Modular Access Floor for Data Center

From Rack to Row to Room to Building

Schneider Electric™

Why using Scneider Electric modular access floor in Data Centers

The evolution of modern Data Centers emphasizes specific exigencies of security, flexibility and modularity due to increasing thermal loads, data exchange capacities, cable volumes and connections over the Data Center lifetime.

Schneider Electric access floor represents a reliable and efficient choice and provides high performances at the lowest management costs.

Advantages of Schneider Electric modular access floor

Adaptability to the various cooling solutions

Under floor space is ideal to place a range of cooling solutions, from direct air distribution to the path for air or chilled water cables.

Lower initial investment

A Data Center layout requires flexibility in the use of space. Areas which are designed today for treading may be used in the future to accommodate heavy devices. The perfect modularity of Uniflair access floor allows to replace the existing structure and panels reducing the initial installation costs; performances will always meet customers' requirements, management costs will be minimized and the available space will be exploited at best.

Enhanced cooling capacity

With heights up to 80-100 cm, the under floor plenum provides virtually unlimited cabling and air flow capacity (even with high density loads) and guarantees easy access.

Air handling optimization

The modular access floor structure and the space underneath the panels provide the support for assembling completely integrated modular equipments for air flow or pressure control. Equipments may be installed - without layout restrictions - on the designed strategic points.

Possibility to freely integrate safe cooling systems

A modular access floor allows to easily integrate, without additional costs, cooling systems intrinsically safe and redundant.

Flexibility over time

In the under floor space, all systems necessary for the room operation (from connection to energy supply network and from direct air distribution system to the possible path for chilled water cables) may be easily adapted and enhanced according to future exigencies which may not be estimated at the Data Center startup.

Security and reliability

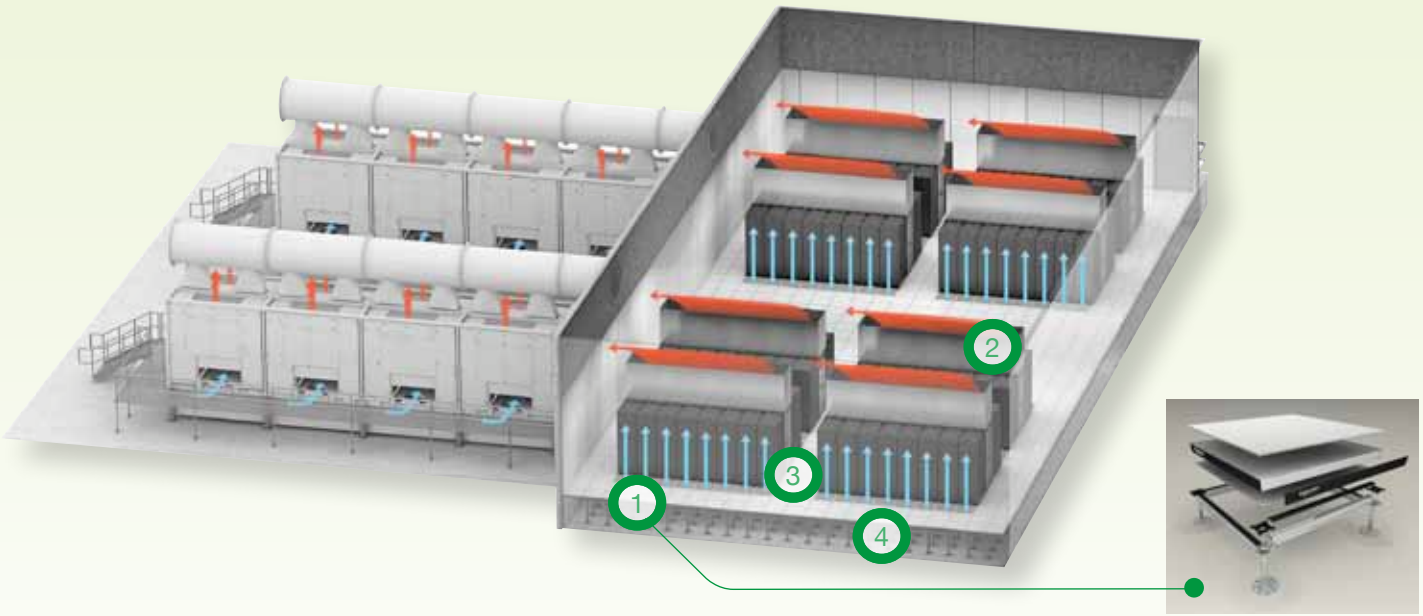
The under floor plenum allows to distribute the chilled water flows while keeping them physically separate from cables and sensitive devices, minimizing the risks of damage in the event of leakages or condensation, breakdowns or malfunctions.

