

HVAC product labelling and certification

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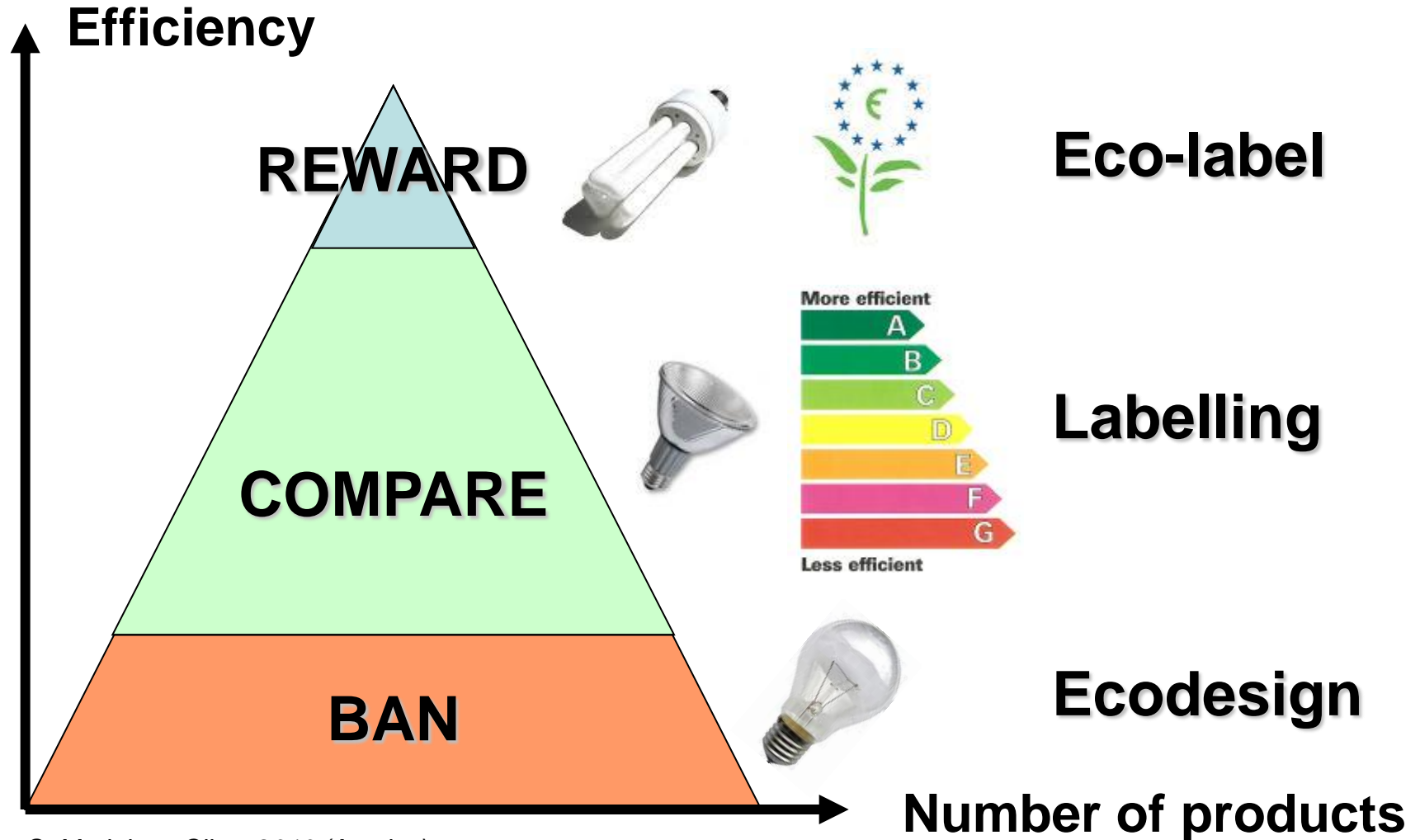
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Eurovent Certification Company (ECC)

www.eurovent-certification.com

1. Labelling directives involving HVAC products
2. Energy labels of HVAC products from voluntary certification schemes
3. Interactions between EU and voluntary energy labels

EU directives for HVAC products



Energy Labelling directives involving HVAC products

1. Existing

- Residential Air conditioners (2002)

2. Up-coming

- Water boilers and heaters
- Residential Air conditioners (2013) - New

Residential Air conditioners (old)

1. Scope

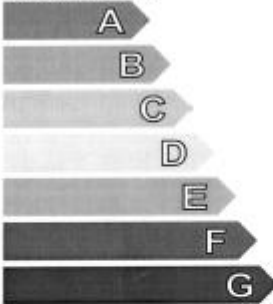



- AC up to 12 kW
- Cooling only and reversible

2. Timeframe

- In place since 2002

3. Key facts

- Energy efficiency based on full load EER (+35°C) and COP (+7°C)
- to be replaced by a new regulation on Jan 2013 (see hereafter)

