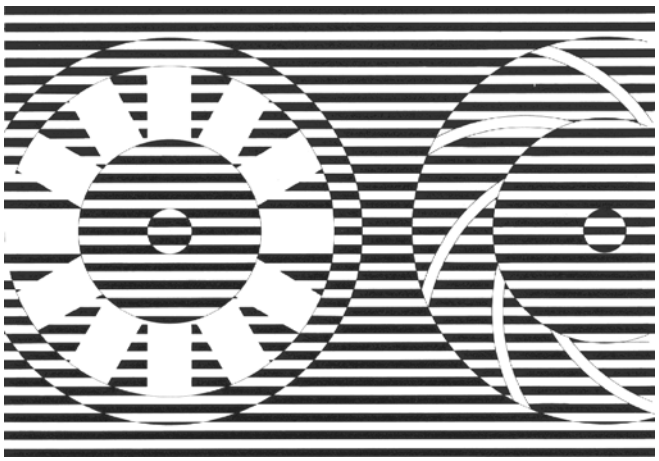
The Innovation Company

LTG Incorporated

High-Efficiency Fans

Axial-Flow Fans and Centrifugal Fans



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VAN/VAH/VAR/VRK/VRS-USA-TP-01 (08/08) 401-50

LTG Axial-Flow and Centrifugal Fans

Depending on application, a fan is required to satisfy a variety of requirements. Selection criteria may include the following:

- Required flow rate
- Overall external pressure
- Power requirement
- Degree of efficiency
- Space required
- Possible control techniques

Given that there is no such thing as an all-purpose fan which combines all these criteria to the optimum extent, LTG has developed a variety of types, with the result that a suitable fan is available to resolve any airflow problem.

The 10-point Programme for economical Fans

1 Optimum aerodynamic characteristics

Inflow losses minimized by flow-inducing intake design, minimal clearance losses between impeller and housing.

2 High degree of efficiency

Up to 89 % in the optimum range.

3 Charcicteristic curve with limit rating

No overloading of the motor under operating conditions at variance with design specification.

4 Smooth running

Impeller dynamically balanced, complete with hub and shaft.

5 Low noise

Within the range of the highest degree of efficiency, the specific sound power level is considerably lower than the guidelines laid down in VDI 2081.

6 Control options

Speed-controlled drive motors, impeller adjustment (VAR type).

7 Robust construction

Durable construction featuring high-strength, torsion resistant steel housing, welded, screwed and painted. Bearings designed to ensure long-term serviceability.

8 High-precision manufacture

Ensures that specified data are complied with.

9 Type availability

Within specified limits, a wide choice of models is available, meeting a variety of criteria.

10 Computer aided design

LTG fans are designed for every application with the aid of EDP programs which take account of selection criteria. This provides an assurance that the fan selected will be suitable for the intended purpose.

VAN-Type High Performance Axial-Flow Fans

The low pressure axial-flow fan type VAN is a high performance fan with aerodynamically optimized characteristies. Impellers are equipped with ten curved blades with laminar profiles complying with the NACA 16 series.

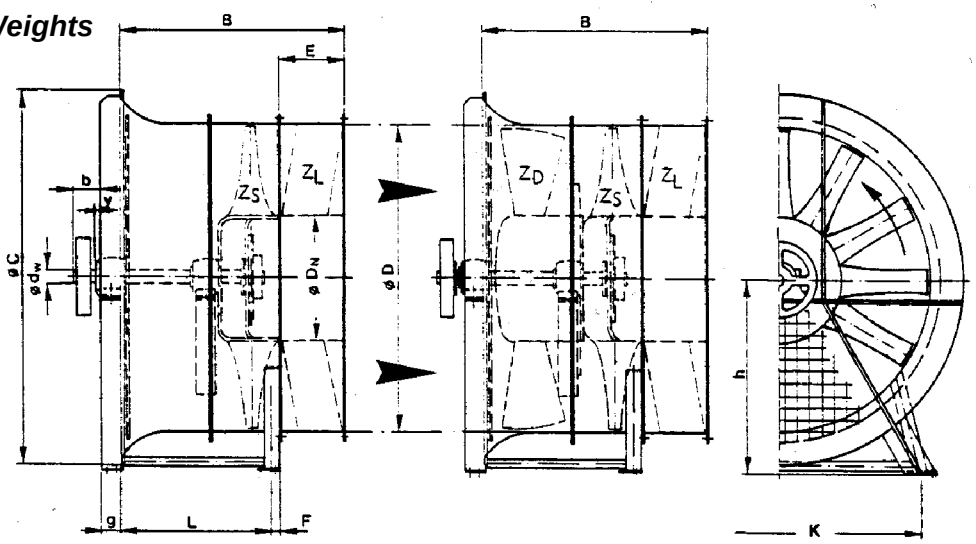
Eight sizes

Flow rates:	17,660 to 265,000 cfm
Maximum total pressure:	1,200 Pa
Impeller diameter:	39.37 to 98.43 inch

In standard configuration, VAN- type fans are equipped with an outlet guide vane system, to which the characteristic curves contained in this document also apply. The theoretical characteristic flow data at the maximum degree of efficiency are as follows:

Degree of efficiency	η_t	89.5 %
Volumetric factor	φ	0.22
Pressure factor	ψ_t	0.168

