

Safety is an indispensable factor when you are considering climate control for your rooms. Whether you are looking for air-conditioning in offices or banks, climate control in sensitive hospital wards, a process climate for IT and production areas or to meet cleanroom requirements. TOUFAN TAHVIEH Air conditioners provide the Perfect solution for all tasks. TOUFAN TAHVIEH is a 10-year old well established company in IRAN with production facility in KARAJ-IRAN, employing over 100 people. The staff of IRAN factory applies innovative approaches and tried-and tested expertise to provide customer needs solutions in line with the constantly increasing demands of the market place. We bring to fruition special projects and meet bespoke requirements, proof of our flexibility. Well thought out, all embracing solutions, from the original idea to advice, planning, development and production, right through to assembly and maintenance. Modern, state-of-the-art production plants and consistently applied quality management under DIN EN ISO 9001:2000 guarantee a recognized quality standard for our products. "Just-in-time" delivery included.

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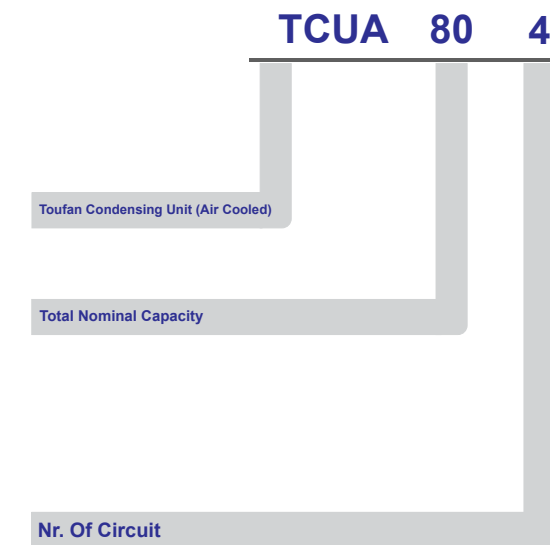
INTRODUCTION

TCUA Series Air Cooled Condensing Unit is the new generation of Toufan Tahviah units.

TCUA Series have quite and low vibration design and are manufactured to meet the requirements of the severe climatic conditions.

TCUA Series are ideally suited for hotels, high-rise buildings, stores, hospitals and modern cooling applications of modern manufacturing industries and industrial application. Up to 4 compressors and 2 independent refrigerant circuits TCUA units can supply one or 2 air handlers.

TCUA units are factory assembled, leak tested, evacuated, internally wired. Every unit is fully tested before delivery and is ready for installation. And include an initial oil charge.



- ▶ CFCopper Fins specify
- ▶ FAP..... Pre Coated Aluminum Fins specify
- ▶ FAAAluminum Fins with Heresite coat Protection specify
- ▶ FCA Copper Fins with Heresite Coat Protection specify
- ▶ ICPIP55 Control Panel
- ▶ CGPCondenser Coil Guard
- ▶ EEV.....Electronic Expansion Valve
- ▶ VMM.....Voltage Monitoring Module
- ▶ MP.....Marine Paint
- ▶ AMPI..... Ammeter and Phase Selector Switch
- ▶ VSS.....Voltmeter and Selector Switch.
- ▶ SDG.....Pressure Gauges

General Features

Compressors Operation

TCUA units are equipped with multiple compressors in order to achieve greater operating flexibility (single compressor just use for small capacities). By cycling individual compressors the system capacity can be modulated with full power savings for the compressors in operation. Toufan Tahviah used a simply method for reduce starting current. By delay between compressors start.

Wide Operating Range

TCUA units are designed, as standard, to operate at a wide range of ambient temperatures from 95°F (35°C), or lower if optional low ambient operation kit is included, to 125°F (52°C).

Main Component Features

Compressors

Compressors used in TCUA series are fully accessible, semi hermetic, reciprocating type, equipped with an oil sight glass, suction and discharge service valves and crankcase heater. These are refrigerant gas cooled and equipped with an oil pressure lubrication

system. The oil pump working in either direction is protected by an oil screen. For protection, all compressors are equipped with oil pressure or oil level control oil level control

The compressors are provided with vibration isolator mounting under the compressors skid and therefore, external to TCUA series, AVM's may be necessary only for critical applications.

The compressor motors have inherent thermal protection. This is in addition to other standard safety and protection controls.

Condensers

Condenser coils are manufactured from seamless copper tubes mechanically bonded to aluminum fins to ensure optimum heat transfer. All coils are tested against leakage by air pressure of 1.3 operation pressure. According to the ASME standard section 8. All standard coils are 2, 3 or 4 rows with 10 or 12 FPI, (2.5,2 mm) fin spacing, 3/8" (9.5 mm) O.D. tubes.

Condenser fin materials should be matched with site conditions to inhibit coil corrosion and ensure extended equipment's life.

For different application requirements, other optional condenser fin materials are available:

- Copper fins
- Aluminum fins
- Pre coated Aluminum fins. The pre-coated is hydrophobic polyurethane resin .This option provides substantial corrosion protection beyond standard coil construction.

- Heresite Coil Coating. The Heresite is a self-etching high performance modified coat that is specifically designed to coat and protect Aluminum and Copper surfaces. In addition, the coating is ideal for the protection of ferrous and nonferrous materials.

Condensers Fans

Axial, low-noise, water-proof type (IP 54) with safety grid.

Electric motors are directly coupled thus reducing vibrations and whatever trouble of transmission, and they're protected from voltage peaks by magneto-thermic switches installed into the electric panel placed on machine side.

Electrical Notes

1. The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per IEC.
2. Minimum fuse size is based upon 150% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit to avoid nuisance trips at start-up due to lock rotor amps. It is not recommended in applications where brown outs, frequent starting and stopping of the unit, and/or operation at ambient temperatures in excess of 95°F (35°C) is anticipated.
3. Maximum fuse size is based upon 225%

of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per IEC.

4. Circuit breakers must be UL listed and CSA certified and maximum size is based on 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit. Otherwise, HCUA-type circuit breakers must be used. Maximum HCUA

Circuit breaker rating is based on 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit.

5. The "INCOMING WIRE RANGE" is the minimum and maximum wire size that can be accommodated by the unit wiring lugs. The (2) preceding the wire range indicates the number of termination points available per phase of the wire range specified. Actual wire size and number of wires per phase must be determined based on the National Electrical Code, using copper connectors only. Field wiring must also comply with local codes.

6. A ground lug is provided for each compressor system to accommodate a field grounding conductor per IEC. A control circuit grounding lug is also supplied.

7. The supplied disconnect is a "Disconnecting Means" as defined in the per IEC and is intended for isolating the unit for the available power supply to perform maintenance and troubleshooting. This disconnect is not intended to be a Load Break Device.

Casing/Structure

The unit casing in HCUA series is made of zinc coated galvanized steel sheets conforming which is phosphatized and baked after an electrostatic powder coat of approximately 60 microns. This finish and coating can pass a 1000 hour in 5% salt spray testing at 95°F (35°C) and 95% RH. TCUA series are assembled on rigid structural galvanized steel painted with electrostatic powder coating. The package is assembled for easy handling during transportation and robust support during installation and operation.

Refrigerant Piping

The refrigeration circuit piping is fabricated from ACR grade copper piping. Each refrigeration circuit includes filter drier, liquid line solenoid valve, and thermostatic expansion valve, sight glass, shut off valve. After fabrication the refrigeration circuit suction line is insulated closed cell pipe insulation.

Optional Features

Alternative Condenser Material

Made of copper tubes and alternative fin material and/or protective coating.

- Copper Fins (CF)
- Pre Coated Aluminum Fins (FAP)
- Aluminum Fins with heresite coat Protection (FAA)

- Copper Fins with heresite Coat Protection (FCA)

Condenser Coil Guard (CGP)

Coil wire mesh guard, in galvanized and painted finish, for condensers. Recommended on ground level installations where coil needs to be protected against vandalism.

Electronic Expansion Valve (EEV)

To provide energy saving benefits over mechanical thermostatic expansion valve (TXV).(installed on AHU instead of thermostatic expansion valve)

Voltage Monitoring Module (VMM)

To prevent HCLA unit operation in the event of phase loss, phase reversal, and under voltage/over voltage on the incoming line voltage.

Marine Paint (MP)

To provide increased corrosion resistant in coastal environments and off shore locations.

Ammeter and Phase Selector Switch (AMPI)

To indicate running Amperes on main incomer/incomers of a condensing unit.

Voltmeter and Selector Switch (VSS)

For incoming line voltage.

Pressure Gauges (SDG)

Suction and discharge and oil pressure indication of each refrigerant circuit.

Capacity Correction & Limits

Altitude Correction Factor

Correction factors must be applied to stand-

ALTITUDE (ft)	ALTITUDE (ft)	CAPACITY MULTIPLIER	COMPRESSOR POWER MULTIPLIER
2000	610	0.99	1.01
4000	1220	0.98	1.02
6000	1830	0.97	1.03
8000	2440	0.96	1.04
10000	3050	0.95	1.05

ard ratings at altitudes above 2000 ft (610 m) using the following multipliers:

Fin Material Correction Factors

The unit ratings are based on copper tube and

Fin Material C.F	AL	CU
	1	1.03

aluminum fins condenser. For alternative condenser material the following factors apply:

Why Compressors fail with flood

1 - Refrigerant Flood Back

Refrigerant flood back occurs during the running cycle of the machine. This is where large volumes of liquid refrigerant are returned to the running compressor down through the Suction pipe work, in an uncontrolled manner. Depending on the degree of liquid returning to the compressor, determines as to what damage will occur. This can often be seen as foaming in the compressors' oil level sight glass.

If liquid is drawn into the cylinder bores, the lubrication to the cylinders and pistons will be washed away causing scoring and overheating in the cylinder, which in turn will lead to small metallic particles contaminating the inside of the machine. This liquid will also dilute the lubricating oil in the compressor sump. As the oil becomes more and more diluted with liquid refrigerant, its ability to lubricate becomes compromised. When this liquid rich oil is drawn up through the crankshaft to lubricate the bearings, con rods, cylinder walls, etc. due to friction the refrigerant in the oil starts to Flash Off into a vapor, this then prevents the oil being able to lubricate the necessary parts, and typically the main bearing and the con rods, furthest from the oil pick up point, will quickly dry out and then seize

Causes of Liquid Flood Back:

- 1- Low Evaporator loads
- 2- Oversized equipment
- 3 - Cold room product distribution (poor air circulation in cold room caused by lights, racking etc.)
- 4- Faulty evaporator fans
- 5- Oil logging in evaporator
- 6- Poor evaporator defrosting or defrost schedules (Iced up evaporator / No air flow / Poor heat transfer)
- 7- Oversized Expansion Valve Orifice
- 8- Wrong type expansion valve
- 9- Expansion valve equalization tube restricted or blocked
- 10- Expansion valve bulb strap loose or bulb in the wrong position on the suction pipe.
- 11- Superheat setting too low

Preventative measures to avoid Refrigerant Flood back:

- 1- Expansion Valve duty must be checked for the correct size orifice.
- 2- Superheat setting must be set for minimum 6-8 Degree °K Superheat (Thermostatic). Can be lower if electronic EEV used.
- 3- Fit correct size Suction Accumulator with proper oil return function.
- 4- Check and reset Defrost control as necessary.
- 5- Fully check the system operation or re-commission the plant.

