MITSUBISHI HEAVY INDUSTRIES

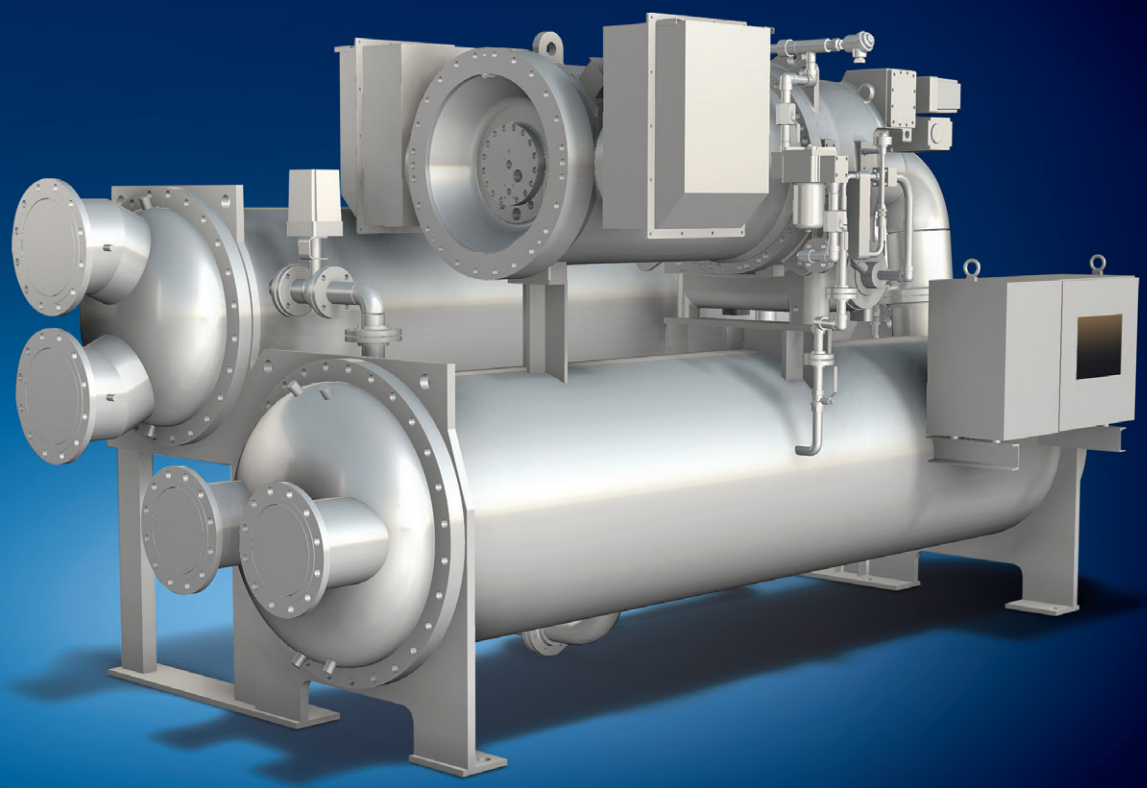
Centrifugal Chiller

Constant speed Variable speed HFC-134a

GART & GART-I

R Model
1477kW (420RT) ~6329kW (1800RT)

P Model
1758kW (500RT) ~9494kW (2700RT)



AHRI CERTIFIED®
www.ahridirectory.org
Water-Cooled Water Chilling and Heat Pump Water-Heating Packages AHRI Standards 550/590 and 551/591

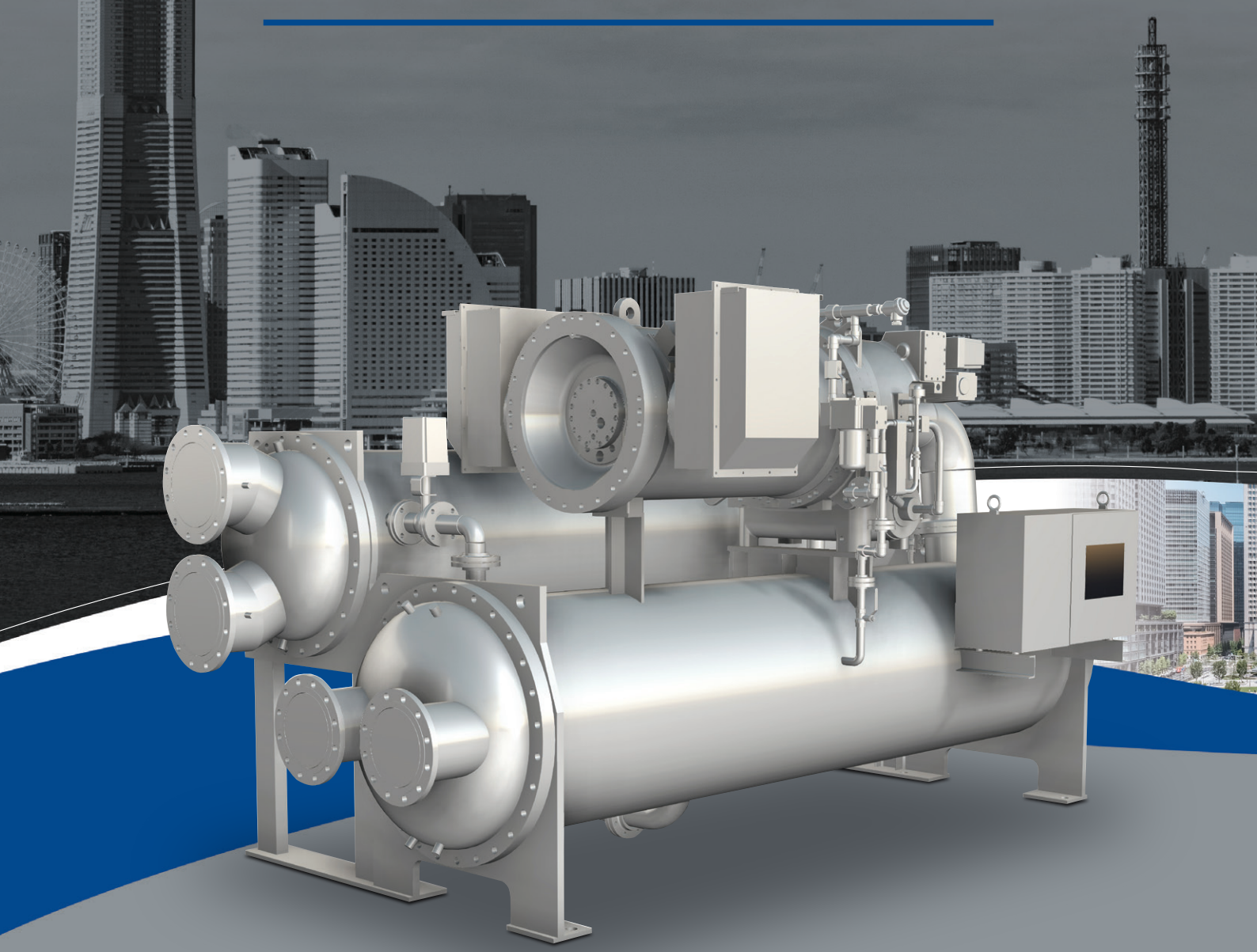
Centrifugal Chiller

Constant speed　　Variable speed　　HFC-134a

GART & GART-I

Regular model (R model)　1477kW (420RT) – 6329kW (1800RT)

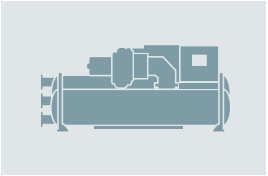
Performance model (P model)　1758kW (500RT) – 9494kW (2700RT)



				R model			P model			
				GART-R	GART-RI	GART-R.HR GART-RI.HR	GART-P	GART-PI	GART-P GART-PI	GART-P.HR GART-PI.HR
Drive (Variable speed / Constant speed)				Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant Variable
Capacity*			*Subject to temp.condition	420-1800RT*1	420-1800RT*1	520-540RT	500-2700RT*1	500-2700RT*1	*2	*3
Temperature	Chilled Water Leaving		Lower Limit	4°C	4°C	4°C	4°C	4°C	Minus 5°C Low temp. use	4°C
Temperature	Cooling Water Entering		Lower Limit	12°C	12°C	12°C	12°C	12°C	12°C	12°C
Temperature	Hot Water Leaving	Heat Recovery	Higher Limit	—	—	45°C	—	—	—	45°C
Load	Control Range in a Constinuous Operation		Standard	100% - 20%	100% - 10%	100% - 30%	100% - 20%	100% - 10%	100% - 30%	100% - 30%
Load			Option	—	—	—	—	—	—	—
Flow Rate	Chilled Water / Cooling Water Flow Rate Control Range	Variable Flow Rate	Standard	100%	100%	100%	100%	100%	100%	100%
Flow Rate			Option *Less than 50% is possible depending on	100% - 50%	100% - 50%	100% - 50%	100% - 50%	100% - 50%	100% - 50%	100% - 50%
Flow Rate	Chilled water Flow Rate Control Range	Excess Flow Rate	Standard	100%	100%	100%	100%	100%	100%	100%
Flow Rate			Option *More 150% is possible depending on model	100% - 150%	100% - 150%	100% - 150%	100% - 150%	100% - 150%	100% - 150%	100% - 150%

*1 for air-conditioner use : Chilled Water 12°C / 7°C
*2 for low temp. use : Brine -5°C , supply range : 530-630, 850-900, 1540-1710
*3 Supply range : 720-820, 1000-1120, 1440-1620, 2000-2250