Dimensions and Weights



Without inlet guide vane *With inlet guide vane*

Size VAN		1000	1250	1400	1600	1800	2000	2240	2500
B	[inch]	30.31	37.01	39.96	43.31	48.82	55	57.2	62.17
ØC	[inch]	48.82	60.91	66.97	73.74	85.75	94.29	103.90	114.65
ØD	[inch]	39.45	49.65	55.71	62.48	70.16	78.7	88.31	99.06
ØD_N	[inch]	15.75	19.69	22.05	25.2	28.35	31.50	35.43	39.37
E	[inch]	8.66	10.83	310	12.20	15.35	19.37	21.38	23.58
F	[inch]	1.42	1.50	1.50	1.50	1.57	1.77	1.77	1.77
K	[mm]	37.4	46.46	49.21	55.12	62.99	70.87	78.74	88.19
L	[inch]	20.24	24.69	26.26	28.03	31.89	33.86	34.06	36.81
h	[inch]	24.80	31.50	35.43	39.37	44.09	49.21	55.12	62.99
Ød_W	[inch]	1.97	2.36	2.36	2.95	2.95	3.54	3.94	3.94
b	[inch]	4.33	5.41	5.51	5.51	5.51	6.69	8.27	8.27
y	[inch]	0.29	0.59	0.39	0.49	0.49	0.79	0.69	0.69
g	[inch]	3.15	3.15	3.54	3.94	3.94	4.72	5.51	5.51
No. of blades Z_D		15	15	15	15	25	25	25	25
No. of blades Z_S		10	10	10	10	10	10	10	10
No. of blades Z_L		13	13	13	13	13	13	13	13
A_R	[m^2] 1)	0.663	1.053	1.326	1.666	2.098	2.636	3.315	4.186
A	[m^2] 2)	0.789	1.249	1.573	1.978	2.494	3.138	3.951	4.972
I	[kg · m^2]	1.38	3.15	5.27	9.50	18.1	30.9	54.3	94.1
Weight without inlet guide vane	[lb]	481	651	761	948	1433	1940	2315	2789
Weight with inlet guide vane	[lb]	573	677	871	1125	1544	2337	2756	3197
Weight of stator	[lb]	88	95	133	166	177	210	309	352

1) A_R = ring area $[(D^2 - D_N^2) \cdot \pi/4]$ 2) A = total area $[D^2 \cdot \pi/4]$

VAN-Type High Performance Axial-Flow Fans

Special Characteristics

High flow rates, even with the smaller sizes, permitting use in centralized locations with limited space.

Impeller and shaft balanced in two planes (static and dynamic) to quality stage Q 2.5 of VDI 2060. Overall, the fan complies with quality stage Q 6.3 of VDI 2060, including bearing play etc.

Standard Configurations

With or without outlet guide vane.

With or without diffuser.

Horizontal or vertical installation.

Special Configurations

Direct drive, intake or discharge side.

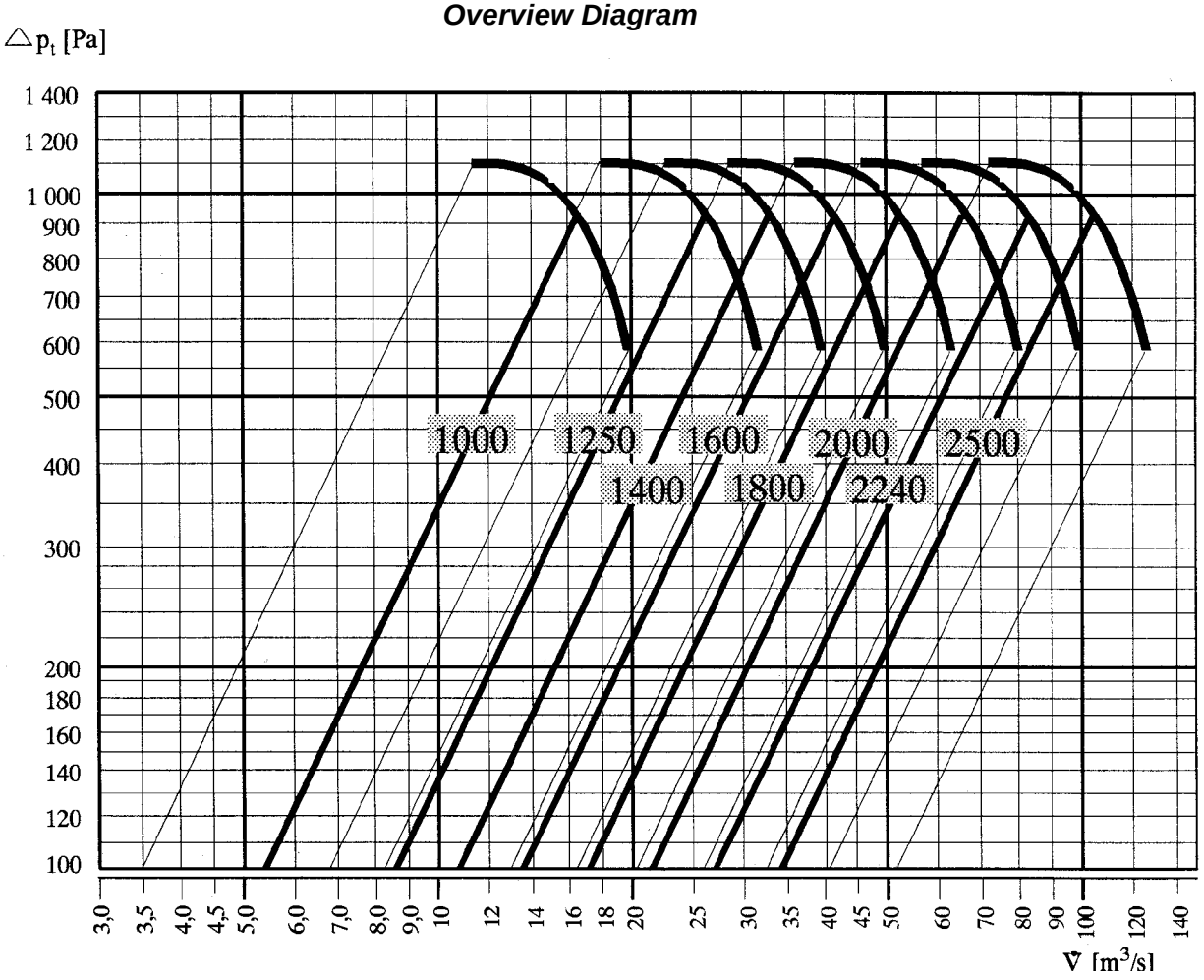
Sealed, separately ventilated impeller bearings for air temperatures above approx. 80°C.

Special corrosion proofing options: sand-blasting, hot galvanizing, rubberizing, stainless steel.

Other Accessories available

Diffuser · intake safety grating · narrow V-belt or flat belt drive · belt guard · baseframe or provision for setting in concrete · vibration insulation · resilient coupling on discharge side · flat or angled steel ring as counterflange on discharge side · wall-mounting ring on discharge side for embedding in concrete · motor slide rails · motor mounting.

Overview Diagram



VAH-Type High Performance Axial-Flow Fans

The high pressure axial-flow fan type VAH is a high performance fan with aerodynamically optimized characteristies. Impellers are equipped with twelve curved blades with laminar profiles complying with the NACA 16 series.

