

TAVAN SARMA

Cooling System Solutions for Sensitive Centers



Cool Unit hdC
High Density Cooling
up to 36kW



Introduction of Tavan Sarma Group

In line with the self-sufficiency of the Iranian industry, Tavan Sarma started manufacturing packaged air conditioning units for sensitive centers such as digital telecommunication centers and computer centers in 1994.

Considering the sensitivity of these centers and the need to meet the required standards, the company, in cooperation with a well-known American company and with the support of 25 years of experience in this field and a customer service representative of the said company, made every effort to ensure that the units were manufactured and operated in compliance with technical specifications and with high quality and efficiency.

Due to the increasing heat generation in data centers and expanding the use of high-density servers, Tavan Sarma has become the first company in Iran to enter the field of providing advanced cooling systems (Coolrow) by obtaining an exclusive representation from a well-known European company and is proud to be the first company to install and operate this type of cooling systems in sensitive centers in Iran.

Considering Tavan Sarma Group's history in manufacturing cooling systems in Iran, this company received the original manufacturer's approval in 2008 to start production in Iran in the form of CKD. The progress and industrial development of the Islamic Republic of Iran, the development of domestically manufactured products with global quality, and the sense of responsibility in supporting data centers are among the most important goals of this group.

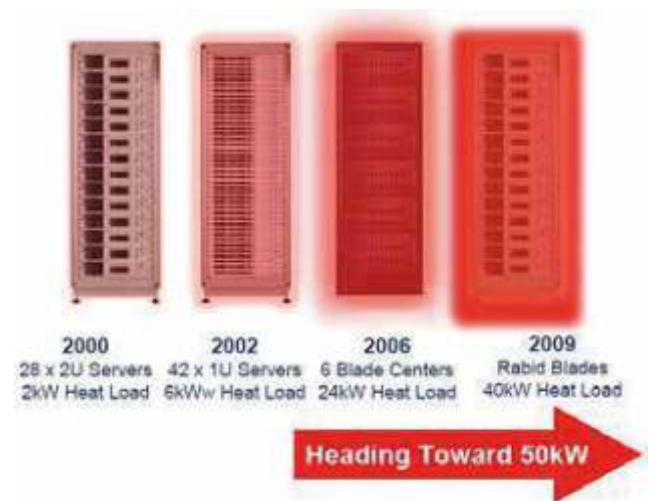
Direct communication with the leading companies in the data center industry and more than 25 years of experience in developing and implementing data center infrastructures in most companies, as well as providing complete solutions with a view to all parts of the physical layer of data centers, are the main pillars of providing services to customers.

The necessity of using Coolrow cooling systems

As average power consumption and heat generation in data center racks tend to increase, cooling systems based on raised floors are no longer able to handle this amount of heat and provide the necessary cooling.

The use of Coolrow cooling systems allows power consumption and heat generation of up to 36 kW and almost 10 tons of refrigeration for one rack.

As a result, all data centers under construction or data centers with high-consumption equipment, such as blade servers or servers with a high number of processors, now choose this method as the main solution for their cooling system.

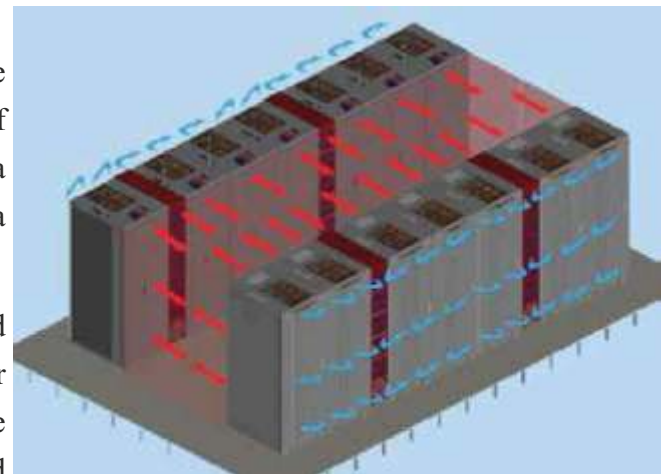


Introduction of the chilled water Coolrow

The creativity of the Coolrow design is that it minimizes the distance between the heat source and the heat collector. This type of cooling system consists of a series of fans, heat exchangers, and a control system. The refrigerant of this system is water or a combination of water and glycol and is fed by a central chiller.

