

SmartAire T

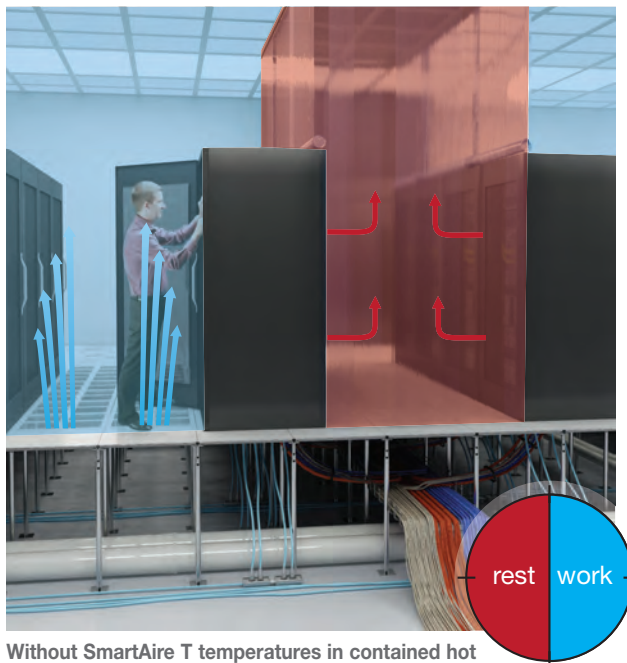
Increase Productivity with Longer Access to Hot Aisle Containment Systems

SmartAire T is designed to provide IT technicians the ability to control the temperature of the hot aisle when access to service equipment is required. Before the tech enters the hot aisle the units are activated by a user supplied trigger. Once powered on the units allow cool plenum air to enter the hot aisle until the predetermined safe working temperature is established. Once the temperature is reached the tech can comfortably work in the contained aisle without breaks until they have completed their tasks, the SmartAire T units will maintain this temperature until the units are deactivated by the technician.

OSHA exposure limits for working environments indicate a certain ratio of rest and work when working in high temperatures. These regulations may suggest periods of rest that limit the amount of time a person can work. Further to the limitations provided by OSHA it is important to create a comfortable working environment as some individuals may have a lower tolerance to heat. By using SmartAire T daisy chained to SmartAire C units in a primary/secondary configuration all the dampers in the aisle will automatically modulate together to quickly reduce the temperature allowing for maximum productivity by all employees.

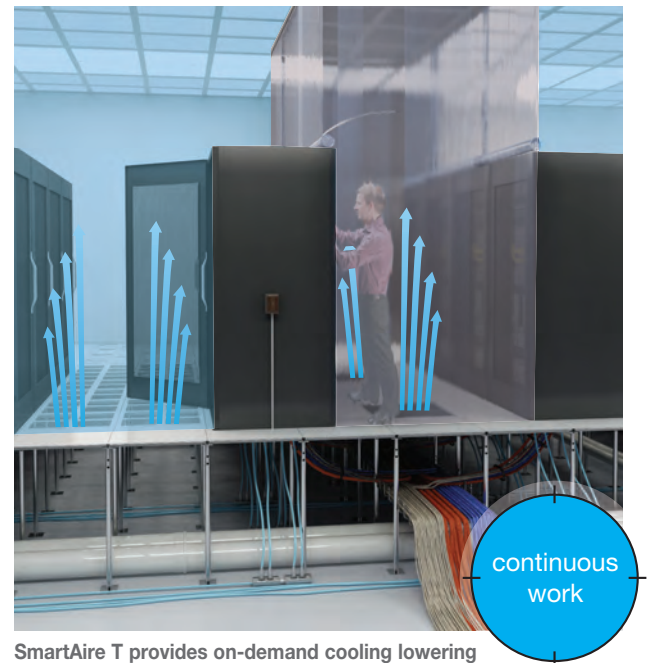


Containment Limits Time Spent in the Hot Aisle



Without SmartAire T temperatures in contained hot aisles can exceed acceptable working conditions and limit the amount of time a technician can safely work on equipment in the aisle.

Work Continuously in the Hot Aisle with SmartAire T



SmartAire T provides on-demand cooling lowering temperatures in a contained hot aisle allowing the technician to safely work on equipment in the aisle for an extended period of time.