Energy		Air-conditioner
Manufacturer		Logo
Outside unit		ABC 123
Inside unit		ABC 123
More efficient 		
Less efficient		
Annual energy consumption, kWh in cooling mode <small>(Actual consumption will depend on how the appliance is used and climate)</small>		X.Y
Cooling output	kW	X.Y
Energy efficiency ratio <small>Full load (the higher the better)</small>		X.Y
Type		
Cooling only	--	←
Cooling + Heating	--	
Air cooled	--	←
Water cooled	--	
Noise (dB(A) re 1 pW)		
Further information is contained in product brochures		
<small>Norm EN 141 Air-conditioner Energy Label Directive 2002/31/EC</small>		

Residential Air conditioners (new)

6/ 2011

1. Status

- Not published yet

2. Scope

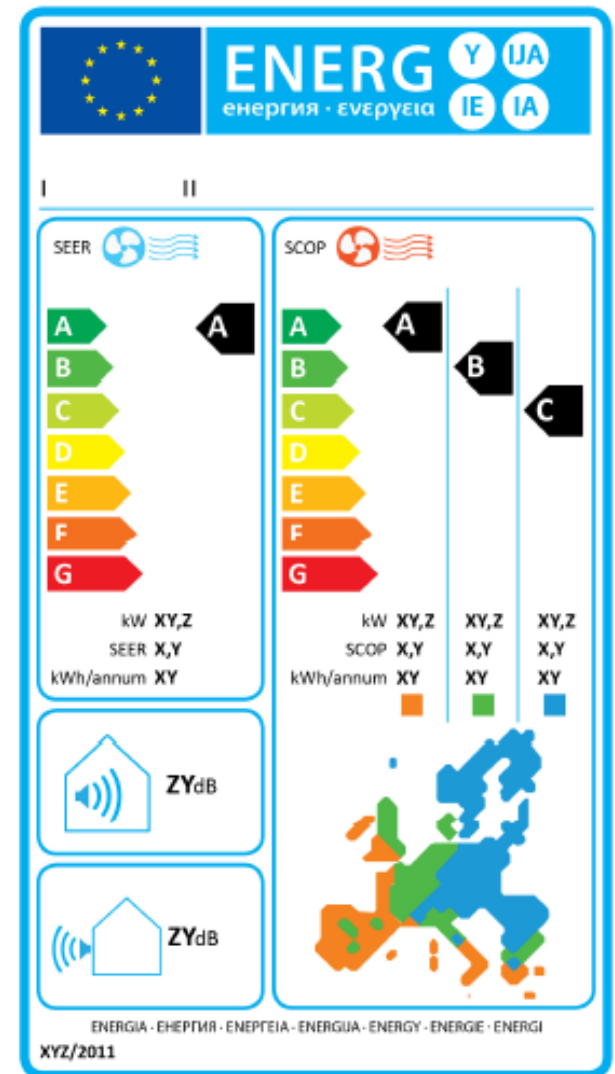
- Air to air AC up to 12 kW

3. Entry into force

- 1st Jan 2013

4. Key facts

- Seasonal efficiencies (SEER and SCOP) are considered



Water boilers and heaters

1. Status

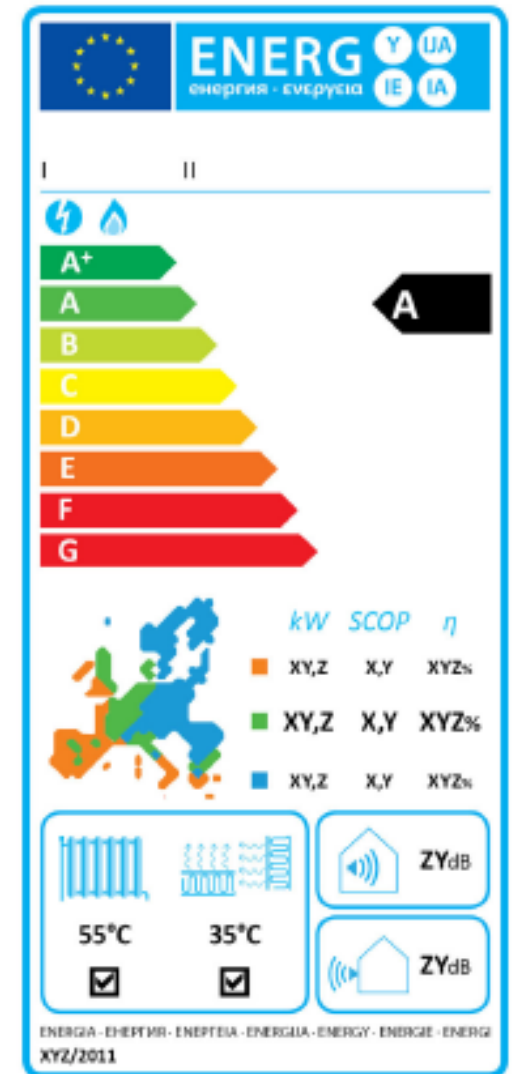
- Not published yet.

