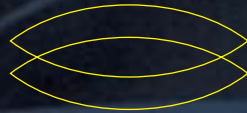


MHI CHILLER

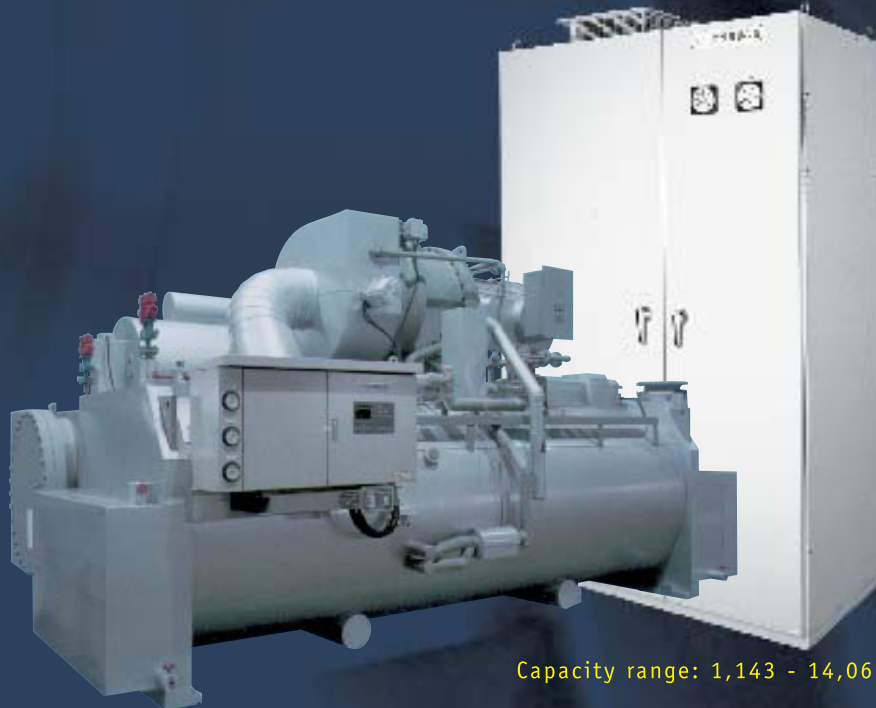
**Two Stage
Centrifugal Liquid Chiller**



NART-I

series

Variable Speed Drive Chiller



Capacity range: 1,143 - 14,066 kW [325 - 4,000 RT]

HFC-134a VARIABLE SPEED DRIVE HIGH EFFICIENT TYPE MITSUBISHI HEAVY INDUSTRIES TWO STAGE CENTRIFUGAL LIQUID CHILLER NART-I Series from 1,143 kW to 14,066 kW (3

COP
17.8

The Highest Level of COP at Partial Load in the World

Mitsubishi Heavy Industries, Ltd. is proud to introduce new variable speed drive centrifugal liquid chiller, NART-I series.

The highest energy saving operation at partial load in the world can be achieved. Advanced technology realized the lowest energy consumption, the highest cost saving operation and preserving the environment of Earth.

NART-I series centrifugal liquid chillers used for large cooling capacity is required through the year, such as clean room, industrial process use and so on, achieve remarkable energy saving.

FEATURES

More energy saving than ever!

Variable speed drive with our high efficient centrifugal liquid chiller NART series

