ENVIRONMENTAL
CLIMATE CONTROL
EQUIPMENT
& SOLUTIONS

SOLUTIONS COP21 PARIS 2015

NEW

ECOPS

Thermorefrigerating pump operating with propane
Packaged unit

MADE IN FRANCE

www.ett.fr

ENERGIE TRANSFERT THERMIQUE

C O N T E N T S

SOLUTIONS COP21 PARIS 2015

"Inventing the future of air conditioning"

General description

The **ETT** packaged unit is delivered ready to operate. Its full aluminium structure (frame & casing) ensures an excellent corrosion protection (20-year anti-corrosion guarantee). The **ETT** unit can be installed either at ground level or on a roof.
ECODESIGN involves DECONSTRUCTION: ETT units are 98% recyclable (re-use and recycling rates based on EFFI+ 220).

Our technical choices have several impacts on the environment

- **Legal and regulatory framework:**
  - In accordance with Directive 2008/98/EC on waste, clause 26: "The polluter-pays principle is a guiding principle at European and international levels. The waste producer and the waste holder should manage the waste in a way that guarantees a high level of protection of the environment and human health.", ETT is a member of "Eco-systèmes Pro".
  - In accordance with articles 5.3, 5.4 and 11 of Regulation (EC) No 303/2008, ETT holds a certificate of capability to handle refrigerants (no. 637).
- **Aluminium: a good choice for the planet!**
  - Aluminium is endlessly 100% recyclable.
  - Recycling covers over 30% of aluminium needs.
- **Low polluting ETT manufacturing process:**
  - Selective sorting, waste recovery, 60% of waste is recycled.
  - No paint on casings, no use of solvent.
  - ISO 14001 Certification (Environmental Management System).
- **Consumables: efficient waste management:**
  - Filtration: ETT units include "ecodesign" air filters (selective sorting: frame - grille - media)

We placed ease of operation at the heart of our units design:

- The separate **technical section** facilitates unit control and maintenance and allows measurement and adjustment during operation.
- The **BEST controller** is specifically designed for this application. It allows great flexibility, thus optimum performance of the **ETT** unit through a user-friendly interface, be it local or remote (with remote display, PC or BMS).

Each unit is checked and tested at the factory, prior to shipment, and a test certificate is issued.
ETT Quality organisation is certified **ISO 9001** (AFNOR Certificate 1994/2016f).

Moreover, each unit is delivered with an **EC standard certificate of conformity** and complies with the standards listed below:

- Machinery Directive 2006/42/EC - Operator's safety
- Low Voltage Directive (LVD) 2014/35/EU
- Electromagnetic Compatibility (EMC) Directive 2014/30/EU
- Gas Appliances Directive (GAD) 2009/142/EC
- EN 60204-1 - Safety of machinery – Electrical equipment of machines
- EN 378-2:2017 – Safety and environmental requirements
- Pressure Equipment Directive (PED) 2014/68/EU (sections 2.10, 2.11, 3.4, 5a and 5d of Annex I)

100% recyclable aluminium

20-year guarantee against corrosion frame - casing

Innovating for the environment

Energy-intensive buildings such as commercial and tertiary sector facilities have a significant carbon footprint.

ETT's Research & Development Department developed an award-winning solution that reuses waste thermal energy rejected by conventional installations to produce hot and cold water simultaneously.

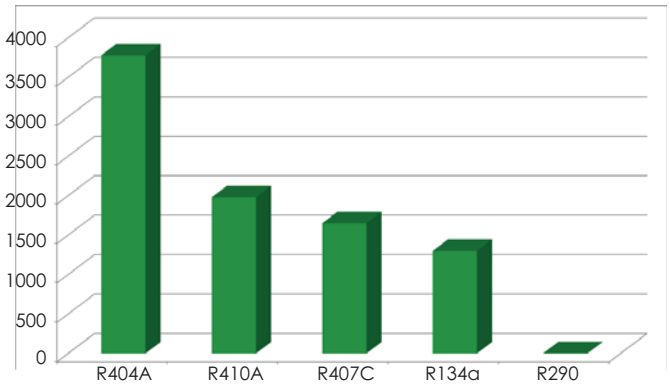
ECOPS is designed to offer:

- ✓ heat and cold production with limited CO_2 emissions
- ✓ energy-efficient operation with low environmental impact (low GWP refrigerant)
- ✓ energy consumption reduction thanks to the variable speed compressor, EC propeller, etc.

Global Warming Potential (GWP):

ECOPS is an eco-friendly thermorefrigerating pump operating with propane (R290),a refrigerant with low environmental impact:

- ✓ Zero ozone depletion (ODP)
- ✓ Global Warming Potential (GWP) of 3 over 100 years



Performance optimisation - Seasonal efficiency:

EC propeller with variable rotation speed (Ø 910)

Variable-speed compressor

ECOPS type 100 - 150

ErP Compliant

Operating principles

ECOPS thermodynamic system reuses waste thermal energy rejected by standard installations for heat and cold production.

