



**SCREWline<sup>4</sup>-i**

**WDAN-iK4 MF 220.2 – 420.2**

Product presentation

# The simultaneous load in new buildings

Modern buildings have simultaneous **heating** / **cooling** demand

This requirement is common for:

- **Offices** with different facades / equipment
- **Hospitals / Hospitality** for different usage / attendance
- **Industry** for either process and/or comfort
- **Commercial** for different usage / attendance

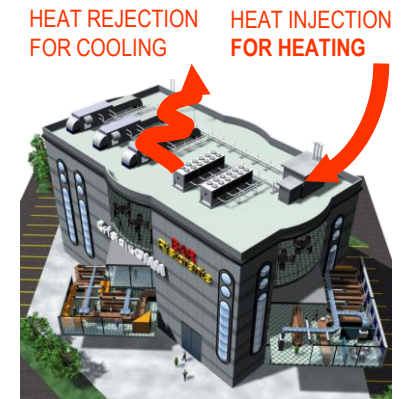
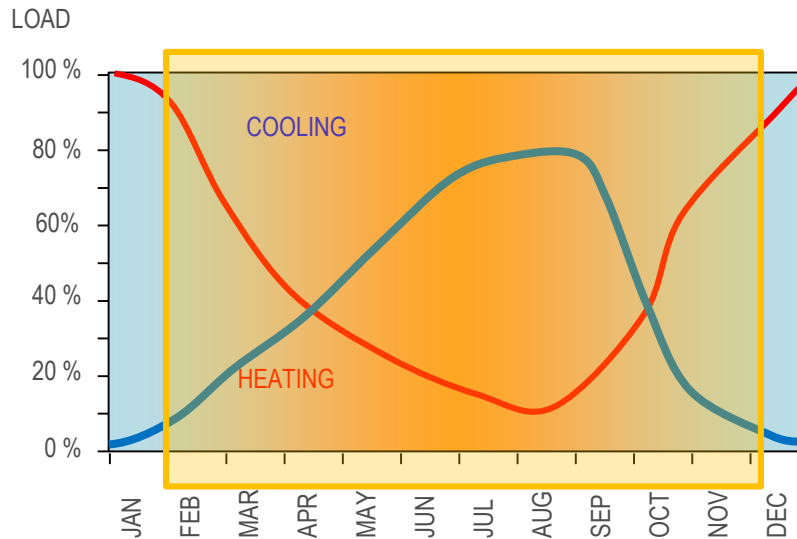


# The simultaneous load in new buildings

The demand of the building varies during the year, according to

- Outdoor temperatures;
- Attendance;
- Use

**Simultaneous** load typically **95 % of time**



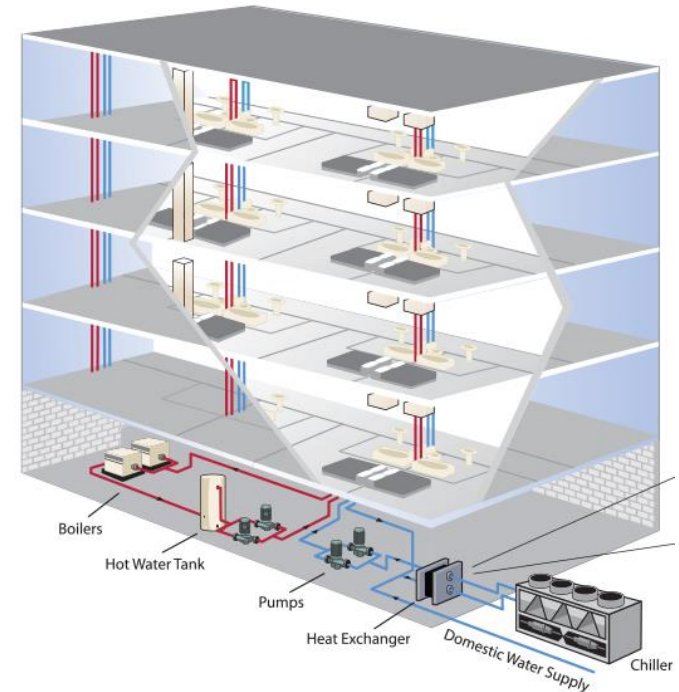
# Traditional Solution

Traditional designs use two independent hydraulic circuits:

- 1 chiller for **cooling**
- 1 boiler for **heating**

**Separate production is not efficient:**

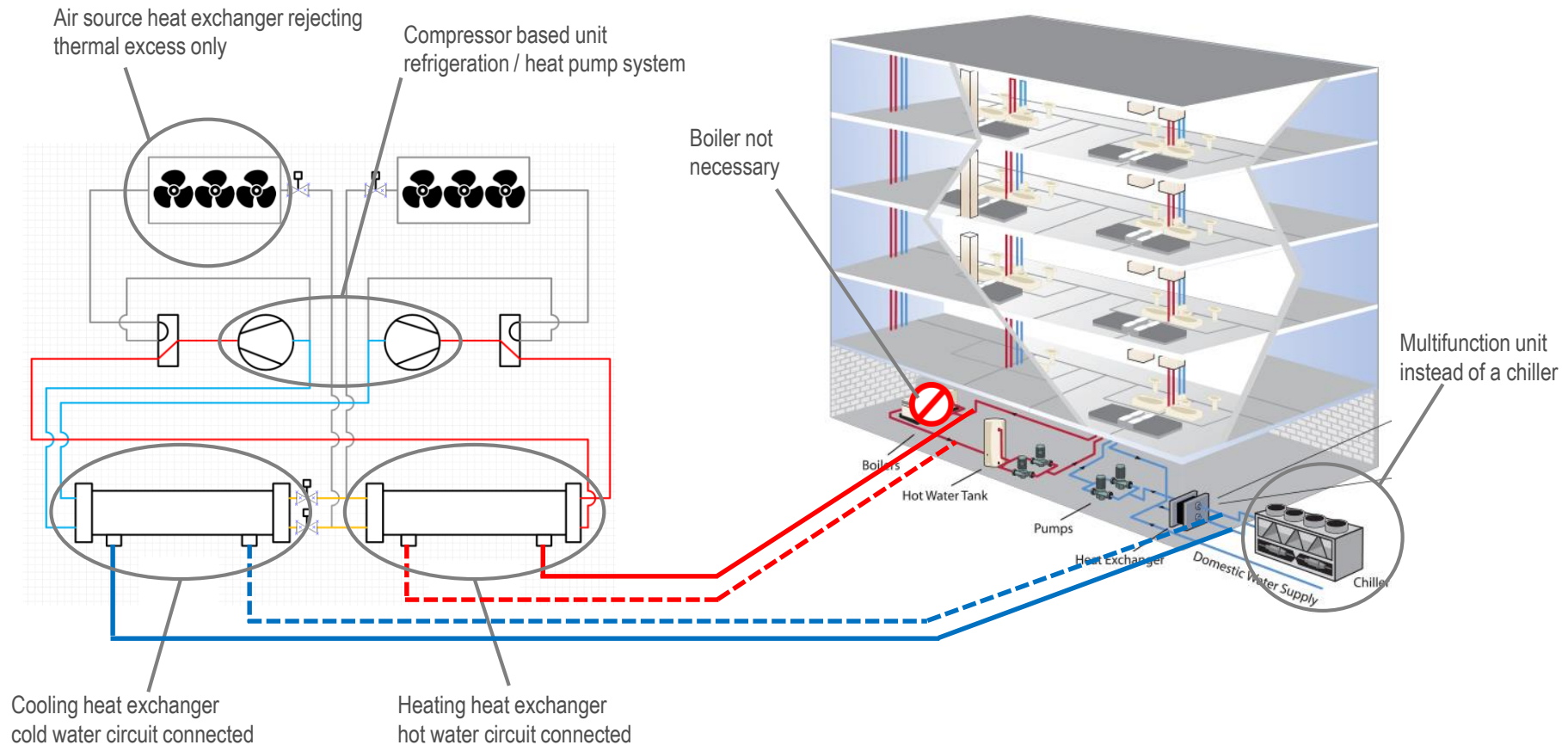
- Chillers and boilers work independently for different demands
- Chill production rejects heat
- This heat could be used for heating
- Less requirement for boilers





