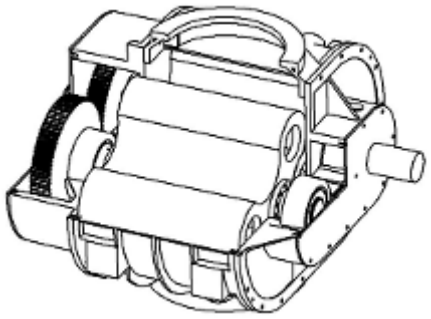
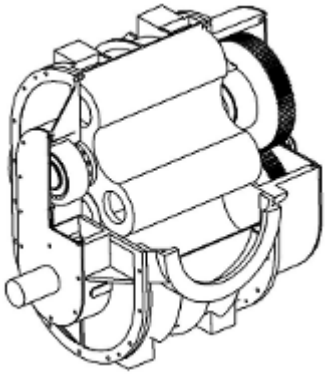
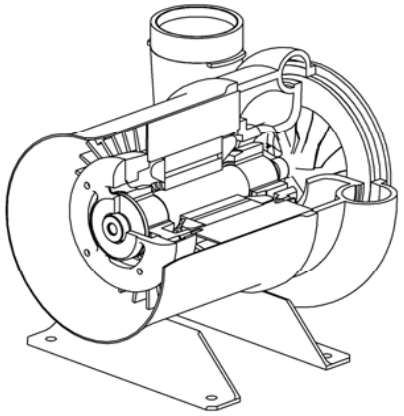
# Brief Introduction for KFM products







Thinking of human and nature together

(株)韓国流体機械

KOREA FLUID MACHINERY CO., LTD.

SINCE 1976

# Table of Contents

# Company Introduction

Thinking of human and nature together

(株)韓国流体機械

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SINCE 1976

# Company Introduction

**☐ Foundation** July 1 1976

**☐ Capacity** Roots Blower 1,000 sets / Month
Turbo Blower 50 sets / Month

**☐ President/CEO** Mr. Chun-Kyung Kim

**☐ Sales Network** Domestic : 18 Distributors
Overseas : 11 Distributors

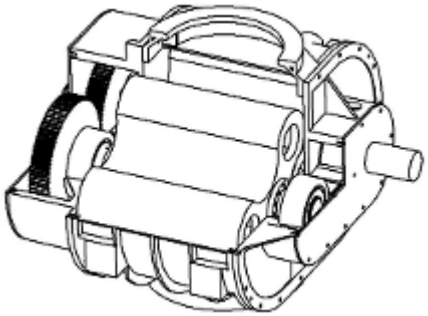
**☐ Major Customers** Top 100 Korean and global conglomerates and projects

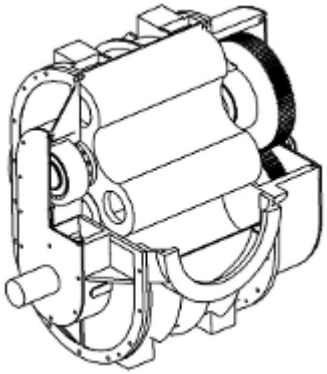
**☐ Brief History:**

| Yrs. | |
|---|---|
| 1976.07 | Founded in Busan, Korea |
| 1978.03 | Firstly localized 3 lobes roots blower in Korea |
| 1983.11 | Developed 3 lobes helical roots blower firstly in Korea |
| 1999.08 | IR 52 National Awards for Innovative Products |
| 2000.12 | Zero Debt management |
| 2002.11 | CE Certification for European market |
| 2005.10 | Developed KFMTB Turbo Blower series |
| 2006.10 | Developed KFMTB200HP |

- ❖ **No.1 Company specialized in Fluid Machinery in Korea**
- ❖ **Technology oriented Company with lots of patents related to Fluid Machinery**
- ❖ **Robust Company with "0" debt**

# Roots Blower





# Roots Blower

***KFM* Roots Blower with over 30 years experience and technology can be fulfilled in any sites with essential and core function and is best solution with reasonable price and function**

## Basic Concept in KFM Roots Blower

- Durability
- Simplest Structure
- Economic Feasibility

# Roots Blower

## Technical and Environmental aspects

- Oil Free(Not necessary to change and refuel oil)
- Reducing Noise, Vibration and Pulsation(3 Lobes Helical Rotor)
- Enabling Mass Production (simple concentric 3 lobes patented curves)
- Improving Efficiency with Tip Seal Technology(10 to 15%)

## Ease of use, Cost efficiency

- Easy assembling and disassembling with simple structure and low maintenance cost
- No Restriction in site condition(saving time and cost)
- One and Simple solution for Air Flow regardless direction
- Plug and Play
- Wide application(Gas transportation, Aeration and so on)

# Roots Blower

## Major Strength and Competitiveness

- 5 Times stronger than normal design for Pressure(normally 1 ㎏/㎠)
- International standard for Flange (10 ㎏/㎠)
- 50,000 hours  Radial bearing life span
- Durability of abrasion (material of rotor : Cast Iron or DCI(Ductile Cast Iron)

## Globally Proven products

- ODM manufacturer for Japanese Company for over 10 years
- Fortune 100s are using for their overseas projects
  (Mid East, Europe and Asia)

# Roots Blower (Brand new U Type)

- **Launching in 3rd quarter in 2013**

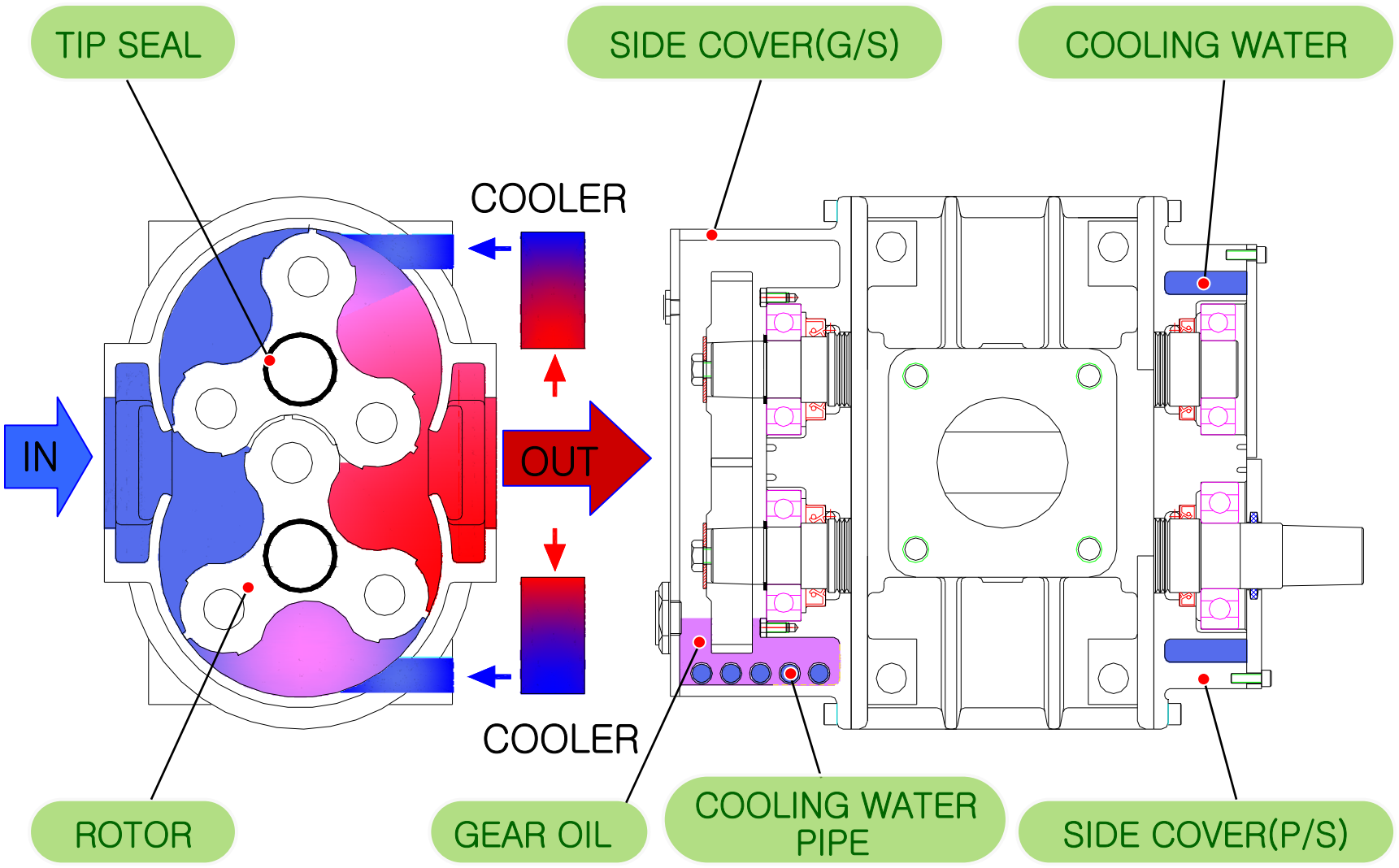
- **One solution for horizontal and vertical air flow condition**
- **One solution for various specification**
- **Components Unification and Standardization**

