

ERAD-E

Air cooled single
circuit condensing unit

Product manual

Wide capacity range (120 kW - 490 kW)
One refrigerant circuit with single screw compressor
Two sound versions available
Compact design
Large operation range (ambient down to -18°C)
Connectability with Daikin AHU's
Extensive option list including heat recovery
Refrigerant: R134a

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Date	-
Supersedes	-

Daikin Applied's new 'ERAD~E-' condensing unit range – the ideal match with our air handling units –

Available in two sound versions (standard and low)

Extensive capacity range composed of 10 sizes (cooling capacity from 120 to 490 kW)

The units are equipped with a R-134a single refrigerant circuit

Featuring a single screw compressor with stepless capacity control allowing the condensing unit to modulate its capacity from 100% to 25%.

Able to operate in ambient temperatures down to -18°C

Compact design

Extensive option list (including heat recovery, soft starter, etc.)



The new single circuit condensing unit features

Application flexibility

The ERAD~E- series is available in a wide range of capacities - 10 different sizes from 120 kW up to 490 kW - and two sound configurations, making it an ideal match for smaller building applications.

Compact design

Each unit is equipped with a R-134a single refrigerant circuit, featuring a compact design with 2 up to 6 fans and thus making this series the perfect choice for retrofit projects.

Large operation range

The new range is available for ambient operating temperatures of -18°C up to 48°C, making the new condensing unit models suitable for comfort and process cooling applications in all climates.

Extensive option list

The base model includes several standard factory mounted options, such as: wye delta starter, phase monitor, hour run meter, etc. Moreover, the new range features an extensive option list, including: heat recovery, soft starter, different coil types, etc.

Superior control logic

The new MicroTech III controller provides an easy to use control environmental. The control logic is designed to provide maximum efficiency, to continue operation in unusual operating conditions and to provide a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, BACnet, Ethernet TCP/IP or Modbus communications.

1 Features and advantages

Low operating cost

ERAD~E- is the result of careful design, aimed to optimize the energy efficiency of the condensing units, with the objective of bringing down operating costs and improving installation profitability, effectiveness and economical management.

The ERAD~E- condensing units use the new very high efficiency single rotor screw compressor design, large condenser coil surface area for maximum heat transfer and low discharge pressure, and advanced technology condenser fans.

Low operating sound levels

Very low sound levels both at full load and part load conditions are achieved by the latest compressor design and by a unique new fan that moves large volume of air at exceptionally low sound levels and by the virtually vibration-free operation.

Excellent serviceability

Field serviceability has not been sacrificed to meet design performance objectives. The compressor is equipped with discharge, liquid and suction shut off valves. The compressor and serviceable components such as filter driers are located on the outside edges of the base allowing easy access. The shaped of the coil allows easy access for inspection and service. The MicroTech III controller gives detailed information on the causes of an alarm or fault.

Proven reliability

Extensive quality control checks during testing and prior shipment guarantee the delivery of a state of the art product.

Infinite capacity control

Cooling capacity control is infinitely variable by means of a single screw compressor controlled by microprocessor system. Each unit has infinitely variable capacity control from 100% down to 25%. This modulation allows the compressor capacity to exactly match the required cooling load.

In case a compressor with load step control is used, the compressor capacity, at partial loads, will be too high or too low compared to the building cooling load. The result is an increase in unit energy costs, particularly at the part load conditions at which the unit operates most of the time.

The ERAD~E- condensing units with stepless regulation offer benefits that the units with step regulation are unable to match. Only a condensing unit with stepless regulation is able to follow the system's cooling demand at any time and to deliver chilled liquid or air at setpoint.

1 Features and advantages

Superior control logic

The new MicroTech III controller provides an easy to use control. The control logic is designed to guarantee a stable operation, to provide maximum efficiency, to continue operation in unusual operating conditions and to provide a history of unit operation. One of the greatest benefits is the easy interface with LonWorks, Bacnet, Ethernet TCP/IP or Modbus communications.

Code requirements – Safety and observant of laws/directives

All ERAD~E- units are designed and manufactured in accordance with applicable selections of the following:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204-1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

Certifications

All units manufactured by Daikin are CE marked, complying with European directives in force, concerning manufacturing and safety. On request units can be produced complying with laws in force in non-European countries (ASME, GOST, etc.), and with other applications, such as naval (RINA, etc.).

