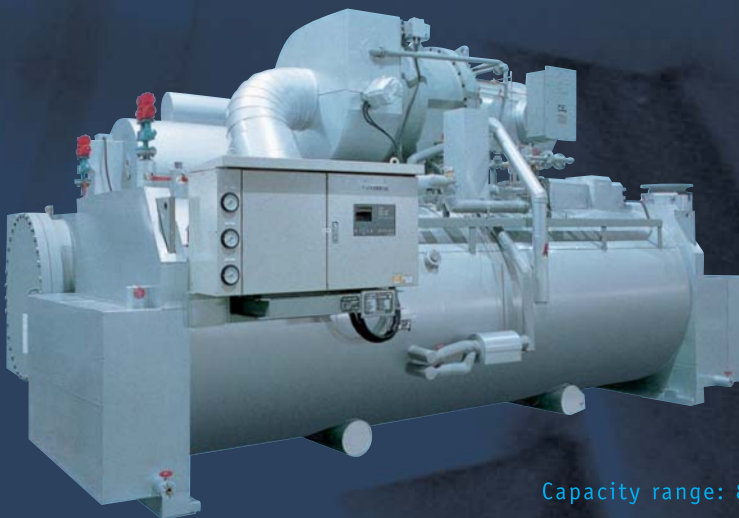


MHI CHILLER

Two Stage  
Centrifugal Liquid Chiller



**NART**  
series



Capacity range: 809 - 14,066 kW [230 - 4,000 RT]

HFC-134a HIGH EFFICIENT TYPE

MITSUBISHI HEAVY INDUSTRIES TWO STAGE CENTRIFUGAL LIQUID CHILLER

**NART Series from 809 kW to 14,066 kW (230 to**

## FEATURES

**1 HFC-134a Chlorine-free refrigerant (Zero ODP)**

**2 COP 6.1 the highest level of efficiency in HFC-134a Centrifugal Liquid Chillers.**

**3 Refrigeration cycle with:**

- High efficient two stage compressor.
- High efficient evaporator, condenser, economizer and subcooler.

**4 Application to low brine temperature cooling for industrial use and ice storage system is available.**

**5 Microcomputer control system with liquid crystal display.**

**6 Advanced control functions (option)**

- Meeting with BAS (Building Automation Systems) requirement. Our BAS is compatible with LONWORKS® net works.

\*LONWORKS® is the registered trademark of Echelon company in the United States and other countries.

- Control several chillers. (maximum 4 chillers)

### Operation board of Microcomputer control panel

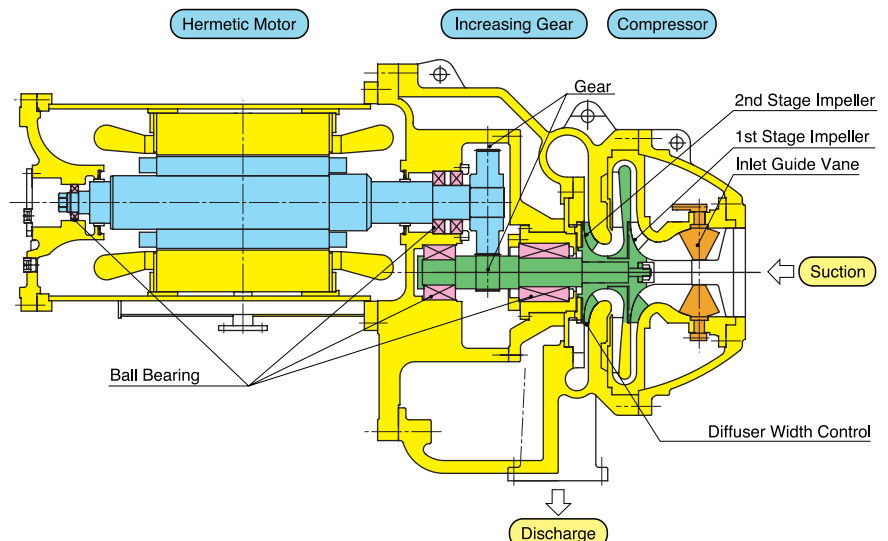


#### Followings are displayed

- Operation data
- Selected operating data
- Failure records
- Selected programmed weekly operation mode

### Two Stage Centrifugal Compressor and Hermetic Motor

- Three-Dimensionally shaped Two stage impellers.
- Inlet Guide Vane and Diffuser Width Control system make the chiller high efficient in wide capacity range.
- Hermetic Motor is cooled with liquid refrigerant.
- Ball bearing is durable for 50,000-hour operation without Overhaul.
- Gear with less mechanical loss is used.



