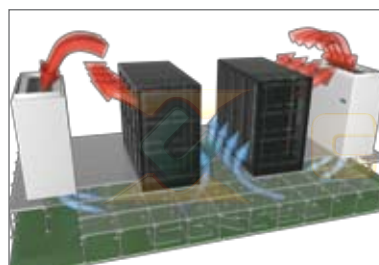


1. TOTAL SOLUTIONS FOR DATA CENTERS

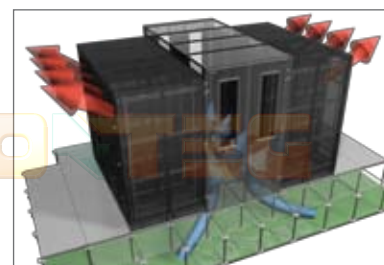
1. TOTAL SOLUTIONS FOR DATA CENTERS

1.1 - Hot / cold aisle	8
1.2 - Contained cold aisle	10
1.3 - Plenum feed with room return	12
1.4 - Room feed with plenum return	14
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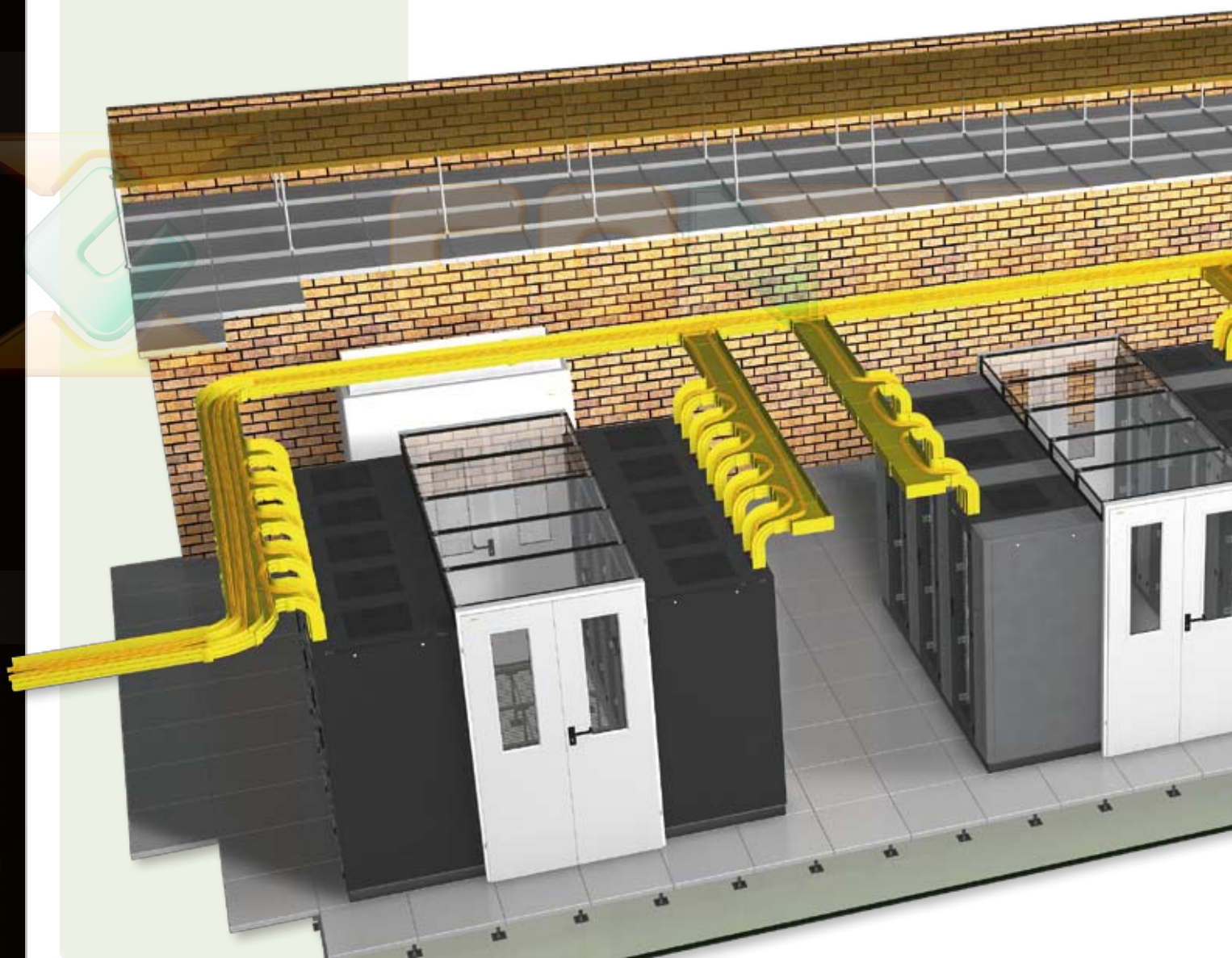
HOT / COLD AISLE

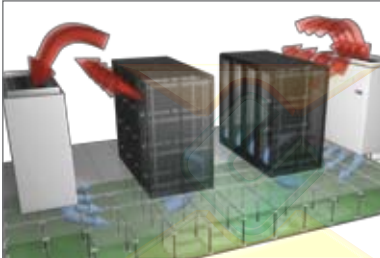
8



CONTAINED COLD AISLE

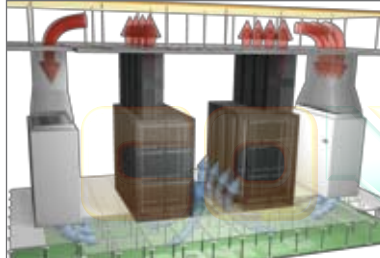
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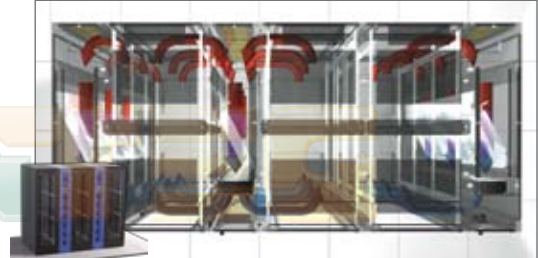
PLENUM FEED WITH
ROOM RETURN

