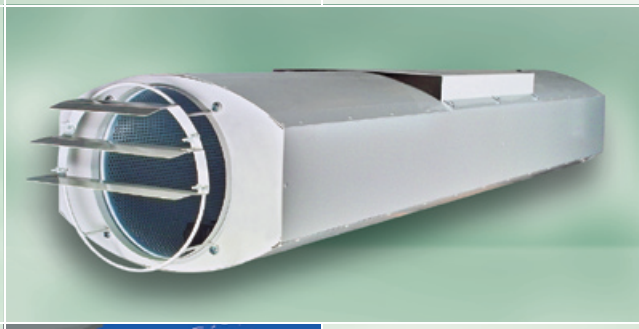
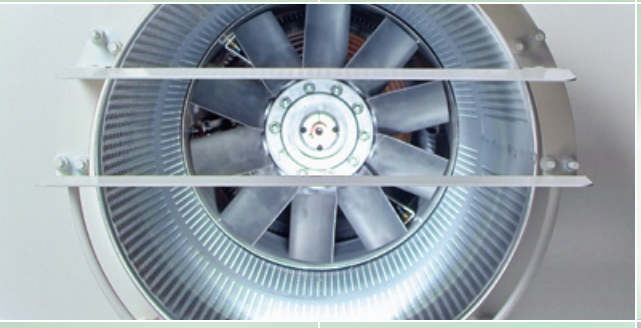
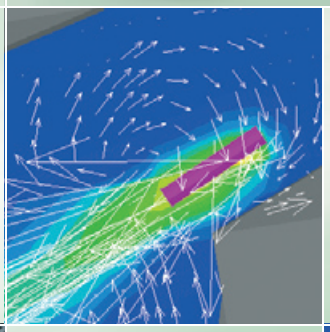
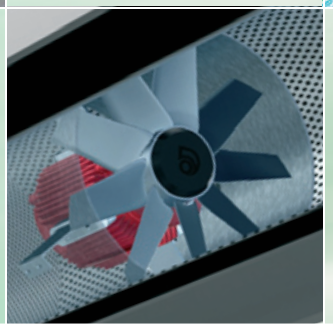
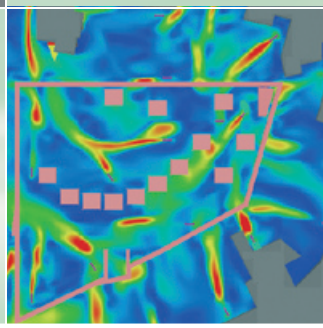










WOLTER Jet Fan Systems –

the innovation in car park ventilation.

wolter

Jet Fans –

the combination of CO-ventilation and smoke exhaust in car parks.

Principle

In recent years, jet fan technology has established itself as the new standard in car park ventilation in the United Kingdom and is quickly gaining acceptance in other countries all over the wold.

As opposed to conventional ventilation concepts based on transverse ventilation and ducted systems, the jet fan technology is derived from the longitudinal ventilation systems found in most road tunnels.

Here, a strream of air is injected into the tunnel by a series of free-blowing silenced axial fans, thus inducing an air movment in addtion to the natural ventilation. The decisive parameters of capacity are the air volume and velocity and therefore the thrust of the fan.

Advantages

By installing an adequate number of jet fans in an enclosed car-park, a constant air-movement can be created ensuring that the CO concentration all over the car park is maintained in line with building regulations.

By a well-designed system of jet fans, the accumulation of exhaust fumes in dead areas can be avoided. The costly installation of ductwork becomes obsolete and the required total capacity of fans can be reduced as pressure drops created by the ducting are avoided.

If required, WOLTER jet fans can be arranged in a high-temperature configuration that will ensure operation at both ambient temperature for CO-ventilation and elevated temperature of 300°C for at least one hour.

By utilising fully reversible impeller technology, the thrust direction of each individual fan can be controlled to contain smoke within the affected area and direct it to the nearest exhaust point. This helps to keep emergency exits free of smoke and prevents smoke from contaminating non-affected areas of the car park.

