Discussion document implementing Directive 2009/125/EC with regard to Ecodesign requirements for the revision of the "fan regulation" Commission Regulation (EU) No. 327/2011

Künzelsau, February 2015

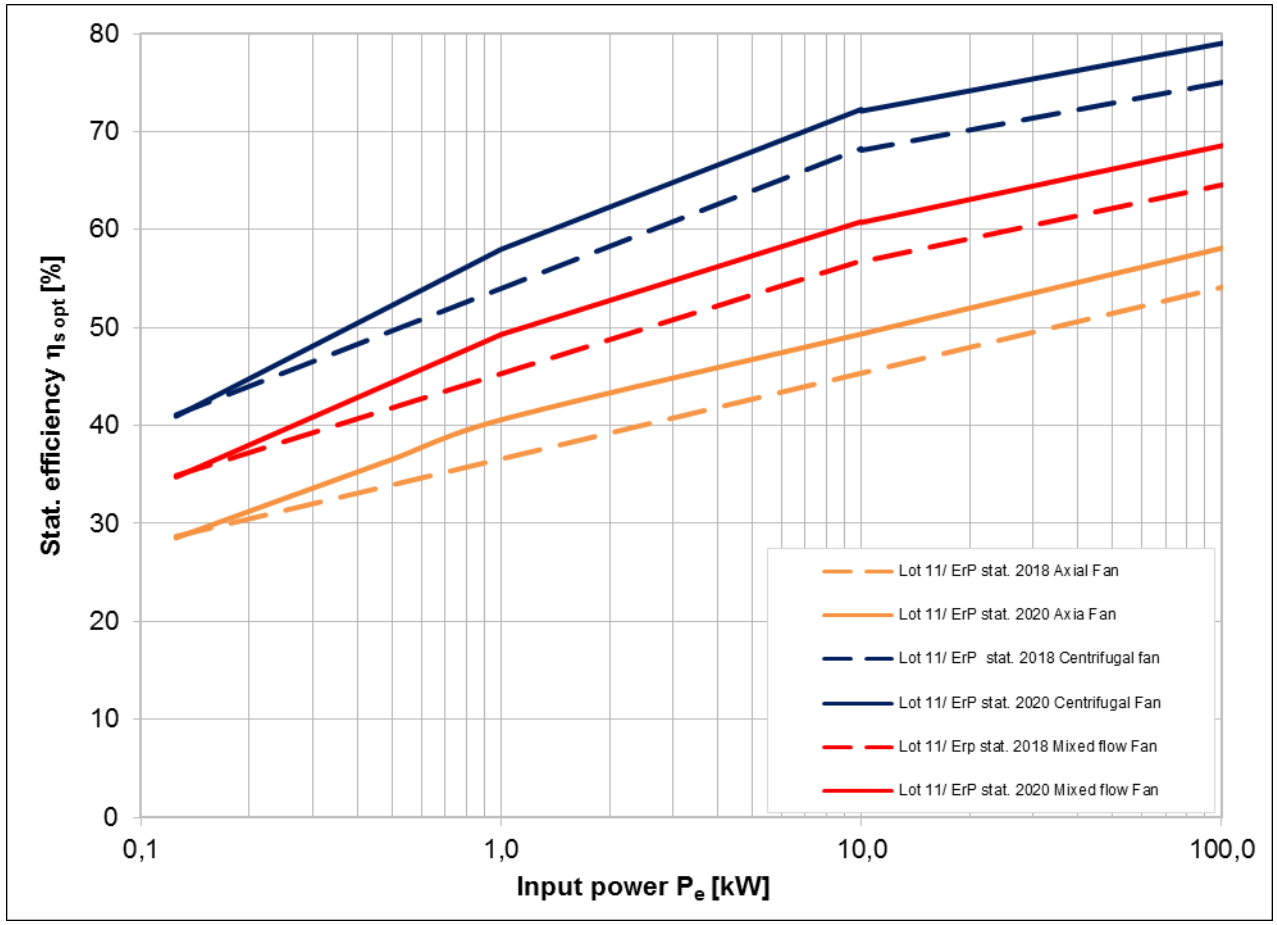
In this document we have done a theoretical calculation based on the proposed VHK slopes and the actual EVIA proposed slopes and efficiency grades where we like to demonstrate that some of the limits are not achievable, especially for fans with higher input power. We have done this in all relevant product groups with an short comment to each category.

