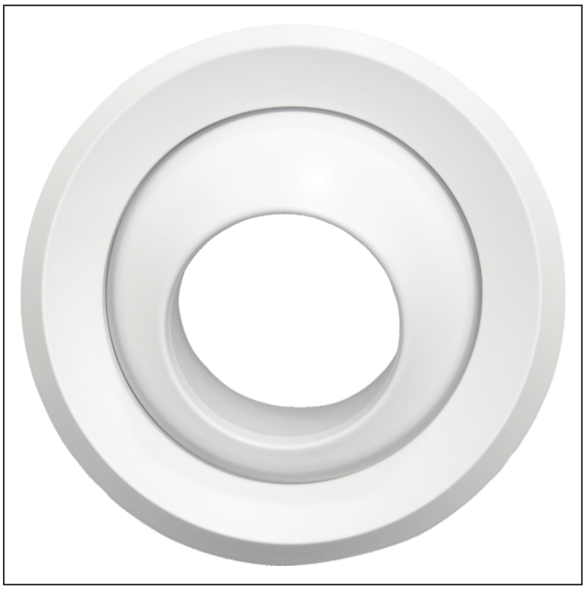
BALL SPOUT



FEATURES

- Made of aluminum with powder coated
- Mainly used for the airport, theater, museum etc.
- Excellent appearance, long space of airflow, low noise
- Eyeball type core rotation.
- Easy to install, adjust & maintenance.
- Can be regulated by hand or electric devices to meet the change of the temperature.

ASSESSORIES

- Opposite Blade Damper:
  Located behind the diffuser or air plenums enamel completed with matt black baked enamel finish.

FINISH

- Aluminum Construction
  Power coated in white as a standard, special color are also available upon request.

DESCRIPTION

- Ball Spout provides ventilation to places where distribution of air via ceiling diffuser is not possible or practical. In a big open space area where ceiling outlets are not able to supply air uniformly to the corners, Ball Spout will be a solution. Air is supplied into the space at high velocity with high induction causes the supply air to mix with the room air effectively. Due to its pleasant appearance, it can be used in large room such as concert, airport, theatre, museum, etc.

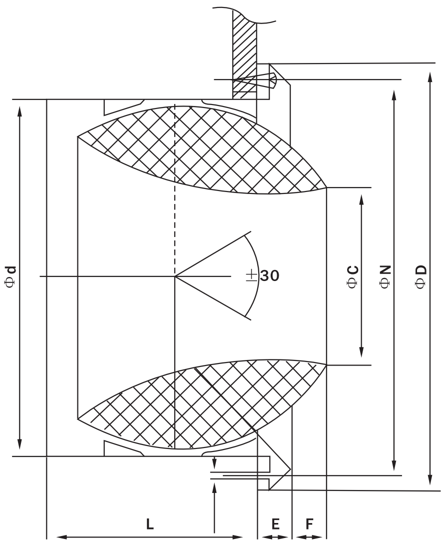
ORDERING INFORMATION

MODEL		SIZE		STYLE		ACCESSORIES
BS	-	Dia.	-	M/E	,	W/OBD

- W/OBD: Completed with OBD
- M/E: Manual or Electric
- Dia.: Specificatin of Ball Spout
- BS: Ball Spout

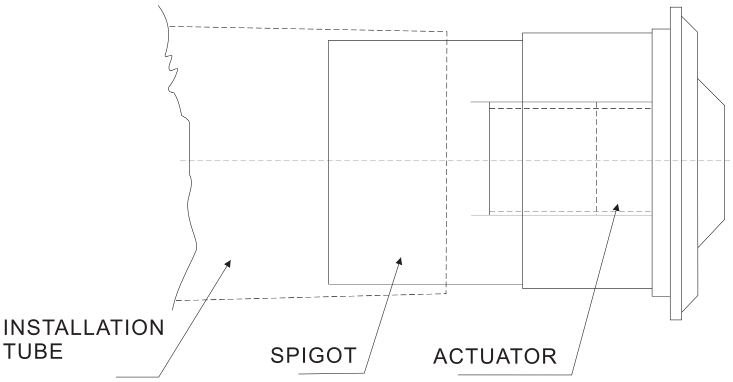
EXAMPLE: Model: **BS - 600-M, W/OBD**
Manual Ball Spout, Dia. 600mm, Complete with Opposed Blade Damper

TYPE AND DIMENSION



MANUAL SPOUT

Insert the spout into the round branch duct of ventilation system directly. or fix the spout to the ceiling or side-wall with self tapping screws after taking off the front circle cover of spout then fix back the cover. It is easy to install or dismantle.