The cooling units on site have a width of 30 cm and are placed between the racks. They draw in the hot air as it leaves the rear opening of the racks, then cool it and blow it to the front of the racks. In this way, the distance between the cooling production and the place where it is needed is very short, which increases the efficiency of the system.

In addition, the heat generated by the servers after they leave the back of the rack is quickly absorbed by this system, and the possibility of mixing hot and cold air is very low.



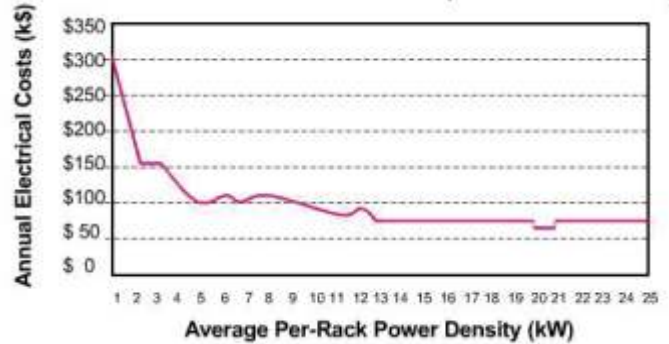


Reduction of energy consumption

Coolrow is offered with three capacities of 17, 36, and 62 kW. This system can provide the required cooling of racks up to 36 kW with a water inlet temperature of 12°C, an air outlet temperature of 22°C, and an air volume of up to 5000 CFM.

The use of Coolrow reduces energy consumption compared to other methods and products for the following reasons:

- 1- 30% less power consumption compared to similar methods
- 2- Reduction in generator capacity and required input power
- 3- Increase in free cooling mechanism operating hours
- 4- No need for a humidifier in many areas

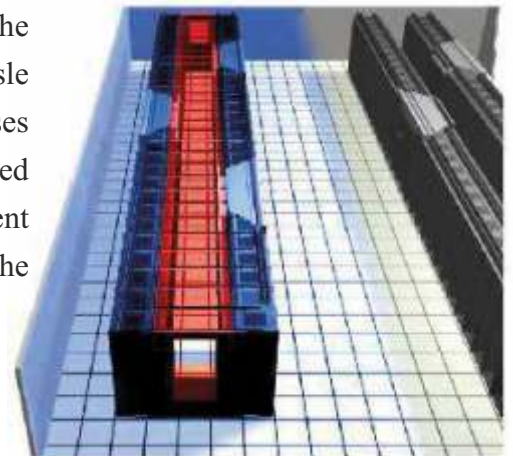


Installation methods

In addition to the fact that this product can be easily placed next to most racks in the data center and works with the mentioned mechanism, it is possible to use complementary systems as follows.

1- Hot or cold aisle containment

To prevent the mixing of hot and cold air and energy loss, the supplementary system of hot aisle containment can be used. The hot aisle with a glass roof and doors at the beginning and end completely encloses the space between the two rows of racks, so that this space is isolated from the outside world. In this way, the hot air is in a closed environment and the only way out is through the cooling systems installed between the racks.