Efficient systems arrangement

The compact structure of modular access floor (the access floor module includes a grid of vertical supports with side of 60 cm) allows full flexibility and is the ideal solution to arrange the various operational systems so that they may easily reach the points of use, enabling layout variation over time.

Minimal maintenance costs

Operating costs are minimized: access to the systems in case of breakdowns or for ordinary maintenance is easy and direct. The operator can enter the under floor plenum by almost every part of the room, in a flexible and safe way, without the use of a ladder or other devices.



1
Panels
Various solutions for the core and for the back and upper finishing.

2
Suction tools
Additional tools for hot air suction improvement.

3
Steel perforated panels
In steel, of the same dimensions as a panel, the upper finishing may be the same as the other panels.

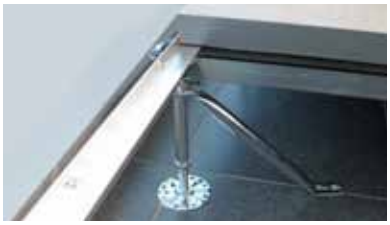
4
Support structure
Made completely from steel, characterized by a range of heights from 5 cm up to 1 meter and above.

Panels

There are two options for the panel core material: high density wooden chipboard (720 kg/m³) or calcium sulphate. The first allows the best combination of mechanical properties and contained weights for an economic purchase with ease of working; the second possesses excellent mechanical properties and fire resistance, greatly reduced sensitivity to humidity and notable acoustic absorption for improved treading comfort. The back of the core panel is covered to further improve mechanical characteristics and increase thermal-hygrometric stability. The materials used are aluminium (0,05 mm thick) or galvanized steel (0,5 mm thick), depending on the protection grade and resistance required. Finishes are normally made from hard plastic laminate, vinyl or rubber (antistatic or conductive version).