ELECTRIC SPOUT

Left sketch shows the detail of installation and construction of Electric Spout. Use a spigot for connection between spout and installation tube at the end of spout. Add a saddle component inside the spout to fix actuator. Generally, the actuator needs 200V type, especially requires DC24V type. According to the requirement, the angle of actuator should be adjusted to less than 60 degree. It is the limited degree when actuator stops at the position for supplying cold air or hot air.

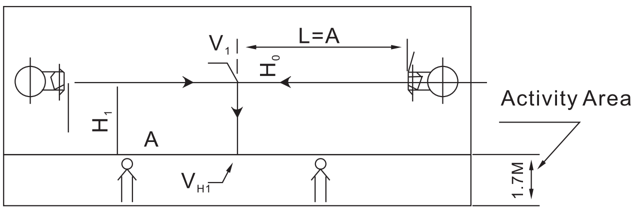
Ball Spout System Size Chart (in mm):

NECK SIZE ΦN	Φd	ΦD	ΦC	L	E	F	Dia. of HOLE FOR INSTALLATION
100	98	146	50	65	65	-2.5	120
125	123	169	60	74	74	0	146
160	158	200	80	91	91	0	180
200	198	257	108	104	104	0	228
250	248	302	136	136	136	5	274
315	313	384	174	166	166	15	346
400	398	467	230	199	199	15	432

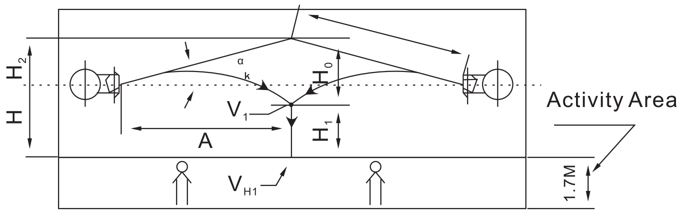
SUPPLYING AIR STATUS

There are three supplying statues of Ball Spout, isothermal air, cold air and hot air. The angle of supplying air is 0 degree at isothermal air condition; The sphere spout should be sloped upwards to α_k when supplying cold air; When supplying hot air, the sphere spout should be sloped downwards to α_w. The sum of α_k and α_w should not exceed 60 degree.

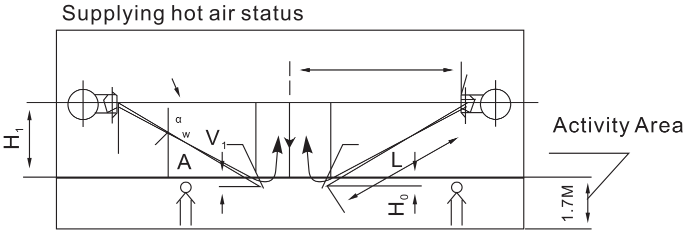
Isothermal status



Supplying cold air status



Supplying hot air status



A ---- The horizontal distance from the spout to the junction of two air flows.

H ---- The height from the spout to the activity area.

H_0 ---- Deviation of airflow caused by difference in temperature when supplying air

H_1 ---- The height from the junction of two airflows above the activity area to the activity area.

H_2 ---- Difference in height from the junction of two spouts' slanting directions to the spout when supplying cold air

L ---- Length at isothermal airflow

α_k ---- The upward angle of spout when supplying cold air

α_w ---- The downwards angle of spout when supplying hot air

Q ---- The air volume of supplying air

S ---- Free area of spout.

V_k ---- Air velocity

V_L ---- Average air velocity at the junction of two airflows.

V_{h1} ---- Average air velocity at Activity Area .

$\triangle_{tz}$ ---- The difference between the temperature of supplying air and room temperature

$\triangle P_t$ ---- Pressure loss

L_{WA} ---- The noise dB(A) of A power rank

CHOICE AND CALCULATION

Primary choice should be accorded to table 1 based on air volume, noise limitation, distance of supplying air and terminal air velocity.

