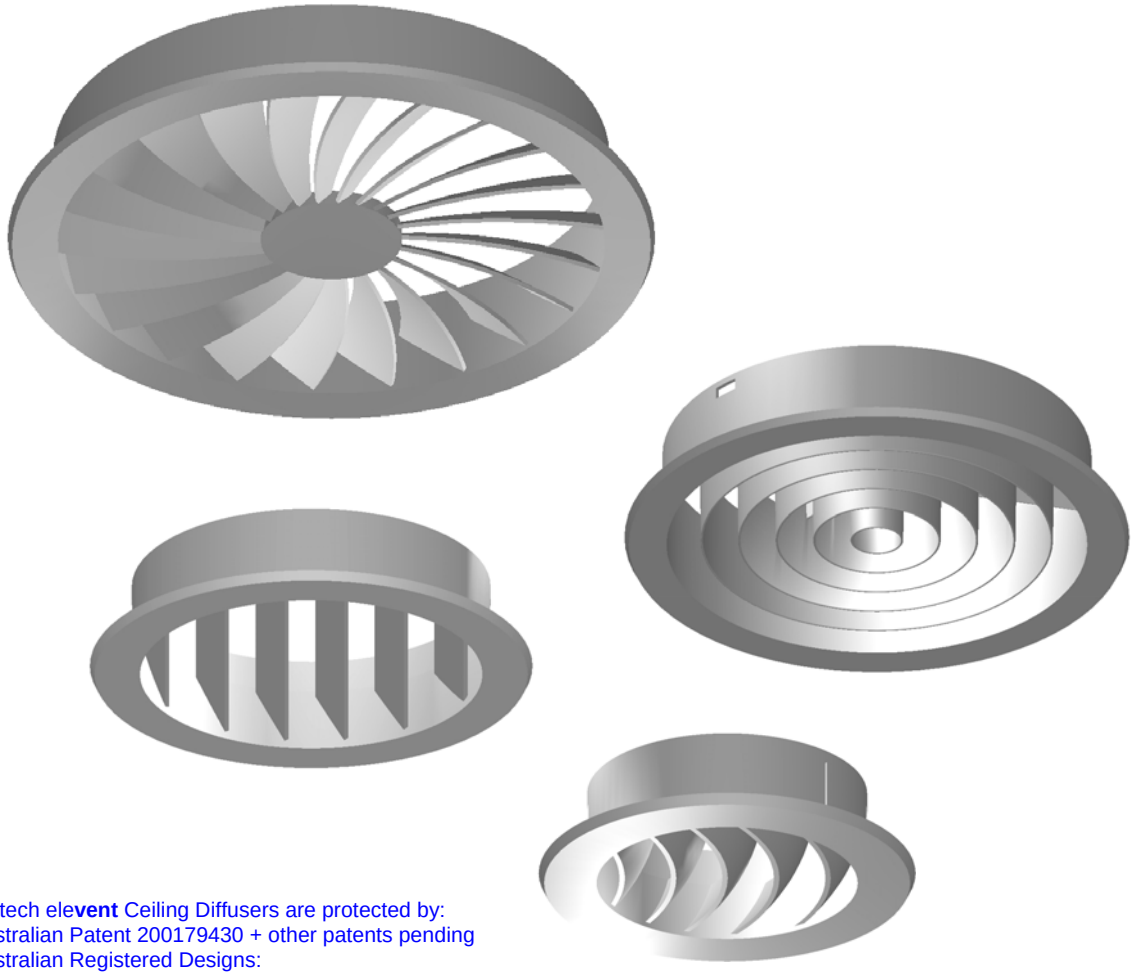
elevent
ceiling diffusers

Technical Selection

Swirl, Jet, Louvred and Curved ceiling diffusers



Paltech ele**vent** Ceiling Diffusers are protected by:
Australian Patent 200179430 + other patents pending
Australian Registered Designs:

200910888	200910896	200911156
200910889	200910897	200911157
200910890	200910898	200911158
200910891	200910899	200911159
200910892	200910900	200911160
200910893	200910901	200911161
200910894	200910902	200911241
200910895	200910903	200911242

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Copies of this manual available from
www.paltech.com.au/datasheets/elevent.pdf
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PALTECH

Overview

Contents

Overview

- Ceiling diffusers for
  - Refrigerated cooling, and reverse cycle heating and cooling
  - Gas ducted heating
  - Air-shifters, ventilation and exhaust
- Four diffusers styles, three colours, five sizes, some with adjustable direction
  - Swirl, Jet, Louvred, Curved
  - White, Satin Chrome plated, Satin Gold plated
  - Sizes from 100mm to 300mm
  - Louvred and Curved adjustable direction
- Two part design
  - Universal adaptor and separate diffuser
  - Adaptor available with optional butterfly dampers
  - Adaptor can be installed and fit-off completed before painting - diffuser can be easily inserted afterwards
  - Diffuser can be easily removed by householder for cleaning or when ceiling is being painted
- Low profile design
  - Harmonises with modern downlights and recessed light fittings in modern interiors
  - Smaller ceiling footprint for a given duct size and less bulky appearance than traditional diffusers
  - Opportunity to provide additional smaller outlets for improved air distribution
- Swirl Diffuser
  - Improved supply air mixing performance provides uniform temperature and improved air changes throughout living space for refrigerated and reverse cycle cooling and heating
- Jet Diffuser
  - High throw, fixed direction, for gas ducted heating, ventilation and exhaust, and for reverse cycle with high ceilings
- Louvred and Curved
  - High throw with adjustable direction for gas ducted heating, ventilation and exhaust, and for reverse cycle with high ceilings
- Designed and manufactured in Australia

Selector Chart

	Swirl	Jet	Louvred (adjustable)	Curved (adjustable)
Gas ducted heating	●	●	●	●
Gas ducted heating with add-on cooling	●	●	●	●
Reverse cycle heating and cooling	●	●	●	●
Reverse cycle heating - high or cathedral ceiling	●	●	●	●
Refrigerated cooling	●		●	●
Exhaust grille		●		
Warm air shifter inlet		●		
Warm air shifter outlet		●	●	●

Application selector chart - suggested Elevent type

● Preferred ● Possible

Swirl Technical Data

The high induction Swirl diffuser creates high entrainment of room air above the occupancy zone, thereby strongly diluting the supply air with room air. Unlike traditional cone-type ceiling diffusers that produce a steady stream of air that flows radially hugging the ceiling, the ele**vent** Swirl produces a number of rotational jets at a downward angle away from the ceiling.

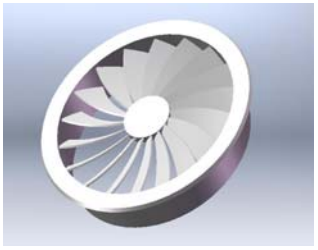
With traditional ceiling diffusers, the slow moving air can suddenly break away from the ceiling, leading to cold air dumping and localised stagnation of air. The effective mixing of the ele**vent** Swirl leads to lower air velocity in the occupancy zone with minimal draughts, uniform temperature through the living space, and high effective air changes.

The Swirl vane design has been configured to provide a lower static pressure than typical swirl designs used in commercial installations, in order to improve compatibility and design familiarity with traditional cone type diffusers and multi-directional outlets that are commonly used in the residential market. Swirl diffusers operate at a slightly higher static pressure to cone type diffusers because of the need to force the airflow through the vanes. The different pressure characteristics of the swirl diffusers means that an installation should avoid mixing diffuser types.

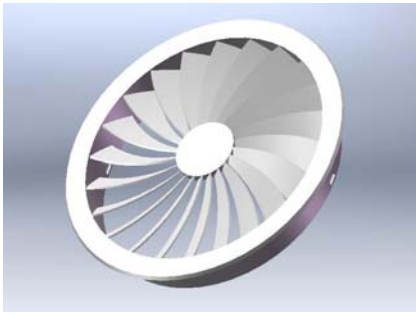
The stable discharge characteristics of the diffuser over a range of supply air temperatures and velocities means that the diffuser is suitable for refrigerated cooling and heating at ceiling heights of 2.4 to 4 metres. The Swirl diffuser has been optimized for refrigerated cooling and reverse cycle heating in which the supply air is +/- 20 degrees of room temperature and the supply air fan runs continuously.

