



MAGNETIC LEVITATION OIL FREE CHILLER



Believe-in Saving Energy

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Model, parameter, performance will change due to product improvement, please noted we would not make further notification. Special parameter is subject to production nameplate.

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BSE19BJ01(01)01

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Believe-in Saving Energy



QUESTCHILLER™



CLOUDCHILLER™



MINI-QUESTCHILLER™



I-CHILLER™



Magnetic Levitation Oil Free Chiller

Wherever a large-scale refrigeration equipment is applied for, a hotel, a business center, an office building, a school, a hospital, a university or a factory, its characteristics of saving energy, safety, stability and being adaptable to the environment are always the key point to be measured. BSE had always taken these factors seriously in the R&D process. Up to date, BSE has developed a wide range of magnetic levitation oil free chiller products. The core technology for the whole family products is the revolutionary magnetic levitation oil-free centrifugal compressor. The compressor is employed with a magnetic levitation shifting bearing that works without mechanical friction and decreases the risk of failure. The equipment is free of the lubricant, which greatly reduce the workload of its maintenance and the cost of its operation. The integrated technology enables to lower the start-up current, and automatically adjust the quantity of refrigeration through the frequency conversion technology to adapt present requirement of refrigeration. BSE's product has reached the highest energy efficiency, and, in particular, the partial load efficiency of the machine's actual operating point has reached an advanced level in the whole industry.

Company Profile

BSE is on of the top ten global enterprises that focuses on magnetic levitation oil free chiller technology, BSE independent has its own R&D center and manufacturing plant. BSE has obtained **67 patents**, including **23 invention patents**, its products have obtained **AHRI certification**, and three perfect management systems, named **ISO9001, ISO14001 and OHSAS18001**.

Today BSE has grown into an international manufacturer for magnetic levitation centrifugal oil free chiller. BSE Provides stable and reliable products, experienced technical team and perfect after-sales service to fulfil the personalized needs of users in commercial, industrial and special industries-around the world.

The Characteristics of BSE's Chiller

- Uses Magnetic Bearing Oil-free Variable Centrifugal Compressor, requires less maintenance
- Optimize multiple compressor operation, higher IPLV and COP
- Modular design, can be expanded, can be split on the spot and operate in parallel
- Uses Flash Tank economizer, simple design, can achieve zero approach temperature ;
- Unique OPFflex™ control system, intelligent temperature control with high precision, wide range of frequency conversion adjustment
- Small volume, light weight, can be transported through passenger lifts to any floor or rooftop plant rooms
- Can be transported separately; each unit could be split on the site
- Uses R134a refrigerant, zero harm to the ozone layer
- 20 seconds quick restart, low startup current of 2A, super quiet
- Diverse unit design, can satisfy projects for business and industry newly built, as well as retrofit projects

TECHNOLOGY

Magnetic Levitation Centrifugal Technology

- Using Danfoss magnetic levitation compressor for higher efficiency
- Keep sustainable high efficiency and save power consumption by more than 45%
- No friction, reducing maintenance work, and the service life is more than 25 years
- The noise is as low as 73dB, silent operation, no additional noise reduction measures, no impact on the surrounding environment
- Two-stage high-speed impeller, the compressor is smaller, lighter and more compact



Modular Design



- Vertical module design, the structure is more compact, saving 50% of the plant room area;
- Multi-module can operate in parallel, single module failure does not affect other modules, more reliable
- Compact structure, easy to transport by elevator and stairs.
- Flexible design, for capacity expansion
- Batch purchase, reducing initial investment costs



Flash Tank Technology

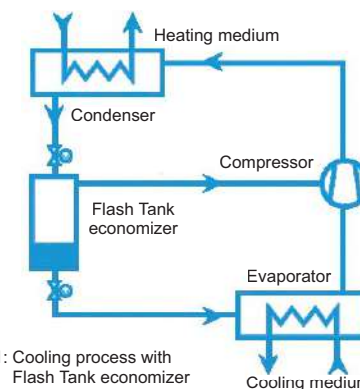
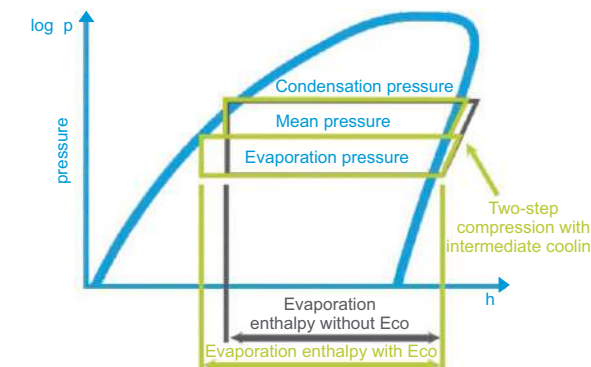


Fig. 1: Cooling process with Flash Tank economizer



- It can achieve zero approach temperature.
- The integrated partial load performance coefficient (IPLV) and coefficient of performance (COP) are higher
- The heat exchange structure is non-walled, simple in design and low in cost
- No additional control unit, always running in the best way
- Maximum possible efficiency gain with partial load guaranteed

OPFlex™ Control Technology



- High-definition touch screen with friendly user interface
- 20 seconds fast restart, starting current low as 2A, saving power consumption
- Connects independent control and group control system to achieve intelligent variable capacity adjustment between module units;
- Precise temperature control, reliability increased by 30%~50%, which can meet the temperature control requirements for different occasions;
- Extensive control functions, simple operation, remote device management, real time data interaction
- Modular I/O design, application of F-Box technology, supporting standard Modbus and BACnet protocol.





QUESTCHILLER™ water cooled chiller with 5628 kW cooling capacity

QUESTCHILLER™

Unit Capacity Range: 70RT-1600RT

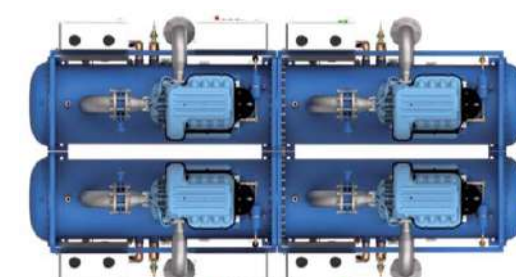
Efficiency, Flash Tank Technology, Intelligent Control

QUESTCHILLER™ high efficiency units: the structure of this chiller is a flooded design with single shell and single head. Compressors are synchronized to variate the capacity for higher efficiency. The full-load COP of all the products in the QUESTCHILLER™ product range exceeds 6.4, and IPLV is as high as 14.0 or above. This efficiency much higher than other conventional chillers. It is especially suitable for public buildings as well as industrial plant projects which requires high load with high efficiency.



