



TUNNEL FAN

KTF & KTF-R Series



Company Profile

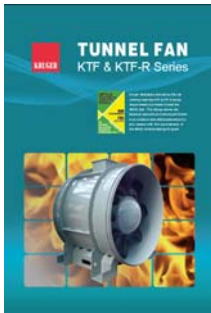
Established in Singapore since 1985, Kruger Ventilation is a full subsidiary company of Soler & Palau Ventilation Group. For decades, Kruger Ventilation continues to be a leading supplier of ventilation solutions for residential, commercial, industrial, and infrastructure applications; the last of which 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-E2-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 450m³/s.
 - Reversible**
Range from diameter 1250 to 2240mm, static pressure up to 2500Pa, flow rate up to 160m³/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.
- **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. Other temperature ratings are available upon request.

Certified by TUV SUD which is a leading international service organization focusing on consulting, testing, certification and training.
- **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

MODEL : KTF 2000

Uni-Directional

KTF - R 2000

Reversible

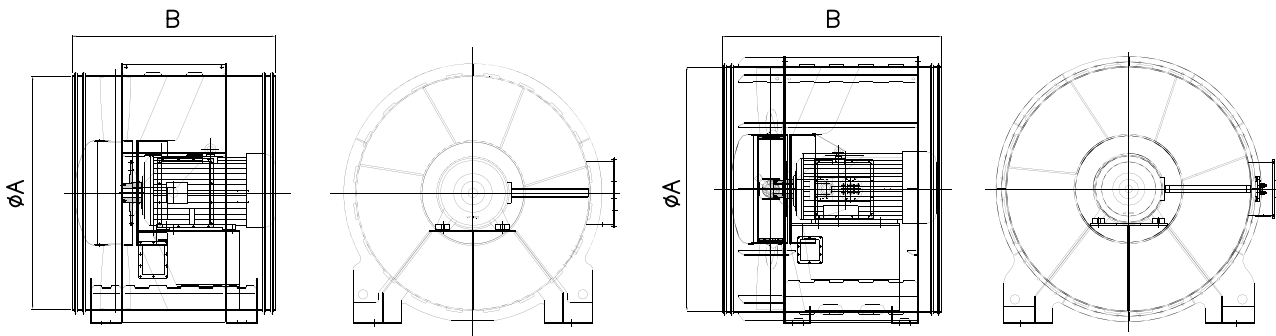
Nominal Fan Diameter

Nominal Fan Diameter

Kruger Tunnel Axial Fan

Kruger Tunnel Axial Fan

Dimension



If dimension "B" is < 1750mm

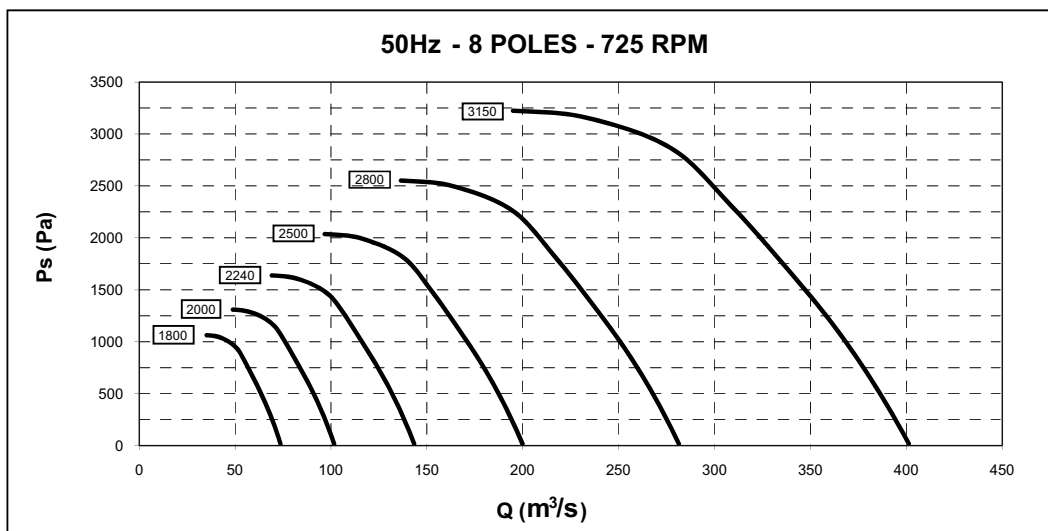
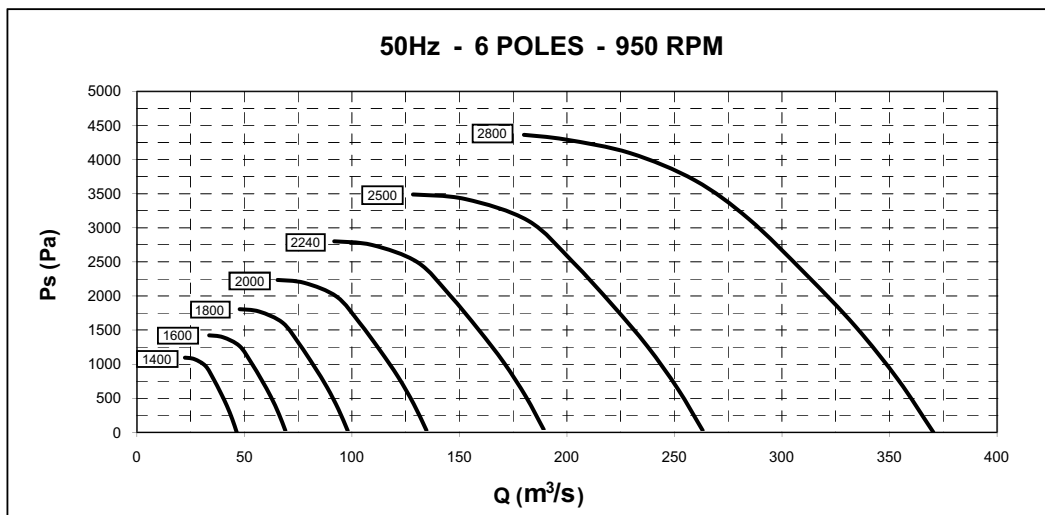
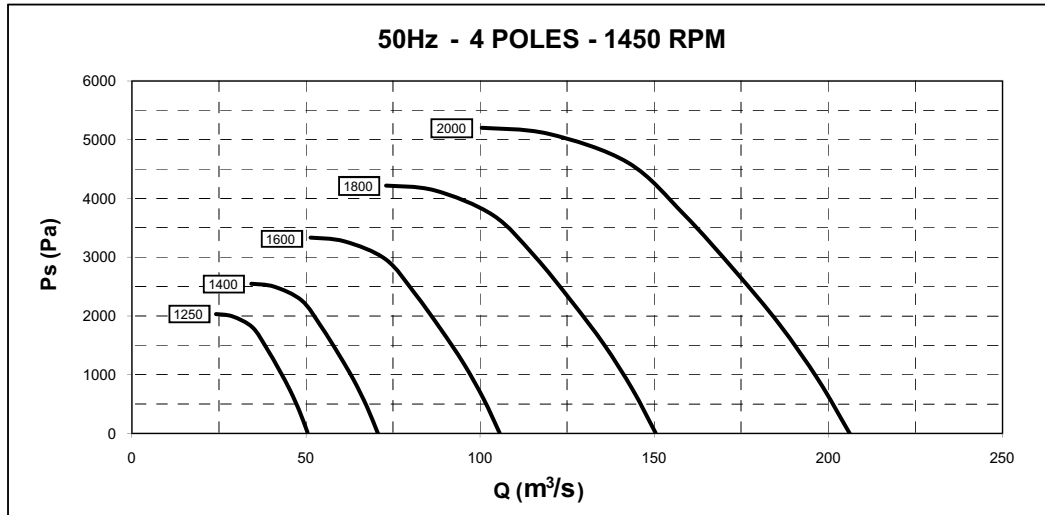
If dimension "B" is >= 1750mm