# 4,000 RT)

## Standard Ratings

### Chilled Water Leaving Temperature 5°C

Item (unit)	Model	NART-	25	30	35	40	45	50	60	70	90	100	120	145	180	200
Cooling capacity	RT		230	270	320	390	460	530	650	700	920	1,040	1,300	1,460	1,820	2,000
	kW		809	949	1,125	1,371	1,618	1,864	2,286	2,461	3,235	3,657	4,571	5,134	6,400	7,033
Chilled water	Entering temperature	°C	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Flow rate	m³/h	139.1	163.3	192.9	235.1	277.2	319.4	391.8	421.9	554.5	626.8	783.5	879.9	1,096.9	1,205.4
	Pressure drop	kPa	107	108	107	112	118	121	57	56	56	57	59	59	100	106
	Piping connection / Nozzle size	A	150	150	150	200	200	200	250	250	300	350	350	350	400	450
	No. of pass	-	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Cooling water	Entering/Leaving temperature	°C	Entering 32°C / Leaving 37°C													
	Flow rate	m³/h	167.4	196.5	231.2	282.1	330.2	380.2	466.3	502.8	660.9	746.3	933.7	1,047.9	1,300.9	1,434.1
	Pressure drop	kPa	104	108	101	108	99	95	52	52	53	53	56	53	110	105
	Piping connection / Nozzle size	A	150	200	200	200	200	250	250	300	300	350	350	350	400	450
	No. of pass	-	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Motor input	kW	50Hz	154	181	207	254	284	332	403	436	575	647	810	905	1,103	1,225
		60Hz	155	182	209	256	288	329	403	438	579	648	815	910	1,111	1,239
Motor output	kW	50Hz	132	156	180	221	257	302	365	396	520	587	733	822	1,024	1,128
		60Hz	133	157	180	221	260	298	363	396	519	584	732	822	1,025	1,136
COP	50Hz	5.26	5.25	5.42	5.39	5.69	5.62	5.67	5.64	5.62	5.65	5.64	5.67	5.80	5.74	
	60Hz	5.23	5.22	5.39	5.36	5.61	5.66	5.68	5.62	5.59	5.65	5.61	5.64	5.76	5.68	
Max. cooling capacity	RT		245	290	360	420	510	590	720	830	1,030	1,210	1,460	1,720	1,850	2,110

### Chilled Water Leaving Temperature 7°C

Item (unit)	Model	NART-	25	30	35	40	45	50	60	70	90	100	120	145	180	200
Cooling capacity	RT		245	290	350	410	500	600	700	810	990	1,170	1,400	1,660	1,850	2,050
	kW		861	1,020	1,231	1,442	1,758	2,110	2,461	2,848	3,481	4,114	4,923	5,837	6,505	7,208
Chilled water	Entering temperature	°C	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Flow rate	m³/h	148.2	175.4	211.2	247.4	301.6	362.0	422.3	488.7	597.3	705.9	844.6	1,001.5	1,116.1	1,236.8
	Pressure drop	kPa	117	121	123	120	134	148	64	71	63	68	66	72	102	109
	Piping connection / Nozzle size	A	150	150	150	200	200	200	250	250	300	350	350	350	400	450
	No. of pass	-	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Cooling water	Entering/Leaving temperature	°C	Entering 32°C / Leaving 37°C													
	Flow rate	m³/h	176.3	208.9	250.0	293.4	355.2	426.5	496.7	575.3	703.8	832.3	994.8	1,181.3	1,307.2	1,453.3
	Pressure drop	kPa	115	122	117	116	114	118	59	67	59	65	63	67	111	108
	Piping connection / Nozzle size	A	150	200	200	200	200	250	250	300	300	350	350	350	400	450
	No. of pass	-	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Motor input	kW	50Hz	154	182	210	249	288	355	402	467	574	688	809	972	1,034	1,182
		60Hz	154	183	212	250	290	350	404	470	581	686	822	977	1,040	1,174
Motor output	kW	50Hz	131	159	183	216	261	324	365	427	519	625	733	886	958	1,099
		60Hz	132	160	184	216	261	318	365	428	522	620	740	885	958	1,085
COP	50Hz	5.59	5.60	5.85	5.79	6.10	5.94	6.12	6.09	6.07	5.98	6.08	6.01	6.29	6.10	
	60Hz	5.61	5.57	5.80	5.76	6.07	6.03	6.09	6.06	5.99	5.99	5.99	5.98	6.26	6.14	
Max. cooling capacity	RT		260	305	380	450	540	620	760	890	1,090	1,280	1,530	1,820	1,940	2,230