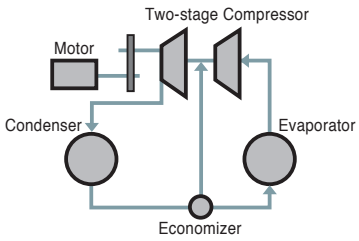
Assured Quality - Designed and quality controlled in Japan



High Efficiency

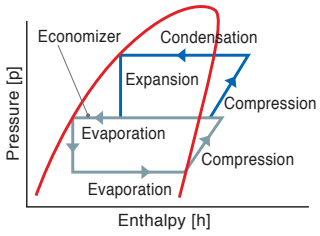
- Newly shaped compressor impellers
- Improved evaporators and condensers
- Adoption of a new two-stage-compression/ two-stage-expansion/economizer cycle enhanced tracking of load fluctuations

Two-stage with Economizer



System

With sub-cooler, spectacular performance



P-h Diagram

Constant speed drive

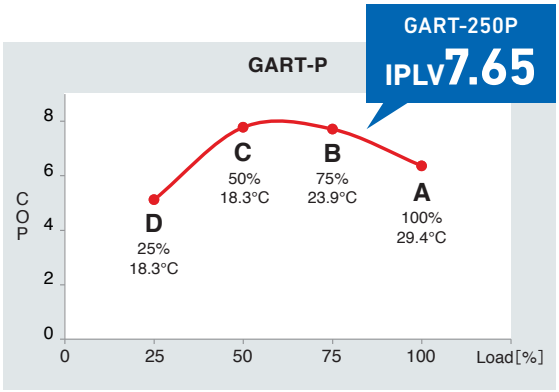
COP [AHRI Standard 550/590(I-P)-2011]

7.08 GART-250P*2 | **0.496** kW/RT

IPLV [AHRI Standard 550/590(I-P)-2011]

7.65 GART-250P*2

*2 : with sub-cooler



Variable speed drive

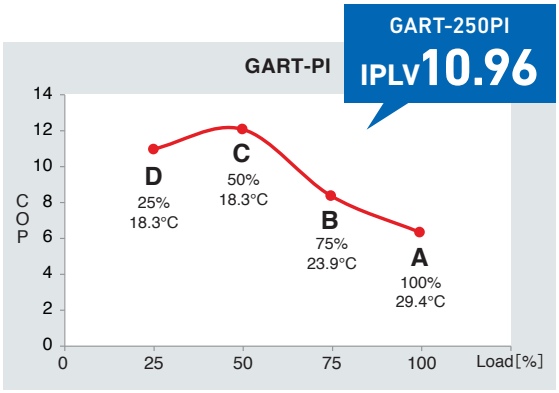
Max. COP at part load

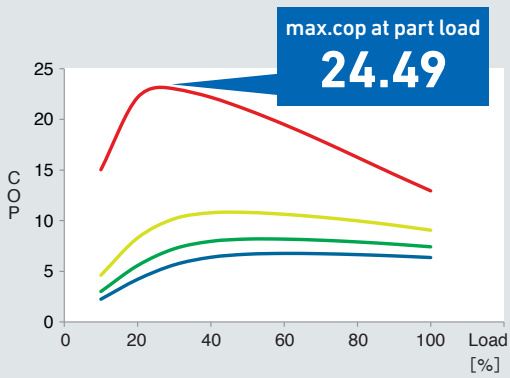
24.49 GART-250PI*2 | **0.144** kW/RT

IPLV [AHRI Standard 550/590(I-P)-2011]

10.96 GART-250PI*2

*2 : with sub-cooler



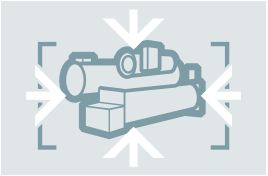


IPLV

IPLV is the formula developed by AHRI to measure the efficiency of chillers under an actual annual operating conditions. IPLV is calculated when the unit is operating at 25%, 50%, 75% and 100% of capacity and at different cooling water temperature.
[AHRI Standard 550/590(I-P)-2020]

IPLV: Integrated Part Load Value
AHRI: Air-Conditioning, Heating and Refrigeration Institute

IPLV = 0.01A + 0.42B + 0.45C + 0.12D
A = COP at 100% load (29.4°C*3) B = COP at 75% load (23.9°C*3)
C = COP at 50% load (18.3°C*3) D = COP at 25% load (18.3°C*3)
Leaving temperature of chilled water: 6.7°C
*3 : Entering temperature of cooling water



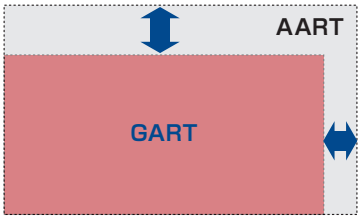
Compact

- Chiller components are arranged in a way to use vertical space optimally
- Compressors, evaporators and condensers have been downsized

Dimensions

Approx. 20% reduction

< compared to previous model : AART 80P >

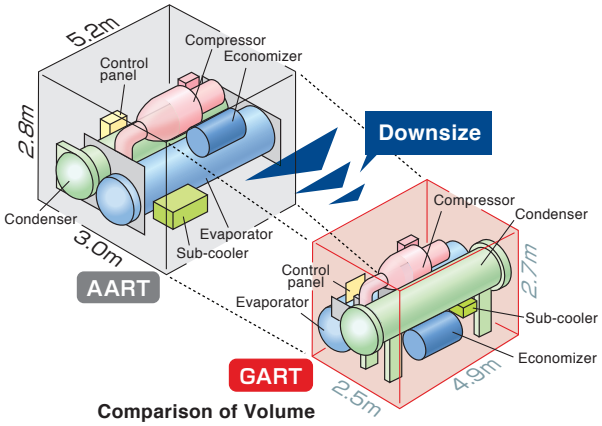


comparision of Dimensions

Volume

Approx. 25% reduction

< compared to previous model : AART 80P >



Comparison of Volume

Multifunction Microcomputer Control

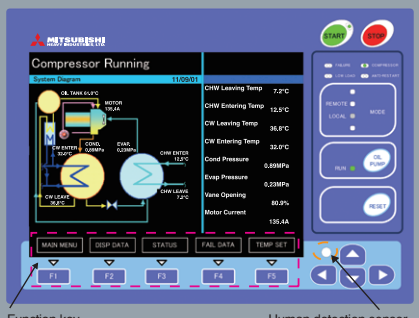
Big — **10.4 inch Display** | Clear — **Digital Display** | Smooth — **Quick Response** (Save Energy)

Liquid Crystal Display (LCD) with automatic lighting-up function

Relight-up by human detection sensor without touching panel

For environmental standards

Realize lead-free substrate
RoHS compliant



Function key — Human detection sensor

Followings are displayed

- Operation data
- Failure data
- Real time trend (max. 5 operational data and max. 3 situational data)
- Setup schedule operation condition <OPTION>

Other Features

Control Function (Option)

- Meeting with BAS (Building Automation System) requirement.
- Meeting with control monitoring equipment
- In case of instantaneous power failure, chiller restarts automatically.

Reliability

- Stability of lubrication oil level and oil temperature improved with oil-cooler for refrigerant and high efficient oil recovering system.
- Chillers are produced at our factory certificated authentication ISO 9001 and 14001.

Maintenance

- Overhaul interval is 50,000 hour in operating time or 7 years in elapsed time, which comes earlier.

Please contact MTH* about overhaul.
The above overhaul time and operation time is for reference only.

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.

Standard Specification without sub-cooler

AHRI 550/590(I-P)-2020 Condition

R model

(Ratings are common to both constant and variable speed)

Item(unit) \ Model		GART-	50R / 50RI		60R / 60RI		70R / 70RI				100R /100RI				
Cooling capacity		RT	420	500	500	600	600	700	800	900	900	1,000	1,100	1,200	1,290
		kW	1,477	1,758	1,758	2,110	2,110	2,461	2,813	3,165	3,165	3,516	3,868	4,220	4,536
Drive	Constant	-	○	○	○	○	○	○	○	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○	○	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	230.3	274.2	274.2	329.1	329.1	383.9	438.8	493.6	493.6	548.4	603.3	658.1	707.5
	No. of pass	-	2												
	Pressure drop	kPa	57	79	53	74	38	51	65	80	53	65	77	90	103
	Piping connection/Nozzle size	inch	8	8	10	10	10	10	10	10	12	12	12	12	12
	Design pressure	MPa(G)	1.0												
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	286.1	341.5	339.5	410.4	407.2	475.3	545.3	617.3	609.4	677.4	747.1	818.1	883.8
	No. of pass	-	2												
	Pressure drop	kPa	40	56	37	53	35	46	59	74	45	55	66	78	89
	Piping connection/Nozzle size	inch	10	10	10	10	12	12	12	12	14	14	14	14	14
	Design pressure	MPa(G)	1.0												
Constant	Motor input	kW(50Hz)	241	292	281	354	335	392	461	542	494	551	617	693	770
	Motror output	kW(50Hz)	215	263	253	322	302	356	421	497	448	502	564	634	708
	COP	-	6.13	6.02	6.27	5.96	6.29	6.28	6.10	5.84	6.41	6.38	6.26	6.09	5.89
	IPLV	-	5.51	5.94	6.12	6.63	5.69	6.12	6.50	6.83	5.93	6.24	6.51	6.74	6.91
Variable	Inverter input	kW(50Hz)	247	299	288	364	342	402	473	563	505	565	634	710	795
	Motor output	kW(50Hz)	215	263	253	322	302	356	421	497	448	502	564	634	708
	COP	-	5.97	5.88	6.11	5.79	6.17	6.12	5.95	5.62	6.27	6.22	6.10	5.95	5.71
	IPLV	-	9.07	9.30	9.62	9.62	9.44	9.69	9.73	9.59	9.74	9.89	9.92	9.91	9.74
Power source : main		V	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV				380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV								
Power source : auxiliary		V	Three-phase 200 / 200 V												

