

## ***Commission Regulation (EU) 327/2011***

*Implementing Directive 2009/125/EC*

*Ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW.*

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## *Purpose*

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The purpose of the directive is:

- To achieve cost-efficient energy improvements of 34 T kW/year equivalent to 16 Mt Co<sup>2</sup> emissions.
- Harmonize energy efficiency requirements across the union.
- Use existing standards to measure and compare efficiencies.

All fans between 125 W to 500 kW electrical input power, except:

- Not for products used in means of transport for persons or goods (ships, trains, cars, etc.)
- Products with less than 3 kW driving something on a shaft (e.g. chain saw)
- Laundry and washer dryers of less than 3 kW
- Kitchen hoods less than 280W
- Explosion proof fans (as defined in directive 94/9/EC)
- Emergency fans for fire safety only
- Hot gas over 100°C
- Fans with motors being cooled over 65°C or under -40°C
- Voltage over 1000 V AC or 1500 V DC
- Fans in toxic, flammable or corrosive environment
- Fans with speeds over 8000 rpm
- Fans with a specific ration over 1.11 (~ 11.000 Pa)
- Transport fans for non gaseous substances

*Different FMEG values are used for different fan types*

	Axial, Forward Curved & Radial Centrifugal fans, Mixed flow fans	Backward Bladed Centrifugal fans with or without housing	Crossflow fans
<10 kW	$\eta_{opt} = 2.74 \cdot \ln(P_e) - 6.33 + N_G$	$\eta_{opt} = 4.56 \cdot \ln(P_e) - 10.5 + N_G$	$\eta_{opt} = 1.14 \cdot \ln(P_e) - 2.6 + N_G$
$\geq 10$ kW	$\eta_{opt} = 0.78 \cdot \ln(P_e) - 1.88 + N_G$	$\eta_{opt} = 1.1 \cdot \ln(P_e) - 2.6 + N_G$	$\eta_{opt} = N_G$

→ See the following pages for a representation of the various FMEG's and optimal minimum efficiencies as demanded by the directive.

$\eta_{opt}$  = Minimum peak efficiency at maximum speed

$P_e$  = Electrical power input in kilowatt.

$N_G$  = Grade number (integer) of the FMEG e.g.  $N_G = 40$  for FMEG 40.

### Eco design requirements – Fan motor

#### Efficiency grades (FMEG)\*

Efficiency grades (FMEG)*				$\eta_{FM\ opt}$ in %				$\eta_{F\ opt}$ in%				Compliance 90%				
Fan types	Measurement category	Static or total	FMEG		11 kW motor		55kW motor		11kW ( $\eta_{mot}=90\%$ )		55 kW ( $\eta_{mot}=94\%$ )		$\eta_{F\ opt}^{11kW}$		$\eta_{F\ opt}^{55kW}$	
			2013	2015	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015	2013	2015
Axial	A,C	Static	36	40	36	40	37	41	40	44	39	44	36	40	36	40
	B,D	Total	50	58	50	58	51	59	56	64	54	63	50	58	49	57
Backward curved centrifugal with housing	A,C	Static	58	61	58	61	59	62	64	68	63	66	58	61	57	60
	B,D	Total	61	64	61	64	62	66	68	71	66	70	61	64	62	63
Backward curved centrifugal w/o housing	A,C	Static	58	62	58	62	59	63	64	69	63	67	58	63	57	61
Forward curved or radial bladed centrifugal	A,C	Static	37	44	37	44	39	46	41	49	43	49	37	45	39	45
	B,D	Total	42	49	42	49	44	51	47	54	47	54	42	49	43	49
Mixed flow	A,C	Static	47	50	47	50	48	51	52	56	51	54	47	51	46	49
	B,D	Total	58	62	59	62	60	63	66	69	64	67	59	63	58	61
Cross flow	B,D	Total	13	21	13	21	13	21	14	23	14	22	13	21	13	20

\* Dual use fans for safety have 10% less efficiency requirement for 2013 and 5% less in 2015.

*Product information requirements*

Information	Technical documentation	Name plate
Overall efficiency	X	X
Installation category (A-D)	X	X
Static or total	X	X
FMEG	X	X
VSD Yes/No	X	X
Year of manufacture	X	
Manufacturer's Name	X	
Product Number	X	
Rated motor power in kW	X	
Speed in rpm	X	
Specific ratio	X	
Other for disposal, maintenance and additional items	X	

## *Verification and Compliance*

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- One unit is tested.
  - It complies if 90% of target efficiency is found.
  - If not, then
    - does not comply if less than 5 units per year are produced.
    - for larger productions per year it does not comply if 3 additional random selected units on average also do not achieve 90% of target efficiency.
- 10% less than the target efficiency is the real target.

				Examples			
Fan types	Measurement category (A-D)	Efficiency category (static or total)	Efficiency grade	$\eta_{FM_{opt}}$ in %		$\eta_{F_{opt}}$ in%	
				11 kW motor	55kW motor	11kW ( $\eta_{mot} = 90\%$ )	55 kW ( $\eta_{mot} = 94\%$ )
Axial	A,C	Static	65	65	66	72	69
	B,D	Total	75	75	76	83	80
Centrifugal Backward curved with housing	A,C	Static	72	72	73	80	78
	B,D	Total	75	75	76	83	80
Centrifugal Backward curved w/o housing	A,C	Static	70	74	76	82	81
Centrifugal Forward curved/ radial bladed	A,C	Static	62	62	64	69	68
	B,D	Total	65	65	67	72	71
Mixed flow	A,C	Static	61	61	62	68	66
	B,D	Total	65	65	66	72	70
Cross flow	B,D	Total	32	32	32	36	34