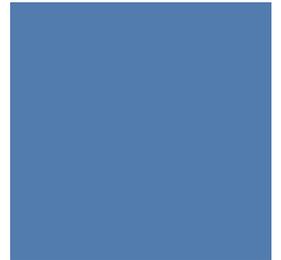




ENVIRONMENTAL  
CLIMATE CONTROL  
EQUIPMENT & SOLUTIONS



# AERONAUTICS



[www.ett-hvac.com](http://www.ett-hvac.com)

Ventilation | Free Cooling

Cooling | Heating

# ETT, the air handling expert

Energie Transfert Thermique is recognised in the airport and aeronautical industry as a specialist in the design and manufacture of air handling systems.

ETT stands out with its wide range of services (consulting, optimisation, auditing, training, etc.). Forging close partnerships with customers is central to our strategy.

Based at the western tip of France, our 18,000 m<sup>2</sup> factory (with 16,000 m<sup>2</sup> dedicated to manufacturing), is certified ISO 9001 and ISO 14001.

With more than 270 employees, ETT is present all over France in 8 regional offices and across the world thanks to its network of agents and distributors.

Bolstered by its Research and Development Department, ETT chose to place innovation and respect for the environment at the heart of its development strategy.



**1979**

Creation of Energie Transfert Thermique

**2001**

Expansion and new organisation:  
8,000 m<sup>2</sup> for Production, a new R&D Department

**2004**

1<sup>st</sup> delivery to DASSAULT

**2007**

ETT executives take over the company (LMBO)

**2008**

1<sup>st</sup> delivery to AIRBUS (more than 160 units today)

**2015 & 2017**

Eurovent Certification  
for the rooftop range



**2018**

AFAQ ISO 14001 certification - no. QUAL/2010/37694.2

AFAQ ISO 9001 certification - no. QUAL/1994/2016e

## ETT, solutions for the aeronautical & airport sector over time



World air traffic is steadily growing: from a few million passengers in 1950 to 3.3 billions in 2014, with the one billion passenger mark reached in 1987.

The International Civil Aviation Organization (ICAO) estimates that the number of air passengers will reach **6 billions by 2030**.

This growth in traffic challenged the logistical and infrastructure models of airports, which had to adapt to new technical and regulatory requirements.

**As Public Access Buildings (PABs), airports and aircrafts need to be adequately ventilated.**

Due to their operating constraints, airports have high energy needs.

To best meet the needs of the aeronautical and airport sector, **ETT has developed a market-driven strategy** based on innovation and respect for the environment.

**ETT provides custom solutions** that meet the requirements of the aeronautical sector, including



**adaptability, for areas with complex thermal loads** (serving several functions and having a high percentage of glass surface), and **mobility, for aircraft ventilation**. As a response to the challenges of these demanding economic times, our solutions focus on total cost reduction, considering all aspects: acquisition cost, installation and commissioning costs, operating costs (energy consumption and maintenance costs).

Thanks to **ETT SysCom**, these solutions can communicate with each other. You can subscribe to our supervision tool (myETTvision) to **remotely monitor and control** your installation **for optimum operating cost management**.

# Air handling essential features

## ETT, IMPROVED THERMAL COMFORT

We developed specialised units for the aeronautical environment in order to ensure optimal comfort for travellers.

### Energy savings

The thermodynamic system is an efficient, economical and environmentally friendly solution for aircraft air conditioning. It offers optimum performance with low energy consumption.

### Modularity and adaptability

Because modularity is key to the aeronautical market, ETT units can easily be installed:

- on trailers, to be moved around the aircrafts (ACU - towable version)
- under the retractable boarding bridges (PCA)
- on the roof of the various airport structures (Rooftop)

## Classification of aircrafts according to ICAOC

Type	Code A	Code B	Code C	Code D	Code E	Code F
Wing span	< 15 m	15 m but < 24 m	24 m but < 36 m	36 m but < 52 m	52 m but < 65 m	65 m but < 80 m
Main outboard wheel	< 4.5 m	4.5 m but < 6 m	6 m but < 9 m	9 m but < 14 m	9 m but < 14 m	14 m but < 16 m
ACU 085/185	X	X				
ACU 285		X	X			
ACU/PCA 485			X	X		
ACU/PCA 685				X	X	X
Examples	Beechcraft	Embraer, Bombardier CRJ Dassault Falcon	A320 B737	A330 B767	B777 B747	A380

100% aluminium,  
recyclable.