This new ETT unit is designed to meet all of the requirements of a building:

> Heating
> Cooling
> Domestic hot water (DHW)

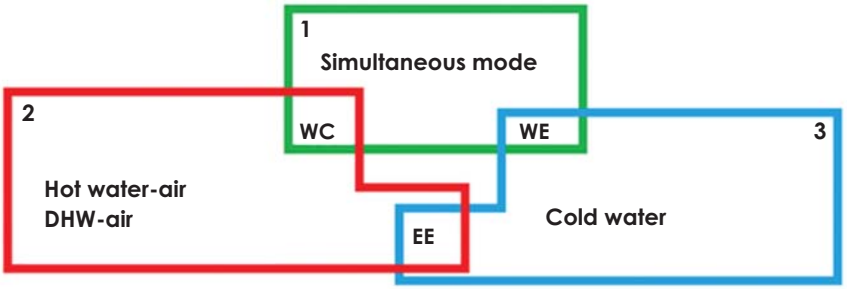
The unit operates as a heat pump:

> Treated fluid: cold water, hot water and domestic hot water (DHW)
> Rejection: outside air

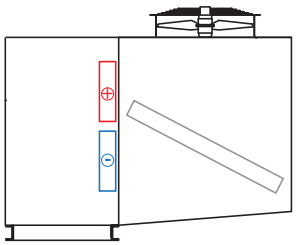
Featured modes

1: Simultaneous mode
2: Heating mode
3: Cooling mode

WC: Water-cooled condenser for heat production
WE: Water-cooled evaporator
EE: External exchanger

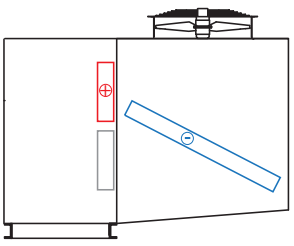


Simultaneous mode



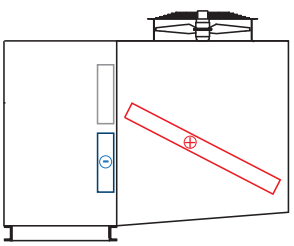
Simultaneous mode: hot water, cold water and domestic hot water temperatures are maintained thanks to the thermodynamic system.

Heating mode



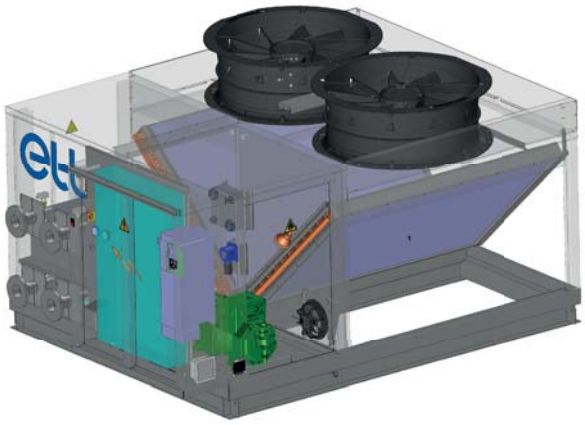
Heating mode: hot water and domestic hot water temperatures are maintained thanks to the thermodynamic system.

Cooling *mode*



Cooling mode: cold water temperature is maintained thanks to the thermodynamic system.

Unit description



The ETT packaged unit comprises 3 different sections:

1. The external section allows thermal exchanges with the environment.
2. The separate technical section houses the refrigeration components and the control components.
3. The electrical section is separated from the technical section.

Aluminium frame and casing:

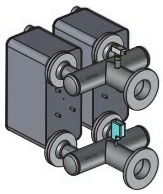
- **Rigid, compact and lightweight packaged unit**, perfectly weather-resistant, with a 20-year anti corrosion guarantee on casing.
- **Watertight floor** with drainage outlets around the unit.
- **Aluminium vertical panels and roof, mounted on aluminium frame. Access through removable panels**.
- **Electrical section with IP54 protection rating.**

ECOPS type 60 - 80

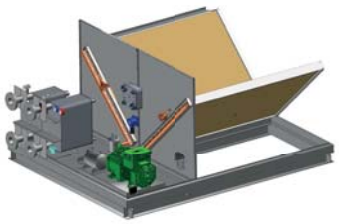
ECOPS type 180 - 270

Energy and thermodynamic assembly:

- **Refrigeration circuits** compliant with European directive on pressure equipment (PED 2014/68/EU).
- **R290 refrigerant** (propane).
- **Direct expansion internal brazed plate exchangers**. The exchanger for cold water production is associated to an electronic expansion valve.