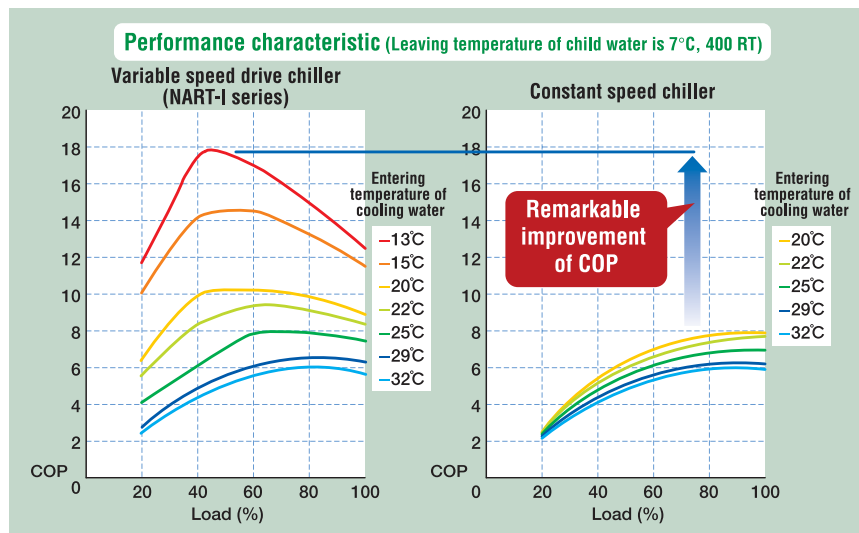
- COP 17.8*, the highest level in the world is achieved through optimum control according to required operation mode.

* Subject to leaving temperature of chilled water is 7°C

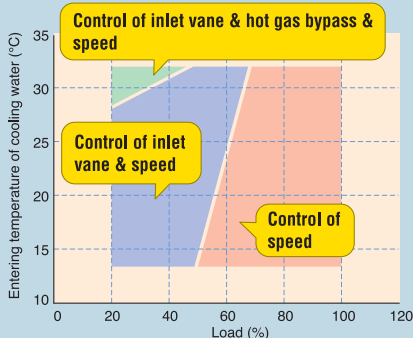
- Annual electricity cost can be reduced by 35% than our constant speed NART series.

Application

Low temperature cooling use like an ice thermal storage system is available.



Control system at operation load



Ultra high performance is achieved with our high efficient chiller NART series and new microcomputer control and variable speed drive.

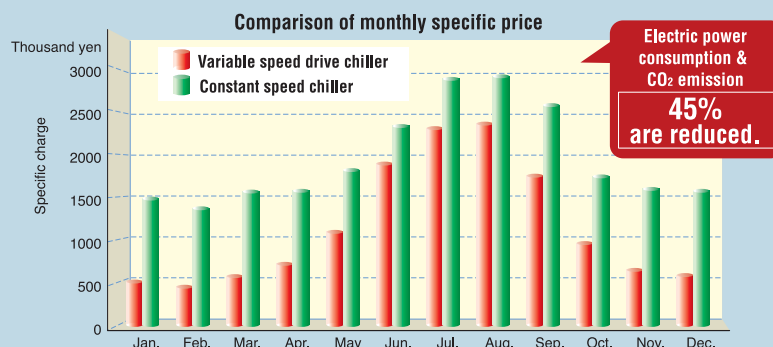
Optimum compressor speed is set through constant calculation of capacity and head of compressor, and maintained with variable speed drive.

Precisely controlled opening of the inlet vane through whole operation range, minimized operation range where hot gas bypass is used.

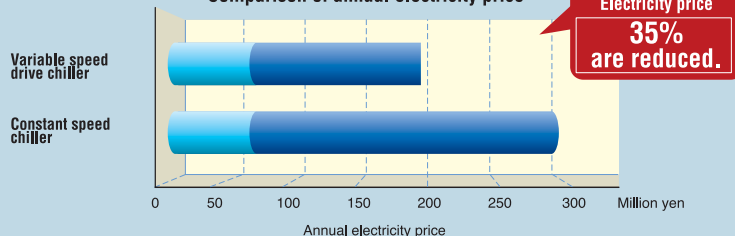
Achievement higher efficient in practical operation range

- Operation at low cooling temperature
Constant speed chiller: up to 20°C
Variable speed drive chiller: applicable up to **13°C**
- High efficiency at low partial load
The highest efficiency in a range of 40%~50% of load

Operation cost according to load pattern for factory process use (400 RT * 3 units)



Comparison of annual electricity price



25 to 4,000 RT)

