TOSHIBA

HIGH CAPACITY HEAT PUMP
UNIVERSAL SMART X EDGE

Air conditioning solutions for large industrial applications

Better Air Solutions

20 years of Toshiba USX milestones

2003

Flex Module FMC 30, 40 HP - Refrigerant R407C

- Equipped with high efficiency reciprocating compressor
- Modular design (Industry first)
- Partial load priority group control
- Built-in variable flow pump (Industry first)
- Equipped with water spray (Industry first)
- Uses refrigerant R407C

2006

Super Flex Module SFMC 30, 45 HP - Refrigerant R410A

- Equipped with high efficiency scroll compressor (Industry No.1)
- X - Frame structure (Industry first)
- Improvement of water spray efficiency (Industry No.1)
- High precision pump variable flow control (Industry first)
- Partial load priority group control
- (Parallel control of three compressors and module group control)
- Uses refrigerant R410A (Industry first)

2010

Universal Smart X 30, 40, 50 HP - Refrigerant R410A

- New development of the world's largest capacity high-efficiency inverter twin rotary compressor (Industry No.1)
- Partial load priority group control
- Evolution of X-frame structure (Industry first)
- Module in module design (Industry first)
- Improvement of water sprinkler efficiency (Industry No.1)
- More precise pump variable flow control (Industry first)
- Uses refrigerant R410A

A new dimension in heating and cooling

2015

USX Series 3

- High efficiency by concentrated winding, etc.
- New development of compressor (Industry No.1)
- No power supply harmonics by three-phase PWM (Industry first)
- 99% power factor by three-phase PWM (Industry No.1)

2017

Universal Smart X USX EDGE Series 60, 70 HP - Refrigerant R410A

- World's largest capacity high-efficiency inverter (Industry No.1)
- 70HP module (Industry No.1)
- Both capacity and space saving with EDGE form (Industry No.1)
- Improved low outside air heating capacity (Industry No.1)

TODAY

Universal Smart X USX EDGE Series 50, 60 & 70 HP

- USX EDGE series available with R32 refrigerant for Japanese and EMEA market
- Large capacity DC inverter twin rotary compressor
- Reduced installation costs due to advanced harmonic & power factor correction
- Enhanced heating capacity for low ambient conditions
- High reliability achieved from compact / space saving modular design
- Modular control for up to 8960HP
- Wi-Fi connection for data collection and analysis

R32 REFRIGERANT

Commitment to better air solutions

The success story of the **Toshiba Universal Smart X** started a long time ago. In 1997, Toshiba brought the predecessor of the current USX onto the Japanese market. Originally intended for industrial use only, work continued to improve the functions and efficiency of the units. In 2010, the first USX model was launched onto the market with the world's most powerful high-efficiency twin rotary inverter compressor.

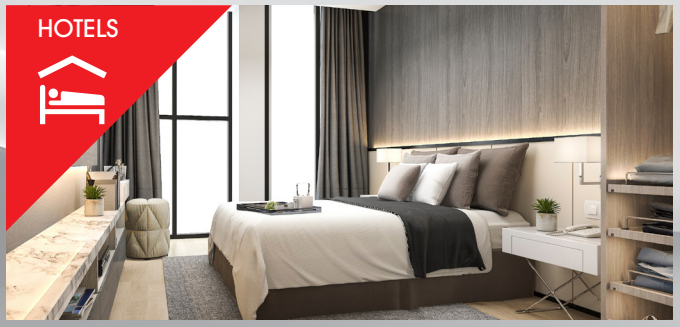
High power twin rotary compressor with direct current inverter.

USX Edge series has high heating capacity and operating temperature range. Impressive even at low ambient temperatures thanks to the twin rotary compressor with refrigerant R32 driven by the highest capacity DC Inverter in the world.

Why develop an R32 high capacity heat pump?