# The Multifunction concept

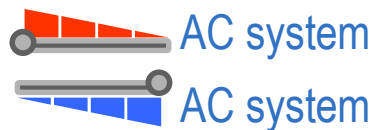
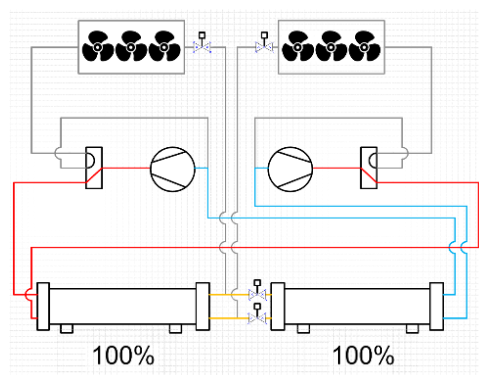
With a **single multifunctional unit** producing cooling and heating simultaneously, independently and efficiently, it is possible to replace both generators (boiler and chiller).



# The Multifunction solution

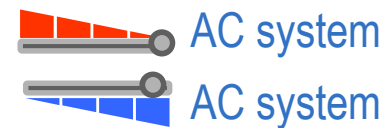
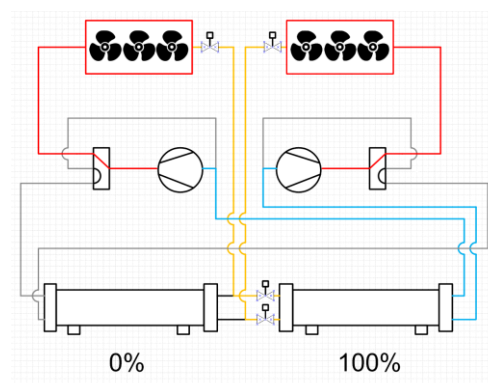
The Multifunction solution is an heat pump based technology unit able to recover the thermal load increasing the already efficient heat pump effect.

## Mid season – Simultaneous load



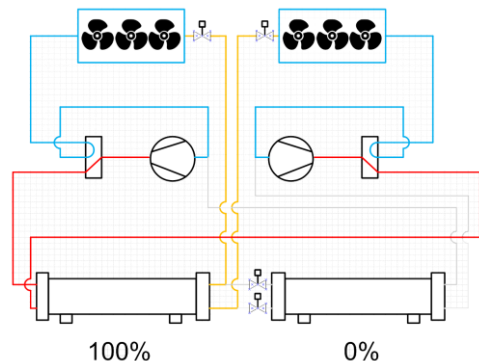
**Total recovery mode.**  
No energy is rejected

## Summer – Cooling prevailing



**Cooling only mode.**  
The excess energy is rejected through the source heat exchanger

## Winter – Heating prevailing



**Heating only mode.**  
The excess energy is rejected through the source heat exchanger

# Multifunction solution advantages

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The capital cost is even lower:

- Boiler is no longer required
- No gas pipes and contract
- No gas-related norms and controls
- Possibility to get renewables benefit
- Possibility to get advantageous electrical contracts
- Smaller footprint used → more surface available
- Faster installation and commissioning

## SCREWLine<sup>4</sup>-i Multifunction, Air source – Main Features

**SCREWLine<sup>4</sup>-i** is the most **technologically advanced solution** available on the Market with inverter screw compressors and R513A refrigerant





# SCREWLine<sup>4</sup>-i Multifunction, Air source – Capacity range

**WDAN-iK4 MF** series is a 2 refrigeration circuits and 2 inverter compressors unit, available in Excellence version, in 3 acoustic versions:

## Acoustic configuration with compressor soundproofing (SC): range 523 kW – 990 kW

SIZES	220.2	240.2	260.2	280.2	320.2	340.2	420.2
Cooling capacity	523	545	575	634	722	792	990
EER	2,88	2,85	3,06	3,11	3,05	3,02	2,85
SEER	5,10	5,08	5,08	5,17	5,12	5,05	5,05
Heating capacity	503	508	537	631	697	776	907
COP	3,11	3,11	3,22	3,11	3,07	3,10	3,05
SCOP	4,03	4,03	4,12	-	-	-	-

## Silenced acoustic version (LN): range 512 kW – 937 kW

SIZES	220.2	240.2	260.2	280.2	320.2	340.2	420.2
Cooling capacity	512	525	569	627	715	783	937
EER	2,85	2,84	3,03	3,10	3,04	3,00	2,91
SEER	5,08	5,11	5,13	5,16	5,12	5,13	5,05
Heating capacity	499	504	533	627	691	769	854
COP	3,17	3,17	3,30	3,18	3,14	3,16	3,21
SCOP	4,07	4,07	4,12	-	-	-	-



## Super-silenced acoustic version (EN): range 450 kW – 876 kW

SIZES	220.2	240.2	260.2	280.2	320.2	340.2	420.2
Cooling capacity	450	496	538	597	676	755	876
EER	2,94	2,82	3,03	3,10	3,06	2,98	2,99
SEER	5,15	5,16	5,18	5,18	5,17	5,06	5,05
Heating capacity	443	476	513	570	636	736	808
COP	3,26	3,22	3,36	3,29	3,21	3,21	3,29
SCOP	4,14	4,12	4,21	-	-	-	-

