HITACHI
Inspire the Next

HEAT EXCHANGER VENTILATION

KPI-(E/H)1E

Technical Catalogue

HITACHI
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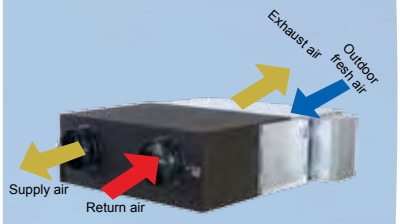


1 Complementary systems

◆ Fan units with energy recovery, KPI

The new KPI units come in a wide range of models with airflows from 500 to 3,000m³/h, which allow a system adapted to any type of installation in accordance with its requirements.

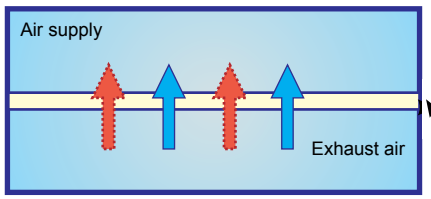
Units from 500 m³/h to 2000 m³/h perform recuperation of temperature and humidity from the inner air. On the other hand the unit of 3000 m³/h only affects the temperature. Depending the installation requirements the units from 500 m³/h to 2000 m³/h allows the user to change the heat exchanger component by one that only works over the temperature.

KPI units are fitted with a highly-efficient exchanger with the following features.

KPI units are fitted with a highly-efficient exchanger with the following features:

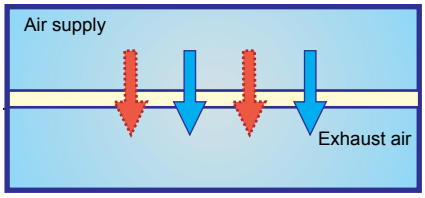
- Fresh air supply for indoor environments.
- Heat transfer from the new air to the discharged air in summer, and the other way around in the winter.
- New air filter.
- As a consequence of the humidity exchanger during summer period, the power consumption of the air conditioner system can be reduced at most in 20%.

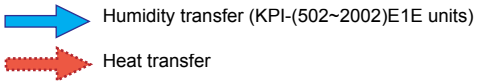
Operation in winter



Heat exchanger

Operation in summer

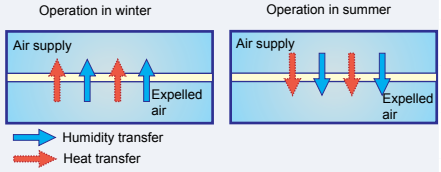




◈ Wide range of units:

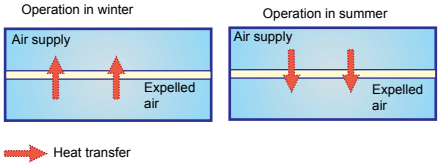
- KPI models with energy recovery:

Model	Flow (m³/h)	Temperature Exchange Efficiency
KPI-502E1E	500	75
KPI-802E1E	800	75
KPI-1002E1E	1,000	78
KPI-1502E1E	1,500	78
KPI-2002E1E	2,000	78



- KPI models with heat recovery:

Model	Flow (m³/h)	Temperature Exchange Efficiency
KPI-3002H1E	3,000	54



☛ Main features of the units:

◈ **Flexibility (KPI-(502~2002)E1E units)**

By just swapping the exchanger one can change from an energy recovery unit to a heat recovery unit, depending on the type of installation.

Heat recovery exchanger

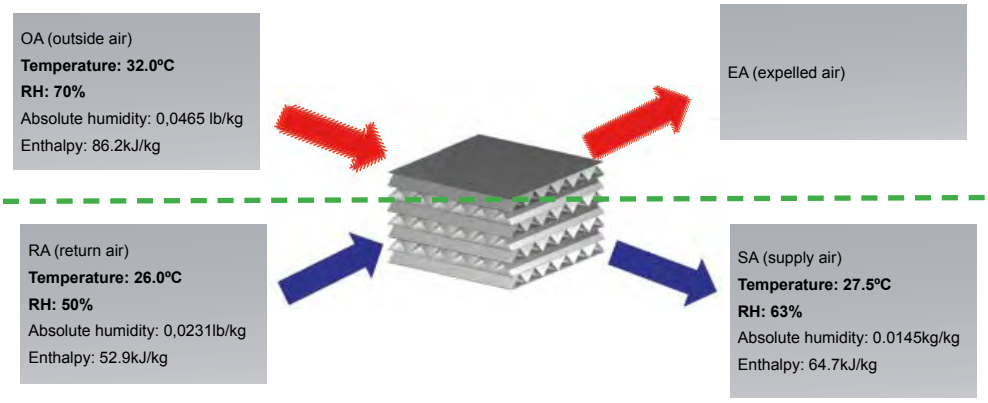
Energy recovery exchanger

◈ **Different operating modes**

Unit KPI-3002H1E always perform the exchange between both streams under any working condition. On the other hand units from 500 m³/h to 2000 m³/h allow the user to choose between different ventilation modes: Forced exchange ventilation, forced free ventilation and automatic ventilation mode.

- Heat exchange mode

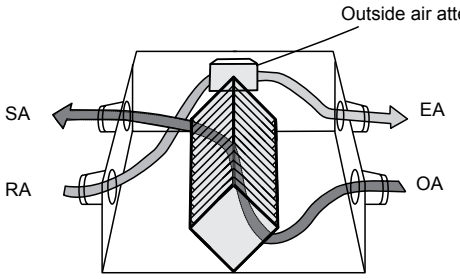
  Under any working conditions, the inlet and outlet stream cross the heat exchanger performing energy transfer between both of them. The exchanger can be of humidity or of humidity and temperature at the same time. The exchange efficiency can reach even to 80%.



(*) Exemple of working in cooling mode

- Ventilation Mode

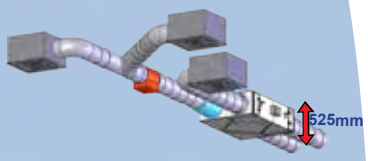
  Air returned from the indoor side is exhausted without heat exchange.



