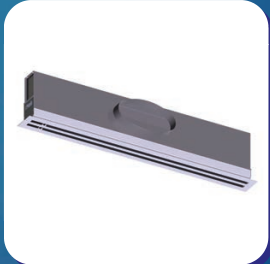


# THERMAL VARIABLE VOLUME LINEAR DIFFUSER

## VLN 4/5

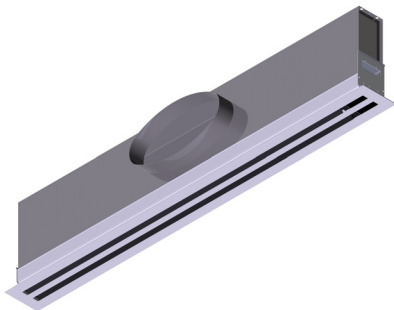
- ❁ CONTROL THE PERIMETER EFFECTIVELY
- ❁ VARIABLE VOLUME HEATING AND COOLING
- ❁ COOLING / HEATING AND COOLING MODELS
- ❁ MANUAL DIRECTIONAL FLOW ADJUSTMENT
- ❁ AUTO DIRECTIONAL FLOW CONTROL
- ❁ EXCELLENT THROW & FLOW
- ❁ THERMALLY POWERED
- ❁ NO MAINTENANCE
- ❁ 10 YEAR ACTUATOR WARRANTY



## FEATURES

When a buildings thermal efficiency is paramount, the ideal solution to limit thermal losses or gains through its exterior is required. The Rickard Thermal Variable Volume Linear Ceiling Diffuser (VLN4/5) is the ideal solution to control a buildings internal perimeter zone. It creates a vertical curtain of conditioned air that acts as a barrier to the thermal load transmitted or lost through the building's exterior. By using innovative forced induction technology the VLN4/5 accurately senses the temperature and adjusts to precisely meet the demand. Manually adjustable or automatic pattern controllers inside the linear slot direct the air horizontally or vertically as required. Since the VLN4/5 uses a wax filled thermal element to sense and drive the diffuser mechanism, no external wiring or power supply is required. The VLN5 has a cooling only mechanism and the VLN4 has both VAV cooling and heating capability. Change-over between cooling & heating control modes is automatic.

Rickard VLN4/5 diffuser tracks are designed to be joined end-to-end to create uninterrupted lengths of attractive linear track.

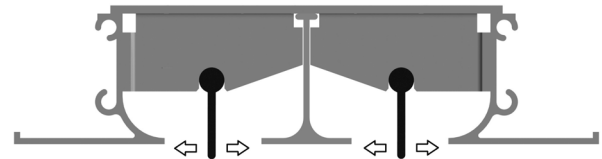
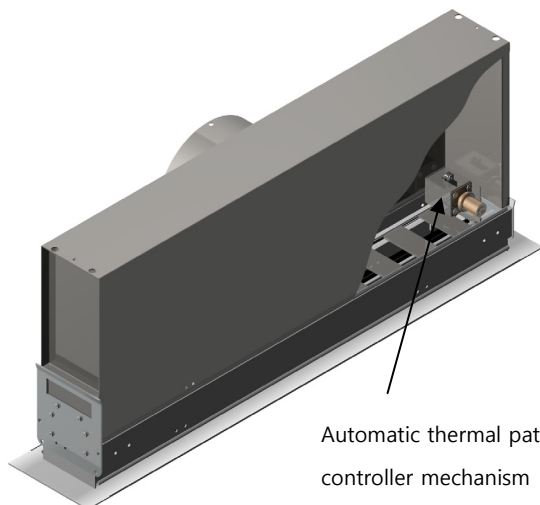


## PERFORMANCE

Rickard VAV Diffusers control Room Temperature by adjusting the volume of air at the diffuser outlet. By changing the diffusers exit geometry, Coanda, Air Velocity and Throw is maintained at minimum and maximum volume. This technology prevents cold air from dumping at minimum, ensures excellent ventilation, air mixing, Air Change Effectiveness (ACE) and therefore thermal comfort (ADPI). Rickard VAV diffusers reduce pressure loss in the system due to their aerodynamic design and the absence of restrictions in the duct work.