# SCREWLine<sup>4</sup>-i Multifunction, Air source – Low environmental impact

**R513A** = Solution with low environmental impact

The environmental benefits of R513A compared to R-134a

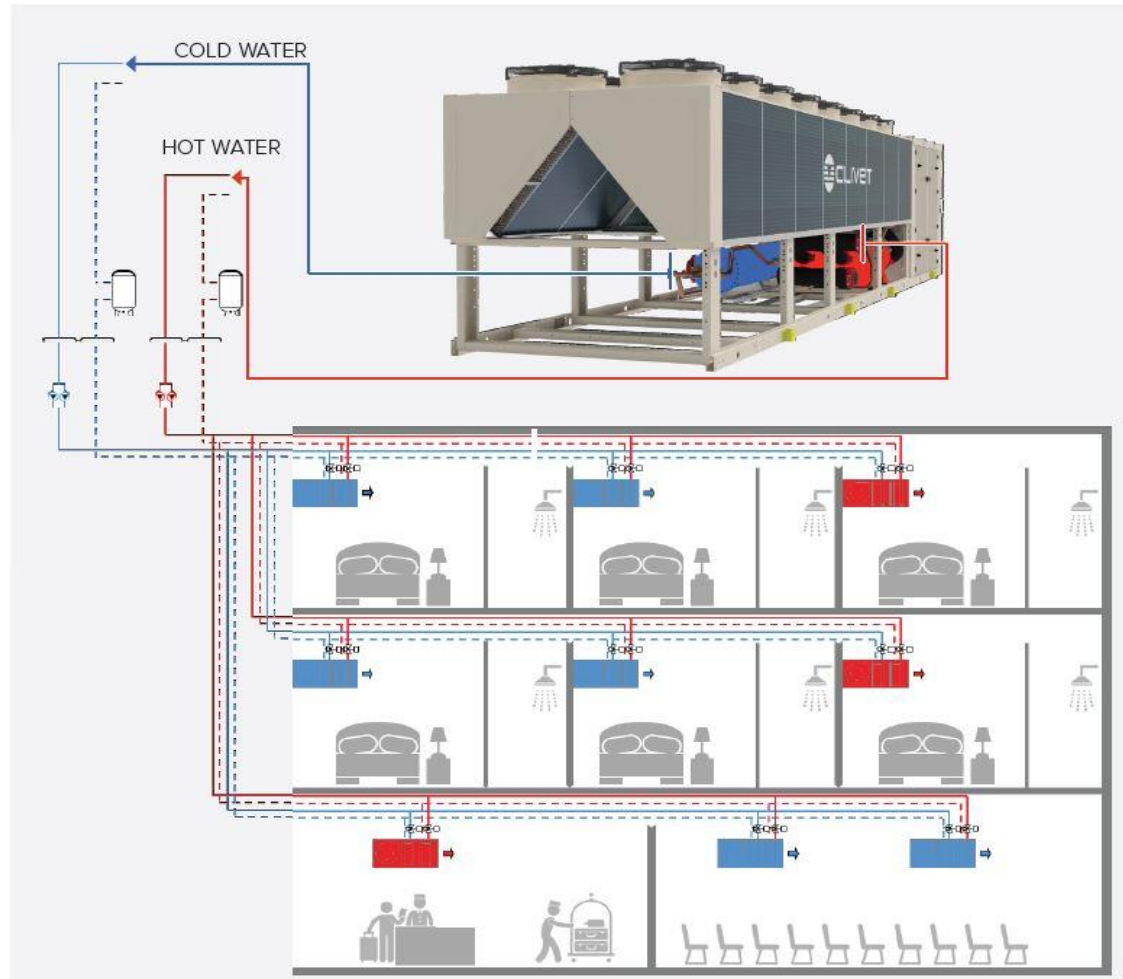
Refrigerant		
Refrigerant type	HFO	HFC
GWP	631	1430
Dispersion in the atmosphere	6 years	14 years
ASHRAE 34, ISO 817 classification	A1	A1



# SCREWLine<sup>4</sup>-i Multifunction, Air source – System configuration

## Configuration for 4-pipe system (4T)

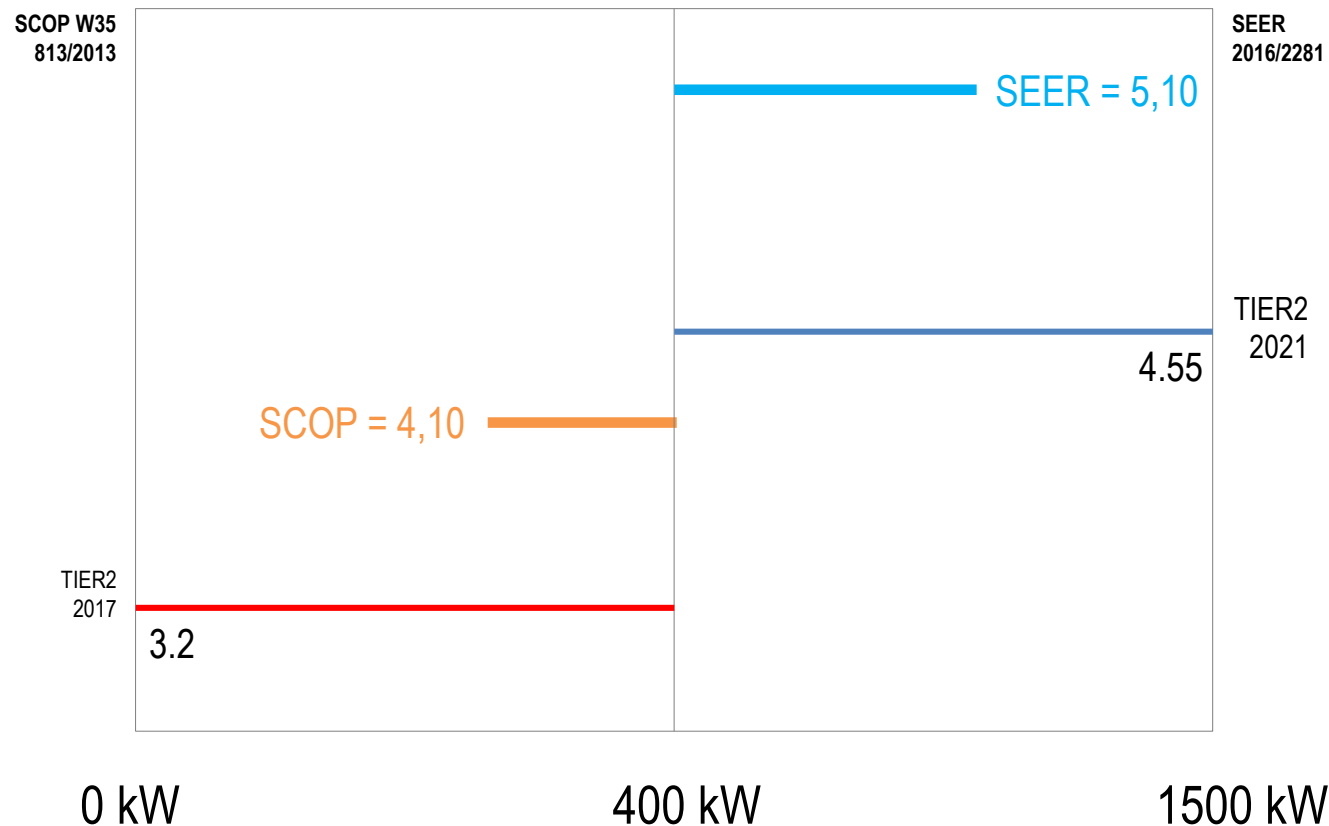
Contemporary demand for hot water and chilled water by Heating/Cooling system



