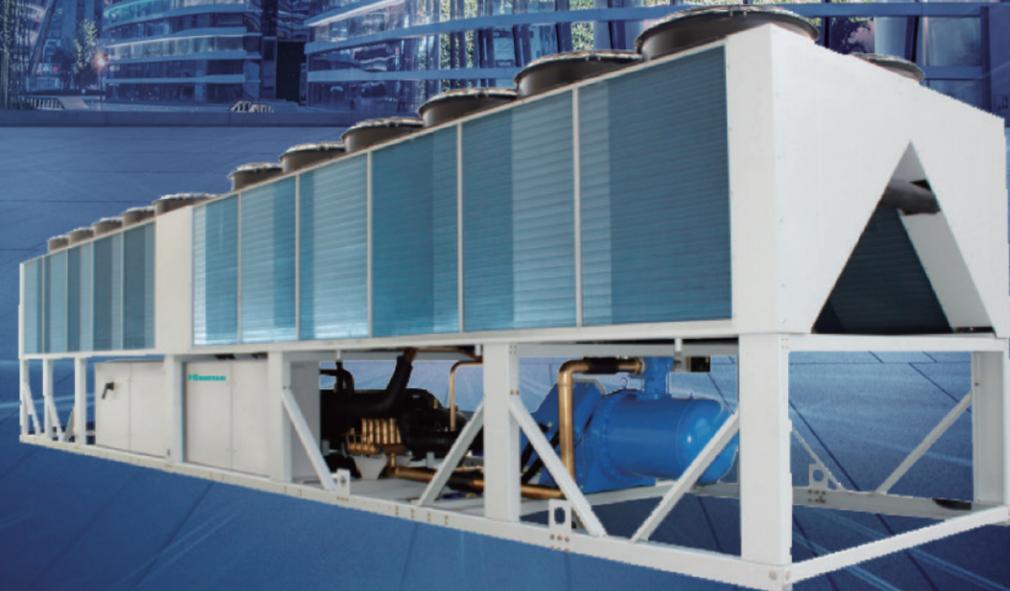


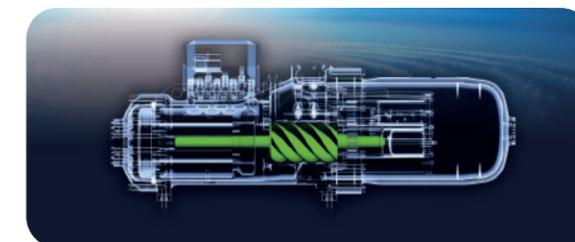
AIR-COOLED SCREW CHILLER



Features

Double Screw Compressor, High Efficiency and Low Noise

The air-cooled screw chiller adopts the new generation high-efficiency double screw compressor with HFC-134a, which is with 5:6 asymmetric rotor design, new screw profile and oil injection design.



Optimal Rotor Design

- The new generation HFC-134a high-efficiency double screw compressor uses the newly optimized 5:6 asymmetric rotor profile made using the patented production process, ensuring the rotor processing precision and optimal fit clearance of rotor.
- The one-shot moulded screw rotor effectively avoids the stress damage of late cutting processing and ensures the higher screw hardness and edge line velocity, shorter compression stroke and more efficient compression.

Double-layer Pressure Compensation Shell

- The double-layer pressure compensation shell made through precision casting of nodular cast iron undergoes precision machining with the M/C machine tool, and a three-dimensional precision measurement instrument is used to check the machining precision so as to ensure that the compressor gap and precision can meet the requirement for efficient operation, and the double wall shell is rather stable and cannot be deformed even in a high pressure state. It not only complies with the pressurization requirement, but also reduces noises.
- The compressor housing adopts two stage casting and is divided into the compression side and oil separation side, with better pressurization performance. Meanwhile, the built-in pressure reducing safety valve can connect the high and low compression chambers for pressure relief, and the relative external safety valve avoids direct refrigerant leakage in the air.

Bearing

- The patented closed pressure-reducing bearing chamber works with the long life bearing, and the pressure relief design of pressure bearing with double bearings is adopted in the axial direction to make the bearing solid and durable. The bearing chamber is separated from the high pressure chamber to reduce the bearing chamber pressure effectively
- and ensure viscosity of the lubricating oil in the bearing cavity. The excellent lubricating oil path fully lubricates the bearing, further increases the bearing service life and ensures safe operation of the unit.