## AUTO HORIZONTAL/VERTICAL FLOW CONTROL (OPTIONAL)

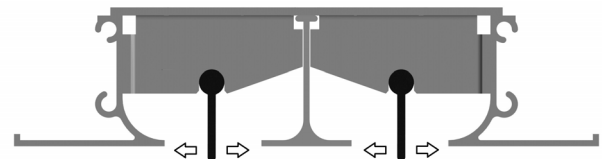
Pattern controllers inside the linear slot automatically direct the air horizontally along the ceiling in cooling and vertically downward in heating.



Automatic pattern controller adjustment

## MANUAL HORIZONTAL/VERTICAL FLOW ADJUSTMENT

Standard manually adjustable pattern controllers inside the linear slot direct the air horizontally or vertically as required. Vertical blow is typically used for heating and horizontal blow for cooling. Sometimes vertical blow is used in heating and cooling along a window facade. Adjustment is made by manually flipping the pattern controllers to the vertical position or to either side.



Manual pattern controller adjustment

## ENERGY SAVINGS

Green Building Benefits. Receive Management, Indoor Environmental Quality and Energy Efficiency Credits by using Rickard VAV Diffusers.

## FLEXIBILITY

Since the VLN4/5 is a self-contained unit, it can be easily moved.

## SENSING ACCURACY

The VLN4/5 uses a wax filled thermal element to sense and drive the diffuser mechanism. A forced induction technology ensures the temperature sensing element reacts within 0.15°C of room temperature for every 1°C difference between room and supply air temperature i.e. the Temperature Difference (TD) between room and supply air.

## COMMISSIONING

The Rickard VLN4/5 is shipped in the fully open position for commissioning purposes.

## CAPITAL & OPERATING COST

The VLN4/5 is a self-powered Variable Geometry VAV diffuser which requires no outside power source or wall thermostats.

Low diffuser height can reduce a buildings overall cost by reducing the height of the ceiling void.

## INSTALLATION SAVINGS

Included Jubilee Clamp saves time and material when attaching the flex.

## MAINTENANCE

The VLN diffusers active section is constructed from corrosion resistant mill galvanized sheet steel and aluminium. The diffuser tracks are constructed from aluminium extrusion and are coated with epoxy powder coating. No regular maintenance is required.

## AESTHETICS

The slim and attractive slot diffuser style provides a clean uninterrupted appearance that meets most architectural requirements.

## WARRANTY

Rickard offers a 10 year manufacturer's warranty on its thermal actuator. Please see Terms and Conditions.

## APPLICATIONS

### VAV COOLING (VLN 5)

### VAV COOLING AND HEATING (VLN 4)

The Rickard Thermal Variable Volume Linear Ceiling Diffuser (VLN4/5) is the ideal solution to control a buildings internal perimeter zone. It creates a vertical curtain of conditioned air that acts as a barrier to the thermal load transmitted or lost through the building's exterior. By using innovative forced induction technology the VLN4/5 accurately senses the temperature and adjusts to precisely meet the demand. Manually adjustable or automatic pattern controllers inside the linear slot direct the air horizontally or vertically as required. Vertical blow is typically used for heating and horizontal blow for cooling. Sometimes vertical blow is manually selected for heating and cooling along window facades. Since the VLN4/5 uses a wax filled thermal elements to sense and drive the diffuser mechanism, no external wiring or power supply is required. The VLN5 has a cooling only mechanism (cold supply) and the VLN4 has both VAV cooling (cold supply air) and heating (hot supply air) capability. Change-over between cooling & heating control modes is automatic.

Rickard VLN4/5 diffuser tracks are designed to be joined end-to-end to create uninterrupted lengths of attractive linear track.

## OPERATION

The Rickard VLN4/5 is shipped in the fully open position for commissioning purposes. Temperature control is activated by removing the commissioning screw, adjusting the temperature to the desired setpoint and engaging the setpoint fixing screw.

Room temperature is controlled by varying the supply air in accordance with demand. No other system is more energy efficient since the volume is controlled to exactly match the requirements of the space served by the diffuser.