NOTES:

OA: Outdoor fresh air
EA: Expelled air
SA: Air supplied
RA: Return air

☛ Main features of the units:



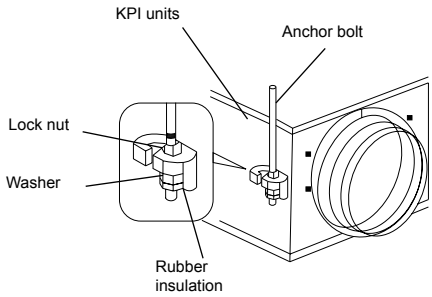
- Automatic Ventilation

  When the unit is set in automatic ventilation mode, is the control itself who decide if the best option is to perform heat exchange or if on the other hand is better a free ventilation mode.

  The variables used by the control are the outdoor temperature, the indoor temperature and also the temperature set by the user. The target is always to have the maximum comfort with the minimum power consumption.

◈ Features

- Low noise level:
  Only the fans move.
- Compact (KPI-(1502/2002)E1E units):
  The slim design of the KPI units make them the most compact in their category.
  Their lightweightness and height make transport easier and mean that less room and time are required for installation, since they can be positioned underneath a suspended ceiling without difficulty, just like any other indoor unit.
- Heat exchanger:
  The heat exchangers have been designed using highly permeable materials, which allows a considerable and/or latent heat exchange between the inside and outside air, ensuring that the two do not mix.
- Easy installation:
  HITACHI's KPI units are installed safely and easily, since they have 4 fastening hooks that allow straightforward and safe installation.
  The ducts are adjusted using a flange that allows them to be moved easily and safely. The fastening system is shown below:



Example: KPI-(502~2002)E1E

- Carefree maintenance:
  The key components of HITACHI's KPI units can be accessed easily, through hatches on the sides and lower parts of the machine. These components include the exchanger, power box and fans.

2 KPI - Energy recovery ventilation units

KPI MODEL			KPI-502E1E	KPI-802E1E	KPI-1002E1E	KPI-1502E1E	KPI-2002E1E	KPI-3002H1E
Air flow rate	Hi	m³/h	500	800	1000	1500	2000	3000
	Med		480	740	960	1440	1920	2870
	Low		450	680	900	1320	1780	2750
External pressure	Hi	Pa	90	90	150	150	160	120
	Med		85	80	140	135	145	110
	Low		75	65	120	110	125	110
Temperature exchange efficiency	Hi	%	75	75	78	78	78	54
Enthalpy exchange efficiency for heating	Hi	%	65	67	68	68	66.5	46
Enthalpy exchange efficiency for cooling	Hi	%	60	61	62	62.5	61.5	46
Sound pressure level	Hi	dB(A)	38	39	40	42	44	45
Sound power level	Hi	dB(A)	52	54	55	59	63	64
External dimensions	Height	mm	330	385	385	525	525	650
	Width		1130	1210	1650	1800	1800	1245
	Depth		925	1015	1215	1130	1430	2124
Net weight		Kg	53	62	99	113	135	209
Packaging measurements		m³	0.34	0.47	0.85	1.07	1.35	1.72
Fan		-						
	Q´ty	-	2	2	2	2	2	2
	Type	-	Multi-blade turbo fan (steel)					
	Power	W	135+135	155+155	380+380	490+490	490+490	680+680

NOTE:

1. The exchange efficiency is based on the EN14511 standard.

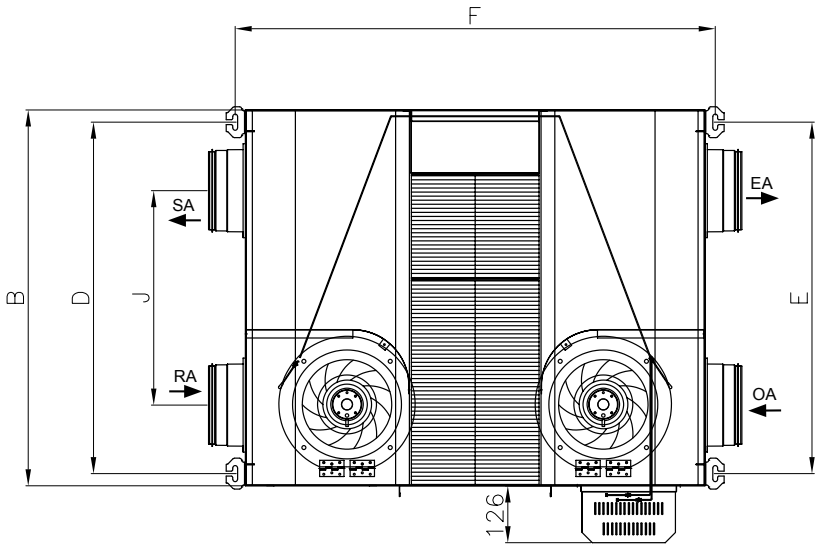
Operating conditions		Cooling	Heating
Indoor air inlet temperature	DB	27.0 °C	20.0 °C
	WB	19.0 °C	
Outdoor air inlet temperature	DB	35.0 °C	7.0 °C
	WB		6.0 °C

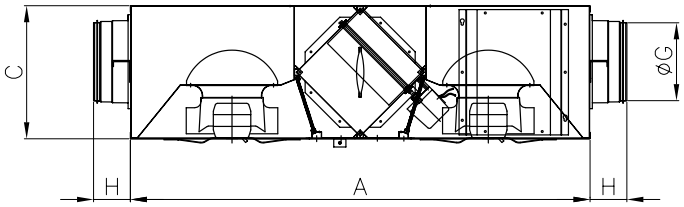
DB: Dry Bulb; WB: Wet Bulb

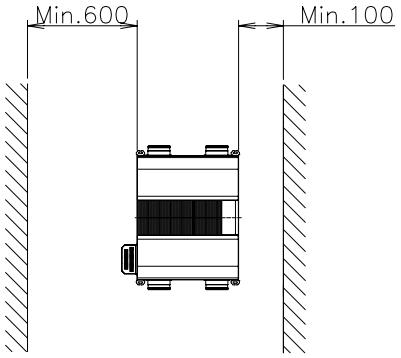
2. The sound pressure level is based on the following conditions:
   - 1.5 meters beneath the unit (no ceiling under the unit), 1 m from suction duct and 2 m from discharge duct.
   - Power supply voltage is 230 V.
3. The above was measured in an anechoic chamber, so reflected sound should be taken into consideration when installing the unit.

