

# ECOi EX THE GAME CHANGER



VRF with outstanding energy-saving performance and powerful operation SEER 7,56 (2-Pipe 18HP model).



A game-changing VRF system delivering energy-saving performance, powerful operation, reliability and comfort surpassing anything previously possible. It represents a true paradigm shift in air conditioning solutions. Taking quality to the extreme — that's the Panasonic challenge.

## 1 High performance at extreme conditions

ECOi EX is highly reliable, with strong cooling & heating power, even when operating at extreme ambient temperatures. The units can operate at 100% of capacity at 43°C, reaching a great cooling operation up to 52°C and in heating -25°C\*.

Also, the ECOi EX features include Bluefin in newly designed heat exchanger improving efficiency as well in marine ambient. A silicone coated PCB (Printed Circuit Board) protects the unit from being damaged by environmental factors such as moisture and dust.

## 2 Outstanding efficiency and comfort

The new ECOi EX system is designed to increase energy efficiency by delivering high SEER rating, as well as high efficiency for part-load operations. The system has reduced energy costs thanks to "All-Inverter Compressors", with independent control to deliver highly flexible performance. Also, the ECOi EX features an enlarged heat exchanger with triple surfaces that allow for improved heat transfer and a newly designed curved air discharge bell-mouth for better aerodynamics. The three-stage oil recovery design makes it able to minimise the frequency of forced oil recovery, leading to reduced energy costs and sustained comfort.

## 3 Superior flexibility

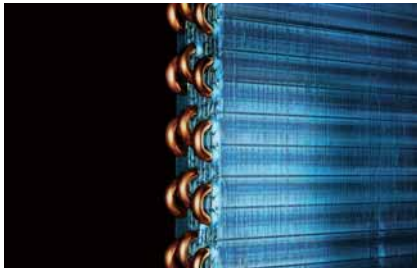
With its up to 1000\* meters of pipeline, its maximum 30 meters height difference between indoor units and its 200 meters length, the design possibilities have grown exponentially making the new ECOi EX the ideal air conditioning option for long haul buildings, such as train stations, airports, schools or hospitals. These advantages are enhanced with the wide range of indoor unit models and capacities facilitating the perfect adaptation to all kind of projects. The careful selection of controls and peripherals such as the Pump Down, the AHU or/and the chiller, enables an optimum system use. Connectable maximum allowable indoor / outdoor capacity ratio up to 200%\*.

\* Conditions of 2-Pipe ECOi EX ME2 Series.



# TOP EFFICIENCY AND COMFORT

Remarkable improvement on key components: extraordinary energy-saving performance and redesigned for smooth and better air discharge.



Enlarged heat exchanger surface area with triple surface.

\* For 8 & 10HP unit, the heat exchanger is 2 row design.



Multiple large-capacity all inverter compressors (more than 14HP).



Newly designed curved air discharge bell mouth for better aerodynamics.

## Improvements on refrigerant circuit

### Compressor.

Redesigned components in the body provide performance improvement especially in the rated cooling condition and AEER performance.



### Accumulator.

New oil returning circuit with control valve makes efficient oil recovery to compressor.

### Oil separator.

Modified tank design makes efficient oil separation with less pressure drop.



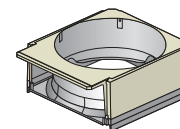
### Receiver tank less design

Improved refrigerant control program recovers the remaining refrigerant gas in the system back to the accumulator tank effectively.

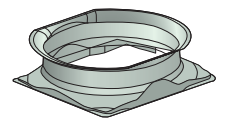


## Smooth exhaust flow by new bell-mouth

The new curved shape with integrated top and bottom assure smooth exhaust flow. This gives more air-volume with same sound level, less input power at same air volume.

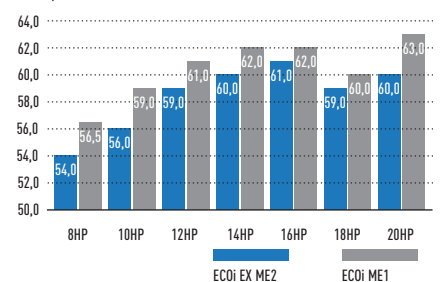


Conventional model (ME1)



New model (ME2)

Sound pressure dB(A)



## Combined 3 surface heat exchanger

The highly efficient piping pattern increases heat exchange performance by 5%. The new heat exchanger features a 3 surface construction.

Compared to the divided dual-surface construction in current models, there is no divided space and the face area of heat exchanger becomes larger.



Conventional model (ME1)



New model (ME2)

# OIL RECOVERY INTELLIGENT CONTROL

## Intelligent 3-stage Oil Management System

In a VRF system, where lengthy piping and a large number of indoor units need to be controlled collectively, the key to maintaining the system's reliability is to ensure an appropriate amount of oil is secured in the compressors. In order to avoid oil shortage in the compressor, maximum operation is normally forcibly conducted at regular intervals to recover oil from indoor units. This method, typically employed in a standard VRF, causes the system to overheat or overcool and thus waste energy. In Panasonic VRF systems, a sensor for detecting oil levels is mounted in each compressor. In installations with multiple outdoor units, a shortage of oil in one compressor can be compensated for by recovering oil either from another compressor in the same unit, from a compressor in an adjacent outdoor unit, or from a connected indoor unit. Panasonic VRF systems provide users with a comfortable environment whilst saving energy.

