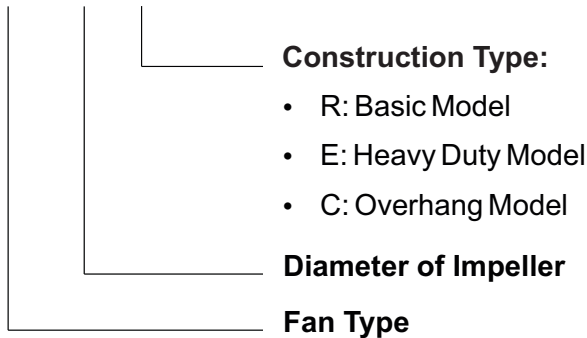


Fan Code

BCS 280 R



General Information

The **FCS/FCD** and **BCS/BCD** series of centrifugal fans with forward/ backward impellers were developed with advanced technologies. They are designed to bear the BS and ISO standard for air performance, sound, and efficiency which are equivalent to AMCA and DIN standard.

The centrifugal fan include 15 models as described in this catalogue. Some of the features and characteristics of these fans are: forward impeller blades, a wide range of applications, compact design, high efficiency, economic exercise, high quality execution, low noise and quiet running, and low power consumption. These fans are ideal for use in central air conditioning systems, in purifiers. The efficiency of all the fans is guaranteed through specific volume figures at maximum pressure differentials. Excellent performance and minimal noise levels are the features of this new fan range. They are also suitable for use in a variety of other ventilation.

Fan type:

- FCS series: Forward curve centrifugal fan with single inlet single width.
- BCS series: High efficiency, backward curve centrifugal fan with single inlet single width.
- FCD series: Forward curve centrifugal fan with double inlet double width.
- BCD series: High efficiency, backward curve centrifugal fan with double inlet double width.

Fan size:

- FCS series: 280mm - 1000mm
- FCD series: 200mm - 1000mm
- BCS series: 280mm - 1400mm
- BCD series: 200mm - 1250mm

These fans can cover the following performance range:

FCS/FCD series: Air volume rate from 700m³/h - 90.000m³/h, static pressure up 1.500Pa.

BCS/BCD series: Air volume rate from 1.000m³/h - 120.000m³/h, static pressure up 3.000Pa.

These fans have been designed for treating clean air within the temperature limits:

- R model: -20°C - 85°C.
- E model: -20°C - 85°C.
- C model: -30°C - 185°C.

(For special execution up to 400°C)

Important: when making a choice of a blowers consider the limit.

- Air volume
- Static pressure
- Output speed of the air
- Impeller diameter
- Absorbed power at the fan shalf
- Efficiency and noise levels.

Construction Information

FCS/FCD and **BCS/BCD** series are mainly constructed of casing, impeller, frame, bearing, shaft, motor and inlet/outlet flange.

Casing

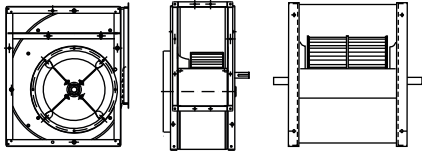

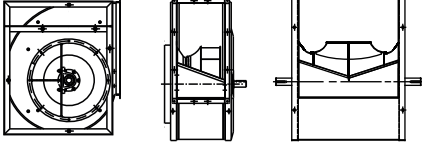

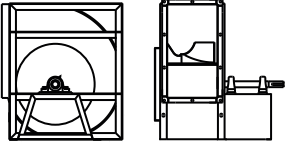

Size ranges are from 200mm to 1400mm diameter.

- Range sizes from 200mm to 1000mm is made of hot galvanized steel with EN 10142. The side plates include inlet cones that are designed with the best aerodynamics for inlet condition. The scroll is fixed to the side plates by spot welding of “Pittsburgh seam locking.”

- For sizes 1120mm to 1400mm are made of mild steel with epoxy painting. The inlet cones are also manufactured in black steel and epoxy painted.

They have thickness from 1.2mm to 5.0mm upon diameter.

Stainless steel of casing is provided on request.

Fan Type	Fan Size	Fan Diagram	Description	Bearing Type
R Model	FCS 280-710 FCD 200-710 BCS 280-710 BCD 200-710		Forward curve and backward curve with belt driven. Standard inlet, outlet flanges.	
E Model	FCS 280-1000 FCD 200-1000 BCS 280-1400 BCD 200-1250		Welded rectangular frame. Ball bearings on both sides on separate frame - fan and motor on common baseframe.	
C Model	FCS 280-1000 BCS 280-1400		Forward curve and backward curve with impeller overhang on the fan shaft, standard inlet and outlet flanges.	