3 Total heat exchanger

◆ **KPI-(502/802)E1E**







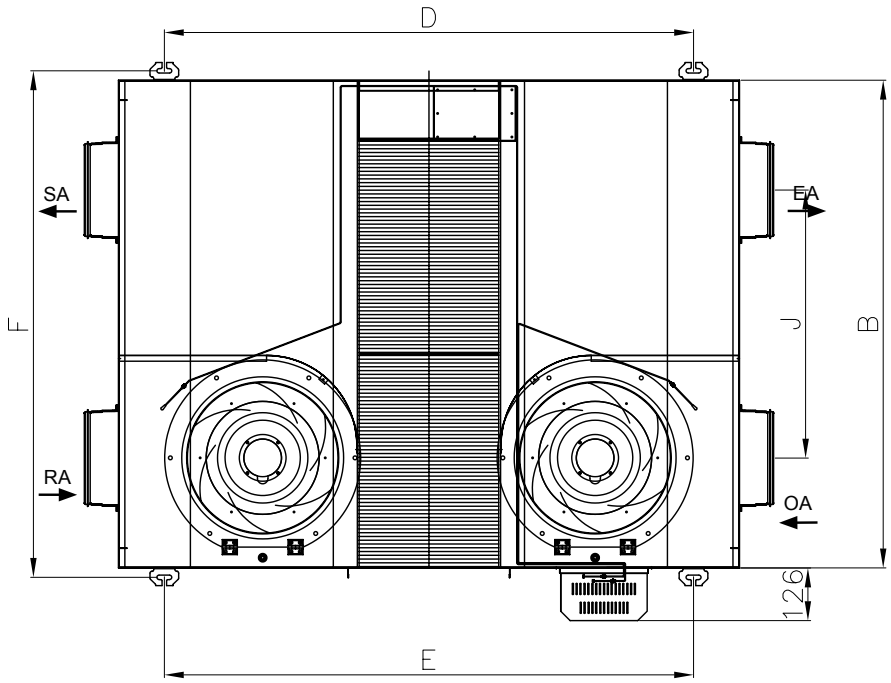
NOTES:

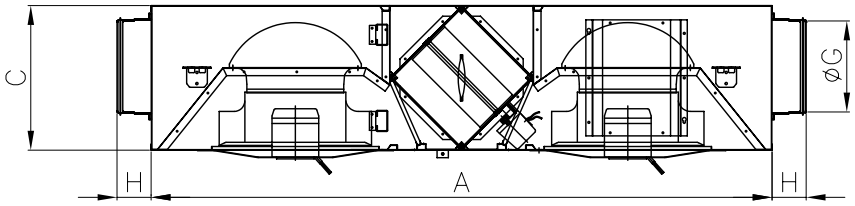
OA: Outdoor air
EA: Expelled air
RA: Return air
SA: Supply air

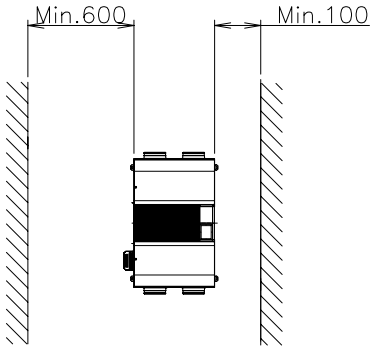
Units: mm

Model	Dimensions			Support for ceiling			Duct connection		
	A	B	C	D	E	F	G	H	J
KPI-502E1E	1130	925	330	864	864	1180	200	90	527
KPI-802E1E	1210	1015	385	1258	954	1260	250	91	567

◆ **KPI-(1002~2002)E1E**







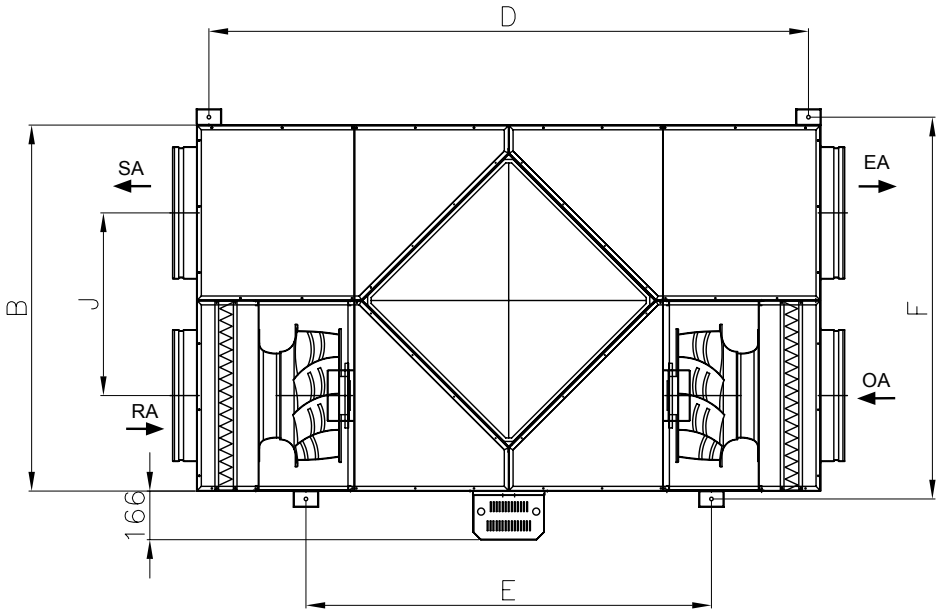
NOTES:

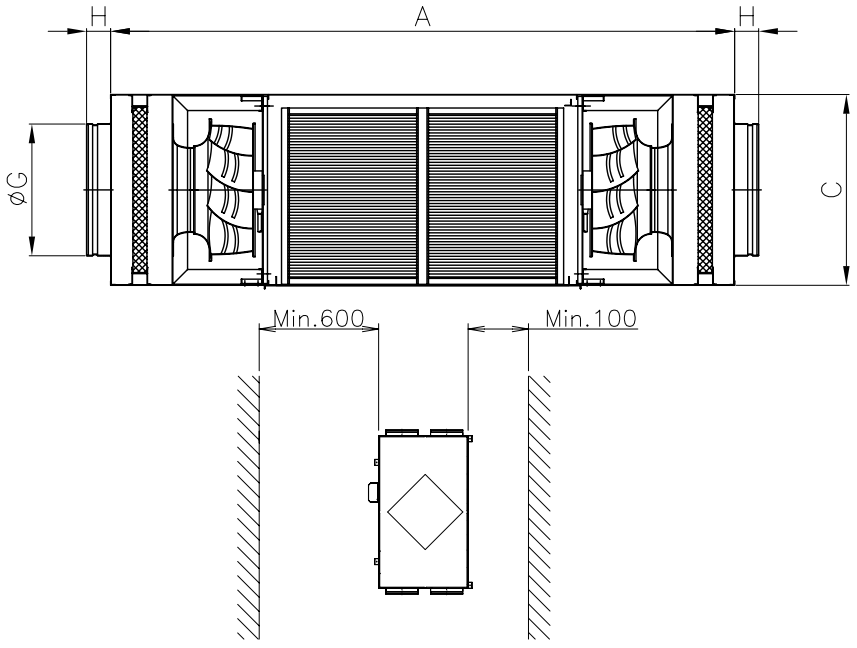
OA: Outdoor air
EA: Expelled air
RA: Return air
SA: Supply air

Units: mm

Model	Dimensions			Support for ceiling			Duct connection		
	A	B	C	D	E	F	G	H	J
KPI-1002E1E	1650	1300	385	1404	1404	1344	250	91	711
KPI-1502E1E	1800	1130	525	1557	1557	1178	300	91	541
KPI-2002E1E	1800	1430	525	1557	1557	1478	350	91	841

◆ **KPI-3002H1E**





NOTES:

OA: Outdoor air
EA: Expelled air
RA: Return air
SA: Supply air

Units: mm

Model	Dimensions			Support for ceiling			Duct connection		
	A	B	C	D	E	F	G	H	J
KPI-3002H1E	2124	1245	650	2040	1380	1300	450	82	622

4.1 KPI system selection procedure

4.1. Selection guide for KPI

There are two methods for calculating the suitable unit:

- **Method 1, Areas**
- **Method 2, Inhabitants**

It is important to check the local legislation regarding certification of the final results. This is a quick method for calculating the ventilation. Remember that this result is only approximate.

The air will need to be renewed in order to reduce the CO_2 levels in the room and to eliminate unpleasant odors, smoke, and pollution. In short, the room must be ventilated to provide a greater comfort level for the occupants.

The first point to analyze is the type of activity for which the room is used. An office is not the same as a bar.

Then, the volume of the room must be calculated.

☛ **Method 1:**

This method is based on **areas** and the frequency of air renewal.

Volume $V\ (m^3) = A \times B \times C$
$A \times B$ = Area of room (m^2)
C = Ceiling height (m)

☛ See table below to determine the number of air ventilations per hour required depending on the type of room. This table is not standard for all countries, although the layout will be the same.

Consult the specific standards for each country.

Type of room	Air ventilation/hour (N)
Cathedral	0
Modern church (low ceiling)	1-2
Schools	2-3
Offices	3-4
Bars	4-6
Hospitals	5-6
Restaurants	5-6
Laboratories	6-8
Discos	10-12
Kitchens	10-15
Laundries	20-30

The flow of air for renewal is calculated using the following formula:

Air flow rate $C\ (m^3/h) = V \times N$
V: Volume of the room (m^3)
N: Number of air ventilations

☛ **Example:**

A bank with an area of 60 m² and an average height of 3 m. requires 4 ventilations per hour. The airflow is therefore:

$C = 180 \times 4 = 720\ m^3/h$

The correct KPI model for this installation is KPI-802E1E. It provides an air flow of between 680 and 800 m³/h.

Method 2:

This system is based on **inhabitants.**

$$\text{Air flow (m}^3\text{/h) } C = \frac{20 \text{ x A x B}}{D}$$

20: Constant
AxB: Area of the room (m²)
D: Area occupied by each person (m²)
This area is limited to 10.

Example:

Bank with an area of 60 m² and 20 people.

$$C = \frac{20 \, x \, 60}{60/20} = 400 \; m^3/h$$

The correct KPI model for this installation is: KPI-502E1E It provides an air flow of between 350 and 500 m³/h.

◆ Applicable area range based on method 1

Considering an average height of 3 m, the suitable area range for the KPI will be calculated with the following air ventilations.

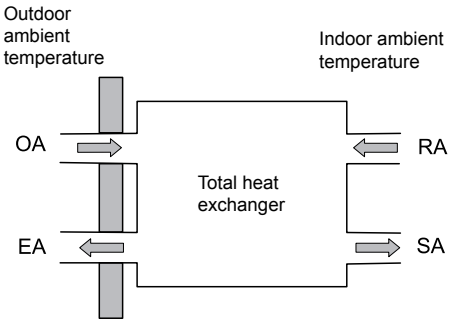
Air ventilations (N)	Unit	Air flow (m³/h)			Area of the room (m²)		
		Nominal	Range		Nominal	Range	
			Min.	Max.		Min.	Max.
2	KPI-502E1E	500	350	640	83	58	107
	KPI-802E1E	800	500	990	133	83	165
	KPI-1002E1E	1000	640	1460	167	107	243
	KPI-1502E1E	1500	810	2040	250	135	340
	KPI-2002E1E	2000	1400	2440	333	233	407
	KPI-3002H1E	3000	2000	3400	500	333	567
5	KPI-502E1E	500	350	640	33	23	43
	KPI-802E1E	800	500	990	53	33	66
	KPI-1002E1E	1000	640	1460	67	43	97
	KPI-1502E1E	1500	810	2040	100	54	136
	KPI-2002E1E	2000	1400	2440	133	93	163
	KPI-3002H1E	3000	2000	3400	200	133	227
7	KPI-502E1E	500	350	640	24	17	30
	KPI-802E1E	800	500	990	38	24	47
	KPI-1002E1E	1000	640	1460	48	30	70
	KPI-1502E1E	1500	810	2040	71	39	97
	KPI-2002E1E	2000	1400	2440	95	67	116
	KPI-3002H1E	3000	2000	3400	143	95	162
10	KPI-502E1E	500	350	640	17	12	21
	KPI-802E1E	800	500	990	27	17	33
	KPI-1002E1E	1000	640	1460	33	21	49
	KPI-1502E1E	1500	810	2040	50	27	68
	KPI-2002E1E	2000	1400	2440	67	47	81
	KPI-3002H1E	3000	2000	3400	100	67	113
15	KPI-502E1E	500	350	640	11	8	14
	KPI-802E1E	800	500	990	18	11	22
	KPI-1002E1E	1000	640	1460	22	14	32
	KPI-1502E1E	1500	810	2040	33	18	45
	KPI-2002E1E	2000	1400	2440	44	31	54
	KPI-3002H1E	3000	2000	3400	67	44	76