- **Direct expansion external exchanger**, made with copper pipes and aluminium fins with vinyl coating and aluminium frame, coupled with an electronic expansion valve in hot water production mode.
  External exchangers angled position and the separation by refrigeration circuit and by compressor ensure quick and efficient defrosting.
- **Optimised defrosting** thanks to the new design of the external section and the integration of a 910 mm propeller fan. Defrosting does not cause any drop in hot water temperature.
- **Variable-speed compressor**: capacity is adjusted to match performance requirements. Operation in part load considerably reduces the number of defrost cycles and their duration.



- **Independent refrigeration circuit**: each refrigerant circuit is equipped with one or more EC propeller fan(s) to ventilate the exchanger.
- **Propane detector**: all units are equipped with a propane detector that stops the unit if propane is detected in the technical section (20% of the lower explosive limit (LEL)).
- **EC propeller**: propeller fan(s) rotation speed is adjusted to the requirement to reduce unit energy consumption.
- **Anti-acid filter drier.**
- **HP and LP switches**.
- **Cycle reversal valve**.

Control description

Electrical assembly:

- **Electrical board** compliant with French standards NF EN C 15-100 and NF EN 60204-01, including:
- ✓ **ETT controller** with display.
- ✓ **Power switch** with lockable external handle for full load cut-off. Connection using standard universal cable. Optional copper/aluminium connection boxes.
- ✓ **400-230-24 volts transformer** for regulation and control circuits.
- ✓ **Faults synthesis** with pending dry contact on terminal.
- ✓ **Numbered terminal blocks** with disconnecting terminals for remote controls and transfers.
- ✓ **Internal wiring** with numbered ferrules at both extremities.
- ✓ **Ik3 breaking capacity** of basis 10 kA.
- ✓ **All components protected** by circuit breakers.
- ✓ **LV distribution rated voltage** compliant with French standards, i.e. rated voltage of 230/400V. French standards also set minimum and maximum acceptable values at the user supply point (average value for 10 lm) within a -10%/+10% range from rated values and maximum acceptable value of the voltage drop gradient to 2%. The voltage drop gradient represents the additional voltage drop created on a network point if 1 kW single-phase is added on this point.

Control assembly:

- **CTN type temperature probes.** Their accuracy and reliability have been tested and validated both at the factory and on site.
- **One or more BEST controllers** (Building Energy Saving Technology) especially developed by ETT for this range of units.

The microprocessor, the memory and the size of the controllers are adapted to the chosen applications and options by integrating a program set-up in the factory. The controller is in a plastic box which guarantees a high mechanical protection and reduces electrostatic shock threats.

Among other functions, the controller includes:

- ✓ **On/Off with remote contact** or vacancy contact.
- ✓ **On/Off** according to programmed schedule (2 time slots per day).
- ✓ **Fault synthesis** with dry contact for transfer to customer system.
- ✓ **3 setpoints**: hot water, cold water and DHW.
- ✓ **Security management** (frost protection thermostat, smoke detector, HP switch, etc.) and faults management.
- ✓ **Optimisation** and equalisation of compressors operating time.
- ✓ **Flash-type analogue and economical management of alternate defrost cycles** for each refrigeration circuit using frost detection and end of defrosting through analogue probes, stop of the concerned exchanger's ventilation, coil drying and starting of a new heating cycle in heat pump mode. External coils angled position helps blowing water away from the coil, ensuring efficient defrosting.
  The hot water circuit is not affected during the defrost cycle. It does not cause any drop in temperature.
- ✓ **Written faults history** (no code needed) with time and outside temperature display.
- ✓ **Operating time counting** (unit, compressors and auxiliaries).

Main options

Hydraulics	▪ Cold water tank, hot water tank and/or DHW tank ▪ Control valve on hot water and cold water circuits ▪ Stop valve on hot water and cold water circuits ▪ Filters
Electricity	▪ Total electrical energy metering according to 2002/91/EC ▪ Aluminium/copper connection terminal blocks (aluminium mandatory for power cables) ▪ 230V/16A single-phase socket in the technical section (separate power supply to be provided by the installer) ▪ Emergency stop button
Control	▪ ETT MediaCom ▪ PGD Touch terminal
Laying	▪ 200 or 400 mm aluminium feet ▪ Roof curb

