



TUNNEL FAN

KJF & KJF-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

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 jet 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 jet 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 jet 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 jet fans are required to removal heat, to provide fresh air for a working environment, and to maintain the proper ambient conditions for system operation.

Fan Features

- **Complete Range**

Range from diameter 560 to 1600mm.

- **High Efficiency**

Thrust efficiency up to 37N/kW.

- **Reliable Performance**

Kruger tunnel jet fans are tested in AMCA accredited laboratory and rated in accordance with AMCA 210 for air performance, and comply with ISO 1940 and AMCA 204 balancing grade G 6.3/G 2.5. Further more, Kruger tunnel jet fans are tested in accordance with EN 12101-3:2002 and comply with the high temperature resistance requirement for 250°C / 2H, 300°C / 1H (F300) and 400°C / 2H (F400) by TUV SUD.

- **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 thrust and thermal shock in case of fire.

- **Robust & Durable Design**

Major components are made from high strength steel.

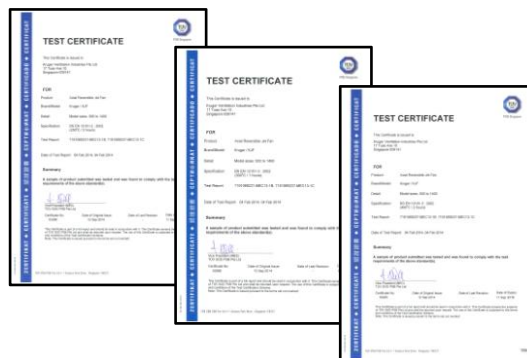
- **Reliable Corrosion Protection**

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

Quality Assurance

- **High Temperature Test**

Kruger tunnel jet fan KJF & KJF-R series are tested in accordance with EN 12101-3:2002 and comply with the high temperature resistance requirement for 250°C / 2H, 300°C / 1H (F300) and 400°C / 2H (F400) by TUV SUD.



- **Pre-Assembly Examination**

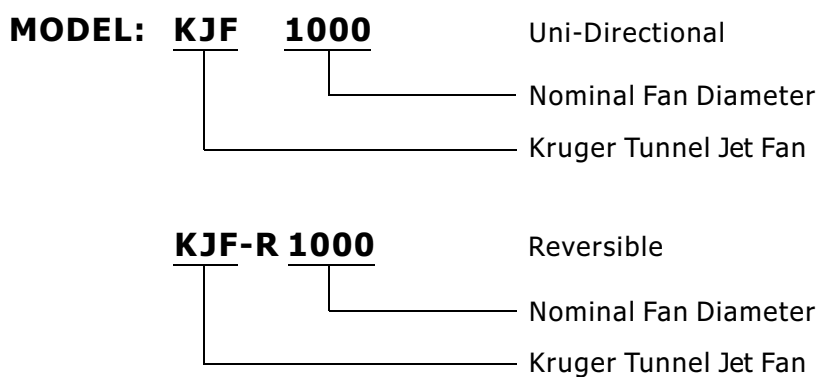
X-Ray examination for Aluminum alloy blades as per ASTM E-155 and dye penetration (non destructive) tests for welds on fan hubs as per ASME Section V, Art. 6 & 24 (identical with ASTM E-165) are available upon request to ensure the impellers are capable of withstanding the effect of all stress and load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

- **After-Assembly Examination**

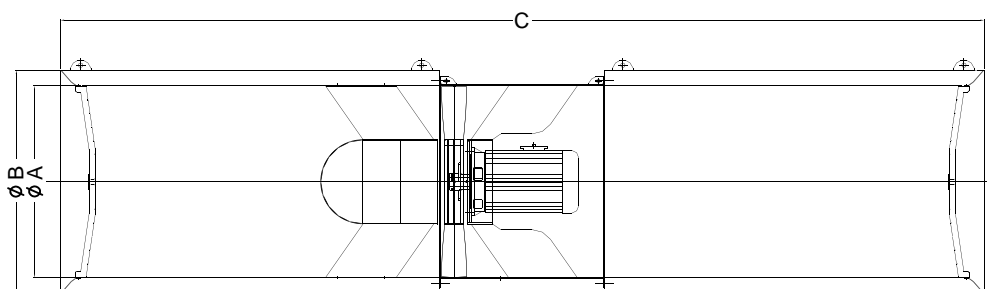
All Kruger tunnel jet fans are balanced in accordance with ISO 1940 and AMCA 204 standard and comply with G4.0 or G2.5 requirement.