NOTE

Liquid Flood back very often occurs during LOW LOAD conditions, which tends to be during the night, due to the lack of activity

such as Door Openings, product movements, fork truck and the cold room Personnel which all give an increase to the plant duty.

Therefore 24 hour logging of the plant operating conditions will often help to pinpoint plant problems that only occur during the night operation, when the plant is unattended.

2 - Flooded Starts

Flooded starts are probably the major cause of compressor failures. Flooded starts occur when liquid refrigerant has migrated from the system and condensed into the compressor oil. Migration can occur in all systems up to a point, due to the vapor pressure of the refrigerant being greater than the vapor pressure of the oil. It is the refrigerant vapor that migrates and then condenses into the colder compressor oil.

Crankcase heaters can help prevent this problem occurring provided the heater is large enough to raise the oil temperature to at least 10°C above the ambient temperature surrounding the compressor.

In cold windy environments the compressor may need an additional belt type crankcase heater plus an insulated jacket to achieve this, and tests should be carried out to confirm that the oil temperature requirements can be satisfied under all ambient temperature conditions.

Long OFF Cycles are also a cause of this problem, especially during the Night, and throughout the Weekends when the plant is least used, and the heat load requirements are minimal.

High temperature rooms often suffer this type of failure due to very short duty cycles and lack of heat load during the winter months.

NOTE

The longer the OFF cycle, the greater the degree of liquid migration. The colder the oil, the greater the degree of liquid to oil migration that takes place.

Typical Causes of Flooded Start

- 1) System Overcharge
- 2) Crankcase Temperature lowers than Evaporator
- 3) Long Off Cycle times
- 4) Compressor sited in a cold windy environment
- 5) Crankcase heater faulty/or of insufficient power to achieve required oil temperature.
- 6) A, one time pump down control
- 7) Leaky solenoid valve

Preventative measures required

- 1) Use a continuous Pump Down control
- 2) Use a belt type crankcase heater plus insulated bl3) Site the compressor in a warmer ambient area

Selection rules

1. Capabilities are based on Refrigerant R-134A and R-22.
2. Ratings may interpolate, but must not be extrapolated.
3. Ratings shown are at saturated suction temperatures corresponding to pressures at the compressor. In actual practice, suction line pressure drop has the effect of reducing

compressor capacity, forcing the compressor to operate at a lower suction pressure to maintain the desired evaporator temperature.

Caution: Toufan Tahviah strongly recommended considering 450 for 10-20% fresh air to avoiding serious problem for compressor.

Selection Procedure

The air-cooled condensing unit may be selected from the Ratings (tables 4, 8, 12, 16) if the ambient air temperature at the condenser and the saturated suction temperature at the compressor are known. The ambient air temperature is a known design parameter, but the suction temperature at the compressor, in many cases, is known only within certain allowable limits. The actual compressor operating suction temperature and the overall performance of the system will depend directly upon the choice of the evaporator. Starting with a preliminary evaporator selection at a nominal evaporator temperature and using data supplied by the evaporator manufacturer, enter the ratings tables and select a unit to meet the required cooling load at a suction temperature at least 2°F below the evaporator temperature. The 2°F allows for normal suction line loss.

SI Example

According to the given data, determine appropriate condensing unit.

Given:

Total Cooling Capacity Required.....19.5 Kw
Temperature Air Entering52 °C

Evaporator Temperature 7.2 °C

Refrigerant..... R134a

(Don't consider piping pressure drop)

From table No.4:

Condensing Unit model..... TCUA-9-1

Compressor..... BITZER / 4TES-9Y

Power Input7.97 Kw

Unit Sizing

It is strongly recommended to size the unit for the present load.

Over sizing is cause of increasing power consumption and decrease compressor's life. (Because of more on/off)

Low Ambient Operation

For efficient operation of condensing unit during intermediate seasons, when temperatures may drop to 50°F (10°C), proper operation is controlled by the following:

Based on the high pressure, MCS cycles the required fans ON

&OFF. If unit operation is envisaged at ambient down to 25°F (-4°C) optional Low Ambient Operation kit should be used (option LAO).

This factory installed arrangement requires control valves, receiver and additional refrigerant charge to build up condensing pressure in condenser coil by flooding refrigerant at low ambient season's operation.

ENGINEERING SPECIFICATIONS-50 HZ- (R-134a)

Model			TCUA-9-1	TCUA-15-1	TCUA-25-1
Cooling Capacity	Ton of Refrigeration		7.98	8.97	14.17
	KW		28.1	31.6	49.9
Compressor	Type	-	recp. Compressor		
	Quantity	-	1	1	1
	Oil Charge	US Gal	0.78	0.78	1.35
LIT		2.6	2.6	4.5	
Condenser Coil	type	-	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins		
	FaceArea	ft ²	28.4	28.4	28.4
		m ²	2.64	2.64	4.62
Condenser Fan	Type		Propeller direct drive 885 RPM		
	Quantity		1	1	2
	Aire Flow RATE	cfm	13530	13250	27200
		l/s	6385.45	6253.3	12836.97
Size	kw	1.75	1.75	3.5	
	lbs	30.8	50.6	72.6	
Refrigrant(R134a)operating charge (approx)	kg	14	23	33	
	Nmber Of Refrigerant Circuit		1	1	1
Unit Operating Weight	lbs	1524.6	1691.8	2131.8	
	kg	693	769	969	

Model			TCUA-30-1	TCUA-35-1	TCUA-40-1
Cooling Capacity	Ton of Refrigeration		16.53	19.37	24.08
	KW		58.2	68.2	84.8
Compressor	Type	-	recp. Compressor		
	Quantity	-	1	1	1
	Oil Charge	US Gal	1.35	1.35	1.42
LIT		4.5	4.5	4.75	
Condenser Coil	type	-	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins		
	FaceArea	ft ²	49.71	49.71	99.42
		m ²	4.62	4.62	9.24
Condenser Fan	Type		Propeller direct drive 885 RPM		
	Quantity		2	2	4
	Aire Flow RATE	cfm	26500	26000	54120
		l/s	12506.61	12270.63	25541.8
Size	kw	3.5	3.5	7	
	lbs	99	116.6	132	
Refrigrant(R134a)operating charge (approx)	kg	45	53	60	
	Nmber Of Refrigerant Circuit		1	1	1
Unit Operating Weight	lbs	2325.4	2523.4	3049.2	
	kg	1057	1147	1386	

Model		*TCUA-50-1-A	*TCUA-50-1-B	TCUA-60-1	
Cooling Capacity	Ton of Refrigeration	28.63	33.09	38.79	
	KW	100.8	116.5	136.6	
Compressor	Type	recp. Compressor			
	Quantity	1	1	1	
	Oil Charge	US Gal	1.42	1.5	1.5
		LIT	4.75	4.5	5
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	99.42	99.42	99.42
		m ²	9.24	9.24	9.24
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	2	4	4	
	Aire Flow RATE	cfm	53000	53000	52000
		l/s	25013.21	25013.21	24541.27
	Size	kw	7	7	7
Refrigrant(R134a)operating charge (approx)	lbs	165	165	198	
	kg	75	75	90	
NMBER Of Refrigerant Circuit		1	1	1	
Unit Operating Weight	lbs	3440.8	3720.2	4144.8	
	kg	1564	1691	1884	

* A type units have compressor with 6 cylinders.

* B type units have compressor with 8 cylinders.

Model		TCUA-18-2	TCUA-30-2	TCUA-50-2	
Cooling Capacity	Ton of Refrigeration	15.96	17.95	28.34	
	KW	56.2	63.2	99.8	
Compressor	Type	recp. Compressor			
	Quantity	2	2	2	
	Oil Charge	US Gal	1.56	1.56	2.7
		LIT	5.2	5.2	9
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	56.81	56.81	99.42
		m ²	5.28	5.28	9.24
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	2	2	4	
	Aire Flow RATE	cfm	27200	30670	27200
		l/s	12836.97	14474.63	12836.97
	Size	kw	3.5	3.5	7
Refrigrant(R134a)operating charge (approx)	lbs	59.4	99	165	
	kg	27	45	75	
NMBER Of Refrigerant Circuit		2	2	2	
Unit Operating Weight	lbs	2664.2	2732.4	3806	
	kg	1211	1242	1730	

Model		TCUA-60-2	TCUA-70-2	TCUA-80-2	
Cooling Capacity	Ton of Refrigeration	33.06	38.74	48.17	
	KW	116.4	136.4	169.6	
Compressor	Type	recp. Compressor			
	Quantity	1	1	1	
	Oil Charge	US Gal	2.7	2.7	2.85
		LIT	9	9	9.5
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	99.42	99.42	149.13
		m ²	9.24	9.24	13.86
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	4	4	6	
	Aire Flow RATE	cfm	53000	52000	79500
		l/s	25013.21	24541.27	37519.82
	Size	kw	7	7	10.5
Refrigrant(R134a)operating charge (approx)	lbs	198	231	264	
	kg	90	105	120	
NMBER Of Refrigerant Circuit		2	2	2	
Unit Operating Weight	lbs	4109.6	4424.2	5062.2	
	kg	1868	2011	2301	

Model		TCUA-100-2-A	TCUA-100-2-B	TCUA-120-2	
Cooling Capacity	Ton of Refrigeration	57.08	66.17	77.59	
	KW	201	233	273.2	
Compressor	Type	recp. Compressor			
	Quantity	1	1	1	
	Oil Charge	US Gal	2.85	3.003	3.003
		LIT	9.5	10	10
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	149.13	198.84	198.84
		m ²	13.86	18.48	18.48
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	8	8	8	
	Aire Flow RATE	cfm	78000	106000	103600
		l/s	36811.9	50026.43	37519.82
	Size	kw	10.5	14	14
Refrigrant(R134a)operating charge (approx)	lbs	330	330	396	
	kg	150	150	180	
NMBER Of Refrigerant Circuit		2	2	2	
Unit Operating Weight	lbs	5599	6529.6	7295.2	
	kg	2545	2968	3316	

ENGINEERING SPECIFICATIONS (50 HZ)