2. Scope

- Boilers with rated input between 4 kW and 70 kW (includes biomass, solid fuels, heat-pumps)

3. Timeframe

- Entry into force 1 year after publication (2013?)



1. Definition of classes according to Building loads

	XXS	XS	S	M	L	XL	XXL	3XL	4XL
A+++	$\eta > 62$	$\eta > 69$	$\eta > 90$	$\eta > 96$	$\eta > 107$	$\eta > 112$	$\eta > 124$	$\eta > 140$	$\eta > 150$
A++	$53 \leq \eta < 62$	$61 \leq \eta < 69$	$72 \leq \eta < 90$	$79 \leq \eta < 96$	$90 \leq \eta < 107$	$92 \leq \eta < 112$	$104 \leq \eta < 124$	$110 \leq \eta < 140$	$120 \leq \eta < 150$
A+	$44 \leq \eta < 53$	$53 \leq \eta < 61$	$55 \leq \eta < 72$	$62 \leq \eta < 79$	$73 \leq \eta < 90$	$76 \leq \eta < 92$	$84 \leq \eta < 104$	$96 \leq \eta < 110$	$96 \leq \eta < 120$
A	$35 \leq \eta < 44$	$38 \leq \eta < 53$	$38 \leq \eta < 55$	$45 \leq \eta < 62$	$56 \leq \eta < 73$	$62 \leq \eta < 76$	$72 \leq \eta < 84$	$80 \leq \eta < 96$	$86 \leq \eta < 96$
B	$32 \leq \eta < 35$	$35 \leq \eta < 38$	$35 \leq \eta < 38$	$39 \leq \eta < 45$	$46 \leq \eta < 56$	$50 \leq \eta < 62$	$60 \leq \eta < 72$	$64 \leq \eta < 80$	$64 \leq \eta < 86$
C	$29 \leq \eta < 32$	$32 \leq \eta < 35$	$32 \leq \eta < 35$	$36 \leq \eta < 39$	$37 \leq \eta < 46$	$38 \leq \eta < 50$	$40 \leq \eta < 60$	$40 \leq \eta < 64$	$40 \leq \eta < 64$
D	$26 \leq \eta < 29$	$29 \leq \eta < 32$	$29 \leq \eta < 32$	$33 \leq \eta < 36$	$34 \leq \eta < 37$	$34 \leq \eta < 38$	$36 \leq \eta < 40$	$36 \leq \eta < 40$	$36 \leq \eta < 40$
E	$23 \leq \eta < 26$	$26 \leq \eta < 29$	$26 \leq \eta < 29$	$30 \leq \eta < 33$	$30 \leq \eta < 34$	$30 \leq \eta < 34$	$32 \leq \eta < 36$	$32 \leq \eta < 36$	$32 \leq \eta < 36$
F	$20 \leq \eta < 23$	$23 \leq \eta < 26$	$23 \leq \eta < 26$	$27 \leq \eta < 30$	$27 \leq \eta < 30$	$27 \leq \eta < 30$	$28 \leq \eta < 32$	$28 \leq \eta < 32$	$28 \leq \eta < 32$
G	$\eta < 20$	$\eta < 23$	$\eta < 23$	$\eta < 27$	$H < 27$	$\eta < 27$	$\eta < 28$	$\eta < 28$	$\eta < 28$

2. Key facts

- For HP, etas are derived from SCOP (calculated using the bin method)

Other HVAC products concerned by Eco-design

1. Existing

- Industrial fans

2. Up-coming

- Residential Ventilation
- Chillers for refrigeration

3. In preparation

- AC and Ventilation for non residential
- Centralized & Decentralized Hot air generators

1. Status

- Published on the OJ on 30 March 2011

2. Scope

- Fans driven (or intended to be driven) by motors
- Input power between 125 W and 500 kW
- Including fans integrated in other products

3. Timeframe

- First Tier: 1st of Jan 2013
- Second Tier: 1st of Jan 2015

➤ No labelling



Residential Ventilation

1. Status

- Commission Working document

2. Scope

- Exhaust ventilation systems
- Balanced ventilation systems
- Fan input up to 125 W