MADE IN  
FRANCE

ett

The air handling expert for airports and aeronautical facilities

# Expertise in Aeronautics

## ETT, SOLUTIONS FOR COMFORT AND ENERGY EFFICIENCY

ETT air preconditioning units are designed to provide the supply air flow rate and pressure needed for the heating, air conditioning and ventilation of aircrafts on the ground or under construction.

### Equipment

#### on the cutting edge of innovation

The unit features, in the direction of the air flow:

- Anodised aluminium fresh air grid mounted on hinges to access the filters.
- Easy-to-remove filter assembly: 98 mm pleated media gravimetric filters (G4) and 98 mm polypropylene opacimetric filters (F9) mounted on a polypropylene frame.
- Single-inlet backward inclined centrifugal fan, chosen for its high static pressure and low sound power, with variable-speed direct drive IE3 (IE4 as an option) motor.
- Direct expansion exchangers, copper pipes and aluminium fins, with high exchange capacity. They have been selected for an air speed lower than 2.5 m/s, to avoid condensates entrainment.



### Comfort and energy savings

Each refrigerant circuit has an HPE+ propeller fan to ventilate its exchanger. The propeller fan is weather-resistant. It consists of a ferrule, a high energy performance aluminium propeller, and a zinc plated steel fan guard, with cataphoresis protection and epoxy coating. Thanks to this new fan design, exchangers' air flow rate increases up to 13% compared to standard fans, while keeping the same power input.

### Electrical board

Compliant with EN 60204-1 standard, including:

- CAREL controller with display
- Fault synthesis with pending dry contact on terminal
- Phase checker
- Blue and red flashing lights (ON and fault indicators)



### Refrigeration circuits

R410A operation:

Each hermetic compressor is associated with an independent refrigeration circuit:

- Electronic expansion valve, essential to optimise cooling cycle efficiency and so, to limit energy consumption
- Variable refrigerant flow rate with (optional) HP control
- Tandem solution for SEER optimisation



### Operating Principle

#### The unit operates as an air conditioner:

- Source: outside air
- Treated fluid: outside air

#### The following operating modes are available:

- Heating with electric auxiliary (optional)
- Economiser: Cooling with outside air, without thermodynamics
- Cooling

The unit operates with all fresh air in those three modes.

#### The ETT packaged unit comprises 3 different sections:

- The internal section ensures blowing aeration (Heating with optional electric auxiliary)
- The external section allows heat dissipation in Cooling mode
- The separate technical section houses the refrigeration components, the electrical board and the control components

#### Aluminium package with watertight floor and:

- Watertight frame with condensate drain pans and drainage outlets around the unit (lift pump as an option)
- AG3 aluminium vertical panels and roof with acoustic and thermal insulation
- Air stream insulation

Stainless steel hinged panels, gasket under compression for tight sealing.

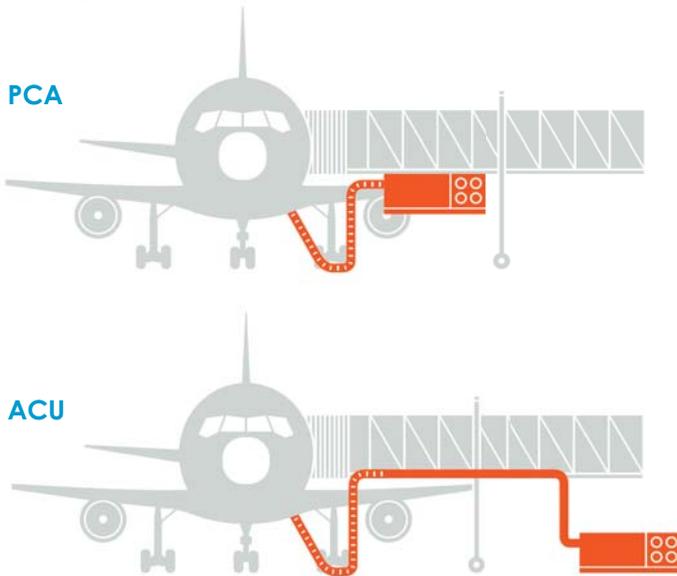
The unit can be installed on a mobile trailer and connected using flexible ductwork.

