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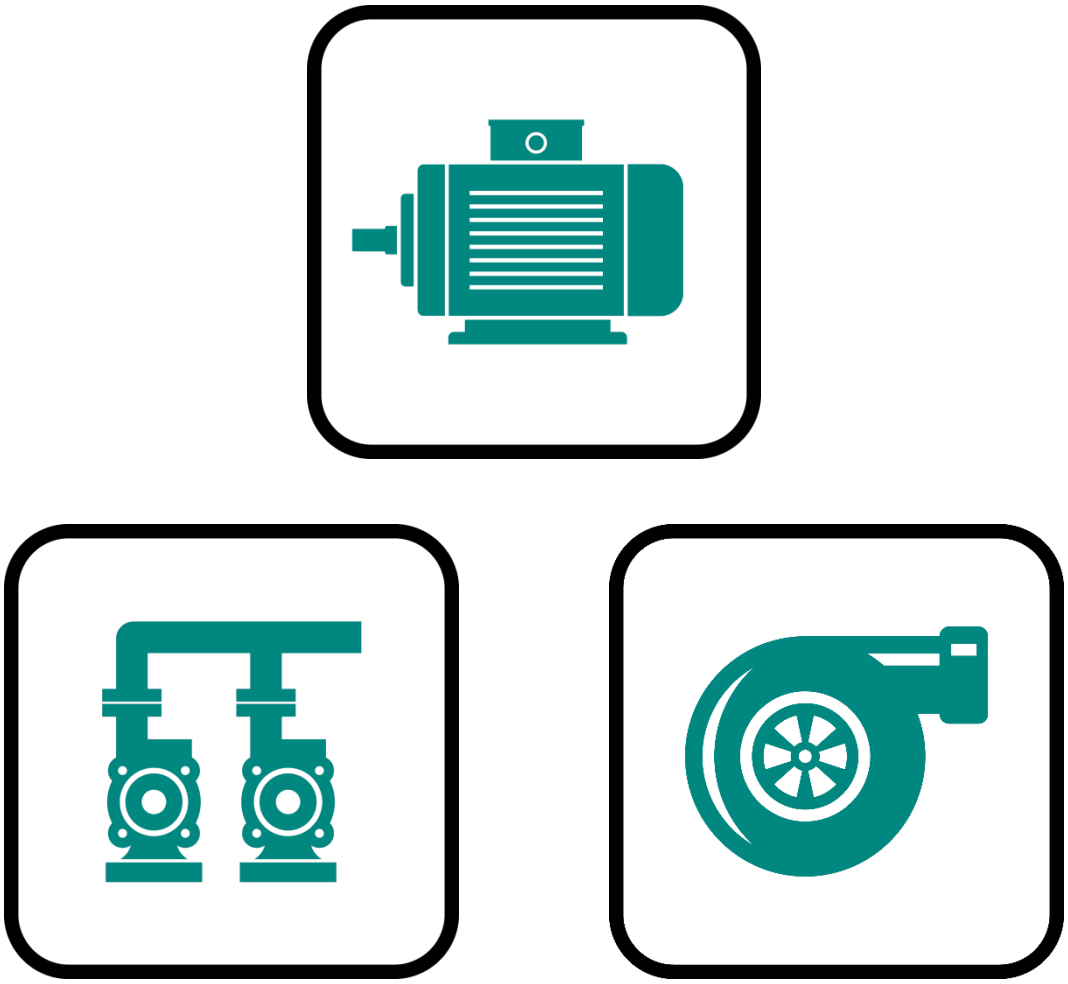
Report of December 2020

Topmotors Market Report Switzerland 2020



TOPMOTORS

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List of abbreviations

CEMEP	European Committee of Manufacturers of Electrical Machines and Power Electronics
EEI	Energy efficiency index for circulators
EnG	Swiss Energy Act
EnEV	Swiss Energy Efficiency Ordinance about the energy efficiency requirements of mass-produced installations, vehicles and equipment
IE1/IE2/IE3/IE4	IE-code for motor efficiency according to IEC 60034-30-1
MEI	Minimum efficiency index for water pumps
MEPS	Minimum energy performance standards
OEM	Original Equipment Manufacturer
SFOE	Swiss Federal Office of Energy
VFD	Variable Frequency Drive

1 Summary

1.1 Goal

This Topmotors Market Report provides information on the status of the electric motors, pumps and fans market in Switzerland for the year 2019. This study, conducted for the fourth time, serves to inform the Swiss Federal Office of Energy (SFOE) and all interested stakeholders about the number of electric motors sold and their compliance with minimum energy performance standards (MEPS). It also covers the availability of motors according to efficiency class and the sale prices of motors and variable frequency drives (VFD). As in 2017 and 2018, market data on circulators, water pumps and fans were collected. In addition, market data from the European Union (EU) is analysed which was revised in 2023 referencing data from CEMEP, the European Committee of Manufacturers of Electrical Machines and Power Electronics.

1.2 Share of electric motors within Swiss electricity consumption

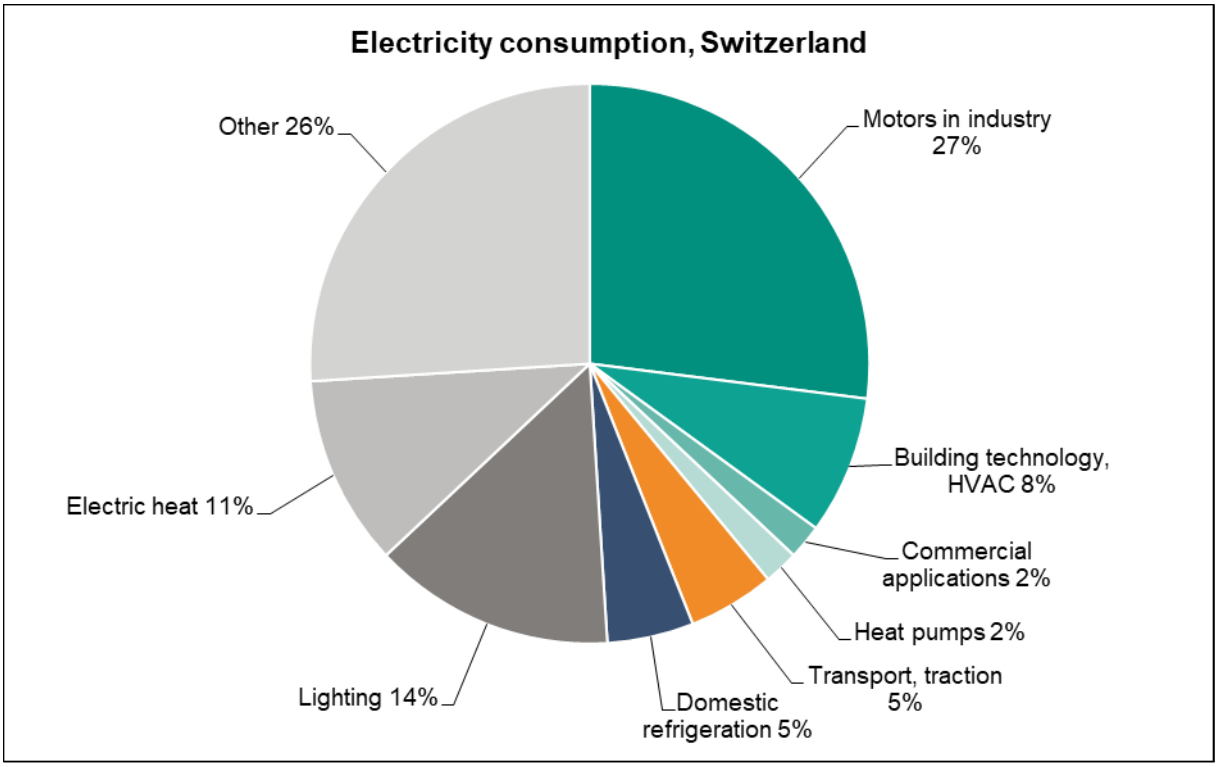

Figure 1: **Share of electric motor driven systems in Swiss electricity consumption (S.A.F.E. / J. Nipkow 2013).** Electric motor driven systems come under the categories of industrial applications, building technology, service sector applications, heat pumps, traction, transport and household appliances, which taken together account for 49% of consumption.

Industrial motors account for 27% of Swiss electricity consumption, as can be seen from Figure 1. Based on the sales figures for low-voltage motors collected by Omdia, 185 401 electric motors with a power range of 0.12 to 1 000 kW were sold in Switzerland in 2019. Overall, these motors have

- a power of 1 165 MW (mechanical) and
- a theoretical annual electricity consumption of 3 982 GWh/a, as can be seen from Table 5 and as is further described in Chapter 5.

Theoretical annual electricity consumption in 2019 accounted for some 7% of total Swiss electricity consumption in 2019[1]. The new motors sold help to rejuvenate the existing motor stock in the industry[2] and boost overall efficiency by replacing older, inefficient motors.

1.3 Key findings

The key findings of the 2019 market survey for low-voltage electric motors, pumps and fans can be summarized as follows, in comparison with the previous years[3]:

MOTORS Switzerland

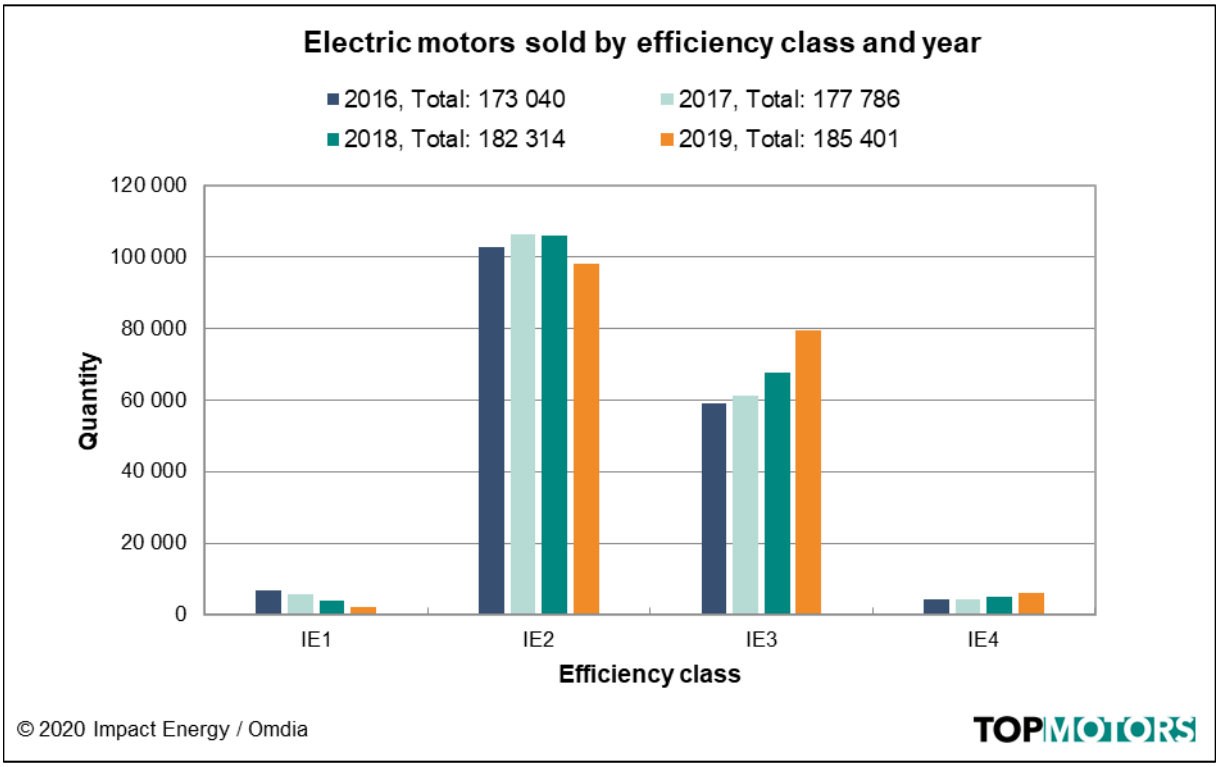

Figure 2: **Number of electric motors sold in Switzerland by efficiency class in the years 2016 to 2019.** In addition, the annual total is indicated in the caption.

- From the total 185 401 (2018: 182 314) electric motors sold in Switzerland in 2019, 81 486 units (share: 44%) are in MEPS scope (i.e., 2-, 4- and 6-poles with a nominal output power of 0.75–375 kW. Previous year 2018: 73 935 units, share: 41%).

- MEPS compliance within the scope of the Swiss Energy Efficiency Ordinance (EnEV):
  - 73% are IE3 and IE4 motors and are MEPS-compliant (previous year 67%).
  - For IE2 motors with a share of 27% (previous year 33%), it cannot be accurately determined to what extent they comply with the MEPS; it is estimated that about half of these motors were sold together with a VFD and thus meet the MEPS.
  - All IE1 motors sold (< 1%, in previous year also < 1%) are non-compliant and can only be put into operation outside the EnEV scope (e.g. as uncooled motors used for a short time).

[1] Total electricity consumption in Switzerland 2019: 57.2 TWh, [14].
[2] In 2006, the stock of motors in Swiss industry was estimated at 2.2 million units. See [13], Table 3-1.
[3] See Topmotors Market Report for 2017 to 2019, [1] [2].

- In 2019, IE4 motors cost about 16% more than IE3 motors (2018: 17%). The price of IE3 premium motors is 16% higher than the less efficient IE2 class (2018: 15%). Thus, the additional cost of the more efficient motors remains more or less the same.

- Under current market conditions in Switzerland (motor prices and electricity costs), normally loaded electric motors in industrial applications of 0.5 to 500 kW in efficiency class IE4 are more efficient than IE2 or IE3 motors. This is described in section 6.6 on the economic efficiency of high-efficiency motors.

- Theoretical annual electricity consumption for the motors sold in Switzerland in 2019 increased significantly (10.4%) compared with the previous year. The figures for total motors sold and more efficient motors sold in 2019 were 1.7% and around 8.8%, respectively.

- Every year, the sale of new, more efficient motors results in electricity savings of 120–200 GWh, or 3–5% of theoretical annual electricity consumption for motors sold in 2019.

- 3% of motors sold have a nominal output power of 37 to 1000 kW and account for around 50% of theoretical annual electricity consumption for motors sold in 2019.

- Motors of the higher efficiency classes IE3 and IE4 are now readily available on the market and can be delivered in a wide variety of nominal output power and poles by a number of suppliers within 4 to 6 weeks. Sales figures for these efficiency classes continue to grow.

- There is a steadily increasing trend towards higher efficiency classes, see Figure 2.

MOTORS European Union (EU)

In the year 2019:

- IE1 motors still have a significant market share in the EU (EU: 18%; CH: < 1%). This can be explained by motors being sold that are not within the scope of MEPS, see Figure 10.

- IE3 motors are the efficiency class most sold in the EU, with a market share of 59%. In Switzerland it is the same, with sales at 71% being higher.

- As before, IE4 motors have only small market shares: 3% in the EU and 2% in Switzerland.

- A clear evolution can be observed on the market, going into the direction of higher efficiency motors, pushed by MEPS. According to market data from CEMEP, between 2015 and 2019, IE2 motors have been gradually outpaced by IE3 motors. The sales shares for IE2 motors were going from 56% down to 20%, for IE3 motors from 16% going up to 59%. This trend continued also for the subsequent years, see Figure 11.

CIRCULATORS

- In 2019, 404 361 circulators (integrated and non-integrated) were sold in Switzerland (2018: 399 585 units), of which 99.98% have an energy efficiency index (EEI) of ≤ 0.23 (2018: 99.94%), and thus comply with MEPS for mass-produced installations, vehicles and equipment set out in Annex 2.8 of Swiss Efficiency Ordinance (EnEV). As in the previous year, nearly all circulators sold are MEPS-compliant.