3. Timeframe

- Not decided yet

4. Key facts

- Requirements on HRS, SPI, control factor, sound power

Chillers for refrigeration

1. Status

- Preparatory study on-going (www.ecofreezercom.org)

2. Scope

- Chillers intended for refrigeration applications

3. Timeframe

- Preparatory study to be finalized by end of 2011

4. Remarks

- Difficult to distinguish in practice between Chillers intended for Refrigeration and Chillers for Air Conditioning

Non residential AC and Ventilation

1. Status

- Preparatory study on-going (www.ecohvac.eu)

2. Scope

- All AC and ventilation equipment not yet covered, e.g.:
AHU, Chillers, Fan Coils, AC and Rooftop > 12 kW

3. Timeframe

- Preparatory study to be finalized by end 2011.

4. Remarks

- Labelling regulation not sure (B2B products)

Heating products

1. Status

- Preparatory study on-going (www.ecoheater.org)

2. Scope

- All devices producing hot air, e.g.:
AHU, Fan Coils, Air Curtains, electric heaters, ...

3. Timeframe

- Preparatory study to be finalized by end 2011.

4. Remarks

- Labelling regulation not sure (B2B products)

Voluntary certification and labelling for HVAC products

What?

Voluntary third party certification schemes like Eurovent Certification may create their own Energy Labels

Why?

- End-users and manufacturers are asking for it
- To fill in the blanks in the EU regulations (for as long as necessary)

Voluntary certification and labelling for HVAC products

1. Existing

- Chillers and Heat-Pumps - since 2004
- Heat Exchangers for Refrigeration - since 2005
- Air Handling Units (AHU) – since 2008
- Rooftops - since 2010
- Fan Coils – since 2011

2. Up-coming

- Air Filters for ventilation - 2012

3. In preparation

- Chilled Beams

Chillers and Heat-Pumps



1. Scope

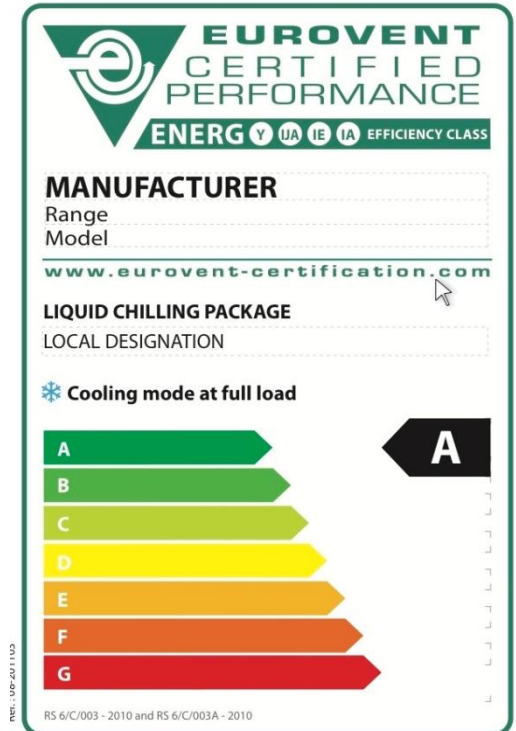
- Air source & water source
- Cooling only Chillers, Reversible units and heating only and Hydronic Heat-Pumps

2. Timeframe

- Certified since 2004.

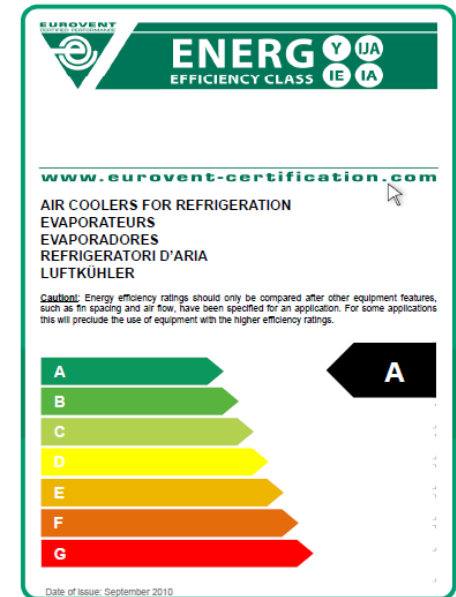
3. Key facts

- Based on EER and COP at full load operation
- Will be updated when seasonal efficiency SEER and SCOP standard will be available (2012?)