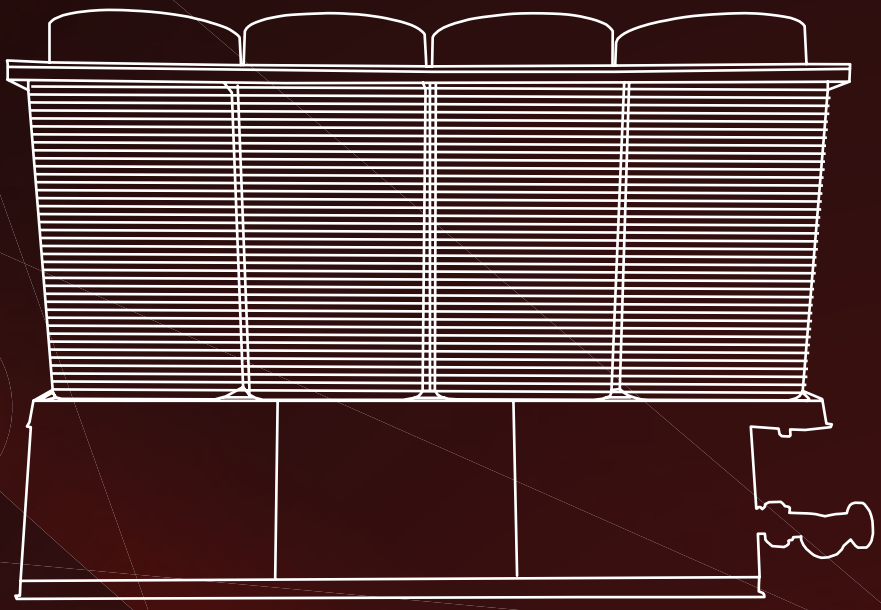
- R32 is more environmentally friendly compared to the conventional R410A model.
- The GWP and converted value of CO_2 for R32 is greatly improved in comparison to R410A.
- The R32 USX EDGE model is in the top of its class in efficiency and has a wide operating range thanks to the advancement in our R32 inverter rotary compressor design.
- Toshiba have strived to build on the success of the award winning R410A USX EDGE modular heatpump.
- Toshiba started selling their modular heat pumps in 2003 into the Japanese domestic market.
- Since 2003 the design has been developed to include many innovative and award-winning design features which make USX the market leader, for air cooled heat pumps, in Japan.
- The change to R32 refrigerant has not compromised the USX EDGE's performance ratings, operating ranges or unique design characteristics.
- R32 refrigerant allows the USX EDGE to have a reduced refrigerant charge.
- The table below shows the difference in refrigerant charge compared to competitors R32 models.
- The USX EDGE has four independent refrigerant circuits to optimise risk diversification and to ensure the required capacity is maintained throughout operation.
- Universal Smart X (USX) EDGE is an air-cooled modular heat pump.
- The heatpump has been designed for high efficiency, low running costs, excellent risk diversification and ease of installation / maintenance, making USX the perfect solution for a wide range of applications.

The smart choice



UNIVERSAL SMART X Series EDGE line up

Toshiba's first air-cooled inverter modular heat pump, designed for Europe. High efficiency combined with cutting edge space saving design.



Models

Internal inverter pump / pumpless / Brine			
Model	**Use**	**Type**	**Power Supply**
Standard model 50 HP / 60HP / 70HP	Cooling only	Standard	3 phase 4 wires 50Hz/60Hz 380 - 415V
		High EER	
	Heat pump	Standard	
		High EER	
Powerful heating type 50HP / 60HP	Heat pump	Standard	
		High EER	

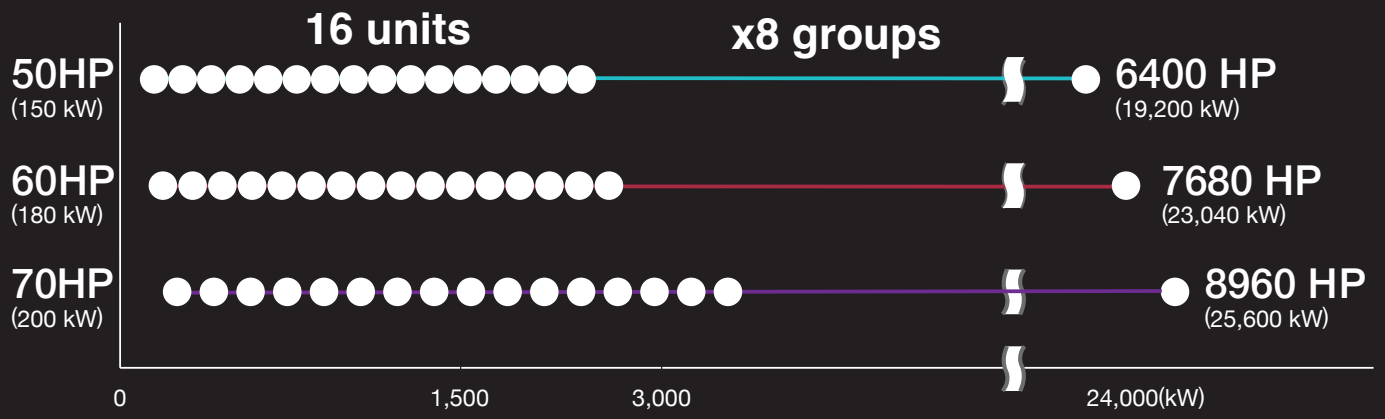
RUA	-	GP	51	1	H	L	N	R	8	-	E

- RUA: Air cooled heat pump
- GP: Universal Smart X Edge (R32)
- 51: Capacity USRT 42: 50HP / 51: 60HP/ 56: 70HP
- 1: Version number
- H: C: Cooling only; H: Heat pump (cooling/heating); F: Hight heating capacity model
- L: Pumpless; 1: Internal pump (pump output 1.5kW); 2: Internal pump (pump output 2.2kW); 3: Internal pump (pump output 3.7kW); 5: Internal pump (pump output 5.5kW)
- N: Blank: Standard type/ N: High - EER type
- R: Blank: Water/R: Brine
- 8: 8: 3ph 4 wires 50Hz/60Hz 380 - 415V
- E: E: Europe, UK: United Kingdom

