

◆ Expanded working range on Air Handling Units (AHU) applications

The working range for combination of DX-Interface series 2 with the outdoor units RAS-XH(V)NP(1)E is expanded in Air Handling Units (AHU) applications.

In case of cooling mode the DX-Interface series 2 can work with indoor unit temperatures from 10 °C to 26 °C (Wet Bulb), equivalent to 15 °C to 35 °C (Dry Bulb) in cooling.

On the other hand, in case of heating operation the inlet air temperature range is also modified, allowing minimum inlet air temperatures to the heat exchanger of 5 °C (DB).

◆ Extended range of compatible heat exchangers, allowing now larger internal volumes

Up to 10.73 dm³ of Heat Exchanger volume can be installed in single combination (1 Outdoor Unit RAS-XH(V)NP(1)E series + 1 DX-Interface series 2).

DX-Interface series 2	
Model	Heat Exchanger maximum internal volume (dm ³) ⁽¹⁾
EXV-2.0E2	1.64
EXV-2.5E2	1.83
EXV-3.0E2	2.89
EXV-4.0E2	4.56
EXV-5.0E2	4.56
EXV-6.0E2	5.11
EXV-8.0E2	6.93
EXV-10.0E2	10.73

⁽¹⁾ Check the limits of piping length vs HEX volume.

◆ Improved functionalities for control by outlet air temperature

- Extended range of setting for control by outlet air temperature

When applied to a system focused on discharge temperature, a more suitable temperature setting range is available. When is set the temperature control method in the remote control, automatically the temperature range of the setting allowed is changed to the values shown in the table:

	Control by inlet temperature	Control by outlet temperature
Cooling mode	19 °C ~ 30 °C (DB)	14 °C ~ 27 °C (DB)
Heating mode	17 °C ~ 30 °C (DB)	19 °C ~ 40 °C (DB)

- Adjustable Thermo-OFF temperature by means of “offset” parameter

All heat exchangers (HEX) designs have a ΔT between T_{in} and T_{out} temperatures. When capacity demand keeps going down in inverter systems, there is a limit where the system operates at a minimum frequency (minimum system capacity), in spite of demand being lower than system capacity at the barely minimum working status. In these operation conditions, and depending on HEX characteristics, it may occur that the outlet temperature becomes lower than setting temperature in cooling mode or higher in heating mode.

Optional function allows to adjust this difference of temperatures to more favourable conditions. This setting allows to select the maximum T_{out} offset temperature (against $T_{setting}$), assuming that setting temperature will not be achieved under certain circumstances.

◆ Extended lineup for applications up to 50 HP

Up to 5 units of DX-Interfaces series 2 can work as a group in the same indoor unit or device with heat exchanger, equivalent to a total power of 50 HP and a maximum heat exchanger volume of 53.65 dm^3 .

NOTE

To get to this maximum power and volume, the heat exchanger has to be split into five sections of 10.73 dm^3 and a 10 HP DX-Interface series 2 has to be connected to each module.

◆ Advanced functions for multiple DX-Interface series 2 installation

Up to 5 DX-Interfaces series 2 can work as a group with the same indoor unit or device with heat exchanger.

- Inlet and outlet air temperatures shared for a group of DX-Interfaces series 2 from one DX-Interface series 2 configured as group controller

When several DX-Interfaces series 2 are working with the same indoor unit or device with heat exchanger (HEX), one of them is set as group controller. Then, the air thermistors (THM1 and THM2) only need to be connected to this DX-Interface series 2 (information is shared through the remote controller transmission wiring).

With this option, installation procedure becomes simplified and less time-consuming.

- Improvement in defrosting procedure of DX-Interfaces series 2 working as a group, avoiding drop of heating capacity

The defrost operation of Outdoor Units connected to DX-Interface series 2 working as a group is timed in order to limit the effect of heating capacity drop caused by simultaneous defrost. This offers more stable capacity and better comfort from the application.