- In 2019, 16 527 046 circulators (integrated and non-integrated) were sold in the EU, of which 94% have an EEI of ≤0.23 and thus comply with the applicable minimum requirements of European Ecodesign Directive No. 641/2009 (which is identical with the Swiss MEPS).

- The total of sales for the circulators in Switzerland corresponds to 2.4% of the EU total.

WATER PUMPS

- In 2019, 53 452 water pumps were sold in Switzerland (2018: 56 274) of which 64% are smaller than 7.5 kW, see Table 20.
- In 2019, submersible multistage pumps (MSS) once again accounted for a high share (38%) of the water pumps sold in Switzerland (2018: 41%).
- The total of sales for the water pumps in Switzerland corresponds to 2.0% of the EU total, as shown in Table 20.
- In 2019, approx. 2.7 million water pumps were sold in the EU (2018: approx. 3.0 million) of which 64% are smaller than 7.5 kW, see Table 20.
- Degree of MEPS compliance in 2019:
  - Once again, almost all the water pumps sold in Switzerland comply with the MEPS set out in Annex 2.9 of the EnEV (minimum efficiency index (MEI) of ≥ 0.4, see Table 21).
  - In the EU, 92% of the water pumps sold comply with the MEPS specified in European Ecodesign Regulation No. 547/2012, which is identical with the Swiss MEPS.

FANS

- In 2019, 121 016 fans were sold in Switzerland (2018: 90 791), of which 76% are smaller than 7.5 kW, 23% are between 7.5–37 kW and 1% are larger than 37 kW.
- In 2019, 12 564 284 fans were sold in the EU (2018: 12 372 398), of which 75% are smaller than 7.5 kW, 23% are between 7.5–37 kW and 2% larger than 37 kW.
- Axial fans accounted for the largest market shares by far, with 56% in Switzerland and 53% in the EU.
- Of the fans sold in Switzerland, 98% comply with the MEPS specified in Annex 2.6 of the EnEV. In the EU, 91% of the fans sold comply with the MEPS specified in the European Ecodesign Directive No. 327/2011 (which is identical with the Swiss MEPS).
- The total of sales for the fans in Switzerland corresponds to 1.0% of the EU total.

2 Background

The Topmotors programme, managed by Impact Energy, has been promoting efficient motor driven system, pumps, fans, compressors, transport and process machines since 2007 with the support of the SFOE.

Motor driven systems represent a large share of Swiss electricity consumption 49%, see Figure 1. More than half of this (some 37%) is for industrial applications and building technology in the service sector (e.g. infrastructure facilities).

With system optimization, 20–30% of electricity savings are possible [1] [6] [9] as can be seen from many best practices (see http://www.topmotors.ch/en/best-practices).

The Swiss National Energy Strategy 2050, approved via public referendum in May 2017, is specifically designed to introduce energy efficiency measures in industry (share of electric motor driven systems in industry 27%, see Figure 1) so as to exploit the large energy savings potential.

3 Goal

The SFOE, as the federal organization responsible for implementing legal measures in the energy field, closely monitors market developments for all energy-using products. It is especially focused on products subject to MEPS pursuant to the Swiss Energy Act (EnG) and the Swiss Energy Efficiency Ordinance (EnEV) about the energy efficiency requirements of mass-produced installations, vehicles and equipment, such as motors, circulators, water pumps and fans, in order to check compliance and plan future requirements. Here, it is important to monitor the market transformation towards energy-efficient equipment and especially the effect of MEPS to verify the success and effectiveness of policy instruments and adequately adjust to their scope.

The analyses for the Topmotors Market Report were first launched in 2017 to research the sale, efficiency (MEPS compliance), availability and specific price (CHF/kW) of electric motors and the specific prices of VFDs. The goal was to cover at least 50% of the market with available data.

The Topmotors Market Report is published to inform the SFOE and all interested stakeholders on the status of the market. Analyses are based on the previous year's data. The Topmotors Market Report 2020 is the fourth such report and covers sales data for 2019. In addition to motors and VFDs, it also contains market data on the sale of circulators, water pumps and fans in Switzerland and in the EU.

4 Legal bases and regulations

In Switzerland, MEPS are in effect for motors, circulators and water pumps (Swiss Energy Act EnG/Swiss Energy Efficiency Ordinance EnEV) and are fully synchronized with the European Ecodesign Directive (see Table 1).

On 25.10.2019, the European Commission published the revised Regulation (EU) 2019/1781 for motors. It specifies more stringent requirements with a broader scope for motors as well as new requirements for VFDs, in phases in 2021 and 2023. These stricter requirements will apply in Switzerland as of 22.4.2020 following the amendment of the EnEV. The higher minimum requirements for motors set out in Annex 2.7 are due to enter into force on 1.7.2021. Further information is available at the Topmotors website: http://www.topmotors.ch/en/news-events[4].

[4] Communications of 25.05.2020 and 29.10.2019:
http://www.topmotors.ch/en/news/swiss-government-synchronizes-energy-efficiency-requirements-electric-motors-eu
http://www.topmotors.ch/de/news/verschaerfte-mindestanforderungen-fuer-elektromotoren

In accordance with Annex 2.7 of the EnEV, in 2019 the scope (hereinafter called EnEV scope) applies to mains operated electric single-speed three-phase 50 Hz or 50/60 Hz squirrel cage induction motors (asynchronous motors), which:

- are designed for continuous operation;
- have a nominal output power of ≤ 1 000 V;
- have a nominal output power between 0.75 and 375 kW;
- have more than 2, 4 or 6 poles.

There is an exclusion for electric motors as per Article 1, para 2 of Ordinance (EG) No. 640/2009. These include for example motors suitable for operation in potentially explosive areas or at altitudes exceeding 1 000 meters above sea level.

The energy efficiency of electric motors is measured as follows according to IEC 60034-30 and has applied since 2014 as per IEC 60034-30-1 from 0.12 to 1 000 kW for 2-, 4-, 6- and 8-poles motors under 1 000 V.

In the reporting year 2019, the following minimum requirements applied in Switzerland for electric motors under the EnEV scope:

- Efficiency class IE3
- or Efficiency class IE2 together with rotational speed through variable frequency drive (VFD)

Product	European Union: Ecodesign Directive, Regulation No.	Switzerland: Efficiency Ordinance (EnEV), Annex No.
Motors	640/2009	2.7
Circulators	641/2009	2.8
Water pumps	547/2012	2.9
Fans	327/2011	2.6

Table 1: MEPS in the European Union and Switzerland

IE code	Designation
IE1	Standard efficiency
IE2	High efficiency
IE3	Premium efficiency
IE4	Super premium efficiency

Table 2: Efficiency classes (IE-code)

5 Methodology

The survey of motors and VFDs for the Topmotors Market Report 2019 followed the same methods as the ones used in 2017, 2018 and 2019 (see [1] [2] [3]). Leading companies in Switzerland that deliver motors, circulators, water pumps, compressors and VFDs were surveyed. In addition, information gathered via interviews conducted by telephone or at trade fairs was included. A total of 14 companies participated in the survey.

The SFOE mandated the independent energy consulting company Impact Energy to conduct a market survey. In turn, Impact Energy commissioned Omdia (formerly IHS Markit), a leading market research agency with global know-how, expertise and experience concerning industrial products. As a neutral body, Omdia was tasked with gathering and anonymizing the market data. Its primary task was interacting with the industrial companies which manufacture, import or sell the products to large end users, original equipment manufacturers (OEMs) and wholesalers.

Companies surveyed were informed about the purpose of the research and told that all data gathered would be processed, anonymized and aggregated confidentially.

The data and findings of the survey cover more than 50% of the market volume. All data were collected by Omdia and anonymized. The subsequent data evaluation work by Impact Energy was based on anonymized files.

As before, the data must be evaluated critically, as the market findings are based on self-declared data by manufacturers complemented by Omdia estimates for the entire Swiss market based on larger international samples. This database only partly reflects the overall Swiss market. Accordingly, Omdia used existing data to estimate the overall volume of the Swiss market. The findings for motors and VFDs, which were surveyed for the fourth time in 2020, appear plausible and consistent.

This Topmotors Market Report was revised in 2023 with motor data for Europe from CEMEP, the European Committee of Manufacturers of Electrical Machines and Power Electronics.

The findings for pumps and fans, which were surveyed for the third time in 2020, also appear plausible and consistent.

The goal in coming years is to increase the quality and reliability of the raw data and their evaluation by having more companies participate in the survey.

The motors' theoretical annual electricity consumption was estimated using the same method and with the same assumptions as in the Topmotors Market Report 2019:

- Average configuration of 4 500 running hours per year
- Average annual load factor of 0.7
- The respective efficiency of each class

As less output class data are available for pumps and fans than for motors, no attempt was made to estimate annual electricity consumption.

6 MOTORS and VFDs

6.1 Motor sales figures

In 2019, according to the survey made, 185 401 electric motors were sold in Switzerland. The market grew by 1.7% in comparison to the previous year, see Table 8.

For motors in the EnEV scope of application minimum values were specified for efficiency levels. In 2019 in the EnEV scope, sales reached 81 486 motors (2018: 73 935). This corresponds to 44% (2018: 41%) of the total motors sold (see Table 3 and Table 4).

<table>
<tr><th>Motors sold 2019</th><th colspan="4">Number of poles</th></tr>
<tr><td>Nominal output power [kW]</td><td>2</td><td>4</td><td>6</td><td>8</td></tr>
<tr><td>0.12–0.75</td><td colspan="4">102 622 units</td></tr>
<tr><td>0.75–375</td><td colspan="3">MEPS scope EnEV
81 486 units</td><td>1 041 units</td></tr>
<tr><td>375–1 000</td><td colspan="4">252 units</td></tr>
</table>

Table 3: **Quantities of electric motors sold in Switzerland by nominal output power and number of poles, 2019.** A total of 185 401 motors were sold, of which 55% have a nominal capacity of less than 0.75 kW. The EnEV scope of minimum requirements for motors is coloured green, in which 81 486 motors (44%) were sold.

MEPS according to EnEV

Motors sold in the MEPS scope applicable for 2019 totalled 70 278 units, or 86% (2018: 60 534 units, 83%). With regard to motors sold in 2019 (see Table 4 and Figure 5), the findings are as follows:

- 73% of motors (efficiency classes IE3 and IE4) meet the 2019 MEPS (2018: 67%).
- For 27% (2018: 33%) of the motors (IE2), it cannot be accurately determined to what extent they meet the MEPS, while it is assumed that they do so to a large degree. Here, it is assumed that 50% of the IE2 motors were sold together with a VFD and thus meet the minimum requirements.
- Even fewer motors (IE1) do not comply with the MEPS (2019: 94 units, or 0.1%, 2018: 0.4%).

Motors sold in 2019	Total	IE1	IE2	IE3	IE4
All motors sold	**185 401**	1 925	98 159	79 354	5 963
Share	**100%**	1%	53%	43%	3%
Motors sold in the EnEV scope	**81 486**	94	22 227	57 701	1 464
Share	**100%**	< 1%	27%	71%	2%
Number of motors in the EnEV scope, requirements met	**70 278**	0	11 113*)	57 701	1 464
Number of motors in the EnEV scope, requirements not met	**11 208**	94	11 114*)	0	0
Degree of requirements met in the EnEV scope	**86%*)**				

Table 4: **Sales figures for motors 2019 and degree of requirements met for motors as per EnEV.** *) Assumption: half of the IE2 motors were sold together with a FU and thus meet the EnEV requirements**.**

Electricity consumption of motors sold

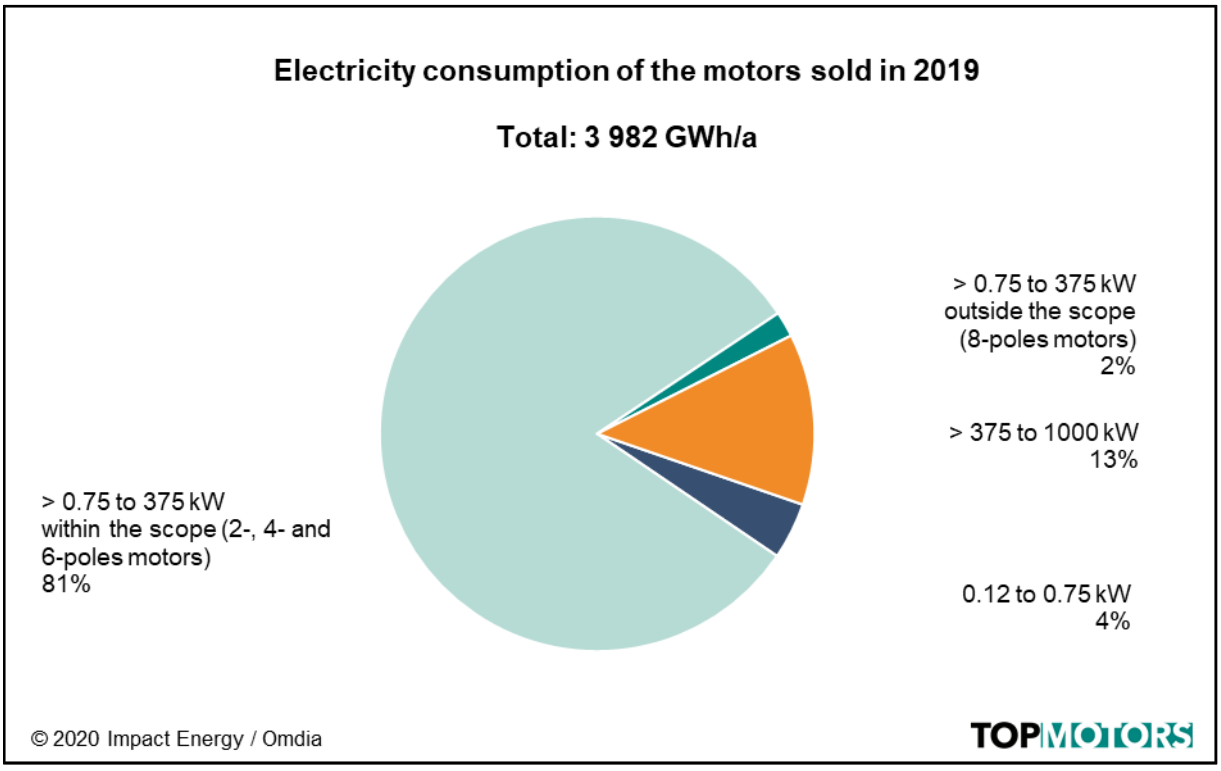

Figure 3: **Theoretical annual electricity consumption by continuous operation of electric motors sold by nominal output power class, 2019.** For the > 0.75 to 375 kW performance range the share of **electricity** consumption of motors within and outside the EnEV scope is identified.