Air ventilations (N)	Unit	Air flow (m^3/h)			Area of the room (m^2)		
		Nominal	Range		Nominal	Range	
			Min.	Max.		Min.	Max.
20	KPI-502E1E	500	350	640	8	6	11
	KPI-802E1E	800	500	990	13	8	17
	KPI-1002E1E	1000	640	1460	17	11	24
	KPI-1502E1E	1500	810	2040	25	14	34
	KPI-2002E1E	2000	1400	2440	33	23	41
	KPI-3002H1E	3000	2000	3400	50	33	57
30	KPI-502E1E	500	350	640	6	4	7
	KPI-802E1E	800	500	990	9	6	11
	KPI-1002E1E	1000	640	1460	11	7	16
	KPI-1502E1E	1500	810	2040	17	9	23
	KPI-2002E1E	2000	1400	2440	22	16	27
	KPI-3002H1E	3000	2000	3400	33	22	38
40	KPI-502E1E	500	350	640	4	3	5
	KPI-802E1E	800	500	990	7	4	8
	KPI-1002E1E	1000	640	1460	8	5	12
	KPI-1502E1E	1500	810	2040	13	7	17
	KPI-2002E1E	2000	1400	2440	17	12	20
	KPI-3002H1E	3000	2000	3400	25	17	28
50	KPI-502E1E	500	350	640	3	2	4
	KPI-802E1E	800	500	990	5	3	7
	KPI-1002E1E	1000	640	1460	7	4	10
	KPI-1502E1E	1500	810	2040	10	5	14
	KPI-2002E1E	2000	1400	2440	13	9	16
	KPI-3002H1E	3000	2000	3400	20	13	23

4.2. Calculation of the heat exchanger efficiency

The following procedure shows how to obtain the total heat exchanger efficiency of the KPI, and the method for calculating the supply air temperature.

The following chart can be used:



NOTE:

OA: Outdoor fresh air
EA: Expelled air
SA: Supply air
RA: Return air

Nominal exchange temperature conditions:

		Indoor (RA)		Outdoor (OA)	
		Temp. (ºC) Dry bulb	Temp. (ºC) Wet bulb	Temp. (ºC) Dry bulb	Temp. (ºC) Wet bulb
Cooling	kW	27±1	20±2	35±1	29±2
Heating	kW	20±1	14±2	5±1	2±2

The air supply flow volume of supply and exhaust is the same.

The equations which give the necessary parameters for calculating the operating conditions of the KPI are given below. First, an energy balance has to be made.

Temperature exchange efficiency (sensible exchange efficiency)

$$\eta_t = \frac{t(OA)-t(SA)}{t(OA)-t(RA)} \times 100\ (\%)$$

NOTE:

The temperature t is given in ºC and DB.
The humidity x in kgw/kga
The enthalpy i in kJ/kg
ηt can be obtained from the graph in section of KPI-Fan performance
By determining the desired air flow, we obtain the temperature exchange efficiency.

Humidity exchange efficiency (latent exchange efficiency)

$$\eta_x = \frac{x(OA)-x(SA)}{x(OA)-x(RA)} \times 100\ (\%)$$

Total heat exchange efficiency (enthalpy exchanger efficiency)

$$\eta_i = \frac{i(OA)-i(SA)}{i(OA)-i(RA)} \times 100\ (\%)$$

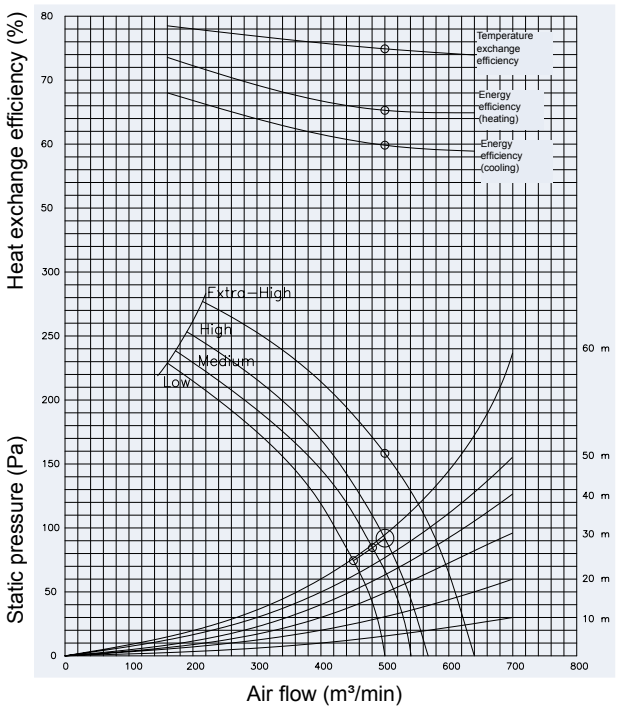
By using the temperature exchange efficiency, the temperature of the supply air can be determined according to the following formula:

$$t(SA) = t(OA)-?_t(t(OA)-t(RA))$$

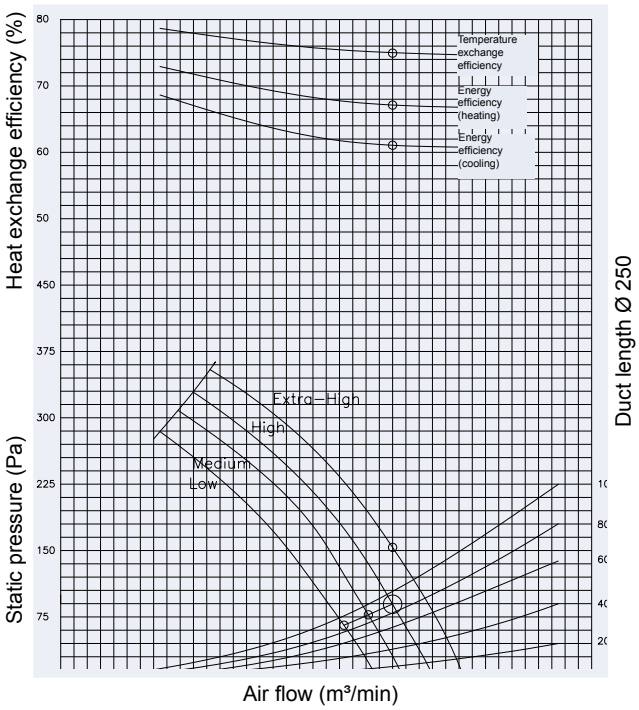
☛ η_t can be obtained from the chart in Section KPI-Fan performance
By determining the desired air flow, we obtain the temperature exchange efficiency.