Data in table 1 is based on single horizontal isothermal airflow.

As experiences, the data in the table is different from the actual data. Such as, 30m of distance of supplying air , 0.25 m/s of air velocity are just theoretical values. In fact, other interferences in room should be considered.

PERFORMANCE DATA

BALL SPOUT SUPPLYING DATA:

(Outlet air velocity <2m/s and noise >55dB(A) are not shown in this table)

TABLE 1

mm Specification /size	m^2 Free Area of spout	The Distance of Supplying Air						m/s Terminal Air Velocity
		10m		20m		30m		
		Q m^3/h	L_{WA} DB(A)	Q m^3/h	L_{WA} DB(A)	Q m^3/h	L_{WA} DB(A)	
100	0.0019	-	-	94	29	140	41	0.25
125	0.0031	-	-	122	25	180	36	
160	0.0050	83	<20	166	<20	248	35	
200	0.0085	104	<20	220	<20	306	27	
250	0.0135	133	<20	274	<20	382	22	
315	0.0225	180	<20	353	<20	540	20	
400	0.0385	234	<20	464	<20	702	<20-	
100	0.0019	94	29	487	50	-	-	0.5
125	0.0031	122	25	245	46	-	-	
160	0.0050	166	<20	331	44	497	55	
200	0.0085	220	<20	435	38	655	40	
250	0.0135	274	<20	547	34	824	45	
315	0.0225	353	<20	702	28	1055	40	
400	0.0385	464	<20	930	20	1393	33	
100	0.0019	187	50	-	-	-	-	1.0
125	0.0031	245	46	-	-	-	-	
160	0.0050	331	44	-	-	-	-	
200	0.0085	435	38	871	-	-	-	
250	0.0135	547	34	1098	53	-	-	
315	0.0225	702	28	1404	48	2160	-	
400	0.0385	930	20	1858	42	2783	53	

Remark:

- Calculation of outlet air velocity of spout: V=Q/3600 ms
- Terminal air velocity must multiply by 1.4 ratio when the space between two spouts "B<0.15A".
  The data above is Axis-installation data based on the direction of airflow from spout as same as of main duct.
- When the slanting angle of spout $\alpha \pm 30°$, the amended noise value should be referred to table 2.
- When the angle between the direction of airflow in main duct and the direction of airflow from spout is 90° , namely Side-installation, the amended noise value should be referred to table 3.

TABLE 2

Specification/ Size	100	125	160	200	250	315	400
Noise Amendment value L_{wA}	+3	+5	+3	+3	+2	+2	+1

TABLE 3

Specification	α=0°	α=90°
100	-6	-4
125	-4	-2
160	-2	0
200	0	+2
250	+2	+4
315	+4	+6
400	+6	+8
500	+5	+5
550	+5	+5
630	+5	+5

Calculation steps

Noted: A, H, $\triangle_{tzcold}$, $\triangle_{tzhot}$, Qcold, Qhot require L, H, H_0, V_L, H_{H1}

Supplying cold air status

(1)Choosing α_k: such as α_k=30° , supplying air upwards

(2)L Value: $L=A/\cos\alpha_k$

(3)H_Z Value: $H_Z=tg\alpha_k$

(4)V_1 can be found in table 4 (base on the specification primary and the distance of supplying air)

(5)H_0 can be found in table 5

(6)H_1 Value: $H_1=H+H_Z-H_O$

(7)V_{H1} can be found in table 6. If it's inconsistent with the set value, it should be recalculated after amending the α_k value until achieves the requirement.

Isothermal status:

(1)The slanting angle of spout is 0° , namely horizontal supplying air

(2)V_L can be found in table 4

V_{h1} can be found in table 6. If it's inconsistent with the set value, α angle of spout must be slanted upward or downward. Then L Value and H Value will be changed. Recalculating until suitable.

