

2CRSi Immersion Cooling Solutions



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Why you should adopt immersion cooling

How do Data Centers manage fatal heat and power usage effectiveness issues today?

Data Centers are specific buildings containing a large quantity of servers, storage racks, network and telecommunications equipments, all producing important amount of heat. Constantly cooling this infrastructure to maintain a stable temperature requires a lot of energy.

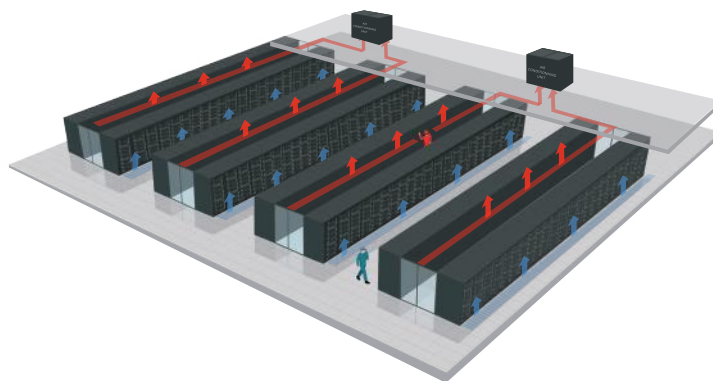
For as long as computing has taken place, there has been the challenge regarding how to efficiently and safely cool systems and Data Centers.

Today, Data Centers account for about 4% of the world's energy consumption and could represent up to 10% in the coming years.

Estimated worldwide Data Center power consumption for 2012 as about 382 billion kWh. Global Data Centers used roughly 416 TWh in 2016. USA Data Centers consumption was 90 billion kWh.

In Europe, according to the European Commission (EC), the energy consumption of Data Centers in 2013 represented 56 billion kWh. The EC estimates that this number reaches 104 billion kWh in 2020.

“Today, the chillers used to cool conventional Data Centers represent between 35% and 40% of the Data Center’s electrical power consumption.”



TRADITIONAL DATA CENTER CONFIGURATION

*Hot and cold aisle configuration.
Arrows show flow of hot and cold air.
Cold air enters from raised floor.
Hot air is drawn into air conditioners.*