**CAPACITY RATING(50 HZ)
R-134a**

Condensing Unit MODEL	no.of circuit	comp.oil charge (dm ³)	condenser coil				condenser fan				
			row	fpi	QTY	total heat rejection (kw)	total face area (m ²)	size (mm)	QTY	total air flow rate (cfm)	motor power (kw)
			total heat rejection (kw)	total face area (m ²)	size (mm)	QTY	total air flow rate (cfm)	motor power (kw)			
TCUA-9-1	1	2.6	2	12	2	38.27	2*1,32	800	1	1*1350	1*1,75
TCUA-15-1	1	2.6	3	10	2	42.75	2*1,32	800	1	1*13250	1*1,75
TCUA-25-1	1	4.5	2	12	2	67.81	2*2,31	800	2	2*13600	2*1,75
TCUA-30-1	1	4.5	3	10	2	79.18	2*2,31	800	2	2*13250	2*1,75
TCUA-35-1	1	4.5	4	10	2	93.93	2*2,31	800	2	2*13000	2*1,75
TCUA-40-1	1	4.75	2	10	4	116.2	4*2,31	800	4	4*13530	4*1,75
TCUA-50 A	1	4.75	3	10	4	138.5	4*2,31	800	4	4*13250	4*1,75
TCUA-50 B	1	5	3	10	4	162.5	4*2,31	800	4	4*13250	4*1,75
TCUA-60-1	1	5	4	10	4	190.4	4*2,31	800	4	4*13000	4*1,75
TCUA-18-2	2	5.2	3	10	4	76.54	4*1,32	800	2	2*13600	2*1,75
TCUA-30-2	2	5.2	3	12	4	85.5	4*1,32	800	2	2*15330	2*1,75
TCUA-50-2	2	9	2	12	4	135.62	4*2,31	800	4	4*13600	4*1,75
TCUA-60-2	2	9	3	10	4	158.36	4*2,31	800	4	4*13250	4*1,75
TCUA-70-2	2	9	4	10	4	187.86	4*2,31	800	4	4*13000	4*1,75
TCUA-80-2	2	9.5	3	10	6	232.4	6*2,31	800	6	6*13250	6*1,75
TCUA-100A-2	2	9.5	4	10	6	277	6*2,31	800	6	6*13000	6*1,75
TCUA-100B-2	2	10	3	12	8	325	8*2,31	800	8	8*13250	8*1,75
TCUA-120-2	2	10	4	12	8	380.8	8*2,31	800	8	8*12950	8*1,75

Condensing Unit MODEL	Comp. brand	Compressor displacement (m3/hr)	eva.temp (C / F)	condenser enter																							
				95 F(35oC)								104 F(40oC)								113 F(45oC)							
				Actual Capacity			Power Input (KW)	requierd Heat Rejection (KW)	Current (amp.)	Actual Capacity			Power Input (KW)	requierd Heat Rejection (kw)	Current (amp.)	Actual Capacity			Power Input (KW)								
				KW	MBH	TON				KW	MBH	TON				KW	MBH	TON									
TCUA-9-1	4TES-9Y	41.33	1,7 / 35	22.1	75.41	6.29	6.14	28.24	11.04	20.3	69.27	5.77	6.47	26.77	11.52	18.6	63.47	5.29	6.76								
TCUA-18-2	(4TES-9Y)*2	(41,33)*2	4,4 / 40	24.9	84.96	7.08	6.37	31.27	11.39	23	78.48	6.54	6.76	29.76	11.96	21	71.66	5.97	7.11								
TCUA-15-1	4PES-15Y	48.5	7,2 / 45	28.1	95.88	7.99	6.59	34.69	11.71	25.9	88.37	7.37	7.04	32.94	12.38	23.8	81.21	6.77	7.45								
TCUA-30-2	(4PES-15Y)*2	(48,5)*2	10 / 50	31.5	107.48	8.96	6.77	38.27	11.97	29.1	99.29	8.28	7.29	36.39	12.75	26.8	91.45	7.62	7.76								
TCUA-25-1	4HE-25Y-40P	73.7	1,7 / 35	44.2	150.817	12.571	12.28	56.48	22.08	40.6	138.53	11.547	12.94	53.54	23.04	37.2	126.932	10.58	13.52								
TCUA-50-2	(4HE-25Y-40P)*2	(73,7)*2	4,4 / 40	49.8	169.925	14.164	12.74	62.54	22.78	46	156.96	13.083	13.52	59.52	23.92	42	143.31	11.945	14.22								
TCUA-30-1	4GE-30Y-40P	84.5	7,2 / 45	56.2	191.763	15.984	13.18	69.38	23.42	51.8	176.75	14.733	14.08	65.88	24.76	47.6	162.418	13.538	14.9								
TCUA-60-2	(4GE-30Y-40P)*2	(84,5)*2	10 / 50	63	214.965	17.918	13.54	76.54	23.94	58.2	198.59	16.553	14.58	72.78	25.5	53.6	182.891	15.245	15.52								
TCUA-35-1	4FE-35Y-40P	101.8	1,7 / 35	49.4	168.56	14.05	13.9	63.3	28.88	45.4	154.91	12.912	14.26	60	29.7	41.4	141.263	11.775	15.2								
TCUA-70-2	(4FE-35Y-40P)*2	(101,8)*2	4,4 / 40	56	191.08	15.927	14.46	70.46	29.52	51.6	176.07	14.676	15.3	66.9	30.54	47.2	161.053	13.424	16								
TCUA-40-1	6GE-40Y-40P	126.8	7,2 / 45	63.2	215.648	17.975	14.96	78.16	30.12	58.4	199.27	16.61	15.94	74.34	31.32	53.6	182.891	15.245	16.8								
TCUA-80-2	(6GE-40Y-40P)*2	(126,8)*2	10 / 50	70.12	239.26	19.943	15.38	85.5	30.62	66	225.20	18.771	16.52	82.52	32.04	60.8	207.459	17.292	17.52								
TCUA-50-1-A	6FE-50Y-40P	(151,6)*2	1,7 / 35	39.6	135.12	11.26	10.87	50.47	22.1	36.7	125.23	10.44	11.5	48.2	22.4	33.8	115.33	9.61	12.08								
TCUA-100-2-A	(6FE-50Y-40P)*2	(151,6)*2	4,4 / 40	44.5	151.84	12.66	11.25	55.75	22.6	41.3	140.92	11.71	11.96	53.26	23	38.1	130.00	10.84	12.62								
TCUA-50-1-B	8GE-50Y-40P	185	7,2 / 45	49.9	170.27	14.19	11.6	61.5	22.5	46.4	158.32	13.20	12.4	58.8	23.5	42.9	146.38	12.20	13.14								
TCUA-100-2-B	(8GE-50Y-40P)*2	(185)*2	10 / 50	55.9	190.74	15.90	11.91	67.81	22.9	52.1	177.77	14.82	12.8	64.9	24	48.2	164.47	13.71	13.62								
TCUA-60-1	8FE-60Y-40P	221	1,7 / 35	79.2	270.242	22.526	21.74	100.94	43.2	73.4	250.45	20.876	23	96.4	44.8	68.2	230.661	19.226	24.16								
TCUA-120-2	(8FE-60Y-40P)*2	(221)*2	4,4 / 40	89	303.681	25.313	22.5	111.5	44.2	82.6	281.84	23.493	23.92	106.52	46	76.2	260.006	21.672	25.24								
			7,2 / 45	99.8	340.533	28.385	23.2	123	45	92.8	316.65	26.394	24.8	117.6	47	85.8	292.762	24.403	26.28								
			10 / 50	111.8	381.478	31.797	23.82	135.62	45.8	104.2	355.55	29.636	25.6	129.8	48	96.4	328.931	27.418	27.24								
			1,7 / 35	46.2	157.64	13.14	12.68	58.88	25.9	42.8	146.04	12.17	13.38	56.18	26.8	39.5	134.78	11.23	14.02								
			4,4 / 40	51.8	176.75	14.73	13.14	64.94	26.5	48.2	164.47	13.71	13.93	62.13	27.5	44.5	151.84	12.66	14.66								
			7,2 / 45	58.2	198.59	16.55	13.58	71.78	27	54.2	184.94	15.42	14.47	68.67	28.2	50.1	170.95	14.25	15.29								
			10 / 50	65.2	222.47	18.54	13.98	79.18	27.5	60.7	207.12	17.26	14.96	75.66	28.8	56.3	192.10	16.01	15.89								
			1,7 / 35	92.4	315.283	26.28	25.36	117.76	51.8	85.6	292.08	24.346	26.76	112.36	53.6	79	269.56	22.469	28.04								
			4,4 / 40	103.6	353.499	29.465	26.28	129.88	53	96.4	328.93	27.418	27.86	124.26	55	89	303.681	25.313	29.32								
			7,2 / 45	116.4	397.174	33.106	27.16	143.56	54	108.4	369.88	30.83	28.94	137.34	56.4	100	341.897	28.498	30.58								
			10 / 50	130.4	444.944	37.088	27.96	158.36	55	121.4	414.24	34.528	29.92	151.32	57.6	113	384.208	32.025	31.78								
			1,7 / 35	54.2	154.64	12.89	15.6	69.80	29.7	50.3	143.24	11.94	16.48	66.78	30.8	46.4	131.64	10.97	17.27								
			4,4 / 40	60.8	171.84	14.32	16.28	77.08	30.6	56.5	159.62	13.30	17.28	73.78	31.9	52.3	147.13	12.26	18.18								
			7,2 / 45	68.2	232.70	15.94	16.93	85.13	31.5	63.6	178.11	14.85	18.06	81.66	33.1	59	164.81	13.74	19.09								
			10 / 50	76.4	212.24	17.69	17.53	93.93	32.3	71.3	198.25	16.52	18.79	90.09	34.1	66.2	186.92	15.58	19.96								
			1,7 / 35	108.4	309.277	25.779	31.2	139.6	59.4	100.6	286.48	23.879	33.56	133.56	61.6	92.2	263.281	21.945	34.54								
			4,4 / 40	121.6	343.672	28.646	32.56	154.16	61.2	113	319.24	26.61	34.56	147.56	63.8	105	294.264	24.528	36.36								
			7,2 / 45	136.4	465.4	31.877	33.86	170.26	63	127.2	356.23	29.693	36.12	163.32	66.2	118	329.614	27.474	38.18								
			10 / 50	152.8	424.471	35.381	35.06	187.86	64.6	142.6	396.49	33.049	37.58	180.18	68.2	132	373.835	31.16	39.92								
			1,7 / 35	67.4	229.98	19.17	19.35	86.75	41.3	62.8	214.28	17.86	20.5	83.3	42.7	58.1	198.25	16.52	21.5								
			4,4 / 40	75.6	257.96	21.50	20.1	95.7	42.2	70.6	240.90	20.08	21.4	92	43.8	65.4	223.15	18.60	22.5								
			7,2 / 45	84.8	289.35	24.12	20.8	105.6	43	79.3	270.58	22.55	22.2	101.5	44.8	73.7	251.48	20.96	23.6								
			10 / 50	94.8	323.47	26.96	21.4	116.2	43.8	88.8	303.00	25.26	23	111.8	45.8	82.7	282.18	23.52	24.5								
			1,7 / 35	134.8	459.958	38.339	38.7	173.5	82.6	125.6	428.57	35.722	41	166.6	85.4	116	396.492	33.049	43								
			4,4 / 40	151.2	515.917	43.003	40.2	191.4	84.4	141.2	481.80	40.159	42.8	184	87.6	131	446.309	37.201	45								
			7,2 / 45	169.6	578.701	48.237	41.6	211.2	86	158.6	541.17	45.108	44.4	203	89.6	147	502.951	41.923	47.2								
			10 / 50	189.6	646.944	53.925	42.8	232.4	87.6	177.6	606.00	50.512	46	223.6	91.6	165	564.37	47.042	49								
			1,7 / 35	79.9	178.46	14.87	23.1	103.00	57.4	73.9	165.97	13.83	24.4	98.30	59.1	66	155.94	13.00	25.4								
			4,4 / 40	89.7	196.88	16.41	24	113.70	58.6	83.1	183.23	15.27	25.4	108.50	60.5	76.6	172.25	14.36	26.6								
			7,2 / 45	100.8	243.94	18.12	24.9	125.70	59.8	93.5	202.55	16.88	26.4	119.90	61.9	86.3	190.53	15.88	27.8								
			10 / 50	112.8	239.53	19.97	25.7	138.50	60.9	104.9	223.22	18.61	27.4	132.30	63.1	96.9	210.19	17.52	28.9								
			1,7 / 35	159.8	356.911	29.75	46.2	206																			