12



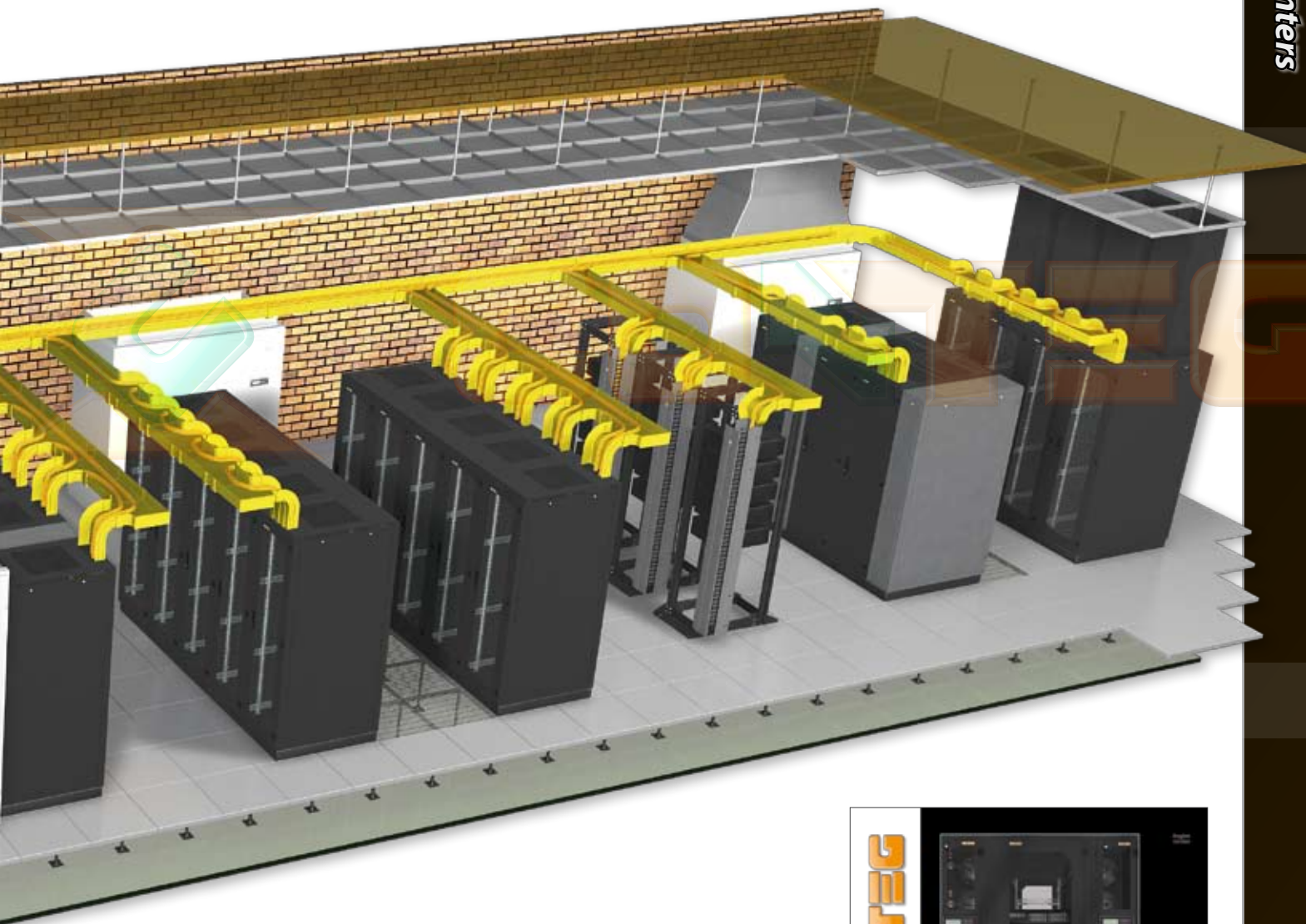
ROOM FEED WITH
PLENUM RETURN

14



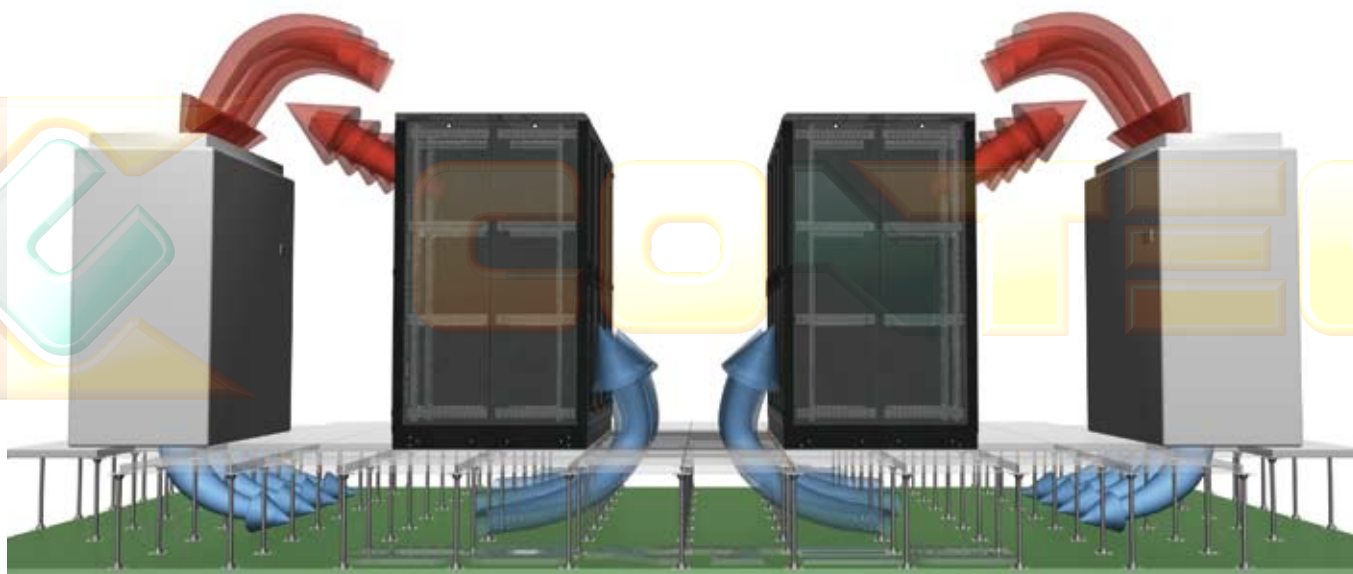
SIDE MOUNT CLOSED LOOP SOLUTIONS

16



Please refer to the Total Solutions for Data Centers brochure. This brochure presents CONTEG's data center solutions in logical arrangement with the basic data center configurations and their related CONTEG products explained.





The Hot / Cold Aisle approach is considered to be the “norm” for data center designs. Racks are aligned front to front and cold air is delivered using the raised floor as a cold air handling space (plenum).

The ANSI/TIA/EIA-942-A (data center) standard recommends a cold aisle width of 1.2 meters (which is equivalent to two floor tiles) to allow a perforated tile to be placed in front of each cabinet which allows for cold air to be delivered to the cabinet front.

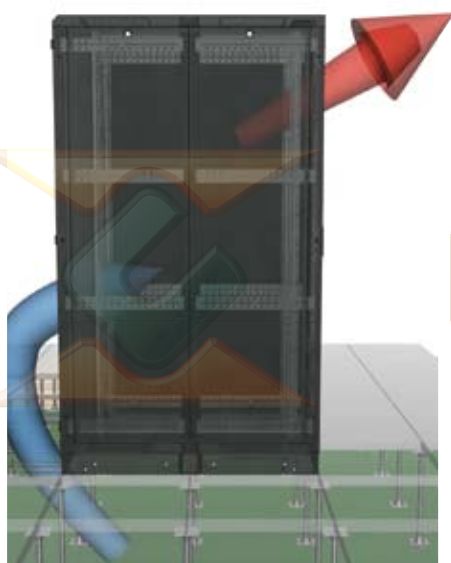
RSF, RDF, RHF and ROF rack series are strongly recommended to be used in hot / cold aisle data center design. For maximum efficiency, highly perforated doors are required; CONTEG test data shows a significant improvement to airflow in the case of 83% super-vented doors being used over standard perforated door types. In order to make the best use of available cold air it is

recommended to blank-off any unused space within the rack by using standard blank panels. Additionally, using an air separation frame at the front of the rack will help to block unwanted cold air by-pass around the mounting profiles leading to an improvement in efficiency and therefore an operational cost saving on equipment that uses front to back airflow.

As an alternative to the cabinets, open frames can be used to house all the equipment. CONTEG has developed a special high-load open frame series called RSG. It is the best choice when unlimited access to the installed equipment is required while safe free-dust environment can

be guaranteed. Because the raised floor is being used to deliver the cold air it is essential that all openings within the floor, such as for the passage of cables, are well sealed using double brush grommets. This helps to maintain static pressure within the floor and minimizes the amount of air that can escape the floor in unintended or undesired locations.

Hot / Cold Aisle design can be modified in various ways to meet today's requirements for higher efficiency. It can be easily improved e.g. by separating the cold and hot air streams - making the solution Contained. See next chapter to learn more.



