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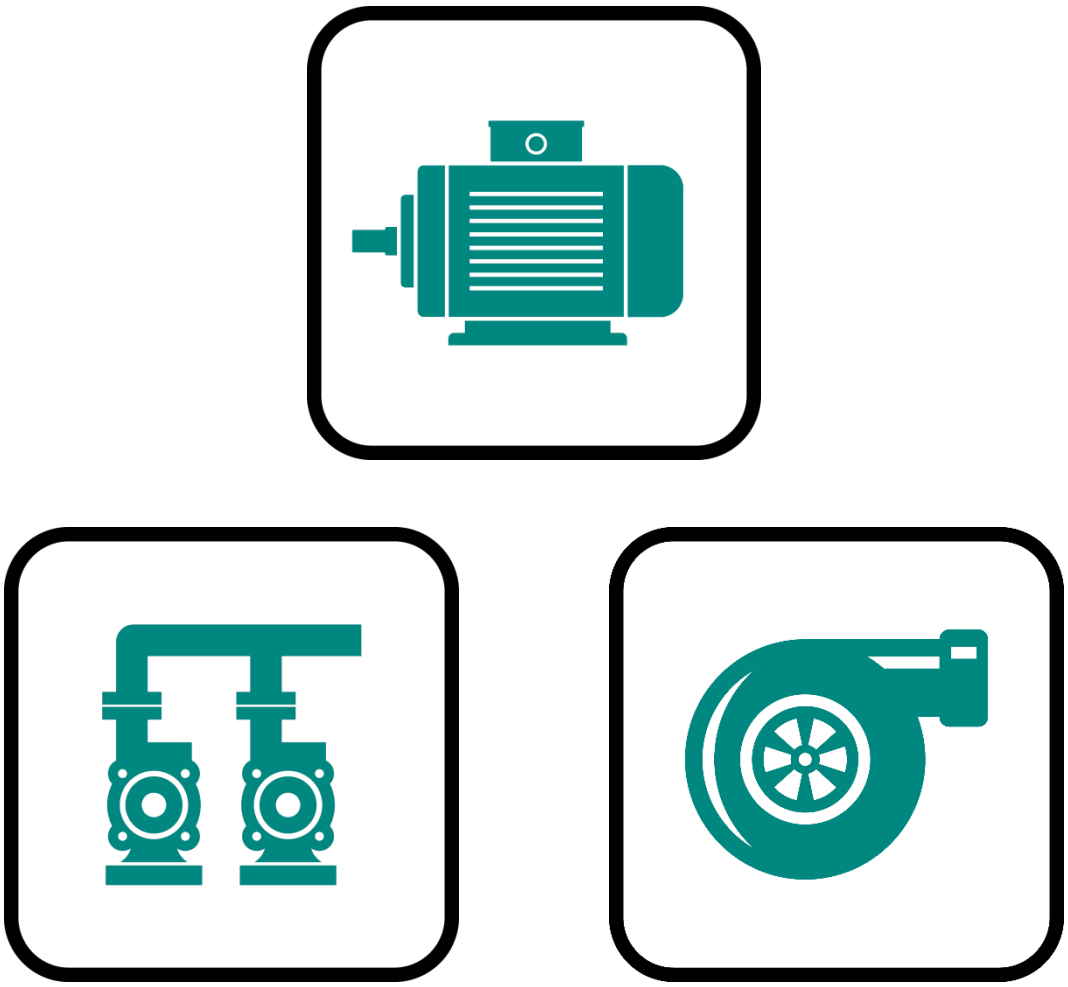
Appliances and Competitive Tenders

Report of June 2020

Topmotors Market Report Switzerland 2019



TOPMOTORS

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The authors of this report are responsible for the content and for the conclusions drawn therefrom.
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Contents

List of abbreviations

SFOE	Swiss Federal Office of Energy
EEI	Energy efficiency index for circulators
EnG	Swiss energy act
EnEV	Swiss energy efficiency ordinance about the energy efficiency requirements of series-produced installations, vehicles and equipment
VFD	Variable Frequency Drive
IE1/IE2/IE3/IE4	IE-code for motor efficiency according to IEC 60034-30-1
MEI	Minimum efficiency index for water pumps
OEM	Original Equipment Manufacturer

1 Summary

1.1 Goal

This Topmotors Market Report provides information on the status of the electric motor market in Switzerland for the year 2018. This study, conducted for the third 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 covered the availability of motors according to efficiency class and the selling price of motors and variable frequency drives (VFDs). As in 2017, market data on circulators, water pumps and fans were collected. In addition, market data from the European Union were analysed.

1.2 Share of the electric motor market within Swiss electricity consumption

Over 182 314 new electric motors were sold in Switzerland in 2018 (2016: 173 040; 2017: 177 786). These motors had an aggregated installed electric power of 1 145 MW (2016: 1 033 MW; 2017: 1 090 MW) and required 3 608 GWh/a of electricity consumption in 2018 (2016: 3 252 GWh/a; 2017: 3 432 GWh/a), accounting for some 6% of total Swiss electricity consumption (57 600 GWh/a). The new motors sold help to rejuvenate the existing motor stock of approximately 2 million motors and boost overall efficiency by replacing older, inefficient motors.

1.3 Key findings

The key findings of the 2018 market survey for low-voltage electric motors, pumps and fans can be summarized as follows, in comparison with the previous years: [1] [2]

MOTORS Switzerland

- From the total 182 314 electric motors sold in Switzerland in 2018 (2017: 177 786), 73 935 (2017: 70 143), or 40.6% (2017: 39.5%) were in MEPS scope (i.e. between 0.75 - 375 kW nominal output power with 2-, 4- and 6-poles).
- Of this total, 66.9% (64.0% in the previous year) were MEPS-compliant (IE3 and IE4). All IE1 motors sold are non-compliant (0.4%, previous year: 0.6%) and can only be put into operation outside the MEPS scope (e.g. as uncooled motors used for a short time). For the remaining 32.8% (previous year: 35.4%) (IE2), it cannot be accurately determined to what extent they complied with the MEPS, while it is assumed that they did so to a large extent.
- Motors of higher efficiency classes IE3 and IE4 are now readily available on the market and can be delivered in a large variety of nominal output power and poles by a number of suppliers within 4 to 6 weeks.
- The price of IE3 premium motors was 15% higher in 2018 (previous year: 14%) than the less efficient IE2 class. The price of the next generation IE4 motors was 17% higher (previous year: 17%) than IE3 motors.[1] Thus, the additional cost of the more efficient motors has remained more or less the same.
- There is a steadily increasing trend towards higher efficiency classes (see Figure 1).

[1] Absolute prices cannot be compared directly with the findings of the Topmotors Market Report 2017 because the 2018 prices are based on a different size classification.

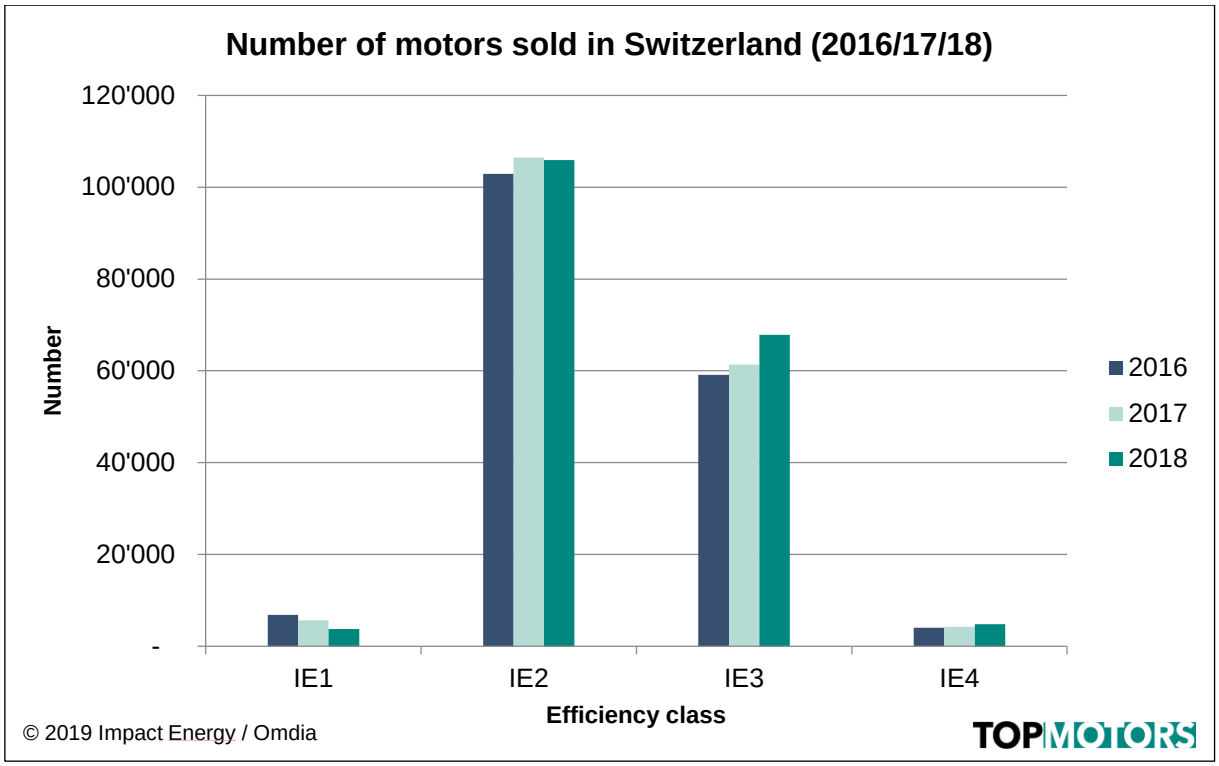

Figure 1: Number of motors sold in Switzerland, comparison for 2016/17/18.

- According to Omdia, only a very few companies actually manufacture in Switzerland.

MOTORS European Union (EU)

- IE1 motors still have a significant market share in the EU (EU: 19.8%; CH: 0.4%).
  IE1 motors will likely be available longer on the European market as in Switzerland.
- IE2 motors are the efficiency class most sold in the EU, with 63.9% (CH: 32.7%).
- IE3 motors are sold less in the EU than in Switzerland (EU: 12.5%; CH: 65.4%).
  IE3 motors are less well established in the EU than in Switzerland but are gaining in popularity.
- IE4 motors are enjoying growing demand (EU: 3.8%; CH: 1.5%).

CIRCULATORS

- In 2018, 399 585 circulators (integrated and non-integrated) were sold in Switzerland, of which 99.9% had an energy efficiency index (EEI) of ≤ 0.23 and thus complied with the MEPS for series-produced installations, vehicles and equipment set out in Annex 2.8 of the Swiss Energy Efficiency Ordinance (EnEV). Non-integrated pumps are sold separately (not as part of a machine or system) and also have their own sales price. Integrated pumps are part of a machine or system that has its own sales price. The end user buys the system.

- In 2018, 17 564 476 circulators (integrated and non-integrated) were sold in the EU, of which 91.5% had an EEI of ≤ 0.23 and thus complied with the applicable minimum requirements of the European Ecodesign Regulation No. 641/2009 (which is identical with the Swiss MEPS).

- The share of circulators sold in Switzerland corresponds to 2.3% of the EU total.

WATER PUMPS

- In 2018, 56 274 water pumps were sold in Switzerland (2017: 51 577), of which 64.5% were smaller than 7.5 kW, 32.6% were between 7.5 and 37 kW and 2.9% were larger than 37 kW.

- In 2018, submersible multistage pumps once again accounted for a high share (41.0%) of the water pumps sold in Switzerland (2017: 39.8%).

- As in 2017, Switzerland's share of the European water pump market was around 2% (see Table 15:).

- In 2018, almost 3 million water pumps were sold in the EU (2017: approx. 2.7 million.), of which 65.2% were smaller than 7.5 kW, 31.8% were between 7.5 and 37 kW and 3.0% were larger than 37 kW.

- Almost 100% of the water pumps sold in Switzerland complied with the MEPS set out in Annex 2.9 of the EnEV with an MEI of ≥ 0.4. In the European Union, in 2018 almost 92% of the water pumps sold complied with the MEPS specified in the European Ecodesign Regulation No. 547/2012 (which is identical with the Swiss MEPS).

FANS

- In 2018, 90 791 fans were sold in Switzerland, of which 75.9% were smaller than 7.5 kW, 22.7% were between 7.5 - 37 kW and 1.4% were larger than 37 kW.

- In 2018, 12 372 398 fans were sold in the EU, of which 75.2% were smaller than 7.5 kW, 23.2% were between 7.5 - 37 kW and 1.6% were larger than 37 kW.

- Switzerland's share of the EU fan market was 0.7%.