The ele**vent** Swirl has been designed to maximise the most important aspect of the diffuser – the airflow – and reduce the space requirements of the installation and mounting mechanisms, which can contribute to an obtrusive appearance in other outlets. The result is a small, low profile design with an elegant appearance that harmonises with downlights, recessed light fittings and other ceiling fittings.

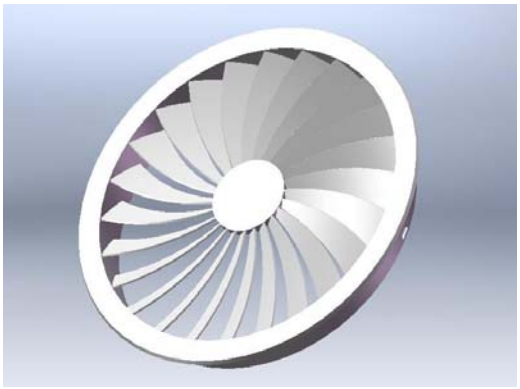
The ele**vent** Swirl is available in three sizes: 200, 250 and 300mm, and three colours: Ceiling White, Satin Chrome plated and Satin Gold plated. The adaptor has optional butterfly dampers for system balancing. The outlet face can be easily removed from the fixed adaptor by hand for cleaning, or to enable the ceiling to be painted, ensuring a neat painted finish around the outlet.