ENGINEERING SPECIFICATIONS - 50 HZ- (R-22)

ELECTRICAL DATA				
Condensing Unit MODEL	Nominal Comp. power (HP)	MRA (Amp)	LRA (Amp)	MAX POWER (kw)
TCUA-9-1	9	19.9	49	13
TCUA-15-1	15	28.2	81	16
TCUA-25-1	25	44	125	25
TCUA-30-1	30	51.2	141	28
TCUA-35-1	35	61.2	141	35
TCUA-40-1	40	73.9	219	42
TCUA-50 A	50	96.2	226	51
TCUA-50 B	50	92	298	51
TCUA-60-1	60	113	349	63
TCUA-18-2	9*2	39.8	98	26
TCUA-30-2	15*2	56.4	162	32
TCUA-50-2	25*2	88	250	50
TCUA-60-2	30*2	102.4	282	56
TCUA-70-2	35*2	122.4	282	70
TCUA-80-2	40*2	147.8	438	84
TCUA-100A-2	50*2	192.4	452	102
TCUA-100B-2	50*2	184	596	102
TCUA-120-2	60*2	226	698	126

Model		TCUA-12-1	TCUA-15-1	TCUA-25-1	
Cooling Capacity	Ton of Refrigeration	12.10	13.97	21.73	
	KW	42.6	49.2	76.5	
Compressor	Type	recp. Compressor			
	Quantity	-	1	1	
	Oil Charge	US Gal	0.78	0.78	1.35
LIT		2.6	2.6	4.5	
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	28.4064	49.7112	56.8128
		m ²	2.64	4.62	5.28
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	2	2	2	
	Aire Flow RATE	cfm	13530	27060	27060
		l/s	22987.47	45974.94	45974.94
Size	kw	1.75	3.5	3.5	
Refrigrant(R134a)operating charge (approx)	lbs	39.7	50.7	83.8	
	kg	18	23	38	
Nmbner Of Refrigerant Circuit		1	1	1	
Unit Operating Weight	lbs	1717.5	1858.5	2422.9	
	kg	779	843	1099	

Model		TCUA-30-1	TCUA-35-1	TCUA-40-1	
Cooling Capacity	Ton of Refrigeration	25.13	29.96	37.40	
	KW	88.5	105.5	131.7	
Compressor	Type	recp. Compressor			
	Quantity	-	1	1	
	Oil Charge	US Gal	1.35	1.35	1.42
LIT		4.5	4.5	4.75	
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	49.7112	99.4224	99.4224
		m ²	4.62	9.24	9.24
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	2	4	4	
	Aire Flow RATE	cfm	25900	26500	52000
		l/s	44004.1	45023.5	88348
Size	kw	3.5	7	7	
Refrigrant(R134a)operating charge (approx)	lbs	99.2	116.9	132.28	
	kg	45	53	60	
Nmbner Of Refrigerant Circuit		1	1	1	
Unit Operating Weight	lbs	2467	2992	3445.9	
	kg	1119	1357	1563	

Model		TCUA-50-1	TCUA-60-1	TCUA-70-1	
Cooling Capacity	Ton of Refrigeration	44.96	52.09	60.21	
	KW	158.3	183.4	212	
Compressor	Type	recp. Compressor			
	Quantity	1	1	1	
	Oil Charge	US Gal	1.42	1.5	1.5
LIT		4.75	5	5	
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	99.4224	149.1336	149.1336
		m ²	9.24	13.86	13.86
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	4	6	6	
	Aire Flow RATE	cfm	51800	79500	77700
		l/s	88008.2	135070.5	132012.3
	Size	kw	7	10.5	10.5
Refrigrant(R134a)operating charge (approx)	lbs	165.4	198.5	231.49	
	kg	75	90	105	
Nمبر Of Refrigerant Circuit		1	1	1	
Unit Operating Weight	lbs	4001.5	4554.8	5064.1	
	kg	1815	2066	2297	

Model		TCUA-60-2	TCUA-70-2	TCUA-80-2	
Cooling Capacity	Ton of Refrigeration	50.27	59.92	74.69	
	KW	177	211	263	
Compressor	Type	recp. Compressor			
	Quantity	2	2	2	
	Oil Charge	US Gal	2.7	2.7	2.85
LIT		9	9	9.5	
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	149.13	149.13	198.84
		m ²	13.86	13.86	18.48
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	6	6	8	
	Aire Flow RATE	cfm	79500	79500	106000
		l/s	37519.82	37519.82	50026.43
Size	kw	10.5	10.5	14	
	Refrigrant(R134a)operating charge (approx)	lbs			
kg		90	105	120	
Nمبر Of Refrigerant Circuit		2	2	2	
Unit Operating Weight	lbs	4404.4	4866.4	5728.8	
	kg	2002	2212	2604	

Model		TCUA-24-2	TCUA-30-2	TCUA-50-2	
Cooling Capacity	Ton of Refrigeration	24.20	27.95	43.45	
	KW	85.2	98.4	153	
Compressor	Type	recp. Compressor			
	Quantity	2	2	2	
	Oil Charge	US Gal	1.56	1.56	2.7
LIT		5.2	5.2	9	
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	56.81	99.42	99.42
		m ²	5.28	9.24	9.24
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	2	4	4	
	Aire Flow RATE	cfm	27060	27200	51800
		l/s	12770.9	12836.97	24446.88
Size	kw	3.5	7	7	
	Refrigrant(R134a)operating charge (approx)	lbs	79.2	99	165
kg		36	45	75	
Nمبر Of Refrigerant Circuit		2	2	2	
Unit Operating Weight	lbs	2952.4	3088.8	4241.6	
	kg	1342	1404	1928	

Model		TCUA-100-2	TCUA-120-2	TCUA-140-2	
Cooling Capacity	Ton of Refrigeration	89.91	104.17	120.42	
	KW	316.6	366.8	424	
Compressor	Type	recp. Compressor			
	Quantity	2	2	2	
	Oil Charge	US Gal	2.85	3.003	3.003
LIT		9.5	10	10	
Condenser Coil	type	Air cooled, 2,3or4 rows, 8,10,12 FPI fin spacing,-Cu tubes, Al fins			
	FaceArea	ft ²	149.13	248.55	298.26
		m ²	13.86	23.1	27.72
Condenser Fan	Type	Propeller direct drive 885 RPM			
	Quantity	8	10	12	
	Aire Flow RATE	cfm	103600	129500	155400
		l/s	48893.76	61117.19	73340.63
Size	kw	14	17.5	21	
	Refrigrant(R134a)operating charge (approx)	lbs	330	396	462
kg		150	180	210	
Nمبر Of Refrigerant Circuit		2	2	2	
Unit Operating Weight	lbs	6969.6	7906.8	8890.2	
	kg	3168	3594	4041	

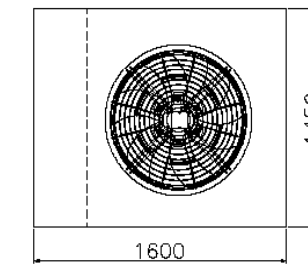
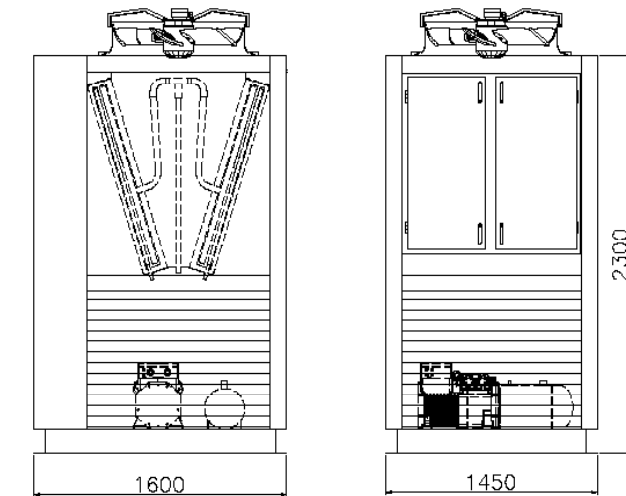
ELECTRICAL DATA

Condensing Unit MODEL	Nominal Comp. power (HP)	MRA (Amp)	LRA (Amp)	MAX POWER (kw)
TCUA-12-1	9	25.1	69	12
TCUA-15-1	15	28.2	81	16
TCUA-25-1	25	44	125	25
TCUA-30-1	30	51.2	141	28
TCUA-35-1	35	62.1	141	35
TCUA-40-1	40	73.9	219	42
TCUA-50-1	50	96.2	226	51
TCUA-60-1	60	113	349	63
TCUA-70-1	70	139	401	78
TCUA-24-2	12*2	50.2	138	24
TCUA-30-2	15*2	56.4	162	32
TCUA-50-2	25*2	88	250	50
TCUA-60-2	30*2	102.4	282	56
TCUA-70-2	35*2	124.2	282	70
TCUA-80-2	40*2	147.8	438	84
TCUA-100-2	50*2	192.4	452	102
TCUA-120-2	60*2	226	698	126
TCUA-140-2	70*2	278	802	156