→ **Quick response and Convenient Maintenance for Customer**

- **Technology Innovation**

→ **Performance and Efficiency Improvement**

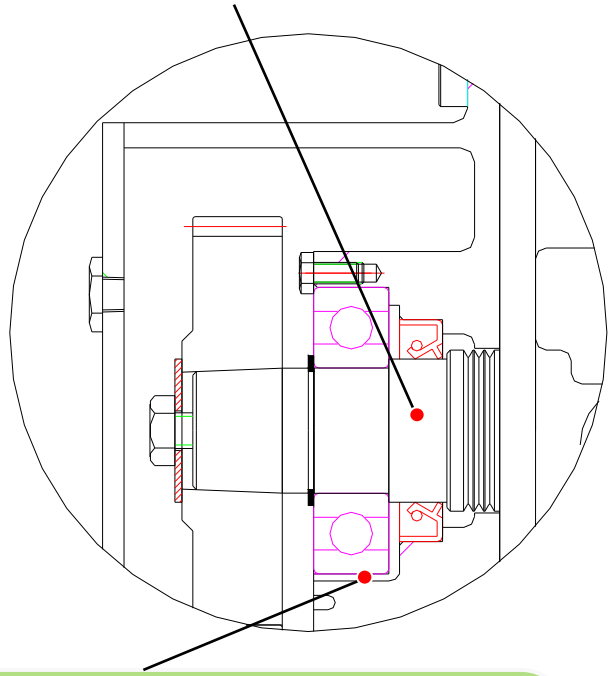
# Back Flow Cooling System(U TYPE)