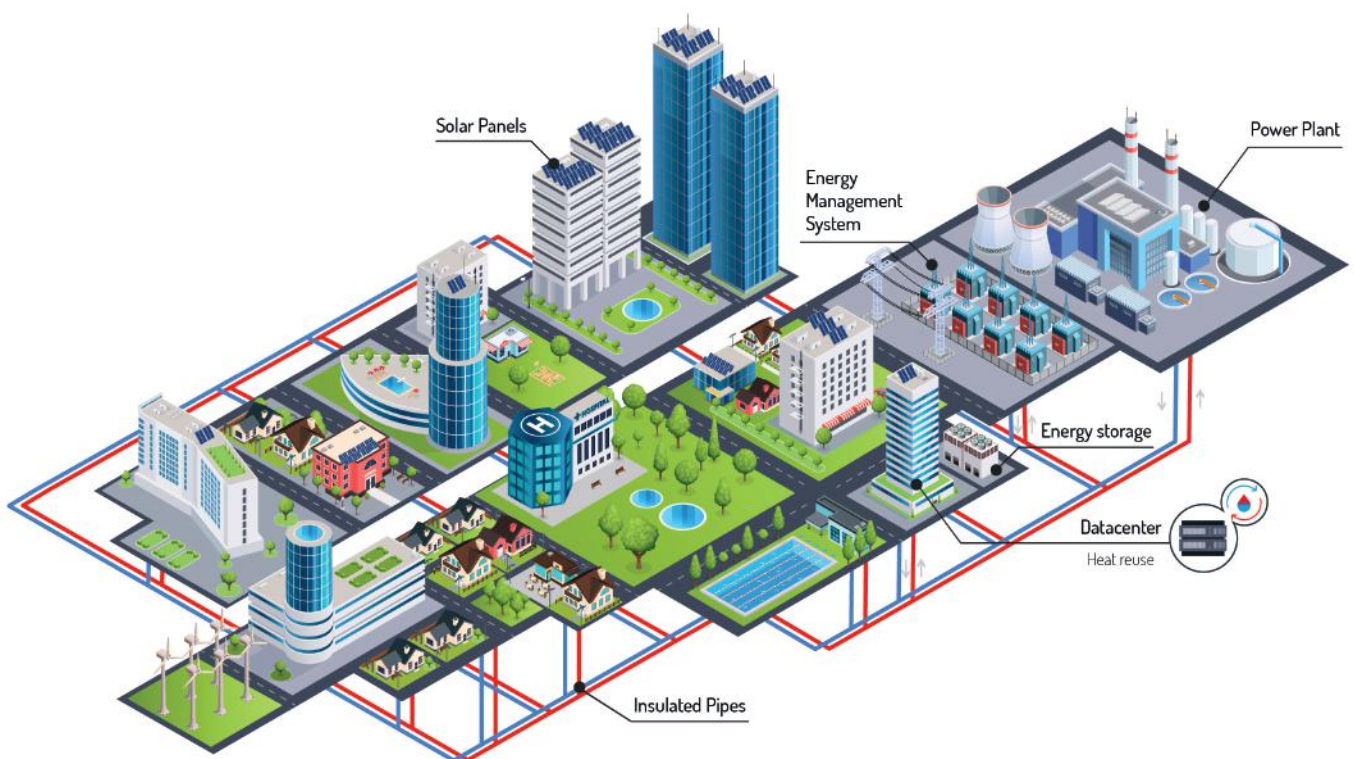
A way to concile IT with the planet

Immersion cooling is a key component in designing Smart Cities. This cooling technology makes it possible to reuse the fatal heat generated by servers through the water network.

As shown below, this hot water might be used as a heating source (for both business and personal use-cases).

The ecological footprint is therefore improved thanks to a reduction of nearly 45% in carbon emissions compared to traditional Data Center.

REUSE OF DATA CENTER HEAT



A way to achieve and exceed your goals

It's time to rethink your Data Center infrastructure by adopting our immersion cooling technology. 2CRSi provides a cost effective and environmentally

friendly alternative that will allow you to exceed your economic and environmental goals.

How does immersion cooling work?

Cooled by  **submer**

2CRSi partners with Submer

Submer Technologies is a European deep tech company, which develops and manufactures hyper-efficient and eco-friendly immersion cooling systems for new-age data centers.

2CRSi and Submer met for the first time in March 2018, at the Cloudfest show, and in September 2018 started a productive and enriching alliance.

Subsequently, the collaboration got reinforced by the creation of the OCtoPus 21" range servers which was complemented by the creation of compatible tanks built by Submer (which systems already offered trays suitable for 2CRSi 19" servers).



Design principles

The immersion cooling technology consists in completely immersing a server into a safe and dielectric liquid*.

Through this process, all the heat generated via the hardware is absorbed by the liquid. This dielectric fluid is able to **capture 1500 times more heat** than air, for the same volume.

The chosen liquid has a flash point which is above 150°C (302°F) and a high stability to prevent any risk of evaporation, overpressure or flammability. The physical-chemical properties of the SmartCoolant, allow higher heat transfer performance than air. The SmartCoolant liquid used by Submer in our Immersion Cooling solutions is a dielectric, synthetic, proprietary fluid, 100% non-hazardous for people or the environment and readily biodegradable according to OECD 301F norm.

