSI further warrants that the portable and tower dryer frame and basket, excluding all auger and auger drive components, shall be free from defects in materials for a period of time beginning on the twelfth (12th) month from the date of purchase and continuing until the sixtieth (60th) month from the date of purchase (extended warranty period). During the extended warranty period, GSI will replace the frame or basket components that prove to be defective under normal conditions of use without charge, excluding the labor, transportation, and/or shipping costs incurred in the performance of this extended warranty.

Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH ABOVE. SPECIFICALLY, GSI MAKES NO FURTHER WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (I) PRODUCT MANUFACTURED OR SOLD BY GSI OR (II) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

GSI shall not be liable for any direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. The sole and exclusive remedy is set forth in the Limited Warranty, which shall not exceed the amount paid for the product purchased. This warranty is not transferable and applies only to the original end-user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor.

GSI assumes no responsibility for claims resulting from construction defects or unauthorized modifications to products which it manufactured. Modifications to products not specifically delineated in the manual accompanying the equipment at initial sale will void the Limited Warranty.

This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained. This Limited Warranty extends solely to products manufactured by GSI.

Prior to installation, the end-user has the responsibility to comply with federal, state and local codes which apply to the location and installation of products manufactured or sold by GSI.

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WHAT IS MIXED FLOW

Basic Information

Mixed flow or “rack” dryers are relatively old technology with patents going back decades.

Mixed flow dryers are characterized by a unique grain column for drying that enables mixing of grain during the drying process and a mixed flow of air throughout the grain.

Figure 1, below represents the airflow path and grain travel through the dryer. As seen in the image, the airflow flows both with and against (vertically) the flow of grain.

For comparison, a schematic of a typical cross-flow dryer is shown in Figure 2. The air in a cross-flow dryer moves perpendicular to the flow of grain as it moves from top-to-bottom in the dryer.

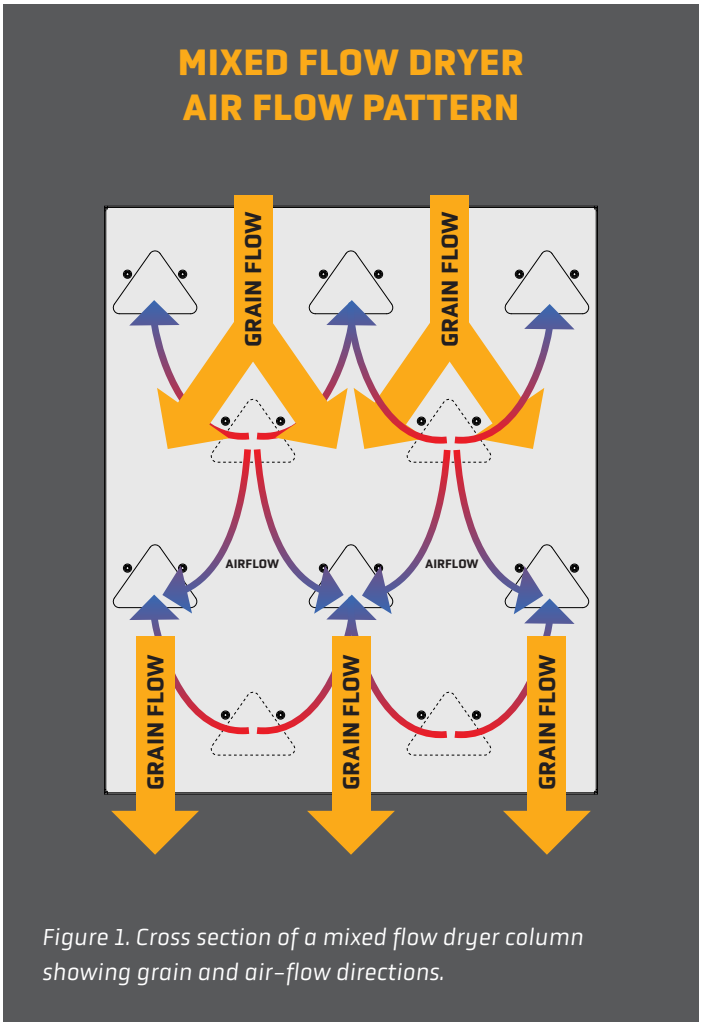


Figure 1. Cross section of a mixed flow dryer column showing grain and air-flow directions.

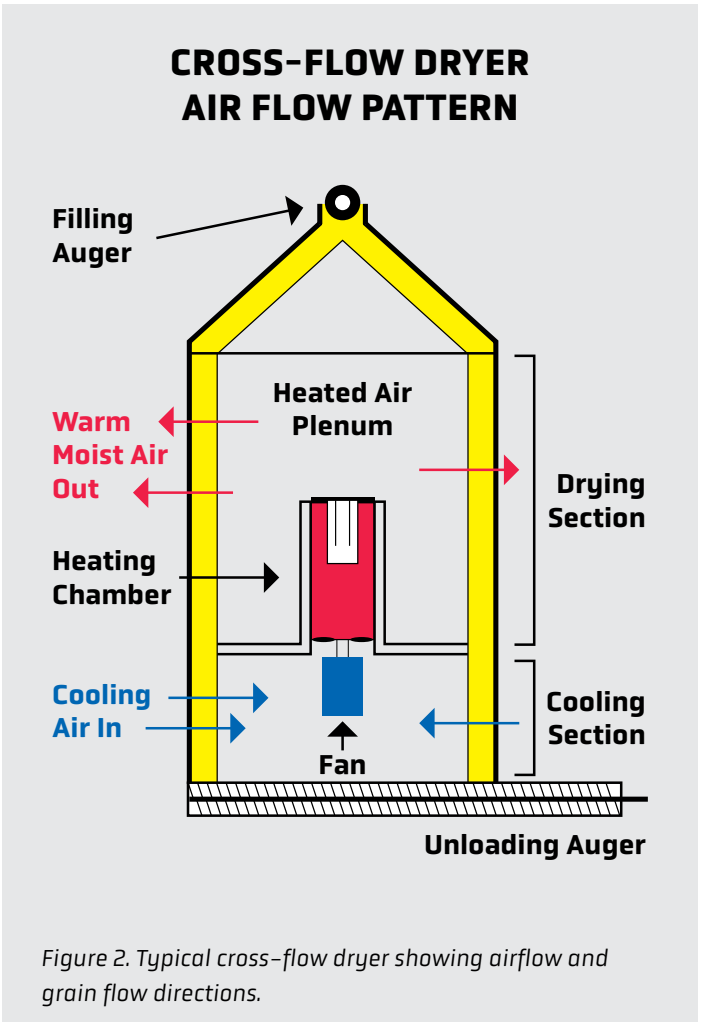


Figure 2. Typical cross-flow dryer showing airflow and grain flow directions.