Versions

ERAD~E- is available in a Standard Efficiency version:

S: Standard Efficiency

10 sizes to cover a range from 116 up to 488 kW with an EER up to 3.30 (data referred to Standard Sound configuration)

The EER (Energy Efficiency Ratio) is the ratio of the Cooling Capacity to the Power Input of the unit. The Power Input includes: the power input for operation of the compressor and fans, the power input of all control and safety devices.

Sound configurations

ERAD~E- is available in two different sound level configurations:

S: Standard Sound

Condenser fan rotating at 920 rpm, rubber antivibration under compressor

L: Low Sound

Condenser fan rotating at 715 rpm, rubber antivibration under compressor, compressor sound enclosure

2 General characteristics

Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) (±RAL7044). The base frame has eye-hook for lifting the unit with ropes for an easy installation. The weight is uniformly distributed along the profiles of the base and this facilitates the arrangement of the unit.

Screw compressors with integrated oil separator

From size ERAD120E-SS to size ERAD250E-SS and from size ERAD120E-SL to size ERAD240E-SL

The compressor is semi-hermetic, single-screw type with one gate-rotor (made of carbon impregnated engineered composite material). The compressor has one slide managed by the unit microprocessor for infinitely modulating the capacity between 100% to 25%. An integrated high efficiency oil separator maximises the oil separation. Standard Start is Wye-delta (Y-Δ) type.

From size ERAD310E-SS to size ERAD490E-SS and from size ERAD300E-SL to size ERAD460E-SL

The compressor is semi-hermetic, single-screw type with gate-rotor (with the latest high-strength fibre reinforced star material). The compressor has an asymmetric slide regulation managed by the unit controller for infinitely modulating capacity between 100% to 25%. An integrated high efficiency oil separator maximizes the oil separation. Standard Start is Wye-delta (Y-Δ) type.

Ecological R-134a refrigerant

The compressors have been designed to operate with R-134a, ecological refrigerant with very low ODP (Ozone Depletion Potential) and GWP (Global Warming Potential) that means low TEWI (Total Equivalent Warming Impact).

Condenser coils

The condenser is manufactured with internally enhanced seamless copper tubes arranged in a staggered row pattern and mechanically expanded into lanced and rippled aluminium condenser fins with full fin collars. An integral sub-cooler circuit provides sub-cooling to effectively eliminate liquid flashing and increase the cooling capacity without increasing the power input.

Condenser fans

The condenser fans are propeller type with high efficiency design blades to maximize performances. The material of the blades is glass reinforced resin and each fan is protected by a guard. Fan motors are protected by circuit breakers installed inside the electrical panel as a standard. The motors are IP54.

Refrigerant circuit

Each unit has 1 refrigerant circuit and includes:

- Compressor with integrated oil separator
- Air Cooled Condenser
- Discharge line shut off valve
- Liquid line shut off valve
- Suction line shut off valve
- Sight glass with moisture indicator
- Filter drier
- Charging valves
- High pressure switch
- High and low pressure transducers

Electrical control panel

Power and control are located in the main panel that is manufactured to ensure protection against all weather conditions. The electrical panel is IP54 and (when opening the doors) internally protected with plexiglas panel against possible accidental contact with electrical components (IP20). The main panel is fitted with a main switch interlocked door.

2 General characteristics

Power Section

The power section includes compressors fuses, fan circuit breaker, fan contactors and control circuit transformer.

MicroTech III controller

MicroTech III controller is installed as standard; it can be used to modify unit set-points and check control parameters. A built-in display shows condensing unit operating status plus temperatures and pressures of liquid or air, refrigerant and air, programmable values, set-points. A sophisticated software with predictive logic, selects the most energy efficient combination of compressor, condenser fans to keep stable operating conditions to maximise condensing unit energy efficiency and reliability. MicroTech III is able to protect critical components based on external signs from its system (such as motor temperatures, refrigerant gas and oil pressures, correct phase sequence, pressure switches and evaporator). The input coming from the high pressure switch cuts all digital output from the controller in less than 50ms, this is an additional security for the equipment. Fast program cycle (200ms) for a precise monitoring of the system. Floating point calculations supported for increased accuracy in P/T conversions.