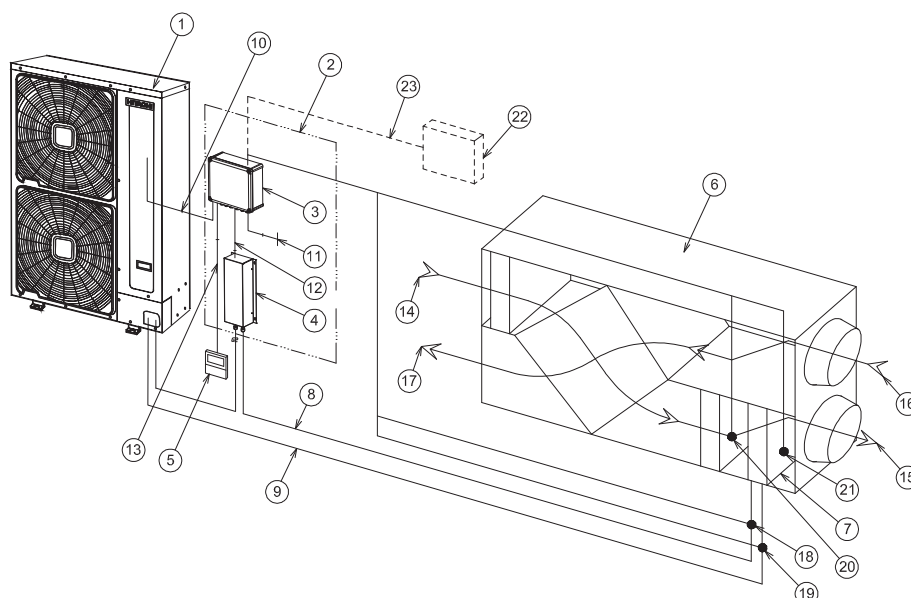
The time for the beginning of defrosting operation of each OU is established according to the total number of DX-Interface series 2 and the individual need for defrost of each OU, assuring secure operation of each unit.

This functionality will only have effect when using the special outdoor unit RAS-XH(V)NP(1)E.

◆ Advanced Optional Functions

- EC Fan or Tap Fan: The control of tap fans and EC fans is possible from the Dx-Interface.
- Defrost signal: Output signal get from the Dx-Interface when the system is in defrost mode.
- Fan operation during defrost: During defrost operation three different fan speed settings are possible: fan speed kept as set, fan speed reduced to low speed and fan stoppage.
- Thermo-ON / Thermo-OFF by an external input instead of typical control logic.
- Operation delay: Once the system is turned on, the unit is kept in off during an specific time. Useful for applications where the Dx-Interface is focused on comfort and not room conditioning.
- Thermistor selection: Option to select between inlet thermistor, external thermistor or remote controller thermistor to perform the cycle control (Only if demand control is based on inlet temperature).
- Fan Stoppage delay: Once the system is switched off, the unit keeps running for a suitable period of time, to for example, perform the air renovation once the activity is conclude.
- CO₂ sensor: By the action of an ON/OFF CO₂ sensor, the Dx-Interface switches the fan speed to high while the CO₂ concentration exceeds the sensor detection threshold.
- Remote temperature thermistor THM-R2AE is available for the DX-Interface Series 2 (EXV-(2.0-10.0)E2).

When connecting the remote temperature thermistor to the THM4 socket on the DX-Interface PCB1, it is automatically recognized and activated by the system control.



Item	Description	Item	Description
1	Hitachi outdoor unit	13	Remote controller communication
2	DX-Interface EXV-(2.0-10.0)E2	14	Outdoor air (AHU applications)
3	Control box	15	Supply air (AHU applications)
4	Expansion valve box	16	Return air (AHU applications)
5	Remote controller (sold separately as an accessory)	17	Exhaust air (AHU applications)
6	Unit or device with heat exchanger	18	Liquid pipe thermistor (THM3, PCB1)
7	DX- heat exchanger	19	Gas pipe thermistor (THM5, PCB1)
8	Liquid line	20	Inlet DX-Coil thermistor (THM1, PCB1)
9	Gas line	21	Outlet DX-Coil thermistor (THM2, PCB1)
10	Outdoor - Indoor communication	22	Field supplied controller (Optional)
11	Power supply	23	Duty signal (0~10 V, 0~5 V, 4~20 mA) (Optional)
12	Expansion valve control communication		

CAUTION

Check the limits of piping length vs HEX volume.

