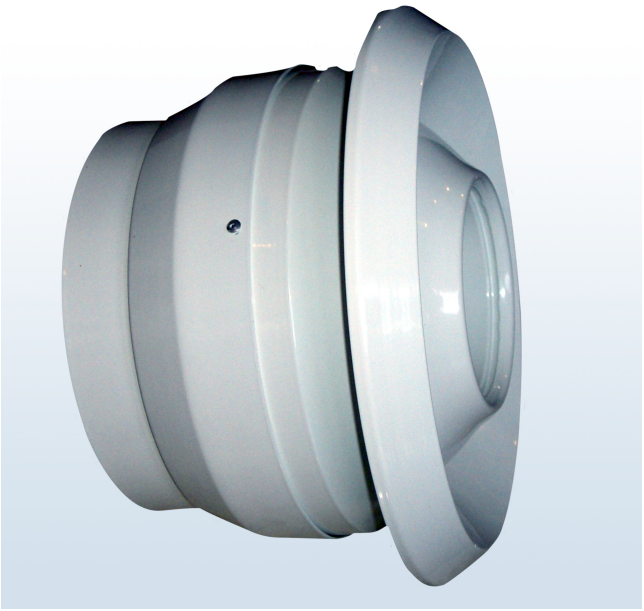
Jet Nozzles
Type BJN



Airflow AC Middle East FZE-LLC

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Jet nozzles are used for preference where the supply air from the diffuser has to travel a large distance to the occupied zone.

This is the case in large rooms (halls, assembly rooms etc.), particularly when the distribution of air via ceiling diffusers is not possible or not practical. Here jet diffusers are arranged in the side wall areas. When the temperature difference between the supply air and the room air changes, the supply air stream is deflected upwards (warm air) or downwards (cold air).
The direction of the supply air flow is also affected by other influences such as local convection effects or draughts within the room.

The direction of the air stream from the type BJN jet nozzle can be easily adjusted manually to suit particular on site conditions.

Also the adjustable movement can be motorised within the range of ± 30°. The electric actuators for this can be externally or internally mounted.

The table below gives a guide for selecting the size of jet nozzles.
The values shown are determined for an isothermal, single free horizontal air stream. According to our extensive experience, air velocities of 0.25 m/s for example, with a throw of 30 m, are only possible in theory as many room parameters must be taken into account with such throw distances.
If the supply air temperature difference changes, the air stream deflection in Diagram must be taken into account.

The noise levels are applicable to type BJN

In the table below no data is given for effective discharge velocities below 2 m/s nor are values given above a sound power level rating of 55 dB(A). If the values required lie outside the limits of this table please refer to our technical department for assistance.

