The EU-Ecodesign Directive
And what you should know about it!
The ErP-Directive and what you should know about it!

Questions and answers regarding the Regulations 640/2009 (IEC motors) and 327/2011 (Fans) and the new directive 1253/1254 (Air Handling Units)

With the adoption of the Kyoto protocol, the European Union committed itself to a reduction of at least 20 per cent in CO2 emissions by 2020. In order to achieve this target, in 2005 the EU ratified the EuP Directive (Energy using Products Directive). In 2009, this was renamed the ErP Directive (Energyrelated Products Directive). It is often simply referred to as the eco-design directive. In specific terms, this concerns Directive 2009/125/EC. We come across this in everyday life, for example with the phasing out of traditional light bulbs or the energy efficiency labelling on fridges, washing machines and so on.

Who is affected by the Directive?
The Directive is mandatory within the states of the EU. This requirement affects not only manufacturers of ventilation and air conditioning products, but also plant manufacturers and system operators. The ErP Regulation covers products which are produced in the European Economic Area as well as those imported from other countries. Products for export outside the EU are not covered by the Regulation. However it is likely that other countries will concern themselves with the subject as well.

An overview of all the requirements of the Ecodesign Directive.
Confusion often arises because two independent regulations must be fulfilled in parallel. A simple summary can be found in the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>IEC-motors</th>
<th>Fans</th>
<th>Ventilation systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Regulation 640/2009</td>
<td>Consideration of nozzle + impeller + motor + any control electronics</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>0.75 - 375 kW</td>
<td>Efficiency class: IE3 or IE2 + FU</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>Regulation 327/2011</td>
<td><strong>Minimum requirements for ventilation systems (≥ 30 W), equipment for residential ventilation with energy labelling</strong></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>7.5 - 375 kW</td>
<td>Efficiency class: IE3 or IE2 + FU</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Frequency converter</td>
<td><strong>Minimum efficiency Stage 2</strong></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>≥ 0.75 kW</td>
<td>Efficiency class: IE2</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td><strong>Minimum efficiency Stage 1</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EU-Regulation 327/2011 for Fans

Thanks to the ErP Directive, the energy-saving potential of numerous energy-related products is being investigated and minimum requirements specified with regard to their energy-efficiency. Eventually, in June 2010, mandatory limit values for fans were specified. The directive defines a fan to be the unit consisting of nozzle, impeller and motor, as well as any control electronics present (see Fig. 1). The aim is to categorise products brought onto the European market with a general minimum efficiency specification for fans. The first stage of the minimum efficiency specifications for fans became effective on 01.01.2013.

More stringent requirements from 01.01.2015

The second stage of Regulation 327/2011 came into effect on 01.01.2015. Then the minimum efficiency requirements will be increased again, compared with the limits from 2013. This means that affected products which do not meet the minimum efficiency requirements can no longer be brought on to the European market from 01.01.2015. That only applies to so called motorized impellers.

Introduction of the Regulation 1253/2014 and 1254/2014

At the 1st of January 2016 the next step of the ErP directive comes into force. It rules ventilation units at all which are intended to replace utilised air by outdoor air in a building or a part of a building. Included are roof fans, duct fans, residential ventilation units and modular air handling units. These Ventilation units have to fulfil a minimum efficiency and need to have at least a multi speed control which is under the response of the installer. Systemair supports all customers with a wide range of controls. Excluded from this regulation are still Ventilation units used for security functions (Ex- and smoke extract) as well as units for processes like extract of aggressive or high temperature mediums.

Definition of “placing on the market”

After the introduction of the regulations 1253/2014 and 1254/2014 at the 1st of January 2016 it is only allowed to sell Ventilation units within the EU which meets their new requirements. Due to high lead times and inventory levels, fan manufacturers will not be able to get through all their stock by the deadline. The legal definition states that the motorised impeller is already on the market once it leaves the factory. Ventilation units which are stocked at the customer before the valuation date are allowed to be installed and set into service afterwards.
Which fans are affected?
Fans of all types of construction with an electrical input power at 30 W are affected by the Directive. For manufacturers such as Systemair, this means that some models with affected motor-impeller units need to be changed and adapted. Systemair will continue to be able to offer you complete model series of the different variants in the future. Fans which are already equipped with EC motors today already meet the requirements.