- The installation distance between the DX-interface and the device with heat exchanger must be the shortest possible.
- Keep the distance between the unit or device with heat exchanger and the expansion valve box for the piping length up to 5 m. Also the elevation difference between the unit or device with heat exchanger and the expansion valve box must be no more than 2 m.
- Make sure that the installation distance between the control box and the unit or device with heat exchanger is short enough that the thermistors sensing are not distorted.
- The thermistor cable should never be installed in the same ducting as power or control cables.

◆ DX-Interface series 2 applications and control mode

The following table summarizes system features for the applications with DX-Interface series 2.

		System		
Application		UTOPIA (IVX , RASC and ES)	UTOPIA DX RAS-XH(V)NP(1)E	SET FREE ⁽⁵⁾
Air curtain	Combinability	Single	-	Multi ⁽⁶⁾
	Control type	Outlet air temperature control	-	Inlet air temperature control
	Air curtain Capacity	2 - 10 HP	-	2 - 10 HP
	Accuracy control level	●●●●○	-	●●●○○ ⁽¹⁾
Duct (≤ 10% Fresh Air)	Combinability	Single	Modular	Multi ⁽⁶⁾
	Control type	Inlet air temperature control	Inlet air temperature control	Inlet air temperature control
	Duct Capacity	2 - 10 HP	12 - 50 HP ⁽²⁾⁽³⁾	2 - 10 HP
	Accuracy control level	●●●●●	●●●●●	●●●○○ ⁽¹⁾
Air handling unit (AHU)	Combinability	-	Single or Modular	-
	Control type	-	Outlet air temperature control or duty signal	-
	UTA Capacity	-	4 - 50 HP ⁽³⁾⁽⁴⁾	-
	Accuracy control level	-	●●●●●	-

NOTE

- ⁽¹⁾ System control focuses on cycle conditions and performance, not inlet air temperature condition only.
- ⁽²⁾ The power range is obtained by the combination of 3 HP to 10 HP outdoor unit models (RAS-XH(V)NP(1)E series).
- ⁽³⁾ In order to ensure balanced working conditions for outdoor units, it is necessary to consider the same capacity outdoor units for a same group.
- ⁽⁴⁾ The power range is obtained by the combination of 4 HP to 10 HP outdoor unit models (RAS-XH(V)NP(1)E series).
- ⁽⁵⁾ 1-1 combination with SET FREE series is not allowed.
- ⁽⁶⁾ In case DX-Interface series 2 ratio is less than 30% of the outdoor units capacity, the total connection ratio against Outdoor Unit Capacity is 50 ~ 130%, Otherwise, total connection ratio is limited to 50 ~ 100%

	DX-Interface series 2 ratio capacity	
	≤ 30%	30 ~ 100%
Total connection ratio capacity against Outdoor Unit Capacity (%)	50 ~ 130%	50 ~ 100%

◆ Thermo-ON/OFF Control Options

The DX-Interface series 2 makes it possible to perform Thermo-ON / Thermo-OFF control in three different ways.

- ✓ Standard Thermo-ON / Thermo-OFF control (Default setting)

Suitable for installations controlled by suction or discharge temperature.

The Thermo-ON / Thermo-OFF logic is operated from the difference between the reference temperature sensor and the set temperature on the remote controller or central controller.

- ✓ By an external input

The Thermo-ON / Thermo-OFF control can be driven externally by an input signal connected to the CN3 socket of the PCB1 of the DX-Interface series 2.

Setting note: DIP Switch 1 – Pin 6 of DX-Interface series 2 PCB2 (small PCB) must be switched on (PCB2-DSW1#6 switched ON). Once the DSW has been set on the PCB, the “i1” input of CN3 is automatically set for Thermo-ON / Thermo-OFF control. The setting of the “i2” input is kept as set on the remote controller.

Please refer to the Service Manual of Hitachi Indoor Units for further information about the setting and connection of the auxiliary inputs to CN3 socket.

- ✓ By the duty signal

For systems controlled by a duty signal, it is possible to force Thermo-OFF from the duty signal itself. When the duty signal reaches the minimum value of its range (0 V or 4 mA), the system switches to Thermo-OFF condition. The duty value must become higher than 8% of its range in order to switch back to Thermo-ON condition.