Cold air is delivered to the cold aisle using the raised floor as a cold air handling plenum, the hot air is blown out on the back side to the hot aisle



Rack design in hot cold aisle arrangement requires front vented (83%) & rear vented (83%) door to easily enter the rack



RSG open frame series (two and four posts) is a racks' alternative which gives you unmatched access to installed equipment

COOLING

In the Hot / Cold Aisle design the airflow is managed at the racks level only. Within the data center / server room no barriers are applied to separate hot and cold air streams. This makes this solution very simple, but creates potentially future problems when high density applications are housed in the cabinets. However for traditional Hot / Cold Aisle design a central room cooling with perimeter positioned close control units is recommended. Such units are not presented in this catalog, however we are ready to supply you also with this product as we collaborate with a global leader in precision cooling.



RECOMMENDED RACK / OPEN FRAME SERIES

Rack / open frame series	Description	Read more
RSF series 19" distribution racks	PREMIUM rack series, highly configurable with load rating up to 1000kg	28
RDF series 19" distribution racks	PREMIUM rack series provides maximum compatibility with Targeted Cooling solutions and developed for cabling support; load rating up to 500kg	24
RHF series 19" distribution racks	PREMIUM rack series provides ultra high load rating up to 1500kg	20
ROF series 19" distribution racks	OPTIMAL rack series, highly configurable with load rating up to 500kg	37
RSG4 series 19" four post open frames	Alternative to racks for housing equipment, load rating up to 1500kg	58

- Front vented door (83% perf. rate) with multipoint swivel handle lock (universal key)
- Rear vented door (83% perf. rate) with multipoint swivel handle lock (universal key)
- Removable sheet steel side panels with lock (universal key)
- Two pairs of 19" vertical sliding extrusions
- Top and bottom openings for cable entry; (only ROF racks with fixed plates)
- Adjustable feet as standard; recommended plinth or plinth with filter (not included)

Protection class IP20, load rating ROF & RDF - 500kg, RSF - 1000kg, (for ROF racks deep 1200mm - 1000kg), RHF - 1500kg, color black RAL 9005 (optionally light gray RAL 7035). For detailed technical information on RSF, RDF, RHF and ROF racks please refer to pages 19 & 37.

Code ¹
RSF-42-60/10T-WWWWA-2EA-H
RSF-45-60/10T-WWWWA-2EA-H
RSF-48-60/10T-WWWWA-2EA-H
RSF-42-60/12T-WWWWA-2EA-H
RSF-42-80/10U-WWWWA-2EA-H
RSF-45-80/10U-WWWWA-2EA-H
RSF-48-80/10U-WWWWA-2EA-H
RSF-42-80/12U-WWWWA-2EA-H

Code ¹
RDF-42-80/10C-WWWWA-2H5-H
RDF-45-80/10C-WWWWA-2H5-H
RDF-48-80/10C-WWWWA-2H5-H
RDF-42-80/12C-WWWWA-2H5-H
Code ¹
RHF-42-60/10L-WWWWA-2EF-H
RHF-42-80/10P-WWWWA-2EF-H

Code ¹
ROF-42-60/10L-WWWWA-205-H
ROF-45-60/10L-WWWWA-205-H
ROF-48-60/10L-WWWWA-205-H
ROF-42-60/12L-WWWWA-20A-H
ROF-42-80/10C-WWWWA-205-H
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ROF-48-80/10C-WWWWA-205-H
ROF-42-80/12C-WWWWA-20A-H

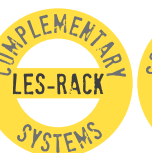
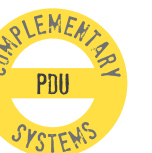
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RSG4-45-19/74-LF
RSG4-45-19/92-LF
RSG4-47-19/50-LF
RSG4-47-19/74-LF
RSG4-47-19/92-LF

¹ All racks in black; for gray - simply change H in the end of the code for B

² All open frames in black

RELATED PRODUCTS

Related products	Description	Read more
Cable entries	Products for passage of cabling/pipes through raised floor with minimal loss of air pressure	116
Modular plinths	Replace adjustable feet and are used as stabilizing and aesthetic element	113
Air separation frames	Prevent by-pass airflow between column and 19" extrusion to optimize cooling of equipment	82
Brackets	Needed when vertical PDU installation into rack is planned	95
Blank panels	Prevent cold air by-pass through unused U positions	82



Basic Hot/Cold Aisle Design Guidelines

- Typically for heat loads of 4.5kW to 6kW per cabinet
- 42U to 48U - 600 mm or 800 mm wide cabinets – 1000 mm to 1200 mm deep cabinets
- Air separation frames – 150 mm or 200 mm deep
- 83% super vented front and rear door
- 1200 mm or 1800 mm aisle spacing
- Double brush grommets for cable entries
- Blanking panels for all vacant equipment mounting locations in racks

Note: Recommendations based on room conditions compliant with TIA-942 standard. All the recommendations indicated in this brochure are typical guidelines to be used as a starting point for planning. Results may vary dependant on the specifics and related variables for each design. Guidance is available from Conteg product specialists to resolve unique design challenges.

1.2 CONTAINED COLD AISLE

252U+



One of the potential drawbacks of the Hot / Cold Aisle approach is the possibility of warm air recirculation due to insufficient static pressure within the raised floor or a lower than optimal ceiling clearance preventing adequate stratification of warm air. Of course, whether this actually occurs or not depends on many variables, however when facing this type of design challenge it makes engineering and financial sense to form a physical barrier between cold and warm air streams.

With CONTEG Contained Aisle solution, the modular containment system is used to physically separate cooled air from hot exhaust by forming a cold plenum space and preventing mixing of hot and cold air, thereby eliminating hot-spots. The contained aisle solution can be deployed where higher density loads are collocated to ensure that all available cooling air is directed to the cabinets. It can also be combined with CONTEG Side Mount Cooling Units to produce cold air locally and ensure that all cold air produced passes through the equipment. The system is designed to work with RSF/RDF/RHF/RSB/ROF rack series - the basis of CONTEG's data center solutions, and it is designed to support racks of 42 and 45U heights.

The transparent sections are manufactured from clear poly carbonate to ensure that light can pass easily into the contained aisle.

As an option, the Contained Aisle system can be fitted with automatic door handlers and integrated with the access control system, environmental monitoring system and fire alarm to ensure that the doors are opened or closed automatically. For example, in the case of a cooling system failure it would be beneficial to open the doors of the cold aisle to allow environmental air to be available to the equipment for cooling and to limit the rate of equipment temperature increase. However, should a fire be detected within a contained aisle,

you would want to ensure that doors are closed to contain the suppressant within the affected aisle. Obviously, this requires co-ordination with the designers of the access control, building management and fire suppression system but gives you an idea of the flexibility that is available with the CONTEG contained aisle system.

Flexible Contained Aisle

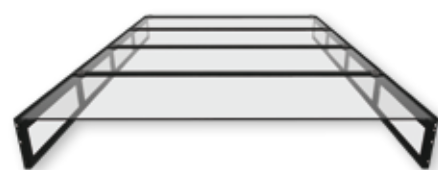
system is available upon request. This system is the ideal solution when a row of racks with different heights or even with gaps because of missing racks is required to be contained. System is based on self-supporting construction with clear polycarbonate panels on the top of the roof. Vertical side sections of the roof feature PVC foil strips, which can be easily cut to the required length. Flexible Contained Aisle can work with standard aisle door (see above) or with PVC foil strips instead of standard door. Contact us for more information.