Volume control is varied by means of a wax filled thermal element which responds to changes in sensed room temperature and drives the diffuser mechanism open or closed. This provides true "VARIABLE GEOMETRY VAV" which effectively maintains air discharge velocity throughout the range of volume control from 100% down to as little as 30%.

## AIRFLOW SELECTION

A further useful feature of the RICKARD VLN is the ease with which the direction of airflow may be adjusted. Although airflow direction is not normally changed once the system is operational, it does simplify the ordering procedure. All linear air diffusion track is identical and the choice of one-way (horizontal or vertical) or two-way blow (horizontal) is easily adjusted by simply flipping the flow directional vane to the preferred side. If automatic changeover between vertical heating and horizontal cooling is required, the VLN4 is available with a thermal strata mechanism.

## COOLING AND HEATING MODE

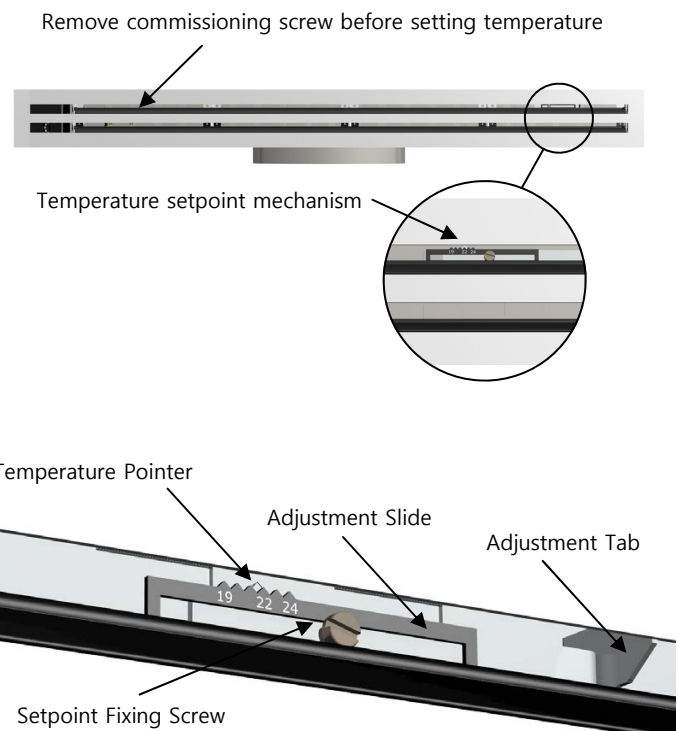
The Series 4 Cooling/Heating VLN Diffuser is identical in appearance to the cooling only version, the only difference being the addition of a second thermal element within the mechanism which automatically changes the action of the diffuser when the system goes into the heating mode. This allows full VAV control of the room when warm air is being supplied to the diffuser.

The cooling/heating change over thermal element is similar to that used for sensing room temperature allowing heating change over to be initiated when the supply air temperature is elevated to 24°C (75°F) and is completed when the supply air temperature reaches 31°C (88°F). Under these circumstances the diffuser will open as sensed room temperature decreases and vice versa. For best results the supply air temperature must be maintained 2°C (3.5°F) above or below the change over range.

## COMMISSIONING AND TEMPERATURE ADJUSTMENT

Temperature control is activated by removing the commissioning screw, adjusting the temperature to the desired setpoint and engaging the setpoint fixing screw. The temperature adjustment slide is shifted by sliding the temperature adjustment tab parallel with the diffuser slot until the desired temperature is aligned with the temperature pointer. The temperature slide is locked in place by tightening the setpoint fixing screw.

**NOTE:** The commissioning screw must be removed and the setpoint fixing screw tightened to activate temperature control.



## SELECTION

The first consideration when designing a system is to calculate the required supply air volume and temperature to satisfy room conditions at maximum heat loads. It is recommended that ducting is sized using static regain design principles. Supply air velocities in branch ducts should be between 3.5 and 7.5m/s (650 and 1500ft/min).