- Of the fans sold in Switzerland, 98% complied with the MEPS specified in Annex 2.6 of the EnEV. In the EU, 90% of the fans sold complied with the MEPS specified in the European Ecodesign Regulation No. 327/2011 (which is identical with the Swiss MEPS).

- In both zones, axial fans accounted for the largest market share, with 55.9% in Switzerland and 53.8% in the EU.

2 Background

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

Motor systems represent a large share of Swiss electricity consumption (49%). More than half of this is for industrial applications and building technology in the service sector (including infrastructure facilities, commercial applications, etc.) accounting for some 37% of Swiss electricity consumption (see Figure 2).

With system optimization, 20-30% of energy savings are possible [1] [5] [8], as can be seen from many best practices (see 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 so as to exploit the large energy savings potential.

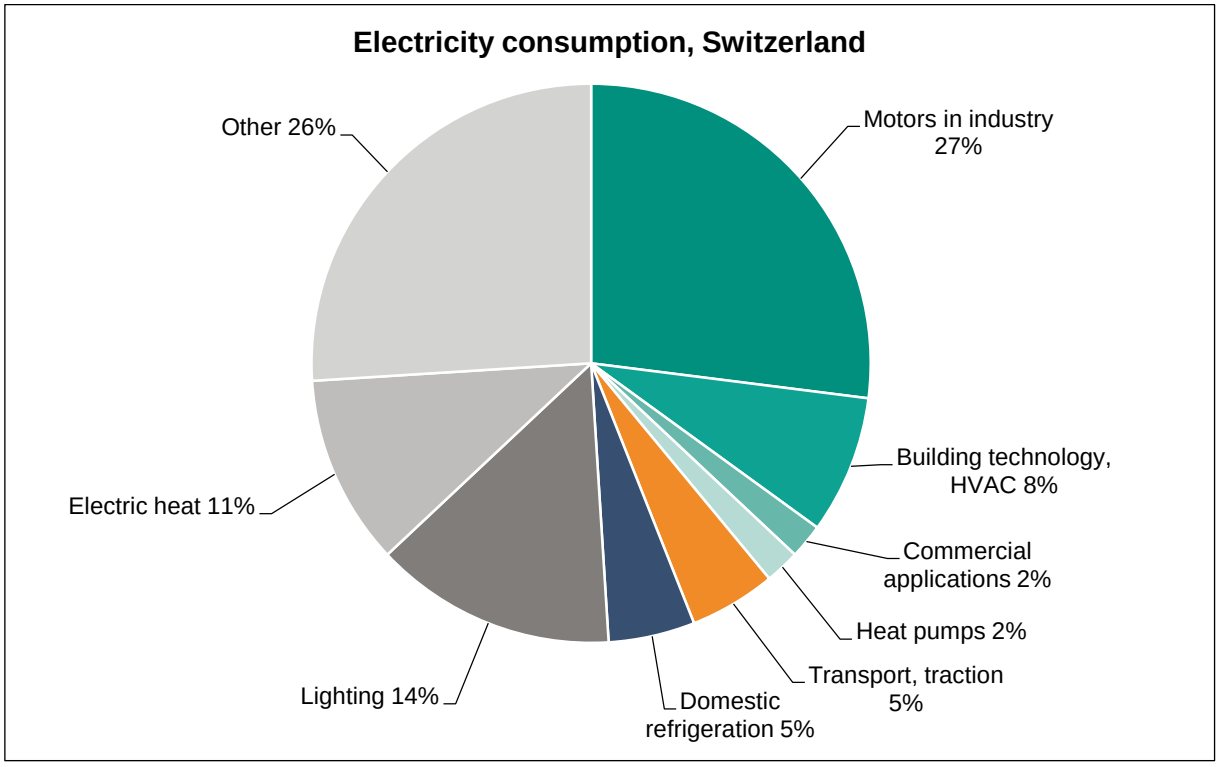

Figure 2: **Share of electric motor systems in Swiss electricity consumption (S.A.F.E. / J. Nipkow 2013)**

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 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 minimum energy performance standards (MEPS) to verify the success and effectiveness of policy instruments and adequately adjust 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 annually to inform the SFOE and all interested stakeholders on the status of the market. The analyses are based on the previous year's data. The Topmotors Market Report 2019 is the third such report and covers sales data for 2018. 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 Scope

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).

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

*On 25 October 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, stepwise from 2021 and 2023. It is expected that these requirements will soon be applied in Switzerland.

From 1 January 2017, the following criteria apply to electric motors falling under the scope of MEPS in Switzerland, as specified in Annex 2.7 of the Swiss energy efficiency ordinance:

- Scope:
  - Motors with nominal output power of minimum 0.75 kW up to maximum 375 kW;
  - 2-, 4-, 6-poles.
- Minimum requirement (energy efficiency class as defined in IEC 60034-30-1):
  - Efficiency class IE3;
  - Or IE2 sold in combination with a VFD.

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 kW to 1000 kW for 2-, 4-, 6- and 8-pole motors under 1000 V:

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 method as the ones conducted in 2017 and 2018 (see [1] [2]). 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 15 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. The first results were presented at the Motor Summit 2019 Switzerland on 4 December 2019 in Bern.

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.

The findings for motors and VFDs, which were surveyed for the third time in 2019, show consistent data.

The findings for pumps and fans, which were surveyed for the second time in 2019, show consistent data too.

The goal for the coming years is to increase the quality and reliability of the raw data and their evaluation, which can also be achieved by having more companies participate in the survey.

The motors' electric energy consumption was estimated using the same method and with the same assumptions as in the Topmotors Market Report 2018:

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

As the available data on the size of pumps and fans are scarce, it was not possible to calculate energy consumption.

6 MOTORS and VFDs

6.1 Motor sales

Switzerland

- In 2018, 182 314 electric motors were sold in Switzerland. In comparison to 2017 (177 783 motors sold), the market grew by 3% (in comparison to 2016, by 5%), see Table 3.

- Sales of **IE1** motors fell sharply (market share 2% with a drop of -45% compared to 2016). Of course, this is due inter alia to the fact that IE1 motors are still allowed for only a few applications. IE1 motors are only sold to original equipment manufacturers (OEMs), which export them to countries with less stringent energy efficiency requirements. It is to be expected that IE1 motors will almost completely disappear from the market over the next 2-3 years.

- **IE2** motors continue to dominate with a market share of 58%, probably because IE2 motors (together with VFDs) are still authorized in Switzerland. However, most of the IE2 motors available on the Swiss market are sold for export or used in cost-effective HVAC applications in Switzerland.

- **IE3** motors continue their advance. Sales were up 15% compared with 2016 (with a 2018 market share of 37%). Whether an IE2 or an IE3 motor is purchased depends on whether the motor buyer is an OEM or a user (end user). IE3 motors will over the next 2-3 years continue to take market share away from IE2 motors and will very likely become the standard in Switzerland in the future. Several motor manufacturers indicated that they offered only IE3 motors at present. In addition, prices for IE3 motors have fallen considerably over the past 2-3 years. The cost differential between an IE2 + VFD and an IE3 has diminished, favouring the purchase of IE3 motors.

- There is continuing strong demand for **IE4** motors on the Swiss market (increase +18% since 2016 with a market share of 3%). However, their use is limited to certain applications where users attach high priority to overall efficiency. As before, price is the main reason for purchasing IE3 motors rather than IE4 motors. IE4 motors still cost 15-20% more than IE3 motors.

Motor sales Switzerland	2016		2017		Change 2016/17	2018		Change 2017/18	Change 2016/18
IE1	6 883	4%	5 668	3%	**-18%**	3 768	2%	**-34%**	**-45%**
IE2	102 931	60%	106 472	60%	**3%**	105 900	58%	**-1%**	**3%**
IE3	59 153	34%	61 364	35%	**4%**	67 832	37%	**11%**	**15%**
IE4	4 073	2%	4 282	2%	**5%**	4 814	3%	**13%**	**18%**
Total	**173 040**	100%	**177 786**	100%	**3%**	**182 314**	100%	**3%**	**5%**

Table 3: Electric motors market 2016 - 2018

Comparison of electric motor sales for the EU and Switzerland

- In 2018, around 7.5 million electric motors were sold in the EU (0.75 kW - 375 kW and all poles). Switzerland's share of motor sales on the European market was about 1%.

- With 19.8%, the share of **IE1** motors within the sales mix in the EU is still considerable (CH: 0.4%), where they are largely sold as cheap export motors. Many of these motors are not MEPS-compliant and are further traded outside the EU market, e.g. in the Middle East, Africa or Eastern Europe. IE1 motors will likely take longer to disappear from the EU market than in Switzerland.

- **IE2** motors are the most sold in the EU with 63.9% (CH: 32.7%). In contrast to Switzerland, IE2 motors could show slight growth in the future. As before, IE2 motors are significantly cheaper in the EU than IE3 motors, even though the price differential has narrowed in recent years.

- With a share of 12.5%, fewer **IE3** motors are sold in the EU as in Switzerland (CH: 65.4%). IE3 motors are not as well established in the EU as in Switzerland, but are gaining in popularity. The trend will probably be similar to the one in Switzerland.

- **IE4** motors are becoming increasingly widespread in the EU (3.8%) (CH: 1.5%). In the EU as well, the high price is an obstacle to increased demand.

See also Figure 3 and Figure 4.