Grain Columns

A typical tower dryer has a grain column thickness of 12.75", and the grain column in a portable is 14" thick. The GSI mixed flow has a 30" wide grain column, similar to other mixed flow dryers in the market. The air flow path through the grain is different in a mixed flow dryer, but the static pressures should be similar to a cross flow dryer. See Table 1 as a reference for the typical static pressure measurements expected for common commodities.

Commodity Type	Expected Static Pressure (in H20)
Corn	≈ 2
Soybeans	≈ 2
Canola	≈ 3.5
Wheat	≈ 3.5

Table 1. Expected static pressure in the mixed flow plenum for common grain types.

Drying Rate

The drying rate in a mixed flow dryer, how quickly grain is dried, is much slower than a cross-flow dryer. In a portable or tower dryer, the typical drying, or retention, time is ≈45 minutes in dry and cool and ≈30 minutes in all heat. The retention time in a mixed flow dryer is about 30% longer in dry and cool, or ≈60 minutes, and about 25% longer in all heat, or ≈38 minutes. These examples are valid for corn when taking out 5% moisture content (20% to 15%) with standard drying temperatures and conditions.

Drying rate is strongly correlated with airflow rate. The higher the airflow rate, the more quickly grain will dry. A typical measure of airflow rate is cubic feet of airflow per minute per bushel of grain in process [CFM/bu]. Though the airflow rate varies for each fan/dryer combination, mixed flow dryers have airflow rates of between 50CFM/bu and 60 CFM/bu compared to about 80 CFM/bu in a cross-flow dryer.

Drying and Holding Capacity

Because the mixed flow dryer has lower airflow rates, more grain needs to be in the drying process at any given time to achieve drying capacity.

For example, comparing ≈1,200 bph (20% to 15%) dryers in dry/cool operation, a 2318 portable and an MX1612, the portable dryer will have ≈870 bushels in process and the mixed flow dryer will have ≈1,100 bushels in the drying process.

WHY MIXED FLOW

Operational Efficiency

Mixed flow dryers are also called “screenless” dryers because they have no screens present in the system. Especially during cold-weather conditions, screens are a condensation point on the dryer and chaff and debris will stick to the screens. When screens get caked with debris, an operator will see drying capacity losses and a drop in fuel efficiency, and the user will have to shut the system down regularly to keep the screens clean.

The exhaust points of the mixed flow dryer are open to atmosphere through a large triangular opening. The large opening allows chaff and debris to leave the dryer without sticking in the exhaust path of the airflow, eliminating the need for in-season cleaning to maintain drying capacity and fuel efficiency.

Drying Flexibility

Because mixed flow dryers have no screened sections, they’re very flexible. Mixed flow dryers can dry multiple commodity types with no change-over or alternative selections required at time of order (0.055" perforated screens, for example). Small grains, like canola, can be dried in the exact same dryer as coarse grains like corn.

Fuel Efficiency

Fuel efficiency is top-of-mind for many customers, and mixed flow dryers are typically more fuel-efficient. Low air-flow rates typically result in improved fuel efficiency.

Grain Quality

Grain quality is directly impacted by drying rate. Generally, slower drying rates result in maximized grain quality. In most cases, farmers and dryer operators think of test-weight when they think of grain quality, but that’s only one measure. Depending on the end-use of the grain (ethanol, human consumption, etc.), grain quality might mean different things. In food-grade applications, high grain quality means limited stress cracks or heat damage to the grain as it’s dried. It’s critical to understand what measure of grain quality a customer is most concerned about when talking through dryer options.

Mixed flow dryers, thanks to long retention times and low airflow rates, typically result in maximized grain quality at the outlet of the dryer. It’s important to note all dryers will increase the grain test-weight, and the drying parameters of cross flow dryers and TopDry can be adjusted to achieve the critical end-use qualities.

Modular Design

A modular design results in a few key benefits. The mixed flow dryers are easily expandable so the dryer capacity can grow as the user’s needs change. They’re also relatively easy to build and require little in-field assembly.

Expansion

Mixed flow dryers can be expanded to (20) drying tiers, with no change to the structure of the dryer. The recommended foundations are designed to support the maximum-height mixed flow dryer in common conditions.

Example: A customer purchased an MX2416 and wants to add capacity. A single (4)-tier heating section could be added to the top to give additional drying capacity and convert the dryer to an MX2420. In another example, a customer who has purchased an MX3210 could add two (5)-tier sections, to make the dryer an MX3220.

THE GSI OFFERING

Load Equipment

A powered load auger provides level fill across the top of the dryer while minimizing the overall height of the system. The load auger and wet-bin are similar to the load auger used in portable dryers. When the dryer is equipped with a powered auger, a paddle-style tilt-switch triggers the request to fill the dryer with grain.

An optional Gravity fill is available and eliminates motors and mechanical systems at the top of the dryer. However, the gravity fill adds additional height to the dryer depending on the footprint of the system, see Table 2 for the additional height requirements. A taller dryer may require additional investment in material handling equipment. When gravity fill is selected, an optional catwalk can be included for service access.