# What is improved ?

## Oil Leak Removal

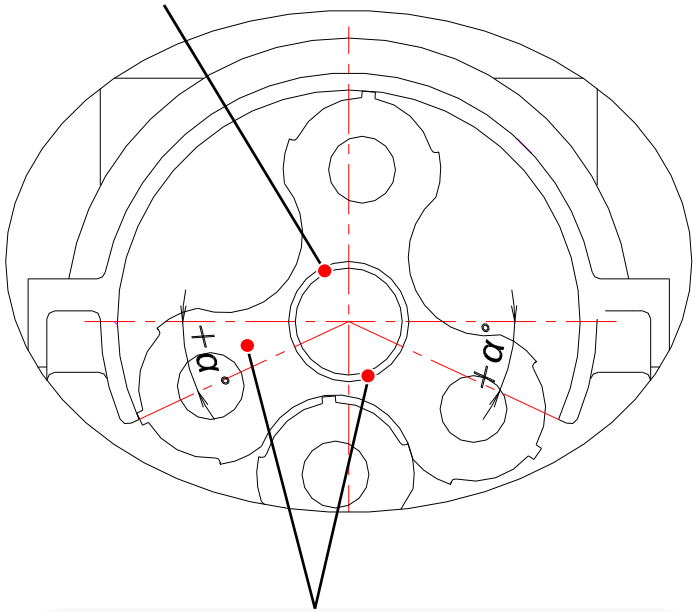
Improvement in shaft surface finishing



Special design for Oil Route

## Noise and Efficiency

TIP SEAL

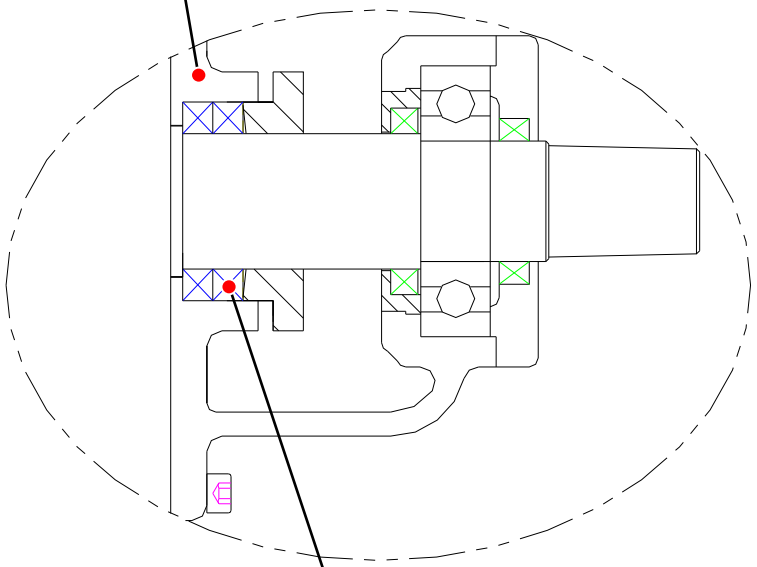



Pulsating Noise reduction and Efficiency improvement

# Diverse application in “SEALING”

## Sample 1

SIDE COVER

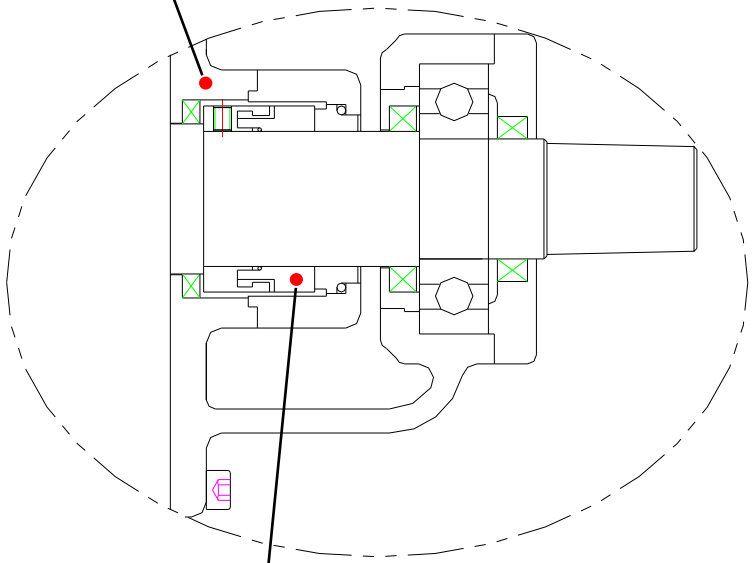


GLAND PACKING

LIP SEAL

## Sample 2

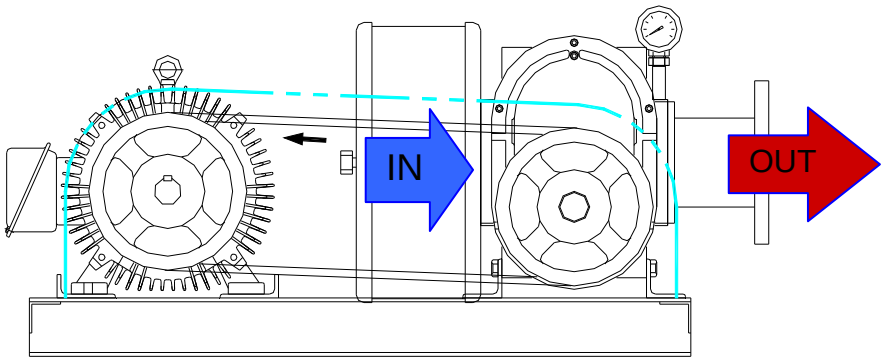
SIDE COVER

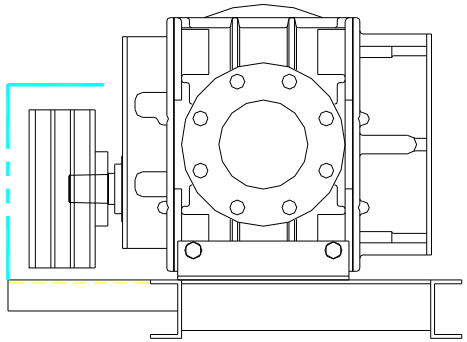


MECHANICAL SEAL

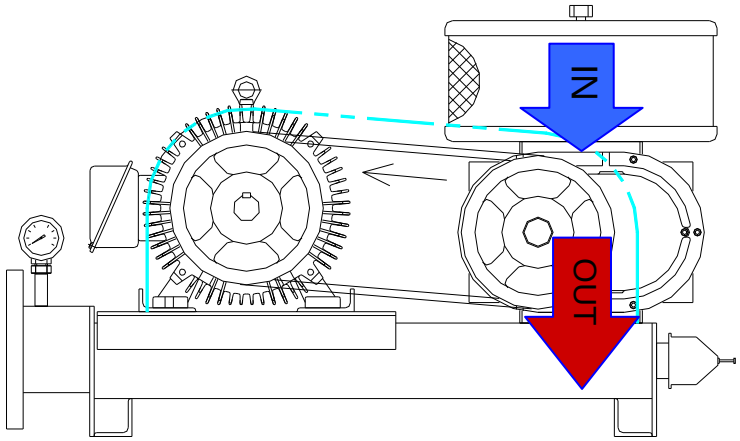
# Direction Free Installation

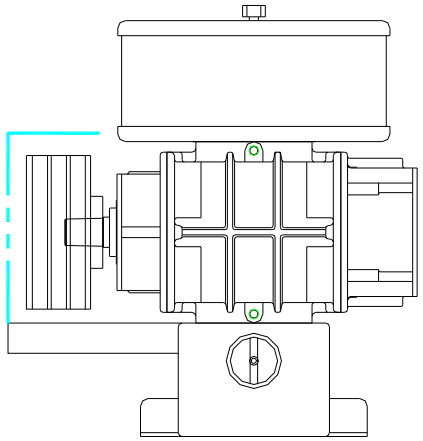
## Horizontal



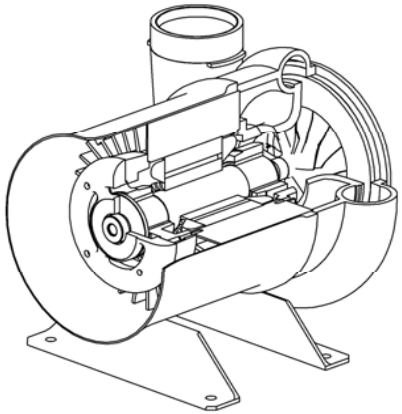



## Vertical



# Turbo Blower



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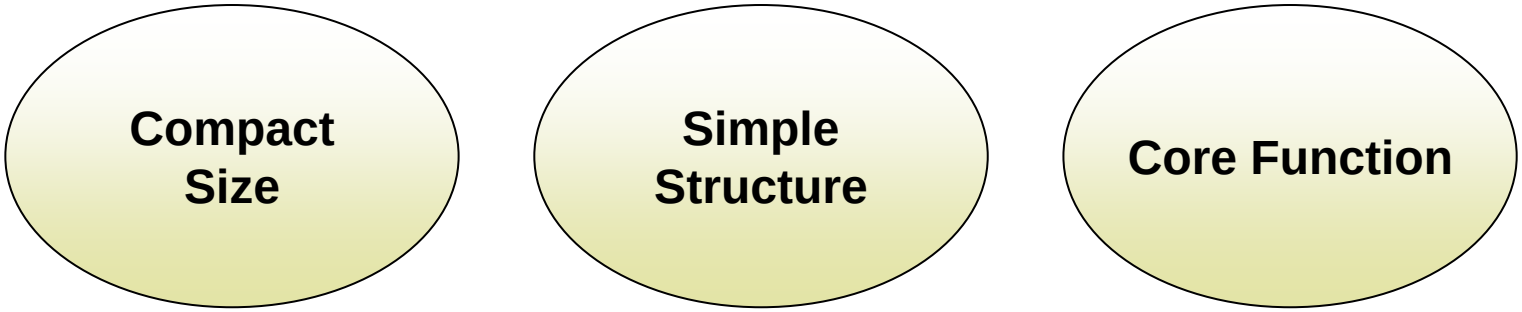
SINCE 1976

# Turbo Blower

***KFM Turbo Blower*** **with over 30 years experience and technology in Roots Blower can be fulfilled in any sites with essential and core function and is best solution with reasonable price and function.** ***KFM*** **is also a major player to expand the technology into other continent.**

- **Turbo Blower is created and commercialized in Korea early in 2000 by convergence in aeronautical, electrical, electronic and IT technology.**

## Basic Concepts in KFM Turbo Blower



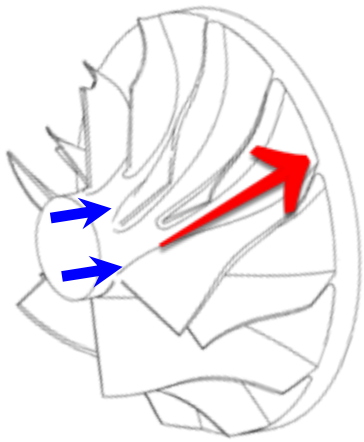
# Turbo Blower

## What is Turbo Blower?

It is a blowing system which generates compressed air with single stage structure and with which PMSM(Permanent Magnetic Synchronous Motor) and Centrifugal Impeller are directly coupled and controls air flow by inverter which controls “RPM”.

## Basic Principle

Inlet air gets high ‘speed energy’ by impeller and changed to ‘pressure energy’ passing volute casing and discharging.
Air flow is controlled by impeller’s speed,“RPM”.