Impeller Data

The impellers are constructed of high grade cold-roll steel, according to the three dimensional flow theory, the impellers are fixed on the center plate and on the end ring with welding by high precision laser cutting machine.

All the impellers are designed highest peripheral speed and high efficiency.

The forward curve impeller of **FCS/FCD** is made of hot galvanized steel.

The backward curve impeller of **BCS/BCD** is made of mild steel, they are welded and epoxy painting. Stainless steel of impeller can be provided on request.

All the impellers are statically and dynamically balanced to ISO 1940 with G2.5mm/s quality standard.

The impellers are secured to the shaft through a steel hub.

Hub bore is precision machined and incorporates as keyway and locking screw.

Shaft

The shafts are made of 45 Cr carbon steel bars. They are coated after assembly to provide corrosion resistance. Shaft size should be designed to meet the first critical speed of at least fan maximum running speed 1.4 times.

Shaft are provided with keyways for the impeller hub and for belt pulleys that can be fitted on either shaft ends.

Stainless steel of shaft can be provided on request.

Frame

The construction frame of R model is made of galvanized steel angle iron bars. The cutting and bending of the frame parts, as well as the TOX connections, are formed with the use of tools to ensure the high accuracy and the rigidity of the frame.

The heavy duty frames of E and C models are made with hot rolled steel and welded by angle steel and flat steel with epoxy painting in order to ensure sufficient rigidity and strength.

All frames can be protected with hot dip galvanized or stainless steel as an option.

Bearing

Ball bearings are used in all of all the centrifugal fans. These are high quality bearings and selected to minimize the fan noise levels. The bearings are pre-lubricated, sealed and self centering.

For construction of R model, the bearings are supplied with lubricated fittings. R model is used single row, deep groove, self-aligning ball bearings. Sealed and lubricated for life, they are locked on the shaft with an eccentric ring clamp and supported, inside electrically conductive rubber shock absorbers, on spider shaped holders bolted on the inlet to the closed side plate.

For construction of E and C models, the bearings are supplied with radial bearing. E and C models are used sealed, single row, self-aligning ball bearings, with eccentric clamp, mounted inside cast iron pillow blocks, with grease nipples, bolted to the side-frames or pedestal.

The bearing service life (L10) are over 100,000 hours (L10 >= 100,000 hours). Limiting values for speed and power are indicated in the characteristic curve and should not be exceeded. Long term quality is safeguarded when general assembly and service guidelines for V-belt drives.

The grooved ball bearings in the rushed cast iron casing are completely sealed and maintenance free. Unavoidable alignment errors are compensated by the spherical outer ring.

The one piece bearing housing conforms to ISO 3228 and allows full utilization of the carrying capacity of the mounted regulating bearing. All casing are equipped with lubricating bore holes for the possibility of secondary lubrication. As protection the lubricating bore holes are closed with a synthetic stopper.

The bearing is attached to the shaft by means of an eccentric tension ring. In order to guarantee the bearing fit is free from play and to avoid corrosion of the tension ring sealed with a liquid synthetic.

Motor Data

Motors incorporated are TEFC (Total Enclosed Fan Cooled), and airstream rated to IEC 34-1.

Protected to IP55 with Class F insulation standard.

Motors are suitable for speed control by frequency inverter, subject to fan selection.

Available specific for your project requirements such as:

- 220-240V / 380-415V-50Hz
- IE1, IE2, IE3 and IE4 Efficiency Classes.
- 2-speed (Full/Half and Full/Two Thirds)
- High temperature motor and double speeds motor (Class H): 250°C/2hrs or 300°C/2hrs.
- Explosion proof motor: Class F and IP55 or IP66 with completed ATEX 2014/34/EU and EN 50014, EN 50018 and EN50281-1-1.

Motor Power:

The power (P_w) on the performance chart refers to the shaft power of the fan.

The rated power of the drive motor equals the total required shaft input multiplied by the safety factor:

$$P_s = P_w : \eta_m$$

Where: P_s = total required shaft input power

η_m = mechanical efficiency

The mechanical efficiency is provided as follow:

Way of ventilator driving	η_m
Electric motor directly driven	1
Coupling directly driven	0.98
V-belt driven	0.95

Outlet/Inlet flange

The inlet flange is made of high grade cold rolling sheet with epoxy coating. The outlet flange is made of galvanized steel. The connections of the flange components to the scroll are made using a TOX non-welding process. This maintains a good flange appearance while also providing sufficient strength and rigidity.