Control section - main features

- Management of the compressor stepless capacity and fans modulation.
- Condensing unit enabled to work in partial failure condition.
- Full routine operation at condition of:
 - high ambient temperature value
 - high thermal load
 - high evaporator entering liquid or air temperature (start-up)
- Display of liquid or air entering/leaving temperature.
- Display of Outdoor Ambient Temperature.
- Display of condensing-evaporating temperature and pressure, suction and discharge superheat for the circuit.
- Leaving liquid or air evaporator temperature regulation. Temperature tolerance = 0,1°C.
- Compressor hours counter.
- Display of Status Safety Devices.
- Number of starts and compressor working hours.
- Optimized management of compressor load.
- Fan management according to condensing pressure.
- Re-start in case of power failure (automatic / manual).
- Soft Load (optimized management of the compressors load during the start-up).
- Start at high evaporator liquid or air temperature.
- Return Reset (Set Point Reset based on return of liquid or air temperature of evaporating section).
- OAT (Outside Ambient temperature) Reset.
- Set point Reset (optional).
- Application and system upgrade with commercial SD cards.
- Ethernet port for remote or local servicing using standard web browsers.
- Two different sets of default parameters could be stored for easy restore.

2 General characteristics

Safety device / logic for each refrigerant circuit

- High pressure (pressure switch).
- High pressure (transducer).
- Low pressure (transducer).
- Fans circuit breaker.
- High compressor discharge temperature.
- High motor winding temperature.
- Phase Monitor.
- Low pressure ratio.
- High oil pressure drop.
- Low oil pressure.
- No pressure change at start.

System security

- Phase monitor.
- Low Ambient temperature lock-out.
- Freeze protection.

Regulation type

Proportional + integral + derivative regulation on the leaving water evaporator output probe.

Condensing pressure

Condensing pressure can be controlled in according to the entering air temperature to the condenser coil. The fans can be managed either with steps, or with a 0/10 V modulating signal or with a mixed 0/10V + Steps strategy to cover all possible operational conditions.

MicroTech III

MicroTech III built-in terminal has the following features.

- 164x44 dots liquid crystal display with white back lighting. Supports Unicode fonts for multi-lingual.
- Key-pad consisting of 3 keys.
- Push'n'Roll control for an increased usability.
- Memory to protect the data.
- General faults alarm relays.
- Password access to modify the setting.
- Application security to prevent application tampering or hardware usability with third party applications.
- Service report displaying all running hours and general conditions.
- Alarm history memory to allow an easy fault analysis.

Supervising systems (on request)

MicroTech III remote control

MicroTech III is able to communicate to BMS (Building Management System) based on the most common protocols as:

- ModbusRTU
- LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology
- BacNet BTP certified over IP and MS/TP (class 4) (Native)
- Ethernet TCP/IP.

2 General characteristics

Standard accessories (supplied on basic unit)

Wye-Delta Compressors starter (Y-Δ) – For low inrush current and reduced starting torque.

Double set-point – Dual leaving liquid or air temperature set-points.

Fans circuit breakers thermal overload relays – Safety devices against fan motor overloading in addition to the normal protection envisaged by the electrical windings.

Phase monitor – The phase monitor controls that phases sequence is correct and controls phase loss.

Discharge line shut off valves – Installed on the discharge port of the compressor to facilitate maintenance operation.

Suction line shut off valve – Installed on the suction port of the compressor to facilitate maintenance operation.

Ambient outside temperature sensor and set-point reset

Hour run meter

General fault contactor – Alarm relay.

Set-point reset – The leaving liquid or air temperature set-point can be overwritten with the following options: 4-20mA from external source (by user); outside ambient temperature; evaporator liquid or air temperature Δt .

Demand limit – User can limit the load of the unit by 4-20mA signal or by network system

Alarm from external device – Microprocessor is able to receive an alarm signal from an external device (pump etc...). User can decide if this alarm signal will stop or not the unit.

Fans circuit breakers – Safety device against motor overloading and short circuit

Main switch interlock door

2 General characteristics

Options (on request)

Total heat recovery – Provided with plate to plate heat exchangers to produce hot water.

Partial heat recovery – Plate to plate heat exchangers installed between the compressor discharge and the condenser coil, allowing to produce hot water.

Soft starter – Electronic starting device to reduce the mechanical stress during compressor start-up.