- Capacity** Up to 1600RT
- Economizer** Flash Tank Technology
- Design** Single system multi compressor
- Structure** Compact Slim & Low Fat
- Intelligent Control** OPFlex™

QUESTCHILLER™ Profile



- The unit can be disassembled into two parts for easier transportation and installation
- Double head unit (single cylinder independent support)
- Multi-machine series, higher efficiency
- Units can be applied flexible with different combination
- Compact design, save space and fit into different plant room locations
- Patent structure design with no piping at the back, 4 units can be placed side by side in series

Comparison between Flash Tank Economizer and Sub-cooling Economizer

Cooling process with Flash Tank economizer

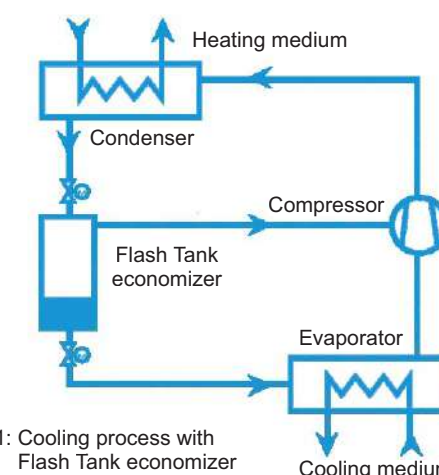


Fig. 1: Cooling process with Flash Tank economizer

- Using Flash Tank technology, zero approach temperature can be achieved. Higher cooling efficiency can be obtained
- Optimum operating behavior at all load levels
- No additional control unit is required as the Flash Tank economizer always operates optimally
- Maximum possible efficiency gain with partial load guaranteed

Cooling process with sub-cooling economizer and superheating control

VS

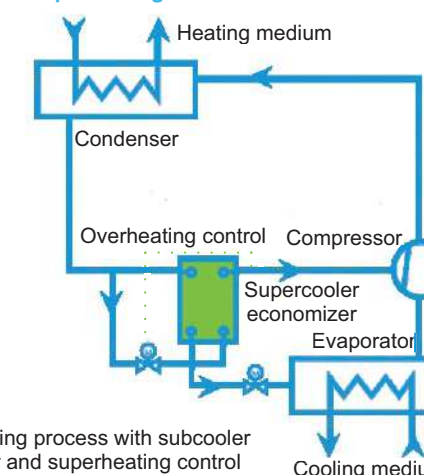


Fig. 2: Cooling process with subcooler economizer and superheating control

- Continuously experiencing heat exchange and pressure losses
- The evaporating refrigerant must be expelled in a superheated state to avoid liquid floodback into the compressor
- Heat exchange temperature difference loss and superheating reduce the potential efficiency gains
- Every deviation from fixed setpoints reduces the effectiveness



MINI-QUESTCHILLER™

Unit Capacity Range: 70RT-600RT



Modular Design, Compact&Flexible, Intelligent Control

MINI-QUESTCHILLER™ modular units chillers: The modular design with single compressor makes the overall structure more compact. The chiller is designed for easy access. Users can operate, maintain or even carry out service replacement works all at front side of the chiller. MINI-QUESTCHILLER™ can also be combined to expand to 4-6 modules, can be connected in series or in parallel to meet different water system applications. The operation of more than one oil-free unit could insure a higher security and stability for the whole cooling system. The operation of the system won't be affected by the breakdown of any unit among it.

Capacity	600RT
Flexible	Vertical Multi-module
Compact	Less Footprint & Weight
Quiet	70dB(A)
Intelligent Control	OPFlex™

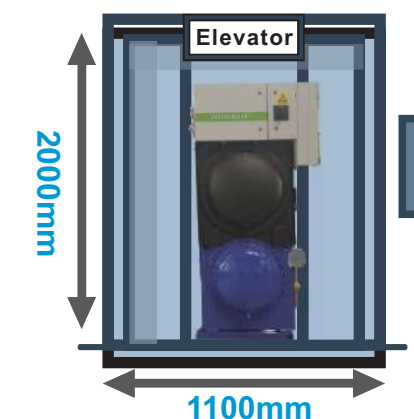
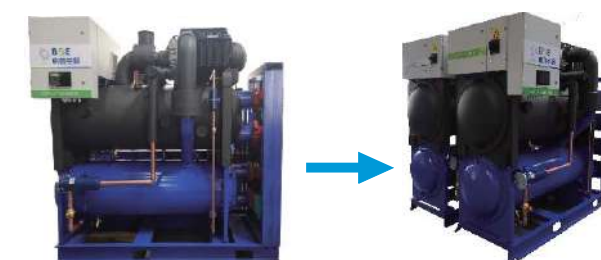
MINI-QUESTCHILLER™ Profile

Modular Design

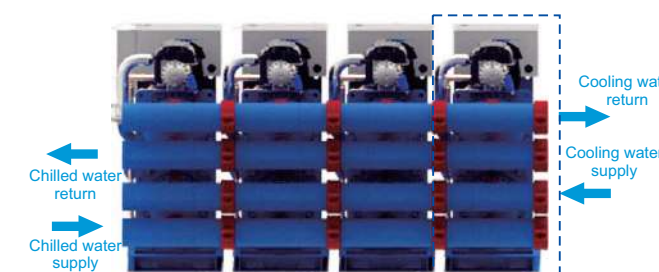
- Modular design, split to transport, flexible application
- Separate docking, easy to install and expand
- Multi-module can operate separately, single module failure does not affect other modules, more reliable
- Optional pipe connection is available for parallel designs