### THROW

This is the distance from the centre of the diffuser to the point at which the supply air velocity has reduced to 0.25m/s (50ft/min) when measured 25mm (1 inch) below the ceiling and the internal volume control damper is in the fully open position. Coning occurs when two airstreams travelling in opposite directions meet and result in a downward cone of moving air. A similar effect is experienced should a diffuser be positioned at a distance from the wall that is less than its throw. The air will strike the wall and flow in a downward direction such that the point at which the air reaches a velocity of 0.25m/s (50ft/min), the sum of the horizontal and vertical travel of the air is equal to the diffuser throw. Throw remains at acceptable levels throughout the range of air flows, a feature of the variable geometry VAV diffuser concept.

### NOISE LEVEL REQUIREMENTS

The published diffuser noise level must be checked to ensure it is within the project specification. Published diffuser noise levels represent only the noise generated by the diffuser and do not take into consideration any duct-borne noise.

### DUCT STATIC PRESSURE

Diffuser performance has been established using diffuser neck TOTAL pressure, although that which is normally known or measured is duct STATIC pressure. What happens between the duct and the diffuser depends on the length and type of flexible duct being used. For simplicity, it can be assumed that the duct STATIC pressure is approximately equal to the diffuser neck total pressure. This is a valid assumption for systems where flexible duct lengths are not excessive and can be explained briefly as follows:

The static pressure loss due to friction in the flexible duct ( $\pm 10\text{Pa}$  or 0.04ins wg) would normally be about the same as the velocity pressure in the neck of the diffuser and since total pressure is the sum of static and velocity pressure, we can say that neck total pressure is numerically approximately the same as duct static pressure. Although the tables reflect diffuser performance for neck total pressures ranging from 30-70Pa (0.04-0.40ins Wg), caution should be exercised when selecting diffusers outside the 40-80Pa (0.8-0.32ins Wg). At lower pressures air movement and induction may be insufficient and at higher pressures draughts and excessive noise may result. Best results are obtained when diffusers are selected at pressures of 40-60Pa (0.12-0.28ins Wg). Bear in mind that all diffusers served by a common duct will all operate at the same static pressure as controlled by the pressure control damper. Therefore diffusers which are able to supply more air than is necessary will be driven partially closed by the temperature controller and hence the system becomes self-balancing.

**NOTE:** Avoid upstream restrictions such as manually adjusted dampers or squashed flexible ducting. The reason being that at maximum flow any restrictions will result in a significant static pressure loss (which for some cases may be desirable) whereas at minimum flow conditions offer virtually no restriction, which will result in the static pressure at the diffuser being too high at minimum flow causing

over-cooling/heating and increased noise.

## TYPES

### TRACK SLOT TYPES

VLN Linear Diffusers are available with Single or Double Slot tracks.

### TRACK LENGTHS

The standard VLN is available in unit lengths of:

600mm

900mm

1200mm

1500mm

### TRACK TYPES

VLN Linear Tracks are designed to fit Plastered Ceilings (Surface Mount) and most Ceiling Grid (Drop-in) variants.

Rickard VLN Diffuser tracks can be joined end-to-end with alignment pins. VLN Tracks are compatible with other Rickard VLN tracks, Dummy tracks (inactive sections of track often used for return air) or CLN tracks (Constant Volume Linear Diffusers).

**NB: Do not butt-join units on their sensing ends.** The VLN4/5 needs the sensing end of the unit to be open for induction and sensing to work correctly. If butt-joining on these ends is required, Rickard recommends the tracks to be extended by 100mm on the sensing end. Please ensure the sales representative is made aware of this requirement.

VLN Linear Diffusers are available with 1 - 2 Slot tracks. Both variants are available with adjustable pattern controllers (vertical to horizontal flow).

VLN Linear Tracks are designed to fit Plastered Ceilings (Surface Mount) and most Ceiling Grid (Drop-in) variants.

Rickard VLN Diffuser tracks are designed to be joined end-to-end to create uninterrupted lengths of attractive linear track. VLN Tracks are compatible with other Rickard VLN tracks, Dummy tracks (inactive sections of track often used for return air) or CLN tracks (Constant Volume Linear Diffusers).

Tracks are finished in a wide range of high quality epoxy powder coated finishes. Matt White comes as standard.



**SPIGOT SIZES**

VLN4/5 SPIGOT DETAILS (mm)				
No. of SLOTS	VLN 600	VLN 900	VLN 1200	VLN 1500
1	150	200	250	300
2	150	200	250	300

**ACTUATOR TYPES**

The Thermally Powered actuator mechanism is available as a cooling only (VLN5) and as a cooling and heating version (VLN4). Change over between modes is automatic.