1. Scope

- Air Cooled Condensers (2005)
- Dry Coolers (2005)
- Dx Air coolers (2011)



Class	Energy consumption	Condensers, Dry coolers	Dx Air Coolers
		$R_{\text{Condensers, Dry coolers}} = \frac{\text{Capacity SC wet}}{\text{Fan power cons}}$	$R_{\text{DxAircoolers}} = \frac{\text{Capacity SC2 wet}}{\text{Fan power cons}} \times \sqrt{\frac{\text{fin spacing}}{4.5}}$
A++	Remarkably low	$R \geq 240$	$R \geq 45$
A+	Extremely low	$160 \leq R < 240$	$35 \leq R < 45$
A	Very low	$110 \leq R < 160$	$27 \leq R < 35$
B	Low	$70 \leq R < 110$	$21 \leq R < 27$
C	Medium	$45 \leq R < 70$	$16 \leq R < 21$
D	High	$30 \leq R < 45$	$12 \leq R < 16$
E	Very high	$R < 30$	$R < 12$



1. Scope

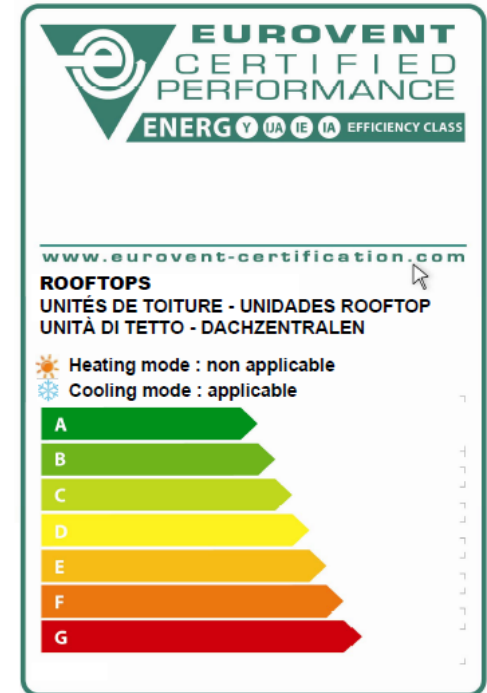
- Air and water source
- Cooling only and reversible
- Up to 100 kW