SmartAire T

Application Example

| OSHA Exposure Limits for Working Environment Temperature* | | | |
|---|-----------------------|--------------------------|-----------------------|
| Work/Rest Ratio (hourly) | Light Work (Max WBGT) | Moderate Work (Max WBGT) | Heavy Work (Max WBGT) |
| Continuous | 86F/30C | 80F/26.7C | 77F/25C |
| 45 Minutes Work - 15 Minutes Rest | 87F/30.6C | 82F/27.8C | 78F/25.6C |
| 30 Minutes Work - 30 Minutes Rest | 89F/31.7C | 85F/29.4C | 82F/27.8C |
| 15 Minutes Work - 45 Minutes Rest | 90F/32.2C | 88F/31.1C | 86F/30C |

| Airflow SmartAire T / DirectAire | | |
|----------------------------------|------------------------|----------------------|
| Static Pressure | SmartAire T (CFM@100%) | SmartAire T (CFM@0%) |
| 0.02 | 945 | 51 |
| 0.04 | 1313 | 73 |
| 0.06 | 1592 | 91 |
| 0.08 | 1824 | 106 |
| 0.10 | 2026 | 119 |

*OSHA Technical Manual Section III: Chapter 4

The example below is based on the adjacent diagram.

Given:

The two rows of IT equipment are equipped with hot aisle containment. Each rack has an installed load of 9kW, for a total pod load of 144kW. The hot air from the servers entering the contained hot aisle is 115.5F DB / 75.2 WB. The total air volume entering the aisle is 797 CFM per rack, or a total of 12,752 CFM. The underfloor air temperature is 80.0F DB / 65.8 WB at 0.10" of H2O static pressure. The current WBGT without using the SmartAire T is calculated to be 87.3F. (WBGT = 0.7 x 75.2 + 0.3 x 115.5 = 87.3) The user would like to allow for continuous moderate work.

Solution:

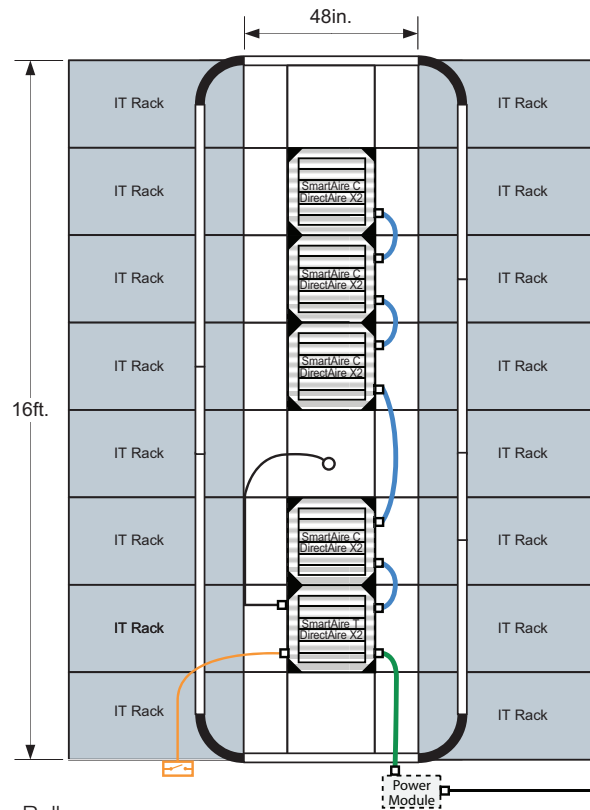
A simple ratio of the dry bulb temperatures can be used to determine the total CFM required to be delivered into the hot aisle to bring the temperature below the threshold required by OSHA. Continuous work requires a WBGT of less than 80F due to the moderate work load expected in the hot aisle. To solve for this, we create the following:

Equation For Data Centers: WBGT = 0.7 x Wet Bulb + 0.3 x Dry Bulb

$$80^{\circ}\text{F WBGT} = 0.7 \times \left(75.2^{\circ} \times \frac{(12752 \text{ CFM})}{\text{Total CFM}} + 65.8^{\circ} \frac{\text{Total CFM} - 12752 \text{ CFM}}{\text{Total CFM}} \right) + 0.3 \times \left(115.5^{\circ} \times \frac{(12752 \text{ CFM})}{\text{Total CFM}} + 80.0^{\circ} \frac{\text{Total CFM} - 12752 \text{ CFM}}{\text{Total CFM}} \right)$$

Solving for the equation above, we find that the total CFM required to be delivered into the hot aisle is 22,104 CFM. Of this, only 9,352 CFM is required from the SmartAire T units, given the 12,752 CFM from the servers. The airflow chart above shows that we need five SmartAire T's to reach the 80° WBGT in this example making the bill of materials:

- 1-SmartAire T
- 4-SmartAire C
- 5-DirectAire X2 Airflow Panels
- 1-16 Power Module
- 5-6' Power Cable



The user would be required to provide the hot aisle entrance signal, in this case a latching entrance switch has been chosen to signal to the SmartAire T to begin temperature control of the hot aisle.