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	Ø A	Ø B	C (1D)	C (2D)
560	560	710	1740	2860
630	630	780	2070	3330
710	710	860	2310	3730
800	800	950	2620	4220
900	900	1050	3080	4880
1000	1000	1200	3260	5260
1120	1120	1320	3480	5720
1250	1250	1450	3830	6330
1400	1400	1600	3860	6660
1600	1600	1800	4160	7360

Model sizes are nominal diameter

All Dimensions in mm

Quick Selection Chart

Model	50Hz				60Hz			
	Operating Speed (rpm)	Max Flow Rate (m ³ /s)	Max Outlet Velocity (m/s)	Max Thrust (N)	Operating Speed (rpm)	Max Flow Rate (m ³ /s)	Max Outlet Velocity (m/s)	Max Thrust (N)
560	2900	9.05	35.84	389	3500	9.82	38.89	458
630	2900	12.94	40.60	630	3500	12.95	40.64	631
710	2900	16.20	40.12	780	1750	10.60	26.25	334
800	2900	20.80	40.36	1008	1750	16.20	31.09	598
900	1450	18.10	27.83	604	1750	22.50	34.59	934
1000	1450	25.30	31.45	955	1750	31.00	38.54	1434
1120	1450	36.05	35.76	1547	1750	39.25	38.93	1834
1250	1450	50.91	40.38	2467	1150	39.50	31.33	1485
1400	1450	64.00	40.53	3112	1150	56.00	35.46	2383

For the selection of size 1600, please contact Kruger.

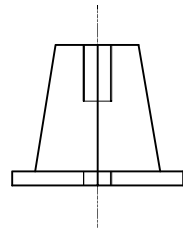
Data shown above are for maximum performance. Please consult Kruger if optimum performance (highest efficiency) is desired.

Accessories

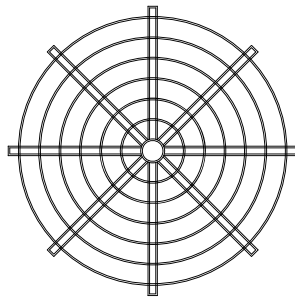
Safety Wire



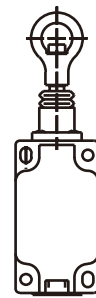
Rubber Isolator



Protection Net



Cable Pull Safety Switch



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 Yi Line CR 388B	Taiwan	Metro	Jet Fan	1120
			Axial Fan	1600
				1800
Downtown Line-Stage 2	Singapore	Metro	Axial Fan	1800-2000
			Jet Fan	1250
Xiang An Subsea Tunnel	China	Road Tunnel	Axial Fan	2800
				2500
				2240
				1120
			Jet Fan	630
Guangzhou Luntou-Sheng Wu island University Crossing Pearl River Tunnel	China	Road Tunnel	Jet Fan	710
Xiao Shan Airport Tunnel	China	Road Tunnel	Jet Fan	710
Wu Songshan Tunnel	China	Road Tunnel	Jet Fan	1120

