FULL FALLING FILM CENTRIFUGAL CHILLER

Climate Solutions for Green Environments
Midea Central Air-conditioner

Entering into the 21st century, the energy has increasingly becomes as a global issue concerning the sustainable development of human-beings. In China, the construction power consumptions take 30% of the totals in the society. However, the power consumptions of air conditioners are 40%-50% of construction power consumptions. With progressive economy, various large-scale constructions are built up everywhere. Thus, building energy has become a common responsibility of the society and an obligation for every air-conditioner supplier.

In the central air-conditioning industry, Midea Central Air-conditioner has been committed to the air-conditioning technology R & D and innovation. From the Chinese first centrifugal chiller to the first full falling-film dual stages centrifugal chiller, Midea has been trying for creating comfortable, energy-saving and environment friendly equipment to the world. The ultra-efficient two-stage compression centrifugal chiller can be applied to a variety of energy-saving projects. It is the ideal choice for urban building and makes a significant contribution to the city building energy saving.
The R134a (LC) series centrifugal chiller was named as the national key product.

Launched the first Chinese VSD (Variable Speed Drive) centrifugal chiller unit.

Developed the Smart Star new generation Simi hermetic centrifugal chiller.

Launched the centrifugal heat pump chiller units.

Launched the first super efficient centrifugal chiller with dual stage compressor and full falling-film evaporator.

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Midea engineers and U.S. experts combine their wisdom and use the cutting-edge aerodynamic and full falling-film technologies to create the third generation super efficient centrifugal chiller, leading to the era of COP 7 and raising the levels of energy saving and environment protection.
WATER COOLED
CENTRIFUGAL CHILLER

International chiller expert with 30 years of experience in chiller design and manufacture. In cooperation with the U.S. chiller experts, created the first super high efficient full falling-film centrifugal chiller.

International quality control expert with 40 years experience in the chiller manufacture and quality development.

International aerodynamic and mechanical expert in centrifugal compressor design. Designed the super efficient impellers and power transmission, raising the efficiency of the compressor to 88.2% and also helped with orifice design and charge optimization.

Five Advantages

Converged the top science and technology

**High Efficiency**
Under the AHRI Conditions, Midea Dual-stage Falling Film Centrifugal Chiller has a COP up to 7.06 W/W.

**Environmental Friendly**
R134a, an environmentally friendly refrigerant, has zero ozone depletion potential and completely meets the Montreal Protocol without any phase-out plan. The initially designed full falling-film evaporator significantly improves the heat exchanging efficiency and reduces by more than 40% refrigerant charge volume.
Low Operation Cost

Midea 3G centrifugal chiller has a COP up to 7.06W/W. Helped by “free cooling” technology during the transition season, it consumes zero power. Both of these greatly reduce the operating cost.

Wide Application

Midea 3G centrifugal chiller with a “wide range” compression ratio design works efficiently in a variety of conditions. These include large temperature difference with small water flow rate systems, variable primary flow systems, water or ground source systems and ice storage systems. The maximum capacity is up to 4400RT in the duplex arrangement. In large projects, it is possible to minimize the initial investment and floor space by using large-capacity chillers.

Reliable Quality

Since the first centrifugal chiller in China was launched by Midea in 1964, Midea has constantly introduced and learned advanced technologies in the following five decades. Pursuing the best qualified products, Midea provides chillers for large projects both at home and abroad, the quality of which has been evidently proved in applications.
Aerodynamic Technology

Advanced design platform improves the performance of impeller, volute and other key components of Midea centrifugal chiller, raising the isentropic efficiency of compressor up to 88.2%.
Newly designed three-dimensional flow impeller Increases the entire aerodynamic efficiency. Enlarge the blade outlet angle, optimize the flow field and smoothen the flow stream, bettering the internal pressure of compressor.