Model	Motor Frame Size	A	B
1250	D160-200	1250	1150
	D225-280		1350
	D315		1650
1400	D180-225	1400	1200
	D250-280		1450
	D315		1650
1600	D200-225	1600	1250
	D250-280		1500
	D315		1750
1800	D225	1800	1300
	D250-280		1550
	D315		1750
2000	D250-280	2000	1600
	D315		1750
	D355		2000
	D450		2350
2240	D280	2240	1600
	D315M/L		1900
	D355		2100
	D400		2300
	D450		2450
2500	D280	2500	1700
	D315		2000
	D355		2250
	D400		2400
2800	D450	2800	2500
	D280		1700
	D315		2050
	D355		2300
3150	D400	3150	2450
	D450		2600
	D280		1750
	D315		2150
	D355		2350
	D400		2550
	D450		2650

- Model sizes are nominal diameter

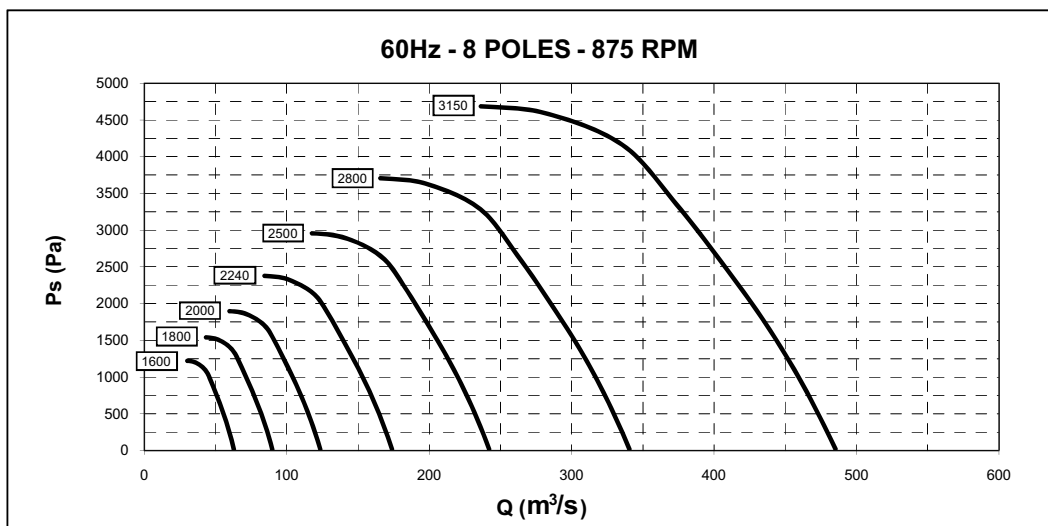
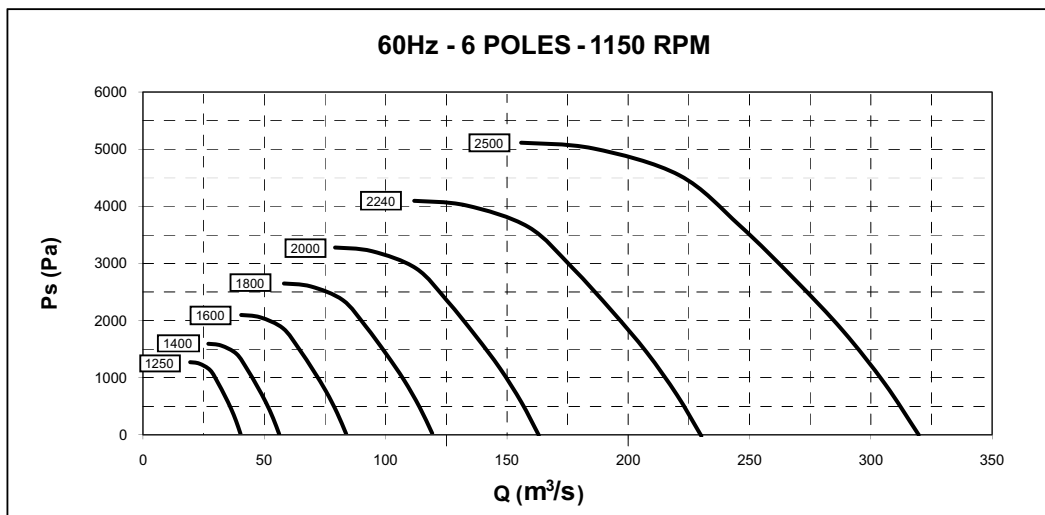
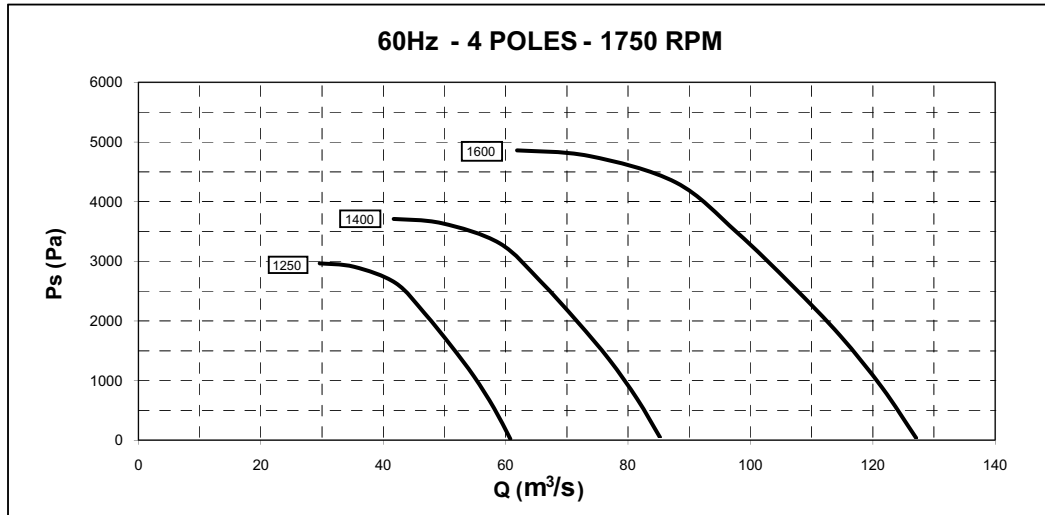
All dimensions in mm