Rigid, compact and lightweight packaged unit, perfectly weather-resistant, with a 20-year anti corrosion guarantee on casing.



20-year guarantee  
against corrosion  
frame - casing

# A dynamic and flexible solution



To meet the needs of the aeronautical market, ETT developed a **dynamic and flexible range of air conditioning units** that reflects its technological innovation and know-how.

Our flexible approach allows for customised air conditioning solutions that can be combined as needed:

- PCA units are positioned under the retractable boarding bridges leading the passengers to the aircrafts.
- ACU units are stationary on the apron and are available in towable mobile version.

The aluminium lightweight construction, combined to low-energy components, perfectly fits these demanding economic times focusing on total cost reduction.

## ACU & PCA ranges

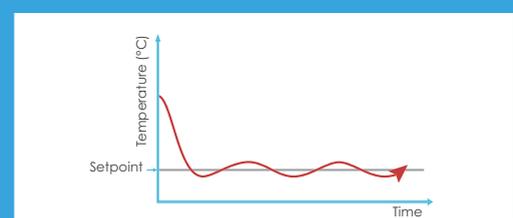
Type	Category of aircrafts	Classification of aircrafts according to ICAO	Flow rate (kg/s)	Pressure (mBar)	Cooling capacity (RT)	Cooling capacity (kW)	Supply air temperature (°C)
ACU 085	A/B	HELICOPTER	0.15-0.3	55	12.5	44	8°C
ACU 185	A/B	BUSINESS AND REGIONAL AIRCRAFTS	0.3-0.6	55	12.5	44	8°C
ACU 285	B/C	SINGLE-AISLE AIRCRAFTS	0.9-1.2	55	25.1	88	8°C
ACU 485	C/D/E	LONG-HAUL AIRCRAFTS	1.5-2.5	75	52.4	184	8°C
ACU 685	C/D/E/F	HIGH-CAPACITY AIRCRAFTS	2.5-3.75	100	78.9	277	8°C
PCA 485	C/D/E	LONG-HAUL AIRCRAFTS	1.5-2.5	75	52.4	184	8°C
PCA 685	C/D/E/F	HIGH-CAPACITY AIRCRAFTS	1.5-2.5	100	78.9	277	8°C



### ETT control system

Control is ensured by a controller developed specifically for ETT. This communicating controller:

- Ensures thermal comfort through progressive control (PID type) of supply air temperature
- Allows local communication through control panel and display of analogue variables (remote communication possible with remote terminal)
- Guarantees component safe operation and sustainability



# AIRPORTS

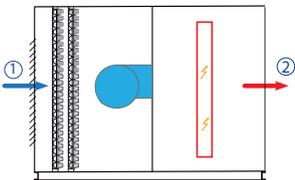


## PCA EH

### PCA EH

**Air conditioning unit** with Heating only mode

**Outdoor installation (fixed or trailer-mounted)**



#### COOLING MODE

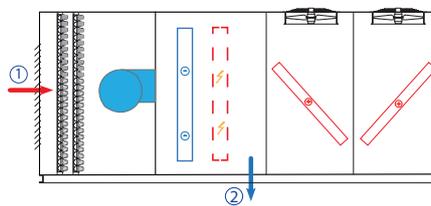
1 FRESH AIR 2 SUPPLY AIR

## PCA 485

### PCA 485

**Fixed air conditioning unit**

**Outdoor installation (under boarding bridge)**



#### COOLING MODE

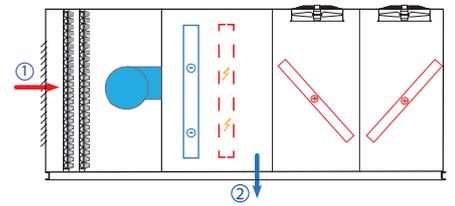
1 FRESH AIR 2 SUPPLY AIR

## PCA 685

### PCA 685

**Fixed air conditioning unit**

**Outdoor installation (under boarding bridge)**

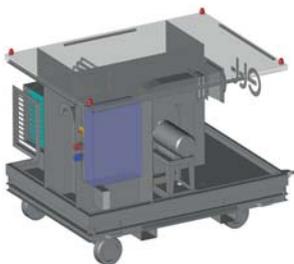


#### COOLING MODE

1 FRESH AIR 2 SUPPLY AIR

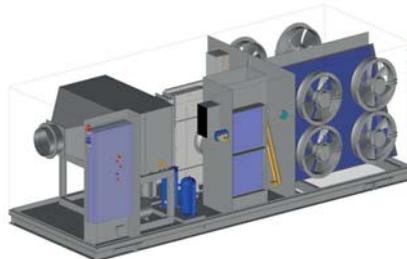
### Mobile ventilation solution for stopover aircrafts