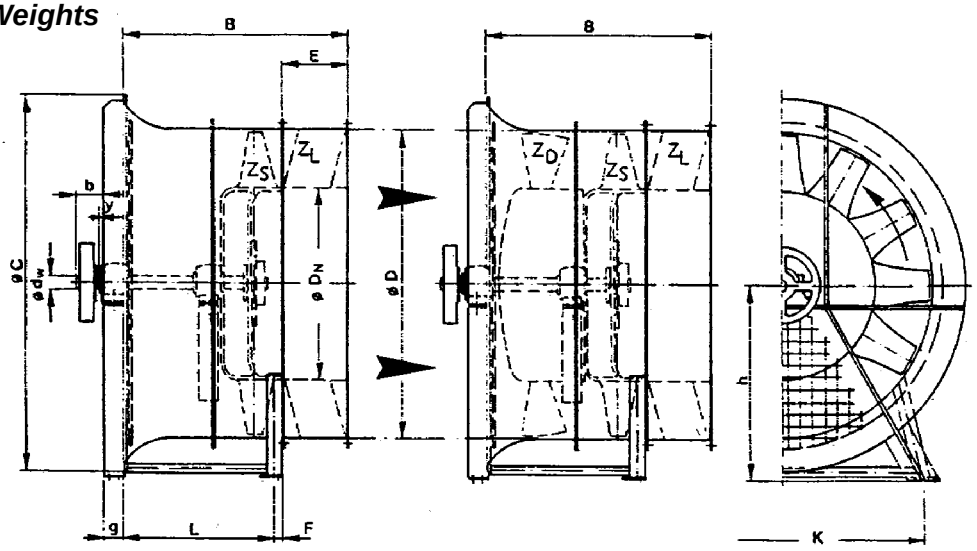
Seven sizes

Flow rates:	17,660 to 265,000 cfm
Maximum total pressure:	3,300 Pa
Impeller diameter:	49.21 to 98.43 inch

All VAH and VAX- type fans are equipped with an outlet guide vane, to which the characteristic curves contained in this document also apply. The theoretical characteristic flow data at the maximum degree of efficiency are as follows:

Degree of efficiency	η_t	89 %
Volumetric factor	φ	0.15
Pressure factor	ψ_t	0.240

Dimensions and Weights



Without inlet guide vane *With inlet guide vane*

Size VAH		1250	1400	1600	1800	2000	2240	2500
B	[inch]	36.85	39.8	42.72	48.70	52.24	53.70	59.06
ØC	[inch]	60.91	66.97	73.74	85.75	94.29	103.90	114.65
ØD	[inch]	49.65	55.71	62.48	70.16	78.70	88.31	99.06
$ØD_N$	[inch]	29.54	33.46	37.40	43.31	47.24	51.18	59.06
E	[inch]	10.67	12.01	13.19	15.24	16.61	17.87	20.47
F	[inch]	1.50	1.50	1.50	1.57	1.77	1.77	1.77
K	[inch]	46.46	49.21	55.12	62.99	70.87	78.74	88.19
L	[inch]	24.69	26.26	28.03	31.89	33.86	34.06	36.81
h	[inch]	31.50	35.43	39.37	44.09	49.21	55.12	62.99
$Ød_W$	[inch]	2.36	2.96	3.54	3.94	4.33	4.92	5.31
b	[inch]	5.51	5.51	5.51	5.51	6.69	8.27	9.25
y	[inch]	1.00	0.98	1.18	1.36	1.38	0.98	1.18
g	[inch]	3.94	4.72	4.72	5.51	5.51	7.09	7.09
No. of blades Z_D		15	15	15	25	25	25	25
No. of blades Z_S		12	12	12	12	12	12	12
No. of blades Z_L		13	13	13	13	13	13	13
A_R	$[m^2]$ 1)	0.897	1.005	1.269	1.544	2.007	2.624	3.205
A	$[m^2]$ 2)	1.249	1.573	1.978	2.494	3.138	3.951	4.972
I	$[kg \cdot m^2]$	9.50	15.1	25.0	42.8	63.1	107	179
Weight without inlet guide vane	[lb]	992	1830	1432	1962	2535	3087	3058
Weight with inlet guide vane	[lb]	1125	2028	1654	2314	2976	3527	4409

1) A_R = ring area $[(D^2 - D_N^2) \cdot \pi/4]$ 2) A = total area $[D^2 \cdot \pi/4]$

VAH-Type High Performance Axial-Flow Fans

Special Characteristics

Use is recommended for high volume flow rates and pressures up to 3,300 Pa.

Impeller and shaft balanced in two planes (static and dynamic) to quality stage Q 2.5 of VDI 2060. Overall, the fan complies with quality stage Q 6.3 of VDI 2060, including bearing play etc.

Standard Configurations

With or without diffuser.

Horizontal or vertical installation.

