

**KRUGER**

# TUNNEL FAN

## KTF & KTF-R Series





# Company Profile

Established in Singapore since 1985, Kruger Ventilation is a full subsidiary company of Soler & Palau Ventilation Group. For decades, Kruger Ventilation continues to be a leading supplier of ventilation solutions for residential, commercial, industrial, and infrastructure applications; the last of which demands a high degree of specialization as in road and metro tunnel ventilation systems. The industry has grown to expect from us to deliver value in unmatched Quality, Delivery, and Service, which are made possible with our engineering expertise, world class manufacturing, and dedication towards innovative excellence. Meeting the needs of our customers is our success.

Kruger tunnel fans are precision engineered for superior performance and trouble-free operation for years to come. Advancements in technology have allowed our tunnel fans, manufactured and assembled in our state-of-the-art ISO 9001 certified factory to achieve world class performances in tunnel ventilation applications. Every Kruger tunnel fan is test run and quality recorded for performance assurance and quality compliance. Full F.A.T. in our AMCA certified test facility with third party certification further ensures our fans comply with the most demanding specifications.

With our continuous commitment towards excellence, and our localization of manufacturing capacity, technical support, testing & commissioning, and after-sales service & maintenance across Asia in seventeen locations, our customers' investments entrusted to us are in good hands, and our promises are always delivered.



**TUNNEL SYSTEMS**  
MADE BY KRUGER



Please refer to the AMCA certified Kruger catalogue CAT029-E0-ED1 for the AMCA certified performance curves.

## Application

Efficient underground space utilization is vital for sustainable urbanization for cities around the world. Consequently, more capitals are invested in underground infrastructure projects in transportation, storage caverns, utility pipelines, etc. Natural ventilation, although is the most economical, has few practical applications due to its limitations. Therefore it is necessary to mechanically ventilate these spaces properly in order to meet the design criteria for system functionality and safety. The applications of tunnel fans are many and to name a few:

### 1. Transportation Tunnel

Road and metro tunnels allow passenger vehicles or trains to go through and under terrains, significantly shorten the commute, making time and energy efficient travel possible. These tunnels also free up valuable land above for other uses. For road tunnel with its high level of contamination from vehicles, and metro tunnel characterized by design complexity for passenger comfort, the tunnel fans must work flawlessly in both cases to provide the necessary air circulation, and most importantly, control smoke pattern in case of fire to ensure the safety of the passengers.

### 2. Underground Construction

Underground constructions such as storage caverns and others require tunnel fans during construction as well as for permanent use. The environment demands the fans to efficiently provide fresh air while removing the pollutants, heat, humidity, and purge the environment of dusts from blasting during the construction phase.

### 3. Utility Tunnel

Utility tunnels are underground construction designed to carry utility lines including electrical power lines, communications cables and optics, water and sewer pipes, making the urban spaces above less obstructed and more aesthetically pleasing. The tunnel fans are required to removal heat, to provide fresh air for a working environment, and to maintain the proper ambient conditions for system operation.

### 4. Wind Tunnel

Wind tunnels are widely used, academically as well as commercially, in aerodynamic research to study the effect of air moving over solid objects such as automobiles, airplanes, building structures, etc. Large tunnel fans are used to create the desired airstream and pattern necessary to conduct the studies.

## Fan Features

- **Complete Range**

- **Uni-directional**

- Range from diameter 1250 to 3150mm, static pressure up to 5000Pa, flow rate up to 450m<sup>3</sup>/s.

- **Reversible**

- Range from diameter 1250 to 2240mm, static pressure up to 2500Pa, flow rate up to 160m<sup>3</sup>/s.

- **High Efficiency**

- Total efficiency as high as 85% for uni-directional fans and 75% for reversible fans.

- **Reliable Performance**

- Kruger tunnel fans are tested in AMCA accredited laboratory and rated in accordance with AMCA 210 for air performance and ISO 1940 and AMCA 204 for balancing quality. Furthermore, Kruger tunnel fans are tested in accordance with EN 12101-3:2002 and comply with the high temperature resistance requirement for continuous operation at 250°C, 300°C and 400°C for a minimum of 2 hours.

- **Stall-Free Operation**

- Non-stall design or anti-stall ring ensures stall-free operation and protect the ventilation fans and upstream/downstream equipment from potential damage.

- **Truly Reversible**

- Reversibility of 97~100%.

- **Adjustable Blade Angle**

- Blade angle can be adjusted to suit tunnel development/control needs.

- **High Strength Blades**

- Specially designed aluminum alloy homogenous aerofoil blades with high yield strength cater for high pressure applications (up to 5000Pa) and thermal shock in case of fire.

- **Robust & Durable Design**

- Major components are made from high strength steel.

- **Reliable Corrosion Protection**

- Hot dipped galvanization as per ISO 1461 to enable fan operation in almost all adverse environments.

## Quality Assurance

- **High Temperature Test**

- Kruger tunnel fan KTF & KTF-R series are tested in accordance with EN 12101-3:2002 and comply with the high temperature resistance requirement for continuous operation at 250°C, 300°C and 400°C for a minimum of 2 hours.

- **Pre-Assembly Examination**

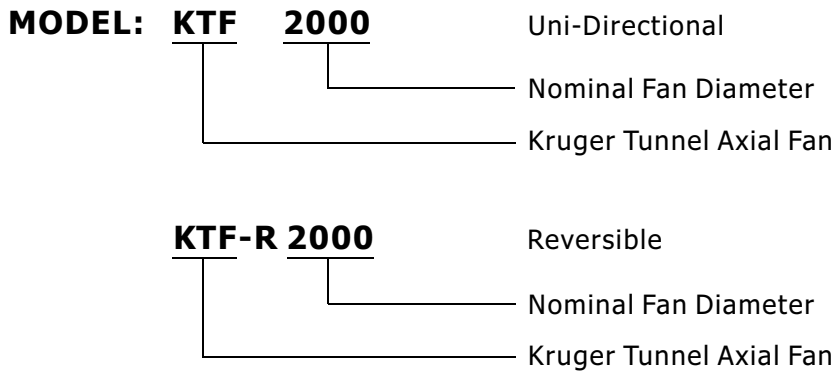
- X-Ray examination for Aluminum alloy blades as per ASTM E-155 and dye penetration (non destructive) tests for welds on fan hubs as per ASME Section V, Art. 6 & 24 (identical with ASTM E-165) are available upon request to ensure the impellers are capable of withstanding the effect of all stress and load during starting, operation and reversal.

