

Our Technologies, Your Tomorrow

# Eco-lution Commercial use Heat pump water heater

# Ecological energy Recovering heat energy from the air





ESA30E

50 нz 12НМ01Е-А-0



# Free energy from the air Overwhelming high performance and high efficiency

"Our technology, Your tomorrow"



Next-generation system developed with our combines responsibility to global environment



#### The most ecological way for supplying hot water Our Heat Pump series





Natural refrigerant CO<sub>2</sub> Air to Water System 30kW ~ 480kW (for commercial use)



Water to Water System Heat recovery type 627kW ~ 3135kW (for industrial use) 627kW ~ 3135kW (for industrial use) \*\* Please refer to the other catalogue.



Q-ton (ESA 30-25 for the Japanese domestic market) received The 2011 Fiscal Year grand prize for Excellence in Energy Efficiency and Conservation in Products Category & Business Model Category from The Energy Conservation Center, Japan (ECCJ) as attached

as attached.

Activities of ECCJ 1) Promotion of energy efficiency and conservation for the industry and commercial

sectors

sectors 2) Providing information for further dissemination of energy-saving equipment 3) Providing information to encourage energy-saving lifestyle 4) Publishing and education 5) International cooperation 6) National examination for the qualified energy managers and the training the future sector and the sector between the sector. http://www.asiaeec-col.eccj.or.jp/index.html



Q-ton (ESA 30-25 for the Japanese domestic market) received the Fiscal Year 2011 technology award from Japan Society of Refrigerating and Air Conditioning Engineers (JSRAE) as attached.

Activities of JSRAE 1) Survey, research, education and training, awards and certificate recognition for entitled engineers and scientists 2) Organization of annual JSRAE meeting, roundtable conferences, training short

Organization of animal JSFAE integring, foundable contentices, training short courses and workshops, technical visits and other events.
 Publication of monthly journal "Relito"(refrigration), Transactions of JSRAE and various books, textbooks, and handbooks.
 Liaison with the International Institute of Refrigeration, IIR.
 Implementation of correspondence education system.
 Other miscellaneoustactivities essential to fulfi the objectives. http://www.jsrae.or.jp/jsrae/Eindex-2.html

# High Performance 25°c+90°c

Even in the extremely cold regions with outdoor temperature as low as -25°C, 90°C water supply is possible

Ecology

COP The industry's highest COP level COP4.3 (In intermediate season)



Air to Water Heat Pump





Q-ton's Technology system unique advantages

**P06** 



Hot water

supply system

Installation

**P10** 

samples





Installation

Specifications and dimensions

work



# Heat Pump technology system

## What is a Heat Pump?

Heat energy is absorbed from the outside air when it passes through the outdoor unit; the energy is transported to the indoor unit in the refrigerant [in this case CO<sub>2</sub>] within the piping system. This eliminates the need to bore holes or bury coils of pipes in the ground as used in conventional ground source systems.

## What is hot water supply by Heat Pump technology system ?



# Offering efficient energy saving is the greatest merit

Typically less than 1kW of output heat energy can be produced by conventional oil or gas boilers. Heat pump technology is capable of producing up to 4.3kW of heat energy from 1kW of energy input making the system 4.3 times more efficient than traditional means.

Furthermore using zero-ODP refrigerant can provide comprehensive solution for realization of low-carbon society.

# Technology for Eco

- 1. Dramatically reducing power consumption
- 2. Increasing Low Carbon initiative
- 3. GWP(Global Warming Potential): 1 (R410 refrigerant:2090)
- 4. ODP(Ozone Depletion Potential): zero