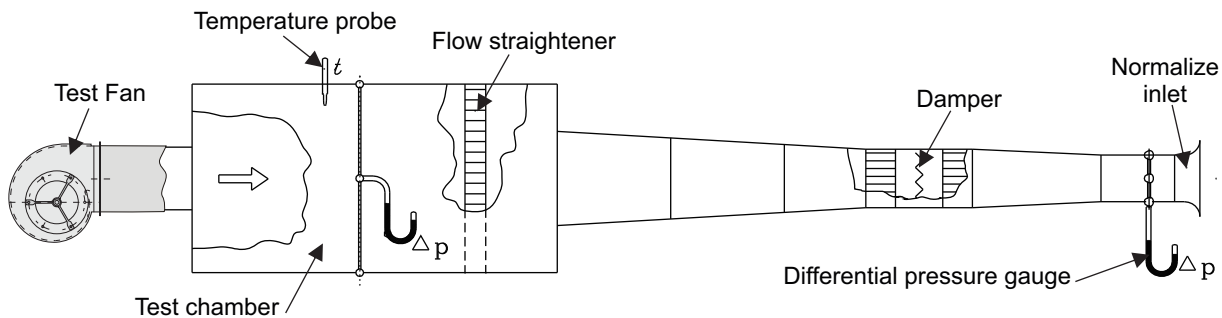
Performance Data

Full details are available on our selection program: Breeze Fan.

- Manufactured under a certified ISO 9001:2015.
- The performance is tested international standards by BS 848-1:1985 and ISO 5801.
- Installation position B, i.e. free inlet and ducted outlet configuration.
- All curves to a density of $\rho = 1,2 \text{ kg/m}^3$, at 20°C .

Please contact our sale department or login <http://www.breeze.com.vn> for selection program.

The performance curves are provided in this catalogue were measured according to BS 848-1:1985 and ISO 5801 in the test chamber.



BS 848 part 1 / ISO 5801

Sound Level

All measurements of the sound that the fans generate have been taken strictly in accordance with BS 848-2, test method 1 and ISO 13347-2 for acoustic performance.

Sound data are determined according to BS EN ISO 5136 – In-duct method.

Published sound power level spectra figures are dBW with a reference of 10^{-12} Watt (1 Pico watt).

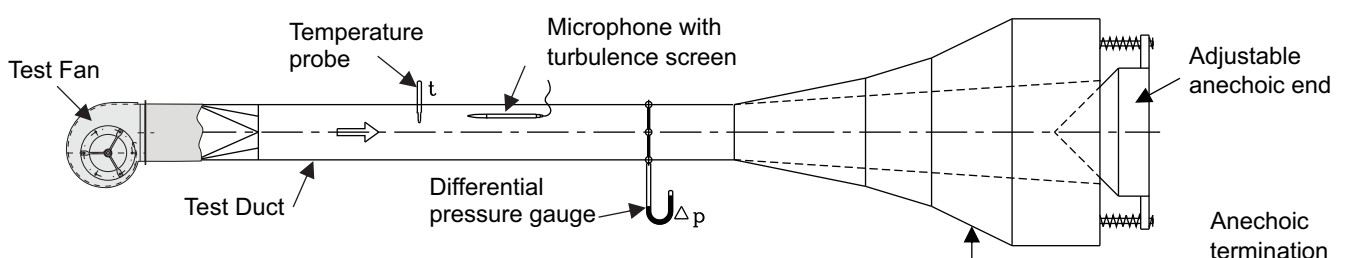
The sound power levels shown on the fan curves are for inlet L_{wiA} scale for installation type D: ducted inlet, ducted outlet. Ratings include the effects of ducted end correction.

The sound pressure level at the inlet at 1m distance in low reflection can be obtained by deducting 11dB from the sound power level at the inlet side. The sound pressure difference from 1m to distance d is obtained as follows:

$$L_{piA} = 10 * \log (1/d)$$

Where: d = distance from fan in meters.

Sound measurement test rig scheme according to BS 848 part 2:1985 and ISO 5136 in the test duct.