# SCREWLine<sup>4</sup>-i Multifunction, Air source – Seasonal Efficiency (Comfort application)

**WDAN-iK4 MF** reaches very **high seasonal efficiency** values

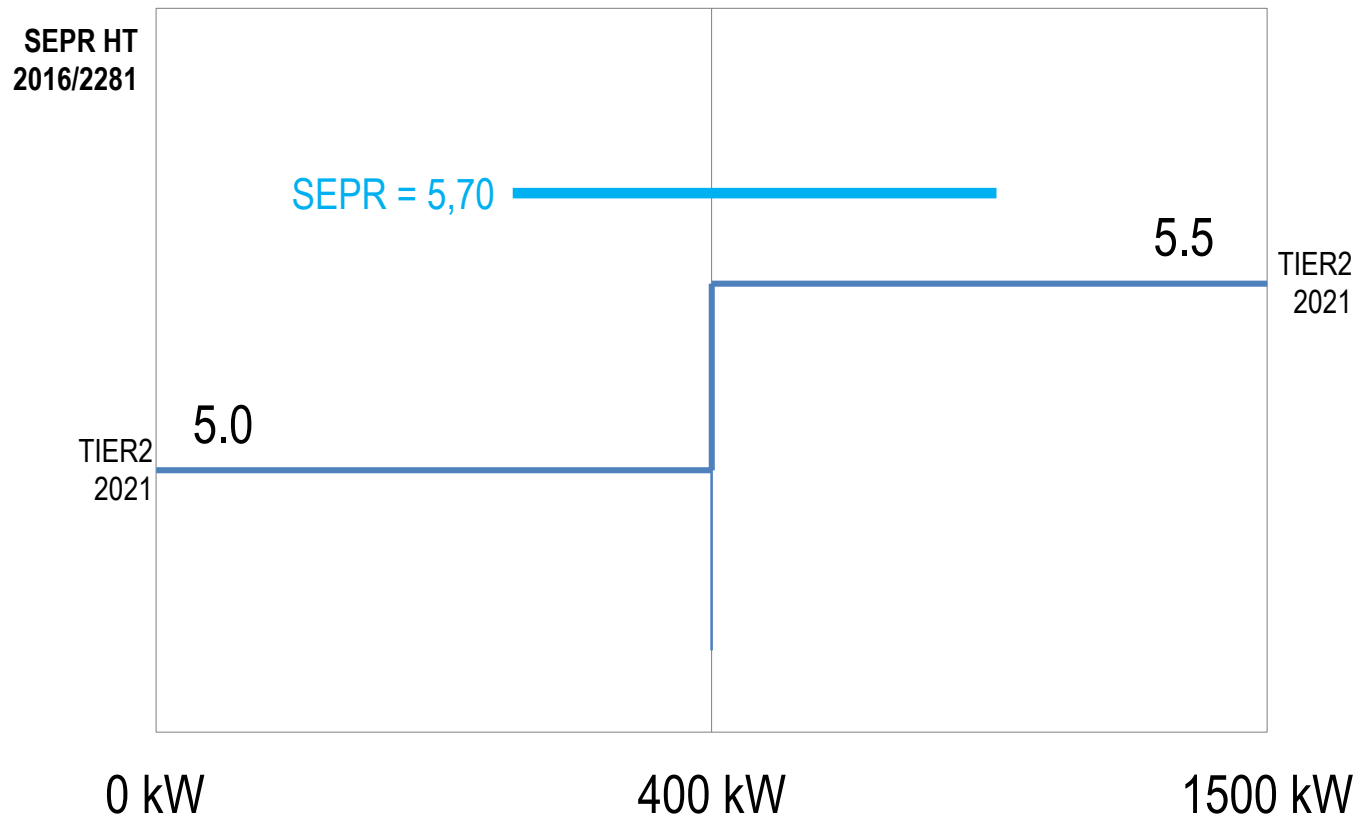
All acoustic versions are already compliant to **2021 requirements (Tier 2)**



# SCREWLine<sup>4</sup>-i Multifunction, Air source – Seasonal Efficiency (Industrial application)

**WDAN-iK4 MF** reaches very **high seasonal efficiency** values

All acoustic versions are already compliant to **2021 requirements (Tier 2)**





# SCREWLine<sup>4</sup>-i Multifunction, Air source – Technologies for high efficiency

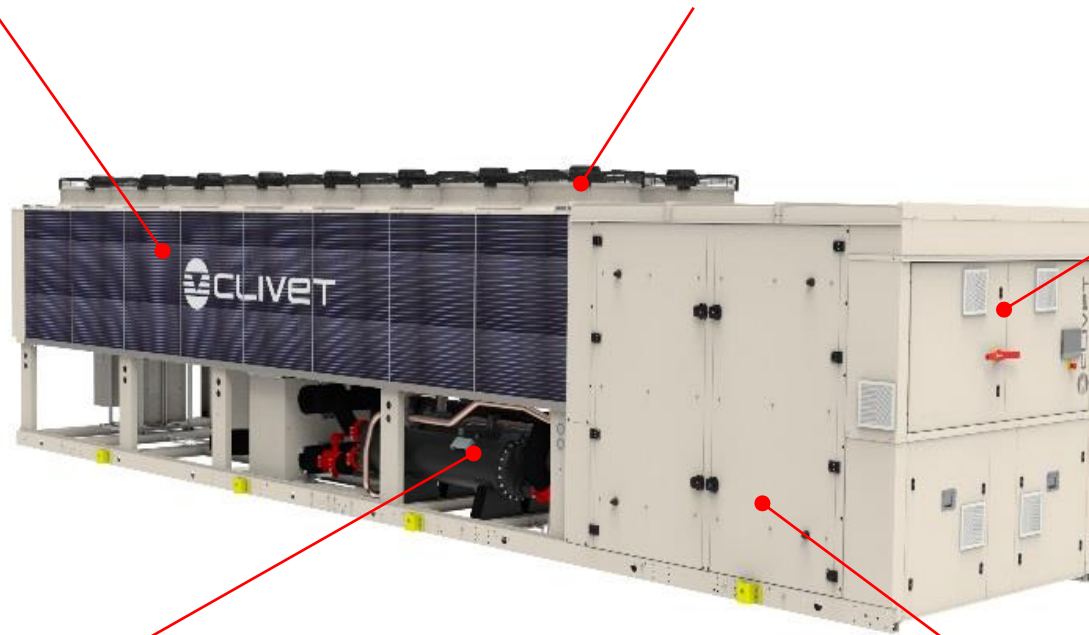
**Copper / Aluminium coil** with hydrophilic treatment

Fans with **electronic speed control** (ECOBREEZE)

Automatic control

High efficiency **cold side and hot side shell and tube heat exchangers** (standard Victaulic connections)

**Compressors with infinitely variable capacity control – FULL INVERTER TECHNOLOGY**



# Inverter screw compressor: Minimum turndown

**SCREWLine<sup>4</sup>-i Multifunction** is equipped with **2 inverter screw compressors**:

- Perfectly match the cooling load of the plant in any condition
- Follow the load also with a great staging
- Ensure high efficiency values, reducing operating costs
- Reduce the sound levels at partial loads
- Ensure a null in-rush current



# Inverter screw compressor: Minimum turndown

The unit, thanks to the two inverter compressors, has a turndown capability of 18% of its nominal capacity, allowing very precise capacity control and a smooth transition from very low to high capacity

T out 35°C  
Load 100%



**EER 2.9**

Really unlikely

T out 30°C  
Load 75%



**EER 3.8**

Very likely

T out 25°C  
Load 50%



**EER 4.9**

Very likely

T out 20°C  
Load 25%



**EER 5.7**

Likely

Thanks to this turndown capability the water content of the system could be reduced at a minimum quantity, avoiding the use of large buffer tanks to ensure reliable and accurate operation

