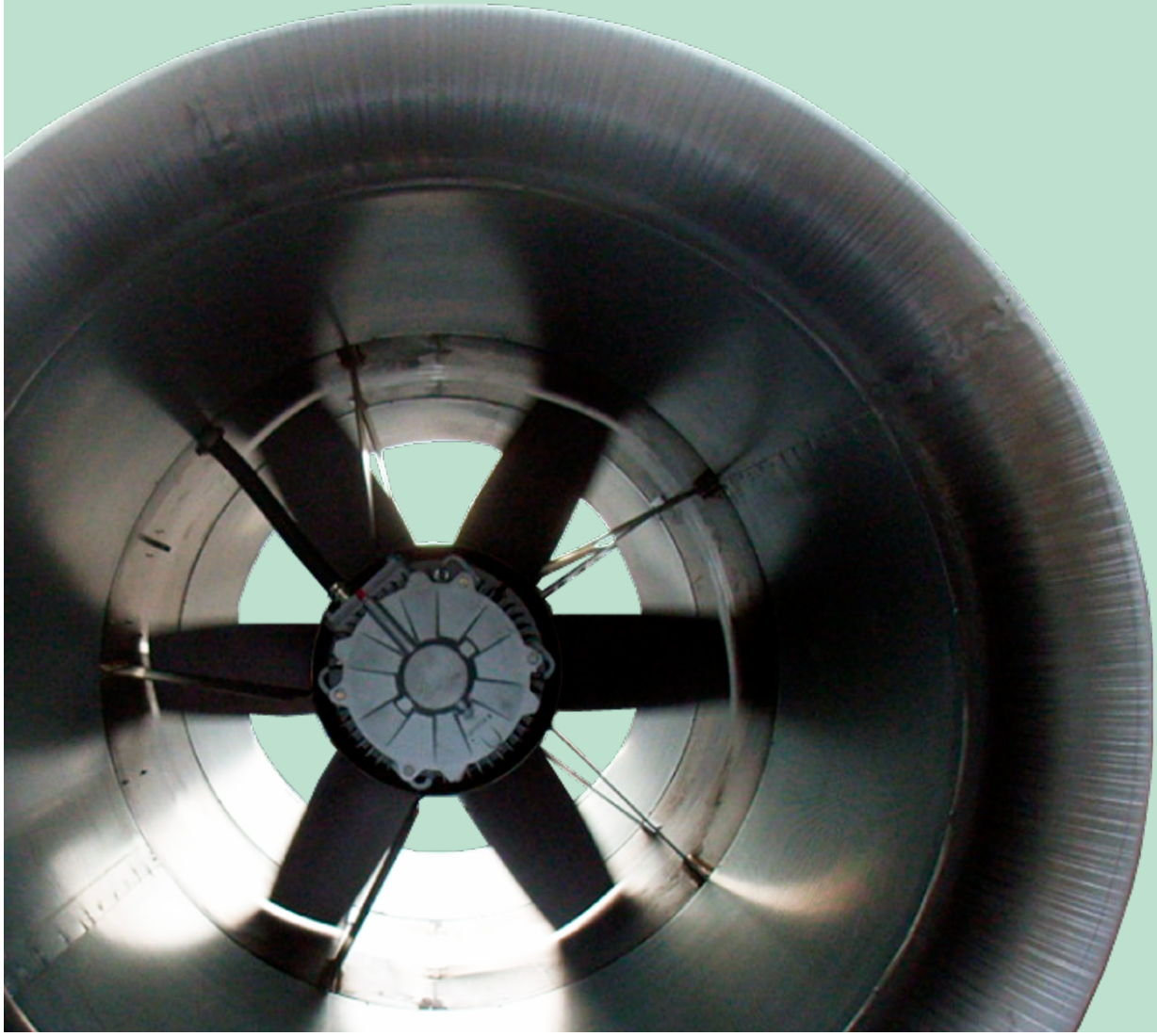
TUNNEL FANS
STANDARD AND HOT SMOKE



Building & Industry
NOVENCO
SCHAKO Group

PRODUCT FACTS

Product

Novenco tunnel fans are produced with either round or rectangular outer dimensions. Both types are made in unidirectional (AUC and AUR) and reversible (ARC and ARR) versions with capacities up to 2900 N of thrust.

Application

The fans have been developed for ventilation of tunnels in aggressive atmospheres such as road traffic and train tunnels. They provide an effective way of handling polluted air and smoke from fires. The fans are in fact part of many concepts for fire fighting.

Sizes and versions

Novenco tunnel fans are manufactured in rectangular and round sizes.
Impeller diameters range from Ø630 to Ø1600 mm.