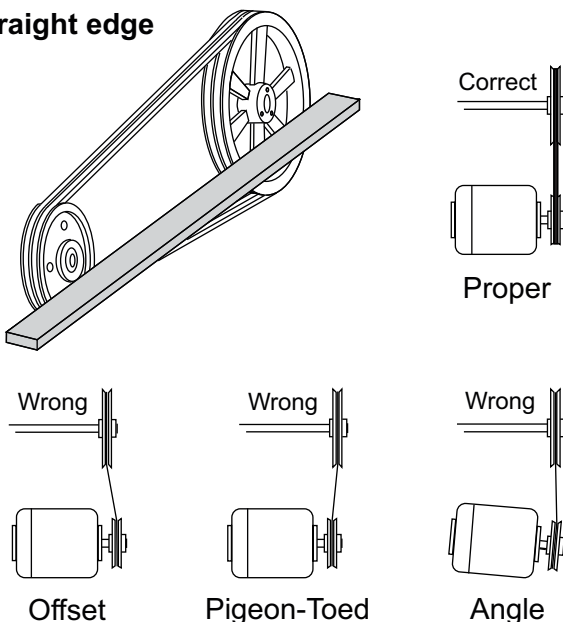
BS 848 part 2 / ISO 5136

Installation and Maintenance

V-belt Drive Installation

1. Remove the protective coating from the ends of the fan shaft and ensure that the shaft ends are free of nick and burrs.
2. Check fan and motor shafts for alignment.
3. The center distance must be controlled as $0.7(d_1 + d_2) < a < 2(d_1 + d_2)$. The belt speed of forward curve fan should be more than 10m/s, but less than 15m/s, ($10 < v < 15\text{m/s}$). The belt speed of backward curve fan should be more than 25m/s, but less than 35m/s ($25 < v < 35\text{m/s}$).
4. Slide sheaves on to the shafts, do not hammer the sheaves on to the shafts with force as this may result in bearing damage.
5. Align fan and motor sheaves with a straight edge, and tighten the sheaves.
6. Place belts over the sheaves with care. Do not bend or squeeze the belts or it might get damaged.
7. Adjust the belt tension until the belts appear snug. Run the unit for a few minutes and allow the belts to set properly.
8. Switch off the fan, adjust the belt tension by moving the motor base. When in operation, the tight side of the belts should be in a straight line from sheave to sheave and there should be a slight bow on the slack side.

Aligning sheaves with a straight edge



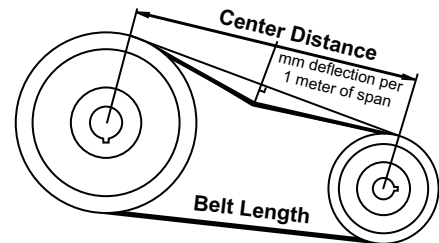
Belt Tension

Before tensioning the belts installed on the pulleys, mark two thin transverse lines on the back of a belt in the middle of the group of belts, these marks shall be as far apart as possible while remaining together on the straight part of the belt strand.

Tighten the belts progressively after turning them for about one minute, several times, after each adjustment, tighten the pulleys so that the length between the two marks is increased by the percentage given in the following table.

This simplified belt tensioning method will facilitate the work done by fitters for maintenance of trapezoidal belt transmissions when important technical data are not available. This avoids the need to calculate the optimum tension.

Belt tension indicator applied to mid center distance.



Belt Section	Force require to deflect A belt 16mm per meter of span		
	Small Pulley/ Diameter (mm)	Newtonian (N)	Kilogram force (Kgf)
SPZ	13-20	56-95	1.3-2.0
	20-25	100-140	2.0-2.5
SPA	25-35	80-132	2.5-3.6
	35-45	140-200	3.6-4.6
SPB	45-65	112-224	4.6-6.6
	65-85	236-315	6.6-8.7
SPC	85-150	224-335	8.7-11.7
	115-150	375-560	11.7-15.3
A	10-15	80-140	1.1-1.5
B	20-30	125-200	2.0-3.1

Bearing Installation

1. Before installing, read bearing manufacturers' procedures. Before putting the new bearings on the shaft, you may need to break what is called swivel torque on the bearings (depending on type of bearing). This is done by holding the bearing housing securely and being able to move the inner bearing race around freely.

2. Apply light film of oil on shaft, then gently slide the new bearing onto the shaft.



Do not hammer bearing onto the shaft!

3. Align bearings on shaft with the previous scribe marks that are on the shaft and lock bearing to shaft.

4. Put bolts into mounting surface and bearings. Do not tighten.

5. Remove block if shaft is supported.

6. Set bearings on support with the scribed marks locating the bearings. Make sure bearings are square and level with the shaft.

7. Tighten bolts and torque bearing bolts, bearing set screws/locking collars as per bearing manufacturers' procedures.

8. Rotate shaft by hand to help allow the bearings to help set in. Also at this time, listen for any unusual noises such as wheel rubbing on cone and any bearing noise.

