KRUGER

# KRUGER

## Agriculture Fan

# Why KRUGER?

KRUGER has been a leading innovator and manufacturer of residential, commercial and industrial fan application solutions across Asia since 1985. Today with a direct presence in over 18 regions throughout Asia; world class R&D and manufacturing facilities; KRUGER are able to offer their customers unparalleled service and support at a local level. Our customers place their trust in KRUGER.

## What is KRUGER Agriculture Fan?

The Kruger Agriculture Fan is designed to provide adequate air movement and ventilation for optimal environmental conditions in greenhouses.

## Why use KRUGER Agriculture Fan?

### GREENHOUSE

Ventilation in a greenhouse consists of replacing of the hot air inside the greenhouse with a high volume of cooler air from the outside to lower the temperature inside the greenhouse, at the same time changing the humidity in it.

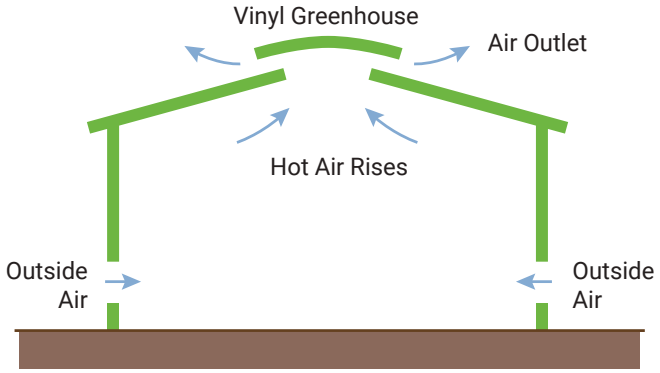



**Figure 1. Natural Ventilation**

**There are two ventilation systems that can be adopted:**

### 1. NATURAL VENTILATION (in Greenhouse)

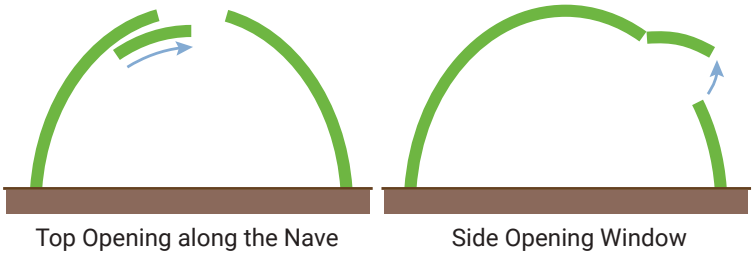



**Figure 2. Local with Exfiltrations**

Opening of at least 15-20% of the covered area, to obtain good air quality.

Common problem with natural ventilation
1. Difficult to know the air change achieved.
2. Impossible to regulate the speed of the airflow on the plants.

## 2. SIMPLE MECHANICAL VENTILATION

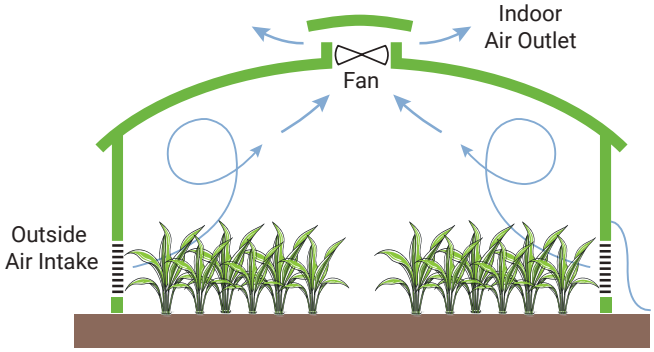



**Figure 3. Simple Mechanical Ventilation (Wide Warehouses)**

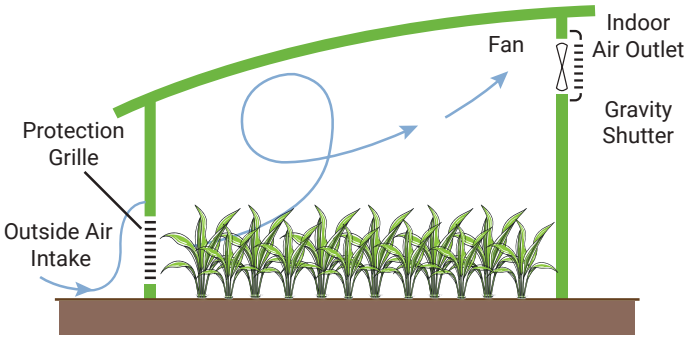



**Figure 4. Simple Mechanical Ventilation (Narrow Buildings)**

In agriculture work, it is important to be able to react quickly at any time to cope with the instantaneous change in weather. Therefore, an automatic system equipped with rain and wind sensors will help to provide a quick response in this case.

Mechanical ventilation consists of renewing the air with the installation of agriculture fans placed on the roof or on the upper part (at one side) of the building, depending on the building's width. The outside air intakes are normally located at the lower part of the wall opposite the fans, or on both sides of the wall if the discharge is central (see Figure 3.)

**The air change per hour "N" that is assumed between 40 to 60, will indicate the necessary airflow.**

**Q total (m3/h) = room volume x N**
And the number of fans "n" will be:
**n = Q total / q (flow of a fan)**

We call it **"simple"**, as it is a very straightforward system where the air is transferred from the outside, "sweeping" the interior of the building before being exhausted by the fan(s). In principle, the minimum internal temperature is to be expected with this system is at least the same as the outside air temperature.