●Standard Rating of NART-I ARI 550-98 Condition

| Model | NART- I | | | | | | | |
|--------------------------------|----------------------|-------------|-------|-------|------------|-------|---------|------|
| | 40 I | 50 I | 70 I | 100 I | 145 I | 200 I | | |
| Cooling capacity | RT | 400 | 570 | 800 | 1,130 | 1,610 | 2,000 | |
| | kW | 1,407 | 2,004 | 2,813 | 3,973 | 5,661 | 7,033 | |
| Chilled water | Entering temperature | 12.2 | | | | | | |
| | Leaving temperature | 6.7 | | | | | | |
| Flow rate | m ³ /h | 217.7 | 310.3 | 435.5 | 615.1 | 876.4 | 1,088.6 | |
| Pressure drop | kPa | 103 | 113 | 61 | 64 | 57 | 79 | |
| Piping connection /Nozzle size | inch | 8 | 8 | 10 | 14 | 14 | 18 | |
| No. of pass | - | 3 | 3 | 2 | 2 | 2 | 2 | |
| Cooling water | Entering temperature | 29.4 | | | | | | |
| | Leaving temperature | 35.4 | | | | | | |
| Flow rate | m ³ /h | 232.9 | 331.8 | 465.7 | 657.9 | 937.3 | 1,164.3 | |
| Pressure drop | kPa | 77 | 65 | 63 | 67 | 59 | 63 | |
| Piping connection /Nozzle size | inch | 8 | 10 | 12 | 14 | 14 | 18 | |
| No. of pass | - | 2 | 2 | 2 | 2 | 2 | 2 | |
| Inverter input | kW | 232 | 325 | 451 | 647 | 916 | 1,113 | |
| Motor output | kW | 200 | 288 | 401 | 569 | 813 | 1,002 | |
| Chiller Dimension | Length | m | 4.50 | 4.60 | 5.12 | 5.19 | 5.52 | 6.50 |
| | Width | m | 2.28 | 2.48 | 2.83 | 3.36 | 3.67 | 4.20 |
| | Height | m | 2.29 | 2.35 | 2.57 | 2.87 | 3.15 | 3.60 |
| Machinery weight | t | 9.70 | 11.70 | 15.40 | 20.70 | 25.80 | 37.00 | |
| Inverter Dimension | Width | m | 1.30 | 1.50 | 1.80 | 2.30 | 2.40 | 4.20 |
| | Depth | m | 0.94 | 0.97 | 1.00 | 2.30 | 2.40 | 2.20 |
| | Height | m | 2.50 | 2.50 | 2.50 | 2.57 | 2.73 | 2.57 |
| | Machinery weight | t | 0.5 | 0.6 | 0.8 | 7.5 | 9.2 | 9.8 |
| Power-supply voltage | | 400 V class | | | 6 kV class | | | |
| COP | | 6.06 | 6.17 | 6.24 | 6.14 | 6.18 | 6.32 | |