**THERMAL STRATA MECHANISM**

Automatic changeover between vertical heating and horizontal cooling is made possible with the optional thermal strata mechanism. The mechanism adjusts the pattern controllers automatically when the supply air is changed from heating to cooling and vice versa.

Change over from horizontal cooling to vertical heating is initiated when the supply air temperature is elevated to 24°C (75°F) and is completed when the supply air temperature reaches 31°C (88°F). For best results the supply air temperature must be maintained 2°C (3.5°F) above or below the change over range.

**MANUAL HORIZONTAL/VERTICAL FLOW ADJUSTMENT**

All Thermal VLN's come with manually adjustable pattern controllers as standard. Pattern controllers inside the linear slot direct the air horizontally or vertically as required. Vertical blow is typically used for heating and horizontal blow for cooling. Sometimes vertical blow is used in heating and cooling along a window facade.

**OPTIONS**

The Rickard Linear Diffuser Range supports the following mounting options.

**EXPOSED TEE CEILING GRID**

**1. DROP-IN MOUNTING**

The Drop-in linear diffuser is designed to lay-in a standard ceiling grid. The linear track has a flange along its length to hide the ceiling boards edge from below. The Drop-in linear diffuser has flat ends to fit neatly inside the tees. Rickard recommends additional support to give the diffuser additional stability and support. Attach wire hangers or threaded rod between the ceiling and the 8mm support holes provided in the top of the diffusers plenum. Linear diffusers of 595 and 1195mm are available to fit 600 and 1200mm ceiling grids respectively. Linear diffusers of 895 and 1495mm are also available.

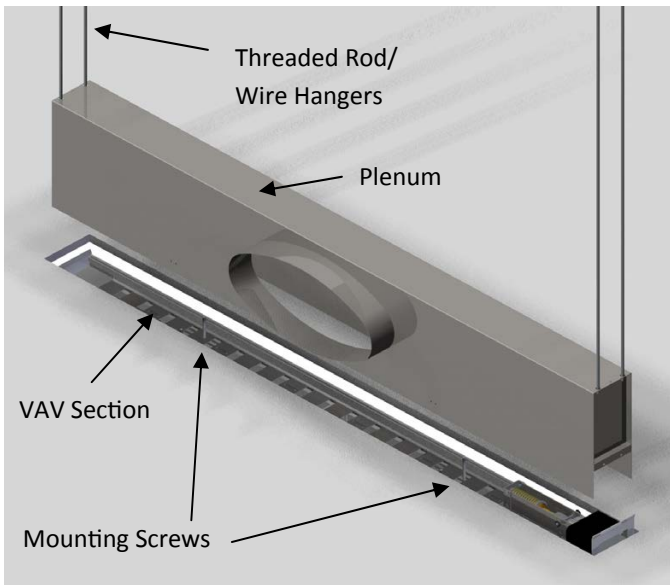
**2. MAINTENANCE OF THERMAL DROP-IN LINEAR DIFFUSERS**

No maintenance is required.

**PLASTERED CEILING**

**1. SURFACE MOUNTING**

Surface mount VLN4/5's are mounted by separating the plenum and the variable air volume (VAV) section. The plenum is installed before the ceiling is installed and the VAV section is attached once the ceiling and its hole is in place. The two parts are screwed together as shown below.



**a. Individual Surface Mounting**

The Surface mount linear diffuser is designed to fit a plastered ceiling from below. The linear track has a flange along its length and end to hide the rough cut edges of a plastered ceiling.