The virtual fire compartments created by jet fans allow for more open-plan design of the car parks.

The use of jet fans achieves comparable, if not superior ventilation results than conventional systems and can offer substantial advantages.

The additional capital cost of the jet fan system is outweighed by potential savings over the traditional ducted system.

The fan-motor-unit can be extracted from the attenuator for servicing.

Components of the Jet Fan System

As a turn-key supplier, WOLTER offers all services and components required to implement an Impulse Ventilation system.

Jet Fans

WOLTER Jet Fans are manufactured in standard sizes of 200, 250, 315, 355 and 370mm impeller diameter and cover all thrustrequirements usually found in relevant specifications. The fan-motor-unit is mounted in a sound-attenuated galvanised steel casing of 2250mm length except the ventilation JFU series is of 1220mm length.

The overall height of the unit is 413mm for 370 series, 352mm for 300 series and 275mm for 250 series and therefore does not significantly obstruct headroom heights within the car park space. Guide vanes mounted on the pressure side direct the airstream underneath down stand beams if necessary. Mounting brackets are fixed as standard, isolator switches in both standardand high-temperature manufacture can be fitted as optional extras.

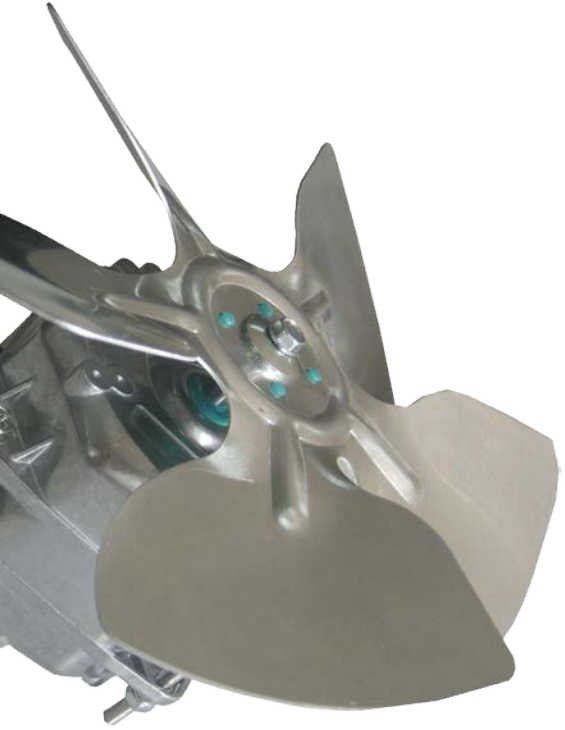
- The aerodynamically shaped impellers are manufactured from injection-moulded aluminium, the pitch angle can be adjusted during standstill.
- Jet Fans can be manufactured in unidirectional or fully-reversible executions, providing almost the same thrust performance in either direction. A 300°C/1h version is available.
- A new registered design feature of the WOLTER Jet Fan is the combined fan-motor-unit which is mounted within a separate casing inserted in the silencer. This will allow the fan-motor-unit to be simply extracted from the silencer section. Should the fan unit require servicing or adjustment of the pitch angle, there is no need to uninstall the complete jet fan.
- Each unit is equipped with a 2-speed motor (2/4-poles). 4-pole speed is usually sufficient for CO-Ventilation under normal conditions. In the event of fire, a considerable power reserve is at disposal by increasing the fan speed. The ventilation JFU series is of 2 pole High/Low speed, however if required, 2-speed motor can also be offered.
- Silencer lengths can be varied should this be required. Also, the fans can be fitted with two motors and two impellers to comply with the run/standby-requirements specified in some countries.

AXV Main Exhaust and Supply Fans

The jet fan system has to be designed so that sufficient air circulation in all areas is guaranteed and exhaust fumes are directed to the nearest exhaust point.