- **Air flow rate:** 1,940 to 3,675 m<sup>3</sup>/h
- **Max. pressure:** 6,000 Pa
- **Heating capacity:** 27/81 kW
- **Connection diameter:** 8"/14"
- **Installed power:** 33/92 kW



### Ventilation solution for stopover aircrafts

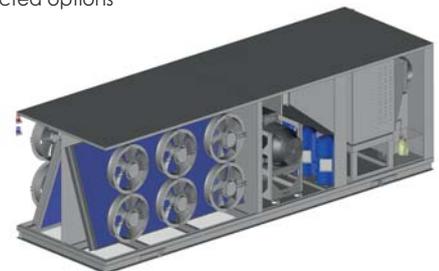
- **Air flow rate:** 1.5 - 2.5 kg/s
- **Max. pressure:** 7,500 Pa
- **Cooling capacity:** 184 kW
- **Heating capacity:** 90 kW
- **Connection diameter:** 14"
- **Absorbed power/Installed power:** 127 kW
- **Connection plug:** 250 A



### Ventilation solution for stopover aircrafts

- **Air flow rate:** 2.5 - 3.5 kg/s
- **Max. pressure:** 10,000 Pa
- **Cooling capacity:** 277 kW
- **Heating capacity:** 120 kW
- **Connection diameter:** 2 x 14"
- **Absorbed power/Installed power:** (\*)
- **Connection plug:** (\*)

(\*) Depending on selected options



Meets IATA AHM  
973 / 974 / 997

# AERONAUTICS

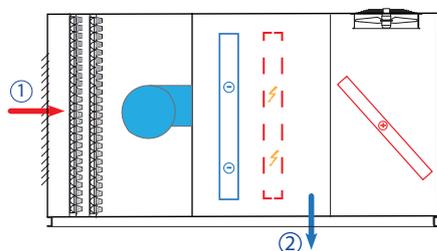


## ACU 085/185

### ACU 085 & ACU 185

Mobile air conditioning unit

Outdoor installation (fixed or trailer-mounted)



COOLING MODE

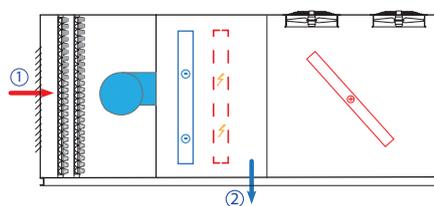
1 FRESH AIR 2 SUPPLY AIR

## ACU 285

### ACU 285

Mobile air conditioning unit

Outdoor installation (fixed or trailer-mounted)



COOLING MODE

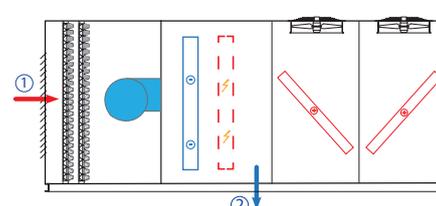
1 FRESH AIR 2 SUPPLY AIR

## ACU 485

### ACU 485

Mobile air conditioning unit

Outdoor installation (fixed or trailer-mounted)

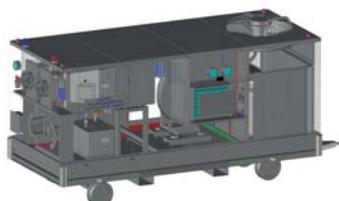


COOLING MODE

1 FRESH AIR 2 SUPPLY AIR

Mobile ventilation solution for aircrafts under construction or under maintenance

- Air flow rate: 0.15 - 0.6 kg/s
- Max. pressure: 5,500 Pa
- Cooling capacity: 18/36.0 kW
- Heating capacity: 3 kW
- Connection diameter: 2 x 8"
- Installed power: 38.5 kW
- Connection plug: 90 A



