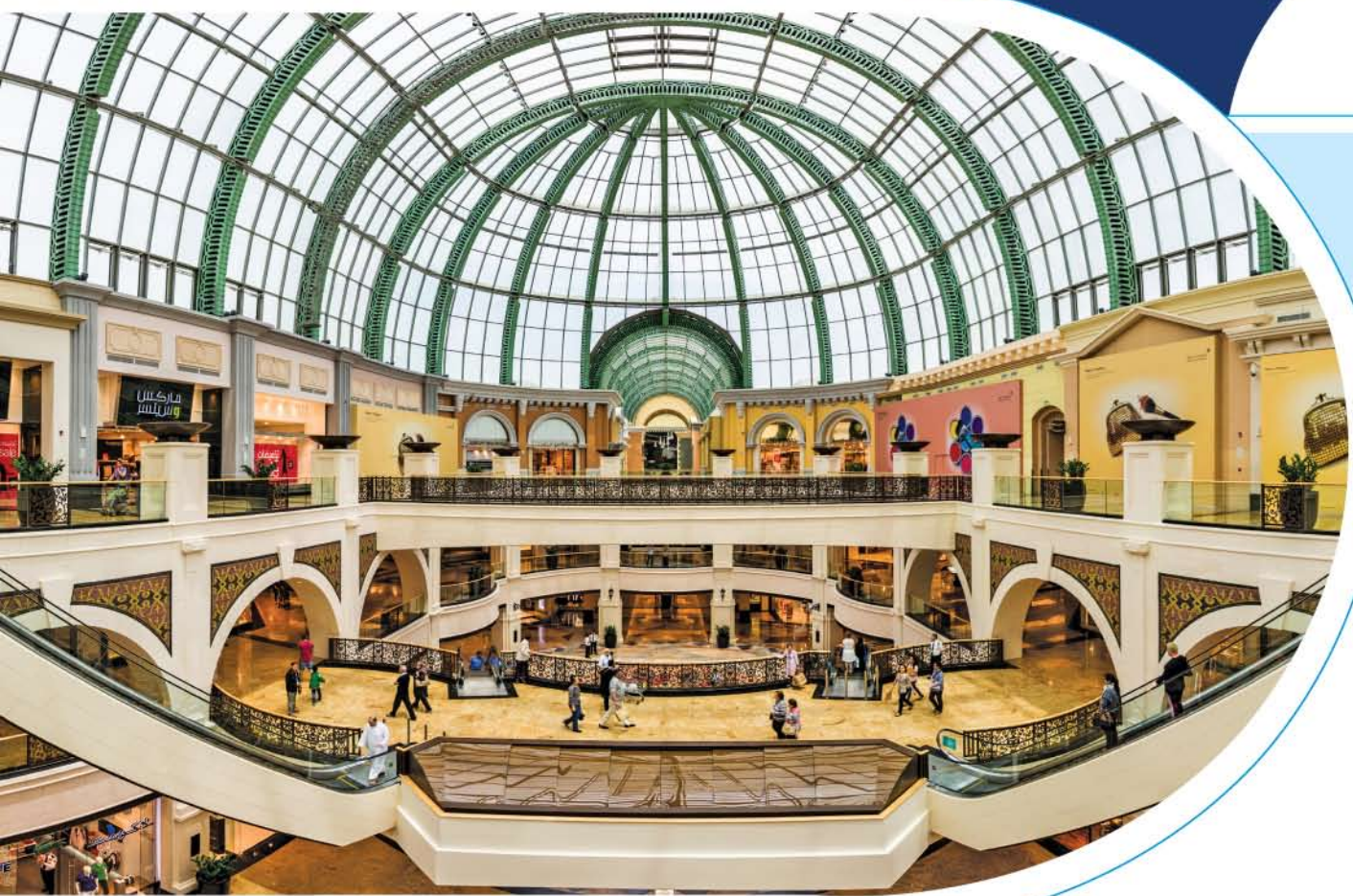


**Water-cooled Screw Chiller  
with Falling Film Technology**



**For nothing less than  
super-efficient cooling.**





## Water-cooled Screw Chiller

Blue Star, India's leading airconditioning company, has been providing expert cooling solutions for over seven decades now. It has been a pioneer in manufacturing a wide range of screw, scroll and centrifugal chillers for various applications like green buildings, hospitals and hotels.