Fans shall be distributed along the length of the building, and gravity louvers shall be placed on the roof or one side, spaced 7 to 10 meters apart. In the case of fans installed at the side of the building, gravity shutters should be installed to avoid backdraft air when the equipment is stopped.

The air inlets will be protected, towards the outside with an anti-bird screen or grilles. Deflectors should be provided towards the interior to avoid incoming outside air directly blowing on the nearby plants.

The electrical connection of the fans will be done through speed regulators that will allow obtaining different ventilation modes according to the needs.

# FARMS

Emissions (gases) produced by animals in an enclosure are detrimental to the health of the animals.

To maintain optimal environmental conditions, it is necessary to extract these gases to ensure they are not exceeding the indicated levels, by replacing them with new air.

**Ventilation in Winter:** ventilation must be kept to a minimum to ensure healthy conditions in the farm.

**Ventilation in Summer:** to evacuate excess heat, significant amounts of air must be extracted and renewed to remove air that is harmful to animals.

# VENTILATION SYSTEM

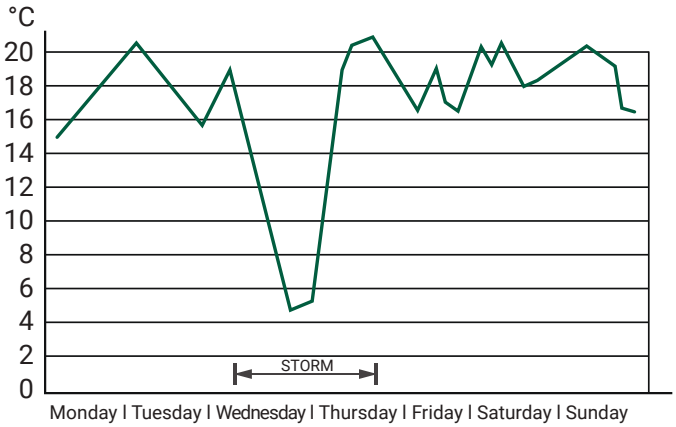



**Figure 5.**

## 1. NATURAL VENTILATION

As shown in Figure 5, it is difficult to respond quickly to sudden changes in temperature, due to the fact that with natural ventilation it is not possible to control the air ventilation rate and regulate the farm's interior environment.
Therefore mechanical ventilation (with fan) will be taken into consideration in this case.

Figure 5 is an example of a possible variation in the interior temperature of a poultry farm with natural ventilation, not automatically controlled, caused by a sudden weather disturbance.

## 2. MECHANIC VENTILATION

TWO Mechanical Ventilation Principles

a) The clean air from the top of the farm so that it undergoes certain heating before reaching the animals.

b) The air extraction from the bottom of the farm, after passing over the animal droppings and avoiding the air from spreading throughout the enclosure.

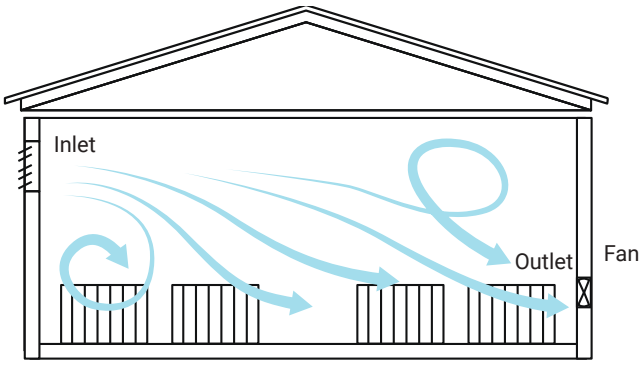



**Figure 6. Vacuum Ventilation**

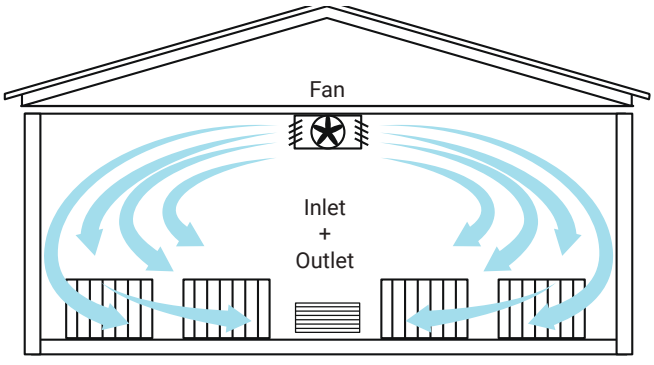



**Figure 7. Overpressure Ventilation**

- Very low air speed, at the level of the animals.
- Easier to blow air into the premises, preheated in winter when there is a flat ceiling.
- Better evacuation of harmful gases.
- Generally lower installation cost.
- Vacuum ventilation can be performed without the need to install ducts.

- Better ventilation air control.
- Independent from external environmental conditions, mainly with respect to the prevailing winds in the region.
- Require additional treatment on the ventilated air (heating, filtering, etc.).
- Easier to ensure a good distribution of air inside the enclosure.