4.3. KPI – Fan performance

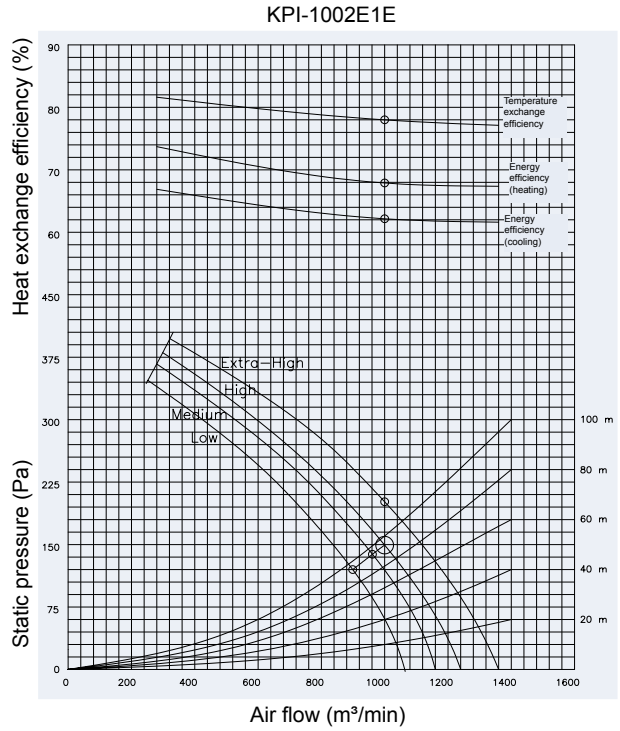
KPI-502E1E



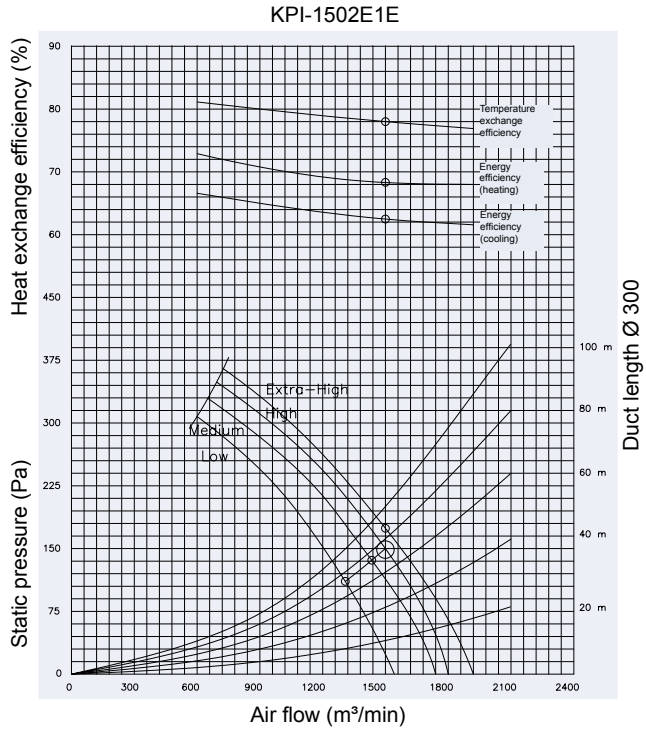
KPI-802E1E



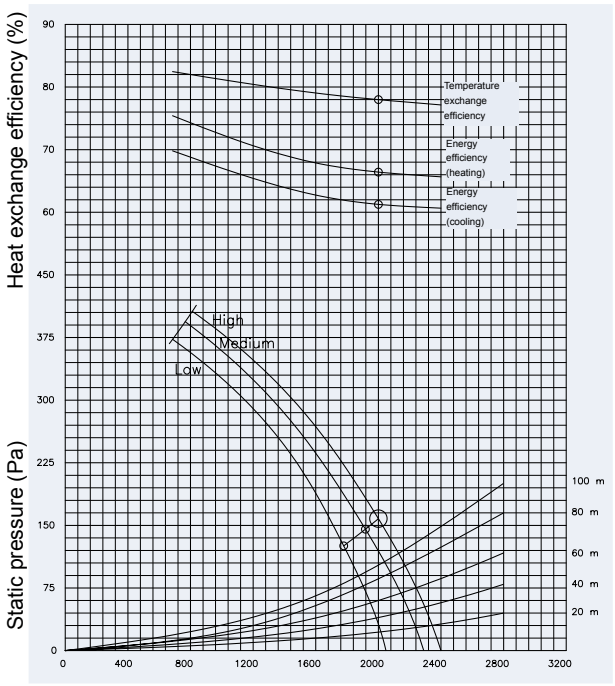
KPI-1002E1E



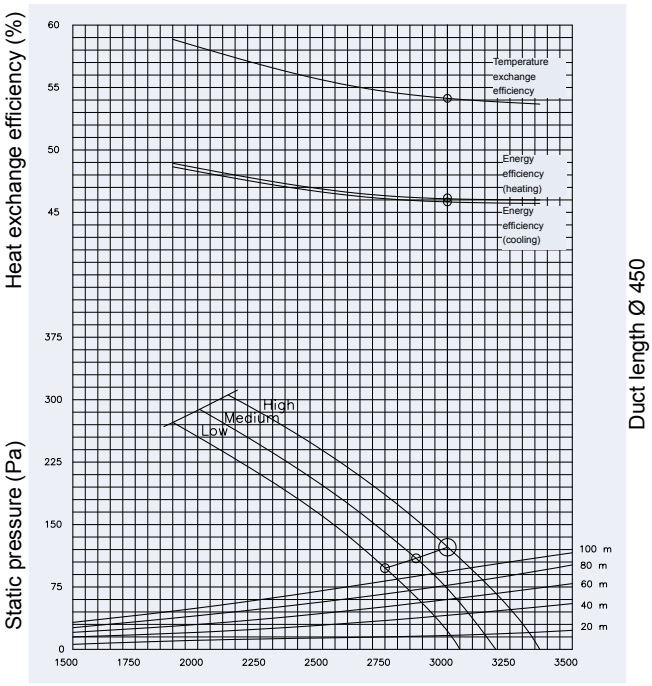
KPI-1502E1E



KPI-2002E1E



KPI-3002H1E



4

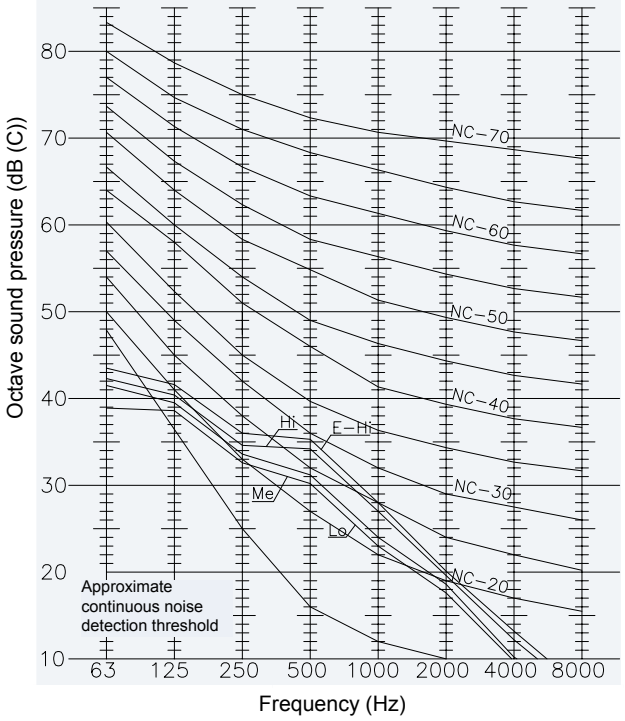
4.4. KPI

Model: KPI-502E1E | Power supply: 230 V 50 Hz

Measurement point: 1.5 meters below the unit with noise protected duct

Acoustic criteria curve

