

# KD series – Industrial double-flow evaporating units



Industrial double-flow evaporating units, in a low-profile design, with built-in control valves, built-in galvanised steel shell and steel bodywork with polyester paint.

## Features

- ▶ 400V 3N 50Hz power supply. Available in 60Hz. Other voltages on request.
- ▶ Double high efficiency coils, in copper pipes and aluminium fins, with 4 or 6 mm fin spacing.
- ▶ Built-in solenoid valve in liquid line and built-in adjustable thermostatic expansion valve.
- ▶ Double stainless steel draining pan and insulation for negative temperature.
- ▶ Air defrost.
- ▶ Low-speed and low-noise axial motor fans.
- ▶ Ready-to-solder refrigeration connections, with oil suction trap.

## Options

- ▶ Electric defrosting by means of heating elements.
- ▶ Electronic expansion valve.
- ▶ Control and power panel with electronic controller and digital display, with differential magneto-thermal protection of heaters and fans, 6 control relays, cold room and defrosting temperature probes, and operating LEDs.
- ▶ G3 filters on fans.
- ▶ Humidification / dehumidification / heating kit.
- ▶ Anti-corrosion battery coating.

DOUBLE HIGH EFFICIENCY COILS

THERMOSTATIC EXPANSION VALVE

REMOVABLE STAINLESS STEEL DRAIN PAN

BUILT-IN SOLENOID VALVE

LOW-NOISE AXIAL MOTOR FANS, MOUNTED ON NOZZLES

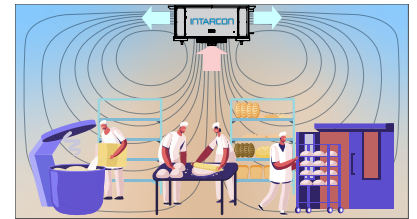
REMOVABLE PANEL FOR MAINTENANCE ACCESS



- ❄ High-efficiency batteries.
- ❄ Expansion and solenoid valves.
- ❄ 100 % factory tested and adjusted units for the highest performance.
- ❄ Electronic control (optional).

## Maximum comfort in industrial workrooms

The configuration of the motor fans in the industrial double flow evaporator, together with the double air supply through the coils, creates a smooth laminar air flow in the cold room with a reduced level of turbulence.



## Electric control panel (optional)

All units can be combined with an advanced multi-function controller, consisting of an electronic board integrated in the control panel and digital control unit.



400V 3N 50Hz | High temperature | Positive temperature | R-134a

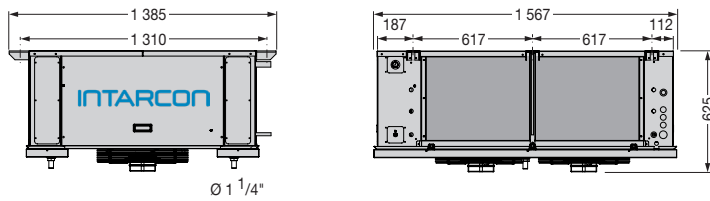
Refrigerant Application	Series / Model	Cooling capacity (W) according to cold room temperature <sup>(1)</sup>				Coil			Fans				Electrical defrost		Liq-Gas Cooling Connection	Weight (kg)	
		SC1	SC2	SC3	SC4	Fin spacing (mm)	Area (m <sup>2</sup> )	Vol. (litres)	Air flow (m <sup>3</sup> /h)	Nx Ø (mm)	Power (W)	I max. (A)	Air Range (m)	Power (W)			Intensity (A)
		10 °C 85 % RH DT1 = 10 K	0 °C 85 % RH DT1 = 8 K	-18 °C 95 % RH DT1 = 7 K	-25 °C 95 % RH DT1 = 6 K												
High	AKD-NY-1 245*	21 400	14 580			4	63.4	13.6	6 500	2x Ø 450	300	1.8	2x 12	12x 800	13.9	1/2"-1 3/8"	170
	AKD-NY-2 250	29 180	19 890			4	88.0	19.0	9 500	2x Ø 500	500	1.4	2x 12	18x 800	20.8	5/8"-1 5/8"	210
	AKD-NY-3 350	40 200	27 400			4	117.6	25.4	13 500	3x Ø 500	760	2.1	2x 12	18x 1 000*	26.0	7/8"-2 1/8"	260
Positive	MKD-NY-1 245*	19 370	13 200			6	42.8	13.6	7 200	2x Ø 450	295	1.8	2x 12	12x 800	13.9	1/2"-1 3/8"	166
	MKD-NY-2 250	25 360	17 280			6	59.4	19.0	10 000	2x Ø 500	485	1.4	2x 12	18x 800	20.8	5/8"-1 5/8"	204
	MKD-NY-3 350	35 170	23 970			6	79.2	25.4	14 500	3x Ø 500	740	2.1	2x 12	18x 1 000*	26.0	7/8"-2 1/8"	252

