HTV Series
Two Stages Centrifugal Chillers
HTV Series

NOTE:
Voltage: 380V~575V
Solid stage/Wye Delta/VFD available
Voltage: 3kV~13.8kV
Across the line available

COP@AHRI

HTV-M
IPLV: 12~13
400RT

HTV-L
IPLV: 11~12
000RT

HTV-G
IPLV: 11~12
600RT

HTV-K
IPLV: 6~7
1100RT

(1200RT)

Unit: Ton

High voltage available

Low voltage available

Factory introduction

Daikin have got a worldwide reputation by providing a full line of qualified products and expertise to meet customized needs. The engineered flexibility of our products allows you to fine tune your HVAC system to meet the specific requirements of your application. You benefit from high energy efficiency, quiet, operation, super or indoor air quality (IAQ) and easy maintenance and service.

Daikin Centrifugal Compressor. Water Chillers are engineered for flexibility and performance - offering choices, options and features that provide the right solution for your specific application-and have been doing so for over fifty years.

- 2012: First centrifugal launched, starting the legend
- 1962: Positive pressure chiller leading the edge (O leakage)
- 1965: Patent design of IGV and movable diffuser (Part load)
- 1971: The first of the world to use dual compressor in one circuit (Long life time)
- 1975: Liquid injection lower down the noise dramatically (Quite operation)
- 1985: The pioneer to apply R134a refrigerant to centrifugal chiller
- 2003: The FIRST magnetic bearing centrifugal chiller change the world
- 2009: The second generation Magnetic bearing compressor
- 2012: Launching of 2 stage high efficiency chiller (COP up to 7.0)
Nomenclature

HT  V  L  KD  KD  47  F  E3616  C3616

- Hermelíc Turbo (Centrifugal chiller)
- Two stage
- Compressor main mode
- First stage impeller
- Condenser code
- Evaporator code
- Power supply code
- Motor code
- Second stage impeller

HTV construction

- Two stage compressor
- Touch screen
- Economizer
- Evaporator
- Condenser
**Unit features**

Two stage compressor with high efficiency economizer

<table>
<thead>
<tr>
<th>Two stage throttling</th>
<th>Sub-cooling</th>
<th>satu rated vapor</th>
</tr>
</thead>
</table>

Sharply reduce the heat exchanger volume.

Evaporator: 16lt, 1-Inch High efficiency EVAP tubes(EHP2)
Condenser: 16lt, 1-Inch High efficiency COND tubes(CRC2)

CFD analysis used to optimized refrigerant distribute and heat exchange rate, reduce the vessel size

**Stable Operation down to 0~15% part load**

- High efficiency motor
- Rolling bearing
- Gear drive

Suction IGV + Second stage DDC control
Full range capacity control, ensure part load high efficiency meanwhile reduce discharge loss and lower down discharge noise

Two impellers rear face. Reduce the thrust and load of the bearing to extend the lifespan.
• Unit features

Flexible application
- Widely used in Big: High condenser entering water temp application.

Refrigerant
- R134a refrigerant contains no chlorine and has zero Ozone Depletion Potential (ODP). No phase out schedule as to Montreal Protocol.
- Positive pressure. No need for additional exhausting device.

Hermetic motor, safe operation
- The compressor motor is isolated from the main refrigerant flow circuit so that any contaminants generated by a motor failure will not pass into the main refrigerant circuit. Moisture, acid and/or carbon particles will be automatically trapped within the compressor’s dedicated coolant feed and return lines.
- The high-pressure subcooled refrigerant flows through a filter-drier to the low-pressure area in the motor housing.
- The refrigerant gas returns to the evaporator after cooling motor.

Lubricating system
- A built-in electric oil pump assembly supplies lubrication at controlled temperature and pressure to all bearing surfaces.
- An internal oil sump contains a submersible fixed-speed oil pump and oil heater, which is thermostatically controlled. Oil is filtered by an externally mounted replaceable cartridge oil filter and is cooled via a refrigerant-cooled plate type oil cooler. Both the oil lubrication piping and oil cooler refrigerant piping are completely factory-installed eliminating the need of any field cooling water and piping.

Unmatched Unloading
- The motor-driven inlet guide vanes (IGV) located at the entrance to the compressor first-stage impeller control the quantity of refrigerant entering the impeller, thereby controlling the compressor capacity in the first-stage.
- A motor-driven variable diffuser or discharge diffuser control (DDC) in the second stage. Both the IGV and DDC motors are single-phase 200V motors.
- Due to refrigerant re-entering the impeller. When in a stall condition, the refrigerant gas is unable to enter the volute due to its low velocity and remains stalled in the impeller. In a surge condition the gas rapidly reverses direction in the impeller causing excessive vibration and heat. Daikin compressors reduce the discharge area as load decreases to maintain gas velocity and greatly reduce the tendency to stall or surge.