[] meaning it does not conduct electricity*



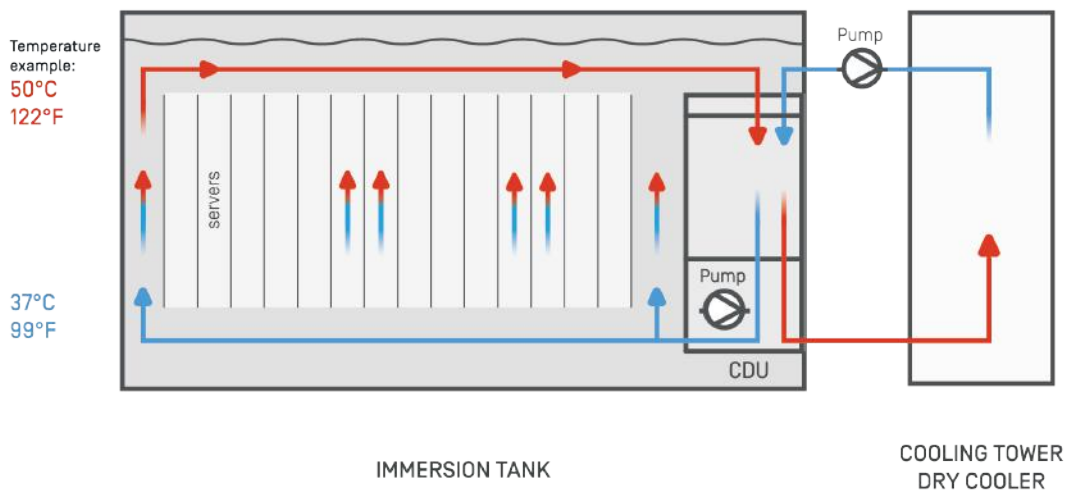
SmartPodXL by Submer, with 3 ranges of servers by 2CRSi [OCtoPus, Atlas and Atlantis]

Simple and efficient

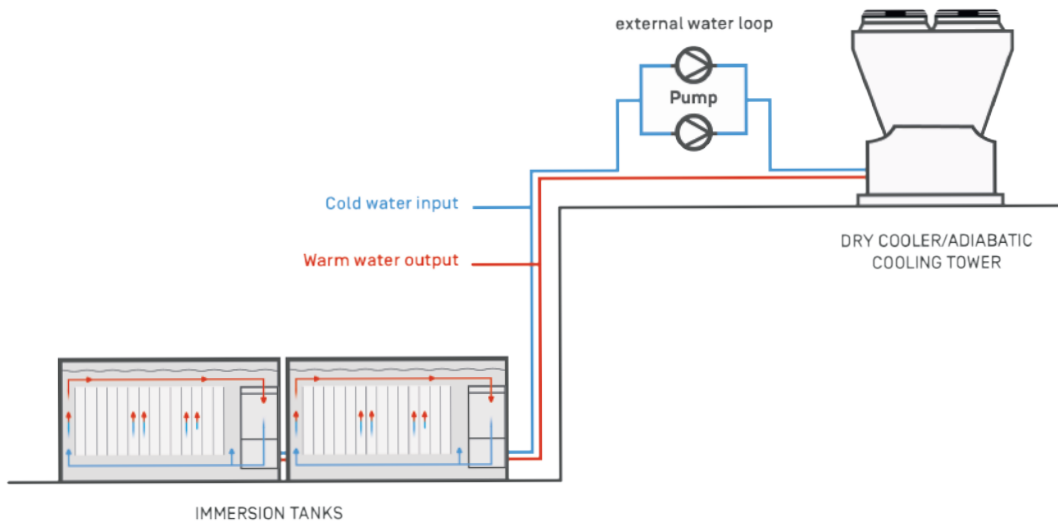
In our single-phase immersion tanks, the heat captured by the liquid from the servers circulates through a pump to a heat exchanger going to a secondary water system.

With immersion cooling, fans have to be removed or deactivated, reducing energy consumption. The heat captured by the network of water pipes can be either reused for heating or evacuated into the air by a dry cooler.