Special Configurations

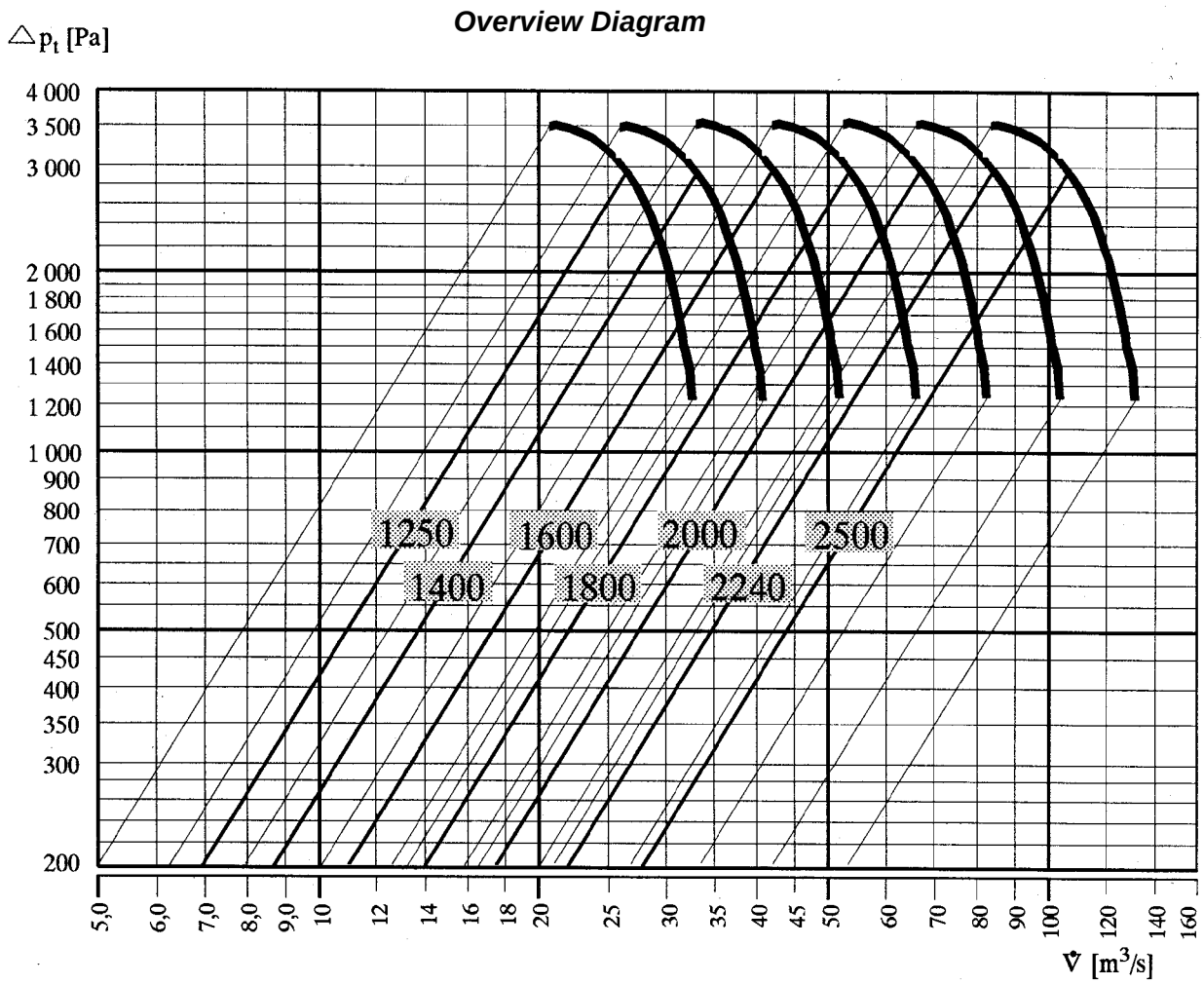
Sealed, separately ventilated impeller bearings for air temperatures above approx. 80°C.

Special corrosion proofing options: sand-blasting, hot galvanizing, rubberizing, stainless steel.

Other Accessories available

Diffuser · intake safety grating · narrow V-belt or flat belt drive · belt guard · baseframe, without provision for setting in concrete · vibration insulation · resilient coupling on discharge side · flat or angled steel ring as counter-flange on discharge side · wall-mounting ring on discharge side for embedding in concrete · motor slide rails · motor mounting.

Overview Diagram



VAR Type High Performance Axial Flow Fan

The VAR type fan with direct drive and adjustable impeller blades (when stationary) is a high performance axial flow fan with aerodynamically optimized characteristics.

Flow rates: up to 160,000 cfm

Maximum total pressure: 2 300 Pa

Fan Design, Construction Type

2 Versions:

Standard version with 10 impeller blades

Special VAR-5 version with 5 impeller blades
(half number of blades for less pressure, otherwise identical to VAR)

3 construction types:

Construction type	opt. total efficiency in %
without guide wheel, without diffuser	83,5
with guide wheel, without diffuser	80,0
with guide wheel, with diffuser	83,0

A diffuser has no significant pressure gain effect on the version without guide wheel

6 Sizes:
800, 900, 1000, 1120, 1250, 1400

Special Characteristics

Direct drive through unilateral wheel bearing on the squirrel-cage standard motor's shaft, positioned on the suction side on a bearing support welded to the casing.

This drive type allows operation of the fan at speeds determined by choice of the standard motor:

n_1 = 970 rpm (6-pole motor, 50 Hz)
n_1 = 1470 rpm (4-pole motor, 50 Hz)

By setting a suitable blade angle any working point of a $\dot{V}$ - Δp range may be achieved.

The casing is painted and consists of a welded sheet steel construction with pressure-side flange, with outside bracing, optional with continuously curved air inlet nozzle or tube connection flange on the suction side.
The foot console of metal sheet is welded to the casing.

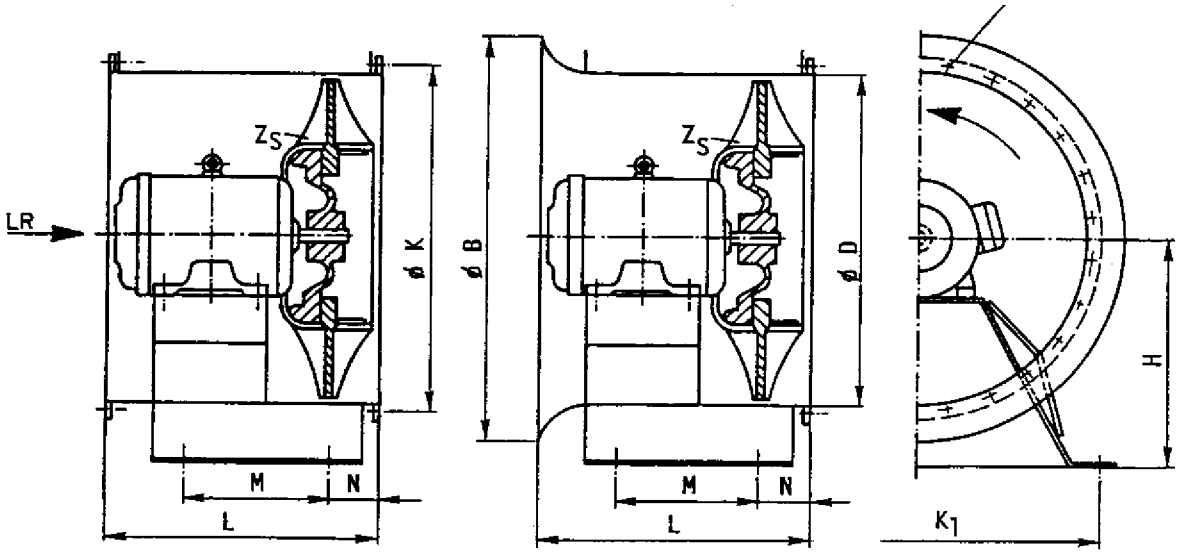
The guide wheel (optional) is made of galvanized metal sheet.