NOTE:

No additional setting is required once the demand control setting has been set as Duty control.

◆ Thermo ON/OFF in capacity control mode by air outlet

All HEX designs have a ΔT between T_{in} and T_{out} temperatures. When capacity demand keeps going down in inverter systems, there is a limit where the system operates at a minimum frequency (minimum system capacity), in spite of demand being lower than system capacity at the barely minimum working status. In these operation conditions, and depending on HEX characteristics, it may occur that the outlet temperature becomes lower than setting temperature (in cooling mode).

An optional function allows to adjust this difference of temperatures to more favourable conditions. The setting of this optional function (E1) can be done through the remote control, accepting several values:

Optional Function E1	
Value	Thermo-ON/OFF offset parameter (when system operates at minimum capacity (min compressor Hz))
00	0
01	2
02	4

This setting allows to select the maximum Tout offset temperature (against Tsetting), assuming that setting temperature will not be achieved under certain circumstances. By doing so, in the same conditions the system can achieve a room temperature higher than setting temperature (in cooling mode), while avoiding the occurrence of cold draft. A function based on the same principle is available for Heating mode, avoiding an excessively high Tout.

E1 selection criterium in cooling mode:

E1 = 0: No deviation from setting temperature (Default)

E1 = 1: Deviation of up to 2 °C more than setting temperature is allowed

E1 = 2: Deviation of up to 4 °C more than setting temperature is allowed

Example (Cooling mode)		
	Typical installation	Thanks to E1=1
Correction value (A)	--	2
Tset	25	25
Tin	27	27
ΔT at minimum frequency	10	10
Tout	17	27
Thermo status	ON	OFF
Over cooling temperature	8	-2

E1 selection criterium in heating mode:

E1 = 0: No deviation from setting temperature (Default)

E1 = 1: Deviation of up to 2 °C less than setting temperature is allowed

E1 = 2: Deviation of up to 4 °C less than setting temperature is allowed



NOTE

Considerations for DX-Interface series 2 installation.

These demand control options require specific considerations:

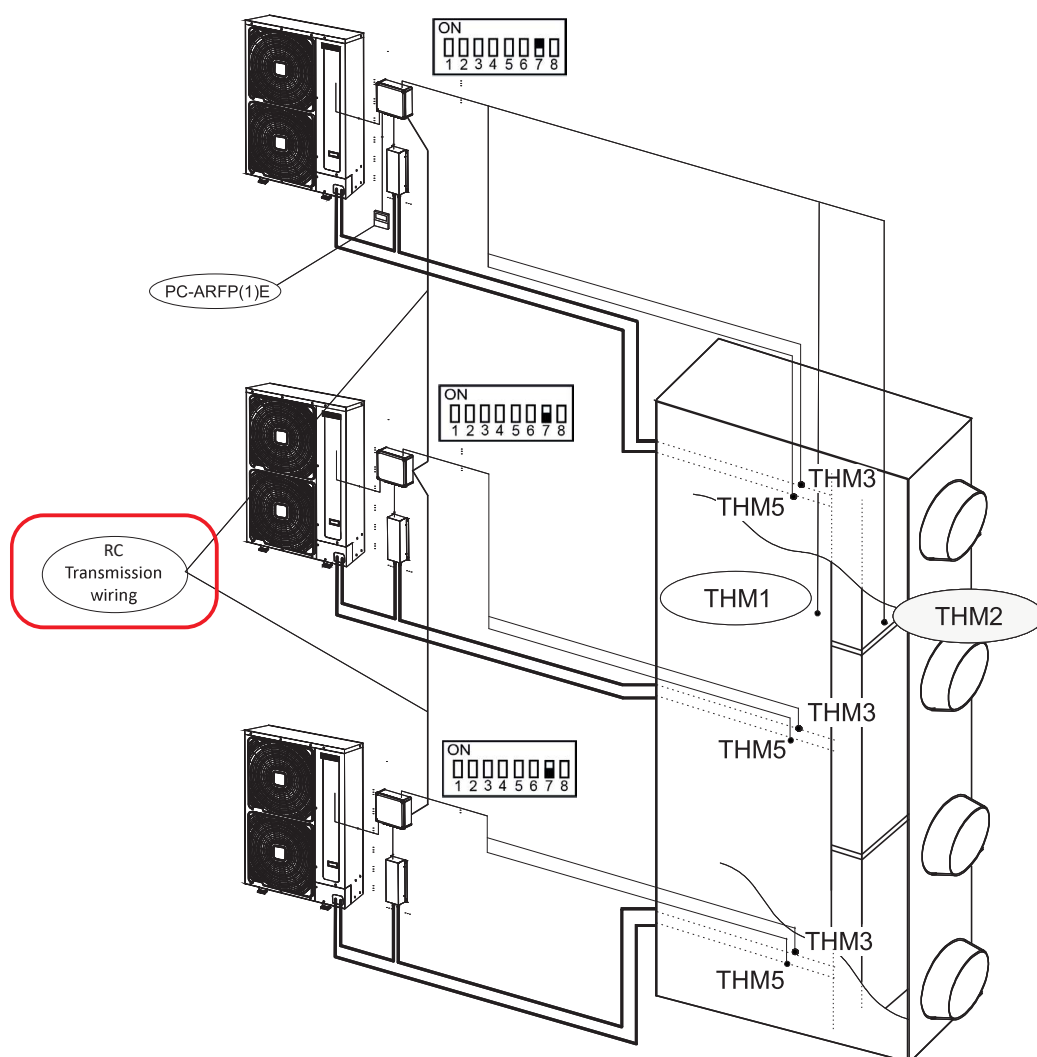
- ✓ **Inlet temperature control:** *The system operates as a standard indoor unit whenever the device connected to the DX-Interface series 2 respects design requirements.*
- ✓ **Duty control and outlet air control:** *Control is possible because the system is able to cope with the changes in demand and operation conditions, but then system accuracy limitations must be taken into consideration. The adjustment of demand might not be guaranteed in all cases, depending on several aspects of the operation conditions (indoor and outdoor air condition, system actions to ensure unit reliability, desired gap between inlet and outlet...).*