Adequately sized main exhaust fans are therefore an important part of the overall system. Where the natural air supply is insufficient, supply fans may have to be installed.

If required by the ventilation design, exhaust fans can also be manufactured as reversible units, e.g. when fresh air needs to be supplied to a certain fire compartment.
AXV axial exhaust fans are available up to size 1800, also for 400°C/2h temperature rating according to DIN EN ISO 12101 Part 3 (CTICM). Alternatively, smoke-rated centrifugal exhaust fans may be supplied.



Sensor and Control Technology

The sensor and control technology is a very important integral part of the jet fan system. The requirement for CO-sensors and smoke detectors in a car park has to be individually determined during the design stage. Also the smoke-exhaust running pattern has to be carefully designed in order to determine exactly which fans have to be put in reverse mode should a fire occur in a specific area. Some fans can serve as standby units only and can be started automatically if certain maximum levels of air pollution a re exceeded.

EC Technology

EC motor technology has been proven in various applications during the last five years. Wolter now introduces EC Fans to develop further energy-saving solutions, particularly important in today's environmentally-conscious world.

Electronically commutated motors offer six major benefits when used in Jet fans.

- Higher efficiency of up to 85% with lower input power.
- Minimal rise in air temperature on the air stream.
- Efficient speed control.
- Longer motor life due to lower running temperatures
- Longer bearing life because of the soft-start feature.

Computational-Fluid-Dynamics Design

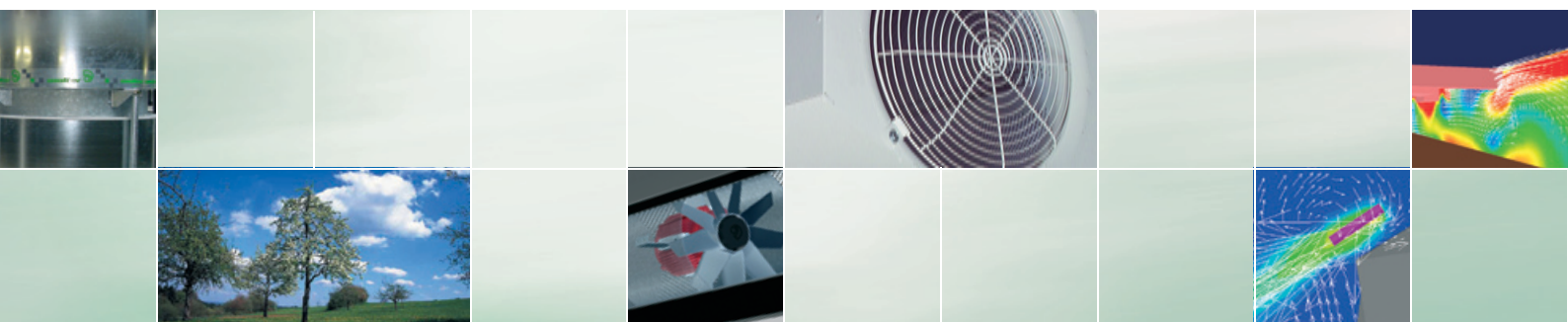
The initial step in the design of a jet fan ventilation system should always be a careful analysis of the air distribution and ventilation situation based on thorough CFD design.

CFD simulation uses purpose-built software that allows us to create a 3-dimensional image of the car park. After determining all relevant parameters such as required air-change rates, volume and air ow direction, the different ventilation scenarios can be studied taking into account all of the above factors. The number, size and positioning of jet fans can then be optimised.

CFD software visualizes direction vectors of airflows and mean age of air distribution in all areas of the underground car park.