# Components of Turbo Blower

## Major Components

| Components | Shapes | Briefs |
|---|---|---|
| Air foil Bearing (Patent registered) |  | - Developed by KFM's technology, Semi-permanent and replaceable bearing<br>- Dry, Non-contacting, Oil-free, Quiet, High Inertia Dynamic Load<br>- Efficient cooling structure does not raise axis temperature<br>- **50% higher load with self-cooling, longer lifespan by removal of bumper foil** |
| BLDC Motor |  | Synchronous type motor which uses permanent magnet to rotor and does vector control by inverter and has high efficiency than induction motor type. |

# Components of Turbo Blower

## Major Components

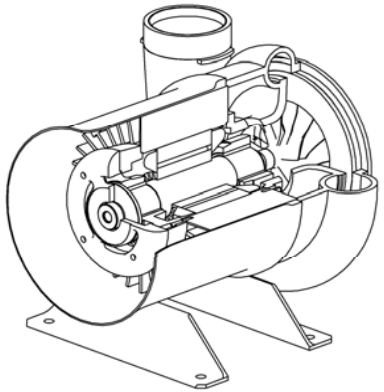
| Components | Shapes | Briefs |
|---|---|---|
| Centrifugal Impeller and Rotor |  | Impeller which is coupled with rotor generates air flow using centrifugal power.<br>Centrifugal Impeller generates high speed and volume air efficiently.<br>Produced by Lost wax precision casting |
| Inverter |  | Controls RPM of Blower by frequency modulation<br>- Up to 60,000rpm |

# Turbo Blower

## Characteristics(Technical and Environmental aspects)

◆ **Self Cooling BLDC Motor(Patent 10-0636002)**

- **error free high efficiency: minimize eddy current loss, iron loss and counter electro motive force**
- **Cooling system is Not necessary**
- **Steady Operation even in hot season**



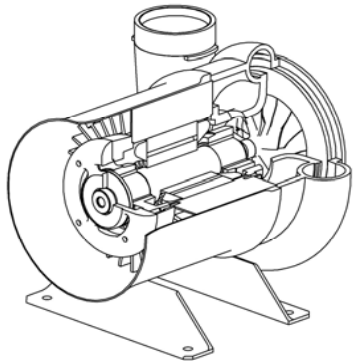
◆ **High Speed, Efficiency Turbo Design Technology(Patent)**

- **30,000~60,000 RPM**
- **Minimize diameter**
- **15%~20% energy efficiency**

◆ **Bump Type Air Foil Bearing(Patent 10-0648637)**

- **No Oil needed : No Environmental Contamination with waste oil**
- **Low Noise(under 85db) No Vibration : Extra silencer is not needed**
- **Quality Assurance : 20,000 on/off test**

# Turbo Blower



## Characteristics(Ease of Use, Cost Efficiency)

◆ **User Friendly**

- **Plug and Play(Not necessary operation training)**
- **Easy transfer between auto and manual mode**
- **Remote control by RS 422/485 telecommunication and interface built in**
- **Easy moving and rearrangement**

◆ **Low Installation cost**

- **Not necessary Foundation and anchoring**
- 40~60% cost saving on civil, construction, electrical and piping works

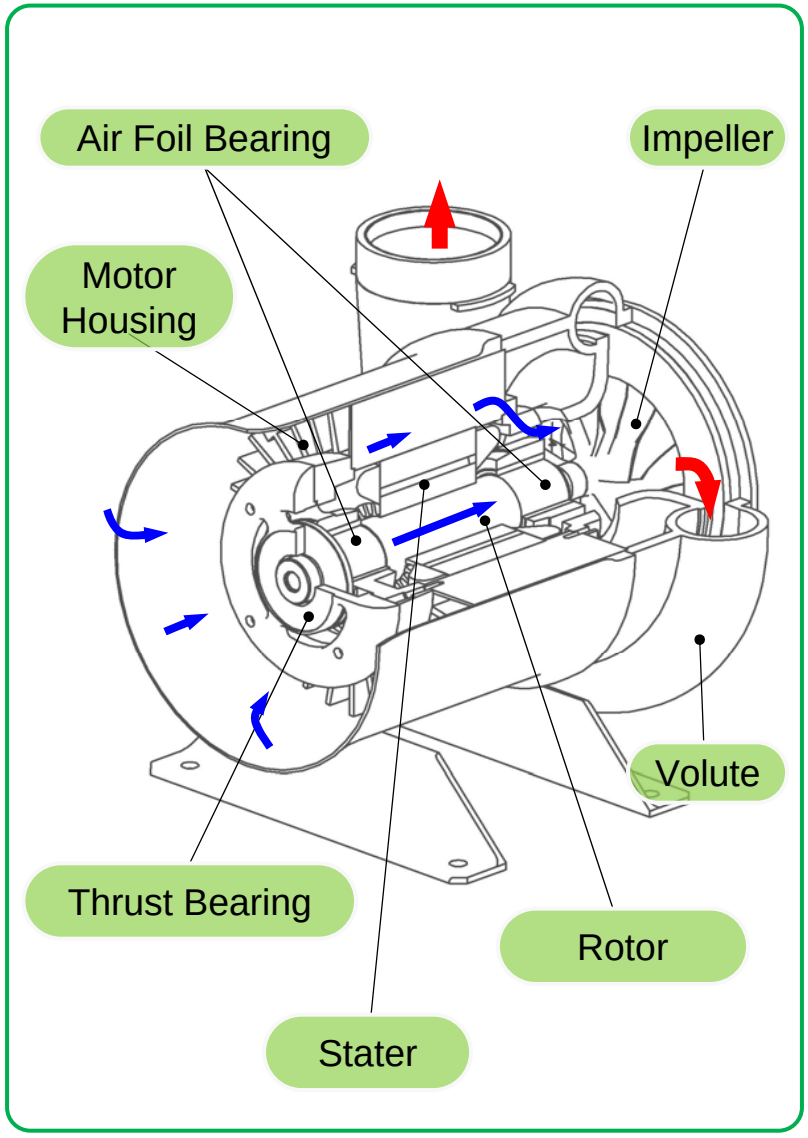
◆ **Small Space**

- **Efficient space management**

◆ **No Maintenance is needed**

- **No refuel oil and No need for consumables**

# Cross sectional view of CORE




Extra cooling fan is not need for motor cooling(self cooling by)

Unique Core part design to prevent from axial thrust(Patent)

Providing balancing at high speed

Axial cooling system for high speed rotor(Patent 10-0636002)

KFM technology and patented air foil bearing(patent 10-0648637)

- Quality assurance(over 20,000 on/off)

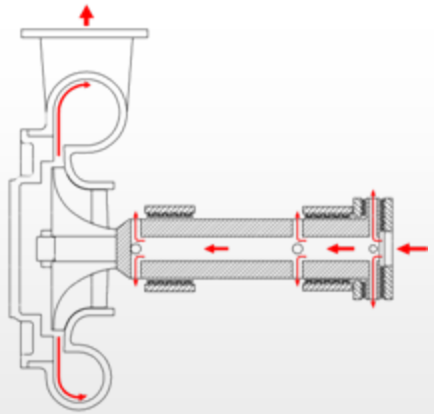
# Cooling System

## Simply cooling inverter and motor utilizing inlet air

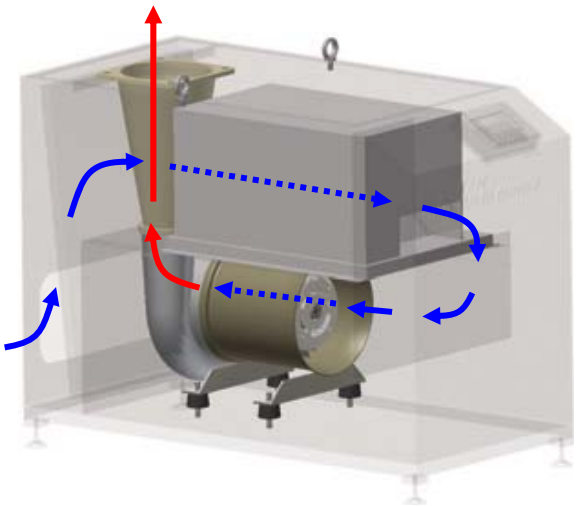
Not only for winding cooling for motor but also for rotor inside