400V 3N 50Hz | High temperature | Positive temperature | Negative temperature | R-449A

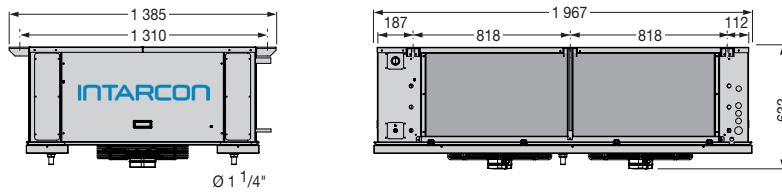
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		10 °C 85 % RH DT1 = 10 K	0 °C 85 % RH DT1 = 8 K	-18 °C 95 % RH DT1 = 7 K	-25 °C 95 % RH DT1 = 6 K												
High	AKD-NG-1 245*	23 910	16 290			4	63.4	13.6	6 500	2x Ø 450	300	1.8	2x 12	12x 800	13.9	5/8"-1 1/8"	170
	AKD-NG-2 250	33 810	23 040			4	88.0	19.0	9 500	2x Ø 500	500	1.4	2x 12	18x 800	20.8	5/8"-1 3/8"	210
	AKD-NG-3 350	46 940	31 990			4	117.6	25.4	13 500	3x Ø 500	760	2.1	2x 12	18x 1 000*	26.0	7/8"-1 5/8"	260
Positive / Negative	MKD-NG-1 245*	21 250	14 480			6	42.8	13.6	7 200	2x Ø 450	295	1.8	2x 12	12x 800	13.9	5/8"-1 1/8"	166
	BKD-NG-1 245*			10 690	8 720												
	MKD-NG-2 250	29 020	19 770			6	59.4	19.0	10 000	2x Ø 500	485	1.4	2x 12	18x 800	20.8	5/8"-1 3/8"	204
	BKD-NG-2 250			14 240	11 620												
	MKD-NG-3 350	40 720	27 750			6	79.2	25.4	14 500	3x Ø 500	740	2.1	2x 12	18x 1 000*	26.0	7/8"-1 5/8"	252
	BKD-NG-3 350			19 750	16 130												