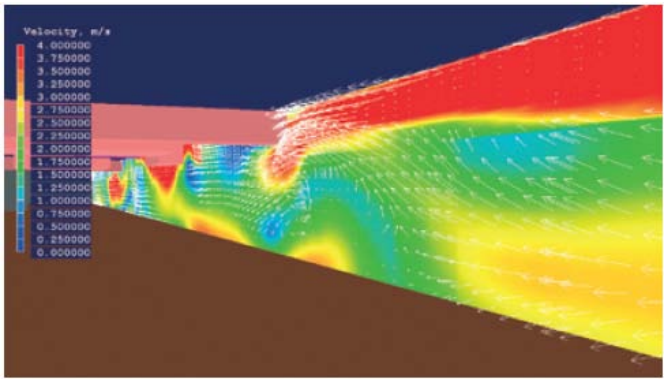
CFD design can also be used to simulate smoke distribution throughout the car park and the jet fans can be positioned accordingly.

WOLTER will be happy to assist you early during the design stage of your car park project.

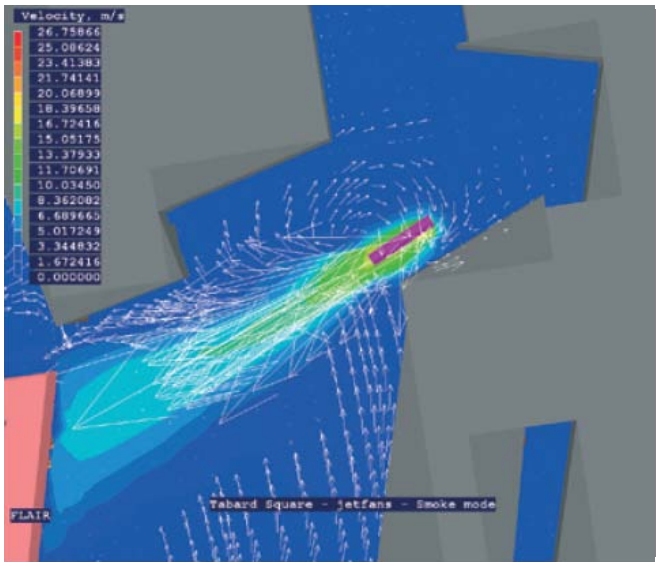


CFD Design Example

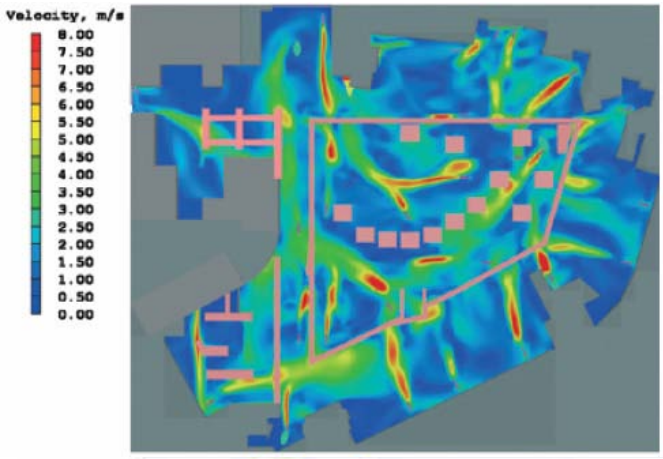
The following screenshots are taken from the designwork for the Tabard Square project in London, which has been implemented using Wolter Jet Fans.