●Standard Rating at Chilled Water Temperature 5°C and 7°C

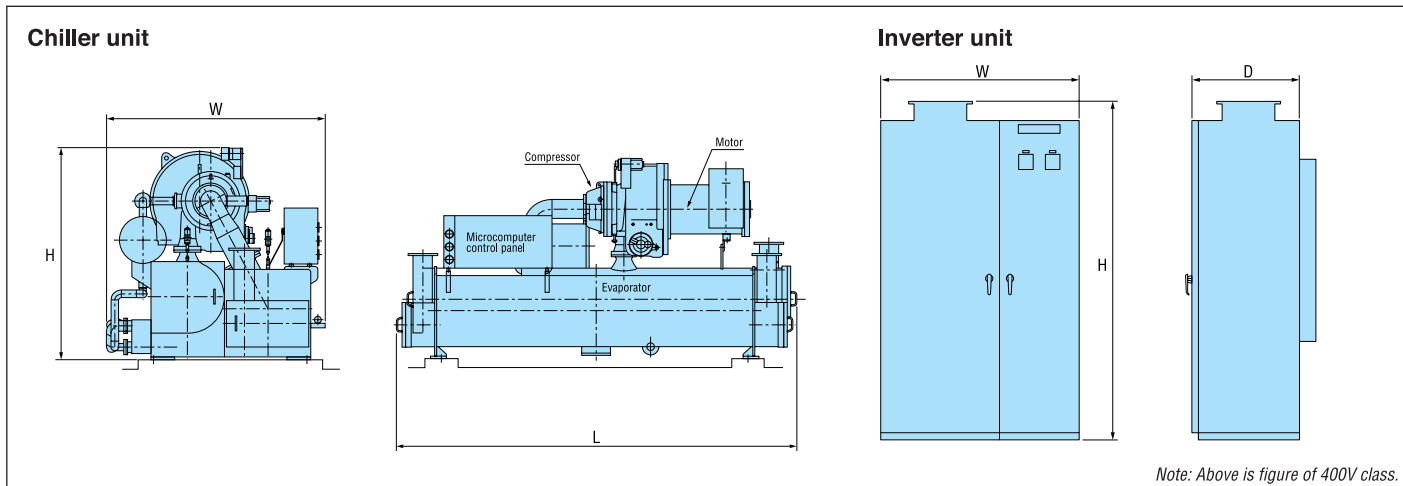
| Model | NART- I | 40 I | | 50 I | | 70 I | | 100 I | | 145 I | | 200 I | |
|--------------------------------|------------------------------|----------------------------|-------|-------|-------|-------|-------|------------|-------|-------|-------|-------|-------|
| | | 5 | 7 | 5 | 7 | 5 | 7 | 5 | 7 | 5 | 7 | 5 | 7 |
| Cooling capacity | RT | 370 | 400 | 530 | 570 | 740 | 800 | 1,060 | 1,130 | 1,490 | 1,610 | 1,850 | 2,000 |
| | kW | 1,301 | 1,407 | 1,846 | 2,004 | 2,602 | 2,813 | 3,727 | 3,973 | 5,239 | 5,661 | 6,505 | 7,033 |
| Chilled water | Entering temperature | 10 | | | | | | | | | | | |
| | Leaving temperature | 12 | | | | | | | | | | | |
| Flow rate | m ³ /h | 224 | 242 | 321 | 345 | 448 | 484 | 641 | 683 | 895 | 974 | 1,119 | 1,210 |
| Pressure drop | kPa | 102 | 115 | 121 | 131 | 52 | 58 | 62 | 54 | 61 | 69 | 84 | 95 |
| Piping connection /Nozzle size | A | 200 | | 200 | | 250 | | 350 | | 350 | | 450 | |
| No. of pass | - | 3 | | 3 | | 2 | | 2 | | 2 | | 2 | |
| Cooling water | Entering/Leaving temperature | Entering 32°C/Leaving 37°C | | | | | | | | | | | |
| | Flow rate | m ³ /h | 265 | 284 | 379 | 404 | 528 | 566 | 756 | 798 | 1,056 | 1,138 | 1,317 |
| Pressure drop | kPa | 68 | 60 | 63 | 71 | 61 | 55 | 63 | 51 | 55 | 53 | 81 | 92 |
| Piping connection /Nozzle size | A | 200 | | 250 | | 300 | | 350 | | 350 | | 450 | |
| No. of pass | - | 2 | | 2 | | 2 | | 2 | | 2 | | 2 | |
| Inverter input | 50Hz | 228 | 245 | 338 | 343 | 476 | 475 | 679 | 680 | 946 | 972 | 1,146 | 1,152 |
| | 60Hz | 230 | 249 | 338 | 345 | 479 | 483 | 689 | 684 | 957 | 969 | 1,152 | 1,154 |
| Motor output | 50Hz | 212 | 211 | 299 | 304 | 424 | 423 | 597 | 599 | 839 | 864 | 1,031 | 1,037 |
| | 60Hz | 212 | 226 | 298 | 304 | 425 | 428 | 602 | 599 | 844 | 855 | 1,032 | 1,034 |
| Chiller Dimension | Length | m | 4.50 | 4.60 | 5.12 | 5.19 | 5.52 | 6.50 | | | | | |
| | Width | m | 2.28 | 2.48 | 2.83 | 3.36 | 3.67 | 4.20 | | | | | |
| | Height | m | 2.29 | 2.35 | 2.57 | 2.87 | 3.15 | 3.60 | | | | | |
| Machinery weight | t | 9.70 | 11.70 | 15.40 | 20.70 | 25.80 | 37.00 | | | | | | |
| Inverter Dimension | Width | m | 1.30 | 1.50 | 1.80 | 2.30 | 2.40 | 4.20 | | | | | |
| | Depth | m | 0.94 | 0.97 | 1.00 | 2.30 | 2.40 | 2.20 | | | | | |
| | Height | m | 2.50 | 2.50 | 2.50 | 2.57 | 2.73 | 2.57 | | | | | |
| | Machinery weight | t | 0.5 | 0.6 | 0.8 | 7.5 | 9.2 | 9.8 | | | | | |
| Power-supply voltage | | 400 V class | | | | | | 6 kV class | | | | | |
| COP | 50Hz | 5.71 | 5.74 | 5.46 | 5.84 | 5.47 | 5.92 | 5.49 | 5.84 | 5.54 | 5.82 | 5.68 | 6.11 |
| | 60Hz | 5.66 | 5.65 | 5.46 | 5.81 | 5.43 | 5.82 | 5.41 | 5.82 | 5.47 | 5.84 | 5.65 | 6.09 |