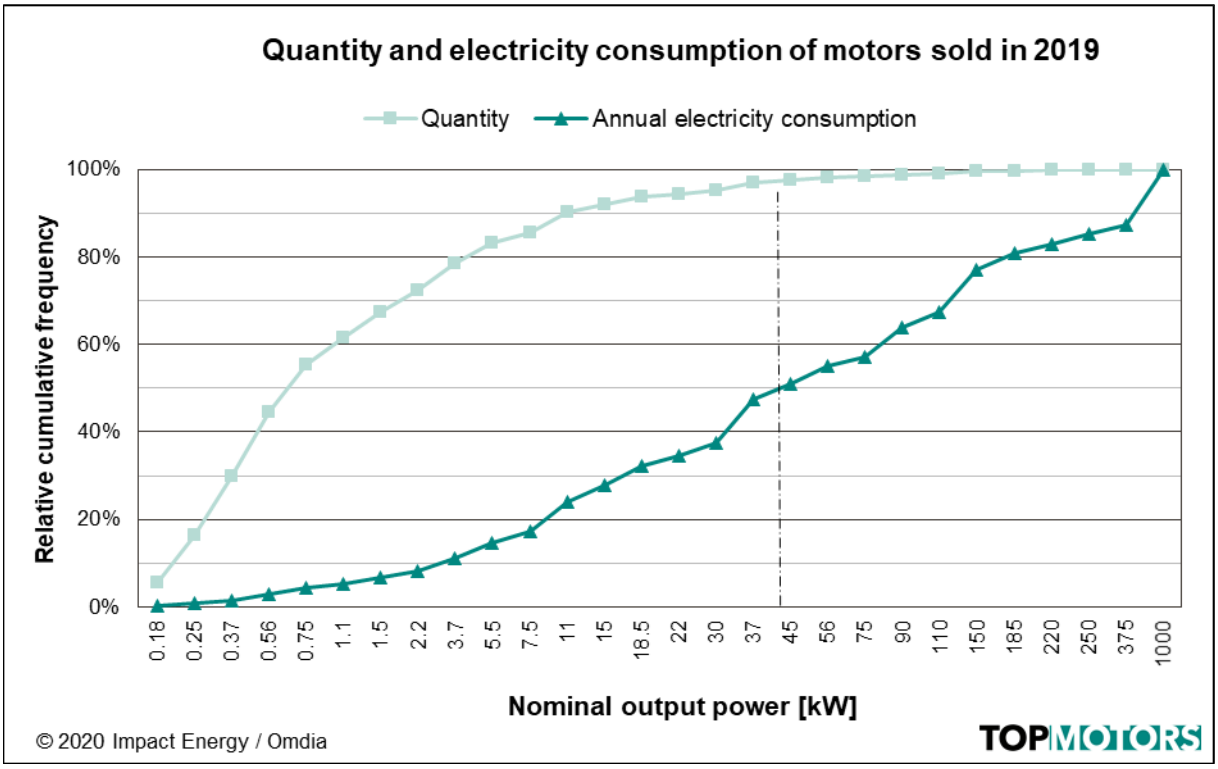

Figure 4: **Relative cumulative frequency of the number and theoretical annual electricity consumption of motors sold with a nominal output power of 0.12 to 1 000 kW, 2019.**

Motors sold in 2019		Motors sold		Motor output (mechanical)		Electricity consumption	
Nominal output power (kW)	Number of poles	Number	Share	MW	Share	GWh/a	Share
0.12–0.75 kW	**2, 4, 6, 8**	102 622	55%	39	3%	168	4%
> 0.75–375 kW	**2, 4, 6, 8**	82 527	45%	971	83%	3 306	83%
> 375–1 000 kW	**2, 4, 6, 8**	252	< 1%	154	13%	507	13%
Total	**2, 4, 6, 8**	**185 401**	**100%**	**1 165**	**100%**	**3 982**	**100%**
> 0.75–375 kW	**2, 4, 6**	**81 486**	**44%**	**949**	**81%**	**3 231**	**81%**

Table 5: **Quantities, motor output (nominal mechanical output power), theoretical annual electricity consumption by continuous operation and their shares by efficiency class and number of poles for the electric motors sold in Switzerland, 2019.** The bottom line of the table indicates the values for motors sold within the EnEV scope.

Theoretical annual electricity consumption by continuous operation of the 185 401 motors sold in 2019 in Switzerland is estimated at 3 982 GWh/a, a 10.4% rise compared to the previous year (3 608 GWh/a). This considerable increase can be explained by the following observations. In relation to the previous year:

- Average mechanical output is up 8.82%;
- Total sales grow by 1.7%;
- Average efficiency improves by 0.16%.

In 2019, 44% of all motors sold are within the EnEV scope. These motors accounted for an unchanged share of 81% of theoretical annual electricity consumption for all motors sold (2018: 81%), as can be seen from Figure 3 and Table 5.

Figure 4 shows the relative cumulative frequency of the number and the electricity consumption of the motors sold in 2019. The vertical line drawn marks half of the electricity consumption. Motors sold with an output of 0.12–37 kW consume half of the electricity and accounted for 97% of the number of units.

From Figure 4 and Table 5, which show the number and electricity consumption for the motors sold, it is clear that:

- 3% of the motors sold have a nominal output power of 37–1 000 kW and account for around 50% of annual electricity consumption.
- A few very large motors (1.4‰ share of total sales; nominal output power of 375–1 000 kW) account for some 13% of annual electricity consumption. In 2021, new MEPS will be introduced for these motors as well.
- In the future, the number of motors sold that must comply with MEPS is expected to more than double due to the broadening of the EnEV scope to include motors with a nominal output power of 0.12–1 000 kW.

Every year, the sale of new, more efficient motors results in electricity savings of 120–200 GWh, or 3– 5% of annual electricity consumption for all motors sold in 2019. The range of the estimate is due to the not precisely known portion of new motors sold to replace old drives (hypothesis 50–75% of the motors sold) and the efficiency of the old motors (hypothesis of efficiency class IE0[5]). Moreover, the new motors sold are more efficient every year, as is further described in Section 6.5 Motor efficiency.

Table 6 and Table 7 show the development of sales figures, mechanical output and annual electricity consumption for motors sold in 2016–2019.

	Sales figures of motors		Motor output (mechanical)		Electricity consumption	
Year	**Quantity**	**Change**	**MW**	**Change**	**GWh/a**	**Change**
2016	173 040	–	958	–	3 290	–
2017	177 786	2.7%	1 090	4.4%	3 432	4.3%
2018	182 314	2.5%	1 145	5.2%	3 608	5.1%
2019	185 401	1.7%	1 165	10.7%	3 982	10.4%

Table 6: Sales figures, motor output (mechanical, total of nominal output power) and theoretical annual electricity consumption by continuous operation for the electric motors sold in Switzerland, 2016 to 2019.

[5] It is assumed that motors in efficiency class IE0 will have 20% more losses than IE1-motors.

	Average motor output (mechanical)		Average electricity consumption	
Year	**kW**	**Change**	**MWh/a**	**Change**
2016	5.54	–	19.01	–
2017	5.62	1.62%	19.30	1.55%
2018	5.77	2.62%	19.79	2.51%
2019	6.28	8.82%	21.48	8.52%

Table 7: **Average motor output power (mechanical, average of nominal output power) and average theoretical annual electricity consumption by continuous operation for the electric motors sold in Switzerland, 2016 to 2019.**

Quantities sold by efficiency class

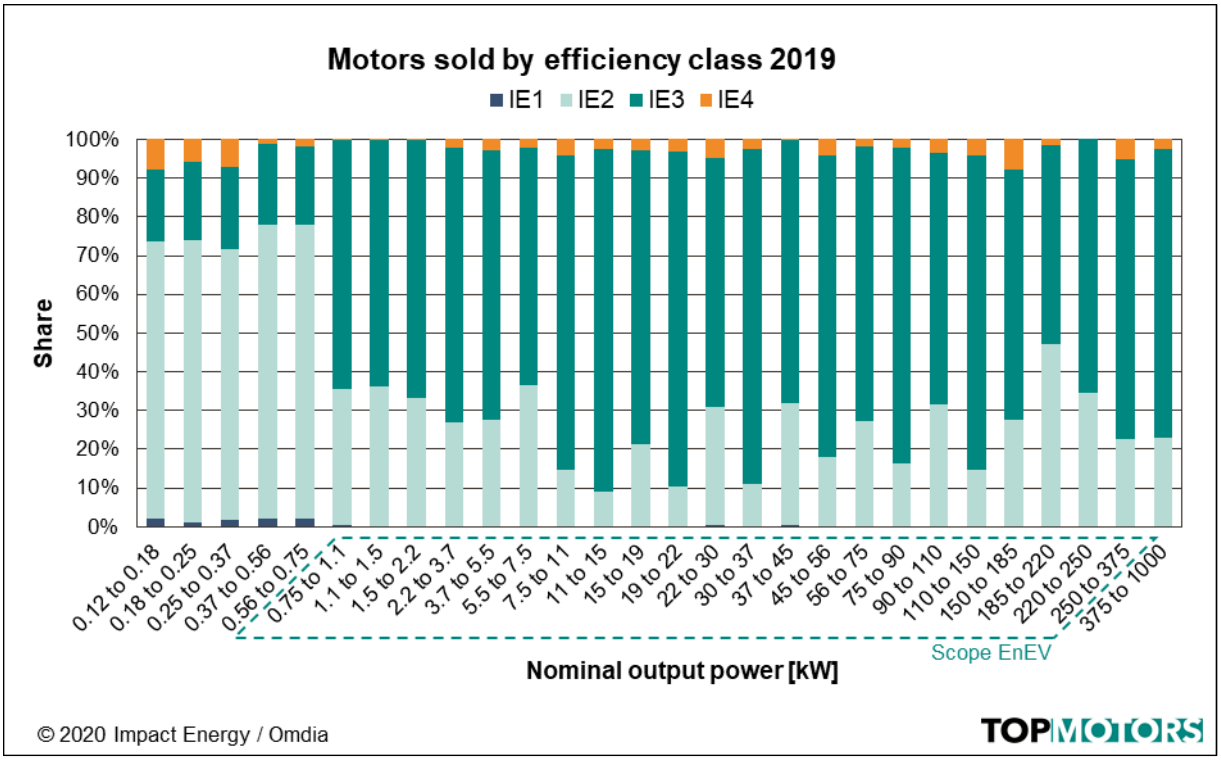

Figure 5: **Motors sold (with 2-, 4- and 6-poles) by efficiency class and nominal output power, 2019. The EnEV scope covers motors with a nominal output power of 0.75–375 kW (green border).**

Motors sold	2016		2018		2019		Change	
	Quantity	Share	Quantity	Share	Quantity	Share	2016/19	2018/19
IE1	6 883	4%	3 768	2%	1 925	1%	-72.0%	-48.9%
IE2	102 931	59%	105 900	58%	98 159	53%	-4.6%	-7.3%
IE3	59 153	34%	67 832	37%	79 354	43%	34.2%	17.0%
IE4	4 073	2%	4 814	3%	5 963	3%	46.4%	23.9%
Total	**173 040**	**100%**	**182 314**	**100%**	**185 401**	**100%**	**7.1%**	**1.7%**

Table 8: **Sales figures by efficiency class, Switzerland, 2016, 2018 and 2019.**

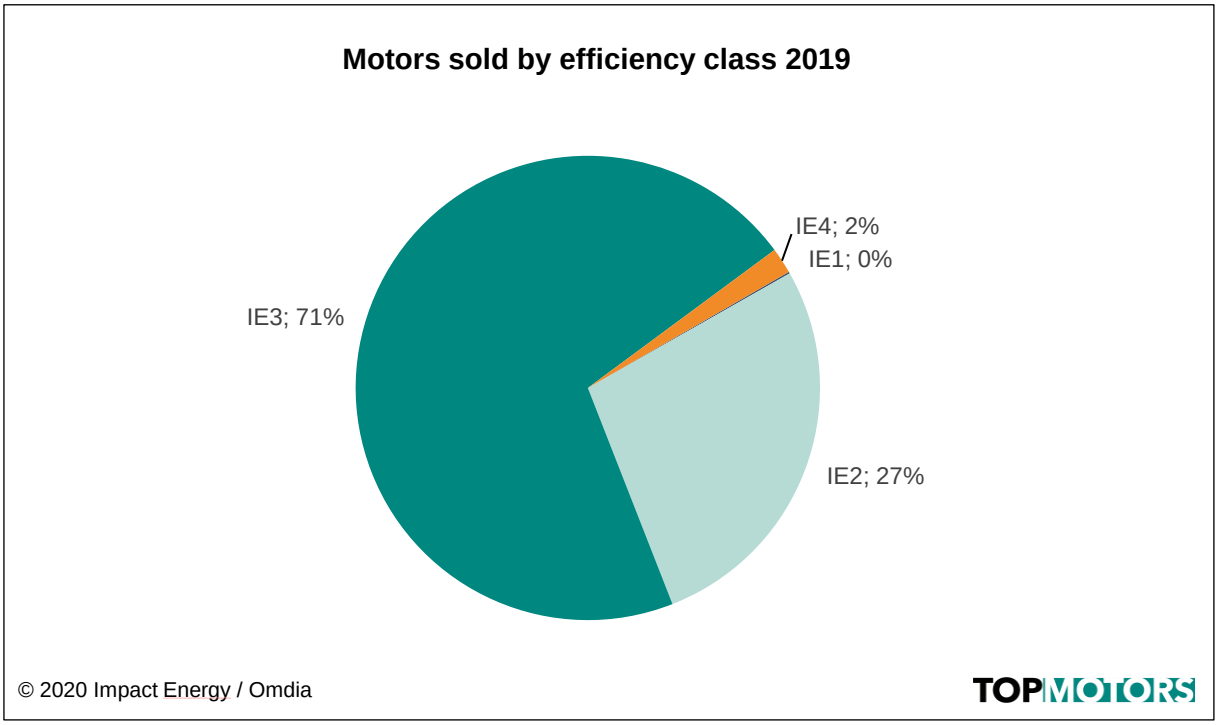

Figure 6: Shares by efficiency class for motors sold in EnEV scope, 2019.

Within the EnEV scope, sales for high-efficiency motors in efficiency classes IE3 and IE4 are clearly higher than for motors with a nominal output power of less than 0.75 kW, where no MEPS apply, as can be seen from Figure 5. Hardly any IE1 motors within EnEV scope were sold.

Sales figures show the following, see Table 8:

- As before, sales of IE1 motors fall sharply (market share 1% with a drop of 72% compared to 2016). This is due to the fact that IE1 motors are still allowed for only a few applications and reflects the impact of the MEPS introduced. IE1 motors are primarily sold to original equipment manufacturers (OEMs), which integrate them into systems and export them to countries with less stringent energy efficiency requirements.

- IE2 motors continue to dominate with a market share of 53%, probably because IE2 motors combined with VFDs are still authorized in Switzerland. IE2 motors sold in Switzerland are primarily used in cost-effective HIVAC applications with load control. However, the bulk of the IE2 motors available on the Swiss market are exported by OEMs after integration into a system. As with IE1 motors, IE2 motors will almost completely disappear once the special provision with VFDs is phased out and such motors can no longer be sold.

- IE3 motors continue to progress. Sales are up to 43%. Whether an IE2 or an IE3 motor is purchased depends on the buyer: OEMs which focus on the total price of the installation tend to opt for a cheaper IE2 motor, whereas end users which factor in life cycle costs probably choose a more efficient IE3 motors. Prices for IE3 motors have fallen considerably in recent years. In any case, the cost for an IE3 motor is lower than for an IE2 motor combined with the required VFD, favouring the purchase of IE3 motors.

- There is continuing strong demand for IE4 motors on the Swiss market (increase +46% since 2016) with a market share of 3%. However, their use is limited to certain applications where users attach high priority to overall efficiency. Although IE4 motors still cost 16% more on average, their economic efficiency is a given in many cases, as can be seen from the cost calculations in Table 13 to Table 15.

Figure 7 gives the share of sales for high-efficiency motors (motors of efficiency classes IE3 and IE4) within EnEV scope for 2017–2019. In 2019, the share of high-efficiency motors within EnEV scope increased by an average 9.1%[6] compared to the previous year (2018: increase of 3.7% in relation to the previous year).