The impeller consists of a cast hub with inserted adjustable, profiled, cast impeller blades.

Fan grade: G 6.3 based on DIN ISO 1940

Dimensions

Tube version **Standard version** 24 holes Ø 12

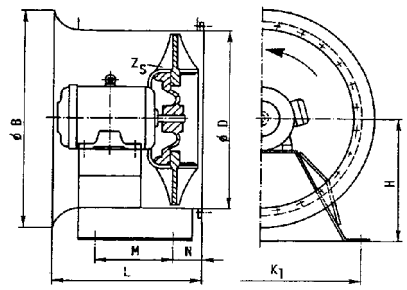


Number of blades: impeller 10
guide wheel 13

VAR Type High Performance Axial Flow Fan

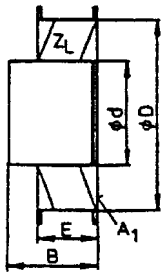
Dimensions

Fan VAR (shown with inlet nozzle)



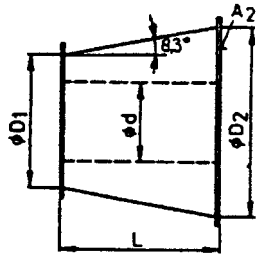
Size VAR	Ø B [inch]	Ø K [inch]	Ø D [inch]	H [inch]	K_1 [inch]	L [inch]	M [inch]	N [inch]	J [kg·m²]
800	40.63	32.95	31.26	21.65	31.89	25.59	11.42	2.83	0.832
900	44.53	36.77	35.16	23.62	35.83	25.59	16.54	2.83	0.925
1000	48.82	41.06	39.45	24.80	37.40	31.5	18.9	3.23	2.479
1120	53.62	46.22	44.25	27.95	41.73	34.65	22.44	3.23	2.990
1250	60.91	51.61	49.65	31.5	46.46	41.73	27.56	3.23	7.756
1400	66.97	57.68	55.71	35.43	49.21	45.27	27.56	3.23	8.990

Guide Wheel VAR



Size VAR	B [inch]	Ø D [inch]	Ø d [inch]	E [inch]	Ring area A_1 [m²]
800	12.05	31.26	17.72	10.24	0.336
900	12.05	35.16	17.72	10.24	0.467
1000	14.92	39.45	22.05	12.6	0.542
1120	14.92	44.25	22.05	12.6	0.746
1250	18.54	49.65	27.56	15.75	0.864
1400	18.54	55.7	27.56	15.75	1.188

Diffuser VAR

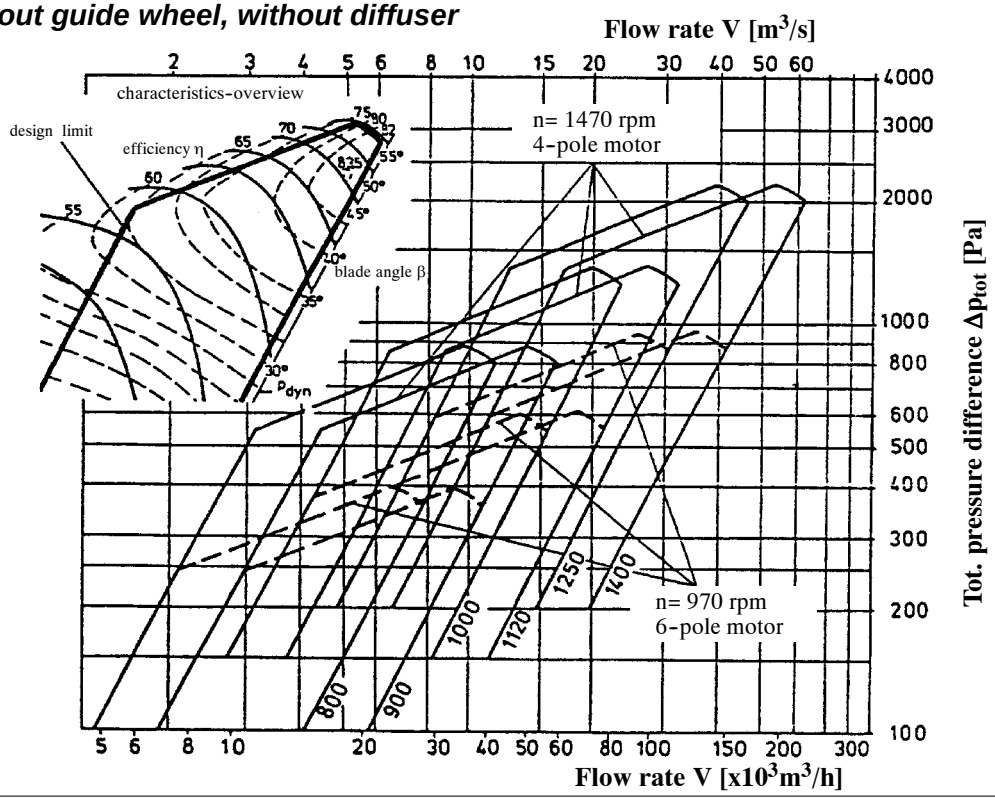


Size VAR	Ø D_1 [inch]	Ø D_2 [inch]	Ø d [inch]	L [inch]	Ring area A_2 [m²]
800	31.42	39.61	17.72	27.95	0.64
900	35.31	44.41	17.72	31.5	0.84
1000	39.61	49.8	22.05	35.43	1.01
1120	44.41	55.87	22.05	39.37	1.34
1250	49.8	62.64	27.56	43.31	1.60
1400	55.87	70.31	27.56	49.21	2.12