Compact & Flexible

- Vertical multi-module design, control box installed at the top end, the structure is more compact
- Compact and flexible, it can be transported to each floor via a passenger elevator
- Small size, light weight, small footprint, saving space



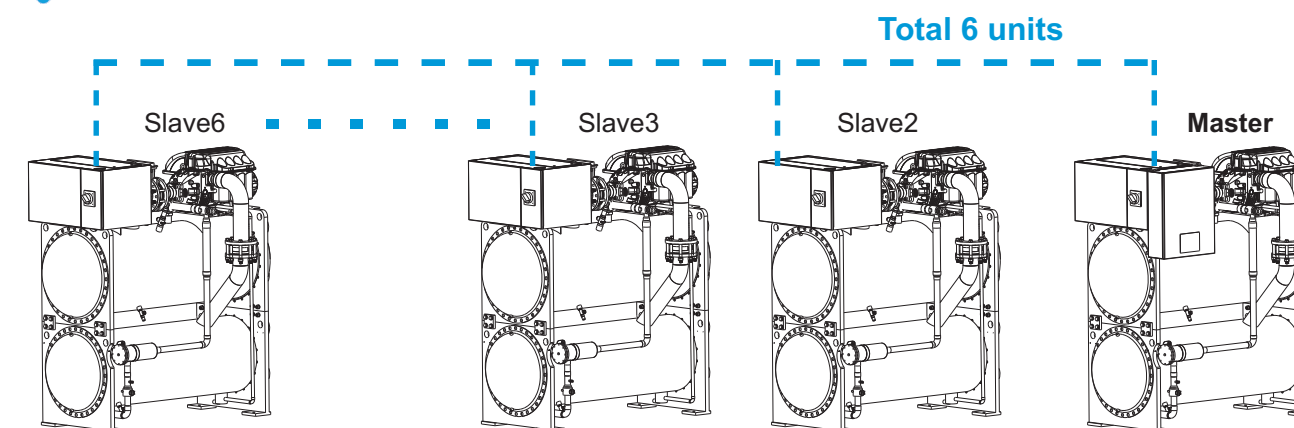
Flexible Application



Modular design
Easy to expand



Single-machine Parallel Application





I-CHILLER™ water cooled modular chiller with 4200 kW cooling capacity

I-CHILLER™

Unit Capacity Range: 71RT-1200RT

- TURBOCOMPRESSOR**
- MODULAR DESIGN**
- COMPACT**
LESS Footprint & Weight
- SLIM & LOW FOOT**

Modular Design, Light Weight, Versatility, Expandability

I-CHILLER™ magnetic levitation oil free variable frequency centrifugal water cooled modular chiller/heat pump adopts all-digital magnetic levitation variable conversion oil-free centrifugal compressors. Combined with high efficiency plate heat exchanger and the powerful OPFlex™ controller, the chiller's annual operating efficiency increased 40% more than traditional units. The modular design of the unit allows for on-site assembling and connection. The footprint of the chiller is only 1m², with a height of only 1.8m and a weight of about 1 ton. It is specially developed by BSE to tackle retrofit projects and dealing with super high-rise buildings.

- Capacity** 150RT
- Footprint** 1m²
- Weight** 1Ton
- Quiet** 55dB(A)
- Patents** 30

I-CHILLER™ Profile

Compact & Flexible

- A uniform size of 1.2mx0.89mx1.8m
- Can be easily placed in basement, mechanical floor and rooftop of the building. Can be transported by elevator with small footprint and light weight
- This characteristic helps to fulfill the vertical partitioning of the whole building, the reduction of the pipe pressure
- It's convenient. Cost saving on transportation and installation



Modular Design

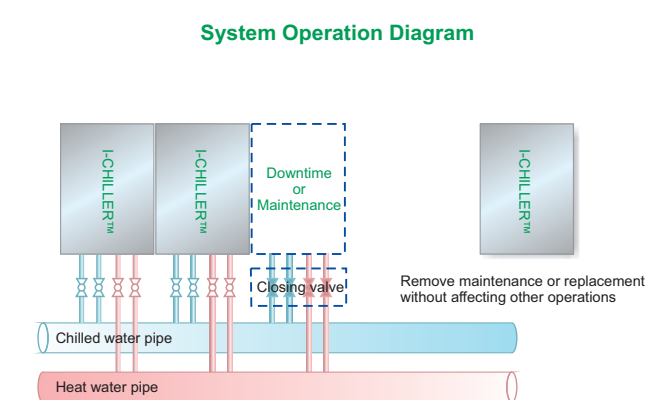
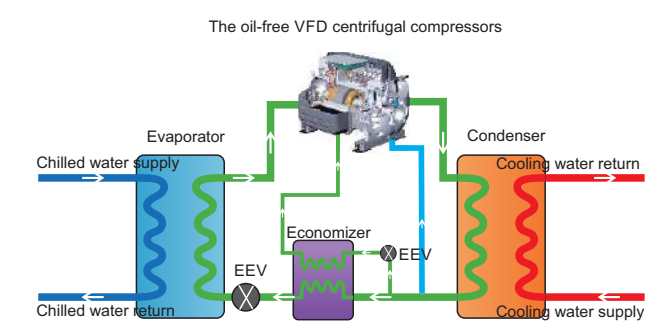
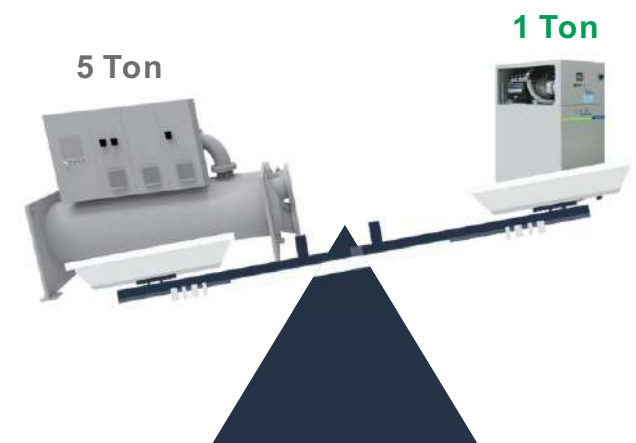
- Modular design with high reliability
- Using modular design, easy to expand
- Owners can buy in batches to reduce initial investment