**b. Butt-joined Surface Mounting**

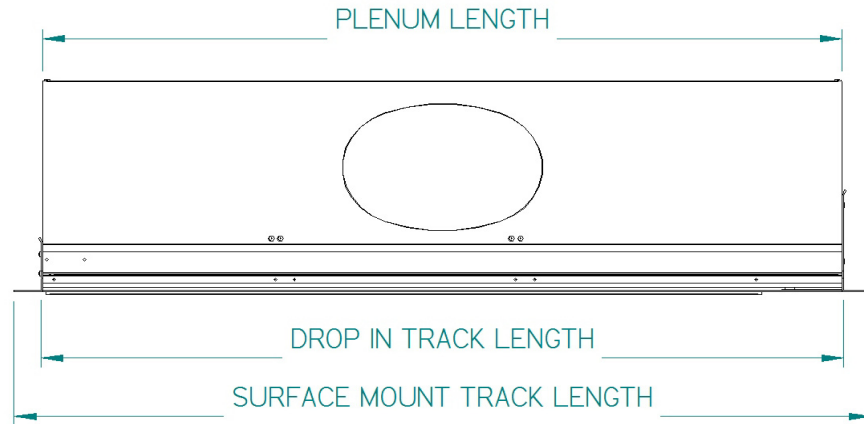
Surface mount linear diffusers can be joined together with other VAV linear diffusers, CAV linear diffuser or inactive track to provide long lengths of uninterrupted linear track. VAV linear diffusers, CAV linear diffuser or inactive track that are to be butt joined should be ordered without angle end borders (the flange on the end of the track). Sey-lock pins will be provided with every diffuser to join the tracks together. Special VAV, CAV or inactive track lengths are available on request.

**NB: Do not butt-join units on their sensing ends.** The VLN4/5 needs the sensing end of the unit to be open for induction and sensing to work correctly. If butt-joining on these ends is required, Rickard recommends the tracks to be extended by 100mm on the sensing end. Please ensure the sales representative is made aware of this requirement.

**2. MAINTENANCE OF THERMAL SURFACE MOUNT LINEAR DIFFUSERS**

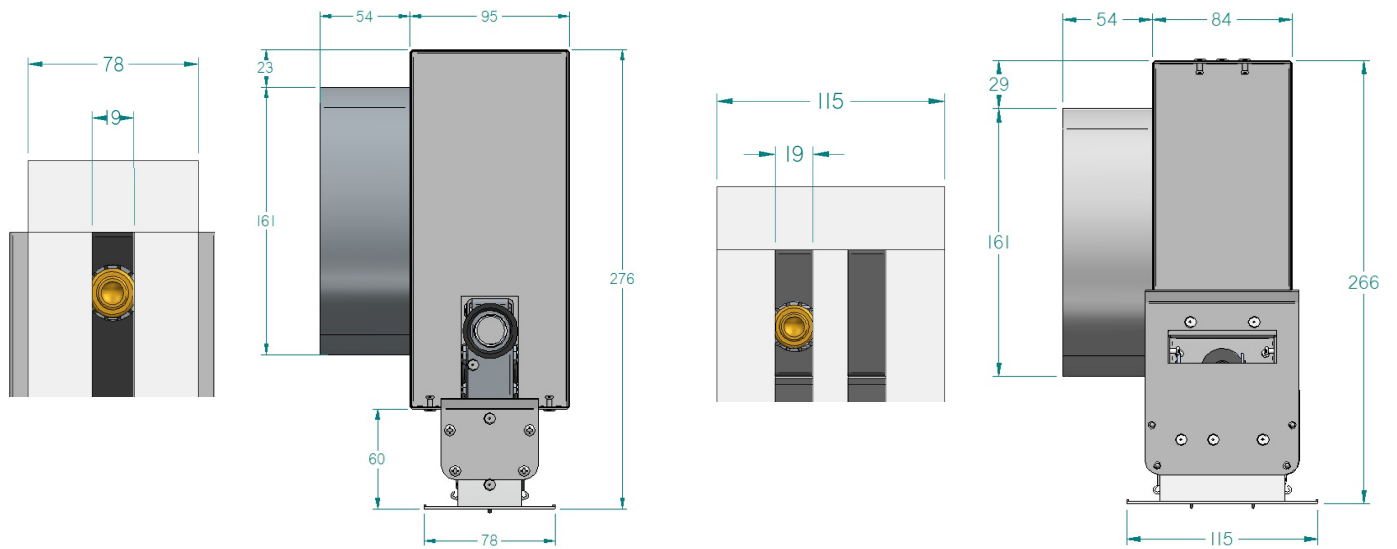
No maintenance is required.