With the growth of the Indian economy, there is a significant increase in demand for electrical energy. Since electrical energy is mostly sourced from coal-based power plants, which contribute to carbon emissions and global warming, there is an urgent need to reduce energy consumption and develop energy-efficient products.

As a leader in airconditioning, with a rich manufacturing experience of over 30 years in chillers, Blue Star has consistently developed energy-efficient chillers for the Indian market. The Company's commitment to deliver a world-class customer experience motivates it to set high standards for its products. With this commitment, Blue Star has led the way in green building initiatives and developing eco-friendly and energy-efficient products.

Now, Blue Star introduces the new generation, AHRI certified Water-cooled Screw Chillers with Falling Film Technology. These chillers are best-in-class energy-efficient screw chillers, optimised to deliver high efficiency both at full loads and part loads.



## Energy efficiency in chillers. The need of the hour.

The building sector represents about 33% of the total electricity consumption in India, with the commercial sector accounting for 8%. An energy code compliant building will normally consume 40% to 60% less energy than conventional buildings.

Various government agencies have therefore established energy codes such as ASHRAE 90.1 and ECBC to ensure that energy efficiency is enforced in buildings.

ASHRAE 90.1 2007 Table

Equipment Class		Minimum COP	Minimum IPLV	Test Standard
Water-cooled, Electrically Operated, Positive Displacement	< 75 tons	$\leq 0.780$ kW/ton	$\leq 0.630$ IPLV	AHRI 550/590
	$\geq 75$ tons and < 150 tons	$\leq 0.775$ kW/ton	$\leq 0.615$ IPLV	
	$\geq 150$ tons and < 300 tons	$\leq 0.680$ kW/ton	$\leq 0.580$ IPLV	
	$\geq 300$ tons	$\leq 0.620$ kW/ton	$\leq 0.540$ IPLV	

ECBC Table

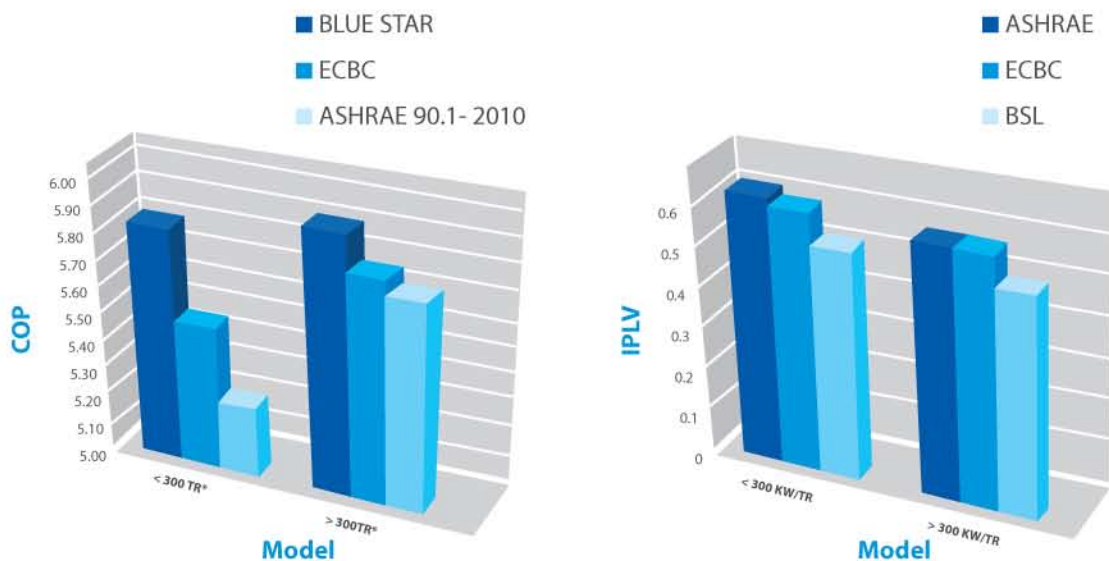
Equipment Class		Minimum COP	Minimum IPLV	Test Standard
Rotary Screw and Scroll Compressor, Water-cooled Chiller	< 530 kW (< 150 tons)	4.7	5.49	ARI 550/590-1998
	$\geq 530$ and < 1050 kW ( $\geq 150$ and < 300 tons)	5.4	6.17	ARI 550/590-1998
	$\geq 1050$ kW ( $\geq 300$ kW)	5.75	6.43	ARI 550/590-1998