Compressor thermal overload relays – Safety devices against compressor motor overloading. This device together with internal motor protection (standard) guarantee the best safety system for compressor motor.

Under/Over Voltage – This device control the voltage value of power supply and stop the chiller if the value exceeds the allowed operating limits.

Energy Meter – This device allows to measure the energy absorbed by the condensing unit during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

Capacitors for power factor correction – To increase the operating power factor of the unit at nominal operating conditions. The capacitors are “dry” self-regenerating type with over pressure disconnecting safety device insulated with a no toxic dielectric mix with no PCB or PCT.

Current limit – To limit maximum absorbed current of the unit whenever is required

Fan speed regulation – To control the fan speed revolution for smooth operating control of the unit during low ambient temperature operation. This option improves also the sound level of the unit.

With “Fan speed regulation” option, by different microprocessor setting, it is also possible to set the “Fan Silent Mode” configuration. It means that the microprocessor clock switches the fan at low speed according to the client setting (i.e. Night & Day), providing that the ambient temperature/condensing pressure is allowing the speed change.

It allows a perfect condensing control down to -10°C .

Speedtrol – Continuous fan speed modulation on the first fan of the circuit. It allows the unit working with air temperature down to -18°C .

Condenser coil guards

Cu-Cu condensing coils – To give better protection against corrosion in aggressive environments.

Cu-Cu-Sn condensing coils – To give better protection against corrosion in aggressive and in salty air environments.

Alucoat condensing coils – Fins are protected by a special acrylic paint with a high resistance to corrosion.

High pressure side manameter

Kit container

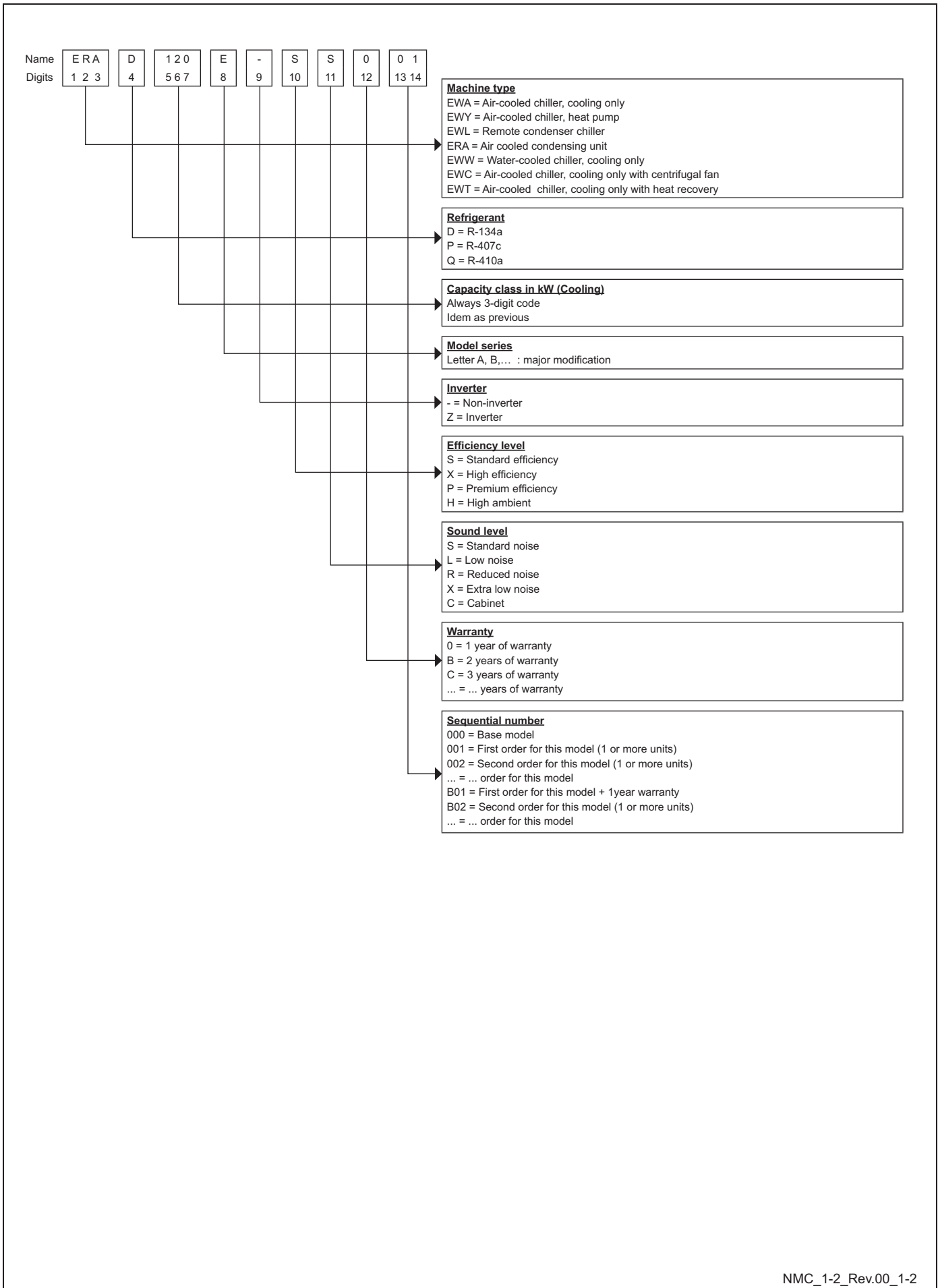
Rubber type anti vibration mounts – Supplied separately, these are positioned under the base of the unit during installation to reduce vibrations.