Item(unit) \ Model		GART-	150R / 150RI					
Cooling capacity		RT	1,300	1,400	1,500	1,600	1,700	1,800
		kW	4,571	4,923	5,274	5,626	5,978	6,329
Drive	Constant	-	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	713.0	767.8	822.7	877.5	932.3	987.2
	No. of pass	-	2					
	Pressure drop	kPa	55	64	72	81	91	101
	Piping connection/Nozzle size	inch	14	14	14	14	14	14
	Design pressure	MPa(G)	1.0					
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	879.4	947.6	1,017.0	1,087.0	1,158.0	1,232.0
	No. of pass	-	2					
	Pressure drop	kPa	50	57	65	73	82	92
	Piping connection/Nozzle size	inch	16	16	16	16	16	16
	Design pressure	MPa(G)	1.0					
Constant	Motor input	kW(50Hz)	709	767	829	900	973	1,066
	Motror output	kW(50Hz)	644	698	757	823	892	980
	COP	-	6.45	6.42	6.36	6.25	6.14	5.94
	IPLV	-	6.01	6.23	6.43	6.60	6.78	6.85
Variable	Inverter input	kW(50Hz)	731	791	855	928	1,004	1,098
	Motor output	kW(50Hz)	644	698	757	823	892	980
	COP	-	6.25	6.22	6.17	6.06	5.96	5.76
	IPLV	-	9.67	9.79	9.86	9.84	9.85	9.70
Power source : main		V	3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV					
Power source : auxiliary		V	Three-phase 200 / 200 V					

Notes:
1. This specification is based on AHRI STANDARD 550/590(I-P)-2020 conditions for temperature and fouling factor of chilled water and cooling water.
2. The above specification is as follows.
   GART-50R/ 50RI, 60R/60RI, 70R/70RI, 100R/100RI : Specificattion of main power sorce 380V
   GART-150R/150RI : Specification of main power sorce 10kV
3. About Drive
   O: available
   ×: not available
4. About Fouling factor
   Chilled water : 1.80×10^{-5} m^2 k/W
   Cooling water : 4.40×10^{-5} m^2 k/W
5. Please contact MTH* in case chiller capacity is more than 1300RT with 400V class because it depends motor output.
6. Design and specifications are subject to change without notice.

Standard Specification without sub-cooler

AHRI 550/590(I-P)-2020 Condition

P model

(Ratings are common to both constant and variable speed)

Item(unit) \ Model		GART-	60P / 60PI		80P / 80PI				100P / 100PI					150P / 150PI					
Cooling capacity		RT	500	600	600	700	800	900	900	1,000	1,100	1,200	1,300	1,300	1,400	1,500	1,600	1,700	1,800
		kW	1,758	2,110	2,110	2,461	2,813	3,165	3,165	3,516	3,868	4,220	4,571	4,571	4,923	5,274	5,626	5,978	6,329
Drive	Constant	-	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	274.2	329.1	329.1	383.9	438.8	493.6	493.6	548.4	603.3	658.1	713.0	713.0	767.8	822.7	877.5	932.3	987.2
	No. of pass	-	2																
	Pressure drop	kPa	36	50	33	44	56	70	37	45	54	63	73	50	58	65	74	82	91
	Piping connection/Nozzle size	inch	10	10	12	12	12	12	14	14	14	14	14	14	14	14	14	14	14
	Design pressure	MPa(G)	1.0																
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	336.8	405.6	404.0	470.7	539.0	609.4	604.8	672.0	740.0	809.8	882.0	874.7	942.0	1010.0	1079.0	1150.0	1222.0
	No. of pass	-	2																
	Pressure drop	kPa	25	35	22	28	36	45	25	31	36	43	50	39	44	50	57	64	71
	Piping connection/Nozzle size	inch	12	12	14	14	14	14	16	16	16	16	16	16	16	16	16	16	16
	Design pressure	MPa(G)	1.0																
Constant	Motor input	kW(50Hz)	264	325	316	365	423	494	467	518	575	643	725	680	733	791	854	926	1,005
	Motror output	kW(50Hz)	237	295	284	330	385	452	422	471	525	588	665	617	667	721	780	848	922
	COP	-	6.66	6.48	6.68	6.75	6.64	6.41	6.78	6.78	6.72	6.57	6.31	6.72	6.72	6.67	6.59	6.45	6.30
	IPLV	-	6.40	6.98	5.95	6.43	6.86	7.20	6.18	6.51	6.82	7.05	7.21	6.19	6.41	6.61	6.81	6.96	7.10
Variable	Inverter input	kW(50Hz)	271	334	324	374	434	507	479	532	590	659	738	701	756	815	880	955	1,036
	Motor output	kW(50Hz)	237	295	284	330	385	452	422	471	525	588	665	617	667	721	780	848	922
	COP	-	6.50	6.32	6.51	6.58	6.48	6.25	6.61	6.61	6.56	6.40	6.19	6.52	6.51	6.47	6.39	6.26	6.11
	IPLV	-	10.15	10.32	9.88	10.30	10.46	10.42	10.19	10.43	10.55	10.53	10.44	10.02	10.18	10.25	10.30	10.25	10.18
Power source : main		V	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV		380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV									3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV					
Power source : auxiliary		V	Three-phase 200 / 200 V																

Item(unit) \ Model		GART-	250P / 250 PI									
Cooling capacity		RT	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700
		kW	6,329	6,681	7,033	7,384	7,736	8,087	8,439	8,791	9,142	9,494
Drive	Constant	-	○	○	○	○	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	987.2	1,042.0	1,097.0	1,152.0	1,207.0	1,261.0	1,316.0	1,371.0	1,426.0	1481.0
	No. of pass	-	2									
	Pressure drop	kPa	54	60	65	72	78	84	91	98	106	113
	Piping connection/Nozzle size	inch	18	18	18	18	18	18	18	18	18	18
	Design pressure	MPa(G)	1.0									
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	1207.0	1274.0	1341.0	1408.0	1476.0	1545.0	1615.0	1684.0	1755.0	1832.0
	No. of pass	-	2									
	Pressure drop	kPa	58	64	70	77	84	91	98	106	114	124
	Piping connection/Nozzle size	inch	20	20	20	20	20	20	20	20	20	20
	Design pressure	MPa(G)	1.0									
Constant	Motor input	kW	916	965	1,017	1,071	1,127	1,189	1,257	1,321	1,396	1,504
	Motror output	kW	831	877	926	977	1,030	1,088	1,152	1,212	1,283	1,384
	COP	-	6.91	6.92	6.91	6.89	6.87	6.80	6.72	6.65	6.55	6.31
	IPLV	-	6.28	6.43	6.59	6.74	6.89	7.02	7.13	7.27	7.38	7.34
Variable	Inverter input	kW	943	995	1,049	1,104	1,162	1,226	1,296	1,362	1,439	1,527
	Motor output	kW	831	877	926	977	1,030	1,088	1,152	1,212	1,283	1,384
	COP	-	6.71	6.71	6.71	6.69	6.66	6.60	6.51	6.45	6.35	6.22
	IPLV	-	10.28	10.40	10.52	10.59	10.65	10.67	10.65	10.65	10.63	10.52
Power source : main		V	3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV									
Power source : auxiliary		V	Three-phase 200 / 200 V									

Notes:
1. This specification is based on AHRI STANDARD 550/590(I-P)-2020 conditions for temperature and fouling factor of chilled water and cooling water.
2. The above specification is as follows.
   GART-60P/60PI, 80P/80PI, 100P/100PI : Specificattion of main power sorce 380V
   GART-150P/150PI, 250P/250PI : Specification of main power sorce 10kV
3. About Drive
   O: available
   ×: not available
4. About Fouling factor
   Chilled water : 1.80×10^{-5} m^2 k/W
   Cooling water : 4.40×10^{-5} m^2 k/W
5. Please contact MTH* in case chiller capacity is more than 1300RT with 400V class because it depends motor output.
6. Design and specifications are subject to change without notice.

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.