# Q-ton's unique advantages

Advantage Overwhelming high capacity and high efficiency **High Performance** Ecology **25**℃ COP 0 can keep 100% capacity under extreme low hot water supply the industry's top level outdoor temperature The first introduction of 30kW inverter type, Achieving the industry's top level COP4.3. Keeping high efficiency and saving energy operation throughout the year. Advanced energy saving operation and low running cost [heating capacity (kW)] 32 High efficiency heat pump water heaters can save running cost 30 compared with traditional oil or gas boilers. 25 Q-ton FSA30 conventiona boiler reduced amount Annual [hot water:65°C] € 13,960 € 4,710 running 9,250 € 15 IS\$**18.270** IS\$ 6,160 **Enough capacity** cost Can keep the same 12,110 US\$ 11,650 3,930 10 even under low capacity down to -7°C of f 7.720 5 temperature the outdoor temperature boiler Q-ton 20 Giving consideration to global environment by use of CO<sub>2</sub> refrigerant [temperature(°CDB)] Using zero-ODP natural refrigerant. (kg-CO<sub>2</sub>) High efficiency can minimize CO<sub>2</sub> emission. reduced amount Annual CO<sub>2</sub> 61,700 emission amount 21,600 boiler Q-ton [Calculation conditions Operation conditions
 System ③ Price rate ④ CO<sub>2</sub> emission amo Activation of Q-ton in the extreme cold region. **Reason for high efficiency** Patent pending Scroll + rotary compressor gas injection Two-stage compressor Scroll system advanced By combination of two systems, high at high pressure ratio efficiency has been achieved in all operation conditions. [High pressure ratio] The first Rotary system advanced scroll in the world at low pressure ratio **,** Intermediate pressure gas injection configuration By increasing refrigerant Increasing refrigerant [Low pressure ratio] circulation circulation, high efficiency in low rotary temperature can be achieved.



# Advantage

# Easy operation

Advanced touch screen panel with full dot Liquid Crystal display

#### eco touch REMOTE CONTROL





Q-ton can be connected up to 16 units.



As up to 480 kW capacity is possible by connecting 16 units of 30kW capacity, you can get enough hot water supply for any requirements. In case of the same operation of all units, you can control the system with only one remote control.























## **SPECIFICATIONS**

		Model	ESA30E-25	
Item		_		
Power supply			3-phase $380V \pm 5\%$ , $400V \pm 5\%$ , $415V \pm 5\%$ $50Hz$	
	Heating capacity	kW	30	
Operation to top up	Water amount	Liter/min	8.97	
(In intermediate season) <sup>11</sup>	Power consumption	kW	6.98	
	COP	-	4.3	
	Heating capacity	kW	30	
Operation to top up	Water amount	Liter/min	5.06	
(In cold region) <sup>*2</sup>	Power consumption	kW	10.73	
	COP	-	2.8	
Operating sound <sup>*3</sup>		dB(A)	58	
	Height	mm	1,690	
Outside dimension	Width	mm	1,350	
	Depth	mm	720 + 35 (Water pipe connection)	
~	Max	A	21	
Curent	Starting	A	5	
Unit weight		kg	375 (During operation 385)	
Color		8	Stucco white (4 2Y7.5/1.1 approx.)	
	Type x Pcs		Hermetic inverter compressor x 1	
Compressor	Nominal output	kW	64	
	Type	K II	B744 (CO2)	
Refrigerant	Charged amount	ka	85	
		кg	0.5 MA69	
Refrigerant oil	Changed and have		1200	
	Charged volume	CC	1200	
Crankcase heater		W	20	
	for water pipe	W	48 × 3	
Anti-freezing heater	for drain pan	W	40 × 2	
	for drain hose	W	$40 \times 2 + 48$	
Heat exchanger, Air side			Copper pipe straight fin type	
Heat exchanger, Water side(Ga	as cooler)		Copper pipe coil type	
	Туре		Axial flow type (direct coupled motor) $\times 2$	
Fan	Output × Pcs	W	386 × 2	
	Air volume	m <sup>3</sup> /min	260	
	Type × output		Non-self-suction spiral type inverter pump × 100W	
Water pump	Materials contacting to water		Bronze, SCS13	
	Actual pump head	m (kPa)	5m (49kPa) @17Liter/min	
	Outdoor air temp	°C	-25 to +43	
Usage temp range	Feed water inlet temp	°C	5-63	
	Hot water outlet temp	°C	60-90	
Water pressure range		kPa	500 or lower	
Defrost			Hot gas type	
Vibration and sound proofing of	devices		Compressor: placed on anti-vibration rubber and wrapped with sound insulation	
Protection devices			High pressure switch, over current protection, power transistor overheat protection and anomalous high pressure protection	
	Feed water inlet		Rc3/4 (Copper 20A)	
Pipe size	Hot water outlet		Rc3/4 (Copper 20A)	
T. Pe one	Drain water outlet		Rc3/4 (Copper 20A)	
	Forth lookage brooker		30A_30mA_0_1sec	
	Dower coble size		$\Box 14 \times 4 (Langth 40m)$	
Floatria wiring	Mouldad anga circuit broales		Dita A 4 (Leligiii 4011)	
	Crown ding wing size		Kated corrent: 50A, switch capacity: 50A	
	Grounding wire size			
	Remote controller wire size		0.3mm <sup>2</sup> × 2cores shielding wire (MVVS)	
Design pressure		MPa	High pressure: 14.0, Low pressure: 8.5	
IP code			IP24	