Spring type anti vibration mounts – Supplied separately, these are positioned under the base of the unit during installation. Ideal for dampening vibrations for installation on roofs and metallic structures.

Double pressure relief valve with diverter

Compressors circuit breakers

3 Nomenclature



4 Technical specifications

4-1 Technical Specifications		ERAD~E-SL	120	140	160	190	210	240	300	350	410	460		
Capacity (1)	Cooling	kW	116.0	137	159	187	209	243	295	352	409	462		
Capacity control	Type	---	Stepless											
	Minimum capacity	%	25											
Unit power input (1)	Cooling	kW	42.3	52.5	57.6	66.3	73.9	78.2	91.5	122	150	167		
EER (1)		---	2.74	2.61	2.75	2.82	2.83	3.11	3.23	2.88	2.73	2.76		
Casing	Colour	---	Ivory White											
	Material	---	Galvanized and painted steel sheet											
Dimensions	Unit	Height	2,273					2,223						
		Width	1,292					2,236						
		Length	2,165			3,065			3,965			3,070		
Weight	Unit	kg	1,712	1,738	1,851	1,897	2,046	2,091	2,534	2,741	2,834	2,870		
	Operating Weight	kg	1,742	1,771	1,886	1,937	2,088	2,136	2,595	2,805	2,907	2,950		
Air heat exchanger	Type	---	High efficiency fin and tube type with integral subcooler											
Fan	Type	---	Direct propeller type											
	Drive	---	DOL											
	Diameter	mm	800											
	Nominal air flow	l/s	8,372	8,144	12,558	12,217	16,744	16,289	25,117		24,433			
	Model	Quantity	No.	2		3			4		6			
		Speed	rpm	715										
Motor input		W	0.78											
Compressor	Type	---	Semi-hermetic single screw compressor											
	Oil charge	l	13					16			19			
	Quantity	No.	1											
Sound level	Sound Power	Cooling	89.0		89.8			90.5		91.7		92.0		92.7
	Sound Pressure (2)	Cooling	71.0		71.2			71.4		72.6		72.5		72.8
Refrigerant circuit	Refrigerant type	---	R-134a											
	Refrigerant charge	kg.	17	20	22	27	29	32	45		54	58		
	N. of circuits	No.	1											
Piping connections	Suction	mm	76								139.7			
	Liquid	mm	28					35						
Safety devices	High discharge pressure (pressure switch)													
	High discharge pressure (pressure transducer)													
	Low suction pressure (pressure transducer)													
	Compressor motor protection													
	High discharge temperature													
	Low oil pressure													
	Low pressure ratio													
	High oil filter pressure drop													
	Phase monitor													
Notes (1)	Cooling capacity, unit power input in cooling and EER are based on the following conditions: SST 7°C; ambient 35°C, unit at full load operation.													
Notes (2)	The values are according to ISO 3744 and are referred to: SST 7°C, ambient 35°C, full load operation.													
Notes (3)	Refrigerant charge is for the unit only; doesn't include external suction and liquid line. Units are shipped without refrigerant charge; holding charge nitrogen 0.5 bar													