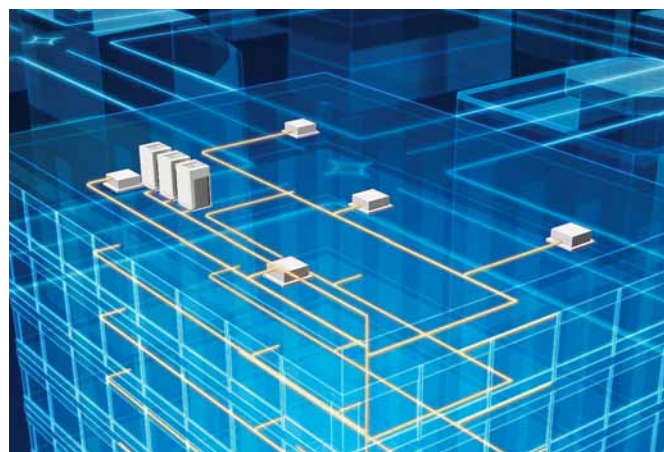
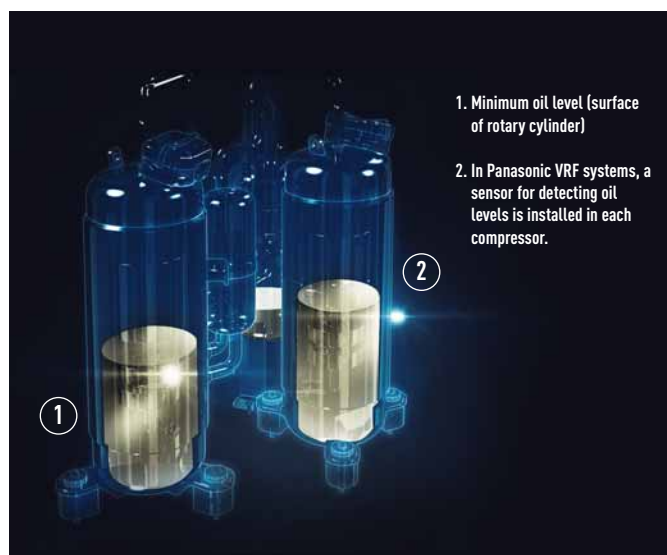
## Oil recovery intelligent control advantages:

1. Higher efficiency
2. Durability
3. Comfort:
  - Continuous operation
  - Low noise
  - Low vibration

## Features of oil recovery design

### Oil sensors installed in each compressor.

Oil sensors installed in each Panasonic compressor precisely monitor oil levels, eliminating unnecessary oil recovery.



**The Panasonic system efficiently manages oil recovery in three stages; minimising the frequency of forced oil recovery while reducing energy cost and maintaining comfort.**

**STAGE-1:** Panasonic compressors are equipped with sensors which monitor oil levels precisely at all times. If oil levels fall, oil can be transferred from other compressors within the same outdoor unit.

**STAGE-2:** If oil levels in all compressors within the outdoor unit fall, oil can be replenished from adjacent outdoor units.

**STAGE-3:** Forced oil recovery is implemented only if oil levels become insufficient in spite of above measures. The Panasonic system's design concept is radically different from conventional oil systems.

### Highly functional oil separator.

Thanks to extended separate piping, oil recovery efficiency reaches 90%, minimising the oil to be discharged from the compressor.



# TWIN ROTARY INVERTER COMPRESSOR

## New twin rotary inverter compressor

Two independently controlled inverter compressors achieve high efficiency. Redesigned components in the body provide performance improvement especially in the rated cooling condition and EER performance.

- Wider and flexible control on Inverter compressor
- Better oil lubrication
- Smooth start up

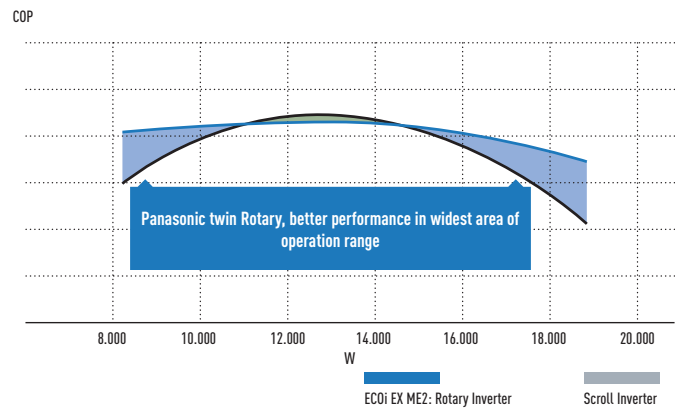


## Extraordinary energy-saving performance

Designed for Actual Operation Performance. Panasonic builds air conditioning systems not only with a high EER for rated operation, but also with Seasonal-EER appropriate to the customer's actual environment of use. For instance, with rated operation, outdoor temperature is constant at 35°C, but in reality the outdoor temperature is continuously changing. Consequently, required air conditioning performance also changes. That's why Panasonic implements the following kind of proprietary control.

1. Set temperature is rapidly attained; full-load operating time is kept to a minimum.
2. The frequency of forced oil recovery is minimised. The volume of oil within the compressors is monitored precisely by sensors, so forced oil recovery under full-load operation is conducted only when necessary. Since this suppresses noise due to oil recovery, comfort is maintained.
3. Panasonic pursues a high EER, of course, as well as high EER in part load, for energy saving performance under a broad range of loads. Panasonic's design concept contributes to substantial energy cost reductions.

