



The MoJet[®]

The Next Generation of Jet Fans for Tunnel Ventilation.

a company of  POWERCHINA

MOJET



TLT-Turbo

TLT-Turbo: Your Partner for Tunnel System Ventilation

A History of Continuous Innovation

TLT-Turbo has over 100 years of experience in ventilation technology and has been developing, manufacturing and constructing axial flow and centrifugal fans and systems for more than 40 years. This extensive experience has been consistently incorporated into the further development of the design, manufacturing and installation of our complete, integrated ventilation systems for road, metro and rail tunnels.

In an emergency situation, smoke is one of the major hazards for people in an underground tunnel. TLT-Turbo is a turnkey partner for smoke extraction systems and we have the ability to provide clear visibility for escape routes. In case of fire, our Metro and Tunnel fans provide smoke free emergency exit routes.

Our fans offer low acoustic noise levels. These fans may be used in tunnel sections as Jet Fans with a free inlet and outlet or on the premises as axial fans in ducted installations. Overpressure installations protect emergency exits against incoming smoke. TLT-Turbo's success story in supplying these fans started in the early 1970's in the Alps. Many important Alptransit-routes have since been equipped with TLT-Turbo Tunnel Fans.

Our fan series is tested to EN 12101-3 standards to provide the desired safety. Specially selected materials, highly heat resistant motors and design precision from TLT-Turbo combine safety with high economic efficiency. Excellent aerodynamic features guarantee lower power consumption and installation costs.

Scope of Supply

- ▶ Smoke Extract Jet Fans
- ▶ MoJet®
- ▶ Smoke Extract Tunnel & Metro Fans
- ▶ Variable Pitch Tunnel & Metro Fans
- ▶ Service & Maintenance
- ▶ Construction Fans
- ▶ Customized Fans
- ▶ CFD and FEM simulations
- ▶ Model- & full size performance testing
- ▶ Innovative MoJets® which improve your Jet Fan performance by up to 50%
- ▶ All relevant ventilation system components from a single source (e.g. dampers, silencers, drive system, etc.)
- ▶ Smart control systems and sensors for condition monitoring
- ▶ BIM integration



Why choose TLT-Turbo?

- ▶ Over 140 years of expertise in fan production
- ▶ Represented in 40 countries, across all continents
- ▶ Over 6000 fans installed worldwide
- ▶ Use of the latest design tools such as FEM and CFD
- ▶ Locations for R&D and manufacturing in Germany, USA, China and South Africa
- ▶ Service locations and authorized service partners in Europe, Russia, North America, India, Australia, China and SEA
- ▶ Test stands in Germany, China and USA

Servicing of Fans and Ventilation Systems

- ▶ Replacement or upgrades of fans and equipment
- ▶ Spare parts
- ▶ Installation, start-up and commissioning
- ▶ User training
- ▶ Maintenance and repair work
- ▶ Diagnostic surveys and complete overhauls of fans and equipment
- ▶ Optimization of your ventilation system even after completion of civil works
- ▶ Aeroacoustic measurements on site
- ▶ Remote supervision
- ▶ Remote problem analysis
- ▶ Carefree service packages
- ▶ Framework agreements

