

11

CONSTANT VOLUME CEILING MOUNTED SWIRL DIFFUSERS

APPLICATIONS

COOLING & HEATING

PROPORTIONAL TERMINAL REHEAT

STAND ALONE OR BMS CONTROLS

WITH OR WITHOUT REMOTE SETPOINT

ADVANTAGES

VERSATILE

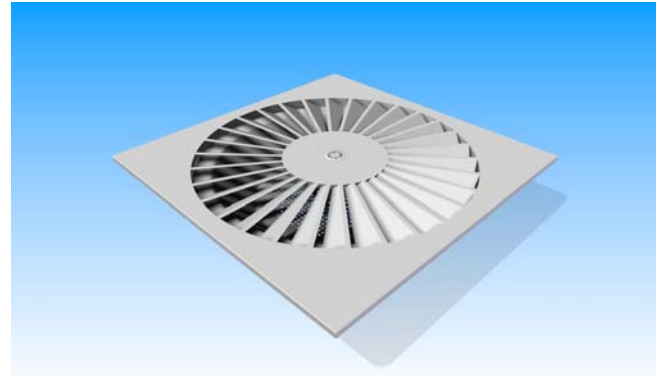
COST EFFECTIVE

TERMINAL HEATING OPTION

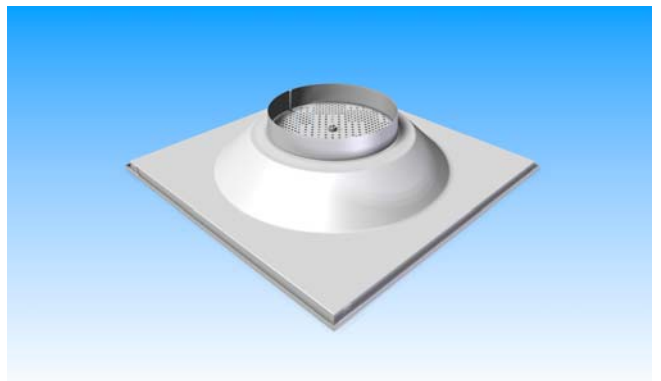
HEATING CONTROL OPTIONS

EASE OF INSTALLATION

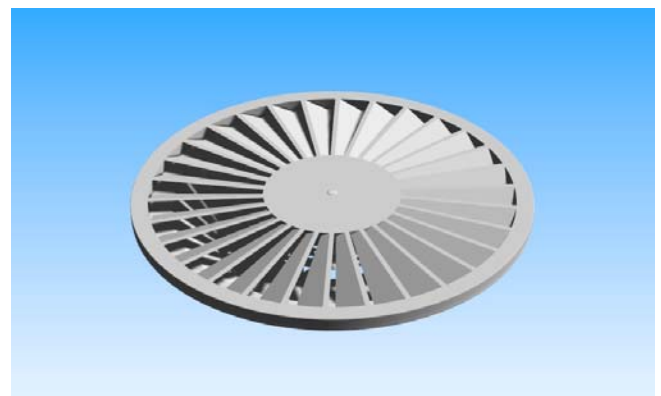
NO REGULAR MAINTENANCE



CSW



CSW



CRW

INTRODUCTION

The RICKARD Constant Volume Swirl Diffusers (Types CSW and CRW) are primarily intended for use in internal zones of buildings where good air mixing is required for improved occupant comfort. Normally these zones are less complex to air condition as load fluctuations are not as severe as those on building perimeter zones. The CSW and CRW, as their names imply, do not automatically regulate the air volume entering the air conditioned space—it is a constant volume device. Consequently, room temperatures will vary with room loads (assuming the duct air temperature and pressure remain constant). This temperature fluctuation may be countered by using the CSW/CRW fitted with a neck mounted re-heater or in conjunction with our TCD-E/H and proportional - integral volume / heater control to provide a measure of variable volume and / or reheat. Should this method be decided upon, care should be taken in the selection of the CSW/CRW diffusers to ensure dumping does not take place at minimum air status. The CSW diffusers are supplied to fit any ceiling layout from 600mm square to 600mm x 1200mm. Section details of how the diffusers can be installed in various suspended and plastered ceiling styles are shown.

Normally the RICKARD CSW is laid into and entirely supported by the suspended ceiling tees. A frame is provided for fitting CRW diffusers into plastered ceiling types.

All diffusers are of a steel construction and are finished in a chip resistant baked epoxy powder coating which is available in a wide range of colours to suit architectural requirements.

SELECTING CSW/CRW DIFFUSERS

The most important practical factors to consider in internal zones are noise levels and uniform air distribution without "dumping" or "coning" effects. "Dumping" is the tendency for cold, dense air to leave the diffusers as a vertical column similar to a waterfall.