IMMERSION TANK DESIGN PRINCIPLE

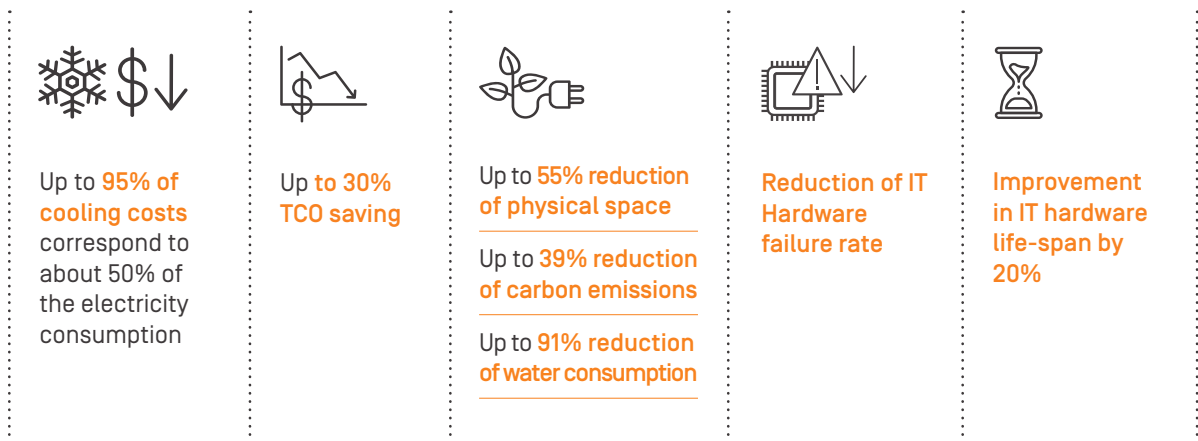


IMMERSION COOLING INFRASTRUCTURE EXAMPLE WITHOUT HEAT REUSE



Key Benefits of Data Center cooled by immersion


Unrivaled Total Cost of Ownership (TCO) compared to a traditional Data Center:



Meeting sustainable and ergonomic needs

The lifetime of immersed components is higher than with an traditional air-cooled solution. A reduced failure rate allows to dramatically reduce replacement costs. Also, thanks to the temperature homogeneity ensured by the dielectric fluid, components are not stressed by sudden temperature changes.

In a conventional air-cooled Data Center, ambient noise can exceed 90 decibels, leading to poor difficult working conditions... As immersion cooling functions without fans, noise pollution is avoided, contributing to better working conditions.

 Homogeneous cooling

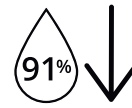
 Noiseless

Carbon Neutrality

2CRSi's immersion cooling technology results in an annual reduction in carbon emissions by up to **39%** * per year, providing similar capacity than a traditional DC. Water consumption can also be reduced by up to **91%** * thanks to immersion.



Up to 39% reduction of carbon emissions



Up to 91% reduction of water consumption

**Comparison tables of carbon emissions and water consumption between two Data Centers (air cooled IT and immersion IT) can be found in the following pages.*

Cool down your investment

Our IT cost effective response to your needs :

-30% CAPEX

Traditional Data Centers require very complex air cooling systems. With Immersion Cooling Technology, there is no need for the installation of refrigerated cabinets, false raised floors, corridors etc. As a result, CAPEX can be reduced by **up to 30%** *.

-40% OPEX

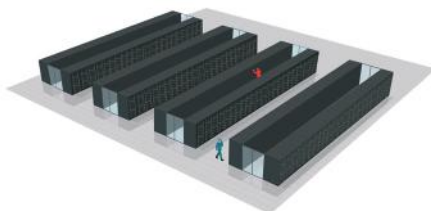
Data Center with Immersion Cooling Technology can reduce power consumption operating costs by **up to 40%** *.

OPTIMIZED FLOOR SPACE

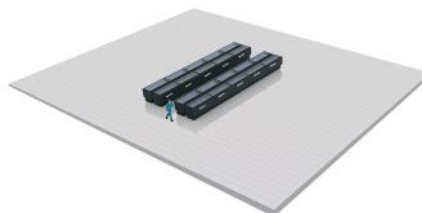
By eliminating essential equipment required for traditional air cooled Data Centers, immersion cooling makes it possible to optimize floor space usage. Our technology allows for greater density for the same number of servers per m² (see below).

[] Estimation, based on use cases.*

Floor space and electricity consumption comparison between air-cooling and immersion



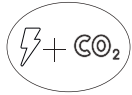
1000 M²:
200 Traditional racks
Rack power: 5 kW on a total of 1 MW Data Center



90 M²:
20 SmartPodXL
Tank power: 50 kW on a total of 1 MW Data Center
Notice: Dedicated ACU is no longer required.

Deep Dive

Comparison of the carbon footprint of two Data Centers



In a increasingly digitalized world, carbon emissions are mainly driven by the extraction of raw materials and their transformation into electronic components, as well as by electrical production of electricity.

In FRANCE: 1 kWh of electricity = 0.104 kg of CO²

(less carbon emissions due to nuclear plants)

In USA: 1 kWh of electricity = 0.454 kg of CO²

CUE

Carbon usage effectiveness (CUE) is a metric that determines the amount of carbon gas emitted by a Data Center on a daily basis. This metric was developed by the non-profit consortium, The Green Grid. It is calculated by dividing the total carbon dioxide emissions equivalents (CO²) of the facility's energy consumption by the total IT energy consumption.