- **After-Assembly Examination**

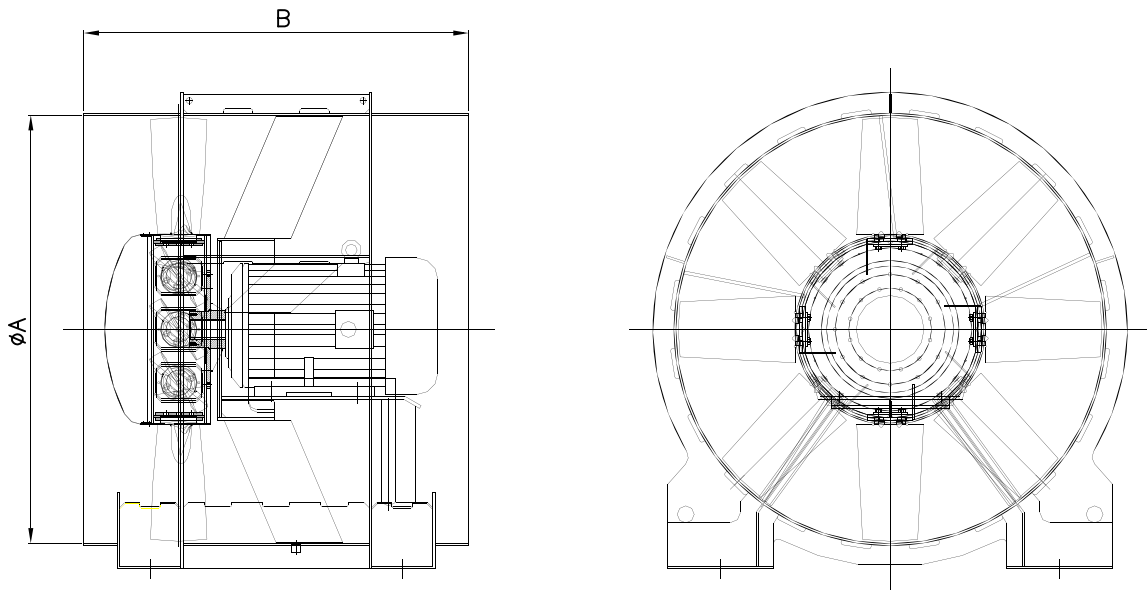
- All Kruger tunnel fans are balanced in accordance with ISO 1940 and AMCA 204 standard and comply with G4.0 or G2.5 requirement.

- Whirl test (over speed test) at 125% of full speed for a minimum of 15 minutes for the impeller is available upon request to ensure the fans are capable of withstanding the effect of all stress and load in case of emergency of malfunction .

**Nomenclature**



**Dimension**

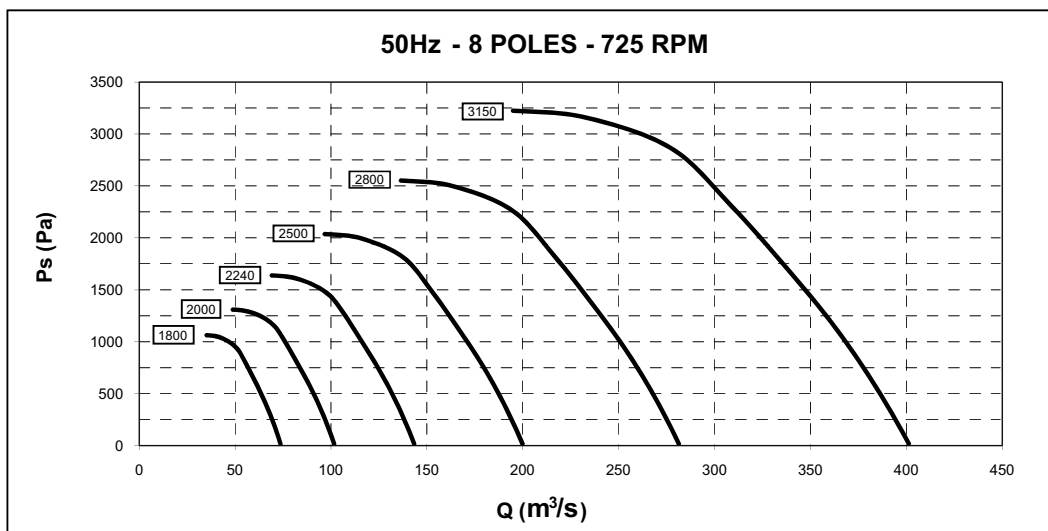
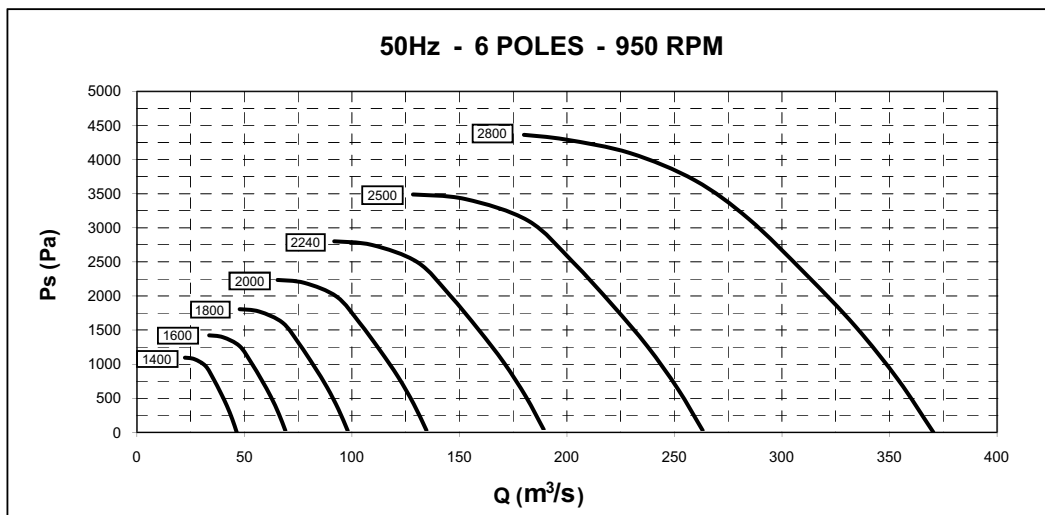
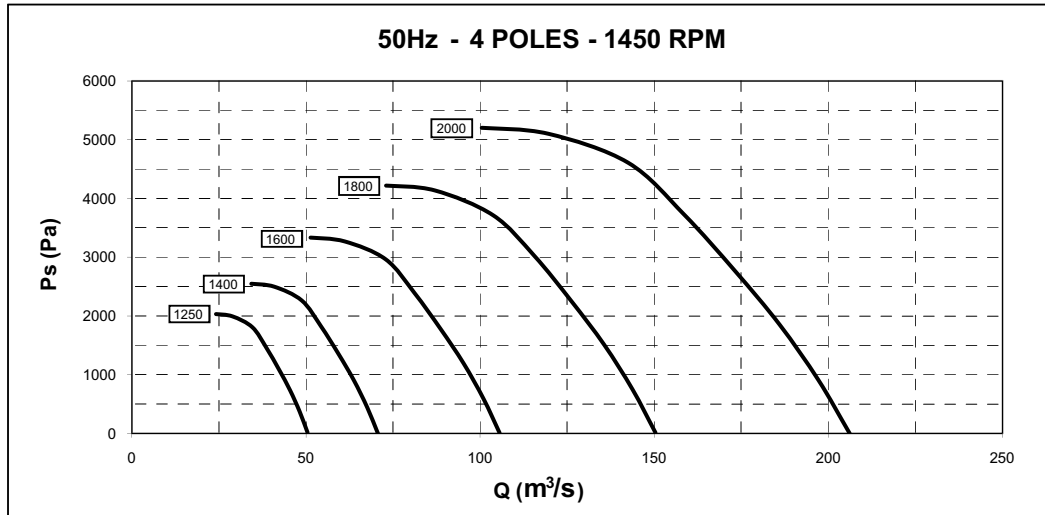


Model	A	B	Max Motor Frame Size
1250	1250	1610	315
1400	1400	1660	315
1600	1600	1700	315
1800	1800	1750	315
2000	2000	2310	450
2240	2240	2370	450
2500	2500	2440	450
2800	2800	2520	450
3150	3150	2610	450

