RICKARD

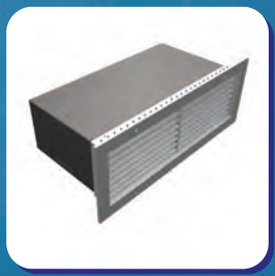
INTELLIGENT COMFORT CONTROL

ELECTRONIC VARIABLE VOLUME WALL BULKHEAD DIFFUSER

5

WBD 1

- VAV PREVENTS DUMPING
- VAV SAVES FAN ENERGY
- EXCELLENT THROW & FLOW
- HEATING AND COOLING
- FOR RESTRICTED CEILING SPACE
- LARGE RANGE OF FINISHES
- NO MAINTENANCE
- 2 YEAR WARRANTY
- NEW STYLE WBD GRILLE AVAILABLE



NEW

FEATURES

The Rickard Wall Bulkhead Diffuser offers all the advantages that you would come to expect from a Rickard VAV diffuser, in a package to suit applications where there are restricted ceiling voids or where fully-covered ceilings are not available. As the name suggests WBDs discharge supply air into the conditioned space from either a side-wall or bulkhead.

Rickard WBDs 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.

PERFORMANCE

Rickard's WBD's have an excellent ability to distribute air across deep rooms.

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.

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ENERGY SAVINGS

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

Rickard MLM controls use energy efficiently. Rickard MLM+ Diffusers use - 2.4 VA (24VDC 100mA) only when the motor is running. MLM24 Power Supply Units use – 40VA (220VAC .2A) or (115VAC .35A) max and can supply up to 15 diffusers. MLM Master Communications Units (MCU2) use – 10VA (24VAC .4A) max and can connect to 60 diffusers.

CONTROLS

Fifteen diffusers can be daisy chained, using the supplied Inter diffuser connecting cable. A PSU power Supply unit (purchased separately), supplies power and communication signal to each diffuser.

Since WBD's are not fitted with onboard sensing, they are not auto-zoned. To operate, they need a wall stat and all secondary diffusers need to be grouped with a primary diffuser with the MLM+ application to operate correctly.

Electronically adjustable maximum and minimum damper limits allow designed airflow volumes to be achieved.

Global manual commands (all diffusers can be driven open) reduce commissioning costs.

Cost effective BACnet BMS integration.

Automatic heating and cooling change-over

MLM+ OPTIONS

Wall thermostat: Plug a wall stat into the interface card fitted to the diffuser. Provides sensing and setpoint adjustment.

Reverse change-over sensors can be provided as an option to ensure correct diffuser control when supply air changes from cooling to heating.

Electric heating can be provided as an option on each diffuser.

Airflow measurement is available for simplified electronic commissioning and controlling of flow maximum & minimum volumes, independent of neck pressure.

Cost effective *BACnet BMS integration* is possible using the MCU interface. This module can connect to four power supplies, providing a cost effective BACnet link for up to 60 diffusers at a time.

CAPITAL & OPERATING COST

WBD's are used in areas where restricted ceiling voids exist or where fully-covered ceilings are not available

MAINTENANCE

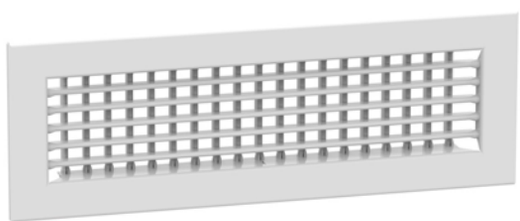
No regular maintenance is required.

The cartridge design allows easy removal if required.

Diffuser life cycle testing gives peace of mind far beyond our two year warranty period (Electronic diffuser range). Life cycle testing is based on 3000 operating hours and 4000 control cycles per year and is the equivalent of 30 years of service.

AESTHETICS

When installed, the only visible portion of the WBD is the Rickard linear bar grille. The grille is available as natural anodized or epoxy powder coated in a wide range colours to suit architectural requirements.



WARRANTY

Rickard offers a 2 year manufacturer's warranty on its Electronic VAV diffusers. Please see Terms and Conditions for a full description of our warranty.

SAFETY

Working plastic components are moulded in glass reinforced Makrolon – Makrolon is flame retardant and chlorine and bromine free when burnt. The Rickard Thermo-Disc and Electronic actuators are moulded in Makrolon and are UL Certified.

APPLICATION

The Rickard Variable Volume Wall Bulkhead Diffuser (WBD) is normally used in areas where restricted ceiling voids exist or where fully-covered ceilings are not available. The WBD, as the name implies, is intended to discharge supply air into the conditioned space from either a sidewall or bulkhead. Frequently building areas have dividing passage ways with ceiling heights lower than those within the areas requiring air conditioning. In this situation the supply air ducting may be run in the void between the passage ceiling and the slab above, with the WBD terminals regulating the supply air from the ducting. In many instances these ceiling voids may also serve as return air plenums.