Air Inlet Filter

- The double-layer large-area air inlet screen is designed to ensure high strength and small pressure loss, not only protecting the compressor completely, but also ensuring long-term operation efficiency of the compressor.

Oil Separator

- The innovative built-in three-stage oil separator adopts the internal three-section oil filter and works together with the high density screen to achieve the optimum oil and gas separation rate of over 99.8%.

Oil Heater

- The compressor is designed with an oil heater to ensure that the lubricating oil still keeps enough viscosity after the unit has stopped for a long term, ensuring reliable operation of the compressor.

36

Features

44

Control System

46

Specification

Stepless Regulation

- The unit uses the slide valve-type load increase/decrease device and is configured with the highly reliable solenoid valve of international brand to implement precise control and stepless regulation in the range of 25% to 100%, thus realizing perfect matching with the actual load, ensuring highly efficient operation of the unit and saving energy as offering a comfortable environment.
- A sliding ECO air inlet is designed in the capacity adjusting slide valve mechanism, and ECO air supply is adjusted and changed along with load, making sure that the compressor energy efficiency can be fully exerted under the partial load.

Discharge Damping Silencer

- The discharge damping silencer designed based on the resonance principle can effectively reduce the vibration transmission, high frequency noise and the discharge noise of compressor.

Motor

- The unit uses the world-renowned high efficiency bipolar three-phase F-grade insulated inductive motor and built-in PTC thermistor and is configured with the intelligent imported motor protection module to protect the motor, accurately monitor the coil temperature of compressor motor and ensure normal operation of the compressor.
- The unique internal cooling channel is designed to ensure that the motor can operate for a long term in a wider compressor operating range. Both the step-down start and direct start modes can be realized.

Long Acting Oil Filter

- The compressor oil way is designed with a built-in 10-micron grade oil filter set with a metal filter screen of high precision to implement 10-micron long acting filtration. It fully filters impurities from the oil way to ensure safe operation of the compressor and needs no replacement throughout the service life of the compressor.

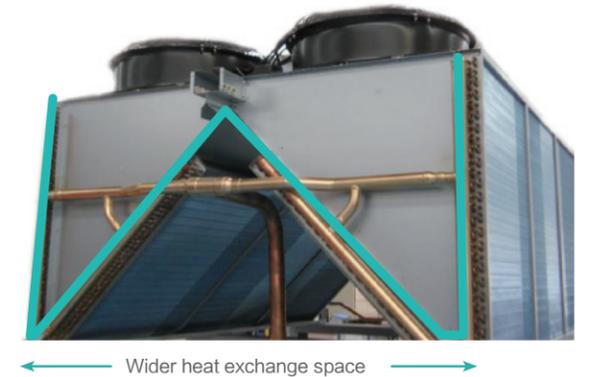
Efficient Heat Exchanger with Excellent Performance

- The heat exchanger adopts the optimized refrigerant distribution design and passes the three major certifications of ASME, PED and GB. The internal heat exchange tube adopts the efficient internal thread heat exchange copper tube to strengthen heat transfer at the water side and refrigerant side, optimize the heat transfer efficiency, reduce the unit's energy consumption, and cut the operating cost for the customer.
- The standard pipe connection mode provided by the heat exchanger is groove clamping connection (with short pipes) which facilitates field installation, and each evaporator is configured with the discharge and drainage devices separately.
- It facilitates the compressor return oil design, simplifies air return without requiring any oil pump and eradicates the frost crack danger of heat exchange tube; the refrigerant charge is only 1/3 of that of a common heat exchanger, without leakage, more reliable and environmentally friendly.
- The anti-freeze electric heater and anti-freeze temperature sensor are installed to implement anti-freeze protection for the unit, and the large barrel type water filter and water flow switch are configured for the water system as additional accessories to implement multi-protection for the waterway system.



Inverted M Type Heat Exchanger of Air Side, Improving the Heat Transfer Effect

- The inverted M type heat exchanger adopts the cooling and heating separation design to effectively reduce the pressure loss of refrigeration system and improve the unit operation efficiency.
- The airflow distribution is even and consistent thanks to the CAE analysis, with no blind zone of heat exchange, realizing high-efficiency heat exchange.