High-performance buildings, such as green buildings, aim to exceed the energy efficiency standards specified in the above codes.

A chilled water system in a commercial building consumes as much as 30% to 35% of the total energy. Which is why, building owners should choose the chiller with care, so that the total lifecycle cost of the system is minimised. Operational costs are typically 10-15 times the capital cost of conventional chillers.

## Unparalleled efficiency from the Experts.

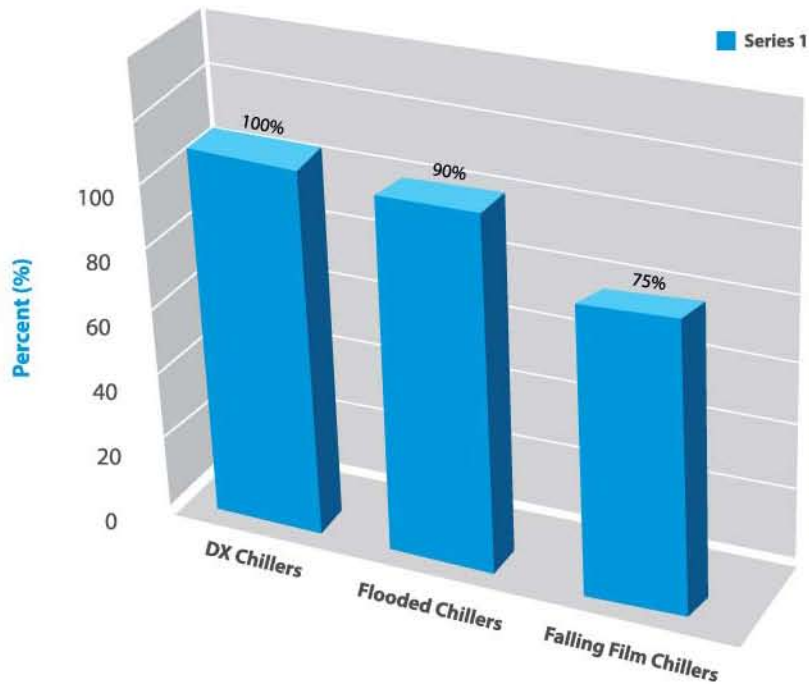


\* Average values furnished for Blue Star

### Efficiency Comparison (COP & IPLV)

Blue Star brings you its latest range of energy-efficient Screw Chillers that come with unparalleled energy and environmental benefits. The energy efficiency of these units can be as high as 5.9 COP in full load, and 8.25 COP in integrated part load value. This results in tremendous energy cost reduction and lower lifecycle costs compared to conventional Screw Chillers available in the market. Needless to say, these chillers exceed the energy-efficiency requirements of ASHRAE 90.1 and ECBC.

## Lifecycle cost for 5 years



### Conventional vs New Generation Chillers

A 300 TR Chiller was taken for comparison with the IPLV values, as per ARI Conditions.

Optimised to deliver high efficiency at both, part loads and high loads, these chillers present the ideal energy efficient solution for applications like commercial buildings, hospitals, hotels and malls.