The Rickard WBD has an excellent ability to distribute air across deep rooms as reflected by the throw data indicated in the selection ta-

bles. There are, however, instances where these throws are too great for a specific area & in which case, the rear horizontal deflection vanes will need to be adjusted.

When installed, the only visible portion of the WBD is the aesthetically pleasing Rickard linear bar grille. This grille may be supplied with a natural anodized finish or epoxy powder coated in a wide range of colours to suit architectural requirements.

OPERATION

Room temperature is intelligently controlled by varying the supply air volume in accordance with demand. The diffuser controller uses a proportional/integral response to achieve this. Volume control is achieved by opening or closing a set of aerodynamic damper blades using our patented electric stepper motor, so as to vary the aperture through which the supply air passes. 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 25%. By using our MLM+ Controls, maximum and minimum supply air volumes may be adjusted to suit the particular design conditions.

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 with the diffusers damper in the fully open position. A downward moving layer of air 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 know or measured is duct STATIC pressure.

Best results are obtained when diffusers are selected at pressures of 30-40Pa (0.12-0.16ins 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. 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.

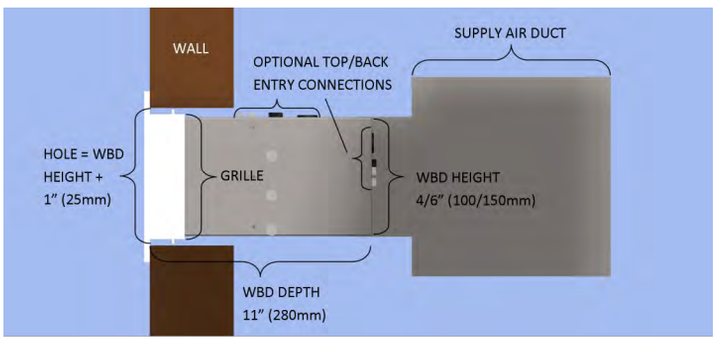
TYPES

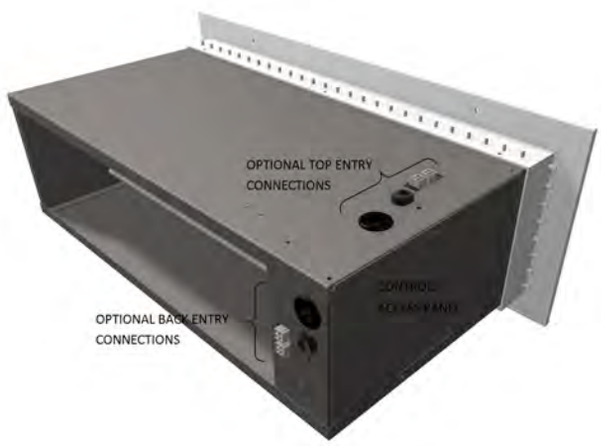
The Rickard Wall Bulkhead Diffuser are available in the following standard sizes:

	Length (mm)										
Height (mm)	300	350	400	450	500	550	600	650	700	750	800
100	x	x	x	x	x	x	x	x	x	·	·
150	·	·	·	·	x	x	x	x	x	x	x

Depending on the installation, WBD's are available with top or back entry cable connections. Top entry is used when there is access between the wall and the duct. Back entry is used when there is only access through the duct.

NOTE: Top Entry and Back Entry connections are separate options.