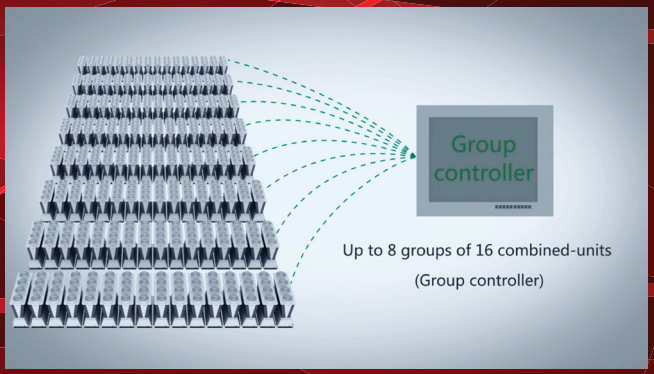
Product Selection

Product Type	Integrated Pump	No Pump	Cooling Only	Heat Pump	High EER	LWT > 4°C (Std.)	LWT > -15°C (Brine)
USX Edge 50 HP / 60HP / 70HP	✓	✓	✓	✓	✓	✓	✓
USX Edge powerful heating type model 50HP / 60HP	✓	✓	✗	✓	✓	✓	✓

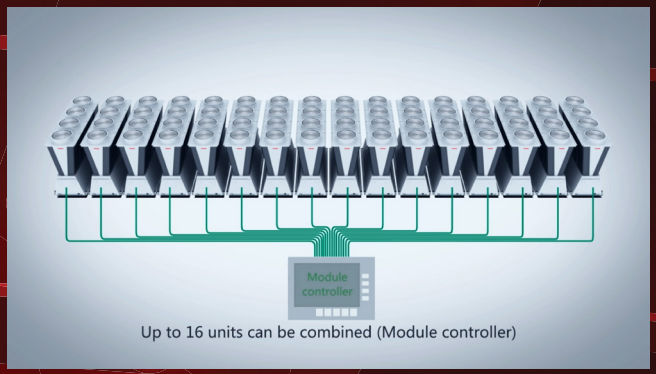
Capacity range



Up to 8 groups of 16 combined units



Up to 16 units can be combined



Smart features

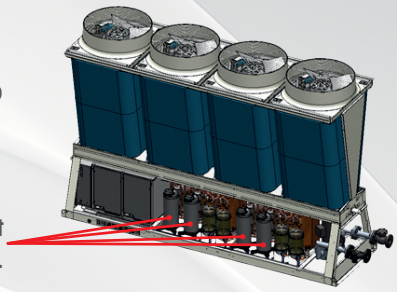
Efficiency at part load

High performance at part load (for high efficiency at low load)

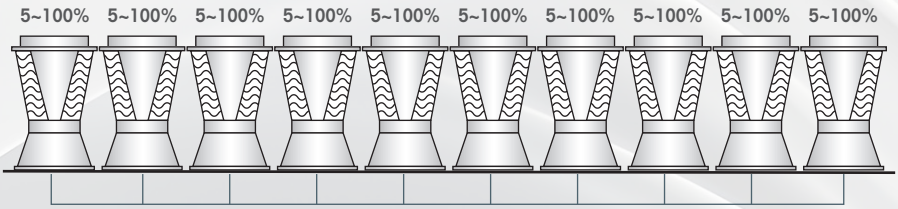
✓ **High performance at part-load and energy savings**

A module with all compressors running can reduce its capacity by up to **20%**.

Each modular unit has **four** compressors.



Together with individual compressor control, **each modular unit** can reduce its capacity by up to **20%÷4 = 5%**.



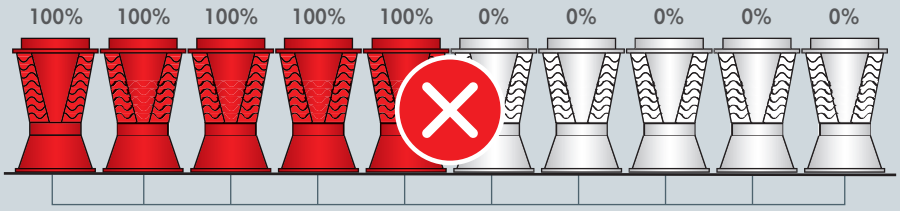
All modular units evenly control capacity

In addition, as a system of multiple modular units, the minimum capacity can be as high as 5%.