Technical features

Type 60 - 80

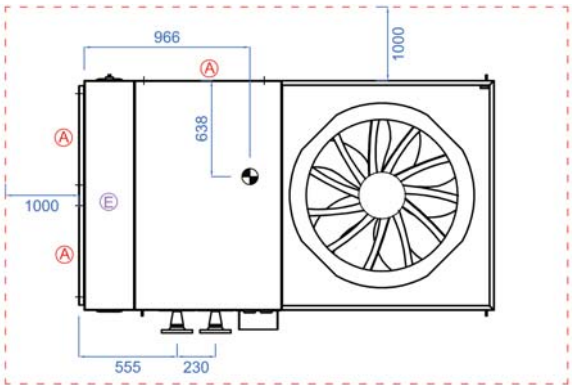
	NAME	Unit	60	80
SPECIFICATIONS	Rated cold water flow rate	m^3/h	7.8	9.9
	Minimum cold water flow rate	m^3/h	4.9	6.9
	Maximum cold water flow rate	m^3/h	9.4	11.8
	Evaporator pressure loss at rated flow rate	mWC	1.9	2.8
	Rated hot water flow rate	m^3/h	9.7	12.4
	Minimum hot water flow rate	m^3/h	6.3	7.9
	Maximum hot water flow rate	m^3/h	11.7	14.9
	Condenser pressure loss at rated flow rate	mWC	2.7	4.1
	SIMULTANEOUS PRODUCTION: CW: 7/12°C - HW: 30/35°C (1)			
	Rated cooling capacity	kW	45.4	57.4
	Rated heating capacity	kW	56.2	71.6
	Total Efficiency Ratio (TER)	kW/kW	9.30	8.94
	SIMULTANEOUS PRODUCTION: CW: 7/12°C - DHW: 60°C			
	Rated cooling capacity	kW	27.8	35.2
	Rated heating capacity	kW	40.7	52.1
	Total Efficiency Ratio (TER)	kW/kW	5.40	5.18
	COLD WATER PRODUCTION: CW: 7/12°C - OUTSIDE T°: 35°C (1)			
	Rated cooling capacity	kW	40.0	49.3
	EER	kW/kW	2.87	2.62
	HOT WATER PRODUCTION: HW: 30/35°C - OUTSIDE T°: 7°C/87% RH (1)			
	Rated heating capacity	kW	49.1	61.1
	COP	kW/kW	4.33	4.20
	DOMESTIC HOT WATER PRODUCTION: DHW: 60°C - OUTSIDE T°: 7°C/87% RH			
	Rated heating capacity	kW	36.3	45.5
	COP	kW/kW	2.91	2.80
	Number of independent refrigeration circuits		1	1
	Power stage		Variable speed	Variable speed
SEASONAL PERFORMANCE	SCOP (2)	kW/kW	3.56	3.56
	SEER (2)	kW/kW	3.37	3.39
	Seasonal energy efficiency (3)	%	142	142
	Energy class (3)		A+	A+
ELECTRICAL CONNECTION	Installed power	kW	18.9	23.9
	Current	A	33.3	42.3
	Starting current	A	33.3	42.3
GENERAL	Outside sound power level	dB(A)	76	82
	Resulting outside sound pressure level at 10 m ref. 10^{-5}, directivity factor: 2	dB(A)	48	54
	Max. outside temperature for cold water production	°C	45	45
	Min. outside temperature for cold water production	°C	5	5
	Max. outside temperature for hot water production	°C	20	20
	Min. outside temperature for hot water production	°C	-15	-15
	Max. outside temperature for domestic hot water production	°C	45	45
	Min. outside temperature for domestic hot water production	°C	-15	-15
	Unit weight without options (4)	kg	422	470

(1) Conditions according to NF EN 14511 (October 2013)
(2) Conditions according to NF EN 14825 (July 2016).
(3) Under Regulation (EU) No 811/2013.

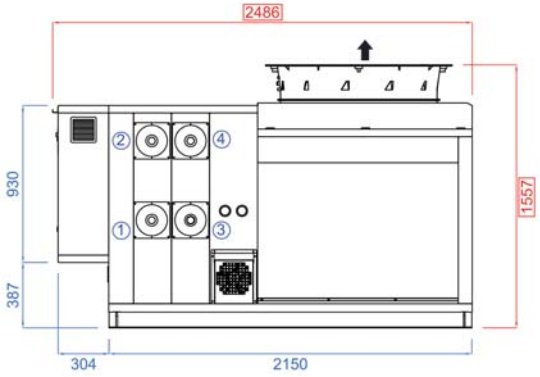
(4) For accessories weight, please consult "Installation accessories: Feet".
400V - 50 Hz + earth without neutral 3-phase power supply
Nota: Calculations based on air with atmospheric pressure properties, at sea level.