Supplying hot air status:

(1)V_L can be destined such as V_l=0.3m/s

(2)L can found in table 4

(3)H_0 can found in table 5

(4)a_w Value: $a_w=\arcsin(H-HO)/L(a_w+a_k)\leqslant 60°$

Calculation sample:

Noted: Two ball spouts , A=10m, H=5m,Qcold=540m^3/h, Qhot=540m^3/h, $\triangle_{tz}$=-8K, $\triangle_{tw}$=+4K

Supplying cold air , also supplying hot air when season exchanged in a high lobby . It is convenient to apply with electric ball spout there. Air velocity is considered at10 m/s at the warm up period of supplying hot air.

According to table 1, considering with noise factor ,the primary choice is dia. 200 spout.

Supplying cold air:

(1)α_k=30°

(2)$L=A/\cos\alpha_k=10/0.86=11.5$m

(3)$H_2=tg\alpha_k=10\times0.58=25.8$m

(4)V_L=1.2 m/s can be found in table 4.

(5)H_0=0.7m can be found in table 5

(6)$H_1=H+H_Z-H_O$=6+5.8+-0.7=10.1m

(7)V_{H1}<0.1m/s can be found in table 6

Supplying hot air:

(1) Preset V_L=1.0m/s

(2) L=13m can be found in table 4

(3) H_O=0.5m can be found in table 5

(4) slanting downwards angle of spout $\alpha_w=\arcsin(H+H_0)/L=\arcsin(5+0.51)/13=25°$,when Q=540m^3/h ,according to table 2 and table 7 , L_{WA}= 44+3 = 47dB(A), according to table 8, pressure loss $\triangle P_t$=160P_a

PERFORMANCE DATA

Data of Air Volume (Q) & Distance of Supplying air (L)

TABLE 4

specification /size	Air volume (Q)	Outlet Air Velocity							
		0.2	0.3	0.4	0.5	0.7	1.0	1.5	2.0
100	72	22	12	9	7.5	5.5			
	180	28	20	14	11.5	9	6		
	180		30	24	19	14	9.5	6.5	5
	252				27.5	20	**12.5**	9	7
	360					27.5	19	12.5	9.5
	540						28	19	14
	720							26	19
125	72	14	10	7	6				
	108	22	14	11	9	6			
	180		25	18	14.5	10.5	7	5	
	252			15	20	14.5	11	7	5.3
	360				30	21.5	15	10	7
	540					30	22	15	11
	720						30	20	15
	1080							29	22
160	108	16	11	8	6.5				
	180	27	18	14	11	8	5.5		
	252		25	19	15	11	8	5	
	360			27	22	16	11	7	5.5
	540					23	16	11	8
	720					30	22	15	11
	1080							23	16
	1440							29	22

TABLE 4

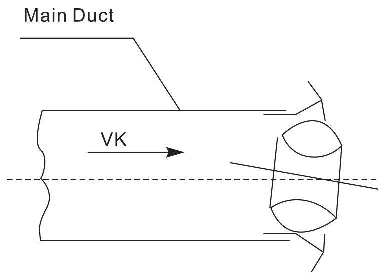
200	108	13	9	7	5				
	180	22	14	11	9	6			
	252	30	21	15	12	9	6		
	360		30	22	16	12	9	5.5	
	540				26	18.5	13	8.5	6.5
	720					25	18	12	7
	1080						26	17.5	10
	1440							23	17
	1800							28	22
250	108	10	7.5	5.5					
	180	16	11	8	6.5				
	252	23	155	11.5	9	6.5			
	360		22	16	13	9	6.5		
	540			25	20	15	10	7	5.5
	720				27	20	14	9	7
	1080					28	20	13	10
	1440						26	18	13
	1800							22	16
315	180	12.5	9	6.5	5.2				
	252	18	12	9	7	5			
	360	25	17	12.5	10	7.5	5		
	540		25	19	15	11	8	5.5	
	720			25	20	15	10	7	5
	1080				30	22	15	10	7.5
	1440					28	20	15	10
	1800						25	20	12.5
	2520							25	18
400	180	10	6.5	5					
	252	14.5	9	6.5	5.5				
	360	19	13	9.5	8	5.5			
	540	28	19	14	11.5	8	6		
	720		26	20	15	11	8	5.5	
	1080			28	23	16	11.5	7.5	6
	1440				30	22	15	10	7.5
	1800					27.5	19	13	10
	2520						27	18	14
	3600							26	20

PERFORMANCE DATA

Interference value of air volume at the spouts (in m)