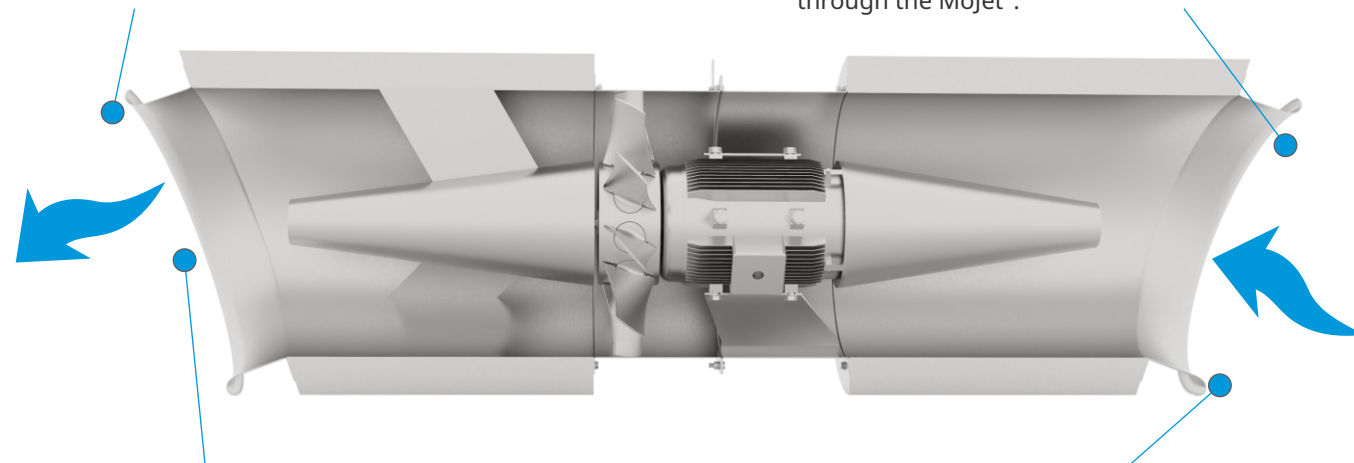
MoJet® Series

Innovative Jet Fans for Operational Ventilation & Smoke Extraction

One of the most common fans in Tunnel and Metro ventilation is the Jet Fan. The Jet Fan (or impulse fan) consists of one impeller (usually reversible by change of motor direction), the electric motor, the casing, two silencers with inlet nozzles and supports to allow the fan to be fixed to the ceiling. The fan is designed for pushing an air column inside a large void (e.g. tunnel) through impulse exchange. Therefore, the Jet Fan has a free inlet and outlet with no duct connections. Based on decades of experience and extensive R&D, TLT-Turbo has developed a new generation of standardized and modularized Jet Fans to bring economic efficiency, quality and the highest degree of efficiency to the next level.

The bellmouth deflects the discharge flow away from the tunnel surfaces, reducing the Coanda effect and hence avoiding the loss of thrust due to aerodynamic friction.

The inlet bellmouth is tilted away from the bounding tunnel surfaces, hence reducing their confining effects and increasing the mass flow through the MoJet®.



The circular bellmouth has an area greater than that of the fan, leading to a lower discharge velocity, reduced discharge pressure drop, increased mass flow, greater static pressure recovery and less aerodynamic shear on tunnel surfaces.

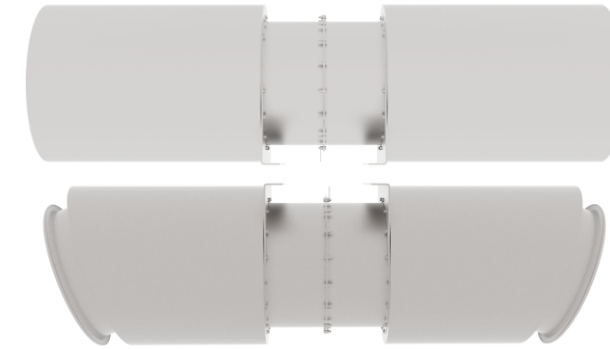
The inlet bellmouth smoothly guides the flow into the silencer, avoiding any flow separation. The inlet pressure drop is reduced by having a circular bellmouth that has a larger area than the fan, and this leads to a higher mass flow.

What Distinguishes the MoJet® from a Conventional Fan

Conventional Jet Fans are the standard means of providing longitudinal ventilation in tunnels. However, they suffer from the following significant disadvantage compared to the MoJet®. **Thrust is lost due to friction between the jet and the tunnel surfaces.** The discharged jet tends to stick to tunnel soffit and walls, due to the Coanda effect and swirl. Typically 30% to 50% of thrust is thereby lost.