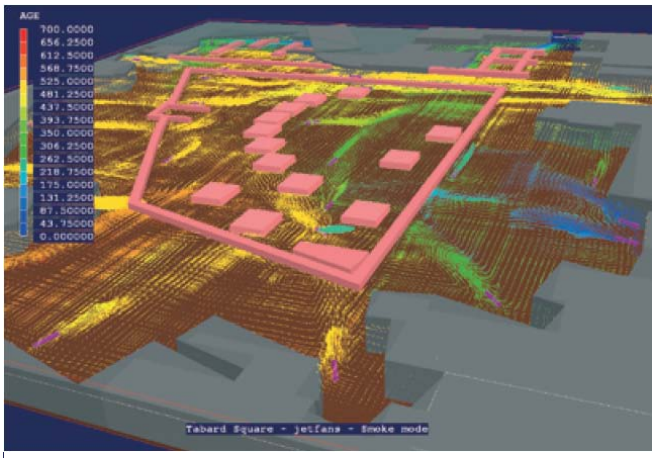
Air-speed profile of a cross-section



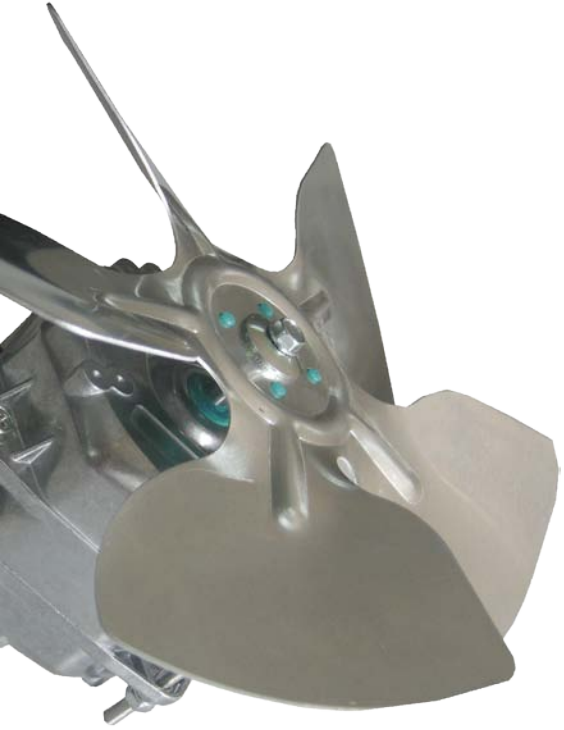
Velocity vectors around a Jet Fan at 10 air changes per hour.



Air-speed profile in 2.5m height at 10 air changes per hour.



Average age of air (in seconds) at 10 air changes per hour.



Impulse Jet Fans in Vertical Arrangement –

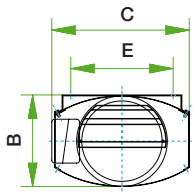
applying jet fan technology to open car parks

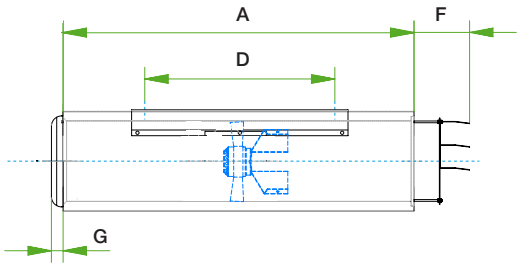
In 2004, WOLTER supplied 149 vertical impulse fans of sizes 1000 and 1400 for the car park ventilation system of Munich's new soccer stadium Allianz-Arena. The Espalande car park can house appproximately 9800 cars and is among the largest one in Europe.

The fans are mounted on the bottom of large atriums and point vertically upwards, thus inducing a secondary airstream that ventilates the open parking decks above.

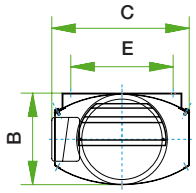
Dimensions

JFU - Jet Fan Uni-Directional Oval

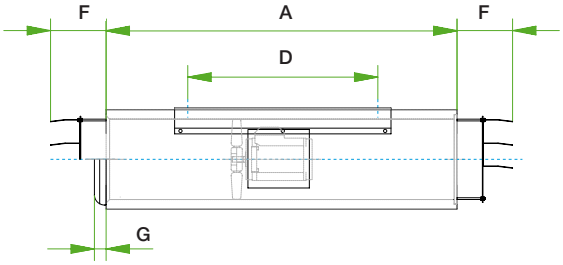




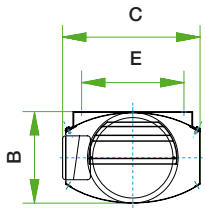
JFUO - Jet Fan Uni-Directional Oval, Short Casing