System Operation

Light Weight

- The footprint of the chiller is only 1m², with a weight of about 1 ton
- Can be easily transported via passenger elevator to the respective floors to be installed





CLOUDCHILLER™ air cooled chiller with 1800 kW cooling capacity

CLOUDCHILLER™

Unit Capacity Range: 85RT-512RT



Energy Efficiency, Low Vibration & Quiet, Parallel Operation

CLOUDCHILLER™ air cooled chiller including package units and remote units two series, which could be used when no cooling water is available. The CLOUDCHILLER™ uses high efficient flooded-type evaporator and modular v-shape wet curtain condenser to further increase efficiency. The IPLV of BSE air cooled chillers is 50% more efficient than the traditional ones. It could sharply decrease the operational cost and reduce the carbon emissions. The application of an oil-free compressor and compared with a screw chiller providing the same cooling energy, their operational noise has a decreasing margin of 5-7dB. The surface of the air-cooled unit coated with epoxy to protect the air-cooled condenser coil from corrosion, combined with many technologies like evaporative cooling, the free cooling, and the EC fans, the chillers could offer more solutions to the industrial cooling, data center cooling and green-energy architectures.

Capacity	512RT
Energy Efficient	High IPLV & COP
Efficient Design	EC fan
Quiet	60dB(A)
Intelligent Control	OPFlex™

CLOUDCHILLER™ Profile

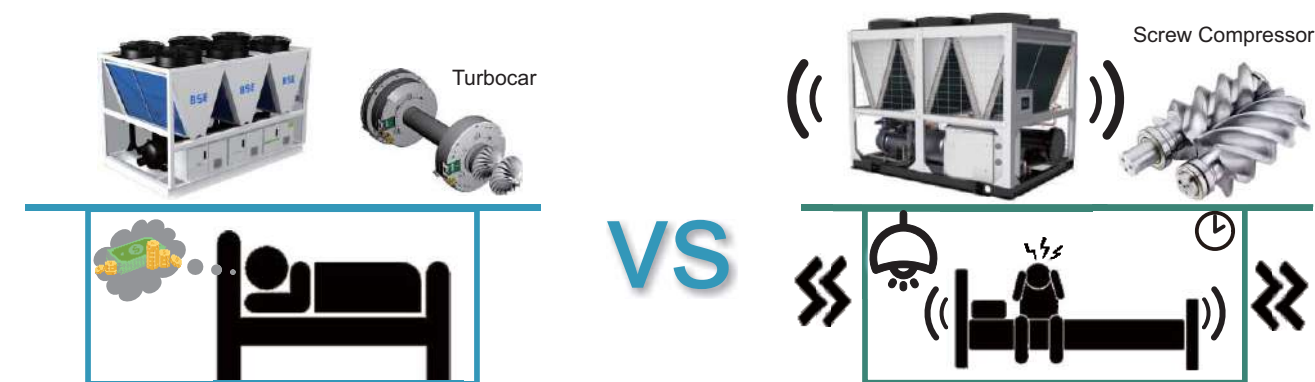
Energy Efficiency

- Uses high efficient flooded-type evaporator
- Condenser uses modular V-shape design, air-cooled, no need for cooling water
- Cooling wet curtain, combined with mist, further enhances units' efficiency
- Cu/Cu coils are available as an alternative to the standard SBS-coated Cu/Al coils. Alternative fin coatings, including nano and epoxy are also available.

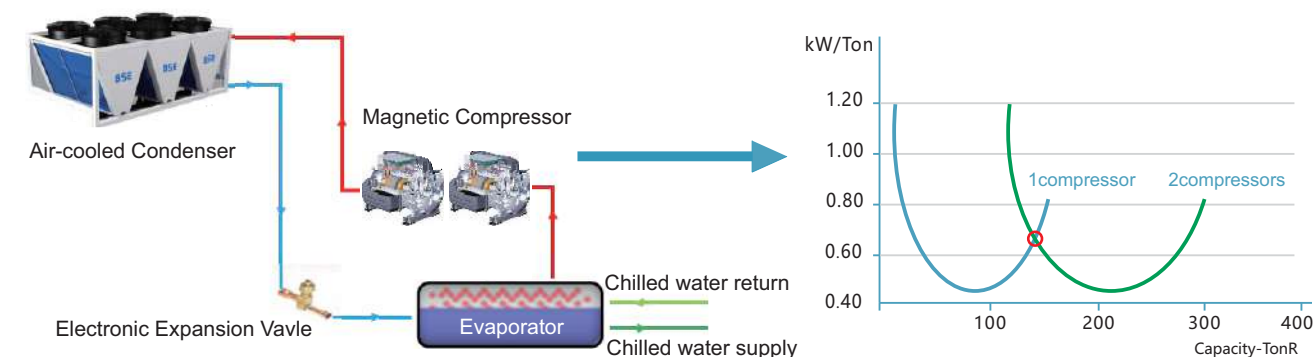


Low Vibration & Quiet

- The highest operation noise of the chiller is only 60dB(A), less disturbing to the environment, which allows a better flexibility for placing
- The small size of the chillers helps to save space of the chiller plants, its light weight helps to make the transportation and installation easy, and also increase the flexibility of the project design



Parallel Operation

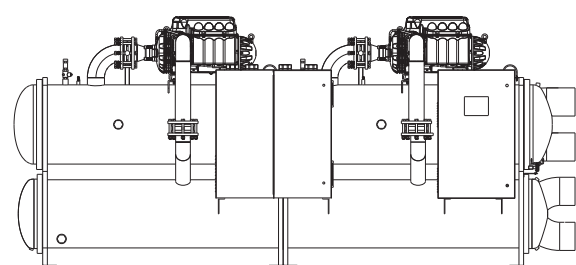


- When the outdoor temperature is low in transition season and in winter, free cooling technology can be used to provide cooling. The refrigerant is circulated through the bypass valve of the compressor, and the refrigeration can be provided for the oil free chiller terminal without turning on the compressor.