Dimensions

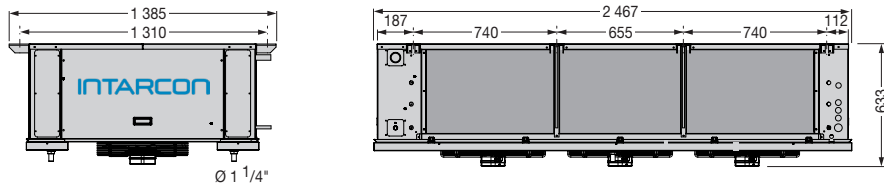
1 series



2 series

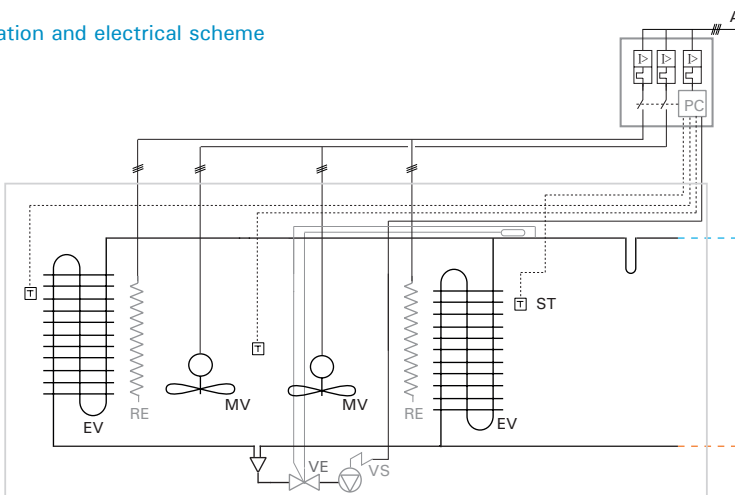


3 series



Dimensions in mm.

Refrigeration and electrical scheme



- MV: MOTOR FAN
- EV: EVAPORATOR
- AC: ELECTRICAL CONNECTION
- ST: COLD ROOM TEMPERATURE PROBE
- PC: CONTROL BOARD
- VE: EXPANSION VALVE
- VS: SOLENOID VALVE
- RE: DEFROST HEATER

<sup>(1)</sup> Cooling capacity at room temperature and relative humidity, calculated from dry cooling capacity according to EN 328 standard, applying the following empirical factors:

Conditions	Reference	Rate
10 °C 85 % RH	EN 328 SC1	1.35
0 °C 85 % RH	EN 328 SC2	1.15
-18 °C 95 % RH	EN 328 SC3	1.05
-25 °C 95 % RH	EN 328 SC4	1.00

To take into account the slip in R-449A, the average evaporating temperature has been considered.

\* Equipment with air defrosting powered at 230V 50Hz.

# Control and power panel

## Microcontroller

Compact control board to control evaporating units up to 3600 W defrost power. Optional for JB, JD and JC series.

- ▶ Electronic microprocessor control unit with digital display, with three control relays for solenoid valve, defrost and fans.
- ▶ Configurable digital input.
- ▶ Compact surface mounting.
- ▶ Supplied with 5 m electrical interconnections and 3 m power supply cable.

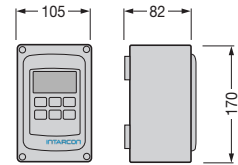
## Features of the control panel

Control and power panel for evaporators in high, medium and low temperature applications, with electronic controller and digital display. Optional for JD (3 to 5), KD, KC, KH and KV series.

- ▶ White painted galvanised sheet steel cabinet with key.
- ▶ Electronic control microprocessor with digital display, with six control relays for solenoid, defrost, fans, light, alarm, and configurable auxiliary relay; temperature and defrost probes,
- ▶ General cut-off switch, differential switch, three-pole contactors and magnetothermic switches for heating elements and fans.
- ▶ Operation indicator lights.
- ▶ Connection terminal block.
- ▶ Independent control for 1 or 2 evaporator units.
- ▶ Electronics with LAN BUS communication for synchronisation of up to 8 devices (except ATM-N-01031 and MTM-N-01161).

## Microcontroller dimensions

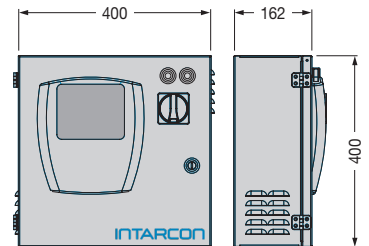
### 0 series



Dimensions in mm.

## Control panel dimensions

### 1 series



Dimensions (mm)	A	B	C
size 1	400	162	400
size 2	600	162	400
size 3	650	162	550
size 4	650	162	750

Dimensions in mm.