2. Timeframe

- Available since 2010

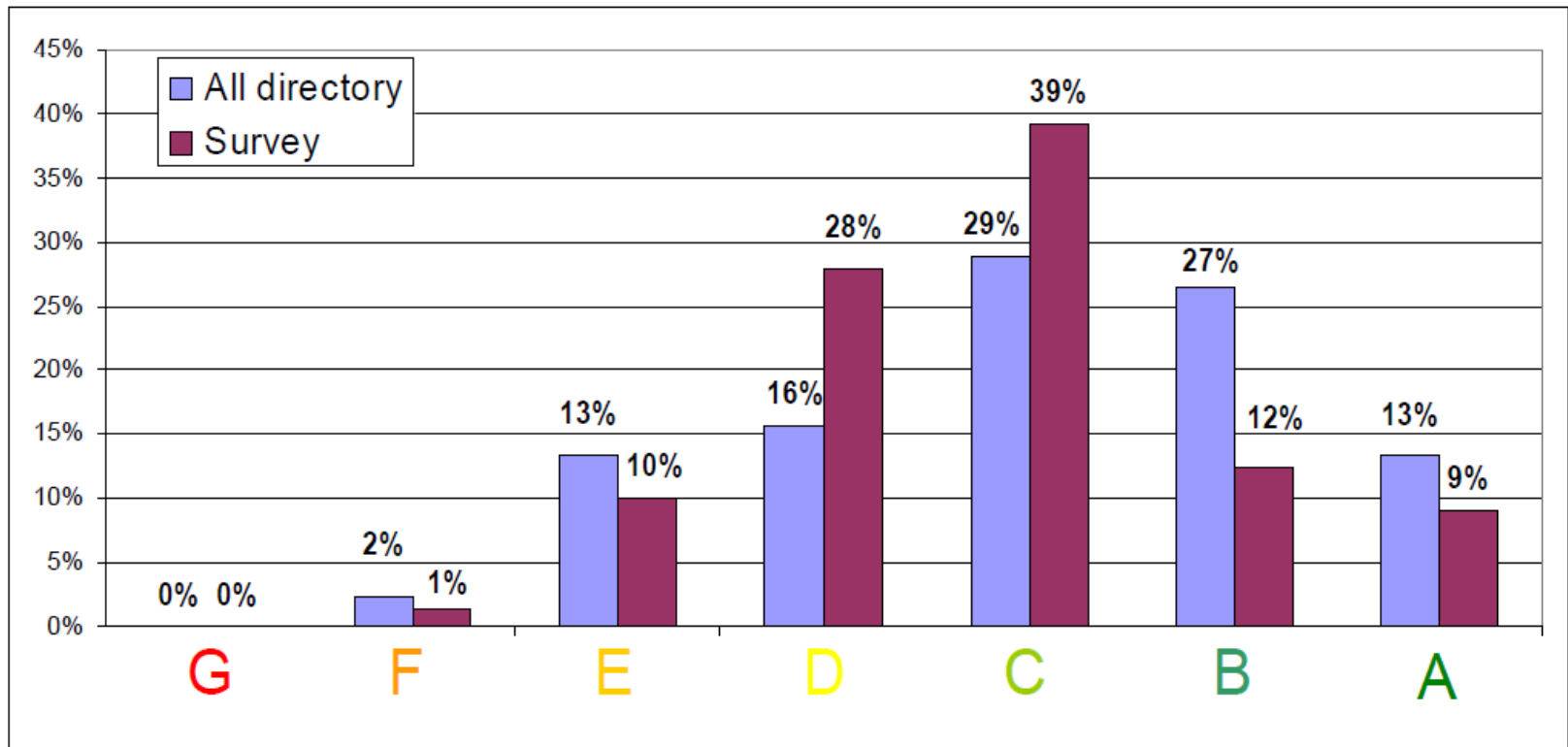
3. Key facts

- Based on EER and COP at full load operation
- Will be updated when seasonal efficiency SEER and SCOP standard will be available (2012?)
- Free cooling function to be included in the future



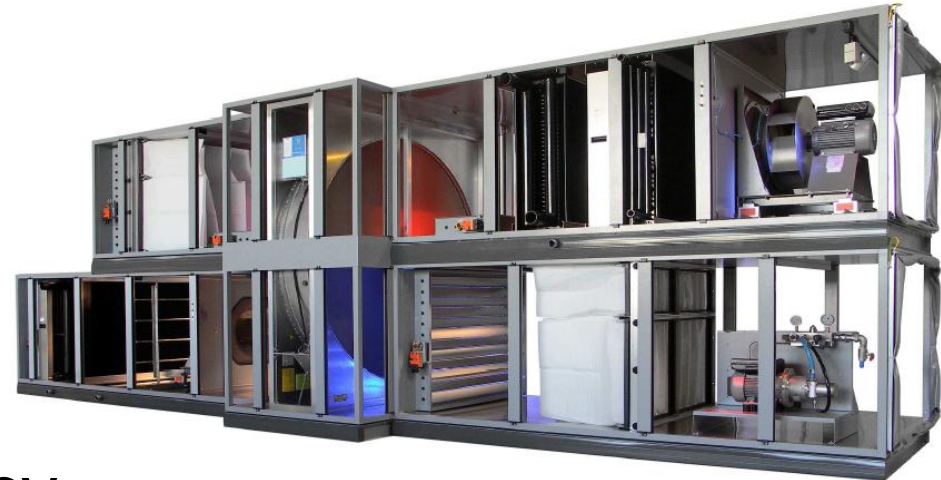


- **Distribution of certified units and acc. to market surveillance of certified manufacturers**



Air handling units

- Interrelationships to evaluate the energy efficiency of AHU are complex and even depend on climate conditions
- One single letter to represent balanced effects:
 - Air velocity in the fan section
 - Heat recovery efficiency and pressure drop
 - Fan efficiency



Air handling units

- Three classifications for three subgroup of products:
 - Design outdoor temperature $< 9^{\circ}\text{C}$ (HRS will significantly save energy)
 - Design outdoor $T > 9^{\circ}\text{C}$: ζ
 - Single extract units : \uparrow
- Five classes from A to E
- Based on new HRS and absorbed fan power classes in EN13053 (amendment)
- Mechanical performance: EN 1886
- A+ under discussion