Dimension (R-134a)

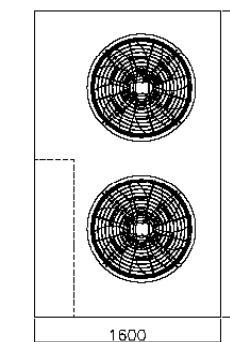
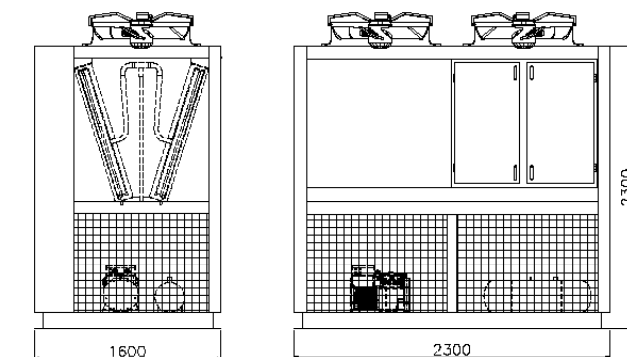
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TCUA-25-1



TCUA-30-1 TCUA-40-1

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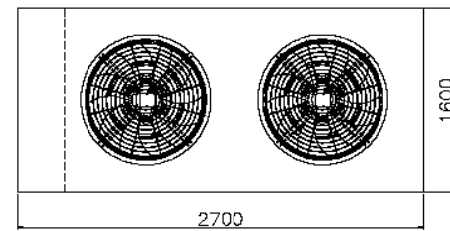
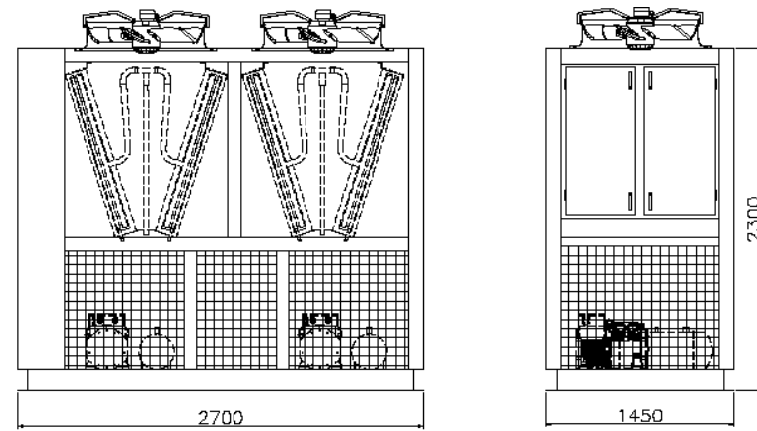


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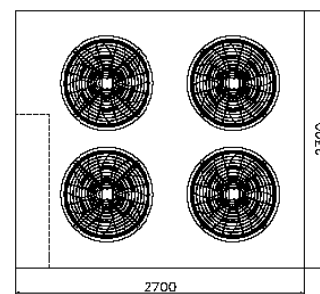
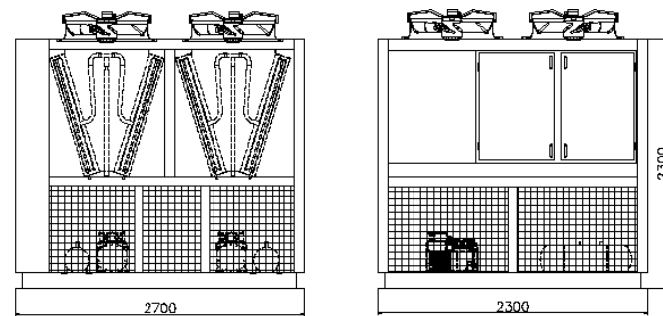
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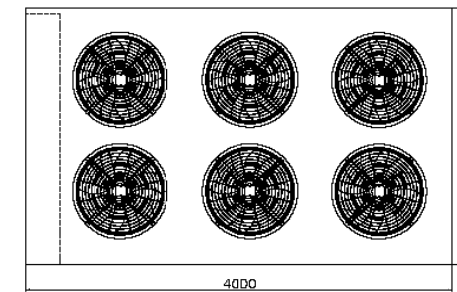
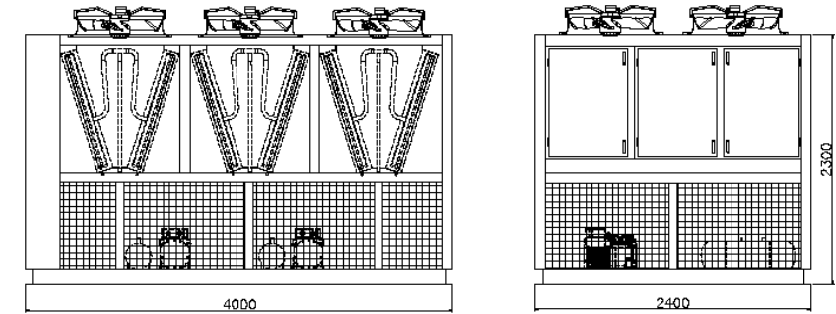
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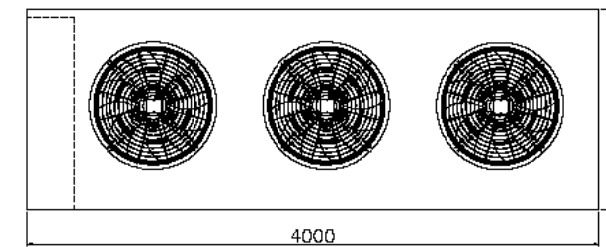
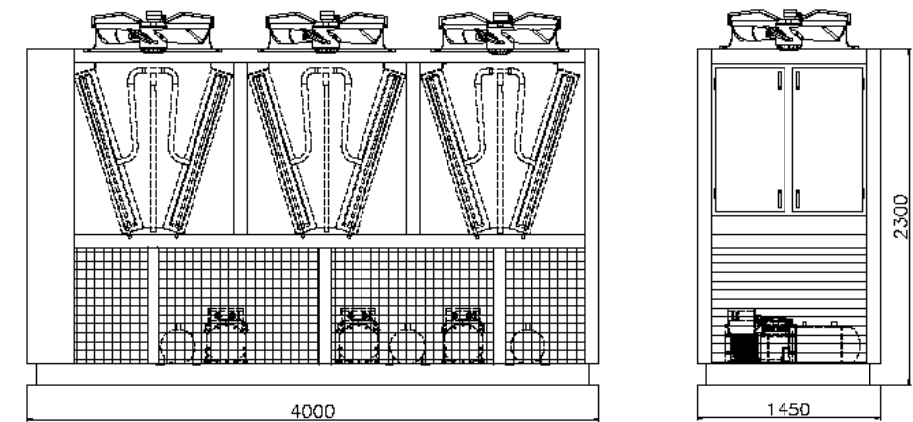


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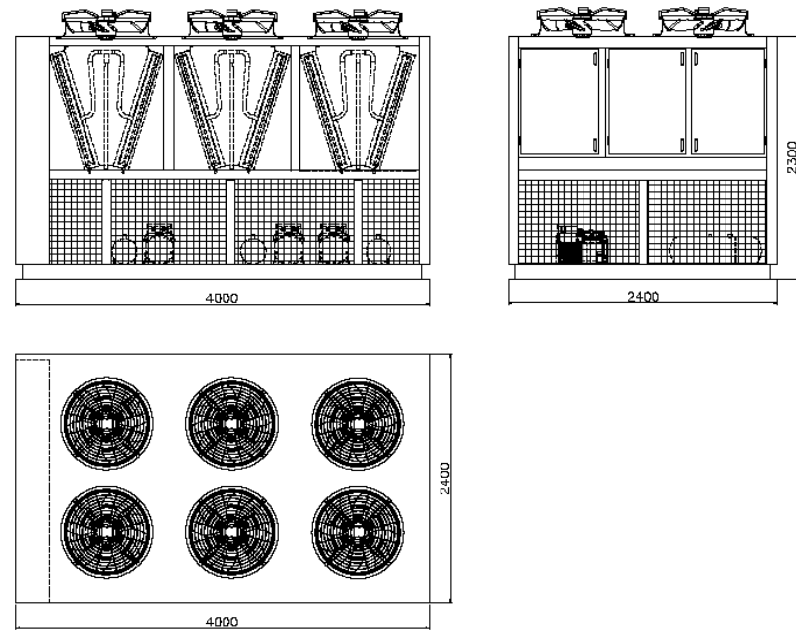
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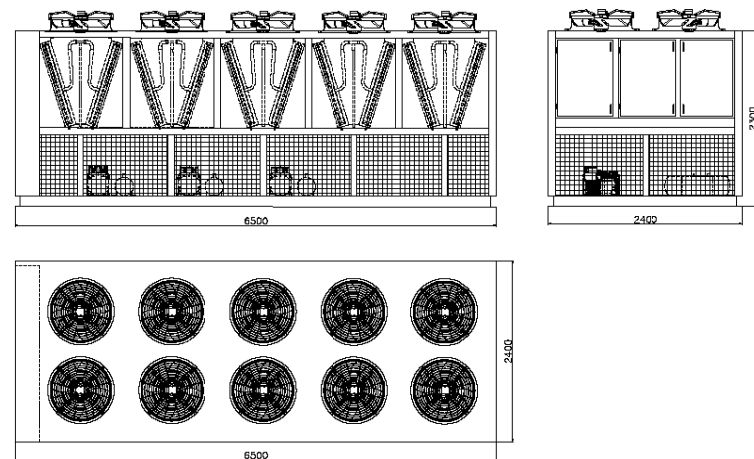
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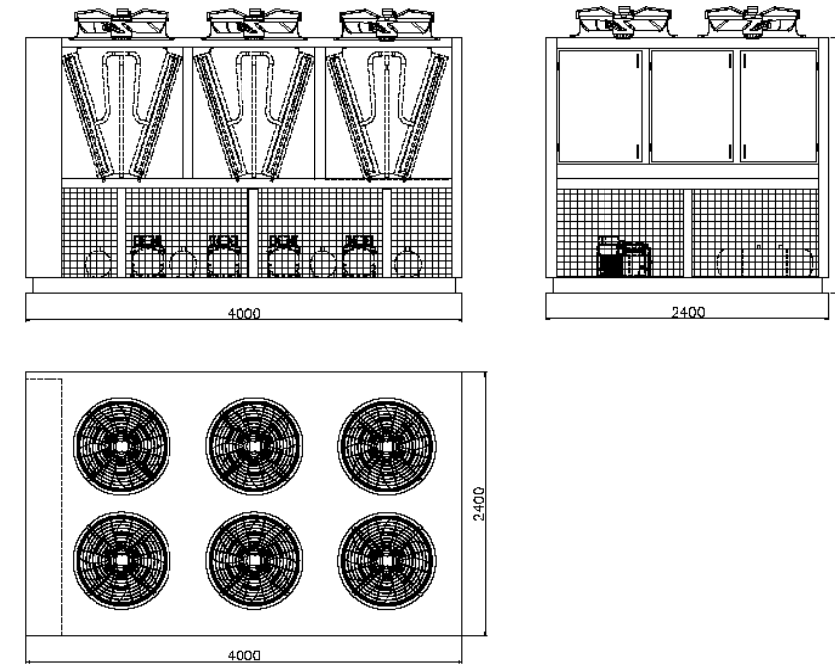
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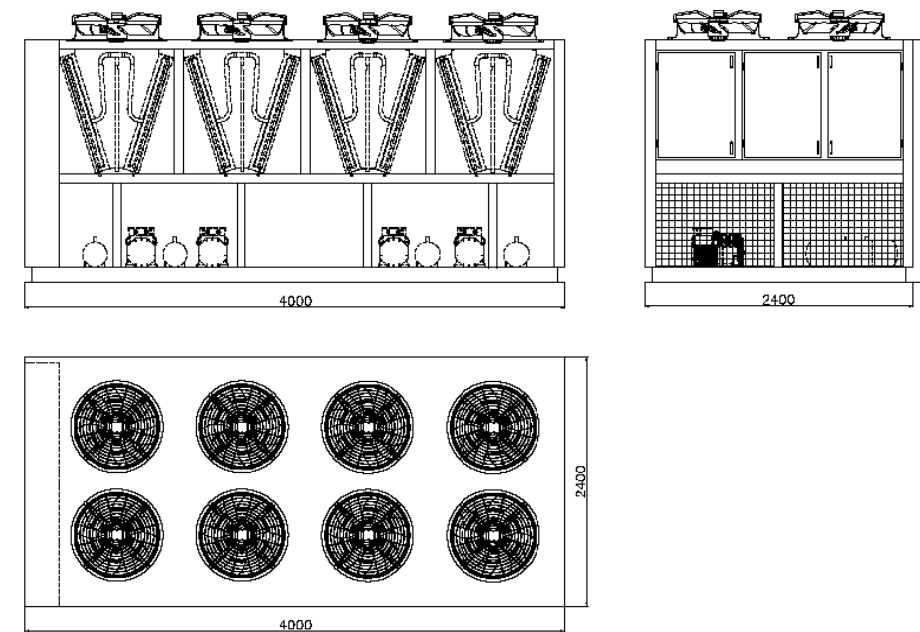
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TCUA-100-4