		Data Center A Air Cooling Efficient and traditional IT	Data Center B Immersion Cooling
	Capacity	12 000 servers	
	Average Power Consumption [per server]	350 W	280 W*
	Total IT Power Consumption	4.2 MW	3.36 MW
	Cooling Overhead	30%	2%
	Electrical Overhead	6%	1%
	Effective PUE [Power Usage Effectiveness]	1.36	1.03
	Total Facility Power	5.7 MW	3.5 MW
	Energy Consumption per year	50 Million kWh	30.3 Million kWh
	USA Carbon emissions per year	22.7 Million kgCO ²	13.8 Million kgCO ²
	FRANCE Carbon emissions per year	5.2 Million kgCO ²	3.2 Million kgCO ²
CUE	USA Effective CUE	0.62 kg CO ² /Kwh	0.47 kg CO ² /Kwh
	FRANCE Effective CUE	0.14 kg CO ² /Kwh	0.12 kg CO ² /Kwh

[*] Reduction due to fans removal



Reduction of the carbon emissions by up to 39% thanks to immersion

Comparison of the water consumption of two Data Centers

To reduce water consumption in Data Centers, a measurement system called WUE (Water Use Efficiency) allows measuring water and energy consumption in Data Centers. WUE is calculated by dividing Data Centers annual Energy source and Site water usages (in Liters) by Total IT Power Consumption.



Notice : WUE is a metric defined by the Green Grid.

		Data Center A Air Cooling Efficient and traditional IT	Data Center B Immersion Cooling
	Total IT Power Consumption	4.2 MW	3.36 MW
	Total Facility Power	5.7 MW	3.5 MW
	Daily site water usage*	507 300 L	43 750 L
	Energy source water per year	94.07 Million L	57 Million L
	Site Water Usage per year	185.16 Million L	15.97 Million L
WUE	Site WUE	7.59 L/kWh	2.48 L/kWh

*Based on James Hamilton's estimate



Reduction of water consumption by up to 91% is enabled by immersion



2CRSi immersion cooling solutions

2CRSi immersed servers

SmartPods by  **submer**

2CRSi immersed servers

A wide range of servers to suit your IT needs

At 2CRSi, we design and manufacture three immersion server ranges based on customer insights.

Our solutions cater to different needs, from generic platforms to high density compute & GPU compute applications. They are conceived to deliver an optimal performance through the use of immersion cooling.

The OCtoPus, the latest generation of 21" servers engineered by 2CRSi, the Atlantis (19"), the Open Plus (21") and the Atlas (21") are specifically designed to be immersed in tanks.

We are not only building tailor-made immersion servers, **we can also transform* your existing servers for immersion cooling.**

() Contact 2CRSi for technical feasibility.*



OCtoPus

21" servers 1 OpenU or multi OpenU

- Inspired by OCP specifications
- Best TCO for large installations
- Stronger performance
- Higher flexibility
- Improved MTBF
- Easy handling
- No PSU



Servers with GPUs

One node and two GPUs	OCtoPus 1.2
One node and four GPUs	OCtoPus 1.4
One node and eight GPUs	OCtoPus 1.8

Servers with dual-CPU with 2-slot GPU

Two nodes with two GPUs each	OCtoPus 2.2
Two nodes with one CPU and four GPUs each	OCtoPus 2.4

Servers with CPU nodes

Three nodes and multiple storage capacities	OCtoPus 3
Four nodes	OCtoPus 4
Five nodes	OCtoPus 5
Eight nodes	OCtoPus 8

Atlas

21" servers 1 OpenU or multi OpenU

- Best TCO for small installations
- High density
- Stronger Performance
- PSU included



Servers with GPUs

One node and two GPUs	Atlas 1.2
One node and four GPUs	Atlas 1.4
One node and eight GPUs	Atlas 1.8

Servers with dual-CPU with 2-slot GPU

Two nodes with two GPUs each	Atlas 2.2
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Atlantis