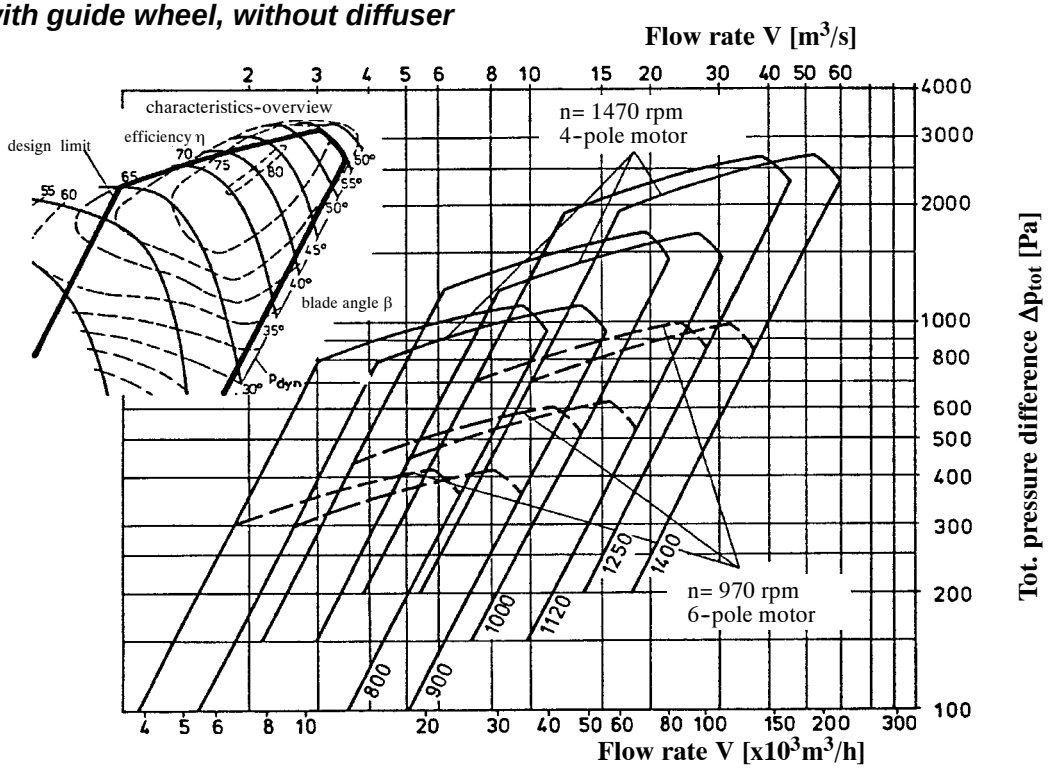
VAR Type High Performance Axial Flow Fan

Design Range

without guide wheel, without diffuser



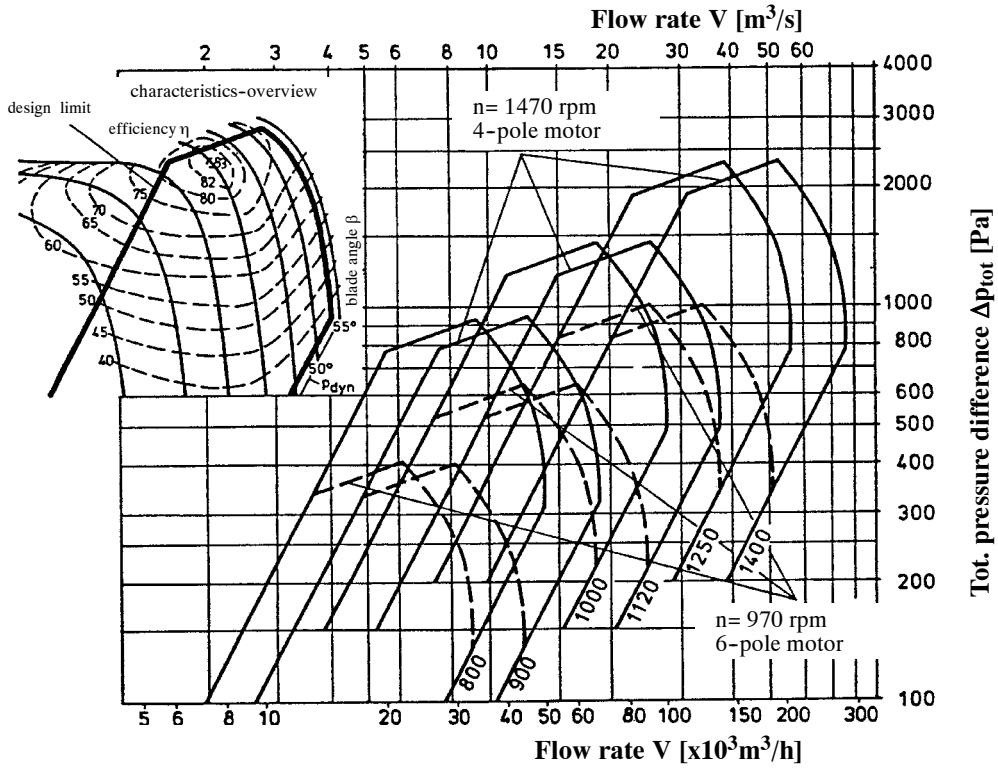
with guide wheel, without diffuser



VAR Type High Performance Axial Flow Fan

Design Range

with guide wheel, with diffuser



Quadrovent Type VRK Centrifugal Fans

Centrifugal fans of small to medium size, housing and impeller of welded construction. Welded impeller with backward curved blades.

With single or double sided intakes, 12 sizes each.

Flow rates:	589 to 58,865 cfm
Maximum total pressure:	2,000 Pa
Nominal sizes:	280 to 1,000
Optimum degree of efficiency:	75%
Degree of efficiency with unrestricted discharge:	72 %

V-belt or flat-belt drive.

Special Characteristics

Low dynamic pressure loss, hence saving on motor output of approx. 25% by comparison with drum rotors; approx. only 5% more motor power required by comparison with high performance fans producing 75% degree of efficiency.

Quality stage Q 6.3 to VDI 2060

Compact dimensions

Low noise

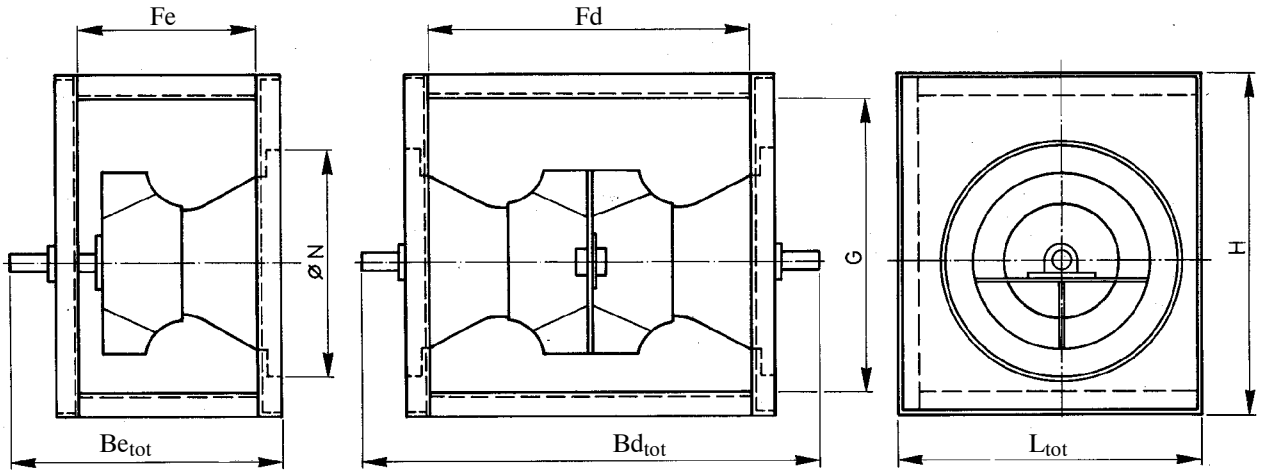
Stable characteristic pressure curve

No possibility of motor overload if installation resistance changes.