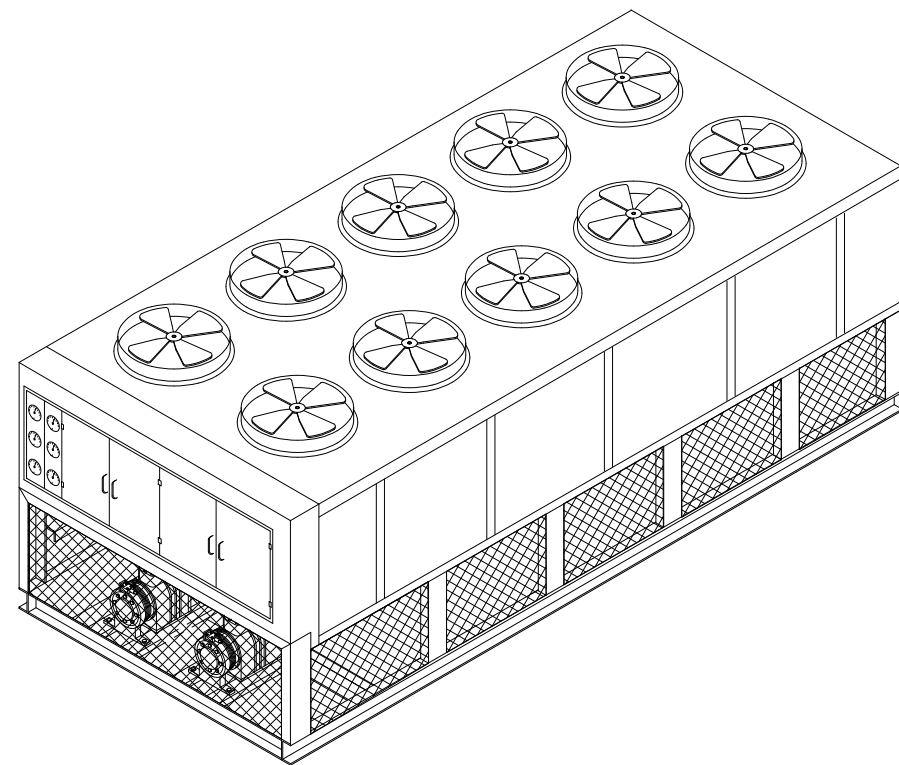
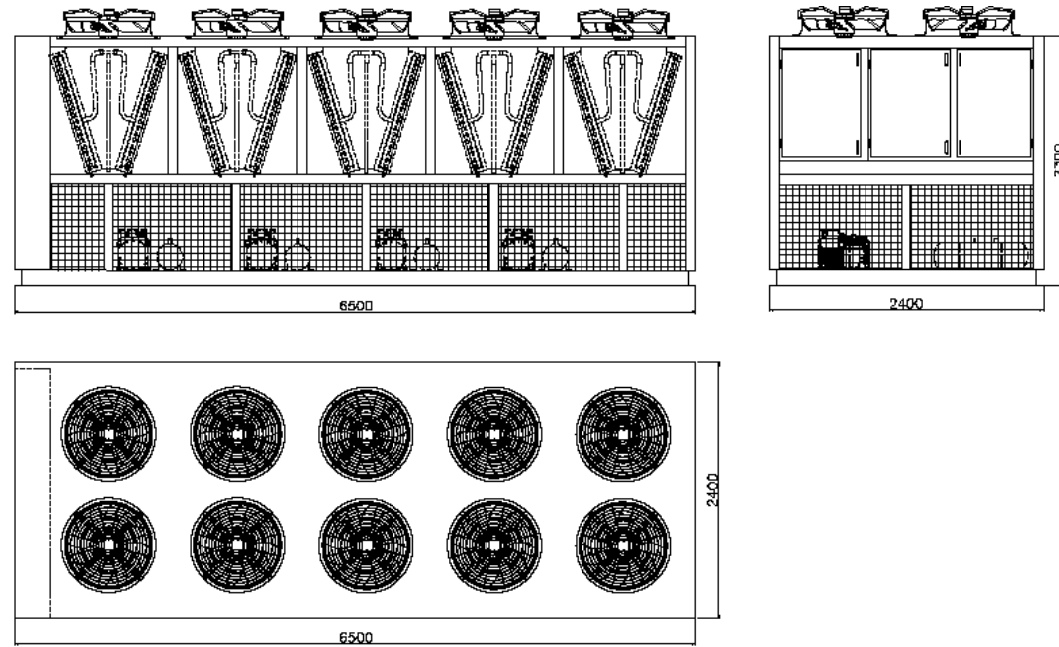
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TCUA-160-4



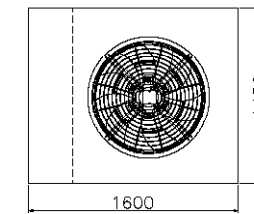
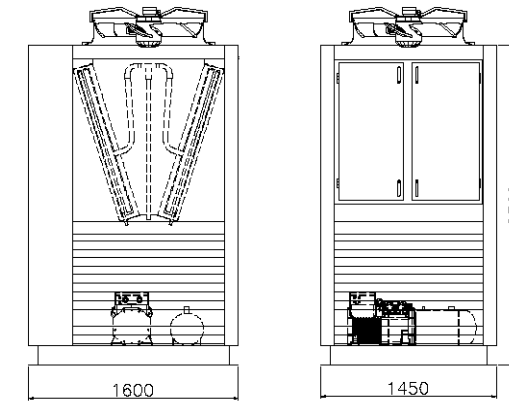
TCUA-200-4



Dimension (R-22)

TCUA-10-1

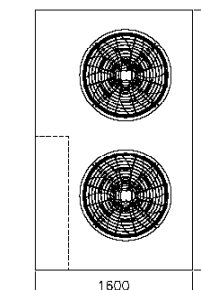
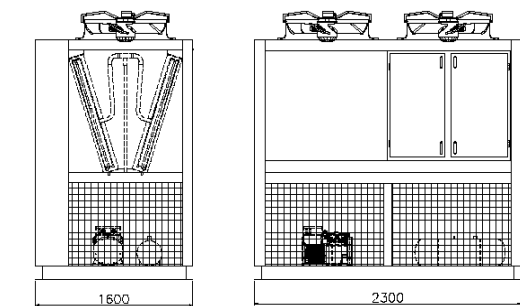
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TCUA-20-1

TCUA-25-1

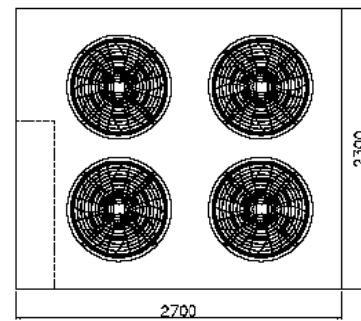
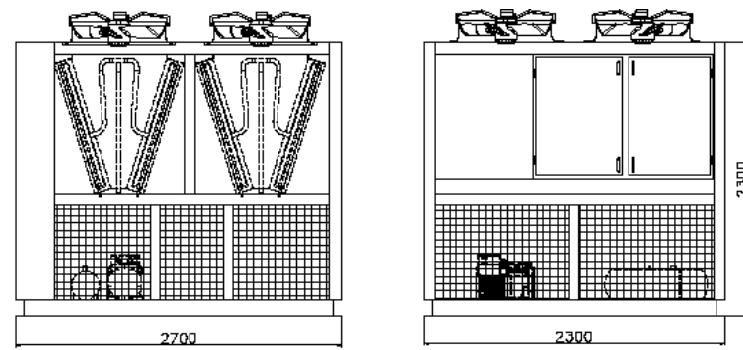
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TCUA-35-1