(Note)

1. Performance of operation to top up in intermediate season shows the capacity measured under the conditions that outdoor air temp is 16°C DB/12°C WB, water inlet temp is 17°C and hot water outlet temp is 65°C.

2. Performance of operation to top up in cold region shows the capacity measured under the conditions that outdoor air temp is -7°C DB/-8°C WB, water inlet temp is 5°C and hot water outlet temp is 90°C excluding heater for anti-freezing water (345W).

3. Operating sound shows a value measured at 1m in front of the unit and 1m above the floor in anechoic room where the sound is resonated a little. Accordingly if the unit is installed on actual site, it is normal that the measured sound there is higher than the value shown above, because it is influenced by surrounding noise and echo in the room.

4. The actual hot water outlet temp may vary ±3°C from target temp according to the change of outdoor air Fixing heat pump unit temp and water inlet temp. And then if feed water inlet temp is 30°C or higher and outdoor air temp is 25°C or higher, hot water outlet temp may be controlled not to increase too high.

5. Please use the clean water. The water quality should follow a guideline of JRA-GL. 02:1994. If the water quality is out of the standard, it may cause troubles such as scale buildup and/or corrosion.

6. These articles mentioned above may vary without any notice according to the development status.

Anchor bolt	$M10 \times 4$
According to the ins	stallation conditions,
please take a measu	are to prevent from
falling, cross wind and	d heavy snow.



## 1. Standard hot water supply system diagram (for unvented cylinder)



#### Component list of hot water supply system (for unvented cylinder)

Part name		Model	General description
1	Heat pump unit	ESA30E-25	For outdoor air temp -25°C
2	Remote controller for heat pump water heater (Optional part)	RC-Q1E	For setting hot water amount and setting hot water temp.
3	Unvented cylinder (Locally procured)	—	Refer to the specifications of unvented cylinder mentioned on next page.
4	Wiring kit for unvented cylinder (Optional part)	MTH-Q1E (20m length of wire) or MTH-Q2E (10m length of wire)	For connecting heat pump unit with unvented cylinder • Connect to the water temp sensor of unvented cylinder • Connect to the 3-way valve for switching to anti-freezing circuit and control it
5	Pressure reducing valve (Locally procured )	—	Setting pressure≤400kPa Connecting pipe size≥ 32A If the feed water pressure exceeds 400kPa, be sure to mount it
6	Hot water temp sensor (Optional part)	MTH-Q3E	Mounting or pasting on the unvented cylinder for detecting hot water temp in the cylinder. 1.25m length x 9
1	3-way valve (Optional part)	MTH-Q4E	For switching to anti-freezing circuit
8	Stop valve of hot water supply (Optional part)	Ive of hot water supply (Optional part) MTH-Q5E If the multiple heat pump water heaters are connected, it is necessary to use at the hot water supp	
9	Anti-freezing water heater (Locally procured)	—	When outdoor air temp becomes below 0°C, be sure to install this heater on the water pipe (10W/m)
10	Air purge valve (Locally procured)	_	For purging the air in the hot water system which is generated during heating up the water in the unit or is mixed in the system when feeding water. Each valve is required for each cylinder.
1	Relief valve (Locally procured)	—	For preventing from increasing pressure in the system during heating up the water. Working pressure: 450±30kPa or lower.
12	Insulation (Locally procured)	_	Heat resistance ≥ 120°C • For the cylinder shell: 50mm or thicker glass wool whose density is 16kg/m <sup>3</sup> . • For the cylinder end plate: 50mm or thicker glass wool whose density is 24kg/m <sup>3</sup> . • For the water piping: 30mm or thicker glass wool whose density is 48kg/m <sup>3</sup> .