Standard Specification with sub-cooler as option

AHRI 550/590(I-P)-2020 Condition

R model

(Ratings are common to both constant and variable speed)

Item(unit) \ Model		GART-	50R / 50RI		60R / 60RI		70R / 70RI				100R /100RI				
Cooling capacity		RT	420	500	500	600	600	700	800	900	900	1,000	1,100	1,200	1,300
		kW	1,477	1,758	1,758	2,110	2,110	2,461	2,813	3,165	3,165	3,516	3,868	4,220	4,571
Drive	Constant	-	○	○	○	○	○	○	○	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○	○	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	230.3	274.2	274.2	329.1	329.1	383.9	438.8	493.6	493.6	548.4	603.3	658.1	713.0
	No. of pass	-	2												
	Pressure drop	kPa	57	79	53	74	38	51	65	80	53	65	77	90	104
	Piping connection/Nozzle size	inch	8	8	10	10	10	10	10	10	12	12	12	12	12
	Design pressure	MPa(G)	1.0												
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	285.1	339.6	338.1	408.1	406.0	473.2	542.5	613.4	607.4	674.6	743.2	813.6	884.7
	No. of pass	-	2												
	Pressure drop	kPa	37	50	34	48	32	42	54	67	42	50	60	70	82
	Piping connection/Nozzle size	inch	10	10	10	10	12	12	12	12	14	14	14	14	14
	Design pressure	MPa(G)	1.0												
Constant	Motor input	kW(50Hz)	235	281	272	340	328	380	444	519	482	534	595	665	741
	Motror output	kW(50Hz)	210	253	244	309	295	344	405	475	436	486	543	609	680
	COP	-	6.28	6.26	6.46	6.20	6.43	6.48	6.33	6.10	6.57	6.58	6.51	6.34	6.17
	IPLV	-	5.63	6.14	6.29	6.84	5.80	6.30	6.70	7.06	6.06	6.41	6.72	6.98	7.22
Variable	Inverter input	kW(50Hz)	241	288	279	349	335	390	456	534	491	548	610	682	762
	Motor output	kW(50Hz)	210	253	244	309	295	344	405	475	436	486	543	609	680
	COP	-	6.12	6.11	6.30	6.05	6.31	6.32	6.16	5.93	6.45	6.42	6.34	6.19	6.00
	IPLV	-	9.27	9.62	9.90	9.97	9.63	9.97	10.05	10.04	10.00	10.18	10.29	10.26	10.22
Power source : main		V	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV				380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV								
Power source : auxiliary		V	Three-phase 200 / 200 V												

Item(unit) \ Model		GART-	150R / 150RI					
Cooling capacity		RT	1,300	1,400	1,500	1,600	1,700	1,800
		kW	4,571	4,923	5,274	5,626	5,978	6,329
Drive	Constant	-	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	713.0	767.8	822.7	877.5	932.3	987.2
	No. of pass	-	2					
	Pressure drop	kPa	55	64	72	81	91	101
	Piping connection/Nozzle size	inch	14	14	14	14	14	14
	Design pressure	MPa(G)	1.0					
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	876.5	943.8	1,012.0	1,081.0	1,152.0	1,223.0
	No. of pass	-	2					
	Pressure drop	kPa	46	52	59	67	75	83
	Piping connection/Nozzle size	inch	16	16	16	16	16	16
	Design pressure	MPa(G)	1.0					
Constant	Motor input	kW(50Hz)	691	744	803	865	937	1,012
	Motror output	kW(50Hz)	627	677	733	791	858	930
	COP	-	6.61	6.62	6.57	6.50	6.38	6.25
	IPLV	-	6.16	6.39	6.61	6.83	6.99	7.16
Variable	Inverter input	kW(50Hz)	711	767	828	893	966	1,044
	Motor output	kW(50Hz)	627	677	733	791	858	930
	COP	-	6.43	6.42	6.37	6.30	6.19	6.06
	IPLV	-	9.92	10.07	10.15	10.19	10.18	10.16
Power source : main		V	3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV					
Power source : auxiliary		V	Three-phase 200 / 200 V					

Notes:
1. This specification is based on AHRI STANDARD 550/590(I-P)-2020 conditions for temperature and fouling factor of chilled water and cooling water.
2. The above specification is as follows.
   GART-50R/ 50RI, 60R/60RI, 70R/70RI, 100R/100RI : Specificattion of main power sorce 380V
   GART-150R/150RI : Specification of main power sorce 10kV
3. About Drive
   O: available
   ×: not available
4. About Fouling factor
   Chilled water : 1.80×10^{-5} m^2 k/W
   Cooling water : 4.40×10^{-5} m^2 k/W
5. Please contact MTH* in case chiller capacity is more than 1300RT with 400V class because it depends motor output.
6. Design and specifications are subject to change without notice.

Standard Specification with sub-cooler as option

AHRI 550/590(I-P)-2020 Condition

P model

(Ratings are common to both constant and variable speed)

Item(unit) \ Model		GART-	60P / 60PI		80P / 80PI				100P / 100PI					150P / 150PI					
Cooling capacity		RT	500	600	600	700	800	900	900	1,000	1,100	1,200	1,300	1,300	1,400	1,500	1,600	1,700	1,800
		kW	1,758	2,110	2,110	2,461	2,813	3,165	3,165	3,516	3,868	4,220	4,571	4,571	4,923	5,274	5,626	5,978	6,329
Drive	Constant	-	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	274.2	329.1	329.1	383.9	438.8	493.6	493.6	548.4	603.3	658.1	713.0	713.0	767.8	822.7	877.5	932.3	987.2
	No. of pass	-	2																
	Pressure drop	kPa	36	50	33	44	56	70	37	45	54	63	73	50	58	65	74	82	91
	Piping connection/Nozzle size	inch	10	10	12	12	12	12	14	14	14	14	14	14	14	14	14	14	14
	Design pressure	MPa(G)	1.0																
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	335.7	403.9	403.1	469.3	537.1	606.8	603.2	669.8	737.4	806.4	877.5	872.1	938.9	1,007.0	1,075.0	1,145.0	1,215.0
	No. of pass	-	2																
	Pressure drop	kPa	23	32	20	26	34	42	24	28	34	40	46	36	41	46	52	58	65
	Piping connection/Nozzle size	inch	12	12	14	14	14	14	16	16	16	16	16	16	16	16	16	16	16
	Design pressure	MPa(G)	1.0																
Constant	Motor input	kW(50Hz)	258	316	310	356	412	479	457	505	560	622	697	665	714	769	827	895	963
	Motror output	kW(50Hz)	231	286	279	322	375	437	413	459	510	569	639	602	649	701	755	819	883
	COP	-	6.83	6.69	6.80	6.91	6.83	6.61	6.93	6.96	6.91	6.79	6.56	6.87	6.89	6.86	6.80	6.68	6.57
	IPLV	-	6.53	7.16	6.07	6.57	7.02	7.39	6.31	6.65	6.98	7.25	7.44	6.32	6.55	6.78	7.00	7.16	7.35
Variable	Inverter input	kW(50Hz)	264	327	321	374	431	498	472	524	579	638	708	696	749	806	865	927	996
	Motor output	kW(50Hz)	231	286	279	322	375	437	413	459	510	569	639	602	649	701	755	819	883
	COP	-	6.65	6.52	6.67	6.74	6.66	6.45	6.76	6.79	6.74	6.62	6.40	6.67	6.69	6.65	6.60	6.48	6.38
	IPLV	-	10.38	10.61	10.10	10.54	10.73	10.73	10.41	10.69	10.83	10.86	10.75	10.25	10.43	10.52	10.60	10.57	10.57
Power source : main		V	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV		380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV									3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV						
Power source : auxiliary		V	Three-phase 200 / 200 V																

Item(unit) \ Model		GART-	250P / 250 PI									
Cooling capacity		RT	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700
		kW	6,329	6,681	7,033	7,384	7,736	8,087	8,439	8,791	9,142	9,494
Drive	Constant	-	○	○	○	○	○	○	○	○	○	○
	Variable	-	○	○	○	○	○	○	○	○	○	○
Chilled Water	Entering temperature	℃	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	Leaving temperature	℃	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7
	Flow rate	m^3/h	987.2	1,042.0	1,097.0	1,152.0	1,207.0	1,261.0	1,316.0	1,371.0	1,426.0	1,481.0
	No. of pass	-	2									
	Pressure drop	kPa	54	60	65	72	78	84	91	98	106	113
	Piping connection/Nozzle size	inch	18	18	18	18	18	18	18	18	18	18
	Design pressure	MPa(G)	1.0									
Cooling Water	Entering temperature	℃	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4	29.4
	Leaving temperature	℃	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6	34.6
	Flow rate	m^3/h	1,204.0	1,270.0	1,337.0	1,404.0	1,471.0	1,540.0	1,609.0	1,678.0	1,748.0	1,820.0
	No. of pass	-	2									
	Pressure drop	kPa	54	60	66	72	78	84	91	98	106	114
	Piping connection/Nozzle size	inch	20	20	20	20	20	20	20	20	20	20
	Design pressure	MPa(G)	1.0									
Constant	Motor input	kW	898	944	993	1,045	1,099	1,156	1,220	1,283	1,353	1,432
	Motror output	kW	813	857	903	953	1,003	1,057	1,118	1,177	1,242	1,317
	COP	-	7.05	7.08	7.08	7.07	7.04	6.99	6.92	6.85	6.76	6.63
	IPLV	-	6.39	6.56	6.73	6.88	7.04	7.20	7.32	7.45	7.57	7.65
Variable	Inverter input	kW	925	973	1,024	1,077	1,133	1,192	1,258	1,323	1,395	1,476
	Motor output	kW	813	857	903	953	1,003	1,057	1,118	1,177	1,242	1,317
	COP	-	6.85	6.87	6.87	6.85	6.83	6.78	6.71	6.64	6.55	6.43
	IPLV	-	10.49	10.64	10.75	10.85	10.91	10.96	10.94	10.96	10.92	10.85
Power source : main		V	3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV									
Power source : auxiliary		V	Three-phase 200 / 200 V									

Notes:
1. This specification is based on AHRI STANDARD 550/590(I-P)-2020 conditions for temperature and fouling factor of chilled water and cooling water.
2. The above specification is as follows.
   GART-60P/60PI, 80P/80PI, 100P/100PI : Specificattion of main power sorce 380V
   GART-150P/150PI, 250P/250PI : Specification of main power sorce 10kV
3. About Drive
   O: available
   ×: not available
4. About Fouling factor
   Chilled water : 1.80×10^{-5} m^2 k/W
   Cooling water : 4.40×10^{-5} m^2 k/W
5. Please contact MTH* in case chiller capacity is more than 1300RT with 400V class because it depends motor output.
6. Design and specifications are subject to change without notice.