9. Connect extended lube lines in new bearings if needed.

10. Reinstall the drive sheaves and belts. Check the belt alignment.

11. Make sure to reinstall all guards and follow proper safety measures before starting up the fan.

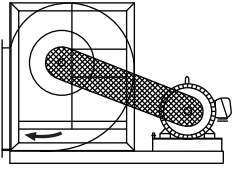
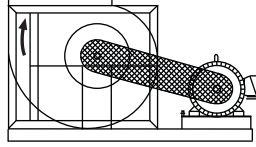
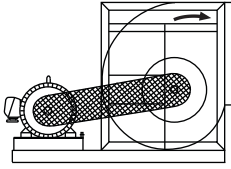
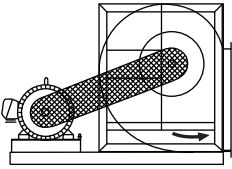
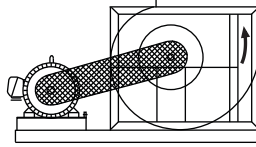
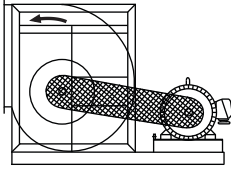
Fan Rotation

Standard fans are supplied with both shaft ends prepared to fit a pulley. They can be indifferently used with either RD or LG rotation. All the versions with side frames can be easily turned to install them in one of the four orientation 0°, 90° and 180°. There is no need to specify fan orientation when ordering standard fans. Fan orientation must be specified instead when ordering fans fitted with accessories which must be located according to the scroll orientation, like drain plugs.

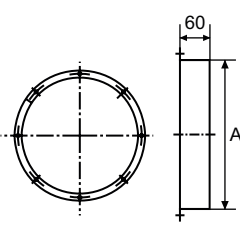
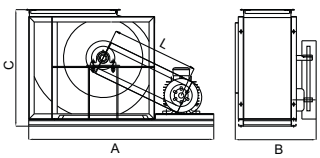
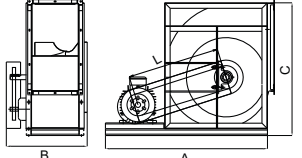
Other accessories may be installed in coded standard positions, identified by letters or numbers. Please, check the details concerning each particular accessory. When requested, fan orientation is identified, according to ISO 13349.

When looking at the fan from the drive side, RD means right (clockwise) rotation, while LG means left (counterclockwise) rotation.

The achievable orientation are shown in the drawing below.

Rotation	0°	90°	180°
RD Right Hand (Clockwise)			
LG Left Hand (Counterclockwise)			

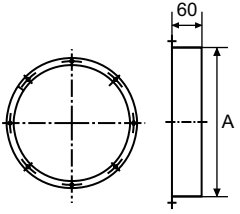
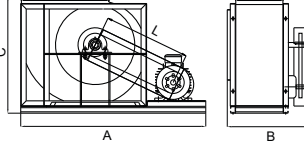
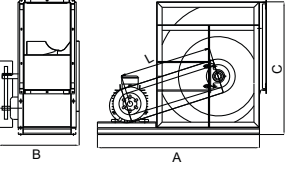
Dimension Information
FCS/BCS-R: Basic Model

Rotation		Flanges					90°			180°		
RD Right Hand		Inlet Flange 										
Size	Frame	A	B	C	D	E	A _{max}	B	C	A _{max}	B	C
280	71-112	292	361	197	417	253	1130	400	516	1050	400	568
315	71-112	322	404	223	460	279	1200	435	568	1100	435	628
355	71-112	362	453	238	509	294	1280	465	628	1160	465	705
400	71-112	404	507	258	563	314	1360	495	701	1230	495	786
	132	404	507	258	563	314	1380	495	701	1250	495	786
450	80-112	448	569	288	625	344	1420	550	776	1300	550	877
	132	448	569	288	625	344	1470	550	776	1380	550	877
500	80-112	510	638	324	684	380	1530	590	850	1380	590	968
	132	510	638	324	684	380	1550	590	850	1400	590	968
560	90-112	570	715	368	771	424	1620	635	956	1460	635	1093
	132-160	570	715	368	771	424	1740	635	956	1560	635	1093
630	90-112	635	801	412	857	468	1780	685	1062	1560	685	1220
	132-160	635	801	412	857	468	1880	685	1062	1650	685	1220
710	90-112	722	898	468	954	524	1920	740	1184	1680	740	1366
	132-160	722	898	468	954	524	2000	740	1184	1770	740	1366

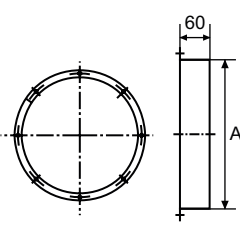
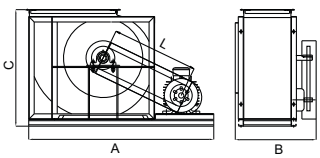
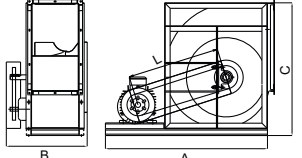
All dimensions in mm.