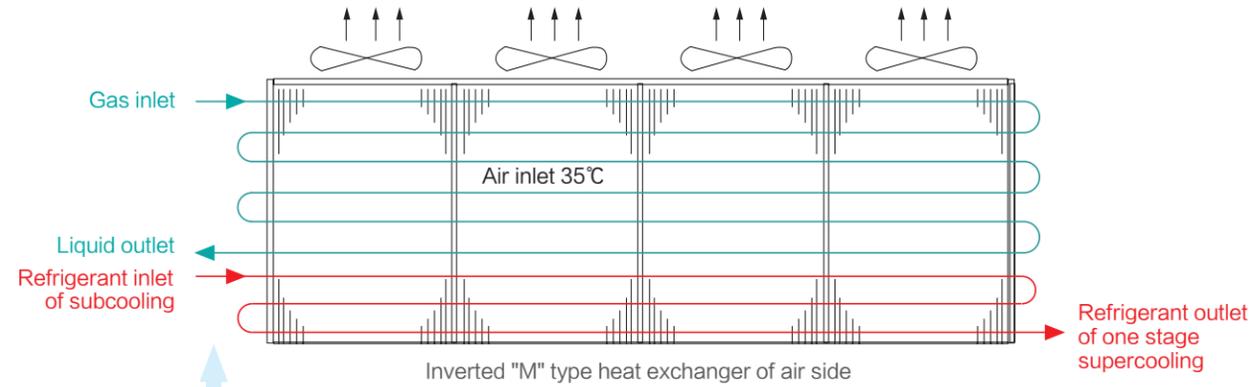
- The unit adopts the seamless inner grooved copper tube of famous brand and the world leading continuous casting and rolling technology to achieve the excellent extension and heat exchange performance. Moreover, heat shrink sleeving is allocated to every heat exchanger distributor to realize shock proof and abrasion proof design.
- Copper tubes for the heat exchanger undergo full mechanical expansion and are staggered and covered with corrugated aluminum condensing fins. In comparison with the fenestrated aluminum fin, the fin features small wind resistance, low dust accumulation probability and reduced heat exchange efficiency attenuation during long term operation, ensuring stable and long term heat exchange of the unit.

Item	Hisense corrugated aluminum fin	Fenestrated aluminum fin (other brands)	Disadvantages of fenestrated aluminum fin
Dust accumulation probability	Small	High	High rate of dust accumulations, fast attenuation of heat exchange efficiency, and low efficiency
Cleaning probability	Small	High	High rate of cleanings and considerable maintenance cost
Wind resistance	Small	High	Big wind resistance, improved fan energy efficiency, and increased operating cost
Defrosting	Easy	Difficult	Hard defrosting, easy secondary frosting, and reduced water temperature of heating, not applicable to the heat pump condition

Two-stage Supercooling Technology

First-stage Supercooling:

The special secondary distribution technology of refrigerant is adopted to recollect the liquid refrigerant, which passes the recooling coil bottom and undergoes one time supercooling to improve the cooling energy efficiency and capacity effectively.



First-stage supercooling realized easily through the unique refrigerant distribution technology of Hisense.

First-stage supercooling of condenser

Second-stage Supercooling:

The efficient economizer implements two stage supercooling and adopts the independent electronic expansion valve to realize accurate throttling control. The differential pressure between the inlet liquid refrigerant and outlet liquid refrigerant is detected to achieve the best control on supercooling degree, further enhance the unit supercooling degree and improve the energy efficiency of main unit.



Second-stage supercooling of the economizer

High Precision Control, Reliable Operation

- The high performance double-screw compressor specially developed for the HCF-134a heat pump, high grade bearing, lubricating oil path design without oil pump, and suction spray and intermediate spray protection of the compressor guarantee extremely safe operation of the compressor.
- The three-level password protection prevents wrong operation of non-professionals and ensures safe operation of the unit. The multi-protection function ensures safe operation of the unit.
- The unit (with standard configuration) adopts outlet water temperature control to ensure constancy of the outlet water temperature, make the terminal temperature regulation more accurate and optimize the user experience; return water temperature control can also be selected to achieve the best unit efficiency under dynamic equilibrium of end user.
- The compressors start one by one to minimize the startup current and reduce the impact on the power grid.