## Table of features for temperature control panel

	Model	Power supply	Max. defrost power (kW)	Max. defrost intensity (A)	Max. fans intensity (A)	VEE <sup>(1)</sup>	Application to evaporators	Control panel size <sup>(2)</sup>
For temperature control 1 evaporating unit	ATM-N-01031	230V	ventilated	--	3	-	JB, JD, JC	0
	ATM-N-11031	230V	ventilated	--	3	•	KC, JD 3-5	1
	ATM-N-13101	400V 3N	ventilated	--	10	•	KD, KH, KV 31,41,32,42	1
	ATM-N-13161	400V 3N	ventilated	--	16	•	KV 43,33,44	1
	MTM-N-01161	230V	3,6	16	3	-	JB, JD 1-2, JC	0
	MTM-N-11161	230V	3,6	16	3	•	JB, JD 1-2, JC	1
	MTM-N-13161	400V 3N	10	16	10	•	JD 3-5, KD 12, KC, KH 11-21-12, KV 31	1
	MTM-N-13201	400V 3N	12	20	10	•	KH 22, KV 41	1
	MTM-N-13321	400V 3N	20	32	10	•	KD 22-33, KH 13-23-14, KV 3256	1
	MTM-N-13401	400V 3N	25	40	10	•	KV 3263-4263, KH 24	1
For temperature control 2 evaporating units	MTM-N-13641	400V 3N	2x 20	64	16	•	KV 43,33,44	2
	ATM-N-11122	230V	ventilated	--	2x 6	•	JB, JD, JC, KC, KD 12	1
	ATM-N-13202	400V 3N	ventilated	--	2x 10	•	KH, KV 31-41-32	2
	ATM-N-13322	400V 3N	ventilated	--	2x 16	•	KV 43-33-44	2
	MTM-N-11322	230V	2x 3,6	2x 16	2x 6	•	JB, JD 1-2, JC	2
	MTM-N-13322	400V 3N	2x 10	2x 16	2x 10	•	KC, JD 3-5, KD 12, KH 11-21-12, KV 31	3
	MTM-N-13402	400V 3N	2x 12	2x 20	2x 10	•	KH 22, KV 41	3
	MTM-N-13642	400V 3N	2x 20	2x 32	2x 10	•	KD 22-33, KH 13-23-14-24, KV 3256-4263	3
	MTM-N-13802	400V 3N	2x 25	2x 40	2x 16	•	KV 3263	3

## Options

- ▶ Control panel available in 60Hz.

<sup>(1)</sup> Optional electronic expansion valve.

<sup>(2)</sup> Optionals, such as electronic expansion valve, may modify the control panel size.

Temperature and humidity control panel (AHM models)

Cuadro de control y potencia para controlar temperatura y humedad, con controlador electrónico y display digital.

- ▶ White painted galvanised sheet steel cabinet with key.
- ▶ Electronic control microprocessor with digital display, with six control relays for solenoid, defrost, fans, light, alarm, and configurable auxiliary relay; temperature and defrost and humidity probes.
- ▶ General cut-off switch.
- ▶ Operation indicator lights.
- ▶ Connection terminal block.
- ▶ Configurable digital input.

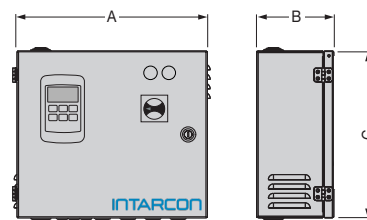
Features of humidity control panel (MHM models)

Control and power panel for evaporators in high, medium and low temperature applications, with electronic controller and digital display.

- ▶ White painted galvanised sheet steel cabinet with key.
- ▶ Electronic control microprocessor with digital display, with six control relays for solenoid, defrost, fans, light, alarm, and configurable auxiliary relay; temperature and defrost probes, and humidity
- ▶ General cut-off switch, differential switch, three-pole contactors and magnetothermic switches for heating elements and fans.
- ▶ Operation indicator lights.
- ▶ Connection terminal block.
- ▶ Configurable digital input and digital input for door microswitch.