200 mm Swirl

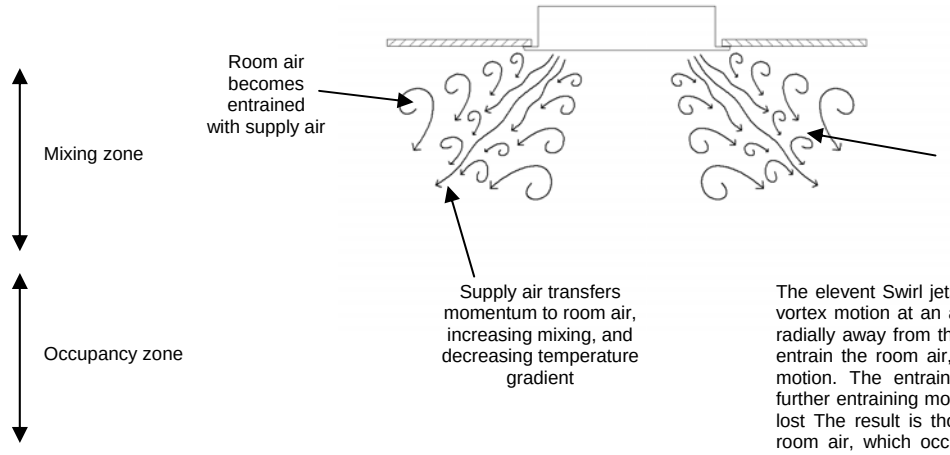


250 mm Swirl



300 mm Swirl

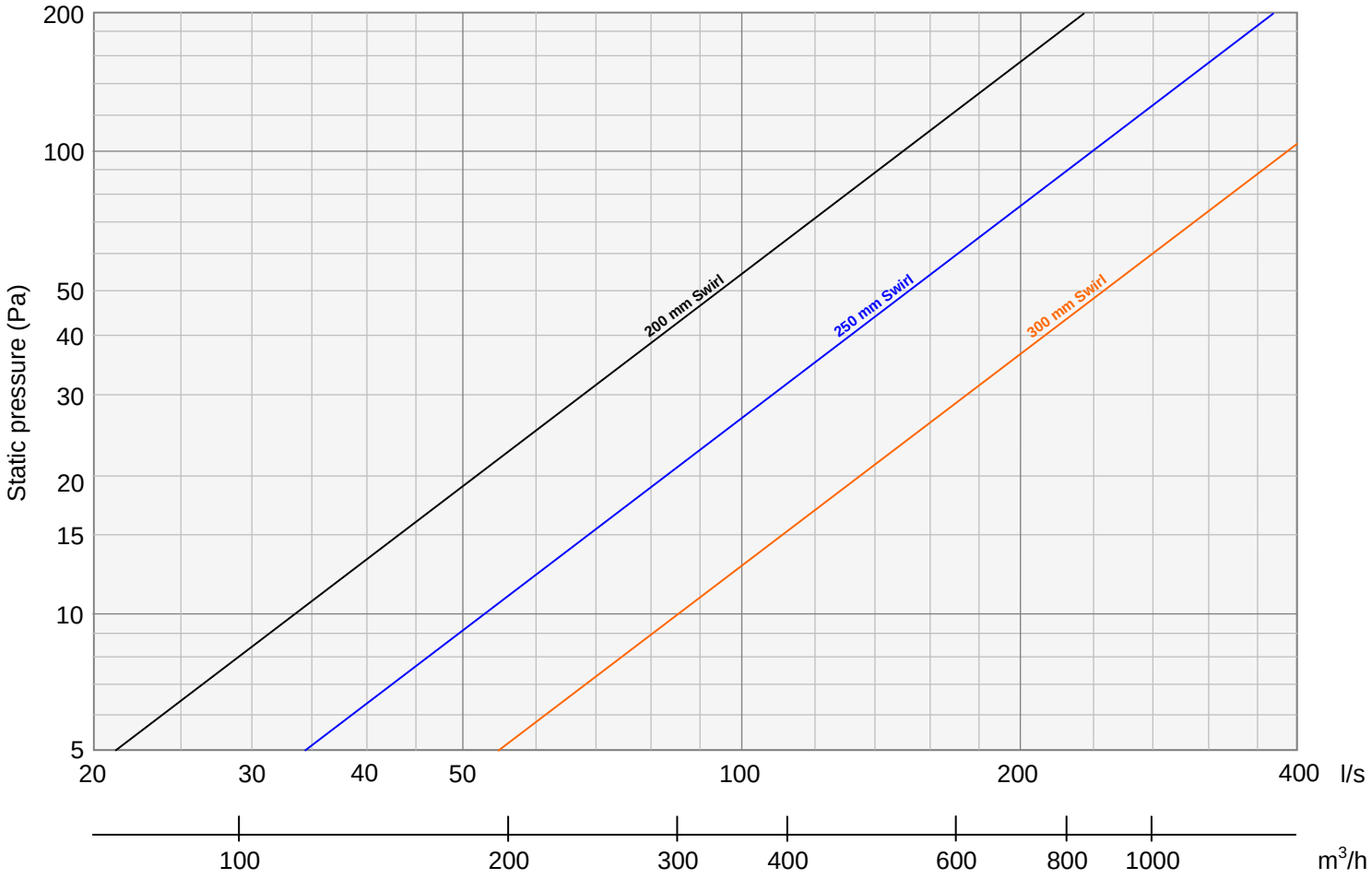
Swirl Technical Data



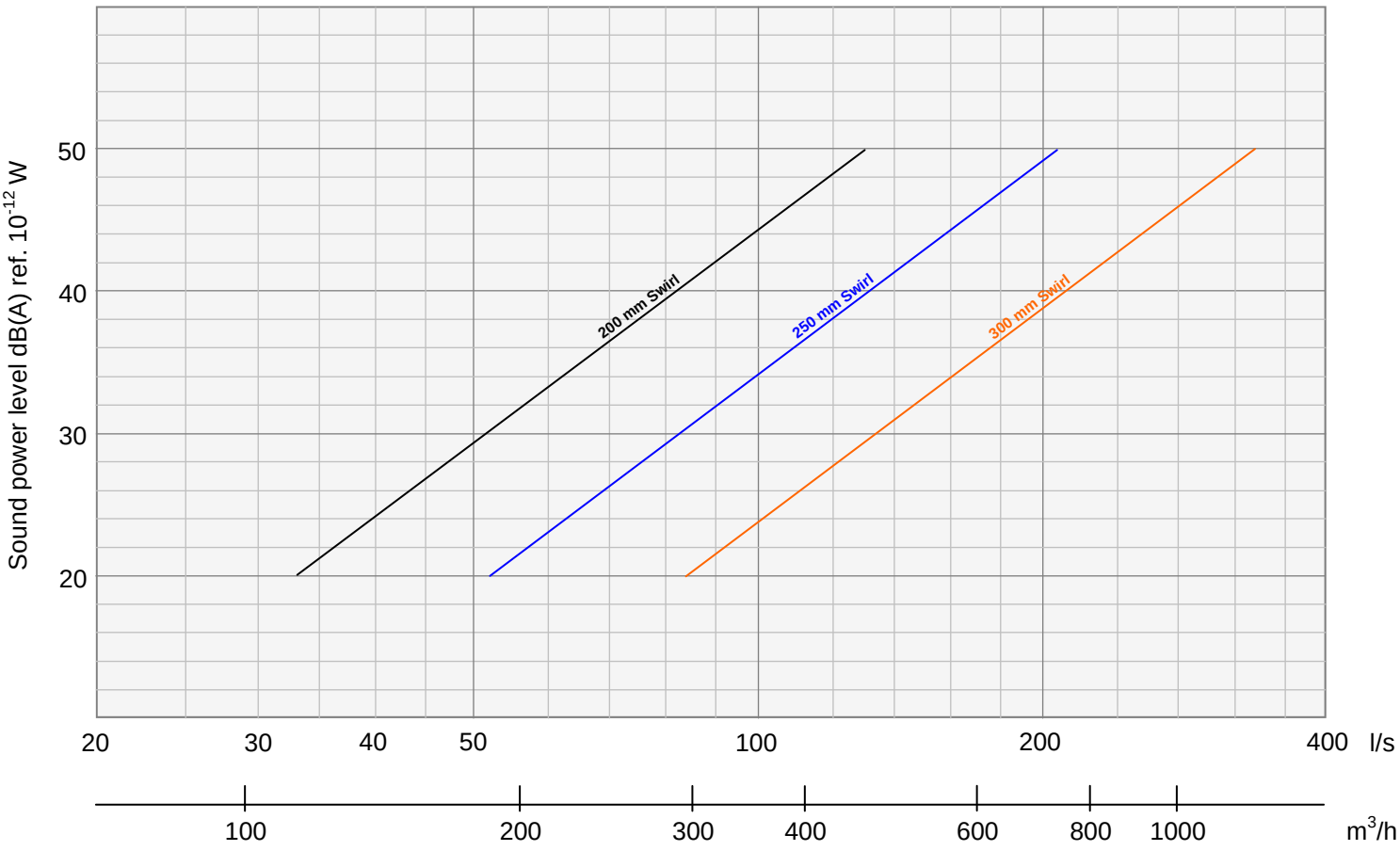
The elevent Swirl jets air from a multitude of jets in a vortex motion at an angle of 40^{o} from horizontal, and radially away from the centre of the diffuser. The jets entrain the room air, dragging it along in a turbulent motion. The entrained room air continues moving, further entraining more room air until all momentum is lost The result is thorough mixing of the supply and room air, which occurs primarily in the mixing zone above the occupancy zone. Further low intensity mixing is accomplished by the continual airflow created by the system fan drawing air back to the return air grille.

Swirl Flow and Pressure Data

	Volumetric flow rate $\dot{V}_{max}$ @ 100 Pa		Discharge height
	l/s	m^3/h	m
200	150	540	2.2 - 6.0
250	240	864	2.2 - 6.0
300	380	1368	2.2 - 6.0



Swirl Acoustic Data

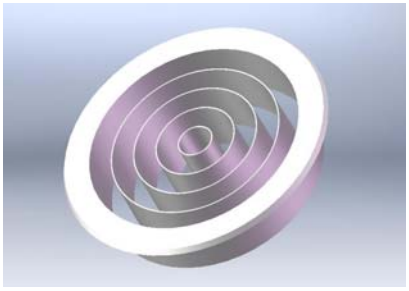


Jet Technical Data

The ele**vent** Jet diffuser jets air vertically downward with low static pressure, creating high entrainment of room air within the occupancy zone. The diffuser is suitable for gas ducted heating, reverse cycle heating for very high ceilings, air shifters and ventilation systems as a supply or return diffuser. The jet has a longer throw than DownJets, and like DownJets, consideration needs to be given to diffuser placement within the living space to avoid draughts.

100 mm Jet

In gas ducted heating applications, the supply air is typically 30 to 50 degrees above room temperature, with fan cycling. Ceiling diffusers need to penetrate the occupancy zone with supply air, and encourage convective currents to mix the warm supply air with the cooler room air throughout the living space.



150 mm Jet

For gas ducted heating applications, installers have the opportunity of using multiple smaller outlets, including a 100mm model, instead of a single outlet to provide improved distribution of warm air. The use of multiple small outlets provides the opportunity to strategically place the outlets in room positions that will maximise heating effectiveness, such as near the two corners of a bedroom opposite the door. A maximum length of 3 metres of duct from the branch is recommended when using 100mm diffusers to avoid high static pressure within the duct.

The ele**vent** Jet has been designed to maximise the most important aspect of the diffuser – the airflow – and reduce the space requirements of the installation and mounting mechanisms, which can contribute to an obtrusive appearance in other outlets. The result is a small, low profile design with an elegant appearance that harmonises with downlights, recessed light fittings and other ceiling fittings.

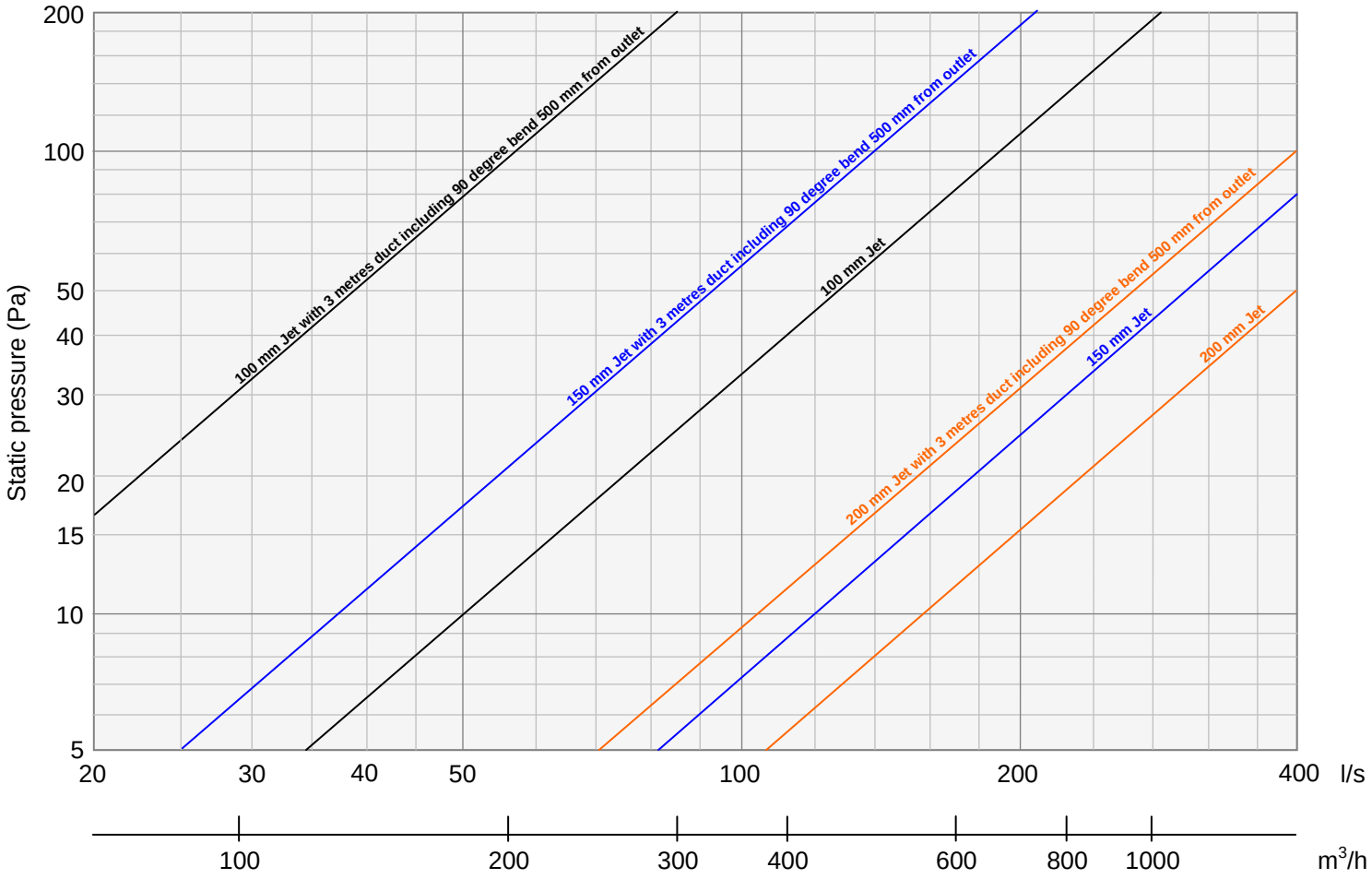
200 mm Jet

The ele**vent** Jet is available in three sizes: 100, 150 and 200mm, and three colours: Ceiling White, Satin Chrome plated and Satin Gold plated . The adaptor has optional butterfly dampers for system balancing on the 150 and 200mm sizes, and a blanking cap is available on the 100mm model to replace the diffuser when shut-off is required. The outlet face can be easily removed from the fixed adaptor by hand for cleaning, or to enable the ceiling to be painted, ensuring a neat painted finish around the outlet.