Construction

The fan casing is of 3 to 4 mm steel sheet with either rectangular or round flanges. Silencers are mounted on both sides of the fan casing.
Fans are as standard delivered with suspension brackets for direct mounting to ceilings.

Optional: A wire guard for mounting on the inlet. A deflector for mouting on the outlet. The deflector allows for deflection of air in any desired direction. Reversible tunnel fans can be delivered with deflectors in both ends.

Motors

The motors are as standard 3x400 V, 50 Hz. Other voltages and frequencies are available on request, for example 3x690 V, 50 Hz.

Motor protection: Min. IP55 in accordance with IEC 34-5
Insulation class: F or H depending on temperature protection
Motor flanges: B14 in accordance with IEC 34-7, alternatively B5

Electric isolation

The tunnel fans are delivered with terminal boxes or optionally with an electric isolating switch.

NovAx™ impeller

The impeller consists of two hub discs with cavities, in which the blades are mounted in preset positions at the calculated angles.

Silencers

The silencers are placed on both sides of the fan casing. Each silencer is fitted with inlet and outlet cones designed for minimum pressure loss.

Materials

Blades: Aluminium alloy
Hub: Sendzimir galvanised steel plate which can be epoxy coated
Casing and motor suspension: Welded steel plate, hot-dip galvanised or stainless steel
Silencers: Sendzimir stainless steel plate
Inside tube for silencers: Perforated galvanised plate or stainless steel
Sound attenuating material: Fire-proof and moisture resistant
Cones: Galvanised or stainless steel
Wire guard: Stainless steel
Deflector: Aerodynamic shaped aluminium wings in a stainless steel bracket
Suspension brackets: Galvanised or stainless steel

Classifications

Environment: Meet requirements for operation in unheated, low corrosive environments according to DS/EN ISO 12944-2
Corrosion category: C3, optionally C4 or C5
Temperature range, standard:
-20 to +40 °C or 0 to +60 °C
Temperature range, max.:
-40 to +120 °C
Temperature ranges, hot smoke fans:
F300 and F400 according to EN 12101-3 for all fans. Fans for F300 were tested at 300 °C for 120 min.
Balancing of impeller unit: According with VDI 2060, ISO 1940, 1-1986 class Q 6.3

Accessories

- Painted- inside, outside or both
- Vibration sensors
- PTC on motor windings
- Temperature sensors on bearings
- Deflectors
- Wire guards
- Safety chains

TUNNEL VENTILATION

Ventilation of tunnels is necessary for at least three reasons.

- To disperse or dillute emission concentrations from everyday traffic, both inside and in the direct vicinity of the tunnels
- To control the spread and movement of smoke from fires
- To control the temperature inside the tunnels in special cases

Air quality and dilution of emission concentrations

In normal operation, traffic emissions consist of exhaust gases as well as dust particles from tires and the road surface. Within the tunnel, this leads to concentrations, which can be dangerous to the health and safety. High concentrations of particles also decrease visibility.

Ventilation of tunnels dilutes and controls the concentration of dangerous gases and particles to meet safety requirements. The background concentration of gases and particles is important to take into account in the calculation of the required ventilation.

Safety – smoke and heat dissipation from fires

When fires are ablaze, persons in the tunnel are at risk. Most victims due to fires perish because of too long exposure to hot and toxic gases, heat radiation and lack of visibility, which block or conceal the escape routes. The first phases of a fire threaten especially the road users, in later phases mainly the emergency workers are in peril.

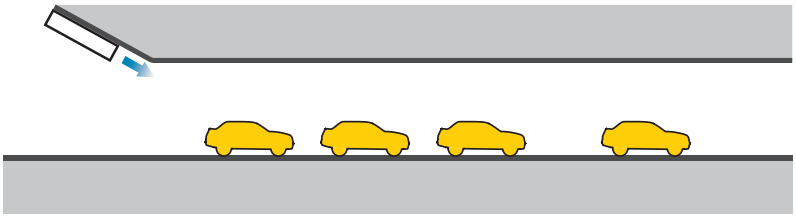
Safety measures in case of fires

- Stop tunnel access to prevent more traffic from entering the smoke
- Provide smoke-free escape routes
- Ensure that emergency services have safe access
  - Rescue trapped victims
  - Control the fire
- Reduce exposure of the tunnel structure to high temperatures
- Prevent backlayering of smoke

Influence of longitudinal ventilation on the backlayering of smoke

In tunnels with longitudinal ventilation, all smoke and gases flow in the traffic direction. With sufficient ventilation, the zone upstream stays smoke free.