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.

Special Specifications : Heat Recovery Use — without sub-cooler

Supply Range【Heat Recovery Mode】: 520 -2250 RT — **For cooling capacity not shown in below table, please contact MTH*.**

P model

【Heat Recovery Mode】 Chilled water entering / leaving :12℃ / 7℃, Hot water entering / leaving : 40℃/ 45℃
【Cooling Mode】 Chilled water entering / leaving :12℃ / 7℃, Cooling water entering / leaving : 32℃ / 37℃

Model		GART-	80P.HR / 80PI.HR			100P.HR / 100PI.HR			150P.HR / 150I.HR			150P.HR / 150PI.HR			250P.HR / 250PI.HR		
Drive		-	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable
Operation mode		-	Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling	
Cooling capacity		RT	800			1,000			1,100			1,500			1,600		
		kW	2,813			3,516			3,868			5,274			5,626		
Heating capacity		kW	3,396	-	-	4,263	-	-	4,680	-	-	6,400	-	-	6,836	-	-
Chilled Water	Flow rate	m^3/h	482.6	482.6	482.6	603.3	603.3	603.3	663.6	663.6	663.6	904.9	904.9	904.9	965.3	965.3	965.3
	No. of pass	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	67.1	67.1	67.1	54	54	54	64	64	64	78	78	78	88	88	88
	Piping connection / Nozzle size	inch	12	12	12	14	14	14	14	14	14	14	14	14	18	18	18
Cooling Water / Hot Water	Flow rate	m^3/h	590.4	569.4	566.4	741.2	713.7	706.5	813.8	784.2	778.4	1,113.0	1,073.0	1,062.0	1,189.0	1,146.0	1,134.0
	No. of pass	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	41.3	39.8	39.4	35	34	33	42	40	40	58	56	55	65	63	62
	Piping connection / Nozzle size	inch	14	14	14	16	16	16	16	16	16	16	16	16	16	16	16
Motor output		kW(50Hz)	534.8	429.2	413.6	684	546	508	744	595	565	1,035	833	778	1,115	901	839
Power source : main		-	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV									3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV			3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV		
Power source : auxiliary		-	Three-phase 200/220 V														

Special Specifications : Low Temperature Use — without sub-cooler

Supply Range【Ice Charge Mode】: 530 -1710 RT — **For cooling capacity not shown in below table, please contact MTH*.**

P model【Brine=Ethyleneglycol 25%】

【Ice Charge Mode】 Brine entering / leaving : -1.5℃ / -5℃, Cooling water entering / leaving : 30℃ / 33.7℃
【Chilled Water Mode】 Brine entering / leaving : 9.1℃ / 5℃, Cooling water entering / leaving : 32℃ / 37℃

Model		GART-	80P / 80PI			100P / 100PI			250P / 250PI		
Drive		-	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable
Operation mode		-	Ice Charge	Chilled Water		Ice Charge	Chilled Water		Ice Charge	Chilled Water	
Cooling capacity		RT	630	770	830	870	1,040	1,080	1,710	2,030	2,030
		kW	2,215	2,708	2,919	3,059	3,657	3,798	6,013	7,138	7,138
Brine	Flow rate	m^3/h	574	598	644	792	807	838	1,557	1,575	1,575
	No. of pass	-	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	108	117	134	102	107	115	149	149	149
	Piping connection / Nozzle size	inch	12	12	12	14	14	14	18	18	18
Cooling Water	Flow rate	m^3/h	639	561	598	882	758	775	1,729	1,473	1,450
	No. of pass	-	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	50	39	44	50	38	39	112	83	80
	Piping connection / Nozzle size	inch	14	14	14	16	16	16	20	20	20
Motor output		kW(50Hz)	471	482	484	647	651	613	1,254	1,240	1,121
Power source : main		-	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV						3kV / 3.3kV / 4.16kV 6kV / 6.6kV / 10kV / 11kV		
Power source : auxiliary		-	Three-phase 200/220 V								

Notes :
1. The above specification is as follows.
   GART-80P/80PI, 100P/100PI,80P.HR/80PI.HR,100P.HR/100PI.HR : Specificattion of main power sorce 380V
   GART-250P/250PI, 150P.HR/150PI.HR,250P.HR/250PI.HR : Specification of main power sorce 10kV
2. About Fouling factor
   Chilled water : 1.80 x 10^{-5} m^2 k/W
   Cooling water : 4.40 x10^{-5} m^2 k/W
3. Design and specifications are subject to change without notice.

Special Specifications : Heat Recovery Use with sub-cooler as option

Supply Range【Heat Recovery Mode】: 500 -2300 RT

For cooling capacity not shown in below table, please contact MTH*.

P model

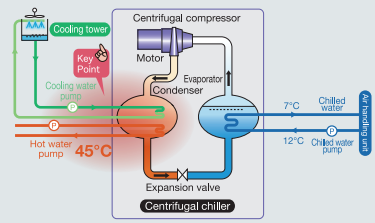
【Heat Recovery Mode】 Chilled water entering / leaving :12℃ / 7℃, Hot water entering / leaving : 40℃/ 45℃
【Cooling Mode】 Chilled water entering / leaving :12℃ / 7℃, Cooling water entering / leaving : 32℃ / 37℃

Model		GART-	80P.HR / 80PI.HR						100P.HR / 100PI.HR						150P.HR / 150I.HR		
Drive		-	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable
Operation mode		-	Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling	
Cooling capacity		RT	700			800			1,000			1,100			1,500		
		kW	2,461			2,813			3,516			3,868			5,274		
Heating capacity		kW	2,974	-	-	3,386	-	-	4,244	-	-	4,641	-	-	6,374	-	-
Chilled Water	Flow rate	m^3/h	422.3	422.3	422.3	482.6	482.6	482.6	603.3	603.3	603.3	663.6	663.6	663.6	904.9	904.9	904.9
	No. of pass	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	52.6	52.6	52.6	67.1	67.1	67.1	53.6	53.6	53.6	63.7	63.7	63.7	77.8	77.8	77.8
	Piping connection / Nozzle size	inch	12	12	12	12	12	12	14	14	14	14	14	14	14	14	14
Cooling Water / Hot Water	Flow rate	m^3/h	517.1	499.8	494.9	588.7	569.4	566.4	738.0	713.7	706.5	807.0	780.7	777.8	1,108.0	1,073.0	1,062.0
	No. of pass	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	30.3	31.4	30.8	38.3	39.8	39.4	32.5	33.8	33.2	38.1	39.8	39.5	53.1	55.6	54.6
	Piping connection / Nozzle size	inch	14	14	14	14	14	14	16	16	16	16	16	16	16	16	16
Motor output		kW(50Hz)	468	382	356	525	429	414	667	546	508	710	579	565	1,011	833	778
Power source : main		-	380V / 400V / 415V 3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV												3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV		
Power source : auxiliary		-	Three-phase 200/220 V														

Model		GART-	150P.HR / 150PI.HR			250P.HR / 250PI.HR											
Drive		-	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable	Constant Variable	Constant	Variable
Operation mode		-	Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling		Heat recovery	Cooling	
Cooling Capacity		RT	1,600			2,000			2,100			2,200			2,300		
		kW	5,626			7,033			7,384			7,736			8,087		
Heating capacity		kW	6791	-	-	8475	-	-	8884	-	-	9299	-	-	9706	-	-
Chilled Water	Flow rate	m^3/h	965.3	965.3	965.3	1,207.0	1,207.0	1,207.0	1,267.0	1,267.0	1,267.0	1,327.0	1,327.0	1,327.0	1,388.0	1,388.0	1,388.0
	No. of pass	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	87.6	87.6	87.6	77.8	77.8	77.8	85.0	85.0	85.0	92.6	92.6	92.6	100	100	100
	Piping connection / Nozzle size	inch	14	14	14	18	18	18	18	18	18	18	18	18	18	18	18
Cooling Water / Hot Water	Flow rate	m^3/h	1,181.0	1,142.0	1,134.0	1,474.0	1,424.0	1,410.0	1,545.0	1,495.0	1,480.0	1,617.0	1,565.0	1,552.0	1,688.0	1,633.0	1,624.0
	No. of pass	-	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Pressure drop	kPa	59.5	62.3	61.5	75.1	77.7	76.2	81.7	84.8	83.3	88.6	92.1	90.7	96	100	98.5
	Piping connection / Nozzle size	inch	16	16	16	20	20	20	20	20	20	20	20	20	20	20	20
Motor output		kW(50Hz)	1,073	882	839	1,325	1,077	1,001	1,379	1,129	1,055	1,439	1,178	1,112	1,492	1,219	1,171
Power source : main		-	3kV / 3.3kV / 4.16kV / 6kV / 6.6kV / 10kV / 11kV														
Power source : auxiliary		-	Three-phase 200/220 V														