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



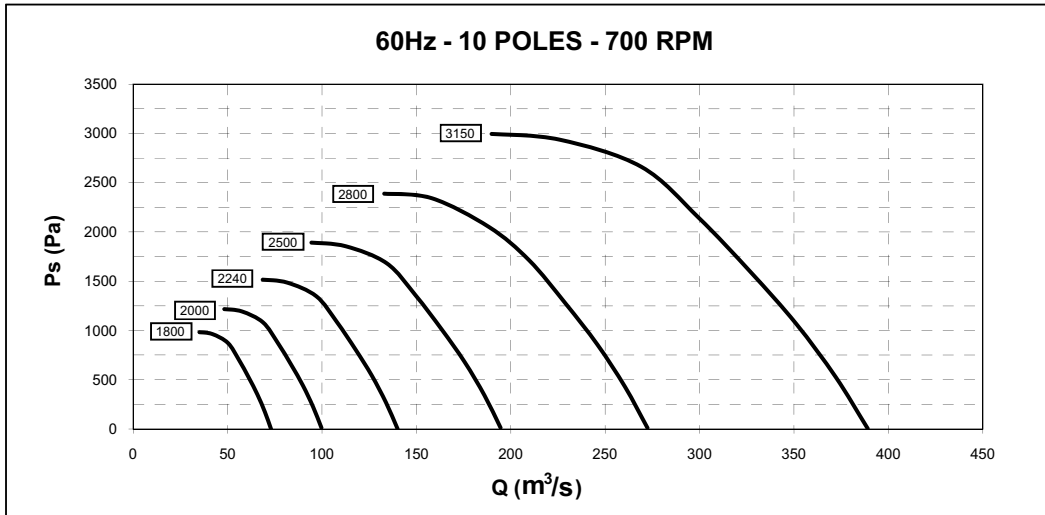
Please contact Kruger for fan selection beyond this range.

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



Please contact Kruger for fan selection beyond this range.