We clearly support the EVIA approach by using an identical slope for all product groups also for the axial fans to bring the slope technically in line with the achievable impeller efficiencies at higher input power. All given limits are based on one Tier, becoming effective in 2020.

Calculation and numbers are based on the Ecodesign requirements for motors considering nominal minimum efficiencies (η) for IE3 efficiency level (50 Hz) and fan energy efficiency requirements for N2018 and N2020 (VHK proposal) or the EVIA proposal.
In all discussions it must be taken into consideration that the calculation is done on a theoretical base and by using the efficiencies of the component impeller and motor in their best efficiency points. In general, fans are designed to operate in this area but not always at peak efficiency of the motor. So a reduction of the theoretical minimum efficiency must be done. We see that this effect will be in a range of 2% to 5%.

All data are referred to efficiency measurement category static (A).

VHK Proposal



Centrifugal Fan

Table 1: Nominal minimum efficiency (η) for IE3 efficiency level (50 Hz) Centrifugal FAN minimum efficiency and impeller efficiency 2018 and 2020 with IE3 8-pole and 4-pole motor from 0,12-75 kW.

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2018 with IE3 8-pole	FAN ηmin 2018 with IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2018 with IE3 8-pole	impeller efficiency FAN ηmin 2018 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	45,1	43,5	46,2	44,2	88,9	67,2	91,1	68,2
0,18	58,7	69,9	46,7	45,6	48,3	46,9	79,5	65,2	82,3	67,1
0,20	60,6	71,1	47,1	46,1	48,9	47,6	77,8	64,9	80,7	66,9
0,25	64,1	73,5	48,2	47,3	50,3	49,2	75,1	64,4	78,4	66,9
0,37	69,3	77,3	50,1	49,4	52,9	52,0	72,3	63,9	76,3	67,2
0,40	70,1	78,0	50,5	49,9	53,4	52,5	72,1	63,9	76,2	67,3
0,55	73,0	80,8	52,2	51,6	55,7	54,8	71,6	63,9	76,3	67,9
0,75	75,0	82,5	54,0	53,4	58,0	57,2	72,0	64,7	77,3	69,4
1,10	77,7	84,1	56,2	55,7	60,2	59,7	72,3	66,2	77,4	70,9
1,50	79,7	85,3	57,9	57,5	61,9	61,5	72,7	67,4	77,7	72,1
2,20	81,9	86,7	60,1	59,8	64,1	63,8	73,4	68,9	78,3	73,6
3,00	83,5	87,7	61,9	61,6	65,9	65,6	74,2	70,3	79,0	74,8
4,00	84,5	88,6	63,6	63,3	67,6	67,3	75,3	71,5	80,0	76,0
5,50	86,2	89,6	65,5	65,3	69,5	69,3	76,0	72,8	80,6	77,3
7,50	87,3	90,4	67,3	67,1	71,3	71,1	77,1	74,2	81,7	78,7
11,00	88,6	91,4	68,8	68,7	72,8	72,7	77,6	75,1	82,1	79,5
15,00	89,6	92,1	69,7	69,6	73,7	73,6	77,7	75,5	82,2	79,9
18,50	90,1	92,6	70,3	70,2	74,3	74,2	78,0	75,8	82,4	80,1
22,00	90,6	93,0	70,8	70,7	74,8	74,7	78,1	76,0	82,5	80,3
30,00	91,3	93,6	71,7	71,6	75,7	75,6	78,5	76,5	82,9	80,8
37,00	91,8	93,9	72,3	72,2	76,3	76,2	78,7	76,9	83,1	81,2
45,00	92,2	94,2	72,9	72,8	76,9	76,8	79,0	77,3	83,4	81,5
55,00	92,5	94,6	73,5	73,4	77,5	77,4	79,4	77,6	83,7	81,8
75,00	93,1	95,0	74,4	74,3	78,4	78,3	79,9	78,2	84,2	82,4

Most centrifugal backward curved motorised impellers are energy-optimised for operation without spiral housing using special three-dimensional blade geometry with rotating bladeless diffuser for high efficiencies and favourable acoustic behavior.