**VLN4 GENERAL DIMENSIONS**



**VLN4 SINGLE SLOT**

**VLN4 DOUBLE SLOT**



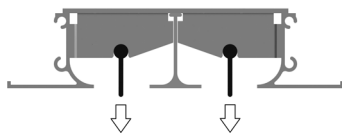
VLN4 GENERAL DIMENSIONS (mm)						
Nominal Length	Plenum Length	Track Length Single/Double Slot Butt-Join Mounting	Track Length Single/Double Slot Drop-In Mounting (T-Bar Ceiling)	Track Length Single/Double Slot Surface Mounting (Plastered Ceiling)	Ceiling Cut-Out Length Single/Double Slot Surface Mounting (Plastered Ceiling)	Spigot Size
600	590	590	595	656	600	150 ø
900	890	890	895	956	900	200 ø
1200	1190	1190	1195	1256	1200	250 ø
1500	1490	1490	1495	1556	1500	300 ø

VLN1 600 2 Slot - 150mm Spigot						
	FULLY OPEN					
NECK TOTAL PRESSURE (Pa)	20	30	40	50	60	70
FLOW (l/s) PATTERN B	43	52	61	68	75	81
FLOW (l/s) PATTERN C	33	40	47	52	58	62
THROW (m) PATTERN B	2,2	2,6	2,7	2,9	3,1	3,2
THROW (m) PATTERN C	3,1	3,6	3,9	4,1	4,3	4,4
NOISE - NC LEVEL	29	32	35	37	39	40

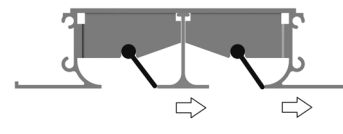
VLN1 900 2 Slot - 200mm Spigot						
	FULLY OPEN					
NECK TOTAL PRESSURE (Pa)	20	30	40	50	60	70
FLOW (l/s) PATTERN B	67	84	97	108	119	128
FLOW (l/s) PATTERN C	56	70	81	90	99	107
THROW (m) PATTERN B	2,7	3,1	3,3	3,5	3,7	3,9
THROW (m) PATTERN C	3,8	4,4	4,7	5	5,2	5,4
NOISE - NC LEVEL	30	34	37	39	41	43

VLN1 1200 2 Slot - 250mm Spigot						
	FULLY OPEN					
NECK TOTAL PRESSURE (Pa)	20	30	40	50	60	70
FLOW (l/s) PATTERN B	85	105	122	137	150	162
FLOW (l/s) PATTERN C	76	94	109	122	134	145
THROW (m) PATTERN B	3,1	3,6	3,8	4,1	4,3	4,5
THROW (m) PATTERN C	4,4	5,1	5,5	5,8	6,1	6,3
NOISE - NC LEVEL	31	35	38	40	42	44

VLN1 1500 2 Slot - 300mm Spigot						
	FULLY OPEN					
NECK TOTAL PRESSURE (Pa)	20	30	40	50	60	70
FLOW (l/s) PATTERN B	123	153	177	198	218	235
FLOW (l/s) PATTERN C	93	116	134	150	165	178
THROW (m) PATTERN B	3,4	4	4,2	4,5	4,7	5
THROW (m) PATTERN C	4,8	5,6	6,1	6,4	6,7	6,9
NOISE - NC LEVEL	32	36	39	41	43	45



**THROW PATTERN B**



**THROW PATTERN C**

Throw data is taken 25mm below the ceiling on a line through the centre of the diffuser with the damper fully open & an air velocity at 0.25m/s.

Noise Criteria levels apply to a single diffuser mounted in a room having a Sound Absorption of 10dB in octave bands having centre frequencies from 125Hz to 8000Hz (i.e. the difference between Sound Pressure Level (dB re:2 x 10<sup>-5</sup> Pa) and Sound Power Level (dBW re: 10<sup>-12</sup> watts) is equal to 10dB). These levels represent only the noise generated by the diffuser and do not take into account any duct-borne noise.

Diffusers are factory set for a minimum of 30% of the maximum flow levels reflected above. It should be noted that minimum diffuser air flow settings are approximate & may depend on site system pressures.

Performance Data applies to Standard Air having a density of 1.2 kg/m<sup>3</sup>.