Longitudinal ventilation with jet



Position of injector fans

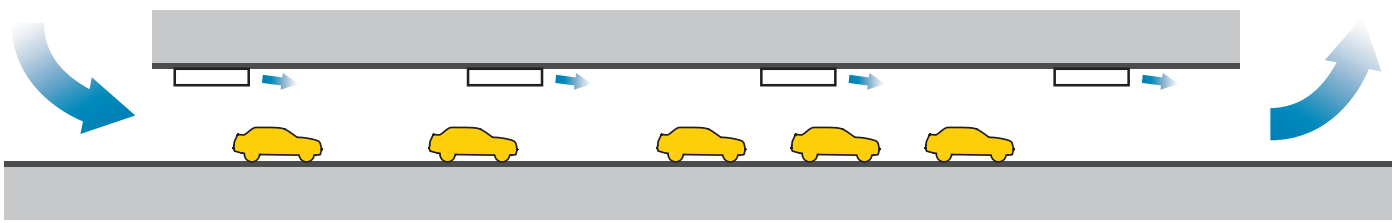
Fans

With longitudinal ventilation, the jet fans generate the predominant airflow through the tunnel. Fresh air is taken in via the tunnel entrance and exhausted at the tunnel outlet.

The position of jet fans close to the tunnel entrance prevents the failure of jet fans in case of fires. They are often referred to as injector fans.

If fires break out, the ventilation controls the direction of the smoke and gases effectively, even with very large fires. The part of the tunnel that is upstream from the fire is completely smoke free, and protects persons from smoke and toxic gases. Upstream, the fire brigade and other emergency services also have good access.

Downstream the tunnel fills completely with smoke. With unidirectional traffic this is no problem, since downstream vehicles leave the tunnel in direction of traffic.



Principle of longitudinal ventilation

Principle of smoke control

Tunnel ventilation systems

Basic system components

- Air supply – through the entrance, mechanically through a shaft, or through a combination of the two
- Air exhaust – through the tunnel exit or by mechanical exhaust
- A number of tunnel fans
- Gas detection system for exhaust gases like CO and NOx
- A control system based on data from the detection system

Additional components in connection with fires

- Fire detection system
- Alarm system for evacuation and for alerting

Pollution ventilation

Calculation of the need for ventilation bases on the physical tunnel dimensions, the expected usage level and distribution of heavy and light vehicles, as well as controlling regulations.

The tunnel fans mix and push the polluted air to the extract points or tunnel exit.

Calculation of longitudinal tunnel ventilation systems

Key to the design of tunnel ventilation systems is the thrust in Newton [N]. The total thrust is the sum of the separate thrusts generated by each jet fan. The total thrust must be large enough to overcome all resistance in the tunnel.

Basis for thrust calculations

- Thrusts of the jet fans
- Influence from the positions of the jet fans
- Resistance of the empty tunnel
- Inflow and outflow losses of the tunnel
- Effect of traffic
- Effect of wind
- Pressure drop over the source of the fire
- Required velocity of the airflow in the tunnel

Installation efficiency of jet fans

The jet fans create a high-speed jet flow along the tunnel interior. This discharge jet flow may cause additional wall friction losses.

The installation efficiency mainly depends on the distance of the jet fans from the walls and ceiling.

Installing jet fans after each other in the longitudinal direction requires care in order for fans not to affect each other. The velocity of the throw at the next row of fans should not be higher than the average velocity of the airflow in the tunnel.

Deflectors on the jet fan outlets reduce the losses and therefore increase the installation efficiency.

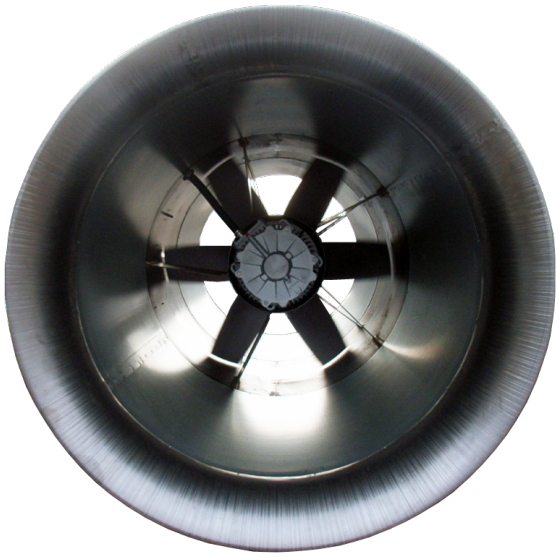
Novenco tunnel jet fans

Novenco tunnel fans type NovAx build on Novenco's ventilation system know-ledge and present energy-saving, silent and efficient system solutions.

The tunnel fans from Novenco feature a wide range of characteristics, which are ideal for efficient ventilation and smoke control.