T water flow very stable



$T \pm 0.5 K$



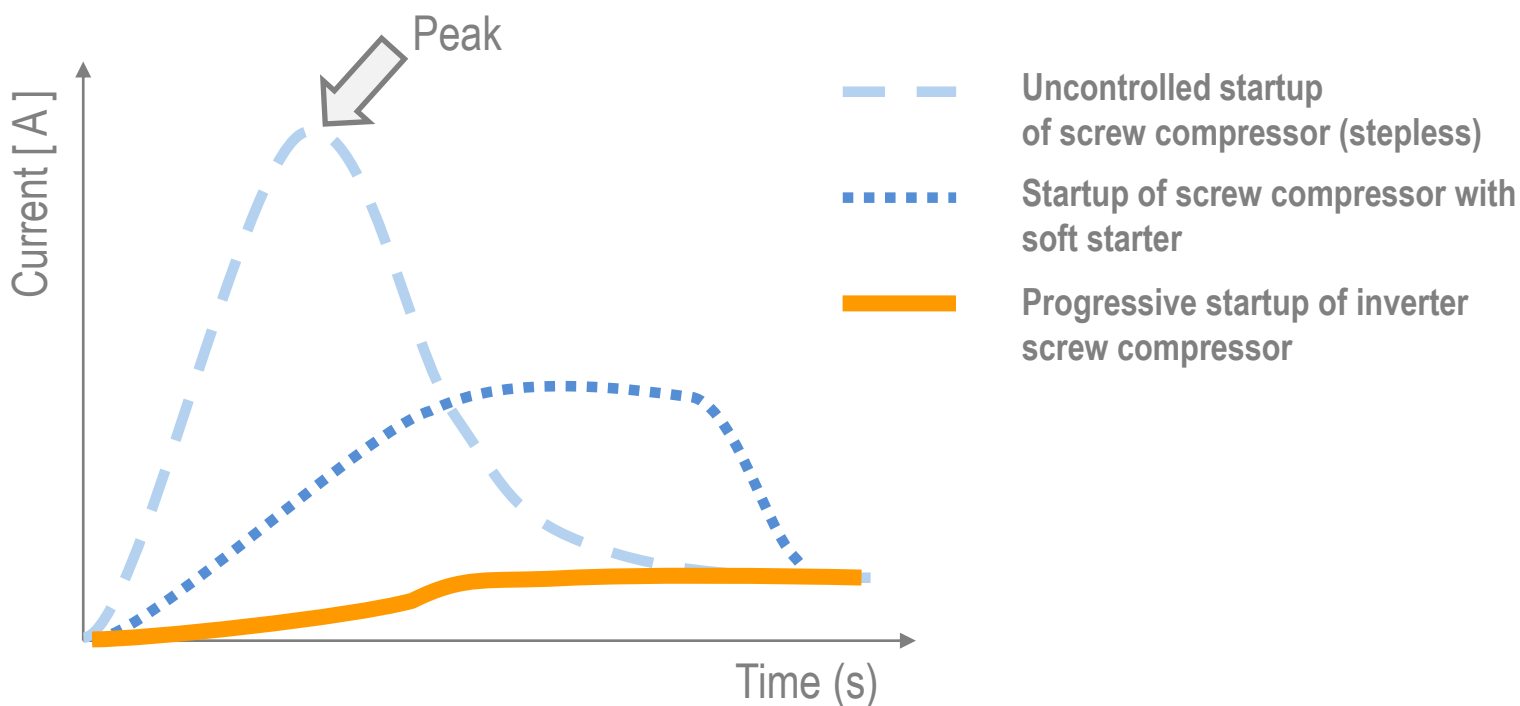
Reduced ON-OFF cycles

Improved reliability and life length

# Inverter screw compressor: In-rush current

Thanks to inverter technology the startup phase, usually the most critical, is gradual from minimum to maximum speed:

- Ensures a null in-rush current
- Avoid the overhead of the host supply
- Avoid mechanical stress on the compressor



# SCREWLine<sup>4</sup>-i Multifunction, Air source – Acoustic configurations

**SC** = Acoustic configuration **with** compressor soundproofing



**LN** = **Silenced** acoustic configuration (same length of SC version)



-8  
dB(A)

**EN** = **Super-silenced** acoustic configuration (same length of SC version)



-12  
dB(A)