## 2. Specifications of unvented hot water storage cylinder for connecting to ESA30E

Please arrange and procure a new unvented cylinder with following specifications for connecting to ESA30E.

\* If connecting ESA30 to the existing cylinder, the hot water temp and amount in the cylinder cannot be detected correctly. In such case, please consult with our distributor.

In some case, preliminary survey on site may be required before installation

Specifications of unvented cylinder

- For commercial use
- The cylinder is installed indoors, not outdoors
- It should be unvented hot water storage cylinder, not open tank
- The minimum capacity is 500liter. If increasing capacity, please use bigger size cylinder or several cylinders in parallel.

• The maximum capacity is 4000liter. (only as a guide) The cylinder capacity may vary according to feed water inlet temp, hot water outlet temp and operation hours in the night. 25837 x Operation hour in the night/ (Hot water outlet temp- feed water inlet temp) =available hot water supply volume (Liter). However, there is dead volume, where the cold water is always filled in, at the bottom of cylinder to which the feed water line is connected. Therefore please select the cylinder volume in consideration of available hot water supply volume and dead volume.

- Design pressure
  - Design pressure is 0.5MPa or higher.

The design pressure of ESA30E is 0.5MPa. Even if the design pressure of the cylinder is 0.5MPa or higher, the maximum water pressure applied to the cylinder actually shall be less than 0.5MPa. And please decide the usage pressure in consideration of allowance and setting value of relief valve.

Even if the actual pressure applied to the cylinder is 0.5MPa, the cylinder can be used, but the minimum pressure shall be 0.1 to 0.2MPa or higher. If the pressure becomes lower than the minimum pressure, water volume becomes decreasing.

• Pipe connection port

Cylinder has one or more pipe connection ports at the top. The size of port shall be 32A or bigger.

If it is smaller than 32A, it is difficult to detect the hot water temp and hot water amount in the cylinder properly. And when discharging the hot water from the cylinder, the outlet flow volume may be restricted.

Cylinder has 2 or more pipe connection ports at the bottom. The size of one port shall be 32A and the other port shall be 20A. · Specifications of inner cylinder

In order to ensure the temp boundary layer as minimum as possible when hot water and feed water flow into the cylinder, the cylinder shall have buffer plates built-in.

• Material

SUS444 or SUS316 (with consideration for stress corrosion cracking resistance)

If using the other material than the specified one, hot water temp and hot water amount in the cylinder may not be detected correctly. Please consult with our distributor.

- Heat resisting temperature
- 90°C

The maximum hot water outlet temp of ESA30E is 90°C. If the heat resisting temp of the cylinder is lower than 90°C. Be sure to reduce the hot water outlet setting temp in order to meet the specifications of the cylinder.

If using the cylinder at the higher water outlet temp than the heat resisting temp of the cylinder, it may have break of the cylinder or leak age of hot water.

• Applying hot water temp sensors on the cylinder

In order to judge the hot water temp and amount in the cylinder, the temp sensors shall be mounted or pasted on the cylinder.

If pasting the temp sensors, they shall be pasted with aluminum adhesive tape whose heat resisting temp is 90°C or higher.

If mounting the temp sensors, the insertion holes with ø7mm or bigger in size and 20mm or deeper in depth are required on the cylinder. MHI's genuine temp sensor, MHT-Q3E (optional part), shall be used.