The typical applications are air conditioning and refrigeration technology and the centrifugal fans are free running and today's best technology is able to reach static impeller efficiencies 75%-76 % at best efficiencies point.

The VHK proposal shows that there will be a need of static impeller efficiencies over this limit by using an IE3 motor. Such impeller efficiencies cannot be achieved.

This means that fans with input power from 4 kW and above cannot be realized in the future.

Forward curved fans are not considered in these numbers and can't reach those requirements. These fans only reach 30-50 % of total system efficiency, which means the removal from the market.

Axial Fans

Table 2: Nominal minimum efficiency (η) for IE3 efficiency level (50 Hz) Axial FAN minimum efficiency and impeller efficiency 2018 and 2020 with IE3 8-pole and 4-pole from 0,12-75 kW.

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2018 with IE3 8-pole	FAN ηmin 2018 with IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2018 with IE3 8-pole	impeller efficiency FAN ηmin 2018 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	31,1	30,2	32,2	30,8	61,4	46,6	63,6	47,6
0,18	58,7	69,9	32,1	31,4	33,7	32,7	54,7	45,0	57,5	46,8
0,20	60,6	71,1	32,4	31,8	34,2	33,2	53,4	44,7	56,4	46,8
0,25	64,1	73,5	33,0	32,5	35,1	34,3	51,5	44,2	54,8	46,7
0,37	69,3	77,3	34,2	33,8	37,0	36,3	49,4	43,7	53,3	47,0
0,40	70,1	78,0	34,5	34,1	37,3	36,7	49,2	43,7	53,3	47,1
0,55	73,0	80,8	35,5	35,1	39,0	38,4	48,7	43,5	53,4	47,5
0,75	75,0	82,5	36,6	36,2	40,6	40,0	48,8	43,9	54,1	48,5
1,10	77,7	84,1	37,9	37,6	42,6	42,2	48,8	44,7	54,8	50,1
1,50	79,7	85,3	39,0	38,7	44,3	43,9	48,9	45,4	55,5	51,4
2,20	81,9	86,7	40,4	40,1	46,3	46,0	49,3	46,3	56,6	53,1
3,00	83,5	87,7	41,5	41,3	48,0	47,7	49,7	47,1	57,5	54,4
4,00	84,5	88,6	42,5	42,3	49,6	49,3	50,3	47,8	58,7	55,7
5,50	86,2	89,6	43,6	43,5	51,3	51,1	50,6	48,5	59,6	57,1
7,50	87,3	90,4	44,8	44,6	53,1	52,9	51,3	49,4	60,8	58,5
11,00	88,6	91,4	46,2	46,1	50,2	50,1	52,1	50,4	56,6	54,8
15,00	89,6	92,1	47,3	47,2	51,3	51,2	52,8	51,3	57,3	55,6
18,50	90,1	92,6	48,1	48,0	52,1	52,0	53,4	51,8	57,8	56,1
22,00	90,6	93,0	48,7	48,6	52,7	52,6	53,8	52,3	58,2	56,6
30,00	91,3	93,6	49,9	49,8	53,9	53,8	54,6	53,2	59,0	57,5
37,00	91,8	93,9	50,6	50,6	54,6	54,6	55,2	53,8	59,5	58,1
45,00	92,2	94,2	51,4	51,3	55,4	55,3	55,7	54,5	60,1	58,7
55,00	92,5	94,6	52,1	52,0	56,1	56,0	56,4	55,0	60,7	59,2
75,00	93,1	95,0	53,3	53,2	57,3	57,2	57,2	56,0	61,5	60,2

Vane axial, Tube axial and the so called propeller fans are different.
In the OEM mass market they can't be rated the same. Especially in the building market and the branches refrigeration, ventilation, heat pumps or agriculture fans for livestock, axial fans have system efficiencies between 30-40%. In these applications propeller fans are used which are designed for operating points at high volume and low pressure. In many cases there fans only operate with a 6-pole or an 8-pole motor. Such impellers do not reach the highest peak efficiencies, maximum achievable impeller static efficiencies are normally 40% to 50%.