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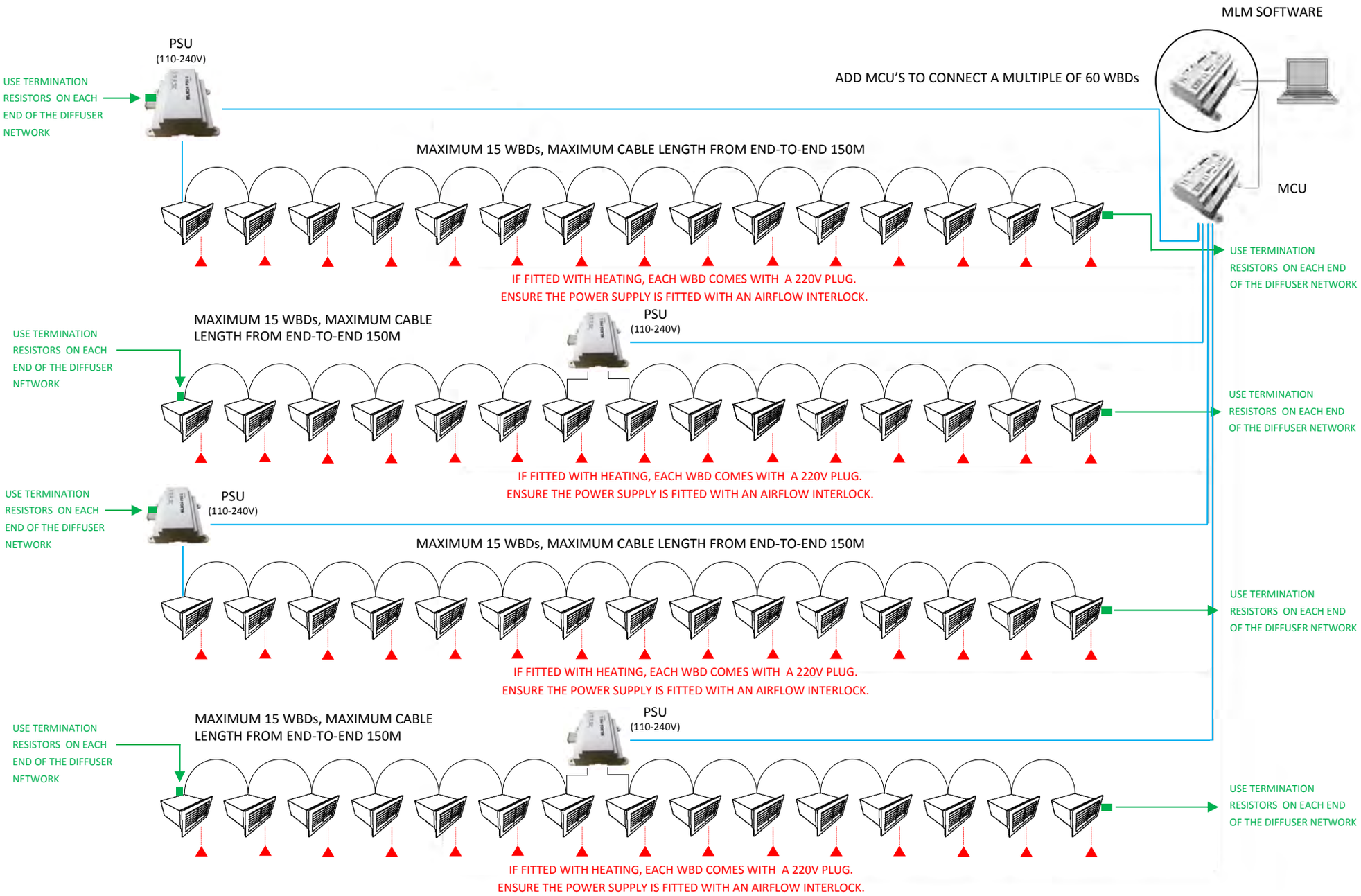
WALL BULKDEAD DIFFUSER (WBD)