## Tables 1 and 2 Ventilation requirement for various animals

| Type of Animal | Optimal Temperature Zones with Calm Air | Sensible Heat Output in W per Animal | | Release of Water Vapor in g/h per Animal | Desirable Ventilation Flow in m³/h | |
|---|---|---|---|---|---|---|
| | | | | | Winter | Summer |
| Milk Cow | -10 to + 30°C | 780 | | 680 | per animal | |
| | | | | | 120-160 | 400-800 |
| Veal | 8 to 16°C (first weeks) | 50 Kg | 120 | 120 | per 100 kg of live weight | |
| | | 150 Kg | 250 | 230 | 40-60 | 100-120 |
| Calf | -10 to +25°C | 300 Kg | 350 | 300 | 40-60 | 100-120 |
| | | 400 Kg | 380 | | | |
| Sheep + Lamb | 8 to +20°C | 85-90/ Sheep | | 60 | 100 | 300-400 |
| Pregnant Sheep | -7 to +20°C | 40-50/ 25 Kg Lamb | | 30 | | |
| Newborn Piglet | 30 to 40°C | | 3.8 | 12 | 40-60 | 100-120 |
| Cow | 21 to 28°C | 10 Kg | 25 | 35 | | |
| Weaned 4 weeks | 20 to 25°C | 20 Kg<br>90 Kg | 50 | 60 | | |
| Finishing Sow | 15 to 25°C | 150 Kg | 125 | 150 | | |
| Pregnant Sow | 12 to 20°C | | 220 | 180 | | |
| Rabbit (less than 8 days) | 30 to 32°C | 2 Kg | 6.2 | 4.6 | per kg of live weight | |
| Fattening or Adult Rabbit | 12 to 25°C | 3 Kg | 9.3 | 7.2 | - | 2-3 |
| Laying Hen | 6 to 24°C | 1.8 Kg | 9.2 | 3.3 | 1.5 | 6-9 |
| | | 2.3 Kg | 11 | 3.9 | | |
| Chicken | "35°C 13 to 20°C" | 0.04 Kg | 0.35 | 0.21 | 0.7 | 3-5 |
| Chick | | 0.45 Kg | 4.3 | 1.5 | | |
| + 4 weeks | | 1.22 Kg | 7 | 2.5 | | |

**Table. 1**

| Species | Age in Weeks | Ambient Temperature °C | Moisture Percentage | Ventilation m³/h | Illumination | |
|---|---|---|---|---|---|---|
| | | | | | Duration | Intensity/m² |
| Dove | Meat Production<br>Reproductor | 12-16 | 60-70% | 2 to 3 m³/h/Kg live weight | 12-15 h | 2 to 3 W |
| Goose | 1 | 20 | | | | |
| | ! | 17 | | | | |
| | " | 17 | | | | |
| | 4 | 15 | | | | |
| | 5 | 15 | | | | |
| | 6 | 15 | | | | |
| | 7 | 15 | | | | |
| | 8 | 15 | | | | |
| | Reproductor | | | | lighting plan | |
| | During the bait | 15-16 | 70-80% | | | |
| Duck | 1 | 18 | 75-70% | 4 to 10 m/h/Kg live weight | 24 h during the 3 days after 16h | 4 W |
| | ! | 18 | 70% | | | 4 W |
| | " | 17 | 70% | | | 3.5 W |
| | 4 | 17-16 | 70-68% | | | 3.5 W |
| | 5 | 16 | 70-68% | | | 3 W |
| | 6 | 15 | 70-68% | | | 2.5 W |
| | 7 | 15 | 70-68% | | | 2.5 W |
| | 8 | 15 | 70-68% | | | 2.5 W |
| | 9 to 16 | 15 | 70-68% | | | 2.5 W |
| Guineafowls | Reproductor | | | | lighting plan | |
| | 1 | 30 | 70-68% | 5 m/h/Kg of live weight and hour | 24 h 14 to 15 h in addition to a lamp during the period of darkness | 4 W |
| | ! | 25 | 70% | | | 4 W |
| | " | 19 | 70-68% | | | 3 W |
| | 4 | 18 | 68-65% | | | 3 W |
| | 5 | 18 | 65-55% | | | 3 W |
| | 6 | 18 | 65-55% | | | 3 W |
| | 7 | 18 | 65-55% | | | 3 W |
| | 8 | 18 | 65-55% | | | 3 W |
| | 9 to 16 | Never less than 16 | 65-55% | | | 3 W |
| | Reproductor | 20 | 55-60% | | lighting plan | |
| Quail | 1 | 22-24 | 70% | 4 to 5 m/h/Kg live weight | All day plus a lamp at night | 3 W |
| | ! | | | | | |
| | " | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |
| | 7 | | | | | |
| | Reproductor | 22-24 | 70% | 4 to 5 | 16 to 18 h | 5 W |
| Turkey | 1 | 24 | 78% | 6 m/h/Kg of weight & *&+ | 24 h | 10-16 W |
| | ! | !" | 65% | | 16 h | 3 W |
| | " | !! | 55-60% | | 16 h | 2 W |
| | 4 | 20 | 55-60% | | 16 h | 2 W |
| | 5 | 18 | 55-60% | | 16 h | 1.5 W |
| | 6 | | 55-60% | | | 0.5 W |
| | 7 | | | | and always a lamp during darkness | 0.5 W |
| | 8 | "from 16 to 18 Never below 14°C" | | | | 0.25 W |
| | 16 | | | | | 0.25 W |
| | 24 | | | | | 0.25 W |
| | Reproductor | 10-12 | 58-60% | | lighting plan | |

**Table. 2**

# Propeller Fan - KAEF Series

**KAEF 800, 900, 1000 and 1250**

Its compact design allows for easy handling and installation, making it ideal for simple and versatile applications.