The effect of dumping is to overcool the person immediately below the diffuser while the person further away will not be cooled enough.

Dumping is eliminated by ensuring that the discharge air energy from the diffuser is adequate to distribute conditioned air evenly throughout the conditioned area and at the same time provide good secondary room air induction rates. Providing the total pressure in the neck of the RICKARD CSW diffuser selected is not too low, dumping of conditioned cold air will not take place. The CSW is designed to be resistant to dumping.

In the context of radial discharge ceiling diffusers, 'coning' occurs when two air streams traveling in opposite directions meet. As a result a downward moving cone of air is produced which will have a similar effect to dumping. Coning is substantially reduced with the use of swirl diffusers, but it can be avoided completely by ensuring that CSW/CRW diffusers are placed far enough apart to eliminate drafts in the conditioned spaces. The Table that follows shows the distance from the centre of a CSW/CRW at which air velocity has reduced to 0.25 m/s (the 'throw' of the diffuser). Using this information,

CSW/CRW diffusers should be situated in the ceiling such that two adjacent diffusers are separated by slightly less than the sum of their throws. Exactly how much less depends largely on the ceiling height and the amount of air movement desired in the conditioned space. If the CSW/CRW is used in conjunction with Variable Linear Diffusers or Side Wall VAV Units, their throws should also be considered.

OPERATION AND ADJUSTMENT

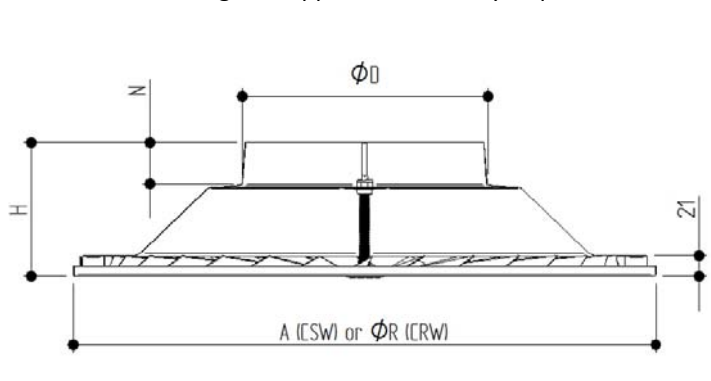
Although the CSW is a constant volume terminal device, the air volume flow rate may be adjusted manually to obtain the required design air flow. This is achieved by manually adjusting the control disc up or down using the screw driver slot located in the face of the trim.

CONSTANT VOLUME SWIRL DIFFUSER PERFORMANCE **CSW CRW**

SIZE	READING	NECK TOTAL PRESSURE (Pa)				
		30	40	50	60	70
150	FLOW l/s	68	79	88	96	104
	THROW m	1.80	2.10	2.30	2.50	2.70
	NC LEVEL	27	29	31	33	35
200	FLOW l/s	112	130	145	159	172
	THROW m	2.20	2.50	2.80	3.10	3.30
	NC LEVEL	28	31	33	35	37
250	FLOW l/s	159	183	205	225	243
	THROW m	2.90	3.30	3.70	4.10	4.40
	NC LEVEL	29	33	35	37	39
300	FLOW l/s	194	224	250	274	296
	THROW m	2.90	3.30	3.7	4.10	4.40
	NC LEVEL	30	33	36	38	40

Throw data is taken 25mm below the ceiling on a line through the centre of the diffuser with the control disc 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: 2x10⁻⁵ Pa) and Sound Pressure Level (dB re: 10⁻¹²) 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 require to be reset on site to compensate for actual site system pressures.



NOMINAL SIZE	DIMENSIONS (mm)				
	Ø D	A	H	N	Ø R
150	153	595 x 595	123	28	580
200	200	595 x 595	125	33	580
250	250	595 x 595	121	34	580
300	293	595 x 595	121	35	580

ELECTRICAL HEATING

The RICKARD CSW/CRW ceiling diffusers may be fitted with electric re-heaters housed within a sleeve which slides into the standard diffuser neck. Heater elements used in the diffusers are “black heat” having a heat density of 3.2W/cm² and are of the stainless steel sheathed type, rated for 110, 208, 230 or 277 Volts. In all cases an auto-reset 65°±5°C and power-reset 85°C±5°C overheat safety cutout is fitted as standard. The “power reset” type is reset by turning the power supply off momentarily. Push-button type manual reset safeties are not recommended in conjunction with diffuser re-heaters.

For additional safety, RICKARD are able to offer an **Airflow Switch** to interrupt power to the re-heater controls when there is insufficient airflow across the heater element.