#### Notes:

- Chilled/Cooling water fouling factor:  
0.000086 m²/KW (0.001 m²/h² C/kcal)
- Maximum working pressure (Chilled water and Cooling water):  
0.7 MPa (7 kg/cm²G)
- Unit capacity of 2,000 RT up to 4,000 RT  
with dual compressors is available.
- The above specification is not data of max. cooling capacity.

#### 4. Power source applicable is as follows.

Voltage	Chiller capacity	
	Less than 700 RT (Does not include 700)	More than 700 RT
380 V	○	Option
3000 V/3300		○
6000 V/6600		○

Please consult with MHI in case chiller capacity is more than 700 RT with 400 V class because it depends of motor output.

## ●ARI 550-98 Condition

Item (unit)	Model	NART-	25	30	35	40	45	50	60	70	90	100	120	145	180	200
Cooling capacity	RT		250	280	340	400	550	570	690	710	920	1,080	1,420	1,520	1,910	2,000
	kW		879	985	1,196	1,407	1,934	2,004	2,426	2,497	3,235	3,798	4,993	5,345	6,716	7,033
Chilled water	Entering temperature	°C	12.2	12.2	12.3	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	°C	6.7													
	Flow rate	m³/h	136.1	152.4	186.5	219.4	301.6	312.6	378.4	389.4	504.6	592.3	778.8	833.6	1,047.5	1,096.9
	Pressure drop	kPa	102	95	99	98	134	115	53	63	59	50	57	53	91	89
	Piping connection / Nozzle size	inch	6	6	6	8	8	8	10	10	12	14	14	14	16	18
	No. of pass	-	3	3	3	3	3	3	2	2	2	2	2	2	2	2
	Leaving temperature	°C	29.4													
Cooling water	Entering/Leaving temperature	°C	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5	34.5
	Flow rate	m³/h	170.9	191.4	235.4	277.1	378.2	392.7	474.6	487.6	633.2	743.2	977.2	1,045.6	1,311.1	1,371.1
	Pressure drop	kPa	102	106	105	105	129	102	54	49	60	53	61	53	112	97
	Piping connection / Nozzle size	inch	6	8	8	8	8	10	10	12	12	14	14	14	16	18
	No. of pass	-	2.2	2.2	3	3	3	3	2	2	2	2	2	2	2	2
	Motor input	kW 50Hz	144	167	191	225	295	308	370	375	494	579	758	813	999	1,041
	Motor output	kW 50Hz	132	148	165	195	268	280	334	339	445	524	685	736	925	965
COP	50Hz	6.09	5.91	6.27	6.25	6.55	6.51	6.56	6.66	6.54	6.56	6.59	6.58	6.72	6.75	
Max. cooling capacity	RT		270	315	380	450	560	640	760	900	1,080	1,270	1,530	1,810	1,950	2,280

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 2,000 RT up to 4,000 RT with dual compressors are available.
4. The above specification is not data of max. cooling capacity.