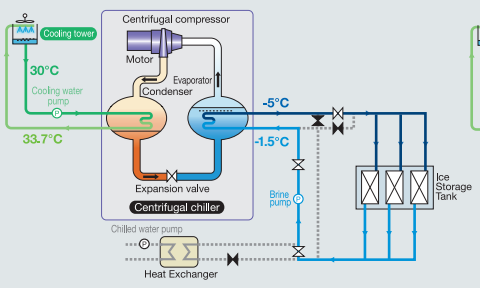
Heat Recovery Use System Flow

【Heat Recovery Mode】

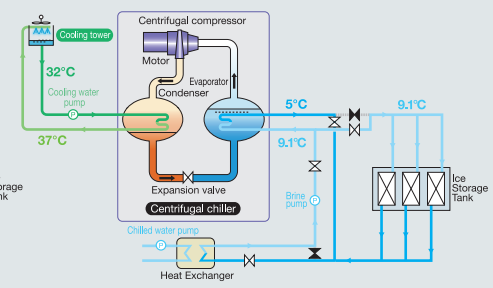


Low Temperature Use System Flow

【Ice Charge Mode (Night)】



【Chilled Water Mode (Day)】



Notes :
1. The above specification is as follows.
   GART-80P.HR/80PI.HR,100P.HR/100PI.HR : Specificattion of main power sorce 380V
   GART-150PI.HR,250P.HR/250PI.HR : Specification of main power sorce 10kV
2. About Fouling factor
   Chilled water : 1.80 x 10^{-5} m^2 k/W
   Cooling water : 4.40 x10^{-5} m^2 k/W
3. Design and specifications are subject to change without notice.

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.

Dimension and Weight

R model

Chiller

Item(unit) \ Model		GART-	50R / 50RI	60R / 60RI	70R / 70RI	100R / 100RI	150R / 150RI
Dimension	Length (L)	m	4.0	4.0	4.4	4.9	5.0
	Width (W)	m	2.2	2.3	2.5	2.6	2.9
	Height (H)	m	2.2	2.3	2.5	2.6	2.9
Weight without sub-cooler	Shipping weight	ton	6.8	7.4	9.7	12.1	17.5
	Operation weight	ton	8.1	8.9	11.8	15.2	21.9
Weight with sub-cooler	Shipping weight	ton	7.0	7.6	9.9	12.4	17.8
	Operation weight	ton	8.3	9.1	12.0	15.5	22.2
Service Clearance	Front	m	1.2	1.2	1.2	1.2	1.2
	Both end	m	1.1	1.1	1.1	1.1	1.1
	Rear	m	0.9	0.9	0.9	0.9	0.9
	Top	m	0.9	0.9	0.9	0.9	0.9

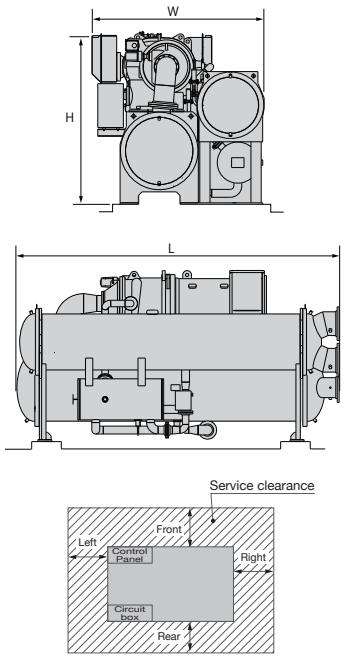
Starter Panel (GART)

Item(unit) \ Model				50R	60R		70R		100R			150R
Chiller Model	GART-											
Cooling Capacity			RT	420-500	500	600	600	700-900	900-1,100	1,200	1,300	1,300-1,800
380V	Dimension	Width(W)	m	0.8	0.8	1.0	0.8	1.0	1.0	1.1	1.2	
		Depth(D)	m	0.7	0.7	0.8	0.7	0.8	0.8	0.9	1.1	
		High(H)	m	1.8	1.8	2.0	1.9	2.0	2.0	2.2	2.2	
	Shipping Weight		ton	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	
	Service Clearance	Front	m	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
		Back	m	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
		Top	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
3kV				Please contact MTH*								
6kV				Please contact MTH*								
10kV	Dimension	Width(W)	m				1.0		1.0			1.0
		Depth(D)	m				1.5		1.5			1.5
		High(H)	m				2.3		2.3			2.3
	Shipping Weight		ton				1.0		1.0			1.0
	Service Clearance	Front	m				1.0		1.0			1.0
		Back	m				0.5		0.5			0.5
		Top	m				0.5		0.5			0.5

Inverter Panel (GART-I)

Item(unit) \ Model				50RI	60RI	70RI	100RI	150RI
Chiller Model	GART-							
Cooling Capacity			RT	500	600	900	1,300	1,800
380V	Dimension	Width(W)	m	1.6	1.7	2.4	2.4	
		Depth(D)	m	0.8	0.8	0.8	0.8	
		High(H)	m	2.6	2.6	2.6	2.6	
	Shipping Weight		ton	1.4	1.6	2.2	2.2	
	Service Clearance	Front	m	1.1	1.1	1.1	1.1	
		Back	m	0.8	0.8	0.8	0.8	
		Top	m	0.5	0.5	0.5	0.5	
3kV	Dimension	Width(W)	m	Please contact MTH*				
		Depth(D)	m					
		High(H)	m					
	Shipping Weight		ton					
	Service Clearance	Front	m					
		Back	m					
		Top	m					
		Left	m					
		Right	m					
6kV	Dimension	Width(W)	m					
		Depth(D)	m					
		High(H)	m					
	Shipping Weight		ton					
	Service Clearance	Front	m					
		Back	m					
		Top	m					
		Left	m					
		Right	m					
10kV	Dimension	Width(W)	m					
		Depth(D)	m					
		High(H)	m					
	Shipping Weight		ton					
	Service Clearance	Front	m					
		Back	m					
		Top	m					
		Left	m					
		Right	m					

Chiller



Notes relating to chiller :
1. Service clearance space must be provided more than above.
2. Tube removal space must be provided at either end.
3. The piping must be arranged with offsets for flexibility, and adequately supported and balanced independently to avoid strain and vibration transmission on the unit.
4. Prepare the hook for raising compressor and motor unit.
5. Refer to this figure to plan suitable and adequate entrance for machine installation, enough clearance should be provided. (Caution: This plan shows the size without insulation. After insulation, the size will increase by the thickness of insulator.)
6. Details or other requirement are mentioned in MHI Thermal Systems*'s drawing " MACHINE LAYOUT ". Please comply with it.
7. The above shipping weight of chiller is weight for 1 piece shipment.
8. Design and specifications are subject to change without notice.

P model

Chiller

Item(unit) \ Model		GART-	60P / 60PI	80P / 80PI	100P / 100PI	150P / 150PI	250P / 250PI
Dimension	Length (L)	m	4.4	4.9	5.0	5.1	6.4
	Width (W)	m	2.4	2.7	2.9	3.1	3.6
	Height (H)	m	2.5	2.6	2.8	3.0	3.3
Weight without sub-cooler	Shipping weight	ton	9.0	11.8	15.4	19.6	27.6
	Operation weight	ton	11.1	14.9	20.0	25.3	36.7
Weight with sub-cooler	Shipping weight	ton	9.2	12.0	15.7	20.0	28.1
	Operation weight	ton	11.3	15.1	20.3	25.7	37.2
Service Clearance	Front	m	1.2	1.2	1.2	1.2	1.2
	Both end	m	1.1	1.1	1.1	1.1	1.1
	Rear	m	0.9	0.9	0.9	0.9	0.9
	Top	m	0.9	0.9	0.9	0.9	0.9

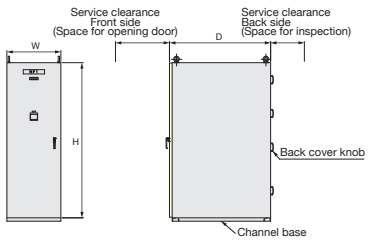
Starter Panel (GART)

Item(unit) \ Model				60P		80P		100P			150P	250P
Chiller Model		GART-										
Cooling Capacity			RT	500	600	600	700-900	900-1,100	1,200	1,300	1,300-1,800	1,800-2,700
380V	Dimension	Width(W)	m	0.8	0.8	0.8	1.0	1.0	1.1	1.2		
		Depth(D)	m	0.7	0.7	0.7	0.8	0.8	0.9	1.1		
		High(H)	m	1.8	1.8	1.9	2.0	2.0	2.2	2.2		
	Shipping Weight		ton	0.5	0.5	0.5	0.5	0.5	0.6	0.7		
	Service Clearance	Front	m	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
		Back	m	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
		Top	m	0.5	0.5	0.5	0.5	0.5	0.5	0.5		
3kV				Please contact MTH*								
6kV				Please contact MTH*								
10kV	Dimension	Width(W)	m			1.0		1.0			1.0	1.0
		Depth(D)	m			1.5		1.5			1.5	1.5
		High(H)	m			2.3		2.3			2.3	2.3
	Shipping Weight		ton			1.0		1.0			1.0	1.1
	Service Clearance	Front	m			1.0		1.0			1.0	1.0
		Back	m			0.5		0.5			0.5	0.5
		Top	m			0.5		0.5			0.5	0.5