These chillers do not use Chlorofluorocarbon (CFC) refrigerants. Instead they use R-134a, an environmentally friendly refrigerant. They also satisfy the requirements of fundamental as well as enhanced refrigerant management of green building design.





## AHRI certified chillers

Blue Star's Water-cooled Screw Chillers with Falling Film Technology are manufactured at Blue Star's own ISO 9001 certified factory. With the Chiller Test Bench certified by the Airconditioning, Heating and Refrigeration Institute (AHRI).

### AHRI Test Lab



#### Range:

**These best-in-class Screw Chillers are available in the following capacities:**

920 kW to 1580 kW - 6 models\* in capacities of 920, 1050, 1150, 1250, 1390 and 1580 kW.

\*All the models are certified by AHRI.



## Features

Blue Star's best-in-class Water-cooled Screw Chillers with Falling Film Technology have the following unique features.



### Efficient Compressor

The reliable semi-hermetic screw compressors are tested in accordance with ARI standards and are quiet in operation, efficient and maintenance-friendly. These compressors have the latest patented profile design, with separate radial and axial force bearings, PTC motor winding protection, discharge temperature protection with its controller, oil level and oil differential pressure switched. This guarantees reliability and long life of bearings even after running for over 1 lakh hours under heavy operating conditions. Moreover, due to fewer moving parts, there is minimum wear-and-tear. This results in longer life of these compressors.







## Falling Film Evaporator

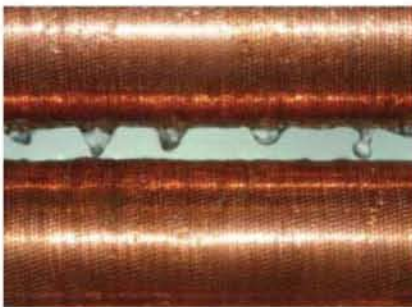
The unit comes with a specially designed, robust Falling Film Evaporator. This new design helps in significantly reducing the refrigerant charge, making it 'green' by design (extremely eco-friendly). It also improves the heat exchange efficiency by maintaining a higher evaporation temperature. As we know, higher the evaporation temperature of the system, greater the cooling capacity of the unit.

Conventional evaporators are either DX type or Flooded in design.

**DX Evaporator:** The DX type Evaporator has refrigerant in the tubes and water in the shell. This design allows use of less refrigerant but reduces efficiency.

**Flooded Evaporator:** The Flooded Evaporator has refrigerant in the shell and water in the tubes. This design increases efficiency but uses more refrigerant, thus proving to be a costly solution for energy management.

**Falling Film Evaporator:** The Falling Film Evaporator's unique design uses less refrigerant (as the refrigerant is sprayed over the tubes). It gives the best efficiency at both part and full loads, making it the most efficient and best suited design for energy management.





## Micro Controller



The control panel is specially designed for this chiller framework. The micro controller's parts and its power section are separated in the control panel for ease of installation and servicing. The microprocessor control panel helps in controlling various chiller operating parameters accurately.

### Salient Features:

- Direct communication through RS-485 to MODBUS
- Dynamic data logging of readings (1020 sets of readings)
- Power supply of 230 V AC
- Graphic display, clear and simple language of information
- Trending facility to analyse chiller operating data for maximising energy savings and enhancing machine uptime
- Scheduling to facilitate auto operation
- Option to upgrade the memory of the controller up to 2 GB via a flash card
- Real-time clock with battery backup to retain the data in the controller memory in case of power failure
- Stores the operating data for 99 trippings to facilitate troubleshooting
- Minimum run-time equalisation logic for compressors
- Allows remote monitoring of the chiller as a standard feature





## Superior mechanical design enhances energy savings.

### Refrigerant Return

By using a mechanical design, the liquid refrigerant from the bottom of the evaporator (not fully evaporated) is returned and distributed from the top again without the use of any external electrical energy. And because the evaporating temperature is higher, it conserves much energy.

### Oil Return

The mechanical design of the eject pump completes the oil return process without any additional power, by using a unique inner structure. It is also very reliable since it doesn't have any mechanical moving parts. It has no transmission part, so there are no maintenance failures.