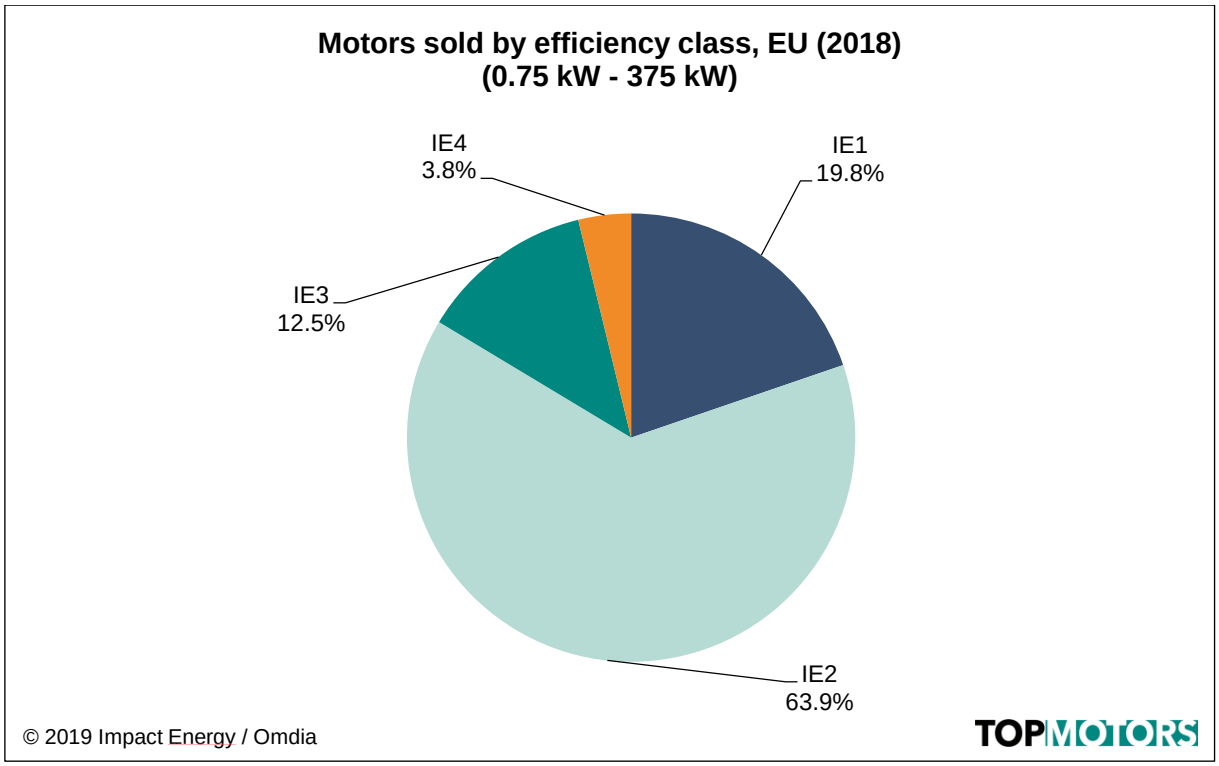

Figure 3: **Motors sold by efficiency class, EU (2018) (0.75 kW - 375 kW)**

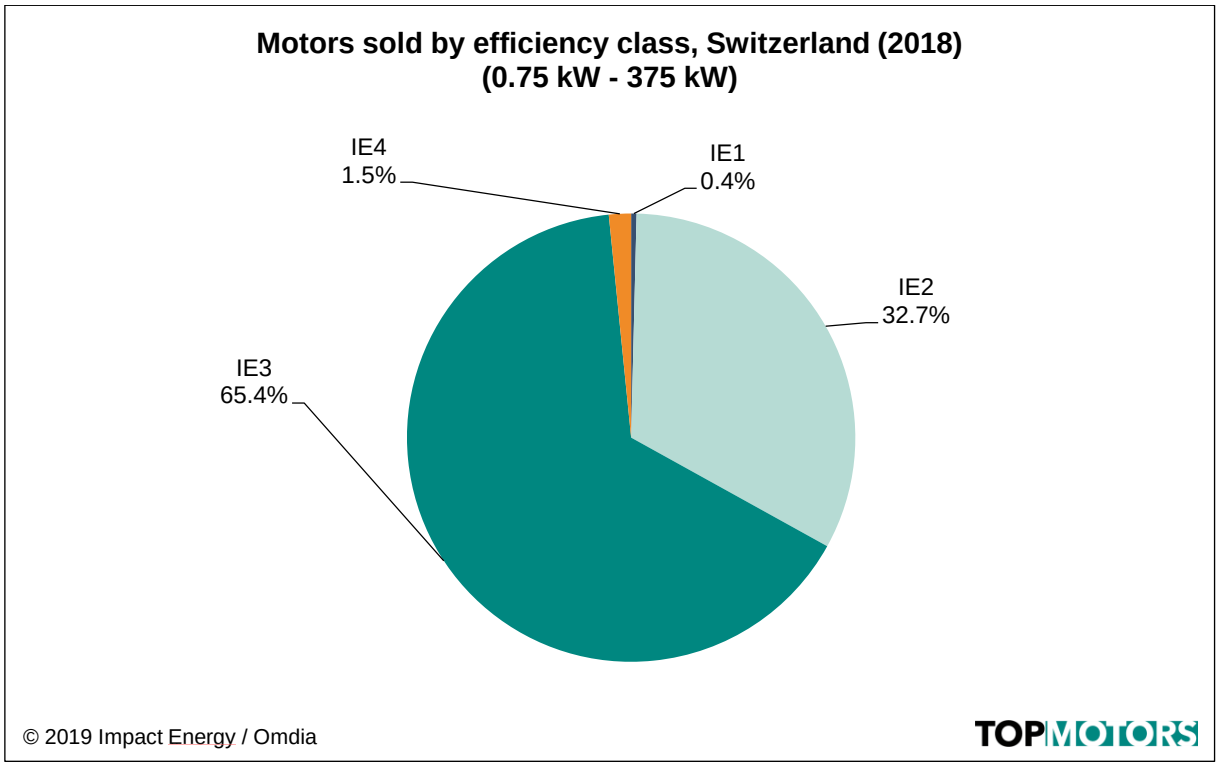

Figure 4 **Motors sold by efficiency class, Switzerland (2018) (0.75 kW - 375 kW)**

CH – EU comparison: motors sold by output

- 44% of the motors sold in the EU had an output of 0.75 - 2.2 kW. In Switzerland, the market share for such motors was 39%. 2.2 - 5.5 kW motors had a market share of 24% in the EU and Switzerland. Motors with an output of 5.5 - 11 kW or 11 - 45 kW sold in the EU and Switzerland each had a market share of 14 - 17%. The share of motors with an output of over 45 kW sold in the EU and Switzerland was 3% and 5%, respectively.

Motors sold by output, 2018		
2018	**CH**	**EU**
Output	**Share**	**Share**
0.75 - 2.2 kW	39%	44%
2.2 - 5.5 kW	24%	24%
5.5 -11 kW	15%	14%
11 - 45 kW	17%	15%
45 - 375 kW	5%	3%
Total	**100%**	**100%**

Table 4: **Motors sold by output, 2018: CH – EU comparison**

Motors sold by number of poles and rotational speed, Switzerland

- For the second time, data were collected on motors' number of poles and rotational speed (see Figure 5 and Figure 6). Once again, **4-pole** motors accounted for half of sales with 50.5% (2017: 50.8%) and repeated the previous year's surprising finding of a high share for faster **2-pole** motors with 41.2% (2017: 41.1%).

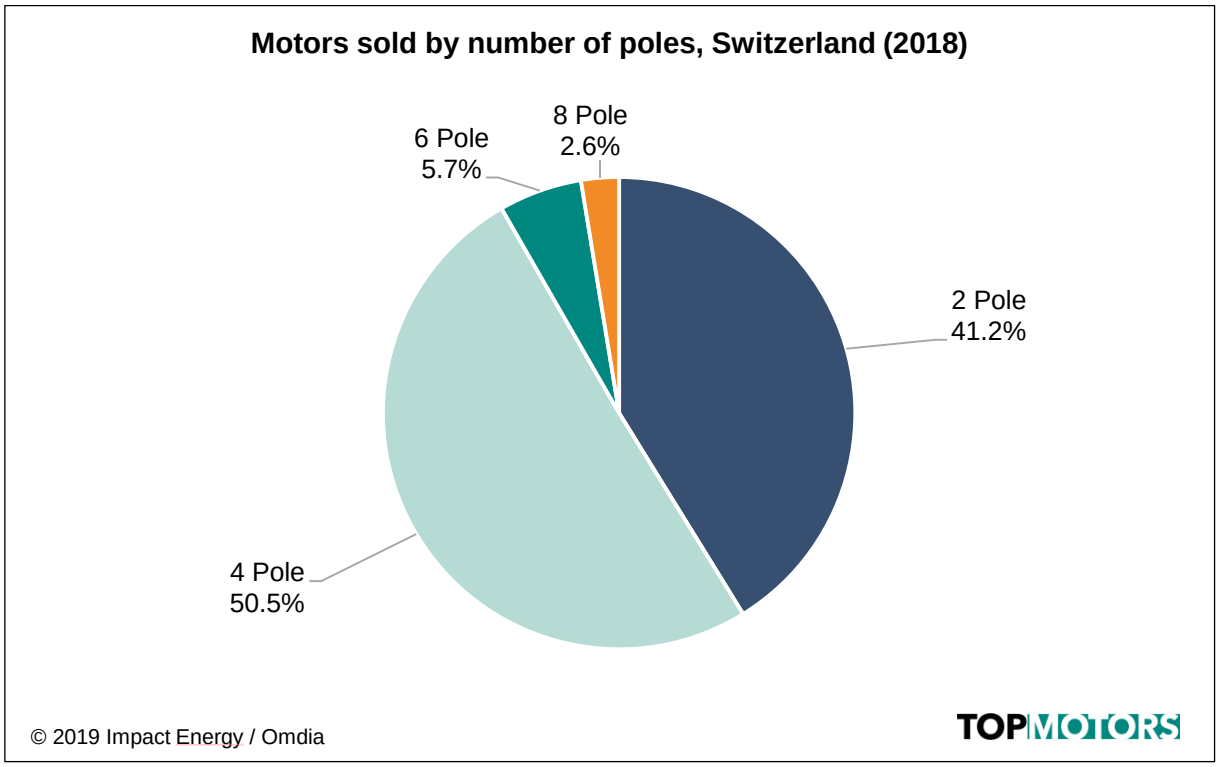

Figure 5: **Motors sold by number of poles**

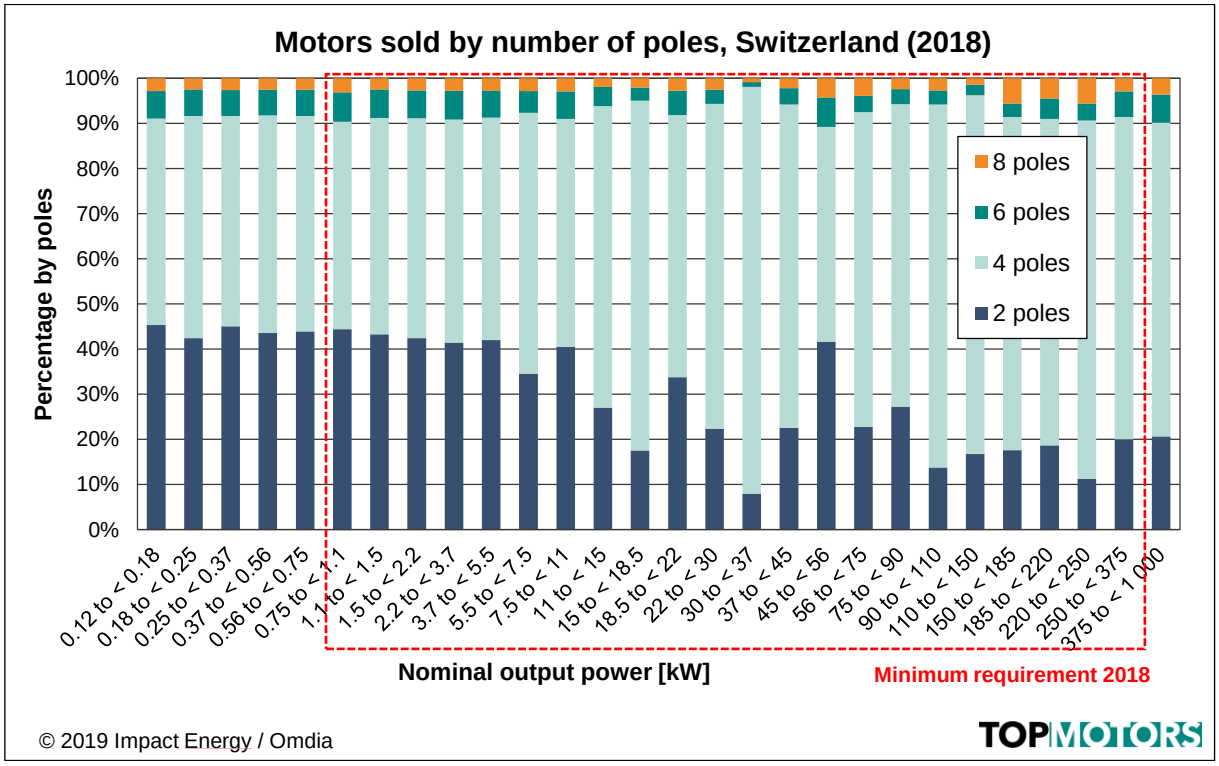

Figure 6: **Motors sold by nominal output power and number of poles**

Motors in the MEPS scope applicable for 2018 (0.75 kW - 375 kW, all poles) totalled 75 926 units, or 41.6% of all motors sold in Switzerland (2017: 71 931; 40.5%). They accounted for 876 MW of output power (83.2% of all motors sold) and 2 983 GWh/a of electric energy consumption (82.7% of all motors sold) (see Table 5 and Figure 8).

Motors sold in Switzerland 2018	Quantity		Motor output (mech.)		Electricity consumption	
Nom. out. power (kW)	Number	Share	MW_{mech}	Share	GWh/a	Share
0.12 - 0.75 kW	106 165	58.2%	40.26	3.8%	175.3	4.9%
> 0.75 - 375 kW	**75 926**	**41.6%**	**876**	**83.2%**	**2 983**	**82.6%**
> 375 - 1 000 kW	223	0.2%	137	13.0%	449	12.5%
Total	**182 314**	**100%**	**1 052**	**100%**	**3 608**	**100%**

Table 5: Quantities for 2018, motor output and electricity consumption by size category (all number of poles)

In 2018, all motors sold in Switzerland accounted for 1 052 MW of output power and for 3 608 GWh/a annual electricity demand (2017: 3 432 GWh/a).

6.2 Motor efficiency

Motors in the MEPS scope applicable for 2018 (0.75 kW - 375 kW and 2-, 4-, 6-pole) totalled 73 935 units (2017: 70 143), accounting for 40.5% (2017: 39.5%) of all motors sold (see Table 6 and Table 7).

Nom. out. power (kW)		Number of poles				
from	to	2	4	6	8	
0.12	**0.75**	All motors surveyed (182 314)				
0.75	**7.5**	**In MEPS scope in 2018 (total 73 935)**				All motors between 0.75 and 375 kW (75 926)
7.5	**375**					
375	**1 000**					

Table 6: Scope of MEPS in Switzerland

The motors in this scope (size and number of poles) accounted for 80.6 % (2017: 81%) of electricity consumption of all motors sold. With regard to the number of compliant motors, in addition to all IE3 and IE4 motors, IE2 motors are estimated at 50%, as the exact number of IE2 motors sold in combination with a VFD is not known.

Out of the motors in the scope, it is assumed that 61 534 (2017: 57 292) or 83.2% (2017: 81.7%) met the 2018 MEPS.
With regard to the motors sold in 2018 (see Figures 8 and 10), the detailed findings are as follows:

- 0.4% of the motors (IE1) did not comply with the MEPS (2017: 0.6%).
- 66.8% of the motors (IE3 and IE4) complied with the MEPS (2017: 64.0%).
- For 32.8% (2017: 35.4%) of the motors (IE2), it cannot be accurately determined to what extent they met the MEPS, while it is assumed that they did so to a large degree. Here, it is assumed that 50% of the IE2 motors were sold together with a VFD.