Cold air is delivered to the cold aisle using the raised floor as a cold air handling plenum, the hot air is blown out on the back side to the data center room, roof and doors are used to prevent mixing hot and cold air



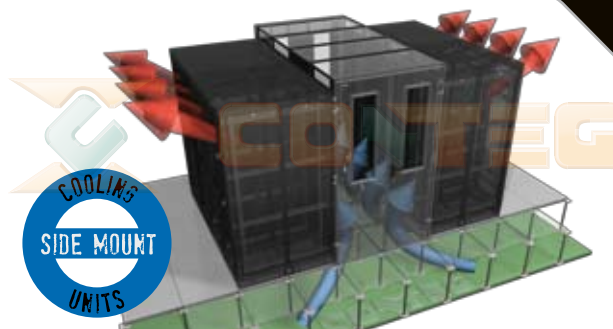
Dual leaf opening door allow access into the contained aisle, it can be equipped by automatic handling systems optionally



By using the roof the cold air is "trapped" in the contained aisle, the roof also efficiently blocks the hot air to re-enter the aisle

COOLING

In the Contained Aisle design the cold air is produced by central cooling system with perimeter mounted CRAC/CRAH units. The raised floor is used as a cold air handling plenum and the cold air enters the aisle via perforated floor tiles. If, from any reason, the raised floor cannot be used, the cold air can be produced locally by in-row side mount cooling units installed directly in the row of racks. This solution is currently very popular as it can address very high heat loads.



RECOMMENDED RACK SERIES

Rack / open frame series	Description	Read more
RSF series 19" distribution racks	PREMIUM rack series, highly configurable with load rating up to 1000kg	28
RDF series 19" distribution racks	PREMIUM rack series provides maximum compatibility with Targeted Cooling solutions and developed for cabling support; load rating up to 500kg	24
RHF series 19" distribution racks	PREMIUM rack series provides ultra high load rating up to 1500kg	20
ROF series 19" distribution racks	OPTIMAL rack series, highly configurable with load rating up to 500kg	37

- Front vented door (83% perf. rate) with multipoint swivel handle lock (universal key)
- Rear vented door (83% perf. rate) with multipoint swivel handle lock (universal key)
- Removable sheet steel side panels with lock (universal key)
- Two pairs of 19" vertical sliding extrusions
- Top and bottom openings for cable entry; (only ROF racks with fixed plates)
- Adjustable feet as standard; recommended plinth or plinth with filter (not included)

Protection class IP20, load rating ROF & RDF - 500kg, RSF - 1000kg, (for ROF racks deep 1200mm - 1000kg), RHF - 1500kg, color black RAL 9005 (optionally light gray RAL 7035). For detailed technical information on RSF, RDF, RHF and ROF racks please refer to pages 19 & 37.

Code ¹
RSF-42-60/10T-WWWWA-2EA-H
RSF-45-60/10T-WWWWA-2EA-H
RSF-42-60/12T-WWWWA-2EA-H
RSF-42-80/10U-WWWWA-2EA-H
RSF-45-80/10U-WWWWA-2EA-H
RSF-42-80/12U-WWWWA-2EA-H

Code ¹
RDF-42-80/10C-WWWWA-2H5-H
RDF-45-80/10C-WWWWA-2H5-H
RDF-42-80/12C-WWWWA-2H5-H

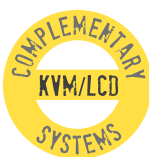
Code ¹
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ROF-45-60/10L-WWWWA-205-H
ROF-42-60/12L-WWWWA-20A-H
ROF-42-80/10C-WWWWA-205-H
ROF-45-80/10C-WWWWA-205-H
ROF-42-80/12C-WWWWA-20A-H

Code
RHF-42-60/10L-WWWWA-2EF-H
RHF-42-80/10P-WWWWA-2EF-H

¹ All racks in black; for gray - simply change H in the end of the code for B

RELATED PRODUCTS

Related products	Description	Read more
In-row side mount cooling	Recommended cooling for very high density contained cold aisles	76
Contained aisle - door	Encloses cold aisle ends whilst providing access to the cold aisle interior	85
Contained aisle - roof	To seal top of aisle between opposing racks to prevent cold and warm air from mixing	85
Automatic door handle	ADH makes the access into the aisle easier as well as it increases the safety	85
Cable entries	Products for passage of cabling/pipes through raised floor with minimal loss of air pressure	116
Modular plinths	Replace adjustable feet and are used as stabilizing and aesthetic element	113
Air separation frames	Prevent by-pass airflow between column and 19" extrusion to optimize cooling of equipment	82
Brackets	Needed when vertical PDU installation into rack is planned	95
Blank panels	Prevent cold air by-pass through unused U positions	82



Basic Air Containment Design Guidelines

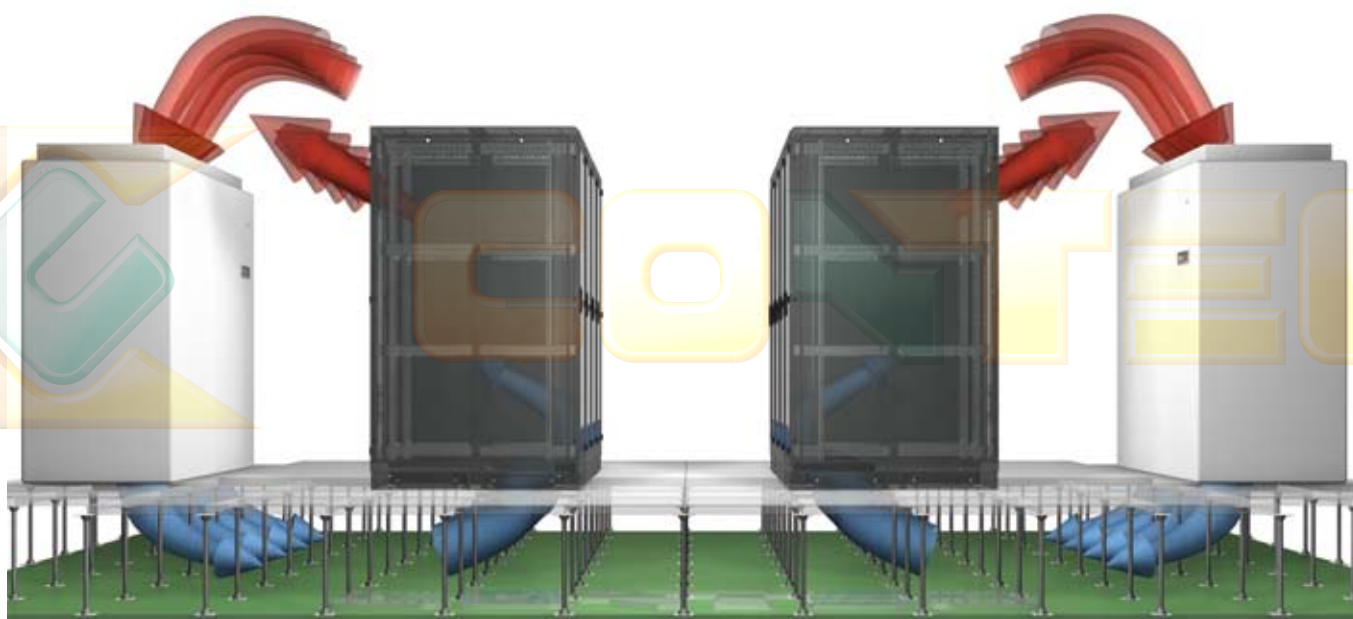
- Typically for heat loads of 4.5kW to >15kW per cabinet
- 42U to 48U - 600 mm or 800 mm wide cabinets - 1000 mm to 1200 mm deep cabinets
- Air separation frames - 150 mm or 200 mm deep
- Air containment system - 1200 mm or 1800 mm standard
- 83% super vented front and rear door (or solid rear door when used with plenum return and chimney)
- 1200 mm or 1800 mm aisle spacing
- Double brush grommets for cable entries

- Blanking panels for all vacant equipment mounting locations in cabinets
- Monitoring of containment and in cabinet environmental conditions

Note: There are many variations of this configuration to include ones for non-raised floor facilities, hot or cold air containment, and configurations that utilize primary or supplemental in-row cooling units

1.3 PLENUM FEED WITH ROOM RETURN

252U+



The CONTEG Plenum Feed with Room Return solution optimizes the use of cooled air by directing the cooled air directly from the raised floor to the equipment within the rack. The rack sits onto a special positioning welded frame (plinth) which replaces a standard 600 x 600 floor tile.