* Dimensions shown are approximate only. The details please contact local sales office for more information.

Dimension Information
FCS/BCS-E: Heavy Duty Model

Rotation		Flanges					90°			180°		
RD Right Hand		Inlet Flange 										
Size	Frame	A	B	C	D	E	A _{max}	B	C	A _{max}	B	C
280	80-112	292	361	197	417	253	1130	430	516	1050	430	568
315	80-112	322	404	223	460	279	1200	465	568	1100	465	628
355	80-112	362	453	238	509	294	1280	495	628	1160	495	705
400	90-112	404	507	258	563	314	1360	525	701	1230	525	786
	132	404	507	258	563	314	1380	525	701	1250	525	786
450	90-112	448	569	288	625	344	1420	580	776	1300	580	877
	132	448	569	288	625	344	1470	580	776	1320	580	877
500	90-112	510	638	324	684	380	1530	620	850	1380	620	968
	132-160	510	638	324	684	380	1640	620	850	1480	620	968
560	100-112	570	715	368	771	424	1620	665	956	1460	665	1093
	132-160	570	715	368	771	424	1740	665	956	1560	665	1093
630	100-112	635	801	412	857	468	1780	715	1062	1560	715	1220
	132-160	635	801	412	857	468	1880	715	1062	1650	715	1220
710	100-132	722	898	468	954	524	1940	770	1184	700	770	1366
	160-200	722	898	468	954	524	2100	770	1184	1870	770	1366
800	112-160	808	1007	520	1063	576	2150	825	1330	1850	825	1548

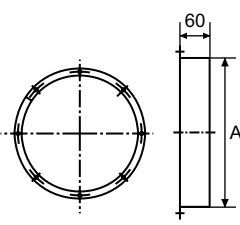
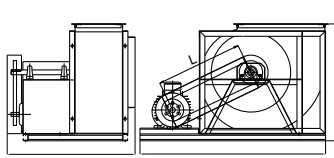
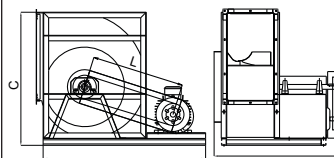
Dimension Information
FCS/BCS-E: Heavy Duty Model

Rotation		Flanges					90°			180°			
RD Right Hand		Inlet Flange 											
													LG Left Hand
Size	Frame	A	B	C	D	E	A _{max}	B	C	A _{max}	B	C	
800	180-225	808	1007	520	1063	576	2320	825	1330	2020	825	1548	
	900	112-132	896	1130	580	1186	638	2280	905	1488	1950	905	1728
		160-180	896	1130	580	1186	638	2420	905	1488	2080	905	1728
1000	200-225	896	1130	580	1186	638	2520	905	1488	2180	905	1728	
	1000	132-180	996	1267	663	1323	719	2580	975	1621	2230	975	1890
		200-250	996	1267	663	1323	719	2750	975	1621	2400	975	1890
1120	160-180	1018	1468	725	1526	825	2810	1200	1900	2410	1200	2050	
	1120	200-225	1018	1468	725	1526	825	2960	1200	1900	2560	1200	2050
		250-280	1018	1468	725	1526	825	3050	1200	1900	2650	1200	2050
1250	160-180	1310	1588	800	1688	900	3060	1300	2100	2610	1300	2400	
	1250	200-225	1310	1588	800	1688	900	3210	1300	2100	2760	1300	2400
		250-280	1310	1588	800	1688	900	3300	1300	2100	2850	1300	2400
1400	160-180	1450	1776	902	1876	1002	3310	1450	2300	2810	1450	2700	
	1400	200-225	1450	1776	902	1876	1002	3460	1450	2300	2960	1450	2700
		250-280	1450	1776	902	1876	1002	3550	1450	2300	3050	1450	2700

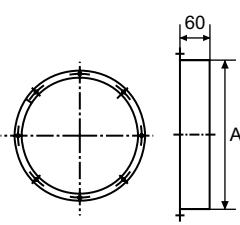
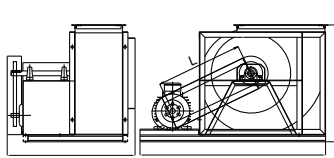
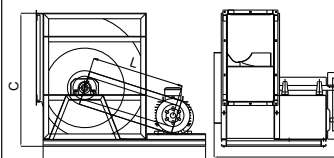
All dimensions in mm.