Standard Configurations

Single sided or double sided intake.
Available in four housing configurations (double sided intake: drive position optional, left or right side).

Dimensions and Weights



single sided intake VRKe — double sided intake VRKd

Size VRK*		280	315	355	400	450	500	560	630	710	800	900	1000
L_{tot}	[inch]	18.19	20.28	22.60	25.34	28.11	31.46	35.12	39.29	43.90	49.13	55.20	62.99
H	[inch]	20.98	23.27	25.83	28.66	31.89	35.47	39.53	44.06	49.13	54.84	61.26	70.00
Be_{tot}	[inch]	15.91	16.97	19.17	20.31	21.85	23.74	25.67	27.60	30.00	33.90	37.32	42.72
Bd_{tot}	[inch]	27.95	29.88	32.32	36.77	39.57	42.91	43.70	47.44	57.72	59.45	67.28	73.39
G	[inch]	18.62	20.91	23.46	26.30	29.53	33.11	37.17	41.69	46.77	52.48	58.90	66.06
Fe	[inch]	8.81	9.88	11.10	12.44	13.98	15.67	17.60	19.72	22.13	24.84	27.87	31.30
Fd	[inch]	15.67	17.60	19.72	22.13	24.85	27.87	31.26	35.08	39.37	44.17	49.57	55.59
N	[inch]	14.06	15.75	17.68	19.80	22.20	24.88	27.91	31.26	35.16	39.45	44.25	48.03
Weight e (max.) [lb]		62	71	86	124	132	190	243	342	397	485	640	1147
Weight d (max.) [lb]		82	106	115	159	188	256	326	441	547	750	1058	1840

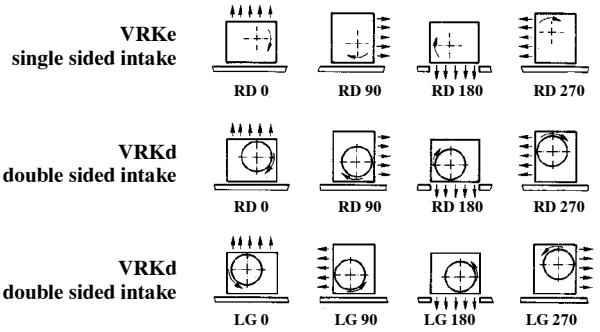
*)The diameter of the impeller in LTG centrifugal fans is approximately one type stage higher than the nominal size