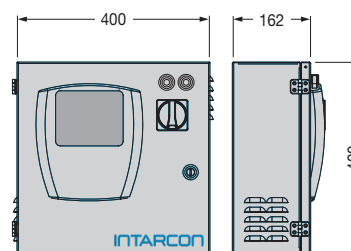
Control panel dimensions for AHM models

1 series



Control panel dimensions for MHM models

1 series



Dimensions (mm)	A	B	C
size 1	400	162	400
size 2	600	162	400
size 3	650	162	550
size 4	650	162	750

Dimensions in mm.

Table of features for para de humidity control panel

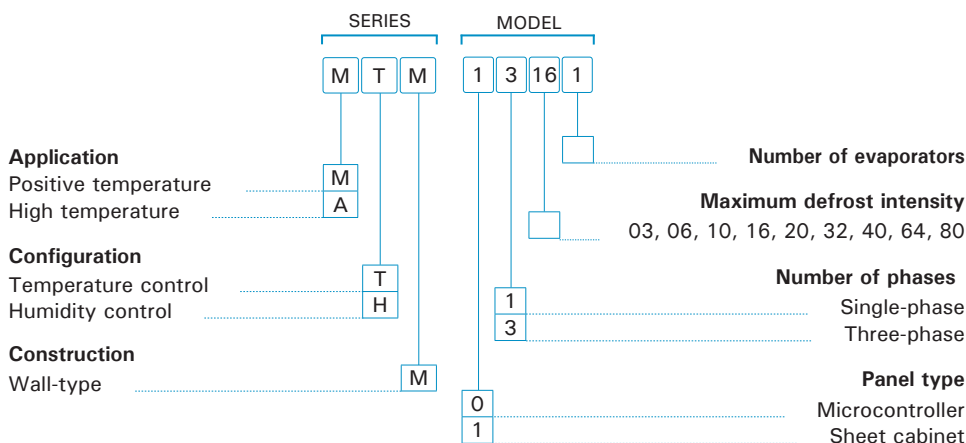
	Model	Power supply	Max. defrost power (kW)	Max. defrost intensity (A)	Max. fans intensity (A)	VEE <sup>(1)</sup>	Application to evaporators	Control panel size <sup>(2)</sup>
For humidity control 1 evaporating unit	AHM-E-11031	230V	ventilated	--	3	•	JB, JD, JC, KC	1
	AHM-E-13101	400V 3N	ventilated	--	10	•	KD, KH, KV 31,41,32,42	1
	MHM-N-11161	230V	3,6	16	3	•	JB, JD 1-2, JC	1
	MHM-N-13161	400V 3N	10	16	10	•	JD 3-5, KD 12, KC, KH 11-21-12, KV 31	1
	MHM-N-13201	400V 3N	12	20	10	•	KH 22, KV 41	1
	MHM-N-13321	400V 3N	20	32	10	•	KD 22-33, KH 13-23-14, KV 3256	1
	MHM-N-13401	400V 3N	25	40	10	•	KV 3263-4263, KH 24	1

Options

- ▶ Control panel available in 60Hz.
- ▶ Control for heating resistances, or dehumidification and heating, only HM models (3 kW, 9 kW, 12 kW, 18 kW, 24 kW and 30 kW).

<sup>(1)</sup> Optional electronic expansion valve.  
<sup>(2)</sup> Optionals, such as electronic expansion valve, may modify the control panel size.

Nomenclature of temperature and humidity control panels



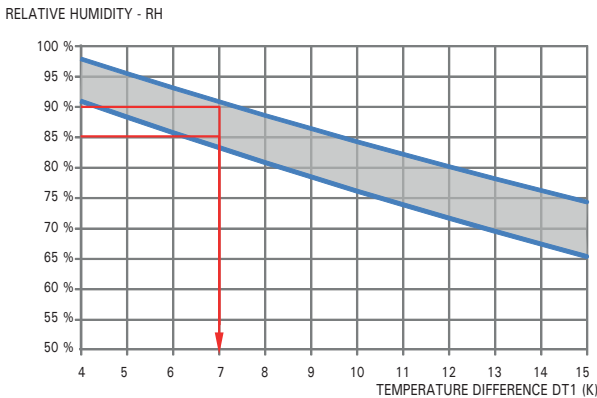
# Method of calculation of evaporating units