◆ **Multiple DX-Interface series 2 installation**

Up to 5 DX-Interface series 2 working with the same indoor unit or device with heat exchanger (HEX) can be installed. Such installation setting is restricted to certain applications, and by the installation of the dedicated IVX Premium RAS-XH(V)NP(1)E. This configuration is not allowed for other outdoor units.

Installation considerations:

- One unit of DX-Interface series 2 is to be set as a group controller, while all the other group members are sub (PCB2, DSW1, pin 7).
- Air thermistors (THM1 and THM2) are only connected to the DX-Interface series 2 set as group controller. However, every DX-Interface needs to be connected to its own pipe thermistors (THM3 and THM5).
- One remote controller PC-ARFP1E/ PC-ARFG(2)-E(B) has to be installed in the DX-Interface series 2 set as group controller and all DX-Interfaces series 2 must be linked through the remote control transmission wiring.
- Outdoor units must be of the same capacity. It is recommended to split the heat exchanger in as many parts as DX-Interface s series 2 are used in the air stream direction, ensuring that all the HEX sections have equivalent inlet air flow and temperature conditions.



Improvement of the defrost procedure

The defrost operation of outdoor unit connected to a DX-Interface series 2 working as a group is timed in order to avoid concurrent operation and limit the effect of a drop in heating capacity. This results in more stable capacity and better comfort for the application.

The beginning of defrosting operation of each OU is established according to the total number of DX-Interfaces series 2 and the individual need for defrost of each OU, so that secure operation can be guaranteed for each OU. In addition, simultaneous defrost is limited in order to obtain a better comfort.

The simultaneous defrost control is established according to the total number of DX-Interfaces series 2 working with the same unit or device with heat exchanger (HEX):

Number of DX-Interfaces series 2	Number of concurrent defrost
2 or 3	only 1 DX-Interface series 2 can defrost
4 or 5	up to 2 DX-Interfaces series 2 can defrost at the same time