E-Hi/Hi/Me/Lo: 35/34/32/31 dB(A)

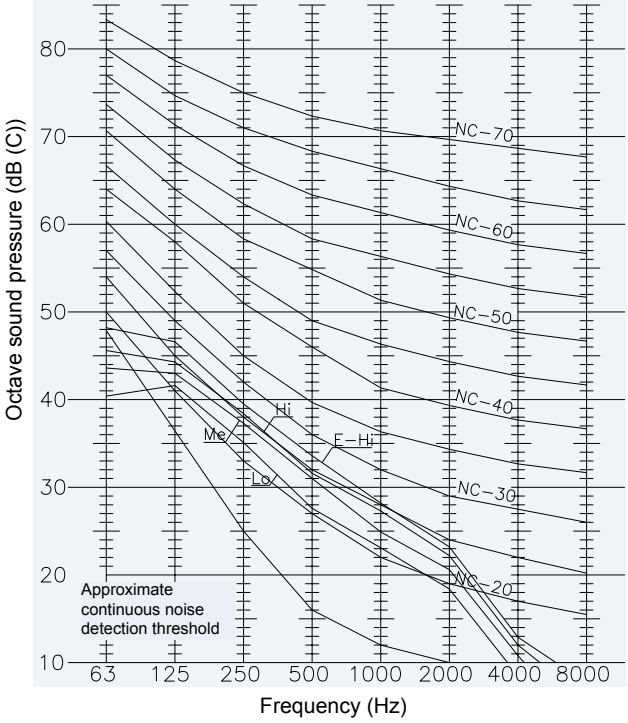


Model: KPI-802E1E | Power supply: 230 V 50 Hz

Measurement point: 1.5 meters below the unit with noise protected duct

Acoustic criteria curve

E-Hi/Hi/Me/Lo: 36/34/33/32 dB(A)

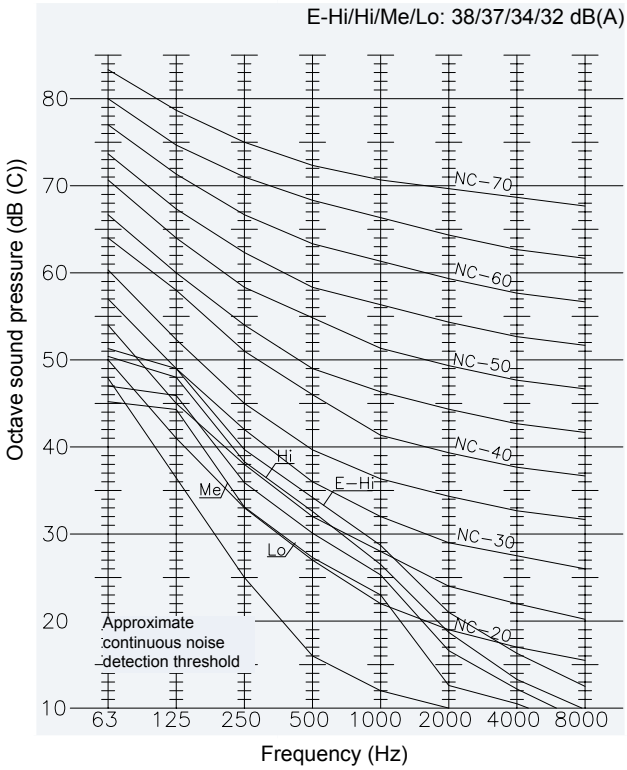


Model: KPI-1002E1E | Power supply: 230 V 50 Hz

Measurement point: 1.5 meters below the unit with noise protected duct

Acoustic criteria curve

E-Hi/Hi/Me/Lo: 38/37/34/32 dB(A)