The VHK proposal shows that there will be need of static impeller efficiencies over this limit by using an IE3 motor.
Such axial propeller fans cannot reach the efficiencies which are needed from 2 kW and above. It must be taken into account that these fans do not have such high peak efficiencies but they are much more efficient in the application they will be used in the market.

Changing to other known fan designs like tube axial or vane axial is much more expensive and often technically not possible and such fans are designed for high pressure. In that case the fan may fulfill the requirements of the fan revision but works in his needed operating point much more inefficient.

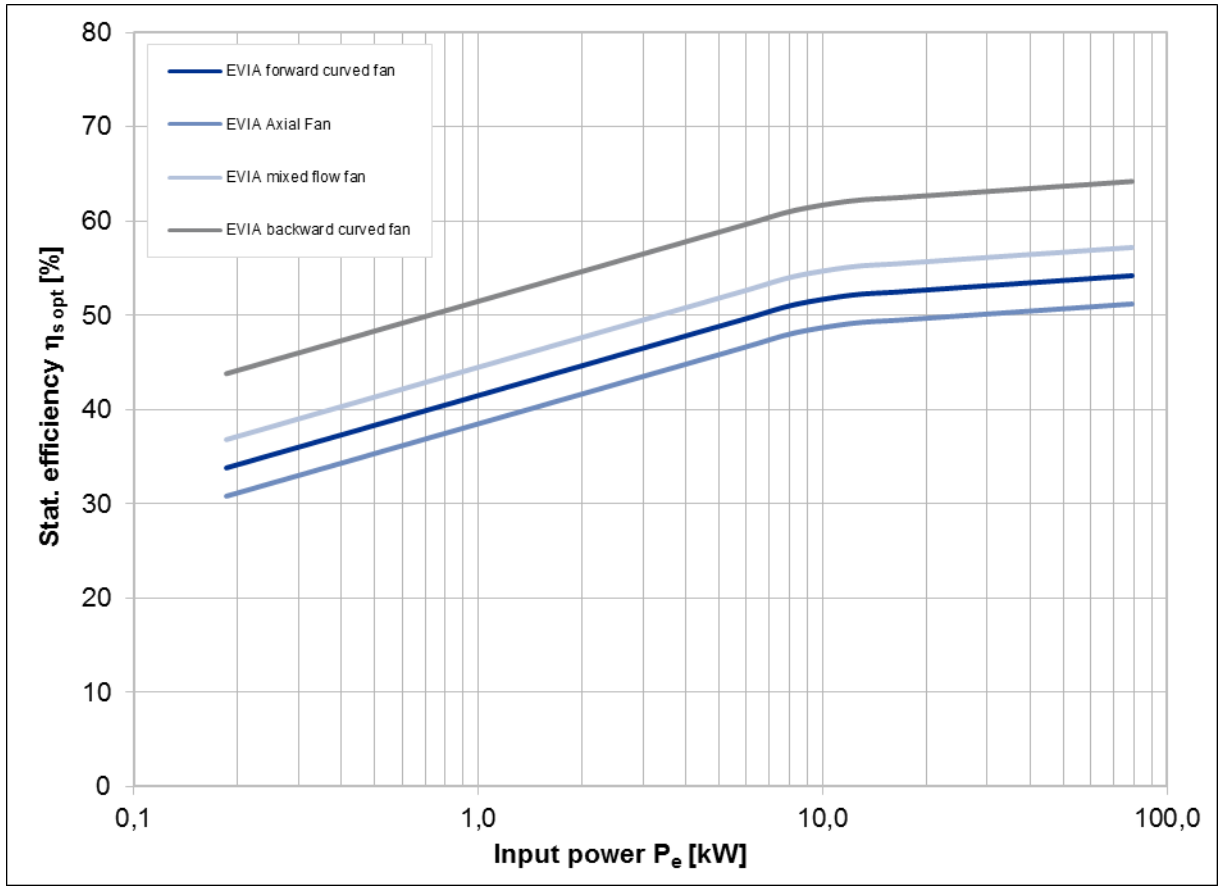
Mixed-Flow Fans

Table 3: Nominal minimum efficiency (η) for IE3 efficiency level (50 Hz) Mixed-flow FAN minimum efficiency and Mixed-flow impeller efficiency 2018 and 2020 with IE3 8-poles and 4-poles from 0,12-75 kW.

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2018 with IE3 8-pole	FAN ηmin 2018 with IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2018 with IE3 8-pole	impeller efficiency FAN ηmin 2018 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	38,1	36,9	39,2	37,5	75,1	56,9	77,3	57,9
0,18	58,7	69,9	39,4	38,5	41,0	39,8	67,1	55,1	69,9	56,9
0,20	60,6	71,1	39,8	39,0	41,5	40,4	65,6	54,8	68,5	56,9
