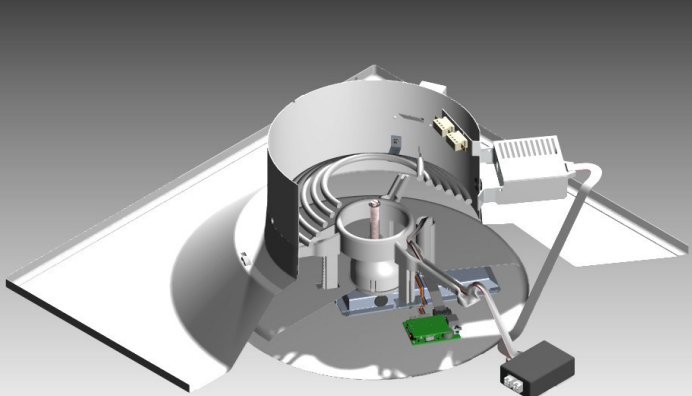


**FEATURES**

**FORM FACTOR**

RICKARD diffusers are fitted with electric re-heaters that are either housed in a modular sleeve (VCD1, VSD1, CCD3, CSD3, VSW1 & CSW3's) or fitted directly to the unit (WBD, VLN). The heaters are energised when additional heating is required in a room.

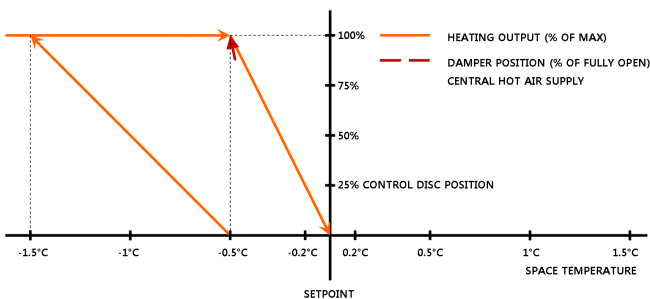


**VAV PLATE DIFFUSER FITTED WITH MODULAR HEATER SPIGOT**



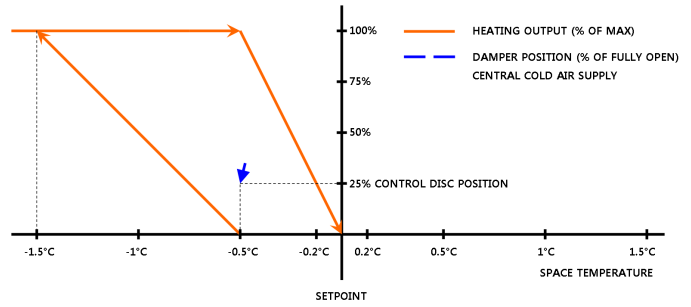
**WBD WITH DEDICATED HEATER FITTED**

Electric heating can be considered to save energy when they are used to heat isolated offices that wouldn't be efficiently heated by raising the central plants temperature. The most efficient scenario in heating is for the central plant to supply sufficient heated air to allow most of the zones to be in control when the diffusers damper is close to minimum position. Zones that are colder are controlled by the diffuser opening further. Zones that cannot be satisfied by the diffuser supplying warm air at full volume are topped up with supplementary heating.



The most efficient scenario in cooling is for the central plant to supply sufficient cool air to allow most of the zones to be in control when the diffuser dampers are close to minimum position. Zones that are warmer can be controlled by the diffuser opening further. Zones that cannot be warmed sufficiently by reducing the cold air supply can be controlled by heating this reduced volume of air.

If the room temperature were to fall by 0.5°C below set point, the Triac Controller will commence energizing the heater proportionally and will fully energize the heater when the room temperature is approximately 1.5°C below set point.



To ensure a building is efficiently heated it is necessary to integrate the Rickard VAV diffuser system with the central plant BMS. This is possible by using Rickard's MLM BMS Compatible Controls.

**PROPORTIONAL HEATING**

For accurate control of room temperature, the electric re-heater is controlled on a step-less, proportional basis. In addition to having a proportional output signal for cooling control, the temperature controller also has a proportional 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.

**CONTROLS**

In a situation where multiple diffusers are controlled from a single controller, each diffuser will be fitted with its own triac that will receive a heating signal from the Primary controller. From the table "Maximum Recommended Heater Output (Watts)" at the end of this section, notice that for each neck total pressure there is a specific heater output quoted. For each diffuser size a standard heater capacity is referenced e.g. in the case of a VCD 250 diffuser, the re-heater sleeve would be factory fitted with a 1500 watt heater. By utilizing the RICKARD MLM or MLM Interoperable BMS Compatible Controls, the heater can be electronically set for an output from 100 to 1500W to match the design engineer's requirements. If the diffuser neck total pressure were to be set to 50Pa and the minimum desired air flow was 30% of maximum with a 17°C temperature rise, the heater output for a VCD 250 should be set to 1350 watts. Please refer to the MLM software help section for setup information.