3 to 9 sets of temp sensors shall be applied to the cylinder.

In order to detect the hot water amount by 10% intervals, 9 sets of temp sensors shall be applied to the cylinder. If reducing the number of temp sensor, the hot water amount cannot be detected properly.

Ex) In case of applying 3 sensors, heat pump unit can detect only 20%, 60% and 100% of HW amount. (Please refer to following table) Therefore, even though 80% of HW amount is set with schedule setting, the HP unit cannot stop at storing 80% of HW amount and it still keeps on operating until storing 100% of HW amount.

And if 30% of HW amount is set for the operating to top up, HP unit cannot start operation to top up until HW amount decreases to 20%. Accordingly, we recommend to apply 9 sensors to the cylinder for precise control.

The positions to apply the temp sensors on the cylinder are depended on the number of sensors and sensors should be applied to the designated positions on the cylinder.

According to the following table, please check the number of sensor and apply each sensor to the designated position of hot water amount % according to the sensor No.

The position to apply temp sensor according to the not water amount %						Recommendable	
Number of sensors to apply							
Sensor No.	3pcs	4pcs	5pcs	6pcs	7pcs	8pcs	9pcs*1
Tht-1	20%	20%	20%	10%	20%	10%	10%
Tht-2	60%	50%	40%	30%	30%	20%	20%
Tht-3	100%*2	75%	60%	40%	40%	30%	30%
Tht-4		100%*2	80%	60%	50%	50%	40%
Tht-5			100%*2	70%	65%	60%	50%
Tht-6				100%*2	80%	70%	60%
Tht-7					100%*2	80%	70%
Tht-8						100%*2	80%
Tht-9							100%*2

\*1 Recommendable number of sensors is 9pcs.

If the number of sensors is less than 9pcs, the hot water amount cannot be detected correctly. \*2 The sensor which detects 100% of HW amount shall be applied to the position within the range of sensitive volume with consideration of dead volume which is 10% of total volume of cylinder.

#### Insulation

Insulation must be required in order to keep hot water temp stored in the cylinder.

Shell	•	End plate
Material: Glass wool		Material: Glass wool
Density: 16kg/m <sup>3</sup>		Density: 24kg/m <sup>3</sup>
Thickness: 50mm or more		Thickness: 50mm or more

• Carry in, Installation and Service & maintenance space It depends on the installation manual of the cylinder procured.

#### 3. Water piping work

#### (1) Outline of water piping



(i) Key consideration for water piping

(i) Key consideration for water p	Joing
Please consider following po	int when designing and installing. (Description of $(1 - 0)$ in above figure)
① Union joint	Be sure to fit it in order to enable the unit replacement easily.
(2) Thermometer	Be sure to equip it for capacity check and operation monitoring
③ Water pressure gauge	You had better equip it for checking operation status.
(4) Valve	Be sure to fit it for servicing such as cleaning heat exchanger and/or replacing unit and etc.
5 Flexible joint	Be sure to fit it for preventing from transmittance of vibration
6 Drain piping	Be sure to make its descending slop as larger as possible and make the distance of its horizontal part as
	shorter as possible in order to prevent the drain water from freezing.
	Moreover, in cold region, be sure to take a measure for anti-freezing drain water by equipping drain
	heater or like that.
⑦ Strainer	Be sure to fit a strainer (60 mesh or more) at the inlet port of the unit to avoid intrusion of foreign matter
	into the unit.
(8) Air purge valve	Be sure to equip it to the place where air may accumulate in order to purge air in the water pipe.
(9) Water piping	Water piping work shall be done by considering to purge air in the water pipe easily. Insulation work
	shall be done sufficiently.
10 Drain valve	Be sure to equip it in order to drain off the water from the system at servicing.
(1) Check valve	Be sure to equip it in order to operate the multiple heat pump water heaters.
(ii) Caution for corrosion	
① Water quality	

It is important to check in advance whether the feed water and hot water have good quality.