### Efficient Flash-type Economiser

By using the unique Economiser, the medium-pressure flash gas and liquid refrigerant are separated efficiently. The medium-pressure flash gas is sent back into the side port of the compressor for the second stage of compression. The saturated liquid refrigerant, now separated, exchanges heat with the low temperature oil-rich refrigerant, extracted from the bottom of the Evaporator. This cools the liquid refrigerant, increasing unit efficiency.



## Summary

The technologies used in the Blue Star Water-cooled Screw Chiller makes it a truly energy-saving product. Here's how.

- Falling Film Spray Evaporator + High-efficiency Heat Exchange Cu Tubes + Low Pressure Boosting Technology = Increased Evaporation Temperature
- Two-stage Falling Evaporation Technology + Increased Evaporation Temperature = Increased Cooling Capacity (Qc)
- Special Condenser Design + High-efficiency Heat Exchange Cu Tubes = Lower Condense Temperature
- Lower Condense Temperature + Unique Compressor Volume = Decreased Power Input

## Other Advantages

**Address large capacity jobs without expensive redundancy chillers.**

The new best-in-class Screw Chillers, with individual unit capacities of up to 450 TR, help address building and process loads of up to 1350 TR in an economic and highly efficient manner. Since each chiller unit comes with multiple compressors, there is sufficient redundancy with built-in multiple chiller units, thereby avoiding the need for exclusive redundancy chillers.

**AHRI Test Lab verified chillers ensure real world savings.**

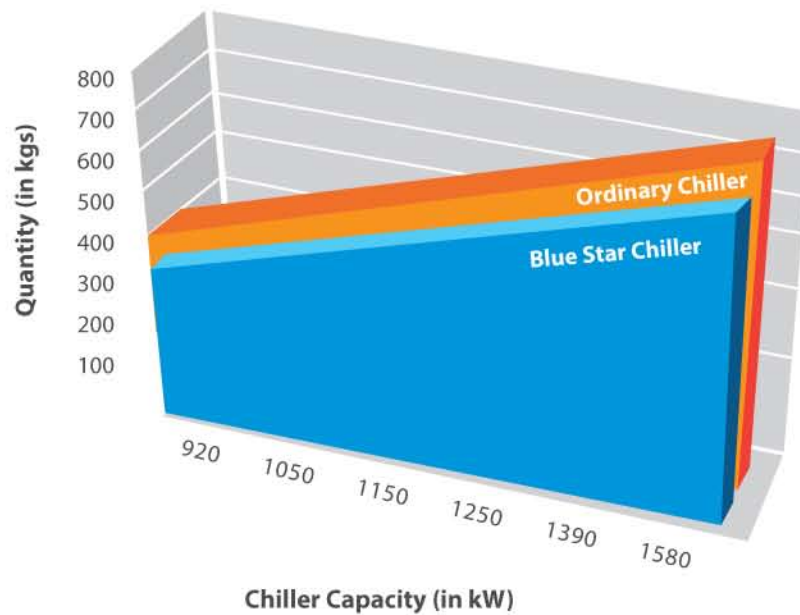
For the first time in India, Blue Star offers air-cooled and water-cooled chillers whose performance can be verified at a certified AHRI test lab, in various ambient conditions. This ensures you get verified performance that enables you to achieve real world savings.