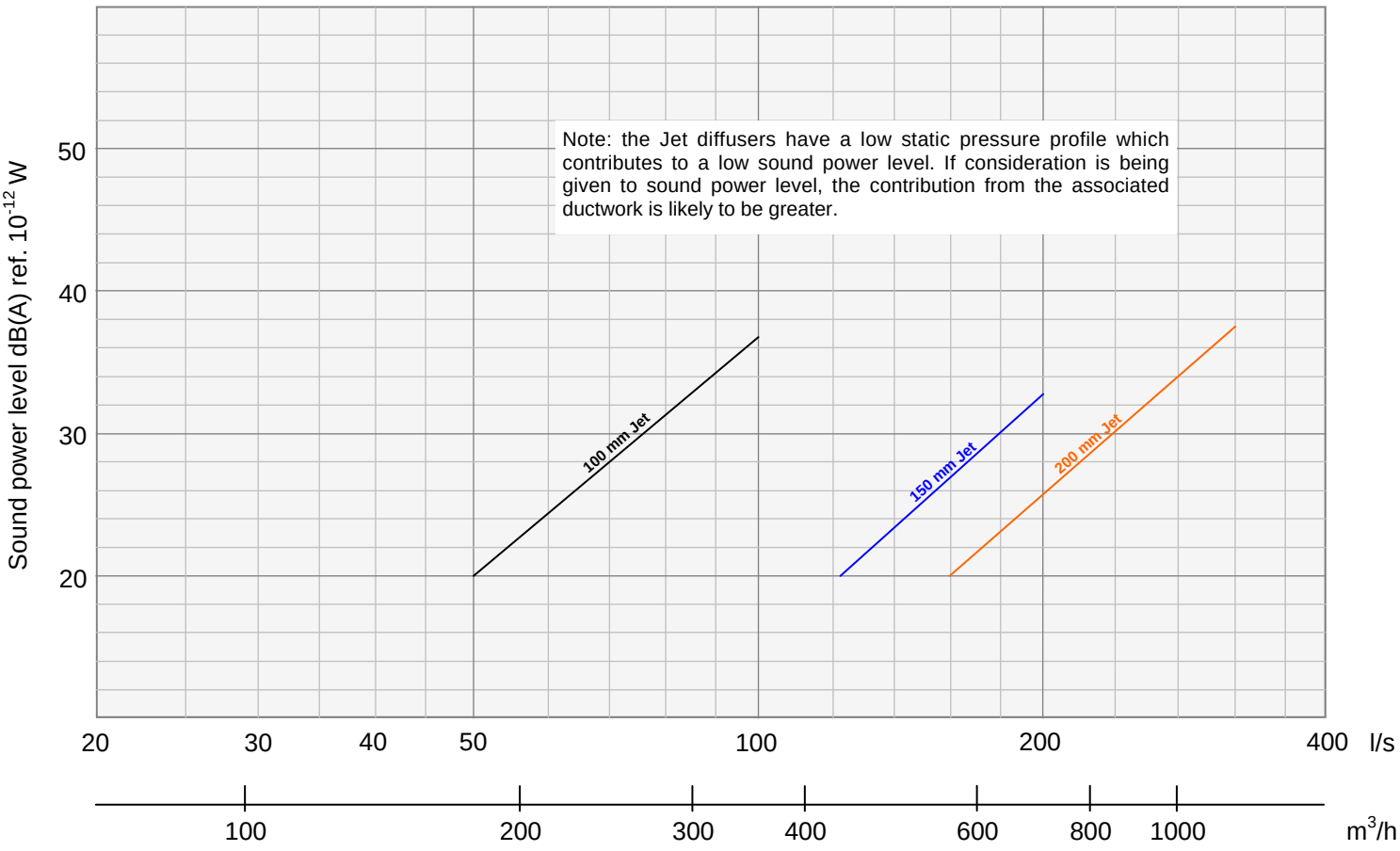
Ideally, equal lengths of ductwork should be used from the branch to each outlet when using the 100mm model if equal airflow is desired. The ele**vent** Jet has low static pressure and consideration needs to be given to system design if mixing the Jet with Louvred and/or Curved ele**vent** diffusers. Equalisation can be achieved by the use of shorter duct lengths and fewer bends on the branches with Louvred and/or Curved.

Jet Flow and Pressure Data

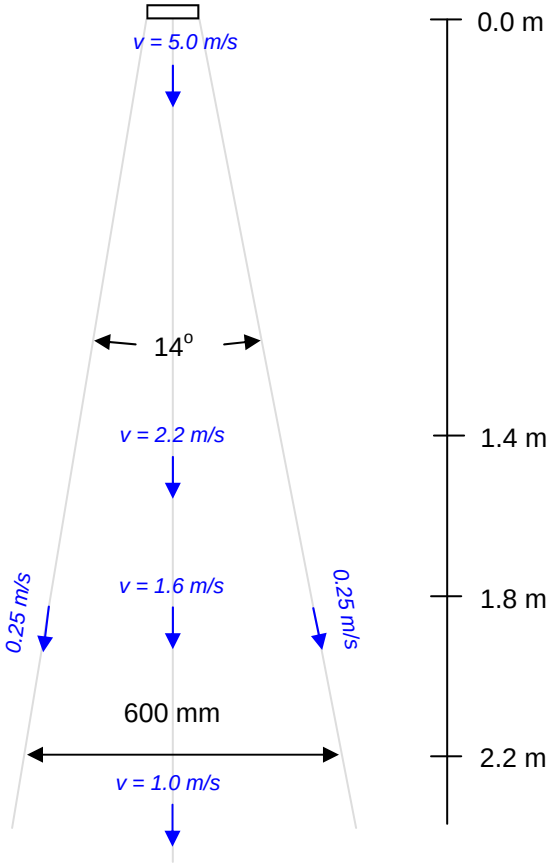
	$\dot{V}_{max}$ with 3 metres of duct and 90° bend @ 100 Pa		Discharge height
	l/s	m^3/h	m
100	55	198	2.2 - 6.0
150	140	504	2.2 - 6.0
200	300	1080	2.2 - 6.0



Jet Acoustic Data



Jet Throw Data



Typical isothermal throw profile of Jet (100 mm @ 40 l/s)

	Isothermal throw (metres) @ 0.3 m/s terminal velocity		
Airflow (l/s)	100 mm Jet	150 mm Jet	200 mm Jet
25	2.8	1.4	1.1
50	5.0	2.8	2.1
75		3.9	2.9
100		5.0	3.6
150		6.8	4.7
200			5.2

Louvred and Curved Technical Data

The Louvred and Curved are adjustable direction ceiling diffusers that produce a stream of air at around 30 degrees from the vertical, with long throw. They are suitable for gas ducted heating, reverse cycle heating with very high ceilings, air shifting and ventilation. The airflow direction can be adjusted by the householder to provide draught free airflow within the living space. With the damper set to open, the diffusers have low static pressure. The Louvred and Curved has a longer throw than DownJets, and like DownJets, consideration needs to be given to diffuser placement within the living space to avoid draughts.