Motors sold in Switzerland 2018	Total	IE1	IE2	IE3	IE4
All motors sold	**182 314**	3 768	105 900	67 832	4 814
	100%	2.1%	58.1%	37.2%	2.6%
Motors in 2018 scope: > 0.75 kW, < 375 kW, w/o 8-pole motors	**73 935**	283	24 236	48 251	1 165
	100%	0.4%	32.8%	65.2%	1.6%

Motors compliant with 2018 MEPS	**61 534**	0	12 118	48 251	1 165
	100%	0%	21.2%	84.2%	2.0%

Share compliance with scope, Total 83.2% (Assumption for IE2: 50% with VFD)

Table 7: Motors sold in Switzerland in 2018 within scope by efficiency class (assumption: 50% of IE2 are equipped with VFDs and thus meet the requirements)

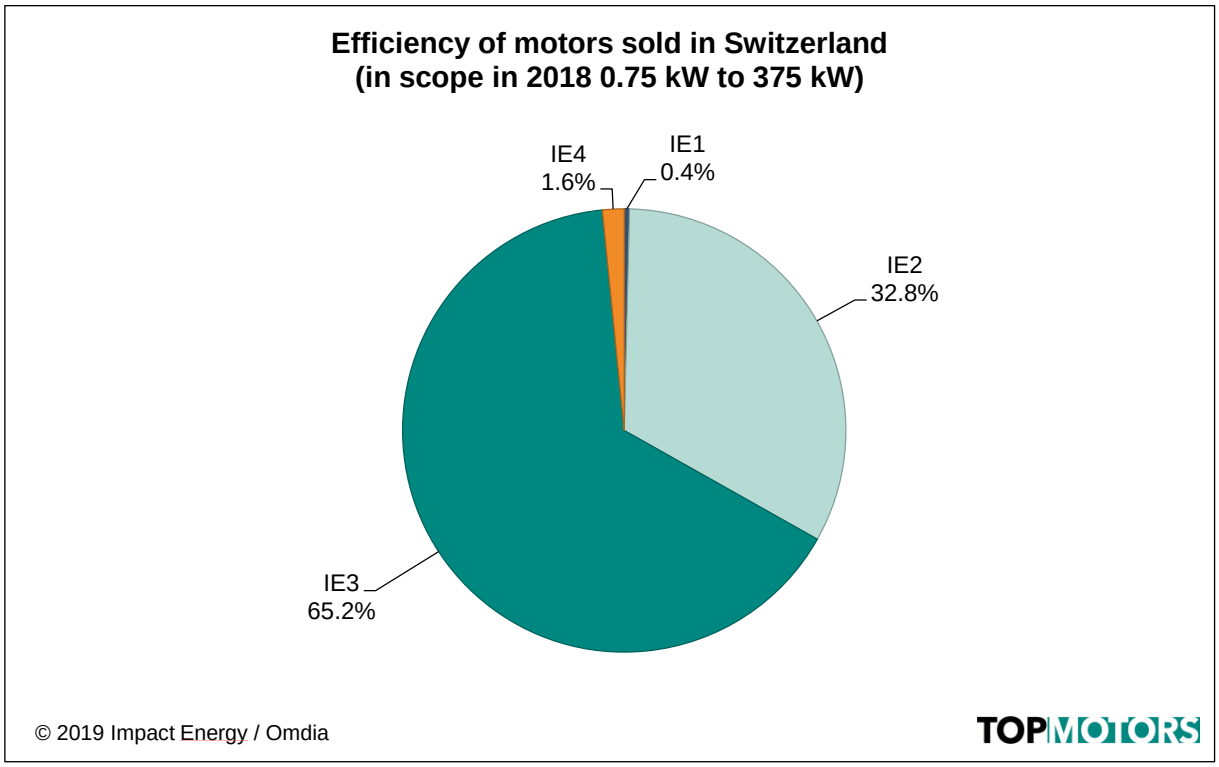

Figure 7: Efficiency of motors sold (2018): 0.75 - 375 kW, 2-, 4-, 6-poles

The share of all motors sold by efficiency class in 2018 (and in comparison to 2017) is shown below. Figure 7Figure 8 shows the sales figures for 2018, whereby 82.7% of electricity consumption in 2018 was between 0.75 kW and 375 kW. Figure 9 shows the sales figures for 2017, where motors in the scope of 0.75 kW to 375 kW accounted for 82.4% of electricity consumption.

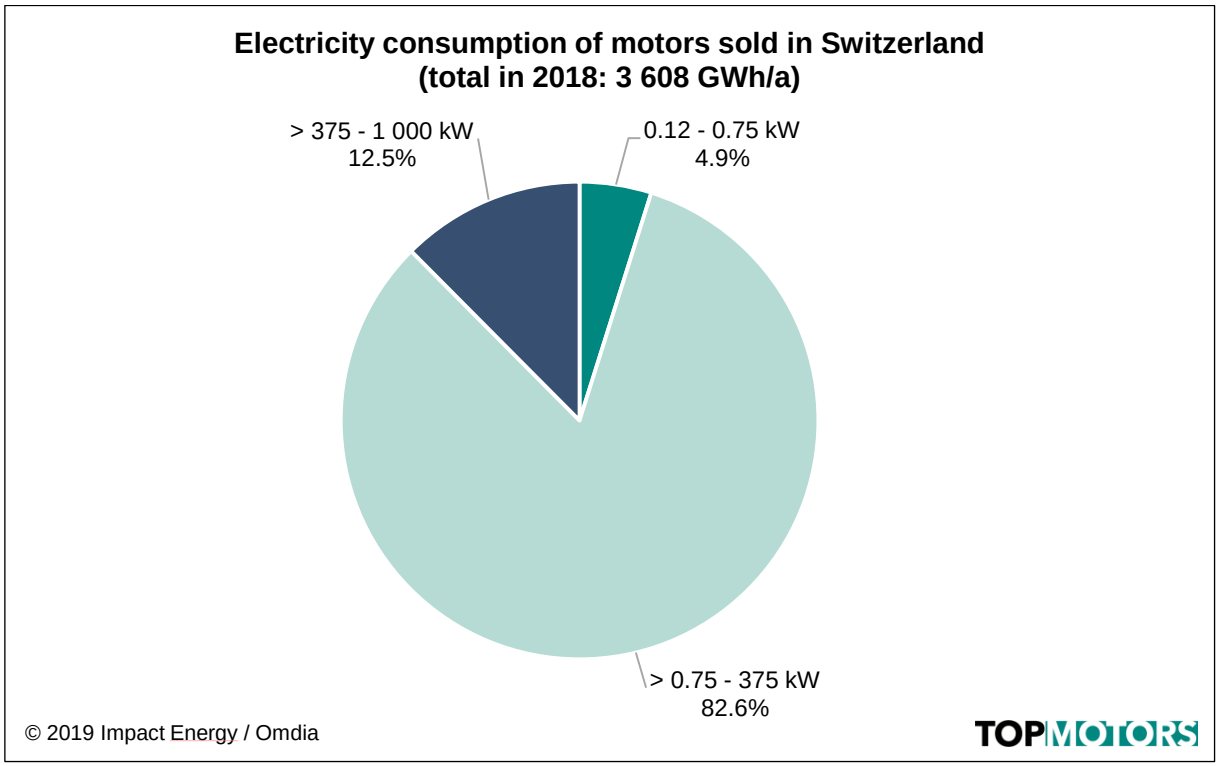

Figure 8: **Motors sold in Switzerland in 2018: electricity consumption by size category**

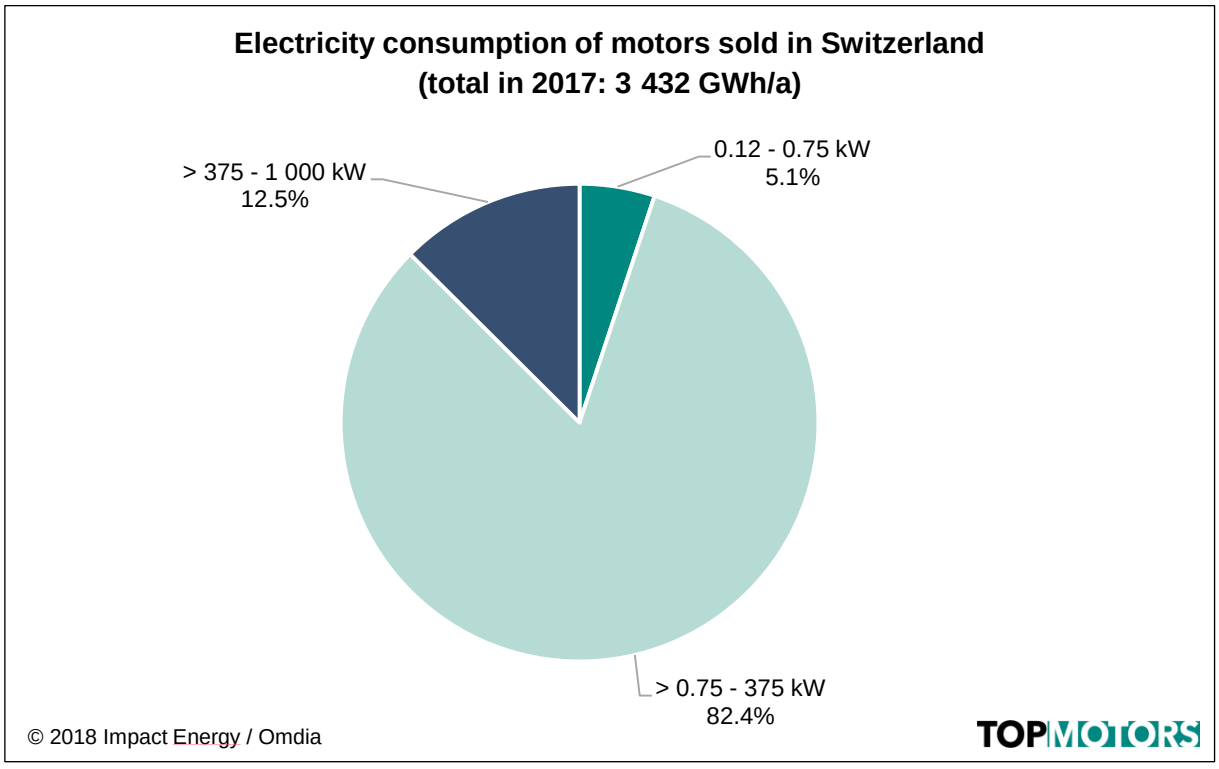

Figure 9: **Motors sold in Switzerland in 2017: electricity consumption by size category**

An efficiency class comparison between 2018 and 2017 by individual motor size reveals a slightly positive trend in the 0.12 kW to 56 kW segment and a clearly positive trend between 56 kW and 185 kW (see Figure 10). The overall breakdown for all efficiency classes is shown in Figure 11 for 2018.

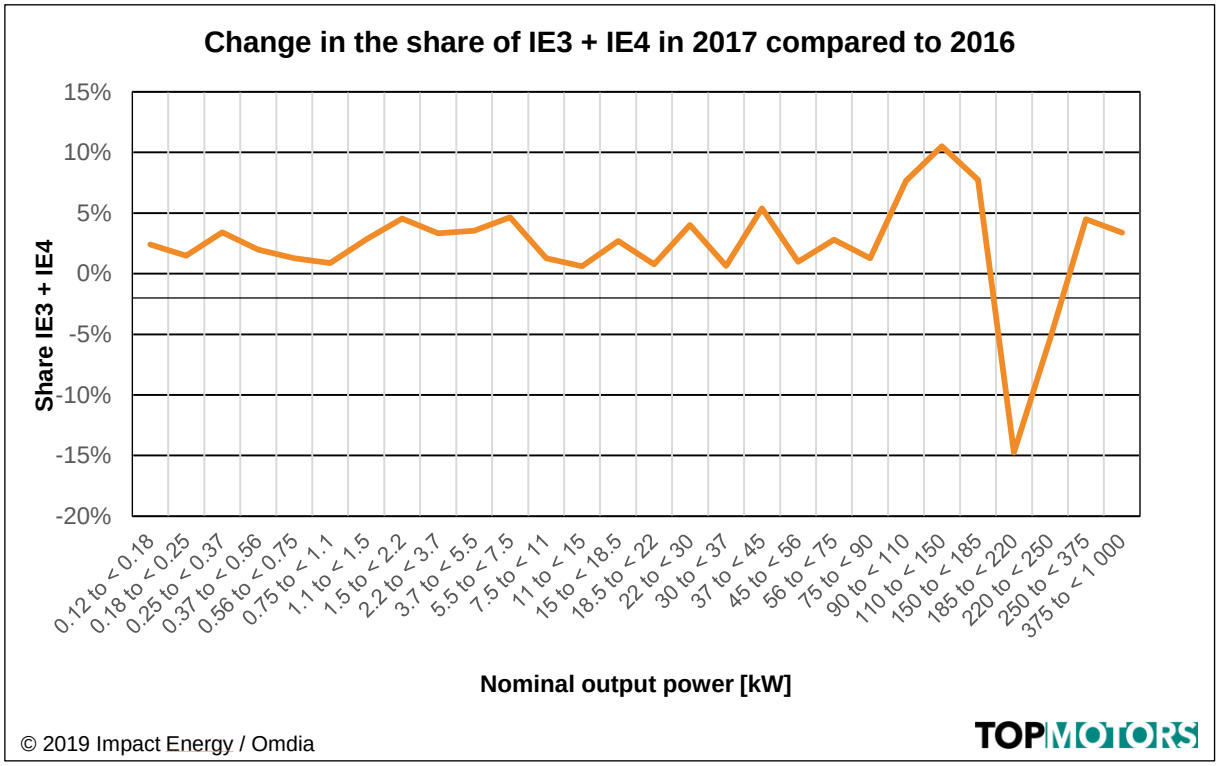

Figure 10: **Change in the share of high-efficiency motors in 2018 compared to 2017**