**IMPORTANT ELECTRICAL INFORMATION:** Electrical reticulation should be designed to manage the heaters full capacity i.e. when a heater is set to 50%, the heater element draws the same current as it would when set to 100% but only draws it for 50% of the time.

**SELECTION GUIDELINES**

When calculating heater capacities for VAV diffusers, please keep in mind that heating in the cooling mode takes place when the diffuser is supplying minimum air flow. Care must therefore be taken to ensure that excessive supply air temperature rises are avoided. Discharge temperatures in excess of 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 room temperature. Please refer to the "Maximum Recommended Heater Output (Watts)" table on page 3 for each diffuser size. These heater output ratings calculated to ensure that the heat rise is no more than 15°C in VAV diffusers and 10°C in CAV diffusers. Please note that these values are a guide and are calculated at 30% volume for VAV diffusers and 100% volume for CAV diffusers.

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

**ELECTRICAL AND OVERHEAT SAFETIES**

**NOTE:** The following safeties should not exclude ducting airflow safeties and a dedicated heater electrical circuit. Please see the following Installation guidelines section.

Every Heater Module is fitted with a coiled electrical element inside a Galvanised sheet metal enclosure. The heater elements is constructed from an Incaloy material that does not glow when energised. This element is selected to reduce the risk of combustible materials igniting should they come into contact with the heater element itself. No combustible materials are used in the construction of a Rickard Diffuser or Heater Module. Rickard diffusers use a high spec flame retardant, self extinguishing polycarbonate plastic that is chlorine and bromine free with a UL94 V-0 rating at 1.5mm. The Heater modules are fitted with their own Triac/Heater driver and receive a proportional signal from the diffuser controls when heating is required. The Triac receives its power from a separate power circuit. Dedicated plug tops can be fitted to the heater module on request.

Each heater modules is fitted with a number of safeties to reduce the risk of failure. The Triac is fitted inside an electrically grounded metal enclosure that is physically attached to the heater module enclosure. This increases the electrical safety of the device should a short circuit occur. A fuse offers additional protection against large current surges and shorts. A Transient suppressor prevents the Triac from failing closed and therefore driving the heater permanently if a voltage surge has occurred.

In some cases when no flow or very low flows occur in the ducting, it is necessary to limit the heaters output to avoid excessive heat build up in the diffuser. For this reason the triac is fitted with a temperature sensor and controls to limit the triac so that the supply air exiting the diffuser never rises above 50°C or 122°F.

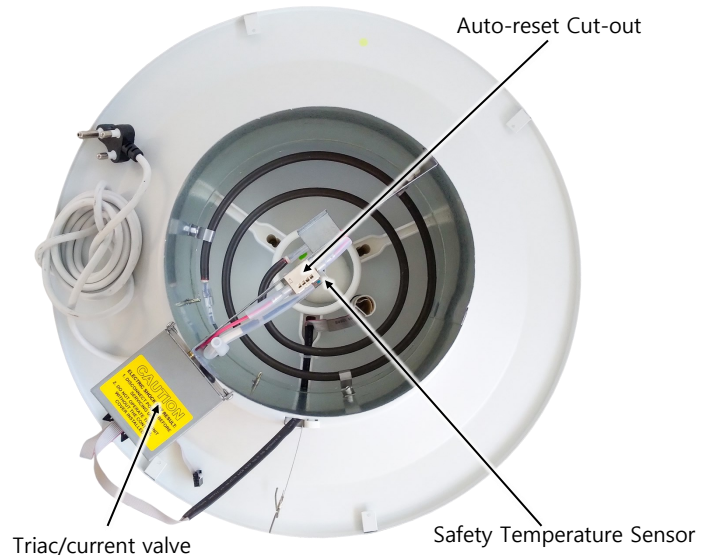
As an added safety an auto-reset 65°±5°C or 149±9°F(10 000 cycles) safety cut-out is fitted as standard. The reset temperatures indicates the air temperature inside the overheat safety cut-out casing at which it operates. Rickard heater modules are designed so that the overheat safety cut-outs trigger when the neck Total pressure is approximately 30Pa or below. The trigger point can vary depending on a number of factors namely, excessively squashed or bent flex, neck size, heater size and damper position. Rickard controls do not activate its heaters below 20% flow damper position, thereby reducing the likelihood of the overheat safeties not triggering in the

range described. Push-button type manual reset safeties are not recommended in conjunction with diffuser re-heaters.