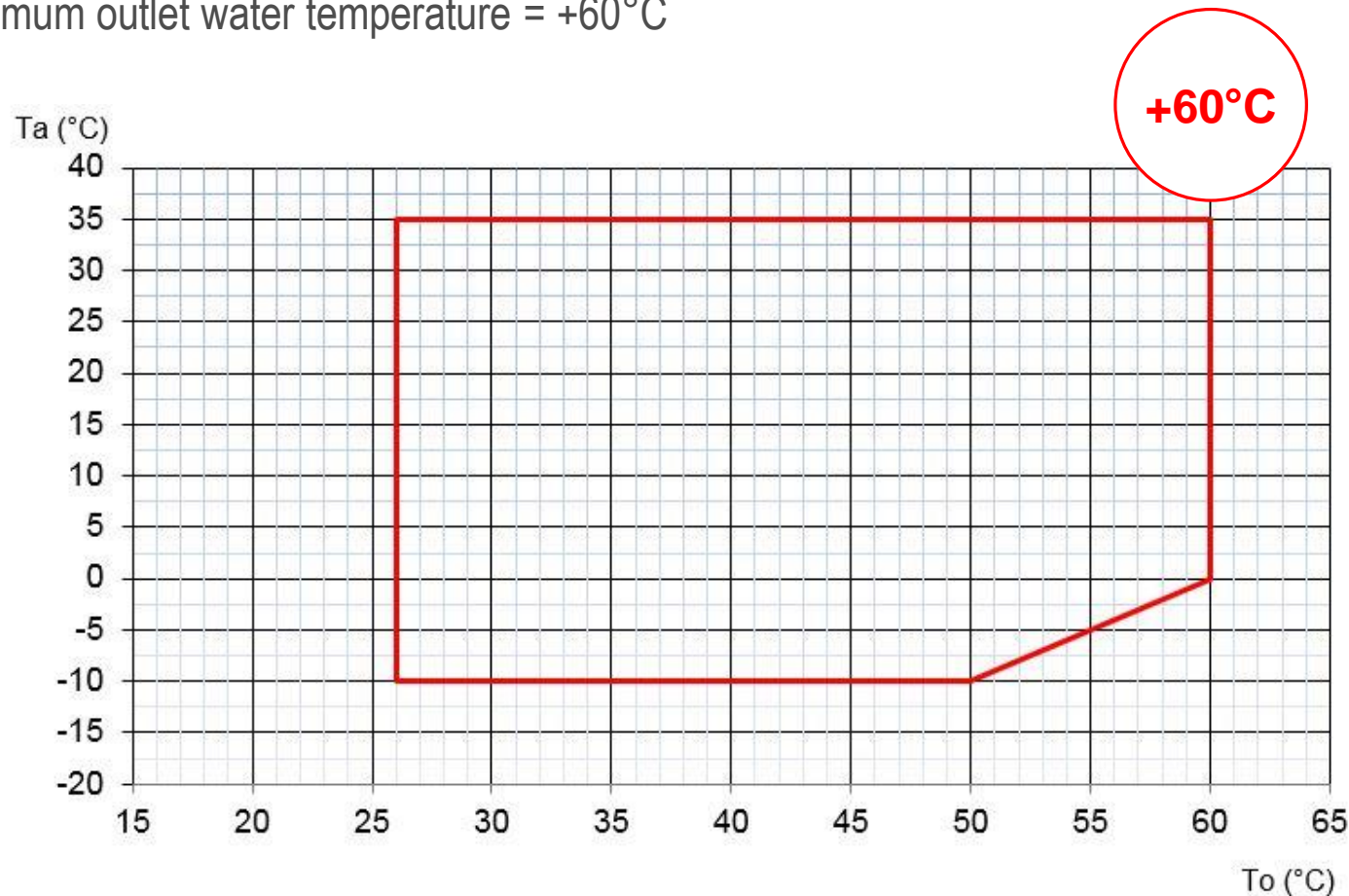


# SCREWLine<sup>4</sup>-i Multifunction, Air source – Operative range in heating

**EXC** = **EXCELLENCE** version, for all acoustic configurations **SC, LN, EN**

Minimum outdoor air temperature = -10°C

Maximum outlet water temperature = +60°C

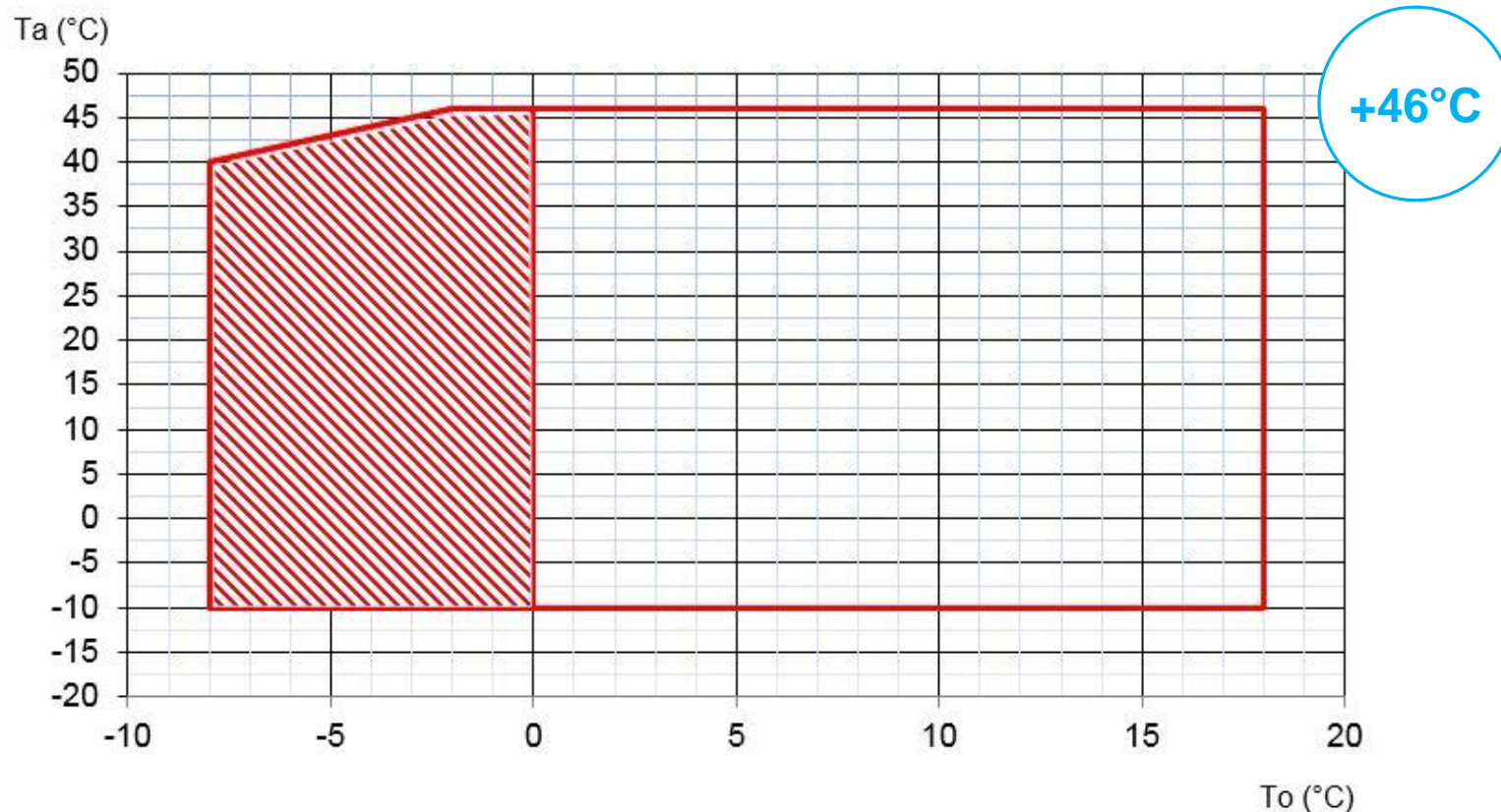


# SCREWLine<sup>4</sup>-i Multifunction, Air source – Operative range in cooling

**EXC** = **EXCELLENCE** version, for all acoustic configurations **SC, LN, EN**

Minimum outdoor air temperature = -10°C

Maximum outdoor air temperature = +46°C

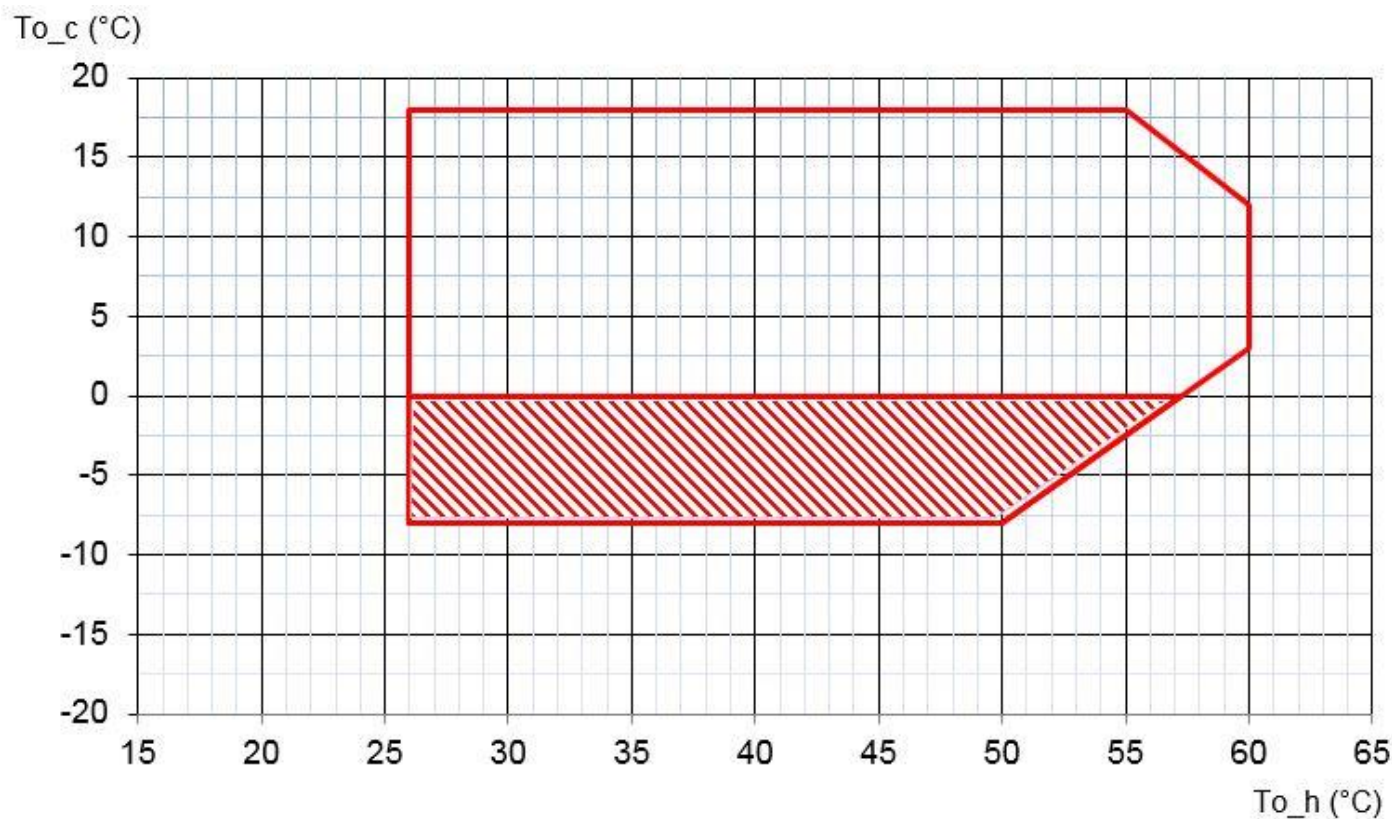


# SCREWLine<sup>4</sup>-i Multifunction, Air source – Operative range with simultaneous loads

**EXC** = **EXCELLENCE** version, for all acoustic configurations **SC, LN, EN**

Minimum cold side outlet water temperature =  $-8^{\circ}\text{C}$

Maximum hot side outlet water temperature =  $+60^{\circ}\text{C}$



# SCREWLine<sup>4</sup>-i Multifunction, Air source – Perfect for Leed

Thanks to specifications and performances as per AHRI is **perfect for LEED\***

## Performance

### Compressor soundproofing acoustic configuration (SC)

SIZE			220.2	240.2	260.2	280.2	320.2	340.2	420.2
Cooling capacity (AHRI 550/590)	4	kW	519	540	570	628	715	785	982
Total power input (AHRI 550/590)	4	kW	181	191	187	203	236	262	346
COP <sub>R</sub>	4	-	2,87	2,84	3,04	3,09	3,03	3,00	2,84
IPLV	4	-	5,21	5,12	5,32	5,36	5,26	5,10	5,37



\* Satisfies prerequisites related to “Minimum Energy Performance” and “Fundamental Refrigerant Management”. Also matches “Enhanced Refrigerant Management” parameters.

# SCREWLine<sup>4</sup>-i Multifunction, Air source – Partial load performances

**Performances at partial load** for each unit are easy to obtain consulting:

## General technical data

Cooling performance at part load - ST/SC