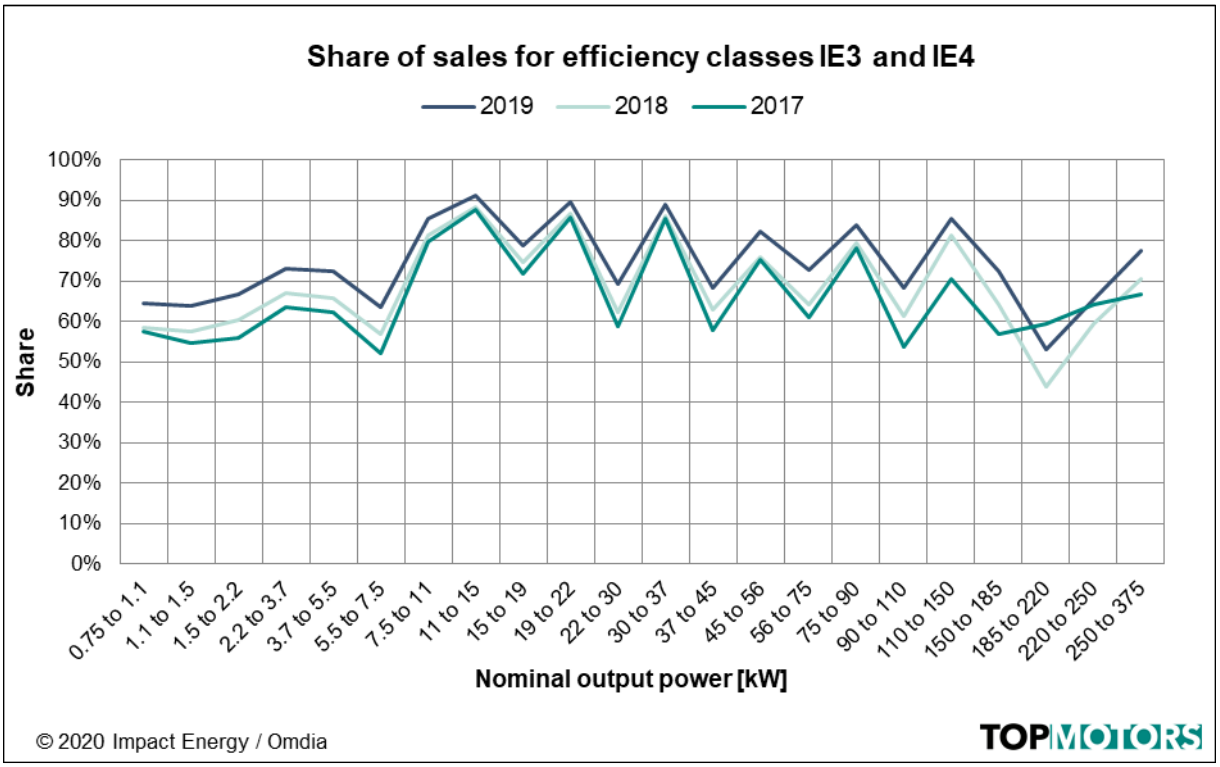

Figure 7: **Share of sales for high-efficiency motors of efficiency classes IE3 and IE4 within EnEV scope, 2017 to 2019.**

[6] Average value of the determined increase for efficiency classes in 0.75–375 kW.

Sales figures by number of poles

As before, the survey covered motors sold by number of poles. Once again, 4-pole motors account for around half of sales with 51%, see Figure 8 (2017: 51%). With 9%, the share of 6-pole motors increased slightly in relation to the previous year by some three percentage points at the expense of 8-pole and 2-pole motors. Figure 9 shows market shares by nominal output power.

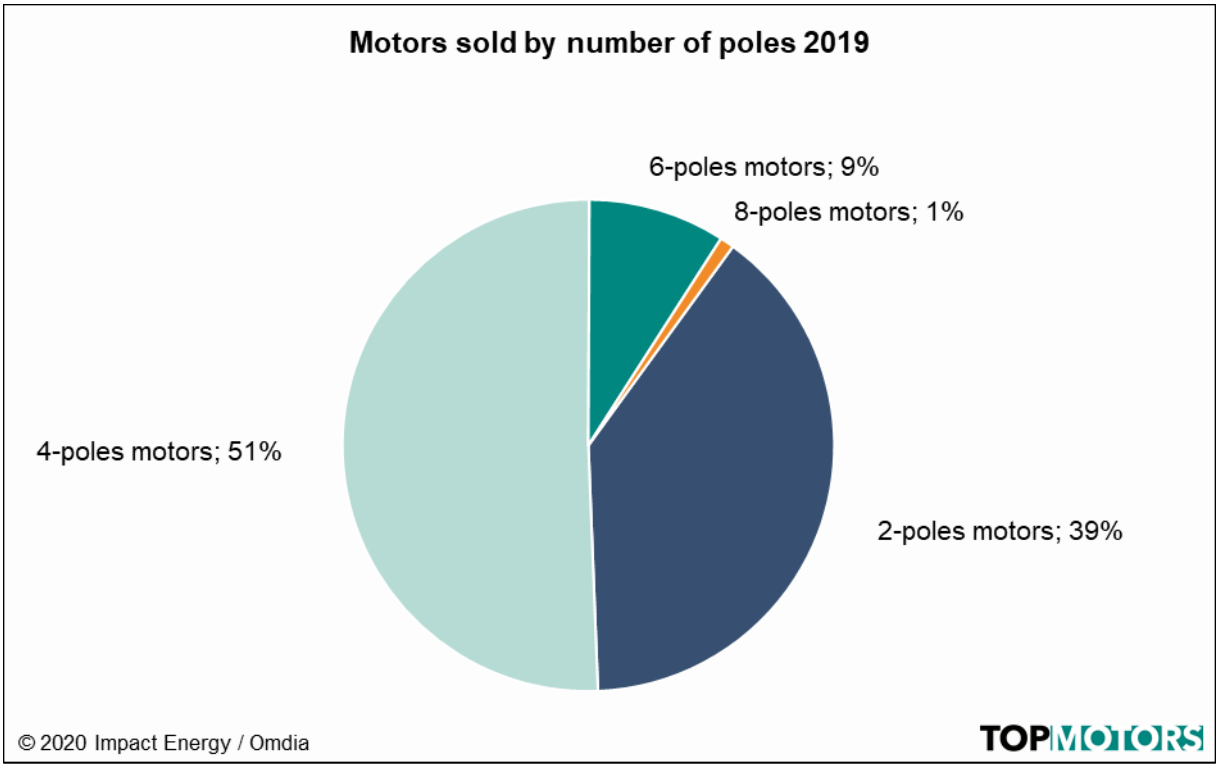

Figure 8: **Market shares by number of poles, Switzerland, 2019.**

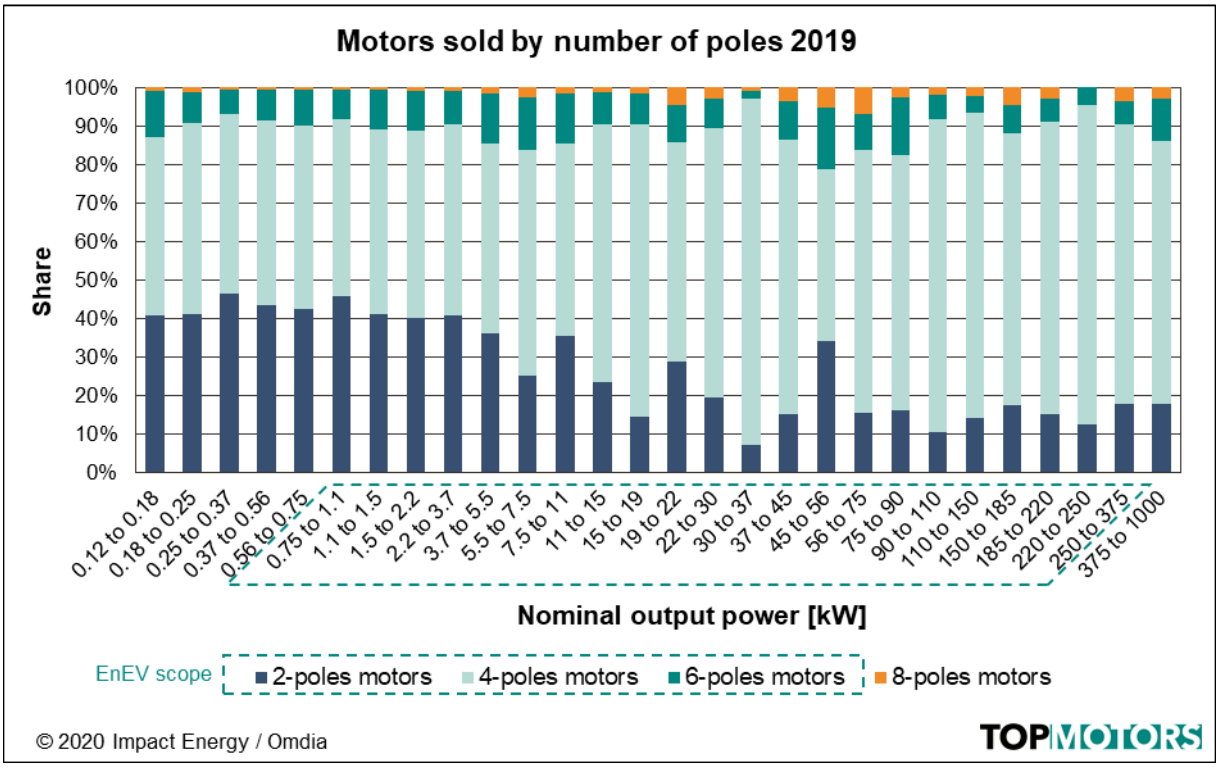

Figure 9: **Motors sold by number of poles and nominal output power, Switzerland, 2019.**

Number of motors sold in Switzerland in comparison to the European Union

This section of the Topmotors Market Report was revised, referencing data from CEMEP, the European Committee of Manufacturers of Electrical Machines and Power Electronics. CEMEP regularly conducts a survey among its members. The survey results cover approximately 70 – 80% of the EU market, the motor size range is 0.75 – 375 kW covering all motors within the scope of the Commission Regulation (EU) No 640/2009.

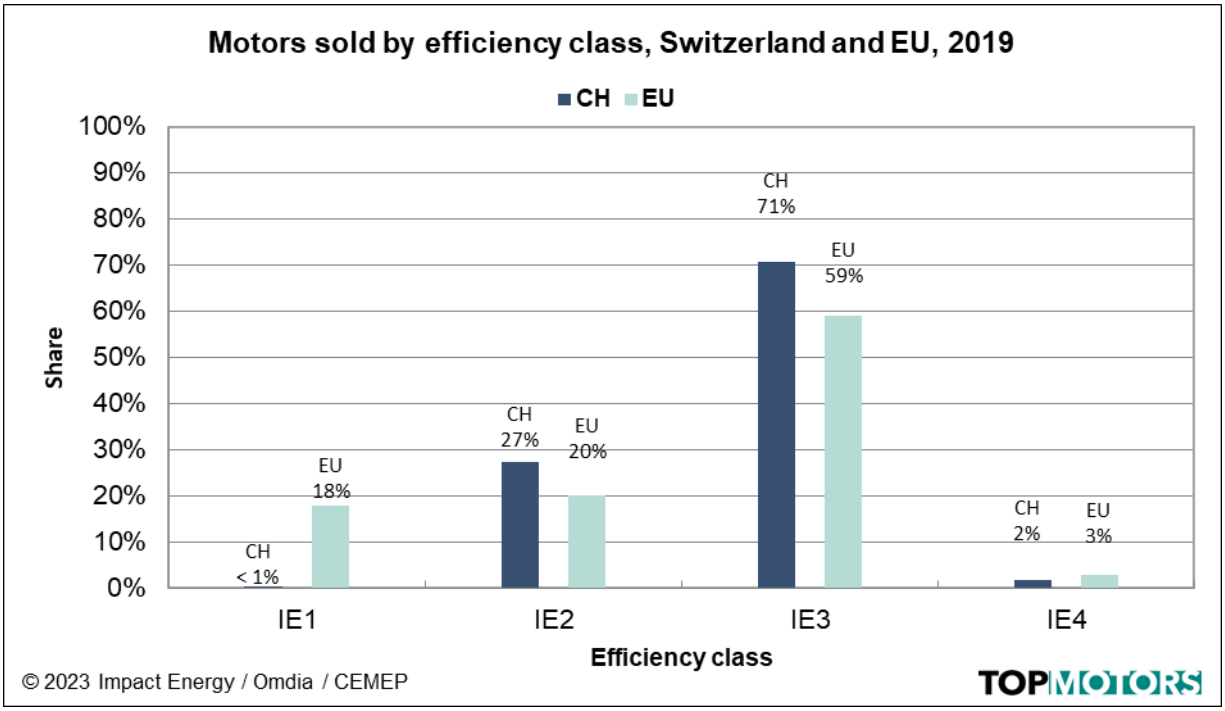

Figure 10: **Shares of the efficiency classes of motors sold in the output power range of 0.75 kW to 1 000 kW (2-4-6-pole motors) for Switzerland and the EU. Source: Omdia for Switzerland, CEMEP for the EU. [15]**

Shares of motors sold 2019	CH
Nominal output power	**Share**
0.75–2.2 kW	38%
2.2–5.5 kW	24%
5.5–11 kW	16%
11–45 kW	17%
45–375 kW	5%

Table 9: **Shares of electric motors sold by nominal output power in Switzerland, 2019.**

The following section compares the status of the motor market in Switzerland and the EU for the year 2019:

- In 2019, around 7.6 million electric motors were sold in the EU (nominal output power 0.75–1 000 kW and 2-pole up to 8-pole motors). Switzerland's share of motor sales in the EU was 1.1%.

- With 18% in 2019, the share of IE1 motors within the sales mix in the EU is still considerable. In Switzerland, motors in this efficiency class are hardly sold anymore, with a share of 0.1%. IE1 motors will probably take longer to disappear from the EU market than in Switzerland.

- The share of IE2 motors has considerably dropped in the EU thanks to the MEPS requirements, to 20% in 2019 (2015: 56%). In comparison, this was at 27% in Switzerland in 2019, a bit higher.
- With a market share of 59%, fewer IE3 motors are sold in the EU than in Switzerland (market share 71%).
- IE4 motors account for a larger share in the EU (3%) than in Switzerland (2%). In the EU as well, the high price is an obstacle to increased demand.
- Based on the CEMEP survey data, a clear evolution towards increased sale of higher efficiency classes can be observed (see Figure 11).