## APPLICATIONS

- WAREHOUSES
  INDUSTRIAL
  BUILDINGS
- GREENHOUSES
- COMMERCIAL
  BUILDINGS
- INSTALLATIONS
  AGRICULTURAL

## FEATURES:

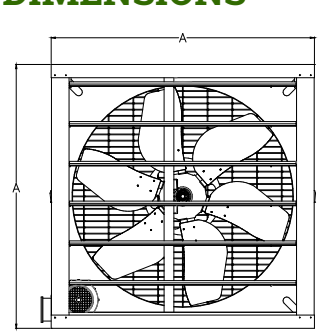
- Sturdy galvanized sheet steel construction.
- Inlet protection net to avoid foreign items entering the fan.
- Pulley and belt transmission allow low-speed operation, reducing the noise level.
- Aerodynamic profiled blades impeller is made of galvanized sheet steel to generate a high flow rate.
- Mechanical opening backdraft shutter avoiding backdraft air.
- Three-phase AC motor as standard and PM motor option
- Motor over Impeller.

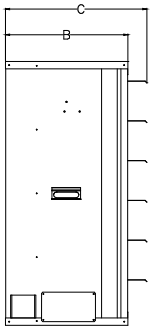
## TECHNICAL CHARACTERISTICS

| Model | Speed (RPM) | Installed Power (kW) | Voltage (V) | Hz | Max.Current (A) | Flow Rate at Free Discharge (CMH/CFM) | Sound Power Lw (A) (dB(A)) | Sound Pressure Lp (A) (dB(A))** |
|---|---|---|---|---|---|---|---|---|
| KAEF800 | 550 | 0.55 | 380 | 50 | 1.189 | 11291/6645 | 73 | 52 |
| KAEF900 | 500 | 0.55 | 380 | 50 | 1.356 | 14076/8284 | 75 | 54 |
| KAEF1000 | 490 | 0.75 | 380 | 50 | 1.578 | 21128/12435 | 79 | 58 |
| KAEF1250 | 540 | 2.20 | 380 | 50 | 4.729 | 40136/23623 | 88 | 67 |

** Inlet Lp(A) sound pressure levels at 3 m are measured at free discharge in spherical free field condition.
- Values shown are for inlet Lwi(A) sound power levels for installation type A: free inlet, free outlet. The A-weighted sound ratings shown have been calculated per AMCA International Standard 301.
- Performance shown is for installation type A - Free inlet, Free outlet. Performance ratings include the effects of inlet grille and backdraft damper. Speed (RPM) shown is nominal. Performance is based on actual speed of test.

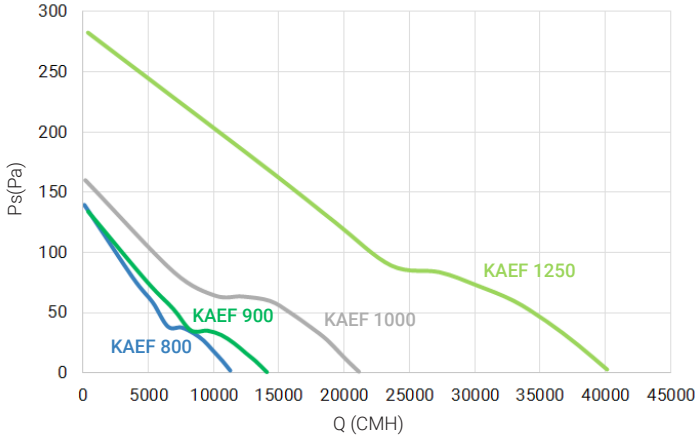
## DIMENSIONS




| | A | B | C | Weight (kg) |
|---|---|---|---|---|
| KAEF800 | 950 | 467 | 552 | 80 |
| KAEF900 | 1075 | 500 | 518 | 87 |
| KAEF1000 | 1175 | 550 | 619 | 100 |
| KAEF1250 | 1459 | 552 | 617 | 140 |

## CHARACTERISTIC CURVES



# Bellmouth Fan - KIBJ Series

**KIBJ 355, 500 and 630**

The compact bell mouth fan is suitable for installation on the ceiling of greenhouses and agricultural farms to provide air movement and induction.

## APPLICATIONS

GREENHOUSES

SWINE FARMS

COW FARMS

CORRALS

## FEATURES:

- Compact short housing made of galvanized sheet steel construction.
- Aerodynamic profiled blades impeller is made of galvanized sheet steel to generate a high flow rate.
- Inlet and Outlet protection net to avoid foreign items entering the fan.
- Direct coupling with single-phase AC motor.
- Motor over Impeller.