* Dimensions shown are approximate only. The details please contact local sales office for more information.

Dimension Information
FCS/BCS-C: Overhang Model

Rotation		Flanges					90°			180°		
RD Right Hand		Inlet Flange 										
Size	Frame	A	B	C	D	E	A _{max}	B	C	A _{max}	B	C
280	80-112	292	361	197	417	253	1130	675	516	1050	675	568
315	80-112	322	404	223	460	279	1200	700	568	1100	700	628
355	80-112	362	453	238	509	294	1280	775	628	1160	775	705
400	90-112	404	507	258	563	314	1360	800	701	1230	800	786
	132	404	507	258	563	314	1380	800	701	1250	800	786
450	90-112	448	569	288	625	344	1420	894	776	1300	894	877
	132	448	569	288	625	344	1470	894	776	1320	894	877
500	90-112	510	638	324	684	380	1530	930	850	1380	930	968
	132-160	510	638	324	684	380	1640	930	850	1480	930	968
560	100-112	570	715	368	771	424	1620	1020	956	1460	1020	1093
	132-160	570	715	368	771	424	1740	1020	956	1560	1020	1093
630	100-112	635	801	412	857	468	1780	1065	1062	1560	1065	1220
	132-160	635	801	412	857	468	1880	1065	1062	1650	1065	1220
710	100-132	722	898	468	954	524	1940	1185	1184	1700	1185	1366
	160-200	722	898	468	954	524	2100	1185	1184	1870	1185	1366
800	112-160	808	1007	520	1063	576	2150	1245	1330	1850	1245	1548

Dimension Information
FCS/BCS-C: Overhang Model

Rotation		Flanges					90°			180°		
RD Right Hand		Inlet Flange 										
Size	Frame	A	B	C	D	E	A _{max}	B	C	A _{max}	B	C
	180-225	808	1007	520	1063	576	2320	1245	1330	2020	1245	1548
900	112-132	896	1130	580	1186	638	2280	1375	1488	1950	1375	1728
	160-180	896	1130	580	1186	638	2420	1375	1488	2080	1375	1728
	200-225	896	1130	580	1186	638	2520	1375	1488	2180	1375	1728
1000	132-180	996	1267	663	1323	719	2580	1450	1621	2230	1450	1890
	200-250	996	1267	663	1323	719	2750	1450	1621	2400	1450	1890
1120	160-180	1018	1468	725	1526	825	2810	1600	1900	2410	1600	2050
	200-225	1018	1468	725	1526	825	2960	1600	1900	2560	1600	2050
	250-280	1018	1468	725	1526	825	3050	1600	1900	2650	1600	2050
1250	160-180	1310	1588	800	1688	900	3060	1750	2100	2610	1750	2400
	200-225	1310	1588	800	1688	900	3210	1750	2100	2760	1750	2400
	250-280	1310	1588	800	1688	900	3300	1750	2100	2850	1750	2400
1400	160-180	1450	1776	902	1876	1002	3310	1950	2300	2810	1950	2700
	200-225	1450	1776	902	1876	1002	3460	1950	2300	2960	1950	2700
	250-280	1450	1776	902	1876	1002	3550	1950	2300	3050	1950	2700

All dimensions in mm.

* Dimensions shown are approximate only. The details please contact local sales office for more information.