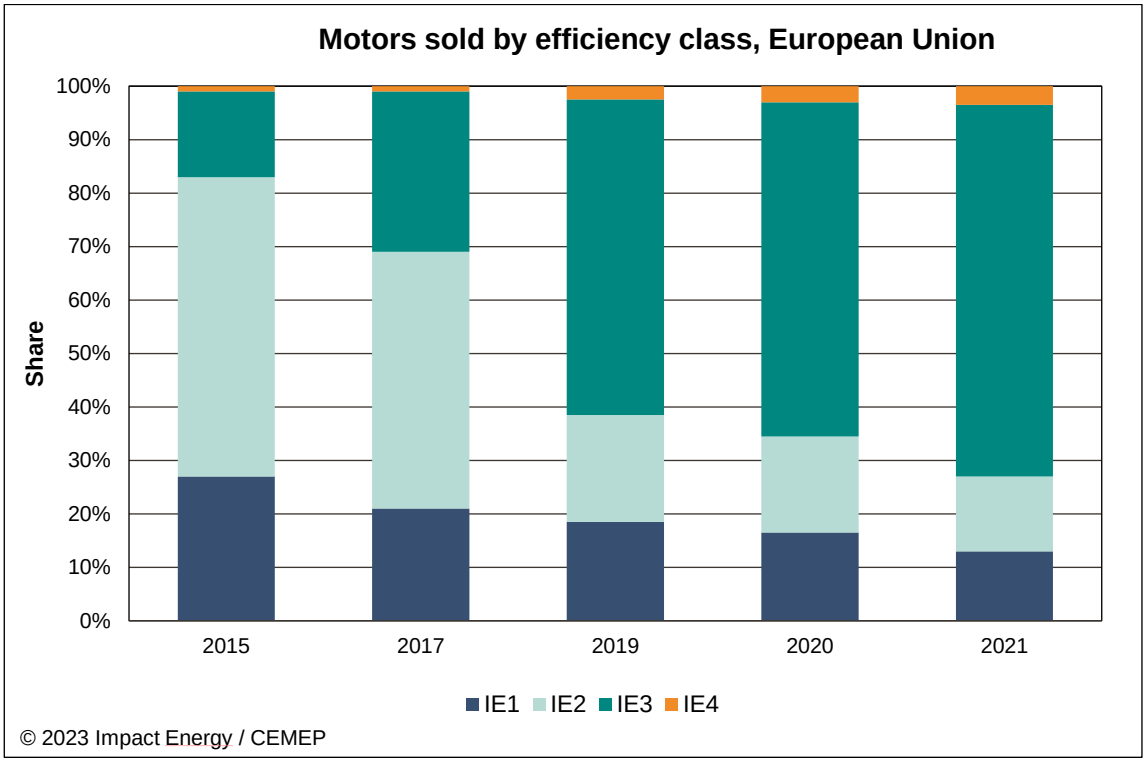

Figure 11: **Shares of the efficiency classes of motors sold in the output power range of 0.75 kW to 375 kW (2, 4 or 6 poles) for the EU. Source: CEMEP. [15] [16]**

6.3 Motor availability

Motor availability by efficiency class, number of poles and size was much the same in 2019 (see Table 10) as in 2018. The trend towards an increase in the number of suppliers of IE4 motors is continuing (see motor availability for previous years in the annex).

Motor availability 2019								
Nominal output power [kW]	IE3 according to IEC 60034-30-1				IE4 according to IEC 60034-30-1			
	Number of poles				Number of poles			
	2	4	6	8	2	4	6	8
0.12 to < 0.18	2	2	2	2	2	2	2	2
0.18 to < 0.25	3	2	5	2	2	2	2	2
0.25 to < 0.37	3	5	5	2	2	2	2	2

0.37 to < 0.56	5	5	5	2	2	2	2	2
0.56 to < 0.75	6	4	4	2	2	2	2	2
0.75 to < 1.1	6	5	5	2	5	5	5	2
1.1 to < 1.5	6	6	6	2	5	5	5	2
1.5 to < 2.2	6	6	6	2	5	5	5	2
2.2 to < 3.7	6	6	6	4	5	5	5	2
3.7 to < 5.5	6	6	6	4	5	5	5	2
5.5 to < 7.5	6	6	6	4	5	5	5	2
7.5 to < 11	6	6	6	4	5	5	5	2
11 to < 15	6	6	6	4	5	5	5	2
15 to < 18.5	6	6	6	4	5	5	5	2
18.5 to < 22	6	6	6	4	5	5	3	2
22 to < 30	6	6	6	4	5	5	3	2
30 to < 37	6	6	6	3	5	5	2	1
37 to < 45	6	6	6	3	4	4	1	1
45 to < 56	6	6	6	3	4	4	1	1
56 to < 75	6	6	6	3	3	3	1	1
75 to < 90	6	6	5	3	4	4	1	1
90 to < 110	6	6	5	3	5	5	1	1
110 to < 150	6	6	5	3	5	5	1	1
150 to < 185	6	6	5	2	5	5	1	1
185 to < 220	6	6	5	1	5	5	1	1
220 to < 250	6	6	2	1	2	3	1	1
250 to < 375	6	6	2	1	2	3	1	1
375 to < 1 000	6	6	2	1	2	3	1	1

Table 10: **Motor availability by efficiency class, number of poles and size, 2019.** The numbers in the cells indicate the number of manufacturers surveyed who are able to deliver such motors within 4 to 6 weeks.

6.4 Motor prices

On the basis of Table 11 and Table 12, the following observations can be made regarding motor prices:

- Prices for IE2 motors decline by an average 1% in 2019 in comparison to the previous year.
- Prices for IE3 motors do not change in 2019.
- Price differentials between IE4 motors and IE3 motors remain with actually 16% on the level of the previous years.
- The average specific prices for motors fall by around 0.7% in 2019 as compared to 2018.

Average specific price for motors 2017–2019 [CHF/kW]			
Selling year	**IE2**	**IE3**	**IE4**
2017	180	204	237
2018	177	202	235
2019	175	202	232
Price development 2019 against previous year	**-1%**	**+0%**	**-1%**

Table 11: **The table shows the average specific motor price in CHF/kW (average of the specific prices for the 28 size categories between 0.12 and 1 000 kW) by efficiency class and the relative price development for 2019 in relation to the previous year.**

Additional costs for more efficient motors 2017–2019			
Selling year	**IE3 < > IE2**	**IE4 < > IE3**	**IE4 < > IE2**
2017	14%	17%	33%
2018	15%	17%	35%
2019	16%	16%	34%

Table 12: **Average for relative additional costs for 2017–2019 (average of the relative specific price differentials for the prices surveyed in 28 nominal output power classes).**

Figure 12 shows the so-called “camelback” curve of specific prices in relation to nominal output power. Specific prices do not change significantly compared with the previous year.

Table 12 shows the trend of additional costs for more efficient motors 2017–2019. The price differential for the next higher efficiency cost is estimated at around 16%.

Additional costs for more efficient motors are examined by motor size. Figure 13 shows the additional motor price by efficiency class. The relative price increases are calculated for the following combinations: efficiency class IE3 compared to IE2; IE4 compared to IE3 and IE4 compared to IE2. The price differential for more efficient motors is significant depending on nominal output power, but has not changed significantly compared to 2017, as can be seen from the data in Table 11 and Table 12.

The methodology for surveying motor prices was refined in 2017 in relation to 2016 (28 size categories instead of 12), so the results are not directly comparable with the results for 2016 (Market Report 2017).

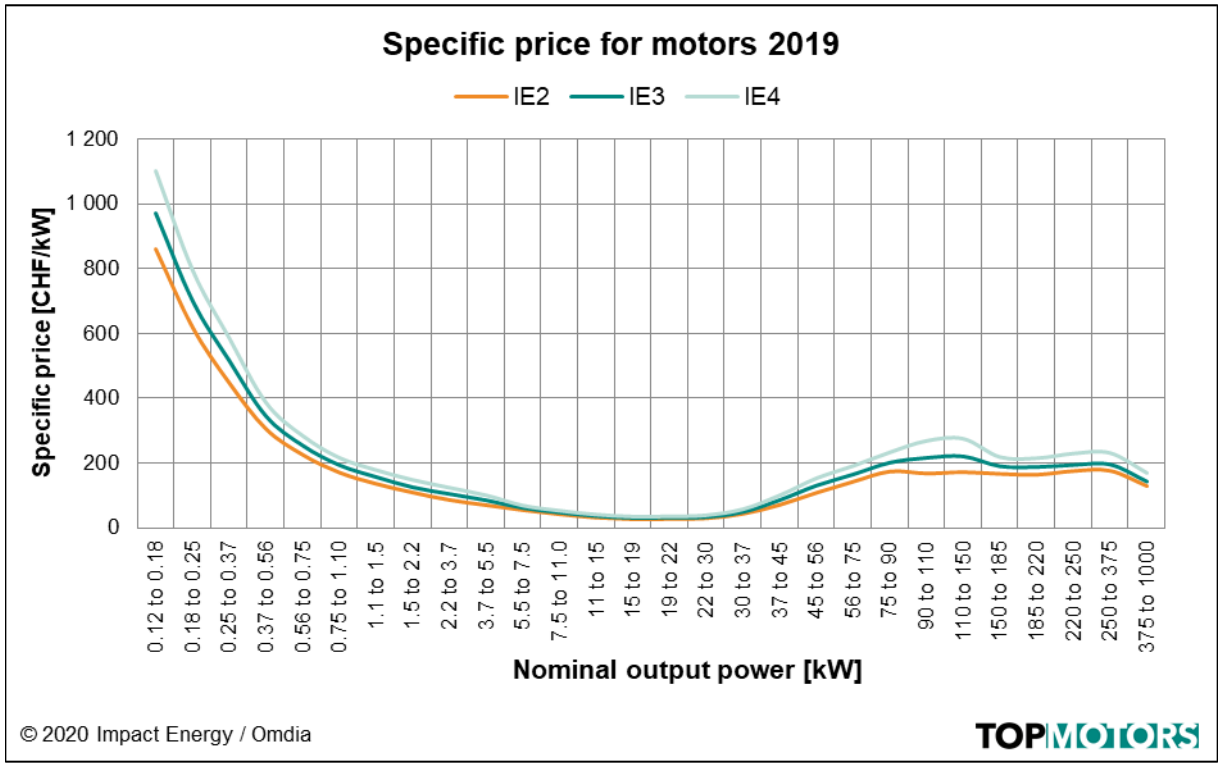

Figure 12: Specific motor prices in CHF/kW, 2019.

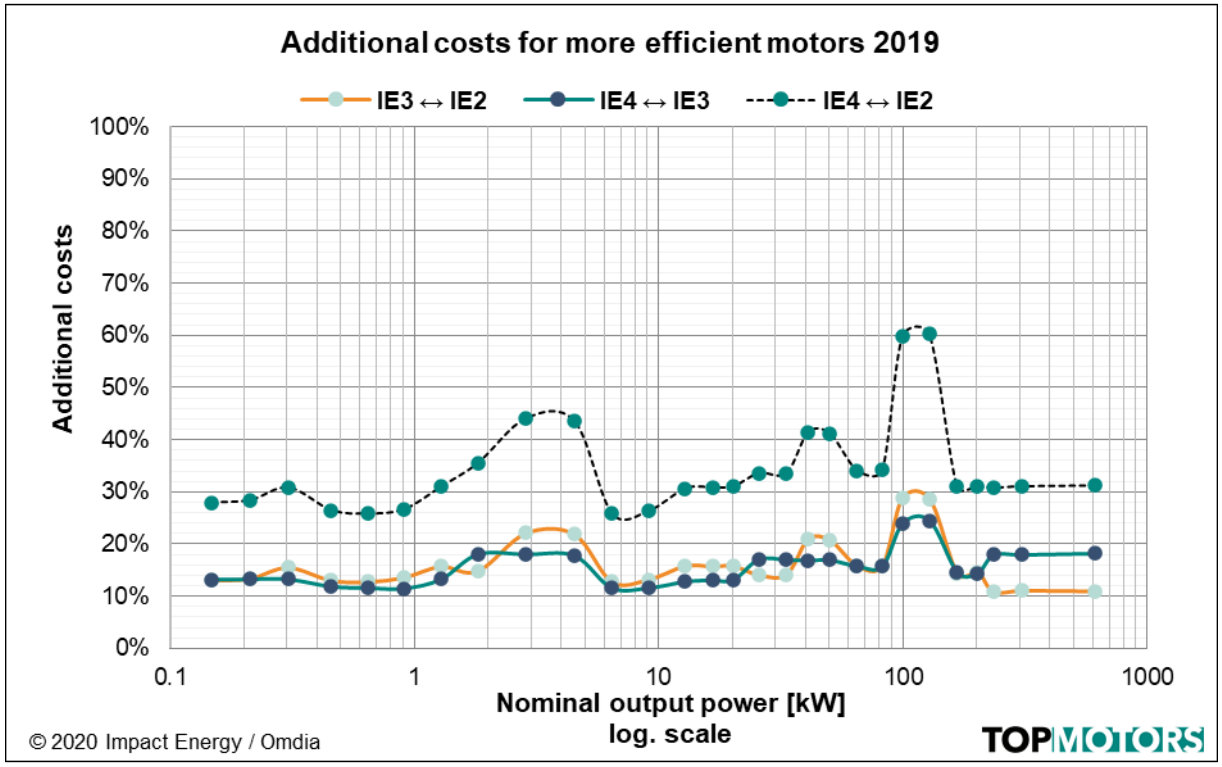

Figure 13: Additional motor price by efficiency class, 2019.

6.5 Motor efficiency

The share of high-efficiency motors has increased in recent years, as shown by Figure 7. Overall, the new motors sold in 2019 are also more energy-efficient than the motors sold in 2016. This improvement can be described by the change in average motor efficiency.
Figure 14 shows average efficiency per nominal output power for motors sold in 2019. Since 2016, average efficiency (mean) has risen by 0.175 percentage points. This increase is due to the fact that the share of sales for high-efficiency motors has grown over the years and is justified by the prescribed MEPS.

In relation to the previous year, average efficiency increased by 0.15% in 2019 (2018: 0.09%).

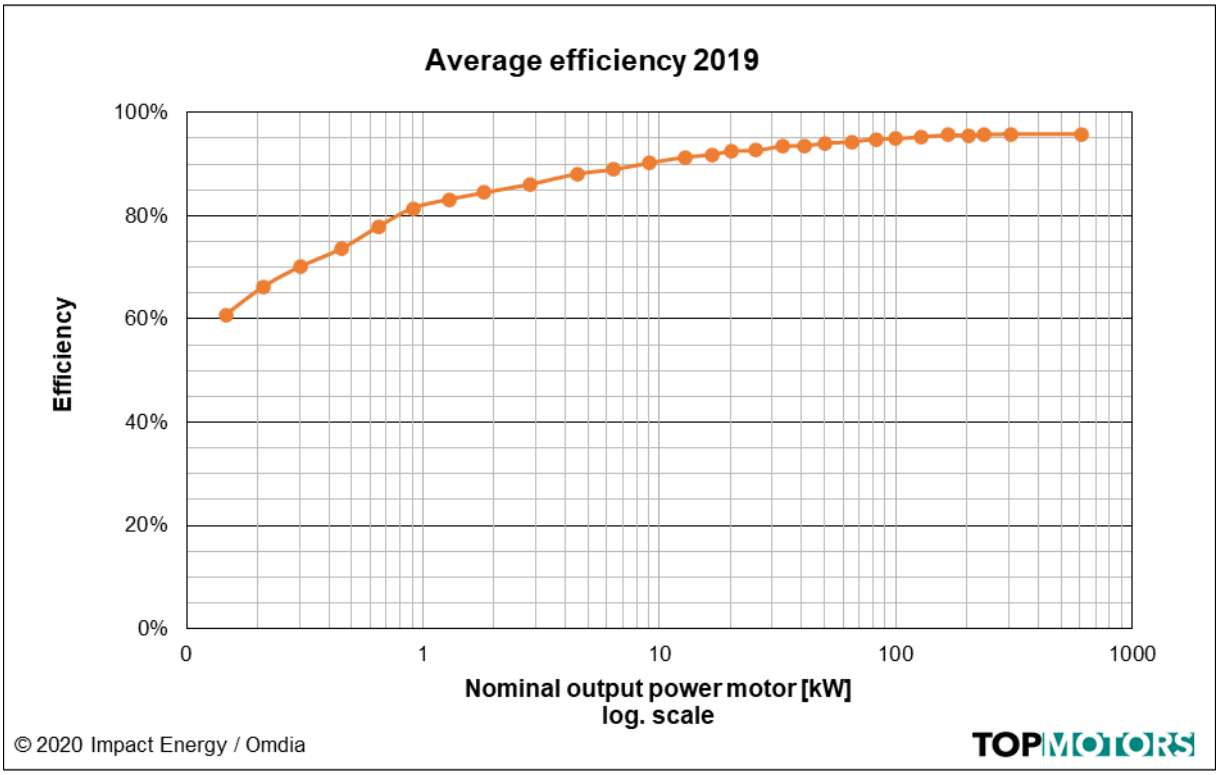

Figure 14: Average efficiency by nominal output power for motors sold, 2019.