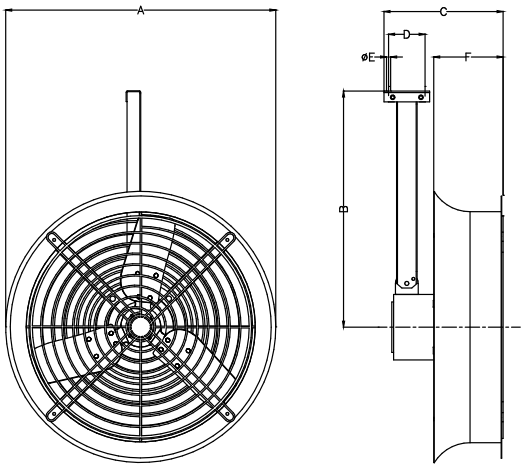
## TECHNICAL CHARACTERISTICS

| Model | Speed (RPM) | Installed power (kW) | Voltage (V) | Hz | Max.Current (A) | Flow (CMH/CFM) | Thrust (N) | Sound Power Lw (A) (dB(A)) | Sound Pressure Lp (A) (dB(A))** |
|---|---|---|---|---|---|---|---|---|---|
| KIBJ355 | 1440 | 0.07 | 230 | 50 | 0.777 | 2491/1466 | 5.80 | 72 | 51 |
| KIBJ500 | 1340 | 0.245 | 230 | 50 | 1.9 | 5796/3411 | 15.84 | 79 | 58 |
| KIBJ630 | 1330 | 0.35 | 230 | 50 | 2.623 | 9715/5718 | 28.01 | 88 | 67 |

** Inlet Lp(A) sound pressure levels at 3 m are measured at free discharge in spherical free field condition.
- Values shown are for inlet Lwi(A) sound power levels for installation type A: free inlet, free outlet. The A-weighted sound ratings shown have been calculated per AMCA International Standard 301.
- Performance shown is for installation type A - Free inlet, Free outlet. Performance ratings include the effects of inlet grille and backdraft damper. Speed (RPM) shown is nominal. Performance is based on actual speed of test.

## DIMENSIONS

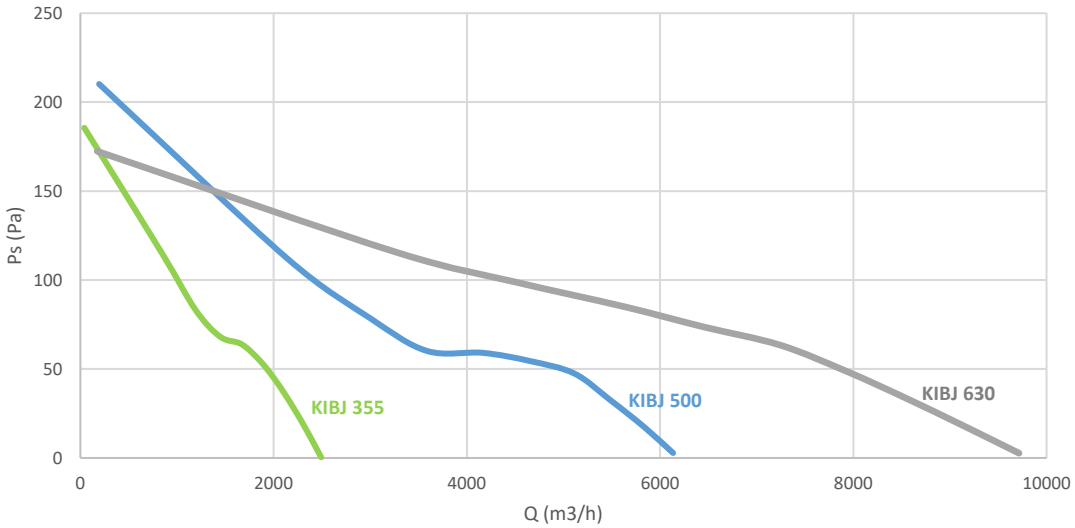
| | KIBJ355 | KIBJ500 | KIBJ630 |
|---|---|---|---|
| A | 455 | 592 | 720 |
| B | 442 | 516 | 589 |
| C | 252 | 261 | 256 |
| D | 80 | 80 | 80 |
| ΦE | 9 | 9 | 9 |
| F | 152 | 152 | 147 |
| Weight (kg) | 9 | 15 | 18 |