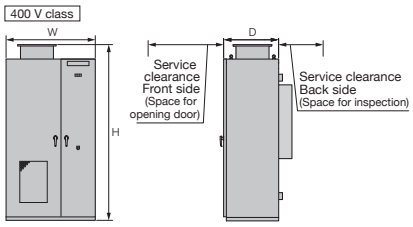
Inverter Panel (GART-I)

Item(unit) \ Model				60PI	80PI	100PI	150PI	250PI
Chiller Model		GART-						
Cooling Capacity			RT	600	900	1,300	1,800	2,700
380V	Dimension	Width(W)	m	1.7	2.4	2.4		
		Depth(D)	m	0.8	0.8	0.8		
		High(H)	m	2.6	2.6	2.6		
	Shipping Weight		ton	1.6	2.2	2.2		
	Service Clearance	Front	m	1.1	1.1	1.1		
		Back	m	0.8	0.8	0.8		
		TOP	m	0.5	0.5	0.5		
3kV	Dimension	Width(W)	m	Please contact MTH*				
		Depth(D)	m					
		High(H)	m					
	Shipping Weight		ton					
	Service Clearance	Front	m					
		Back	m					
		Top	m					
		Left	m					
		Right	m					
6kV	Dimension	Width(W)	m					
		Depth(D)	m					
		High(H)	m					
	Shipping Weight		ton					
	Service Clearance	Front	m					
		Back	m					
		Top	m					
		Left	m					
		Right	m					
10kV	Dimension	Width(W)	m					
		Depth(D)	m					
		High(H)	m					
	Shipping Weight		ton					
	Service Clearance	Front	m					
		Back	m					
		Top	m					
		Left	m					
		Right	m					

Starter Panel (GART)



Inverter Panel (GART-I)



Notes relating to starter / inverter panel :
1. Refer to MHI Thermal Systems*'s drawing "STARTER / INVERTER PANEL OUTLINE"at installation.
2. Shipping weight of starter / inverter panel is approximate weight of standard specification.
3. Design and specifications are subject to change without notice.

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.

Scope and Specification of Supply

	Item	Specifications	Constant	Variable
			GART	GART-I
Equipment	**Chiller Assembly**	ndoor 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	△	△
	Evaporator & Condenser	GB (Chinese national standard)	○	○
		Horizontal shell and tube type with copper tube (3/4"OD) Design pressure of water box: 1.0 MPa (G)	○	○
		Marine type water box with hinge	—	—
		Design pressure of water box: Over 1.0 MPa (G)	△	△
	Safety Device	High condensing pressure, Low evaporating pressure, Low oil pressure, Low chilled water leaving 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 Prepare 380V three-phase four-wire as an auxiliary power. In case of other voltage, contact MTH*.	○	○
	Starter Panel(GART) Inverter Panel(GART-I)	Self standing, indoor	○	○
		Self standing outdoor	—	—
		Starting method 【380/400/415V】 Star-delta, 【10/11kV】 Direct	○	—
		Starting method 【380/400/415V】 Soft starter 【10/11kV】 Auto-transformer	△	—
		Starting method 【380/400/415V】 【10/11kV】 Inverter	—	○
		Starting method 【3/6kV class】 Direct, Auto - transformer	△	—
		Starting method 【3/6kV class】 Inverter	—	△
		Installer Breaker GART : MCCB or ACB of 380/400/415V. PF of 10/11kV, GART-I: MCCB of 380/400/415V. DS of 10/11kV	○	○
		Capacitor for power factor improvement	△	—
		10, 11 kV/50 Hz power for compressor motor	△	—
		Tie transformer for control power	△	△
	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, Rubber pad of vibration isolating, Special insulation tape of compressor motor terminal, Flow sensor of chilled water and cooling water	○	○
		Foundation bolt	△	△
		Spring pad for vibration isolating	△	△
		Charging hose for refrigerant	△	△
		General tool and tool box	△	△
	Spare Parts	An oil filter element, A filter drier, A fuse for control panel and starter panel	△	△

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

Item		Specifications	Constant	Variable
			GART	GART-I
Test	Shop Test	Test in accordance with GB (Chinese national standard)	△	△
		Test in accordance with AHRI 550/590	△	△
	Witness Test	Witness test at manufacture's site (Dalian,China)	△	△
Painting	Chiller	Rust preventing paint (two coat)	○	○
		Finish coat	△	△
	Control Panel	Rust preventing and finish coat (color: RAL7032)	○	○
	Starter Panel(GART)/Inverter Panel(GART-I)	Rust preventing and finish coat (color: RAL7032)	○	○
Insulation of Chiller		Not provided (Purchaser's scope. Instruction for insulation to be submitted.) Please follow our INSULATION PROCEDURE.	—	—
Delivery		FOB Dalian port in China	○	○
		Ex warehouse at Dalian port in China (on truck)	△	△
		CIF port near Site	△	△
Shipping Style of Chiller		Integrated style	○	○
		Divided style	△	△
Site Works	Foundation	Customer's scope	×	×
	Installation	Chiller installation, setting of anchor bolt, water pipe and piping works, and cable and wiring works at site	△	△
		Supervisor for site installation	×	×
	Commissioning	Supervisor for site commissioning	△	△
Others	Code and Standard	GB(Chinese national standard)	○	○
		DOSH (Malaysia), MOM (Singapore)	—	—
		ASME ASTM	—	—
	Capacity Control	100-20%, Controlling compressor inlet guide vane (1st & 2nd stage) and hot gas bypass valve	○*1	○*1
		100-10%, Larger hot gas bypass valve than standard	—	○*1
		100-0%	—	—
	Restart after instantaneous power failer		△	△
	Control Interface	Interface and communication to Building Control System	△	△
	Drawings	Specification and scope of supply	○	○
		General arrangement (including foundation)	○	○
		Outline of control panel	○	○
	Documents	Sequence diagram Operation and maintenance instruction	○ ○	○ ○
		Performance test report	△	△

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.
*1: Except Low temp.used and Heat pump used conditions

Option

Excess Flow Rate Function
(Variable Over Water Flow System)

※patented technology

In case multiple constant speed chillers are operated, such as district cooling system or a large capacity system case, the cooling demand may be relatively small depending on the season or time of operation.
Even in this case, multiple chiller unit need to operate to secure minimum chilled water flow rate even though actual cooling demand is lower than multiple chiller operation level.Therefore, each chiller is forced to operate in the low load area where COP is relatively low level.In addition, the number of operating cooling and chilled water pumps are increase, whole chiller system COP may be decreased affected by these negative factors.

For the variable over flow system, the chiller and water pump are designed to achieve chilled water flow rate more than its rated values. This design suppresses the number of operating chillers including water pumps and secure the cooling water flow rate simultaneously. Moreover, by suppressing the number of operating chillers, the load of each operating chiller will be increased and this will help chiller to operate at the load where COP is relatively higher. As a result, whole chiller system COP may be improved accordingly.

Then, the COP of the whole system is improved.Figure 1 and 2 show the operating simulation of this system.※
If the variable over water flow system is not adopted, it is required to start three chillers and those auxiliaries to secure 1,210 m3/h chilled water flow rate. (Figure 1) Accompanying with the increase of the chilled water flow rate, each chiller is started one by one and the COP of the whole system decreases at each time. (Figure 2) This is caused because each chiller must be operated at low load (cooling demand / the number of chiller units).

When the variable over water flow system is adopted, it is capable of securing 1,210 m^3/h chilled water flow rate by starting only one over flow control chiller. This chiller operates at the load equivalent to the cooling demand and makes it possible to operate at a higher COP, comparing to the chiller without this system under the same condition.

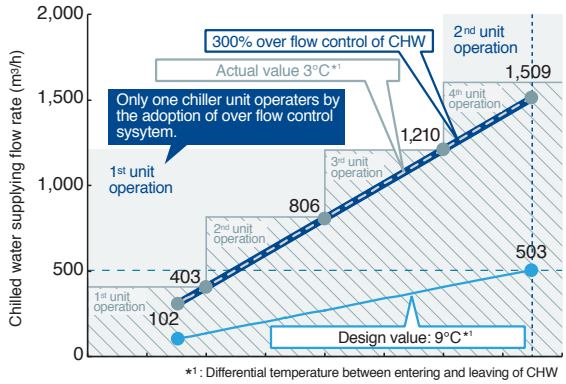


Figure 1
Suppression of the Number of Operating Chiller Units by Excess Flow Control

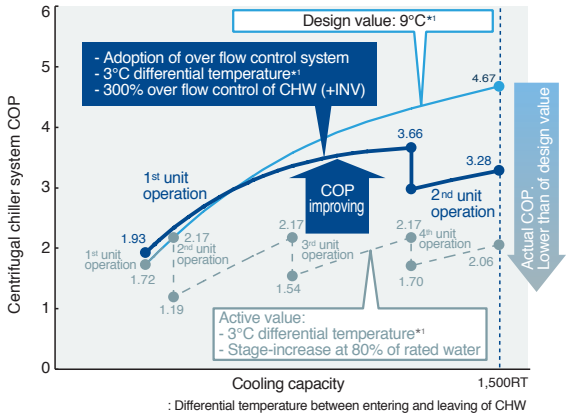


Figure 2
Improvement of Centrifugal Chiller System COP by Excess Flow Control

Notes:-Rated chilled water flow rate is 503 m3/h or 403 m3/h (80%) for operating multiple chiller units.
-Only one chiller unit operates by the adoption of over flow control system (300%).