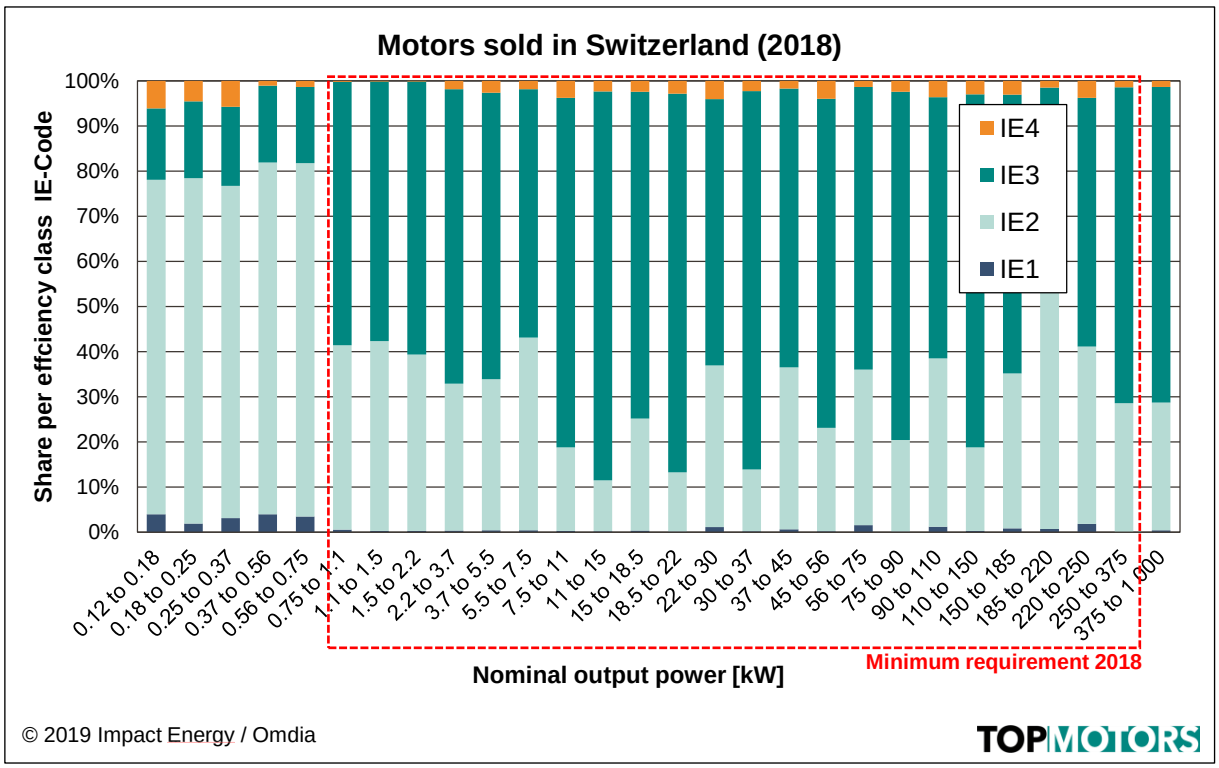

Figure 11: **Efficiency class by size (2018): 40.5% of all motors sold were in scope; 0.75 - 375 kW, 2-, 4-, 6-poles (see also Table 7)**

6.3 Motor availability

Motor availability by efficiency class, number of poles and size was much the same in 2018 (see Table 8Table 8:) as in 2017. The slight rise in supply for IE3 and the significant increase in the number of suppliers of IE4 motors, as between 2016 and 2017, were not in evidence (see Annex).

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

Table 8: **Motor availability by efficiency class, number of poles and size (2018).**
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

Average prices for motors in 2018 declined somewhat in percentage terms compared to 2017.

- Prices for **IE2** motors declined by an average 2% in 2018, a trend which is not likely to continue in light of the sustained demand for IE2 motors and rising material costs.
- In 2016 and 2017, prices for **IE3** motors fell significantly, as manufacturers pushed for their spread and the replacement of IE2 motors. These price drops are now considered as part of a declining trend, as IE3 prices fell by an average 1% in 2018 as against 2017.
- Price differentials between **IE4** motors and IE3 motors remained relatively high at 15-20%. The gap widened slightly in comparison to 2017, because prices for IE3 motors fell faster than prices for IE4 motors. IE4 motors, with their often expensive permanent magnet technology, continue to be viewed as premium products with a high price tag. Some manufacturers also see rising raw material prices (e.g. copper over the past 3 years) as a price driver.
- The average specific prices for motors in all three efficiency classes fell by around 1% in 2018 as against 2017. The methodology for surveying motor prices was refined in 2017 and 2018 as compared to 2016 (28 size categories instead of 12), so the results are not directly comparable with the results for 2016.

Specific price 2017/2018 (CHF/kW)			
Selling year	**IE2**	**IE3**	**IE4**
2017	**180**	**204**	**237**
2018	**177**	**202**	**235**
Price premium 2017/2018	**-1.7%**	**-1.0%**	**-0.8%**

Table 9: Average specific motor prices CHF/kW by efficiency class 2017/2018 (average value for 28 size categories)

The price differentials between the best and the worst motors increased slightly in 2018, which could be explained by the slight rise in material costs for better motors (see Table 10:).

Additional market price			
Selling year	**IE3 < > IE2**	**IE4 < > IE3**	**IE4 > > IE2**
2017	**13.6%**	**16.8%**	**32.8%**
2018	**15.0%**	**17.2%**	**35.0%**

Table 10: Price differentials (average value of specific prices for all sizes) 2017/2018

Once again, the «camel back» curve of specific prices by size category did not change significantly compared with the previous year and still needs further interpretation (see Figure 12).

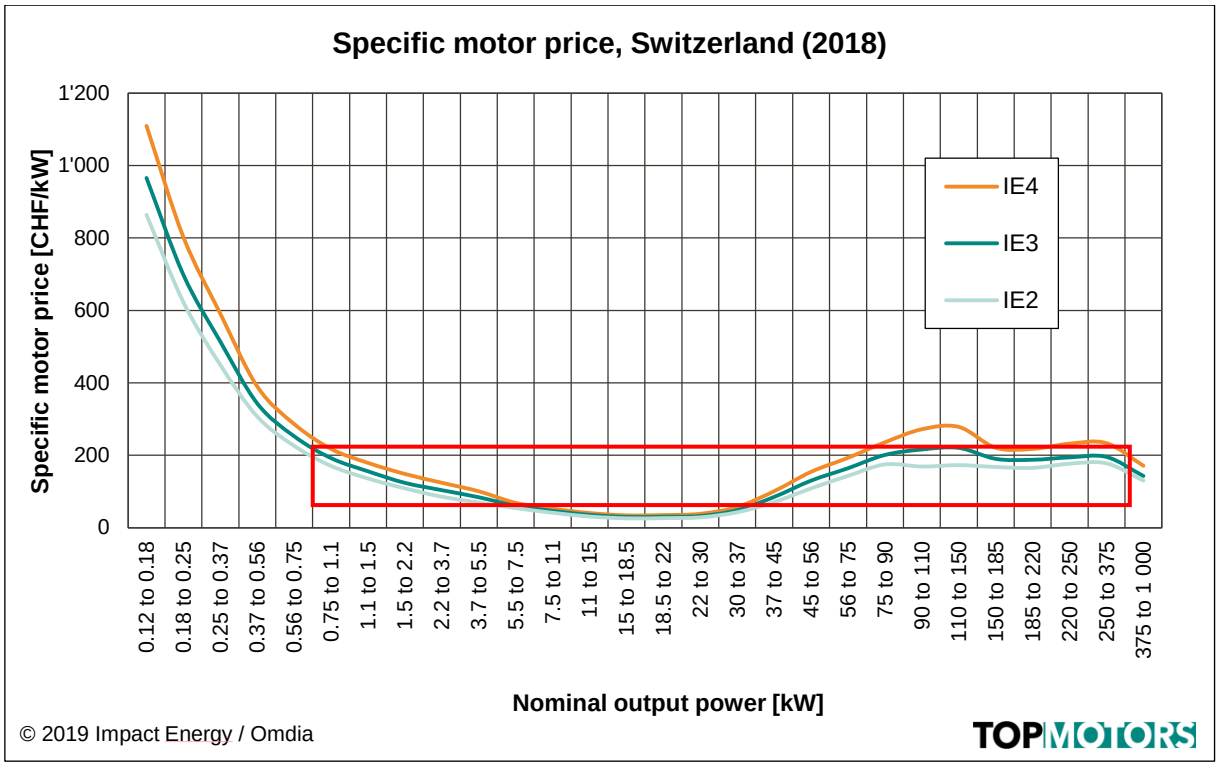

Figure 12: **Specific motor prices, 2018 (red box is the typical area for motor prices)**

The additional costs for more efficient motors (IE3 and IE4) as compared with standard motors (IE2) were examined by motor size. The three curves compared are shown in Figure 13:
IE3 as compared with IE2, IE4 as compared with IE3 and IE4 as compared with IE2.

The cost differential varies significantly depending on nominal output power (see Figure 13), but did not change significantly compared with 2017:

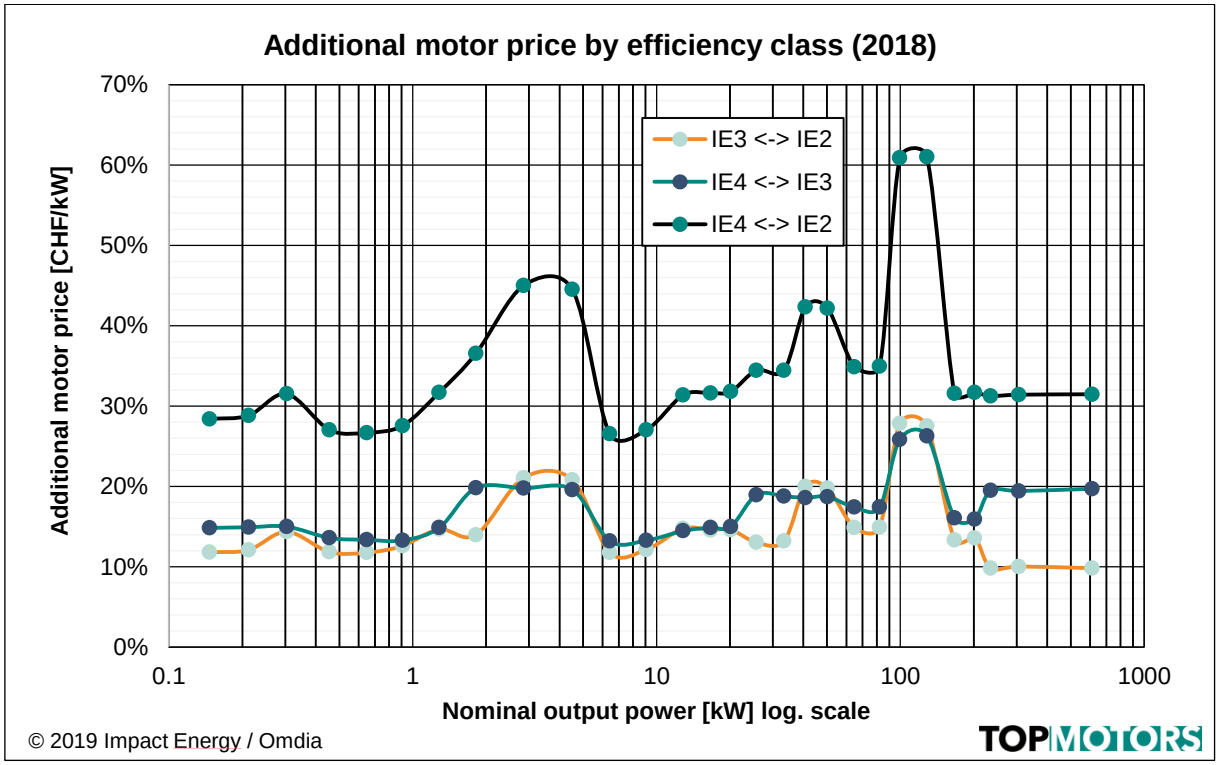

Figure 13: **Additional motor price by efficiency class**

6.5 Motor age

In 2018, 182 314 motors were sold in Switzerland (2017: 177 786; 2016: 173 040). On the basis of various previous surveys, the stock of electric motors in Switzerland is estimated at some two million. The stock divided by the number of motors sold gives the figure of about 10.9 years, which is not the same thing as the average useful life of the motors in service. This would only be the case if all motors sold were replacement products. In reality:

- old products keep running longer than assumed (or are no longer used but not yet disposed of),
- new products are purchased as replacements (or stored as a backup),
- other new motors are purchased and used for further applications.