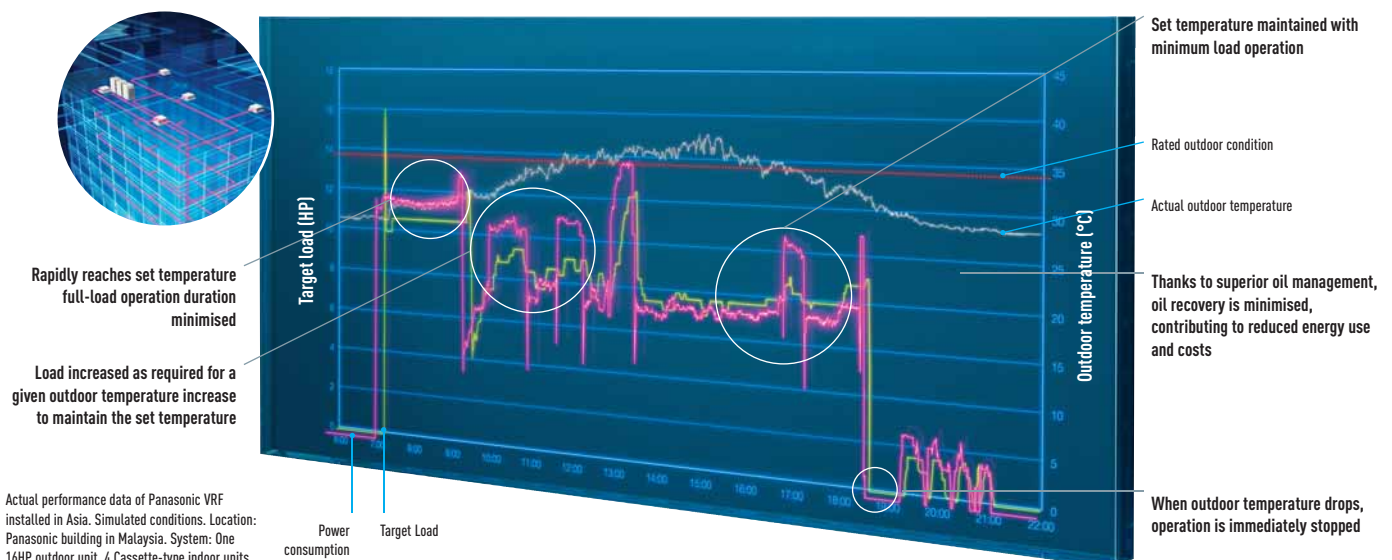
## Compressor efficiency electric system VRF.



## Number of Inverter compressors

Size	2-Pipe ECOi EX ME2				3-Pipe ECOi EX MF3								
	Small		Medium		Medium		Large						
HP	8HP	10HP	12HP	14HP	16HP	18HP	20HP	8HP	10HP	12HP	14HP	16HP	
Number	1 pc.		1 pc.	2 pcs.	2 pcs.	1 pc.		2 pcs.					

## Actual operation data graph of Panasonic VRF



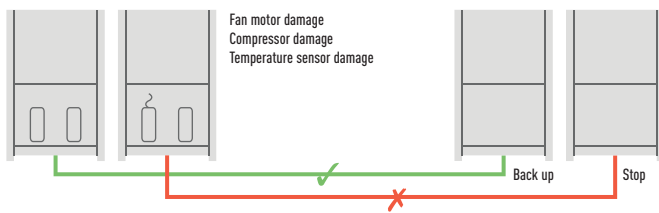
Actual performance data of Panasonic VRF installed in Asia. Simulated conditions. Location: Panasonic building in Malaysia. System: One 16HP outdoor unit, 4 Cassette-type indoor units.

# SUPERIOR QUALITY, RELIABILITY AND DURABILITY

## High safety operation in case of breakdown!

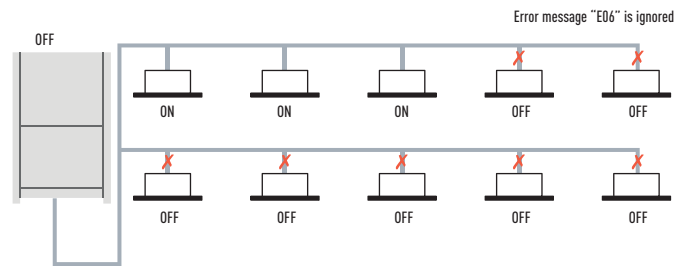
### Automatic Back-Up operation. Ensures heating and cooling.

It is possible for the system to keep working, even if the compressors, fan motor and the temperature sensor are damaged (even when a compressor fails in single unit with 2 compressors inside).



### The system will still operate up to 25% of the connected indoor units.

System will not stop when up to 25% of indoor units have power supply breakdown when they are ON Mode.

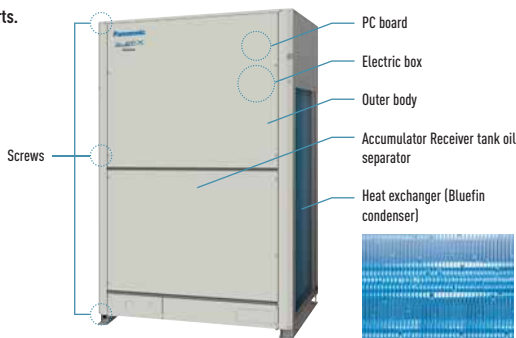


## Hi-durability outdoor unit

Treated for high resistance to corrosion (rust and salty air) to ensure long-lasting performance.