High performance at part load (also as a system)

For example, with a 50% load, the USX EDGE chiller and heat pump distributes the system load evenly over the entire system.

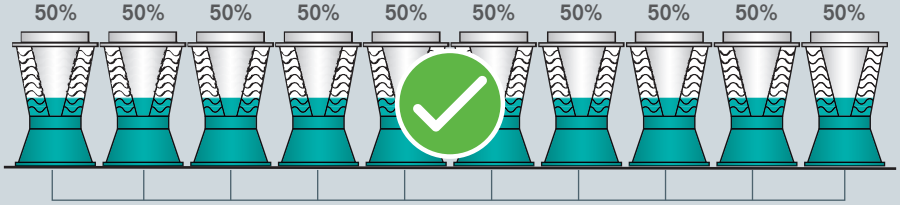
System: **150kW×10 units**



Load: **750kW (=50% di 1.500kW)**
Outlet water temperature: **7°C**
Water flow rate: **430L/min per unit**
Ambient temperature: **35°C**

Cap. **150kW x 5** = 750kW
COP **3.62** (at full load)
P.I. **42.5kW x 5** = 212.5kW

Model: **Series USX 50HP x 10 units / [RUAGP421H1] ×10**



Cap. **75.0kW x 10** = 750kW

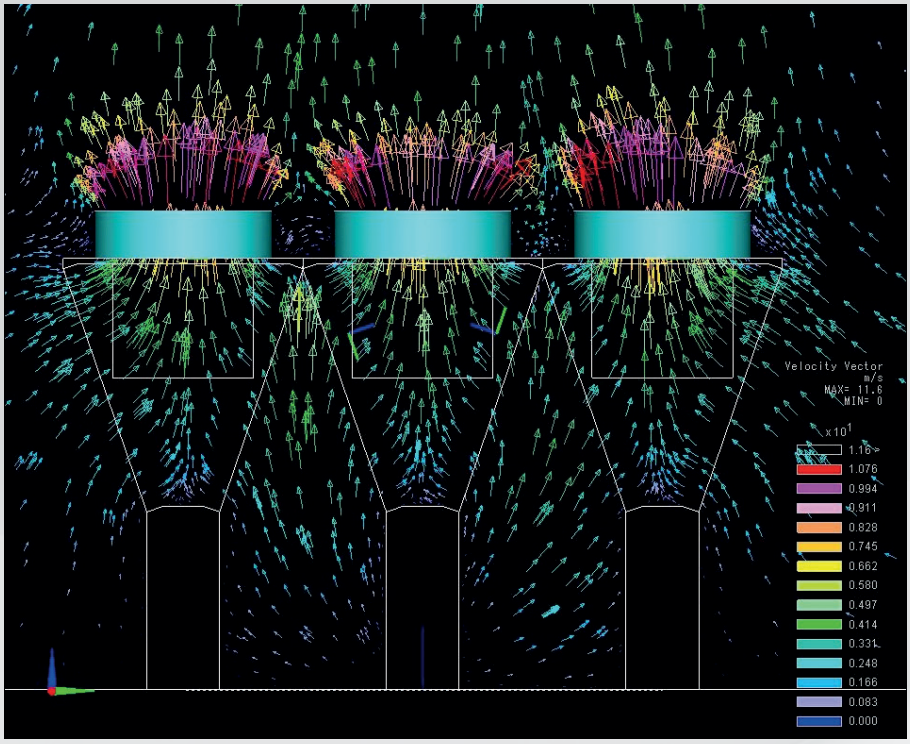
COP **4.03 (load 50%)**
IMPROVEMENT BY **11%**

P.I. **18.6kW x 10** = 186kW
12% SAVINGS

THIS LOAD DISTRIBUTION METHOD IS ALSO APPLIED TO SINGLE-UNIT SYSTEMS TO ACHIEVE THE SAME HIGH PARTIAL LOAD PERFORMANCE.