# Bellmouth Fan - KIBJ Series

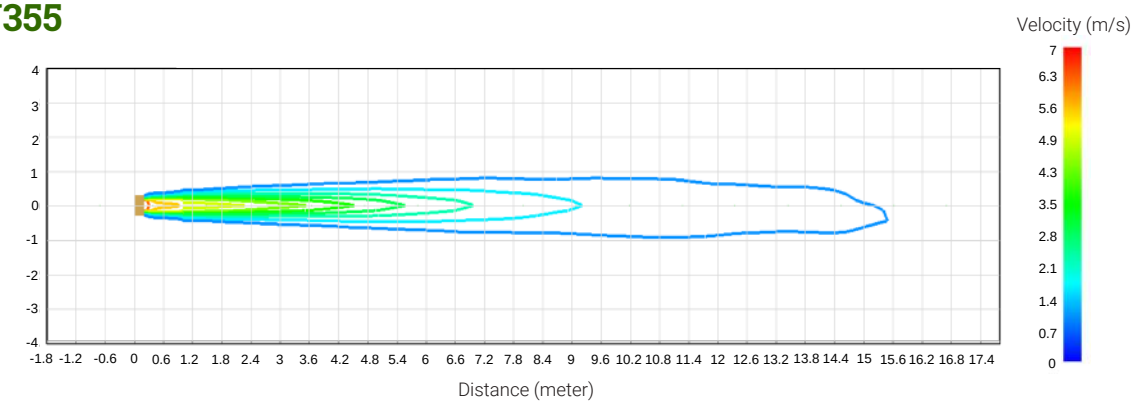
## CHARACTERISTIC CURVES

### Fan Curve

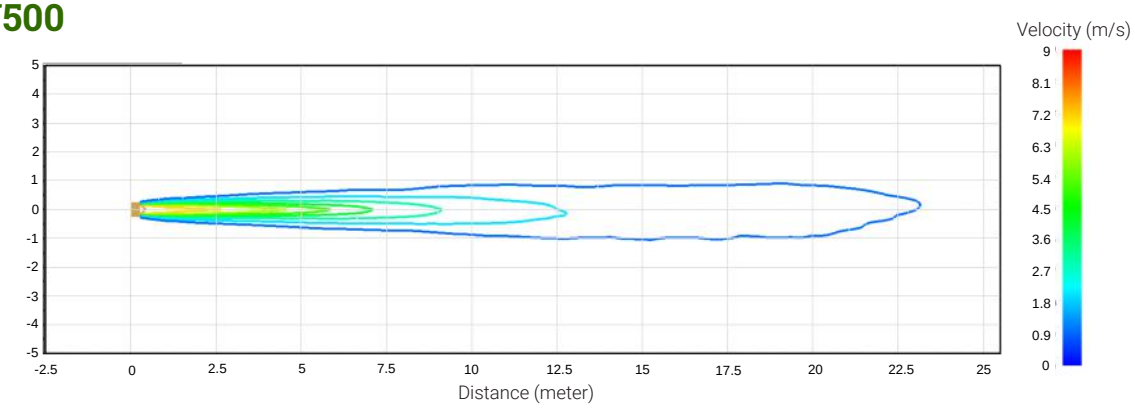



### Velocity Profile

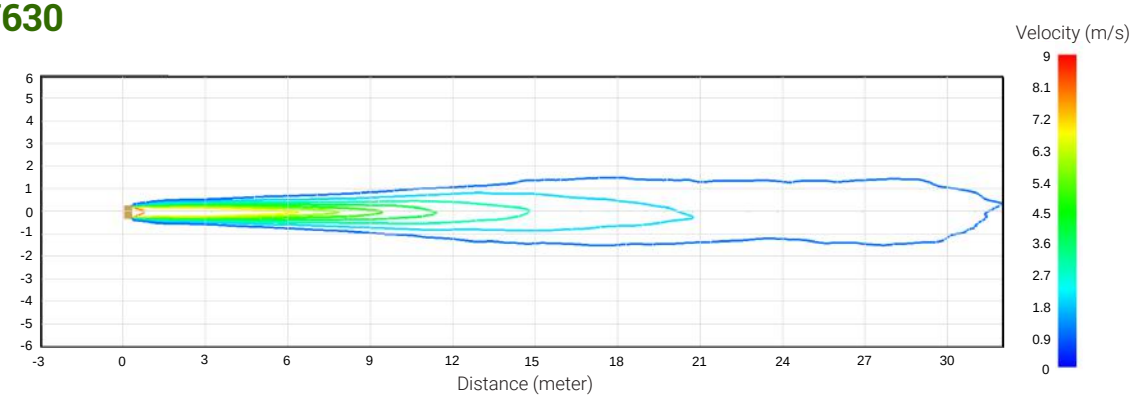
#### KIBJ355




#### KIBJ500




#### KIBJ630



# Axial Fan - KITJ Series

**KITJ 500**

The KITJ provides air recirculation that helps to homogenize the temperature and humidity conditions inside greenhouses.

## APPLICATIONS

GREENHOUSES

## FEATURES:

- Fan housing made of galvanized sheet steel construction.
- Aerodynamic profiled blades impeller is made of galvanized sheet steel to generate a high flow rate.
- Inlet and Outlet protection net to avoid foreign items entering the fan.
- Direct coupling with three-phase AC motor as standard and PM motor option is available upon request.
- Impeller over motor.

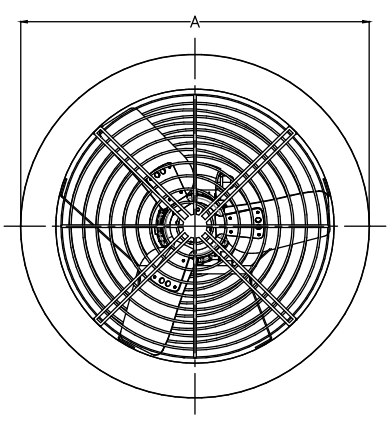
## TECHNICAL CHARACTERISTICS

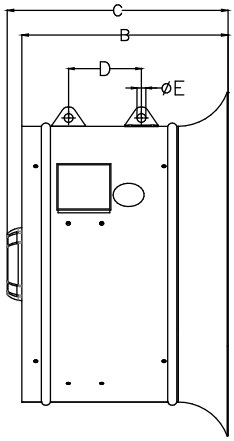
| Model | Speed (RPM) | Installed power (kW) | Voltage (V) | Hz | Max.Current (A) | Flow (CMH/CFM) | Thrust (N) | Sound Power Lw (A) (dB(A)) | Sound Pressure Lp (A) (dB(A))** |
|---|---|---|---|---|---|---|---|---|---|
| KITJ 500 | 1440 | 0.37 | 380 | 50 | 1.060 | 5184/3051 | 12.67 | 83 | 62 |

** Inlet Lp(A) sound pressure levels at 3 m are measured at free discharge in spherical free field condition.
- Values shown are for inlet Lwi(A) sound power levels for installation type A: free inlet, free outlet. The A-weighted sound ratings shown have been calculated per AMCA International Standard 301.
- Performance shown is for installation type A - Free inlet, Free outlet. Performance ratings include the effects of inlet grille and backdraft damper. Speed (RPM) shown is nominal. Performance is based on actual speed of test.