Installation Guide

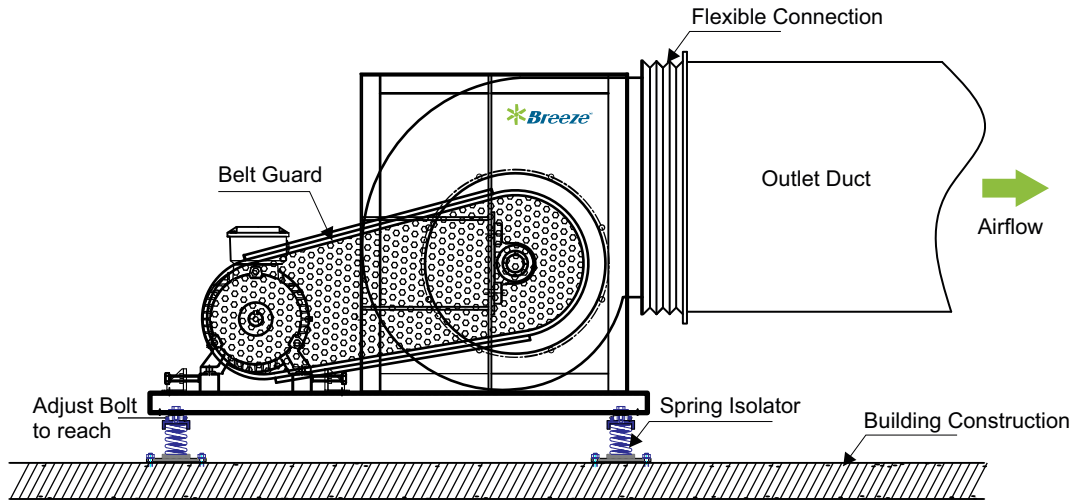


Fig 01. Mounting type

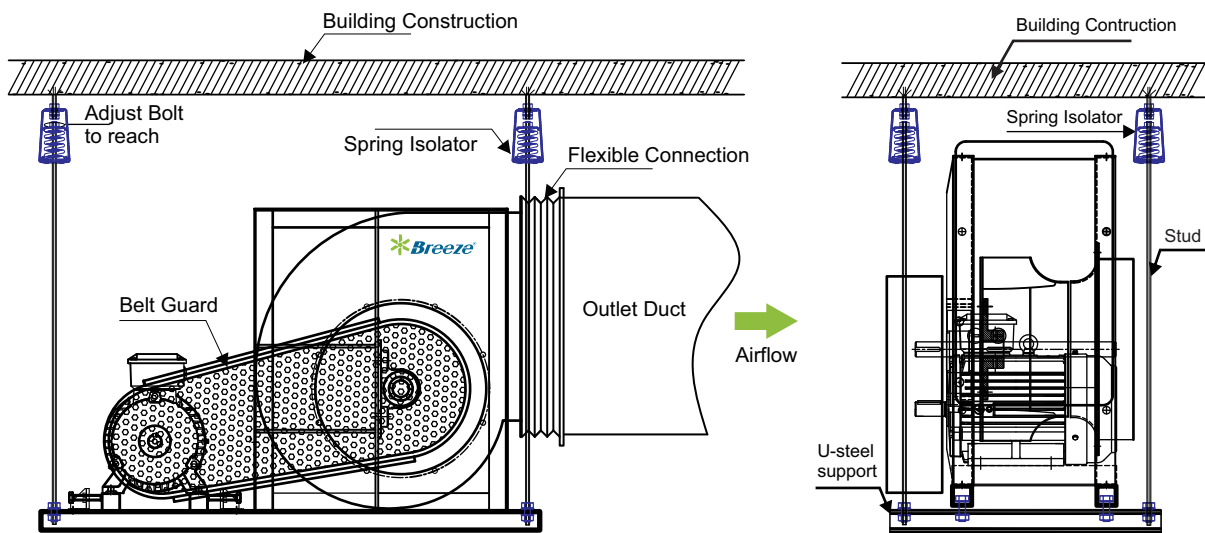


Fig 02. Hanging type

In case: Installation position B, i.e. free inlet and ducted outlet configuration.

Obstruction at fan inlet:

Allow a gap of at least one fan diameter between fan inlet and obstruction and fit a diffuser on the discharge.

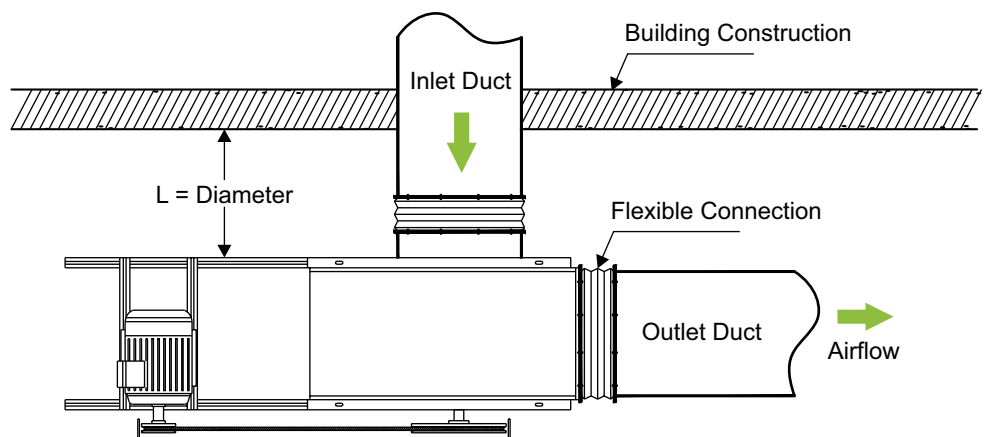


Fig 03. Top view