Dimensions and connections

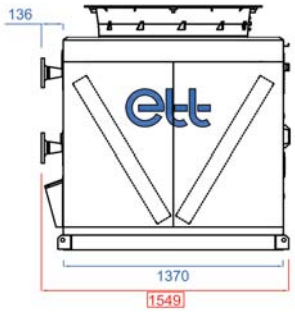
Top view:



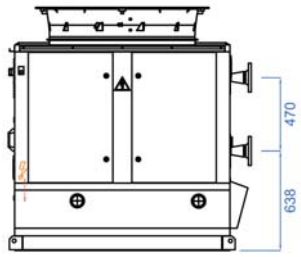
Side view:



Rear view:



Front view:



① Hot water inlet (DN 65)
② Hot water outlet (DN 65)
③ Cold water outlet (DN 65)
④ Cold water inlet (DN 65)
Ⓐ Access
⚡ Power supply
Ⓔ Technical section
--- Provide 1000 mm clearance (minimum) around the unit to facilitate access.
⬆ Air flow direction

	Length	Width	Height
Casing dimensions	2454 mm	1370 mm	1318 mm
Transport overall dimensions	2486 mm	1549 mm	1557 mm

Technical features

Type 100 - 130 - 150

	NAME	Unit	100	130	150
SPECIFICATIONS	Rated cold water flow rate	m^3/h	13.9	17.8	20.2
	Minimum cold water flow rate	m^3/h	8.2	11.3	13.6
	Maximum cold water flow rate	m^3/h	16.7	21.4	24.3
	Evaporator pressure loss at rated flow rate	mWC	0.9	1.5	1.9
	Rated hot water flow rate	m^3/h	17.1	21.9	24.9
	Minimum hot water flow rate	m^3/h	11.4	14.3	16.0
	Maximum hot water flow rate	m^3/h	20.6	26.3	29.8
	Condenser pressure loss at rated flow rate	mWC	1.0	1.6	2.1
	SIMULTANEOUS PRODUCTION: CW: 7/12°C - HW: 30/35°C (1)				
	Rated cooling capacity	kW	81.2	103.9	117.8
	Rated heating capacity	kW	99.1	126.9	143.7
	Total Efficiency Ratio (TER)	kW/kW	9.55	9.34	9.14
	SIMULTANEOUS PRODUCTION: CW: 7/12°C - DHW: 60°C				
	Rated cooling capacity	kW	49.9	63.3	71.3
	Rated heating capacity	kW	72.1	92.2	104.4
	Total Efficiency Ratio (TER)	kW/kW	5.35	5.20	5.11
	COLD WATER PRODUCTION: CW: 7/12°C - OUTSIDE T°: 35°C (1)				
	Rated cooling capacity	kW	71.3	89.8	100.0
	EER	kW/kW	2.93	2.75	2.63
	HOT WATER PRODUCTION: HW: 30/35°C - OUTSIDE T°: 7°C/87% RH (1)				
	Rated heating capacity	kW	88.9	110.9	123.9
	COP	kW/kW	4.28	4.20	4.13
	DOMESTIC HOT WATER PRODUCTION: DHW: 60°C - OUTSIDE T°: 7°C/87% RH				
	Rated heating capacity	kW	65.7	82.5	92.4
	COP	kW/kW	2.80	2.76	2.72
	Number of independent refrigeration circuits		1	1	1
	Power stage		Variable speed	Variable speed	Variable speed
SEASONAL PERFORMANCE	SCOP (2)	kW/kW	3.65	3.66	3.59
	SEER (2)	kW/kW	3.82	3.60	3.46
	Seasonal energy efficiency (3)	%	146	146	144
ELECTRICAL CONNECTION	Installed power	kW	32.8	40.8	47.0
	Current	A	59.4	72.6	82.1
	Starting current	A	59.4	72.6	82.1
GENERAL	Outside sound power level	dB(A)	83	85	86
	Resulting outside sound pressure level at 10m ref. 10^{-5}, directivity factor: 2	dB(A)	55	57	58
	Max. outside temperature for cold water production	°C	45	45	45
	Min. outside temperature for cold water production	°C	5	5	5
	Max. outside temperature for hot water production	°C	20	20	20
	Min. outside temperature for hot water production	°C	-15	-15	-15
	Max. outside temperature for domestic hot water production	°C	45	45	45
	Min. outside temperature for domestic hot water production	°C	-15	-15	-15
	Unit weight without options (4)	kg	878	907	910

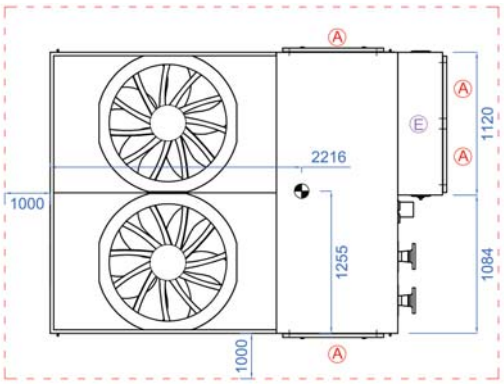
(1) Conditions according to NF EN 14511 (October 2013)
(2) Conditions according to NF EN 14825 (July 2016).
(3) Under Regulation (EU) No 813/2013.