Novenco jet fans characteristics

- High efficiency
- Low sound
- Compact construction
- Low installation height
- High temperature resistance



ARR tunnel fan

PRODUCT DESCRIPTION

Fan types

The tunnel fans are manufactured in both round (AUR/ ARR) and space saving rectangular (AUC/ARC) types. Both types are made in either unidirectional or reversible designs.
The impellers range in diameter from Ø630 to Ø1600 mm for fans with round (AUR-ARR) cross-sections and from Ø630 to Ø800 mm for the rectangular (AUC-ARC) versions.

Fan casings

The fan casings are welded steel constructions in 3 or 4 mm hot-dip galvanised sheet steel depending on size. Alternatively, the casings can be made in stainless steel.

Motors

These are as standard 3x400 V, 50 Hz. Other voltages and frequencies are available on request, for example 3x690 V, 50 Hz. Motors have direct start. The motor protection is IP 55 in accordance with IEC 34-5. Insulation is class F or H.

Safety switches

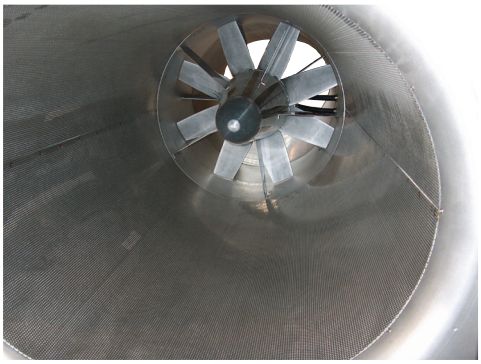
All fan types can be delivered with safety switches mounted or with terminal boxes.

Installation

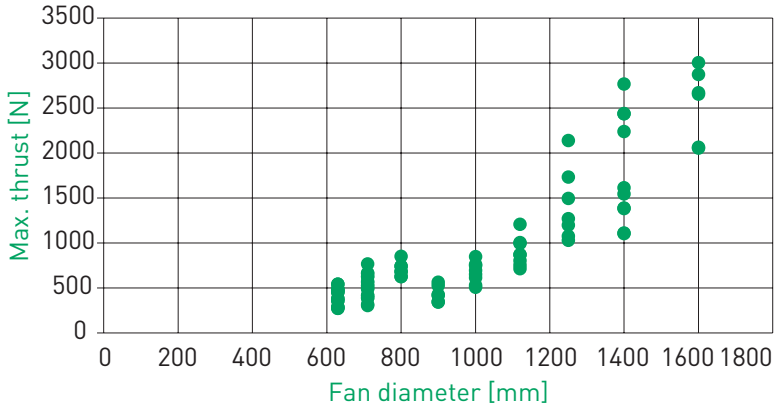
The fans have brackets to facilitate mounting to the ceiling.

Temperature operating ranges

The standard range is-20 to +40 °C or 0 to +60 °C. Fans used for fire fighting can operate between 200- 400 °C for 1- 2 hours. Please note that the given performance at 400 °C cannot be delivered by all fan sizes.



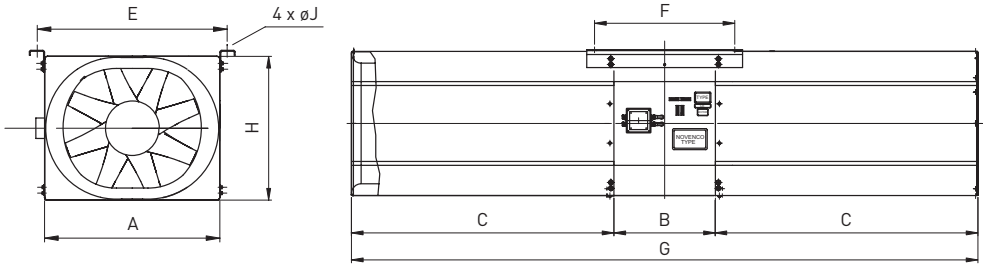
AUC tunnel fan with core



Tunnel fan comparison chart

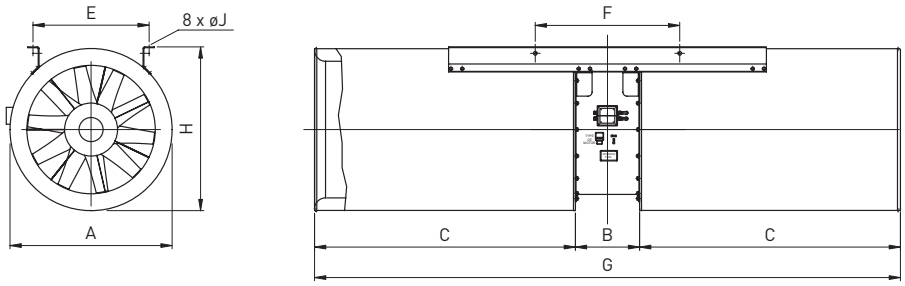
Painted ARR tunnel fans awaiting packaging and shipment