WBD1

SIZE	READING	WBD ONBOARD SENSING STATIC PRESSURE (Pa)				WBD REMOTE SENSING STATIC PRESSURE (Pa)			
		20	30	40	50	20	30	40	50
300/100	FLOW l/s	58	75	90	95	73	90	102	116
	THROW(m) max/min	5.2	6.4	7.2/3.7	8.3/4.1	6.3/3.2	7.3/3.9	8.2/4.1	9.7/4.9
	NC LEVEL	28	32	36	38	29	33	37	39
350/100	FLOW l/s	80	102	113	122	98	117	132	145
	THROW(m) max/min	7.2/3.8	8.2/4.1	9.5/4.7	10.1/5.0	6.9/3.6	8.8/4.7	10.2/5.0	11/5.1
	NC LEVEL	29	33	37	39	29	33	36	38
400/100	FLOW l/s	100	130	149	155	116	138	149	164
	THROW(m) max/min	7.8/4.2	8.6/4.7	10/5.0	11/5.1	8.4/4.5	9.1/5.0	10/5.1	10/5.4
	NC LEVEL	29	33	36	38	29	33	36	39
450/100	FLOW l/s	105	140	153	160	130	153	169	192
	THROW(m) max/min	7.0/3.6	8.4/4.9	9.1/5.2	10.7/5.4	8.2/4.4	9.4/5.2	10.7/5.8	11.4/5.8
	NC LEVEL	29	33	37	39	29	34	36	39
500/100	FLOW l/s	110	144	162	170	132	161	182	208
	THROW(m) max/min	8.4/4.6	9.4/5.1	10/5.5	11/5.4	8.4/4.4	9.7/5.3	11/5.9	12/6.0
	NC LEVEL	29	34	37	39	30	34	38	40
550/100	FLOW l/s	120	156	185	200	149	175	202	219
	THROW(m) max/min	8.2/4.3	9.5/5.1	10.6/5.9	11.7/6.1	8.8/4.9	9.8/5.6	11.1/5.8	12.4/6.9
	NC LEVEL	30	34	38	40	30	34	38	40
600/100	FLOW l/s	135	178	205	229	166	194	219	247
	THROW(m) max/min	8.6/4.7	10/5.6	11/6.4	13/7.0	8.8/4.8	10/6.0	12/6.6	13/7.2
	NC LEVEL	30	34	38	40	30	33	38	41
650/100	FLOW l/s	160	215	252	275	180	218	247	277
	THROW(m) max/min	8.8/4.9	10.3/5.8	11.7/6.6	13/7.2	8.9/4.9	10.1/5.2	11.3/6.3	12.6/6.8
	NC LEVEL	30	33	38	41	30	34	39	41
500/150	FLOW l/s	165	219	258	292	199	240	301	335
	THROW(m) max/min	8.7/4.9	10/5.6	11/6.4	13/7.1	8.8/5.0	10/5.9	12/6.6	13/7.8
	NC LEVEL	30	35	39	41	30	35	39	41
550/150	FLOW l/s	190	250	288	302	223	267	309	346
	THROW(m) max/min	8.8/4.7	10.5/6.1	11.2/6.4	12.8/7.6	9.6/5.1	11.7/6.4	13.1/7.3	15/8.3
	NC LEVEL	30	34	38	41	31	35	39	41
600/150	FLOW l/s	215	263	304	340	260	307	356	390
	THROW(m) max/min	9.2/4.9	12/6.4	13/7.1	16/8.4	9.8/5.2	11/6.6	13/7.5	15/8.8
	NC LEVEL	31	35	38	41	31	35	39	41
650/150	FLOW l/s	230	300	350	370	267	329	378	410
	THROW(m) max/min	9.4/5.0	10.3/6.4	13/7.4	15/8.6	9.7/5.2	10.9/6.7	13.6/7.8	15.4/8.9
	NC LEVEL	32	35	39	42	32	35	39	42
700/150	FLOW l/s	267	329	378	410	288	352	407	455
	THROW(m) max/min	9.7/5.2	11/6.7	14/7.8	15/8.9	10/6.0	13/7.2	15/8.8	16/9.3
	NC LEVEL	32	35	39	42	32	35	39	42
800/150	FLOW l/s	305	373	431	482	329	403	465	520
	THROW(m) max/min	10/5.5	11/7.0	15/8.3	16/9.2	10/5.6	11/7.4	15/8.5	16/9.4
	NC LEVEL	32	35	39	42	32	35	39	42

Throw data is taken 25mm below the ceiling on a line through the centre of the diffuser with the volume control blades fully open & an air velocity of 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^{-5} Pa) and Sound Power Level (dBW re: 10^{-12} 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 require to be reset on site to compensate for actual site system pressures. Performance Data applies to Standard Air having a density of 1.2 kg/m3.

GENERAL

Rickard Diffusers can be fitted with Supply Air Sensors to measure the Temperature of the air supplied from the Air Handling Unit.

Rickard Controls Algorithm will ensure cooling and heating of the occupied space is maximized depending on the temperature of supply air.

The sensor is also called a Change-over sensor, since it can change the direction of control disc operation to maximize cooling or heating performance.

OPERATION

There are four Change Over modes that can be selected:

Default: Change between cold and hot supply mode when Supply Air reaches Room temp +/- 1°C band.

At Setpoint: Change between cold and hot supply mode when Supply Air reaches Setpoint +/- 1°C band.

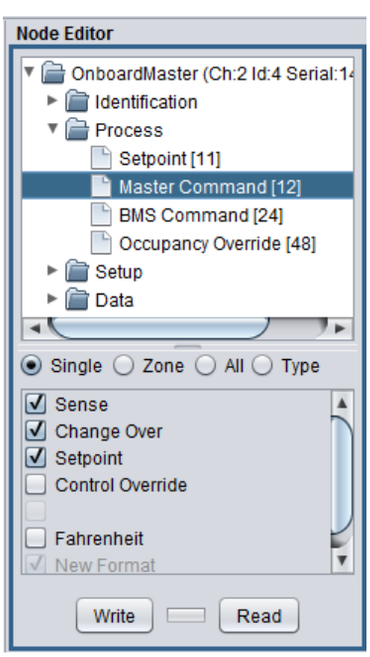
At Fixed Value: Change between cold and hot supply mode when Supply Air reaches the Fixed Value chosen +/- 1°C band.