Be sure to use cyclic water and makeup water whose qualities are within the range of water quality criteria mentioned in Page 20. (2) Foreign matter in water

If solid matter such as sand and small stone and/or floating suspended solid such as corrosion product exist in water, the heattransfer surface of heat exchanger is directly attacked by water flow, and corrosion may be created locally. In order to avoid such corrosion by these foreign matters, be sure to fit a cleanable strainer (60 mesh or higher) at the water inlet port of the unit to remove foreign matters.

③ Contact of different metal

Depending on the type of metal, if different metals contact directly, corrosion may be generated at contact part.

Refer to followings and in case of the combination of different metals to generate corrosion, take a measure not to generate corrosion by inserting a non-conductive material (non-metallic insulation flange and etc) between the metals or by other method The combination not to generate (I) Stainless steel (SUS304, SUS316)

corrosion by contact of metals 2 Bronze

act of metals (2) Bronze (3) Copper

④ Others

- 1) Water pipe shall have no water leak and no air intrusion. Especially if air intrudes at suction side of pump, pump performance becomes decreasing and it may cause generation of noise
- 2) Be sure to take into consideration for water pipe not to freeze at stopping operation in winter

#### Water piping work

• When doing piping work between the heat pump unit and the unvented cylinder, be sure not to interfere the service space of the heat pump unit. Regarding the service space, please refer to chapter 2

# (2) Limitation of piping length between the heat pump unit and the unvented cylinder Be sure to install the heat pump unit and the unvented cylinder in the shortest piping length from the view point of saving energy. Piping length and height difference shall be within a following range. Limitation of piping length i) Piping length: Within 15m (equivalent length for pipe size 20A) Within ±15m Within ±15m

(Equivalent length) Between heat pump unit and unvented cilynder

#### (3) Drain piping work

- At a place where the drain water from the heat pump unit becomes a problem, please install drain piping by using drain elbow, drain grommet (locally prepared)
- The end of drain pipe shall be open the air.
- When draining from drain pipe of unvented cylinder, open the pressure relief valve (raise the lever), and after the end of drain, close the valve (let down the lever)

#### (4) Water quality criteria

Makeup water and cyclic water shall be the water within the range of water quality criteria mentioned below. If water quality is out of the range of criteria, it may cause a trouble such as scale adhesion and corrosion.

	Item		Cyclic water (60°C< ≦90°C)	Makeup water
	pH (25°C)	-	7.0 - 8.0	7.0 - 8.0
	Electric conductivity (25°C)	mS/m	≦30	≦30
	Chloride ion	mgCl <sup>-</sup> /L	≦30	≦30
	Sulphate ion	mgSO32-/L	≦30	≦30
Standard items	Acid consumption (pH4.8)	mgCaCO <sub>3</sub> /L	≦50	≦50
	Sulphide ion/Acid consumption	-	≦0.5	<u>≦</u> 0.5
	Total hardness	mgCaCO <sub>3</sub> /L	≦70	≦70
	Calcium hardness	mgCaCO <sub>3</sub> /L	≦50	≦50
	Ionic silica	mgSiO <sub>2</sub> /L	≦20	≦20
	Iron	mgFe/L	≦0.1	≦0.3
	Copper	mgCu/L	≦0.1	≦0.1
Reference items	Sulphide ion	mgS <sup>2-</sup> /L	Not detected	Not detected
	Ammonium ion	mgNH <sup>4+</sup> /L	≦0.1	≦0.1
	Residual chlorine	mgCl /L	≦0.1	≦0.3
	Free carbon	mgCO <sub>2</sub> /L	≦0.4	≦4.0
	Stability index		_	_

## 4. Heat pump unit installation space (Service space)



## 5. Electrical wiring work

Electrical installation work must be performed by an electrical installation service provider qualified by a power provider of the country. Electrical installation work must be executed according to the technical standards and other regulations applicable to electrical installations in the country.

Please install an earth leakage breaker without fail. The installation of an earth leakage breaker is compulsory in order to prevent electric shocks or fire accidents.