Smart features

Excellent air distribution



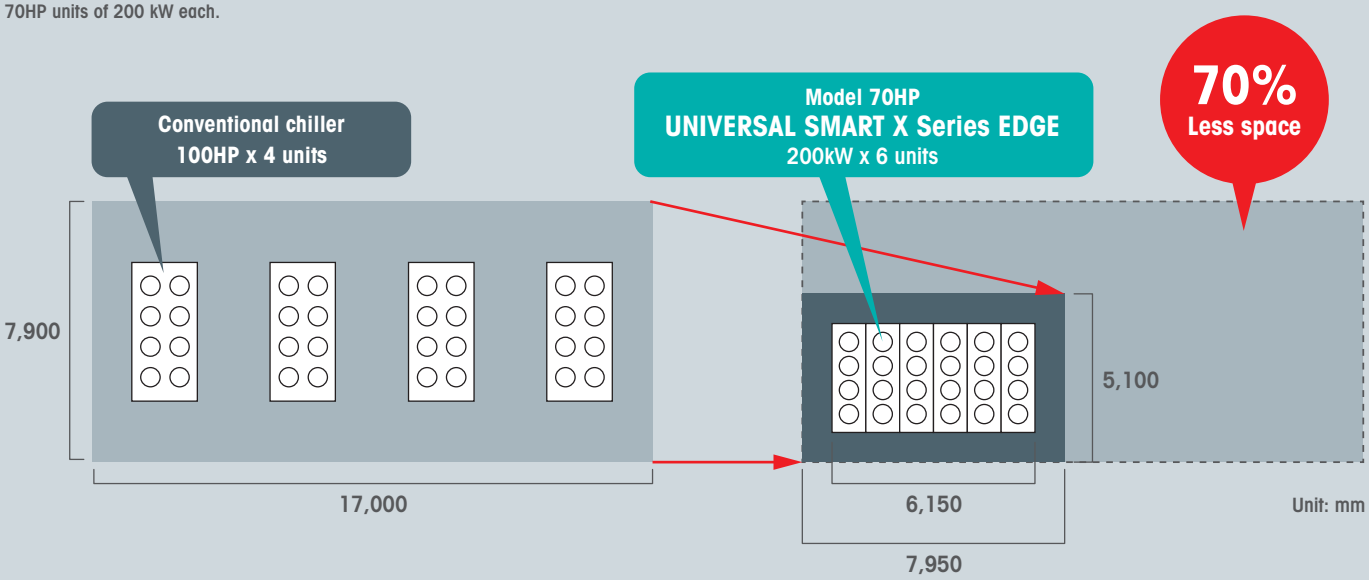
THE ERGONOMIC X-SHAPE OF THE USX IS AT THE ORIGIN OF OUTSTANDING ADVANTAGES

The X-frame chassis was designed using airflow analysis.
Optimised air distribution allows the units to be installed at a side by side distance of 30mm with no reduction in the USX EDGE's performance.

Extremely compact installations

- Optimised airflow thanks to the unique X-frame design.
- A compact design for easy installation even in small spaces.
- A modular design for easy replacement and multi-step installation.
- 70% less installation space compared to conventional R134a*

* Compared to the space required to install a conventional system consisting in four RUA-SA30001H units for a cooling load of 1,200kW. Compared to six USX EDGE 70HP units of 200 kW each.

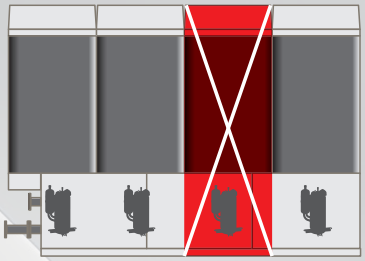


Smart features

Risk diversification for peace of mind

HIGHLY RELIABLE MODULAR SYSTEM

- There are four independent refrigerant circuits in each module, allowing excellent diversification.
- Cost-effective solution with low costs for backup.
- The reduction in available capacity for maintenance or repair is extremely limited: from a maximum of 1/4 of the total power in the case of single-module applications up to 1/(4xN) in the case of N-module applications.



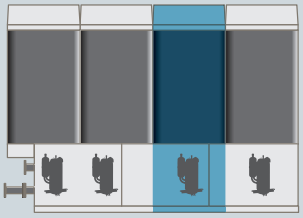
Backup for each circuit

Backup for every modular unit*

* Considering this example, the maximum available power reduction is limited to 1/(4x12)=2% of the total.

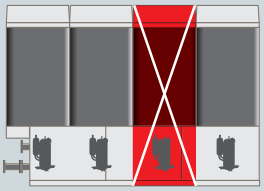
The defrosting operation is performed separately for each compressor.

The use of the backup function allows the defrosting of only one compressor at a time, thus avoiding the reduction of the temperature of the hot water produced by the module.