Note: Selecting this unit does not completely eliminate the possibility of rust developing. For details concerning unit installation and maintenance, please consult an authorised dealer.

### Specially protected parts.



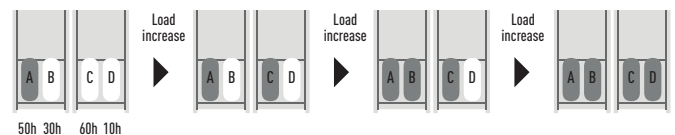
## Extended compressor life by uniform compressor operation time

The total run-time of compressors are monitored by a built-in microcomputer, which ensures that operation times of all compressors within the same refrigerant circuit are balanced.

Compressors with histories showing shorter run times are selected first, ensuring equal wear and tear across all units and extending the working life of the system.

### System example.

A,C: DC inverter compressor  
B,D: Constant speed compressor



\* Depend on accumulated operation time of each compressors.

\* Compressor priority has possibility to be changed.

[e.g] Case 1: A→C→B→D, Case 2: C→A→D→B, Case 3: A→C→D→B, Case 4: C→A→B→D

\* Also other cases available.

## A large number of indoor unit models can be connected



# NEW 3-PIPE ECOi EX MF3 SERIES

## Simultaneous heating and cooling VRF System

The new Panasonic 3-Pipe ECOi EX MF3 series offers the ideal solution to meet customer's demand.

### Upgraded energy efficiency utilized ECOi EX technology.

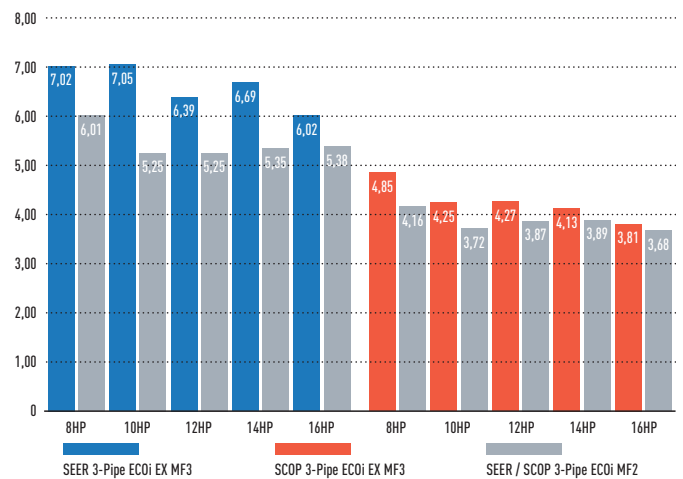
- SEER / SCOP improved in full capacities from 8 to 16HP
- SEER / SCOP follows LOT21 from started from January 2018
- EER / COP is certified in Eurovent

### Design flexibility.

- High reliability even under tough temperature condition
- Maximum 52 indoor units connectable
- Slim heat recovery box with just 200 height
- Farthest piping length between indoor units and outdoor units: 200m

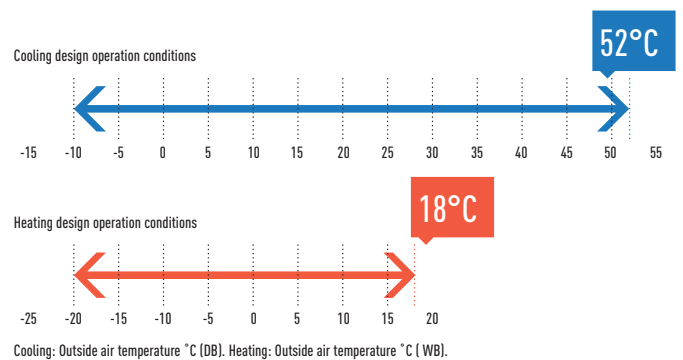
### Excellent seasonal energy saving.

SEER / SCOP (W/W)



## Extended design operation conditions

Cooling design operation conditions: The cooling operation range has been extended to -10°C ~ 52°C by changing the outdoor fan to an Inverter type. Heating design operation conditions: Stable heating operation even with an outside air temperature of -20°C. The heating operation range has been extended to -20°C by use of a compressor with a high-pressure vessel.



## Wide temperature setting range

Wired remote control heating temperature setting range is 16 to 30°C.

## Increased maximum number of connectable indoor units

Maximum 48HP with 52 indoor units can be set up according to user needs. Connectable indoor/outdoor unit capacity ratio up to 150%.

System ( HP)	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
Connectable indoor units*: 150 %	19	24	29	34	39	43	48	52					52								

\*Depending on indoor units types. Please check service manuals.

## Power suppression control for energy saving (Demand control)<sup>1</sup>

The 3-Pipe ECOi EX MF3 Series has a built-in demand function which uses the inverter characteristics. With this demand function, the power consumption can be set in three steps, and operation<sup>2</sup> at optimum performance is performed according to the setting and the power consumption. This function is useful to reduce the annual power consumption and to save electricity costs while maintaining comfort.

<sup>1</sup> An outdoor Seri-Para I/O unit is required for demand input.

<sup>2</sup> Setting is possible as 0% or in the range from 40 to 100% (in steps of 5%). At the time of shipping, setting has been done to the three steps of 0%, 70%, and 100%.

Simultaneous heating and cooling VRF system.  
The new 3-Pipe ECOi EX MF3 Series offers the solution for the most demanding customers.