6.6 Efficiency of high-efficiency motors

It is financially worthwhile to use high-efficiency IE3 and IE4 motors in industrial applications, as can be seen from the following examples in Table 13 to Table 15. The expected additional costs for the more efficient motors are amortised through lower annual electricity costs within a short period of time. For motors with a nominal output power of less than 45 kW, the additional cost is generally amortised within less than three years.
When purchasing an electric motor, it is imperative to factor in its life-cycle costs, which primarily consist of electricity costs. For example, for an 11 kW IE3 motors, electricity costs account for over 95%.[7]

[7] Reference: de Almeida, 2008. See also Topmotors Fact sheet No. 5, Efficiency.

It should further be noted that over 50% of existing motors are already older than their expected technical service life.[8] Thus, motors are often used for much longer than the technical service life of 10 to 20 years (depending on their nominal power output) applied for calculation purposes. As far as actual service life is concerned, considerable electricity savings can be made with powerful motors (so-called "golden end"). This is clear from the example of cumulative savings over 20 years of CHF 38 275 for a 500 kW IE4 motor, see Table 14.

Cost comparison		Efficiency class				Comparison	
Nominal output power	Useful life	IE2		IE3		Amortisation	Economy
		Costs		Costs			
		Motor	Electricity	Motor	Electricity		
kW	Years	CHF	CHF	CHF	CHF	Years	CHF
0.5	10	142	2 600	160	2 445	1.2	136
5	12	318	26 189	388	25 598	1.2	521
50	15	5 430	304 511	6 557	300 955	3.2	2 429
500	20	88 140	3 974 763	97 818	3 937 500	2.6	27 585

Table 13: Cost comparison for motors of efficiency classes IE2 and IE3.

Cost comparison		Efficiency class				Comparison	
Nominal output power	Useful life	IE2		IE4		Amortisation	Economy
		Costs		Costs			
		Motor	Electricity	Motor	Electricity		
kW	Years	CHF	CHF	CHF	CHF	Years	CHF
0.5	10	142	2 600	179	2 330	1.4	232
5	12	318	26 189	457	24 896	1.1	1 155
50	15	5 430	304 511	7 667	297 170	3.0	5 104
500	20	88 140	3 974 763	115 631	3 908 997	4.2	38 275

Table 14: Cost comparison for motors of efficiency classes IE2 and IE4.

Cost comparison		Efficiency class				Comparison	
Nominal output power	Useful life	IE3		IE4		Amortisation	Economy
		Costs		Costs			
		Motor	Electricity	Motor	Electricity		
kW	Years	CHF	CHF	CHF	CHF	Years	CHF
0.5	10	160	2 445	179	2 330	1.7	96
5	12	388	25 598	457	24 896	1.0	633
50	15	6 557	300 955	7 667	297 170	2.9	2 675
500	20	97 818	3 937 500	115 631	3 908 997	6.2	10 690

Table 15: Cost comparison for motors of efficiency classes IE3 and IE4.

As motor prices in individual cases can differ sharply from the average prices used in the cost calculation, buyers are advised to obtain several quotes in each case, especially for higher-efficiency motors.

As can be seen from Table 13 to Table 15, under current market conditions in Switzerland (motor prices and electricity costs), normally loaded electric motors in industrial applications of 0.5–500 kW in

[8] This can be seen from a Topmotors survey conducted in 2014 in conjunction with the EASY promotion programme covering over 4200 motors in Switzerland. See also Topmotors Basics No. 3, Old EMDS waste precious electric energy, 2017.

efficiency class IE4 are more efficient than IE2 or IE3 motors. The following assumptions were made for the cost comparison:

- Motor costs were determined according to average sales prices for 2019 (source: Omdia, 2020).
- Theoretical electricity costs during the period of use in continuous operation were calculated for a 4-pole motor using the following parameters: electricity cost 0.12 CHF/kWh, 4 500 operating hours per year, load factor 0.7.
- Amortisation period (static): additional cost of the more efficient and more expensive motor divided by annual electricity savings.
- Amount saved: electricity savings during the period of use in relation to the additional cost for the more efficient motor.

6.7 Sales figures for VFDs (frequency converters)

The use of VFDs is increasing steadily. Growth is driven by the following factors:

- Since 2015 IE2 motors can only be used in combination with a VFD.
- VFDs can be used for speed regulation and can be matched to the currently required load. This ensures energy-efficient and cost-effective motor operation.
- For technical reasons, some high-efficiency motors such as permanent magnet motors cannot be operated without VFDs.

In 2019, 146 578 VFDs were sold in Switzerland, of which 32% are 1-phase and 68% are 3-phase, see Table 16.

VFD sales 2019				
Nominal output power	**Phases**	**Quantity**	**Share**	**Share**
0.1–0.75 kW	1-phase	38 648	26%	32%
0.76–2.2 kW	1-phase	7 445	5%	
> 2.2 kW	1-phase	615	< 1%	
< 2.2 kW	3-phase	30 434	21%	68%
2.2–7.4 kW	3-phase	35 548	24%	
7.5–22 kW	3-phase	23 012	16%	
23–75 kW	3-phase	7 454	5%	
76–110 kW	3-phase	1 245	1%	
111–250 kW	3-phase	1 530	1%	
251–500 kW	3-phase	368	< 1%	
> 500 kW	3-phase	280	< 1%	
Total		**146 579**	**100%**	**100%**

Table 16: Sales figures for VFDs by nominal output power, 2019.

6.8 VFD prices

Compared to the previous year, prices for VFDs once again showed only a slight change, as can be seen from Figure 15. In 2019, average specific VFD prices falls by 1.1% in relation to the previous year, see Table 17.

Specific price for VFD 2016–2019	
Year	**CHF/kW**
2016	357
2017	374
2018	373
2019	368

Table 17: **Average specific price for VFDs (average for 12 size categories), 2016 to 2019.**

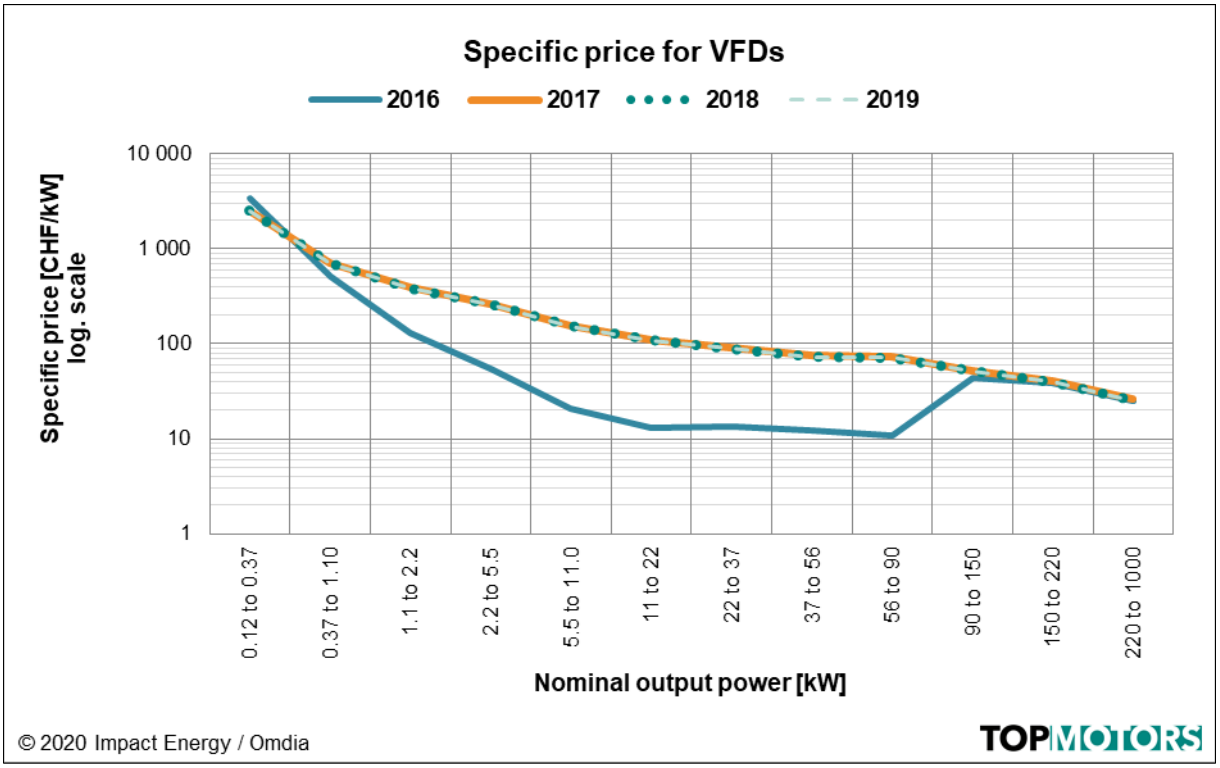

Figure 15: **Specific price for VFDs in CHF/kW, 2016 to 2019.**

7 PUMPS and FANS

The findings of the survey are based on figures from Omdia's databased and surveys. Quantitative and qualitative information was generated via interviews with Swiss and European manufacturers.

The Swiss companies surveyed reported that the bulk of their products met the MEPS, whereas the share of MEPS-compliant products was lower in the EU. The sales data collected confirmed this assessment (see Table 19 and Figure 16).

7.1 Pumps

Circulators

Glandless circulators are used to circulate water in a closed circuit, primarily in heating systems but also in cooling systems, etc. In accordance with the EU's 2009 Ecodesign Regulation No. 641, a glandless circulator is a circulator where the shaft of the motor is directly coupled to the impeller and the motor is immersed in the pumped medium. A further distinction is made between integrated and non-integrated circulators. Non-integrated circulators are sold separately and do not form part of a machine or system. Integrated circulators form part of a machine or system (e.g. boiler or heat exchanger) that is sold to the end user as a whole.

The authoritative Ecodesign Regulation No. 641 for glandless circulators with hydraulic power of between 1 and 2 500 W has been in force in Europe since 2013 and was tightened in 2015. The minimum requirements can only be met by using an integrated, high-efficiency pump, consisting of a variable frequency drive (VFD), a permanent magnet motor (PM motor) and an efficient impeller.

In 2019, 404 361 circulators (integrated and non-integrated) were sold in Switzerland (2018: 399 585). Nearly all circulators (2019: 99.98%; 2018: 99.94%) have an energy efficiency index (EEI) of ≤0.23.

In 2019, 16 527 046 circulators (integrated and non-integrated) were sold in the EU (2018: 17 564 476), of which 94% have an EEI of ≤0.23 (2018: 91%). The lower sales figures are due to a slight adjustment of market volume on the occasion of the market data collection for 2019.

The share of circulator sales in Switzerland amounts to some 2.4% of the sales total for the EU (2018: 2.3%).

As in the previous year, nearly all circulators sold in Switzerland in 2019 meet the minimum requirements. In the EU, this share increased by 3 percentage points from the previous year to 94% in 2019.

Circulator Sales figures 2019	Switzerland	EU
Type of pumps	**Quantity**	**Quantity**
non-integrated	183 095	7 356 188
integrated	221 266	9 170 858
Total	**404 361**	**16 527 046**

Table 18: Sales figures of circulators by type (integrated and non-integrated), Switzerland and EU, 2019.

Circulator Sales figures 2019	Switzerland		EU	
Energy efficiency index	**Quantity**	**Share**	**Quantity**	**Share**
EEI > 0.23	78	< 1%	975 812	6%
EEI ≤0.23	404 283	100%	15 551 234	94%
Total	**404 361**	**100%**	**16 527 046**	**100%**
	CH Share EU			2.4%

Table 19: **Sales figures of circulators by energy efficiency index, Switzerland and EU, 2019.**

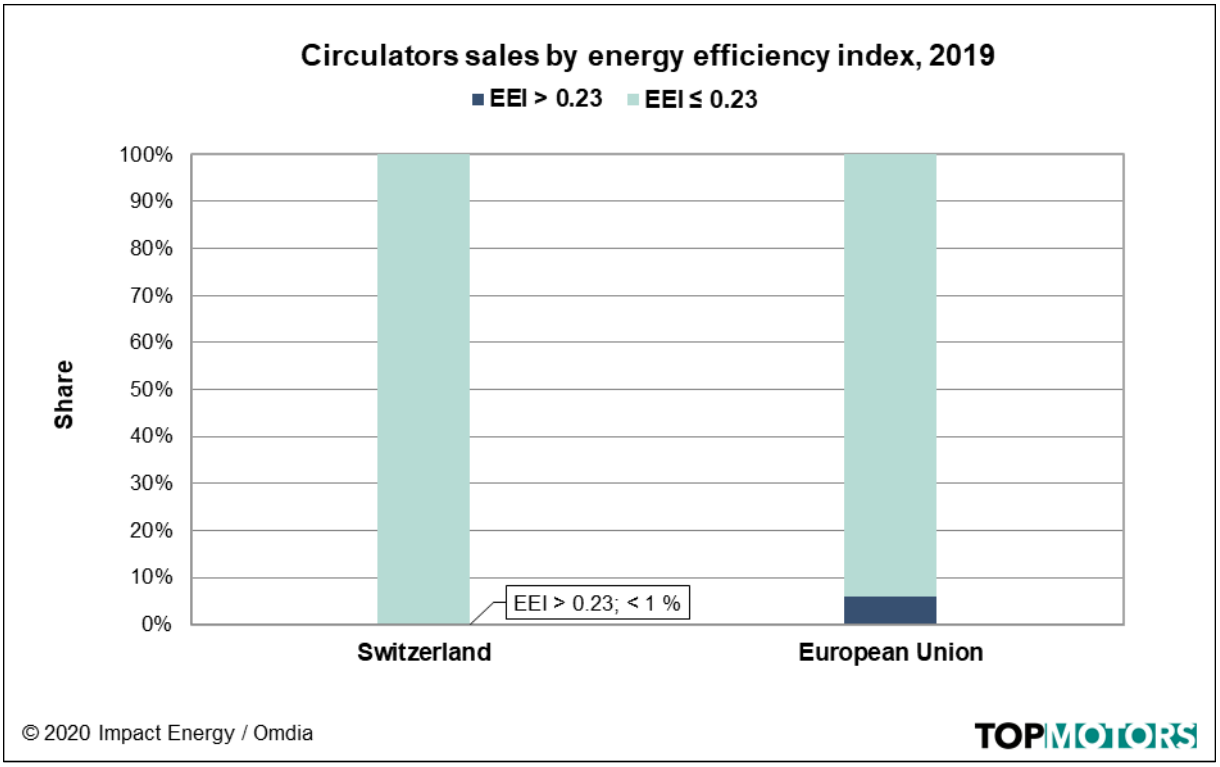

Figure 16: **Shares of sales for circulators by energy efficiency index (EEI). EEI ≤ 0.23 is the minimum requirement for Switzerland and the EU. 2019.**

Water pumps

Glanded water pumps serve in many ways to transport liquids. As the promotion of clean water is paramount, axial, multistage and submersible pumps are generally used.

The five types of water pumps with a capacity of less than 150 kW, as specified by EU Ecodesign No. 547/2012 and also referred to in Annex 2.9 of the EnEV, are not yet widely available among pump manufacturers and retailers (even though this Regulation was adopted in 2012 and has been in force since 2013). In Omdia's view, the relevant findings must therefore be treated with some caution.