In fact, according to previous surveys by Topmotors on 4 142 motors, the actual average age of motors in use is significantly higher at 17.3 years.

6.5 VFD sales

- The use of VFDs is increasing steadily, inter alia because since 2015 new IE2 motors can only be used in combination with a VFD. VFDs remain a key option for a reasonable speed regulation designed to ensure energy-efficient motor operation. In addition, some high-efficiency motors such as permanent magnet motors cannot be operated without VFDs.

- In 2018, 149 482 VFDs were sold in Switzerland, of which 27% were 1-phase and 73% were 3-phase (see Table 11 and Figure 14).

VFD sales, Switzerland (2018)			
Nominal output power	**Phase**	**Quantity**	**Share (%)**
0.1 - 0.75 kW	1-phase	**29 827**	**20.0%**
0.76 - 2.2 kW	1-phase	9 990	6.7%
> 2.2 kW	1-phase	1 001	0.7%
< 2.2 kW	3-phase	**38 353**	**25.7%**
2.2 - 7.4 kW	3-phase	**34 319**	**23.0%**
7.5 - 22 kW	3-phase	**22 984**	**15.4%**
23 - 75 kW	3-phase	8 734	5.8%
76 - 110 kW	3-phase	1 681	1.0%
111 - 250 kW	3-phase	1 354	0.9%
251 - 500 kW	3-phase	644	0.4%
> 500 kW	3-phase	595	0.4%
Total		**149 482**	**100%**

Table 11: VFD sales by nominal output power (2018)

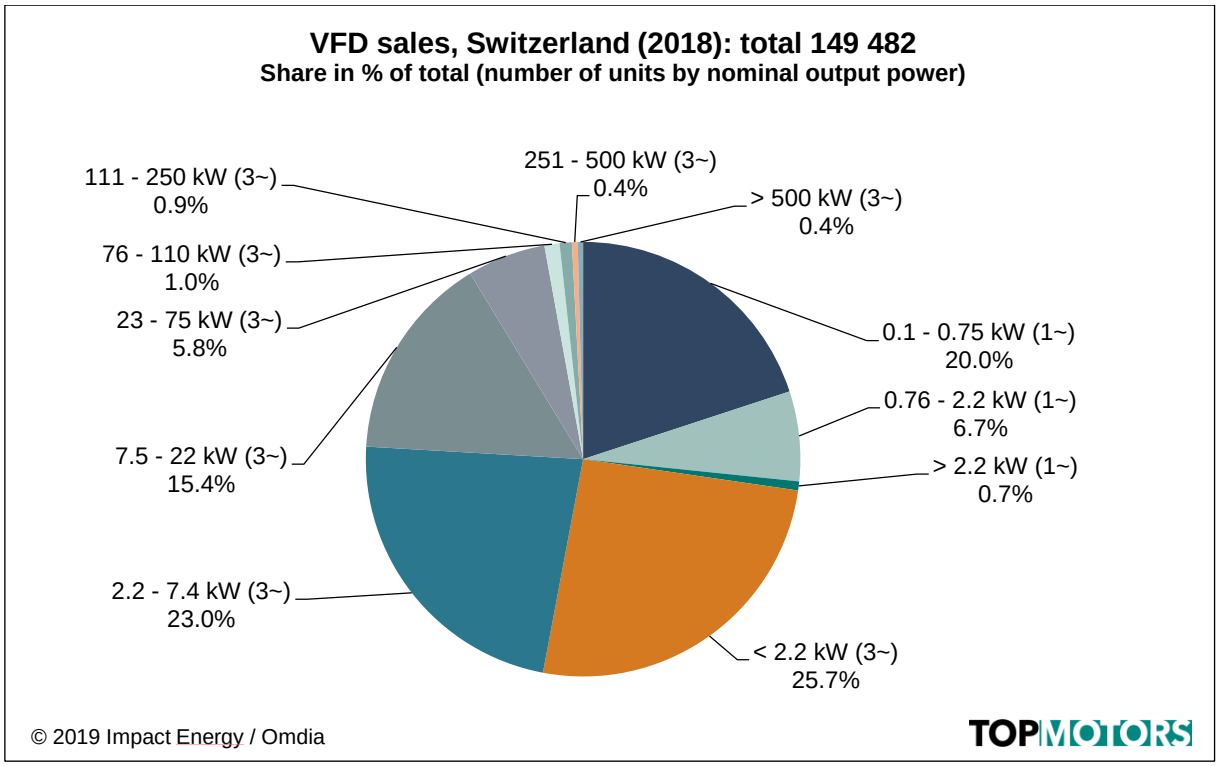

Figure 14: VFD sales by nominal output power (2018)

6.6 VFD prices

- Compared to the previous year, prices for VFDs showed a slight change. VFD prices in Switzerland fell by an average 0.5% between 2017 and 2018.
- Average specific VFD prices rose by 5% in 2017 as against 2016, because specific prices in the medium-sized segment were higher. In 2018, these prices stayed high, and fell slightly or remained unchanged compared with 2017 (see Table 12).

VFD prices 2016-2018 (average values)	
2016	356.6 CHF/kW
2017	374.3 CHF/kW
2018	372.5 CHF/kW
Change 2016/18	**+4.5%**

Table 12: Specific VFD prices 2016/17/18 (average value for 12 size categories)

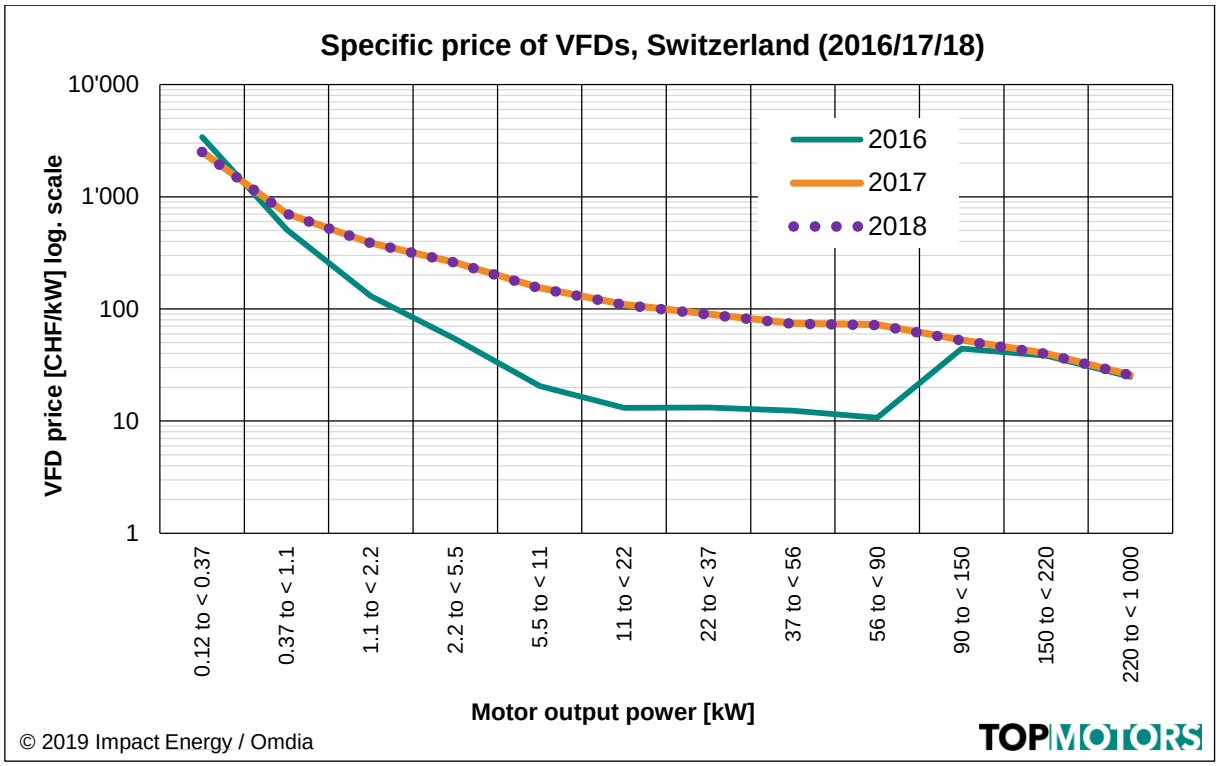

Figure 15: Specific VFD prices, comparison for 2016, 2017 and 2018

Specific VFD prices for 2018 compared with 2017 hardly changed, moving in an area almost identical to the previous year (disappearance of the ‘camel back’) and showing a plausible decrease between small and large VFDs (see Figure 15).

7 PUMPS and FANS

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

The Swiss companies surveyed reported that the majority 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 14 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 and other types of systems (they are not used for drinking water or waste water). 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.

The Ecodesign Regulation 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 2018, 399 585 circulators (integrated and non-integrated) were sold in Switzerland, of which 99.9% had an EEI of ≤ 0.23.
- In 2018, 17 564 476 circulators (integrated and non-integrated) were sold in the EU, of which 91.5% had an EEI of ≤ 0.23.
- The share of circulator sales in Switzerland was equivalent to 2.3% of the units sold in the European circulator market.

Circulator sales (2018)	Switzerland	EU
Non-integrated	181 374	7 839 102
Integrated	218 211	9 725 374
Total	**399 585**	**17 564 476**

Table 13: Circulator sales (integrated & non-integrated) 2018; Switzerland and EU

2018	Switzerland		EU	
Circulators	Quantity	Share	Quantity	Share
EEI > 0.23	236	0.1%	1 493 847	8.5%
EEI ≤ 0.23	399 349	**99.9%**	16 070 629	**91.5%**
Total	**399 585**	**100%**	**17 564 476**	**100%**
CH share EU	2.3%			

Table 14: **Pump sales in Switzerland and the EU in 2018: Integrated & non-integrated circulators**

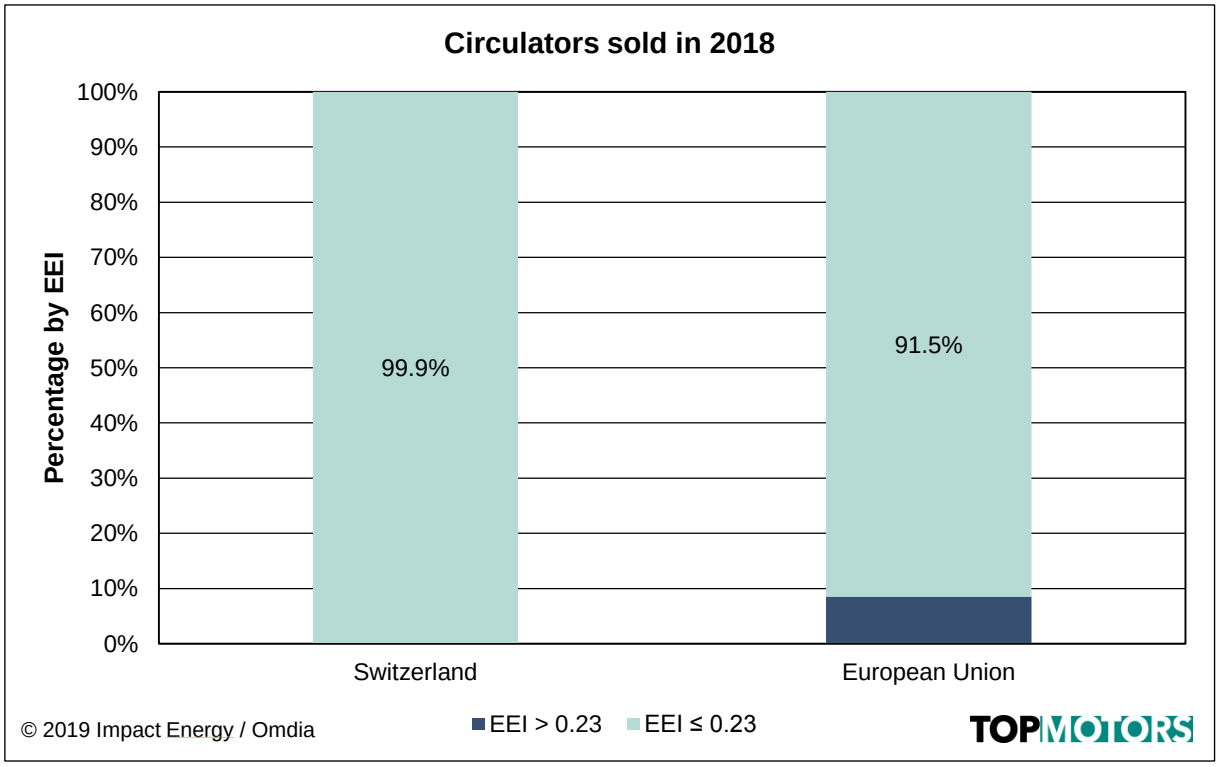

Figure 16: **Share of circulator sales according to EEI (≤ 0.23 is the minimum requirement for Switzerland/European Union)**

- **Conclusion**: In 2018, nearly 100% of all circulators sold in Switzerland meet the minimum requirements. The EU is on the way to this nearly full compliance.