Type BJN

Size	Throw 10 m $\dot{V}$ l/s	10 m L_{WA} dB(A) …-F	10 m L_{WA} dB(A) …-V*	10 m L_{WNC} NC …-F	10 m L_{WNC} NC …-V*	20 m $\dot{V}$ l/s	20 m L_{WA} dB(A) …-F	20 m L_{WA} dB(A) …-V*	20 m L_{WNC} NC …-F	20 m L_{WNC} NC …-V*	30 m $\dot{V}$ l/s	30 m L_{WA} dB(A) …-F	30 m L_{WA} dB(A) …-V*	30 m L_{WNC} NC …-F	30 m L_{WNC} NC …-V*	Air Velocity $\bar{v}_L$ m/s
100	–	–	–	–	–	26	31	29	30	23	39	42	41	41	35	
125	–	–	–	–	–	34	27	25	26	22	50	37	36	37	30	
160	23	<20	<20	<20	<20	46	<20	<20	<20	<20	69	32	35	33	28	
200	29	<20	<20	<20	<20	61	<20	<20	<20	<20	85	26	27	25	20	0.25
250	37	<20	<20	<20	<20	76	<20	<20	<20	<20	106	2 3	22	23	< 20	
315	50	<20	<20	<20	<20	98	<20	<20	<20	<20	150	2 1	20	22	< 20	
400	65	<20	<20	<20	<20	129	<20	<20	<20	<20	195	< 20	< 20	21	< 20	
100	26	31	29	30	23	52	50	50	49	45	–	–	–	–	–	
125	34	27	25	26	22	68	46	46	45	40	–	–	–	–	–	
160	46	<20	<20	<20	<20	92	39	44	40	37	138	50	55	51	49	
200	61	<20	<20	<20	<20	121	36	38	35	31	182	47	50	47	44	0.5
250	76	<20	<20	<20	<20	152	32	34	32	26	229	43	45	43	39	
315	98	<20	<20	<20	<20	195	27	28	28	20	293	39	40	40	32	
400	129	<20	<20	<20	<20	258	27	20	28	< 20	387	37	33	39	26	
100	52	50	50	49	45	–	–	–	–	–	–	–	–	–	–	
125	68	46	46	45	40	–	–	–	–	–	–	–	–	–	–	
160	92	39	44	40	37	–	–	–	–	–	–	–	–	–	–	
200	121	36	38	35	31	242	49	–	49	–	–	–	–	–	–	1.0
250	152	32	34	32	26	305	51	53	51	47	–	–	–	–	–	
315	195	27	28	28	20	390	47	48	48	41	585	53	–	54	–	
400	258	27	20	28	< 20	516	45	42	43	35	773	51	53	53	47	

Jet Nozzles
Type BJN

AIRFLOW AC

Dimensions

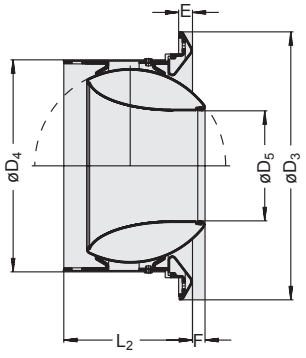
Jet nozzles type BJN are suitable for all type of large space cooling requirements.

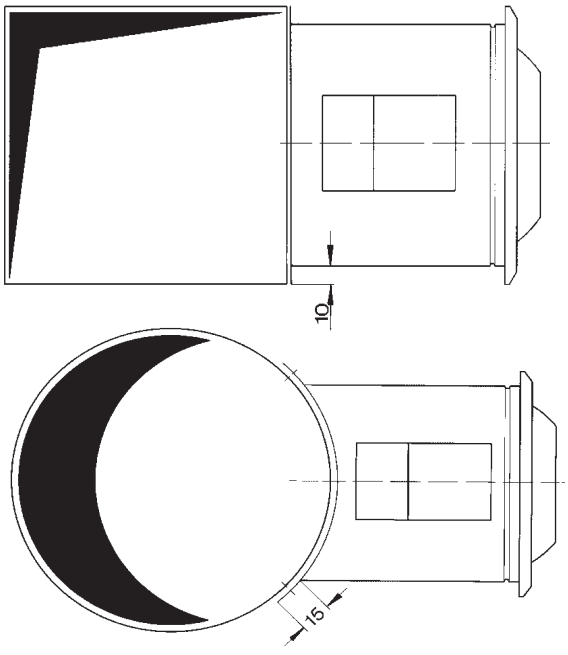
Adjustable construction type BJN consists of a spherical discharge nozzle mounted in a round casing and is complete with a flange and circular spigot for direct connection to a circular duct. The nozzle can be adjusted manually up to max. 30° in any direction.

A rear duct connection element with a peripheral flange and optional spigot with flange are available as options for fixing to the side of rectangular or circular ducts.