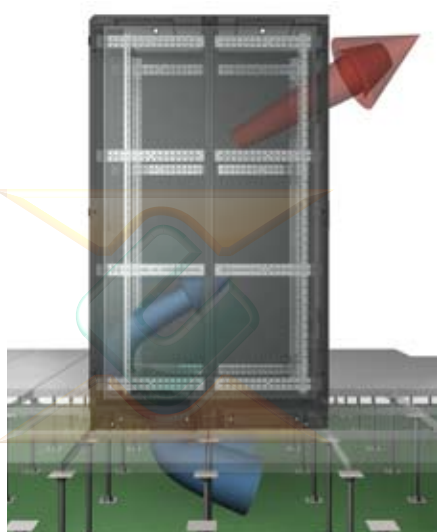
A deflector located in the bottom of the rack directs the cold air to the front of the rack to be drawn through the equipment mounted inside. A variable flow-regulating louvre can be installed to control air-flow throughput or shut the air supply off if no equipment is housed in the rack.

Cooled air is kept within the rack by a solid front door which can be either glass or metal depending

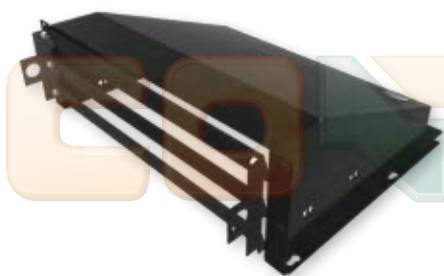
on preference. A separation frame is used to create a cold zone in front of the installed equipment. All unused positions should be covered by blank panels to prevent cold air leakage. Hot exhaust air is rejected from the rack into the room through a super-vented rear door ensuring thus that cold supply and hot exhaust air-streams remain separated resulting in more efficient use of the

cooled air and elimination of hot spots.

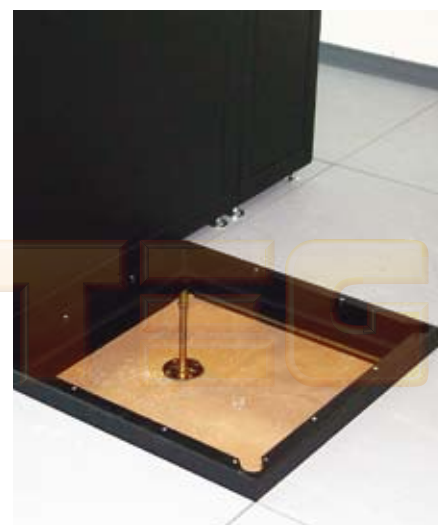
One significant advantage of the Plenum Feed Room Return system is the flexibility of floor planning. Dedicated hot and cold aisles are no longer required as the rack contains and separates the hot and cold airstreams.



Cold air is forwarded to the cold zone by deflector, cold zone is created by separation frame: blank panels and solid front door, the hot air leaves rack through super-vented door



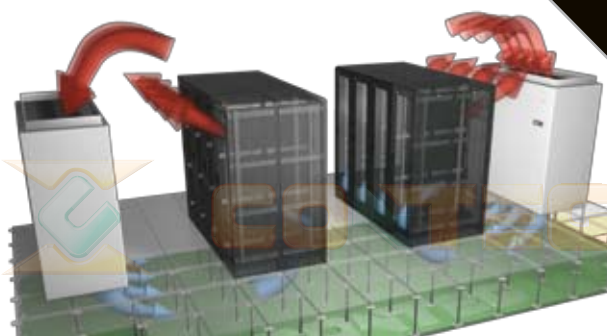
Air flow deflector is used to direct the cold air (which is coming from raised floor plenum) to the front part of rack, a louvre can be used to stop the air intake if no equipment is installed



Positioning welded frame replaces floor tile and allows the rack to be well positioned on the raised floor construction

COOLING

In the Plenum Feed with Room Return design the cold air is usually produced by central room cooling with perimeter positioned close control units. The raised floor is used as a cold air handling plenum. The cold air enters directly the front part of rack via positioning plinth. This makes both air streams, cold and hot, separated so their mixing is prevented. CONTEG is ready to supply you with needed cooling solution as we cooperate with one of the global leaders in precise cooling.



RECOMMENDED RACK SERIES

Rack / open frame series	Description	Read more
RSF series 19" distribution racks	PREMIUM rack series, highly configurable with load rating up to 1000kg	28
RDF series 19" distribution racks	PREMIUM rack series provides maximum compatibility with Targeted Cooling solutions and developed for cabling support; load rating up to 500kg	24
RHF series 19" distribution racks	PREMIUM rack series provides ultra high load rating up to 1500kg	20
ROF series 19" distribution racks	OPTIMAL rack series, highly configurable with load rating up to 500kg	37

- Front glass door with multipoint swivel handle lock (universal key)
- Rear vented door (83% perf. rate) with multipoint swivel handle lock (universal key)
- Removable sheet steel side panels with lock (universal key)
- Two pairs of 19" vertical sliding extrusions
- Top and bottom openings for cable entry; (only ROF racks with fixed plates)
- Adjustable feet as standard; combined with positioning plinth DP-PRF-ROF-60/60 (frame not included)

Protection class IP20, load rating ROF & RDF - 500kg, RSF - 1000kg, (for ROF racks deep 1200mm - 1000kg), RHF - 1500kg, color black RAL 9005 (optionally light gray RAL 7035). For detailed technical information on RSF, RDF, RHF and ROF racks please refer to pages 19 & 37.

Code ¹
RSF-42-60/10T-GWWWA-2EA-H
RSF-45-60/10T-GWWWA-2EA-H
RSF-48-60/10T-GWWWA-2EA-H
RSF-42-60/12T-GWWWA-2EA-H
RSF-42-80/10U-GWWWA-2EA-H
RSF-45-80/10U-GWWWA-2EA-H
RSF-48-80/10U-GWWWA-2EA-H
RSF-42-80/12U-GWWWA-2EA-H

Code ¹
RDF-42-80/10C-GWWWA-2H5-H
RDF-45-80/10C-GWWWA-2H5-H
RDF-48-80/10C-GWWWA-2H5-H
RDF-42-80/12C-GWWWA-2H5-H

Code ¹
ROF-42-60/10L-GWWWA-205-H
ROF-45-60/10L-GWWWA-205-H
ROF-48-60/10L-GWWWA-205-H
ROF-42-60/12L-GWWWA-20A-H
ROF-42-80/10C-GWWWA-205-H
ROF-45-80/10C-GWWWA-205-H
ROF-48-80/10C-GWWWA-205-H
ROF-42-80/12C-GWWWA-20A-H

Code
RHF-42-60/10L-GWWWA-2EF-H
RHF-42-80/10P-GWWWA-2EF-H

¹ All racks in black; for gray - simply change H in the end of the code for B

RELATED PRODUCTS

Related products	Description	Read more
Air separation frame	Prevent by-pass airflow between column and 19" extrusion to optimize cooling of equipment	82
Positioning plinth	The rack sits onto a special welded plinth which replaces a standard 600x600 floor tile	113
Air flow deflector	Used to lead the cold air directly to the cold zone in front part of a rack	82
Cable entries	Products for passage of cabling/pipes through raised floor with minimal loss of air pressure	116
Brackets	Needed when vertical PDU installation into rack is planned	95
Blank panels	Prevent cold air by-pass through unused U positions	82