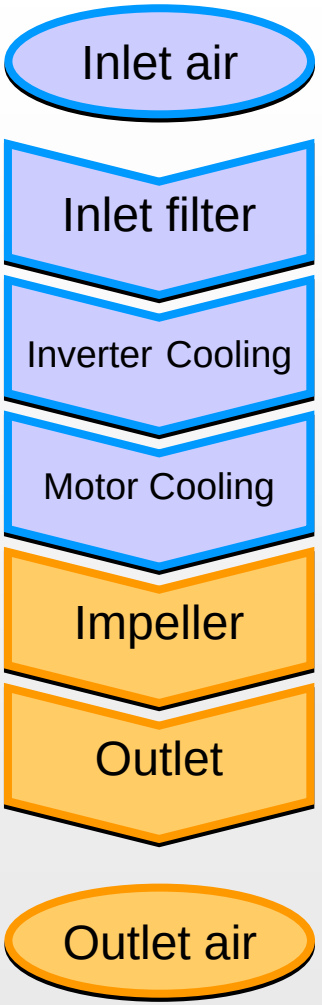
## No need extra cooling system

(1) Nothing for additional power loss
(2) Simple structure without cooling fan and water



Patent:10-0781127





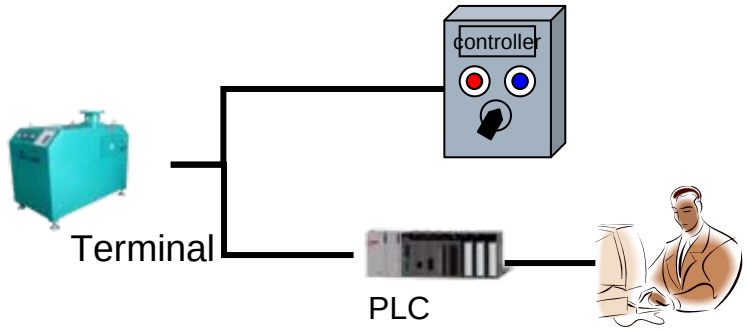
# Remote Control

## Providing customers(system) with remote control I/F

### Terminal

Remote control by control signal

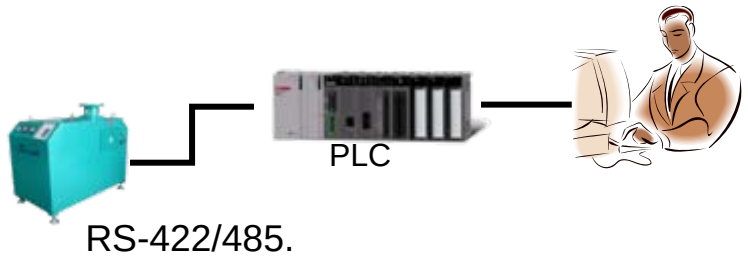
| | |
|---|---|
| DISPLAY | RUN/STOP, ERROR STATUS |
| CONTROL | RUN,STOP,ADJUST AIR FLOW, ERROR RESET |




### RS-422 / RS-485

Remote control by communication data

| | |
|---|---|
| DISPLAY | RUN/STOP, ERROR STATUS, INVERTE TEMPERATURE, CURRENT, VOLTAGE, FREQUENCY, RUN TIME, etc |
| CONTROL | RUN,STOP, ADJUST AIR FLOW, ERROR RESET, SETING |



# Performance Table

| DISCAHRGE PRESSURE (kg/㎠) | KFMTB030 | KFMTB050 | KFMTB075 | KFMTB100 | KFMTB150 | KFMTB200 |
|---|---|---|---|---|---|---|
| | SUCTION VOLUME FLOW RATE (㎥/min) | | | | | |
| 0.3 | 23 | 44 | 62 | 88 | 124 | 160 |
| 0.4 | 22 | 41 | 60 | 82 | 119 | 154 |
| 0.5 | 21 | 36 | 55 | 74 | 106 | 142 |
| 0.6 | 18 | 32 | 48 | 63 | 95 | 128 |
| 0.7 | 16 | 26 | 40 | 56 | 84 | 110 |
| 0.8 | 13 | 22 | 36 | 48 | 72 | 94 |
| 0.9 | - | 16 | 33 | 45 | 67 | 87 |
| 1.0 | - | - | 28 | 41 | 63 | 82 |

# Summary

**Economic Feasibility**

- Removal of unnecessary components and automated energy saving
- Power factor improvement and down sizing by high speed operation
- Lower Price by self developed components
- Removal of extra cooling system by self cooling system

**Eco-Friendly**

- Under 85dB(A) Noise
- Air Foil Bearing(100% Oil less)
- Reusable Filter (Just Cleaning and reuse)

**Convenience**

- Larger operation scope with Regulator(patent 10-1004700)
- Self adjustment in operation by usage
- Remote control by RS-422/485
- Plug and play

**Durability**

- Longer life span by air foil bearing load capa. expansion(Patent 064863)
  ⇒ over 20,000 on/off test
- 10 years design life of inverter and cooling fan, relay adopted
- temperature control improvement by self cooling system (Motor, bearing)

# Thank You


Thinking of human and nature together

(株)韓国流体機械

KOREA FLUID MACHINERY CO., LTD.