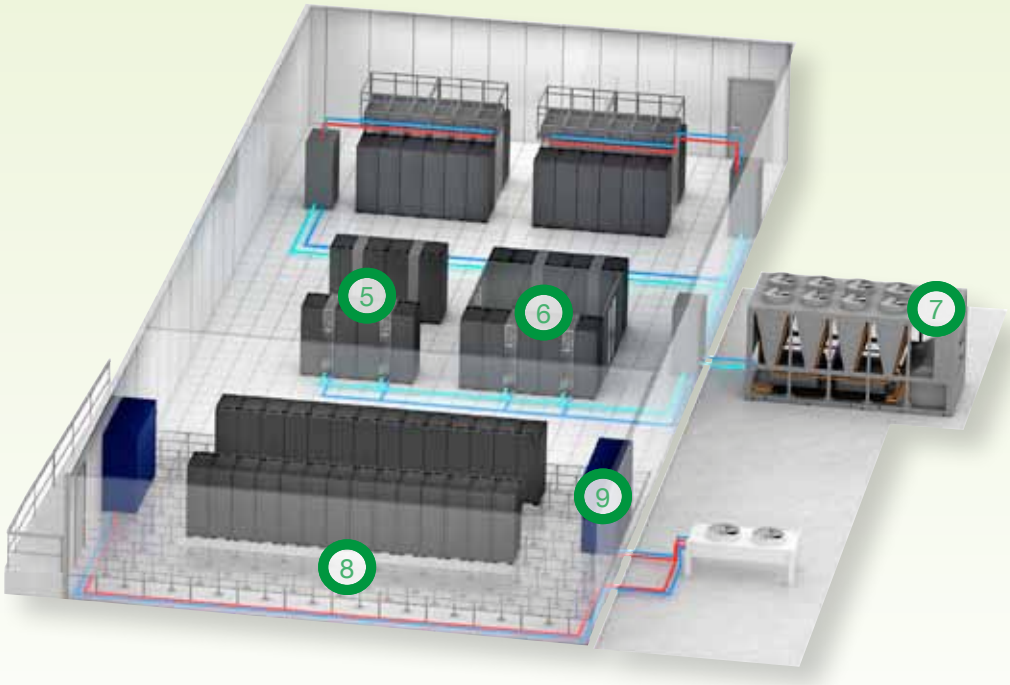
Support structure

Uni8 Evolution pedestals are made completely from galvanized steel with available heights from 5,5 cm. Supports are made of a tube secured to the circular basis. The shaped head is connected to a threaded crossbar and a regulation nut. The support head is shaped in order to position the stringers not only around the perimeter of the panel but also on one or both of the diagonals. Special versions of the support are also available in case particularly high mechanical resistance is required. In galvanized steel, the stringers permit to increase the mechanical resistance and the stability of the floor. Special bridge stringers are also available which allow to connect the supports at greater distances than those of a single module so as to exploit spaces without limits as regards the installation of Data Center systems. Self-extinguishing and sound-proofing gaskets protect the metallic components.



Tubular brace fixing

The use of tubular brace fixing, positioned according to the room layout, absorbs the dynamic horizontal stress of the modular access floor. This element is made of a tubular frame in galvanized steel with diameter of 25 mm and thickness of 1,2 mm; the two ends are specifically shaped in order to provide an optimal connection to the supports (by means of a connecting metal ring) and to the slab (by means of brackets).



5

In row cooling systems (alternate and at the back)

Units for cooling the Racks placed inside the room.

6

Containment

A solution allowing to completely separate hot and cold air flows.

7

Chilled water production system

Units for the production of chilled water to the in row conditioning units.

8

Linear grills

In aluminium, available for air transition, they are inserted inside a panel.

9

In room cooling system

Perimeter units for the distribution of refrigerated air underneath the floor.

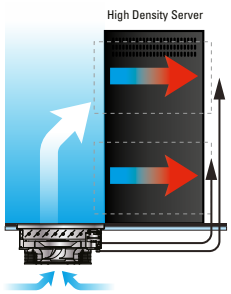
Linear grills

Linear grills consist of a set of longitudinal fins in anodized aluminium joined together. They are normally used where the free under floor plenum is used for distributing air. Various widths are available (95, 145, 195 and 295 mm) and they integrate completely into the panel module.
They guarantee an air flow of 650-2000 m³/h a 20 Pa.

Steel perforated panel

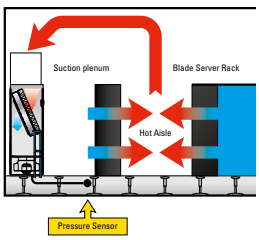
It is made of a flat steel sheet secured to a frame consisting of metal grilles and it is used for under floor air distribution. A covering perforated to the same geometry is glued on the upper side of the panel.

The 588 holes panel, for example, where 22% of the area is free, provides an air flow of 1200 m³/h at 20 Pa. Steel perforated panels equipped with an air-flow regulation device are also available.



Active Floor®

Active Floor® is a flexible and modular system for cooling Data Centers with medium and high density loads. Integrated within a modular access floor in front of the intake section of the rack, the Uniflair Active Floor® fits exactly into a modular access floor panel. The cold air produced by the Close Control perimeter units is directly channelled to the source of the thermal load thanks to the advanced adjustment of the direction of the air flow. The Active Floor® creates a high density bubble of air which is maintained at a constant temperature along the whole intake section of the rack, guaranteeing operation at the nominal design conditions. The air flow varies according to the actual thermal load and is detected by two sensors placed on the discharge section of the server.