Water pumps

Glanded water pumps are used in many different ways to transport liquids. Clean water is paramount (i.e. not waste water or drinking water) and axial, multistage and submersible pumps are used.

The five types of water pumps with a capacity of less than 150 kW, as specified by EU Ecodesign Regulation No. 547/2012 and also referred to in Annex 2.9 of the EnEV, are not yet very common among pump manufacturers and retailers (although this Regulation was adopted in 2012 and has been in force since 2013). According to Omdia, 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 2018, 56 274 water pumps were sold in **Switzerland** (2017: 51 577), of which 64.5% were smaller than 7.5 kW, 32.6% were between 7.5 and 37 kW and 2.9% were larger than 37 kW (see Table 15).

- Almost 100% of the water pumps sold in **Switzerland** met the minimum requirement of a minimum efficiency index (MEI) of ≥ 0.4 as set out in Annex 2.9 of the EnEV (see Table 16:).

- In 2018, submersible multistage pumps (MSS) once again accounted for a high share (41.0%) of the water pumps sold in **Switzerland** (2017: 39.8%). 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 (see Table 17: and Figure 17).

- As in 2017, the share of water pump sold in **Switzerland** in 2018 amounted to around 2% of the units sold in the European water pump market (see Table 15).

- In 2018, nearly 3 million water pumps were sold in the **EU** (2017: around. 2.7 Mio.), of which 65.2% were smaller than 7.5 kW, 31.8% were between 7.5 and 37 kW and 3.0% were larger than 37 kW (see Table 15).

- For the first time, this year's report provides detailed information on the share of pumps that meet the minimum requirements set out in the European Ecodesign Regulation No. 547/2012 with an MEI of ≥ 0.4: almost 92% of the water pumps sold in the **EU** met the minimum requirements (see Table 16).

Water pumps by output	Switzerland		EU	
	Quantity	Share	Quantity	Share
< 7.5 kW	36 293	64.5%	1 924 032	65.2%
7.5-37 kW	18 351	32.6%	939 760	31.8%
> 37 kW	1 630	2.9%	87 229	3.0%
Total	**56 274**	**100%**	**2 951 021**	**100%**
CH share EU	1.9%			

Table 15: **Pump sales in Switzerland and the EU in 2018: Water pumps**

Minimum requirements	Switzerland			EU		
Water pumps by type	< 7.5 kW	7.5-37 kW	> 37 kW	< 7.5 kW	7.5-37 kW	> 37 kW
ESCC	99.4%	99.5%	99.6%	90.6%	91.2%	92.0%
ESCCi	99.3%	99.5%	99.6%	90.7%	91.3%	91.9%
MS-V	99.8%	99.8%	99.9%	92.1%	92.9%	93.5%
MSS	99.8%	99.8%	99.9%	92.3%	93.0%	93.6%
ESOB	99.4%	99.5%	99.5%	90.7%	91.2%	91.9%
Total	**99.5%**	**99.6%**	**99.7%**	**91.3%**	**91.9%**	**92.6%**
Total	**99.6%**			**91.9%**		

Table 16: **Share of pump sales in Switzerland and the EU, which meet the minimum requirements**

Water pumps by type	Switzerland							
	< 7.5 kW		7.5-37 kW		> 37 kW		Total	
	Quanti-ty	Share	Quanti-ty	Share	Quanti-ty	Share	Quanti-ty	Share
ESCC	2 169	6.0%	4 648	25.3%	704	43.2%	7 521	13.4%
ESCCi	4 417	12.2%	1 989	10.8%	351	21.6%	6 757	12.0%
MS-V	8 885	24.5%	3 757	20.5%	26	1.6%	12 669	22.5%
MSS	16 383	45.1%	6 124	33.4%	549	33.7%	23 056	41.0%
ESOB	4 439	12.2%	1 833	10.0%	0*	0%	6 272	11.1%
Total	**36 293**	**100%**	**18 351**	**100%**	**1'630**	**100%**	**56 274**	**100%**

Table 17: **Water pump sales in Switzerland in 2018: water pump units by type**

*No products were sold in this category and size.

Water pumps by type	EU							
	< 7.5 kW		7.5-37 kW		> 37 kW		Total	
	Quantity	Share	Quanti-ty	Share	Quanti-ty	Share	Quantity	Share
ESCC	106 666	5.5%	222 282	23.7%	34 020	39.0%	362 968	12.3%
ESCCi	212 769	11.1%	96 678	10.3%	16 836	19.3%	326 283	11.1%
MS-V	414 786	21.6%	174 424	18.6%	7 519	8.6%	596 728	20.2%
MSS	966 187	50.2%	353 253	37.6%	28 853	33.1%	1 348 293	45.7%
ESOB	223 625	11.6%	93 124	9.9%	0*	0%	316 749	10.7%
Total	**1 924 032**	**100%**	**939 760**	**100%**	**87 229**	**100%**	**2 951 021**	**100%**

Table 18: **Water pump sales in the EU in 2018: water pump units by type**

*No products were sold in this category and size.

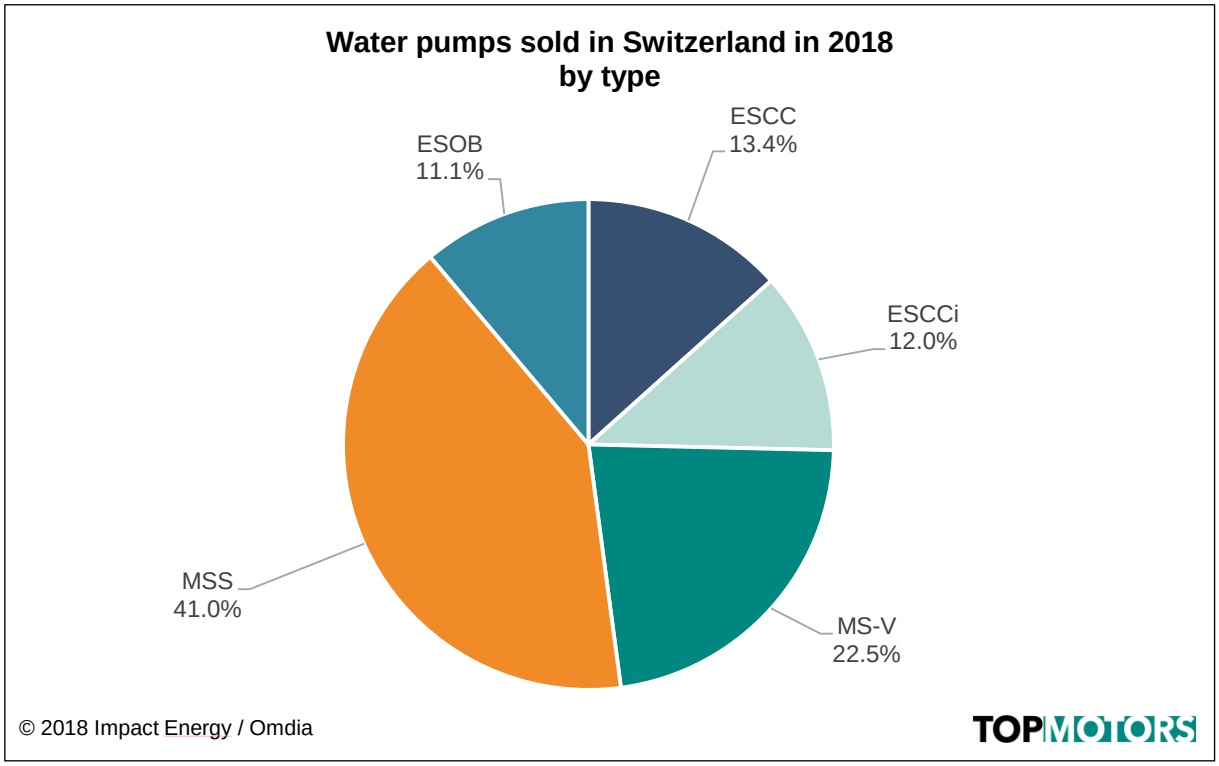

Figure 17: **Water pumps sold in Switzerland in 2018 by type**

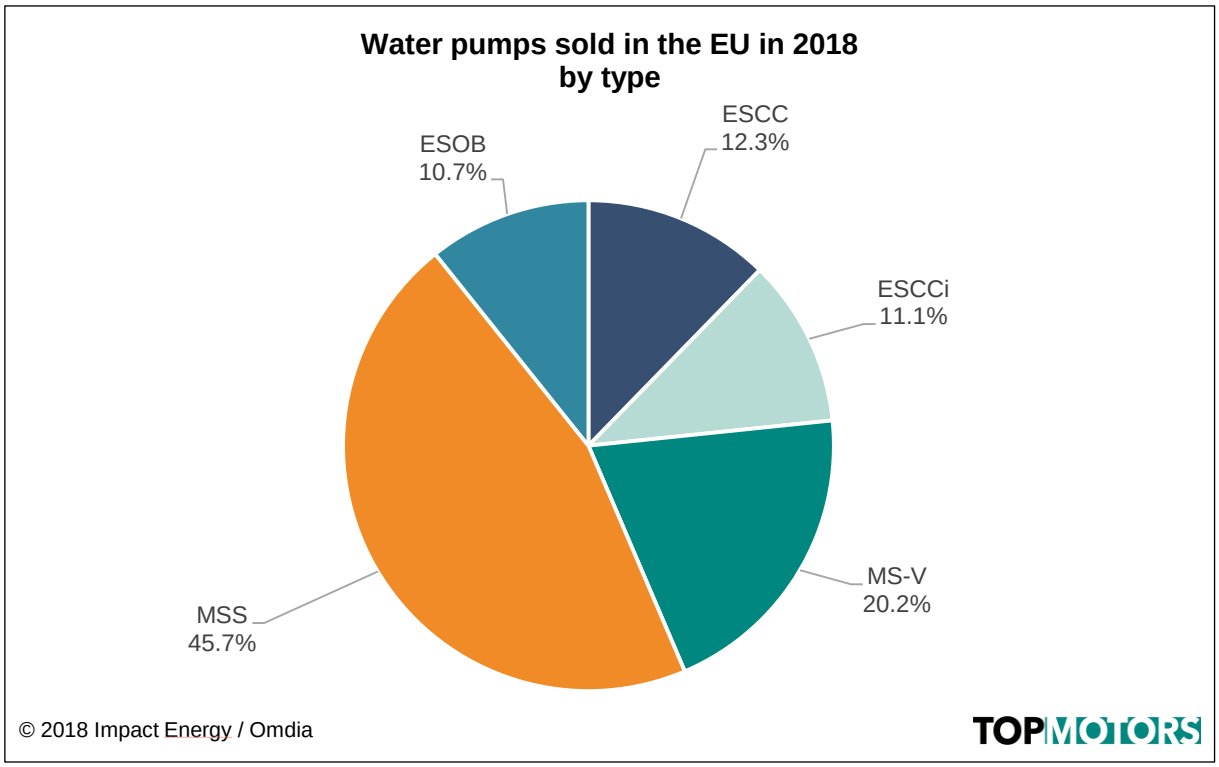

Figure 18: **Water pumps sold in the EU in 2018 by type**

7.2 Fans

EU Ecodesign Regulation 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

- In 2018, 90 791 fans were sold in **Switzerland**. Of these, 75.9% were smaller than 7.5 kW, 22.7% were between 7.5 - 37 kW and 1.4% were larger than 37 kW (see Table 19:). Around 31% of the fans were used in households, 50% in the service sector and 19% in industry.