SPECIAL APPLICATIONS

Split Applications

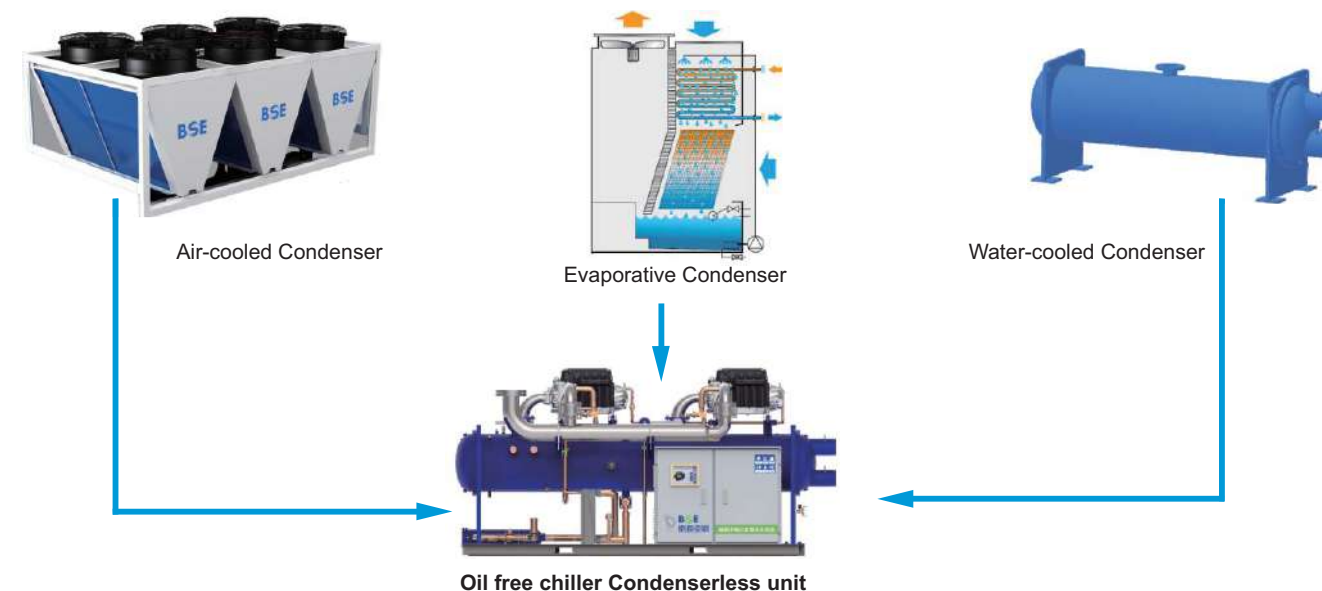
Single compressor independent refrigeration system structure, the system structure is simple, transportation advantages.



Project Site View

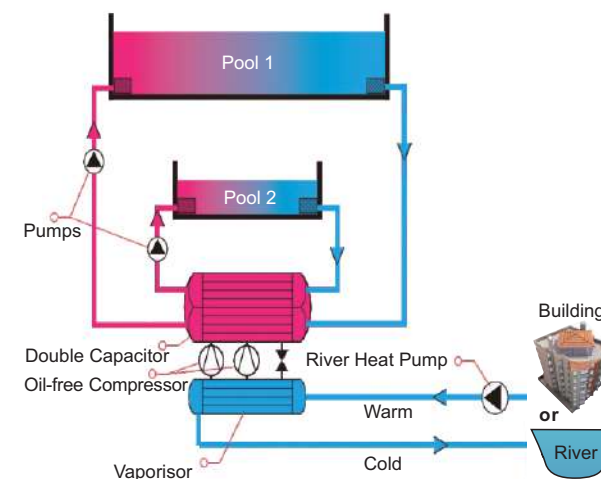
The unit is transported by separate module, which can easily pass the industrial standard doors. It is then combined on site to carry out parallel operation. It is especially suitable for projects with narrow transportation paths and difficult to reach locations.

Remote Condenser



The special design of the condenserless unit can be connected to a variety of condensers, such as water-cooled condensers, air-cooled condensers, evaporative cooling condensers, etc.

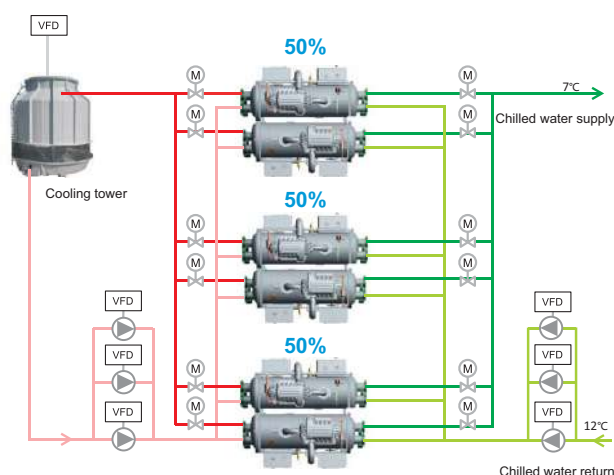
Heat Recovery(Pool Swimming)



- The process waste heat can be cleverly used by the BSE's oil free chiller twin capacitor technology to heat buildings or to produce warm water
- By separating the shell-and-tube heat exchanger, it can be run with two mediums: on the one hand, the so-called loss circuit (open cooling tower) and on the other hand, the closed circuit (for the waste heat recovery)
- The special appeal is in the direct use of heat transfer from the refrigerant to the application without a heat exchanger. The minimal additional costs for such a system are scrp within a few years
- Reduce the amount of heat generated by atmospheric waste heat and reduce global warming
- Saving a lot of hot water expenses, and the energy saving effect is obvious

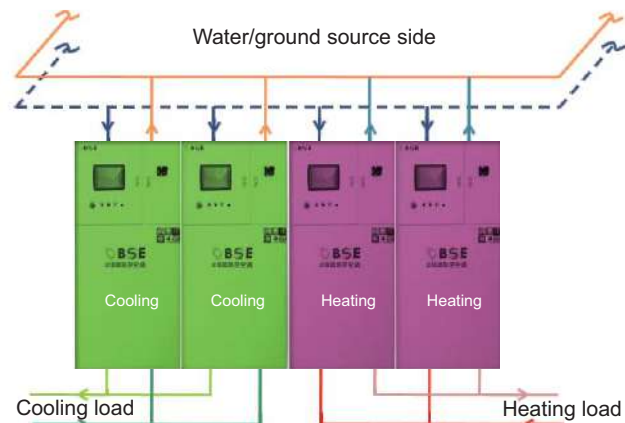
SPECIAL APPLICATIONS

Module Application



QUESTCHILLER™ unit module chiller application

When some units are operating for the cooling while some are operating for the heating, their respective loads do not affect each other; meanwhile, the Water/ground source side neutralize the coldness and the heat, which is helpful to improve the efficiency of all units, hence the energy efficiency of the whole system.