Anti-frosting Design of the System (Optional)

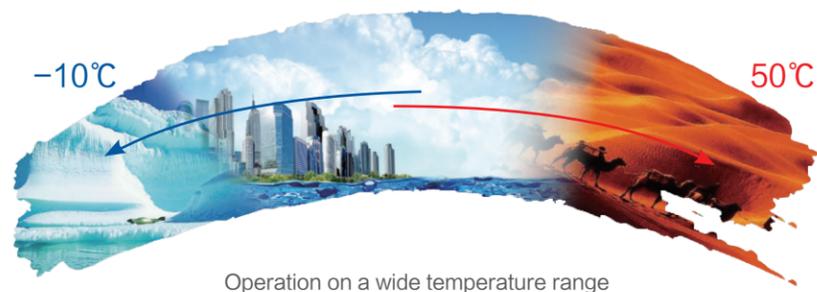
Unique Defrosting Heat Exchanger (Special)

- The difficulty of icing at the bottom of the finned heat exchanger in winter is eliminated to improve the heating efficiency and save more energy.
- The traditional heat exchanger is narrow at the bottom, and the melt water during defrosting easily gathers to lead to ice accretion.
- The unique flow path design of Hisense can gather waste heat during defrosting to make it pass through the bottom of the flow path, avoiding ice accretion at the bottom during defrosting at low temperature and realizing more thorough defrosting.



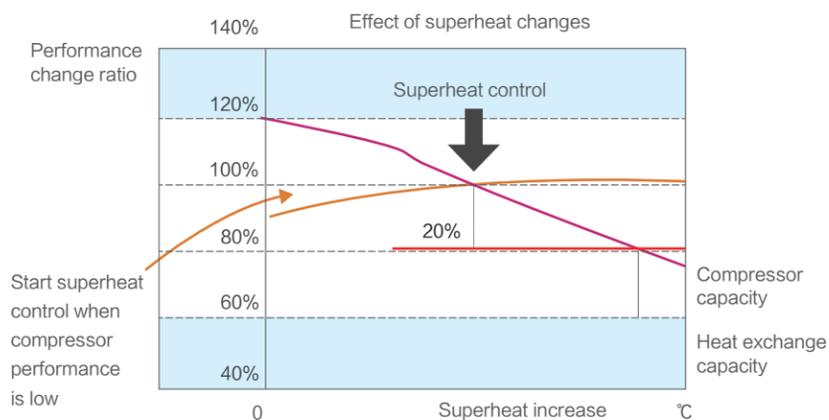
Wider Operation Range and Longer Service Life

- The unit casing adopts the galvanized steel sheet (complying with the EU ROHS standard), undergoes electrostatic orange pattern spraying with anticorrosive paint, and uses stainless steel screws to prevent corrosion effectively and adapts to various outdoor adverse conditions.
- The unit can cope with the outdoor wide temperature range of -10°C to 50°C .
- The unit supports air-to-air heat exchange that does not pollute the environment and meets environmental regulations.



Accurate and Stable EEV Control

The 0~3810 step electronic expansion valve control technology can realize fine adjustment in the range of 10% to 100%, achieve best control on the superheat degree and ensure high performance operation of the unit.



Note:
Decreased or unstable superheat will reduce the performance of the compressor, and even prevent the refrigerant from evaporating, resulting in liquid compression, resulting in compressor failure. Increased superheating will reduce the performance of the water-side heat exchanger.



Note:
The unit uniquely adopts the dual power supply design of electronic expansion valve to implement power-off delay protection and prevent hidden danger of liquid hammer against the compressor when the power supply of the unit fails unexpectedly.

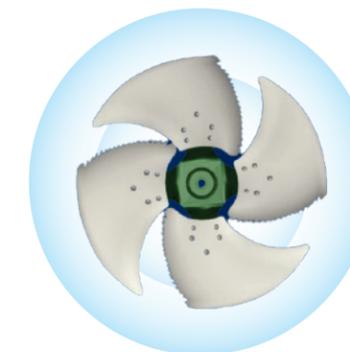
Environmentally Friendly Refrigerant R134a

The environmentally friendly refrigerant R134a with excellent performance saves power consumption and contains no chlorine element, so it does not damage the atmospheric ozone layer and has no forbidden period. The refrigerant reduces CO_2 emission effectively, alleviates the increasingly serious urban heat island effect and constructs green life buildings.