Dryer Length	Added Height
16'	3' 10"
24'	6' 7"
32'	9' 5"

Table 2. Additional height above the standard auger top when gravity fill is included.

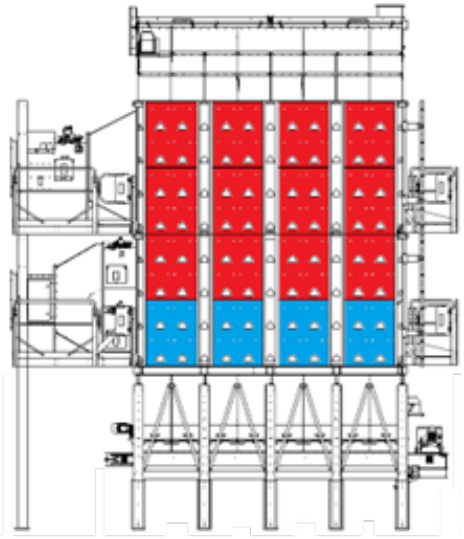


Figure 3. Side view of an MX1608 with (6) drying tiers in red and (2) cooling tiers in blue.

Drying and Cooling Sections

Each drying "tier" consists of a triangular duct on the inside of the dryer and a corresponding outlet duct opening to free atmosphere. Each tier is approximately 2' tall.

Drying sections are available in a several common sizes depending on dryer configuration. (4)-tier sections are configured in all-heat or dry/cool configurations, and (5)-tier sections are configured with a single fan-heater unit. Each section is assembled in the factory for quick installation in the field except for some wiring and pipe-train assembly where the modules connect.

Split plenum sections are required in specific applications to maximize drying capacity while still providing enough cooling capacity to bring the grain down to the necessary "cool" temperature. Dryers 14-tiers and shorter will have a split plenum section with the bottom two tiers used for cooling when operating in Dry/Cool. An example, MX1612 in Figure 4. A typical 12-tier dryer showing the split between drying and cooling sections with a split plenum bottom section. In Dry/Cool operation, the MX1612 will use ten tiers for drying (red) and two tiers for cooling (blue).

The number of tiers required to cool is typically between 20% and 30% of the dryer's height. For example, a 14-tier dryer will likely cool in the bottom four tiers, about 28% of the dryer. An 8-tier dryer will typically cool in the bottom two tiers, about 25% of the dryer. Tower dryers, for comparison, are split about 70% of the dryer for heated drying and 30% for vacuum cooling.

Each drying section is made of the same materials whether it's designed to be stacked near the bottom of the dryer or the top. Common modules eliminate the confusion of stacking order and makes on-site assembly more straightforward.

Depending on dryer size, drying sections will be stacked in a specific order, but 5-tier drying sections will be placed at the top in most configurations. See installation manuals on the GSI website for specific assembly guides.

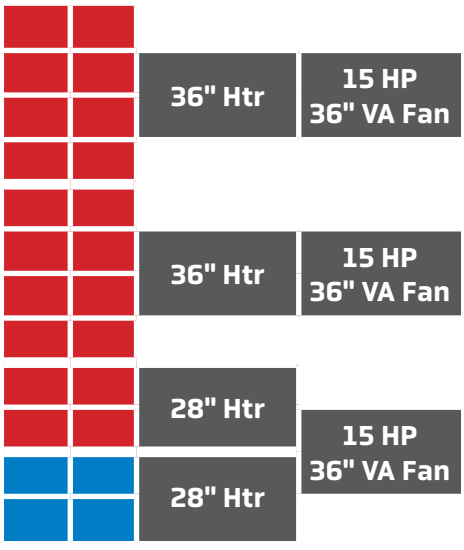


Figure 4. A typical 12-tier dryer showing the split between drying and cooling sections with split plenum bottom section.

Fan/Heater Assemblies

Centrifugal fans on the dryers are double-wheel, dual-inlet fans with aluminum wheels. Fan HP ratings for each dryer length are shown in Table 3. Note, this is not total required horsepower – it shows the HP ratings for the individual fans used. A 16' dryer will not use a fan motor bigger than 20 HP, for example.

Dryer Length	15	30	40	50
16'	X	X		
24'		X	X	
32'			X	X

Table 3. Possible fan HP for dryer length family.

Unload Section

At the bottom of the mixed flow sections, the dryer transitions down to a chain-conveyor unload with a single discharge point. A single 7" meter roll on each side is used to meter the flow of grain through the drying process. The metering system uses a 7" diameter aluminum extrusion with adjustable gates to manage the drying flow. The column width and geometry of the system require a different design than the standard 7" meter roll found in portable dryers. The meter rolls are independently driven by separate motors and are controlled from a single frequency drive. Each meter roll will spin at the same rate, and rotation is monitored on both meter rolls.

A chain conveyor is the standard, and only, unload option for conveying grain to a single point of discharge. Straight discharge extensions are available in 2', 4', 6', 8', and 10' lengths. For a given dryer footprint, the gear reducer and motor combination will be the same whether a discharge extension is included or not.

Static moisture samples are taken at the end of the conveyor to ensure consistent moisture readings and allow the user to take a calibration sample. The moisture sampler utilizes the same blower unit as portable dryers for sample clean-out.

ACCESSORIES

Access Catwalk

An available access catwalk can be mounted at the top of the dryer providing service and maintenance access. The catwalk is compatible with both the gravity fill and the load auger top. See Figure 5 for an image of how the catwalk and gravity fill system integrate. The catwalk will be accessed from both the fan access ladder on the front of the dryer and the plenum access ladder on the rear of the dryer.

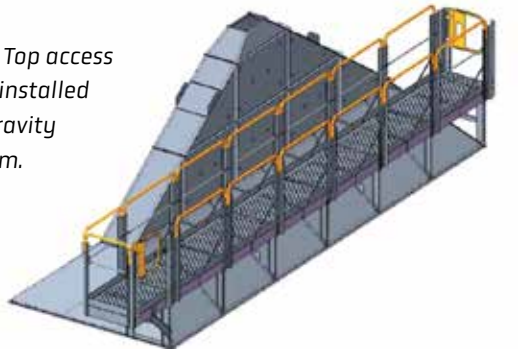


Figure 5. Top access catwalk installed with a gravity fill system.