The newly designed high efficient three-dimension flow alloy impeller, produced in German GMD 5-aixs machine center, has high machining precision and reduces 30% of thickness for the impeller, thus reducing the axial force loss and separation loss.
Midea CAC aspires after the professional for decades like a
day, every technological leap from the perseverance and
the pursuit of beauty. The new ultra-efficient two-stage
compression falling-film centrifugal chiller unit converges,
the wisdom and intelligence of the top chiller experts from
China and the United States.
Under the AHRI Conditions, it has a COP up to 7.06 W/W
and IPLV up to 11.6 W/W.
Pre-swirling Guide Vane Technology
Prospective-Control Logic
Free Cooling Technology
Low Operation Cost
Wide Application
Reliable Quality
High Efficiency
Environmental Friendly

Five Advantages

Five Advantages:
- High Efficiency
- Environmental Friendly
- Low Operation Cost
- Wide Application
- Reliable Quality

Advantages:
- High Efficiency
- Environmental Friendly
- Low Operation Cost
- Wide Application
- Reliable Quality
Explore the Frontier of Aerodynamic Technology

Full Flow Pass Optimization further increases the efficiency

Newly designed three-dimensional flow impeller, coupling with the optimized volute, ensures the flow velocity and maximizes the efficiency.

- Midea centrifugal compressor adopts the over-hung volute thus compacting the structure.

- The gas flow perfectly matches the interior flow channel, hence the loss of impact reduced.

- Aerodynamic loss balance design reduces the aerodynamic noise.
Pre-swirling Guide Vane Technology

The compressor is equipped with airfoil shape pre-swirling guide vane, which will produce swirl under different load conditions, hence to extend the operation range and increase the part load efficiency.

Dual stage compression Technology

- Unique designed dual stage compression technology enhances the heat absorption capacity of refrigerant, and lowers the power consumption, which increases 6% of efficiency over the single stage compressor.
- Dual stage impeller is an equal ratio compression design, which helps to reduce the rotate speed and enhance the reliability.
- Unique three-stage separation economizer simplifies the system design.
Six Core Technologies

Creative Heat-exchanging Technology

**Full falling-film Evaporating Technology**

The unique full falling-film evaporating technology: spraying technology makes the liquid refrigerant form and evaporate on the surface of evaporating tubes, which significantly boosts the heat-exchanging efficiency and reduces 40% refrigerant charge. Midea adopts patented technologies to ensure refrigerant distributed evenly and avoid non liquid on part tubes, which extend the potential heat-exchanging capacity to the full and enhance the efficiency of the whole system.

**Condenser**

High efficient heat-exchanger and optimized structure enhance the heat exchanging performance. The design of reverse flow sub-cooling chamber with multiple turbulences increases the sub-cooling degree and improves the performance.
Prospective-Control Logic

The microcomputer control system has such as the trend prediction, self-diagnosis, self-adjustment and safety protection, capable to predict real load change according to the target values and historical load levels, prospectively modify the operation load and prevent energy waste.

Free Cooling Technology - Refrigeration Migration

Midea 3G Centrifugal Chiller features the ‘Free Cooling Technology’. When the outdoor temperature is low and large commercial buildings’ interior spaces may need cooling, the main unit will work on ‘Free Cooling’ mode. Free cooling is the production of chilled water Without running compressor. The relative warm, and the energy is carried directly to the low pressure condenser, where it is cooled and condensed by the water from the cooling tower. Then the low temperature liquid refrigerant flows to the evaporator driving by gravity, then naturally circulates.

The cost is saved due to the compressor’s inactivity, zero power consumption of the main unit. The principle is that the refrigerant tends to move towards the coldest point in a refrigeration circuit. It can be used generally in the transition season such as late fall, winter and early spring.
Intelligent Control

User-friendly Interface

Intelligent Control, convenient for operation and maintenance

- The Microprocessor-based control system is equipped with an MODBUS-RTU port or other optional protocols that offers multiple remote control, monitoring and diagnostic possibilities. It provides a platform to display the real time information and self-control the entire system. It also integrates the logical program such as pre-alarm, safety protection, interlock control etc., which ensures the system’s proper start/start, normal operation and energy saving pause operation.
- The unit controller is factory mounted, wired and tested before shipment, to ensure machine operation in a proper condition.