Optimal Aerofoil Spiral Fan, Large Airflow with Low Noise

- The fan adopts aerofoil axial fan design, which looks like the bird's wings. It can effectively decrease the noise from the air interference. Moreover, it adopts large diameter aluminum blade to achieve higher airflow.
- Through the optimized design of the front end of the curved impeller, the generation of air vortex at the edge of the fan impeller is controlled, improving the fan efficiency and lowering the fan noise.
- The motor ensures zero idling and provides the thermal protection function, with a longer service life.
- The motor is directly driven to eliminate transmission loss effectively and reduce vibration.
- In addition, a high static pressure fan motor is optional, meeting all kinds of scenarios with static pressure requirements.



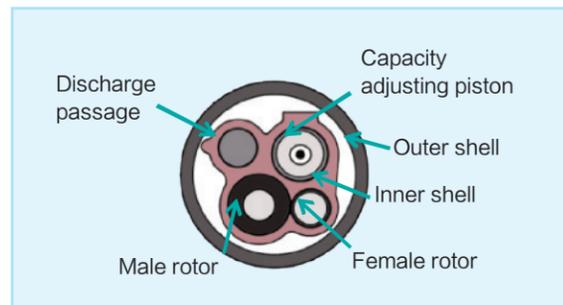
Convenient Installation and Simple Maintenance

- The unit adopts the integral structure. One unit adopts the one inlet and one outlet system for the waterway to achieve simple installation. The user only needs to connect the power supply and water supply before operation, and does not need to rebuild an equipment room or purchase cooling tower and other auxiliary equipment, so the construction period can be shortened effectively and the installation cost is cut down.
- Due to the integrated design of the electrical part and the main unit, the user does not need to set a special power distribution cabinet, saving the complex power distribution work.
- Electrical layout adopts strong and weak current separation, switch design of power-on interlock and unique integrated design of electric shock prevention. The strong current cabinet is equipped with an anti-shock insulating glass baffle, and the standard main line configured for the electric control cabinet of unit is connected to the protection box to prevent electric shock.
- The intelligent control system automatically monitors and controls the operating status of the unit and displays the fault cause in case of an exception to facilitate unit maintenance.

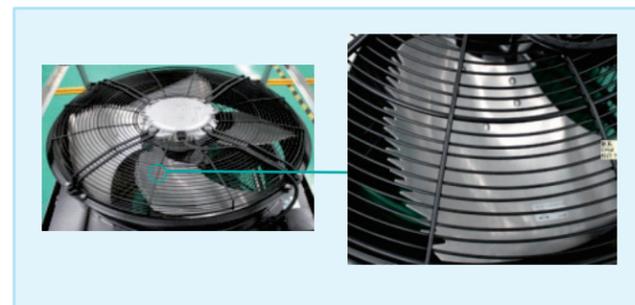


Optimization Measures of Noise Reduction

- Source noise reduction: The double-wall pressure compensation shell reduces noise transmission from the source, the high precision rotor undergoes cutting-edge machining to ensure the meshing accuracy, and the rotor compression surface undergoes laser hardening treatment and cannot be deformed under compression force. The minimal vibration and smooth operation reduces the operating noise effectively.
- Exhaust noise reduction: The compressor is provided with a built-in discharge damping silencer, which is designed according to the resonance principle to effectively reduce the noise generated by high pressure discharge vibration of the compressor.
- Fan noise reduction: The unit employs the most advanced aerofoil type spiral fan with a large diameter aluminum blade, which looks like a bird's wings unfolded, and the sickle-shaped fan controls generation of air vortex at the fan impeller edge. The noise is reduced by 6 dB(A) in comparison to the common axial fan.
- Noise reduction measures for unit vibration: Flexible fastening parts are used at the key nodes of pipeline to reduce vibration effectively, and the directions of all the copper tubes are systematically optimized to greatly reduce the operating vibration of the unit body.
- Noise reduction during operation: The standard combined spring shock absorber is configured for the unit before delivery, the quantity, bearing points and bearing specifications of the configured shock absorbers are matched according to the weight and structural center of gravity of the corresponding unit, and the user can install a spring shock absorber between the unit bottom frame and the foundation to greatly reduce vibration transmission during operation of the unit, better reducing noise during operation.