Conveyor Extensions

Straight intermediate sections are available in 2' increments from 2' to 10' long to extend the unload conveyor beyond the typical discharge point. The extension will ship as an accessory and will require field installation. The extension will include all necessary parts including the chain, paddles, and pipe for the moisture sampler. No change to the conveyor motor or gear reducer is required for an extension.

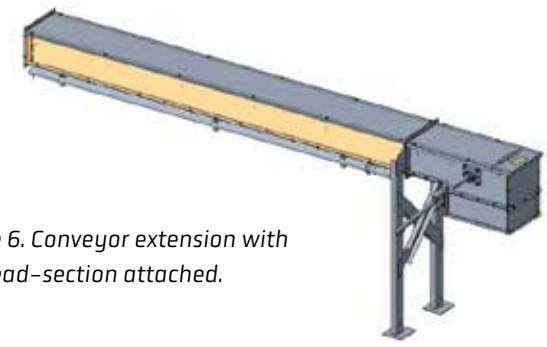


Figure 6. Conveyor extension with the head-section attached.

CERTIFICATIONS

CSA

Dryers can include options to carry the CSA mark of certification for use in Canada. All CSA listed mixed flow dryers carry the CSA mark from the factory – no field inspection is required. The listed products are certified to CSA 3.8:21.

IMPORTANT QUESTIONS

What is the expected harvest rate (in bushels per day)?

How many hours does the end-user intend on drying in a day?

GSI recommends 12- to 15-hours of drying per day during the harvest season.

How does the end-user expect harvest size to change in the next (5) years?

Harvest size may increase due to acquired acres or through yield improvements. Keep in mind the mixed flow dryers may be expanded in the future to add drying capacity, but sizing with some excess capacity from the beginning is the best path forward. Also remember dryer ratings are based on #2 yellow corn, drying rates in other commodities will vary.

Does the end-user need to dry and cool in the dryer, or will it be drying in all-heat?

If the user wants to dry in all-heat and the storage or cooling bin is over about 50,000 bushels, in-bin cooling becomes more difficult. If proper in-bin cooling isn't possible, GSI recommends cooling grain in the dryer before sending it to the storage bin.

Does the expected installation location have any footprint or height limitations?

If height limitations exist, a longer, shorter dryer may be the best option. If the available footprint is limited, a taller dryer in a smaller footprint will likely be required.

Is the end-user (or surrounding neighbors) sensitive to debris and chaff being expelled from the dryer?

Because the exhaust of the mixed flow dryer is expelled to the atmosphere, mixed flow dryers release much debris.

SHIPPING, FIELD ASSEMBLY AND INSTALLATION

Shipping

Mixed flow dryers will ship as assembled modules from the factory. The load/unload of the dryer will ship as a single module from the factory, and each drying section will ship independent of the others. NOTE: A double-drop or "low-boy" trailer is required for shipping to eliminate the need for over-height permits. The maximum shipping height of the modules is 10' – 7'. Reference Table 5 for the nominal dimensions of the completed sections as they're shipped from the factory.

Maximum Shipping Dimensions	Model Family	Unload / Load Section	Drying Section
Heights		10' 7"	10' 4"
Width		8' 6"	8' 6"
Length	16'	20' 9"	27' 0"
	24'	28' 9"	35' 0"
	32'	36' 9"	43' 0"

Table 5. Typical dimensions for sections shipped from the factory.

Fuel Supply Guidance

Adequately sized supply lines need to be provided to ensure the dryer can operate at the maximum BTU. Table 6, below, provides minimum supply line sizes for selected maximum BTU. Each maximum BTU line corresponds with a supply line size, so an LP dryer with a 15mmBTU/Hr firing rate will need at least a 3/4" supply line. As another example, an LP dryer that has a combined maximum BTU of 22mmBTU/hr needs at least 1" feed line from the LP tank. Local site conditions, distance from the tank to the dryer, and other factors may dictate a larger supply line than what's shown. Keep in mind the max BTU includes all the burners operating at maximum capacity.

Max BTU (mmBTU/HR)	LP	Max BTU (mmBTU/HR)	NG
7.5	1/2"	3.5	1-1/2"
15	3/4"	7.5	2"`
27	1"	12	2-1/2"
40.5	1-1/4"	24	3"
		34	3-1/2"
		40.5	4"

Table 6. Recommended minimum fuel supply line for LP and NG dryers.

Foundation Recommendations

Foundation recommendations are provided for reference and cost estimation purposes. The recommended foundations are available on OneGSI, and they're designed for the maximum height dryer. Site–specific conditions and environmental loads should be considered in the final foundation design, and a foundation designed for the specific case should be obtained, if necessary.

Stacking Guidance

The estimated weight for each available section is shown in the assembly manual available on the grainsystems.com website. Each module has standard lifting points, and the dryer will have lifting brackets installed from the factory. The lifting brackets must be removed from the drying sections once the section is assembled to the dryer; the lifting brackets can be discarded once removed.

PRIMARY COMPETITION & COMPETITIVE ANALYSIS

Sukup

The Sukup offering is differentiated from other competitors in the market because of the screened cooling section in the bottom of the dryer. Mixed flow dryers are typically pressure-cooled which effectively cools the grain, but the heated air is exhausted into the environment. One of Sukup's key selling features is their ability to cool under a vacuum and recycle the heat from cooling grain back into the drying process to improve fuel efficiency.

Unload augers are standard on 16' and 24' models with an option to upgrade to a single-point unload drag conveyor. The drag conveyor is standard on the 32' models. A single meter-roll is used to meter the flow of the grain through the individual grain columns.