Which fans are not affected?
Fans with the purpose of providing protection and which are outside certain temperature ranges are not affected. This includes:
- Single stage smoke extraction fans, as long as these are not used for daily ventilation on demand
- Explosion-protected fans
- Fans for the extraction of aggressive media
- Fans for transported media temperatures above 100°C
- Fans for ambient temperatures above 65 °C

During the course of the introduction of the Directives, many manufacturers will also improve these motors without being legally required to do so.

There is also a Regulation for motors ("Motor Directive") – what’s the difference?
The ErP Implementation Regulation No. 640/2011/EC already came into effect in 2011. This specifies the efficiency of electric motors or, more specifically, IEC standard motors. This regulation refers only to the motor. Since 01.01.2015 only asynchronous motors with an efficiency class of at least IE2 (up to and including 5,5 kW) and from 7,5 kW with efficiency class IE3 may be brought onto the market. The use of IE2 is allowed at Motors above 7,5 kW if they are used with a speed control (e.g. Frequency converter).

The following applies for IEC standard motors:
- From June 16, 2011: Class IE2 for motor powers \( \geq 0.75 \text{ kW} \).
- From January 1, 2015: Class IE3 or IE2+FU for motor powers from 7.5 to 375 kW.
- From January 1, 2017: Class IE3 or IE2+FU for motor powers from 0.75 to 375 kW.
Air handling units (AHU) for non-residential ventilation; (NRVU) > 250 [m³/h].

What does it mean?

For BVU’s: AHU’s used in a balanced ventilation system in a building (fans in supply-air and fans in extract-air) have to be equipped with a heat recovery system (HRS) and to contain filters in supply and extract-air. On top the electrical power consumption of the fans regarding these demands is restricted.

For UVU’s: AHU’s which are part of a hybrid ventilation system (fans combined with natural supply or exhaust), have to meet minimum static fan efficiency, a F7 filter in supply air and a maximum power demand of the fan related to the ‘supply-filter’.

Exceptions

This Regulation shall not apply to ventilation units which:

• When electric power input is less than 30W (per air stream)
• Axial or centrifugal fans, which are only equipped with a housing.
• Explosion-protected fans
• Single stage smoke extraction fans, as long as these are not used for daily ventilation on demand
• Fans for transported media temperatures above 100 °C
• Fans for ambient temperatures above 65 °C
• Temperature of air stream or motor-surrounding under 40°C
• Supply voltage exceeds 1.000 V AC or 1.500 V DC
• Fans for the extraction of aggressive media
• AHU includes a heat exchanger and a heat pump for heat recovery.
• When applied for kitchen range hoods;

Important terms and abbreviations:

Air handling units (AHU) consisting at least of impeller, motor und casing

Residential ventilation unit (RVU) at air-flows up to 250 resp. 1.000 m³/h

Non-residential ventilation unit (NRVU) at air-flows above 1.000 resp. 250 m³/h. Absatz: -> At air-flows between 250 and 1000m³/h the manufacturer has to declare, if it is a RVU or a NRVU.

Heat recovery system (HRS) as part of a bidirectional ventilation unit

Specific ecodesign requirements for non residential ventilation units from 01.01.2016 (intensification 2018)

• All fans suitable for multi-speed-drive (min. 3 steps plus 0) or variable-speed-drive. Controller can be external.
• All bidirectional ventilation units (BVU) have to be equipped with a heat-recovery-system (HRS).
• All HRS shall have a thermal bypass facility (as bypass or control-function).
• Minimum thermal efficiency HRS:
  » run-around = 63 % (2018 = 68 %)
  » for higher efficiency bonus for higher efficiency calculation formula:
    E = (ηt_NWLA - 0.63) * 3000
  » all other recovery systems = 67 % (2018 = 73 %).
  » bonus for higher efficiency; calculation formula:
    E = (ηt_nwla - 0.67) * 3000
• Minimum fan efficiency for UVU (ŋvu) amounts
  » 6.2 % * ln(P) + 35.0 %, when P ≤ 30 kW and
  » 56.1 %, when P > 30kW.
• Maximum internal specific fan power of ventilation components (SVL_int_limit) in W/(m³/s) for a BVU with run-around HRS:
  1700 + E – 300 * q_nom/2 – F, when q_nom < 2 m³/s
  1400 + E – F, when q_nom ≥ 2 m³/s;
  » for a BVU with other HRS:
  1200 + E – 300 * q_nom/2 – F, when q_nom < 2 m³/s
  900 + E – F, when q_nom ≥ 2 m³/s;
  » 250 for an UVU intended to be used with a filter.
• Systemair provides the relevant data according Erp by selection of the unit.