- In 2018, 12 372 398 fans were sold in the **EU**. Of these, 75.2% were under 7.5 kW, 23.2% were between 7.5 - 37 kW and 1.6% were larger than 37 kW (see Table 19). Around 32% of the fans were used in households, 49% in the service sector and 19% in industry.

- The fans sold in **Switzerland** accounted for 0.7% of all fans sold in the **EU**.

2018	Switzerland		EU	
Fans	**Quantity**	**Share**	**Quantity**	**Share**
<7.5 kW	68 887	75.9%	9 303 575	75.2%
7.5-37 kW	2 0579	22.7%	2 876 058	23.2%
>37 kW	1 307	1.4%	192 765	1.6%
Total 2018	**90 791**	**100%**	**12 372 398**	**100%**
CH share EU	0.7%			

Table 19: Total fan sales in Switzerland and the EU in 2018

- About 98% of the fans sold in **Switzerland** met the minimum requirements specified in Annex 2.6 of the EnEV.
- About 90% of the fans sold in the **EU** met the minimum requirements set out by EU Ecodesign Regulation No. 327/2011.

Figure 19 shows the efficiency of the four basic fan types.

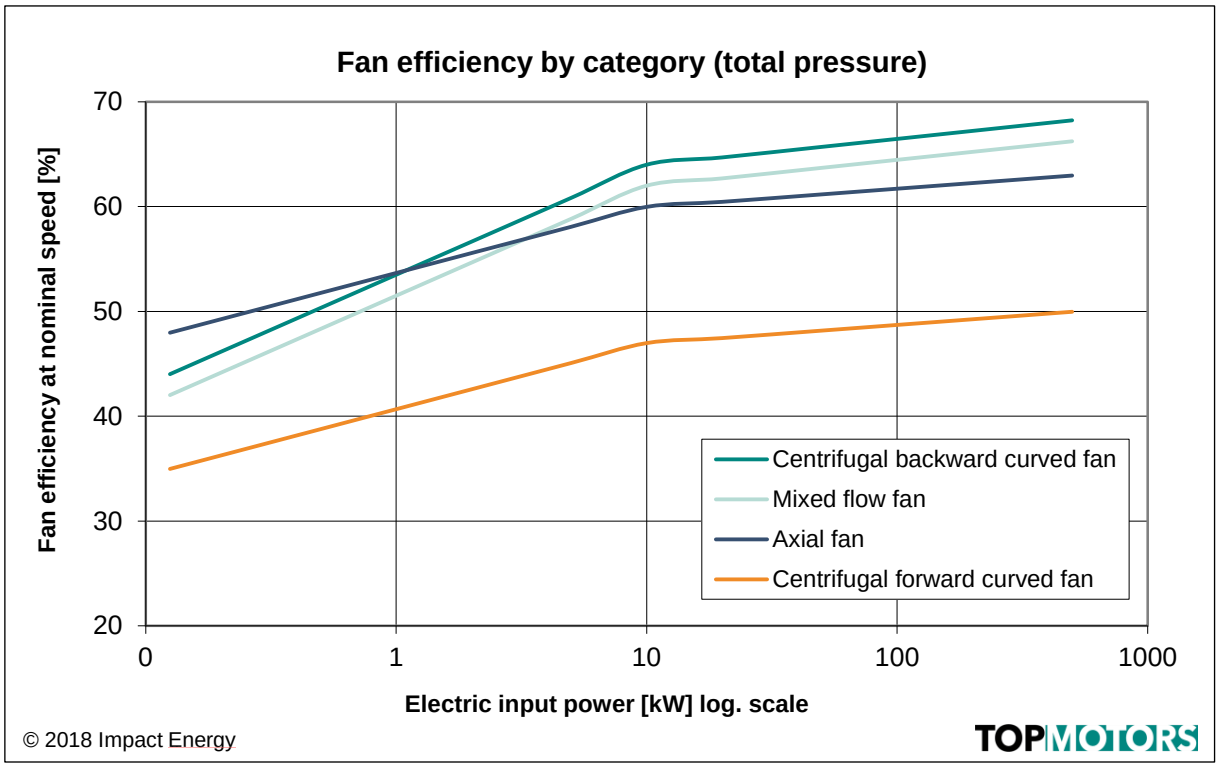

Figure 19: **Fan efficiency by type and size at maximum speed in accordance with EU Ecodesign Regulation No. 327/2011**

The distribution of fan types sold in Switzerland and the EU in 2018 is shown in Table 20 and also in Figure 20 and Figure 21.

- In both regions, axial fans accounted for the largest market shares by far, with 55.9 % in Switzerland and 53.8% in the EU (see Table 20).

Fans by types	Switzerland		EU	
	Total	%	Total	%
Axial fans	50 759	55.9%	6 661 299	53.8%
Centrifugal forward-curved fan Centrifugal radial bladed fan	19 517	21.5%	2 984 222	24.1%
Backward-curved fan (with housing)	7 720	8.5%	1 141 972	9.2%
Backward-curved fan (without housing)	9 212	10.1%	1 108 567	9.0%
Diagonal fan	898	1.0%	138 571	1.1%
Cross flow fan	2 685	3.0%	337 766	2.7%
Total	**90 791**	**100%**	**12 372 398**	**100%**

Table 20: **Fan sales in Switzerland and the EU in 2018: quantities by fan type**

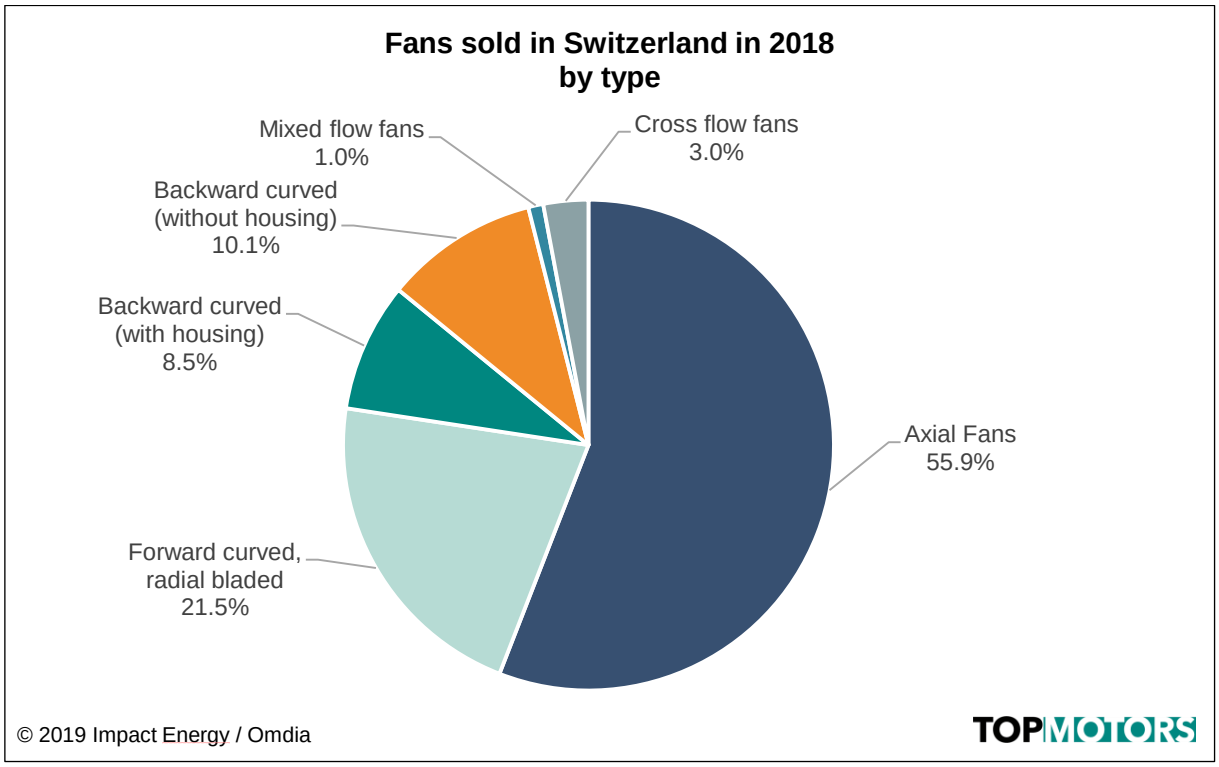

Figure 20: **Fans sold in Switzerland in 2018 by type**

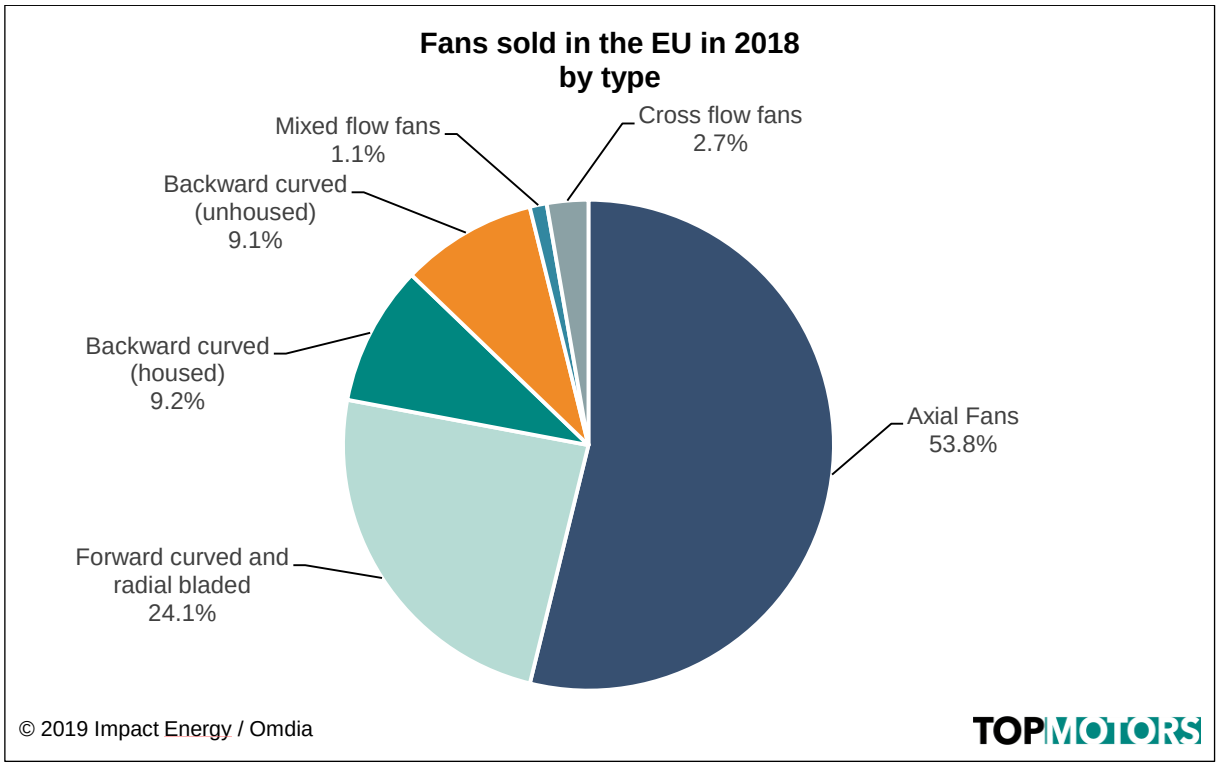

Figure 21: **Fans sold in the EU in 2018 by type**

8 Observations and recommendations

This study is the third of its kind to be conducted in Switzerland. The motor section was further developed compared to the Topmotors Market Report 2018. The section on pumps and fans was also expanded and refined, as was the comparison with European data.

The findings for the development of elements subject to minimum requirements in Switzerland are promising and must continue to be monitored annually.

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 1 000 kilowatts). In a second phase, the even higher efficiency class Super Premium IE4 will apply as from 1 July 2023 for medium-sized motors. 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, electric motors in motor systems account for around half of the total energy consumption in the EU. The new regulation and the tighter requirements will allow annual savings of 1.2 billion euros and 10 TWh of electric energy plus a reduction of 3 million tonnes of emissions of CO_2 equivalents. It is expected that Switzerland will soon apply these requirements.
This will open a new chapter for motors, which will once again require accurate, long-term observation. In terms of pumps and fans as well, the data collected and market share trends should be monitored in the coming years, in parallel with legal developments.

As regards the use of energy-efficient motor systems, Switzerland remains a leader in comparison to Europe. 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 due to historical and current managerial and incentive systems for the promotion of energy efficiency.

9 Contact

To improve the collection of data, all manufacturers and representatives of the products in the Swiss market analysed here are invited to make their data available to the market research group Omdia (if they have not already done so). Citing «Topmotors Market Report», please contact: Alastair Smith (alastair.smith@omdia.com).

10 References

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11 Annex

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.

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
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	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

Availability of motors 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.

2016								
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	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