4 Technical specifications

4-1 Electrical Specifications		ERAD~E-SL	120	140	160	190	210	240	300	350	410	460	
Power Supply	Phase	---	3										
	Frequency	Hz	50										
	Voltage	V	400										
	Voltage Tolerance	Minimum	%	-10%									
		Maximum	%	+10%									
Unit	Maximum starting current	A	156		203		298		346	426			
	Nominal running current cooling	A	73	90	98	111	127	298	346	426			
	Maximum running current	A	85	101	115	129	155	133	154	203	248	274	
	Maximum current for wires sizing	A	94	111	126	142	171		205	264	308		
Fans	Nominal running current in cooling	A	5.2		7.8		10.4		15.6				
Compressor	Phase	No.	3										
	Voltage	V	400										
	Voltage Tolerance	Minimum	%	-10%									
		Maximum	%	+10%									
	Maximum running current	A	80	96	107	121	145		171	410	264		
Starting method	---	Wye – Delta type (Y – Δ)											
Notes	Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.												
	Maximum starting current: starting current of biggest compressor + fans current												
	Nominal current in cooling mode is referred to the following conditions: evaporator 12°C/7°C; ambient 35°C.compressor + fans current.												
	Maximum running current is based on max compressor absorbed current in its envelope and max fans absorbed current												
	Maximum unit current for wires sizing is based on minimum allowed voltage												
Maximum current for wires sizing: (compressors full load ampere + fans current) x 1,1.													

5 Sound Levels

ERAD-E-SS

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2×10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
120	75.5	70.8	68.9	75.3	64.3	61.7	53.0	47.3	73.5	91.5
140	75.5	70.8	68.9	75.3	64.3	61.7	53.0	47.3	73.5	91.5
170	75.7	71.0	69.1	75.5	64.5	61.9	53.2	47.5	73.7	92.3
200	75.7	71.0	69.1	75.5	64.5	61.9	53.2	47.5	73.7	92.3
220	75.9	71.2	69.3	75.7	64.7	62.1	53.4	47.7	73.9	93.0
250	77.1	72.4	70.5	76.9	65.9	63.3	54.6	48.9	75.1	94.2
310	77.0	72.3	70.4	76.8	65.8	63.2	54.5	48.8	75.0	94.2
370	77.3	72.6	70.7	77.1	66.1	63.5	54.8	49.1	75.3	94.5
440	77.3	72.6	70.7	77.1	66.1	63.5	54.8	49.1	75.3	94.5
490	78.0	73.3	71.4	77.8	66.8	64.2	55.5	49.8	76.0	95.2

ERAD-E-SL

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2×10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
120	73.0	68.3	66.4	72.8	61.8	59.2	50.5	44.8	71.0	89.0
140	73.0	68.3	66.4	72.8	61.8	59.2	50.5	44.8	71.0	89.0
160	73.2	68.5	66.6	73.0	62.0	59.4	50.7	45.0	71.2	89.8
190	73.2	68.5	66.6	73.0	62.0	59.4	50.7	45.0	71.2	89.8
210	73.4	68.7	66.8	73.2	62.2	59.6	50.9	45.2	71.4	90.5
240	74.6	69.9	68.0	74.4	63.4	60.8	52.1	46.4	72.6	91.7
300	74.5	69.8	67.9	74.3	63.3	60.7	52.0	46.3	72.5	91.7
350	74.8	70.1	68.2	74.6	63.6	61.0	52.3	46.6	72.8	92.0
410	74.8	70.1	68.2	74.6	63.6	61.0	52.3	46.6	72.8	92.0
460	75.5	70.8	68.9	75.3	64.3	61.7	53.0	47.3	73.5	92.7

NOTES

The values are according to ISO 3744 and are referred to: evaporator 12/7° C. air ambient 35° C. full load operation