SINGLE COMPRESSOR SHUT-DOWN FOR DEFROSTING OR MAINTENANCE

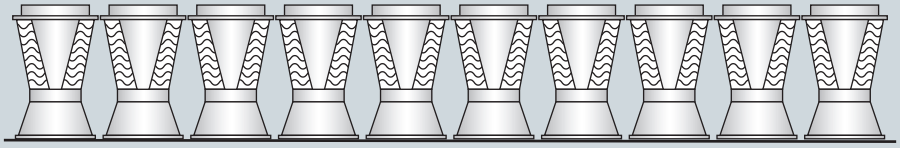
X4



180kW
Total module capacity

45kW - 25%
Total capacity reduction

System: **USX Modular Chiller and Heat Pump 1,800kW (512RT)**



One-unit stop:
10 modular units of 180kW
180kW - only **10,0%** of the total capacity

Stopping a compressor:
4 circuits of **45kW** for each unit - only **2.5%** of the total capacity

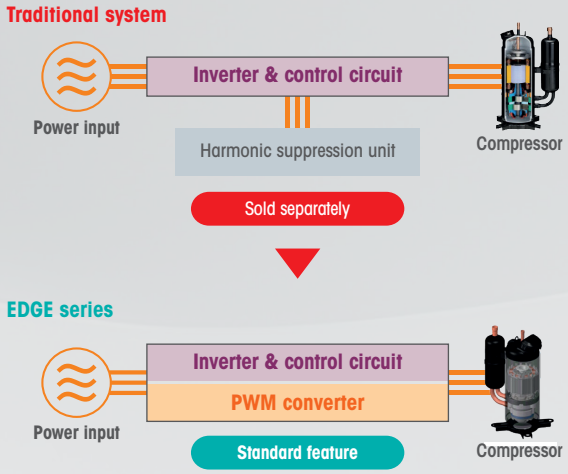
Smart features

Improved harmonic suppression function

The harmonic suppression function is installed as a standard feature on all models and achieves a power factor of up to 99%. This decreases electric transformer volume as well as reducing installation costs.

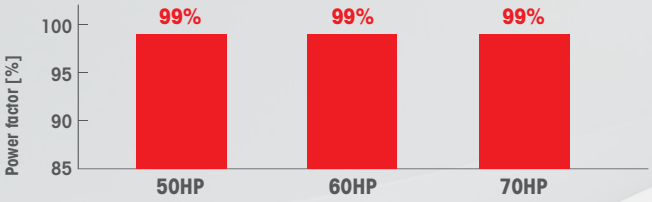
Adavantages of the PWM converter

1. Eliminates the problems caused by harmonic current.
2. Reduces in consumption volume of electrical equipment.

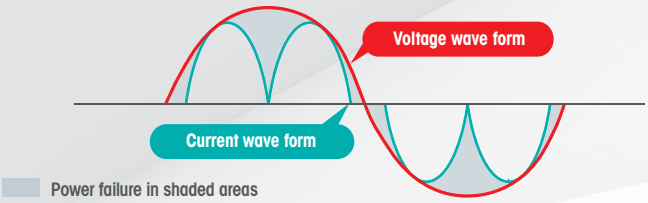


Achieve the 99% power factor

1. Power loss reduction through load current.
2. Improving the efficiency of electrical equipment through current reduction.



Efficiency reduction projection



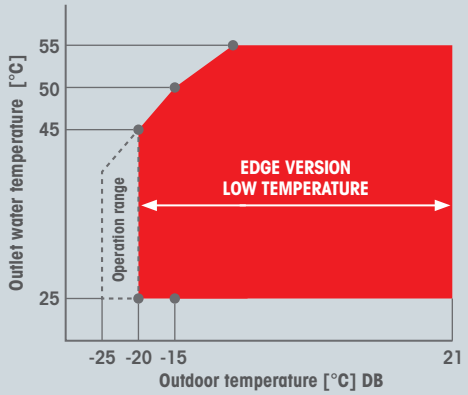
Enhanced heating capacity at low temperatures

The low temperature EDGE version achieves a high heating capacity, with outside temperatures down to -20°C, and in some conditions down to -25°C. It also minimizes capacity drop-off during defrosting operations.

USX EDGE LOW TEMPERATURE VERSION

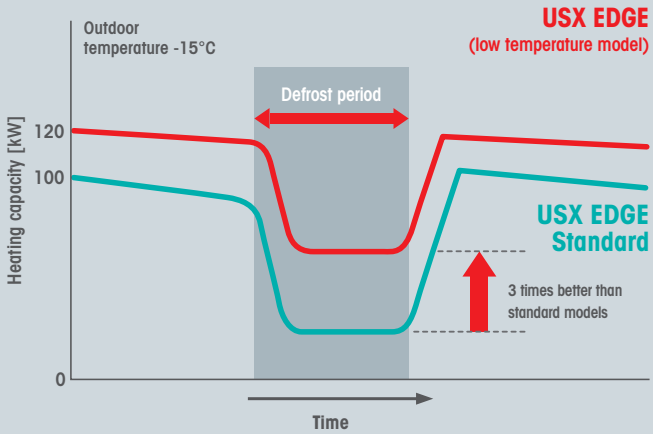
At outside temperatures as low as -15°C, the system is still able to produce hot water up to 50°C. At -20°C, the hot water produced is up to 45°C.