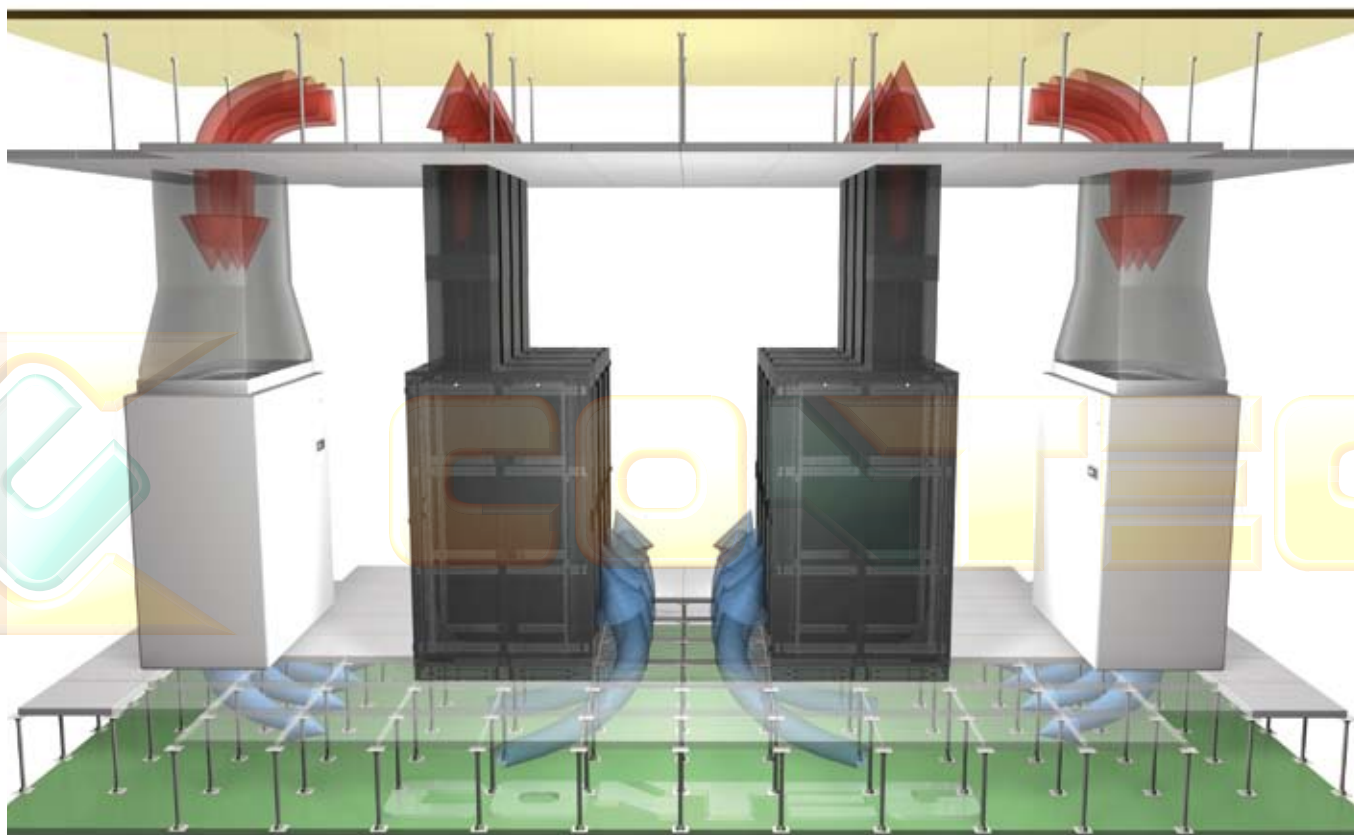


Basic Plenum Feed with Room Return Design Guidelines

- Typically for heat loads of 4.5kW to 6kW per cabinet
- 42U to 48U - 600 mm or 800 mm wide cabinets – 1000 mm to 1200 mm deep cabinets
- Positioning plinth when using 600 mm wide cabinets
- Air separation frames – 200 mm deep
- Front glass door
- 83% super vented rear door
- Air flow deflector optionally with louvers
- 1200 mm or 1800 mm aisle spacing
- Double brush grommets for cable entries
- Blanking panels for all vacant equipment mounting locations in cabinets
- Monitoring of in cabinet environmental conditions

Note: This configuration has many variables such as supply air volume and velocity along with the type and position of the equipment mounted in the cabinet. Conteg product specialists are available to assist with details related to designing using this configuration.

1.4 ROOM FEED WITH PLENUM RETURN 252U+



One of the potential drawbacks of Contained Cold Aisle and Direct Feed / Room Return technologies is that the warm exhaust air is being released into the facility room. Generally this should not pose a problem as long as the layout of the data center takes this into account. However, in certain very high density applications it may be desirable to completely separate the hot exhaust from the cool supply air.

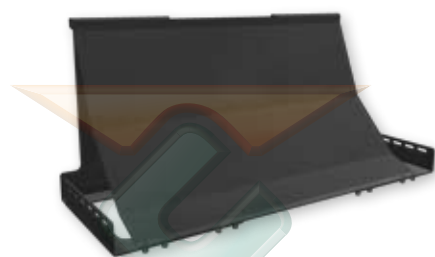
CONTEG's Hot Plenum Return Kit (HPR) addresses this requirement by using a vertical "chimney" at the top rear of the rack directly connected to a hot plenum at ceiling height. A turning vane located at the bottom rear of the rack helps to optimize the flow of hot exhaust into the "flue", while the large surface area of the chimney ensures that large volumes of air can be passed at relatively low velocities.

The hot plenum is formed by installing

a suspended ceiling within the facility room and rather than stratification principle of the warm exhaust (typical in a traditional hot/cold aisle arrangement), the hot exhaust air removal into a separate air handling space is used. The Computer Room Air Handlers (CRAC/CRAH) are also connected to the plenum so that an air loop is formed.

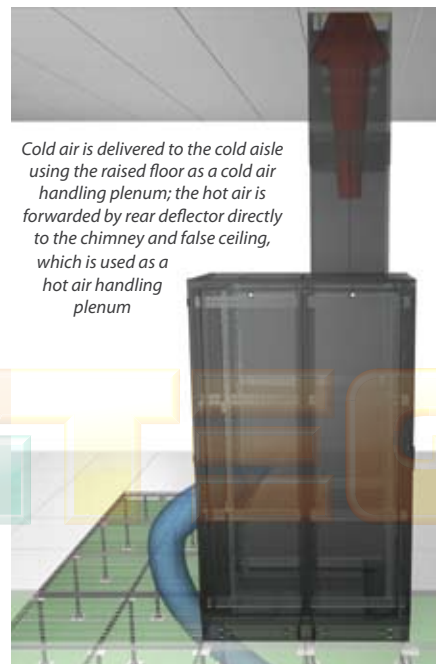
This layout can allow very high heat densities with excellent cooling system efficiency; a study

by Intel who originally pioneered this concept, shows that this design can handle as much as 30kW per rack.



Turning Vane is designed to enhance the natural draw effect of the chimney, it is installed in the rear part of rack and forwards the hot air directly to the above chimney

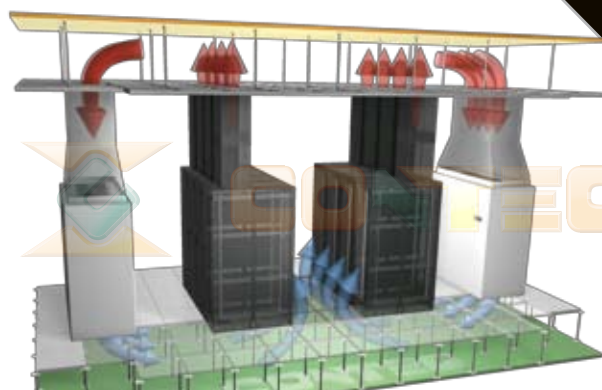
Chimney is designed to form a duct for the hot exhaust between the rack and the hot plenum, its height is adjustable from 750 to 1360mm



Cold air is delivered to the cold aisle using the raised floor as a cold air handling plenum; the hot air is forwarded by rear deflector directly to the chimney and false ceiling, which is used as a hot air handling plenum

COOLING

In the Room Feed with Plenum Return design the cold air is usually produced by central room cooling with perimeter positioned close control. The suspended ceiling is used as a hot air handling plenum while the cold air is delivered to the room using raised floor as a cold air handling plenum. In sites where is no raised floor displacement cooling can be used instead of traditional down-flow CRAC/CRAH raised floor solutions. This can be useful where insufficient building clearance exists for the installation of both raised floor and suspended ceiling. CONTEG is ready to supply you with needed cooling solution as we cooperate with one of the global leaders in precise cooling.