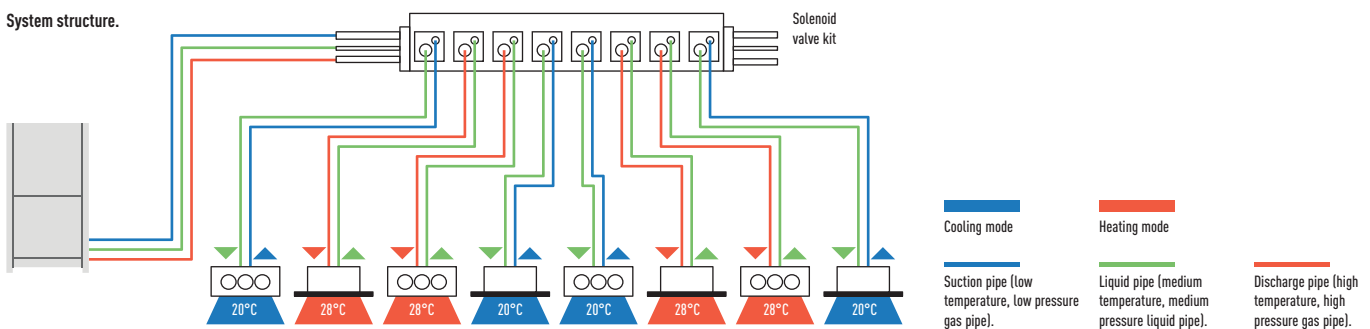


**Slim 3-Pipe Control Box Kit / Multiple connection type**

**New Heat Recovery Box to connect multiple indoor units with just one box, 4, 6 and up to 8 indoor units or groups.**  
The height is only 200mm. This is good advantage specially in hotel applications, where space for connecting several boxes is limited.

**Individual control of multiple indoor units with solenoid valve kits.**

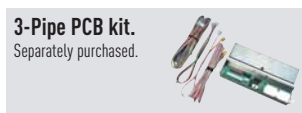
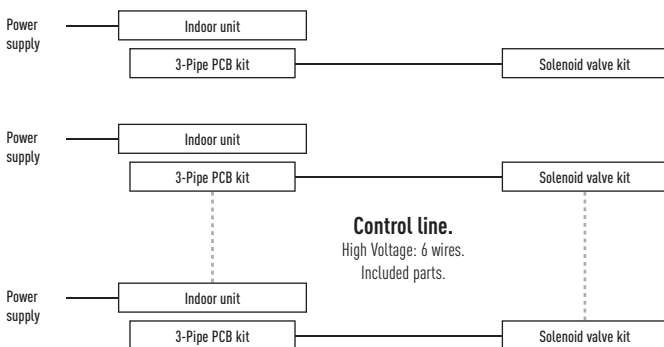
- Any design and layout can be used in a single system.
- Cooling operation is possible up to an outdoor temperature of -10°C.



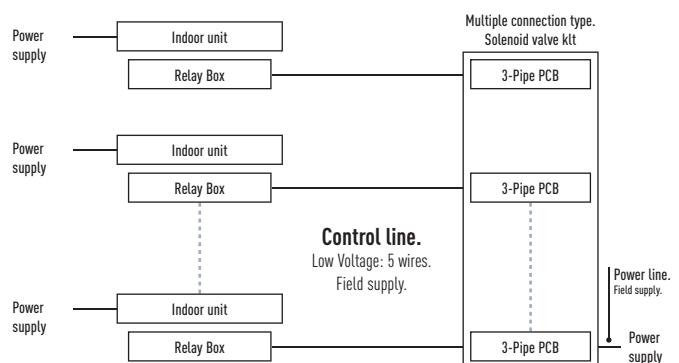
	<b>1 port</b>	<b>4 port</b>	<b>6 port</b>	<b>8 port</b>
<b>56 type</b>	<b>CZ-P56HR3</b>	<b>CZ-P456HR3</b>	<b>CZ-P656HR3</b>	<b>CZ-P856HR3</b>
<b>160 type</b>	<b>CZ-P160HR3</b>	<b>CZ-P4160HR3</b>	—	—

**Solenoid valve kit / wiring work**

**Current model / single connection type**



**New model / multiple connection type**

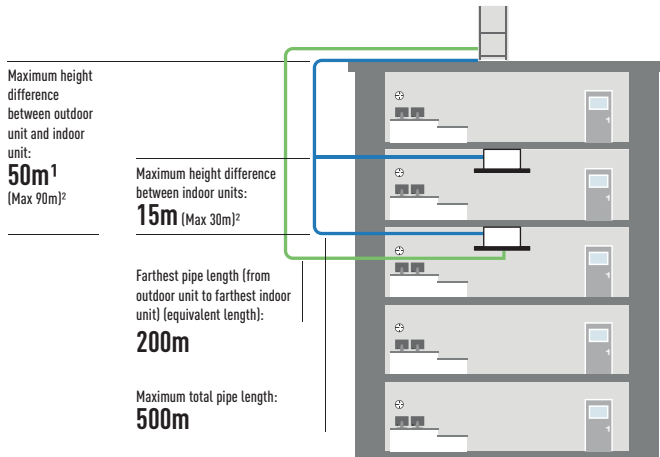




# NEW 3-PIPE ECOi EX MF3 SERIES SUPERIOR FLEXIBILITY

## Increased piping lengths and design flexibility

Adaptable to various building types and sizes. Actual piping length: 200m.  
Maximum piping length: 500m.