(Since this heat pump unit employs inverter control, please **use an impulse withstanding type one** to prevent the earth leakage breaker from false activation.<u>+</u>

#### (1) Wiring system drawing



#### (2) Connecting method of power cable

This heat pump unit corresponds to 3-phase 380V±5% (50Hz), 400V±5% (50Hz) and 415V±5% (50Hz). of power specifications. However for creating 200V±10% of power voltage for control line, it is necessary to change connection of wire on the terminal block (TB2) in the control box according to the supply power voltage to be used.

#### (a) Method for leading out cables

- Cables can be led out through the front, right, left panel and bottom plate.
- In wiring on installation site, cut off a half-blank (Ø50 or elongate hole 40x80) cover for penetration of cables with nipper.
- In case of a collective drain piping, please use the hole to lead out cables or pipe other than the hole on bottom plate.
- If the hole on bottom plate is used, be careful to apply adequate seal in order not to leak drain.

#### (b) Notabilia in connecting power cables

- Connect the grounding wire before connecting power cable. When connecting a grounding wire to a terminal block, use a grounding wire whose length is longer than the power cable so that it may not be subject to tension.
- Do not turn on power until installation work is completed. Turn off power to the unit before servicing the unit.
- Ensure that the unit is properly grounded.
- Power cables must always be connected to the power cable terminal block and clamped them outside the control box.
- In connecting to the power cable terminal block, use a round -type crimped terminal. • If 2 cables connect to one terminal block, be sure to put the crimped terminals to back connection
- And in such case place a thin cable on the thick cable as shown in the right figure. • Use specified wires in wiring, and fasten them securely in such a manner that the terminal
- blocks are not subject to external force.
- In tightening a screw of terminal block, be sure to use a correct-size screw driver. Tightening a screw of terminal block with excessive torque force may break the screw. For the tightening torque of terminals, refer to the table shown at right.
- When electrical installation work is completed, make sure that all electrical components in the control box have no loose connector coupling or no loose terminal connection.

#### (c) Heat pump unit power supply specifications: 3-phase 380V/400V/415V±5% 50Hz

Cable size for power source	Wire length (m)	Earth leakage breaker (Grounding fault, overload,	Earth wire		
(mm <sup>2</sup> )		short circuit protection)	Size (mm <sup>2</sup> )	Screw type	
14	35	30A, 100mA, 0,1sec or shorter	14	M6	

#### Please note

- (1) Wiring procedure is determined by JEAC8001 (please adapt it to the regulations in effect in each country.)
- (2) The wire length and cable size in above table show that within 2% of voltage drop. If the wire length exceeds the value shown in the above table, review the cable size according to the regulations of the country.
- ③ If the earth leakage breaker is exclusive for ground fault protection, the circuit breaker is required additionally.
  - For selecting the circuit breaker, please refer to the technical manual or ask our distributor.

#### (3) Connecting method of signal wire

- The signal line is DC5V so that please do not connect single phase 220V/230V/240V of power cable to the signal line. In case to connect power cable, the fuse on the control PCB is blown.
  - (1) Please check that power cable is not connected to the signal line.
  - <sup>(2)</sup> Before turning on power supply, be sure to check resistance on the terminal block of signal line. If the measured resistance is  $100\Omega$  or lower, power line may touch to signal line.
  - Standard signal wire size is 0.75mm<sup>2</sup> x 2 cores shielding wire (MVVS)
- The both end of shielding wire shall be grounded.

#### Remote controller wiring

- Standard remote controller wire size is 0.3mm<sup>2</sup> x 2 cores shielding wire (MVVS)
- The both end of shielding wire shall be grounded.
- If using 100m or longer wire, please use the wire size shown in below table.





Mitsubishi Heavy Industries, Ltd. Air-Conditioning & Refrigeration Systems Headquarters 16-5, Konan 2-chome, Minato-ku, Tokyo, 108-8215 Japan http://www.mhi.co.jp





M12 Power cable terminal block