Size	D_1	D_2	D_3	D_4	D_5	E	F	K	L_1	L_2	L_3*
100	136	115	146	98	50	11	– 3	134	94	87	84
125	159	138	169	123	64	11	3	157	112	96	94
160	225	201	200	158	82	11	9	188	122	105	114
200	265	241	257	198	108	16	9	242	153	126	143
250	315	291	302	248	136	16	21	287	187	162	172
315	400	376	384	313	174	23	23	358	224	196	223
400	485	461	467	398	230	24	45	441	287	201	262

Size	Possible Circular Duct Diameters R					
	200	250	315	500	630	800
100	●					
125		●				
160			●	●	●	●
200				●	●	●
250				●	●	●
315				●	●	●
400					●	●





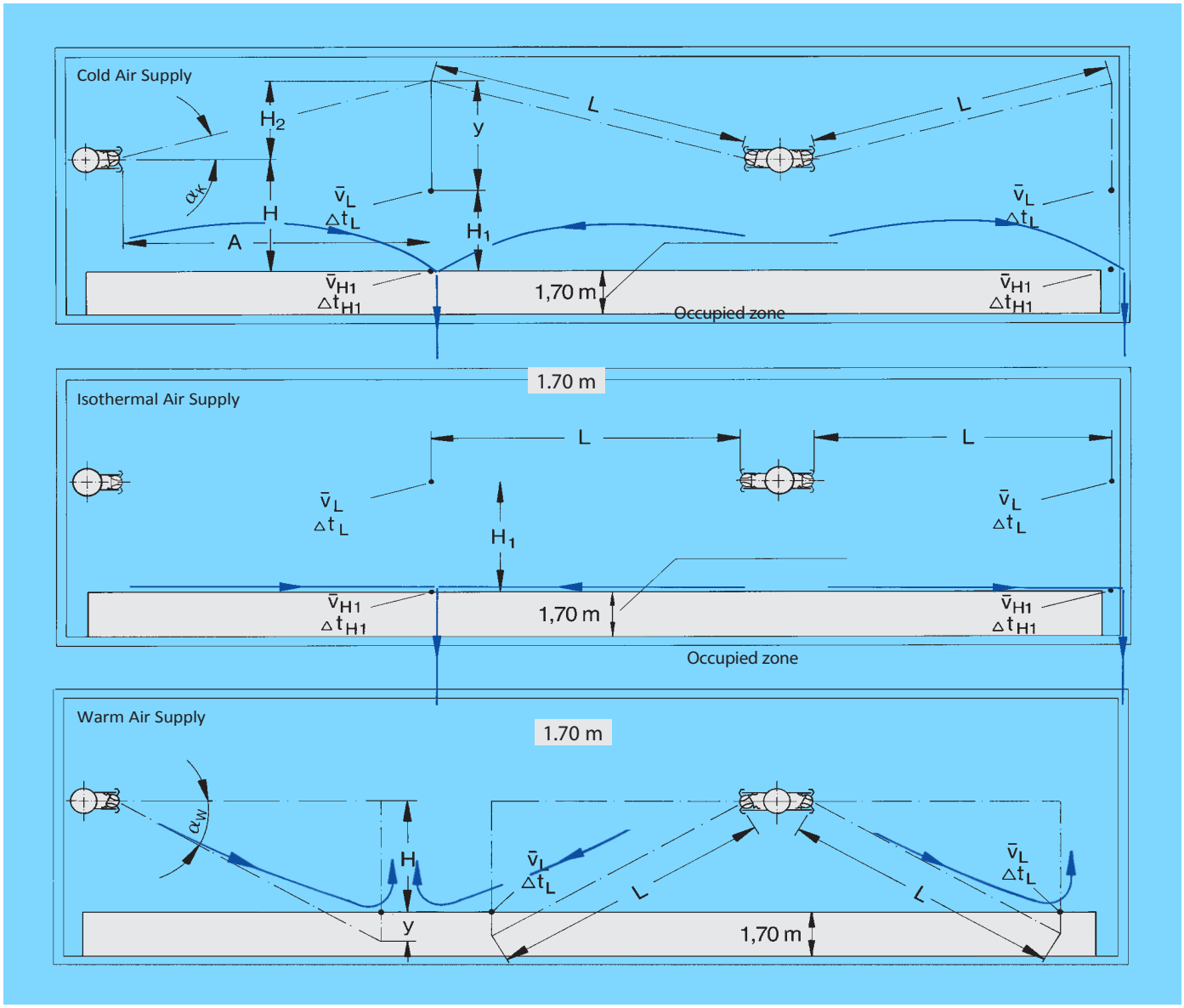
Materials

The discharge nozzle and Flange ring are in aluminium (natural finish).
The mounting for the eyeball is with rings colour white RAL 9010. Temperature resistant up to max50°C.
The duct connection element are galvanized sheet steel
The surface can be painted if required, powder coated in white (RAL 9010) or other RAL colours.

Installation

Jet nozzles are suitable for mounting on rectangular or circular ducts.
A circular undrilled flange for either screw or rivet fixing.
A Neoprene strip should preferably be fixed earlier.
A spigot is provided for direct connection to spiral or flexible circular ducts.
The spigot diameter standard duct sizes

A	in m:	Horizontal distance from nozzles to the airstream collision point
B	in m:	Spacing distance between two nozzles in a row
H	in m:	Nozzle installation height above occupied zone
H_1	in m:	Height of collision point of two air streams above occupied zone
H_2	in m:	Height of collision point of two air streams above mounting position of nozzles, for isothermal conditions
L	in m:	Length of air stream for isothermal conditions
$L_{max.}$	in m:	Max. penetration depth of warm air stream directed vertically downwards