# Q & A

# Turbo Blower Market

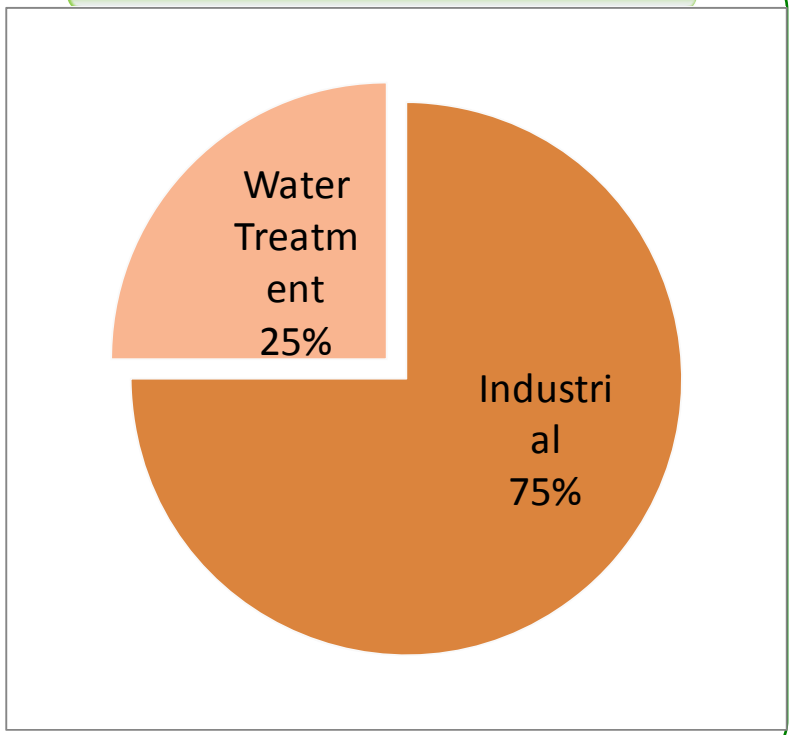
## Key word in Turbo Blower

Energy Saving

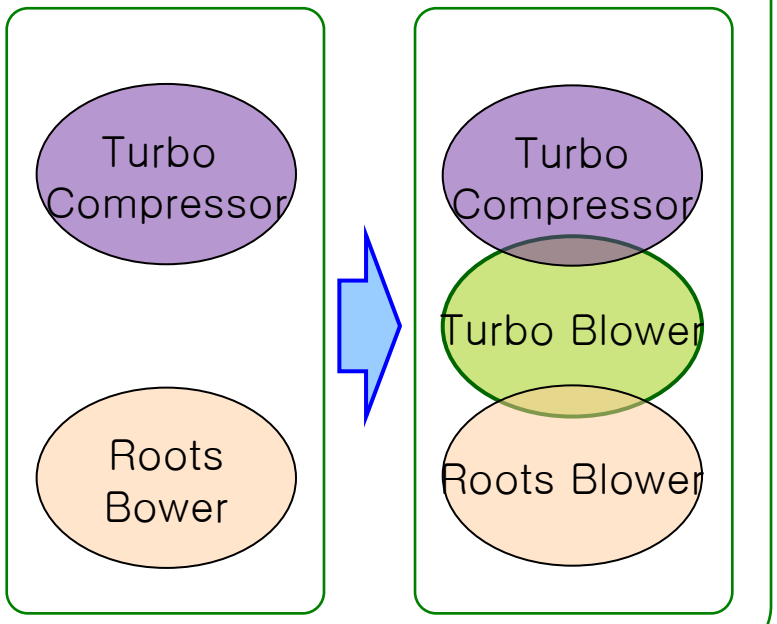
Eco Friendly

Managerial Convenience

## Market worldwide




## Market Trend



# Roots Blower vs Turbo Blower

| | Roots Blower | Turbo Blower |
|---|---|---|
| Principle & Structure | Transferring positive displacement air by rotating two indented rotor | Transforming and Compressing Speed Energy to Pressure Energy by Centrifugal power from impeller |
| Shape of Rotor |  |  |
| Advantage & Strength | -Low Cost<br>-Operation even in poor surroundings<br>-Operation even in high pressure change<br>-Vacuum Pump usage available<br>-Extra small and large size available<br>-steady products with over 150 years history | -High pressure efficiency<br>-Diverse operation control available<br>-Low Noise and Pulsation<br>-Easy installation<br>-Oil Free and eco friendly<br>-Low Maintenance cost<br>-Plug and Play |

# Types of Turbo Blower

Co.H in Denmark
Speed Increasing Gear

Popular worldwide
High cost and large space

=

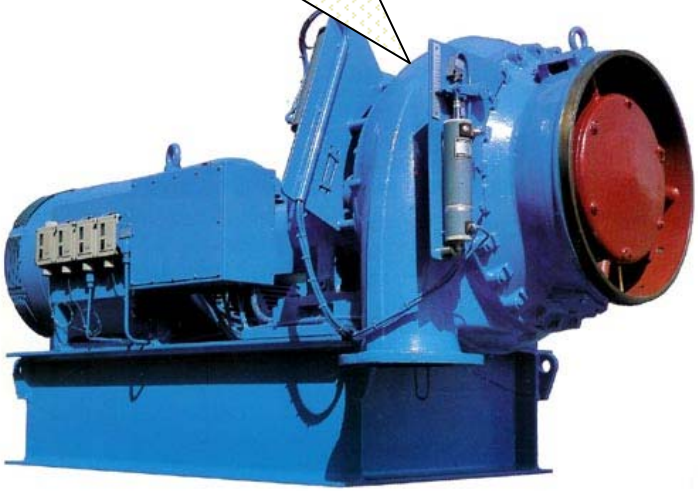
Co. S in Germany
Inverter Control

Commercialized in Europe
Good Performance
High Cost

=

KFM
Inverter Control

Auto operation
Economic feasibility &
Convenience




***Exactly same discharge Pressure among 3 companies***

# Comparison Table

| | Speed Increasing Gear | Inverter Control | Inverter Control |
|---|---|---|---|
| Size | Very Big(KA2-GK2)<br>W700 x L2800 x H1050 | Small<br>1600 x 1100 x 1750 | Very small(KFM TB100)<br>W1300 x L750 x H850 |
| Weight | Over 1700kg | Around 1200kg | Below 420kg |
| Bearing & Oil | Sleeve Bearing<br>Grease and Oil needed<br>Need to replace bearing | Air foil bearing<br>No Oil<br>Semi Permanent | Air Foil Bearing<br>No Oil<br>Permanent |
| Noise | Over 95dBA | Around 85dBA | Around 85dBA |
| Pulsation | 1~2mm/s | ? | No Pulsation |
| Price | 600% | 300% | 100% |
| Market | Exiting in the market | European Market | 4~5 Korean Companies lead world market |

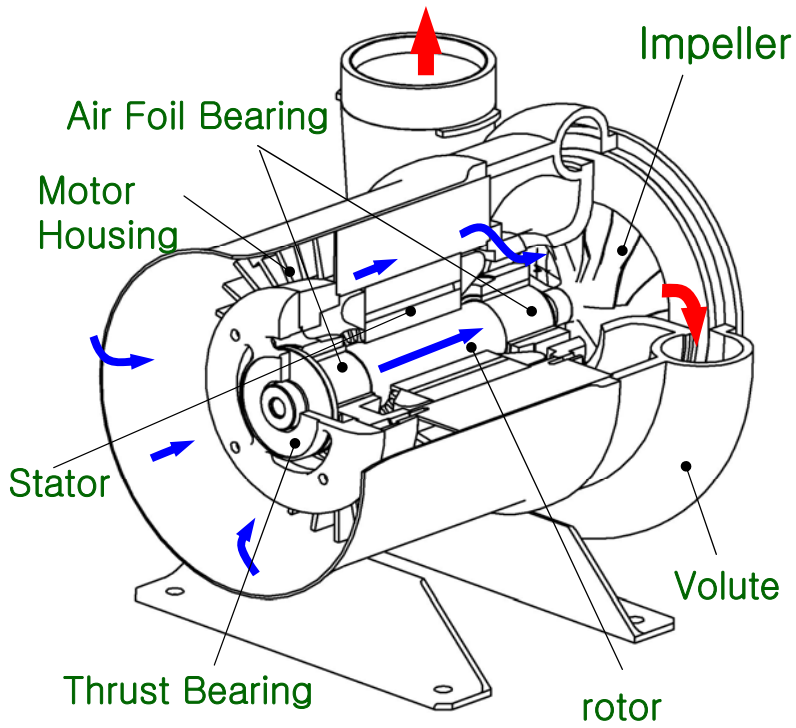
# Comparison Table(1)

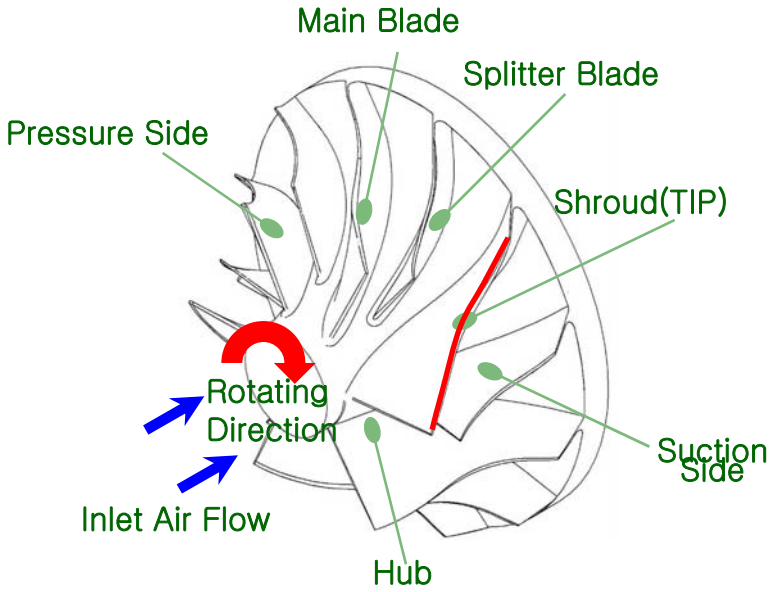
| | Co. K | Co. N | Co. A | *KFM* | Remarks |
|---|---|---|---|---|---|
| M/S | +++++ | +++ | ++ | ++ | KFM is second mover in Turbo Blower. |
| Tech. | ++++ | ++++ | +++ | +++++ | |
| Field Experience | ++ | ++ | ++ | +++++ | Over 38 years field experience |
| Assem. Capa. | +++++ | ++ | ++ | +++++ | Others are in very beginning stage |
| Customer Satisfactn. | +++ | ++ | + | +++++ | Service issues in China market (Co, N, A) |
| Capital | ++ | + | + | +++++ | Debt Free |