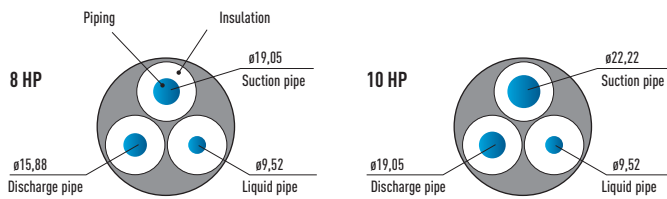


1. 40m if the outdoor unit is below the indoor unit.
2. Setting change is necessary. Please contact an authorized Panasonic dealer in the case of conditions below:  
50 < Height difference between OU and IU ≤ 90 or 15 < Height difference between IUs ≤ 30.

## Excellent cost saving and smaller piping size

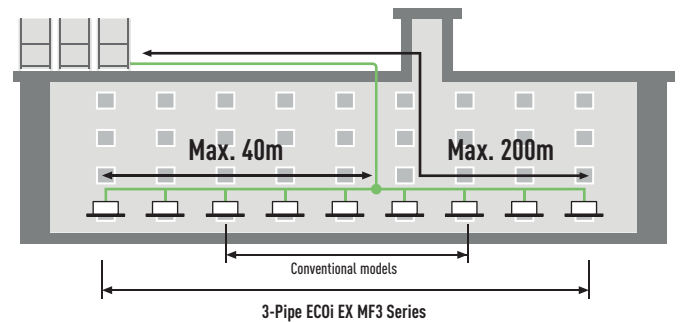
By using R410A with low pressure loss, pipe sizes for discharge, suction and liquid are all reduced.

This makes it possible to aim for reduced piping space, improved workability at the site, and reduction of the piping material costs.



## Up to 40m piping after first branch

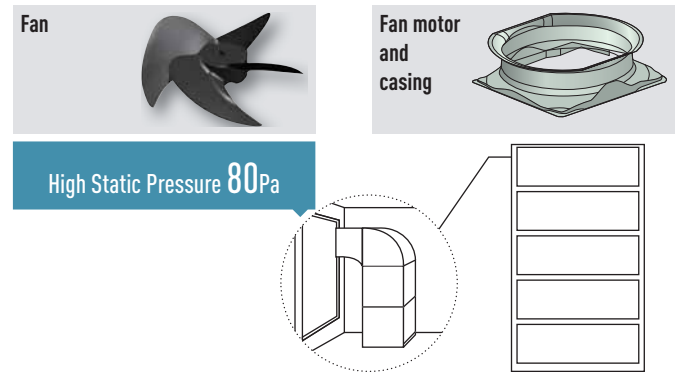
Up to 52 units can be connected to one system. Flexible piping layout makes it easier to design systems for locations such as train stations, airports, schools and hospitals.



## High external static pressure on condensers

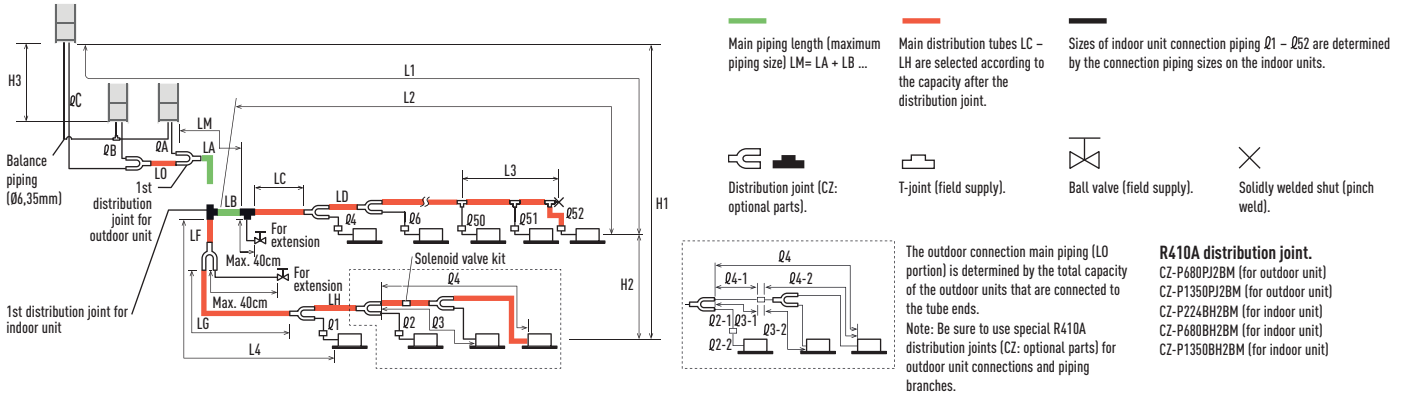
With a newly designed fan, fan guard, motor, and casing, new models can be custom-installed on-site to provide up to 80 Pa of external static pressure.

An air discharge duct prevents shortages of air circulation, allowing outdoor units to be installed on every floor of a building.



# NEW 3-PIPE ECOi EX MF3 SERIES PIPING DESIGN

Select the installation location so that the length and size of refrigerant tubing are within the allowable range shown in the figure below.