α_K	in °:	Discharge angle for cold air
α_W	in °:	Discharge angle for warm air
i	:	Air induction ratio at distance L
$\dot{V}$	in l/s:	Volume flow rate
$\dot{V}$	in m^3/h:	Volume flow rate
y	in m:	Air stream deflection due to temperature difference from isothermal conditions
v_{eff}	in m/s:	Effective air discharge velocity at nozzle
v_K	in m/s:	Air velocity in duct
$\bar{v}_L$	in m/s:	Mean air stream velocity
$\bar{v}_{H1}$	in m/s:	Time average air velocity entering occupied zone
Δt_Z	in K:	Temperature difference between supply air and room air
Δt_L	in K:	Temperature difference between core and room air at distance L
Δt_{H1}	in K:	Temperature difference between core, when entering occupied zone, and room air
Δp_t	in Pa:	Total pressure drop
L_{WA}	in dB(A):	A-weighted sound power level
$L_{W\,NC}$	:	Noise criteria rating of sound power level spectrum
$L_{W\,NR}$	:	$L_{W\,NR} = L_{W\,NC} + 1.5$
L_{pA}, L_{pNC}	:	A-weighting or NC-rating respectively of room sound pressure level $L_{pA} \approx L_{WA} - 8$ dB $L_{pNC} \approx L_{W\,NC} - 8$ dB



Example

Data given:
2 nozzles are to be fitted at a spacing of 20 m (A = 10 m) and at a height of H = 5 m above the occupied zone, discharging towards each other.

The hall is very high, so free jet streams can be assumed.
For cooling, for each nozzle $\dot{V}_K$ = 150 l/s with $\Delta t_K = -8$ K and for heating, $\dot{V}_W$ = 150 l/s with $\Delta t_W = +4$ K.

Solution:
Selection procedure as follows :

From selection page, a jet nozzle type BJN size 200 is selected.

Result:
Jet nozzles BJN 200, must be installed horizontally with the movement set such that a swivel angle of 30° upwards occurs with cold air and 25° downwards for warm air.