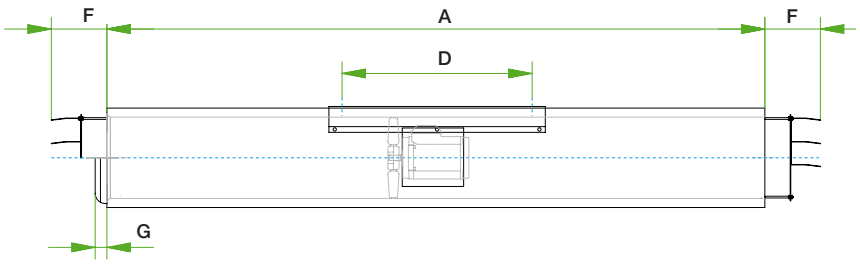
JFRO - Jet Fan Fully Reversible Oval, Short Casing



JFUO - Jet Fan Uni-Directional Oval, Long Casing



JFRO - Jet Fan Fully Reversible Oval, Long Casing



Type	A	B	C	D	E	F	G
JFU 250/200AE	1220	275	395	690	290	155	40
JFU 250/250AE	1220	275	395	690	290	155	40
JFU 300/300AE	1220	352	530	690	400	155	40
JFU 370/370AE	1220	413	600	690	450	155	40
JFUO 250/250L	1800	275	395	690	290	155	40
JFUO 250/250S	1220	275	395	690	290	155	40
JFRO 250/250L	1800	275	395	690	290	155	Na
JFRO 250/250S	1220	275	395	690	290	155	Na
JFUO 300/250L	2250	352	530	690	400	155	40
JFUO 300/250S	1220	352	530	690	400	155	40
JFUO 300/300L	2250	352	530	690	400	155	40
JFUO 300/300S	1220	352	530	690	400	155	40
JFRO 300/300L	2250	352	530	690	400	155	Na
JFRO 300/300S	1220	352	530	690	400	155	Na
JFUO 370/315L	2250	413	600	690	450	155	40
JFUO 370/315S	2250	413	600	690	450	155	40
JFUO 370/355L	2250	413	600	690	450	155	40
JFUO 370/355S	1220	413	600	690	450	155	40
JFUO 370/370L	2250	413	600	690	450	155	40
JFUO 370/370S	1220	413	600	690	450	155	40
JFRO 370/370L	2250	413	600	690	450	155	Na
JFRO 370/370S	1220	413	600	690	450	155	Na

Technical Data

» Range:

Wolter Jet Fans are available in Unidirectional sizes 200, 250, 300, 315, 355, and 370 and fully-reversible sizes 250, 300, and 370.

» Impeller:

Impellers with pitch adjustable blades are made of injection-moulded aluminium and pre-set for the required duty except the ventilation JFU series is of sheet metal blade. They are class Q6.3 balanced in accordance with VDI 2060 / ISO1940/1-1986.

» Airflow direction:

Discharge guide vanes allow to adjust the airflow direction according to architectural requirements.

» Temperature Rating:

All fans are can be manufactured to correspond to F200 and F300 requirements for smoke-extract applications.

» AC Motor/ EC Motor / Isolator Switch:

All motors are 2/4-pole in Dahlander connection, designed for 400V 50Hz but except the ventilation JFU series are of 2 pole or 4 pole designed for 230V 50Hz. Upon request, it can be make to 2/4 pole as well. Protection classis IP55 according to IEC34-5 except the JFU series is of IP54 protection class. Motors are connected to an outside junction box or lockable isolator switch for 40°C standard temperature or 300°C/1h. EC motors of IP55 protection class also guarantees energy saving with 1/3 of the heat loss compared to conventional AC motors.

» Housing:

All fan casings are manufactured as one integral sound attenuator of 1220mm or 2250mm length and except the ventilation JFU series of 1220mm length. All casings are oval-shaped in order to minimise headroom obstruction.
The fan-motor-assembly is designed as a slide-in tube which can easily be fitted and retracted through the attenuator inlet. In case of servicing or pitch angle adjustment it is therefore possible to simply pull out the fan unit without dismounting the complete attenuator from the ceiling. Rigid mounted brackets are fitted as standard.