Model sizes are nominal diameter

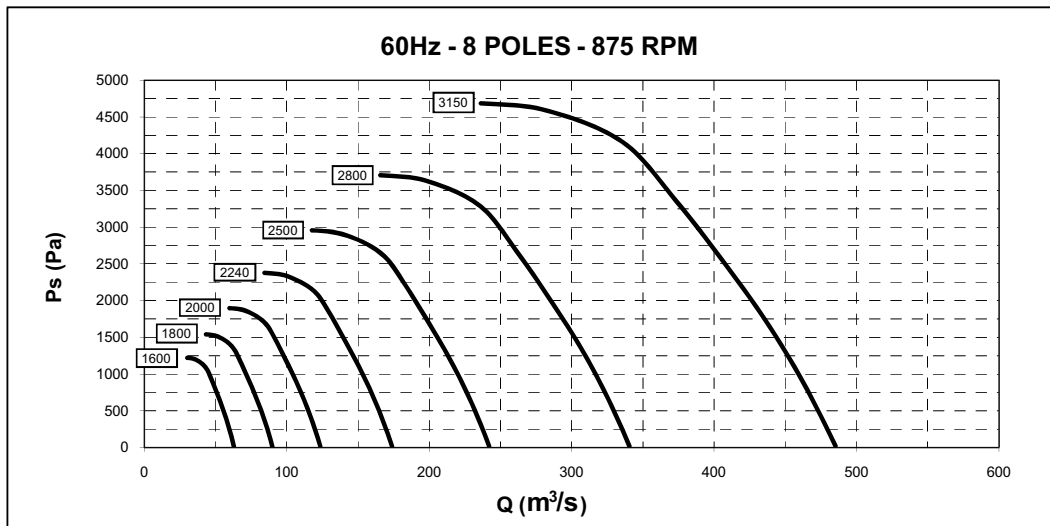
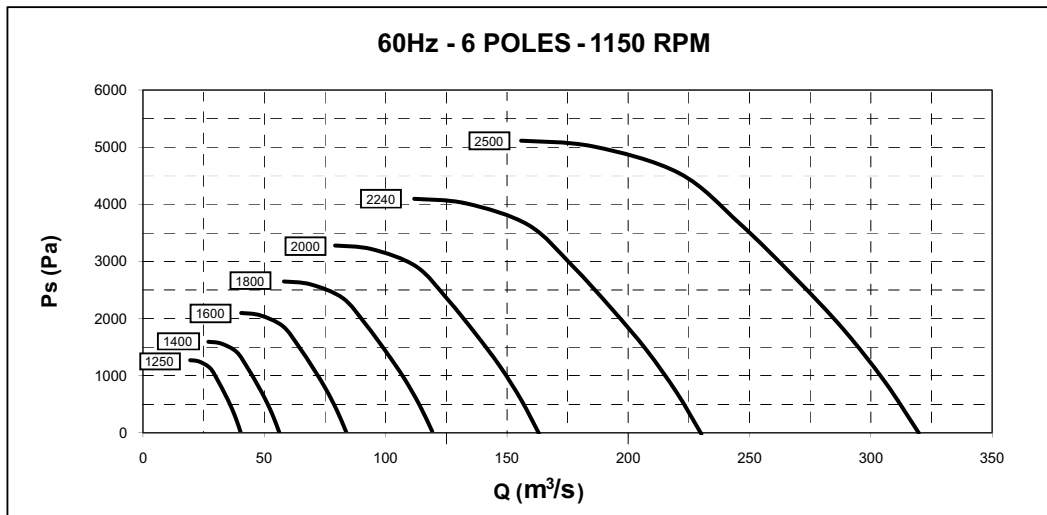
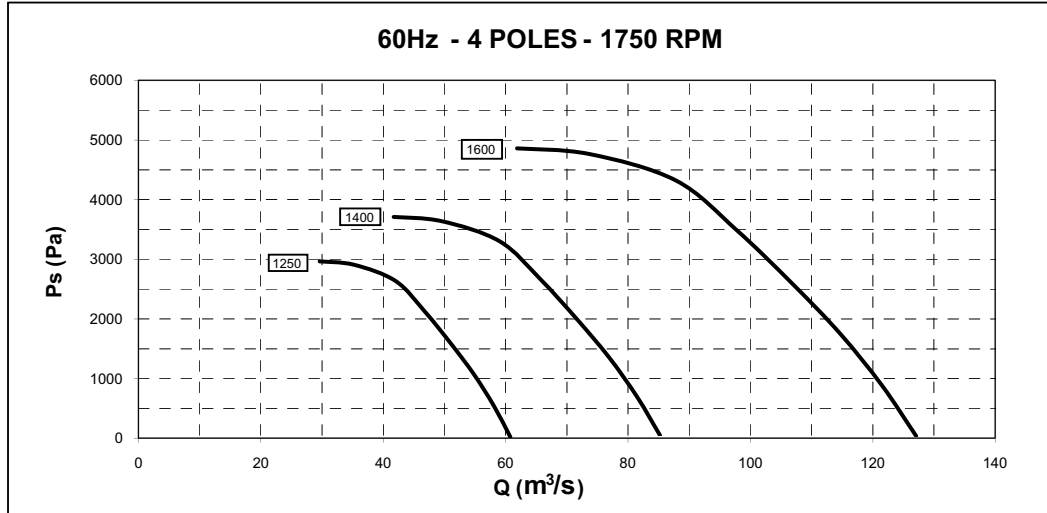
All Dimensions in mm

## Quick Selection Chart - Fan KTF Series (Uni-Directional)



Please contact Kruger for fan selection beyond this range.