For additional safety, RICKARD offer an Airflow Switch to interrupt power to the re-heater controls when there is insufficient airflow across the heater element. The switch is calibrated to disable the heater current valve below a static pressure of 12Pa (+/- 5Pa).

The switch operates as a dead man switch i.e. if the cable between the switch and the heater controls is unplugged, the heater will not operate.

**STANDARD SAFETIES FITTED TO ALL VAV DIFFUSER TYPE (VCD1, VSD1, CCD3, CSD3, VSW1, CSW, WBD's, CLN's and VLN's)**



**OPTIONAL AIRFLOW CUT-OUT/SWITCH**



**TESTING**

All electrical wiring associated with the re-heater is carried out in the factory and all units are carefully tested for correct operation.

**OPTIONS**

- Heaters are available in various capacities, ranging from 0.5kW to 2.5kW.
- Airflow Switch to interrupt power to the re-heater controls when there is insufficient airflow across the heater element.

## INSTALLATION GUIDELINES

Your duct design should supply between 30 and 60Pa total pressure at each diffuser to ensure adequate flow across the heaters.

Please ensure the ducting is fitted with an airflow interlock/paddle switch that cuts the power to the electrical reticulation serving the diffusers in the event of a loss of flow. This will ensure that the diffusers heaters are not energised when the AHU is off.

Rickard recommends a dedicated electrical outlet be fitted to the building heater reticulation and dedicated plug top be fitted to the diffusers. This will ensure that the airflow interlock always cuts power to the diffusers heaters and not other equipment plugged into the same circuit. This will also ensure that heaters are always plugged into a protected circuit.

Please see the "Electric Plug Ordering" Document for more details to order the correct plug top for your installation.

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open																			
VCD	Pa	20			30			40			50			60			70		
	Neck Size	kW			kW			kW			kW			kW			kW		
		Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set
	150	0.35	0.50	70%	0.34	0.50	68%	0.50	0.50	100%	0.50	0.50	100%	0.60	0.75	80%	0.65	0.75	87%
	200	0.60	0.75	80%	0.70	0.75	93%	0.75	0.75	100%	0.90	1.00	90%	1.00	1.00	100%	1.00	1.00	100%
	250	0.85	1.00	85%	1.00	1.00	100%	1.15	1.25	92%	1.30	1.50	87%	1.40	1.50	93%	1.50	1.50	100%
	300	1.00	1.00	100%	1.25	1.25	100%	1.50	1.50	100%	1.65	2.00	83%	1.75	2.00	88%	2.00	2.00	100%
	350	1.30	1.50	87%	1.50	1.50	100%	1.85	2.00	93%	1.85	2.00	93%	2.25	2.50	90%	2.50	2.50	100%

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open																	
VSW	Pa	30			40			50			60			70			
	Neck Size	kW			kW			kW			kW			kW			
		Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	
	150	0,35	0,5	70%	0,4	0,5	80%	0,45	0,5	90%	0,5	0,5	100%	0,55	0,75	73%	
	200	0,6	0,75	80%	0,7	0,75	93%	0,8	1	80%	0,85	1	85%	0,9	1	90%	
	250	0,85	1	85%	1	1,25	80%	1,1	1,5	73%	1,2	1,25	96%	1,3	1,5	87%	
	300	1	1	100%	1,2	1,5	80%	1,35	1,5	90%	1,5	1,5	100%	1,6	2	80%	

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open																	
VLN1 2 Slot Pattern C	Pa	30			40			50			60			70			
	Length	kW			kW			kW			kW			kW			
		Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	
	600	0,3	0,5	60%	0,35	0,5	70%	0,35	0,5	70%	0,4	0,5	80%	0,45	0,5	90%	
	900	0,45	0,5	90%	0,55	0,55	100%	0,6	0,75	80%	0,65	0,75	87%	0,7	0,75	93%	
	1200	0,65	0,75	87%	0,75	0,75	100%	0,8	1	80%	0,9	0,9	100%	1	1	100%	
	1500	0,85	0,85	100%	1	1	100%	1,1	1,25	88%	1,2	1,2	100%	1,3	1,5	87%	