The cooling section of the Sukup dryer utilizes perforated screens, much like a portable dryer. Multiple perforation sizes are available, which means the dryer can only be set-up for a single commodity type – small grains or coarse grains.

The Sukup mixed flow dryer utilizes a backward curved centrifugal fan to draw air through the screens for cooling and to pressurize the lowest heat section. The backward-curved fans will look very similar to a standard centrifugal fan seen in a bin aeration application. The remaining fans utilize a forward-curve blower design.

QuadraTouch Pro™, a PLC based control, is standard on all Sukup dryers including the mixed flow.

To expand the Sukup mixed flow, the dryer must be specified as "expandable" from the point of order. When ordering a dryer for expansion, the cooling section height is increased to allow for adequate cooling capacity when drying capacity is increased. Heavier mixed flow drying tiers are also shipped for the bottom of the stack. When ordering an "expandable" dryer, a single 4-tier drying module can be added in the future. A "double expandable" dryer will support the addition of (2) 4-tier drying section.

When comparing the Sukup offering to other mixed flow dryers, ensure a good comparison is made. Since Sukup uses a screened cooling section, a 12-tier dryer from Sukup will not have the same drying capacity as a 12-tier dryer from another manufacturer in dry/cool because most manufacturers utilize at least (2) mixed flow tiers for cooling. Please also note the Sukup dryers cannot be operated in all-heat. For example, a Sukup TM1612 has 12 drying tiers. It's best to compare the capacity of an MX1614 when comparing side-by-side.

Sukup also has launched an all-heat mixed flow dryer. The all-heat mixed flow removes the screened cooling section, and the dryer appears to operate like a traditional all-heat mixed flow with centrifugal fans on the end of the drying sections. Based on the literature, an all-heat mixed flow from Sukup can be compared tier-for-tier to the GSI product. For example, an MX1612 can compare directly to a TB1612. Also in their literature, the offering seems to be limited to 16' and 24' models and relatively short drying heights (12-tiers).

PRIMARY COMPETITION & COMPETITIVE ANALYSIS

NECO

NECO provides two dryer options to the market. The Mixed Flow Grain Dryer and the K Series Grain dryer. Both products are typical mixed flow dryers with centrifugal fans on one end of the dryer.

Single-phase dryers come standard with frequency drives (VFD) on the blowers for managing airflow, and the VFDs are optional on three-phase applications. A key difference in the NECO dryer is in the cooling section. The bottom fan/heater unit can be adjusted in the field to adjust how much cooling is done in the dryer. With an air diverter in the transition section, an operator can cool in one, two, or three tiers depending on grain and environmental conditions.

NECO dryers use forward-curve centrifugal blowers which tend to stall at lower static pressures. This style fan is more typically suited to low air velocity, high air volume applications.

For unloading, an auger unload is the standard equipment with a drag conveyor as an option. At the unload, a VFD is standard when the drag conveyor option is selected, and it's optional for auger unloads. A frequency drive on the unload gives the operator some flexibility to slow down or speed up the unload equipment to match the drying capacity. A full unload may reduce the amount of handling damage during the unload part of the process.

Commander controls are the standard, PLC based control system on the NECO dryers and contain Dryer Master™ logic embedded in the software.

A pre-cleaner system is available to remove some chaff and other debris from the crop as it enters the dryer. The pre-cleaner consists of a small aspirator blower near the fill spout and a cyclone to separate the debris from the air stream. The pre-cleaner requires a gravity fill.

NECO K Series dryers are marketed as a compact, low-cost entry point to mixed flow dryers for smaller farm operations. The K Series dryers are single-fan systems, and have 12' long drying columns.

For both the K Series and the Mixed Flow line, the NECO models can be compared directly to the GSI models. For example, a NECO D16140 is a 16', 12-tier dryer. The capacity can be compared directly to the GSI MX1612.

When comparing the dry/cool capacities between the GSI an NECO models, keep in mind the NECO ratings will typically be for the *minimum* amount of cooling. In a 16-tier NECO dryer, the cooling is typically going to take place in the bottom two tiers of the dryer compared to cooling in the bottom four-tiers in the GSI. Keep in mind, minimum cooling *may* not be adequate cooling in all circumstances.

PRIMARY COMPETITION & COMPETITIVE ANALYSIS

Mathews Company (M-C)

M-C goes to market with (2) unique mixed flow dryer product lines. The Delta series is the traditional mixed flow dryer from M-C, and the Fusion is intended to be a lower priced alternative.

The Delta series dryers utilize mixed-flow centrifugal blowers (similar to the blowers used in tower dryers) to provide the drying and cooling air. The Delta series dryers can be operated in all-heat or dry/cool, depending on the specific application. They utilize a heat mixing chamber external to the dryer to give an even heat mix as the drying air enters the drying chamber. However, this limits flexibility because a dryer operator is managing only one plenum temperature.

Delta series dryers are available in 16', 24', and 32' lengths, and various combinations of drying tiers to achieve capacities from ≈700bph to ≈3,400 bph (20% to 15%, dry/cool). For comparison, the tier height of a Delta series dryer can be compared to the same tier-height of the GSI dryer. A D1200 can be compared to an MX2412. The Delta series dryer does have more holding capacity.

Accu-Dry moisture-based controls are available as an option on the Delta series dryers which includes DryerMaster hardware and software for moisture control. A drag conveyor is another option; an unload auger is the standard unload equipment.

In the Fusion series dryers, more traditional centrifugal fans with line burners are used to reduce cost. This gives some additional flexibility to the dryer operator to manage plenum temperatures independently in all-heat or dry/cool. When comparing a Fusion series dryer to a GSI Mixed Flow, the drying tiers can be compared one to one. An F480 Fusion dryer compares to an MX2408, for example. As with the Delta series, the holding capacity of an F480 will be slightly more than an MX2408.

A 10" unload conveyor appears to be the only unload option on the Fusion series dryers; no unload conveyor is listed in their literature.