7 Standard rating

7 - 1 Cooling capacity tables

ERAD-E-SL

Size	SST (°C)	Condenser Inlet Air Temperature (°C)													
		20		25		30		35		40		45		48	
		Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)	Cc (kW)	Pi (kW)
120	-9	78.7	24.9	74.3	27.3	69.6	29.9	64.6	32.7	59.3	35.8	53.7	39.1	50.2	41.2
	-7	84.9	25.7	80.3	28.2	75.4	30.8	70.2	33.7	64.8	36.8	58.9	40.1	55.3	42.3
	-5	91.4	26.6	86.6	29.1	81.5	31.8	76.1	34.7	70.5	37.8	64.4	41.2	60.6	43.4
	-3	98.2	27.6	93	30.1	88	32.9	82.2	35.8	76.2	39.0	70.0	42.4	66.0	44.5
	-1	105	28.7	100	31.2	94	34.0	88.5	37.0	82.3	40.2	75.8	43.6	69.1	43.7
	1	113	29.8	107	32.4	101	35.2	95.1	38.2	88.6	41.4	81.8	44.9	70.7	41.9
	3	120	31.1	114	33.7	108	36.5	102	39.5	95.1	42.8	88.0	46.3	72.2	40.4
	5	128	32.3	122	35.0	116	37.8	109	40.9	102	44.2	89.5	44.5	73.3	38.9
	7	136	33.7	130	36.4	123	39.2	116	42.3	109	45.6	91.3	42.9	74.7	37.7
	9	145	35.1	138	37.8	131	40.7	123	43.8	116	47.2	92.5	41.4	76.4	36.8
	11	154	36.6	146	39.4	139	42.3	131	45.4	121	47.9	94.0	40.1	76.8	35.5
	13	158	37.4	151	40.1	143	43.1	135	46.2	122	47.1	94.1	39.3	77.4	35.0
	140	-9	94.1	30.5	88.7	33.5	82.9	36.7	76.8	40.1	70.2	43.9	63.3	47.9	58.9
-7		102	31.6	95.9	34.6	89.8	37.9	83.5	41.4	76.7	45.2	69.5	49.3	65.0	51.9
-5		109	32.8	103	35.9	97	39.2	90.4	42.7	83.3	46.6	75.9	50.7	70.8	52.8
-3		117	34.1	111	37.2	104	40.5	97.5	44.1	90.2	48.0	82.5	52.2	72.7	50.3
-1		126	35.5	119	38.6	112	42.0	105	45.6	97.3	49.6	89.3	53.8	75.2	48.6
1		134	37.0	127	40.1	120	43.5	113	47.2	105	51.2	93.6	53.3	76.3	46.4
3		143	38.5	136	41.7	128	45.2	121	48.9	112	52.9	95.4	51.1	78.3	45.1
5		152	40.2	145	43.4	137	46.9	129	50.7	120	54.7	97.2	49.3	79.7	43.6
7		162	41.9	154	45.2	146	48.7	137	52.5	128	56.6	98.6	47.4	80.6	42.1
9		172	43.7	163	47.1	155	50.6	146	54.5	131	55.0	100	45.9	82.1	41.0
11		182	45.7	173	49.0	164	52.7	154	56.6	132	53.1	101	44.4	83.0	39.9
13		187	46.7	178	50.1	169	53.7	159	57.6	133	52.1	102	43.9	83.2	39.3
160		-9	106	34.4	101	37.6	94	41.1	87.8	44.9	80.8	49.1	73.3	53.8	68.6
	-7	115	35.5	109	38.8	102	42.4	95.5	46.2	88.3	50.5	80.4	55.3	75.6	58.4
	-5	124	36.8	117	40.1	111	43.7	104	47.6	96.0	52.0	88.0	56.8	82.8	60.0
	-3	133	38.1	126	41.4	119	45.1	112	49.1	104	53.5	95.7	58.4	90.3	61.6
	-1	143	39.4	136	42.8	128	46.5	121	50.6	112	55.1	104	60.1	98.2	63.4
	1	153	40.9	145	44.3	138	48.1	130	52.2	121	56.8	112	61.9	105	64.0
	3	163	42.4	156	45.9	147	49.7	139	53.9	130	58.5	121	63.7	108	62.0
	5	174	44.1	166	47.6	158	51.4	149	55.7	139	60.4	129	65.7	110	59.9
	7	186	45.8	177	49.4	168	53.3	159	57.6	149	62.4	135	65.8	112	57.7
	9	197	47.7	188	51.3	179	55.3	169	59.7	159	64.5	137	63.0	114	56.0