▲ Interface Display

- Graphical display
- Touch screen
- Operation status

▲ Operation Control

- Set outlet temperature by users
- Automatically load or unload according to the chilled water temperature
- Pause function reduces the operation cost
- Independent start/stop control

▲ Safety Protection

- Oil pressure difference low/too low
- Oil temp. High & too high
- Compressor motor ampere high & too high
- Compressor motor ampere too low
- Evaporator pressure low/too low (Evaporator)
- Refrigerant pressure high/too high (Condenser)
- Oil pump overload
- Starter fault
- Long time starting
- Water cut off in evaporator or condenser
- Anti-freezing protection

▲ Interlock Control

- Oil pump pre-lubrication/ post-lubrication
- Water pump pre-running/ post-running
- Starter interlock control
- Pause/Stop mode Inlet Guide Vane interlock
- Pause/stop mode inlet guide vane interlock
- Safety testing before start
- Pre-alarm interlock control
**Intelligent Control Logic Ensures System Reliability**

By monitoring all the parameters such as chilled water outlet temp., setting temp., evaporating pressure, condensing pressure and inlet guide vane opening degree, etc., the intelligent control logic decides the best load adjustment method and optimizes the frequency of motor and the opening rate of inlet guide vane to guarantee the safe operation in various load conditions.

**Advanced Control Room & Centralized Controls**

The conventional BMS system only focuses on the interlock control, operation status and parameter monitor, which is capable to achieve automation and energy management, but it neglects the optimization of equipment matching and controlling. Midea centralized energy management system attaches importance on building load prediction and control, and coordinates the operation of air-conditioner, fan and water pumps to realize the optimum energy management.

**Centralized Control and Remote Management**

**System Control Functions:**
- Pragmatic Control Modes
- Various and auto control, remote and local control, etc.
- Equalized operation time:
  - Automatically balance the operation time of each unit to extend the life-span and minimize the maintenance
- Optimum operation schedule:
  - Optimizes the operation schedule and qty. of water pumps, to minimize the total system power consumption.
- System data report:
  - It reports the operation capacity, power consumption and energy saving effect, as well the malfunction record and historical operation record.
- Strategies to address problems
- System status indication and pre-alarm/alarm functions ensure the safety. Complete event management provides operator convenience to check historical records.
- Remote communication function
  - Adoption of the public open protocol enables the data exchange between the onsite energy management centre and the upper remote monitoring system and remote operation, maintenance and management.

**Energy management:**
- Climatic feedback control: Collect outdoor temperature and accordingly adjust the water volume when climate changes, thus reducing the energy consumption.
- Cycle duty operation: Supply different capacity according to specific application in each building
- Load prediction control: Due to perspective control logic, it decreases the frequency of startup and shutdown and minimizes the impact to the power grid, therefore extending the life span and reducing power consumption.
### Specification

<table>
<thead>
<tr>
<th>Model</th>
<th>LC1200ES</th>
<th>LC1300ES</th>
<th>LC1400ES</th>
<th>LC1500ES</th>
<th>LC1600ES</th>
<th>LC17000ES</th>
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<tbody>
<tr>
<td>RT</td>
<td>1200</td>
<td>1300</td>
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<td>1600</td>
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<td>393</td>
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<td>COP</td>
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<td>Chilled water flow volume, m³/h</td>
<td>726</td>
<td>786</td>
<td>847</td>
<td>907</td>
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<td>1028</td>
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<td>Chilled water pressure drop, kPa</td>
<td>77</td>
<td>76</td>
<td>78</td>
<td>75</td>
<td>77</td>
<td>81</td>
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<tr>
<td>Water pipe inlet/outlet temperature, °C</td>
<td>12.3°C/6.7°C (54°F/44°F)</td>
<td>12.3°C/6.7°C (54°F/44°F)</td>
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<td></td>
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<tr>
<td>Cooling water flow volume, m³/h</td>
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<td>983</td>
<td>1059</td>
<td>1135</td>
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<td>1285</td>
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<td>Cooling water pressure drop, kPa</td>
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<td>Efficiency</td>
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<td>Refrigerant</td>
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<td>Weight Dimension</td>
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<td></td>
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</tr>
</tbody>
</table>

### Notes:

1. Nominal Cooling capacities are based on AHRI 550/590-2011 conditions:
   - Chilled water inlet/outlet temperature 12.3°C/6.7°C (54°F/44°F).
   - Cooling water inlet/outlet temperature 29.4°C/35°C (85°F/95°F).
2. The design fouling factor for both evaporator and condenser are 0.086 m²·°C/kW (0.0005ft²·°F·hr/Btu), other requirements can be customized.
3. The design working pressure for both evaporator and condenser are 1.0 MPa, higher pressure demand can be customized.
4. Manufacturer reserves the right to change any product specifications without notice.
### Dimension and Fundation