On both the Delta and Fusion series dryers, M-C utilizes a tapered-duct in effort to even out the airflow through the grain from the inside to the outside of the column. Both series also utilize the Pinnacle 20|20 controls, a PLC based touchscreen system with side-by-side touchscreens for navigation.

PRIMARY COMPETITION & COMPETITIVE ANALYSIS

Grain Handler

Grain Handler dryers utilize a fan-under design, where the blowers are located underneath the drying column, and a line-burner running the length of the dryer. The fans are forward-curve centrifugal blowers mounted underneath the dryer. In this configuration, drying temperatures are managed with a single plenum temperature target and the heat distribution varies naturally with the hottest part of the dryer near the top of the plenum. Because of the dryer's architecture, the system operates only in dry & cool, and cannot operate in all-heat.

Grain Handler claims the ability to run a large dryer (5,000bph) on single phase power as a product differentiator.

Gravity fill is likely the most common configuration for Grain Handler dryers, but they do offer two different types of conveyor on the load side. A level drag and a scalper drag, to help spread fines and other debris through the system are optional. The leveling drag conveyor is the only option on dryers 40' and longer.

The unload of the Grain Handler dryer comes standard with twin drag conveyors underneath the metering system. This results in two discharge points, one for each grain column. An optional cross-auger or a 2-into-1 Y are available as add-ons to bring the grain to a single point for reclaim.

The standard Grain Handler controls are simplified temperature controls with automatic control of the plenum temperature. A modulating valve is used to control the plenum temperature, and a VFD with input from a temperature sensor is controlling the unload speed. The VFD controls the metering rolls and the unload conveyor to ensure the unload conveyor is running full. Dryer Master controls are available as an option with Grain Handler dryers.

Grain Handler offers some of the largest mixed flow dryers on the market with footprints from 8' long to 48' long and heights from 10-tiers (≈32') to 26-tiers (66') and listed dry & cool capacities up to ≈7,400 bph.

When comparing a GSI Mixed Flow to a Grain Handler, the tier heights can be considered equivalent. A GH3218 should be compared with a GSI MX3218. Fan horsepower in a Grain Handler dryer will often be less than the horsepower for a comparably sized GSI dryer. Remember, airflow is a significant factor in drying performance.

PRIMARY COMPETITION & COMPETITIVE ANALYSIS

Brock

Brock launched their mixed flow dryer, Vector late in 2023. It closely resembles traditional mixed flow dryers like NECO and utilizes end-mounted centrifugal fans to provide the process air. The fans are double wide, dual inlet blowers, and the dryer can be operated in all-heat or dry/cool modes. Brock utilizes a manual air-diverter to manage the change between all-heat and dry/cool.

On the fill side of the dryer, a leveling auger or gravity fill can be configured from the factory.

The Vector dryer utilizes the same EVENFLO unload conveyor as SuperB portable dryers. The EVENFLO conveyor eliminates the need for meter rolls by using the conveyor paddles to pull grain from the columns as they move through the unload section. The Vector has no rotating augers or metering rolls in the unload.

Brock's standard control option is their Intui-Dry (PLC based) system with the TrueGrain moisture sensor system. The TrueGrain moisture sampler launched in 2022 and meters grain through the moisture sensor at a slow rate between two sensing plates. It does not take a static sample, nor is there a location to collect a sample for calibration.

The Brock offering includes 16' and 24' footprint length models with tier-heights up to 20-tiers. Their literature lists drying capacities 785 bph to 2,900 bph (20% - 15%, dry and cool). Generally, the tier-heights of a Vector dryer will be comparable to the GSI offering. An MX1612 can be compared to a 1612 Vector dryer.

APPENDIX 1: DRYER MODEL NUMBER DETAIL

Part Number Reference

The standard GSI Mixed Flow Dryer part number is (13) characters long, and each character is meaningful. The different characters and their meaning is shown below.

Dryer Length

Indicates the footprint or model length of the dryer.

16: 16' footprint family
24: 24' footprint family
32: 32' footprint family

Tier Height

XX: Drying tiers

Minimum Value: 08
Maximum Value: 20

i.e. 08 = 8 tiers of drying capacity

Voltage

1: 220V, Single Phase
2: 230V, Three Phase
4: 460V, Three Phase
5: 575V, Three Phase
8: 208V, Three Phase