	11	210	49.7	200	53.3	190	57.4	180	61.8	169	66.8	140	61.4	115	54.2
	13	216	50.7	206	54.4	196	58.4	185	63.0	174	68.0	140	60.2	116	53.6
	190	-9	127	39.0	120	42.8	112	46.9	104	51.4	95.7	56.2	86.7	61.4	81.1
-7		137	40.3	129	44.2	122	48.4	113	52.9	105	57.8	95.2	63.1	89.4	66.4
-5		147	41.8	139	45.7	131	49.9	123	54.5	114	59.4	104	64.8	98.0	68.1
-3		158	43.4	150	47.3	142	51.6	133	56.2	123	61.2	113	66.6	107	70.0
-1		169	45.0	161	49.0	152	53.3	143	58.0	133	63.0	122	68.5	114	70.6
1		181	46.8	172	50.8	163	55.2	153	59.9	143	65.0	132	70.5	117	67.8
3		194	48.7	184	52.8	175	57.2	164	61.9	153	67.1	142	72.6	120	65.5
5		207	50.7	197	54.8	186	59.3	176	64.1	164	69.2	148	71.9	122	63.1
7		220	52.8	209	56.9	199	61.5	187	66.3	176	71.5	150	68.9	124	61.2
9		234	55.0	223	59.2	211	63.8	199	68.7	187	74.0	153	67.2	126	59.3
11		248	57.3	236	61.6	224	66.2	212	71.2	199	76.5	155	64.6	127	57.2
13		255	58.6	243	62.9	231	67.5	218	72.5	202	76.4	157	64.0	128	56.5
210		-9	141	43.7	134	47.9	126	52.4	117	57.5	107	63.2	95.0	69.8	86.7
	-7	153	45.2	145	49.4	136	54.0	127	59.2	117	65.0	104	71.6	95.3	76.0
	-5	165	46.8	156	51.0	148	55.7	138	60.9	127	66.8	113	73.5	104	78.0
	-3	177	48.4	169	52.7	159	57.5	149	62.8	137	68.8	123	75.6	113	80.1
	-1	190	50.2	181	54.6	171	59.4	160	64.8	147	70.9	132	77.7	122	82.2
	1	204	52.1	194	56.5	184	61.4	172	66.9	158	73.0	142	80.0	131	84.6
	3	218	54.1	208	58.6	197	63.5	184	69.1	169	75.3	152	82.4	140	86.2
	5	233	56.2	222	60.8	210	65.8	196	71.4	181	77.8	162	84.9	143	82.6
	7	249	58.5	237	63.1	224	68.2	209	73.9	192	80.4	173	87.5	146	79.8
	9	265	60.9	252	65.6	238	70.8	222	76.6	204	83.1	180	87.8	149	76.7
	11	281	63.4	267	68.2	252	73.5	235	79.4	216	86.0	184	84.9	152	74.5
	13	289	64.8	275	69.6	259	74.9	242	80.9	222	87.5	185	83.3	152	72.8
	240	-9	160	45.5	155	50.6	150	56.0	142	61.9	133	68.7	120	76.3	111
-7		171	46.8	167	52.0	162	57.5	154	63.6	144	70.5	131	78.3	121	83.5
-5		183	48.2	179	53.5	174	59.1	166	65.4	156	72.4	142	80.3	131	85.6
-3		196	49.6	192	55.1	186	60.9	178	67.2	167	74.4	152	82.5	142	87.8
-1		209	51.2	205	56.8	199	62.7	191	69.2	179	76.5	163	84.7	152	90.1
1		222	52.9	219	58.6	212	64.6	203	71.3	191	78.7	174	87.0	158	88.8
3		236	54.7	233	60.5	226	66.6	216	73.4	203	81.0	185	89.5	162	85.6
5		251	56.6	247	62.5	240	68.8	229	75.7	215	83.5	196	92.0	164	82.1
7		267	58.7	262	64.6	254	71.1	243	78.2	227	86.0	202	90.8	167	79.4
9		283	60.8	278	66.9	269	73.5	257	80.7	240	88.7	205	87.3	170	77.5
11		299	63.2	293	69.4	284	76.1	270	83.4	253	91.5	208	84.6	171	74.6
13		307	64.4	301	70.6	292	77.4	277	84.8	259	93.0	210	83.7	172	73.6

NOTES

Cc (cooling capacity) - Pi (unit power input) - SST (compressor saturated suction temperature)