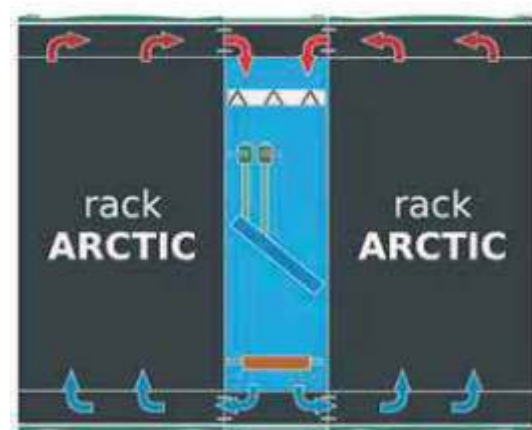
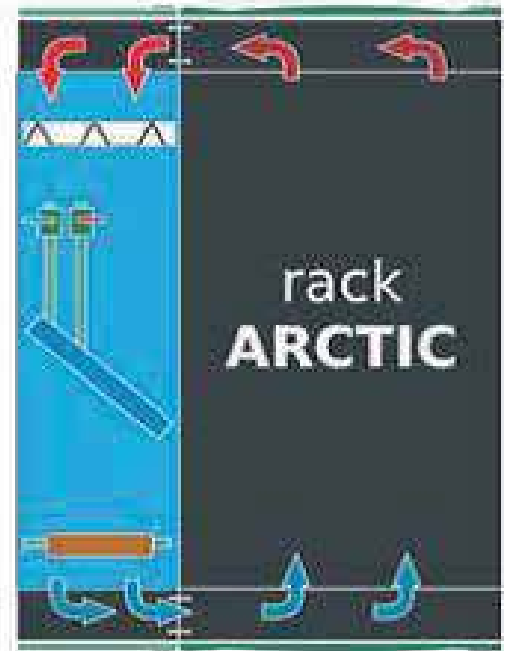
2- In rack hot channel

In this method, by increasing the depth of the racks, a hot channel and a cold channel are created in the front and behind the racks, and Coolrow is placed specifically for one or two racks. The cooling system draws the hot air from the servers through this channel and directs the cold air to the front of the racks through another channel.

This type of implementation is often used in data centers that only need to increase capacity for a limited number of racks.

The proposed layouts using the channel are as follows:

- Considering a dedicated Coolrow for each rack and the possibility of generating up to 36 kW of cooling capacity for each rack
- Considering one Coolrow for two racks and the possibility of generating up to 18 kW of cooling power for each rack
- Considering two Coolrows for one rack and possible power consumption of up to 72 kW for each rack