Performance

Fan Type	Motor Power [kw]	Nominal Current [A]	Fan Speed [1/min]	Volume Flow [m³/s]	Thrust [N]	Sound Pressure [dB(A) 3m/45º]	Weight [kg]
Impulse Jet Fan JFUO, Uni-directional, 300ºC/2h, casing length 2250mm, except JF 250 casing length 1800mm							
JFUO 250/250L-300º	0.75/0.15	1.7/1.0	2800/1400	0.80/0.40	16/4	50/39	71
JFUO 300/250L-300º	1.3/0.30	2.8/1.3	2800/1400	1.31/0.66	42/11	53/43	108
JFUO 300/300L-300º	1.3/0.30	2.8/1.3	2800/1400	1.45/0.74	32/8	54/44	108
JFUO 370/315L-300º	2.0/0.5	4.2/1.56	2800/1400	2.02/1.02	63/18	63/49	142
JFUO 370/355L-300º	2.0/0.5	4.2/1.56	2800/1400	2.50/1.25	75/19	70/54	142
JFUO 370/370L-300º	2.4/0.6	5.0/1.9	2800/1400	2.80/1.40	82/21	72/56	153
Impulse Jet Fan JFRO, full reversible, 300ºC/2h, casing length 2250mm, except JF 250 casing length 1800mm							
JFRO 250/250L-300º	0.75/0.15	1.7/1.0	2800/1400	0.75/0.38	14/4	49/38	71
JFRO 300/300L-300º	1.3/0.3	2.8/1.3	2800/1400	1.35/0.68	27/7	54/44	108
JFRO 370/370L-300º	2.4/0.6	5.0/1.9	2800/1400	2.63/1.30	72/18	68/52	150
Impulse Jet Fan JFUO, Uni-directional, 300ºC/2h, casing length 1220mm							
JFUO 250/250S-300º	0.75/0.15	1.7/1.0	2800/1400	0.80/0.40	16/4	53/42	65
JFUO 300/250S-300º	1.3/0.30	2.8/1.3	2800/1400	1.31/0.66	42/11	56/46	78
JFUO 300/300S-300º	1.3/0.3	2.8/1.3	2800/1400	1.45/0.74	32/8	57/47	78
JFUO 370/315S-300º	2.0/0.5	4.2/1.56	2800/1400	2.02/1.02	63/18	63/49	99
JFUO 370/355S-300º	2.0/0.5	4.2/1.56	2800/1400	2.50/1.25	75/19	73/57	96
JFUO 370/370S-300º	2.4/0.6	5.0/1.9	2800/1400	2.80/1.40	82/21	74/58	102
Impulse Jet Fan JFRO, full reversible, 300ºC/2h, casing length 1220mm							
JFRO 250/250S-300º	0.75/0.15	1.7/1.0	2800/1400	0.75/0.38	14/4	52/41	65
JFRO 300/300S-300º	1.3/0.3	2.8/1.3	2800/1400	1.35/0.68	27/7	57/47	78
JFRO 370/370S-300º	2.4/0.6	5.0/1.9	2800/1400	2.63/1.30	72/18	71/55	102