Hydronic Fan Coils



1. Scope

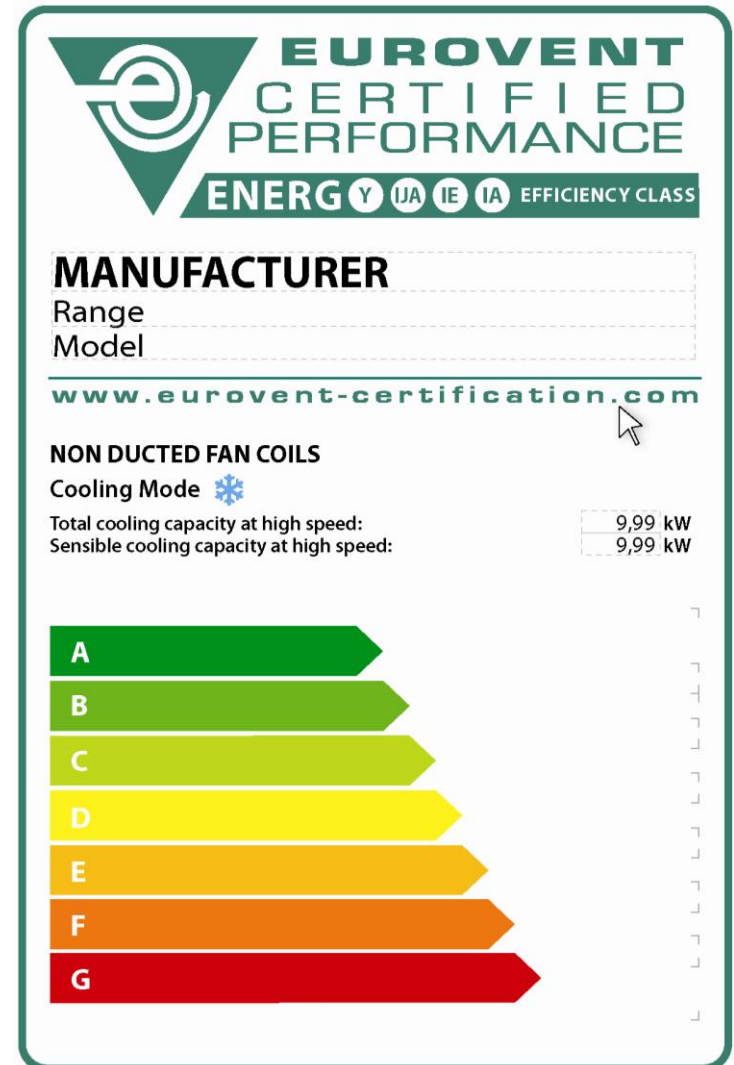
- Ducted and non ducted
- 2 pipes and 4 pipes

2. Timeframe

- Available since 2011

3. Key facts

- Based on « FCEER » and « FCCOP »:
Weighted average efficiency between low, medium and high speeds.



**EUROVENT
CERTIFIED
PERFORMANCE**

ENERGY IJA IE IA EFFICIENCY CLASS

MANUFACTURER
Range
Model

www.eurovent-certification.com

NON DUCTED FAN COILS
Cooling Mode ❄️

Total cooling capacity at high speed:	9,99 kW
Sensible cooling capacity at high speed:	9,99 kW

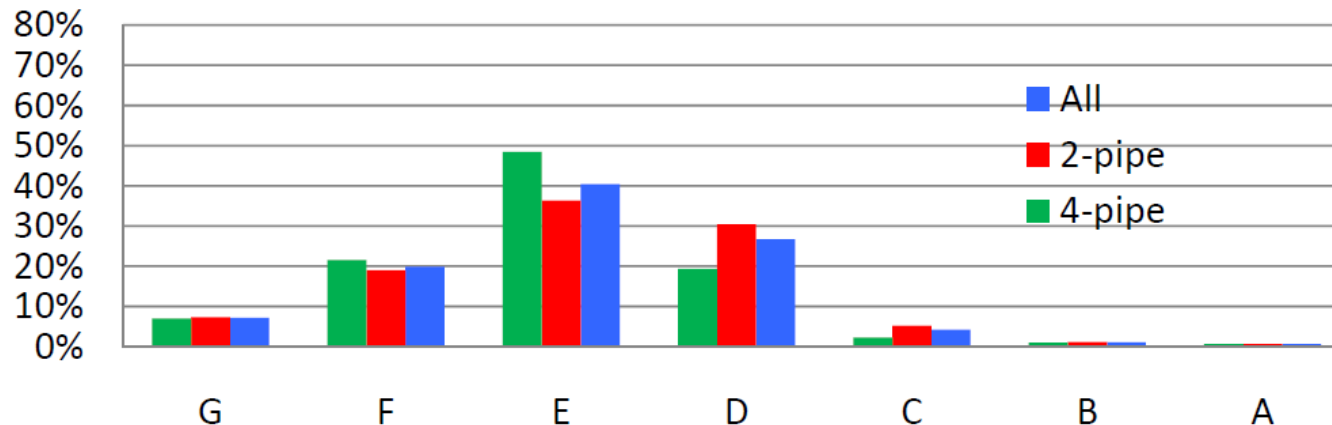
A
B
C
D
E
F
G

Hydronic Fan Coils

- FCEER definition**

$$FCEER = \frac{5\% \cdot Pc_{high} + 30\% \cdot Pc_{med} + 65\% \cdot Pc_{low}}{5\% \cdot Pe(c)_{high} + 30\% \cdot Pe(c)_{med} + 65\% \cdot Pe(c)_{low}}$$