0,25	64,1	73,5	40,6	39,9	42,7	41,8	63,3	54,3	66,6	56,8
0,37	69,3	77,3	42,2	41,6	44,9	44,1	60,8	53,8	64,8	57,1
0,40	70,1	78,0	42,5	42,0	45,4	44,6	60,6	53,8	64,7	57,2
0,55	73,0	80,8	43,9	43,4	47,3	46,6	60,1	53,7	64,8	57,7
0,75	75,0	82,5	45,3	44,8	49,3	48,8	60,4	54,3	65,7	59,2
1,10	77,7	84,1	47,0	46,6	51,0	50,6	60,5	55,5	65,7	60,2
1,50	79,7	85,3	48,5	48,1	52,5	52,1	60,8	56,4	65,8	61,1
2,20	81,9	86,7	50,2	50,0	54,2	54,0	61,3	57,6	66,2	62,2
3,00	83,5	87,7	51,7	51,4	55,7	55,4	61,9	58,7	66,7	63,2
4,00	84,5	88,6	53,1	52,8	57,1	56,8	62,8	59,6	67,5	64,1
5,50	86,2	89,6	54,6	54,4	58,6	58,4	63,3	60,7	67,9	65,1
7,50	87,3	90,4	56,1	55,9	60,1	59,9	64,2	61,8	68,8	66,2
11,00	88,6	91,4	57,5	57,4	61,5	61,4	64,9	62,8	69,4	67,1
15,00	89,6	92,1	58,5	58,4	62,5	62,4	65,3	63,4	69,7	67,7
18,50	90,1	92,6	59,2	59,1	63,2	63,1	65,7	63,8	70,1	68,1
22,00	90,6	93,0	59,7	59,7	63,7	63,7	65,9	64,1	70,4	68,4
30,00	91,3	93,6	60,8	60,7	64,8	64,7	66,6	64,8	70,9	69,1
37,00	91,8	93,9	61,5	61,4	65,5	65,4	67,0	65,4	71,3	69,6
45,00	92,2	94,2	62,1	62,0	66,1	66,0	67,4	65,9	71,7	70,1
55,00	92,5	94,6	62,8	62,7	66,8	66,7	67,9	66,3	72,2	70,5
75,00	93,1	95,0	63,8	63,8	67,8	67,8	68,6	67,1	72,8	71,3

The efficiency limits for mixed flow fans are high and ambitious. Such fans are normally used in application where the input power is not higher than 10 kW.