AFPS

AFPS is a control module that maintains a constant nominal pressure underneath the floor (from 20 up to 80 Pa) and manages the fan speed in all operating conditions and for the entire lifetime of the room. The system maintains a constant pressure underneath the floor even during standard and emergency maintenance, thus avoiding the creation of hot spots. This system is also able to automatically adapt to the addition of new equipment and increases in the thermal load of the room.

AFPS integrates with the distribution systems (active and passive) maintaining a constant pressure underneath the floor and optimizing the system efficiency.

30KAL and 30KFL Panel

The panel 30KAL consists of a high density calcium sulphate board core (1500 kg/m^3) with nominal thickness 30 mm. It is covered on the lower face with a 0,05 mm thick aluminium foil (while the panel 30KFL is covered with a 0,5 mm thick sheet of zinc-plated steel) and on the upper face with a 0,9 mm thick plastic laminate (HPL High Pressure Laminate). The panel is provided with a 0,45 mm thick black plastic edge material that is self-extinguishing, non-creaking and PVC free and which is glued along the panel sides.

30KAL AND 30KFL PANEL PHYSICAL & DIMENSIONAL PROPERTIES (in compliance with European standard EN 12825)

		Standard Test	Unit	Value	Tolerance
Calcium sulphate core thickness			mm	30	
Calcium sulphate core density			kg/m^3	≥1500	±5%
Nominal panel weight	30KAL		kg	17,0	±5%
	30KFL			18,1	
Calcium sulphate core electrical vertical resistance		EN 1081	ohm	≥10^7	
Calcium sulphate core fire reaction classification		EN 13501-1	Class A1		
Panel fire resistance classification		EN 13501-2	REI 30		
Laminate covering fire reaction classification		D.M. 26/06/84	Class 1		
Laminate covering electrical vertical resistance		EN 1081	Not antistatic: ≥10^{10}ohm Static-dissipative: 10^6 - 10^{9}ohm		
Plastic edge self-extinguishing classification		UL94	Class V0		

30KAL AND 30KFL PANEL PHYSICAL & DIMENSIONAL PROPERTIES (in compliance with European standard EN 12825)

		Unit	Value	Tolerance
Nominal dimension		mm	600x600	±0,2 (class 1)
Nominal thickness (laminate thickness: 0,9 mm)	30KAL	mm	31,1	±0,3 (class 1)
	30KFL		31,6	
Planarity		mm	≤0,6	
Diagonal difference		mm	≤0,4	
Inclined edge angle		degree	4°	±15'

30KAL AND 30KFL PANEL PHYSICAL & DIMENSIONAL PROPERTIES (in compliance with European standard EN 12825)

Type of structure: UNI8 Evolution (height: up to 600 mm)			Type of stringer	
		Unit	M (medium)	P (heavy)
Concentrated load at the centre of side at 2.5 mm deflection	30KAL	kN	2,7	3,1
	30KFL		4,0	4,6
Max allowed load at the centre of side (*)	30KAL	kN	2,8	2,9
	30KFL		5,1	5,2
Concentrated load at the centre of panel at 2.5 mm deflection	30KAL	kN	3,9	4,2
	30KFL		5,2	5,5
Max allowed load at the centre of panel (*)	30KAL	kN	4,4	4,6
	30KFL		8,5	8,6
Uniformly distributed load at 2,5 mm deflection	30KAL	kN/m^2	20,0	25,0
	30KFL		26,0	31,0
Load class	30KAL		1	1
	30KFL		4	5
Deflection class	30KAL		B	A
	30KFL		A	B

(*): the panel breaking load is obtained multiplying the max allowed load by 2 (safety factor).