# Comparison Table(2)

| | Co. K | Co.N | Co. A | *KFM* | Remarks |
|---|---|---|---|---|---|
| **Cash Flow** | ++ | ++ | + | **+++++** | |
| **Sales Channel** | ++ | +++ | +++ | **+++++** | |
| **Delivery** | 60~90 Days | 90~120 Days | 90~120 Days | **30~60 Days** | KFM has blower assembly only facility |
| **History** | 1997 | 2000 | 2002 | **1974** | |
| **Price** | 150% | 160% | 130% | **100%** | Function oriented<br>Smaller, Less Concepts |
| | ++++ | +++ | ++ | **+++++** | KFM is THE BLOWER company |

# CORE


Impeller
Air Foil Bearing
Motor
Housing
Stator
Volute
Thrust Bearing
rotor


Main Blade
Splitter Blade
Pressure Side
Shroud(TIP)
Rotating
Direction
Suction
Side
Inlet Air Flow
Hub

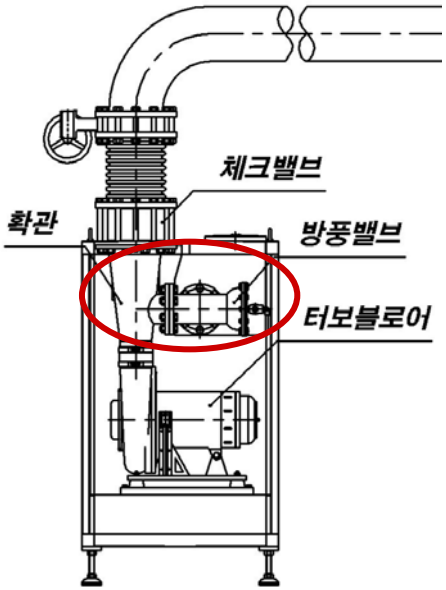
# How KFM can give customers tangible benefit ?

1. **Smaller Size, Less Weight through High speed rotation (35,000~60,000 rpm)**
2. **Core Function Oriented Design(Removal of unnecessary components and function)**
3. **Automated mass production Assembly Line**
4. **Minimized sales channels**
5. **Customer's Choice (Roots Blower vs Turbo Blower)**

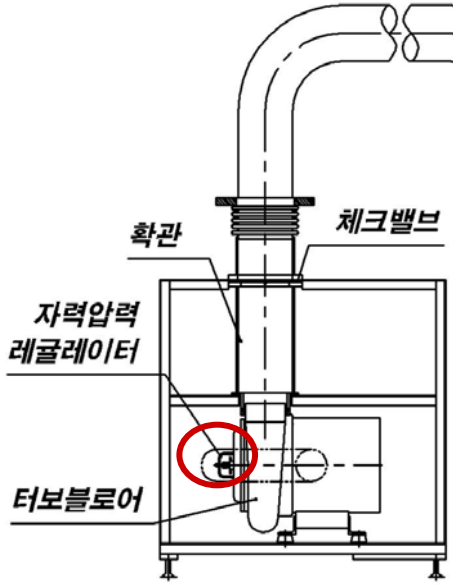
# Free from Surging

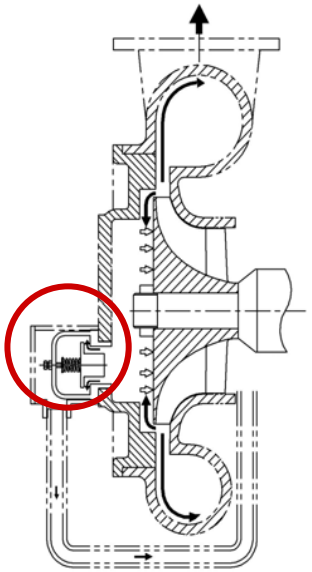
| | Method | Resetting | Power |
|---|---|---|---|
| KFM | Regulator | Not necessary | No Need |
| Co.A | BOV + Sensors | needed | Power needed |
| Co.B | BIOV + Guide Vane + Sensors | needed | “ |

## Other Turbo Blower

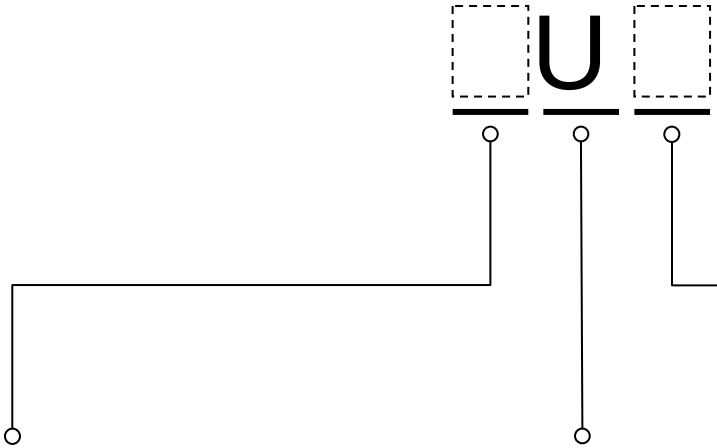



## KFM Turbo Blower



# U Type Roots Blowe Codes




| Rotor shape & material | U Type | 흡입/토출 방향 |
| --- | --- | --- |
| • S : Spur<br>• H : Helical | • UNIFICATION | • P : Horizontal<br>• T : Vertical |

# Patents &Certificates

The United States of America

The Director of the United States Patent and Trademark Office

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extensions.

Nicholas P. Godici

Acting Director of the United States Patent and Trademark Office

The Patent Office

Certificate of Grant of Patent

Patent Number: GB2341640
Proprietor(s): Chunkyung Kim
Inventor(s): Chunkyung Kim

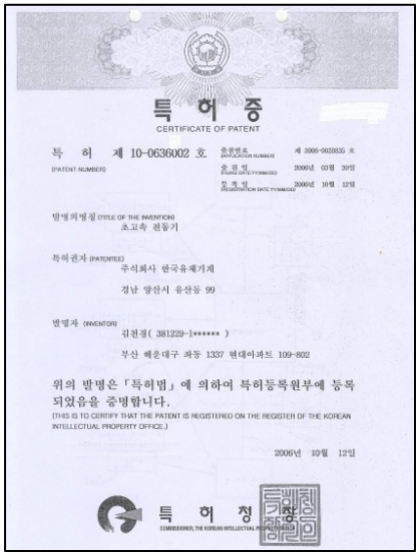
This is to Certify that, in accordance with the Patents Act 1977,

a Patent has been granted to the proprietor(s) for an invention entitled "**Fluid pump**" disclosed in an application filed **29 April 1999**.