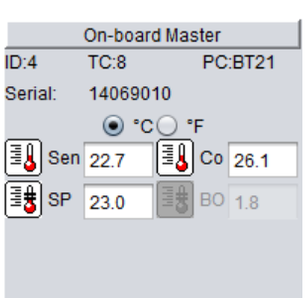
Heater Control: Change between cold and hot supply mode when Supply Air reaches the Fixed Value chosen +/- 1°C band.

The diffuser will keep the heater on even when the control disc opens towards fully open.

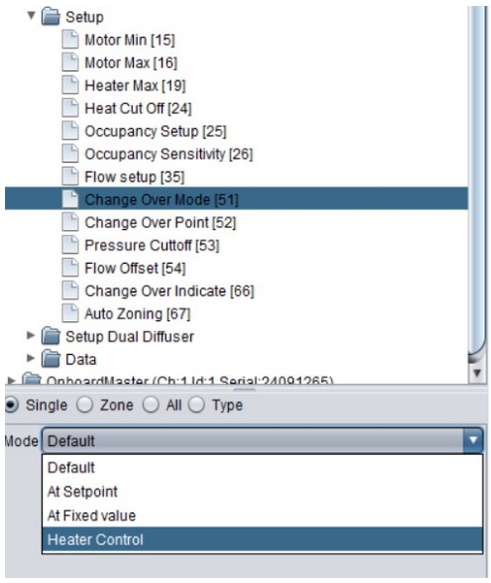
SETTINGS

Activate Change Over functionality under the OnBoardMaster/ Process/Master Command tag. When selected, the CO sensor value will be displayed in bold. **ONLY ACTIVATE ON ONE MASTER PER ZONE**

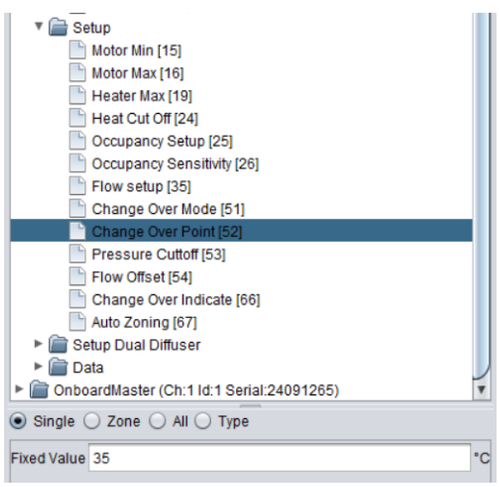




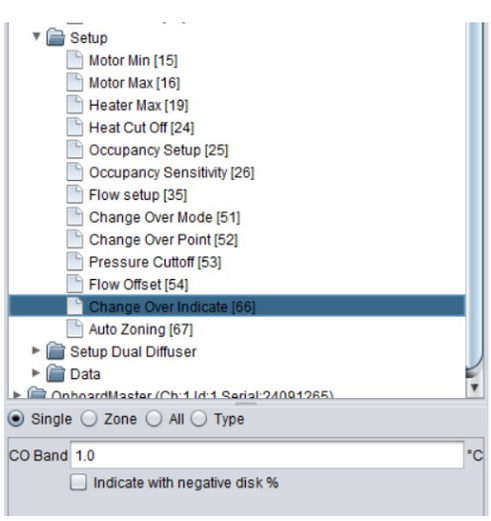
Activate Change Over mode under the Diffuser/Setup/Change Over Mode tag.



Enter Fixed Value Change Over Point under the Diffuser/Setup/ Change Over Point tag.



Changeover Band can be modified under the Diffuser/Setup/Change Over Indicate tag.



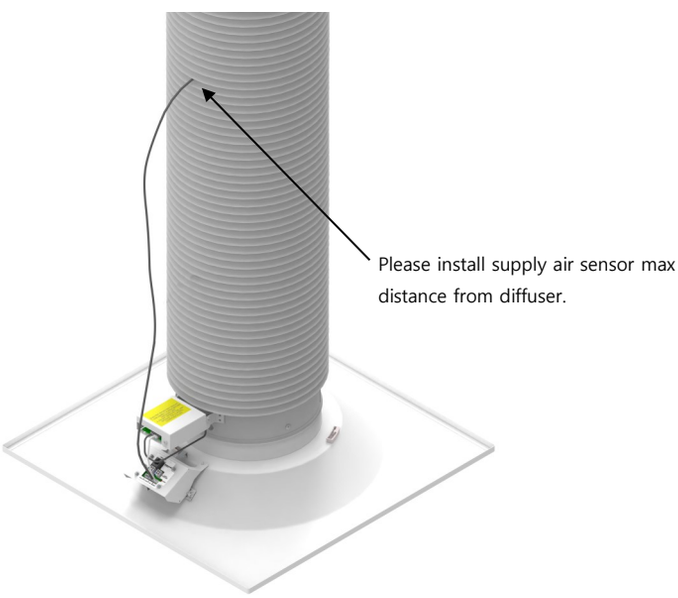
INSTALLATION

Converting a standard RICKARD master diffuser to incorporate changeover functionality is as simple as plugging in the supply air/ changeover temperature sensor and activating it using the software. Every master controller is pre-activated. This temperature sensor must be fitted in such a way that it senses the primary air temperature being supplied to the diffuser.