Figure 1: Fixed vs. Movable Discharge Geometry

Above, the drawing on the left shows a cross-section view of the operation at full load of a unit with a fixed compressor discharge. At full load, a large quantity of gas is discharged with a fairly uniform discharge velocity as indicated by the arrows. The center drawing shows a fixed compressor discharge at reduced capacity. Note that the velocity is not uniform and the Refrigerant tends to re-enter the impeller. This is caused by low velocity in the discharge area and the high pressure in the condenser, resulting in unstable surge operation and with noise and vibration generated. The following cutaway picture shows the unique Daikin movable discharge geometry. As the capacity reduces, the movable unloader piston travels inward, reducing the discharge cross-section area and maintaining the refrigerant velocity. This mechanism allows our excellent unloading capacity reduction.

Pump down
- Daikin centrifugal chiller are designed for refrigerant pump down, where the refrigerant will be isolated from condenser.
\textbf{Unit features}

VFD application

Chiller 99% time working at part load, motor variable speed control by VFD

\textbf{Start benefit:}
From 1Hz
No more than 100% RLA
Inhibit inrush current

\textbf{IPLV or NPLV improve:}
Improve kW/ton in part Load
Shorten investment payback time, save money

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{chart.png}
\caption{Inrush current comparison}
\end{figure}
Control features

MicroTech Control

- Daikin Centrifugal chillers are equipped with the proven reliability of the MicroTech controls system with touch-screen interface. The control system is designed for easy and intuitive operation, and configured for efficient and reliable operation. Plus, Daikin's Open Choice™ feature allows integration with your building automation system (BAS) through an optional communication module;

- The 15-inch color touch-screen is mounted on a fully adjustable arm. The chiller is graphically displayed, with all operating parameters viewable on the screen. Alarm history and operation setpoints are easily accessed through intuitive touch-screen buttons. The chiller operating manual is also viewable on the touch screen and can be downloaded via USB.

<table>
<thead>
<tr>
<th>Running Parameter</th>
<th>Security/Shut off protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evap EWT/Evap LWT</td>
<td>Refrigerant Pressure too low or too high;</td>
</tr>
<tr>
<td>Refrigerant Temp/Pressure</td>
<td>Oil pressure too high or too low;</td>
</tr>
<tr>
<td>Compressor Percent RL</td>
<td>Motor running status;</td>
</tr>
<tr>
<td>Compressor Run Hour/Starts</td>
<td>System pump failure;</td>
</tr>
<tr>
<td>Capacity Limit/Setpoint</td>
<td>Suction/discharge pressure too high;</td>
</tr>
<tr>
<td>Display the cause of the current fault and the last twenty-five fault conditions</td>
<td>Start up failure;</td>
</tr>
<tr>
<td>Subcool/superheat temperature</td>
<td></td>
</tr>
<tr>
<td>Oil temperature/oil pressure</td>
<td></td>
</tr>
<tr>
<td>Suction/discharge pressure</td>
<td></td>
</tr>
</tbody>
</table>

MicroTech Controls Enhance Operating Economy

Many features have been integrated into MicroTech controls to ensure optimum operating economy. In addition to replacing normal relay logic circuits, we've enhanced the controller's energy saving capabilities with the following features:

- Direct control of water pumps: Optically isolated, digital output relays provide automatic lead-lag of the evaporator and condenser pumps, permitting pump operation only when required.

- User-programmable compressor soft loading: Prevents excessive power draw during pull down from high chilled water temperature conditions;

- Chilled-water reset: Reset the leaving water temperature based on the return water temperature. Raising the chilled water setpoint during periods of light loads dramatically reduces power consumption;

- Demand limit control: Maximum motor current draw can be set on the panel, or can be adjusted from a remote 4-20mA or 1-5 VDC BAS signal. This feature controls maximum demand charges during high usage periods;

- Condenser water temperature control: Capable of four stages of tower fan control, plus an optional analog control of either a three-way tower-bypass valve or variable speed tower-fan motor. Stages are controlled from condenser-water temperature. The three-way valve can be controlled to a different water temperature or track the current tower stage. This allows optimum chilled water plant performance based on specific job requirements;

- Staging Options (Multiple Chiller Installations): The MicroTech controller is capable of compressor staging decisions and balancing compressor loads between up to four HTV. Daikin chillers using defaults or operator-defined staging.

- Plotting Historic Trends: Past operation of the chiller can be plotted as trend lines and even downloaded to a spreadsheet for evaluation and analysis;

Building Automation Systems

All MicroTech controllers are able to communicate with BAS, providing seamless integration and comprehensive monitoring, control, and two-way data exchange with industry standard protocols such as LONMARK, Modbus or BACnet.

Open Choices Benefits

- Easy to integrate into your building automation system
- Factory- or field-installed communication modules
- Comprehensive point list for system integration, equipment, monitoring and alarm notification
- Comprehensive data exchange

Integration Made Easy

Daikin unit controllers strictly conform to the interoperability guidelines of the LONMARK Interoperability Association and the BACnet Manufacturers Association. We are received LONMARK certification with the optional LONWORKS communication module.

