



DEFENDER
FROST PROTECTION SOLUTIONS



Peace of mind in frost protection

Effective frost management will protect your investment from the damage caused by frost

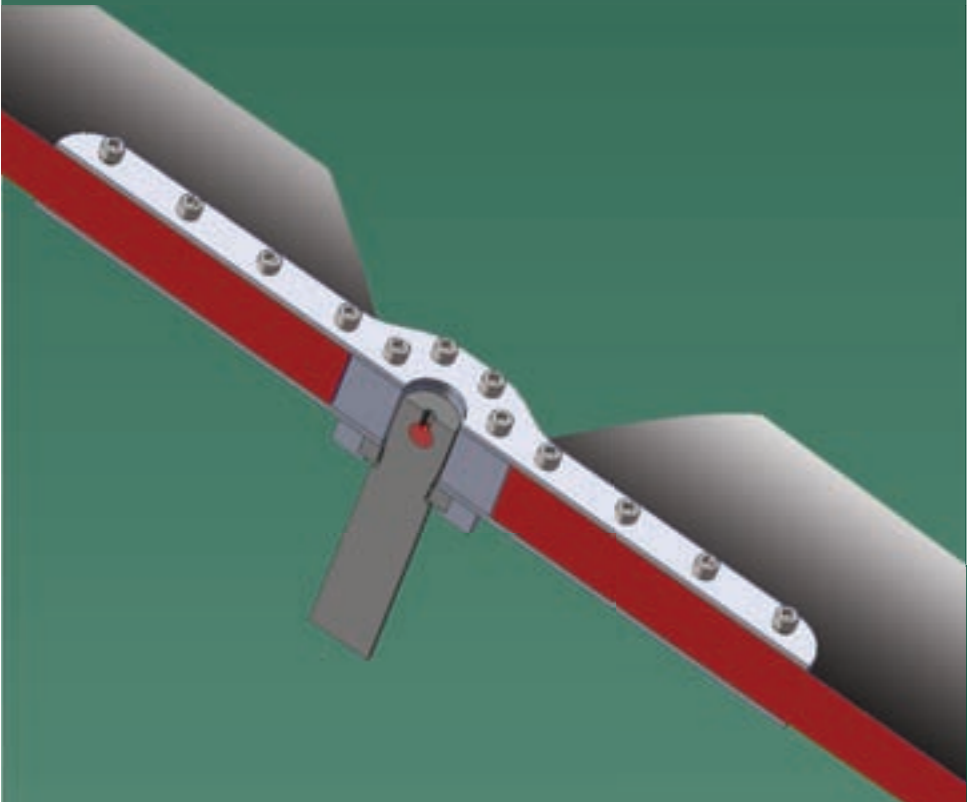
LOW NOISE, HIGH POWER

One of the key components that has made the Defender frost fan the 'machine of choice' for many growers since it was released to the market in 2009 is the composite fan blade assembly. The result of a 36 month research and development program focussed on designing a high performance fan with reduced noise emissions, the Defender has been a clear success.

Built from a combination of carbon fibre and other composites, and using modern techniques to ensure reliability and consistency is maintained to the highest level, the Defender fan is capable of producing over 7000nm of thrust, over 30% more than other brands of frost fans tested whilst producing less than 50dBA (Leq) when tested at a 300m radius.

The solid steel hub is mounted to the output shaft by mean of a 'teeter pin' which allows the blade assembly to pivot or 'teeter' by several degrees freely. When the upper gear drive precesses through 360 degrees under operation, the cross drift can place substantial stress loadings onto frost fans. The 'teetering' allows the fan to unload these stresses and eliminate any long term detrimental effect from them. A Teflon bush is incorporated into the hub design to provide a damper in the teetering action.

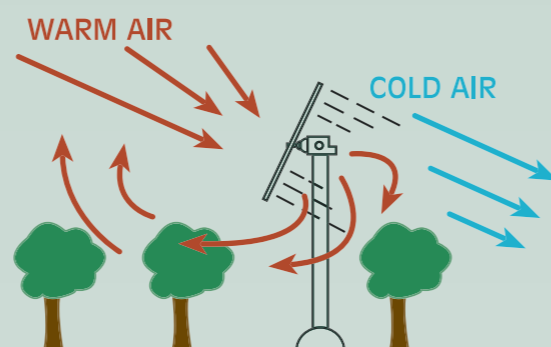
The fan blades are mounted to the hub assembly using laser cut steel plates that clamp the composite blades and the assembly is then bolted together with 24 high grade fasteners.