## Condiciones estándares de cálculo

Condition	Cool room temperature	Relative humidity	DT1	Superheating	Liquid temperature
SC1	10 °C	85 %	10 K	6,5 K	30 °C
SC2	0 °C	85 %	8 K	5,2 K	30 °C
SC3	-18 °C	95 %	7 K	4,5 K	20 °C
SC4	-25 °C	95 %	6 K	3,9 K	20 °C
SC5	-34 °C	95 %	6 K	3,9 K	20 °C

The cooling capacities have been calculated using standard conditions according to standard EN 328.

## Choice of Temperature Difference (DT1)



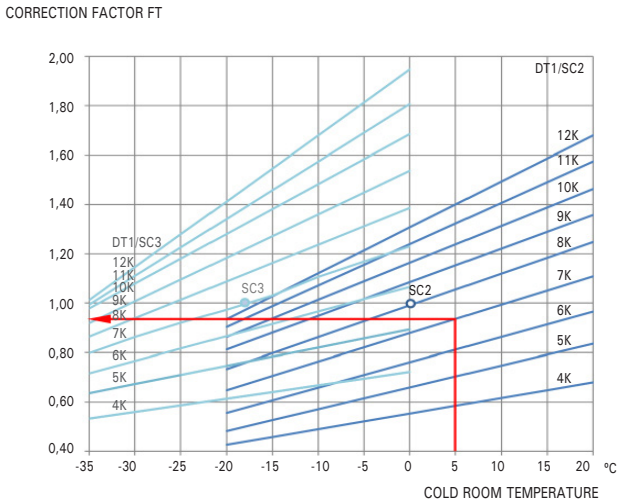
The Temperature Difference DT1 is defined as the difference between the temperature of the air entering the evaporator and the evaporating temperature of the refrigerant.

In positive temperature conservation cold rooms, the Temperature Difference in the evaporator has a great influence on the degree of humidity in the environment, in addition to other factors such as the design of the cold room, the rate of ventilation and the transpiration of the stored product.

In negative temperature cold rooms, the DT1 has little influence on the relative humidity, while an excessive DT1 will imply a lower evaporation temperature and lower performance of the compressors.

The attached graphic will allow you to choose the most suitable DT1 for sizing of the evaporator. Depending on the desired relative humidity, we look for the intersection point with the curve, obtaining the value of the new thermal jump:

## Correction factor for calculation condition (FT)



To obtain the cooling capacity at another cold rooms temperatures and thermal jump, you must use the correction factor FT.

The attached graph will allow you to obtain, based on the ambient temperature and the Temperature Difference DT1, said factor, taking as reference the standard power level SC2 or SC3:

**Calculation example:** it is desirable to store vegetables at temperature of 5 °C and relative humidity between 85 and 90 %, with estimated refrigeration needs of 38 kW and using refrigerant R-449A in direct expansion.

To obtain the degree of relative humidity, we choose a Temperature Difference 7 K the cold room, and we can see that this calculation condition corresponds to a correction factor FT = 0.94.

We can calculate the corrected cooling capacity:

We choose the evaporating unit MKH-NG-2350 with a cooling capacity SC2 = 45.2 kW

$$Q_c = \frac{38 \text{ kW}}{0,94} = 40,42 \text{ kW}$$

## Evaporator selection

To select an evaporator, you must calculate the corrected refrigeration capacity using the following formula:

$$Q_c = \frac{Q_o}{FT}$$

## Online selection and calculation of evaporators with the Calcooling software

The cooling calculator includes an advanced calculation method for refrigeration systems, based on calculation rules suggested by ASHRAE, refrigerant properties by REFPROP from the NIST and updated thermodynamic correlations for the calculation of heat transfer coefficient.



<https://intarcon.calcooling.com/>