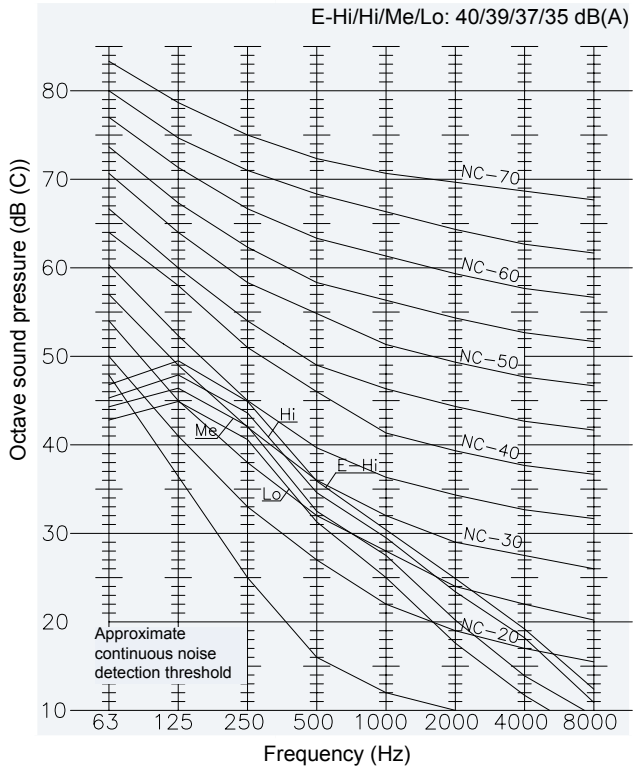


Model: KPI-1502E1E | Power supply: 230 V 50 Hz

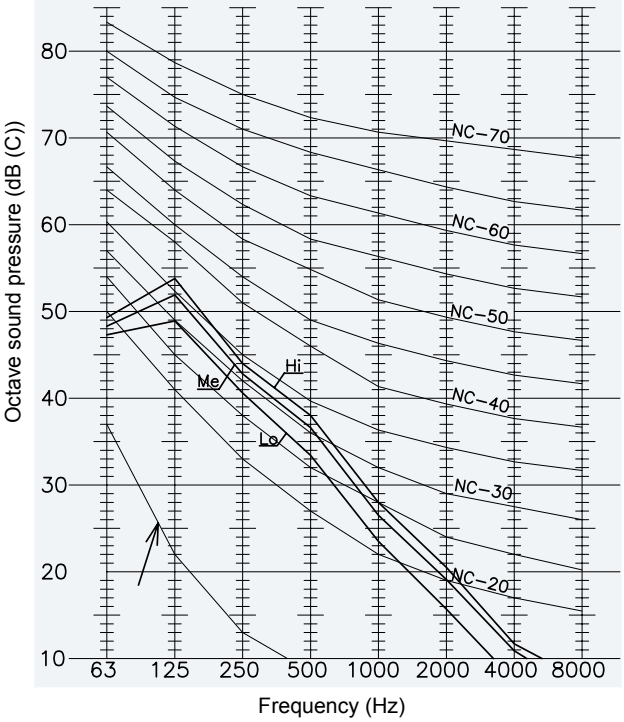
Measurement point: 1.5 meters below the unit with noise protected duct

Acoustic criteria curve

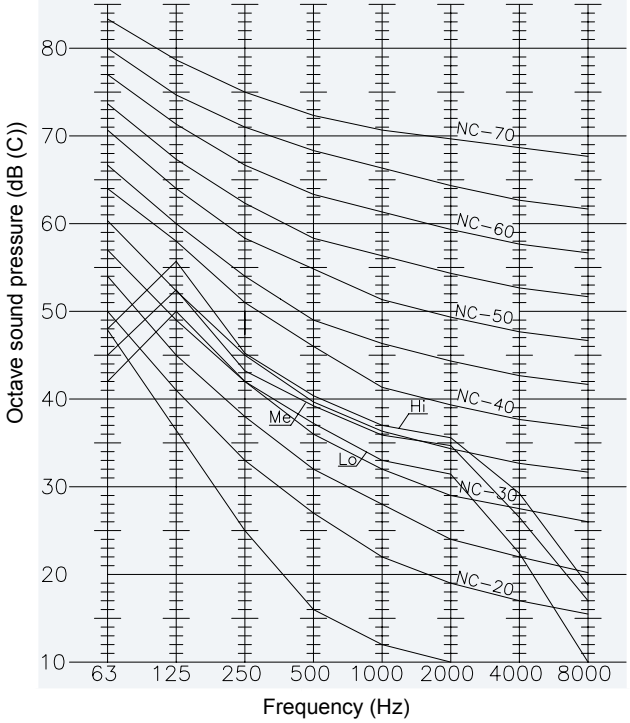
E-Hi/Hi/Me/Lo: 40/39/37/35 dB(A)



Model: KPI-2002E1E	Power source: 230 V 50 Hz
Measurement point:	1.5 meters below the unit with noise protected duct
	Acoustic criteria curve
	Hi/Me/Lo: 41/40/37 dB(A)



Model: KPI-3002H1E	Power source: 230 V 50 Hz
Measurement point:	1.5 meters below the unit with noise protected duct
	Acoustic criteria curve
	Hi/Me/Lo: 45/43/40 dB(A)



5. Electrical Data

Model	Main unit power			Applicable voltage		Fan motor			
	U (V)	PH	f (Hz)	U max. [V]	U min [V]	IPT [kW]	RNC [A]	Max. IPT [kW]	Max. Cur. [A]
KPI-502E1E	230	1	50	253	207	0.22	0.9	0.23	4.0
KPI-802E1E	230	1	50	253	207	0.37	1.6	0.40	4.0
KPI-1002E1E	230	1	50	253	207	0.58	2.7	0.62	8.0
KPI-1502E1E	230	1	50	253	207	0.79	3.6	0.88	8.0
KPI-2002E1E	230	1	50	253	207	0.89	4.0	0.91	8.0
KPI-3002H1E	230	1	50	253	207	1.45	6.0	1.45	12.0

U: Power voltage
PH: Phase (φ)
f: Frequency
IPT: Total input power
RNC: Running current
Cur: Current

NOTE

The specifications in these tables are subject to change without notice to allow HITACHI to offer its customers the latest innovations.