DIMENSIONS



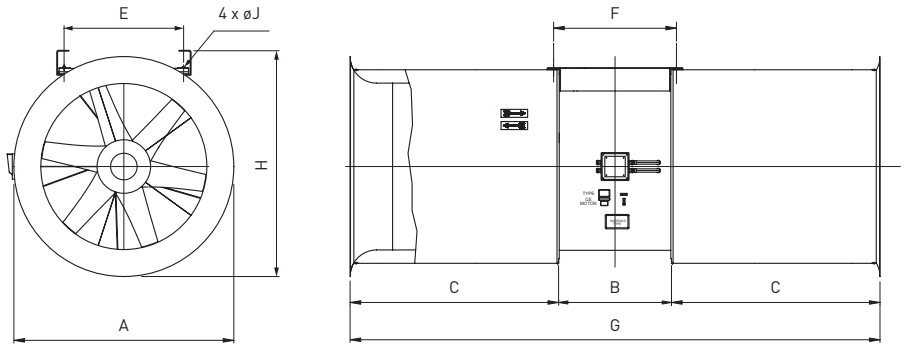
Fan types	A [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	H [1] [mm]	ØJ [mm]	Max. total weight [2] [kg]
630/280-8	820	520	1350	895	720	3220	670	24	350
710/280-8	900	520	1350	975	720	3220	750	24	430
800/280-8	990	520	1350	1065	720	3220	840	24	480

AUC-ARC sizes 630 - 800 – unidirectional and reversible



Fan types	Silencing	ØA [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	H [1] [mm]	ØJ [mm]	Max. total weight [2] [kg]
630/280-8	1D	840	400	690	600	900	1780	850	24	185
	2D			1375			3150			220
710/280-8	1D	920	400	750	660	900	1900	930	24	190
	2D			1500			3400			280
800/280-8	1D	1010	400	800	760	900	2000	1020	24	—
	2D			1625			3650			360
	3D			2400		1200	5200			700 [3]
800/330-8	3D									

AUR-ARR sizes 630 - 800 – unidirectional and reversible



Fan types	Silencing	ØA [mm]	B [mm]	C [mm]	E [mm]	F [mm]	G [mm]	H [1] [mm]	ØJ [mm]	Max. total weight [2] [kg]
900/403-6	1D	1200	850	1180	760	925	3210	1200	14	460
1000/403-6	1D	1333	850	1300	760	925	3450	1340	14	510
1120/403-6	1D	1330	850	1250	800	925	3350	1340	24	860
	2D	1347		2370			5590	1347		1030
	3D	1337								—
1250/403-6	1D	1650	850	1570	900	925	3990	1660	24	610
	2D	1530		2500		2000	5850	1595		—
1250/578-10	1D	1650	850	1570	900	925	3990	1660	14	630
1400/403-6	1D	1800	1120	1530	1000	1220	4150	1710	24	760
1400/578-10	1D	1800	1120	1720	1000	1220	4560	1810	18	780
1600/578-10	1D	1813	1120	1920	1150	1220	4960	1860	24	840

AUR-ARR sizes 900 - 1600 – unidirectional and reversible

1. Heights are the fan heights with installation brackets. Add to these the height of the vibration mounts, which is typically 20 mm, to arrive at the full installation height.

2. Weights excl. motors

3. Weights incl. motors

PERFORMANCE DATA

Fan types	Thrust meas. [N]		Motor rating [kW]	Motor sizes	Thrust eff. [N/kW]		Volume flow [m3/s]		Air speed [m/s]		Shaft power [kW]	Max. impeller RPM [1]		Sound pressure [dB(A)] [2]	
	F300	F400			F300	F400	F300	F400	F300	F400		F300	F400	No core	With core
AUC 630/280-8	278	273	7.5	112	37.1	36.3	8.73	8.64	28.01	27.72	7.0			61	59
	367	359	11.0	132	30.6	29.9	10.02	9.92	32.15	31.83	10.5			62	60
	451	442	15.0	160	30.1	29.5	11.11	10.99	35.63	35.27	14.5			63	61
	520	509	18.5		28.1	27.5	11.93	11.81	38.28	37.89	18.0			64	62
AUC 710/280-8	293	287	7.5	112	39.0	38.2	10.09	9.99	25.49	25.23	7.1		3000	62	60
	400	392	11.0	132	33.4	32.7	11.79	11.67	29.77	29.47	10.5	3000		63	61
	506	495	15.0	160	33.7	33.0	13.25	13.12	33.48	33.14	14.5			64	62
	602	589	18.5		32.5	31.9	14.46	14.31	36.51	36.14	18.0			65	63
	737	722	27.0		28.4	27.8	16.01	15.85	40.43	40.02	25.4			67	65
AUC 800/280-8	654	n/a	18.5		35.3	34.6	16.98	16.81	33.78	33.44	18.0		n/a	68	67
	816		27.0		31.4	30.7	18.97	18.77	37.73	37.35	25.1			69	66