Performance between -20°C and -25°C is not guaranteed. Exceptional environmental factors, such as blizzard, may inhibit operation at temperatures of -20°C or below.

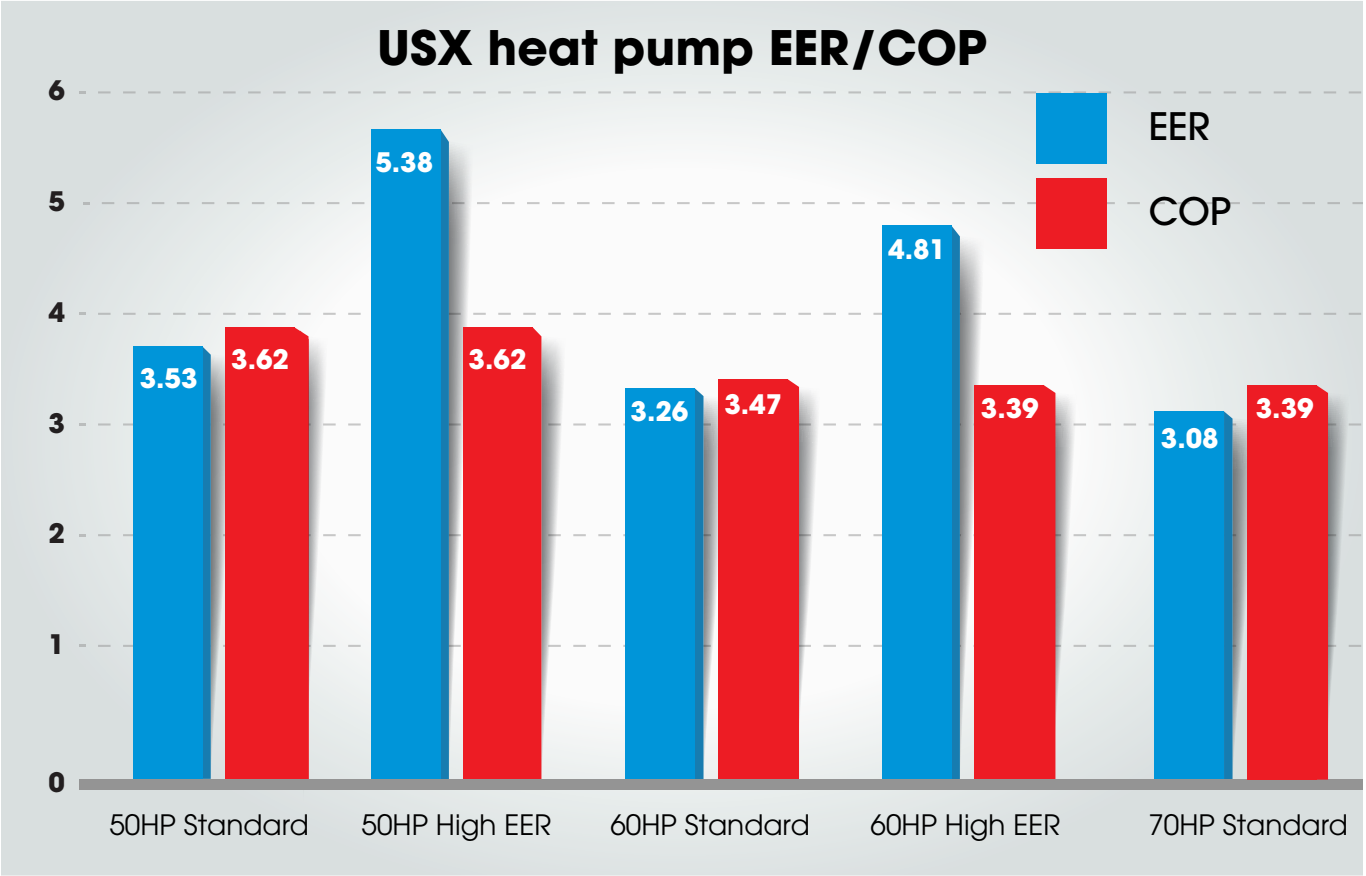


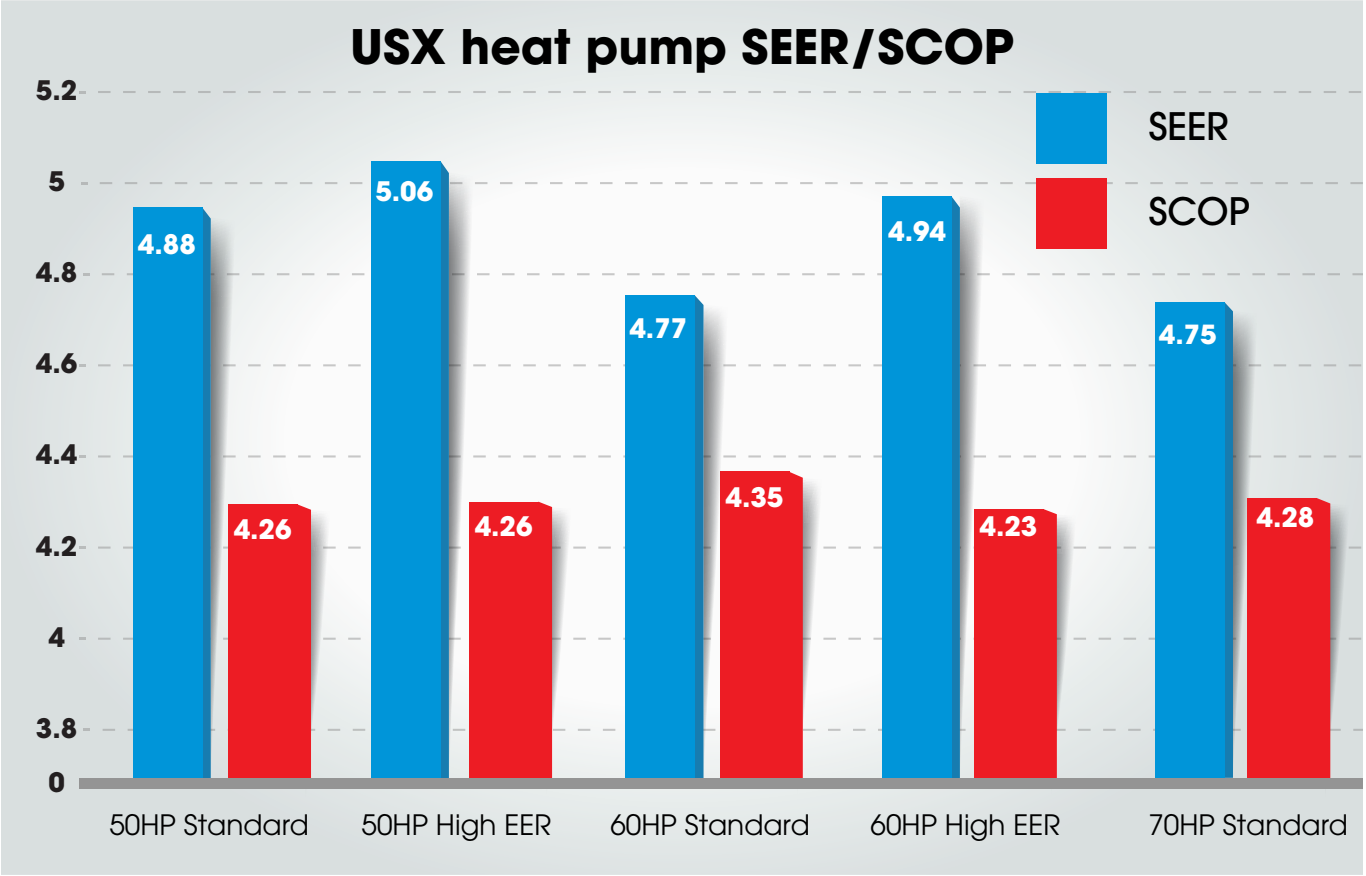
Thanks to a new and advanced controller, the EDGE low temperature models can reduce the loss of capacity during defrosting by three times compared to standard models.

Energy usage during defrosting



USX heat pump high engery efficiencies





Key winning points

As standard, the USX EDGE comes complete with four inverter driven fan motors. This helps reduce the modules noise level output, by reducing the fans rotation speed in accordance to the systems load conditions and also improves the overall efficiency.

- Wide operating range
- Advance defrost control
- Space saving chassis design
- High system and part load efficiencies
- Award winning & innovative modular design
- Environmentally friendly R32 refrigerant (low GWP)
- Module in module design to maximise risk diversification
- Patented X-frame design to optimise air flow around /through the air heat exchanger
- Large capacity DC twin rotary compressor enhancing heating operation down to -20°C
- Reduced installation costs due to advanced electronics to suppress harmonics current & improve power factor correction (up to 99%) for the installation
- Ability to remove a unit from the system for servicing with a simple button to enable works to be carried out without taking the whole system offline

All of the module's main components (compressors, inverter pump etc.) are fully enclosed by several access panels.

Notes:

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