Cold air
① $\alpha_K = 30°$
② $L = \frac{A}{\cos \alpha_K} = 11.5$ m
③ $H_2 = \tan \alpha_K \cdot A = 5.8$ m
④ from diagram 1: $f_L = 1.2$ m/s
⑤ from diagram 2: $y = 0.72$ m
⑥ $H_1 = H + H_2 - y = 5 + 5.8 - 0.72 = 10.1$ m
⑦ from diagram 3: $f_{H1} < 0.07$ m/s

Warm air
① Given: $f_L = 1.0$ m/s
② from diagram 1: L = 13 m
③ from diagram 2: y = 0.51 m
④ $\alpha_W = \sin^{-1}((H + y) / L) = 25$

from diagram 8 (with axial connection):
at $\dot{V}$ = 150 l/s
$L_{WA} = 44 + 3^* = 47$ dB(A)
$L_{WNC} = 37 + 3^* = 40$ NC
$\Delta p_t = 160$ Pa

from diagram 9 (with branch connection):
at 150 l/s and $f_K = 6$ m/s
$L_{WA} \approx 45$ to 50 dB(A) + 2 = *47–52 dB(A)
$L_{WNC} \approx 41$ to 46 NC
$\Delta p_t = 130$ Pa x 1.2* ≈ 16 Pa

Given:

A, H, $\Delta t_{Z\ Heating}$, $\Delta t_{Z\ Cooling}$, f_W, f_K

Preliminary selection from table on page 3:

Volume flow rate f
Size of jet nozzle BJN

Note:

If in a line of nozzles the spacing B between the nozzles is < 0.15 · A then and Δt_L must be multiplied by 1.4.

Cold Air

① α_K is selected: e.g. $\alpha_K = 30°$ — α_K = … °

② L is calculated: $L = \frac{A}{\cos \alpha_K}$ — L = … m

③ H_2 is calculated: $H_2 = \tan \alpha_K \cdot A$ — H_2 = … m

④ f_L from diagram 1 — f_L = … m/s

⑤ y from diagram 2 — y = … m

⑥ H_1 is calculated: $H_1 = H + H_2 - y$ — H_1 = … m

⑦ f_{H1} from diagram 3 — f_{H1} = … m/s

If f_{H1} differs from set value, procedure must be repeated with revised α_K!

⑧ Δt_{H1} from diagram 4: $\Delta t_{H1} = (\Delta t_{H1} / \Delta t_Z) \cdot \Delta t_Z$ — Δt_{H1} = … K

Isothermal Air

Horizontal discharge at $\alpha = 0°$

① f_L from diagram 1 (L = A) — f_L = … m/s

② $\bar{v}_{H1}$ from diagram 3 (H = H_1) — f_{H1} = … m/s

If $\bar{v}_{H1}$ deviates from the specified value, α must be corrected upwards or downwards. L and H_1 are changed as a result. Repeat the analysis.

Warm Air

① f_L is specified: e.g. $\bar{v}_L = 0.3$ m/s — f_L = … m/s

② L from diagram 1 — L = … m

③ y from diagram 2 — y = … m

④ α_W is calculated: $(\alpha_W = \sin^{-1}((H + y) / L)$ — α_W = … °

Note: $\alpha_W + \alpha_K$ = max. 60°

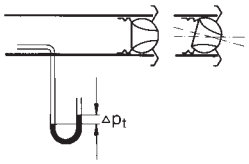
Motorised adjustment of the discharge angle on a change of supply air temperature is only possible up to max. $\alpha_W + \alpha_K = 60°$.