Section sketch map of double layer casing



Advanced aerofoil type spiral design

Ultra Low Noise Type (Optional)

- Sound insulation and noise reduction: The unit adopts the sound proof box (optional) of compressor, which is pasted with 40 mm efficient sound absorbing material. This method can be used to reduce noise by 6 dB(A).
- Flexible soft connection (optional): The flexible connection of the suction side and discharge side of the compressor can be used to further reduce the suction/discharge noise of the compressor.
- Fan speed control (optional): The fan motor adjusts the motor speed according to the system temperature detected by the sensor and reduces the operating noise of the unit during partial load.



Control System

Hisense Intelligent Group Control System

- Hisense provides the intelligent group control system software, which can implement centralized control on multiple main units, automatically balance the operating time of multiple units, and perform automatic switching when a unit fails, making the system operate more intelligently and stably and achieving the objective of energy conservation.
- The system adopts the international RS485 standard serial communication interface, and can be connected with other building control systems (BAS) through the communication protocol conversion module (optional) provided by Hisense to realize group control of multiple units. The standard protocol includes BacNet, Modbus and Lonworks.
- The 10-inch large LCD touch screen display digital control center professionally developed by Hisense provides monitoring, data recording, safety protection and convenient operation for the system. A series of technical information can be displayed just by pressing a single key. Obviously, it makes the operation of the unit more convenient.
- The LCD displays the information about the water chiller, subsystem and system parameters, and can display multiple operating parameters simultaneously on the same screen. Besides, the administrator can also set an access password to prevent change to the set value without permission.



"Black Box" Function

The unit is equipped with an advanced microcomputer controller with "black box" function, which can monitor and store the operating parameters of the unit in real time, and can continuously record all the data of the unit's operating status in the past year. Also, it can quickly and accurately check the abnormal operation, easy to analyze and solve the problems.



Displaying Information

The control center implements continuous monitoring of the operating system and displays the unit running status and fault information.

The displayed status information includes, but not limited to:

- Unit status
- Unit capacity
- Compressor, water pump and expansion valve status
- Inlet and outlet water temperatures
- Suction/discharge pressure/oil pressure of compressor
- Suction/discharge temperature/oil temperature of compressor, etc.

Alarm information includes, but not limited to:

- Power supply over/under-voltage and reverse phase/phase loss protection
- Compressor high/low voltage protection
- Compressor and fan overload protection
- Oil filter clogging protection
- Discharge temperature high protection
- Anti-freezing protection, cutoff protection and frequent start/stop protection
- Feedback on various pressure/temperature sensor faults, etc.

Functions

- Three level password protection of factory, service and user
- Power-on self-test function
- Weekly timed-on/off function
- Memory function in power failure
- Unit preheating
- Outlet/return water temperature setting/control
- Automatic/manual control of unit operation
- Balancing compressor operating time
- Delayed start control of compressor
- Compressor start time setting
- Compressor energy regulation control/setting

Unit Configuration

Standard unit accessories

- Spring shock absorber
- Water filter
- Water flow switch
- Clamp

Unit Options

- Low temperature cooling type/annual heat pump type
- Plateau type
- Ultra low noise type
- "Hisense Cloud" remote monitoring
- Centralized controller
- Remote touch screen controller
- Soft starter/inverter start
- Building automation interfaces – Modbus, LonWorks, BACnet
- Flange interface
- Anticorrosive fin
- Water side pressure bearing 1.6 Mpa
- Built-in hydraulic module (some models are available)

Note: For the above options, contact the local office.