Mobile ventilation solution for aircrafts under construction or under maintenance

- Air flow rate: 0.9 - 1.2 kg/s
- Max. pressure: 5,500 Pa
- Cooling capacity: 88 kW
- Heating capacity: 45 kW
- Connection diameter: 14"
- Installed power: 58 kW
- Connection plug: 125 A



Mobile ventilation solution for stopover aircrafts or aircrafts under maintenance

- Air flow rate: 1.5 - 2.5 kg/s
- Max. pressure: 7500 Pa
- Cooling capacity: 184 kW
- Heating capacity: 90 kW
- Connection diameter: 14"
- Installed power: 127 kW
- Connection plug: 250 A



# AERONAUTICS

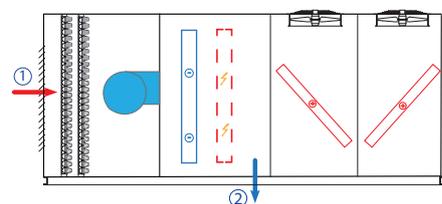


## ACU 685

### ACU 685

Mobile air conditioning unit

Indoor installation (fixed or trailer-mounted)



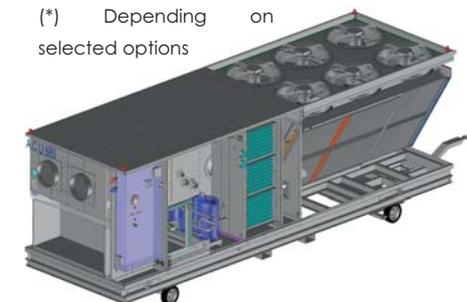
#### COOLING MODE

1 FRESH AIR 2 SUPPLY AIR

Mobile ventilation solution for aircrafts under construction or under maintenance

- Air flow rate: 2.5 - 3.75 kg/s
- Max. pressure: 7500 Pa
- Cooling capacity: 277 kW
- Heating capacity: 120 kW
- Connection diameter: 2 x 14"
- Absorbed power/Installed power: (\*)
- Connection plug: (\*)

(\*) Depending on selected options

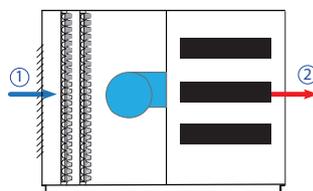


## TEST STAND

### TEST STAND

Test unit for aircrafts under construction

Indoor or outdoor installation



#### VENTILATION MODE

1 FRESH AIR 2 SUPPLY AIR

Ventilation solution

- Air flow rate: 1.5 kg/s
- Max. pressure: 7500 Pa
- Connection diameter: 14"
- Installed power: 23 kW
- Connection plug: 63 A



## ACCESSORIES

### VENTILATION DUCTWORK

Air preconditioning ductwork for aircrafts

Standard or bespoke

Small footprint air conditioning ductwork (ideal for pits, hatches, reels, storage boxes...)



Please consult us.

### AIRCRAFT PCA CONNECTIONS

Air preconditioning connections for aircrafts



Please consult us.

Meets IATA AHM  
973 / 974 / 997

# AIRPORTS

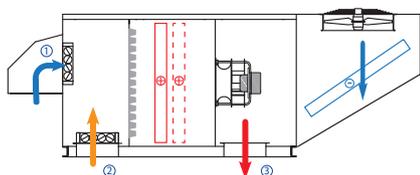


## ULTI+

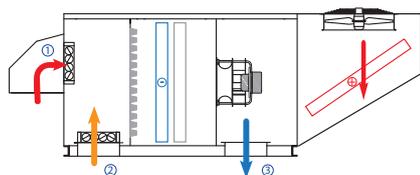
### STANDARD ROOFTOP

**Single flow** heat pump  
Performance optimisation Seasonal efficiency

**Outdoor, roof or boarding bridge installation**



HEATING MODE



COOLING MODE

- 1 FRESH AIR
- 2 RETURN AIR
- 3 SUPPLY AIR
- 4 EXHAUST AIR

**Cooling solution for boarding bridges or production halls**

- **Rated air flow rate:** 4,500 to 38,000 m<sup>3</sup>/h
- **Net cooling capacity:** 20.4 to 188.7 kW
- **Net EER:** 2.90 to 4.28
- **Net heating capacity:** 19.9 to 203.7 kW
- **Net COP:** 3.56 to 4.59