Dated 7 August 2002

Alison Brimelow
Comptroller General of Patents, Designs and Trade Marks
UNITED KINGDOM PATENT OFFICE

**The attention of the proprietor(s) is drawn to the important notes overleaf.**



특 허 증

CERTIFICATE OF PATENT

특 허 제 10-0636002 호

(PATENT NUMBER)

2006년 03월 30일

2006년 10월 12일

발명의명칭 (TITLE OF THE INVENTION)
초고속 전동기

특허권자 (PATENTEE)
주식회사 한국유체기계
경남 양산시 유산동 99

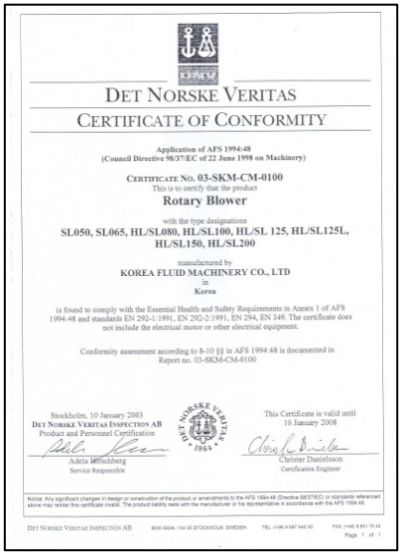
발명자 (INVENTOR)
김천정( 381229-1****** )
부산 해운대구 좌동 1337 현대아파트 109-802

위의 발명은 「특허법」에 의하여 특허등록원부에 등록되었음을 증명합니다.

(THIS IS TO CERTIFY THAT THE PATENT IS REGISTERED ON THE REGISTER OF THE KOREAN INTELLECTUAL PROPERTY OFFICE.)

2006년 10월 12일

특 허 청



DET NORSKE VERITAS

CERTIFICATE OF CONFORMITY

Application of AFS 1994:48
(Council Directive 98/37/EC of 22 June 1998 on Machinery)

CERTIFICATE No. 03-SKM-CM-0100

This is to certify that the product

**Rotary Blower**

with the type designations

**SL050, SL065, HL/SL080, HL/SL100, HL/SL 125, HL/SL125L, HL/SL150, HL/SL200**

manufactured by

KOREA FLUID MACHINERY CO., LTD
in
Korea

is found to comply with the Essential Health and Safety Requirements in Annex 1 of AFS 1994:48 and standards EN 292-1:1991, EN 292-2:1991, EN 294, EN 349. The certificate does not include the electrical motor or other electrical equipment.

Conformity assessment according to 8-10 §§ in AFS 1994:48 is documented in Report no. 03-SKM-CM-0100

Stockholm, 10 January 2003
DET NORSKE VERITAS INSPECTION AB
Product and Personnel Certification
Adela Jeftichberg
Service Responsible

This Certificate is valid until
10 January 2008
Christer Danielsson
Certification Engineer

DET NORSKE VERITAS

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. 0486-1999-AQ-SEO-RvA

*This is to certify that the Quality Management System of*

KOREA FLUID MACHINERY CO., LTD.

*at*

#99, Yusan-Dong, Yangsan-City, Kyungnam, Korea

*has been found to conform to the Quality Management System Standard:*

**ISO 9001:2000, KS A 9001:2001**

*This Certificate is valid for the following product or service ranges:*

**Design, Manufacture and Repair Service of Blowers and Compressors**

*Original Certification date:* July 2nd, 1999

*This Certificate is valid until:* July 2nd, 2008

*Compliance to the Standard in respect to the indicated scope is verified by the DNV approved registered Team Leader*

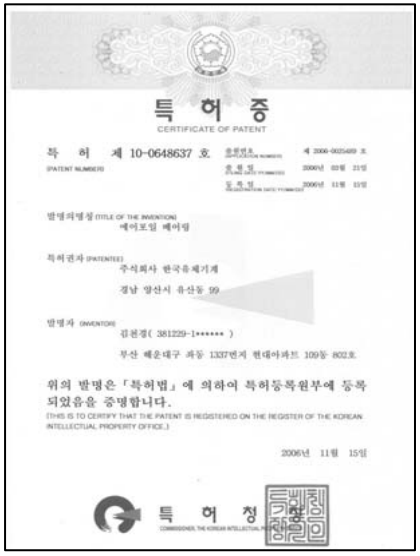
Sang-Hoon Kang
*Lead Auditor*

*Place and date:* Seoul, October 26th, 2005

*for the Accredited Unit:* DNV CERTIFICATION B.V., THE NETHERLANDS

In-Kyoon Ahn
*Management Representative*

Lack of fulfilment of conditions as set out in the Appendix may render this Certificate invalid



특 허 증

CERTIFICATE OF PATENT

특 허 제 10-0648637 호

(PATENT NUMBER)

2006년 03월 21일

2006년 11월 15일

발명의명칭 (TITLE OF THE INVENTION)
베어링용 베어링

특허권자 (PATENTEE)
주식회사 한국유체기계
경남 양산시 유산동 99

발명자 (INVENTOR)
김천정( 381229-1****** )
부산 해운대구 좌동 1337번지 현대아파트 109동 802호

위의 발명은 「특허법」에 의하여 특허등록원부에 등록되었음을 증명합니다.

(THIS IS TO CERTIFY THAT THE PATENT IS REGISTERED ON THE REGISTER OF THE KOREAN INTELLECTUAL PROPERTY OFFICE.)

2006년 11월 15일

특 허 청

# Domestic Sales & Service network

| | | |
|---|---|---|
| K | 본 사<br>(Main Office & Yangsan Plant) | TEL : (055)372-0911/4<br>FAX : (055)372-0915 |
| S | 서울 사무소<br>(Seoul Office) | TEL : ( 02 )501-4860<br>FAX : ( 02 )501-4862 |
| Q | 서비스센터<br>(KFM. A/S Center) | TEL : (055)384-6851<br>FAX : (055)385-6851 |
| N | 남서울 영업소<br>(South Seoul Agency) | TEL : ( 02 )894-2750<br>FAX : ( 02 )894-2753 |
| W | 서서울 영업소<br>(West Seoul Agency) | TEL : (02)2688-2251<br>FAX : (02)2689-6514 |
| E | 동서울 영업소<br>(East Seoul Agency) | TEL : (031)767-3451<br>FAX : (031)767-3450 |
| L | 북서울 영업소<br>(North Seoul Agency) | TEL : (031)847-7707<br>FAX : (031)847-7720 |
| B | 부산 영업소<br>(Busan Agency) | TEL : (051)555-9681<br>FAX : (051)555-9683 |
| D | 대구 영업소<br>(Daeku Agency) | TEL : (053)383-0546<br>FAX : (053)383-5145 |
| G | 광주 영업소<br>(Gwangjoo Agency) | TEL : (062)525-0937<br>FAX : (062)523-7082 |
| C | 중부 영업소<br>(Daejeon Center Agency) | TEL : (042)628-0911<br>FAX : (042)627-8664 |
| U | 울산 영업소<br>(Ulsan Agency) | TEL : (052)298-5656<br>FAX : (052)293-9668 |
| T | 수원 영업소<br>(Soowon Agency) | TEL : (031)378-0911<br>FAX : (031)245-7228 |
| M | 경남 영업소<br>(Kyungnam Agency) | TEL : (055)276-3317<br>FAX : (055)276-3318 |
| J | 전남 영업소<br>(Jeonnam Agency) | TEL : (061)690-5300<br>FAX : (061)684-4776 |
| Z | 제주 영업소<br>(Chejoo Agency) | TEL : (064)757-5060<br>FAX : (064)759-4050 |
| Y | 남부 서비스센터<br>(Nambu A/S Center) | TEL : (063)842-4689<br>FAX : (063)841-4691 |
| R | 강원 영업소<br>(Kangwon Agency) | TEL : (033)646-8870<br>FAX : (033)646-8879 |
| F | 영남 영업소<br>(Yeongnam Agency) | TEL : (055)382-1967<br>FAX : (055)363-5724 |

# Front View of KFMC


- 99 Yusan Dong Yang-San city, Kyung-sang Nam-Do, Korea
- www.kfmblower.com