19" servers 1 U or multi U

- Best profitability
- Stronger performance
- Higher flexibility
- PSU included



Servers with GPUs

One node and two GPUs	Atlantis 1.2
One node and four GPUs	Atlantis 1.4
One node and eight GPUs	Atlantis 1.8

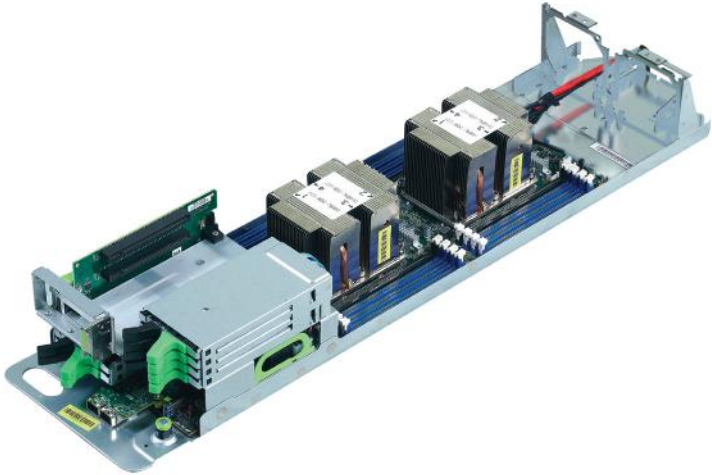
Servers with dual-CPU with 2-slot GPU

Two nodes with two GPUs each	Atlantis 2.2
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Open Plus

21" servers 2 OpenU

- Based on OCP specification
- Best TCO for large installations
- Stronger performance
- Higher flexibility
- Improved MTBF
- Easy handling
- No PSU



Servers with CPU nodes

Three nodes	Leopard	Tioga Pass	Capri
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SmartPods



In 2018, based on customer input from various industries (Oil & Gas, Banking, European Security), 2CRSi came up with a solution capable of transposing air cooled servers to immersion cooled servers.

Our objective was to deliver a solution that could allow for IT densification, components failure reduction and life cycle increase, whilst yielding financial savings. The next step was the tanks, that could take this vision to the next level.

SmartPodX & SmartPodXL : immersion cooling made practical

The SmartPodX & SmartPodXL have a cooling capacity of **50 kW**. This dissipation is made possible thanks to the CDU (Cooling Distribution Unit) exchangers, which are directly integrated in each tank.



SmartPodX

SmartPodXL+ : unrivaled density

The XL+ has 2 CDUs for a total dissipation capacity of **100 kW** for 39 OpenU or 41 U.

The CDUs ensure the temperature exchange between the hot liquid and the cold water getting into the tanks. The CDUs are equipped with a **double pump**, ensuring the appropriate redundancy and creating a movement within the liquid to ensure uniform cooling throughout the entire system.



SmartPodXL+

SmartPod statement of line*

	SmartPodX	SmartPodXL	SmartPodXL+
IT Hardware capacity	21U / 19 0U	44U / 42 0U	41U / 39 0U
Dimensions	120(L) x 93(W) x 121(H) cm	228(L) x 90(W) x 119(H) cm	228(L) x 90(W) x 119(H) cm
Weight [Empty]	411 kg / 905 lbs	671 kg / 1,476 lbs	766,95 kg / 1,690 lbs
SmartCoolant capacity	576 l / 152,2 gal	1 186 l / 313 gal	1 186 l / 313 gal
Total weight [Full of SmartCoolant]	872 kg / 1,922 lbs	1 691 kg / 3,728 lbs	1 787 kg / 3,940 lbs
Typical SmartCoolant/Temperature setpoint	40°C-60°C/104°F-140°F		

The CDU (Cooling Distribution Unit)*

	SmartPodX	SmartPodXL	SmartPodXL+
Heat dissipation capacity	50 kW	50 kW	100 kW
Max power consumption	750 W	750 W	1 500 W
Mechanical Power Usage Effectiveness	1,015		
Redundancy	2N / Tier III	2N / Tier III	2N / Tier IV
Power supply	380-400V 50Hz / 208-230V 60Hz		
Power supply connection	Industrial connector three phase 3P+E +N 32A IEC60309 / plug L2120 20A NEMA		
Water supply connection	G 1 1/4" BSPP female , NPT male		
Monitoring	+ 20 real-time metrics over public REST API / DCIM compatible		