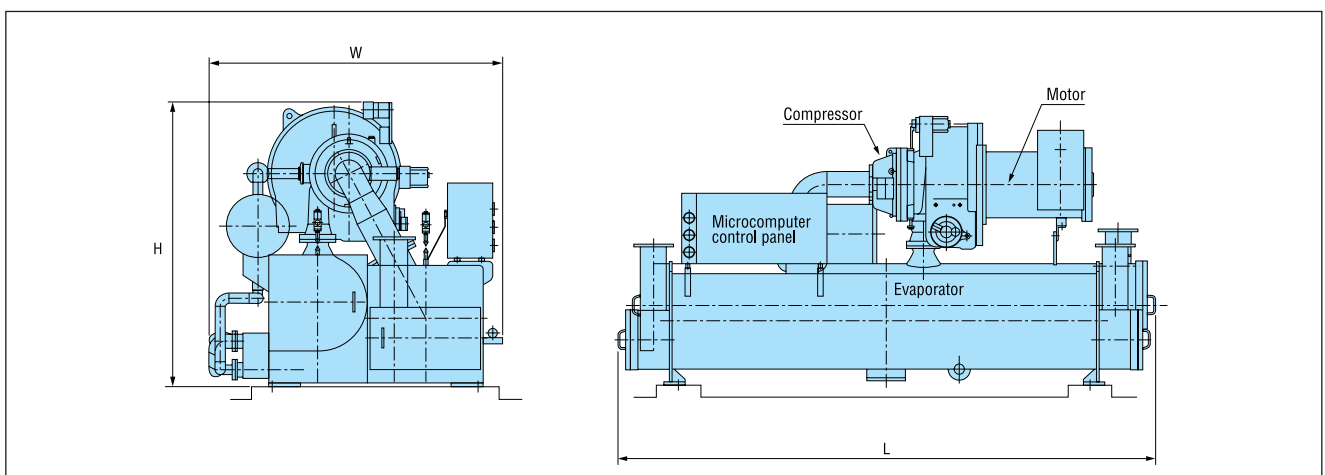
4. Power source applicable is as follows.

Voltage	Chiller capacity	
	Less than 700 RT (Does not include 700)	More than 700 RT
380 V	○	Option
3000 V/3300		○
6000 V/6600		○

Please consult with MHI in case chiller capacity is more than 700 RT with 400 V class because it depends of motor output.

## ■ Dimensions and Weights

Item (unit)	Model	NART-	25	30	35	40	45	50	60	70	90	100	120	145	180	200
Chiller Dimension	Length	m	4.5	4.6	4.6	4.6	4.6	4.7	5.4	5.5	5.5	5.5	5.5	5.6	6.7	6.7
	Width	m	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.8	3.2	3.4	3.5	3.5	4.0	4.2
	Height	m	2.2	2.2	2.3	2.3	2.4	2.4	2.4	2.6	2.6	2.8	2.9	3.1	3.2	3.5
Machinery weight	t		8.3	8.5	9.6	10.1	11.1	11.9	15.2	15.5	19.6	21.5	24.7	26.6	33.5	35.9



# 4,000 RT)

## ■ Scope of Supply

○: Standard scope of supply      △: To be supplied as option  
 ×: Not within scope of work of supply      —: Not available