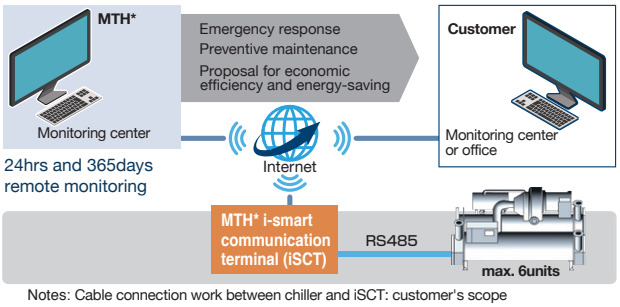
Instantaneous Power Failure Restart

Possible to restart operation automatically, if the instantaneous power failure time is within set value
Initial set value of instantaneous power failure time is as follows.

- Standard Option : 2 seconds
- Special Option : abailable to extend up to 3600 seconds by changing the parameter

Remote Monitoring Program
(WEB communication)

Commitment of maintenance program is required

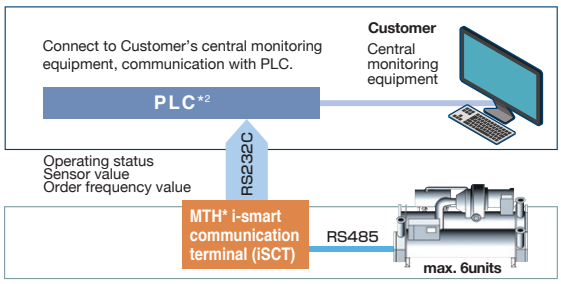


Notes: Cable connection work between chiller and iSCT: customer's scope

24-hour and 365-day remote monitoring program is suitable for maintaining the performance and function of the centrifugal chiller.

Features
The remote monitoring program enables various performances.
1) Monitoring the operation status
2) Emergency response/treatment and report of the result
3) Submission of monthly report of data and customer's observation
4) Proposal for preventive maintenance and economical use based on the result of the analysis of accumulated data
This program is not available for poor quality internet connections environment.

Central Monitoring



*2 PLC: MELCO MELSEC or Modbus

Features
The remote monitoring program enables various performances.
1) Output operation data at customer's central monitor through MHI i-smart communication terminal.
2) Operation data can be used for the following items at customer's central monitor.
- Trend
- Operation status of chillers
- Daily report and monthly report etc.
3) Total connection/transmission distance of RS485 with max. 500 m

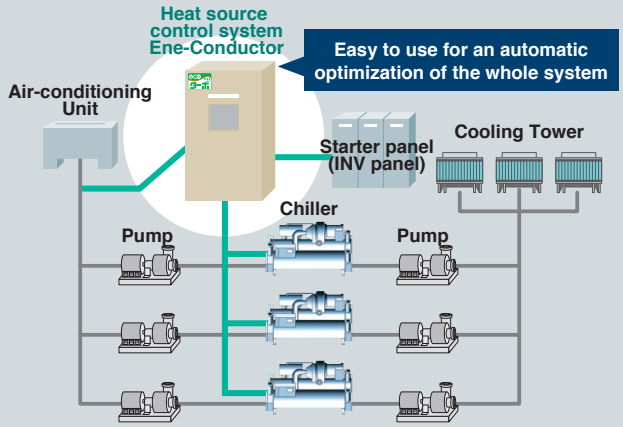
Feature of MTH* specialized communication terminal

Compact size (W317 x H78 x D265 mm: excluding projection portion)
Connected to AC 100 V plug
High speed data processing by 32 bit CPU

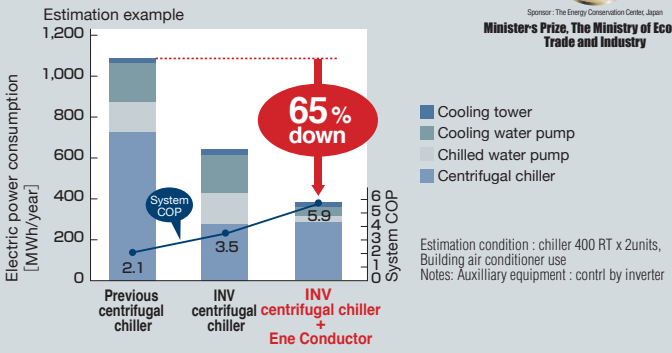
More Energy saving

Heat Source Control System
Ene-Conductor

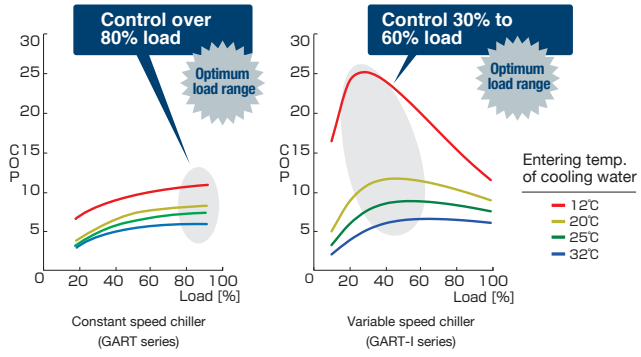
- Improvement of system COP by optimal control which gets the best perfomance out of centrifugal chiller
- Various energy-saving control functions



- **Improvement in COP of centrifugal chiller**
- **Chilled water variable flow control**
- **Cooling water variable flow control**



Control functions of Ene-Conductor



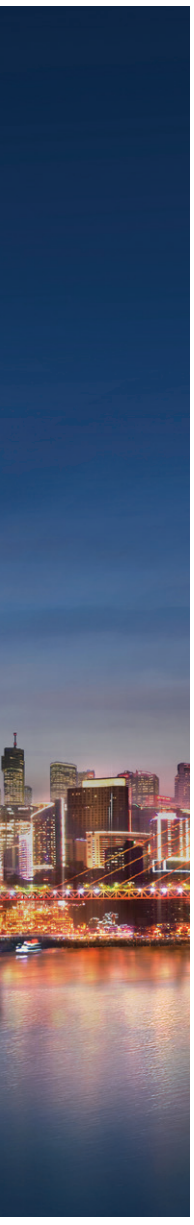
- **Optimize load distribution and operation number**

In the case where the system combines multiple chillers with different performance, the Ene-Conductor automatically calculates the best load for each chiller to obtain the highest COP of the complete system.

- **Multiple chiller control**
- **Chilled / hot water variable flow rate control** (Primary pump)
- **Cooling water variable flow rate control**
- **Cooling tower operation/ fan control**
- **Coolling water bypass valve control**
- **Chilled / hot water bypass valve control**
- **Chilled / hot water secondary pump control**

*MTH : Mitsubishi Heavy Industries Thermal Systems, Ltd.

CHONGQING RAFFLES CITY
(Chongqing, China)



Raffles City Chongqing is located in Chao Tian Men, facing the junction of the Yangtze River and the Jialing River, it has a vivid name of Setting Sail Toward a New Horizon. Raffles City Chongqing was designed by international renowned architect Moshe Safdie and the iconic project has been designed to look like a powerful sail cleaving through strong winds and waves. Over 30 international top consulting firms are work together for this project, and it has been awarded U.S. Green Building LEED (leadership in energy and Environmental Design) Gold pre-certification and high-rise building innovation award 2016 in China. Raffles City Chongqing, with a total construction area of over 1.12 million sqm, comprises 8 super tower buildings, including high-end residential, shopping malls, office buildings, international five-star hotel and service apartments. In the future, the Raffles City Chongqing will become the new landmark of Chongqing!

Capitaland has partnered SP* Group (SP) to provide the advanced district cooling technology for Raffles City Chongqing, including the design, construction, and operation of the cutting-edge efficient cooling system.

The regional cooling system will be through the integrated underground pipe network, will provide customers with high-quality air conditioning services, the innovative development of urban energy conservation and emission reduction, building a green and high-quality urban lifestyle for Chongqing residents.

As the single largest investment by a Singapore Company in China, Raffles City Chongqing is jointly developed by CapitaLand and Ascendas-Singbridge, and it will be completed in phases from 2018. SP is responsible for providing regional cooling services for the whole project. It can be seen as the first attempt by SP to introduce the advanced regional cooling technology and operation into China.

Chongqing forms part of the 5 key focal region of CapitaLand in China. At present, CapitaLand has built 8 Raffles City in China, and 7 of them have been under operation, with Raffles City Chongqing the largest development in terms of size and investment value.

Our high efficiency centrifugal chillers are adopted by contractors to create clean and comfortable environment by making rational use of regional energy effectively.

MHI Group will use the strength and technology to achieve commitment to witness the rise of Chongqing and China's new landmark!

*Abbreviation for Singapore Power

2500 RT x 4 units (GART-250P)
840 RT x 4 units (GART-80P)

Total 13,360 RT

GART & GART-I

R Model / P Model

Our factories are ISO9001 and ISO14001 certified.

Certified ISO 9001

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

Registration number: 02115Q10571R0S
Date of certificate: May 21, 2015

Certified ISO 14001

Certificate number: YKA4005636
Date of certificate: December 27, 2017

Registration number: 02115E10252R0S
Date of certificate: May 21, 2015

· Because of our policy of continuous improvement, we reserve right to make changes in all specifications without notice.
· Option items are included in the pictures of chiller. · Unauthorized reproduction is prohibited.

www.mhi-mth.co.jp/en/

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(Wholly-owned subsidiary of MITSUBISHI HEAVY INDUSTRIES, LTD.)
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MTHSS010,2210 (1.5) R5

Edited in Japan

SPEC: R19