How does a frost fan work?

During daylight hours the sun radiates heats energy onto the earth and this is energy is absorbed. As the sun sets and the lower atmosphere begins to cool, the heat transfer process reverses and the stored heat is transferred into the surrounding air by convection.

When the air is essentially motionless (no or little wind), this more buoyant 'warmed' air, rises through the cooler layer and forms a layer, known as the inversion layer, situated above a layer of cooler air at ground level.



Frost fans operate by drawing down this warmer layer of air and mixing it with the cooled air at ground level to minimise of prevent the formation of frost conditions within the footprint of the machine.

The effective footprint of the machine will depend on a number of factors including the thrust of the fan, the ambient temperature of the air at ground level, the length or duration of the frost event and the strength or amount of heat stored in the inversion layer.

Questions & Answers

Q: HOW MUCH AREA DOES A DEFENDER FROST FAN COVER

A: Coverage will depend on a number of factors including ambient temperature, katabatic drift speed, presence and strength of inversion conditions and topographical features. A Defender frost fan will protect approximately 8-10 hectares depending on the factors above.

Q: DO TWO OR FOUR BLADE FANS WORK BETTER?

A: Whilst much is claimed about various blade designs, both two and four bladed fans will work for frost fighting. The Defender designers chose to maintain a two bladed design to allow the use of a 'teeter hub' to reduce operational stresses on the blade, it being impossible to utilise this feature on a four bladed design. Testing has proven that the 2 bladed Defender fan is producing substantially greater levels of thrust when compared with other two and four bladed designs.

Q: HOW DO WE DECIDE WHERE THE FAN SHOULD GO AND WHO INSTALLS IT?

A: When you purchase a Defender frost fan you will receive qualified and experienced advice from our product specialists to assist with ascertaining the ultimate situation for the fan. Once the site is determined, the installation process is fully undertaken by our team including excavation, installation of foundation and set-up of the Defender fan.

Q: DO YOU PROVIDE ASSISTANCE WITH BUILDING AND RESOURCE CONSENT REQUIREMENTS FROM LOCAL BODIES?

A: When you purchase a Defender frost fan, the application and procurement of building consents is fully managed on your behalf. If Resource consent is required, you can choose for us to fully manage this process on your behalf or to do so yourself with support from our team.

Q: HOW DO I KNOW HOW TO OPERATE MY DEFENDER FAN AND DOES THE AUTO START FUNCTION MEAN I CAN LEAVE IT TO OPERATE UNATTENDED?

A: You will receive full operator training on installation of the Defender and an instruction manual is also provided. The auto-start function is designed to allow a number of machines to start up concurrently under frost conditions, not to eliminate the need for personal onsite. We recommend that personnel that are trained in the operation of the fan are onsite at all time during the time your Defender frost fan is operating.

Q: SHOULD I USE DIESEL HEATERS WITH MY DEFENDER FROST FAN?

A: Diesel heaters have shown to work well in conjunction with frost fans, and provide a boost in available heat which can be critical in some frost event when the inversion layer is limited or in a long duration frost event. Testing indicates that 20-30 diesel heaters, when situated updrift or in a circle around a Defender frost fan, can add approximately 1°C across the footprint of the frost fan.

Q: HOW OFTEN SHOULD MY DEFENDER FROST FAN BE SERVICED?

A: Despite the fact that many frost fans only operate for limited hours each year, it is very important that the machine is serviced every year to prevent deterioration of lubricants and to ensure the machine is fully functional and ready to fight frost on your property.

Engine Control

Activates electronic throttling device after warm up period has elapsed to activate centrifugal clutch

Wireless temperature system allows probe to be placed within 100m of the windmachine



Computer controlled engine management system

Comprehensive yet simple and easy to use

Full auto-start capability with adjustment in start/stop temperatures adjustable in 0.1 degree points