Deployment Requirements*

	SmartPodX	SmartPodXL	SmartPodXL+
Water supply in let temperature	Recommended less or equal to 32°C / 89°F Inhibitors and/or softners: depending on Icing and Water quality conditions		
Water flow rate	9 to 11 m3/h / 2,378 to 2,906 gal/hr		
Warm water outlet temperature	Expected 37°C / 99°F		
Floor load capacity	900 kg/m ² / 1980 lbs/ft ² (IT Hardware not considered)		
Fire Supression System	Standard air-cooled Data Center tire suppression system		
Temperature	-20°C to 55°C / -4°F to 131°F		

[*] All these informations are relative to the SmartPod 4.1 version.

And to go even further: Meet **The Dry Zone**, our latest innovation

In regards to our customer request, 2CRSi developed an external extension called '**Dry Zone**', in order to offer space efficiency.

This tank add-on allows installation of any switch or storage device outside of the SmartPod, to keep them away from the dielectric fluid/liquid .



Advantages:

Increased profitability

The Dry Zone offers an additional 12 OpenU capacity to the SmartPod. Your TCO is reduced accordingly.

Improve data cables management

The connection between the immersed IT infrastructure and switches is made at the front of the tank, allowing easier access and better cable management.

Keep your switches and storage devices away from liquid

Our Dry Zone keeps your devices running without any modification such as fan desactivation, firmware updates, etc.

Easy mounting and removal of the add-on part

The mounting is made on existing screws and the whole Dry Zone structure can be easily moved with the SmartPod.

Easy cables access



Two possible versions



6 U for switches
[2 U x 3 switches]



12 U for switches
[2 U x 6 switches]

2CRSi immersion cooling solutions: statement of line

Specifications overview*

	OCtoPus		Open Plus	Atlas	Atlantis
Format	21" 1 node	21" 3 nodes	21" 3 nodes	21" 1 node	19" 1 node
Number of servers per SmartPodX	16 **	48**	24**	19	21
Number of servers per SmartPodXL	39 **	117**	58**	42	44
Number of servers per SmartPodXL+	36 **	108**	54**	39	41
PDB [OCP accepted]	Yes	Yes	Yes	-	-
Busbar [OCP accepted]	Yes	Yes	Yes	-	-
PSU [integrated in servers]	-	-	-	Yes	Yes
Power distribution from tank	No	No	No	Yes	Yes

[*] All these informations are relative to the SmartPod 4.1 version.

[**] The OCP powershell can use 30U.



About 2CRSi

Created in 2005, 2CRSi focuses on server design and manufacturing.

We provide suitable products for industries which require Data Centers looking for high-performance and high-density systems combined with energy efficiency.

Our products are designed and manufactured in France, the United Kingdom and USA.

We deploy our products on a very large scale in 25 countries for computing, data storage and data transfer.

Research and Development

A strong R&D investment enables us to re-think and re-design next generation servers, from A to Z. Our in-house expertise allows us to develop electronic and mechanical features to address our clients' unique needs.

Mechanics

Software Engineering

Electronics

Innovation

Thermodynamics

Strong partnerships

Our partners network encompasses well known actors, as well as smaller growing businesses. Working in close collaboration allows us to leverage any technology available on the market: from tried and tested equipment to disruptive technologies, we streamline and re-think the whole concept to perfectly match our clients' needs, in an energy efficient and affordable way.



Western Digital

AMD



Our value proposition

Green-IT

2CRSi has already been acknowledged by its peers for designing and engineering solutions that will lead the way to a greener future.

High performance

Our R&D works to optimize our solutions' density, compute power and network speed capabilities. We also improve our solutions' efficiency, flexibility and ease of use.

Tailor-made

Your specific needs drive our technical approach: from our existing offer to new developments, we customize our servers according to your criteria.

Smart Design

Our solutions are designed to be simple, flexible and scalable.

Operational agility

We allocate specific resources to your projects.

2CRSi
 DESIGNER AND MANUFACTURER
 OF INNOVATIVE AND ENERGY-EFFICIENT
 IT SOLUTIONS

Global Presence



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