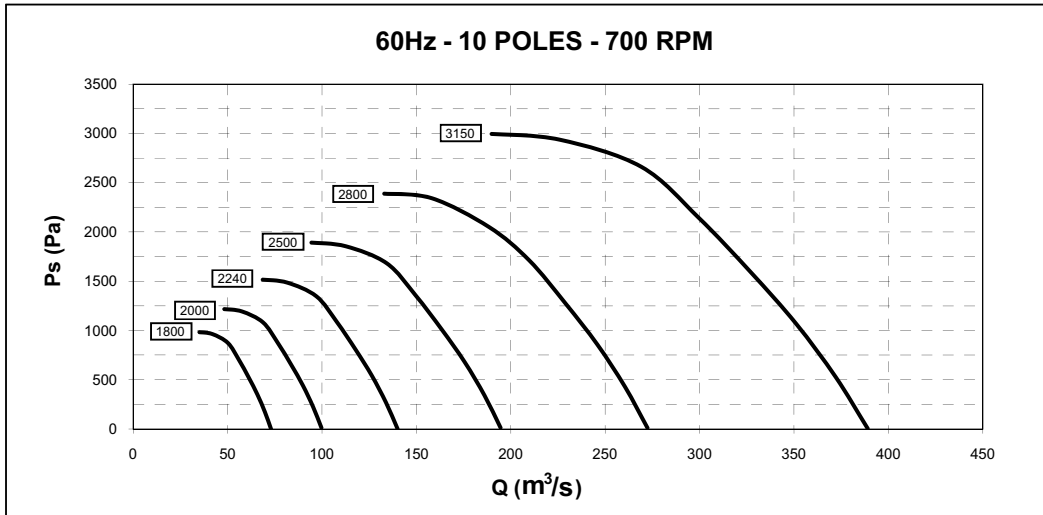
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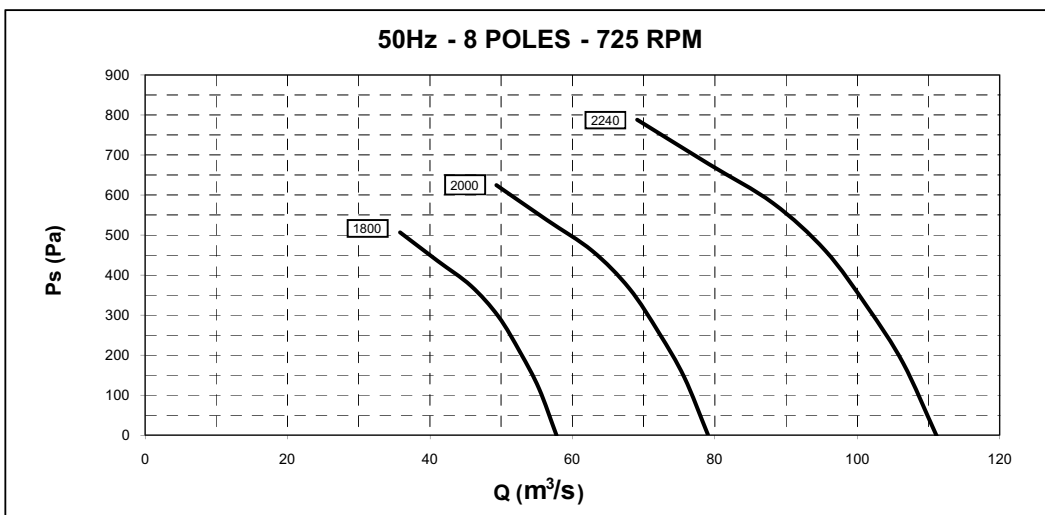
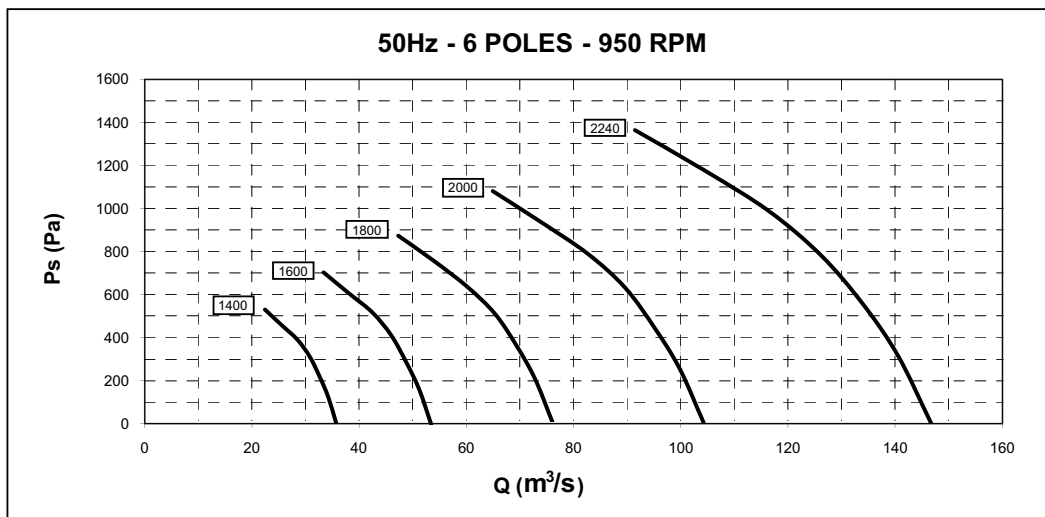
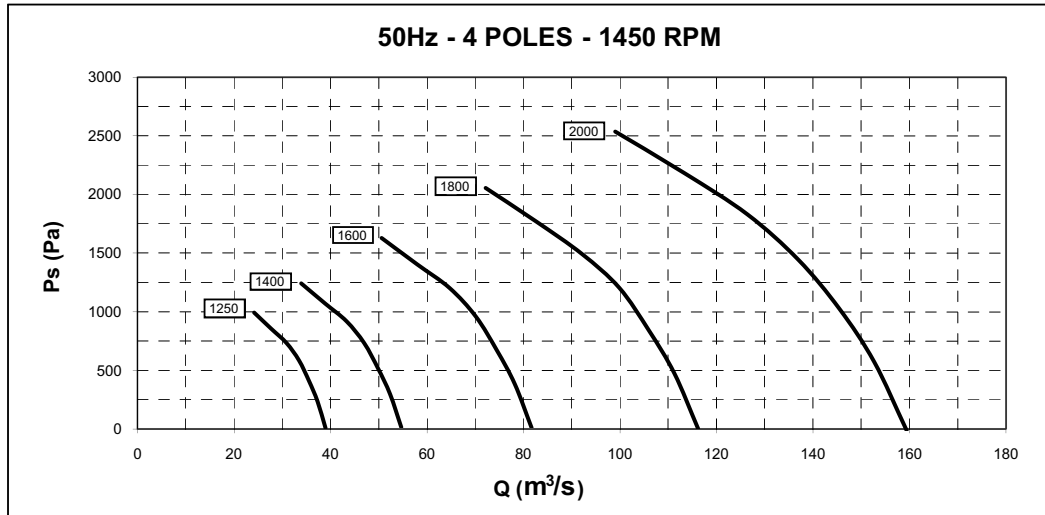
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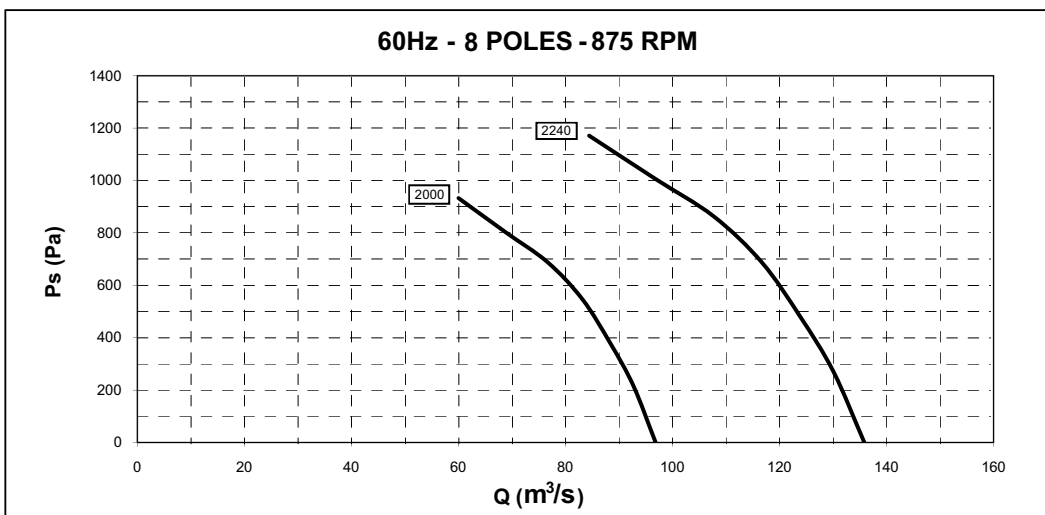
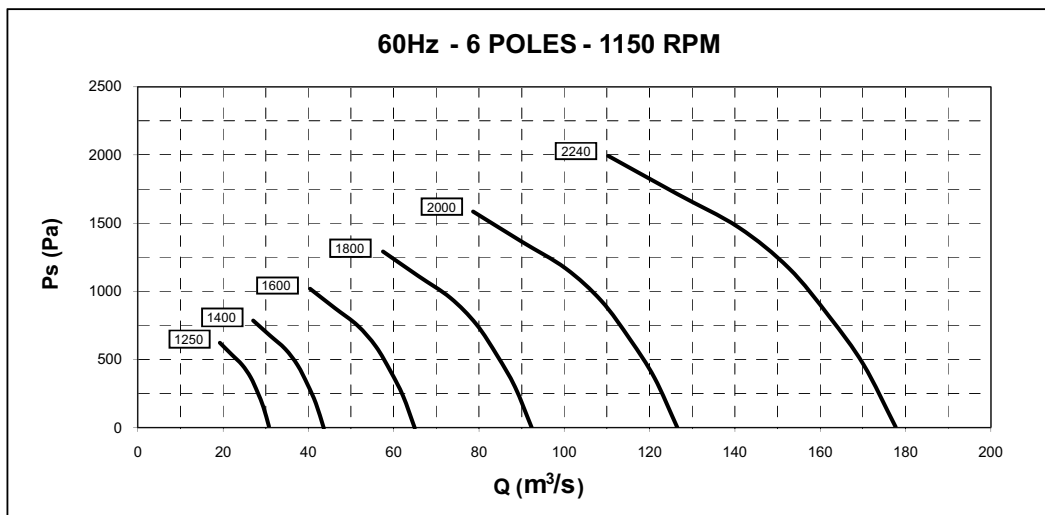
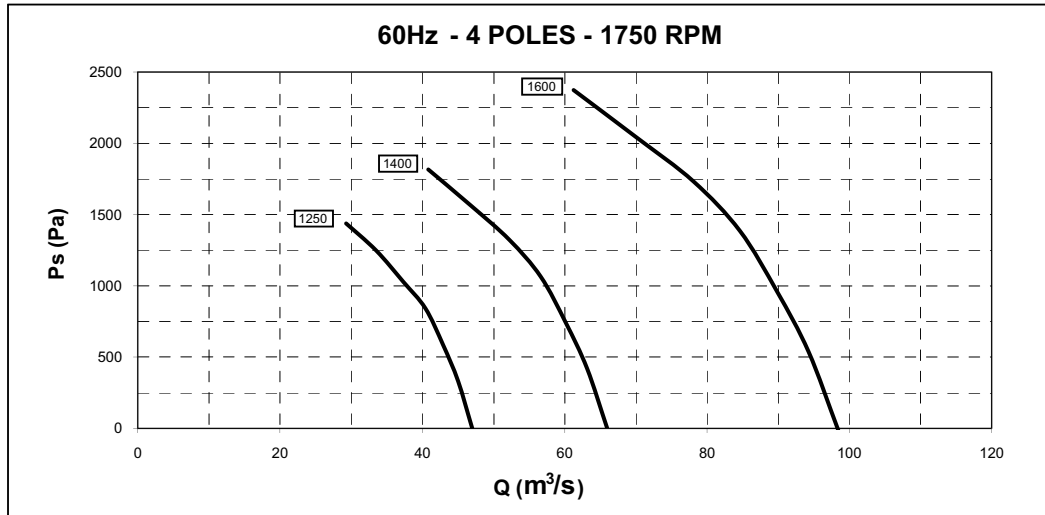