In gas ducted heating applications, the supply air is typically 30 to 50 degrees above room temperature, with fan cycling. Ceiling diffusers need to penetrate the occupancy zone with supply air, and encourage convective currents to mix the warm supply air with the cooler room air throughout the living space. In one placement configuration, the diffusers can be directed towards a wall to encourage convection currents within the room.

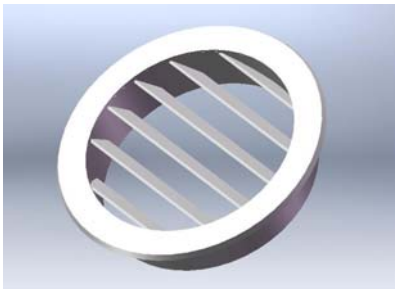
Installers have the opportunity of using multiple smaller outlets, including a 100mm model, instead of a single outlet to provide improved distribution of air. The use of multiple small outlets provides the opportunity to place the outlets in room positions that will maximise heating effectiveness, such as near the two corners of a bedroom opposite the door. A maximum length of 3 metres of duct from the branch is recommended when using 100mm diffusers to avoid high static pressure within the duct.

The ele**vent** Louvred and Curved has been designed to maximise the most important aspect of the diffuser – the airflow – and reduce the space requirements of the installation and mounting mechanisms, which can contribute to an obtrusive appearance in other outlets. The result is a small, low profile design with an elegant appearance that harmonises with downlights, recessed light fittings and other ceiling fittings.

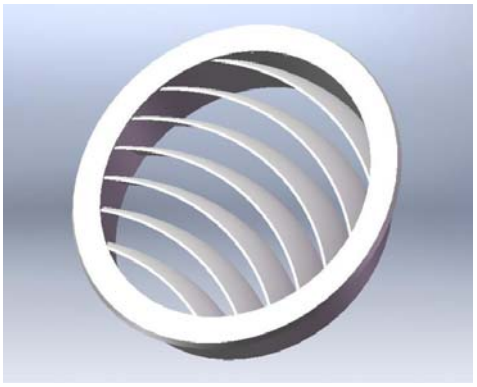
The ele**vent** Louvred and Curved is available in three sizes: 100, 150 and 200mm, and three colours: Ceiling White, Satin Chrome plated and Satin Gold plated. The adaptor has optional butterfly dampers for system balancing on the 150 and 200mm sizes, and a blanking cap is available on the 100mm model to replace the diffuser when shut-off is required. The outlet face can be easily removed from the fixed adaptor by hand for cleaning, or to enable the ceiling to be painted, ensuring a neat painted finish around the outlet.

Ideally, equal lengths of ductwork should be used from the branch to each outlet when using the 100mm model if equal airflow is desired. The Louvred and Curved have higher static pressure than the Jet and consideration needs to be given to system design if mixing the Louvred/Curved with the Jet. Equalisation can be achieved by the use of shorter duct lengths and less bends on the branches with Louvred and/or Curved.