Tunnel Ventilation Methods

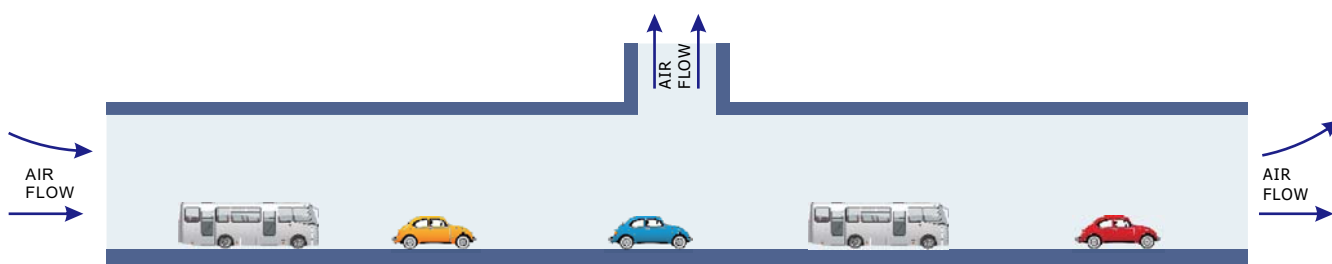
Different countries/regions may have different requirements/regulations on tunnel ventilation systems. There are many types of ventilation systems. However, only two types of fans are used: axial fans and jet fans. Axial fans are used to supply fresh air and extract contaminated air / smoke. Jet fans 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.

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

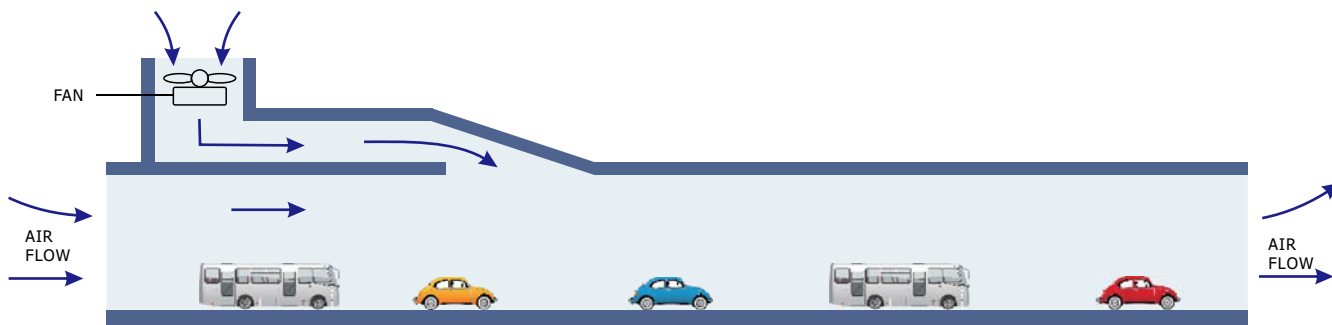
1. Natural Ventilation



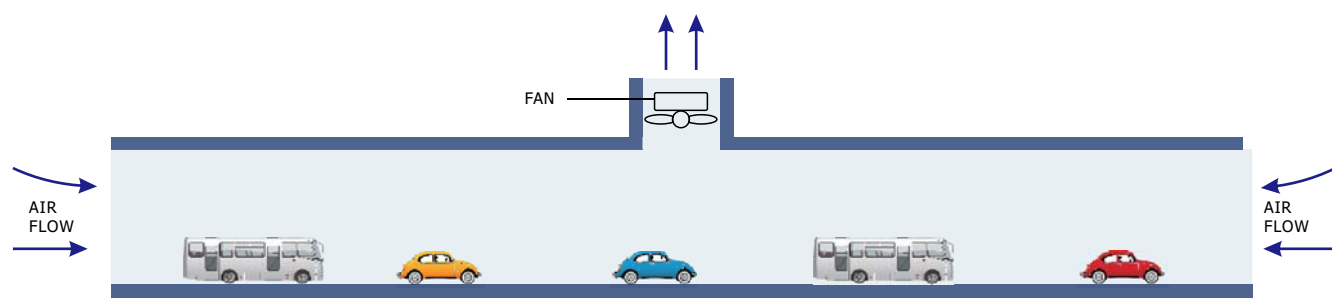
2. Natural Ventilation with Central Shaft