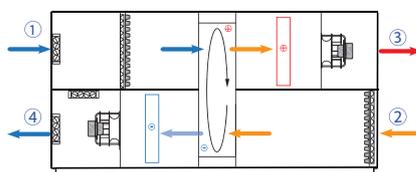


## PACARE HPE+

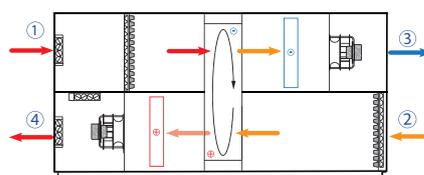
### PACARE HPE+

**Double flow** heat pump with recovery module with rotary exchanger

**Indoor or outdoor installation**



HEATING MODE

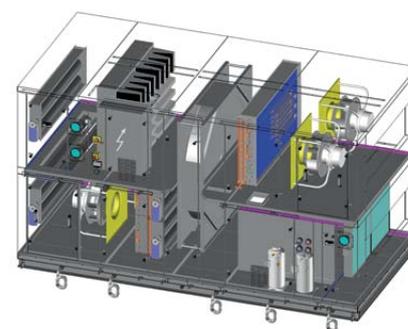


COOLING MODE

- 1 FRESH AIR
- 2 RETURN AIR
- 3 SUPPLY AIR
- 4 EXHAUST AIR

**Ventilation and air conditioning solution for optimum air quality**

- **Air flow rate:** 1,800 to 35,000 m<sup>3</sup>/h
- **Max. pressure:** 600 Pa
- **Cooling capacity:** 14 to 230 kW
- **Heating capacity:** 24 to 390 kW



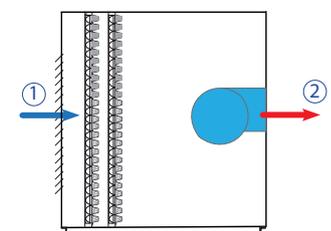
## EXHAUST UNIT

### ATEX EXHAUST UNIT

Polluted air removal in explosive atmospheres



**Indoor or outdoor installation**

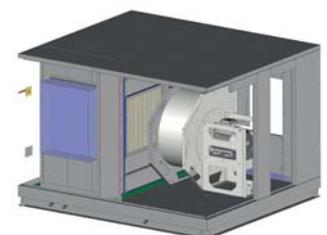


VENTILATION MODE

- 1 FRESH AIR
- 2 SUPPLY AIR

**Ventilation solution for optimum air quality**

- **Air flow rate:** 1,000 to 10,000 m<sup>3</sup>/h
- **Max. pressure:** 1,000 Pa



# Main options

- Soft start system with frequency inverter to reduce kickback during start-up and adjust air flow rate depending on the unit connected
- Electric heater with Triac
- Chilled or hot water coil
- Trailer mount
- Flexible ductwork connection
- One or two aluminium openings for duct connection
- Polyurethane coating (marine paint) on fins
- SRV (Variable Cooling System) frequency inverter coupled to one of the compressors
- 50 Hz/60 Hz power supply with Marechal socket with handle and finger draw plate
- IE3 (supply air fan) and IE4 (propeller fan) electronically commutated motor
- Temperature probe to control room air temperature in the cabin
- Humidity probe to control supply air temperature
- Filters fouling control pressure probe to control supply air flow rate
- SYNTHEPARK system with speaker, audio message upon unit start-up
- myETTvision communication module
- Remote control box or remote touchscreen terminal
- Resistant paint with SKYDROL®



## ETT Services

### After-sales\*

- Commissioning and settings
- Assistance and troubleshooting
- On-site technical support
- Helpline
- Technical expertise

20-year guarantee  
against corrosion  
frame - casing

### Service contract\*

- Guarantee extension
- Customised maintenance program
- Refrigeration circuits tightness testing
- Safety regulatory controls
- Emergency spare parts
- Maintenance log for each type of unit
- Factory supervision
- Staff training

\*Country-dependent, please consult us



## ETT & **ecodesign**:

**GREEN DESIGN involves DECONSTRUCTION:** ETT units are 98% recyclable.

- **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).



Reference: MARK-PLA\_04-EN\_A

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