NOTE: Slave diffusers receive a control signal from the master diffuser and therefore do not require nor should they be fitted with a changeover sensor. It is also important that a slaves changeover sensing is turned off on the MLM application. Failure to do so will result in a zone not operating correctly. Only one changeover sensor should be activated per zone i.e. the master.

VCD1 Shown. Use the same connector on other models.

If a re-heater is fitted to the neck of the diffuser, care must be taken to ensure that, the changeover sensor is installed in such a way that it is not affected by radiant heat from the heater. Every changeover sensor is labeled "Please install supply air sensor max distance from diffuser" to ensure this.



VCD1 Shown. Always locate sensor away from heater when fitting to other models.

The controller compares the primary air and room temperature. Whenever the supply air temperature exceeds the room temperature by one degree Celsius, the control action is reversed and switches to heating mode. Cooling mode is re-instated when the primary air temperature falls one degree Celsius below room temperature.

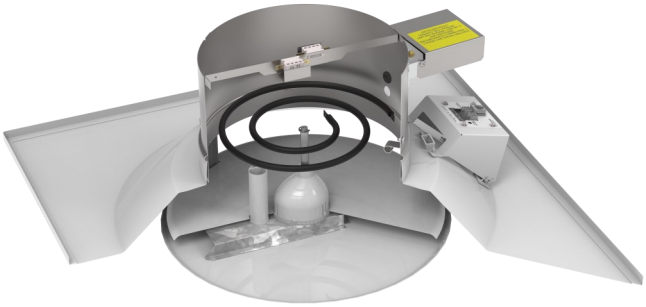
ENERGY EFFICIENCY

Should a VAV air diffusion unit be fitted with a re-heater, the heater will be proportionally energized between 0.5°C and 1.5°C below set-point temperature, regardless of which mode the controller is in. Effectively, a re-heater will only be energized at Minimum Supply Air Status when cold air is supplied from the AHU and at Maximum Supply Air Status when in Heating Change Over mode. This control logic is extremely energy efficient from a Green Building perspective.

FEATURES

FORM FACTOR

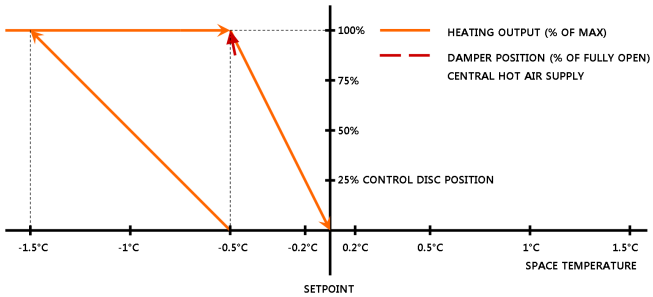
RICKARD diffusers are fitted with electric re-heaters that are either housed in a modular sleeve (VCD1, VSD1, CCD3, CSD3, VSW1, CSW, WBD's , CLN's and VLN's) or fitted directly to the unit (WBD, VLN). The heaters are energised when additional heating is required in a room.



VAV PLATE DIFFUSER FITTED WITH MODULAR HEATER SPIGOT

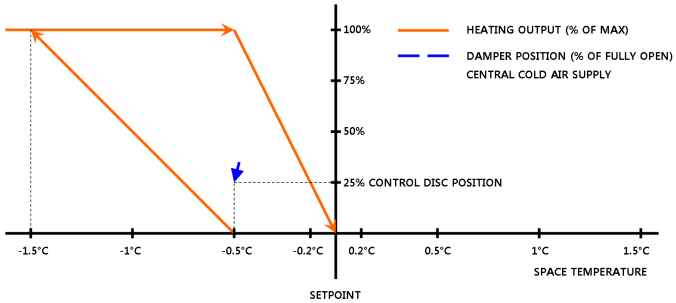
WBD WITH DEDICATED HEATER FITTED

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 toped 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 duct 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 occurred.