Tunnel fans type AUC

Fan types	Thrust meas. [N]		Motor rating [kW]	Motor sizes	Thrust eff. [N/kW]		Volume flow [m3/s]		Air speed [m/s]		Shaft power [kW]	Max. impeller RPM [1]		Sound pressure [dB(A)] [2]	
	F300	F400			F300	F400	F300	F400	F300	F400		F300	F400	No core	With core
ARC 630/280-8	261	256	7.5	112	34.8	34.1	8.44	8.35	27.08	26.80	7.2			61	59
	342	335	11.0	132	28.5	27.9	9.66	9.56	30.98	30.66	10.8			62	60
	434	425	15.0	160	28.9	28.3	10.88	10.77	34.91	34.55	14.8			63	61
	470	461	18.5		25.4	24.9	11.33	11.22	36.35	35.98	18.2			64	62
ARC 710/280-8	305	299	7.5	112	40.7	39.9	10.05	9.94	25.37	25.11	7.5		3000	63	61
	372	365	11.0	132	31.0	30.4	11.36	11.24	28.69	28.40	11.0	3000		64	62
	472	462	15.0	160	31.5	30.8	12.80	12.67	32.32	31.99	14.4			65	63
	538	526	18.5		29.1	28.5	13.30	13.16	33.58	33.24	17.8			66	64
	636	623	27.0		24.5	24.0	14.85	14.70	37.51	37.13	25.0			67	65
ARC 800/280-8	600	n/a	18.5		32.4	31.8	15.86	15.70	31.56	31.23	18.0		n/a	70	69
	712		27.0		27.4	26.8	17.73	17.55	35.28	34.92	25.1			71	70

Tunnel fans type ARC

Motor data is for WEG motors. Other makes and data are available on request.

Fan types	Thrust meas. [N]		Motor rating [kW]	Motor sizes	Thrust eff. [N/kW]		Volume flow [m3/s]		Air speed [m/s]		Shaft power [kW]	Max. impeller RPM [1]		Sound pressure [dB(A)] [3]			
														1D		2D	
	F300	F400			F300	F400	F300	F400	F300	F400		F300	F400	F300	F400	F300	F400
AUR 630/280-8	278	273	7.5	112	37.1	36.3	8.73	8.64	28.01	27.72	7.3	3000	3000	70	71	66	67
	367	359	11.0	132	30.6	29.9	10.02	9.92	32.15	31.83	10.8			72	73	68	69
	451	442	15.0	160	30.1	29.5	11.11	10.99	35.63	35.27	14.6			73	74	69	70
	520	509	18.5		28.1	27.5	11.93	11.81	38.28	37.89	18.0			74	75	70	71
AUR 710/280-8	400	392	11.0	132	33.4	32.7	11.79	11.67	29.77	29.47	10.6			73	74	69	70
	506	495	15.0	160	33.7	33.0	13.25	13.12	33.48	33.14	14.5			74	75	70	71
	602	589	18.5		32.5	31.9	14.46	14.31	36.51	36.14	18.5			75	76	71	72
AUR 800/280-8	654	n/a	18.5		35.3	34.6	16.98	16.81	33.78	33.44	18.3		n/a	77	78	73	74
AUR 900/403-6	334	327	7.5	112	44.5	43.6	13.45	13.31	21.14	20.92	7.4	1500	1500	64	65	61	62
	409	400	11.0	132	40.9	40.0	14.89	14.74	23.40	23.16	9.8			65	66	62	63
	540	529	15.0	160	36.0	35.3	17.09	16.92	26.87	26.60	14.0			67	68	64	65
AUR 1000/403-6	509	498	11.0	132	46.3	45.3	18.44	18.25	23.48	23.24	10.8			66	67	63	64
	626	613	15.0	160	41.7	40.9	20.46	20.25	26.05	25.78	14.5			67	68	64	65
	731	715	18.5		39.5	38.7	22.09	21.86	28.13	27.84	18.1			68	69	65	66
	815	798	22.0		37.0	36.3	23.34	23.10	29.71	29.41	21.4			69	70	66	67
AUR 1120/403-6	725	710	15.0		48.3	47.3	24.65	24.40	25.02	24.76	14.4			69	70	66	67
	835	818	18.5		45.1	44.2	26.46	26.19	26.86	26.59	17.6			69	70	66	67
	953	933	22.0		43.3	42.4	28.22	27.93	28.65	28.35	21.4			70	71	67	68
	1158	1134	30.0	180	38.6	37.8	31.15	30.83	31.61	31.29	28.9			71	72	68	69
AUR 1250/403-6	1033	1011	22.0	160	47.0	46.0	32.84	32.51	26.76	26.49	21.9			72	73	69	70
	1216	1191	30.0	180	40.5	39.7	35.63	35.27	29.04	28.74	28.2			73	74	70	71
	1435	1405	37.0	200	38.8	38.0	38.70	38.31	31.54	31.21	36.2			74	75	71	72
AUR 1250/578-10	2052	2010	75.0	250	27.4	26.8	46.29	45.82	37.72	37.34	72.4			78	79	74	75
AUR 1400/403-6	1066	1043	22.0	160	48.4	47.4	37.35	36.97	24.26	24.02	21.0			74	75	71	72
	1332	1305	30.0	180	44.4	43.5	41.77	41.35	27.14	26.86	28.7			76	77	73	74
	1549	1517	37.0	200	41.9	41.0	45.05	44.59	29.26	28.96	35.9			76	77	73	74
AUR 1400/578-10	2241	2194	75.0	250	29.9	29.3	55.32	54.76	35.94	35.57	72.5			79	80	76	77
	2655	2600	90.0	280	29.5	28.9	58.97	58.37	38.31	37.92	87.5			80	81	77	78
AUR 1600/578-10	1980	1939	55.0	250	36.0	35.3	58.21	57.61	28.95	28.65	53.1	1000	1000	80	81	77	78
	2560	2507	75.0		34.1	33.4	66.17	65.49	32.91	32.57	72.5			81	82	78	79
	2882	2822	90.0	280	32.0	31.4	70.21	69.49	34.92	34.56	85.7			81	82	78	79