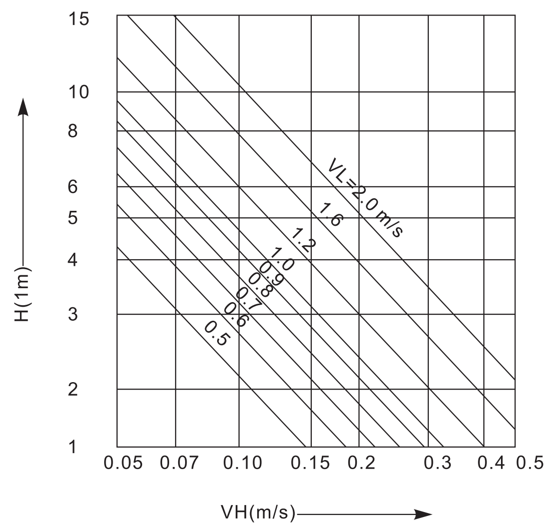
TABLE 5

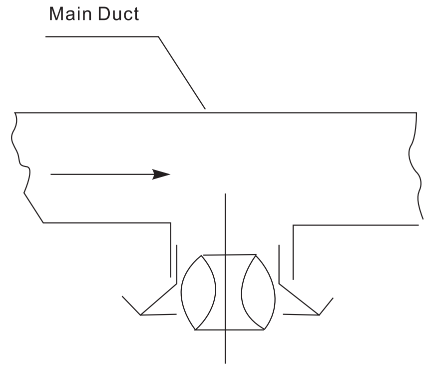
	m^3/h	L=4				L=5				L=7				L=10				L=15				L=20				L=30			
		2K	4K	8K	12K	2K	4K	8K	12K	2K	4K	8K	12K	2K	4K	8K	12K	2K	4K	8K	12K	2K	4K	8K	12K	2K	4K	8K	12K
100	72							0.28	0.4	<0.2	0.4	0.8	1.2	0.55	1.3	2.4	3.5	1.8	4	7.5	12	4.5	9	18		16			
	108											0.35	0.5	0.28	0.6	1.2	1.8	0.9	148		6.5	2	4.5	9	15	7	16		
	180														0.25	0.45	0.68	0.4	0.8	1.7	2.6	0.9	2	4	6.5	2.6	6	10	17
	360																			0.4	0.65	0.23	0.5	1.0	1.5	0.8	1.7	3	4
125	72			0.3	0.45	<0.2	0.3	0.55	0.9	0.4	0.8	1.6	2.4	1.2	2.4	4	7	4.5	8	16		8	17						
	108							0.25	0.35	<0.2	0.35	0.7	1	0.45	0.9	1.8	2.7	1.8	4	7.5	12	4	9			13			
	180											0.3	0.45	0.22	0.4	0.85	1.4	0.7	136		4	1.8	4	7.5	12	6	14		
	360																		0.35	0.65	1	0.4	0.85	1.7	2.6	1.4	2.7	5	8
	540																			0.35	0.5	0.2	0.4	0.7	1.0	0.6	1.2	2.3	3.5
160	108			0.3	0.4	<0.2	0.3	0.6	0.85	0.4	0.8	1.6	2.3	1	2.2	4	6.5	4	7.5	15	20	8	19						
	180							0.25	0.35	<0.2	0.3	0.6	0.9	4.5	0.9	1.7	2.5		0.28	0.5	0.8	3	7	15	20	10	20		
	360														0.25	0.5	0.8	0.45	0.85	1.8	2.7	1	2.1	4.5	6.5	3.5	7	15	
	540																		0.35	0.7	1	0.45	0.9	1.8	2.6	1.5	2.7	6	8
	720																		0.2	0.4	0.6	0.25	0.5	0.9	1.5	0.8	1.6	3.1	4.5
200	180			0.25	0.35	<0.2	0.25	0.5	0.7	0.3	0.7	1.5	2	0.9	2	4	6	3	6	13	19	7	16						
	360											0.35	0.5	0.25	0.5	1	1.5	0.85	1.9	3.5	5	1.9	4	8	12	6	13		