The reversible MoJet® tunnel ventilation system can increase in-tunnel aerodynamic thrust by up to 50%, with reduced power consumption. To achieve such a significant improvement in performance, the MoJet® uses shaped nozzles which turn the jet flow away from the tunnel soffit and walls. This reduces surface friction, minimizing the Coanda Effect, where a reduction in static pressure due to the high jet velocity tends to deflect the jet towards any solid surface. The MoJet® represents a significant improvement over older technologies to reduce the Coanda effect, such as slanted silencers and jet flow deflectors.

Direct Design Comparison



Design comparison of conventional Jet Fan (top) and innovative MoJet® (bottom)

Technology	Deflect Jet	Compact	No Jet Throw Extension	No Noise Regeneration	No Deflector Metal Fatigue Risk	No Additional Power	No Risk of Bearing Damage
Conventional	X	✓	✓	✓	✓	✓	✓
Deflectors	✓	✓	X	X	X	X	✓
Slanted Silencers	✓	X	✓	✓	✓	X	X
MoJet®	✓	✓	✓	✓	✓	✓	✓

Your Benefits



Reduced number of Jet Fans

The innovative design results in markedly improved energy efficiency and fewer or smaller Jet Fans being required to provide the same degree of ventilation, as verified by independent measurements in full-scale tunnels. The reduction in the number of fans leads to lower procurement, installation and maintenance costs.

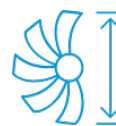


Reduction of up to 50% in power consumption

This leads to lower costs for energy and installed power, as well as a lower carbon footprint.

Changed fan diameter

Since MoJets® deliver greater in-tunnel aerodynamic thrust than conventional Jet Fans, a smaller fan diameter may be selected while still delivering the required thrust. MoJets® can be installed very close to tunnel walls and soffits, with only minimal clearance for maintenance and tolerances being required. This may allow the designer to increase the fan diameter, while still not encroaching upon the traffic space. Increasing the fan diameter allows additional thrust to be obtained, or to significantly reduce the power consumption for the same thrust. It may also be possible to specify four-pole motors to reduce the fan speed while still achieving the required thrust – this can reduce the power consumption and the noise emissions substantially.



Reduced cabling costs

Since MoJets® can be installed much closer together in a longitudinal direction than conventional Jet Fans.

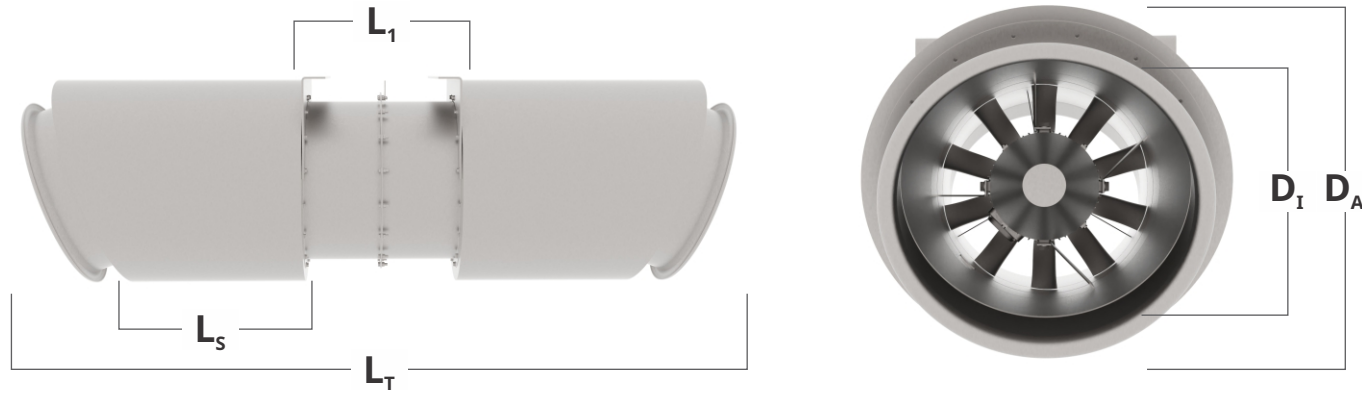
Shorter longitudinal distances between fans

MoJets® can be arranged at typically half the longitudinal distance between successive fans, compared to conventional Jet Fans. This is because the jet dissipates into the tunnel air much more rapidly with the MoJet®, compared to a conventional Jet Fan. Shorter longitudinal distances allow reductions in cable lengths, and hence significant savings.