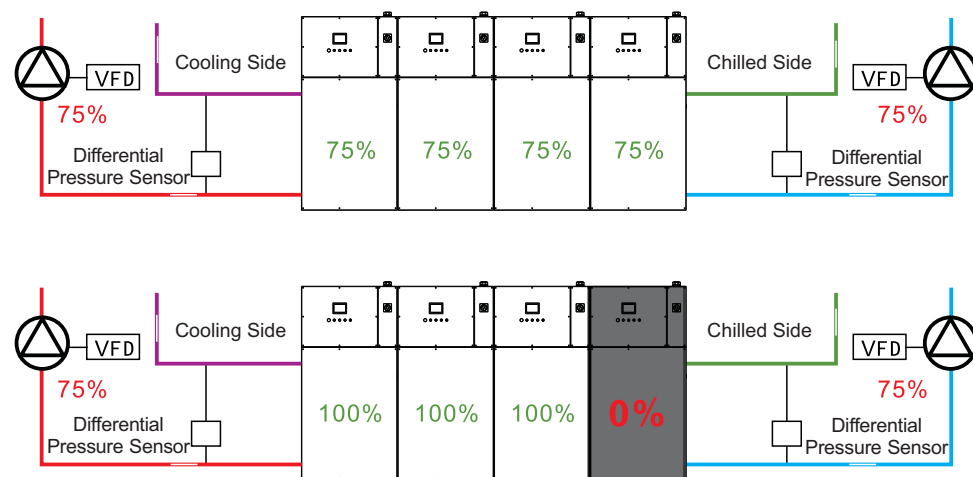


Variable Flow

When the pump speed drops to 4/5 of the original, it saves 48.8% energy. When the pump speed drops to 1/2 of the original, it saves up to 87.5% energy.

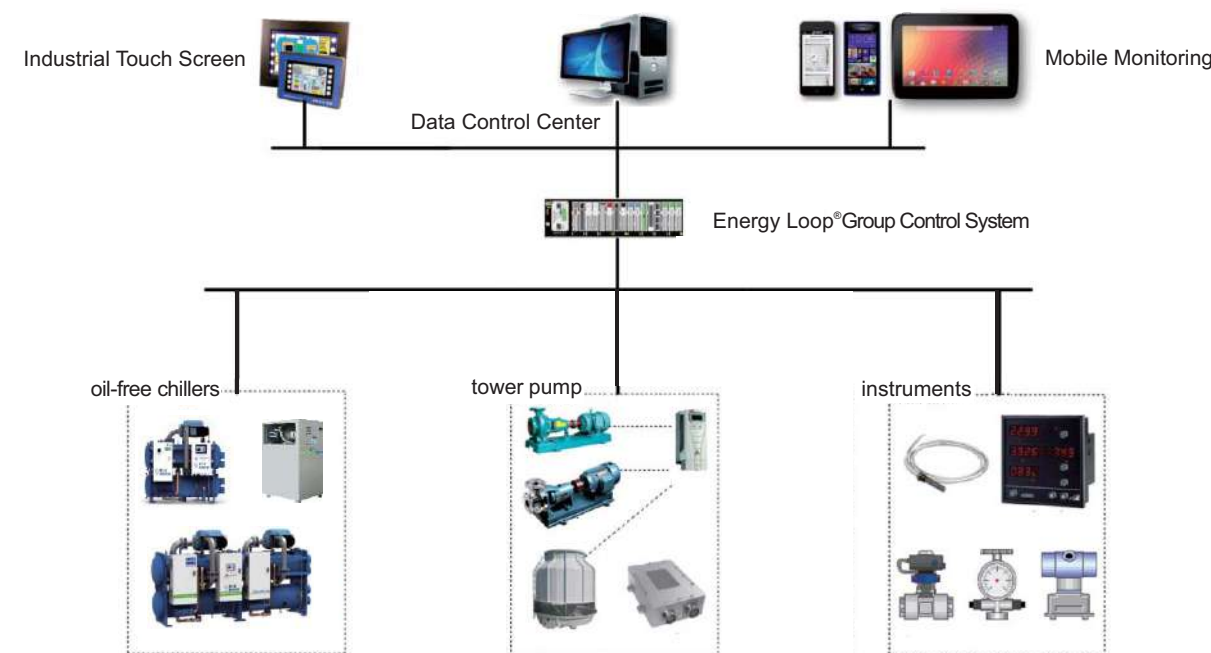
BSE water-cooled modular unit uses a variable water flow rate controller to analyse demand load of the air conditioning system. Variable control ensures the water flow rate matches the system demand closely at anytime.

After the system water flow drops, the water flow to each modular units are maintained, ensuring efficient heat transfer.



BSE Energy Loop® Group Control System

- BSE's self-developed group control system
- Uses BSE Energy Loop® Group Control System, can increase plant room energy system efficiency by 20%
- Powerful PAC and central integrated control system, making sure high performance operation of the whole chiller system for energy saving
- Uses industrial grade parts, modular I/O design, and RS485 and Ethernet communication, supports Modbus protocol
- Uses MMP protocol, achieving high speed IO data scanning and control function
- Combining plant room automatic control, energy saving strategy and remote communication into one, allowing real time remote monitoring and diagnosis



Average Annual Chiller Plant Efficiency in kW/Ton (C.O.P.)