## Ranges that apply to refrigerant piping lengths and to differences in installation heights

Items	Mark	Contents	Length (m)
Allowable piping length	L1	Maximum piping length	Actual length ≤200 <sup>1)</sup> Equivalent length ≤210 <sup>1)</sup>
	Δ L (L2-L4)	Difference between maximum length and minimum length from the 1st distribution joint	≤50 <sup>2)</sup>
	LM	Maximum length of main piping [at maximum size] * Even after 1st distribution joint, LM is allowed if at maximum piping length.	— <sup>3)</sup>
	Ø1, Ø2- Ø52	Maximum length of each distribution tube	≤50 <sup>4)</sup>
	L1+ Ø1+ Ø2- Ø51+ ØA+ØB+LF+LG+LH	Total maximum piping length including length of each distribution tube (only liquid piping)	≤500
	ØA, ØB+LO, ØC+LO	Maximum piping length from outdoor's 1st distribution joint to each outdoor unit	≤10
Allowable elevation difference	Ø1-2, Ø2-2 ~ Ø52-2	Maximum length between solenoid valve kit and indoor unit	≤30
	H1	When outdoor unit is installed higher than indoor unit	≤50
	H2	When outdoor unit is installed lower than indoor unit	≤40
Allowable length of joint piping	H3	Maximum difference between indoor units	≤15 <sup>5)</sup>
	L3	T-joint piping (field-supply); Maximum piping length between the first T-joint and solidly welded-shut end point	≤4
			≤2

L = Length, H = Height

1) If the longest piping length (L1) exceeds 90m (equivalent length), increase the sizes of the main pipes (LM) by 1 rank for suction pipes, discharge pipes and liquid pipes. Use a field supply reducer. Select the pipe size from the table of main piping sizes (Table 3) and from the table of refrigerant piping sizes (Table 8). 2) If the longest main piping length (LM) exceeds 50m, increase the main piping size at the portion before 50 m by 1 rank for the suction pipes and discharge pipes. Use a field supply reducer. Determine the length less than the limitation of allowable maximum piping length. For the portion that exceeds 50m, set based on the main piping size (LA) listed in Table 3. 3) If the piping length marked "L" (L2-L4) exceeds 40m, increase the piping size at the portion after the 1st distribution joint by 1 rank for the liquid pipe, suction pipe and discharge pipe. Refer to the Technical Data for the details. 4) If any of the piping length exceeds 30m, increase the size of the suction pipes, discharge pipes and liquid pipes by 1rank.

\* The outdoor connection main piping (LO portion) is determined by the total capacity of the outdoor units that are connected to the pipe ends.

## System limitations.

Maximum number allowable connected outdoor units	3
Maximum capacity allowable connected outdoor units	135kW (48HP)
Maximum connectable indoor units	52
Maximum allowable indoor / outdoor capacity ratio	50-150%

1) In the case of 24 HP (type 68kW) or smaller units, the number is limited by the total capacity of the connected indoor units.

2) Up to 3 units can be connected if the system has been extended.

3) It is strongly recommended that you choose the unit so the load can become between 50 and 130%.

## Additional refrigerant charge.

Liquid piping size Inch (mm)	Amount of refrigerant charge/m (g/m)
1/4 (6,35)	26
3/8 (9,52)	56
1/2 (12,70)	128
5/8 (15,88)	185
3/4 (19,05)	259
7/8 (22,22)	366

## Necessary amount of additional refrigerant charge per meter, according to discharge piping size.

Discharge piping size	Inch (mm)	1/2 (12,70)	5/8 (15,88)	3/4 (19,05)	7/8 (22,22)	1 (25,40)	1-1/8 (28,58)	1-1/4 (31,75)	1-1/2 (38,10)
Additional amount	g/m	12	21	31	41	55	71	89	126

## Refrigerant piping.

Piping size Inch (mm)	Material Temper - 0	Material Temper - 1/2 H, H
1/4 (6,35)	t 0,8	7/8 (22,22) t 1,0
3/8 (9,52)	t 0,8	1 (25,40) t 1,0
1/2 (12,70)	t 0,8	1-1/8 (28,58) t 1,0
5/8 (15,88)	t 1,0	1-1/4 (31,75) t 1,1
3/4 (19,05)	t 1,2	1-1/2 (38,10) t 1,15
		1-1/5 41,28 t 1,20

\* When bending the tubes, use a bending radius that is at least 4 times the outer diameter of the tubes. In addition, take sufficient care to avoid crushing or damaging the tubes when bending them.

## NEW 3-PIPE ECOi EX MF3 SERIES

**4,85**  
SCOP

NEW  
18



### Simultaneous heating and cooling operation with heat recovery type.

New 3-Pipe ECOi EX MF3 Series is one of the most advanced VRF systems. Not only high-efficient performance for simultaneous heating and cooling, but also sophisticated installation and maintenance available.

- Achieving SCOP 4,77 as the top class in the industry (LOT21 Seasonal heating efficiency value for 8HP outdoor unit)
- Simultaneous cooling and heating operation with up to 39 indoor units
- Slim heat recovery boxes with just 200mm height fit with the ceiling space limited in hotel applications
- Rotation operation function and back-up operation function provided

### Technical focus

- High SEER/SCOP at full Load capacity (Follows LOT21)
- EER, COP: Eurovent certified
- Standardisation of outdoor unit to one compact casing size
- The constant-speed compressor adopts a high-performance internal high-pressure scroll
- Up to 52 indoor units connectable
- High external static pressure 80 Pa with a newly designed fan, fan guard, motor, and casing
- Silent outdoor unit operation: Minimum 54dB(A) for 8HP
- Bluefin condenser outdoor unit