- Notes: 1. This specification is based on ARI 550-98 conditions for temperature and fouling factor of chilled water and cooling water.
 2. Maximum working pressure (Chilled water and Cooling water): 0.7 MPa (7 kgf/cm²G)
 3. Unit capacity of 2,000RT up to 4,000 RT with dual compressors are available.
 4. Power source applicable is as follows.

- Notes: 1. Chilled/Cooling water fouling factor: 0.000086 m²K/W (0.001 m²h²C/kcal)
 2. Maximum working pressure (Chilled water and Cooling water): 0.7 MPa (7 kgf/cm²G)
 3. Unit capacity of 2,000 RT up to 4,000 RT with dual compressors are available.
 4. Power source applicable is as follows.

| Voltage | Chiller capacity | |
|-------------|---|--------------------|
| | Less than 1,000 RT (Does not include 1,000) | More than 1,000 RT |
| 380 V | ○ | Option |
| 3000 V/3300 | ○ | ○ |
| 6000 V/6600 | ○ | ○ |

| Voltage | Chiller capacity | |
|-------------|---|--------------------|
| | Less than 1,000 RT (Does not include 1,000) | More than 1,000 RT |
| 380 V | ○ | Option |
| 3000 V/3300 | ○ | ○ |
| 6000 V/6600 | ○ | ○ |



NART-I series 1,143 - 14,066 kW [325 - 4,000 RT]

ISO 9001



Certificate number: JQA-0709
Date of certificate: December 16, 1994

Our Air-Conditioning & Refrigeration Systems Headquarters is an ISO (International Organization for Standardization) 9001 quality management system certified organization.

PED



Certificate: PED97/23/EC Module H1
Certificate number: 01 202J/Q-010001
Certified by: TÜV CERT (Germany)
Date of certificate: April 22, 2001

Our Air-Conditioning & Refrigeration Systems Headquarters is a PED (Pressure Equipment Directive) 97/23/EC Module H1 certified organization.

ISO 14001



Certificate number: JQA-EM0256
Date of certificate: November 20, 1998



Certificate number: 771887
Date of certificate: June 26, 1998

Our Air-Conditioning & Refrigeration Systems Headquarters is an ISO (International Organization for Standardization) 14001 environmental management system certified organization.

MITSUBISHI HEAVY INDUSTRIES, LTD.

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Because of our policy of continuous improvement, we reserve right to make changes in all specifications without notice.