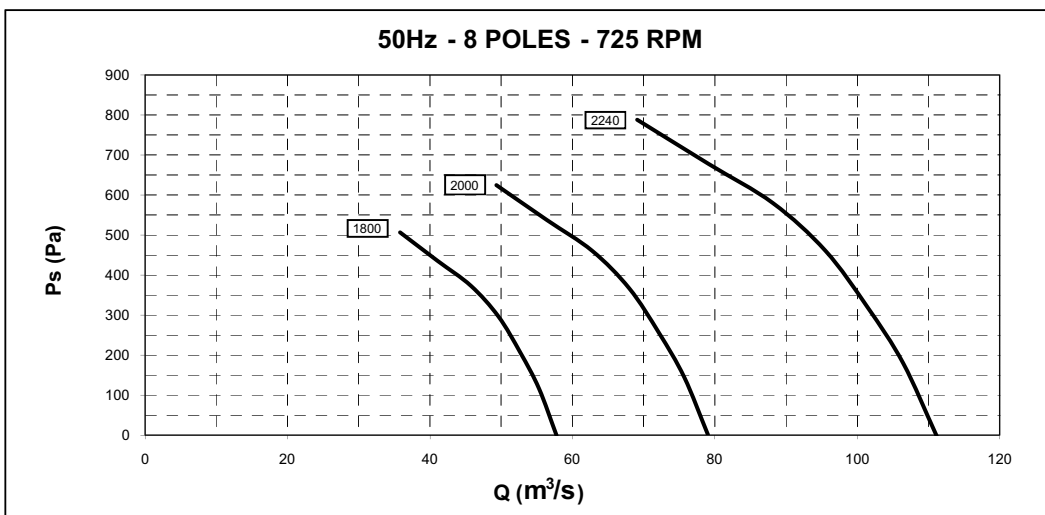
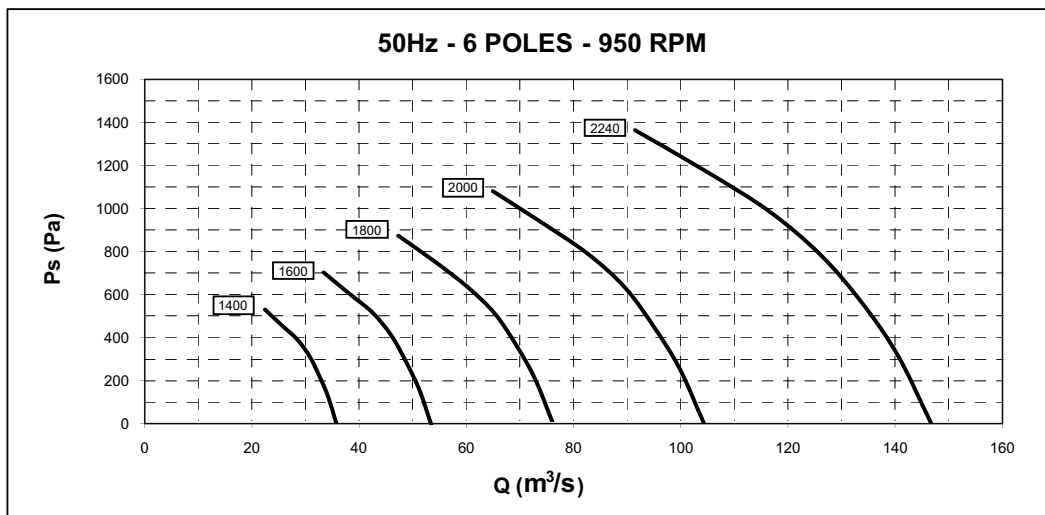
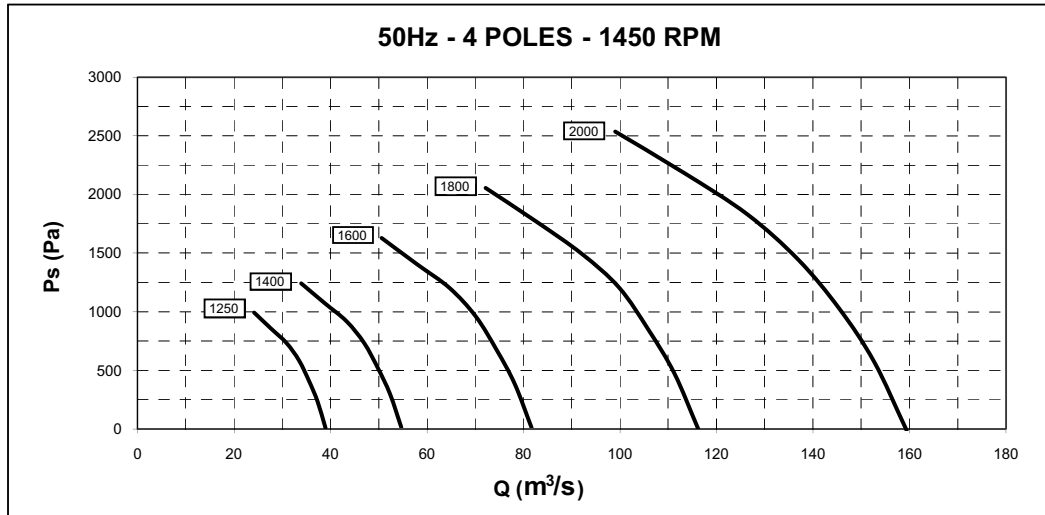
Quick Selection Chart - Fan KTF Series (Uni-Directional)