100 mm Curved



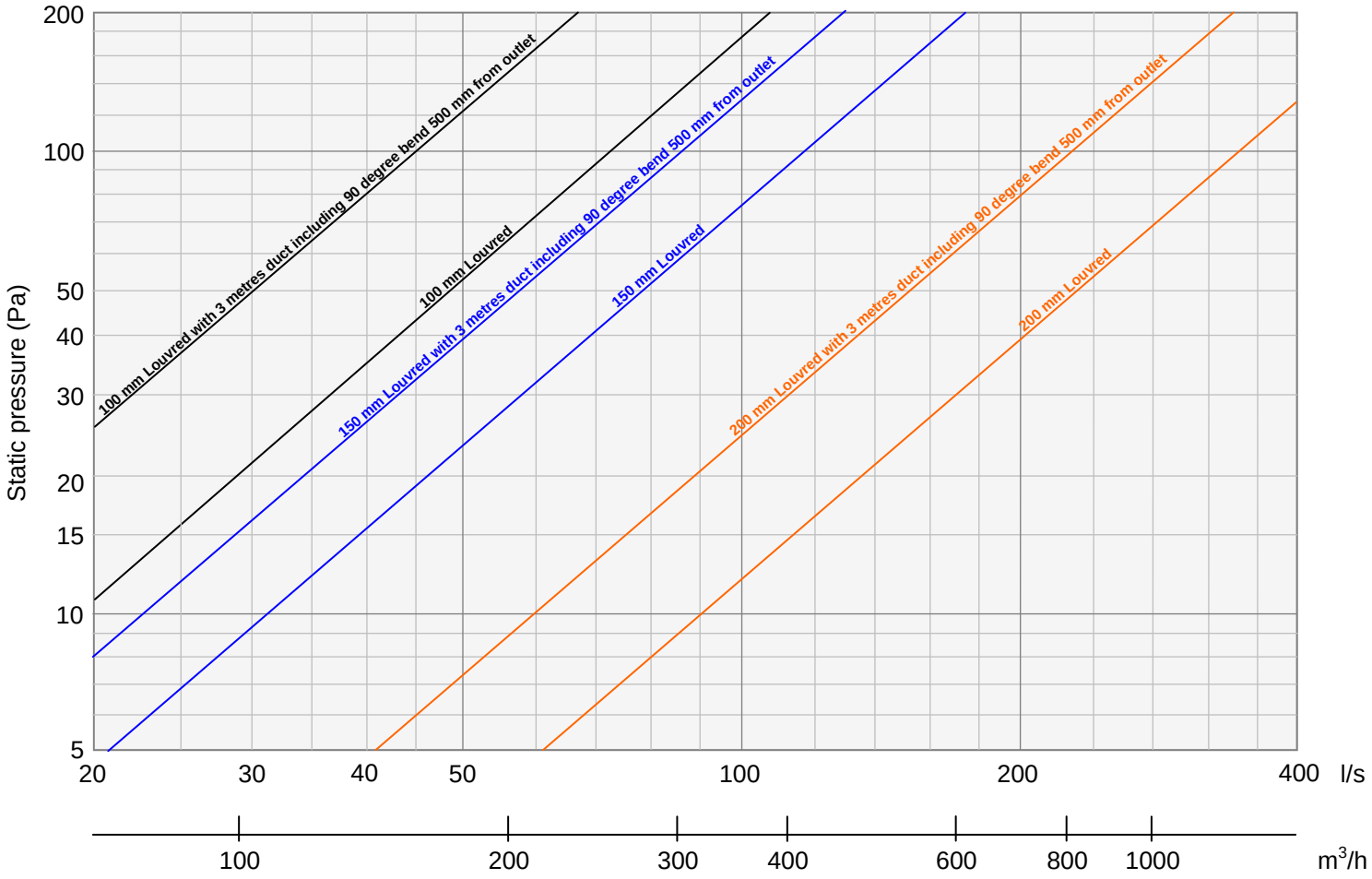
150 mm Louvred



200 mm Curved

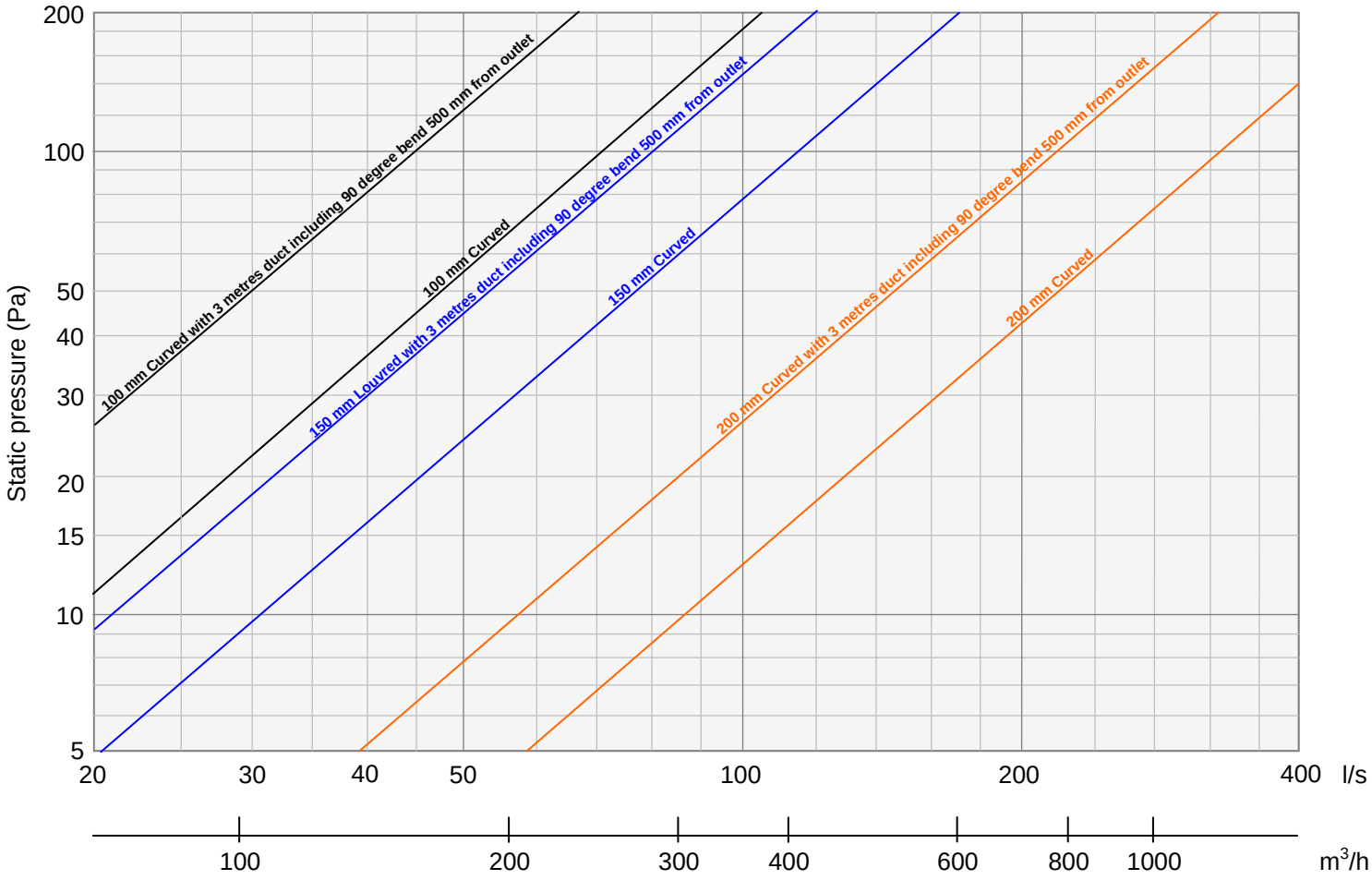
Louvred Flow and Pressure Data

	$\dot{V}_{max}$ with 3 metres of duct and 90° bend @ 100 Pa		Discharge height
	l/s	m^3/h	m
100	45	162	2.2 - 6.0
150	85	306	2.2 - 6.0
200	230	828	2.2 - 6.0

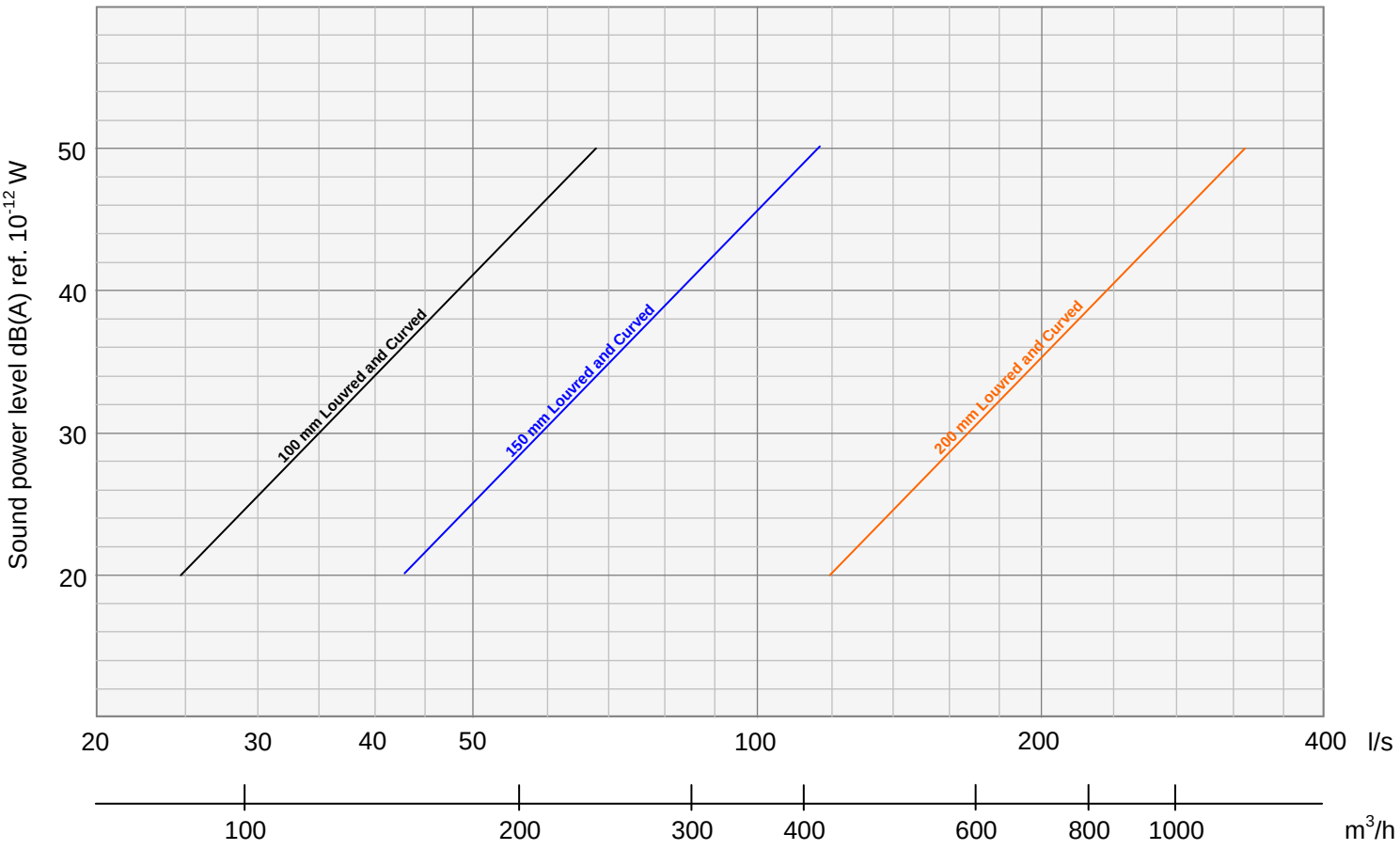


Curved Flow and Pressure Data

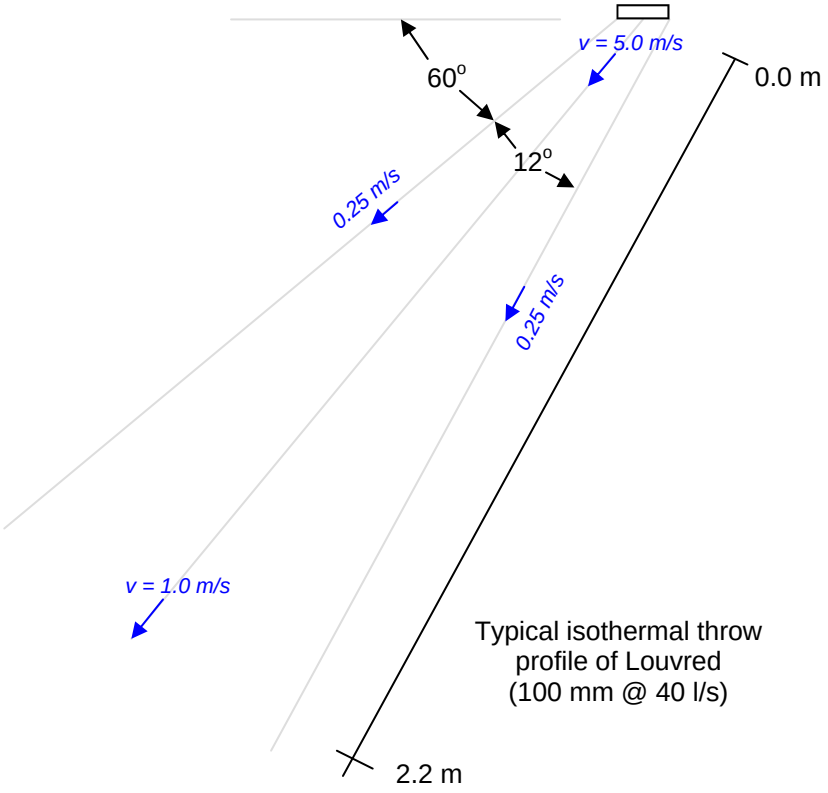
	$\dot{V}_{max}$ with 3 metres of duct and 90° bend @ 100 Pa		Discharge height
	l/s	m^3/h	m
100	42	151	2.2 - 6.0
150	80	288	2.2 - 6.0
200	220	792	2.2 - 6.0