			8HP	10HP	12HP	14HP	16HP
Outdoor Units			U-8MF3E8	U-10MF3E8	U-12MF3E8	U-14MF3E8	U-16MF3E8
Power supply	Voltage	V	380/400/415	380/400/415	380/400/415	380/400/415	380/400/415
	Phase		Three Phase	Three Phase	Three Phase	Three Phase	Three Phase
	Frequency	Hz	50	50	50	50	50
Cooling capacity		kW	22,40	28,00	33,50	40,00	45,00
EER <sup>1)</sup>		W/W	5,11	4,72	3,91	3,70	3,49
SEER <sup>2)</sup>		W/W	<b>7,02</b>	<b>7,05</b>	<b>6,39</b>	<b>6,69</b>	<b>6,02</b>
Running current cooling		A	7,16/6,80/6,55	9,90/9,41/9,07	3,19/13,20/12,70	18,20/17,30/16,70	21,30/20,20/19,50
Input power cooling		kW	4,38	5,93	8,57	10,80	12,90
Heating capacity		kW	25,00	31,50	37,50	45,00	50,00
COP <sup>1)</sup>		W/W	5,25	5,17	4,51	4,21	4,17
SCOP <sup>2)</sup>		W/W	<b>4,85</b>	<b>4,25</b>	<b>4,27</b>	<b>4,13</b>	<b>3,81</b>
Running current heating		A	7,78/7,39/7,12	10,20/9,66/9,31	13,40/12,80/12,30	18,10/17,20/16,50	20,00/19,00/18,30
Input power heating		kW	4,76	6,09	8,32	10,70	12,00
Starting current		A	1,00	1,00	1,00	2,00	2,00
External static pressure (Max)		Pa	80	80	80	80	80
Air volume		m/min	210	220	232	232	232
Sound pressure	Normal mode	dB(A)	54,00	57,00	60,00	61,00	62,00
	Silent mode 1 / 2	dB(A)	51,00/49,00	54,00/52,00	57,00/55,00	58,00/56,00	59,00/57,00
Sound power	Normal mode	dB	76,00	78,00	81,00	82,00	82,00
Dimension	H x W x D	mm	1842x1180x1000	1842x1180x1000	1842x1180x1000	1842x1180x1000	1842x1180x1000
Net weight		kg	261	262	286	334	334
Piping connections <sup>3)</sup>	Liquid pipe	Inch (mm)	3/8(9,52)/1/2(12,70)	3/8(9,52)/1/2(12,70)	1/2(12,70)/5/8(15,88)	1/2(12,70)/5/8(15,88)	1/2(12,70)/5/8(15,88)
	Discharge pipe	Inch (mm)	5/8(15,88)/3/4(19,05)	3/4(19,05)/7/8(22,22)	3/4(19,05)/7/8(22,22)	7/8(22,22)/1(25,40)	7/8(22,22)/1(25,40)
	Suction pipe	Inch (mm)	3/4(19,05)/7/8(22,22)	7/8(22,22)/1(25,40)	1(25,40)/1-1/8(28,58)	1(25,40)/1-1/8(28,58)	1-1/8(28,58)/1-1/4(31,75)
	Balance pipe	Inch (mm)	1/4(6,35)	1/4(6,35)	1/4(6,35)	1/4(6,35)	1/4(6,35)
Refrigerant [R410A]		kg/TCO <sub>2</sub> Eq.	6,80/14,1984	6,80/14,1984	8,30/17,3304	8,30/17,3304	8,30/17,3304
Maximum allowable indoor / outdoor capacity ratio %			50 ~ 150	50 ~ 150	50 ~ 150	50 ~ 150	50 ~ 150
Operating range	Cool Min ~ Max	°C	-10 ~ +52	-10 ~ +52	-10 ~ +52	-10 ~ +52	-10 ~ +52
	Heat Min ~ Max	°C	-20 ~ +18	-20 ~ +18	-20 ~ +18	-20 ~ +18	-20 ~ +18
	Simultaneous op.	°C	-10 ~ +24	-10 ~ +24	-10 ~ +24	-10 ~ +24	-10 ~ +24

#### Solenoid valve kit

KIT-P56HR3	KIT-P56HR3	3-Pipe control Solenoid valve kit (up to 5,60kW)
	CZ-P56HR3	Solenoid valve kit (up to 5,60kW)
	CZ-CAPE2	3-Pipe control PCB
KIT-P160HR3	KIT-P160HR3	3-Pipe control Solenoid valve kit (from 5,6 to 10,60kW)
	CZ-P160HR3	Solenoid valve kit (up to 16,00kW)
CZ-CAPEK2	CZ-CAPE2	3-Pipe control PCB
		3-Pipe control PCB for wall mounted

#### 3-Pipe control box kit

CZ-P456HR3	4 ports 3 pipe box (up to 5,60kW)
CZ-P656HR3	6 ports 3 pipe box (up to 5,60kW)
CZ-P856HR3	8 ports 3 pipe box (up to 5,60kW)
CZ-P4160HR3	4 ports 3 pipe box (up to 16,00kW)

<sup>1)</sup> EER and COP calculation is based in accordance to EN14511. <sup>2)</sup> SEER/SCOP is calculated based on the seasonal space cooling/heating efficiency "η" values of the COMMISSION REGULATION (EU) 2016/2281. SEER, SCOP = (η + Correction) × PE. <sup>3)</sup> Pipe diameter under 90m for ultimate indoor unit / over 90m for ultimate indoor unit (if the longest piping equivalent length exceeds 90m, increase the sizes of the main tubes by 1 rank for gas tubes and liquid tubes).