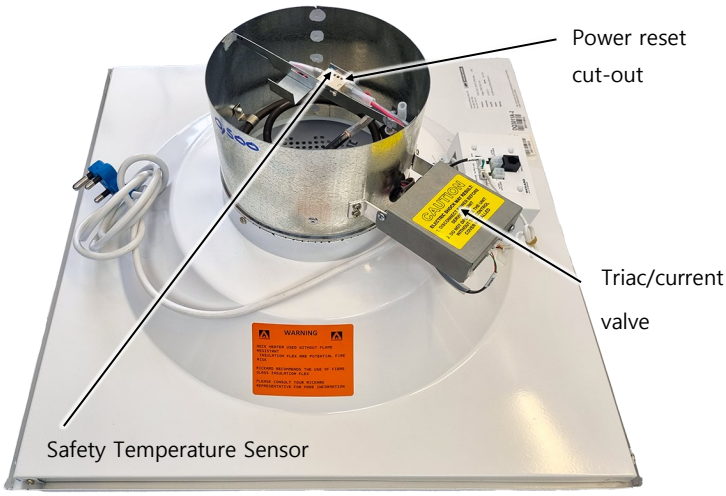
In some cases when no flow or very low flows occur in the ducting, it is necessary to limit the heaters output to avoid excessive heat build up in the diffuser. For this reason the triac is fitted with a temperature sensor and controls to limit the triac so that the supply air exiting the diffuser never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

As an added safety a power-reset 85°±5°C or 185±9°F (3000 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.

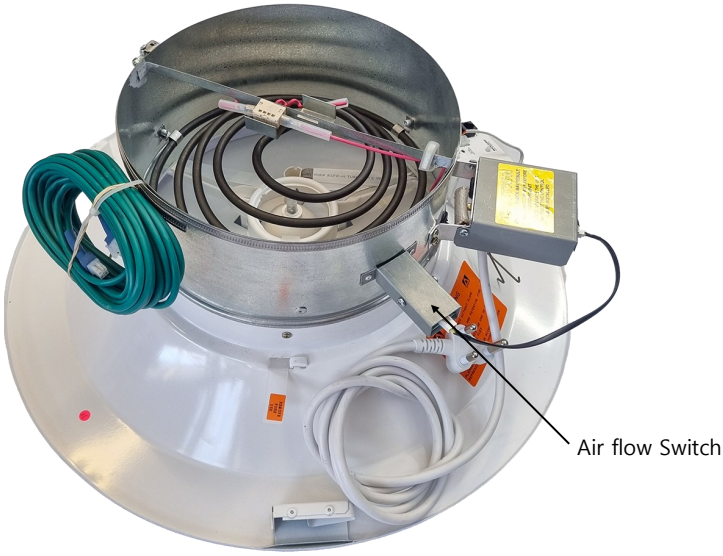
For additional safety, RICKARD offer an Airflow Switch to interrupt power to the re-heater controls when there is insufficient airflow across the heater element. The switch is calibrated to disable the heater current valve below a static pressure of 12Pa (+/- 5Pa).

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.

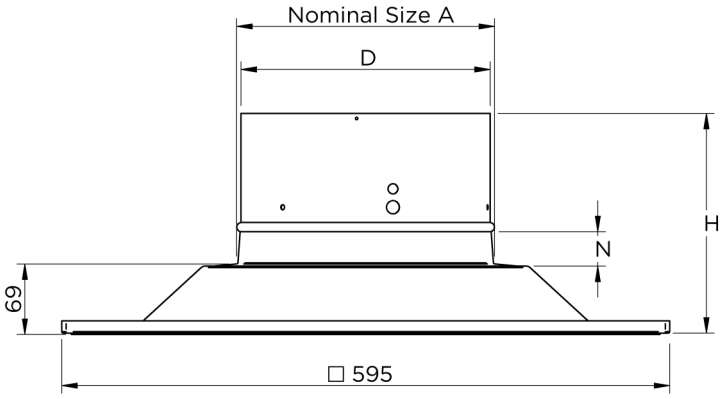
INSTALLATION GUIDELINES

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.



NOMINAL SIZE A	NECK DIAMETRE Ø D (mm)	NECK HEIGHT Ø N (mm)	OVERALL HEIGHT Ø H (mm)
150	148	26	211
200	195	32	217
250	244	32	217
300	287	35	220
350	337	40	225

VCD	Max Heater Size for each neck extension height or heater type *																			
	Pa		20			30			40			50			60			70		
	Diffuser Neck Extension Height/ Type *		145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *
	Heater Size		kW			kW			kW			kW			kW			kW		
	VCD Neck Size (mm)	150	0.25	n/a	0.25	0.25	n/a	0.25	0.5	n/a	0.5	0.5	n/a	0.5	0.5	n/a	0.5	0.5	n/a	0.5
		200	0.5	n/a	0.5	0.75	n/a	0.75	0.75	n/a	0.75	0.75	n/a	0.75	1	n/a	1	1	n/a	1
		250	0.75	n/a	0.75	1	n/a	1	1	n/a	1	1.25	n/a	1.25	1.25	n/a	1.25	1.25	n/a	1.25
		300	1	n/a	1	1.25	n/a	1.25	1.5	n/a	1.5	1.5	n/a	1.5	1.5	n/a	1.5	2	n/a	2
		350	1.25	n/a	1.25	1.5	n/a	1.5	1.5	n/a	1.5	1.5	n/a	1.5	2	n/a	2	2.5	n/a	2.5