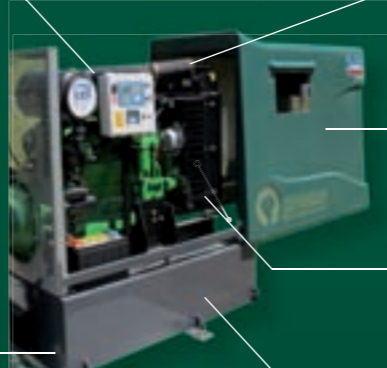
Power plant

High capacity exhaust muffler with stainless steel vertical exhaust pipe

Industrial duty air cleaner

John Deere 6068T engine (6.8lt turbocharged diesel producing 172 gross intermittent horsepower at 2400rpm)

Built in 'cold air chamber' in cabinet for engine to draw from



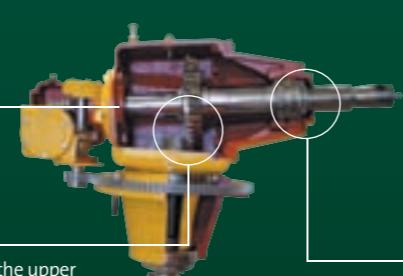
Fully enclosed engine cabinet which rolls smoothly to facilitate opening and closing

Factory high capacity radiator

Engine is fully rubber mounted to eliminate vibration

High capacity (540lt) Diesel tank in base

taper roller bearings for long life durability and reliability



Spiral bevel gears in the upper and lower gear drives are precision machined from nickel alloy steel, case hardened and lapped in sets

Double lip, spring loaded seals used on input and output shafts of gear drives



Towers and drivelines

FMR towers are constructed from spiral welded tube which is then blasted, before being coated with a high grade paint coating.

- '1410' series drivelines are a three piece unit with universal joints factory balanced to eliminate vibrations
- Centrifugal clutch rated to 250hp for reliable power transmission
- A hydraulic folding tower option is available which allows the wind machine to be lowered in the off-season

Gear drive

- Amarillo Gear Drives are designed and manufactured in accordance with American Gear Manufacturers Association (AGMA) standards for strength and durability
- Upper: Amarillo UD105 Gear Drive, AGMA rating of 226hp.
- Lower: Amarillo W85 Gear Drive, AGMA rating of 193hp
- Heavy duty machined castings ensure bearings and gears are correctly positioned under all load conditions.

Defender specification

Defender fan:	Composite 2 bladed fan assembly with 'teetering' hub design
Fan length:	6.36mt
Noise emissions:	+50 dBA (Leq) @ 300mt (operating at standard operating engine speed of 2050rpm)
Engine:	John Deere 6068T, 6 cylinder, turbocharged industrial diesel engine
Power rating:	172hp @2500rpm
Engine management system:	Customised Defender engine management system which monitors, logs and reports all key operating parameters
Auto start system:	Custom controller which monitors ambient temperature via a wireless sensor situated up to 100mt away (with radiation shield for accuracy) and activates start procedure once temperature reaches a pre-set alert level.
Battery charging:	Solar charging system fitted as standard feature
Wind speed protection:	Optional system which monitors wind speed and shuts down machine once wind speed exceeds 7km/hr
Engine cabinet:	Fully enclosed and locking composite engine hood which slides open for refuelling and servicing
Fuel tank:	540lt capacity in base of engine cabinet
Tower:	508mm diameter, spiral welded tube
Tower height:	10.4mt
Tower finish:	High grade paint coating in dark green for improved aesthetics
Driveline:	3 piece driveline, factory balanced with industrial universal joints for reliability
Upper Geardrive	Amarillo 2.5:1 ratio Geardrive with integrated precession drive
Lower Geardrive	Amarillo 2.25:1 ration Geardrive
Clutch	Heavy duty centrifugal clutch rated to 250hp



Harvest electronics weather stations

FMR Group is one of the largest resellers & installers of Harvest weather stations in New Zealand.

Our team can advise on a weather station that will provide you with the information you need to manage your operation in changing climates.

FMR Group Ltd is one of the few resellers that offers a full installation & backup service, ensuring you obtain optimum information from your investment.

WEATHER STATION BASE SYSTEM

- Solar powered base station
- Under normal conditions data recorded hourly
- Under frost conditions data recorded each minute
- Data stores in Harvest database
- Data processed and displayed online
- Growing Degree Days (GDD) and Richardson Chill Units (RCU) calculated and displayed online
- Alarms and passwords for frost, heat, or wind can be configured online

Vineyard heaters

- American design
- Optimised by Canterbury University
- Manufactured from electro galvanised steel for long life
- 40l tank for long burn time
- High efficiency return stack
- Approx. 45kw output
- Easy assembly