EVIA Proposal



Centrifugal forward curved fan

Table 4: Centrifugal forward curved fan minimum efficiency 2020 and impeller efficiency 2020 with IE3 8-poles and 4-poles from 0,12-75 kW

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	34,9	33,8	68,9	53,9
0,18	58,7	69,9	36,1	35,3	61,5	51,7
0,20	60,6	71,1	36,4	35,7	60,1	51,3
0,25	64,1	73,5	37,2	36,6	58,0	50,6
0,37	69,3	77,3	38,6	38,1	55,8	50,0
0,40	70,1	78,0	38,9	38,5	55,6	49,9
0,55	73,0	80,8	40,2	39,7	55,1	49,8
0,75	75,0	82,5	41,5	41,1	55,3	50,3
1,10	77,7	84,1	43,1	42,7	55,5	51,2
1,50	79,7	85,3	44,4	44,1	55,7	52,0
2,20	81,9	86,7	46,0	45,7	56,2	53,1
3,00	83,5	87,7	47,3	47,1	56,7	54,0
4,00	84,5	88,6	48,6	48,4	57,5	54,8
5,50	86,2	89,6	50,0	49,8	57,9	55,7
7,50	87,3	90,4	51,3	51,1	58,8	56,8
11,00	88,6	91,4	52,2	52,1	58,9	57,1
15,00	89,6	92,1	52,5	52,5	58,6	57,0
18,50	90,1	92,6	52,7	52,7	58,5	56,9
22,00	90,6	93,0	52,9	52,9	58,4	56,9
30,00	91,3	93,6	53,2	53,2	58,3	56,9
37,00	91,8	93,9	53,5	53,4	58,2	56,9
45,00	92,2	94,2	53,7	53,7	58,2	57,0
55,00	92,5	94,6	53,9	53,9	58,3	57,0
75,00	93,1	95,0	54,2	54,2	58,2	57,1

We support the EVIA approach to take the same slopes as backward curved fans by using an efficiency grade of N52 and to set an additional cap at 5 kW input power.

A cap starting from 5 kW input power and above and will eliminate the most ineffective fans which are used in the ventilation business and other applications. Therefore backward curved fans can be used.

Centrifugal backward curved fan

Table 5: Centrifugal backward curved fan minimum efficiencies 2020 and impeller efficiency 2020 with IE3 8-poles and 4-poles from 0,12-75 kW

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	44,9	43,8	88,6	67,6
0,18	58,7	69,9	46,1	45,3	78,6	64,8
0,20	60,6	71,1	46,4	45,7	76,6	64,3
0,25	64,1	73,5	47,2	46,6	73,6	63,4
0,37	69,3	77,3	48,6	48,1	70,2	62,3
0,40	70,1	78,0	48,9	48,5	69,8	62,1
0,55	73,0	80,8	50,2	49,7	68,8	61,6
0,75	75,0	82,5	51,5	51,1	68,7	61,9
1,10	77,7	84,1	53,1	52,7	68,3	62,7
1,50	79,7	85,3	54,4	54,1	68,2	63,4
2,20	81,9	86,7	56,0	55,7	68,4	64,3
3,00	83,5	87,7	57,3	57,1	68,7	65,1
4,00	84,5	88,6	58,6	58,4	69,3	65,9
5,50	86,2	89,6	60,0	59,8	69,5	66,7
7,50	87,3	90,4	61,3	61,1	70,2	67,6
11,00	88,6	91,4	62,2	62,1	70,2	68,0
15,00	89,6	92,1	62,5	62,5	69,8	67,8
18,50	90,1	92,6	62,7	62,7	69,6	67,7
22,00	90,6	93,0	62,9	62,9	69,4	67,6
30,00	91,3	93,6	63,2	63,2	69,3	67,5
37,00	91,8	93,9	63,5	63,4	69,1	67,6
45,00	92,2	94,2	63,7	63,7	69,1	67,6
55,00	92,5	94,6	63,9	63,9	69,1	67,5
75,00	93,1	95,0	64,2	64,2	69,0	67,6

Centrifugal backward curved fan shall stay at the same limit as 2015 (EVIA position). Possible is a maximum efficiency grade of N64 for fans with and without housing due to the higher motor efficiencies which will be in the market 2020 (general IE3).