Quick Selection Chart - Fan KTF-R Series (Reversible)



Please contact Kruger for fan selection beyond this range.

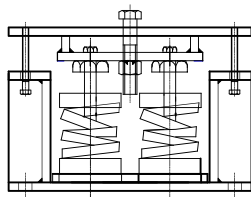
### Quick Selection Chart - Fan KTF-R Series (Reversible)



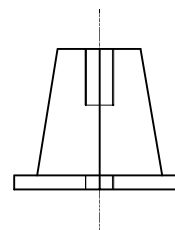
Please contact Kruger for fan selection beyond this range.

**Accessories**

Spring Isolator



Rubber Isolator



Inlet Bellmouth



Counter Flange



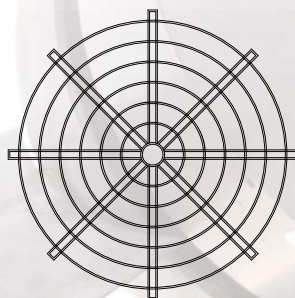
Safety Wire



Cable Pull Safety Switch



Protection Net



## Typical Project Reference

Project Name	Country	Application	Type	Fan Size
Metro Xin Zhuang Line CK378A	Taiwan	Metro	Axial Fan	1800
			Jet Fan	1400
Metro Xin Zhuang Line CK378B	Taiwan	Metro	Axial Fan	1800
			Jet Fan	1120
Metro Xin Zhuang Line CK378D	Taiwan	Metro	Axial Fan	1800
Metro Xin Zhuang Line CK378H	Taiwan	Metro	Axial Fan	1800
Metro Xin Yi Line CR 388A	Taiwan	Metro	Axial Fan	1800
			Axial Fan	1600
Metro Xin Yi Line CR 388B	Taiwan	Metro	Jet Fan	1120
			Axial Fan	1600
			Axial Fan	1800
TaoYuan Airport CA 384	Taiwan	Metro	Axial Fan	1800
			Axial Fan	1250
Downtown Line-Stage 2	Singapore	Metro	Axial Fan	1800-2000
			Jet Fan	1250
Xiang An Subsea Tunnel	China	Road Tunnel	Axial Fan	2800
			Axial Fan	2500
			Jet Fan	1120
			Jet Fan	630
Guangzhou Luntou-Sheng Wu island University Crossing Pearl River Tunnel	China	Road Tunnel	Jet Fan	710
Xishan Taigu Tunnel	China	Road Tunnel	Axial Fan	2500
Xiao Shan Airport Tunnel	China	Road Tunnel	Jet Fan	710
Wu Songshan Tunnel	China	Road Tunnel	Jet Fan	1120
Xin Baoxian	China	Road Tunnel	Axial Fan	2500
BaGuaShan	Taiwan	Road Tunnel	Axial Fan	2500
Marina Common Service Tunnel	Singapore	Utility	Axial Fan	1800-2000
Jurong Rock Cavern	Singapore	Storage	Axial Fan	1800



## Tunnel Ventilation Methods

Different countries/regions may have different requirements/regulations on tunnel ventilation systems. There are many types of ventilation systems. However, only two types of fans are used: axial fans and jet fans. Axial fans are used to supply fresh air and extract contaminated air / smoke. Jet fans are used in longitudinal ventilation system to push the contaminated air / smoke to a place where it can then be extracted out by axial fans. The following are illustrations of different tunnel ventilation systems that are in common use.