Protocol Options

- BACnet MS/TP
- BACnet IP
- BACnet Ethernet

The BAS communication module can be factory installed, or field installed depending on customer requirement.

Electric Power Options

In order for the BAS to read the full complement of power data on low and medium voltage solid state, across-the-line, and wye-delta starters, the optional field metering package must be ordered with the chiller. Otherwise the BAS will only read the average unit amperes. This power data is not available to a BAS on all other starter voltages and types.
Options

Marine water boxes
Change the direction of water pipe in smaller chiller plant.

Flanges (Victraulic groove ready is standard)
ANSI raised face flanges on either the evaporator or condenser. Mating flanges are by others. 0.028 or 0.035 in. tube wall thickness. For applications with aggressive water conditions requiring thicker tube walls.

Vessel standard (GB vessel code is standard)
GB vessel code constructed under Chinese standard, ASME standard is optional.

Water-side vessel construction of 300 psi (150 psi is standard)
For high-pressure water systems, typically high-rise building construction.

Single insulation
1/2 inch, on evaporator, suction piping, and motor barrel; For normal machine room applications.

Double insulation
1-1/2 inch, on evaporator, suction piping, and motor barrel; For high humidity locations and ice making applications.

Extended warranties
Extended 1, 2, 3, or 4-year warranties for parts only for or parts and labor are available for the entire unit or compressor/motor only.

Witness test
A Daikin international engineer oversees the testing in the presence of the customer or their designate and translates the test data onto an easy-to-read spreadsheet. The tests can be run at AHRI load points and are run to AHRI tolerance of capacity and power. Allow two to three hours of test time per load point specified.

Supply voltage
From 380V~11000V, 50Hz/60Hz available

Export packaging
Can be either skid or full crate for additional protection during shipment. Units normally shipped in containers.

BAS interface module
Factory-installed on the unit controller (can also be retrofitted).

Control starter
Wye-Delta low Voltage
Solidate Low Voltage
VFD Low Voltage
Across the line Medium/High Voltage

Specifications

1000 Ton Technical Data Reference

<table>
<thead>
<tr>
<th>Component</th>
<th>Type</th>
<th>Brand</th>
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</thead>
<tbody>
<tr>
<td>Compressor</td>
<td>Water cooled centrifugal chiller</td>
<td>Daikin</td>
</tr>
<tr>
<td>Model</td>
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</tr>
<tr>
<td>Efficiency</td>
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<tr>
<td>Power input</td>
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</tr>
<tr>
<td>Refrigerant</td>
<td>R-134a</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Semi-hermetic centrifugal compressor</td>
<td></td>
</tr>
<tr>
<td>Cooler</td>
<td>Open 2-stage</td>
<td></td>
</tr>
<tr>
<td>Condenser</td>
<td>0-100% Stainless steel control</td>
<td></td>
</tr>
<tr>
<td>Drive</td>
<td>Electric drive</td>
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</tr>
<tr>
<td>Antisurge</td>
<td>Movable diffuser</td>
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</tr>
<tr>
<td>Oil system</td>
<td>Oil circuit type</td>
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<tr>
<td>Filter</td>
<td>Wire cloth</td>
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<tr>
<td>Emergency</td>
<td>Auto oil supply</td>
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<tr>
<td>Lubrication</td>
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<tr>
<td>Evaporator</td>
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<tr>
<td>Condenser</td>
<td>Shell &amp; Tube type C4616</td>
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<td>LO:VT</td>
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<tr>
<td>Flow rate</td>
<td>70.8</td>
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</tr>
<tr>
<td>Static head</td>
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<tr>
<td>Cooling factor</td>
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<tr>
<td>Pressure</td>
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<tr>
<td>Condenser</td>
<td>Shell &amp; Tube type C4616</td>
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<tr>
<td>LO:VT</td>
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<td>Pressure</td>
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<tr>
<td>Absorber</td>
<td>3mm Rubber pad vibration absorber</td>
<td>8803600</td>
</tr>
<tr>
<td>Dimension</td>
<td>L x W x H (mm)</td>
<td>670 x 462 x 702</td>
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<tr>
<td>Chiller weight</td>
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<tr>
<td>Motor</td>
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<tr>
<td>Voltage</td>
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<td>Motor type</td>
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<td>Motor cooling type</td>
<td>Refrigerant cooling</td>
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<td>Starter</td>
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<tr>
<td>Type</td>
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<tr>
<td>R.x</td>
<td>6.5</td>
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</tr>
<tr>
<td>Inrush current</td>
<td>4741</td>
<td></td>
</tr>
</tbody>
</table>

Cautions on product corrosion
1. Air conditioners should not be installed in areas where corrosive gases, such as acid gas or alkaline gas, are produced.
2. If the unit is to be installed close to the sea shore, direct exposure to the sea breeze should be avoided. If you need to install the unit close to the sea shore, contact your local distributor.

Dealer

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