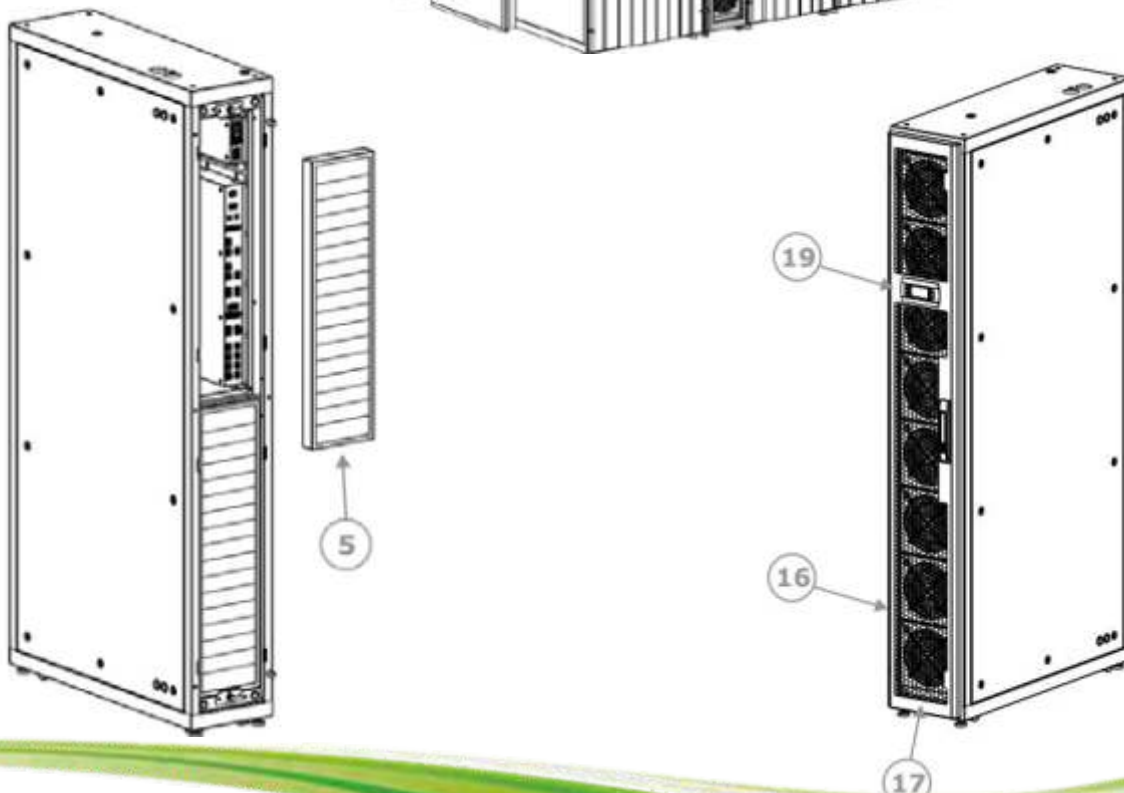
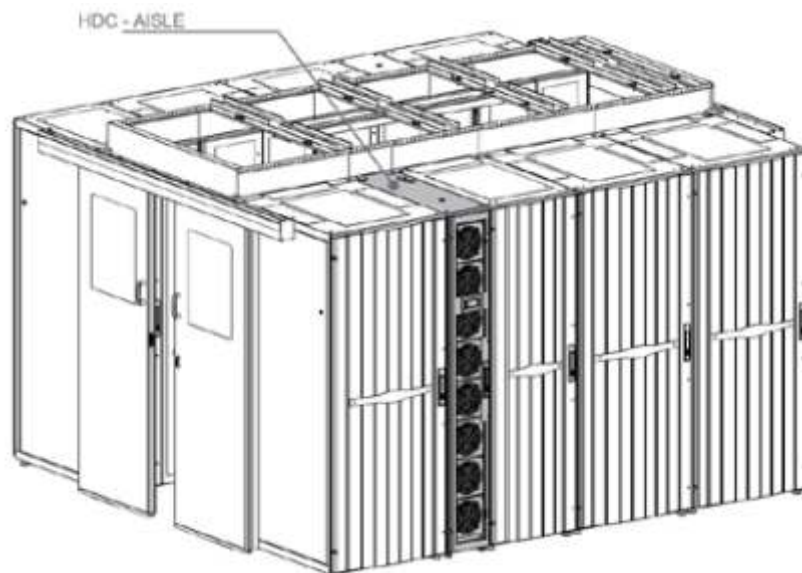
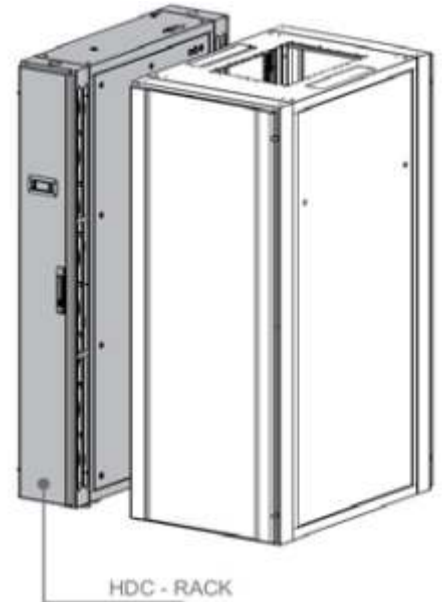