⑤ Δt_L from diagram 4: $\Delta t_L = (\Delta t_L / \Delta t_Z) \cdot \Delta t_Z$ — Δt_L = … K

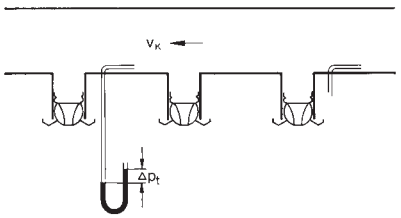
Example for installation for Nozzles

Jet nozzles attached to circular duct (axial installation)

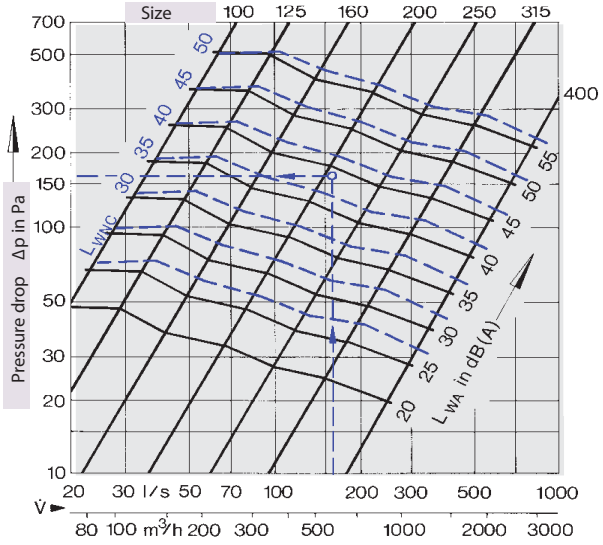
Type - BJN



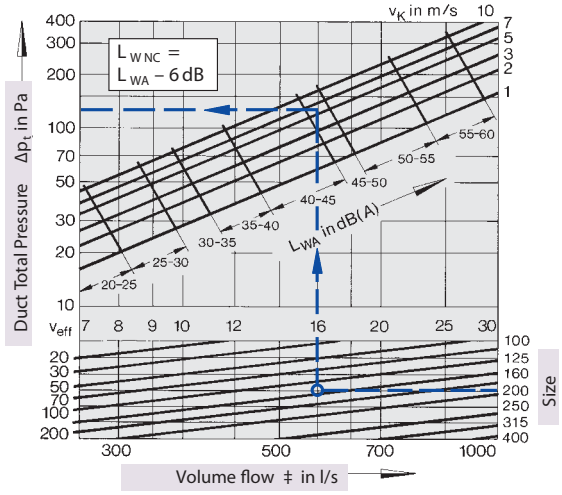
Jet nozzles attached to the side of a common duct (branch installation)



1 Sound Power and Pressure Drop for axial installation BJN



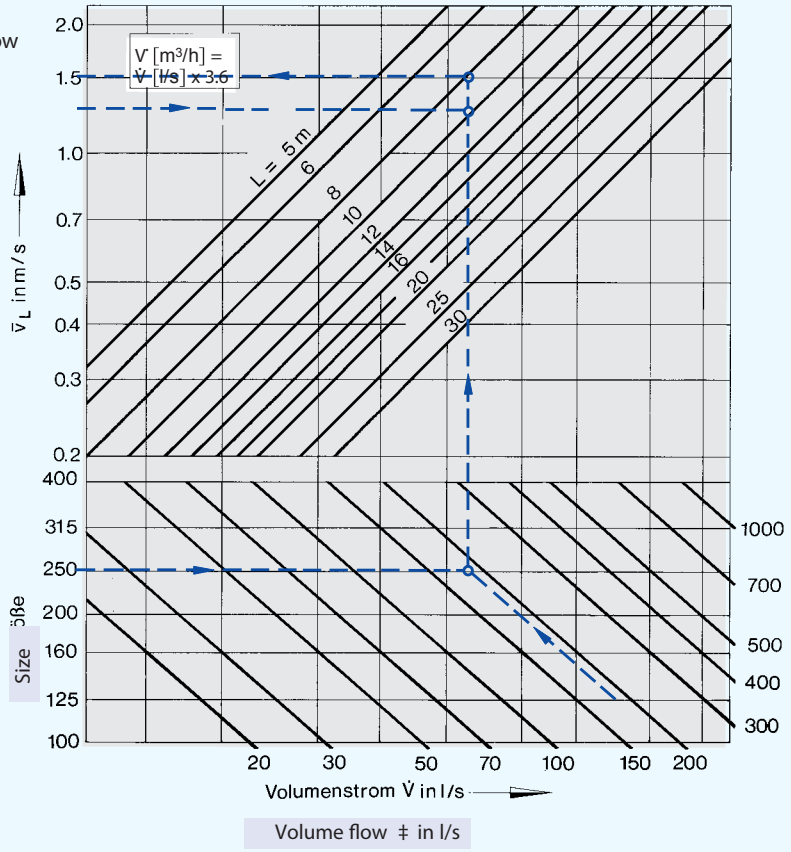
2 Sound Power and Pressure Drop for branch installation