Item		Specifications	
Equipment	Chiller Assembly	Indoor type (including control panel)	○
		Outdoor type (including control panel)	△
	Compressor	Hermetic, two-stage, centrifugal type	○
	Compressor Motor	Liquid refrigerant cooled, hermetic, squirrel cage, 3-phase, induction type motor, 2 pole, insulated grade F	○
	Step-up Gear	Integrated inside compressor housing, single helical gear	○
	Lubrication System	Trochoid pump with submerged motor, refrigerant cooled oil cooler, single oil filter, oil heater with temperature control	○
		Double oil filter	△
	Capacity Control	100-20%, Controlling compressor inlet guide vane, diffuser width of second stage and hot gas bypass valve	○
		100-10%, Larger hot gas bypass valve than standard	△
	Heat Exchanger	Japanese High Pressure Gas Safety Law and JIS	○
		Horizontal shell and tube type with copper tube (3/4"OD) Design pressure of water box: 1.0 MPa	○
		Marine type water box with hinge	○
		Tube material other than copper (ex: cupronickel, admiralty brass, titanium)	△
		Tube sheet material other than steel (ex: naval brass clad steel, titanium clad steel)	△
	Safety Device	Design pressure of water box: Over than 1.0 MPa	△
		High condenser pressure, Low evaporator pressure, Low oil pressure, Low chilled water outlet temperature, Low chilled water flow rate, Low cooling water flow rate, High oil temperature, High compressor motor coil temperature, Low voltage, Compressor motor over load	○
	Microcomputer Control Panel	Mounted on heat exchanger, indoor non hazardous type with color liquid crystal display, lamps and control switches on microcomputer operation board	○
	Starter Panel	Self standing, indoor, non hazardous type with a volt meter	○
		Self standing outdoor, hazardous type with a volt meter	△
		Star delta starter of low voltage, reactor starter	○
		Auto-transformer starter Line starter	△
		Ammeter	△
		Integrating watt meter	△
		Power fuse medium voltage	△
		Capacitor for power factor improvement	△
		380V power for compressor motor (less than 710 kW)	○
		10,11kV/50Hz power for compressor motor	△
Tie transformer for control power (ex: 400/200 V)	△		
Material	JIS (Japan Industrial Standard), JEC (Japanese Electrotechnical Committee), JEM (The Standard of Japan Electrical Manufacture's Association) ASME ASTM (Steel Material only)	○ —	
Refrigerant	HFC134a in pressure bottles for one (initial) charge	○	
Lubrication Oil	Ester oil in can for one (initial) charge	○	
Accessory	A thermometer of oil reservoir, Sight glasses, Pressure gauges of condenser, Evaporator and oil pressure, Rubber pad of vibration isolating, Chemical anchor bolt, Special insulation tape of compressor motor terminal, Flow switch of chilled water and cooling water	○	
	Spring pad for vibration isolating	△	
	Thermometer for chilled water and cooling water	△	
	Charging hose for refrigerant	△	
	General tool and tool box	△	
	Spare Parts	An oil filter element, A filter drier, A fuse for control panel	○
Test	Factory Performance Test	To be tested in accordance with JIS B8621	○
	Witness Test	To be tested in accordance with ARI 550/590	△
	Witness Test	Owner and/or representative witness test in factory	△
Painting	Chiller	Rust preventing paint (one coat)	○
	Control Panel	Finish coat	△
	Starter Panel	Rust preventing and finish coat (color: Munsel 5Y7/1)	○
Insulation of Chiller	Chiller	Rust preventing and finish coat (color: Munsel 5Y7/1)	○
	Insulation of Chiller	Not provided (Purchaser's scope. Instruction for insulation to be submitted.) Polystylen form covered by Colored steel sheet 0.3 mm	○ △
Delivery	Delivery	FOB Kobe port in Japan	○
	Delivery	Ex warehouse at Kobe port in Japan (on truck)	△
	Delivery	CIF port near Site	△
Shipping Style of Chiller	Shipping Style of Chiller	Integrated style	○
	Shipping Style of Chiller	Divided style	△
Site Works	Installation	Chiller installation, fabrication, setting of anchor bolt, water pipe and piping works, and cable and wiring works at site	×
		Supervisor for site installation	△
	Foundation	Chiller and starter panel	×
Others	Commissioning	Supervisor for site commissioning	△
	Control Interface	Interface and communication to Building Control System (Available only for LonWORKS®)	△
		Specification and scope of supply	○
	Drawings	General arrangement (including foundation)	○
		Outline of control panel	○
Sequence diagram		○	
Documents	Operation and maintenance instruction	○	
	Test and inspection record	△	

# NART series 809 - 14,066 kW [230 - 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: YKA 0771887  
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.



**Air-Conditioning & Refrigeration Systems Headquarters**  
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Because of our policy of continuous improvement, we reserve right to make changes in all specifications without notice.