- Current distribution of Eurovent certified non-ducted Fan Coils:**



➤ **Very ambitious scaling in view of up-coming EC fan motor units**

Air Filters for Ventilation

1. Scope

- G4-F9 Air Filters acc. to EN779
- Standard size (592x592mm)
- Rated at 3400 m³/h

2. Timeframe

- Energy Rating defined in Eurovent 4/11 (2011) (available on www.eurovent-association.eu)
- Energy efficiency class to be certified in 2012 (only for F5-F9)

3. Key facts

- Energy efficiency based on average pressure drop measured during EN779 test
- Rating Method already discussed within CEN and ISO



Air Filters for Ventilation

26/ 2011

- **Annual Energy consumption definition:**

$$W = \frac{q_V \cdot \overline{\Delta p} \cdot t}{\eta \cdot 1000}$$

Where: $q_V = 0.944 \text{ m}^3/\text{s}$; $t = 6000 \text{ h}$ and $\eta = 0.50$

- **Energy classes definitions:**

Filter class	G4	M5	M6	F7	F8	F9
MTE	—	—	—	MTE ≥ 35%	MTE ≥ 55%	MTE ≥ 70%
	$M_G = 350 \text{ g ASHRAE}$	$M_M = 250 \text{ g ASHRAE}$		$M_F = 100 \text{ g ASHRAE}$		
A	0 – 600 kWh	0 – 650 kWh	0 – 800 kWh	0 – 1200 kWh	0 – 1600 kWh	0 – 2000 kWh
B	> 600 kWh – 700 kWh	> 650 kWh – 780 kWh	> 800 kWh – 950 kWh	> 1200 kWh – 1450 kWh	> 1600 kWh – 1950 kWh	> 2000 kWh – 2500 kWh
C	> 700 kWh – 800 kWh	> 780 kWh – 910 kWh	> 950 kWh – 1100 kWh	> 1450 kWh – 1700 kWh	> 1950 kWh – 2300 kWh	> 2500 kWh – 3000 kWh
D	> 800 kWh – 900 kWh	> 910 kWh – 1040 kWh	> 1100 kWh – 1250 kWh	> 1700 kWh – 1950 kWh	> 2300 kWh – 2650 kWh	> 3000 kWh – 3500 kWh
E	> 900 kWh – 1000 kWh	> 1040 kWh – 1170 kWh	> 1250 kWh – 1400 kWh	> 1950 kWh – 2200 kWh	> 2650 kWh – 3000 kWh	> 3500 kWh – 4000 kWh
F	> 1000 kWh – 1100 kWh	> 1170 kWh – 1300 kWh	> 1400 kWh – 1550 kWh	> 2200 kWh – 2450 kWh	> 3000 kWh – 3350 kWh	> 4000 kWh – 4500 kWh
G	> 1100 kWh	> 1300 kWh	> 1550 kWh	> 2450 kWh	> 3350 kWh	> 4500 kWh

A. EU labels accelerate standardization work

Examples:

Seasonal efficiency calculation for AC, Heat-Pumps, Chillers (prEN14825)

EU commission mandate to CEN

- Standard to be used within the certification programmes

B. Voluntary labels prepare work for EU labels

Examples:

Eurovent Certification labels for AHUs and Fan Coils are looked at with attention by Armines (preparatory study for Lot 6)

- EU has ready made scheme that can serve as a strong basis for implementing measures

C. Voluntary labels provide market data on energy efficiency

Examples:

Eurovent Certification provides data on energy efficiency, energy consumption for AC, Chillers, AHU, Fan Coils, etc.

- Preparatory studies use extensively the pool of certified data for their market assessments

D. Problems if EU labels and voluntary labels have different requirements

Example: AC up to 12 kW

Current EU label sets a 15% tolerance

Eurovent Certification label implies an 8% tolerance

- Eurovent Certified units labelled **C** could be labelled **A** and still be in conformity with EU regulation

E. Voluntary labels complete Market Surveillance (MS) activity

Example: AC up to 12 kW

Market Surveillance of Member states for AC units can be estimated between **0 and 10 tests/year***

Eurovent Certification manage more than **120 tests/year** (mean since 2000)

- Voluntary labels testing activity and MS activity of Member states are complementary

* Estimation based on the Survey of Compliance Directive 92/75/EEC (Energy Labelling) – Final Report, Fraunhofer Institute (2009)

Conclusion and perspectives

- EU Energy Labels process helps voluntary labels
- Voluntary labels helps EU Energy labels
- Coordination is needed in order to not penalize one or the other
- MS to take into account certified products?

Thank you for your attention