VSW	Max Heater Size for each neck extension height or heater type *																		
	Pa		30			40			50			60			70		
	Diffuser Neck Extension Height/Type *		145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *
	Heater Size		kW			kW			kW			kW			kW		
	VSW Neck Size (mm)	150	0.25	n/a	0.25	0.25	n/a	0.25	0.5	n/a	0.5	0,5	n/a	0,5	0.5	n/a	0.5
		200	0.5	n/a	0.5	0.75	n/a	0.75	0.75	n/a	0.75	0.75	n/a	0.75	0.75	n/a	0.75
		250	0.75	n/a	0.75	1	n/a	1	1	n/a	1	1.25	n/a	1.25	1,25	n/a	1,25
		300	1	n/a	1	1.25	n/a	1.25	1.25	n/a	1.25	1,5	n/a	1,5	1.5	n/a	1.5

* Other: In-line Heater/Side Entry Plenum.

The largest heater shown for each neck size creates a heat rise of +/- 15°C when the damper closes down to minimum position i.e. the diffusers default minimum position is set to supply 30% air volume when the heaters are activated. If the diffusers minimum is reduced a larger heat rise will result.

	Max Heater Size				
	Pa	20	30	40	50
	Size (mm)	kW			
WBD	300/100	0.25	0,5	0.5	0.5
	350/100	0.5	0.5	0.75	0,75
	400/100	0.5	0,75	0.75	0.75
	450/100	0.75	0.75	0.75	1
	500/100	0.75	0.75	1	1
	550/100	0,75	1	1	1.25
	600/100	0.75	1	1.25	1,25
	650/100	1	1	1,25	1.5
	500/150	1	1,25	1.5	1.5
	550/150	1.25	1.25	1.5	1.5
	600/150	1.25	1.5	1.5	2
	650/150	1.25	1.5	2	2
	700/150	1.25	1.5	2	2.5
	800/150	1,75	2	2,5	2,5

	Max Heater Size						
	Pa		30	40	50	60	70
	Heater Size		kW				
VLN1 2 Slot	Track Length	600mm	0.25	0.25	0.5	0,5	0.5
		900mm	0.5	0.75	0.75	0.75	0.75
		1200mm	0.5	1	1	1.25	1,25
		1500mm	0.75	1.25	1.25	1,5	1.5

The largest heater shown for each neck size creates a heat rise of +/- 15°C when the damper closes down to minimum position i.e. the diffusers default minimum position is set to supply 30% air volume when the heaters are activated. If the diffusers minimum is reduced a larger heat rise will result.

	Max Heater Size for each neck extension height or heater type																			
	Pa		20			30			40			50			60			70		
	Diffuser Neck Extension Height/ Other Type *		145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *
	Heater Size		kW			kW			kW			kW			kW			kW		
CCD	CCD Neck Size (mm)	150	0.5	1	1.25	0.5	1	1.5	0.5	1	1.5	0.5	1	2	0.5	1	2	0.5	1	2
		200	1	1.5	1.5	1	1.5	2	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5
		250	1	1.5	2	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5	1	1.5	2.5
		300	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
		350	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

	Max Heater Size for each neck extension height or heater type																			
	Pa		20			30			40			50			60			70		
	Diffuser Neck Extension Height/ Other Type *		145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *	145 mm	200 mm	Other *
	Heater Size		kW			kW			kW			kW			kW			kW		
CSW	CSW Neck Size (mm)	150	0.5	0.75	0.75	0.5	0.75	0.75	0.5	0.75	1	0.5	0.75	1	0.5	0.75	1	0.5	0.75	1.25
		200	1	1.25	1.25	1	1.25	1.25	1	1.25	1.5	1	1.25	1.5	1	1.25	2	1	1.25	2
		250	1.25	1.5	1.5	1.25	2	2	1.25	2	2	1.25	2	2.5	1.25	2	2.5	1.25	2	2.5
		300	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

* Other: In-line Heater/Side Entry Plenum.

Orange cells indicate In-line Heaters/Side Entry Plenums that require 2 heater elements and 2 triacs.

The largest heater shown for each neck size creates a heat rise of +/- 10°C when the damper is 100% open. A heat rise of >10°C will occur when damper positions are less 100% open.