A distinction is made between the following five water pump types in the Directive:

- ESOB end suction own bearing
- ESCC end suction close coupled
- ESCCi end suction close coupled inline
- MS-V vertical multistage
- MSS submersible multistage

In 2019, 53 452 water pumps were sold in Switzerland (2018: 56 274), of which 64% are smaller than 7.5 kW, 33% are between 7.5–37 kW and 3% are larger than 37 kW (see Table 20).
Almost all water pumps sold in Switzerland meet the minimum requirement of a minimum efficiency index (MEI) of ≥ 0.4 as per Annex 2.9 of the EnEV (see Table 21).

In 2019, multistage submersible pumps (MSS) once again account for a high share (38%) of the water pumps sold in Switzerland (2018: 41%), (see Table 22 and Figure 17). These permanently installed or mobile pumps are used for a wide range of purposes, such as water supply, irrigation (e.g. in agriculture), construction, swimming pools and aquariums, firefighting and disaster prevention. This is clearly a key market segment, for which there are not yet any ISO standards for submersible pumps and no IEC standards for electric motors in underwater applications.
In 2019, 2.74 million water pumps were sold in the EU, a figure somewhat lower than in the previous year (approx. 2.95 million units). As the hypothesis is that the MSS segment was slightly overestimated in previous years, among other things the size of this segment is reduced in this year's study. The share of water pumps sold in Switzerland is about 2.0% of the units sold in the European water pump market (2018: 1.9%), see Table 20.

This year's report once again provides more detailed information on the share of pumps that meet the minimum requirements set out in European Ecodesign Regulation No. 547/2012 with an MEI of ≥ 0.4n: with 92.4%, the minimum requirement compliance rate for water pumps sold in the EU is slightly higher than in the previous year (see Table 21).

Water pumps Sales figures 2019	Switzerland		EU	
Nominal output power	Quantity	Share	Quantity	Share
< 7.5 kW	34 262	64%	1 767 033	64%
7.5–37 kW	17 659	33%	891 615	33%
> 37 kW	1 531	3%	81 867	3%
Total	**53 452**	**100%**	**2 740 515**	**100%**
CH Share EU				2.0%

Table 20: **Sales figures of water pumps, Switzerland and EU, 2019.**

Water pumps MEPS compliance 2019	Switzerland			EU		
Type of pumps	Nominal output power			Nominal output power		
	< 7.5 kW	7.5–37 kW	> 37 kW	< 7.5 kW	7.5–37 kW	> 37 kW
ESCC	99.5%	99.5%	99.6%	91.0%	91.7%	92.4%
ESCCi	99.4%	99.6%	99.7%	91.5%	92.3%	92.7%
MS-V	99.8%	99.9%	99.9%	92.5%	93.2%	93.7%
MSS	99.8%	99.9%	99.9%	92.5%	93.2%	93.8%
ESOB	99.4%	99.5%	-	91.0%	91.5%	-
MEPS compliance (average)	**99.6%**	**99.7%**	**99.8%**	**91.7%**	**92.4%**	**93.1%**
MEPS compliance (average)	**99.7%**			**92.4%**		

Table 21: **Share of water pumps sold that meet the MEPS, Switzerland and EU, 2019.**

Water pump Sales figures 2019	Switzerland							
	Nominal output power						Total	
	< 7.5 kW		7.5–37 kW		> 37 kW			
Type of pumps	Quan-tity	Share	Quan-tity	Share	Quan-tity	Share	Quan-tity	Share
ESCC	2 072	6%	4 563	26%	689	45%	7 324	14%
ESCCi	4 292	13%	1 934	11%	338	22%	6 564	12%
MS-V	8 875	26%	3 782	21%	25	2%	12 683	24%
MSS	14 553	42%	5 530	31%	478	31%	20 562	38%
ESOB	4 469	13%	1 850	10%	0*)	0%	6 319	12%
Total	**34 262**	**100%**	**17 659**	**100%**	**1531**	**100%**	**53 452**	**100%**

Table 22: **Water pump sales in 2019 in Switzerland: quantities by type.** *) No pump sales were recorded in this category.

Water pump Sales figures 2019	EU							
	Nominal output power						Total	
	< 7.5 kW		7.5–37 kW		> 37 kW			
Type of pumps	Quantity	Share	Quantity	Share	Quantity	Share	Quantity	Share
ESCC	102 530	6%	216 180	24%	32 574	40%	351 283	13%
ESCCi	204 339	12%	95 350	11%	16 039	20%	315 728	12%
MS-V	407 670	23%	176 764	20%	7 938	10%	592 372	22%
MSS	830 878	47%	312 098	35%	25 317	31%	1 168 293	43%
ESOB	221 615	13%	91 224	10%	0*)	0%	312 839	11%
Total	**1 767 033**	**100%**	**891 615**	**100%**	**81 867**	**100%**	**2 740 515**	**100%**

Table 23: **Water pump sales in 2019, in the EU: quantities by type.** *) No pump sales were recorded in this category.

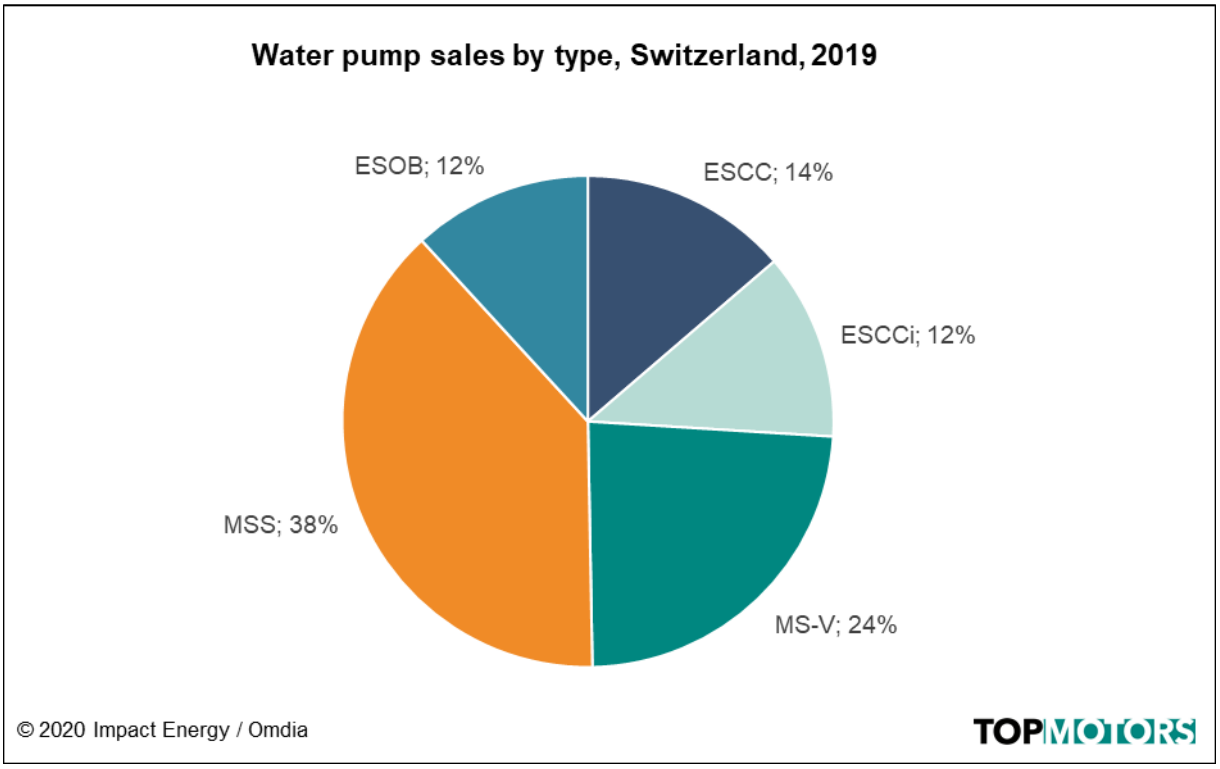

Figure 17: **Water pump sales, shares by pump type, Switzerland, 2019.**

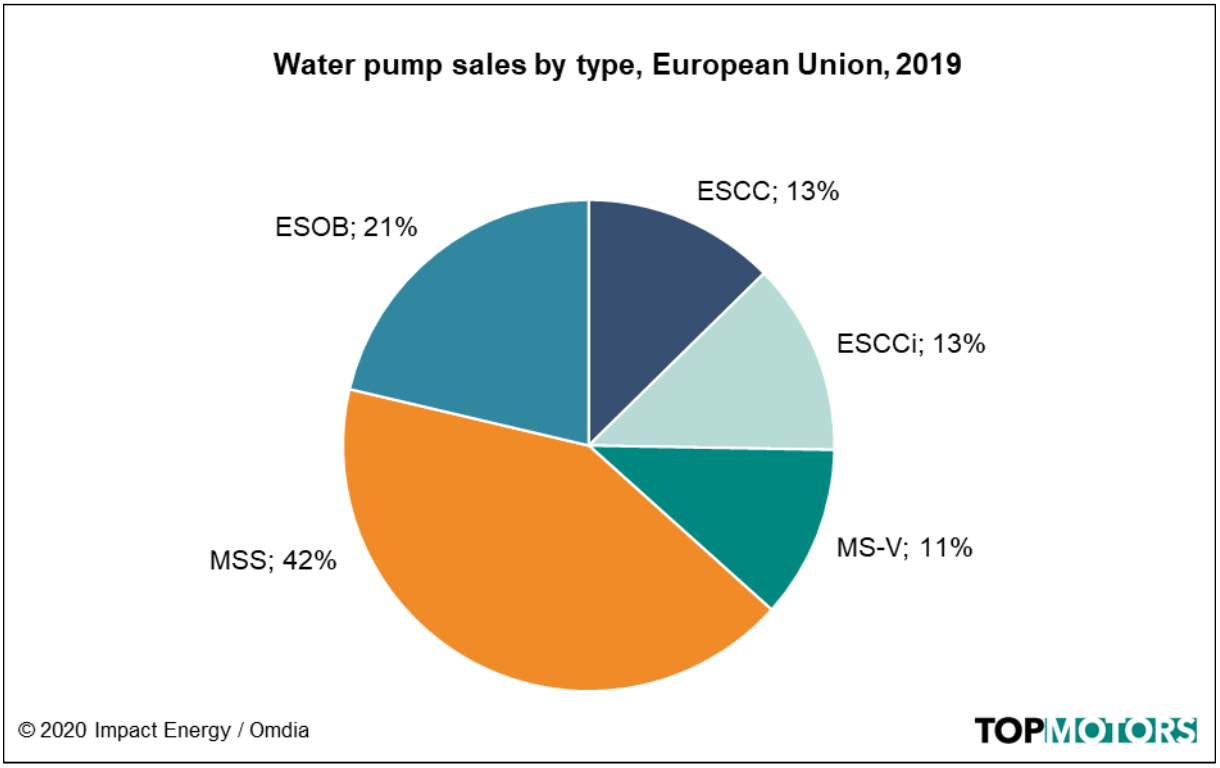

Figure 18: **Water pump sales, share by type, EU, 2019.**

7.2 Fans

Figure 19 illustrates efficiency values for four fan types. EU Ecodesign Directive No. 327/2011 makes a distinction between the following six fan types:

- Axial fans
- Centrifugal forward-curved fans and centrifugal radial bladed fans
- Centrifugal backward-curved fans without housing
- Centrifugal backward-curved fans with housing
- Mixed flow fans
- Cross flow fans

Sales figures for Switzerland and EU

In 2019, 121 016 fans were sold in Switzerland (2018: 90 791). In Omdia's view, the large increase in relation to the previous year is due to an improved data basis in the market for fans that remains difficult to evaluate.

In 2019, 12 564 284 fans were sold in the EU (2018: 12 372 398). Fans sold in Switzerland account for 1.0% of all fans sold in the EU. Table 24 provides information on market share by nominal output power for both Switzerland and the EU:

- 50% in the service sector;
- 31% in households;
- 19% in industry.

Figure 20 and Figure 21 as well as Table 25 break down fans sold in Switzerland and the EU in 2019 by type. With respective shares of 56% for Switzerland and 53% for the EU, axial fans account for the lion's share of fans sold in 2019, see Table 25.

Meeting the minimum efficiency requirements

- 98% of the fans sold in Switzerland meet the minimum requirements according to EnEV Annex 2.6.
- 91% of the fans sold in the EU meet the minimum requirements set out by EU Ecodesign Regulation No. 327/2011.

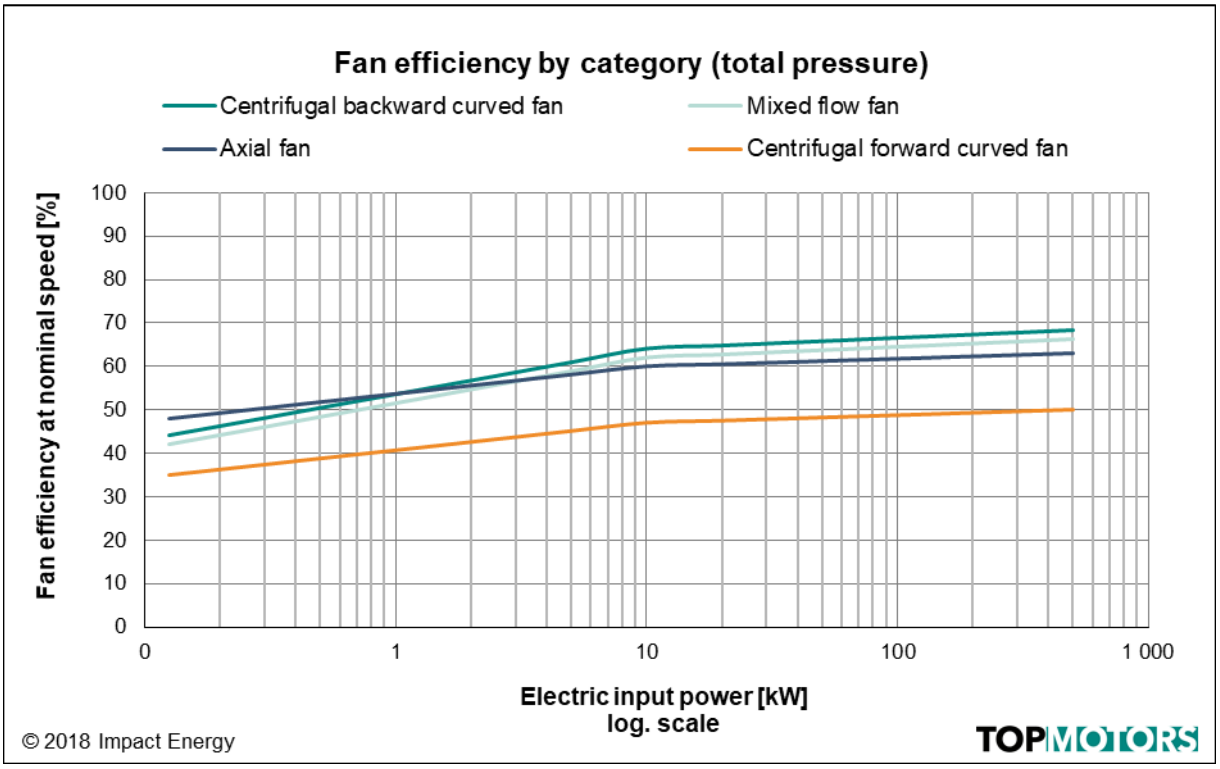

Figure 19: **Efficiency values for various fan types by nominal power (electrical input), according to European Ecodesign Directive No. 327/2011.**