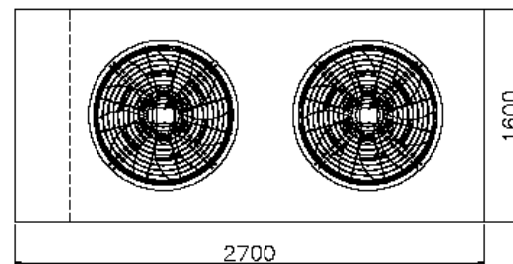
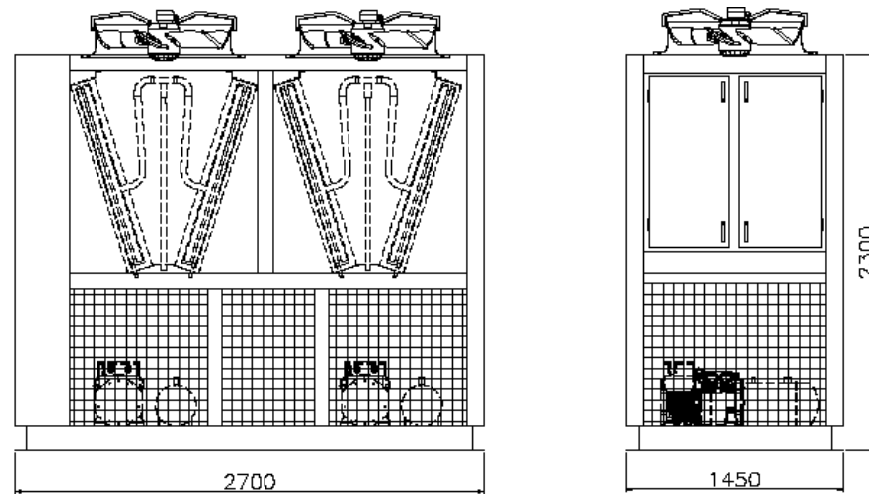
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TCUA-50-1



TCUA-20-2

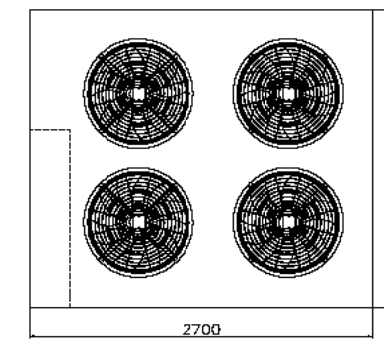
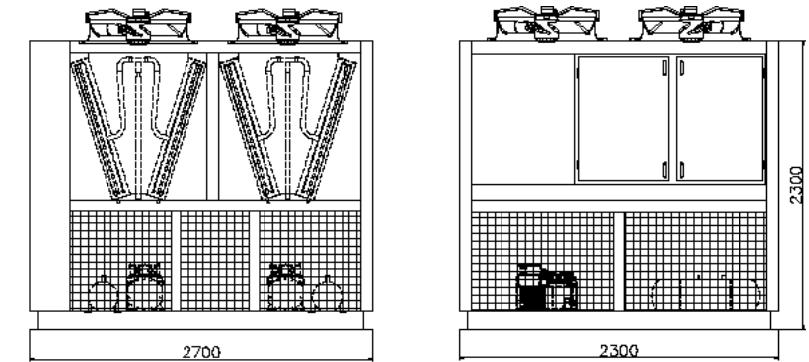
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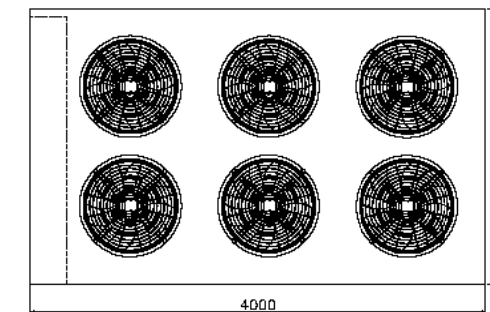
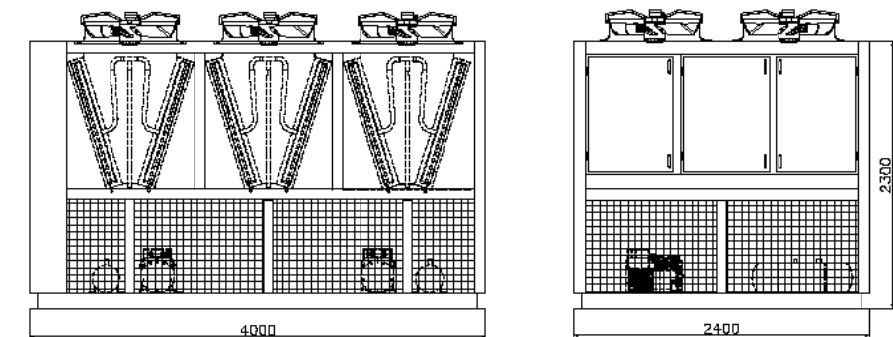
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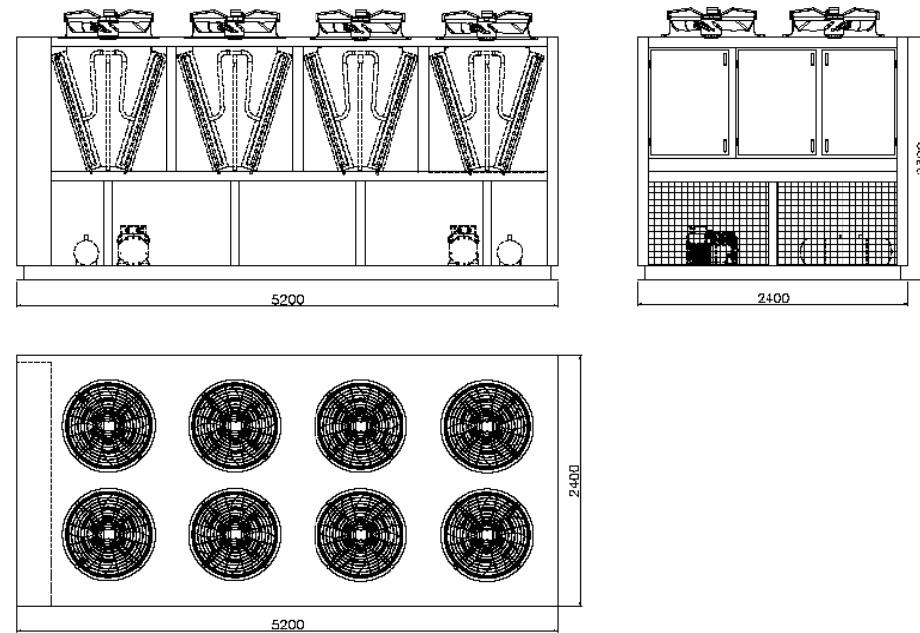


TCUA-70-2

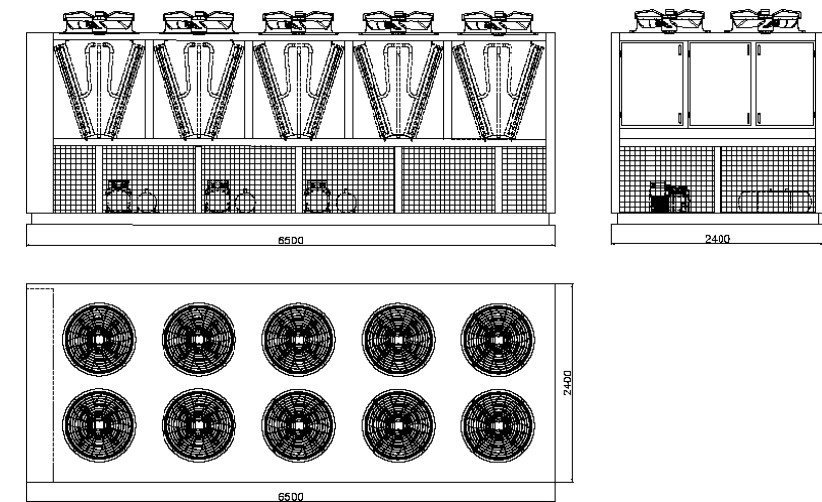
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TCUA-100-2



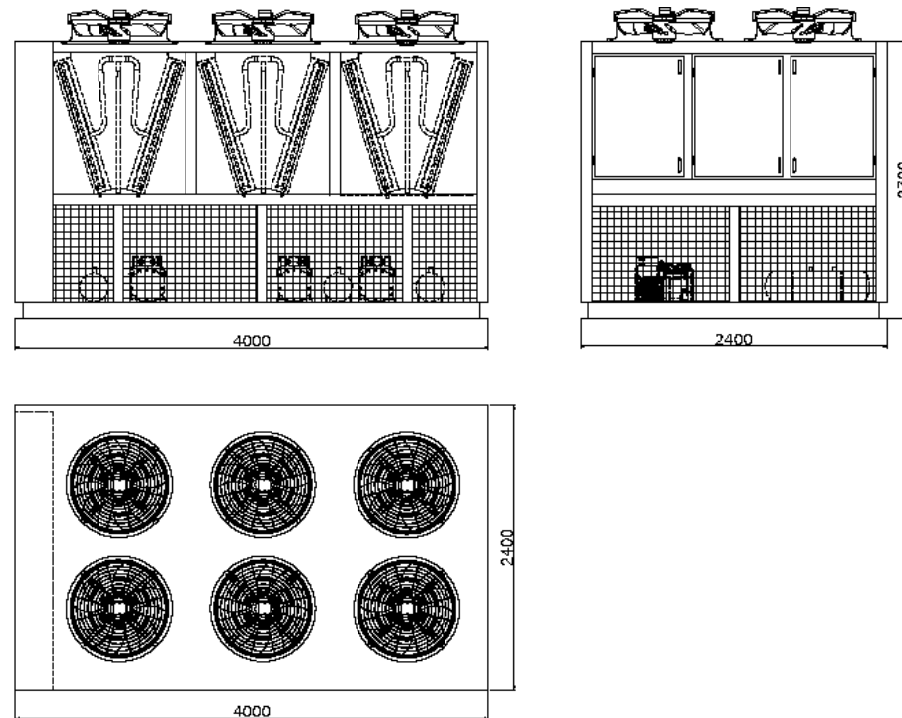
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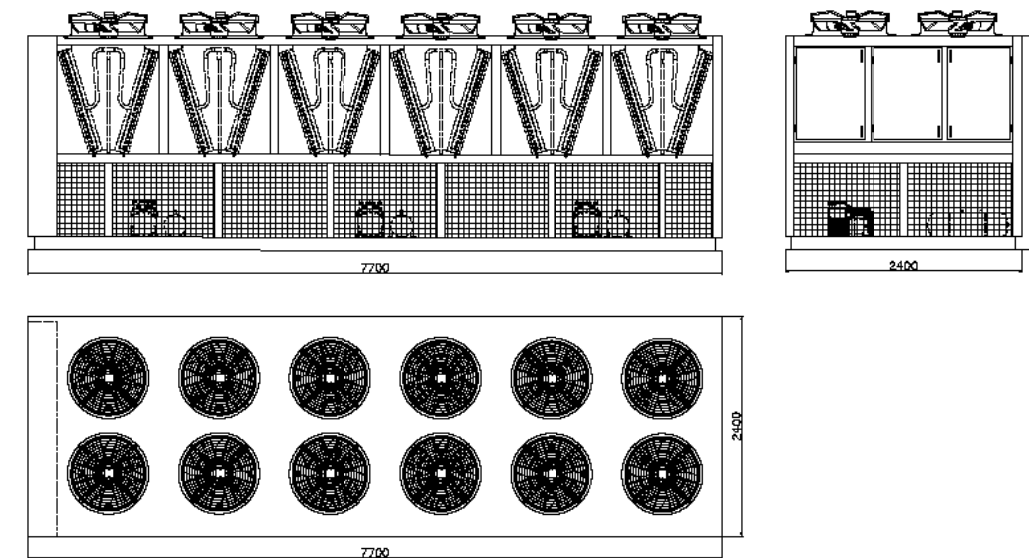
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TCUA-70-3