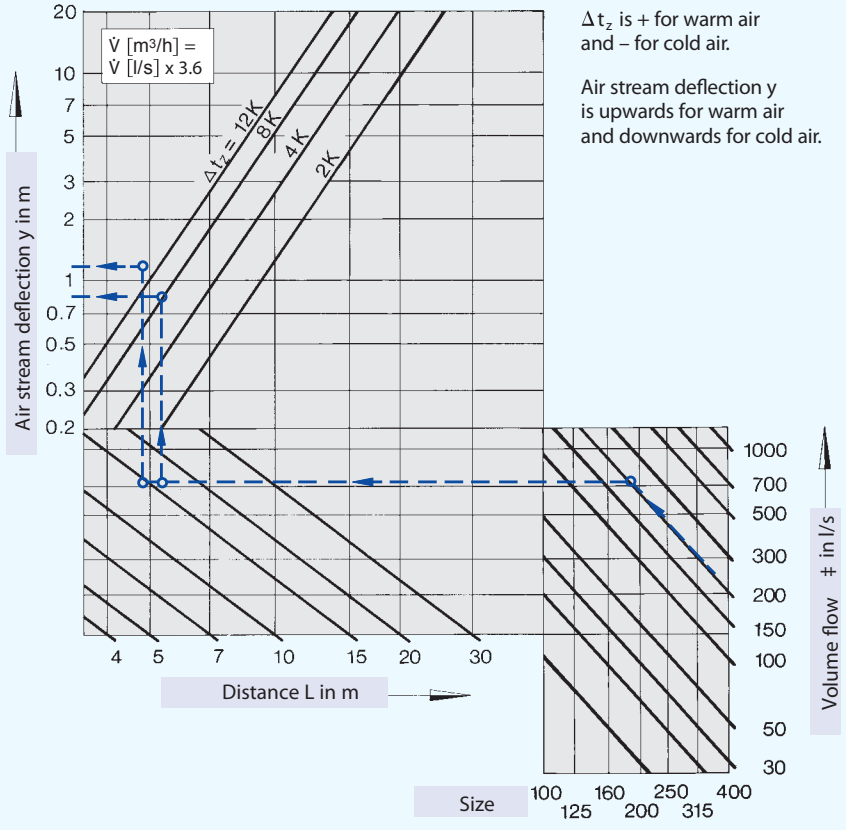
Correction to Diagram 2			
Size	Swivel angle		Δ p_t
	0°	30°	30°
	BJN	**BJN**	**BJN**
	L_{WA} / L_{WNC}	L_{WA} / L_{WNC}	
100	– 6	– 4	x 1.2
125	– 4	– 2	x 1.2
160	– 2	0	x 1.2
200	0	2	x 1.2
250	2	4	x 1.2
315	4	6	x 1.2
400	6	8	x 1.2

Correction to Diagram 2, for swivel angle α = ±30°							
Size	100	125	160	200	250	315	400
L_{WA} / L_{WNC}	+ 3	+ 5	+ 3	+ 3	+ 2	+ 2	+ 1

1 Core velocity and Throw



2 Air Stream Deflection



Δt_z is + for warm air and – for cold air.

Air stream deflection y is upwards for warm air and downwards for cold air.