40LAL and 40LFL Panel

The panel 40LAL consists of a high density particle board core (720 kg/m^3) with nominal thickness 38 mm. It is covered on the lower face with a 0,05 mm thick aluminium foil (while the 40LFL panel is covered with a 0,5 mm thick sheet of zinc-plated steel), and on the upper face with a 0,9 mm thick plastic laminate (HPL High Pressure Laminate). The panel is provided with a 0,45 mm thick black plastic edge material that is self-extinguishing, non-creaking and PVC free and which is glued along the panel sides.

40LAL AND 40LFL PANEL PHYSICAL & DIMENSIONAL PROPERTIES (in compliance with European standard EN 12825)

		Standard Test	Unit	Value	Tolerance
Particle board core thickness			mm	38	
Particle board core density			kg/m^3	≥720	±5%
Nominal panel weight	40LAL		kg	10,7	±5%
	40LFL			11,8	
Particle board core electrical vertical resistance		EN 1081	ohm	≥10^{10}	
Particle board core fire reaction classification		EN 13501-1	Class Cfl		
Panel fire resistance classification		EN 13501-2	REI 30		
Laminate covering fire reaction classification		D.M. 26/06/84	Class 1		
Laminate covering electrical vertical resistance		EN 1081	Not antistatic: ≥10^{10}ohm Static-dissipative: 10^6 - 10^{9}ohm		
Plastic edge self-extinguishing classification		UL94	Class V0		

40LAL AND 40LFL PANEL PHYSICAL & DIMENSIONAL PROPERTIES (in compliance with European standard EN 12825)

		Unit	Value	Tolerance
Nominal dimension		mm	600x600	±0.2 (class 1)
Nominal thickness (laminate thickness: 0,9 mm)	40LAL	mm	39,1	±0.3 (class 1)
	40LFL		39,6	
Planarity		mm	≤0,6	
Diagonal difference		mm	≤0,4	
Inclined edge angle		degree	4°	±15'

40LAL AND 40LFL PANEL PHYSICAL & DIMENSIONAL PROPERTIES (in compliance with European standard EN 12825)

Type of structure: UNI8 Evolution (height: up to 600 mm)			Type of stringer	
		Unit	M (medium)	P (heavy)
Concentrated load at the centre of side at 2.5 mm deflection	40LAL	kN	2,6	3,0
	40LFL		3,2	3,5
Max allowed load at the centre of side (*)	40LAL	kN	3,1	3,2
	40LFL		4,1	4,2
Concentrated load at the centre of panel at 2.5 mm deflection	40LAL	kN	3,7	4,1
	40LFL		4,9	5,3
Max allowed load at the centre of panel (*)	40LAL	kN	6,4	6,5
	40LFL		6,9	7,0
Uniformly distributed load at 2,5 mm deflection	40LAL	kN/m^2	18,0	22,0
	40LFL		25,0	30,0
Load class	40LAL		2	2
	40LFL		3	3
Deflection class	40LAL		B	B
	40LFL		C	B

(*): the panel breaking load is obtained multiplying the max allowed load by 2 (safety factor).

Uni8 Evolution Structure

Uni8 Evolution structure consists of the following elements: pedestal, connecting stringers and the gaskets, to be put on the pedestal heads and on stringers.

Each metallic component is made from steel with an electrolytic galvanized surface treatment (minimum thickness 3µ) on all surfaces.

Special versions of the pedestal are also available: with under head height regulation, with increased section and reinforced version.

The UNI8 Evolution structure can be supplied with one of the following types of stringers:
light (L), medium (M), heavy (P), extra heavy ("H" version) and diagonal stringers ("D" and "X" versions).