Mechanical Features

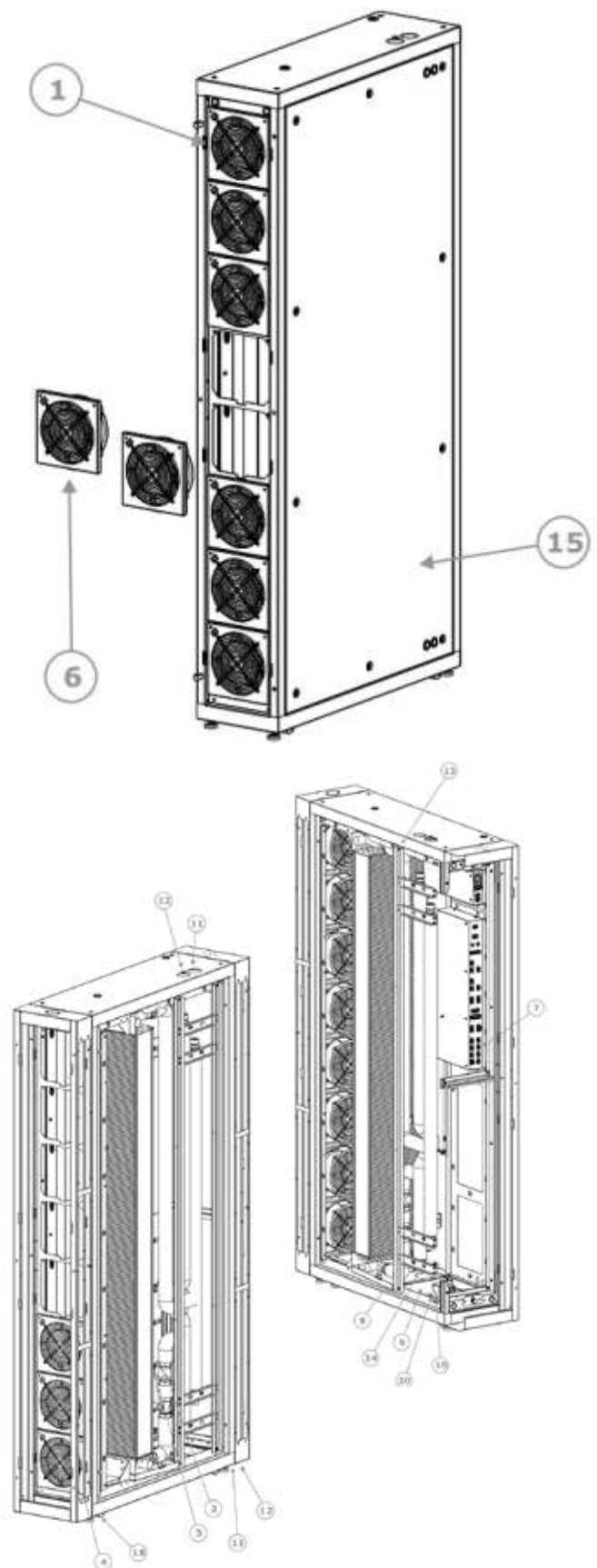
The mechanical features of Coolrow are as follows

- Compatible with standard data center racks, does not take up rack space
- Can be installed on pre-installed racks
- Can be implemented as an aisle or channel installation method
- The ability to change the layout



Functional features (internal components)

1. 8 fans with the possibility to adjust the speed from 30 to 100% according to the heat load
2. 3-way gradual valve
3. Internal bypass
4. Cooling distribution at the height of the rack
5. Replaceable filters during operation
6. Replaceable fans during operation
7. Replaceable sensors in the hot aisle
8. Coil condensate drain pan
9. Second pan for leak detection
10. Condensate pump
11. Input and output pipes
12. Adjustable brush cover at the entrance of the pipes
13. Air valve
14. Drain valve
15. Enclosing panels with thermal insulation
16. Door with security lock and possibility to install an access control system based on card and code (optional)
17. Steel plate with an open section of 81%
18. Adjustable base
19. Control screen with keypad
20. Leakage sensor





Control and management functions

The supplied cooling system has sensors for temperature, humidity, leakage, etc., which can collect data and provide it to the data center managers via the control panel of the unit or via the network using IP protocol. In addition, the cooling systems can generate alerts for data center management based on the data received from the sensors. The results of these alerts are displayed via the unit's control panel, the network, or in audible and visual forms.