## DIMENSIONS

| A | B | C | D | ΦE | Weight (kg) |
|---|---|---|---|---|---|
| 626 | 370 | 397 | 131 | 16 | 23 |



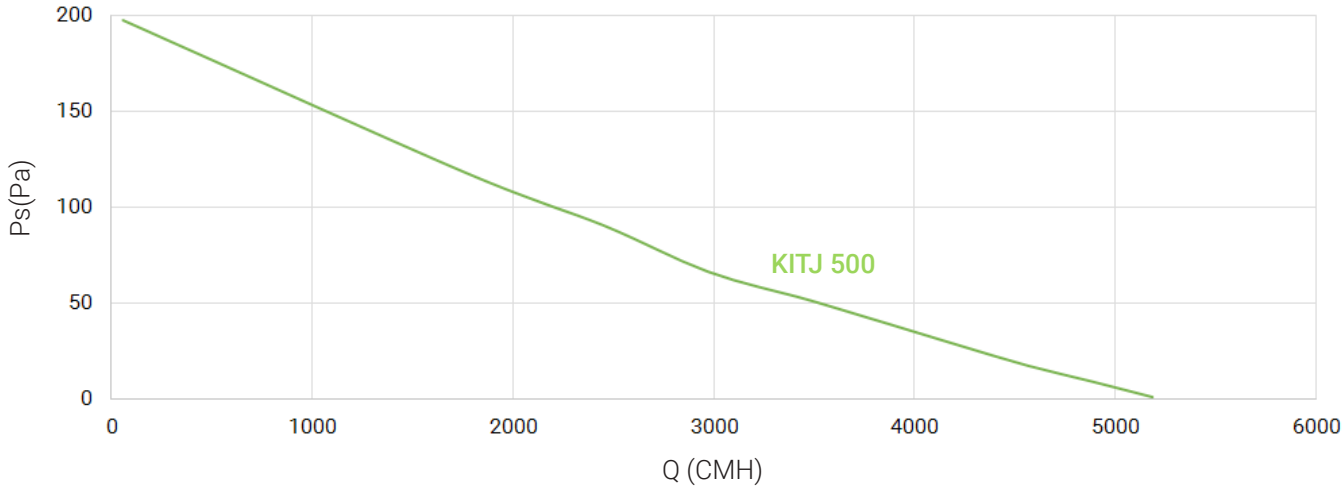



# Axial Fan - KITJ Series

## CHARACTERISTIC CURVES

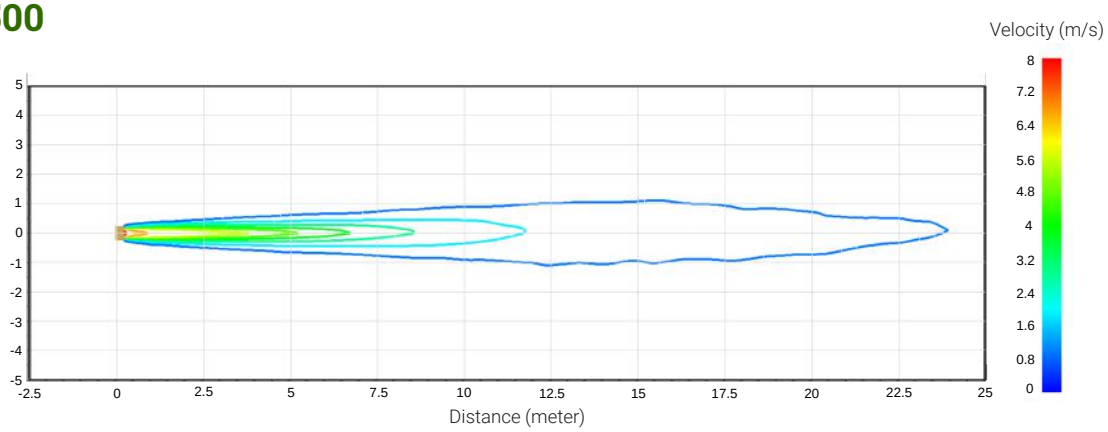
### Fan Curve

### KITJ 500




### Velocity Profile

### KITJ 500



KRUGER

# KRUGER Ventilation Group


**THAILAND (Regional HQ)**
KRUGER VENTILATION INDUSTRIES ASIA CO. LTD.
30/159 Moo 1, Sinsakorn Industrial Estate,
Chetsadawithi Road, Khok Kham Mueng, Samuthsakorn 74000, Thailand
Tel: +662 1054298 Fax: +662 0248256-9
Website: www.krugerfan.com

**THAILAND**
KRUGER VENTILATION IND. (THAILAND) CO. LTD.
30/105 Moo 1, Sinsakorn Industrial Estate,
Chetsadawithi Road, Khok Kham Mueng, Samuthsakorn 74000, Thailand
Tel: +662 1050399 Fax: +662 1050370-2
Email: mktg@kruger.co.th

**INDIA**
KRUGER VENTILATION INDUSTRIES (INDIA) PVT. LTD.
Kruger Centre, Mumbai-Nasik Highway,
Kalamgaon, Shahapur, Thane 421601, Maharashtra, India
Tel: +91 9960558899/9975577211
Email: sales@krugerindia.com