	540														0.3	0.5	0.85	0.4	0.9	1.8	2.7	1	2.1	4	6	3.5	7	15	20
	720															0.25	0.4	0.25	0.45	0.9	1.5	0.5	1	2	3	1.5	3	6	9
	1080																		0.25	0.45	0.7	0.25	0.5	1	1.5	0.8	1.7	3.1	5
250	360							0.3	0.4	0.2	0.4	0.85	1.3	0.5	1.2	2.4	3.5	2	4	8.5	14	4.5	9	18		15			
	540											0.35	0.5	0.25	0.5	1	1.5	0.85	1.8	3.6	5.2	2	4	8.5	14	6.5	15		
	720														0.25	0.5	0.7	0.4	0.8	1.7	2.4	0.9	1.9	3.6	5.2	2.7	6	12	18
	1080																		0.4	0.7	1	0.4	0.9	1.8	2.7	1.4	2.6	5	8
	1800																			0.3	0.5	0.2	0.4	0.7	1.2	0.6	1.3	2.4	4
315	360			0.25	0.25	<0.2	0.25	0.5	0.75	0.3	0.7	1.4	2	0.9	2	4	6	3	6.5	13	18	7	16						
	540							0.25	0.35	<0.2	0.3	0.55	0.85	0.45	0.9	1.8	2.7	1.6	3.2	6.5	9.5	3.5	7	15	20				
	720											0.4	0.5	0.25	0.5	1	1.7	0.85	1.9	3.8	5	2	4	8	13	6.5	14		
	1080														0.2	0.35	0.6	0.4	0.8	1.6	2.4	0.9	1.9	3.8	5.6	2.8	6	12	19
	1800																		0.3	0.6	0.9	0.35	0.7	1.4	2	1	2.3	4.6	6
	2520																			0.3	0.5	0.2	0.4	0.7	1.2	0.6	1.3	2.6	4
400	540			0.25	0.35	<0.2	0.35	0.5	0.8	0.3	0.7	1.4	2	0.9	1.8	3.8	6	3	6	13	19	7	16						
	720							0.3	0.7	0.2	0.4	0.7	1.2	0.55	1.2	2.3	2.7	1.8	4	8	12	4.5	9	18					
	1080											0.3	0.5	0.25	0.5	1	1.7	0.9	1.8	3.6	5.5	2	4	8	13	6	14		
	1800														0.2	0.35	0.6	0.35	0.7	1.5	2.2	0.7	1.7	3	4.5	2.6	5.2	10	16
	2520																		0.35	0.7	1	0.45	0.9	1.8	2.7	1.3	2.6	5.2	8
	3600																			0.3	0.5	0.2	0.4	0.7	1.0	0.6	1.4	2.6	4