Tunnel fans type AUR

Motor data is for WEG motors. Other makes and data are available on request.

Fan types	Thrust meas. [N]		Motor rating [kW]	Motor sizes	Thrust eff. [N/kW]		Volume flow [m3/s]		Air speed [m/s]		Shaft power [kW]	Max. impeller RPM [1]		Sound pressure [dB(A)] [3]			
														1D		2D	
	F300	F400			F300	F400	F300	F400	F300	F400		F300	F400	F300	F400	F300	F400
ARR 630/280-8	261	256	7.5	112	34.8	34.1	8.44	8.35	27.08	26.80	7.2	3000	3000	72	73	67	68
	342	335	11.0	132	28.5	27.9	9.66	9.56	30.98	30.66	10.8			72	73	68	69
	434	425	15.0	160	28.9	28.3	10.88	10.77	34.91	34.55	14.8			75	76	71	72
	470	461	18.5		25.4	24.9	11.33	11.22	36.35	35.98	18.2			78	79	74	75
ARR 710/280-8	372	365	11.0	132	31.0	30.4	11.36	11.24	28.69	28.40	11.0			73	74	69	70
	472	462	15.0	160	31.5	30.8	12.80	12.67	32.32	31.99	14.4			75	76	71	72
	550	539	18.5		29.7	29.1	13.81	13.67	34.88	34.52	17.8			76	77	72	73
	636	623	27.0		24.5	24.0	14.85	14.70	37.51	37.13	25.0			79	80	75	76
ARR 800/280-8	600	n/a	18.5		32.4	31.8	16.25	16.08	32.32	31.99	18.0		n/a	79	80	75	76
	710		27.0		27.3	26.8	17.68	17.50	35.17	34.81	25.1			81	82	77	78
ARR 900/403-6 [4]	329	322	7.5	112	43.9	43.0	13.86	13.72	21.79	21.56	7.1	1500	1500	66	67	63	64
	400	392	11.0	132	40.0	39.2	15.27	15.12	24.01	23.77	9.8			67	68	64	65
	504	494	15.0	160	33.6	32.9	17.14	16.97	26.95	26.68	14.6			69	70	66	67
ARR 1000/403-6 [4]	487	477	11.0	132	44.2	43.3	18.73	18.54	23.84	23.60	10.5			69	70	66	67
	590	578	15.0	160	39.4	38.5	20.62	20.41	26.25	25.99	14.6			70	71	67	68
	667	653	18.5		36.1	35.3	21.92	21.70	27.91	27.63	18.1			71	72	68	69
	719	704	22.0		32.7	32.0	22.76	22.53	28.98	28.68	20.3			72	73	69	70
ARR 1120/403-6 [4]	684	670	15.0		45.6	44.7	24.87	24.62	25.24	24.99	14.7			74	75	71	72
	773	757	18.5		41.8	40.9	26.43	26.16	26.82	26.55	18.0			74	75	71	72
	834	817	22.0		37.9	37.1	27.45	27.17	27.86	27.58	21.2			75	76	72	73
	964	944	30.0	180	32.1	31.5	29.51	29.20	29.95	29.64	28.6			77	78	74	75
ARR 1250/403-6 [4]	989	968	22.0	160	44.9	44.0	33.36	33.02	27.19	26.91	21.2			77	78	74	75
	1150	1126	30.0	180	38.3	37.5	35.97	35.60	29.31	29.01	28.4			78	79	75	76
ARR 1250/578-10 [4]	1662	1627	75.0	250	22.2	21.7	43.25	42.81	35.24	34.88	72.4			81	82	77	78
ARR 1400/403-6 [4]	1061	1039	22.0	160	48.2	47.2	38.89	38.49	25.26	25.01	21.0			77	78	73	74
	1326	1298	30.0	180	44.2	43.3	43.48	43.03	28.24	27.96	28.7			79	80	75	76
	1481	1450	37.0	200	40.0	39.2	45.97	45.50	29.86	29.56	35.9			79	80	75	76
ARR 1400/578-10	2147	2102	75.0	250	28.6	28.0	55.32	54.76	35.94	35.57	72.5			82	83	78	79
	2340	2292	90.0	280	26.0	25.5	57.76	57.17	37.52	37.14	87.5			83	84	79	80
ARR 1600/578-10	1970	1929	55.0	250	35.8	35.1	60.57	59.95	30.13	29.82	53.1	1000	1000	83	84	79	80
	2547	2494	75.0		34.0	33.3	68.87	68.16	34.25	33.90	72.5			84	85	80	81
	2755	2698	90.0	280	30.6	30.0	71.64	70.91	35.63	35.27	85.7			84	85	80	81