**MIDDLE EAST**
CONTACT: KRUGER VENTILATION INDUSTRIES (INDIA) PVT. LTD.
Tel: +91 9766323730 / + 91 9975577211
Email: rahul@krugerindia.com

**INDIA (NORTH)**
KRUGER VENTILATION INDUSTRIES (NORTH INDIA) PVT LTD
Village Rohad, Tehsil Bahadurgarh, Jhajjar, Haryana-124507
Tel. +91-9958991652/9958991660/8586966303
Fax +91-1276-278096
Email: sales.kni@krugerindia.com , service@krugerindia.com

**KOREA**
NEOMATE CO. LTD.
2-1010, Ace High Tech City B/D, 775 Gyeongin-ro,
Yeongdeungpo-gu, Seoul, Korea. Postal Code 07299
Tel: +82-2-2679-2052 Fax: +82-2-2679-2174
Email: y7890@neomate.co.kr

**MYANMAR**
KRUGER VENTILATION (MYANMAR) CO. LTD.
Room No. F21, Thiri Yadanar Whole Sale Market, (Htawunbe)
Toe Chae Ward, North Okkalapa Township, Yangon.
Tel: +959 763141081/2/3
Email: htoon@krugermm.com

**SINGAPORE**
KRUGER ENGINEERING PTE. LTD.
2 Venture Drive #20-23, Vision Exchange,
Singapore 608526.
Tel: +65 68631191 Fax: +65 68631151
Email: mktg@krugerfan.com

**AUSTRALIA**
S&P KRUGER AUSTRALIA PTY. LTD.
2 Cunningham St, Moorebank N.S.W. 2170
Tel: +61 2-98227747
Fax: +61 2-98227757
Email: info@sandpkruger.com.au

**INDONESIA**
P.T. KRUGER VENTILATION INDONESIA.
JL. Teuku Umar No.20,
Karawaci - Tangerang 15115, Indonesia
Tel: +62 21-5512288/5513557 Fax: +62 21-5513502
Email: mktg@krugerindo.co.id

**CHINA (GUANGZHOU)**
GUANGZHOU KRUGER VENTILATION CO. LTD.
No. 9 Huahui Road, Huashan, Huadu,
Guangzhou, P.R. China 510880
Tel: +86 20-66356635 Fax: +86 20-86786001/86786500
Email: gzkruger@krugergz.com

**CHINA (TIANJIN)**
TIANJIN KRUGER VENTILATION CO. LTD.
Jingjin Science and Technology Park
Wuqing District, Tianjin, China
Tel: +86 22-22143480/3481 Fax: +86 22-22143482
Email: krugertj@krugertj.com

**CHINA (SHANGHAI)**
Shanghai Kruger Ventilation Co.,Ltd.
No.500 Yuanguo Road, Anting,Jiading District,
Shanghai 201814, P.R. China
Tel: +86 21-69573266 Fax: +86 21-69573296
Email: shkruger@krugerchina.com

**CHINA (WUHAN)**
WUHAN KRUGER VENTILATION CO. LTD.
No. 805, Huian Ave, Dongxihu District, Wuhan, Hubei, P.R. China 430040
Tel: +86 27- 83248840/83060522/83097505
Fax: +86 27- 83261886
Email: whkruger@krugerwh.com

**HONG KONG**
KRUGER VENTILATION (HONG KONG) LIMITED.
Flat C, 9/F, Yeung Yiu Chung (No.8) Industrial Building,
20 Wang Hoi Road, Kowloon Bay, Kowloon, Hong Kong
Tel: +852 22469182 Fax: +852 22469187
Email: info@kruger.com.hk

**TAIPEI**
KRUGER VENTILATION (TAIWAN) CO. LTD.
No. 157, Ping-an Rd, Hengfeng Village,
Dayuan Shiang Taoyuan County 337, Taiwan
Tel: +886 3-3859119 Fax: +886 3-3859118
Email: sales@krugertwn.com.tw

**MALAYSIA**
KRUVENT INDUSTRIES (M) SDN. BHD.
Lot 850, Jalan Subang 7, Taman Perindustrian Subang,
47500, Subang Jaya, Selangor D.E.
Tel: +603 80743399 Fax: +603 80743388
Email: mktg@kruger.com.my

**PHILIPPINES**
KRUGER M & E INDUSTRIES CORP.
B3 Welborne Industrial Park
Bancal Carmona Cavite 4116, Philippines
Tel: +63-917-561-9088 / +63-917-596-7288
+63-917-712-8438 / +63-917-306-8288
Email: mktg@krugerph.net

**VIETNAM**
KRUGER VENTILATION INDUSTRIES (VIETNAM) CO. LTD.
Lot A7. 2-4, C2 Road, Thanh Thanh Cong IZ,
Trang Bang Dist. Tay Ninh Province, Vietnam
Tel: +84-276 3585200/01/02 Fax: +84-276 3585199
Email: mktg@krugervn.com



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**Kruger Ventilation Industries Asia Co., Ltd.**

30/159 Moo 1, Sinsakorn Industrial Estate
Chetsadawithi Road, Khok Kham Mueng,
Samuthsakorn 74000, Thailand
Tel: +662 1054298  Fax: +662 0248256-9
Website: www.krugerfan.com
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