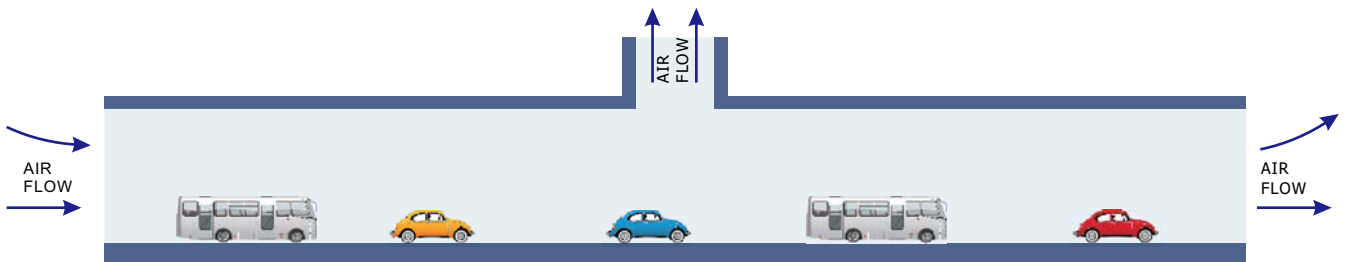
### A. General Tunnel Ventilation

**This applies to both road tunnel and subway (metro) tunnel, road tunnel is used for illustration purpose.**

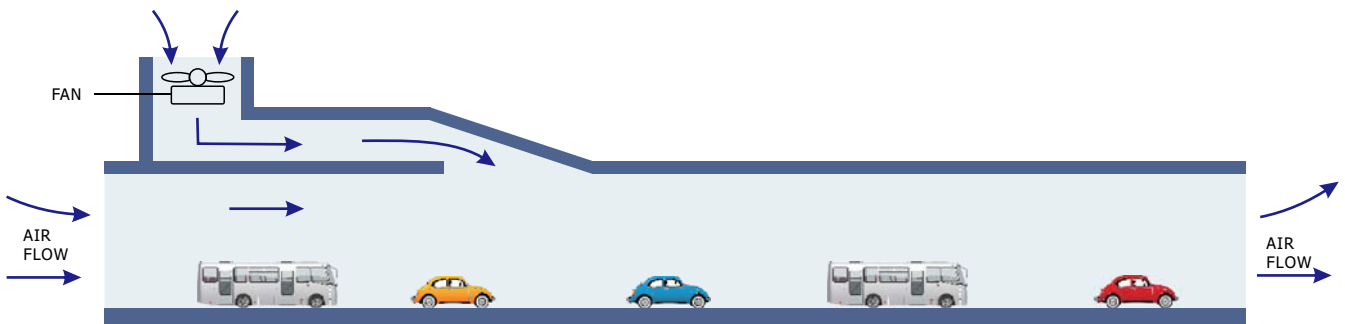
#### ■ 1. Natural Ventilation



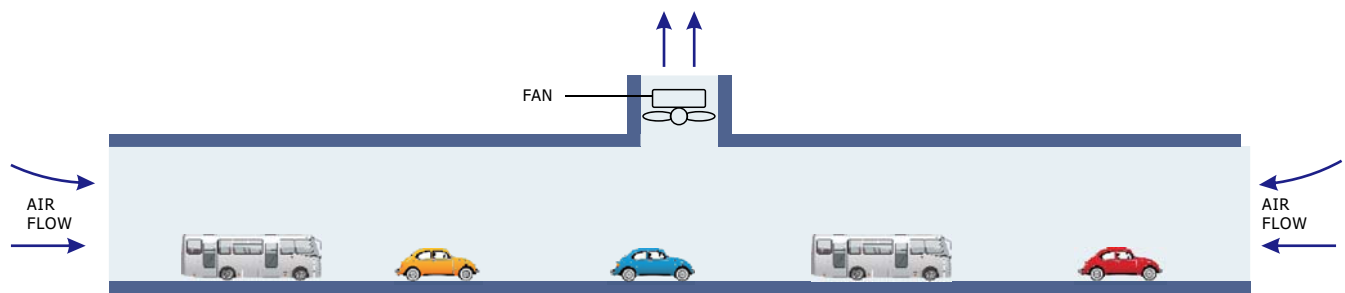
#### ■ 2. Natural Ventilation with Central Shaft



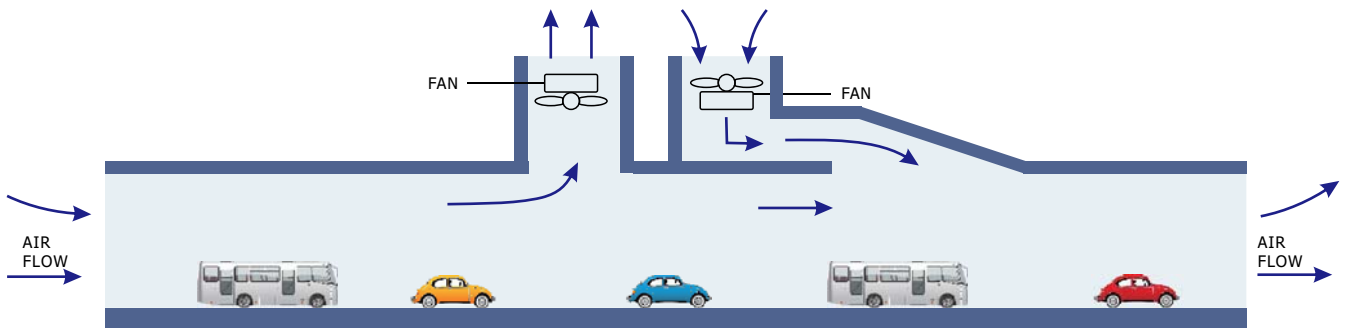
#### ■ 3. Injection Type Longitudinal Ventilation



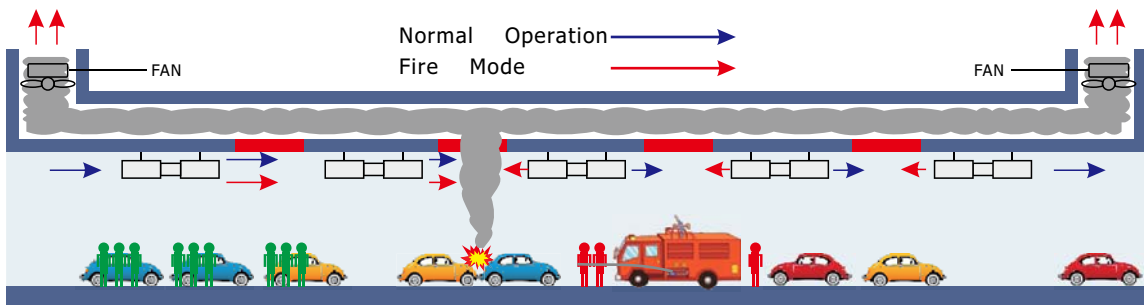
#### ■ 4. Central Exhaust Shaft Type Longitudinal Ventilation



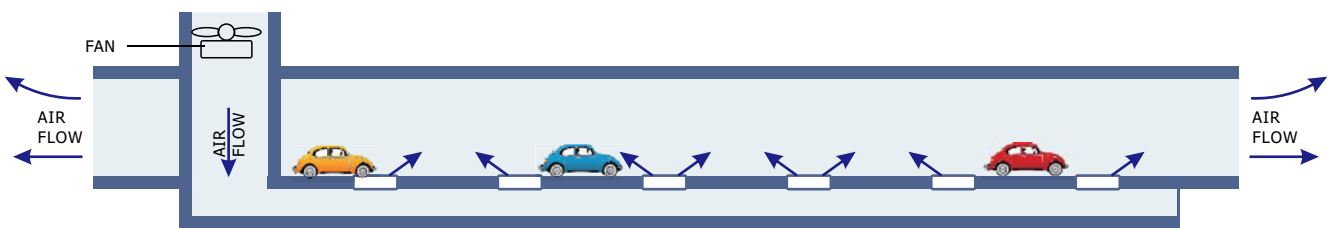
5. Central Supply & Exhaust Shaft Type Longitudinal Ventilation