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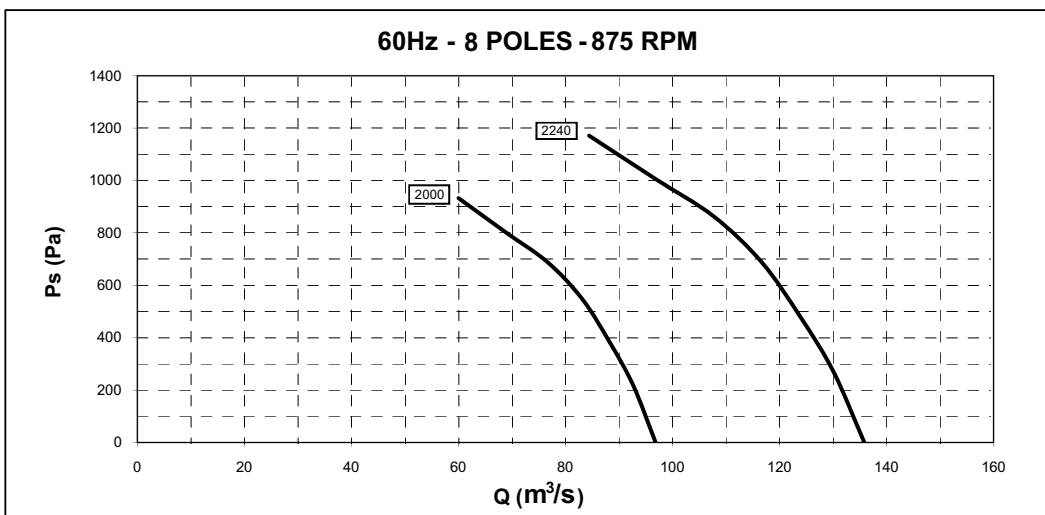
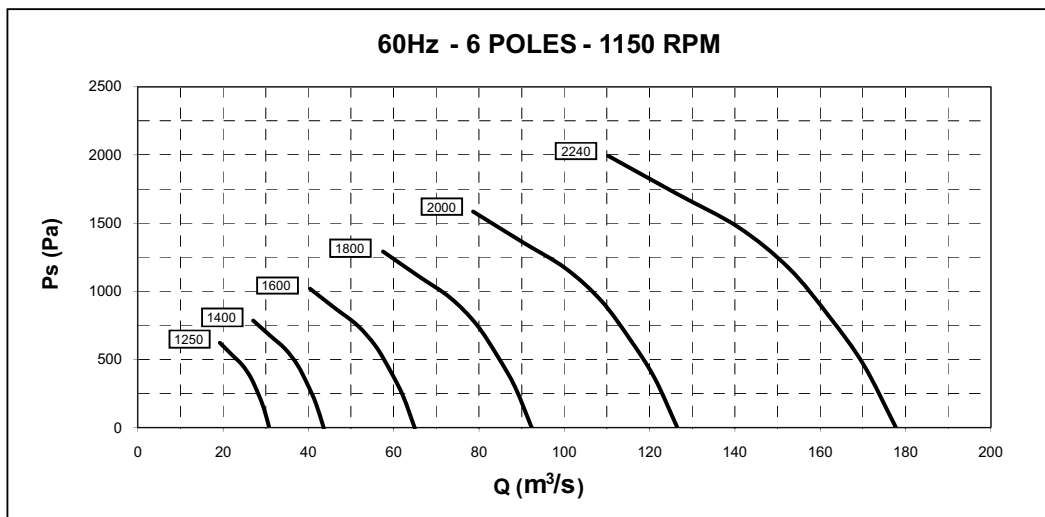
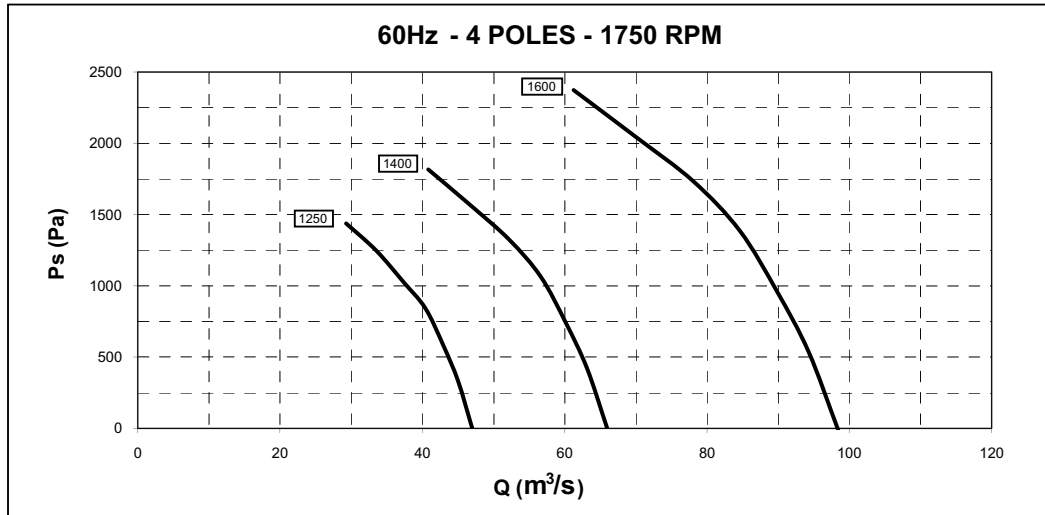


Quick Selection Chart - Fan KTF-R Series (Reversible)



Please contact Kruger for fan selection beyond this range.

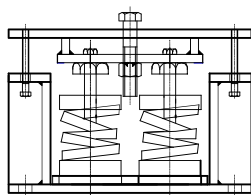
Quick Selection Chart - Fan KTF-R Series (Reversible)



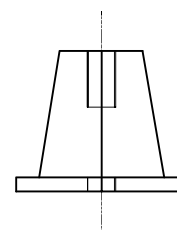
Please contact Kruger for fan selection beyond this range.