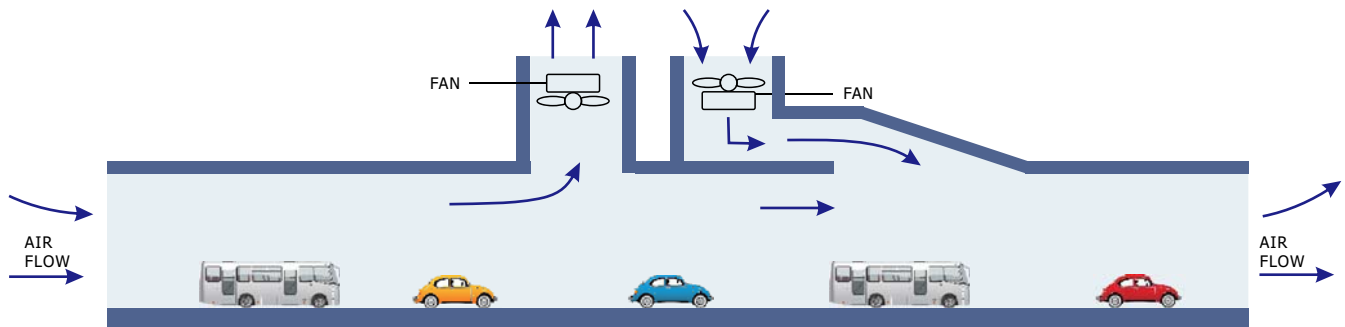
3. Injection Type Longitudinal Ventilation



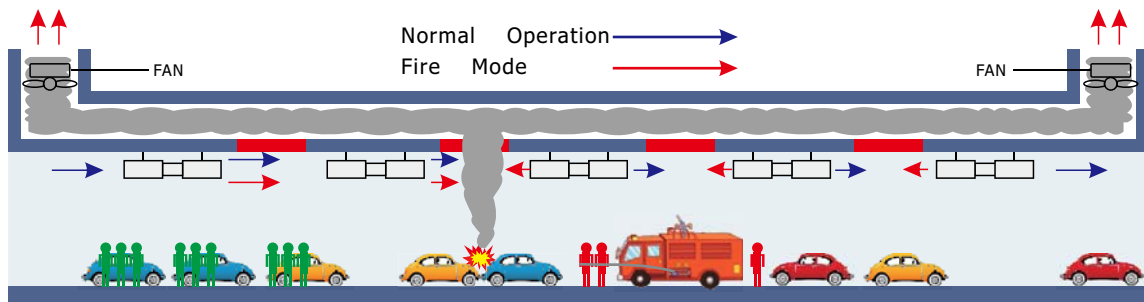
4. Central Exhaust Shaft Type Longitudinal Ventilation



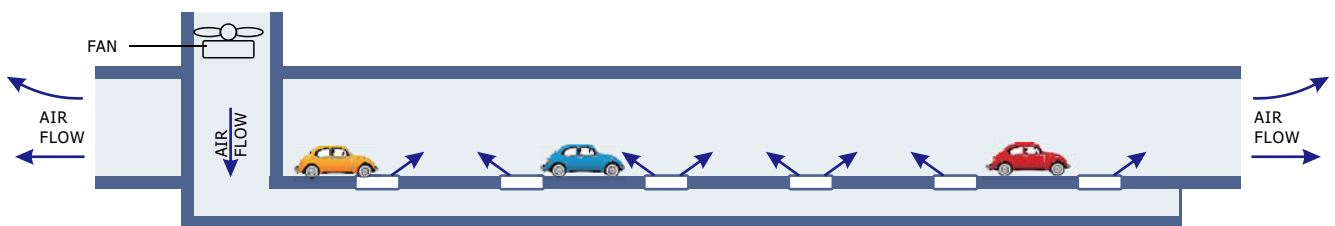
5. Central Supply & Exhaust Shaft Type Longitudinal Ventilation