Sales figures of fans 2019	Switzerland		EU	
Nominal output power	Quantity	Share	Quantity	Share
< 7.5 kW	91 741	76%	9 457 388	75%
7.5–37 kW	27 516	23%	2 908 881	23%
> 37 kW	1 760	1%	198 015	2%
Total	**121 016**	**100%**	**12 564 284**	**100%**
CH Share EU				1.0%

Table 24: **Sales figures of fans by nominal output power 2019, Switzerland and EU.**

Sales figures of fans 2019	Switzerland		EU	
Type of fan	Quantity	Share	Quantity	Share
Axial fans	67 190	56%	6 715 610	53%
Centrifugal forward-curved fan Centrifugal radial bladed fan	26 260	22%	3 058 147	24%
Backward-curved fan (with housing)	10 394	9%	1 170 991	9%
Backward-curved fan (without housing)	12 379	10%	1 134 555	9%
Diagonal fan	1 187	1%	139 464	1%
Cross flow fan	3 607	3%	345 518	3%
Total	**121 016**	**100%**	**12 564 284**	**100%**

Table 25: **Sales figures of fans by type, Switzerland and EU, 2019.**

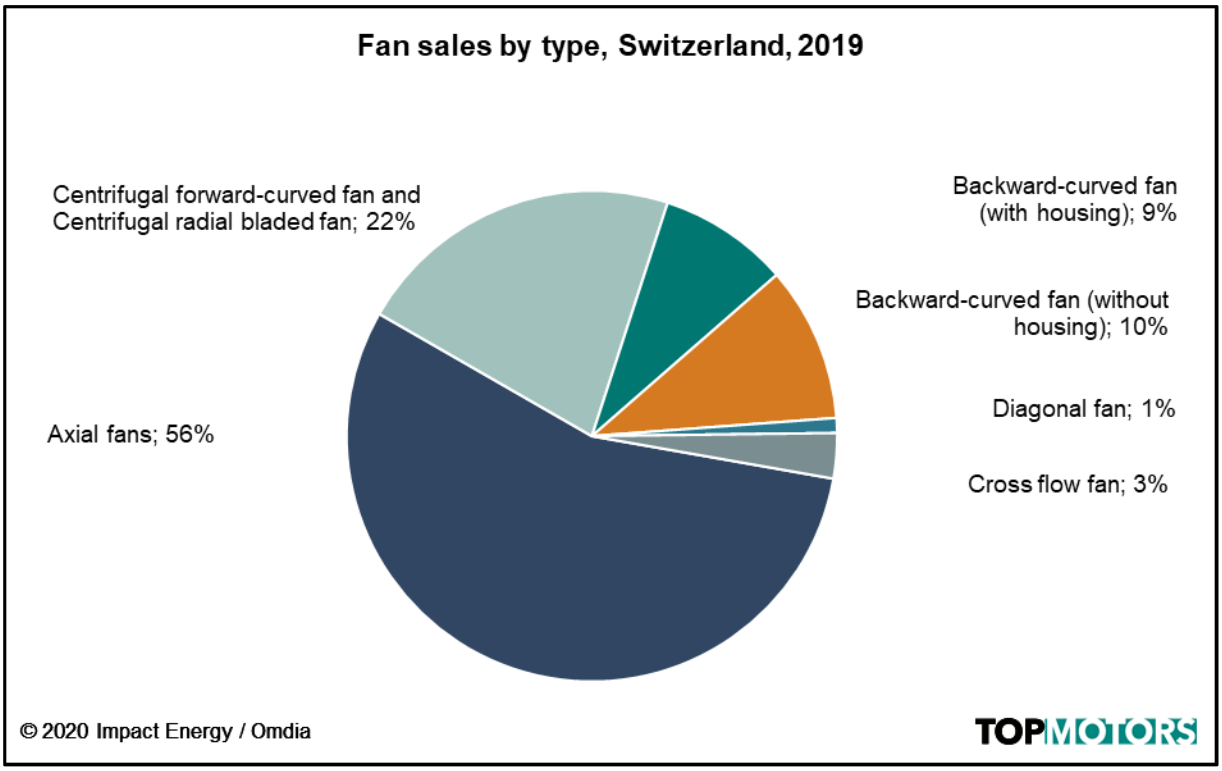

Figure 20: **Fan sales, shares by fan type, Switzerland, 2019.**

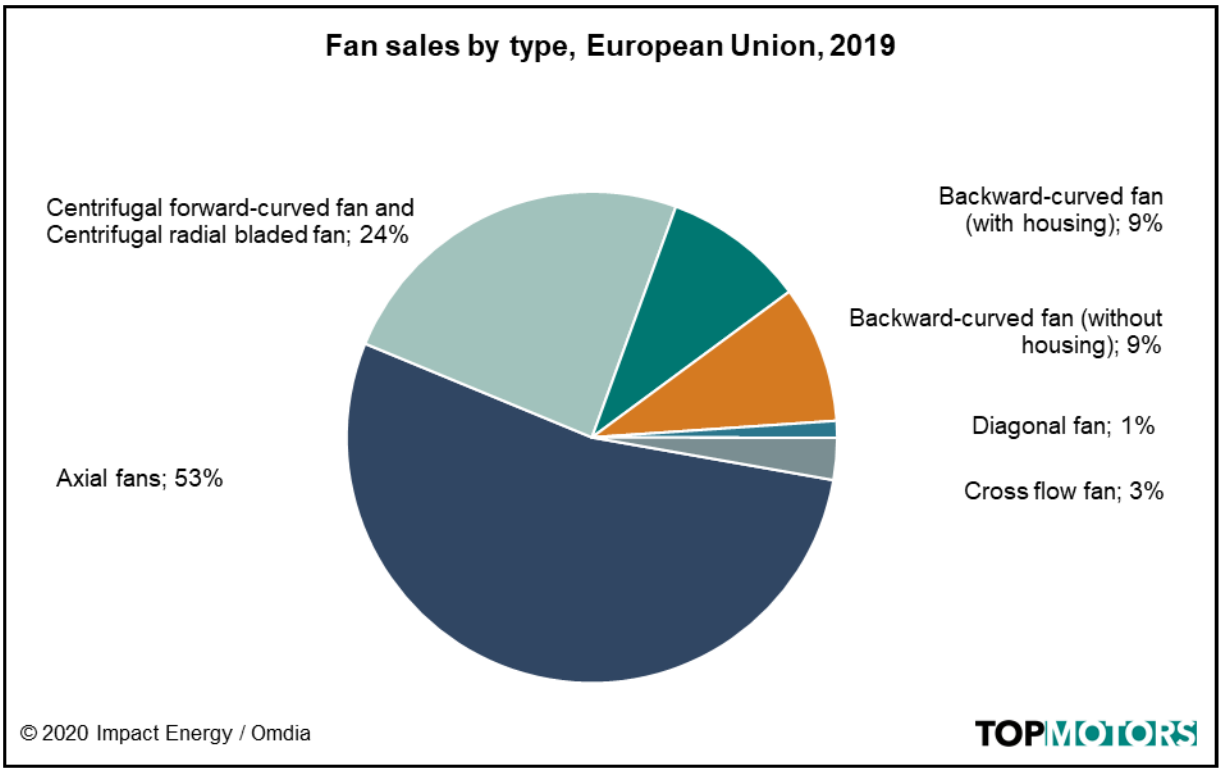

Figure 21: **Fan sales, shares by fan type, EU, 2019.**

8 Observations and recommendations

This study is the fourth of its kind to be conducted in Switzerland. As in the previous year, it also contains data on the European market. The motor section is further developed based on reports and data from previous years and supplemented through further considerations, including cost calculations for high-efficiency motors or estimates of annual electricity savings with newly purchased more efficient motors. The section on pumps and fans is also expanded and refined.

As regards the use of energy-efficient motor driven systems, Switzerland seems to be ahead of the EU. The degree of compliance with regulations and standards is one of the highest for all countries both inside and outside the European Union. This is presumably due to historical and current managerial and incentive systems for the promotion of energy efficiency.

On 25 October 2019, the European Union published more stringent minimum energy efficiency requirements for electric motors via EU Regulation No. 2019/1781. These will enter into force on 1 July 2021 and will cover both smaller motors (from 120 watts) and large motors (up to 1000 KW). In a second phase, the even higher efficiency class Super Premium IE4 will apply as from 1 July 2023 for medium-sized motors (75–200 kW). With these changes, the EU will for the first time be in the lead worldwide in terms of minimum requirements for motor efficiency.

According to EU estimates,[9] electric motors in motor driven systems account for around half of total electricity consumption in the EU. The new regulation and the tighter requirements will allow annual savings by 2030 of €1.2 billion[10] and 10 TWh of electricity plus an annual net reduction of 3 million tonnes of emissions of CO_2 equivalents.
Switzerland has adopted these requirements by amending the Swiss Energy Efficiency Ordinance (EnEV) on 22.4.2020. This will open a new chapter for motors. Owing to the new legislation that will enter into force in 2021 and 2023, major changes are expected on the motor market in the near future. To evaluate the impact of the measures adopted, accurate and regular observation of the market will be necessary in coming years. In terms of pumps and fans as well, data collection and monitoring of market share trends should also continue.

9 Contact

To improve the data, all manufacturers and representatives of the products in the Swiss and European markets analysed here are invited to make their data available to Impact Energy (if they have not already done so. Citing «Topmotors Market Report» please contact Rita Werle (rita.werle@impact-energy.ch).

10 Acknowledgements

The authors of this report would like to thank CEMEP, the European Committee of Manufacturers of Electrical Machines and Power Electronics, for sharing the results of their survey which were referenced for the status of motors on the European market for the revision of this report.

[9] See Regulation (EU) 2019/1781 of October 1, 2019.
[10] Calculation based on an electricity price of 0.12 EUR/kWh.

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12 Annex

Motor availability by efficiency class, number of poles and size (2018)
The numbers in the cells indicate the number of manufacturers surveyed in 2018 who were able to deliver such motors within 4–6 weeks.

Motor availability 2018								
Nominal output power [kW]	IE3 according to IEC60034-30-1				IE4 according to IEC60034-30-1			
	Number of poles				Number of poles			
	2	4	6	8	2	4	6	8
0.12 to < 0.18	2	2	2	2	2	2	2	2
0.18 to < 0.25	3	2	4	2	2	2	2	2
0.25 to < 0.37	3	5	5	2	2	2	2	2
0.37 to < 0.56	5	5	5	2	2	2	2	2
0.56 to < 0.75	6	4	4	2	2	2	2	2
0.75 to < 1.1	6	6	6	2	3	3	3	2
1.1 to < 1.5	6	6	6	2	5	5	5	2
1.5 to < 2.2	6	6	6	2	5	5	5	2
2.2 to < 3.7	6	6	6	4	5	5	3	2
3.7 to < 5.5	6	6	6	4	5	5	3	2
5.5 to < 7.5	6	6	6	4	5	5	3	2
7.5 to < 11	6	6	6	4	5	5	3	2
11 to < 15	6	6	6	4	5	5	3	2
15 to < 18.5	6	6	6	4	5	5	3	2
18.5 to < 22	6	6	6	4	5	5	3	2
22 to < 30	6	6	6	4	5	5	3	2
30 to < 37	6	6	6	3	5	5	2	2
37 to < 45	6	6	6	3	4	4	1	1
45 to < 56	6	6	6	3	4	4	1	1
56 to < 75	4	4	3	3	3	3	1	1
75 to < 90	6	5	4	3	4	4	1	1
90 to < 110	6	5	4	3	5	5	1	1
110 to < 150	6	5	4	3	5	5	1	1
150 to < 185	6	5	4	2	5	5	1	1
185 to < 220	6	5	4	1	5	5	1	1
220 to < 250	6	5	4	1	2	4	1	1
250 to < 375	6	5	2	1	2	4	1	1
375 to < 1 000	6	5	2	1	2	4	1	1

Motor availability by efficiency class, number of poles and size (2017)
The numbers in the cells indicate the number of manufacturers surveyed in 2017 who were able to deliver such motors within 4–6 weeks.

Motor availability 2017								
Nominal output power [kW]	IE3 according to IEC60034-30-1				IE4 according to IEC60034-30-1			
	Number of poles				Number of poles			
	2	4	6	8	2	4	6	8
0.12 to < 0.18	2	2	2	2	2	2	2	2
0.18 to < 0.25	3	2	5	2	2	2	2	2
0.25 to < 0.37	3	5	5	2	2	2	2	2
0.37 to < 0.56	5	5	5	2	2	2	2	2
0.56 to < 0.75	6	4	4	2	2	2	2	2
0.75 to < 1.1	6	5	5	2	3	3	3	2
1.1 to < 1.5	6	6	6	2	5	5	5	2
1.5 to < 2.2	6	6	6	2	5	5	5	2
2.2 to < 3.7	6	6	6	4	5	5	3	2
3.7 to < 5.5	6	6	6	4	5	5	3	2
5.5 to < 7.5	6	6	6	4	5	5	3	2
7.5 to < 11	6	6	6	4	5	5	3	2
11 to < 15	6	6	6	4	5	5	3	2
15 to < 18.5	6	6	6	4	5	5	3	2
18.5 to < 22	6	6	6	4	5	5	3	2
22 to < 30	6	6	6	4	5	5	3	2
30 to < 37	6	6	6	3	5	5	2	1
37 to < 45	6	6	6	3	4	4	1	1
45 to < 56	6	6	6	3	4	4	1	1
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185 to < 220	6	5	4	1	5	5	1	1
220 to < 250	6	5	2	1	2	3	1	1
250 to < 375	6	5	2	1	2	3	1	1
375 to < 1 000	6	5	2	1	2	3	1	1

Motor availability by efficiency class, number of poles and size (2016)
The numbers in the cells indicate the number of manufacturers surveyed in 2016 who were able to deliver such motors within 4–6 weeks.

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	Number of poles				Number of poles			
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0.12 to < 0.18	2	2	2	2	1	1	1	1
0.18 to < 0.25	3	2	5	2	1	1	1	1
0.25 to < 0.37	5	5	5	2	1	1	1	1
0.37 to < 0.56	6	5	5	2	1	1	1	1
0.56 to < 0.75	6	4	4	1	1	1	1	1
0.75 to < 1.1	6	5	5	2	2	2	2	1
1.1 to < 1.5	6	6	6	2	4	4	4	1
1.5 to < 2.2	6	6	6	2	4	4	4	1
2.2 to < 3.7	6	6	6	4	4	4	3	1
3.7 to < 5.5	6	6	6	4	4	4	3	1
5.5 to < 7.5	6	6	6	4	5	5	3	1
7.5 to < 11	6	6	6	4	5	5	3	1
11 to < 15	6	6	6	4	5	5	3	1
15 to < 18.5	6	6	6	4	5	5	3	1
18.5 to < 22	6	6	6	4	5	5	3	1
22 to < 30	6	6	6	4	5	5	3	1
30 to < 37	6	6	6	3	5	5	2	0
37 to < 45	6	6	6	3	4	4	1	0
45 to < 56	6	6	6	3	4	4	1	0
56 to < 75	3	3	2	2	3	3	0	0
75 to < 90	6	5	4	3	4	4	1	0
90 to < 110	6	5	4	3	5	5	1	0
110 to < 150	6	5	4	3	5	5	1	0
150 to < 185	6	5	4	2	5	5	1	0
185 to < 220	6	5	4	1	5	5	1	0
220 to < 250	6	5	2	1	2	2	1	0
250 to < 375	6	5	2	1	2	2	1	0
375 to < 1 000	6	5	2	1	2	2	1	0