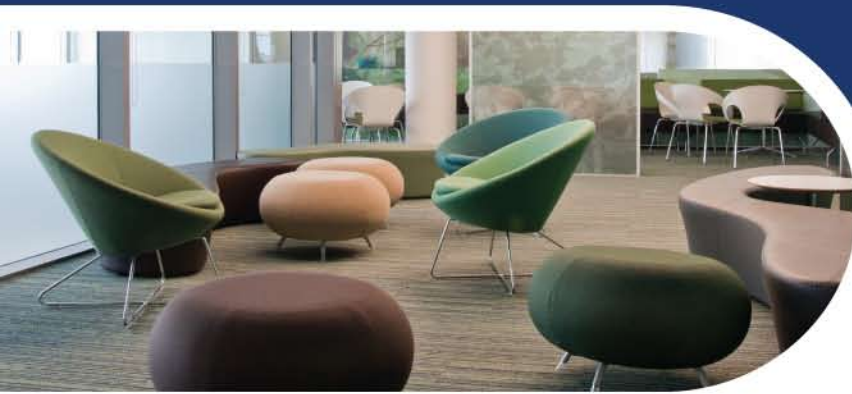


### Environmentally responsible design.

With the global need to reduce leakages of HFC gases in the atmosphere, the unique design of Blue Star's Falling Film Screw Chillers enables a 40% reduction in refrigerant charge from conventional designs. Reinforcing our commitment to being green in every aspect of our design. These units also use a green gas R134A, which enables higher heat transfer thereby delivering better efficiency. Further, the low refrigerant charge ensures low maintenance costs during the service life of the equipment.

### Blue Star vs. Ordinary Chiller Refrigerant Charge





## Unmatchable part load performance.

In most airconditioning applications, the chillers operate at part loads due to the changing weather conditions and internal loads. This means, not only do the chillers have to deliver good full load efficiency but also outstanding part load efficiency. Taking advantage of the lower entering condenser water temperatures, the tandem compressor design, Falling Film Evaporator heat exchanger, and rugged condenser, these units ensure outstanding energy performance in full and part load. In fact, they can deliver industry-best COP values of up to 8.25 IPLV, at AHRI test conditions.

## Robust service-friendly design.

The design of Blue Star Screw Chiller with Falling Film Technology is such that it offers easy access to compressors for efficient preventive maintenance and routine service. The condenser tubes, which come with nano-meter coating technology, are much easier to clean as they accumulate less scales due to the unique heat exchanger design.

## Technical specifications for R134a Water-cooled Chillers with Falling Film Evaporators

Description	Units	LCWX2-0920FFA	LCWX2-1050FFA	LCWX2-1150FFA	LCWX2-1250FFA	LCWX2-1390FFA	LCWX2-1580FFA
Nominal Cooling Capacity	kW	920	1050	1150	1250	1390	1582
<b>Compressor</b>							
Type	Semi-hermetic Twin Screw						
Quantity	No.	2	2	2	2	2	2
Operating Speed	RPM	2950	2950	2950	2950	2950	2950
Electrical Power Supply	360 - 440 V, 3 Ph, 50 Hz						
<b>Condenser</b>							
Type	Shell & Tube Condenser						
No. of Passes (Water Side)	No.	2	2	2	2	2	2
No. of Refrigerant Circuits	No.	1	1	1	1	1	1
Water Connection Size In / Out	Inch	6	8	8	8	8	10
<b>Evaporator</b>							
Type	Shell & Tube Falling Film Evaporator						
No. of Passes (Water Side)	No.	2	2	2	2	2	2
No. of Refrigerant Circuits	No.	1	1	1	1	1	1
Water Connection Size In / Out	Inch	6	8	8	8	8	10
<b>Economiser</b>							
Flash Tank							
<b>Overall Dimension</b>							
Length	mm	4300	4700	4700	4750	5000	5800
Width	mm	2030	2060	2060	2200	2080	2400
Height	mm	2000	2060	2060	2200	2150	2250
<b>Weight</b>							
Operating Weight	kg	6800	7350	8400	9100	10900	11500

#Specifications are subject to change due to continuous product development.

Rating Conditions (As per ARI 550/590 std)

1. Condenser Entering Water Temperature at 85° F at the Flow Rate of 3 USGPM/TR
2. Cooler Leaving Water Temperature at 44° F at the Flow Rate of 2.4 USGPM/TR
3. Condenser Fouling Factor 0.00025 Hr.Sq.ft.Deg.F/BTU
4. Cooler Fouling Factor 0.0001 Hr.Sq.ft.Deg.F/BTU





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