(4) For accessories weight, please consult "Installation accessories: Feet".
400V - 50 Hz + earth without neutral 3-phase power supply
Nota: Calculations based on air with atmospheric pressure properties, at sea level.

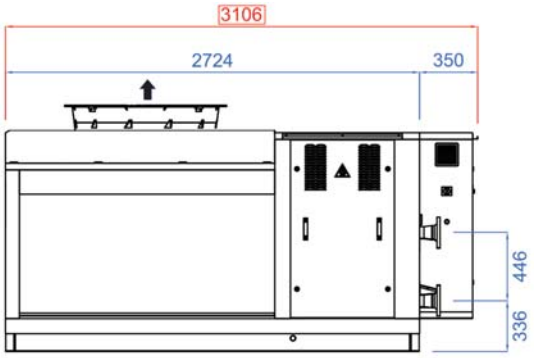
Dimensions and connections

Type 100 - 130 - 150

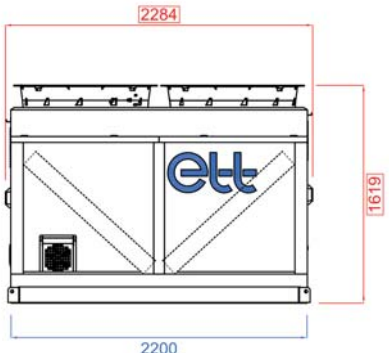
Top view:



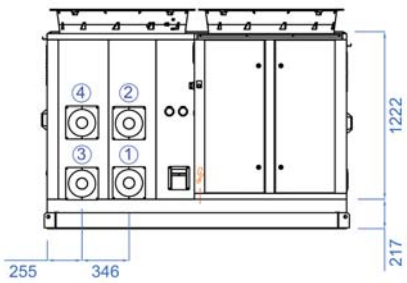
Side view:



Rear view:



Front view:



① Hot water inlet (DN 80)
② Hot water outlet (DN 80)
③ Cold water outlet (DN 80)
④ Cold water inlet (DN 80)
Ⓐ Access
⚡ Power supply
Ⓔ Technical section
--- Provide 1000 mm clearance (minimum) around the unit to facilitate access.
⬆ Air flow direction

	Length	Width	Height
Casing dimensions	3074 mm	2200 mm	1440 mm
Transport overall dimensions	3106 mm	2284 mm	1619 mm

Technical features

Type 180 - 240 - 270

	NAME	Unit	180	240	270
SPECIFICATIONS	Rated cold water flow rate	m^3/h	25.8	33.0	37.4
	Minimum cold water flow rate	m^3/h	14.9	20.4	24.3
	Maximum cold water flow rate	m^3/h	30.9	39.5	44.8
	Evaporator pressure loss at rated flow rate	mWC	1.6	2.6	3.3
	Rated hot water flow rate	m^3/h	31.6	40.5	45.9
	Minimum hot water flow rate	m^3/h	23.1	29.1	32.7
	Maximum hot water flow rate	m^3/h	38.0	48.6	55.1
	Condenser pressure loss at rated flow rate	mWC	1.8	2.8	3.5
	SIMULTANEOUS PRODUCTION: CW: 7/12°C - HW: 30/35°C (1)				
	Rated cooling capacity	kW	150.0	191.8	217.4
	Rated heating capacity	kW	182.8	234.2	265.5
	Total Efficiency Ratio (TER)	kW/kW	9.83	9.54	9.34
	SIMULTANEOUS PRODUCTION: CW: 7/12°C - DHW: 60°C				
	Rated cooling capacity	kW	99.9	126.6	142.5
	Rated heating capacity	kW	144.3	184.4	208.7
	Total Efficiency Ratio (TER)	kW/kW	5.41	5.25	5.14
	COLD WATER PRODUCTION: CW: 7/12°C - OUTSIDE T°: 35°C (1)				
	Rated cooling capacity	kW	133.8	167.3	186.8
	EER	kW/kW	3.11	2.91	2.56
	HOT WATER PRODUCTION: HW: 30/35°C - OUTSIDE T°: 7°C/87% RH (1)				
	Rated heating capacity	kW	167.4	210.2	232.7
	COP	kW/kW	4.32	4.30	4.16
	DOMESTIC HOT WATER PRODUCTION: DHW: 60°C - OUTSIDE T°: 7°C/87% RH				
	Rated heating capacity	kW	133.3	168.2	188.8
	COP	kW/kW	2.78	2.75	2.72
	Number of independent refrigeration circuits		2	2	2
	Power stage		Variable speed	Variable speed	Variable speed
SEASONAL PERFORMANCE	SCOP (2)	kW/kW	3.60	3.61	3.56
	SEER (2)	kW/kW	3.90	3.81	3.67
	Seasonal energy efficiency (3)	%	144	144	142
ELECTRICAL CONNECTION	Installed power	kW	64.6	80.6	93
	Current	A	116.8	143.2	162.2
	Starting current	A	206.6	243.8	307.3
GENERAL	Outside sound power level	dB(A)	82	85	88
	Resulting outside sound pressure level at 10m ref. 10^{-5}, directivity factor: 2	dB(A)	54	57	60
	Max. outside temperature for cold water production	°C	45	45	45
	Min. outside temperature for cold water production	°C	5	5	5
	Max. outside temperature for hot water production	°C	20	20	20
	Min. outside temperature for hot water production	°C	-15	-15	-15
	Max. outside temperature for domestic hot water production	°C	45	45	45
	Min. outside temperature for domestic hot water production	°C	-15	-15	-15
	Unit weight without options (4)	kg	1736	1796	1800