The control functions of the proposed cooling system are as follows:

- 1-Reception of the readings acquired by the sensors
- 2-Verification of the readings and activation of the required alarms
- 3-Temperature control on the front of the rack
- 4-Display the data on the front panel and the Network
- 5-Possibility of connection to the network and data transmission
- 6-Possibility of defining the conditions for the inlet and outlet temperature
- 7-Possibility of defining the fan mode, the water mode, the valve mode, and the emergency mode
- 8-Log the events with the date and time
- 9-Management of the alarms

Display features of control boards are as follows

- 1- Display the humidity status of the site
- 2- Display the status of the humidifier and dehumidifier
- 3- Display the cold status
- 4- Display the status of the fans
- 5- Display the temperature and humidity set in the package and the possibility of accessing them (modifying them)
- 6- Display the name and number of the group in which the package is located
- 7- Display the set parameters related to the network
- 8- Display and recording of the status of alarms in a general and integrated form
- 9- Display of the working hours of the system components in hours and minutes
- 10- Possibility of using the software in small and large networks



Introduction of Direct Expansion (DX) Coolrow

In addition to manufacturing water-based Coolrows, this company has also been producing Direct Expansion (DX) Coolrows with the following features since 2019:

Technologies used

Today, reducing the cost of energy consumption in sensitive centers is one of the main objectives of system designers. In this respect, one of the main objectives of the development of the IS cooling system was to use technologies that offer the lowest power consumption, the highest efficiency, and the highest reliability ratio, and at the same time maintain the main applications of this device.

- R410 refrigerant
- Use of scroll compressors
- Electronic expansion valve (EEV)
- Humidifier
- Touch screen keyboard and display



Electronic expansion valve (EEV)

The use of this type of valve allows the manufactured equipment to always be at the cutting edge of cooling system technology. This innovation allows very precise electronic control of the refrigerant flow in the circuit, resulting in greater efficiency and optimal use of the capacity of the unit.

Since this valve is controlled directly by the microprocessor, with the precise control of superheat we increase the COP of the unit in conditions where the outside temperature is low, and therefore the system operates with a much lower condensing pressure than the old mechanical valves.

The use of these types of valves also allows the dehumidification of the system without air volume reduction.





Values and features

- Precision and reliability
- High utilization factor
- Various models
- Reducing energy consumption
- Compact
- Intelligent control system
- Possibility of control and monitoring via network
- High efficiency
- Eco-friendly
- Use of inverters for energy saving
- Use of centrifugal fans for higher CFM



Continuous operation

TS cooling systems can operate 24/7/365 without interruption and in all ambient conditions, from dry to humid and from -20°C to $+53^{\circ}\text{C}$, and to regulate humidity in any room.



99.99 Precise control

As the name of this type of system suggests, it is equipped with a special microprocessor and can produce cooling and humidity with a high precision of up to 0.1°C .

Control and monitoring

The microprocessor embedded in this system offers the possibility to connect to all control and monitoring networks through SNMP and Modbus protocols. The application software of the system can be installed on the central computer, and in this application, the cooling systems of a center can be controlled and monitored in an integrated and graphical way.



Table of the capacity of the Coolrow cooling systems - Chilled Water Coolrow

Chilled Water Precision Air Conditioner - Coolrow			
Model	TS17FS	TS36FS	TS62FS
Type of Blower Fan		Axial	
Air Flow Fate (CFM)	2000	2500	5900
Air Flow Rate (m ³ /h)	3400	4250	10000
Number of Fans	6	8	4
Total Capacity (kW)	17	36	62
Inlet Water Temp (°C)	7	7	7
Max Inlet Pressure (bar)	5	5	5
Required Water Flow Rate (l/s)	1	1	2.9
Dimension (L*D*H) (cm)	200*100*30	200*100*30	200*100*60
Weight (kg)	200	250	380
Power Supply (V-Hz-A)	220-50-4	220-50-6	220-50-6