3.1.10 DX-Interface

			DX-Interface models							
			EXV- 2.0E2	EXV- 2.5E2	EXV- 3.0E2	EXV- 4.0E2	EXV- 5.0E2	EXV- 6.0E2	EXV- 8.0E2	EXV- 10.0E2
Control Box										
Casing colour			Natural Grey (Munsell 1.0Y8.5/0.5)							
Dimensions	Height	mm	291	291	291	291	291	291	291	291
	Width	mm	341	341	341	341	341	341	341	341
	Depth	mm	127	127	127	127	127	127	127	127
Weight		kg	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Maximum fan current		A	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Power supply			1~ 230V 50Hz							
Expansion valves										
Casing colour			White (RAL-9016)							
Dimensions	Height	mm	431	431	431	431	431	431	431	431
	Width	mm	199	199	199	199	199	199	199	199
	Depth	mm	103	103	103	103	103	103	103	103
Weight		kg	2.0	2.7	2.7	2.7	2.7	2.7	4.5	4.5
Piping connection		mm	Ø 6.35	Ø 9.52	Ø 9.52	Ø 9.52	Ø 9.52	Ø 9.52	Ø 9.52	Ø 9.52
Accessories										
Remote control (Sold separately as an option)			PC-ARFP1E / PC-ARFG(2)-E(B)							
Centralized remote control (Sold separately as an option)			Central controllers are only compatible when the system is in control by Inlet temperature							

3.1.11 Adjusted capacities of indoor units

Unit whose capacity can be set through the DSW setting, the capacity are shown in the following table:

Power (HP)		1.3 (*)(**)		1.3 (*)(***)		1.8 (*)		2.3 (*)	
Variable capacity through DWS		1.0 → 1.3	1.5 → 1.3	2.0 → 1.3	2.5 → 1.8	3.0 → 1.8	3.5 → 1.8	4.0 → 2.3	4.5 → 2.3
Nominal cooling capacity (UTOPIA and CENTRIFUGAL series)	kW	3.2	3.2	4.5	5.3				
Nominal heating capacity (UTOPIA and CENTRIFUGAL series)	kW	3.6	3.6	5.0	6.0				
Nominal cooling capacity (SET FREE series)	kW	3.8	3.8	5.2	6.7				
Nominal heating capacity (SET FREE series)	kW	4.2	4.2	5.6	7.5				

(*) Capacity available with DSW3 setting.

(**) Only for RPK units.

(***) Not for RPK units.

4.6 Selection procedure for DX-interface

Units to be connected to the DX-Interface series 2 must satisfy the following requirements.

DX-Code	Mode	Allowed Heat exchanger Capacity (kW) ⁽¹⁾			Heat Exchanger Inner Volume (dm ³) ⁽²⁾			Recommended Heat Exchanger Air flow (m ³ /min)	
		Min	Nom	Max	Min	Max	Max ⁽²⁾ (Only UTOPIA RAS-XH(V)NP(1)E)	Min	Max
EXV-2.0E2	Cooling	4.0	5.0	5.6	0.57	1.16	1.64	8.0	21.0
	Heating	4.5	5.6	7.1					
EXV-2.5E2	Cooling	4.8	6.0	6.3	0.89	1.35	1.83	11.5	26.0
	Heating	5.6	7.0	7.1					
EXV-3.0E2	Cooling	5.7	7.1	8.0	1.03	1.57	2.89	12.5	30.0
	Heating	6.4	8.0	9.0					
EXV-4.0E2	Cooling	8.0	10.0	11.2	1.51	2.37	4.56	20.0	36.0
	Heating	9.0	11.2	12.5					
EXV-5.0E2	Cooling	10.0	12.5	14.0	1.92	2.37	4.56	23.0	41.5
	Heating	11.2	14.0	16.0					
EXV-6.0E2	Cooling	11.2	14.0	16.0	1.92	2.92	5.11	25.0	42.5
	Heating	12.8	16.0	18.0					
EXV-8.0E2	Cooling	16.0	20.0	22.4	2.92	3.89	6.93	59.0	78.0
	Heating	17.9	22.4	25.0					
EXV-10.0E2	Cooling	20.0	25.0	28.0	3.89	4.76	10.73	68.0	89.0
	Heating	22.4	28.0	31.5					

⁽¹⁾ Cooling and heating capacity data are based on the following indoor and outdoor temperature conditions, according to the EN 14511 standard.

Operation 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

Pipe length: 7.5 m; pipe height: 0 m.

⁽²⁾ Check the limits of piping length vs HEX volume.