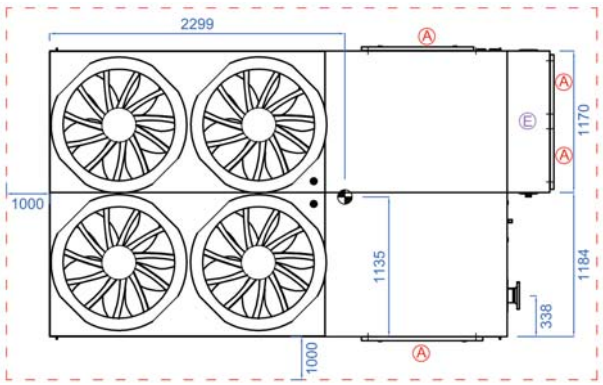
(1) Conditions according to NF EN 14511 (October 2013)
(2) Conditions according to NF EN 14825 (July 2016).
(3) Under Regulation (EU) No 813/2013.

(4) For accessories weight, please consult "Installation accessories: Feet".
400V - 50 Hz + earth without neutral 3-phase power supply
Nota: Calculations based on air with atmospheric pressure properties, at sea level.

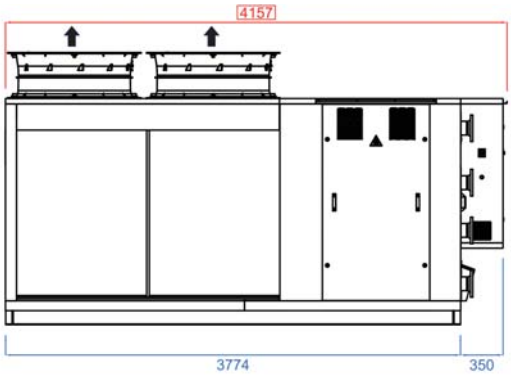
Dimensions and connections

Type 180 - 240 - 270

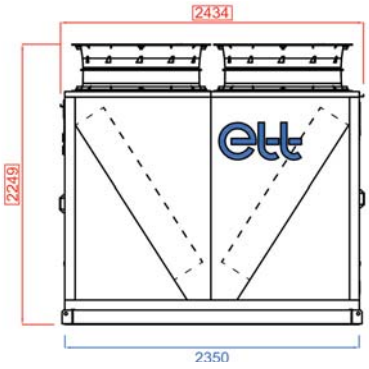
Top view:



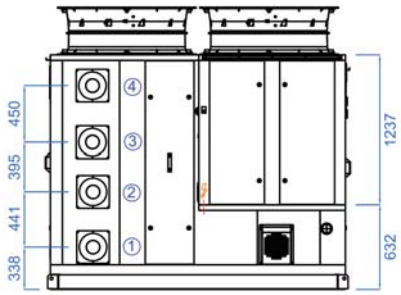
Side view:



Rear view:



Front view:

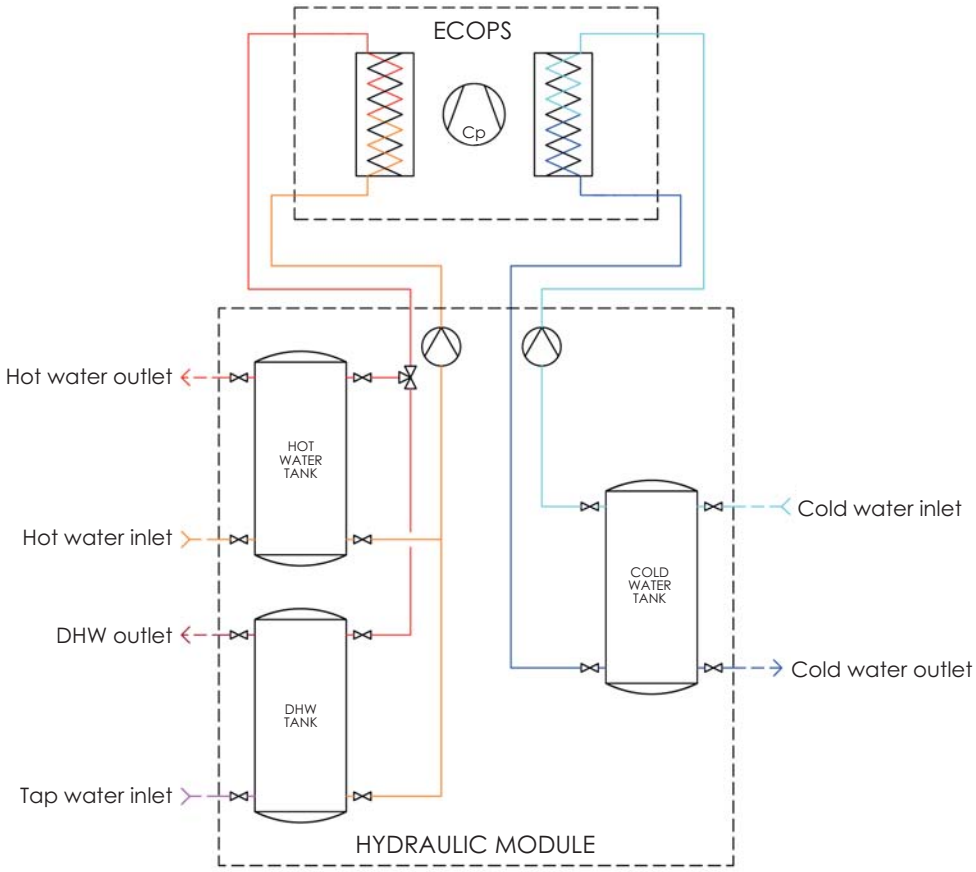


① Hot water inlet (DN 100)
② Hot water outlet (DN 100)
③ Cold water outlet (DN 100)
④ Cold water inlet (DN 100)
Ⓐ Access
⚡ Power supply
Ⓔ Technical section
--- Provide 1000 mm clearance (minimum) around the unit to facilitate access.
⬆ Air flow direction

	Length	Width	Height
Casing dimensions	4124 mm	2350 mm	1869 mm
Transport overall dimensions	4157 mm	2434 mm	2249 mm

Option: Hydraulic module

Schematic diagram



Hydraulic module:

- ✓ Cold water tank
- ✓ Hot water tank
- ✓ Domestic hot water (DHW) tank

- **The module is equipped with a 3-way valve** in order to supply the relevant tank when the hot water and domestic hot water are both being used.
- **The module includes one water pump per exchanger**.
- **The hydraulic module is delivered in a separate section** designed according to the number of tanks required for your installation.
- **Modules including a DHW tank include auxiliary electric heating.**

Aluminium casing:

- **Rigid, compact and lightweight packaged unit**, perfectly weather-resistant, with a 20-year anti corrosion guarantee on casing.
- **Watertight checker plate floor** with drainage outlets around the unit, connected to rubber siphons.
- **Aluminium vertical panels and roof, mounted on aluminium frame. Access door with square key locks.**

Nota: For more information, contact your local sales representative.

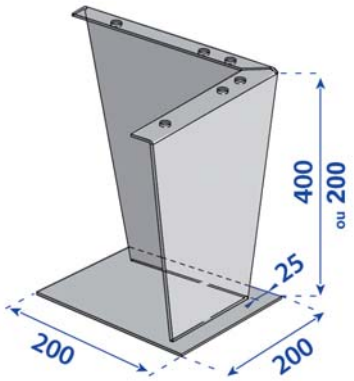
Total sound level

Sound power level

FREQUENCY BAND Hz ▶	63	125	250	500	1000	2000	4000	8000	Overall level Lw (dB(A))
ECOPS 60	48.5	62.0	68.5	69.5	70.0	69.0	64.0	55.0	**76**
ECOPS 80	57.0	69.0	74.1	75.5	75.0	74.0	70.0	60.0	**82**
ECOPS 100	61.0	70.0	76.1	77.5	77.0	75.5	72.0	63.0	**83**
ECOPS 130	63.0	71.0	77.1	78.5	78.0	77.0	73.5	64.5	**85**
ECOPS 150	62.5	69.5	78.5	80.0	79.0	78.0	74.5	65.0	**86**
ECOPS 180	56.0	67.0	75.4	76.3	76.8	75.6	71.0	64.4	**82**
ECOPS 240	59.0	70.0	76.6	79.0	79.0	77.6	73.6	66.0	**85**
ECOPS 270	64.6	75.6	80.1	82.6	82.0	80.0	76.6	68.6	**88**

Installation accessories: Feet

Aluminium fixed foot
Unitary weight: 1 kg



Unit	60	80	100	130	150	180	240	270
Nr. of feet	4	4	4	4	4	4	4	4

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