To ensure electrical safety our Triacs are fitted with the following safeties. A fuse protects against large current surges and shorts and a transient suppressor protects against voltage surges.

Heaters are available in various capacities, ranging from 0.5kW to 2.5kW. When calculating heater capacities for CAV diffusers, care must be taken to ensure that an excessive supply air temperature rise in the diffuser is avoided. Discharge temperatures in excess of than 32°C are likely to cause stratification within the room. As a guide-line, the temperature of the air leaving the diffuser should not be more than 10°C above actual room temperature. Kindly refer to the following table giving the maximum recommended heater /size able to fit within the heater sleeve for each diffuser neck size. Heater output ratings may be adjusted electronically for an air temperature rise up to those quoted in the following table, a standard feature of the RICKARD **MLM, Mini BMS** and **Interoperable BMS Compatible Controls**.

IMPORTANT: These maximum capacities do not take into account limitations of the triac which is rated at 12A maximum. This reduces the capacity of the triac at low voltage supply.

HEATER CONTROL

For accurate control of room temperature, the electric re-heater is controlled on a step-less, proportional-integral basis. In addition to having a proportional-integral output signal for cooling control, the temperature controller also has a proportional-integral output signal for heating. This is done by means of a triac switching set (current valve) which varies the heater output capacity by cycling the power supply to the heater on and off – Pulse Width Modulation (PWM). This switching takes place over a cycle of approximately 2 seconds and always occurs at zero voltage to avoid radio frequency interference and voltage spikes. The “on” and “off” periods are varied in proportion to the amount of heating required, i.e., a required heating capacity of 75% will result in an “on” period of 1.5 seconds and an “off” period of 0.5 seconds.

In a situation where multiple diffusers are controlled from a single controller, each diffuser will be fitted with its own triac set that will receive a heating signal from the Master controller. The heating signal transmitted by the controller is a 9 Volt DC signal.

From the table “Temperature Rise at Rated Maximum Diffuser Air Flow”, it will be noted that for each neck total pressure there is a specific heater output quoted and for each diffuser size a standard heater capacity is referenced. For example, in the case of a CSW 250 diffuser, the re-heater sleeve would be factory fitted with a 1000 watt heater, which by utilizing the **RICKARD MLM, Mini BMS or Interoperable BMS Compatible Controls**, can be electronically set for any output from as little as 50 watts to 1000 watts to match the design engineer’s requirements for minimum cooling mode supply air flow and desired leaving air temperature. Therefore, if the diffuser neck total pressure were to be set at 50Pa and the minimum desired minimum air flow was 30% of maximum with 11°C air temperature rise, the heater output for a CSW 250 required would be 740 watts, set by using a computer for the **MLM, Mini BMS or Interoperable BMS Compatible Controls**. Kindly refer to Section 11 of this catalogue for more detailed information.

All electrical wiring associated with the re-heater is carried out in the factory and all units carefully tested for correct operation. The re-heater power supply should be interlocked with an air flow/pressure switch to isolate the heaters in the event of a loss of air flow.

SIZE	READING	NECK TOTAL PRESSURE (Pa)				
		30	40	50	60	70
150	FLOW l/s	54	63	70	77	83
	THROW m	1.4	1.70	1.8	2.10	2.30
	NC LEVEL	-	25	27	29	31
200	FLOW l/s	112	130	145	159	172
	THROW m	2.20	2.5	2.8	3.10	3.30
	NC LEVEL	28	31	33	35	37
250	FLOW l/s	159	183	205	225	243
	THROW m	2.90	3.30	3.70	4.10	4.40
	NC LEVEL	29	33	35	37	-
300	FLOW l/s	194	224	250	274	296
	THROW m	2.90	3.30	3.70	4.10	4.40
	NC LEVEL	30	33	36	38	40

SAMPLE SPECIFICATION

Supply and install where indicated on the engineering drawings Rickard type CSW (CRW) constant volume square (round) Swirl ceiling mounted diffusers to provide horizontal throw, high induction supply air. Connection to the diffusers shall be vertical entry through a seamless backpan having a circular inlet collar. The diffusers shall incorporate a perforated air volume balancing damper adjustable from below the ceiling using a screw driver slot located in the face of the trim. Each diffuser is to be finished in a textured semi-matt white chip resistant epoxy coating.

NECK TOTAL PRES-	40	50	60	70	FIXED HEATER CAPACITY (WATTS)
NECK DIAMETER	MAXIMUM HEATER				
150	230	250	280	300	500
200	480	530	580	620	750
250	660	740	810	880	1000
300	810	900	990	1070	1250