Quadrovent Type VRK Centrifugal Fans

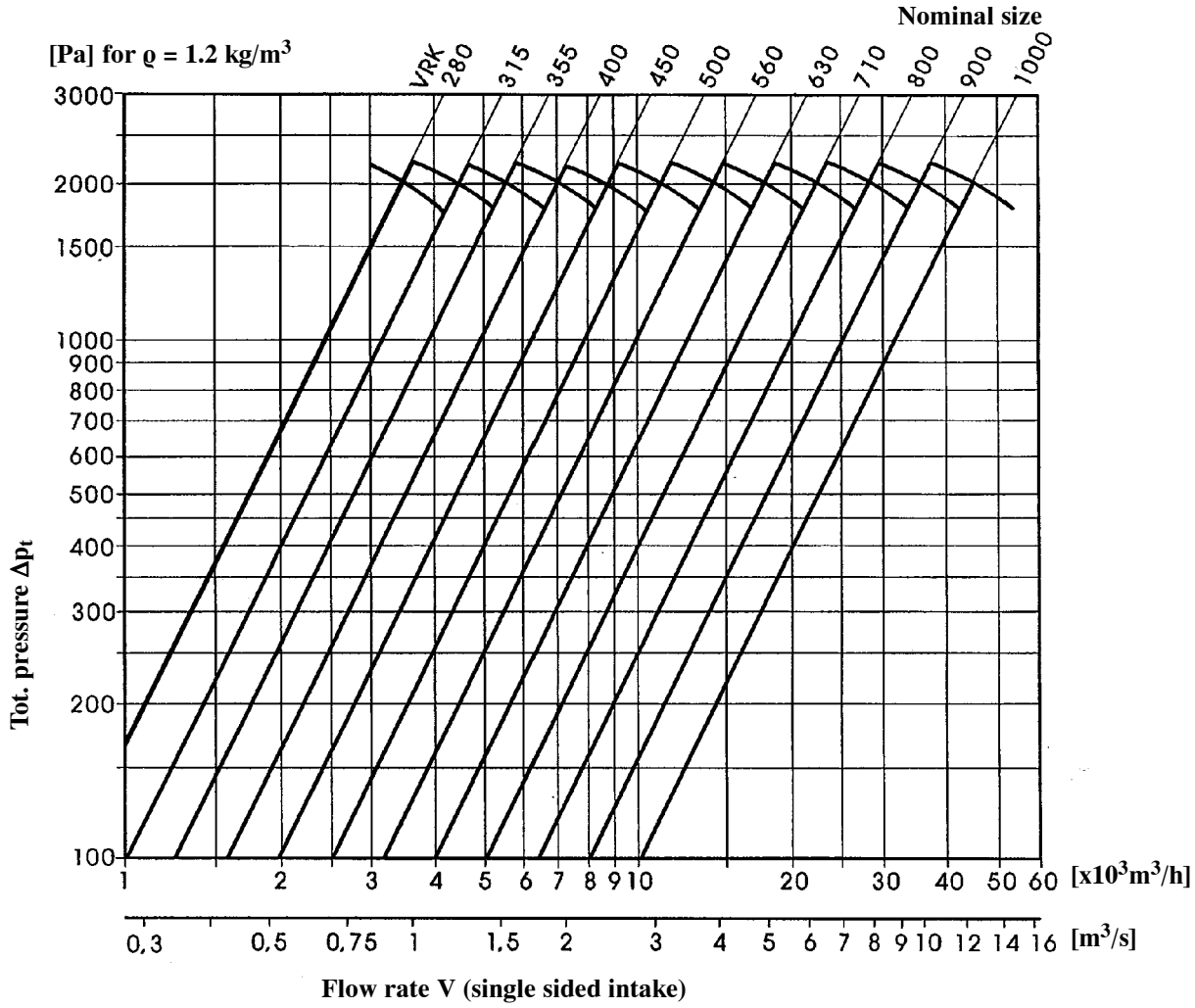
Design Range

The overview diagram shows the range of applications for type VRK fans. This will serve as a preliminary guide to selecting the size of fan required.

Housings



Overview Diagram



Low-Pressure Centrifugal Fans Type VRS

High-performance centrifugal fans.
High-strength welded housing. Welded impeller with backward curved blades.
With single or double sided intakes, 10 sizes each.

Flow rates:	2 060 to 117 730 cfm
Maximum total pressure:	4,000 Pa
Nominal sizes:	450 to 1,250
Optimum degree of efficiency:	85%

V-belt or flat-belt drive.

Special Characteristics

High degree of efficiency and compact dimensions, even at high conveying pressures.

Quality stage Q 6.3 to VDI 2060

Stable characteristic pressure curves, hence possibility of unlimited flow control and parallel operation.

Specific sound power level at optimum degree of efficiency, 31 dB.

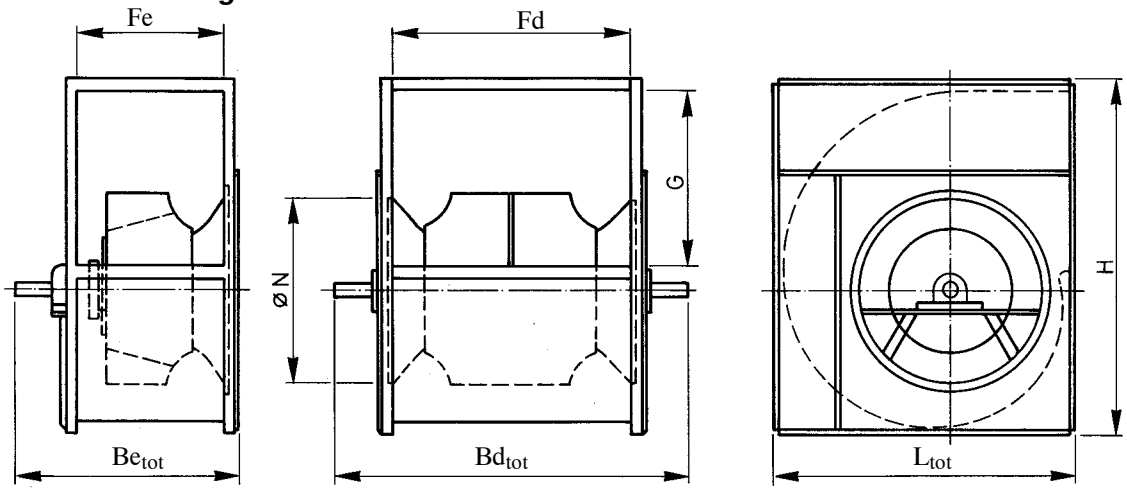
Standard Configurations

Single sided or double sided intake.
Available rotating clockwise or anti-clockwise in each group of four housing configurations. Double sided intake: drive position optional, left or right side.

Special Configurations

Special corrosion proofing options:
Sand blasting, hot galvanizing, rubberizing, stainless steel.

Dimensions and Weights



single sided intake VRSe — double sided intake VRSd

Size VRS*		450	500	560	630	710	800	900	1000	1120	1250
L_{tot}	[inch]	32.44	35.91	39.92	44.41	49.84	55.43	61.73	69.21	77.20	86.18
H	[inch]	37.56	41.73	46.61	51.97	58.82	65.60	73.15	82.44	92.72	103.43
Be_{tot}	[inch]	23.82	25.79	27.17	29.92	32.40	37.13	40.63	44.41	49.13	55.12
Bd_{tot}	[inch]	39.02	42.13	45.28	50.83	57.48	53.39	60.24	66.57	75.35	83.15
G	[inch]	18.62	20.91	23.46	26.30	29.53	33.11	37.17	41.69	46.77	52.44
Fe	[inch]	13.98	15.67	17.60	19.72	22.13	24.84	27.87	31.30	35.24	39.37
Fd	[inch]	24.84	27.87	31.26	35.08	39.37	44.17	49.57	55.59	62.40	70.00
N	[inch]	22.05	24.72	27.76	31.10	35.00	39.29	44.06	48.03	49.65	49.65
		one-piece						multi-part			
Weight e (max.)	[lb]	172	218	298	364	454	595	1047	1559	2293	2672
Weight d (max.)	[lb]	320	397	518	618	1058	1323	2061	2657	3439	4145

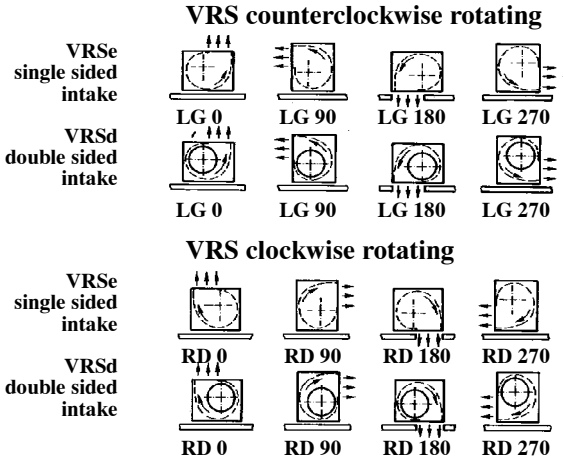
*)The diameter of the impeller in LTG centrifugal fans is approximately one type stage higher than the nominal size

Low-Pressure Centrifugal Fans Type VRS

Design Range

The overview diagram shows the range of applications for type VRK fans. This will serve as a preliminary guide to selecting the size of fan required.

Housings



Overview Diagram