SIZE	Load	Entering external exchanger air temperature (°C)							
		35°C			30°C			25°C	
		kWf	kWe_tot	EER	kWf	kWe_tot	EER	kWf	kWe_tot
440.2	100	790	260	3,04	820	240	3,41	846	222
	75	593	167	3,55	615	153	4,03	635	139
	50	395	97,4	4,06	410	88,2	4,65	423	80,4
	25	198	44,4	4,44	205	39,0	5,26	212	34,8
	Minimum	83	19,2	4,32	88	16,9	5,21	93	15,1

**Documentation**

part load							
Capacity required (kW)		0					
external exchanger air intake (°C)		35					
Part Load							
Cooling capacity (kW)		500	500	500	500	500	500
Compressor power input (kW)		137	132	128	125	124	124
Total power input (kW)		152	148	144	144	143	146
EER		3.28	3.37	3.47	3.47	3.49	3.42
EER compressor		3.65	3.78	3.90	3.99	4.03	4.03
Internal exchanger thermal head (°C)		4.58	4.31	3.96	3.55	3.22	3.00
Water flow-rate (User Side) (l/s)		26.1	27.7	30.2	33.6	37.1	39.8
Internal exchanger pressure drops (kPa)		31.8	35.5	41.3	43.9	52.4	59.2

**Selection software**



# SCREWLine<sup>4</sup>-i Multifunction, Air source – Technical Insights

## Functionalities and options available



# Simplifies and industrializes the plant

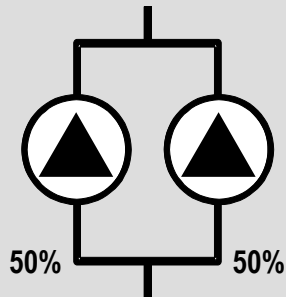
Optional integrated **pumping groups** save:

- Time and cost for the **set-up**
- Floor area for pumping equipment and relevant clearance

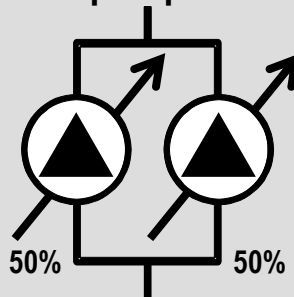
**Available options** for cold side and hot side:

## Parallel operation

Hydropack  
2 pumps

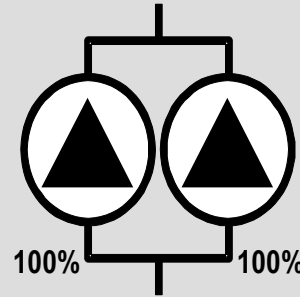


Hydropack  
2 inverter  
pumps

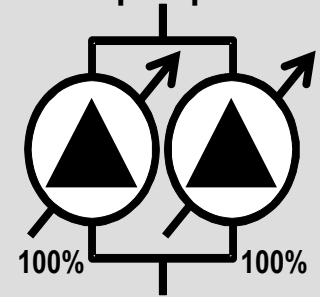


## Stand by operation

Hydropack  
1+1 pump



Hydropack  
1+1 inverter  
pump

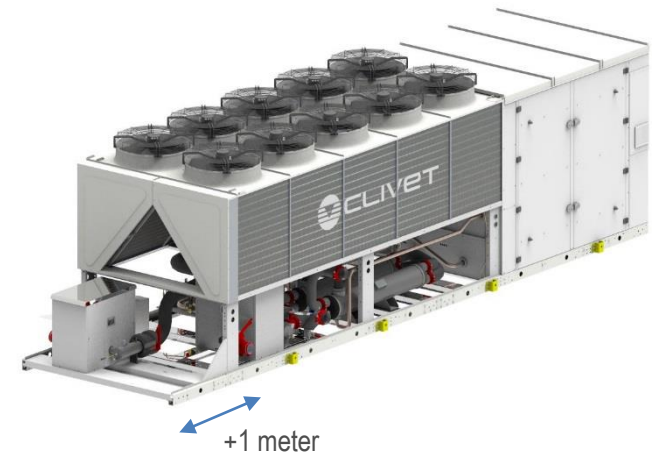


It is necessary to select the same type of hydronic assembly for cold side and hot side