BSE All-Variable Packaged Chiller Plant is configured with Energy Loop® Group Control System

	BSE All-Variable Packaged Chiller Plant (Energy Loop® Group Control System)			90% conventional cooling stations				
	Outstanding	Good	commonly	Also need to improve				
kW/ton	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
C.O.P.	(7.0)	(5.9)	(5.0)	(4.4)	(3.9)	(3.5)	(3.2)	(2.9)

Notes: Input energy includes chillers, tower fans, and condenser & chilled water pumping

WHY CHOOSE BSE

Why Choose BSE

1 2 3 4 5

Excellent know-how oil free technology

nearly 70 related patents

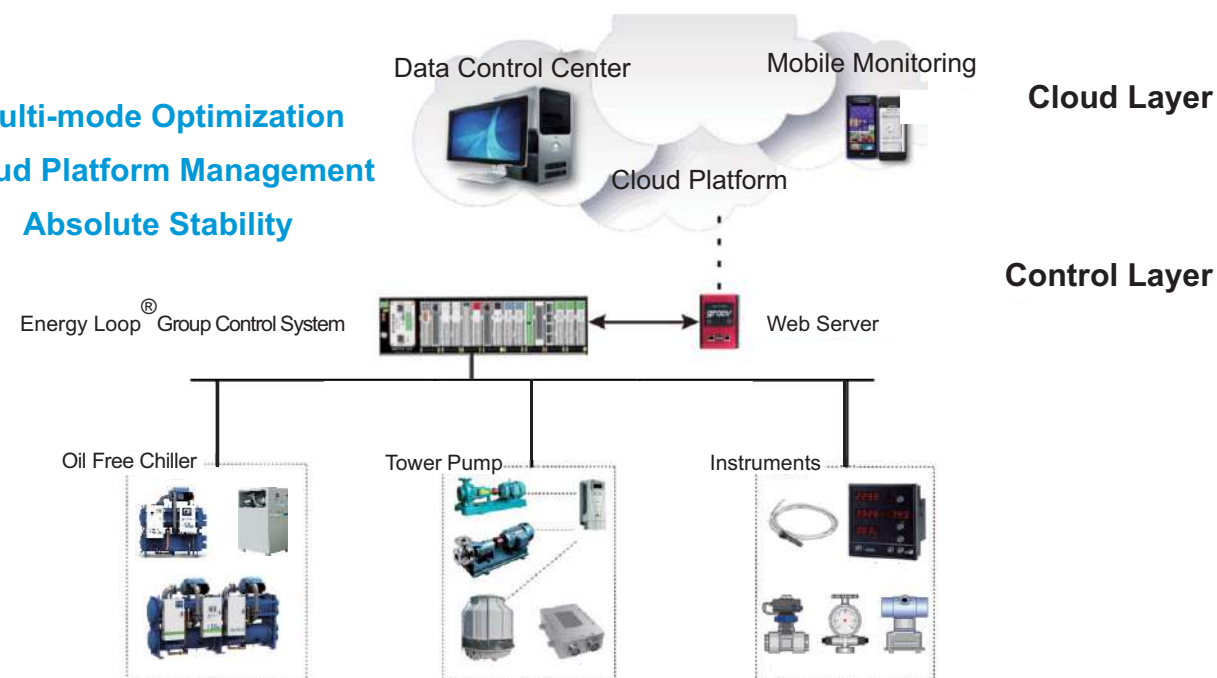
OPFlex™ control system more reliable

Remote monitoring less maintenance

custom design

Service

Multi-mode Optimization
Cloud Platform Management
Absolute Stability



Understanding Customer Needs



Project Site Investigation



Customized Solution



7Days × 24Hours



Remote Data Monitoring Capability

WHY CHOOSE OIL FREE CHILLER



HOTEL

- **Quiet Operation:** low noise, low vibration, no impact to the surrounding environment
- **Ensure Comfortability:** high stability, to ensure comfort
- **Remote Monitoring:** powerful remote communication capability for remote monitoring and diagnosis
- **Energy Efficient:** 50% higher than the conventional chiller, part load saving effect is more obvious
- **Flexible and Compact:** small size, light weight and small footprint

HOSPITAL

- **Comfort and Reliability:** stable and reliable unit, in particular the protruding part load performance to ensure comfort
- **Emergency Backup Power:** starting current is only 2A, automatic restart in 20 seconds, saving power consumption
- **Remote Monitoring:** seamless building group control system, remote monitoring and diagnosis
- **Maintenance Cost:** no oil maintenance, operation and maintenance cost savings
- **Dimension and Weight:** compact, convenient and simple to repair

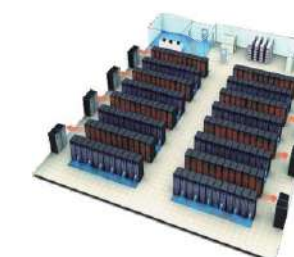
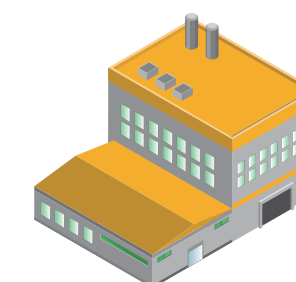


OFFICE BUILDING

- **Reliability:** magnetic levitation compressor for high reliability
- **Energy Efficiency Ratio:** 50% higher than traditional chillers, more energy-saving effect in partial load
- **Easy Maintenance:** no oil, simple maintenance, cost savings
- **Noise Level:** low noise, low vibration, no impact to the surrounding environment
- **Remote Monitoring:** seamlessly building group control system for remote monitoring and diagnosis
- **Environmental Protection:** using environmentally friendly refrigerant R134a, no damage to the ozone layer

INDUSTRY

- **Reliable and Efficient:** efficient and stable operation of the unit, a large range of load variations
- **Maintenance Cost:** no need for oil maintenance, operation and maintenance cost savings
- **Emergency Backup Power:** starting current is only 2A, automatic restart in 20 seconds, saving power consumption
- **Remote Monitoring:** powerful remote communication capability for remote monitoring and diagnosis
- **Environmental Protection:** using environmentally friendly refrigerant R134a, no damage to the ozone layer



DATA CENTER

- **Efficient and energy saving:** under the condition of high temperature of chilled water outlet, to further improve efficiency, reduce the PUE value system
- **Reliable and stable:** uninterrupted operation throughout the year, ensure the accuracy of temperature control and operation stability
- **Easy Maintenance:** no oil, simple maintenance, cost savings
- **Noise Level:** low noise, low vibration, no impact to the surrounding environment
- **Remote Monitoring:** seamlessly building group control system for remote monitoring and diagnosis

CASE STUDY



Swire Group — TaiKoo Li Sanlitun SWIRE PROPERTIES

Reconstruction project: Swire Group focuses on the development and management of commercial, retail, hotel and residential properties, especially large-scale integrated property projects, and has accumulated more than 40 years of experience in design, development and management. BSE provide multiple magnetic levitation oil free chillers for TaiKoo Li Sanlitun in Beijing.