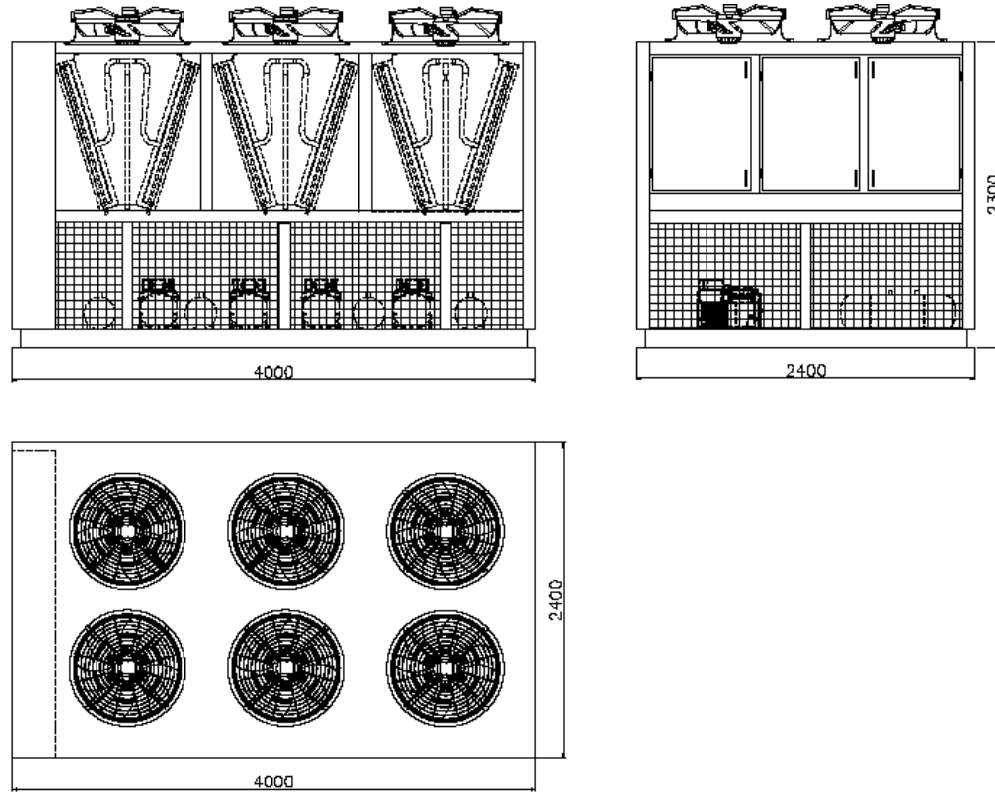
TCUA-80-3



TCUA-150-3

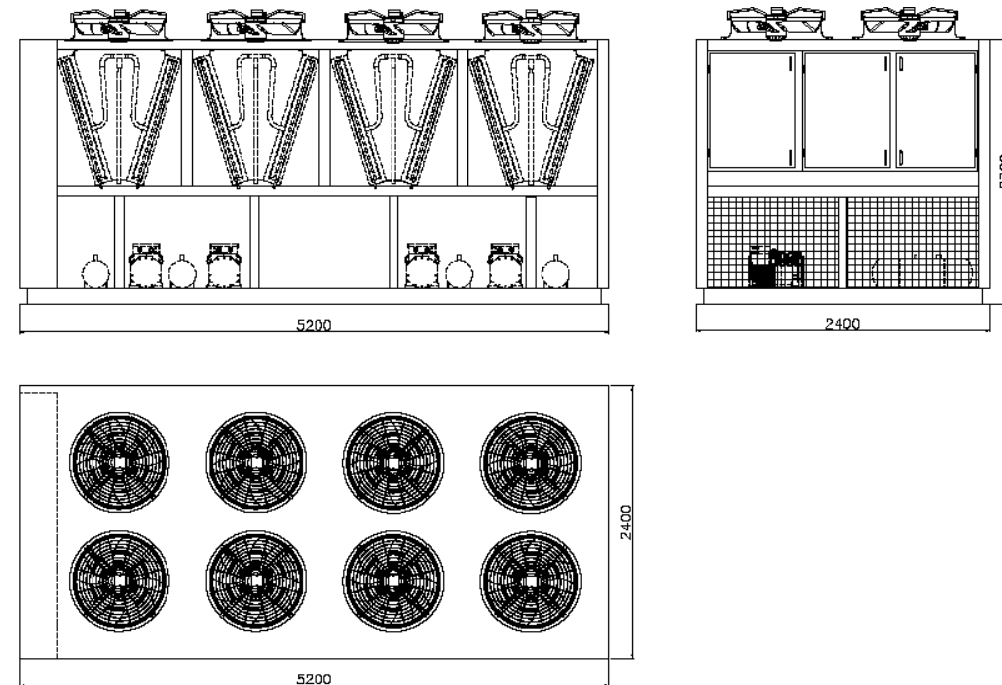


TCUA-80-4

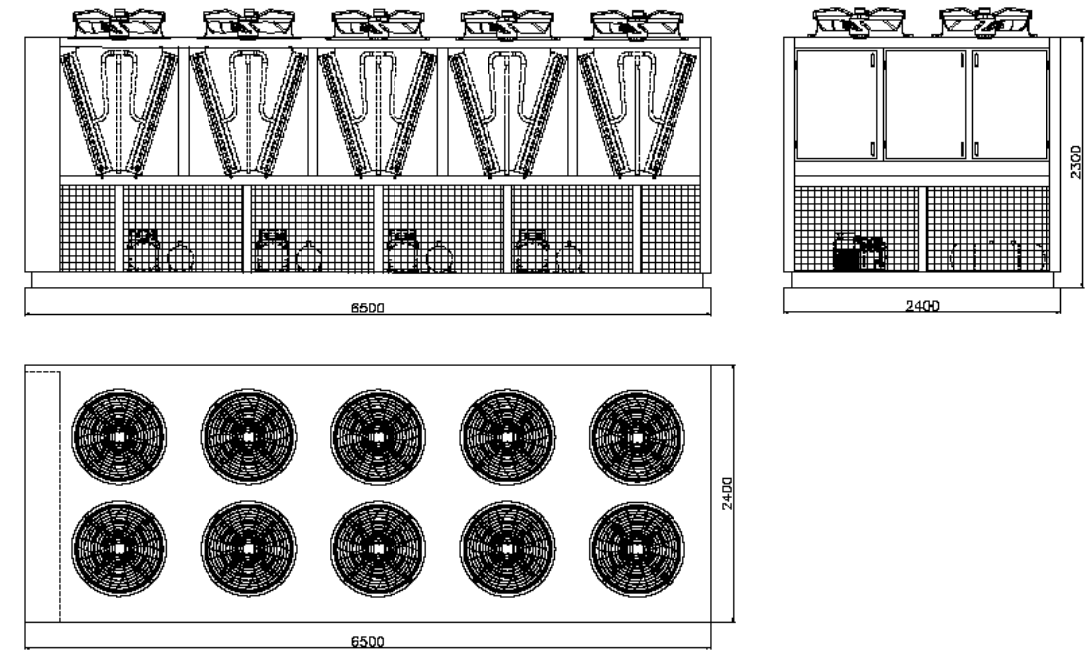


TCUA-100-4

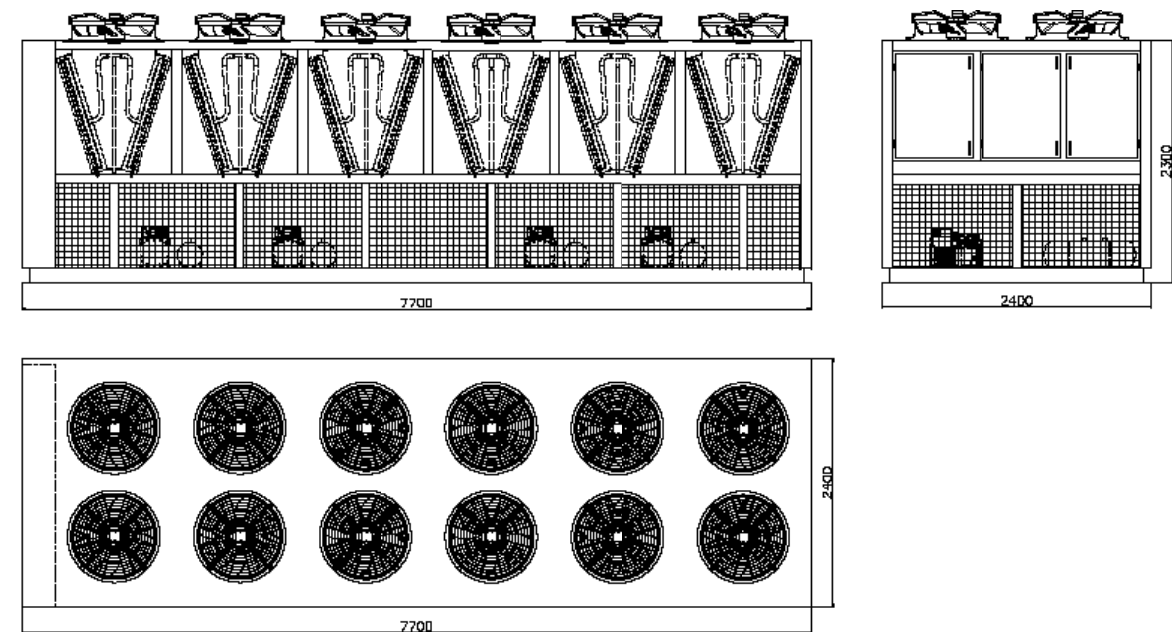
TCUA-120-4



TCUA-140-4



TCUA-160-4



TCUA-200-4