Specification

Model	HFR/LGE -*/GH/AE	093S	109S	126S	132S	146S	168S	180S	188S	202D	218D	
Nominal cooling capacity	kW	308.5	367.2	414.5	442.6	483.5	549.3	594.3	632.8	683.8	734.4	
	USRT	87.7	104.4	117.8	125.9	137.5	156.2	169.0	179.9	194.4	208.8	
	× 10 ⁴ kcal/h	26.5	31.6	35.6	38.1	41.6	47.2	51.1	54.4	58.8	63.2	
Nominal heating capacity	kW	292.1	346.8	393.7	419.5	457.3	520.3	562.2	602.2	648.0	693.6	
	USRT	83.0	98.6	111.9	119.3	130.0	147.9	159.8	171.2	184.2	197.2	
	× 10 ⁴ kcal/h	25.1	29.8	33.9	36.1	39.3	44.7	48.3	51.8	55.7	59.6	
Cooling power input	kW	104.9	123.7	138.2	148.6	162.5	183.7	200.4	209.5	230.6	248.6	
Heating power input	kW	98.0	115.8	129.1	135.4	149.0	166.9	190.7	197.7	214.0	232.4	
Control type	-	25%~100% stepless regulation									12.5%~100% stepless regulation	
Startup type	-	Y-Δ										
Power supply	-	AC 3Φ, 380V/50Hz										
Refrigerant	Type	R134a										
	Circuits No.	No.	1	1	1	1	1	1	1	1	2	2
	Control type	-	Electronic expansion valve									
Compressor	Type	Semi-hermetic dual-screw type										
	Qty	No.	1	1	1	1	1	1	1	1	2	2
Fan	Type	Spiral axial fan										
	Qty	No.	6	8	8	10	10	12	12	14	14	16
	Power input	kW	9.6	12.8	12.8	16	16	19.2	19.2	22.4	22.4	25.6
	Air flow	× 10 ⁴ m ³ /h	12	16	16	20	20	24	24	28	28	32
Air-side heat exchanger	Type	Fin tube type										
	FPI	Inch	16FPI									
Water-side heat exchanger	Type	Dry shell and tube type										
	Water flow under cooling	m ³ /h	53.1	63.2	71.3	76.1	83.2	94.5	102.2	108.8	117.6	126.3
	Water flow under heating	m ³ /h	50.2	59.6	67.7	72.1	78.7	89.5	96.7	103.6	111.4	119.3
	Water resistance	kPa	38	44	48	36	34	47	54	56	48	61
	Diameter of connected pipe	Inch	8	5	5	6	6	6	6	6	6	
Rated current	A	209	240	258	279	303	339	353	371	449	480	
Max. operating current	A	275	303	338	345	385	434	505	512	578	606	
Max. startup current	A	414	649	710	710	882	882	1007	1007	689	952	
Unit dimensions	Length	mm	3750	4650	4650	5550	5550	6450	6450	7350	8000	8900
	Width	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
	Height	mm	2525	2525	2525	2525	2525	2525	2525	2525	2525	2525
Unit weight	Transportation	kg	3528	4453	4463	5621	5881	5861	5961	6887	7588	8414
	Operation	kg	3728	4653	4713	5924	6184	6211	6311	7307	8008	8834

Notes:

- Cooling design condition: outdoor dry bulb temperature 35°C, outlet water temperature 7°C and water flow 0.172 m³/(h · kW).
- Power distribution and wiring on the unit installation site are subject to the unit nameplates or installation instructions.