Solution: Uses BSE I-CHILLER™ modular unit which occupies only 1m² of space, unit can operate, can work in extreme weather conditions, guaranteeing indoor air-conditioning comfort.

Benefits: After the reconstruction, the unit achieved annual energy savings of **86%**, approximately **1.18 million kWh!**

China-Hong Kong — Mei Foo Sun Chuen

Reconstruction project: Mei Foo Sun Chuen was the first large private housing estate in Hong Kong completed in 1968. At the time of its completion, 99 towers were considered to be the world's largest private residential developments, housing approximately 130,000 apartments, approximately 70,000 to 80,000 people.

Solution: BSE'S condenserless chiller is combined with the remote air-cooled condenser to replace the original water-cooled screw unit and the water-cooled cooling tower system. With positive feedback of high efficiency and stability, second phase reconstruction continue to use BSE magnetic levitation chiller solutions.

Benefits: It is expected that the air-conditioning system after the transformation will save about **60%** of the annual operating costs.



Thailand — Thai Union Group PCL

Reconstruction project: Established in 1977, Thai Union Group PCL focuses on seafood and is the world's largest manufacturer of store-able tuna products. It is one of the world's largest suppliers of high-quality seafood and has exceeded its annual sales. \$3.7 billion.

Solution: Since the freshness of seafood has extremely strict temperature requirements, and there are strict requirements for the control of room temperature. Therefore, the owner has adopted two 200RT QUESTCHILLER™ magnetic levitation oil free chiller to provide guarantee for efficient and stable for seafood storage.

Benefits: After the transformation, energy saving is about **45%** compared to conventional units.

United States of America — SanDisk

Reconstruction project: SanDisk Semiconductor (Shanghai) Co., Ltd. is the only full-featured assembling and testing factory of SanDisk Group in the world. The plant is a four-story building with 34,000 m² of building surface. The chillers is required to operate 24-7-365 with cooling capacity adjusted in a wide range.

Solution: The original traditional centrifugal unit in the factory was replaced with the BSE QUESTCHILLER™ magnetic levitation oil free chiller, and BSE Energy Loop® group control system was used together. Based on the excellent operation of the BSE unit, the second phase of the SanDisk plant was completed in 2017.

Benefits: The entire chiller plant finally get the energy-saving is more than **20%**.



Thailand — CLUB MED

Reconstruction project: Founded in 1966, CLUB MED is the world's largest resort chain. After more than half a century of operation, its current resorts are located in the most beautiful corners of the world, and Phuket's CLUB MED is one of them.

Solution: In the first phase of the project, the BSE CLODUCHILEER™ was used instead of the original air-cooled unit, and the second phase was operated with QUESTCHILLER™ condenserless unit. It has been highly recognized by the owners and brings comfort and coolness to the tourists who come to the resort.

Benefits: After the renovation, the energy saving rate is expected to reach **35%**.

America — Emerson Climate Technology

Reconstruction project: Emerson Climate Technology is a large-scale multi-national company, which mainly committed in producing the air-conditioner compressors, the condensers, the fluid control units, the components of the air-conditioners, the condensing units and the electric motors with world leading technologies.

Solution: BSE configured their new laboratories with one BSMW series 145RT oil-free frequency conversion centrifugal chiller that is able to meet the accurate requirement for the water temperature control of the laboratories. Since its formal operation in 2011, the chiller has been working over 700 days without any rest and has shown its superiority in quality. Based on the outstanding performance of BSE air conditioner products in their laboratories, Emerson Climate Technology chose BSE 150RT oil-free chillers was used for their development center

Benefits: The energy saving rate up to **50%**.



COST COMPARISON & TECHNICAL DATA

Life Cycle Cost Comparison



1. Electricity fees are assumed to be constant and base fee increases by 2% per year based on 0.14 USD/kWh.
 2. Assume maintenance costs increase by 2% per year.

MINI-QUESTCHILLER™ QUESTCHILLER™ I-CHILLER™ CLOUDCHILLER™

Chiller Type	Water Cooling	Air Cooling	Modular	Cooling Capacity (RT)	Number of Fan	Maximum Condenser Outlet Temperature		Lowest Chilled Water Outlet Temperature		Starting Current (A)
						38°C	55°C	5°C	18°C	
M BSMW0334EMB1	•		•	95		•		•	•	2
M BSMW0464EMC1	•		•	129		•		•	•	2
M BSMW0528EMD1	•		•	150		•		•	•	2
Q BSMW0528EVD1	•			150		•		•	•	2
Q BSMW0528FVD1	•			150		•		•	•	2
Q BSMW0555FVD1	•			158		•		•	•	2
Q BSMW0703EVF1	•			200		•		•	•	2
Q BSMW0703FVF1	•			200		•		•	•	2
Q BSMW0740FVF1	•			210		•		•	•	2
I BMMW0350EVB1	•		•	100		•	•	•	•	2
I BMMW0525EVD1	•		•	150		•	•	•	•	2
C BSMA0316EVB1		•		90	4-6			•	•	5
C BSMA0422EVC1		•		120	6-8			•	•	5
C BSMA0633EVB2		•		180	8-10			•	•	5
C BSMA0844EVC2		•		240	10-12			•	•	5

1. Unit operating environment temperature requirements: Maximum temperature 45°C, Minimum temperature 3°C.
 2. Above units size and technical parameters for reference only. For more models please consult BSE Sales Department. Please noted we would not make further notification on technical parameter modification.

Type Instructions