Axial fan

Table 6: Axial fan minimum efficiencies 2020 and impeller efficiency 2020 with IE3 8-poles and 4-poles from 0,12-75 kW

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	31,9	30,8	63,0	47,5
0,18	58,7	69,9	33,1	32,3	56,4	46,2
0,20	60,6	71,1	33,4	32,7	55,2	46,0
0,25	64,1	73,5	34,2	33,6	53,4	45,7
0,37	69,3	77,3	35,6	35,1	51,4	45,5
0,40	70,1	78,0	35,9	35,5	51,3	45,5
0,55	73,0	80,8	37,2	36,7	51,0	45,5
0,75	75,0	82,5	38,5	38,1	51,3	46,1
1,10	77,7	84,1	40,1	39,7	51,6	47,2
1,50	79,7	85,3	41,4	41,1	51,9	48,2
2,20	81,9	86,7	43,0	42,7	52,5	49,3
3,00	83,5	87,7	44,3	44,1	53,1	50,3
4,00	84,5	88,6	45,6	45,4	54,0	51,2
5,50	86,2	89,6	47,0	46,8	54,5	52,2
7,50	87,3	90,4	48,3	48,1	55,3	53,3
11,00	88,6	91,4	49,2	49,1	55,5	53,8
15,00	89,6	92,1	49,5	49,5	55,2	53,7
18,50	90,1	92,6	49,7	49,7	55,2	53,7
22,00	90,6	93,0	49,9	49,9	55,1	53,6
30,00	91,3	93,6	50,2	50,2	55,0	53,6
37,00	91,8	93,9	50,5	50,4	55,0	53,7
45,00	92,2	94,2	50,7	50,7	55,0	53,8
55,00	92,5	94,6	50,9	50,9	55,0	53,8
75,00	93,1	95,0	51,2	51,2	55,0	53,9

The EVIA proposal to axial fans is still very ambitious for axial propeller fans and will lead to a ban of such fans from the market.

This will create problems in many low pressure applications like refrigeration or agriculture. A second efficiency grade is needed in addition to the actual limits which are achievable for so called “high pressure fans” (vane axial). One possible option is a reduction of the efficiency grade by 4% points (N-4) if the fans are designed for a static pressure of maximum 300 Pa at its best efficiency point, but not lower as in the current regulation. We do not want to make the limits lower than before.

Mixed flow fan

Table 7: Mixed flow fan minimum efficiencies 2020 and impeller efficiencies 2020 with IE3 8-poles and 4-poles from 0,12-75 kW

rated output power [kW]	minimum efficiency (η) IE3 8-pole	minimum efficiency (η) IE3 4-pole	FAN ηmin 2020 with IE3 8-pole	FAN ηmin 2020 with IE3 4-pole	impeller efficiency FAN ηmin 2020 with IE3 8-pole	impeller efficiency FAN ηmin 2020 with IE3 4-pole
0,12	50,7	64,8	37,9	36,8	74,8	56,8
0,18	58,7	69,9	39,1	38,3	66,6	54,8
0,20	60,6	71,1	39,4	38,7	65,1	54,5
0,25	64,1	73,5	40,2	39,6	62,7	53,9
0,37	69,3	77,3	41,6	41,1	60,1	53,2
0,40	70,1	78,0	41,9	41,5	59,8	53,1
0,55	73,0	80,8	43,2	42,7	59,2	52,9
0,75	75,0	82,5	44,5	44,1	59,3	53,4
1,10	77,7	84,1	46,1	45,7	59,3	54,4
1,50	79,7	85,3	47,4	47,1	59,5	55,2
2,20	81,9	86,7	49,0	48,7	59,8	56,2
3,00	83,5	87,7	50,3	50,1	60,3	57,1
4,00	84,5	88,6	51,6	51,4	61,1	58,0
5,50	86,2	89,6	53,0	52,8	61,4	58,9
7,50	87,3	90,4	54,3	54,1	62,2	59,9
11,00	88,6	91,4	55,2	55,1	62,3	60,3
15,00	89,6	92,1	55,5	55,5	61,9	60,2
18,50	90,1	92,6	55,7	55,7	61,8	60,1
22,00	90,6	93,0	55,9	55,9	61,7	60,1
30,00	91,3	93,6	56,2	56,2	61,6	60,1
37,00	91,8	93,9	56,5	56,4	61,5	60,1
45,00	92,2	94,2	56,7	56,7	61,5	60,1
55,00	92,5	94,6	56,9	56,9	61,5	60,1
75,00	93,1	95,0	57,2	57,2	61,5	60,2