Performance

Fan Type	Motor Power [kw]	Nominal Current [A]	Fan Speed [1/min]	Volume Flow [m³/s]	Thrust [N]	Sound Pressure [dB(A) 3m/45º]	Weight [kg]
Impulse Jet Fan JFU, Uni-directional, 40ºC, casing length 1220mm							
JFU 250/200AE-40º-M	0.19/0.17	0.9/0.8	2730/2500	0.53/0.47	11/9	54/52	31
JFU 250/200AE-40º-L	0.18/0.16	0.9/0.8	2600/2160	0.50/0.40	10/6	53/50	31
JFU 250/250AE-40º-M	0.19/0.17	0.9/0.8	2730/2500	0.58/0.53	9/7	54/52	30
JFU 250/250AE-40º-L	0.18/0.16	0.9/0.8	2600/2160	0.55/0.44	8/5	53/50	30
JFU 300/300AE-40º-4	0.14	0.63	1390	0.46	4	48	70
JFU 300/300AE-40º-2	0.25	1.1	2530	0.91	13	59	70
JFU 370/370AE-40º	0.17	0.75	1395	0.76	7	52	92
Impulse Jet Fan JFUO, Uni-directional, 40ºC, casing length 2250mm, except JF 250 casing length 1800mm							
JFUO 250/250L-40º	0.55/0.11	1.3/0.85	2800/1400	0.80/0.40	16/4	50/39	71
JFUO 300/250L-40º	1.1/0.25	2.4/1.1	2800/1400	1.31/0.66	42/11	53/43	105
JFUO 300/300L-40º	1.1/0.25	2.4/1.1	2800/1400	1.45/0.74	32/8	54/44	105
JFUO 370/315L-40º	2.0/0.5	4.2/1.56	2800/1400	2.02/1.02	63/18	63/49	139
JFUO 370/355L-40º	2.0/0.5	4.2/1.56	2800/1400	2.50/1.25	75/19	70/54	139
JFUO 370/370L-40º	2.0/0.5	4.2/1.56	2800/1400	2.70/1.35	80/20	72/56	145
Impulse Jet Fan JFRO, full reversible, 40ºC, casing length 2250mm, except JF 250 casing length 1800mm							
JFRO 250/250L-40º	0.55/0.11	1.3/0.85	2800/1400	0.75/0.38	14/4	49/38	71
JFRO 300/300L-40º	1.1/0.25	2.4/1.1	2800/1400	1.35/0.68	27/7	54/44	105
JFRO 370/370L-40º	2.0/0.5	4.2/1.56	2800/1400	2.50/1.25	70/18	67/51	145
Impulse Jet Fan JFUO, Uni-directional, 40ºC, casing length 1220mm							
JFUO 250/250S-40º	0.55/0.11	1.3/0.85	2800/1400	0.80/0.40	16/4	53/42	65
JFUO 300/250S-40º	1.1/0.25	2.4/1.1	2800/1400	1.31/0.66	42/11	56/46	78
JFUO 300/300S-40º	1.1/0.25	2.4/1.1	2800/1400	1.45/0.74	32/8	57/47	78
JFUO 370/315S-40º	2.0/0.5	4.2/1.56	2800/1400	2.02/1.02	63/18	66/52	99
JFUO 370/355S-40º	2.0/0.5	4.2/1.56	2800/1400	2.50/1.25	75/19	73/57	96
JFUO 370/370S-40º	2.0/0.5	4.2/1.56	2800/1400	2.70/1.35	80/20	75/59	102
Impulse Jet Fan JFRO, full reversible, 40ºC, casing length 1220mm							
JFRO 250/250S-40º	0.55/0.11	1.3/0.85	2800/1400	0.75/0.38	14/4	52/41	65
JFRO 300/300S-40º	1.1/0.25	2.4/1.1	2800/1400	1.35/0.68	27/7	57/47	78
JFRO 370/370S-40º	2.0/0.5	4.2/1.56	2800/1400	2.50/1.25	70/18	71/55	102

Wolter GmbH + Co. KG
Am Wasen 11
D-76316 Malsch
Tel.:(+49) 07204 / 92010
Fax:(+49) 07204 / 920111
www.wolterfans.de
info@wolterfans.de

Wolter Asia Ltd
Unit 12, 2F., Kin Fat Industrial Centre
13 Kin Fat Street, Tuen Mun, N.T. Hong Kong.
Tel. :(+852) 24560198
Fax :(+852) 24560290
www.wolter.com.hk
info@wolter.com.hk