Accessories

Spring Isolator



Rubber Isolator



Inlet Bellmouth



Counter Flange



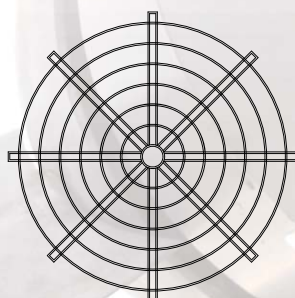
Safety Wire



Cable Pull Safety Switch



Protection Net



Typical Project Reference

Application	Project Name	Country & Region	Type	Fan Size	
Metro	Metro Downtown Line – Stage 2	Singapore	Axial Fan	1800, 2000	
			Jet Fan	630, 1250	
	Metro Xin Zhuang Line CK 378 A/B/D/H	Taiwan (Taipei)	Axial Fan	1800	
			Jet Fan	1120, 1400	
	Metro Xin Yi Line CR 388 A/B	Taiwan (Taipei)	Axial Fan	1600, 1800	
			Jet Fan	1120	
	Metro Tao Yuan Airport CA 384		Axial Fan	1250, 1800	
Metro Project Mass Rapid Transit Lembah Kelang: Jajaran Sungai Buloh - Kajang	Malaysia	Axial Fan	1800, 2000		
		Jet Fan	1120		
Chile Metro Line 3 and 6	Chile	Axial Fan	2500		
Mexico Metro Line 3, 7 and 12	Mexico	Axial Fan	1600, 2000, 2240		
Road Tunnel	Xiang An Subsea Tunnel	China (Fujian)	Axial Fan	2240, 2500, 2800	
			Jet Fan	630, 1120	
	Ning Wu Expressway (Dong Gong Shan Tunnel & Fen Shui Guan Tunnel)		Axial Fan	2500, 2800	
			Jet Fan	1120	
	Jian Tai Expressway (Tai Ning Tunnel)		Axial Fan	2500, 3150	
			Jet Fan	1120	
	Zhang Yong Expressway (Guan Tian Tunnel)		Axial Fan	2500	
			Jet Fan	1120	
	JingTai Expressway (Tian Long Shan Tunnel)		Axial Fan	2500, 3150	
			Jet Fan	1120	
	JingTai Expressway (Huang Zhu Shan Tunnel)		Axial Fan	3150	
			Jet Fan	1120	
	JingTai Expressway (Niu Yan Shan Tunnel)		Axial Fan	2500, 2800	
	JingTai Expressway (Yan Qian Tunnel)		Axial Fan	2500	
	Meiyu Expressway (Qi Shan Tunnel)		Axial Fan	2500, 2800, 3150	
	Shen Hai Alternated Route Expressway (Ci Gan Yan Tunnel)		Axial Fan	2800	
	Shen Hai Alternated Route Expressway (You Che Ling Tunnel)		Axial Fan	3150	
	Wuhan East Lake Under Lake Tunnel		China (Hubei)	Axial Fan	2240, 2500
				Jet Fan	630, 1000, 1250
	Second Link Road Hankou Railway Station Road Tunnel			Jet Fan	560
	Chang Ping Expressway (Hong Ti Guan Tunnel)			Axial Fan	2800
	Xin Bao Expressway (Yun Zhong Shan Tunnel)		China (Shanxi)	Axial Fan	2500
	Tai Gu Expressway (Xi Shan Tunnel)			Axial Fan	2500
	Hai He Cross River Tunnel		China (Tianjin)	Axial Fan	1600, 2240
				Jet Fan	800
	Yuewu Expressway (Ming Tang Shan Tunnel)		China (Anhui)	Axial Fan	2240
	Xin Zhong Zhou Tunnel		China (Tianjin)	Jet Fan	630
Luntou-Shengwudao-HEMC Tunnel		Jet Fan	710		
Hangzhou Xiao Shan Airport Tunnel	China (Zhejiang)	Jet Fan	710		
Hong Kong-Macau-Zhuhai Bridge Tunnel Project	China (Hong Kong-Macau-Zhuhai)	Axial Fan	2500, 3150		
		Jet Fan	630, 1120, 1250		
Jurong Rock Cavern	Singapore	Axial Fan	1600, 1800, 2000		
Singapore Woodsville Tunnel		Jet Fan	1250		
Ba Gua Shan Tunnel	Taiwan (Changhua)	Axial Fan	2500		
Storage	Jurong Rock Cavern	Singapore	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.

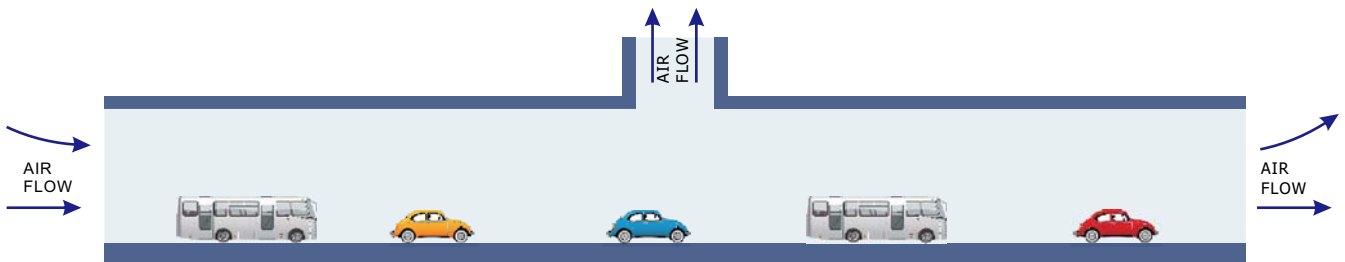
A. General Tunnel Ventilation

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

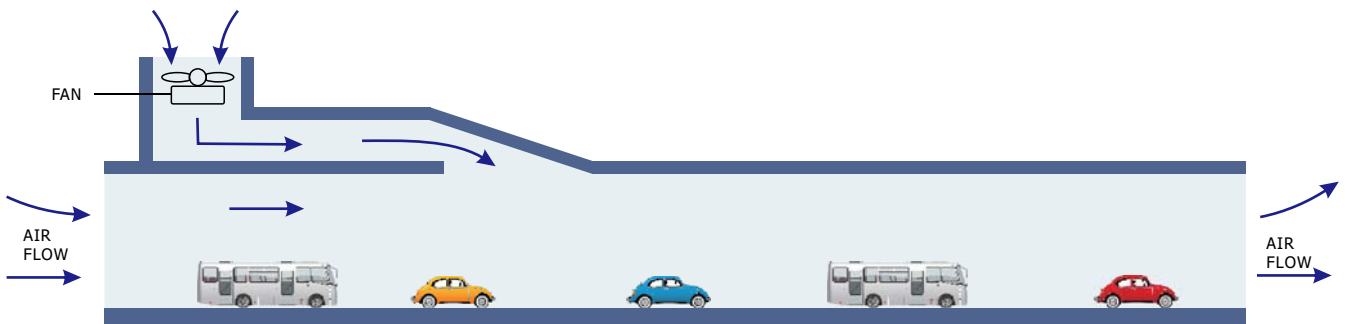
1. Natural Ventilation



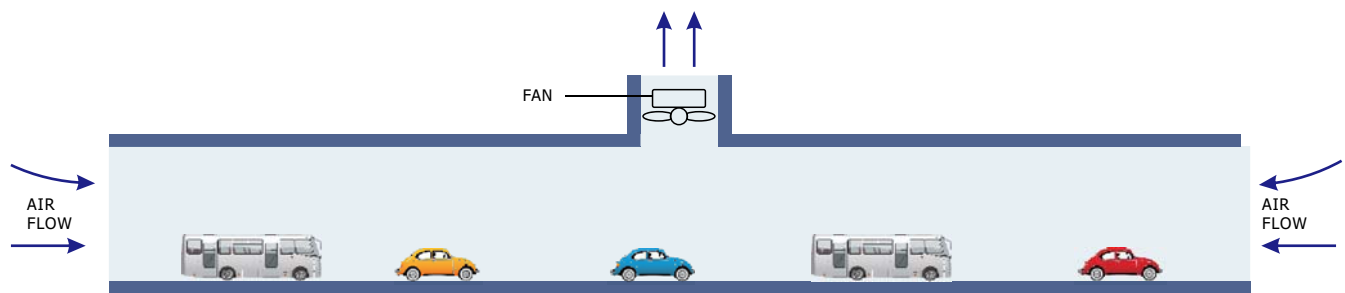
2. Natural Ventilation with Central Shaft