Louvred and Curved Acoustic Data



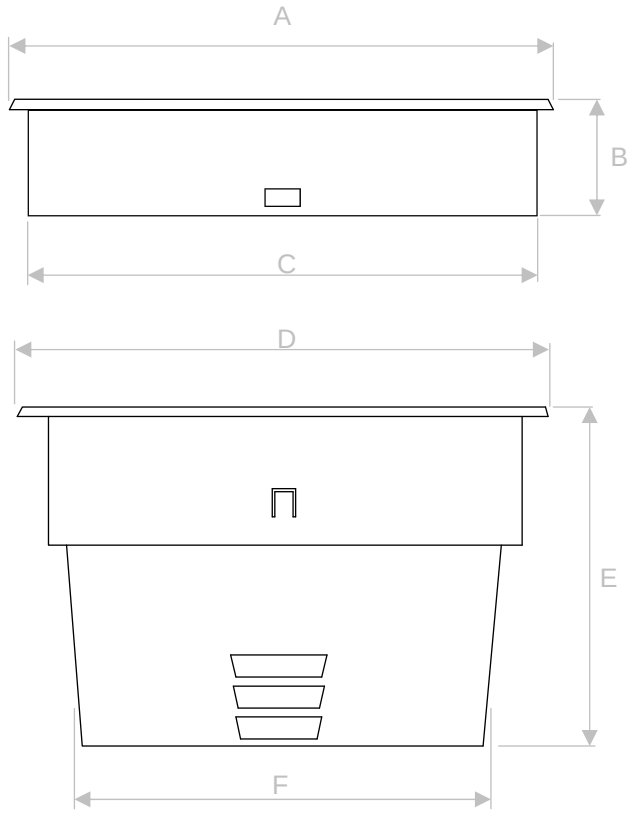
Louvred and Curved Throw Data



Typical isothermal throw profile of Louvred (100 mm @ 40 l/s)

	Isothermal throw (metres) @ 0.3 m/s terminal velocity		
Airflow (l/s)	100 mm Jet	150 mm Jet	200 mm Jet
25	3.0	1.6	1.3
50	5.2	3.0	2.3
75		4.1	3.1
100		5.2	3.8
150		7.1	4.9
200			5.5

Construction and Dimensional Data

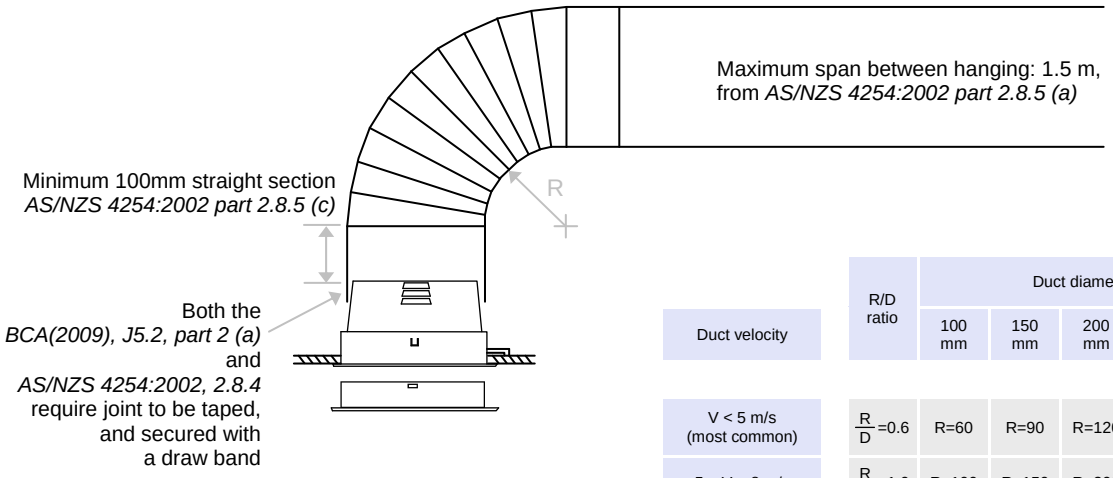


Construction

The diffuser faces are constructed of ABS polymers, and are suitable for heated air up to 80°C and cooled air down to 0°C. All sizes except for 100mm can be supplied with butterfly dampers installed in the adaptor for balancing. The 100mm has an optional shut-off face, which can be inserted by the householder/occupier in place of any of the standard faces to shut-off a room or area. The Swirl is available in three sizes: 200, 250 and 300mm. The Jet, Louvred and Curved types are available in three sizes: 100, 150 and 200mm.

		100 mm (4 inch)	150 mm (6 inch)	200 mm (8 inch)	250 mm (10 inch)	300 mm (12 inch)
Diffuser (all types) overall diameter	A	140	190	240	329	379
Diffuser (all types) height	B	37	42	49	49	49
Diffuser (all types) collar outer diameter	C	104	154	204	283	333
Adaptor overall diameter	D	135	183	235	324	374
Adaptor height	E	130	132	155	167	192
Adaptor mid-taper collar diameter	F	102	152	203	254	305
Hole size		122	172	222	300	350

Mounting and Cleaning Instructions



Duct velocity	R/D ratio	Duct diameter (D) 100 mm	150 mm	200 mm	250 mm	300 mm
V < 5 m/s (most common)	$\frac{R}{D}$=0.6	R=60	R=90	R=120	R=150	R=180
5 < V < 8 m/s	$\frac{R}{D}$=1.0	R=100	R=150	R=200	R=250	R=300
V > 8 m/s	$\frac{R}{D}$=1.5	R=150	R=225	R=300	R=375	R=450

Minimum required bend radius
Table from AS/NZS 4254:2002 Part 2.8.5 (h)

Installation

1. Mark and cut hole - holesaws are available for some sizes.
2. Pull duct through hole from above.
3. Attach duct to adaptor to AS/NZS 4254 part 2.8.4, using adhesive tape and draw band
4. Pull mounting clips inwards towards centre of adaptor.
5. Push adaptor and duct up through hole in plaster board.
6. With one hand on the adaptor and pushing adaptor against plaster board:
    a) Move mounting clip upward.
    b) Push mounting clip about half-way in.
    c) Bring mounting clip down towards top of plaster board.
    d) When the clip reaches the plaster board, push the clip inwards firmly.
    e) Repeat for all clips.
7. Put diffuser against adaptor and rotate until mounting slots correspond to grooves in adaptor.
8. Push diffuser into adaptor firmly until it clicks.

The ele**vent** adaptor is designed for use with plaster or panel board from 5 to 20 mm thickness. For panels up to 30 mm, the top of the mounting clips can be cut off to increase the available panel thickness.

Removal of adaptor

1. Remove diffuser from adaptor by placing two fingers into the diffuser and pulling firmly.
2. Using a narrow flat blade screwdriver, gently lever mounting clip inwards.
3. Repeat for all clips.

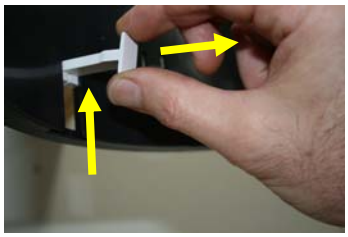
Painting and fit-off

The ceiling can be painted with the adaptor installed, and the diffuser pushed in afterwards.
Each size of the ele**vent** shares the same adaptor, so the diffuser style or colour can be changed after installation.