TS: Tavan Sarma Group

FS: Front Side





Table of the capacity of the Coolrow cooling systems - DX Coolrow

Refrigerant	R410		
Model	TSDXR10(BS)	TSDXR20(BS)	TSDXR40(BS)
	TSDXR10(FS)	TSDXR20(FS)	TSDXR40(FS)
Total Capacity (kW)	10	20	40
Sensible Capacity (kW)	9	18.5	36
Type of Blower Fan	Backward	Backward	Backward
Expansion Valve	Electronic	Electronic	Electronic
Air Flow Rate (CFM)	2200	3000	5000
Air Flow Rate (m ³ /h)	3737	5100	8500
Number of Fans	4	5	4
Number of Refrigeration Cycles	1	1	1
Number of Compressors	1	1	1
Power Supply (V-Hz-A)	380-50-13	380-50-22	380-50-30
Dimension (L*D*H) (cm)	200*107*30	200*107*30	200*120*60
Weight (kg)	180	220	320
Number and Type of Condensers (46°C)	1*ACC4	1*ACC6	1*ACC10
Number and Type of Condensers (49°C)	1*ACC6	1*ACC8	1*ACC12

DX: Direct Expansion

R: Coolrow

FS: Front Side

BS: Beside

Return air temperature: 25°C

RH: 35%

Table of the capacity of the Coolrow inverter-equipped cooling systems - DX Coolrow

Refrigerant	R410									
Model	TSDXR20i(BS)					TSDXR40i(BS)				
	TSDXR20i(FS)					TSDXR40i(FS)				
Capacity	30%	40%	60%	80%	100%	30%	40%	60%	80%	100%
Total Capacity (kW)	6.6	8.4	13.1	17.5	21.5	14.	18.5	24	34	41.5
Sensible Capacity (kW)	4.77	7.6	12.96	16.4	20	13.5	17.8	25.2	33.1	40
SHR	0.92	0.9	0.98	0.93	0.94	0.95	0.95	0.95	0.97	0.96
Total Input Power (kW)	3.3	4	5.5	7	8.4	4	4.8	6.5	9	13
EER	2	2.1	2.38	2.5	2.55	3.5	3.8	3.68	3.7	3.19
Type of Blower Fan	Backward					Backward				
Expansion Valve	Electronic					Electronic				
Air Flow Rate (CFM)	3000					5000				
Air Flow Rate (m ³ /h)	5100					8500				
Number of Fans	5					4				
Number of Refrigeration Cycles	1					1				
Number of Compressors	1					1				
Power Supply (V-Hz-A)	380-50-22					380-50-30				
Dimension (L*D*H) (cm)	200*107*30					200*120*60				
Weight (kg)	220					320				
Number and Type of Condensers (46°C)	1*ACC6					1*ACC10				
Number and Type of Condensers (49°C)	1*ACC8					1*ACC12				

DX: Direct Expansion

R: Coolrow

FS: Front Side

BS: Beside

Return air temperature: 25°C

RH: 35%

i: inverter



Table of the capacity of the Cooside cooling systems - DX Coolside

Refrigerant	R410		
Model	TSDXR10(BS)	TSDXR20(BS)	TSDXR40(BS)
	TSDXR10(FS)	TSDXR20(FS)	TSDXR40(FS)
Total Capacity (kW)	10	20	40
Sensible Capacity (kW)	9	18.5	36
Type of Blower Fan	Backward	Backward	Backward
Expansion Valve	Electronic	Electronic	Electronic
Air Flow Fate (CFM)	2200	3000	5000
Air Flow Rate (m ³ /h)	3737	5100	8500
Number of Fans	4	5	4
Number of Refrigeration Cycles	1	1	1
Number of Compressors	1	1	1
Power Supply (V-Hz-A)	220-50-6	220-50-8	220-50-10
Dimension (L*D*H) (cm)	200*107*30	200*107*30	200*120*60
Weight (kg)	140	170	240
Number and Type of Condensers (46°C)	1*ACC20	1*ACC20	1*ACC40