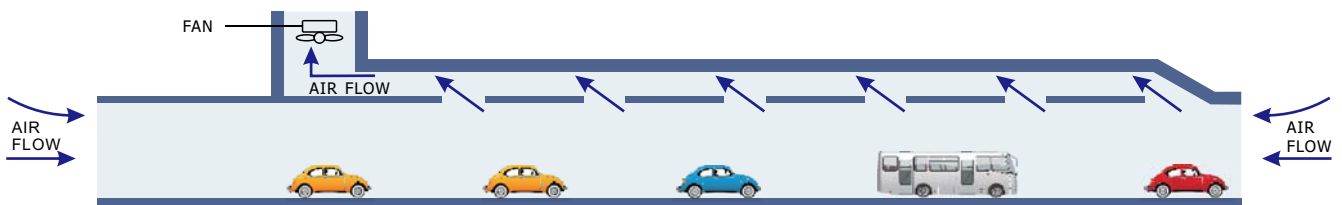
6. Point Extraction Type Longitudinal Ventilation (PEV)



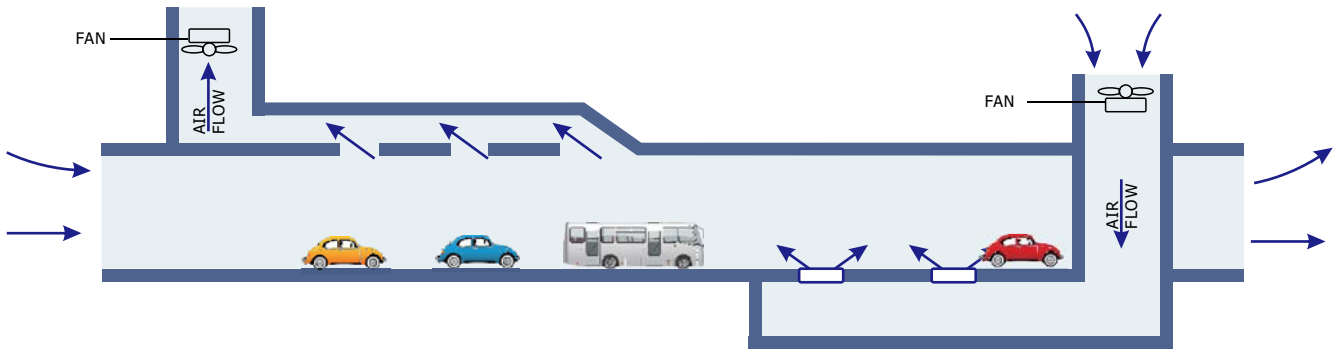
7. Semi-Transverse Supply Type



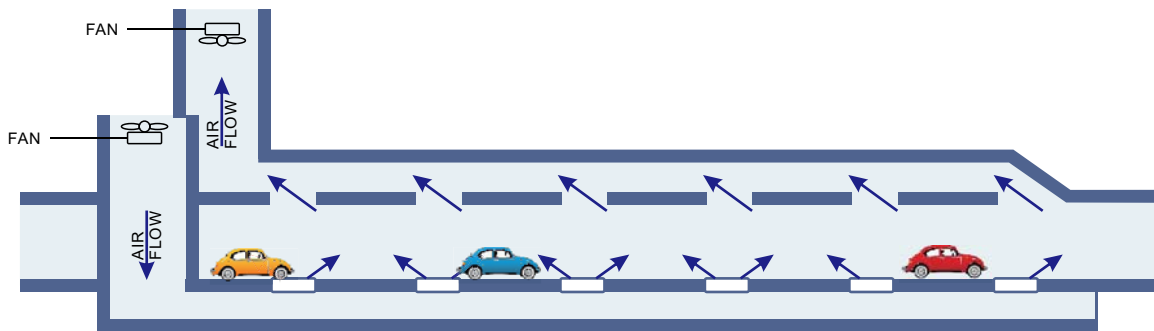
8. Semi-Transverse Exhaust Type



■ 9. Semi-Transverse Half Supply Half Exhaust Type

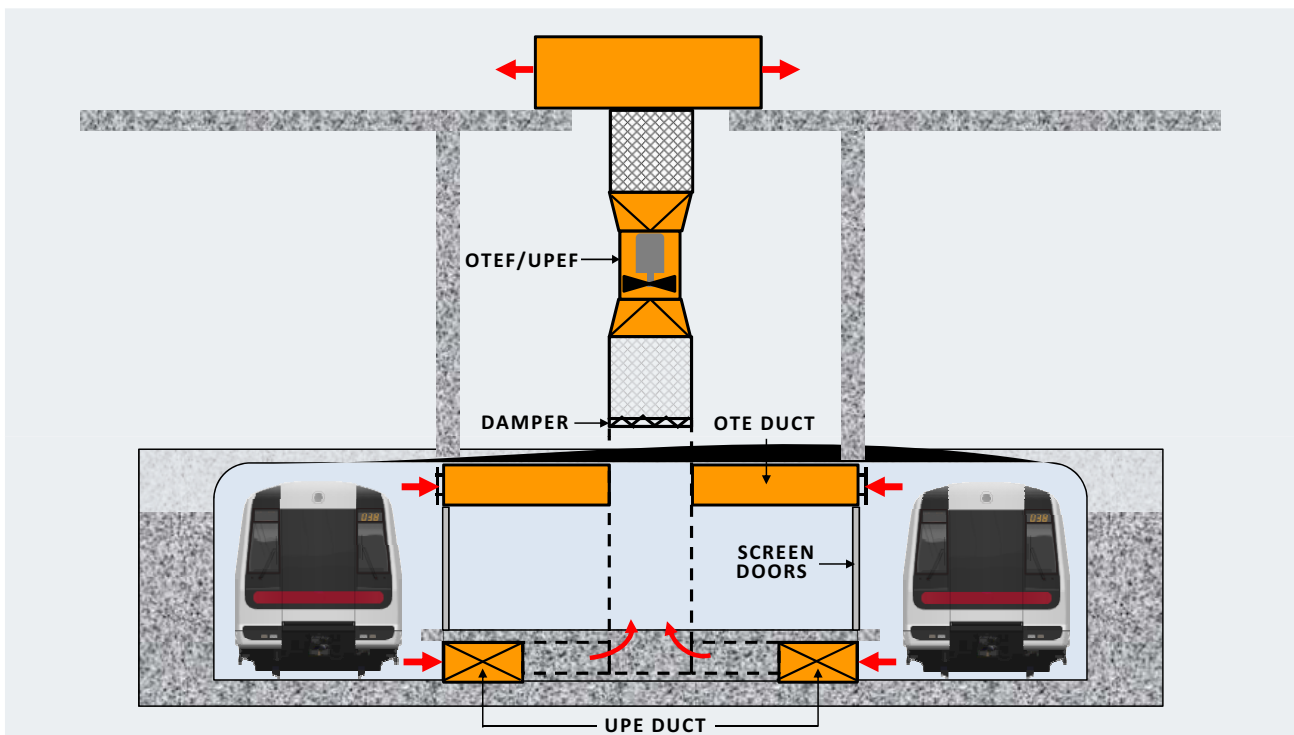


■ 10. Fully Transverse Type



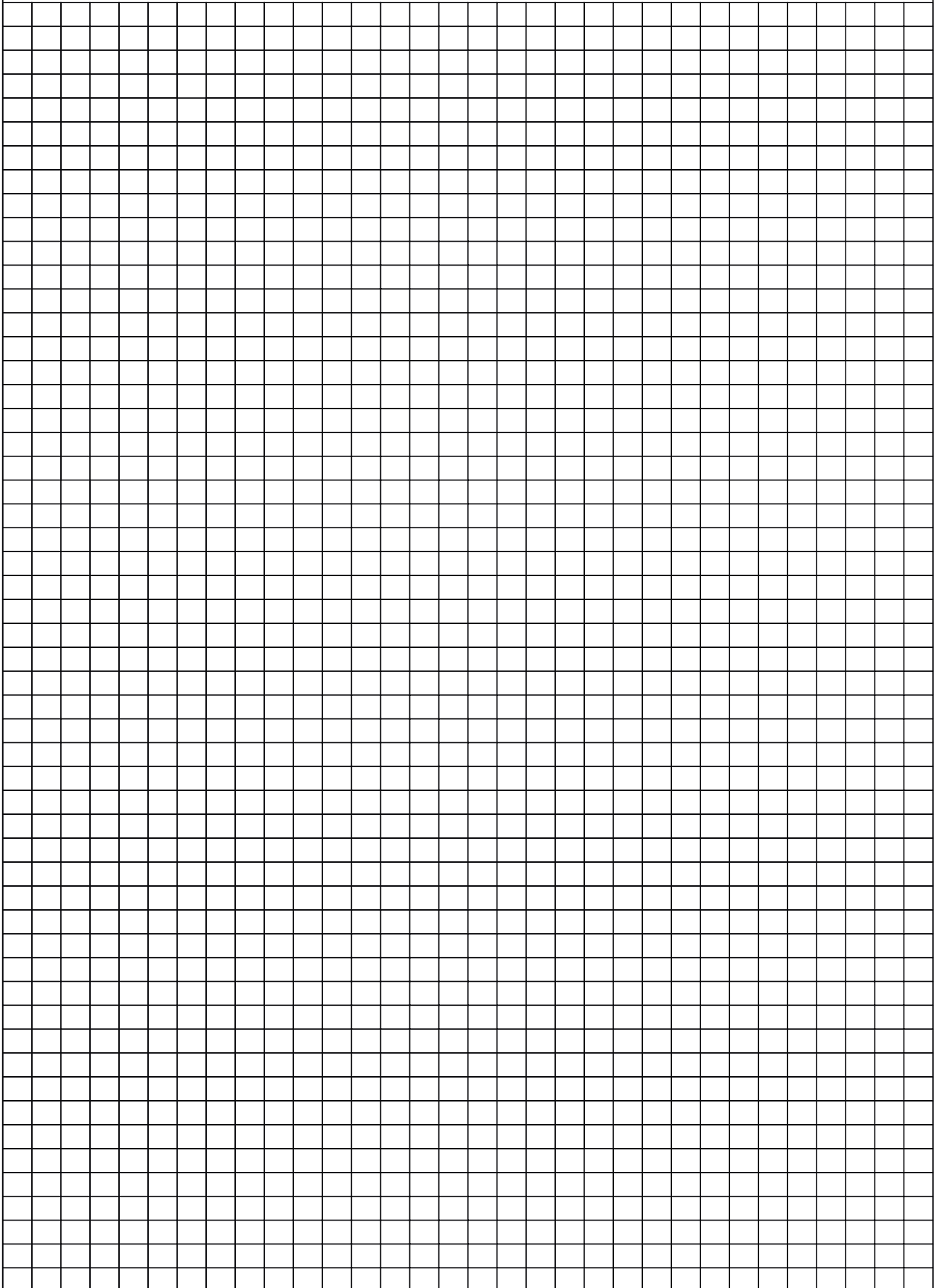
**B. Metro Ventilation**

**This applies to Trackway Exhaust**

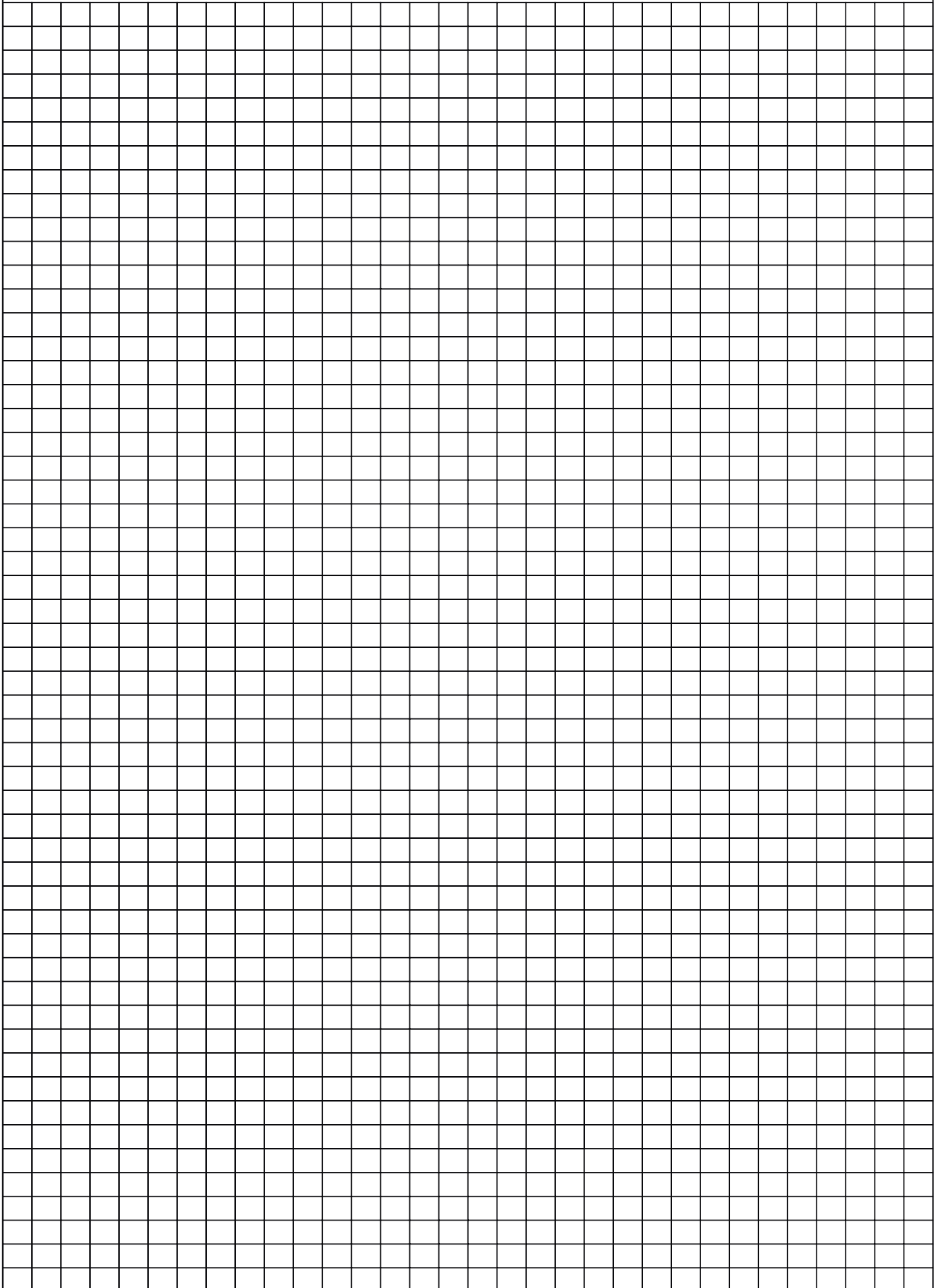




## NOTES



## NOTES



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The company is always improving and developing its products, therefore the company reserves the right of making changes to the illustrated products. Certified dimension can be provided upon request.



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Website:www.krugerfan.com

**CNo.-CAT029(S1).E0 October 2013**

A member of

Soler&Palau  Ventilation Group