TYPE OF SUPPORT	COMPONENTS FEATURES	NOMINAL HEIGHT (with regulation range)	WORKING AXIAL LOAD (*) (safety factor: 2)
UNI8 Evolution	Tube: Ø: 20 mm / thickness: 2 mm Threaded crossbar: M16 Base: Ø: 90 mm / thickness: 1,5 mm	from 55 mm (±10 mm) to 620 mm (±50 mm)	from 40 kN (55 mm) to 20 kN (620 mm)
UNI8 Evolution with under head height regulation	Tube: Ø: 20 mm / thickness: 2 mm Threaded crossbar: M16 Base: Ø: 90 mm / thickness: 1,5 mm	from 190 mm (±35 mm) to 620 mm (±50 mm)	20 kN
UNI8 Evolution with increased section	Tube: Ø: 25 mm / thickness: 1,5 mm Threaded crossbar: M16 Threaded bush: M16 Base: 100x100 mm / thickness: 2,5 mm	from 620 mm (±50 mm) to 980 mm (±50 mm)	from 15 kN (620 mm) to 5 kN (980 mm)
UNI8 Evolution reinforced version	Tube: Ø: 30 mm / thickness: 2 mm Threaded crossbar: M20 Threaded bush: M20 Base: 100x100 mm / thickness: 2,5 mm	from 1000 mm (±40 mm) to 1500 mm (±40 mm)	from 15 kN (1000 mm) to 5 kN (1500 mm)

(*): the breaking load is obtained multiplying the working load by 2 (safety factor).

Some extra features are available:

- **Tubular bracing frame:** made by means of tubular frames fixed to the concrete slab. The quantity and location of the frames depend on: geometry and extension of the access floor, typology and distribution of the static and dynamic loads applied.

TYPE OF SUPPORT	STATIC LOADS	DYNAMIC LOADS (i.e. fork lifts, transpallet, hand-carts, cars)
UNI8 Evolution	Not necessary	Not necessary (to evaluate for higher pedestals)
UNI8 Evolution Under head height regulation	Not necessary	Not necessary (to evaluate for higher pedestals)
UNI8 Evolution with increased section	To evaluate	Required with mechanical fixing of the pedestal base to the slab
UNI8 Evolution Reinforced version	To evaluate	Required with mechanical fixing of the pedestal base to the slab

- **Electrical continuity:** guaranteed only by means of the stringers (every typology) fixed to the pedestal heads by means of metric self-tapping screws.
- **Earthing system:** feasible on structures with stringers. When the access floor area is less than 50 m^2 it is advisable to make one on each side of the floor. For access floor areas above 50 m^2, it is advisable to install one earthing system on each side of every 50 m^2 floor area.
- **Alternative surface treatments:** specific surface treatment such as yellow passivation and nichel coating are available. They provide better performances against corrosion risk and the zink whiskers phenomenon.

Brennercom Cube Reference

Brennercom manages dial-up/Internet connections in Austria and Italy and operates in co-location for several companies.

The project concerns a 700 kW high density modular data center equipped with about 50 racks. It was characterized by co-design activity between customer, engineer, installer and supplier of cooling solutions.

The plant design was focused on granting high system reliability and relevant energy saving benefits and therefore the chiller units are equipped with Intelligent free-cooling and electronic expansion valve, while the chilled water close control units are equipped with EC fans and AFPS system.

The plant operation is monitored and managed by a BMS system integrated with the cooling solution.

Server farm

Bolzano - Italy

Year

2008-2009

Air conditioning Units

CW downflow close control units
Free-cooling chillers
BMS integrated system

Modular Access Floor

600x600 mm calcium sulphate panel
Lower aluminium covering
Other devices (Active floor, 588 holes steel perforated panels, linear grills, …)

Main features

- Total cooling capacity = 700 kW
- Turn-key solution
- High energy efficiency unit
- Chillers equipped with dual power supply
- Quick and easy to install and maintenance
- The free placement of all the installations (electrical, electronic, hydraulic and air conditioning equipments) in the plenum underneath the floor
- Future positioning of extra structures in order to increase the load bearing capacity
- Tight dimensional tolerances of panels (-0,1/+0,2 mm) and fully modularity
- Excellent fire and acoustic behavior
- Use of eco-friendly materials

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ISO 9001 - Cert. n. 341

ISO 14001 - Cert. n. 0333A