Fuel Type

B: Liq. Petroleum
F: Natural Gas

Load/Unload Auxiliary

A: 7.5 HP
B: 10 HP
C: 15 HP
S: No Auxiliary

Load End

F: Front (Fan End) Fill
R: Rear Fill
G: Gravity Fill

Discharge End

R: Rear Discharge

Fan Type

A: Vane-Axial Fans
C: Centrifugal Fans
V: VFD Centrifugal Fans

Dryer Type

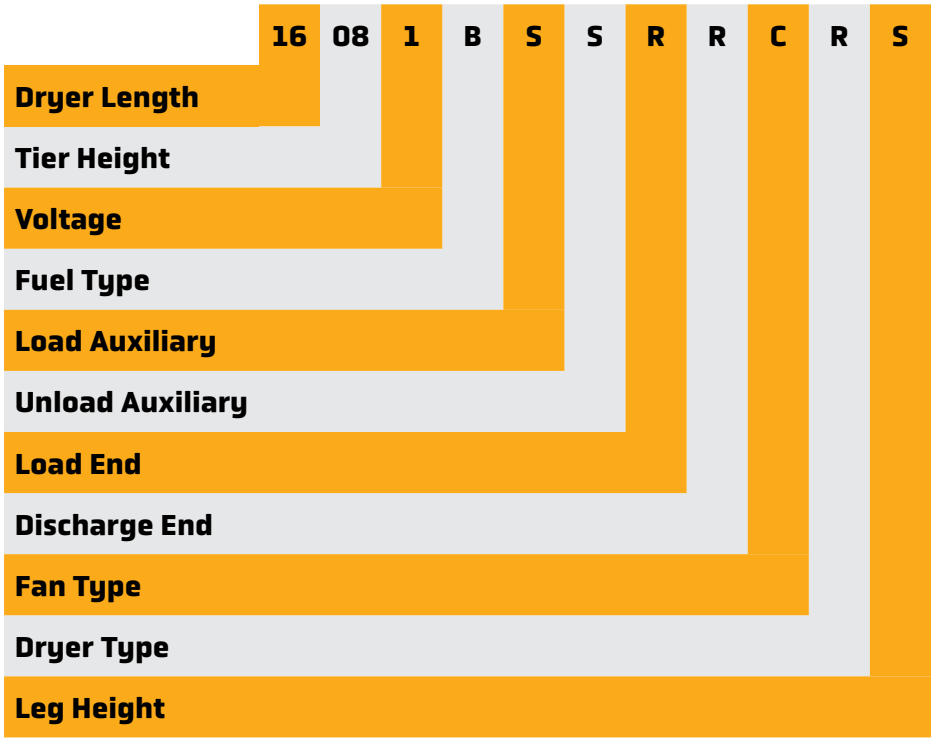
C: CSA Certified

R: Regular

Leg Height

S: 36" Legs
T: 48" Legs

MIXED FLOW DRYER PART NUMBER DETAIL



APPENDIX 2: 1600 SPECIFICATIONS

	1608	1610	1612	1614	1616	1618	1620
DRYING CAPACITY (BPH), SHELLED CORN [1]							
DRY AND COOL 30% TO 15%	340	460	470	700	750	800	910
DRY AND COOL 25% TO 15%	440	590	730	900	960	1,030	1,160
DRY AND COOL 20% TO 15%	710	960	1,180	1,450	1,550	1,670	1,890
FULL HEAT 30% TO 15% [2]	590	750	890	1,060	1,190	1,340	1,470
FULL HEAT 25% TO 15% [2]	70	900	1,060	1,270	1,430	1,600	1,770
FULL HEAT 20% TO 15% [2]	1,060	1,330	1,580	1,890	2,130	2,380	2,630
TOTAL HOLDING CAP. (AUGER FILL)	1,037	1,221	1,405	1,589	1,773	1,957	2,141
TOTAL HOLDING CAP. (GRAVITY FILL)	1,048	1,232	1,416	1,600	1,784	1,968	2,152
GRAIN COLUMN HOLDING CAP. (BU.)	736	920	1,104	1,288	1,472	1,656	1,840
TOP AUGER (LOADING)	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP
DISCHARGE CONVEYOR (UNLOADING)	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP
METER ROLL DRIVE	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP
INSTALLED LENGTH	27'9"	27'9"	27'9"	27'9"	27'9"	27'9"	27'9"
INSTALLED WIDTH	9'2"	9'2"	9'2"	9'2"	9'2"	9'2"	9'2"
INSTALLED HEIGHT (AUGER)	31'7"	35'7"	39'7"	43'7"	47'7"	51'7"	55'7"
INSTALLED HEIGHT (GRAVITY FILL)	35'5"	39'5"	43'5"	47'5"	51'5"	55'5"	59'5"
HEATERS (MAX BTU) (mmBTU)	10.5	13.4	15.7	18.7	21	23.9	26.2
FANS (AXIAL)	(2) 15 HP★	(2) 20 HP	(3) 15 HP★	(2) 20 HP	(4) 15 HP★	(2) 20 HP	(5) 15 HP★
				(1) 15 HP		(2) 15 HP	
FANS (CENTRIFUGAL)	(2) 15 HP★	(2) 30 HP	(3) 15 HP★	(2) 30 HP	(4) 15 HP★	(2) 30 HP	(5) 15 HP★
				(1) 15 HP		(2) 15 HP	
FULL LOAD AMPS (FAN(S), LOAD AUGER, DISCHARGE CONVEYOR) [3]							
SINGLE PHASE, 220 V.	190	N/A	260	N/A	330	N/A	445
THREE PHASE, 208 V.	132	163	179	211	226	259	273
THREE PHASE, 230 V.	119	147	162	191	205	234	247
THREE PHASE, 460 V.	60	74	81	96	102	117	124
THREE PHASE, 575 V.	48	59	65	77	82	94	99

1 *Capacities listed are wet bushels, for mature unfrozen #2 yellow shelled dent corn at listed moisture content and are estimates based on drying principles, field results and computer simulation. Variance may occur due to grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, adverse weather conditions, etc.*

2 *Grain discharged hot from the dryer will result in a final moisture content of 15% after cooling in the bin.*

3 *Full Load Amps: Fan(s) & Dryer Load & Unload motor name plate amperages + 5 for control & VFD load.*