**LC1200ES–LC2200ES**

<table>
<thead>
<tr>
<th>Dimensional Layout</th>
<th>Foundation Details</th>
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</thead>
<tbody>
<tr>
<td>Center line of condenser</td>
<td>Center line of evaporator</td>
</tr>
<tr>
<td>Cond. water outlet</td>
<td>Cond. water inlet</td>
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<tr>
<td>Evap. water outlet</td>
<td>Evap. water inlet</td>
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<tr>
<td>Fundation layout</td>
<td>1:25</td>
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<tr>
<td>Foundation layout</td>
<td>Rubber Pad 615x330x100</td>
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<tr>
<td>Steel Base 820x300x100</td>
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</tr>
<tr>
<td>Filled with Concrete</td>
<td></td>
</tr>
<tr>
<td>Filled with Concrete</td>
<td></td>
</tr>
</tbody>
</table>

| Model       | (A) | (B) | (C) | M | G | E | N | P | Q | R | S | U | T | F | L | K | I | H | J | Dim. | Condenser |
|-------------|-----|-----|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|----------|
| LC1200ES    | 5490| 2800| 2920| 3100| 1150| 1050| 300 | 280 | 300 | 450 | 600 | 100 | 6340 | 625 | 1175| 725 | 760 | 1340 | 1400 | DN350  |
| LC1300ES    | 5490| 2800| 2920| 3100| 1150| 1050| 300 | 280 | 300 | 450 | 600 | 100 | 6340 | 625 | 1175| 725 | 760 | 1340 | 1400 | DN350  |
| LC1400ES    | 5490| 2800| 2920| 3100| 1150| 1050| 300 | 280 | 300 | 450 | 600 | 100 | 6340 | 625 | 1175| 725 | 760 | 1340 | 1400 | DN350  |
| LC1500ES    | 5490| 2800| 2920| 3100| 1150| 1050| 300 | 280 | 300 | 450 | 600 | 100 | 6340 | 625 | 1175| 725 | 760 | 1340 | 1400 | DN350  |
| LC1600ES    | 5490| 2800| 2920| 3100| 1150| 1050| 300 | 280 | 300 | 450 | 600 | 100 | 6340 | 625 | 1175| 725 | 760 | 1340 | 1400 | DN350  |
| LC1700ES    | 5790| 3150| 3180| 3450| 3800| 1700| 300 | 280 | 300 | 450 | 600 | 100 | 6540 | 740 | 1440| 840 | 785 | 1415 | 1575 | DN400  |
| LC1800ES    | 5790| 3150| 3180| 3450| 3800| 1700| 300 | 280 | 300 | 450 | 600 | 100 | 6540 | 740 | 1440| 840 | 785 | 1415 | 1575 | DN400  |
| LC1900ES    | 5790| 3150| 3180| 3450| 3800| 1700| 300 | 280 | 300 | 450 | 600 | 100 | 6540 | 740 | 1440| 840 | 785 | 1415 | 1575 | DN400  |
| LC2000ES    | 5790| 3150| 3180| 3450| 3800| 1700| 300 | 280 | 300 | 450 | 600 | 100 | 6540 | 740 | 1440| 840 | 785 | 1415 | 1575 | DN400  |
| LC2100ES    | 5790| 3150| 3180| 3450| 3800| 1700| 300 | 280 | 300 | 450 | 600 | 100 | 6540 | 740 | 1440| 840 | 785 | 1415 | 1575 | DN400  |
| LC2200ES    | 5790| 3150| 3180| 3450| 3800| 1700| 300 | 280 | 300 | 450 | 600 | 100 | 6540 | 740 | 1440| 840 | 785 | 1415 | 1575 | DN400  |
Climate Solutions for Green Environments

GD Midea Heating & Ventilating Equipment Co., Ltd.
Is certified under the ISO 14001 International standard for environmental management.
Certificate No. 15912E1002R6L

GD Midea Heating & Ventilating Equipment Co., Ltd.
Is certified under the ISO 9001 International standard for quality assurance.
No. 01 100 919209

GD Midea Heating & Ventilating Equipment Co., Ltd.
Certificate of Occupational Health and Safety Management System
Certificate No. 1091262000R6L-1.

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