The EVIA proposal to use an efficiency grade in the middle of the axial and the centrifugal backward curved fan limits is ambitious but will be acceptable. This means an efficiency grade of N55. If the backward curved limit goes to N64 instead of N62, the limit for mixed flow fans should be N56. We recommend using only one level for mixed flow fans to avoid loopholes by developments for mixed flow fans that are designed for an axial direction with angle between 20° to 45°. These are the more inefficient mixed flow fans and to have only one level offers the opportunity to bring such inefficient fans out of the market. This is similar to the situation between backward curved and forward curved fans.

Summary:

We clearly see that the actual given efficiencies from VHK are not possible to be achieved for fans with the highest possible motor efficiency (IE 3) when the power input is higher than 2 kW (axial) or 5 kW (centrifugal).

The EVIA proposal is done with the knowledge of the market and what can be realized.

Ziehl-Abegg and other EVIA companies wish to get an ambitious regulation.

For the so called axial propeller fans, due to the lower achievable maximum efficiency the efficiency grade must be reduced. The solution could be to reduce the efficiency grade of the axial category by 4% points if it is a fan with a maximum static pressure of 300 Pa at its best efficiency point.

Efficiency grades for mixed flow fans are less different from the VHK proposal; it is preferred to have the same slope as used for backward curved fans. Definition of only one efficiency grade makes sense to avoid developments for low efficient mixed flow fans with a more axial oriented angle between 20° and 45°.

The cap for forward curved fans over 5 kW input power is acceptable.

The efficiency grades for the centrifugal fans are already very high, but an increase of 2 % (N64) in the efficiency grade could be accepted.

Summary of limits and categories:

Ziehl-Abegg proposes efficiency grades and categories by using the backward curved slope of the actual fan regulation 327/2011.

Axial fans:	N48 and a decrease of N-4 for axial fans designed for max. 300 Pa static efficiency at the best efficiency point, but not lower than the actual regulation
Centrifugal fans backward curved:	N62, max. N64
Centrifugal fans forward curved:	N52 + cap over 5 kW input power
Mixed flow fans:	N55 or max. N56 (if backward curved goes to N64)

About Ziehl-Abegg

Ziehl-Abegg (Kuenzelsau, Baden-Wurttemberg, Germany) is one of the leading global companies in the ventilation and drive technology sector with matching control technology. Examples of application areas for the products include heating and refrigeration plant, clean rooms and agricultural systems. Back in the Fifties' Ziehl-Abegg established the basis for modern fan drives: external rotor motors which remain, even today, state-of-the-art worldwide. Another area of business is electric motors which provide the power e.g. for elevators, medical applications (computer tomography equipment) or deep-sea underwater vehicles. The theme of electro-mobility/clean power for motor vehicles was established as part of the Ziehl-Abegg Automotive Team in 2012 that incorporates the sales and further development of a wheel hub drive for urban buses already in use in several countries

The high-tech company has an impressive and extensive range of vertical manufacture. Ziehl-Abegg employs 1,900 personnel in its production plants in Southern Germany. The company has a global workforce of 3,400, spread between 16 production plants, 27 companies and 86 sales locations. The products, approx. 30,000 in all, are sold in more than 100 countries. Sales revenues in 2014 totalled 423 million euro. Exports account for two thirds of sales.

Emil Ziehl founded the company in Berlin in 1910, manufacturing electric motors. After the Second World War the company's headquarters were relocated to Southern Germany. Ziehl-Abegg SE is not a listed company but family-owned.
For more information go to www.ziehl-abegg.com

Ziehl-Abegg SE

Jürgen Albig - Head of Productmanagement