# Simplifies and industrializes the plant

## Unit dimensions 220.2 - 240.2:

Excellence		220.2	240.2
Standard Length	mm	7756	7756
Length with hydronic assembly option	mm	8751	8751



## Unit dimensions 260.2 - 420.2:

Excellence		260.2	280.2	320.2	340.2	420.2
Standard Length	mm	8725	9700	10680	10680	10755
Length with hydronic assembly option	mm	8725	9700	10680	10680	10755



Simplifies and industrializes the plant

**EMC filtering for residential-industrial environment EN 61800-3 cat C2 (optional):**

Unit is supplied as standard with **network choke**:

- Solution for industrial process



Unit with **EMC filter**:

- Solution for commercial / residential application

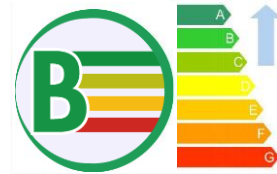


# ECOSHARE: Automatic management of a group of units

Modular system with **ECOSHARE** up to 7 units in local network

In comparison with a single unit of equivalent overall capacity it offers **many advantages** such as:

- **Increased energy efficiency**



- **Higher resilience**





# ECOSHARE: Automatic management of a group of units

**ECOSHARE functionality:** automatic management of a group of units that operates on the same circuit, by means of the creation of a **CLIVET local network**.

The group control is assigned to a unit identified as **MASTER**.

The local network can be extended **up to 7 units (1 Master and 6 Slaves)**.

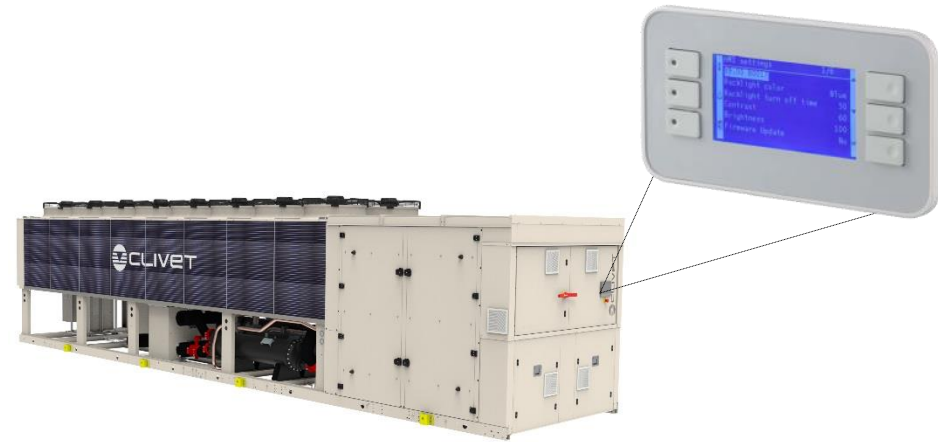
- **Maximum reliability** → Unexpected breakdown does not compromise the whole system
- **Distribution Principles:**
  - **Vertical saturation:** The unit is activated if the previous one is at full load
  - **Horizontal saturation:** Units are activated following the group maximum efficiency

**Pumping group:** for both distribution technologies it is possible to have either the pumping group **always activated** or activated **only when at least one compressor of the unit** (chiller, heat pump, multifunction, ecc.) **is in operation**.

# Simplifies and industrializes the plant

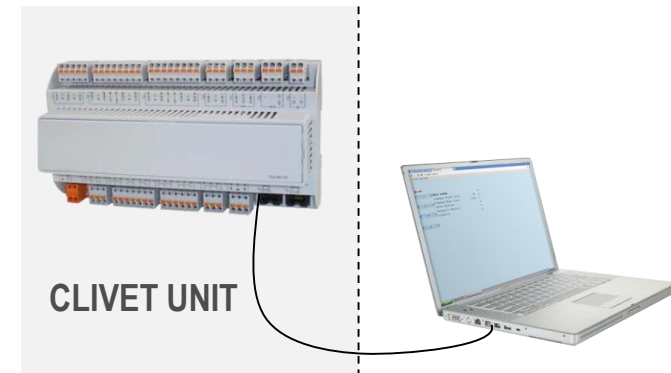
## On board display

- Enables to interact easily and immediate with the unit



## Connection to the PC through Ethernet port:

- Simplifies after-sales service thanks to the performing diagnostic, updating and for remote assistance tools



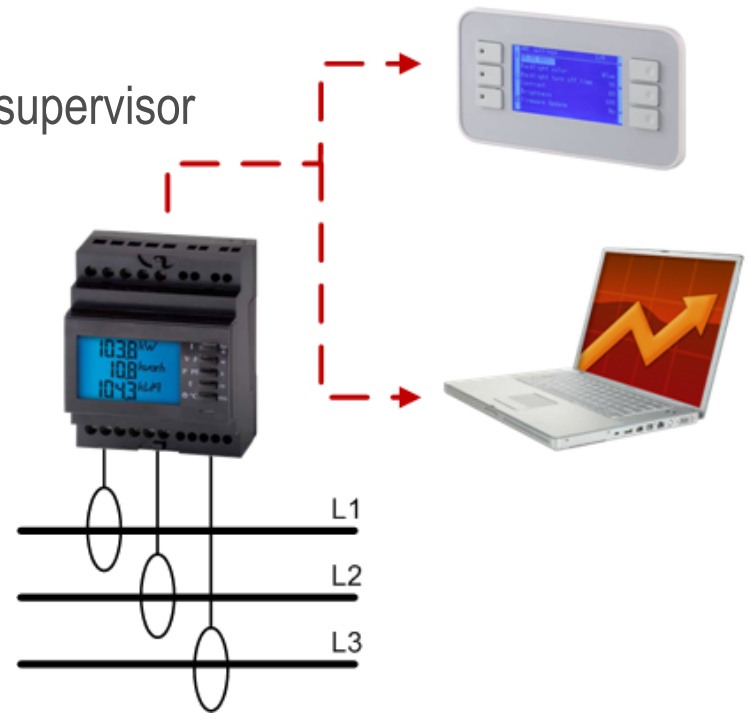
# Simplifies and industrializes the plant

## Energy measuring

- It **displays** the main unit's electrical parameters
- It **displays** them on the unit display
- It **transmits** them via the serial connection to the supervisor

The monitored **electrical parameters** are:

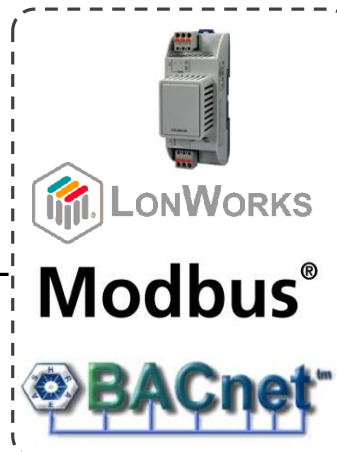
- Voltage/ Current/ Frequency
- Cosfe/ Harmonic components
- Power input/ Energy



# Simplifies and industrializes the plant

The unit can be remotely managed by:

- optional **remote control**
  - replicates the on board user interface
- the **potential free contacts** as standard
- the **supervision system**
  - through different communication protocols



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*humanizing technology*