Axis-installation

TABLE 6





Side-installation

Noise Rank & Pressure Loss of Axis-installation Spouts

TABLE 7

Specification	Air volume Q(m^3/h)																							
	80		100		150		200		300		400		500		700		1000		1500		2000		3000	
	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}	△pt	L_{WA}
100	70	25	95	30	220	42	400	52																
125	25	<20	45	<20	95	30	180	40	400	52	700	>55												
160	10	<20	17	<20	40	30	70	28	160	41	280	49	400	55										
200					13	<20	24	<20	60	27	90	35	145	42	290	53	600	>55						
250									20	<20	35	23	55	30	100	40	200	50	450	>55				
315											14	<20	20	<20	40	27	90	40	180	50	300	>55	700	<55
400															12	<20	26	24	55	35	100	45	200	55

When spout should be slanted, such as α =30°, pressure loss must multiply 1.2 ratio. Amends Noise Class based on table 2.

Noise Class (L_{WA}) & Pressure Loss In Main Nozzle($\triangle P_t$) of Side-installation Spouts

TABLE 8

SPECIFI CAITON	AIR VELOCITY m/s	AIR VOLUME Q (m_3/h) 72		108		180		252		360		540		720		1080		1800		2520		3600	
		$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}	$\triangle P_t$	L_{WA}
100	2	50	37	85	48	180	58																
	3	56	38	11	50	21	58																
	5	70	39	125	51	260	60																
	7	85	39	150	52	320	>60																
	10	100	40	185	53	360	>60																
125	2	24	24	40	35	80	45	140	56														
	3	28	24	52	36	100	46	170	57														
	5	35	25	162	37	130	49	210	57														
	7	40	25	175	38	148	50	250	58														
	10	38	26	185	38	170	51	290	58														
160	2					138	32	65	42	130	53	200	>60										
	3					45	33	80	43	140	153	240	>60										
	5					58	34	100	43	170	154	300	>60										
	7					65	35	120	44	190	154	350	>60										
	10					78	36	170	44	240	54	390	>60										
200	2							30	27	50	37	90	50	140	56								
	3							380	28	60	38	120	51	175	56								
	5							45	28	75	40	140	51	210	57								
	7							55	29	85	40	160	52	250	57								
	10							60	30	100	41	190	52	290	58								
250	2											25	23	42	36	70	43	130	53				
	3											29	24	55	37	85	44	150	54				
	5											36	25	65	38	110	44	180	55				
	7											40	26	80	38	130	45	210	55				
	10											50	27	90	39	150	45	250	56				
315	2													36	30	58	40	145	56				
	3													42	31	70	41	170	57				
	5													55	32	80	42	225	57				
	7													60	33	100	42	250	58				
	10													70	34	120	43	290	58				
400	2															26	26	65	42	120	52	180	60
	3															36	26	80	43	140	53	240	>60
	5															40	27	95	43	170	53	280	>60
	7															47	27	120	44	200	54	320	>60
	10															55	28	135	44	230	54	380	>60

When spout should be slanted, such as α =30°, pressure loss must multiply 1.2 ratio. Amends Noise Class based on table 2.

Maximum Depth (LMax) of Supplying Hot Air Downwards Vertically (in m)

Supplies hot air downwards vertically from the ceiling when the slanting angle of spout is 0°.

TABLE 9

specifi-cation	Difference in temperature of supplying air	Air volume Q(m^3/h)												
100	+5	6.5	9.0	13.0	17.5	24.0								
	+10	4.8	6.8	8.8	13.5	17.0	24.0							
	+15	4.0	5.7	7.2	12.0	15.0	20.0							
	+20	3.6	5.0	6.6	9.8	13.5	17.5							
125	+5	5.0	7.2	8.8	11.0	13.8	18.0	26.0						
	+10	3.8	5.4	6.7	7.9	11.5	14.2	19.0	24.0					
	+15	3.2	4.5	5.7	6.6	8.8	12.0	16.5	20.0					
	+20	2.7	4.0	5.0	5.9	7.8	10.5	14.2	17.5					
160	+5		5.5	6.8	8.0	11.0	14.0	19.5	25.0	29.5				
	+10		4.0	5.0	6.0	7.9	12.0	14.2	13.5	22.5				
	+15		3.4	4.3	5.1	6.6	8.8	13.0	15.5	14.0				
	+20		3.0	3.8	4.5	5.9	7.8	11.5	14.0	12.0				
200	+5		4.2	5.4	6.8	8.4	12.0	15.0	18.0	24.0	27.5			
	+10		3.2	4.0	4.8	6.3	8.6	12.0	14.0	17.4	20.0			
	+15			3.4	4.0	5.3	7.0	9.5	12.5	14.5	17.0			
	+20			2.9	3.5	4.7	6.2	8.4	11.0	13.5	15.0			
250	+5				5.0	6.7	8.7	12.5	15.0	18.0	20.5	27.0		
	+10				3.7	4.9	6.5	9.0	12.0	13.5	15.5	19.5	23.5	
	+15				3.1	4.2		7.5	9.4	12.0	13.5	17.0	19.5	
	+20				2.7	3.8	4.9	6.7	8.4	10.0	12.0	14.5	17.0	
315	+5					5.0	6.8	9.3	12.5	14.0	16.0	20.0	25.0	
	+10					3.8	5.0	7.0	8.8	11.5	12.5	15.0	18.5	
	+15					3.2	4.3	5.9	7.3	8.8	10.0	13.0	15.5	
	+20						3.8	5.2	6.6	7.8	8.8	12.0	13.5	
400	+5								5.2	7.2	9.1	11.5	18.0	26.0
	+10								3.9	5.4	6.8	8.1	14.5	18.0
	+15								3.3	4.6	5.8	7.0	12.5	16.5
	+20								2.8	4.0	5.0	6.0	11.5	14.0