Technical Details

Weight and Dimensions



Fan Type	TAS 5.6			TAS 6.3			TAS 7.1			TAS 8			TAS 9		
Inner Diameter (D _i)	560			630			710			800			900		
Active Part Length (L ₁)	560			600			680			740			700		
Silencer Length (L _s)	1xD	1.5xD	2xD	1xD	1.5xD	2xD	1xD	1.5xD	2xD	1xD	1.5xD	2xD	1xD	1.5xD	2xD
	560	840	1120	630	945	1260	710	1065	1420	800	1200	1600	900	1350	1800
Outside Diameter Silencer (D _a)	760			830			910			1000			1200 (1100)		
Total Length (L _t)	2435	3000	3550	2260	3300	3900	2960	3670	4380	3270	4060	4670	3580	4470	5400
Total Weight Approx. (kg)	345	360	400	370	400	430	530	565	600	590	640	685	585	620	660

Fan Type	TAS 10			TAS 11.2			TAS 12.5			TAS 14			TAS 16		
Inner Diameter (D _i)	1000			1120			1250			1400			1600		
Active Part Length (L ₁)	780			900			1020			1060			1120		
Silencer Length (L _s)	1xD	1.5xD	2xD	1xD	1.5xD	2xD	1xD	1.5xD	2xD	1xD	1.5xD	2xD	1xD	1.5xD	2xD
	1000	1500	2000	1120	1680	2240	1250	1875	2500	1400	2100	2800	1600	2400	3200
Outside Diameter Silencer (D _a)	1300 (1200)			1420 (1320)			1650 (1450)			1800 (1600)			2000 (1800)		
Total Length (L _t)	4300	5300	5300	4770	5890	7000	5360	6600	7860	5940	7340	8740	6590	8200	9800
Total Weight Approx. (kg)	770	810	855	1015	1090	1200	1600	1850	2200	1780	1950	2000	2050	2190	2420

Standard Design Features

- ▶ Standardized fan series in 10 sizes from 560 mm to 1,600 mm in diameter
- ▶ 100% reversible flow direction
- ▶ Designed to endure temperatures of up to 300 °C for 2 hours (F200, F300 tested acc. to EN 12101-3)
- ▶ Specifically designed to meet challenging requirements in the corrosive tunnel environment
- ▶ Highest quality standards to guarantee safe operation, low maintenance and long lifetime

Customizable Parts and Add-Ons

- ▶ Modular tube silencers up to 2xD
- ▶ Energy efficient MoJet® silencers and nozzles up to 2xD for new fans and upgrades
- ▶ Fan mountings tailored to the shape of the tunnel profile
- ▶ Fan mountings for assembly either directly on the tunnel or on a self-standing support frame
- ▶ Heavy duty fan designed to endure high temperatures of more than 400 °C for 2 hours
- ▶ High efficient motors IE3 and higher to meet future energy efficiency trends and regulations
- ▶ Unidirectional flow with the highest efficiencies

Corrosion protection customized to the environmental conditions up to C5:

- ▶ Fan design using stainless steel material 1.4404, 1.4571 or higher
- ▶ Galvanizing according to ISO 14713-1
- ▶ Wet painting
- ▶ Duplex systems with wet paint or powder coating

Curious about the MoJet®? Enquire Now!

- ▶ Performance data on request – Conventional Jet Fan vs. MoJet®
- ▶ We create an ROI calculation for you in different scenarios to determine your cost saving potential over life time!

Want to know more?
Find more information on the MoJet® and download links to the digital brochure as well as detailed specifications on our website. Scan the QR Code for direct access.



Germany . China . South Africa . USA . India . South Korea
Australia . Hungary . Russia



○ Business Location with Manufacturing and Service Workshop

● Business Location

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