DX: Direct Expansion

R: Coolrow

FS: Front Side

BS: Beside

Return air temperature: 25°C

RH: 35%

**Tavan Sarma chilled water InRows in 17, 36,
and 62 kW cooling capacities**

Tavan Sarma Group
Data Center Cooling Solution



Tavan Sarma DX InRows in 20
and 40 kW cooling
capacities – inverter-equipped



**Tavan Sarma DX InRows in
20 and 40 kW cooling capacities – inverter-equipped**

Table of the capacity of the Coolside inverter-equipped cooling systems - DX Coolside

Refrigerant	R410									
	TSDXR20i(BS)					TSDXR40i(BS)				
Model	TSDXR20i(FS)					TSDXR40i(FS)				
Capacity	30%	40%	60%	80%	100%	30%	40%	60%	80%	100%
Total Capacity (kW)	6.6	8.4	13.1	17.5	21.5	14.	18.5	24	34	41.5
Sensible Capacity (kW)	4.77	7.6	12.96	16.4	20	13.5	17.8	25.2	33.1	40
SHR	0.92	0.9	0.98	0.93	0.94	0.95	0.95	0.95	0.97	0.96
Total Input Power (kW)	3.3	4	5.5	7	8.4	4	4.8	6.5	9	13
EER	2	2.1	2.38	2.5	2.55	3.5	3.8	3.68	3.7	3.19
Type of Blower Fan	Backward					Backward				
Expansion Valve	Electronic					Electronic				
Air Flow Fate (CFM)	3000					5000				
Air Flow Rate (m ³ /h)	5100					8500				
Number of Fans	5					4				
Number of Refrigeration Cycles	1					1				
Number of Compressors	1					1				
Power Supply (V-Hz-A)	220-50-8					220-50-10				
Dimension (L*D*H) (cm)	200*107*30					200*120*60				
Weight (kg)	170					240				
Number and Type of Condensers (46°C)	1*ACC20					1*ACC40				

DX: Direct Expansion

R: Coolrow

FS: Front Side

BS: Beside

Return air temperature: 25°C

RH: 35%

i: inverter

Condenser Specifications – Coolrow Type

Model	ACC4	ACC6	ACC8	ACC10	ACC12	ACC15
Cooling Capacity (kW)	22	28	36	42	50	70
Air Flow Rate (CFM)	10000	11000	12000	12000	18000	24000
Air Flow Rate (m ³ /h)	17000	18700	20400	20400	30600	40800
Noise (dB)	64	64	68	68	70	70
Length (cm)	130	137	155	200	232	310
Width (cm)	88	93	108	108	108	108
Height (cm)	95	95	95	95	95	95
Weight (kg)	120	140	160	180	200	300



Condenser Specifications – Coolside Type

Model	ACC40	ACC20
Cooling Capacity (kW)	20	40
Air Flow Rate (CFM)	11000	14000
Air Flow Rate (m ³ /h)	18600	23780
Noise (dB)	64	71
Length (cm)	160	230
Width (cm)	50	50
Height (cm)	140	140
Weight (kg)	180	230
Power Supply	380-50-16	380-50-22





Tavan Sarma Group
Data Center Cooling Solution

Tavan Sarma Group

Datacenter Cooling Solutions

Design, Manufacturing, and Implementation
of Cooling Systems for Sensitive Centers

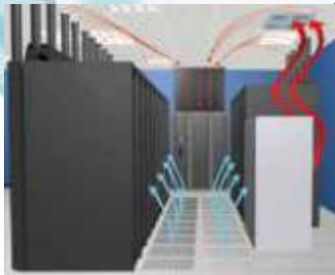
InRow DX/CX

CARC/CRAH

Inrow
DX/CW



CRAC / CRAH



Tavan Sarma Tahviyeh
Data Center Cooling Solution



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Data Center Cooling Solution



Behin Service
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Containment



In Rack



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