Model	HFLGE -°GH/AE	247D	257D	277D	291D	313D	335D	359D	371D	388T	420F	
Nominal cooling capacity	kW	823.9	882.0	929.1	961.0	1031.9	1099.2	1181.7	1265.7	1316.7	1418.2	
	USRT	234.3	250.8	264.2	273.2	293.4	312.5	336.0	359.9	374.4	403.2	
	× 10 ³ kcal/h	70.9	75.9	79.9	82.6	88.7	94.5	101.6	108.8	113.2	122.0	
Nominal heating capacity	kW	781.2	837.5	878.1	908.7	975.9	1043.0	1107.6	1210.0	1250.2	1341.6	
	USRT	222.1	238.1	249.7	258.4	277.5	296.6	314.9	344.0	355.5	381.4	
	× 10 ³ kcal/h	67.2	72.0	75.5	78.1	83.9	89.7	95.2	104.1	107.5	115.4	
Cooling power input	kW	277.2	296.5	311.4	325.1	346.9	368.4	401.7	421.5	440.0	479.1	
Heating power input	kW	256.7	269.0	281.9	294.0	313.5	333.5	381.3	395.2	411.7	446.4	
Control type	-	12.5%~100% stepless regulation								8.3%~100% stepless regulation	6.3%~100% stepless regulation	
Startup type	-	Y-Δ										
Power supply	-	AC 3φ, 380V/50Hz										
Refrigerant	Type	-	R134a									
	Circuits No.	No.	2	2	2	2	2	2	2	2	3	4
	Control type	-	Electronic expansion valve									
Compressor	Type	-	Semi-hermetic dual-screw type									
	Qty	No.	2	2	2	2	2	2	2	2	3	4
Fan	Type	-	Spiral axial fan									
	Qty	No.	16	20	20	20	22	24	24	28	28	30
	Power input	kW	25.6	32	32	32	35.2	38.4	38.4	44.8	44.8	48.0
	Air flow	×10 ³ m ³ /h	32	40	40	40	44	48	48	56	56	60
Air-side heat exchanger	Type	-	Fin tube type									
	FPI	Inch	16FPI									
Water-side heat exchanger	Type	-	Dry shell and tube type									
	Water flow under cooling	m ³ /h	141.7	151.7	159.8	165.3	177.5	189.1	203.3	217.7	108.8+117.6	117.6+126.3
	Water flow under heating	m ³ /h	134.4	144.1	151.0	156.3	167.9	179.4	190.5	208.1	103.6+111.4	111.4+119.3
	Water resistance	kPa	56	61	56	70	55	80	90	71	56/48	48/61
	Diameter of connected pipe	Inch	6	6	8	8	8	8	8	8	6+6	6+6
Rated current	A	514	556	582	606	642	677	706	743	820	929	
Max. operating current	A	676	690	730	770	819	868	1010	1024	512+578	578+606	
Max. startup current	A	1048	1055	1227	1267	1316	1316	1512	1519	1007+689	689+952	
Unit dimensions	Length	mm	8900	10700	10700	10700	11600	12500	12500	14300	15350	16900
	Width	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
	Height	mm	2525	2525	2525	2525	2525	2525	2525	2525	2525	2525
Unit weight	Transportation	kg	8447	8643	9685	9785	9769	10813	11123	11523	13742	14938
	Operation	kg	8867	9063	10165	10265	10269	10703	11623	12123	14542	15758

Notes:

- Cooling design condition: outdoor dry bulb temperature 35°C, outlet water temperature 7°C and water flow 0.172 m³/(h · kW).
- The HFLGE-390T* and HFLGE-420F* units consist of the master unit and slave unit, which are transported to the site by segment for combination.
- Power distribution and wiring on the unit installation site are subject to the unit nameplates or installation instructions.

Working temperature range of units

	Cooling	Heating
Outdoor maximum temperature (°C)	50	50
Outdoor minimum temperature (°C)	5	-10
Water side maximum outlet water temperature(°C)	15	55
Water side maximum temperature difference (°C)	8	8
Water side minimum temperature difference (°C)	4	4

Notes:

If the cooling at the ambient temperature -15°C to 5°C is required, contact the technical personnel at your local office of Hisense.

Altitude correction factor

Altitude (m)	0	300	600	900	1200	1500	1800
Atmospheric pressure (bar)	1.013	0.977	0.942	0.908	0.875	0.843	0.812
Cooling correction factor	1.000	0.993	0.986	0.979	0.973	0.967	0.960
Input power correction factor	1.000	1.005	1.009	1.015	1.021	1.026	1.031

Correction factor for adding ethylene glycol

Ethylene glycol solution concentration (%)	10	20	30	40	50
Cooling capacity correction factor	0.991	0.982	0.972	0.961	0.946
Input power correction factor	0.996	0.992	0.986	0.976	0.966
Water flow correction factor	1.013	1.040	1.074	1.121	1.178
Water pressure drop correction factor	1.070	1.129	1.181	1.263	1.308

Correction factor of operating performance at low temperature

Ethylene glycol chilled water outlet temperature (°C)	2	0	-2	-4	-6	-8
Maximum outdoor ambient temperature (°C)	40	39	38	37	36	35
Cooling capacity correction factor Compressor input	0.842	0.785	0.725	0.67	0.613	0.562
power correction factor	0.95	0.94	0.92	0.89	0.87	0.84
Minimum ethylene glycol solution concentration (%)	10	20	20	30	30	30