★ *Available in single phase.*

2400 SPECIFICATIONS

	2408	2410	2412	2414	2416	2418	2420
DRYING CAPACITY (BPH), SHELLED CORN [1]							
DRY AND COOL 30% TO 15%	490	640	810	960	1,070	1,120	1,300
DRY AND COOL 25% TO 15%	630	820	1,040	1,230	1,360	1,440	1,660
DRY AND COOL 20% TO 15%	1,020	1,330	1,690	2,000	2,220	2,340	2,700
FULL HEAT 30% TO 15% [2]	850	1,040	1,270	1,460	1,730	1,880	2,110
FULL HEAT 25% TO 15% [2]	1,020	1,250	1,520	1,750	2,080	2,260	2,530
FULL HEAT 20% TO 15% [2]	1,510	1,850	2,260	2,610	3,090	3,360	3,770
TOTAL HOLDING CAP. (AUGER FILL)	1,564	1,840	2,116	2,392	2,668	2,944	3,220
TOTAL HOLDING CAP. (GRAVITY FILL)	1,611	1,887	2,163	2,439	2,715	2,991	3,267
GRAIN COLUMN HOLDING CAP. (BU.)	1,104	1,380	1,656	1,932	2,208	2,484	2,760
TOP AUGER (LOADING)	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP
DISCHARGE CONVEYOR (UNLOADING)	10 HP	10 HP	10 HP	10 HP	10 HP	10 HP	10 HP
METER ROLL DRIVE	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP
INSTALLED LENGTH	35'9"	35'9"	35'9"	35'9"	35'9"	35'9"	35'9"
INSTALLED WIDTH	9'2"	9'2"	9'2"	9'2"	9'2"	9'2"	9'2"
INSTALLED HEIGHT (AUGER)	31'7"	35'7"	39'7"	43'7"	47'7"	51'7"	55'7"
INSTALLED HEIGHT (GRAVITY FILL)	38'2"	42'2"	46'2"	50'2"	54'2"	58'2"	62'2"
HEATERS (MAX BTU) (mmBTU)	14.3	17.3	21.5	24.5	28.7	31.6	35.9
FANS (AXIAL)	(2) 25 HP	(2) 30 HP	(3) 25 HP	(2) 30 HP	(4) 25 HP	(2) 30 HP	(5) 25 HP
				(1) 25 HP		(2) 25 HP	
FANS (CENTRIFUGAL)	(2) 30 HP	(2) 40 HP	(3) 30 HP	(2) 40 HP	(4) 30 HP	(2) 40 HP	(5) 30 HP
				(1) 30 HP		(2) 30 HP	
FULL LOAD AMPS (FAN(S), LOAD AUGER, DISCHARGE CONVEYOR) [3]							
SINGLE PHASE, 220 V.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
THREE PHASE, 208 V.	202	230	273	301	344	373	415
THREE PHASE, 230 V.	183	208	247	272	311	337	375
THREE PHASE, 460 V.	92	104	124	136	156	169	188
THREE PHASE, 575 V.	74	84	99	109	124	135	150

1 *Capacities listed are wet bushels, for mature unfrozen #2 yellow shelled dent corn at listed moisture content and are estimates based on drying principles, field results and computer simulation. Variance may occur due to grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, adverse weather conditions, etc.*

2 *Grain discharged hot from the dryer will result in a final moisture content of 15% after cooling in the bin.*

3 *Full Load Amps: Fan(s) & Dryer Load & Unload motor name plate amperages + 5 for control & VFD load.*

3200 SPECIFICATIONS

	3208	3210	3212	3214	3216	3218	3220
DRYING CAPACITY (BPH), SHELLED CORN [1]							
DRY AND COOL 30% TO 15%	620	790	1,040	1,220	1,330	1,410	1,670
DRY AND COOL 25% TO 15%	800	1,020	1,330	1,560	1,710	1,800	2,130
DRY AND COOL 20% TO 15%	1,300	1,650	2,160	2,530	2,770	2,929	3,460
FULL HEAT 30% TO 15% [2]	1,080	1,290	1,620	1,830	2,170	2,370	2,700
FULL HEAT 25% TO 15% [2]	1,300	1,550	1,950	2,190	2,610	2,840	3,250
FULL HEAT 20% TO 15% [2]	1,930	2,300	2,900	3,260	3,890	4,230	4,830
TOTAL HOLDING CAP. (AUGER FILL)	2,092	2,460	2,828	3,196	3,564	3,932	4,300
TOTAL HOLDING CAP. (GRAVITY FILL)	2,198	2,566	2,934	3,302	3,670	4,038	4,406
GRAIN COLUMN HOLDING CAP. (BU.)	1,478	1,847	2,217	2,586	2,956	3,325	3,695
TOP AUGER (LOADING)	10 HP	10 HP	10 HP	10 HP	10 HP	10 HP	10 HP
DISCHARGE CONVEYOR (UNLOADING)	15 HP	15 HP	15 HP	15 HP	15 HP	15 HP	15 HP
METER ROLL DRIVE	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP	(2) 1/3 HP
INSTALLED LENGTH	43'9"	43'9"	43'9"	43'9"	43'9"	43'9"	43'9"
INSTALLED WIDTH	9'2"	9'2"	9'2"	9'2"	9'2"	9'2"	9'2"
INSTALLED HEIGHT (AUGER)	31'7"	35'7"	39'7"	43'7"	47'7"	51'7"	55'7"
INSTALLED HEIGHT (GRAVITY FILL)	41'7"	45'7"	49'7"	53'7"	57'7"	61'7"	65'7"
HEATERS (MAX BTU) (mmBTU)	17.6	19.9	26.3	28.6	35.1	37.4	43.9
FANS (AXIAL)	(2) 30 HP	(2) 40 HP	(3) 30 HP	(2) 40 HP	(4) 30 HP	(2) 40 HP	(5) 30 HP
				(1) 30 HP		(2) 30 HP	
FANS (CENTRIFUGAL)	(2) 40 HP	(2) 50 HP	(3) 40 HP	(2) 50HP	(4) 40 HP	(2) 50 HP	(5) 40 HP
				(1) 40 HP		(2) 40 HP	
FULL LOAD AMPS (FAN(S), LOAD AUGER, DISCHARGE CONVEYOR) [3]							
SINGLE PHASE, 220 V.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
THREE PHASE, 208 V.	252	307	335	390	418	472	500
THREE PHASE, 230 V.	228	278	303	353	378	427	452
THREE PHASE, 460 V.	114	139	152	177	190	214	226
THREE PHASE, 575 V.	92	112	122	142	152	171	181

1 *Capacities listed are wet bushels, for mature unfrozen #2 yellow shelled dent corn at listed moisture content and are estimates based on drying principles, field results and computer simulation. Variance may occur due to grain's physiological factors (kernel size, chemical composition, variety, maturity), excessive fines, adverse weather conditions, etc.*

2 *Grain discharged hot from the dryer will result in a final moisture content of 15% after cooling in the bin.*

3 *Full Load Amps: Fan(s) & Dryer Load & Unload motor name plate amperages + 5 for control & VFD load.*

GSI

MIXED FLOW
GRAIN DRYERS

PIG-021 / NOVEMBER 2024