Recommended Heater settings & sizing for a 15 Degree C Heat Rise @ 30% Open														
WBD	Pa	20			30			40			50			
	Size (mm)	kW			kW			kW			kW			
		Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	
	300/100	0,4	0,5	80%	0,5	0,5	100%	0,55	0,75	73%	0,6	0,75	80%	
	350/100	0,55	0,75	73%	0,65	0,75	87%	0,7	0,75	93%	0,75	0,75	100%	
	400/100	0,6	0,75	80%	0,75	0,75	100%	0,8	1	80%	0,9	1	90%	
	450/100	0,7	0,75	93%	0,8	1	80%	0,9	1	90%	1	1	100%	
	500/100	0,7	0,75	93%	0,85	1	85%	0,95	1	95%	1,1	1,25	88%	
	550/100	0,75	0,75	100%	0,95	1	95%	1,1	1,25	88%	1,2	1,25	96%	
	600/100	0,9	1	90%	1	1	100%	1,2	1,25	96%	1,25	1,25	100%	
	650/100	0,95	1	95%	1,15	1,25	92%	1,25	1,25	100%	1,45	1,5	97%	
	500/150	1	1	100%	1,25	1,25	100%	1,6	2	80%	1,8	2	90%	
	550/150	1,2	1,25	96%	1,4	1,5	93%	1,65	2	83%	1,85	2	93%	
	600/150	1,4	1,5	93%	1,6	2	80%	1,9	2	95%	2	2	100%	
	650/150	1,4	1,5	93%	1,7	2	85%	2	2	100%	2,2	2,5	88%	
	700/150	1,5	1,5	100%	1,85	2	93%	2,2	2,5	88%	2,4	2,5	96%	
	800/150	1,75	2	88%	2,1	2,5	84%	2,5	2,5	100%	2,5	2,5	100%	

To limit stratification in heating Rickard recommends that the heater outputs be limited to the values published in the tables above. The calculated values will ensure that the heat rise is no more than 15°C in VAV diffusers and 10°C in CAV diffusers. Please note that these values are a guide and are calculated at 30% volume for VAV diffusers and 100% volume for CAV diffusers. By adjusting the diffuser damper position down, a smaller volume will create a larger heat rise and therefore increase the likelihood of stratification. The Fit column indicates the maximum fitted heater size recommended, the Adjust value indicates the maximum heater setting recommended to achieve a 15°C (VAV) or 10°C (CAV) heat rise and the Set column is the MLM Heater Output % value required to achieve a 15°C (VAV) or 10°C (CAV) heat rise.

Recommended Heater settings & sizing for a 10 Degree C Heat Rise @ 100% Open																			
CCD	Pa	20			30			40			50			60			70		
	Neck Size (mm)	kW			kW			kW			kW			kW			kW		
		Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set
	150	1.30	1.50	87%	1.50	1.50	60%	1.75	2.00	88%	2.00	2.00	100%	2.25	2.50	90%	2.40	2.50	96%
	200	1.80	2.00	90%	2.25	2.50	90%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%
	250	2.30	2.50	92%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%
	300	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%
	350	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	200%

Max Element Size before extending spigot length: 150mm = 0.75kW, 200mm = 1.25kW, 250mm = 1.5kW, 300mm = 2.0kW, 350mm = 2.5kW

Recommended Heater settings & sizing for a 10 Degree C Heat Rise @ 100% Open																			
CSW	Pa	20			30			40			50			60			70		
	Neck Size (mm)	kW			kW			kW			kW			kW			kW		
		Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set	Adjust	Fit	Set
	150	0.70	0.75	93%	0.80	1.00	80%	1.00	1.00	100%	1.00	1.00	100%	1.15	1.25	92%	1.25	1.25	100%
	200	1.20	1.25	96%	1.30	1.50	87%	1.50	1.50	100%	1.75	2.00	88%	1.90	2.00	95%	2.00	2.00	100%
	250	1.80	2.00	90%	2.00	2.00	100%	2.25	2.50	90%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%
	300	2.00	2.00	100%	2.40	2.50	96%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%	2.50	2.50	100%

To limit stratification in heating Rickard recommends that the heater outputs be limited to the values published in the tables above. The calculated values will ensure that the heat rise is no more than 15°C in VAV diffusers and 10°C in CAV diffusers. Please note that these values are a guide and are calculated at 30% volume for VAV diffusers and 100% volume for CAV diffusers. By adjusting the diffuser damper position down, a smaller volume will create a larger heat rise and therefore increase the likelihood of stratification. The Fit column indicates the maximum fitted heater size recommended, the Adjust value indicates the maximum heater setting recommended to achieve a 15°C (VAV) or 10°C (CAV) heat rise and the Set column is the MLM Heater Output % value required to achieve a 15°C (VAV) or 10°C (CAV) heat rise.