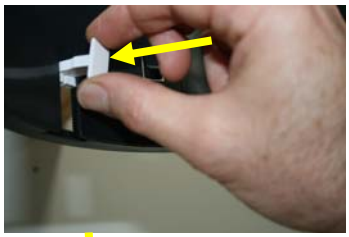
Cleaning

The diffuser can be removed by placing two fingers into the diffuser and pulling down. The diffuser can be cleaned with warm water and non-abrasive cleaning cloths and solutions. Extra care should be given to Satin Chrome and Satin Gold colours to avoid scratching the surface.

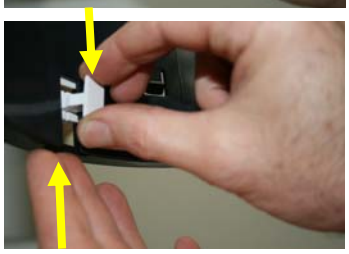
Mounting Clip Instructions



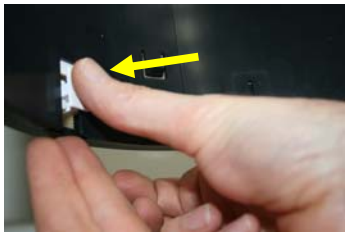
After placing adaptor in hole, move mounting clip upward and pull inwards.



With adaptor in position, push mounting clip about half-way in.



While holding adaptor firmly against plaster, bring clip downwards until it stops against the plaster.



While continuing to push adaptor against plaster, push clip in 90% of the way. Repeat for all the clips.

If the adaptor is holding firmly against the plaster, push all clips in the rest of the way. However if any edges are sagging, repeat the process to ensure all clips are tight.

To remove, place small flat blade screwdriver under clip.

Gently level clip inwards.

Australian Building Code (BCA 2009) Insulation Tables

	For systems up to 65 kW (most domestic systems)						
	Evaporative cooling system	**Heating-only system or refrigerated cooling-only system**			**Combined heating and refrigerated cooling system**		
	All climate zones	Climate zones 1,3,4,6 and 7	Climate zone 2 and 5	Climate zone 8	Climate zone 1,3,4,6 and 7	Climate zone 2 and 5	Climate zone 8
		Melbourne	*Sydney East*	*Alpine regions of Victoria and NSW*	*Melbourne*	*Sydney East*	*Alpine regions of Victoria and NSW*
		Sydney West	*Brisbane*		*Sydney West*	*Brisbane*	
		Canberra	*SE coast Qld*		*Canberra*	*SE coast Qld*	
		Far north Qld	*Adelaide*		*Far north Qld*	*Adelaide*	
		Country Vic. except alpine	*Perth*		*Country Vic. except alpine*	*Perth*	
		Tasmania			*Tasmania*		
Ductwork R_t	0.6	1.0	1.0	1.5	1.5	1.0	1.5
Fittings R_t	0.4						

Data current for 2009 BCA - current table available at www.paltech.com.au - go to datasheets, duct, BCA
Complete climate zone data available from:
http://www.abcb.gov.au/go/whatweredoing/workprogram/projectsae/energy/eemaps

	For systems over 65 kW				
	Evaporative cooling system	**Heating system or refrigerated cooling system**			
	All climate zones	Climate zones 1, 3 and 4	Climate zone 2 and 5	Climate zone 6 and 7	Climate zone 8
		Darwin	*Sydney East*	*Melbourne*	*Alpine regions of Victoria and NSW*
		Inland and arid Australia	*Brisbane*	*Sydney West*	
			SE coast QLD	*Canberra*	
		Far north Qld	*Adelaide*	*Country Vic. except alpine*	
			Perth	*Tasmania*	
Ductwork and fittings R_t - **within a conditioned space**	Nil	1.0	1.0	1.3	1.5
Ductwork and fittings R_t - **all other locations**	0.9	1.8	1.5	1.8	2.0

Data current for 2009 BCA - current table available at www.paltech.com.au - go to datasheets, duct, BCA
Complete climate zone data available from:
http://www.abcb.gov.au/go/whatweredoing/workprogram/projectsae/energy/eemaps

Australian Building Code (draft BCA 2010) Insulation Tables

	For class 1 buildings (houses etc.)					
	Heating-only system or cooling-only system, including evaporative			Combined heating and refrigerated cooling system		
	Climate zones 1,3,4,6 and 7	Climate zone 2 and 5	Climate zone 8	Climate zone 1,3,4,6 and 7	Climate zone 2 and 5	Climate zone 8
	Melbourne	*Sydney East*	*Alpine regions of Victoria and NSW*	*Melbourne*	*Sydney East*	*Alpine regions of Victoria and NSW*
	Sydney West	*Brisbane*		*Sydney West*	*Brisbane*	
	Canberra	*SE coast Qld*		*Canberra*	*SE coast Qld*	
	Far north Qld	*Adelaide*		*Far north Qld*	*Adelaide*	
	Country Vic. except alpine	*Perth*		*Country Vic. except alpine*	*Perth*	
	Tasmania			*Tasmania*		
Ductwork - insulation R	1.0	1.0	1.5	1.5	1.0	1.5
Fittings R_t	0.4					

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	For class 2 to 9 buildings (commercial etc.) with > 10 kW		
	Heating system or refrigerated cooling system		
	Climate zone 1, 2, 3 and 5	Climate zone 4, 6 and 7	Climate zone 8
	Sydney East	*Melbourne*	*Alpine regions of Victoria and NSW*
	Brisbane	*Sydney West*	
	SE coast QLD	*Canberra*	
	Adelaide	*Country Vic. except alpine*	
	Perth	*Tasmania*	
Ductwork and fittings - insulation R - **within a conditioned space**	1.2	1.0	1.6
Ductwork and fittings - insulation R - **exposed to direct sunlight**	3.0	3.0	3.4
Ductwork and fittings - insulation R - **all other locations**	2.0	2.0	2.4

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Ordering Information

	Qty. per box	100mm (4 inch)	150mm (6 inch)	200mm (8 inch)	250mm (10 inch)	300mm (12 inch)
Adaptor	20	1311	1321	1331	1341	1351
Adaptor with Damper set	20		1322	1332	1342	1352
Damper set	20		1323	1333	1343	1353
Blank Cap	20	1312				
Swirl White (standard)	20			1731	1741	1751
Swirl Satin Chrome	20			1732	1742	1752
Swirl Satin Gold	20			1733	1743	1753
Jet White (standard)	20	1411	1421	1431		
Jet Satin Chrome	20	1412	1422	1432		
Jet Satin Gold	20	1413	1423	1433		
Louvred White (standard)	20	1511	1521	1531		
Louvred Satin Chrome	20	1512	1522	1532		
Louvred Satin Gold	20	1513	1523	1533		
Curved White (standard)	20	1611	1621	1631		
Curved Satin Chrome	20	1612	1622	1632		
Curved Satin Gold	20	1613	1623	1633		
Holesaw and arbour	1	1314	1324			

Shipping Information

	Size (mm)	Units per box	Mass (kg)		Volume (m^3)	
			Unit	Box	Dimensions	Box
Adaptor without dampers - 1311	100	20	0.14	2.8	150 x 467 x 572	0.040
Adaptor without dampers - 1321	150	20	0.21	4.2	375 x 375 x 560	0.079
Adaptor with dampers - 1322	150	20	0.25	4.9	375 x 375 x 560	0.079
Adaptor without dampers - 1331	200	20	0.31	6.1	490 x 490 x 670	0.161
Adaptor with dampers - 1332	200	20	0.39	7.7	490 x 490 x 670	0.161
Adaptor without dampers - 1341	250	20	0.43	8.6	345 x 632 x 740	0.162
Adaptor with dampers - 1342	250	20	0.55	11.0	345 x 632 x 740	0.162
Adaptor without dampers - 1351	300	20	0.57	11.4	425 x 735 x 750	0.235
Adaptor with dampers - 1352	300	20	0.74	14.8	425 x 735 x 750	0.235
Elevent	100	20	0.11	2.1	150 x 390 x 272	0.016
Elevent	150	20	0.18	3.5	205 x 370 x 430	0.033
Elevent	200	20	0.22	4.4	260 x 470 x 505	0.062
Elevent	250	20	0.38	7.6	340 x 495 x 645	0.109
Elevent	300	20	0.50	10.0	392 x 500 x 745	0.146

Comparative Smoke Tests