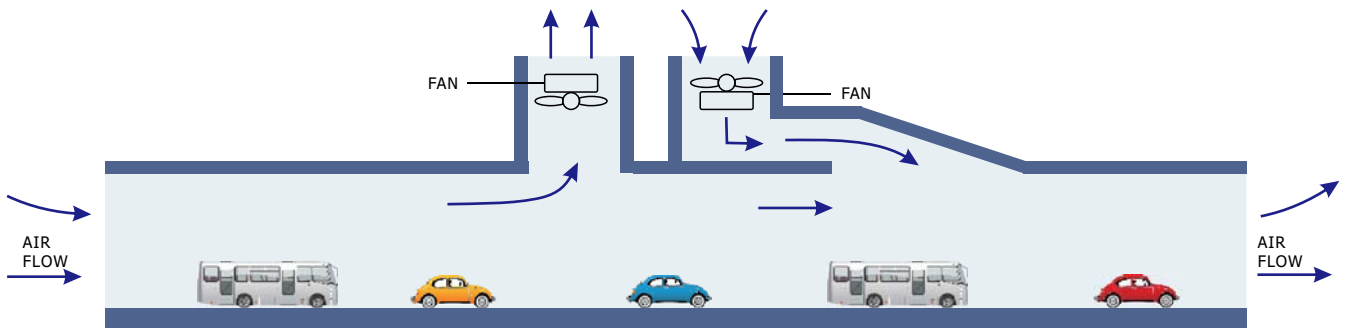
3. Injection Type Longitudinal Ventilation



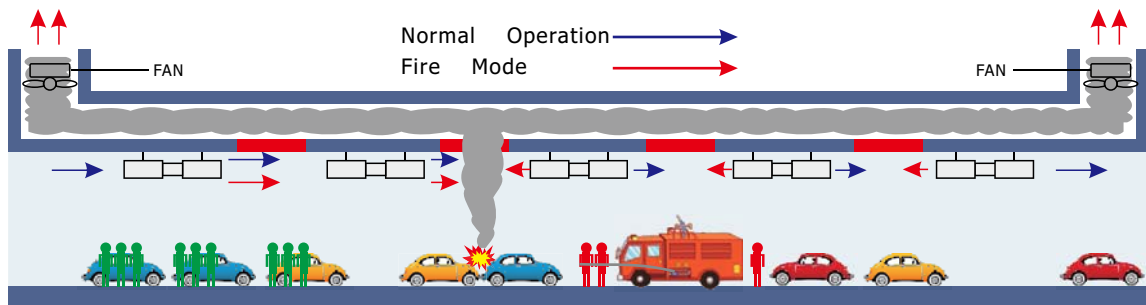
4. Central Exhaust Shaft Type Longitudinal Ventilation



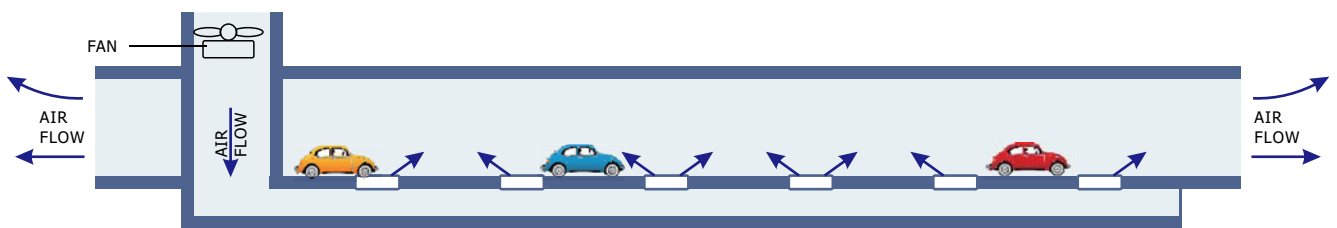
5. Central Supply & Exhaust Shaft Type Longitudinal Ventilation



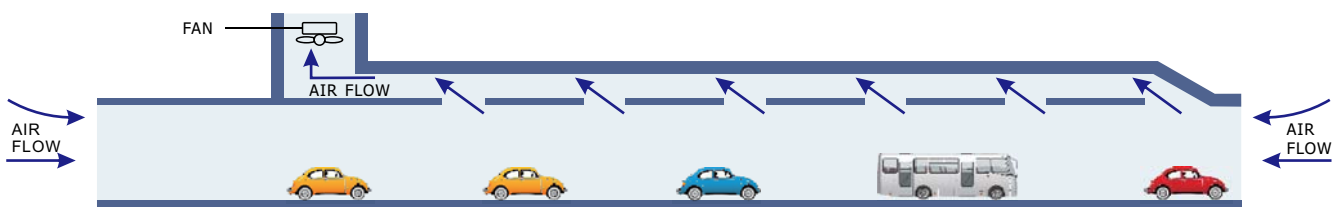
6. Point Extraction Type Longitudinal Ventilation (PEV)