Tunnel fans type ARR

1. Motor data is for 400 V, 50 Hz. Actual RPMs depend among other things on motor size and efficiency class. Values here are maximum values across IE1 and IE3.
2. Sound data is at 10 m and 45° free field for F300 and F400 approved fans without deflectors and wire protection guards. Values are for inlet side. Total noise from both sides is 3 dB(A) higher.
3. Sound data is at 10 m and 45° free field for fans without deflectors and wire protection guards. Values are for inlet side. Total noise from both sides is 3 dB higher.
For fans with 3D sound dampers the sound pressure is 3 dB(A) lower.
4. Tunnel fans type ARR with hub size Ø403 are available with special impeller blades for high pressure. For fan sizes Ø900 - Ø1120 these run 1500 RPM and for fan sizes Ø1250 - Ø1400 they run 1000 RPM.

Motor data is for WEG motors. Other makes and data are available on request.

QUALITY AND SERVICE

Rest assured

The Novenco tunnel fans are produced in accordance with Novenco's well-known quality standards. Novenco Building & Industry A/S is ISO certified and all fans are inspected and tested.

The fans are offered with options for technical guidance on installation, test of function and training of personnel.

Warranty

Novenco provides according to law a standard 12 months warranty from the product is sent from the factory. The warranty covers materials and manufacturing defects. Wear parts are not covered.
Extended warranty can be agreed upon.

Important

This document is provided 'as is'. Novenco Building & Indsutry A/S reserves the right to changes without further notice due to continuous product development.

Some pictures in the catalogue show products with accessories fitted.

The fans are designed for continuous operation. The following kinds of operation may cause fatigue break in the impellers and endanger people.

- Operation in stall area
- Operation with pulsating counter pressure – called pump mode
- Operation with exceedingly starts and steps
- If in doubt, Novenco should be contacted to assess the suitability of the fans.

Patents and trademarks

Novenco®, ZerAx®, 诺文科, 诺万科 and are 诺克 NOVENCO registered trademarks of Novenco A/S.

AirBox™ and NovAx™ are trademarks of Novenco Building & Industry A/S.

Other trademarks appearing in this document are the property of their respective owners.

Quality and environment

Novenco Building & Industry A/S is certified in accordance with ISO 9001 and 14001.

ISO 9001
ISO 14001
BUREAU VERITAS
Certification

All Novenco Building & Industry's products are designed, developed and manufactured in Denmark.

MU 15486 1217

Building & Industry

NOVENCO

SCHAKO Group

WWW.NOVENCO-BUILDING.COM