RECOMMENDED RACK SERIES

Rack series	Description	Read more
RSF series 19" distribution racks	PREMIUM rack series, highly configurable with load rating up to 1000kg	28
RDF series 19" distribution racks	PREMIUM rack series provides maximum compatibility with Targeted Cooling solutions and developed for cabling support; load rating up to 500kg	24

- Front vented door (83% perforation level) with multipoint swivel handle lock (universal key)
- Rear sheet steel door with multipoint swivel handle lock (universal key)
- Removable sheet steel side panels with lock (universal key)
- Two pairs of 19" vertical sliding extrusions
- Top and bottom openings for cable entry
- Adjustable feet as standard; recommended plinth or plinth with filter (not included)

Protection class IP20, load rating RDF - 500kg, RSF - 1000kg, color black RAL 9005 (optionally light gray RAL 7035). For detail technical information on RDF or RSF racks please refer to page 24 & 28.

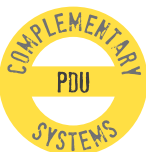
Code ¹
RSF-42-60/12T-WWSWA-2EA-H
RSF-42-80/12U-WWSWA-2EA-H

Code ¹
RDF-42-80/12C-WWSWA-2H5-H

¹ All racks in black; for gray - simply change H in the end of the code for B

RELATED PRODUCTS

Related products	Description	Read more
Air separation frame	Prevent by-pass airflow between column and 19" extrusion to optimize cooling of equipment	82
Chimney	System for direction hot air from the rack directly to the plenum - ceiling	82
Turning vane	Part of chimney product for direction hot air from bottom to upper part of rack	82
Cable entries	Products for passage of cabling/pipes through raised floor with minimal loss of air pressure	116
Modular plinths	Replace adjustable feet and are used as stabilizing and aesthetic element	113
Brackets	Needed when vertical PDU installation into rack is planned	95
Blank panels	Prevent cold air by-pass through unused U positions	82



Basic Room Feed with Plenum Return Design Guidelines

- Typically for heat loads up to 12.5kW or greater per cabinet
- 42U to 48U – 600 mm or 800 mm wide cabinets – 1200 mm deep
- Air separation frames – 150 mm or 200 mm deep
- 83% super vented front door
- Solid rear door
- Turning vane for bottom rear of cabinet
- Chimney system for directing hot air to return plenum
- 1200 mm or 1800 mm aisle spacing
- Double brush grommets for cable entries
- Blanking panels for all vacant equipment mounting locations in cabinets
- Monitoring of return plenum and in cabinet environmental conditions

Note: Cooling capacity of this configuration can reach higher values depending on many variables such as capacity and features of precision computer room cooling unit, ratio of supply air space to return plenum space and amount of air obstructions in the supply and return air spaces.

1.5 SIDE MOUNT CLOSED LOOP SOLUTIONS 42U+

Side Mount Closed Loop architecture offers the ability to achieve up to 36kW per rack of cooling power in one specific assembly. This type of architecture can be especially useful when planning to install a few very high power racks into a facility as the racks do not release any heat out into the data center environment. It is also an ideal solution when limited rack space (for example, in atypical server room of a mid-size company) is required, but the cooling becomes an issue because of high density applications housed there.



Illustrative image only

The side mount closed loop architecture is based on side mount cooling units from Targeted Cooling portfolio and 600mm wide RSF racks. Cool air is generated by the side mount cooling unit(s) and delivered into the cold zone at the front part of rack(s) where it is close to the equipment cooling intake. The hot exhaust from the equipment is then removed from the hot zone at the rear part of rack(s) by the side mount cooling unit(s), cooled and delivered back into the cold zone, forming a closed recycling air loop. This architecture ensures, that heat generated within the cabinet is removed at the point of production and not released into the data center or server room environment, thereby minimizing the chances of localized hot-spots forming in the high density zones.

Side Mount Closed Loop architecture is available in simple 1 rack - 1 cooling unit design or in modular design, when virtually unlimited number of racks and cooling units can be combined into a closed module. The modular design is fully flexible and accommodate any combinations of cooling units and racks to give the required levels of cooling and redundancy.

SIMPLE SIDE CLOSED LOOP

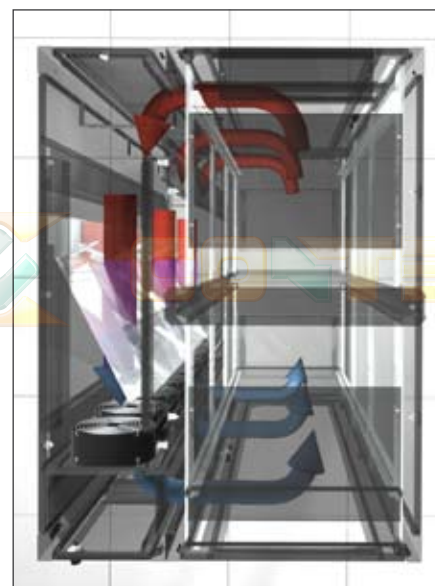
Simple Side Closed Loop consists of one pre-configured RSF rack and one side cooling direct expansion (DX) or chilled water (CW) unit. The product is delivered fully assembled with needed passive airflow management installed. Both the rack as well as cooling unit are positioned on common high strength plinth, which is equipped with 6 transportation high load castors and are combined with feet for fixing the closed loop in the final position. The ease of installation and transportation presents the main advantage of this solution. The Simple Side Closed Loop is delivered on special pallet with unloading ramp. You need just to position the product on demanded position and connect it to the refrigerant piping. The Simple Side Closed loop is fully tested at our factory, so you can rely on.

Simple Side Closed Loop is available in 42, 45 and 48U height and depth 1200mm. Its total (cooling unit + rack) width is 900mm. The portfolio contains Simple Side Closed Loops with cooling capacity from 12kW up to 36kW.

The one to one design results in no redundancy. The risk of cooling unit failure and possible downtime can be limited with optional Monitoring and Emergency Opening Systems.

Simple Side Closed Loop represents quick and easy solution when limited amount of highly heating applications are to be housed. The existing data center or server room infrastructure must include (must allow installation of) needed piping and outdoor chiller.

Protection class IP54, load rating RSF - 1000kg, color black RAL 9005 (optionally light gray RAL 7035). Separation frame and sealing. For detail technical information on RSF racks please refer to page 28. Side cooling unit with bottom piping (upper piping upon request). Piping and outdoor chiller are not a standard part of this product. For more information on side cooling units please refer to page 76.