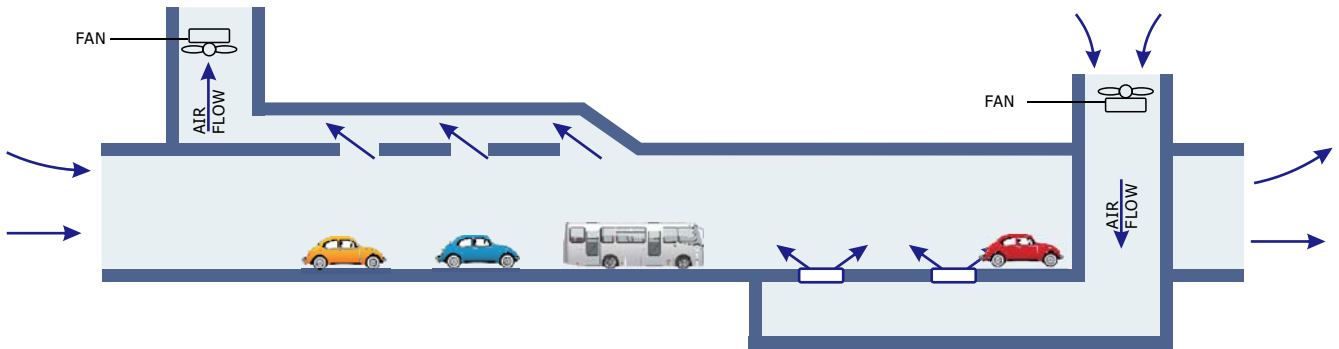
7. Semi-Transverse Supply Type



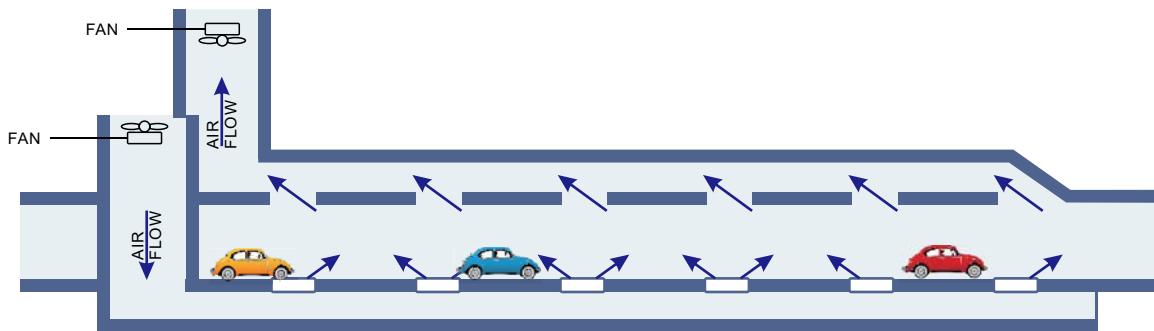
8. Semi-Transverse Exhaust Type



■ 9. Semi-Transverse Half Supply Half Exhaust Type

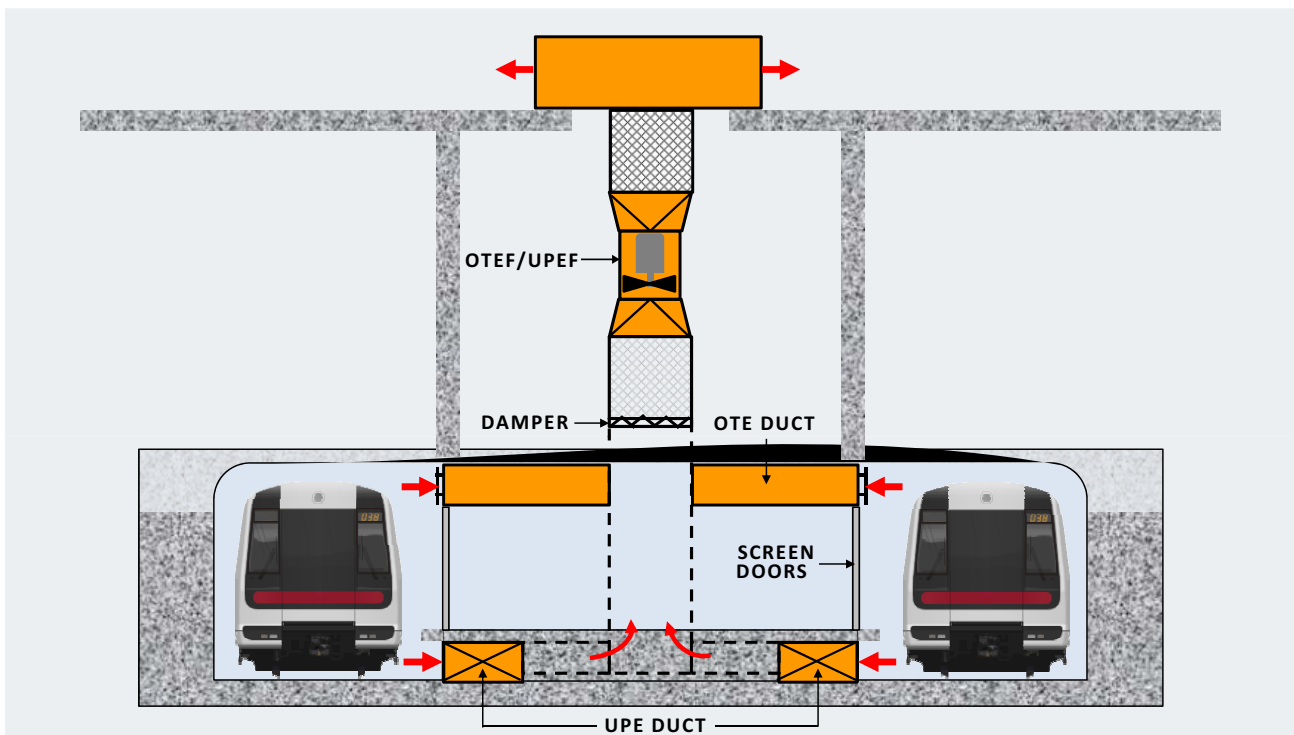


■ 10. Fully Transverse Type



B. Metro Ventilation

This applies to Trackway Exhaust



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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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CNo.-CAT029(S1).E0 April 2015

A member of

Soler&Palau  Ventilation Group