Unidirectional ventilation unit (UVU)
Ventilation unit with only one air-flow (supply or exhaust). Balanced by natural air supply or exhaust (over- or under pressure).

Bidirectional ventilation unit
ventilation unit with supply and exhaust air-flow (with both supply and exhaust fans).

Multi-speed-drive (Multi-stage operation)
min. 3 steps or more plus zero (off)

Speed controllable
stepless via integrated or external control unit
Residential ventilation unit EU 1253/2014 and 1254/2014 (B2C, Label)

- Minimum requirements from January 1, 2016: The units must save at least as much primary energy (electricity and heat) as they use (electricity)
- Minimum requirements from January 1, 2018: The units must save significantly more primary energy than they use – the ventilation heat requirement of the residential building will be approximately halved
- Energy efficiency label from A+ to G (see Fig. 2)

The energy label should permit the end user to compare products easily, enabling them to select energy-efficient products. In contrast to other electrical equipment, the energy classes on the labels of residential ventilation equipment are determined by a calculated parameter, the specific energy consumption, or SEC. This value should display the energy-saving potential of the equipment used in kilowatt hours per m² per year.

<table>
<thead>
<tr>
<th>SEV class</th>
<th>SEV in kWh/a m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+ (highest efficacy)</td>
<td>SEV &lt; -42</td>
</tr>
<tr>
<td>A</td>
<td>-42 ≤ SEV -34</td>
</tr>
<tr>
<td>B</td>
<td>-34 ≤ SEV -26</td>
</tr>
<tr>
<td>C</td>
<td>-26 ≤ SEV -23</td>
</tr>
<tr>
<td>D</td>
<td>-23 ≤ SEV -20</td>
</tr>
<tr>
<td>E</td>
<td>-20 ≤ SEV -10</td>
</tr>
<tr>
<td>F</td>
<td>-10 ≤ SEV -0</td>
</tr>
<tr>
<td>G (lowest efficacy)</td>
<td>0 ≤ SEV</td>
</tr>
</tbody>
</table>

SEC value and energy class assignment.

Central residential ventilation unit with heat recovery

As shown in Figure 2, this is not only influenced by known parameters such as electrical power consumption or heat recovery, but, to a great degree, by the mode of operation as well.

So a Unit X may well achieve a better energy class when operated according to demand (e.g. moisture and CO2 sensors influence the air quantity), than in a time-controlled or manually-controlled version.

[Fig. 2]
Ecodesign

“Ecodesign” means the incorporation of environmental requirements into product design, with the aim of improving the environmental acceptability of the product throughout its entire life cycle. (Directive 2009/125/EC)

ErP

ErP stands for „Energy-related Product“ which refers to an object whose use influences the consumption of energy in some way and which is brought onto the market and/or put into service”. (Directive 2009/125/EC)

IE

IE stands for International Efficiency.

Directive

Within the EU, a Directive is a legal act which must be implemented by the member states in national law. How they implement the directives is left up to the individual member states.

Regulation

Within the EU, a Regulation is a legal act which, in contrast to an EU Directive, is valid directly in all member states. This means that the Regulation (EU) No. 327/2011 of the Commission from March 30, 2011 for the implementation of the Directive 2009/125/EC of the European Parliament and of the Council, specifies minimum efficiency requirements for fans driven by motors with an electrical input power of between 125 W and 500 kW.

Glossary

Central extract air fan without heat recovery

Exhaust systems without heat recovery score worse than units with heat recovery, since the exhaust heat is lost. For exhaust systems, the mode of operation also has a large influence on the energy class.

<table>
<thead>
<tr>
<th>Time controlled</th>
<th>Demand controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Energy Efficiency Chart]</td>
<td>![Energy Efficiency Chart]</td>
</tr>
</tbody>
</table>

Unit characteristic

Sound power level

Sound pressure level in the room <30 dB (A) depending on the installation