Top view - air flow detail - closed air-loop architecture with side cooler



Example of Simple Closed loop - Illustrative image

Simple Side Close Loop's Code ¹	Description
RSF-42-90/12T-GWSWN-A2/DX	Simple Side Closed Loop 42U x 900 x 1200 with 12kW DX ² cooling unit
RSF-42-90/12T-GWSWN-A8/DX	Simple Side Closed Loop 42U x 900 x 1200 with 20kW DX ² cooling unit
RSF-42-90/12T-GWSWN-A4/CW	Simple Side Closed Loop 42U x 900 x 1200 with 22kW CW cooling unit ³
RSF-42-90/12T-GWSWN-B2/CW	Simple Side Closed Loop 42U x 900 x 1200 with 30kW CW cooling unit ³
RSF-42-90/12T-GWSWN-C4/CW	Simple Side Closed Loop 42U x 900 x 1200 with 36kW CW cooling unit ³

Add -T in the end of the closed loop's code for top connection of water piping (bottom connection as standard); drain pump is standard part of delivery; available for models using CW cooling units only

Add -EC in the end of the closed loop's code for having EC fans in your cooling unit; available for models using CW cooling units only

Add -E in the end of the closed loop's code for having emergency opening system (EOS) pre-installed; EOS includes 4 electronic latches, special strengthened door with multipoint lock, gas struts; RAMOS Mini C unit recommended for operation (not part of delivery)

¹ Simple Side Closed Loop in 45 and 48U height available upon request

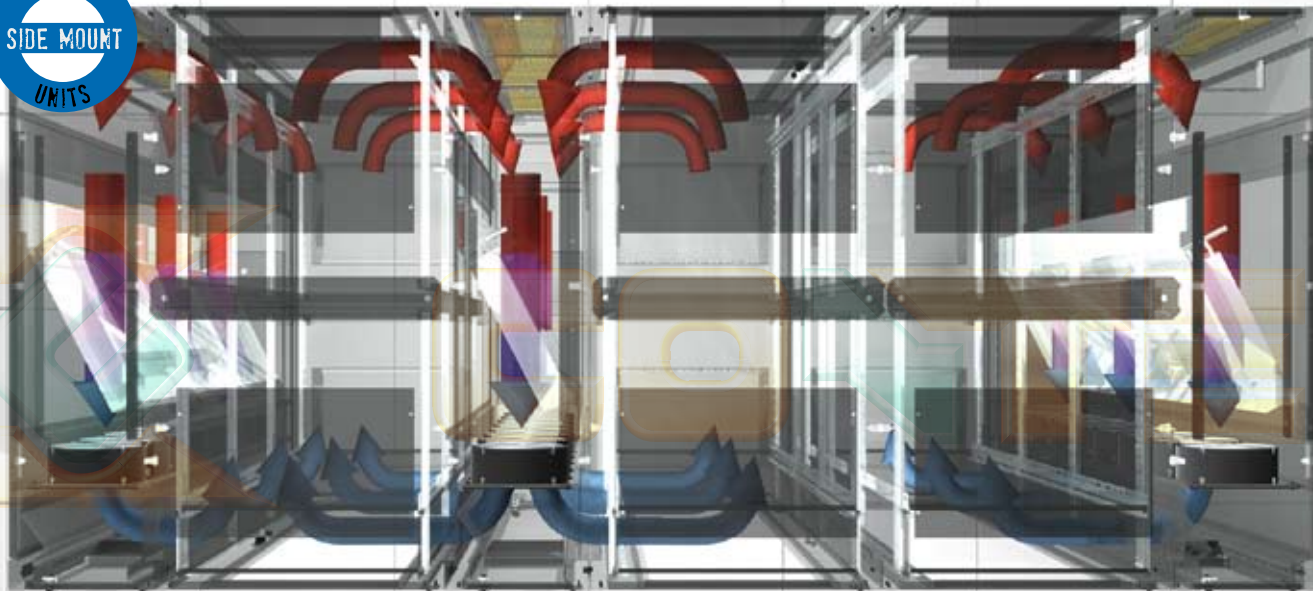
² Outdoor unit AC-DX-xxxxxxx required (not part of delivery)

³ MODBUS adapter included

MODULAR SIDE CLOSED LOOP

42U+

Modular Side Closed Loop Architecture represents the ultimate in flexibility. High Density side mount cooling units are combined with RSF racks to provide a "closed modules" with a common cold zone at the front of the racks and a common hot zone at the rear of the racks. The design is fully flexible and can accommodate any combination of cooling units and racks to give the required levels of cooling and redundancy.



Top view - air flow detail - closed air-loop architecture with side coolers

The modular architecture is pre-designed for 1200mm deep, 600 or 800mm wide and 42, 45 or 48U high RSF racks and for 1200mm deep, 300mm wide and 42, 45 or 48U high side mount cooling units.

The module can consist of virtually unlimited number of RSF racks and cooling units. 6 racks (252 - 288U) could be understood as a limit where

standard data center layout's application should be considered. The configuration of the rack differs according to its position in the module - please be aware of it when planning the module. All racks are delivered fully assembled with needed passive airflow management installed.

Both cooling unit versions, chilled water (CW) as well as direct expansion (DX), are available to

provide the module with needed cooling power up to 36kW per rack. The module can be easily designed in fully redundant mode.

Modular Side Closed Loop can be configured according to needs of any individual customer and can be anytime in the future modified and completed with additional racks and cooling units.

Modular Side Closed Loop RACKS

Middle rack's code	End-of-the-row rack's code	Description
RSF-42-60/12T-GWSWM-MCL	RSF-42-60/12T-GWSWN-MCL	RSF Modular Closed Loop Rack 42U x 600 x 1200
RSF-42-80/12U-GWSWM-MCL	RSF-42-80/12U-GWSWN-MCL	RSF Modular Closed Loop Rack 42U x 800 x 1200
RSF-45-60/12T-GWSWM-MCL	RSF-45-60/12T-GWSWN-MCL	RSF Modular Closed Loop Rack 45U x 600 x 1200
RSF-45-80/12U-GWSWM-MCL	RSF-45-80/12U-GWSWN-MCL	RSF Modular Closed Loop Rack 45U x 800 x 1200
RSF-48-60/12T-GWSWM-MCL	RSF-48-60/12T-GWSWN-MCL	RSF Modular Closed Loop Rack 48U x 600 x 1200
RSF-48-80/12U-GWSWM-MCL	RSF-48-80/12U-GWSWN-MCL	RSF Modular Closed Loop Rack 48U x 800 x 1200

Add -E in the end of the rack's code for having emergency opening system (EOS) pre-installed; EOS includes 4 electronic latches, special strengthen door with multipoint lock, gas struts; RAMOS Mini C unit recommended for operation (not part of delivery)

Modular Side Closed Loop COOLING UNITS ¹

Cooling unit's code ²	Description
AC-SM-DX/A2-42-30/120	Direct Expansion, 12kW, 42U x 300 x 1200 ³
AC-SM-DX/A8-42-30/120	Direct Expansion, 20kW, 42U x 300 x 1200 ³
AC-SM-CW/A4-42-30/120	Chilled Water, 22kW, 42U x 300 x 1200; MODBUS adapter included
AC-SM-CW/B2-42-30/120	Chilled Water, 30kW, 42U x 300 x 1200; MODBUS adapter included
AC-SM-CW/C4-42-30/120	Chilled Water, 36kW, 42U x 300 x 1200; MODBUS adapter included

Add -T in the end of the closed loop's code for top connection of water piping (bottom connection as standard); drain pump is standard part of delivery; available for models using CW cooling units only

Add -EC in the end of the closed loop's code for having EC fans in your cooling unit; available for models using CW cooling units only

¹ Plinth is not a standard part of delivery

² Modular Side Closed Loop cooling units in 45 and 48U height available upon request

³ Outdoor unit AC-DX-xxxxxxx required (not part of delivery)

Protection class IP54, load rating RSF - 1000kg, color black RAL 9005 (optionally light gray RAL 7035). Separation frame and sealing. For detail technical information on RSF racks please refer to page 28. Side cooling unit with bottom piping (upper piping upon request). Piping and outdoor chiller are not a standard part of this product. For more information on side cooling units please refer to page 76.

RELATED PRODUCTS

Emergency Opening System automatically opens the front and rear doors of the racks in the case of an eventual cooling failure occurs and the inside environment begins to heat up. The problem is detected by the **RAMOS monitoring system** (not standard part of Emergency Opening System), which sends an alarm to the Emergency Opening System. Thanks to this function the possible equipment damage is prevented. However this function cannot compete with protection provided by fully redundant module configuration.