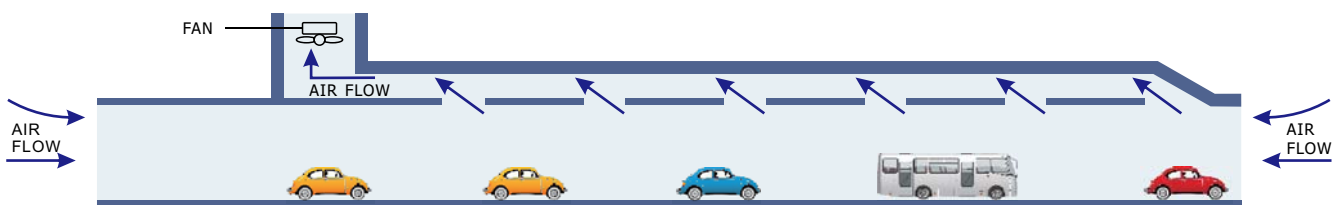
6. Point Extraction Type Longitudinal Ventilation (PEV)



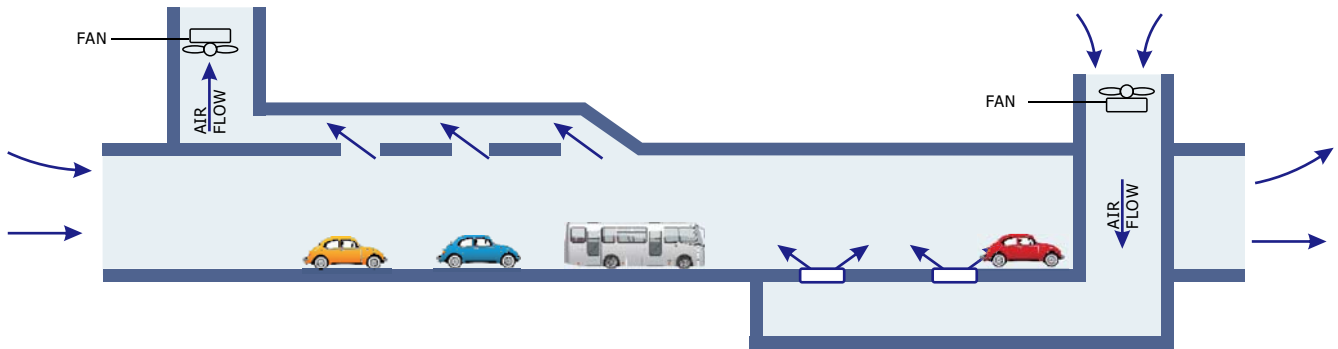
7. Semi-Transverse Supply Type



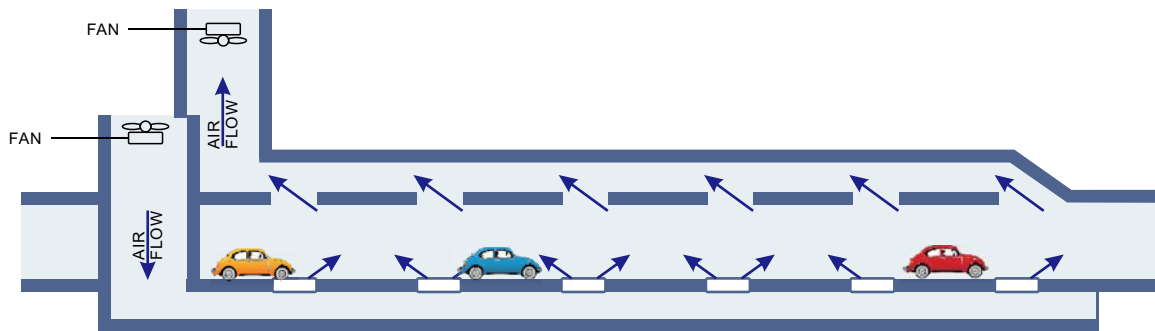
8. Semi-Transverse Exhaust Type



9. Semi-Transverse Half Supply Half Exhaust Type



10. Fully Transverse Type



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